



**S-PIPETTE<sup>®</sup> S3**  <sup>TM</sup>





## **Thank you!**

Thank you for purchasing the S3 Pipettor, part of the S-Pipette series, by Apricot Designs, Inc.

The S-Pipette series multi-channel liquid handling pipettors bring automated liquid handling within reach of any lab that needs to routinely perform pipetting operations onto microplates.

The S3 Pipettor adds greater flexibility with automated X, Y & Z positioning, automated 24 to 96 and 96 to 384 indexing. Automated open clamp and LED display light the stage. Plus, access to the S3 Pipettor core is quick and easy for additional flexibility in pipettor operation. Just determine the pipetting configuration that best matches the applications you want to perform. Then, load a 96 or 384 channel core into the pipettor (without tools!), and you're ready to go.

This manual is your ready reference to the care, maintenance, and operation of the instrument, so you should store it in a convenient place.

With proper handling and maintenance, as detailed in this manual, this instrument will provide years of efficient and reliable service.

Failure to adhere to proper care, maintenance, and operation of the instrument may lead to poor experimental results, reduced equipment life, and the possibility of injury to the operator.

Our ongoing commitment is to help you get the best results. We truly appreciate your business and the trust you have placed in us.

Should you have any questions, comments, or suggestions regarding this instrument, please feel free to contact us.

Sincerely,

Felix H. Yiu,  
Founder and CEO  
Apricot Designs, Inc.

# NOTICES

The Apricot Designs logo is a trademark of Apricot Designs, Inc.

All information and specifications are deemed accurate at the time of publication. Specifications subject to change.

Apricot Designs is not responsible for any errors that may occur.

## Frequency Interference

There are a variety of external causes for frequency interference and/or interruptions in connectivity or loss of data/information.

Frequency interference can occur when another signal passes through your location corrupting the signal.

Frequency interference is location specific and not device dependent and may result from the location of the device and nearby competing signals.

Apricot Designs staff does not provide any technical support relating to troubleshooting or identifying frequency interference.

Apricot Designs, Inc. assumes no responsibility for any damage or loss resulting from the use of this manual.

The information contained in this manual is subject to change without notice.

S3 Pipettor Version 1.00 © 2020 Apricot Designs, Inc.

# TABLE OF CONTENTS

1 - Specifications.....	6
1.1 - Safety Precautions .....	7
1.2 - Inspection and Set-Up .....	8
1.3 - Moving the S3 Pipettor .....	9
1.4 - Software Specs and Requirements .....	10
2 - Features.....	11
2.1 - Shuttle Encoder .....	12
2.2 - Applications .....	12
2.3 - Core, Tip, and Head Compatibility.....	13
2.4 - Pipettor + Head + Tips = Repeatable Results.....	14
2.5 - EZ-Load Tip Technology.....	14
2.6 - Accessing the Pipetting Core.....	15
2.7 - Loading a 96 or 384 Channel Core .....	15
3 - User Login.....	16
3.1 - GLP.....	16
3.2 - Login Software with Three Level Account.....	16
4 - Operation Overview.....	19
5 - Main Screen Overview .....	20
6 - Settings Tab Overview .....	21
6.1 - How to Connect Tablet to S3 Pipettor.....	21
6.1.1 - Hardware Setting .....	21
6.1.2 - Software Setting.....	22
6.2 - Confirm Head Volume.....	22
6.3 - Leave Plate Slow.....	22
6.4 - Enable GLP (CFR21 Part 11).....	22
6.5 - Config Parameter .....	23
6.5.1 - Overshoot for 96/384.....	23
6.6 - Select Head/Plate Database .....	24
6.7 - Training Plate .....	25
7 - Creating a Protocol .....	26
7.1 - Aspirate .....	27
7.2 - Dispense.....	28
7.3 - Empty .....	29
7.4 - Mix .....	30
7.5 - Wash .....	31
7.6 - Pause .....	32
7.7 - Transfer.....	33
7.8 - Serial Dilution.....	34
7.9 - Fill Plate.....	35
7.10 - Pooling .....	36
7.11 - Set Parameter .....	37
7.12 - Comments.....	37
7.13 - Start Loop/End Loop.....	38
7.14 - Open File, Save File, Save File As.....	38
7.15 - Clear Current/Clear All.....	39
7.16 - Variable.....	39
8 - Manual Operation .....	40
9 - Pipetting Technique .....	41
9.1 - Training Plates.....	41
9.2 - Improving Accuracy.....	41
10 - Continuous Variable Target Correction (CVTC) .....	43
10.1 - How to Change CVTC.....	44
10.1.1 - Aspirate Value.....	46
10.1.2 - Dispense Value.....	46
11 - Emergency Stop .....	47
12 - Care and Maintenance.....	47
13 - Troubleshooting .....	49
14 - Warranty.....	50

# 1 SPECIFICATIONS

The following is a list of the ideal operating parameters for the S3. This instrument will perform optimally and safely under standard laboratory settings. The use of this instrument in other environments is not recommended, and results may prove unsatisfactory.

<b>Model</b>	S3
<b>Dispensing Precision</b>	(1250) <3% CV at 10 $\mu$ L (1000) <3% CV at 10 $\mu$ L (500) <3% CV at 5 $\mu$ L (125) <3% CV at 1 $\mu$ L <b>*Note:</b> 1250 $\mu$ L Aluminum Core
<b>Dispensing Accuracy</b>	(1250) +/- 2% error at 10 $\mu$ L (1000) +/- 2% error at 10 $\mu$ L (500) +/- 2% error at 5 $\mu$ L (125) +/- 2% error at 1 $\mu$ L
<b>Resolution</b>	(1250/1000/500) 1 $\mu$ L (125) 0.1 $\mu$ L
<b>Volume</b>	Max channel capacity 1250 $\mu$ L  Dispense range (1250) 5–1000 $\mu$ L (1000) 5–1000 $\mu$ L (500) 1–500 $\mu$ L (125) 0.5–125 $\mu$ L
<b>Particle Size</b>	< 0.032" diameter to prevent tip blockage
<b>Current</b>	3 Amp
<b>Power (Input)</b>	100 – 240VAC, 50 – 60Hz
<b>Power Consumption (MAX)</b>	130W
<b>Power Consumption Idle</b>	60W
<b>Operating Temperature</b>	40 –104°F, 5 – 40°C
<b>Relative Humidity (MAX)</b>	80% (non-condensing)
<b>Equipment Ratings</b>	Indoor use only, temperature regulated, non-dusty
<b>Altitude</b>	Up to 2000m
<b>Pollution degree</b>	2
<b>Power supply voltage</b>	Fluctuations not exceeding $\pm$ 10% of the nominal voltage
<b>Transient overvoltage</b>	According to Category II (Installation Category)
<b>Dimensions</b>	18"W x 16"D x 23"H 457mm W x 406mm D x 584mm H
<b>Weight</b>	Approx. 60lbs (27kg)

# 1.1 – Safety Precautions:

The S3 Pipettor is designed and engineered with your safety in mind. However, failure to adhere to proper care, maintenance, and operation of the instrument may lead to poor experimental results, reduced equipment life, and the possibility of injury to the operator.

**Please adhere to the following safety guidelines when working with the S3 Pipettor:**

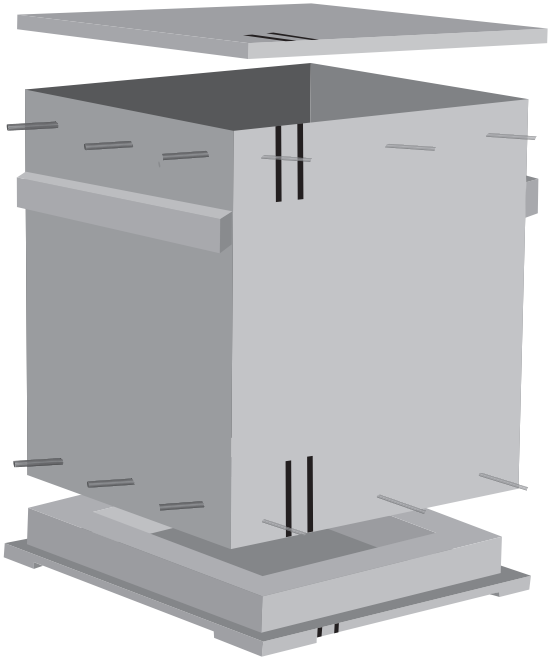
- ◆ Open the hood to exchange cores only!
- ◆ Do not attempt to make an adjustment or try to repair something that is not working correctly – this could result in injury and will void the warranty. If you encounter a problem with the instrument, please contact Apricot Designs, Inc. or your distributor.
- ◆ Operate the instrument in an indoor environment only!
- ◆ Avoid exposure to direct sunlight and excessive humidity. Also, for safe operation, do not operate the instrument with wet hands.
- ◆ Always connect the instrument via a grounded power outlet.
- ◆ Use only Apricot Designs optional tools, equipment, and peripherals!
- ◆ Our optional tools, equipment, and peripherals will enhance the performance of the manufactured instrument to help you get the best results.
- ◆ It is highly recommended that you use disposable tips manufactured by Apricot Designs because they are designed to perform optimally with our instruments.
- ◆ Using add-on products or modifications not supplied by Apricot will void the warranty and likely affect the performance of the instrument as well as lead to poor experimental results, reduced equipment life, and the possibility of injury to the operator.
- ◆ Under no circumstances should any part of the operator's body or any foreign object(s), except the labware in use, enter the area directly under the pipetting tips and above the elevator. In case of emergency, turn the power off immediately.
- ◆ Place the instrument on a sturdy and level surface. Use appropriate caution when operating this instrument.
- ◆ Wear protective clothing/goggles when dealing with dangerous, corrosive, or radioactive substances.
- ◆ This instrument is designed to fit inside a suitably-sized fume hood when working with volatile organic solvents.

For full instructions regarding the handling of pathogens or biological hazards in Risk Group 2 or higher, please refer to the current edition of the *Laboratory Biosafety Manual*, published by the World Health Organization.

## 1.2 - Inspection and Set-Up

Care should be exercised when unpacking the crate.

Inspect the instrument for any visible damage that may have occurred during shipping.



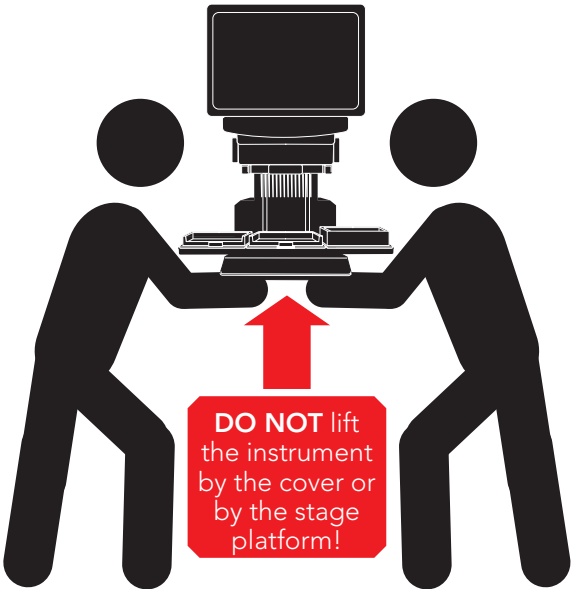
### No Damage to the Instrument

- ◆ After confirming that there is no damage you can start the installation of the S3 Pipettor.
- ◆ Re-assemble and save the shipping crate for future use.
- ◆ We recommend that you read through the Operating Instructions Manual before you start the install process.
- ◆ Place the instrument on a sturdy and level surface.
- ◆ Use appropriate caution when operating this instrument.
- ◆ Verify that the ON/OFF switch is in the OFF position.
- ◆ Using the power cord provided connect the instrument entry connector and connect the opposite end to a power outlet with a ground connection.
- ◆ The instrument is ready to turn on. Press the ON/OFF switch to the ON position.

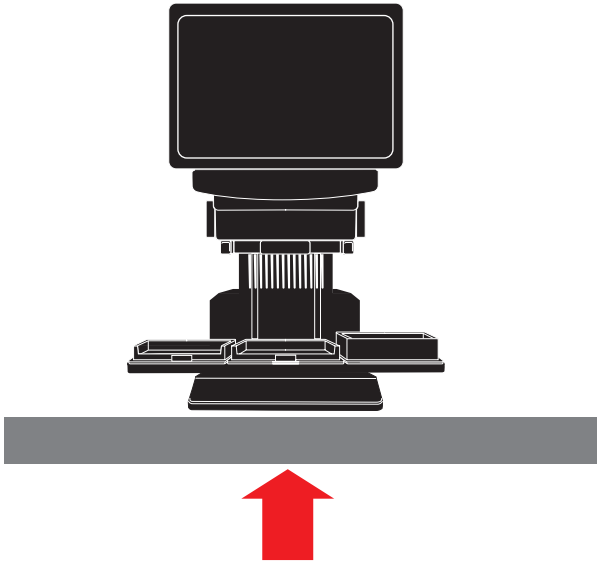
# 1.3 - Moving the S3 Pipettor



Lift the S3 Pipettor unit by the base plate of the instrument.



Keep your back straight and lift with your legs to avoid possible injury.  
The instrument is quite heavy so several people are required to move it.



Place the instrument on a steady, sturdy, flat and level surface.

# 1.4 – Software Specs and Requirements

The S3 works on a Windows 7/8/10 64-bit computer.

## S3 System Requirements

- Microsoft Surface Pro
- i5 CPU Processor, 4gb RAM, 1gb HD  
Apricot representative will assist in developing your requirements/specifications list.
- USB cable, type B to type A
- Power cord

## Software Requirement:

Microsoft Office 2010, AccessDatabaseEngine\_64.exe

**Note:** *AccessDatabaseEngine\_64.exe is included in the Apricot Software folder after installation.*

## Display Requirement

- Screen resolution needs to be 1920 x 1080
- Change Display size to 100% ratio

**Note:** *Both of these requirements can be found in Control Panel->Display.*

## 2 FEATURES

# S-PIPETTE<sup>®</sup> S3



Automated High-Performance  
Multichannel Pipetting

### Innovative, Accurate, Precise

A high-performance multi-channel liquid handling system – easily configured for a variety of applications

### Touchscreen

Easy and intuitive pipettor operation via Microsoft Surface Pro™ Tablet

Greater flexibility – use the removable WiFi-enabled tablet to operate the instrument from outside the fume hood

### Automated Plate Elevators

Automated plate sampling – automatically raise or lower plate/reservoir to programmable height

### Optional Configurations

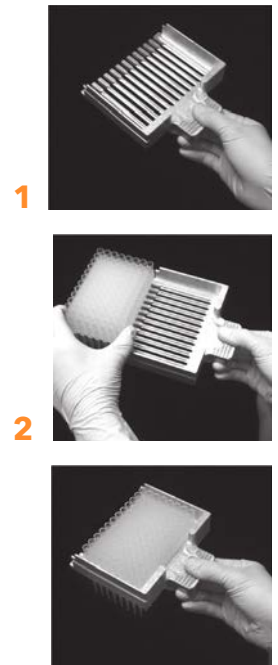
Automated X, Y, Z positioning 2, 3, or 4-position shuttle.

### Trusted Brand

Apricot Designs specializes in high quality multi-channel pipettors designed to help you get the best results

### EZ-Load Tip Technology

Load disposable tips into the head quickly and easily without smashing tipboxes!



**3 LOAD!**

### Interchangeable Pipetting Core

Precise 96 and 384 channel pipetting. Choose the dispense range to match your application needs.\*

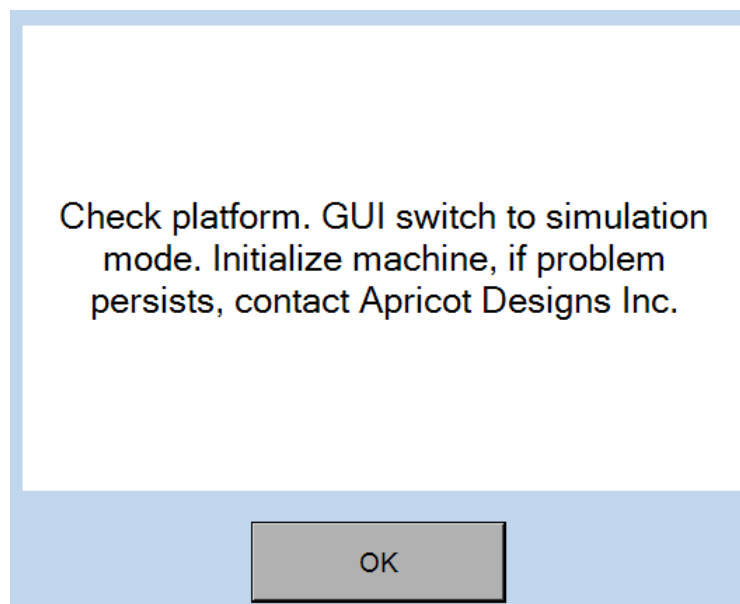


No Tools needed!\*

- ◆ High-performance instrument – easily configured for a variety of applications.
- ◆ Automated pipetting into all wells of a 96-well plate with the 96 core, into all wells of a 384-well plate with the 384 core
- ◆ 12x faster than an 8-channel handheld pipettor – pipette into all 96 wells without having to replace tips 12 times
- ◆ Pipette 24, 96 and 384 full plate
- ◆ Serial dilution by column: 8, 16
- ◆ Automated plate elevators for plate sampling – automatically raise or lower plate/reservoir to programmable height
- ◆ Apricot EZ-Load tip technology to load disposable tips quickly and easily, without tools!
- ◆ Control via easy to use interface – Microsoft Surface Pro™ Tablet (Bluetooth-enabled)
- ◆ 2-, 3-, or 4-position shuttle with programmable serial dilution indexing
- ◆ Small footprint maximizes bench space and fits suitable hoods

## 2.1 – Shuttle Encoder

The S3 shuttle motor encoder is capable of detecting obstructions. An obstruction will prompt the software to stop a protocol and display the following message.



## 2.2 – Applications

- Plate replication
- Plate reformatting
- Reagent addition
- Compound addition
- Serial dilution by column

## 2.3 – Core, Tip, and Head Compatibility

The S3 base unit is compatible with five different pipetting cores (96/1250, 96/1000, 96/500, 96/125, and 384/125). Each Core is designed to work optimally within its volume range and requires a specific Head and Tip combination.

The system is also capable of Serial Dilution. Specific Heads or Inserts and Tips are required.

Tips are available in Non-Sterile (NS), Sterile (S), and Filter Sterile (FS).

Please see the matrix below for complete Core/Head/Tip compatibility. The part numbers listed are for your convenience in ordering.

*\*Please contact your Apricot Sales or Service representative for assistance.*

384/125	Volume Range	Heads	Tips (384 channel)	Serial Dilution Heads/Inserts	Serial Dilution Tips (Strip Tips)
SP-C-384-125	.5-125 $\mu$ L	SP-384-A-01-0125	125-384-EZ-NS/S/FS	SP-384-A-01-125-SC	125-016-EZ-NS/S/FS
			050-384-EZ-NS/S/FS		050-016-EZ-NS/S/FS
			015-384-EZ-NS/S		

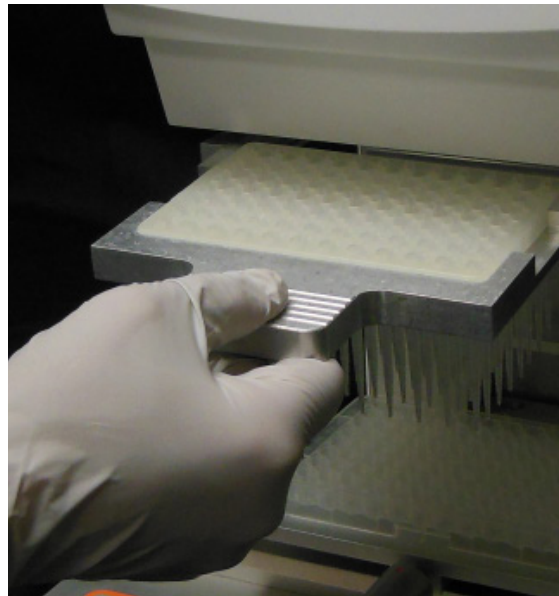
96/125	Volume Range	Heads	Tips (096/024 channel)	Serial Dilution Heads/Inserts	Serial Dilution Tips (Strip Tips)
SP-C-096-125	.5-125 $\mu$ L	SP-096-A-01-0125	125-096-EZ-NS/S/FS	SP-096-A-01-0125-SC	125-008-EZ-NS/S/FS
			050-096-EZ-NS/S/FS		050-008-EZ-NS/S/FS
			015-096-EZ-NS/S		

96/550	Volume Range	Heads	Tips (096/024 channel)	Serial Dilution Heads/Inserts	Serial Dilution Tips (Strip Tips)
SP-C-096-500	1-500 $\mu$ L	SP-096-A-01-0500	550-096-EZ-NS/S/FS	096-A-01-EZL-550-SC	550-008-EZ-NS/S/FS
			250-096-EZ-NS/S/FS	(w/SP-096-01-0500)	250-008-EZ-NS/S/FS
			550-024(OS)-EZ-NS/S/FS		
	1-125 $\mu$ L	SP-096-A-01-0125	125-096-EZ-NS/S/FS	SP-096-A-01-0125-SC	125-008-EZ-NS/S/FS
			050-096-EZ-NS/S/FS		050-008-EZ-NS/S/FS
			015-096-EZ-NS/S		

96/1000	Volume Range	Heads	Tips (096/024 channel)	Serial Dilution Heads/Inserts	Serial Dilution Tips (Strip Tips)
SP-C-096-1000	5-1000 $\mu$ L	SP-096-A-01-1000	1000-096-EZ-NS/S/FS	096-A-01-EZL-1000-SC	1000-008-EZ-NS/S/FS
				(w/SP-096-01-1000)	
	5-500 $\mu$ L	SP-096-A-01-0500	550-096-EZ-NS/S/FS	096-A-01-EZL-0500-SC	550-008-EZ-NS/S/FS
			250-096-EZ-NS/S/FS	(w/SP-096-A-01-0500)	250-008-EZ-NS/S/FS
			550-024(OS)-EZ-NS/S/FS		
	5-125 $\mu$ L	SP-096-A-01-0125	125-096-EZ-NS/S/FS	SP-096-A-01-0125-SC	125-008-EZ-NS/S/FS
			050-096-EZ-NS/S/FS		050-008-EZ-NS/S/FS
			015-096-EZ-NS/S		

## 2.4 - Pipettor + Head + Tips = Repeatable Results

The S3 Pipettor, pipetting head, and tips in a variety of volumes is a triad that works together *to help you get the best results.*



### EZ-Load = EZ-Change

The “pipette head” is separate from the pipetting mechanism, allowing easy and economical reconfiguration in the lab. Changing heads only takes a few seconds – easily reconfigure as needed! For best pipetting results – consider pipette tip selection along with the “pipette head” that will be used.

## 2.5 - EZ-Load Tip Technology

The S3 Pipettor uses the exclusive EZ-Load tips to simplify pipettor operation with disposable tips. This patented technology from Apricot Design is the only system using disposable tips that do not need to be “pressed on” with excessive downward force in order to create a reliable seal.

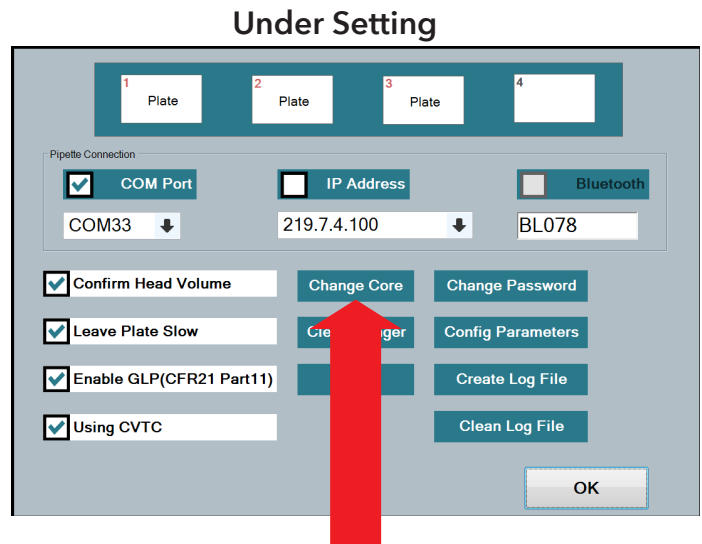


Load disposable tips into the head quickly and easily. No tools required for a consistent seal!

## 2.6 - Accessing the Pipetting Core

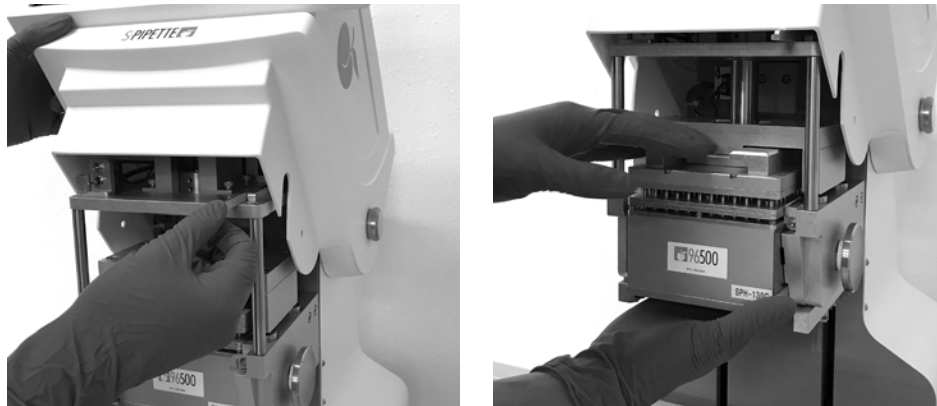
### Interchangeable Pipetting Core

The S3 Pipettor features an interchangeable pipetting core. To change the core tap the Settings tab from the user interface screen then select Change Core in the Settings menu. Selecting Change Core moves the plunger to a designated position for core exchange.



### Accessing the Core

To access first remove the lock screws, raise the hood and set the hood on the support rod.



## 2.7 - Loading a 96 or 384 Channel Core

Determine the pipetting configuration that best matches your application. Load a 96 or 384 channel core into the S3 Pipettor.



## 3 USER LOGIN

### 3.1 - GLP

To meet United States Food and Drug Administration (FDA) regulations for electronic records (21 CFR Part 11), where the electronic record is required to have controls for security and/or traceability purposes. For example, e-signatures, editing protocols, backup of records, audit trails, operational checks, etc.

Double click the S3 software icon and the login screen will show up. If this is the first time using the software, an Apricot professional will log in and set up User Name and Password for you. If you have any questions, please contact Apricot Designs representative for assistance.

### 3.2 - Login Software with Three Level Account



APRICOT DESIGNS S3

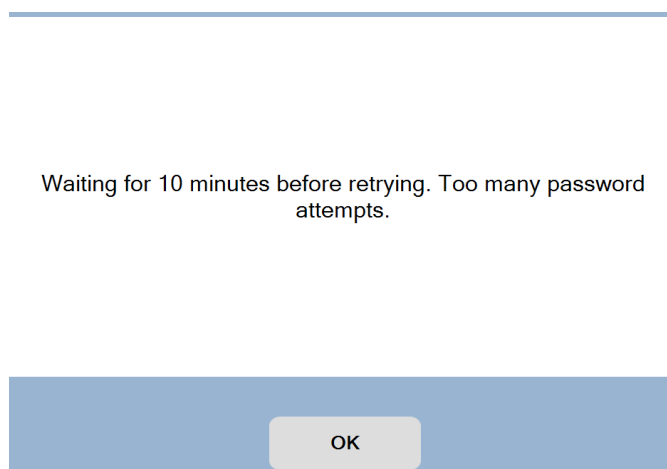
Language: English

Username: Admin

Password:

Cancel OK

**Note:** Make sure to input the correct password. An incorrect password will lock the login for 10 minutes. The following pop up message will appear:



Waiting for 10 minutes before retrying. Too many password attempts.

OK

## User Names and Features

Priority	Level	Example Name	Features
Highest	Admin	Admin/Apricot	Create/Edit/Save Protocol, Create/Delete Log Files and Super User.
Medium	Super User	Lab Manager	Create/Edit/Save Protocol, Create/Delete User.
Low	User	Technician	Open Protocol File, Run Protocol.

## Admin Account

### Add Super User

Only Admin level logins or an Apricot Employee can add Super User logins to the Admin Account. Fill in Username and Password then click Add Super User tab.

The screenshot shows the 'APRICOT DESIGNS S3' interface. On the left, there are two buttons: 'Add Super User' (highlighted in orange) and 'Change Password' (grey). On the right, there are three input fields: 'Language' (a dropdown menu set to 'English'), 'Username' (a text box containing 'Admin'), and 'Password' (an empty text box). Below these fields is a 'Delete User' button (grey). A note states: 'Notes: user name and password must be more than 5 characters.' At the bottom, there are two more input fields: 'First Name' (containing 'Apricot') and 'Last Name' (containing 'Administrator'). Below these are 'Cancel' and 'OK' buttons (both orange).

### Delete Super User

Select the user name then click Delete User.

### Restore Super User

Admin can restore a previously deleted Super User/New user account with same original level by entering the same name and password, then click Add Super User.

## Super User Account

### Add New User

Fill in Username and Password then click Add New User.

The screenshot shows a dialog box titled 'APRICOT DESIGNS S3'. On the left, there are two buttons: 'Add New User' (orange) and 'Change Password' (grey). On the right, there are three input fields: 'Language:' with a dropdown menu set to 'English', 'Username:' with a dropdown menu set to 'Apricot', and 'Password:' with an empty text box. Below these is a 'Delete User' button (grey). A horizontal line separates the top section from the bottom section. Below the line, there is a note: 'Notes: user name and password must be more than 5 characters.' To the left of this note is another note: 'Notes: first and last names can be updated when password changing.' To the right of this note are two input fields: 'First Name:' with 'Apricot' and 'Last Name:' with 'Manager'. At the bottom are two buttons: 'Cancel' (orange) and 'OK' (orange).

### Delete New User

Select the user name then click Delete User.

## New User Account

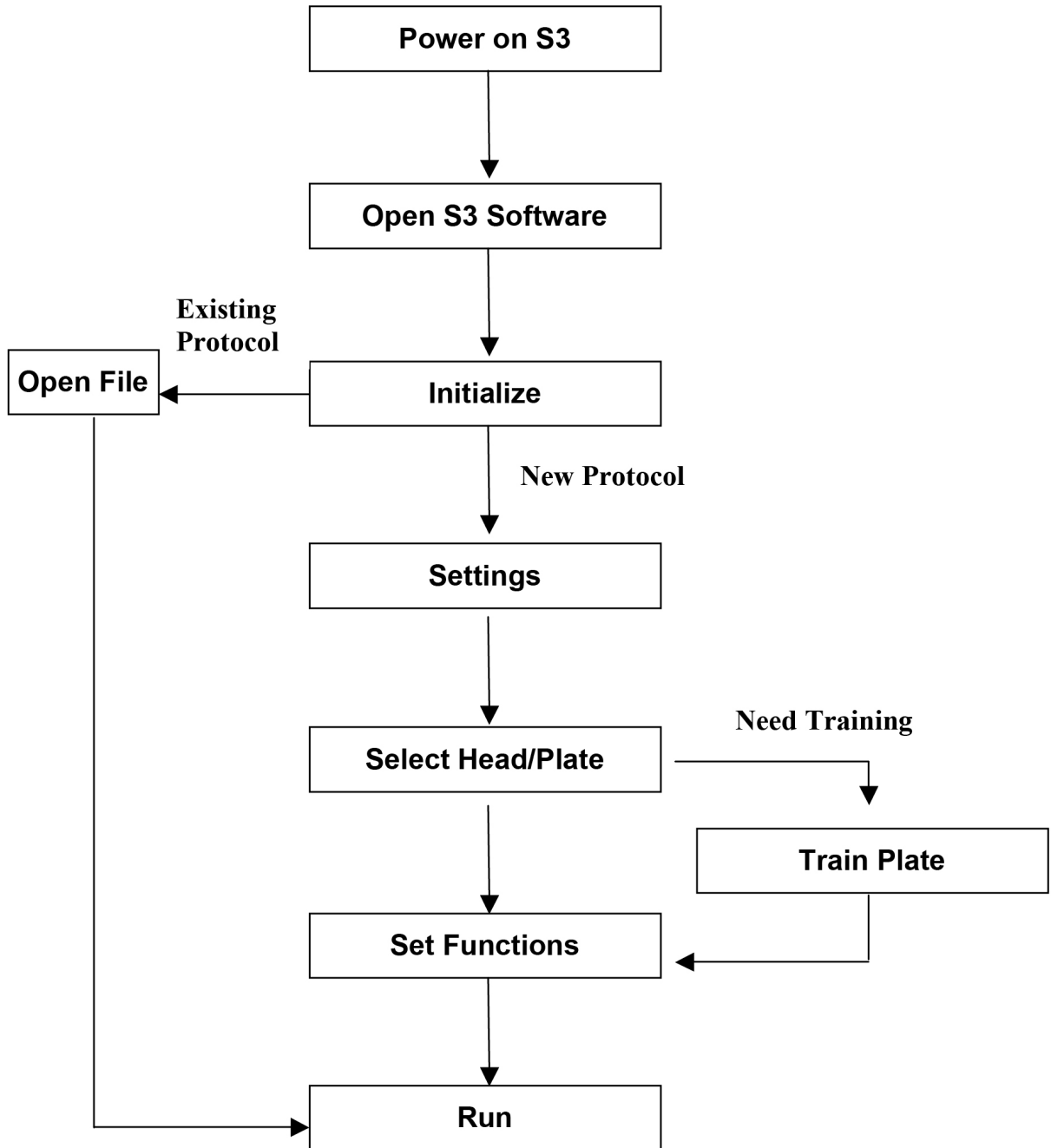
### Change Password

Click Change Password. Select the User Name then fill in Current and New Password fields. Confirm the new password then click ok.

The screenshot shows a dialog box titled 'APRICOT DESIGNS S3'. On the left, there is a 'Change Password' button (orange). On the right, there are three input fields: 'Language:' with a dropdown menu set to 'English', 'Username:' with a dropdown menu set to 'Customer', and 'Password:' with an empty text box. Below these are two more input fields: 'New Password:' and 'Confirm Password:'. A horizontal line separates the top section from the bottom section. Below the line, there is a note: 'Notes: first and last names can be updated when password changing.' To the right of this note are two input fields: 'First Name:' with 'Customer' and 'Last Name:' with 'User'. At the bottom are two buttons: 'Cancel' (orange) and 'OK' (orange).

# 4 OPERATION OVERVIEW

## S3 Operation Flow Chart



# 5 MAIN SCREEN OVERVIEW

Plate/Stage Positions



Active Protocol Steps



The screenshot displays the main interface of a laboratory automation software. It is divided into several sections:

- Plates:** A row of four icons representing 96-well plates, labeled 1, 2, 3, and 4.
- Control Panel:** Contains buttons for 'Initialize', 'Run All', 'Stop', and 'Run Loop'. A 'Loop Cycle' field is set to 1.
- Protocol Functions:** A grid of buttons for various operations: Aspirate, Dispense, Empty, Mix, Wash, Transfer, Serial Dilution, Fill Plate, Pooling Plate, Start Loop, End Loop, Set Parameter, Pause, and Comment.
- Protocol Steps:** A list of four steps:
  - 1 Y Aspirate 10ul, Airgap 0ul/0ul at Station 1
  - 2 Y Dispense 10ul at Station 4
  - 3 Y Mix 10ul, Airgap 0ul, 4 Times at Station 2, 0ul retained
  - 4 Y Transfer 10ul (0ul/0ul) from S2 to S2
- Header:** Shows 'Untitled - SP3'.
- Footer:** Displays 'Head: No.0: SPR-EZL500-96, 96ch(0), 500 ul', 'Simulation Mode', 'Model: 96ch-500uL', and an 'Add' button.

Selected Head



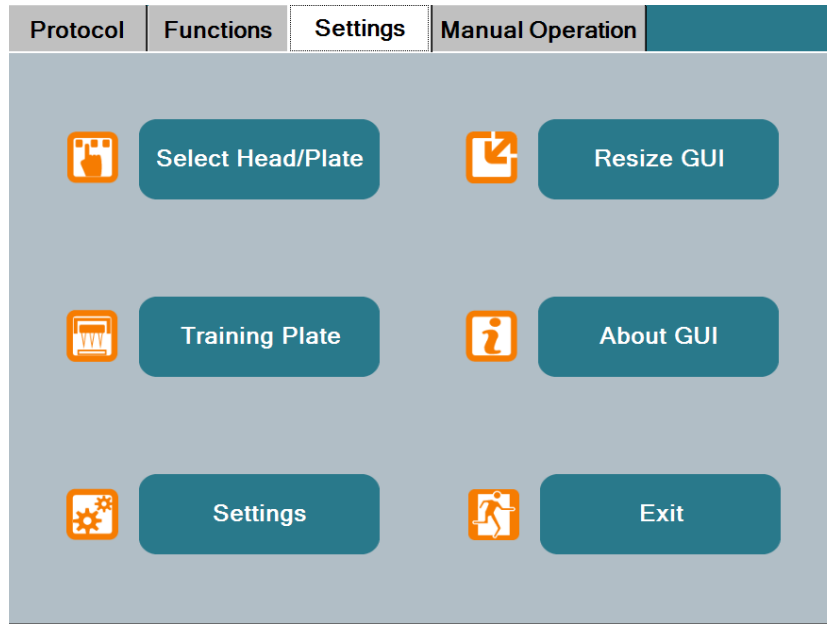
Simulation/  
Operation Mode



Core Format



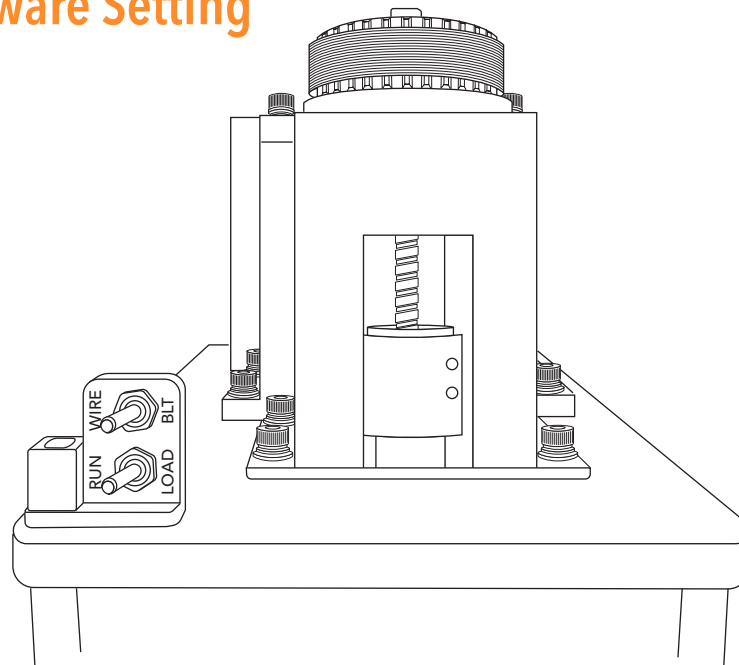
# 6 SETTINGS TAB OVERVIEW



## 6.1 – How to Connect Tablet to S3 Pipettor

The tablet can communicate with the S3 via the built in USB wired connection or the on-board Bluetooth. There are 2 settings, hardware and software, which must be selected to utilize either connection.

### 6.1.1 – Hardware Setting



The Wired/Wireless Bluetooth switch corresponding can be accessed by raising the hood (see Accessing the Pipetting Core for easy to follow instructions).

There are 2 labeled switches. Flip the switch to choose Wired or Bluetooth communication.

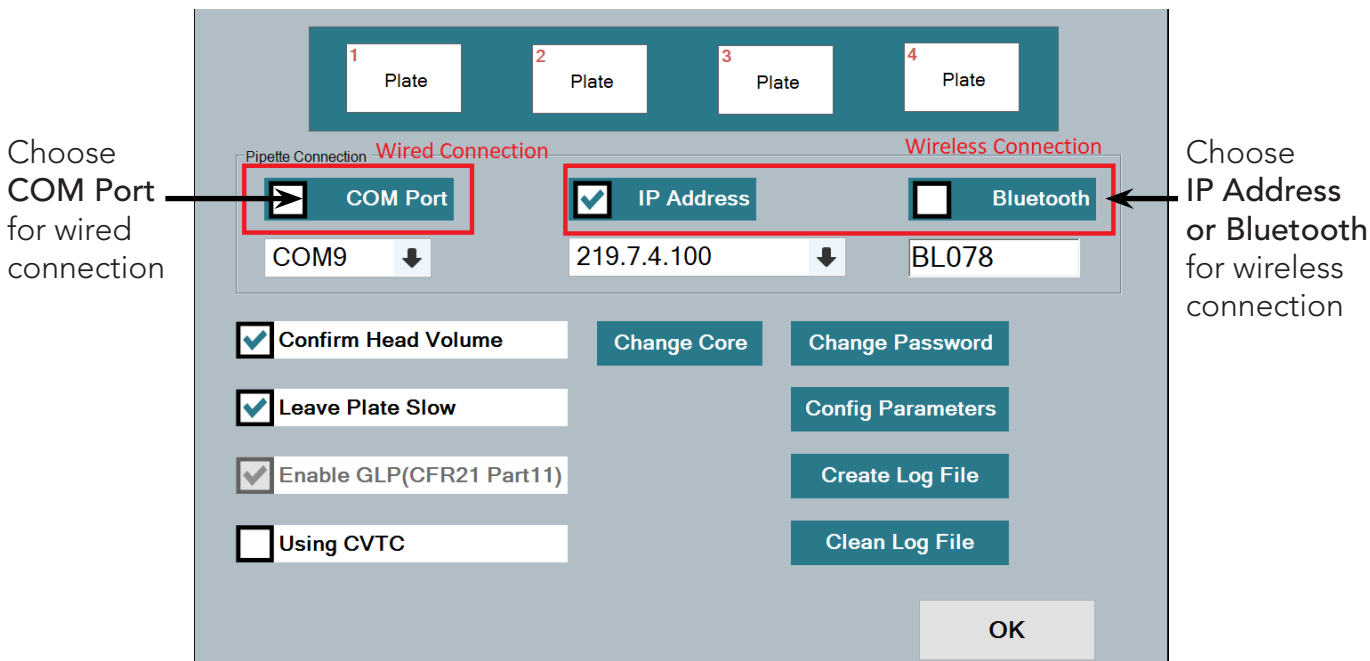
## 6.1.2 – Software Setting

Open the **SETTINGS** tab in the S3 software, then select Settings from the menu.

Click **COM Port** for wired connection or **IP Address** or **Bluetooth** for wireless connection.

Check the COM Port setting in the computer device manager. Confirm the port number in the drop down matches the number in the device manager.

The address for wireless connection is located on the label on the back of the instrument cover.



After choosing the connection, click OK then click Initialize to confirm communication.

## 6.2 – Confirm Head Volume

The Software will prompt the user to confirm the maximum volume of the selected head after each initialization.

## 6.3 – Leave Plate Slow

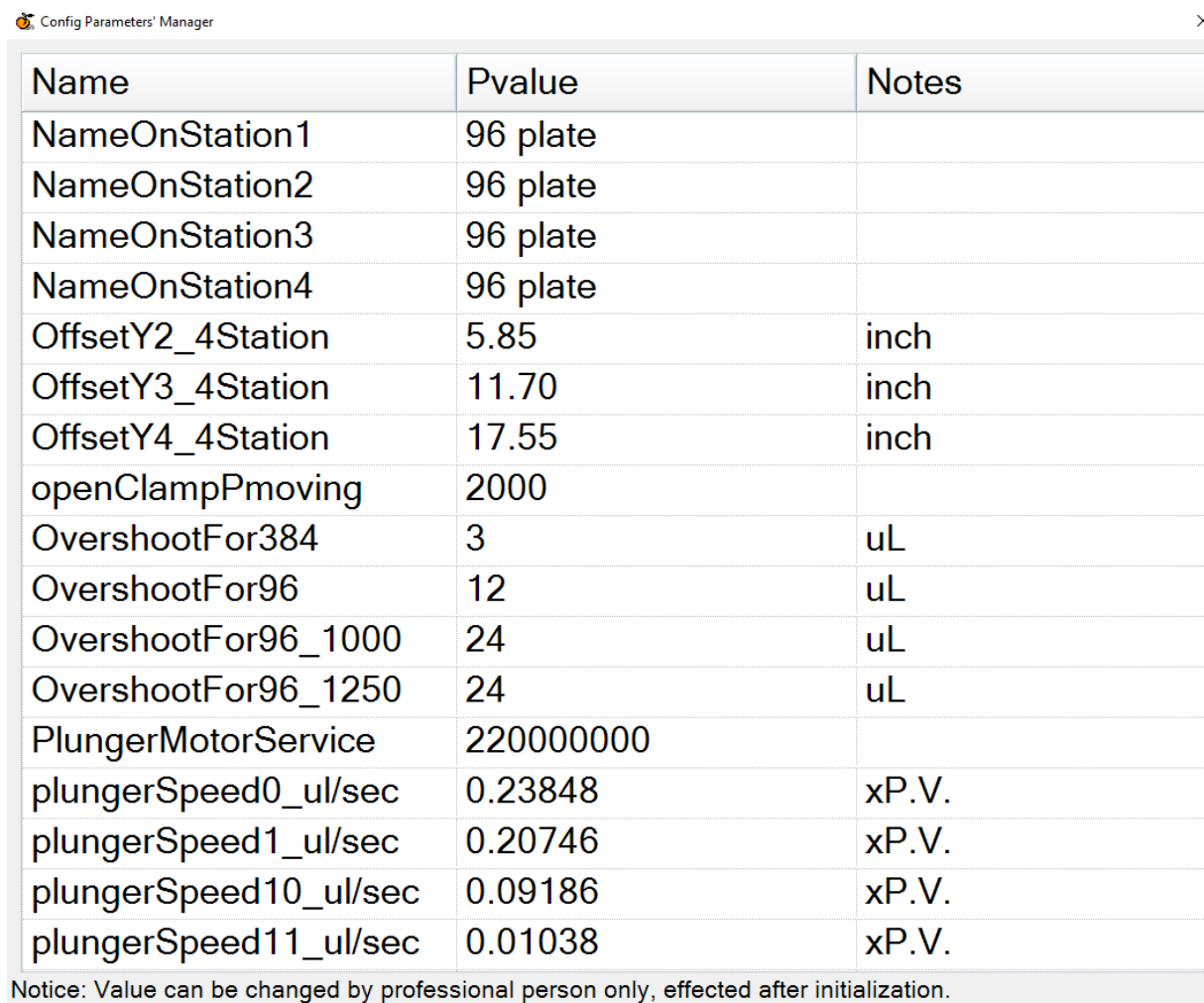
Enabling the Leave Plate Slow function will reduce the speed of the Z-axis as the tips enter and exit the plate well. This function is useful for cell-culture applications and helps improve CVs by reducing residual drops on the tips. If disabled, the Z speed will run at the default setting throughout the program.

## 6.4 – Enable GLP (CFR21 Part 11)

Enable/Disable user login requirement.

## 6.5 – Config Parameter

The user can change any of the listed parameters in the Config Parameter settings. Please consult a Apricot representative for any questions about the Config settings. Changing parameters without full knowledge may cause unexpected results.



The screenshot shows a window titled "Config Parameters' Manager" with a close button (X) in the top right corner. The window contains a table with three columns: "Name", "Pvalue", and "Notes". The table lists various parameters such as "NameOnStation1" through "NameOnStation4", "OffsetY2\_4Station", "OffsetY3\_4Station", "OffsetY4\_4Station", "openClampPmoving", "OvershootFor384", "OvershootFor96", "OvershootFor96\_1000", "OvershootFor96\_1250", "PlungerMotorService", "plungerSpeed0\_ul/sec", "plungerSpeed1\_ul/sec", "plungerSpeed10\_ul/sec", and "plungerSpeed11\_ul/sec". The "Notes" column contains units like "inch" and "uL", or "xP.V.". Below the table, a notice states: "Notice: Value can be changed by professional person only, effected after initialization."

Name	Pvalue	Notes
NameOnStation1	96 plate	
NameOnStation2	96 plate	
NameOnStation3	96 plate	
NameOnStation4	96 plate	
OffsetY2_4Station	5.85	inch
OffsetY3_4Station	11.70	inch
OffsetY4_4Station	17.55	inch
openClampPmoving	2000	
OvershootFor384	3	uL
OvershootFor96	12	uL
OvershootFor96_1000	24	uL
OvershootFor96_1250	24	uL
PlungerMotorService	220000000	
plungerSpeed0_ul/sec	0.23848	xP.V.
plungerSpeed1_ul/sec	0.20746	xP.V.
plungerSpeed10_ul/sec	0.09186	xP.V.
plungerSpeed11_ul/sec	0.01038	xP.V.

Notice: Value can be changed by professional person only, effected after initialization.

### 6.5.1 – Overshoot for 96/384

The Overshoot value is calculated automatically by the the software to optimize pipetting results. The value is based on the high volume of the selected core. However, this value can be adjusted by the user. Setting the value to 0 disables the overshoot.

## 6.6 – Select Head/Plate Database

Once communication is established, the user is required to select the current Head format in the Software. Click the Select Head/Plate tab on Settings page.

Choose the appropriate head from the Select Head Menu.

Head No.	Order No.	Channels	Category	Volume	Height	Tip Type
0	SPR-EZL500-96	96	Dispo	500	3.027	EZL
3	SPR-EZL125-96	96	Dispo	125	2.147	EZL
6	SPR-EZL50-96	96	Dispo	50	1.907	EZL
9	SPR-EZL250-96	96	Dispo	250	3.027	EZL
16	SPR-EZL500-96F	96	Dispo	350	3.027	EZL
19	SPR-EZL125-96F	96	Dispo	90	2.147	EZL
22	SPR-EZL50-96F	96	Dispo	35	1.907	EZL
25	SPR-EZL250-96F	96	Dispo	175	3.027	EZL

If writing a Protocol or utilizing Manual function the user is required to assign plates to the stage. Click the Select Plate tab and choose the appropriate plates from the menu. Left click on the desired plate and then left click on the appropriate stage position. The plate will appear on the stage map.

Plate Name:

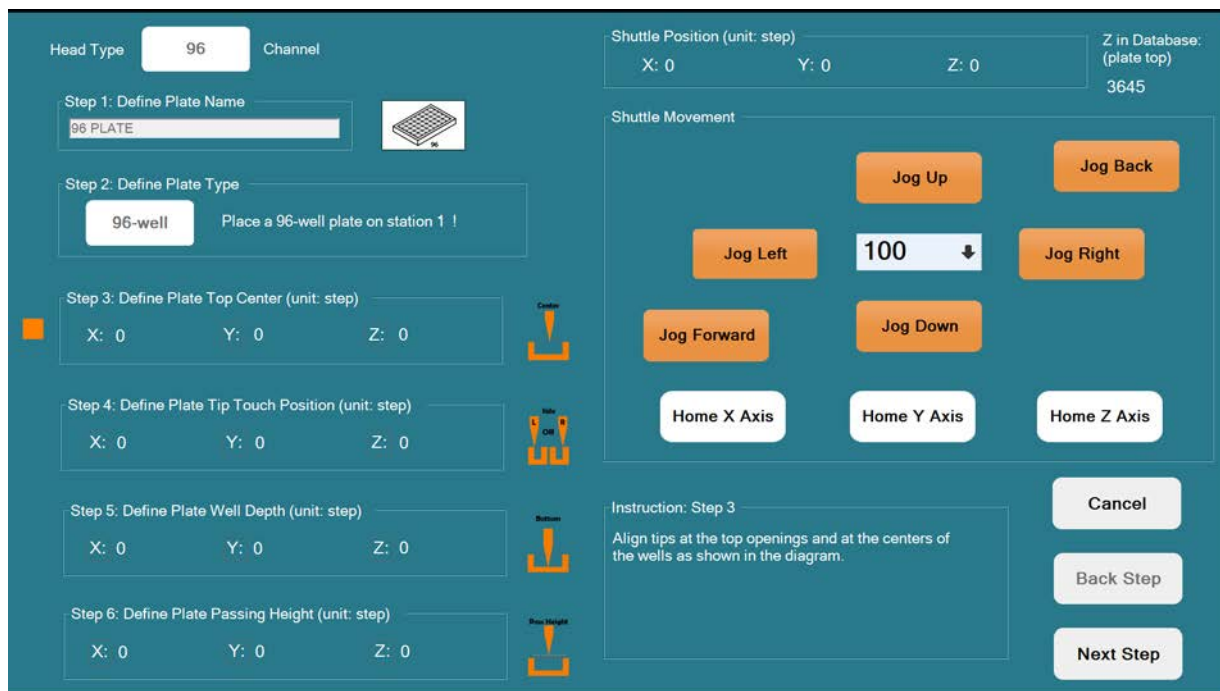
Copy Plate    Rename Plate    Delete Plate

If the plate database is empty, the user will be required to add plates by utilizing the Training Plate function.

## 6.7 – Training Plate

To add new labware to the database, place the labware on the stage and click on the corresponding position in the software.

Click the Training Plate tab on the Settings page.



**Note:** When training a plate, be sure to select the corresponding tip in the Head Library. Users can use 96 tips to train a 96- or 384-well plate.

- Step 1. Plate Name:** Only for New Plate.
- Step 2. Plate Type:** Only for New Plate.
- Step 3. Top Center:** Follow diagram display.

Align the tip to the top center of the plate. Jog up and down to position the tip height. Jog left and right to center the tip.

- Step 4. Tip Touch:** Follow diagram display. Adjust so the tip touches the side of the well.

- Step 5. Well Depth:** Follow diagram display. Jog up and down until the bottom of the plate touches the tip lightly.

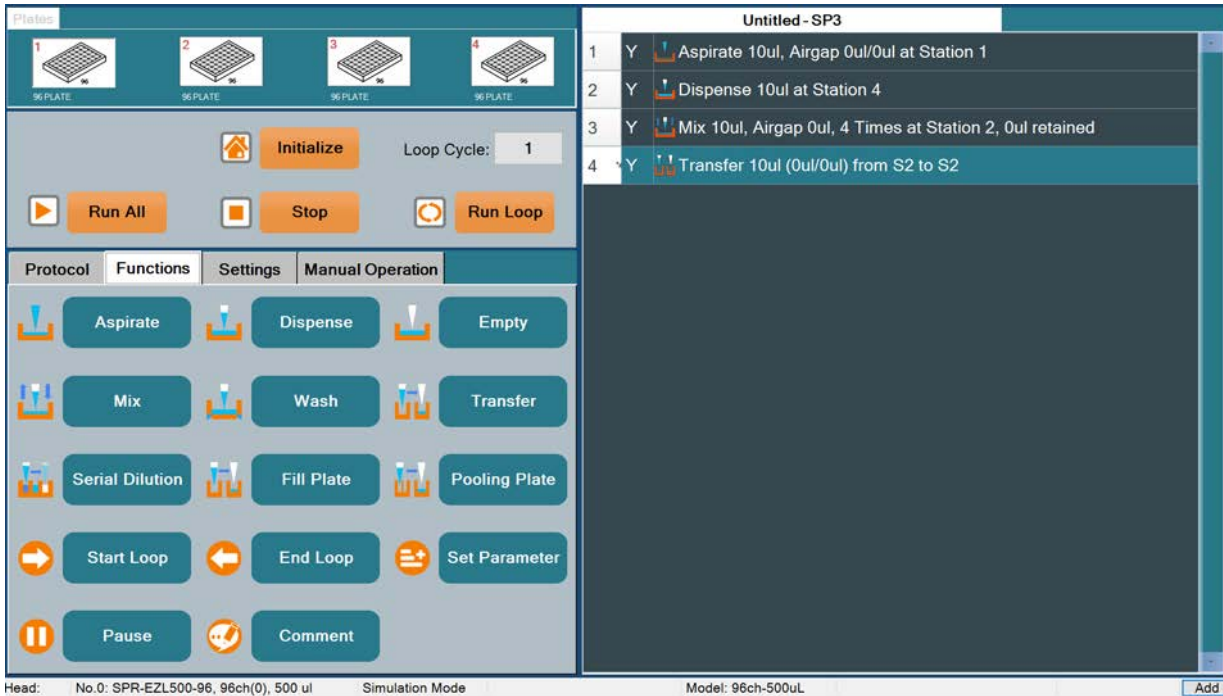
- Step 6. Pass Height:** Follow diagram display.

After the plate settings are defined, you will be prompted to name and save the plate to the database.

# 7 CREATING A PROTOCOL

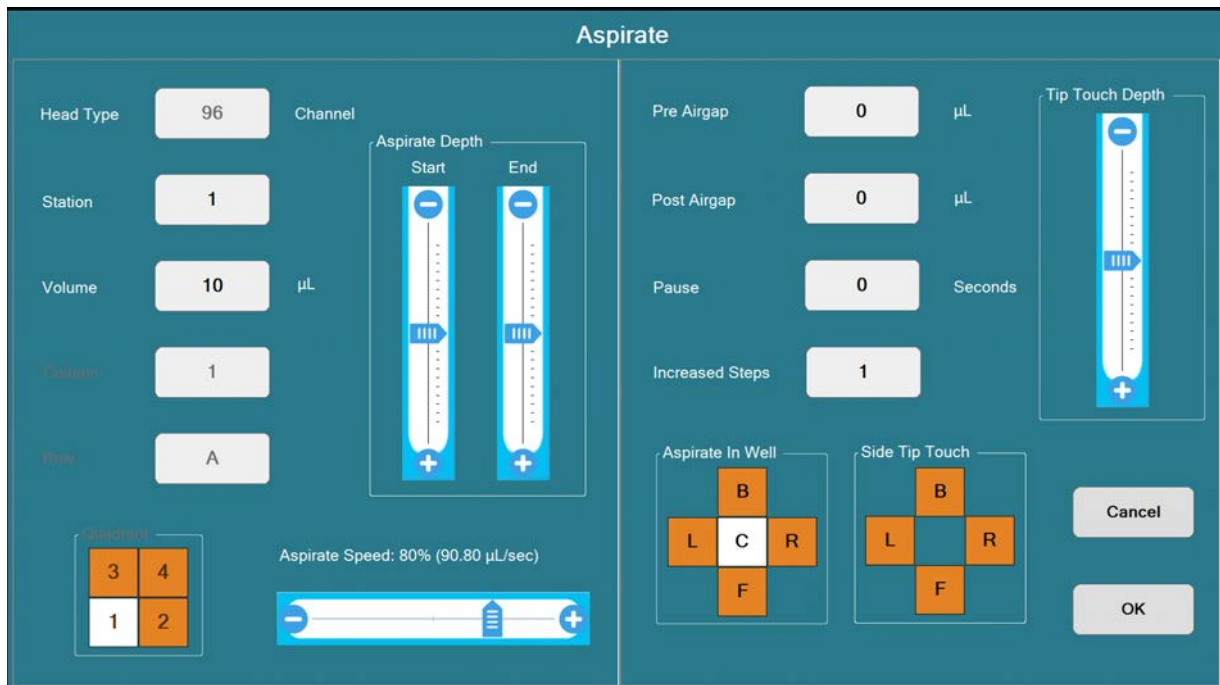
After selecting the pipetting head and placing the labware on the stage positions, the user can begin creating a Protocol.

Click on the Functions tab to display the liquid handling functions menu.



Left click on the desired function, then Left click on the labware/stage position where the function is to be performed. This will open the function parameters page. Please see below for parameter page overviews.

# 7.1 - Aspirate



- Head Type:** Select head type, 384/96 or 24/12 head.
- Station:** Select source station to aspirate.
- Volume:** Amount of liquid to aspirate.
- Column:** Select column of plate to aspirate.
- Quadrant:** Enabled using a 96-channel or single row/column of 12-channel, 8-channel head to a 384 plate.
- Plunger Speed:** Aspirate speed of the plungers.
- Aspirate Depth:**
  - Start:** Depth of well where tips start to aspirate.  
For example, if start depth is 50% and well is 1000mm in depth, tips will move 500mm into well to aspirate.
  - End:** Depth of well where tips finish aspirating.
- Pre Airgap:** Volume of air that plungers will aspirate into tips before aspirating liquid from well.
- Post Airgap:** Volume of air that plungers will aspirate into tips after aspirating liquid from well.
- Pause:** Pause time before tips move out of well after aspirating.
- Increased Steps:** Number of different aspiration points from Start Depth to End Depth.
- Tip Touch Depth:** Depth of well where tips touch the side of well after aspirating.
- Side Tip Touch:** Tips touch edge of well before moving out of well.  
Tips can move to one side or combine different sides in all 4 directions.
- Aspirate in Well:** Specifically, aspirate from a corner of well.

## 7.2 - Dispense

- Head Type:** Select head type, 384/96 or 24/12 head.
- Station:** Select target station to dispense.
- Volume:** Amount of liquid to dispense.
- Column:** Select column of plate to dispense (selectable in portrait mode).
- Quadrant:** Enabled using a 96-channel or single row/column of 12-channel, 8-channel head to a 384 plate.
- Plunger Speed over 60µL:** Dispense speed of plungers for over 60µL.
- Plunger Speed:** Dispense speed of plungers for under 60µL.
- Dispense Depth:** **Start:** Depth of well where the tips start to dispense.  
For example, if start depth is 50% and well is 1000mm in depth, tips will move 500mm into well to dispense.  
**End:** Depth of well where tips finish dispensing.
- Decreased Steps:** Numbers of different dispense points from the Start Depth to End Depth.
- Pause:** Pause time before tips move out of well after dispense.
- Bottom Tip Touch:** Tips move down to selected depth after dispensing.
- Bottom Touch Depth:** Depth of well where tip touches the bottom of well after dispensing.
- Dispense in Well:** Specifically, dispense to a corner of well.
- Side Tip Touch:** Tips touch edge of well before moving out of well.  
Tips can move to one side or combine different sides in all 4 directions.
- Side Tip Touch Depth:** Depth of well where tips touch sides of well after dispensing.

## 7.3 - Empty

The screenshot shows the 'Empty' configuration screen. It includes the following settings:

- Head Type: 96
- Channel: Empty Depth (vertical slider)
- Station: 3
- Column: 1
- Row: A
- Quadrant: 2x2 grid with cells 1, 2, 3, 4
- Empty Speed: 80% (90.80 µL/sec)
- Empty Speed Over 60µL: 80% (90.80 µL/sec)
- Bottom Tip Touch: No
- Side Touch Depth (vertical slider)
- Bottom Touch Depth (vertical slider)
- Empty in Well: 3x3 grid with cells L, C, R, B, F
- Side Tip Touch: 3x3 grid with cells L, C, R, B, F
- Buttons: Cancel, OK

- Head Type:** Select head type, 384/96 or 24/12 head.
- Station:** Select target station to empty.
- Column:** Select column of plate to empty (selectable in portrait mode).
- Quadrant:** Enabled using a 96-channel or single row/column of 12-channel, 8-channel head to a 384 plate.
- Plunger Speed for Over 60µL:** Empty speed of plungers for over 60µL.
- Plunger Speed:** Empty speed of the plungers for under 60µL.
- Empty Depth:** Depth of well where tips start to empty.  
For example, if start depth is 50% and well is 1000mm in depth, tips will move 500mm into well to empty.
- Bottom Tip Touch:** Tips move down to selected depth after emptying.
- Bottom Touch Depth:** Depth of well where the tip touches the bottom of well after emptying.
- Empty in Well:** Specifically, empty to a corner of well.
- Side Tip Touch:** Tips touch edge of well before moving out of well.  
Tips can move to one side or combine different sides in all 4 directions.
- Side Tip Touch Depth:** Depth of well where tips touch sides of well after emptying.

## 7.4 - Mix

- Head Type:** Select head type, 384/96 or 24/12 head.
- Station:** Select target station to mix.
- Mix Volume:** Amount of liquid to mix.
- Cycle:** Number of times to mix liquid.
- Column:** Select column of plate to mix (selectable in portrait mode).
- Quadrant:** Enabled using a 96-channel or single row/column of 12-channel, 8-channel head to a 384 plate.
- Mix Depth:** Depth of well where tips aspirate/dispense the liquid.  
(Aspirate/Dispense)
- Plunger Speed:** Aspirate/dispense speed of the plungers in mix.  
(Aspirate/Dispense)
- Airgap:** Volume of air that plungers will aspirate into tips before mixing the liquid.
- Volume Retained:** Amount of liquid that the tips will aspirate after mixing.
- Mix at Corners:** Specifically, mix in a corner of well.
- Bottom Tip Touch:** Tips move down to selected depth after mix.
- Side Tip Touch:** Tips touch edge of well before moving out of well.  
Tips can move to one side or combine different sides in all 4 directions.
- Tip Touch Depth:** Depth of well where tips touch sides/bottom of well after mix.  
(Side/Bottom Touch)

## 7.5 - Wash

The screenshot shows the 'Wash' configuration interface. On the left, there are input fields for 'Head Type' (96), 'Station' (3), 'Pre Airgap' (0 μL), 'Volume' (10 μL), and 'Wash Cycle' (4 Times). In the center, there are two vertical sliders for 'Wash Depth' labeled 'Aspirate' and 'Dispense'. On the right, there are input fields for 'Using Pump' (No), 'Pre Fill Period' (0 Seconds), and 'Post Wash Period' (0 Seconds). At the bottom right, there are sliders for 'Dispense Speed' (80% (90.80 μL/sec)) and 'Aspirate Speed' (80% (90.80 μL/sec)). 'Cancel' and 'OK' buttons are located at the bottom right.

- Head Type:** Select head type, 384/96 or 24/12 head.
- Station:** Select target station to wash.
- Airgap:** Volume of air that plungers aspirate into the tips before washing tips.
- Volume:** Amount of liquid to wash.
- Cycle:** Number of times plunger will wash tips.
- Wash Depth:** Depth of well where tips aspirate/dispense liquid.  
(Aspirate/Dispense)
- Aspirate Speed:** Aspirate speed of plungers in wash.
- Using Pump:** Turn pump on, or off.
- Pre Fill Period:** Time for pump to fill up liquid in wash station before washing tips.
- Post Wash Period:** Time for pump to empty liquid in wash station before washing tips.
- Dispense Speed:** Dispensing speed of plungers in wash.

## 7.6 - Pause

**Pause**

Minute: 0      Home X: No      Change Tips: No

Second: 5      Home Y: No

Wait for User: Yes      Home Z: No

Comment: test

Cancel      OK

<b>Minute (min):</b>	The pause time in minutes that software will pause until next protocol.
<b>Second (sec):</b>	The Pause time in seconds that software will pause until next protocol.
<b>Wait for User (yes/no):</b>	Wait for user to resume protocol.
<b>Home X (yes/no):</b>	Move to X home position.
<b>Home Y (yes/no):</b>	Move to Y home position.
<b>Home Z (yes/no):</b>	Move to Z home position.
<b>Change Tips:</b>	Instrument will pause and unclamp automatically for user to exchange the tips.
<b>Comment:</b>	Display a message.

## 7.7 – Transfer

The screenshot shows a control panel for a liquid handling robot, divided into Source and Target sections. The Source section includes: Head Type (96), Source Station (2), Pre Airgap (0 μL), Volume (10 μL), Post Airgap (0 μL), Pause (0 Seconds), Source Column (1), and Source Row (A). It features an Aspirate Depth slider and a 2x2 quadrant selector (1, 2, 3, 4). The Target section includes: Target Station (2), Target Column (1), Target Row (A), Bottom Touch (No), Side Tip Touch (a 4-way selector with L, R, B, F), Target Depth (a slider), and Tip Touch Depth (Side and Bottom sliders). It also has a 2x2 quadrant selector (1, 2, 3, 4) and a Target Depth slider. Both sections have speed sliders set to 80% (90.80 μL/sec). Buttons for Cancel and OK are at the bottom right.

- Head Type:** Select head type, 384/96 or 24/12 head.
- Source Station:** Select source station to aspirate.
- Volume:** Volume of liquid plungers will aspirate.
- Source Column:** Select column of plate to aspirate (selectable in portrait mode).
- Quadrant:** Enabled using a 96-channel or single row/column of 12-channel, 8-channel head to a 384 plate.
- Aspirate Speed:** Aspirate speed of plungers.
- Aspirate Depth:** Depth of well where tips start to aspirate.  
For example, if start depth is 50% and well is 1000mm in depth, tips will move 500mm into well to aspirate.
- Pre Airgap:** Volume of air that plungers will aspirate into tips before aspirating liquid from well.
- Post Airgap:** Volume of air that plungers will aspirate into tips after aspirating liquid from well.
- Pause:** Pause time before tips move out of well after dispense.
- Target Station:** Select target station to dispense.
- Target Column:** Select column of plate to dispense (selectable in portrait mode).
- Bottom Tip Touch:** Tips move down to selected depth after empty.
- Dispense Depth:** Depth of well where tips start to dispense.  
For example, if start depth is 50% and well is 1000mm in depth, tips will move 500mm into well to dispense.
- Side Tip Touch:** Tips touch edge of well before moving out of well.  
Tips can move to one side or combine different sides in all 4 directions.
- Tip Touch Depth:** Depth of well where tips touch sides/bottom of well after empty.  
(Side/Bottom Touch)
- Dispense Speed:** Dispense speed of plungers.

## 7.8 – Serial Dilution

The screenshot shows a control interface for serial dilution. It is organized into three columns: Source, Serial Dilution, and Target. The Source column contains settings for Head Type (8), Source Station (1), Pre-Airgap (0), Aspirate Volume (10), and Source Column (1). It also includes a 2x2 grid for selecting a quadrant (1-4) and a vertical slider for Aspirate Depth. The Serial Dilution column contains Target Station (1), Mix Volume (10), Mix Cycle (1), Start Column (1), End Column (1), and Column Interval (1). It also features two horizontal sliders for S.D. Aspirate Speed and S.D. Dispense Speed, both set to 80%, and a vertical slider for Serial Dilution Depth. The Target column includes a 2x2 grid for selecting a quadrant (1-4) and a vertical slider for Side Tip Touch, which has four directional options: B (Back), L (Left), R (Right), and F (Front). At the bottom right are Cancel and OK buttons.

- Head Type:** Select head type, 384/96 or 24/12 head.
- Source Station:** Select source station to aspirate.
- Pre Airgap:** Volume of air that plungers will aspirate into tips before aspirating liquid from the well.
- Aspirate Volume:** Volume of liquid plungers will aspirate for serial dilution.
- Quadrant:** Enabled using a 96-channel or single row/column of 12-channel, 8-channel head to a 384 plate.
- Aspirate Speed:** Aspirate speed of plungers.
- Aspirate Depth:** Depth of well where tips start to aspirate. For example, if start depth is 50% and well is 1000mm in depth, tips will move 500mm into well to aspirate.
- Target Station:** Select target station for serial dilution.
- Mix Volume:** Amount of liquid to mix.
- Mix Cycle:** Number of times plunger will mix liquid.
- Start Column:** Start Column for mix.
- End Column:** End Column for mix.
- Column Interval:** Select Column Interval for Serial Dilution function. "1" = all columns, "2" skips every other column, "3" skips 2nd and 3rd columns, etc.
- Tip Touch Depth:** Depth of well where tips touch sides of the well after mix.
- Serial Dilution Depth:** Depth of well where mix tips aspirate/dispense liquid. (Aspirate/Dispense)
- Side Tip Touch:** Tips touch edge of well before moving out of well. Tips can move to one side or combine different sides in all 4 directions.
- Serial Dilution Speed:** The mix speed of the plungers. (Aspirate/Dispense)

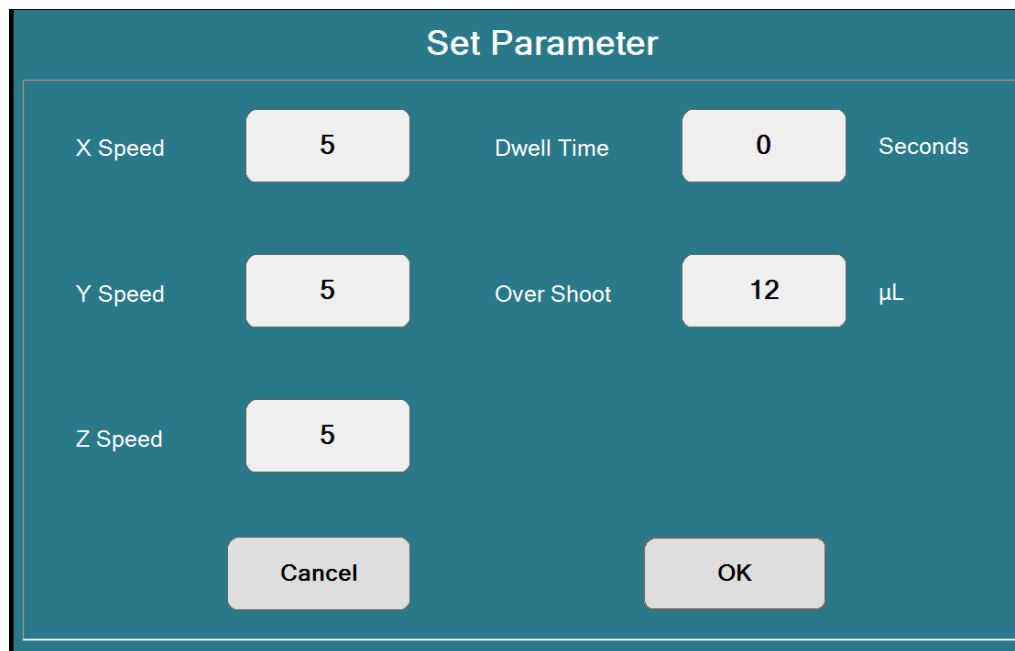
## 7.9 – Fill Plate

- Head Type:** Select head type, 16/8 head.
- Source Station:** Select source station to aspirate.
- Pre Airgap:** Volume of air that plungers will aspirate into tips before aspirating liquid from well.
- Max Aspirate Vol:** Max volume of liquid plungers will aspirate.
- Remain Volume:** Volume of liquid that is in the tip at the end of pipetting.
- Source Column:** Select column of plate to aspirate (selectable in portrait mode).
- Quadrant:** Enabled using a 96-channel or single row/column of 12-channel, 8-channel head to a 384 plate.
- Aspirate Speed:** Aspirate speed of plungers.
- Aspirate Depth:** Depth of well where tips start to aspirate. For example, if start depth is 50% and well is 1000mm in depth, tips will move 500mm into well to aspirate.
- Target Station:** Select target station to fill plate.
- Fill Volume:** Amount of liquid per well.
- Start Column:** Start column for fill plate (selectable in portrait mode).
- End Column:** End column for fill plate (selectable in portrait mode).
- Column Interval:** Select Column Interval for Fill Plate function. "1" = all columns, "2" skips every other column, "3" skips 2nd and 3rd columns, etc.
- Bottom Tip Touch:** Tips move down to selected depth after dispense.
- Dispense Depth:** Depth of well where tips start to dispense. For example, if start depth is 50% and well is 1000mm in depth, tips will move 500mm into well to dispense.
- Side Tip Touch:** Tips touch edge of well before moving out of well. Tips can move to one side or combine different sides in all 4 directions.
- Tip Touch Depth:** Depth of well where tips touch sides/bottom of well after dispense. (Side/Bottom Touch)
- Dispense Speed:** Dispense speed of plungers.

## 7.10 – Pooling

- Head Type:** Select head type, 16/8 head.
- Source Station:** Select source station for pooling.
- Pre Airgap:** Volume of air that plungers will aspirate into tips before aspirating liquid from the well.
- Max Aspirate Volume:** Max volume of liquid plungers will aspirate.
- Pooling Volume:** Amount of liquid aspirated per well.
- Start Column:** Start column for pooling plate.
- End Column:** End column for pooling plate.
- Column Interval:** Select Column Interval for Pooling function. "1" = all columns, "2" skips every other column, "3" skips 2nd and 3rd columns, etc.
- Quadrant:** Enabled using a 8-channel to a 384 plate.
- Aspirate Speed:** Aspirate speed of plungers.
- Aspirate Depth:** Depth of well where tips start to aspirate.  
For example, if start depth is 50% and well is 1000mm in depth, tips will move 500mm into well to aspirate.
- Target Station:** Select target station to empty.
- Target Column:** Select the column of station to empty.
- Bottom Tip Touch:** Tips move down to selected depth after empty.
- Disperse Depth:** Depth of well where tips start to dispense.  
For example, if start depth is 50% and well is 1000mm in depth, tips will move 500mm into well to dispense.
- Side Tip Touch:** Tips touch edge of well before moving out of well.  
Tips can move to one side or combine different sides in all 4 directions.
- Tip Touch Depth: (Side/Bottom Touch)** Depth of well where tips touch sides/bottom of well after empty.
- Disperse Speed:** Disperse speed of plungers.

## 7.11 - Set Parameter



The 'Set Parameter' dialog box has a teal header and a white content area. It contains five input fields: 'X Speed' (5), 'Y Speed' (5), 'Z Speed' (5), 'Dwell Time' (0) with 'Seconds' to its right, and 'Over Shoot' (12) with 'µL' to its right. At the bottom are 'Cancel' and 'OK' buttons.

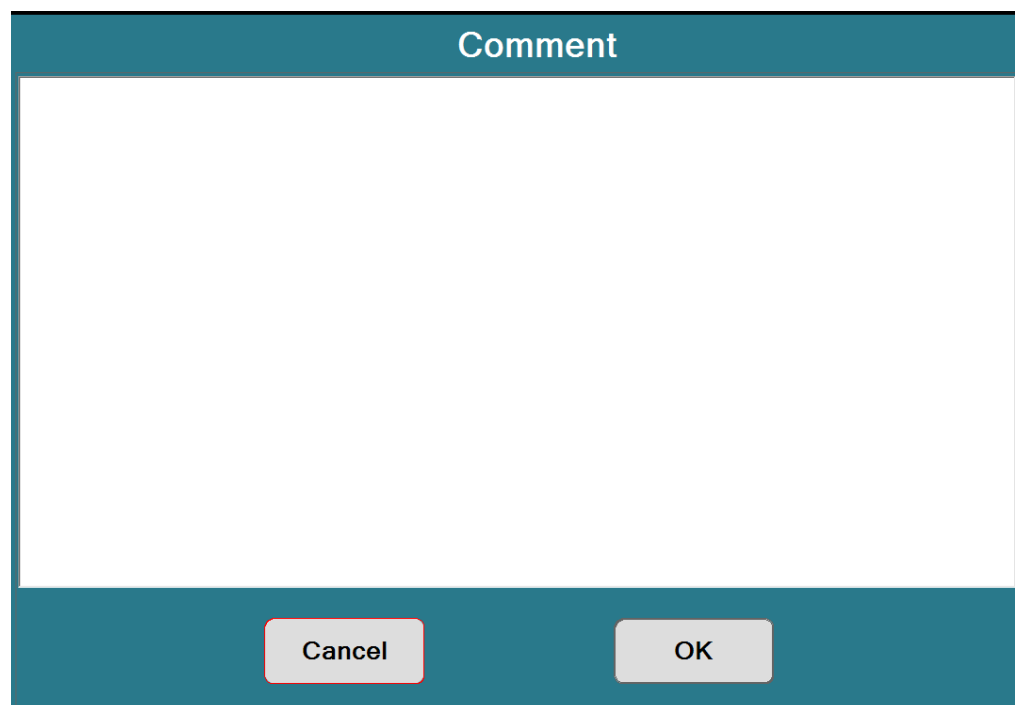
Parameter	Value	Unit
X Speed	5	
Y Speed	5	
Z Speed	5	
Dwell Time	0	Seconds
Over Shoot	12	µL

Set X, Y and Z speed, 0 = slowest and 100 = fastest.

Overshoot: Change the overshoot value.

Dwell Time: Pause time after all the plunger movement.

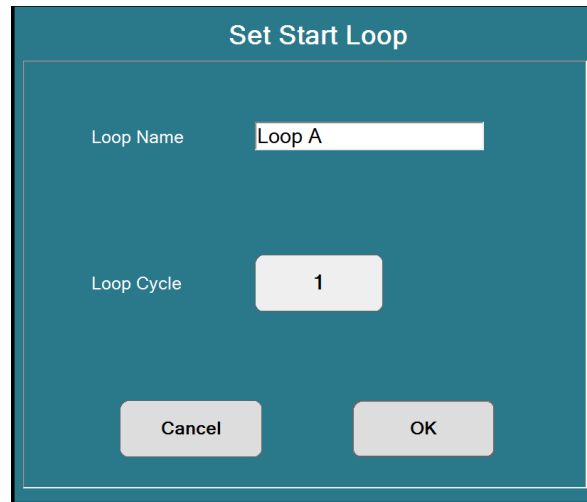
## 7.12 - Comments



The 'Comment' dialog box has a teal header and a large white text area for input. At the bottom are 'Cancel' and 'OK' buttons.

## 7.13 – Start Loop/End Loop

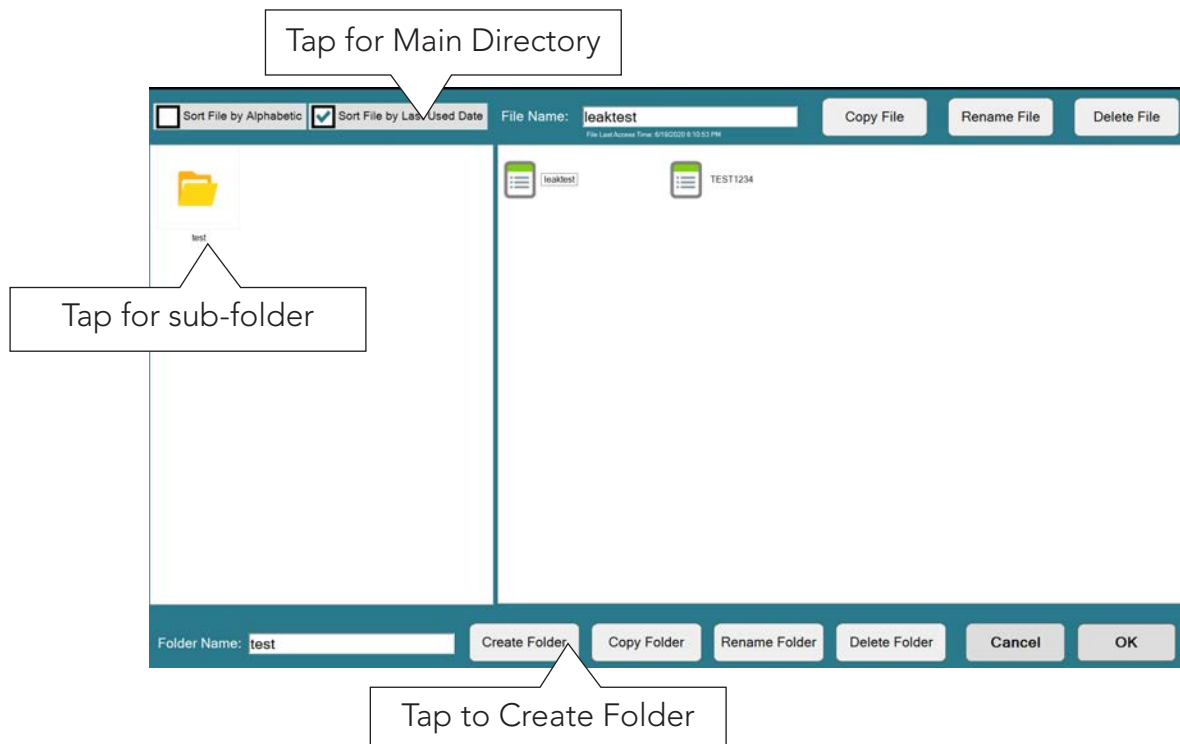
Software will run the protocols starting at “Start Loop” then end at “End Loop” for the selected number of cycles.



- Loop Name:** Name of the Loop
- Loop Cycle:** Number of times the loop will run
- End Loop:** Select “End Loop” that will finish the loop

## 7.14 – Open File, Save File, Save File As

Completed protocols can be named and saved as .SPR files in the Protocol Directory. Protocols saved in the directory are available to be opened and run. The user has the option to Create sub-folders within the Main Directory.



**Create Folder:** Enter the name of the new folder in the Folder Name field then select the Create Folder function. Folders can be copied, renamed or deleted.

## 7.15 - Clear Current/Clear All

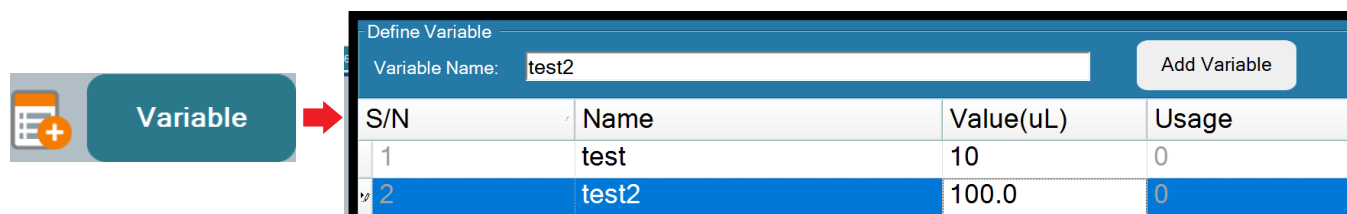
With 'Y', instrument will run this line of protocol.

With 'N', instrument will skip this line of protocol.

Untitled - SP3	
1	Y Aspirate 10ul, Airgap 0ul/0ul at Station 1, Col 1
2	N Dispense 10ul at Station 3, Col 1
3	Y Empty at Station 2, Col 1
4	N Pause and Waiting for User

## 7.16 - Variable

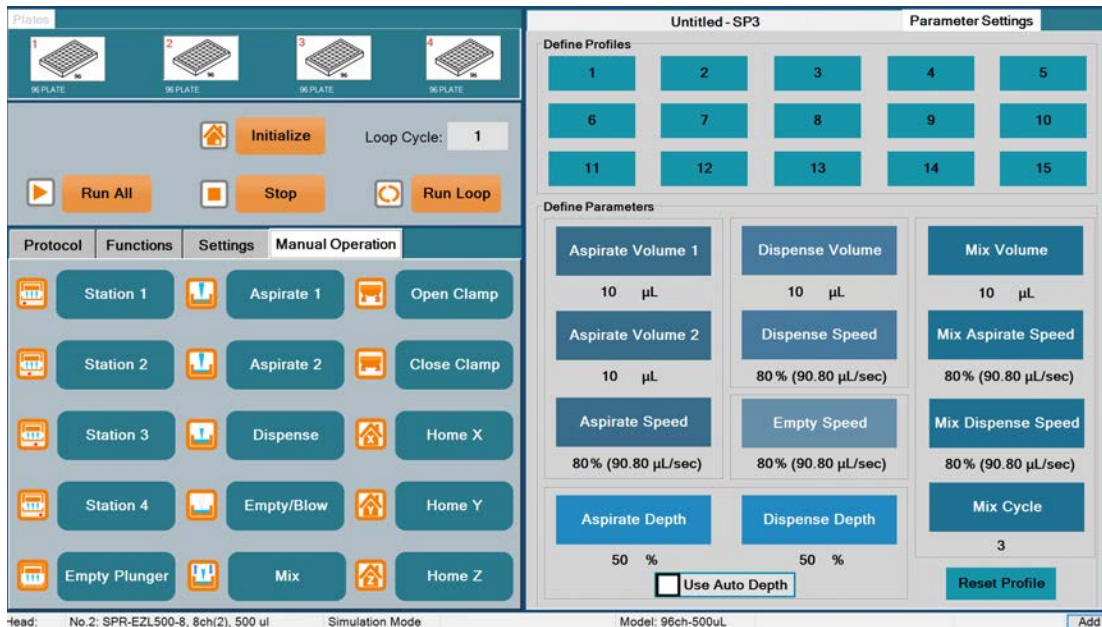
To simplify the protocol writing process, the end user can utilize the Variable function to add recurring volumes for specific functions. For example, if multiple protocols require 1000 $\mu$ L and 10 $\mu$ L volumes, these can be added to the variable list and then selected during the writing process.



S/N	Name	Value(uL)	Usage
1	test	10	0
2	test2	100.0	0

## 8 MANUAL OPERATION

The Manual Operation tab allows the user operate the system without creating a protocol. This can be useful for one-time transfers, additions or mix functions, and it allow the user to Change Tips outside of a protocol.



For Manual Operation the user must first select the appropriate head and labware as instructed in the Create Protocol section, then follow the instructions below.

- ◆ Set the desired volumes, speed and height settings in the Define Parameters table.
- ◆ In the Manual Operation table click on the desired Station button. The shuttle will position itself under the pipetting head.
- ◆ Press the desired liquid handling function on the Manual Operation tab.
- ◆ Use Open Clamp/Close Clamp functions to replace tips.

The Manual Function tab also allows the user to Home individual axis, and purge tips with the Empty/Blow function.

**Note:** Selecting the “Use Auto Depth” function will automatically lift the shuttle to the programmed depth. This depth is based on the Plate Definition as described in Training Plate. If unchecked the user will manually lift the stage to the appropriate height, then press the liquid handling function.

**Note:** The Define Profiles table allows the user to save up to 15 different parameter settings based on the Define parameter field. These parameter settings are saved under each User. Set the desired volumes/speeds etc., in the Define Parameters field, then click on one of the numbers in the Define Profiles field to save those settings. After the parameters are saved, the user can click on the Profile number to load the settings for use.

## 9 PIPETTING TECHNIQUE

Apricot Designs pipettors are highly accurate and precise systems. However, to achieve optimum results, the end user should practice some specific programming and pipetting techniques.

### 9.1 – Training Plates

In some versions of Apricot Software, the end user is responsible for adding plates/reservoirs to the software database. These user defined settings will be utilized when writing programs. Inaccurate settings can result in complications. Please use the following guidelines for defining plates.

**Well Top** – The bottom of the tip should be level with the top plane of the plate and centered over the well. An accurate Well Top setting (along with the Well Bottom setting) will help insure greater accuracy when selecting the operation depth of a liquid handling function.

**Well Bottom** – The tip bottom should be just above the bottom of the well (not touching the bottom surface). To set this, the user can drive the tip down, using small increments, until it touches the plate. Then move up in small increments until the plate can slide or lift slightly under the tip. The tips should not touch the well bottom when 100% depth is selected in the liquid handling functions.

**Note:** When performing Tissue Culture, or similar assays which require the well's lower portion to be undisturbed, the user can program a Well-Bottom height that will be above the samples. This will help prevent accidents in programming.

**Tip Touch** – The Tip Touch function is designed to help draw liquid off the tip. The user should set the Tip-Touch position to make contact with the well (the Tip-Touch setting should not move the plate).

**Note:** When setting the Tip Touch position, consider the shape of the well. For example, a V shaped well definition should be based on the desired depth (in the plate) of the Tip Touch function in a program.

### 9.2 – Improving Accuracy

Within the Aspirate command, the user can adjust Overshoot, Pre-Air Gap, Post-Air Gap, Plunger Speed, Depth settings. Each of these should be utilized properly for good pipetting technique.

**Note to the programmer:** Many of the settings discussed are located within the liquid handling commands of a program (aspirate/dispense/empty/mix etc.). These settings are “local” and will be applied only to the specific program. Any settings that are made within a Config or Setup file will be “universal” and will apply to all programs as they run.

The **Overshoot** and the **Pre-Air Gap** functions are both designed to help improve pipetting accuracy. Each is designed for specific types of dispensing and **should never be used together in the same Aspirate command.**

**Overshoot** – The overshoot function can improve the accuracy of Multi-Dispense and Serial-Dilute commands. It automatically over-aspirates the target volume of the Aspirate command and immediately dispenses the excess back into the source (the Overshoot volume is set by the user). The extra movement of the plungers helps pick up slack in the chain of motor and piston movements and “primes” the piston for an accurate initial dispense. The following are standard Overshoot volumes for the Apricot pipettors (based on the high volume of the system).

- 125 $\mu$ L = 3 $\mu$ L Overshoot
- 550 $\mu$ L = 12 $\mu$ L Overshoot
- 1000 $\mu$ L = 24 $\mu$ L Overshoot

**If the first dispense of a Multi-Dispense function is lower than the target volume, the user should increase the Overshoot value.**

**The Overshoot should be changed to 0 for a Neat Transfer (1-3 $\mu$ L transfer) and the user should incorporate Pre-Airgap.**

**Pre-Air Gap** – The Pre-Air Gap setting is designed to Aspirate a specific volume of air, dictated by the user, before aspirating the volume of liquid. It will help with the accuracy of Neat Dispensing. As with the Overshoot, The Pre-Air Gap helps pick up slack in the chain of motor movements and provides greater accuracy.

**Note:** Using an Empty command will purge both the Liquid and Air Gap. A Dispense command allows the user to set a specific dispense volume.

**Note:** When the Pre-Air gap is purged, it can cause air bubbles in the sample. To prevent this the user can program a slower Plunger Speed during Dispense, and/or utilize the **Divided Steps** function in the Dispense and Empty commands.

**Post Air Gap** – The Post Air-Gap is best utilized when aspirating liquids with a low surface tension (Methanol for example). The post air gap will provide a buffer between the liquid and the tip orifice. This will help slow, or prevent, the liquid from leaking prematurely. An Empty command will purge the Air-Gap and the Liquid. Pre and Post-Air Gaps can be combined within a function.

**Tip Touch** – the Tip-Touch function can be utilized to help prevent post-dispense hanging-drops, thus providing a complete dispense. It is very useful for dispensing into a dry plate.

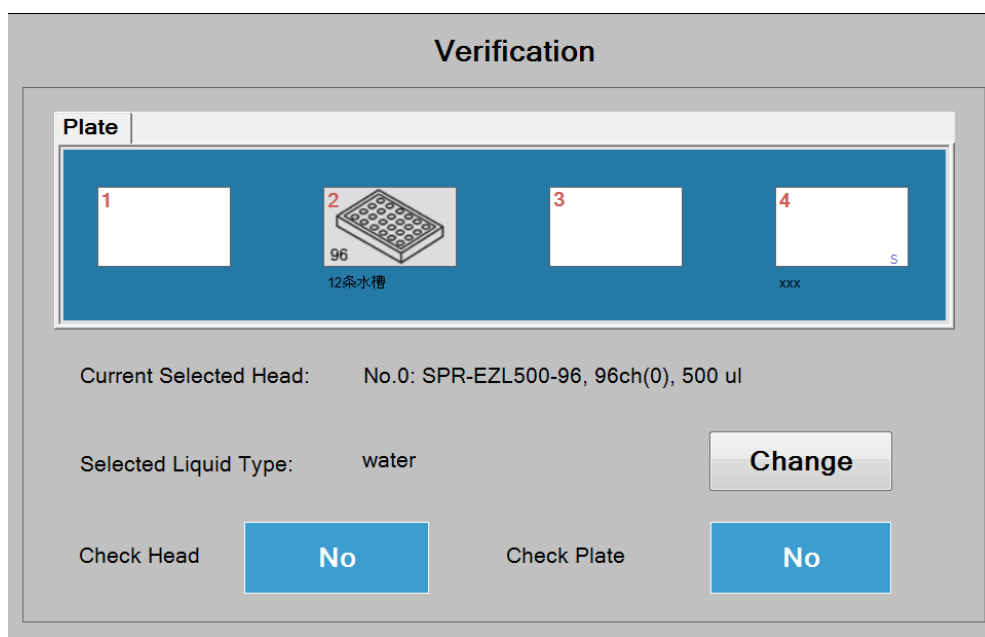
**Plunger Speed** – Slowing the plunger speed can improve results when working with viscous materials. The slower speed allows the natural capillary action of the tips to work more efficiently.

**Dwell Time** – The Dwell Time setting is useful for accurately Aspirating/Dispensing **viscous** material. Dwell Time is defined as the amount of time the tips stay in position after liquid handling functions. Similar to slowing the Plunger Speed, a longer Dwell Time allows capillary action to work more efficiently. This setting is usually located in the CONFIG or SETUP files of applicable Apricot Software.

## 10 Continuous Variable Target Correction (CVTC)

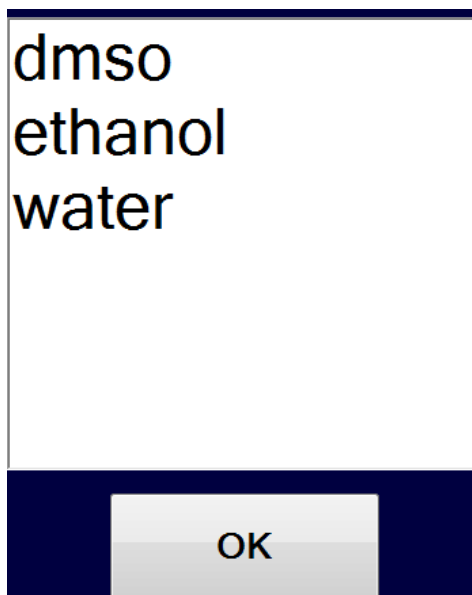
**CVTC** can adjust the plunger motor steps according to the liquid level in the tips. This is very useful for accurate multiple dispense like fill plate with a column head.

- ◆ Click **Run All** and click “Change” to select liquid type.



The image shows a software interface titled "Verification". It contains a "Plate" section with four numbered slots (1, 2, 3, 4). Slot 2 contains an icon of a 96-well plate with the text "96" and "12条水槽" below it. Slot 4 contains the text "xxx" and "S". Below the plate section, the "Current Selected Head" is "No.0: SPR-EZL500-96, 96ch(0), 500 ul". The "Selected Liquid Type" is "water", with a "Change" button to its right. At the bottom, there are two "Check" options: "Check Head" with a "No" button and "Check Plate" with a "No" button.

- ◆ Select the liquid type then click “OK”



The image shows a dialog box for selecting a liquid type. It lists three options: "dmso", "ethanol", and "water". At the bottom of the dialog box is an "OK" button.

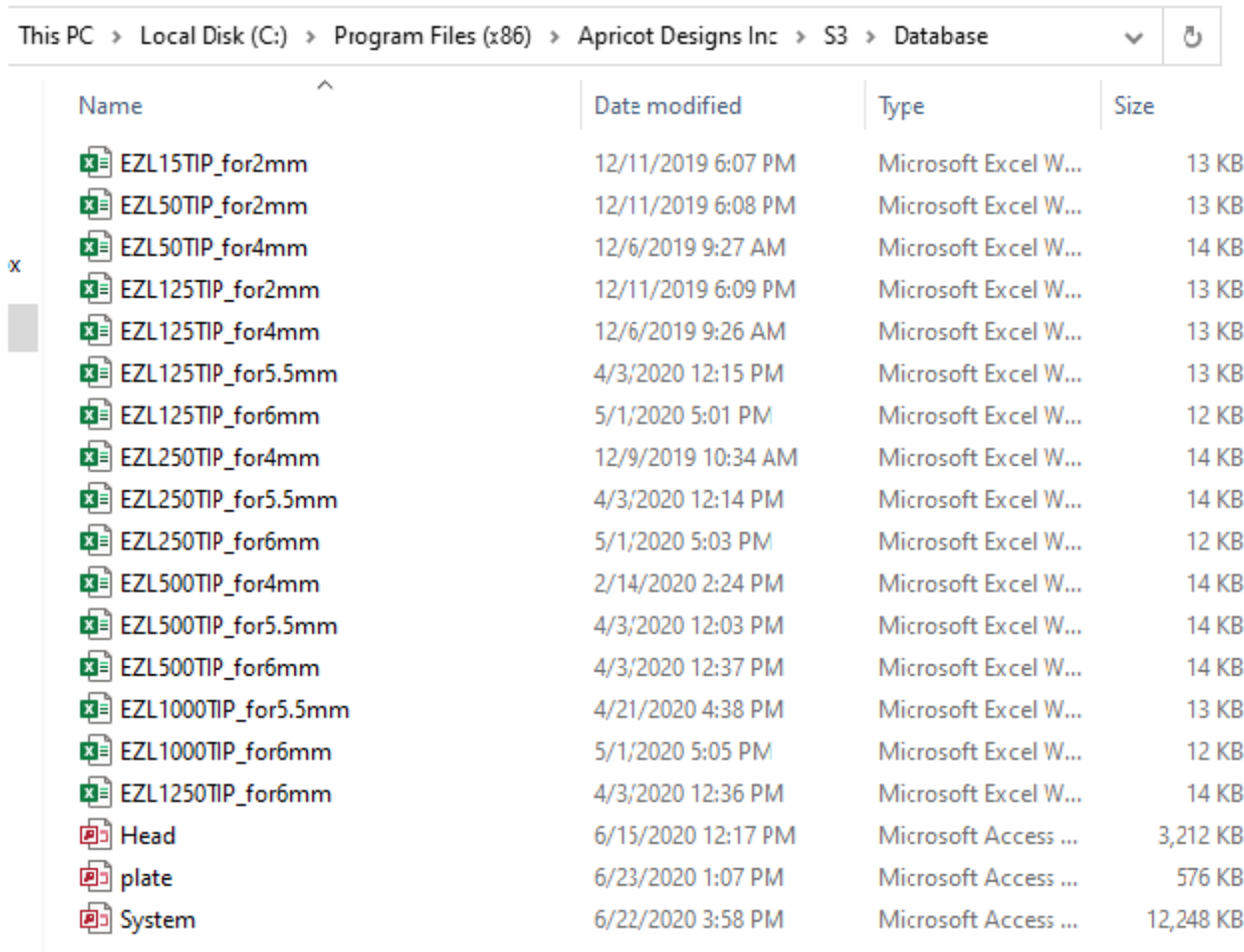
# 10.1 – How to Change CVTC

CVTC is composed two part of values, Aspirate and Multiple Dispense. Aspirate value corrects the motor steps to aspirate the desired volume, and Multiple Dispense value corrects the motor steps to dispense at different region of the tip.

**Note:** Turn off CVTC in config when obtaining new value.

Open the Correction Excel files for the different volume of tips.

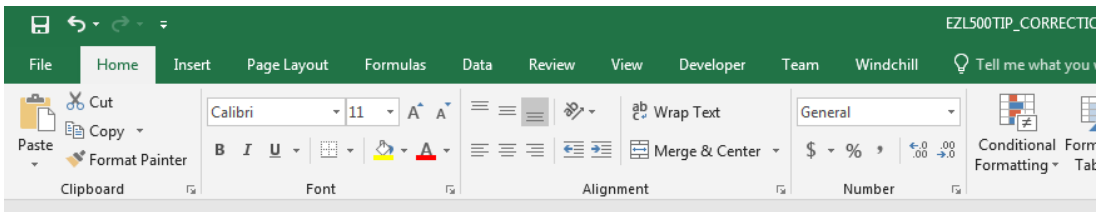
The path C:\Program File\Apricot Designs Inc\S3\Database



This PC > Local Disk (C:) > Program Files (x86) > Apricot Designs Inc > S3 > Database

Name	Date modified	Type	Size
EZL15TIP_for2mm	12/11/2019 6:07 PM	Microsoft Excel W...	13 KB
EZL50TIP_for2mm	12/11/2019 6:08 PM	Microsoft Excel W...	13 KB
EZL50TIP_for4mm	12/6/2019 9:27 AM	Microsoft Excel W...	14 KB
EZL125TIP_for2mm	12/11/2019 6:09 PM	Microsoft Excel W...	13 KB
EZL125TIP_for4mm	12/6/2019 9:26 AM	Microsoft Excel W...	13 KB
EZL125TIP_for5.5mm	4/3/2020 12:15 PM	Microsoft Excel W...	13 KB
EZL125TIP_for6mm	5/1/2020 5:01 PM	Microsoft Excel W...	12 KB
EZL250TIP_for4mm	12/9/2019 10:34 AM	Microsoft Excel W...	14 KB
EZL250TIP_for5.5mm	4/3/2020 12:14 PM	Microsoft Excel W...	14 KB
EZL250TIP_for6mm	5/1/2020 5:03 PM	Microsoft Excel W...	12 KB
EZL500TIP_for4mm	2/14/2020 2:24 PM	Microsoft Excel W...	14 KB
EZL500TIP_for5.5mm	4/3/2020 12:03 PM	Microsoft Excel W...	14 KB
EZL500TIP_for6mm	4/3/2020 12:37 PM	Microsoft Excel W...	14 KB
EZL1000TIP_for5.5mm	4/21/2020 4:38 PM	Microsoft Excel W...	13 KB
EZL1000TIP_for6mm	5/1/2020 5:05 PM	Microsoft Excel W...	12 KB
EZL1250TIP_for6mm	4/3/2020 12:36 PM	Microsoft Excel W...	14 KB
Head	6/15/2020 12:17 PM	Microsoft Access ...	3,212 KB
plate	6/23/2020 1:07 PM	Microsoft Access ...	576 KB
System	6/22/2020 3:58 PM	Microsoft Access ...	12,248 KB

User can select the liquid type by click on the tab on the bottom of the excel page.



Aspirate Value

	Aspirate			Multiple Dispense			
	Target(uL)	Result(uL)	Error(%)	TipVolume(uL)	Dispense(uL)	Result(uL)	Error(%)
3	500	495		500	100	102	
4	400	396		400	100	101	
5	300	297		300	100	100	
6	200	198		200	100	100	
7	100	99		100	20	20	
8	70	68		80	20	20	
9	60	58		60	10	10	
10	50	48		50	5	5	
11	48	47		45	5	5	
12	40	39		40	5	5	
13	30	29		35	5	4.9	
14	20	18.5		30	5	4.8	
15	10	9.5		25	5	4.7	
16	5	4.6		20	5	4.6	
17	4	3.5		15	5	4.5	
18	3	2.2		10	5	4.4	
19	2	1.2		5	1	0.9	
20	1	0.2		4	1	0.8	
21				3	1	0.7	
22				2	1	0.6	
23				1	1	0.5	
24							
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35							
36							
37							
38							

Multi Dispense Value

Liquid Type



## 10.1.1 – Aspirate Value

Aspirate the max volume of the tip then dispense and weight the volume.

**For example:** For 500 $\mu$ L tips, aspirate 500 $\mu$ L then empty and weight it. Enter 500 in “Target ( $\mu$ L)” then enter the weight in “Result ( $\mu$ L)” and save the file. If there is specific volume that’s needed for example to fill a 384 plate with 2 $\mu$ L per well and need an accurate 48 $\mu$ L. Then Aspirate 48 $\mu$ L then empty and weight it.

## 10.1.2 – Dispense Value

The most efficient way to collect the values is to weigh smaller volume for the top and bottom region of the tip and weight larger volume for the middle region of the tip.

**For example:** For 1000 $\mu$ L tips, aspirate 1000 $\mu$ L then weight every 20 $\mu$ L first then increase to 100 or 200 $\mu$ L, then change back to 20 $\mu$ L for the last 200 $\mu$ L region of the tip.

Small volume data isn’t always the best, it depends on the range of pipetting volume.

**For example:** If protocol requires 50 $\mu$ L dispense, then its best to collect data for the 50 $\mu$ L dispense.

Tip Type	Smallest Resolution ( $\mu$ L)	Recommend Resolution ( $\mu$ L)
1000 $\mu$ L	10	20
500 $\mu$ L	5	10
125 $\mu$ L	1	2
50 $\mu$ L	0.5	1

# 11 EMERGENCY STOP

Located on the bottom panel (front right) of base cover of the instrument is a red **emergency stop** button. The button doubles as a power indicator light.

When pressed, the instrument will stop and the Z-elevator will move down in case something is pinched. A message will appear on the screen instructing the user to put a reservoir under the tips to catch any remaining liquid. Click the button again to release and the machine will empty the liquid and move the shuttle back to the home position. Select initialize to reset, then the instrument is ready to operate.



## 12 CARE AND MAINTENANCE

Proper care and maintenance is an important part of user safety. It can help to prolong equipment life and have a positive impact on your results, as well.

### **Proper usage of tips will prevent contamination.**

- Avoid touching the bottom of plates/reservoirs while aspirating or dispensing to prevent liquid from reversing flow and contaminating the core.
- When using low volume tips on high volume instruments, exercise extreme caution in setting the volume to avoid over aspiration and contaminating the core.
- While replacing tips, avoid contact between the tips' discharge end and the head to prevent cross contamination. Cleaning the head regularly using ethyl alcohol is recommended.

It is imperative that an appropriate cleaning regimen be devised so that the pipetting heads and cores do not become contaminated or damaged by harsh solvents.

### **Recommended, easy to follow, regular maintenance program for the S3 Pipette:**

#### **Always unclamp the tips from the pipettor after use!**

- Never leave tips clamped in the pipettor overnight.

#### **Clean the unit regularly.**

- Using a clean cloth moistened with ethyl alcohol or cleanser wipe down the instrument surfaces.
- Avoid cleaning the Touch Screen with solvent or cleanser that may damage the screen surface.

#### **Regularly inspect the underside of the cores, the top of the pipetting heads and all moving parts.**

- Look for and remove dirt or foreign objects. Failure to do so may severely jeopardize the performance of the instrument.

#### **Regularly lubricate all moving parts.**

- Lubricate with high-quality instrument-grade lubricant that contains silicone or molybdenum as necessary.

#### **Regularly inspect the instrument for worn or damaged components.**

- Replace worn or damaged components immediately. For help with replacing components, please contact Apricot Designs, Inc. or your distributor.

#### **Periodically apply a thin layer of mineral oil to the bottom of the core.**

- Applying a thin layer of mineral oil will help to promote proper vacuum seal. Caution: Use mineral oil only. Other types of lubrication may be detrimental to the gasket material and prevent a reliable seal.

#### **Yearly maintenance is recommended.**

- Proper maintenance helps ensure the accuracy and performance of your S3 Pipettor.

# 13 TROUBLESHOOTING

## Grant Permission for user in Win 7 and up Operating System.

**Problem:** Unable to change COM port, change protocol, teach new plate/position.

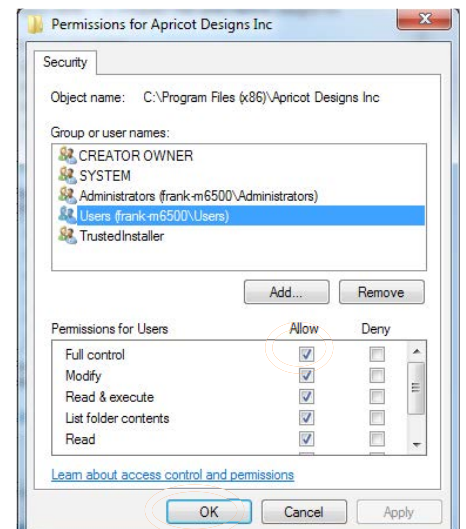
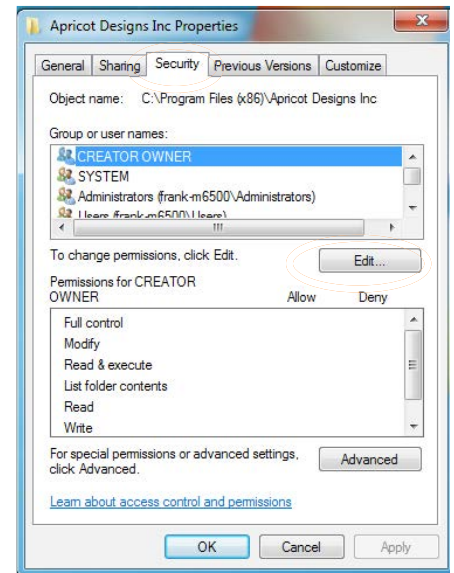
**Solution 1:** Grant security permission for user.

**Steps:**

1. **Locate software folder:** Usually under C:\Program Files\ Apricot Designs.
2. Right Click the Folder and select Properties.
3. Select Security: Then click Edit
4. Check Allow full control for the Users.
5. Click Apply then OK  
to close the window and it is completed.

**Solution 2:** Install "AccessDatabaseEngine\_x64.exe" in the computer.

You will also be required to change the COM Port, or IP Address.



## 14 WARRANTY

Apricot Designs, Inc. warrants to the original purchaser of the S3 Pipettor that the instrument will meet the original manufacturer's performance specifications, and that the instrument will be free from defects in material and/or workmanship in normal for one year from the date of delivery.

If the instrument is found to be defective during the warranty period, Apricot Designs, Inc. will repair or replace any defects in material and/or workmanship, or any failure of the system to conform to specifications, at no charge. The original purchaser must report any defects to Apricot Designs, Inc. in writing before the expiration date.

This warranty covers normal use and does not apply to the following:

- Damage during shipment other than original shipment to purchaser.
- Damage caused by impact with other objects, dropping, falls, spilled substances, or caustic liquids.
- Damage caused by unauthorized attachments, alterations, modifications or foreign objects.
- Damage caused by improper maintenance.
- Damage caused by other abuse, misuse, negligence, forces of nature or acts of God.
- Damage caused by the result of service or modification by anyone other than Apricot Designs, Inc., or its authorized agents.





Apricot Designs, Inc.

677 Arrow Grand Circle, Covina, CA 91722, USA

Tel: (626) 966-3299

Fax: (626) 966-3200

[info@apricotdesigns.com](mailto:info@apricotdesigns.com)

[www.apricotdesigns.com](http://www.apricotdesigns.com)

© Copyright 2020 Apricot Designs, Inc.