Resodyn
ACOUSTIC MIXERS

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Introduction

RAMware[3] is a software interface for control and monitoring of Resodyn Resonant Acoustic Mixer operation and data retrieval via a Microsoft Windows® compatible computer with a USB cable connection. RAMware[3] may be used with any of Resodyn's state-of-the-art Resonant Acoustic Mixers, including LabRAM I, LabRAM II, LabRAM II H, OmniRAM, RAM 5, or RAM 55. Changes from RAMware[2] include the ability to use the same software across multiple RAM platforms, remote control and monitoring of mixture vacuum and temperature, updated user-friendly input screens and data viewer, and many additional features such as the option to disable the auto logoff feature. RAMware[3] is compatible with Windows® 7, 8, and 10 operating systems. For proper software operation a minimum of 4 GB memory and 2 GHz processor speed is recommended for the computer on which RAMware[3] is installed. Detailed installation instructions can be found in the accompanying manual, *RAMware[3] Installation Guide*.

How to Use this Manual

The **RAMware[3] Operations Manual and Users' Guide** is designed to provide step-by-step instructions and visual illustrations of the key operations of the software.

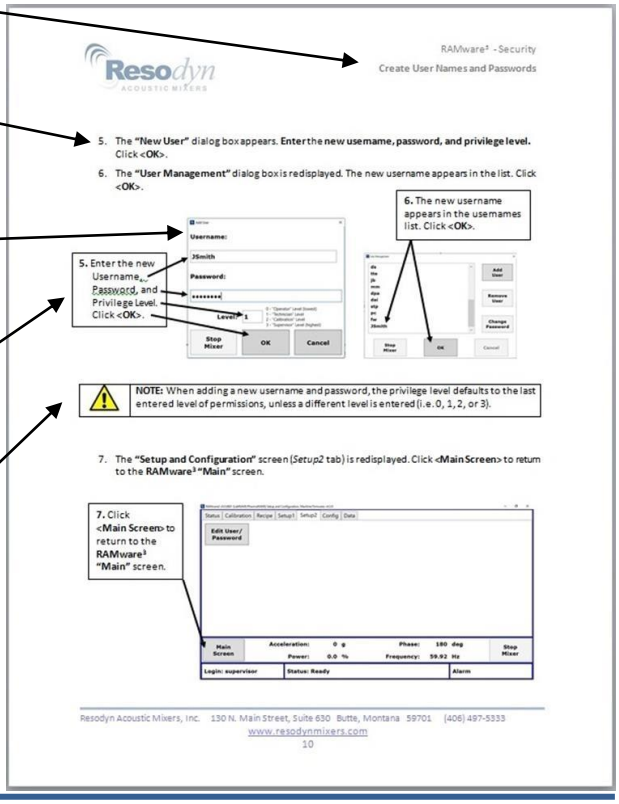
Each Section provides a purpose description.

The steps of operation are described in the text.

Accompanying screen illustrations mimic what you will see on the screen during that step.

Boxed "call-outs" highlight the steps as described in the text for quick operation.

Take particular note of boxes with Alert symbols that provide critical instruction to ensure the proper use of your Resodyn mixer and RAMware[3].



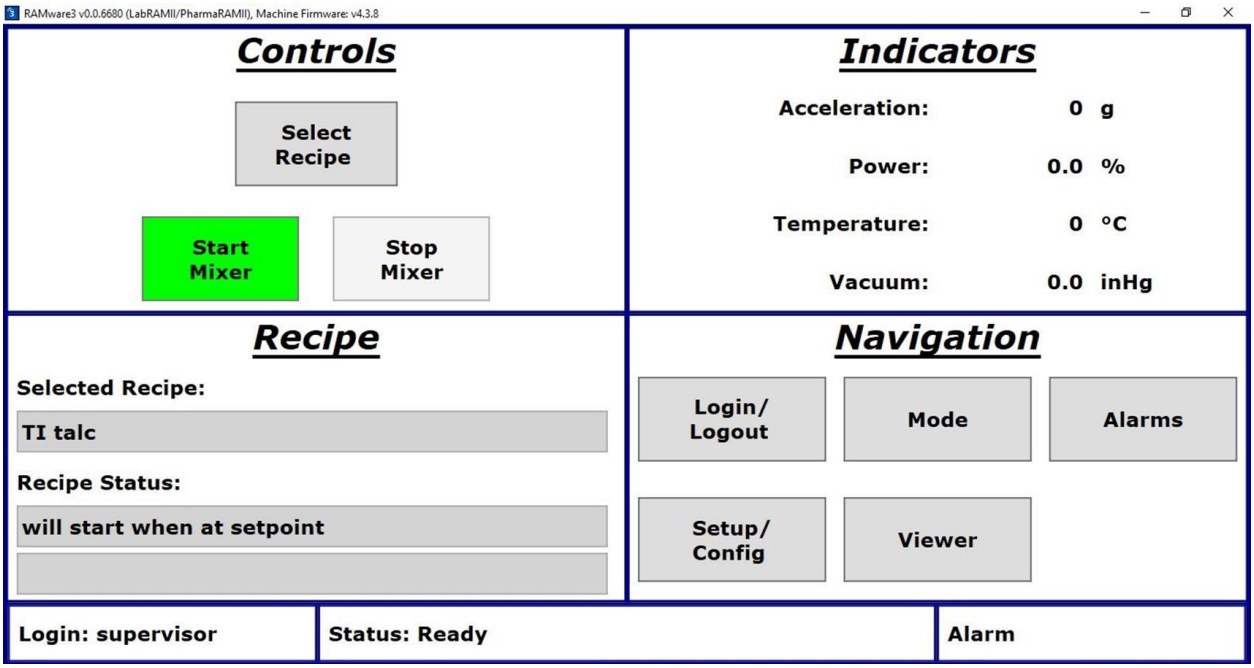
RAMware[3] - The Basics

Starting RAMware[3]

Please complete the installation of RAMware[3] according to the instructions found in the accompanying manual, *RAMware[3] Installation Guide*.

The RAM mixer must be turned on and connected to your PC (i.e. via USB cable) before using RAMware[3].

Please note that the RAMware[3] software will initiate a synchronization process upon connection with the LabRAMII. Depending on the number of files saved on the LabRAM II, this process could take several minutes to several hours. All log files saved on the LabRAM II will then be deleted as they are now copied to the computer that is running RAMware[3]. If you have been using RAM Tools to copy data, it may be faster to synchronize all existing files with RAM Tools and then delete the files from the LabRAM II using the local touch screen.



RAMware[3] software can be used to Setup, Operate, Troubleshoot, or Maintain your Resodyn mixer. These functions are outlined briefly below for your reference in using RAMware[3].

RAM mixer Setup

1. Login as Supervisor
2. Create users & passwords- Technician, Operator, etc.
3. Select setup options: timer, lighting, operational, etc.
4. Create configuration for fixture and optional equipment
5. Create automated recipes (up to 10 segments each)
    - A. Select Configuration
    - B. Define segments
    - C. Define Alarm limits
6. Enter sensor calibration information
7. Logoff as Supervisor

RAM mixer Operation

1. Login as Technician or Operator
2. Recipe Mode
    - A. Choose recipe
    - B. Run recipe
3. Auto Mode
    - A. Select Configuration and set Alarm limits
    - B. Set Acceleration setpoint
    - C. Set Temperature setpoint (optional)
    - D. Set Vacuum level setpoint (optional)
    - E. Set Timer (Supervisor sets Timer options)
    - F. Run mixer
4. View current or historical data plots in Viewer
5. Export current or historical data as csv file

RAM mixer Troubleshooting

1. While logged in as Technician or Operator
2. Review and acknowledge any active Alarms
3. Confirm Alarm limits are not missing
4. Confirm proper Configuration is selected
5. View Inputs/Outputs in Status tab of Setup/Config
6. View data in Viewer
7. While logged in as Supervisor
8. Check settings in Settings1 tab of Setup/Config
9. Check Configuration fixture and options
10. Check calibration constants

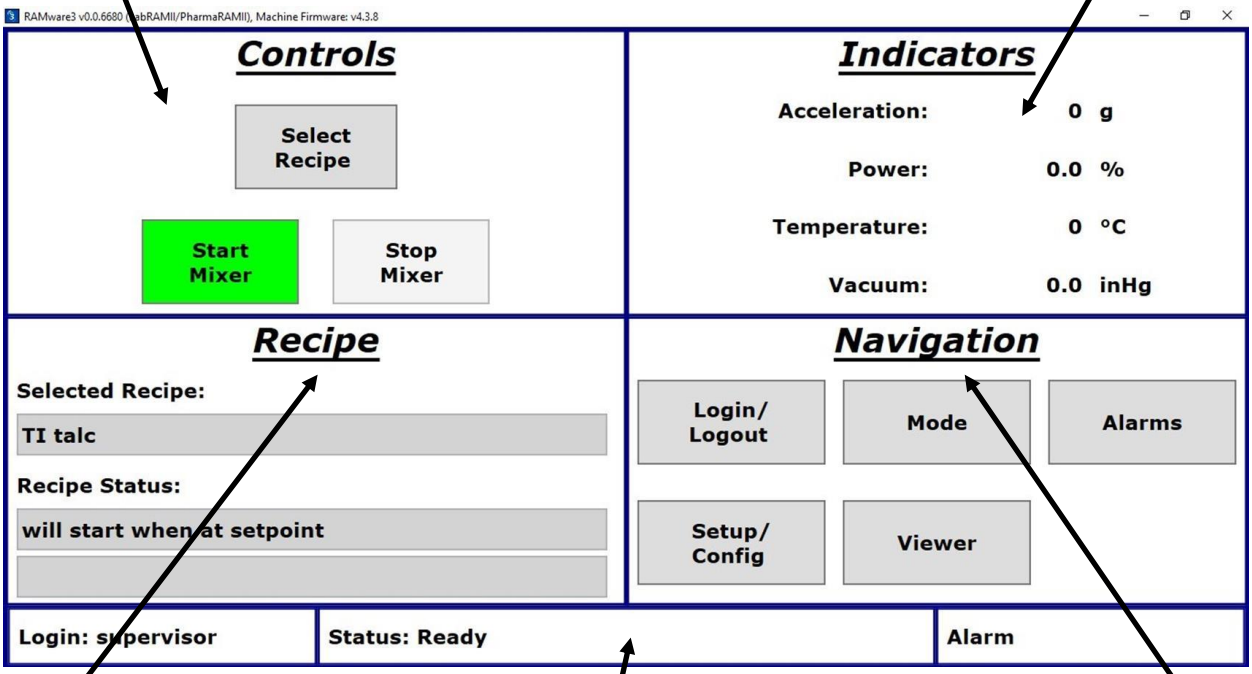
RAM Maintenance

1. Login as Calibration or Supervisor
2. Recalibrate sensors and enter updated calibration
3. Login as Supervisor
4. Delete outdated recipes and users, if desired
5. Add new recipes, if desired

Main Screen Overview

Controls
This panel allows the user to start and stop the mixer and to select a Recipe when in *Recipe* mode or input acceleration, temperature, and vacuum setpoints and alarm limits when in *Auto* mode.

Indicators
This panel displays real-time mixer data (acceleration, power, temperature, and vacuum.)



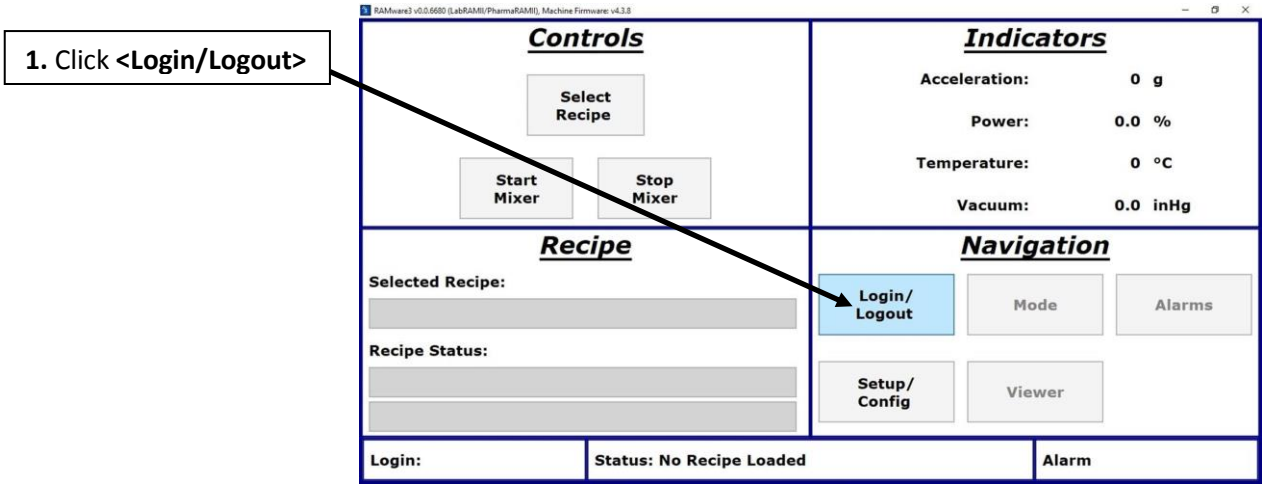
Recipe or Timer
This panel displays the selected recipe and status when in *Recipe* mode or the timer and timer controls when in *Auto* mode.

Navigation
<Login/Logout> – User logs in or out.
<Mode> - Select *Recipe* or *Auto* mode.
<Alarms> - View/acknowledge alarms.
<Setup/Config> - View mixer inputs/outputs, enter calibration constants, edit recipes, select preferences, edit users, see data file sizes/limits, delete data.
<Viewer> - View data trends or download data for current or previous mixes.

Status Bar
Login: identifies current user.
Status: RAM mixer status (i.e. ready, running, timer expired, etc.)
Alarm: turns red or yellow for alarm condition

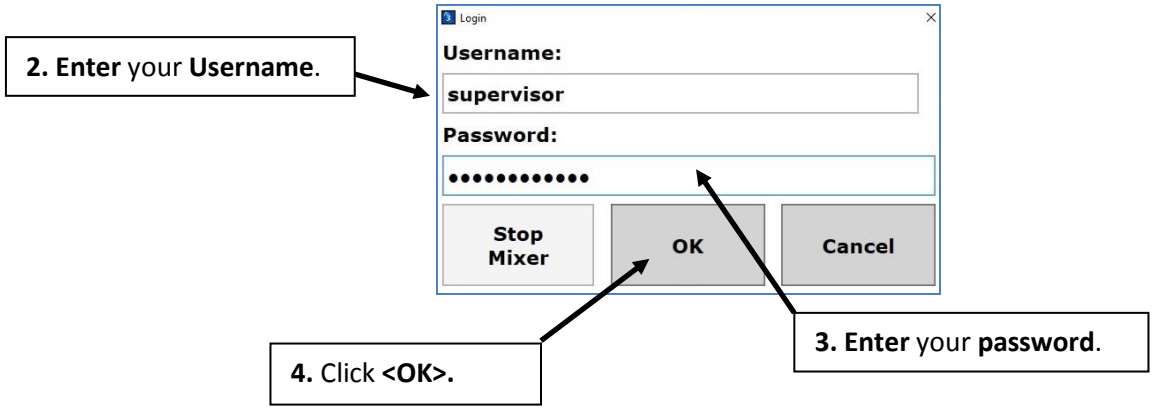
Logging In

1. Click **<Login>** in the **"Navigation"** panel of the **RAMware^3 "Main"** screen.



The **"Login"** dialog box appears.

2. **Enter** your **Username** in the Username field. Note: on first time login for a new RAM mixer installation, use "supervisor" (all lowercase) in both the Username and Password fields to gain supervisor level access and set up user accounts. It is strongly recommended that after such a first time login, the supervisor password be changed from the default and the updated password stored in a secure location.
3. **Enter** your **Password** in the Password field.
4. Click **<OK>.**



Security – Four Levels of Users

In order to operate a RAM mixer, user authentication (login) is required. RAMware[3] includes the same four login privilege levels to control access to machine features as in the factory supplied internal RAM mixer software, summarized in the table below by user type.

Level	User Type	Privileges Description
3	**Supervisor**	Highest level of access Instrument calibration Status viewing for troubleshooting User creation/maintenance Date/time setting Recipe creation Optional feature configuration Data file management 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

NOTE: A supervisor log-in is required to create/maintain user names and passwords. Users, recipes, and preferences already set up for a given RAM mixer (e.g. via the mixer touch screen) are all accessible and adjustable via the RAMware[3] interface, just as they are via the mixer Human Machine Interface (HMI) touch screen.

For log-in instructions, see the previous page.

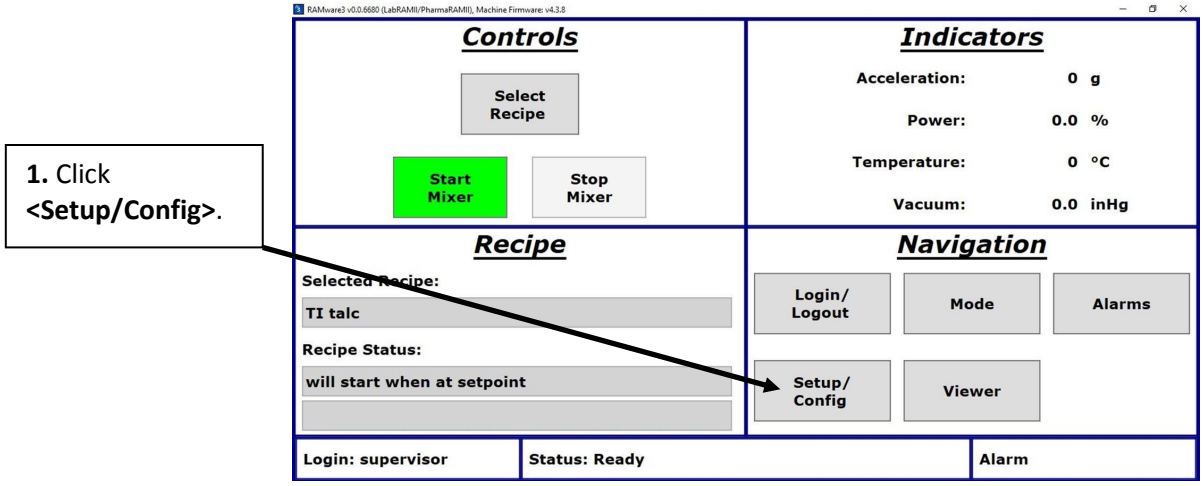
If you already have a log-in and password, please proceed to “Modes of Operation” on Page 15.

If you forget your supervisor password call customer support at (406)-497-5333 for assistance.

Create User Names & Passwords

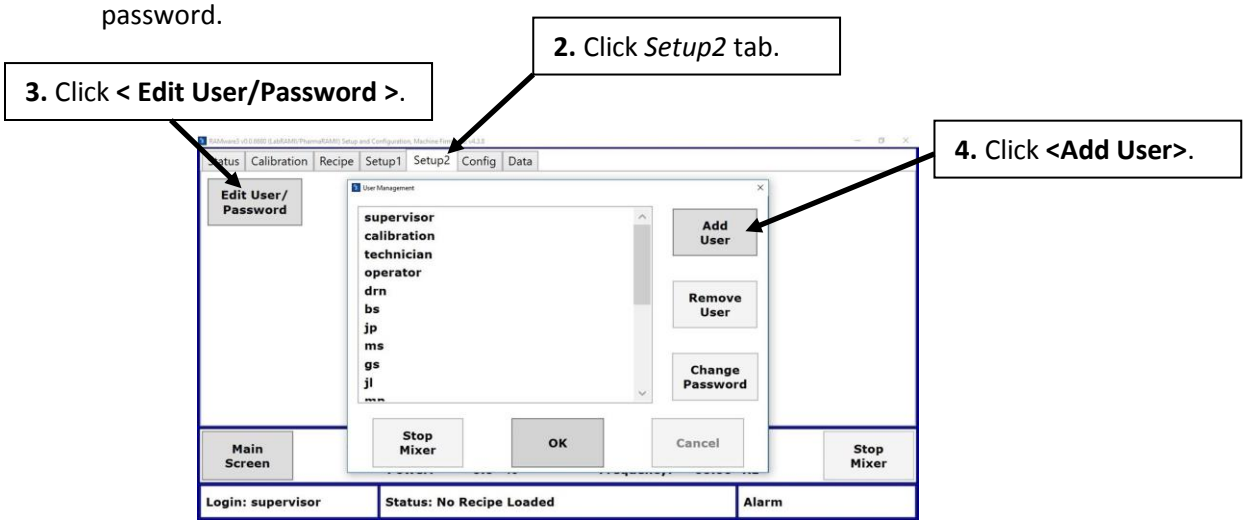
User Names are created and maintained in the *Setup2* tab of the **"Setup and Configuration"** screen accessible via the **<Setup/Config>** button on the **"Navigation"** panel.

1. Click **<Setup/Config>** on the **"Navigation"** panel of the Main Screen.

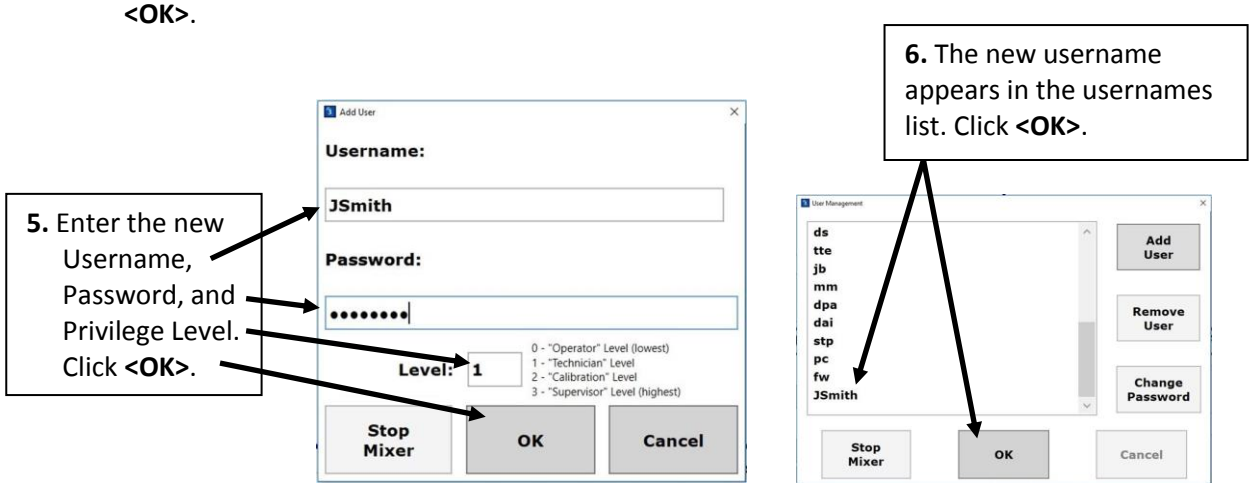


The **"Setup and Configuration"** screen is displayed with seven tabs at the top (*Status*, *Calibration*, *Recipe*, *Setup1*, *Setup2*, *Config*, and *Data*.)

2. Click the *Setup2* tab of the **"Setup and Configuration"** screen.
3. Click **<Edit User>**
4. The **"Edit User/Password"** dialog box appears. Click **<Add User>** to add a new username and password.

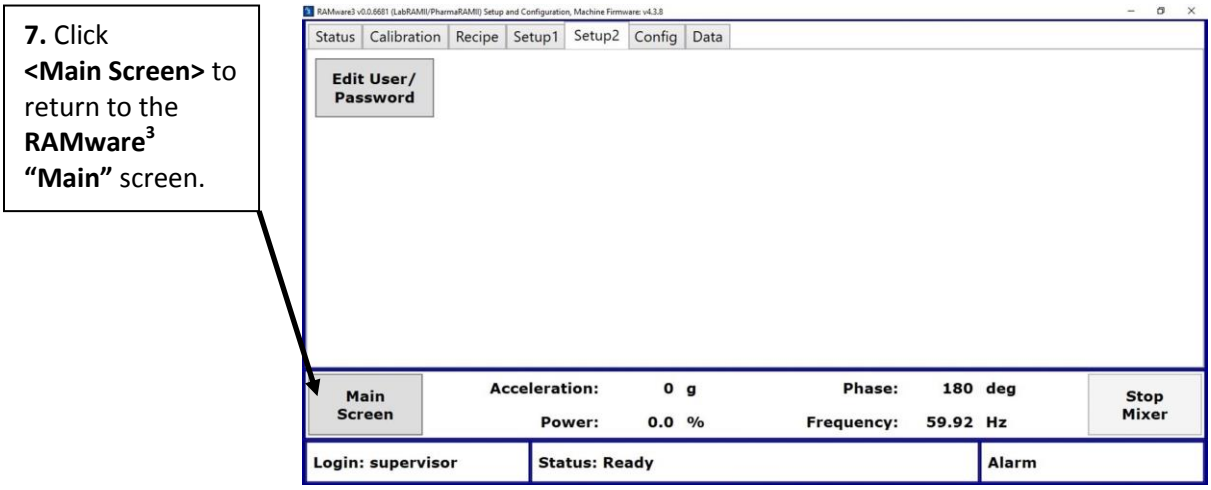


5. The **"New User"** dialog box appears. **Enter** the **new username, password, and privilege level.** Click **<OK>**.
6. The **"User Management"** dialog box is redisplayed. The new username appears in the list. Click **<OK>**.



NOTE: When adding a new username and password, the privilege level defaults to the last entered level of permissions, unless a different level is entered (i.e. 0, 1, 2, or 3).

7. The **"Setup and Configuration"** screen (*Setup2* tab) is redisplayed. Click **<Main Screen>** to return to the **RAMware^3 "Main"** screen.



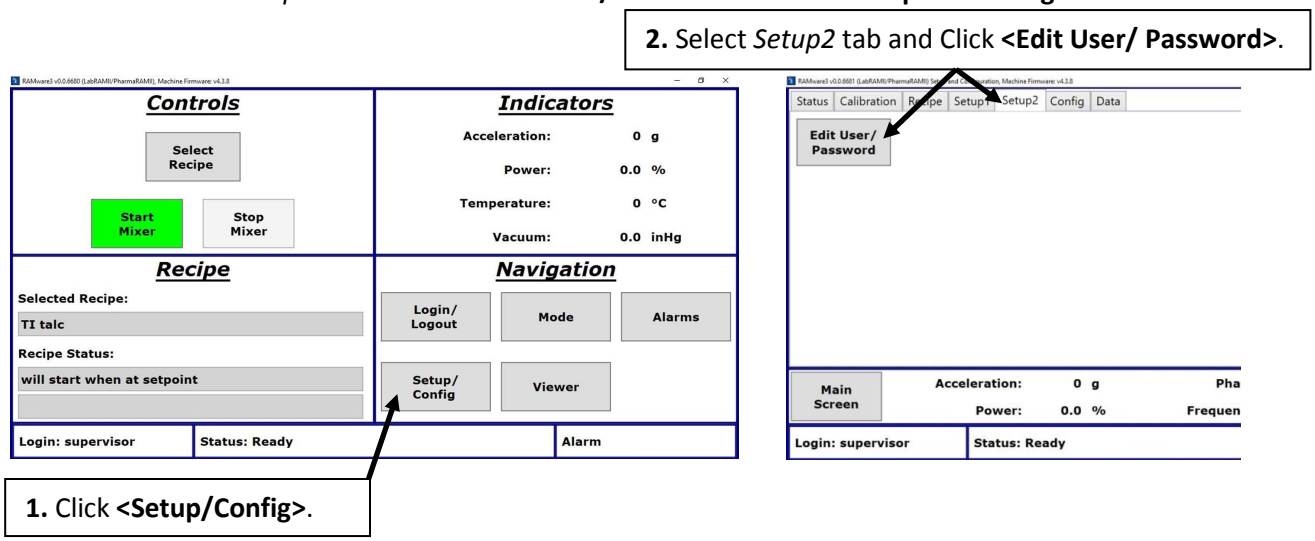
Remove User Names and Passwords

User Names are created/maintained/removed in the *Setup2* tab of the **"Setup and Configuration"** screen accessible via the **<Setup/Config>** button on the **"Navigation"** panel.

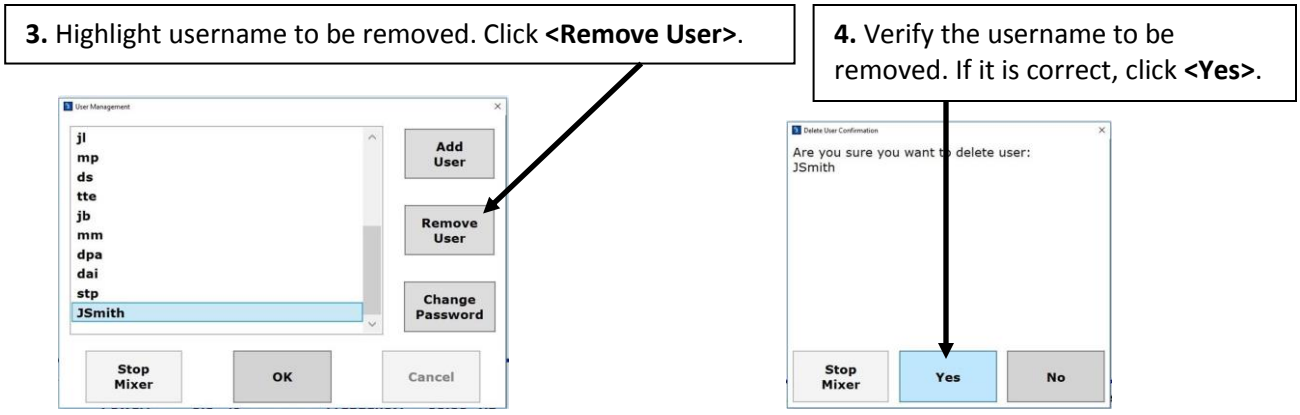
1. Click **<Setup/Config>** on the **"Navigation"** panel.

The **"Setup, Configuration, and Troubleshooting"** screen is displayed.

2. Select the *Setup2* tab and click **<Edit User/Password>** on the **"Setup and Configuration"** screen.



3. The **"User Management"** dialog box appears. Highlight the username to be removed. Click **<Remove User>** to remove the username and password.
4. The **"Delete user confirmation"** dialog box appears, displaying the username to be removed. Click **<Yes>** to remove the username and password.



5. The **"User Management"** dialog box is redisplayed. The username has been removed from the list. Click **<OK>**.

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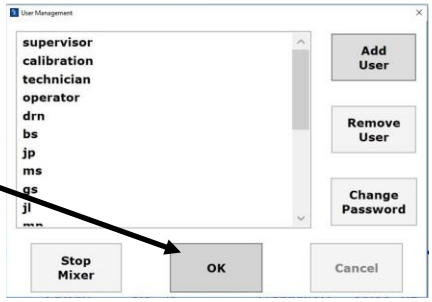

6. The **"Setup and Configuration"** screen (*Setup2* tab) is redisplayed. Click **<Main Screen>** to return to the **RAMware^3 "Main"** screen.

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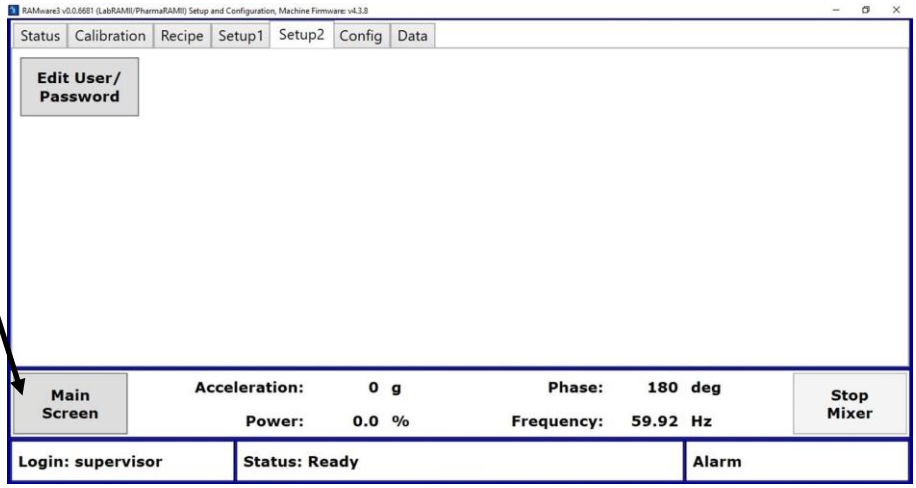


Modes of Operation

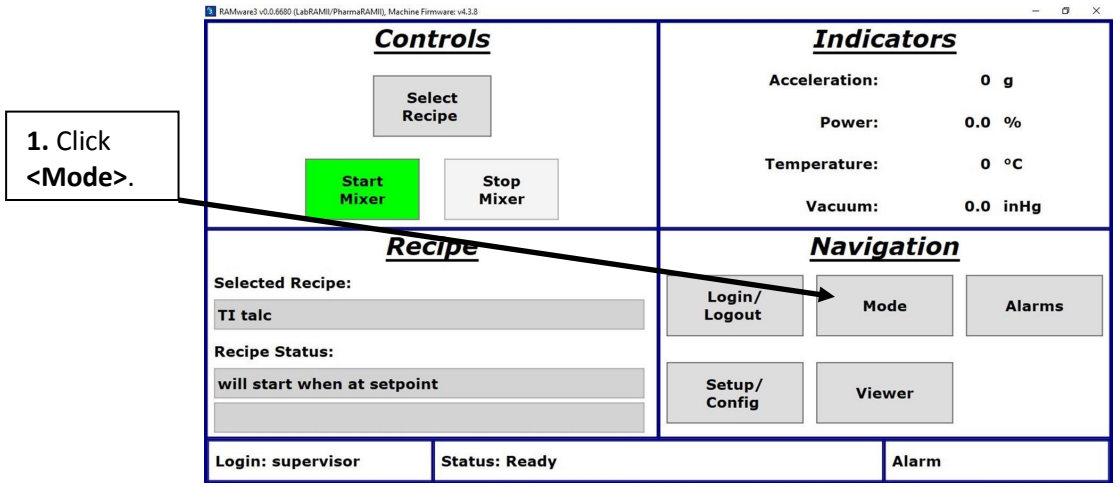
There are two modes of operation available in RAMware[3], summarized below:

- Recipe: User runs an existing recipe. *See page 43 for recipe creation, modification, and deletion instructions.*
- Auto: User inputs acceleration, temperature (optional), and vacuum level (optional) setpoints. A timer is available for timed operation.

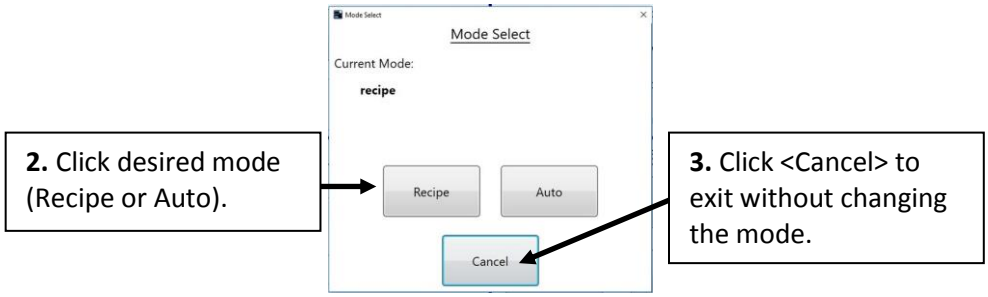
A recipe is pre-defined program of mixer operation having up to 10 segments, with an independently specified acceleration, temperature (optional), vacuum level (optional), and duration for each segment. Recipe Mode is intended to be the primary mode used by operator level users, while Auto Mode is used by higher privilege user levels to characterize a mixing process for eventual recipe programming.

Selecting A Mode of Operation

1. Click on the **<Mode>** button in the **"Navigation"** panel.



2. **Select** the **desired mode** of operation. The mode will be changed and you will be returned to the "**Main Screen**".
3. To exit without changing the mode, click <**Cancel**>.

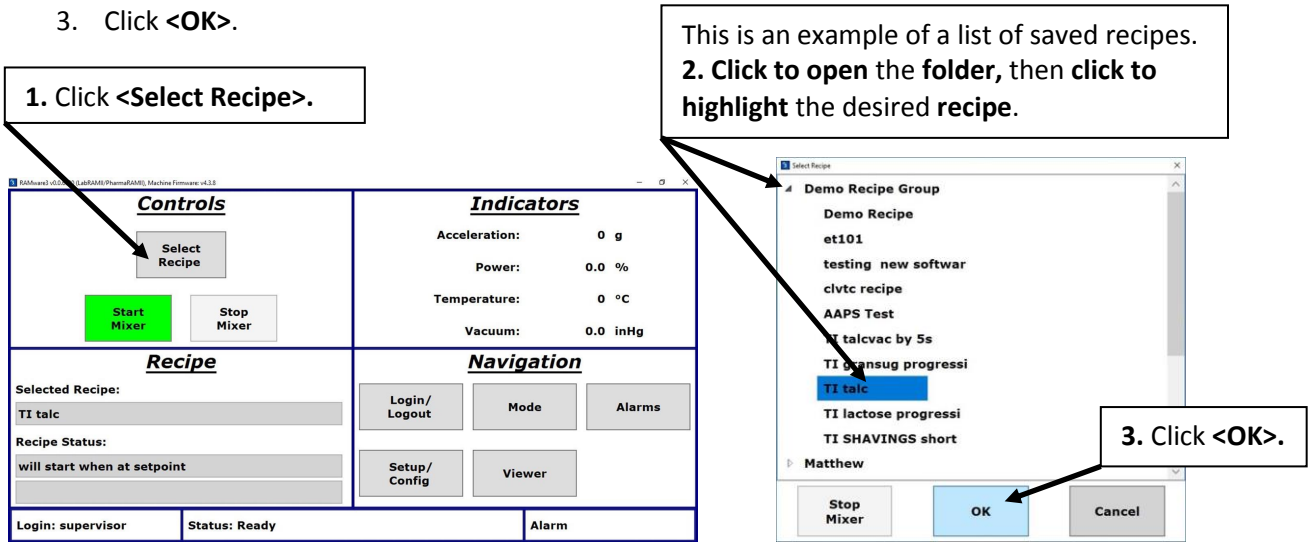


Using Recipe Mode

Recipe mode allows users to select and run an existing recipe. The following section describes the steps for operating a RAM mixer via the RAMware[3] program in Recipe Mode. Note that this sequence assumes the user has already logged in to the system and that the desired recipe has already been created.

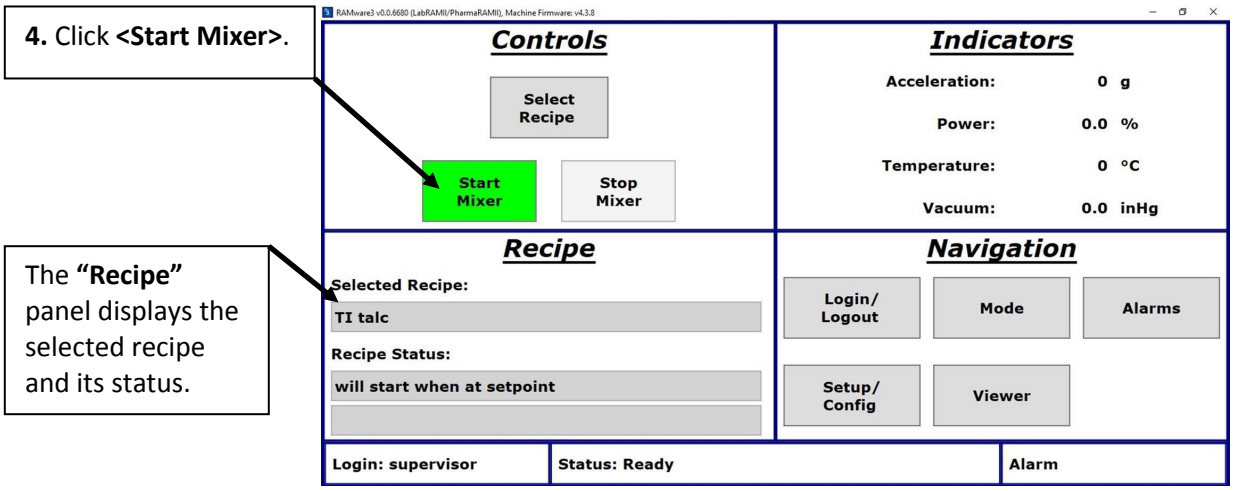
After selecting **<Mode>** from the "**Navigation"** panel and then **<Recipe>,** the **<Select Recipe>** button is displayed in the Control Panel.

1. Click **<Select Recipe>** to display the "Select Recipe" dialog box.
2. From the **"Select Recipe"** dialog box, click the triangle to open the folder containing the desired recipe, then click or use arrow keys to **highlight** the **desired recipe.**
3. Click **<OK>**.



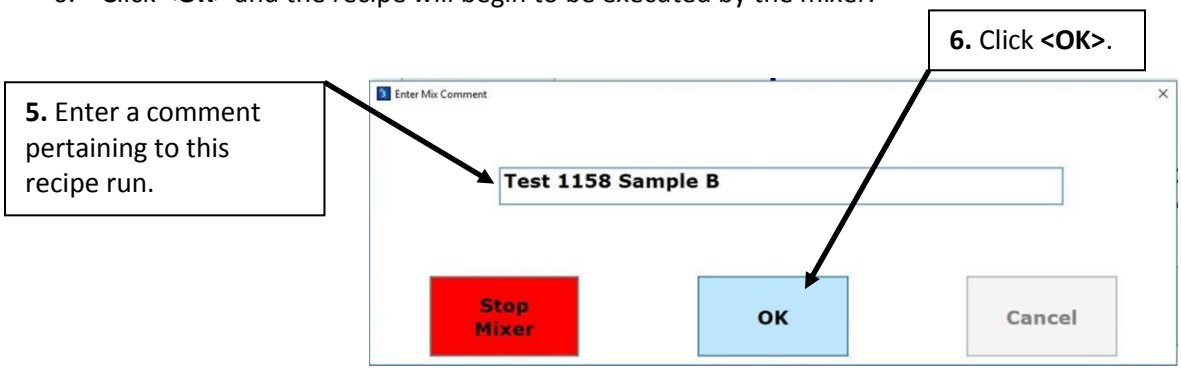
Users are then returned to the **RAMware[3] "Main"** screen and the selected recipe is displayed in the **"Recipe"** panel.

4. Click **<Start Mixer>** to run the selected recipe.



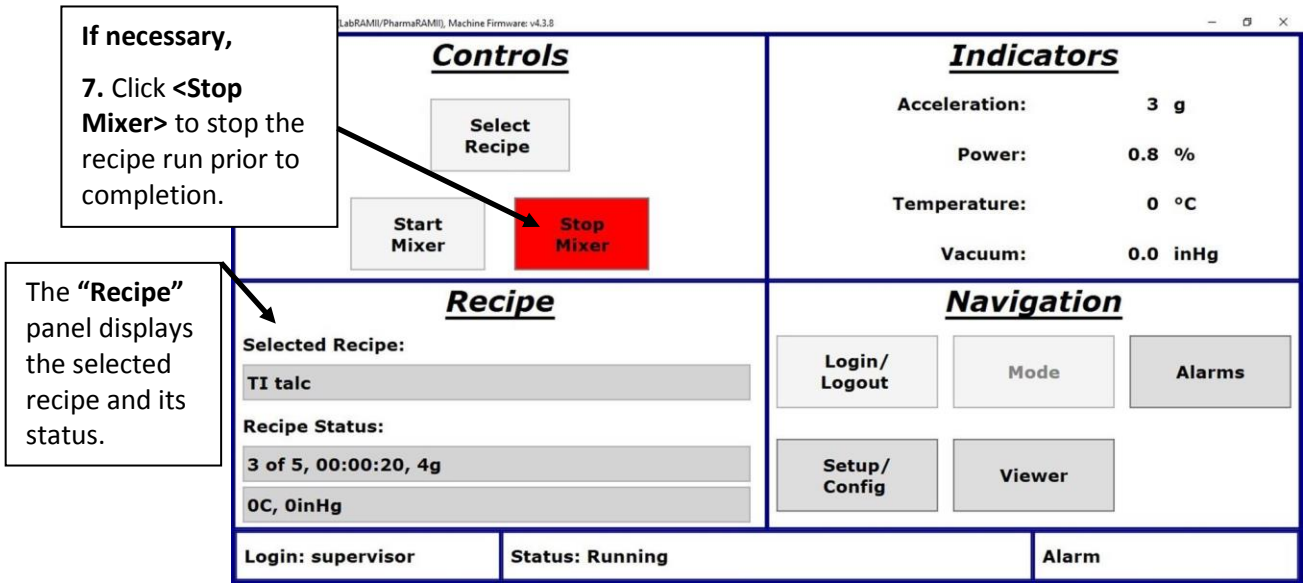
⚠	**NOTE**: Make sure the RAM mixer is turned on. A communication error alarm will appear if the RAM mixer is turned off.

5. In the **"Enter Mix Comment"** dialog box users may enter a comment about the current recipe run such as a test name or batch number. The previous run's comment is populated in the Mix Comment Box by default unless the "Clear Mix Comment" checkbox is checked in the "Operational Options" panel of the *Settings1* tab of the "**Settings and Configuration**" screen.
6. Click **<OK>** and the recipe will begin to be executed by the mixer.



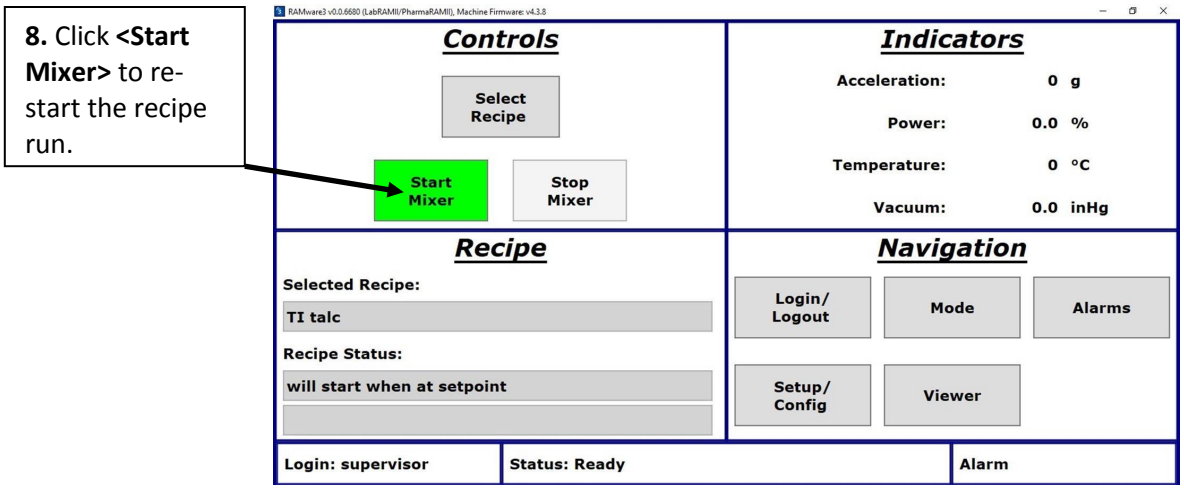
When the acceleration reaches its setpoint, the Recipe panel will update and display the currently executing segment, total segments, and remaining time on the current segment acceleration, temperature , and vacuum setpoints. If the RAM mixer setup is not utilizing temperature or vacuum control equipment, the setpoints and indicators for these parameters will read "0C" and "0inHg", respectively. Recipe execution will stop automatically upon completion.

7. To stop the recipe before its' completion, click the **<Stop Mixer>** button in the **"Controls"** panel. Note that the **<Stop Mixer>** button on the RAM mixer *touch screen* is not operable when controlling the RAM mixer via RAMware[3] on a computer.



When the **<Stop Mixer>** button is used to stop the recipe run, the RAM mixer stops and the **<Start Mixer>** button turns green in the **"Controls"** panel of the RAMware[3] screen.

8. To start the recipe, click **<Start Mixer>**.



The **"Recipe action"** dialog box appears, with two options, **<Start Over>** or **<Resume>**.

If you **<Resume>**, the **"Enter Mix Comment"** dialog appears so a new comment can be entered. Once the comment is entered, the recipe and RAM mixer resume operation, picking up where the recipe left off.

If you **<Start Over>**, the **"Enter Mix Comment"** dialog appears so a new comment can be entered. Once the comment is entered, the recipe and RAM mixer restart from the beginning of the recipe.

Auto Mode

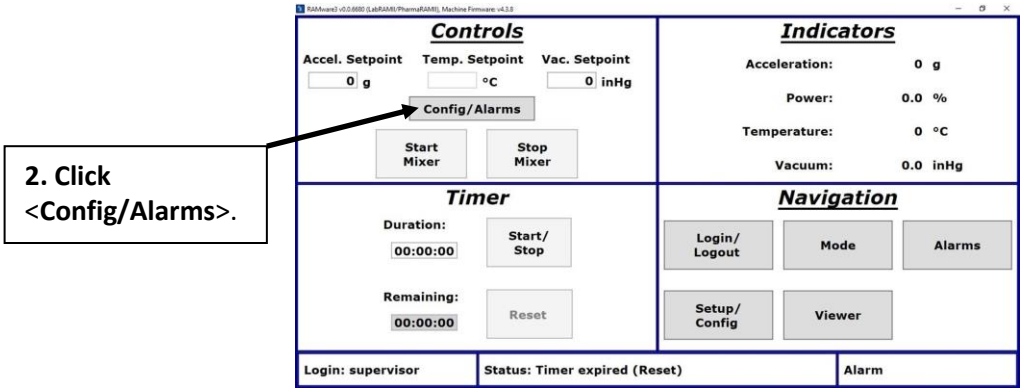
Auto Mode is an alternative to **Recipe Mode** which is intended to allow users to vary mixing conditions for mixing operations where the optimal recipe (one or more time segments of constant acceleration, temperature, and vacuum) is not yet known. **Auto Mode** allows users to run the RAM mixer at a specific acceleration setpoint ("g" value or multiples of acceleration due to gravity), temperature setpoint (if optional temperature control system is installed), and vacuum setpoint (if optional remotely controllable vacuum control system is installed.) A timer can also be set which will automatically stop the mixer once the timer reaches zero. User-defined alarm setpoints can also be entered to ensure that mixing parameters do not go beyond specific limits during operation.

Auto Mode Configuration and User-defined Alarm Limits

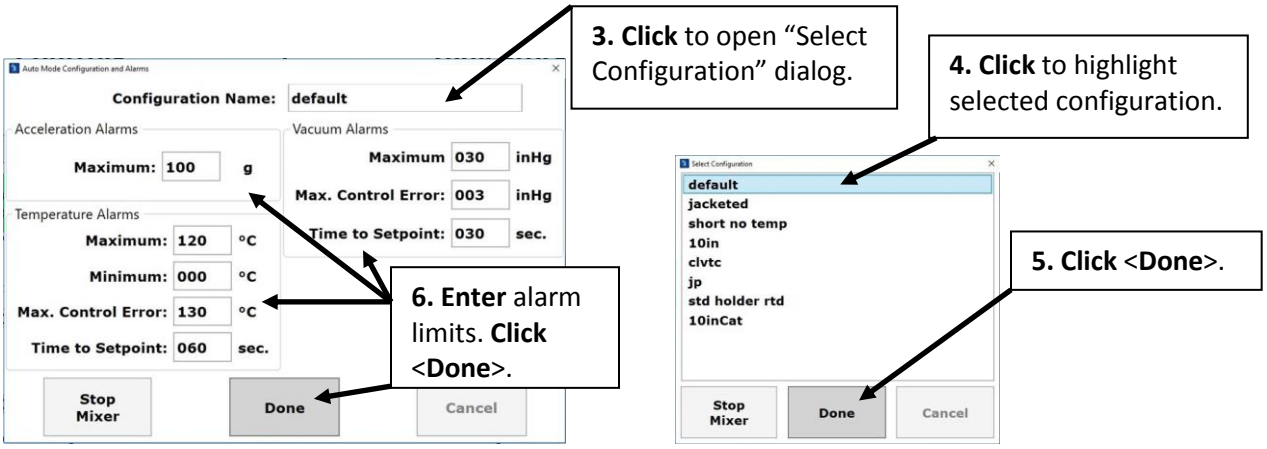
Before using the RAM mixer in **Auto Mode**, make sure an appropriate configuration and acceptable user-defined alarm limits have been specified in the "**Auto Mode Configuration and Alarms**" dialog. This dialog is used to select an appropriate configuration which tells the RAM mixer what fixture to expect and whether to record temperature data (all zeros are recorded in the temperature data for any temperature which is not indicated as active in the configuration.) If the configuration is improperly specifed for the fixture in use, the mixer may alarm or have difficulty operating (fixture options are pre-loaded into the RAM mixer operating system with RAM settings appropriate for each fixture weight.) The list of configurations can be edited by a supervisor level user in the *Config* tab of the "**Settings and Configuration**" screen (accessed via <**Settings/Config**> button on **Navigation** panel of the **Main Screen**.)

This dialog also allows a user to enter limitations for setpoint entry and shut the machine down if the alarm value is exceeded for acceleration, temperature, and vacuum level. If, for example, the material being mixed by the RAM mixer was acceleration sensitive, the "Maximum Acceleration" could be limited in this screen. If any Alarm input box is left blank, the RAM mixer may not start until a valid value is entered into each box.

1. Click on the <**Mode**> button in the **Controls** panel of the "**Main Screen**" and click <**Auto**> and <**Done**> to set the Mode to "**Auto**" as described previously in the "Selecting A Mode of Operation" section on page 15.
2. Set the vessel configuration and alarm limits by clicking on the <**Config/Alarms**> button to view and/or change the vessel configuration and alarm setpoints (see "Configuration**"** section on page 28 for more information on Configuration and Alarms). The "**Auto Mode Configuration and Alarms**" screen is displayed.



3. Select a configuration by clicking on the "Configuration Name" box. This brings up the "Select Configuration" dialog.
4. Click on a Configuration to select it. The selected configuration profile tells the RAM mixer what fixture to expect and whether to record temperature data. If the configuration is improperly specifed for the fixture in use, the mixer may alarm or have difficulty operating. The list of configurations can be edited by a supervisor level user as described in X on page X.
5. Click <**Done**>.
6. Use the keyboard to enter limits for Acceleration, Temperature, and Vacuum alarms. RAM mixing will stop any time the measured value exceeds the user-specified maximum limit or drops below the user-specified minimum limit for acceleration, temperature, or vacuum level. Also, for Temperature (or Vacuum level), if the system is not able to reach the setpoint to within the user-specified "Max. Control Error" °C (or inHg) within the the user-specified "Time to setpoint" number of seconds, the RAM mixing will stop and an alarm will be generated. The limits entered must be within the following ranges: Acceleration 0 to 100 *g*; Temperature maximum and minimum 0 to 250 °C; Vacuum maximum 0 to 30 inHg; all max control error and time to setpoint limits 1 to 999. Then click <**Done**>.



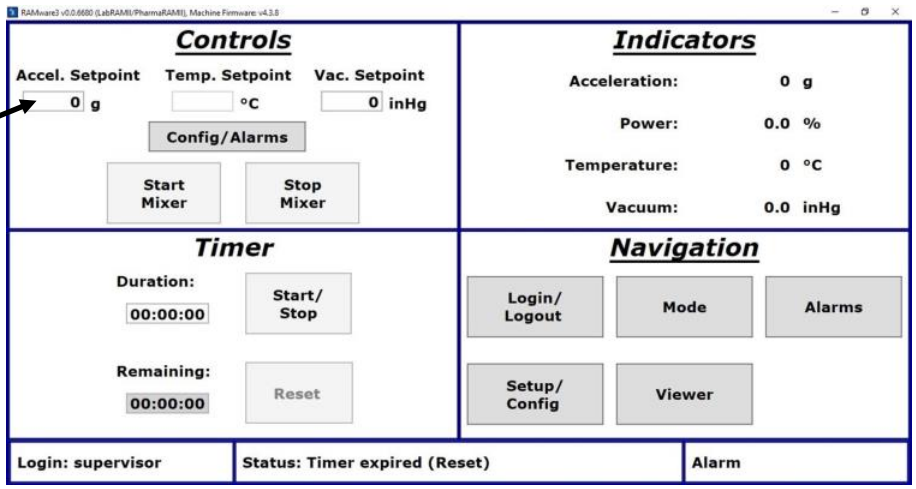
Using Auto Mode

After selecting **<Mode>** in the "**Navigation"** panel and then selecting **<Auto>**, the **RAMware^3 "Main"** screen configuration changes to reflect "**Auto Mode"** in the two panels on the left hand side, as seen in the screen capture below. In Auto mode, the "Controls" panel has three textboxes that are used to enter setpoints for acceleration (in *g*), temperature (in °C), and vacuum (in inHg). The <**Config/Alarms**> button in the "Controls" panel is used to input user-defined limits for alarms on certain parameters, discussed in detail on page X. The <**Start Mixer**> and <**Stop Mixer**> buttons operate the same as in Recipe Mode. Note that the <**Stop Mixer**> and <**Start Mixer**> buttons on the RAM mixer touch screen are not operable when controlling the RAM mixer via RAMware^3 on a computer. The lower left panel 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."

1. Click in the **"Accel. Setpoint**" box in the **"Controls"** panel to display the mixer acceleration setpoint entry dialog.

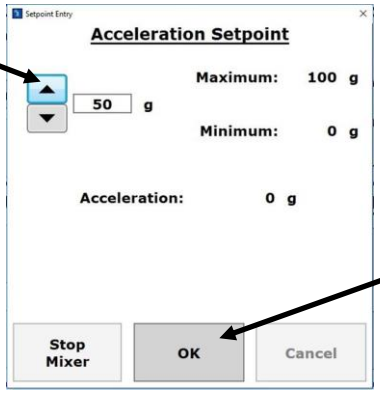
Controls Panel

1. Click in the **"Accel. Setpoint"** box to display the setpoint entry dialog.



2. **Click on the up or down arrow** to increment **the acceleration setpoint up or down**, **click and hold the up or down arrow** to **rapidly change the acceleration setpoint** up or down, or double-click on the setpoint value to type in a new value using the keyboard. Use of the arrows may be helpful to prevent typing errors.
3. Click **<OK>**.

2. Use the arrows or keyboard to e**nter** the desired **setpoint** - between 0 and 100 g.

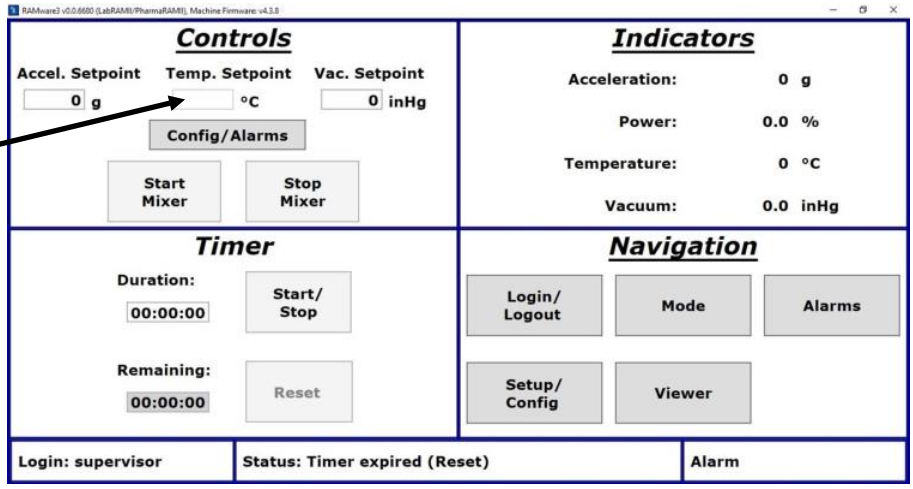


3. Click **<OK>**.

The **RAMware^3 "Main"** screen is redisplayed with the user defined **"Setpoint"** in the **"Controls"** panel.

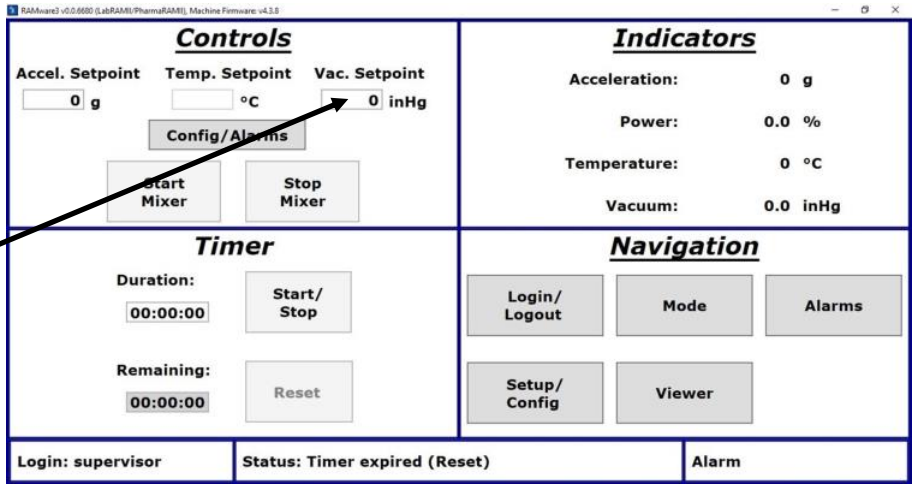
4. If temperature control is desired and the mixer has a temperature control system (e.g. a jacketed vessel and a feedback loop to control the incoming heat transfer fluid temperature), click in the "Temp. Setpoint" box in the "Controls" panel to display the temperature setpoint entry dialog.

4. Click in the **"Temp. Setpoint"** box to display the setpoint entry dialog, if temperature control capability is installed.



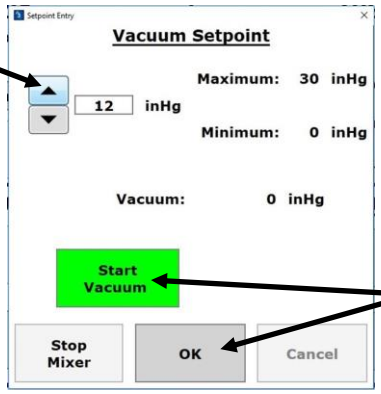
5. **Click on the up or down arrow** to increment **the temperature setpoint up or down**, **click and hold the up or down arrow** to **rapidly change the temperature setpoint** up or down, or double-click on the setpoint value to enter a new value using the keyboard.
6. If it is desired to apply vacuum to the mix and the mixer is equipped with a remotely controllable vacuum system, click in the "Vac. Setpoint" box in the "Controls" panel to display the Vacuum setpoint entry dialog.

6. Click in the **"Vac. Setpoint"** box to display the setpoint entry dialog.



7. **Click on the up or down arrow** to increment **the vacuum setpoint up or down**, **click and hold the up or down arrow** to **rapidly change the vacuum setpoint** up or down, or double-click on the setpoint value to enter a new value using the keyboard.
8. Click <**Start Vacuum**> to immediately start the vacuum, or click <**OK**> to return to the "Main Screen". Note that the actual vacuum unit must be turned on and connected to the mixer to enable remote control of vacuum. Also note that when in Auto mode the vacuum does not automatically start when the mixer is started and must be manually started from this screen by clicking the <**Start Vacuum**> button.

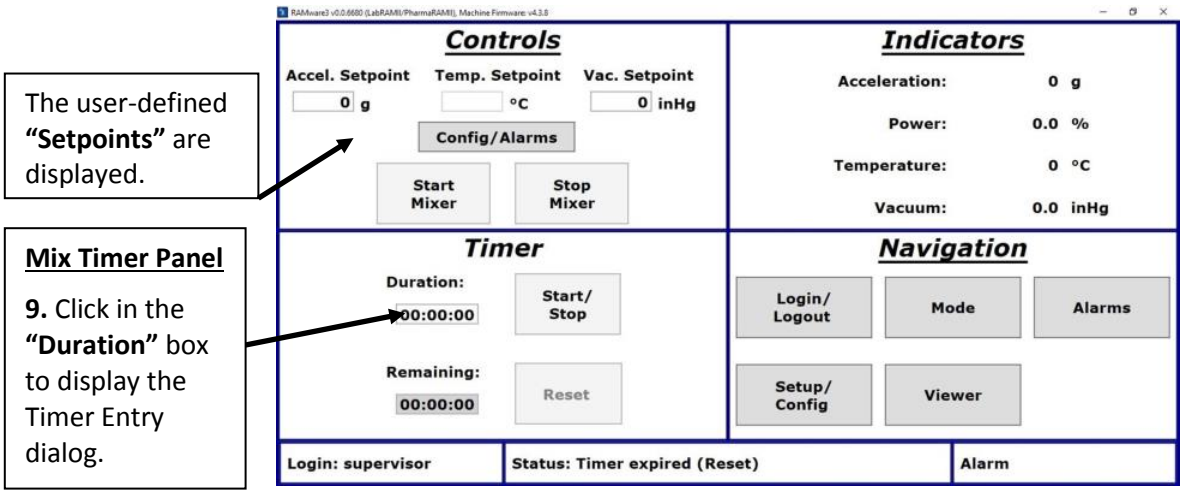
7. Use the arrows or keyboard to **enter** the desired **setpoint** - between 0 and 30 inHg.



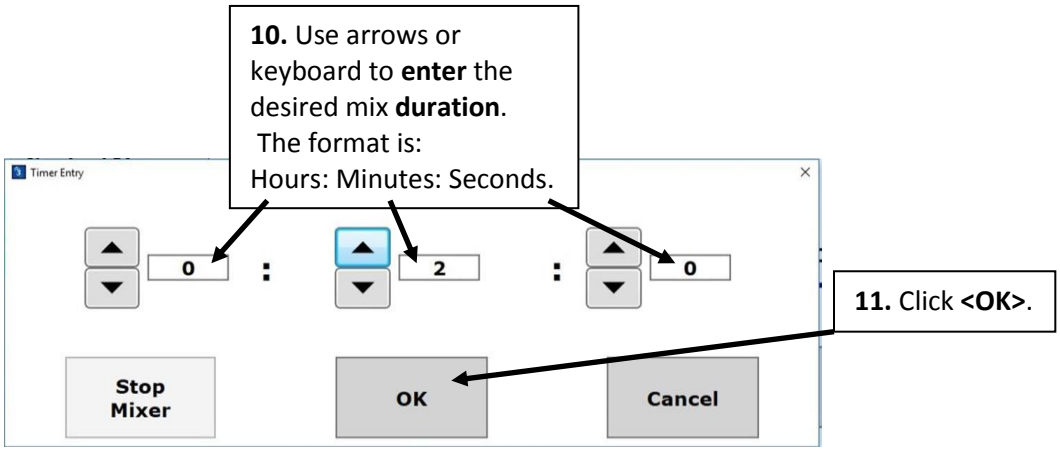
8. Click <**Start Vacuum**> to start the vacuum now or **<OK>** to return to the **Main Screen** without starting vacuum.

9. If you wish to set a timer to automatically stop, click in the **"Duration"** field of the **"Mix Timer"** panel to bring up the **Timer Entry** dialog. ***Otherwise, proceed to step 12.***

⚠	**NOTE**: When using the timer, the RAM mixer will stop automatically when the time has expired. If instead the mixer is stopped manually by the user, the timer will stop.



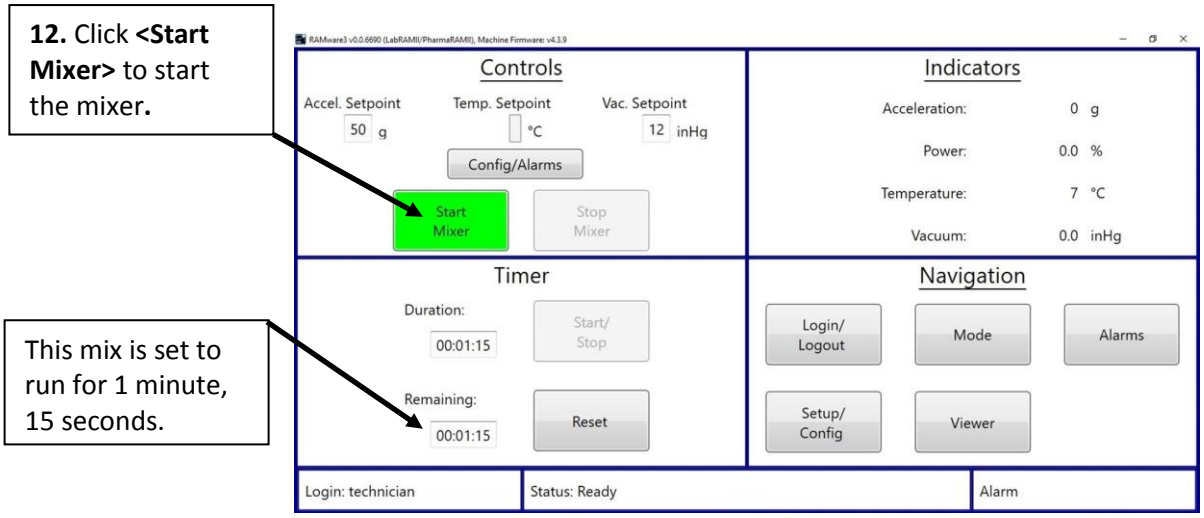
10. **Click** on the **arrows or** use the keyboard to **enter** the desired **hours / minutes / seconds** for the timed mix.
11. **Click <OK>.**



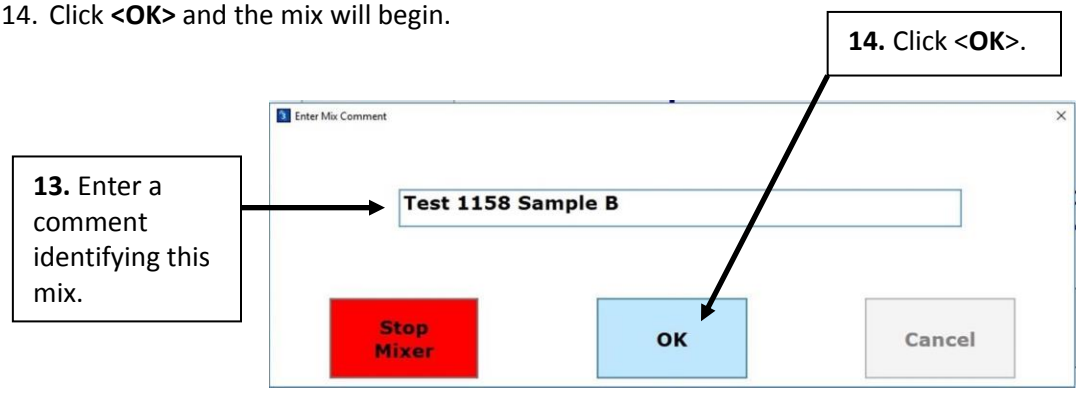
⚠	**NOTE**: Depending on the Auto Timer option selected in the *Settings1* tab of the "**Settings and Configuration**" screen, the mix timer will either have to be started manually (**Manual**), will start immediately as soon as the mixer starts (**Immediately**), or will start once the mixer reaches the desired acceleration setpoint (**At-setpoint**).

The **RAMware[3] "Main"** screen is redisplayed with the user defined **"duration"** for this mix in the **"Mix Timer"** panel.

12. Click **<Start>** in the **"Controls"** panel to start the mixer. The **"Enter Mix Comment"** dialog box will appear.



13. In the **"Enter Mix Comment"** dialog box users may enter a comment about the current auto run such as test name or batch number. The previous run's comment is populated in the Mix Comment Box by default unless the "Clear Mix Comment" checkbox is checked in the "Operational Options" panel of the *Settings1* tab of the "**Settings and Configuration**" screen.
14. Click **<OK>** and the mix will begin.

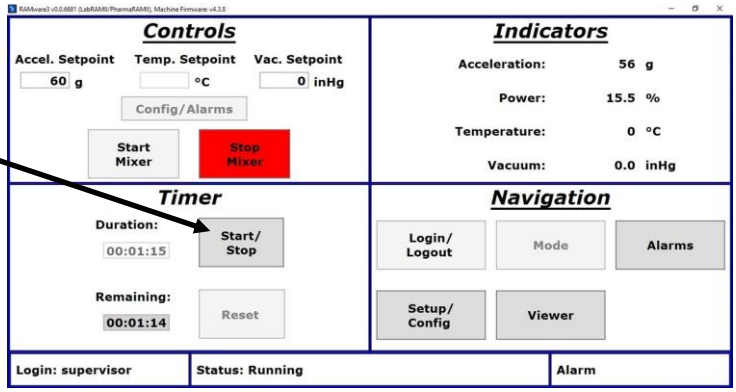


The mixer starts and the **RAMware[3] "Main"** screen is displayed. The **"Indicators"** panel displays the real-time acceleration, power, temperature, and vacuum data from the RAM mixer.

⚠	**NOTE**: The mix timer will have to be started manually each time if an option other than "Manual**"** has not been selected for the "**Auto Timer"** in the *Settings1* tab of the "**Settings and Configuration**" screen.

15. If Auto Timer settings are set to "Manual" and you would like to use the timer, set the timer (Steps 9-11 above) and click **<Start/Stop>** in the **"Timer"** panel to start the timer.

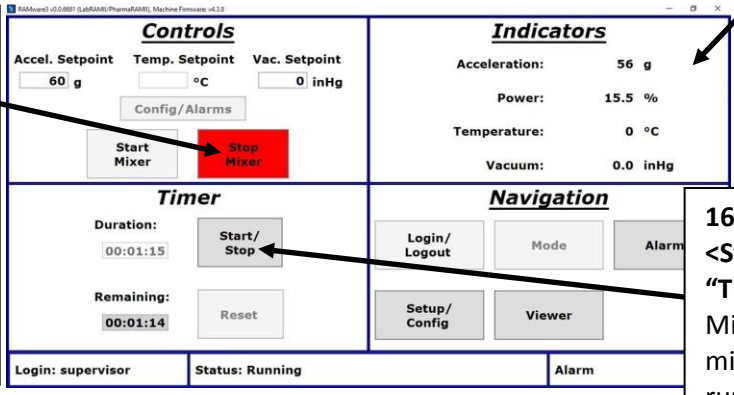
15. Click **<Start/Stop>** to start the timer. The LabRAM will stop when the time has expired.



16. To stop the Mix Timer only, click the **<Start/Stop>** button in the **"Mix Timer"** panel. This **will stop the timer, but the RAM mixer will continue mixing**.

17. To stop the RAM mixer before the completion of this run, click the **<Stop Mixer>** button in the **"Controls"** panel. This **will stop both the RAM mixer** and the **Mix Timer**. Note that the <**Stop Mixer**> button on the built-in RAM mixer *touch screen* is not operable when controlling the RAM mixer via RAMware[3] on a computer.

17. If necessary, click **<Stop Mixer>** in the **Controls** panel to stop the LabRAM *and* the Mix Timer. Otherwise the RAM mixer will stop when the timer runs out.



The **"Indicators"** panel is displaying real-time data from the RAM mixer.

16. If desired, click **<Start/Stop>** in the **"Timer"** panel to stop the Mix Timer only. The RAM mixer will continue running.

⚠	**NOTE**: the <**Stop Mixer**> button on the built-in RAM mixer *touch screen* is not operable when controlling the RAM mixer via RAMware[3] on a computer.

Configurations

The "**Configuration"** tells the RAM mixer what fixture to expect, as well as other user-defined options such as whether to record temperature data. Note that all zeros are recorded in the temperature data for any temperature which is not marked as present in the configuration description. If the configuration fixture specified is not appropriate for the fixture in use, the mixer may alarm, have difficulty operating, or be slower to reach the acceleration setpoint. Fixture options are pre-loaded into the RAM mixer operating system with internal RAM control settings to accommodate each fixture weight.

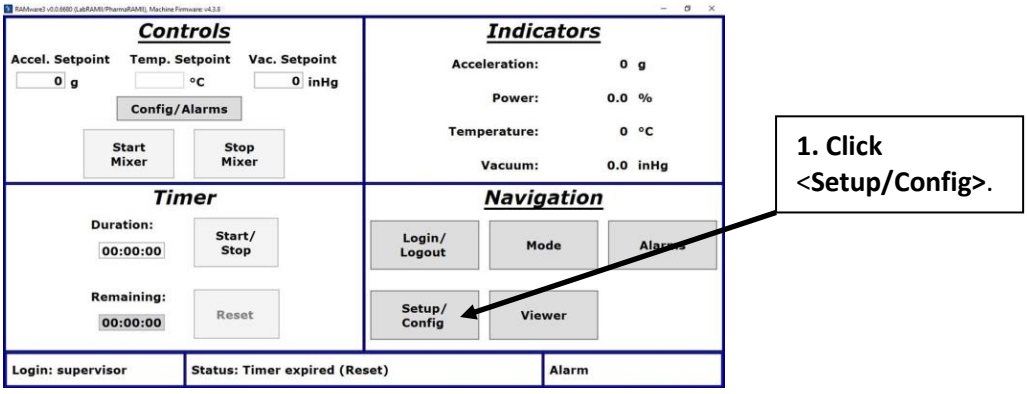
An appropriate **Configuration** must be specified prior to mixing. In Recipe Mode, this is done when the Recipe is defined (see Recipe Management section on page 40). In Auto Mode, this is done from the "**Main Screen**" using the <**Config/Alarms**> button in the **Controls** panel, as described in the Auto Mode Configuration and User-defined Alarm Limits section on page 20.

The details of each **Configuration** can be edited by a supervisor level user, including selection of one of the pre-defined fixtures as well as optional equipment to be included such as temperature sensors. For RAM 5 mixers, options for mixing vessel and vacuum chuck equipment are also included in the **Configuration**. **Configurations** can be created, edited, and deleted by any supervisor level user on the *Config* tab of the "**Settings and Configuration**" screen (accessed via <**Settings/Config**> button on **Navigation** panel of the "**Main Screen"**), as described below.

Editing Fixture and Optional Equipment Configurations

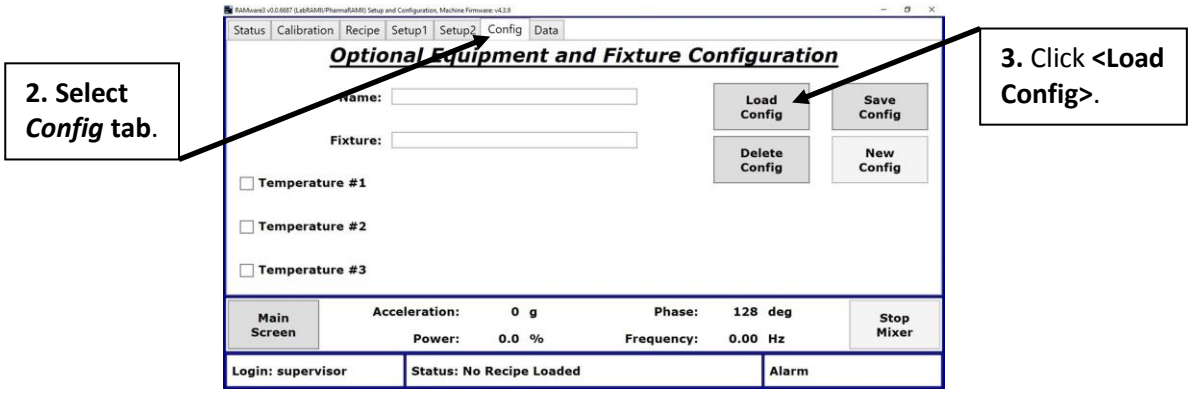
To edit optional equipment and fixture configurations, first log in as a supervisor (highest privilege level, see "Logging In" section on page 9), and then perform the following steps.

1. Click on the <**Settings/Config**> button on **Navigation** panel of the "**Main Screen**". The *Status* tab of the **"Settings and Configuration"** screen will appear.

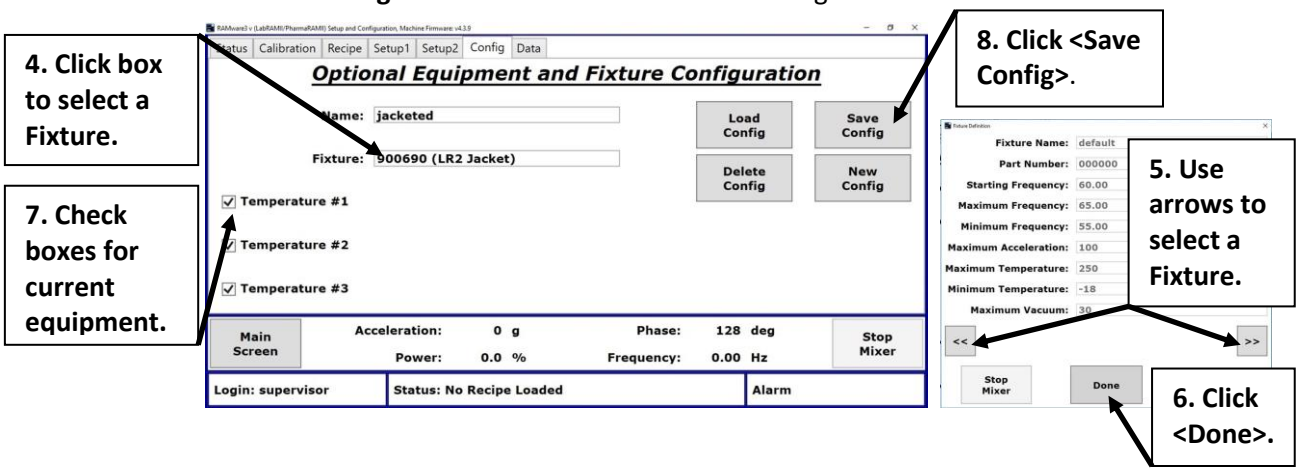


2. Click on the *Config* tab at the top of the screen and the *Config* tab screen will be displayed. From here you can load or delete an existing **Configuration**, create a new configuration (as long as there are less than 8 **Configurations** already existing), or save a **Configuration** you have created or modifed.

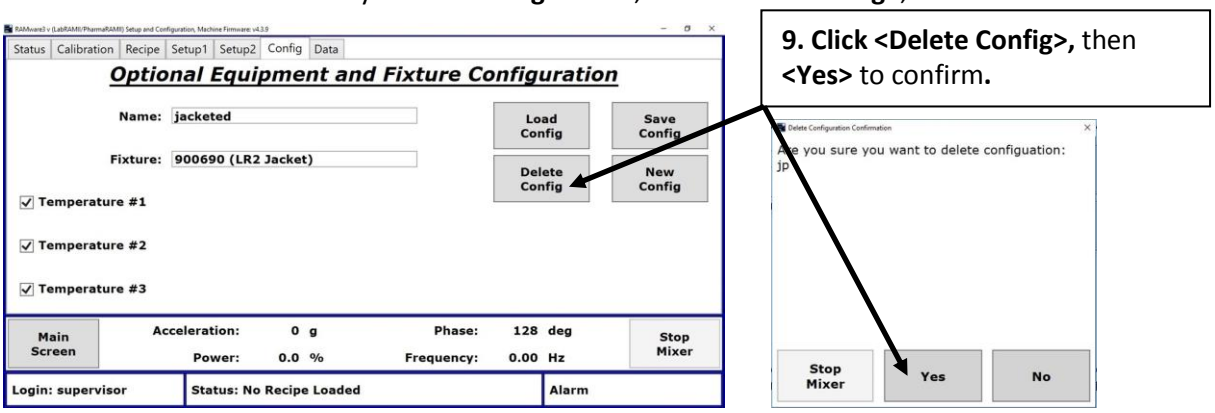
3. To load an existing **Configuration**, click <**Load Config**> to load the configuration you wish to edit.



4. To modify the loaded configuration, click in the "Fixture" box to open the "Fixture Selection" dialog.
5. Click on the left/right arrows to select a fixture.
6. Click <**Done**> to complete the Fixture selection and close the dialog box.
7. Check or uncheck the boxes which correspond with any optional equipment which will be used with this configuration (i.e. Temperature #1, #2, and #3).
8. Click the <**Save Config**> button to save the modified Configuration.



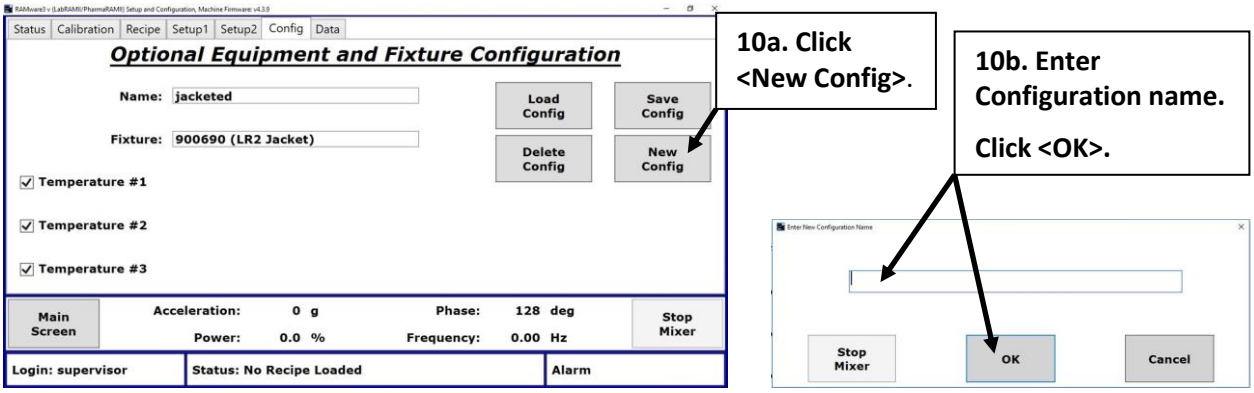
9. To delete the currently loaded **Configuration**, click <**Delete Config**>, and click <**Yes**> to confirm.



10. To create a new **Configuration**,

    a. Click the <**New Config**> button. (**Note**: this button is only active if there are less than 8 configurations already saved.) This opens the "Enter New Configuration Name" dialog.

    b. Use the keyboard to enter the name of the configuration. Then click <**OK**>.



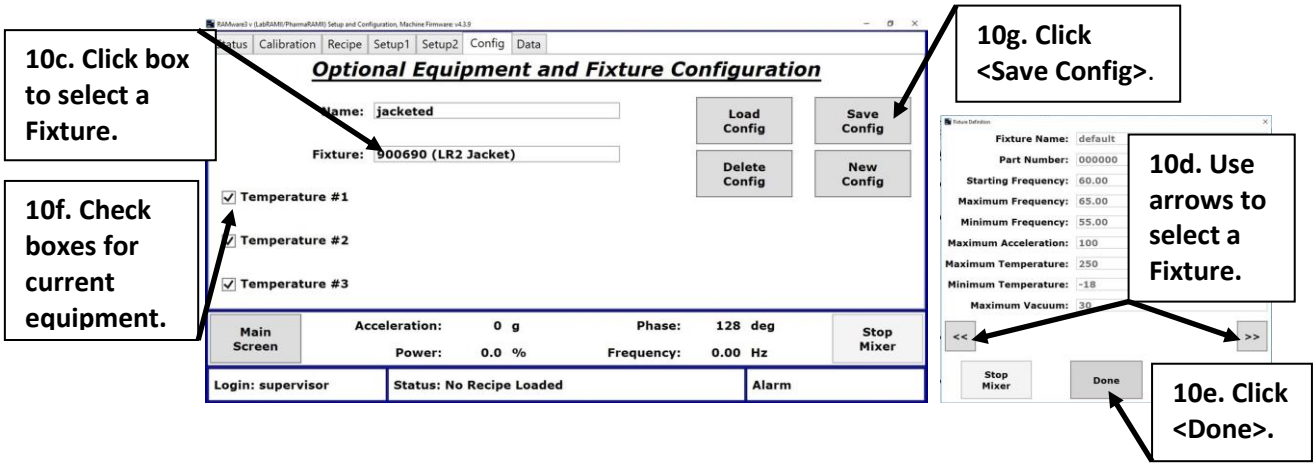
    c. Click in the "Fixture" box to open the "Fixture Selection" dialog.

    d. Click on the left/right arrows to select a fixture.

    e. Click <Done> to complete the Fixture selection and close the dialog box.

    f. Check or uncheck the boxes which correspond with any optional equipment which will be used with this configuration (i.e. Temperature #1, #2, and #3).

    g. Click the <Save Config> button to save the newly created Configuration.


10c. Click box to select a Fixture.
10f. Check boxes for current equipment.
10g. Click <Save Config>.
10d. Use arrows to select a Fixture.
10e. Click <Done>.
Calibration
Recipe
Setup1
Setup2
Config
Data
Optional Equipment and Fixture Configuration
jacketed
Fixture:
900690 (LR2 Jacket)
Load Config
Save Config
Delete Config
New Config
Temperature #1
Temperature #2
Temperature #3
Main Screen
Acceleration: 0 g
Power: 0.0 %
Phase: 128 deg
Frequency: 0.00 Hz
Stop Mixer
Login: supervisor
Status: No Recipe Loaded
Alarm
Fixture Name: default
Part Number: 000000
Starting Frequency: 60.00
Maximum Frequency: 65.00
Minimum Frequency: 55.00
Maximum Acceleration: 100
Maximum Temperature: 250
Minimum Temperature: -18
Maximum Vacuum: 30
<<
>>
Stop Mixer
Done

Alarms

Each RAM mixer protects itself and the user by monitoring operational parameters that could cause damage or injury if allowed to go beyond safe bounds. When any of these parameters are violated, an **Alarm** is generated and the mixer will stop accelerating/mixing. The user is notified of the **Alarm** in the lower right hand corner of 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 has occurred, and yellow indicates a warning.

User-specified **Alarm** limits must be entered prior to mixing. In Recipe Mode, this is done when the recipe is defined (see Recipe Management section on page 40). In Auto Mode, this is done from the "**Main Screen**" using the <**Config/Alarms**> button in the **Controls** panel, as described in the Auto Mode Configuration and User-defined Alarm Limits section on page 20.

The "**Alarms**" screen, accessed via the <**Alarms**> button in the "**Navigation Panel**" of the "**Main Screen**" allows viewing and acknowledgement of alarms. The Alarms screen is in a tabular format that shows when each alarm was triggered, a message describing the issue, when the alarm was acknowledged, when the alarm was recovered (the condition corrected), and the alarm ID number.

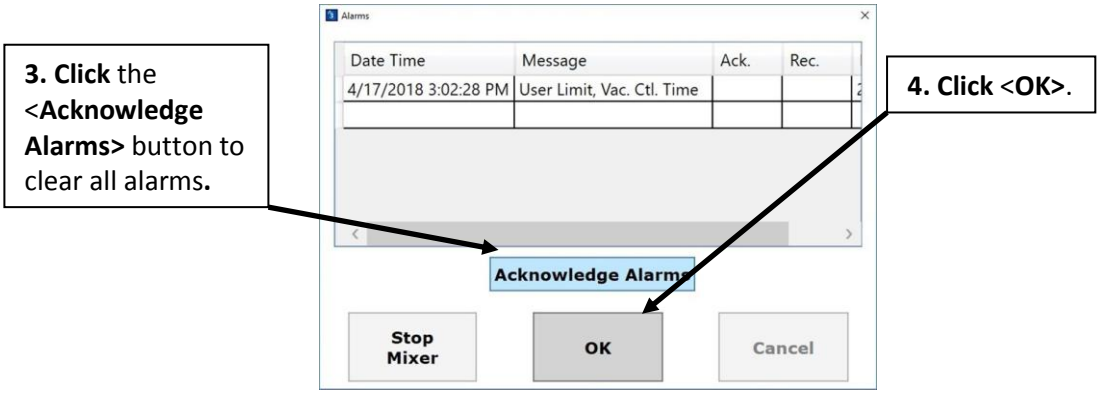
Whenever an alarm is triggered, recovered, or acknowledged, a log file stored in the RAM mixer's memory is updated. The alarm logs, like all data generated by the RAM mixer, can be accessed via the RAMware^3 software (see "Viewing Historical Alarm Data" on page 33 for instructions on viewing alarm logs.)

Using Alarms

Some alarm limits are pre-programmed into the RAM mixer to ensure the mixer is not subjected to conditions outside acceptable bounds. Other alarm limits are set by the user before operating in **Auto Mode** or during recipe creation and editing based on the conditions required by the specific mixture being processed (i.e. acceleration, temperature, and vacuum.) For instructions on setting or changing user-specified alarm limits in **Auto Mode**, see the "Auto Mode Configuration and User-defined Alarm Limits" section on page 20. For instructions on setting or changing user-specified alarm limits in Recipe Mode, see the "How to Create or Edit a Recipe" section on page 43.

Instructions for viewing and acknowledging alarms are given below.

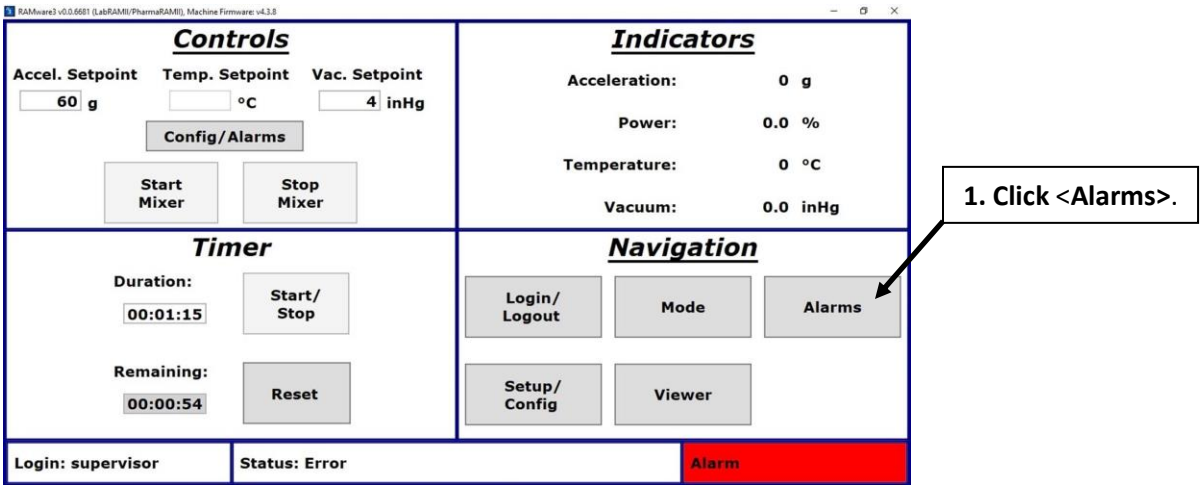
1. **Click** the <**Alarms**> button in the "**Navigation**" panel of the "**Main Screen"**.
2. **Review** the cause of the alarm(s) and make sure the cause(s) of the alarm(s) has been recovered/corrected.
3. **Click** the <**Acknowledge Alarms>** button to clear all alarms**.**
4. **Click <OK>** to return to the "**Main Screen**"**.**



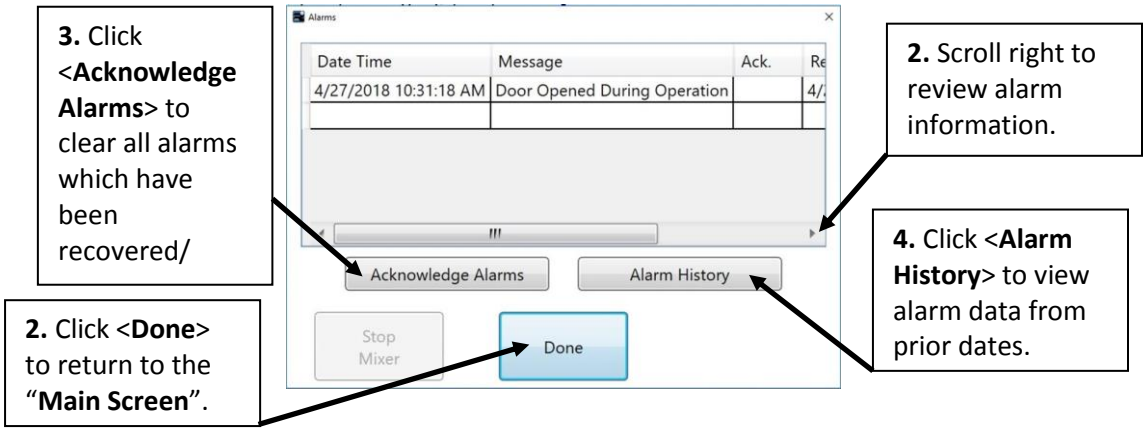
Viewing Historical Alarm Data

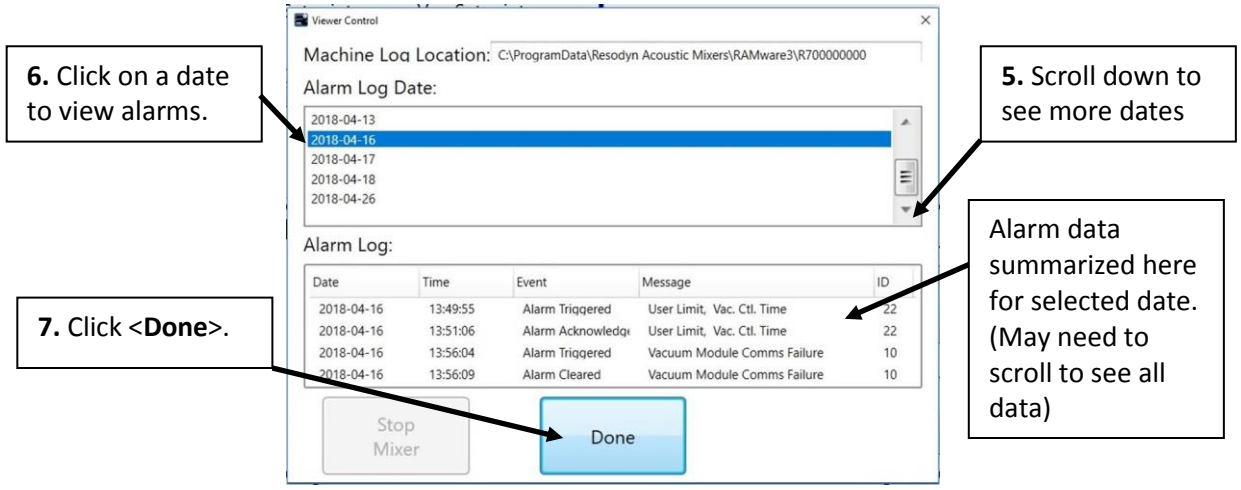
The procedure for viewing historical alarm data is described below.

1. Click the <**Alarms**> button on the "**Main Screen**". The alarms dialog opens.



2. Scroll to the right to review all the information about each alarm.
3. To acknowledge all currently listed alarms which have been recovered, click <**Acknowledge Alarms**>. Once all alarms have been recovered and acknowledged, the RAM mixer can be restarted.
4. To view all historical alarms from any prior date stored in the mixer, click <**Alarm History**>.
5. Use vertical scroll bar to view the prior dates of interest
6. Click on a date to view all alarms logged on that date.
7. Click <**Done**> to return to "**Alarms**" dialog.


3. Click <**Acknowledge Alarms**> to clear all alarms which have been recovered/
2. Click <**Done**> to return to the "**Main Screen**".
Alarms
Date Time
Message
Ack.
4/27/2018 10:31:18 AM
Door Opened During Operation
Acknowledge Alarms
Alarm History
Stop Mixer
Done
2. Scroll right to review alarm information.
4. Click <**Alarm History**> to view alarm data from prior dates.

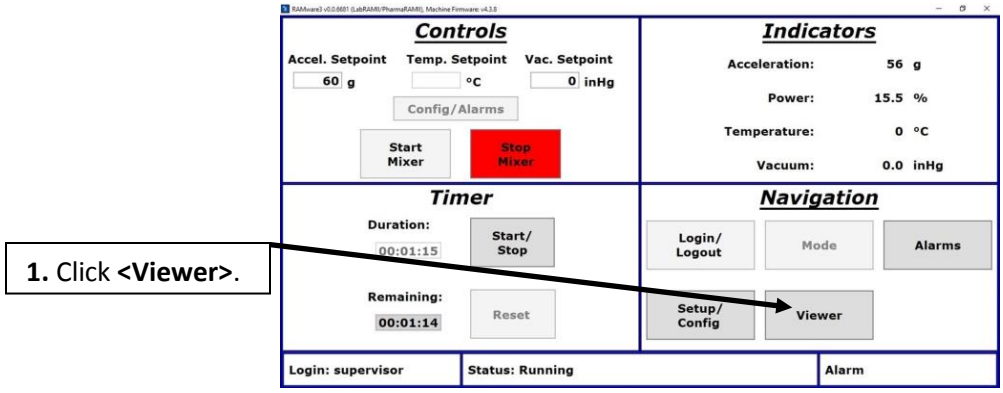

6. Click on a date to view alarms.
7. Click <**Done**>.
Viewer Control
Machine Log Location: C:\ProgramData\Resodyn Acoustic Mixers\RAMware3\R700000000
Alarm Log Date:
2018-04-13
2018-04-16
2018-04-17
2018-04-18
2018-04-26
Alarm Log:
Date
Time
Event
Message
ID
2018-04-16 13:49:55 Alarm Triggered User Limit, Vac. Ctl. Time 22
2018-04-16 13:51:06 Alarm Acknowledge User Limit, Vac. Ctl. Time 22
2018-04-16 13:56:04 Alarm Triggered Vacuum Module Comms Failure 10
2018-04-16 13:56:09 Alarm Cleared Vacuum Module Comms Failure 10
Stop Mixer
Done
5. Scroll down to see more dates
Alarm data summarized here for selected date. (May need to scroll to see all data)

Viewer – Working With Captured Mixing Data

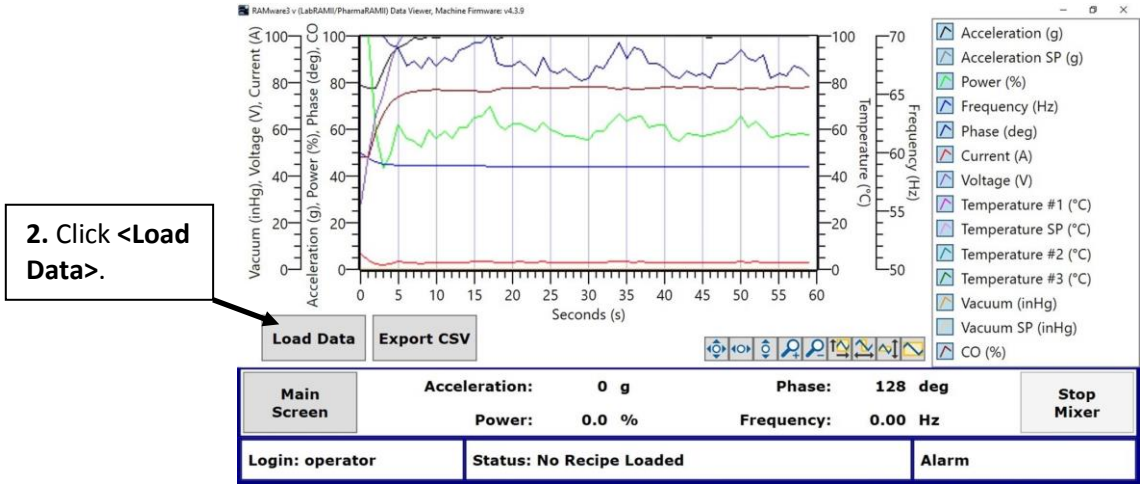
Viewer – Accessing Mix Data

Mix data can be viewed while the mix is running or at a later time. The **<Viewer>** button located in the **"Navigation"** panel, allows users to view real-time data or historical data from a specified run as trend lines, in a time-history format. RAMware[3] collects and stores the data each time the RAM mixer runs.

1. To access your data, click the **<Viewer>** button on the **"Navigation"** panel. This will launch the **"Viewer"** module, and real-time data from the current or most recently viewed run will be plotted.

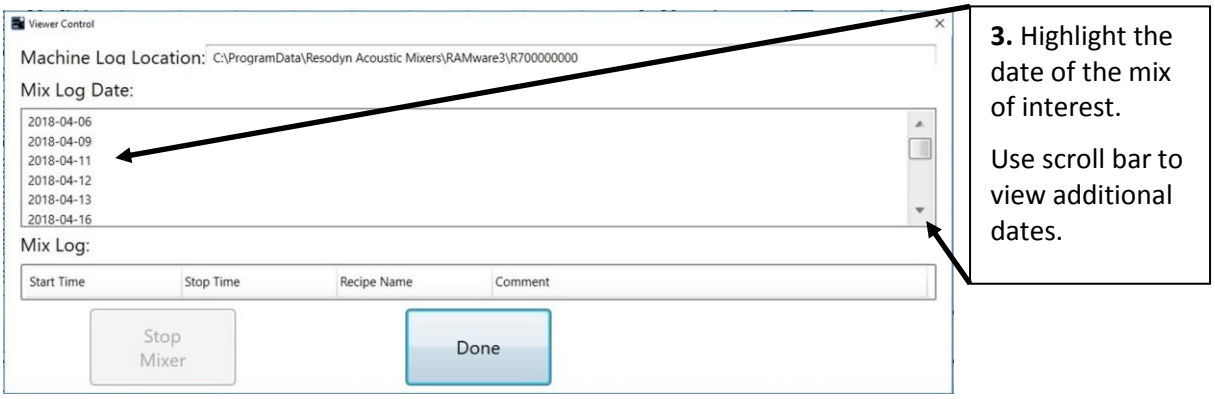


2. To view data from a different mix (i.e. historical data), click the **<Load Data>** button in the lower left-hand corner. This will open the **"Mix Log"** dialog box.



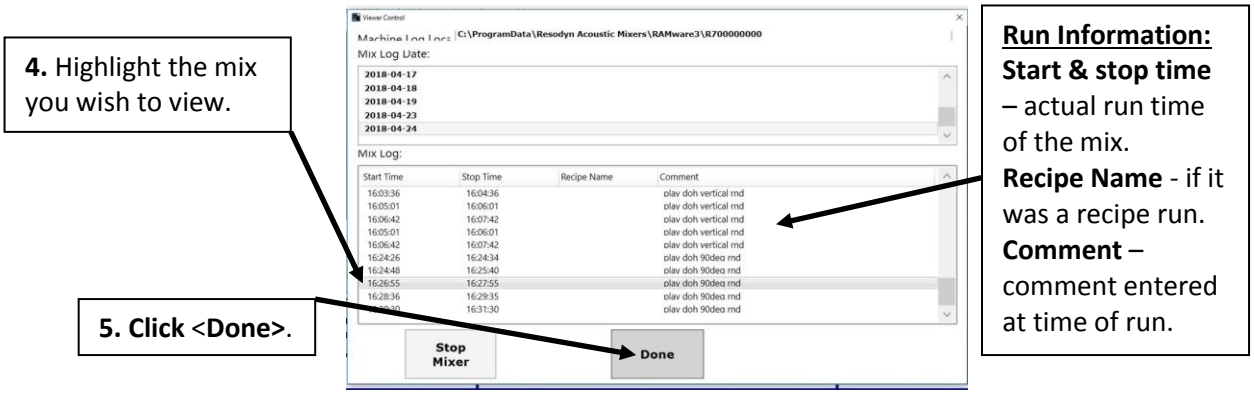
The **"Mix Log"** dialog displays all the mix files which reside on the Mixer hard drive. To view logged mix data from a particular date, highlight that date.

3. In the "Mix Log Date" box **Highlight** the **date** on which the mix of interest was performed. Use the scroll bar if needed to view additional dates in the list.



The **"Mix Log"** dialog box will then list all the mixes that ran on the selected date.

4. **Highlight** the specific **mix** for which you wish to view or export data.
5. Click **<Done>** to view the graph for the selected run.

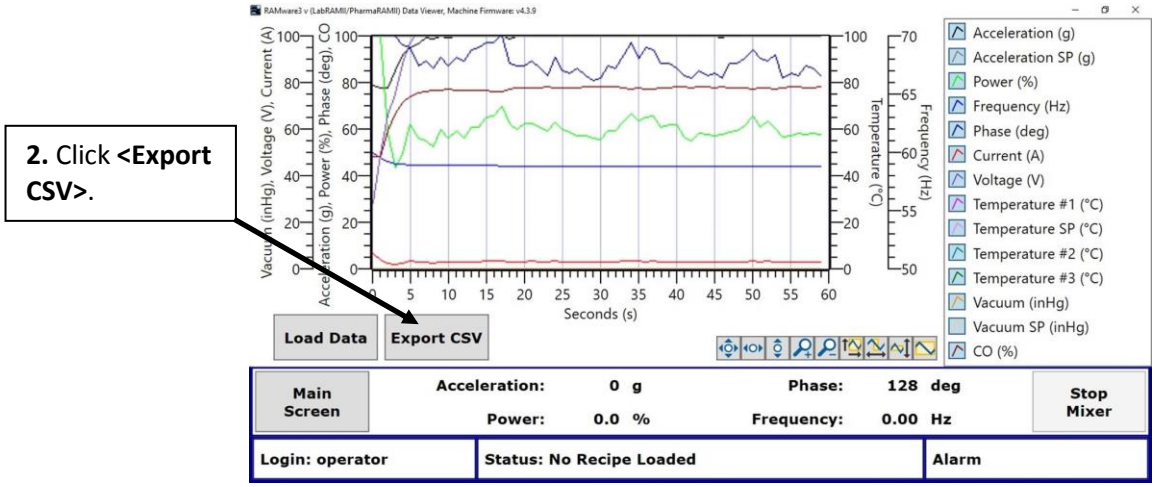


This graph displays the historical data generated during the selected mix. Every time the RAM mixer runs, **Viewer** plots the data for that mix and stores it on the hard drive.

Viewer – Exporting Mix Data

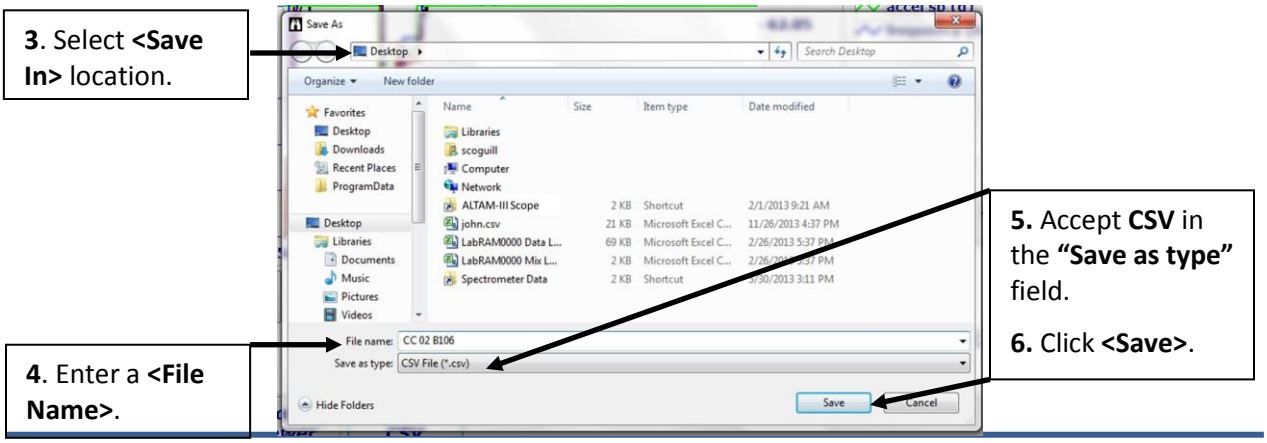
The Viewer can also be used to export the data currently pulled up in Viewer (can only export a single mix run at a time). If it is desired to export data for multiple runs at once, please use RAM Tools (a separate software package provided with each RAM mixer). The instructions to export the data currently selected in Viewer are given below.

1. From the Main Screen, open the Viewer and load the data you wish to export, as described in the "Viewer – Working With Captured Mixing Data" section on page 35.
2. Click <Export CSV> and the data export dialog will come up.



The Microsoft **"Save As"** dialog box appears.

3. In the **"Save in"** field select the location for the exported data to reside.
4. In the **"File name"** field enter a name for this data file.
5. In the **"Save as type"** field accept the given file extension of CSV.
6. Click **<Save>**.



Viewer – How to Customize Viewer Graphs

Any trend line on the Viewer plot can be hidden/re-displayed by clicking on the icon for that trend in the legend to the right of the plot – the legend symbol is greyed out when the trend line is hidden. The trend line plot view can also be manipulated by the buttons beneath the plot which include pan, zoom, and fit to window options. A description of the function of each button is shown when the mouse is hovered over that button. When real-time data are being viewed, instantaneous values for Acceleration, Power, Frequency, and Phase are each shown in a panel below the plot.

The trend lines plotted by Viewer are:

- **Acceleration (g)** – this trend line represents the acceleration being produced by the motion of the RAM mixer. Acceleration represents how vigorously the material is being mixed.
- **Acceleration sp (g)** – this trend line represents the acceleration setpoint.
- **Power (%)** – this trend line represents the amount of input power that is being provided to the RAM mixer. Power is automatically adjusted by the mixer to obtain the acceleration setpoint.
- **Frequency (Hz)** – this trend line represents the frequency at which the mix container on the RAM mixer is cycling (the number of times the mixer platform goes up-and-down in one second.) This number serves as a diagnostic item only and is not customer adjustable.
- **Phase (deg)** – this trend line represents the shift between the input force and the payload acceleration and can be used as a diagnostic or indicator of change in the mixing regime/characteristics.
- **Current (A)** – this trend line represents the real-time total current which is being drawn by the mixer in amps.
- **Voltage (V)** – this trend line represents the real-time voltage being supplied to the mixer in volts.
- **Temperature #1, #2, or #3 (°C)** – these trend lines represent the temperature measured from the temperature sensor on channels #1, #2, or #3. If no sensor is connected or temperature is disabled in the specified configuration, these will read zero.
- **Temperature SP (°C)** – this trend line represents the setpoint for Temperature #1, if applicable.
- **Vacuum (inHg)** – this trend line represents the measured vacuum level (relative to ambient pressure) in inches of mercury. For example, if the ambient pressure is 28.5 inches of mercury absolute (0.95 atm) and the vacuum pulls the mix pressure down to 0.5 inches of mercury absolute (0.017 atm), this corresponds to a vacuum level of 28.0 inHg relative to ambient.
- **Vacuum SP (inHg)** – this trend line represents the vacuum level setpoint.
- **CO (%)** – this trend line represents the percentage of allowable power needed to achieve acceleration setpoint.

1. All 14 trendlines are displayed on the graph by default. To toggle between hide/show state for each trendline, click on the corresponding trend checkbox in the legend. Hidden trend checkboxes in the legend appear greyed out and the trend lines disappear.
2. Use the buttons on the right hand side below the plot to
   a. pan the view up/down/left right (first button to the left),

b. pan the view left/right along the time axis (second button),

c. pan the view up/down (third button),

d. zoom in (fourth button),

e. zoom out (fifth button),

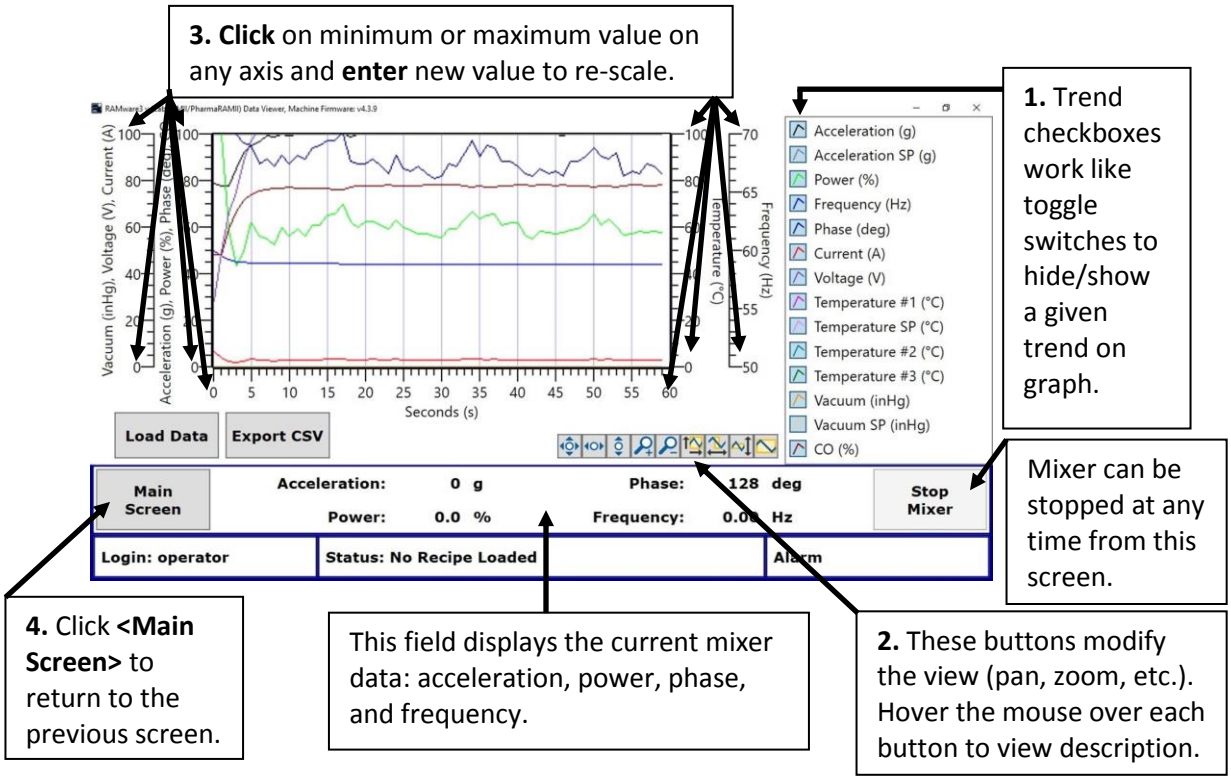
f. vertical and horizontal zoom within selected square (sixth button- click the button, then click and drag a rectangle around the area of the plot you want to zoom in on),

g. horizontal zoom (time axis) within selected square (seventh button- click the button, then click and drag a rectangle over the area of the plot you want to zoom in on),

h. vertical zoom within selected square (eighth button- click the button, then click and drag a rectangle over the area of the plot you want to zoom in on), and

i. zoom to fit (ninth/last button- will zoom in as far as possible on each trendline, such that the entire duration of the mix is included, adjusting each axis accordingly.

3. Click on the minimum or maximum value of any axis on the plot (horizontal or vertical) and use the keyboard to enter a new value to re-scale the trend-lines associated with that axis.



4. Click **<Main Screen>** to return to the "**Main Screen**" or click <**Stop Mixer**> to stop the mixer at any time. Returning to the "**Main Screen**" and restarting the viewer by clicking <**Viewer**> will reset the view to the default (displays entire mix duration with all ten trend-lines).

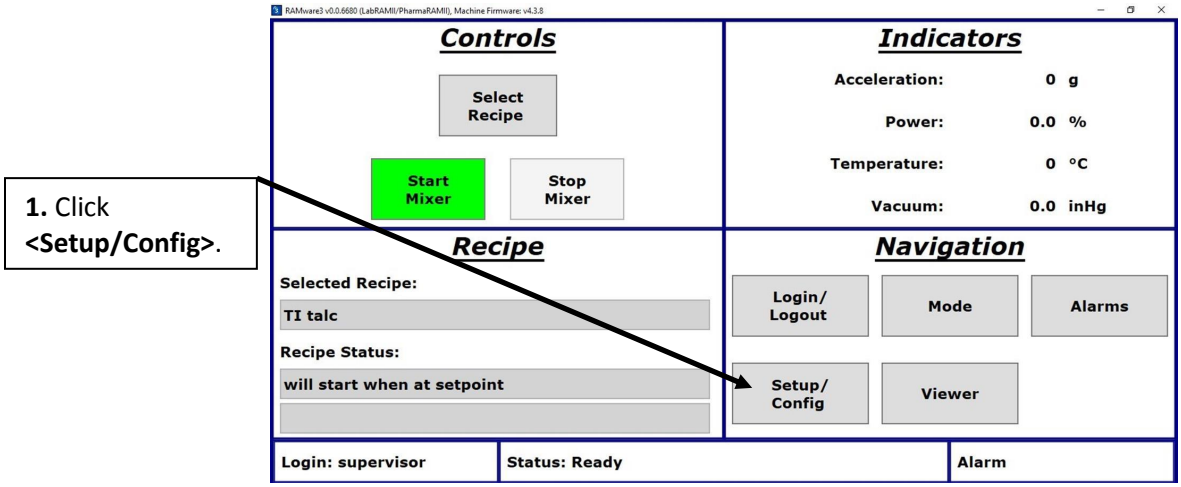
Recipe Management

How to Access the Recipe Maintenance Module

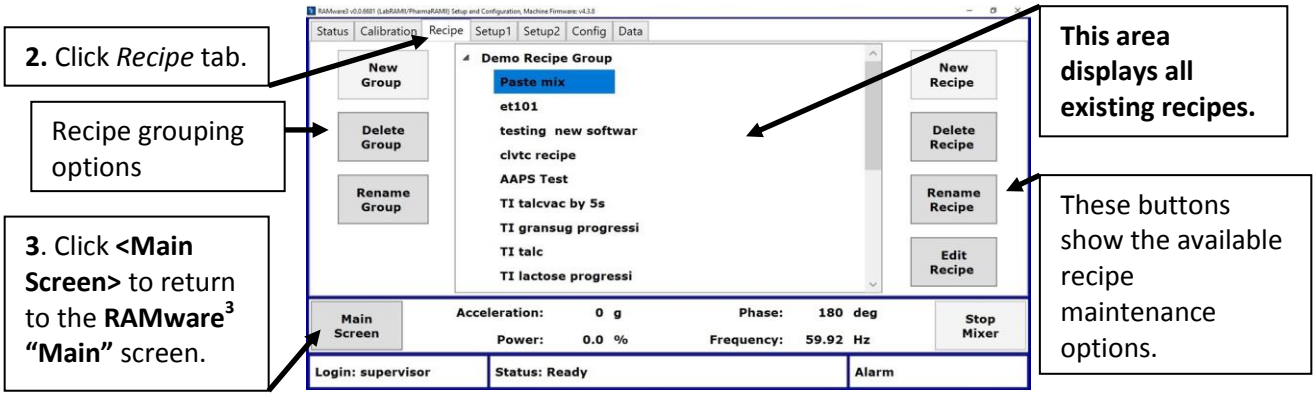
RAMware[3] contains a recipe feature which allows users to create/edit/save, and delete recipes.

The recipe maintenance module can be accessed through the **"Setup and Configuration"** screen when logged in at the "supervisor" level of privileges.

1. Click on the **<Setup/Config>** button in the **"Navigation"** panel. This will open the **"Setup and Configuration"** screen.



2. Click the *Recipe* tab to open the recipe editing screen.
3. Modify recipes as desired (see following section) and click **<Main Screen>** to return to the **RAMware[3] Main** screen.

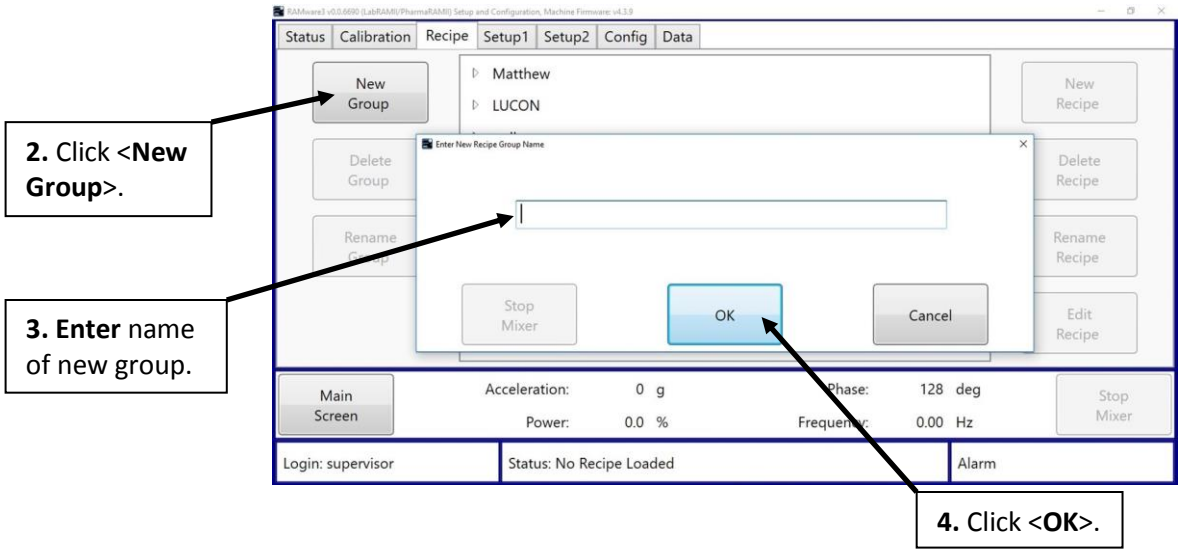


How to Manage Recipe Folders

Once the Recipe Maintenance Module has been accessed through the *Recipe* tab of the **"Setup and Configuration"** screen as described in the previous section (page 40), you are ready to create, edit, and group your recipes. Recipes can be organized into up to 10 folders of 10 recipes each. Once a recipe belongs to a folder it cannot be moved to a different folder or location without deleting the recipe and re-creating it in the new location, so thought should be given to recipe organization when a recipe is first created. Once 10 groups exist, an existing group and all recipes associated with it must be deleted prior to creating a new group.

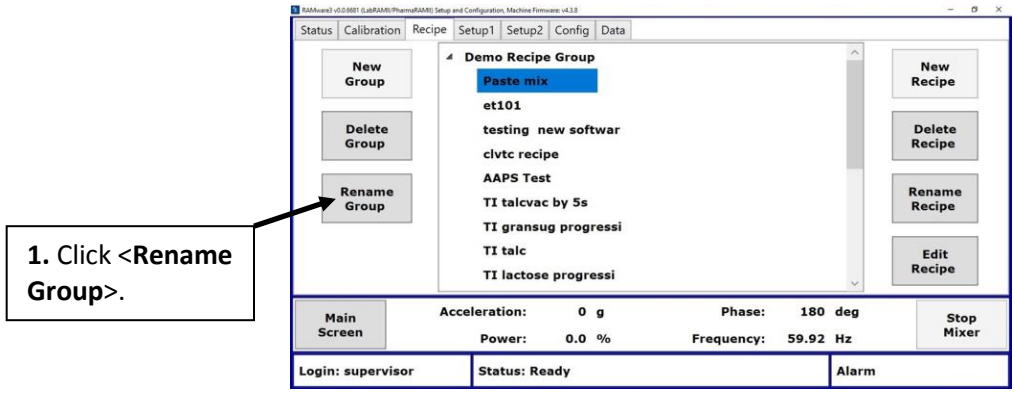
A user creating a recipe should first determine in which of the existing folders the recipe should be placed, or whether a new folder should be created for the recipe. Instructions on how to create a new recipe folder and rename or delete an existing folder are given below.

1. Access the recipe maintenance module as described in the section entitled "How to Access the Recipe Maintenance Module" on page 40.
2. To create a new recipe group, click <**New Group**> (only possible if 9 or less groups are present). The "**Enter New Recipe Group Name**" dialog appears.
3. Type the new Group name in the box.
4. Click <**OK**>.

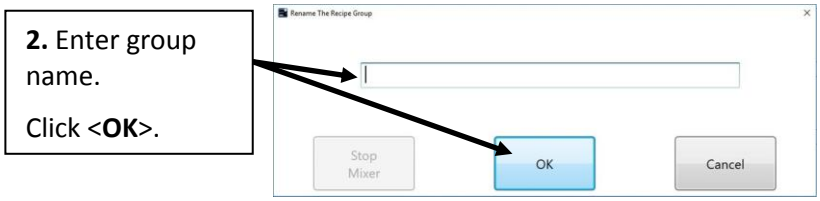


To rename an existing group of recipes:

1. Click on the <**Rename Group**> button. You will be asked to confirm if you are sure.

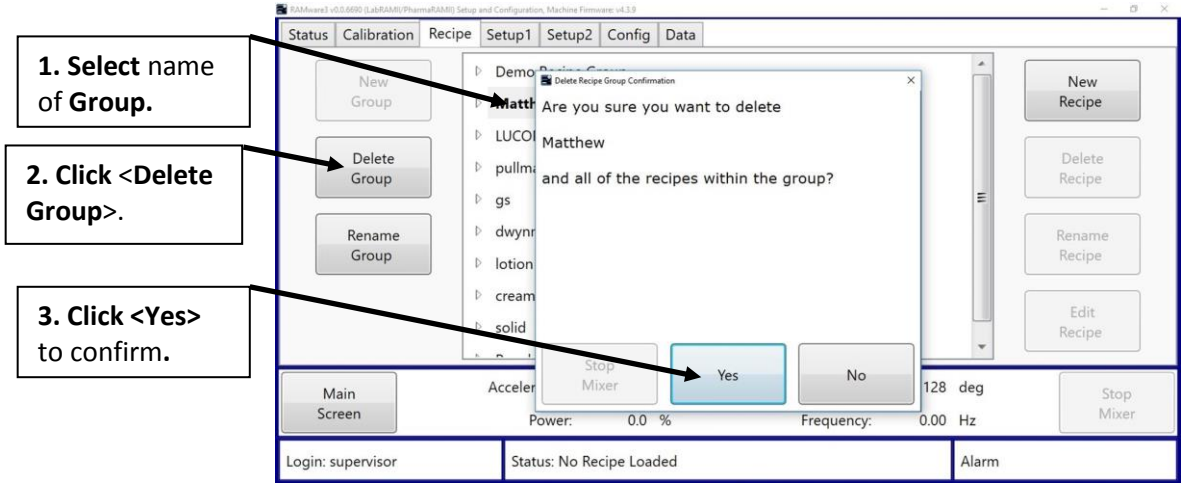


2. Type the new name of the group and click <OK>.



To delete an existing group of recipes:

1. Select the name of the Group you wish to delete.
2. Click on the <**Delete Group**> button. You will be asked to confirm if you are sure.
3. Click <Yes> to confirm that you want to delete the group and all the recipes in it.

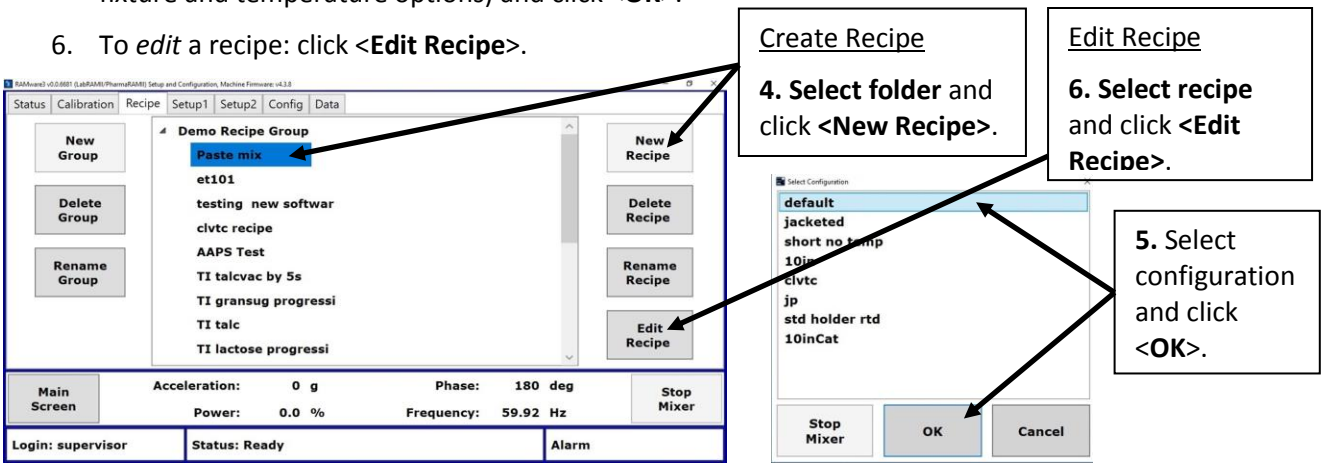


How to Create or Edit a Recipe

Once the Recipe Maintenance Module has been accessed through the *Recipe* tab of the **"Setup and Configuration"** screen as described in the section entitled "How to Access the Recipe Maintenance Module" (page 40), you are ready to create, edit, and group your recipes. Note that only 100 recipes (10 folders with 10 recipes each) are able to be stored on a RAM mixer at any one time. To create a recipe once the limit has been reached, an existing recipe must first be deleted. A user creating a recipe should first determine in which of the existing folders the recipe should be placed, or whether a new folder should be created for the recipe. Instructions on how to create a new recipe folder and rename or delete an existing folder are given in section entitled "How to Manage Recipe Folders" on page 41.

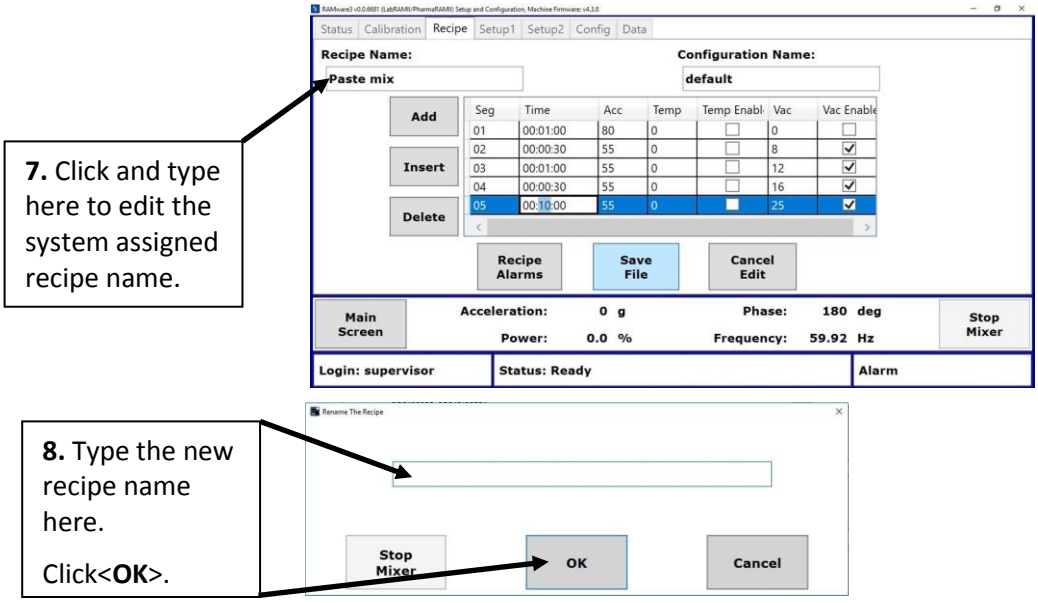
Creating and editing a recipe involve the same steps except that a different button is used to access each. To create a recipe, follow steps 4 and 5, then skip to step 7 below. To edit a recipe skip steps 4 and 5 and start with step 6 below.

4. To *create* a recipe: Select the folder (or file inside the folder) where the new recipe will be located. Then click **<New Recipe>**. The system will automatically open the "Select Configuration" dialog box.
5. Click on the desired configuration name in the list to select a configuration (includes the desired fixture and temperature options) and click <**OK**>.
6. To *edit* a recipe: click <**Edit Recipe**>.

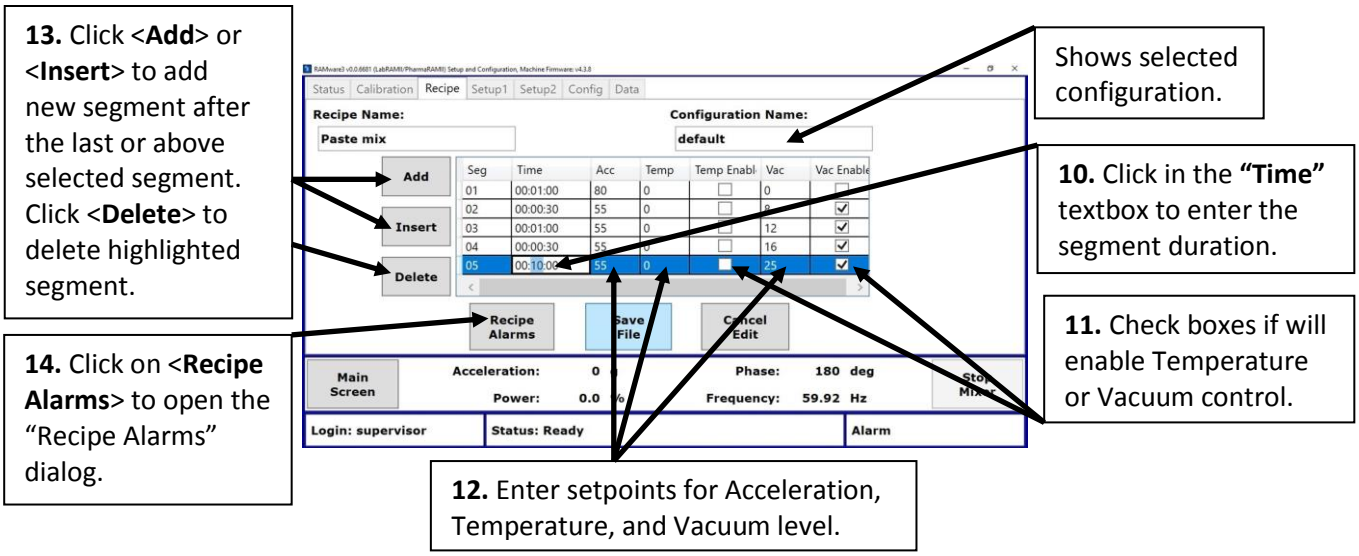


The recipe entry/editing section is then displayed. A recipe can include up to 10 segments, each containing a specific duration and acceleration setpoint, and optionally, a temperature setpoint and vacuum setpoint.

7. Click on the generic recipe name placeholder in the "**Recipe Name**" box to rename the recipe.
8. Enter the new name for the recipe in the "**Rename the Recipe**" box. Click <**OK**>.

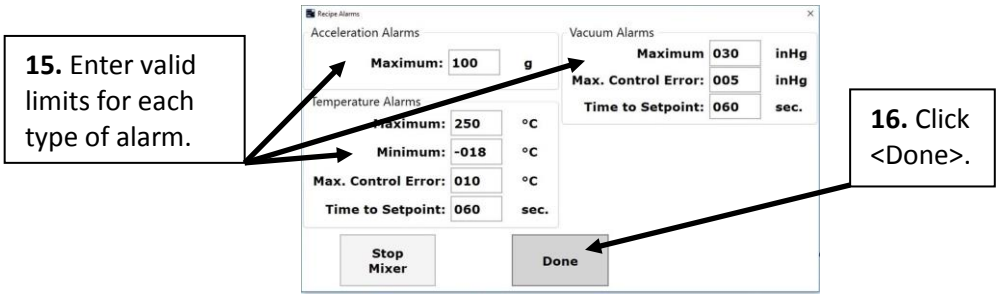


9. For each segment of the recipe (there can be up to 10), perform steps 9-12 below.
10. Click the **"Time"** textbox. The **Time Entry** dialog will be displayed. Use the arrows or keyboard to enter the duration for this segment of the recipe.
11. If Temperature or Vacuum control is desired, check the appropriate checkbox (under "**Temp Enable**" or "**Vac Enable**") for this segment.
12. Click in the box and use the keyboard to enter setpoints for the Acceleration, Temperature, and Vacuum level for this segment.
13. If an additional segment is desired, click the <**Add**> button to add a new segment after the last segment or click <**Insert**> to add a new segment above the selected segment. Click <Delete> to delete the selected segment.
14. Click on <**Recipe Alarms**> to set the alarms for this recipe.

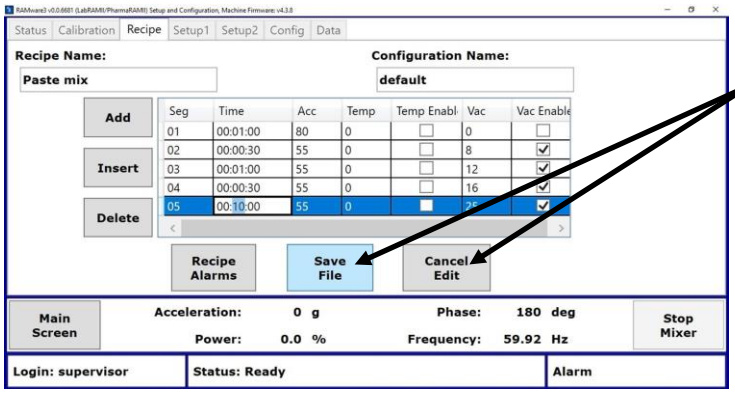


NOTE: Repeat steps 10-13 until the entire recipe has been entered.

15. Use the keyboard to enter limits for Acceleration, Temperature, and Vacuum alarms. RAM mixing will stop any time the measured value exceeds the user-specified maximum limit or drops below the user-specified minimum limit for acceleration, temperature, or vacuum level. Also, for Temperature (or Vacuum level), if the system is not able to reach the setpoint to within the user-specified "Max. Control Error" °C (or inHg) within the the user-specified "Time to setpoint" number of seconds, the RAM mixing will stop and an alarm will be generated. The limits entered must be within the following ranges: Acceleration 0 to 100 *g*; Temperature maximum and minimum 0 to 250 °C; Vacuum maximum 0 to 30 inHg; all max control error and time to setpoint limits 1 to 999.
16. Click <**Done**> to accept all values as entered and close the window, or <**Cancel Edit**> to discard your changes.

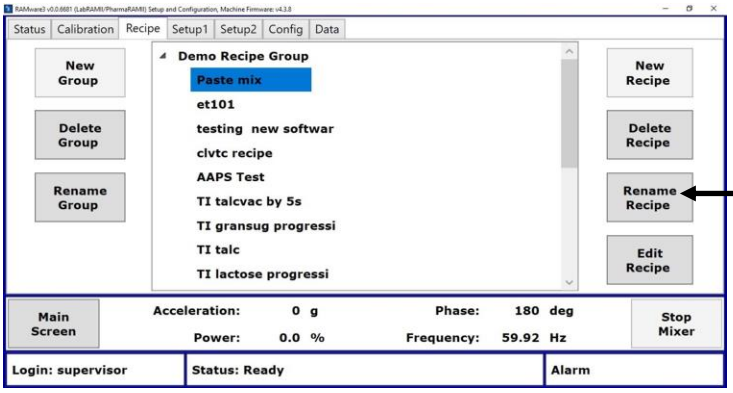


17. Once the recipe is complete, click **<Save File>** to save the recipe. A dialog will appear asking if you really want to save the Recipe. Click <**Yes**>.



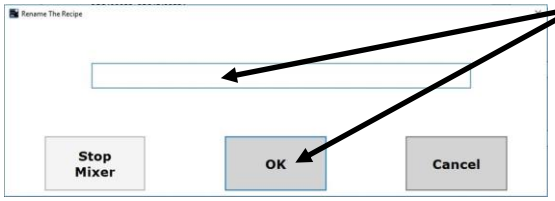
17. Click <**Save File**> to save the recipe or <**Cancel Edit**> to discard changes.

18. If desired, click **<Rename Recipe>** to change the name of this or any recipe.



18. Click **<Rename Recipe>**.

19. A dialog will appear, displaying the current recipe name. Click in the recipe name box and enter the new name for the recipe. Click **<OK>**. The list of recipes is redisplayed, with the new recipe name.



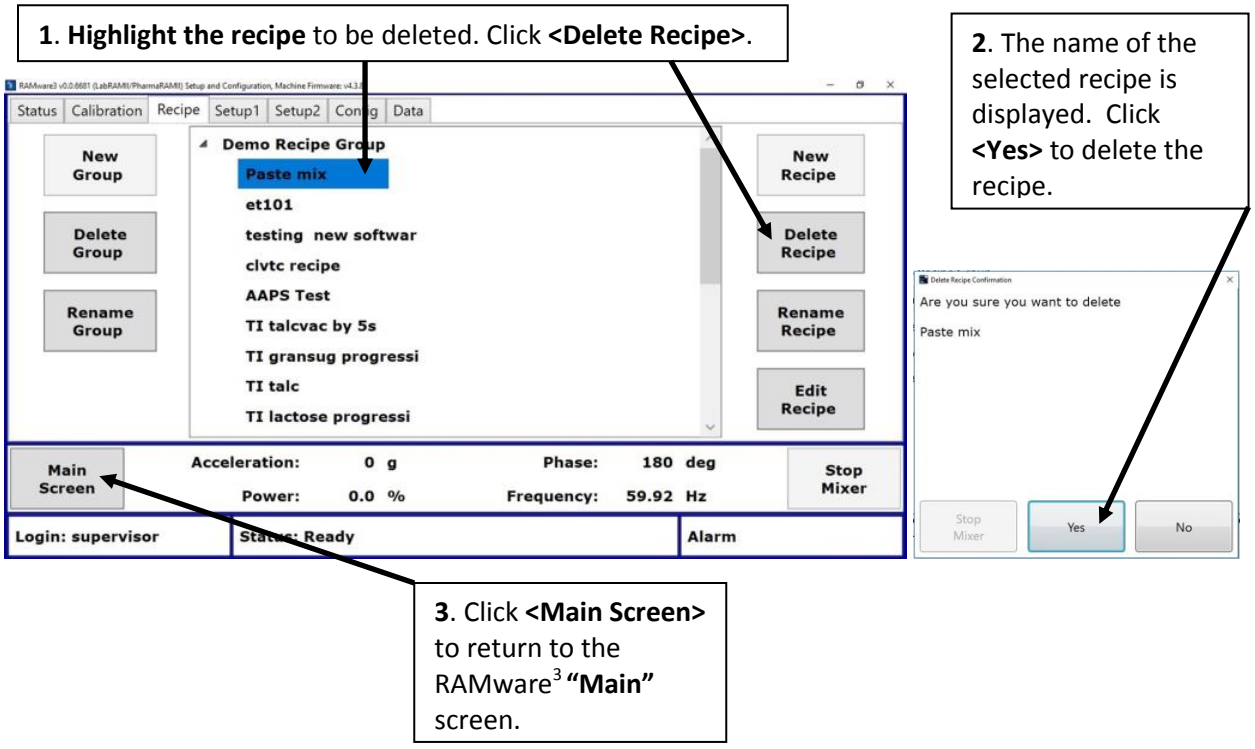
19. Enter the name for this recipe. Click **<OK>**.

20. Click **<Main Screen>** to return to the **RAMware[3] "Main"** screen.

How to Delete a Recipe

To delete a recipe, the Recipe Maintenance Module is first accessed through the *Recipe* tab of the **"Setup and Configuration"** screen as described in the section entitled "How to Access the Recipe Maintenance Module" on page 40. Then the following instructions apply.

1. Highlight the recipe to be deleted. Click **<Delete Recipe>**.
2. The **"Delete Recipe Confirmation"** dialog box appears, displaying the name of the selected recipe. Click **<Yes>** to delete the recipe.
3. Click **<Main Screen>** to return to the **RAMware[3] "Main"** screen

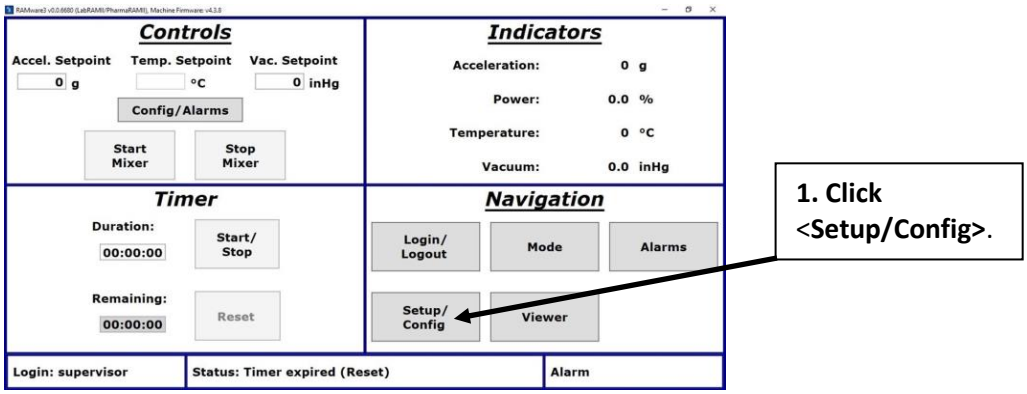


Sensor Calibration

To maintain safe, consistently high-quality mixing, it is recommended that the sensors for the control loops associated with RAM mixing be properly calibrated before use. The sensors that were shipped with your RAM mixer were calibrated at the factory. The *Calibration* tab of the "**Setup and Configuration**" screen is used to verify calibrations and to adjust calibration coefficients as needed. 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 sensors can be calibrated with any standard systems used for that purpose. The "Zero" calibration constant represents the offset between the apparent value read by the sensor and the true value based on a calibration standard at the *minimum* value of interest (sensor reading – true value). The "Calibration" constant represents the ratio between the true value based on a calibration standard and the apparent value read by the sensor (corrected for offset) at the *maximum* value of interest [true value/(sensor reading + "Zero" offset value].

Calibrated sensor values will be used for the Accelerometer, Temperature, and Vacuum control loops and for the values recorded in the data files during mixing. This section describes how to view and edit the calibration constants. You must be logged in at a supervisor privilege level to modify the calibration values.

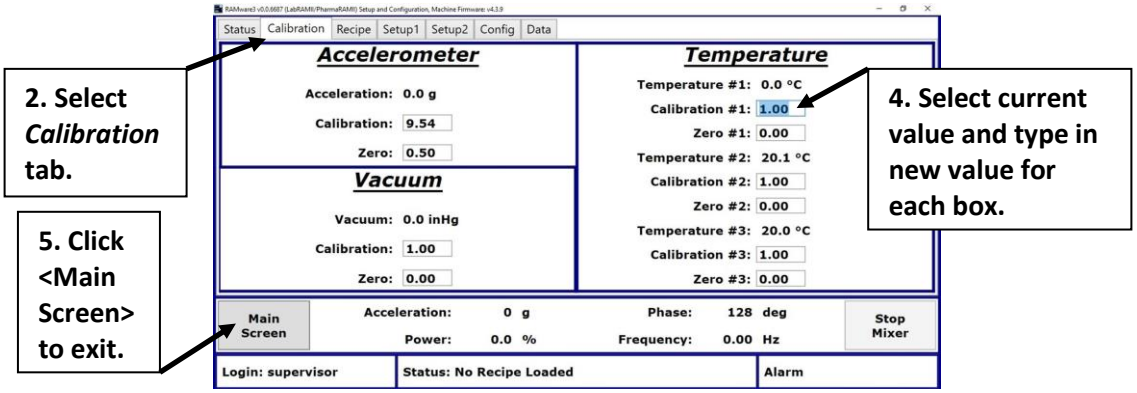
1. **Click** the <**Setup/Config**> button in the "**Navigation**" panel of the "**Main Screen"**. This will open the *Status* tab of the "**Setup and Configuration**" screen.



2. Select the *Calibration* tab on the "**Setup and Configuration**" screen.
3. Make a note or take a photo of all the calibration constants as currently entered (these may not be recoverable once altered, and no confirmation is required to change them.)
4. Click in each Accelerometer, Temperature and Vacuum zero or calibration constant box to be updated, select the old value, and type in the updated constant.
    a. Zero values: the offset between the apparent value read by the sensor and the true value based on a calibration standard at the *minimum* value of interest (sensor reading – true value).

b. Calibration values: the ratio between the true value based on a calibration standard and the apparent value read by the sensor (corrected for offset) at the *maximum* value of interest [true value/(sensor reading + "Zero" offset value].

5. Confirm the updated calibration constants have been correctly entered and click the <**Main Screen**> button or select any other tab to automatically save the values on the page.



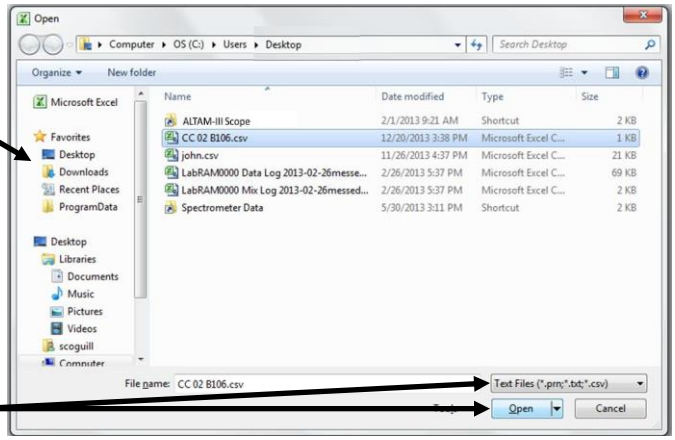
Appendix A – How to View Data Exported from Viewer

Each time the RAM mixer is run, RAMware[3] collects and stores mix data on the hard drive of your computer. Using the RAM Viewer application, users can export this data (as explained in the section "Viewer – Exporting Mix Data" on page 37) to be used in an Excel file. Microsoft Excel must be on the user's computer in order to use this feature. Note that RAM Tools can also be used to export RAM mixer data. Following are instructions for viewing data after exporting as a csv file.

Open Microsoft Excel.

1. Within Excel, select **>File, >Open**. The **"Open"** dialog box appears.
2. In the **"Look in"** field select the location of the exported file.
3. In the **"Files of type"** field select **txt.csv** files.
4. Click **<Open>**.

2. Select the location of the exported CSV file.



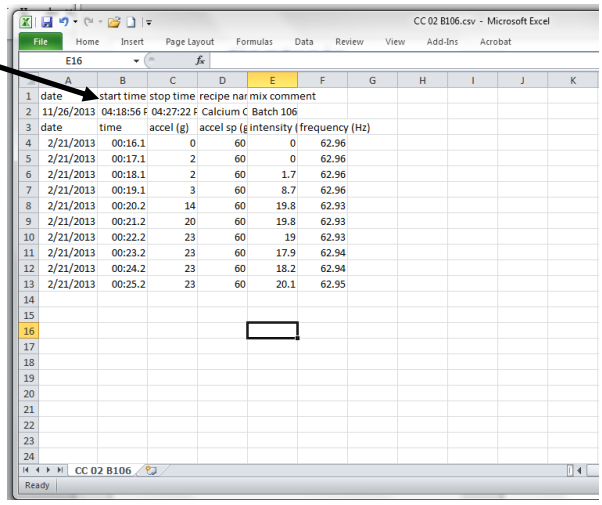
3. Select **txt, csv** files.

4. Click **<Open>**.

The exported data is now displayed in an Excel Spreadsheet.

The second column of the spreadsheet contains **"Start Time"** data. This column must be reformatted to properly display the exported time data.

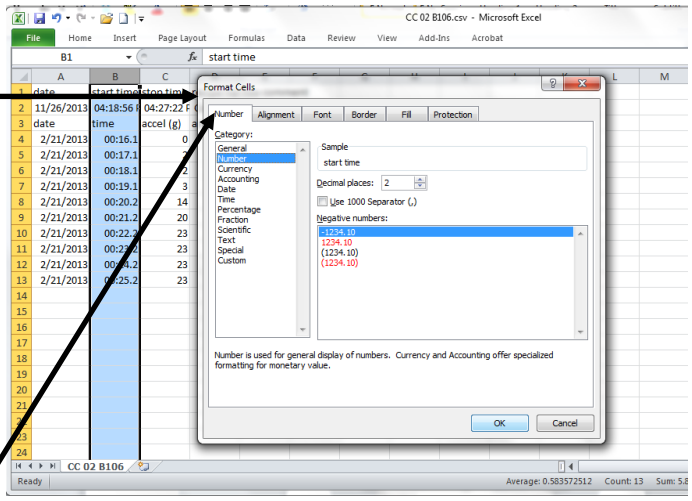
1. Right click on the **"start time"** column, B.



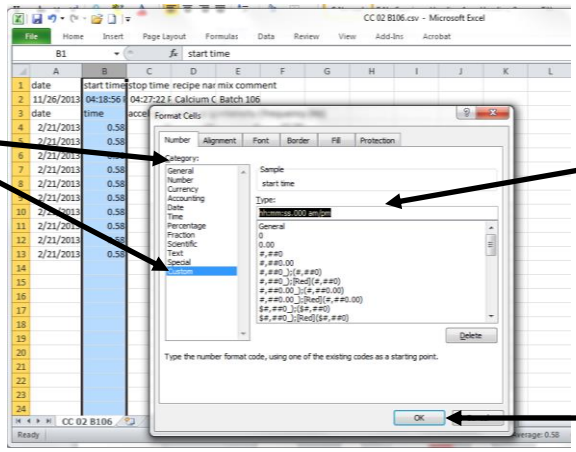
1. Right click on the **"Start time"** column.
2. Select **>Format Cells**.
3. The **"Format Cells"** dialog box appears. Click the **<Numbers>** tab.

2. Select **"Format Cells"**.

3. Click the **<Numbers>** tab.



4. Within the **<Numbers>** tab, in the **"Category"** field select **"Custom"**.
5. In the **"Type"** field enter: **hh:mm:ss.000 am/pm**.
6. Click **<OK>**.

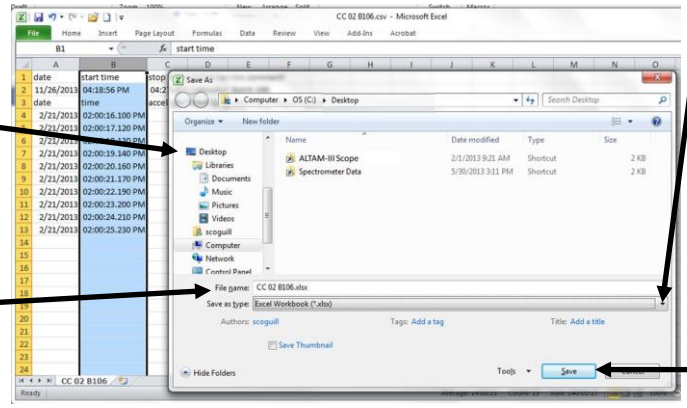


The **"Start Time"** field **now properly displays the exported time data** in this spreadsheet.

7. **Save your spreadsheet** as an actual **.xls file**. Click **File > Save As**.

The Microsoft **"Save As"** dialog box appears.

8. In the **"Save in"** field select the location for the exported data to reside.
9. In the **"File name"** field enter a name for this data file.
10. In the **"Save as type"** field select .xls (Microsoft Excel Workbook).
11. Click **<Save>**.



This exported file is now ready for use.