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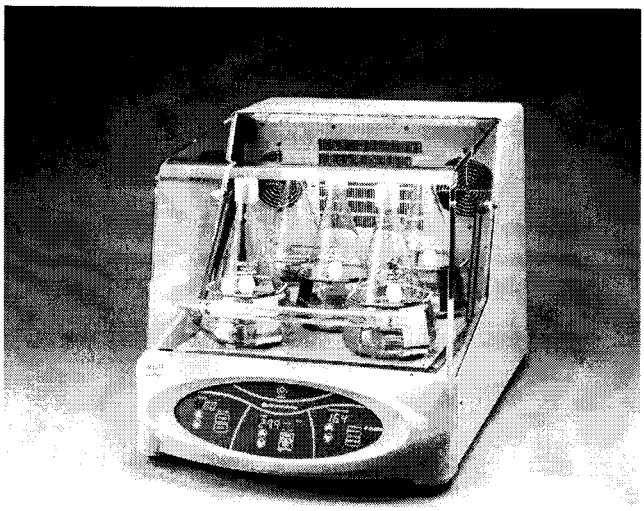
OPERATION MANUAL

MANUAL NO. 057-287-00
REV. E
ECN 19157

LAB-LINE® MAX Q 4000 INCUBATED & 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



Barnstead International | Lab-Line
Your Lab Starts Here

1999 North 15th Ave.. Melrose Park, IL 60160-1491 USA
PHONE: (563) 556-2241 or (800) 522-5463; FAX: (563) 589-0516

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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.

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SECTION 1

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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SECTION 2

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.

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SECTION 3

PRODUCT PROFILE

3.1 OVERVIEW:

The Lab-Line MAX Q 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 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. 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 keypad 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, 5°C above ambient to 60°C, ±0.1°C at 37°C in flask.
- High Temperature: SHKA4000-5, SHKA4000-6CE, SHKE4000-5, SHKE4000-6CE, 5°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.
- ¾ 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.

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Catalog 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
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

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Catalog Number	ALL ANALOG "A" SERIES UNITS	ALL ANALOG "A" SERIES UNITS	ALL DIGITAL "E" SERIES UNITS	ALL DIGITAL "E" SERIES UNITS
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 ½ inches (1.27 cm)	3 individual LED displays indicate temperature, time and speed simultaneously. 3 characters height ½ inches (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.

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PRODUCT PROFILE (Con't): 3.2 SPECIFICATIONS (Con't):

Catalog Number	ALL ANALOG "A" SERIES UNITS	ALL ANALOG "A" SERIES UNITS	ALL DIGITAL "E" SERIES UNITS	ALL DIGITAL "E" SERIES UNITS
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	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.

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Catalog Number	ALL ANALOG "A" SERIES UNITS	ALL ANALOG "A" SERIES UNITS	ALL DIGITAL "E" SERIES UNITS	ALL DIGITAL "E" SERIES UNITS
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
Optional Platform Dimensions L X W	18" X 18" (45.7 X 45.7 cm)	18" X 18" (45.7 X 45.7 cm)	18" X 18" (45.7 X 45.7 cm)	18" X 18" (45.7 X 45.7 cm)
Exterior Unit Dimensions L X W X H	32" X 22.5" X 22" (81.3 x 57.2 X 55.9 cm)	32" X 22.5" X 22" (81.3 x 57.2 X 55.9 cm)	32" X 22.5" X 22" (81.3 x 57.2 X 55.9 cm)	32" X 22.5" X 22" (81.3 x 57.2 X 55.9 cm)

3.3 UNIT'S ENVIRONMENTAL OPERATING CONDITIONS:

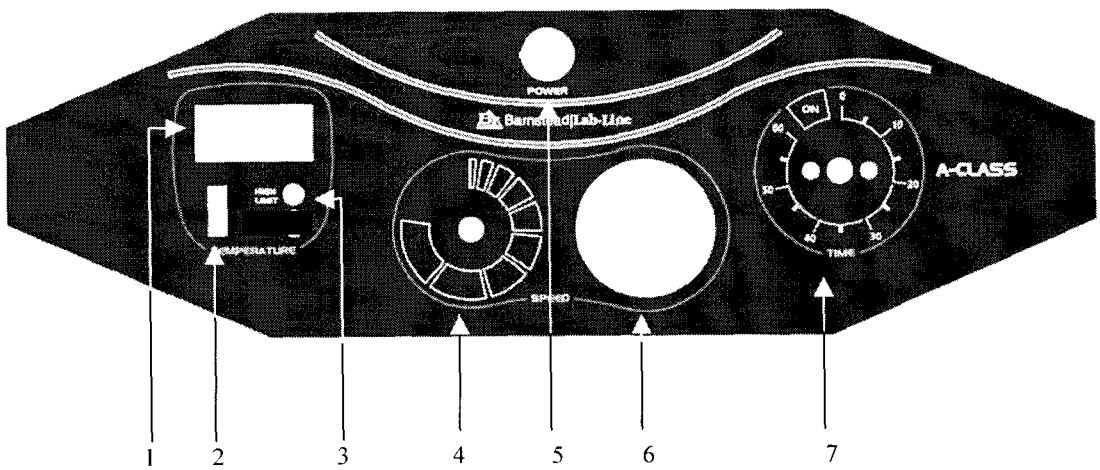
Pollution Degree**	2
Installation Category**	II
Altitude	2000 meters MSL (Mean Sea Level)
Relative Humidity	20% to 80% maximum, non-condensing
Electrical Supply	120 VAC or 240 VAC
Voltage Tolerance	±10% of normal rated line
Temperature	15°C to 32°C
Product Usage	This product is intended for use indoors **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 CO_2 ENRICHED ATMOSPHERE. THE FORMATION OF CARBONIC ACID COULD CAUSE ELECTRICAL FAILURES.

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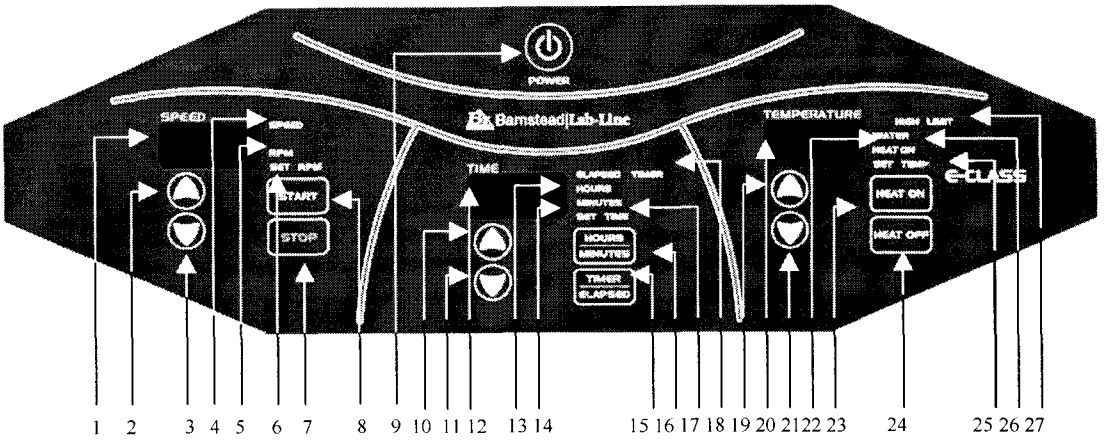
3.4 A-CLASS CONTROL PANEL FEATURES:



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 chose either continuous or timed operation.

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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 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. **HOURS**: Timer indicates hours
14. **MINUTES**: Timer indicates minutes
15. **TIMER/ELAPSED**: Allows the user to choose elapsed time operation, **ELAPSED**, or timed operation, **TIMER**
16. **HOURS/MINUTES** Membrane Switch: Allows user to choose timing operation in either hours or minutes
17. **SET TIME**: Illuminates when time is being set
18. **ELAPSED TIMER** Light: Indicates accumulated time
19. ⇧ Up Arrow Key: Increases temperature
20. **TEMPERATURE** Display: 3 digit LED indicates chamber temperature
21. ⇩ Down Arrow Key: Decreases temperature
22. **WATER** Light: This display has no function on this unit
23. **HEAT ON** Switch: Turns on heat
24. **HEAT OFF** Switch: Turns off heat
25. **SET TEMP** Light: Indicates temperature can be set
26. **HEAT ON** Light: Indicates heaters are energized
27. **HIGH-LIMIT** Light: Indicates high-limit control has been activated

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SECTION 4

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.
- Shakers with refrigeration should be placed near an accessible drain.

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4.3 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.

- ⚠ **WARNING:** DO NOT OPERATE SHAKER WITH A DAMAGED ELECTRICAL CORD.

- Leave shaker disconnected when not in use.

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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.

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. Positions 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.

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SECTION 5

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 13 for control panel reference.

5.1A **POWER** SWITCH:

1. Depress top portion of power switch to turn **ON** 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.

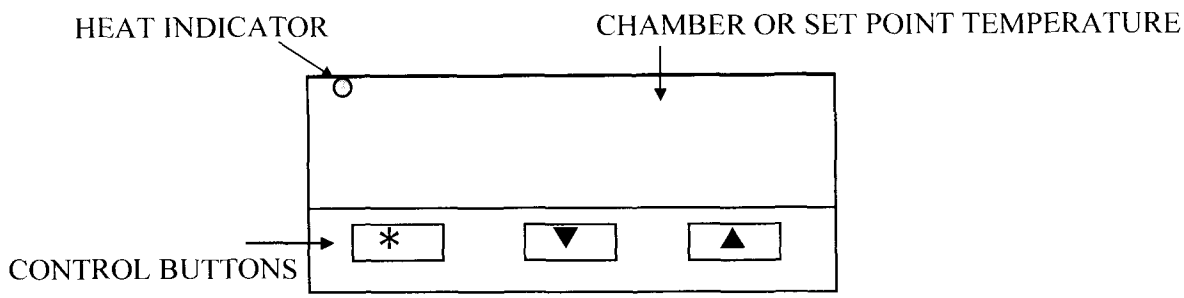
NOTE: SHAKER WILL NOT OPERATE IF THE TIMER IS IN THE OFF POSITION.

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5.1 A-CLASS: (Con't)

Please refer to page 13 for control panel reference.

5.1D TEMPERATURE CONTROLLER-SETTING TEMPERATURE:



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.

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5.1 A-CLASS: (Con't)

Please refer to page 13 for control panel reference.

5.1E 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 indicate **LEUL**. Press and hold the **"STAR"** (✱) key and using the up arrow key adjust the display to read. 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.

7. Using the examples shown below 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.

Thermometer	=	60 °C	Thermometer	=	70 °C
Controller Reading	=	65 °C	Controller Reading	=	65 °C
Subtract	=	-5 °C	Subtract	=	+5 °C
Enter **Zero** value of -5 °C			Enter **Zero** value of +5 °C		

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 above.

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OPERATION: (Con't)

5.2 E-CLASS:

Please refer to page 14 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. THERE WILL BE AN AUDIBLE BEEP BEFORE THE DISPLAY LIGHTS.

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. THERE WILL BE AN AUDIBLE BEEP BEFORE THE DISPLAY LIGHTS.

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.

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5.2 E-CLASS: (Con't)

Please refer to page 14 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 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.

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5.2 E-CLASS: (Con't)

Please refer to page 14 for control panel reference..

5.2F 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 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 twice to complete return to normal operating mode.

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5.2 E-CLASS: (Con't)

Please refer to page 14 for control panel reference.

5.2G 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; 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.

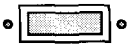
5.2H SETTING TIMER FOR CONTINUOUS TIMING:

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.

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5.2I 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.



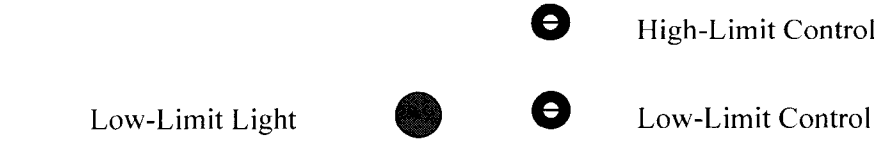
NOTE: RS232 INTERFACE PORT IS FOR OUTPUT ONLY. INTERFACE CABLES MUST NOT EXCEED 9.8' (3m) IN LENGTH.

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5.3 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.

NOTE: SHAKERS WITHOUT OPTIONAL REFRIGERATION SYSTEM ONLY HAVE HIGH-LIMIT CONTROL ON SIDE PANEL.



Setting High-Limit Control:

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.

   6A. 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.

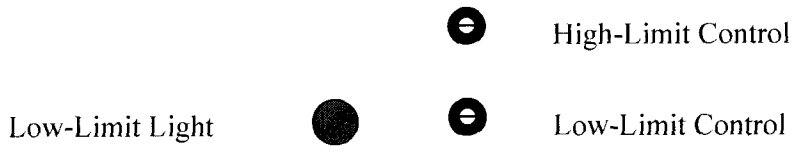
   6B. For E-Class shakers, when set point is reached, high-limit status lamp will flash and the audible alarm will beep once. Rotate the high-limit control slowly clockwise approximately 1/8 of a turn beyond this point.
7. When desired temperature is achieved, load the shaker.

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.

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5.4 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.



Setting Low Limit Control:

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.

⚠ **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.

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OPERATION: (Con't)

5.5 OPTIONAL REFRIGERATION SYSTEM:

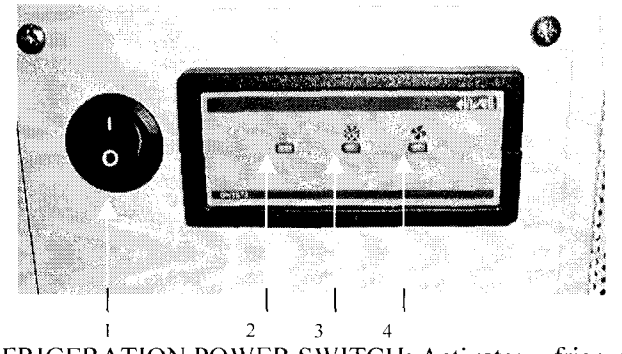
NOTE: This section applies only to units supplied with this option. The refrigeration system on the A and E series shakers are identical in operation. Please refer to the refrigeration schematic on page 51 for refrigeration replacement parts.

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.

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, 1 is **ON**, 0 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 1-½ minute delay. Green fan status lamp flashes during this fan-delay period.

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SECTION 6

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	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	Re-set 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.

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SECTION 7

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 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:

- Take out the 2 motor mount screws and lift the motor out.
- 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.
- Belt tension is automatically set by the location of the motor and is not adjustable.
- 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.

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SECTION 8

REPLACEMENT PARTS

SHKA4000, SHKA4000-1CE, SHKA4000-5, SHKA4000-6CE, SHKA4000-7, SHKE4000-8CE
SHKE4000, SHKE4000-1CE, SHKE4000-5, SHKE4000-6CE, SHKE4000-7, SHKE4000-8CE

CATALOG NUMBER	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, SHKE-4000-5	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 **SHKA**4000 UNITS	Circuit Breaker, 0.8 Amp:	330-399-00
ALL **SHKA**4000 UNITS	Circuit Breaker, 10 Amp, 120V:	330-119-00
SHKA4000-1CE, SHKE4000-1CE, SHKE4000-6CE	Circuit Breaker, 5 Amp, 240V:	330-118-00
ALL **SHKA**4000 UNITS	Disc Thermostat:	330-397-00
SHKE4000, SHKE4000-1CE, SHKE4000-5, SHKE4000-6CE	Display/time/speed/temp bd	019-536-00
ALL **SHKE**4000 UNITS	Drive belt	150-288-00
ALL **SHKA**4000 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 **SHKA**4000 UNITS	Knob,	560-275-00
ALL **SHKA**4000 UNITS	Knob, Locking Tab:	600-125-00
ALL **SHKA**4000 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 **SHKA**4000 UNITS	Mini Rocker Switch:	440-397-00
ALL **SHKE**4000 UNITS	Motor:	370-390-00

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ALL **SHKA**4000 UNITS	Motor:	370-388-00

REPLACEMENT PARTS: (Con't)

CATALOG NUMBER	DESCRIPTION	PART NUMBER
	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 **SHKE**4000 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 **SHKE**4000 UNITS	Prwr/ Mtr Drive PC BD	019-534-00
ALL **SHKA**4000 UNITS	Red Lens:	360-234-00
ALL **SHKA**4000 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 **SHKA**4000 UNITS 240 VOLT	Speed Control, 240V:	229-419-00
ALL **SHKA**4000 UNITS	Speed Control, 120V:	227-598-00
ALL ABOVE CATALOG NUMBERS	SPST Switch:	440-080-00
ALL **SHKA**4000 UNITS	Tach PCB:	228-612-00
ALL **SHKA**4000 UNITS	Tachometer:	660-111-00
SHKA4000	RPO Configured Temp Controller, 120V	485-360-17
SHKA4000-5		485-360-19
SHKA4000-7		485-360-20
SHKA4000-1CE	RPO Configured Temp Controller, 240V	485-522-01
SHKA4000-6CE		485-522-03
SHKA4000-8CE		485-522-04
ALL ABOVE CATALOG NUMBERS	Thermostat:	920-301-00
ALL ABOVE CATALOG NUMBERS	Thumb Screw:	562-184-10
ALL **SHKA**4000 UNITS	Timer	270-135-00

WIRING DIAGRAMS:

SHKA4000	D-229-329-00
SHKA4000-1CE	D-229-348-00
SHKE4000	D-229-330-00
SHKE4000-1CE	D-229-349-00
SHKA4000-5	D-229-336-00
SHKA4000-6CE	D-229-338-00
SHKE4000-5	D-229-337-00
SHKE4000-6CE:	D-229-339-00
SHKA4000-7	D-229-340-00
SHKA4000-8CE	D-229-341-00
SHKE4000-7	D-229-342-00
SHKE4000-8CE	D-229-343-00
REFRIGERATION SCHEMATIC	B-797-172-11

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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 workmanship for the lifetime of the unit, the remainder of this product shall be free of defects in materials and workmanship 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,

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