
PowerPac Universal Power Supply

Instruction Manual

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



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Safety

Caution/Warning



PowerPac power supplies have been tested 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.



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.

- 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.
- Always connect the power supply to a 3-prong, grounded AC outlet, using the 3-prong AC power cord provided with the power supply.
- 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 61010-11 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.
- Do not operate the power supply in extreme humidity (>95%) or where condensation can short the internal electrical circuits of the power supply.
- 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.
- 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 might 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.

¹ IEC 61010-1 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 one-volt increments
- Current:** Adjustable from 10 to 2500 milliamps (mA) in one-milliamp increments
- Power:** Adjustable from 1 to 500 watts (W) in 1-watt increments
- Output jacks:** Four sets of output jacks are provided to facilitate connection of up to four identical electrophoresis cells simultaneously

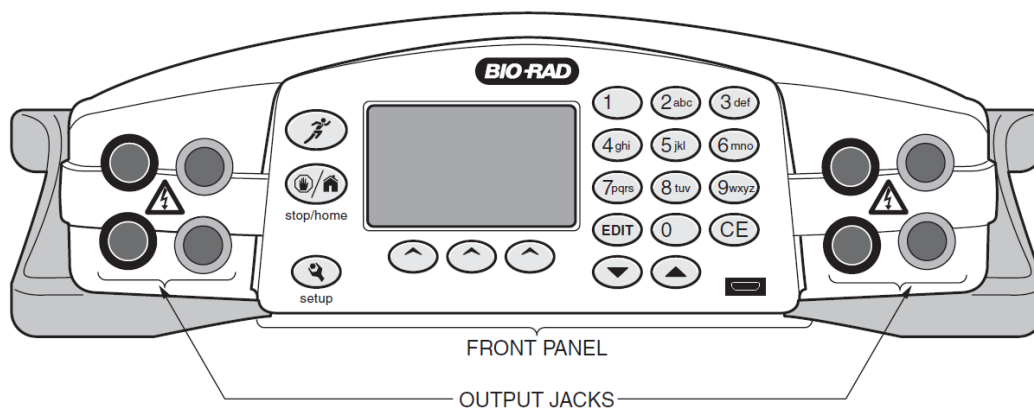


Figure 1. Front view

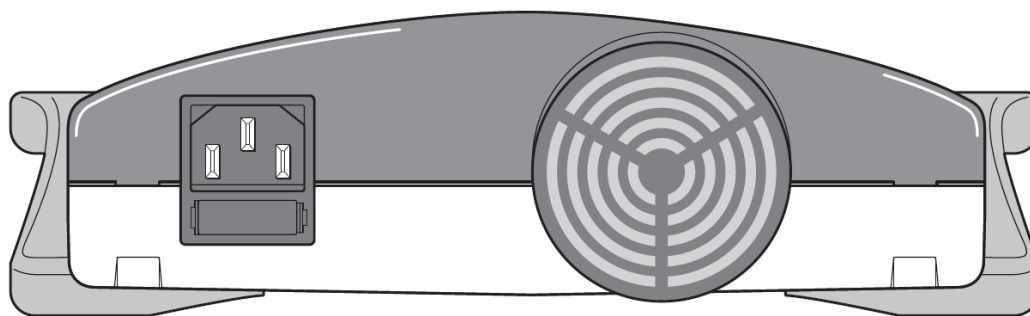


Figure 2. Rear view

The PowerPac Universal has the following features:

- Constant voltage, constant current, or constant power operation with automatic crossover
- Storage capacity for up to nine user-defined methods, with up to nine steps in each method
- Three user-definable, single-step methods accessible from the Home (startup) screen
- 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
- LCD screen displays all run parameters at once
- IEC 61010-1 international safety certification
- Input power 100–240 VAC, 50/60 Hz
- Four output terminals
- Stackable case with adjustable viewing angle via flip down legs (see Figure 3)
- Micro USB port **for Bio-Rad service use only**

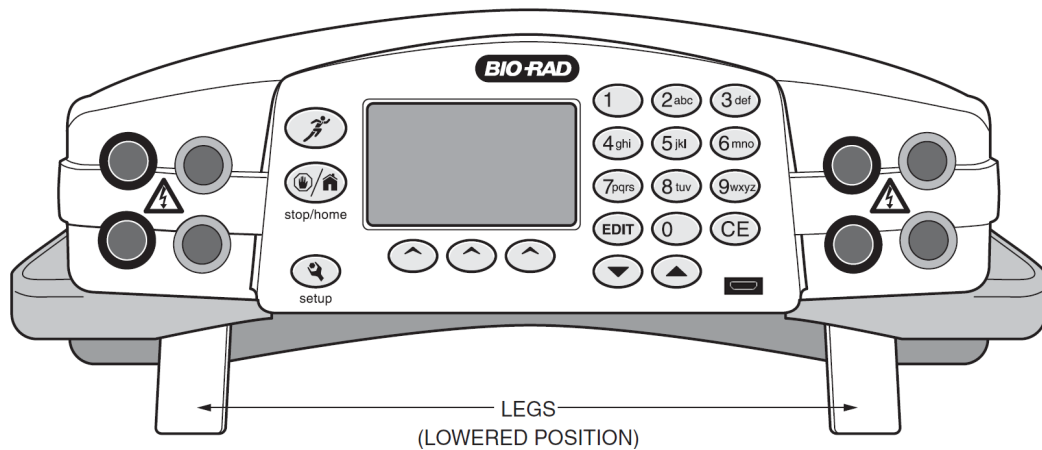


Figure 3. Front view with legs in lowered position

1.2 Unpacking

When you receive your power supply, carefully inspect the container for any damage which might have occurred in shipping. Severe damage to the container might 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 might 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

NOTE: If any part is missing, contact Bio-Rad Laboratories immediately.

Section 2 Control Features

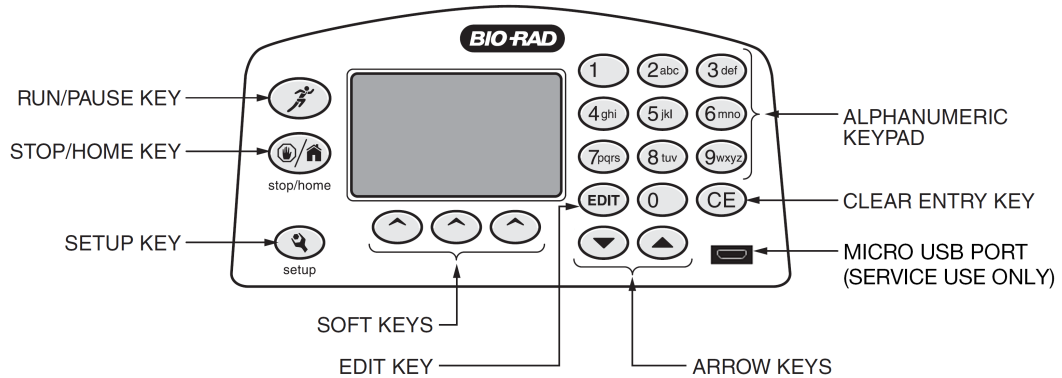








Figure 4. Front Panel

| Key | Description |
|---|---|
| RUN/PAUSE  | Starts or pauses a run. When paused, the run parameters for the current or subsequent step(s) can be edited. The modified method can 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, you must press SAVE 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. The selected item is indicated by inverted text on the LCD display. |
| CE  | Deletes alpha-numeric characters from a parameter value or method name, or restores a 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 causes the character displayed at the cursor position to toggle between those associated with the key (e.g., 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. |

Section 3

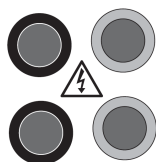
Setup and Operation

3.1 Setup

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

| Step | Procedure | Description |
|------|-----------|-------------|
|------|-----------|-------------|

1. Connect electrophoresis cells.



Insert power leads into one of the output terminals located on the front of the power supply.

NOTE: The ⚡ symbol indicates high voltages. Insert the power leads perpendicular to the curve of the case (see Figure 5).

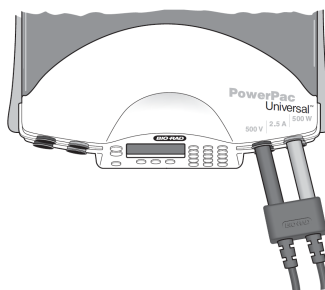


Figure 5. Power leads connected correctly

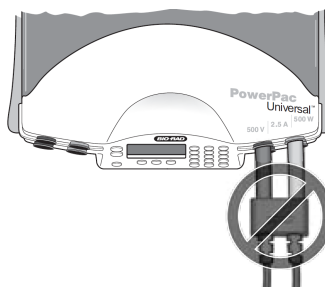
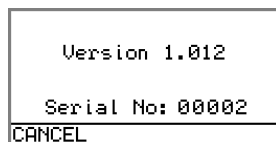


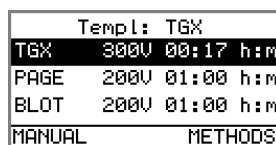
Figure 6. Power leads connected incorrectly

2. Turn on power.



Power-up screen





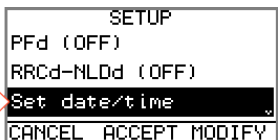
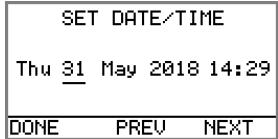
Use the switch located on the right side of the power supply to turn the power on. When turned on, the unit briefly displays the firmware version and serial number and then goes to the Home screen. Use the Home screen soft keys to operate the power supply in Manual mode ([see Section 3.3](#)) or method mode ([see Section 3.4](#)).





Home screen

MANUAL mode: Program and run a single-step method without saving it to memory.

METHOD mode: Program, save, and run single- or multi-step methods.






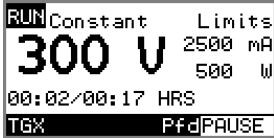





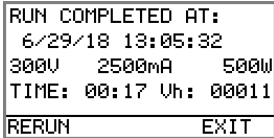
| Step | Procedure | Description |
|------|--|---|
| 3. | Open the setup editor.  | Press SETUP to start the setup editor. You can press the SETUP key from any screen, except the run screen. |
| 4. | Set the power failure detection (PFd) mode.  | <p>a. Use the up/down arrow keys to highlight the PFd setting.</p> <p>b. Press the MODIFY key to display the appropriate option:</p> <ul style="list-style-type: none"> • OFF: Turns PFd off. If a power failure occurs, the run is terminated. • ON NEXT RUN ONLY: Turns PFd on for a single run. • ON: Turns PFd on. The run will resume when the power is restored after single or multiple power failures. <p>WARNING: Turning the power supply off to stop a run in progress is regarded as a power failure and the interrupted run, if PFd is set to ON, will resume the next time the power supply is turned on.</p> |
| 5. | Set the Rapid Resistance Change detection/No Load detection (RRCd-NLDd) mode.  | <p>a. Use the up/down arrow keys to highlight the RRCd-NLDd setting.</p> <p>b. Press the MODIFY key to display the appropriate option:</p> <ul style="list-style-type: none"> • OFF: Turns RRCd-NLDd off. Detection of a load change greater than 20% or 15 mA, or the absence of a load (current is less than 2 mA), causes an alarm to sound and pauses the run. • ON: Turns RRCd-NLDd on. Does not detect sudden load changes or the absence of a load. In this mode, the  symbol is displayed on the Run screen as a reminder that this safety feature has been turned off. <p>NOTE: This mode is used to complete electrophoresis applications such as the D-Code (requires that Rapid Resistance Change detection be turned off) or applications such as isoelectric focusing (requires < 2 mA current).</p> |
| 6. | Set the clock (date/time).   | <p>a. Use the up/down arrow keys to highlight Set date/time.</p> <p>b. Press the MODIFY key to enter the edit mode.</p> <p>c. Use the PREV and NEXT soft keys to move the cursor between the day, date, and time fields. Use the alphanumeric keypad to enter the date and time values, and use the up/down arrow keys to set the month and year.</p> <p>d. Press the DONE soft key when you've completed the settings. Press Setup once to return to the previous screen or twice to exit setup mode.</p> <p>NOTE: The PowerPac Universal contains an internal battery to maintain the clock settings during power off.</p> |

| Step | Procedure | Description |
|------|--|---|
| 7. | Set the display contrast.  | a. Use the up/down arrow keys to highlight Disp. contrast. b. Press the MODIFY key to enter the edit mode. c. Use the alpha-numeric keypad to enter the contrast setting (range: 1–9). d. Press the DONE soft key when you've completed the setting. |
| 8. | Set the key chirp mode.  | a. Use the up/down arrow keys to highlight the Key chirp setting. b. Press the MODIFY key to toggle the chirp mode on and off: <ul style="list-style-type: none"> • OFF: No sound is produced when touchpad keys are pressed. • ON: A chirp sound is produced whenever any touchpad key is pressed. <p>NOTE: The chirp mode setting does not affect alarms.</p> |
| 9. | Accept the setup changes. | Press the ACCEPT soft key to save all setup changes. The display returns to the Home screen . Alternatively, you can press the CANCEL soft key to cancel all setup changes. |




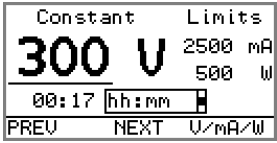



3.2 Using the Templates

The Home screen provides access to three templates designed to accommodate common TGX, PAGE, and Agarose blot (BLOT) protocols. The templates are provided as a fast and easy way to execute a saved, user-defined, single-step run from the Home screen. You can run these templates as is (see [Section 3.2.1](#)), or you can edit them for your needs (see [Section 3.2.2](#)).

3.2.1 Run a Template



| Step | Procedure | Description |
|------|---|---|
| 1. | Set up the power supply. | Refer to Section 3.1 for instrument setup. |
| 2. | Navigate to the Home screen.  | Press the  key to navigate to the Home screen, where the three templates are displayed. |
| 3. | Select the template to run.  | Press the up/down arrow keys to highlight the template you want to run. |
| 4. | Start the run.  | Press  to start the run. |
| 5. | Monitor the run.  | Use the Run screen to monitor run parameters or to pause a run. The Run screen displays the elapsed time versus the programmed time, voltage, current, and power values. To stop or terminate the run, press  . To pause the run, press the PAUSE soft key or  . To resume, press the RESUME soft key or  . While paused, you can edit the run as follows: a. From the Run Paused screen, press the EDIT soft key or  . b. Edit the parameters (see Step 3 in Section 3.2.2 for details) c. When you finish editing the parameters, press  to resume the run with the new parameters. NOTE: The template (method) is automatically saved with the new parameters. |
| 6. | Exit the Run Completed screen.  | After the run is complete, the Run Completed screen appears. Press the EXIT soft key to return to the Home screen. |

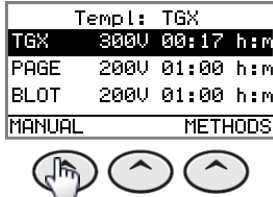
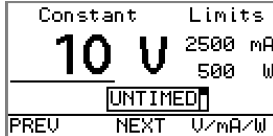
3.2.2 Edit a Template





| Step | Procedure | Description |
|------|--|---|
| 1. | Select the template to edit.  | Starting at the Home screen, press the up/down arrow keys to highlight the template you want to edit. |
| 2. | Enter the edit mode.  | Press  to access the template's parameter screen. |
| 3. | Adjust the run parameters. The following screen shows the factory default parameters for the TGX template:  | <p>The parameter ranges are as follows:</p> <ul style="list-style-type: none"> • V (volts): 10–2500 • mA (milliamps): 10–2500 • W (watts): 1–500 • hh:mm (timer hours and minutes): 00:01–99:59 • VHOURS (timer volt-hours): 1–99999 <p>a. Use the alpha-numeric keypad to enter the Constant value.</p> <p>b. Press the NEXT soft key to highlight the timer value.</p> <p>c. Do one of the following, depending on the timer mode you need:</p> <ul style="list-style-type: none"> • Timer hours/minutes (default): <ul style="list-style-type: none"> i) Use the alpha-numeric keypad to adjust the timer value. ii) Press the NEXT soft key. • Timer volt-hours: <ul style="list-style-type: none"> i) Press the NEXT soft key. ii) Use the up/down arrow keys to set the timer mode to VHOURS. iii) Press the PREV soft key or  to highlight the timer value, and use the alpha-numeric keypad to enter the volt-hours value. iv) Press the NEXT soft key. • Untimed: <ul style="list-style-type: none"> i) Press the NEXT soft key. ii) Use the up/down arrow keys to set the timer mode to VHOURS. <p>d. Press the NEXT soft key (<u>twice</u> for timed runs) to highlight the top-right limits parameter, and use the alpha-numeric keypad to set the parameter value.</p> <p>e. Press the NEXT soft key to highlight the lower-right limits parameter, and use the alpha-numeric keypad to set the parameter value.</p> |
| 4. | Return to the Home screen.  | Press  to return to the Home screen. NOTE: The template (method) is automatically saved with the new parameters. |

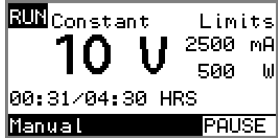
3.3 Manual Mode Operation

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

The Manual mode allows you to program and start a single-step run with a minimum number of keypad touches. The settings for a Manual mode run are saved as soon as you either execute the run by pressing the  key or return to the Home screen by pressing the  key, and will persist until you implement new parameters in Manual mode. Manual mode settings are not affected by cycling power or by executing stored runs using the Method operating mode (see [Section 3.4](#)).

| Step | Procedure | Description |
|------|---|--|
| 1. | Set up the power supply. | Refer to Section 3.1 for instrument setup. |
| 2. | Select the Manual mode. | On the Home screen, press the MANUAL soft key to perform a single-step run in Manual mode. NOTE: To create and run with a multi-step method, press METHODS and refer to Section 3.4 for instructions. |
| |  | |
| 3. | Select the control parameter (Constant). | Use the V/mA/W soft key to select the control parameter (volts, milliamps, or watts) according to your preference. Each press of the V/mA/W soft key cycles through the parameters. The selected parameter (Constant) appears on the left in large bold text, and is set to its minimum value. The limit parameters (Limits) appear on the right in smaller text on two lines, and are set to their respective maximum values. |
| |  | |

| Step | Procedure | Description |
|------|----------------------------|---|
| 4. | Adjust the run parameters. | <p>NOTE: If you will perform the run as an un-timed run at the default parameter values, skip to Step 5.</p> <p>The parameter ranges are as follows:</p> <ul style="list-style-type: none"> • V (volts): 10–2500 • mA (milliamps): 10–2500 • W (watts): 1–500 • VHOURS (timer volt-hours): 1–99999 • hh:mm (timer hours and minutes): 00:01–99:59 <ol style="list-style-type: none"> a. Use the alpha-numeric keypad to enter the Constant value. b. Press the NEXT soft key to highlight the timer. c. Press the up/down arrow keys to select the timer mode: UNTIMED, VHOURS, or hh:mm. <p>NOTE: If you are creating an UNTIMED run, skip to Step 4.e.</p> d. Press the PREV soft key or  to highlight the timer value, and use the alpha-numeric keypad to enter the timer value. e. Press the NEXT soft key (<u>twice</u> for timed runs) to highlight the top-right limits parameter, and use the alpha-numeric keypad to set the parameter value. f. Press the NEXT soft key to highlight the lower-right limits parameter, and use the alpha-numeric keypad to set the parameter value. |
| 5. | Start the run. | <p>Press the run key to start the run.</p> <p>NOTE: The run parameters are automatically saved, and persist until you establish new parameters in the Manual mode.</p> |
| 6. | Monitor the run. | <p>Use the Run screen to monitor run parameters or to pause a run. The Run screen displays the elapsed time versus the programmed time, voltage, current and power values.</p> <p>To pause the run, press the PAUSE soft key or . To resume, press the RESUME soft key or . While paused, you can edit the run (see Section 3.4.3 for details).</p> <p>To stop or terminate the run, press .</p> |

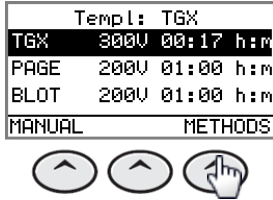

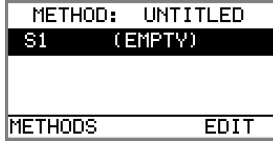
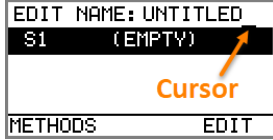
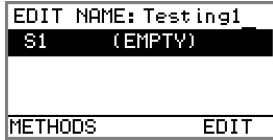


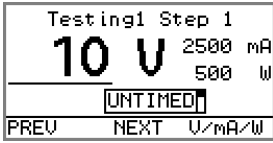
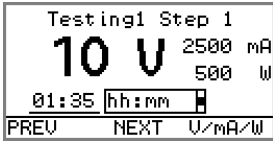

3.4 Method Mode Operation



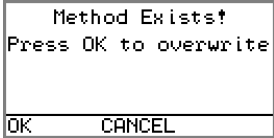

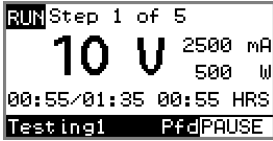
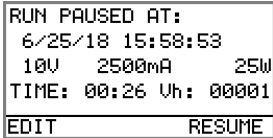
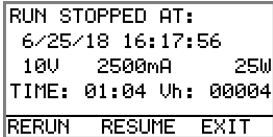



This section describes how to program and perform a run in Method mode. Method mode operation allows users to create and run single-step and multi-step methods. In method mode, up to nine methods, each with up to nine steps, can be programmed, stored, or edited.

3.4.1 Create and Run a New Method

This section describes how to create and run a new method.

| Step | Procedure | Description |
|------|--|---|
| 1. | Set up the power supply. | Refer to Section 3.1 for instrument setup. |
| 2. | Select the programming mode. | On the Home screen, press the METHODS soft key to display the Method List screen. |
| |  | |
| 3. | Create a new method. | To begin creating a new method, press the NEW soft key. The Method screen appears with S1 (EMPTY) flashing, and the soft keys change to METHODS and EDIT. |
| |   | <p>NOTE: Up to nine methods can be stored in the PowerPac. 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/down arrow keys to select a method and then press the DELETE soft key.</p> |
| 4. | Name the new method. | Use the following process to name the new method: |
| |   | <ol style="list-style-type: none"> Press the up arrow key to select the method name field. A blinking cursor appears to the right of the method name (UNTITLED_). Press the (CE) key multiple times to delete the characters (right to left) in the method name. Use the alpha-numeric keypad to enter the new method's name (up to 10 characters). For assistance, refer to the alpha-numeric keypad description (page 5). The example to the left shows a method name of Testing1. Press the down arrow key to accept the method name. The S1 (EMPTY) step resumes flashing, which indicates that Step 1 is undefined and is ready for you to edit it. |

| Step | Procedure | Description |
|------|--|--|
| 5. | <p>Edit the first step in the method.</p>   | <p>a. Press the EDIT soft key to open the Step Edit screen and edit Step 1 (S1).</p> <p>b. Use the V/mA/W soft key to select the control parameter (volts, milliamps, or watts) according to your preference. Each press of the V/mA/W soft key cycles through the parameters. The selected control parameter appears on the left in large bold text, and is set to its minimum value. The limit parameters appear on the right in smaller text on two lines, and are set to their respective maximum values.</p> <p>c. Adjust the run parameters for the current step. ← See a finished example on the left. The parameter ranges are as follows: <ul style="list-style-type: none"> • V (volts): 10–2500 • mA (milliamps): 10–2500 • W (watts): 1–500 • V HOURS (timer volt-hours): 1–99999 • hh:mm (timer hours and minutes): 00:01–99:59 </p> <p>i) Use the alpha-numeric keypad to enter the Constant value.</p> <p>ii) Press the NEXT soft key to highlight the timer.</p> <p>iii) Press the up/down arrow keys to select the timer mode: UNTIMED, V HOURS, or hh:mm. NOTE: If you are creating an untimed run, skip to Step 5.c.v. Be aware that steps subsequent to an untimed step are ignored.</p> <p>iv) Press the PREV soft key or EDIT to highlight the timer value, and use the alpha-numeric keypad to enter the timer value.</p> <p>v) Press the NEXT soft key (<u>twice</u> for timed runs) to highlight the top-right limits parameter, and use the alpha-numeric keypad to set the parameter value.</p> <p>vi) Press the NEXT soft key to highlight the lower-right limits parameter, and use the alpha-numeric keypad to set the parameter value.</p> <p>vii) Press EDIT to navigate to the Method screen. Before adding more steps to the method, or saving the method, you must navigate to the Method screen.</p> <p>If you need to add more steps, proceed to Step 6; otherwise, skip to Step 7 to save the method.</p> |
| |  | |

| Step | Procedure | Description |
|------|---|--|
| 6. | <p>Add additional steps to the method.</p>  | <p>For each additional step (up to nine total) complete the following:</p> <ol style="list-style-type: none"> On the Method screen, press the down arrow to highlight the next EMPTY step. Complete the step definition procedure in Step 5 (page 15). <p>After you are finished creating the necessary steps for the method, proceed to Step 7 to save the method.</p> |
| 7. | <p>Save the method.</p>  | <p>Use the following process to save the method:</p> <ol style="list-style-type: none"> On the Method screen, press the METHODS soft key to access the Method List screen. On the Method List screen, press the SAVE soft key to save the method. Notice that the “(unsaved)” portion of the method name is removed and the SAVE soft key label changes to NEW. If you need to make changes to the method, press the OPEN soft key and edit the steps as needed (for assistance, see Section 3.4.2); otherwise, proceed to Step 9. <p>NOTE: If you edit a method, pressing the SAVE soft key from the Method List screen displays the Method Exists! message. Press the OK soft key to save (overwrite) the edited method.</p>  |
| 8. | <p>Start the run.</p>  | <p>Press the run key to start the run.</p> |
| 9. | <p>Monitor the run.</p>    | <p>Use the Run screen to monitor run parameters or to pause a run. The Run screen displays the following:</p> <ul style="list-style-type: none"> The method being run The present step being run in the method The elapsed time versus the programmed time The present voltage, current, and power values <p>To pause the run, press the PAUSE soft key or . To resume, press the RESUME soft key or . While paused, you can edit the run (see Section 3.4.3 for details).</p> <p>To stop the run, press . The Run Stopped screen appears. From this screen, you can rerun the method from the beginning (RERUN soft key), resume the run (RESUME soft key), or terminate the run (EXIT soft key).</p> |

| Step | Procedure | Description |
|------|---------------------------|--|
| 10. | View the run information. | After the run is complete, the Run Completed screen appears. |

```

RUN COMPLETED AT:
 6/25/18 15:42:18
 10V 2500mA 25W
TIME: 01:35 UH: 00005
RERUN          EXIT

```

3.4.2 Edit (or View) and Run a Saved Method

This section describes how to edit, view, and run a saved method. The procedure below also describes how to create a new method derived from an existing method

| Step | Procedure | Description |
|------|------------------------------|--|
| 1. | Set up the power supply. | Refer to Section 3.1 for instrument setup. |
| 2. | Select the programming mode. | On the Home screen, press the METHODS soft key to access the Method List screen. |

```

Templ: TGX
TGX 300V 00:17 h:m
PAGE 200V 01:00 h:m
BLOT 200V 01:00 h:m
MANUAL          METHODS

```

| | | |
|----|--------------------------|---|
| 3. | Open an existing method. | On the Method List screen, use the up and down arrow keys to select a method to edit and then press the OPEN soft key to view the method. |
|----|--------------------------|---|

```

--METHOD LIST--
Testing1
METHODS DELETE NEW

```

| | | |
|----|------------------------|--|
| 4. | Select a step to edit. | Press the up or down arrow key to select the step you want to edit, and then press the EDIT soft key to view the step parameters. 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 as described in Step 4 of Section 3.4.1 on page 14 . |
|----|------------------------|--|

```

METHOD: Testing1
S1 10V 01:35 h:m
S2 120V 00240 UHR
S3 1800mA 00:32 h:m
METHODS DELETE EDIT

```

| | | |
|----|-------------------------------------|--|
| 5. | Edit the selected step. | Edit the step according to the process in Step 5 of Section 3.4.1 on page 15 . |
| 6. | Add additional steps to the method. | For each additional step (up to nine total) complete the following: <ul style="list-style-type: none"> a. On the Method screen, press the down arrow to highlight the next EMPTY step. b. Complete the step definition procedure in Step 5 (page 15). <p>After you are finished creating the necessary steps for the method, proceed to Step 7 to save the method.</p> |

```

METHOD: Testing1
S1 10V 01:35 h:m
S2 (EMPTY)
METHODS          EDIT

```

| Step | Procedure | Description |
|------|-----------|-------------|
|------|-----------|-------------|

7. Save the method.

```
METHOD: Test ing1
S1 10V 01:35 h:m
S2 120V 00240 VHR
S3 1800mA 00:32 h:m
METHODS DELETE EDIT
```

Use the following process to save the method:

- a. On the Method screen, press the METHODS soft key to access the Method List screen. Notice that edits are made to a copy of the original method. The edited method appears in the method list with the name of the original method appended with (unsaved).

```
--METHOD LIST--
Test ing1 (unsaved)
Test ing1
OPEN DELETE SAVE
```

- b. Starting from the Method List screen, you can either overwrite the existing method or save the new version with a different name. Therefore, do one of the following:

- Overwrite the existing method:
 - i) Press the SAVE soft key to save the method. Notice that pressing the SAVE soft key on the Method List screen displays the Method Exists! screen.


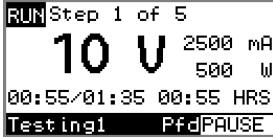
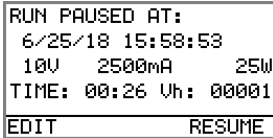


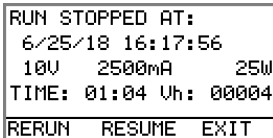


```
Method Exists!
Press OK to overwrite
OK CANCEL
```

- ii) Press the OK soft key to save (overwrite) the previous version of the method.

```
--METHOD LIST--
Test ing1
OPEN DELETE NEW
```

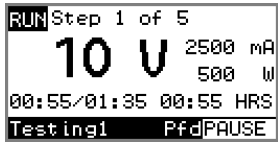

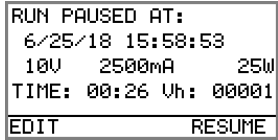

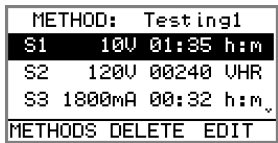


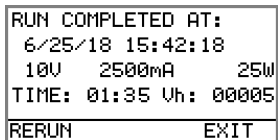
- Save the edited method with a new name:
 - i) Press the OPEN soft key.
 - ii) Press the up arrow key until EDIT NAME appears at top of the screen and a cursor appears to the right of the method name.
 - iii) Press the **CE** key multiple times to delete the characters (right to left) in the method name.
 - iv) Use the alpha-numeric keypad to enter the new method's name (up to 10 characters).
 - v) Press the Methods soft key.
 - vi) Press the SAVE soft key. The example the follows shows the new method name as Another1.

```
--METHOD LIST--
Another1
Test ing1
OPEN DELETE NEW
```

| Step | Procedure | Description |
|------|---|---|
| 8. | Start the run.  | Press the run key to start the run. |
| 9. | Monitor the run.  | Use the Run screen to monitor run parameters or to pause a run. The Run screen displays the following: <ul style="list-style-type: none"> • The method being run • The present step being run in the method • The elapsed time versus the programmed time • The present voltage, current, and power values |
| |  | To pause the run, press the PAUSE soft key or  . To resume, press the RESUME soft key or  . While paused, you can edit the run (see Section 3.4.3 for details). |
| |  | To stop the run, press  . The Run Stopped screen appears. From this screen, you can rerun the method from the beginning (RERUN soft key), resume the run (RESUME soft key), or terminate the run (EXIT soft key). |
| 10. | View the run information.  | After the run is complete, the Run Completed screen appears. |

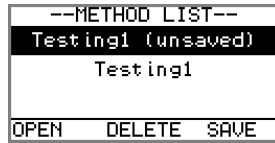
3.4.3 Edit a Paused Run

This section describes how to edit a paused run.

| Step | Procedure | Description |
|------|---|---|
| 1. | Pause the run.  | While a run is in progress (Run screen is displaying a run in progress), press the PAUSE soft key or  . The PowerPac displays a Run Paused screen. |
| 2. | Edit the method.  | The Run Paused screen displays the current run parameters, as well as the date and time that the run was paused. Press the EDIT soft key or  to begin editing the method. |
| 3. | Edit each step as needed.  | For each step you want to edit: <ol style="list-style-type: none"> Press the up or down arrow key to select the step. Press the EDIT soft key to view the step's parameters. Edit the step's parameters according to the process in Step 5 of Section 3.3.1 on page 15. If needed, add steps to the method according to the process in Step 6 of Section 3.3.1 on page 16. When you are finished with edits, proceed to Step 4. |
| 4. | Resume the run.  | Press  to resume the run. NOTE: Let the run finish before proceeding to Step 5. |
| 5. | Exit the Run Completed screen.  | After the run is complete, the Run Completed screen appears. Press the EXIT soft key to return to the Method List screen. |

| Step | Procedure | Description |
|------|-----------|-------------|
|------|-----------|-------------|

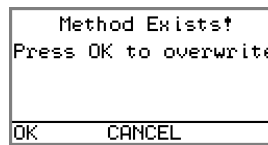
6. Save the changes.



Notice that after editing an existing method – even while the method was running – the PowerPac instrument makes a copy of the original method. The edited method appears in the method list with the name of the original method appended with (unsaved).

Starting from the Method List screen, you can either overwrite the existing method or save the new version with a different name. Therefore, do one of the following:

- Overwrite the existing method:
 - a. Press the SAVE soft key to save the method. Notice that pressing the SAVE soft key on the Method List screen displays the Method Exists! screen.



- b. Press the OK soft key to save (overwrite) the old version of the method.



- Save the edited method with a new name:
 - a. Press the OPEN soft key.
 - b. Press the up arrow key until EDIT NAME appears at top of the screen and a cursor appears to the right of the method name.
 - c. Press the **CE** key multiple times to delete the characters (right to left) in the method name.
 - d. Use the alpha-numeric keypad to enter the new method's name (up to 10 characters).
 - e. Press the Methods soft key.
 - f. Press the SAVE soft key.

Section 4

Maintenance and Troubleshooting

4.1 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.

4.2 Troubleshooting

4.2.1 Basic Troubleshooting

| Problem | Cause | Solution |
|---|--|--|
| No display/lights/fan | <ol style="list-style-type: none">1. No AC power.2. Failed fuse. | <ol style="list-style-type: none">1. Check if the PowerPac Universal is unplugged, or if there is a problem with the AC power source, or if the power switch is in the off position.2. Replace the fuse. See Section 4.3 for details. |
| Repeated failed fuses | Hardware failure. | Contact Bio-Rad Technical Support. |
| 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 #165-5061), which accommodates most standard 4 mm banana lugs, to make secure electrical connection. CAUTION: Use of this PowerPac adaptor voids IEC 61010-1 safety provisions. |
| Clock loses settings on power off | Onboard battery depleted. | Contact Bio-Rad Technical Support. |

4.2.2 Power Failure Detection

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

ON: PFd is enabled and "PFd" appears on the run screen. A run will resume when power is restored after single or multiple power failures(s).

ON NEXT RUN ONLY: PFd is enabled for a single run and is then disabled for all subsequent runs. "PFd" appears on the run screen for the run in which it is active.

OFF: PFd is disabled. A run will terminate if a power failure occurs and Error code 07 appears on the screen (see [Section 4.2.4](#)).


If a power failure occurs during a run the following screens will appear, depending on the PFd Mode.

| PFd Mode | Screen(s) Displayed | Description |
|----------|---|---|
| ON | <pre> RUN COMPLETED AT: 6/29/18 12:35:56 200V 105mA 21W TIME: 00:01 Vh: 00002 RERUN MORE EXIT </pre> <pre> AC POWER INTERRUPTED AT: 6/29/18 12:35:00 RESTARTED RUN AT: 6/29/18 12:35:57 RERUN BACK EXIT </pre> | <p>The Run Completed screen includes the "MORE" item when a run has terminated due to a power failure.</p> <p>Press the MORE soft key to display details about the most recent power outage and when power was restored, and then do one of the following:</p> <ul style="list-style-type: none"> • 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. |
| OFF | <pre> ERROR STOP: CODE 7 RUN POWER FAILURE RUN STOPPED RESET WHEN READY RESET </pre> | <p>This error screen appears if a run has terminated due to a power failure.</p> <p>Press the RESET soft key to return to the Home screen.</p> |

4.2.3 Rapid Resistance Change Detection/No Load Detection

Rapid Resistance Change detection/No Load detection (RRCd-NLDd) is used to determine the instrument's 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.

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 4.2.4](#), ERROR STOP 01 and 09).

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

NOTE: This mode is used to complete electrophoresis applications such as the D-Code (requires that Rapid Resistance Change detection be turned off) or applications such as isoelectric focusing (requires < 2 mA current).

4.2.4 Error Messages

| Error Message | Cause | Solution |
|--|---|---|
| <p>ERROR STOP: CODE 01 NO LOAD DETECTED CORRECT AND CONTINUE <u>RUN PAUSED</u> CONTINUE CANCEL</p> | <ol style="list-style-type: none"> 1. Electrophoresis cell not connected to the power supply, or buffer levels too low 2. Current load less than 2 mA | <ol style="list-style-type: none"> 1. Make sure all electrical connections make good contact and the cables and wire electrodes are in good condition. Verify buffer levels are appropriate. 2. Verify the electrophoresis application power requirements match PowerPac Universal output range. NOTE: The No Load detection can be deactivated (see Sections 3.1 and 4.2.3). |
| <p>ERROR STOP: CODE 02 OVER CURRENT CORRECT AND CONTINUE <u>RUN PAUSED</u> CONTINUE CANCEL</p> | <p>Output leads shorted, or there is shorting due to wrong connections</p> | <p>Make sure all electrical connections make good contact and the cables and wire electrodes are in good condition. Verify buffer levels are appropriate.</p> |
| <p>ERROR STOP: CODE 03 OVER VOLTAGE CORRECT AND CONTINUE <u>RUN PAUSED</u> CONTINUE CANCEL</p> | <p>Control circuitry problems</p> | <p>Press the CONTINUE soft key to continue the run. If the problem continues, cycle power and restart the run. If the problem still persists, contact Bio-Rad Technical Support.</p> |
| <p>ERROR STOP: CODE 04 WATCHDOG TIMEOUT</p> | <p>Internal firmware failure</p> | <p>Cycle power and restart the run. If the problem still persists, contact Bio-Rad Technical Support.</p> |
| <p>ERROR STOP: CODE 05 STUCK KEY</p> | <p>Key on the front panel stuck</p> | <p>Make sure keypad is not coated with foreign substance. Try running fingers over keypad to loosen keys. If the problem persists, contact Bio-Rad Technical Support.</p> |
| <p>ERROR STOP: CODE 06 OUTPUT HIGH</p> | <ol style="list-style-type: none"> 1. Attempted restart before output has discharged 2. Very low loading | <ol style="list-style-type: none"> 1. Wait longer before restarting. 2. Check connections for external device driving the output. <p>If the problem persists, contact Bio-Rad Technical Support.</p> |
| <p>ERROR STOP: CODE 07 RUN POWER FAILURE RUN TERMINATED <u>RESET WHEN READY</u> RESET</p> | <p>AC Power interrupted during the run and the run was terminated because the Power Failure detection is OFF</p> | <p>To continue a run after a power failure, activate the Power Failure Detection mode (see Section 3.1).</p> |

| Error Message | Cause | Solution |
|--|--|---|
| <p>ERROR STOP: CODE 08 REGULATION ERROR RUN TERMINATED <u>RESET WHEN READY</u> RESET</p> | Control circuitry problems | Press the RESET soft key to clear the screen, then restart the run. If the problem continues, cycle power and restart the run. If the problem still persists, contact Bio-Rad Technical Support. |
| <p>ERROR STOP: CODE 09 RAPID CHANGE IN R CORRECT AND CONTINUE <u>RUN PAUSED</u> CONTINUE CANCEL</p> | <ol style="list-style-type: none"> Loose output connections leading to intermittent connection to the loads Electrophoresis cells added or removed during the run Change in buffer levels | <ol style="list-style-type: none"> Verify all electrical connections. Pause power supply prior to adding or removing electrophoresis cells. Verify buffer levels are appropriate. <p>NOTE: Certain applications exhibit intrinsic fluctuations in resistance (e.g., D-Code). 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 4.2.3).</p> |
| <p>ERROR STOP: CODE 10</p> | Power failure detected (likely as a result of a very short power loss) | If power returns for ≥ 2 seconds, the instrument should automatically restart. If not, start the instrument manually. If the problem persists, check input power for integrity. |
| <p>ERROR STOP: CODE 11 GROUND LEAK CORRECT AND CONTINUE <u>RUN PAUSED</u> CONTINUE CANCEL</p> | Insulation failure in the electrical connections made outside the power supply caused a current flow that might create an unsafe condition | <ol style="list-style-type: none"> Check electrical connections, electrophoresis cell, and chiller system for leaks. Verify that the electrophoresis cell rests on an insulated and dry surface. Check power source connections. Additional capacitance to ground from external EMC filters or a UPS (uninterruptible power supply) can cause excessive ground currents. |
| <p>ERROR STOP: CODE 12 REGULATION ERROR RUN TERMINATED <u>RESET WHEN READY</u> RESET</p> | Improper load, or connection to a voltage source | Press the RESET soft key and restart run. If the problem continues, cycle power and restart the run. If the problem still persists, contact Bio-Rad Technical Support. |
| <p>ERROR STOP: CODE 13 CALIBRATION FAULT <u>RUN PAUSED</u> CONTINUE CANCEL</p> | Loss of, or corruption of, precise calibration in EEPROM | Contact Bio-Rad Technical Support. The instrument will still operate but the output might be outside of accuracy specifications. |

| Error Message | Cause | Solution |
|---|--|--|
| <p>ERROR STOP: CODE 14 V LIMIT</p> <p><u>RUN PAUSED</u> CONTINUE CANCEL</p> | Voltage limit exceeded | Press the CONTINUE soft key to continue the run. If the problem persists, contact Bio-Rad Technical Support. |
| <p>ERROR STOP: CODE 15 A LIMIT</p> <p><u>RUN PAUSED</u> CONTINUE CANCEL</p> | Amperage limit exceeded | Press the CONTINUE soft key to continue the run. If the problem persists, contact Bio-Rad Technical Support. |
| <p>ERROR STOP: CODE 16 W LIMIT</p> <p><u>RUN PAUSED</u> CONTINUE CANCEL</p> | Wattage limit exceeded | Press the CONTINUE soft key to continue the run. If the problem persists, contact Bio-Rad Technical Support. |
| <p>ERROR STOP: CODE 17 OVERHEATING</p> | Internal maximum temperature exceeded – potential causes: blocked vent, fan failure, component failure | Check for obstructions to fan opening and/or ventilation slots. Check that fan is operating. If unable to resolve, contact Bio-Rad Technical Support. |
| <p>ERROR STOP: CODE 18 OPERATING BELOW 10V</p> | Operating below 10 V (connected load and parameter values would require operating < 10 V output) | <p>Not applicable to voltage mode.</p> <p>If operating in current mode, increase the current (mA) setting or decrease the load (increase its resistance).</p> <p>If operating in wattage mode, increase the power (W) setting or decrease the load resistance.</p> |

4.3 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 failed.

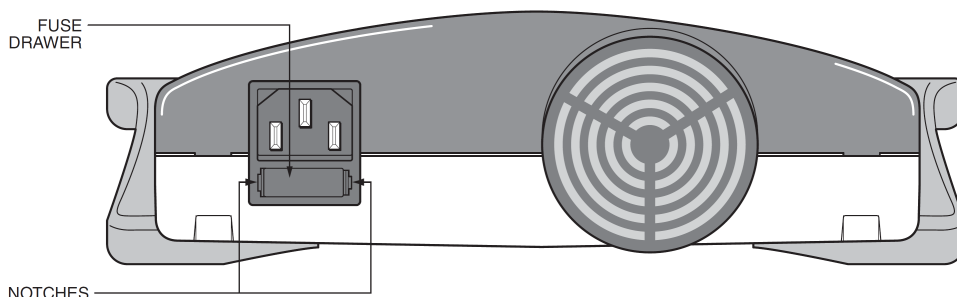


Figure 7. Rear view showing fuse drawer with notches

3. Remove the failed fuse from the fuse holder. Replace it with a 8.0 A, 250 VAC 5 mm x 20 mm fast-blow fuse (Bio-Rad catalog #12008061).²
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.

NOTE: Repeated fuse failure might indicate a hardware failure. Contact Bio-Rad Technical Support.

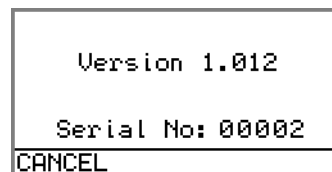
4.4 Expediting Technical Support

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

Product model: The product model is located on the sticker on the bottom of the unit (example: PowerPac Universal Power Supply).

Serial number: The serial number is located on the sticker on the bottom of the unit. Also the PowerPac device displays the serial number momentarily after switching the power ON (example: Serial No: 00002).

Software version: The PowerPac device displays the software version momentarily after switching the power ON (example: Version 1.012).



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

² Fuse specifications are applicable to products with a serial number of 042BR30000 and higher.

Appendix A

Specifications

| Specification | Details |
|-----------------------------|--|
| Output | 500 V, 2500 mA, 500 W |
| Output range (programmable) | 10–500 V (adjustable in 1 V increments) 10–2500 mA (adjustable in 1 mA increments) 1–500 W (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 99:59 hours, or timed to 99999 volt-hours |
| Pause/resume function | Yes |
| Display | 128 x 64 pixel monochrome backlit LCD |
| Operating Conditions | 0–40°C; 10–95% humidity in the absence of condensation |
| Safety compliance | IEC 61010-1 |
| 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 (mains/line in) and neutral |
| Input power (nominal) | 100–240 VAC, 50/60 Hz |
| Dimensions | 27.5 cm X 9.8 cm X 34.5 cm (10.83 in X 3.86 in X 13.58 in) |
| Weight | 2.5 kg (5.5 lbs) |

Appendix B

Warranty and Ordering Information

Warranty Terms

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:

- Defects caused by improper operation.
- Repair or modification done by anyone other than Bio-Rad Laboratories or their authorized agent.
- Use with cables or connectors not specified by Bio-Rad Laboratories for this power supply.
- Deliberate or accidental misuse.
- Damage caused by disaster.

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

Product/Warranty Information

Model: _____
Serial Number: _____
Date of Delivery: _____
Warranty Period: _____

Ordering Information

| Catalog Number | Description |
|----------------|---|
| 164-5070 | PowerPac Universal power supply, 100–240 VAC |
| 165-5061 | PowerPac Adaptor, qty 1 |
| 165-5066 | PowerPac Adaptor, qty 2 |
| 12008061 | Replacement Fuse, 8.0 A, 250 VAC, 5 x 20 mm, fast blow ³ |

³ Fuse specifications are applicable to products with a serial number of 042BR30000 and higher.



**Bio-Rad
Laboratories, Inc.**

Life Science
Group

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