

USER GUIDE

life

PowerEase® 90W Power Supply

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Introduction

Product contents

Contents

Component	Quantity	Regulatory mark(s) on electrical plug
PowerEase® 90W Power Supply	1 each	
Extra Fuse	1 each	
Type B Power Cord	1 each (PS0090)	CSA
JIS 8303 Power Cord	1 each (PS0090)	PSE
Type G Power Cord	1 each (PS0091, PS0092)	ASTA
Type CEE 7/7 Power Cord	1 each (PS0091, PS0092)	VDE, KEMA, CEBC, NEMKO, DEMKO, FIMKO, SEMKO, OVE, CE, ESC, IMQ
GB 15934-2008 Power Cord	1 each (PS0091, PS0092)	CCC
Type I Power Cord	1 each (PS0092)	NSW 18392
Quick Reference Card	1 each	

Important: Some of the power cords appear similar; users should utilize the cord approved for their country/region. North America customers should use the Type B power cord and Japanese customers should use the JIS 8303 power cord. Chinese customers should use the GB 15934-2008 power cord and Australia/New Zealand customers should use the Type I power cord.

Upon receiving the instrument

Examine the unit carefully for any damage incurred during transit. Any damage claims must be filed with the carrier, keep the supplied box for inspection. The warranty does not cover in-transit damage.

To ensure safe, reliable operation, always operate the PowerEase® 90W Power Supply in accordance with the manufacturer's instructions. Always wear protective gloves and safety glasses when working in a laboratory environment. Avoid exposing the power supply to liquids as these may damage the unit and void the warranty.

Product description

Introduction

The PowerEase® 90W Power Supply is a microprocessor-controlled power supply designed to meet most electrophoresis needs in a single easy to use unit. The power supply's small foot print and stacking feature conserve valuable bench space. This instrument is ideal for DNA/RNA electrophoresis, SDS-PAGE, and native PAGE. With four sets of output jacks that can be used simultaneously, the PowerEase® 90W Power Supply is designed to run applications at maximal power and efficiency. The PowerEase® 90W Power Supply offers two modes: Constant Voltage and Constant Current. This manual describes the setup and operation of PowerEase® 90W Power Supply including important information on safety and maintenance of the unit.

**Features of the
PowerEase® 90W
Power Supply**

- Constant Voltage or Current
- Capable of running multiple electrophoresis units
- LCD display with clear menu prompts for easy use
- Four sets of output terminals
- Capability to specify run durations

Description of buttons and switches

Front view of PowerEase® 90W Power Supply



Rear view of PowerEase® 90W Power Supply



Operational keys

PowerEase® 90W Power Supply key pad



Key	Use the key to...
^ (Up Arrow)	Toggle the cursor position up and increase values when settings are flashing.
∨ (Down Arrow)	Toggle the cursor position down and decrease values when settings are flashing.
Mode	Cycle between voltage, current, and time settings, allowing values to be changed.
Constant	Toggle between constant voltage and current operation.
Start/Pause	Start, pause, and resume power supply operation without resetting the timer.
Stop	Stop power supply operation, reset the timer, turn off the beeper.

Methods

Getting started

Install the PowerEase® 90W Power Supply

1. Check the label located near the AC inlet to ensure that the unit is compatible with locally provided voltage.
2. Place the PowerEase® 90W Power Supply on a level laboratory bench. Keep the area around the power supply clear to ensure proper ventilation of the unit.
3. For your safety: Position the unit properly such that the On-Off switch and the AC inlet located on the rear of the unit are easily accessible.
4. Ensure the AC power switch is in the Off position.
5. Attach the power cord to the AC inlet. Use only properly grounded AC outlets and power cords.
6. Connect the leads from the electrophoresis unit; insert the positive lead (+) into the positive (red) output jack, and the negative lead (-) into the negative (black) output jack.

Important guidelines

Introduction

The important guidelines for operating the PowerEase® 90W Power Supply are provided in this section. We recommend that you carefully review these guidelines before operating the instrument.

Important: For best results, do **NOT** use the PowerEase® 90W Power Supply at its maximum electrical load limits. Variations in buffer conditions can result in exceeding the power supply's maximum voltage or current output capacity and produce undesirable variations in performance.

Recommendation

The duration of electrophoresis can be defined in time (hours/minutes). When using this or any electrophoresis product, we recommend that you adhere to the protocols given in the electrophoresis product manuals, and durations, specified in time.

Important: For best results, follow these important guidelines when running multiple gels and electrophoresis units concurrently. For example:

- Avoid running samples of widely differing salt concentrations or sample buffers at the same time or on the same gel.
- Properly prepare your samples.

Note: Variations in conductivity due to differences in buffer salt concentrations can affect the run of all the samples run at the same time.

Operation modes

Introduction

The PowerEase® 90W Power Supply is a microprocessor-controlled power supply designed to meet most electrophoresis needs in a single, easy to use unit. The power supply offers two modes: Constant Voltage and Constant Current. Use the Constant Voltage or Constant Current Mode for applications that require only one specific voltage limit or current limit during the entire duration of electrophoresis.

Constant operation protocol

Instructions for operating the PowerEase® 90W Power Supply in the **Constant Mode** are provided in this section. The **Constant Voltage** or **Constant Current Mode** allows you to specify a voltage limit or current limit to be used during the entire duration of electrophoresis. Review the guidelines provided in this manual before starting electrophoresis using the PowerEase® 90W Power Supply.

A basic **Constant Voltage** or **Constant Current Mode** operating procedure of the PowerEase® 90W Power Supply is provided below. We recommend reading the guidelines provided in this manual for best results before starting an operation.

1. Use the power switch on the rear side of the instrument to turn on the PowerEase® 90W Power Supply.

The display screen will illuminate.

The screen displays the last set **V** (voltage) in large bold type on the left side of the display and **TIME** and **AMP** in small type on the right side of the display.

2. Press the **Constant** key to select either **Constant Voltage** or **Constant Current** from the display screen.

The screen displays the selected operating mode in large bold type on the left of the display.

3. Use the **^** **v** arrow keys to set the selected operation [voltage (VOLT) or current (AMP)] to the appropriate values.

4. Use the **Mode** key to select **TIME** and use **^** **v** arrow key to set the time (hours/minutes) to specify the duration of the electrophoresis.

5. Press **Start/Pause** key to start electrophoresis. The Red LED illuminates when the electrophoresis is running.

6. Press the **Start/Pause** key again to temporarily interrupt power to ongoing electrophoresis without terminating the operation along with LED flashing.

7. Press **Start/Pause** key to restart electrophoresis.

8. Press **Stop** key to stop the electrophoresis.

Note: If the parameters need to be changed during the run you must press **Start/Pause**, enter the changes, and then press **Start/Pause** once again to restart your operation.

Note: After stopping and restarting an operation, the timer resets to the selected time

Limiting parameter settings

Introduction

The PowerEase® 90W Power Supply is capable of operating at limiting Voltage, or limiting Current. We recommend operating the PowerEase® 90W Power Supply at limiting voltage for most applications. See below for more details.

Voltage limiting

For most electrophoresis methods resistance increases throughout the run. Limiting the voltage provides the following advantages:

- Current and power decrease throughout the run, providing an improving margin of safety over time.
- The same voltage setting can be used regardless of the number or thickness of gels being electrophoresed.

Current limiting

Discontinuous buffer systems and, to a lesser extent, continuous systems increase resistance during the run. If you use the current limiting setting on the PowerEase® 90W Power Supply, the voltage will increase as resistance increases to satisfy Ohm's law ($V=IR$). If no voltage limit is set and a local fault condition occurs, such as a poor connection, very high local resistance may cause the voltage to increase to the maximum capacity of the power supply. This may lead to local overheating and damage to the electrophoresis cell or create unsafe conditions. When operating under constant current conditions, set a voltage limit on the power supply at or slightly above the maximum expected voltage.

Appendix A

General safety



WARNING! Protection impairment if used in a manner not specified by the manufacturer.

Instrument safety

Avoid electrical shock

The PowerEase® 90W Power Supply produces up to 300 voltage outputs which are electrically isolated from ground to reduce the risk of electrical shock to the user. Follow the guidelines below to ensure safe operation of the unit.

The PowerEase® 90W Power Supply has been designed for use with electrophoresis cells with shielded banana plugs thus minimizing any potential shock hazard to the user. Life Technologies recommends against the use of unshielded banana plugs.

To avoid electrical shock:









1. NEVER connect or disconnect wire leads from the power jacks when the red indicator light at the Start/Stop key is on or when “RUNNING” is displayed on the screen.
2. WAIT at least 5 seconds after stopping a run before handling output leads or connected apparatus.
3. ALWAYS make sure that hands, work area, and instruments are **clean** and **dry** before making any connections or operating the power supply.
4. ALWAYS connect the power supply to a properly grounded AC outlet.

Avoid damage to the instrument

1. For proper ventilation, leave at least 10 cm of space behind the instrument, and at least 5 cm of space on each side.
2. Do not operate the power supply in high humidity environments (> 95%), or where condensation may occur.
3. To avoid condensation after operating the power supply in a cold room, place the unit in a sealed plastic bag prior to removing the power supply from the cold room. After removing the power supply from the cold room, allow at least 2 hours for the unit to equilibrate to room temperature before removing the plastic bag and operating the unit.

Explanation of symbols and warnings

Symbols and warnings

Symbol	English	Français
	Caution, risk of electrical shock	Attention, risque de choc électrique
	Caution, risk of danger Consult the manual for further safety information.	Attention, risque de danger Consulter le manuel pour d'autres renseignements de sécurité.
	Do not dispose of this product in unsorted municipal waste.  CAUTION! To minimize negative environmental impact from disposal of electronic waste, do not dispose of electronic waste in unsorted municipal waste. Follow local municipal waste ordinances for proper disposal provision and contact customer service for information about responsible disposal options.	Ne pas éliminer ce produit avec les déchets usuels non soumis au tri sélectif.  CAUTION! Pour minimiser les conséquences négatives sur l'environnement à la suite de l'élimination de déchets électroniques, ne pas éliminer ce déchet électronique avec les déchets usuels non soumis au tri sélectif. Se conformer aux ordonnances locales sur les déchets municipaux pour les dispositions d'élimination et communiquer avec le service à la clientèle pour des renseignements sur les options d'élimination responsable.
	Indicates conformity with European Union requirements for safety and electromagnetic compatibility.	Indique la conformité avec les prescriptions en matière de sécurité et de compatibilité électromagnétique de l'Union européenne.
	Indicates conformity with Australian standards for electromagnetic compatibility.	Indique la conformité avec les normes australiennes de compatibilité électromagnétique.
	Indicates conformity with safety requirements for Canada and USA	Indique la conformité avec les prescriptions en matière de sécurité du Canada et des États-Unis.

Production regulatory compliance

Federal Communications Commission Advisory

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their expense. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Environmental design compliance

This equipment is compliant with Directive 2011/65/EU - European Union "RoHS Directive" - Restriction of hazardous substances in electrical and electronic equipment.

Appendix B

Troubleshooting

Observation	Possible cause	Recommended action
The LCD screen remains blank and the fan does not run when the power is turned on	AC power cord is not connected	Check AC power cord connections at both ends. Use the correct cord.
	The fuse has blown	Replace the fuse
Operation stops with alarm: The screen displays "NO LOAD"	Electrophoresis leads are not connected to the power supply or to the electrophoresis unit(s), or there is a broken circuit in the electrophoresis cell	Check the connections to the power supply and on your electrophoresis cell to make sure the connection is intact; check condition of wires in electrophoresis unit. Close the circuit by reconnecting the cables. Press Start/Pause to restart the run.
	High resistance due to tape left on a pre-cast gel, incorrect buffer concentration, or incorrect buffer volumes in the electrophoresis cell	Correct the condition by making sure the tape is removed from the pre-cast gel, buffers are prepared correctly, and the recommended volume of buffer is added to the electrophoresis unit.
Operation stops with alarm: Display shows "OVER VOLTAGE"	Circuit is interrupted	<ul style="list-style-type: none"> • Verify that the running buffer is correct. • Verify the all cables are attached correctly • Turn the Power switch off and on again; restart application. • If you cannot restart the instrument, turn off the power, disconnect the power cord from the outlet, and contact Technical Service.
Operation stops with alarm: Display shows "LEAKAGE"	Ground leak detected during run	Check the electrophoresis system for improper grounding. Restart the power supply by turning the Power switch off and on.
Operation stops with alarm: Display shows "OVER TEMP"	Power supply is overheating	<ul style="list-style-type: none"> • Turn off power supply. Check for sufficient airflow around the power supply fan. After cooling down, restart the power supply by turning the Power switch to the on position. • If you cannot restart the instrument, turn off the power, disconnect the power cord from the outlet, and contact Technical Service.

Common errors

Observation	Possible cause
No load	<ul style="list-style-type: none"> • The electrophoresis system is not connected to the power leads, check the power leads • The electrophoresis system has a short, the platinum wire is broken or the banana connectors are damaged • Buffer concentration too low • Buffer volume too low • Short in power cord • Current has dropped below acceptable rating (4 mA)
Short circuit	<ul style="list-style-type: none"> • Load exceeds 500 mA • Blown fuse in the power supply • Incorrect input voltage (check input voltage switch near power inlet)
Change in load	<ul style="list-style-type: none"> • Electrophoresis systems were added or removed during a run • Buffer leaking in a connected system • Excessive temperature increase • Excessive buffer evaporation • Loose connection in a connected system • Current set too low
Change in constant mode	<ul style="list-style-type: none"> • Voltage changes to current <p style="margin-left: 40px;">Current set too low. Ceiling hit and constant mode changed from voltage to current. Increase current to 500 mA.</p> • Current changes to voltage <p style="margin-left: 40px;">Voltage set to low. Ceiling hit and constant mode changed from current to voltage. Increase voltage to 300 V</p>

The PowerEase® 90W Power Supply has automatic cross over, set voltage or current, and preset power. During the electrophoresis process only one parameter is limiting at a time. The limiting parameter, together with the conductivity in the electrophoresis system, and the values for the other parameters determine the maximum output.

Appendix C

Operational electrical parameters

Ohm's Law and Joule's Law

Electrophoresis is the migration of a charged particle under the influence of an electrical field. The power supply output parameters voltage, current, and power are related by the following two equations:

Voltage (V) = Current (I) x Resistance (R); ($V=IR$)

Power (P) = Current (I) x Voltage (V); ($P=IV$)

Resistance

Resistance of the assembled electrophoresis cell is dependent on the conductivity of the gel buffer, the thickness of the gel, and the number of gels being run. Although the resistance is determined by the gel system, the resistance can vary over the course of an electrophoretic separation. For instance, in the Tris-Glycine buffer system, the fast moving, highly conductive chloride ions in the gel are gradually replaced by the slower moving, less conductive glycine ions from the running buffer as the gel runs. As a result, the resistance of the gel increases as the chloride/glycine front moves down the gel.

Voltage

The velocity with which an ion moves in an electric field will vary in proportion to the field strength (volts per unit distance). The higher the voltage the faster an ion will move.

Current

Current is a function of the number of ions passing a given cross-section of the circuit at a given time. For a given gel/buffer system, at a given temperature, current will vary in proportion to the field strength (voltage) and/or cross-sectional area (number and/or thickness of the gels). Ions in solution and at a given voltage will move faster as the temperature increases, increasing current.

Power

The power in Watts, or the rate of heat generated by the system, is directly proportional to voltage and current ($P=IV$).

Appendix D

Product specifications

Feature	Specifications
Input Power (switchable)	115 VAC, 50/60 Hz 230 VAC, 50/60 Hz
Fuses	One 2A/250V, one extra fuse is provided
Output power in watts	90 watts
Output voltage range	2~300 V
Output current range	4~500 mA
Timer	~99.99 hr/min
Terminal pairs	4 (4 positive voltage and 4 negative voltage)
Operating Modes <ul style="list-style-type: none"> • Constant Voltage • Constant Current 	1 V incremental settings 1 mA incremental settings
Crossover	Automatic
Display type	Backlit LCD Graphic type
Display size	53.64 x 15.64 mm (W x H)
Pause function	Yes
Safety features	No Load Detection Load Change Detection Overload Detection Ground Leak Detection Auto Restart
Stackable	Yes
Housing material	Flame retardant ABS
Housing size	200 x 290 x 70 mm (W x D x H)
Operating temperature	0°C–40°C
Environmental condition	95% RH (non-condensing), 75 KPa–106 Kpa, altitude not to exceed 2000 meters
Weight	1.2 kg
Certifications	CE, cETLus, c-Tick
Warranty	1 year

Appendix E

Repair and maintenance

Introduction

The PowerEase® 90W Power Supply requires no periodic maintenance program with the exception of an occasional dry wipe-down of the instrument.

Encountering problems

Check the troubleshooting section, see Appendix B

Contact Technical Support, see Appendix F

If the unit must be shipped back for repair, contact support for a Return Authorization Number and shipping instructions; see Appendix F

Replace the fuse

One extra fuse is supplied with the PowerEase® 90W Power Supply. For additional fuses, contact support; see Appendix F

To replace the fuse:

1. Turn off the main power switch at the rear of the PowerEase® 90W Power Supply and detach the power cord from the rear of the PowerEase® 90W Power Supply.
2. Open the fuse compartment located inside the Power Inlet by inserting a small flat blade screwdriver into the slot on top of the fuse compartment. Turn the screwdriver to gently pry open the fuse compartment.

Note: The fuse compartment will not open with the power cord in place.

3. Pull the fuse holder out of the compartment and inspect the fuse. If the fuse is burned or there is a break in the fuse element, replace the fuse with an identical type of fuse (2A/250V).
4. Place the fuse holder back into the compartment.
5. Snap the cover closed.



Appendix F

Documentation and support

Services and support

For the latest services and support information for all locations, go to www.lifetechnologies.com

At the website, you can:

- Access worldwide telephone and fax numbers to contact Technical Support and Sales facilities
- Search through frequently asked questions (FAQs)
- Submit a question directly to Technical Support (techsupport@lifetech.com)
- Search for user documents, SDSs, vector maps and sequences, application notes, formulations, handbooks, certificates of analysis, citations, and other product support documents
- Obtain information about customer training
- Download software updates and patches

Safety Data Sheets (SDS)

Safety Data Sheets (SDSs) are available at www.lifetechnologies.com/support.

Certificate of Analysis

The Certificate of Analysis provides detailed quality control and product qualification information for each product. Certificates of Analysis are available on our website. Go to www.lifetechnologies.com/support and search for the Certificate of Analysis by product lot number, which is printed on the box.

Limited product warranty

Life Technologies Corporation and/or its affiliate(s) warrant their products as set forth in the Life Technologies' General Terms and Conditions of Sale found on Life Technologies' website at www.lifetechnologies.com/termsandconditions. If you have any questions, please contact Life Technologies at www.lifetechnologies.com/support.

For support visit lifetechnologies.com/support or email techsupport@lifetech.com

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