User Guide

Molecular Devices AWES Automation Assistant

Revision 4

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Contents

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SAFETY SUMMARY

Warnings and Cautions in this Manual

Refer to the ImageXpress Micro and other integrated device's manuals for pertinent safety information. Consult each applicable section in the user's manuals and heed all displayed and defined warnings and cautions.

NOTE: **CAUTION!** Safety glasses must be worn when working within the SCARA work envelope. When teaching positions with the SCARA, move the robot at appropriate speeds.

NOTE: There is the potential for labware spillage when moving filled plates with the SCARA. Perform a dry run before running with actual reagents/samples and take appropriate precautions.

NOTE: An Abort button is displayed during movements of the SCARA initiated from the options form or manual control form of the SCARA SILAS Module. Clicking the Abort button will not cause the SCARA to stop moving immediately. Rather, it will complete moving to the next point in the path before stopping. The E-stop button can be used to stop movement of the SCARA immediately.

Introduction

Overview

This document provides operating instructions for the AWES Automation Assistant for a Molecular Devices ImageXpress Micro imager. The AWES Automation Assistant is a robotic plate loader application for the ImageXpress Micro that allows automated processing of up to 207 microplates by the ImageXpress Micro in a preconfigured order.

> **NOTE:** This document only provides operating instructions for the AWES Automation Assistant hardware and software. For installation and configuration instructions refer to the separately provided installation manual.

System Components

The following items are provided as part of the AWES Automation Assistant integration:

- Plate position with MS-3 barcode reader
- (1) 18-shelf plate hotel
- Network hub and cables
- E-Stop button for the SCARA
- SCARA framing block
- AWES Automation Assistant Software

Prerequisites

- PreciseFlex PF 400 SCARA
- ImageXpress Micro XLS, Confocal, or 4
- Cytomat 2C or Cytomat 6001 Storage Device

It is assumed that all hardware and software components listed in the previous section have been installed and properly configured. It is also assumed that the ImageXpress Micro functions correctly in stand-alone mode, as well as through external control. All SCARA accessible positions on the system should have been properly framed.

> **NOTE:** For detailed installation and configuration instructions for the AWES Automation Assistant refer to the AWES Automation Assistant installation manual (*INSTALL - AWES Automation Assistant*).

AWES Automation Assistant Software

Overview

The AWES Automation Assistant software is a stand-alone software application that allows walk-away configuration and execution of imaging by the ImageXpress Micro. The AWES Automation Assistant software lets the user configure protocols and/or journals to run for each plate, controls lid removal and replacement, handles barcode reading, and remotely controls the ImageXpress Micro through MetaXpress software. The AWES Automation Assistant software also provides logging of system data (executed actions and reported errors).

➢ Supported Labware Types

The following points need to be taken into consideration when choosing labware for use with the AWES Automation Assistant:

- Lidded and lidless ANSI/SBS - sized microplates with a gripper-accessible surface at least 3 mm in height are supported (the SCARA usually grips lidded plates at the skirt; lidless plates are usually gripped above the skirt). An example of these grips is shown in Figure 2.
- Plates less than 10 mm tall require a special adapter for the plate stage of the ImageXpress Micro. This adapter is supplied by Molecular Devices. [Note that the SCARA robot must be framed either with or without the adapter. Standard and short plates cannot be used in the same run.]
- Lidded plates are not supported in the ImageXpress Micro. The lid can be automatically removed by the SCARA and stored in the plate hotel during imaging of the plate.
- Molecular Devices 3-Slide Holder labware is supported.

➢ Supported Experiments

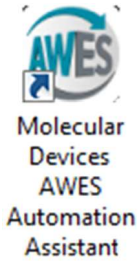
The AWES Automation Assistant supports protocols (`.HTS` files) and journals (`.JNL` files) as well as protocols that contain journals. These protocols and journals must have been previously created within the MetaXpress software and saved to files. For each plate to be processed, any combination of protocols and journals can be configured and will be executed in the configured order. Keep in mind that a journal may require user interaction.

➢ Order of Operation

The typical order of operation is as follows:

1. The user loads plates to be imaged into hotels and/or storage devices.
2. If a new labware type is introduced, the user defines the SCARA grips for the new labware type within the AWES Automation Assistant software.
3. Within the AWES Automation Assistant software, for each plate, the user selects one or more protocols/journals to be executed, the labware type, whether the labware is lidded, whether to read the plate barcode, and the location of the plate within the hotels.
4. If desired, the user can change the order in which plates are processed.
5. The user saves the configuration and starts execution of the automated plate imaging. Plates are processed in the order specified.
6. After all plates have been processed, the user must clear the current configuration before a new configuration can be entered.

Starting the AWES Automation Assistant Software



The AWES Automation Assistant software is typically started by double-clicking the shortcut icon on the desktop. The software can also be started from the **Start** menu by selecting **Start –> All Programs -> Molecular Devices AWES Automation Assistant**. The main window of the AWES Automation Assistant software is shown in Figure 1.

There are three tabs at the top of the main window, each containing a different user interface for a specific purpose: System, Logs, and Setup.

The **System** tab contains five items. A toolbar at the top ① contains buttons for running, pausing, and aborting a method, a check box for automatically restarting the system, as well as configuring and clearing the labware setup. The **Hotels** section ② shows the current status of the plates that are configured on the system. The **Labware** section ③ shows a variety of information about the plates within the system in a tabular format. The **Actions** section ④ shows all the actions executed by the AWES Automation Assistant software. At the bottom of the window is a bar ⑤ that shows an error history.

Clicking the **Configure Labware** button on the top menu displays the **Configure Labware** window (Figure 6). The window is divided into four sections. At the top of the window are controls for selecting one or more protocols and/or journals to run, the type of labware used, as well as whether or not the labware is lidded and whether or not to read the barcode. The **Hotels** section is used to select the hotel shelves of the configured labware. The **Labware** section shows information about the configured labware in table format. At the bottom of the screen are controls for specifying a run start delay, to load and save the configuration, and buttons for submitting or cancelling a labware configuration.

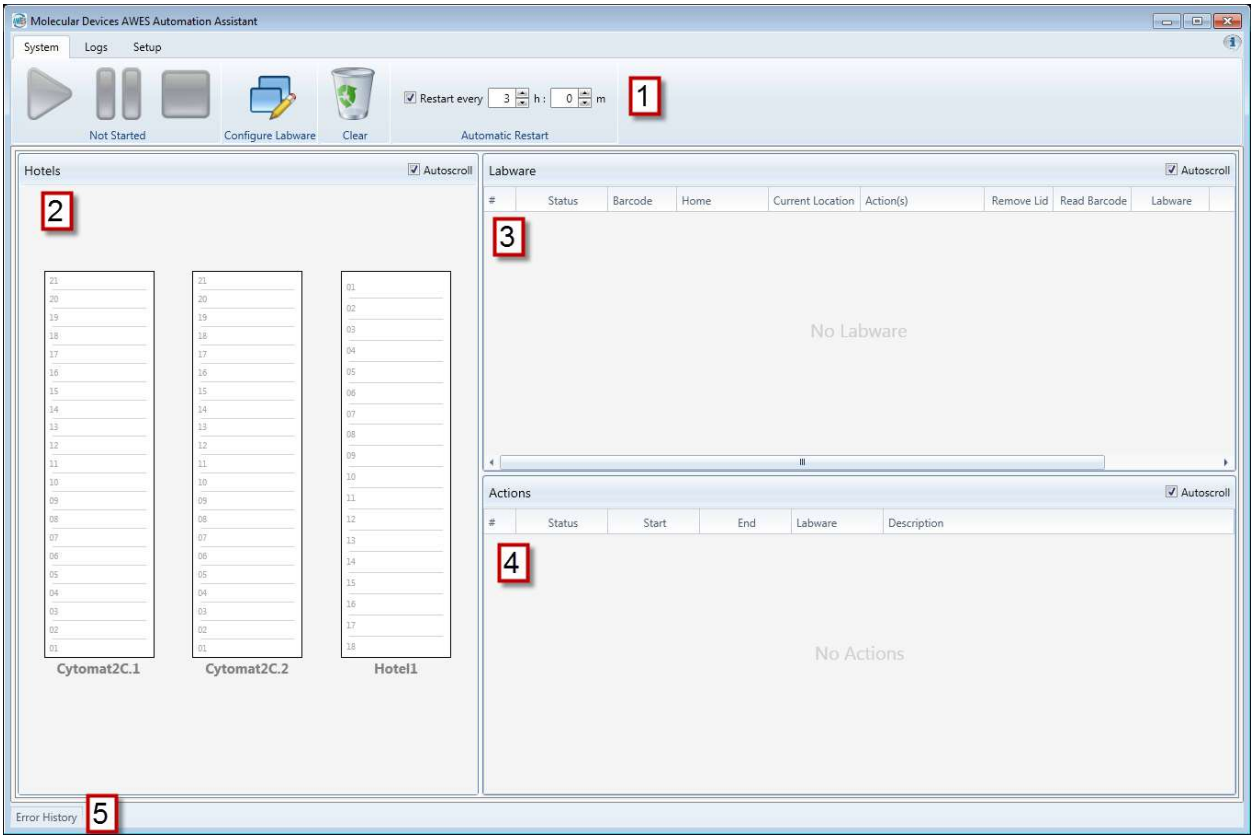


Figure 1 – Main Window

The **Logs** tab shows a user interface that allows viewing of current and past log data for labware and actions. Logged data are stored in a database and can be retrieved, filtered, and sorted.

The **Setup** tab contains three sections. A menu at the top contains buttons for accessing the Options and Manual Control dialogs for the SCARA, the Barcode Reader, and the ImageXpress Micro. The **Hotel Section** displays the number and capacity of hotels available. The **Labware Setup** section allows definition of different labware types in terms of gripper access by the SCARA. Each labware used in a method first has to be defined here. The **Setup** tab is only enabled after a labware configuration has been cleared.

Setup Tab

➢ Defining New Labware

Before a new labware type can be used, it must be defined in terms of gripper access by the SCARA. This is done in the **Labware Setup** section of the **Setup** tab (Figure 3). Each labware type requires the user to enter a labware name and four measurements that the software uses to determine the height at which the SCARA grips the plate and/or lid. Measurements are in millimeters and need to be accurate to allow correct placement and handling of plates and lids.

To define a new labware type:

1. Click the **Add** button to add a new labware type. This will add a row to the **Labware Setup** table.
2. In the newly created row, enter a name for the labware in the **Name** column.
3. If the labware is always lidless, skip this step. If the plate is ever lidded, then measure the distance (in millimeters) from the bottom of the plate to the height at which the SCARA gripper fingers need to

engage the lid (while on the plate) for lid removal. Measure to the middle of the finger pads. Refer to the graphics in the software (shown in Figure 2) for an illustration of the distance to be measured. The SCARA gripper pad is represented by the top, red line. Enter the distance from the labware bottom to the middle of the gripper in the **Lid On Labware** column.

4. If the labware is always lidless, skip this step. If the plate is ever lidded, measure the distance (in millimeters) from the bottom of the lid to the height at which the SCARA gripper fingers need to engage the lid for transport when not on a plate. (Figure 2) Ensure the height is measured from the bottom of the lid to the same point on the lid used in the previous step. Enter this value in the **Lid Only** column.
5. If the labware is always lidless, skip this step. If the plate is lidded, measure the distance (in mm) from the bottom of the plate to the height at which the SCARA gripper fingers need to engage the plate to transport it when lidded. This is usually on the skirt of the plate, although some plates have a very small skirt that makes it necessary to grip above the skirt, but without gripping the lid. Enter this value in the **Lidded Labware** column.

> **NOTE:** Certain types of lidded labware cannot be gripped by the SCARA gripper and therefore cannot be used. This is the case for plates with low skirts (< 3 mm) and lids that sit on or closely above the skirt. This is also the case for lids that have a tight fit, as the plate will then be lifted with the lid when lid removal is attempted. Always test new labware without valuable liquid present before actual use.

6. Measure the distance (in mm) from the bottom of the plate to the height at which the SCARA gripper fingers need to engage a lidless plate (after lid removal or if the plate never had a lid). The SCARA should grip the plate above the skirt in order to allow it to be placed into the ImageXpress Micro plate position without causing the SCARA gripper fingers to collide with the recessed plate stage. A height of 9.0 mm is recommended. Enter this value in the **Labware Only** column.

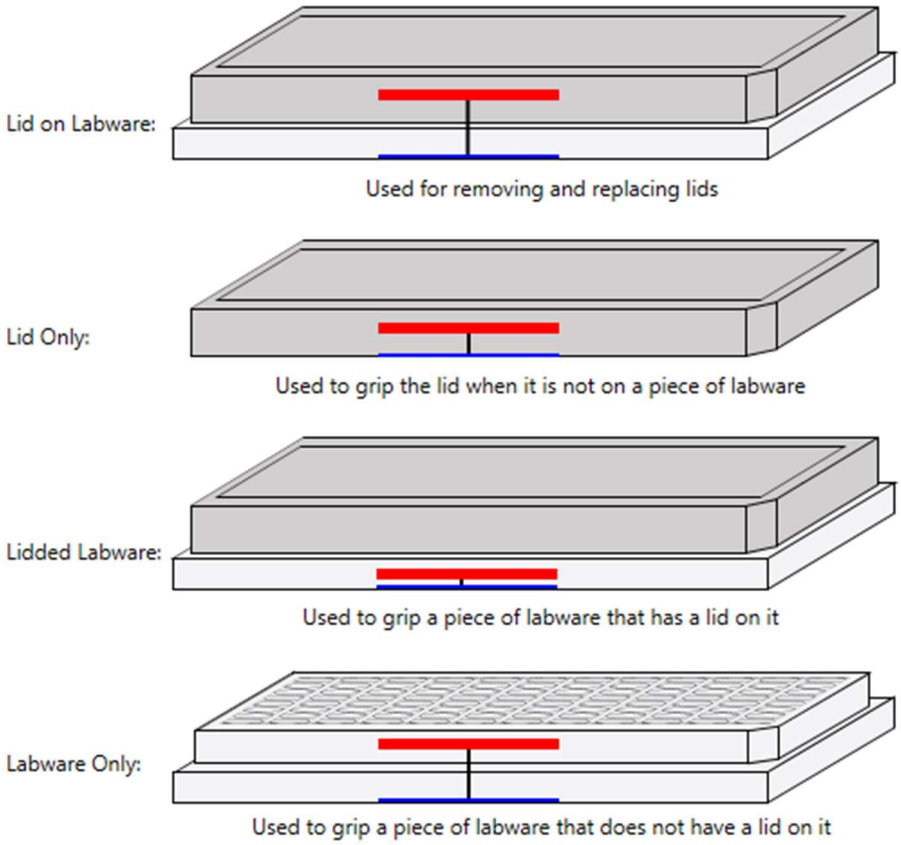


Figure 2 – Measuring Grip Offsets

> **NOTE:** For short plates (less than 10 mm tall), that need to be gripped lower, a modified plate stage (plate adaptor) for the ImageXpress Micro is available from Molecular Devices. If this is installed, then the SCARA must be retaught at the ImageXpress Micro and only short plates may be used on the system.

Figure 3 shows some example labware configurations for different types of plates.

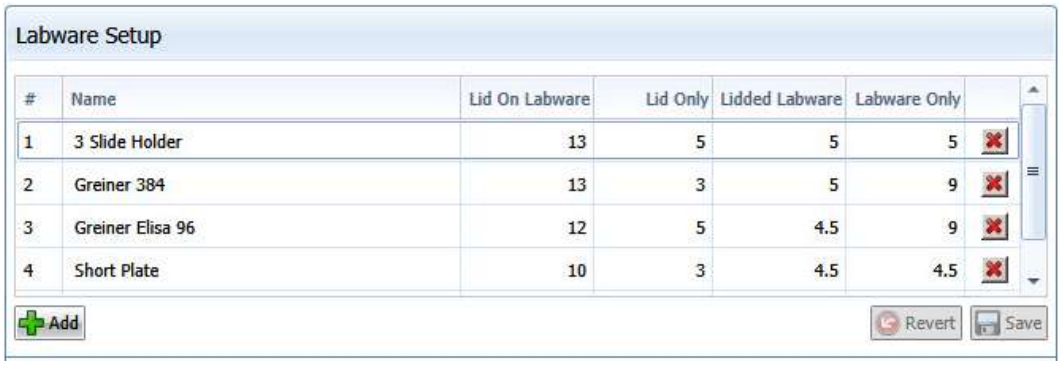


Figure 3 – Example Labware Definitions

7. After all labware has been defined, click the **Save** button to save the changes.

➢ Options and Manual Control Dialogs

The Options and Manual Control dialogs for the ImageXpress Micro, SCARA, storage device, and barcode reader can be accessed through the **Setup** tab of the AWES Automation Assistant. The Options

dialog is a user interface for configuring device specific options, such as communications settings. The Manual Control dialog is a user interface that allows execution of device specific commands, for example, reading a barcode using the barcode reader or moving a plate between positions using the SCARA. Manual Control is used for initial configuration, testing, troubleshooting, and during error recovery.

> **NOTE:** All device options are configured during installation of the system and should not need to be changed. Manual control of the SCARA through its Manual Control dialog may be necessary for error recovery. Refer to the "Appendix A: Error Handling" section on page 20 for more information on how to deal with errors.

System Tab

➢ Configuring Labware Setup

This section explains how to create a system labware configuration for an automated run. The labware configuration window is displayed by clicking the **Configure Labware** button on the main menu of the **System** tab. To configure labware:

1. Select one or more protocols and/or journals to run for a particular labware. Each piece of labware can be assigned different protocols/journals.
2. Specify the type of labware used for the currently selected protocols. The labware must match the labware specified when the protocols/journals were created.
3. Indicate whether the labware is lidded and whether the barcode needs to be read.
4. Select the position(s) of the labware within the hotels. Multiple positions can be selected. The plates will be processed in the order that the positions are selected, unless and until the list is rearranged.
5. Select a run start delay, if desired.
6. After all labware has been configured, optionally save the configuration for later use and submit the configuration.

Selecting Actions

> **NOTE:** All protocols or journals must be created and tested in MetaXpress software before they can be used with the AWES Automation Assistant software.

1. Within the **Configure Labware** window, click the **Actions** drop-down box. Initially, the **Selected Actions** and **Available Actions** lists will be empty (Figure 4).
2. If the protocol/journal desired is not already in the list, then add it to the **Available Actions** list by clicking the **Add New** button. The **New Action** dialog appears.
3. In the **New Action** dialog click the **Configure** button. This will bring up the Action Configuration Window.
4. Select the Action that you would like to perform from the drop down at the top.
5. Configure the action.
6. To get an accurate time estimate the protocol should be run from this screen using a representative plate and sample to what will be used in the actual run. If this cannot be done a time estimate may be entered in the boxes at the bottom of the window. The time estimate should be as accurate as possible.

> **NOTE:** If the exact time is not known, it is better to overestimate the time to prevent timeout errors.

7. Click **OK** to close the **Action Configuration** window.
8. Enter a **Name** for the Action. This will typically be the name of the protocol or journal that was selected.
9. Click on the desired protocol/journal in the **Available Actions** list to add it to the **Selected Actions** list. This is the list that will be executed. It can contain multiple protocols/journals, which will be executed in the order listed. The plate will remain in the ImageXpress Micro until all protocols/journals have been executed.

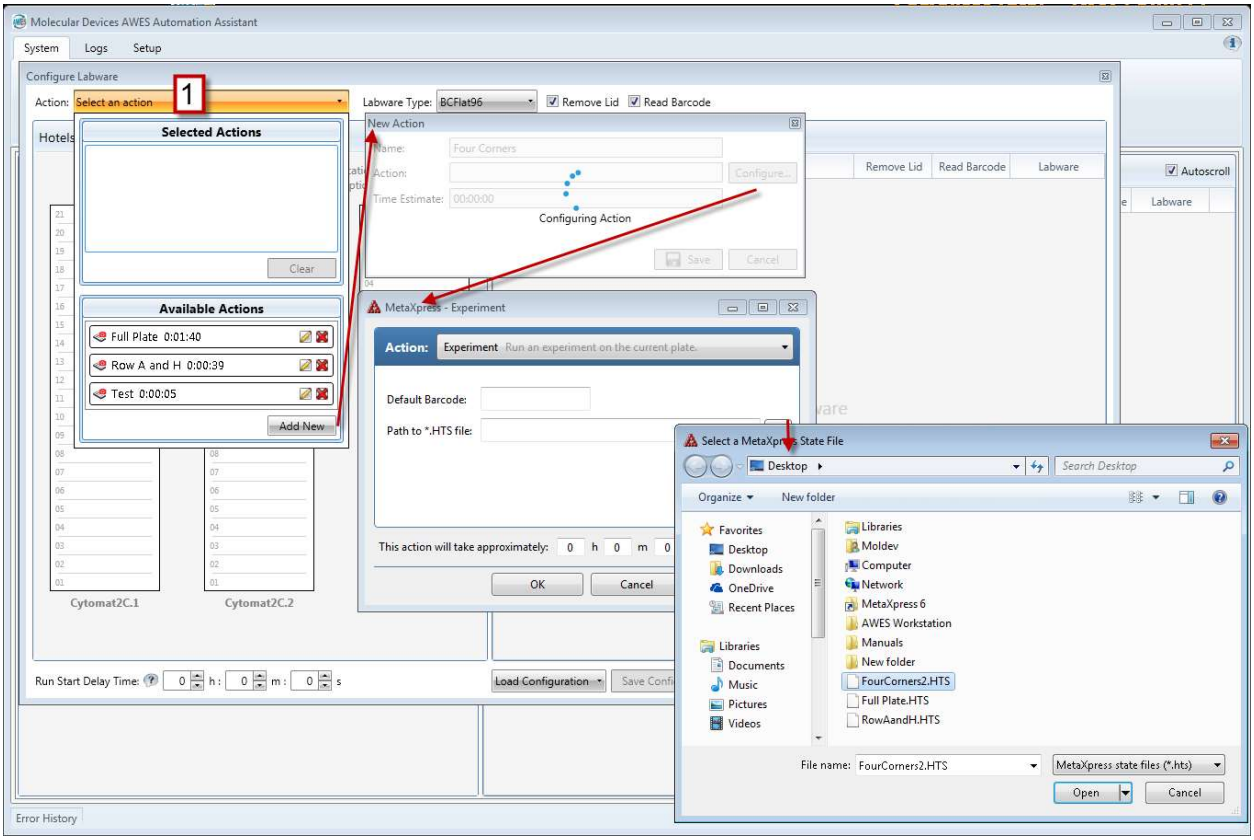


Figure 4 – Selecting an Action: Note that the Add New button and subsequent dialogs are only needed if the Action has not been previously added.

Selecting Labware Type

10. After the actions have been selected, select the labware type used from the **Labware Type** drop-down box (Figure 5). Only labware that has been previously defined is listed here (refer to the "Defining New Labware" section on page 8 for instructions on adding a new labware type). The labware must also be compatible with the actions to be executed.

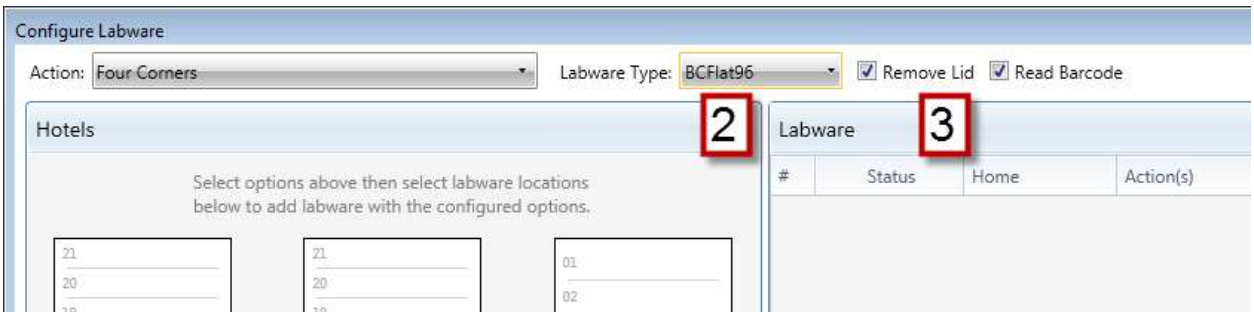


Figure 5 – Selecting Labware Type, Lid, and Barcode Options

Selecting Lid and Barcode Options

11. After selecting the labware type, check the **Remove Lid** box if the labware is lidded and the **Read Barcode** box if the labware has a barcode that should be read (Figure 5).

If a lid is present, it must always be removed before putting the plate into the ImageXpress Micro. The lid will be removed at the barcode reader position and stored on the lid storage position while the plate is processed in the imager. A barcode is read at the barcode reader position before putting the plate into the

imager. The barcode must be on the A1 short edge (front) of the plate (the side facing the back of the hotel when loaded onto a shelf).

Selecting Labware Positions

12. Select the desired shelf positions for the labware configuration shown at the top of the window by clicking on the desired position(s) in the **Hotels** layout (Figure 6). Multiple shelves can be selected by clicking on them. Multiple adjacent shelves within a hotel can be selected by rubber-banding multiple positions. A whole hotel can be selected/deselected by hovering the mouse pointer over the hotel name and clicking the + or **X**.
13. If there are more than 3 total hotels on the system click the arrows at the bottom of the Hotels window to scroll through the available hotels on the system.

Labware is processed in the order it was added, however, the order can be changed at any time during a run. To remove a labware from a position, click the **X** on that labware. Hover the mouse pointer over a labware item to display additional information about that labware. As shelf positions are selected, new rows are added to the **Labware** table showing configuration information for the labware added.

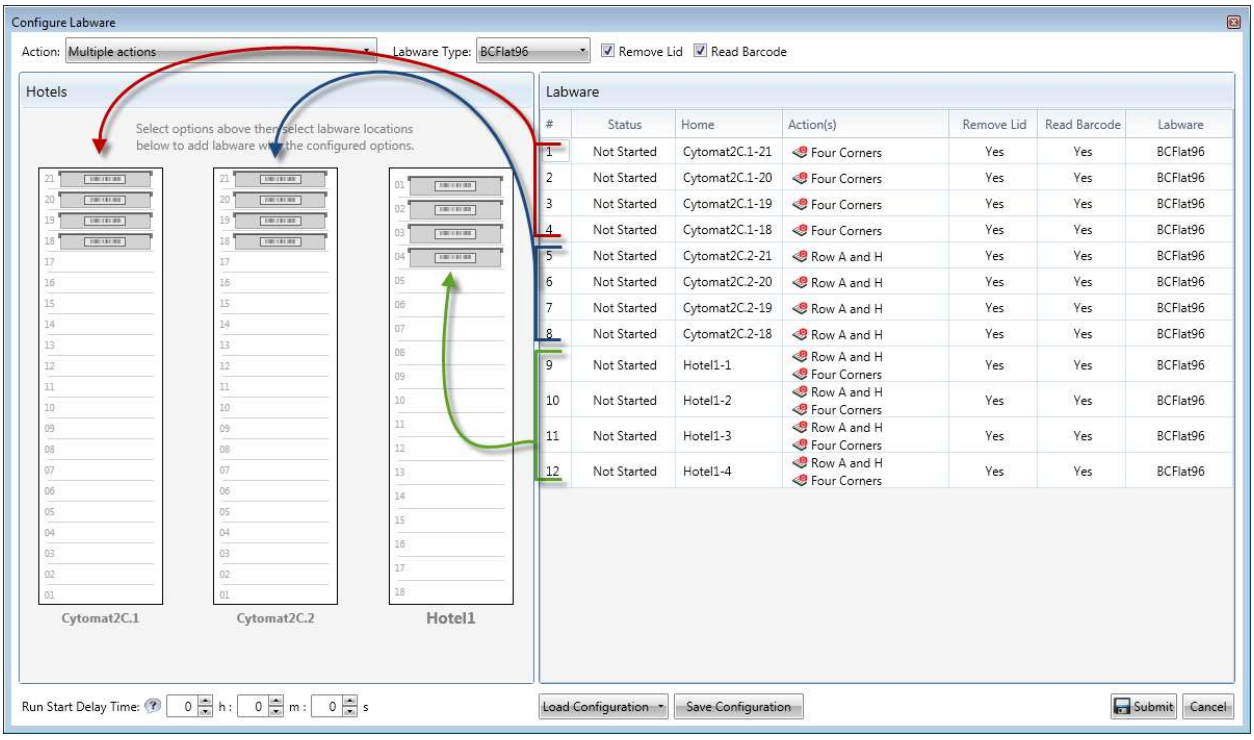


Figure 6 – Selecting Hotel Position for Labware

To change the order in which labware will be processed, select the labware in the **Labware Table** (or alternatively by clicking on it in the **Hotels** layout) and then either drag the selection within the list or right-click on the selection to open the context menu shown in Figure 7 and select the desired action.

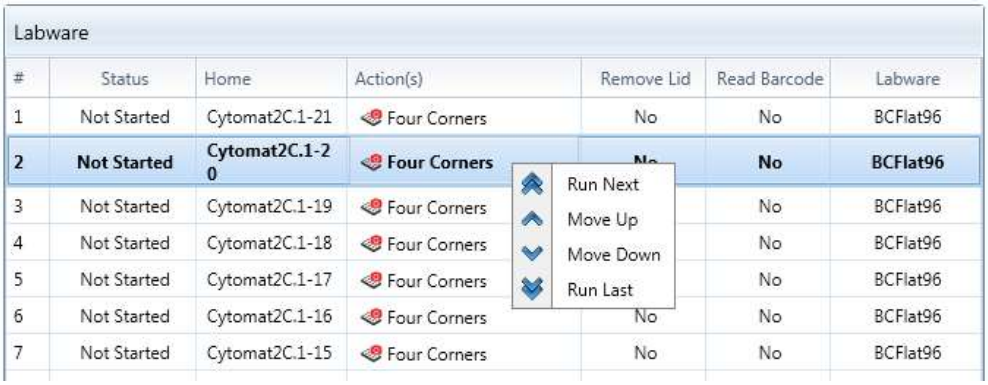


Figure 7 – Changing Run Order

14. If the run contains different types of labware and/or different protocols/journals that need to be run, repeat steps 1 through 12 for each new configuration.

> **NOTE:** The current labware configuration can be changed during a run by pausing the run, adding/removing labware, changing the run order, and resuming the run.

Selecting a Run Start Delay

15. If desired, select a **Run Start Delay Time** at the bottom of the window. The run will automatically start after the indicated time has passed.

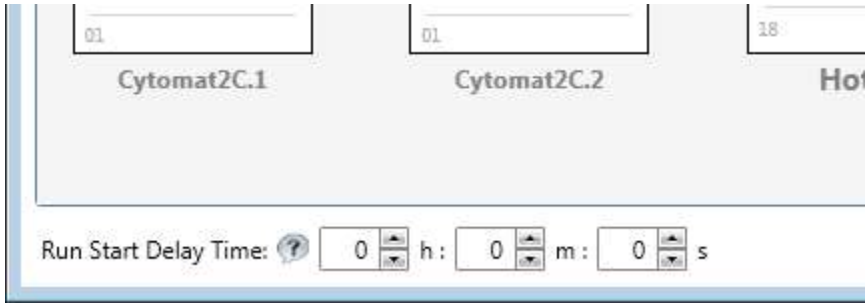


Figure 8 – Selecting Run Start Delay (lower left corner)

Loading/Saving/Submitting a Labware Configuration

16. After all labware has been configured, the configuration can be saved via the **Save Configuration** button. The labware configuration can be submitted (with or without saving) by clicking the **Submit** button in the lower right corner of the window. A message box is displayed asking for confirmation before proceeding with the run (Figure 9).

Figure 9 – Confirmation Dialog

A configuration can be saved and reused later; this includes the protocols/journals to be run, labware types, and labware locations. To save a configuration, click the **Save Configuration** button on the bottom of the window (Figure 10). Enter a name for the configuration. If the name already exists, the existing configuration will be overwritten.

When the **Submit** button is clicked, the current configuration will be automatically saved with the special name of **Last Used**. When a configuration is saved in the middle of a run (while the run is paused), only the plates that have not yet been processed are saved. This makes it easy to restart a run if it needs to be halted (for example, due to an error; see below).

To load a saved configuration, click the **Load Configuration** button and select the configuration to be loaded from the drop-down list. A saved configuration can be deleted from the list by clicking the button next to it (Figure 10).

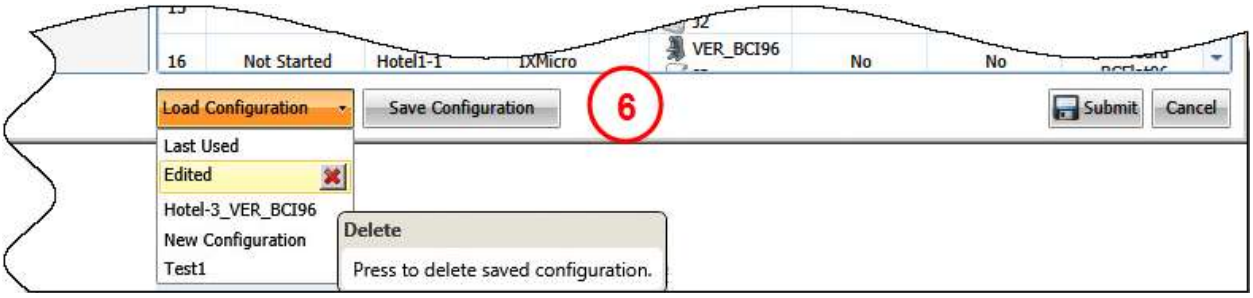


Figure 10 – Loading or Saving a Configuration

Loading and saving of configurations can be particularly useful in an error situation that requires the current run to be aborted. If an error occurs that is irrecoverable, the user can pause the run, open the **Configure Labware** window, save the current configuration (the plates that have not yet been processed), and then abort the run. After resolving the problem that caused the error, the saved configuration can then be loaded and the run can be continued. If a plate was in progress when the run was aborted, it will not be included – disposition of such a plate must be made and then it can be included or not, as desired, by configuring it and adding it to the labware configuration.

➢ Starting a Run

Once a labware configuration has been submitted, a few checks should be performed before starting a run:

- Ensure all devices are powered on and connected to the controller computer.
- Check that MetaXpress software is running and external control is enabled.
- Observe that the SCARA is in a safe position and orientation and does not have any labware gripped. This will automatically be the case whenever the previous run successfully finished. The SCARA should be in a safe orientation at the top of the vertical axis with the outer link partially folded in under the inner link and the gripper partially folded in under the outer link, pointing away from the robot (Figure 18). The SCARA can be manually moved to this position. To move the SCARA up and down, press the little button on the underside of the inner link.

> **NOTE:** This same safe orientation of the robot should also be observed for error recovery (refer to the "Appendix A: Error Handling" section starting on page 20).

- Double check that the correct labware is located in the correct hotel and storage device positions. Plates should be loaded with the A1-well facing towards the back of the static hotel. Plates loaded in a Cytomat should have the A1 location facing away from the door. Barcodes are read on that side of the plate also. Plates should be fully on their shelves, oriented so they are aligned with the shelves.
- Make sure that there is no plate in the ImageXpress Micro, on the Cytomat transfer station, BCR, or lid storage positions.

To start a run, click the green play button on the menu. The run starts by first initializing all devices, including the ImageXpress Micro, barcode reader, storage device, and SCARA. During initialization of the SCARA, the gripper will open and close.

If a run delay was entered the run will not start immediately and a run delay countdown will be shown where the time remaining is displayed

During a run, the information displayed in the **Hotels**, **Labware**, and **Actions** sections of the **System** tab is continuously updated as labware is being processed.

The **Hotels** section indicates which labware has already been processed (shown in green), which labware is currently being processed (green progress bar) and remaining labware (shown in grey). Hovering the mouse cursor over a piece of labware displays additional information.

The **Labware** section shows information about labware configuration, as well as which labware is currently being processed. If a barcode was read on the labware, it will be displayed in the **Barcode** column. Labware information is logged and can be viewed via the **Logs** tab.

The **Actions** section lists completed and pending actions for the run. If any errors occur during the run, they will also show up in the list. All executed actions and encountered errors are logged and can be viewed via the **Logs** tab.

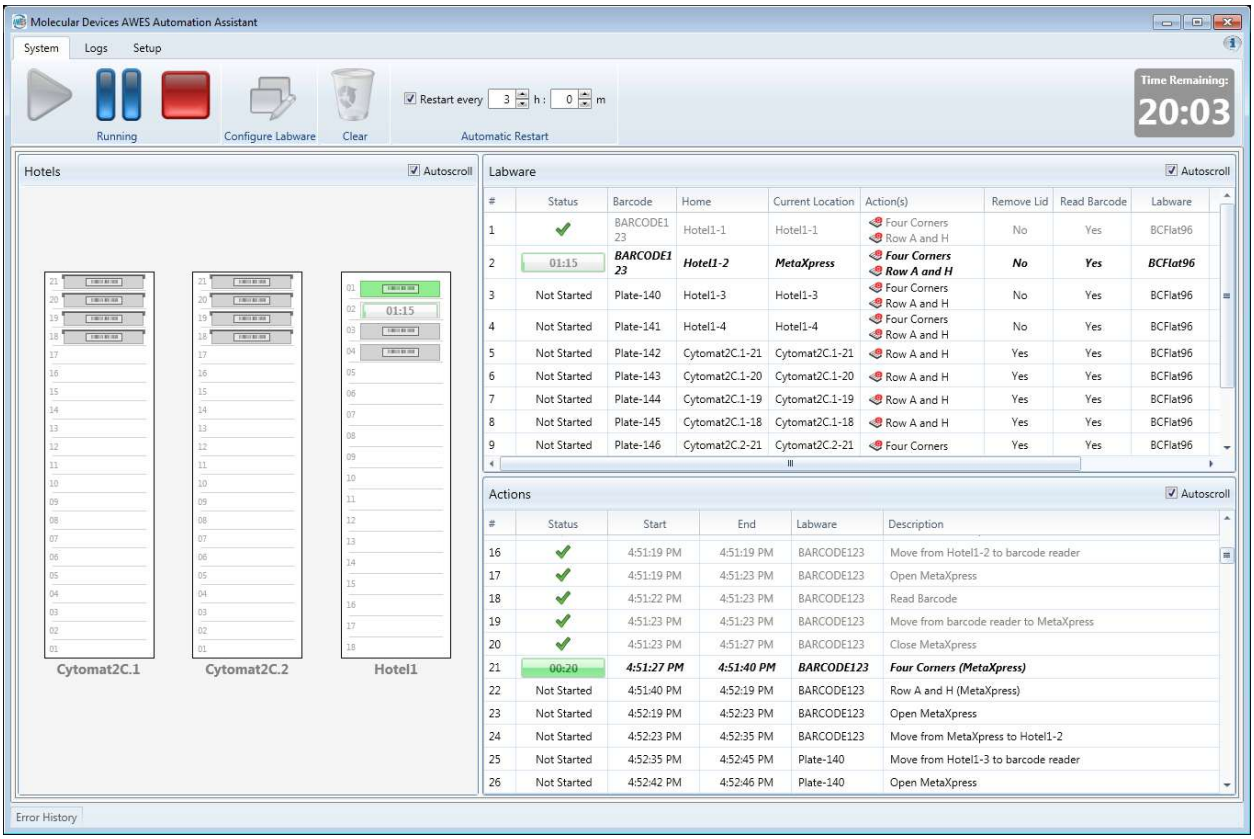


Figure 11 – Systems Tab during a Run

The run can be paused at any time by clicking the pause button on the menu. The run will pause after the SCARA completes its current move, or if the run is paused during a read, it will pause after the read is finished. Only while a run is paused can the **Configure Labware** button be clicked to change labware configuration. The run can be resumed by pressing the play button.

A run can be aborted by clicking the abort button  on the menu. Once a run has been aborted, it cannot be resumed.

To clear the current labware configuration click the clear button  on the menu. This button is only enabled when a run is paused or completed. The **Setup** tab will only be enabled after an existing labware configuration has been cleared.

The estimated time remaining until completion of the current run is shown in the upper, right corner of the window. Note that this estimate is very dependent upon the times entered for protocols/journals.

If the **Restart every ____** check box is checked the run will restart based on the time configured. The time entered is the time between the start of one run to the start of the next. For example if a run taking 1 hour was configured to restart every 3 hours the run would start, take 1 hour to complete, and then the system would sit idle for two hours and then restart.

Logs Tab

The **Logs** tab allows viewing of all logged labware, actions, and error information (Figure 12). The data can be filtered to display specific information. The start date and end date specified in the **From** and **To** boxes at the top of the window provide a global filter that applies to all Labware and Actions data. After entering the dates, click the refresh button to update the data that is displayed.

Further filtering can be performed on the individual columns of data. Clicking on a column header will sort the data in alphabetical or numerical order. Clicking on a funnel icon will display a dialog that allows further filtering of data within the particular column. Filters can be applied to multiple columns.

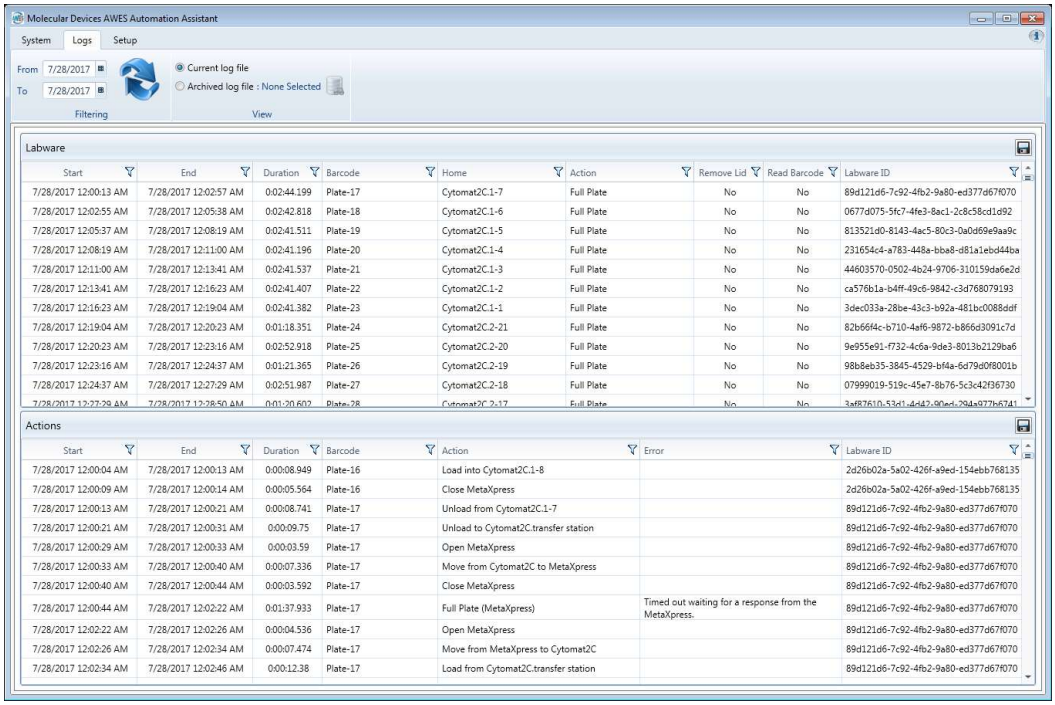


Figure 12 – Logs Tab

The currently displayed data (after filtering and sorting) can be saved to a Comma Separated Values (CSV) file for Labware or Actions by clicking the associated save button .

All data is automatically written to a database file named `Log.db3` located on the local hard disc drive at `C:\ProgramData\Beckman Coulter\Molecular Devices AWES Automation Assistant` Logged data can either be retrieved from the current log file or from an archived log file. To retrieve data from an archived log file, select the **Archived log file** radio button at the top of the window and then select the appropriate log file in the displayed browser dialog.

To create an archive of an existing log file:

1. Close the AWES Automation Assistant software.
2. Browse to the `Log.db3` file at `C:\ProgramData\Beckman Coulter\Molecular Devices AWES Automation Assistant`.
3. Either rename the `Log.db3` file or copy it to a different location to create the archive.

When the AWES Automation Assistant software is started again, if `Log.db3` exists, data will continue to be written to it. If it does not exist, a new, empty database file with that name will be created.

Appendix A: Error Handling

If an error occurs during a run, an error notification box is displayed and the error is logged. The error will also be displayed in the **Actions** list, as well as in the **Error History** table at the bottom of the window (Figure 14). At the same time, a new icon will be displayed on the toolbar at the top of the window, indicating the number of errors that have not been addressed:

Figure 13 – Error Icon

Depending on the error, the user has several options to respond to an error message. These are usually **Pause System**, **Abort**, **Retry**, **Ignore**, or simply close the error dialog.

- **Pause System** has the same effect as clicking the pause button. When the system is paused, Manual Control for the devices can be accessed to help resolve the error before resuming.
- **Abort** has the same effect as clicking the abort button.
- **Retry** will retry the action that caused the error.

> **NOTE:** For actions involving the SCARA, **Retry** generally should not be used unless and until additional manual actions have been taken to resolve the error situation, as it will likely cause the SCARA robot to crash, possibly dropping labware.

- **Ignore** will act as if the current action succeeded, and move on to the next action.

> **NOTE:** **Ignore** should almost never be used, unless and until additional manual actions have been taken to resolve the error situation.

- If an error dialog is closed by clicking the ⊠ in the upper, right corner, it can be retrieved by clicking the error icon.

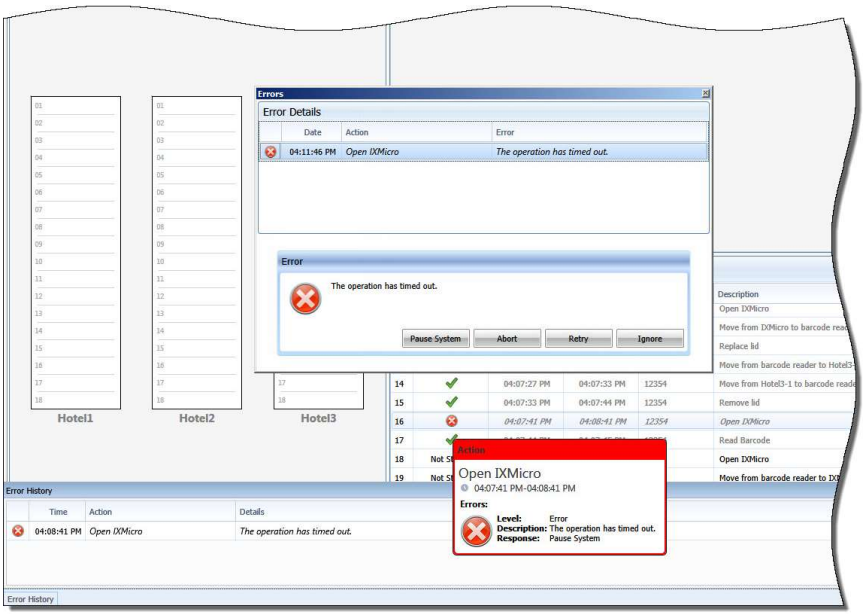


Figure 14 – Example Error Notification

Initialization Errors

At the beginning of a run the ImageXpress Micro, SCARA, storage device, and barcode reader will be initialized. If an initialization error occurs, check the following:

- The device is powered on.
- The device is communicating. Check for disconnected communications cables.
- The SCARA robot is in a safe orientation, with nothing blocking the gripper fingers.
- For ImageXpress Micro: MetaXpress software is running.

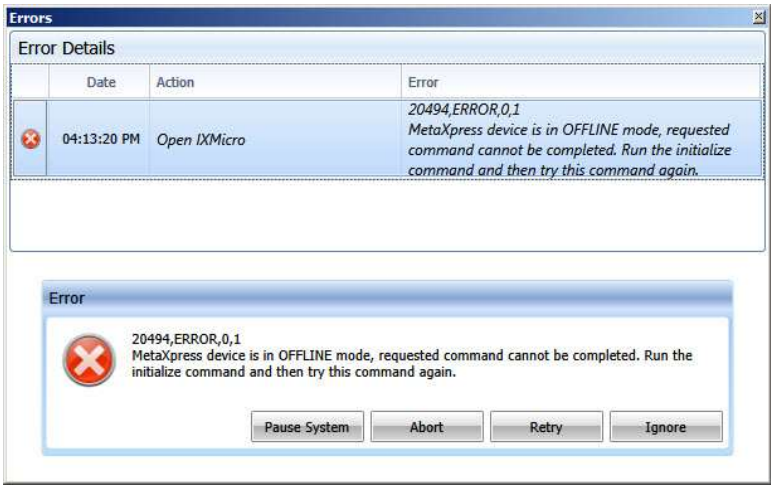


Figure 15 – Example ImageXpress Micro Initialization Error

NOTE: If the SCARA has been previously powered off and back on, an initialization error will result when the software is trying to initialize the SCARA (Figure 16). Click **Retry** in the error message dialog in order to redo and complete the initialization.

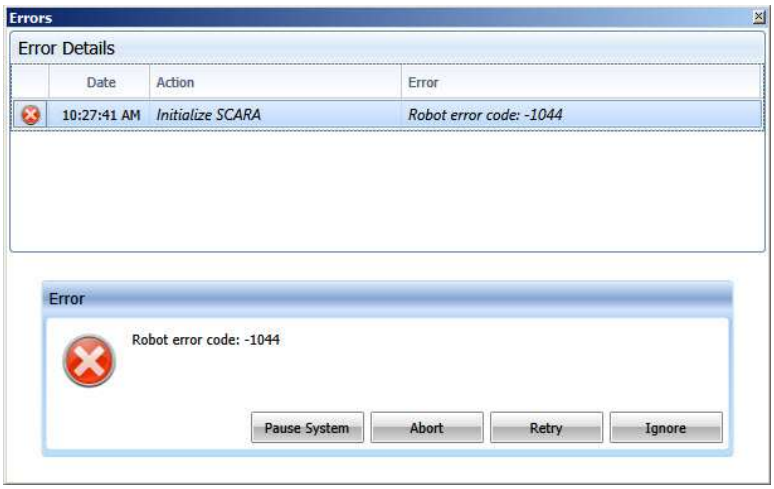


Figure 16 – Example SCARA Initialization Error

ImageXpress Micro Timeout Errors

Timeout errors from the ImageXpress Micro can be caused by protocol/journal time estimates that are too short. If a timeout error occurs, the ImageXpress Micro will continue reading the plate. An error message is displayed with the option to **Retry**, **Ignore**, or **Abort** (Figure 17). Do not click any of the options. Close the error notification box by clicking the ☒ in the top, right corner. The error will be automatically retracted once the read finishes and the run will continue.

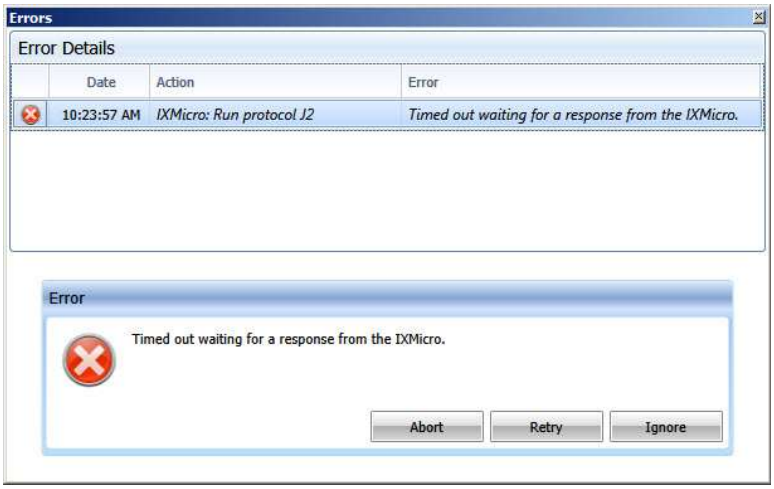


Figure 17 – Example Timeout Error

Plate Handling Errors

Plate handling errors can occur due to various reasons, such as incorrectly framed positions, incorrect labware placement, incorrect labware definition, incompatible labware types, mechanical failures, etc.

When an error occurs during plate movement, it is usually required to move the SCARA to a safe position and orientation before continuing the run. This can be done by hand after the E-Stop has been pressed, which frees the SCARA. To move the SCARA up and down, press the little button on the underside of the inner link.

The safe position and orientation for the robot is at the top of the vertical axis, with the outer link partially tucked under the inner link, and the gripper partially folded in under the outer link, pointing away from the robot, as shown in Figure 18.

Make sure the SCARA is not gripping labware.

Figure 18 – SCARA in Safe Position and Orientation

> **NOTE:** If an error occurs during transportation of labware to the ImageXpress Micro, and the door of the ImageXpress Micro has already been opened, the latch on the plate stage of the ImageXpress Micro will automatically close after 60 seconds. After correcting the error, and before resuming the run, execute an additional **Open** command through the Manual Control dialog or through MetaXpress Software for the ImageXpress Micro to open the latch again.

Typical SCARA Error Cases

The following table lists some of the typical error cases for SCARA during a run and possible solutions.

Error Case	Solution
Error from SCARA: **No labware detected** SCARA tried to grip labware at a hotel position, but the labware is missing.	• Press the E-stop button. This will free the SCARA. • Move the SCARA by hand to a safe position and orientation. • Release the E-Stop. • Replace the missing labware. • Click **Retry** on the error message, and **Retry** again if there is a second error message.
Error from SCARA: **No labware detected** SCARA is at the Frame Point of the position and has labware gripped.	• Pause the system and open the SCARA Manual Control dialog. • Execute the **Set Gripper Width** action with a **Grip Width** of 85 to open the gripper. • Execute the **Exit Device** action for the current position. The SCARA will move to the Safe Point. • Close the Manual Control dialog and click **Retry** on the error message dialog. The SCARA will try to grip the labware again. If the error persists, the labware may be incompatible, or there might be a problem with the gripper which requires a service call.
The E-stop is activated during movement of the SCARA. The SCARA is transporting labware.	• Move the SCARA by hand to a safe position and orientation. • Remove the labware from the gripper and put it back where it was picked up. • Release the E-Stop. • Click **Retry** on the error message, and **Retry** again if there is a second error message.

Table 1 – Some Possible Errors and Solutions

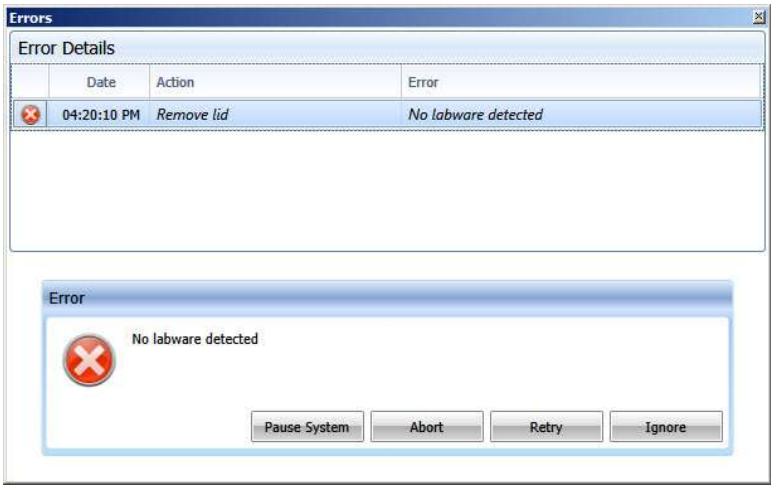


Figure 19 – No Labware Detected Error

Appendix B: Manual Control Dialogs

When the system is idle, or when a run has been paused, the Manual Control dialogs for the ImageXpress Micro, SCARA, storage device, and barcode reader can be accessed through the **Setup** tab of the AWES Automation Assistant software to perform an action on these devices. Manual Control can be used as part of troubleshooting or error recovery. To execute an action for a device, open the Manual Control dialog, select and configure an appropriate action, and then click the **Run Now** button to execute the action.

SCARA Module Manual Control

NOTE: Before executing an action that moves the SCARA, ensure the robot is in a safe position and orientation to execute the command.

NOTE: While the action executes, an **Abort** button will be shown. Clicking the **Abort** button will not immediately stop movement of the SCARA! Instead, the SCARA will finish moving to the next point in the command sequence before stopping.

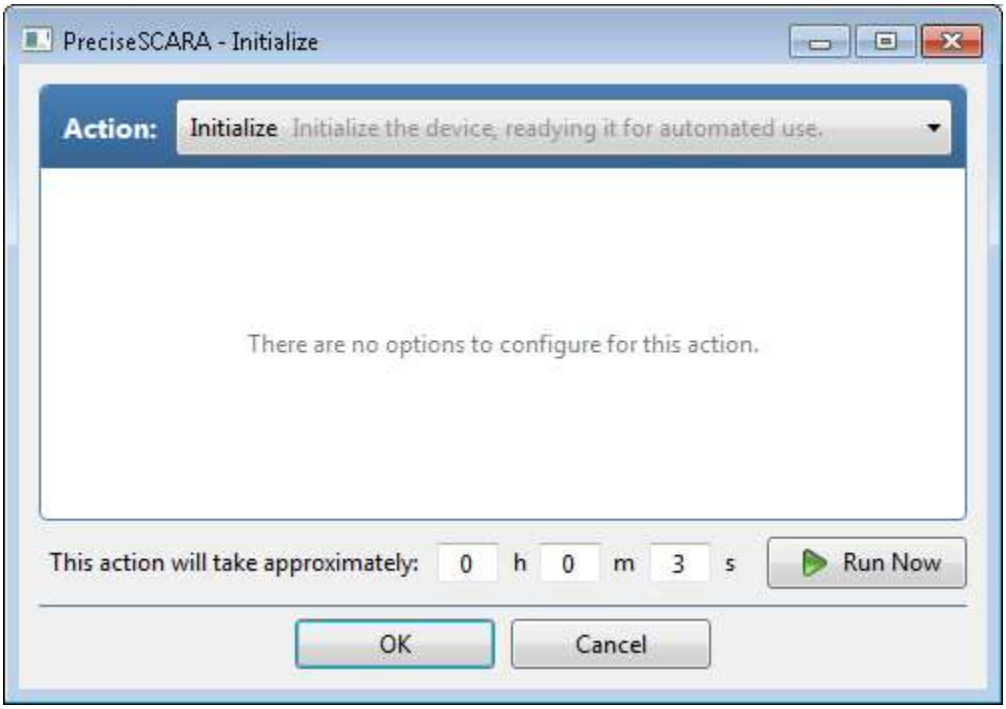


Figure 20 – SCARA Manual Control Dialog

The following table lists the available actions, as well as a short description.

Action	Description
Initialize	Establishes communication with the SCARA. Enables motor power and homes the gripper.
Move Plate	Moves a plate between two selected positions using a selected grip and speed. Positions must have been configured in the SCARA options form. The SCARA starts at the Safe Point of the first position and ends at the Safe Point of the second position.

Action	Description
Pick Plate	Moves to the selected position from the Safe Point using a selected grip and speed, grips a plate, and returns to the Safe Point with the plate gripped.
Put Plate	SCARA puts a plate it is holding at a selected position using a selected grip and speed. Movement starts and ends at the Safe Point of the position.
Enter Device	SCARA moves to a position starting at the Safe Point, going to the Entry Point, Approach Point, and then to the Frame point at the selected speed.
Exit Device	SCARA exits a position in the reverse of the "Enter Device" order.
Move Safe Point	SCARA moves directly to the Safe Point of a device at the selected speed.
Move Entry Point	SCARA moves directly to the Entry Point of a device at the selected speed.
Move Approach	SCARA moves directly to the Approach Point of a position at the selected speed.
Move Frame	SCARA moves directly to the Frame Point of a position at the selected speed.
Set Gripper Width	Opens/closes the gripper to the selected width.
Grip Plate	Grips a plate using the settings for the selected grip.
Home Gripper	Homes the gripper.
Enable Robot	Enables motor power to the SCARA.
Free Robot	Sets motors to low power to allow joints to be moved by hand.

Table 2 - SCARA SILAS Module Actions

ImageXpress Micro Manual Control

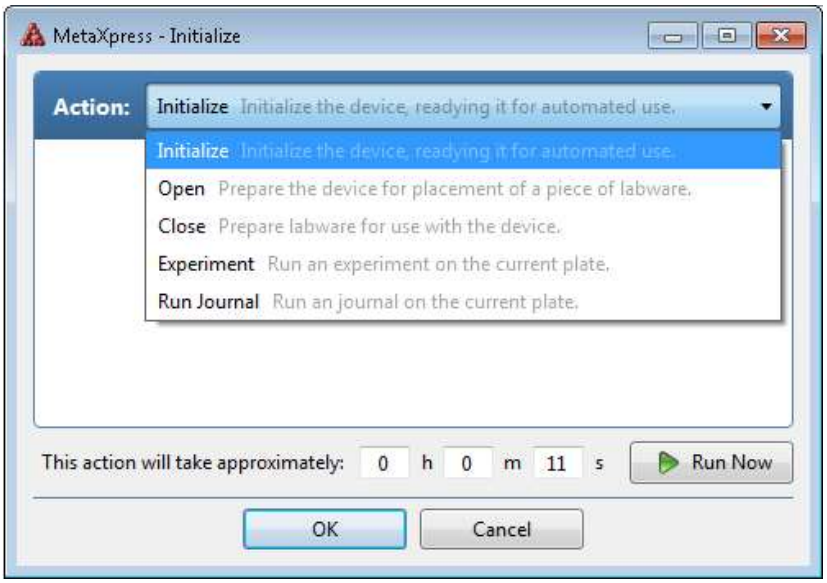


Figure 21 – ImageXpress Micro Manual Control Dialog

The following table summarizes the available actions:

Action	Description
Initialize	Establishes communication between the host computer and the instrument and executes an Open / Close cycle.
Open	Opens the access door to the device and opens the plate latch for 60 seconds. **NOTE:** After 60 seconds the plate latch is automatically closed. It is safe to repeat the Open command to reopen the plate latch.
Close	Closes the access door to the device and latches the plate latch.
Experiment	Executes the experiment per the specified `.HTS` file.
Run Journal	Executes the journal entry based on the `.JNL` journal file chosen.

Barcode Reader Manual Control

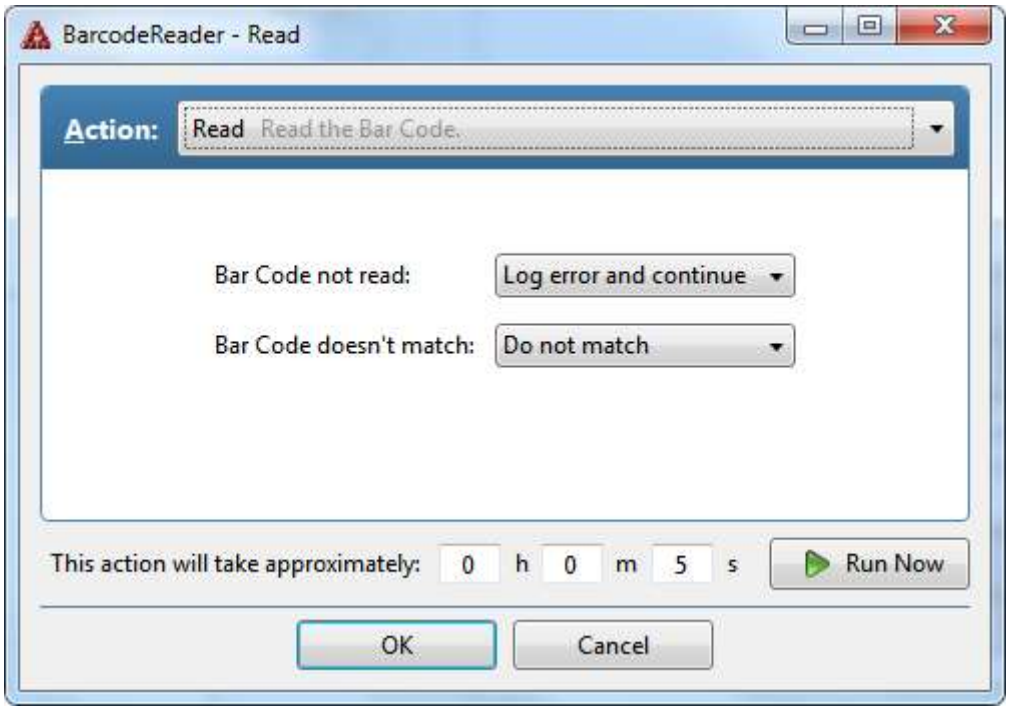


Figure 22 –Barcode Reader Manual Control Dialog

The only available action for the barcode reader is **Read**. Select the **Read** option from the dropdown at the top of the dialog, then click "Run Now" to attempt to read a barcode. If a barcode was read successfully, it will be displayed as part of the command completion message.

Cytomat Manual Control

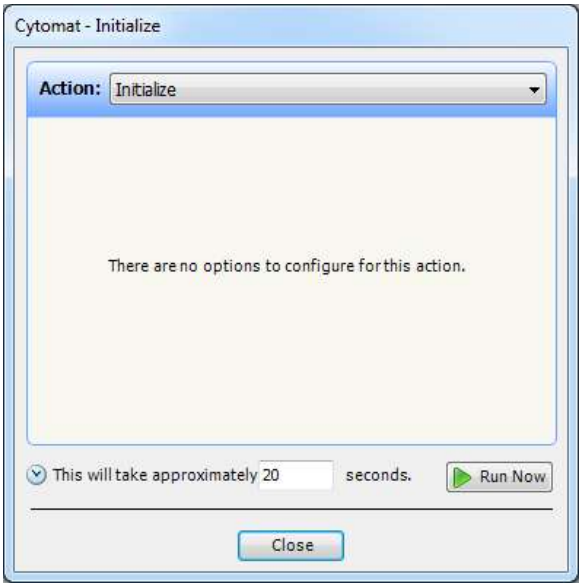


Figure 23 – Cytomat Manual Control Dialog

In the **Action Configuration Dialog**, there are several actions available: **Initialize**, **Load**, **Unload**, **Unload Internal**, **Unload External**, **Load External**, **Load Internal**, **Open Gate**, **Close Gate**, **Spin To Hotel**. Select the desired action and configure any applicable settings that are then displayed. Click the button in the lower corner to run the configured action.

> **NOTE:** Some of these actions may not be available depending on the options and features of the Cytomat device.

The following table summarizes the available actions:

Action	Description
Initialize	Initializes the device by seeking the home state of the turntable and placing the handler in a recognizable starting position.
Load	The handler retrieves labware from the Transfer Station and places the labware into the specified hotel position. The Transfer Station must have labware sensed by the barrel sensor before the command will run. The destination hotel position must be empty and capable of accommodating the labware being loaded.
Unload	The handler retrieves labware from the specified hotel position and places the labware onto the Transfer Station. The Transfer Station must be empty before the command will run. The specified source hotel position must have labware in it or an error will occur when an attempt to get the labware fails.
Unload Internal	This is the first half of an Unload command. The handler retrieves labware from the specified hotel position. The labware will remain on the shovel of the handler. The handler must be empty and the hotel position must have labware.
Unload External	This is the second half of an Unload command. The handler will place the labware it is already holding onto the Transfer Station. The handler must already have labware and the Transfer Station must be empty. If the AWES Automation Assistant is an incubator, the door will automatically open and close as needed for this command.
Load External	This is the first half of a Load command. The handler retrieves labware from the Transfer Station. The labware will remain on the shovel of the handler, inside the device. The Transfer Station must have labware and the handler must be empty. The gate will automatically open and close as needed for this command.
Load Internal	This is the second half of the Load command. The handler will place the labware it is already holding into the specified hotel position. The handler must already have labware and the specified hotel position must be empty.
Open Gate	This opens the gate at the back of the device.
Close Gate	This closes the gate at the back of the device.
Spin To Hotel	This spins the internal carousel so the selected hotel is in front of the transfer station shuttle elevator.

Table 3 – Cytomat Action Commands