Thermo SCIENTIFIC

EC3000XL2

Electrophoresis Power Supply

LTM1593X1 8/30/07

Thermo Scientific EC3000 Electrophoresis Power Supply

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Safety Considerations

Read and understand this manual completely before attempting to set up or use this instrument.

This equipment has been designed and tested to conform to IEC1010-1 safety standards, as applicable to laboratory instrumentation. This applies only to the EC3000 when used as specified in the documentation, in its intended applications, with Thermo approved electrophoresis apparatus only. Usage in any other manner may not provide similar performance or safety protection.

This equipment is provided with a 3-conductor, grounded AC line cord. The protective earth ground is necessary for safe operation. Do not use any other AC line cord with this instrument.

The EC3000 is a high voltage power supply capable of generating dangerous levels of voltage and current during operation. Exercise caution when working around and with the electrical connections of this equipment. Always check electrical connectors, wires, and associated apparatus for any signs of wear or damage before using with this equipment. Be sure to use only electrophoresis equipment that is suitably rated for the voltage and current capabilities of the EC3000 power supply.

The output of the EC3000 power supply is intended for connection to electrically isolated electrophoresis apparatus only. Use only with electrically isolated electrophoresis apparatus with minimum isolation of 3000V. Do not connect any terminal of the EC3000 output to earth ground. This may impair the safety protection provided by the equipment, or cause equipment damage.

The high voltage output of the EC3000 power supply takes some amount of time to decay when unloaded or lightly loaded. Wait a minimum of 60 seconds after stopping a run before touching the power supply leads.

This equipment has a protective ground leakage current of 0.5mA at 120VAC, and 1mA at 230VAC. While significantly below the 3.5mA limitation for laboratory instrumentation, some applications and locations require a leakage current below 0.5mA. Check the specific requirements of your application before using this equipment.

This equipment is for indoor use only.

Introduction

Thank you for selecting a Thermo Scientific EC3000 Electrophoresis power supply. This manual describes the operation of the EC3000. The power supply that you have purchased is the most productive and easy-to-use unit available anywhere. This manual should answer any questions that might arise in operating your power supply; however, don't hesitate to call our Thermo Lab Equipment Technical Support Hotline at 1-800-943-2006 or 1-800-926-0505 if you need any assistance.

The EC3000 power supply is designed to provide constant voltage, current, power, or temperature in both Manual and Programmed modes of operation commonly used in electrophoresis applications. One to four sets of electrophoresis cells can be connected in parallel and run simultaneously. The EC3000 can deliver up to 400W of total output power. When operating in any constant mode, the power supply automatically limits the other parameters to either the power supply maximum, or a lower limit if set by the user. If any non-constant limit is reached, the power supply will automatically switch control modes, controlling the limit parameter. Note: The unit will not crossover and control for temperature when the unit is in the Constant Current, Constant Voltage, or Constant Power mode. The only time the unit will control for temperature as an upper limit is when the unit is in the Constant Temperature mode (See Constant Temperature Operations section for details). In this way, the EC3000 protects your electrophoresis cells from damaging over power conditions. The EC3000 power supply also provides for timed and volt-hour operation in all control modes, and allows an automatic completion in the event of a power loss if enabled.

Features

- 20-3000V, adjustable in 1 volt steps
- 1-400mA, adjustable in 1mA steps
- 1-400W, adjustable in 1W steps
- 0-90C, adjustable in 1degree C steps
- Automatic control mode crossover
- 0-99 hour 59 minute timed run
- 0-9999 volt-hour timed run
- Automatic restart if loss of AC power (if enabled)
- Large LCD display

Unpacking the Power Supply

When unpacking your EC3000 power supply, be sure you have received the following items.

- EC3000 unit
- AC line cord
- This manual

Inspect your equipment and packaging material for signs of damage. Damage to the shipping container may indicate rough handling which could cause internal damage to the power supply. If you suspect shipping damage to the power supply, contact your carrier for instructions on filing a claim. If you are missing any of the above items, contact your supplier for instructions.

Specifications

AC input Power

95-265VAC, 50-60Hz, 500VA Max

Environmental

Operating temperature: 0-40°C, 0-95% R.H. non-condensing
Altitude: 2000m
Overvoltage category II, IEC664
Pollution degree 2, IEC664

DC output Power

20-3000VDC, 400W Max
1-400mA, 400W Max
Ripple: ± 1%
Drift: ± 1%, after 30-minute warm-up

Getting Started

Select a location that allows for 3" clearance behind the power supply, and comfortable reach of the front panel controls and cell connections. Do not block the vented area of the case - on the front bottom of the unit, or the fan area at the rear. Connect the power supply to a 3-prong grounded AC outlet, **using the AC cord provided with the unit only**. Connect the electrophoresis apparatus to the power supply, making sure to match the red positive lead to the red positive jack, and the black negative lead to the black negative jack. Similarly, connect a second or more electrophoresis apparatus to the power supply if you plan to run more than one in parallel. Attach a temperature probe to the EC3000 rear located connector and the electrophoresis apparatus if you intend to perform temperature-controlled runs. Note that only one electrophoresis apparatus can be controlled when using temperature control. Power the unit on using the AC power switch located at the rear of the unit, next to the AC line cord entry.

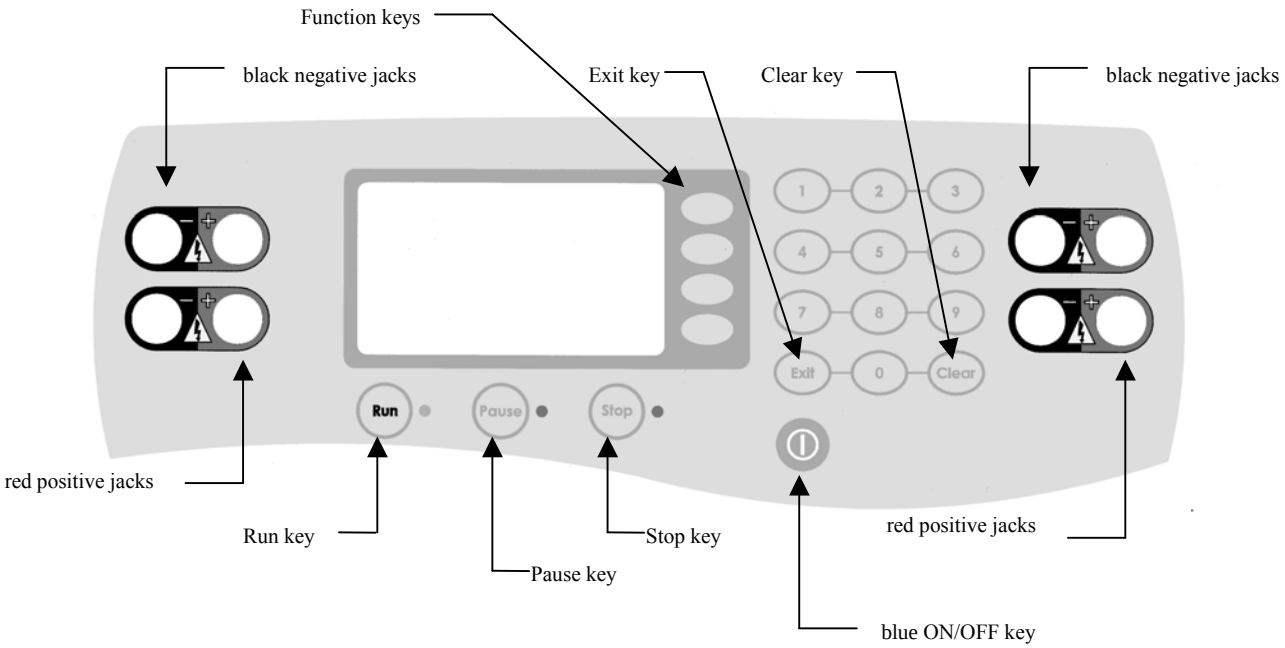

Figure 1. Front Panel Controls

Using the Power Supply

Press the blue key on the front of the unit to enable/disable the control logic. The LCD display will illuminate and allow selection of MANUAL or PROGRAM mode of operation as well as enable/disable automatic power-fail restart. Toggle automatic power-fail restart by pressing the topmost function key to the right of the display. Select MANUAL or PROGRAM mode using the function keys to the right of the display (see Programming section for programming mode description). In manual mode, the EC3000 preserves the constant setpoint each time you start a run. The constant parameter is saved independently for each mode; constant voltage, current, power, and temperature.

Note: The unit will not crossover and control for temperature when the unit is in the Constant Current, Constant Voltage, or Constant Power mode. The only time the unit will

control for temperature as an upper limit is when the unit is in the Constant Temperature mode (See Constant Temperature Operations section for details).

To change the control mode, press the Exit key. From the resulting screen, select the new constant parameter using the function keys to the right of the display.

After selecting a control mode and setting the limit and timed run parameters if desired, press the Run key to energize the power supply output. The power supply output will ramp up to the appropriate setpoint, while not allowing any limit parameter to be exceeded. If any limit parameter should be exceeded, then the power supply will crossover control modes, making the limit parameter the new control setpoint. The run mode display shows the controlled parameter highlighted, and will automatically change if a crossover has occurred.

To stop a run in progress, press the Run key, the Stop key, or the blue ON/OFF key. The display will change to "STOP" signifying that the output is no longer energized. To pause a run in progress, press the Pause key. The display will change to "PAUSE" signifying that the output is no longer energized, and that the run can be resumed. Pressing Run or Pause resumes the run from the previous point (i.e. for a timed run). Only a run that has been paused can be restarted. After Stopping a run, or to change parameters of a (paused) run, you must cycle the control logic off and then back on by pressing the blue ON/OFF key.

During a run, the display will show the actual values of voltage, current, power, and temperature. The time value displays elapsed time for an untimed run, or time left for a timed run. The volt-hour value displays the accumulated volt-hour value for the run.

Constant Voltage Operations

From the mode selection screen, select constant voltage operation by pressing the appropriate function key located to the right of the display. To get to the selection screen from an operating screen, press Exit, or cycle the control logic off and then back on by pressing the blue ON/OFF key and selecting MANUAL. The EC3000 will display the last saved setpoint for constant voltage mode. To switch between volts/current/power and time/volt-hours/temperature, press function key F1. To change a parameter, press the function key located to the right of the display, next to the parameter you wish to change. The EC3000 will allow a new value to be entered using the keypad numeric keys. Press the function key labeled "Enter" to complete the new setting. Press Clear to erase previous keystrokes. Press Exit to cancel entering a new value. The EC3000 will not accept a voltage setpoint outside of the allowed range. Press Clear to re-enter an appropriate value.

The limit parameters are normally set to the power supply maximum values. The EC3000 will not accept a limit parameter outside of the allowed range.

In addition, the EC3000 will never exceed the maximum power output specification of 400W.

Constant Current Operations

From the mode selection screen, select constant current operation by pressing the appropriate function key located to the right of the display. To get to the selection screen from an operating screen, press Exit, or cycle the control logic off and then back on by pressing the blue ON/OFF key and selecting MANUAL. The EC3000 will display the last saved setpoint for constant current mode. To switch between volts/current/power and time/volt-hours/temperature, press function key F1. To change a parameter, press the function key located to the right of the display, next to the parameter you wish to change. The EC3000 will allow a new value to be entered using the keypad numeric keys. Press the function key labeled "Enter" to complete the new setting. Press Clear to erase previous keystrokes. Press Exit to cancel entering a new value. The EC3000 will not accept a current setpoint outside of the allowed range. Press Clear to re-enter an appropriate value.

The limit parameters are normally set to the power supply maximum values. The EC3000 will not accept a limit parameter outside of the allowed range.

In addition, the EC3000 will never exceed the maximum power output specification of 400W.

Constant Power Operations

From the mode selection screen, select constant power operation by pressing the appropriate function key located to the right of the display. To get to the selection screen from an operating screen, press Exit, or cycle the control logic off and then back on by pressing the blue ON/OFF key and selecting MANUAL. The EC3000 will display the last saved setpoint for constant power mode. To switch between volts/current/power and time/volt-hours/temperature, press function key F1. To change a parameter, press the function key located to the right of the display, next to the parameter you wish to change. The EC3000 will allow a new value to be entered using the keypad numeric keys. Press the function key labeled "Enter" to complete the new setting. Press Clear to erase previous keystrokes. Press Exit to cancel entering a new value. The EC3000 will not accept a power setpoint outside of the allowed range. Press Clear to re-enter an appropriate value.

The limit parameters are normally set to the power supply maximum values. The EC3000 will not accept a limit parameter outside of the allowed range.

Constant Temperature Operations

NOTE: The EC3000 controls for temperature by regulating the power output by the unit until the set temperature control limit is reached. The unit will generate a constant power output to the selected device until the temperature setpoint of the gel is reached. Once the set temperature control limit is achieved, the EC3000 will regulate the power output to maintain the gel at a fixed temperature. It is important to optimize the power required for an application so that there is sufficient power output from the EC3000 power supply to enable the gel to reach the required temperature. If the output power is not sufficient in allowing the gel to reach the desired temperature, the unit will not be able to control /limit the temperature of the device.

From the mode selection screen, select constant temperature operation by pressing the appropriate function key located to the right of the display. To get to the selection screen from an operating screen, press Exit, or cycle the control logic off and then back on by pressing the blue ON/OFF key and selecting MANUAL. The EC3000 will display the last saved setpoint for constant temperature mode. To switch between volts/current/power and time/volt-hours/temperature, press function key F1. NOTE: Only the power and temperature values will be control parameters in the constant temperature mode. If you desire, the ***default voltage and current limits*** may be changed. However, the unit will ***not*** control for either voltage or current while in the constant temperature mode. To change a parameter, press the function key located to the right of the display, next to the parameter you wish to change. The EC3000 will allow a new value to be entered using the keypad numeric keys. Press the function key labeled "Enter" to complete the new setting. Press Clear to erase previous keystrokes. Press Exit to cancel entering a new value. The EC3000 will not accept a temperature setpoint outside of the allowed range. Press Clear to re-enter an appropriate value.

The limit parameters are normally set to the power supply maximum values. The EC3000 will not accept a limit parameter outside of the allowed range.

In addition, the EC3000 will never exceed the maximum power output specification of 400W.

To run in the Constant Temperature Mode, an FBTEMP temperature probe must be plugged into the unit. Please ensure that the FBTEMP temperature probe is securely sealed to the surface of the apparatus to be measured.

Timed Operations

It is possible to enter an amount of time for the power supply to provide power, after which it will automatically shut off. Use this feature for timed runs.

Set up a constant mode setpoint and limits as described above. Enter a time duration of 0-99 hours, 59 minutes. A time duration of zero effectively disables timed run mode.

When running a timed run, the time parameter displays the time remaining in the run. When running a non-timed run, the time parameter displays the elapsed time during the run.

Volt-Hour Operations

It is possible to enter an amount of volt-hours for the power supply to provide power, after which it will automatically shut off. Volt-hours is the integration of voltage over time. Use volt-hour control to provide consistency between runs.

Set up a constant mode setpoint and limits as described above. Enter a volt-hour duration of 0-9999 volt-hours. A volt-hour duration of zero effectively disables volt-hour run mode.

During a run, the volt-hour value displays the accumulated volt-hour value for the run.

Automatic Power-fail Restart

Automatic power-fail restart capability allows a timed or volt-hour run which is interrupted by loss of AC power to be restarted automatically, so that the total time/volt-hour programmed for the run will be met. **NOTE:** Loss of AC power includes switching off the unit using the power switch located at the rear of the unit. *When performing timed or volt-hour runs with power-fail restart enabled, always use the front panel controls to stop a run in progress.*

To enable power-fail restart, press the top function key when in the mode selection screen (MANUAL or PROGRAM). The state of power-fail restart will toggle from off to on or on to off with each keypress.

When AC power is restored during a run in which power-fail restart is enabled, the display will show "POWER-FAIL RESTART" for approximately 10 seconds indicating power-fail restart pending. During this time the output is not energized, to allow safely stopping the run (by pressing Run). After the power-fail restart pending delay is completed, the power supply output will ramp up to the setpoint value and the run will continue from that point. Any number of power interruptions can occur during the completion of a single run.

If a power-fail restart occurs during the running of a program the EC3000 will complete the interrupted step, and then advance to the next step in the program.

Programming

The EC3000 can store 9 programs, each containing 9 steps. A program step is a constant voltage, current, power, or temperature setpoint with any associated limit parameters, and most importantly a time and/or volt-hour setting. When running a program step, after the time or volt-hour limit is reached, the EC3000 will automatically run the next program step (if there is one). After all program steps are completed in a program the EC3000 will shut down. Any sequence of control mode and timed/volt-hour steps can be contained in a program. Note that a program step can contain a zero for the time and volt-hour parameters, in which case the EC3000 will continue to maintain that setpoint indefinitely (just like the setting had been run from MANUAL mode).

To enter programming mode from an operating screen, cycle the control logic off and then back on by pressing the blue ON/OFF key and selecting PROGRAM. The EC3000 will display the program screen, which shows the number of steps contained in the selected program. Use the function keys to the right of the display to move through the 9 possible programs. To run the program starting from step 1, press the Run key. To edit a program (including adding a first step to an empty program) press the function key labeled EDIT. The EC3000 will display the step screen, which shows the parameters for the selected step (except when the program is empty in which case the EC3000 automatically starts entering the first step as follows). Use the function keys to the right of the display to move through the 9 possible steps. To run the program starting

from the selected step, press the Run key. To edit a step press the function key labeled EDIT. The EC3000 displays the mode selection screen. Select a constant mode of operation by pressing the appropriate function key located to the right of the display. To switch between volts/current/power and time/volt-hours/temperature, press function key F1. To change a parameter, press the function key located to the right of the display, next to the parameter you wish to change. The EC3000 will allow a new value to be entered using the keypad numeric keys. Press the function key labeled "Enter" to complete the new setting. Press Clear to erase previous keystrokes. Press Exit to cancel entering a new value. The EC3000 will not accept any parameter outside of the allowed range. Press Clear to re-enter an appropriate value. When all the parameters of the step are as desired, press Exit to return to the step screen. The newly entered parameters will be displayed in the selected step. To add a step after the selected step press the function key labeled ADD. Enter parameters for the step as for EDIT, pressing Exit when complete.

To delete a program or step, press the Clear key from the program or step screen as desired. After confirmation the EC3000 will remove the selected program or step from memory.

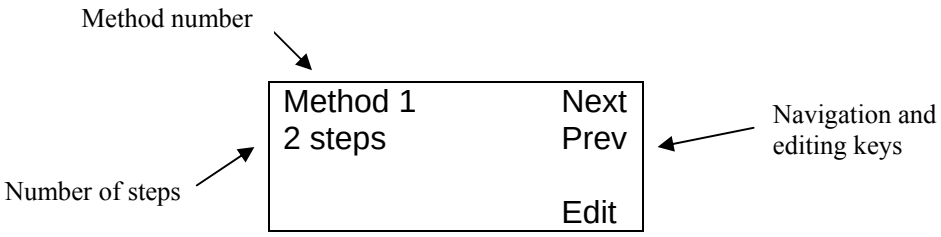

Figure 2. Program screen

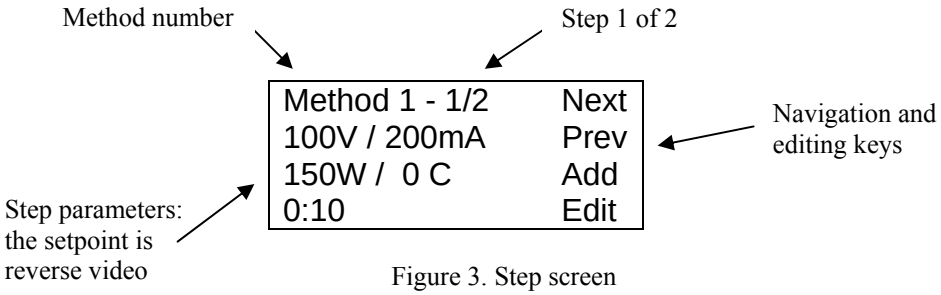

Figure 3. Step screen

Cleaning

Before cleaning the unit, be sure to always turn off AC power using the switch at the rear of the unit, and then disconnecting the AC line cord. The front of the unit is sealed and can be wiped clean with any mild detergent solution. Avoid harsh cleaners or agents as they may deteriorate the surface of the tactile membrane keys.

Troubleshooting and Error Indications

The EC3000 detects and reports several events and conditions that are considered errors. The EC3000 will stop any run in process and display "ERROR XX" where XX is one of the below listed errors. When the EC3000 is displaying an error indication, press the blue ON/OFF key to clear the error and return to setup mode, or press the Run key to resume the run (after correcting the cause of the error). Note that loss of AC power during a run is considered an error condition. Always stop a run before turning off AC power to the EC3000.

'XX'	Condition and possible remedy
00 **20**	Minimum load current detected. The output is not connected, or the electrophoresis apparatus is not set up properly. Check your setup and connections.
01 **21**	Maximum load current exceeded. The output is short circuit, or the electrophoresis apparatus is not set up properly. Check your setup and connections
02	Step load current change. The EC3000 has detected a large change in load current. Check your setup and connections
03	Loss of AC power; PF enabled and completed. The EC3000 detected loss of AC power, however the run was completed as programmed.
04	Loss of AC power; PF disabled and not completed. The EC3000 detected loss of AC power, the run was not completed since PF was not enabled.
05	Loss of AC power; run not timed. The EC3000 detected loss of AC power.
06-99	The EC3000 detected an internal error condition. Contact technical support for instructions.

Before servicing the unit, be sure to always turn off AC power using the switch at the rear of the unit, and then disconnecting the AC line cord. The EC3000 power supply requires no periodic servicing and should provide years of trouble free operation. Should you need to replace the fuses proceed as follows:

Replacing a fuse

CAUTION: The EC3000 uses double pole neutral fusing.
Turn off AC power using the switch at the rear of the unit, and then disconnecting the AC line cord. Remove the fuse holder assembly using a small flat blade screwdriver.
Always replace both fuses with appropriate replacement fuses: 5A, 250V, 5X20mm, type T fuse (T5A,250V) (Thermo catalog number FB-FUSE-3).

EC3000 Warranty Statement

The Thermo Scientific Company ("Thermo") warrants to the direct purchaser that the EC3000 will be free from defects in material or workmanship for a specified warranty period. During that period, Thermo will repair or replace the product or provide credit, at its sole option, upon prompt notification and compliance with its instructions. For EC3000 power supplies that specified period is 48 months from manufacturing date.

Unless otherwise agreed, the warranty is limited to the country in which the product is sold.

No Thermo employee, agent or representative has the authority to bind Thermo to any oral representation or warranty concerning any product sold. Any oral representation or warranty made prior to purchase of any product and not set forth in writing and signed by a duly authorized officer of Thermo shall not be enforceable by the purchaser.

THERMO EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Thermo's sole responsibility and the purchaser's exclusive remedy for any claim arising out of the purchase of any product listed above is repair, replacement or credit as described above, where applicable. In no event: 1) shall the cost of the exclusive remedy exceed the purchase price: 2) shall Thermo be liable for any special, indirect, incidental, consequential, or exemplary damages, howsoever arising, even if Thermo has been advised of the possibility of such damages.

Each article that Thermo furnishes will conform to the written specifications given in this manual, or those of a further improved model. Changes are made often to the information in the manual and will be incorporated into future editions.

Compliance

EMC - This equipment when used in accordance with the instruction manual conforms to EMC Directive 89/336/EEC and EMC Standard EN61326, as applicable to electrical equipment for measurement control and laboratory use.

IEC - This equipment has been designed and tested to conform to Low Voltage Directive 73/23/EEC and IEC 1010-1 Safety Standards, as applicable to electrical equipment for measurement control and laboratory use.

Replacement Parts

AC line cord, UK Plug	FB-CORD-2
AC line cord, Cont. Euro Plug	FB-CORD-3
Fuse, T5A,250V	FB-FUSE-3

Technical Support: 1-800-943-2006 or 1-800-926-0505

Accessories

Adapter for Cells	FBAD-1
Under Counter Bracket	FBUB3000
Temperature Probe (0 – 90 C)	FB-TEMP