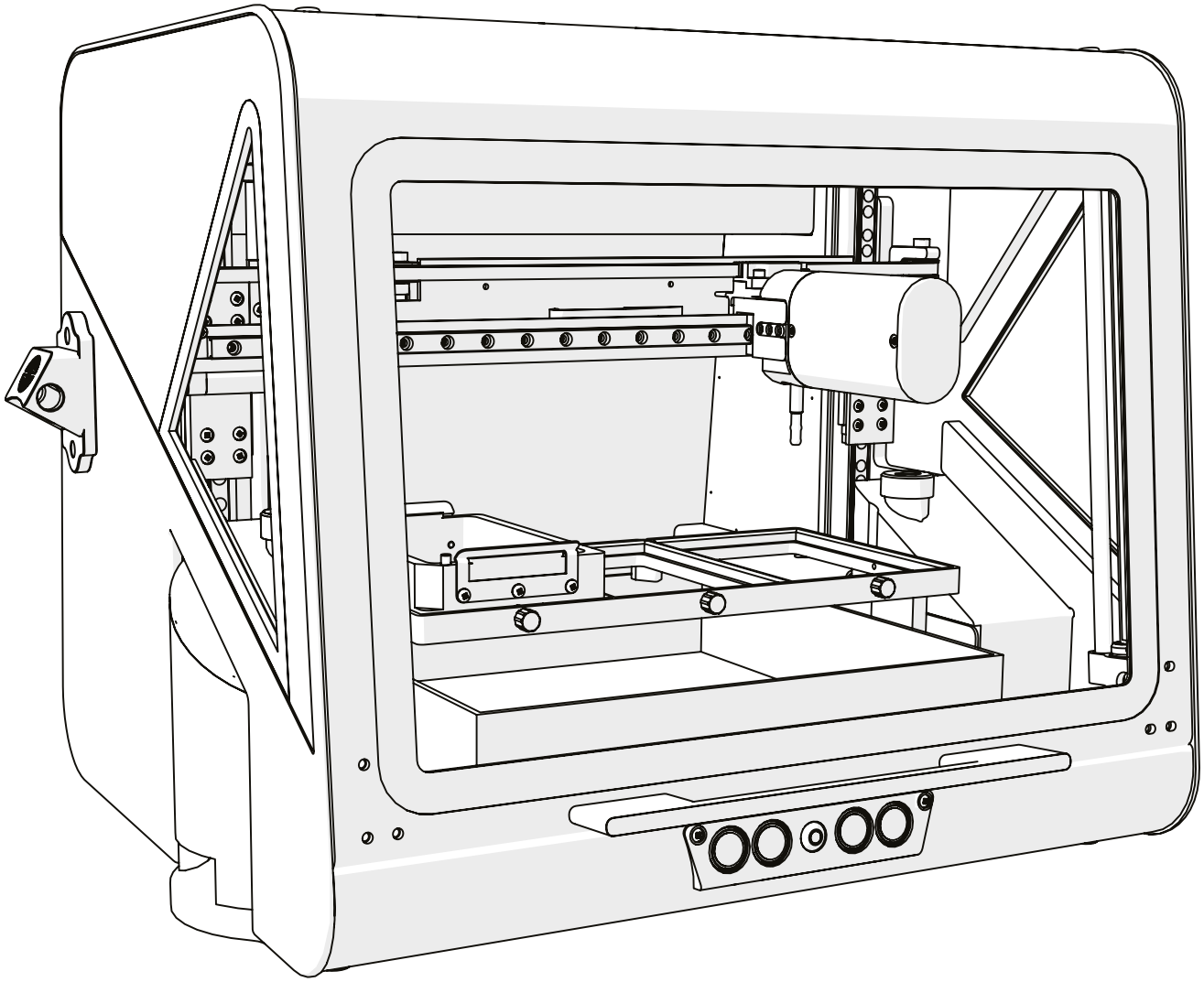
SINGER INSTRUMENTS
A RESPONSIBILITY TO SCIENCE!

SQWERTY!

USER GUIDE v1.1



For more support resources visit
bit.ly/SQWERTYhelp

READ BEFORE YOU START!

- Minimum System Requirements
  OS Windows 10 Home/Professional
  Memory 4GB Ram
  Storage 60GB SSD
  Processor Intel® Core™ m3 or above
  Display resolution at least 1920x1080

- Supported labware! SQWERTY accepts SBS standard labware. Smaller labware can be accommodated using a rack or adapter.

- Labware types Visit bit.ly/ SQWERTYPipetteModule for a full breakdown of all supported labware types.

- Use the correct tip style. SQWERTY supports the Tecan LiHa style of robotic tip. We can't guarantee that other tip styles will fit or work as expected.

JOIN OUR DISCOVERY COMMUNITY!

Join our Discovery community and help us make the product features YOU want.

The Discovery Community is a group of scientists helping us to understand and solve anything causing frustration in their lab.

Help us to shape product development and have a say in future product updates. You'll also get early access to new features and be able to test things before release.

We'll even throw in some cheeky vouchers, Singer discounts and maybe even some cake!

Scan the QR Code or visit bit.ly/DiscoCommunity to join.

bit.ly/DiscoCommunity

SQWERTY

INTRODUCTION

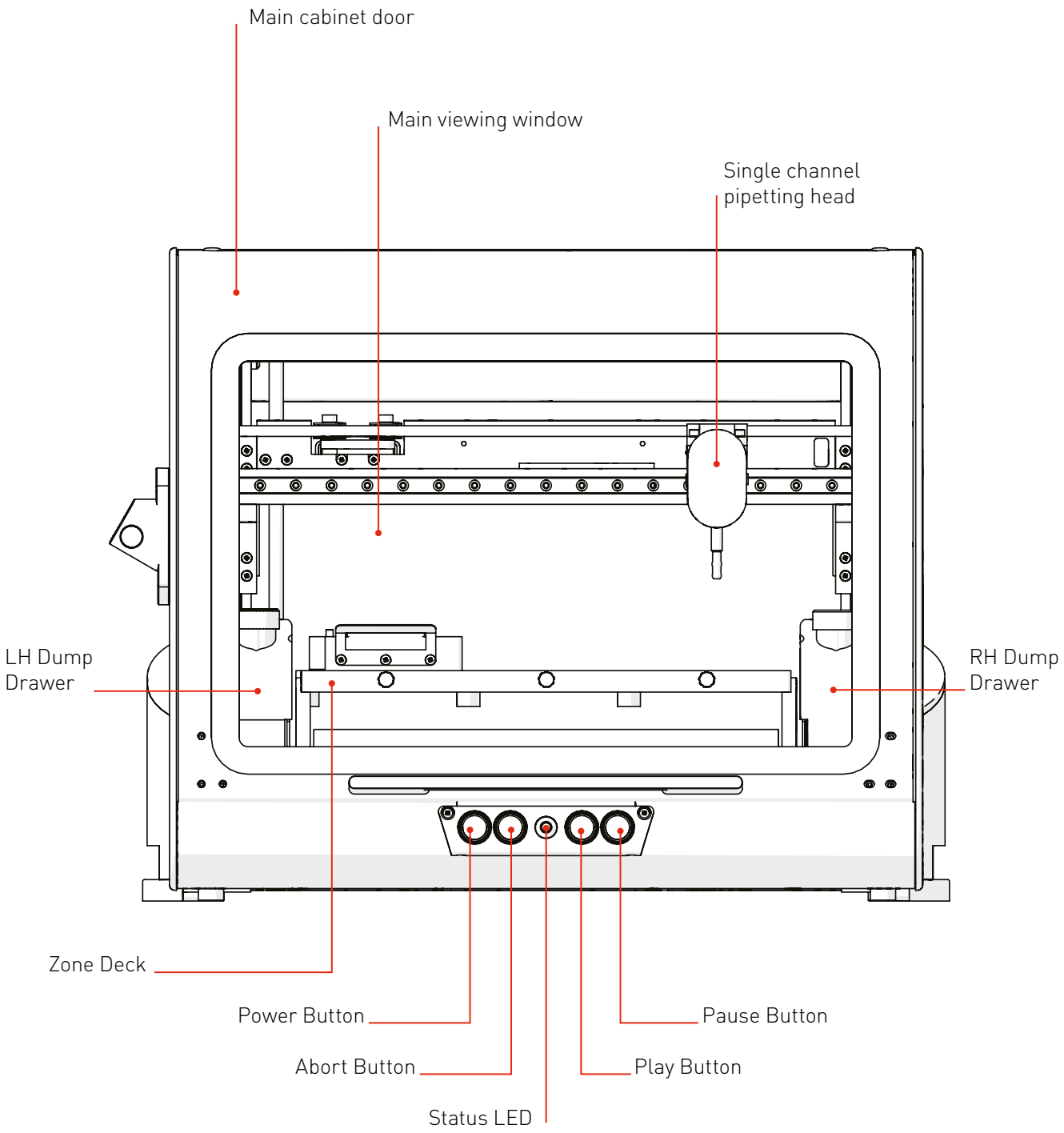
SQWERTY is a new generation of pipetting. A compact pipetting robot built for everyday use. SQWERTY makes it quick and easy to run complex pipetting workflows involving almost any liquid or labware.

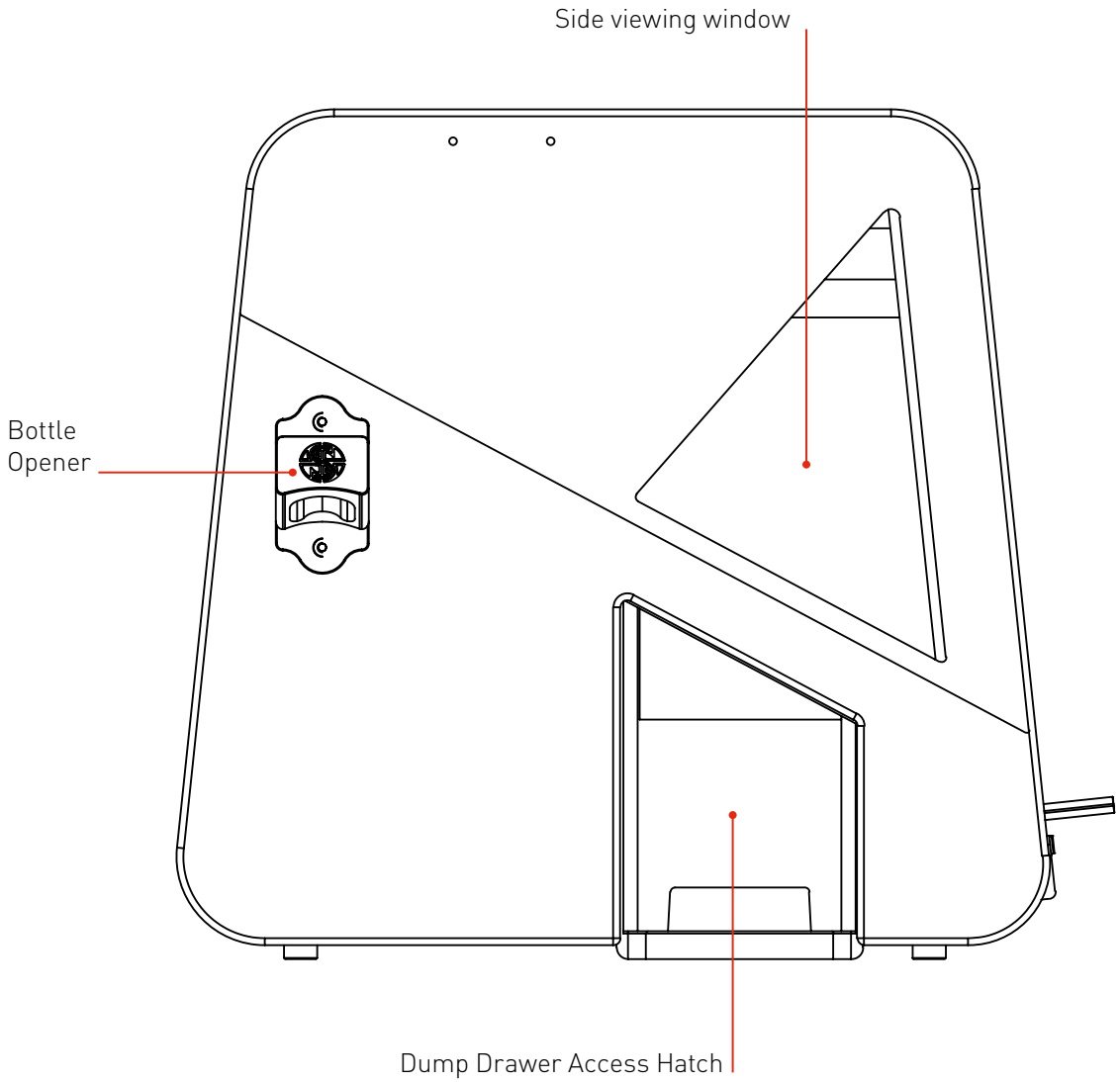
The information in this guide relates to software version:
1.10.0

OUT OF THE BOX

Find out what comes with SQWERTY. We'll take you through the steps involved in unboxing and assembling ready for your new life of pain-free pipetting.

FRONT

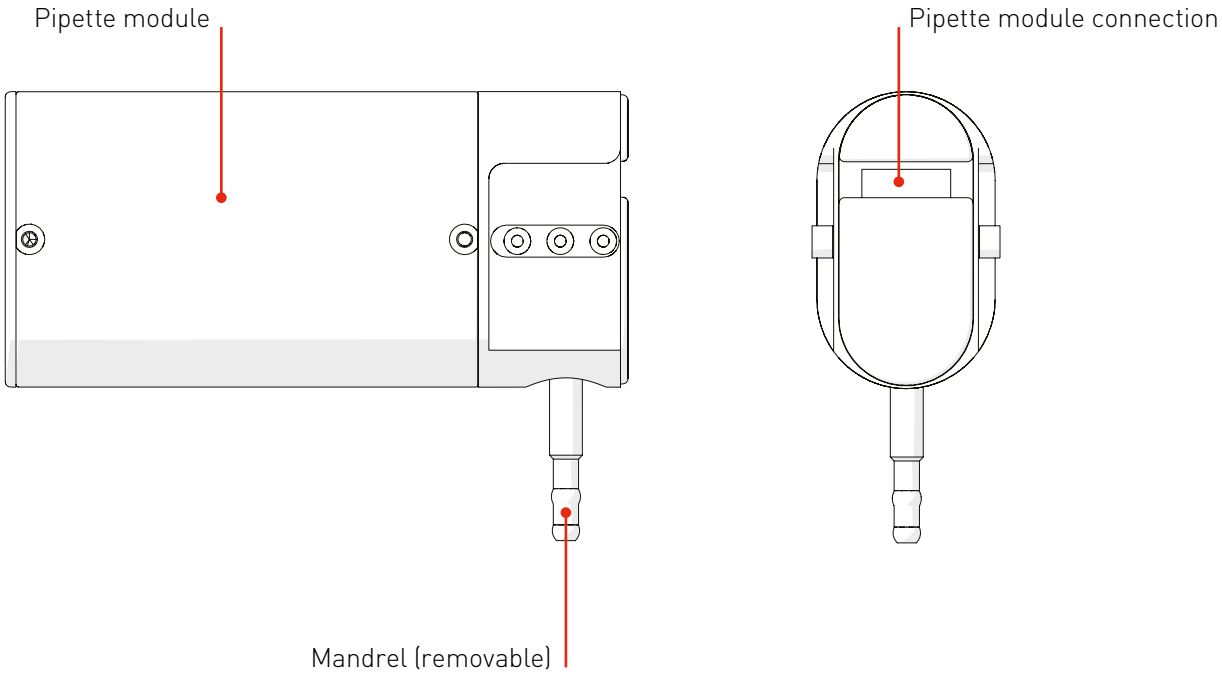

Main cabinet door
Main viewing window
Single channel pipetting head
LH Dump Drawer
RH Dump Drawer
Zone Deck
Power Button
Abort Button
Status LED
Play Button
Pause Button


Side viewing window
Bottle Opener
Dump Drawer Access Hatch

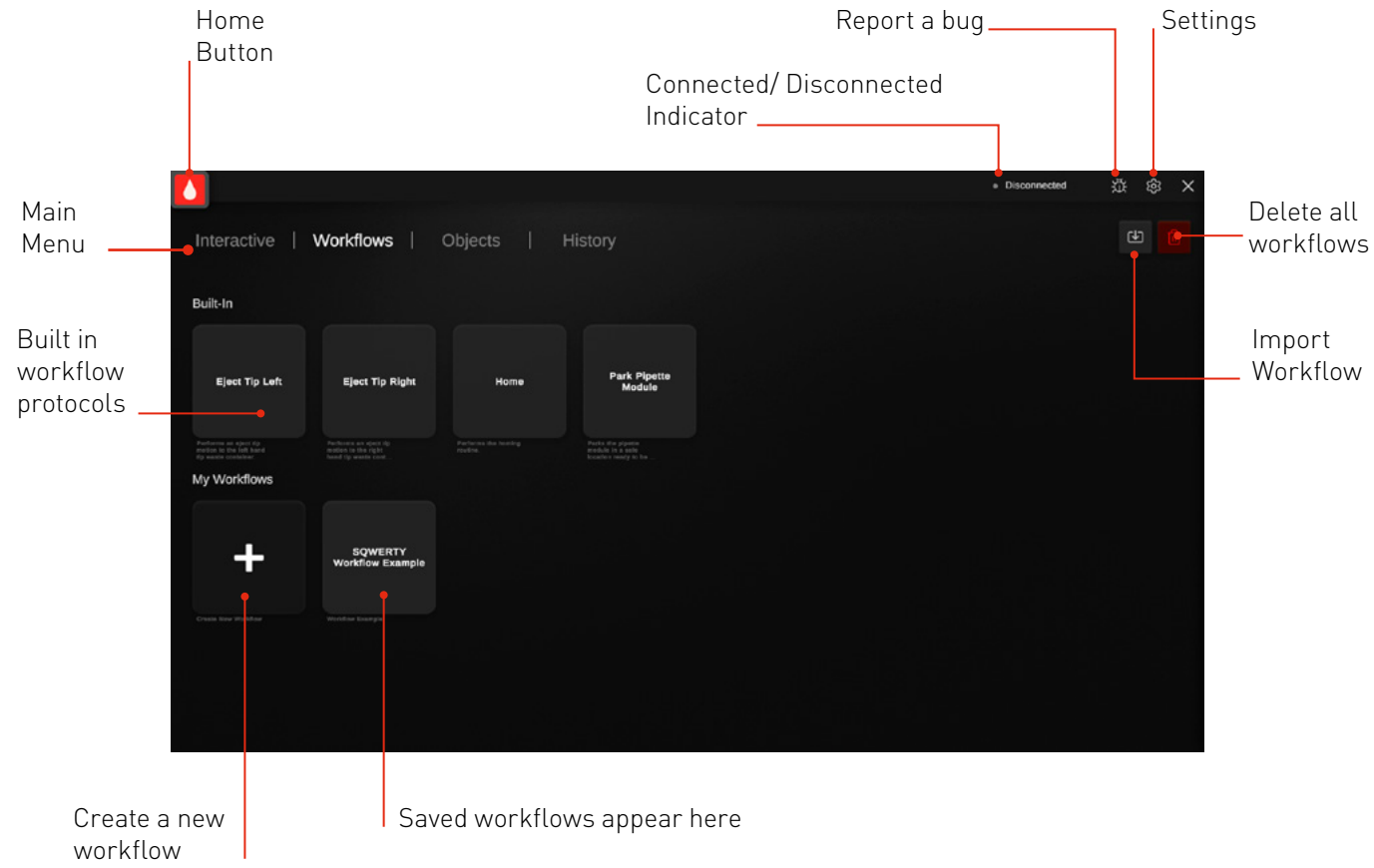
PIPETTE MODULE

SQWERTY is supplied with a 250µl Calibrated Pipette Module as standard.

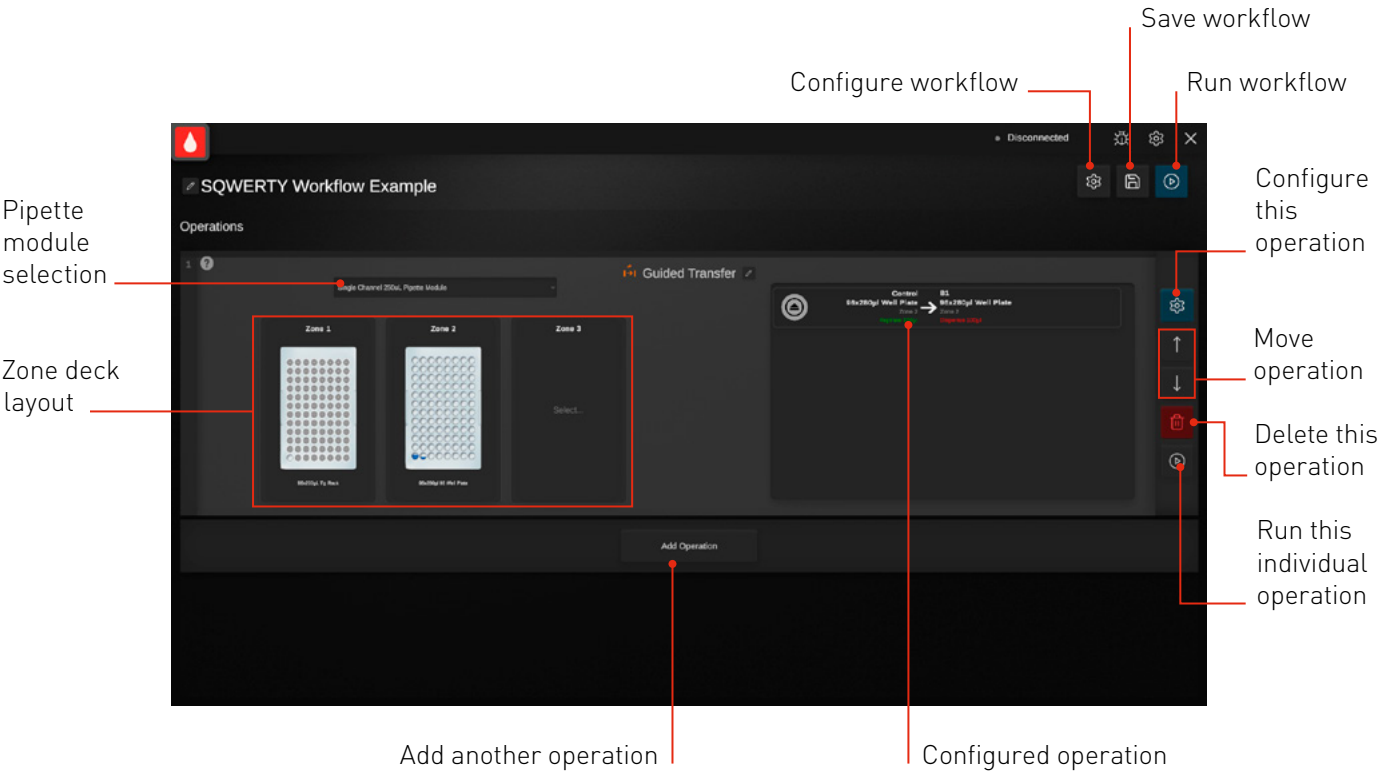
*The latest datasheet on pipette module precision and accuracy can be found by scanning the QR code.
bit.ly/SQWERTYPipetteModule



SOFTWARE - MAIN MENU



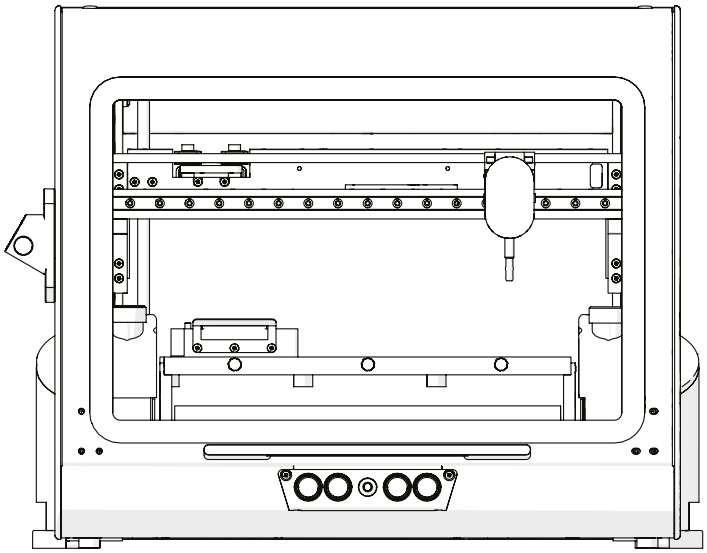
SOFTWARE - WORKFLOW



SQWERTY BOX

1. SQWERTY Liquid Handler

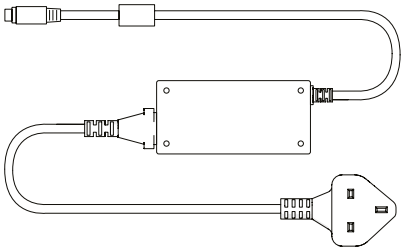
1.



ACCESSORIES TRAY

2. Power Supply
3. Drip Tray
4. 250µl Calibrated Pipette Module
5. Pipette Module Mandrel Removal Tool
6. Calibration Tools
7. Waste Containers (Left & Right)
8. Tip Rack Adapter
9. Tip Rack Stand

2.



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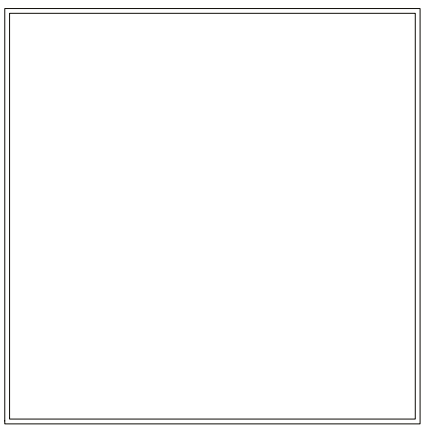

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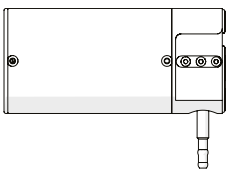
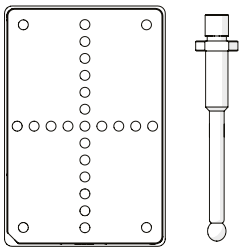


5.

6.



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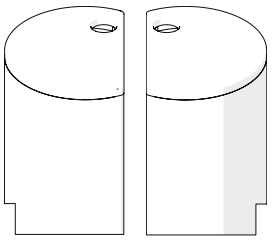

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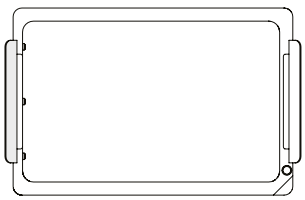
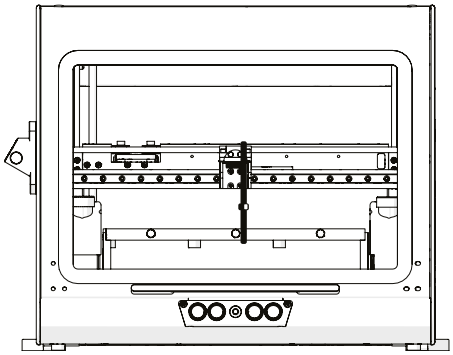


9.

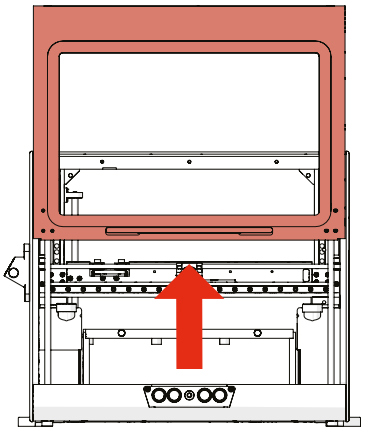
UNBOXING & ASSEMBLY - SQWERTY

1



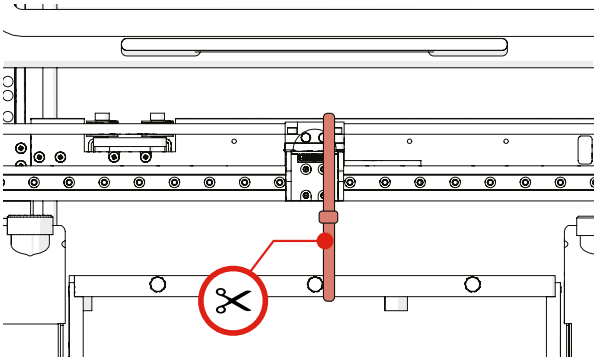
- Remove SQWERTY from its packaging and position on your workspace.

2



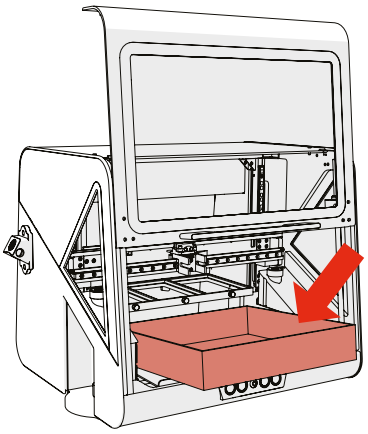
- Lift up the SQWERTY cabinet door.

3



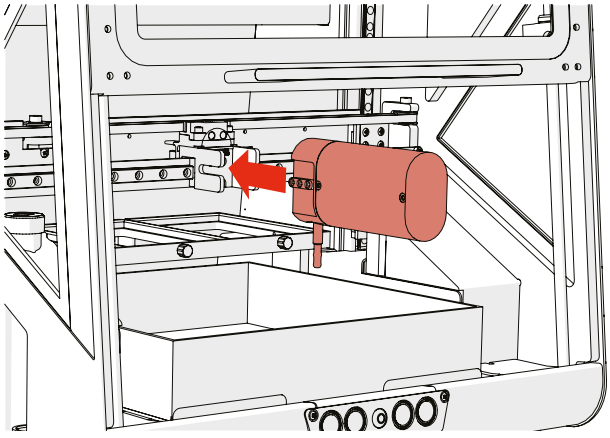
- Carefully cut and discard the cable tie securing the zone deck.

4



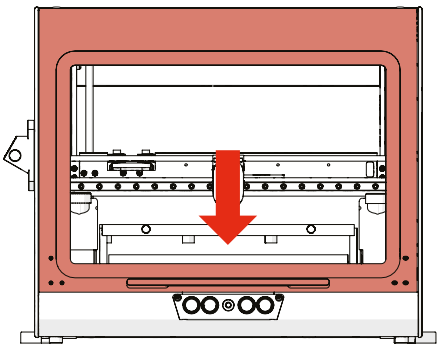
- Insert the Drip Tray underneath the deck.

5



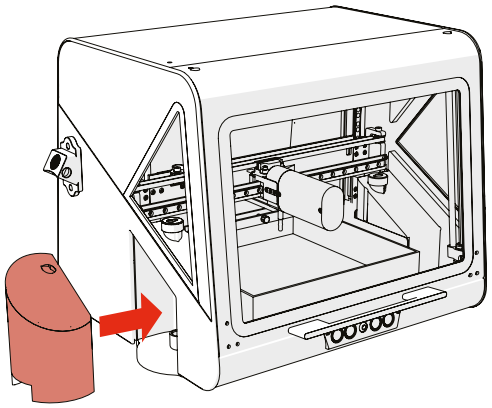
- Attach the pipette module into its locator. Ensure that the pipette module is pushed all the way in.
- NOTE: SQWERTY will not run if the pipette module is not connected properly.

6



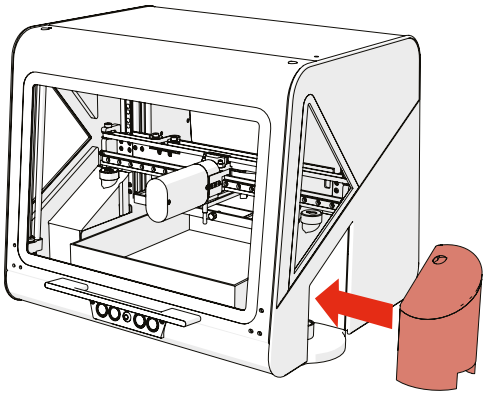
- Close the SQWERTY door

7



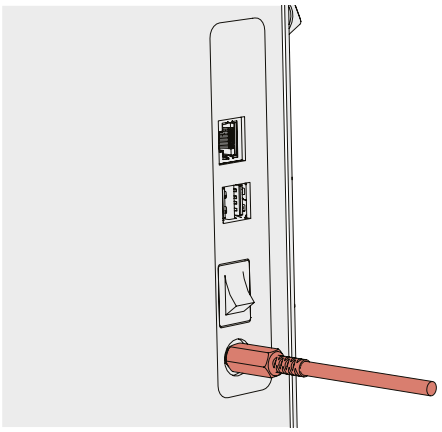
- Insert the left-hand waste container into the left bay.

8



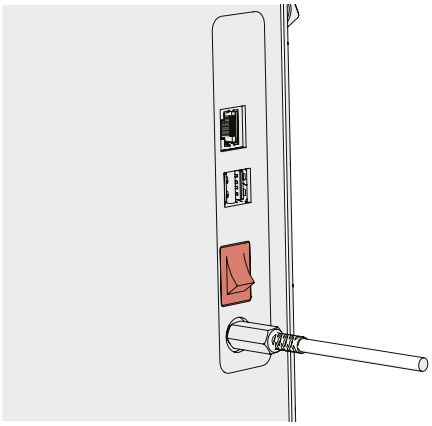
- Insert the right-hand waste container into the right bay.

9



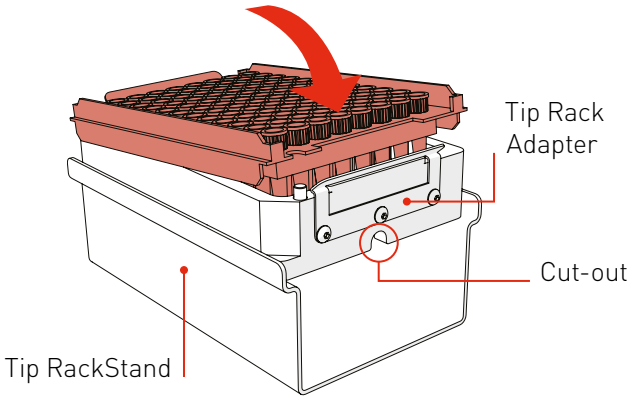
- Plug in the power supply into the wall and the power socket on the back of SQWERTY.

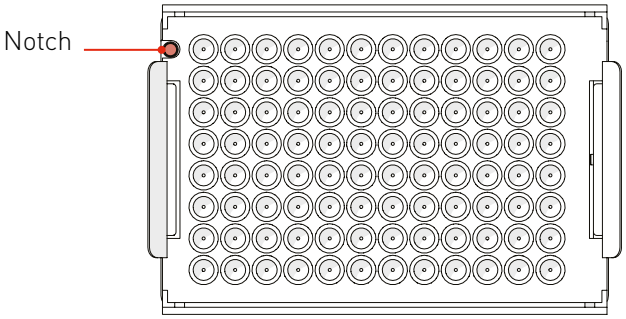
10



- Turn on SQWERTY using the power switch on the back. SQWERTY will perform its initialisation routine which should take about 50 seconds.
- Download the software from the email sent to you.

1

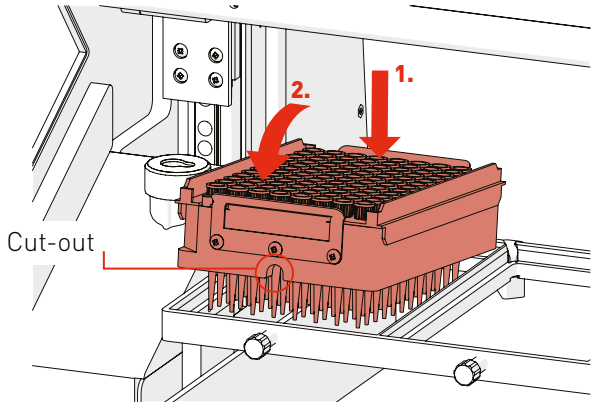


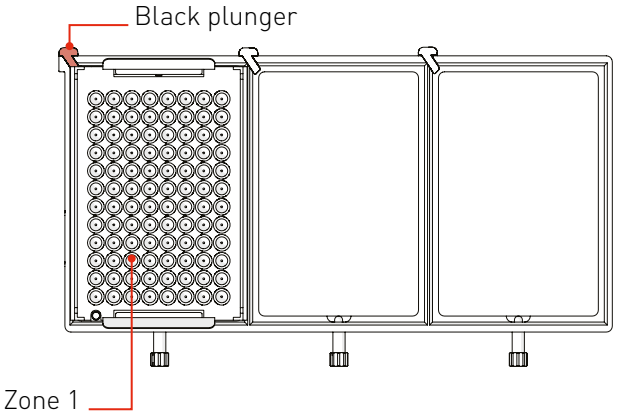


- Place the tip wafer onto the Tip Rack Adapter.
- Line up the notch in the wafer with the upstand on the tip rack adapter to ensure the correct orientation.

- Make sure the wafer is firmly under the clips on the Tip Rack Adapter
- Use the Tip Rack Stand to support the Tip Rack Adapter when inserting the tips wafer.

2

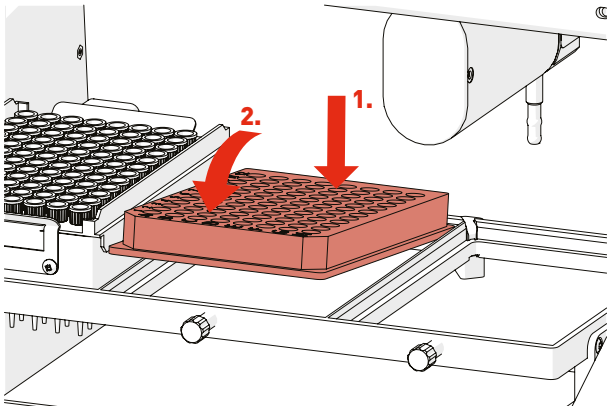


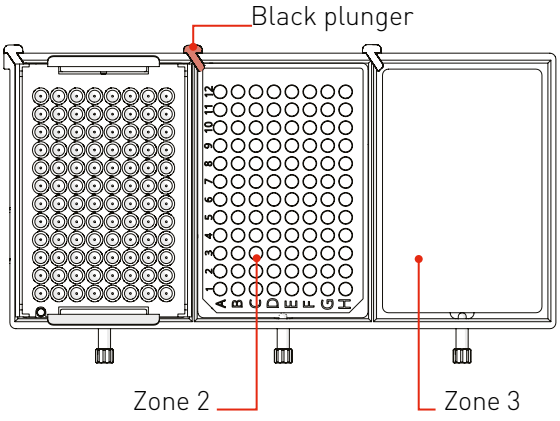


- Pipette tips are always inserted into Zone 1. Insert the back of the Tip Rack Adapter (1) and Wafer into Zone 1 on the deck.
- The cut-out should face towards you.

- (2) Firmly push against the black plunger and lower the front of the adapter onto the deck.

3





- All other labware is inserted into Zone 2 and 3. Insert the back of the plate (1) used into Zone 2 or 3 on the deck.

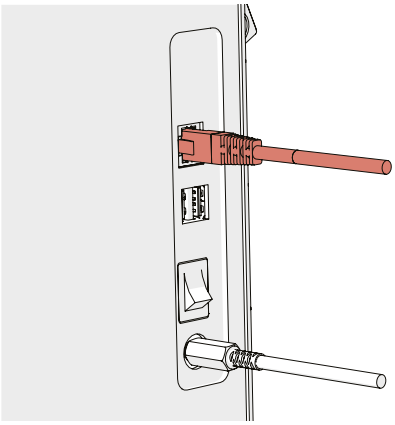
- (2) Firmly push against the black plunger and lower the front of the plate onto the deck.

CONNECTING TO SQWERTY

You can connect to SQWERTY either via Ethernet or over WiFi. The following section will breakdown each method.

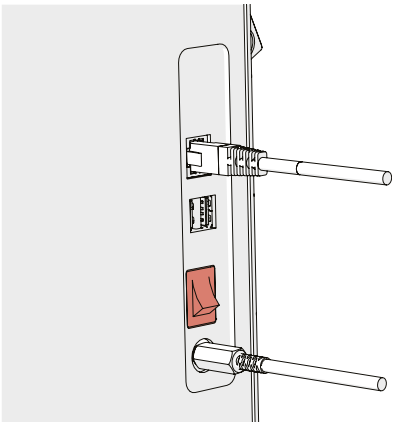
CONNECTING TO SQWERTY - METHOD 1: ETHERNET CABLES

1



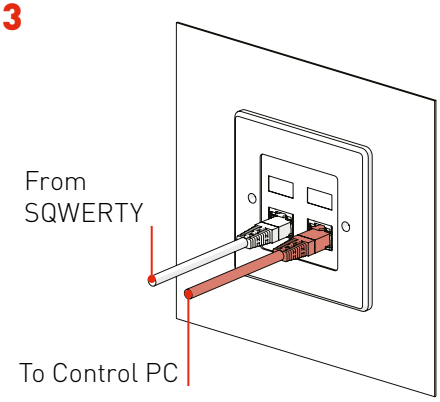
- Connect an ethernet cable between SQWERTY and an ethernet socket.

2



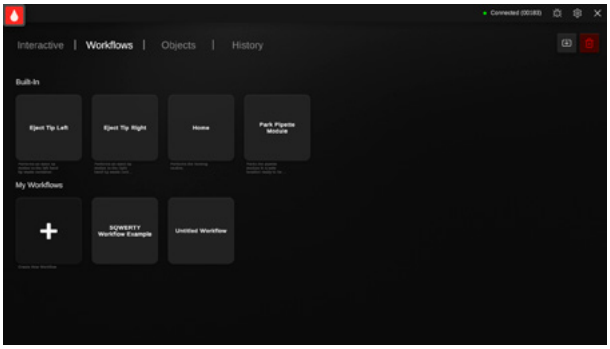
- Power on the SQWERTY unit.

3



- Connect a second ethernet cable between a second ethernet socket on the same network and a computer running the SQWERTY software.

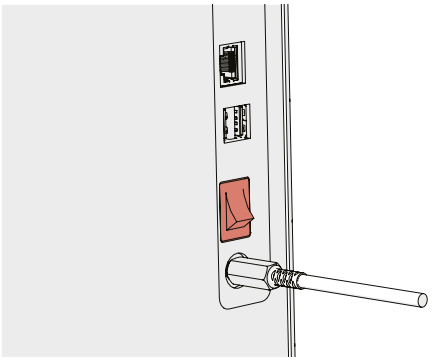
4



- Open up the SQWERTY software. The SQWERTY unit will be automatically connected and ready to do some science.

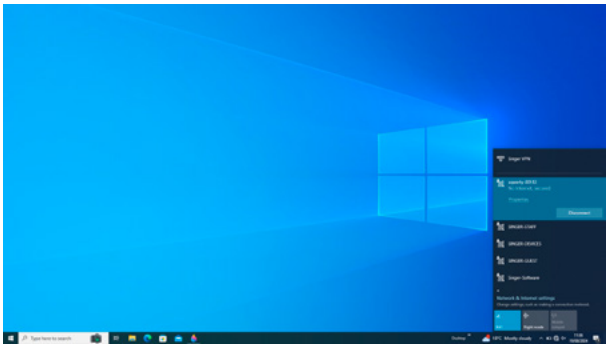
CONNECTING TO SQWERTY - METHOD 2: WIFI

1



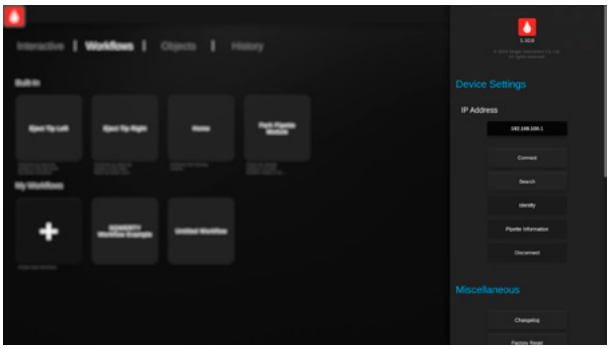
- Power on the SQWERTY unit.

2



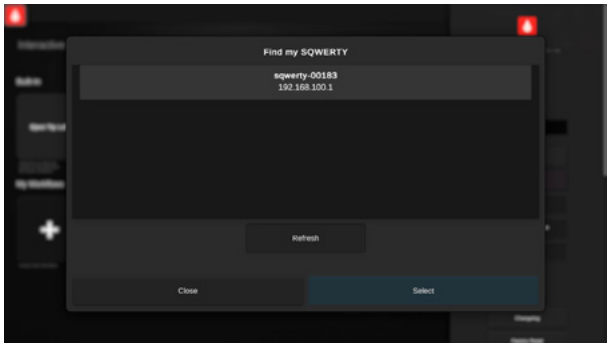
- Open the list of available, WiFi Connections on the control PC and select the sqwerty-xxxxx option.
- The password can be found by the serial number window on the back of the machine.

3



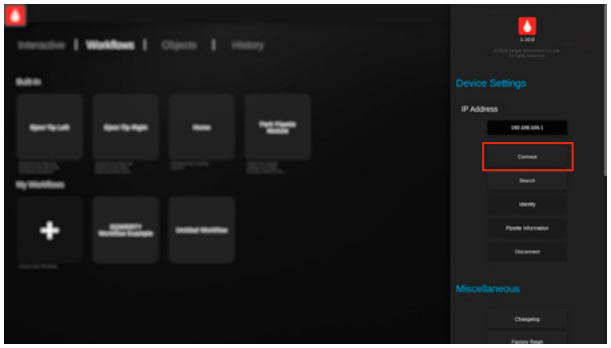
- Open the SQWERTY software and press the cog in the top right hand corner to load the device settings.

4



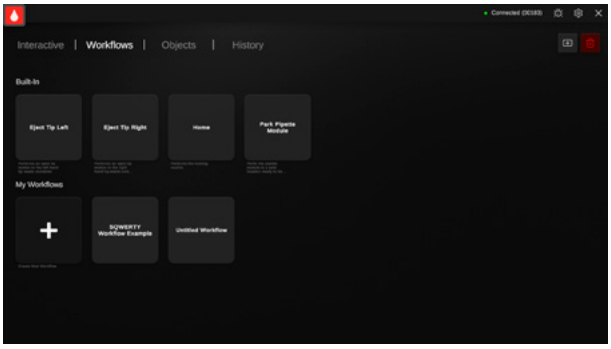
- Press Search to open up the *Find my SQWERTY* menu and select your SQWERTY unit from the list.
- Press the blue select button to continue.

5



- Press the Connect button in the device settings menu and wait 15 seconds for SQWERTY to connect.
- To confirm the connection, press the Identify button and SQWERTY will flash its internal lights.

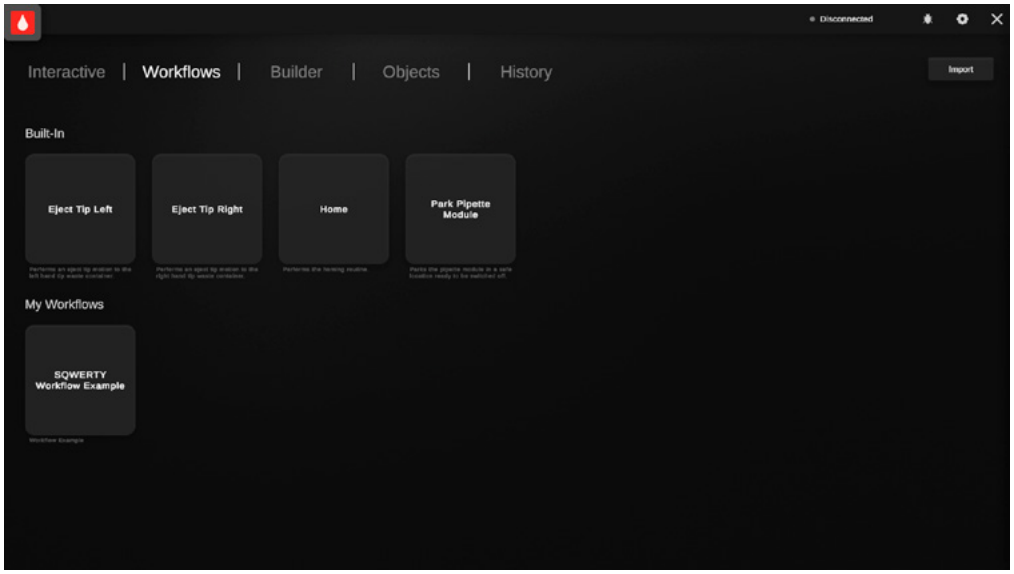
6



- SQWERTY is now connected and ready to do some science.
- NOTE: The software will remember the SQWERTY unit IP address, the next time you open the software you can skip step 4.

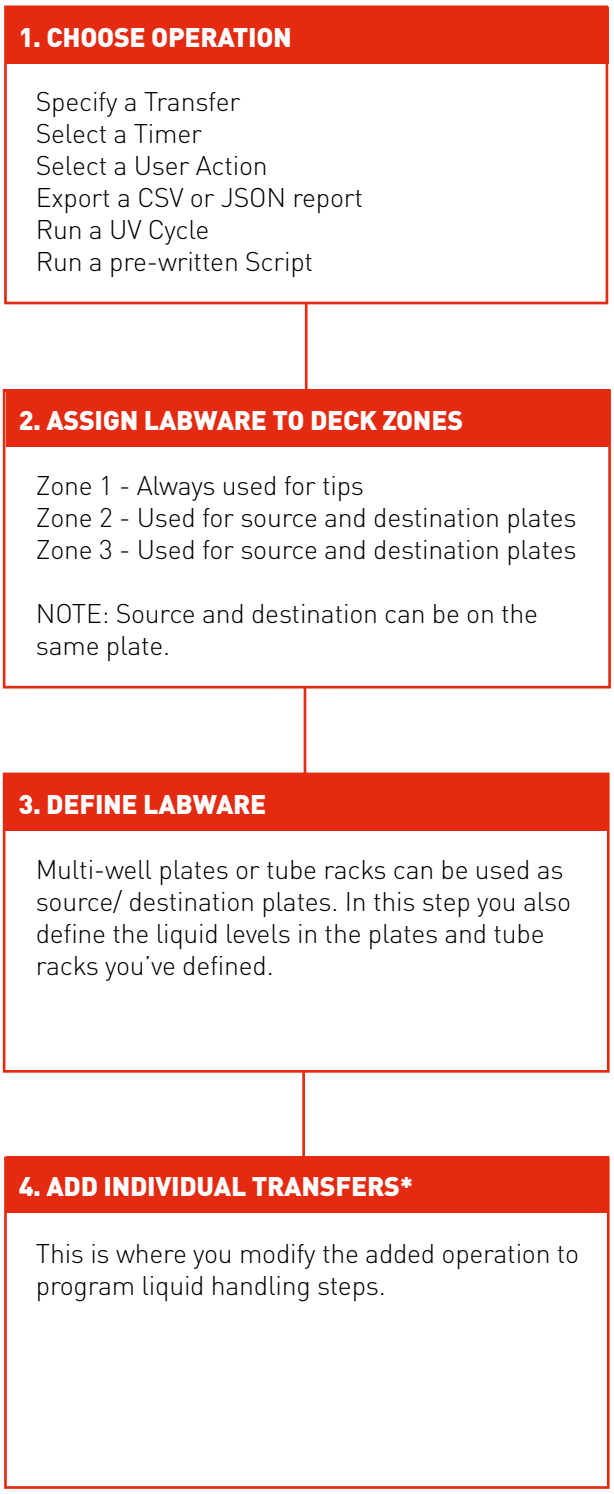
WORKFLOWS

SQWERTY workflows are written in the *Builder* tab. Workflows can be broken down into a series of operations: mainly transfers, multi-dispenses and serial dilutions. Let's take a look at building a workflow and using these operations.



WORKFLOW SEQUENCE

All workflows are built from the following sequence:



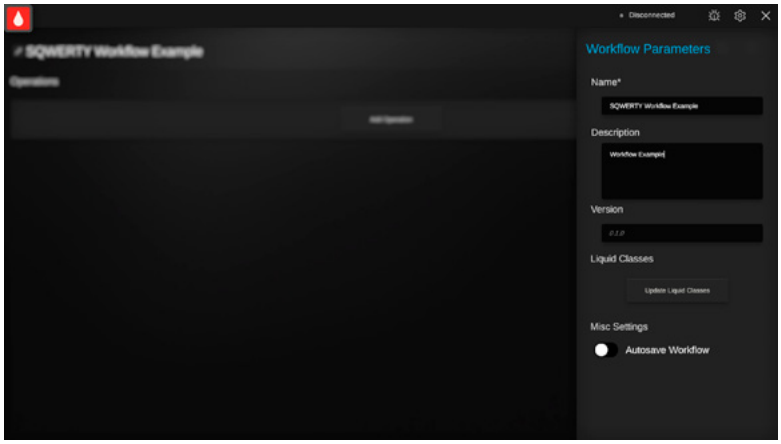
* The word transfer is also used to describe the Individual liquid handling step within operations.

SETTING UP A GUIDED TRANSFER

A Guided Transfer allows you to set up quick transfers by selecting a source/ source pool and the final volume that goes into the destination well/ tube(s). SQWERTY will take care of the rest.
NOTE: Some advanced parameters are still adjustable.

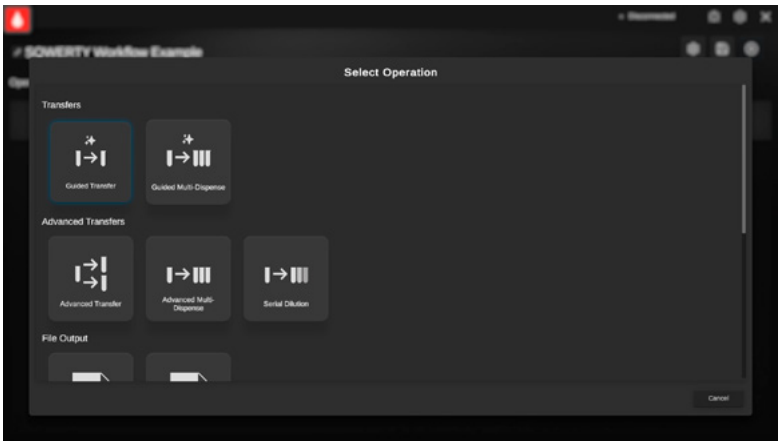
1

- Open the latest version of the SQWERTY software and select the *Workflows* tab.
- Click the plus symbol below Workflow Templates to create a new workflow.
- Give your workflow a unique name and a brief description. Click away from the Parameters panel to save your settings.
- NOTE: You can edit this name by clicking the pencil in the top left hand corner or the configure workflow cog.



2

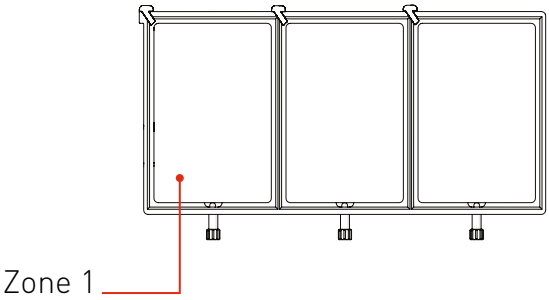
- Click *Add Operation* and select Guided *Transfer*.

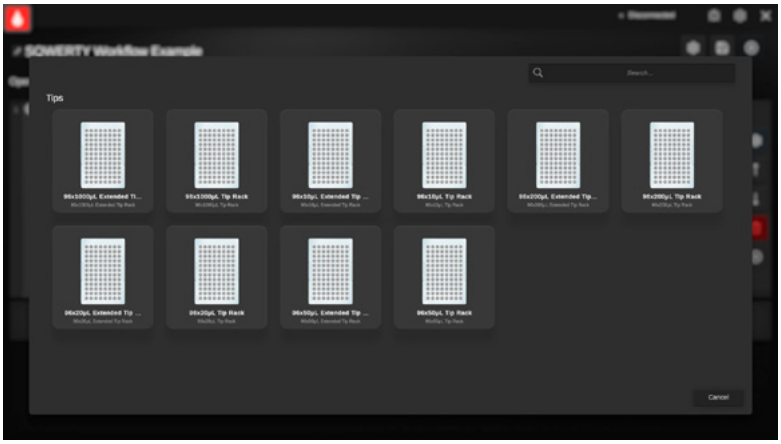


3

- Select the tips that will be used in Zone 1. Ensure that these tips are located securely in Zone 1 before starting the workflow.

- NOTE: The extended tip rack holds the tips about 1cm higher than the normal tip rack.



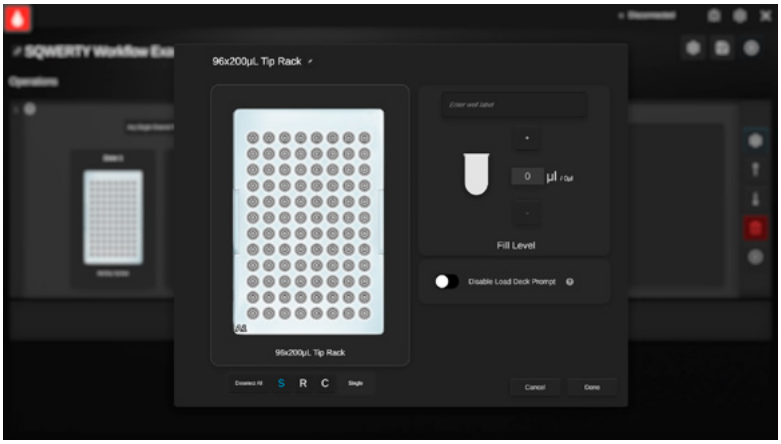


4

- Use the All/ S/ R/ C controls to select positions of tips (all are selected as default). Click *Done* when ready.

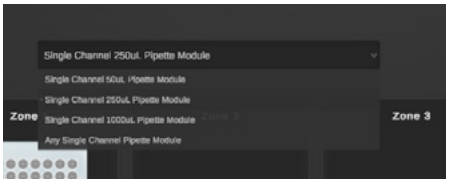
  A. S - select/ deselect a single position
  B. R - select/ deselect a row of 12 tips (vertical)
  C. C - select/ deselect a column of 8 tips (horizontal)

- NOTE: Each tip position will be scanned for presence of a tip during the workflow.

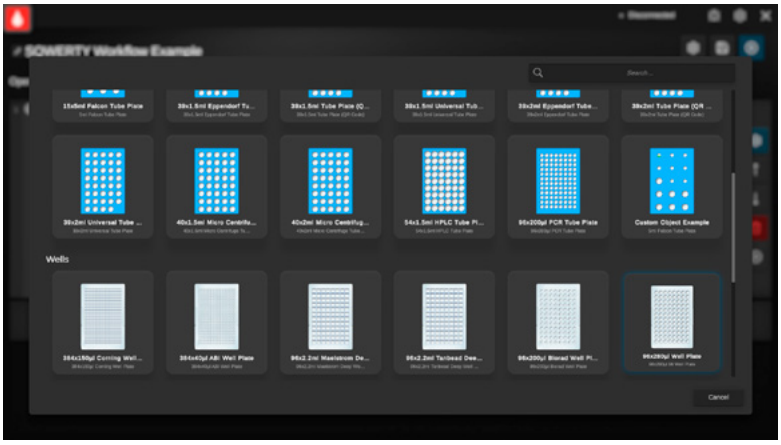


5

- Use the drop-down to select the pipette module you wish to use for this operation.

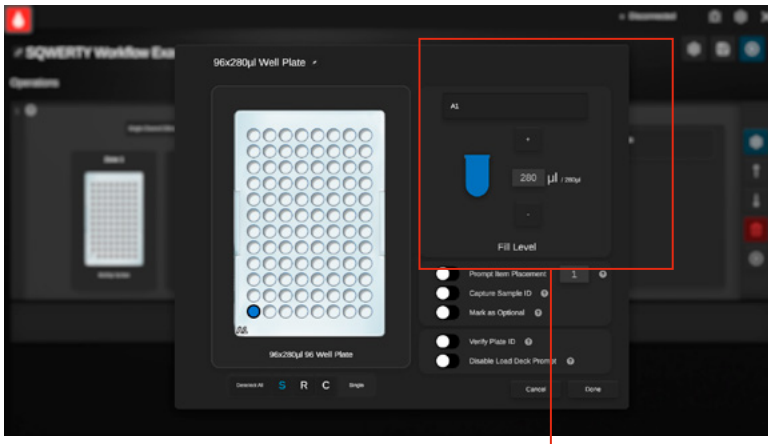


- Click on Zone 2 and select the labware that you want to use from the object library.



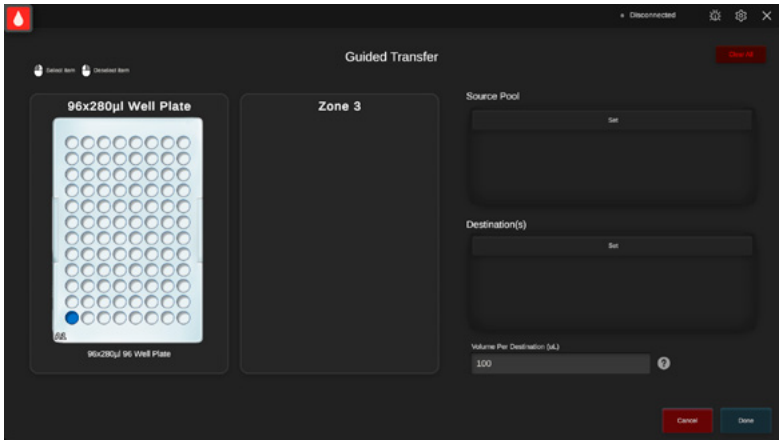
6

- You will be prompted if you wish to set all wells/ tubes as full at the start. (Set as max level for that type of labware).
- From this screen you can edit the volume in each well. First select which wells to edit using the same actions as in Step 4. Then manually click and drag on the fill level or type a custom volume.
- You can also rename wells/ tubes by overwriting the well position marker. (E.g. Control instead of A1)



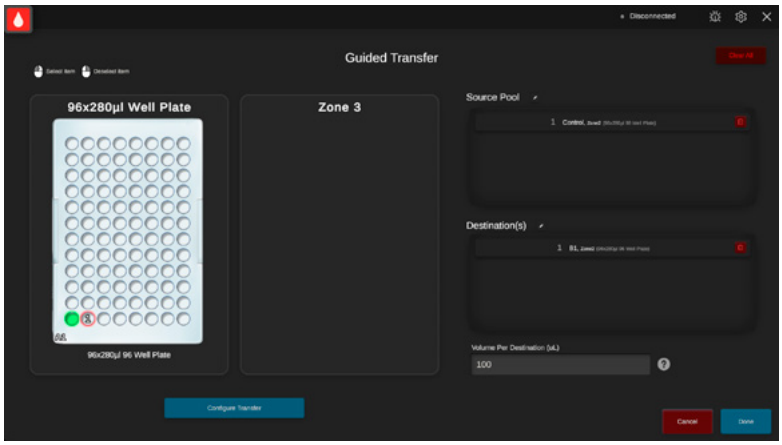
7

- Press Done to return to the Workflow Builder. If using Zone 3, select it from the builder and repeat Steps 5 -6. Press the Done button to return to the workflow builder.
- Click the blue cog icon on the right hand side of the screen to continue.



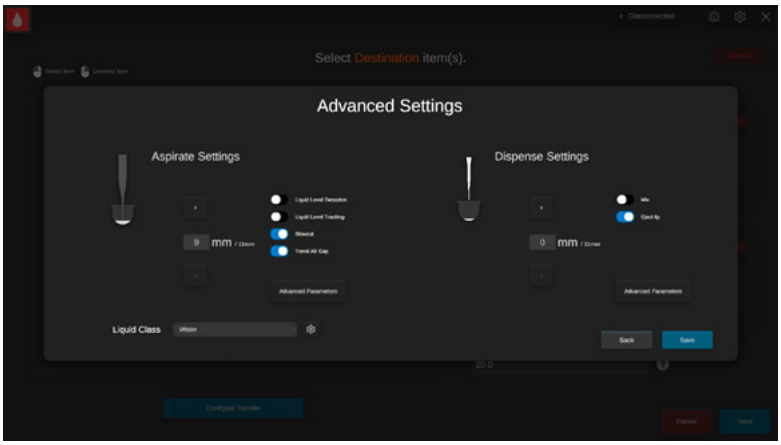
8

- Select the Source well/ tube(s) by clicking *Set* under Source Pool and clicking on your chosen source on the diagram, this will appear in Green.
- NOTE: Selecting more than one well/ tube will pool the volume of liquids represented in the individual tubes. (E.g. Two selected tubes containing 1ml of water means there's 2ml in the source pool.
- Select the destination well/ tube by clicking set under Destination(s) and clicking on your chosen destinations on the diagram. These will appear with a red circle.
- Specify the final destination volume by filling in the Volume per destination field.



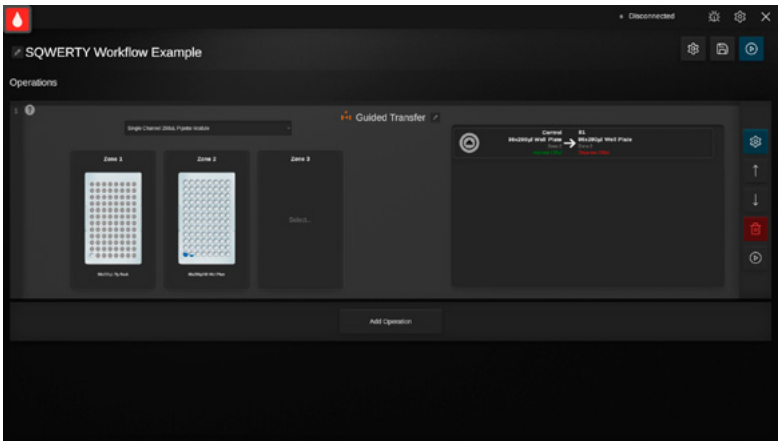
9

- Click *Configure Transfer* to bring up the advanced settings.
- The guided transfer mode will automatically set most of the parameters based on the source pool and destinations specified.
- However some settings can still be adjusted (E.g. Insertion Depth, Liquid Level Detection, Blowout, etc). Click on Advanced Parameters to adjust. For a full list of all the parameters see the breakdown on page 46.



10

- Repeat Steps 8-9, if you would like to add any extra transfers from the same source pool.
- Press Done in the bottom right hand corner to complete the operation.
- Each specified transfer will appear in the panel on the right hand side of the screen.
- Press the Blue Cog button to edit the operation or press the Red Bin button to delete the operation.
- If you have multiple operations in a workflow, the order can be rearranged using the arrows.
- Visit the Run A Workflow section (p34) to learn how to run a workflow.

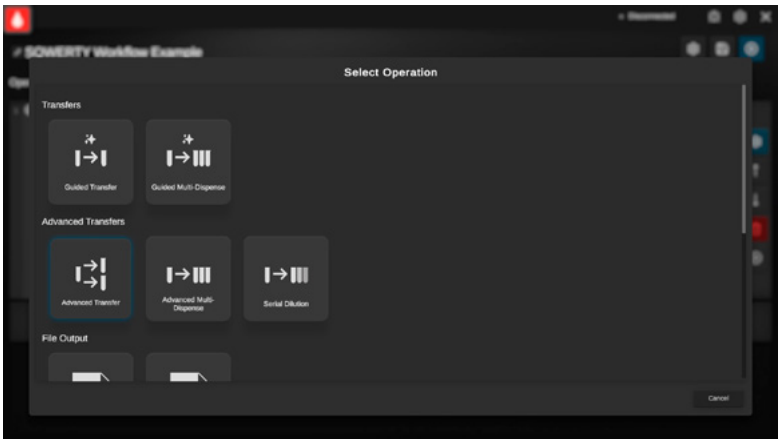


SETTING UP AN ADVANCED TRANSFER

The Advanced Transfer works just like the Guided Transfer. With this option all of the parameters are adjustable.

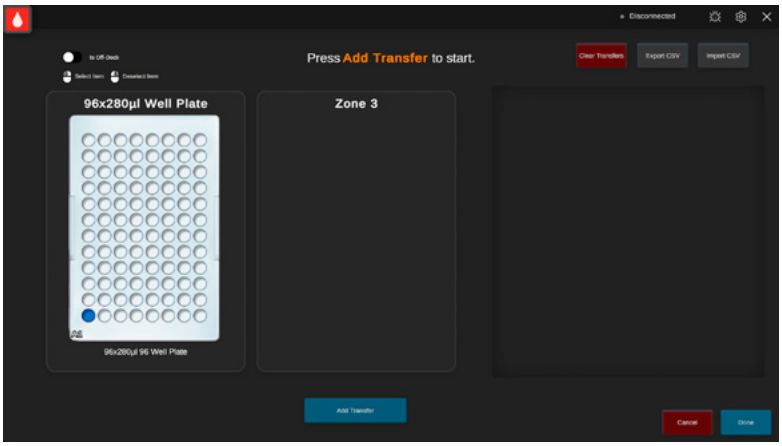
1

- If Advanced Transfer is your first operation, set up your workflow as per Step 1 of the 'Guided Transfer' section.
- Click *Add Operation* and select *Advanced Transfer*.



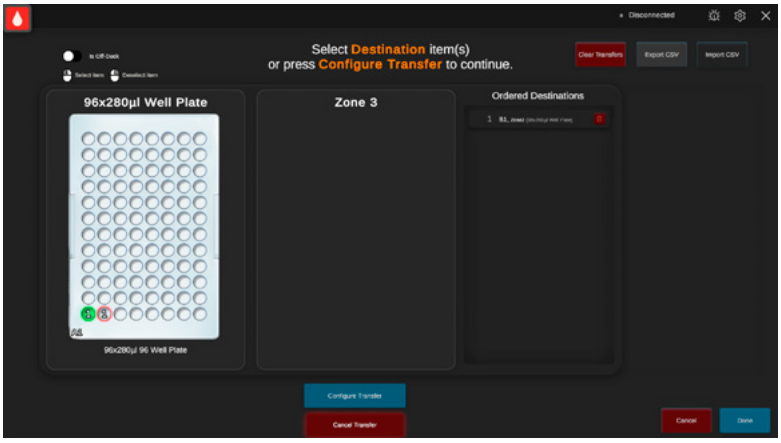
2

- Set up the deck zones with the labware you'd like to use as per Steps 3-6 in the 'Guided Transfer' section.
- Click the blue cog icon on the right hand side of the screen and press the Blue *Add Transfer* button to continue.



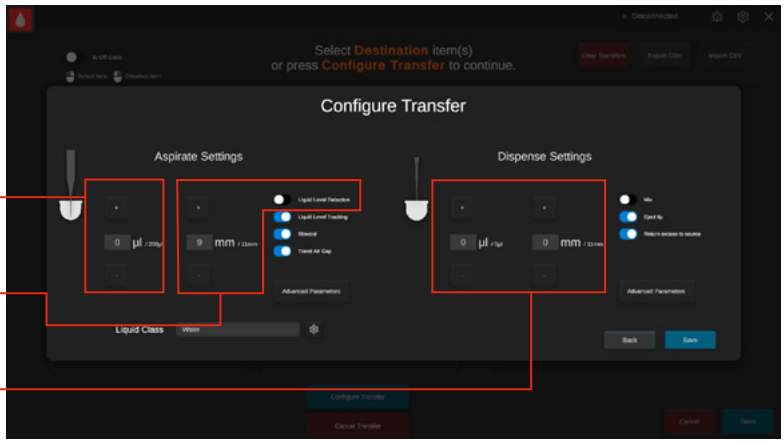
3

- Select the Source well/ tube(s) on the diagram, this will appear in Green. If multiple sources are selected, these will not be pooled. E.g. 1st Selected Source will go to destination 1, 2nd selected source will go to destination 2.
- Press the Select Destinations button and click or drag on the diagram to highlight the destinations.
- NOTE: You can click and drag to highlight multiple destinations or select individual locations.



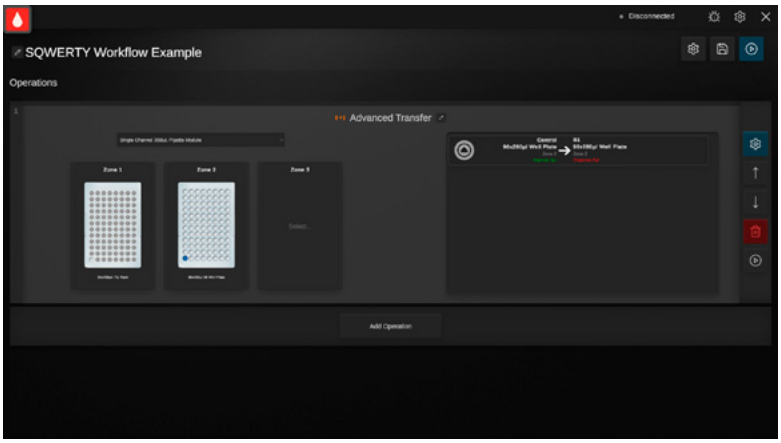
4

- With your Source and destination set, click *Configure Transfer.*
- A. Set the volume of aspirate by clicking and dragging downwards on the diagram, typing in a volume or by using the +/- buttons.
- B. Turn on Liquid Level Detection or manually set the travel distance of the tip.
- C. Set the volume of dispense and the immersion depth as per steps 1 & 2.
- D. Once you are happy with your settings. Click *Save.*



5

- Repeat Steps 2-4, if you would like to add any extra transfers.
- Press Done in the bottom right hand corner to complete the operation.
- Each specified transfer will appear in the panel on the right hand side of the screen.
- Press the Blue Cog button to edit the operation or press the Red Bin button to delete the operation.
- If you Have multiple operations in a workflow, the order can be rearranged using the arrows.
- Visit the Run A Workflow section (p34) to learn how to run a workflow.

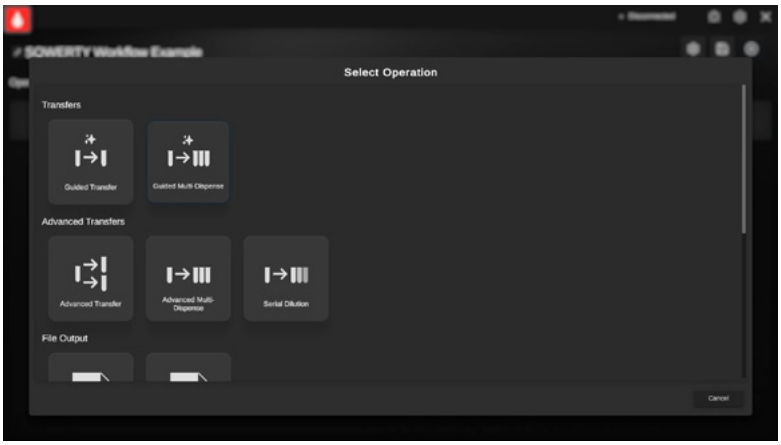


SETTING UP A GUIDED MULTI DISPENSE

A 'guided multi-dispense ' is an operation which allows you to quickly aliquot from a single source well/ tube(s) to multiple destination well/tube(s). SQWERTY does the rest. Some advanced parameters are still adjustable for improved accuracy.

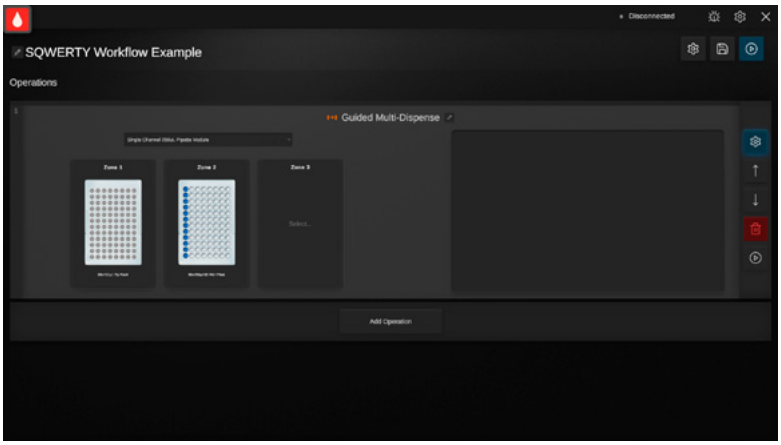
1

- If Guided Multi-Dispense is your first operation, set up your workflow as per Step 1 of the 'Guided Transfer' section.
- Click *Add Operation* and select *Guided Multi-Dispense*.



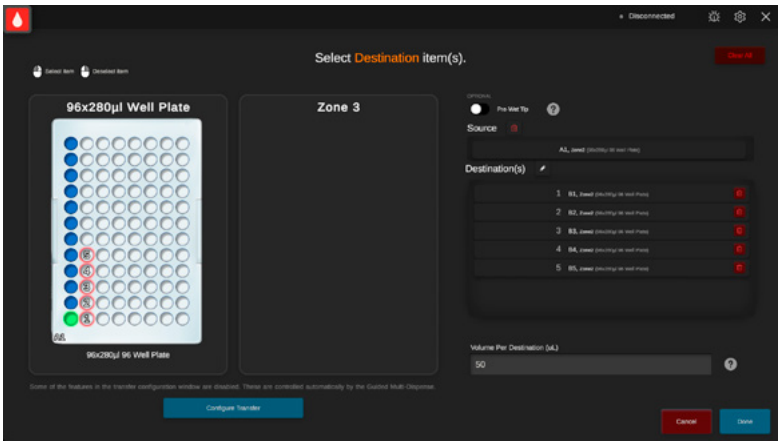
2

- Set up the deck zones with the labware you'd like to use as per Steps 3-6 in the 'Guided Transfer' section.
- Click the blue cog icon on the right hand side of the screen to continue.



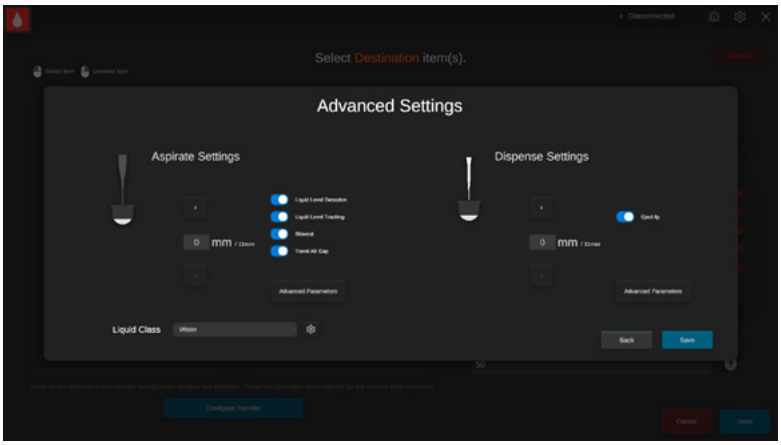
3

- Select the Source well/ tube(s) by clicking *Set* under the Source heading and clicking on your chosen source on the diagram, this will appear in Green.
- Select the Destination well/ tube by clicking set under Destination(s) and clicking on your chosen destinations on the diagram. These will appear with a red circle.
- NOTE: You can click and drag to highlight multiple destinations or select individual locations
- Specify the final destination volume by filling in the Volume per destination field.



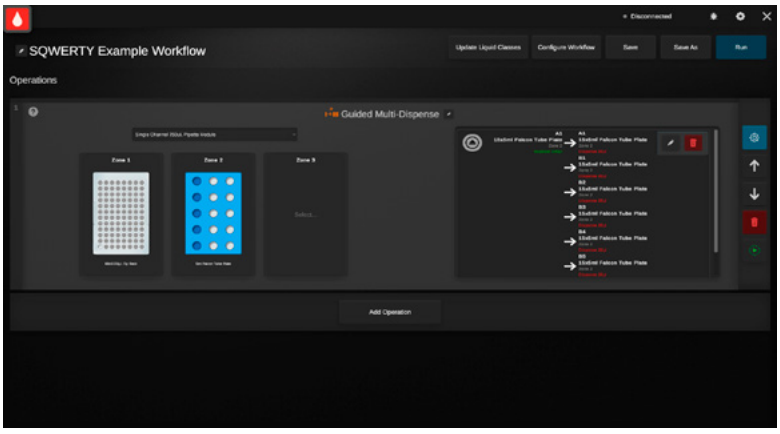
4

- Click *Configure Transfer* to bring up the advanced settings.
- The Guided Multi-Dispense mode will automatically set most of the parameters based on the source and destinations specified.
- However some settings can still be adjusted (E.g. Insertion Depth, Liquid Level Detection, Blowout, etc). Click on Advanced Parameters to adjust. For a full list of all the parameters see the breakdown on page 46.



5

- Repeat Steps 2 - 4, if you would like to add any extra transfers.
- Press Done in the bottom right hand corner to complete the operation.
- Each specified transfer will appear in the panel on the right hand side of the screen.
- Press the Blue Cog button to edit the operation or press the Red Bin button to delete the operation.
- If you have multiple operations in a workflow, the order can be rearranged using the arrows.
- Visit the Run A Workflow section (p34) to learn how to run a workflow.

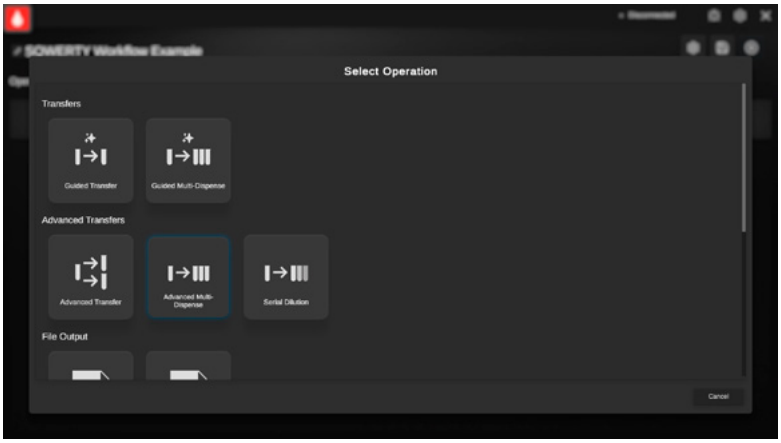


SETTING UP AN ADVANCED MULTI-DISPENSE

The Advanced Multi-Dispense works just like the Guided Multi-Dispense. With this option all of the parameters are adjustable.

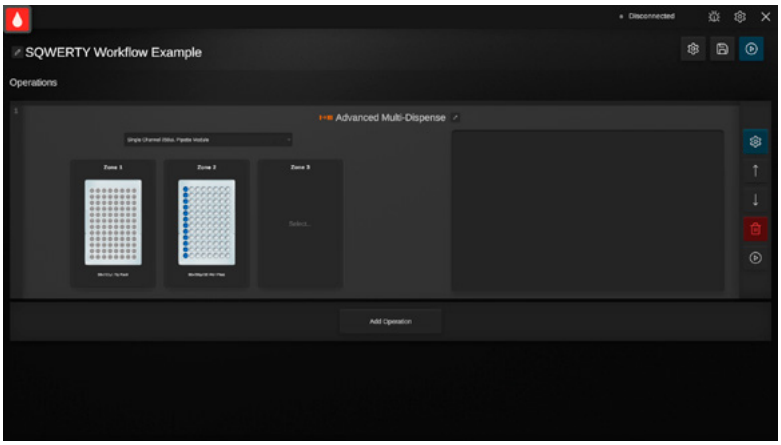
1

- If Advanced Multi-Dispense is your first operation, set up your workflow as per Step 1 of the 'Guided Transfer' section.
- Click *Add Operation* and select *Advanced Multi-Dispense*.



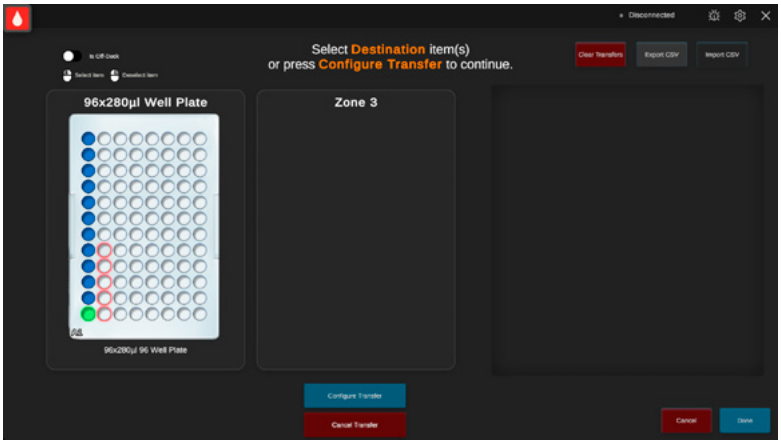
2

- Set up the deck zones with the labware you'd like to use as per Steps 3-6 in the 'Guided Transfer' section.
- Click the blue cog icon on the right hand side of the screen and press the Blue *Add Transfer* button to continue.



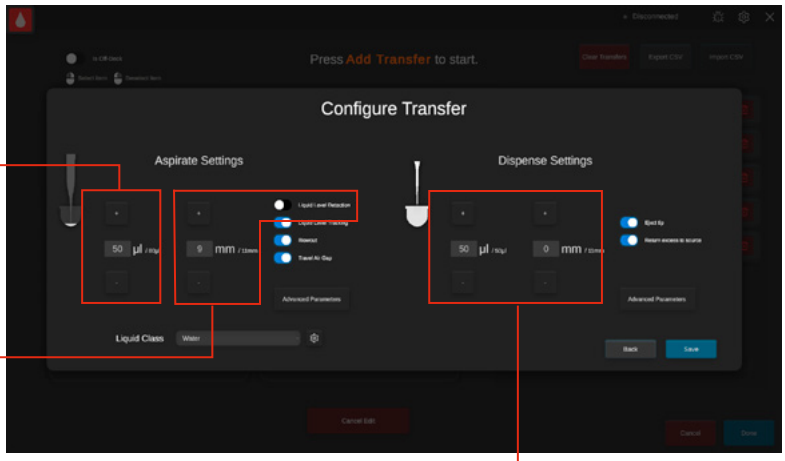
3

- Select the Source well/ tube(s). These will appear in green.
- Next, select the destination well/ tube(s). These will appear with a red circle.
- NOTE: You can click and drag to highlight multiple destinations or select individual locations.



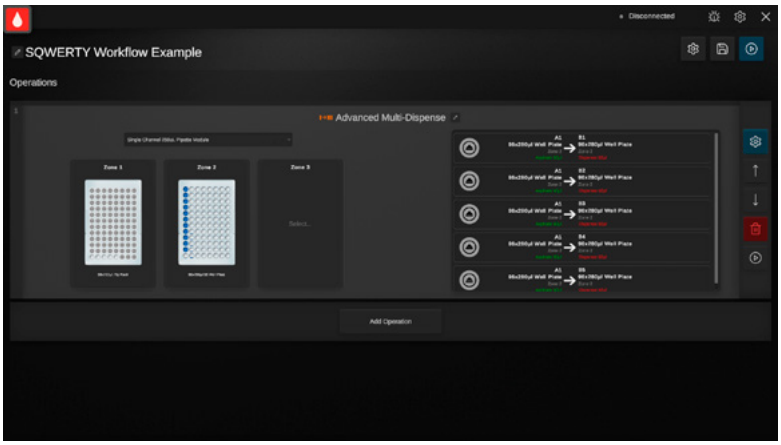
4

- With your Source and destination set, click *Configure Transfer*.
- A. Set the volume of aspirate by clicking and dragging downwards on the diagram, typing in a volume or by using the +/- buttons.
- NOTE: Make sure the aspirate is dispense volume x number of destination wells
- B. Turn on Liquid Level Detection or manually set the travel distance of the tip.
- C. Set the volume of dispense and the immersion depth as per steps 1 & 2. Each destination will receive the same volume.
- D. Once you are happy with your settings. Click *Save*.



5

- Repeat Steps 2-4, if you would like to add any extra transfers.
- Press Done in the bottom right hand corner to complete the operation.
- Each specified transfer will appear in the panel on the right hand side of the screen.
- Press the Blue Cog button to edit the operation or press the Red Bin button to delete the operation.
- If you have multiple operations in a workflow, the order can be rearranged using the arrows.
- Visit the Run A Workflow section (p34) to learn how to run a workflow.

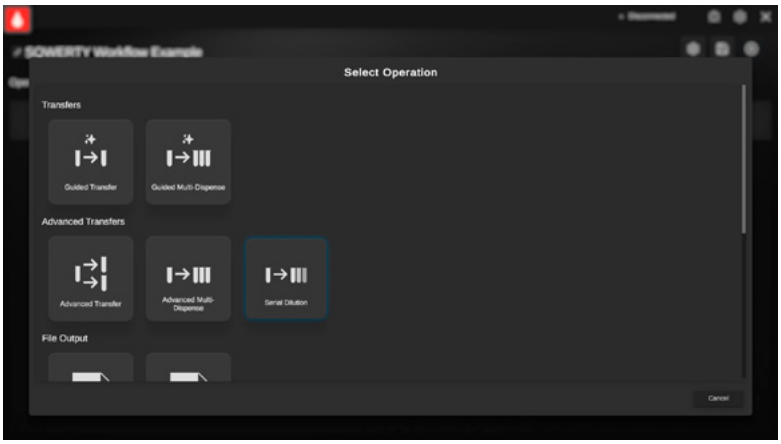


SETTING UP A SERIAL DILUTION

Serial dilution is a step-wise dilution of a solution using another liquid (typically water) to produce a range of sample concentrations.

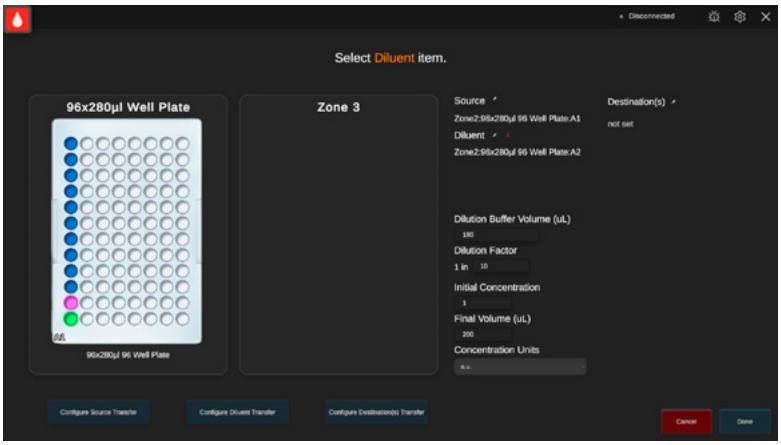
1

- If Serial Dilution is your first operation, set up your workflow as per Step 1 of the 'Guided Transfer' section.
- Click *Add Operation* and select *Serial Dilution.*
- Set up the deck zones with the labware you'd like to use as per Steps 3-6 in the 'Guided Transfer' section.



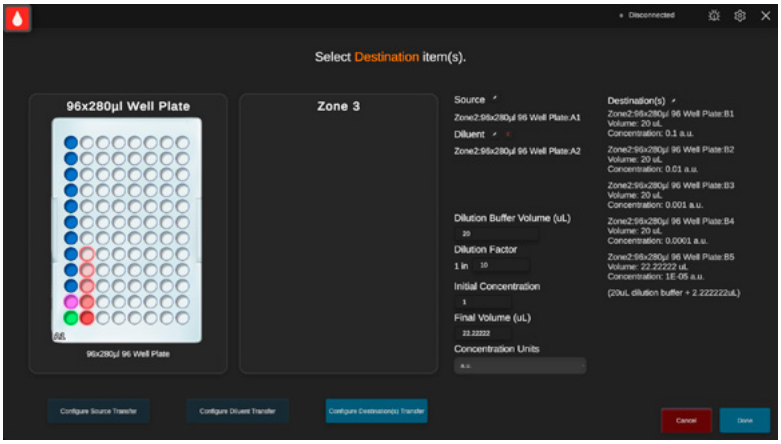
2

- Click the blue cog icon on the right hand side of the screen.
- Select the source well/ tube position by clicking the pencil icon next to ***Source*** and selecting the source location which contains the liquid to be diluted. This will appear in green.
- Select the diluent well/ tube position by clicking the pencil icon next to Diluent and selecting the location that contains the liquid the source will be diluted with.
- NOTE: If the diluent for the concentration gradient has already been dispensed elsewhere, then no diluent needs to be set.



3

- Select the destination well/tube position by clicking the pencil icon next to destination and select the wells/ tubes that the concentration gradient should be made over. The selection will appear as a red gradient.
- NOTE: You can click and drag to highlight multiple destinations or select individual locations. The first well selected will have the highest 'Source' concentration, the last well will have the lowest 'Source' concentration.



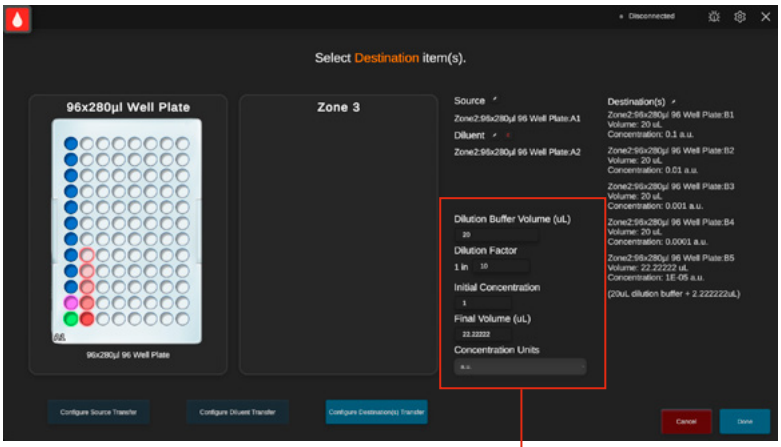
4

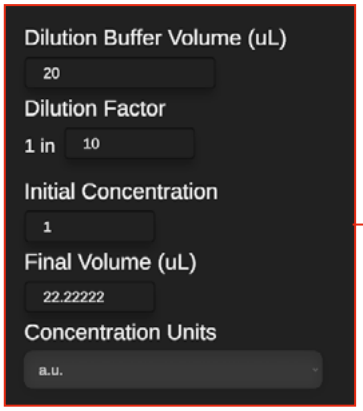
- Set the Serial Dilution Settings.

RECOMMENDED: Set the dilution factor and the final volume, let the software calculate the rest automatically.

ADVANCED: Manually set all of the serial dilution settings.

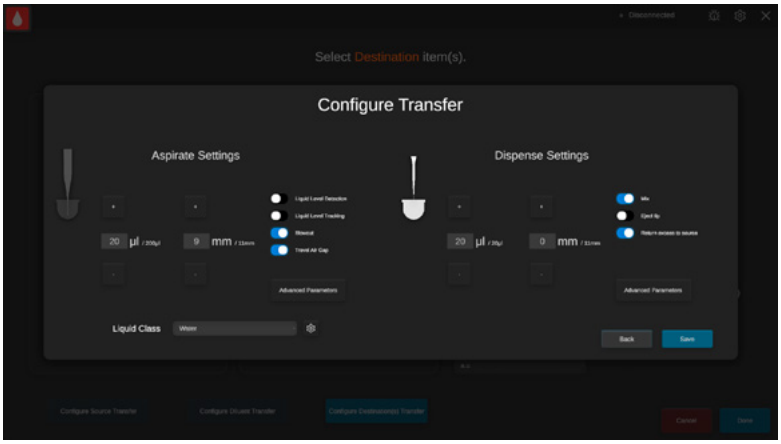
- Dilution Buffer Volume (µL) - the volume of diluent dispensed into each destination well
- Dilution Factor - degree by which the concentration of the Source liquid is reduced in each destination well.
- Initial Concentration - Concentration of the Source Location. This will have no effect on the actual serial dilution itself, but the concentration displayed in the reports will be accurate.
- Final Volume (µL) - Dilution Buffer Volume (µL) + Volume taken from the Source (or previous well in the serial dilution.)
- Concentration Units - Arbitrary Units (a.u.)





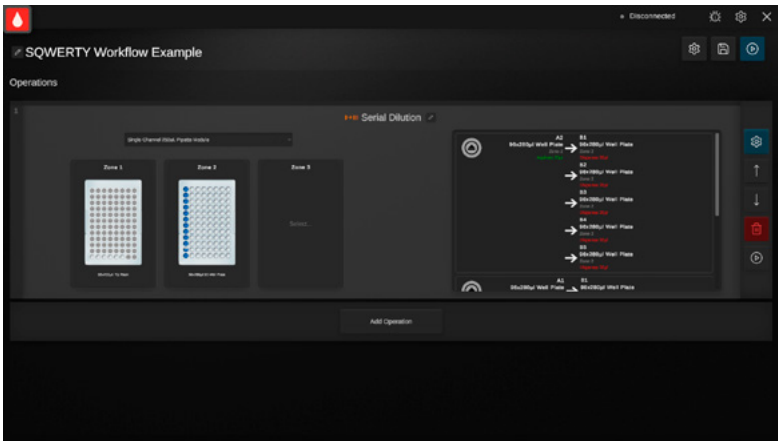
5

- Like Transfer & Multi-Dispense, you can also configure the transfers in a Serial Dilution operation.
- Select the pencil icon next to either 'Source', 'Diluent' or 'Destination' and click configure transfer.
- Don't modify the volumes as they were calculated by the software in Step 4.
- When your happy with your settings, click Save.



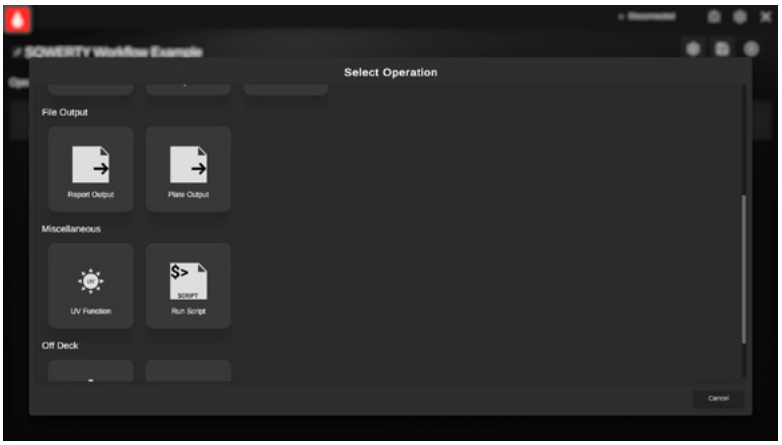
6

- Repeat Steps 2-4, if you would like to add any extra transfers.
- Press Done in the bottom right hand corner to complete the operation.
- Each specified transfer will appear in the panel on the right hand side of the screen.
- Press the Blue Cog button to edit the operation or press the Red Bin button to delete the operation.
- If you have multiple operations in a workflow, the order can be rearranged using the arrows.
- Visit the Run A Workflow section (p34) to learn how to run a workflow.



OTHER OPERATIONS

FILE OUTPUT



REPORT OUTPUT
Exports a CSV report to a file location of your choice. Contains the actions SQWERTY has completed up to this point in the workflow.

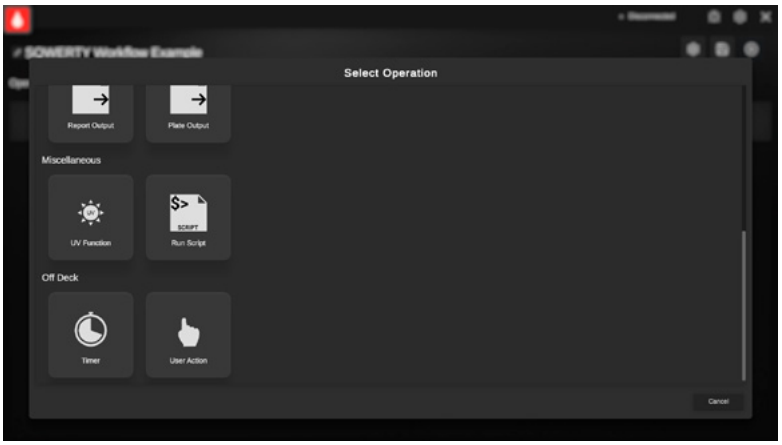
PLATE OUTPUT
Exports a JSON file to a file location of your choice. Contains the data of contents and volume of selected zones at this point in the workflow.

MISCELLANEOUS

UV FUNCTION
Turn on the UV LED lights for up to 99 minutes and 99 seconds. This operation helps to sterilise the interior of the machine.

RUN SCRIPT
Add in pre-written scripts for extra actions. This feature is for advanced users only, please visit the technical support site on how to use this operation.

OFF DECK



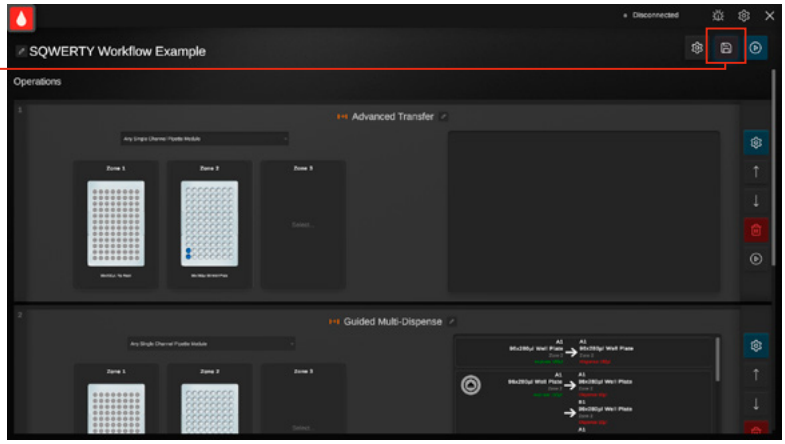
TIMER
Set a timer up to 2 hours and 46 minutes (9999 seconds) before moving on to the next operation or finishing the workflow.

USER ACTION
Setting a user action pauses the workflow and brings up a message prompting you to complete an action.(e.g. 'Centrifuge for 20 min at 20 000 g' or 'Change the pipette module').

HOW TO CREATE A WORKFLOW - SAVING & LOADING

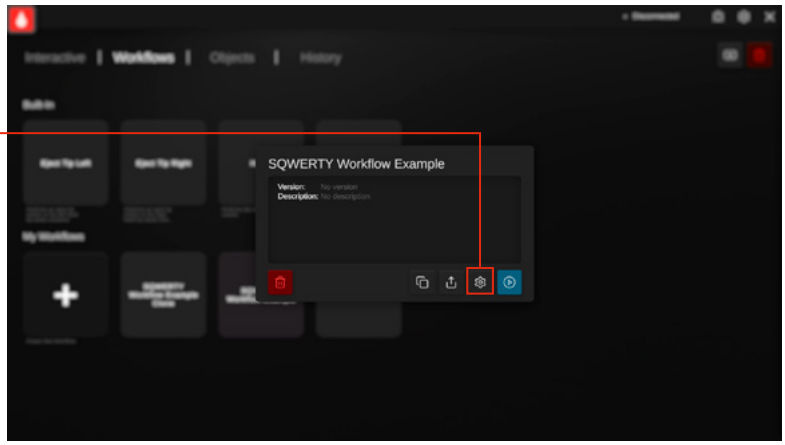
SAVING

- Press the save icon in the top right-hand corner to save the workflow.
- If you don't press the save icon, the software will prompt you to save the workflow when you exit.
- Click the pencil icon next to the workflow name to bring up the workflow parameters. From here you can enable 'Autosave workflow'. This automatically saves the workflow when you exit.



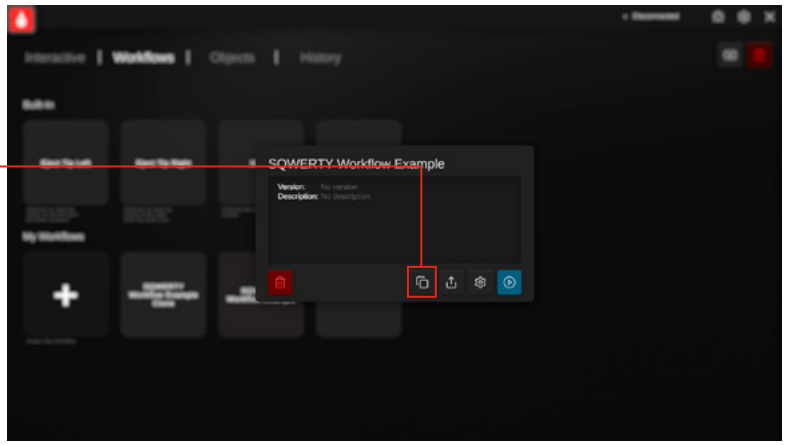
OPEN EXISTING WORKFLOWS

- Existing workflows can be found in the *My Workflows* section of the *Workflows* tab. Simply click on the workflow you want to open and press the cog button to edit.
- When saving an existing workflow, the software will warn you that this workflow already exists. Press *Overwrite* to save the new changes or press *Keep Existing* to cancel the changes made and return to the main menu without saving.



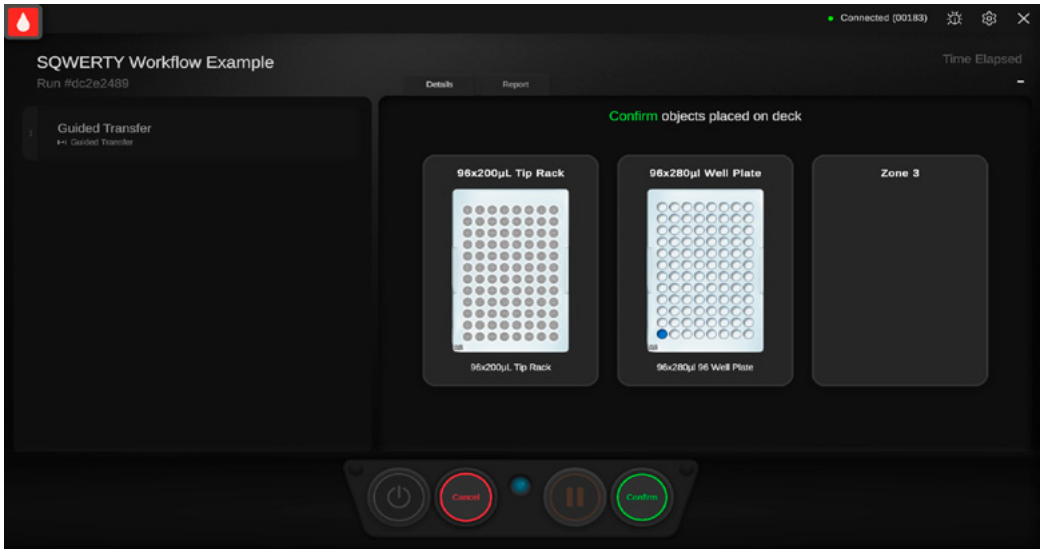
CLONE A WORKFLOW

- To duplicate a workflow, select it from the list in the *My Workflows* section.
- Press the *Clone a Worklfow* button to duplicate the file.
- The duplicate file can be accessed from the *My Workflows*. Click on the duplicate file to bring up its menu and select the Cog button to open.
- Click the pencil next to the name to edit the *Workflow Parameters* as desired.



RUN A WORKFLOW

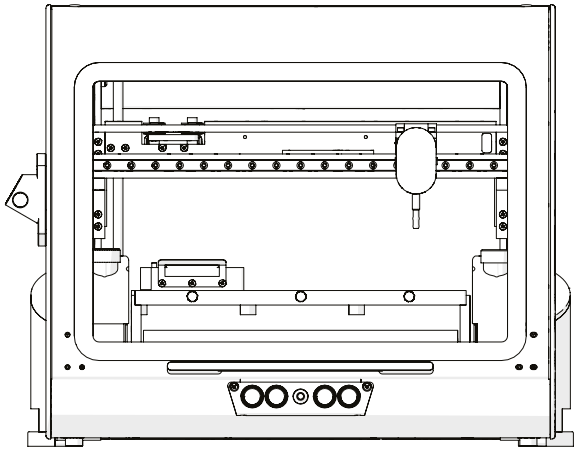
Workflows can be run from the My Workflows menu or inside of a selected workflow. This quick guide will breakdown both methods.



HOW TO RUN A WORKFLOW - RUN WORKFLOW

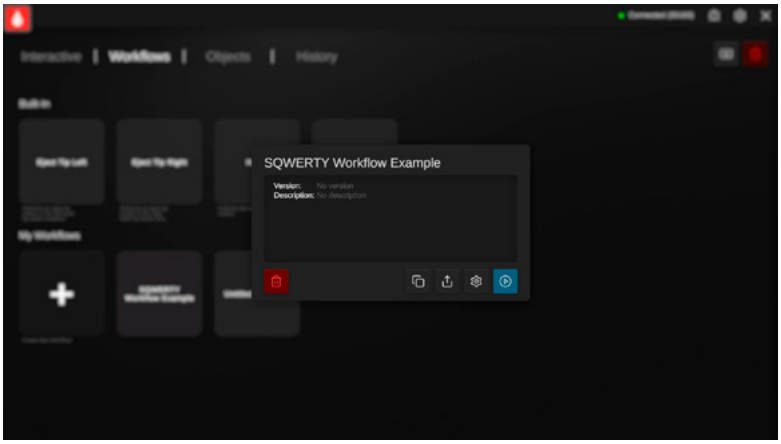
1

- Make sure your PC is connected to SQWERTY.
- Ensure that there are no tips on the pipette module, the door is closed and the tip waste boxes are installed.(See the Unboxing and Assembly Section p11).



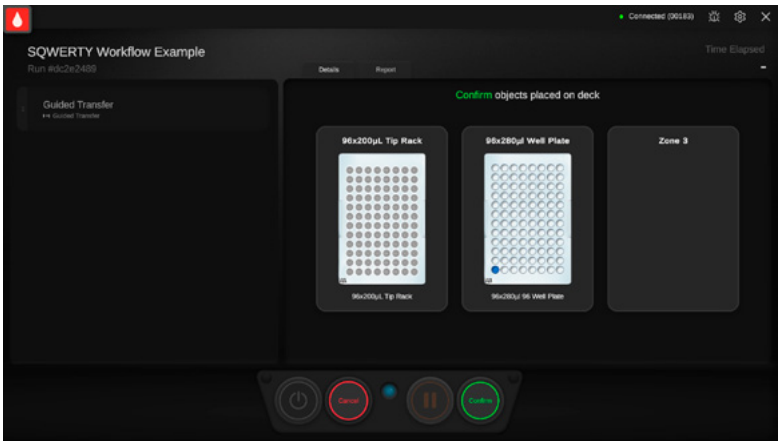
2

- Select the *Workflows* tab and click the workflow that you wish to run. (See the Workflows Section to learn how to make a Workflow p17)



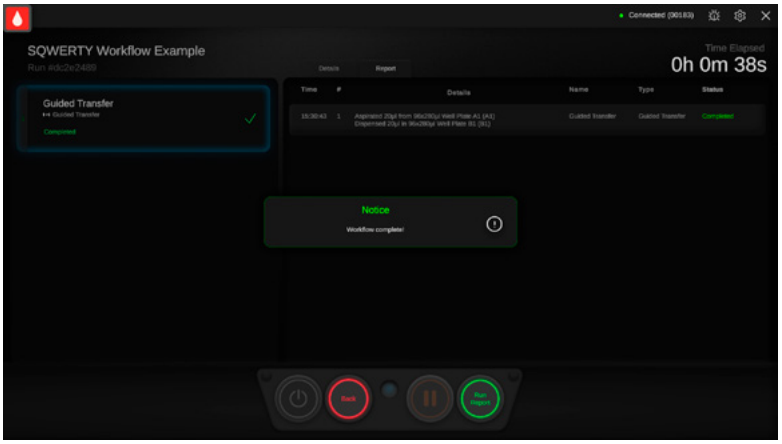
3

- Click the blue run button to bring up the run menu. You will be asked to confirm that your required labware is loaded on the deck.
- Fill the plate locations you are using with the appropriate volume of liquid.
- Ensure the labware is placed in the correct zones on the deck. (See the tips and plates setup guide p13).
- Make sure the door is closed and press the green *Confirm* button to continue.



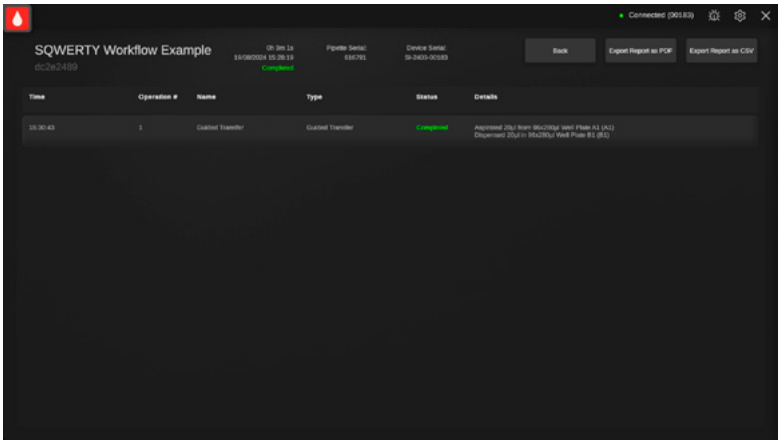
4

- SQWERTY will begin its run.
- If an error message appears, follow any on screen prompts. If there are any issues, stop the workflow and correct the operations from the *Workflows* tab.
- Wait for the workflow to complete. Go Science!



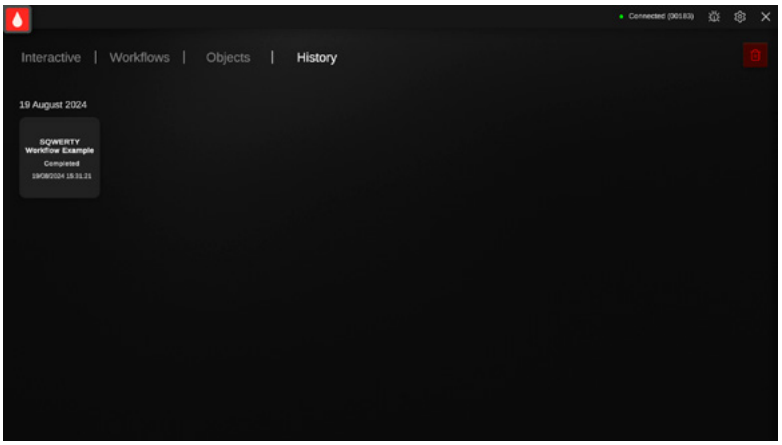
5

- Click the green *Run Report* button to review the completed workflow.
- Press the *Back* button to return to the menu screen.



6

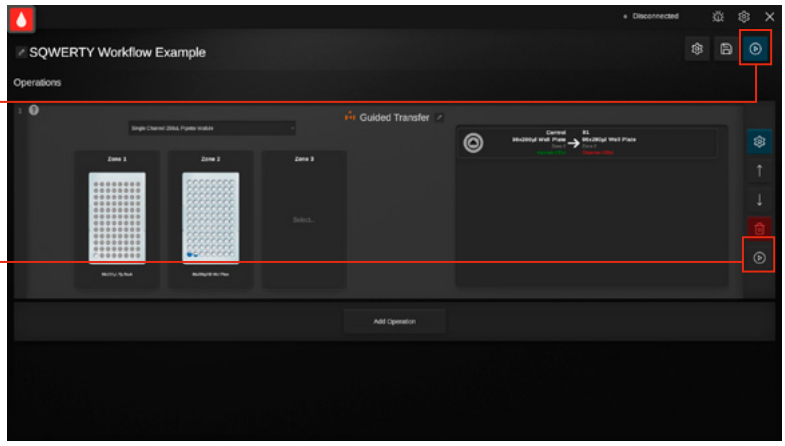
- Previously run workflows can be found in the *History* tab. Click on the relevant report to open.



HOW TO RUN A WORKFLOW - RUN INDIVIDUAL OPERATIONS

1

- Workflows can also be run from inside the workflow builder. Press the blue *Run* icon and follow steps 1 - 6 in the run workflow section.
- Alternatively individual operations can be run from inside the workflow builder. Press the black Run button on the right hand side of the operation to run just that part.
- NOTE: Ensure the correct labware has been loaded onto the deck before pressing run. (See the tips and plates setup guide p13).

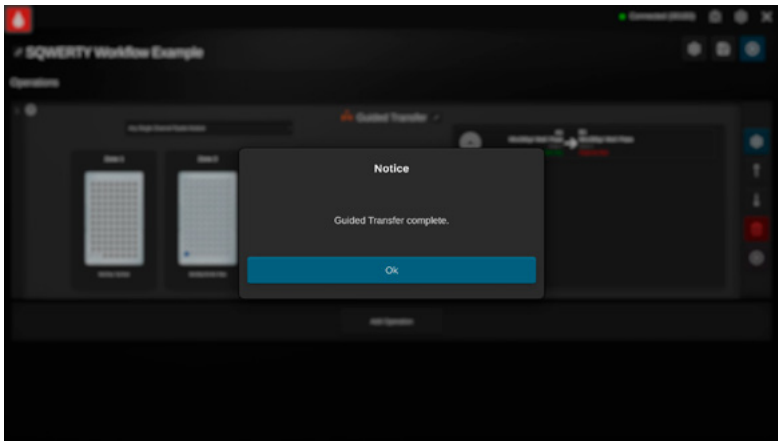


2

- Wait for the transfer to complete. Press the highlighted red *Hand* button to abort the transfer at any point.

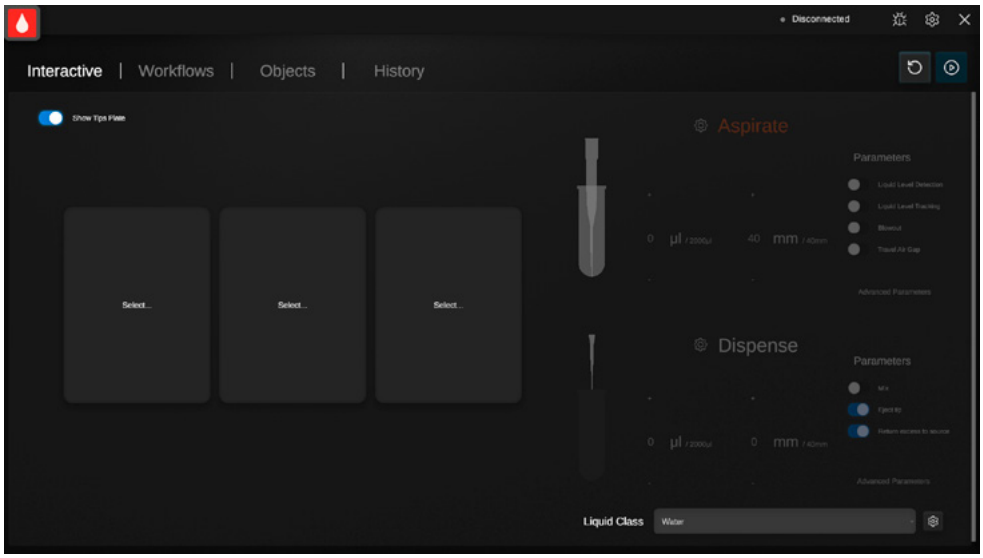
3

- When the transfer has completed press the blue *OK* button to return to the workflow builder.
- Press the blue cog button in the transfer to update any parameters.



INTERACTIVE MODE

The Interactive mode can be used to quickly test transfers before building bigger workflows. Let's find out how to use it, start by clicking on the Interactive Tab in the menu.

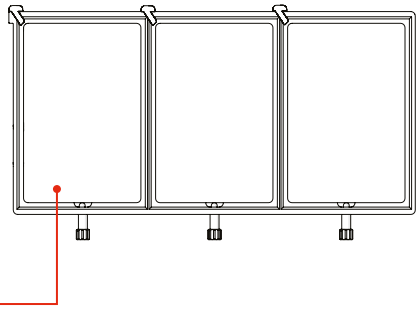


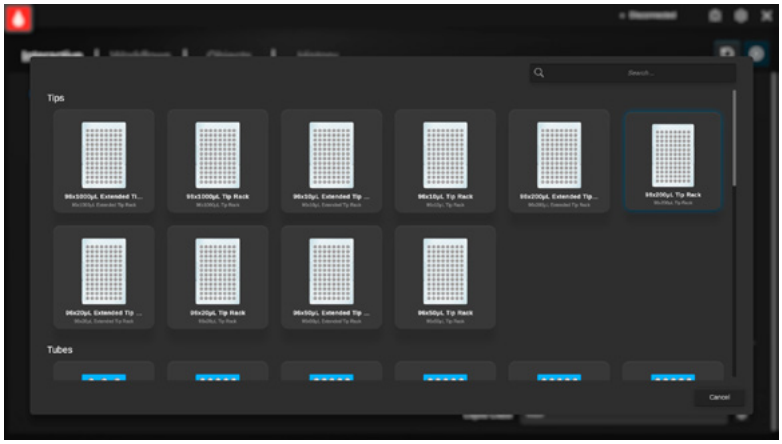
INTERACTIVE - HOW TO TEST A TRANSFER

1

- With the *Interactive* tab selected, click on Zone 1 to select the tips that you want to use. Ensure that these tips are located securely in Zone 1 before starting the transfer.

- NOTE: The extended tip rack holds the tips about 1cm higher than the normal tip rack.

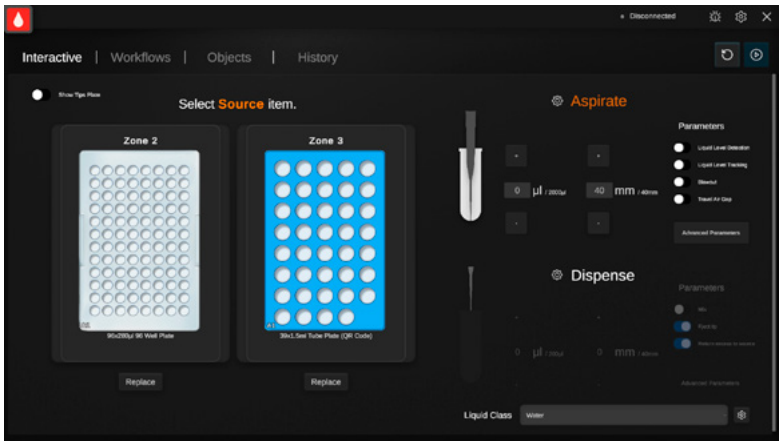




2

- Click on Zone 2 and select the labware that you want to use from the object library. Repeat with Zone 3 if using.

- To view or edit your tip selection, turn on the *Show Tips Plate* toggle.



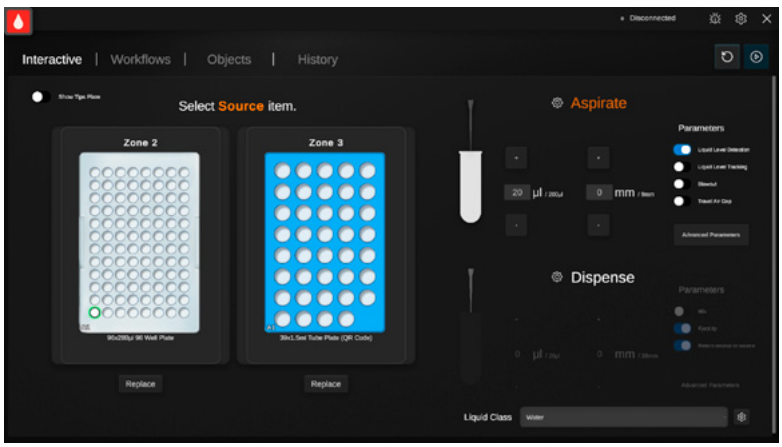
3

- Aspirate will already be selected by default. Specify your source location by clicking on the corresponding tube/ well on the diagram. Your selection will appear in Green.

- Set the volume of aspirate by clicking and dragging downwards on the diagram, typing in a volume or by using the +/- buttons.

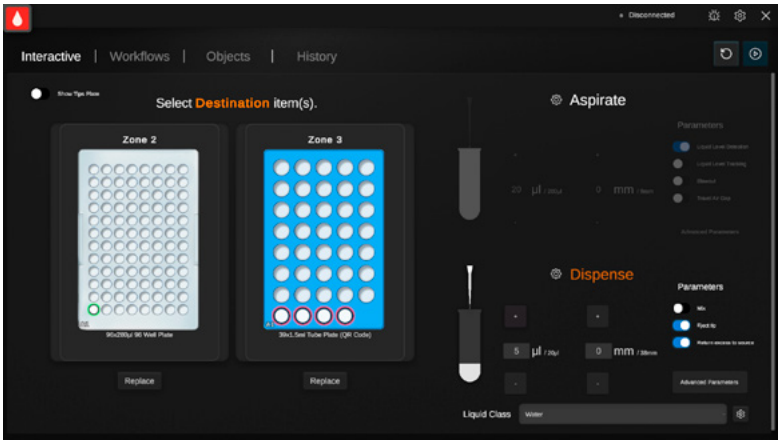
- Turn on Liquid Level Detection or manually set the travel distance of the tip.

- You can also adjust the advanced parameters and toggles.



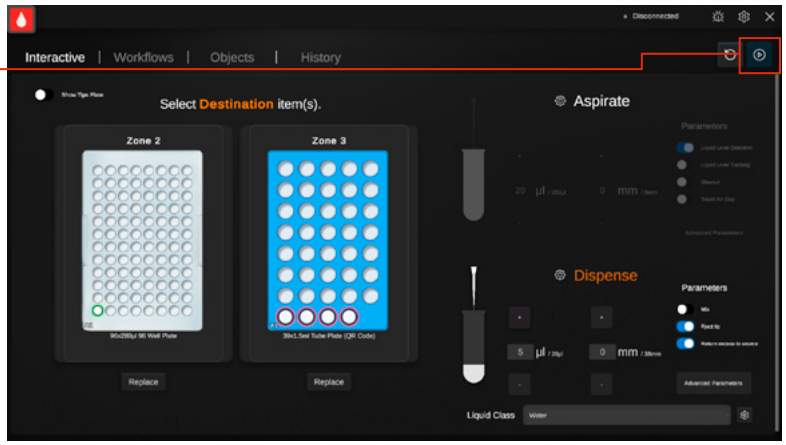
4

- Select Dispense and specify the destination Tubes/Wells. Your selection will appear in red.
- Set the volume to dispense by clicking and dragging downwards on the diagram, typing in a volume or by using the +/- buttons.
- You can also adjust the advanced parameters and toggles.



5

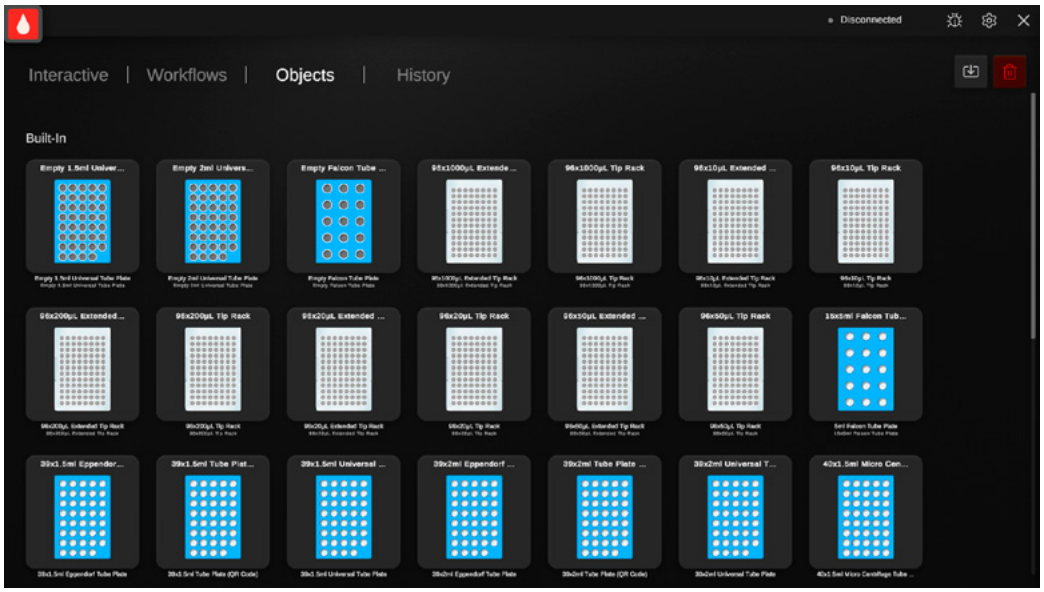
- When you are happy with your settings. Press Run to start the transfer.



OBJECT BUILDER

The Object builder lets you create custom labware to suit your specific labware needs. This feature is handy if your plate type is not in the supplied list in the workflow builder.

Start by pressing the Objects tab in the main menu.

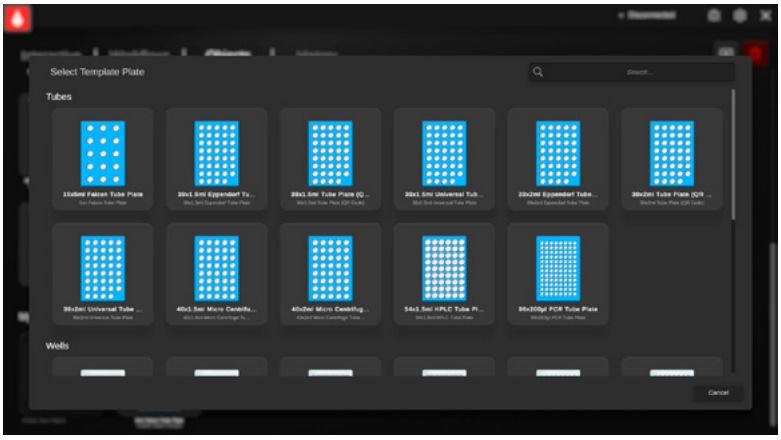


1

- Start by clicking on the *Objects* tab.
- Scroll down to *My Objects* and click on the plus button.

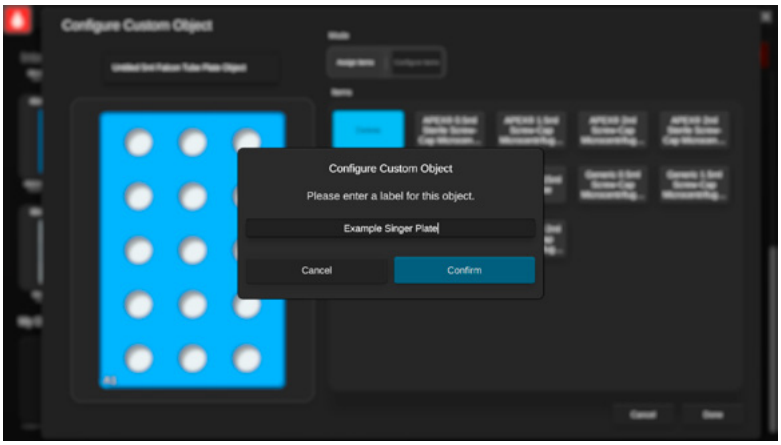
2

- Select an existing plate that you would like to use as a template for your custom labware.
- Ensure that you select something with the correct number of locations as these cannot be added later.
- Match the template to the labware you want to use. E.g. Select a well based template if you want to create a well based project.



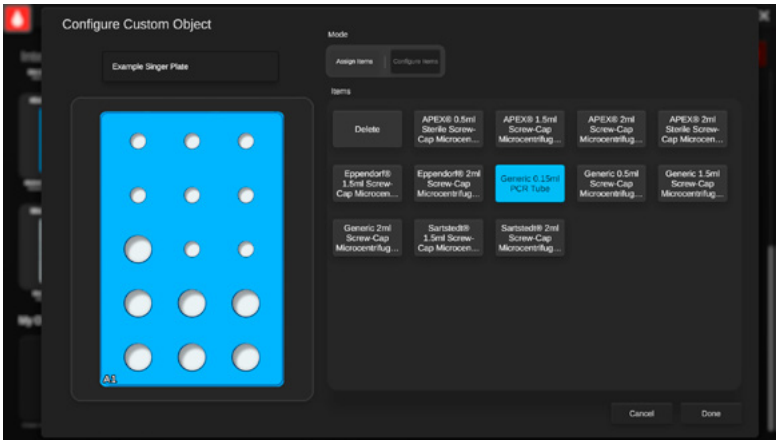
3

- Give your custom object a unique name. This can be edited later by clicking on the object name.



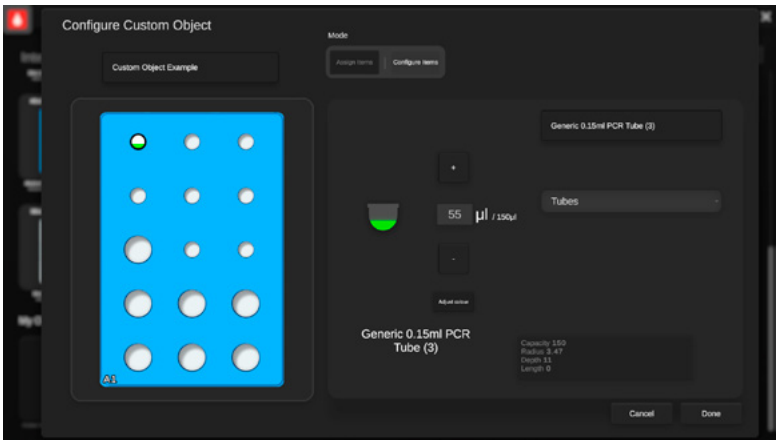
4

- Assign an item you wish to place in your custom plate from the *Items* list.
- If the required object is not on the Items List select the closest object.
- Select the position you wish to place the items in. The graphic will change as you select new positions.



5

- Select *Configure Items*
- Select the tube/ well position you wish to configure. From this screen you can:
- A. Select the volume of liquid you wish to automatically assign to that position
- B. Give the position a unique name
- C. Adjust the colour of the position contents to indicate a different type of liquid.
- D. Select the category you wish to assign to the object.
- NOTE: The shape details of this position appear at the bottom of this screen.
- When your happy with the configuration, press done.



6

- The new custom object will appear under *My Objects* and can be used in all your workflows.
- If you wish to edit your object, select it and then press *Edit*.

BEST PRACTICE

We want you to have a trouble-free time with your SQWERTY, so we've assembled some handy hints, tips and troubleshooting answers to keep you on the straight and narrow.

CLEANING

PLASTIC PARTS

Drip tray, tip waste containers (including lids) and plastic labware adaptors can be removed and washed with hot soapy water, dried and then wiped down with 70% Industrial Methylated Spirits (IMS).

METAL PARTS

Metal labware adaptors, the mandrel (tip cone adaptor) and calibration adaptor can be autoclaved up to 15 minutes at 121 °C. Allow these to completely dry before using in SQWERTY.

SURFACES

Wipe down both internal and external surfaces of SQWERTY and the pipette module with 70% IMS.

UV

Turn on the UV lights for at least 20 minutes up to 1 hour to help minimise external contamination. A UV function can be incorporated into a workflow as a selectable step (See the Workflows Section p17).

Liquid Level Detection (LLD)
Automatically detects the liquid level at each new source location.

Liquid Level Tracking (LLT)
Automatically moves the pipette tip down throughout the workflow based on how much liquid has been removed; no need to manually adjust the insertion depth.

Blowout
Ensures all excess liquid is removed from the tip at the end of the transfer. This parameter works best for highly viscous fluids and forward pipetting.

Travel Air Gap
Prevents dripping during transfer, so less risk of contamination or volume loss.

Mix
Ensures uniform concentration of liquids throughout the well/tube. Improves consistency of results between wells.

ADVANCED PARAMETERS

Blowout Volume

- Increase the Blowout Volume for more viscus fluids which need a greater volume of air to ensure complete dispensing of the target volume.
- Reduce for the liquids that dispense easily and do not require a blowout.

Air Gap Volume

- Increase the Air Gap Volume for less viscous liquids that require a greater volume to prevent dripping.
- Reduce for the liquids that have a greater surface tension or adhesion so are unlikely to drip. Use at least the 1 µL default volume just in case the tension is broken during movement.

LLD Max Travel

- Increase to ensure that the LLD will continue to the base of the well/tube when using LLD. This will take longer, so if you have a low volume source, it's best to manually set the depth a few millimetres above the base.
- Reduce when you know the liquid surface is nearer the top of the well/tube. That way, an error is produced faster if the pressure change is not detected.

Eject Tip
Ensures any unintentional excess liquid is removed from the system by discarding the tip to the tip waste bins.

Forward Pipetting*
Won't deliver any more than is aspirated. The entire tip volume can be utilised for transfer if necessary. Takes less time as there is no need to return the excess to source or eject.

Reverse Pipetting*
Ensures the minimum target dispense is met, highly recommended during multi-dispense or transfer of highly viscous liquids. Also reduces the dead air volume for more accurate pipetting.

Return Excess to Source
Makes reverse pipetting more accurate and reduces the need to eject tips each time.

*Not actually parameters/ settings that can be turned on/off but refer to the aspiration:dispense ratio.

LLD Extra Travel

- Increase to sink the tip further into the well after the surface is detected. This ensures that there is a sufficient volume of liquid between the tip entrance and the liquid surface to prevent air aspiration. If the surface detection is inaccurate or there are bubbles on the surface, the extra travel ensures the tip actually gets beneath the surface.
- Reduce when a low volume of liquid is being aspirated to reduce the risk of crashing into the base of the labware.

Mix Volume

- Increase to ensure a more uniform mix throughout the well/tube, ensuring the entire volume is integrated. A greater volume risks unintended liquid retention after the mix. Multiple liquid types/concentrations are contaminating the tip during mixing, so this means more ejections are required.
- Reduce the mix volume for smaller destination locations so that you do not incorporate air aspiration and bubbles.

Mix Insertion Depth

- Ensures the entire volume is reached and there is no air included in the aspiration. Increases risk of liquid adherence to the outside of the tip causing drips. Also risks crashing into the bottom of the labware.
- Increased risk of air aspiration (can be mitigated by 'Mix LLT'). Less likely to crash into the bottom of the labware or have excess liquid adhering. Won't necessarily mix as effectively unless the other settings are increased.

Mix Liquid Level Tracking (Mix LLT)

- Ensures the pipette follows the lowering liquid level without aspirating air during the mix.
- No additional movement to account for liquid loss due to other transfers.

Mix Flow Rate

- Increase to complete the mix faster and more vigorously. However this does risk shearing cells, damaging delicate fluids and bubbling.
- Reduce for a more gentle mix. This is more suitable for highly viscous liquids. The flow rate should be equal to, or less than the liquid class defined flow rate. Won't mix as effectively without increasing another mix setting.

Mix Cycles

- Increase the number of mixes to mix the tube/well more effectively.
- Reduce the number of mixes to speed up the cycle time. Some benefits of mixing.

LIQUID CLASSES

The Liquid Class editor can be found on the Configure Transfer screen. It can also be accessed via SQWERTY Settings.

Aspirate/Dispense Flow Rate (µl/s)

- Increased - Completes transfers faster and may mix liquids more effectively at dispense without using a mix. Risks bubbles and cell shearing.
- Reduced - More effective for highly viscous liquids with low fluid velocity or liquids the require more gentle handling.

Aspirate/Dispense Dwell Time (ms)

- Increased - Takes longer but a deeper mix ensures the entire volume of a low fluid velocity enters/exits the pipette tip.
- Reduced - Faster for low viscosity liquids.

Blowout/ Air Gap Flow Rate (µl/s)

- Increased - Increases speed but risks breaking the surface tension of the liquid in the tip and resulting in inaccurate transfers.
- Reduced - Slower but more effective in low velocity liquids.

LLD Aspirate Rate (µl/s)

- Increased - Might trigger LLD a bit earlier for more viscous liquids. Wouldn't recommend changing for most uses.
- Reduced - Should be optimised in collaboration with LLD speed to find a good merge of speed and accuracy.

LLD Pressure Threshold

- Increased - The tip will move through surface layers that have lower surface tension before detecting the liquid surface. If estimated too high the tip may not recognise the surface and abort after the max travel is reached.
- Reduced - More sensitive to liquid surfaces but risks false positive surface recognition. Resulting in air aspiration.

LLD Speed (mm/s)

- Increased - Faster but less reliable. Will go deeper beneath the liquid surface before pressure threshold is reached, halting Z axis movement.
- Reduced - More reliable, takes longer to find the surface but detects it more accurately when it does.

HOME SCREEN

HOME
Takes you back to the home screen.

BUG REPORT
Takes you to a form to report any bugs.

SETTINGS
Takes you to the SQWERTY settings menu.

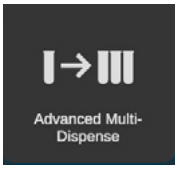
WORKFLOWS

CREATE NEW WORKFLOW
Starts a fresh workflow. Click *Add Operation* afterwards to begin.

GUIDED TRANSFER
Operation which sets up a quick transfer between source and destination. Some parameters can be adjusted.

GUIDED MULTI-DISPENSE
Operation which sets up a quick transfer from one source to multiple destinations. Some parameters can be adjusted.

ADVANCED TRANSFER
Operation which moves liquid from a source to destination. All parameters can be adjusted.



ADVANCED MULTI- DISPENSE
Operation which moves liquid from one source to multiple destination wells. All parameters can be adjusted.

SERIAL DILUTION
Operation which creates a range of sample concentrations. Solution is diluted using another liquid.

REPORT OUTPUT
Exports a CSV report to a file location of your choice. Contains the actions SQWERTY has completed so far in the workflow.

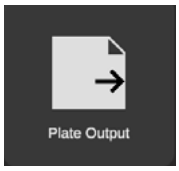


PLATE OUTPUT
Exports a JSON file to a file location of your choice. Contains content and volume of selected zones.

UV FUNCTION
Turns on the UV LED lights for up to 99 minutes 99 seconds.

RUN SCRIPT
Add in a pre written script which performs extra actions.

TIMER
Set a timer up to 2 hours and 46 minutes (9999 seconds).

USER ACTION
Set a user action to pause the workflow and brings up a pre set message.

OPERATION SET-UP

CONFIGURE THIS OPERATION
Takes you to the operation settings menu. Operation parameters are adjusted here.

MOVE OPERATION UP
Moves the operation up in the workflow.

MOVE OPERATION DOWN
Moves the operation down in the workflow.

DELETE THIS OPERATION
Deletes the operation from the workflow.

RUN INDIVIDUAL OPERATION
Runs an individual operation in the workflow. Use this to test out an operation before running the workflow.

HELP
Provides helpful instructions in select parts of the software.

PROBLEM	SOLUTION
Not all liquid is being dispensed from the tip.	Try enabling Blowout and steadily increase the blowout volume. Click on Aspirate *Advanced Parameters* to change the volume.
Blowout is missing some liquid, it's sticking to the inside of the pipette tip.	Access *Liquid Class* settings by clicking on the cog icon in the bottom right corner of the software and reduce the *Blowout Flow Rate.*
Air is being aspirated into the tip instead of liquid.	Modify the immersion depth to ensure the tip is reaching the liquid. Use the +/- buttons or type in a depth in the Aspirate section. If your using a higher viscosity liquid, slow down the *Aspiration Flow Rate* in the *Liquid Class* settings.
Liquid Level Detection (LLD) is too sensitive (Missing the liquid level).	If using a liquid class other than water, increase the *LLD Pressure Threshold* parameter in the *Liquid Class* settings. If the problem persists, increase *LLD Extra Travel* in aspirate *Advanced Parameters.*
Liquid Level Detection (LLD) is detecting external drips instead of the surface of the liquid.	Use a shallower depth for dispensing. If you have mixing enabled, don't forget to modify that depth in dispense *Advanced Parameters*. Finally, try decreasing *LLD Extra Travel* in aspirate *Advanced Parameters.* If the problems still persist, turn on tip eject in the dispense Parameters to prevent external drips from even occurring.
Liquid Level Detection (LLD) is super slow.	In the *Liquid Class* increase *LLD speed*. If unsatisfied with the speed, consider switching to using manual aspirate/dispense immersion depth settings with *Liquid Level Tracking* enabled instead of LLD.
My tip is travelling deeper into the source location than specified.	Decrease *LLD Extra Travel* in aspirate *Advanced Parameters* and the *LLD Pressure Threshold* in *Liquid Class* settings. If this doesn't work, reduce the *LLD Speed* in the *Liquid Class* settings.
There's too much volume in my tip but I'm only transferring 200µL (within pipette module range)	Check the values for *Blowout* and *Travel Air Gap* in the aspirate *Advanced Parameters* as they both count towards the volume range. Readjust the *Travel Air Gap : Your Liquid : Blowout* ratio to sum up to the pipette module maximum volume.
My labware is overflowing with liquid.	Remember that liquid displacement exists because SQWERTY doesn't! Adjust the immersion depth of the pipette tip to be right at the top of the liquid surface, or lower the amount of liquid in the source well/tube.
I lost a tip underneath the tray in SQWERTY.	Turn off the main unit and remove the drip tray. Tip SQWERTY backwards to see if the tip rolls out towards the back of the unit. Feel around with your hands and remove it if you can. If it's still stuck or unreachable, use a screwdriver to undo the two small screws in the centre front and two in the centre back (these hold the metal base sitting underneath the drip tray). Keep the screws and washers in a safe space while you remove the metal tray and retrieve the tip. Replace the metal tray and hold it in place with the washers and screws. Place two opposite screws (no washers) front and back to hold the plate down. Screw in the remaining screws (with washers) tightly. Replace the original pair of screws but this time with the washers in place.

TECHNICAL SPECIFICATIONS (HARDWARE)

GENERAL
- Vertical Sliding Door
- X Deck with (3x) SBS/ANSI Zones
- Tip Eject Containers (Left Hand and Right Hand)

DIMENSIONS
- Length: 421mm (16.6")
- Width: 405mm (16")
- Height (Door Closed*): 365mm (14.4")
- Height (Door Open*): 598mm (23.5")

*From Bench Top

WEIGHT
- 16kg (35 lbs) without accessories or consumables

NO COST ACCESSORIES
- Bottle Opener
- Calibrated Pipette Module (variable volume ⩽250µl)*
- Deck Calibration Verification Plate
- Tip Waste Calibration Tool
- Calibration Probe
- Gloss Black Acrylic Drip Tray
- Tip Waste Container (Left & Right)
- Tip Waste Container Lid (Left & Right)
- Pipette Module Mandrel Long - Type A
- Pipette Module Mandrel Removal Tool - Type A
- Tip Rack Adapter (25mm Height) - Mandrel Type A
- Plate Holder - Stainless Steel

*The latest datasheet on pipette module precision and accuracy can be found by scanning the QR code.
bit.ly/SQWERTYPipetteModule

POWER REQUIREMENTS
- 110-240V AC 50-60Hz 3 Amps
- External power supply: 24V DC, 6.75A

MINIMUM SYSTEM REQUIREMENTS
- OS Windows 10 Home/Professional
- Memory 4GB Ram
- Storage 60GB SSD
- Processor Intel® Core™ m3 or above
- Display resolution at least 1920x1080

LED ILLUMINATION
- Internal Illumination LED (White Light)
- UV-C Sterilisation LED (265nm)

CONNECTIVITY
- (2x) USB 3.0
- Ethernet
- WiFi

OPERATING CONDITIONS
- For indoor use only - fluctuations not exceeding 10% of nominal walls or other items
- Use in a well-ventilated area
- Ambient temperature range 15°C to 40°C (59°F to 104°F)
- Altitude to 2000m (6500ft)
- Relative humidity not exceeding 80%
- Mains supply
- Overvoltage category II IEC60364-4-443
- Pollution degree 2 IEC664
- Use with a minimum distance all round of 200mm (8") from walls or other items

SUGGESTED TIP EJECT CAPACITY
- Tip Eject Capacity 10µl - 96 Tips (20µl type with filter)
- Tip Eject Capacity 20µl - 96 Tips
- Tip Eject Capacity 50µl - 48 Tips
- Tip Eject Capacity 175µl - 48 Tips (200µl type with filter)
- Tip Eject Capacity 200µl – 48 Tips
- Tip Eject Capacity 1000µl – 12 Tips

MOVEMENT SPEED
- Max speed:
  X: 200mm/s
  Y: 200mm/s
  Z: 60mm/s
- Max acceleration:
  X: 300mm/s2
  Y: 300mm/s2
  Z: 300mm/s2

DISPENSE SPEED
- Calibrated Pipette Module ⩽ 50µl - 1800 µl/s
- Calibrated Pipette Module ⩽ 250µl - 450 µl/s
- Calibrated Pipette Module ⩽ 1000µl - 150 µl/s

COMPATIBLE LABWARE
- SBS/ANSI format plates
- Max density 384-well plate
- Tecan LiHa style pipette tips
- Microcentrifuge tubes (1.5-2ml Eppendorf style)
- 0.2ml, 0.5ml PCR tubes

OPERATING NOISE
- < 60dbA

OPERATING HUMIDITY
- 20-80% RH at 40°C (104°F)

RECOMMENDED MEDIA TEMPERATURE
- 15-40°C (59-104°F)

COMPLIANCE STANDARDS

- ISO 23783

LIQUID HANDLING STANDARDS

- IEC61010-1: 2010 + A1:2016 Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1 : General requirements.
- EN 61326-1: 2021 - Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements.
- ETSI EN 301 489-1 v2.2.3 (2019) - Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for Electromagnetic Compatibility.
- FCC CFR 47: Part 15: B: 2015 - Radio Frequency Devices.
- CES-003 Issue 7 - Innovation, Science and Economic Development Canada. Spectrum Management and Telecommunications. Interference-Causing Equipment Standard Information Technology Equipment (including
- Digital Apparatus).
- EN 62471:2008 - Photobiological safety of lamps and lamp systems.

MEDICAL DEVICES AND CLINICAL DIAGNOSTIC COMPLIANCE & USAGE

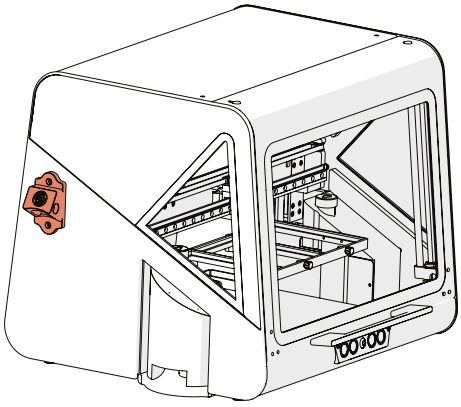
- Not compliant

POST-EXPERIMENTAL PROCEDURE

1

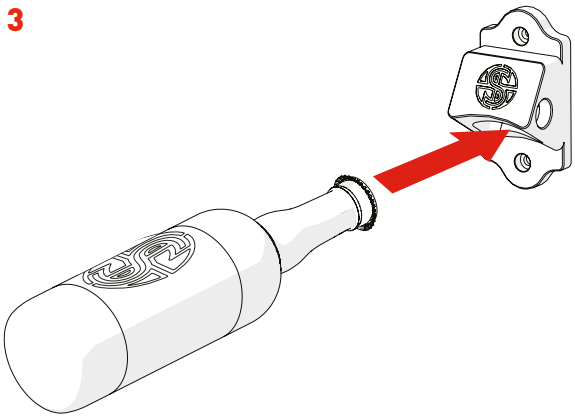
· Select a **Delicious Beverage.**

2



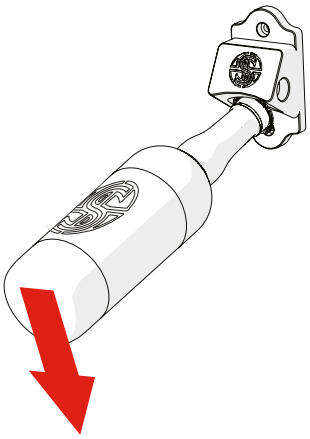
· Locate the Bottle Opener on your SQWERTY.

3



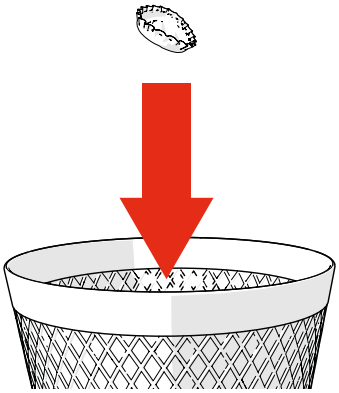
· Insert the Bottle into the Bottle Opener.

4



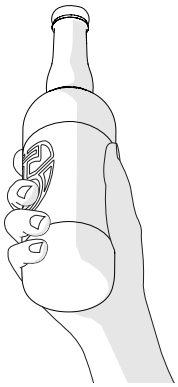
· Lever the Bottle to remove the Bottle Cap.

5



· Place the Bottle Cap in the Bin. Nobody likes a litter bug!

6



· Success! Time to enjoy your Delicious Beverage - you've earned it!
· Repeat steps 1-6 until suitably relaxed.

NOTES

NOTES

SINGER INSTRUMENTS
A RESPONSIBILITY TO SCIENCE!

Roadwater
Watchet
Somerset
TA23 0RE
UK

+44 (0)1984 640226 (tel)
+44 (0)1984 641166 (fax)

contact@singerinstruments.com
singerinstruments.com

DISCLAIMER

At Singer Instruments, we are constantly seeking to improve our products and adapt them to the requirements of modern research techniques and testing methods. This involves modification to the mechanical structure and optical design of our instruments. Therefore, all descriptions and illustrations in this user guide, including all specifications are subject to change without notice.