

MaxQ 5000 Incubated and Refrigerated Floor Shakers

Operating Manual and Parts List LT2087X1 Rev. 1



Models covered in this manual	
Model number	Voltage
SHKA5000 (4348)	120V
SHKA5000-1CE (4349)	240V
SHKE5000 (4350)	120V
SHKE5000-1CE (4351)	240V
SHKA5000-7 (4354)	120V
SHKA5000-8CE (4355)	240V
SHKE5000-7 (4356)	120V
SHKE5000-8CE (4358)	240V

MANUAL NUMBER LT2087X1 (7004348)

1	26361/SI-10360	9/10	Added note on pg 4-1 to route drainage tube on back of unit to drain	ccs
0	--	5/10	Transfer to Marietta (was LT2087X1 8/7/09)	ccs
REV	ECR/ECN	DATE	DESCRIPTION	By



Important Read this instruction manual. Failure to read, understand and follow the instructions in this manual may result in damage to the unit, injury to operating personnel, and poor equipment performance. s

Caution All internal adjustments and maintenance must be performed by qualified service personnel. s

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Important operating and/or maintenance instructions. Read the accompanying text carefully.



Potential electrical hazards. Only qualified persons should perform procedures associated with this symbol.



Equipment being maintained or serviced must be turned off and locked off to prevent possible injury.



Hot surface(s) present which may cause burns to unprotected skin, or to materials which may be damaged by elevated temperatures.



Marking of electrical and electronic equipment, which applies to electrical and electronic equipment falling under the Directive 2002/96/EC (WEEE) and the equipment that has been put on the market after 13 August 2005.



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- 4 Always use the proper protective equipment (clothing, gloves, goggles, etc.)
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Section 1 Safety Information

Your Thermo Scientific MaxQ 5000 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, pay attention to the Notes, Cautions and Warnings 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. Use appropriate hand and eye protection when handling hazardous chemicals.
2. Refer servicing to qualified personnel.
3. Do not modify construction and/or assembly of equipment.
4. Do not remove tags, labels, decals, or other information from the unit.
5. Stand clear of equipment when it is operating.
6. 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.

To avoid personal injury (continued)

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

Note The figured 40-50 lbs at 450-500 rpm is based on the SHKE5000 performance and is presented per UL requirement. s

Note If operating in the shaded region, unit stabilizer kit must be used in order to maintain safe operation. Kit may be ordered directly from factory at no charge. s

Section 2 Specifications

Model No.	All Analog "A" Class Units	All Analog "A" Class Units	All Analog "E" Class Units	All Analog "E" Class Units
Exterior Unit Dimensions in. (cm)				
Width	41" (104.1 cm)	41" (104.1 cm)	41" (104.1 cm)	41" (104.1 cm)
Height	41" (104.1 cm)	41" (104.1 cm)	41" (104.1 cm)	41" (104.1 cm))
Length	32" (81.3 cm)	32" (81.3 cm)	32" (81.3 cm)	32" (81.3 cm)
Weight lbs (kg)	476 (215.9)	476 (215.9)	512 (232.2)	512 (232.2)
Electrical: Standard Temperature/Refrigerated - Dedicated Power Source				
Volts (AC)	120/120	220-240/220-240	120/120	220-240/220-240
Amps	12.0/14.0	6.5/8.5	7.5/14.0	6.5/8.5
Watts	1450/1600	1500/1950	900/1600	1500/1950
Freq.	50/60 (both models)	50/60 (both models)	50/60 (both models)	50/60 (both models)
Speed	40 to 400 rpm, ±10 rpm	40 to 400 rpm, ±10 rpm	15 to 500 rpm, +1 rpm	15 to 500 rpm, +1 rpm
Timer	Continuous or timed from 1-60 mins	Continuous or timed from 1-60 mins	Continuous or timed from 0.1-999 hours or 0.1-999 mins	Continuous or timed from 0.1-999 hours or 0.1-999 mins
Recorder Output	None	None	None	None
RS232 Interface	None	None	Monitor speed and time with a computer	Monitor speed and time with a computer
Display	Analog tachometer displays speed in rpm	Analog tachometer displays speed in rpm	2 individual LED displays indicate time and speed simultaneously. 3 characters height 1/2 inch (1.27 cm)	2 individual LED displays indicate time and speed simultaneously. 3 characters height 1/2 inch (1.27 cm)
Soft Start Feature	None	None	Software algorithms prevent sudden start/stops	Software algorithms prevent sudden start/stops
Mutable Alarms	None	None	Audible portion of the alarm can be silenced for a 1 hr. period without deactivating the actual alarm condition by depressing any key	Audible portion of the alarm can be silenced for a 1 hr. period without deactivating the actual alarm condition by depressing any key

Section 2
Specifications

Motor	All Analog "A" Class Units	All Analog "A" Class Units	All Analog "E" Class Units	All Analog "E" Class Units
Model No.	Permanent Magnet DC	Permanent Magnet DC	Solid State Brushless DC	Solid State Brushless DC
Speed	None	None	Audible with flashing LED indicates when speed deviates more than 10% of set point	Audible with flashing LED indicates 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 xW
30115	Universal 30" x 18" (76.2 x 45.7 cm)

The MAXQ 5000 series of incubated and refrigerated floor shakers are available in one of two control configurations:

- A-Class shakers SHKA5000, SHKA5000-1CE, SHKA5000-7 and SHKA5000-8CE: control temperature by a Proportional/Integral/Derivative (PID) 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 SHKE5000, SHKE5000-1CE, SHKE5000-7 and SHKE5000-8CE: 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. Solid-state DC brushless motor provides more power. 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.

Two temperature ranges are available all with accuracy of $\pm 0.1^{\circ}\text{C}$ at 37°C in flask:

- Standard Temperature: SHKA5000, SHKA5000-1CE, SHKE5000 and SHKE5000-1CE, 10°C above ambient to 60°C .
- Refrigerated: SHKA5000-7, SHKA5000-8CE, SHKE5000-7 and SHKE5000-8CE: 15°C BELOW ambient to 60°C . Refrigeration system needs to be turned off whenever the set point is at or above 32°C .

In addition, all versions offer:

- Drive interrupt halts shaking action when door is opened.
- Door window.
- Foot pedal opens door automatically for hands free operation.
- 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.
- 1-inch (2.54 cm) triple eccentric orbital drive on 6 sets of permanently lubricated ball bearings.
- Over temperature protection in the event of primary control failure.
- 75 lb. (34 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 :120VAC or 240VAC

Voltage Tolerance: +10% of normal rated line

Temperature: 15°C to 32°C

Product Usage: Indoor use only

Caution Shaker operation in a CO₂ enriched atmosphere is not recommended. Formation of carbonic acid could cause electrical failures. s

Section 3 Control Panel Features

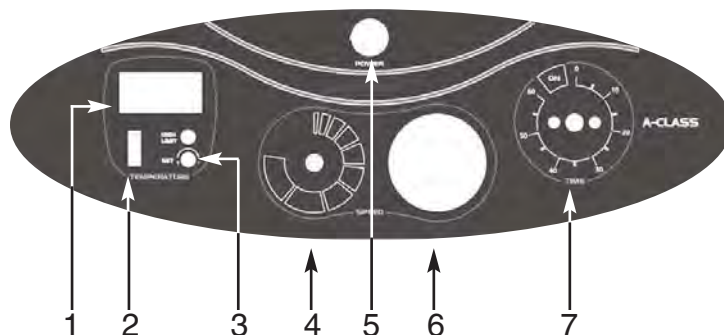


Figure 3-1. A-Class Control Panel Features

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.

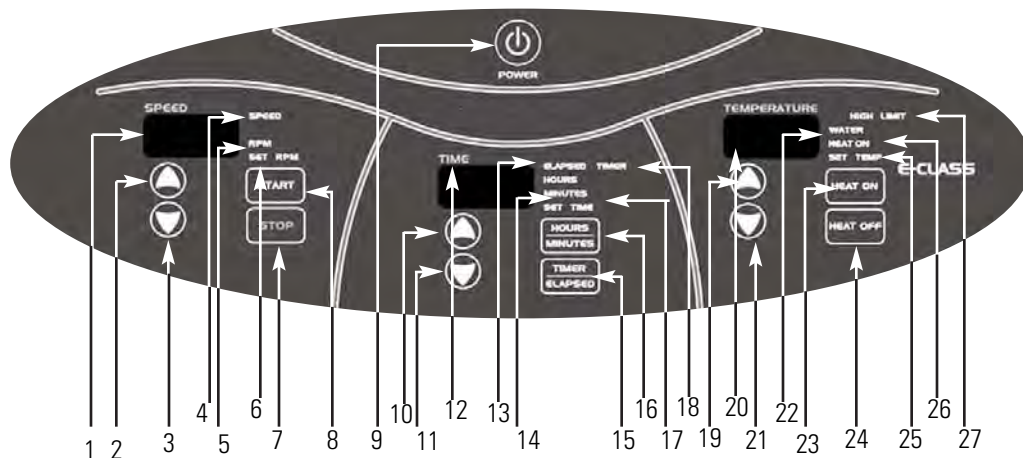


Figure 3-2. E-Class Control Panel Features

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 function serves no purpose 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.

Section 4 Unpacking and Installation

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 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. Call for a damage inspection promptly.

Location

Put the shaker on a level surface 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 12" (30.5 cm) of clearance around the unit for free air convection and user convenience.

Shakers with refrigeration should be placed near an accessible drain. Route the drainage tube on the back of the unit to this drain.

Electrical Requirements

Models SHKA5000, SHKA5000-7, SHKE5000 and SHKE5000-7 shakers require a 120 VAC, 50/60 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.

Refrigerated models require a dedicated power source. SHKA5000-7 and SHKE5000-7 are supplied with a 20 amp power cord.

Electrical Requirements (cont.)

Models SHKA5000-1CE, SHKA5000-8CE, SHKE5000-1CE and SHKE5000-8CE shakers require a 220-240VAC 50/60 Hz power source. Power cords are supplied.

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.

Disconnect unit from the power source when not in use.

Warning Do not operate shaker with a damaged electrical cord. s

Adjusting Shaker Feet

In order for this shaker to function safely, the feet must be adjusted before use so that all four feet are in good contact with the floor, and reasonably level.

Warning A shaker with poorly adjusted feet will be unstable and possibly dangerous. s

Warning Check shaker to make sure it is level. If not, adjust shaker feet until shaker is level. s

It is very important that this unit have the feet adjusted in the position in which it will be used, and if moved, must be re-adjusted in the new location before use. This will help prevent the unit from 'walking' at higher speeds and loads. To accomplish this, proceed as follows:

1. Set all four feet to a height that will allow any casters present to be clear of the floor, and so that they are the same distance from the bottom of the sheet metal cabinet.
2. Tighten the jam nuts on the two rear feet to the bottom of the cabinet. This will lock the rear feet.
3. Check the unit for rocking. Run the unit slowly. If it rocks, one of the front feet is not in contact with the floor. Using a 3/4" (1.9 cm) open end wrench, adjust the non-contacting front foot downward so that it makes good contact with the floor. This can be easily accomplished with the unit slowly running, since the foot being adjusted is intermittently off the floor.

Adjusting Shaker Feet (continued)

4. Add load and speed. If unit continues to rock, continue to adjust the non-contacting foot downward until it makes good contact with the floor. At this point, friction with the floor will make the foot hard to turn and the unit will be standing with equal load on all four feet.
5. After the adjusting process is complete, tighten the remaining jam nuts on the front feet against the cabinet.
6. When moving shaker to a new location, loosen locknuts around shaker's feet and raise feet until adjoining casters support the full weight of the shaker and the shaker rolls freely on the ground. Roll shaker to new location. After repositioning shaker, lower feet until casters are off the ground and the full weight of the shaker is resting on the feet. Level shaker and tighten locknuts.

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. Remove 4 flat-head screws from the mounting blocks.
3. Secure platform, sold separately, to the mounting blocks using 4 flat-head screws. Make sure countersinks face up.
4. Flasks and test tubes should be inserted in the clips and racks after installing the shaking platform.

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. s

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.

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

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

Loading the Shaker Platform

For optimum performance, distribute the load evenly on the platform's clips or racks. Under uneven loads and fast shaking speeds, the unit may vibrate.

At slow to mid-range shaking speeds, load distribution will not cause excessive vibration.

For low-temperature work, it may be advisable to wait until the chamber temperature has stabilized at the desired set point before loading the platform.

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.

Section 5 Operation

A-Class - refer to Section 3 for control panel references.

Power Switch

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

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

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.

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

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. s

Temp 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
*S	Decrease set point
*T	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.

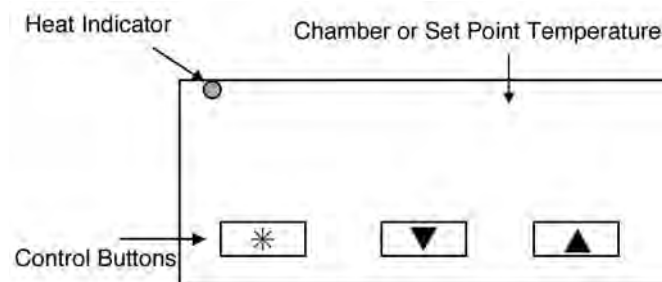


Figure 5-1. Control Panel

Temperature Calibration

1. Fill a 250 ml erlenmeyer flask with approximately 100ml 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.

Temperature Calibration (cont.)

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.
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 $\pm 0.5^{\circ}\text{C}$.
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 $\pm 0.5^{\circ}\text{C}$. If not, repeat Steps 6, 7 and 8 above.

Table 5-1. Determining Zero Value

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		

E-class - refer to Section 3 for control panel references.

Turning Shaker On

Beginning with the shaker power being turned off:

1. Press membrane POWER switch once to turn on shaker.
2. Press membrane POWER switch a second time to turn off shaker.

Setting Shaker Speed

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 illuminated when shaker power is activated. s

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.

Calibrating Shaker Speed

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. s

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 Calibration mode.

Calibrating Shaker Speed (continued)

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 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 switch for desired timing mode.
3. Hold down appropriate arrow 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 sound at the end of the timing cycle and platform rotation will cease.

Setting Timer for Continuous Shaking

1. Press TIMER/ELAPSED 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 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 5-2. 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.”

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

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.

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.

Temperature Calibration (cont.)

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.
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. s

Setting the High Limit Control

The high-limit control is located on the right rear side panel of the shaker cabinet. The high-limit light is located on the control panel.

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

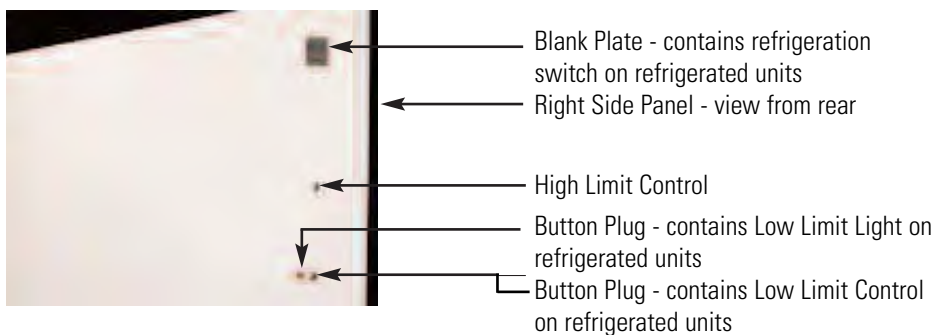


Figure 5-3. High Limit Controls

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.

Setting High Limit Control (continued)

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 1/8th 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 1/8th 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. s

Setting Low Limit Control, Refrigerated

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

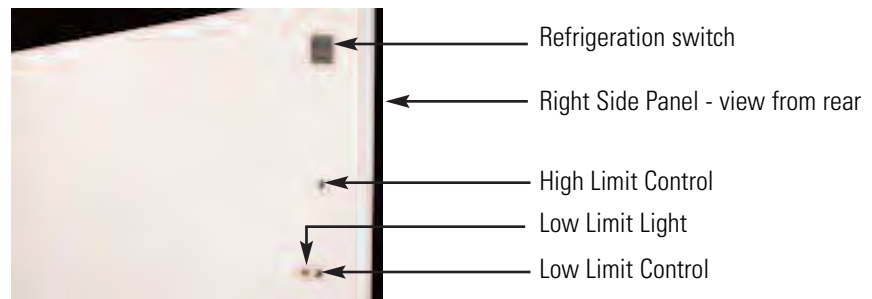


Figure 5-4. Low Limit Controls

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.

Setting Low Limit Control (cont.)

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° 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. s

Optional Refrigeration System

Note This section applies only to units supplied with this option. The refrigeration system on A and E Class shakers is identical in operation. s

With system power on, refrigeration can be initiated by turning ON the refrigeration switch located to the left of the defrost timer on the lower right side panel of the shaker cabinet. Refrigeration should be initiated only when a temperature set point of approximately 32°C or less, based on your ambient temperature, is required. 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.

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. This may turn the fans off for several minutes until it completes a normal defrost cycle. There is a dedicated sensor inside the coils which will terminate 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 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.

Optional Refrig. System (continued)

1. Defrost Time Power Status Lamp (ON): Timer is powered along with refrigeration system whenever green power status lamp is lit.
2. Defrost Status Lamp: 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.
3. Fan Delay Status Lamp: During defrost timer power-up and after defrost cycle, the circulating fan is locked off for a 1½ minute delay. Green fan status lamp flashes during this fan-delay period.

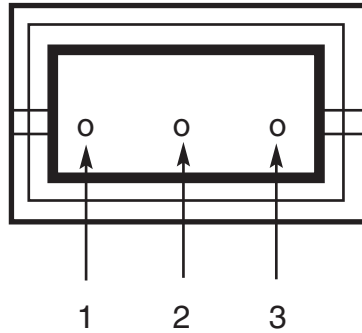


Figure 5-5. Optional Refrigeration Controls

Section 6 Maintenance

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.

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

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

Note Make no attempt to service or repair a Thermo Scientific product under warranty before consulting your Thermo Scientific 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, call Technical Services. No merchandise should be returned directly to the factory without obtaining a Return Materials Authorization (RMA) number from Technical Services.

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, 3/8-16 flat head screws in the platform center. Remove the sheet metal panel under the platform to expose the belt and interior parts. Inspect the drive belt for wear and proper tension. Order a replacement if necessary.

For A-Class series only:

1. Remove the 2¼-20 x ½ motor mount screws and lift the motor out.
2. Two 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" (0.476 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.

Section 7 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 the power supply that matches unit requirements
	E-Class, Check fuse	Replace fuse
	E-Class, check for flashing lights on control panel	Press any 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.

Hi-Limit Thermostat Failure

In the unlikely event that the programmed hi-limit and the user adjustable hi-limit thermostats fail, there is a third overtemperature 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-set table 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 (see Figure 7-1). 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 Technical Services for further assistance.



Over Temperature Thermostat

Figure 7-1. Overtemperature Thermostat

Section 8
Replacement Parts

Component	SHKA5000 (Series 1414)	SHKA5000-1CE (Series 1414)	SHKA5000 (Series 2087)	SHKA5000-8CE (Series 1414)	SHKE5000 (Series 1414)	SHKE5000-1CE (Series 1414)	SHKE5000-7 (Series 2087)	SHKE5000-8CE (Series 2087)
Belt	150-317-00	150-317-00	150-317-00	150-317-00	150-317-00	150-317-00	150-317-00	150-317-00
Brush set	SRX42	SRX42	SRX42	SRX42				
Cable, ribbon, Display/Main PC Board					WHX38	WHX38	WHX38	WHX38
Circuit Breaker, 10 amp		330-119-00				330-119-00		
Circuit Breaker, 15 amp	330-124-00			330-124-00	330-124-00			330-124-00
Circuit Breaker, 20 amp			330-128-00				330-128-00	
Circuit Breaker, 3 amp	330-125-00	330-125-00	330-125-00	330-125-00				
Compressor			797-696-00	797-700-00			797-696-00	797-700-00
Controller, programmed	485-360-17	485-522-01	485-360-20	485-522-04				
Dryer			796-998-00	796-998-00			796-998-00	796-998-00
Dust Cover					420-265-01	420-265-01	420-265-01	420-265-01
Fan, compressor & chamber	370-395-00	370-396-00	370-395-00	370-396-00	370-395-00	370-396-00	370-395-00	370-396-00
Foot, leveling	790-430-00	790-430-00	790-430-00	790-430-00	790-430-00	790-430-00	790-430-00	790-430-00
Fuse, 0.1 Amp			330-401-00	330-401-00			330-401-00	330-401-00
Gas Shock	850-120-00	850-120-00	850-120-00	850-120-00	850-120-00	850-120-00	850-120-00	850-120-00
Handle, Cover	560-279-00	560-279-00	560-279-00	560-279-00	560-279-00	560-279-00	560-279-00	560-279-00
Heater, tube	340-363-00	340-363-00	340-408-00	340-363-01	340-363-00	340-363-00, 340-363-01	340-408-00	340-363-01
Knob, low profile	560-275-00	560-275-00	560-275-00	560-275-00				
Knob, locking tab	600-125-00	600-125-00	600-125-00	600-125-00				
Lamp base	360-233-01	360-233-01	360-233-01	360-233-01			360-233-01	360-233-01
Latch and pin	600-150-00	600-150-00	600-150-00	600-150-00	600-150-00	600-150-00	600-150-00	600-150-00
Linecord	470-264-00	470-305-00	470-122-00	470-305-00	470-264-00	470-305-00	470-122-00	470-305-00
Linecord, UK		CRX108		CRX108		CRX108		CRX108
Linecord, China		CRX115		CRX115		CRX115		CRX115
Motor	MT1411X1	MT1411X1	MT1411X1	MT1411X1	370-387-00	370-387-00	370-387-00	370-387-00
PC Board, Power/Motor Drive					019-534-00	019-534-00	019-534-08	019-534-08
PC Board, Display/Time/Speed					019-536-00	019-536-00	019-536-08	019-536-08
Heat Control Assy					019-550-00	019-550-00	019-614-08	019-614-08
PC Board, Pcmd Microprocessor					019-533-10	019-533-10	019-533-11	019-533-11
Power Supply					460-317-00	460-317-00	460-317-00	460-317-00
Pulley, Driver	150-316-00	150-316-00	150-316-00	150-316-00	150-316-00	150-316-00	150-316-00	150-316-00
Red Lens	360-234-00	360-234-00	360-234-00	360-234-00	360-234-00	360-234-00		
Relay, general purpose	400-217-00	400-162-00	400-217-00	400-162-00				
Relay, Solid State	400-233-00	400-233-00	400-233-00	400-233-00				
Relay, 11 pin			400-164-00	400-221-00			400-164-00	400-221-00
Sensor, Vibration					440-399-00	440-399-00	440-399-00	440-399-00

Section 8
Replacement Parts

	SHKA5000 (SERIES 1414)	SHKA5000-1CE (SERIES 1414)	SHKA5000-7 (SERIES 2087)	SHKA5000-8CE (SERIES 2087)	SHKE5000 (SERIES 1414)	SHKE5000-1CE (SERIES 1414)	SHKE5000-7 (SERIES 2087)	SHKE5000-8CE (SERIES 2087)
Shaker mechanism	019-678-00	019-678-00	019-678-00	019-678-00	019-678-00	019-678-00	019-678-00	019-678-00
Speed control	227-598-00	229-419-00	227-598-00	229-419-00				
Switch, High pressure			920-396-00	920-396-00			920-396-00	920-396-00
Switch, Lid	440-229-01	440-229-01	440-229-01	440-229-01	440-229-01	440-229-01	440-229-01	440-229-01
Switch, Low pressure			920-395-00	920-395-00			920-395-00	920-395-00
Switch, Mini Rocker	440-397-00	440-397-00	440-397-00	440-397-00				
Switch, Power, Round	440-396-00	440-396-00	440-396-00	440-396-00				
Switch, Rocker			SWX143				SWX143	
Tach PCB	228-612-00	228-612-00	228-612-00	228-612-00				
Tachometer	660-111-00	660-111-00	660-111-00	660-111-00				
Temperature sensor	410-632-00	410-632-00	410-632-00	410-632-00	410-632-00	410-632-00	410-632-00	410-632-00
Thermostat			920-098-01	920-098-01			920-098-01	920-098-01
Thermostat, Hi-Limit	CNX177	CNX177	CNX177	CNX177	CNX177	CNX177	CNX177	CNX177
Thermostat, OTP	330-400-00	330-400-00	330-403-00	330-400-00	330-400-00	330-400-00	330-403-00	330-400-00
Timer	270-135-00	270-135-00	270-135-00	270-135-00				
Timer, Defrost			270-108-00	270-108-00			270-108-00	270-108-00
Transformer			460-318-00	460-318-00			460-318-00	460-318-00
Valve, Expansion			797-567-00	797-567-00			797-567-00	797-567-00
Valve, Solenoid			797-698-00	797-698-00			797-698-00	797-703-00
Varistor	410-629-00	410-631-00	410-629-00	410-631-00				410-631-00
Wiring Diagram	229-359-00	229-374-00	229-368-00	229-375-00	229-361-00	229-382-00	229-363-00	229-384-00
Wiring Harness, main	WH1414X3	WH1414X9	WH1414X4	WH1414X10	WH1414X6	WH1414X6	WH1414X6	WH1414X6

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 Thermo Scientific dealer from whom you purchased this unit or can be obtained promptly from the factory. When service or replacement parts are needed, check first with your dealer. If the dealer cannot handle your request, then contact our Technical Services Department.

Prior to returning any materials, please contact our Technical Services Department for a "Return Materials Authorization" number (RMA). Material returned without an RMA number will be refused.

Thermo Scientific
401 Millcreek Road
Marietta, Ohio 45750
United States

www.thermofisher.com

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