Amgen Biotech Experience

Scientific Discovery for the Classroom

"I wouldn't have known about this field, how stimulating and enjoyable it is, without having sampled the life of a scientist through the biotech labs used by the Amgen Biotech Experience."

—Audrey Izuhara, research technician and former ABE student

Bringing Science to Life

Science, technology, engineering, and mathematics (STEM) are critical to the worldwide economy and are a core of many industries. Innovative STEM education programs will maximize students' learning of knowledge and skills that can be applied to these fields. The Amgen Biotech Experience (ABE) gives students the opportunity to gain hands-on experience with many of the same techniques that biotechnology researchers use to produce cutting-edge human therapeutics.

ABE is an innovative science education program that introduces students to the importance of scientific discovery through a molecular biology learning experience that links core science concepts to real-world applications. The program provides secondary school teachers with the curriculum, professional development, and lab equipment and supplies to engage students in this rigorous science education program.

www.amgenbiotechexperience.com

Enriching Students' Lives in the Classroom and Beyond

Through ABE, students cultivate critical skills—including analysis, synthesis, evaluation, and problem-solving—that will serve them throughout their lives, whether they choose to pursue a career in science or work in an entirely different field.

ABE began in Los Angeles, California, 25 years ago through a unique collaboration of Amgen scientists and science educators with the vision to bring the excitement of biotechnology to secondary school students. The program has since developed a robust curriculum and expanded to multiple communities in the United States and Europe. The ABE Program Office based at Education Development Center, Inc. (EDC), a global nonprofit organization with deep experience and expertise in science education, provides leadership and support to strengthen the program worldwide.

To date, the Amgen Foundation has committed nearly $13 million toward the ABE program, making this opportunity possible for hundreds of thousands of students and thousands of teachers across the United States and Europe.

Amgen Foundation

The Amgen Foundation seeks to advance excellence in science education to inspire the next generation of innovators, and invest in strengthening communities where Amgen staff members live and work. To date, the Foundation has donated more than $200 million in grants to local, regional and international nonprofit organizations that impact society in inspiring and innovative ways. In addition to the Amgen Biotech Experience, the Amgen Foundation brings the excitement of discovery to the scientists of tomorrow through several signature programs, including Amgen Scholars and Amgen Teach. For more information, visit www.AmgenInspires.com and follow us on www.twitter.com/amgenfoundation.

EDC

Education Development Center, Inc. (EDC) is a global nonprofit organization headquartered in Waltham, Massachusetts. EDC's mission is to create learning opportunities for people around the world, empowering them to pursue healthier and more productive lives. EDC works with public-sector and private partners, harnessing the power of people and systems to improve education, health promotion and care, workforce preparation, communications technologies, and civic engagement. Learn more at www.edc.org.

www.amgenbiotechexperience.com

Amgen Biotech Experience

Scientific Discovery for the Classroom

ABE Equipment Quick Guides

Pipets:

- Volume Setting: The pipet volume is shown on the handle grip window. To set volume make sure that the desired volume clicks into place, the digits are visible in the display window and that the volume is within the pipette's range.
- **WARNING: USING EXCESSIVE FORCE TO TURN THE PUSH BUTTON OUTSIDE THE PIPETS RANGE WILL JAM THE MECHANISM AND DAMAGE THE PIPET.**

Electrophoresis Chamber:

1. Place the tray on a level surface
2. Insert the comb
3. Pour agarose gel to a 4-5mm thickness
   Note: When pouring agarose make sure that agarose gel has cooled before pouring into gel tray. Pouring agarose before it cools to this temperature can cause the tray to crack.
4. Add buffer to electrophoresis chamber
   MAKE SURE THAT THERE IS BUFFER COVERING THE TOP OF THE GEL SO THAT CURRENT CAN RUN CONTSTANT.
5. Load DNA samples into the wells.
6. Put the lid on the electrophoresis chamber
7. Plug the chamber into the power supply.
8. Turn the power supply on and set to appropriate voltage.
   WARNING: MAKE SURE THERE IS NO LIQUID ON THE OUTSIDE SURFACE OF THE CHAMBER. DO NOT TURN ON THE POWER SUPPLY UNTIL THE COVER HAS BEEN PUT ON THE CHAMBER.
   Make sure not to run the gel at too high of a voltage, high voltages can cause curving of the bands which could make it difficult to interpret results.

FOTO/Phoresis UV Transilluminator Operation:

1. Open UV blocking cover, place the mini gel on the purple filter glass and close the cover.
   CAUTION: DO NOT USE FOTO/PHORESIS IF COVER IS BROKEN.
2. Turn on the power
3. View the sample
   ONLY VIEW THE SAMPLE WITH THE COVER ON, THIS PROTECTS FROM UV EXPOSURE.
4. Photograph gel if desired
5. Once you are done looking at the gel turn the power off, remove the gel and wipe the purple filter glass.

Mini Centrifuge:

1. Before running the centrifuge make sure the power switch is in the "on" position.
2. To begin the run simply close the lid of the centrifuge
3. To stop rotation press down on the lid release tab located on the front of the unit.

4. After the rotor has stopped the lid can be opened by lifting the lid on the hinge.
5. Always make sure that the centrifuge is properly balanced in order to prevent rotor damage.

Water Bath:

Status indication lights are as follows:
RUN LED: operating status
HEAT LED: operating of heating element
O/T LED: it is ON when over temperature device is active
WARNING: DO NOT TURN ON UNIT UNTIL WATER HAS BEEN ADDED TO THE RESERVOIR

1. Press main power switch
2. Select appropriate temperature
3. Set over temp limit to 10-15 degrees higher than the set temperature.

Micro centrifuge Bio-Rad 16K:

1. Plug in the centrifuge, lid should click open
2. Remove rotor lid
3. Load centrifuge with appropriate sized tubes
   MAKE SURE CENTRIFUGE IS BALANCED BEFORE RUNNING
4. Replace rotor top and close lid
   DO NOT RUN CENTRIFUGE WITHOUT REPLACING ROTOR LID
5. Set desired speed and time
   WARNING: DO NOT OPEN THE CENTRIFUGE UNTIL THE ROTOR HAS COME TO A COMPLETE STOP

Micro centrifuge Eppendorf:

1. Turn on centrifuge with switch located on the back by the power supply cord
2. Press open button on the front to open the lid
3. To remove rotor cover twist the handle left
4. Load centrifuge, pay careful attention that the unit is balanced
   CENTRIFUGE MUST BE BALANCED
5. Once samples are loaded replace the rotor cover by twisting to the right until you hear a click
   DO NOT RUN CENTRIFUGE WITHOUT REPLACING ROTOR LID
6. Close the lid
7. Set proper time and speed
8. Press the start button
9. Once cycle is complete the centrifuge lid will open on its own
   WARNING: DO NOT OPEN THE CENTRIFUGE UNTIL THE ROTOR HAS COME TO A COMPLETE STOP

Incubating Mini Shakers - VWR:

1. Plug in power cord once the standby light has illuminated the unit is ready for use.
2. Press the standby button to move unit from standby mode
3. Press the up/down arrows below the temperature display until you reach desired temperature.
   CAUTION: THE HOT INDICATOR LIGHT WARNS THAT THE TEMPERATURE OF THE AIR IN THE CHAMBER IS MORE THAN 40 DEGREES CELSIUS (104 F)

4. Press the on/off button to start the heating function.
5. Press up/down button to adjust the speed display. The on/off button will start the shaking function.

Electrophoresis power supply - BIORAD:

1. Turn on power
2. Connect the electrophoresis cells to the power supply
3. To set the voltage press the key with V/mA and the clock until the V light it lit up
4. Use the scroll key to set desired voltage
5. To set the timer press the key with V/mA and the clock until the clock icon is lit up. Use the scroll key to set desired time.
6. Once time and voltage are set press the run key to start.
7. Once run is complete press the stop key, then turn off the power supply.

Electrophoresis power supply – THERMO SCIENTIFIC

1. Press the blue key in the middle of the unit to power on
2. Press the set key to set until the volts light it lit, then use the blue scroll key to change to desired volts.
3. Press the set key until the time light is lit and use the blue scroll key to set desired time.
4. Once all parameters have been set press the run key to start.

Limited Warranty

See the Limited Warranty and Limitations of Liability Statement. Please complete and return the Warranty Registration Card on receipt of your pipette.

RAININ pipettes are calibrated with RAININ tips. To assure excellent reproducibility and performance, use only RAININ tips as recommended in this manual. Specified performance is guaranteed only when RAININ tips are used.

Contacting RAININ

Technical Information:
T: 800-543-4030 F: 510-564-1617 tech.support@rainin.com
Pipette Service:
T: 800-662-7027 F: 781-935-7631 service@rainin.com
Direct Order Line:
T: 800-472-4646 F: 510-564-1617 pipets@rainin.com
RAININ website: www.rainin.com

From outside North America: T: +1-510-564-1600
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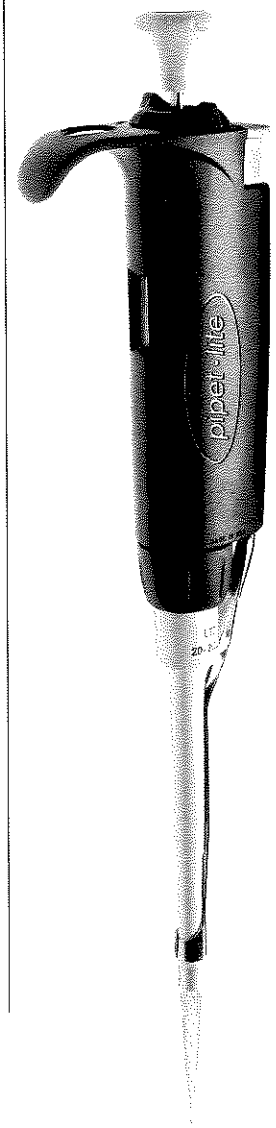
Prices and specifications are subject to change without notice.

ISO 9001:2000 ACCREDITED

9920-237 Rev L

Pipet-Lite®

Magnetic Assist Pipette



continuously-adjustable digital microliter pipette

11 pipettes for volume ranges from 0.1 µL to 20 mL

Pipet-Lite 200 µL shown

RAININ®

Table of Contents

Figures

Line Drawings

Contents of package

Pipet-Lite as ordered
Instruction Manual
Performance Assurance Brochure
Sample tips
Rainin Test Report
If any item is missing call Customer Service: 800-472-4646.

Introduction

Pipet-Lite is an air-displacement pipette which incorporates major ergonomic improvements to reduce the risk of repetitive strain injury and pain – low force seals and lower spring forces contribute to a lighter feel. A magnet is used to help sense and hold the piston in the zero position, which reduces static force on the operator's hand.

In the models with LTS™ shafts, the patented LiteTouch™ Tip Ejection System reduces total pipetting forces by up to 70%.

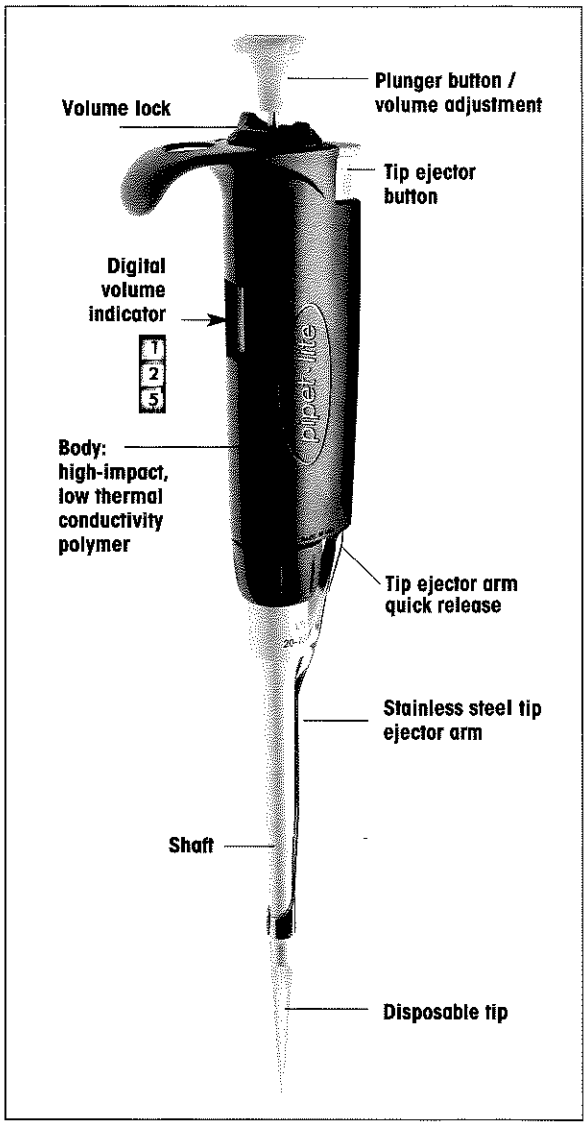
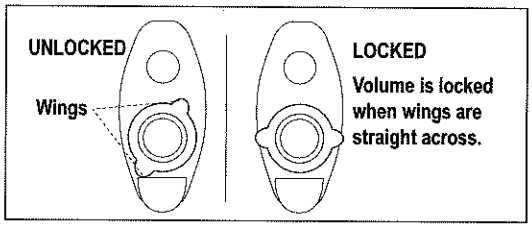


Figure 1 Pipet-Lite 200 µL

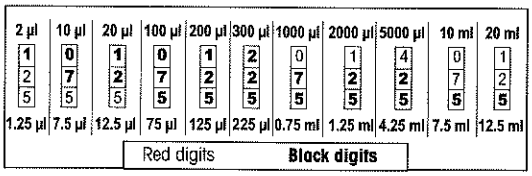
Setting Volume

1. Turn the volume lock counter-clockwise to the position shown at left below so the volume setting mechanism is unlocked and free to turn.



2. With the mechanism unlocked, orient Pipet-Lite so you are looking at the digital volume indicator, then rotate the plunger button to change volume – counter-clockwise to increase, and clockwise to decrease volume.

   The volume indicator is read from the top down.

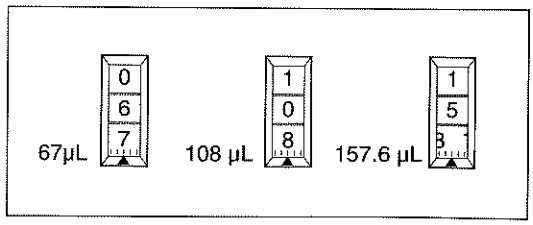


   2–20 µL: Black – µL. Red – tenths, hundredths of µL.
   100–300 µL: All digits black – whole µL.
   1000–5000 µL: Red – mL. Black – tenths, hundredths of mL.
   10 mL: Red – mL. Black – tenths of mL
   20 mL: Red – mL. Black – tenths of mL.

3. To eliminate errors due to mechanical backlash: when setting the desired volume, first turn the knob ⅛ turn above the desired volume. Then turn the knob slowly clockwise until the desired volume is displayed. **Always dial down to the desired volume.**

4. Turn the volume lock clockwise (see diagram above) to prevent accidental changes to the volume setting.

Example volumes for the 200 µL model are shown below (note the intermediate setting at the right).



Volume ranges and increments are shown below:

Pipet-Lite Volume	Range (µL) Adjustable	Recommended	Increment µL
2 µL	0 to 2	0.1 to 2	0.002
10 µL	0 to 10	0.5 to 10	0.02
20 µL	0 to 20	2 to 20	0.02
100 µL	0 to 100	10 to 100	0.2
200 µL	0 to 200	20 to 200	0.2
300 µL	0 to 300	30 to 300	0.5
1000 µL	0 to 1,000	100 to 1,000	2.0
2000 µL	0 to 2,000	200 to 2,000	2.0
5000 µL	0 to 5,000	500 to 5,000	5.0
10 mL	0 to 10 mL	1 mL to 10 mL	20.0
20 mL	0 to 20 mL	2 mL to 20 mL	20.0

Filter

Pipet-Lite 5000 µL, 10 mL, and 20 mL pipettes use a filter in the end of the shaft to help prevent liquid entering the shaft and contaminating the piston, should the plunger snap up during aspiration. Using such a filter is particularly important when pipetting large volumes. Replace the filter if it gets wet.

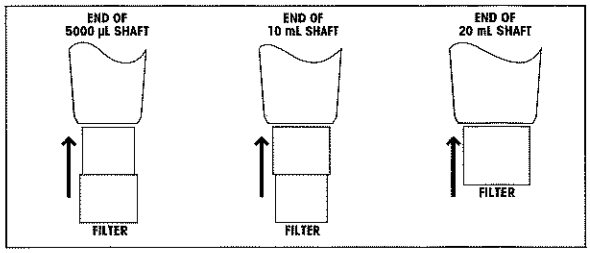


Figure 2 Filter Orientation

The 5000 µL and 10 mL pipettes use the same filter oriented as shown in the diagram above:

5000 µL: insert the small diameter into the shaft.

10 mL: insert the large diameter into the shaft.

Filter part numbers are 6190-164 (pack of 100) and 6190-165 (pack of 1000).

The filter for 20 mL is a cylinder. Filter part numbers: 6190-221 (pack of 100) and 6190-222 (pack of 500).

Tip Selection and Mounting

Always use RAININ tips with Pipet-Lite pipettes. Pipet-Lite pipettes are calibrated with RAININ tips, and performance to published specifications can only be guaranteed when RAININ tips are used.

To mount a tip, press the Pipet-Lite shaft into the end of the tip with light force. The tip will seal properly on the shaft with minimal force — do not use more force than is required.

Tip Immersion Depth

The recommended depth for tip insertion into the sample for each Pipet-Lite volume is shown below.

Pipet-Lite	Volume Range	Immersion Depth
2 µL	0.1 - 2 µL	1-2 mm
10 µL	0.5 - 10 µL	1-2 mm
20 µL	2 - 20 µL	2 - 3 mm
100 µL	10 - 100 µL	2 - 3 mm
200 µL	20 - 200 µL	3 - 6 mm
300 µL	30 - 300 µL	3 - 6 mm
1000 µL	100 - 1000 µL	3 - 6 mm
2000 µL	200 - 2000 µL	3 - 6 mm
5000 µL	500 - 5000 µL	6 - 10 mm
10 mL	1 mL - 10 mL	6 - 10 mm
20 mL	2 mL - 20 mL	6 - 10 mm

Tip immersion depth is critical. If these depths are exceeded, the volume measured may be inaccurate, possibly out of specification. Tip angle is also important. Hold the pipette within 20 degrees of vertical.

Operation

Before pipetting valuable samples, it is a good idea to practice aspirating and dispensing water before pipetting with actual samples.

1. Set the desired volume as described on page 2.
2. Attach a new RAININ tip. Press the shaft into the tip with only sufficient force to make a good seal.
3. Press the plunger button to the FIRST STOP, and hold it in this position. The magnetic assist will help you sense and hold this position.
4. Holding Pipet-Lite vertically, place the tip into the sample to the proper depth and relax your thumb pressure on the plunger. The light piston spring will move the piston upward, aspirating sample. Do not let go of the plunger button, or the piston may snap up quickly, resulting in inaccurate measurement.
5. Pause briefly (longer for macrovolume pipettes) to ensure that the full volume of sample is drawn into the tip.
6. Withdraw the tip from the sample. If any liquid remains on the outside of the tip, wipe it carefully with a lint-free tissue, taking care not to touch the tip orifice.

Dispensing:

1. Touch the tip end against the side wall of the receiving vessel and press the plunger slowly, past the FIRST STOP, to blowout (bottom of stroke.) Wait: 1 second for 2–300 µL volumes, 1-2 seconds for 1000 µL and larger. (Longer for viscous solutions.)
2. Still holding the plunger, withdraw the tip, sliding it along the wall of the vessel. Release the plunger.
3. Press the tip ejector button lightly to discard the tip. Use a new tip for each sample to prevent carry-over. Repeat for the next pipetting cycle.

Pipetting Guidelines

Pipet-Lite pipettes incorporate several new features which enhance pipetting consistency. You should also maintain:

1. Consistent pickup and dispense rhythm.
2. Consistent speed and smoothness when pipetting.
3. Consistent pressure on the plunger button at the FIRST STOP.
4. Consistent immersion depth. See table on page 4.
5. Pipette vertically, or within 20° of vertical.
6. Don't invert or lay the pipette flat with liquid in the tip.

Pre-Rinsing Recommended

Some solutions may leave a film on the inside tip wall. This film remains relatively constant in successive pipettings with the same tip, so excellent precision can be obtained by refilling the tip and using the refilled volume as the sample. Successive samples from this same tip will exhibit good reproducibility.

Reverse Mode Pipetting

Another way of reducing error due to film retention, especially useful for more viscous liquids, is reverse mode pipetting. The operating sequence is reversed:

1. Mount a disposable tip on the pipette shaft.
2. Press the pushbutton fully to the SECOND STOP.
3. Immerse the tip in liquid and allow the button to return slowly to the fully UP position. Wait a moment for the liquid column to reach equilibrium in the tip.

4. Wipe any excess liquid from the outside of the tip without touching the orifice.
5. To dispense, rest the end of the tip against the vessel wall and press the plunger to the first stop. Hold this position a few seconds, or long enough for the liquid column to reach equilibrium again.
6. Remove the tip from the receiving vessel without blowing out the remaining liquid.
7. Return excess sample in the tip to the original sample container, if desired. Discard the used tip.

Pipetting Liquids of Varying Density

Pipet-Lite lets you compensate for solutions of density much different from water, by setting the volume slightly higher or lower than that required. The compensation amount must be determined empirically.

For example, if pipetting 10 µL of CsCl solution, you determine that the volume delivered is actually 8.5 µL (≥5 samples). Change the volume setting to 11.8 µL and repeat the measurements. If the volumes delivered are still not close enough to 10 µL, make another slight volume adjustment until the measurements are as desired.

Temperature Considerations

Warm or cold liquids can be measured with good precision by using a consistent pipetting rhythm. This will help minimize any differences in heating or cooling effects within the pipette.

Use a new tip each time for best accuracy and precision when measuring samples with temperatures greatly different from ambient, and do not pre-rinse. As with any air-displacement pipette, you will get best results if there is no delay between picking up the sample and dispensing it.

Autoclaving

Autoclavable parts of Pipet-Lite are the shaft and the tip ejector: 121°C, 1 bar, 15-20 minutes.

Do not autoclave the complete pipette or any parts other than the shaft and the tip ejector.

Tip Ejector Arm Removal

Three types of tip ejector are used and all types can be removed with minimum effort - **do not use force.**

For models up to 2000 µL, press in the quick-release tabs on the ejector arm and pull the ejector down.

For 5000 µL and 10 mL models, grasp the top of the ejector arm and pull outward then downward.

For the 20 mL model, pull off the lower part of the ejector arm; the upper part stays in place. (Replace by aligning the rod with the hole in the upper part and pressing firmly.)

To replace the ejector arm (except 20 mL), insert the shaft through the large opening, align the top with the tip ejector pushrod, and push until the ejector arm snaps in place.

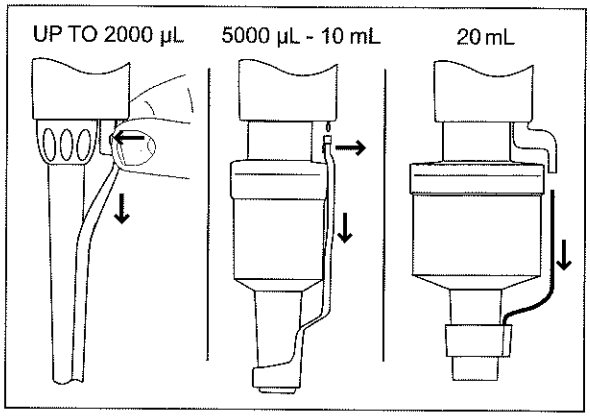


Figure 3 Removing the Tip Ejector Arm

Pipet-Lite Storage

After use, store the pipette in a clean safe place. Pipet-Lite is a precision instrument and should be treated with the level of care appropriate for laboratory instrumentation. Three types of hanger are available to hold your Pipet-Lite conveniently when not in use.

CR-7: Free-standing carousel holds seven pipettes.

HU-M3: Set of three individual magnetic Hang-Ups™ for mounting on ferrous surfaces.

HU-S3: Three Hang-Ups attached to a clamp which fits onto a shelf.

Troubleshooting and Repairs

WARNING:

When removing the shaft from the pipette body, make sure the spring, seal and o-ring do not fall off the piston, especially on the smaller models.

Sample Splash (liquid inside the mechanism)

1. Remove the tip ejector arm. Also refer to the appropriate drawing on page 12 or 13.
2. On pipettes up to 1000 µL, unscrew the shaft coupling (B) and remove the shaft (C). For 2000 µL, unscrew the shaft. For 5000 µL, 10 mL and 20 mL unscrew the lower part of the shaft. Note the way the spring, seal and O-ring fit on the piston.
3. Inspect the seal assembly and piston for contamination. The piston should be shiny and free of corrosion. Clean with distilled water or isopropyl alcohol. Dry with a lint-free tissue and reassemble after inspecting the interior of the shaft for any contamination. For 5000 µL, 10 mL and 20 mL models, apply a small amount of grease to the seal.
4. If piston corrosion or staining is evident, do not use the instrument. Call 800-662-7027 for Service.

Leaks, Inaccuracy, Abnormal Stroke

1. **Loose shaft.** Tighten coupling by hand.
2. **Split or cracked shaft.** Remove the tip ejector and inspect the shaft. Replace the shaft if necessary. If the shaft was dropped, remove it to see if the piston is bent. If so, return the instrument for service.
3. **Worn seal and / or o-ring.** All models up to 2000 µL incorporate a polyethylene seal and o-ring. Examine the seal and o-ring, replacing them as necessary. Pull off the old seal and o-ring, position the new seal and o-ring on the piston assembly as shown in the drawings on pages 12-13, and reassemble the pipette.

   Note: It is NOT necessary to recalibrate Pipet-Lite after changing seals.
4. **Do not lubricate any components*.** Pipet-Lite uses a dry sealing system. *Except 5000µL, 10 mL, and L-20ML models. These pipettes require a small amount of grease to be applied to the o-ring to make the seal.

Service, Calibration and Repair

RAININ Pipette Repair and Calibration facilities:

It is recommended to use only genuine RAININ replacement parts such as seals, o-rings, and shafts. It is NOT necessary to recalibrate the pipette after changing the seal, o-ring, or shaft. Recalibration of the pipette is only necessary when the piston is replaced, and should be done only by qualified factory-trained personnel in one of the above-mentioned facilities.

For pipettes under warranty, please note that the warranty will be voided if the pipette has been damaged as a result of physical or chemical abuse, or if the pipette has been repaired or recalibrated by any service facility which is not authorized by Rainin.

In the US, call 800-543-4030 for service. Or visit the web: www.rainin.com/service.asp.

Service is also available outside the US.

See the RAININ website home page, www.rainin.com, and click on the link "Customers outside North America".

METTLER TOLEDO Pipette Repair and Calibration facilities or authorized RAININ distributors who provide service can be found by following this link and specifying the country or geographical region.

Contact Technical Support at 800-543-4030 for further information.

Specifications

These manufacturer's specifications should be used as guidelines when establishing your own performance specification.

Pipet-Lite Specifications						
	Volume	Increment	Accuracy		Precision	
Model	µL	µL	%	µL (±)	%	µL (≤)
2 µL	0.2	0.002	12.0	0.024	6.0	0.012
	1.0		2.7	0.027	1.3	0.013
	2.0		1.5	0.030	0.7	0.014
10 µL	1.0	0.02	2.5	0.025	1.2	0.012
	5.0		1.5	0.075	0.6	0.03
	10.0		1.0	0.1	0.4	0.04
20 µL	2	0.02	7.5	0.15	2.0	0.04
	10		1.5	0.15	0.5	0.05
	20		1.0	0.2	0.3	0.06
100 µL	10	0.2	3.5	0.35	1.0	0.1
	50		0.8	0.4	0.24	0.12
	100		0.8	0.8	0.15	0.15
200 µL	20	0.2	2.5	0.5	1.0	0.2
	100		0.8	0.8	0.25	0.25
	200		0.8	1.6	0.15	0.3
300 µL	30	0.5	2.5	0.75	1.0	0.3
	150		0.8	1.2	0.25	0.375
	300		0.8	2.4	0.15	0.45
1000 µL	100	2	3.0	3.0	0.6	0.6
	500		0.8	4.0	0.2	1.0
	1000		0.8	8.0	0.15	1.5
2000 µL	200	2	3.0	6.0	0.6	1.2
	1000		0.8	8.0	0.2	2.0
	2000		0.8	16.0	0.12	2.4
5000 µL	500	5	2.4	12.0	0.6	3.0
	2500		0.6	15.0	0.2	5.0
	5000		0.6	30.0	0.16	8.0
10 mL	1 mL	20	5.0	50.0	0.6	6.0
	5 mL		1.0	50.0	0.2	10.0
	10 mL		0.6	60.0	0.16	16.0
20 mL	2 mL	20	5.0	100.0	0.6	12.0
	10 mL		1.0	100.0	0.2	20.0
	20 mL		0.6	120.0	0.16	32.0

Specifications are subject to change without notice.

Acids and Corrosives

After pipetting concentrated acids or highly corrosive solutions, disassemble Pipet-Lite and inspect and clean the piston assembly, shaft, and seal with distilled water. Dry all components thoroughly and reassemble.

Extensive contact with corrosive fumes may result in premature seal wear and damage to the piston. Exposure of internal components to corrosive fumes can be reduced by using RAININ tips with aerosol barrier filters.

Replacement Parts (see pages 12-13)

Legend for Pipet-Lite 2 µL to 2000 µL

A - Plunger Button **B- Shaft Coupling** **C - Shaft***
D - Tip Ejector* **E - Piston Assembly** **F - Seal**
G - O-ring **H - Stroke Spring** **J - Seal Retainer**

L- Series: note the second set of A and B (shaded) are for the new-handle Pipet-Lite (2007)

	L-2	L-10	L-20	L-100	L-200	L-300	L-1000	L-2000
A	6202-055	6202-056	6202-057	6202-058	6202-059	6202-306	6202-060	6202-192
A	6202-500	6202-501	6202-502	6202-504	6202-505	6202-506	6202-507	6202-509
B	6202-062	6202-062	6202-062	6202-062	6202-062	6202-062	6202-062	n/a
B	6202-499	6202-499	6202-499	6202-499	6202-499	6202-499	6202-499	n/a
C	6202-063	6202-064	6202-065	6202-066	6202-067	6202-425	6202-068	6202-214
D	6202-071	6202-071	6202-071	6202-073	6202-073	6200-419	6202-074	6200-168
E	6202-076	6202-077	6202-078	6202-079	6202-080	6202-427	6202-081	6202-082
F	6200-131	6200-138	6200-143	6200-150	6200-154	6200-415	6200-161	6200-166
G	6200-132	6200-139	6200-170	6200-151	6200-155	6200-414	6200-162	6200-167
H	6202-083	6202-083	6202-083	6202-084	6202-084	6202-084	n/a	n/a
J	6200-196	6200-196	6200-198	6200-201	6200-200	6200-416	n/a	n/a

SL- Series: note the second set of A and B (shaded) are for the new-handle Pipet-Lite (2007)

	SL-2	SL-10	SL-20	SL-100	SL-200	SL-300	SL-1000	SL-2000
A	6202-109	6202-110	6202-111	6202-112	6202-113	6202-426	6202-114	6202-115
A	6202-516	6202-517	6202-518	6202-519	6202-520	6202-521	6202-522	6202-523
B	6202-062	6202-062	6202-062	6202-062	6202-062	6202-062	6202-062	n/a
B	6202-515	6202-515	6202-515	6202-515	6202-515	6202-515	6202-515	n/a
C	6200-134	6200-140	6200-145	6200-147	6200-157	6200-413	6200-160	6200-169
D	6200-133	6200-133	6200-144	6200-148	6200-156	6200-419	6200-163	6200-168
E	6202-183	6202-184	6202-185	6202-079	6202-080	6202-427	6202-081	6202-082
F	6200-131	6200-138	6200-143	6200-150	6200-154	6200-415	6200-161	6200-166
G	6200-132	6200-139	6200-170	6200-151	6200-155	6200-414	6200-162	6200-167
H	6202-083	6202-083	6202-083	6202-084	6202-084	6202-084	n/a	n/a
J	6200-196	6200-196	6200-198	6200-201	6200-200	6200-416	n/a	n/a

* These parts are autoclavable (C - shaft, D - tip ejector arm)

Legend for Pipet-Lite 5000 µL , 10 mL and 20 mL

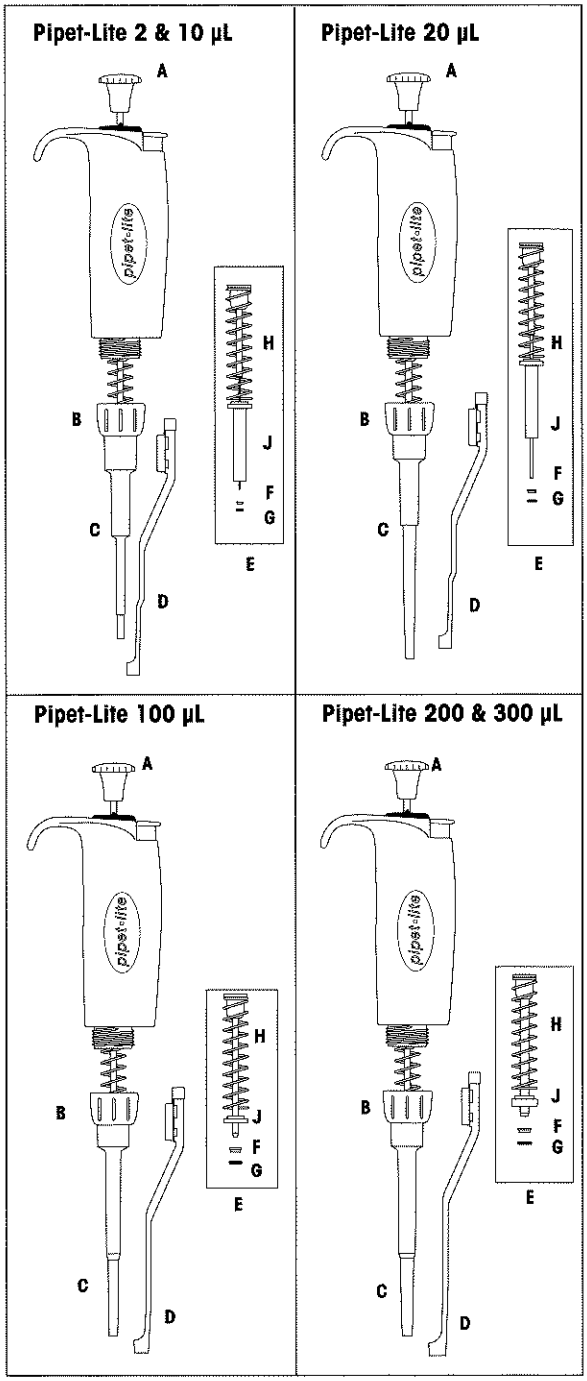
A - Plunger Button **C- Tip Ejector*** **D - Piston Assembly**
E - Piston O-ring **F - Cylinder** **G - Cylinder O-ring** **H - Shaft***

	L- Series:			SL- Series:	
	L-5000	L-10ML	L-20ML	SL-5000	SL-10ML
A	6202-193	6202-194	6202-297	6202-217	6202-218
A	6202-510	6202-511	6202-512	6202-524	6202-525
C	6200-373	6200-374	6202-298	6200-373	6200-374
D	6202-215	6202-216	6202-296	6202-215	6202-216
E	6200-363	6200-369	6202-299	6200-363	6200-369
F	6200-365	6200-371	6202-301	6200-365	6200-371
G	6200-364	6200-370	6202-300	6200-364	6200-370
H	6202-222	6202-223	6202-302	6200-362	6200-368

* These parts are autoclavable (C - tip ejector arm, H - shaft)

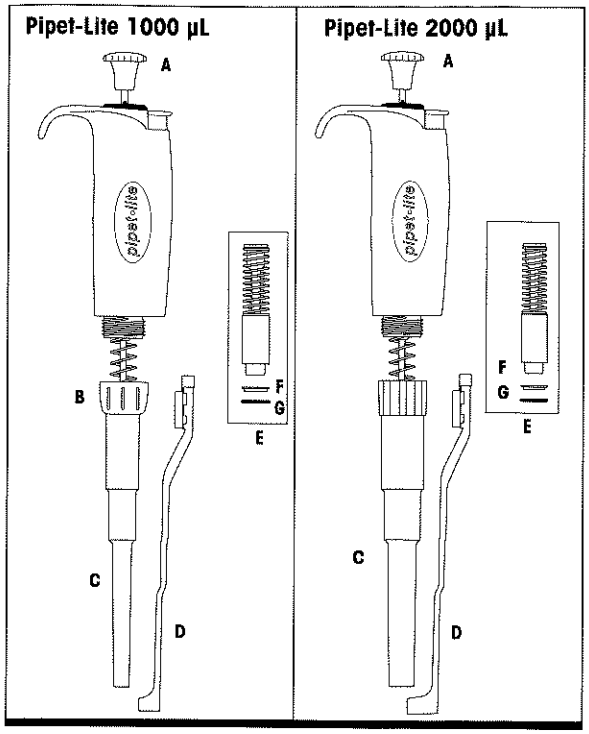
Common parts for 5000 µL, 10 mL, and 20 mL:

Tube of grease: 6100-555
Filters for 5000 µL/10 mL: 6190-164 (100), 6190-165 (1000)
Filters for 20 mL: 6190-221 (100), 6190-222 (500)



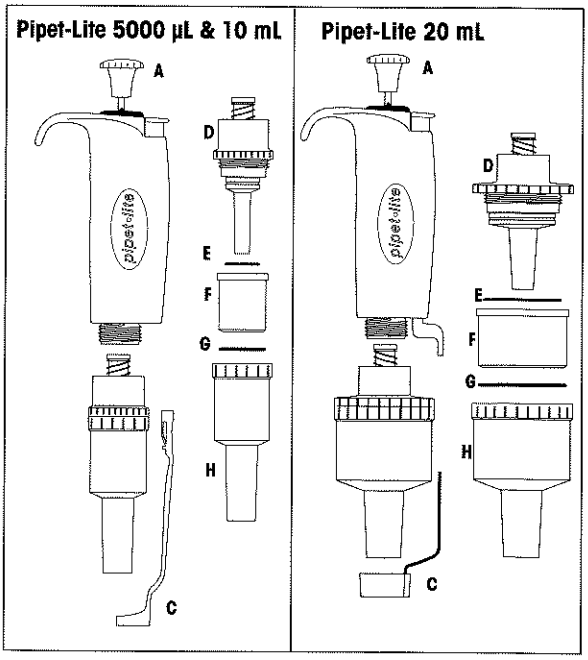
Legend for Pipet-Lite 2 µL to 2000 µL Models
(this page and top of next page)

A - Plunger Button
B- Shaft Coupling
C - Shaft
D - Tip Ejector
E - Piston Assembly
F - Seal
G - O-ring
H - Stroke Spring
J - Seal Retainer



Legend for Pipet-Lite 5000 µL, 10 mL and 20 mL (below)

A - Plunger Button
C- Tip Ejector Arm
D - Piston Assembly
E - Piston O-ring
F- Cylinder
G - Cylinder O-ring
H - Shaft



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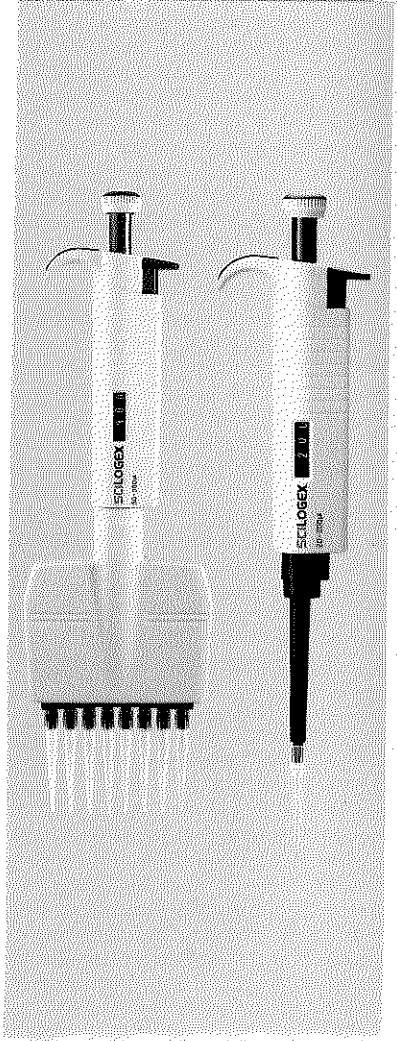
SCILOGEX

MicroPette Pipettor

User Manual



CONTENTS

1. YOUR NEW PIPETTOR

Your new hand held pipettor is a general purpose pipettor for the accurate and precise sampling and dispensing of liquid volumes. The pipettors operate on the air displacement principle and use disposable tips.

The range of pipettors cover a volume range from 0.1 µl to10ml.

All pipettors have been quality tested according to ISO 8655/DIN 12650. The quality control according to ISO 8655/DIN 12650 involves gravimetric testing of each pipettor with distilled water (quality 3, DIN ISO 3696) at 22°C using the manufacturer's original tips.

1.1. Adjustable volume pipettors

Volume range	Increment	Tip
0,1 - 2,5 µl	0,05 µl	10 µl
0,5 - 10 µl	0,1 µl	10 µl
2-20 µl	0,5 µl	200,300 µl
5 - 50 µl	0,5 µl	200,300,350 µl
10-100 µl	1 µl	200,300,350 µl
20-200 µl	1 µl	200,300,350 µl
50 -200 µl	1 µl	200,300,350 µl
100-1000 µl	5 µl	1000 µl
200 - 1000 µl	5 µl	1000 µl
1- 5 ml	50 µl	5 ml
2-10ml	0,1ml	10ml

Volume range	Increment	Tip
8-ch 0,5-10 µl	0,1 µl	10 µl
8-ch 5-50 µl	0,5 µl	200,300,350 µl
8-ch 50-300 µl	5 µl	350µl
12-ch 0,5-10 µl	0,1 µl	10 µl
12-ch 5-50 µl	0,5 µl	200,300,350 µl
12-ch 50-300 µl	5 µl	350 µl

1.2. Fixed volume pipettors

Volume	Tip
5 µl	10 µl
10 µl	10 µl
20 µl	200,300,350 µl
25 µl	200,300,350 µl
50 µl	200,300,350 µl
100 µl	200,300,350 µl

Volume	Tip
200 µl	200,300,350 µl
250 µl	1000 µl
500 µl	1000 µl
1000 µl	1000 µl
2000 µl	5000 µl
5000 µl	5000 µl

1.3. Tips

These detachable, disposable tips are made of natural colour poly-propylene.

Note: Never pipette liquid without attaching a tip to the pipettor!

Product	Qty of tips/Unit
Tip 10 µl in single tray	8x12
Tip 10 µl in bag	1000
Tip 300 µl in single tray	8x12
Tip 300 µl in bag	1000
Tip 350 µl in single tray	8x12
Tip 350 µl in bag	1000
Tip 1000 µl in single tray	8x12
Tip 1000 µl in bag	500
Tip 5 ml Plus in bag	100
Tip 10ml in bag	250

2. UNPACKING

The pipettor package contains the following items:

- Pipettor
- Calibration/Opening tool
- Grease
- Instructions for use
- Pipettor holder
- Tip
- Performance certificate according to ISO8655/DIN12650

3. INSTALLING THE PIPETTOR HOLDER

For convenience and safety always keep the pipettor vertically on its own holder when not in use. When installing the holder, please follow the instructions below:

1. Clean the shelf surface with ethanol.
2. Remove the protective paper from the adhesive tape.
3. Install the holder as described in Figure 2A.
   (Make sure the holder is pressed against the edge of the shelf.)
4. Place the pipettor onto the holder as shown in Figure 2B.

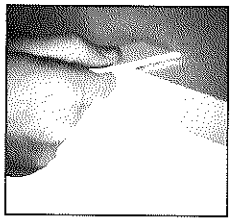


Fig. 2A

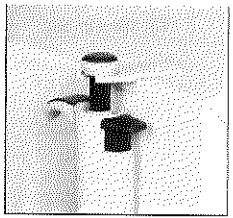
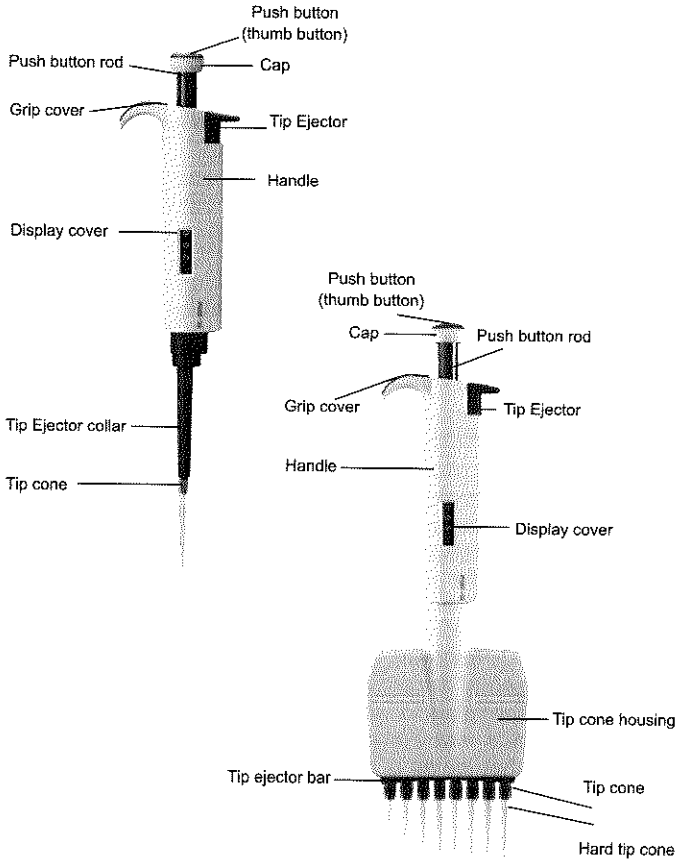


Fig. 2B

4. PIPETTOR COMPONENTS



5. PIPETTOR OPERATION

5.1. Volume setting

The volume of the pipettor is clearly shown through the handle grip window. The delivery volume (variable volume pipettors only) is set by turning the thumb button clockwise or anticlockwise (Fig. 3). When setting the volume, please make sure that:

- The desired delivery volume clicks into place
- The digits are completely visible in the display window
- The selected volume is within the pipettor's specified range.

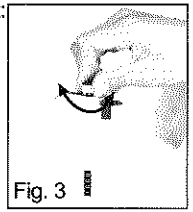


Fig. 3

Using excessive force to turn the push button outside the range may jam the mechanism and damage the pipettor.

5.2. Sealing and ejecting tips

Before fitting a tip make sure that the pipettor tip cone is clean. Press the tip on the cone of the pipettor firmly to ensure an airtight seal. The seal is tight when a visible sealing ring forms between the tip and the black tip cone (Fig. 4).

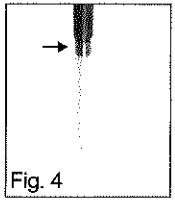


Fig. 4

Each pipettor is fitted with a tip ejector to help eliminate the safety hazards associated with contamination. The tip ejector needs to be pressed firmly downwards to ensure proper tip ejection (Fig. 5). Make sure that the tip is disposed of into a suitable waste container.

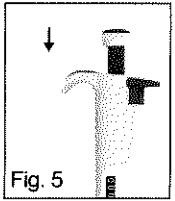


Fig. 5

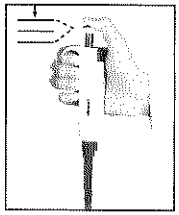
6. PIPETTING TECHNIQUES

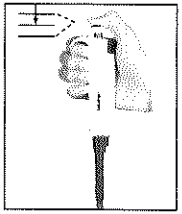
6.1. Forward pipetting

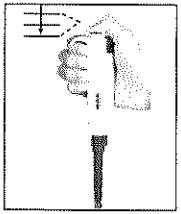
Make sure that the tip is firmly attached to the tip cone. For best results the thumb button should be operated slowly and smoothly at all times, particularly with viscous liquids.

Hold the pipettor vertically during aspiration. Make sure that the liquid and container vessel are clean and that the pipettor, tips and the liquid are at the same temperature.

1. Depress the thumb button to the first stop (Fig. 6B).
2. Place the tip(s) just under the surface of the liquid (2-3 mm) and smoothly release the thumb button. Carefully withdraw the tip from the liquid, touching against the edge of the container to remove excess.
3. Liquid is dispensed by gently depressing the thumb button to the first stop (Fig. 6B). After a short delay continue to depress the thumb button to the second stop (Fig. 6C). This procedure will empty the tip(s) and ensure accurate delivery.
4. Release the thumb button to the ready position (Fig. 6A). If necessary change the tip(s) and continue with pipetting.


Starting position
Fig. 6A


First stop
Fig. 6B


Second stop
Fig. 6C

6.2. Reverse pipetting

The reverse technique is suitable for dispensing liquids that have a tendency to foam or have a high viscosity. This technique is also used for dispensing very small volumes when it is recommended that the tip is first primed with the liquid before pipetting. This is achieved by filling and emptying the tip(s).

1. Depress the thumb button all the way to the second stop (Fig. 6C). Place the tip(s) just under the surface of the liquid (2-3mm) and smoothly release the thumb button.
2. Withdraw the tip(s) from the liquid touching against the edge of the container to remove excess.
3. Deliver the preset volume by smoothly depressing the thumb button to the first stop (Fig. 6B). Hold the thumb button at the first stop. The liquid that remains in the tip(s) should not be included in the delivery.
4. The remaining liquid should now be discarded with the tip(s) or delivered back into the container vessel.

7. PIPETTING RECOMMENDATIONS

- Hold the pipettor vertically when aspirating the liquid and place the tip only a few millimetres into the liquid
- Prerinse the tip before aspirating the liquid by filling and emptying the tip 5 times. This is important especially when dispensing liquids which have a viscosity and density different from water
- Always control the push button movements with the thumb to ensure consistency
- When pipetting liquids at a temperature different from ambient, prerinse the tip several times before use

8. STORAGE

When not in use it is recommended that your pipettor is stored in a vertical position. See Installing the pipettor holder (Chapter 3).

9. PERFORMANCE TEST AND RECALIBRATION

Each pipettor has been factory-tested and certified at 22°C according to ISO 8655/Din 12650. The following table shows the maximum permitted errors (Fmax) for manufacturers given in ISO 8655/DIN 12650, which further advises each user to establish their own maximum permitted errors (Fmax user). The Fmax user should not exceed the Fmax by more than 100%.

Note: Pipettor specifications are guaranteed only with manufacturer's tips.

	Nominal volume	Maximum permitted errors (Fmax)	Nominal volume	Maximum permitted errors (Fmax)
Single-channel pipettors:	5 µl	±0.3 µl	200 µl	±2 µl
	10 µl	±0.3 µl	250 µl	±2.5 µl
	20 µl	±0.4 µl	500 µl	±5 µl
	25 µl	±0.5 µl	1000 µl	±10 µl
	50 µl	±0.8 µl	2000 µl	±20 µl
	100 µl	±1.5 µl	5000 µl	±50 µl
Multichannel pipettors:	10 µl	±0.6 µl	250 µl	±5.0 µl
	50 µl	±1.6 µl	300 µl	±6.0 µl

9.1. Performance test (Checking calibration)

- Weighing should take place at 20-25°C, constant to ±0.5°C.
- Avoid drafts.

1. Set the desired testing volume of your pipettor.
2. Carefully fit tip onto the tip cone.
3. Prerinse tip with distilled water by pipetting the selected volume 5 times.

4. Carefully aspirate the liquid, keeping the pipettor vertical.
5. Pipette distilled water into a tared container and read the weight in mgs. Repeat at least five times and record each result. Use an analytical balance with a readability of 0.01 mgs. To calculate the volume, divide the weight of the water by its density (at 20°C: 0.9982). This method is based on ISO 8655/DIN 12650.
6. Calculate the F-value by using the following equation:
   F=| inaccuracy (µl) | + 2 x imprecision (µl).
   Compare the calculated F-value to the corresponding Fmax user. If it falls within the specifications, the pipettor is ready for use. Otherwise check both your accuracy and precision and, when necessary, proceed to Recalibration procedure.

9.2. Recalibration procedure

1. Place the calibration tool into the holes of the calibration adjustment lock (under the thumb button) (Fig. 7).
2. Turn the adjustment lock anticlock - wise to decrease and clockwise to increase the volume.
3. Repeat Performance test (Checking calibration) procedure from step 1 until the pipetting results are correct.

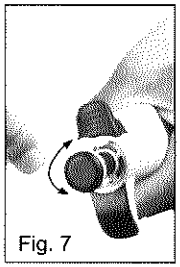


Fig. 7

10. MAINTENANCE

To maintain the best results from your pipettor each unit should be checked every day for cleanliness. Particular attention should be paid to the tip cone(s).

The pipettors have been designed for easy in-house service. However, we also provide complete repair and calibration service including a service report and performance certificate(s). Please return your pipettor to your local representative for repair or recalibration. Before returning please make sure that it is free from all contamination Please advise our Service Representa - tive of any hazardous materials which may have been used with your pipettor.

Note: Check the performance of your pipettor regularly e.g. every 3 months and always after in-house service or maintenance.

10.1. Cleaning your pipettor

To clean your pipettor use ethanol and a soft cloth or lint-free tissue. It is recommended to clean the tip cone regularly.

10.2. In-house maintenance

1. Hold down the tip ejector.
2. Place the tooth of the opening tool between the tip ejector and the tip ejector collar to release the locking mechanism (Fig. 8).
3. Carefully release the tip ejector and remove the ejector collar.
4. Place the wrench end of the opening tool over the tip cone, turning it anticlockwise. Do not use any other tools (Fig. 9). The 5 ml tip cone is removed by turning it anticlockwise. Do not use any tools (Fig. 10).
5. Wipe the piston, the O-ring and the tip cone with ethanol and a lint-free cloth.
   Note: Models up to 10 µl have a fixed O-ring located inside the tip cone. Therefore, the O-ring cannot be accessed for maintenance.
6. Before replacing tip cone it is recommended to grease the piston slightly using the silicone grease provided.
   Note: Excessive use of grease may jam the piston.
7. After reassembling use the pipettor (without liquid) several times to make sure that the grease is spread evenly.
8. Check the pipettor calibration.

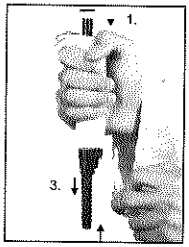


Fig. 8

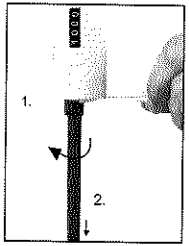


Fig. 9

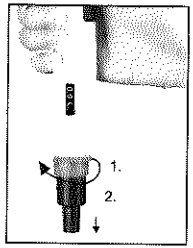


Fig. 10

11. TROUBLE SHOOTING

Trouble	Possible cause	Solution
Droplets left inside the tip	Unsuitable tip	Use original tips
	Non-uniform wetting of the plastic	Attach new tip
Leakage or pipetted volume too small	Tip incorrectly attached	Attach firmly
	Unsuitable tip	Use original tips
	Foreign particles between tip and tip cone	Clean the tip cone, attach new tip
	Instrument contaminated or insufficient amount of grease on piston and O-ring	Clean and grease O-ring and piston, clean the tip cone Grease accordingly
	O-ring not correctly positioned or damaged	Change the O-ring
	Incorrect operation	Follow instructions carefully
	Calibration altered or unsuitable for the liquid	Recalibrate according to instructions
	Instrument damaged	Send for service
Push button jammed or moves erratically	Piston contaminated	Clean and grease O-ring and piston, clean the tip cone
	Penetration of solvent vapours	Clean and grease O-ring and piston, clean the tip cone
Pipettor blocked, aspirated volume too small	Liquid has penetrated tip cone and dried	Clean and grease O-ring and piston, clean the tip cone
Tip ejector jammed or moves erratically	Tip cone and/or ejector collar contaminated	Clean the tip cone and the ejector collar

12. WARRANTY INFORMATION

The pipettors are warranted for three years against defects in materials and workmanship. Should it fail to function in any period of time, please contact your local representative immediately. The warranty will not cover defects caused by normal wear or by using the pipettor against the instructions given in this manual.

Each pipettor is tested before shipping by the manufacturer. The Quality Assurance Procedure is your guarantee that the pipettor you have purchased is ready for use.

SPECIFICATIONS

Adjustable volume pipettors

Volume range	Volume	Inaccuracy ±	Imprecision ±
0.1-2.5 µl	2.5 µl	2,50 %	2,00 %
	1.25 µl	3,00 %	3,00 %
	0.25 µl	12,00 %	6,00 %
0.5-10 µl	10 µl	1,00 %	0,80 %
	5 µl	1,50 %	1,50 %
	1 µl	2,50 %	1,50 %
2-20 µl	20 µl	0,90 %	0,40 %
	10 µl	1,20 %	1,00 %
	2 µl	3,00 %	2,00 %
5-50 µl	50 µl	0,60 %	0,30 %
	25 µl	0,90 %	0,60 %
	5 µl	2,00 %	2,00 %
10-100 µl	100 µl	0,80 %	0,15 %
	50 µl	1,00 %	0,40 %
	10 µl	3,00 %	1,50 %
20-200 µl	200 µl	0,60 %	0,15 %
	100 µl	0,80 %	0,30 %
	20 µl	3,00 %	1,00 %
50-200 µl	200 µl	0,60 %	0,15 %
	100 µl	0,80 %	0,30 %
	50 µl	1,00 %	0,40 %
100-1000 µl	1000 µl	0,60 %	0,20 %
	500 µl	0,70 %	0,25 %
	100 µl	2,00 %	0,70 %
200-1000 µl	1000 µl	0,60 %	0,20 %
	500 µl	0,70 %	0,25 %
	200 µl	0,90 %	0,30 %
1-5 ml	5 ml	0,50 %	0,15 %
	2.5 ml	0,60 %	0,30 %
	1 ml	0,70 %	0,30 %
2-10ml	10ml	0,60%	0,20%
	5ml	1,20%	0,30%
	2ml	3,00%	0,60%

Volume range	Volume	Inaccuracy ±	Imprecision ±
8-ch 0,5-10 µl	10 µl	1,50 %	1,50 %
	5 µl	2,50 %	2,50 %
	1 µl	4,00 %	4,00 %
8-ch 5-50 µl	50 µl	1,00 %	0,50 %
	25 µl	1,50 %	1,00 %
	5 µl	3,00 %	2,00 %
8-ch 50-300 µl	300 µl	0,70 %	0,25 %
	150 µl	1,00 %	0,50 %
	50 µl	1,50 %	0,80 %
12-ch 0,5-10 µl	10 µl	1,50 %	1,50 %
	5 µl	2,50 %	2,50 %
	1 µl	4,00 %	4,00 %
12-ch 5-50 µl	50 µl	1,00 %	0,50 %
	25 µl	1,50 %	1,00 %
	5 µl	3,00 %	2,00 %
12-ch 50-300 µl	300 µl	0,70 %	0,25 %
	150 µl	1,00 %	0,50 %
	50 µl	1,50 %	0,80 %

Fixed volume pipettors

Volume	Volume	Inaccuracy ±	Imprecision ±
5 µl	5 µl	1,30 %	1,20 %
10 µl	10 µl	0,80 %	0,80 %
20 µl	20 µl	0,60 %	0,50 %
25 µl	25 µl	0,50 %	0,30 %
50 µl	50 µl	0,50 %	0,30 %
100 µl	100 µl	0,50 %	0,30 %
200 µl	200 µl	0,40 %	0,20 %
250 µl	250 µl	0,40 %	0,20 %
500 µl	500 µl	0,30 %	0,20 %
1000 µl	1000 µl	0,30 %	0,20 %
2000 µl	2000 µl	0,30 %	0,15 %
5000 µl	5000 µl	0,30 %	0,15 %

Liquid: Distilled water (quality 3, DIN ISO 3696)
Reference temperature: 22°C, constant to ±0.5°C
Tested: According to ISO 8655/DIN 12650 using original manufacturer's tips

OPERATING INSTRUCTIONS

MINI CENTRIFUGE

MODEL C1301-ISC-P

CE

February 2002
Version 1

General Information:

The ISC BioExpress Mini Centrifuge is supplied with two rotors, one for microtubes and one for 0.2ml PCR strip tubes. The 6 x 1.5ml rotor is designed to centrifuge up to six individual 1.5ml plastic microcentrifuge tubes. It will also accept 0.5ml and 0.4ml tubes with the adapters supplied with the unit. Adapters are available separately for 0.2ml tubes. The strip tube rotor is designed to centrifuge two 8 x 0.2ml strip tubes. It will also accept up to 16 individual 0.2ml tubes. Both rotors are designed for applications requiring relatively low g-forces, such as microfiltration, cell separation and quick spin downs from the walls of tubes. Please read this manual thoroughly before attempting to operate the centrifuge.

Warranty:

The centrifuge and rotor are covered by a one year warranty. This warranty is void in the event of incorrect operation, use of nonstandard spare parts or accessories and unauthorized modification of the rotor or centrifuge. The rotor warranty does not cover normal wear and tear or damage and/or weakening caused by radioactive contamination, cleaning agents, or overtightening of the allen screw. Fuses are not covered by the warranty.

Exchanging Rotors:

The centrifuge is supplied with two interchangeable rotors. The rotors are easily exchanged using the allen wrench provided. Locate the set screw on the rotor shaft below the rotor head. Using the wrench, loosen the set screw and pull up on the rotor to remove. Place the other rotor into position on the motor shaft. Take care not to press the rotor down so far as to compress the rubber collar at the base of the shaft. Tighten the screw using the allen wrench until finger tight. Do not overtighten as this will cause damage to the rotor and the motor shaft.

Operation:

Before operating the centrifuge, be sure that the power switch is in the "on" position. To begin a run, simply close the lid of the centrifuge. No other controls are required. To stop rotation, press down on the lid release tab on the front of the unit. This will release the lid lock and the rotor will slow gradually to a complete stop. Caution: Do not attempt to open the lid or remove samples until the unit has come to a complete stop. After the rotor has stopped, the lid may be opened by grabbing it with the thumb on the front and fingers on the back then lifting the lid back on the hinge.

Safe operation of the centrifuge requires that the rotor be loaded in a balanced fashion. Failure to load the rotor properly presents a hazardous condition and may damage the centrifuge. Individual tubes, strip tubes and/or adapters must always be loaded symmetrically to ensure proper balance. Never run the centrifuge with only one strip tube in place.

Safety Precautions:

NEVER use the centrifuge in any manner not specified in these instructions.
NEVER operate the centrifuge without a rotor properly attached to the shaft.
NEVER fill tubes while they are in the rotor. Liquid spillage may harm unit.
NEVER put hands in the rotor area unless the rotor is completely stopped.
NEVER move the centrifuge while the rotor is spinning.
NEVER use solvents or flammables near this or other electrical equipment.
NEVER centrifuge flammable, explosive or corrosive materials
NEVER centrifuge hazardous materials outside of a hood or proper containment facility
ALWAYS load the rotor symmetrically. Each tube should be counterbalanced by another tube. Weight of individual tubes may not exceed of 3.0g.
ALWAYS locate the centrifuge within easy access to an electrical outlet.
ALWAYS use only microcentrifuge tubes made from plastic and designed to withstand centrifugal forces of at least 2,000 xg.

Cleaning:

Before using any cleaning or decontamination methods except those recommended by the manufacturer, check with the manufacturer that the proposed method will not damage the equipment. To clean the centrifuge, use a damp cloth and a mild, noncorrosive detergent (ph <8). After cleaning, ensure all parts are dried thoroughly before attempting to operate the unit. Do not immerse the centrifuge in liquid or pour liquids over it.

Questions and Service:

Should you have a question about the centrifuge or require service for the unit, please use the contact numbers listed below. Do not send in a unit for service without first calling to obtain a repair authorization number and a decontamination form. Should the centrifuge require service, be sure to decontaminate it and enclose the decontamination form. The unit should be properly packed to avoid damage. Any damage resulting from improper packaging shall be the responsibility of the user.

Specifications:

Dimensions... ..... 6" x 6" (153 x 153mm)
Electrical ..... 115V, 60Hz, 130mA or 240V, z50/60Hz, 65mA
Fuse ..... 0.5A, 250V (F)
Speed 6000rpm
RCF ..... 2000 x g

Spare Parts:

Replacement 1.5ml rotor: C-1300-RT
Replacement strip rotor: C-1300-RTS
Replacement allen key: C-1300-RWReplacement fuses: C-1200-F

ISC BioExpress®

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420 N. Kays Drive
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Phone 800 999-2901
Fax 801 547-5051

e-mail: isc@bioexpress.com
website: www.iscbioexpress.com

INSTRUCTION MANUAL

Mini Single & Mini Dual Cell Electrophoresis Chambers

Cat. No. (E)1-1408 (Single Cell)
Cat. No. (E)1-1409 (Dual Cell)

CAUTION
Read and understand this manual before using this product.

950 Walnut Ridge Drive • Hartland, WI 53029-9388 • USA

Research Products Division
Technical Service: 414-369-7000
Phone Orders: 1-800-DNA-FOTO
(1-800-362-3686)
Fax Orders: 1-800-362-3642

Educational Products Division
Technical Service: 414-369-7000
Phone Orders: 1-800-362-4657
Fax Orders: 1-800-362-3642

Instruction Manual for the Mini Single Cell & Mini Dual Cell Electrophoresis Chambers

Cat. No. (E)1-1408 Mini Single Cell
Cat. No. (E)1-1409 Mini Dual Cell

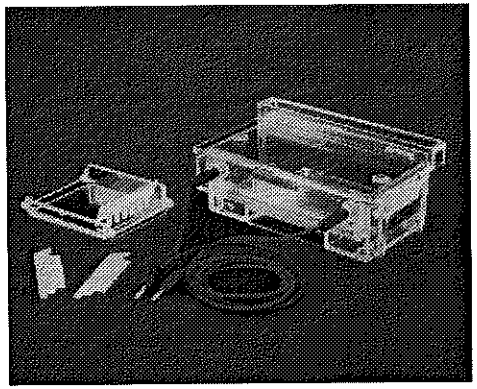
Table of Contents

DWG # 106-207 Part # 78-1451

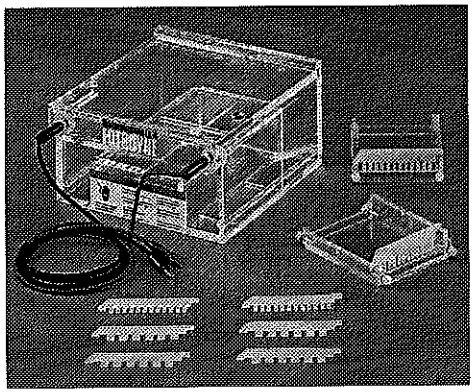
Introduction

The FOTODYNE Mini Single and Mini Dual Cell Electrophoresis Chambers are constructed of rugged acrylic plastic, and designed with platinum electrodes to give optimal performance. The UV transparent gel trays are equipped with self-sealing and adjustable gates to eliminate the need for taping. The gates are pushed up for gel pouring and down for electrophoresis. The trays have notches in two places, at one end and in the center, to allow for positive placement of the 6, 8, 10, or 12-well comb. For safety, access to the gel during electrophoresis is prevented by the interlocking safety lid which has 3-foot long power leads attached.

The Mini Single Cell Electrophoresis Chamber includes one gel tray and four combs (one each 6, 8, 10, and 12-well). The Mini Dual Cell has two gel trays and eight combs (two each 6, 8, 10, and 12-well). Two gels may be run simultaneously in the Dual Cell, or alternatively a single gel may be run with the aid of the included acrylic centering blocks.



Mini Single Cell Electrophoresis Chamber (E)1-1408



Mini Dual Cell Electrophoresis Chamber (E)1-1409

Specifications

Mini Single Cell Electrophoresis Chamber

- Chamber: 17.5 cm L x 10.0 cm W x 7.0 cm H (6.8" x 3.9" x 2.75")
- Gel size (each): 7.1 cm x 9.3 cm (use 6.6 ml of agarose for each mm of gel thickness; 5 mm thick gels use approximately 30 ml)
- Minimum required buffer volume: 150 ml
- Weight: 0.75 kg (1 lb, 11 oz) with lid, combs, and tray

Mini Dual Cell Electrophoresis Chamber

- Chamber: 18 cm L x 20 cm W x 10.5 cm H (7.75" x 7" x 4.25")
- Gel size (each): 7.1 cm x 9.3 cm (use 6.6 ml of agarose for each mm of gel thickness; 5 mm thick gels use 30 ml)
- Minimum required buffer volume: 700 ml
- Weight: 1.4 kg (3 lb 1 oz) with lid, combs, and trays

Combs

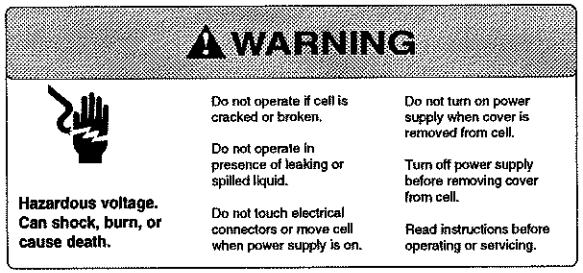
- 12-well comb tooth dimensions (each tooth): 3.5 mm wide x 1.5 mm thick. 20 µl maximum well volume for a 5 mm thick gel (approximately 5.4 µl per mm of well depth). Catalog No. 1-1416
- 8-well comb tooth dimensions (each tooth): 5.0 mm wide x 1.5 mm thick, 30 µl maximum well volume (approximately 7.7 µl per mm of well depth). Catalog No. E1-1427
- 10-well comb tooth dimensions (each tooth): 4.0 mm wide x 1.5 mm thick, 25 µl maximum well volume (approximately 6.4 µl per mm of well depth). Catalog No. E1-1428
- 6-well comb tooth dimensions (each tooth): 6.5 mm wide x 1.5 mm thick. 40 µl maximum well volume for a 5 mm thick gel (approximately 10 µl per mm of well depth). Catalog No. 1-1414
- Optional Preparative comb: one 54 mm x 1.5 mm thick center well; approximately 320 µl maximum well volume for a 5 mm thick gel (81 µl per mm of well depth), and two outer wells each 3.5 mm x 1.5 mm thick. 20 µl maximum well volume for a 5 mm thick gel (approximately 5.4 µl per mm of well depth). Catalog 1-1412

Safety Information

The FOTODYNE Mini Single and Mini Dual Cell Electrophoresis Chambers have been designed to be used with high voltage power supplies. The high voltages used in their application can shock, burn, or cause death. These cells should **not** be operated if the chamber is cracked or broken or in the presence of leaking or spilled liquid. **Do not** touch electrical connectors or move the chamber when the power supply is connected to it. **Do not** turn on the power supply or attempt to operate the electrophoresis chamber when the cover is removed. Turn off the power supply before removing the cover from the chamber. Read and understand all instructions before operating or servicing. If you have any questions regarding the safe operation of the FOTODYNE Single and Dual Cell Electrophoresis Chambers, please call FOTODYNE at 1-800-362-3686 for technical service.

SAFETY LABEL AND PLACEMENT

Hazardous voltage safety label:



Placement of hazardous voltage label: Front center of buffer chamber

Unpacking Instructions

Check-out Procedure

1. Unpack and examine the Single or Dual Cell Electrophoresis Chamber carefully. Immediately report any damage to the transporting carrier and to FOTODYNE Incorporated. Be sure to save all cartons for claim purposes if damage is found.

2. Before getting started, check for the parts against the list below. Identify the following components:

Unpacking Instructions (cont.)

Single Cell Electrophoresis Chamber

a. One Single Cell Electrophoresis Chamber with platinum electrode wires
b. One safety lid with attached 3-foot long power leads
c. One UV transparent gel tray with two end gates
d. One 6-well comb (1.5 mm thick)
e. One 8-well comb (1.5 mm thick)
f. One 10-well comb (1.5 mm thick)
g. One 12-well comb (1.5 mm thick)

Dual Cell Electrophoresis Chamber

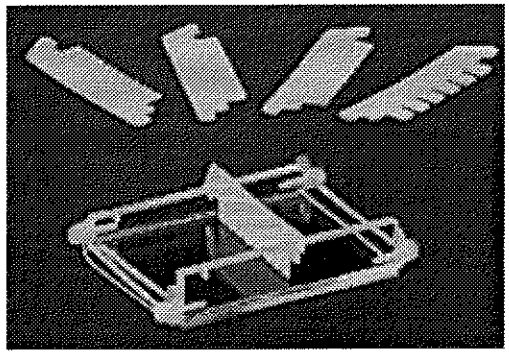
a. One Dual Cell Electrophoresis Chamber with platinum electrode wires
b. One safety lid with attached 3-foot long power leads
c. Two UV transparent gel trays each with two end gates
d. Two 6-well combs (1.5 mm thick)
e. Two 6-well combs (1.5 mm thick)
f. Two 6-well combs (1.5 mm thick)
g. Two 12-well combs (1.5 mm thick)
h. Two acrylic centering blocks

Operating Instructions

Electrophoresis Chamber(s)

1. **Place the tray on a level surface.** Prepare the gel tray by adjusting the screws so that the gates are snug with the edges of the tray and require reasonable effort to move up and down. Gates that have been over-tightened tend to leak. With the gates in the "up" position, put the gel tray on a smooth, level surface for pouring.

NOTE: Once the tension on the gates has been properly adjusted, it is not usually necessary to loosen and retighten the screws with each use.



2. **Insert the comb.** The comb is inserted and positioned using the slots cut into the sides of the tray. Criteria for comb selection should be the number of samples and the desired sample volume in each well. The positioning of the comb depends on the number of combs used and the estimated distance the samples will be electrophoresed. If using one comb in each tray, position it at the end of the tray. If using two combs in each tray, position one at the end and one in the middle to divide each tray into two equal sections.

   Note: Recall that nucleic acids migrate toward the anode (red lead), and away from the cathode (black lead) in an electric field. The comb closest to the end of the gel should be placed at the cathode so that the samples migrate into the gel, not out of the gel and into the buffer.

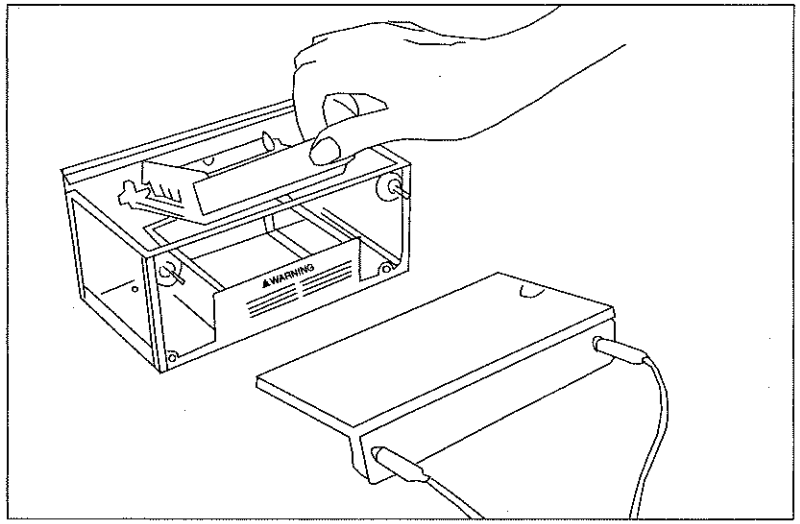
3. **Determine the appropriate agarose concentration, electrophoresis buffer composition, and the desired gel thickness.** For general purposes, 0.8% agarose gels of a 4 - 5 mm thickness in TBE or TAE electrophoresis buffer work well (See Additional Information, page 9 for information on buffers and gels).

4. **Pour the agarose gel.** Once the gel mixture has cooled to about 65°C, pour the agarose solution into the gel tray. Pour with a smooth and even motion. Avoid introducing air bubbles into the gel. If there are bubbles present they may be broken or removed using a micropipettor.

5. **Place the gel tray in the electrophoresis chamber.** After the gel has solidified (at least 20 minutes), carefully remove the comb by pulling it straight up and out of the slots used to position it. Push the gates down to expose the ends of the gel. Place the gel tray onto the center platform inside the electrophoresis chamber so that the taller side of the gel tray is on the same side of the chamber as the electrical posts (e.g., the comb slots at the end of the tray will be closest to the black, or negative, electrode). The gel should remain in the tray with as little disturbance as possible. Alternatively, the gel can be carefully wrapped or covered with plastic wrap and stored at 4°C (refrigerator) for up to one week.

   Note: If only one tray is to be used in a Dual Cell Electrophoresis Chamber, the tray with the gel should be placed with the gates down in roughly the middle of the center platform of the electrophoresis chamber. To help in placing the tray, first position the acrylic centering blocks on

the center platform against each side wall of the chamber, then place the tray with the gel between them. Place the gel tray onto the center platform so that the taller side of the gel tray is on the same side of the chamber as the electrical posts (e.g., the comb slots at the end of the tray will be closest to the black, or negative, electrode). The centering blocks are not required for positioning the gel tray, however, single gels run with the blocks in place run slightly faster than those run without them.



6. **Add buffer to the electrophoresis chamber.** Pour approximately 150 ml (single cell chamber) or 700 ml (dual cell chamber) of the 1X buffer used to make the gel into the electrophoresis chamber until the buffer level slightly covers the gel. Wells should be visible in the gel and completely submerged in the buffer solution. **Do not fill the chamber above the electrode posts.**

7. **Load your DNA samples into the wells.** Load volumes will depend on the comb used and the thickness of the gel. For a 5 mm thick gel, using a 1.5 mm 6-well comb the maximum load volume is 40 µl, and for the same gel using a 1.5 mm 8, 10, or 12-well comb the maximum loads are 30 µl, 25 µl, and 20 µl, respectively. Load the sample using the appropriate size micropipettor. Take care not to introduce air bubbles into the wells; air bubbles will float out of the wells, dragging some of the sample along with them.

8. **Put the lid on the electrophoresis chamber.** Gently slide the lid onto the electrophoresis chamber until the cover is firmly seated against the chamber body and the banana plug connectors are fully engaged.

   CAUTION: Remove any liquid on the outside surface of the electrophoresis chamber before turning on the power. DO NOT turn on the power supply until the cover is on the chamber. Turn the power supply off before removing the cover from the chamber. DO NOT touch the electrical connectors or move the chamber when the power supply is on. Failure to follow these safety procedures could result in electrical shock, burns, or other serious health risks.

9. **Plug the electrophoresis chamber into the power supply.** Plug the electrophoresis lead into the corresponding outlets on a power supply (red[+] to red [+], black [-] to black[-]).

10. **Turn the power supply on and adjust the voltage to the desired setting.** The gel(s) should be run at a constant voltage. The voltage setting will determine the speed of electrophoresis, and to some extent, the resolution. The table below illustrates the relationship between voltage and running time for resolving DNA fragments ranging from 1000 to 6000 base pairs in a 1% agarose gel with one comb located at the end of the gel:

Voltage	Estimated time of Electrophoresis
10V	20-24 hours
20V	12-16 hours
60V	2 hours
120V	50 minutes

Care must be taken not to run the gel at too high a voltage. High voltages may generate a significant amount of heat introducing "smiling" (a curving of bands) in the gel, and reduce the ability to correctly interpret results. It may be desirable to run several gels at several different settings to determine the best voltages to use.

11. **Stop electrophoresis.** After electrophoresis for the appropriate length of time, turn off the power supply and unplug the leads by grasping the plugs, not the cords. Remove the lid from the electrophoresis chamber and take out the gel tray (with gel).

CAUTION: The gel will slide easily on the tray after electrophoresis. Take care not to drop the gel out of the tray when removing and carrying it. If desired, the gates may be raised to help keep the gel on the tray.

12. Place the tray onto a paper towel on the bench top. If ethidium bromide has been included in the gel or buffer, your gel is now ready for visualization on an ultraviolet light tranilluminator (see "Staining Procedures", p. 11). If not, the gel must be placed in a tray large enough for staining.

Additional Information

Preparing an Agarose Gel

1. **Determine agarose concentration.** The concentration of agarose determines the size range of linear DNA fragments which can be separated and resolved. Generally, the concentrations most used are from 0.6 to 1.5% (weight/volume). The following chart gives the sizes of DNA best resolved for several different agarose concentrations.

% agarose (w/v)	Range of separation (sizes in bases)
0.6	1000 - 20,000
0.7	800 - 12,000
1.0	500 - 10,000
1.2	400 - 6,000
1.5	200 - 3,000

2. **Calculate gel volume.** To calculate the volume of molten agarose solution required to pour a gel, multiply the length (cm) x width (cm) x thickness (cm) of the desired gel. This will give the required volume in milliliters. For example, to determine the volume of agarose needed for a 5 mm (0.5 cm) thick mini gel, multiply as follows: 9.3 cm (length) x 7.1 cm (width) x 0.5 cm = 33.015 cm^3 = 33 ml

3. **Select buffer composition.** The electrophoresis buffer conducts the electric field to and through the gel, and helps maintain a balanced pH in the chamber. It is present in the gel and in the chamber at a 1X concentration. Formulas for two commonly used electrophoresis buffers, TBE and TAE, are shown on the following page.

10X TBE Buffer

108.00 g	Tris Base
0.74 g	EDTA, disodium salt (or 40 ml 0.5 M EDTA sol.)
55.00 g	Boric Acid

Add ingredients to 800 ml **distilled** water, and stir to dissolve. Adjust to a final volume of 1 liter by adding distilled water. Store at room temperature.

50X TAE Buffer

242.0 g	Tris Base
57.1 ml	Glacial Acetic Acids
100.0 ml	0.5 M EDTA, pH 8.0

Add ingredients to 500 ml **distilled** water, and stir to dissolve. Adjust to a final volume of 1 liter by adding distilled water. Store at room temperature.

1X TBE Buffer

100 ml	10X TBE Buffer
900 ml	distilled water

Mix thoroughly by stirring. Store at room temperature. *Note: TBE Buffer can be saved and reused several times.*

1X TAE Buffer

20 ml	50X TAE Buffer
980 ml	distilled water

Mix thoroughly by stirring. Store at room temperature.

4. **Dissolve the agarose.**

   a. To make a 4-5 mm thick, 0.8% agarose mini gel, dissolve 0.24 g agarose in 30 ml of 1X TBE or TAE buffer in a 50 ml flask, beaker or screw-capped tube. Stir well to suspend agarose.

   b. Cap flask or tube loosely and dissolve agarose by either:

      i. Heating in a microwave oven for 60-90 seconds. Watch carefully so that it does not boil over.

      OR

      ii. Heating in a boiling water bath (10-15 minutes) with occasional gentle swirling until the agarose is in solution.

      OR

      iii. Heating directly a top a hot plate or over a Bunsen burner to boiling. Do not allow to boil for more than one minute to minimize evaporation.

   Note: Check to make certain there are no lumps of undissolved agarose after heating. Lumps in the poured gel will interfere with the separation.

   c. After dissolving the agarose, allow it to cool to approximately 65°C (until it can be comfortably held) before casting the gel.

5. **Cast the gel**

   a. Slide the plastic gates on both ends of the gel tray into the "up" position and secure them in place by tightening the adjusting screws. Do not over-tighten the screws, because this may cause leakage. Once the tension on the gates has been properly adjusted, it is not usually necessary to loosen and retighten the screws with each use.

   b. With the gel tray sitting on a flat surface, place the 6- or 12-well comb in the slots located near the end of the tray.

   c. Slowly pour the melted agarose into the tray.

   d. Allow the agarose gel to stand undisturbed until it has solidified for at least 20 minutes. The gel will become opaque as it solidifies.

Staining Procedures

Ethidium Bromide

WARNING: Ethidium bromide is a known mutagenic substance and causes skin irritation. Avoid breathing and contact with eyes. Use vinyl/latex gloves when handling ethidium bromide and gels treated with this stain. All spent buffers and other materials containing ethidium bromide must be disposed of properly.

1. Depending on the size of the staining vessel, prepare a 0.5 µg/ml ethidium bromide solution by diluting a stock solution (1-10 mg/ml) with distilled (or deionized) water. For two gels, as much as 500 ml may be needed.
   To prepare 500 ml of a 0.5 µg/ml solution from a 10 mg/ml stock solution, add 25 µl of the stock solution to 500 ml of distilled water, and stir.

2. Put the gel (keep it in the gel tray) in a staining tray and add the ethidium bromide solution. Make certain that the gel is covered with the staining solution. Approximately 10 minutes is sufficient time to stain most DNA gels, but longer periods may be needed.

Additional Information (cont.)

3. Dispose of staining solution by proper methods or collect in a labelled container for reuse. Fill staining tray with distilled (or deionized) water so that the gel is completely covered. Allow the gel to destain for approximately 10 minutes. Destaining helps to remove background staining of the agarose gel and is not always necessary. The gel is now ready for visualization on an ultraviolet transilluminator.

Disposal of Ethidium Bromide

1. Pour the diluted ethidium bromide solution into an appropriately sized container.
2. For every 100 ml of ethidium bromide solution to be decontaminated, add 0.1 g of activated charcoal.
3. Set the charcoal/ethidium bromide slurry at room temperature for approximately 1 hour, stirring occasionally.
4. Place one sheet of filter paper in the funnel, and set the funnel over an empty container or over the sink.
5. Pour the charcoal/ethidium bromide slurry through the filter. The liquid filtrate is decontaminated, and can be washed down the sink.
6. Dispose of the filter paper containing the activated charcoal by placing it in a plastic bag and discarding it in a hazardous waster container for future incineration. Ethidium bromide decomposes at 262°C.
7. Decontaminate ethidium bromide spills with a slurry of 0.1 g activated charcoal in 100 ml water. Discard the cleaning materials in a hazardous waste container.

Methylene Blue

Methylene blue is used as a safe alternative to ethidium bromide for visualizing DNA in agarose gels. The DNA/stain complexes will appear as blue bands in the lighter blue background of the gel. Despite the greater time requirements and the 3 to 5-fold lower sensitivity associated with methylene blue staining, many teachers now prefer it to using ethidium bromide. It is much less toxic, easier and safer to handle, and reusable numerous times.

Additional Information (cont.)

1. **Prepare a 0.02% (w/v) methylene blue solution:** The volume needed will depend on the size of the staining tray. To prepare 500 ml of staining solution, dissolve 0.1 g of methylene blue powder in 500 ml of distilled (or deionized) water. The solution may be stored at room temperature.
2. **Place the gel in a staining tray.**
3. **Add the methylene blue solution:** Slowly add 0.02% methylene blue solution to the staining tray until the gel is covered.
4. **Stain the gel:** Stain for at least 20 minutes with occasional rocking of the tray. The staining time is flexible, from 20 minutes to overnight.
5. **Pour off stain:** Using a funnel, carefully drain the stain back into the methylene blue storage bottle. The solution is reusable for an indefinite number of stainings over a 3 to 6 month period.
6. **Destain the gel:** With the gel still in the staining tray, rinse it with tap water for several seconds and then fill the tray with tap water. Allow the gel to destain with occasional rocking for at least 20 minutes to remove excess stain from the gel. Then pour the water down the drain. If DNA bands are not visible try staining and destaining for a longer period of time.

Servicing and Maintenance Information

The Single and Dual Cell Electrophoresis Chambers have no user serviceable components. If the unit fails to operate as instructed, or if there are any questions regarding its correct usage, please contact FOTODYNE Incorporated for technical assistance at 1-800-362-3686.

For best results, keep your electrophoresis chamber clean. All acrylics are oil-based resins and are not resistant to organic solvents or alcohols. Ethanol should not be used to clean acrylic electrophoresis chambers and trays. Such treatment removes important oils from acrylic, Plexiglas®, and Lucite® and may damage the gel system. Continued ethanol abuse results in "crazing" in which fine cracks develop in the acrylic over time. We suggest that acrylic electrophoresis chambers and trays be cleaned with non-organic, non-alcohol cleaners. In most cases, mild detergents and water (followed by a thorough distilled water rinse) should adequately clean your system. If you have any questions or problems, please feel free to contact FOTODYNE Incorporated for technical assistance.

Related Equipment

Product	Cat. No.
FOTO/Force® 250 Power Supply	(E)7-4297
FOTO/Force® 150 Power Supply	(E)7-4265
FOTO/Force® 120 Power Supply	(E)7-4296
FOTO/Phoresis® White Light Transilluminator	(E)1-1700
FOTO/Phoresis® UV Transilluminator	(E)1-1430
FCR-10 Camera	(E)5-5330
FOTO/Phoresis® Photographic Hood	(E)1-1440
Threaded Glass Filter, Ethidium Bromide	(E)3-4309
Threaded Glass Filter, Methylene Blue	(E)3-4308
Ethidium Bromide Filter Kit	(E)3-4205
Coomassie/Methylene Blue Filter Kit	(E)3-4224
Polaroid Type 667 Film	(E)4-4667
MiniVisionary™ Benchtop Documentation System	(E)6-2310

Ordering Information/Technical Assistance

ORDERING INFORMATION

Call or Fax Toll-Free:

Educational Products Division
Technical Service: 414-369-7000
Phone Orders: 1-800-362-4657
Fax Orders: 1-800-362-3642

Research Products Division
Technical Service: 414-369-7000
Phone Orders: 1-800-DNA-FOTO
1-800-362-3686
Fax Orders: 1-800-362-3642

Mail to:

FOTODYNE INCORPORATED
950 Walnut Ridge Drive
Hartland, WI 53029-9388
USA

TECHNICAL ASSISTANCE

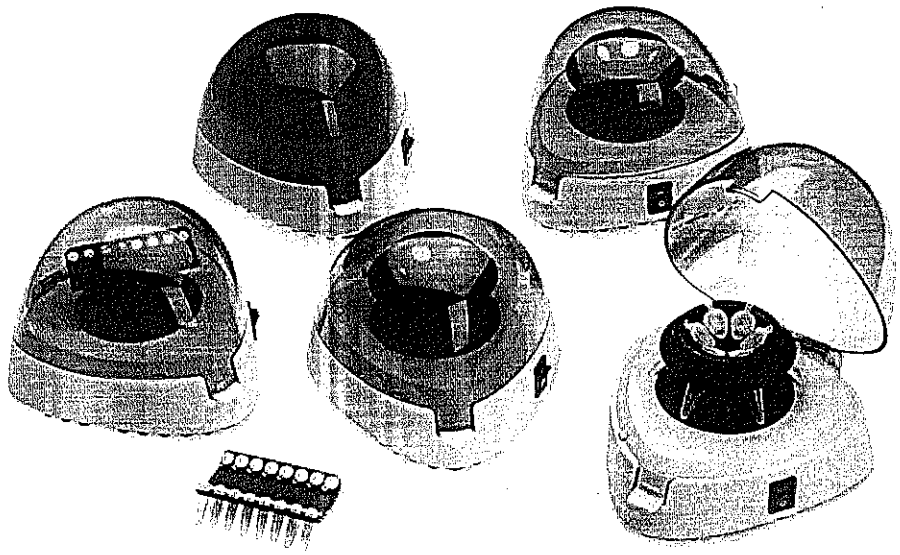
Technical questions regarding the operation and safe use of this instrument should be directed to FOTODYNE Incorporated. Call 1-414-369-7000.

3/96

Labnet

Labnet International, Inc.

Spectrafuge Mini Centrifuge
User Manual



C1301
C1301-230V

CE

LIT M00402

Labnet

Labnet International, Inc.

July 2012 Rev 2

General Information:

The Spectrafuge Mini Centrifuge is supplied with two rotors, one for microtubes and one for 0.2ml PCR strip tubes. The 6 x 1.5ml rotor is designed to centrifuge up to six individual 1.5ml plastic microcentrifuge tubes. It will also accept 0.5ml and 0.4ml tubes with the adapters supplied with the unit. Adapters are available separately for 0.2ml tubes. The strip tube rotor is designed to centrifuge two 8 x 0.2ml strip tubes. It will also accept up to 16 individual 0.2ml tubes. Both rotors are designed for applications requiring relatively low g-forces, such as microfiltration, cell separation and quick spin downs from the walls of tubes. Please read this manual thoroughly before attempting to operate the centrifuge.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Warranty:

The centrifuge and rotor are covered by a one year warranty. This warranty covers the centrifuge and rotor. This warranty is void in the event of incorrect operation, use of nonstandard spare parts or accessories and unauthorized modification of the rotor or centrifuge. The rotor warranty does not cover normal wear and tear or damage and/or weakening caused by radioactive contamination, cleaning agents, or over tightening of the allen screw. Fuses are not covered by the warranty.

Exchanging Rotors:

The centrifuge is supplied with two interchangeable rotors. The rotors are easily exchanged using the allen wrench provided. Locate the set screw on the rotor shaft below the rotor head. Using the wrench, loosen the set screw and pull up on the rotor to remove. Place the other rotor into position on the motor shaft. Take care not to press the rotor down so far as to compress the rubber collar at the base of the shaft. Tighten the screw using the allen wrench until finger tight. Do not over tighten as this will cause damage to the rotor and the motor shaft.

Installation:

Place the centrifuge on a level, clean surface, position the centrifuge near an accessible power outlet so that the cord and outlet are within easy reach of the operator.

Operation:

Before operating the centrifuge, be sure that the power switch is in the "on" position. To begin a run, simply close the lid of the centrifuge. No other controls are required. To stop rotation, press down on the lid release tab on the front of the unit. This will release the lid lock and the rotor will slow gradually to a complete stop. Caution: Do not attempt to open the lid or remove samples until the unit has come to a complete stop. After the rotor has stopped, the lid may be opened by grabbing it with the thumb on the front and fingers on the back then lifting the lid back on the hinge. Safe operation of the centrifuge requires that the rotor be loaded in a balanced fashion. Failure to load the rotor properly presents a hazardous condition and may damage the centrifuge. Individual tubes, strip tubes and/or adapters must always be loaded symmetrically to ensure proper balance. Never run the centrifuge with only one strip tube in place.

LIMITED WARRANTY

Labnet International, Inc. warrants that this product will be free from defects in material and workmanship for a period of one (1) year from date of purchase. This warranty is valid only if the product is used for its intended purpose and within the guidelines specified in the supplied instruction manual.

Should this product require service, contact Labnet International, Inc.'s Service department at 732-417-0700 to receive a return authorization number and shipping instructions. Products received without proper authorization will be returned. All items returned for service should be sent postage prepaid in the original packaging or other suitable carton, padded to avoid damage. Labnet International, Inc. will not be responsible for damage incurred by improper packaging. Labnet International, Inc. may elect for onsite service for larger equipment.

This warranty does not cover damage caused by accident, neglect, misuse, improper service, natural forces or other causes not arising from defects in original material or workmanship. This warranty does not cover motor brushes, fuses, light bulbs, batteries or damage to paint or finish. Claims for transit damage should be filed with the transportation carrier.

ALL WARRANTIES INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE LIMITED IN DURATION OF 12 MONTHS FROM THE ORIGINAL DATE OF PURCHASE.

LABNET INTERNATIONAL, INC.'S SOLE OBLIGATION UNDER THIS WARRANTY IS LIMITED TO THE REPAIR OR REPLACEMENT, AT LABNET INTERNATIONAL, INC. DISCRETION, OF A DEFECTIVE PRODUCT. LABNET INTERNATIONAL, INC. IS NOT LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGE, COMMERCIAL LOSS OR ANY OTHER DAMAGES RESULTING FROM THE USE OF THIS PRODUCT.

Some states do not allow limitation on the length of implied warranties or the exclusion or limitation of incidental or consequential damages. This warranty gives you specific legal rights. You may have other rights which vary from state to state.

No individual may accept for, or on behalf of Labnet International, Inc., any other obligation of liability, or extend the period of this warranty.

Mail Warranty Registration to :

Labnet International, Inc.
31 Mayfield Ave.
Edison, NJ 08837

or

Register online at

www.labnetinternational.com

✂ cut along the dotted line

To validate the warranty, complete and return this card within 10 days.

Model _____

Serial No. _____ Date Tested _____

Date Rec'd _____ PO# _____

Name/Title _____

Phone _____

Institution _____

Address _____

City _____ State _____ Zip/Postal Code _____ Country _____

Purchased from (distributor) _____

How would you rate the quality of this product? ☐ Excellent ☐ Good ☐ Fair ☐ Poor

What feature(s) on this product made you purchase it? _____

What feature(s) would you change to improve the performance of this product? _____

Labnet
Labnet International, Inc.
31 Mayfield Avenue. Edison.NJ.08837
(p) 732.417.0700 (f) 732.417.1750)

Declaration of Conformity

Number: CE 00401

Labnet International, Inc,., 31 Mayfield Ave., Edison, NJ 08837 USA

Labnet International declares that the devices described below are in conformity with the EC directives listed. In the event of unauthorized modification of any of the devices listed below, this declaration becomes invalid.

Device Name: Spectrafuge Mini Centrifuge

Device Models Numbers: C1301
C1301-230V

Relevant EC Directives: Low Voltage Directive 2006/95/EC
EMC Directive 2004/108/EC
RoHS 2011-65-EU
WEEE 2002/96/EC

Harmonized Standards: EN 61010 Issued: 2001
EN 61010-2-020: 2006
EN 61326-1: 2006

Date: May 1, 2012

Peter Will
Product Line Manager

Labnet
Labnet International, Inc.

Safety Precautions:

NEVER use the centrifuge in any manner not specified in these instructions.

NEVER put hands in the rotor area unless the rotor is completely stopped.

NEVER move the centrifuge while the rotor is spinning.

NEVER use solvents or flammables near this or other electrical equipment.

NEVER centrifuge flammable, explosive or corrosive materials

NEVER centrifuge hazardous materials outside of a hood or proper containment facility

NEVER continue to operate a centrifuge that is vibrating excessively.

ALWAYS load the rotor symmetrically. Each plate should be counterbalanced by another plate of the same brand, type and volume.

ALWAYS use plates that have been sealed in some manner to avoid spillage.

ALWAYS load plates so that the sealed side faces the center of the rotor and the bottom of the plate faces out.

ALWAYS be sure the plates are pushed all the way to the bottom of the rotor slot before operating the centrifuge.

ALWAYS locate the centrifuge within easy access to an electrical outlet.

Cleaning:

Before using any cleaning or decontamination methods except those recommended by the manufacturer, check with the manufacturer that the proposed method will not damage the equipment. To clean the centrifuge, use a damp cloth and a mild, noncorrosive detergent (ph <8). After cleaning, ensure all parts are dried thoroughly before attempting to operate the unit. Do not immerse the centrifuge in liquid or pour liquids over it.

Questions and Service:

Should you have a question about the centrifuge or require service for the unit, please use the contact numbers listed below. Do not send in a unit for service without first calling to obtain a repair authorization number and a decontamination form. Should the centrifuge require service, be sure to decontaminate it and enclose the decontamination form. The unit should be properly packed to avoid damage. Any damage resulting from improper packaging shall be the responsibility of the user.

Specifications:

Dimensions... ..... 6" x 6" (153 x 153mm)

Electrical 115V, 50/60Hz,130mA

Fuse ..... 0.5A, 250V (F)

Speed 6000rpm

RCF ..... 2000 x g Ambient Operating Range: 0 to 40°C,< 85%

Spare Parts:

Replacement 1.5ml rotor: C-1300-RT

Replacement strip rotor: C-1300-RTS

Replacement allen key: C-1300-RW

Replacement fuses: C-1200-F

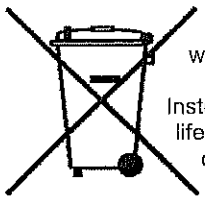
Appendix

Symbols and Conventions

The following chart is an illustrated glossary of the symbols that may be used in this manual or on the product.

	The electrical warning indicates the presence of a potential hazard which could result in electrical shock.
	**CAUTION** This symbol refers you to important operating and maintenance (servicing) instructions within the product Instruction Manual. Failure to heed this information may present a risk of damage or injury to persons or equipment.
	This symbol identifies a Protective Earth (PE) terminal, which is provided for connection of the supply system's protective earth (green or green/yellow) conductor.

EQUIPMENT DISPOSAL



This equipment is marked with the crossed out wheeled bin symbol to indicate that this equipment must not be disposed of with unsorted waste.

Instead it's your responsibility to correctly dispose of your equipment at lifecycle-end by handing it over to an authorized facility for separate collection and recycling. It's also you responsibility to decontaminate the equipment in case of biological, chemical and/or radiological contamination, so as to protect from health hazards the persons involved in the disposal and recycling of the equipment.

For more information about where you can drop off your waste equipment, please contact your local dealer from whom you originally purchased this equipment.

By doing so, you will help to conserve natural and environmental resources and you will ensure that your equipment is recycled in a manner that protects human health.

Thank you

Labnet
Labnet International, Inc.

Labnet International, Inc,.
31 Mayfield Ave., Edison, NJ 08837
(P) +732-417-0700 (F) +732-417-1750
Email: labnetinfo@corning.com
www.labnetinternational.com

NOTES

PLEASE RETURN

Operating Instructions

Bio-Rad Laboratories Model 16K Microcentrifuge 166-0602 and 166-0612

Bio-Rad Laboratories
2000 Alfred Nobel Drive
Hercules, CA 94547
1-800-4BIORAD

BIO-RAD

BRUCE WALLACE

Safety Precautions

NEVER use the centrifuge in any manner not specified in these instructions.
NEVER operate the centrifuge without a rotor properly attached to the shaft.
NEVER fill tubes while they are in the rotor. Liquid spillage may harm unit.
NEVER put hands in the rotor area unless the rotor is completely stopped.
NEVER move the centrifuge while the rotor is spinning.
NEVER use solvents or flammables near this or other electrical equipment.
NEVER centrifuge flammable, explosive or corrosive materials
NEVER centrifuge hazardous materials outside of a hood or proper containment facility
ALWAYS load the rotor symmetrically. Each tube should be counterbalanced by another tube of the same type and weight
ALWAYS locate the centrifuge within easy access to an electrical outlet.
ALWAYS use only microcentrifuge tubes made from plastic and designed to withstand centrifugal forces of at least 16,000 xg.

Table of Contents

1. General Information

This manual provides important safety information for the Model 16K laboratory microcentrifuge. It should be kept near the centrifuge for quick and easy reference.

1.1 Description

The Model 16K is a small benchtop centrifuge designed for separation of various research samples. The motor is brushless and requires no routine maintenance. The Model 16K is supplied with an 18 x 1.5ml rotor for micro samples. Adapters are available for tubes smaller than 1.5ml. The Model 16K reaches speeds of up to 14,000rpm/16,000 x g.

1.2 Safety precautions

Note: All users of the centrifuge must read the Safety Precautions section of this manual before attempting to operate the unit!

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not operate the centrifuge if any of the following conditions exist:

-The centrifuge has not been installed properly
-The centrifuge is partially dismantled
-Service has been attempted by unauthorized or unqualified personnel
-The rotor has not been installed securely on the motor shaft
-Rotors and accessories not belonging to the standard range are being used without permission being obtained from the manufacturer to use such rotors and/or accessories in the centrifuge
Exception: Microcentrifuge tubes made of plastic, normally available in the laboratory.
-The centrifuge is located in an explosive atmosphere
-Materials to be centrifuged are combustible and/or explosive
-Materials to be centrifuged are chemically reactive
-The rotor load is not properly balanced

1.3 Technical data

Dimensions	
Width	8.25 inches (21 cm)
Depth	8.9 inches (22.6 cm)
Height	7.6 inches (19.3 cm)
Maximum speed	14,000rpm
Maximum RCF	16,000 x g
Maximum volume	18 x 1.5/2.0ml
Admiss. density	1.2kg/dm^3
Electrical/fuse rating	120V~, 50-60Hz, 1.0A/2.5AT 230V~, 50-60Hz, 0.6A/1.25AT

1.4 Accessories supplied with centrifuge

Each unit is supplied with 1 instruction manual, 1 warranty card, 1 power cord and a rotor screw wrench.

1.5 Warranty

This centrifuge has been subject to thorough testing and quality control. In the unlikely event of a manufacturing fault, our one year warranty (from the date of delivery) covers the centrifuge and the rotor. This warranty becomes invalid in the case of incorrect operation, use of nonstandard spare parts or accessories and unauthorized modification of the rotor or centrifuge.

2. Installation

2.1 Unpacking the centrifuge

Before unpacking the centrifuge, inspect the outside of the carton for any shipping damage.

The centrifuge is delivered in a carton with protective cushions. Remove the centrifuge from the carton. Retain the carton and cushions until it has been established that the centrifuge is working properly.

Inspect the centrifuge for any visible signs of shipping damage. Shipping damage is the responsibility of the transportation carrier. Any claims for damage must be filed within 48 hours.

The accessories supplied with the centrifuge should be kept with the instruction manual near the centrifuge's place of installation.

2.2 Required space

The centrifuge should be installed on a rigid, even surface such as a stable laboratory bench, cabinet, etc. To guarantee sufficient ventilation, ensure that the centrifuge has at least 15cm (6 inches) of free space on all sides, including the rear.

The centrifuge should not be located in areas subject to excessive heat such as in direct sunlight or near radiators or the exhaust of a compressor, as a buildup of heat may occur within the chamber.

2.3 Installation

Make certain that the timer is set to the off position. Before operating the centrifuge, check that the power source corresponds to that on the manufacturer's rating label, then connect the power cord to the centrifuge and the power source.

ATTENTION: The timer must be in the OFF position before connecting the power cord. Failing to place the timer in the off position may result in damage to the centrifuge and injury to personnel.

3. Installation of rotor and rotor maintenance

3.1 Rotors and accessories

The following accessories are available for the Model 16K:

Angle rotor for 18 x 1.5ml tubes (Included with unit)

Tube measurement	1.5ml (10 x 40mm)
Max. speed/rcf	14,000rpm/16,000 x g
Centrifuging radius	7.3cm

Adapter for 0.5ml tubes

Order no.	C-1205
Tube measurement	8 x 30mm
Max. speed/RCF	14,000rpm/14,462 x g
Centrifuging radius	6.6cm

Adapter for 0.4ml tubes

Order no.	C-1206
Tube measurement	6 x 47mm
Max. speed/RCF	14,000rpm/16,000 x g
Centrifuging radius	7.3cm

Adapter for 0.2ml tubes

Order no.	C-1222
Tube measurement	6 x 21mm
Max. speed	14,000rpm
Centrifuging radius	6.1cm
RCF (g-value)	13,366 x g

3.2 Rotor maintenance

The rotor should be cleaned thoroughly after each use. **Thorough cleaning must be performed when spinning samples containing phenol or phenol chloroform.** Periodically inspect the rotor for dents, dings, scratches, discoloration and cracks. If any damage to the rotor is found, discontinue use of the rotor immediately and replace.

3.3 Mounting and securing the angle rotor

Remove the rotor screw from the motor shaft by turning the screw counterclockwise. Clean the motor shaft and the rotor mounting hole (see figures 1&2). Place the rotor on the motor shaft ensuring that the cross-pin (figure 1) aligns correctly with the rotor slot (see figure 2). Figures 1 and 2 next page.

Reinstall the rotor screw on the motor shaft by turning it clockwise. Hold the rotor with one hand and hand-tighten the rotor screw. Then use the supplied 1/4 inch wrench to tighten the screw an additional quarter turn.

When loading the rotor, refer to figure 3 (located on page 5). Loading in the pattern indicated will ensure a balanced load. Tubes to be loaded should be filled equally by eye. The difference in the weight between the tubes should not exceed 0.1 gram. A partially loaded rotor may be centrifuged if the loading scheme for balancing a rotor given in figure 3 is followed.

Caution: Be sure to tighten the rotor screw with a wrench before operation.

3.4 Removing the rotor

Using an adjustable wrench or the 1/4 inch wrench supplied to loosen the screw and remove the rotor retaining screw/washer assembly by turning it counterclockwise. Lift the rotor directly upward in a straight vertical motion.

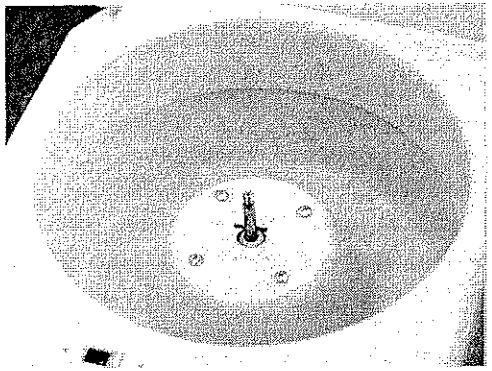


Figure 1. Chamber and motor shaft

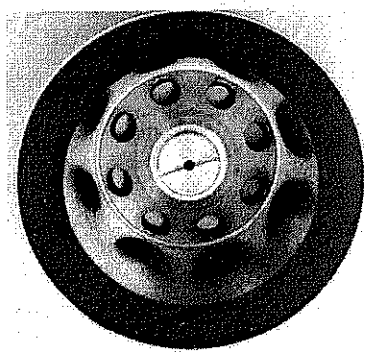


Figure 2. Bottom of angle rotor

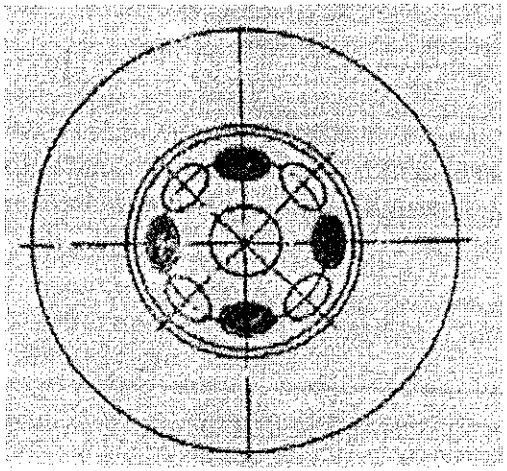


Figure 3. Loading the rotor

3.5 Overloading rotors

The maximum load of the rotor and the maximum speed have been established by the manufacturer. Do not attempt to exceed these values. The maximum speed of the rotor has been measured for liquids having a homogeneous density of 1.2g/ml or less. In order to centrifuge liquids with a higher density it is necessary to reduce the speed. **Failure to reduce the speed may result in damage to the rotor and centrifuge.** The revised maximum speed can be calculated with the following formula:

$$\text{Reduced speed } (n_{red}) = \sqrt{\frac{1.2}{\text{higher density value}}} \times \text{max speed } (n_{max})$$

Example:

Where the density of the liquid is 1.7, the new maximum speed would be calculated as follows:

$$n_{red} = \sqrt{\frac{1.2}{1.7}} \times 14{,}000 = 9{,}882 \text{ rpm}$$

If in doubt concerning maximum speeds, please contact the manufacturer for assistance.

4. Operation

ATTENTION: Never attempt to operate the centrifuge with rotors or adapters that show signs of corrosion or mechanical damage. Never centrifuge strongly corrosive materials that may damage the rotors or accessories.

4.1 Closing the lid

After the rotor has been properly secured and loaded, close the centrifuge lid, making sure that the interlock has been engaged.

4.2 Lid release

Once the run has been completed and the rotor come to a stop, the lid will open automatically. If the lid does not open automatically, press the lid button. Note that the lid button will not operate while the rotor is spinning.

WARNING: Do not attempt to open the lid of any centrifuge until the rotor has come to a complete stop.

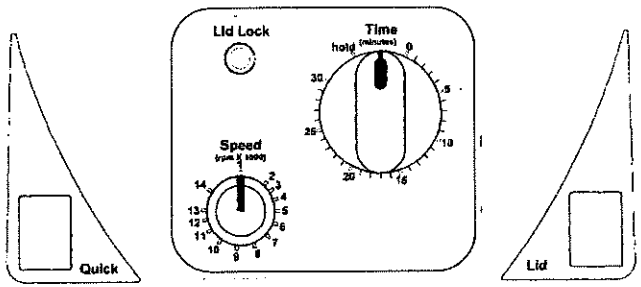


Figure 4. Control panel layout

In the event of a power failure or malfunction, it may be necessary to open the lid manually.

1. Disconnect the power cord from the wall socket.
2. Remove the plastic plug, located on the left side of the unit, below the quick button.
3. Pull the cord (attached to the plug) to open the lid lock manually.

4.3 Lid lock

The centrifuge can be started only with the lid securely closed. When the rotor begins to accelerate, the lid lock indicator light turns on and the lid button becomes inoperable. Do not attempt to open the lid until the lid lock indicator turns off. At the end of the run, the lid will automatically open.

4.4 Speed selection

The speed (rpm) can be selected to 14,000rpm with the knob labeled "speed". The scale is directly proportional to the speed - a setting of 9 corresponds to 9,000rpm, a setting of 13 corresponds to a speed of 13,000rpm, etc.

4.5 Selection of operating time and momentary operation

Operation of the centrifuge begins when the timer knob is turned clockwise to set a run time. For run times less than 5 minutes, turn the knob clockwise past the halfway point and then counterclockwise to the desired time. For run times longer than 5 minutes, turn the knob clockwise to the desired time.

When the preselected time expires, the centrifuge will stop automatically. To stop the centrifuge prior to the expiration of set

time, turn the timer knob to the zero position.

The centrifuge may be operated manually by pressing and holding the quick button. The centrifuge will continue to run as long as the button is depressed.

Some models are equipped with a timer that includes a hold position. Continuous operation of these models may be achieved by turning the timer knob firmly to the left. The centrifuge will continue to operate until the knob is turned to the zero position.

Note: The timer knob may be turned in either direction during operation of the centrifuge without damage to the timer mechanism.

5. Service and Maintenance

5.1 Centrifuge service

The brushless motor in the Model 16K requires no routine maintenance. Any required service should be performed by authorized, qualified personnel only. Repairs performed by unauthorized personnel may void the warranty.

5.2 Cleaning the centrifuge

Always keep the centrifuge housing, rotor chamber, rotor and rotor accessories clean. All parts should be wiped down periodically with a soft cloth. For more thorough cleaning, use a neutral cleaning agent (pH between 6 and 8) applied with a soft cloth. Excessive amounts of liquid should be avoided. Liquid should not come into contact with the motor. After cleaning, ensure that all parts are dried thoroughly by hand or in a warm air cabinet (maximum temperature 50°C)

5.3 Cleaning the rotor

The rotor should be cleaned after each use. When spinning samples containing phenol or phenol chloroform, the rotor should be cleaned immediately after use.

5.4 Disinfection

Should a spill of infectious materials occur within the rotor or chamber, the unit should be disinfected. This should be performed by qualified personnel with proper protective equipment.

5.5 Replacing fuses

Check the fuse when it is recommended in the Troubleshooting Guide located in this manual. The fuse holder is located in the power inlet on the rear of the unit. Disconnect the power cord from the power inlet. Open the fuse holder drawer by inserting a small screwdriver under the tab and prying it open. Remove the innermost (operative) fuse from its retaining tabs and replace the fuse if necessary. A spare fuse is located in the outermost chamber of the fuse drawer. Replace only with a fuse of exactly the same value as the original. (Fuse type may be found in the Technical data section of this manual.)

6. Troubleshooting Guide

Please refer to this guide before calling for service.

Centrifuge will not start

Possible reason:	No power supply
Solution:	Check that power is being supplied to the outlet Check that the power cord is plugged into both the wall outlet and the back of the centrifuge Check that power cord is not damaged
Possible reason:	Blown fuse
Solution:	Check fuse and replace if necessary

Lid lock will not release

Possible reason:	Defective lid lock
Solution:	Open manually and have unit serviced
Possible reason:	No power from PC board
Solution:	Call for service
Possible reason:	Lid lock is jammed
Solution:	Call for service
Possible reason:	Centrifuge is not receiving power
Solution:	See "Centrifuge will not start"

Centrifuge cannot be started, although power is on

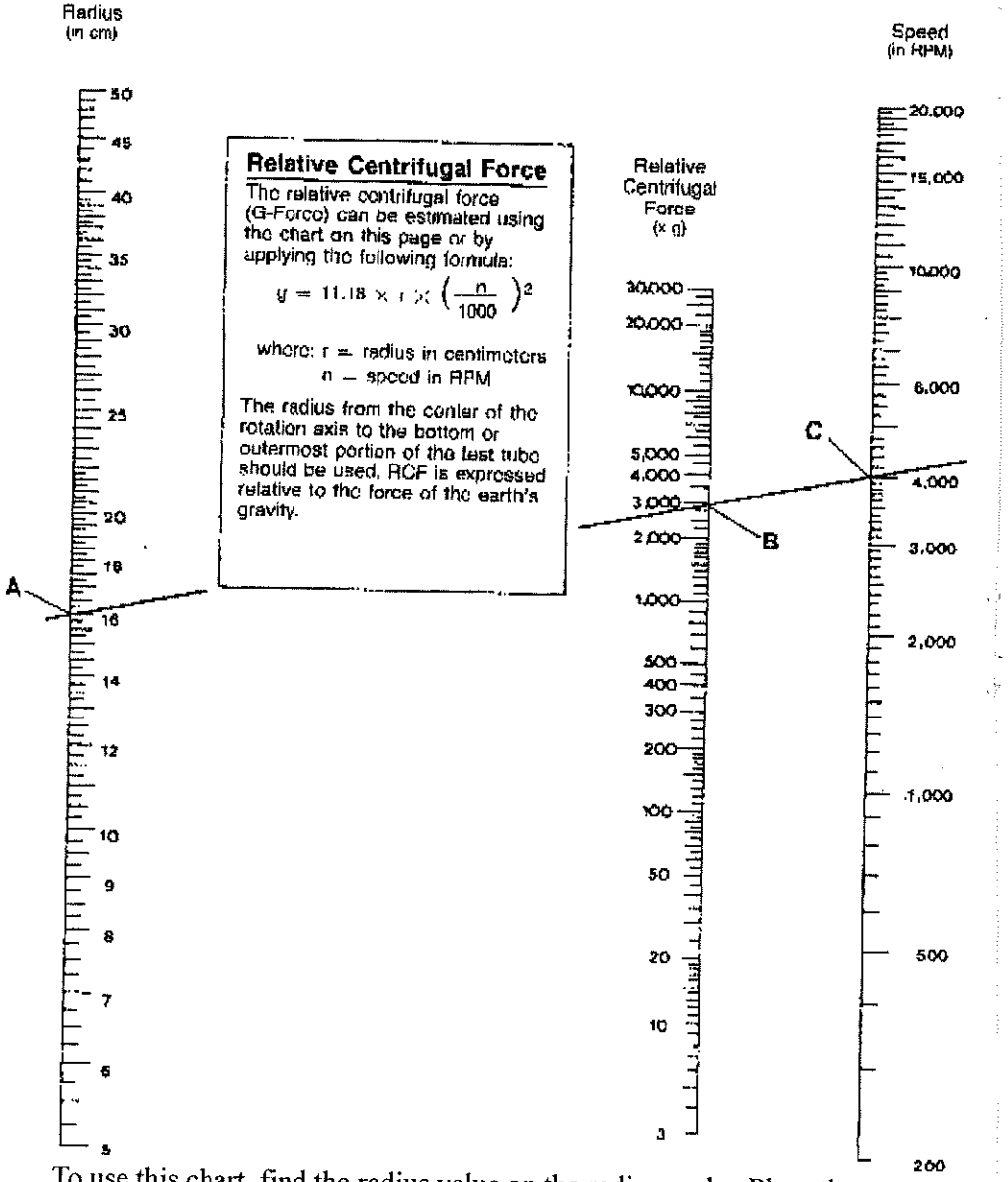
Possible reason:	Lid not closed correctly
Solution	Close lid correctly

Possible reason:	No speed or time has been selected
Solution:	Set speed and/or time

7. Determination of g-values

The centrifuging radius of the 1.5ml rotor is 7.3cm. See Section 3.1 for the correct radius when using adapters and smaller tubes. The chart on the next page can be used to determine g-values.

RELATIVE CENTRIFUGAL FORCE



To use this chart, find the radius value on the radius scale. Place the edge of a ruler on the value. Place the right side edge of the ruler on the speed scale at the desired speed. The estimated RCF can then be read from the RCF scale where the ruler edge passes through it. This chart can also be used to determine the proper speed for the desired RCF value.

Notes

INSTRUCTION MANUAL

FOTO/Phoresis® UV Transilluminator

Cat. No. (E)1-1430 (120VAC, 60Hz)
Cat. No. (E)1-1432 (220VAC, 50Hz)
Cat. No. (E)1-1434 (240VAC, 50Hz)

CAUTION
Read and understand this manual before using this product.

950 Walnut Ridge Drive • Hartland, WI 53029-9388 • USA

Research Products Division
Technical Service: 262-369-7000
Phone Orders: 1-800-DNA-FOTO
(1-800-362-3686)
Fax Orders: 1-800-362-3642

Educational Products Division
Technical Service: 262-369-7000
Phone Orders: 1-800-362-4657
Fax Orders: 1-800-362-3642

Instruction Manual for the FOTO/Phoresis® UV Transilluminator

Cat. No. (E)1-1430 (120VAC, 60Hz)
Cat. No. (E)1-1432 (220VAC, 50Hz)
Cat. No. (E)1-1434 (240VAC, 50Hz)

Table of Contents

Part # 78-1502 Rev. A

Introduction

The FOTO/Phoresis® UV Transilluminator is equipped with two 9-watt, mid-range ultraviolet light bulbs. The peak emission of these bulbs is close to 300 nm, the optimum wavelength for viewing and photographing DNA stained with ethidium bromide. Nearly 85% of the 300 nm light is transmitted by the dark purple filter glass. A patented UV-blocking safety interlocking cover makes it possible to safely view a gel without the use of UV-blocking eyeglasses. When the cover is lifted the UV lamps turn off.

The FOTO/Phoresis® UV Transilluminator is ideally suited for use with the hand-held FOTODYNE FCR-10 Camera and the FOTO/Phoresis® Photographic Hood or the MiniVisionary™ Benchtop Electronic Documentation System. The FOTO/Phoresis® Hood and the 5-5334 hood for the MiniVisionary™ fit securely around the UV filter glass frame and are equipped with the same safety interlock as the UV-blocking cover. A red indicator light on the front of the transilluminator lets the operator know when the UV bulbs are on when either hood is in place. The 7.6 x 9.8 cm image size for the FOTO/Phoresis® Hood will accommodate most mini-gels and has the advantage of allowing 1:1 reproduction of images; that is, the size of the photographic print is exactly the same as the subject being photographed.

The FOTO/Phoresis® UV Transilluminator can also be used for UV mutagenesis experiments. The UV filter glass frame has been designed to accommodate 100 mm Petri dishes.

Specifications

Features

- Two, 9 watt 300 nm peak emission bulbs
- 8.6 x 10.8 cm viewing surface

Dimensions

- 19.9 cm Wide x 28 cm Long x 11 cm High
- Shipping weight: approximately 3.63 kg (8 lbs)

Operating Temperature

- Operating temperature range: 0° C to 40° C

Power Requirements

- 120 V AC, 60 Hz, 1.1 Amp;
  1.6 Amp, 250V, 5 x 20 mm time delay fuse
- 220 V AC, 50 Hz, 0.5 Amp;
  0.8 Amp, 250V, 5 x 20 mm time delay fuse
- 240 V AC, 50 Hz, 0.5 Amp;
  0.8 Amp, 250V, 5 x 20 mm time delay fuse

Safety Information

- *ULTRAVIOLET (UV) RADIATION CAN CAUSE SEVERE EYE AND SKIN DAMAGE!*

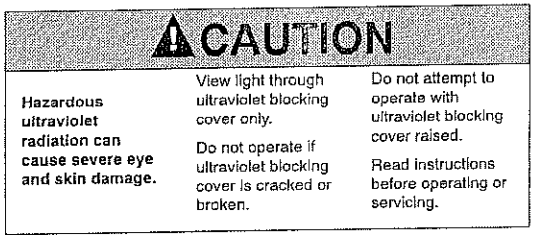
- *FOR MAXIMUM PROTECTION FROM SKIN DAMAGE, WEAR A UV BLOCKING FACE SHIELD AND PROTECTIVE CLOTHING IN ADDITION TO UV BLOCKING EYEGLASSES.*

WARNING: Ultraviolet radiation can be harmful to both the eyes and skin. It is important that care be taken when using any ultraviolet light source. Always wear protective eye covering when using midrange or shortwave radiation. Never look into an ultraviolet light source with unprotected eyes. To be on the safe side, always avoid excessive exposure to ultraviolet radiation and wear proper protective equipment for eyes, face, neck and clothing for exposed skin (face, hands, arms, etc.). Also, avoid reflected ultraviolet light.

Safety Label and Placement

Hazardous ultraviolet radiation safety label:

Located on the top of the transilluminator, centered along the front edge of the UV blocking cover.



Unpacking Instructions

Check-out Procedure

1. Unpack and examine the FOTO/Phoresis® UV Transilluminator carefully. Immediately report any damage to the transporting carrier and to FOTODYNE Incorporated. Be sure to save all cartons and packing material for claim purposes if damage is found.

2. Before getting started, check for the parts against the list below. Identify the following components:

   a. Transilluminator
   b. Power Cord
   c. Instruction Manual
   d. Warranty Card

Operating Instructions

Set-up

1. Place the FOTO/Phoresis® UV Transilluminator on a level surface in proximity to a properly grounded three-conductor outlet. Leave several inches of space in the rear to prevent blockage of the vents on the back of the unit.

2. Plug the power cord into the back of the unit. With the power switch on the front of the unit in the OFF position, plug the other end of the power cord into a properly grounded three-conductor outlet. **Please note: This is a three-wire ground style cord and should not be used with a conversion plug inserted into a two-wire receptacle.**

   Note: For the 220 V or 240 V, 50 Hz models, the power cord will arrive with one end open. You will need to attach the appropriate plug for your specific receptacle.

Operating Instructions (cont.)

CAUTION: Ethidium bromide is a known mutagen and a possible carcinogen. Use vinyl or latex gloves when handling gels treated with this stain. All spent buffers and other materials containing ethidium bromide should be disposed of properly.

Operation

1. **Position the sample:** Open the UV blocking cover. Place a stained mini-gel on the purple filter glass surface inside the black plastic frame and close the UV blocking cover.

   CAUTION: Do not use the FOTO/Phoresis® UV transilluminator if the UV blocking cover is cracked or broken. Contact FOTODYNE for replacement or repairs.

2. **Turn on the power:** With the UV blocking cover down, depress the top half of the power switch to turn the transilluminator on. The UV lamps should light up within a few seconds, and the red interlock indicator light will illuminate. All UV lamps and the interlock indicator light will shut off when the UV blocking cover is raised.

   CAUTION: If the UV lamps do not shut off when the cover is raised, do not attempt to use the transilluminator. To prevent the possibility of serious eye and skin damage, contact FOTODYNE to make arrangements for a replacement or repair.

3. **View the sample:** The UV blocking cover makes it possible to view a fluorescent gel without wearing UV blocking eyeglasses. In most cases, the stained DNA bands can be observed with the room lights on. However, it may be necessary to turn the room lights off to see faint bands.

   CAUTION: When you are ready to look at your gel, view it only through the UV blocking cover. Do not attempt to operate the transilluminator with the UV blocking cover raised. Any attempt to override the safety interlock and view the gel directly could result in serious eye and skin damage, and would invalidate the warranty on this instrument.

4. **Photograph gel if desired:** See page 6 (Additional Information) for instructions on photographing ethidium bromide stained mini-gels.

Operating Instructions (cont.)

5. **Turn off power**: When done viewing, the FOTO/Phoresis® UV Transilluminator should be switched off to ensure the maximum life of the bulbs.

Clean-up

1. **Remove subject from the transilluminator:** Remove gel by lifting or sliding it, and wipe the purple filter glass surface with a soft, non-abrasive cloth or tissue.

2. **Rinse the plastic surface:** Rinse the purple filter glass surface with distilled water and wipe dry with a soft, non-abrasive cloth or tissue.

Additional Information

Photography with the FCR-10 Camera

The FOTO/Phoresis® UV Transilluminator was originally designed for use with the FOTODYNE FCR-10 Camera (Catalog Number 5-5330) and the FOTO/Phoresis® Photographic Hood (Catalog Number 1-1440). The recommendations that follow are for photodocumentation of ethidium bromide stained mini-gels using Polaroid Type 667 Black and White Film (Catalog Number 4-4667).

1. **Check the camera:** The FOTODYNE FCR-10 camera should be loaded with Polaroid Type 667 film. The film pack (10 shots) is placed into the camera back with the black paper side down and the black tab extending out of the camera back. Next, close and latch the camera back and pull the black tab straight out. A white, numbered tab should appear.

2. **Install the Ethidium Bromide Threaded Glass Filter:** If an Ethidium Bromide Threaded Glass Filter (Catalog Number 3-4309) is to be used, screw it on the camera lens before attaching the photographic hood.

3. **Attach photographic hood:** Attach the FCR-10 Camera to the photographic hood by matching the two grommet and plunger assemblies. These assemblies are located on top of the hood on either side of the mounted lens (diopter). Press the plungers inside the hood until they click into place on the camera.

Additional Information (cont.)

4. **Set the aperture and shutter speed:** Set the aperture (f-stop) on the shutter at f/5.6. Set the shutter speed at 2 (1/2 second). This is a good starting exposure point for ethidium bromide stained DNA gels using Polaroid Type 667 film. If the photograph is too light, change the f-stop aperture to f/8. If it is too dark, increase the exposure time to 1 (1 second). Additional changes may be required to obtain the proper exposure for your gel.

5. **Place the stained gel on the FOTO/Phoresis® UV Transilluminator:** Close the UV blocking cover, and turn the transilluminator on. Orange bands of stained DNA should be visible on the gel.

6. **Photograph the gel:** To photograph the gel, open the UV blocking cover and place the camera hood on the transilluminator so that the trigger grip faces you. The FOTO/Phoresis® hood (Catalog Number 1-1440) fits securely around the outside of the black plastic frame. Once the hood is placed on the transilluminator, you should see the red interlock indicator light turn on. If the interlock indicator light does not come on, the safety interlock on the FOTO/Phoresis® hood is not properly aligned with the transilluminator. To correct this, simply remove the hood from the camera, turn it 180 degrees, and re-attach the hood to the camera. If the interlock indicator light still does not come on, contact FOTODYNE for technical assistance. With the hood on the transilluminator and the interlock indicator light on, hold the camera steady with one hand while you pull the trigger with the other hand.

7. **Develop the photograph.** Remove the camera and hood from the transilluminator and set it on a solid surface. Holding the camera, pull the white tab out from the side of the camera in a steady, continuous manner. Once the white tab is free from the camera, a white tab with arrows should appear where the white tab had been. Pull this black tab straight out in one steady motion. This action will start the film developing. After the appropriate time, as indicated by the particular film being used (45 seconds at 70°F for Type 667 film), peel the finished photograph from the developing pad.

Documentation with the MiniVisionary™

The FOTO/Phoresis® UV Transilluminator can also be used with the MiniVisionary™ Benchtop Electronic Documentation System (Catalog Number (E)6-2310). The 5-5334 Photographic Hood, which is equipped with the same safety interlock as the UV blocking cover, should be used for this means of photodocumentation. The following instructions are recommended for documenting ethidium bromide stained mini-gels.

1. **Check the Thermal Printer:** The MiniVisionary™ Thermal Printer should be loaded with a roll of Thermal Print Paper (60-2012 box of 4 rolls). Consult the MiniVisionary™ Instruction Manual for directions for loading paper into the printer.

2. **Attach Photographic Hood to Camera:** Attach the mounted CCD Camera to the 5-5334 photographic hood by matching the two grommet and plunger assemblies. These assemblies are located on top of the hood on either side of the mounted lens (diopter). Press the plungers inside the hood until they click into place on the CCD camera mount.

3. **Install the Ethidium Bromide Interference Filter:** Rubberized filter retainers (Catalog No. 77-9078) should be mounted onto the plastic clips on either side of the diopter inside the hood before installing the Ethidium Bromide Interference Filter (Catalog No. 62-2020). Handling the filter only by its metal frame, insert the filter completely between the filter retainers such that it is securely held in place.

4. **Set the aperture and frames of integration:** Set the aperture (f-stop) on the lens to f/6. The focal length of the lens should be set to 0.4m (or below). Increase the number of frames of integration displayed on the MiniVisionary™ Controller to 240 frames. This is a good starting point for ethidium bromide stained DNA gels. If the photograph is too light, change the f-stop aperture to f/8. If it is too dark, increase the number of frames of integration to 400. Additional changes may be required to obtain the proper exposure for your gel.

5. **Place the stained gel on the FOTO/Phoresis® UV Transilluminator:** Close the UV blocking cover and turn the transilluminator on. Orange bands of stained DNA should be visible on the gel.

6. **Photograph the gel:** To photograph the gel, open the UV blocking cover and place the camera hood on the transilluminator such that the safety interlock is toward the front right side of the transilluminator. The 5-5334 hood fits securely around the outside of the black plastic frame. The red interlock indicator light on the front of the transilluminator will illuminate to indicate that the UV bulbs have lit. If the indicator light does not come on, contact FOTODYNE for technical assistance. With the hood on the transilluminator, and the interlock indicator light on, press the "PRINT" button on the MiniVisionary™ Controller. After the appropriate selected exposure time, the thermal print gel image will emerge from the Thermal Printer. NOTE: Pressing the "PRINT" button on the Thermal Printer will result in the acquisition and printing of only 1 frame of video regardless of the number of frames indicated in the MiniVisionary™ Controller display. Such images will appear unacceptably dark and featureless. To obtain the selected exposure, always press the "PRINT" button on the Mini-Visionary™ Controller.

Mutagenesis of Bacteria on Petri Dishes

Conditions for optimal mutagenesis of bacteria with the FOTO/Phoresis® UV Transilluminator vary according to a variety of factors including species, strain, medium, and even dish composition. The following procedure has been developed by Diane Sweeney of Crystal Springs Upland High School (Hillsborough, CA) to demonstrate mutation of the amylase gene in *Bacillus*.

1. Spread 2 or 3 drops of a turbid overnight culture of amylase producing *Bacillus* on a nutrient agar + 2% starch Petri dish.

2. Place the Petri dish, with its lid off, face down on the FOTO/Phoresis® UV Transilluminator filter glass. Turn on the power switch and close the UV blocking cover to initiate exposure. Turn off the transilluminator after 10 to 30 seconds. A range of exposure times may be tested to determine the optimal duration.

3. Incubate plate(s) at 37°C or room temperature until colonies appear. Assay for effect of UV light on amylase production.

Servicing Information

CAUTION: Before opening any transilluminator for service or repairs, unplug the electrical cord. Do this even when checking or replacing bulbs, etc. This ensures that power to the instrument is off, avoiding ignition of the bulbs and the possibility of shock hazard while servicing.

Fuses

After unplugging the electrical cord, locate the fuse cartridge above the power cord receptacle on the back of the unit. Open the fuse cartridge by pinching together both black arrows. The cartridge will pop out of the unit. Remove the fuse and visually inspect it for burn-out. Replace the bad fuse with the appropriate replacement (see "Related Equipment", page 13). Slide the fuse cartridge back into its proper position until it clicks into place.

Bulbs

Before attempting to replace a bulb, first check the fuse. To replace the bulbs, remember to unplug the power cord from the outlet. This ensures that the power to the instrument is off which avoids unintentional ignition of the bulbs and the possibility of shock hazard. **Always wear protective UV blocking eyeglasses when servicing the transilluminator.** Carefully remove the metal cover by removing the four screws on the sides of the unit (2 screws per side). Gently lift the metal cover frame straight up. The cover will be attached to the base by a wire. Carefully place the cover next to the base such that the wire remains attached and is not pulled tightly. **DO NOT HANG THE COVER BY THE CONNECTING WIRE!** Care should be taken not to damage the plastic UV blocking cover, which is hinged to the metal cover. The cover can be secured to the metal cover with a piece of tape to avoid damage during servicing.

CAUTION: Broken UV bulbs present a hazard of skin laceration and exposure to toxic mercury vapor and a toxic dust/powder. Wear protective gloves when removing bulbs. Do not breathe the mercury vapor or the dust/powder if the bulb should break.

Remove the twin tubes by grasping the metal collar at the base of the bulb with thumb and first finger and gently pulling the bulb straight out of the socket. Do not remove the bulb from the socket by pulling from the center or the end of the bulb. Wear protective gloves to avoid injury should the bulb break. Replace the bulb by pushing it straight into the socket.

Servicing Information (cont.)

To replace the cover, position it exactly above the base and gently lower it into position, making sure that there are no wires caught in between the top cover and the metal part of the base. Line up the screw holes on either end of the unit and replace the screws. Plug the power cord back into the transilluminator and then into a properly grounded three-conductor outlet. **Please note: This is a three-wire ground style cord and should not be used with a conversion plug inserted into a two-wire receptacle.**

If, after testing the transilluminator, you find that the bulb(s) still does not light, then a ballast may need to be replaced. To replace the ballast, call FOTODYNE for technical assistance at 1-800-362-3686.

UV Filter Glass

The UV Glass Filter, being the single most costly component of the transilluminator, requires some special care. Residue from gels, in combination with the UV light, may leave a film on the surface of the glass. It may be difficult or impossible to remove this film. Also, the filter glass is quite hygroscopic and water taken up by the glass may result in "clouding" and loss of transmittance. Ethidium-bromide can also stain the glass, resulting in high background and reduced resolution. The glass may be cleaned using a non-abrasive towel and a glass cleaner such as Windex, Sparkle, etc. Ethanol may also be used.

After many hours of use, the filter glass may need to be replaced as indicated by a relative decrease in light intensity or a relative decrease in intensity of ethidium bromide-stained DNA bands over time (see Related Equipment, page 13). When the new filter glass arrives use the following directions to aid the replacement. Carefully remove the metal cover by removing the four screws on the sides of the unit (2 screws per side). Slowly lift the metal cover frame straight up (it will be attached to the base by a single wire) and set it and the base sideways on a solid surface.

Open the UV blocking cover. While holding one of the four screwheads on the black plastic frame with a screwdriver, turn the white nut on the underside of the metal cover with your fingers or a 3/8" wrench. Once the nut is loose it should easily come apart from the screw. Do the same for the remaining three screws.

Remove the old filter glass and gasket and replace with the new glass and gasket. Replace the black plastic frame. Line up the screw holes on the four sides of the frame and replace the screws and nuts. To tighten the screws, hold the nut with your fingers or a 3/8" wrench and tighten the screw with a screwdriver.

Servicing Information (cont.)

Position the metal cover above the base and gently lower it into position, making sure that there are no wires caught in between the top cover and the metal part of the base. Line up the screw holes on either end of the unit and replace the screws.

With the exception of the fuse, bulbs, and UV filter glass, the FOTO/Phoresis® UV Transilluminator has no user serviceable components. If the unit fails to operate as instructed, or if there are any questions regarding its correct usage, please contact FOTODYNE Incorporated for technical assistance at 1-800-362-3686.

Related Equipment

Product	Cat. No.
FCR-10 Camera	5-5330
FOTO/Phoresis® UV Photographic Hood	1-1440
8.1 x 10.0 cm Photographic Hood	5-5335
Ethidium Bromide Threaded Glass Filter (for FCR-10 Camera)	3-4309
Polaroid Type 667 Film	4-4667
Single Cell Electrophoresis Chamber	1-1408
Dual Cell Electrophoresis Chamber	1-1409
MiniVisionary™ Benchtop Digital Documentation System	(E)6-2310
Midrange UV Bulbs, 300 nm, 9 watt	11-2122
Replacement UV Filter Glass, 9.4 x 11.6 cm	1-1450
Fuse for 120V FOTO/Phoresis® UV Transilluminator	77-2055
Fuse for 220V and 240V FOTO/Phoresis® UV Transilluminator	77-2065

Ordering Information/Technical Assistance

ORDERING INFORMATION

Call or Fax Toll-Free:

Educational Products Division
Technical Service: 262-369-7000
Phone Orders: 1-800-362-4657
Fax Orders: 1-800-362-3642

Research Products Division
Technical Service: 262-369-7000
Phone Orders: 1-800-DNA-FOTO
1-800-362-3686
Fax Orders: 1-800-362-3642

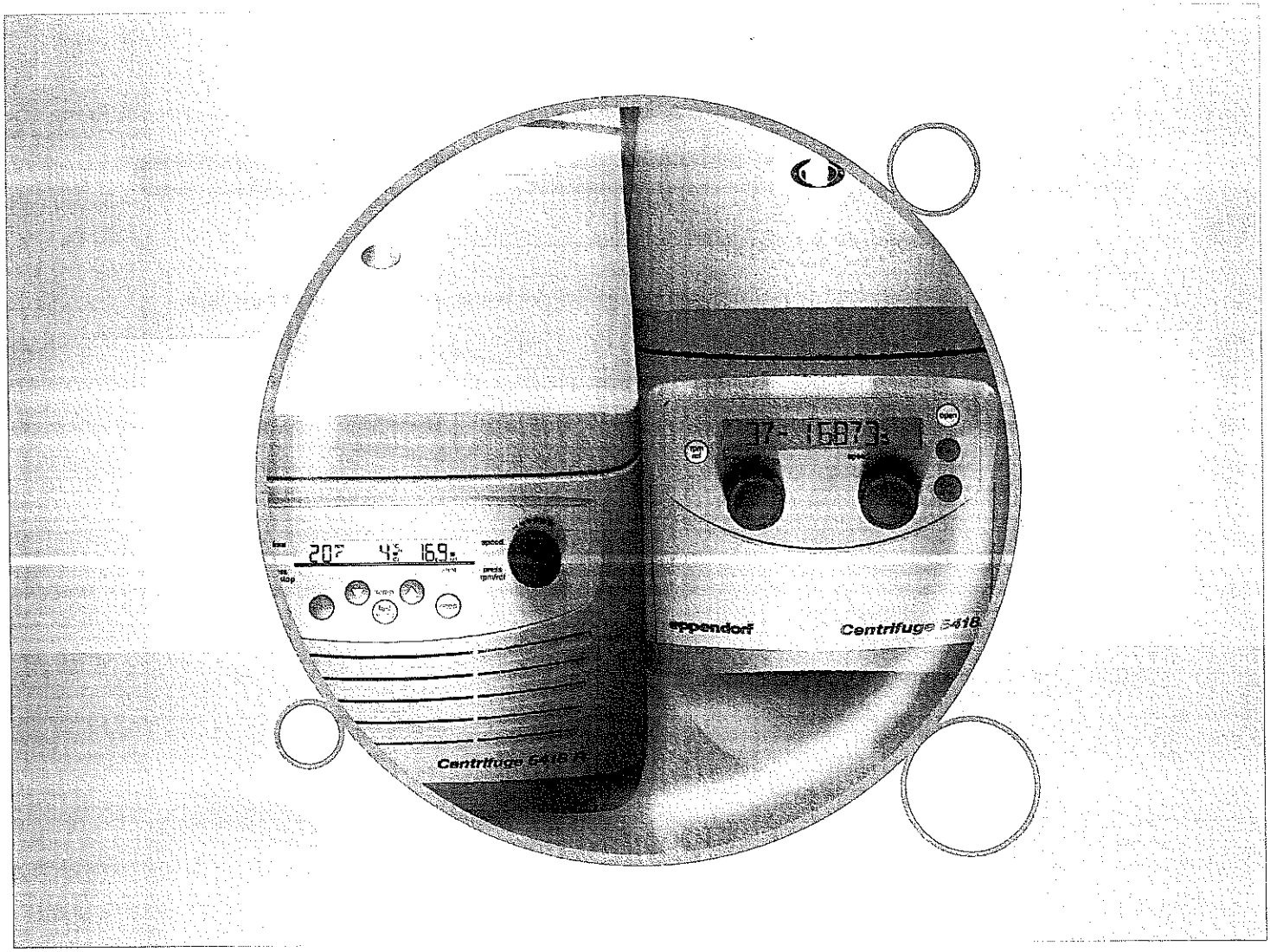
Mail to:

FOTODYNE INCORPORATED
950 Walnut Ridge Drive
Hartland, WI 53029-9388
USA

TECHNICAL ASSISTANCE

Technical questions regarding the operation and safe use of this instrument should be directed to FOTODYNE Incorporated. Call 1-262-369-7000.

01/03



Centrifuge 5418/5418 R

Operating manual

eppendorf

2 Product description

EN

Operating manual

2.1 Main illustration

The depiction of the Centrifuge 5418 / 5418 R can also be found on the front fold-out page (see Fig. 1 + 2).

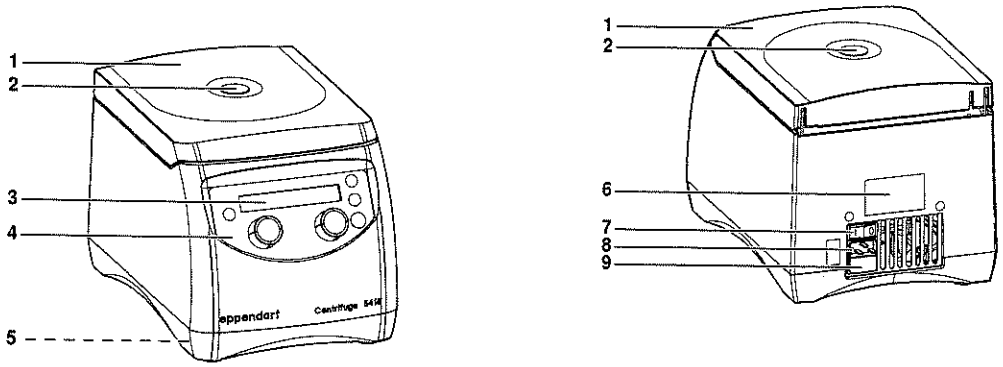


Fig. 1: Front and rear view of the Centrifuge 5418

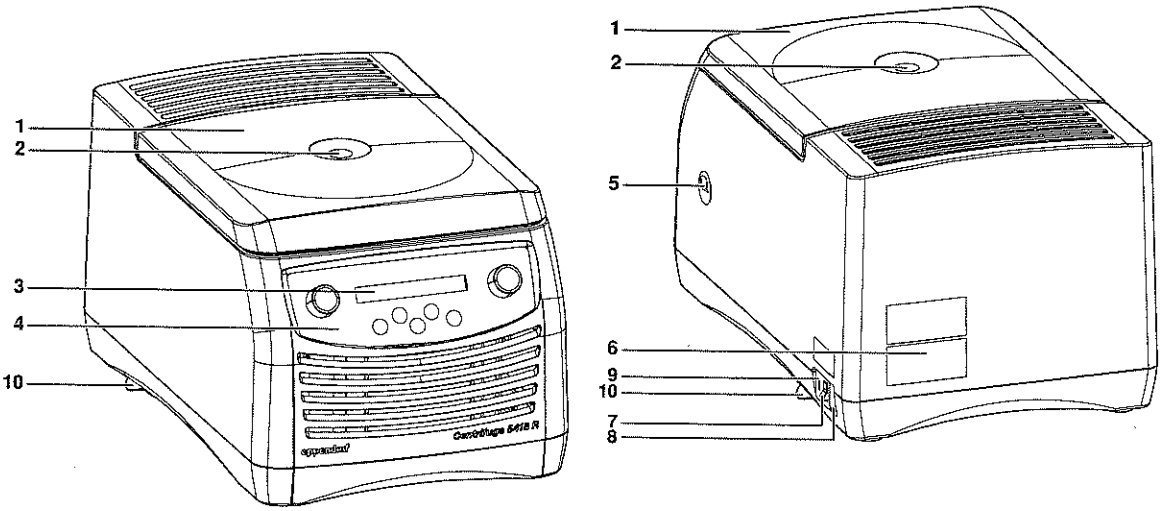


Fig. 2: Front and rear view of the Centrifuge 5418 R

1 Centrifuge lid	**2 Monitoring glass** Visual control for rotor stop or option for speed control via stroboscope.
3 Display Depiction of the current centrifuging parameters and device settings (see Fig. 4 on p. 17).	**4 Control panel** For operating the centrifuge (see Fig. 3 on p. 17).
5 Emergency lid release (see *Emergency lid release on p. 29*)	**6 ID plate**
7 Mains switch Switch for switching the device on and off. Switch position 0: The device is switched off. Switch position I: The device is switched on.	**8 Mains connection** Connection socket for the mains cable supplied.
9 Fuse holder	**10 Condensation water tray (only 5418 R)**

5 Operation

5.1 Overview of operating controls

Before using the Centrifuge 5418 / 5418 R for the first time, familiarize yourself with the operating controls and the display.

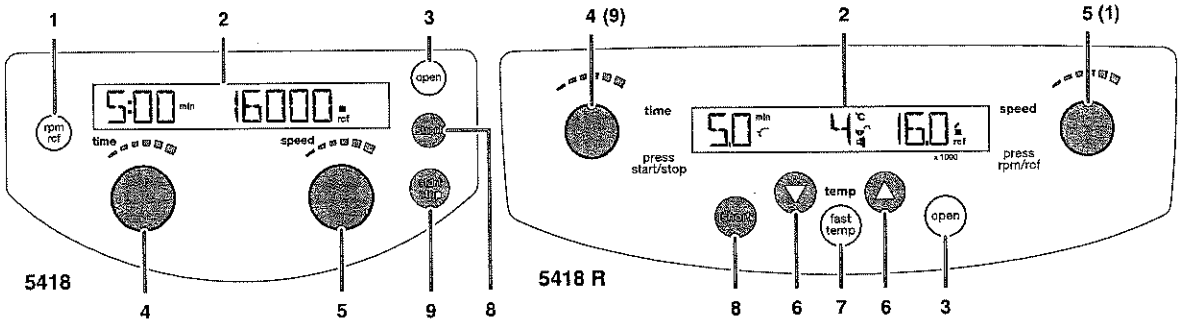


Fig. 3: Control panel of the Centrifuge 5418 and Centrifuge 5418 R.

1 **Switch the displayed centrifuging speed (rpm/rcf)** (see *Rcf display and calculation on p. 10)*	2 **Display**
3 **Release lid**	4 **Adjust the centrifuging duration** **Only 5418 R**: Press the **time** dial to start and stop centrifugation.
5 **Set the speed of centrifugation** **Only 5418 R**: Press the **speed** dial to switch the displayed centrifugation speed (rpm/rcf).	6 **Adjust the temperature (only 5418 R)**
7 **Start the temperature control run fast temp (only 5418 R)**	8 **Short spin centrifugation** (see *Short spin centrifugation on p. 23)*
9 **Start and stop centrifugation**	

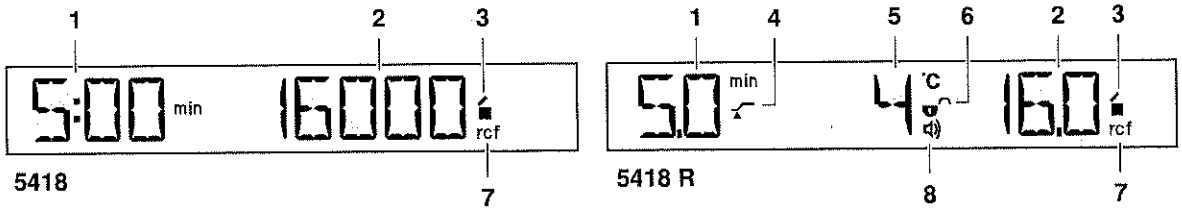


Fig. 4: Display of the Centrifuge 5418 and Centrifuge 5418 R.

1 **Centrifuging duration**	2 **g-force (rcf) or speed (rpm)** 5418 R: Set value x 1000
3 **Status of the centrifuge** 🔓: Centrifuge lid unlocked. 🔒: Centrifuge lid locked. ■ (Flashing): centrifuging in progress.	4 **At set rpm (only 5418 R)** : Start of run time when reaching 95% of the preset g-force (rcf) or speed (rpm). : Start of run time immediately.
5 **Temperature (only 5418 R)**	6 **Status of the key lock (only 5418 R)** 🔒: Centrifuging parameters cannot be modified unintentionally. 🔓: No key lock.
7 **Status of the centrifugation speed display** **rcf**: g-force (relative centrifugal force) **rpm**: revolutions per minute	8 **Status of the alarm (only 5418 R)** 🔔: Switched on. No symbol: switched off.

5 Operation

5.2 Preparing for centrifugation

5.2.1 Switching on the centrifuge

1. Switch the centrifuge on, using the mains switch.
   After switching on at the mains power switch, the centrifuge lid opens automatically.
2. Open the closed centrifuge lid by pressing the **open** key.
   The parameter settings of the last run are displayed.

5.2.2 Inserting the rotor

NOTICE!

If handled incorrectly, the rotor can fall over.

The rotor lid screw may become loose if it is used to retain the rotor.

- Always grasp the rotor with both hands for holding or transport.

1. Place rotor vertically onto the motor shaft.
2. Insert the rotor key supplied into the rotor nut.
3. Turn rotor key **clockwise** until the rotor nut is firmly tightened.

5.2.3 Loading the rotor

CAUTION!

Risk of injury from asymmetric loading of rotors.

- Load rotors symmetrically with identical tubes.
- Only load adapters with suitable tubes.
- Always use tubes of the same type (weight, material/density and volume).
- Check symmetric loading by balancing the adapters and tubes used with scales.

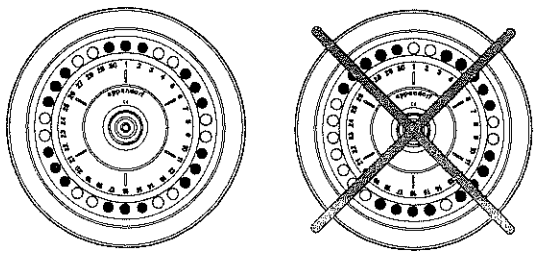
CAUTION!

Risk from damaged or overloaded tubes!

- When loading the rotor, note the safety instructions with regard to hazards from overloaded or damaged tubes (see *Warnings for intended use on p. 12)*

To load the rotor, proceed as follows:

1. Check the maximum load (adapter, tube and contents) per rotor bore.
   The maximum load is 3.75 g per rotor bore. This information can also be found on the rotor.
2. Load rotor and adapters only with the tubes intended for them.
3. Insert tubes opposite each other in pairs into the rotor bores. For symmetrical loading, tubes that are opposite each other must be of the same type and contain the same filling quantity.



In order to minimize weight differences between filled sample tubes, we recommend taring with a scale. This will reduce wear on the drive and cut running noise.

5 Operation

5.2.4 Closing the rotor lid

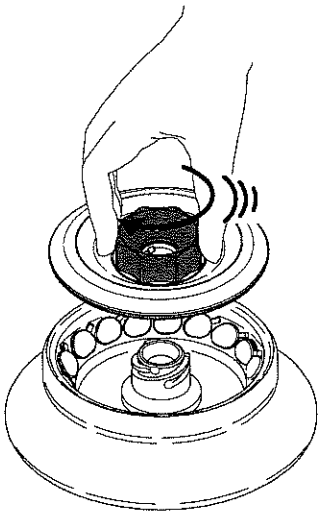
With the rotor FA-45-18-11 centrifugation is also possible without a rotor lid.

Please also note:

- The tube lids must be closed securely.
- Without the rotor lid, the rotor is not aerosol-tight.
- The centrifugation is slightly louder.
- Spin columns must always be centrifuged with a rotor lid.

1. Check that the outer sealing ring is fitted properly in the groove.
2. Fit the rotor lid vertically on the rotor.
3. Lock the rotor by turning the red rotor lid screw clockwise beyond an audible *click* until it can be turned no further.

   The rotor is not properly closed until an audible *click* is heard!



5.2.5 Closing the centrifuge lid

WARNING!

Centrifuge lid can crush. Keep hands clear.

- When opening or closing the device lid, do not reach between the lid and device or into the latching mechanism of the lid.
- Always open the centrifuge lid completely to prevent it from falling.

1. Check correct attachment of rotor and rotor lid.
2. Push down the centrifuge lid until the lid latch engages and the lid is automatically closed.

The centrifuge will close automatically.

The display shows the symbol ■.

Only 5418: The **open** key lights blue.

5 Operation

5.3 Cooling (only 5418 R)

5.3.1 Temperature adjustment

▸ Set the temperature using the **temp** arrow keys from 0 °C to +40 °C.

5.3.2 Temperature display

If the rotor is stopped:	Set temperature
During centrifugation:	Actual temperature

5.3.3 Temperature monitoring

After the set temperature has been reached the centrifuge responds as follows to temperature fluctuation during centrifugation:

Deviation from the target value	Action
ΔT > 3 °C	Temperature display flashes.
ΔT > 5 °C	Periodic warning sound and visual indication **Error 18**. Centrifugation is stopped automatically.

5.3.4 Fast Temp

This function can be used to start a temperature control run directly without samples with a rotor and temperature-specific speed in order to quickly adjust the rotor chamber, incl. rotor and adapters, up to the set target temperature.

Requirement

- The centrifuge is switched on.
- The rotor and rotor lid are properly attached.
- The centrifuge lid is closed.
- The temperature and g-force (rcf) or speed (rpm) are set for the subsequent centrifugation (see *Centrifugation on p. 21).*

1. Press the **fast temp** key.

   The display shows **FT** as well as the current temperature and g-force (rcf) or speed (rpm).

   The temperature control run ends automatically when the target temperature has been reached. A periodic signal tone sounds.

   The cooling time from room temperature (~ 23 °C) to 4 °C takes approx. 16 min.

2. Press the **start/stop** key to terminate the temperature control run early.

After the set temperature has been reached and the temperature control run is complete, the centrifuge keeps the rotor chamber, with the centrifuge lid closed, at the set temperature, if the temperature is below the ambient temperature. Irrespective of the target temperature, however, this continuous cooling does not go below 4 °C to prevent the rotor chamber from freezing.

The centrifuge stops the run automatically when the rotor has reached the set temperature. Therefore, there may be a delay between the display of the achieved set temperature and the automatic end of the temperature control run.

5 Operation

5.3.5 Continuous cooling

When the rotor is stopped the rotor chamber is kept at the target temperature when the following prerequisites are met:

- The centrifuge is switched on.
- The centrifuge lid is closed.
- The target temperature is below the ambient temperature.

During continuous cooling the following applies:

- The target temperature is displayed.
- Irrespective of the target temperature, continuous cooling does not go below 4 °C to prevent the rotor chamber and the samples from freezing and increased condensation in the device.
- Because the rotor does not rotate during this process the temperature adjustment is slower.

To end continuous cooling, open the centrifuge lid.

If the centrifuge is not used for more than 8 hours, the continuous cooling is switched off automatically. This protects against ice formation in the rotor chamber and in the tubes as well as increased condensation in the device.

The display shows the set temperature of the rotor chamber.

With **fast temp** you can quickly reach the desired temperature again (see p. 20).

5.4 Centrifugation

CAUTION!

Risk from incorrectly-loaded rotors and damaged/overloaded tubes!

- Before commencing centrifugation, follow the safety instructions relating to hazards from asymmetrically loaded and/or overloaded rotors and from overloaded, damaged and/or open tubes (see *Warnings for intended use on p. 12)*.

CAUTION!

Risk of injury from improperly attached rotors and rotor lids.

- Centrifuge only with the rotor and rotor lid firmly tightened.
- If unusual noises occur when the centrifuge starts, the rotor or the rotor lid may not be properly secured. Stop centrifugation immediately by pressing the **start/stop** key.

Before using the Centrifuge 5418 / 5418 R for the first time, familiarize yourself with the operating controls and the display (see *Overview of operating controls on p. 17)*.

Each of the centrifuging variants described here must be preceded by the preparation described above (see *Preparing for centrifugation on p. 18)*.

Only 5418 R: Please also note the instructions on cooling (see p. 20).

5.4.1 Centrifuging with time preset

Perform the following steps in the sequence described.

1. Use **time** to set the run time.
2. **Only 5418 R**: Use **temp** to set the temperature.
3. Use **speed** to set the g-force (rcf) or speed (rpm).
4. Press **start/stop** to start centrifuging.

5 Operation

During centrifugation

- In the display ∎ flashes while the rotor is running.
- The remaining run time is displayed in minutes, in 30s increments below ten minutes. The last minute is counted down in seconds.
- **Only 5418 R**: The actual temperature is displayed.
- The current g-force (rcf) or rotor speed (rpm) is displayed.
- The **fast temp** (only 5418 R), **open** and **short** keys are blocked during centrifugation.
- During the run you can modify the total run time, the temperature (only 5418 R), the speed and the rpm/rcf display. **Only 5418 R**: To change the centrifugation parameters, press the **short** key first.

  The values flash in the display during the change. The new parameters are adopted immediately. When the time is changed during a run, the time which has already elapsed is taken into account. Note that the shortest new total run time which can be set is the time which has already elapsed plus 2 minutes.
- You can also terminate the centrifugation before the set run time has elapsed by pressing the **start/stop** key.

End of centrifugation

- After completion of the set time, the centrifuge stops automatically. During braking the elapsed centrifugation time is displayed flashing. When the rotor stops a signal tone is sounded.
- **Only 5418**: The centrifuge lid opens automatically. The display shows the symbol ∎.
- **Only 5418 R**: The centrifuge lid remains closed to maintain the sample temperature. You can open it by pressing the **open** key.

5. Remove centrifuge contents.

5.4.2 Centrifuging in continuous operation

Perform the following steps in the sequence described.

1. Use **time** to set the continuous run.

   The continuous run function can be set above 9:59 h or under 30 s (5418) or above 99 min or under 0.5 min (5418 R). The timer shows **oo** to indicate continuous operation.
2. **Only 5418 R**: Use the **temp** arrow keys to adjust the temperature.
3. Use **speed** to set the g-force (rcf) or speed (rpm).
4. Press **start/stop** to start centrifuging.

   In the display ∎ flashes while the rotor is running.

   Time is counted upwards, first in 30-second increments and then in minute increments from ten minutes.
5. Press **start/stop** to end centrifuging after the desired time period.
   - During the braking process, centrifuging duration flashes in the display.
   - When the rotor stops a signal tone is sounded.
   - **Only 5418**: The centrifuge lid opens automatically. The display shows the symbol ∎.
   - **Only 5418 R**: The centrifuge lid remains closed to maintain the sample temperature. You can open it by pressing the **open** key.
6. Remove centrifuge contents.

5 Operation

5.4.3 Short spin centrifugation

5418: You can carry out a short spin run with the maximum g-force (rcf) or speed (rpm).

5418 R: You can carry out a short spin run with the currently set, or maximum, g-force (rcf) or speed (rpm). Set this short spin mode as described in the following section.

Selecting short spin mode (only 5418 R)

1. Press the **short** key while the centrifuge lid is open.
   The current mode is displayed:
   - Display **1 – 14 t** (run at preselected speed)
   - Display **14 t** (run at maximum speed of 14,000 rpm)
2. When the centrifuge lid is open, press the **short** key for longer than 2 s to switch between these modes.

Performing short spin centrifugation

1. **Only 5418 R**: A short run at preselected g-force (rcf) or speed (rpm) can be set directly using the **speed** dial.
2. **Only 5418 R**: Use the **temp** arrow keys to adjust the temperature.
3. Start short spin run: Hold down the **short** key.
   - In the display ■ flashes while the rotor is running.
   - The time is counted upwards in seconds.
   - During short run centrifuging all other keys are blocked.
4. End short spin run: Release the **short** key.
   - During the braking process, centrifuging duration flashes in the display.
   - **Only 5418**: The centrifuge lid opens automatically. The display shows the symbol ■.
   - **Only 5418 R**: The centrifuge lid remains closed to maintain the sample temperature. You can open it by pressing the **open** key.
5. Remove centrifuge contents.

During the braking process, centrifuging can be restarted up to two more times by pressing the **short** key again.

5.4.4 Removing the rotor

1. Turn the rotor nut **counterclockwise** using the rotor key supplied.
2. Remove rotor by lifting vertically.
3. **Only 5418 R**: Switch off the centrifuge after use and empty the condensation water tray (pull out from the left or right side of the device). Leave centrifuge lid fully opened and protect it against closing.

5.5 Standby mode (only 5418)

If the centrifuge has not been used for 15 min, it switches to standby mode. The **EP** logo then appears in the display. When a button or knob is used or the centrifuge lid is closed, the centrifuge is reactivated and ready for operation.

5.6 Special functions (only 5418 R)

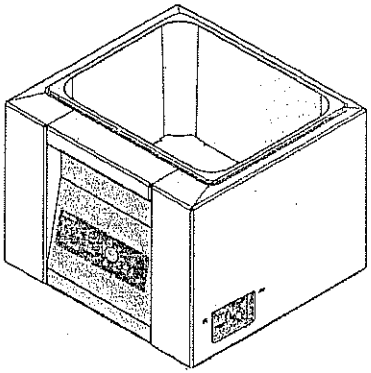
Function	Status of centrifuge lid	Press > 2 s key	Display
Modify parameter during the cycle.	■ closed	**short**	Flashes 5 s
Enable/disable signal tone.	■ open	**open**	
Enable/disable key lock.	■ open	**short + open**	
At set rpm (Fig. 4 on p. 17)	■ open	**time**	

OPERATING MANUAL

[Basic Water Bath]

Model : BW – 05B, 10B, 20B

Manual No : 00HAA0001200(Rev.2)



This operating manual describes the important subjects to maintain the product's functions and to use it safely. Especially, be sure to read <Safety Precaution> carefully before you use this equipment. Please keep this operating manual close to the equipment to use it after reading through it once. Please place it where the new user can find it easily for the safety use when you hand over or lend the equipment to others

JEIO TECH

Table of Contents

Chapter 1

Introduction

Thank you for purchasing the Lab Companion Bath.

Lab Companion Baths are realized perfectly the control and Bath circumstance related to the operator's experimental condition. Excellent Incoloy sheath heater positioned below bath widely and offers prompt temp compensation and accurate temp uniformity.

Before using the Bath, please comprehend the manual in detail.

Including;

- Caution about the operating manual
- Warning mark
- Caution for safe operation and unauthorized modification
- Disclaimer

Caution about the operating manual

1. Always keep this instruction near to the instrument.
2. Copying and distributing part or the whole of this the operating instruction with no permission are prohibited with the law.
3. The operating instruction promised perfection but please ask an agent or us if you have any question about insufficient points, error and omission on the operating instruction.

Warning mark

1. This operating instruction uses the warning Signal Word for safe operation to prevent the users from accidents or damage beforehand.
2. Defined by the Symbol Mark about the safety caution.

	"Warning" means that the user may have serious damage and even die by improper handling on this unit.
	"Caution" means that the user may have minor damage and unit may have physical damage by improper handling on this unit.
	Protective Ground Terminal It marks the terminal must be connected Ground prior to operating the product.
	It marks additional information on the operation and features of the product.

3. Be fully aware of the warning contents during operation.
4. Please exchange original label to the new warning label when it is unreadable from warning out.

☞ **Please request the new label to an agent or us.**

Caution for safe operation and unauthorized modification

1. In order to protect the product and system, please use the product in accordance with the instructions.
2. We shall not be responsible for any incidental or abnormal operation for breach of any express or implied warranty on this product or any part thereof.
3. It forbids reorganization of Inside of the product or adds.
4. Please contact the agent or us in case of the component and the consumable parts of the product will be replaced.
5. Do not give a strong shock to the product. It becomes the cause of product damage and wrong operations.

Disclaimer

1. In no event will Jeio Tech industries be liable for any incidental or consequential damages for breach of any implied warranty relating to the product.
2. Any special indirect or consequential property or commercial damage of any nature whatsoever. Some cases do not allow the exclusion of incidental or consequential damages, so the above limitation may apply to you.

Chapter 2

Check the condition of unit

Before you install Shaker, inspect it for damage that may have occurred in transportation. Confirm any damage for compensating following the Compensation regulations and transportation of Lab Companion.

Check the condition of unit before unpack

Protection from any damage occurring in transit, Lab Companion administers excellent packing and radical transportation.

Any damage or loss during transit, all responsibility is filled with the delivery carrier.

After receiving the unit, carefully unpack and inspect it for damage.
If the unit is damaged or loss during transit, Make sure as follows to be protected from the "Lab Companion Regulations"

Confirmation a damaged unit

1. Check the front and rear sides of the unit under packed condition.
2. Carefully unpack the package.
3. Check with care any damage during the transportation of the unit
4. Check the parts (i.e. accessories- Page 9) of the unit.

Compensation regulation of damaged unit

If the unit is damaged, contact the delivery service company immediately.

1. Keep the condition as it delivered and wait for the confirmation by the carrier.
2. Within 15 days, submit an application be made in writing to the delivery service company.

NOTICE	**Do not discard the carton or packing material for the unit until you have checked all of the damaged parts.**

Compensation regulation of transport

1. Any damage that is occurred during the transport is responsible to the delivery service company.
2. Except for all damage from the transport, we Jelo Tech will service or return.
3. 3. If Jelo Tech or our authorized dealers do not deliver the unit, Jelo Tech disclaims all the responsibility for the damage.

Chapter 3

Installation

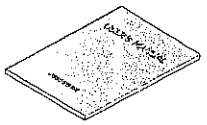
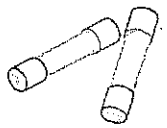
Before installation, be sure to check the electric conditions for electric safe. All persons expected to carry out operation, installation and maintenance of the unit, read and understand the safety information and operating instructions.

Including;

- contents
- Installation
  - Check points
  - Select a proper place
  - Level off
  - Power connection

Contents

After unpacking, Please check listed Bath component description as follows.
If you didn't receive one or more component as follow, Contact the Jeio Tech Service center or the distributor where you purchased.

	
Operating manual After unpacking, check the operating manual. If you didn't receive the operating manual, Contact the distributor or the Jeio Tech service center.	**Fuse** During being in use, if you contact the service center or the distributor, you will receive the service.

Installation

The machine should be installed on a safe and proper environment following to the below

Check Points

- Select a proper place, Level off the machine, - Power connection

Select a proper place

1. **Operating condition**
   Room condition of temperature and humidity should be normal as 18 ℃ ~ 25℃, below 80%RH.

2. **Environmental condition**
   Do not expose the machine to direct ray of light.

3. **Setting place**
   The floor should be on flat and leveled ground.

4. **Space**
   The machine should be kept at least 1.5m from any illuminators and 20 cm from walls.

⚠ CAUTION	**The machine should be operated at the optimum condition for cleanness, electricity and preparation against fire.**

Level off

All of the bottom sides should be leveled.

Power connection

Check the ID Plate on the back side of the machine to find the electric conditions.
Power must be used upper 2 classes grounded.

⚠CAUTION	**Check the power plug to find if the electric conditions are correct. The voltage fluctuation should be within 10%.**
⚠WARNING	**Do not connect the power before checking how to do correct operation.**

1. Check if the plug condition and electric wires are normal.
2. Check the connection of ground wire.

Chapter 4

Safety Alert and Caution

⚠WARNING	**"Alert"** shows that users can be dead or seriously wounded by wrong operation.
⚠CAUTION	**"Notice"** shows that users can be wounded or machines broken by wrong operation.

"Signal Word" is used in the operation manual for safe and proper operation and keeps users from being damaged by accidents.
Each "Symbol Mark" is identified following to the degree of importance and danger.

Pay attention to the "Alert" and "Notice" in the manual to avoid from any accidents.

Safety Alert

⚠WARNING	"Alert" shows that users can be dead or seriously wounded by wrong operation.

Main Power

- **Check the voltage, phase and capacity on the ID plate before installation. Sources of electricity should be separately wired.**
- **The sources of electricity should be grounded.**
  The sources of electricity without ground connection can cause serious damage to users or the machine.
  Don't earth the machine to gas pipes or water pipes.
- **Do not connect multiple power cord.**
  It can cause fire and malfunction.
- **Running water recommended must be non-flammability.**
  In case of flammability, the flashing point of running water must be over 40℃.

Safety

- **Running water can be circulated and pumped below 20degrees.**
- **Running water circulated and pumped can be used below ambient 20℃. Running water must be lower 5℃ from the flashing point. (Fp-5)**
- **Don't install the machine near to places where inflammable gas can be leaked.**
  Do not use the machine near to places where explosion can be happened due to organic evaporating gases.
  Explosive materials: Acid, Esther, Nitro compound
  Inflammable materials: salt peroxides, inorganic peroxide, salt acids
- **Do not put inflammables and explosives in the machine.**
- **Put off the power plug if some sounds and smell, smokes are happened.**
- **Keep out the machine from heating source and sun direct. Install the unit ambient 5℃~40℃and below 80%RH.**
- **Do not use the machine at places where moisture is high and flooding can be happened.**
- **Do not disassemble or fix, change the machine.**
- **Do not move the machine when running water heated. Must drain running water completely when moving the machine.**
  Overflowing running water can cause malfunction and burn.
- **At least 2 persons should move the machine when it is necessary.**
- **Be careful to enter moisture, organic solvents, dust and corrosiveness gas.**

Caution

⚠CAUTION	"Notice" shows that users can be wounded or machines broken by wrong operation.

Main Power

- **Do not put heavy things on the power line. Do not put the machine on the line.**
  It causes fire and electric shock.
- **Connect the plug correctly and do not touch it with hands.**
  It can cause fire if the connection is not fit.
  It can cause fire and damage to users.
- **Install the machine near to the power cord can be easily reached.**

Safety

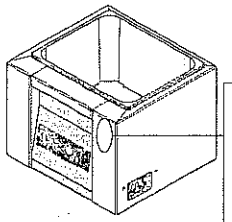
- **Do not install the machine near the high frequency noise place.**
  Keep out a high-frequency welder and mass capacity SCR Controller.
- **Do not put inflammables and explosives in the machine.**
- **Do not install the machine near to the organic solvents.**
  It may cause fire and malfunction.
- **Do not make the machine wet while cleaning. Do not put liquid on the machine.**
  If the machine is wet, off the power and contact where you purchase the machine to check it.
- **Do not shock the machine or vibrate it.**
  It can cause damage to the machine.
- **Do not clean the machine with solvent abstergent. Use smooth cloths.**
  Cleaning with solvent can cause fire and deformity.

Alert Label

Alert labels are attached on the body for informing of safety and danger.

Keep the alerts in mind and follow the instruction

Ask extra labels to where you purchased the equipment if they're damaged.



*** Warning**

It informs not to put flammable or explosive samples in the chamber.

*** Caution**

Users can be burnt by the hot surface of the chamber due to the high temperature.

Chapter 5

Names of each Component & Functions

Please, we recommend that operator learns name of each part of main body and function & and operation of display before using unit.

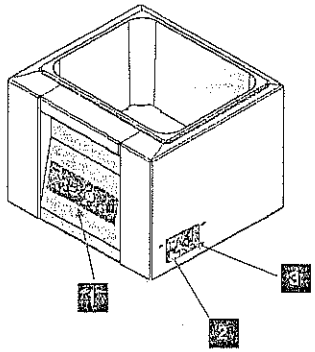
If you do not understand any, please, contact with agent or Jelo tech.

Including;

- Part names and functions
  - Main Body
  - Over temp. limit

Part names and functions

1. Main Body



1. Control Panel

Setting controls and operating

2. Main Power Switch

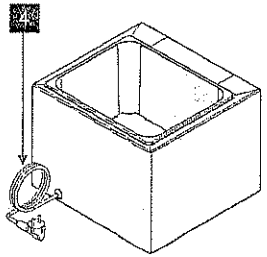
3. Fuse

Safety device is for preventing internal flow from overcuuent.

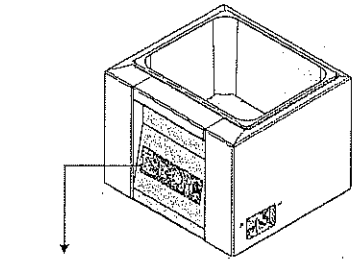
For replacement;

Model	115V	230V	100V
BW-05B	5A	8A	8A
BW-10B	5A	10A	12A
BW-20B	10A	10A	12A

4. Main Power Plug & Cable



2. Over Temp. Limit



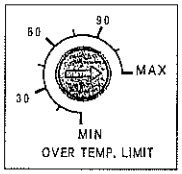
Over Temp. Limit

This safety device cuts mains of equipment and the unit stops when it detects high temperature over set temperature.

Indication : Buzzer and O/T LED blinking.

To start the unit again, press START/STOP key.

Note) Please, eliminate the potential dangerous factor.



How to set :

1. Turn the knob (red color) of over temperature limit to clockwise with screw driver.
2. Set the value 10℃~15℃ higher than set temperature.

Chapter 6

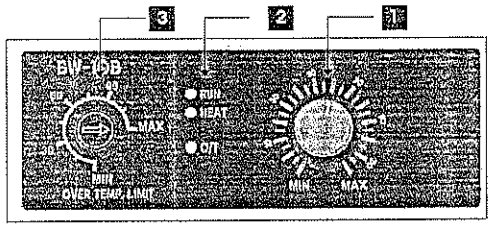
Controls and functional element

Please, learn controls and functional element before operating unit.

Including;

- Operating and Functional element
- Temperature setting procedure

Operating and functional element



1. Rotary knob for temperature

   Tuning the aim of analogue rotary knob to set temperature.

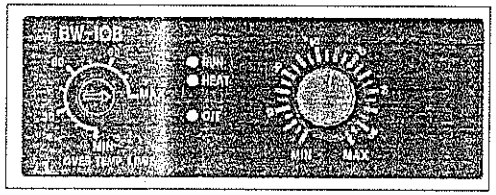
2. Status indication

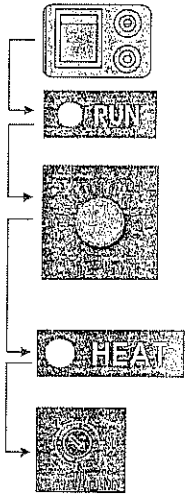
   RUN LED: operating status.
   HEAT LED: operating of heating element.
   O/T LED: It is ON when overtemperature device is activated.

3. Over Temp. Limit

   To prevent overheat of the unit or higher temperature than set temperature.

Temperature setting procedure





① Press Main Power Switch.

A. RUN LED is ON.

B. The unit starts operating.

② Tune the aim (temperature) of rotary knob.

Switch	Range
Value	0 ~ 110

A. HEAT LED blinks and is ON after tuning.

③ Set Over temp. limit 10 ~ 15℃ higher than set temperature.

Chapter 7

Maintenance & Troubleshooting

This chapter shows symptoms while operation. Please contact us referring to the contents when the equipment has problems.
Please keep in mind how to clean the equipment and maintain it regularly.

Including;

- Maintenance
  - Every week/month/quarter/year
- Safekeeping and cleaning
  - Storage/Cleaning/Cleaning accessories
- Troubleshooting

Maintenance

Every Week

- Check the connection of the accessories.
- Keep clean the surface of the equipment..

CAUTION	Do not clean the bath with sulfuric acid, hydrochloric acid or organic solvent which can cause damage to the surface of the equipment.

Every Month

- Check the condition of power plug or wires.
- Check the button input condition, set values are input correctly
- Check the condition of "Over Temp. Limit"

CAUTION	Stop draining water if the water in the bath is hot. User can be burnt. Put gloves when draining.

Every Quarter

- Check the every week/month "check point".
- Check if vibration or noise happens in the equipment.

Every Year

- Check the every week/month/quarter "check point".
- Check the temperature is controlled properly. Check if the constant temperature is maintained.

NOTICE	Maintain the equipment following to the maintenance standard for keeping the equipment under the best condition.

Safekeeping and Cleaning

Storage

Storage

Keep the equipment following to the orders below in case no operation for a long time.

1. Power off.
2. Get rid of all solvents in the chamber.
3. Keep the equipment after packing for dust protection.

External cleaning

Cleaning

External cleaning

1. Clean the external body by detergent.
2. Clean the external body by soft towel with pure water.
3. Clean the display with dry towel.

Inner cleaning

Inner cleaning

1. Power off.
2. Clean in the bath by soft towel with detergent.
3. Clean it with dry towel.

Cleaning Accessories

Cleaning accessories

1. Soak accessories in detergent.
2. Clean it with pure water.
3. Keep it after drying.

CAUTION	Please contact local dealer in case cleaning the equipment without methods mentioned in the manual not to damage it while cleaning.

CAUTION	When getting rid of toxic chemical materials or gases licked out from the equipment, close safety gloves and mask for protection.

Troubleshooting

Follow the below when problems happen.
Please ask service if problems not included in the table happen or can't be solved by the mentioned solutions.

Symptoms	Causes	Solutions
The equipment is not on.	■ Wrong electric standard. *- Or -* ■ Circuit breaker is off or power failure *- Or -* ■ The plug is not fit into the socket properly. *- Or -* ■ Fuses are disconnected. *- Or -* ■ Socket/plug/power lines are damaged.	1. Check the ID plate on the back to find electric condition whether it's fit to the socket power. *If not sloved....* 2. Check if the power is off. If the circuit breaker is off, fix it and operate the equipment again. *If not solved...* 3. Plug the power to the socket again. *If not solved...* 4. Check if the fuse set on the back of the equipment is short circuitted. Replace with a new one when short circuitted. Fuse capacity: Refer to Specifications (Page 27) *If not solved...* 5. Check the socket/plug/power lines and replce with new one if they are damaged. 6. Contact your local dealer to fix the equipment if the problems are not yest solved.
Fuses are short circuitted friquently.	■ Electric standare of fuses are not fit. *- Or -* ■ Wires are damaged or shorted. *- Or -* ■ Power input parts are wet.	1. Connect the fuse tightly after checking voltage and amphere. Refer to "Specifications" (Page 27) *If not solved...* 2. Replace with a new wires if they are damaged or shorted. *If not solved...* 3. If the power connecting parts are wet, dry them and reconnect. 4. Contact your local dealer to fix the equipment if the problems are not yet solved.
If circuit breakage is shorted continually.	■ Too many plugs are connected.	1. Check the voltage capacity supplied to the circuit breaker. 2. Check many similar equipments are connected on the socket. Use separate socket not exceeded of the voltage capacity. 3. Contact your local dealer to fix the equipment if the problems are not yet solved.

Symptoms	Causes	Solutions
Display does not show anything when power is on.	■ Innter harness falls *- Or -* ■ Controller & Display fails.	1. Check the equipment by contacting the local dealer.
The equipment stops working automatically.	■ The equipment is affected by strong noise.	1. Check equipments with strong noises are installed near to the equipment and keep it far from them. 2. Contact your local dealer to fix the equipment if the problems are not yet solved.
The equipment stops working by "Over Temp Limit".	■ Over Temp. Limit is set wrongly.	Reset the "Over Temp. Limit". 1. Operate the equipment again to find any problems. 2. Contact your local dealer to fix the equipment if the problems are not yet solved.

Chapter 8

Specifications and Circuit diagram

Check the specifications and circuit diagrams of the basic baths for proper operation.

Including;

- Specifications
- Circuit diagram

Specifications

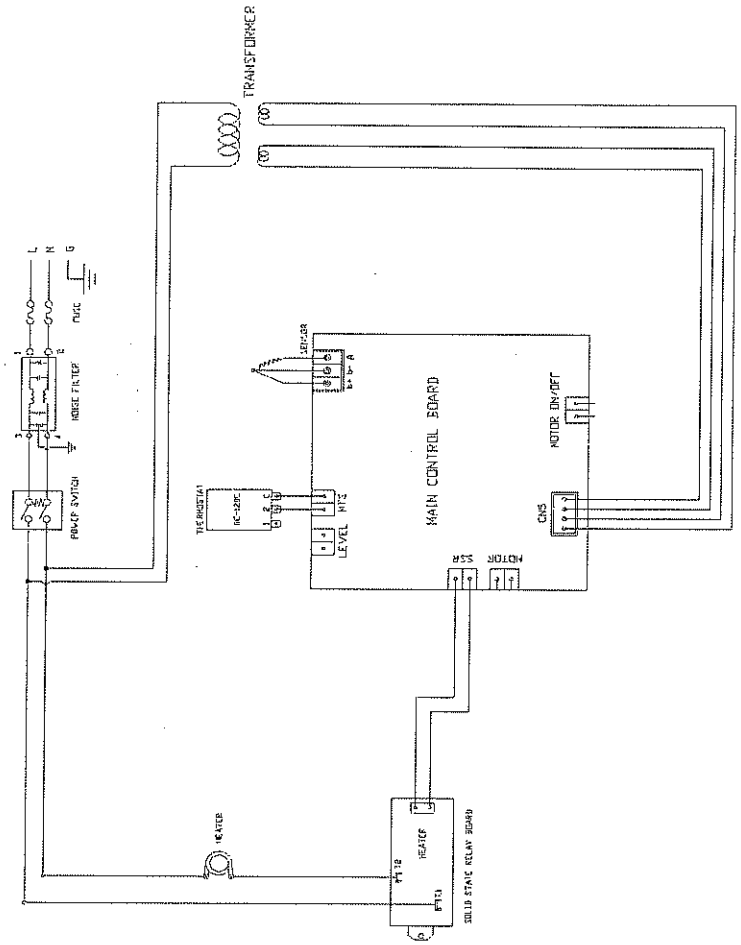
Model		BW-05B	BW-10B	BW-20B
Chamber volume		3.5ℓ	11.5ℓ	20ℓ
Temperature	Range	Amb. +7℃ ~ 100℃(lid off)		
	Accuracy	±0.5℃ at 50℃		
	Uniformity	±0.3℃ at 50℃		
	Heat up Time	50℃ within 40min		
	Controller	Analog controller type		
Permissible Environment condition		Temperature 5℃ to 40℃ Maximum relative humidity 80% Altitude up to 2,000m		
Material	Internal	Stainless steel, 0.6t		
	External	Steel, 1.2t, Double painted & baked		
Heater		700W/230V 700W/120V 700W/100V	1000W/230V 1000W/120V 1000W/100V	2000W/230V 1000W/120V 1000W/100V
Sensor		Pt 100 Ω		
Size(mm) (W×D×H)	Bath	240×136×115	300×240×165	498×300×165
	Top open	240×136	300×240	498×300
	Overall (Lid off)	303×242×245	357×330×290	564×392×295
Safety device		Over temp limit / Current fuse		
Electric requirement	230VAC, 60/50Hz	3.0A	4.4A	8.7A
	120VAC, 60Hz	5.8A	8.3A	8.3A
	100VAC, 60Hz	7.0A	10.0A	10.0A
Weight(Net)		6.5Kg	10Kg	18.5Kg

※ 1) Technical data (according to DIN 12876)

※ Accuracy, Uniformity and Heat up time are changed by room temp. condition of heating load, power voltages.

Circuit diagram

Models –BW-05B, 10B, 20B



Chapter 9

Warranty & Service

The equipment Is covered by the warranty standard regulated by Jeio tech. Exceptions from the standards can't be covered by warranty.

Including;

- Warranty and Service
  - Warranty service
  - Exceptions from warranty
  - Service request
  - Return process

Warranty and Service

Under Warranty

Warranty service

If trouble occurs during product use, User can get free service for 2 year from the date of purchase.

Exception

Exceptions from warranty

User can not be credited by warranty in case of as below.

1. If trouble occurs by an act of God.
2. If the equipment breaks down due to misusing of available voltage.
3. If damage occurs by dropping a product, or impact.
4. If damage occurs in an appearance by organic solvents such as thinner, benzene.
5. If damage occurs without following to notice in the manual
6. If damage occurs by fixing the equipment by any person who is not related with Jelo tech.
7. If damage occurs by a mistake of a customer

Service

Service request

1. Contact the local agent with claim form including the below conditions.

* Date of purchase
* Name/Address/Contact no./E-mail
* Serial Number
* Symptoms

Returns

Return process

Contact the local agent with claim form including the below conditions

* Date of purchase
* Name/Address/Contact no./E-mail
* Serial Number
* Symptoms
* Causes of returns
* Forwarder information

Service contact

Service contact

Korea (Head office-Overseas department)

#1005, Byucksan Digital Valley 6-cha,
481-4 Gasan-Dong, Geumcheon-Gu,
Seoul, Republic of Korea (153-803)
TEL: +82 - (0)2 - 2627 - 3816
FAX: +82 - (0)2 - 3143 - 1824
http://www.jeiotech.com
E-mail: overseas@jeiotech.com

The Americas (U.S.A. Branch)

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TEL: +1 781-376-0700
FAX: +1 781-376-0704
E-mail: info@jeiotech.com

China

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Postcode: 200052
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FAX: 86-21-62940602
E-mail: wslee@jeiotech.com

South East Asia

No.7A, Jalan Kemboja 1 B/2, 48300 Bandar Bukit Beruntung, Selangor Darul Ehsan, Malaysia
TEL: 603-60285833, 603-60285825
FAX: 603-60285822
E-mail: labcomp@streamyx.com

England (UK)

Unit 33 , Monument Business Park Warpsgrove Lane , Chalgrove , Oxfordshire OX44 7RW , UK
TEL: +44-1865-400321
FAX: +44-1865-400736
E-mail: labcompanion@medlineuk.com

Thermo
SCIENTIFIC

EC300XL

Electrophoresis Power Supply

LTM1596X2 *23/7/10*

Thermo Scientific EC300 Electrophoresis Power Supply

Table of Contents

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 CSA1010 safety standards, as applicable to laboratory instrumentation. This applies only to the EC300 when used as specified in the documentation, in its intended applications, with Thermo approved electrophoresis apparatus only. Usage in any other manor 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 EC300 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 EC300 power supply.

The output of the EC300 power supply is intended for connection to electrically isolated electrophoresis apparatus only. Use only with electrically isolated electrophoresis apparatus with minimum isolation of 600V. Do not connect any terminal of the EC300 output to earth ground. This may impair the safety protection provided by the equipment, or cause equipment damage.

The high voltage output of the EC300 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 less than 0.5 mA using test methods defined in CSA1010 and CSA151.

This equipment is for indoor use only.

Introduction

Thank you for selecting a Thermo Scientific EC300 Electrophoresis power supply. This manual describes the operation of the EC300. 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 EC300 power supply is designed to provide constant voltage or constant current output to apparatus used in electrophoresis applications. One to three sets of electrophoresis cells can be connected in parallel and run simultaneously. The EC300 can deliver up to 75W of total output power. When operating in constant voltage or constant current mode, the power supply automatically limits the other parameter to either the power supply maximum, or a lower limit if set by the user. If this non-constant limit is reached, the power supply will automatically switch control modes, from constant voltage to constant current, or vice versa. In this way, the EC300 protects your electrophoresis cells from damaging over power conditions. The EC300 power supply also provides for timed operation in either voltage or current modes, and allows an automatic completion in the event of a power loss if enabled by the user.

- 10-300V, adjustable in 1 volt steps
- 4-400mA, adjustable in 1mA steps
- 75W maximum output
- Automatic control mode crossover
- 0-999 minute timed run
- Automatic restart if loss of AC power (if enabled)
- Bright 3-digit display

Unpacking the Power Supply

When unpacking your EC300 power supply, be sure you have received the following items.

- EC300 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

100-120 VAC, 50-60Hz, 100VA 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

10-300VDC, 75W Max
4-400mA, 75W 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 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. Power the unit on by connecting the AC power cord to the power entry on the rear panel then plugging the 3 prong AC plug into a power source. Connect the power supply to a 3-prong grounded AC outlet, **using the AC cord provided with the unit only**.

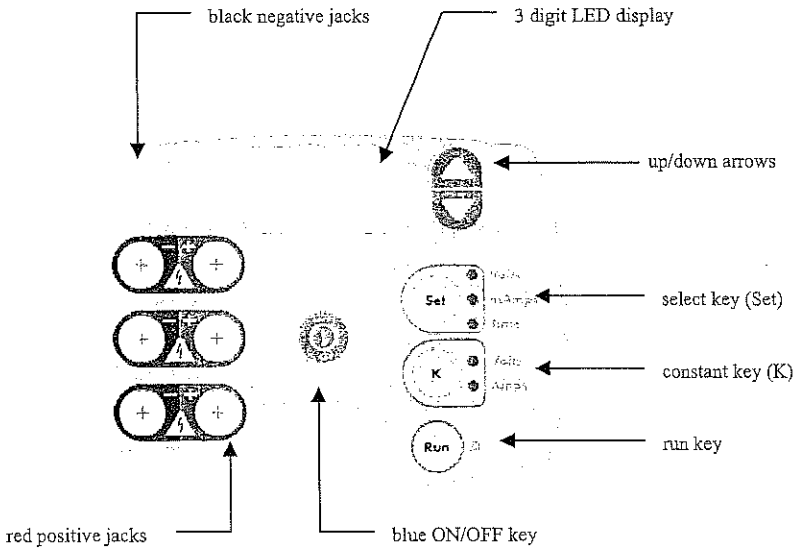


Figure 1. Front Panel Controls

Using the Power Supply

Press the blue key on the front center of the unit to enable the control logic. The 3-digit display will illuminate and show the setpoint value of the last saved run setup. The EC300 preserves the run settings each time you start a run. One set of conditions is saved for each mode, constant voltage or constant current. The setpoint value, limit parameter, time duration, and power-fail restart setting is saved. This allows convenient setup for repetitive runs.

To change the control mode, press the constant key. This key toggles control from constant voltage to constant current. Each time, the EC300 will display the last saved setpoint value for that particular mode.

After selecting a control mode, either constant voltage or current, and setting the limit and timed run parameters if desired (see Constant Voltage/Current Operations) press the Run key to energize the power supply output. The power supply output will ramp up to the appropriate setpoint, while not allowing the limit parameter to be exceeded. If the limit parameter should be exceeded, then

the power supply will crossover control modes, making the limit parameter the new control setpoint. The front panel constant mode LED indicator will change to indicate that a crossover has occurred.

To stop a run in progress, press the Run key or the blue ON/OFF key. The display will change to "OFF" signifying that the output is no longer energized. Pressing run again resumes the run from the previous point (i.e. for a timed run). Pressing any other key will return to setup mode in either constant voltage or constant current mode as appropriate.

During a run, the display will automatically cycle between voltage, current, and time displays. Voltage and current is displayed as actually measured by the EC300. When displaying the controlled setpoint, i.e. voltage for constant voltage control, the arrow keys can be used to modify the setpoint. The limit parameter cannot be changed during a run. The time parameter displays elapsed time for an untimed run, and time left for a timed run.

Constant Voltage Operations

Press the constant key (labeled K) until the LED indicating "Volts" is illuminated. Each time the constant key is pressed, the EC300 will display the last saved setpoint value for that particular mode. Use the UP and DOWN arrow keys to change the setpoint to the desired value (10-300 volts). The EC300 will not allow setting a voltage setpoint outside of the allowed range. Press and hold either arrow key to quickly change the setpoint.

The limit parameter, in this case current, is normally set to the power supply maximum value of 400 mA. To set a lower limit value, press the Set key until the LED indicating "mAmps" is illuminated. Use the UP and DOWN arrow keys to change the limit to the desired value (4-400 mA). The EC300 will not allow setting a current limit outside of the allowed range.

In addition, the EC300 will never exceed the maximum power output specification of 75W. When starting a run, the power supply calculates a maximum limit parameter, above which the power supply maximum power output rating would be exceeded. If this value is lower than the limit setpoint entered, the EC300 will use this lower limit parameter.

Constant Current Operations

Press the constant key (labeled K) until the LED indicating "Amps" is illuminated. Each time the constant key is pressed, the EC300 will display the last saved setpoint value for that particular mode. Use the UP and DOWN arrow keys to change the setpoint to the desired value (4-400 mA). The EC300 will not allow setting a current setpoint outside of the allowed range. Press and hold either arrow key to quickly change the setpoint.

The limit parameter, in this case voltage, is normally set to the power supply maximum value of 300 volts. To set a lower limit value, press the Set key until the LED indicating "Volts" is illuminated. Use the UP and DOWN arrow keys to change the limit to the desired value (10-300 volts). The EC300 will not allow setting a voltage limit outside of the allowed range.

In addition, the EC300 will never exceed the maximum power output specification of 75W. When starting a run, the power supply calculates a maximum limit parameter, above which the power supply maximum power output rating would be exceeded. If this value is lower than the limit setpoint entered, the EC300 will use this lower limit parameter.

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.

Press the Set key until the LED indicating "Time" is illuminated. Use the UP and DOWN arrow keys to change the time duration to the desired value (0-999 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

Automatic Power-fail Restart

Automatic power-fail restart capability allows a timed run which is interrupted by loss of AC power to be restarted automatically, so that the total time programmed for the time parameter will be met. **NOTE:** Loss of AC power includes unplugging the unit. *When performing timed runs with power-fail restart enabled, always use the front panel controls to stop a run in progress.*

To enable power-fail restart, press and hold the Set key when changing to the time parameter (from the current parameter). While continuing to hold the Set key, simultaneously press and release the UP arrow key. The display will show "PF" momentarily to indicate power-fail restart is active. Whenever power-fail restart is enabled, "PF" is displayed briefly as the time parameter is selected by pressing the Set key. The power-fail restart feature can be enabled either before or after changing the time duration to the desired value (0-999 minutes). Setting the time duration to zero will automatically disable power-fail restart (if you have enabled power-fail restart before setting a time value, and want to disable it, then simply increment and then decrement the time parameter back to zero to disable power-fail restart).

When AC power is restored during a timed run in which power-fail restart is enabled, the display will show "PF" 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 time will continue from that point. Any number of power interruptions can occur during the completion of a single run.

Cleaning

Before cleaning the unit, be sure to always remove power by unplugging the unit from the AC power source. 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 EC300 detects and reports several events and conditions that are considered errors. The EC300 will stop any run in process and display "EXX" where XX is one of the below listed errors. When the EC300 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 EC300.

E'XX'	Condition and possible remedy
00	Minimum load current detected. The output is not connected, or the electrophoresis apparatus is not set up properly. Check your setup and connections.
01	Maximum load current exceeded. The output is short circuit, or the electrophoresis apparatus is not set up properly. Check your setup and connections
03	Loss of AC power; PF enabled and completed. The EC300 detected loss of AC power, however the run was completed as programmed.
04	Loss of AC power; PF disabled and not completed. The EC300 detected loss of AC power, the run was not completed since PF not enabled.
05	Loss of AC power; run not timed. The EC300 detected loss of AC power.
06-99	The EC300 detected an internal error condition. Contact technical support for instructions.

Before servicing the unit, be sure to always unplug the unit from the AC power source. The EC300 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 EC300 may use double pole neutral fusing.
Turn off AC power by disconnecting the AC line cord. Remove the fuse holder assembly using a small flat blade screwdriver. Always replace both fuses with appropriate replacement fuses: 1.5A, 250V, 5X20mm, type T fuse (T1.5A,250V) (Thermo catalog number FB-FUSE-1).

EC300 Warranty Statement

The Thermo Scientific Company ("Thermo") warrants to the direct purchaser that the EC300 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 EC300 power supplies that specified period is 12 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

CSA 1010

This equipment has been designed and tested to conform to CSA1010 safety standards, as applicable to laboratory instrumentation. This applies only to the EC300 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 suitable protection.

Accessories

Adapter for Cells	FBAD-1
Under Counter Bracket	FBUB300

Replacement Parts

AC line cord	FB-CORD-1
Fuse, T1.5A, 250V	FB-FUSE-1

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

PLEASE RETURN WITH KIT

PowerPac™ Basic Power Supply

Instruction Manual

Catalog Number
164-5050

BIO-RAD

Table of Contents

List of Figures

Safety

Caution/Warning

PowerPac power supplies use high output voltages that are electrically isolated from earth ground to minimize the risk of electrical shock to the user. The following guidelines should be observed and followed when using a PowerPac power supply.

PowerPac power supplies have passed test for operation at temperatures between 0° and 40° C, with relative humidity between 0 and 95% non-condensing. Operating the power supply outside these conditions is not recommended by Bio-Rad and will void the warranty.

1. To ensure adequate cooling of the power supply, be sure that there is at least 6 cm clearance around the power supply. Do not block the fan vents at the rear of the unit.
2. Always connect the power supply to a 3-prong, grounded AC outlet, using the 3-prong AC power cord provided with the power supply.
3. Bio-Rad electrophoresis cells have molded two-prong plugs that are inserted into the power supply's high voltage output jacks. These plugs have been EN 61010* certified for safety compliance for use with PowerPac power supplies. Use of other plugs or banana jacks is done at the user's own risk and is not recommended by Bio-Rad. When inserting and removing the molded two-prong plug, always grasp the plug by the molded support at the rear of the plug. Do not grasp the individual prong ends.
4. Do not operate the power supply in extreme humidity (>95%) or where condensation can short the internal electrical circuits of the power supply.
5. When taking the power supply into a cold room, the unit can be operated immediately. However, when removing the power supply from the cold room, let the unit equilibrate to room temperature for a minimum of 2 hours before using it.
6. Never connect a high voltage output lead to earth ground. This defeats the floating electrical isolation of the power supply and exposes the user to potentially lethal high voltages.

Important

This instrument is intended for laboratory use only.

This product conforms to the class A standards for Electromagnetic Emissions, intended for laboratory equipment applications. It is possible that emissions from this product may interfere with some sensitive appliances when placed nearby or on the same circuit as those appliances. The user should be aware of this potential and take appropriate measures to avoid interference.

Bio-Rad's PowerPac power supplies are designed and certified to meet EN 61010* safety standards. Certified products are safe to use when operated in accordance with the instruction manual. This safety certification does not extend to electrophoresis cells or accessories that are not EN 61010 certified, even when connected to this power supply.

This instrument should not be modified or altered in any way. Alteration of this instrument will void the manufacturer's warranty, void the EN 61010 certification, and create a potential safety hazard for the user.

Bio-Rad is not responsible for any injury or damage caused by the use of this instrument for purposes other than those for which it is intended, or by modifications of the instrument not performed by Bio-Rad or an authorized agent.

*EN 61010 is an internationally accepted electrical safety standard for laboratory instruments.

Section 1
Introduction

1.1 Overview

The PowerPac Basic provides constant voltage or constant current to instruments used in electrophoresis. The power supply operates at the values specified for the constant parameter. However, to prevent damage to the electrophoresis cell, the PowerPac Basic provides automatic crossover to constant current or constant voltage, depending on which set value is first reached. When the set limit of the non-constant parameter is reached, and the power capability of the unit is not exceeded, the power supply will switch, making the non-constant parameter the new constant parameter.

Output specifications:

Voltage:	Adjustable from 10 to 300 Volts, in 1 volt increments.
Current:	Adjustable from 4 to 400 milliamperes (mA) in 1 mA increments.
Power:	75 watts (maximum).
Four output jacks:	Up to four identical electrophoresis cells can be connected in parallel to the power supply.

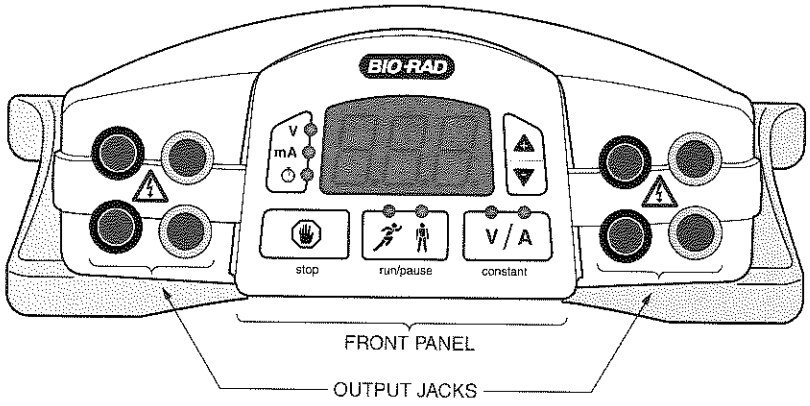


Fig. 1. Front View.

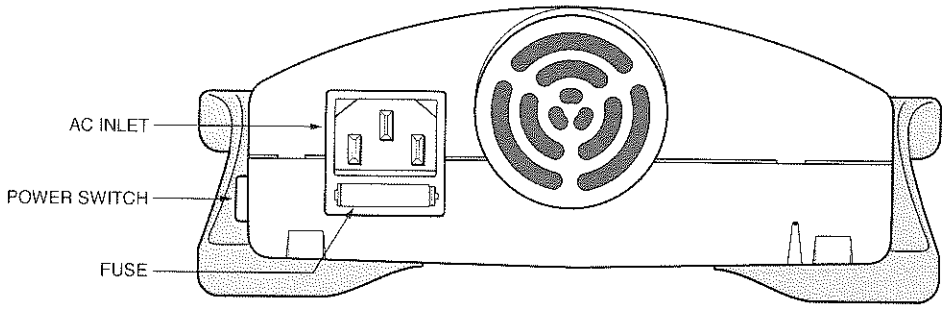


Fig. 2. Rear View.

The PowerPac Basic has the following features:

- Programmable constant voltage or constant current with automatic crossover
- Timer control from 0 to 999 minutes
- 3-digit LED display
- Pause mode for editing running parameters
- Automatic detection of no load conditions and rapid changes in resistance
- Power Failure Detection in timed modes allowing completion of run
- Stackable case with adjustable viewing angle via flip down legs (see Figure 3)

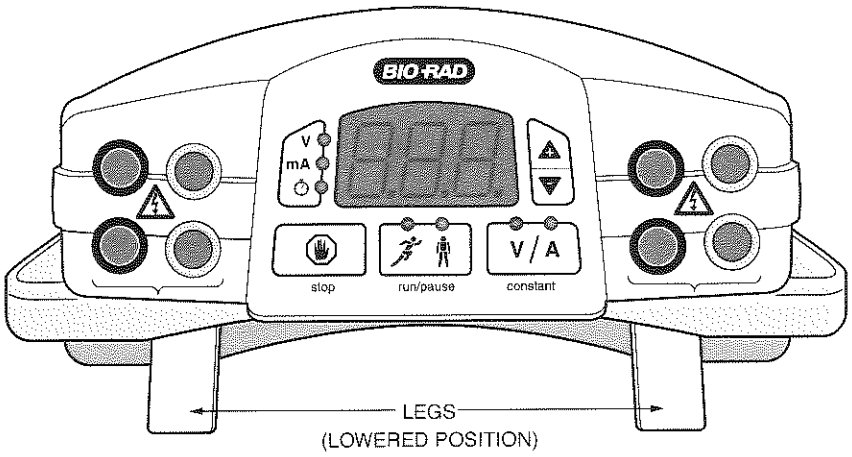


Fig. 3. Front View with Legs in Lowered Position.

1.2 Unpacking

When you receive the power supply, carefully inspect the container for any damage which may have occurred in shipping. Severe damage to the container may indicate damage to the power supply itself. If you suspect damage to the unit, immediately file a claim with the carrier in accordance with their instructions before contacting Bio-Rad Laboratories.

After unpacking the PowerPac Basic, remove the plastic film from the translucent green top case. The plastic film may leave a residue. If so, clean with a soft, damp cloth.

Contents include:

- PowerPac Basic power supply
- Power cord
- Instruction manual
- Warranty card
- Declaration of conformity

If any part is missing or damaged, contact Bio-Rad Laboratories immediately.

Section 2
Control Features

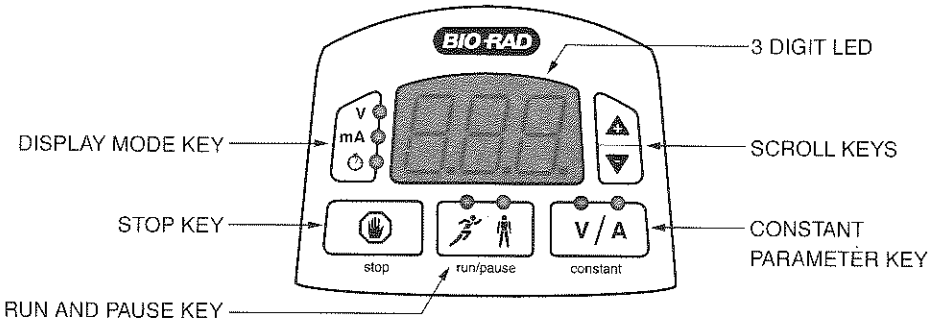
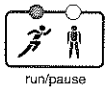
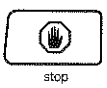
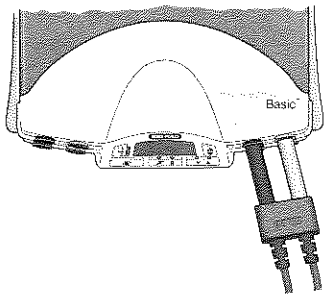
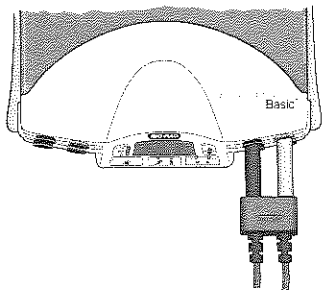
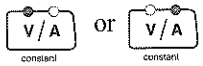
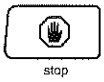
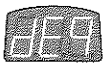


Fig. 3. Front Panel.

Key	Description
	Constant Parameter Key: • Selects either constant voltage or current. • The LED indicates the selected parameter. During a run, maximum power is indicated when both LED's are lit.
	Display Mode Key: • Selects the parameter to be displayed (volts, milliamperes or minutes). The LED displays the value of the indicated parameter.
	Scroll Keys: • Changes the value of the selected parameter. If the Scroll Key is pressed constantly for more than 5 units in either direction, +/-, the values will increase/decrease in increments of 10 to reach the desired value faster.
	Run & Pause Key: • Starts and pauses a run. Pausing allows editing of the constant parameter and the parameter values. • Corresponding LED indicates the status of the power supply.
	Stop key: • Stops run. Constant parameter and limit parameter values are preserved. Timer is reset to zero.

Section 3
Setup and Operation

STEP	PROCEDURE	DESCRIPTION
1.	Turn power on.	Press the power switch located on the right side of the unit to the on position. The default setting is constant V, and the LED display shows zero value. To display firmware version number, hold down constant parameter key while turning the power switch to the on position.
2.	Connect the electrophoresis cell(s) to the power supply. 	The power leads are color coordinated to the output terminals in red and black. ⚠ indicates high voltages. **Note**: Power leads must be inserted perpendicular to the curve of the case.
		
	Fig. 5. Power leads connected correctly.	**Fig. 6. Power leads connected incorrectly.**
3.	Select the constant parameter  	Press the Constant key to select the constant parameter, either voltage or current. The LED on the parameter key corresponding to the selected constant parameter will light up. The display shows the zero value for the constant parameter.
4.	Enter a value for the constant parameter using the scroll key. 	Use the scroll key to enter the desired value. Voltage: 10–300V adjustable in 1V increments. Current: 4–400 mA adjustable in 1 mA increments. **Note**: If the scroll key is pressed constantly for more than 5 units in either direction, +/-, the values will increase/decrease in increments of 10 to reach the desired value faster.
5.	Enter value for limit parameter. For volts   For milliamperes  	Use the parameter key to select the limit parameter. The maximum default value, 300V or 400mA, is displayed. Select a suitable limit value to avoid excessive power conditions for the application.

STEP	PROCEDURE	DESCRIPTION
6.	Programming a timed run  	Use the parameter key to select time. The display will show a zero value. Use the scroll key to enter the desired time up to 999 minutes. If no time is entered the run will continue until the run is terminated by pressing the stop key. When 999 minutes is reached, the clock resets to zero and the run continues. **Note:** • In a timed run the displayed time is the remaining time. Pressing the pause key will keep the remaining time. Pressing the stop key will reset the time to zero. • In an untimed run the displayed time is the elapsed time. Pressing the pause key will retain the elapsed time.
7.	<u>Optional</u>; *available only when a timed run is programmed.* Power Failure detection.  **Caution**: Always use the stop key to terminate a run in progress. Use of the power switch to terminate a run in progress is treated as a power failure and the appropriate error code is displayed when the unit is turned back on	Activating the Power failure detection mode is possible for timed runs only. • Make sure the parameter key is in time mode (time LED is lit) • Enter the desired time if not previously entered • Hold down the stop key for ~2 seconds until the display shows Pfd. This indicates the Power Failure Detection is activated. **Note**: After completion or termination of a run, the Power Failure Detect mode is automatically de-activated. See Section 4.2, Troubleshooting, for details on Power Failure Detect error messages.
8.	<u>Optional</u> De-activation of change in resistance feature.   	Certain applications exhibit fluctuations in resistance that can trigger the change in resistance error codes. If this is the case, the change in resistance feature can be de-activated to allow un-interrupted completion of a run. • Make sure the parameter key is in current mode (current LED is lit) • Hold down the stop key for ~2 seconds until the display shows dE9 **Note**: After completion or termination of a run the Change in Resistance Detection is automatically activated. **Caution**: De-activating this safety feature increases the chance of electrical hazard.

STEP	PROCEDURE	DESCRIPTION
9.	Start the run 	Press the run/pause key to start the run. The run LED is lit.
10.	Viewing and editing options during a run.	• Viewing: Press the parameter key to view the corresponding value on the display • Editing: Edit the constant parameter value and the time value for timed runs **Note**: Editing the limit value is possible in the pause mode. To change from an un-timed to a timed run, stop the run and re-program.
11.	Pause mode 	Press run/pause key during a run to enter the pause mode. When the pause LED is lit it is possible to: • Safely make adjustments to the instrument connected to the power supply • Edit the values for all parameters • Change the constant parameter **Note**: To change from an un-timed to a timed run, stop the run and re-program.
12.	End of run.	When a run is completed, i.e., a timed run has ended or an untimed run is stopped, the constant parameter value and limit parameter value are preserved. The timer is reset to zero. Neither the run nor the pause LED is lit, indicating that no power is supplied to the output jacks.
13.	Terminating a timed run in progress	Press the stop key to terminate a timed run. The constant parameter value and limit parameter value are preserved. The timer is reset to zero. Neither the run nor the pause LED is lit indicating that no power is supplied to the output jacks.
14.	Powering down	Press the stop key before turning the power switch to the off position. If this is not done, a power failure will be detected causing an automatic restart if the Power Failure Detection is enabled.

Section 4
Maintenance and Troubleshooting

4.1 Maintenance

The PowerPac Basic requires little maintenance to assure reliable operation. To clean the case, first unplug the power supply. Use a damp cloth to wipe down the outer case.

4.2 Troubleshooting

Problem	Cause	Solution
No display/lights/fan	1. No AC power. 2. Blown fuse. 3. Power switch exercised rapidly to the on and off positions.	1. Check if PowerPac Basic is unplugged, or problem with AC power source, or power switch is in off position. 2. Replace fuse. See section 4.3 for details. 3. The unit needs to be reset. Turn power switch to the off position, wait 5–10 seconds, then turn power switch to the on position to resume normal operation.
Repeated blown fuses	Hardware failure	Contact Bio-Rad Technical Resources.
Leads from cell are not long enough to fit output jacks	Output terminals for the PowerPac Basic are recessed 16 mm to meet safety regulations. Some leads are not long enough to make electrical connection.	Use the PowerPac Adaptor, which accommodates most standard 4 mm banana plugs, to make a secure electrical connection. **Note**: Use of the PowerPac Adaptor voids EN61010 safety provisions.
E1 error code displayed	No load detected • Instrument not connected to PS • The current load is below 4mA	Verify all electrical connections. Verify buffer levels where appropriate.
E2 error code displayed	Over current (load current greater then 400 mA)	Check for and correct any short circuit or excessive load problem. Excessive load due to high buffer concentration will require the buffer be remade. Then, • Press  key to resume the run or, • To clear the error code, press any key (other then  key).
E3 error code displayed	Over voltage (load voltage over 300 V)	Turn power supply off, then on to reset. If problems persists, contact Bio-Rad Technical Resources.
E5 error code played	A power failure occurred during a timed run with Power Fail Detection (PFd) activated, and run is completed. Power Fail detection (Pfd) is de-activated after completion or termination of each run.	
E6 error code displayed	A power failure occurred during a timed run without Power Fail Detection (PFd) activated, and run is not completed.	
E7 error code displayed	Power Failure occurred during an untimed run or the power switch was turned off before pressing stop,. and run is not completed. Power Fail detect (Pfd) cannot be activated for untimed runs.	

Problem	Cause	Solution
E8 error code displayed	Regulation error	Turn power supply off, then on to reset. If problem persists, contact Bio-Rad Technical Resources
E9 error code displayed	Change in Load Resistance. The PowerPac Basic detects drastic changes in resistance which may indicate failure of the cell's power leads or a loose output connection. Note: Certain applications exhibit fluctuations in resistance that can trigger the change in resistance error code. If this is the case, the change in resistance feature can be deactivated to allow uninterrupted completion of a run. (see Section 3, Step 8) Caution: Deactivating this safety feature increases the possibility that a failure of the power leads or loose output connection will not be detected.	Check and correct any potential resistance problem then, • press run/pause key to resume run or, • press any key, other than the run/pause key, to clear the error code.
E10 error code displayed	Unacceptable value(s) entered	Clear the code by pressing any key other than the run/pause key. Then, enter values within range of PowerPac Basic and press the run/pause key
E12 error code displayed	Internal Over Current	Possible power supply malfunction. Check for and correct problems such as dirty contacts, frayed wires, excessive buffer concentration. Then press any key other than the run/pause key to clear the code.
E13 error code displayed	Internal Short Circuit	
E14 error code displayed	Internal Over Voltage	
E15 error code displayed	Internal Short Circuit	
E16 error code displayed	Hardware failure	Contact Bio-Rad Technical Resources
E17 error code displayed	Hardware failure	
E98 error code displayed	Internal system error	
E99 error code displayed	Internal system error	

4.3 Replacing a Fuse

If there is no display, lights, or fan, and the PowerPac Basic is plugged into a working AC power outlet with the power switch in the on position, the fuse may need to be replaced.

1. Disconnect the power cord from the electrical outlet.
2. Insert a flat blade screwdriver into the notches of the power entry module's fuse holder to release it. See Figure 5.
3. Remove the fuse from the fuse holder. Replace with 2.5A, 250V, 5 X 20 mm fuses (Bio-Rad part number 900-7283).
4. Re-insert the fuse holder into its position. Press the fuse holder gently until it snaps into place.

The unit is now ready for use.

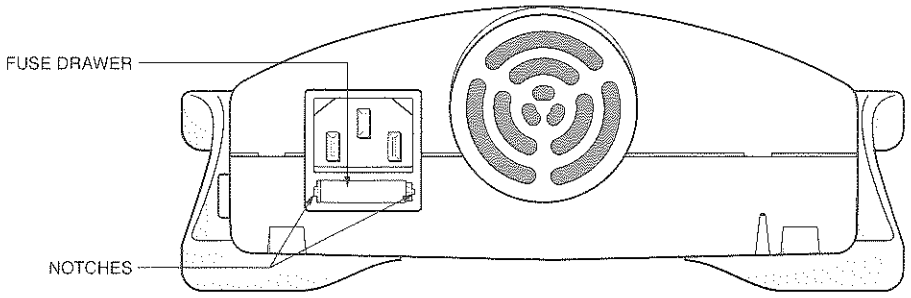


Fig. 5. Rear View Showing Fuse Drawer with Notches.

Note: Repeated blowing of the fuse indicates a hardware failure and Bio-Rad should be contacted for repair.

4.4 Firmware Version Number

To display the PowerPac Basic's firmware version number while the power supply is off, hold down the constant parameter key and concurrently turn the power switch to the on position. All of the LEDs and segments in the 3 digit LED display will light. Release the constant parameter key and the firmware version number will then appear for a few seconds. The power supply is now ready for operation.

Appendix A

Specifications and Ordering Information

Input Power	
nominal	100–120/220–240 VAC, 50 or 60 Hz
actual	90–132 or 198–264 VAC, 50 or 60 Hz
Fuses	2.5 A, 250 VAC, 5mm x 20mm, Type T
Input Power Cord	3-wire; grounded
Output (Programmable)	
Voltage	10 V to 300 V, fully adjustable in 1 V steps
Voltage Accuracy	± 2% of reading or 3 volts, whichever is more
Current	4 mA to 400 mA, fully adjustable in 1 mA steps
Current Accuracy	± 2% of reading or 3 mA, whichever is more
Power (maximum)	75 W
Terminals	4-pair recessed banana jacks, floating in parallel
Timer Control	001 to 999 minutes, fully adjustable
Ripple	< 1% @ 300 V and 70 W
Line Regulation	< 1% @ 300 V and 70 W, 90–132 or 198–264VAC
Load Regulation	<1% @ 300 V for a 50% change in output load
Drift	< 1% @ after 15 min warmup at 300 V and 70 W
Noise	55 dBA at 1 meter
Readout Stability	
Volts	±1 V
Current	± 1 mA
Safety Features	
No load detection	Indicated by error message on display
Sudden load change detection	Indicated by error message on display
Overload/short circuit protection	Automatic power limit
Input line protection	Fuse on both hot and neutral
Auto power up after power failure	User-selectable, setup values maintained
Safety Compliance	EN-61010
EMI	Conforms to CE standards for Emissions and Immunity class A, tested only at 230V. See Declaration of Conformity for details. TUV EMC certification
Display Functions	3-digit LED displays voltage, current, or time
Function Modes	Constant voltage, constant current, timer, pause User-selectable automatic power-up after power failure
Environmental	
Operating Temperature	0–40°C
Humidity	0–95%, in the absence of condensation
Dimensions	25 cm (L) x 21 cm (W) x 8.5 cm (H)
Unit is stackable	
Weight	1.1 kg

Appendix B
Warranty and Ordering Information

Warranty

The PowerPac Basic is warranted for 3 years against defects in materials and workmanship. If any defects should occur during this warranty period, Bio-Rad Laboratories will replace the defective parts without charge. However, the following defects are specifically excluded:

1. Defects caused by improper operation.
2. Repair or modification done by anyone other than Bio-Rad Laboratories or their authorized agent.
3. Use with cables or connectors not specified by Bio-Rad Laboratories for this power supply.
4. Deliberate or accidental misuse.
5. Damage caused by disaster.

For inquiry or request for repair service, contact your local Bio-Rad office.

Warranty Information

Model: _____

Serial Number: _____

Date of Delivery: _____

Warranty Period: _____

Ordering Information

Catalog Number	Description
164-5050	PowerPac Basic power supply, 100–120/220–240V
165-5061	PowerPac Adaptor, qty 1
165-5066	PowerPac Adaptor, qty 2
900-7283	Replacement Fuse, 2.5 A, 250 V, 5 x 20 mm, 1 ea

INSTRUCTION MANUAL

FOTO/Phoresis® UV Transilluminator

Cat. No. (E)1-1430 (120VAC, 60Hz)
Cat. No. (E)1-1432 (220VAC, 50Hz)
Cat. No. (E)1-1434 (240VAC, 50Hz)

CAUTION
Read and understand this manual before using this product.

950 Walnut Ridge Drive • Hartland, WI 53029-9388 • USA

Research Products Division
Technical Service: 262-369-7000
Phone Orders: 1-800-DNA-FOTO (1-800-362-3686)

Educational Products Division
Technical Service: 262-369-7000
Phone Orders: 1-800-362-4657
Fax Orders: 1-800-362-3642

Instruction Manual for the FOTO/Phoresis® UV Transilluminator

Cat. No. (E)1-1430 (120VAC, 60Hz)
Cat. No. (E)1-1432 (220VAC, 50Hz)
Cat. No. (E)1-1434 (240VAC, 50Hz)

Table of Contents

Part # 78-1502 Rev. A

Introduction

The FOTO/Phoresis® UV Transilluminator is equipped with two 9-watt, mid-range ultraviolet light bulbs. The peak emission of these bulbs is close to 300 nm, the optimum wavelength for viewing and photographing DNA stained with ethidium bromide. Nearly 85% of the 300 nm light is transmitted by the dark purple filter glass. A patented UV-blocking safety interlocking cover makes it possible to safely view a gel without the use of UV-blocking eyeglasses. When the cover is lifted the UV lamps turn off.

The FOTO/Phoresis® UV Transilluminator is ideally suited for use with the hand-held FOTODYNE FCR-10 Camera and the FOTO/Phoresis® Photographic Hood or the MiniVisionary™ Benchtop Electronic Documentation System. The FOTO/Phoresis® Hood and the 5-5334 hood for the MiniVisionary™ fit securely around the UV filter glass frame and are equipped with the same safety interlock as the UV-blocking cover. A red indicator light on the front of the transilluminator lets the operator know when the UV bulbs are on when either hood is in place. The 7.6 x 9.8 cm image size for the FOTO/Phoresis® Hood will accommodate most mini-gels and has the advantage of allowing 1:1 reproduction of images; that is, the size of the photographic print is exactly the same as the subject being photographed.

The FOTO/Phoresis® UV Transilluminator can also be used for UV mutagenesis experiments. The UV filter glass frame has been designed to accommodate 100 mm Petri dishes.

Specifications

Features

- Two, 9 watt 300 nm peak emission bulbs
- 8.6 x 10.8 cm viewing surface

Dimensions

- 19.9 cm Wide x 28 cm Long x 11 cm High
- Shipping weight: approximately 3.63 kg (8 lbs)

Operating Temperature

- Operating temperature range: 0° C to 40° C

Power Requirements

- 120 V AC, 60 Hz, 1.1 Amp;
  1.6 Amp, 250V, 5 x 20 mm time delay fuse
- 220 V AC, 50 Hz, 0.5 Amp;
  0.8 Amp, 250V, 5 x 20 mm time delay fuse
- 240 V AC, 50 Hz, 0.5 Amp;
  0.8 Amp, 250V, 5 x 20 mm time delay fuse

Safety Information

- ULTRAVIOLET (UV) RADIATION CAN CAUSE SEVERE EYE AND SKIN DAMAGE!

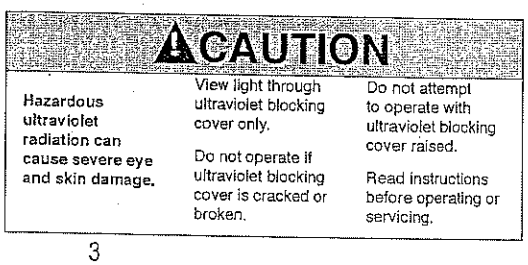
- FOR MAXIMUM PROTECTION FROM SKIN DAMAGE, WEAR A UV BLOCKING FACE SHIELD AND PROTECTIVE CLOTHING IN ADDITION TO UV BLOCKING EYEGLASSES.

WARNING: **Ultraviolet radiation can be harmful to both the eyes and skin.** It is important that care be taken when using any ultraviolet light source. Always wear protective eye covering when using midrange or shortwave radiation. Never look into an ultraviolet light source with unprotected eyes. To be on the safe side, always avoid excessive exposure to ultraviolet radiation and wear proper protective equipment for eyes, face, neck and clothing for exposed skin (face, hands, arms, etc.). Also, avoid reflected ultraviolet light.

Safety Label and Placement

Hazardous ultraviolet radiation safety label:

Located on the top of the transilluminator, centered along the front edge of the UV blocking cover.



Unpacking Instructions

Check-out Procedure

1. Unpack and examine the FOTO/Phoresis® UV Transilluminator carefully. Immediately report any damage to the transporting carrier and to FOTODYNE Incorporated. Be sure to save all cartons and packing material for claim purposes if damage is found.

2. Before getting started, check for the parts against the list below. Identify the following components:

   a. Transilluminator
   b. Power Cord
   c. Instruction Manual
   d. Warranty Card

Operating Instructions

Set-up

1. Place the FOTO/Phoresis® UV Transilluminator on a level surface in proximity to a properly grounded three-conductor outlet. Leave several inches of space in the rear to prevent blockage of the vents on the back of the unit.

2. Plug the power cord into the back of the unit. With the power switch on the front of the unit in the OFF position, plug the other end of the power cord into a properly grounded three-conductor outlet. Please note: This is a three-wire ground style cord and should not be used with a conversion plug inserted into a two-wire receptacle.

   Note: For the 220 V or 240 V, 50 Hz models, the power cord will arrive with one end open. You will need to attach the appropriate plug for your specific receptacle.

Operating Instructions (cont.)

CAUTION: Ethidium bromide is a known mutagen and a possible carcinogen. Use vinyl or latex gloves when handling gels treated with this stain. All spent buffers and other materials containing ethidium bromide should be disposed of properly.

Operation

1. **Position the sample:** Open the UV blocking cover. Place a stained mini-gel on the purple filter glass surface inside the black plastic frame and close the UV blocking cover.

   CAUTION: Do not use the FOTO/Phoresis® UV transilluminator if the UV blocking cover is cracked or broken. Contact FOTODYNE for replacement or repairs.

2. **Turn on the power:** With the UV blocking cover down, depress the top half of the power switch to turn the transilluminator on. The UV lamps should light up within a few seconds, and the red interlock indicator light will illuminate. All UV lamps and the interlock indicator light will shut off when the UV blocking cover is raised.

   CAUTION: If the UV lamps do not shut off when the cover is raised, do not attempt to use the transilluminator. To prevent the possibility of serious eye and skin damage, contact FOTODYNE to make arrangements for a replacement or repair.

3. **View the sample:** The UV blocking cover makes it possible to view a fluorescent gel without wearing UV blocking eyeglasses. In most cases, the stained DNA bands can be observed with the room lights on. However, it may be necessary to turn the room lights off to see faint bands.

   CAUTION: When you are ready to look at your gel, view it only through the UV blocking cover. Do not attempt to operate the transilluminator with the UV blocking cover raised. Any attempt to override the safety interlock and view the gel directly could result in serious eye and skin damage, and would invalidate the warranty on this instrument.

4. **Photograph gel if desired:** See page 6 (Additional Information) for instructions on photographing ethidium bromide stained mini-gels.

5. **Turn off power:** When done viewing, the FOTO/Phoresis® UV Transilluminator should be switched off to ensure the maximum life of the bulbs.

Operating Instructions (cont.)

Clean-up

1. **Remove subject from the transilluminator:** Remove gel by lifting or sliding it, and wipe the purple filter glass surface with a soft, non-abrasive cloth or tissue.

2. **Rinse the plastic surface:** Rinse the purple filter glass surface with distilled water and wipe dry with a soft, non-abrasive cloth or tissue.

Additional Information

Photography with the FCR-10 Camera

The FOTO/Phoresis® UV Transilluminator was originally designed for use with the FOTODYNE FCR-10 Camera (Catalog Number 5-5330) and the FOTO/Phoresis® Photographic Hood (Catalog Number 1-1440). The recommendations that follow are for photodocumentation of ethidium bromide stained mini-gels using Polaroid Type 667 Black and White Film (Catalog Number 4-4667).

1. **Check the camera:** The FOTODYNE FCR-10 camera should be loaded with Polaroid Type 667 film. The film pack (10 shots) is placed into the camera back with the black paper side down and the black tab extending out of the camera back. Next, close and latch the camera back and pull the black tab straight out. A white, numbered tab should appear.

2. **Install the Ethidium Bromide Threaded Glass Filter:** If an Ethidium Bromide Threaded Glass Filter (Catalog Number 3-4309) is to be used, screw it on the camera lens before attaching the photographic hood.

3. **Attach photographic hood:** Attach the FCR-10 Camera to the photographic hood by matching the two grommet and plunger assemblies. These assemblies are located on top of the hood on either side of the mounted lens (diopter). Press the plungers inside the hood until they click into place on the camera.

4. **Set the aperture and shutter speed:** Set the aperture (f-stop) on the shutter at f/5.6. Set the shutter speed at 2 (1/2 second). This is a good starting exposure point for ethidium bromide stained DNA gels using Polaroid Type 667 film. If the photograph is too light, change the f-stop aperture to f/8. If it is too dark, increase the exposure time to 1 (1 second). Additional changes may be required to obtain the proper exposure for your gel.

Additional Information (cont.)

5. **Place the stained gel on the FOTO/Phoresis® UV Transilluminator:** Close the UV blocking cover, and turn the transilluminator on. Orange bands of stained DNA should be visible on the gel.

6. **Photograph the gel:** To photograph the gel, open the UV blocking cover and place the camera hood on the transilluminator so that the trigger grip faces you. The FOTO/Phoresis® hood (Catalog Number 1-1440) fits securely around the outside of the black plastic frame. Once the hood is placed on the transilluminator, you should see the red interlock indicator light turn on. If the interlock indicator light does not come on, the safety interlock on the FOTO/Phoresis® hood is not properly aligned with the transilluminator. To correct this, simply remove the hood from the camera, turn it 180 degrees, and re-attach the hood to the camera. If the interlock indicator light still does not come on, contact FOTODYNE for technical assistance. With the hood on the transilluminator and the interlock indicator light on, hold the camera steady with one hand-while you pull the trigger with the other hand.

7. **Develop the photograph.** Remove the camera and hood from the transilluminator and set it on a solid surface. Holding the camera, pull the white tab out from the side of the camera in a steady, continuous manner. Once the white tab is free from the camera, a white tab with arrows should appear where the white tab had been. Pull this black tab straight out in one steady motion. This action will start the film developing. After the appropriate time, as indicated by the particular film being used (45 seconds at 70°F for Type 667 film), peel the finished photograph from the developing pad.

Additional Information (cont.)

Documentation with the MiniVisionary™

The FOTO/Phoresis® UV Transilluminator can also be used with the MiniVisionary™ Benchtop Electronic Documentation System (Catalog Number (E)6-2310). The 5-5334 Photographic Hood, which is equipped with the same safety interlock as the UV blocking cover, should be used for this means of photodocumentation. The following instructions are recommended for documenting ethidium bromide stained mini-gels.

1. **Check the Thermal Printer:** The MiniVisionary™ Thermal Printer should be loaded with a roll of Thermal Print Paper (60-2012 box of 4 rolls). Consult the MiniVisionary™ Instruction Manual for directions for loading paper into the printer.

2. **Attach Photographic Hood to Camera:** Attach the mounted CCD Camera to the 5-5334 photographic hood by matching the two grommet and plunger assemblies. These assemblies are located on top of the hood on either side of the mounted lens (diopter). Press the plungers inside the hood until they click into place on the CCD camera mount.

3. **Install the Ethidium Bromide Interference Filter:** Rubberized filter retainers (Catalog No. 77-9078) should be mounted onto the plastic clips on either side of the diopter inside the hood before installing the Ethidium Bromide Interference Filter (Catalog No. 62-2020). Handling the filter only by its metal frame, insert the filter completely between the filter retainers such that it is securely held in place.

4. **Set the aperture and frames of integration:** Set the aperture (f-stop) on the lens to f/6. The focal length of the lens should be set to 0.4m (or below). Increase the number of frames of integration displayed on the MiniVisionary™ Controller to 240 frames. This is a good starting point for ethidium bromide stained DNA gels. If the photograph is too light, change the f-stop aperture to f/8. If it is too dark, increase the number of frames of integration to 400. Additional changes may be required to obtain the proper exposure for your gel.

5. **Place the stained gel on the FOTO/Phoresis® UV Transilluminator:** Close the UV blocking cover and turn the transilluminator on. Orange bands of stained DNA should be visible on the gel.

Additional Information (cont.)

6. **Photograph the gel:** To photograph the gel, open the UV blocking cover and place the camera hood on the transilluminator such that the safety interlock is toward the front right side of the transilluminator. The 5-5334 hood fits securely around the outside of the black plastic frame. The red interlock indicator light on the front of the transilluminator will illuminate to indicate that the UV bulbs have lit. If the indicator light does not come on, contact FOTODYNE for technical assistance. With the hood on the transilluminator, and the interlock indicator light on, press the "PRINT" button on the MiniVisionary™ Controller. After the appropriate selected exposure time, the thermal print gel image will emerge from the Thermal Printer. NOTE: Pressing the "PRINT" button on the Thermal Printer will result in the acquisition and printing of only 1 frame of video regardless of the number of frames indicated in the MiniVisionary™ Controller display. Such images will appear unacceptably dark and featureless. To obtain the selected exposure, always press the "PRINT" button on the Mini-Visionary™ Controller.

Mutagenesis of Bacteria on Petri Dishes

Conditions for optimal mutagenesis of bacteria with the FOTO/Phoresis® UV Transilluminator vary according to a variety of factors including species, strain, medium, and even dish composition. The following procedure has been developed by Diane Sweeney of Crystal Springs Upland High School (Hillsborough, CA) to demonstrate mutation of the amylase gene in Bacillus.

1. Spread 2 or 3 drops of a turbid overnight culture of amylase producing Bacillus on a nutrient agar + 2% starch Petri dish.

2. Place the Petri dish, with its lid off, face down on the FOTO/Phoresis® UV Transilluminator filter glass. Turn on the power switch and close the UV blocking cover to initiate exposure. Turn off the transilluminator after 10 to 30 seconds. A range of exposure times may be tested to determine the optimal duration.

3. Incubate plate(s) at 37°C or room temperature until colonies appear. Assay for effect of UV light on amylase production.

Servicing Information

CAUTION: Before opening any transilluminator for service or repairs, unplug the electrical cord. Do this even when checking or replacing bulbs, etc. This ensures that power to the instrument is off, avoiding ignition of the bulbs and the possibility of shock hazard while servicing.

Fuses

After unplugging the electrical cord, locate the fuse cartridge above the power cord receptacle on the back of the unit. Open the fuse cartridge by pinching together both black arrows. The cartridge will pop out of the unit. Remove the fuse and visually inspect it for burn-out. Replace the bad fuse with the appropriate replacement (see "Related Equipment", page 13). Slide the fuse cartridge back into its proper position until it clicks into place.

Bulbs

Before attempting to replace a bulb, first check the fuse. To replace the bulbs, remember to unplug the power cord from the outlet. This ensures that the power to the instrument is off which avoids unintentional ignition of the bulbs and the possibility of shock hazard. **Always wear protective UV blocking eyeglasses when servicing the transilluminator.** Carefully remove the metal cover by removing the four screws on the sides of the unit (2 screws per side). Gently lift the metal cover frame straight up. The cover will be attached to the base by a wire. Carefully place the cover next to the base such that the wire remains attached and is not pulled tightly. **DO NOT HANG THE COVER BY THE CONNECTING WIRE!** Care should be taken not to damage the plastic UV blocking cover, which is hinged to the metal cover. The cover can be secured to the metal cover with a piece of tape to avoid damage during servicing

CAUTION: Broken UV bulbs present a hazard of skin laceration and exposure to toxic mercury vapor and a toxic dust/powder. Wear protective gloves when removing bulbs. Do not breathe the mercury vapor or the dust/powder if the bulb should break.

Remove the twin tubes by grasping the metal collar at the base of the bulb with thumb and first finger and gently pulling the bulb straight out of the socket. Do not remove the bulb from the socket by pulling from the center or the end of the bulb. Wear protective gloves to avoid injury should the bulb break. Replace the bulb by pushing it straight into the socket.

Servicing Information (cont.)

To replace the cover, position it exactly above the base and gently lower it into position, making sure that there are no wires caught in between the top cover and the metal part of the base. Line up the screw holes on either end of the unit and replace the screws. Plug the power cord back into the transilluminator and then into a properly grounded three-conductor outlet. **Please note: This is a three-wire ground style cord and should not be used with a conversion plug inserted into a two-wire receptacle.**

If, after testing the transilluminator, you find that the bulb(s) still does not light, then a ballast may need to be replaced. To replace the ballast, call FOTODYNE for technical assistance at 1-800-362-3686.

UV Filter Glass

The UV Glass Filter, being the single most costly component of the transilluminator, requires some special care. Residue from gels, in combination with the UV light, may leave a film on the surface of the glass. It may be difficult or impossible to remove this film. Also, the filter glass is quite hygroscopic and water taken up by the glass may result in "clouding" and loss of transmittance. Ethidium-bromide can also stain the glass, resulting in high background and reduced resolution. The glass may be cleaned using a non-abrasive towel and a glass cleaner such as Windex, Sparkle, etc. Ethanol may also be used.

After many hours of use, the filter glass may need to be replaced as indicated by a relative decrease in light intensity or a relative decrease in intensity of ethidium bromide-stained DNA bands over time (see Related Equipment, page 13). When the new filter glass arrives use the following directions to aid the replacement. Carefully remove the metal cover by removing the four screws on the sides of the unit (2 screws per side). Slowly lift the metal cover frame straight up (it will be attached to the base by a single wire) and set it and the base sideways on a solid surface.

Open the UV blocking cover. While holding one of the four screwheads on the black plastic frame with a screwdriver, turn the white nut on the underside of the metal cover with your fingers or a 3/8" wrench. Once the nut is loose it should easily come apart from the screw. Do the same for the remaining three screws.

Remove the old filter glass and gasket and replace with the new glass and gasket. Replace the black plastic frame. Line up the screw holes on the four sides of the frame and replace the screws and nuts. To tighten the screws, hold the nut with your fingers or a 3/8" wrench and tighten the screw with a screwdriver.

Servicing Information (cont.)

Position the metal cover above the base and gently lower it into position, making sure that there are no wires caught in between the top cover and the metal part of the base. Line up the screw holes on either end of the unit and replace the screws.

With the exception of the fuse, bulbs, and UV filter glass, the FOTO/Phoresis® UV Transilluminator has no user serviceable components. If the unit fails to operate as instructed, or if there are any questions regarding its correct usage, please contact FOTODYNE Incorporated for technical assistance at 1-800-362-3686.

Related Equipment

Product	Cat. No.
FCR-10 Camera	5-5330
FOTO/Phoresis® UV Photographic Hood	1-1440
8.1 x 10.0 cm Photographic Hood	5-5335
Ethidium Bromide Threaded Glass Filter (for FCR-10 Camera)	3-4309
Single Cell Electrophoresis Chamber	1-1408
Dual Cell Electrophoresis Chamber	1-1409
MiniVisionary™ Benchtop Digital Documentation System	(E)6-2310
Midrange UV Bulbs, 300 nm, 9 watt	11-2122
Replacement UV Filter Glass, 9.4 x 11.6 cm	1-1450
Fuse for 120V FOTO/Phoresis® UV Transilluminator	77-2055
Fuse for 220V and 240V FOTO/Phoresis® UV Transilluminator	77-2065

Ordering Information/Technical Assistance

ORDERING INFORMATION

Call or Fax Toll-Free:

Educational Products Division
Technical Service: 262-369-7000
Phone Orders: 1-800-362-4657
Fax Orders: 1-800-362-3642

Research Products Division
Technical Service: 262-369-7000
Phone Orders: 1-800-DNA-FOTO
1-800-362-3686
Fax Orders: 1-800-362-3642

Mail to:

FOTODYNE

950 Walnut Ridge Drive
Hartland, WI 53029-9388
USA

TECHNICAL ASSISTANCE

Technical questions regarding the operation and safe use of this instrument should be directed to FOTODYNE Incorporated. Call 1-262-369-7000.

INSTRUCTION MANUAL

talboys™

Professional 1000-3 Incubating Orbital Shaker

Professional 1000MP Incubating Microplate Shaker

Table of Contents

Package Contents

Professional 1000-3 Incubating Orbital Shaker or
Professional 1000MP Incubating Microplate Shaker
92" (234cm) detachable power cord
Instruction manual
Warranty card

Warranty

Manufacturer warrants this product to be free from defects in material and workmanship when used under normal conditions for five (5) years. Please complete and return the enclosed warranty card. For your reference, make a note of the serial number, date of purchase and supplier here.

Serial Number: _____

Date of Purchase: _____

Supplier: _____

Installation

Upon receiving the Talboys Incubating Orbital/Microplate Shaker, check to ensure that no damage has occurred during shipment. It is important that any damage that occurred in transport is detected at the time of unpacking. If you do find such damage the carrier must be notified immediately.

After unpacking, place the Incubating Orbital/Microplate Shaker on a level bench or table, away from explosive vapors. Secure to an immovable work surface by pressing down on the four (4) corners of the unit, creating a strong suction to the work surface (**DO NOT** place on a bench mat). Ensure that the surface on which the unit is placed will withstand typical heat produced by the unit. Always place the unit on a sturdy work surface.

The Incubating Orbital/Microplate Shaker is supplied with a power cord that is inserted into the IEC connector on the back of the unit first, then it can be plugged into a properly grounded outlet. The 120V unit plugs into a 120 volt, 50/60 Hz source. The 230V unit plugs into a 230 volt, 50/60 Hz source.

Maintenance & Servicing

The Incubating Orbital/Microplate Shaker is built for long, trouble-free, dependable service. No lubrication or other technical user maintenance is required. However at least every three (3) months you should:

- Unplug the unit.
- Remove any accumulated dirt from the base and tray.
- Check all accessible items to make sure they are properly tightened.

The unit should be given the care normally required for any electrical appliance. Avoid wetting or unnecessary exposure to fumes. Spills should be removed promptly. **DO NOT** use a cleaning agent or solvent on the front panel or lid which is abrasive or harmful to plastics, nor one which is flammable. Always ensure the power is disconnected from the unit prior to any cleaning. If the unit ever requires service, contact your Talboys representative.

Environmental Conditions

Operating Conditions: Indoor use only.

Temperature:	5 to 40°C (41 to 104°F)
Humidity:	maximum 80% relative humidity, non-condensing
Altitude:	0 to 6,562 ft (2000 M) above sea level

Non-Operating Storage:

Temperature:	-20 to 65°C (-4 to 149°F)
Humidity:	maximum 80% relative humidity, non-condensing

Installation Category II and Pollution Degree 2 in accordance with IEC 664.

Equipment Disposal

This equipment must not be disposed of with unsorted waste. It is your responsibility

to correctly dispose of the equipment at life-cycle-end by handing it over to an authorized facility for separate collection and recycling. It is also your responsibility to decontaminate the equipment in case of biological, chemical and/or radiological contamination, so as to protect the persons involved in the disposal and recycling of the equipment from health hazards.

For more information about where you can drop off your waste of equipment, please contact your local dealer from whom you originally purchased this equipment. By doing so, you will help to conserve natural and environmental resources and you will ensure that your equipment is recycled in a manner that protects human health.

Safety Instructions

Please read the entire instruction manual before operating the Incubating Orbital/ Microplate Shaker.

WARNING! DO NOT use the Incubating Orbital/Microplate Shaker in a hazardous atmosphere or with hazardous materials for which the unit was not designed. Also, the user should be aware that the protection provided by the equipment may be impaired if used with accessories not provided or recommended by the manufacturer, or used in a manner not specified by the manufacturer.

Always operate unit on a level surface for best performance and maximum safety.

DO NOT lift unit by the tray or lid.

CAUTION! To avoid electrical shock, completely cut off power to the unit by disconnecting the power cord from the unit or unplug from the wall outlet. Disconnect unit from the power supply prior to maintenance and servicing.

Spills should be removed promptly. **DO NOT** immerse the unit for cleaning.

DO NOT operate the unit if it shows signs of electrical or mechanical damage.

CAUTION! The caution hot indicator light warns that the temperature of the top plate is above 40°C. The light will illuminate and remain lit when the temperature of the top plate reaches approximately 40°C. When the heat is turned off, the caution hot indicator light will stay lit until the temperature of the top plate is less than 40°C.

Earth Ground - Protective Conductor Terminal

Alternating Current

Standards & Regulations

Henry Troemner LLC hereby declares under it's sole responsibility that the construction of this product conforms in accordance with the following standards:

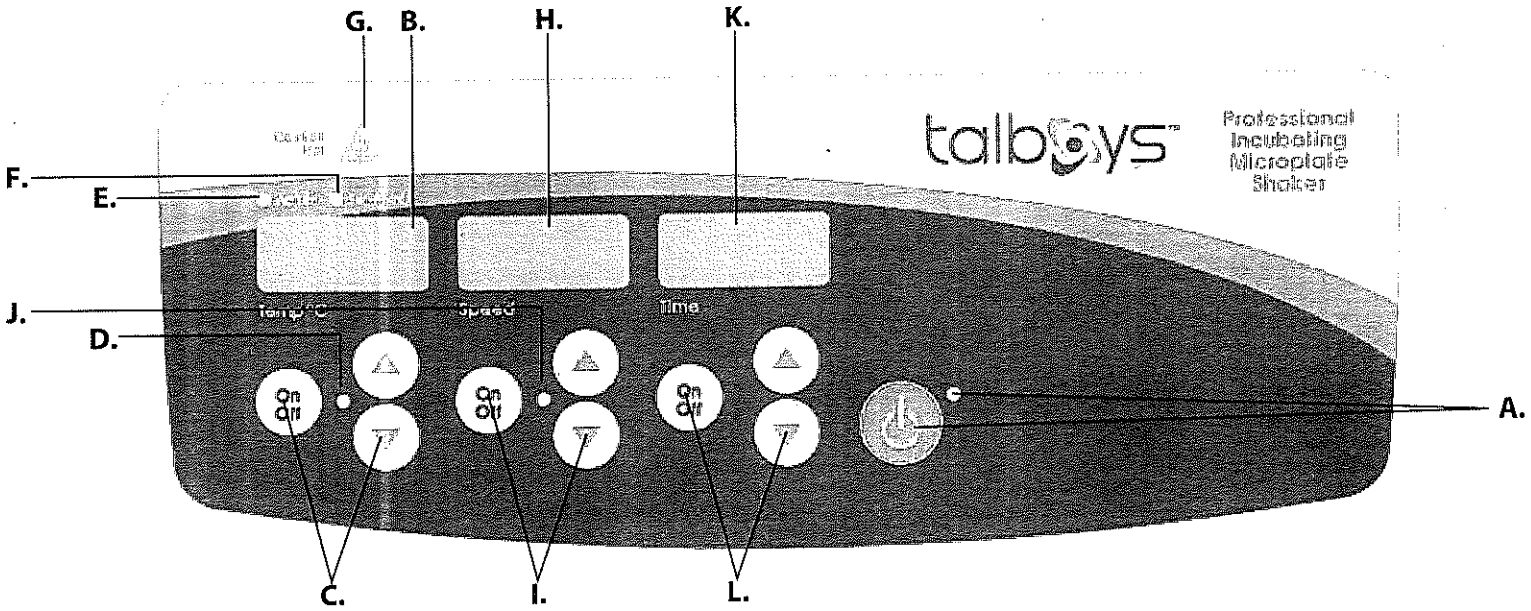
Associated EU directives:
EMC directive 2004/108/EC
LVD directive 2006/95/EC
ROHS directive 2011/65/EU
WEEE directive 2002/96/EC

Safety standards:
IEC 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use. Part I: General Requirements.

CSA/CAN C22.2 No. 61010-1-04
CSA/CAN C22.2 No. 61010-2-051-04
CSA/CAN C22.2 No. 0-M91
UL 61010-1

EMC standards:

IEC 45501	IEC 61000-4-3
EN 55022A	IEC 61000-4-4
IEC 6100-3-2	IEC 61000-4-5
IEC 6100-3-3	IEC 61000-4-6
IEC 61000-4-1	IEC 61000-4-11
IEC 61000-4-2	



Control Panel

The front panel of the Incubating Orbital/Microplate Shaker contains all the controls and displays needed to operate the unit.

A. Standby button/standby indicator light: The standby indicator light will illuminate when the unit is plugged in. The unit will be in standby mode. Press the standby button to activate the temperature, speed and time functions. The standby indicator light will shut off and the temperature, speed and time displays will illuminate. Press the standby button again and the unit will once again be in standby mode.

B. Temperature display: Displays the actual/set-point temperatures in conjunction with the actual/set-point indicator lights. **C.** Up/down arrows for set-point control. On/off button starts/stops the heating function. **D.** The heat indicator light will be illuminated when the unit is heating.

E. Actual indicator light: Illuminates when the temperature displayed is the actual temperature of the air in the chamber.

F. Set-point indicator light: Illuminates when the set-point temperature is displayed.

G. Caution hot indicator light: Illuminates when the air temperature of the chamber is above 40°C (104°F).

H. Speed display: Displays the speed of the shaker. **I.** Up/down arrows for set-point control. On/off button starts/stops shaking function. **J.** The speed indicator light will be illuminated when the unit is shaking.

K. Time display: Displays accumulated time (continuous mode) or how much time is remaining (timed mode). The display range is from 0 to 9,999 minutes in one (1) second increments. The display will indicate minutes and seconds until the timer reaches 99 minutes and 59 seconds (99:59), then the display will automatically display minutes up to 9,999. **L.** Up/down arrows for set-point control. On/off button starts/stops the time function.

Professional 1000-3 Incubating Orbital Shaker Specifications

Overall dimensions (L x W x H):	17 x 11 x 10.5" (43.2 x 27.9 x 26.7cm)
Interior dimensions (L x W x H):	11.3 x 8.3 x 5.4" (28.7 x 21.1 x 13.7cm)
Tray dimensions (L x W):	11 x 7.75" (27.9 x 19.7cm)
Electrical (50/60 Hz):	120 volts, 5 amps, 450 watts 230 volts, 5 amps, 450 watts
Fuses:	5mm x 20mm, 5 amp quick acting
Temperature range:	ambient +5°C to 65°C
Temperature uniformity:	±0.5°C at 37°C
Speed range:	100 to 1200rpm
Speed accuracy:	±2% of set speed up to 999rpm ±5% 1000 to 1200rpm
Timer:	1 second to 9999 minutes (increased in 1 second increments)
Orbit:	0.125" (3mm)
Maximum weight capacity:	~ 8lbs (3.6kg), up to 1000rpm ~ 5lbs (2.3kg), over 1000rpm
Controls:	see page 4
Tray material:	aluminum
Ship weight:	30lbs (13.6kg)

Professional 1000-3 Incubating Orbital Shaker Set-Up

The Incubating Orbital Shaker is supplied with a tray designed to hold a variety of accessories.

1. Flat containers can be shaken by placing them on the tray.
2. The tray also has mounting holes ready for use with the flask clamps or test tube racks.

See page 13, for optional accessories and unit capacities.

PROFESSIONAL 1000MP INCUBATING MICROPLATE SHAKER SPECIFICATIONS

Professional 1000MP Incubating Microplate Shaker with microplates

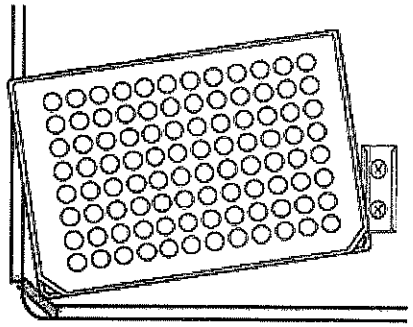
Overall dimensions (L x W x H):	17 x 11 x 7.75" (43.2 x 27.9 x 19.7cm)
Tray dimensions (L x W):	11 x 7.75" (27.9 x 19.7cm)
Electrical (50/60 Hz):	120 volts, 5 amps, 450 watts 230 volts, 5 amps, 450 watts
Fuses:	5mm x 20mm, 5 amp quick acting
Temperature range:	ambient +5°C to 65°C
Temperature uniformity:	±0.5°C at 37°C
Speed range:	100 to 1200rpm
Speed accuracy:	±2% of set speed up to 999rpm ±5% 1000 to 1200rpm
Timer:	1 second to 9999 minutes (increased in 1 second increments)
Orbit:	0.125" (3mm)
Capacity:	4 microplates or 2 micro-tube racks
Controls:	see page 4
Tray material:	aluminum
Ship weight:	30lbs (13.6kg)

PROFESSIONAL 1000MP INCUBATING MICROPLATE SHAKER SET-UP

The Incubating Microplate Shaker is designed to hold two (2) or four (4) microplates, or two (2) Micro-Tube Racks.

1. Place two (2) microplates or deep well blocks diagonally on the tray, or place four (4) microplates or deep well blocks on the tray. The plates/blocks do not have to be filled.
2. Place the corner of the plate/block under the spring located at each corner of the tray.
3. Slide plate/block into place. You are ready to use.

2.



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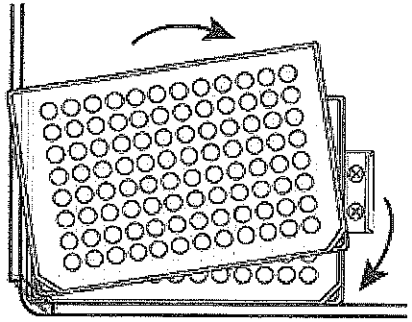

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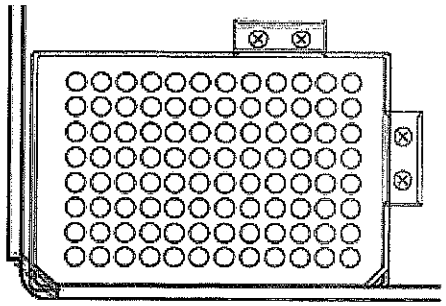
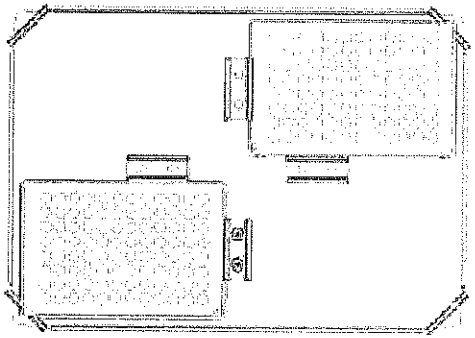
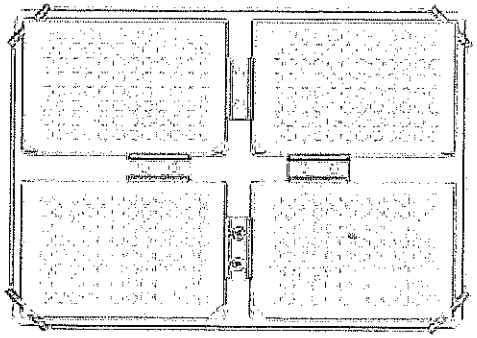


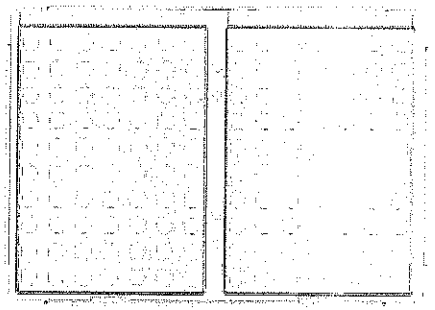
PROFESSIONAL 1000MP INCUBATING MICROPLATE SHAKER TRAY CONFIGURATIONS



(2) microplates



(4) microplates



(2) Micro-Tube Racks

NOTE: The tray on the Incubating Microplate Shaker is not designed to hold flask clamps.

Professional Incubating Orbital/Microplate Shaker Operating Instructions

The Incubating Orbital/Microplate Shakers have been designed for the temperature, speed and time functions to work independently of one another. The temperature and speed can be reset without resetting the timer and the timer can be stopped and started without interrupting the heating and shaking functions.

1. **Getting ready:**
   a. Plug the power cord into a properly ground outlet. The standby indicator light will illuminate, verifying power to the unit.
   b. Press the standby button to move the unit from standby mode. The standby indicator light will turn off and the temperature, speed and time displays will illuminate, displaying the previously used settings.

2. **Setting temperature:**
   a. Press the up/down arrows below the temperature display until you reach the desired temperature. When you release the button, the display will blink off and then on indicating the new set temperature has been accepted.
   b. Press the on/off button to start the heating function. The indicator light below the temperature display will illuminate to indicate the heating function is in use and remain lit until heating has ceased.
   c. Temperature adjustments can be made without interrupting heating by using the up/down arrows below the temperature display. After the change has been made and you release the button, the display will blink off and then on indicating the new set temperature has been accepted.
   d. To stop the heating function, press the on/off button below the temperature display. The heat indicator light will turn off.

CAUTION HOT indicator:

The caution hot indicator light warns that the temperature of the air in the chamber is above 40°C (104°F). The light will illuminate and remain lit when the temperature of the air in the chamber reaches approximately 40°C (104°F). When the heat is turned off, the caution hot indicator light will stay lit until the temperature of the air in the chamber is less than 40°C (104°F).

3. **Setting speed:**
   a. Press the up/down arrows below the speed display until you reach the desired speed. When you release the button, the display will blink off and then on indicating the new set speed has been accepted.
   b. Press the on/off button to start the shaking function. The indicator light below the speed display will illuminate to indicate the shaking function is in use and remain lit until shaking has ceased. The microprocessor controlled ramping feature slowly increases speed until the set-point is reached which helps to avoid splashing, and provides excellent low end control.
   c. Speed adjustments can be made without interrupting shaking by using the up/down arrows below the speed display. After the change has been made and you release the button, the display will blink off and then on indicating the new set speed has been accepted.
   d. To stop the shaking function, press the on/off button below the speed display. The speed indicator light will turn off.

4. **Setting time to zero (0:00) and continuous mode:** Accumulated time.
   a. Press and hold the on/off button below the time display. After three (3) seconds the display will indicate the previous set time.
   b. Simultaneously press both the up and down arrows, the display will indicate zero (0:00). The unit time is now set to zero (0:00) minutes. Alternately, you can use the up/down arrows to get to zero (0:00).
   c. Press the on/off button below the time display. The display will indicate the accumulated time. The up/down arrows will become inactive. To stop timer, press the on/off button again. **IMPORTANT:** This will **NOT** interrupt the shaking function. Press the on/off button below the speed display to interrupt the shaking function.
   d. To reset, press and hold the on/off button below the time display. After three (3) seconds the display will indicate the previous set time, which was zero (0:00).

5. **Setting timed mode:** Programmed time.
   a. Press the up/down arrows below the time display until you reach the desired time.
   b. Start this function by pressing the on/off button below the time display. The unit will run for the selected time, the up/down arrows will become inactive while the timer is running. The unit will stop shaking when the time display reaches zero (0:00). Four (4) audible beeps will indicate the count down function is complete. The time display will default back to the set time. To repeat for the same time, simply press the on/off button again.
   c. To interrupt an automatic timing cycle before it is completed, press the on/off button below the time display. The display will flash off and on to indicate the time function is on "hold". **IMPORTANT:** This will **NOT** interrupt the shaking function. Press the on/off button below the speed display to interrupt the shaking function. Restart the timer by pressing the on/off button below the time display. Unit will continue counting down to zero (0:00). When the display reaches zero (0:00), you will hear the four (4) audible beeps that indicate the count down function is complete and the shaking function will cease.

6. **Turning unit off:**
   a. To turn the unit off, press the standby button. The temperature, speed and time displays will be blank, the standby indicator light will illuminate. The Incubating Orbital/Microplate Shaker should be kept in standby mode when not in use. To completely cut off power to the unit, disconnect the power cord from the unit or unplug from the wall outlet.

OPERATING TIPS

As a safety feature, a built-in program will shut power off to the motor if the tray is prevented from rotating, or the unit is overloaded beyond its recommended weight capacity.

Built-in memory maintains the last used temperature, speed and time settings during a power interruption.

SINGLE POINT CALIBRATION PROCEDURE

This procedure is used to fine tune and calibrate the Incubating Mini-Microplate Shaker at a specific temperature setting. This process may be repeated for up to three (3) separate set-points. If a fourth calibration set-point is entered, the first set-point entered will be overwritten.

1. Turn unit on.
2. Set desired temperature.
3. Stabilize one (1) hour or more, measuring the temperature with a temperature probe/thermometer.
4. Press and hold standby button, then press the temperature up arrow once. The unit will beep two (2) times, confirming calibration mode. The display will now be flashing.
5. Press the temperature up/down arrows until the display matches the temperature probe/thermometer.
6. Press standby button to exit calibration mode and return to normal heating.

This process may be repeated at the same set-point, multiple times for fine tuning if desired.

The unit will now use the biased offset for that specific temperature setting and increase or decrease temperature accordingly to bring the temperature to set temperature. The decimal point of the display will flash to indicate a biased offset is being used. All other temperature settings will use the standard internal calibration. This offset will be stored in memory and retained until reset.

To restore unit to factory setting:

Press and hold the standy button while pressing the temperature down arrow once. The reset will be confirmed with two (2) audible beeps. Press the standby button to exit calibration mode and return to normal heating.

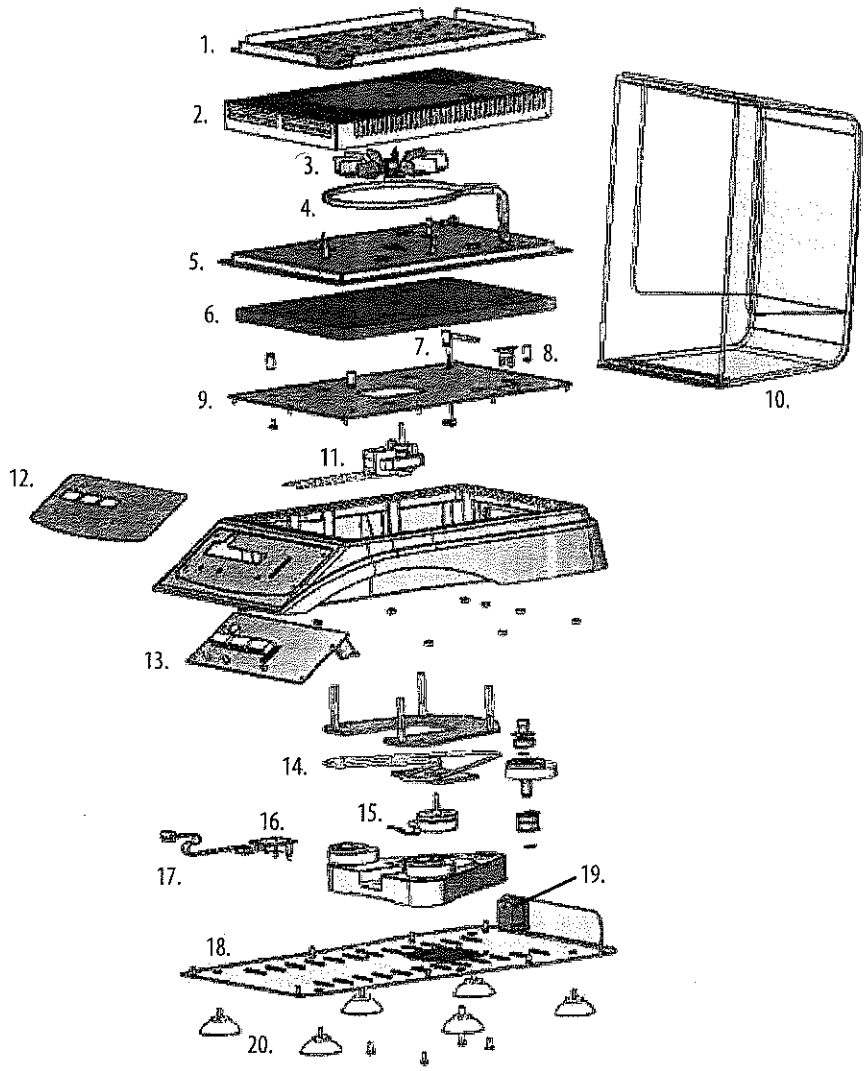
During operation, any rattling or ticking sounds may indicate a loose screw on the tray, a tray attachment or an accessory. All accessories should be sufficiently tightened in place before starting the unit.

TROUBLESHOOTING

To clear error press the standby button

Problem	Cause	Solution
Unit fails to power on	Missing or blown fuse	Add or replace fuse as necessary. If problem persists, please contact your Talboys Representative for repair.
Unit is excessively noisy	Rattling or ticking sounds may indicate a loose screw on the tray	Ensure that tray is secured tightly. If problem persists, please contact your Talboys Representative for repair.
E1	RTD open or over temperature	This error cannot be fixed by end user. Please contact your Talboys Representative for repair.
E2	RTD shorted or temperature below 0°C	This error cannot be fixed by end user. Please contact your Talboys Representative for repair.
E3	Drive system failure Loose suction cup foot Ceased bearing Drive belt broken	Remove the mechanical obstruction. In the event a foot (suction cup) has come loose from the bench top, firmly press down on the four (4) corners of the unit creating a strong suction to the work surface (**DO NOT** place on bench mat). If problem persists, please contact your Talboys Representative for repair.
E4	Unit overload Or Loose suction cup foot	Ensure the load is evenly distributed and does not exceed the maximum load capacity for the unit. In the event a foot (suction cup) has come loose from the bench top, firmly press down on the four (4) corners of the unit creating a strong suction to the work surface (**DO NOT** place on bench mat). If problem persists, please contact your Talboys Representative for repair.
E5	Unit temperature is above 80°C	Press the standby button to turn the unit off and allow it to cool. If the E5 error persists, switch the unit off and contact your Talboys representative for repair.

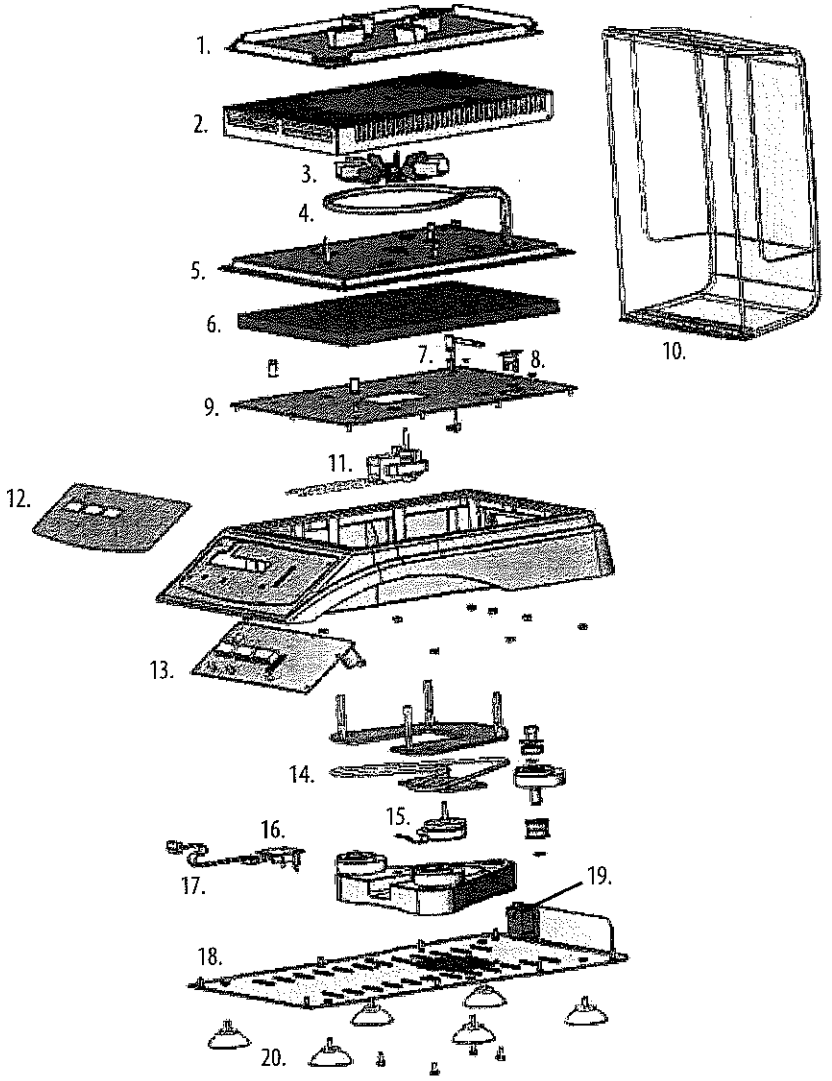
Professional 1000-3 Incubating Orbital Shaker Replacement Parts



Description		Part Number
1. Tray		580056-00
2. Incubator housing		280319-00
3. Heater fan		280357-00
4. Heater:	120V:	380710-00
	230V:	380711-00
5. Base plate, incubator		280320-00
6. Insulation		280322-00
7. Temperature sensor, RTD		380721-00
8. Thermostat		380723-00
9. Top plate, incubator		280978-00
10. Lid		280309-00
11. Motor fan:	120V:	380731-00
	230V:	380732-00
12. Front panel membrane switch		385701-00
13. Display board		380717-00
14. Belt		580019-00
15. Motor		380712-00
16. Motor transition board		380715-00
17. Connection cable		380720-00
18. Base plate		380304-00
19. IEC power entry module		386122-00
20. Feet (suction cup)		545014-00
Detachable 92" (234cm) power cord:	120V:	330100-00
	Euro plug:	330101-00

Professional 1000MP Incubating Microplate Shaker Replacement Parts

Description		Part Number
1. Tray assembly		880761-00
2. Incubator housing		280319-00
3. Heater fan		280357-00
4. Heater:	120V:	380710-00
	230V:	380711-00
5. Base plate, incubator		280320-00
6. Insulation		280322-00
7. Temperature sensor, RTD		380721-00
8. Thermostat		380723-00
9. Top plate, incubator		280978-00
10. Lid:	clear:	280308-00
	opaque:	280349-00
11. Motor fan:	120V:	380731-00
	230V:	380732-00
12. Front panel membrane switch		385700-00
13. Display board		380717-00
14. Belt		580019-00
15. Motor		380712-00
16. Motor transition board		380715-00
17. Connection cable		380720-00
18. Base plate		280304-00
19. IEC power entry module		386122-00
20. Feet (suction cup), clear lid		545014-00
Feet (sorbothane), opaque lid		280959-00
Detachable 92" (234cm) power cord:	120V:	330100-00
	Euro plug:	330101-00



Accessories

Test Tube Racks

Description	Tube Capacity	Platform Capacity	Part Number
10 to 13mm Test Tube Rack	63	1	980193
14 to 16mm Test Tube Rack	48	1	980194
18 to 20mm Test Tube Rack	35	1	980195
22 to 25mm Test Tube Rack	24	1	980196
15mL Centrifuge Tube Rack	35	1	980198
50mL Centrifuge Tube Rack	12	1	980199
1.5 to 2mL Micro-Tube Rack	70	2	980191

Flask Clamps

Description	Material	Platform Capacity	Part Number
10mL Erlenmeyer Flask Clamp	Stainless Steel	35	980078
25mL Erlenmeyer Flask Clamp	Stainless Steel	20	980079
50mL Erlenmeyer Flask Clamp	Stainless Steel	12	980080
125mL Erlenmeyer Flask Clamp	Stainless Steel	8	980081
250mL Erlenmeyer Flask Clamp	Stainless Steel	5	980082
125mL Erlenmeyer Flask Clamp	PVC	8	980428
250mL Erlenmeyer Flask Clamp	PVC	4	980429

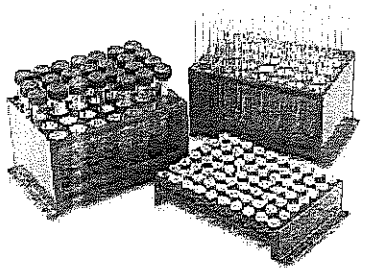
INSTALLATION OF ACCESSORIES

Installation of Test Tube Racks - Incubating Orbital Shaker

1. Unit should be in standby mode.
2. Align the clip on the rack to the right side of the tray.
3. Press the test tube rack in place, you will hear the test tube rack clip into position. No mounting screws are required.

Installation of 1.5 to 2mL Micro-Tube Rack - Incubating Microplate Shaker

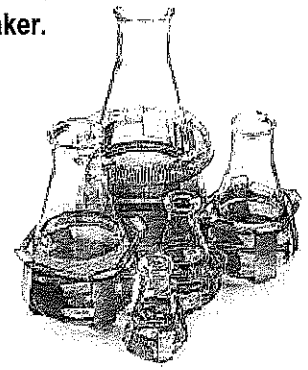
1. Unit should be in standby mode.
2. Align the Micro-Tube Rack side-to-side on the tray.
3. Press the Micro-Tube Rack in place, you will hear the Micro-Tube Rack clip into position. No mounting screws are required.



Installation of Flask Clamps - Incubating Orbital Shaker

1. Unit should be in standby mode.
2. Line up the hole(s) in the flask clamp to the hole(s) in the tray. Using the screw(s) provided, hand tighten into place using a flathead screwdriver. **DO NOT** over tighten.
3. Insert flask into clamp and wrap the spring around the neck of the clamp to hold secure.

Not for use with the Incubating Microplate Shaker.



VWR®
We Enable Science

Instruction Manual

Incubating Mini Shakers
Incubating Microplate Shakers

Table of Contents

Package Contents

Incubating Mini Shaker or Incubating Microplate Shaker
92" (234cm) detachable power cord
Instruction manual

Warranty

Manufacturer warrants this product to be free from defects in material and workmanship when used under normal conditions for five (5) years. Register your equipment or instrument online at: www.vwrsp.com/warranty for US residents or www.vwrcanlab.com/warranty for Canadian residents. For your reference, make a note of the serial number, date of purchase and supplier here.

Serial Number: _____

Date of Purchase: _____

Supplier: _____

Installation

Upon receiving the VWR Incubating Mini/Microplate Shaker, check to ensure that no damage has occurred during shipment. It is important that any damage that occurred in transport is detected at the time of unpacking. If you do find such damage the carrier must be notified immediately.

After unpacking, place the Incubating Mini/Microplate Shaker on a level bench or table, away from explosive vapors. Secure to an immovable work surface by pressing down on the four (4) corners of the unit, creating a strong suction to the work surface (**DO NOT** place on a bench mat). Ensure that the surface on which the unit is placed will withstand typical heat produced by the unit. Always place the unit on a sturdy work surface.

The Incubating Mini/Microplate Shaker is supplied with a power cord that is inserted into the IEC connector on the back of the unit first, then it can be plugged into a properly grounded outlet. The 120V unit plugs into a 120 volt, 50/60 Hz source. The 230V unit plugs into a 230 volt, 50/60 Hz source.

Maintenance & Servicing

The Incubating Mini/Microplate Shaker is built for long, trouble-free, dependable service. No lubrication or other technical user maintenance is required. However at least every three (3) months you should:

- Unplug the unit.
- Remove any accumulated dirt from the base and tray.
- Check all accessible items to make sure they are properly tightened.

Maintenance & Servicing (cont'd)

The unit should be given the care normally required for any electrical appliance. Avoid wetting or unnecessary exposure to fumes. Spills should be removed promptly. **DO NOT** use a cleaning agent or solvent on the front panel or lid which is abrasive or harmful to plastics, nor one which is flammable. Always ensure the power is disconnected from the unit prior to any cleaning. If the unit ever requires service, contact your VWR representative.

Environmental Conditions

Operating Conditions: Indoor use only.

Temperature:	5 to 40°C (41 to 104°F)
Humidity:	maximum 80% relative humidity, non-condensing
Altitude:	0 to 6,562 ft (2000 M) above sea level

Non-Operating Storage:

Temperature:	-20 to 65°C (-4 to 149°F)
Humidity:	maximum 80% relative humidity, non-condensing

Installation Category II and Pollution Degree 2 in accordance with IEC 664.

Safety Instructions

Please read the entire instruction manual before operating the Incubating Mini/Microplate Shaker.

WARNING! DO NOT use the Incubating Mini/Microplate Shaker in a hazardous atmosphere or with hazardous materials for which the unit was not designed. Also, the user should be aware that the protection provided by the equipment may be impaired if used with accessories not provided or recommended by the manufacturer, or used in a manner not specified by the manufacturer.

Always operate unit on a level surface for best performance and maximum safety.

DO NOT lift unit by the tray or lid.

CAUTION! To avoid electrical shock, completely cut off power to the unit by disconnecting the power cord from the unit or unplug from the wall outlet. Disconnect unit from the power supply prior to maintenance and servicing.

Spills should be removed promptly. **DO NOT** immerse the unit for cleaning.

DO NOT operate the unit if it shows signs of electrical or mechanical damage.

Earth Ground - Protective Conductor Terminal

Alternating Current

Standards & Regulations

Troemner, LLC hereby declares under it's sole responsibility that the construction of this product conforms in accordance with the following standards:

Safety standards:

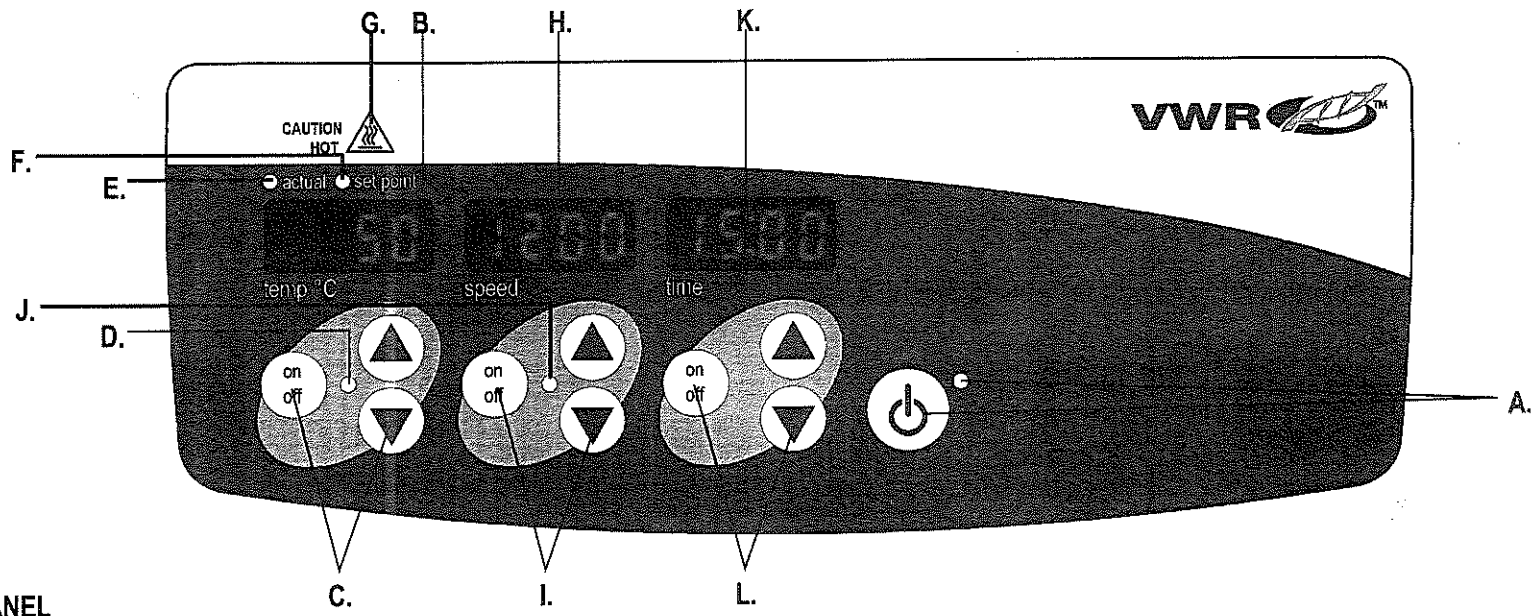
IEC 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use. Part I: General Requirements.
IEC 61010-2-010	Part II: Particular requirements for laboratory equipment for the heating of materials.
IEC 61010-2-051	Part II: Particular requirements for laboratory equipment for mixing and stirring.

UL Std. No. 61010-1
CSA/CAN C22.2 No. 0-M91
CSA/CAN C22.2 No. 61010-1-04

EMC standards:

FCC-B	EN55022-B
EN6100-3-3	EN6100-4-5
EN61000-4-2	EN61000-4-3
EN61000-4-4	EN61000-4-6
EN61000-4-11	EN61326-1 Class A

Associated EU guidelines:
EMC directive 2004/108/EC
LVD directive 2006/95/EC
RoHS directive 2011/65/EU



Control Panel

The front panel of the Incubating Mini/Microplate Shaker contains all the controls and displays needed to operate the unit.

A. Standby button/standby indicator light: The standby indicator light will illuminate when the unit is plugged in. The unit will be in standby mode. Press the standby button to activate the temperature, speed and time functions. The standby indicator light will shut off and the temperature, speed and time displays will illuminate. Press the standby button again and the unit will once again be in standby mode.

B. Temperature display: Displays the actual/set-point temperatures in conjunction with the actual/set-point indicator lights. **C.** Up/down arrows for set-point control. On/off button starts/stops the heating function. **D.** The heat indicator light will be illuminated when the unit is heating.

E. Actual indicator light: Illuminates when the temperature displayed is the actual temperature of the air in the chamber.

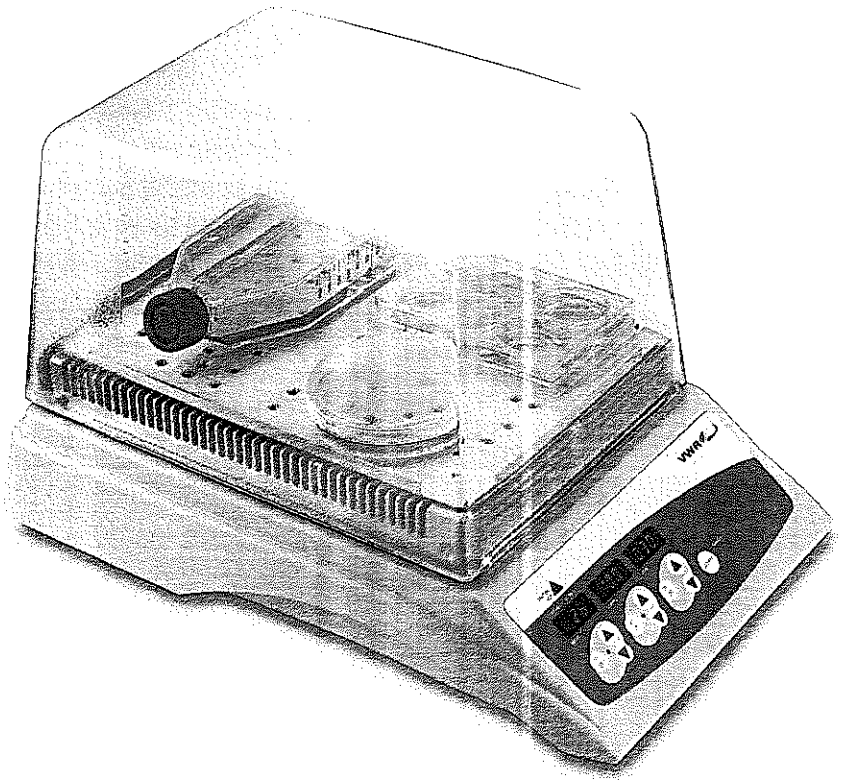
F. Set-point indicator light: Illuminates when the set-point temperature is displayed.

G. Caution hot indicator light: Illuminates when the air temperature of the chamber is above 40°C (104°F).

H. Speed display: Displays the speed of the shaker. **I.** Up/down arrows for set-point control. On/off button starts/stops shaking function. **J.** The speed indicator light will be illuminated when the unit is shaking.

K. Time display: Displays accumulated time (continuous mode) or how much time is remaining (timed mode). The display range is from 0 to 9,999 minutes in one (1) second increments. The display will indicate minutes and seconds until the timer reaches 99 minutes and 59 seconds (99:59), then the display will automatically display minutes up to 9,999. **L.** Up/down arrows for set-point control. On/off button starts/stops the time function.

INCUBATING MINI SHAKER SPECIFICATIONS



Incubating Mini Shaker with plasticware

Overall dimensions (L x W x H):	17 x 11 x 10.5" (43.2 x 27.9 x 26.7cm)
Interior dimensions (L x W x H):	11.3 x 8.3 x 5.4" (28.7 x 21.1 x 13.7cm)
Tray dimensions (L x W):	11 x 7.75" (27.9 x 19.7cm)
Electrical (50/60 Hz):	120 volts, 5 amps, 450 watts 230 volts, 5 amps, 450 watts
Fuses:	5mm x 20mm, 5 amp quick acting
Temperature range:	ambient +5°C to 65°C
Temperature uniformity:	±0.5°C at 37°C
Speed range:	100 to 1200rpm
Speed accuracy:	±2% of set speed up to 999rpm ±5% 1000 to 1200rpm
Timer:	1 second to 9999 minutes (increased in 1 second increments)
Orbit:	0.125" (3mm)
Maximum weight capacity:	~ 8lbs (3.6kg), up to 1000rpm ~ 5lbs (2.3kg), over 1000rpm
Controls:	see page 4
Tray material:	aluminum
Ship weight:	30lbs (13.6kg)

Incubating Mini Shaker Set-Up

The Incubating Mini Shaker is supplied with a tray designed to hold a variety of accessories.

1. Flat containers can be shaken by placing them on the tray.
2. The tray also has mounting holes ready for use with the flask clamps or test tube racks.

See page 14, for optional accessories and unit capacities.

INCUBATING MICROPLATE SHAKER SPECIFICATIONS

Incubating Microplate Shaker with microplates

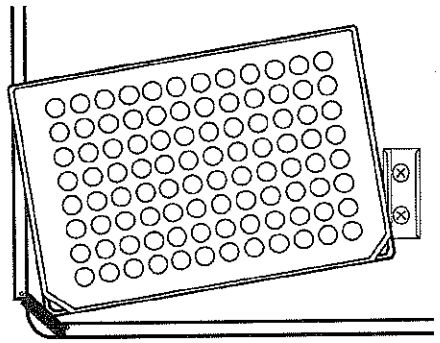
Overall dimensions (L x W x H):	17 x 11 x 7.75" (43.2 x 27.9 x 19.7cm)
Tray dimensions (L x W):	11 x 7.75" (27.9 x 19.7cm)
Electrical (50/60 Hz):	120 volts, 5 amps, 450 watts 230 volts, 5 amps, 450 watts
Fuses:	5mm x 20mm, 5 amp quick acting
Temperature range:	ambient +5°C to 65°C
Temperature uniformity:	±0.5°C at 37°C
Speed range:	100 to 1200rpm
Speed accuracy:	±2% of set speed up to 999rpm ±5% 1000 to 1200rpm
Timer:	1 second to 9999 minutes (increased in 1 second increments)
Orbit:	0.125" (3mm)
Capacity:	4 microplates or 2 Micro-Tube Racks
Controls:	see page 4
Tray material:	aluminum
Ship weight:	30lbs (13.6kg)

INCUBATING MICROPLATE SHAKER SET-UP

The Incubating Microplate Shaker is designed to hold two (2) or four (4) microplates, or two (2) Micro-Tube Racks.

1. Place two (2) microplates or deep well blocks diagonally on the tray, or place four (4) microplates or deep well blocks on the tray. The plates/blocks do not have to be filled.
2. Place the corner of the plate/block under the spring located at each corner of the tray.
3. Slide plate/block into place. You are ready to use.

2.



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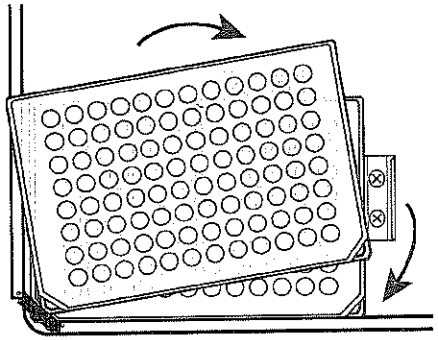

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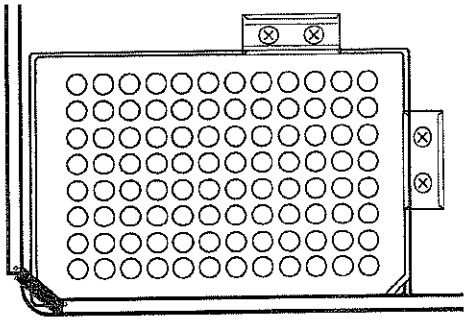
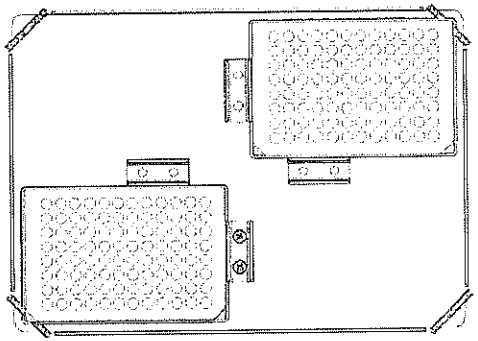
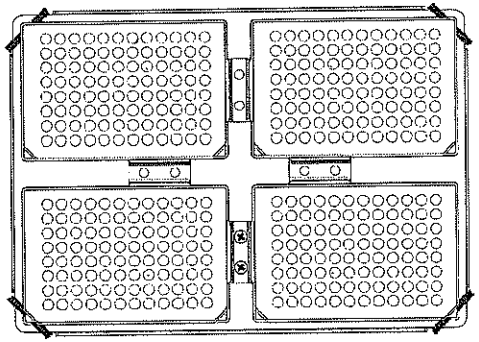


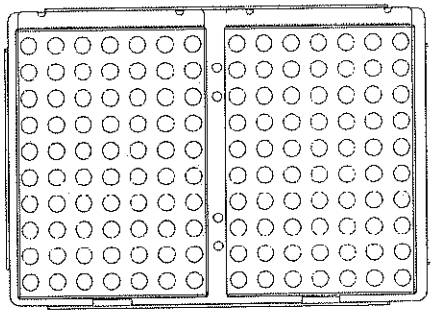
INCUBATING MICROPLATE SHAKER TRAY CONFIGURATIONS



(2) microplates



(4) microplates



(2) Micro-Tube Racks

NOTE: The tray on the Incubating Microplate Shaker is not designed to hold flask clamps.

Incubating Mini and Microplate Shaker Operating Instructions

The Incubating Mini/Microplate Shakers have been designed for the temperature, speed and time functions to work independently of one another. The temperature and speed can be reset without resetting the timer and the timer can be stopped and started without interrupting the heating and shaking functions.

1. **Getting ready:**
   a. Plug the power cord into a properly ground outlet. The standby indicator light will illuminate, verifying power to the unit.
   b. Press the standby button to move the unit from standby mode. The standby indicator light will turn off and the temperature, speed and time displays will illuminate, displaying the previously used settings.

2. **Setting temperature:**
   a. Press the up/down arrows below the temperature display until you reach the desired temperature. When you release the button, the display will blink off and then on indicating the new set temperature has been accepted.
   b. Press the on/off button to start the heating function. The indicator light below the temperature display will illuminate to indicate the heating function is in use and remain lit until heating has ceased.
   c. Temperature adjustments can be made without interrupting heating by using the up/down arrows below the temperature display. After the change has been made and you release the button, the display will blink off and then on indicating the new set temperature has been accepted.
   d. To stop the heating function, press the on/off button below the temperature display. The heat indicator light will turn off.

CAUTION HOT indicator:
The caution hot indicator light warns that the temperature of the air in the chamber is above 40°C (104°F). The light will illuminate and remain lit when the temperature of the air in the chamber reaches approximately 40°C (104°F). When the heat is turned off, the caution hot indicator light will stay lit until the temperature of the air in the chamber is less than 40°C (104°F).

3. **Setting speed:**
   a. Press the up/down arrows below the speed display until you reach the desired speed. When you release the button, the display will blink off and then on indicating the new set speed has been accepted.
   b. Press the on/off button to start the shaking function. The indicator light below the speed display will illuminate to indicate the shaking function is in use and remain lit until shaking has ceased. The microprocessor controlled ramping feature slowly increases speed until the set-point is reached which helps to avoid splashing, and provides excellent low end control.
   c. Speed adjustments can be made without interrupting shaking by using the up/down arrows below the speed display. After the change has been made and you release the button, the display will blink off and then on indicating the new set speed has been accepted.
   d. To stop the shaking function, press the on/off button below the speed display. The speed indicator light will turn off.

4. **Setting time to zero (0:00) and continuous mode:** Accumulated time.
   a. Press and hold the on/off button below the time display. After three (3) seconds the display will indicate the previous set time.

b. Simultaneously press both the up and down arrows, the display will indicate zero (0:00). The unit time is now set to zero (0:00) minutes. Alternately, you can use the up/down arrows to get to zero (0:00).
c. Press the on/off button below the time display. The display will indicate the accumulated time. The up/down arrows will become inactive. To stop timer, press the on/off button again. **IMPORTANT:** This will **NOT** interrupt the shaking function. Press the on/off button below the speed display to interrupt the shaking function.
d. To reset, press and hold the on/off button below the time display. After three (3) seconds the display will indicate the previous set time, which was zero (0:00).

5. **Setting timed mode:** Programmed time.
   a. Press the up/down arrows below the time display until you reach the desired time.
   b. Start this function by pressing the on/off button below the time display. The unit will run for the selected time, the up/down arrows will become inactive while the timer is running. The unit will stop shaking when the time display reaches zero (0:00). Four (4) audible beeps will indicate the count down function is complete. The time display will default back to the set time. To repeat for the same time, simply press the on/off button again.
   c. To interrupt an automatic timing cycle before it is completed, press the on/off button below the time display. The display will flash off and on to indicate the time function is on "hold". **IMPORTANT:** This will **NOT** interrupt the shaking function. Press the on/off button below the speed display to interrupt the shaking function. Restart the timer by pressing the on/off button below the time display. Unit will continue counting down to zero (0:00). When the display reaches zero (0:00), you will hear the four (4) audible beeps that indicate the count down function is complete and the shaking function will cease.

6. **Turning unit off:**
   a. To turn the unit off, press the standby button. The temperature, speed and time displays will be blank, the standby indicator light will illuminate. The Incubating Mini/Microplate Shaker should be kept in standby mode when not in use. To completely cut off power to the unit, disconnect the power cord from the unit or unplug from the wall outlet.

OPERATING TIPS

As a safety feature, a built-in program will shut power off to the motor if the tray is prevented from rotating, or the unit is overloaded beyond its recommended weight capacity.

Built-in memory maintains the last used temperature, speed and time settings during a power interruption.

SINGLE POINT CALIBRATION PROCEDURE

This procedure is used to fine tune and calibrate the Incubating Mini-Microplate Shaker at a specific temperature setting. This process may be repeated for up to three (3) separate set-points. If a fourth calibration set-point is entered, the first set-point entered will be overwritten.

1. Turn unit on.
2. Set desired temperature.
3. Stabilize one (1) hour or more, measuring the temperature with a temperature probe/thermometer.
4. Press and hold standby button, then press the temperature up arrow once. The unit will beep two (2) times, confirming calibration mode. The display will now be flashing.
5. Press the temperature up/down arrows until the display matches the temperature probe/thermometer.

6. Press standby button to exit calibration mode and return to normal heating.

This process may be repeated at the same set-point, multiple times for fine tuning if desired.

The unit will now use the biased offset for that specific temperature setting and increase or decrease temperature accordingly to bring the temperature to set temperature. The decimal point of the display will flash to indicate a biased offset is being used. All other temperature settings will use the standard internal calibration. This offset will be stored in memory and retained until reset.

To restore unit to factory setting:
Press and hold the standby button while pressing the temperature down arrow once. The reset will be confirmed with two (2) audible beeps. Press the standby button to exit calibration mode and return to normal heating.

TROUBLESHOOTING

During operation, any rattling or ticking sounds may indicate a loose screw on the tray, a tray attachment or an accessory. All accessories should be sufficiently tightened in place before starting the unit.

Error Code	Software Test	Cause
E04	unit overloaded	maximum load exceeded
		loose foot (suction cup) *

Press the standby button to clear this error. Be sure the load is within the maximum load capacity before restarting the unit. If the E04 error persists, switch the unit off and contact your VWR representative for repairs.

Error Code	Software Test	Cause
E03	drive system failure	ceased bearing
		drive belt broken
		mechanical obstruction
		loose foot (suction cup) *

Press the standby button to clear this error and remove the mechanical obstruction. If the E03 error persists the reason may be a ceased bearing or broken drive belt and should **NOT** be addressed by the end user. Switch the unit off and contact your VWR representative for repairs.

* In the event a foot (suction cup) has come loose from the bench top, the unit will register an errant E04 or E03 error message due to the instability of the unit. Press the standby button to clear this error. Firmly press down on the four (4) corners of the unit, creating a strong suction to the work surface (**DO NOT** place on bench mat). Press the standby button to resume operation.

Error Code	Cause
E02	RTD shorted or temperature below 0°C (32°F)
E01	RTD open or temperature over 100°C (212°F)

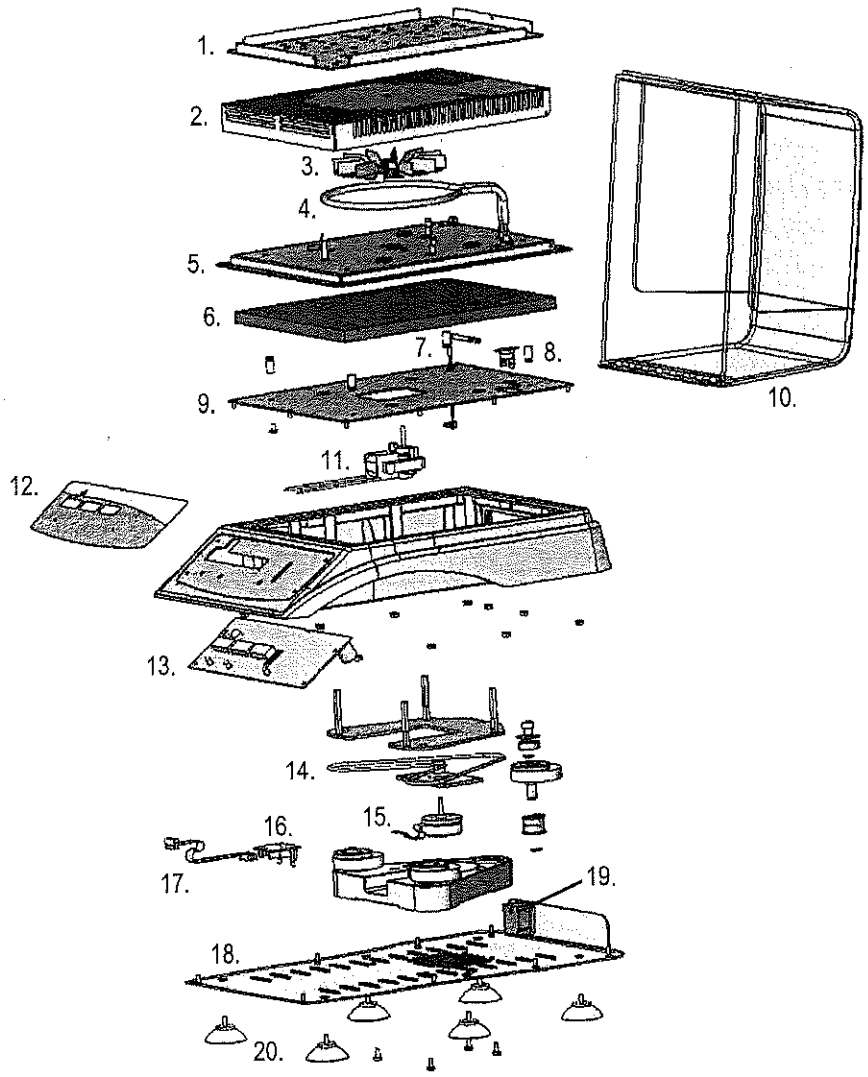
The E02 and E01 errors should **NOT** be addressed by the end user. Switch the unit off and contact your VWR representative for repairs.

Error Code	Cause
E05	Unit temperature is above 80°C (176°F)

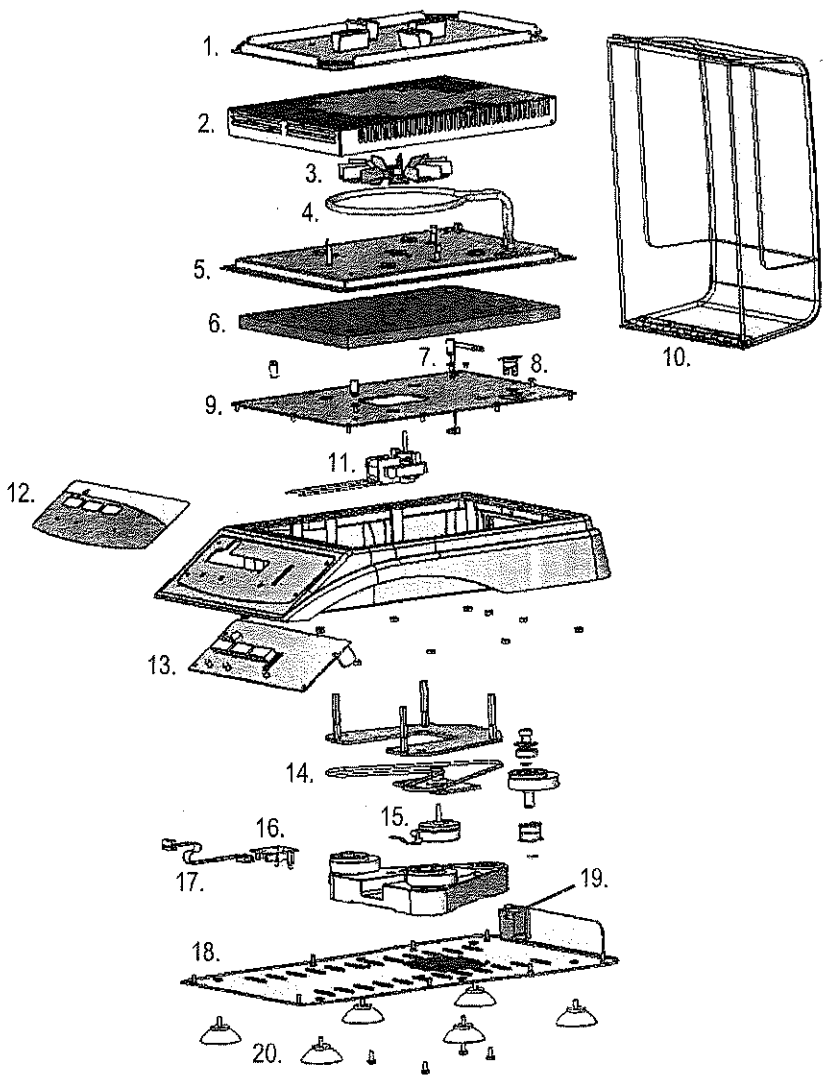
Press the standby button to turn the unit off and allow it to cool. If the E05 error persists, switch the unit off and contact your VWR representative for repair.

INCUBATING MINI SHAKER REPLACEMENT PARTS

DESCRIPTION		PART NUMBER
1. Tray		580056-00
2. Incubator housing		280319-00
3. Heater fan		280357-00
4. Heater,	120V	380710-00
	230V	380711-00
5. Base plate, incubator		280320-00
6. Insulation		280322-00
7. Temperature sensor, RTD		380721-00
8. Thermostat		380723-00
9. Top plate, incubator		280321-00
10. Lid,		280309-00
11. Motor fan, 120V		380731-00
	230V	380732-00
12. Front panel membrane switch		380706-00
13. Display board		380824-00
14. Belt		580019-00
15. Motor		380712-00
16. Motor transition board		380715-00
17. Connection cable		380720-00
18. Base plate		280304-00
19. IEC power entry module		386122-00
20. Feet (suction cup)		545014-00
Detachable 92" (234cm) power cord:	120V	330100-00
	EURO	330101-00



INCUBATING MICROPLATE SHAKER REPLACEMENT PARTS



DESCRIPTION		PART NUMBER
1. Tray assembly		880761-00
2. Incubator housing		280319-00
3. Heater fan		280357-00
4. Heater,	120V	380710-00
	230V	380711-00
5. Base plate, incubator		280320-00
6. Insulation		280322-00
7. Temperature sensor, RTD		380721-00
8. Thermostat		380723-00
9. Top plate, incubator		280321-00
10. Lid,	clear	280308-00
	opaque	280349-00
11. Motor fan,	120V	380731-00
	230V	380732-00
12. Front panel membrane switch		380705-00
13. Display board		380824-00
14. Belt		580019-00
15. Motor		380712-00
16. Motor transition board		380715-00
17. Connection cable		380720-00
18. Base plate		280304-00
19. IEC power entry module		386122-00
20. Feet (suction cup), clear lid		545014-00
Feet (sorbothane), opaque lid		280959-00
Detachable 92" (234cm) power cord:	120V	330100-00
	EURO	330101-00

TEST TUBE RACKS

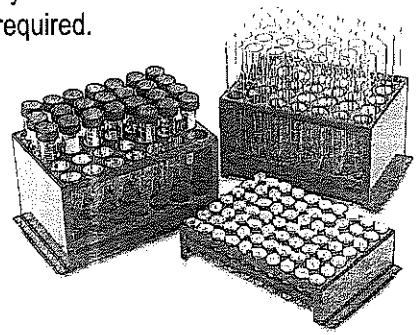
DESCRIPTION	TUBE CAPACITY	PLATFORM CAPACITY	CAT. NO.
10 to 13mm Test Tube Rack	63	1	12620-956
14 to 16mm Test Tube Rack	48	1	12620-958
18 to 20mm Test Tube Rack	35	1	12620-960
22 to 25mm Test Tube Rack	24	1	12620-962
15mL Centrifuge Tube Rack	42	1	11301-134
50mL Centrifuge Tube Rack	12	1	11301-136
1.5 to 2mL Micro-Tube Rack	70	2	12620-952

Installation of Test Tube Racks - Incubating Mini Shaker

1. Unit should be in standby mode.
2. Align the clip on the rack to the right side of the tray.
3. Press the test tube rack in place, you will hear the test tube rack clip into position. No mounting screws are required.

Installation of 1.5 to 2mL Micro-Tube Rack - Incubating Microplate Shaker

1. Unit should be in standby mode.
2. Align the Micro-Tube Rack side-to-side on the tray.
3. Press the Micro-Tube Rack in place, you will hear the Micro-Tube Rack clip into position. No mounting screws are required.



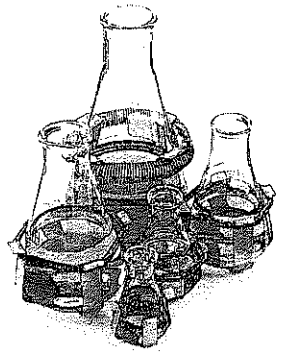
FLASK CLAMPS

DESCRIPTION	MATERIAL	PLATFORM CAPACITY	CAT. NO.
10mL Erlenmeyer Flask Clamp	stainless steel	35	57018-775
25mL Erlenmeyer Flask Clamp	stainless steel	20	57018-786
50mL Erlenmeyer Flask Clamp	stainless steel	12	57018-797
125mL Erlenmeyer Flask Clamp	stainless steel	8	57018-800
250mL Erlenmeyer Flask Clamp	stainless steel	5	57018-811
125mL Erlenmeyer Flask Clamp	PVC	8	97003-576
250mL Erlenmeyer Flask Clamp	PVC	4	97003-578

Installation of Flask Clamps - Incubating Mini Shaker

1. Unit should be in standby mode.
2. Line up the hole(s) in the flask clamp to the hole(s) in the tray. Using the screw(s) provided, hand tighten into place using a flathead screw-driver. **DO NOT** over tighten.
3. Insert flask into clamp and wrap the spring around the neck of the clamp to hold secure.

Not for use with the Incubating Microplate Shaker.



MyCycler™ Thermal Cycler
Quick Guide

Starting the Instrument

Plug in the MyCycler, and a quick diagnostic routine will be performed. Once this routine is completed, the Home screen is displayed. An LED on the front panel of the instrument glows to indicate that the MyCycler is on.

Important: If this is the first time you are turning the instrument on, it is crucial that you install the correct fuse first, as described in section 1.3.2 of the instruction manual. Failure to do so may result in damage to the unit and invalidation of the warranty.

Putting the Instrument into Standby Mode

When the instrument is on, hold down the Standby key on the front panel of the instrument for 3 seconds. If the instrument is in an idle state, Standby mode will be started. If a protocol is either running or has been edited without saving, you will be prompted to verify the selection prior to initiating Standby mode.

Note: Standby mode is a feature to reduce power consumption of an idle instrument. Just enough power is supplied to maintain microprocessor operation. To shut off the instrument completely, remove the electrical plug from the outlet.

Running a Stored Protocol

1. From the Home screen, press **F1-Protocol Library** to display the menu of available protocols.
2. Use the arrow keys to highlight the desired protocol, and press **Enter**.
3. Select **Run Protocol** from the selection box.
4. Confirm the selections in the **Run Setup** screen. You may specify the temperature measurement mode, and whether or not to include a hot start prior to running the protocol.

Creating a New Protocol

1. From the Home screen, press **F2-Create** to display the menu of available protocol templates.
2. Choose a preprogrammed template protocol to edit, or select the **Custom** option from the selection menu; press **Enter**
   - Editable fields for the protocol may be changed using the arrow keys and alphanumeric keys
   - To add or delete a step or cycle, press **F4-Add/Del**
   - To choose increment or decrement time or temperature, put the cursor on the time or temperature field to be adjusted and press **F3-Option**
3. When you finish editing the protocol, press **F5-Done**
   - To run the edited protocol without saving the edits, choose **Run Protocol** from the selection box

     or
   - To save the edits prior to running the protocol, choose **Save Protocol** or **Save Protocol As...** from the selection box. Once edits are saved, you may run the protocol from the Protocol Library

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Editing a Stored Protocol

1. From the Home screen, press **F1-Protocol Library** to display the menu of available protocols.
2. Use the arrow keys to highlight the desired protocol, and press **Enter**.
3. Select **Edit Protocol** from the selection box
   - Editable fields for the protocol may be changed using the arrow keys and alphanumeric keys
   - To add or delete a step or cycle, press **F4-Add/Del**
   - To choose increment or decrement time or temperature, put the cursor on the time or temperature field to be adjusted and press **F3-Option**
4. When you finish editing the protocol, press **F5-Done**
   - To run the edited protocol without saving the edits, choose **Run Protocol** from the selection box

     or
   - To save the edits prior to running the protocol, choose **Save Protocol** or **Save Protocol As...** from the selection box. Once edits are saved, you may run the protocol from the Protocol Library

AMPLIFICATION

T100™ Thermal Cycler

Quick Guide

Starting the Instrument

Remove the T100 thermal cycler from the box and plug it in. Turn on the power switch on the back of the instrument. The T100 cycler will perform a quick self-test and then display the Home screen (Figure 1).

Setting the Date and Time

First make sure the system clock is correct for your time zone so that all runs are accurately recorded in the run log.

1. In the Home screen, touch **Tools** and then **Settings** to display the instrument settings menu (Figure 2).
2. Touch the fields for Month, Day, Year, Hours, and Minutes and edit the values using the pop-up keypad.
3. Touch **Save** to save the changes.
4. Touch **Home** to return to the Home screen.

Creating a New Protocol

1. To create a new protocol, touch **New Protocol** in the Home screen.
2. The New Protocol screen displays a graphical view of the protocol (Figure 3). Edit the value of any of the following parameters by touching the corresponding field:
   - Temperature
   - Hold time
   - Number of repeats in the GOTO loop
   - Starting step for the GOTO loop
   - Sample volume
   - Lid temperature
3. To select a step, touch anywhere outside the temperature box. The step becomes highlighted to indicate that it is selected. Once a step is selected, you can insert a new step after the selected step, delete the selected step, or configure the options for the step.

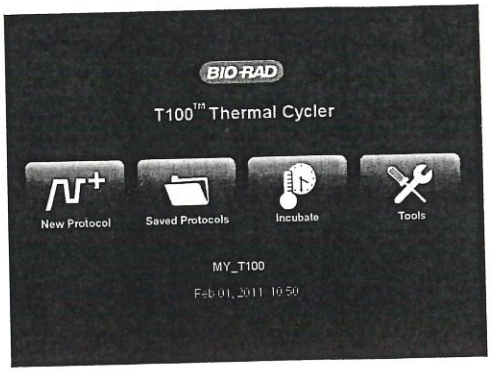

Fig. 1. T100 thermal cycler Home screen.

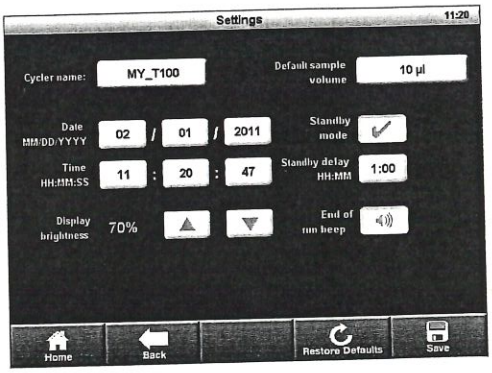

Fig. 2. Settings screen.

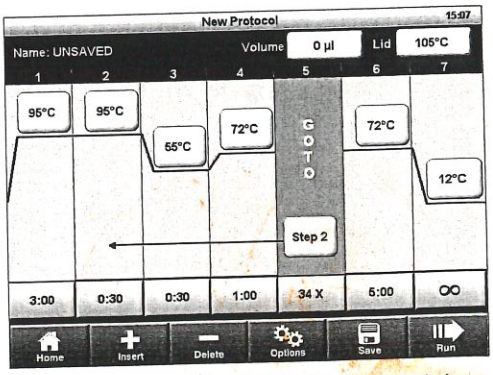

Fig. 3. New Protocol screen showing graphical view of a protocol.

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4. To insert a step, touch **Insert**. The screen will display the type of steps to insert (Figure 4). Select **Temperature** for a temperature hold step, **Gradient** for a thermal gradient for protocol optimization, or **GOTO** to insert a GOTO step that will loop back to repeat the specified steps in your protocol (typically denaturation, annealing, and extension).
5. To delete a step, select the step and touch **Delete**.
6. To configure advanced parameters for a step, such as Temperature, Increment, Time, Extend, Gradient, and Ramp rate, select a step and touch **Options** (Figure 5). Program the required parameters as needed.
7. Touch **Save** to select a folder location and save the protocol.
8. Touch **Run** to start the protocol. You can also run a protocol without saving it by touching **Run** at any time while editing.

Running and Editing a Saved Protocol

1. In the Home screen, touch **Saved Protocols**. The T100 cycler organizes all the protocols into folders. A preinstalled library of standard protocols is in the MAIN folder (Figure 6).
2. Select a folder from the Folders column, then select a protocol file from the Files column.
3. Review the selected protocol using the Preview column on the right.
4. Touch **Run** to start the run or touch **Edit** to edit the protocol.

For more information, visit
www.bio-rad.com/T100QuickGuide.

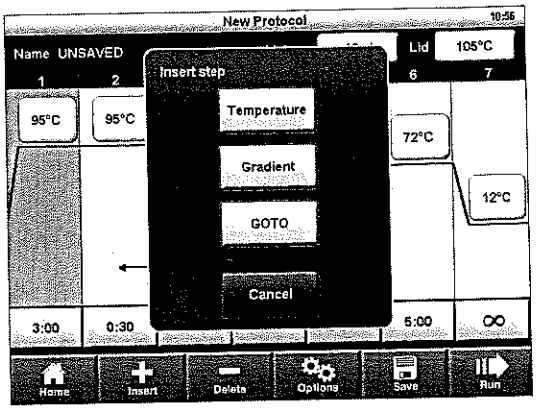

Fig. 4. Insert step window.

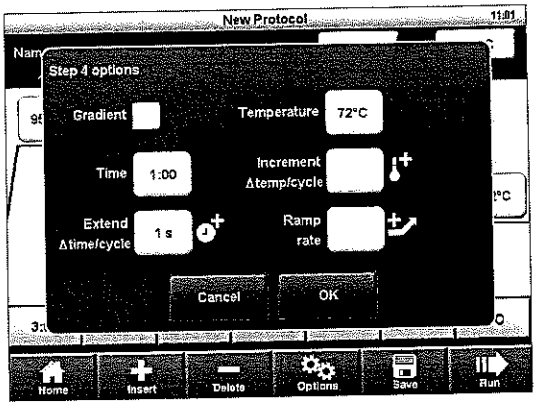

Fig. 5. Options window showing advanced parameters.

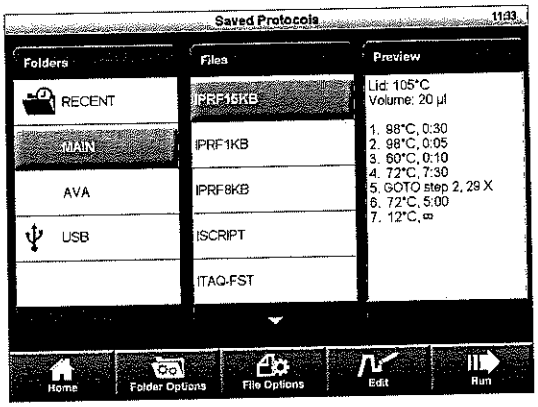

Fig. 6. Saved Protocols screen showing the preinstalled library of standard protocols in the MAIN folder.

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FULL TEACHER PTC PCR PROTOCOL - located where green tab in Resource Binder HERE IS THE PTC PCR PROGRAM:

2. Program your thermocycler by creating a new PCR protocol, following the temperature and time specifications below. Name this protocol "**PTC PCR Program**".

	Step	Temperature	Time
	Initial Denaturation	94°C	300 seconds
Repeat 35 times	Denaturation	94°C	30 seconds
	Annealing	64°C	30 seconds
	Extension	72°C	30 seconds
	Final Extension	72°C	60 seconds

Table 2: PCR Cycle details