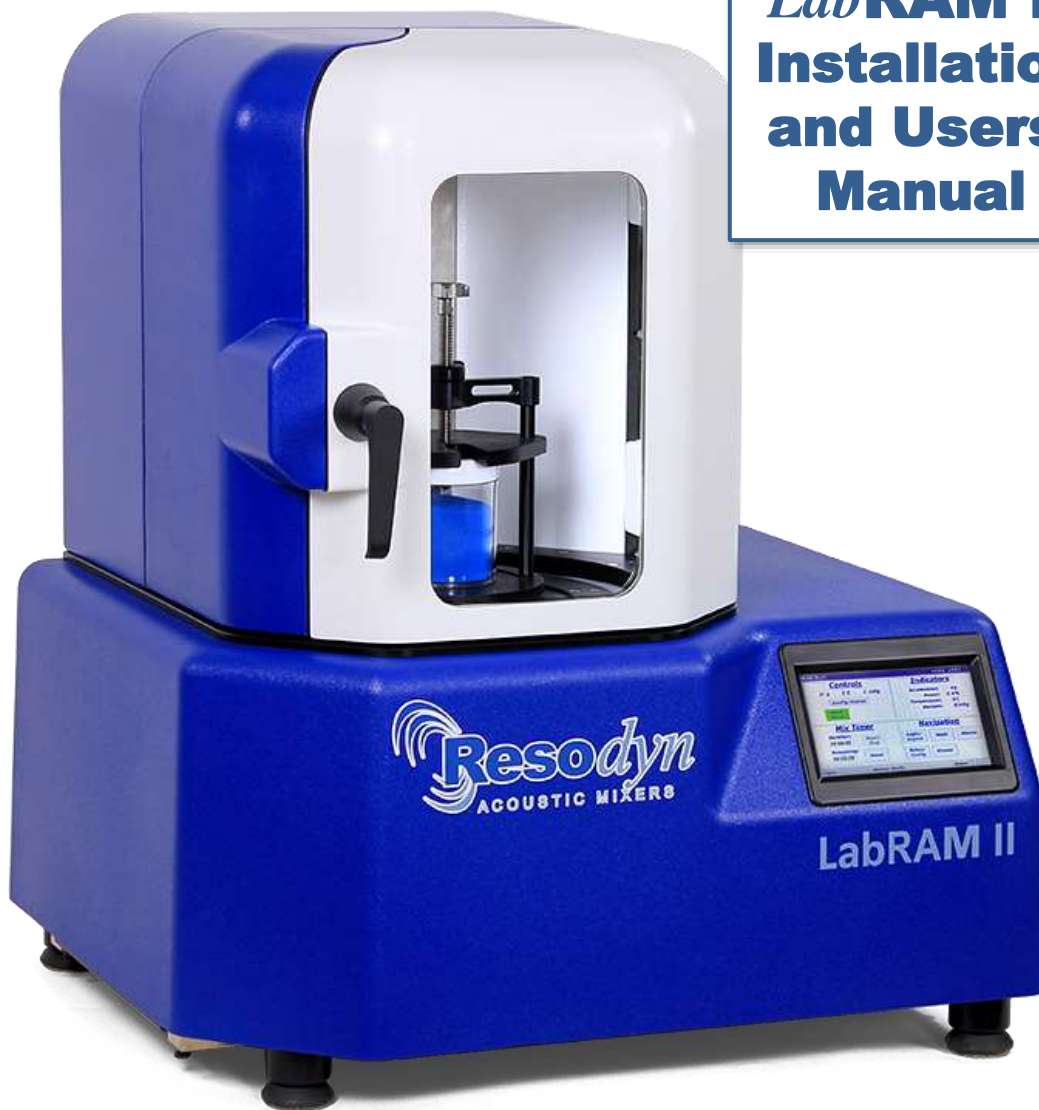




***Lab*RAM II  
Installation  
and Users'  
Manual**



## Table of Contents

1	Introduction .....	1
2	Definitions .....	2
3	Safety .....	3
3.1	General Safety Considerations .....	3
3.2	Warnings and Cautions.....	3
3.3	Important Safety Notes .....	4
3.4	Location Advisory .....	4
3.5	Component Replacement .....	4
3.6	Customer Responsibility .....	4
3.7	Handling/Lifting .....	5
3.8	Guards and Safety Devices .....	6
3.9	Using Retractable Handles .....	6
3.10	Technical Support for Mixer Operation:.....	6
4	System Overview .....	7
4.1	ResonantAcoustic® Mixing Platform .....	8
4.2	Acoustic Enclosure .....	8
4.3	Touch Screen Human Machine Interface (HMI) .....	8
4.4	Standard Vessel Fixture and Vessels.....	9
4.5	Processing Accessories .....	10
5	System Specifications .....	11
5.1	Voltage Level.....	11
5.2	Power Consumption.....	11
6	Installation and Support.....	12
6.1	Unpacking, Lifting, and Placing LabRAM II .....	12
6.2	Mounting.....	12
6.3	Door Operation .....	13
6.4	Remove the Shipping Lock Bar.....	14
6.5	Vessel Holder Assembly .....	14
6.6	Electrical Connections .....	16
7	Quick Start .....	17
7.1	Setup .....	17
7.1.1	Open the Hood Door(s) .....	17
7.1.2	Securing Container in the Vessel Holder .....	17
7.1.3	Close the Doors .....	17
7.2	Power-Up.....	17
7.3	Login.....	18
7.4	Select the Recipe.....	19

7.5	Run the Recipe .....	19
7.6	Completion .....	21
8	HMI (Human Machine Interface) – Overview .....	22
8.1	Main Screen.....	22
8.2	Login.....	23
8.3	Operational Modes (Recipe and Auto) .....	23
8.4	Alarming .....	23
8.5	Setup and Configuration Screens .....	23
8.6	Viewer.....	24
9	HMI Operation – Security and Login .....	25
9.1	Login Levels and Privileges .....	25
9.2	Screen Operations - Logging In/Out.....	26
9.3	Log Files .....	27
10	HMI Operation – Modes of Operation .....	28
10.1	Screen Operations - Recipe Mode .....	28
10.2	Screen Operations - Auto Mode.....	31
11	HMI Operation – Alarming .....	36
11.1	Screen Operations - Alarms.....	36
12	HMI Operation – Viewer .....	38
12.1	Screen Operations - Viewer .....	38
13	HMI Operation – Setup and Configuration .....	40
13.1	Status Tab .....	41
13.2	Calibration Tab .....	41
13.3	Recipe Tab .....	41
13.3.1	Screen Operations – Edit an Existing Recipe.....	42
13.3.2	Screen Operations – Create New, Rename, and Delete .....	45
13.4	Setup1 Tab .....	49
13.4.1	Auto Timer Group Box .....	49
13.4.2	Lighting Group Box .....	49
13.4.3	Machine Options Group Box .....	49
13.4.4	Operational Options Group Box .....	50
13.5	Setup Tab .....	50
13.5.1	Screen Operations – User Management .....	51
13.6	Setting Date and Time .....	52
13.7	Config Tab .....	52
13.7.1	Screen Operations – Edit a Configuration .....	53
13.7.2	Screen Operations – Create a Configuration .....	55
13.7.3	Configuration Usage .....	56
13.8	Data Tab.....	57
14	Care and Maintenance .....	58

14.1	Preventive Maintenance .....	58
14.2	Cleaning Procedures .....	58
14.3	Accelerometer Calibration.....	58
14.4	Maintenance .....	58
14.4.1	Major Repairs .....	58
14.4.2	Recommended Maintenance Schedule .....	59
14.5	Replacement of Serviceable Parts .....	59
14.5.1	Fuse Replacement.....	59
14.5.2	Bellows Replacement .....	60
14.5.3	Accelerometer Replacement.....	60
15	Troubleshooting and Service .....	61

# 1 Introduction

The LabRAM II is an advanced, low-frequency, acoustic mixer. It is the second generation of ResonantAcoustic® Mixers LabRAM, an innovative approach to multiple mixing applications. These applications include powder-powder systems, liquids, creams, highly viscous gels and pastes, as well as sieving and grinding (with the proper vessels and attachments).

RAM mixing provides:

- Exceptionally uniform mixing across a broad range of materials.
- Significantly shorter mixing times than traditional methods.
- Completely sealed, dust-free mixing process resulting in enhanced operator safety.
- Highly repeatable results from mix-to-mix, ensuring batch-to-batch product quality.

## ResonantAcoustic® Mixing (RAM) and Acceleration

The primary driving mechanism that creates mixing by the ResonantAcoustic® Mixing (RAM) technology is Acceleration (rate of change of velocity). The unit of measure of acceleration in the International System of Units (SI) is meters per second squared, or  $m/s^2$ . A more familiar way to describe this phenomenon is the acceleration of gravity here on earth, or  $g$ . One  $g$  is the acceleration of gravity at the Earth's surface and uses the standard gravity symbol:  $g_n$ , defined as  $\sim 9.81$  meters per second squared.

Acceleration is the driving mechanism for acoustic mixing, stated in units of the acceleration of standard gravity - or  $g$  - as outlined above. For example, a heavily loaded mixture of solids with a viscous liquid may be best mixed at an acceleration of 80  $g$ , or 80 times the force of gravity.

The correct level of acceleration creates micro-mixing zones that liquids and viscous materials require, and creates the chaotic collision phenomenon that effectively mixes solids and powders. The process of determining an optimal acceleration to obtain the best mixing is an iterative one, arrived at through observation, optimization, and product quality testing. Resodyn Acoustic Mixers process engineers and technical sales staff are always available to provide assistance in this process.

Furthermore, acceleration is measured the same way across all RAM technology platforms. So, 50  $g$  on the LabRAM mixer is equivalent to 50  $g$  on the RAM 5 or RAM 55 mixers.

It is also important to note that, while mechanical devices typically rely on *increasing* the power to improve mixing, better mixing with RAM technology is not necessarily the result of more power. Instead, the quality of mixing is the result of the *right combination* of energy applied to the materials - in the form of acceleration for an adequate amount of time. Therefore, some materials may be best mixed at a lower level of acceleration.

## 2 Definitions

Acceleration:	A change in velocity with respect to time that is expressed in “g.” Different mix media mixes at different accelerations, based on the material and the expected results. (See “g” below.)
Damping:	A term to quantify the instantaneous amount of energy absorbed by the mix media while mixing.
g:	A measure of acceleration expressed as a multiple of the gravitational acceleration applied to the vessel and mix media during mixing. For example, 10 g is 10 times the force of gravity. It may also be shown as g. Another term that may be used to describe the acceleration is “gravities.” (See “Acceleration” above.)
HMI:	Human Machine Interface. The control and input system screen used to operate the LabRAM.
Headspace:	The volume of compressible air, gas, or void space above the mixing media in the vessel that is not occupied.
Mixing Media:	Defined as the material inside the mixing vessel.
Mixing Power:	The amount of power being delivered by the RAM system to perform mixing.
Mixing Regime:	This term identifies certain modes of mixing. The mixing regime defines the bulk flow pattern of the mix during mixing. A regime changes when the bulk patterns change. For example, a stable fluid mixing regime for thick pastes would be one that flows from the bottom of the vessel up the center and then across the top and down the sides. Another mixing regime is when the flow pattern is reversed and the flow comes up the sides of the vessel and down the center of the vessel.
RAM:	ResonantAcoustic® Mixing or ResonantAcoustic® Mixer.
RAMWare:	Control software that runs on a Personal Computer (PC) and provides control to, and feedback from, the mixing process. (Also RAMWare2).
Resonance:	The frequency (nominally 60 Hz) at which the RAM mechanical system operates in the most efficient manner.
Vacuum:	Internal vessel pressure that is less than atmospheric pressure.

### 3 Safety

Every effort has been made to assure that the LabRAM II is easy to use, reliable, and safe. This section outlines the general safety considerations and defines caution and warning symbols used throughout this manual.




#### 3.1 General Safety Considerations

For safe operation, the LabRAM II should be operated only within the limits outlined in the system specifications. The following classification defines acceptable use for the LabRAM II.


- Indoor use only.
- Main supply voltage fluctuations are not to exceed  $\pm 10\%$  of the nominal supply voltage.
- This equipment is suitable for continuous operation.
- For use in non-hazardous environments as classified by the United States National Electrical Code (NEC).

#### 3.2 Warnings and Cautions


Throughout the manual, the following symbols are used to identify warnings and cautions:

	The caution symbol indicates a potential hazardous situation which could result in minor injury or damage to the product.
	<p>The high voltage symbol indicates the possibility of electrical shock.</p> <p>This symbol means <u>turn off</u> the electrical supply before removing any cover with the symbol attached. Failure to do so may cause exposure to electrical shock hazard.</p> <p>Access to electrical components should only be carried out by a licensed electrician or qualified electrical engineer.</p> <p><b>NEVER</b> attempt to modify any electrical components or circuits as this may affect the safe operation of the machine.</p>
	Electrostatic Discharge (ESD) sensitive components.

### 3.3 Important Safety Notes


	<p>This equipment should only be operated by trained and qualified personnel.</p> <p>Mixing operations can generate heat and internal pressure depending on material and mixer accelerations. Do not mix materials longer than what has been characterized as safe.</p> <p>Do not attempt to run the machine without a mix container holder. Equipment damage may result.</p> <p>Do not disable or tamper with any safety items, such as safety interlock switches located on the LabRAM II system.</p> <p><b>Note:</b> Changes in noise level or frequency are common during mixing operations. If rattling, metal-on-metal, or obnoxious noises occur, turn off the LabRAM II and contact Resodyn Acoustic Mixers Technical Support as seen in Section 3.10.</p>
---	--

### 3.4 Location Advisory

	<p>The LabRAM II system is designed to be operated in non-hazardous environments.</p> <p>The LabRAM II system is protected by an IP20 enclosure which is not rated for operation in dusty environments.</p> <p>The LabRAM II system is rated for operating in ambient environments between 0°C – 40°C (32°F – 104°F).</p>
--	---

### 3.5 Component Replacement

The system is designed with components that are specifically rated for use with the LabRAM II machine. Only replace worn or damaged components with direct factory replacement parts or parts approved by Resodyn Acoustic Mixers. Incorrect component replacement can impair the safety of the equipment and risk injury to personnel.

	<p>Do not replace components with non-factory components. Non-factory replacement parts may not be rated to be used to the LabRAM II machine requirements, which will compromise the safety of the operating personnel and may cause damage to the equipment.</p>
---	---

### 3.6 Customer Responsibility

- Ensure that all operators have received the correct training to operate the mixer.
- Ensure that all operators have read and understood this instruction manual.
- Ensure that a qualified electrician carries out any electrical maintenance.
- Allow only Resodyn Acoustic Mixers Service Engineers to repair a LabRAM II, or return to Resodyn after receiving a Return Authorization.



### 3.7 Handling/Lifting

The LabRAM II mixer weighs 260 lb with no additional options. The mixer should be lifted by at least four (4) people, one on each side.

The two primary lifting positions are on either side of the LabRAM II machine where retractable, integral lifting handles are located (see Figure 1). Always exercise caution when lifting and moving the LabRAM II to avoid striking other objects.

Two remaining personnel can assist in lifting the LabRAM mixer at the remaining two sides next to the machine feet. There is ~1 ½" clearance under the LabRAM II. This space allows the retractable handles to be securely positioned under the machine when not in use. The LabRAM II mixer should be lifted by at least four (4) people, positioned at each side of the machine as designated by circles in Figure 1. The arrows show the recommended locations to place the hands for lifting the machine using a combination of base plate handholds and base plate retractable handles.

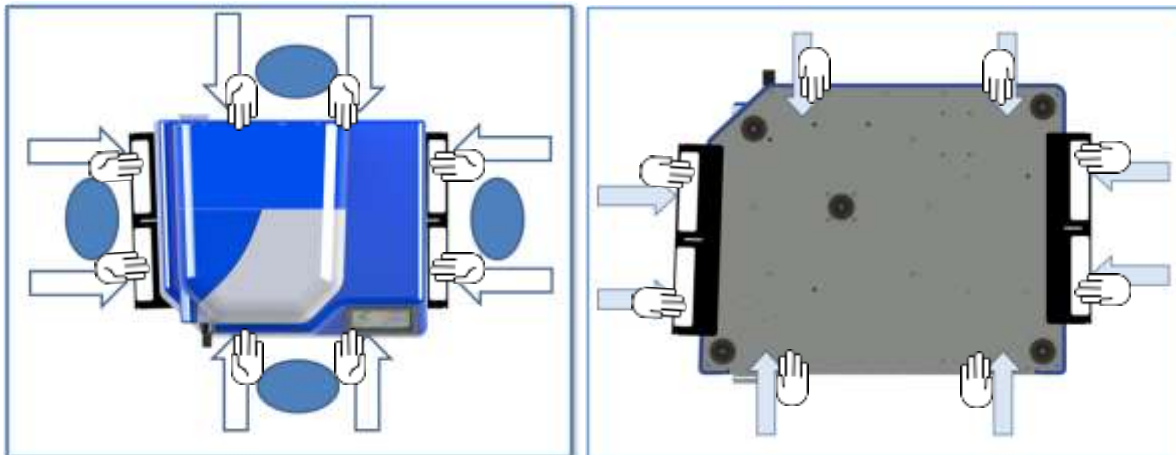


Figure 1 – Overhead View, lifting positions and handles      Figure 2 - Underside View, lifting positions and handles

Figure 2 shows the underside of the mixer indicating the recommended location of the hands for lifting and carrying the LabRAM II machine using retractable handles.

Do not lift using any location other than the retractable handles of the mixer's baseplate and the hand holds as indicated above. Doing so may cause damage and failure of the LabRAM II machine and may cause injury.



For safe lifting and transporting of the mixer, the mixer should be lifted by at least four (4) people, one on each side as shown above.

### 3.8 Guards and Safety Devices

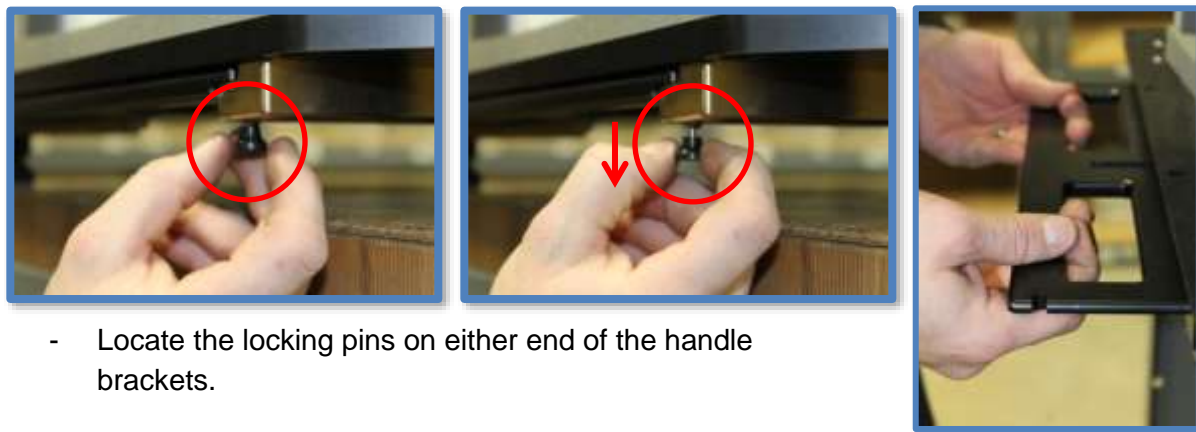
Ensure all safety devices (limit switches, etc.) are functioning correctly, and regularly check their operation.

### 3.9 Using Retractable Handles

When the LabRAM II has been located in the area of final installation, make sure the area is prepared and ready for installation. Carefully follow the unpacking instructions in Section 6 of the User's Manual.

Retractable handles are located on both sides of the LabRAM II, installed in the base plate out of the way when not in use.

When you are prepared to lift and place the machine:



- Locate the locking pins on either end of the handle brackets.
- Pull straight down to release the locking pins while pulling the handles horizontally toward you until they click-lock into the *open* position.
- Reverse the procedure when the LabRAM II is in its intended position. The locking pins will automatically click-lock back in place after the handles have been slid horizontally back under the machine. Make sure the closed-lock position is attained.
- Check for any materials or other blockage below the machine if the handles do not smoothly return to their original position.

### 3.10 Technical Support for Mixer Operation:

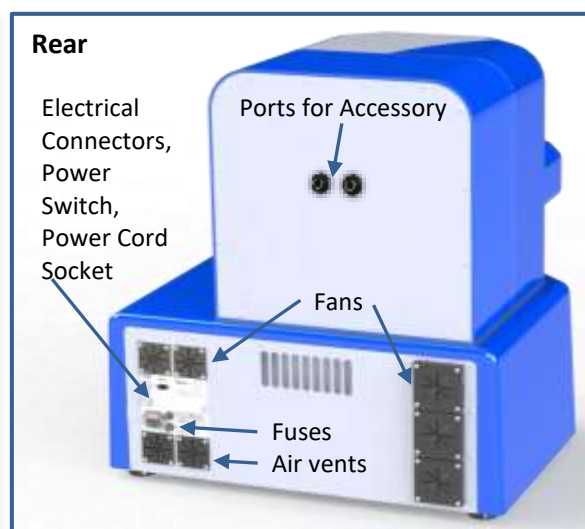
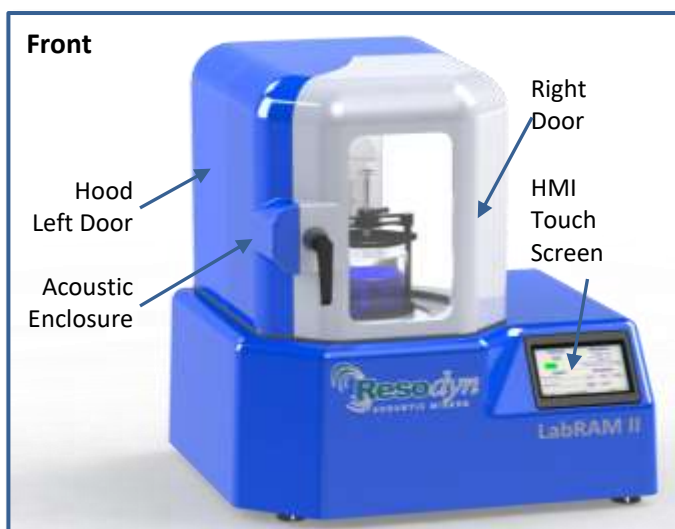
Contact your Resodyn Acoustic Mixers customer service representative for questions or the contacts provided below for additional technical support.

Technical Support for Mixer Operation:

Phone:	+1-406-497-5333	Resodyn Acoustic Mixers 130 North Main, Suite 630 Butte, Montana 59701 USA
Fax:	+1-406-497-5206	
e-mail:	service@resodynmixers.com	

## 4 System Overview

The LabRAM II mixer is a ResonantAcoustic® Mixer (RAM) specifically designed and manufactured for use in mixing up to 2.2 lb (1 kg) of materials. The LabRAM II is a highly versatile mixing system that is designed for laboratory and production environments. The LabRAM II system is equipped with proprietary mixing control circuitry, a vessel holder, machine safety interlocks, and a molded plastic acoustic enclosure. The LabRAM II external features include the Acoustic Enclosure, Hood, Left and Right Door, Touch Screen Human Machine Interface (HMI), Power Switch, Electrical Connectors and Fuses, Cooling Fans, and Air Vents.




#### 4.1 ResonantAcoustic® Mixing Platform

The LabRAM II delivers energy to the material being mixed by moving the mixing vessel up and down 60 times per second at up to 100 g of acceleration.

#### 4.2 Acoustic Enclosure

The acoustic enclosure surrounds the patented resonator system. The enclosure reduces the sound emitted by the LabRAM II and covers moving parts that could pose a risk to operators.




During operation, the Payload Plate, Cancellation Plate, Fixture, and Vessel are operating at up to 100 g of acceleration at nominally sixty times per second. Serious bodily injury is possible if one comes into contact with these moving surfaces.



#### 4.3 Touch Screen Human Machine Interface (HMI)

The HMI is the primary user interface on the LabRAM II. The LabRAM II is digitally controlled through the HMI. All data entry and operations are provided through software keypads and buttons on the screen. The touch screen and operating system is described in detail in Section 8 HMI (Human Machine Interface) – Overview.



v12.3

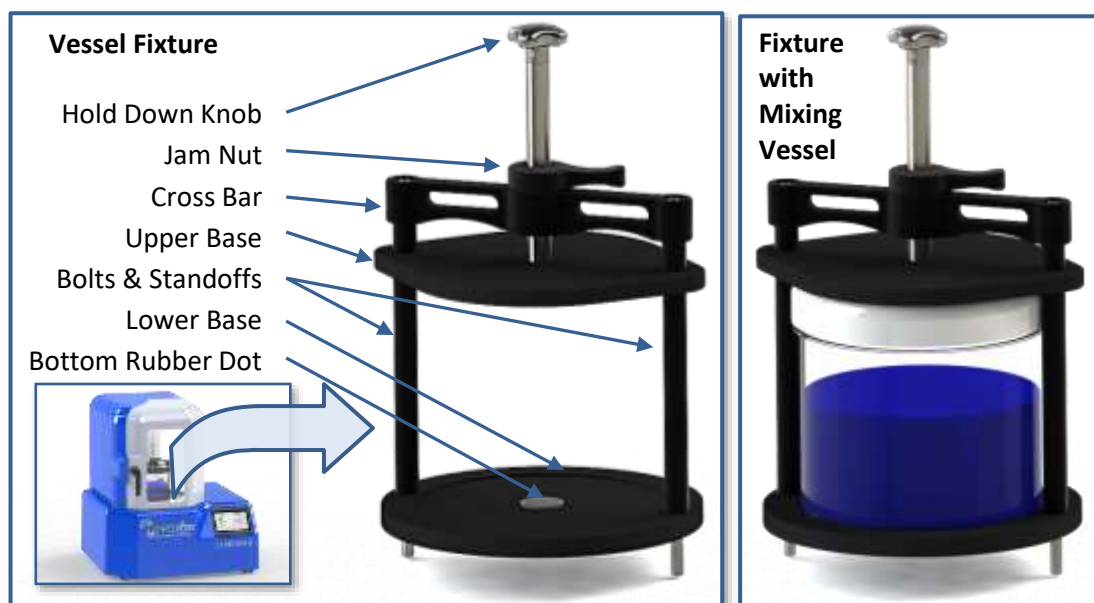
Recipe Mode	
<p><b>Controls</b></p> <p>Select Recipe</p>	<p><b>Indicators</b></p> <p>Acceleration: 0 g</p> <p>Power: 0.0%</p> <p>Temperature: 0 C</p> <p>Vacuum: 0 inHg</p>
<p><b>Recipe</b></p> <p>Selected Recipe:</p> <div style="border: 1px solid black; height: 20px; width: 100%;"></div> <p>Recipe Status:</p> <div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<p><b>Navigation</b></p> <div style="display: flex; justify-content: space-between;"> <div> <p>Login/Logout</p> <p>Setup/Config</p> </div> <div> <p>Mode</p> <p>Viewer</p> </div> <div> <p>Alarms</p> </div> </div>
<p>Login: default      Status: Ready      Alarm</p>	

HMI Touch Screen

#### 4.4 Standard Vessel Fixture and Vessels

The standard and supplied Vessel Holder, or hold-down fixture, for the LabRAM II is 5" in diameter and accommodates vessels between the heights of 2.5" and 5.125." Components and function of the Vessel Holder are described in detail below.

For vessels shorter than 2.5", spacers must be acquired from Resodyn Acoustic Mixers. Some applications also require specialized, custom hold-down fixtures. Resodyn can accommodate virtually any vessel shape that a given mixing application requires. Contact Resodyn Acoustic Mixers to learn more at +1-406-497-5333 or [info@resodynmixers.com](mailto:info@resodynmixers.com).



The Hold-Down Knob turns a threaded shaft that is connected to the Upper Base. Turning the Hold-Down Knob clockwise lowers the Upper Base, while turning it counterclockwise raises the Upper Base. The Upper Base holds the Mixing Vessel securely in place when tightened against it with the Hold Down Knob, and locked with the Jam Nut.

The Bottom Rubber Dot provides support to the center-bottom of the Mixing Vessel and helps prevent horizontal movement while processing. Do not operate the LabRAM II without the Bottom Rubber Dot.

**The Jam Nut is critical for locking the vessel in place.** When secured against the top of the Upper Base, the Jam Nut prevents the Hold-Down Knob from loosening during operation. The Jam Nut must be tightened after the Vessel is secured in place using the Hold-Down Knob.

If the Mixing Vessel is not secure in the Vessel Holder during operation, damage may occur to the mixer, vessel, and the mixing material. Significant mixing ingredient spillage may also occur. If you require vessel spacers, or a custom Vessel Holder, contact your Resodyn Acoustic Mixers sales representative at +1-406-497-5333 or [info@resodynmixers.com](mailto:info@resodynmixers.com).



## 4.5 Processing Accessories

LabRAM II accessories are available to expand its processing capabilities. Those accessories include Manual and Automatic Vacuum Systems, Jacketed Vessel Heating/Cooling Systems, and Spray Coating Systems. For details on operation of these systems with the LabRAM II, refer to the detailed Installation and Operation Manual provided with each system.

- Manual Vacuum System - Enables the user to control the pressure inside the Mixing Vessel. Pressure is controlled manually by the user to develop optimal processing characteristics that can be integrated with processing recipes.
- Automatic Vacuum System – Enables the user to control the pressure inside the Mixing Vessel. Pressure can be controlled manually by the user, or automatically by the LabRAM II as a parameter of a processing recipe.
- Jacketed Vessel Heating/Cooling System – Mixing ingredient temperature is monitored and automatically controlled via a Jacketed Mixing Vessel and Heater/Chiller Unit circulating heated/chilled fluid.
- Spray Coating System – Enables addition of atomized liquid to the mixing vessel during operation for particle coating processing applications.



User Manuals for LabRAM II Processing Accessories are available for download at <http://ResodynMixers.com/support/>

## 5 System Specifications

The LabRAM II is equipped with the following external connectors:

- 1) Inlet power
- 2) Mini USB
- 3) Fuses (X2)
- 4) Communication Connector for Automatic Vacuum System

All external connections are found in the back panel of the LabRAM II machine. See Section 6.6 for a detailed illustration.

**Table 5-1. LabRAM II System Specification.**

Maximum Payload Capacity	2.2 lbs.
Sound Emitted	<70 dB at 3' at 100 g with an empty vessel.
Vessel Temperature Monitoring	3 RTD's monitored and recorded (optional)
Automatic/Programmable Vacuum	Yes (optional)
Data Logging	Yes
Remote Operation	Yes
Computerized Operator Interface	Yes
Weight	260 lbs. plus vessel holder fixture
Dimensions (Resonator)	28" W 25" D 32" H
Electrical @ 50/60 Hz, CE Certified	100-120 / 200-240 VAC



**NOTE:** The LabRAM II system weighs approximately 260 lb (117.93 kg) without a vessel holder fixture, and should be handled by a minimum of four people lifting the machine at each side. Make sure to use safe and adequate lifting procedures. The lifting procedures are described in Section 3.7 Handling/Lifting. The system should be placed on a table or bench rated to support the mixer and any auxiliary equipment, supplies, or loads.

### 5.1 Voltage Level

The LabRAM II is designed to utilize single phase 100-120 or 200-240 VAC 50Hz/60 Hz supply voltages for use worldwide.

### 5.2 Power Consumption

The LabRAM II is designed to be energy efficient by operating at a resonant condition when mixing. Depending on the acceleration set point, vessel selection, and mix media, the LabRAM II will draw between 80 and 1200 Watts.

## 6 Installation and Support

### 6.1 Unpacking, Lifting, and Placing LabRAM II

Upon receipt of the LabRAM II, do not unpack or remove any packaging materials until positioned as close to the installation location as possible. When in position, remove all wrapping and strapping, and shipping paperwork for your records.

*Retain all packaging material for at least one (1) year, in case machine transport or warranty service is necessary. Original packaging is required for service shipment during the warranty period and is highly recommended for any shipment performed during the life of the product.*

- Open the top of the box and remove any packing materials, bubble wrap or other items.
- When all packaging material is removed, slide the packaging box/sleeve up and over the LabRAM II. The LabRAM II should be the only remaining item, resting on cushioning bags in a corrugated tray on the shipping pallet.
- Make sure to remove any loose packaging material from the area before attempting to move or install the LabRAM II
- With a minimum of four people lifting at all four sides, and using appropriate lifting practices, the LabRAM II can be lifted straight up and carried to its installation location. See Section 3.7.
- When placing the LabRAM II at its location, allow enough room around the machine to complete the installation, route wires, and allow for working space, etc.
- After installing the Vessel Holder (Section 6.5 Vessel Holder Assembly) and making all necessary connections to any accessories such as vacuum systems, re-locate the LabRAM II to its final position.

### 6.2 Mounting

The LabRAM II should be installed on a stable, rigid surface that is rated to support the mixer's weight. If other equipment or materials are to be placed or used on the same surface, a higher weight rating should be used as appropriate.

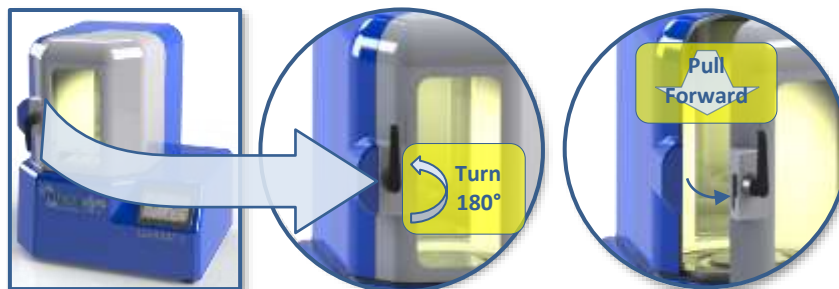
ResonantAcoustic® Mixing (RAM) technology imparts near-zero forces to the surface on which it is mounted. Careful placement of the mixer, and leveling of the surface by a qualified technician, is recommended, as is periodic inspection of the positioning and condition of the surface. Surrounding instruments and accessories should be considered in an overall placement plan.



### 6.3 Door Operation

To access the resonator plate and mixing chamber, and install the vessel holder, turn the door handle counterclockwise 180°, releasing the right-hand door. Pull the handle outward to open.

**NOTE:** When power is supplied to the LabRAM II, the mixing chamber is lit internally whenever the doors are closed and secured. The light automatically turns off when the door is opened.



To open the left-hand door for better access to the mixing chamber, locate the door latch near the lower left-hand corner of the hood opening.

Release the door catch at the lower left as shown below by pushing the top of the latch lever to the left until it clears the catch, allowing the door to swing open.



To reclose the left-hand door, swing the open panel to the right until the latch re-engages with the catch. The right-hand door must be properly closed and latched with the left-hand door. Always close the left-hand door first, followed by the right-hand door.



LabRAM II's right-hand door functions as an interlock.

The machine cannot be operated with the right-hand, viewing door open. Make sure to close the left-hand door first to maximize the interlock function.

## 6.4 Remove the Shipping Lock Bar

The LabRAM II is shipped with a Lock Bar to secure the resonator during transportation. The Lock Bar **MUST** be removed before proceeding with installation or attempting to operate the LabRAM II.

Remove the 3/16" Hex Wrench from its shipping bag attached to the Warning Label. Using the provided Hex Wrench, remove the two 1/4"-20 socket head cap screws securing the lock bar across the mixing platform. Remove the Lock Bar by lifting it off of the platform and retain it along with screws for future re-positioning or transport of mixer. A padded Resodyn case is shipped with the LabRAM II for your documentation, manuals, this hardware and other materials.

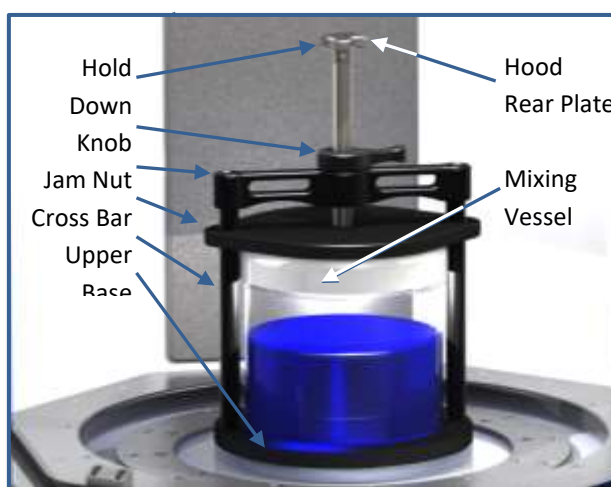


With the shipping bracket removed, the Vessel Holder assembly can be installed using the instructions that follow.

## 6.5 Vessel Holder Assembly

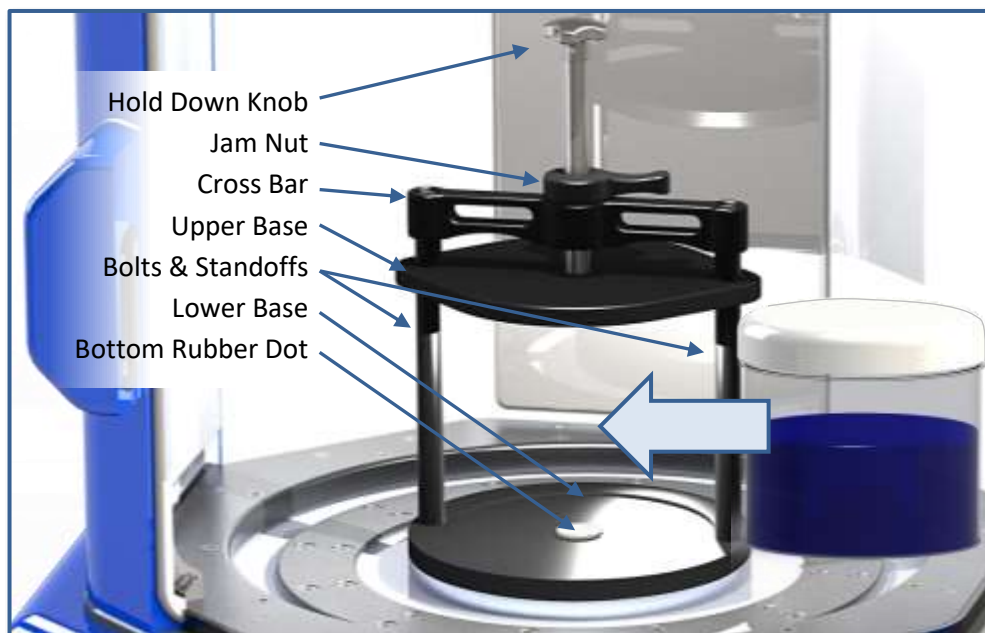
Remove the Vessel Holder Assembly from the accessory box accompanying the shipment.

**NOTE:** The Vessel Holder is shipped with nuts fastened to the bottom of the 1/4"-20 socket head cap screws. These nuts hold the fixture together during shipment. Remove these two nuts and store them with other hardware. With the nuts removed, use care not to remove parts or change the orientation of the components until familiar with the assembly.



Follow the positioning and sequence below for installation, or if reassembly or fixture movement is needed in the future.

Make sure the long, ¼"-20 socket head cap screws are positioned properly throughout the overall Vessel Holder assembly. The cap screws must pass through the Top Cross Bar, Upper Base, Standoffs, and Lower Base as shown. Thread the two ¼"-20 socket head cap screws into the Top Plate loosely, alternating between screws. When fully seated, torque each cap screw to 8 ft-lb (10.8 Nm) using a 3/16" Hex Wrench.



On the highest setting, the LabRAM II mixer payload operates at 100 g of acceleration, where 1 g equals the acceleration of gravity on the surface of the earth. Care should be taken to torque the screws to 8 ft-lb (10.8 Nm) to prevent the Fixture and Vessel from loosening during operation.

All Vessel Holder assemblies will match a hole pattern in the Top Plate. Mounting hole pattern for the standard 5" vessel holder is ¼"-20 threads measuring 5.75" center-to-center.

The mounting plate that comes standard with the LabRAM II also has mounting holes to accept fixtures and vessels from the original LabRAM. The fastener holes are four ¼"-20 threads measuring 4.375" center-to-center.

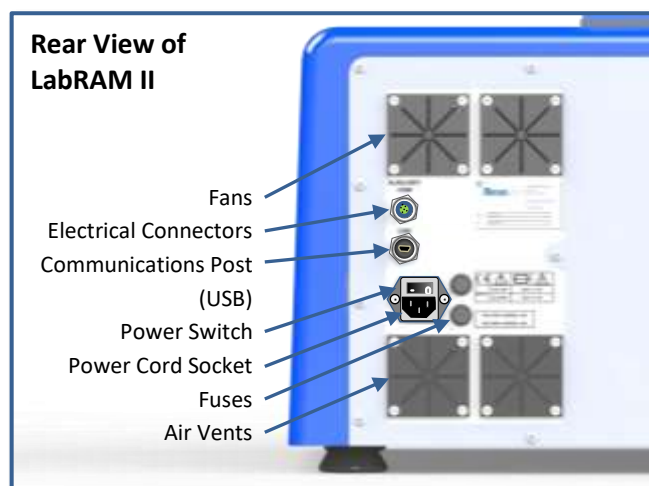
See the detailed illustration below for the position of these mounting holes.



**Figure 2 Resonator Plate Mounting Hole Locations** LabRAM II shown without doors for illustration purposes. The doors are required for operation of the machine.

## 6.6 Electrical Connections

Electrical power is provided to the LabRAM II through the cord labeled “Power” which connects to the Power Cord Socket on the back panel of the LabRAM II. The electrical source and fuses should be rated for the supply power for your area. The following cord and fuse ratings for the voltages are as follows: 10 Amps for 100-120 VAC and 8 Amps for 200-240 VAC. Plug one end of the power cord into the Power Cord Socket in the rear of the machine and plug the other end into the wall power receptacle.



## 7 Quick Start

This section defines the minimum steps required to operate the LabRAM II. All instructions and guidelines in Section 6 must be completed before attempting a Quick Start or operation of the LabRAM II.

### 7.1 Setup

To first set up the LabRAM II mixer, the mixing vessel must be installed. The fixture must have a vessel installed before operating the mixing vessel.

#### 7.1.1 Open the Hood Door(s)

Door operation is described in detail and illustrated in Section 6.3 - Door Operation.

#### 7.1.2 Securing Container in the Vessel Holder

Place the mixing vessel centered on of the Lower Base, ensuring to align over the bottom dot, as described in Section 6.5 Vessel Holder Assembly. If the Dot is missing, call Resodyn Customer Service at +1-406-497-5333. Turn the Hold-Down Knob clockwise at the top of the fixture until the Upper Base securely holds the Mixing Vessel in place. Tighten the Jam Nut to lock the Vessel Holder assembly together. The Mixing Vessel should not feel loose if grabbed and moved while fastened in the holder. If the vessel feels loose, tighten further. Vessel spacers may also be used under the mixing vessel when mixing in short vessels.

#### 7.1.3 Close the Doors

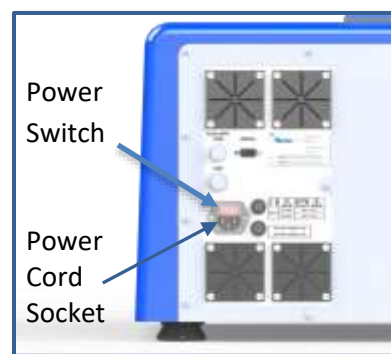
Door operation is described in detail and illustrated in Section 6.3 - Door Operation. The status on the HMI screen should read “Ready” and a green start button should be displayed if in “Auto” mode and in “Recipe” mode if a recipe has been chosen.

### 7.2 Power-Up

If not already plugged in, plug the provided power cord into the Power Cord Socket (shown at right) and a wall outlet.

Toggle the power switch (located above the Power Cord Socket) to the on, or “I”, position.

When power is applied to the system, the Resodyn Acoustic Mixers logo is displayed on the HMI screen during boot-up. When ready for operation, the second screen shown below to the lower right will be displayed. This screen displays “Recipe Mode” in the title bar, and will be referred to as the “Main Screen” throughout this Manual.



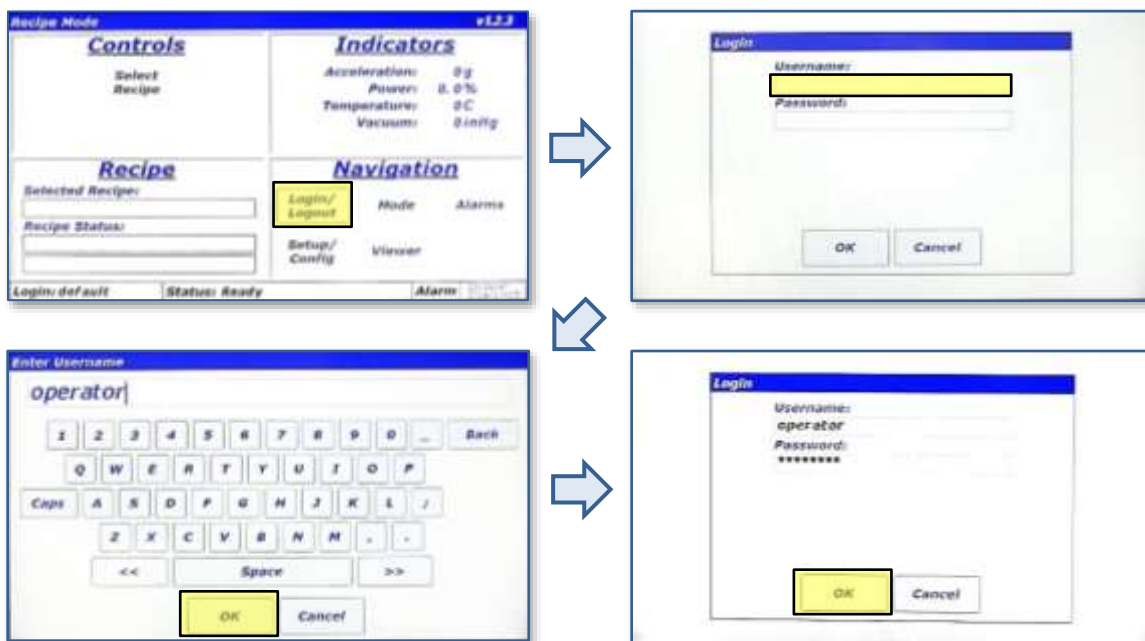




### 7.3 Login

Before running the LabRAM II, a user login is required. For quick-start, the lowest level login will be used. By default, both the username and password are “operator.”

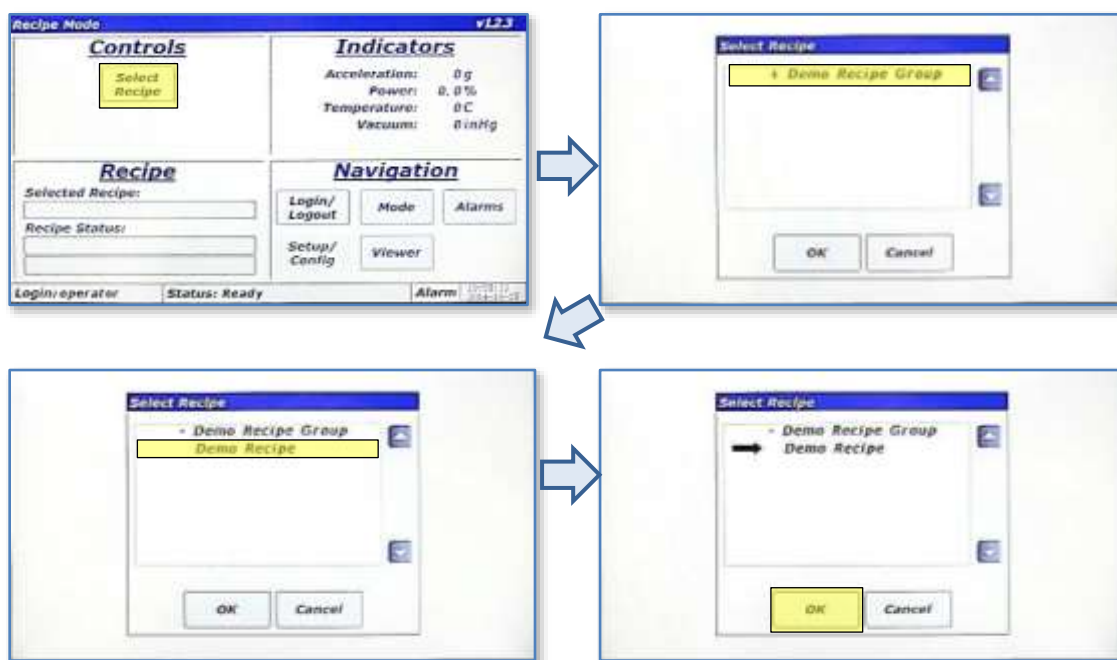
1. Touch the <Login/Logout> button.
2. Touch the <Username:> text box. This will launch the “Enter Username” alpha-numeric keypad.
3. Using the keypad, enter “operator” as the username.
4. Touch <OK> button after entering username.
5. Repeat steps 1-3, entering “operator” as the password.
6. When both username a password are entered, touch the <OK> button on the “Login” screen. The Main Screen will be displayed with several more buttons enabled.



## 7.4 Select the Recipe

The LabRAM II is provided with a demonstration recipe to use as a reference and guideline. The following demonstrates how to select a recipe for mixing using that demonstration recipe.

1. Touch the <Select Recipe> button. The “Select Recipe” screen is displayed.
2. Touch the line that displays “+ Demo Recipe Group.” This will expand the Demo Recipe Group and show the recipe(s) contained in that group. The demonstration recipe supplied with the LabRAM II is called “Demo Recipe.”
3. Touch the line that displays “Demo Recipe.” A black arrow will appear to the left of the recipe selected. This black arrow indicates that the recipe has been selected.
4. Touch the <OK> button to return to the Main Screen.



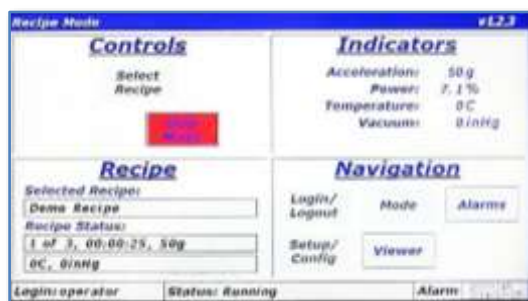
5. The Main Screen will display the name of selected recipe in the “Recipe” pane, and the green <Start Mixer> button will also appear. Touch the <Start Mixer> button to initiate a mix cycle.



## 7.5 Run the Recipe

A recipe is a pre-defined mixing routine that runs the mixer at specific acceleration, vacuum (if equipped), and temperature (if equipped) settings for defined periods of time.

1. Press the <Start Mixer> button to begin the mix cycle.
2. The “Enter Mix Comment” screen will appear. Enter a description of the mix or comment about the mixing routine to be performed, i.e., Batch #123, or Test #1. Use the keypad to enter mix comment.
3. After touching the <OK> button on the “Enter Mix Comment”, the actual accelerating/mixing will begin, and the Main Screen will be displayed again. The <Start Mixer> button will change to the red <Stop Mixer> button on the Main Screen. The “Recipe” pane will update as the recipe executes by displaying the current segment, total segments, current segment timer, acceleration setting, temperature setting, and vacuum setting. Measured values will be displayed in the Indicators Pane.
4. When the final recipe’s timer counts down to 00:00:00, the mixer will stop. The <Stop Mixer> button will change to the <Start Mixer> button. This completes the recipe execution. Repeat the Demo Mix recipe for familiarization if necessary or required.





## **7.6 Completion**

When the middle section of the Recipe Status Bar reads “Status: Ready”, the LabRAM II’s doors can be opened and the Mixing Vessel can be removed.

1. Open the doors.
2. Loosen Jam Nut, then the Hold-Down Knob, and remove the Mixing Vessel.
3. If no further mixes are required, turn the power switch to the off position.

## 8 HMI (Human Machine Interface) – Overview

The HMI is the primary user interface on the LabRAM II. The LabRAM II is completely digitally controlled and control is provided by the HMI. All data entry and operations are provided through software keypads and buttons on the screen.

This section will cover the top-level features of the HMI operation, and the details of these topics will be described in subsequent sections.

### 8.1 Main Screen

The Main Screen is the primary screen for control of the LabRAM II. Its appearance will vary depending on operating mode (Recipe or Auto), and machine operation status. The basic sections of the Main Screen are illustrated and described below.



- Title Bar – Displays mode and the firmware version.
- Controls Pane – Area where the user selects, Starts, and Stops recipes in Recipe Mode, or enters setpoints (Acceleration, Temperature, and Vacuum) in Auto Mode.
- Indicators Pane – Contains the value of measured parameters.
- Recipe and Timer Status Pane – Displays recipe and auto mode timer status.
- Navigation Pane – Buttons for screen navigation.
- Status Bar – Displays current username, machine status message, alarm status, and date/time.

## 8.2 Login

As illustrated in the Quick Start section, in order to operate the LabRAM II, user authentication (login) is required. Four different login privilege levels are provided to control access to machine features. The LabRAM II is delivered with pre-configured users at each level of login for demonstration purposes. These logins are tabulated below. Once users are familiar with the system it is recommended to delete these users, change the passwords upon familiarization of their use, and/or establishing new ones.

Level	Username	Password
0	operator	operator
1	technician	technician
2	calibration	calibration
3	supervisor	supervisor

Begin at the <Login/Logout> button in the “Navigation Pane.” Refer to the Quick Start section for screen procedures to log in. Detailed descriptions of available operations and features, and definitions of the login levels, can be found in Section 9 HMI Operation – Security and Login.

## 8.3 Operational Modes (Recipe and Auto)

The LabRAM II is controlled through two operating modes, Auto Mode and Recipe Mode. Recipe Mode should be the primary mode used by Operators, while Auto Mode is used by advanced users to characterize a mixing process for eventual recipe programming. Level 0 (operator level) can be locked out of Auto mode.

The <Mode> button in the “Navigation Pane” allows switching between operational modes. Note that operational modes cannot be changed while the LabRAM II is accelerating/mixing.

## 8.4 Alarming

Several operational parameters are monitored in the LabRAM II to protect the equipment and the user. If the safe bounds of any of these parameters are exceeded, or the equipment is operated incorrectly, an Alarm will be triggered, and the mixer will stop. The Status Bar has a field that reads “Alarm.” In an alarm condition, this field will turn red for a shutdown alarm or yellow for a warning alarm.

The <Alarms> button in the “Navigation Pane” allows viewing of alarms in a tabular format for review, and acknowledgment of alarms to clear them.

## 8.5 Setup and Configuration Screens

The Setup and Configuration screens are accessed with the <Setup/Config> button. This screen set allows setting customizable options, viewing critical machine parameters, data management, recipe creation, and calibration.

The Level 0 (operator) login level does not have any access to the Setup and Configurations screen set, while other levels have varying access to features. The breakdown of feature access is defined in Section 9.1 Login Levels and Privileges.

## **8.6 Viewer**

All measured parameters including acceleration, power, frequency, temperature, and vacuum are plotted in a time-history format in the Viewer screen. The Viewer screen is accessed via the <Viewer> button in the "Navigation Pane. See Section 12 HMI Operation – Viewer for detailed description and instructions.

## 9 HMI Operation – Security and Login

To protect the LabRAM II from unauthorized use and to maintain a record of which users operated the mixer, the system uses a user authentication system. Users are required to enter a username and password before operating the mixer. If the machine is not running and no user interaction with the HMI is detected for 10 minutes, then the current user will be automatically logged out.

### 9.1 Login Levels and Privileges

The following table summarizes the different login levels and their associated privileges.

Level	Name	Privilege Description
3	Supervisor	(Highest level of access) User creation/maintenance Date/time setting Recipe creation Optional feature configuration Data file management Instrument calibration Status viewing for troubleshooting Recipe Mode operation Auto Mode operation
2	Calibration	Instrument calibration Status viewing for troubleshooting Recipe Mode operation Auto Mode operation
1	Technician	Status viewing for troubleshooting Recipe Mode operation Auto Mode operation
0	Operator	(Lowest level of access) Recipe Mode operation Optional Auto Mode operation

## 9.2 Screen Operations - Logging In/Out

The following table outlines the steps for logging in using the pre-configured supervisor login.



1. Touch the <Login/Logout> button



2. The "Login" screen will appear. Touch the textbox beneath "Username:."



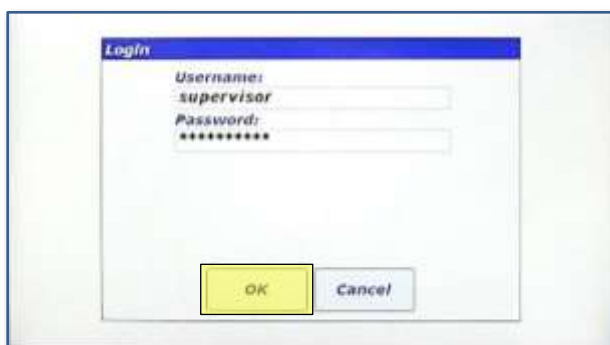
3. Using the keypad, enter "supervisor" for the username. Touch the <OK> button when finished.



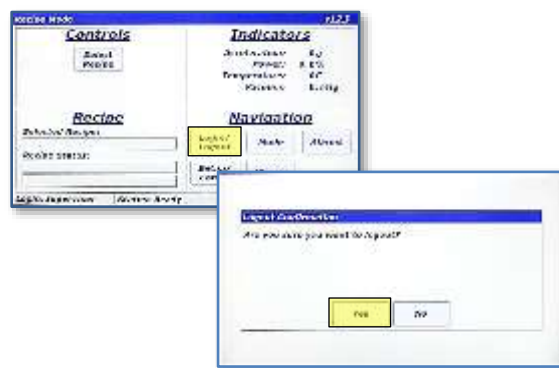
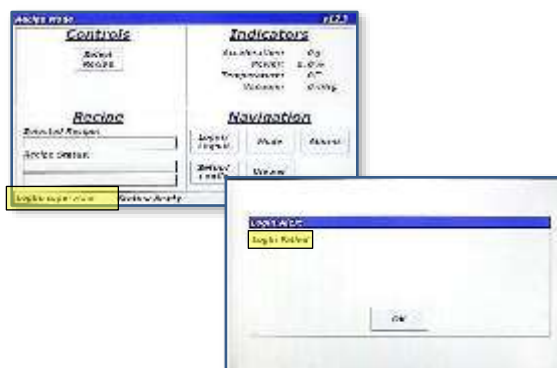
4. The "Login" screen will reappear and "supervisor" will be visible in the "Username:" textbox. Now, touch the "Password:" textbox to enter the password.



5. Using the keypad, enter "supervisor" for the password. Touch the <OK> button when finished.



6. The "Login" screen will reappear, and "supervisor" will be visible in the "Username:" textbox and the asterisk masked password will also be visible. Touch OK to login.



7. If the login attempt is successful, image 1 above will be displayed and the “supervisor” username will be displayed in the lower right corner. If login is unsuccessful, a dialog will be displayed notifying the user (image 2 above).
8. To logout, simply touch the <Login/Logout> button again. A confirmation dialog box will appear. Touching yes on that dialog will log the current user out.

### 9.3 Log Files

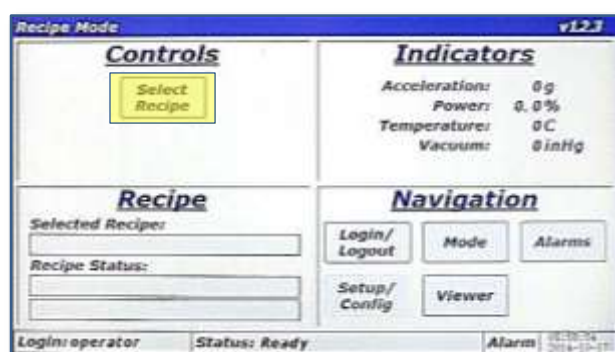
Every login attempt, successful or not, is logged to data files in the LabRAM II’s memory. These files can be uploaded to a PC via USB for data archiving. See Section 13.8.

## 10 HMI Operation – Modes of Operation

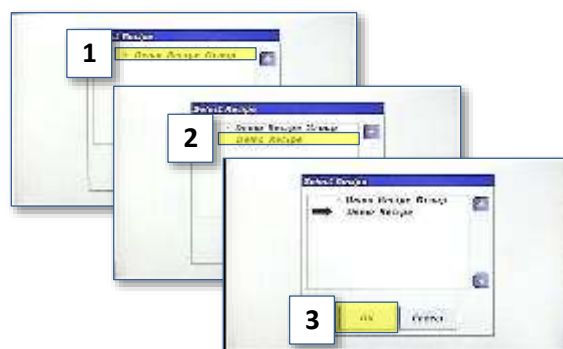
As previously noted, the LabRAM II is controlled through two operating modes, which are referred to as Auto Mode and Recipe Mode. Recipe Mode is the primary mode used by operators, while Auto Mode is used by higher levels to characterize a mixing process for eventual recipe programming. This section covers the details of the LabRAM II in Recipe Mode and Auto Mode.

### 10.1 Screen Operations - Recipe Mode

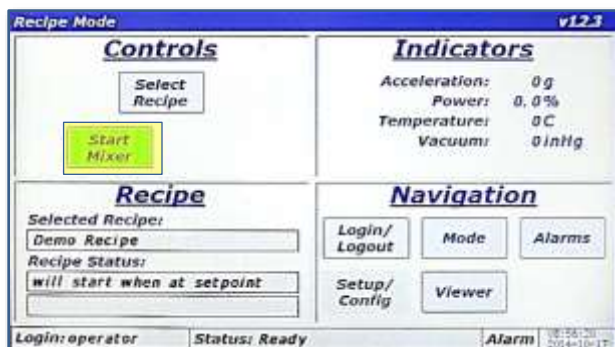
The following table details the steps for operating the LabRAM II in Recipe Mode. Note that this sequence assumes the user has already logged in to the system.



1. Touch the <Select Recipe> button.



2. Touch "Demo Recipe Group" (item 1) to expand the group. Touch "Demo Recipe" to select it (item 2). A black arrow will appear next to the recipe. Touch <OK> to load the recipe (item 3).

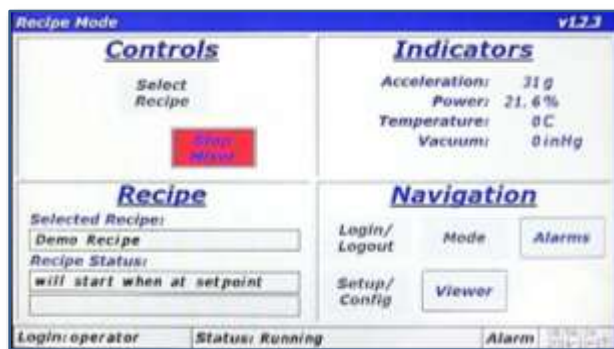


3. The main screen is displayed, and the <Start Mixer> button will be visible while the Recipe pane will display the name of the recipe just selected. Touch the <Start Mixer> button to begin the recipe mixing cycle.

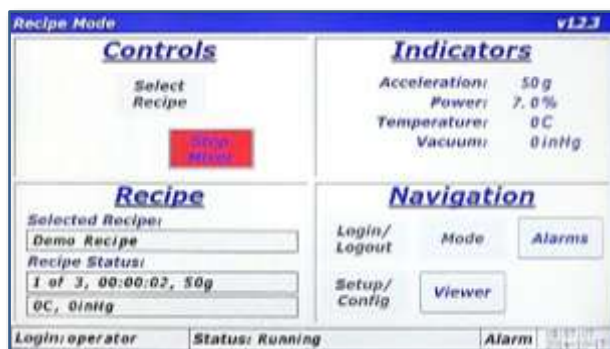


4. The "Enter Mix Comment" screen will appear. Enter a fitting description of the current mix being executed. The text entered in this screen is stored in a log file in the LabRAM II's memory. Touch <OK> when finished.



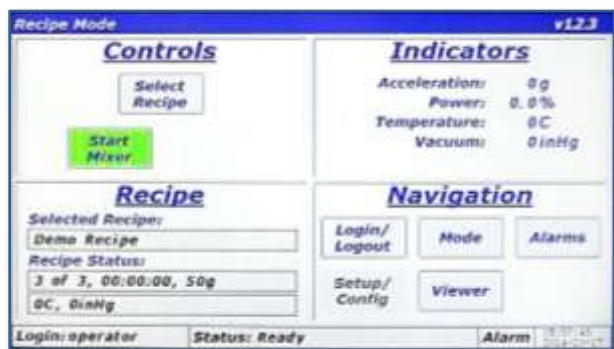


5. The Main Screen is again displayed, and the LabRAM II will begin accelerating/mixing. The <Start Mixer> button changes to the <Stop Mixer> button. The recipe pane content will not update until the measured acceleration reaches the programmed setpoint. E.g., if the recipe calls for 60g of acceleration, updates will not start until acceleration reaches that 60 g.

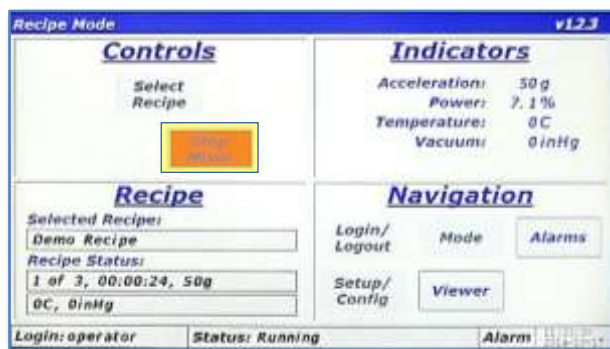


6. When acceleration reaches setpoint, the Recipe pane will update and display the currently executing segment, total segments, and remaining time on current segment, acceleration setpoint, temperature setpoint, and vacuum setpoint.

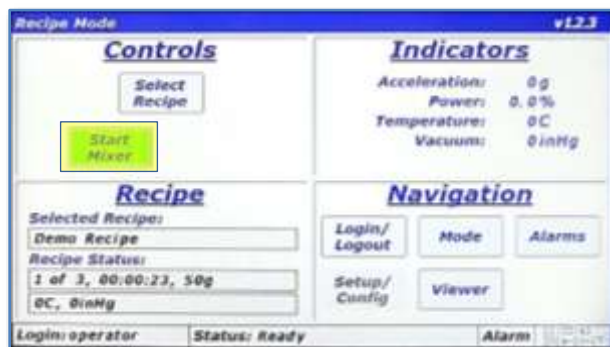
NOTE: If not equipped with temperature or vacuum control, the setpoints for these parameters will read 0 C and 0 torr, respectively.



7. When the timer of the final segment expires, the mixer will stop. The <Stop Mixer> button changes to and the <Start Mixer> button. This completes a complete recipe mixing cycle.



8. The LabRAM II can be stopped by touching the <Stop Mixer> button during a recipe mix. Normally, this is only done if a user forgot to add an ingredient. Upon stopping the recipe, the timer will pause. To stop the mixer while running in Recipe Mode, simply touch the <Stop Mixer> button.



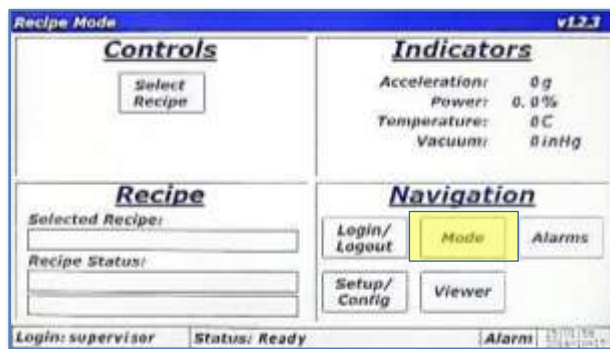
9. When the machine is stopped, the door can be opened, and ingredients added (or the cause for stopping can be corrected). The LabRAM II can then be restarted by touching the <Start Mixer> button.
10. The "Enter Mix Comment" screen will appear again. Enter a fitting description. Touch <OK> when finished.



11. The LabRAM II will give the option of starting from the beginning of the recipe by touching the <Start Over> button, or continuing from the point the mixer was stopped by touching the <Resume> button.

## 10.2 Screen Operations - Auto Mode

The following details the steps for operating the LabRAM II in Auto Mode. Note that this sequence assumes the user has already logged in to the system with authorized login credentials to operate in Auto Mode.



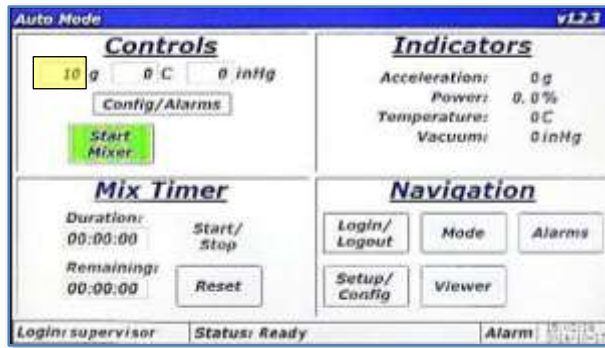
1. Touch the <Mode> button.



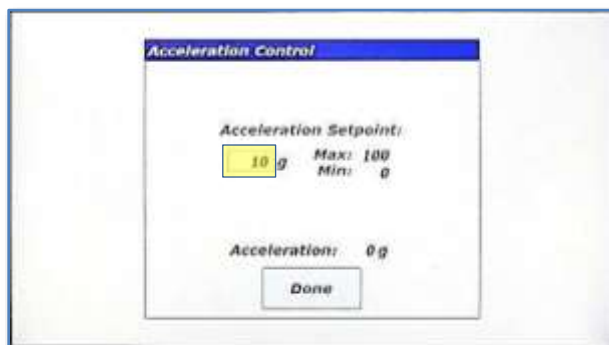
2. The "Mode Select" dialog is displayed. Touch the <Auto> button to change from Recipe to Auto Mode.



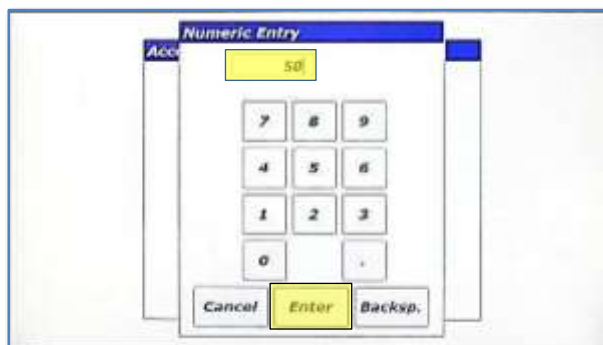
3. Touch the <OK> button to close the "Mode Select" dialog.



4. The Main Screen will appear but will have some differences from Recipe Mode. The Controls Pane now has three textboxes that are used to enter setpoints for acceleration (in g), temperature (in C), and vacuum (in torr). The <Config/Alarms> button is used for entering user limits for certain parameters and will be discussed later. The <Start Mixer> and <Stop Mixer> buttons operate the same as Recipe Mode. The lower right pane is now titled "Mix Timer" instead of "Recipe." The "Mix Timer" is used to enter and operate the timer for Auto Mode. To update the acceleration setpoint, touch the textbox next to "g."



5. The "Acceleration Control" dialog will appear. The acceleration setpoint can be entered in this dialog. The entered value for acceleration must lie between these maximum and minimum values or the entry will not be accepted. To change the acceleration setpoint, touch the textbox next to "g."

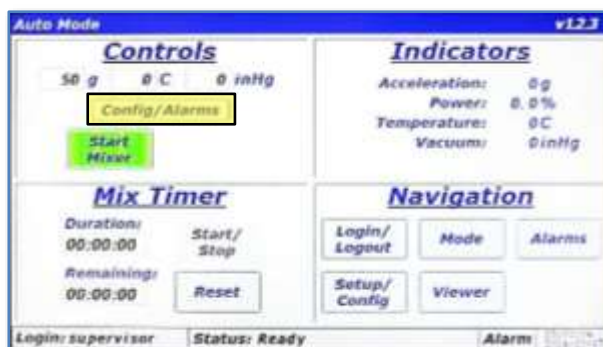


6. A numeric keypad will appear. Enter the new setpoint value and touch the <Enter> button to close the keypad.

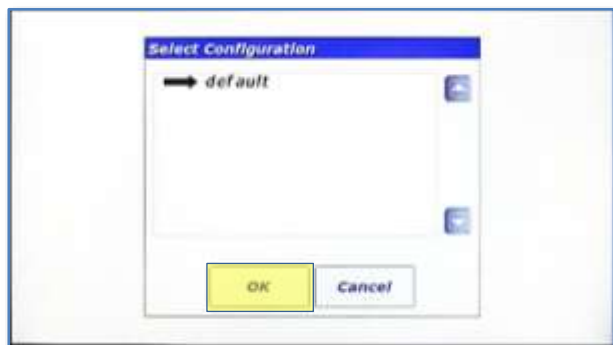


7. The newly entered setpoint will now appear in the textbox. Touch <Done> to close the "Acceleration Control" dialog.

NOTE: If the LabRAM II is mixing or in acceleration, the setpoint would be used as soon as a valid setpoint was entered. The LabRAM II does not wait for you to touch <Done>.

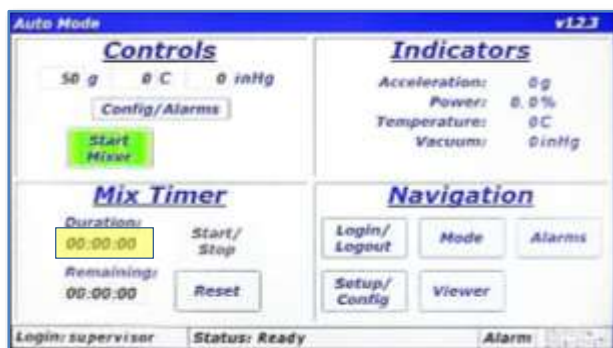
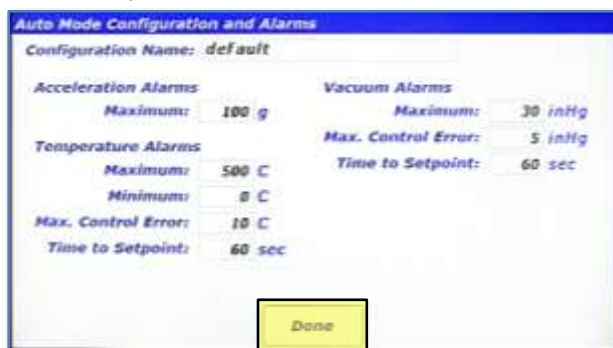


8. The new setpoint will now be updated in the Main Screen. To enter user-defined limitations and select a Configuration, touch the <Config/Alarms> button.



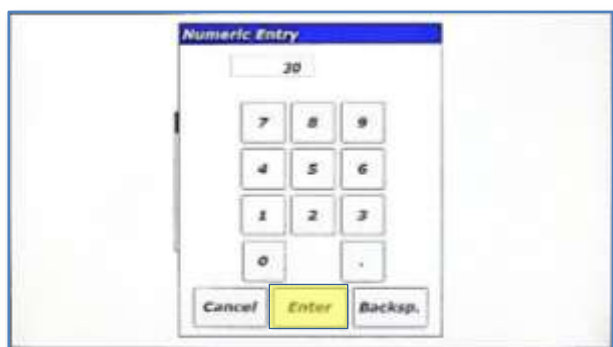
9. The "Auto Mode Configuration and Alarms" screen is displayed. This screen allows a user to enter limitations that will shut the machine down (and limit setpoint entry) if they are exceeded. If, for example, the material being mixed by the LabRAM II was acceleration sensitive, the Maximum Acceleration could be limited in this screen. The Configuration for Auto Mode is selected by touching the textbox next to "Configuration Name:."

10. The "Select Configuration" dialog will appear, and the Configuration can be selected from the list (only one configuration is defined in the image). Touch <OK> after the configuration has been selected.



11. The "Auto Mode Configuration and Alarms" screen will be displayed again. To close the dialog touch <Done>.

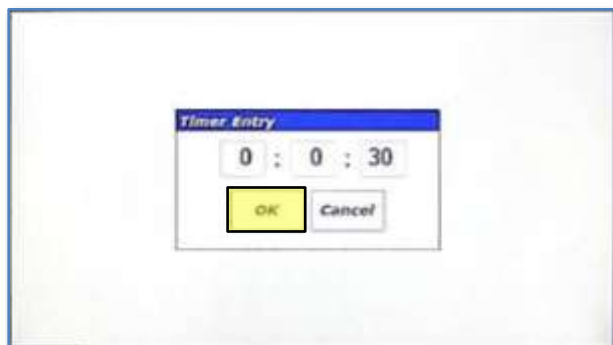
12. To enter a timer duration, touch the textbox under "Duration:" in the Mix Timer Pane.



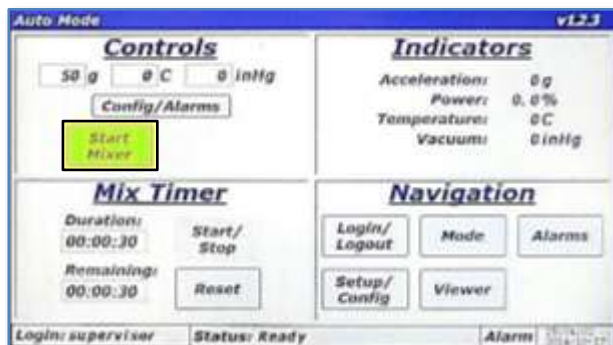
13. The "Timer Entry" dialog appears. The dialog has three textboxes, which are, going from left-to-right hours:minutes:seconds. Touch the right textbox to enter seconds.

14. The "Numeric Entry" dialog will popup. Using the numeric keypad, enter 30 (for 30 seconds). Touch <Enter> when complete.





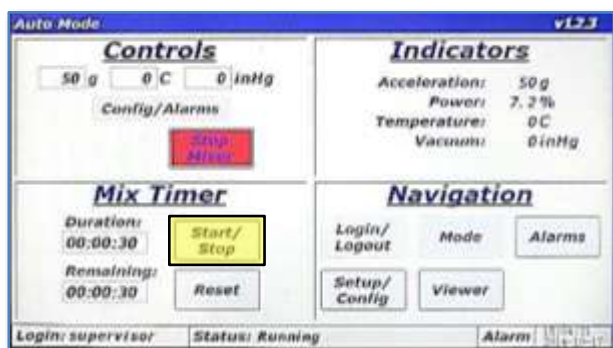
15. The entry from the previous step is displayed in the "Timer Entry" dialog. To edit hours and minutes, simply repeat the previous steps using the other textboxes. When complete, touch the <OK> button.



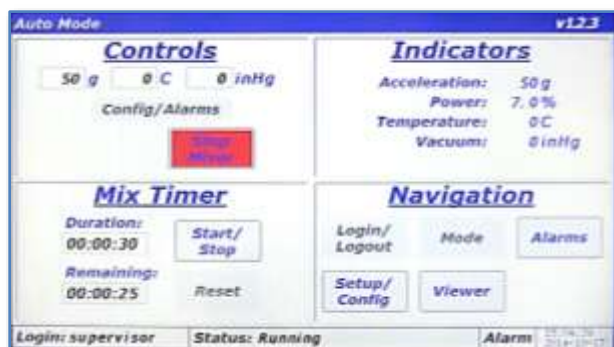
16. The timer value, 30 seconds in this case, will appear in the Mix Timer pane in the textboxes under "Duration:" and "Remaining:." Touch the <Start Mixer> button to begin a mix cycle in Auto Mode.



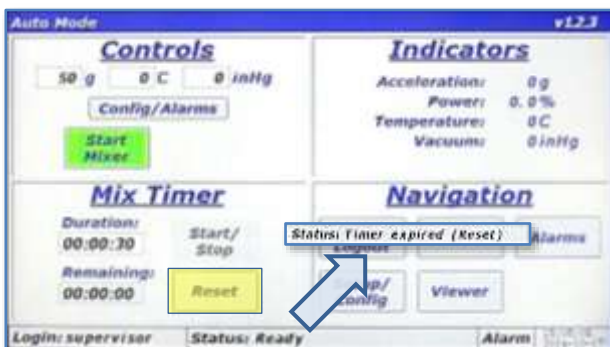
17. The "Enter Mix Comment" screen will appear. Enter a fitting description of the current mix. The text entered in this screen is stored in a log file in the LabRAM II's memory. Touch <OK> when finished.



18. The Main Screen is again displayed and the LabRAM II will begin accelerating/mixing. The <Start Mixer> button changes to the <Stop Mixer> button. Depending on Auto Mode Timer mode configured, the timer may start immediately, it may start when the mixer is at acceleration setpoint, or not at all (manual). The factory default for this option is manual mode where the user must touch the <Start/Stop> to start the timer. Touch <Start/Stop> in the Mix Timer pane.



19. When the timer is actually running the <Reset> button will be disabled. Also, the timer duration cannot be changed when the timer is running. Pressing the <Start/Stop> button will pause/stop the timer, which will re-enable the <Reset> button. If the <Reset> button is pressed, it will reload the timer to the initial value.



20. When timer expires, the LabRAM II will stop accelerating/mixing. If the Auto Mode timer is set to the manual option, the middle portion of the Status Bar will read "Status: Ready." If the Auto Mode timer is set to the immediate or at-setpoint option, the middle portion of the Status Bar will read "Status: Timer expired (Reset)." If this message is visible, the <Start Mixer> button is hidden. The user must press the <Reset> button or load a new duration for the Auto Mode mix timer.

## 11 HMI Operation – Alarming

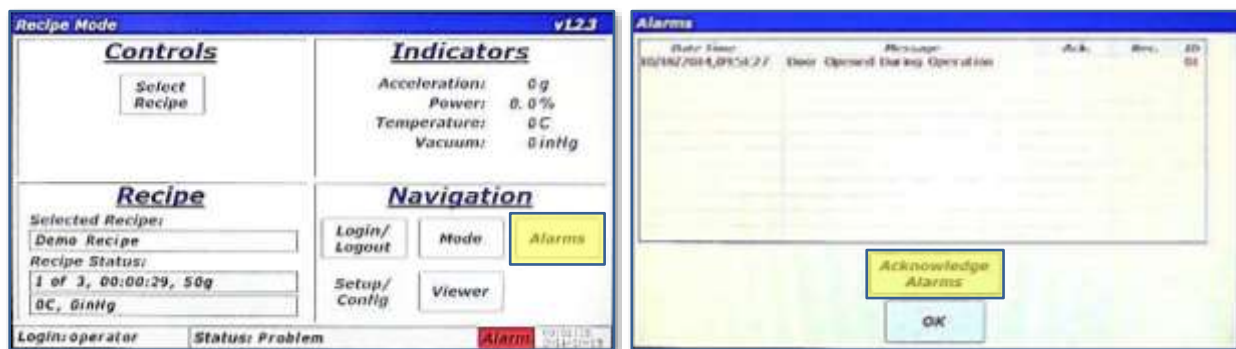
The LabRAM II protects itself and the user by monitoring parameters that could cause damage or injury. When any of these parameters are violated, the mixer will stop accelerating/mixing and the user is notified at the Main Screen by a change in the color of the Alarm section of the Status Bar to red or yellow. Red indicates a shutdown error is present, and yellow indicates a warning is active.

The Alarm screen is accessed by touching the <Alarms> button from the Main Screen in the Navigation Pane. The Alarms screen provides a tabular format that shows when an alarm is posted, its message, when it recovered or the condition is corrected, when the alarm was acknowledged, and the alarm ID number.

Whenever an alarm is triggered, acknowledged, or recovered, a log file stored in the LabRAM II's memory is updated. The alarm logs can be uploaded to a computer through USB. (See Section 13.8 for uploading instructions.)

### 11.1 Screen Operations - Alarms

The following details the steps for viewing and managing alarms.



1. When an alarm is active, the "Alarm" section of the Status Bar will turn red for a shutdown alarm and yellow for a warning. To view the alarm, touch the <Alarms> button.
2. The "Alarms" screen is displayed with the alarm message on the first line of the table. In this case, the "Door Opened During Operation" alarm has been triggered. This alarm is triggered if the LabRAM II door is opened during a mixing cycle. Note that when an alarm is active and unacknowledged the alarm message will be red. The columns of the table are as follows:
  - Date Time: the date and time that the alarm was activated
  - Message: the alarm description
  - Ack.: the time that the alarm was acknowledged
  - Rec.: the time that the alarm was recovered
  - ID: alarm identification number
 Touch the <Acknowledge Alarms> to acknowledge the alarm.

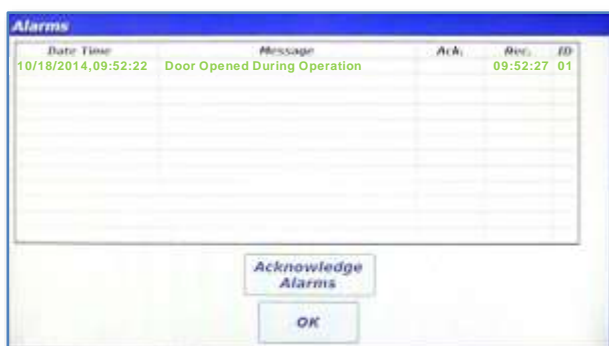




3. The alarm font turns blue and a time is inserted into the "Ack." Column. The blue color indicates an alarm that is still active but has been acknowledged. If the door is physically closed, the alarm will recover, and the message will disappear from the alarm table.



4. The alarm message disappears when an acknowledged alarm recovers.



5. If the alarm is recreated but the door closed (alarm recovered) before acknowledgment, the above alarm message will be displayed. Under this condition, the alarm message is green and the "Rec." column is populated with a time. If the <Acknowledge Alarms> is touched, the alarm message will disappear because it will be recovered and acknowledged.



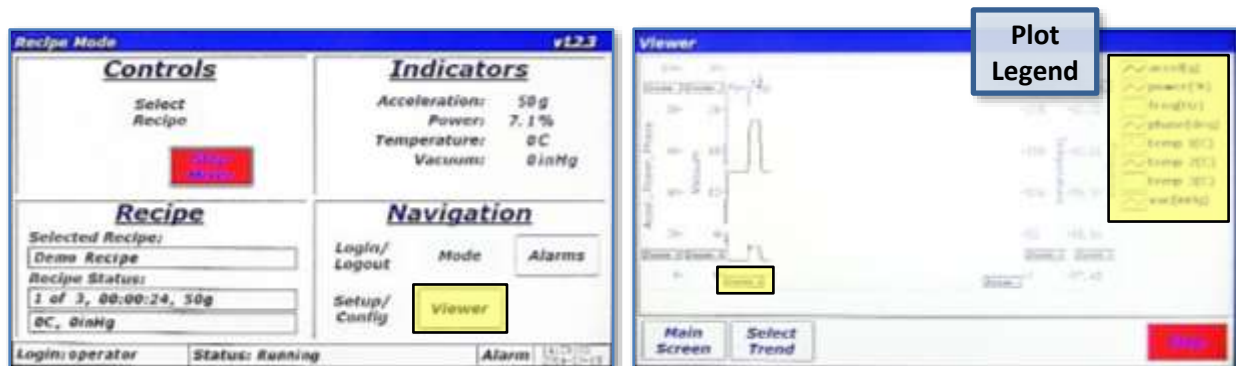
6. The alarm message disappears when an acknowledged alarm recovers.

## 12 HMI Operation – Viewer

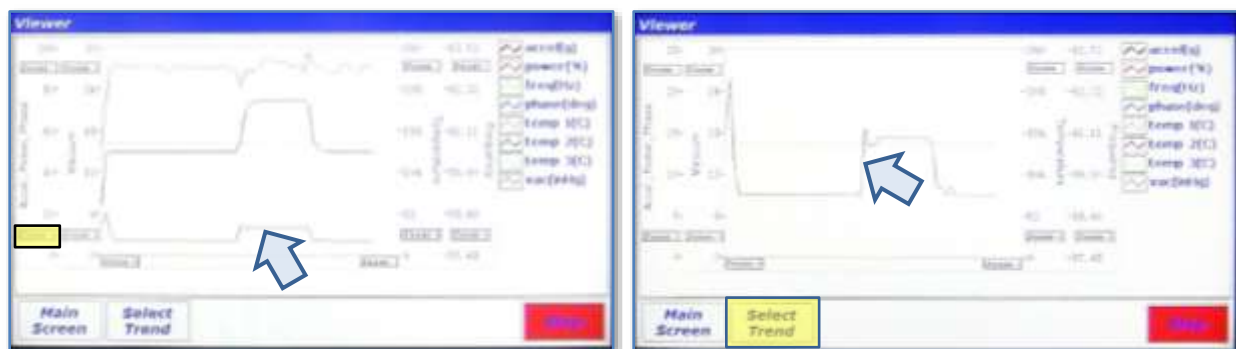
The LabRAM II measures several parameters important to mixing efficiency. These measure parameters can be viewed in real-time as time-history plots. To view real-time plots, touch the <Viewer> button in the Navigation Pane of the Main Screen.

### 12.1 Screen Operations - Viewer

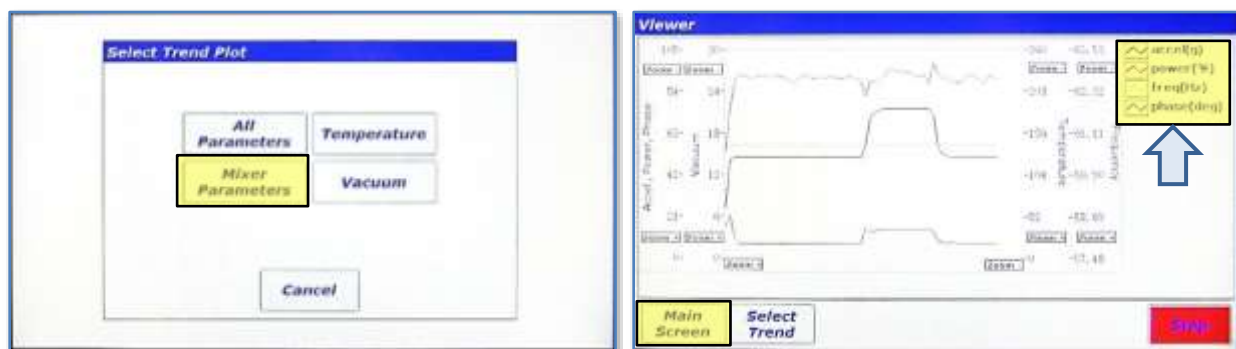
The following details the steps for viewing real-time measured parameters.



1. With the LabRAM II mixing/accelerating in either Recipe or Auto Mode, touch the <Viewer> button in the Navigation Pane.
2. The "Viewer" screen will appear. This screen is a time-history plot of a maximum of eight parameters. The plot colors and names are located in the Plot Legend. Four Y-Axes have independent zooming capabilities. All plots share a single X-Axis zoom. To Zoom In on the X-Axis, touch and hold the <Zoom +> button on the X-Axis.



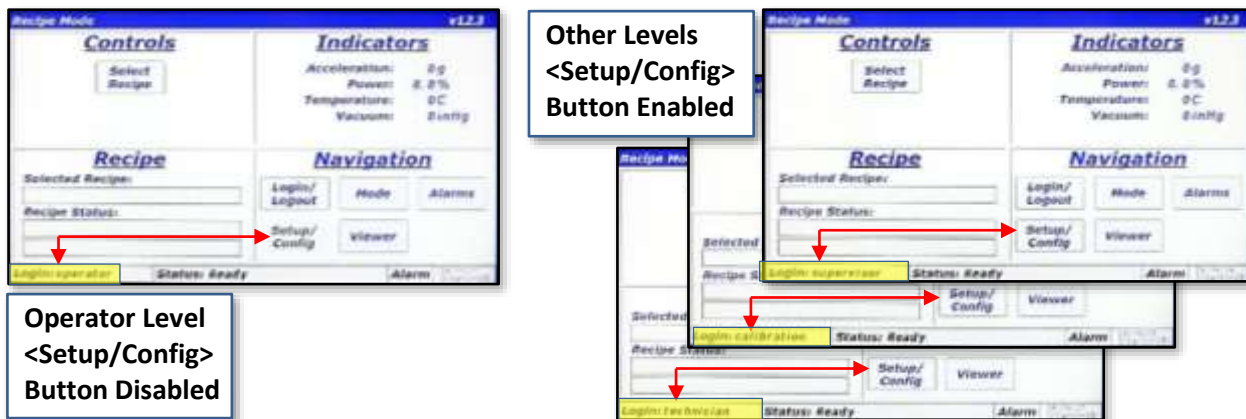
3. The visible plots will now have a shorter overall time, and will be "zoomed in." Touching the <Zoom -> button will have the opposite effect. Zooming on the vertical Y-Axes uses the same method. To zoom in on the smaller "power(%)" plot, touch and hold the <Zoom +> button on the "Accel., Power, Phase" Y-Axis.
4. The smaller "power(%)" can now be examined more closely. To focus on a specific parameter of interest, pare down other visible parameters, touch the <Select Trend> button.



5. The "Select Trend Plot" dialog will appear. This dialog allows selecting the display of specific parameters. The buttons on this dialog will generate different versions of the graph displaying plots according to the button labels selected. Touching the <Mixer Parameters> displays only the four parameters related to mixing.
6. This image shows only the four mixer parameters in the plot as indicated by the contents of the Plot Legend. To return to the Main Screen, touch the <Select Trend>.

## 13 HMI Operation – Setup and Configuration

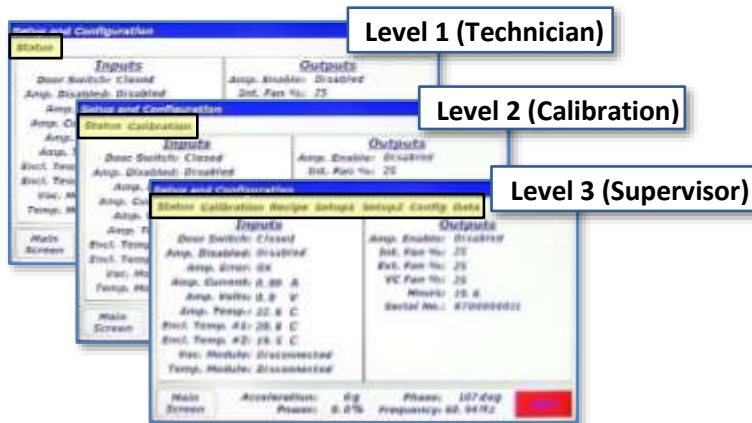
The LabRAM II offers the user extensive customization and flexibility. The Setup and Configuration screen provides user control of optional features, and manages the configuration of the LabRAM II. The Setup and Configuration screen is accessed by touching the <Setup/Config> button from the Main Screen. If logged in at Level 0 (operator), this button is disabled, while the button is enabled for all other login levels (refer to image), but the content of the Setup and Configuration screen is adjusted based on the user's login level.



The Setup and Configuration screen is laid out in a tabbed format, like many modern web browsers. Touching a tab title will switch between tabs. Tabs are visible based on the user's login level. The table to the right identifies the tabs and login level required to access those tabs. The associated image illustrates how the Setup and Configuration screen changes appearance based on login level.

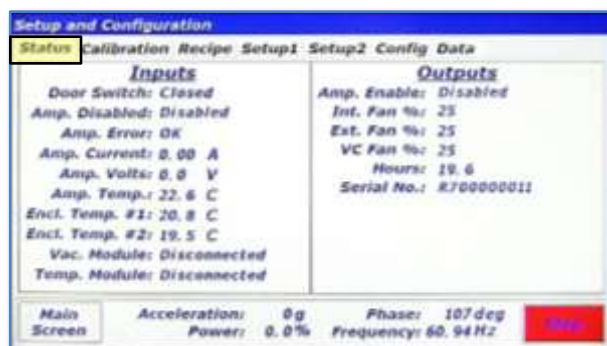
Tab Name	Login Level Required		
Status	Supervisor	Calibration	Technician
Calibration	Supervisor	Calibration	
Recipe	Supervisor		
Setup 1	Supervisor		
Setup 2	Supervisor		
Config	Supervisor		
Data	Supervisor		

**NOTE:** The following descriptions and instructions of the Setup and Configuration screen in Section 13 assume a Level 3 (Supervisor) login.



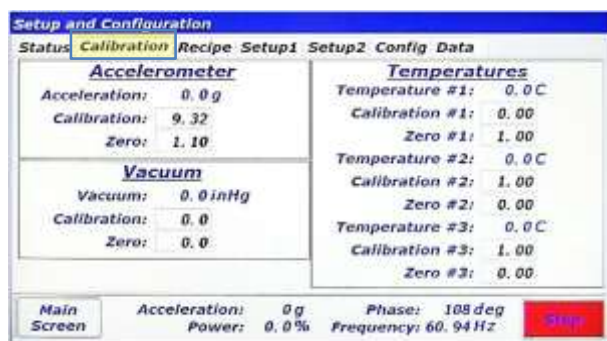
### 13.1 Status Tab

The Status Tab is used to examine machine parameters and perform diagnostics, if needed. The left portion of the tab is dedicated to machine **inputs** including switch and amplifier status, amplifier voltage/current, enclosure temperatures, and vacuum/temperature module communication status. The right portion of the tab is dedicated to machine **outputs** including amplifier enable command, fan speeds, machine hours and serial number.



### 13.2 Calibration Tab

The Calibration Tab is used to verify calibrations and to adjust calibration coefficients. Resodyn Acoustic Mixers provides calibration standards to calibrate the accelerometer. Procedures are provided with a Calibration Kit available from Resodyn. Accelerometer calibration should be performed annually. Vacuum and temperature can be calibrated with any standard systems used for that purpose.



**NOTE: By default, Temperature Calibration Values must be set to 1.00**

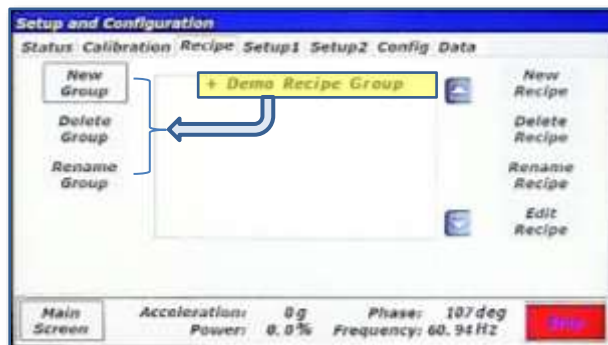
### 13.3 Recipe Tab

The Recipe Tab is used to create and edit recipes and recipe groups. The LabRAM II has the capability to store 10 recipe groups with 10 recipes per group, for a total of 100 recipes. Recipe groups can be thought of “folders,” and recipes are analogous to “files” on a computer. Recipe Groups can be created, renamed, and deleted in the recipe tab. Individual Recipes can be created, renamed, deleted, and edited from the recipe tab. The remainder of this section provides detail of recipe operations.



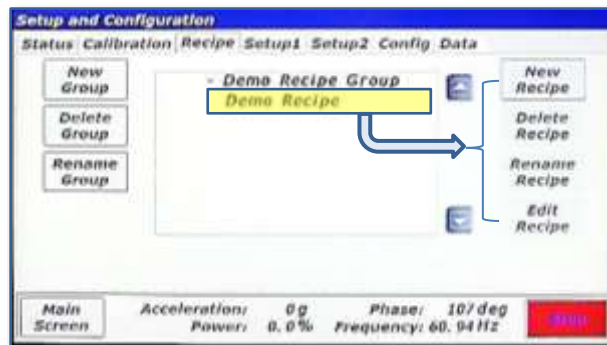
### 13.3.1 Screen Operations – Edit an Existing Recipe

The following section details how to edit an existing recipe. The LabRAM II is shipped with a demonstration recipe and group, used as the example to be edited below.



1. While in the Recipe Tab of the Setup and Configuration screen, touch the "+ Demo Recipe Group" line. This will expand the recipe group.

**NOTE:** The buttons on the left side of this tab are used for recipe group management, while the buttons on the right are used for recipe management. The buttons on both sides will change enabled/disabled state based on selection of recipe groups and recipes. In the image above, all of the buttons on the right are disabled because no recipe group or recipe is selected in the list. Only the <New Group> button is enabled on the left because no recipe group has been selected.

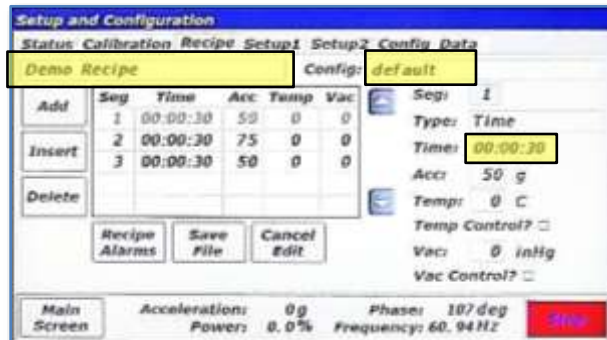


2. After expanding the "Demo Recipe Group", the "+" next to the group name changes to a "-" and the recipes in that group are listed. In this case, there is only one recipe listed named "Demo Recipe." Touch the line with the recipe.



3. After touching the recipe name, an arrow will appear indicating that the recipe has been selected. To view/edit the contents of this recipe touch the <Edit Recipe> button.

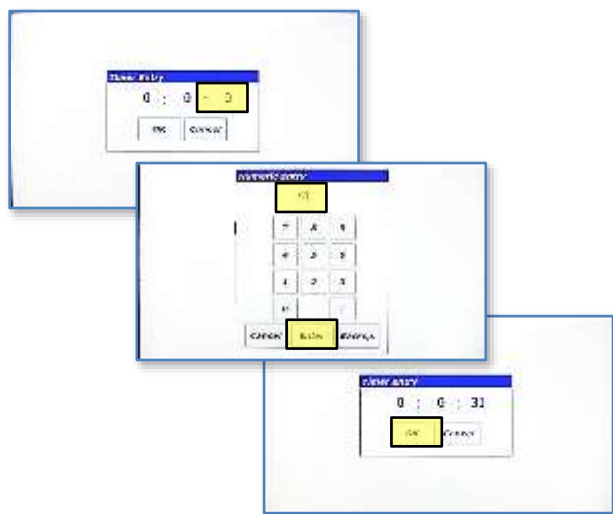
**NOTE:** The buttons on both sides are now enabled because a recipe group and recipe are expanded and selected, respectively.



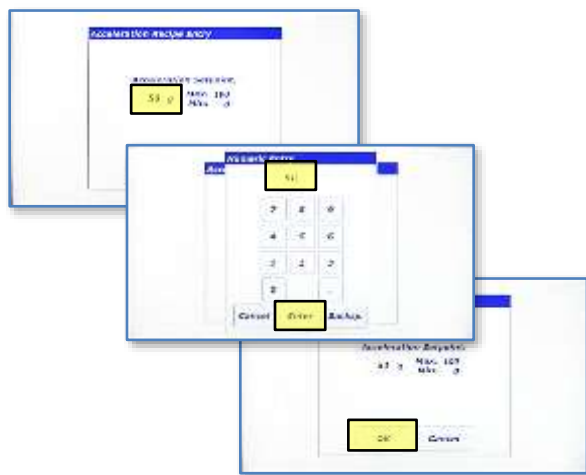
4. The recipe contents will be read from the LabRAM II's memory and displayed in the screen shown above. The recipe name (*Demo recipe*) is displayed in the top-left textbox. The Configuration associated with this recipe (default) is displayed in the top-right textbox. The <Add>, <Insert>, and <Delete> buttons on the left side of the screen are used to add or remove segments to the recipe. The table in the middle of the screen shows already defined segments. The controls on the right side of the screen are used to change settings for time, acceleration, temperature, and vacuum. To demonstrate usage of these controls, the time for segment 1 will be changed from 30 seconds to 31 seconds, and the acceleration setpoint will be changed from 50g to 51g. Touch the textbox next time "Time:."

**NOTE:** Segments are time steps of the recipe. In the screen above, each row in the table is a segment.

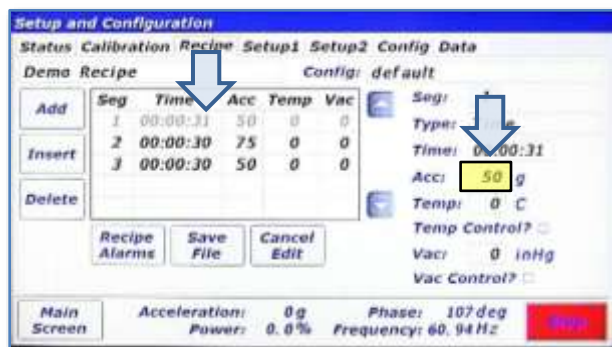




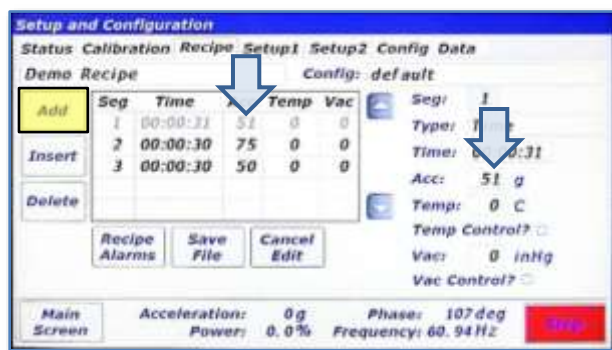
5. The timer entry for recipe editing is the same as in Auto Mode. Touch the seconds textbox, enter 31 using the "Numeric Entry" dialog and then touch the <Enter> button. Touch OK in the "Timer Entry" dialog when complete.



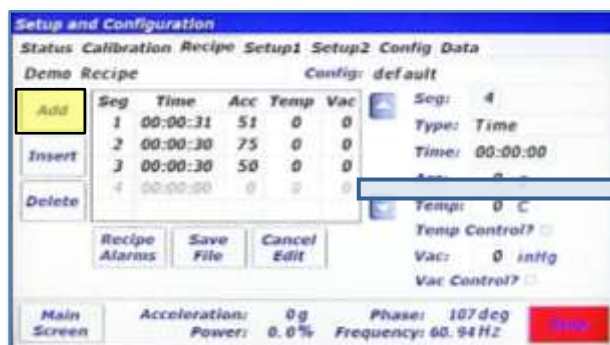
7. The "Acceleration Recipe Entry" dialog will appear. Use this dialog entry the same as the Auto Mode acceleration entry. Touch the textbox and enter 51 using the "Numeric Entry" dialog and then touch the <Enter> button. When complete, touch the <OK> button.



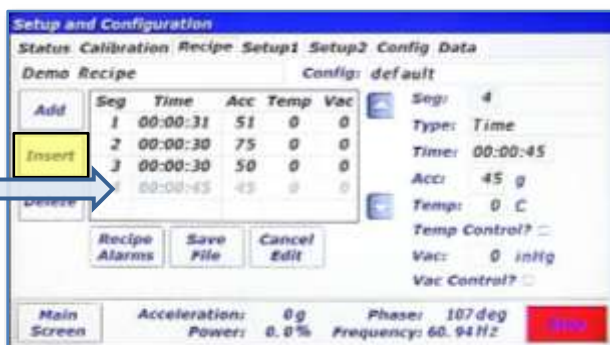
6. The time for segment 1 is now 31 seconds. To update the acceleration setpoint from 50g to 51g, touch textbox next to "Acc:."



8. The new setpoint of 51g now appears in the table and in the control on the right-side. Temperature and vacuum setpoints can be entered in the same fashion, if these the LabRAM II is equipped with these options. Touch the <Add> button on the left-side of the screen to append a segment to the end of this recipe.



9. A new segment, segment 4, is now added to the end of the this recipe. Using the methods previously described, this segment can be edited to have a time duration of 45 seconds and an acceleration setpoint of 45g, as shown on the following screen.

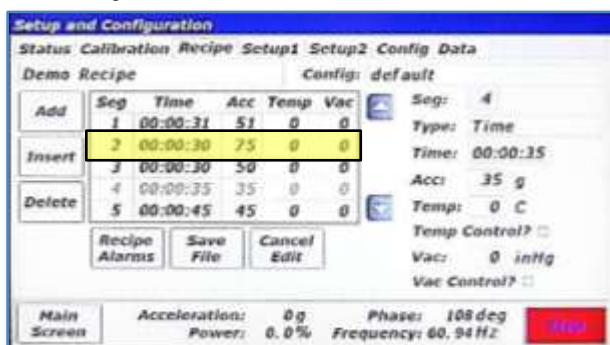


10. To add another segment between existing segments in the recipe, the <Insert> button will be used this time. Touch the <Insert> button to add another segment ahead of the selected segment. Since segment 4 is selected (light grey color), the new segment will become segment 4 and the old segment 4 will become segment 5, as shown in the next screen.

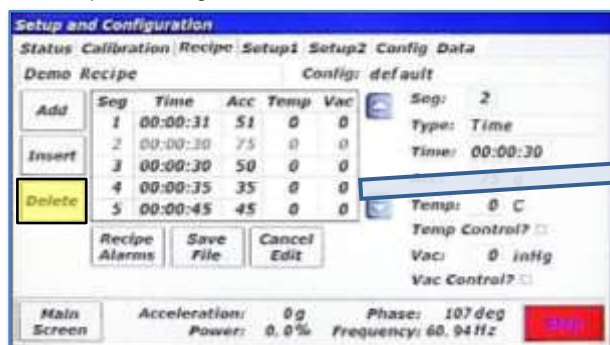
**NOTE:** The selected segment is a lighter grey color than the other segments. To select a different segment, touch the desired segment in the table control.



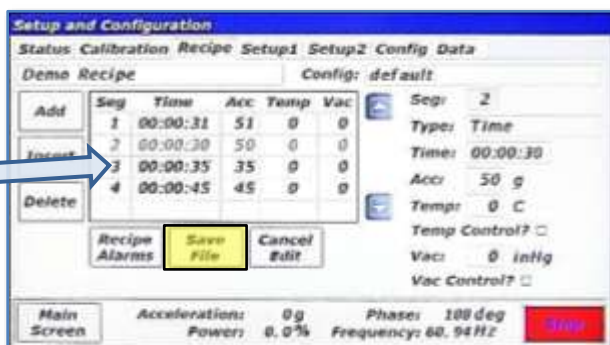
11. To edit the contents of the new segment 4, use the methods previously described. This segment is edited to have a time duration of 35 seconds and an acceleration setpoint of 35 g, as shown in the next screen.



12. The new segment 4 now has updated time and acceleration setpoint. To delete a segment, first touch segment 2.



13. Segment 2 is now highlighted (light grey). Touch the <Delete> button on the left to delete segment 2.



14. The previous segment 2 is now deleted and the previous segments 3,4, and 5 are shifted up one position. To complete this recipe edit, touch the <Save File> button.



15. A confirmation dialog will appear. Touch <Yes> to save.

### 13.3.2 Screen Operations – Create New, Rename, and Delete

This details how to create a new recipe group and then add a new recipe to that group. It assumes the user is logged in as a supervisor



1. To create a new recipe group, touch the <New Group> button.
2. Using the keypad enter the new group's name. Then touch <OK>.



3. The new group will appear in the list. To add a recipe to this group, the group must be selected first. Touch the line with "+ new group"
4. The <New Recipe> button will now be enabled. Touch it to create a new recipe.



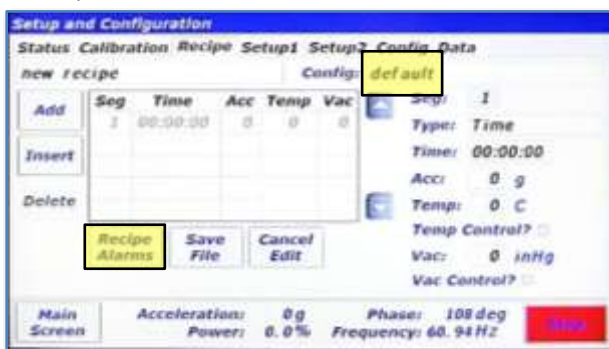
5. The “Select Configuration” dialog will appear. Configurations will be discussed in a later section. Touch <OK>.



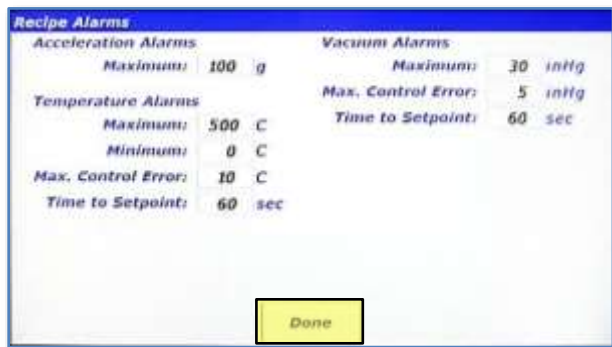
6. When a new recipe is created, a default name is given to the recipe. Also, a blank segment 1 is automatically added. To change the name, touch the textbox in the top-left hand corner.



7. Rename the recipe and touch <OK>.



8. If the configuration ever needs to be changed, touch the textbox next to “Config:.” This will launch the “Select Configuration” dialog as seen in step 5. The “Type:” textbox is used for selecting the segment type. **NOTE:** Currently Time segments are the only option. This feature will be expanded in future firmware revisions or the LabRAM II. Touch the <Recipe Alarms> button.

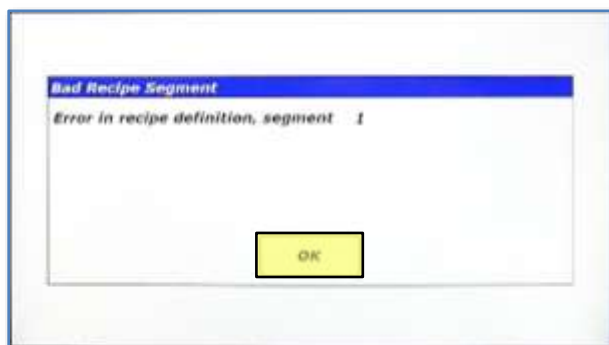


9. The “Recipe Alarms” screen will appear. This screen performs the identical function as the “Auto Mode Configuration and Alarms” but for Recipe Mode. This screen allows the user to enter limitations for the recipe. If for example, the material that will be mixed with this recipe was temperature sensitive, the Maximum temperature could be set here to protect the material from overheating. Touch <Done> when done entering alarm limits.

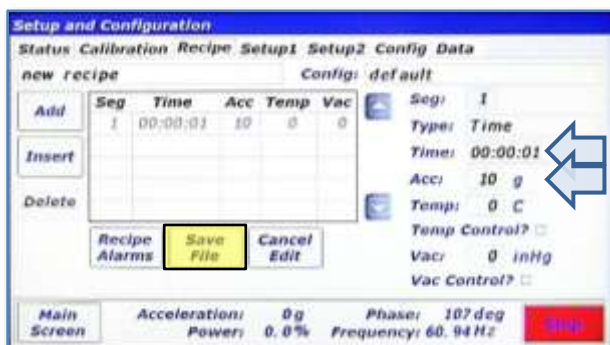


10. LabRAM II will automatically check for input errors. To demonstrate the error checking functionality, touch the <Save File> button without editing the empty segment 1.





11. The “Bad Recipe Segment” dialog will appear and it specifies that something is wrong with the definition of segment 1. The time for segment 1 is 00:00:00, which is not allowed. Acceleration, temperature, and vacuum setpoints all need to lie between values entered in the “Recipe Alarms” as well to pass the error checking. Additionally, the setpoints are checked against fixture limits. Fixtures are discussed in a subsequent section. Touch <OK> to return to the editing screen.



12. Correcting the contents of the recipe by entering qualifying data allows saving. Touch <Save File>.



13. Now that the recipe is correct, the “Recipe Save” dialog appears. Touch <Yes>.



14. After expanding “new group”, “new recipe” is visible. Select “new recipe” by touching its line. Recipes can also be renamed from this screen. Touch the <Rename Recipe> button on the right.



15. Rename the recipe and touch <OK>.



16. Recipes are also deleted from this screen. Select the renamed recipe and Touch the <Delete Recipe> button.



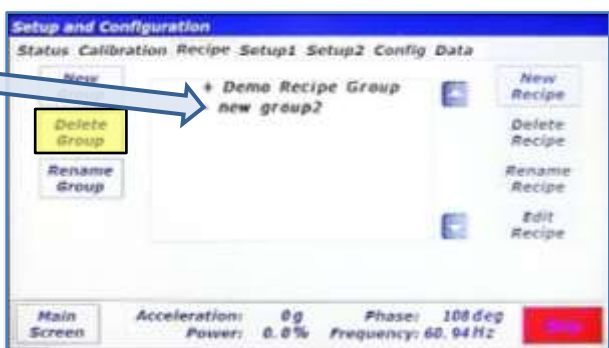
17. Touch <Yes> on the "Recipe Delete Confirmation" dialog to delete the recipe.



18. Selecting "new group" again will confirm that the recipe is deleted. Recipe Groups are also renamed and deleted from this screen. The process for this is identical to recipe renaming and deleting. With "new group" selected ("-" next to "new group"), touch the <Rename Group> button.



19. Rename the recipe group and touch <OK>.



20. The group has been renamed. To delete the new group, select it and touch the <Delete Group> button.



21. Confirm delete by touching <Yes> in the "Group Delete Confirmation" dialog.



22. The group has been deleted.



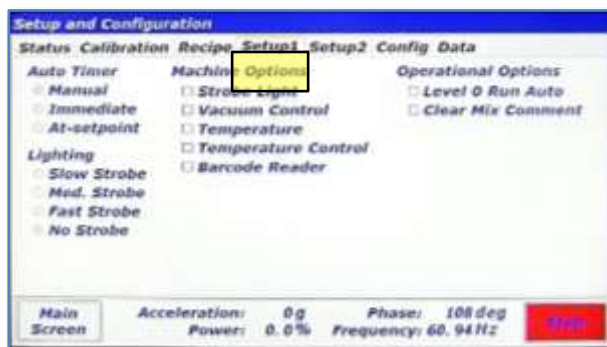
## 13.4 Setup1 Tab

The Setup1 Tab is used to configure optional features and enable machine options.

### 13.4.1 Auto Timer Group Box

This group box allows setting of the auto mode timer's behavior:

- **Manual:** Auto Mode timer starts only when user presses <Start/Stop>.
- **Immediate:** Auto Mode timer starts as soon as LabRAM II starts mixing/accelerating.
- **At-setpoint:** Auto Mode timer starts as soon as LabRAM II acceleration reaches initial setpoint.

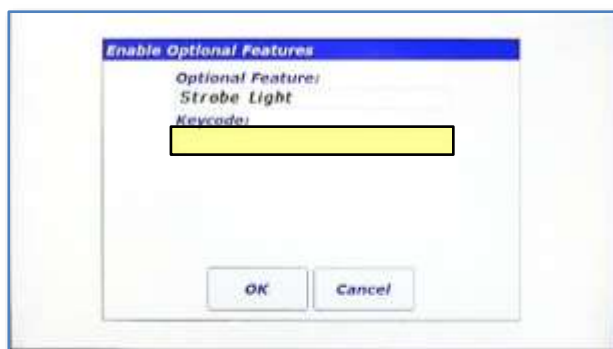
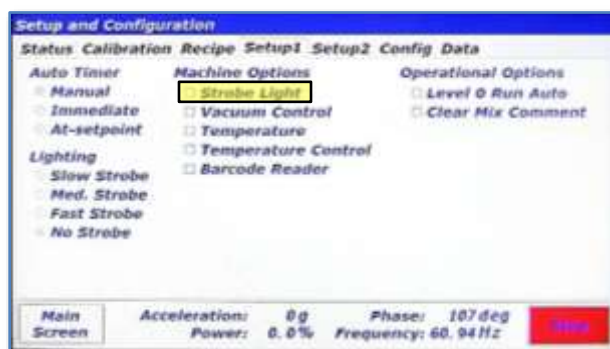


### 13.4.2 Lighting Group Box

This group box controls the behavior of the optional strobe light feature for the LabRAM II. The controls in this group box will only be active if the LabRAM II is equipped with the strobe option. The top three selections (<Slow Strobe>, <Med. Strobe>, <Fast Strobe>) adjust the strobe speed. The bottom selection, <No Strobe> sets the lighting to a fixed illumination. The <No Strobe> setting is the only allowed setting if the strobe light feature is not equipped.

### 13.4.3 Machine Options Group Box

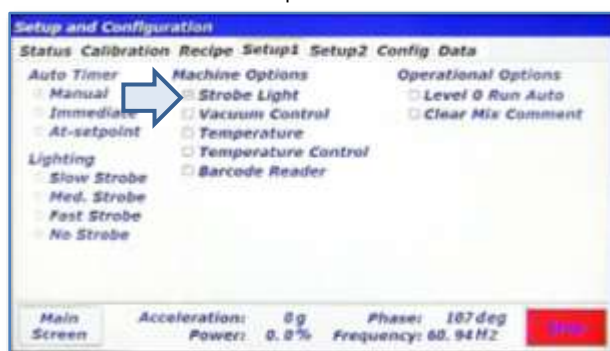
If a LabRAM II user decides to enable features after initial purchase, a keycode will need to be entered to turn those features on. The Machine Options Group Box allows the user to enable optional features by entering a keycode. Additionally, this box indicates enabled features with a checked box. The following illustrates the process of enabling an optional feature.



1. To enable the strobe light feature, touch the strobe light check box. Call Resodyn Acoustic Mixers to access a key code at +1-406-497-5333.
2. The "Enable Optional Features" dialog will appear. Touch the textbox under "Keycode:."



3. Enter the keycode provided by Resodyn Acoustic Mixers. Touch <OK> when complete.
4. Touch OK to attempt activation.



5. If activation is successful, then a checkbox will appear in front of the option. Otherwise, a failure dialog will appear.

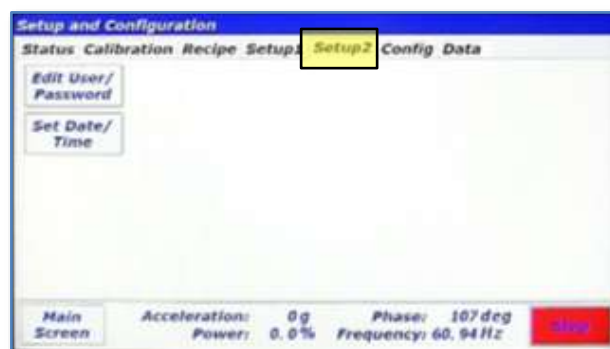
### 13.4.4 Operational Options Group Box

User preference options are located in the Operational Options Group Box. Currently, there are only two options:

- **Level 0 Run Auto:** If this checkbox is checked, Level 0 (Operator) is allowed to operate the LabRAM II is Auto Mode.
- **Clear Mix Comment:** By default, the previous Mix Log Comment is retained between a LabRAM II shutdown and re-start. This can be useful if a specific comment protocol is required. Checking this option will clear the Mix Log Comment between starts and force the user to re-type the mix comment.

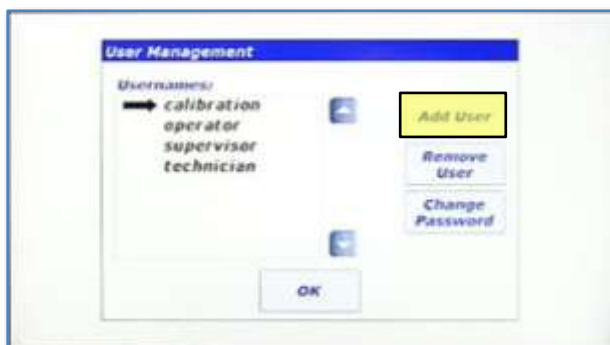
### 13.5 Setup Tab

Currently, only two buttons are present on the Setup2 Tab. The top button, <Edit User/Password> provides a user management utility to create new users, change passwords, and delete users. The <Set Date/Time> button is used to adjust the system date and time.



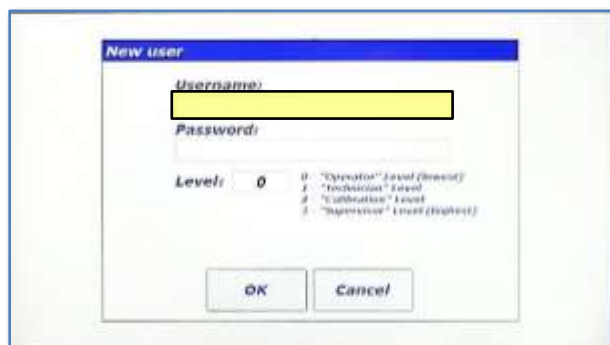
### 13.5.1 Screen Operations – User Management

This details how to create a new Level 2 (Calibration) user login.



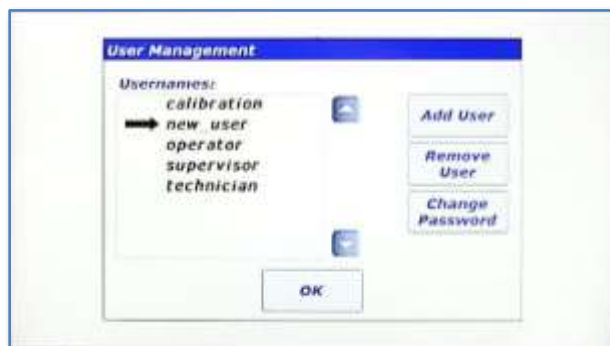
1. Touch the <Edit User/Password> button.

2. The "User Management" dialog appears. Touch the <Add User> button.



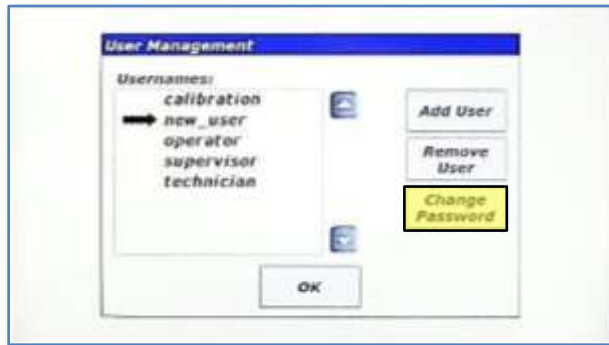
3. The "New User" dialog appears. Touch the "Username:" textbox to enter a new username.

4. Enter the new username and password using the same method as initial login and set the login level number according to the description in the dialog. In this case, a Level 2 (Calibration) login will be created. Touch <OK> to create the new user.



5. The new user has been created. To change the password created in Step 4, touch the <Change Password> button.

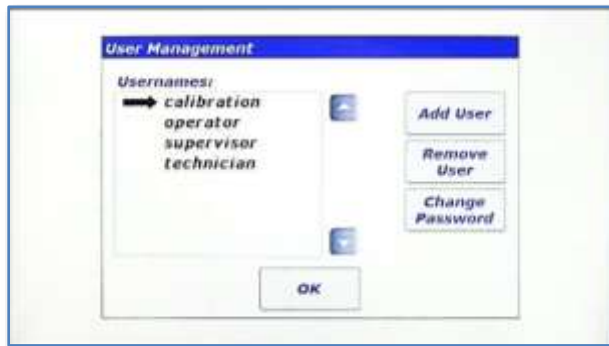
6. The "Change password" dialog will appear. Enter the old password from Step 4, and new password and then touch <OK>.



7. The password has been changed when the "User Management" dialog reappears. Otherwise, a failure dialog will notify the user of failed password change. To delete a user, select it, and touch the <Remove User>.



8. Confirm user delete by touching the <Yes> button in the "User Delete Confirmation" dialog.



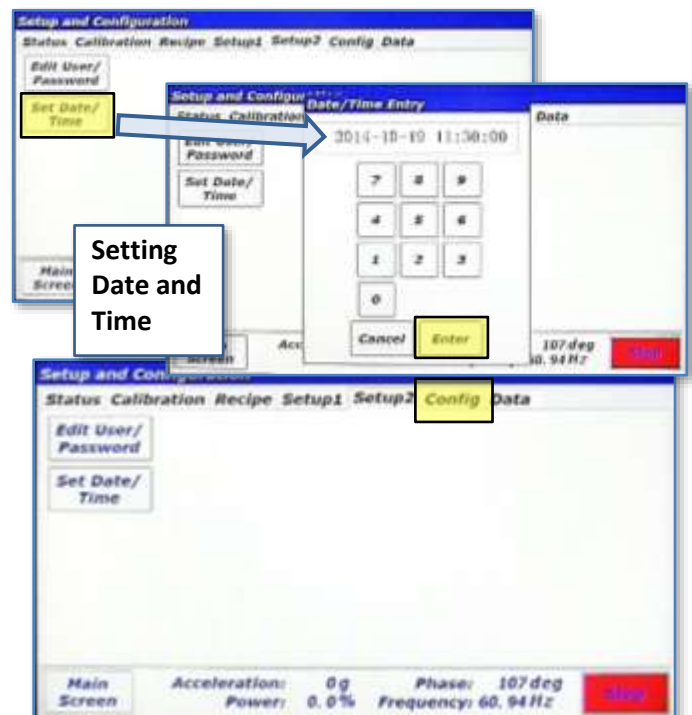
9. The user has been deleted.

### 13.6 Setting Date and Time

Touch <Set Date/Time> on the Setup2 tab to set the system date and time. The entire date and time must be set for the update to work correctly. Date is entered in YYYY-MM-DD format and time is entered in 24 hour format, i.e., HH:MM:SS. Touch <Enter> when complete.

### 13.7 Config Tab

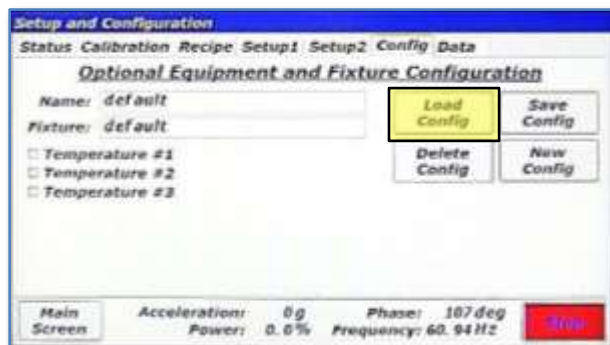
The Config Tab provides a method of enabling/disabling certain features of the machine. Temperature measurement can be deactivated as necessary to avoid alarm conditions that are not applicable to a mix setup. If a temperature sensor is not being used, its alarming functions must be shut off.



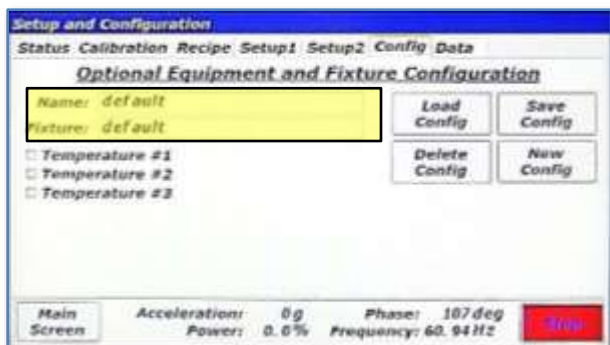
This tab also allows selection of configured fixtures (mix container and mix container holders) that provide necessary operating parameters and limitations of different fixtures.

### 13.7.1 Screen Operations – Edit a Configuration

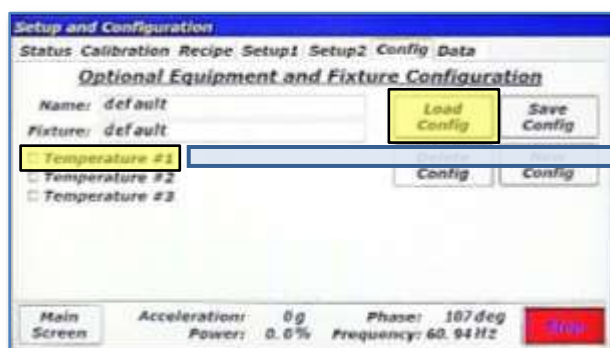
The following walk-through modifies the configuration provided with the LabRAM II called “default.” This sequence assumes that temperature measurement option is equipped, and that temperature #1 was not used initially.



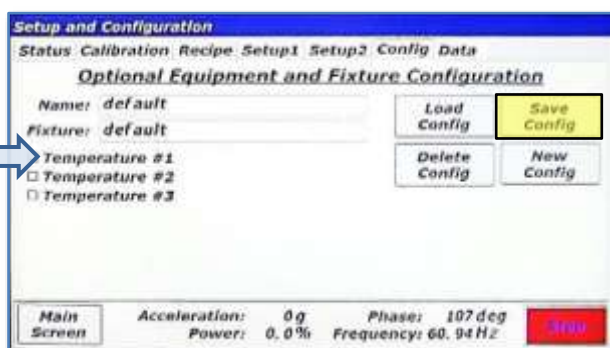
1. In the Config tab, touch the <Load Config> button.



2. In the “Select Configuration” dialog, there is only one configuration defined, “default.” It is already selected. Touch <OK>.



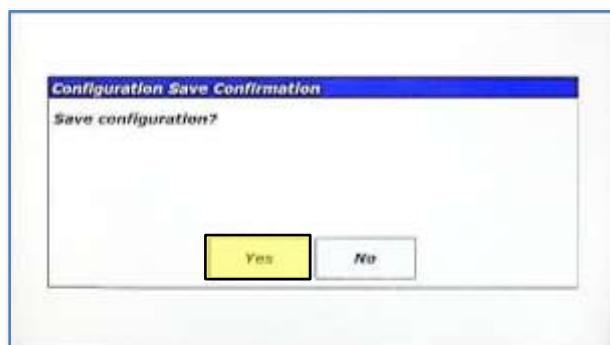
3. The “default” configuration is now loaded. Notice that none of the temperature checkboxes are checked. This means that in its current state, no temperature alarming would be active and all temperatures would read “0.” Turn on temperature #1 by touching it.



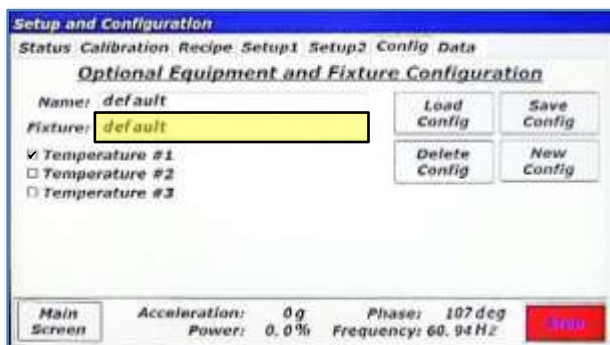
4. Temperature #1 is now checked. Touch the <Save Config> button to commit changes.

NOTE: The default configuration cannot be deleted, but it can be modified.

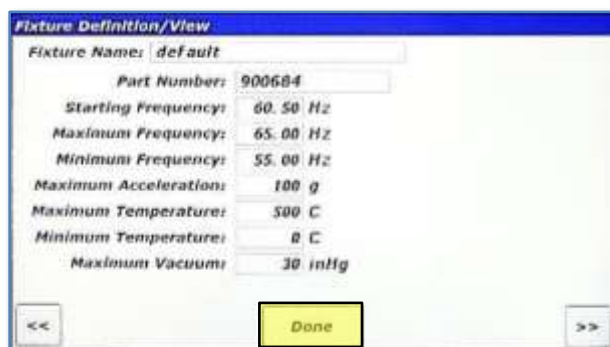




5. Touch <Yes> on the "Configuration Save Confirmation" dialog box.



6. Now that temperature #1 is checked and the default configuration saved, Temperature Channel #1 will be monitored and displayed. Additionally, all fixture and user temperature alarm limits will be activated.  
The name given to the original fixture shipped with the LabRAM II is also referred to as "default." A fixture contains operational parameters associated with a mix container holder and mix container. Fixture files define these parameters. Fixture files are created by Resodyn Acoustic Mixers and cannot be modified, but they are viewable. Touch the textbox next to "Fixture:."

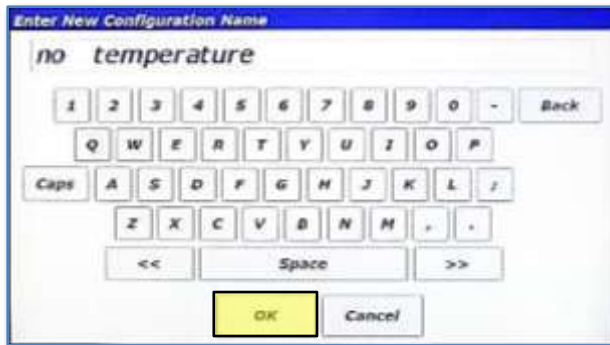


7. The "Fixture Definition/View" screen will appear. The parameters for the selected fixture are displayed. When new fixtures are ordered, fixture files will need to be installed on the mixer using the procedure accompanying the fixture. If the system has more than one fixture defined, the "<<" and ">>" buttons scroll through all of the fixture files. Touch <Done>.



### 13.7.2 Screen Operations – Create a Configuration

The following details the creation of a configuration that could be used without temperature by modifying the default configuration using temperature.



1. Touch the <New Config> button.

2. Enter a name for the configuration and touch <OK>.



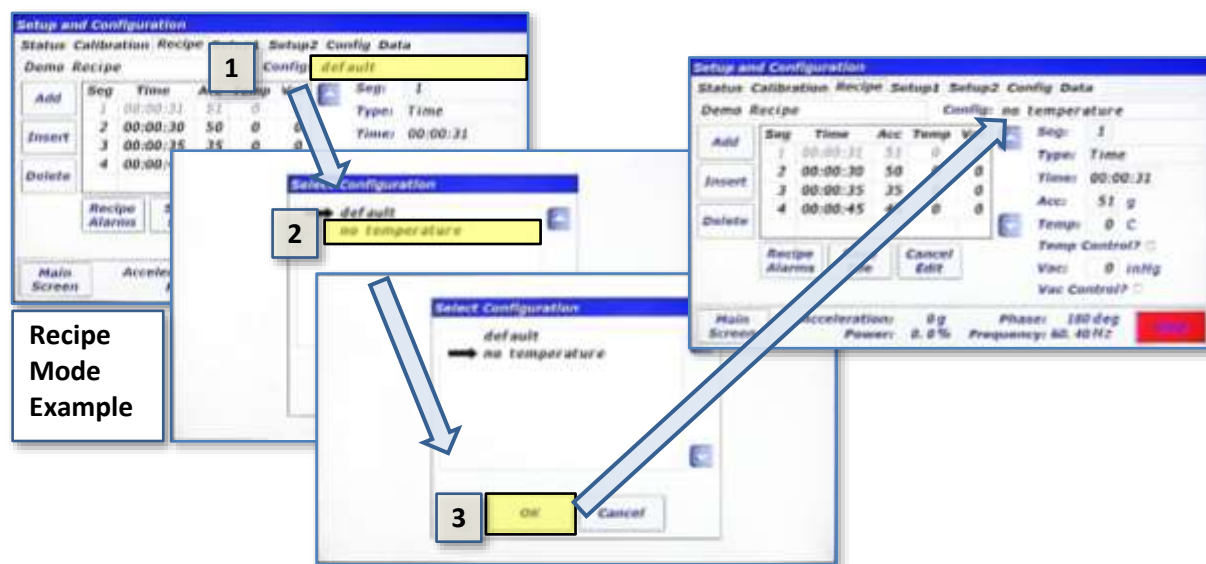
3. Touch <Save Config> to save this configuration that does not use temperature monitoring.

4. Touch <Yes> on the "Configuration Save Confirmation" dialog box.

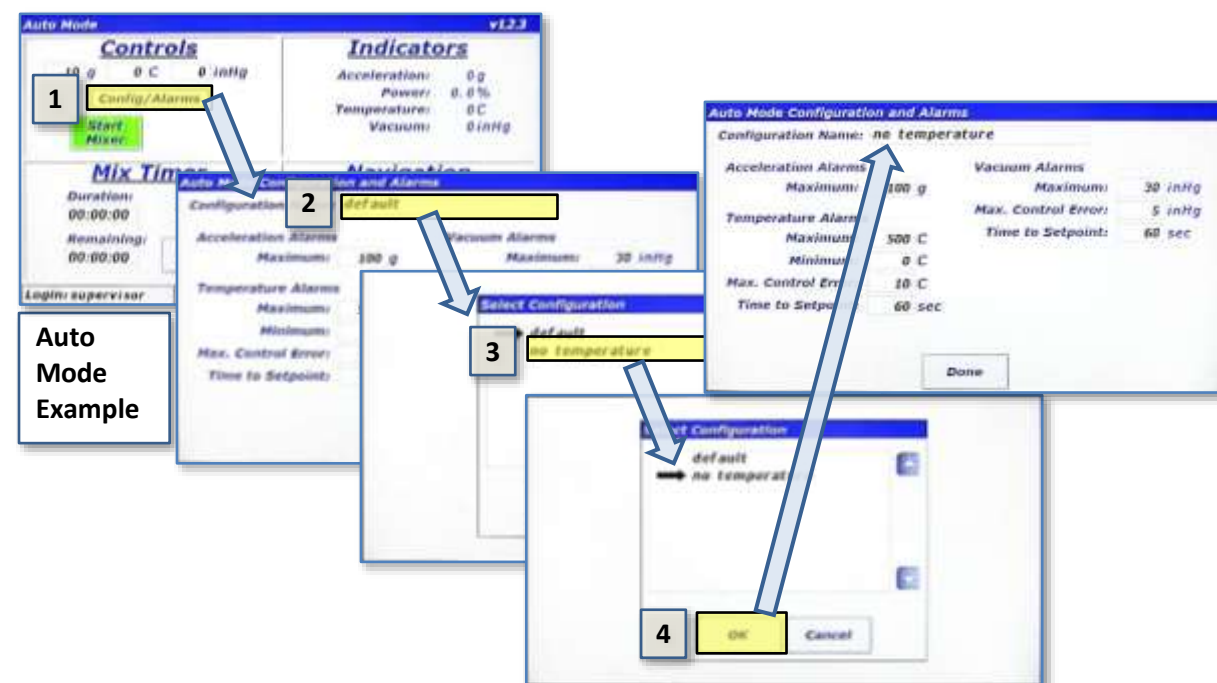
### 13.7.3 Configuration Usage

This section will provide a refresher of how Configurations are used. Configurations are used for both Recipe and Auto Mode.

In Recipe Mode, the Configuration is selected as soon as a new recipe is created or by touching the textbox next to “Config:.” Refer to the following illustration.



In Auto Mode the Configuration is selected by first touching the <Config/Alarms> button in the Controls pane and then selecting it in the “Auto Mode Configuration and Alarms” screen.



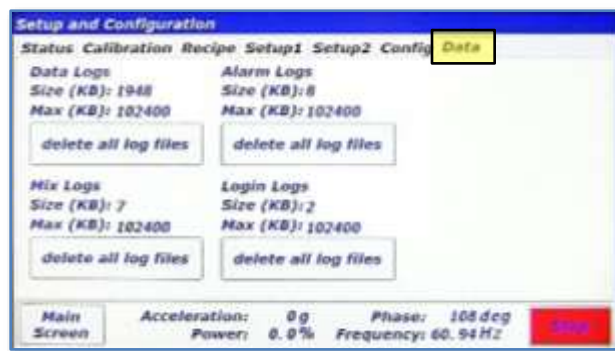
### 13.8 Data Tab

The LabRAM II stores log files for a variety of purposes. The list below summarizes the files that are captured on the LabRAM II.

- **Data Logs:** Measured parameters are captured and written to data log files when the LabRAM II is mixing/accelerating. Measured parameters include acceleration, power, temperatures, voltage/current, and vacuum.
- **Alarms Logs:** Every time an alarm is triggered, cleared, or acknowledged, a message is written to an alarm log file.
- **Mix Logs:** Mix Log files are written to whenever a mix cycle starts or stops. The mix log comment, start/stop time, operational mode, recipe name (if in recipe mode) are all written to the Mix Log files.
- **Login Logs:** Every successful and unsuccessful login attempt is written to a login log file.

It is the user's responsibility to manage the size of the log file directories. The Data Tab provides the means to clean up the log file directories.

Pressing the <delete all log files> button for any of the log file groups will delete all files in that directory. Warning alarms will be triggered if any of the directories exceed 100MB (102400kB), and files will be automatically deleted on a new day if any of the directories exceed 200MB.



All log files can be synchronized with a computer using the RAM Tool application developed by Resodyn Acoustic Mixers. Contact Resodyn Acoustic Mixers to obtain a copy at +1-406-497-5333.

## 14 Care and Maintenance

Resodyn Acoustic Mixers are assembled at our corporate facilities in Butte, Montana, USA under a strict quality manual and an overriding corporate culture of producing world-class equipment that is built to last.

In order to help ensure long life and effective maintenance, it is important to participate in general cleaning and maintenance as indicated below.

### 14.1 Preventive Maintenance

The bellows can prematurely wear and become damaged if loose materials are allowed to remain in the resonator area. Cleaning of the upper resonator and bellows ensures a long life of the bellows. If necessary, use a small hand vacuum to clear debris from the bellows area, using care sure not to create a vacuum between the device and the bellows material. Use a soft, non-abrasive cloth and water to complete cleaning the bellows.

### 14.2 Cleaning Procedures

The molded plastic Acoustic Enclosure should be cleaned with a soft, non-abrasive cloth and water with slight additives of neutral washing agents (pH 5 – 8). Greasy or oily substances may be removed by rubbing with a cloth wetted with isopropyl alcohol (IPA) or white spirit free of aromatic compounds. Rinse with damp, cold water after every cleaning process to remove any remnants of the cleaning process.

Do not use solvents or similar containing esters, ketones, aromatics, or halogenated hydrocarbons. Do not use strong acids alkaline detergents or abrasives. Rinse with cold water after every cleaning process.

### 14.3 Accelerometer Calibration

The LabRAM II acceleration should be calibrated once a year or per the end users specified preventative maintenance schedule or when the accelerometer is replaced.

The calibration kit can be purchased or rented from Resodyn Acoustic Mixers.

### 14.4 Maintenance

The LabRAM II is designed with few serviceable replaceable parts.

#### 14.4.1 Major Repairs

All repairs inside the enclosure should be diagnosed and repaired by Resodyn Acoustic Mixers trained repair personnel only.



Do NOT attempt to remove the acoustic enclosure. Electrical shock hazards exist that can cause personal injury.

All components not listed on the replaceable wear parts or spare parts list should also be replaced by Resodyn Acoustic Mixers trained repair personnel only.

### 14.4.2 Recommended Maintenance Schedule

The recommended preventative maintenance intervals for the LabRAM II only involve the bellows (see Section 14.5.2). The bellows are to be visually inspected weekly and replaced as necessary. Recommended on-hand spare parts and their quantities are listed in Table 14-1.

**Table 14-1. Recommended On- Hand Spare Parts List.**

Description	Part Number	Quantity
Bellows Replacement Kit	903350	1
*Fuses, 10A, Time Lag (For 100-120 VAC)	002618	2
*Fuses, 8A, Time Lag (For 200-240 VAC)	002942	2

\*Note – only select one fuse type based on VAC of Machine

### 14.5 Replacement of Serviceable Parts

Common user-serviceable replacement parts are identified below. These parts are the fuses, bellows, and accelerometer, as listed in Table 14-2. The bellows estimated life is greater than 2000 hours and the accelerometer is greater than 2,000 hours.

**Table 14-2. Customer Replaceable Parts List.**

Description	Part #	Qty
<b>For Accelerometer Replacement Parts Select ONLY ONE of the following</b>		
Accelerometer Integrated Cable Assembly for Serial Numbers <b>greater than</b> R7000000225 (LabRAM II) or R2000000233 (PharmaRAM II)	902066	1
Accelerometer Integrated Cable Assembly for Serial Numbers <b>shown below or less than</b> R7000000225 (LabRAM II) or R2000000233 (PharmaRAM II)	902067	1
Bellows Replacement Kit (for all *RAM II models)	903350	1
*Fuses, 10A, Time Lag (For 100-120 VAC)	002618	2
*Fuses, 8A, Time Lag (For 200-240 VAC)	002942	2

\*Note – only select one fuse type based on VAC of Machine

#### 14.5.1 Fuse Replacement

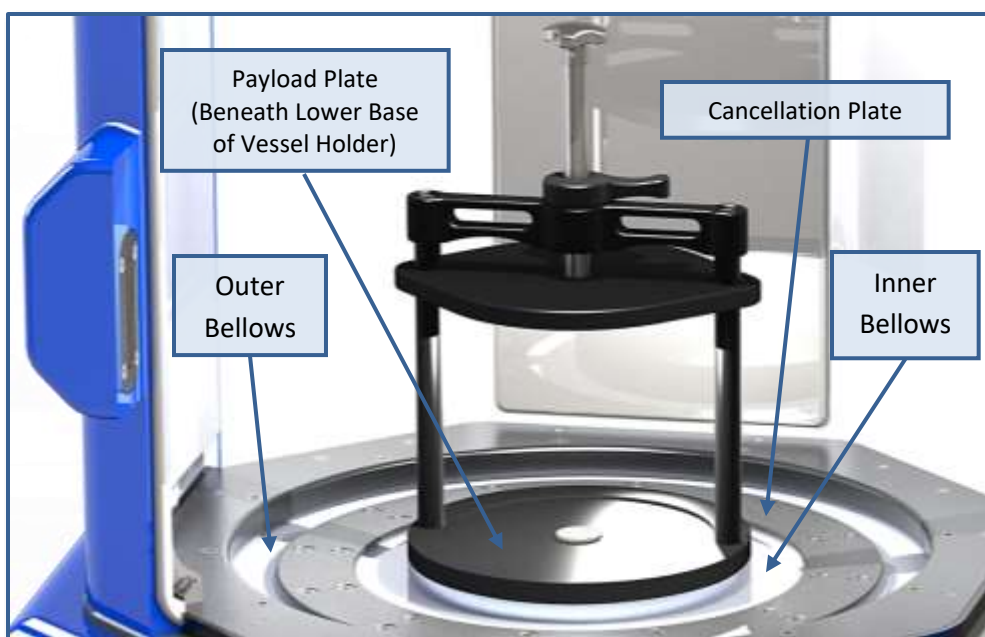
The fuse should only be replaced when the machine does not power up, but power is being delivered to the machine. If this occurs, call Resodyn Acoustic Mixers for further instructions, +1-406-497-5333.

Fuse access is located on the lower left area of the back of the LabRAM II, shown in Section 6.6 Electrical Connections. Turn the fuse cap counterclockwise to remove fuse.

Insert new fuse into cap and turn cap clockwise until secure. If the LabRAM does not power up, call Resodyn Mixers service at +1-406-497-5333.

### 14.5.2 Bellows Replacement

The LabRAM II is equipped with a sealed inner enclosure that houses the Resonator. The interior of the machine is sealed with inner and outer bellows between the moving plates and the enclosure. These bellows are designed for operational life greater than 2000 hours. Should replacement be required, instructions for the bellows are provided with the replacement parts.



### 14.5.3 Accelerometer Replacement

The LabRAM II is equipped with an accelerometer that is mounted to the underside of the Payload Plate. The accelerometer is designed for an operational life greater than 2,000 hours. Should replacement be required, instructions for the accelerometer are provided with the replacement part. When an accelerometer is replaced, the LabRAM II must be calibrated or damage to the machine may occur. Calibration Kits are available through Resodyn Acoustic Mixers.



## 15 Troubleshooting and Service

The LabRAM II system should only be operated when it is in good working condition. If the system shows any signs of visible damage or fails to operate as outlined in this manual, the system should not be operated. For operational errors and troubleshooting, refer to the Troubleshooting Table below.

Some solutions to resolve common operational events are shown in Table 15-1. Troubleshooting Table. Review the chart and attempt the solution. If the problem persists, contact your Resodyn Acoustic Mixers customer service representative at +1-406-497-5333.

**Table 15-1. Troubleshooting Table.**

Description of Problem	Potential Problem	Solution
<b>Mixer will not power up</b>	Power cord unplugged	Ensure that the power cord is plugged into the mixer and a wall outlet.
	Main fuses blown	Contact Resodyn Acoustic Mixers for replacement fuses.
	Power switch off	Ensure that the power switch (located on the back of the machine above power cord socket) is in the on position, "I."
<b>Door Opened During Operation</b>	Door opened before mixer stopped	Door was opened when the mixer was running, which stopped the machine. Do not open the door while the mixer screen shows "Running" in the status bar.
<b>Broken Accelerometer</b>	Accelerometer cable or accelerometer has failed	Accelerometer and cable assembly must be replaced. Contact Resodyn Acoustic Mixers.
<b>Amplifier Over Temperature</b>	Mixer amplifier is too hot	Ensure adequate ventilation on the backside of the mixer.
		Ensure room temperature is within specified range.
<b>Enclosure Over Temperature</b>	Mixer enclosure is too hot	Ensure adequate ventilation on the backside of the mixer, at least 1" – 2".
		Ensure room temperature is within specified range.
<b>Amplifier Error</b>	Vessel overloaded	Remove mix material until it is within the maximum specified load limits, i.e., no more than 1000 grams.
	Shorted wire	Contact Resodyn Acoustic Mixers.
	Broken wire	Contact Resodyn Acoustic Mixers.

Description of Problem	Potential Problem	Solution
<b>Amplifier Over Current</b>	Vessel overloaded	Remove mix material until it is within the maximum specified load limits.
	Incorrect fixture file	Ensure that the correct fixture file is being used for the fixture on the LabRAM II.
<b>Over Acceleration (g)</b>	Mixer exceeded maximum acceleration	Contact Resodyn Acoustic Mixers.
<b>HMI Comms Error</b>	The HMI has ceased to communicate with the main controller	Contact Resodyn Acoustic Mixers.
<b>Vacuum Module Comms Failure</b>	Communication Cable Unplugged	Ensure that the communication cable between the LabRAM II and the vacuum module are connected.
	Vacuum module turned off	Ensure that the vacuum module is plugged in and turned on.
<b>Fixture Limit, High Accel. or User Limit, High Accel.</b>	Accelerometer cable or accelerometer has failed	Accelerometer and cable assembly must be replaced.
	Incorrect user limit	Verify user limits are correct.
<b>Fixture Limit, High Temp. or Fixture Limit, Low Temp. or User Limit, High Temp. or User Limit, Low Temp.</b>	RTD not plugged in	Verify the RTD is plugged in, or if not in use, ensure Configuration has Temperature #1 unchecked.
	Broken RTD or RTD cable	Replace RTD and accelerating portion of RTD cable.
	Bad RTD calibration	Verify RTD calibration.
	Incorrect user limit	Verify user limits are correct.
<b>Fixture Limit, High Vac. or User Limit, High Vac.</b>	Bad vacuum calibration	Verify vacuum calibration.
	Incorrect user limit	Verify user limits are correct.
<b>User Limit, Vac. Ctl. Error or User Limit, Vac. Ctl. Time</b>	Vacuum leak	Check the system for a vacuum leak
	Disconnected vacuum line	Ensure all vacuum lines are connected correctly
<b>Over Accel. at Low Frequ.</b>	Vessel overloaded	Remove mix material until it is within the maximum specified load limits or reduce acceleration.
	Incorrect fixture file	Ensure that the correct fixture file is being used for the fixture on the LabRAM II.

