Barnstead International

MaxQ 4000 Incubated and Refrigerated Shakers

MODEL NO.
SHKA4000
SHKA4000-1CE
SHKA4000-5
SHKA4000-6CE
SHKA4000-7
SHKA4000-8CE
SHKE4000
SHKE4000-1CE
SHKE4000-5
SHKE4000-6CE
SHKE4000-7
SHKE4000-8CE

057-287-00 • 8/9/06

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Safety Information

Alert Signals

Warning
Warnings alert you to a possibility of personal injury.

Caution
Cautions alert you to a possibility of damage to the equipment.

Note
Notes alert you to pertinent facts and conditions.

Hot Surface
Hot surfaces alert you to a possibility of personal injury if you come in contact with a surface during use or for a period of time after use.

Electric Shock
Cautions you to risks of electric shock.

Your Barnstead|Lab-Line MaxQ 4000 Shaker has been designed with function, reliability, and safety in mind. It is your responsibility to install it in conformance with local electrical codes. For safe operation, please pay attention to the alert signals throughout the manual.

This manual contains important operating and safety information. The user must carefully read and understand the contents of this manual prior to the use of this equipment.

Warnings

To avoid electrical shock, always:

1. Use a properly grounded electrical outlet of correct voltage and current handling capacity.

2. Disconnect from the power supply prior to maintenance and servicing.

To avoid personal injury:

1. Do not use in the presence of flammable or combustible materials — fire or explosion may result. This device contains components which may ignite such materials. Not rated for use in hazardous atmospheres.

2. Use appropriate hand and eye protection when handling hazardous chemicals.

3. Refer servicing to qualified personnel.

4. Do not modify construction and/or assembly of equipment.

5. Do not remove tags, labels, decals, or other information from the unit.

6. Stand clear of equipment when it is operating.

7. If shaking action will result in the evolution of gases or fumes, carry out the operation in a well-ventilated laboratory hood.

8. Use equipment only for its intended purpose. Use only the accessories and attachments that are shipped with the equipment or are specified for it. Substituting other attachments or accessories can produce hazards or make the unit inoperative.

9. Perform regular maintenance service as specified in this manual and keep unit in good repair. Do not operate with known defects.

10. Do not use the shaker to mix flammable materials or where the transfer of mechanical energy to glass could cause glass breakage.

General Specifications

Model number	All Analog "A" Series units	All Analog "A" Series units	All Digital "E" Series units	All Digital "E" Series units
Exterior Unit Dimensions				
Length	32" (81.3 cm)	32" (81.3 cm)	32" (81.3 cm)	32" (81.3 cm)
Width	22.5" (57.2 cm)	22.5" (57.2 cm)	22.5" (57.2 cm)	22.5" (57.2 cm)
Height	22" (55.9 cm)	22" (55.9 cm)	22" (55.9 cm)	22" (55.9 cm)
Weight	120 lbs (54.4 kg)	120 lbs (54.4 kg)	165 lbs (74.9 kg)	165 lbs (74.9 kg)

Model number	All Analog "A" Series units	All Analog "A" Series units	All Digital "E" Series units	All Digital "E" Series units
Electrical - Standard Temperature				
Voltage AC	120	220-240	120	220-240
Amperage	5.0	3.0	5.0	2.5
Wattage	625	725	625	625
Frequency	60	50/60	60	50/60
High Temperature				
Voltage AC	120	220-240	120	220-240
Amperage	9.0	5.0	9.0	4.5
Wattage	1100	1200	1100	1100
Frequency	50/60	50/60	50/60	50/60
Refrigerated				
Voltage AC	120	220-240	120	220-240
Amperage	14.0	7.0	14.0	7.0
Wattage	1500	1500	1500	1500
Frequency	60	50	60	50

General Specifications

Model number	All Analog "A" Series units	All Analog "A" Series units	All Digital "E" Series units	All Digital "E" Series units
Speed Accuracy	40 to 400 rpm	40 to 400 rpm	15 to 500 rpm ±1 rpm	15 to 500 rpm ±1 rpm
Timer	Continuous or timed operation from 1-60 min.	Continuous or timed operation from 1-60 min.	Continuous or timed operation 0.1-999 hours or 0.1-999 mins.	Continuous or timed operation 0.1-999 hours or 0.1-999 mins.
Display	3 individual LED displays indicate temperature in 1°C increments. Analog tachometer displays speed in rpm.	3 individual LED displays indicate temperature in 1°C increments. Analog tachometer displays speed in rpm.	3 individual LED displays indicate temperature, time and speed simultaneously. 3 characters height 1/2 inch (1.27 cm)	3 individual LED displays indicate temperature, time and speed simultaneously. 3 characters height 1/2 inch (1.27 cm)
Mutable Alarms	None	None	Audible portion of the alarm can be silenced for a period of 1 hour without deactivating the actual alarm condition by depressing any key.	Audible portion of the alarm can be silenced for a period of 1 hour without deactivating the actual alarm condition by depressing any key.
Motor	Permanent Magnet DC	Permanent Magnet DC	Solid State Brushless DC	Solid State Brushless DC
Soft Start Feature	None	None	Software algorithms prevent sudden start/stops.	Software algorithms prevent sudden start/stops.
RS232 Interface *	None	None	Monitor speed, temperature in °C and time with a computer.	Monitor speed, temperature in °C and time with a computer.
Recorder Output *	None	None	10 mv/°C output monitors temperature with external chart recorder.	10 mv/°C output monitors temperature with external chart recorder.

** Interface cables not to exceed 9.8 ft. (3 m) in length.*

Model number	All Analog "A" Series units	All Analog "A" Series units	All Digital "E" Series units	All Digital "E" Series units
Alarms				
Speed	None	None	Audible with flashing LED indicate when speed deviates more than 10% of set point.	Audible with flashing LED indicate when speed deviates more than 10% of set point.
Speed Shut off	None	None	When speed deviates 10% of set point, unit will shut down immediately.	When speed deviates 10% of set point, unit will shut down immediately.
Timer	None	None	Beeps twice when time has expired. Shaking motion stops.	Beeps twice when time has expired. Shaking motion stops.
Unbalanced Load	None	None	If the unit is running in an unbalanced condition, an alarm will sound and the shaker will stop until the end user corrects the condition. The speed display will flash "bAL" on speed panel LED.	If the unit is running in an unbalanced condition, an alarm will sound and the shaker will stop until the end user corrects the condition. The speed display will flash "bAL" on speed panel LED.

Optional Platform Dimensions in. (cm)	
Catalog Number	**L x W**
30110	Universal 18" x 18" (45.7 x 45.7 cm)

The Barnstead|Lab-line MaxQ 4000 series of bench top, incubated and refrigerated shakers are available in either analog or digital control configurations:

- A-Class shakers: SHKA4000, SHKA4000-1CE, SHKA4000-5, SHKA4000-6CE, SHKA4000-7, SHKA4000-8CE: control temperature by a Proportional/Integral/Derivative (PID) micro-processor-based controller. Solid-state control maintains time and speed and is adjustable with rotary dials. Analog tachometer displays speed in RPM, verifying accuracy of speed setting. Refrigerated units feature environmentally safe CFC free insulation and coolant.

- E-Class shakers: SHKE4000, SHKE4000-1CE, SHKE4000-5, SHKE4000-6CE, SHKE4000-7, SHKE4000-8CE: control temperature, time and speed by a Proportional/Integral/Derivative (PID) microprocessor-based controller that is adjustable with membrane switches on a key-pad in 1 rpm increments. Refrigerated units feature environmentally safe CFC free insulation and coolant. Flashing display indicates power interruption. Pressing any key will clear display. Non-volatile memory maintains speed and time set points in the event of a power interruption. Speed and time set points are automatically reactivated after power is restored.

- Temperature range and accuracy follow. All units have a uniformity of ±0.5°C at 37°C in flask:

  Standard Temperature: SHKA4000, SHKA4000-1CE, SHKE4000, SHKE4000-1CE, 10°C above ambient to 60°C, ±0.1°C at 37°C in flask.

  High Temperature: SHKA4000-5, SHKA4000-6CE, SHKE4000-5, SHKE4000-6CE, 10°C above ambient to 80°C, ±0.1°C at 37°C in flask.

- Refrigerated: SHKA4000-7, SHKA4000-8CE, SHKE4000-7, SHKE4000-8CE, 15°C below ambient to 60°C, ±0.1°C at 37°C in flask. Refrigeration system needs to be turned off whenever the set point is at or above 32°C.

In addition, all versions offer:

- Space efficient tubular heaters.
- Drive interrupt halts shaking action when lid is opened.
- All set points are retained by non-volatile memory that automatically reactivates after power is restored.
- Visual, user adjustable over-temperature safety signal with independent thermostat controls the heat if main controller fails.
- 3/4 inch (1.9 cm) triple eccentric orbital drive.
- 6 permanently lubricated ball bearings.
- 50 lb (22.7 kg) platform load capacity at safe speeds less than 400 rpm for A-Class shakers and less than 500 rpm for E-Class shakers.
- UL, cUL and CE certification.

Environmental Operating Conditions

Pollution Degree**	2
Installation Category**	II
Altitude	2000 meters MSL (Mean Sea Level)
Relative Humidity	20% to 80% maximum, non-condensing
Electrical Supply	120 VAC or 240 VAC
Voltage Tolerance	±10% of normal rated line
Temperature	15°C to 32°C
Product Usage	This product is intended for use indoors **only**

***Refer to IEC 664-1*

Caution
It is not recommended to operate shaker in a CO_2 enriched atmosphere. The formation of carbonic acid could cause electrical failures.

Declaration of Conformity

(for CE models only)

Barnstead International hereby declares under its sole responsibility that this product conforms with the technical requirements of the following standards:

EMC:	EN 61000-3-2	Limits for harmonic current emissions
	EN 61000-3-3	Limits for voltage fluctuations and flicker
	EN 61326-1	Electrical equipment for measurement, control, and laboratory use; Part I: General Requirements
Safety:	EN 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use; Part I: General Requirements
	EN 61010-2-051	Part II: Particular requirements for laboratory equipment for mixing and stirring

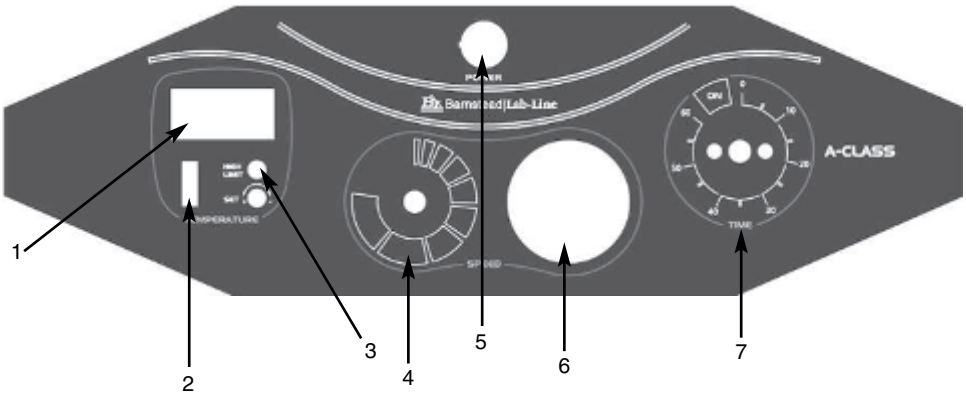
per the provisions of the Electromagnetic Compatibility Directive 89/336/EEC, as amended by 92/31/EEC and 93/68/EEC, and per the provisions of the Low Voltage Directive 73/23/EEC, as amended by 93/68/EEC.

The authorized representative located within the European Community is:

Electrothermal Engineering Ltd.
419 Sutton Road
Southend On Sea
Essex SS2 5PH
United Kingdom

Copies of the Declaration of Conformity are available upon request.

A-Class Control Panel Features - Figure 1



1. Temperature Controller: Maintains chamber temperature.

2. Temperature Switch: Activates heater-allowing controller to maintain temperature.

3. Temperature High-Limit Light: Illuminates when high limit thermostat is controlling chamber temperature.

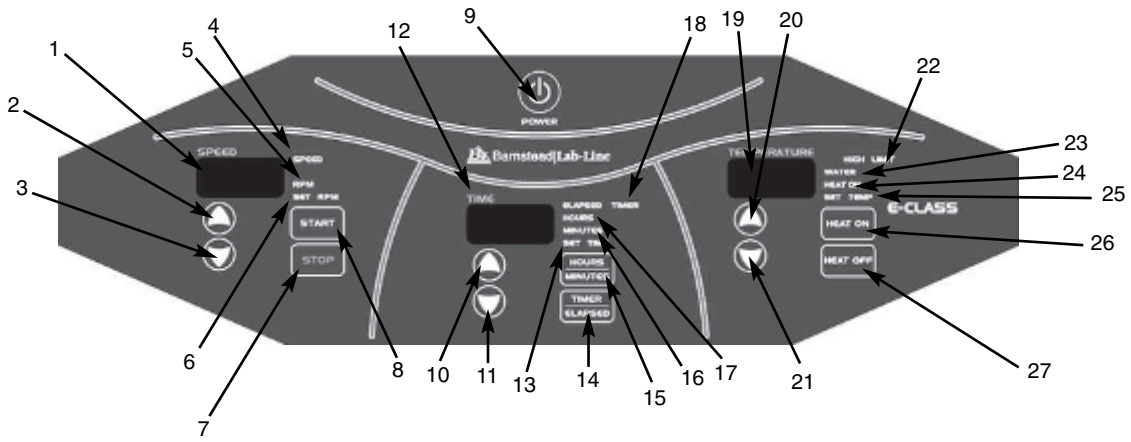
4. Speed Control: Sets platform rotation speed.

5. Power Switch: Turns power on and off to shaker.

6. Speed Tachometer: Analog display of platform rotation speed.

7. Time(r): Allows user to choose either continuous or timed operation.

E-Class Control Panel Features - Figure 2



1. Speed Display: 3 digit LED indicates actual or set point speed
2. Up Arrow Key: Increases platform rotation speed
3. Down Arrow Switch: Decreases platform rotation speed
4. Speed Light: Red light Illuminates when a locked rotor or over-speed condition exists
5. RPM Light: Illuminates to indicate actual speed
6. Set rpm Light: Illuminates when speed is being set
7. Stop Switch: Stops platform rotation
8. Start Switch: Starts platform rotation
9. Power Switch: Turns power on and off to shaker
10. Up Arrow Key: Increases shaking time
11. Down Arrow Key: Decreases shaking time
12. Time(r) Display: 3 digit LED indicates time remaining or elapsed time
13. Set time: Illuminates when time is being set
14. Timer/Elapsed: Allows the user to choose elapsed time operation, elapsed, or timed operation, timer.
15. Hours/Minutes Membrane Switch: Allows user to choose timing operation in either hours or minutes
16. Minutes: Timer indicates minutes
17. Hours: Timer indicates hours
18. Elapsed Timer Light: Indicates accumulated time
19. Temperature Display: 3 digit LED indicates chamber temperature
20. Up Arrow Key: Increases temperature
21. Down Arrow Key: Decreases temperature
22. High-Limit Light: Indicates high-limit control has been activated
23. Water Light: This display has no function on this unit
24. Heat on Light: Indicates heaters are energized
25. Set temp Light: Indicates temperature can be set
26. Heat on Switch: Turns on heat
27. Heat off Switch: Turns off heat

Unpacking and Installation

Shipping Carton

This should be inspected upon delivery. When received, carefully examine for any shipping damage before unpacking. If damage is discovered, the delivering carrier should specify and sign for the damage on you copy of the delivery receipt.

Open the carton carefully making certain that all parts are accounted for before packaging materials are discarded. After unpacking, if damage is found, promptly report it to the carrier and request a damage inspection properly.

IMPORTANT: Failure to request an inspection of damage within a few days after receipt of shipment absolves the carrier from any liability for damage. You must call for a damage inspection promptly.

Unpacking

Use the packing list below when unpacking to verify that the complete unit has been received. Do not discard packing materials until all is accounted for.

The following items are included in the shipment:
MaxQ 4000 shaker
Operator's Manual- 057-287-00
Product Registration Card- 528-022-00
Inspection Tag- 528-028-00
Mounting Plate Mat- 790-316-11
Thumb Screw Knob (4) - 562-184-10
Male Connector (E-class only)- 420-359-00

If any items are missing, contact Barnstead International at 1-800-553-0039.

Location

Put the shaker on a level table or bench capable of supporting the weight of the shaker with any accessories while in operation. Place shaker near an electrical outlet that matches the unit nameplate requirements. Allow approximately 2" (5 cm) of clearance around the unit for free air convection, accessory attachments and user convenience. Shakers with refrigeration should be placed near an accessible drain.

Warning
Do not operate shaker with a damaged electrical cord.

Electrical Requirements

SHKA4000 and SHKE4000 series shakers require a 120 VAC, 60 Hz power source. They are supplied with a 3-wire line cord and should be plugged into an outlet designed for 3-prong plugs. If an extension cord is used, it also should be the 3-wire grounded type. For an outlet designed to accept 2-prong plugs (ungrounded), it is required that a qualified electrician replaces the outlet with a new, grounded type.

SHKA4000-1CE and SHKE4000-1CE series shakers require a 220-240 VAC, 50/60 Hz power source. They are supplied with a Schuko cordset.

If a plug must be installed, use only the 3-prong grounded type, rated for the unit load requirements and matching the power outlet. Make sure the green ground wire is secured to the plug ground terminal.

To eliminate hazard of electrical shock, make sure floor around shaker is dry. In the event of accidental spilling or splashing of liquids, clean up and/or neutralize the spilled liquids before continuing.

Leave shaker disconnected when not in use.

Caution
Do not operate shaker with an unbalanced load. Platforms should be loaded for optimum stability and operation. Do not lift shaker by the platform.

Platform Installation

1. Select the appropriate platform for the vessels to be shaken. A wide variety of platforms and accessories are available:

   • Dedicated platforms have the maximum number of flask clamps attached for safe operation.

   • Combination platforms allow the user to shake a wide variety of different sized vessels on the same platform.

2. Carefully position the platform horizontally over the shaker's mounting plate, aligning the 4 mounting holes.

3. Position one of the thumbscrews provided through each of the 4-platform mounting holes and tighten securely.

Flask Clamp Installation

Each flask clamp contains a support spring located at the narrow top of the clamp.

Depending on the size of the clamp, the clamp base may contain one or several screws necessary to secure the clamp to the platform. All screws provided with the clamp must be properly attached to the platform.

1. Carefully place the desired vessel in the clamp by first pulling the clamp spring far enough apart to enable the flask base to be positioned inside the clamp. Gently slide the flask into its proper position securing it to the wider bottom of the clamp. The spring will hold the neck of the flask securely in place and provide security during shaking.

2. Make sure all vessels are securely clamped before turning on unit.

Warning
Do not operate the shaker at speeds that will cause the contents of vessels to be thrown out.

Wherever possible, vessels should contain a stopper to prevent hazardous substances being thrown out during the mixing action.

Test Tube Rack Installation

1. Position the test tube rack on the combination platform so that the cutouts on the rack's outside bottom are aligned with corresponding mounting holes on the platform. There are two cutouts on each side of the rack.

2. Secure the rack to the platform with mounting screws provided with the rack.

Operation

A-Class

Please refer to page 11 for control panel reference.

Caution
It is recommended that shaking action be started at a low speed in order to check that all vessels are secure and that no spilling of contents will occur.

Power Switch

1. Depress top portion of power switch to turn on shaker.

2. Depress bottom portion of power switch to turn off shaker.

Speed Control and Display

1. Slowly rotate the knob on the solid-state speed control clockwise to increase speed and counterclockwise to decrease speed. The markings on the outside of the dial are for reference purposes only.

2. The speed control tachometer provides an analog readout of the actual platform rotation speed up to a maximum of 400 rpm.

Note
Shaker will not operate if the timer is in the off position.

Time(r)

1. From the 12 o'clock off position, rotate timer knob counterclockwise to the ON position to initiate continuous operation.

2. For timed operation, rotate timer knob clockwise from 1 minute to 60 minutes. The markings on the side of the dial are in 5-minute increments.

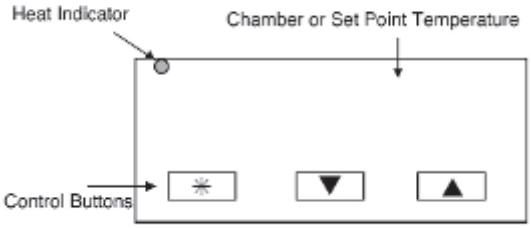


Figure 3: Temperature Controller

Temperature Controller-Setting Temperature

Please refer to Figure 3 for control panel reference.

1. CONTROLLER SELF-TEST: When the shaker is powered up, the controller will display 8888 along with the three decimal points and the HEAT ON indicator lamp. The display will then blank out for 2 seconds before showing the chamber temperature.

2. HEAT ON INDICATOR: The HEAT ON indicator lamp is lit when the chamber heaters are receiving power. The lamp will normally flash when the chamber temperature is at set point.

3. SET POINT ADJUSTMENTS: The temperature controller normally displays the chamber temperature. To view or change the temperature set point proceed as follows:

Press	Controller
✳	View set point
✳ ▼	Decrease set point
✳ ▲	Increase set point

A. Press and hold the “star” (✳) key and use either the up or down arrow key to adjust the set point to the desired temperature. Release the “star” (✳) key.

B. Allow sufficient time for chamber temperature to stabilize.

Temperature Calibration

1. Fill a 250-ml Erlenmeyer flask with approximately 100 ml of water and position it at the approximate geometric center of the shaking platform.

2. Install a thermocouple inside the flask with the thermocouple junction in direct contact with the water.

3. Press and hold the “star” (✳) key and using the up or down arrow key, adjust the set point to the desired temperature.

4. Allow the shaker to run until chamber temperature has stabilized.

5. The controller display should now be indicating the set point temperature. Make note of the thermometer reading.

6. Press and hold both arrow keys until the controller display indicates “tunE”. Release the arrow keys. Press and release the down arrow key, the display should now alternate between “LEUL” and “1”. Press and hold the “star” (✳) key and using the up arrow key adjust the display to read “3”. Release the “star” (✳) key. The display should now alternate between “LEUL” and “3”. Press and release the up arrow key until the display indicates “Zero”. The display should now alternate between “Zero” and a numerical value.

7. Using the examples shown in Figure 4 and the thermometer value obtained in step 5 above, enter the correct “Zero” value into the controller by pressing the “star” (✳) key and using the up or down arrow key. If there is already a “Zero” value present then add the new value to the one already present.

8. When the correct “Zero” value has been entered, press and hold the two arrow keys together until the display again indicates the chamber temperature. If the procedure was done correctly, the controller display should now agree with the thermometer reading to within ±0.5°C.

9. Allow the unit to run for at least an additional 30 minutes.

10. Re-check the thermometer reading. The controller display and the thermometer should agree to within ±0.5°C. If not repeat steps 6, 7 and 8.

Thermometer	=	60 °C
Controller Reading	=	65 °C
Subtract	=	-5 °C

Enter Zero value of -5 °C

Thermometer	=	70 °C
Controller Reading	=	65 °C
Subtract	=	+5 °C

Enter Zero value of +5 °C

Figure 4: Determining Zero Value

E-Class

Please refer to page 12 for control panel reference.

Turning Shaker On

Beginning with the shaker power off.

1. Press membrane power switch once (I) to turn on shaker.
2. Press membrane power switch a second time (O) to turn off shaker.

Note
There will be a 3 second delay from the time power is turned on to the time the shaker is activated. Control panel will illuminate when shaker power is activated. There will be an audible beep before the display lights up.

Setting Shaking Speed

1. Hold down appropriate arrow membrane switch in the speed module of the control panel, up or down, until desired speed is set up to 500 rpm. SET RPM light will illuminate.
2. Press START membrane switch to begin shaking. RPM light will illuminate.
3. Press STOP membrane switch to end shaking. SET RPM light will illuminate.

Note
Speed can be changed without pressing the start or stop membrane switches. Simply press the appropriate up or down membrane switch until desired rpm is reached. There will be an audible beep before the display lights.

Calibrating Shaking Speed

1. Choose a speed for which calibration is desired by using the shaker's up or down arrow keys.
2. Measure current shaker speed by using a digital hand held tachometer.
3. If the tachometer reading matches the shaker display, no calibration is necessary. If the tachometer reading is different from the shaker's display, then calibration is required.
4. To get into the calibration mode, hold down the START key, press and release the STOP key, then release the START key.

5. The decimal point on the SPEED display will flash indicating you are in the calibration mode.

6. Use the up or down arrow keys to set the shaker speed to match the tachometer's readout.

7. Press STOP key to enter the new speed value.

8. Press START key to exit the calibration mode.

Setting Operating Temperature

1. Press and hold up arrow key to increase temperature, release key when desired set point is obtained.

2. Press and hold down arrow key to decrease temperature, release key when desired set point is obtained.

3. Once set, temperature control is initiated by pressing the heat on button; the heater will react and start increasing the temperature to reach the set point.

4. During operation, both the up and down arrow keys can be used to adjust the temperature to a new set point.

AC Power Loss

The operating microprocessor possesses a non-volatile memory. Upon resumption or recovery from an AC power loss, the following will be noted:

- All readouts will flash until any key is pressed.

- If unit was shaking at the time of power failure, it will resume operation at the speed and timer settings that were entered at the time that AC power failed.

Temperature Calibration

1. Fill a 250-ml Erlenmeyer flask with approximately 100 ml of water and position it at the approximate geometric center of the shaking platform.

2. Install a thermocouple inside the flask with the thermocouple junction in direct contact with the water.

3. Adjust the safety thermostat to its maximum clockwise position.

4. Using the up and down keys, adjust the set point temperature to read 37°C or any other desired set point.

5. Allow sufficient time for chamber temperature to stabilize.

6. Press HEAT ON button and, while continuing to hold, press and release the HEAT OFF button. Now, release the HEAT ON button.

7. The decimal point should now be flashing indicating that the unit is in the temperature calibration mode.

8. Use the up and down arrow keys to adjust the temperature on LED readout to match the temperature reading on the thermocouple meter.

9. Press the HEAT OFF button. The beeper will sound indicating that the new calibration value you have entered is now stored in the non-volatile memory of the temperature controller.

10. Press HEAT ON button twice to complete return to normal operating mode.

Note
It is important to press the HEAT OFF button to exit the calibration mode.

Setting Timer for Timed Shaking

1. Press TIMER/ELAPSED membrane switch until TIMER and SET TIME lights are illuminated. The HOURS or MINUTES light will also light up at this point depending on which option was previously chosen.

2. Press HOURS/MINUTES membrane switch for desired timing mode.

3. Hold down appropriate arrow membrane switch in the TIME module of the control panel, up or down, until desired timing cycle is set from 0.1 hour up to 999 hours, or from 0.1 minute to 999 minutes depending on which timing mode is chosen. SET TIME light will illuminate.

4. Press START to begin timed shaking; count-down will begin from time set. TIMER and MINUTES or HOURS lights will illuminate and timer will count down from time selected. An audible alarm will sound at the end of the timing cycle and platform rotation will cease.

Setting Timer for Continuous Shaking

1. Press TIMER/ELAPSED membrane switch until ELAPSED light is illuminated. The HOURS or MINUTES light will also light up at this point depending on which option was previously chosen.

2. Press HOURS/MINUTES membrane switch for desired timing mode.

3. TIME display should show 000. Press START to begin timed shaking. Timer will begin to count up and will display accumulated time in display window. Platform rotation will cease and TIME display will flash when ELAPSED time reaches 999 minutes or 999 hours.

RS232 Interface Port

The RS232 interface port is located on the left side rear of the shaker cabinet and requires the use of a laptop or desk top computer running Microsoft Windows 98 or newer operating system.

Figure 5: RS232 Interface Port

Hyperterminal Configuration

1. Power up the host computer and close any running applications.

2. Open the HyperTerminal application by clicking on “Start” \ “Programs” \ “Accessories” \ “Communications” \ “HyperTerminal.”

3. In the “Connection Description” box, enter the name “Max Q Shaker” and choose an icon and click “OK.”

4. In the “Connect To” box, verify that “COM1” is selected under “Connect Using.” Click “OK.”

5. In the “COM1 Properties” box \ “Port Settings” folder select the following options:

   Bits per second: ⇨ 19200
   Data bits: ⇨ 8
   Parity: ⇨ None
   Stop bits: ⇨ 1
   Flow control ⇨ None

   After verifying the above settings, click “OK.”

6. In the main dialog box click on “File” \ “Save.”

7. Exit the program by clicking on “File” \ “Exit” \ “Yes”.

Note
RS232 Interface Port is for output only. Interface cables must not exceed 9.8' (3m) in length.

8. Verify the program was saved by going to "Start" \ "Programs" \ "Accessories" \ "Communications" \ "HyperTerminal" \ "Max Q Shaker."

9. This completes the configuration of HyperTerminal.

10. Turn shaker off and connect computer (COM 1) to shaker (COM PORT) with DB-9 serial printer cable.

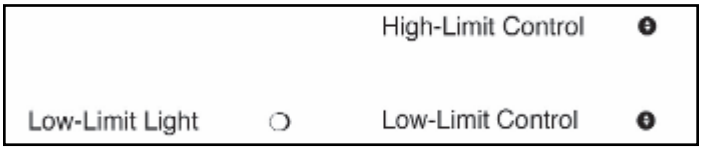
11. Start HyperTerminal by clicking on "Max Q Shaker."

12. Power up shaker. Shaker will screen print speed, time and temperature at one-minute intervals.

Note
Shakers without optional refrigeration system only have high-limit control on side panel.

Setting High-Limit Control

The high and low-limit controls are located on the right front side panel of the shaker cabinet. The high-limit light is located on the control panel.



1. Make appropriate power connection.

2. Turn power switch ON.

3. Rotate high-limit control fully clockwise.

4. Set chamber temperature.

5. Allow sufficient time for chamber temperature to stabilize before setting the high-limit control.

6. Rotate high-limit control slowly counterclockwise until set point is reached.

- For A-Class shakers high-limit light will illuminate when set point is reached. Rotate high-limit control clockwise until status lamp goes out. Make an additional 1/8 of a turn clockwise beyond this point.

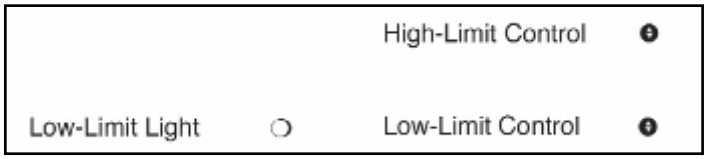
Warning
Do not operate the unit if any of the temperature controls become inoperative. A hazardous condition will develop which can result in injury or death and property damage.

- For E-Class shakers, when set point is reached, high-limit status lamp will flash and the audible alarm will beep once. Rotate the high-limit control slowly clockwise approximately 1/8 of a turn beyond this point.

7. When desired temperature is achieved, load the shaker.

Setting Low-Limit Control, Refrigerated Units

The high and low limit controls are located on the right front side panel of the shaker cabinet. The high-limit light is located on the control panel. The low-limit control and low limit light are available only on units supplied with optional refrigeration system.



1. Turn ON refrigeration switch located to the left of the defrost timer on the right rear of the shaker cabinet.

2. Rotate low-limit control fully counterclockwise.

3. Set chamber temperature.

4. Allow sufficient time for chamber temperature to stabilize before setting the low-limit control.

5. Rotate low-limit control slowly clockwise. When the set point is reached, low-limit status lamp will illuminate. Rotate the low-limit control slowly counterclockwise until the low-limit status lamp goes out.

6. Continue rotating the low-limit control about 5 degrees of rotation to set it about 1°C to 3°C below the set point, the low-limit status lamp will extinguish and the temperature control status lamp stays lit.

7. When desired temperature is achieved, load the shaker.

Optional Refrigeration System

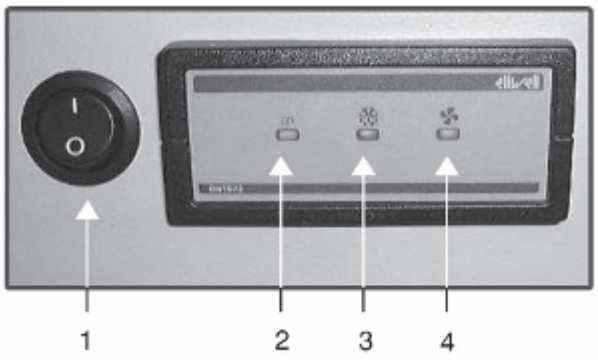
This section applies only to units supplied with this option. The refrigeration system on the A and E series shakers are identical in operation. Please refer to page 31 for refrigeration replacement parts.

When the unit power is on, refrigeration can be initiated by turning ON the refrigeration switch which is located to the left of the defrost timer on the lower right side panel of the shaker cabinet. This should be initiated (turned on) only when a temperature set point of approximately 32°C or less is required (based on your ambient temperatures). Both the main power switch and the refrigeration switch need to be ON for the refrigeration system to work. When the refrigeration switch is activated, the compressor system will run continuously and the system will go through the following routine:

Upon every activation of the refrigeration switch to the ON position, there is an approximate 2-minute delay until the compressor becomes activated. This is a safety feature, to prevent damage to the compressor in the case of quickly switching the refrigeration switch off and on again. Because the compressor does not turn on immediately after switching the refrigeration switch to on, please note, THIS IS NORMAL. The defrost timer will begin initiation. This may turn the fans off for several minutes until it completes a normal defrost cycle.

During operation, the defrost timer will automatically "engage" every 4 hours, switching cold gas through the evaporator (inside) coils to hot gas in order to defrost the coils. There is a dedicated sensor inside the coils which will terminate the defrost when the temperature reaches a point where it is assured that there is no ice or frost on the coil. At low set point temperatures (i.e. 5°C), this defrost time will be longer than higher set point temperatures (i.e. 25°C), which may initiate and terminate immediately because the coils will be much warmer at higher set point temperatures.

Figure 6: Defrost Timer



The defrost timer, part #270-108-00, is located on the lower right side panel of the shaker cabinet to the right of refrigeration power switch and is engaged whenever the refrigeration system is turned on.

1. **Refrigeration Power Switch** - Activates refrigeration system, I is ON, O is OFF.

2. **Defrost Time Power Status Lamp (Power)** - Timer is powered along with refrigeration system whenever green power status lamp is lit.

3. **Defrost Status Lamp (Defrost)** - Cooling coil is being defrosted whenever yellow defrost status lamp is ON. Hot gas is being bypassed through the iced coil. When ice on the coil has melted, defrost cycle ends automatically.

4. **Fan Delay Status Lamp (Fans)** - During defrost timer power-up and after defrost cycle, the circulating fan is locked off for a 1-1/2 minute delay. Green fan status lamp flashes during this fan-delay period.

Maintenance

Cleaning

Wash the exterior of the unit with a soft cloth using a solution of mild soap and water, rinse off with clean water and dry thoroughly.

Suggested with every 3 months of constant use

Any internal adjustments or repairs must be performed by a qualified service representative.

Remove the platform by loosening 4, thumbscrews in the platform center. Remove the sheet metal panel (9 screws) under the platform to expose the belt and interior parts. Inspect the drive belt for wear. Order a replacement if necessary.

For A-Class series only

1. Take out the 2 motor mount screws and lift the motor out.

2. 2 brushes are located under plastic caps on opposite sides of the lower part of the motor. Unscrew the plastic caps and slide the brushes out. Replace brushes when they are worn down to 3/16" (0.48 cm) in length.

3. Belt tension is automatically set by the location of the motor and is not adjustable.

4. To align a pulley, loosen the motor pulley set screws, slide the pulley up or down into alignment then securely tighten the motor pulley set screws.

Note
Make no attempt to service or repair a Barnstead International product under warranty before consulting your Barnstead International dealer. After the warranty period, such consultation is still advised, especially when the repair may be technically sophisticated or difficult.

Warning
Disconnect plug from electrical outlet before attempting any maintenance or repair of the unit.

Note
The shaking mechanism is equipped with sealed ball bearings which do not require further lubrication or adjustment.

Troubleshooting

Problem	Possible Causes	Solutions
Shaker doesn't operate	Check if power cord is plugged in.	Plug in.
	Check if power supply matches requirements on data label.	Locate power supply that matches unit requirements.
	E-Class, check circuit breaker.	Reset circuit breaker.
	E-Class, check for flashing lights on control panel.	Press any membrane switch on control panel.
	E-Class, check if elapsed timer is flashing.	Reset timer.
	A-Class, check if timer is in off position.	Set timer for continuous or timed operation.
	A-Class, check if power switch is functioning.	Replace if defective.
Platform doesn't rotate or has erratic speed	Check for power to motor.	Replace motor if defective.
	Check drive belt.	Replace if worn, broken or slipped off pulley.
	A-Class, check for power to speed control.	Replace if defective.
Shaker won't heat	E-Class make sure "HEAT ON" lamp is lit.	Push "HEAT ON" button.

Replacement Parts

Available Shakers: SHKA4000, SHKA4000-1CE, SHKA4000-5, SHKA4000-6CE, SHKA4000-7, SHKA4000-8CE, SHKE4000, SHKE4000-1CE, SHKE4000-5, SHKE4000-6CE, SHKE4000-7, SHKE4000-8CE

Catalog Number (Shaker)	Description	Part Number
SHKA4000-5, SHKE4000-5, SHKA4000-6CE, SHKE4000-6CE	Cover Hi-Temp	720-588-01
SHKA4000, SHKA4000-1CE, SHKE4000, SHKE4000-1CE	Cover	720-588-00
SHKA4000, SHKE4000, SHKA4000-5, SHKE4000-5	Fan (120V)	160-203-00
SHKA4000-5, SHKE4000-6, SHKA4000-5, SHKE4000-5	Fan, 240V Hi-Temp	160-204-00
SHKA4000, SHKA4000-1CE, SHKE4000, SHKE4000-1CE	Fan, 240V	160-204-00, 160-199-00
SHKA4000-1CE, SHKA4000-6CE	Capacitor	310-191-00
SHKA4000, SHKA4000-5, SHKA4000-1CE, SHKA4000-6CE	Circuit Breaker, 0.7 Amp, 120V Hi-Temp	330-250-00
ALL SHKA4000 UNITS	Circuit Breaker, 0.8 Amp	330-399-00
ALL SHKA4000 UNITS	Circuit Breaker, 10 Amp, 120V	330-119-00
SHKA4000-1CE, SHKE4000-1CE, SHKE4000-6CE	Circuit Breaker, 5 Amp, 240V	330-118-00
ALL SHKA4000 UNITS	Disc Thermostat	330-397-00
SHKE4000, SHKE4000-1CE, SHKE4000-5, SHKE4000-6CE	Display/time/speed/temp bd	019-536-00
ALL SHKE4000 UNITS	Drive belt	150-288-00
ALL SHKA4000 UNITS	Drive belt	150-318-00
ALL ABOVE CATALOG NUMBERS	Drive Crank:	803-632-00
ALL ABOVE CATALOG NUMBERS	Gas Spring:	850-117-00
SHKE4000, SHKE4000-5, SHKE4000-1CE, SHKE4000-6CE	Heat/blwr/controller	019-653-00
SHKA4000-5, SHKE4000-5	Heater, 120V Hi-Temp	340-398-01
ALL ABOVE CATALOG NUMBERS	Heater, 120V	340-394-00
SHKE4000-5, SHKE4000-6CE	Heater, 240V Hi-Temp	340-398-01
SHKE4000-5, SHKE4000-6CE	Heater, 240V	340-391-01
ALL ABOVE CATALOG NUMBERS	Idler	803-633-00
ALL ABOVE CATALOG NUMBERS	Immersible RTD Temp sensor	410-632-00
ALL SHKA4000 UNITS	Knob	560-275-00
ALL SHKA4000 UNITS	Knob, Locking Tab	600-125-00

REPLACEMENT PARTS

Available Shakers: SHKA4000, SHKA4000-1CE, SHKA4000-5, SHKA4000-6CE, SHKA4000-7, SHKA4000-8CE, SHKE4000, SHKE4000-1CE, SHKE4000-5, SHKE4000-6CE, SHKE4000-7, SHKE4000-8CE

Catalog Number (Shaker)	Description	Part Number
ALL SHKA4000 UNITS	Lamp Base	360-233-01
ALL ABOVE CATALOG NUMBERS (120V)	Line Cord, 120V	470-264-00
ALL ABOVE CATALOG NUMBERS (240V)	Line Cord, CE, 240V	470-305-00
ALL SHKA4000 UNITS	Mini Rocker Switch	440-397-00
ALL SHKE4000 UNITS	Motor	370-390-00
ALL SHKA4000 UNITS	Motor	370-388-00
	Motor replacement brushes for 370-388-00	370-272-01
ALL ABOVE CATALOG NUMBERS	Operators manual	057-287-00
ALL ABOVE CATALOG NUMBERS	Platform Mat	790-316-13
ALL SHKE4000 UNITS	Power Supply	460-315-00
SHKE4000, SHKE4000-1CE	Program Micro Bd	019-533-04
SHKE4000-5, SHKE4000-6CE	Program Micro Bd	019-533-05
ALL SHKE4000 UNITS	Prwr/ Mtr Drive PC BD	019-534-00
ALL SHKA4000 UNITS	Red Lens	360-234-00
ALL SHKA4000 UNITS	Round Power Switch	440-396-00
ALL ABOVE CATALOG NUMBERS	Rubber Foot	790-423-00
ALL ABOVE CATALOG NUMBERS	Shaker Mechanism	019-455-00
ALL ABOVE CATALOG NUMBERS	Solid State Relay	400-233-00
ALL SHKA4000 UNITS 240 VOLT	Speed Control, 240V	229-419-00
ALL SHKA4000 UNITS	Speed Control, 120V	227-598-00
ALL ABOVE CATALOG NUMBERS	SPST Switch	440-080-00
ALL SHKA4000 UNITS	Tach PCB	228-612-00
ALL SHKA4000 UNITS	Tachometer	660-111-00
SHKA4000 SHKA4000-5 SHKA4000-7	RPO Configured Temp Controller, 120V	485-360-17 485-360-19 485-360-20
SHKA4000-1CE SHKA4000-6CE SHKA4000-8CE	RPO Configured Temp Controller, 240V	485-522-01 485-522-03 485-522-04
ALL ABOVE CATALOG NUMBERS	Thermostat	920-301-00
ALL ABOVE CATALOG NUMBERS	Thumb Screw	562-184-10
ALL SHKA4000 UNITS	Timer	270-135-00

Wiring Diagrams

Catalog Number	Description
D-229-329-00	SHKA4000
D-229-348-00	SHKA4000-1CE
D-229-330-00	SHKE4000
D-229-349-00	SHKE4000-1CE
D-229-336-00	SHKA4000-5
D-229-338-00	SHKA4000-6CE
D-229-337-00	SHKE4000-5
D-229-339-00	SHKE4000-6CE
D-229-340-00	SHKA4000-7
D-229-341-00	SHKA4000-8CE
D-229-342-00	SHKE4000-7
D-229-343-00	SHKE4000-8CE
B-797-172-11	Refrigeration schematic

Ordering Procedures

Please refer to the Specification Plate for the complete model number, serial number, and series number when requesting service, replacement parts or in any correspondence concerning this unit.

All parts listed herein may be ordered from the **Barnstead International** dealer from whom you purchased this unit or can be obtained promptly from the factory. When service or replacement parts are needed we ask that you check first with your dealer. If the dealer cannot handle your request, then contact our Customer Service Department at 563-556-2241 or 800-553-0039.

Prior to returning any materials to **Barnstead International**, please contact our Customer Service Department for a “Return Goods Authorization” number (RGA). Material Returned without an RGA number will be returned.

Warranty

Barnstead International (“Barnstead”) warrants that this product carries a five year warranty on parts, one year warranty on labor and a lifetime warranty on the drive mechanism. The warranty is effective from the first to occur (i) the date the product is sold by Barnstead or (ii) the date the product is purchased by the original retail customer (the “Commencement Date”). Except as expressly stated above,

BARNSTEAD MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, WITH RESPECT TO THE PRODUCTS AND EXPRESSLY DISCLAIMS ANY AND ALL WARRANTIES, INCLUDING BUT NOT LIMITED TO, WARRANTIES OF DESIGN, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

An authorized representative of Barnstead must perform all warranty inspections. In the event of a defect covered by Barnstead ’s warranty, Barnstead shall, as its sole obligation and exclusive remedy, provide free replacement parts to remedy the defective product

Barnstead ’s warranty provided hereunder shall be null and void and without further force or effect if there is any (i) repair made to the product by a party other than Barnstead or its duly authorized service representative, (ii) misuse (including use inconsistent with written operating instructions for the product), mishandling, contamination, overheating, modification or alteration of the product by any customer or third party or (iii) use of replacement parts that are obtained from a party who is not an authorized dealer of Barnstead .

IN NO EVENT SHALL BARNSTEAD BE LIABLE TO ANY PARTY FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, OR FOR ANY DAMAGES RESULTING FROM LOSS OF USE OR PROFITS, ANTICIPATED OR OTHERWISE, ARISING OUT OF OR IN CONNECTION WITH THE SALE, USE OR PERFORMANCE OF ANY PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, TORT (INCLUDING NEGLIGENCE), ANY THEORY OF STRICT LIABILITY OR REGULATORY ACTION.

The name of the authorized Barnstead International dealer nearest you may be obtained by calling 1-800-446-6060 (563-556-2241) or writing to:

BarnsteadInternational

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