

PS 2A200

power supply



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Safety warnings and precautions

Important user information

Please read this entire manual to fully understand the safe and effective use of this product. The lightning symbol within an equilateral triangle is intended to alert the user to the risk of exposure to high voltages.

If you have any comments on this manual, please send them to us at:

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Français



Renseignements importants d'utilisation

Pour une bonne compréhension et une utilisation en sécurité maximale, il convient de lire entièrement ce manuel. Le symbole de l'éclair dans un triangle équilatéral a pour objet d'attirer l'attention de l'utilisateur sur un danger d'exposition à la haute tension.

Tous vos commentaires sur ce manuel seront les bienvenus et veuillez les adresser à:

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Información importante para el usuario

Para comprender el producto y utilizarlo con seguridad es necesario leer este manual en su totalidad. El símbolo del rayo en un triángulo equilátero alerta al usuario sobre el riesgo de exposición a altas tensiones.

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Informazioni importanti per l'operatore

Per un utilizzo sicuro del prodotto, leggere attentamente l'intero contenuto del presente manuale. Il simbolo del fulmine all'interno di un triangolo equilatero indica all'utente la presenza di un rischio di esposizione ad alte tensioni.

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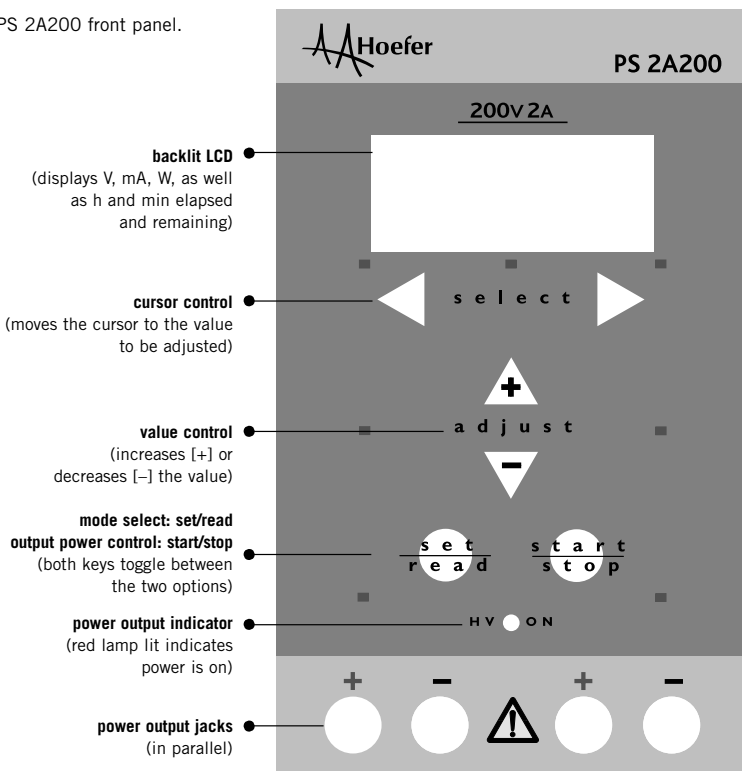
Power supply function and description

Please note the following power output limitations:

- The maximum power supply output is 200 W, so the maximum current of 2000 mA is available at ≤ 1000 V.
- At the maximum voltage setting of 200 V, the current is limited to ≤ 1000 mA.

The PS 2A200 power supply provides the high-current capability required for such electrophoresis applications as tank and semidry electrotransfers. The backlit liquid crystal display (LCD) reports power supply status, and displayed parameters are set by pressing the keys indicated by raised dots and arrows on the power supply face. Two pairs of recessed output jacks accept 4 mm plugs, which are connected in parallel.

Fig 1. PS 2A200 front panel.



Power output is controlled by setting a maximum value for voltage (1 to 200 V), current (1 to 2000 mA), or watts (1 to 200 W). The PS 2A200 automatically “crosses over,” or switches the controlling parameter according to programmed limits as resistivity changes during a run. Run duration can be untimed or programmed to a maximum of 99 h and 59 min. A printed record of the power supplied during a run can be obtained by connecting the RS 232 serial communications port to a printer.

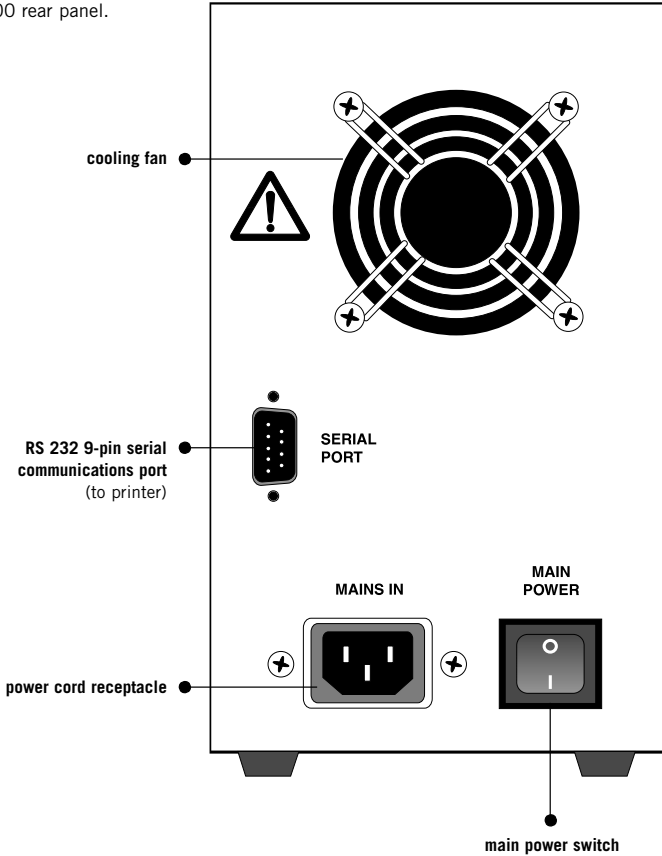
Unpacking

Unwrap all packages carefully and compare contents with the packing list, making sure all items arrived. If any part is missing, contact your local Hoefer, Inc. sales office. Inspect all components for damage that may have occurred while the unit was in transit. If any part appears damaged, contact the carrier immediately. Be sure to keep all packing material for damage claims or to use should it become necessary to return the unit.

Rear panel

The main power switch and power cord receptacle are at the rear of the instrument. A communications port allows a printout of the power and time parameters of the most recent run (see page 18).

Fig 2. PS 2A200 rear panel.



This declaration of conformity is only valid for the instrument when it is:

- used in laboratory locations
- used as delivered from Hoefer, Inc. except for alterations described in the user manual
- connected to other CE-labeled instruments or products recommended or approved by Hoefer, Inc.

Specifications

Power requirement

Frequency	47–63 Hz
Line voltage	90–265 VAC
Power consumption	300 W maximum

Power output

200 W maximum

User interface

4 line × 16 character
backlit LCD display,
membrane keypad

Programmable parameters

3 named protocols
3 steps maximum for each protocol
0–200 V, 1 V step
0–2000 mA, 1 mA step
0–200 W, 1 W step
00:01–99:59 h:min, 1 min step
1–9 999 Vh, 1 Vh step

Communications port

RS 232 9-pin male serial connector,
1200 or 9600 baud, no parity, 8 data bits,
1 stop bit, no flow control

Operating environment

Indoor use, 5–40 °C, relative humidity 0–90%
noncondensing, pollution degree 2, overvoltage
category II

Dimensions (h × w × d) 22 × 12 × 28 cm
(8.6 × 4.3 × 10.7 in)

Weight 2.6 kg (5.8 lb)

Safety Open circuit message if
resistance is $\geq 300 \text{ k}\Omega$

Product certifications

Safety	UL61010A-1: 10/93, EN61010-1: 1993 (IEC1010-1), CSA (22.1010.1-92)
Emissions Immunity	EN55011: 1991 Class B EN50 082-1:92 CE



Because this instrument can develop sufficient voltage and current to produce a lethal shock, care must be exercised in its operation.

Power supply safety

- The PS 2A200 is designed in accordance with the IEC 1010 electrical safety standard. Nevertheless, it should be used only by properly trained operators. Read this entire manual before using the power supply and use only according to the instructions.
- **If this equipment is used in a manner not specified by Hofer, Inc., the protection provided by the equipment may be impaired.**
- The instrument must always be used with the earth lead of the power cord correctly grounded to earth at the mains outlet.
- Use only undamaged electrical wire and equipment specified for the voltages you will use. All equipment connected to high voltage should be in accordance with IEC 1010-1:1993.
- Keep the instrument as dry and clean as possible. Wipe regularly with a soft, damp cloth. Let the power supply dry completely before use. If wetted, unplug the power supply until the instrument is dry.
- Do not operate the instrument in extreme humidity (above 90%). Avoid condensation by letting the unit equilibrate to ambient temperature when taking the power supply from a colder to a warmer environment.
- Because this power supply has high-current capability, check the rating of any equipment attached. Do not exceed its rating when setting the power supply limits.
- To permit sufficient cooling, ensure that the vents in the rear and underside of the instrument are not covered.
- This instrument is designed for indoor laboratory use only.

Mesures de sécurité pour le générateur



Cet instrument est capable de produire suffisamment de voltage et de courant pour causer une électrocution, son utilisation doit s'effectuer avec caution.

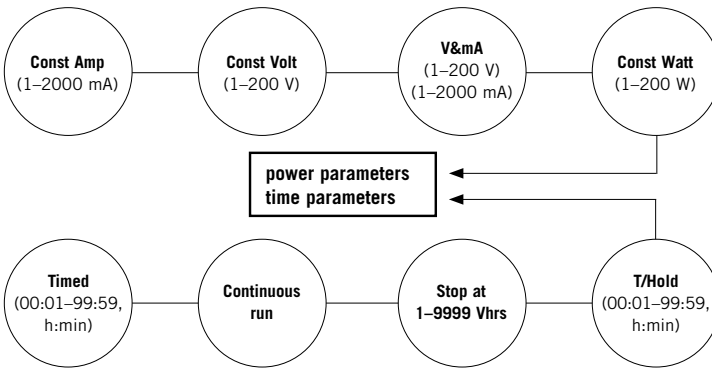
- Le PS 2A200 est dessiné en conformité avec les standards de sécurité électrique IEC1010. Néanmoins, il ne devrait être utilisé que par du personnel correctement formé. Veuillez lire ce manuel entièrement avant d'utiliser le générateur et ne l'utiliser que selon le mode d'emploi.
- **Si cet instrument n'est pas utilisé en conformité avec les recommandations de Hoefler, Inc., les protections de sécurité qui équipent cet appareil peuvent être rendues inefficaces.**
- L'instrument doit toujours être utilisé avec la prise de terre correctement branchée sur une prise de courant équipée.
- N'utiliser que des fils électriques et pièces d'équipement spécifiés pour le voltage requis. Tout instrument branché sur haut voltage doit être en conformité avec IEC 1010-1:1993.
- Maintenir cet instrument aussi sec et propre que possible. Dépoussiérer régulièrement avec un chiffon doux et humide. Si le générateur est mouillé, le débrancher et le laisser sécher complètement avant de l'utiliser.
- Ne pas utiliser cet instrument dans des conditions d'humidité extrêmes (au dessus de 90%). Eviter toute condensation lorsque vous déplacez le générateur d'un environnement froid pour un environnement plus chaud en le laissant s'équilibrer à la température ambiante.
- Du fait que ce générateur peut produire de hauts voltages, vérifier la capacité des instruments à y brancher. Ne pas dépasser leur capacité lors de l'ajustement des limites du générateur.
- Vérifier que les orifices d'aération à l'arrière et en dessous de l'instrument ne sont pas obstrués afin de permettre une aération suffisante.
- Cet appareil est prévu pour l'utilisation à l'intérieur d'un laboratoire uniquement.

Parameter and operation overview

Parameter options

The PS 2A200 can be set within the parameter options mapped out below. Note that power parameters are displayed on the top line of the LCD, and time parameters are displayed on the bottom. Options are listed in the order they are encountered.

Fig 3. Parameter options.



Power parameters

Because the power limit is 200 W ($W = V \cdot A$), the maximum current of 2000 mA can be delivered only if voltage is limited to ≤ 100 V. Conversely, the maximum voltage of 200 V can be delivered only if the current is limited to ≤ 1000 mA.

During a run the location of the cursor indicates which parameter is being held constant. If load requirements are such that an unprogrammed crossover occurs (for instance, instead of holding voltage constant, as programmed, current is held constant), the parameter unit (V, mA, or W) will flash, indicating that this value rather than the programmed value is being held constant.

Time parameters

The run duration can be programmed (00:01–99:59 hrs), unlimited, or set for a specified number of volt-hours. The timed/hold option (T/Hold) delivers 5 V to the load at the end of the timed run to minimize band diffusion in gradient gels.

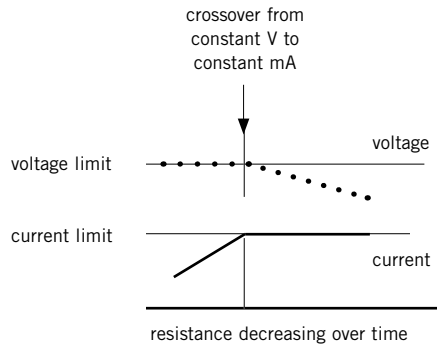
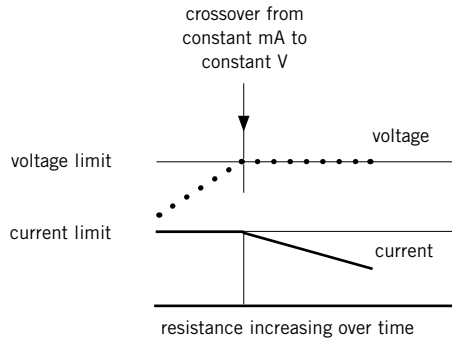
Power supply output limits

The PS 2A200 can be programmed to limit only voltage (V), only current (mA), voltage and current together (V&mA), or only power (W). The power supply will operate at the set limits provided the “load,” or power requirement, does not exceed the power supply rating. When *both* current and voltage limits are set, the load draws the required power within those limits.

“Crossover” occurs when the second parameter limit is reached as system resistance changes. At this point the second parameter is held constant and the previously unchanging parameter is allowed to adjust downward as system resistance changes. (System resistance is affected by discontinuous buffers and changes in temperature.) When the power supply is delivering power (the HV lamp is lit), the location of the cursor indicates which parameter is being held constant.



Fig 4. Power supply crossover.



Power supply operation

Connections

Important! Use only *one* hand when making or breaking a connection to avoid making a complete circuit across your body. Also, make sure your other hand is not touching anything that grounds you.

Important! If you are in the middle of a run and wish to connect or disconnect the leads, always turn power supply off (press *start/stop*) and wait for the HV lamp to turn off.



Fig 5. The output jacks are recessed and color coded.

Recommended leads:

- 4 mm (banana) plugs, fixed insulating sheaths

Will accept:

- 4 mm (banana) plugs, unsheathed or retractable sheaths

Not recommended:

- Stackable plugs

Note: If you wish to connect a printer or computer, install the RS 232 cable before turning on the power.

1

Connect the mains power cord

Connect the mains power cord to the power cord receptacle on the rear panel and to a suitable grounded three-wire AC power outlet. Place the power supply so that the fan on the back panel and the vents on the bottom are not obstructed.

2

Connect the HV power leads

Connect the apparatus to the power supply by plugging the lead connectors into the recessed output jacks (Fig 5).

3

Turn on the main power switch on the rear panel. After the unit completes a 20 s diagnostic cycle, the power supply will be in SET mode, in which the power and time parameters programmed for the previous run are displayed.

To set the baud rate press the left and right arrows simultaneously to access the setup menu:

```
PS2A200 Setup
      procedure
up to adj V & A
down to set baud
```

Press the down arrow to access the baud rate screen.

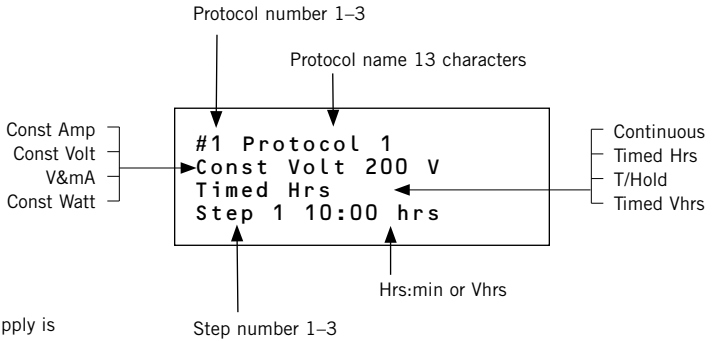
```
Serial Port
  baud rate: 1200
Up & down to set
Right to exit >
```

Use the up or down arrows to set the baud rate and the right arrow to exit to the main menu.

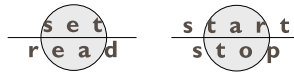
Power parameters

There are many possible displays in SET mode, but all use the format illustrated immediately below. (In contrast, READ mode, shown at bottom, is always characterized by a display of all three V, mA, and W values.)

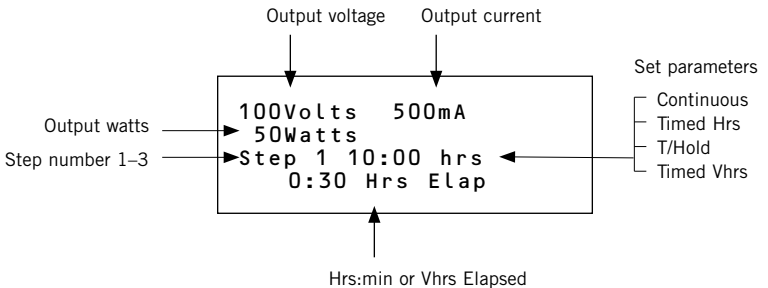
SET mode



Note: The power supply is in SET mode by default except when power is being delivered to a load. Once the HV output is on (the *start/stop* key has been pressed) SET mode is selected by pressing the *set/read* key. After 5 s of inactivity, the power supply switches to the READ mode automatically.

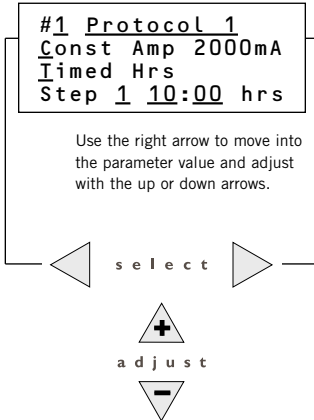


READ mode



Setting constant current output

On the left side of the screen the left arrow selects which parameter to adjust.



1

Select "Const Amp"

Place the cursor in the first field of the second line by pressing the *select* arrow keys (left and right arrows under the display). Then press the *adjust* arrow keys (pointing up and down) until "Const Amp" displays in the field.

As you scroll through the four options, a short beep indicates each change.

2

Set the amp value

Place the cursor under the digit in the mA digit field that you wish to change by pressing the *select* arrow keys. Select the value of the digit by pressing the *adjust* arrow keys. The + arrow increases the value, and the - arrow decreases the value. A short beep indicates that the change was registered. Repeat for each of the four active digits in this field (1–2000 mA).

Note: The output jacks are in parallel. If both pairs of jacks are used, the total mA value displayed will be divided between the loads in inverse proportion to the resistance of each load. For two identical loads to be run at constant mA, set twice the current desired for a single load. The set voltage is supplied to both pairs of output jacks.

3

When the *start/stop* key is pressed to start the run, the cursor will be in the mA field to indicate that this value is being held constant. So long as the cursor is in the mA field, this value can be edited without switching to SET mode. To edit other parameters during a run, press the *set/read* key.

```
#1 Protocol 1
Const Volt 200 V
Timed Hrs
Step 1 10:00 hrs
```

Note: The maximum current available at 200 V is 1000 mA due to the relationship $W = V \cdot A$.

Setting constant voltage output

①

Select "Const Volt"

Place the cursor in the first field of the second line by pressing the *select* arrow keys (left and right arrows under the display). Then press the *adjust* arrow keys (pointing up and down) until "**Const Volt**" displays in the field.

As you scroll through the four options, a short beep indicates each change.

②

Set the voltage value

Place the cursor under the digit in the V digit field that you wish to change by pressing the *select* arrow keys. Select the value of the digit by pressing the *adjust* arrow keys. A short beep indicates that the change was registered. Repeat for each of the three active digits in this field (1–200 V).

③

When the *start/stop* key is pressed to start the run, the cursor will be in the V field to indicate that this value is being held constant. This value can be edited without switching to SET mode. To edit other parameters during a run, press the *set/read* key.

```
#1 Protocol 1
Const Watt 200 W
Continuous run
```

Note: The output jacks are in parallel. If both pairs of jacks are used, the total mA value displayed will be divided between the loads in inverse proportion to the resistance of each load. For two identical loads to be run at constant mA, set twice the current desired for a single load. The set voltage is supplied to both pairs of output jacks.

Setting constant wattage output

①

Select "Const Watt"

Place the cursor in the first field of the second line by pressing the *select* arrow keys (left and right arrows under the display). Then press the *adjust* arrow keys (pointing up and down) until "**Const Watt**" appears in the field.

As you scroll through the four options, a short beep indicates each change.

②

Set the wattage value

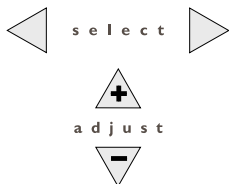
Place the cursor under the digit in the W digit field that you wish to change by pressing the *select* arrow keys. Select the value of the digit by pressing the *adjust* arrow keys. A short beep indicates that the change was registered. Repeat for each of the three active digits in this field (1–200 W).

③

When the *start/stop* key is pressed to start the run, the cursor will be in the W field to indicate that this value is being held constant. This value can be edited without switching to SET mode. To edit other parameters during a run, press the *set/read* key.



#1 Protocol 1
V&mA 200V 2000mA
Time & Hold 5V
9:30 hrs



Limiting both voltage and current

1

Select "V & mA"

Place the cursor in the first field of the second line by pressing the *select* arrow keys (left and right arrows under the display). Then press the *adjust* arrow keys (pointing up and down) until "V & mA" appears in the field.

As you scroll through the four options, a short beep indicates each change.

2

Set the voltage and current values

Place the cursor under the digit in the V digit field that you wish to change by pressing the *select* arrow keys. Select the value of the digit by pressing the *adjust* arrow keys. A short beep indicates that the change was registered. Repeat for each of the three active digits in this field (1–200 V). Repeat for the four active digits in the "mA" field (1–2000 mA).

3

When the *start/stop* key is pressed to start the run, the cursor will be in the field of the value presently held constant. Crossover will occur as required to keep output within the set limits.

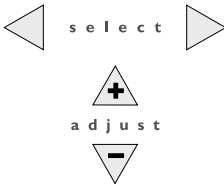


Time parameters

There are four time options to choose from:

- The **Continuous run** option delivers power until the operator manually turns off the power supply.
- The **Timed Hrs** option delivers power for the set time.
- The **Time & Hold** (timed/hold) option delivers power for the set time and then holds the voltage at 5 V to minimize band diffusion in gradient gels until the operator manually turns off the power supply.
- The **Timed Vhrs** option delivers a preset amount of power measured in volt-hours (Vhrs) and then stops all power output.

```
#1 Protocol 1
Const Volt 200 V
Timed Hrs
Step 1: 10:00
```



```
#1 Protocol 1
Const Volt 200 V
Time & Hold 5V
10:00 hrs
```

```
#1 Protocol 1
Const Volt 200 V
Timed Vhrs
Step1: 10000 Vhrs
```

1

Select the time option

Place the cursor in the first field of the third line by pressing the *select* arrow keys (left and right arrows under the display).

Then press the *adjust* arrow keys (pointing up and down) to select **Continuous run**, **Timed Hrs**, **Time & Hold 5V**, or **Timed Vhrs** displays in the field. In the **Timed Hrs** and **Timed Vhrs** modes place the cursor under the Step number field and select the step number (1–3) if you desired more than one step.

As you scroll through the four options, a short beep indicates each change.

2

Set the run duration

Timed Hrs and Time & Hold 5V—Place the cursor under the digit in the h:min (00:00) field that you wish to change by pressing the arrow keys. Select the value of the digit by pressing the arrow keys. The + arrow increases the value, and the – arrow decreases the value. A short beep indicates that the change was registered. Repeat for each of the four active digits in this field. The maximum value is 99 h and 59 min.

Timed Vhrs—Follow the same procedure as above, placing the cursor under the digit in the Vhrs field. The maximum value is 60000 volt-hours.

Starting the run

Press the *start/stop* key to activate the DC output. The red HV lamp lights and a beep indicates that power is supplied. A flashing colon in the time field indicates that the timer is running.

The LCD reports power output values and selected power and time options. The location of the cursor indicates the parameter held constant, and the time elapsed and time or volt-hours remaining are displayed on the second line.

Note 1: Displayed output values include the governing parameter that you set, indicated by the cursor position, and the other power variables, which are calculated according to the power relation $W = V \cdot A$.

Note 2: If the V, mA, or W flashes, it is to alert the operator that this parameter is being held constant rather than the programmed parameter because of changes in the electrical load.

1:30 hrs remain
Up to continue
Down to abort

Important! If you are in the middle of a run and wish to connect or disconnect leads, always turn off the power supply (press *start/stop*) and wait for the HV indicator lamp to turn off.

Note: If the AC mains power is interrupted while the power supply is on, the power supply stores the actual values and resumes operation at those values when the mains power comes back on.

During the run

Press the *start/stop* key anytime to deactivate the DC output. The HV lamp will turn off.

For Continuous runs, the LCD will switch to SET mode.

For Timed and Time & Hold runs, the LCD will indicate the time remaining. Press the + *adjust* key to resume at the same point or the – *adjust* key to stop the run.

Adjusting parameters during a run

The location of the cursor indicates which parameter is being held constant, and this parameter can be adjusted directly by pressing the + and – *adjust* keys. Other parameters can be adjusted by pressing the *set/read* key to switch to SET mode. After 5 s of inactivity, the display automatically reverts to READ mode.

At the end of the run

Once a time or volt-hour limit is reached, a 30 second beep sounds. The LCD will report that the cycle is complete. At the end of a Time & Hold run, there will be an additional message indicating that the voltage output is being held at 5.0 V. Pressing any key will display the last parameters set.

```
Cycle Complete
Press any key
```

```
Cycle Complete
Holding at 5.0V
```

Reviewing run parameters

After the run, the LCD will display statistics for the completed run when both the HV power is off (the HV lamp is not lit) and the *set/read* key is pressed. The programmed settings and power conditions at the start, midpoint, and end of the run as well as the total volt-hours will be displayed.

Documenting the run

Recorded information includes the instrument serial number and software version, the protocol name and running conditions, a report of the output every five minutes and indications of each step change and the end of the run.

```
Hoefer PS2A200 Power Supply
Serial No. test-EPS4
Software Ver. B0
Protocol # 1 Protocol 1
***** Run conditions *****
Timed Hrs
Const Volt
Step #1 0:05 Hrs
 50 Volts
Step #2 0:30 Hrs
150 Volts

***** Run started *****
At total run time 0:00 Hrs
 50Volts 246mA
 12Watts
Step:1 0:05 Hrs
 0:00 Hrs Elap

***** End Time Step *****
At total run time 0:05 Hrs
 50Volts 246mA
 12Watts
Step:1 0:05 Hrs
 0:05 Hrs Elap

At total run time 0:10 Hrs
150Volts 732mA
110Watts
Step:2 0:30 Hrs
 0:05 Hrs Elap

At total run time 0:30 Hrs
150Volts 727mA
109Watts
Step:2 0:30 Hrs
 0:25 Hrs Elap

***** End Time Step *****
At total run time 0:35 Hrs
150Volts 726mA
109Watts
Step:2 0:30 Hrs
 0:30 Hrs Elap

***** Run ended *****
At total run time 0:35 Hrs
```

Troubleshooting

Display shows “Open circuit”

- Check that both leads from each electrophoresis unit are plugged in completely.
- Check that both electrophoresis unit electrodes contact buffer and that buffer contacts both ends of the gel.
- Check electrode connections.
- Check for broken leads or electrodes.

No display

- Check that the power supply is plugged into a working receptacle.
- Check that the main power switch is on.

Unable to change parameter values

- Check that the instrument is in SET mode and that the cursor is located in the field in which you wish to adjust the value.

Care and maintenance

- If spilled liquid leaks onto the circuit boards, do not plug the power supply into a power outlet. Call Hofer, Inc. for advice before using.
- Turn the mains power switch off and unplug the power cord before cleaning.
- Use a soft cloth dampened with water or a mild cleaning solution to clean the cabinet and display.

Customer service information

Technical service and repair

Hofer, Inc. offers complete technical support for all of our products. If you have any questions about how to use this product, or would like to arrange to repair it, please call or fax your local Hofer, Inc. representative.

Ordering information

	qty.	code no.
PS 2A200 Power Supply , universal voltage 90-265 VAC, 47–63 Hz	1	PS2A200
Power cord , 115 V	1	PSCORD-115
Power cord , 230 V	1	PSCORD-230
User manual	1	PS2A200-IM



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Hoefer, Inc.
953 Indiana Street
San Francisco, CA
94107 USA

www.hoeferinc.com

