Please read these instructions carefully before using this power supply.

Veuillez, avant tout emploi du générateur, lire attentivement ce manuel d’utilisation.
SAFETY NOTICES
NOTICES DE SÉCURITÉ

⚠️ WARNING: This notice alerts you to a potentially dangerous situation.

⚠️ AVERTISSEMENT: Cette notice attire votre attention sur des dangers potentiels.

⚠️ CAUTION: This notice means serious damage may occur to your power supply or chamber.

⚠️ PRECAUTION: Cette notice attire votre attention sur des dangers sérieux pour votre générateur ou votre chambre d’électrophorèse.

NOTE: This notice gives useful advice or suggestions to raise the performance or reliability of your power supply.

⚠️ WARNING

This power supply has been designed to be used as a source of DC power for electrophoresis. It is capable of generating lethal currents. Use the same precautions as with any electrical device. Do not operate without the cover in place. Do not connect the output to earth ground. Do not operate in a damp, humid, environment where condensing moisture may short out internal electrical components. Do not operate with connecting cables which have exposed wires. Do not pull the leads out of the 4mm output connectors while the unit is in operation. Follow all appropriate safety measures outlined by the chamber manufacturer.

⚠️ AVERTISSEMENT

Ce générateur a été conçu pour être utilisé comme source de courant (DC) pour l’électrophorèse, et il est capable de générer un courant mortel. Prenez les mêmes précautions que pour tout autre appareil électrique. N’utilisez pas l’appareil sans que le couvercle de la chambre soit placé. Ne raccordez pas les sorties à la terre. N’utilisez pas l’appareil dans des environnements humides, où la condensation pourrait causer des dommages aux composants électriques internes. Ne mettez pas l’appareil en route avec des câbles ou partie de câble dénudé. Ne retirez pas les câbles des sorties de 4mm pendant que l’appareil est en fonctionnement. Prendre toutes les précautions recommandé par le fabricant de la chambre d’électrophorèse.
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SPECIFICATIONS

Type Output: Constant Voltage or Constant Milliamps with automatic crossover

Maximum Voltage: 250 Volts

Maximum Current: 500 Milliamps

Maximum Power: 125 Watts

Regulation: \( \leq 1\% \)

Accuracy: \( \pm 1.5\% \) full scale for each display

Number of Output Terminals: Four sets of recessed 4mm output connectors

Safety Interlock: Load sensing shut-down-on disconnect. Key actuation necessary to begin voltage generation. In the event of shutdown due to power interruption, automatic restart is provided.

Timer: 0.00 to 24 hrs 00 min.

Input Power: 110 Volts or 240 Volts AC, 50/60 Hertz, 250 Watts

Ambient Operating Temperature Range: 0°C - 30°C (non-condensing atmosphere)

Dimensions: 7.5” (D) x 8.75” (W) x 5.5” (H)

19cm x 22cm x 14cm

Weight: (net) 11 lbs 5 kg

Weight: (shipping) 15 lbs 6.8 kg

WARRANTY

This laboratory equipment was produced by Thermo Electron with the highest practical standards of materials, workmanship, and design. The design and manufacture of parts have been conceived with one purpose — to produce a unit which will give satisfactory service.

Thermo Electron guarantees this unit to be free from defects in materials or workmanship under normal use or service for four years from date of shipment. If, during this time, this unit proves defective in materials or workmanship, the Company will repair or replace it free of charge if returned to us prepaid. This guarantee does not cover damage in transit, damage caused by carelessness, misuse or neglect, or unsatisfactory performance as a result of conditions beyond our control or consequential losses as a result of our product.
INTENDED USES AND SET UP

This power supply is intended to be used with electrophoretic devices designed to operate at or below 250 volts and 500 milliamps. Four sets of output connectors operate in parallel to provide a constant voltage (10 - 250V) or constant current (10 - 500mA); the maximum power output is 125 watts.

Make sure that the unit is set up in a location where it is protected from physical damage, moisture, corrosive agents and extreme temperatures. The unit should be readily accessible for safe operation.

Use the power cord to connect the unit to the AC Mains carrying the appropriate specified voltage (V) in accordance with the rating label located at the rear of the unit. Make sure that the mains receptacle has the proper 3-wire (grounded or earthed) connections.

WARNING

Do not pull the leads out of the 4mm output connectors while the power supply is in operation!

AVERTISSEMENT

Ne retirez pas les cables des sorties de 4mm pendant que l’appareil est en fonctionnement!
Appendix C. Running Multiple Chambers

This power supply is equipped with four sets of 4mm output connectors which are connected in parallel. The significance of this fact can be explained by studying the following statements.

1. The voltage is applied equally to all branch paths in a parallel circuit.
2. The current flow in the branch paths of a parallel circuit is determined by the resistance of the individual paths.
3. The sum of the currents entering the branch paths of a parallel circuit is equal to the sum of the currents leaving the branch paths of a parallel circuit.

A practical example of this is described as follows:

The power supply is connected to two identical horizontal submarine electrophoresis chambers (cells A and B). The power supply output is adjusted to 100 volts, at constant voltage, and the current display indicates 60 milliamps. By applying the three rules for parallel circuits we can determine the following information.

1. The voltage applied to both Cell “A” and Cell “B” is 100 volts. (Rule 1)
2. The sum of the currents flowing through Cell “A” and Cell “B” is equal to 60 milliamps. (Rule 3)

Switch off the power supply and momentarily disconnect Cell “B”. Switch the power supply back on and note how the output current reading drops to 35 milliamps. From this, the following information can be derived.

1. The current flow through Cell “B” is equal to 60 milliamps minus 35 milliamps i.e. a net value of 25 milliamps. (Rule 3)
2. The reason Cell “A” and Cell “B” have different current readings is due to the difference in resistance between Cells “A” and “B”. (Rule 2)

WARNING

Do not pull the leads out of the 4mm output connectors while the power supply is in operation!

AVERTISSEMENT

Ne retirez pas les cables des sorties de 4mm pendant que l’appareil est en fonctionnement!

Always make sure that the DC output is off and that both of the leads are disconnected from the 4mm output connectors on the front of the power supply before you remove the gels from the electrophoresis chambers. This is particularly important when several chambers are connected to the power supply at the same time since the “No Load Detection Safety Feature” of the power supply does not shut the voltage output off when one of the gels is still connected.
Step 4. Using the Adjustment Knob (2), adjust the first operating limit to the desired value as shown on the Digital Volts/Milliamps/Time Display (8). Operating limits can range between 10 and 250V, 10 and 500mA and 1 minute (0.01) and 24 hours (24.0); (.00 = Timer Off). Several seconds after the desired setting has been entered, the power supply will automatically revert to the Actual Display Mode and the Actual Display LED (10) will be illuminated.

Step 5. Return to Step 3 to select the second operating limit. Once selected, the user may rotate the adjustment knob or depress the Display Key (6) to switch to the Set Mode. Once in the Set Mode, the second operating limit can be set. Use the same procedure to set the last operating limit.

Step 6. Press the DC On/Off Key (4), and make sure that the red DC On LED (5) is illuminated. Note that the Actual Display LED (10) is now illuminated. Verify that the appropriate values for the selected operating limits are displayed on the Digital Volts/Milliamps/Time Display (8).

Step 7. The Timer On LED (3) will tell you whether your count-down Timer has been activated, and the V at Limit and mA at Limit LEDs (3) will indicate whether you are operating at constant voltage (V) or at constant current (mA), respectively. You can also check the limits which have been set and the actual operating conditions, at any time, by pressing the Display (6) and Select Mode (11) keys.

NOTE: When the power supply is used in constant current mode, select an operating time for volts which is greater than the actual value by 10% or 25 volts, whichever is greater.

NOTE: The Adjustment Knob (2) can be turned clockwise and counterclockwise past zero. For example, the voltage may be set at at 0 when the power supply is switched on, but the user may want to set it to 245V. If the Adjustment Knob is turned counterclockwise the voltage can be quickly set to 245V.

NOTE: When the power supply is used in constant current mode, select an operating time for volts which is greater than the actual value by 10% or 25 volts, whichever is greater.

NOTE: Rotating the Adjustment Knob (2), at any time, will cause the power supply to automatically switch into the Set Display Mode. When this happens the Set Display LED will be illuminated and the operating limits may be changed. Approximately 5 seconds after the Adjustment Knob stops rotating the power supply will revert to the actual mode and the Actual Display LED will be illuminated.

NOTE: The Adjustment Knob (2) can be turned clockwise and counterclockwise past zero. For example, the voltage may be set at at 0 when the power supply is switched on, but the user may want to set it to 245V. If the Adjustment Knob is turned counterclockwise the voltage can be quickly set to 245V.

NOTE: The Adjustment Knob (2) can be turned clockwise and counterclockwise past zero. For example, the voltage may be set at at 0 when the power supply is switched on, but the user may want to set it to 245V. If the Adjustment Knob is turned counterclockwise the voltage can be quickly set to 245V.

NOTE: Some users prefer to set up the chamber, switch the power supply's output on, and adjust the operating limits before the samples are actually loaded. If you choose to do this follow these five steps.

(i) Confirm that the chamber and the power supply are functioning properly.
(ii) Determine what the safe operating limits are,
(iii) Switch the power supply's output off using the DC On/Off Key,

NOTE CONTINUED ON NEXT PAGE
NOTE CONTINUED:
(iv) Load the samples, and
(v) Switch the power supply on using the DC On/Off Key and readjust the operating limits if necessary.

The power supply will retain its settings in memory only if the DC output has actually been activated. Once in memory, the settings which are being used for the run will be retained until they are changed by the operator.

USING THE TIMER IN THE COUNT-UP OR COUNT-DOWN MODE

This power supply is equipped with a dual function Timer. In the passive, or count-up mode, the Timer will accrue elapsed time when the DC On LED is illuminated. In the active, or count-down mode, the Timer will keep track of the elapsed time, and terminate the high voltage DC output and sound an alarm at the end of the set time interval.

Time is shown in hours and minutes during the first 9 hours and 59 minutes (9.59), and in hours and 10 minute intervals between 10 and 24 hours (10.0 - 24.0).

Count-Up Mode

To utilize the Timer in the passive, count-up mode, the time interval must be set to .00 before the DC output is activated. In the count-up mode, the Timer will be reset to zero (.00) if the DC output is switched off by pressing the DC On/Off Key or by switching the AC Mains Power Switch off; a power failure will also reset the count-up Timer to .00.

The count-up Timer can accrue time for up to 24 hours. When more than 24 hours have elapsed, the DC On LED and the Digital Volts/Milliamps/Time Display will flash.

Count-Down Mode

To use the Timer in the active, or count-down mode, a time interval must be set before the DC output is activated. Once set, the Timer will count down whenever the DC On LED is illuminated. Note that both the DC On LED and the Timer On LED will be illuminated, indicating the Timer is functioning in the count-down mode. In the count-down mode there is a pause function. The Timer will pause during the run if the DC output is switched off with the DC On/Off Key, or if there is a power failure. The Timer resumes when the DC On/Off Key is switched on, or when power is restored. When the power supply is switched off with the AC Mains Power Switch, the count-down timer will be reset.

Appendix A. Setting Safe Operating Limits.

Most chambers are made of acrylic plastic which may warp at high temperatures (above 55 °C). For this reason it is especially important to determine the normal operating conditions for each application and to confirm they do not exceed the safe operating limits of the chamber being used.

The following procedure illustrates how normal operating conditions can be determined and how this information can be used to choose safe operating limits for an agarose gel run in a submarine chamber at a constant voltage of 125 volts.

1. Adjust the operating limits to 125V, 500mA, Timer at 0.00.
2. Start the run by pressing the DC On/Off Key, and note the mA value when the voltage has reached 125V and the V at Limit LED is illuminated.
3. Adjust the mA setting so that it exceeds the actual value by 10% or by 10 milliamps, whichever is greater. Thus the Set and Actual values may look like this.

NOTE: Some electrophoretic techniques can store energy in the chamber over a period of time. This energy, which manifests itself as a low voltage, may inhibit the normal function of the load sensing interlock. When a run is restarted, an E01 error message may appear and the power supply may not start. To overcome this effect, press and hold the DC On/Off Key again until the power supply’s voltage begins to rise.
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**TITLE:** POWER SUPPLY 250-90  TEST PROCEDURE

**WRITTEN BY:** D. Evans

**APPROVED:**

**SIGNATURE**

**DATE:** 8/05/88

**PROEDURE NO.**

**PAGE 1 OF:**

**REVISION C**
250-90 POWER SUPPLY TEST PROCEDURE

Equipment Required:

Two, calibrated 3 1/2 digit DMM's configured to measure current and voltage.
Stopwatch
100 Ohm load
2500 Ohm load
470K 0.5W Resistor
Insulated trimming tool
Short Circuit Test Fixture

Please read this test specification and the user manual completely before commencing work.

NOTE 1: The unit must be connected to the AC supply via a GFCI outlet.

NOTE 2: As voltages up to 400VAC are present with in the unit DO NOT TOUCH ANY PART OF THE CIRCUITRY WITHOUT REMOVING THE POWER FIRST AND WAITING A MINUTE FOR ANY CAPACITORS TO DISCHARGE.

1. Remove the lid from the unit and visually check the UUT (Unit under test) for correct assembly before applying power, especially note that the position of the transformer connector J14 matches the supply voltage (marked on PCB).

2. Connect the UUT to the appropriate supply voltage (115V /230V).

3. Switch the unit ON.

4. Verify that the following indicators are on and that all the others are off:
   
   
   Set  amber
   V  amber

5. Verify that the display shows 00 (Note the unit will only show 00 at initial switch on. If the unit has been RUN before then it will show the set voltage used previously).

6. Press Select Mode once. Verify that the V indicator is off and the mA indicator (amber) is on.

7. Verify that the display shows 500.

8. Press Select Mode once. Verify that the mA indicator is off and that the time symbol indicator (amber) is on.

PROCEDURE TITLE: Power Supply 250-90 Test Procedure
9. Verify that the display shows .00.

10. Press Select Mode once. Verify that the time symbol indicator is off and that the V indicator is on.

11. By turning the adjustment knob clockwise and counter clockwise verify that the display goes from 00 to 250 and back again. Set the voltage to 250.

12. Connect the UUT to a 2500 Ohm load. PRESS DC "ON/OFF"

13. Verify that the DC On (red), V at limit (amber) Actual (amber) and V (amber) indicators are on and that all of the others are off.

14. Adjust pot AR2 until the actual output voltage = 250V +/- 1V, as seen on a stand-alone calibrated DMM.

15. Turn the adjustment knob, verify that the Set indicator is on and the Actual indicator is off. Continue turning the adjustment knob until the display shows 100V. Verify that the Set led turns off after approximately 5 sec, that the Display led turns on and the display reads 100V. Check that the output voltage is 100V +/- 2V.


17. Connect the UUT to a 100 Ohm load. Press DC On/Off (UUT switches on).

18. Verify that the DC Led is On, mA at limit, Actual and V indicators are on and that all of the others are off.

   Press Select Mode and Display. Verify mA Led is "ON" and that the display shows 500 and can be adjusted from 00 to 500 by turning the adjustment knob clockwise and counter clockwise. Set the display to 500 and press Display.

COLD CALIBRATION TEST:
Adjust pot AR1 until the actual current = 500mA +/- 2mA.

21. Turn the adjustment knob, Verify that the Set indicator is on and the Actual indicator is OFF. Continue turning the adjustment know until the display shows 100mA. Verify the Set led turns off after approximately 5 secs, that the ACTUAL led turns "ON" the and the display reads 100mA. Check that the actual output current is 100mA +/- 4mA.

22. Press Select Mode verify that the time symbol indicator is "ON". Verify that the time display is incrementing in 1-minute intervals by using the stopwatch.

PROCEDURE TITLE: Power Supply 250-90 Test Procedure
23. Press On/Off. UUT is "OFF". Verify that the time display is .00.

24. By turning the adjustment knob clockwise and counter clockwise, verify that the display goes from .00 to 24.0 and back again. Set a time of 1 minute.

25. Press On/Off (UUT is "ON") and start the stopwatch. Verify that the Timer On indicator (amber) is ON.

26. Verify that the power supply switches off after 1 min (+/- 1 sec) after giving 3 sets of 4 beeps.

27. Change load to 2.5K ohm.

28. Press On/Off. Verify that the unit restarts and begins delivering power. Disconnect the power to the unit by removing the plug from the wall. Then reconnect power to the unit, the unit should restart and go to the setpoints.

29. Switch the unit OFF/ON using the power switch, Verify that the UUT does not restart but that the setpoints are retained.

30. Change the load to 470K. Verify that the UUT can be turned on by pressing the ON/OFF key.

31. Press ON/OFF. Disconnect all loads. Press ON/OFF. Verify that the error message E01 appears, flashing on the display.

32. Verify that the message can be removed by pressing ON/OFF. Continue to press ON/OFF. Verify that the output voltage starts to increase but that the error message reappears when the ON/OFF button is released.

33. SHORT CIRCUIT TEST:
   Connect the unit to a 2500ohm load and a set to deliver 250V, 500mA. Switch the unit on, verify that the voltage has stopped increasing and short-circuit the output of the unit using short circuit test fixture. Check that the unit display E04 and that the actual output voltage dropped to <10V (as measured by the DMM). Remove the short circuit test fixture. Turn the unit ON and verify the the unit starts up again.

34. HI-POT TEST the UUT
   Per Procedure number 112-4000-00.
35. **BURN-IN TEST:**
   Connect a 2500 Ohm load. Set the timer to 8 hours and put the UUT on the soak test rack and run at 250V for a minimum of 8 hours.

36. **HOT CALIBRATION TEST:**
   Verify the calibration and readjust, if necessary. When performing the hot calibration remove only one unit at a time from the burn-in rack. The unit must be transferred to the test bench and calibration must begin as quickly as possible.

37. Reset the UUT to ON, 500Ma, .00 time.
   NOTE: The unit must be turned on to store the values. Test travel ticket to be filled in per procedure SOP #7.

38. Test travel ticket to be filled in per Procedure SOP #7.