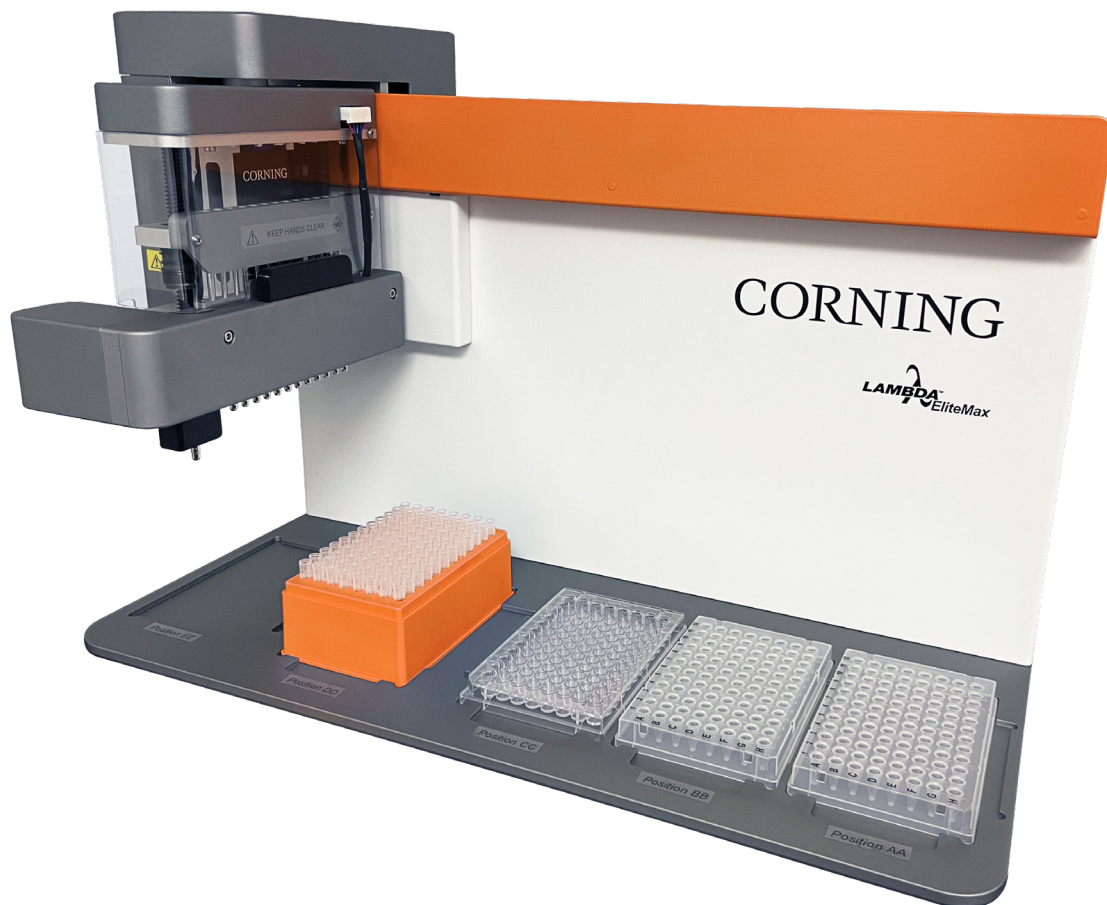


Corning® Lambda™ EliteMax Semi-automated Benchtop Pipettor

CORNING

Instruction Manual

Catalog Number:
6070



UK
CA CE

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1.0 Introduction

1.1 Overview

Thank you for purchasing the Corning® Lambda™ EliteMax Benchtop Pipettor, an affordable and easy-to-use liquid handler. From simple plate fillings to complex protocols, the instrument is the perfect addition to your lab.

The Corning Lambda EliteMax Benchtop Pipettor can perform a variety of liquid handling tasks including:

- ▶ Plate fillings from reagents reservoirs
- ▶ Serial dilutions, plate-to-plate transfers, and plate replication
- ▶ Well-to-well transfers (cherry picking protocol for single-channel head only)
- ▶ Accurately and precisely transferring liquids and volumes between microplates
- ▶ Transferring by row or by column
- ▶ More complex applications can be performed such as sample preparation, timed reaction, PCR preparation, cell-based assays set up, tube-to-tube transfers, and more

Please read the manual before operating the instrument.

1.2 Symbols and Conventions



CAUTION: This symbol refers you to important operating and maintenance (servicing) instructions within the product Instruction Manual. Failure to heed this information may present a risk of damage or injury to persons or equipment.



This symbol provides useful information to the user while using or operating the instrument.



At any time while the instrument is running, you can press the Stop button located at the bottom left of the Runtime Screen. This will pause the instrument and give you the option to abort or to continue the protocol.

1.3 Safety Information

During the operation, maintenance, or repair of the Corning Lambda EliteMax Benchtop Pipettor, the following safety measures should be taken or, in consequence, the safeguards provided by the Corning Lambda EliteMax Benchtop Pipettor are likely to be damaged, the rated safety level to be reduced, and the rated operation conditions to be affected. Corning shall not be in any way responsible for the consequences resulting from the operator not observing the following requirements.



Grounding

AC power's grounding should be reliable to safeguard against an electric shock. The 3-pin plug supplied with the Corning Lambda EliteMax Benchtop Pipettor power cable is a safety device that should be matched with a suitable grounded socket. Never allow the third ground pin to be floating. If the 3-pin plug cannot be inserted, it is recommended to ask an electrician to install an appropriate power socket.



Keeping Away from Electric Circuits

The operator should not open the Corning Lambda EliteMax Benchtop Pipettor without first consulting the Customer Service team. Changing components or adjusting certain parameters inside the device must be performed by certified professional maintenance personnel only. Do not change any elements while the power is still on.



AC Power Considerations

Before turning on the power, always make sure that the main voltage is within the range of required power supply and that the rating current of the power socket meets the required specification.



AC External Power Supply Considerations

As an accessory of the Corning Lambda EliteMax Benchtop Pipettor, the external AC power supply should be placed in a safe area. If it is damaged, the AC power supply cannot be repaired, but instead must be replaced by a new one. The external power supply should be free of any objects and placed in a ventilated area during the Corning Lambda EliteMax Benchtop Pipettor's operation. Keep the power supply away from high traffic areas.



Connect the AC Power Line

While connecting the AC power line, the user should insert the plug firmly to ensure good contact between the plug and socket. Pull the plug, but not the cable, when the plug needs to be disconnected from the mains.



Design Environments

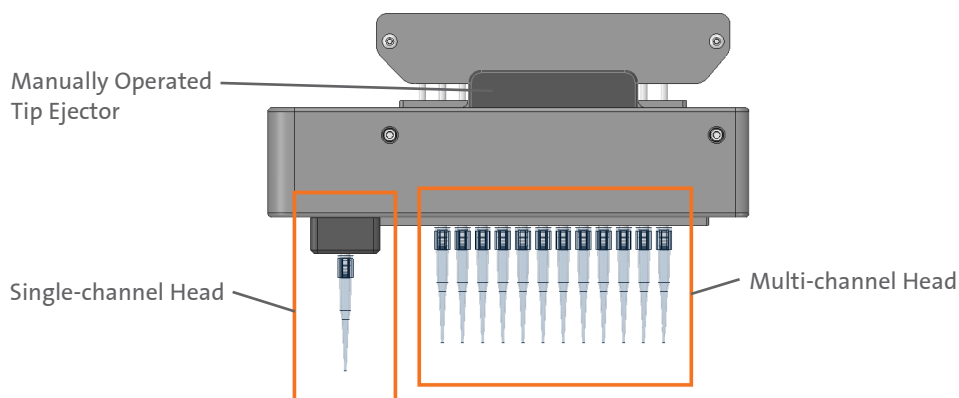
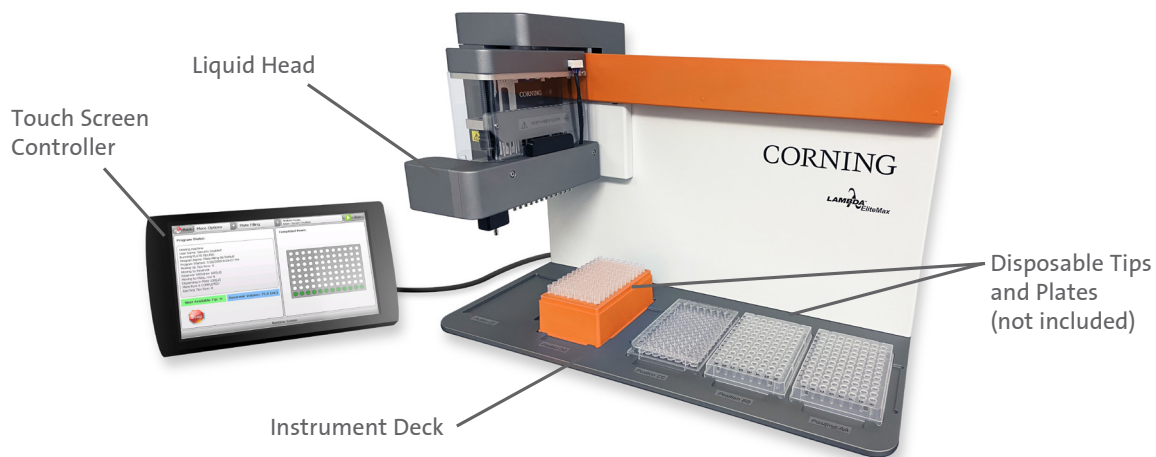
The Corning® Lambda™ EliteMax Benchtop Pipettor should be placed in a low-humidity, dust-free, well ventilated room without caustic gas, corrosive vapors, or powerful magnetic interference. The Corning Lambda EliteMax Benchtop Pipettor should never be operated near water sources such as pools and water pipes. Never cover or obstruct the openings of the Corning Lambda EliteMax Benchtop Pipettor as they are designed for ventilation and prevention of the device's interior from becoming too hot. When the instrument is running, the shortest distance between its openings and the nearest object should be at least 20 inches (50 cm). Do not place the device on a soft surface. Place the device on a stable, level bench or hood. Excessive jarring or vibration during operation may affect the device's performance. Operating conditions that cause a high temperature environment will result in the degraded performance or failure of the Corning Lambda EliteMax Benchtop Pipettor. Additionally, the device should be protected against any kind of heat sources such as sunlight, ovens, or central heating equipment. If the Corning Lambda EliteMax Benchtop Pipettor is to sit idle for extended periods of time, it is recommended to disconnect the power line from the mains, and cover the device with a piece of soft cloth or plastic to prevent against dust.



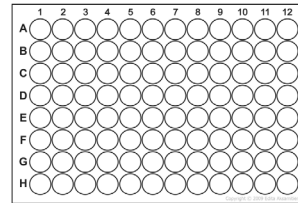
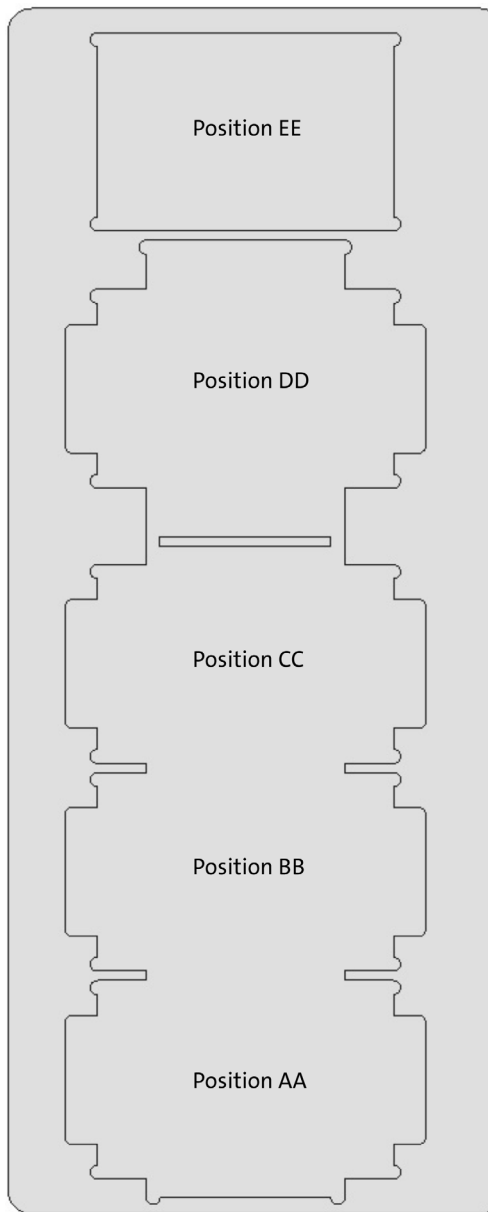
CAUTION: If any of the following events occur, the operator is advised to disconnect the power cable from the mains, and contact your local Corning representative or ask a certified maintenance engineer for assistance.

- ▶ Liquid enters the device.
- ▶ The device malfunctions, giving off an abnormal sound or odor.
- ▶ The device falls onto the floor or the housing is damaged.
- ▶ There are significant changes in the device's performance.

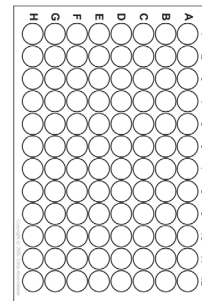
1.4 Instrument Identification



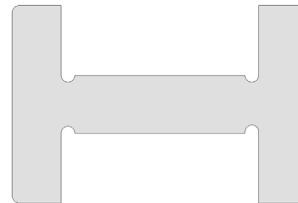
1.5 Deck Positions and Orientation Convention



Landscape Orientation



Portrait Orientation



Portrait Adapter Plate



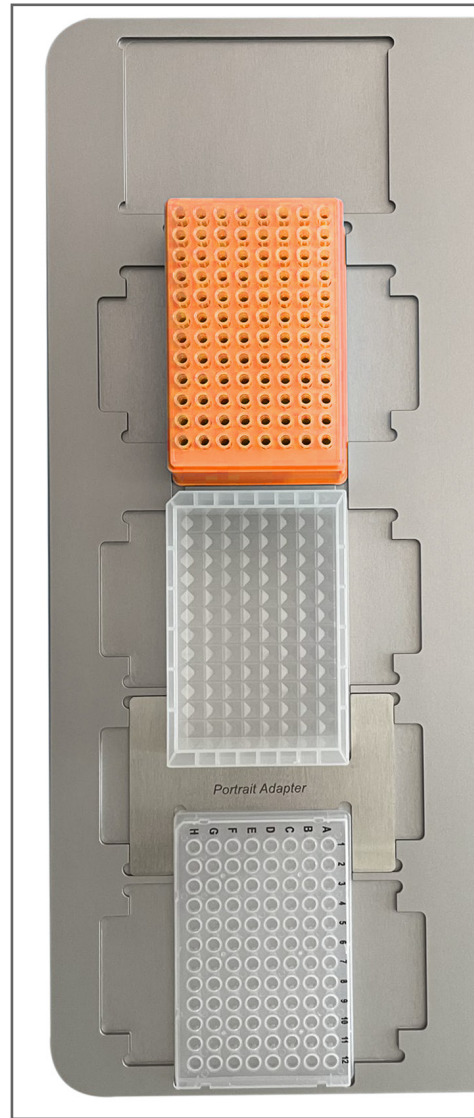
CAUTION: Before running any protocols, make sure ALL tip racks, plates, reservoirs, and accessories share the same orientation to avoid possible collision that can damage the instrument or the sample plate.

If there is any apparent damage to the system, the user should investigate the nature of the damage before plugging the unit into the mains to ensure that the powering up of the system will not create a hazardous condition or damage internal components. If the damage appears significant, call your local Corning representative before connecting the unit to the mains.

Typical landscape layout orientation.



Typical portrait layout orientation.
NOTE: Portrait adapter between plates.



1.6 Package Contents

Cat. No.	Description	Qty/Pk
6070	Corning® Lambda™ EliteMax Semi-automated Benchtop Pipettor	1
6071	Touch screen controller with software and license	1
6073	External power supply	1
6104	Portrait adapter stainless steel plate	1
–	Power cords (US, EU, UK, CHN)	1
–	Instruction manual	1
–	Calibration certificate	1

1.7 Specifications

Performance Specifications	
Pipetting Channels	Single-channel and 12-channel for 96-well format
Volume Range	1 μL to 200 μL
Plate Formats	96-well standard, shallow, deep well, microcentrifuge, V-, U-, and flat-bottom
Functions and Protocols	Plate fillings, serial dilutions, plate-to-plate transfers, plate replication, sample preparation, cherry picking protocol (for single-channel head only), and other more complex protocols can be implemented

Accuracy	
20 μL	$<\pm 2.0\%$
100 μL	$<\pm 1.5\%$
200 μL	$<\pm 1.0\%$

Precision	
20 μL	$<1.5\%$ CV
100 μL	$<1.0\%$ CV
200 μL	$<0.7\%$ CV

NOTE: The instrument uses a programmable calibration algorithm, where aspiration, dispense, and liquid speed can be adjusted for a particular reagent. Precision and accuracy can be highly improved for a particular reagent and transfer volume.

- Precision shown as percentage of coefficient of variation.
- Multi-channel specifications represent the performance of all channels of a pipet.
- All values shown as reference. Corning EliteMax tips used. See **NOTE** above.

Technical Data	
Dimensions (W x D x H)	
Main Unit	20.5 x 11.3 x 14.2 in. (520 x 285 x 360 mm)
Touch screen controller	11.3 x 6.3 x 5.3 in. (284 x 160 x 135 mm)
External power supply	55 in. (140 cm)
External power cord	72 in. (183 cm)
Touch screen controller cable	60 in. (152.4 cm)
Weight	
Main Unit	44 lbs. (20 kg)
Touch screen controller	3.3 lbs. (1.5 kg)
Power Requirements	
Main power supply	100-240 VAC, 47-63 Hz
Device input	24 VDC, 120W (US, EU, UK, and CHN plug types included)
Operating Temperature	5°C to 40°C (relative humidity 80% up to 30°C or 45% relative humidity at 40°C)
Storage Temperature	-10°C to +50°C

1.8 Initial Installation

To install the unit:

1. Connect the Touch Screen Controller cable into the rear panel of the Corning® Lambda™ EliteMax Benchtop Pipettor.
2. Connect the round connector of the universal external power supply into the rear panel of the instrument. Push in firmly until you feel it click into position.
3. Connect the AC power cord to the universal external power supply and then to the AC wall power receptacle. The AC power receptacle should be able to supply approx. 300W and MUST be grounded to a true earth ground.
4. Power up the unit by rocking the Reset/Off switch located in the back of the Corning Lambda EliteMax Benchtop Pipettor to the Reset position. The instrument should boot up, and the home screen will appear in a few seconds.

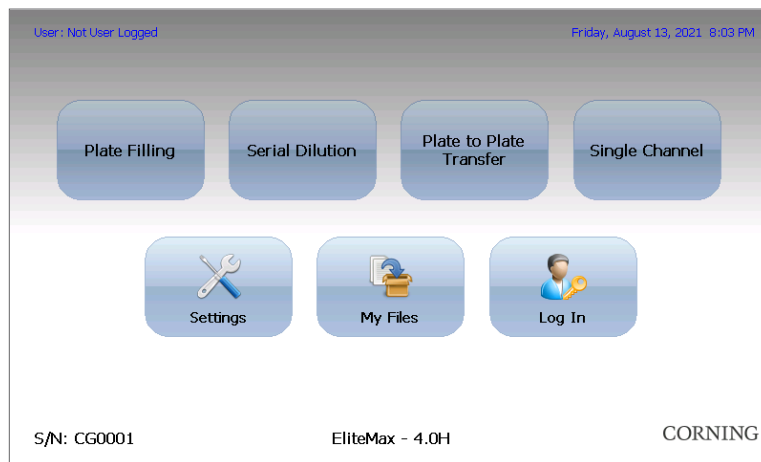


2.0 Instrument Operation

2.1 Touch Screen User Interface

2.1.1 Main Menu

After powering up the Corning Lambda EliteMax Benchtop Pipettor, you will be presented with the main screen or Home Screen.



Simply touch the desired button to access the submenu.

- ▶ **Plate Filling:** Create, run, save, or edit a Plate Filling protocol.
- ▶ **Serial Dilution:** Create, run, save, or edit a Serial Dilution protocol.
- ▶ **Plate to Plate Transfer:** Create, run, save, or edit a Plate-to-Plate Transfer protocol.
- ▶ **Single Channel:** Create, run, save, or edit a Single-channel protocol (this is also known as cherry picking with the single-channel head only).
- ▶ **Settings:** Change instrument settings, access calibration data and other configuration tools.
- ▶ **My Files:** View user-created protocols and data logged information. From here you are also able to delete unwanted protocols.
- ▶ **Log In:** Login under a specific user profile. To access this menu, a user profile must be created first in Settings.

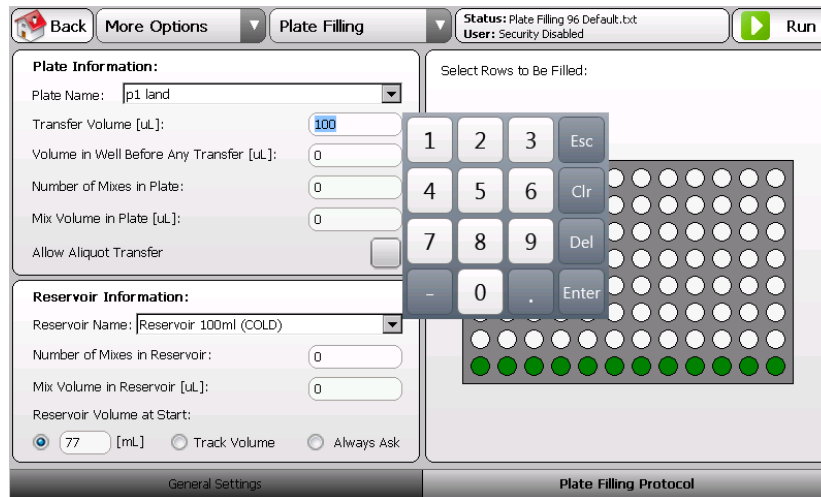
2.1.2 Numeric and Alphanumeric Keypad

To change settings, touch the text box, dropdown menu, or other control that you wish to interact with. A numeric or alphanumeric keypad will automatically appear next to the selected field or control as shown.

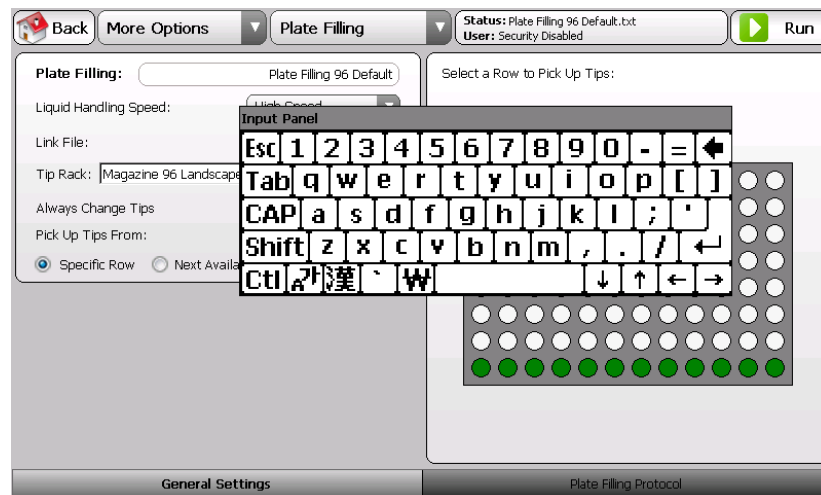
Tip

If you are unable to edit or change values, the screen is most likely locked or disabled so that you don't accidentally change any important values or settings. To enable the screen, just click or touch on the More Options drop down menu, and select Edit User Program (Protocol Toolbar). Now you should be able to edit or change any desired values. Every time you open or save a protocol, the screen is automatically disabled for safety reasons.

Numeric keypad



Alphanumeric keypad



2.1.3 Protocol Toolbar Description

All protocols share the same top Toolbar as shown here.



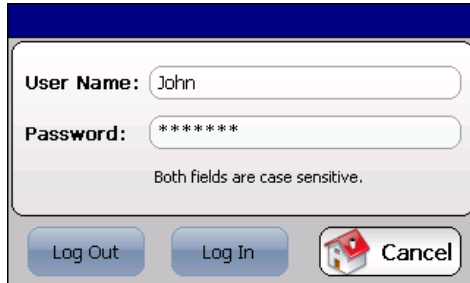
Menu Item	Description
	Use to exit your current page and return to the main menu.
	Use this menu to: <ul style="list-style-type: none"> ▶ Edit the current loaded user protocol. ▶ Open user created protocols. ▶ Save user-created protocols. ▶ Delete user-created protocols. ▶ Reset Next Available Tips (NAT). See more details under the Protocol General Settings section. ▶ Reset reservoir VOLUME tracking feature. See more details under the Protocol General Settings section. ▶ Switch current logged on user.
	Use to move to a different user protocol without going back to the Home Screen. This feature works as a shortcut to a different user protocol.
	The status window shows the current status of the instrument and the User Name of the logged-on user.
	Use the Run button to execute the current protocol. CAUTION: Verify that the tip rack and other necessary plates/reservoirs are in the correct positions before pressing Run. Running the protocol without the appropriate placement can result in the instrument crashing and possible damage to the instrument or plate sample.

2.1.4 Log In User Information

This feature allows different users to share the instrument while avoiding unintentional modification or deletion of user protocols. If this feature is enabled, the user needs to enter their credentials to operate the instrument.

After pressing the Log In button, the following screen appears where the user can enter their credentials and log in. User Name and password fields are case-sensitive. The login screen and toolbar will show if there is a current logged-on user.

After using the instrument, the user can log out from this same screen.



This feature allows different users to share the instrument while avoiding unintentional modification.

NOTE: The instrument is shipped with security disabled.

See Settings/Users, User Management module Section 3.6 to manage users and to enable or disable this feature.

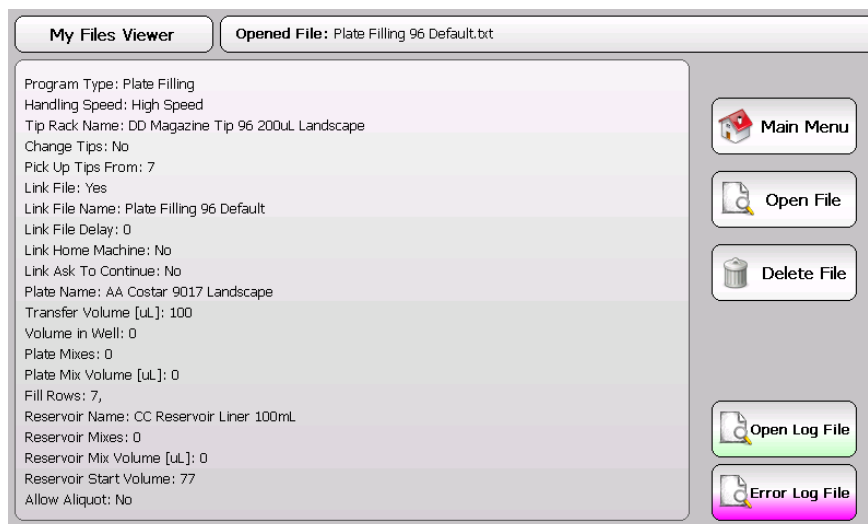
Just in case, the factory default login credentials are included here:

Username: labmanager
Password: 12341234

It is important that you change or delete the factory default credentials once you have set up at least one other administrative user in the User Management module. Make sure that the newly created user has administrative privileges, or they will not be able to access the Settings menu.

2.1.5 My Files User Menu

After pressing the My Files button, the following screen will appear:

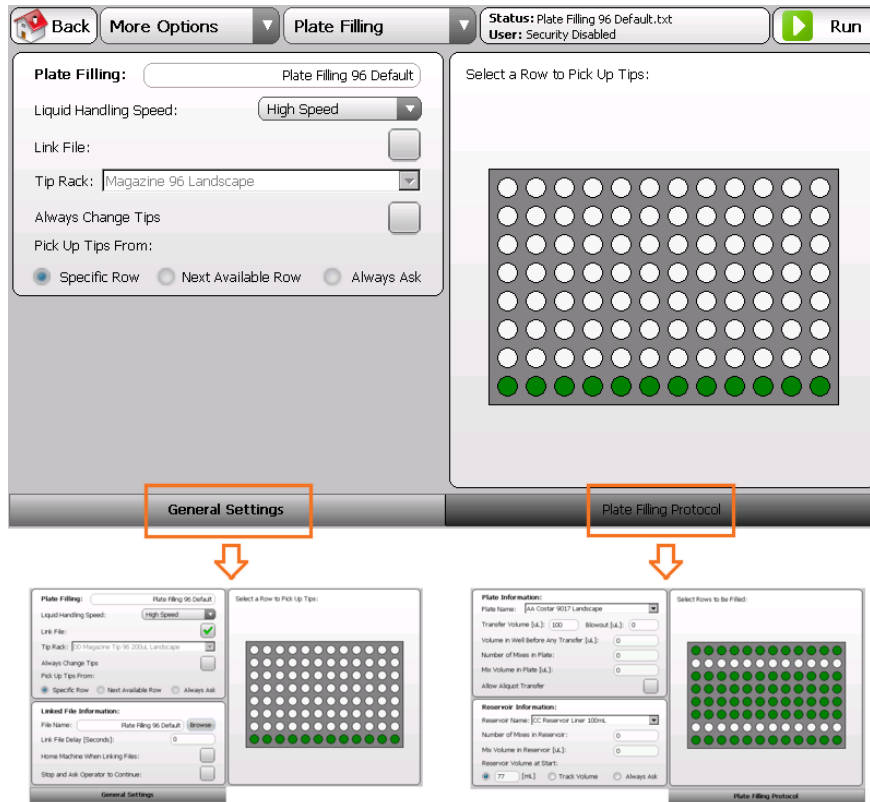


In this screen, saved protocols can be seen in a clearer more readable text format. Press the corresponding button to perform the desired task. **NOTE:** Deleting files requires Delete permissions which are assigned by an administrator (if this feature is enabled). See Settings/Users Section 3.6 to manage users and to enable or disable these privileges.

2.2 Creating and Running User Protocols

2.2.1 Plate Filling

By pressing the Plate Filling button in the main menu, the following screen will appear:



NOTE: The Plate Filling protocol contains two tabs: General Settings and Plate Filling Protocol. See Table 1 for more details.

Tip If you are unable to edit or change values, the screen is most likely locked or disabled so that you don't accidentally change any important values or settings. To enable the screen, just click or touch on the More Options drop down menu and select Edit User Program (Protocol Toolbar). Now you should be able to edit or change any desired values. Every time you open or save a protocol, the screen is automatically disabled for safety reasons.

Table 1. General Settings Tab Menu: Plate Filling

Menu Item	Description
Plate Filling: <input type="text" value="Plate Filling 96 Default"/>	Name of the current protocol.
Liquid Handling Speed: <input type="button" value="High Speed"/> <input type="button" value="Low Speed"/> <input type="button" value="Medium Speed"/> <input type="button" value="High Speed"/>	Use to set the aspirate and dispense liquid head speed. Use Low speed for viscous solutions and when working with cells. Use higher speeds when using thinner solutions or reagents. NOTE: The higher the speed, the faster the protocol will be completed.
Link File: <input checked="" type="checkbox"/>	When this box is checked, it allows the user to specify the following protocol to be executed once the current one is completed. See Linked File Information (Table 2) for more details.
Tip Rack: <input type="text" value="DD Magazine Tip 96 200uL Landscape"/> <input type="text" value="DD Magazine Tip 96 200uL Landscape"/> <input type="text" value="DD Magazine Tip 96 200uL Portrait"/>	Utilize this dropdown menu to select the rack of tips to be used with this protocol.

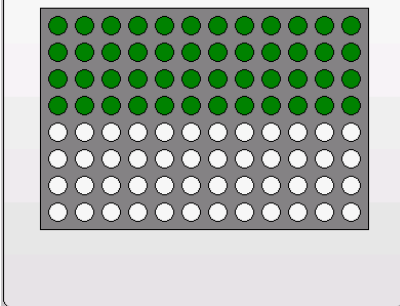
Table 1. General Settings Tab Menu: Plate Filling (continued)

Menu Item	Description
<input type="checkbox"/> Always Change Tips	When this box is checked, the instrument will pick up a new row of tips every time a different row or column is accessed on the microplate.
Pick Up Tips From: <input checked="" type="radio"/> Specific Row <input type="radio"/> Next Available Row <input type="radio"/> Always Ask	Use to select how the disposable tips are going to be consumed. <ul style="list-style-type: none"> When Specific Row is selected, tips are picked up always from the same location. Use the plate image on the right side of the screen to specify the tip's location. When Next Available Row is selected, the instrument will pick up the first unused row of tips from the rack. This is automatically tracked by the instrument in the NAT (Next Available Tip) feature. To reset NAT, select More Options/Reset NAT located in the toolbar. When Always Ask is selected, the instrument will prompt the user for a tip row each time the protocol is executed.
Linked File Information: You can link as many protocols as necessary to perform your experiment. The link file settings will be saved with the protocol, and the linking will occur each time the protocol is executed. NOTE: The following sub-menu appears only when the Link File box is checked.	
<div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin-bottom: 5px;"> Tip It is recommended that you create all of your protocols first, and then add the links between them. This helps to avoid errors caused by trying to link to a protocol that doesn't exist. </div>	
File Name: <input type="text" value="step 2"/> <input type="button" value="Browse"/>	Specify the name of the protocol to be executed when the current protocol is completed. If the protocol already exists, click on the Browse button to select the file you want to link. You can also type in the name of the file.
Link File Delay [Seconds]: <input type="text" value="0"/>	Specify a time delay value in seconds between completion of the current protocol and the start of the next linked protocol.
<input type="checkbox"/> Home Machine When Linking Files:	When this box is checked, the instrument will perform a full Home axis routine.
<input type="checkbox"/> Stop and Ask Operator to Continue:	When this box is checked, the instrument will pause between protocols until the operator instructs the instrument to continue. NOTE: This setting will override any value in the Link File Delay field.

Table 2. Plate Filling Protocol Tab Menu

Menu Item	Description
Plate Name: <input type="text" value="AA Costar 9017 Landscape"/>	Use to select the plate to be filled.
Transfer Volume [μ L]: <input type="text" value="100"/>	Specify the volume [μ L] that you want to transfer from the reagent reservoir into the plate wells.
Blowout [μ L]: <input type="text" value="10"/>	This is the volume of air [μ L] to be displaced after all transfer volume has been dispensed into the wells. This feature helps to dispense all excess liquid that remains in the tip after each dispense. The air volume should be sufficient to assist the separation of the droplet from the tip into the well, but not so great that air bubbles become a problem. The instrument automatically calculates the maximum air volume possible based on the stroke specified in Tip Air Gap (see Settings). If you enter a very large volume, the instrument will use the maximum air volume accessible. The Blowout parameter is most often optimized by trial and error.

Table 2. Plate Filling Protocol Tab Menu (continued)

Menu Item	Description
Volume in Well Before Any Transfer [uL]: <input type="text" value="0"/>	Specify whether or not there is liquid in the target cells before the filling occurs. The instrument uses this information to determine the liquid meniscus height to properly position the tips for optimal liquid transfers.
Number of Mixes in Plate: <input type="text" value="1"/>	Enter a value to determine how many times the mix is performed on each row after the liquid transfer has occurred.
Mix Volume in Plate [uL]: <input type="text" value="1"/>	Enter a volume [μL] that you would like to aspirate and dispense when performing the mixes specified in the previous step.
Allow Aliquot Transfer <input checked="" type="checkbox"/>	When this box is checked, the instrument will withdraw enough reagent from the reservoir to fill specified rows without having to refill each time. The instrument will automatically calculate how much is needed to fill wells with the specified volume. Allow Aliquot Transfer option speeds up the plate filling protocol.
Reservoir Name: <input type="text" value="CC Reservoir Liner 100mL"/>	Use to select the reservoir that you want to withdraw from.
Number of Mixes in Reservoir: <input type="text" value="0"/>	Enter a value to determine how many times the mix is performed in the reservoir before any liquid transfer occurs.
Mix Volume in Reservoir [uL]: <input type="text" value="0"/>	Enter a volume [μL] that you would like to aspirate and dispense when performing the mixes in the reservoir.
Reservoir Volume at Start: <input checked="" type="radio"/> 77 [mL] <input type="radio"/> Track Volume <input type="radio"/> Always Ask	<p>Use to determine reservoir condition at start.</p> <ul style="list-style-type: none"> Fix volume at start. Enter a value here [mL]. Every time this protocol is executed, the instrument assumes that the reservoir contains the specified amount of reagent. When Track Volume is selected, the instrument will keep track of the remaining reagent left in the reservoir. When there is not enough reagent in the reservoir, the instrument will stop and ask the user to refill it. To reset the reservoir volume, select More Options/Reset VOLUME from the toolbar. When Always Ask is selected, the instrument will prompt the user for the reservoir volume each time the protocol is executed.
<div style="border: 1px solid gray; padding: 5px;"> <p>Select Rows to Be Filled:</p>  </div>	<p>Touch a row on the plate image to select or deselect a row to be filled. Only rows that have been highlighted in green will be filled.</p>



CAUTION: Verify that the tip rack and other necessary plates/reservoirs are in the correct positions before pressing Run. Running the protocol without the appropriate placement can result in the instrument crashing and possible damage to the instrument or plate sample.

To save the protocol, select More Options/Save User Program from the toolbar.

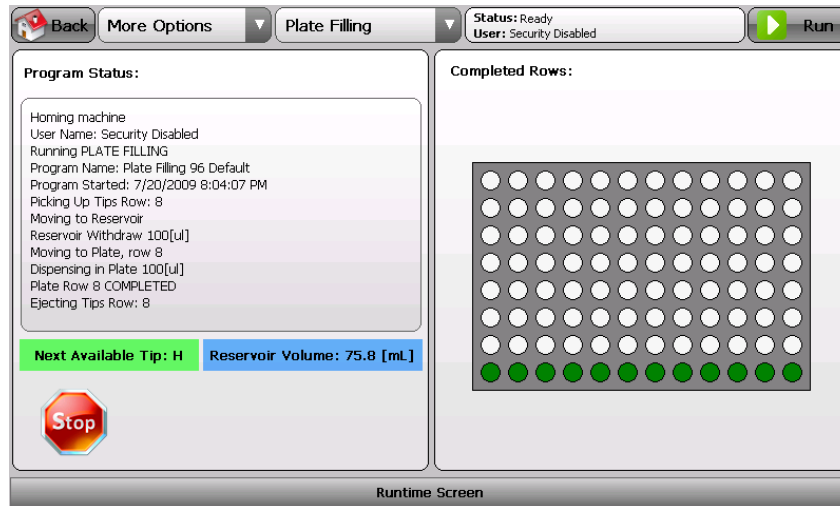
To execute the protocol, press Run on the toolbar.



At any time while the instrument is running, you can press the Stop button located at the bottom left of the Runtime Screen. This will pause the instrument and give you the option to abort or to continue the protocol.

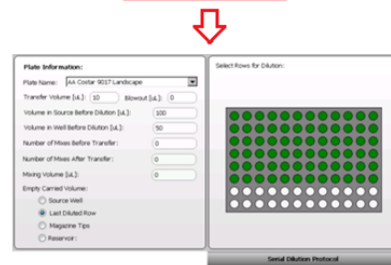
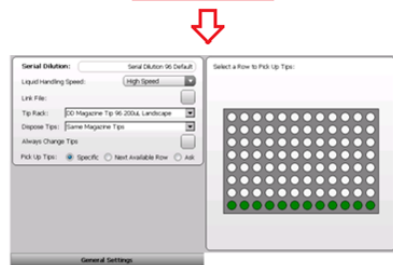
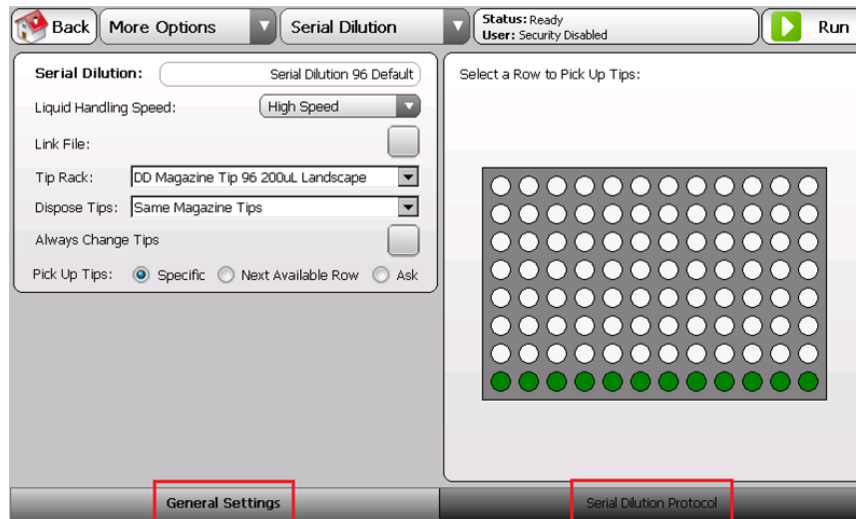
After pressing the Run button, the instrument checks for protocol errors or inconsistency such as the filling of a row that will cause the well to overflow. If any error or inconsistency is detected, the instrument will warn you and give you the opportunity to correct the issue.

While executing the protocol, the Runtime Screen will be displayed. This screen shows the status of each operation performed by the instrument in real time. The wells in the plate image, located on the right side of the screen, will turn green as they are filled.



2.2.2 Serial Dilution

By pressing the Serial Dilution button in the main menu, the following screen will appear:



NOTE: The Serial Dilution protocol contains two tabs: General Settings and Serial Dilution Protocol. See Table 3 for more details.



If you are unable to edit or change values, the screen is most likely locked or disabled so that you don't accidentally change any important values or settings. To enable the screen, just click or touch on the More Options dropdown menu and select Edit User Program (Protocol Toolbar). Now you should be able to edit or change any desired values. Every time you open or save a protocol, the screen is automatically disabled for safety reasons.

Table 3. General Settings Tab Menu: Serial Dilution Protocol

Menu Item	Description
Serial Dilution: <input type="text" value="Serial Dilution 96 Default"/>	Name of the current protocol.
Liquid Handling Speed:	Use to set the aspirate and dispense liquid head speed. Use Low speed for viscous solutions and when working with cells. Use higher speeds when using thinner solutions or reagents. NOTE: The higher the speed, the faster the protocol will be completed.
Link File: <input checked="" type="checkbox"/>	When this box is checked, it allows the user to specify the following protocol to be executed after the current one is completed. See Linked File Information (Table 4) for more details.
Tip Rack:	Use to select the rack of tips to be used in this user protocol.
Dispose Tips:	Use to select where to dispose the used tips after the serial dilution is completed.
Always Change Tips <input type="checkbox"/>	When this box is checked, the instrument will pick up a new row of tips every time a different row or column is accessed on the microplate.
Pick Up Tips From: <input checked="" type="radio"/> Specific Row <input type="radio"/> Next Available Row <input type="radio"/> Always Ask	Use to select how the disposable tips are going to be consumed. <ul style="list-style-type: none"> ▶ When Specific Row is selected, tips are always picked up from the same location. Use the plate image on the right side of the screen to choose the tip's location. ▶ When Next Available Row is selected, the instrument will pick up the first unused row of tips from the rack. This is automatically tracked by the instrument in the NAT (Next Available Tip) feature. To reset NAT, select More Options/Reset NAT from the toolbar. ▶ When Always Ask is selected, the instrument will prompt the user for a tip row each time the protocol is executed.
Linked File Information: You can link as many protocols as necessary to perform your experiment. The link file settings will be saved with the protocol, and the linking will occur each time the protocol is executed.	
NOTE: The following sub-menu appears only when the Link File box is checked.	
It is recommended that you create all of your protocols first, and then add the links between them. This helps to avoid errors caused by trying to link to a protocol that doesn't exist.	
File Name: <input type="text" value="step 2"/> <input type="button" value="Browse"/>	Specify the name of the protocol to be executed when the current protocol is completed. If the protocol already exists, click on the Browse button to select the file you want to link. You can also type in the name of the file.
Link File Delay [Seconds]: <input type="text" value="0"/>	Specify a time delay value in seconds between completion of the current protocol and the start of the next linked protocol.

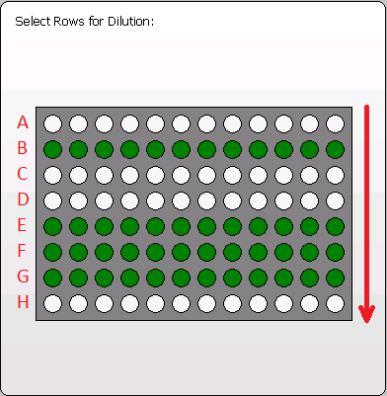
Table 3. General Settings Tab Menu: Serial Dilution Protocol (continued)

Menu Item	Description
Home Machine When Linking Files: <input type="checkbox"/>	When this box is checked, the instrument will perform a full Home axis routine.
Stop and Ask Operator to Continue: <input type="checkbox"/>	When this box is checked, the instrument will pause between protocols until the operator instructs the instrument to continue. This setting will override any value in the Link File Delay field.

Table 4. Serial Dilution Protocol Tab Menu

Menu Item	Description
Plate Name: AA Costar 9017 Landscape	Use to select the plate to be filled.
Transfer Volume [μL]: 100	Use to specify the volume [μL] that you want to transfer when performing the serial dilution.
Blowout [μL]: 10	<p>This is the volume of air [μL] to be displaced after all transfer volume has been dispensed into the wells.</p> <p>This feature helps to dispense all excess liquid that remains in the tip after each dispense. The air volume should be sufficient to assist the separation of the droplet from the tip into the well, but not so great that air bubbles become a problem.</p> <p>The instrument automatically calculates the maximum air volume possible, based on the stroke specified in Tip Air Gap (see Settings). If you enter a very large volume, the instrument will use the maximum air volume accessible.</p> <p>The Blowout parameter is most often optimized by trial and error.</p>
Volume in Source Before Dilution [μL]: 100	<p>Enter the volume [μL] that is already present in the “source” wells.</p> <p>The instrument uses this information to determine the liquid meniscus height to properly position the tips for optimal liquid transfers.</p>
Volume in Well Before Dilution [μL]: 50	<p>Enter the volume [μL] that is already present in the wells to be diluted.</p> <p>The instrument uses this information to determine the liquid meniscus height to properly position the tips for optimal liquid transfers.</p>
Number of Mixes Before Transfer: 0	Enter a value to determine how many times the mix is performed in each row before any liquid transfer occurs.
Number of Mixes After Transfer: 0	Enter a value to determine how many times the mix is performed in each row after the liquid transfer occurs.
Mixing Volume [μL]: 0	Enter a volume [μL] that you would like to aspirate and dispense when performing the mixes specified in the previous steps.
Empty Carried Volume: <input type="radio"/> Source Well <input type="radio"/> Last Diluted Row <input type="radio"/> Magazine Tips <input checked="" type="radio"/> Reservoir: CC Reservoir 20ml	<p>Select where you want the instrument to dispense the carried-over reagent after the serial dilution is completed.</p> <ul style="list-style-type: none"> ▶ Source Well: The first accessed row of the serial dilution protocol. ▶ Last Diluted Row: The last accessed row of the serial dilution protocol. ▶ Magazine Tips: Dispose of carried-over reagent in the tips rack when returning or ejecting tips. ▶ Reservoir: Use the dropdown menu to select a reagent reservoir.

Table 4. Serial Dilution Protocol Tab Menu (continued)

Menu Item	Description
	<p>Touch a row on the plate image to select or deselect a row to be filled. Only rows that have been highlighted in green will be accessed.</p> <p>NOTE: The serial dilution is always executed from top to bottom (A-H). The first row, from top to bottom, is considered the SOURCE row. As shown in the image, it's possible to skip rows while performing a serial dilution. The same principle applies when working with plates in portrait orientation (1-12), top to bottom.</p>



CAUTION: Verify that the tip rack and other necessary plates/reservoirs are in the correct positions before pressing run. Running the protocol without the appropriate placement can result in the instrument crashing and possible damage to the instrument or plate sample.

To save the protocol, select More Options/Save User Program from the toolbar.

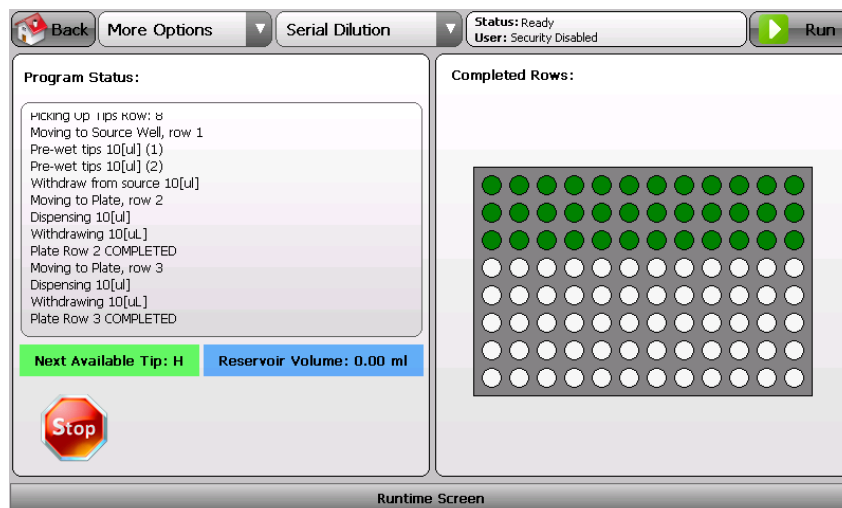
To execute the protocol, press Run on the toolbar.



At any time while the instrument is running, you can press the Stop button located at the bottom left of the Runtime screen. This will pause the instrument and give you the option to abort or to continue the protocol.

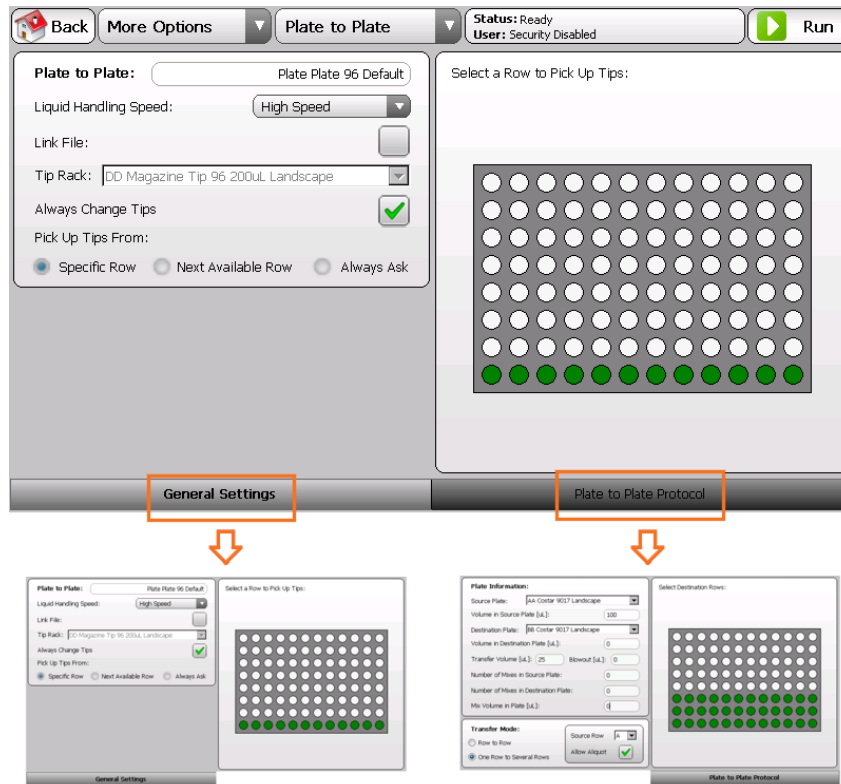
After pressing the Run button, the instrument checks for protocol errors or inconsistency such as the filling of a row that will cause the well to overflow. If any error or inconsistency is detected, the instrument will warn you and give you the opportunity to correct the issue.

While executing the protocol, the Runtime screen will be displayed. This screen shows the status of each operation performed by the instrument in real time. The wells in the plate image, located on the right side of the screen, will turn green as they are filled.



2.2.3 Plate-to-Plate Transfers

By pressing the Plate-to-Plate Transfer button in the main menu, the following screen will appear:



NOTE: The Plate-to-Plate Transfer protocol contains two tabs: General Settings and Plate-to-Plate Protocol. See Table 5 for more details.



If you are unable to edit or change values, the screen is most likely locked or disabled so that you don't accidentally change any important values or settings. To enable the screen, just click or touch on the More Options drop down menu and select Edit User Program (Protocol Toolbar). Now you should be able to edit or change any desired values. Every time you open or save a protocol, the screen is automatically disabled for safety reasons.

Table 5. General Settings Tab Menu: Plate-to-Plate protocol

Menu Item	Description
Plate to Plate: <input type="text" value="Plate Plate 96 Default"/>	Name of the current protocol.
Liquid Handling Speed: <input type="button" value="High Speed"/> <input type="button" value="Low Speed"/> <input type="button" value="Medium Speed"/> <input type="button" value="High Speed"/>	Use to set the aspirate and dispense liquid head speed. Use Low speed for viscous solutions and when working with cells. Use higher speeds when using thinner solutions or reagents. NOTE: The higher the speed, the faster the protocol will be completed.
Link File: <input type="checkbox"/>	When this box is checked, it allows the user to specify the following protocol to be executed after the current one is completed. See Linked File Information below for more details.
Tip Rack: <input type="text" value="DD Magazine Tip 96 200uL Landscape"/> <input type="text" value="DD Magazine Tip 96 200uL Landscape"/> <input type="text" value="DD Magazine Tip 96 200uL Portrait"/>	Use to select the rack of tips to be used with this protocol.
Always Change Tips <input type="checkbox"/>	When this box is checked, the instrument will pick up a new row of tips every time a different row or column is accessed on the microplate.

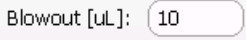


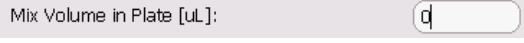
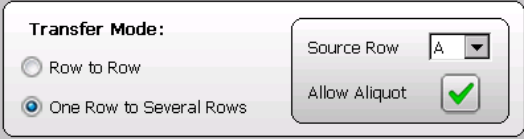
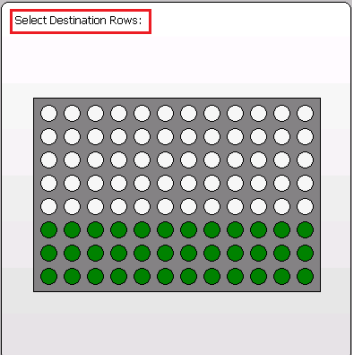
Table 5. General Settings Tab Menu: Plate-to-Plate protocol (continued)

Menu Item	Description
<p>Pick Up Tips From:</p> <p><input checked="" type="radio"/> Specific Row <input type="radio"/> Next Available Row <input type="radio"/> Always Ask</p>	<p>Use to select how the disposable tips are going to be consumed.</p> <ul style="list-style-type: none"> ▶ When Specific Row is selected, tips are always picked up from the same location. Use the plate image on the right side of the screen to choose the tip's location. ▶ When Next Available Row is selected, the instrument will pick up the first unused row of tips from the rack. This is automatically tracked by the instrument in the NAT (Next Available Tip) feature. To reset NAT, select More Options/Reset NAT from the toolbar. ▶ When Always Ask is selected, the instrument will prompt the user for a tip row each time the protocol is executed.
<p>Linked File Information: You can link as many protocols as necessary to perform your experiment. The link file settings will be saved with the protocol, and the linking will occur each time the protocol is executed.</p> <p>NOTE: The following sub-menu appears only when the Link File box is checked.</p> <p>Tip It is recommended that you create all of your protocols first, and then add the links between them. This helps to avoid errors caused by trying to link to a protocol that doesn't exist.</p>	
<p>File Name: <input type="text" value="step 2"/> <input type="button" value="Browse"/></p>	<p>Specify the name of the protocol to be executed when the current protocol is completed. If the protocol already exists, click on the Browse button to select the file you want to link. You can also type in the name of the file.</p>
<p>Link File Delay [Seconds]: <input type="text" value="0"/></p>	<p>Specify a time delay value in seconds between completion of the current protocol and the start of the next linked protocol.</p>
<p>Home Machine When Linking Files: <input type="checkbox"/></p>	<p>When this box is checked, the instrument will perform a full Home axis routine.</p>
<p>Stop and Ask Operator to Continue: <input type="checkbox"/></p>	<p>When this box is checked, the instrument will pause between protocols until the operator instructs the instrument to continue. This setting will override any value in the Link File Delay field.</p>

Table 6. Plate-to-Plate Protocol Tab Menu

Menu Item	Description
<p>Plate Name: <input type="text" value="AA Costar 9017 Landscape"/></p>	<p>Select the plate you want to withdraw from or the Source plate.</p>
<p>Volume in Source Plate [μL]: <input type="text" value="100"/></p>	<p>Enter the volume [μL] that is already present in the Source wells. The instrument uses this information to determine the liquid meniscus height to properly position the tips for optimal liquid transfers.</p>
<p>Destination Plate: <input type="text" value="BB Costar 9017 Landscape"/></p>	<p>Select the plate where you want to dispense to or Destination Plate. If you want to transfer within the same plate, select the same plate you selected previously in Source Plate.</p>
<p>Volume in Destination Plate [μL]: <input type="text" value="0"/></p>	<p>Enter the volume [μL] that is already present in the Destination Plate wells. The instrument uses this information to determine the liquid meniscus height to properly position the tips for optimal liquid transfers.</p>
<p>Transfer Volume [μL]: <input type="text" value="100"/></p>	<p>Use to specify the volume [μL] that you want to transfer from the Source Plate to the Destination Plate.</p>

Table 6. Plate-to-Plate Protocol Tab Menu (continued)

Menu Item	Description
	<p>The volume of air [μL] to be displaced after all transfer volume has been dispensed into the wells.</p> <p>This feature helps to dispense all excess liquid that remains in the tip after each dispense. The air volume should be sufficient to assist the separation of the droplet from the tip into the well, but not so great that air bubbles become a problem.</p> <p>The instrument automatically calculates the maximum air volume possible, based on the stroke specified in Tip Air Gap (see Settings). If you enter a very large volume, the instrument will use the maximum air volume accessible.</p> <p>The Blowout parameter is most often optimized by trial and error.</p>
	<p>Enter a value to determine how many times the mix is performed in each row of the Source Plate before any liquid transfer occurs.</p>
	<p>Enter a value to determine how many times the mix is performed in each row of the Destination Plate after the liquid transfer occurs.</p>
	<p>Enter a volume [μL] that you would like to aspirate and dispense when performing the mixes specified in the previous steps.</p>
	<p>Select the transfer method between plates:</p> <ul style="list-style-type: none"> ▶ Row to Row: The instrument transfers from the row in the Source Plate to the corresponding row in the Destination Plate. This is mainly used to do plate replications. ▶ One Row to Several Rows: The instrument transfers from the specified row in the Source Plate to multiple rows in the Destination Plate. Select from the dropdown menu the Source row. When Aliquot is checked, the instrument will withdraw enough reagent from the Source row to fill all of the selected destination rows without having to refill each time.
	<p>Touch a row on the plate image to select or deselect the rows to be accessed. Only rows that have been highlighted in green will be filled.</p>



CAUTION: Verify that the tip rack and other necessary plates/reservoirs are in the correct positions before pressing run. Running the protocol without the appropriate placement can result in the instrument crashing and possible damage to the instrument or plate sample.

To save the protocol, select More Options/Save User Program from the toolbar.

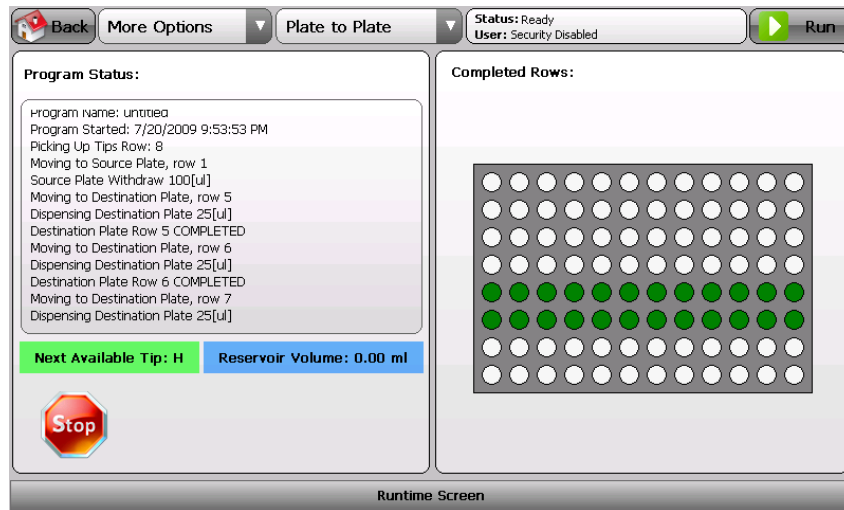
To execute the protocol, press Run on the toolbar.



At any time while the instrument is running, you can press the Stop button located at the bottom left of the Runtime Screen. This will pause the instrument and give you the option to abort or to continue the protocol.

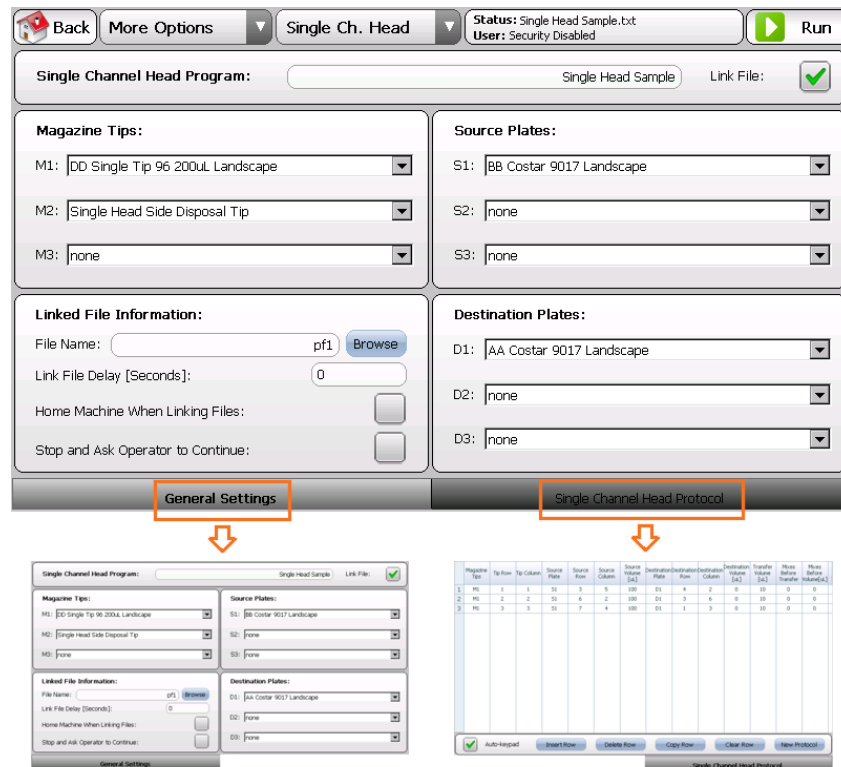
After pressing the Run button, the instrument checks for protocol errors or inconsistency such as the filling of a row that will cause the well to overflow. If any error or inconsistency is detected, the instrument will warn you and give you the opportunity to correct the issue.

While executing the protocol, the Runtime screen will be displayed. This screen shows the status of each operation performed by the instrument in real time. The wells in the plate image, located on the right side of the screen, will turn green as they are filled.



2.2.4 Cherry Picking Protocols for Single-channel

By pressing the Single-channel button in the main menu, the following screen will appear:



NOTE: The Single-channel protocol contains two tabs: General Settings and Single-channel Head Protocol. See Table 7 for more details.

Tip If you are unable to edit or change values, the screen is most likely locked or disabled so that you don't accidentally change any important values or settings. To enable the screen, just click or touch on the More Options drop down menu and select Edit User Program (Protocol Toolbar). Now you should be able to edit or change any desired values. Every time you open or save a protocol, the screen is automatically disabled for safety reasons.

Table 7. General Settings Tab Menu: Single-channel Head Protocol

Menu Item	Description
Single Channel Head Program: <input type="text" value="Single Head Sample"/>	Name of the current protocol.
Link File: <input checked="" type="checkbox"/>	When this box is checked, it allows the user to specify the following protocol to be executed after the current one is completed. See Linked File Information below for more details.
Magazine Tips: M1: <input type="text" value="DD Single Tip 96 200uL Landscape"/> M2: <input type="text" value="Single Head Side Disposal Tip"/> M3: <input type="text" value="none"/>	Use the dropdown menus to assign the Tip Racks to either the M1, M2, or M3 reference racks. You need at least one “M” reference tip rack to run the protocol. However, up to three racks can be assigned for larger, more complex protocols.
Source Plates: S1: <input type="text" value="BB Costar 9017 Landscape"/> S2: <input type="text" value="none"/> S3: <input type="text" value="none"/>	Use the dropdown menus to assign the Source Plates to either the S1, S2, or S3 reference plates. You need at least one “S” reference source plate to run the protocol. However, up to three plates can be assigned for larger, more complex protocols. NOTE: Source Plate references the plate that you want to withdraw from.
Destination Plates: D1: <input type="text" value="AA Costar 9017 Landscape"/> D2: <input type="text" value="none"/> D3: <input type="text" value="none"/>	Use the dropdown menus to assign the Destination Plates to either the D1, D2, or D3 reference plates. You need at least one “D” reference source plate to run the protocol. However, up to three plates can be assigned for larger more complex protocols. NOTE: Destination Plate references the plate that you want to dispense the aspirated volume from.
Linked File Information: You can link as many protocols as necessary to perform your experiment. The link file settings will be saved with the protocol, and the linking will occur each time the protocol is executed. NOTE: The following sub-menu appears only when the Link File box is checked. <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin-bottom: 5px;"> T ip </div> It is recommended that you create all of your protocols first, and then add the links between them. This helps to avoid errors caused by trying to link to a protocol that doesn't exist.	
File Name: <input type="text" value="step 2"/> <input type="button" value="Browse"/>	Specify the name of the protocol to be executed when the current protocol is completed. If the protocol already exists, click on the Browse button to select the file you want to link. You can also type in the name of the file.
Link File Delay [Seconds]: <input type="text" value="0"/>	Specify a time delay value in seconds between completion of the current protocol and the start of the next linked protocol.
Home Machine When Linking Files: <input type="checkbox"/>	When this box is checked, the instrument will perform a full Home axis routine.
Stop and Ask Operator to Continue: <input type="checkbox"/>	When this box is checked, the instrument will pause between protocols until the operator instructs the instrument to continue. This setting will override any value in the Link File Delay field.

When the Single-channel Head Protocol tab is selected, a table is presented like the one shown here. The table is used for the creation of the protocol.

NOTE: The entire table does not fit on the touch screen controller, you will need to touch and hold on the table to pan around the document.

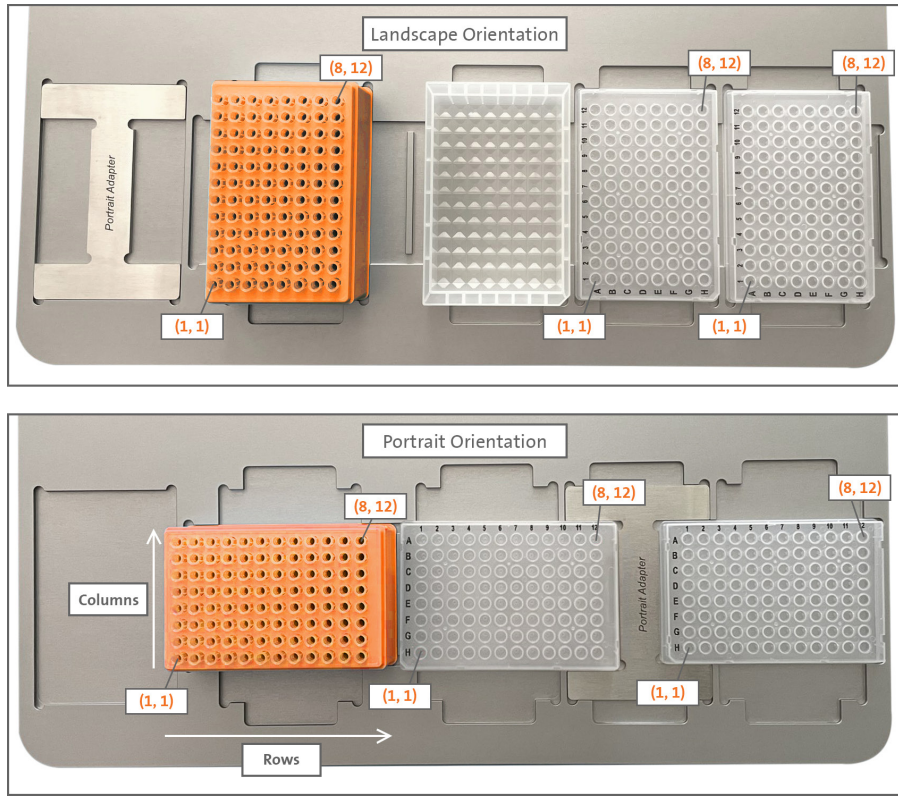
Magazine Tips	Tip Row	Tip Column	Source Plate	Source Row	Source Column	Source Volume [uL]	Destination Plate	Destination Row	Destination Column	Destination Volume [uL]	Transfer Volume [uL]	Mixes Before Transfer	Mixes After Transfer	Mixes Before Volume[uL]	Mixes After Volume[uL]	Liquid Handling Speed	Dispose Tip	Pause [sec]	Blowout [uL]
1	M1	1	S1	3	5	100	D1	4	2	0	10	0	0	0	0	High	m1	0	5
2	M1	2	S1	6	2	100	D1	3	6	0	10	0	0	0	0	High	m2	0	4
3	M1	3	S1	7	4	100	D1	1	3	0	10	0	0	0	0	High	m2	0	3

As shown in the image above, Protocol STEPS are always executed from **Top to Bottom** and each Protocol STEP (or row) is interpreted from **Left to Right**.

For example, row number 1 is executed first in the image above. The instrument will pick up the tip from rack M1(1,1) and transfer 10 [µL] from the source plate S1(3,5) to the destination plate D1(4,2). After the liquid transfer is performed, the tip will be disposed (or returned, in this case) into the M1 tip rack. Subsequent rows are executed in a similar manner until the end. This example should help you to understand the protocol execution sequence.

To change values in the table, just touch the cell that you want to access, and then double tap it. The alphanumeric keypad will pop up, and the value in the cell can then be modified or added. If you cannot see the cell because the alphanumeric keypad is on top of it, touch and hold on the top gray bar of the keypad to move it around.

The following image shows the convention utilized to define the coordinates, row and column of each well in the plates, regardless of the plate orientation. The same principle applies to tip racks or any other accessory. **NOTE:** It is very important that the plates, tip racks, or any other accessory is properly defined or created to avoid possible collisions.



The instrument will recognize if the following Protocol Step (or row) is calling for the same disposable tip that is already present in the single-channel head. If that is the case, the instrument will continue the execution of the protocol without interruptions. Otherwise, it will automatically swap the tips according with the protocol parameters.

Table 8. Single-channel Head Protocol Tab Menu

Menu Item	Description								
<table border="1"> <thead> <tr> <th>Magazine Tips</th> <th>Tip Row</th> <th>Tip Column</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td>1</td> </tr> </tbody> </table>	Magazine Tips	Tip Row	Tip Column	M1	1	1	<p>These columns specify the exact disposable tip to be used during this protocol step.</p> <p>NOTE: The Magazine Tips fields only accept either M1, M2, or M3 words (lower or upper case). M1, M2, or M3 mnemonics represent the tip rack, and are referenced in the General Settings tab. Tip Row and Tip Column represent the location of the tip in the rack. See above the convention utilized to determine the tip location in the rack.</p>		
Magazine Tips	Tip Row	Tip Column							
M1	1	1							
<table border="1"> <thead> <tr> <th>Source Plate</th> <th>Source Row</th> <th>Source Column</th> <th>Source Volume [uL]</th> </tr> </thead> <tbody> <tr> <td>S1</td> <td>3</td> <td>5</td> <td>100</td> </tr> </tbody> </table>	Source Plate	Source Row	Source Column	Source Volume [uL]	S1	3	5	100	<p>These columns specify the source well that you would like to withdraw from.</p> <p>NOTE: The Source Plate field only accepts either S1, S2, or S3 words (lower or upper case). S1, S2, or S3 mnemonics represent the source plate, and are referenced in the General Settings tab. Tip Row and Tip Column represent the location of the well in the Source plate. See above the convention utilized to determined well location in the plate.</p>
Source Plate	Source Row	Source Column	Source Volume [uL]						
S1	3	5	100						
<table border="1"> <thead> <tr> <th>Destination Plate</th> <th>Destination Row</th> <th>Destination Column</th> <th>Destination Volume [uL]</th> </tr> </thead> <tbody> <tr> <td>D1</td> <td>4</td> <td>2</td> <td>0</td> </tr> </tbody> </table>	Destination Plate	Destination Row	Destination Column	Destination Volume [uL]	D1	4	2	0	<p>These columns specify the destination well in which you would like to dispense the aspirated volume. NOTE: The Destination Plate field only accepts either D1, D2, or D3 words (lower or upper case). D1, D2, or D3 mnemonics represent the destination plate, and are referenced in the General Settings tab. Tip Row and Tip Column represent the location of the well in the destination plate. See above the convention utilized to determined well location in the plate.</p>
Destination Plate	Destination Row	Destination Column	Destination Volume [uL]						
D1	4	2	0						

Table 8. Single-channel Head Protocol Tab Menu (continued)


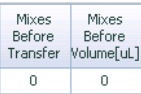
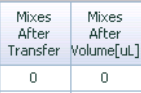




Menu Item	Description
	This column specifies the volume [μL] to be transferred from the source well into the Destination well.
	These columns specify the number of mixes and the mix volume [μL] to be performed in the Source well before any liquid transfer has been made.
	These columns specify the number of mixes and the mix volume [μL] to be performed in the Destination well after the liquid transfer has been made.
	This column specifies the Aspirate and Dispense speed of the single-channel head. Use Low speed for viscous solutions and when working with cells. Utilize the higher speeds when using thinner solutions or reagents. NOTE: This field only accepts HIGH, MED, or LOW as commands. This includes lower or upper case letters, or that they at least start with letters H, M, L.
	This column specifies where to dispose the tip after the protocol step is completed. NOTE: The Dispose Tip field only accepts either M1, M2, or M3 words (lower or upper case). M1, M2, or M3 mnemonics represent the tip rack, and are referenced in the General Settings tab. NOTE: The instrument will use the same coordinates, row and column, from when the tip was picked up.
	After the liquid transfer is completed, the instrument will pause for the number of seconds specified in this field before executing the next protocol step.
	<p>This is the volume of air [μL] to be displaced after all transfer volume has been dispensed into the destination well.</p> <p>This feature helps to dispense all excess liquid that remains in the tip after each dispense. The air volume should be sufficient to assist the separation of the droplet from the tip into the well, but not so great that air bubbles become a problem.</p> <p>The instrument automatically calculates the maximum air volume possible, based on the stroke specified in Tip Air Gap (see Settings). If you enter a very large volume, the instrument will use the maximum air volume accessible.</p> <p>The Blowout parameter is most often optimized by trial and error.</p>

Table 9. Single-channel Head Protocol – Table Controls


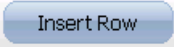


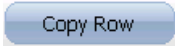
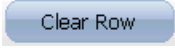

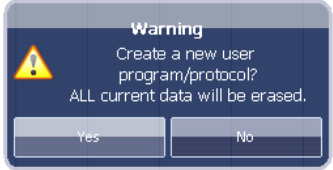
Menu Item	Description
	When this box is checked, the alphanumeric keypad will automatically pop up when double tapping on a table's cell.
	<p>When this button is pressed, the following message screen appears. It is recommended that you first select the table's row in which you would like to perform the task.</p> 

Table 9. Single-channel Head Protocol – Table Controls (continued)

Menu Item	Description
	This button allows you to delete the selected row from the table. It is recommended that you first select the table's row in which you would like to perform the task.
	This button allows you to copy the selected row from the table. It is recommended that you first select the table's row in which you would like to perform the task.
	NOTE: It is recommended that you first select the table's row in which you would like to perform the task. This button will erase all fields in the selected row.
	This button will erase all fields in the table. The following message is presented: 

To save the protocol, select More Options/Save User Program from the toolbar.

To execute the protocol, press Run on the toolbar.



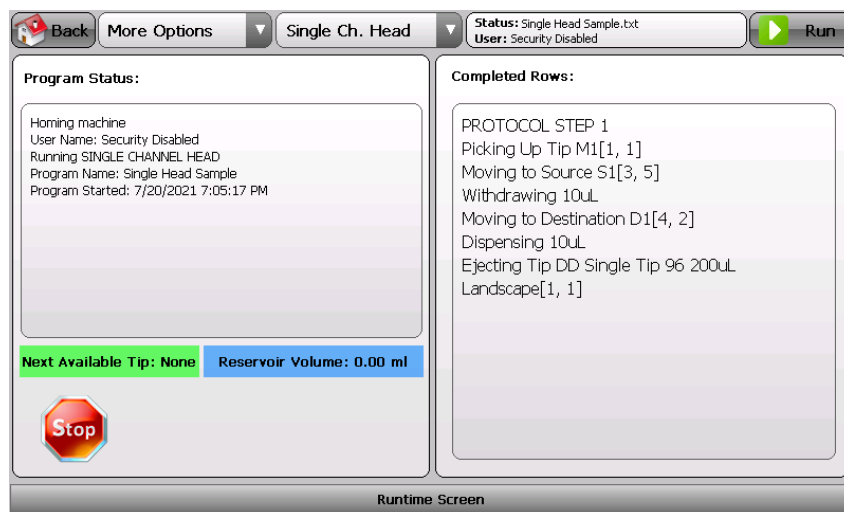
CAUTION: Verify that the tip rack and other necessary plates/reservoirs are in the correct positions before pressing run. Running the protocol without the appropriate placement can result in the instrument crashing and possible damage to the instrument or plate sample.



At any time while the instrument is running, you can press the Stop button located at the bottom left of the Runtime Screen. This will pause the instrument and give you the option to abort or to continue the protocol.

After pressing the Run button, the instrument checks for protocol errors or inconsistency such as the filling of a row that will cause the well to overflow. If any error or inconsistency is detected, the instrument will warn you and give you the opportunity to correct the issue.

While executing the protocol, the Runtime Screen will be displayed. This screen shows the status of each operation performed by the instrument in real time.



2.2.5 Linking Simple Protocols

The Corning® Lambda™ EliteMax Benchtop Pipettor allows you to specify a protocol to be run after the current one finalizes. In this way, you can create more complex and advanced protocols by linking the simple ones together.

You can link as many simple protocols as needed to create larger, more complex ones.

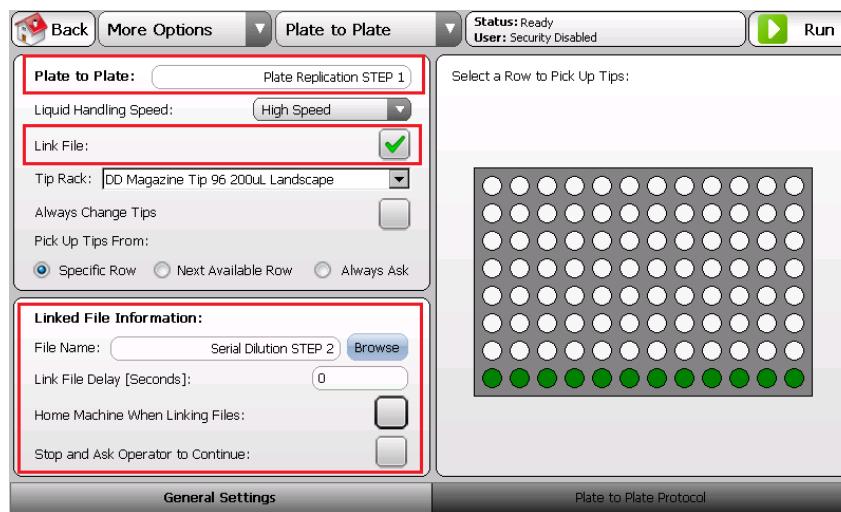
The Link File Information is saved with its protocol, so next time that the protocol is executed, the linked file will be called.

Tip To avoid errors caused by trying to link to a protocol that doesn't exist, create all simple protocols first, and save them. Then, add the links between them.

NOTE: Make sure you press the Run button (toolbar) from the first protocol in the sequence of linked protocols, otherwise the current screen protocol will be executed.

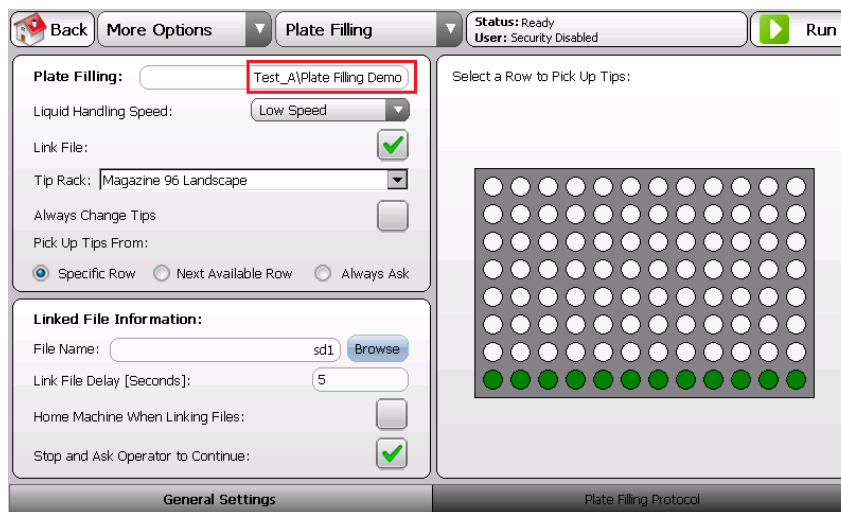
Example: After a plate replication, you want to perform a serial dilution.

To perform a plate replication, you use the Plate-to-Plate transfer protocol. **NOTE:** The Link File box is checked, allowing the Linked File Information menu to be visible. There, you can enter or browse for the name of the protocol to be called after completion of the plate replication. In summary, after the completion of Plate Replication STEP 1, Serial Dilution STEP 2 is called.



Tip To “group” or organize larger protocols inside folders, add the backward slash key (\) between the name of the folder you wish to use or create, and the protocol name.

“Test_A” represents the folder name and “Plate Filling Demo” is the protocol name.



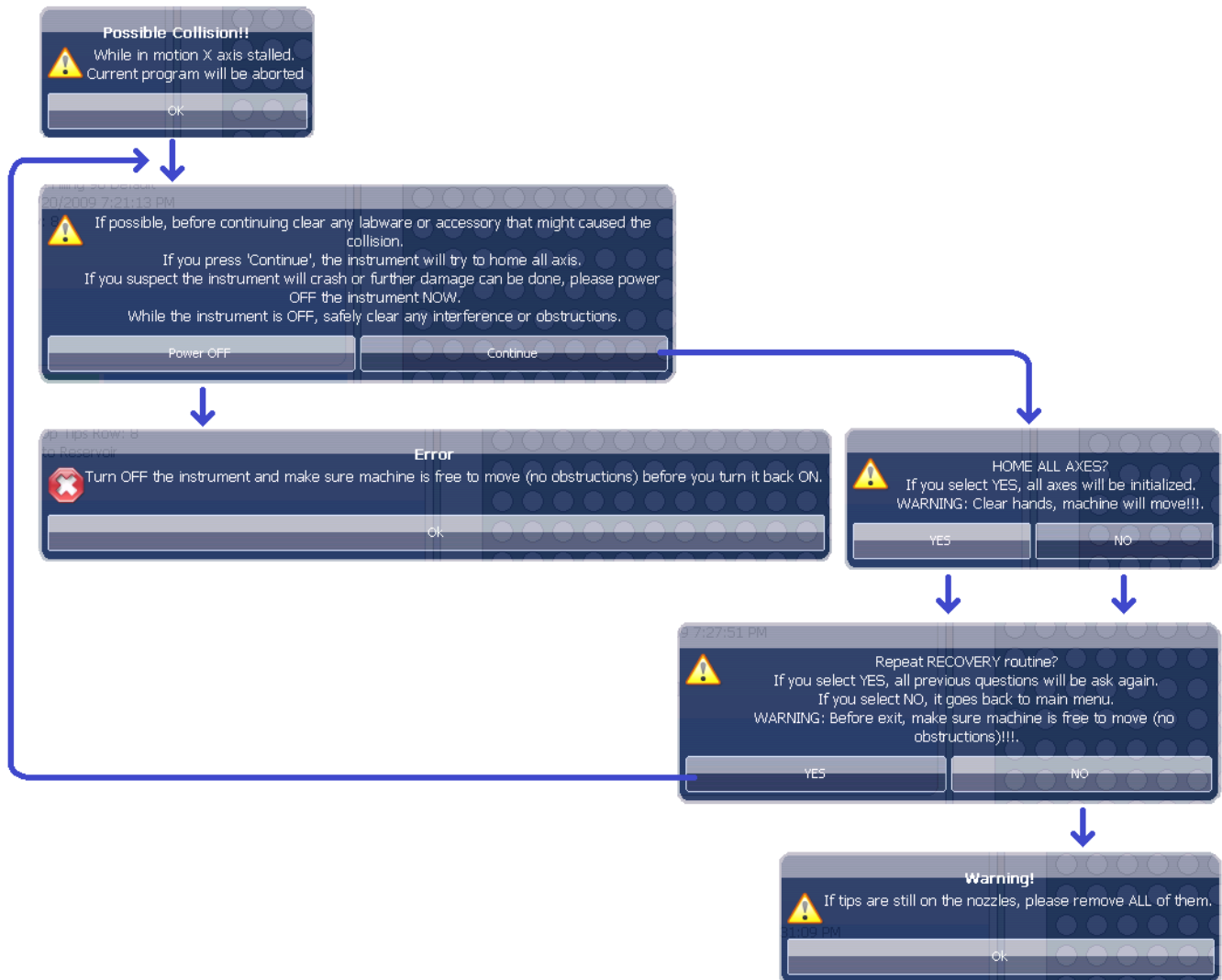
2.2.6 Collision Detection

Misplacing tip racks, plates, and accessories on the deck can make the instrument more prone to crashes while in motion. When a possible collision occurs or an overload condition is detected, the instrument stops immediately, and all servo motors are de-energized for safety reasons. The current protocol will be terminated and the operator is notified of the situation. Reference the flow diagram to better understand the collision recovery sequence.



CAUTION: Always verify that the tip rack and other necessary plates/reservoirs are in the correct positions before running any protocol. Running the protocol without the appropriate placement can result in the instrument crashing and possible damage to the instrument or plate sample. Never rely on the collision detection feature for your safety. Always keep your hands clear during operation. Always use safety glasses and protective clothing while operating the instrument.

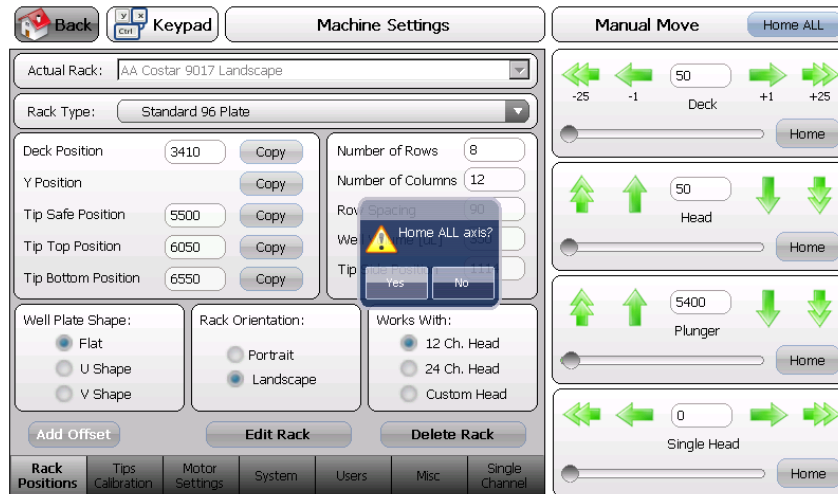
Collision Recovery Sequence – Flow Diagram



3.0 Settings: General Configurations

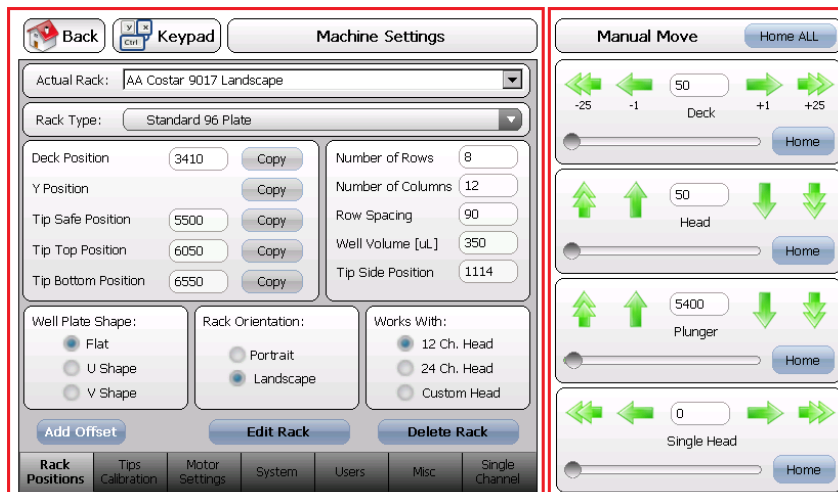
3.1 Screen Layout and Overview

By pressing the Settings button in the main menu, the following screen will appear. If you are prevented from entering here, security is enabled, so you will need to log in with administrator privileges. Please reference the Log In information (Section 2.1.4) for more details.

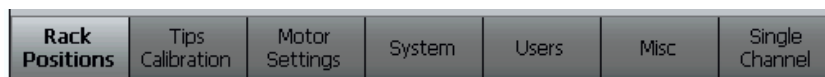


After you have entered the settings area, a message box will be presented asking if you want to Home ALL axis. It is recommended that you always select Yes, unless you are performing other settings that do not require instrument motion or calibration. By selecting Yes, the instrument will move each axis to its initial position.

The Settings screen is divided in two areas. The area on the left is used to access different setting menus. The area on the right is used to manually move the liquid head mechanism and instrument's axis.



Use the following tabs to access different configuration menus.



CAUTION: Exercise caution when entering values as a collision can occur.

Use the sub-menus on the right to manually move each axis.

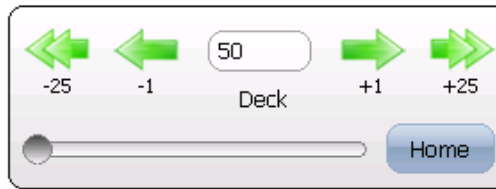
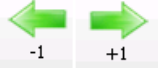





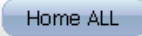


Table 10. Manual Axis Motion

Menu Item	Description
	<p>When pressing a Single Arrow icon, the selected axis will move one step at a time. To jog the axis at a low speed and in short increments, press and hold the single arrow icon. As soon as you release the control, the instrument will stop.</p>
	<p>When pressing a Double Arrow icon, the selected axis will move 25 steps at a time. To jog the axis, press and hold the double arrow icon. As soon as you release the control, the instrument will stop.</p>
	<p>The text box shows the current axis position. It is possible to enter a value by tapping on the control. By doing this, a numeric keypad will pop up. After entering a different value and hitting enter, the instrument will move to the entered position immediately.</p> <p> CAUTION: Exercise caution when entering values as a collision can occur.</p> 
	<p>Selected axis will be initialized and moved to its original position.</p>
	<p>ALL axes are initialized. Instrument will move to its original position.</p>

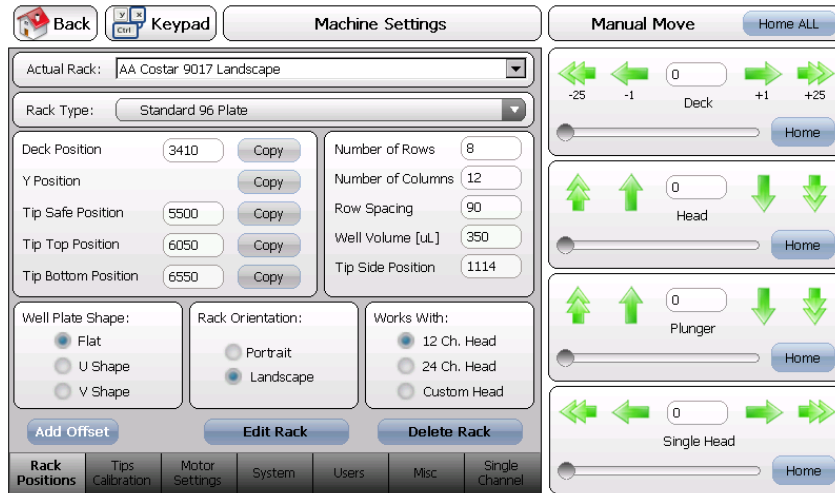


CAUTION:

- ▶ Always keep hands clear while performing manual moves.
- ▶ Look for movement trajectory to avoid collisions.
- ▶ Instrument can crash and possible damage to the instrument or plate sample can occur.

3.2 Rack Positions Menu

When the Rack Positions is selected, the following screen appears.



The Rack Positions menu allows you to create or define a new plate, tip rack, or accessory. The instrument is compatible with a variety of standard plates, but it is possible to define non-standard plates, custom plates, or other accessories.

Use this menu to adjust the alignment of an already existing plate, tip rack, or accessory.

The following table provides details about the functionality of the controls in this menu.

Table 11. Rack Positions Tab Menu

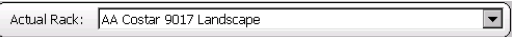
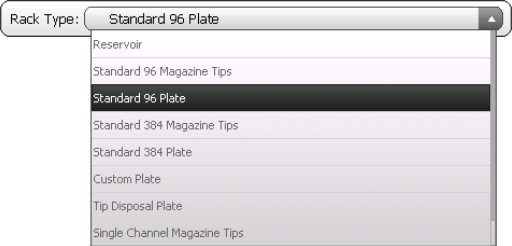
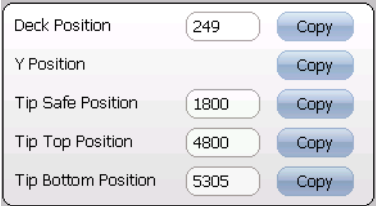
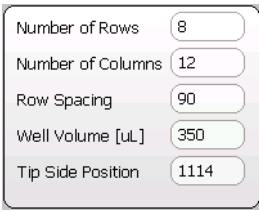
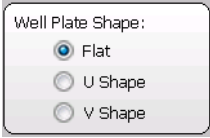
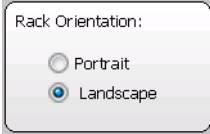
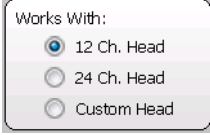





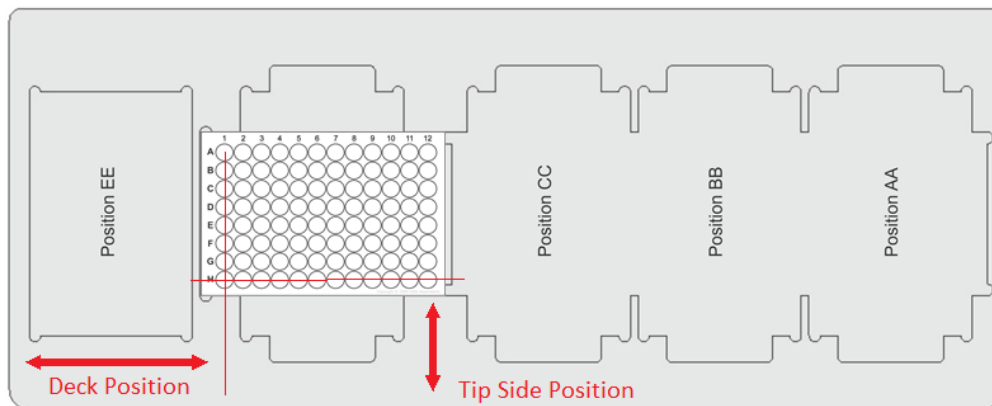
Menu Item	Description
	Use to select the rack to be edited or to enter name for a new one.
	Select the rack type you are creating or editing.
	<p>The information in this section determines the location or coordinates of the rack from the origin of each axis.</p> <ul style="list-style-type: none"> ▶ Copy buttons: are used to copy actual coordinates from the manual movement controls into their corresponding rack positions. ▶ Deck Position: The position in which the tip is aligned at the center of the first row of wells. ▶ Y Position: N/A. ▶ Tip Safe Position: A position high enough above the plate in which the liquid head can move freely without hitting anything. ▶ Tip Top Position: The Position in which the tip is touching the liquid meniscus at the well's working volume. ▶ Tip Bottom Position: Approx. 0.1 to 0.3 mm above the bottom of the plate well or reservoir.

Table 11. Rack Positions Tab Menu (continued)

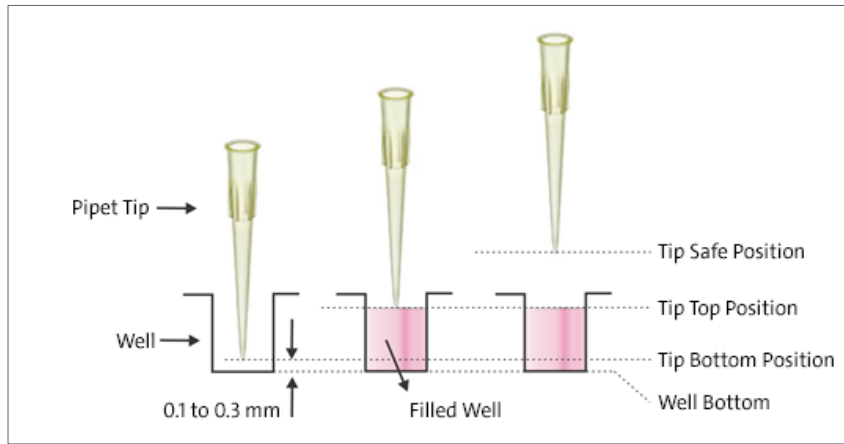
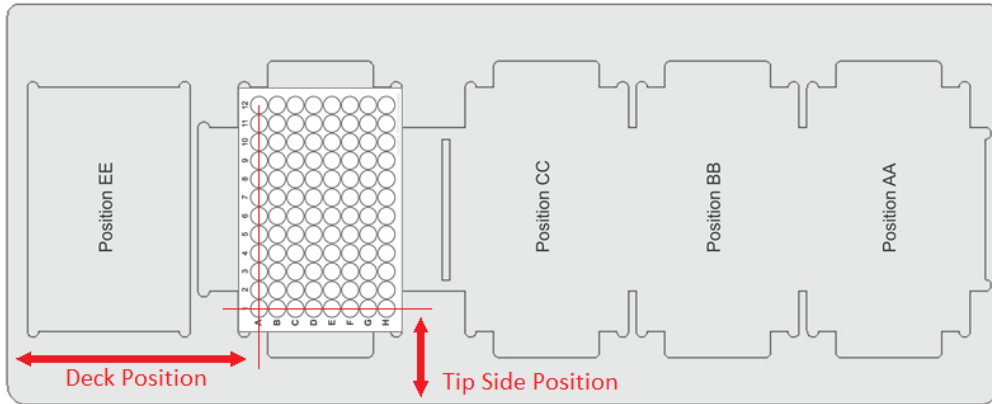
Menu Item	Description
	<p>This section is used to define the rack.</p> <ul style="list-style-type: none"> ▶ Row Spacing: The distance between wells. This value can be obtained by counting the steps between well centers. ▶ Well Volume: The working volume [μL] of the well. ▶ Tip Side Position: Represents the coordinate of the first most outside column of the rack and only used with the single-channel head.
	<p>This section is used to define the shape of the well at the bottom of the plate. Only used in well plates, custom plates, and reservoirs.</p>
	<p>This section is used to define the orientation of the rack on the instrument's deck.</p> <p>See Deck Positions and Orientation Convention section for more details.</p>
	<p>This section is used to define the liquid head that is to be used with the rack.</p> <p>NOTE: 12-Ch. Head should always be selected unless a custom liquid head is supplied with the instrument.</p>
	<p>This button shows a sub-menu where you can modify multiple rack coordinates at once. CAUTION: Use this feature with caution since you can ruin all rack file configuration.</p> <p>This sub-menu is mainly used during factory calibration and maintenance.</p>
	<p>If the screen is grayed out, use this button to enable the rack editor.</p>
	<p>When the rack editor is enabled, this button becomes visible. Use this button to disable rack editor and prevent any unintentional modification of values.</p>
	<p>Use this button to delete the currently selected rack from the Actual Rack dropdown menu.</p>
	<p>Use this button to save the rack definition.</p>

Deck Position and Tip Side Position. The same applies to all other plate slots on the deck.

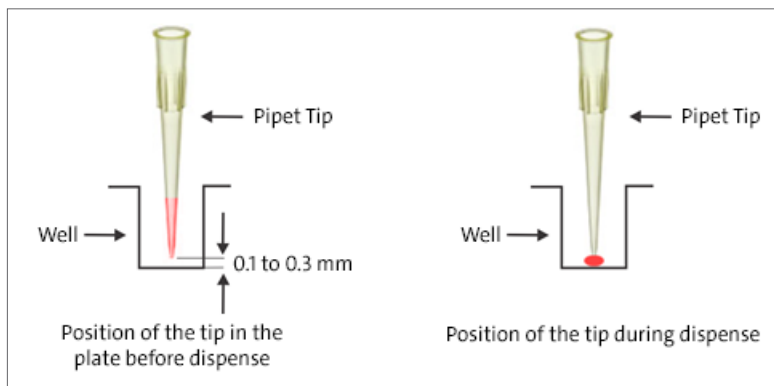
Deck Position Portrait Orientation



Deck Position Landscape Orientation



As shown, make sure that the gap between the tip and the bottom of the well is approx. 0.1 to 0.3 mm to avoid blockage or to prevent the droplet being transferred into the well. **NOTE:** This is highly important, especially when dispensing into dry plates. Proper tip height also helps with plate's manufacturing deviations. Proper height positioning of the pipette tips in the plate or reservoir is crucial to improve instrument performance and precision.

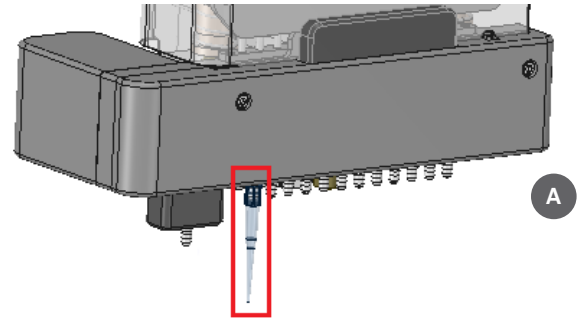


3.2.1 Procedure to Align New Plates or to Check Current Plate Positions

1. Press the Home All button to initialize the instrument.
2. From the dropdown menu in the Actual Rack field, select the rack you want to edit or a similar one that can be used as a reference rack to create a newer one.
3. Select the Edit Rack button.
4. If you are creating a new rack, enter a new name in the Actual Rack field.
5. Place the new or previously defined rack on deck of the instrument.
6. **Multi-channel Liquid Head Racks:**

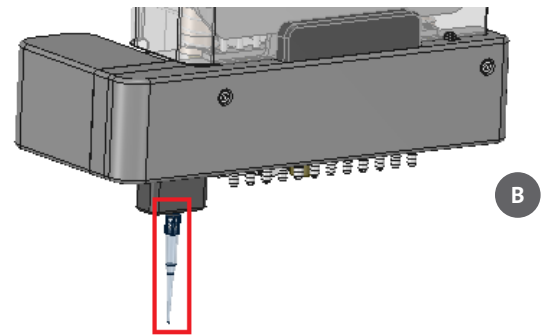
- ▶ Manually insert a pipet tip on the barrel of the multi-channel liquid head.

NOTE: Make sure that the tip is straight and perpendicular to the deck surface as shown (A).



Single-channel Head Tip Racks ONLY:

- ▶ When defining a **Single-channel Tip Rack**, the alignment procedure is the same, except for the fact that you must manually insert a pipet tip on the barrel of the single-channel liquid head. Make sure that the tip is straight and perpendicular to the deck surface as shown (B). You **MUST** enter coordinates for the Tip Side Position when defining this type of rack. To do so, use the manual motion arrow keys and carefully move the liquid head until the pipet tip is aligned to the center of the first row-column of the plate. When the pipet tip is perfectly aligned to the center of the well, copy the value shown in Single Head manual control into Tip Side Position field. Press the Copy button next to the Deck Position field value now, or later in Step 8.



7. In the Rack Orientation section, select portrait or landscape accordingly.
8. Using the manual motion arrow keys, carefully move the liquid head until the pipet tip is aligned to the center of the first row of the plate. When the pipet tip is perfectly aligned to the center of the well, press the Copy button next to the Deck Position field value.
9. Using the manual motion arrow keys, carefully move the liquid head up or down until the tip is almost touching the bottom of the well. Use the figure above as a reference to understand positions definition and the required tip gap.



CAUTION: Exercise caution when moving the liquid head down. When you are near the bottom of the well, use the single arrow button for precise and slow positioning of the tip. When the tip reaches the desired position, press the Copy button next to Tip Bottom Position. After that, move the tip out of the well.



At the correct tip bottom height position, the plate can be slid by hand from side to side. There should be minimum movement (approx. 0.1 to 0.3 mm) when trying to lift the plate before it makes contact with the tip.

10. Using a calibrated manual pipet, pre-fill the well to its working volume. Using the manual motion arrow keys, carefully move the liquid head down until the tip touches the liquid meniscus (with a few extra steps). Press the Copy button next to Tip Top Position. It's also a good practice at this point to enter the volume [μL] that you poured in the well into the Well Volume [μL] field.



The instrument uses Tip Top Position, Tip Bottom Position, Well Volume [μL], Well Plate Shape, and other relevant information to calculate the meniscus height. From there the calculated meniscus height is used to precisely position the tip for optimal liquid transfers and to minimize tip coating.

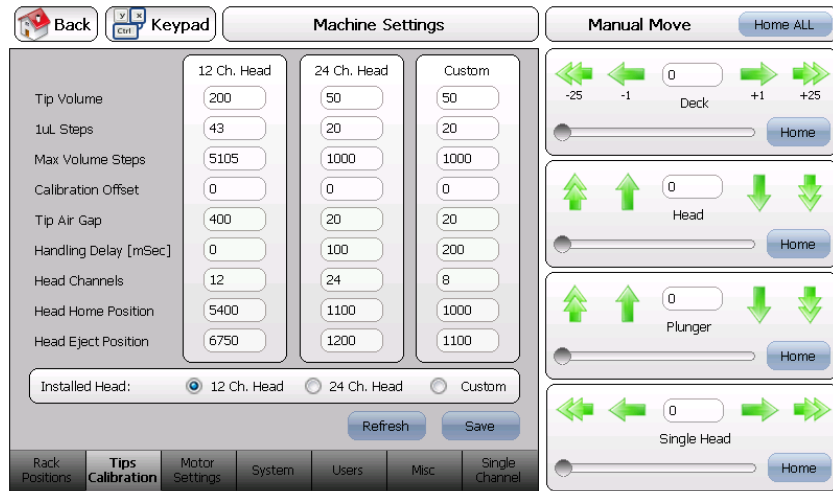
11. Using the manual motion arrow keys, carefully move the liquid head up until the bottom of the tip is high enough so that any movement of the liquid head has no chance of hitting any objects on the deck. Press the Copy button next to Tip Safe Position.
12. Complete or edit all other remaining fields in this section accordingly.
13. If you are creating a new rack definition based on an existing one, do not forget to rename the rack. Press Save to finish creating or editing the rack definition.

3.3 Tips Calibration

The Tips Calibration menu screen contains calibration data for the liquid head installed in the system. These settings are used to calibrate and fine tune liquid head dispense characteristics.



CAUTION: The instrument is calibrated before shipment. Changing factory settings can affect the accuracy and precision of the instrument or make it inoperable. Proceed with caution.



The instrument uses two predefined calibration points. A linear interpolation is used to determine intermediate points. This algorithm is very accurate and produces very precise liquid transfers. Since the algorithm utilizes calibration points, it's possible to target a specific volume range or to fine tune reagents of various viscosities. The following chart is a graphical representation of the liquid transfer algorithm.

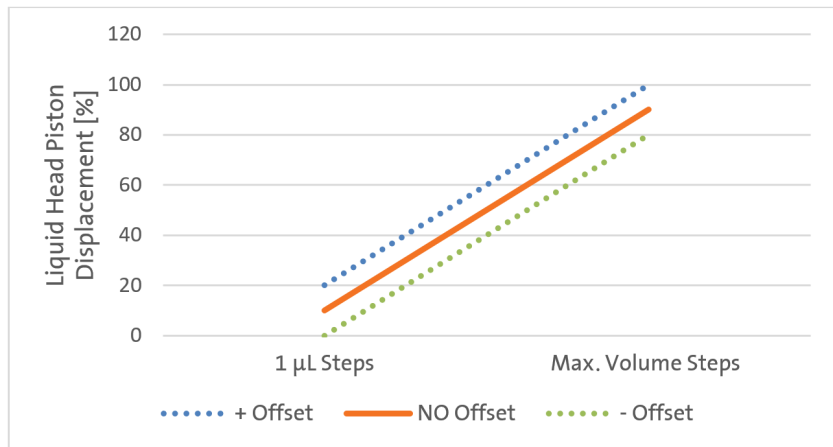





Figure 1. Graphical representation of the liquid transfer algorithm.

Table 12. Tips Calibration Tab Menu

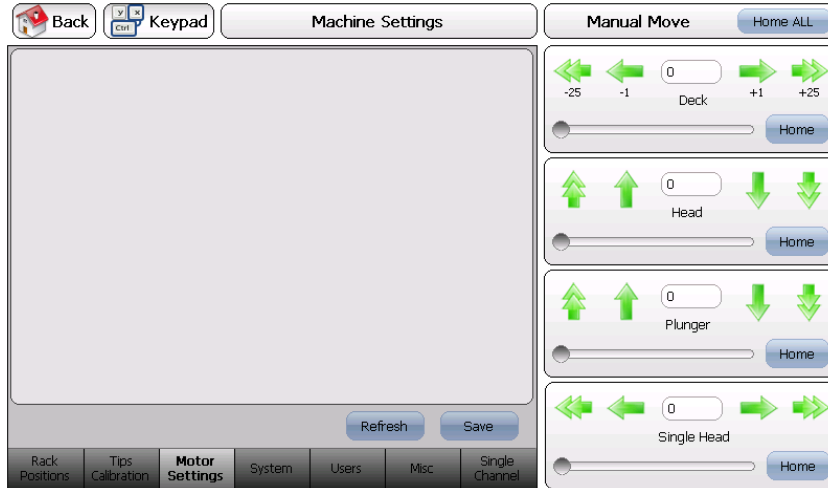
Menu Item	Description
~	Tip's volume capacity [μL]. This will usually be 200 [μL] for 96-well plates (12-channel head).
1 μL Steps	Lower Limit Calibration Point. <ul style="list-style-type: none"> Simple Calibration Method: Fill a row with 10 [μL] using the Plate Filling protocol. Use gravimetric method or a plate reader to determine accuracy of the liquid dispensed into the row. If the liquid dispensed is lower than expected, then increase 1 μL Steps value. If the liquid dispensed is higher than expected, then decrease 1 μL Steps value. Iterate this process until acceptable results are obtained.
Max. Volume Steps	Upper Limit Calibration Point. <ul style="list-style-type: none"> Simple Calibration Method: Fill a row at maximum pipet tip capacity (200 μL for example) using the Plate Filling protocol. Use gravimetric method or a plate reader to determine accuracy of the liquid dispensed into the row. If the liquid dispensed is lower than expected, then increase 1 μL Steps value. If the liquid dispensed is higher than expected, then decrease 1 μL Steps value. Iterate this process until acceptable results are obtained.
Calibration Offset	Use this value to compensate calibration data in the entire working volume range. This is useful to quickly compensate for viscous reagents or to fine tune the liquid transferring in the entire volume range. See the Figure 1 (above) the effect produced in the calibration curve as this value is increased or decreased. It essentially moves the curve up or down.
Tip Air Gap	This is the maximum permissible stroke in motor steps for the Blowout feature. This feature helps dispense all liquid that remains in the tip after each dispense. Factory settings should be acceptable for most applications but may be changed if needed. The instrument automatically calculates the maximum Blowout air volume possible, based on Tip Air Gap stroke, mounted liquid head and calibration parameters. NOTE: Make sure this value is not so large that the eject bar is actuated when the air Blowout feature is used.
Handling Delay (mSec)	This value represents a delay in “milliseconds” where the instrument will pause between aspiration and dispense cycles. When working with cells or viscous reagents, this delay may help to stabilize the internal pressure inside the tip for more accurate transfers. The higher the value, the longer the protocol will take to finish.
Head Channels	Number of channels on the installed liquid head.
Head Home Position	Rest position of the liquid head after initializing the axis.
Head Eject Position	Final position of the liquid head eject bar after ejecting tips.
Installed Head	Currently installed liquid head on the Instrument. Do not change factory settings, unless instructed to do so. <div style="border: 1px solid gray; padding: 5px; width: fit-content; margin: 5px auto;"> Installed Head: <input checked="" type="radio"/> 12 Ch. Head <input type="radio"/> 24 Ch. Head <input type="radio"/> Custom </div>  CAUTION: When swapping liquid heads, the instrument will Home the axis first for easier installation of the new head. Be sure to follow warning messages and keep hands clear while homing.
	Reloads and updates screen values from memory.
	Saves current values in memory.

3.4 Motor Settings

This screen contains factory motor driver parameters. Values have been optimized for the instrument. Changing values may affect overall performance or make the instrument inoperable.



CAUTION: These settings should only be changed when performing service or repairs by a qualified engineer. Improper values or settings will make the instrument inoperable or cause damage to the electronics.



3.5 System Information Tab

Press the Refresh button to populate the system information box. This screen is used to detect instrument configuration, software version, and to perform troubleshooting.

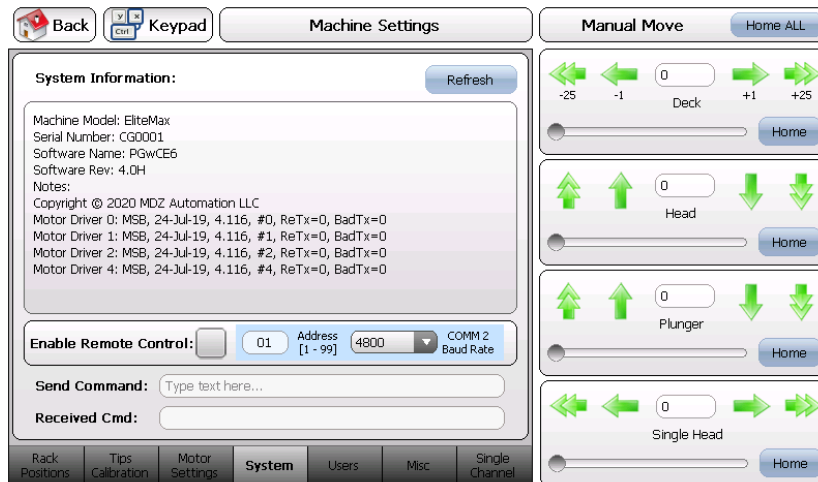



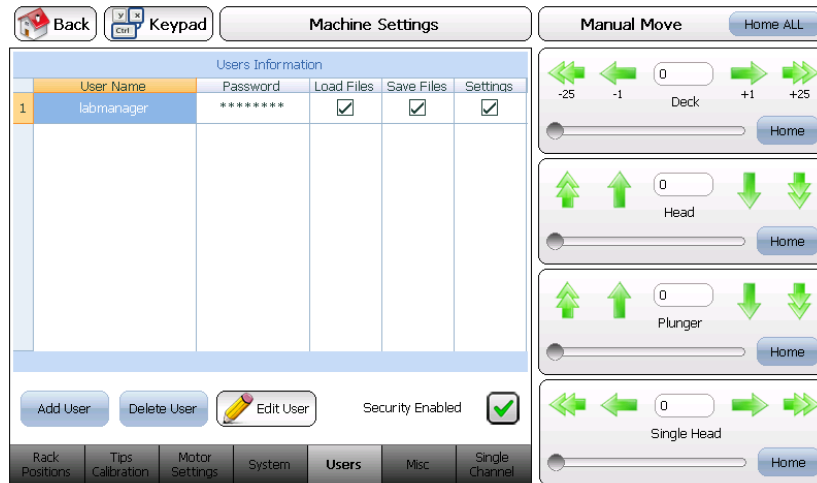
Table 13. System Information Tab Menu

<p>Enable Remote Control: <input type="checkbox"/> 01 Address [1 - 99] 4800 COMM 2 Baud Rate</p>	<p>The instrument can be controlled externally by a PC or embedded system. Special software and driver is necessary. Do not enable remote control when using the instrument as a stand-alone device.</p>
<p>Send Command: <input type="text" value="Type text here..."/></p> <p>Received Cmd: <input type="text"/></p>	<p> CAUTION: This command menu should only be used when performing service or troubleshooting. Improper values or settings will make the instrument inoperable or cause damage to the electronics.</p>

3.6 User Management

Different permissions and privileges can be assigned to users to operate the instrument. Enabling security access protects user protocols from deletion. It also protects settings from being changed that can make the instrument inoperable or affect its performance.

The instrument can also be used without Security enabled depending on your lab requirements.








The screenshot shows the 'Machine Settings' interface. At the top, there are navigation buttons for 'Back', 'Keypad', and 'Machine Settings'. Below this is a 'Users Information' table with the following data:

User Name	Password	Load Files	Save Files	Settings
1 labmanager	*****	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Below the table are buttons for 'Add User', 'Delete User', and 'Edit User'. A 'Security Enabled' checkbox is checked. At the bottom, there is a navigation bar with buttons for 'Rack Positions', 'Tips Calibration', 'Motor Settings', 'System', 'Users', 'Misc', and 'Single Channel'. On the right side of the screen, there is a 'Manual Move' section with four motor control panels: 'Deck', 'Head', 'Plunger', and 'Single Head'. Each panel has directional arrows, a numerical display (0), and a 'Home' button.

Table 14. Tips Calibration Tab Menu

Menu Item	Description
Security Enabled 	Use this check box to enable or disable the Security feature. NOTE: When enabling this feature, make sure that at least one user has administrative privileges or you won't be able to access the Settings menu.
 	Use these buttons to add or edit user profiles. After pressing either button, the following screen is presented where you can select User Profile privileges. <div data-bbox="837 443 1227 884" style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Edit User</p> <p>User Name: <input type="text" value="labmanager"/></p> <p>Password: <input type="password" value="*****"/></p> <p>Re-password: <input type="password" value="*****"/></p> <p>Allow User to:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Load User Programs <input checked="" type="checkbox"/> Save User Programs <input checked="" type="checkbox"/> Change Settings <p>All fields are case sensitive.</p> <p style="text-align: center;"> <input type="button" value="Save"/> <input type="button" value="Cancel"/> </p> </div>
	Select the user on the table, and then press the button to delete it. Confirm from the message box. <div data-bbox="906 978 1162 1115" style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"> Delete user: 'labmanager'?</p> <p style="text-align: center;"> <input type="button" value="Yes"/> <input type="button" value="No"/> </p> </div>

3.7 Miscellaneous Settings

After pressing the Misc tab, the following screen is presented.

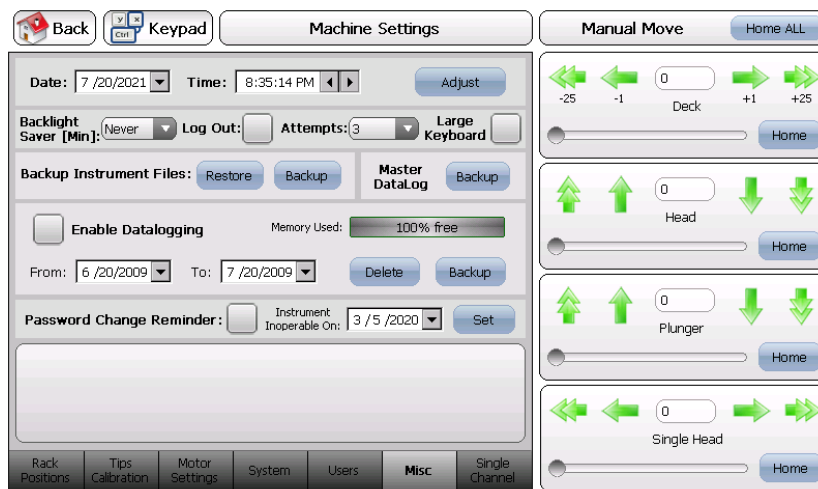


Table 15. Miscellaneous Tab Menu

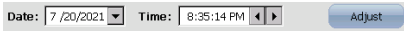
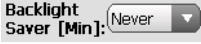

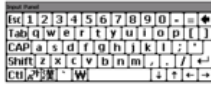



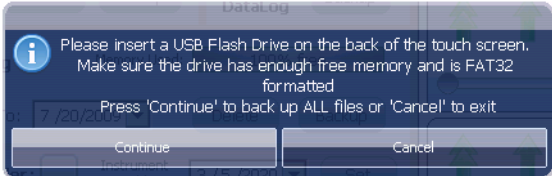
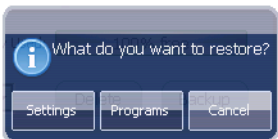
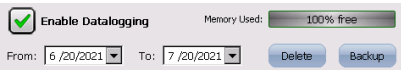
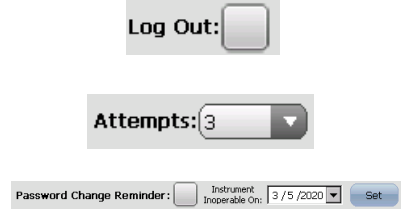
Menu Item	Description
	<p>Set date and time.</p> <p>Press the Adjust button, then adjust the date and time accordingly. When you are done, press the Set button so the changes take effect.</p>
	<p>Set the touch screen backlight saver timer.</p>
	<p>Check this box to select your preferred alphanumeric keypad:</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Standard Size</p> </div> <div style="text-align: center;">  <p>Large Size</p> </div> </div>
	<p>To prevent loss of data caused by user error or unit failure, it is recommended that you perform an instrument back up on a regular basis or before making any changes to the system.</p> <p>Insert the USB flash drive in the USB port located at the back of the touch screen.</p> <div style="text-align: center;">  </div> <ul style="list-style-type: none"> ▶ Backup: Press the Backup button, and follow the on screen instruction. <div style="text-align: center;">  </div> <ul style="list-style-type: none"> ▶ Restore: Press the Restore button, and follow the on screen instruction. You'll need a USB flash drive that contains a valid backup file. <div style="text-align: center;">  </div> <ul style="list-style-type: none"> ▶ Master DataLog: Press this button, and follow the on screen instruction. The instrument creates a .csv file that contains troubleshooting information.

Table 15. Miscellaneous Tab Menu (continued)

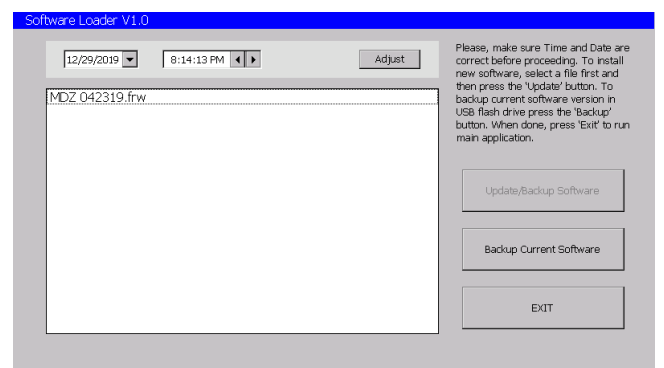
Menu Item	Description
	<p>When enabling Data logging, the instrument has the ability to record user activity and actions performed on the instrument. A status bar shows the memory consumed by the Data logging feature.</p> <p>NOTE: Make sure that the time and date are correct so the time stamped data is accurate. Activity logged data includes:</p> <ul style="list-style-type: none"> - Run User Protocols - Successful and Failed Log In Attempts - Modified or Deleted User Protocols - Changes to User Privileges or Permissions <p>▶ Delete: Select the date range using the controls, and press the Delete button to proceed.</p> <p>▶ Backup: Insert a USB flash drive in the USB port as shown above, then select the date range using the controls, and press Backup button to proceed. Follow the on screen instruction. Log files can be opened with almost any text editor to access content.</p>
	<p>Some laboratories and agencies require electronic documentation and electronic signatures records for traceability and audit. Data logging functionality in combination with these advanced user management features, make the software easier to validate or to comply with certain regulations (for example 21 CFR Part 11). Check with your legal department and experts to determine if the functionality of the instrument is sufficient to comply with the requirement of the regulatory agency you are considering.</p> <ul style="list-style-type: none"> ▶ Log Out: Enabling this feature causes the user to be logged out after a period of inactivity. Set inactivity period in the Backlight Saver dropdown menu. ▶ Attempts: The instrument will lock out the operator after a predetermined number of failed log in attempts is reached and must be unlocked by a user with administrator privileges. ▶ Password Change Reminder: When this feature is enabled, seven days before the due date, the instrument will remind the operator to change the password. The instrument becomes inoperable on the due date and the user password must be changed.

3.8 Software Update

When new features or a custom software is released, the instrument’s software can be updated. You can request the latest software updates from your Corning representative.

Once you receive the software update, follow these steps:

1. Backup all of your instruments files and settings as indicated in Backup Instrument files section.
2. Turn off the instrument.
3. Copy the supplied instrument’s software file (for example “MDZ 042319.frw”) into a USB flash drive main root directory. You can use any brand of USB flash drive with the instrument as long as it has been formatted to the “FAT32” format. For questions on formatting your drive, contact your IT administrator or your local Corning representative.
4. Insert the USB flash drive with the supplied instrument’s software file (for example “MDZ 042319.frw”) into the port labeled USB Host located on the rear of the touch screen controller.
5. Turn on the instrument.
6. After a few seconds, the Software Loader screen will appear.
7. Select the software file you want to update, and click on the Update/Backup Software button. Follow the on screen directions.
8. After the software is updated, remove the USB flash drive, and store it in a safe place.
9. Turn off the instrument and wait 30 seconds.
10. Turn the instrument back on. The instrument is now ready to be used with the new software.



Software Loader screen

4.0 Spare Parts and Accessories

Cat. No.	Description	Qty/Pk
6071	Touch screen controller with software and license	1
6102	Touch screen controller base	1
6073	External power supply	1
6104	Portrait adapter stainless steel plate	1
6112	Liquid head mounting screw set	1
6113	Liquid head front acrylic cover	1
6133	Main head beam back cover	1
6134	Plunger electrical back cover	1
6149	Head shipping bracket support	1

5.0 Limited Warranty

Corning Incorporated (Corning) warrants that this product will be free from defects in material and workmanship for a period of one (1) year from date of purchase. CORNING DISCLAIMS ALL OTHER WARRANTIES WHETHER EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE. Corning's sole obligation shall be to repair or replace, at its option, any product or part thereof that proves defective in material or workmanship within the warranty period, provided the purchaser notifies Corning of any such defect. Corning is not liable for any incidental or consequential damages, commercial loss or any other damages from the use of this product.

This warranty is valid only if the product is used for its intended purpose and within the guidelines specified in the supplied instruction manual. This warranty does not cover damage caused by accident, neglect, misuse, improper service, natural forces or other causes not arising from defects in original material or workmanship. This warranty does not cover motor brushes, fuses, light bulbs, batteries or damage to paint or finish. Claims for transit damage should be filed with the transportation carrier.

In the event this product fails within the specified period of time because of a defect in material or workmanship, contact Corning Customer Service at: USA/Canada 1.800.492.1110, outside the U.S. +1.978.442.2200, visit www.corning.com/lifesciences, or contact your local support office.

Corning's Customer Service team will help arrange local service where available or coordinate a return authorization number and shipping instructions. Products received without proper authorization will be returned. All items returned for service should be sent postage prepaid in the original packaging or other suitable carton, padded to avoid damage. Corning will not be responsible for damage incurred by improper packaging. Corning may elect for onsite service for larger equipment.

Some states do not allow limitation on the length of implied warranties or the exclusion or limitation of incidental or consequential damages. This warranty gives you specific legal rights. You may have other rights which vary from state to state.

No individual may accept for, or on behalf of Corning, any other obligation of liability, or extend the period of this warranty.

For your reference, make a note of the serial and model number, date of purchase, and supplier here.

Serial No. _____ Date Purchased _____

Model No. _____ Supplier _____

6.0 Equipment Disposal



According to Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE), the Corning® Lambda™ EliteMax Semi-automated Benchtop Pipettor is marked with the crossed-out wheeled bin and must not be disposed of with domestic waste.

Consequently, the buyer shall follow the instructions for reuse and recycling of waste electronic and electrical equipment (WEEE) provided with the products and available at www.corning.com/weee.

Warranty/Disclaimer: Unless otherwise specified, all products are for research use or general laboratory use only.* Not intended for use in diagnostic or therapeutic procedures. Not for use in humans. These products are not intended to mitigate the presence of microorganisms on surfaces or in the environment, where such organisms can be deleterious to humans or the environment. Corning Life Sciences makes no claims regarding the performance of these products for clinical or diagnostic applications. *For a listing of US medical devices, regulatory classifications or specific information on claims, visit www.corning.com/resources.

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