

USER GUIDE

**invitrogen™**  
by *life* technologies™

# ZOOM® Dual Power Supply

A two-in-one programmable power supply  
for high voltage/low current and low  
voltage/high current electrophoresis  
applications

Catalog numbers ZP10001, ZP10002

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**For Research Use Only. Not intended for any animal or human  
therapeutic or diagnostic use.**

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# Warning

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## **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.

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## **Product Use**

**For research use only.** Not intended for any animal or human therapeutic or diagnostic use.

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# Safety Information

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## Avoiding Electrical Shock

The ZOOM® Dual Power produces high 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 ZOOM® Dual Power 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. ONLY connect the power supply to a properly grounded AC outlet.
- 

## Avoiding 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, wrap the unit in a plastic bag and allow at least 2 hours for the unit to equilibrate to room temperature before removing the bag and operating the unit.
- 

## Symbols

The symbols used on the ZOOM® Dual Power are explained below.

Symbol	Explanation
	Used on the ZOOM® Dual Power to indicate an area where a potential shock hazard may exist.
	Used on the ZOOM® Dual Power to indicate a warning. Consult the manual to avoid possible personal injury or instrument damage.
	WEEE (Waste Electrical and Electronic Equipment) symbol indicates that this product should not be disposed of in unsorted municipal waste. Follow local municipal waste ordinances for proper disposal provisions to reduce the environmental impact of WEEE.

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# Consignes De Securite

## Consignes De Securite

Le ZOOM® Dual Power génère des courants de haut voltage; la construction du système est faite suivant toutes précautions pour isoler l'utilisateur et éviter tout choc électrique. Toutefois, il est impératif d'observer les consignes suivantes pour éviter tout tisque lors de l'utilisation de l'appareil.

ZOOM® Dual Power est destiné à être utilisé avec des curves d'électrophorèse équipées avec des fiches banane protégées pour minimiser tout risque de choc électrique. L'utilisation d'autres types d'équipements n'est pas recommandée par Life Technologies et se fait aux risques et périls de l'utilisateur.




## Pour éviter Tout Choc électrique

1. Ne jamais connecter ou déconnecter les cables quand le voyant rouge de l'indicateur "Start/Stop" est allumé ou quand le message "RUNNING" est present sur le monitor.
2. Attendre un minimum de 5 secondes après avoir arrêté le courant avant de manipuler le système.
3. Vérifier que vos mains sont sèches et propres avant d'effectuer toute connection.
4. Utiliser des prises de courant munies d'une connection à la terre.

## Pour éviter d'endommager l'appareil:

1. Assurer une ventilation correcte, en laissant un minimum d'espace derrière (10 cm) et sur les côtés (5 cm) de l'appareil.
2. N'utilisez pas le générateur dans un environnement humide (> 95%) ou avec des risques de condensation.
3. Pour éviter la condensation lors de l'utilisation de l'appareil en chambre froide, enveloppez-le dans une poche plastique et laissez l'appareil s'équilibrer à la température ambiante avant de retirer le sac et de l'utiliser.

## Signification des pictogrammes

	Sur le ZOOM® Dual Power, signale les zones où un risque de choc électrique peut exister.
	Sur le ZOOM® Dual Power, signale un risque potentiel pour l'utilisateur ou pour l'équipement. Veuillez consulter le mode d'emploi.
	WEEE (Waste Electrical and Electronic Equipment)

# Sicherheits Anweisungen

## Sicherheits Anweisungen

Das ZOOM® Dual Power Stromversorgungsgerät produziert Gleichstrom-Hochspannung, die vom Erdleiter elektrisch getrennt ist, um das Risiko des Benutzers für einen Stromschlag zu minimieren. Trotzdem sollten folgende Sicherheitsrichtlinien beachtet werden, damit ein einwandfreier Betrieb des Gerätes gewährleistet ist.

Das ZOOM® Dual Power ist für den Betrieb von Elektrophoresezellen mit isolierten Bananen-Schutzkontaktsteckern entwickelt worden. Somit ist eine Gefährdung durch Stromschlag bei sachgerechter Benutzung ausgeschlossen. Die Verwendung von anderen, ungeschützten Bananensteckern geschieht auf Risiko des Benutzers und Life Technologies rät ausdrücklich davon ab.

## So verhindern Sie eine Gefährdung durch Stromschlag




1. Ziehen Sie niemals die Kabel in die Stromausgangsbuchsen am Gerät heraus, wenn das rote Licht am Start/Stop Bedienungsknopf leuchtet oder wenn "RUNNING" auf dem Monitor angezeigt wird.
2. Warten Sie mindestens 5 Sekunden nach Beendigung und Ausschalten eines Laufs, bevor Sie die Anschlusskabel der Zelle herausziehen.
3. Achten Sie darauf, dass die Arbeitsplatzumgebung der Zelle sauber und trocken ist. Sie sollten niemals mit nassen Händen Gerät, Kabel oder Steckverbindungen anfassen.
4. Schliessen Sie das PowerEase® Dual nur an eine einwandfrei geerdete 220-230V Strombuchse an.

## Um Beschädigung des Geräts zu vermeiden

1. Achten Sie auf wenigstens 10 cm Platz hinter und 5 cm neben dem Gerät, um seine eingebaute Kühlventilation nicht zu beeinträchtigen.
2. Verwenden Sie das Gerät nicht in Räumen mit hoher Luftfeuchtigkeit (>95%) oder wo es Wasserdampfkondensation ausgesetzt ist.
3. Ist das Gerät in einem Kühlraum verwendet worden, und soll es nach der Benutzung wieder unter Normaltemperatur arbeiten, ist es vor der Umsetzung in eine Kunststoffhülle zu verschliessen. Es soll mindestens 2 Stunden darin auf die neue Umgebungstemperatur angepasst werden, bevor die Hülle entfernt und das Gerät wieder in Betrieb genommen wird.

## Symbolerklärung

Die folgenden Symbole werden auf dem ZOOM® Dual Power verwendet.

	Weist auf eine Zone hin, wo Gefährdung durch Stromschlag besteht.
	Lesen Sie die Bedienungsanleitung, um Verletzungen oder Beschädigung des Gerätes zu vermeiden.
	WEEE (Waste Electrical and Electronic Equipment)



# Product Contents

**Types of Products** This manual is supplied with the following products:

Product	Catalog no.
ZOOM® Dual Power (100–120 VAC, 50/60 Hz)	ZP10001
ZOOM® Dual Power (200–240 VAC, 50/60 Hz)	ZP10002

Product Contents	Component	Quantity
	ZOOM® Dual Power	1 each
	Instruction Manual	1 each
	Extra Fuse	1 each
	Power Cord (for U.S./Canada/Taiwan/Japan or Europe)	1 each
	Warranty Card	1 each
	Quick Reference Card	1 each
	See the next page for specifications and a detailed description of the ZOOM® Dual Power.	

**Upon Receiving the Instrument** Examine the unit carefully for any damage incurred during transit. Any damage claims must be filed with the carrier. The warranty does not cover in-transit damage.



To ensure safe, reliable operation, always operate the ZOOM® Dual Power in accordance with the manufacturer's instructions. Always wear protective gloves and safety glasses when working in a laboratory environment. See safety information on pages vi–viii  
Warranty information is provided on page 41.

# Product Specifications

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## ZOOM® Dual Power Specifications

<b>Input Power</b>	110 VAC, 50–60 Hz 220 VAC, 50–60 Hz
<b>Fuses</b>	One 4A/250V, one extra fuse is provided
<b>Power Consumption</b>	420 watts at maximum load
<b>Output Range</b>	<p><b>High Voltage / Low Current Side</b>            1–3,500 VDC (minimum step size 1 V)            0.01–10 mA (minimum step size 0.01 mA)            0.1–35 W (minimum step size 0.1 W)            Automatic crossover on reaching set limits.</p> <p><b>Low Voltage / High Current Side</b>            1–250 VDC (minimum step size 1 V)            1–800 mA (minimum step size 1 mA)            1–200 W (minimum step size 1 W)            Automatic crossover on reaching set limits.</p>
<b>Accuracy</b>	<p><b>High Voltage / Low Current Side</b>            1–1,000 VDC : ± 10 volts            1,001–3,500 VDC : ± 20 volts</p> <p><b>Low Voltage / High Current Side</b>            1–250 VDC : ± 2 volts</p> <p><b>Duration Limits</b>      <b>Time:</b> 1–9,999 min  <b>Volt-hours:</b> 1–65,000 volt-hours</p>
<b>Power Outlets</b>	8 pairs of terminals: 4 high voltage and 4 low voltage 4 sets of electrophoretic systems can be operated under high voltage and 4 sets under low voltage conditions concurrently
<b>Operating Modes</b>	Constant voltage, constant current, constant power
<b>Circuit Protection</b>	Open Circuit; Short Circuit; Thermal Protection Over Voltage, Over Current, Over Power
<b>Safety</b>	No Load Detection Enable/Disable Isolated Floating Ground Overload detection
<b>Memory Control</b>	Non-volatile, up to 24 hours Custom Methods Stored to RAM
<b>Memory</b>	15 programs on high voltage side, 15 programs on low voltage side, up to 6 steps each

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## Product Specifications, Continued

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**ZOOM® Dual  
Power  
Specifications,  
Continued**

<b>Computer Interface</b>	RS-232 (not active)
<b>Display</b>	LCD, view area 111.7 × 86 mm
<b>Temperature</b>	Ambient 4–40°C
<b>Dimensions</b>	23.5 cm (w) × 34.5 cm (h) × 31 cm (d) (37 cm (d) with power cord attached)
<b>Weight</b>	12 kg (26.5 lbs)
<b>Environmental</b>	≤ 100% RH, 75 KPa-106 Kpa, Altitude not to exceed 2,000 meters
<b>Conditions Certifications:</b>	CE, CSA

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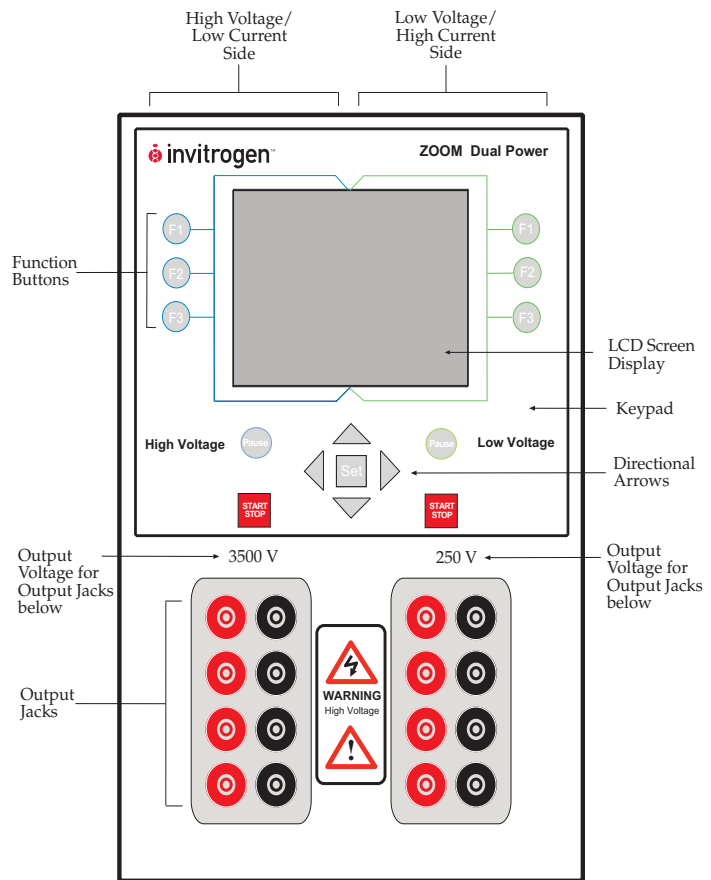
The CE mark symbolizes that the product conforms to all applicable European Community provisions for which this marking is required. Operation of the unit is subject to the conditions described in this manual.

The protection provided by the equipment may be impaired if the equipment is used in a manner not specified by Life Technologies.

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# Description

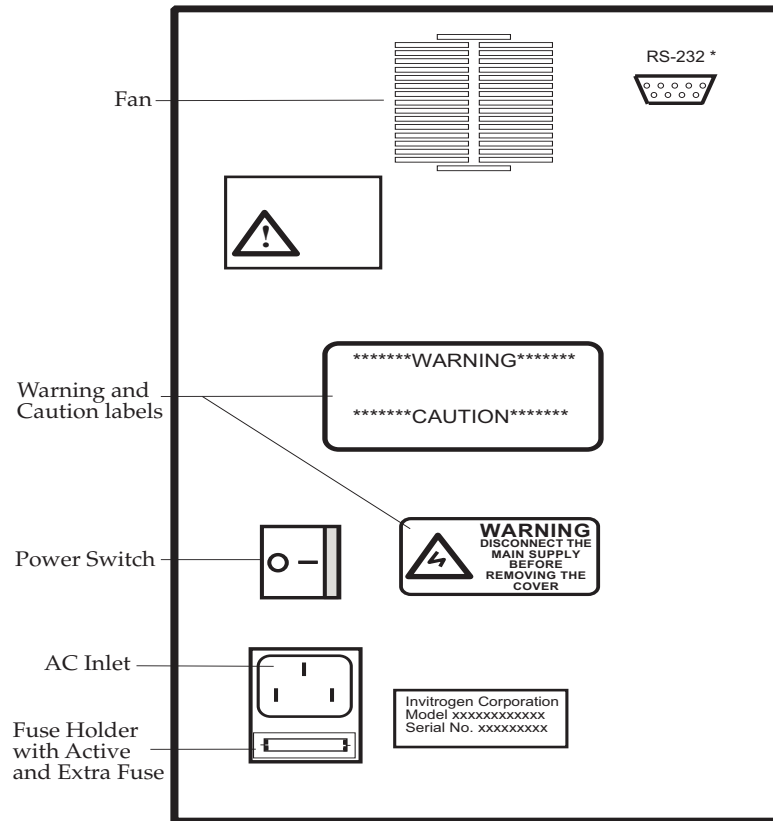
## Front View of ZOOM® Dual Power



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## Description, Continued

### Rear View of ZOOM® Dual Power



\* The RS-232 communications port is currently not active.

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## Description, Continued

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### Keys      Key Functions

#### Operational keys



#### **Start/Stop** key:

Used to start and stop operations from the **Running Screen**



#### **Pause** key:

Used to temporarily interrupt power to an operation in progress without terminating electrophoresis and to resume power after pausing without resetting the timer



#### **Set** key:

Used to select the type of parameter and to set the entered parameter values

#### Directional arrows



#### **Left Arrow:**

Used to move cursor towards the left across screen and left across numeric place values



#### **Right Arrow:**

Used to move cursor towards the right across screen and right across numeric place values



#### **Up Arrow:**

Used to move cursor up between parameters and to increase numeric values



#### **Down Arrow:**

Used to move cursor down between parameters and to decrease numeric values

#### Functional keys



#### **F1** key:

Used to choose Constant Operation, to move to the next screen, or to move to the previous screen, depending on the sign displayed next to the F1 key on the screen



#### **F2** key:

Used to choose Programming Mode, to move to the previous screen, or to enable/disable the No Load detection alarm, depending on the sign displayed next to the F2 key on the screen



#### **F3** key:

Used to toggle between limiting voltage (V), current (mA), and power (W), to toggle between minutes and volt-hours, or to switch between STEP and RAMP settings, depending on the sign displayed next to the F3 key on the screen

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# Introduction

## Product Overview

### ZOOM® Dual Power Supply

The ZOOM® Dual Power is a microprocessor-controlled programmable power supply designed to meet all electrophoresis needs in a single easy to use unit.

The power supply is capable of running high voltage/low current and high current/low voltage applications concurrently. This is achieved by two independently controlled sections, one on each side of the ZOOM® Dual Power, each capable of running multiple gel electrophoresis units at the same time.

The high voltage/low current section on the left side of the instrument is ideal for IPG strips and IEF applications.

The low voltage/high current section on the right side of the instrument is ideal for DNA/RNA electrophoresis, SDS-PAGE, native PAGE, second-dimension SDS-PAGE, and blotting applications.

With four sets of output jacks on each side that can be used simultaneously, the ZOOM® Dual Power is designed to use bench space and application run time at maximal efficiency.

The ZOOM® Dual Power offers two modes, Constant Operation or Programmable Mode that can run concurrently (see page 8 for more details).

This manual describes the setup and operation of ZOOM® Dual Power including important information on safety and maintenance of the unit.

### Applications

Typical applications for the high voltage/low current side and the low voltage/high current side of the ZOOM® Dual Power and supporting products are listed below. Similar products from other providers can be used also. See page 40 for additional Accessory Products.

Side	Example Application	Life Technologies: Electrophoresis systems
<b>High voltage/low current</b>	<ul style="list-style-type: none"><li>• Solution phase isoelectric focusing</li><li>• Isoelectric focusing in tube or slab gels</li><li>• Isoelectric focusing in IPG strips</li></ul>	<ul style="list-style-type: none"><li>• ZOOM® IEF Fractionator</li><li>• ZOOM® IPGRunner™ system</li><li>• IEF horizontal and vertical Gels</li></ul>
<b>Low voltage/High current</b>	<ul style="list-style-type: none"><li>• DNA restriction analysis</li><li>• Blotting applications</li><li>• DNA and RNA electrophoresis</li><li>• SDS-PAGE, including second dimension</li><li>• Native PAGE</li></ul>	<ul style="list-style-type: none"><li>• XCell™ SureLock™ Mini-Cell</li><li>• XCell4 SureLock™ Midi-Cell</li><li>• XCell6™ MultiGel Unit</li><li>• XCell II™ Blot Module</li></ul>

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## Product Overview, Continued

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### Features of the ZOOM® Dual Power

Important features of the ZOOM® Dual Power are listed below:

- Use high voltage/low current and low voltage/high current sides independently and concurrently
  - Capable of running multiple electrophoresis units on each side
  - Large LCD display with clear menu prompts for easy use
  - Memory for 30 storable programs with up to six steps per program
  - Displays each program on a single screen that allows you to easily review and quickly edit any given step during programming
  - Step and Ramp functions for discrete and gradual changes of electrical parameters
  - Programming capabilities for limiting voltage (V), current (mA), or power (W)
  - Four sets of output jacks for each section: high voltage/low current and low voltage/high current
  - You can disable the No Load detection alarm system to power high voltage applications, such as isoelectric focusing, that require very low current
  - Capability to specify run durations by time or volt-hours
- 

### Purpose of the Manual

This manual includes the following information:

- Safety information
- Instructions for setting up the instrument
- Guidelines for operating the ZOOM® Dual Power in the Constant Operation mode (page 10) and Programmable Mode (page 16)
- Recommendations for maximum number of gels that can run concurrently (page 7) and for running conditions for a wide variety of gel systems for the high voltage/low current and low voltage/high current side of the ZOOM® Dual Power supply (pages 31–35)
- Introduction to operational electric parameters (voltage, current, and power) (page 36)
- Guidelines on choosing limiting parameter settings for electrophoresis (page 37) and duration in time or volt-hours (page 38)
- Guidelines for repair and maintenance (page 39)

Follow the recommendations and guidelines provided in this manual for your safety, best results, and optimal performance of your ZOOM® Dual Power.

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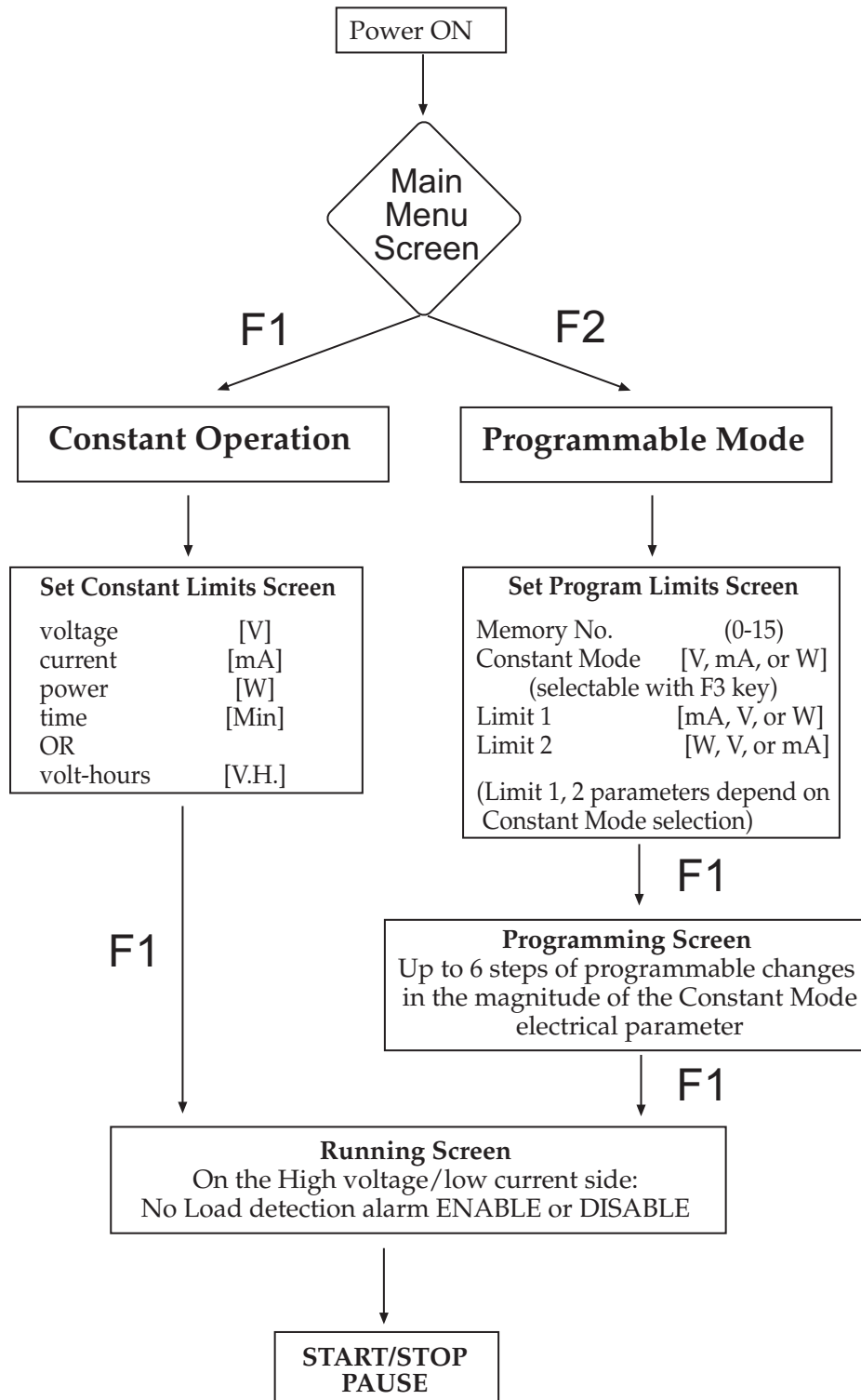
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## Product Overview, Continued

### Flowchart

The flowchart below describes the various screens displayed on the ZOOM® Dual Power and the keys used to navigate through the screens.



# Methods

## Getting Started

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### Installing the ZOOM® Dual

1. **Check the label located near the AC inlet to ensure that the unit is compatible with locally provided voltage.**
  2. Place the ZOOM® Dual Power 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 (page xiii) are easily accessible.
  4. Ensure the AC power switch is in the **Off** position (page xiii).
  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 red lead (+) into the red output jack, and the black lead (-) into the black output jack.
-

## Important Guidelines

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### Important

For best results, do **NOT** use the ZOOM® Dual Power at its maximal electrical load limits. Variations in buffer conditions can result in exceeding the power supply's maximum voltage, current, or power output capacity and produce undesirable variations in electrophoretic separations.

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### General Operating Instructions

Follow the instructions below to operate the ZOOM® Dual Power.

- Turn on the ZOOM® Dual Power by toggling the power switch on the rear side of the instrument. Upon start-up, the **Main Menu Screen** appears on the screen (see pages 8 and 10).
- Use the **Pause** and **Start/Stop** keys and output jacks on the **left** side of the instrument for **high voltage/low current** applications.
- Use the **Pause** and **Start/Stop** keys and output jacks on the **right** side of the instrument for **low voltage/high current** applications.

The functions below apply to both **Constant** and **Programmable** operational modes. Use these functions to move between screens as directed.

- Use the **F1** key at the page-up or page-down sign to move to the previous screen or to the next screen, respectively.
  - Use the **F2** key at the ESC sign on the screen to return to the **Main Menu Screen** or to move from the **Programming Screen** to the **Set Program Limits Screen**.
- 



The duration of electrophoresis can be defined in time (minutes) or volt-hours. For more information about choosing between time and volt-hours, see page 38.

We do **NOT** recommend that you use the volt-hour feature with Life Technologies electrophoresis products. Life Technologies electrophoresis products are optimized for speed and efficiency. Most concern over volt-hours occurs with high voltage applications, such as IEF. Life Technologies' ZOOM® IPGRunner™ System is designed to minimize voltage requirements, which minimizes problems associated with variable resistance.

When using this or any Life Technologies electrophoresis product, we recommend that you adhere to the protocols given in the electrophoresis product manuals, and durations, specified in time.

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## Important Guidelines, Continued

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### Important

At any given time, one program or set of electrical parameters can drive the high voltage/low current outlets on the left side while another can concurrently drive the low voltage/high current outlets on the right side of the instrument to control multiple gels and electrophoresis units on each side simultaneously.

**Ensure that all separations performed simultaneously on the same side of the instrument require nearly the same conditions.** See Appendix on pages 31–35 for recommended run conditions.

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

For example:

- When operating the low voltage/high current side, run EITHER multiple NuPAGE® Novex® Bis-Tris OR Novex® Tris-Glycine gels since the two different gel types require different run conditions and durations for optimal performance.
- Similarly, when operating the high voltage/low current side, ensure that all concurrent operations require similar conditions.
- When using the high voltage/low current side run either the ZOOM® IEF Fractionator or ZOOM® IPGRunner™ with the ZOOM® Dual Power because the recommended voltage profiles for ZOOM® IEF Fractionator differ significantly from those for ZOOM® IPGRunner™ (see Appendix, pages 34–35).
- When running isoelectric focusing applications, all samples that are run concurrently on the same side of the ZOOM® Dual Power should have very similar salt concentrations.
  - Avoid running samples of widely differing salt concentrations or sample buffers at the same time or on the same gel.
  - Properly prepare and desalt 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.

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*Continued on next page*

## Important Guidelines, Continued

### Low Voltage/ High Current Side

The table below provides guidelines for the number of gels from Life Technologies you can run concurrently on the low voltage/high current side of the ZOOM® Dual Power. Follow these guidelines for best results.

Gel Type	Maximum Number of Gels or Blots
NuPAGE® Novex® Bis-Tris Mini Gels	6 gels
Novex® Tris-Glycine Mini Gels	18 gels
NuPAGE® Novex® Tris-Acetate Mini Gel	12 gels
Novex® Tricine Mini Gels	8 gels
NuPAGE® Novex® Midi Gels	4 gels
Novex® Tris-Glycine Gels for Blotting	6 blots
NuPAGE® Novex® Bis-Tris Gels for Blotting	4 blots
NuPAGE® Novex® Tris-Acetate Gels for Blotting	3 blots
Novex® Zymogram Gels	18 gels

### High Voltage/ Low Current Side

The table below provides guidelines for the number of strips and fractionators from Life Technologies you can run concurrently on the high voltage/low current side of the ZOOM® Dual Power. Follow these guidelines for best results.

Separation Type	Units
ZOOM® IPG Strips	48 Strips in 4 ZOOM® IPGRunner™ units
ZOOM® IEF Fractionation	4 ZOOM® IEF Fractionator units with ZOOM® Disks



Run all applications that require **250 V or less** on the low voltage/high current side of the ZOOM® Dual Power.

# Operational Modes

## Introduction

The ZOOM® Dual Power is designed to operate under two modes, **Constant Operation** or **Programmable Mode**, depending upon your electrophoresis needs.

Use the **Constant Operation** for applications that require only one specific voltage limit, current limit, and power limit continuously during the entire duration of electrophoresis.

Use the **Programmable Mode** for applications that require up to 6 successive changes in voltage (V), current (mA), or power (W) as discrete changes (STEP) or as gradients (RAMP).



## Note

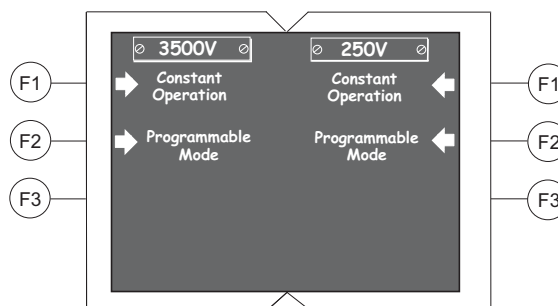
Examples and guidelines for the compatibility of various electrophoresis applications on the high voltage/low current and low voltage/high current side of the instrument and run conditions for various gels and strips are listed on page 1 and in the Appendix (page 31–35).


Review the guidelines provided in this manual before starting electrophoresis using the ZOOM® Dual Power.


## Main Menu Screen

The **Main Menu Screen** is the first screen to appear after turning on the power to your instrument.

You can choose the operational Mode (**Constant Operation** or **Programmable Mode**) on the **left** side of the instrument for a **high voltage/low current** application or on the **right** side of the instrument for a **low voltage/high current** application



- On the **Main Menu Screen**:
  - The keys on the left side control the high voltage/low current side; power is delivered to the four left-side output jacks only.
  - The keys on the right side control the low voltage/high current side; power is delivered to the four right-side output jacks only.
- Both sides share the use of the key  and

the directional arrow keys  (also see figure on page xii).

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## Operational Modes, continued

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### Basic Constant Operation Protocol

A basic **Constant Mode** operating procedure of the ZOOM<sup>®</sup> Dual Power is provided below. We recommend reading the guidelines provided in this manual for best results before starting an operation.

For more detailed instructions, see pages 10–15 for **Constant Operation** and pages 16–28 for **Programmable Mode**.

1. Use the power switch on the rear side of the instrument to turn on the ZOOM<sup>®</sup> Dual Power. The **Main Menu Screen** will appear on the screen.
  2. Press the left or right **F1** key to choose high voltage/low current (left) or low voltage/high current (right) operation (also see page 1 and Appendix, pages 31–35). The **Set Parameters Screen** appears.
  3. Set voltage (V), current (mA) and power (W) parameters to the appropriate values (also see pages 36 and 37). Choose and set the time (minutes) or volt-hours to specify the duration of the electrophoresis (also see page 38).
  4. Press **F1** to continue to the **Running Screen**.
  5. Press the **Start/Stop** key to begin electrophoresis.
-

# Constant Operation

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## Introduction

The **Constant Operation** allows you to specify a voltage limit, current limit, and power limit to be used continuously during the entire duration of electrophoresis.

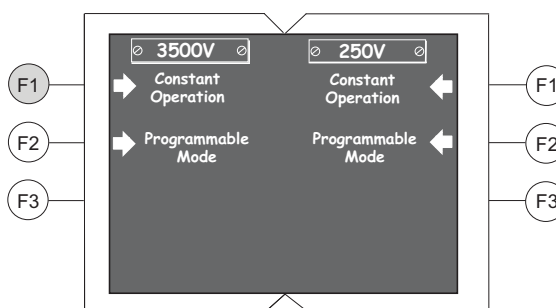
For **Programmable Mode** see page 16.

Review the guidelines provided in this manual before starting electrophoresis using the ZOOM® Dual Power.

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## Constant Operation

Press the **F1** key of the appropriate side of the instrument (left side for high voltage/low current or right side for low voltage/high current applications) to select **Constant Operation** from the **Main Menu Screen**.



### Note

- The following screen examples use the high voltage section (left side) of the power supply. Except when noted otherwise, use these directions also for the low voltage section (right side) of the instrument.
- Examples and guidelines for the compatibility of various electrophoresis applications on the high voltage/low current and low voltage/high current side of the instrument and run conditions for various gels and strips are listed on page 1 and in the Appendix (page 31–35).

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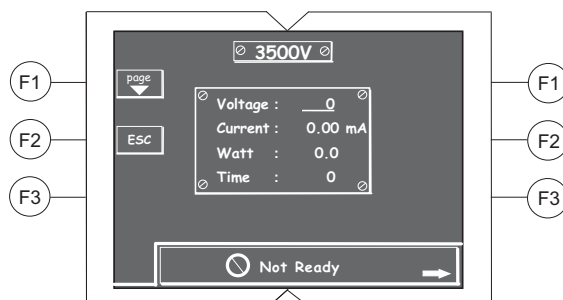


# Constant Operation, Continued

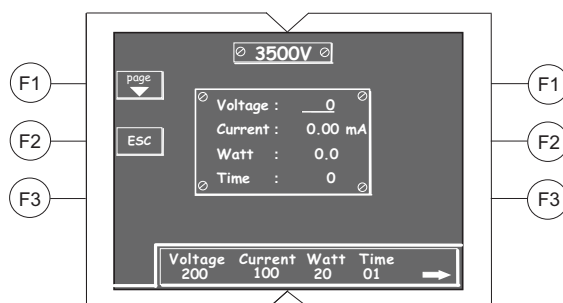
## Set Constant Limits Screen

### 1. Set Constant Limits Screen

- When **Constant Operation** is selected, the **Set Constant Limits Screen** is displayed.
- The **Set Constant Limits Screen of the Constant Operation** mode allows you to enter parameters for voltage (V), current (mA), and power (W), and to set the duration of electrophoresis in minutes or volt-hours (V/H).
- Press **F2 (ESC)** at any time to return to the **Main Menu Screen**.



**Note:** Display of **Not Ready** on the bottom of the screen indicates that the opposite side of the instrument is currently not in use, in this case the right side or low voltage/high current side, indicated by an arrow. If the opposite side of the instrument is in use, the running conditions are displayed (see example below).



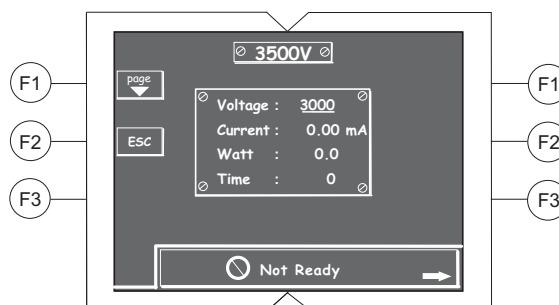
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## Constant Operation, Continued

### Set Constant Limits Screen, Continued

#### 2. Set Limits for Electrophoresis

- Use the **Up** and **Down Arrows** to move the cursor to each parameter (in the example below, voltage) to enter the values for the running limits.
- Press the **Set** key to change the cursor and begin entering a value.
- Use the **Up** and **Down Arrows** to increase and decrease the numeric values.
- Use the **Left** and **Right Arrows** to move between number place values.
- When your limits are entered, press the **Set** key again to set the entered limit values.



Use the chart below to determine the permitted range of settings and step increments for each parameter limit according to which side of the power supply is to be used.

Output Ranges		
Unit	High Volt/Low Current Side	Low Volt/High Current Side
Volts	1–3,500 V in 1 V steps	1 to 250 V in 1 V steps
Current	0.01 mA to 10 mA in 0.01 mA steps	1 to 800 mA in 1 mA steps
Power	0.1 to 35 W in 0.1 W steps	1 to 200 W in 1 W steps
Time	1 to 9999 min (1 min steps) <b>OR</b> 1 to 6,5000 volt-hours (1 V-H steps)	

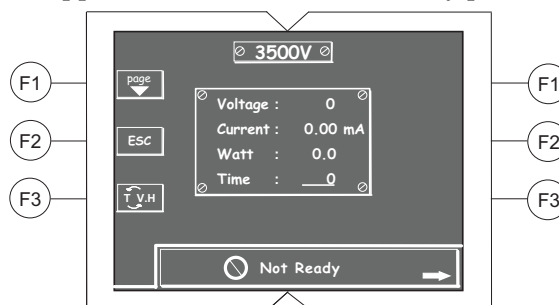
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## Constant Operation, Continued

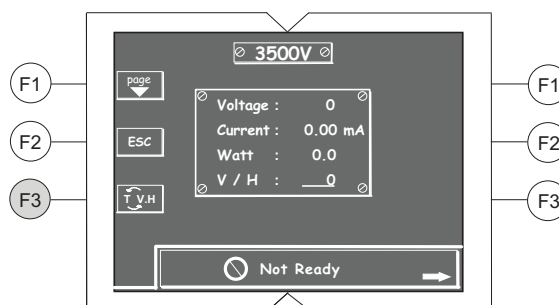
### Set Constant Limits Screen, Continued

#### 3. Toggling between Minutes and Volt-Hours

- The duration of your operation can be specified in time (minutes) or in volt-hours (V/H).
- To change between time (the default setting) and volt-hours, use the **Down Arrow** to move the cursor to the Time variable.
- A toggle option appears on the screen at the **F3** key position.



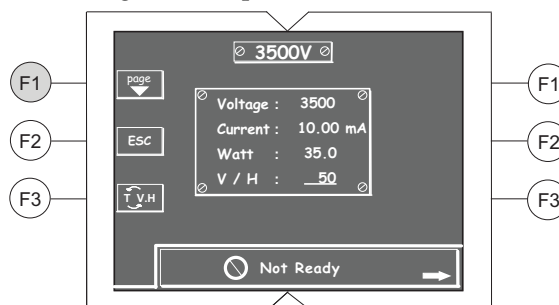
- Press **F3** and the duration variable will switch from time units to volt-hours.



- See page 38 of the Appendix for more information on time and volt-hours.

#### 4. Continue to Running Screen

- Once all run parameters are accurately set, press **F1** to continue to the **Running Screen** to begin electrophoresis.



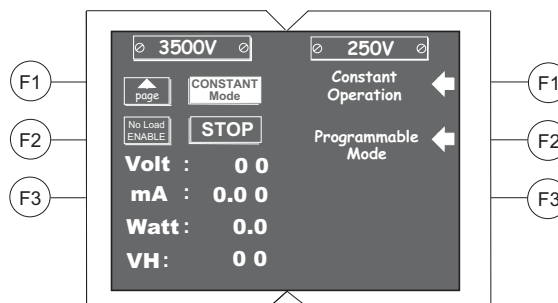
*Continued on next page*

# Constant Operation, Continued

## Running Screen

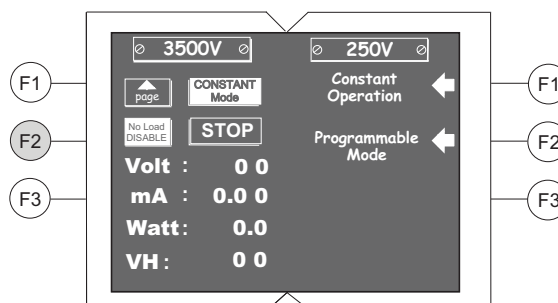
### 1. Running Screen

- The **Running Screen** displays the operational mode, operating electrical conditions, duration and No Load detection alarm status.



### 2. Disabling the No Load Detection Alarm

- The option to **DISABLE** the No Load detection alarm is only available on the high voltage/low current side. On the low voltage/high current side the No Load detection alarm is permanently enabled.
- If your application will be running on low current (for example isoelectric focusing), press **F2** from the **Running Screen** before starting electrophoresis to disable the No Load detection alarm. When the No Load detection alarm is **DISABLED**, a current below 0.01 mA is permitted.



- When the No Load detection alarm is disabled, the LCD screen displays “NO LOAD DISABLE” at the **F2** position.
- As a safety precaution, once electrophoresis has stopped the No Load detection alarm automatically reactivates.



### DISCONNECT ANY LEADS OR UNITS NOT IN USE WHEN RUNNING ELECTROPHORESIS WITH THE NO LOAD DETECTION ALARM DISABLED.

- Disabling the No Load detection alarm allows high voltage to run through any leads that are plugged into the power supply, regardless of whether or not they are attached to electrophoresis units or appropriately buffered systems.
- Do **NOT** touch any attached leads when the No Load detection alarm is **DISABLED**, as it may cause a severe electrical shock.

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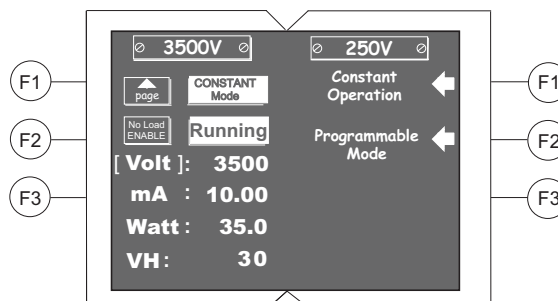
## Constant Operation, Continued

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### Running Screen, Continued

#### 3. Start, Stop, and Pause Electrophoresis

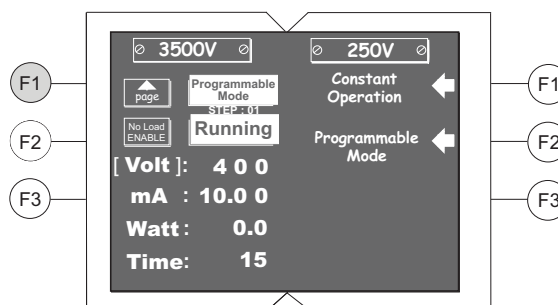
- Press the **Start/Stop** key to begin electrophoresis. Brackets indicate the limiting electrical parameter (in the example below [Volt]).



- Press the **Pause** key to temporarily interrupt power to ongoing electrophoresis without terminating the operation. When paused, "PAUSE" is displayed on the screen. Press the **Pause** key again to resume electrophoresis without resetting the timer.
- Press **Start/Stop** to stop electrophoresis. You must stop electrophoresis to modify any running parameters (see 5. below).
- The end of an operation is indicated by an audio signal (periodic beeping for 1 minute) and the screen displays "FINISH". Press the **Start/Stop** key to stop the signals.

#### 4. To View the Limits of Electrophoresis in Progress

- Press **F1** to return from the **Running Screen** to the **Set Constant Limits Screen**, where you can view but not edit the settings.



#### 5. To change Limits of Electrophoresis in Progress

- If you need to make changes to the current running limits, you must stop electrophoresis by pressing the **Start/Stop** key. Enter the changes on the **Set Constant Limits Screen** (see page 11). After changing the limits, press **F1** to return to the **Running Screen**.
- Press **Start/Stop** once again to restart your operation.

**Note:** After stopping and restarting an operation, the timer resets and does not take into account the time that electrophoresis was in progress before it was stopped.

---

# Programmable Mode

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## Introduction

Instructions for using the ZOOM® Dual Power in the **Programmable Mode** are provided in this section.

The **Programmable Mode** allows you to vary levels in voltage (V), current (mA), and power (W) during specified periods of time as discrete changes (STEP) or as gradients (RAMP) for up to 6 Steps, depending upon your electrophoresis needs.

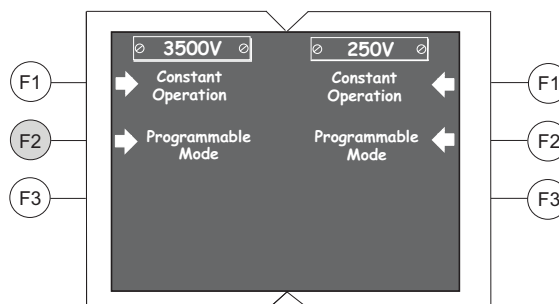
For **Constant Operation** see page 10.

Review the guidelines provided in this manual before starting electrophoresis using the ZOOM® Dual Power.

---

## Programmable Mode

To choose **Programmable Mode**, press the F2 key from the **Main Menu Screen** selections.



### Note

- The following screen examples use the high voltage section (left side) of the power supply. Except when noted otherwise, use these directions also for the low voltage section (right side) of the instrument.
  - Examples and guidelines for the compatibility of various electrophoresis applications on the high voltage/low current and low voltage/high current side of the instrument and run conditions for various gels and strips are listed on page 1 and in the Appendix (page 31–35).
- 

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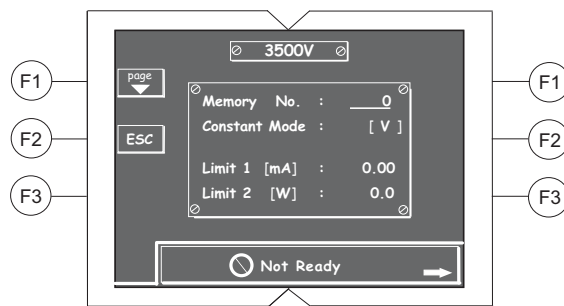
# Programmable Mode, Continued

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## Set Program Limits Screen

### 1. The Set Program Limits Screen

- When **Programmable Mode** is selected, you are taken to the **Set Program Limits Screen**.
- The **Set Program Limits Screen** of the **Programmable Mode** allows you to enter a program number, to select the electrical parameter (V, mA, W) to be held constant (**Constant Mode**), and to set limits on the other electrical parameters for that program.
- When entering the **Set Program Limits Screen** after turning on the instrument, the most recently used program appears on the screen.
- Press **F2 (ESC)** at any time to return to the **Main Menu Screen**



**Note:** Display of “Not Ready” on the bottom of the screen indicates that the opposite side of the instrument is currently not in use, in this case the right side or low voltage/high current side, pointed out by an arrow. If the opposite side of the instrument is in use, the running conditions are displayed (see page 11).

### 2. Selecting a Memory No. for a Program

- You can store a total number of 30 programs, 15 on each side of the power supply. Enter a number from 1 to 15 to access previously stored programs, or to enter a new program.

**Note:** Memory No. 0 is used to enter a program for immediate use and will not be stored. If you need to store your program for future use, choose from Memory Nos. 1–15.

- All parameters entered under a Memory No. (other than Memory No. 0) are automatically saved.
- Enter changes under the same Memory No. to overwrite previously stored program settings.
- If you want to change a program and save it under a different Memory No., choose the Memory No. first then enter the parameters for the new program.
- Follow the instructions in this section to enter or edit the parameters in the **Programmable Mode**.

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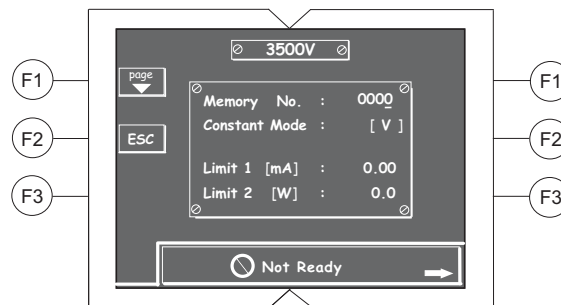
*Continued on next page*

# Programmable Mode, Continued

## Set Program Limits Screen, Continued

### 3. Setting Limiting Parameters

- To enter a value for one of the parameters, use the **Up** and **Down Arrows** to move the cursor to the desired variable (in this example, Memory No.).
- Press the **Set** key to change the cursor and begin entering a numeric value.
- Use the **Up** and **Down Arrows** to increase and decrease the numeric values.
- Use the **Left** and **Right Arrows** to move the cursor between numeric place values.
- When the running conditions are entered, press the **Set** key again to set the entered parameters.



- The chart below lists the permitted ranges of settings and step increments for each parameter, according to the side of the power supply that is to be used.

Output Ranges		
Unit	High Volt/Low Current Side	Low Volt/High Current Side
Volts	1 to 3,500 V in 1 V steps	1 to 250 V in 1 V steps
Current	0.01 mA to 10 mA in 0.01 mA steps	1 to 800 mA in 1 mA steps
Power	0.1 to 35 W in 0.1 W steps	1 to 200 W in 1 W steps

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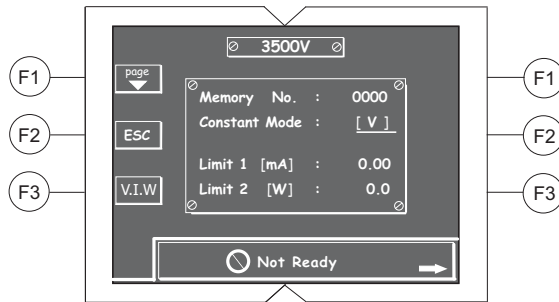


## Programmable Mode, Continued

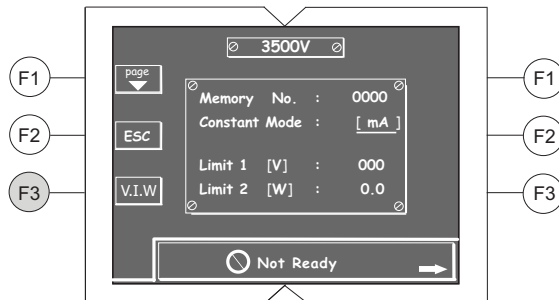
### Set Program Limits Screen, Continued

#### 4. Choosing Constant Voltage, Constant Current, or Constant Power

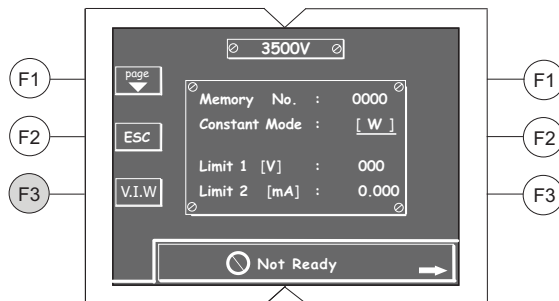
- To change the constant electrical parameter from voltage (V) (the default setting) to current (mA) or power (W), use the **Up** and **Down Arrows** to move the cursor to the **Constant Mode** parameter. For assistance in choosing a constant power setting, see page 37.
- A toggle option appears on the screen at the **F3** key.



- Press **F3** to change the **Constant Mode** parameter from V to mA. This will change Limits 1 and 2 to V and W, respectively.



- Press **F3** again to change the **Constant Mode** parameter to W. This will change Limits 1 and 2 to V and mA, respectively.



- Press **F3** once more to return to the default setting with **Constant Mode** parameter set as V, and Limits 1 and 2 set as mA and W, respectively.

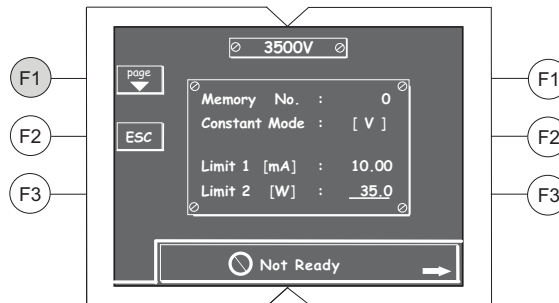
*Continued on next page*

# Programmable Mode, Continued

## Set Program Limits Screen, Continued

### 5. Continue to the Programming Screen

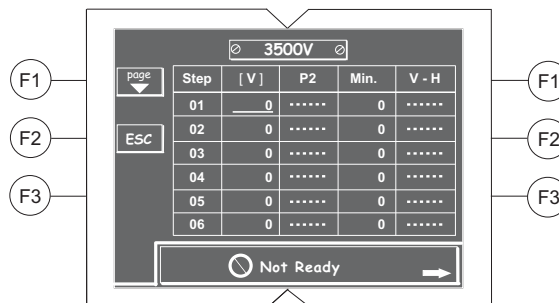
- Once the **Set Program Limits Screen** values are correctly entered. Press **F1** to continue to the **Programming Screen**.



## Programming Screen

### 1. The Programming Screen

- The **Programming Screen** allows you to enter up to 6 changes (Steps) of values of the **Constant Mode** parameter during the course of an operation.



- An entire custom program is set on this single screen, allowing you to easily review the whole program or to quickly alter any given step at any time during your programming.

**Note:** In this example, the **Constant Mode** parameter is voltage. Consequently, values in the P2 column (used for ramped changes, as described on pages 22–24) also refer to voltage.

- Press **F2** (ESC) at any time to return to the **Set Program Limits Screen**.

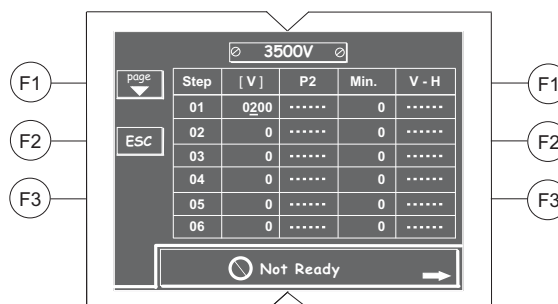
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## Programmable Mode, Continued

### Programming Screen, Continued

#### 2. Setting Program Parameters

- To enter a value for one of the program parameters, use the **Up** and **Down** and **Left** and **Right Arrows** to move the cursor along rows and columns to the desired cell (in the example below, starting voltage for Step 01).
- Press the **Set** key to change the cursor to enter a numeric value.
- Use the **Up** and **Down Arrows** to increase and decrease numeric values.
- Use the **Left** and **Right Arrows** to move the cursor between number place values.
- If your program has less than 6 Steps, enter 0 values for the Steps that are not to be used. The program ends after the last Step for which you entered non-zero values.



- Once the desired values are entered, press the **Set** key again to save your program.
- The chart below lists the permitted ranges of voltage, current, power and time settings and the step increments available for each parameter according to the side of the instrument that is to be used.

Output Ranges		
Unit	High Volt/Low Current Side	Low Volt/High Current Side
Volts	1 to 3,500 V in 1 V steps	1 to 250 V in 1 V steps
Current	0.01 mA to 10 mA in 0.01 mA steps	1 to 800 mA in 1 mA steps
Power	0.1 to 35 W in 0.1 W steps	1 to 200 W in 1 W steps
Time	1 to 9999 min (1 min steps) <b>OR</b> 1 to 6,5000 volt-hours (1 V-H steps)	

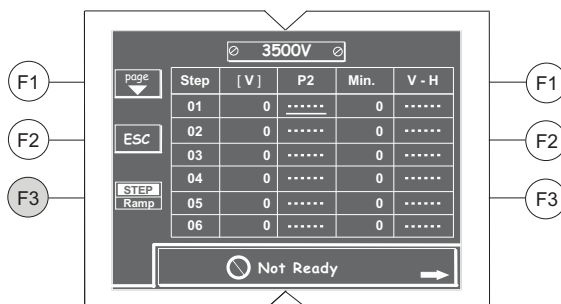
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## Programmable Mode, Continued

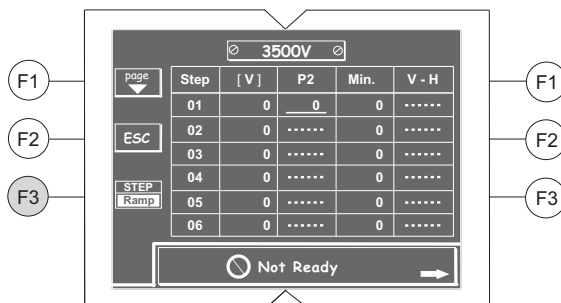
### Programming Screen, Continued

#### 3. Toggling between STEP and RAMP Settings

- Each step of your custom program can be a discrete change at a specified time (STEP setting), or a linear gradient across a period of time (RAMP setting).
- The P2 column is used for a step in which the RAMP function is desired for the limiting parameter. The numeric value entered in P2 represents the endpoint of the gradient.  
**Note:** P2 is in the same electrical parameter that you set the Constant Mode on the **Set Program Limits Screen** (page 17–20).
- To change any individual step in your program from the STEP function (the default setting) to the RAMP function, use the **Up** and **Down** and **Left** and **Right Arrows** to move the cursor into the P2 cell corresponding to the Step that you would like to change to the RAMP function (in the example below, the P2 cell for Step 01 is indicated).
- A toggle option appears on the screen at the **F3** key.
- Press **F3** to change the targeted P2 cells from STEP function to RAMP function. Each time you press **F3**, the setting switches between the STEP and RAMP option.
- A dashed line in the P2 cells indicates that the Step of the operation is currently set in the STEP function. **No value can be entered on a dashed line.**



- An underlined number in the P2 cell indicates that the Step of that operation is currently set in the RAMP function, and a numeric value for the desired endpoint of a **Constant Mode** linear gradient can be entered.



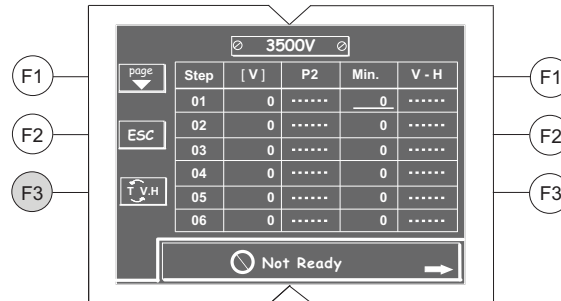
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# Programmable Mode, Continued

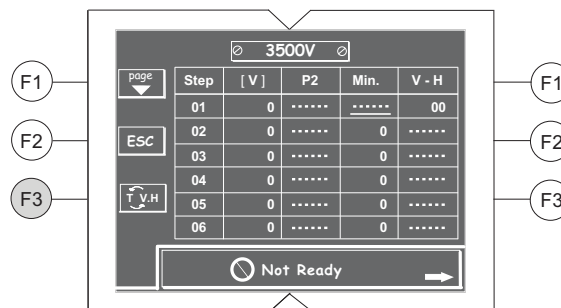
## Programming Screen, Continued

### 4. Toggling between Minutes and Volt-Hours

- The duration of discrete Steps (STEP function) in your program can be specified in time (Min. column) or in volt-hours (V-H column). The duration of gradient Steps (RAMP function) can only be specified in time.
- To change any individual Step in your operation from minutes to volt-hours, use the **Up** and **Down** and **Left** and **Right Arrows** to move the cursor to either the Min. column or the V-H column cell that corresponds to the Step you would like to switch (in the example below, Step 01).
- A toggle option appears on the screen at the **F3** key.
- Press **F3** to toggle between Min. (default) and V-H in the row representing the Step you want to edit.
- A number in the Min. cell indicates that a numeric value can be entered, and the duration of the Step will be specified in minutes.



- A number in the V-H cell indicates that a numeric value can be entered, and the duration of the Step will be specified in volt-hours.



- For assistance in choosing between time and volt-hours, see page 38 of the Appendix.

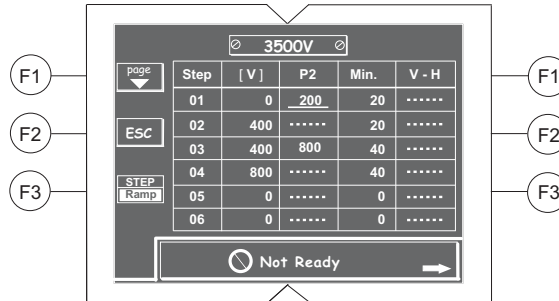
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# Programmable Mode, Continued

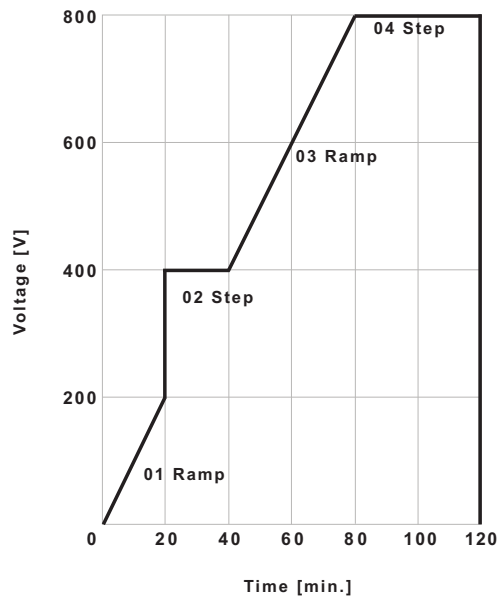
## Programming Screen, Continued

### 5. Example parameters of an alternating RAMP and STEP operation

- An example of a program with alternating RAMP and STEP settings is shown below. The duration of each Step is set in minutes.



- The graph below illustrates changes in voltage over time during the programmed operation above.



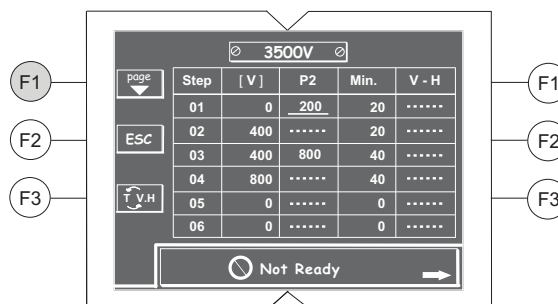
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## Programmable Mode, Continued

### Programming Screen, Continued

#### 6. Continue to the Running Screen

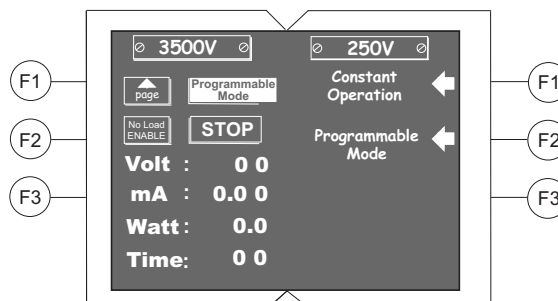
- Once the parameters of the program are correctly entered and set, press **F1** to continue to the **Running Screen**.



### Running Screen

#### 1. Running Screen

- The **Running Screen** displays the operational mode (**Constant Operation** or **Programmable Mode**), run conditions, and the status of the No Load detection alarm.



- To view your current program, press **F1** to return to the **Programming Screen**.

**Note:** After electrophoresis is started, you can view but not edit the **Programming Screen**. If you need to modify parameters, you must stop electrophoresis first before you can enter changes to the parameters on the **Set Program Limits Screen** and/or **Programming Screen** (see pages 17–23).

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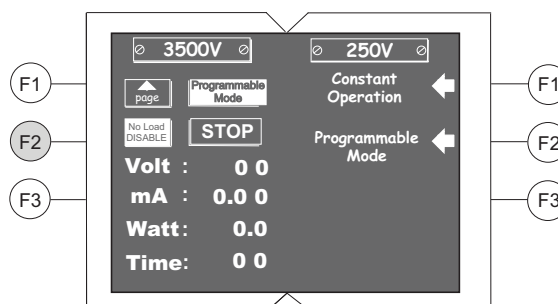
## Programmable Mode, Continued

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### Running Screen, Continued

#### 2. Disabling the No Load Detection Alarm

- The option to DISABLE the No Load detection alarm is only available on the high voltage/low current side. On the low voltage/high current side the No Load detection alarm is permanently enabled.
- If your application requires very low current (for example isoelectric focusing) press **F2** from the **Running Screen** before starting the program to disable the No Load detection alarm. In this setting, currents below 0.01 mA are permitted.



- When the No Load detection alarm is disabled, the screen displays “NO LOAD DISABLE” at the **F2** position.
- As a safety precaution, once the program has stopped, the No Load detection alarm automatically re-activates.



#### DISCONNECT ANY LEADS OR UNITS NOT IN USE WHEN RUNNING ELECTROPHORESIS WITH THE NO LOAD DETECTION ALARM DISABLED.

- Disabling the No Load detection alarm allows high voltage to run through any leads that are plugged into the power supply, regardless of whether or not they are attached to electrophoresis units or appropriately buffered systems.
- Do NOT touch any attached leads when the No Load detection alarm is DISABLED, as it may cause a severe electrical shock.

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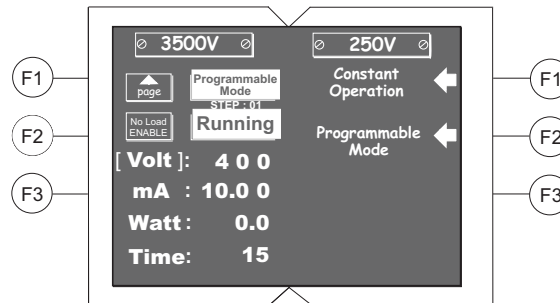
## Programmable Mode, Continued

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### Running Screen, Continued

#### 3. Start, Stop, and Pause a Program

- Press the **Start/Stop** key to start the program. Brackets indicate the limiting parameter (in the example below [Volt]).



- Press the **Pause** key to temporarily interrupt power without terminating the program. Press the **Pause** key again to resume the program.
- Press the **Start/Stop** key to stop the entire program. You must stop the program to modify any of the parameters (see next page).
- Upon completion of a program, the **Running Screen** displays **FINISH** and an audio signal (periodic beeping for 1 minute) will occur. Press the **Start/Stop** key to stop the signals.

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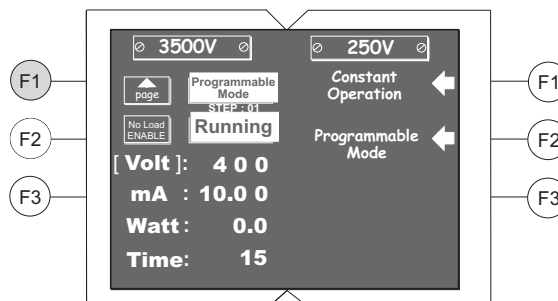
## Programmable Mode, Continued

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### Running Screen, Continued

#### 4. To View the Parameters of a Program in Progress

- Press **F1** on the **Running Screen** to return to the **Programming Screen** and/or once more to return to the **Set Program Limits Screen**. On both screens you can view but not change the settings while the program is in progress.



#### 5. To Change Parameters of a Program in Progress

- To change running parameters, you must stop the program by pressing the **Start/Stop** key.
- Press **F1** to go to the **Programming Screen** (page 20) to change steps of the program and press **F1** once more to go to the **Set Program Limits Screen** (page 17) to change electrical limits of the program.
- After entering the parameter changes, press **F1** once if you were on the **Programming Screen** or twice if you were on the **Set Program Limits Screen** to return to the **Running Screen**.
- Press **Start/Stop** to restart your program.

**Note:** After stopping and restarting an operation, the timer resets and does not take into account the time that electrophoresis was in progress before it was stopped.

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# Troubleshooting

## Introduction

Review the information in the table below to troubleshoot operating problems.

Observation	Cause	Solution
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 cords.
	The fuse has blown	Replace the fuse (see page 39).
Operation stops with alarm: The screen displays <b>NO LOAD</b>	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 <b>Stop/Start</b> 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.
	High voltage application is set to run on a very low current	DISABLE No Load alarm on the Running Screen (pages 14, 26), for example when performing an isoelectric focusing application.
Operation stops with alarm: Display shows <b>OVER VOLTAGE</b>	Circuit is interrupted	<ul style="list-style-type: none"> <li>• Verify that the running buffer is correct.</li> <li>• Verify the all cables are attached correctly</li> <li>• Turn the Power switch off and on again; restart application.</li> <li>• If you cannot restart the instrument, turn off the power, disconnect the power cord from the outlet, and contact Technical Support (page 41).</li> </ul>
Operation stops with alarm: Display shows <b>LEAKAGE</b>	Ground leak detected during run	Check the electrophoresis system for improper grounding. Restart the power supply by turning the Power switch off and on.

*Continued on next page*

## Troubleshooting, Continued

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Observation	Cause	Solution
Operation stops with alarm: Display shows <b>OVER TEMP</b>	Power supply is overheating	<ul style="list-style-type: none"><li>• Turn off power supply. Check for sufficient airflow around the power supply fan (pages vi-viii and xiii). After cooling down, restart the power supply by turning the Power switch to the on position.</li><li>• If you cannot restart the instrument, turn off the power, disconnect the power cord from the outlet, and contact Technical Support (see page 40).</li></ul>

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## Appendix

### Run Conditions for Gels

#### Introduction



Guidelines for electrophoresis run conditions for mini gels, midi gels, and IEF applications using the ZOOM® Dual Power are described in this section.

Run all applications that require **250 V or less** on the low voltage/high current side of the ZOOM® Dual Power.

#### Mini Gels

Follow the recommended conditions listed below for running 1.0 mm thick mini gels on the low voltage/high current side of the ZOOM® Dual Power.

**Note:** A 1.5-mm thick gel will take 5–10 minutes longer than a similar 1.0-mm thick gel. In the table below, current is indicated per gel.

Mini Gel Type	Voltage (V)	Approximate Duration (minutes)	Expected Initial Current (mA)
4% Tris-Glycine	125	90	30–40
6% Tris-Glycine	125	95	30–40
8% Tris-Glycine	125	100	30–40
10% Tris-Glycine	125	105	30–40
12%, 14%, 4–20% Tris-Glycine	125	110	30–40
16% Tris-Glycine	125	115	30–40
18% Tris-Glycine	125	120	30–40
4–12% Tris-Glycine	125	105	30–40
8–16% Tris-Glycine	125	105	30–40
10–20% Tris-Glycine	125	120	30–40
10% Tricine	125	70	80
16% Tricine	125	90	80
10–20% Tricine	125	75	80
10% Zymogram	125	100	30–40
12% Zymogram	125	110	30–40
4–16% Zymogram	125	100	30–40
6% TBE	200	65	10–18
10% TBE	200	100	10–18
20% TBE	200	105	10–18
4–20% TBE	200	70	10–18
6% TBE-Urea	180	45	10–20
10% TBE-Urea	180	60	10–20
15% TBE-Urea	180	80	10–20

*Continued on next page*

## Run Conditions for Gels, Continued

### Mini Gels, continued

Mini Gel Type	Voltage (V)	Approximate Duration (Minutes)	Expected Initial Current (mA)	
IEF, pH 3–7 *	Step 1	100	60	5–6
	Step 2	200	60	5–6
	Step 3	500	30	5–6
IEF, pH 3–10 *	Step 1	100	60	5–6
	Step 2	200	60	5–6
	Step 3	500	30	5–6
NuPAGE® Novex® 10% Bis-Tris with MES SDS Running Buffer	200	35	100–125	
NuPAGE® Novex® 4–12% Bis-Tris with MES SDS Running Buffer	200	35	100–125	
NuPAGE® Novex® 10% Bis-Tris with MOPS SDS Running Buffer	200	50	100–125	
NuPAGE® Novex® 4–12% Bis-Tris with MOPS SDS Running Buffer	200	50	100–125	
NuPAGE® Novex® 7% Tris-Acetate with Tris-Acetate SDS Running Buffer	150	60	40–55	
NuPAGE® Novex® 3–8% Tris-Acetate with Tris-Acetate SDS Running Buffer	150	70	40–55	
NuPAGE® Novex® 3–8% Tris-Acetate with Tris-Glycine Native Running Buffer	150	120	18	

\* Run Step 1 and Step 2 of IEF Mini Gels on the low voltage/high current side and Step 3 on the high voltage/low current side of the instrument.

Note, that only one IEF Mini Gel can be run at a time due to the maximum current of 10 mA that can be delivered on the high voltage/low current side of the ZOOM® Dual Power.

*Continued on next page*

## Run Conditions for Gels, Continued

### Midi Gels

Follow the recommended conditions listed below for running 1.0-mm thick NuPAGE® Novex® Midi-Gels on the low voltage/high current side of the ZOOM® Dual Power. In the table below, current is indicated per gel.

Midi Gel Type	Voltage (V)	Approximate Duration (Minutes)	Expected initial current (mA)
NuPAGE® Novex® 10% Bis-Tris with MES SDS Running Buffer	200	40	160–200
NuPAGE® Novex® 4–12% Bis-Tris with MES SDS Running Buffer	200	40	160–200
NuPAGE® Novex® 10% Bis-Tris with MOPS SDS Running Buffer	200	55	160–200
NuPAGE® Novex® 4–12% Bis-Tris with MOPS SDS Running Buffer	200	55	160–200
NuPAGE® Novex® 3–8% Tris-Acetate with SDS Tris-Acetate Running Buffer	150	70	70–90
NuPAGE® Novex® 3–8% Tris-Acetate with Tris-Glycine Native Running Buffer	150	120–180	40–45

*Continued on next page*

## Run Conditions for Gels, Continued

### Isoelectric Focusing (IEF) using ZOOM® Strips

For best results, follow the recommended conditions listed below for performing IEF using ZOOM® Strips on the high voltage/low current side of the ZOOM® Dual Power. For each type of strips, broad range (pH 4–7, pH 6–10, pH 3–10 linear, pH 3–10 non-linear), narrow range (pH 4.5–5.5, pH 5.3–6.3, pH 6.1–7.1), and basic range (pH 9–12), you can choose from two protocol options (A and B) for performing IEF depending on whether you are using RAMP or STEP functions in your program.

**Note:** DISABLE the No Load detection alarm (see pages 14, 26).

\*Parameters **per strip:** Current Limit: 50 µA, Power Limit: 0.1 W

Isoelectric Focusing using ZOOM® Strips *			
Gel Type		Voltage	Recommended Duration
<b>Broad Range ZOOM® Strips.</b>			
<i>Protocol A (Voltage Ramp)</i>	Step 1	175 V	15 minutes
	Step 2	175–2000 V ramp	45 minutes
	Step 3	2000 V	30 minutes
<i>Protocol B (Step Voltage)</i>	Step 1	200 V	20 minutes
	Step 2	450 V	15 minutes
	Step 3	750 V	15 minutes
	Step 4	2000 V	30 minutes
<b>Narrow Range ZOOM® Strips</b>			
<i>Protocol A (Voltage Ramp)</i>	Step 1	175 V	15 minutes
	Step 2	175–2000 V ramp	45 minutes
	Step 3	2000 V	105 minutes
<i>Protocol B (Step Voltage)</i>	Step 1	200 V	20 minutes
	Step 2	450 V	15 minutes
	Step 3	750 V	15 minutes
	Step 4	2000 V	105 minutes
<b>ZOOM® Strips pH 9–12</b>			
<i>Protocol A (Voltage Ramp)</i>	Step 1	175 V	15 minutes
	Step 2	175–2000 V ramp	45 minutes
	Step 3	2000 V	60 minutes
<i>Protocol B (Step Voltage)</i>	Step 1	200 V	20 minutes
	Step 2	450 V	15 minutes
	Step 3	750 V	15 minutes
	Step 4	2000 V	60 minutes

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## Run Conditions for Gels, Continued

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### Isoelectric Focusing (IEF) using the ZOOM<sup>®</sup> IEF Fractionator and ZOOM<sup>®</sup> Disks

Use the conditions listed below on the high voltage/low current side of the ZOOM<sup>®</sup> Dual Power as a starting point to develop your solution phase IEF method using the ZOOM<sup>®</sup> IEF Fractionator and ZOOM<sup>®</sup> Disks.

**Note:** DISABLE the No Load detection alarm (see pages 14 and 26).

\*Parameters **per fractionator**: Current Limit: 2 mA, Power Limit: 2 W for the recommended load of 2 mg total protein per fractionators.

Isoelectric Focusing using the ZOOM <sup>®</sup> IEF Fractionator and ZOOM <sup>®</sup> Disks*		
	Voltage	Recommended Duration
Step 1	100 V	20 minutes
Step 2	200 V	80 minutes
Step 3	600 V	80 minutes

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## Operational Electric Parameters

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### Power Considerations

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:

$$\text{Voltage (V)} = \text{Current (I)} \times \text{Resistance (R)}; (V=IR)$$

$$\text{Power (W)} = \text{Current (I)} \times \text{Voltage (V)}; (W=IV)$$

---

### 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, and the current decreases.

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### 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.

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### 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.

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### Power

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

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# Choosing Limiting Parameter Settings

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## Introduction

The ZOOM® Dual Power is capable of operating at limiting voltage, limiting current, or limiting power. We recommend operating the ZOOM® Dual Power at limiting voltage for most applications. See below for more details.

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## 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 ZOOM® Dual Power, the voltage will increase as resistance increases to satisfy Ohm's law ( $V=IR$ , see page 36). 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.

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## Power Limiting

If power is constant, voltage will increase and current will decrease during a run, but the total amount of heat generated by the system will remain constant throughout the run. However, locally high resistance can cause a high proportion of the total heat to be generated over a small distance. This can damage the electrophoresis cell and/or gel(s).

If operating at limiting power, set the voltage limit to slightly above the maximum expected for the run.

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# Choosing Run Duration in Time or Volt-Hours

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## Introduction

The ZOOM® Dual Power allows specification of run durations by time (minutes) or number of volt-hours (V-H, or V/H, or V.H) for the **Constant Operation** mode and for program steps of the **Programmable Mode** that are set at the STEP function (discrete steps). We recommend specifying operations in time for most applications when using Life Technologies products. See below for more details.

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## Time versus Volt-Hours

The ZOOM® Dual Power can be programmed to stop after a specified amount of time has passed (in minutes), or after a specific number of volt-hours have been reached.

In some cases, particularly with isoelectric focusing of highly conductive samples, a long period of electrophoresis must take place before maximal desired voltage is attained. In such cases, specifying the duration of the electrophoresis by time may result in an inferior separation and/or inconsistent results. Better results can often be obtained by specifying a total number of volt-hours for the electrophoretic separation. For example, a separation equivalent to electrophoresis at 1,000 V over 2 hours can be specified by choosing a voltage limit of 1,000 V and a duration of 2,000 volt-hours.

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## Note

We recommend AGAINST using the volt-hour feature of the ZOOM® Dual Power when using it with Life Technologies electrophoresis systems and tools.

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# Repair and Maintenance of ZOOM® Dual Power

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## Introduction

The ZOOM® Dual Power requires no periodic maintenance program with the exception of an occasional dry wipe-down of the instrument.

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## Encountering Problems

1. Check the troubleshooting section on page 29.
  2. Call Technical Support (see page 41).
  3. If the unit must be shipped back for repair, contact Life Technologies or the distributor for a Return Authorization Number and shipping instructions. The unit will be repaired as quickly as possible and returned to you.
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## Replacing the Fuse

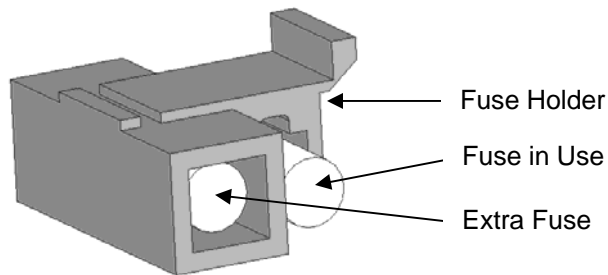
One extra fuse is supplied with ZOOM® Dual Power. For additional fuses, contact Life Technologies Technical Support, see page 26.

To replace the fuse:

1. Turn off the main power switch at the rear of the ZOOM® Dual Power and detach the power cord from the rear of the ZOOM® Dual Power.
2. Open the fuse compartment located inside the Power Entry Module (see page xiii for rear view of the ZOOM® Dual Power) by inserting a small flat blade screwdriver into the slot below the ON/OFF switch. 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 (4A/250V) as provided in the fuse holder (see figure below).
4. Place the fuse holder back into the compartment.
5. Snap the cover closed.



## Accessory Products

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### Additional Products

Additional products are available for use with the ZOOM® Dual Power that include the ZOOM® IEF Fractionator, ZOOM® IPGRunner™, and the XCell™ line of gel electrophoresis units. These units are designed for use with a large variety of pre-mixed buffers, pre-cast gels, and pre-cast immobilized pH gradient (IPG) gel strips for gel electrophoretic separation and isoelectric focusing applications. For further information about these and other products suitable for use with the ZOOM® Dual Power, visit [www.lifetechnologies.com](http://www.lifetechnologies.com) or contact Technical Support (page 41).

Product	Quantity	Cat. no.
XCell™ SureLock™ Mini-Cell	1 unit	EI0001
XCell4 SureLock™ Midi-Cell	1 unit	WR0100
XCell6™ MultiGel Unit	1 unit	E10006
XCell II™ Blot Module	1 unit	EI9051
ZOOM® IPGRunner™ Mini-Cell	1 unit	ZM0001
ZOOM® IPGRunner™ Combo Kit	1 kit	ZM0002
ZOOM® IPGRunner™ Retrofit Kit	1 kit	ZM0004
ZOOM® IEF Fractionator Combo Kit	1 kit	ZF10001
ZOOM® IEF Fractionator	1 unit	ZF10002

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### NuPAGE® Pre-Cast Gels

The NuPAGE® Novex® Pre-Cast Gel systems are high-performance polyacrylamide Bis-Tris gels and Tris-Acetate gels for the separation of small to large size molecular weight proteins. The unique formulation and neutral operating pH offer significant advantages including longest shelf life, best resolution, sharpest bands, fastest runs, best protein stability, highest protein capacity and most efficient transfers. A wide variety of NuPAGE® Novex® Pre-Cast gels are available to provide optimal separation results. For more information, visit [www.lifetechnologies.com](http://www.lifetechnologies.com) or contact Technical Support (see page 40).

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### ZOOM® Strips and Disks

ZOOM® Strips are IPG Strips allow that you to take advantage of oil-free, trouble-free isoelectric focusing (IEF) with the ZOOM® IPGRunner™ system. Life Technologies offers a wide variety of ZOOM® IPG Strips to suit your specific needs.

ZOOM® Disks are pre-cast, pre-labeled immobilized buffer disks for convenient and effective solution phase isoelectric focusing with the ZOOM® IEF Fractionator that allow resolving samples into seven fractions.

For more information visit [www.lifetechnologies.com](http://www.lifetechnologies.com) or contact Technical Support (see page 40).

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# Technical Support

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**Obtaining support** For the latest services and support information for all locations, go to [www.lifetechnologies.com/support](http://www.lifetechnologies.com/support).

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](mailto: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](http://www.lifetechnologies.com/support).

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## **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](http://www.lifetechnologies.com/support) and search for the Certificate of Analysis by product lot number, which is printed on the box.

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## Purchaser Notification

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**Limited Use Label  
License: Research  
Use Only**

The purchase of this product conveys to the purchaser the limited, non-transferable right to use the purchased amount of the product only to perform internal research for the sole benefit of the purchaser. No right to resell this product or any of its components is conveyed expressly, by implication, or by estoppel. This product is for internal research purposes only and is not for use in commercial services of any kind, including, without limitation, reporting the results of purchaser's activities for a fee or other form of consideration. For information on obtaining additional rights, please contact [outlicensing@lifetech.com](mailto:outlicensing@lifetech.com) or Out Licensing, Life Technologies, 5791 Van Allen Way, Carlsbad, California 92008.

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# Warranty

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## **ZOOM® Dual Power Warranty**

Life Technologies (a part of Life Technologies Corporation) warrants to the original purchaser ("Purchaser") that the ZOOM® Dual Power Supply ("Instrument") will be free from defects in materials and workmanship for a period of one (1) year from the date of delivery. Life Technologies agrees, as its sole responsibility under this limited warranty, and upon prompt notice of a defect, to replace or refund purchase price, at its discretion, any device discovered to be defective within the warranty period. This warranty does not include replacement or refund necessitated by accident, abuse, neglect, misuse, unauthorized repair or modification of the Instrument.

In the event that Life Technologies determines that the Instrument is in need of replacement, this Standard Warranty includes replacement parts and labor for the Instrument. This Standard Warranty includes shipment of the Instrument or replacement to and from Life Technologies.

THIS WARRANTY AND THE REMEDIES SET FORTH HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS OR IMPLIED WARRANTIES (INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT), AND NO OTHER WARRANTIES SHALL BE BINDING UPON LIFE TECHNOLOGIES CORPORATION. IN NO EVENT SHALL LIFE TECHNOLOGIES CORPORATION BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OR MALFUNCTION OF THIS DEVICE OR THE SYSTEM WITH WHICH IT IS USED, EVEN IF SUCH DAMAGES COULD BE ANTICIPATED BY LIFE TECHNOLOGIES CORPORATION.

To obtain service during the warranty period, contact Life Technologies Technical Support for further instruction.

### **OUT OF WARRANTY SERVICE**

Contact Life Technologies Technical Support. We will be happy to assist you by phone at no charge. Replacement of the device or components if needed, will be billed depending on replaced components or the complete Instrument. You will also be billed for shipment of the replacement components or the Instrument.

Purchase of the ZOOM® Dual Power Supply indicates acceptance of the terms and conditions herein.

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**For support visit** [www.invitrogen.com/support](http://www.invitrogen.com/support) or email [techsupport@invitrogen.com](mailto:techsupport@invitrogen.com)

[www.lifetechnologies.com](http://www.lifetechnologies.com)

