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OPERATION MANUAL

MANUAL NO. 057-810-00

REV. C

ECN 19193

LAB-LINE® MAX Q MINI 4450 SHAKER

MODEL NO.

SHKA4450, SHKA4450CC

SHKA4450-1CE, SHKA4450CC-1CE

SHKE4450, SHKE4450CC

SHKE4450-1CE, SHKE4450CC-1CE



BI Barnstead International | *Lab-Line*
Apogee Your Lab Starts Here

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SAFETY INFORMATION

ALERT SIGNALS



WARNING

Warnings alert you to a possible personal injury.



CAUTION

Cautions alert you 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.



CAUTION

Cautions alert you to risks of electric shock.

INTRODUCTION

THANK YOU

for selecting Lab-Line Instruments for your equipment needs. For maximum value and ease of start-up,

PLEASE PROCEED AS FOLLOWS:

- Use the Packing List, provided at the end of this manual, when unpacking to verify that the complete unit has been received. Do not discard packing materials until all is accounted for.
- Read this operation manual thoroughly *before* deciding upon an appropriate location for the unit.
- Insist that every operator of this unit becomes familiar with the Operation Section of this manual.
- Be sure to fill out the Warranty Registration Card and mail it in to Lab-Line Instruments within seven (7) days after receiving the unit.

IF

after reading this manual you should have any difficulties with the installation or operation instructions, please call:

Lab-Line Customer Relations Department
(563) 556-2241 or (800) 522-5463

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SAFE OPERATION



WARNING:

- DO NOT MODIFY CONSTRUCTION AND/OR ASSEMBLY OF EQUIPMENT.
- DO NOT REMOVE TAGS, LABELS, DECALS OR OTHER INFORMATION FROM THE UNIT.
- STAND CLEAR OF EQUIPMENT WHEN IT IS OPERATING.
- IF SHAKING ACTION WILL RESULT IN THE EVOLUTION OF GASES OR FUMES, CARRY OUT THE OPERATION IN A WELL-VENTILATED LABORATORY HOOD.
- DO NOT USE EQUIPMENT FOR OTHER THAN 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.
- PERFORM REGULAR MAINTENANCE SERVICE AS SPECIFIED IN THIS MANUAL AND KEEP UNIT IN GOOD REPAIR. DO NOT OPERATE WITH KNOWN DEFECTS.
- DO NOT USE THE SHAKER TO MIX FLAMMABLE MATERIALS OR WHERE THE TRANSFER OF MECHANICAL ENERGY TO GLASS COULD CAUSE GLASS BREAKAGE.

PRODUCT PROFILE

3.1 OVERVIEW:

The Lab-Line Mini MAX Q 4450 bench top, incubated shakers are available in either analog or digital control configurations:

- A-Class shakers: SHKA4450, SHKA4450CC, SHKA44500-1CE and SHKA4450CC-1CE: control temperature by a Proportional/Integral/Derivative microprocessor-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.
- E-Class shakers: SHKE4450, SHKE4450CC, SHKE4450-1CE and SHKE4450CC-1CE: control temperature, time and speed by a Proportional/Integral/Derivative (PID) microprocessor-based controller that is adjustable with membrane switches on a keypad in 1 rpm increments. 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.
- Models SHKA4450CC, SHKA4450CC-1CE, SHKE4450CC and SHKE4450CC-1CE include a cooling coil to allow a below ambient temperature in the shaker's chamber.
- Temperature range 5°C above ambient to 80°C.
- 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.
- ¾ inch (1.9 cm) triple eccentric orbital drive.
- 6 permanently lubricated ball bearings.
- 35 lb (15.9 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.

Catalog Number	SHKA4450 SHKA4450CC	SHKA4450-1CE SHKA4450CC- 1CE	SHKE4450 SHKE4450CC	SHKE4450-1CE SHKE4450CC- 1CE
Electrical Voltage AC Amperage Wattage Frequency	120 4.5 500 60	220-240 2.25 500 50	120 4.5 500 60	220-240 2.25 500 50
Speed Accuracy	40 to 400 rpm ±2 rpm	40 to 400 rpm ±2 rpm	15 to 500 rpm ±1 rpm	15 to 500 rpm ±1 rpm
Timer	Continuous or timed operation from 1 minute to 60 minutes	Continuous or timed operation from 1 minute to 60 minutes	Continuous or timed operation from 0.1 hour up to 999 hours or 0.1 minute to 999 minutes	Continuous or timed operation from 0.1 hour up to 999 hours or 0.1 minute to 999 minutes
Display Mutable Alarms	LED display indicates temperature in 0.1°C increments. Analog tachometer displays speed in rpm None	LED display indicates temperature in 0.1°C increments. Analog tachometer displays speed in rpm None	3 individual LED displays indicate temperature, time and speed simultaneously. 3 characters, height ½ inches (1.27 cm) Audible portion of the alarm can be silenced for a period of 1 hour without deactivating the actual alarm condition by depressing any key.	3 individual LED displays indicate temperature, time and speed simultaneously. 3 character, height ½ inches (1.27 cm) Audible portion of the alarm can be silenced for a period of 1 hour without deactivating the actual alarm condition by depressing any key.

Catalog Number	SHKA4450 SHKA4450CC	SHKA4450-1CE SHKA4450CC- 1CE	SHKE4450 SHKE4450CC	SHKE4450-1CE SHKE4450CC- 1CE
Alarm				
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	Continuous operation (hold) or timed operation from 1 to 60 minutes.	Continuous operation (hold) or timed operation from 1 to 60 minutes.	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.
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

Catalog Number	SHKA4450 SHKA4450CC	SHKA4450-1CE SHKA4450CC-1CE	SHKE4450 SHKE4450CC	SHKE4450-1CE SHKE4450CC-1CE
RS232 Interface*	None	None	Monitor speed, temperature and time with a computer	Monitor speed, temperature and time with a computer
Recorder Output* (Located on left side rear of shaker)	None	None	10 mv/C output monitors temperature with external chart recorder	10 mv/C output monitors temperature with external chart recorder
Optional Platform Dimensions L X W	13" X 11" (33.0 X 27.9 cm)	13" X 11" (33.0 X 27.9 cm)	13" X 11" (33.0 X 27.9 cm)	13" X 11" (33.0 X 27.9 cm)
Exterior Dimensions L X W X H	27.16" X 14.09" X 15.75" (69.0 X 35.8 X 40.0 cm)	27.16" X 14.09" X 15.75" (69.0 X 35.8 X 40.0 cm)	27.16" X 14.09" X 15.75" (69.0 X 35.8 X 40.0 cm)	27.16" X 14.09" X 15.75" (69.0 X 35.8 X 40.0 cm)

3.3 UNIT'S 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

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

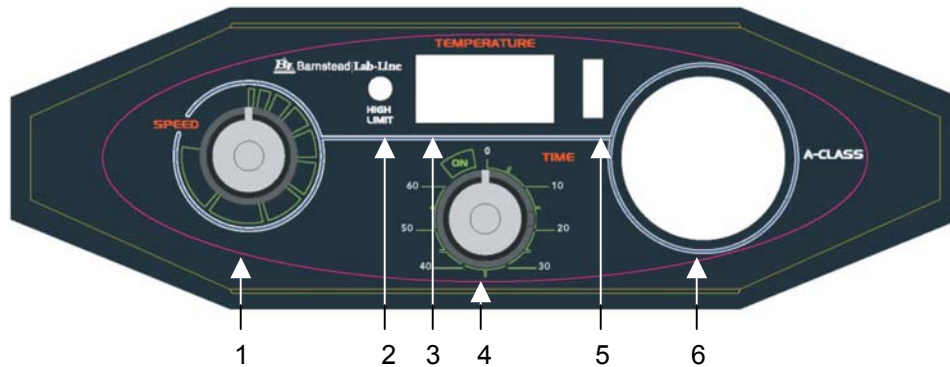
**Refer to IEC 664-1



CAUTION: IT IS NOT RECOMMENDED TO OPERATE SHAKER IN A CO₂ ENRICHED ATMOSPHERE. THE FORMATION OF CARBONIC ACID COULD CAUSE ELECTRICAL FAILURES.

PRODUCT PROFILE: (Con't)

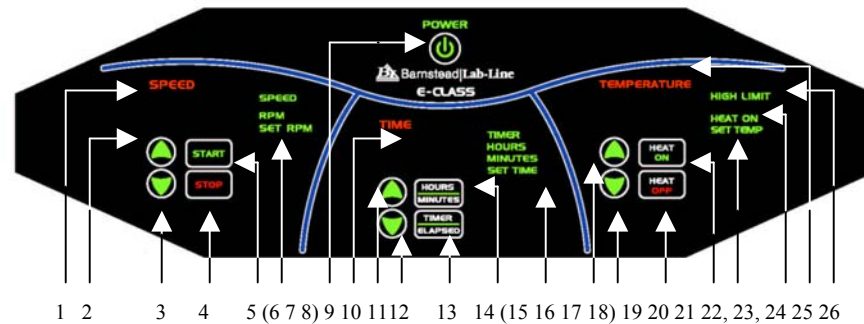
3.4 A-CLASS CONTROL PANEL FEATURES:



1. **SPEED** Control: Sets platform rotation speed.
2. **HIGH-LIMIT** Light: Illuminates when high limit thermostat is controlling temperature.
3. **TEMPERATURE** Controller: Maintains temperature.
4. **TIME(R)**: Allows user to chose continuous timing or set timed operation.
5. Heat Switch: Activates heater, turns heat on and off.
6. Speed Tachometer: Analog display of platform rotation speed (RPM).

PRODUCT PROFILE: (Con't)

3.5 E-CLASS CONTROL PANEL FEATURES:



1. **SPEED** Display: 3-digit LED indicates actual or set point speed
2. Up Arrow Switch: Increases platform rotation speed
3. Down Arrow Switch: Decreases platform rotation speed
4. **STOP** Switch: Stops platform rotation
5. **START** Switch: Starts platform rotation
6. **SPEED** Light: Red light Illuminates when a locked rotor or over-speed condition exists
7. **RPM** Light: Illuminates to indicate actual speed
8. **SET RPM** Light: Illuminates when speed is being set
9. **POWER** Switch: Turns power on and off to shaker
10. **TIME** Display: 3-digit LED indicates time remaining or elapsed time
11. Up Arrow Switch: Increases shaking time
12. Down Arrow Switch: Decreases shaking time
13. **TIMER/ELAPSED**: Allows the user to choose elapsed time operation, **ELAPSED**, or timed operation, **TIMER**
14. **HOURS/MINUTES** Membrane Switch: Allows user to choose timing operation in either hours or minutes
15. **TIMER**: Allows the user to choose elapsed time operation, **ELAPSED** is the default setting. User must press **TIMER** switch for timing operations
16. **HOURS**: Timer indicates hours
17. **MINUTES**: Timer indicates minutes
18. **SET TIME**: Illuminates when time is being set
19. Up Arrow Key: Increases temperature
20. Down Arrow Key: Decreases temperature
21. **HEAT OFF** Switch: Turns off heat
22. **HEAT ON** Switch: Turns on heat
23. **HEAT ON** Light: Indicates heaters are energized
24. **SET TEMP** Light: Indicates temperature can be set
25. **TEMPERATURE** Display: 3-digit LED indicates chamber temperature
26. **HIGH LIMIT** Light: Indicates hi-limit control has been activated.

INSTALLATION


4.1 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 your 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 promptly.
- **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.

4.2 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's nameplate requirements.
- Allow approximately 2" (5 cm) of clearance around the unit for free air convection, accessory attachments and user convenience.

4.3 ELECTRICAL REQUIREMENTS:

- SHKA4450, SHKA4450CC, SHKE4450 and SHKE4450CC 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.
- SHKA4450-1CE, SHKA4450CC-1CE, SHKE4450-1CE and SHKE4450CC-1CE shakers require a 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.
-  **WARNING: DO NOT OPERATE SHAKER WITH A DAMAGED ELECTRICAL CORD.**
- Leave shaker disconnected when not in use.

INSTALLATION: (Con't)



CAUTION: DO NOT OPERATE SHAKER WITH AN UNBALANCED LOAD. PLATFORMS SHOULD BE LOADED FOR OPTIMUM STABILITY. DO NOT LIFT SHAKER BY THE PLATFORM.

4.4 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.

4.5 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. Secondly, gently slide the flask into its proper position securing it to the wider bottom of the clamp. The spring will hold the body 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.

4.6 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



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.



5.1 A-CLASS:

Please refer to page 12 for control panel reference.



5.1A POWER SWITCH:

1. Depress top portion of power switch to turn on shaker. Power switch is located on the left front side of the shaker.
2. Depress bottom portion of power switch to turn off shaker.

5.1B 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.

5.1C 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.



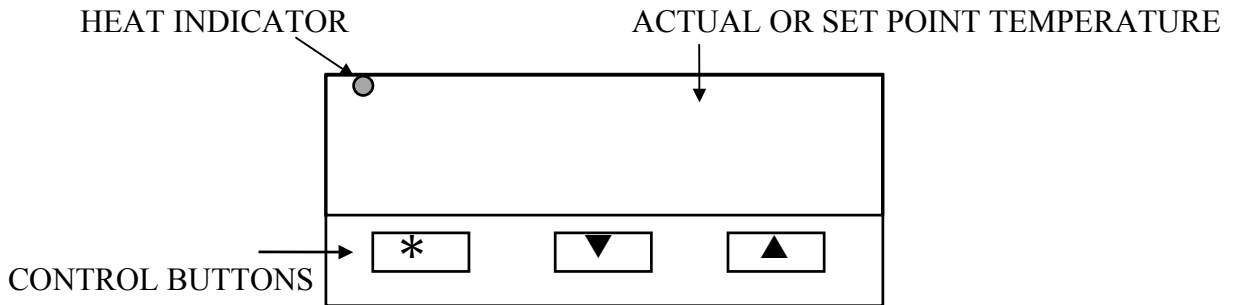
NOTE: SHAKER WILL NOT OPERATE IF THE TIMER IS IN THE OFF POSITION.

OPERATION: (Con't)

5.1 A-CLASS: (Con't)

Please refer to page 12 for control panel reference.

5.1D TEMPERATURE CONTROLLER/SETTING TEMPERATURE:



1. **CONTROLLER SELF-TEST:** When the oven 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 at least 30 minutes for the temperature to stabilize.

OPERATION: (Con't)

5.1 A-CLASS: (Con't)

Please refer to page 20 for temperature controller reference.

5.1E TEMPERATURE CALIBRATION:

1. Fill a 250-ml Erlenmeyer flask with approximately 50 ml of water and position at the 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. Press and hold the “**STAR**” (*) key and using the **UP** or **DOWN** arrow key, adjust the set point to the desired temperature.
5. Allow the unit to run for at least 30 minutes.
6. The controller display should now be indicating the set point temperature. Make note of the thermometer reading.
7. 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 indicate **LEUL**. Press and hold the “**STAR**” (*) key and using the **UP** arrow key adjust the display to read **3**. Release the “**STAR**” (*) key. Press and release the **UP** arrow key until the display indicates **Zero**. The display should now alternate between **Zero** and a numerical value.
8. Using the examples shown below and the thermometer value obtained in step 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.

$$\begin{array}{rcl} \text{Thermometer} & = & 60\text{ }^{\circ}\text{C} \\ \text{Controller Reading} & = & 65\text{ }^{\circ}\text{C} \\ \hline \text{Subtract} & = & -5\text{ }^{\circ}\text{C} \end{array}$$

Enter **Zero** value of -5 °C

$$\begin{array}{rcl} \text{Thermometer} & = & 70\text{ }^{\circ}\text{C} \\ \text{Controller Reading} & = & 65\text{ }^{\circ}\text{C} \\ \hline \text{Subtract} & = & +5\text{ }^{\circ}\text{C} \end{array}$$

Enter **Zero** value of +5 °C

9. 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 $\pm 0.5^{\circ}\text{C}$.
10. Allow the unit to run for at least 60 minutes.
11. Recheck the thermometer reading the controller display and the thermometer should agree to within $\pm 0.5^{\circ}\text{C}$. If not repeat steps 7, 8 and 9 above.

OPERATION: (Con't)

5.1 A-CLASS: (Con't)

Please refer to page 12 for control panel reference.

5.1F SETTING HI-LIMIT CONTROL:



NOTE: THE HI-LIMIT CONTROL IS LOCATED ON THE RIGHT FRONT SIDE OF THE CABINET.

1. Make appropriate power connection.
2. Turn power switch **ON**.
3. Using a small screwdriver, rotate high-limit control fully clockwise.
4. Set chamber temperature.
5. Allow sufficient time for temperature to stabilize before setting the high-limit control.
6. Rotate high-limit control slowly counterclockwise until set point is reached. 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.
7. When desired temperature is achieved, load the shaker.



WARNING: DO NOT OPERATE THE SHAKER IF ANY OF THE TEMPERATURE CONTROLS BECOME INOPERATIVE. A HAZARDOUS CONDITION WILL DEVELOP WHICH CAN RESULT IN INJURY OR DEATH AND PROPERTY DAMAGE.

OPERATION: (Con't)

5.2 E-CLASS:

Please refer to page 13 for control panel reference.

5.2A TURNING SHAKER ON:

Beginning with the shaker power being turned OFF

1. Press membrane **POWER** switch once (1) to turn ON shaker
2. Press membrane **POWER** switch a second time (0) 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.

5.2B 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.

5.2C 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

OPERATION: (Con't)

5.2 E-CLASS: (Con't)

Please refer to page 13 for control panel reference.

5.2D 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.

5.2E SETTING HI-LIMIT CONTROL:



NOTE: THE HI-LIMIT CONTROL IS LOCATED ON THE LOWER FRONT SIDE OF THE CABINET.

1. Make appropriate power connection.
2. Turn power switch **ON**.
3. Using a small screwdriver, 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. Turn the Hi-Limit control slowly counterclockwise and wait several seconds between adjustments since there may be a 5 to 10 second delay before the hi-limit alarm sounds. 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.



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.

OPERATION: (Con't)

5.2 E-CLASS: (Con't)

Please refer to page 13 for control panel reference.

5.2F 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

5.2G TEMPERATURE CALIBRATION:

9. Fill a 250-ml Erlenmeyer flask with approximately 50 ml of water and position at the center of the shaking platform.
10. Install a thermocouple inside the flask with the thermocouple junction in direct contact with the water
11. Adjust the safety thermostat to its maximum clockwise position.
12. Adjust the set point temperature, using the **Up** and **Down** keys, to read 37°C or any other desired set point
13. Allow sufficient time for the temperature to stabilize—30 minutes.
14. Press heat on button and, while continuing to hold, press and release the heat off button. Now, release the heat on button
15. The decimal point should now be flashing indicating that the unit is in the temperature calibration mode.
16. Use the Up and Down arrow keys to adjust the temperature on LED readout to match the temperature reading on the thermocouple meter.
17. Press the heat off button. The beeper will sound indicating that the new, calibration value that you have entered is now stored in the nonvolatile memory of the temperature controller.



NOTE: IT IS IMPORTANT TO PRESS THE HEAT OFF BUTTON TO EXIT THE CALIBRATION MODE.

10. Press heat on button to complete return to normal operating mode.

OPERATION: (Con't)

5.2 E-CLASS: (Con't)

Please refer to page 13 for control panel reference.

5.2H 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.
4. Press **START** to begin timed shaking-countdown 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 annunciate at the end of the timing cycle and platform rotation will cease.

5.2I SETTING TIMER FOR CONTINUOUS TIMING:

1. Press **TIMER/ELAPSED** membrane switch until **TIMER** light is off. 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. Press **START** to begin timed shaking. **TIME** display should show 000. Timer will begin to count up and will display accumulated time in display window. Display will flash when 999 minutes or 999 hours is achieved.

OPERATION: (Con't)

5.2 E-CLASS: (Con't)

5.2J 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



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”.
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: RS232 INTERFACE PORT IS FOR OUTPUT ONLY. INTERFACE CABLES MUST NOT EXCEED 9.8' (3m) IN LENGTH.

OPERATION: (Con't)

5.3 OPTIONAL COOLING COIL

USING THE OPTIONAL COOLING COIL:

Either tap water or other user-supplied media from a refrigerated circulator flows through the submerged cooling coil.

1. Adjust setpoint to the desired temperature.
2. Connect the coolant hoses to the cooling coil fittings on the back of the unit. Start the coolant flowing through the cooling coil; flow rate should be at least 6-8 liters per minute. The coolant temperature must be at least 15°C less than the desired chamber temperature. The coolant flow and temperature must be constant.
3. Allow the chamber temperature to stabilize at the setpoint.
4. Readjust the safety thermostat.
5. Lift the cover and load platform. Close lid.

TROUBLE SHOOTING

The following is intended as a reference guide to help in servicing this unit if problems should occur.

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

OVER TEMPERATURE PROTECTION:

In the unlikely event that the programmed hi-limit and the user adjustable hi-limit thermostats fail, there is a third over temperature thermostat. The thermostat is located underneath the shaker's back panel. If the shaker fails to heat with the "HEAT ON" lamp lit and the user settable hi-limit thermostat set to the fully clockwise position, it will be necessary to reset the secondary over temperature thermostat. To do so, proceed as follows:

1. **Disconnect power cord from outlet.**
2. Remove rear panel.
3. Locate the thermostat on top of plenum. The thermostat has a small button that needs to be pressed in to reset the thermostat.
4. Once the thermostat is reset, reinstall the rear panel, plug the power cord back into the outlet and verify the unit is heating again.
5. If the shaker still fails to heat, contact Lab-Line customer service for further assistance.

MAINTENANCE

BE ADVISED:



NOTE: MAKE NO ATTEMPT TO SERVICE OR REPAIR A LAB-LINE PRODUCT UNDER WARRANTY BEFORE CONSULTING YOUR LAB-LINE DEALER. AFTER THE WARRANTY PERIOD, SUCH CONSULTATION IS STILL ADVISED, ESPECIALLY WHEN THE REPAIR MAY BE TECHNICALLY SOPHISTICATED OR DIFFICULT.

IF ASSISTANCE IS NEEDED BEYOND WHAT THE DISTRIBUTOR CAN PROVIDE, PLEASE CALL THE LAB-LINE CUSTOMER RELATIONS DEPARTMENT AT (563) 556-2241 OR (800) 522-5463. NO MERCHANDISE, HOWEVER, SHOULD BE RETURNED DIRECTLY TO LAB-LINE WITHOUT PRIOR APPROVAL FROM LAB-LINE.



WARNING: DISCONNECT PLUG FROM ELECTRICAL OUTLET BEFORE ATTEMPTING ANY MAINTENANCE OR REPAIR OF THIS UNIT.

A QUALIFIED SERVICE REPRESENTATIVE MUST PERFORM ANY INTERNAL ADJUSTMENTS OR REPAIRS.

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.

MAINTENANCE:

SUGGESTED WITH EVERY 3 MONTHS OF CONSTANT USE:



NOTE: THE SHAKING MECHANISM IS EQUIPPED WITH SEALED BALL BEARINGS WHICH DO NOT REQUIRE FURTHER LUBRICATION OR ADJUSTMENT.

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

REPLACEMENT PARTS

SECTION 8

PART NO.	DESCRIPTION	SHKA4450	SHKE4450	SHKA4450-1CE	SHKE4450-1CE
057-810-00	Operation Manual	√	√	√	√
150-318-00	Belt, Drive	√		√	
150-288-00	Belt, Drive 3/16 X 22-3/8		√		√
160-208-00	Chamber Blower-120V	√	√		
330-399-00	Circuit Breaker, 0.8-Amp	√			
330-119-00	Circuit Breaker, 10-Amp	√	√		
485-360-17	Controller, Programmed	√			
720-592-01	Cover	√	√	√	√
420-265-01	Dust Cover, D-Sub		√		√
790-078-00	Mounting Feet	√	√	√	√
560-281-00	Handle	√	√	√	√
340-364-00	Heater, 500W-120V	√	√		
570-378-00	Hinge, Cover	√	√	√	√
682-720-00	Keyboard With Graphics		√		√
560-274-00	Knob	√		√	
600-125-00	Knob, Locking Tab	√		√	
470-364-00	Linecord	√	√		
790-316-11	Mat, Platform	√	√	√	√
370-388-00	Motor	√		√	
370-390-00	Motor		√		√
805-931-00	Pan, Holder-Platform	√	√	√	√
019-671-00	PCB, Display-Time, Speed		√		√
019-653-00	PCB, Heat/Blower/Controller Assy		√		√
019-533-09	PCB, Micro-Programmed		√		√
019-534-00	PCB, Power/Motor Drive		√		√
228-612-00	PCB, Tach	√		√	
460-315-00	Power Supply		√		√
150-287-00	Pulley, Drive	√		√	
150-297-00	Pulley, Driver		√		√
470-357-00	Ribbon Cable		√		√
019-445-00	Shaker Mechanism Assy	√	√	√	√
400-233-00	Solid State Relay	√		√	
227-598-00	Speed Contro-120VI	√			
830-476-00	Spring, Gas	√	√	√	√
440-080-00	Switch, Push Button-Cover	√	√	√	√
440-397-00	Switch, Mini Rocker-Heat	√		√	
440-359-00	Switch, Rocker	√		√	
660-111-00	Tachometer	√		√	
410-632-00	Temp Sensor, RTD	√	√	√	√
920-301-00	Thermostat	√	√	√	√
330-400-00	Thermostat, OTP	√	√	√	√
270-135-00	Timer	√		√	
229-395-00	Wiring Diagram	√			
229-392-00	Wiring Diagram		√		
160-209-00	Cooling Fan-240V			√	√
370-355-00	Cooling Fan-120V	√	√		

NOTE: MODELS WITH COOLING COILS (CC IN MODEL NUMBER) HAVE IDENTICAL PARTS.

REPLACEMENT PARTS: (Con't)

PART NO.	DESCRIPTION	SHKA4450	SHKE4450	SHKA4450-1CE	SHKE4450-1CE
229-396-00	Wiring Diagram			√	
229-397-00	Wiring Diagram				√
160-280-01	Chamber Blower-240V			√	√
330-138-00	Circuit Breaker-0.5 Amp			√	
229-419-00	Speed Control-240V			√	
340-364-01	Heater, 500W-240V			√	√
470-371-00	Linecord-240V			√	√
485-522-03	Controller, Programmed			√	
370-272-01	Motor Brushes	√		√	
330-118-00	Circuit Breaker-5.0Amps			√	√

NOTE: MODELS WITH COOLING COILS (CC IN MODEL NUMBER) HAVE IDENTICAL PARTS.

**NEED A PART? CALL THE LAB-LINE PARTS HOTLINE.
CALL (563) 556-2241 or (800) 522-5463: FAX (563) 589-0516.**

LAB-LINE RESERVES THE RIGHT TO CHANGE SPECIFICATIONS WITHOUT PRIOR NOTICE

WARRANTY

LAB-LINE INSTRUMENTS, INC. (“Lab-Line”) warrants that the drive mechanism for this product manufactured by Lab-Line shall be free of defects in materials for the lifetime of the unit, the remainder of this product shall be free of defects in materials for a period of 60 months from the first to occur of (i) the date the product is sold by Lab-Line or (ii) the date the product is purchased by the original retail customer (the “Commencement Date”). Labor will be for a period of 12 months. Except as expressly stated above,

LAB-LINE 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 Lab-Line must perform all warranty inspections. In the event of a defect covered by Lab-Line’s warranty, Lab-Line shall, as its sole obligation and exclusive remedy, provide free replacement parts to remedy the defective product.

Lab-Line’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 Lab-Line 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 Lab-Line.

IN NO EVENT SHALL LAB-LINE 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 your nearest authorized Lab-Line dealer may be obtained by calling 1-800-522-5463.



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PACKING LIST

The following loose parts are packed with this unit. Before discarding any packing materials, please be sure that nothing has been overlooked.

MODEL NO. SHKA4450, SHKA4450CC, SHKA4450-1CE, SHKA4450CC-1CE,
SHKE4450, SHKE4450CC, SHKE4450-1CE, SHKE4450CE-1CE

CHECKED BY: _____

DATE: _____

PACKED BY: _____

CHECKED	ITEM	PART NUMBER	QUANTITY
_____	Operation Manual	057-810-00	1
_____	Registration Card	528-022-00	1
_____	Inspection Tag	528-028-00	1
_____	Mounting Plate Mat	790-316-11	1
_____	Thumb Screw Knob	562-184-10	4
_____	Male Connector E-Class Only	420-359-00	1



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