Resodyn
ACOUSTIC MIXERS

Automatic Vacuum System Installation and Users' Manual

Resodyn Acoustic Mixers • 130 N. Main Street • Butte, MT 59701 • 406-497-5333 • www.resodynmixers.com

Notes & Information

Date of Purchase

Date of Installation

Pilot Testing

Production Start

Maintenance Record

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1 Introduction

The Resodyn Acoustic Mixers Automatic Vacuum Control Module (Automatic Vacuum System) is a standalone vacuum and control system that can be connected to various RAM platforms to control and monitor the vacuum inside the mixing vessel. The vacuum system is supplied with 0.25” (6.35 mm) OD vacuum lines and two 10µm filters.

Key Features:

- Consistent and repeatable vacuum
- In-line vacuum filters keep pump clean, reducing maintenance
- Automatic, digital control
- Manual vacuum control allows recipe development
- Oil-less vacuum pump results in clean operation and very low maintenance

The Automatic Vacuum System provides the following processing advantages for RAM:

- Virtually eliminates mixing air entrainment
- Automated control enables hands-free operation
- Programmable control when coupled with a compatible RAM device
- Sets multiple mixing and vacuum parameters
- Easy to install and operate

2 Definitions

Acceleration:	A change in velocity with respect to time that is expressed in "*g*" and used as a unit of input in RAM technology (e.g., 35 *g* of acceleration was used for 3 minutes to complete the mix). Different mixing media process at different accelerations, based on the material and the expected results.
Headspace:	The volume of compressible air, gas, or void space that is not occupied, above the mixing media in the vessel.
inHg:	Units of vacuum used on older Manual Vacuum Machines (inches of mercury) pulled below the ambient pressure. (29.92 inHg is 1 atm). This measure can become variable from one altitude to another.
Millibar (mbar)	One of the units of measure and input used when drawing pressure with the Resodyn Vacuum System. This method is based on an absolute scale and displays the same measure regardless of altitude. (This option is selected at purchase.).
Mixing Media:	Defined as the material inside a LabRAM I or LabRAM II mixing vessel on which vacuum can be drawn to improve mixing results.
Mixing Power:	The amount of power being delivered by the LabRAM system to perform mixing and can be affected by the use of vacuum.
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. Mixing regimes are affected when applying vacuum during processing.
RAM:	ResonantAcoustic® Mixing or ResonantAcoustic® Mixer.
Resonance:	The frequency (nominally 60 Hz) at which the LabRAM I and LabRAM II mechanical system operates in the most efficient and powerful manner.
torr:	One of the units of measure and input used when drawing pressure with the Resodyn Vacuum System. This method is based on an absolute scale and displays the same measure regardless of altitude. (This option is selected at purchase.)
Vacuum:	Internal vessel pressure that is less than atmospheric pressure.

3 Safety

Every effort has been made to assure that the Automatic Vacuum System 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 Automatic Vacuum System should be operated only within the limits outlined in the system specifications. The following classification defines acceptable use for the Automatic Vacuum System.

- Indoor use only.
- Main supply voltage fluctuations are not to exceed ±10% of the nominal supply voltage.
- This equipment is suitable for continuous operation.

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.
	The high voltage symbol indicates the possibility of electrical shock. This symbol means turn off the electrical supply before removing any cover with the symbol attached. Failure to do so may cause exposure to electrical shock hazard. Access to electrical components should only be carried out by a licensed electrician or qualified electrical engineer. **NEVER** attempt to modify any electrical components or circuits as this may affect the safe operation of the machine.
	Electrostatic Discharge (ESD) sensitive components.

3.4 Component Replacement

The system is designed with components that are specifically rated for use with the Automatic Vacuum System 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.

⚠	Do not replace components with non-factory components. Non-factory replacement parts may not meet the Automatic Vacuum System machine requirements, which will compromise the safety of the operating personnel and may cause damage to the equipment.

3.5 Customer Responsibility

- Ensure that all operators have received the correct training to operate the vacuum module and mixer.
- Ensure that all operators have read and understood this manual.
- Ensure that a qualified electrician carries out any electrical maintenance.
- Allow only Resodyn Acoustic Mixers Service Engineers to repair an Automatic Vacuum System or return to Resodyn after receiving a Return Authorization Number from a Resodyn sales representative.

3.6 Handling/Lifting

Upon receipt of the Automatic Vacuum System, do not unpack or remove any of the packaging materials until positioned as close to the installation location as possible. When in position, carefully follow the instructions in the section below.

To prevent additional charges, retain all packaging should machine movement or unexpected warranty service be necessary. Original packaging will be required for service shipment during the warranty period and is highly recommended for any shipment performed during the entire life of the product.

- DO NOT use lifting accessories around or attached to parts that may be damaged or fail during lifting.
- DO NOT use lifting accessories around sharp edges that may damage the item and cause the machine to fall.
- DO exercise caution when lifting and moving the equipment to avoid striking other objects.

The Automatic Vacuum System weighs 35 lbs. The Automatic Vacuum System was packaged in a cardboard box with padding around the unit. The Automatic Vacuum System is light enough to be carried by a single individual but can be carried by multiple people if required.

3.7 Mounting

The Automatic Vacuum System should be installed on a stable rigid surface capable of supporting the weight of the module. The Automatic Vacuum System should be mounted on top of a table by the (4) four support feet shown below.

3.8 Guards and Safety Devices

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

3.9 Technical Support for Mixer Operation:

The Automatic Vacuum 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 section.

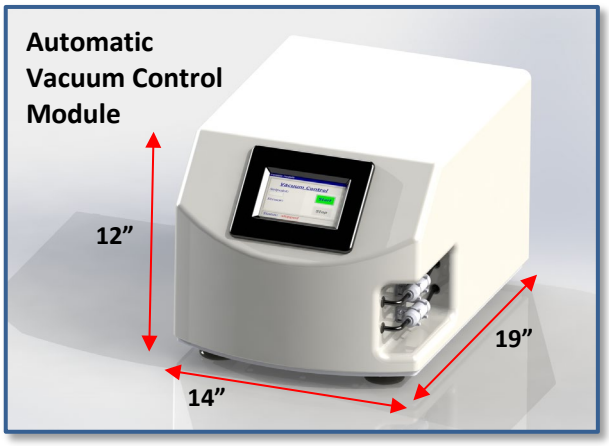
If necessary, contact your Resodyn Acoustic Mixers customer service representative for questions or the contacts provided below for additional technical support.

Technical Support for Mixer Operation:

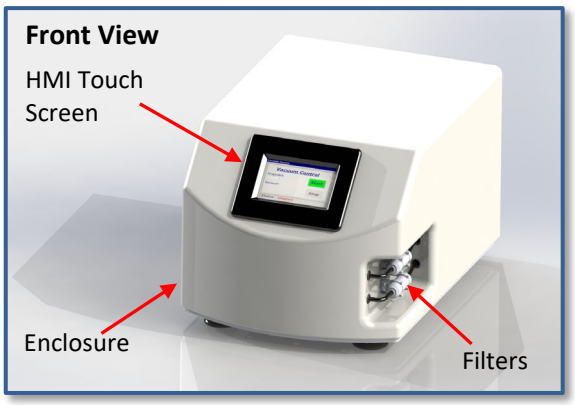
Phone: (406) 497-5333 Fax: (406) 497-5206 e-mail: service@resodynmixers.com	Resodyn Acoustic Mixers 130 North Main, Suite 630 Butte, Montana 59701

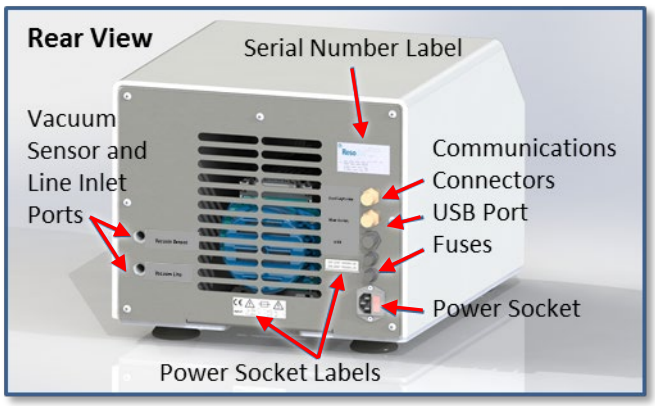
4 System Overview

The Automatic Vacuum System is specifically designed and manufactured for pulling and controlling the vacuum in the mixing container being processed with LabRAM I, LabRAM II or PharmaRAM II device. The Automatic Vacuum System external features include the Enclosure, Touch Screen Human Machine Interface (HMI), Electrical Connectors and Fuses, Mini USB Port, Vacuum Filters, Power Entry Module, and Communication (Comm) Connectors.



4.1 Enclosure





The enclosure protects components and user from any electrical shock while also reducing the sound emitted. The vacuum lines are fed from the back of the enclosure (inlet ports) to the filters. This allows the vacuum lines to be kept away from the working area.

4.2 Touch Screen Human Machine Interface (HMI)

The touch screen HMI is the primary user interface on the Automatic Vacuum System. The Automatic Vacuum System is digitally controlled through the HMI located on the front of the device. All data entry and operations are provided through keypads and buttons on the touch screen. The touch screen and operating system is described in more detail in Section 8 HMI – Overview.

4.3 Vacuum Lines and Filters

The Automatic Vacuum System is equiped with 0.25” (6.35 mm) vacuum line. The system has 10 µm inline filters for the vacuum and vacuum sensor lines. The vacuum line pulls a vacuum in the mixing vessel, while the sensor line transmitts a signal to a sensor for monitoring the vacuum in the mixing vessel. This provides a method to monitor the *true* vacuum in the mixing vessel.

5 System Specifications

The Automatic Vacuum System is equipped with the following external connectors:

- Power connection
- Mini USB
- Two (2) Fuses
- Filters with 0.25” OD Vacuum Tube Connectors
- Communication (Comm.) Connections

See Section 4, Page 9 for detailed illustrations

The Automatic Vacuum System overall system specifications are provided in Table 5-1.

Table 5-1 Automatic Vacuum Control Module System Specifications

Dimensions (Width x Depth x Height)	14” x 19” x 12” (36cm x 49cm x 31cm)
Weight	35lbs (15kg)
Vacuum	Down to 10 torr (13.3 mbar)
Electrical @50/60 Hz, CE Certified	100-120VAC / 200-240VAC
Fuses @ 50/60 Hz	3A @ 100-120VAC / 2A @ 200-240VAC
Standard Filtration Size	0.0004” (10µm)

5.1 Voltage Requirements

The Automatic Vacuum System is designed to utilize single phase 100-120 VAC or 200-240 VAC 50Hz/60Hz supply voltages for use worldwide. The systems are configured with the specified fuses 3A for 100-120 VAC or 2A for 200-240 VAC 50Hz/60Hz supplied by the factory.

5.2 Power Consumption

The Automatic Vacuum System consumes less than 150 Watts during normal operation.

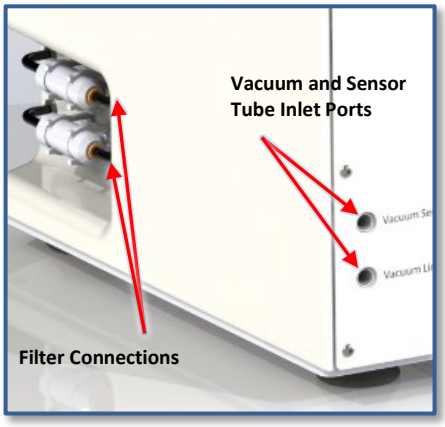
6 Installation and Support

Unpacking, Lifting, and Placing the Automatic Vacuum System

Please see Section 3.6 Handling and Lifting and 3.7 Mounting on Page 7 and 8 for important information.

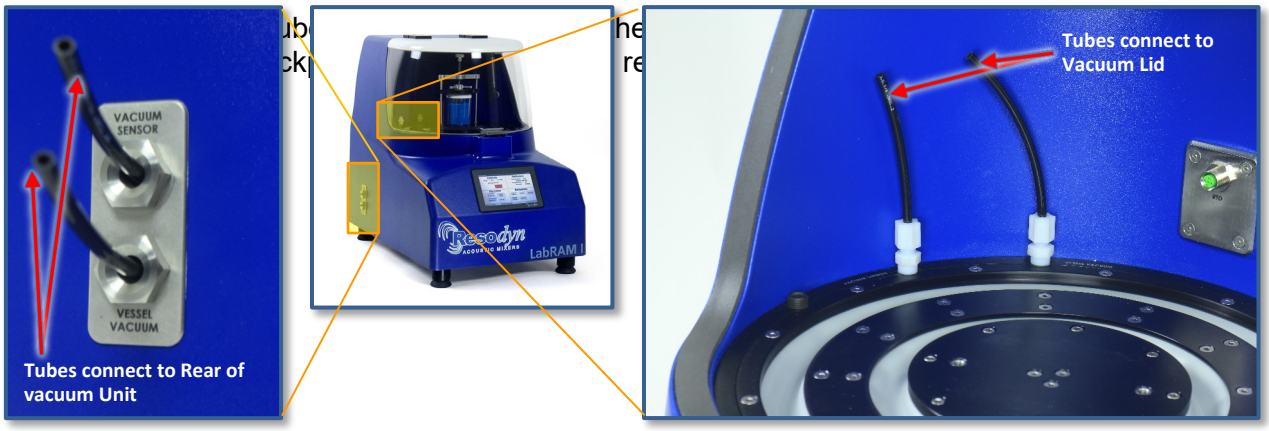
6.1 Connecting Vacuum System to LabRAM I and LabRAM II

The Automatic Vacuum System is connected to LabRAM machines via *two* supplied 0.25" (6.35 mm) tube connectors. Insert the end of *one* of the tubes into the Vacuum or Sensor port on the back of the machine as shown to the right until the tube exits the System housing right before the filter cartridge connection. Push the tube end into the filter connectors until the tube is securely seated in the cartridge quick connector. Check to make sure that the connectionis secure.



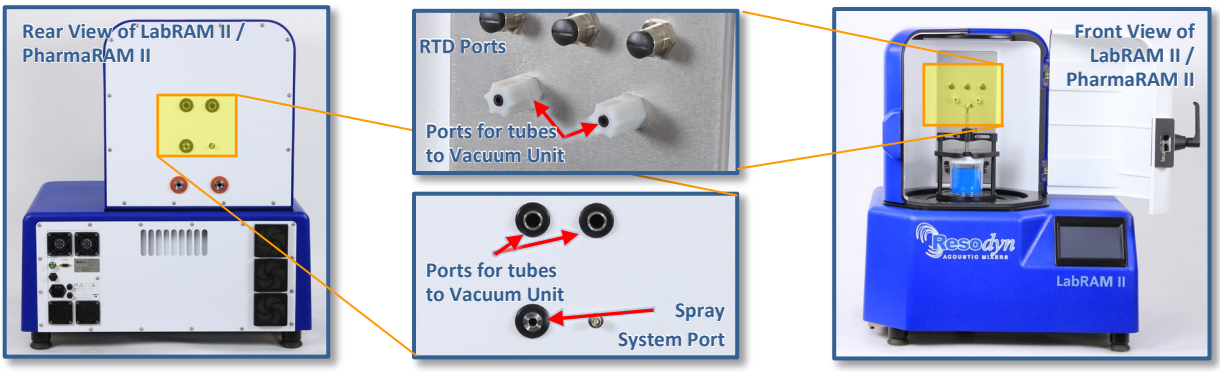
Before routing the other end of each tube through the vacuum ports on the left side (viewed from the front) of the LabRAM I as shown, or on the backpanel of the LabRAM II as shown, estimate the length of the tube needed to connect the two machines. Cut the tube as necessary.

If Space allows, the tube can be left the full length in case of later reconfiguration. Loosen the compression fitting nut (see the next page) to allow the vacuum tube to pass through the machine housing and fittings.



LabRAM I Vacuum and Sense Line Tube locations

Similarly, route the tubes through the back of the manual Vacuum unit housing. Then route the tubes through the backpanel of the LabRAM II, recalling to loosen the compression fitting nut.

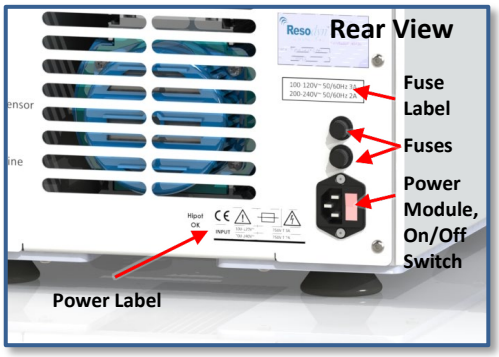


LabRAM II Vacuum and Sense Line Tube locations

Compression Fitting Components

Each vacuum tube passes through the compression fitting in the LabRAM machines. The fitting is composed of 3 pieces: the compression nut, a conically shaped ferrule and a second ferrule with a flattened end. These components are configured as shown to the left. If incorrectly configured, the fitting on the tube will not function properly making the tubes insecure. All fitting related tubes or hoses should be configured to allow for movement of the mixing vessel. No sharp turns, twists, or kinks should be allowed to remain in any tubes or hoses.

6.2 *Electrical Connections*



Electrical power is provided to the Manual Vacuum System through a power cable connected to the power entry module. 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:

- 3 Amps for 100-120 VAC
- 2 Amps for 200-240 VA

6.3 *USB Connection*

The USB mini connection on the back of the Automatic Vacuum System machine is used for firmware upgrades. To update the firmware a computer with RAMTools software must be used. The RAMTools software Installation and User Guide should be consulted on how to update the machine firmware.

6.4 *Mixer Communication Connection*

The Automatic Vacuum System may be controlled remotely by a compatible RAM platform. The communication between the remote panel and the Automatic Vacuum System machine is over a communication cable connected by a m12 connectors on the Automatic Vacuum System and the compatible RAM platform. A communication cable has been provided with the system for connection between a compatible RAM platform and the Automatic Vacuum System machine.

6.5 Auxiliary Comm. Connection

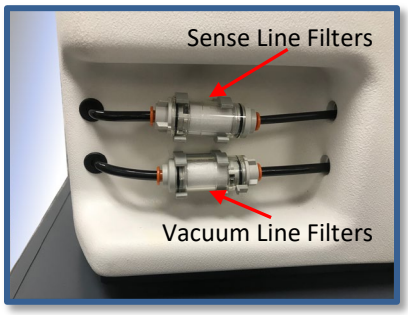
The Auxiliary Comm. Connection is currently not used.

6.6 Filter Cartridge Replacement

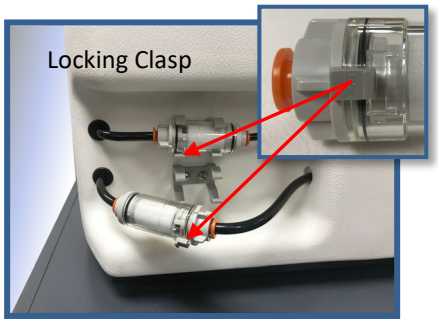
Frequency of use will determine the life of the filters in the Vacuum System filter cartridges. Inspect frequently for material, debris, or other conditions that can affect the filters' effectiveness. Follow the steps below to change filters

Two filter cartridges are located on the lower right side of the machine when facing the HMI control panel. The upper cartridge is the "sense" line and the lower cartridge is the "vacuum" line.

1. Grasp the filter cartridge between the grey holding clips and pull out horizontally to access the cartridge filters. NOTE: When using entire cartridges (902712, discard the old cartridge appropriately and replace it with a new one. Continue to use the vacuum system.



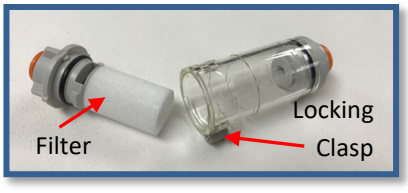
2. If replacing the filter element (002965) only, remove the vacuum tubes from either end by compressing the quick release fittings toward the cartridge body. Note the orientation of the arrow molded into the body of the cartridge in relation to the front and back of the machine. (Sense line – points to rear / Vacuum line – points to front.)



3. Compress the locking clasp toward the opposite end of the cartridge and rotate the cap counterclockwise to open and release the cap from the cartridge.

4. Remove and discard the old filter appropriately and replace with a new filter element (PN 002965).

5. Reverse the steps above, making sure to re-orient the cartridge in the proper direction. The body of the cartridge is marked with an arrow as well. (Sense line – points to rear / Vacuum line – points to front.)



6. Repeat with the other cartridge. Inspect frequently for replacement.

7 Quick Start

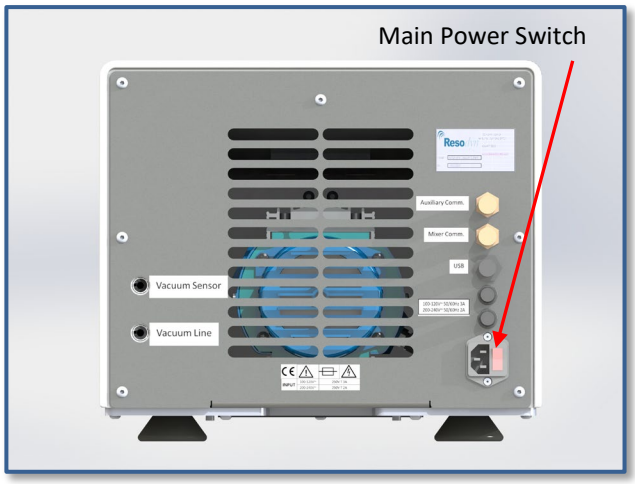
This section defines the minimum steps required to operate the Automatic Vacuum System. All instructions and guidelines in Section 6 must be completed before attempting a Quick Start or operation of the Automatic Vacuum System.

7.1 Setup

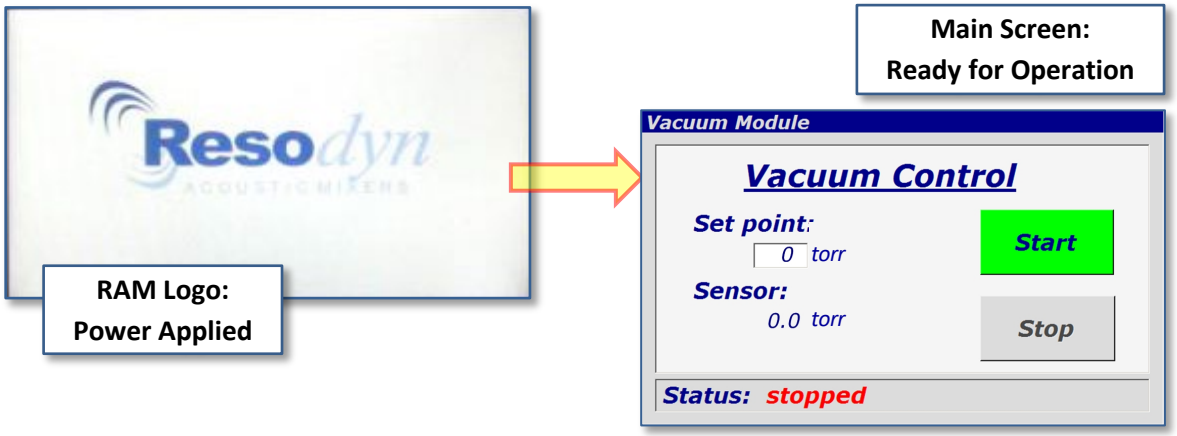
To first set up the Automatic Vacuum System, the unit should be installed close to a compatible RAM mixer. The vacuum sensor and vacuum lines should be connected to the RAM Vacuum Lid of a mixing vessel. The mixing vessel and vacuum lid should be installed in the compatible RAM mixer.

7.2 Power-Up

Toggle the Main Power Switch (located on the Power Entry Module) to the on, or "I," position to enable power to the Automatic Vacuum System control box. Ensure the switch is on the "I" position.



Resodyn Acoustic Mixers screen is displayed momentarily on the HMI screen. When ready for operation, the second screen shown below to the lower right will be displayed. This screen, shown after the boot-up is complete, displays "Vacuum Module" in the title bar, and will be referred to as the "Main Screen" throughout this Manual.



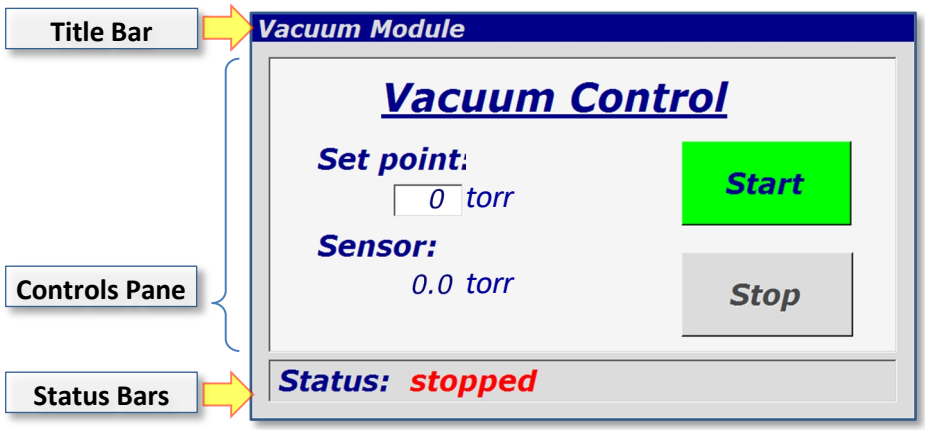
8 HMI (Human Machine Interface) – Overview

The HMI is the primary user interface on the Automatic Vacuum System. The Automatic Vacuum System is operated completely digitally, 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 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 Automatic Vacuum System. 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 the vacuum system, enters set points (vacuum pressure) and also displays the value of the measured vacuum.
- Status Bar – Displays current username, machine status message, alarm status, and date/time.

8.2 Alarming

There is no monitoring or alarming on the Automatic Vacuum System when operating independently. However, when connected with a compatible RAM platform, such as the LabRAM II, control and communication alarms are monitored by the compatible RAM platform, described below in Section 11.

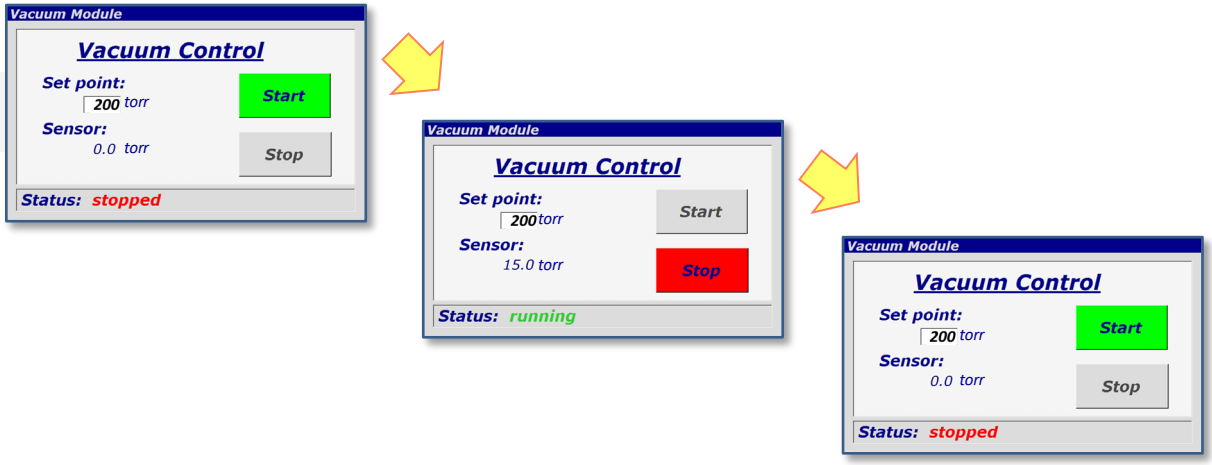
9 HMI Operation – Automatic Vacuum Control Module

The Automatic Vacuum System is operated by the on-board HMI or by the HMI of a compatible RAM system the Automatic Vacuum System is connected through. When the Automatic Vacuum System is operated independently, the vacuum is controlled by setting a desired vacuum set point in “torr.”

The vacuum set point is set by first pressing the highlighted button of the Set point box. This will bring up the “Numeric Keyboard” screen, shown on the right, where the vacuum set point in torr as the input. Values from 0 - 762 torr may be input and the “OK” button pressed to implement the vacuum set point.

In the example below, 200 torr is input. The vacuum pump does not pull vacuum until the “Start” button is pressed.

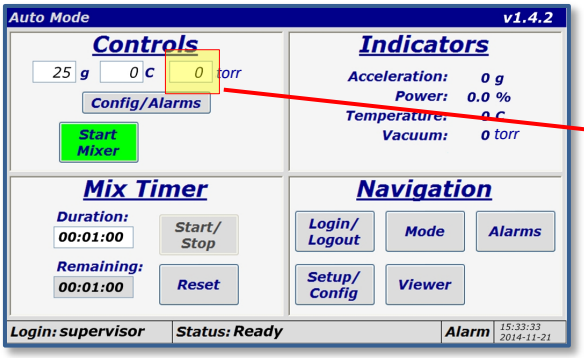
Once the start button is pressed, the Status changes from “stopped” to “running.” The closed loop control adjusts the vacuum pressure to the Set point. The Sensor readout displays the actual vacuum to the operator on the HMI screen. When the red “Stop” button is pressed, the vacuum is vented and the internal pressure in the vessel is returned to ambient pressure.



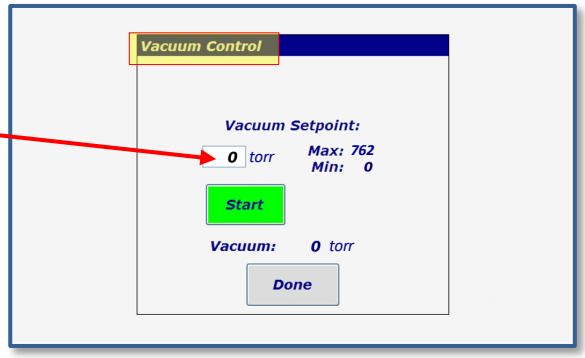
10 HMI Operation – Remote

The Automatic Vacuum System may be integrally operated by a compatible RAM platform machine such as a LabRAM II. The following images illustrate control of the Automatic Vacuum System with a LabRAM II system.

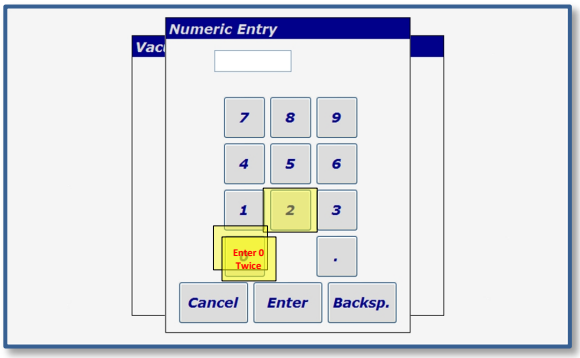
The Automatic Vacuum System can be controlled either in “Auto” mode or in the “Recipe” mode using a stored, pre-programmed recipe. In “Auto” mode, the vacuum is controlled under the Controls Panel. The set point and the pump ON and OFF are determined and set by the user on the HMI. Adjust the vacuum by pressing the vacuum control set point button in the controls panel.



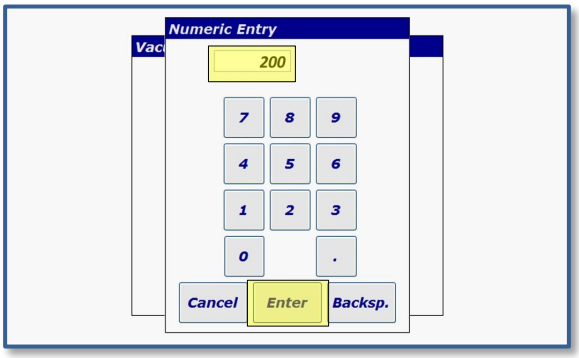
To enter a vacuum set point, press the “*torr*” box to highlight it and activate the Vacuum Controls window.



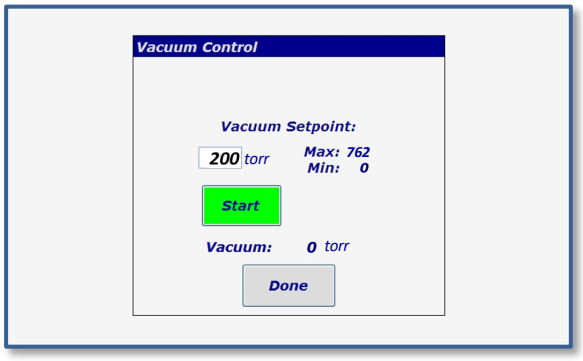
In the Vacuum Control window, the vacuum set point can be adjusted and the vacuum pump can be turned ON or OFF by pressing the Start or Stop buttons.



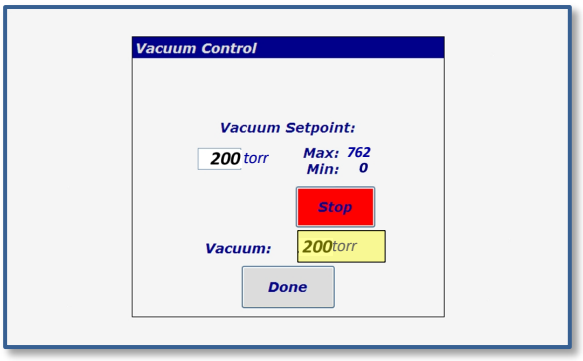
After pressing Start, the Numeric Entry Keyboard appears to enter the desired vacuum level.



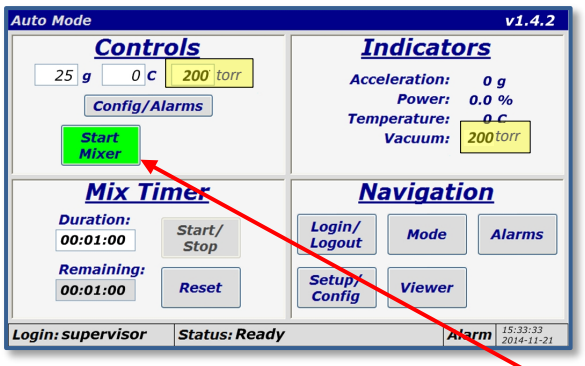
In this example, 200 is entered on the Numeric entry for the vacuum level. Press Enter.



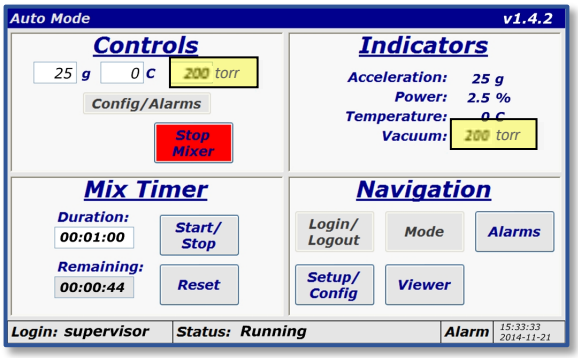
The Vacuum Control window is now populated with the desired setting. Note that the current vacuum applied is zero because the vacuum system has not been started. Press Start to begin vacuum operation.



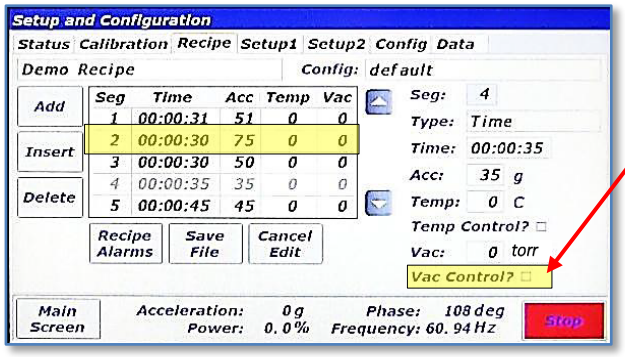
When operating, the Vacuum Control window will indicate the vacuum set point, as well as the real-time vacuum being applied. Pressing the Done button completes the Vacuum set point operation. The set point can also be changed at this point by re-entering the desired value and again pressing the Done button.



After completing the vacuum set point operation, the Auto Mode window appears to allow the mixer to be Started. Note that Controls window shows 200 as the vacuum set point and the Indicator window shows 200 as the real-time vacuum applied.



Recipe mode can be used to fully control vacuum operation during each recipe segment similar to the process described here, without needing to adjust the vacuum set point for each separate Recipe segment. The set point can be changed at this point by simply re-entering the desired value.



When developing Recipes (refer to the LabRAM II Manual Recipe Section for more detail), each recipe segment may be assigned a specific vacuum value from 0 to 30 torr. Note that the "Vac Control?" checkbox must be selected for each segment requiring a vacuum setting. A segment not requiring a setting may either be designated as "0 torr" or by leaving the "Vac Control?" box unselected.

11 HMI Operation – Alarming

The Automatic Vacuum System does not alarm when run independently. However, when connected to a compatible RAM platform, such as the LabRAM II, the LabRAM II monitors the communication and vacuum and displays errors for user intervention or attention.

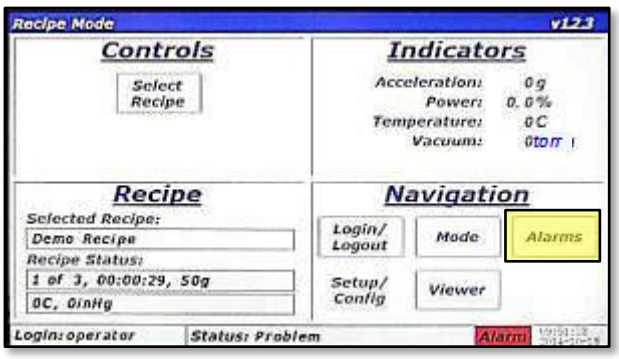
Three errors on the LabRAM II may be present. The alarms are triggered when:

- The communication is lost with the Automatic Vacuum System after vacuum has been started
- A recipe is chosen that requires vacuum control and no Automatic Vacuum System is detected
- The vacuum doesn't reach the set point within a user specified amount of time (set in the machine settings tab)

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 using RAMTools. Contact Resodyn Acoustic Mixers for more information about RAMTools at 406-497-5333

11.1 Screen Operations - Alarms

The following steps detail the procedure for viewing and managing alarms.



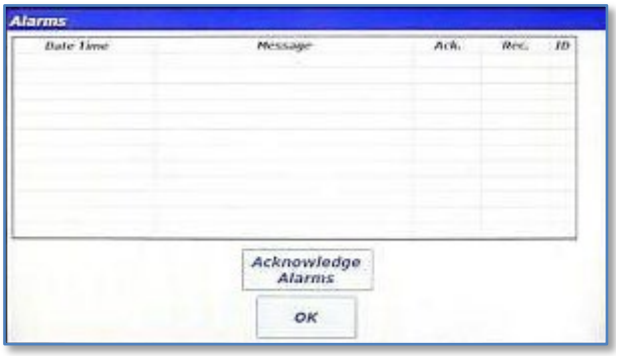
1. When an alarm is active, the "Alarm" section of the Status Bar will turn red for a shutdown alarm and yellow for a warning. To view the alarm, touch the <Alarms> button.

tour

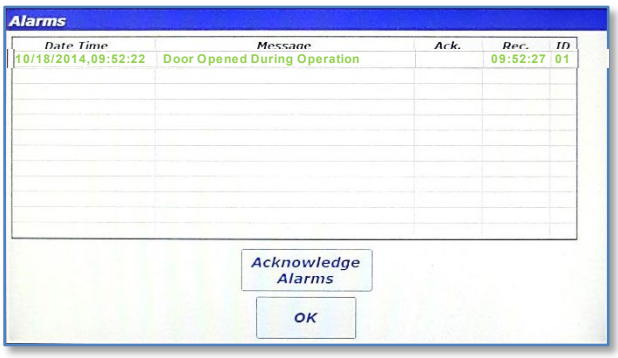
2. The “Alarms” screen is displayed with the alarm message on the first line of the table. In this case, the “Door Opened During Operation” alarm has been triggered. This alarm is triggered if the Automatic Vacuum System is operating and the LabRAM II door is opened. Note that when an alarm is active 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.

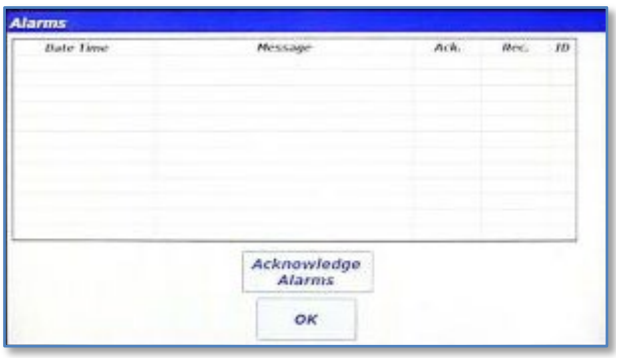
3. The alarm font turns blue and a time is inserted into the “Ack.” Column. The blue color indicates an alarm that is still active but has been acknowledged. If the door is physically closed, the alarm will recover and the message will disappear from the alarm table.



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



5. If the alarm repeats with the door closed (alarm recovered) before acknowledgment, the above alarm message will be displayed in **green** and the "Rec." column registers a time. The alarm message will disappear when <Acknowledge Alarm> is touched since it is recovered and acknowledged.



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

12 Care and Maintenance

Resodyn Acoustic Mixers are assembled at our corporate facilities in Butte, Montana, USA under a strict quality manual and overriding corporate philosophy of building world class equipment that is built to last. In order to help ensure long life, it is important to participate in and practice general cleaning and maintenance as indicated below:

12.1 Preventive Maintenance

The vacuum system is designed to be low maintenance. As such, there are only two items that require scheduled servicing:

- Tubing - The vacuum lines should be replaced when any material is present in the line, the tubes are cracked or damaged
- Filters – Check filters periodically\ and replace when necessary.
- The vacuum filters should be inspected weekly and replaced as necessary

12.2 Cleaning Procedures

Clean 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 process.

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

12.3 Repairs and Replacement Parts

All components not listed in the Maintenance and Recommended Spare Parts sections should be replaced by Resodyn Acoustic Mixers trained repair personnel only!

12.3.1 Major Repairs

All repairs inside the enclosure, unless otherwise stated in this manual, should be diagnosed and repaired by Resodyn Acoustic Mixers trained repair personnel only.

	Do NOT attempt to take off the acoustic enclosure because of electrical shock hazards. The high voltage symbol indicates the possibility of electrical shock.

12.3.2 Recommended Spare Parts

Recommended spare parts are listed in Table 12-1 as well as the recommended quantities to have on hand.

Table 12-1 Automatic Vacuum Control Module Spare Parts List

Description	Part Number	Quantity
Fuses, 3A, Time Lag (For 100-120 VAC)	002442	2
Fuses, 2A, Time Lag (For 200-240 VAC)	002964	2
Vacuum Tubing, 0.25”	103146	2
Vacuum Spares Kit	902709	1
10 µm Vacuum Filter	002965	4
Filter Cartridge Spares kit (pack of 4)	902712	1

12.3.3 Fuse Replacement

The fuses should only be replaced when the machine does not power up, but power is being delivered to the machine. If this occurs, the fuse can be replaced, and operation can continue. However, please call your Resodyn Acoustic Mixers representative for any further instructions.

	Ensure the power to the Automatic Vacuum System is turned off and disconnected before performing any maintenance on the unit.

12.3.4 Technical Support:

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

13 Troubleshooting and Service

The Automatic Vacuum System systems 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.

If necessary, contact your Resodyn Acoustic Mixers customer service representative with questions or additional technical support related to the mixer at 406-497-5333.

Listed below are basic solutions to check before contacting your Resodyn Acoustic Mixers service representative. Use the following chart to resolve common operational events. If the problem persists, contact your customer service representative at the phone number above.

Table 13-1. Troubleshooting Table.

Description of Problem	Potential Problem	Solution
Vacuum is not being drawn in the mixing vessel	Vacuum line plugged	Ensure vacuum lines are clean.
	Vacuum lines not connected	Ensure the vacuum lines are fully seated in the vacuum line connections.
Vacuum Module Comms Failure	Communication cable unplugged	Ensure that the communication cable between the Automatic Vacuum System and the vacuum module are connected.
	Vacuum module turned off	Ensure that the vacuum module is plugged in and turned on.
Fixture Limit, High Vac. **or** **User Limit, High Vac.**	Bad vacuum calibration	Verify vacuum calibration
	Incorrect user limit	Verify user limits are correct
User Limit, Vac. Ctl. Error **or** **User Limit, Vac. Ctl. Time**	Vacuum leak	Check the system for a vacuum leak
	Disconnected vacuum line	Ensure all vacuum lines are connected correctly
LCD Screen is not on	Main Power Switch is off	Toggle the Main Powder Switch to “on” or I”
	Fuse is blown	Call 406-497-5333 for replacement instructions

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