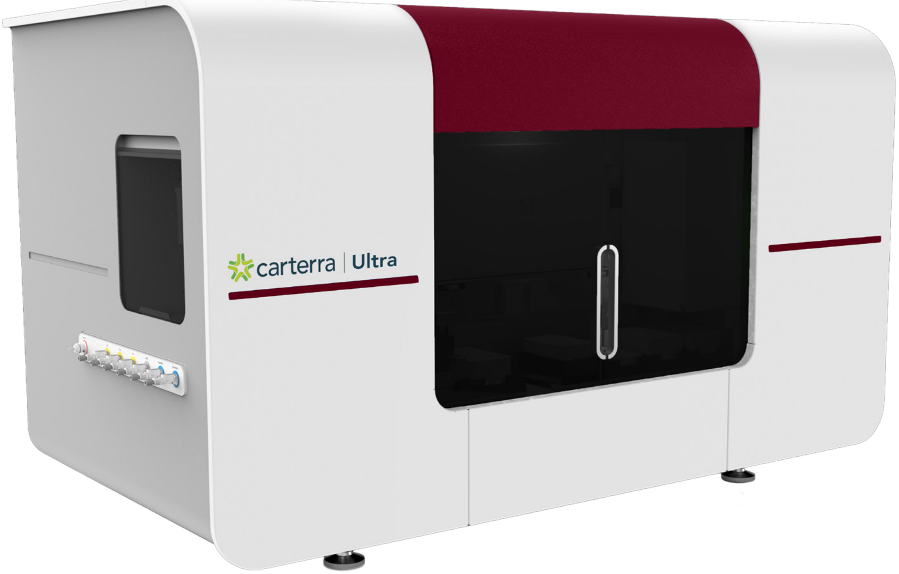
Carterra Ultra® Instrument User Manual

Ultra



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1. Introduction

1.1 Information About This Manual

The instructions contained in this document provide the information needed to operate and maintain Ultra properly. Additional documentation can be found at www.carterra-bio.com, or by contacting Customer Support at support@carterra-bio.com.

1.2 Intended Purpose of Ultra

Carterra Ultra® enables real-time, label-free analysis of molecular interactions. It is intended for research use only and not for use in diagnostic procedures. Do not expose the device to any external radiation. Using Ultra for purposes other than intended may invalidate the warranty.

1.3 Regulatory Information

The Ultra is intended for research use only and is not for use in diagnostic procedures.

1.4 Associated Documentation

The User Manual is supplied in PDF format on the instrument computer. Other resources, such as specification sheets, application notes, and technical literature, are available at www.carterra-bio.com.

1.5 Glossary

Term	Definition
Advanced Single Flow Cell (aSFC)	Single-channel device that delivers solution to the sensor chip surface.
Analyte	Solution phase biomolecule injected across the chip surface.
Association Phase	Cycle phase in which an analyte is injected to assess its propensity to interact with the surface.
Baseline	Period of buffer flow before sample injection/association phase.
Capture	Non-covalent immobilization of a ligand to the chip surface.
Chip	The functionalized gold surface, prism, and mounting cartridge assembly.
Couple	Covalent immobilization of a ligand to the chip surface.
Custom Ultra 96-channel Print Head™ (cPH)	Multichannel print head that delivers multiple solutions to the sensor chip surface in parallel.
Cycle	Collection of phases that repeat for each line in the experimental method queue. For example, a regenerative kinetics cycle would consist of baseline, association, dissociation, regeneration, and stabilization.
Dissociation Phase	Cycle phase during which system buffer flows across the chip surface and the dissociation of bound analytes from the surface-deposited ligand is monitored over time.

Ligand	Biomolecule coupled or captured to the chip surface.
MC	Multichannel. The fluidics mode which uses the Custom Ultra 96-channel Print Head (cPH).
Phase	A distinct time segment of the assay cycle during which the experimental condition is constant.
Prism	Angular cut glass block used to direct incident laser light both to the chip surface and out to the charge-coupled device (CCD) camera detector.
Reference Region	Interspot ROIs used for local referencing.
Regeneration Phase	Removal of captured ligand(s) or bound analyte(s) from the chip surface by injection of a solution with, for example, low pH or high salt.
Response Unit (RU)	A unit of response on the sensorgram y-scale corresponding to a 0.1 millidegree shift in the SPR minima.
SC	Single Channel. The fluidics mode which uses the Advanced Single Flow Cell (aSFC).
Sensor	Surface Plasmon Resonance Imaging (SPRi) detection format consisting of a near-IR laser and a high-resolution charge-coupled device (CCD) camera detector.
Sensorgram	The time resolved signal recorded during an SPR experiment.
Region of Interest (ROI)	Area of the surface being monitored for binding. ROIs consist of locations with coupled or captured ligands as well as empty interspot locations used as references.
SPR	Surface Plasmon Resonance
Surface	Functionalized gold surface that provides a chemistry for attachment of biomolecules.

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2. Safety Instructions

2.1 Safety Precautions

- Only properly trained personnel may operate and maintain Ultra.
- Do not operate the instrument in any way other than described in the User Manual.
- Ultra is not intended for use with flammable or corrosive substances.
- Take care that fingers are not trapped by moving parts. Pinch points are clearly marked within the system. Take additional precautions around these areas of the instrument, especially when the instrument is running.
- The two needle-based autosamplers are the main pinch-points and are labeled appropriately.
- Never place hands inside the instrument while it is in use. If doors are opened, the motors will continue through the last command and then stop. They will not move again until after the doors are closed. Do not open the doors while the instrument is running.
- Ultra is extremely heavy. Use four or more properly trained people, or suitable lifting equipment, when moving the instrument. Lifting equipment must not press on the instrument covers. Carterra strongly recommends that Ultra only be moved by Carterra Field Service Engineers. If Ultra needs to be moved, please contact Carterra.
- The instrument must always be connected to a grounded power outlet.
- Due to the size and power requirements of the instrument, it is unsafe to use any power cord other than the one supplied by Carterra. Please contact Customer Service to ensure that you have the correct power cord.
- Keep the power switch and power cord plug easily accessible at all times so they can be quickly disconnected if needed.
- All service and repair, with the exception of operations explicitly described in the User Manual, must be carried out by Carterra personnel. Do not open any covers or replace any parts unless specifically described in the User Manual.

2.2 Labels

The illustration below shows an example of the system serial number label. The label is attached to the main connector panel on the rear right of the instrument. In addition, the illustrations below show examples of hazard warning labels found on Ultra. These labels are designed to help users avoid injury when operating the instrument.

Symbol	Meaning
	System serial number label found on the back of the instrument.
	Caution - pinch point. Keep hands and fingers clear during operation.
	Electrical shock hazard. Disconnect power cord from electrical outlet before removing this panel or starting any service.

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2.3 Emergency Procedures

2.3.1 Emergency

To stop the system in an emergency, disconnect the main power from the instrument using the main switch on the rear top center panel.

2.3.2 Software Stop

Click the stop icon in the experiment runner. The system will stop upon completion of the current action, which will potentially result in sample loss. If required, switch off power to the instrument using the power switch.

2.3.3 Power Failure

If the instrument shuts down unexpectedly, contact Customer Support at:

Telephone: 1-844-642-7635, Option 3
Email: support@carterra-bio.com
Web: www.carterra-bio.com/support

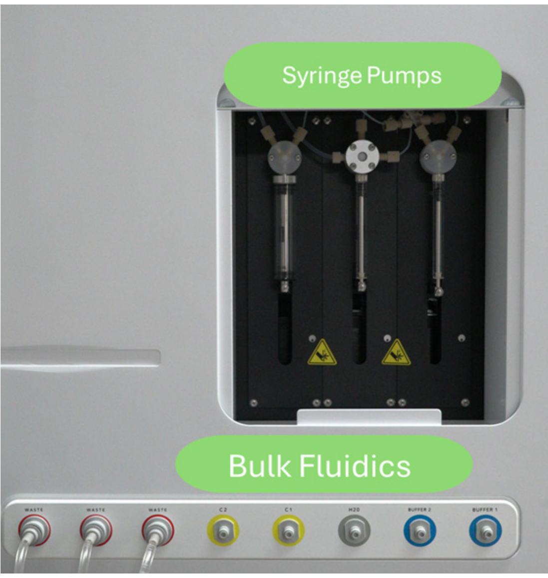
2.4 Disposal

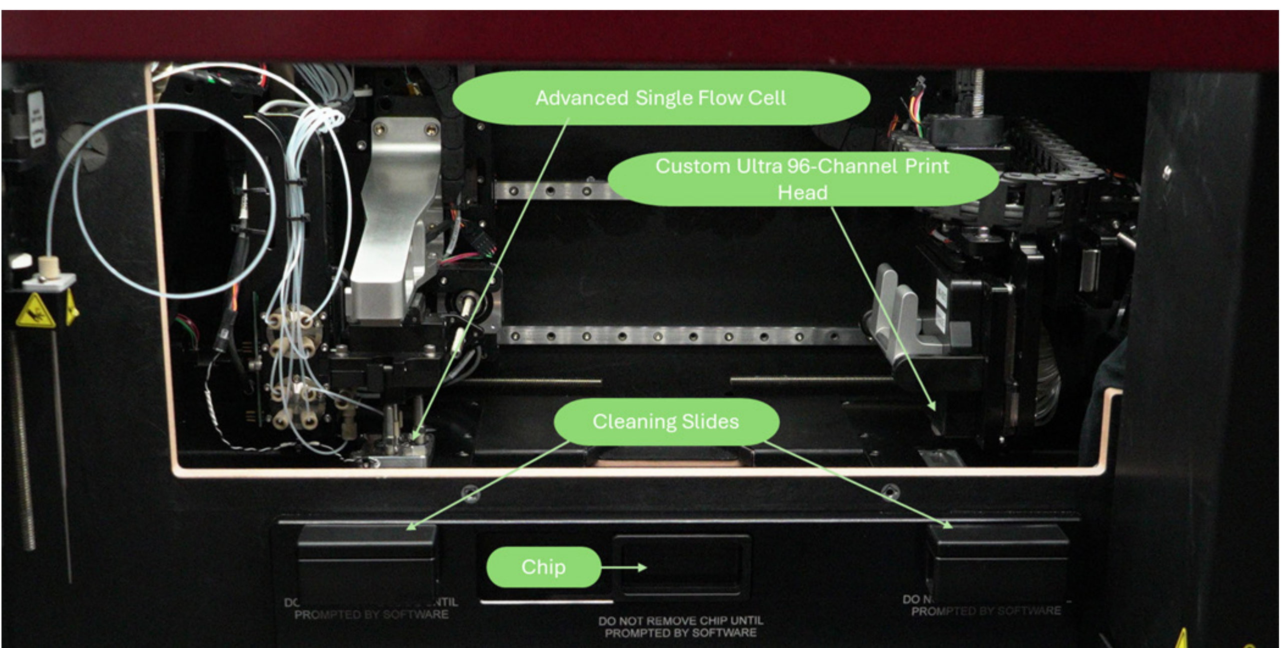
The instrument must be decontaminated before decommissioning. All local laws and regulations must be followed for disposal and recycling of the various materials in Ultra. Electronic waste and electrical equipment must be collected separately and not disposed of as unsorted municipal waste.

3. System Description

3.1 Instrument Components

Ultra has two fluidic systems: 1) Multichannel (MC), and 2) Single Channel (SC). Each fluidic system is comprised of its own pumps, sample decks, reagent inlets, autosamplers, and cleaning stations.





3.2 Fluidic Systems

3.2.1 Cleaning Slides

A cleaning slide holder is located on the left and right sides of the instrument. When removing the slides, ensure that the instrument status reads Instrument Idle, confirming that both the Advanced Single Flow Cell (aSFC) and Custom Ultra 96-Channel Print Head (cPH) are undocked from the cleaning slides. Hold the slide-holder handle (black) and gently pull straight toward the body. Rinse a fresh 1.2 mm glass slide with water and isopropanol to eliminate dust and glass particles. Wipe with lint free wipes or lens paper and insert it into the slot, making sure to push the holder all the way in. Use re-cleaned or new cleaning slides each time before priming the flow cells on the cleaning slides. This avoids salt and contaminate build up on the interface of the aSFC and cPH.

3.2.2 Bulk Fluidics Reagents

System fluids are supplied to Ultra through a 5-port bulkhead located on the left side of the instrument. This bulkhead is connected via tubing to bottles for system buffers, 18 MΩ filtered water, and cleaning solutions. Three additional bulkhead ports are used to send waste fluids to the waste container located beneath the instrument. Chosen caps should restrict dust from entering the solutions and be vented to prevent pressure changes as fluid volume changes during operation.

3.2.3 Multichannel Fluidics

The multichannel (MC) fluidics path is principally comprised of the cPH that, when pressed against the sensor chip, creates 96 discrete channels. Each channel is linked, through peristaltic pumps, to one of 96-needles in an autosampler that can draw samples from microplates in Bays 3, 4, and 5 on the right-hand sample deck. During MC sample delivery, samples are drawn into fluidics and exposed to the chip surface using a back and forth motion, allowing for delivery of 96 samples with extended contact time using 200 µL of each sample.

3.2.4 Single Channel Fluidics

The single channel (SC) fluidics path is principally comprised of the aSFC. When docked against the sensor surface, the aSFC creates a single large flow cell that covers all the ROIs simultaneously. Samples are drawn from Bays 1 & 2 and passed over all ROIs. Each analyte injection uses 180 µL of sample. Analyte sample flows back and forth across the chip surface during an injection, enabling long contact times at high flow rates.

3.3 Temperature Control

3.3.1 Interaction Temperature

The temperature at the chip surface is referred to as the interaction temperature. The interaction temperature may be set from 10 °C to 40 °C in the Navigator software. Experiments will not start (unless specifically overridden by the user) until the actual temperature is equilibrated to within 2 °C of the set temperature.

3.3.2 Sample Deck Temperature

The temperature of the sample decks is referred to as the sample deck temperature. The sample decks can be set from 10 °C to 20 °C (Although it should not be set below the dew point to avoid excessive condensation.) An experiment will start even if the sample deck has not achieved the set temperature in the program.

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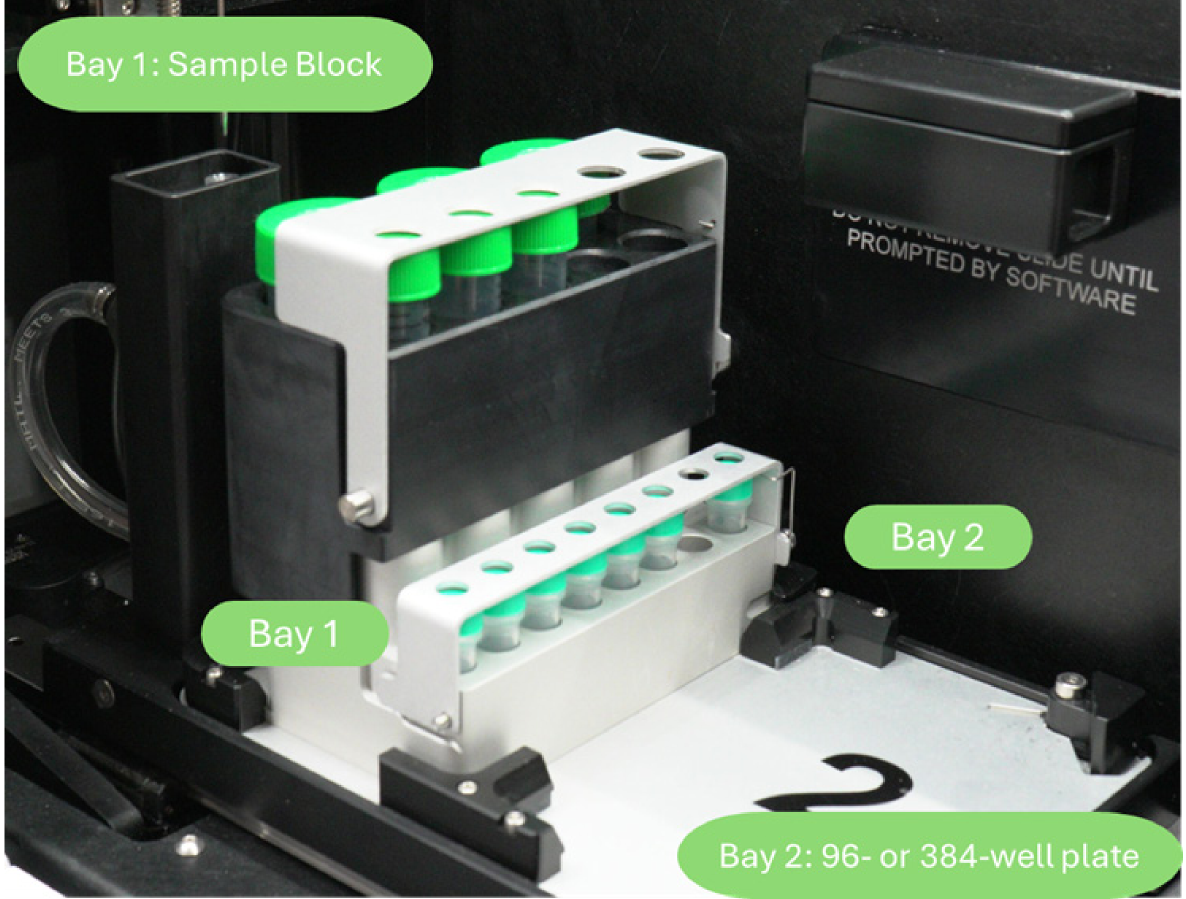
3.4 Sample Handling

Ultra provides two sample decks, one on the left side for the SC fluidics and one on the right for the MC fluidics. The SC side has two bays numbered 1 & 2, and the MC side has three bays numbered 3, 4, & 5.



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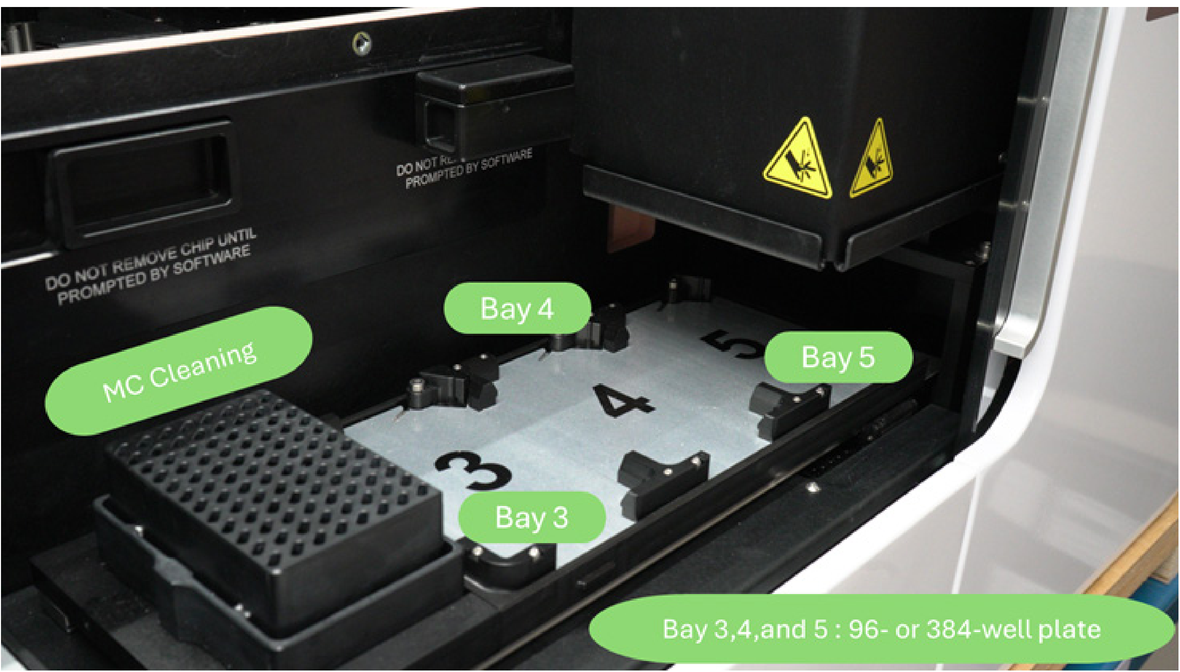

All sample bays can hold 96- and 384-well microplates. Only Carterra-approved microplates should be used. To minimize sample evaporation over extended runs, it is recommended to use well plate covers.

Bay 1 on the SC side can accept the reagent sample block. It can hold up to 3 x 50 mL conical tubes, 5 x 15 mL conical tubes, and 8 x 1.5 mL vials. The required consumables table lists the approved labware for use with Ultra.

Each sample deck has a cleaning station. The MC cleaning station has a removable block that can be rinsed with 18 MΩ water only if salt buildup is present. See section 6.2 for the cleaning procedures. The SC cleaning station should not be removed for cleaning. If salt buildup is observed in or around the SC cleaning station, please contact Customer Support.

3.5 Surface Plasmon Resonance Signal Detection and Processing

Inside Ultra, molecular interactions are interrogated in real-time using surface plasmon resonance detection technology. Plasmons are electromagnetic surface waves induced in thin-film metals when illuminated at the total internal reflectance (TIR) angle. Plasmon resonance results in a narrow dip in the intensity of the reflected light at the SPR angle. Small changes in refractive index near the metal surface alter the SPR angle. When docked to a microfluidic flow cell, samples can be delivered to the surface by the fluidics subsystems. Binding partners can be attached to the sensor surface (ligands) and allowed to interact with molecules passed over the surface (analytes). Whenever ligand and analyte molecules bind, the accumulation of mass near the surface changes the SPR angle. The continuously monitored changes of this angle are converted to “Response Units” (RUs) and reported as a function of time.

Ultra divides a sensor chip into 192 regions of interest and monitors them simultaneously. For the highest quality data, Carterra recommends using up to 96 ROIs to contain ligand molecules while the other 96 serve as references whose response will be subtracted from the ligand regions during data reduction.

Ultra’s light source is a near-infrared laser. The laser is reflected off a piezoelectric mirror that directs the beam in a rapid scanning pattern across the ROIs on the chip and at different angles. The light is recorded by a high-speed camera and directed to the computer through two video interlink cables. The segmentation and integration of the intensity over a range of angles allows for defining the SPR curve and its interpretation as RU. It is recommended that users do not run other programs on the computer during data collection to allow sufficient computational resources to handle the high-bandwidth data stream and its processing.

3.6 System Software

3.6.1 Navigator (Control Software)

The Navigator control software enables Ultra operation, acquires real-time data, and guides the user through the customization of provided wizards to configure and execute assays. Navigator is comprised of both the client software (GUI interface) and the Navigator server. Navigator generates results files that end with .sprdata.

3.6.2 Data Analysis Software

Carterra provides software packages for the analysis of data collected with Ultra.

The Kinetics Analysis Software opens any .sprdata file and provides tools for viewing any kind of experiment, and specifically for fitting for kinetic affinity, equilibrium affinity, collecting report points, quantitation, statistical data summaries, etc. Data analyzed with Kinetics will be saved as .kitx files.

The Carterra Epitope Analysis software is tailor-made for handling all the workflows related to Epitope mapping/binning, mutant mapping, and peptide mapping. Data analyzed with Epitope will be saved as .ebp files.

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4. Operation

4.1 Starting the System

Power on the instrument using the main switch on the rear top center panel. Once the machine has powered on, start up the control computer and start Navigator.

4.2 Navigator Pages and Related Actions

Down the left side of the dashboard is a series of functional buttons that direct the user to further instrument functionality.

My Dashboard	Page with access to all the features available in the software.
Experiment Wizard	Page for the experiment that is currently being designed/opened.
Experiment Manager	Page with a list of all the user-created and saved Wizards containing customized run parameters.
Experiment Runner	Page to review and check the planned experiment and see data collection while the experiment is running.
Chip Manager	Page for chip management.
Cleaning & Maintenance	Page for instrument maintenance, cleaning, and support.

4.2.1 My Dashboard

Upon opening Navigator, the user is presented with the My Dashboard page. This window is divided into several sections, each of which is described in more detail below.

1. **Banner:** The banner across the top of the window provides important status and alert information to the user.

   a. **Instrument name and current state:** The left side of the banner contains the name of the instrument and a status message describing the instrument's status. If a red hourglass is present, the user is being asked to wait for an action to be completed. A green hourglass means the instrument is idle and the user can initiate an action.

   b. The right side of the banner is **the status of the instrument's thermals and sensor chip**. The on/off status indicates if thermal control is active or inactive for the interaction temperature (thermometer icon) and the sample decks (indicated by the plate icon). If the thermal system is on, a temperature value is displayed in green if the system is at or near the set temperature and red if it has not yet achieved the set temperature. If the thermal system is off, it will display "Off". The user can type in a number for the desired temperature and press the green arrow to set the new temperature. Temperature control can be stopped by pressing the red circle with the white square in it. To the right is an icon indicating if a chip is docked or not and the type of chip (if currently docked).

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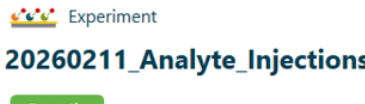
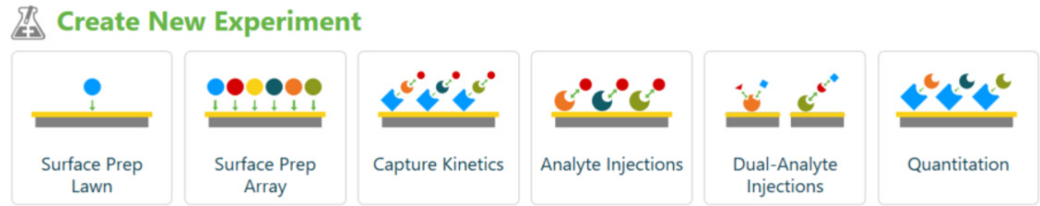
2. If the instrument is currently running, the "**Running Experiment**" section will list the details. Clicking the "Details" button will take the user to the Experiment runner tab.



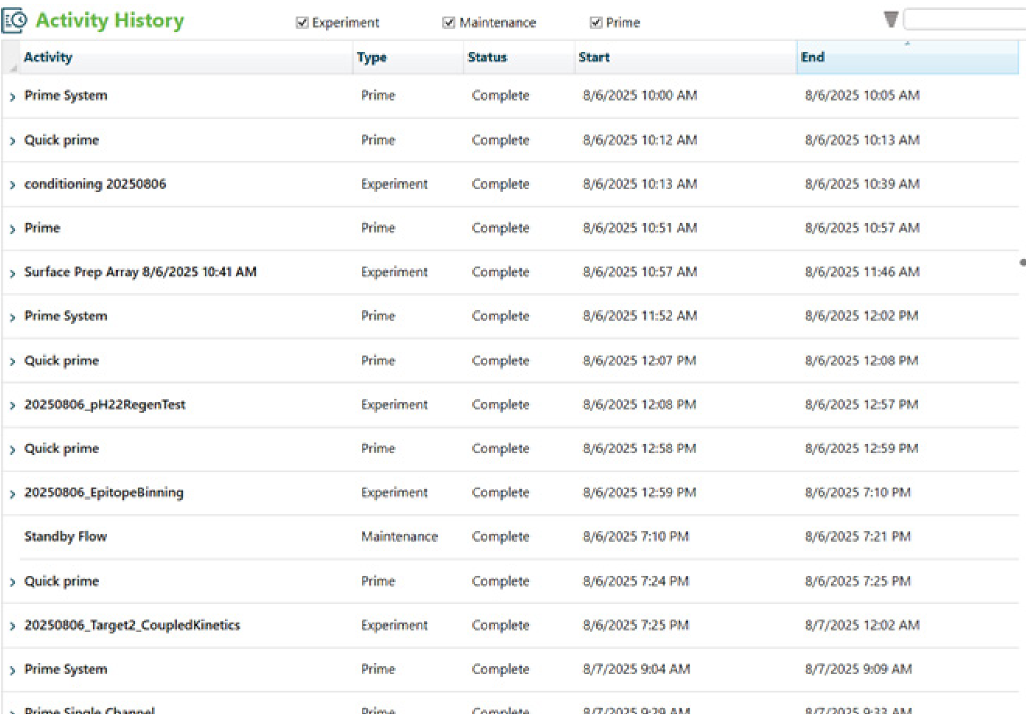
Type **Analyte Injections**
Chip **20260211_CMDP_Chip (CMDP)**
Start **2/11/2026 11:50 AM**

Estimated End Time
2/11/2026 12:00 PM

3. The "**Create New Experiment**" panel contains wizards covering the full experimental functionality of Ultra. Clicking on each one takes the user to that wizard and the user can begin designing the experiments.



4. **Activity History:** Allows the user to review all tasks Ultra has carried out recently, including wizards run, cleaning procedures, and primes. The list is searchable using the text box on the top right of the panel.



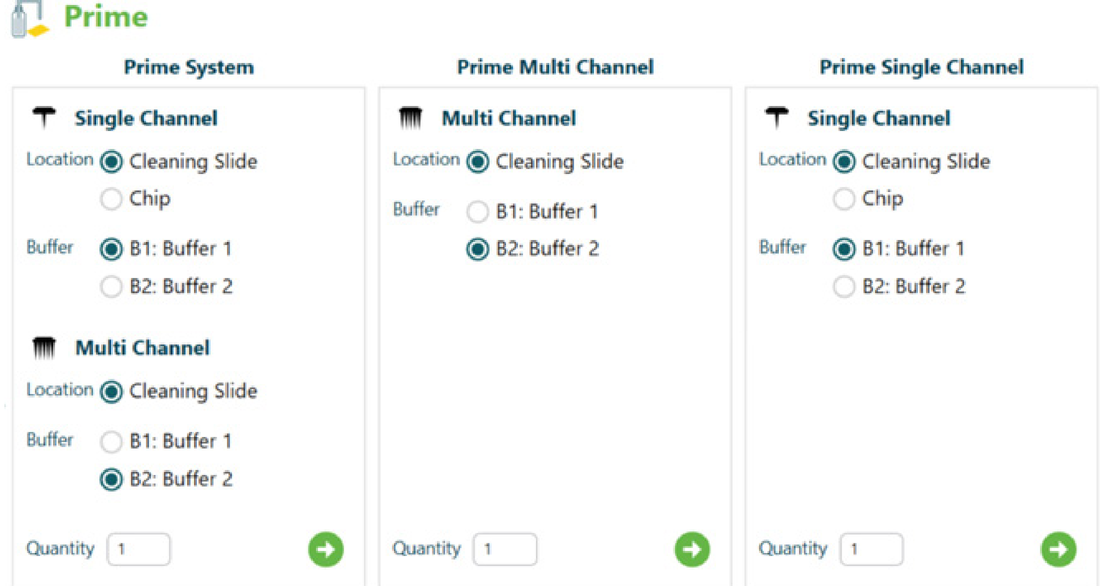
Activity History ☑ Experiment ☑ Maintenance ☑ Prime

Activity	Type	Status	Start	End
Prime System	Prime	Complete	8/6/2025 10:00 AM	8/6/2025 10:05 AM
Quick prime	Prime	Complete	8/6/2025 10:12 AM	8/6/2025 10:13 AM
conditioning 20250806	Experiment	Complete	8/6/2025 10:13 AM	8/6/2025 10:39 AM
Prime	Prime	Complete	8/6/2025 10:51 AM	8/6/2025 10:57 AM
Surface Prep Array 8/6/2025 10:41 AM	Experiment	Complete	8/6/2025 10:57 AM	8/6/2025 11:46 AM
Prime System	Prime	Complete	8/6/2025 11:52 AM	8/6/2025 12:02 PM
Quick prime	Prime	Complete	8/6/2025 12:07 PM	8/6/2025 12:08 PM
20250806_pH22RegenTest	Experiment	Complete	8/6/2025 12:08 PM	8/6/2025 12:57 PM
Quick prime	Prime	Complete	8/6/2025 12:58 PM	8/6/2025 12:59 PM
20250806_EpitopeBinning	Experiment	Complete	8/6/2025 12:59 PM	8/6/2025 7:10 PM
Standby Flow	Maintenance	Complete	8/6/2025 7:10 PM	8/6/2025 7:21 PM
Quick prime	Prime	Complete	8/6/2025 7:24 PM	8/6/2025 7:25 PM
20250806_Target2_CoupledKinetics	Experiment	Complete	8/6/2025 7:25 PM	8/7/2025 12:02 AM
Prime System	Prime	Complete	8/7/2025 9:04 AM	8/7/2025 9:09 AM
Prime Single Channel	Prime	Complete	8/7/2025 9:29 AM	8/7/2025 9:33 AM

5. **Standby Mode on Chip:** Start instrument standby by pressing the green button with the right arrow in it. This will direct Ultra to cycle buffer through the SC fluidics to prevent drying out of the liquid path or the chip.

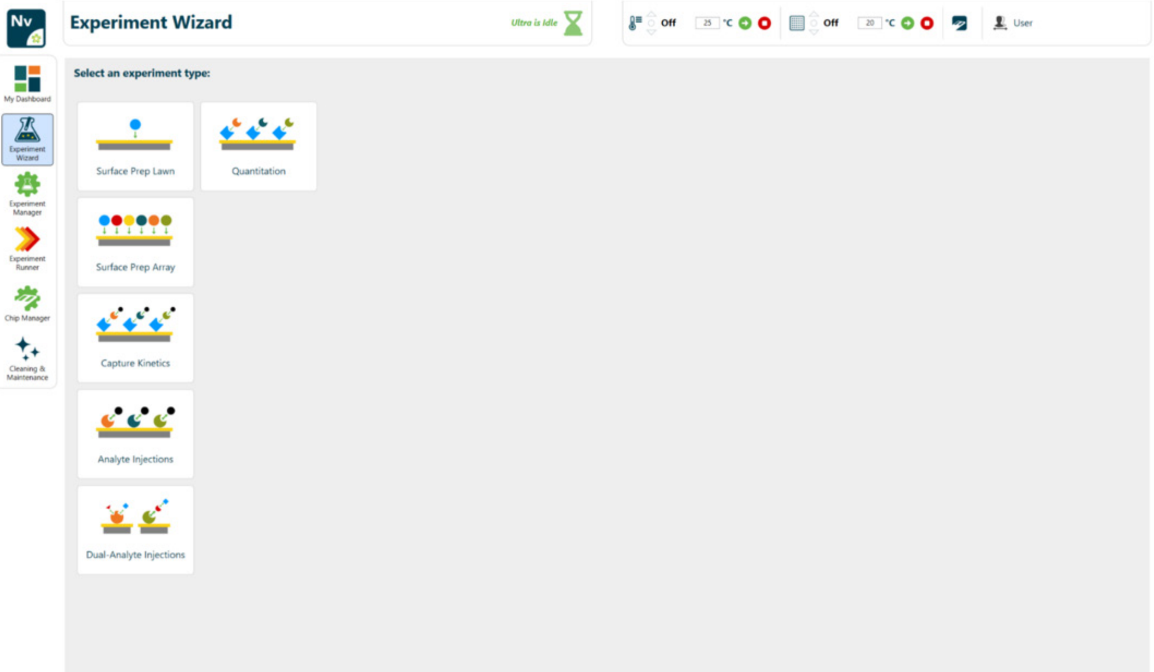
6. **Prime:** Ultra provides multiple priming options to prepare the instrument with running buffer before setup and experiments. Ultra supports two running buffers (B1 and B2). Each fluidic side (SC and MC) can be primed simultaneously or separately with B1 or B2 as selected in this tab. Priming can be performed on cleaning slides, which enables buffer exchange without wetting a chip. If a chip is docked and in use and the user wishes to prime the SC system without the chip drying out, they can select prime on chip.

The Prime section includes three panels to prime both sides, SC only or MC only. For each selection, choose B1 or B2 and whether to prime on chip or on the cleaning slide, and specify the number of prime cycles. The MC side will always prime on its cleaning slide; the SC side may be primed on either the cleaning slide or the chip.



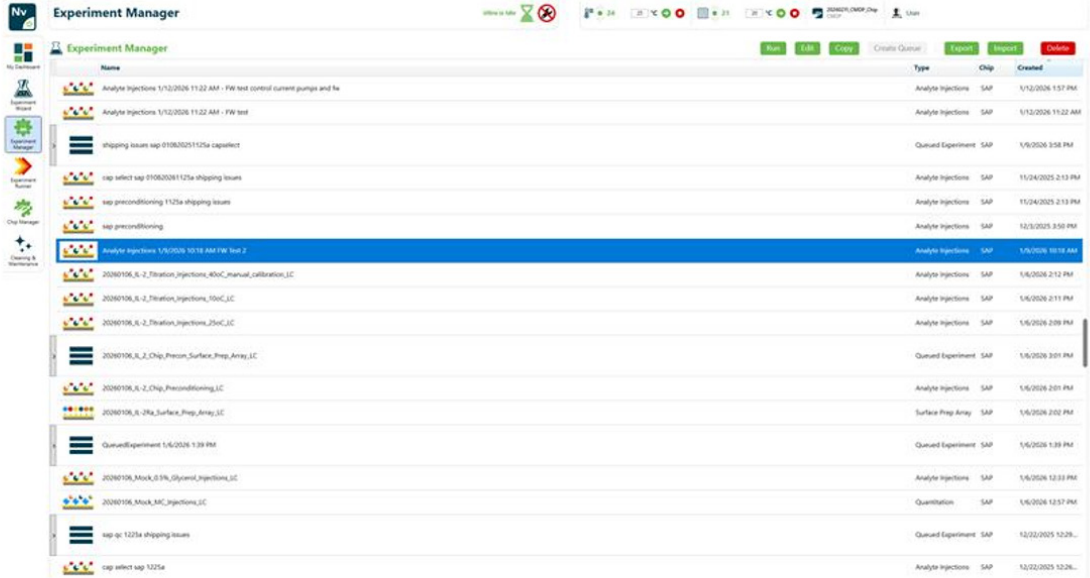
4.2.2 Experiment Wizard

This opens the experiment currently being created or edited. The user can configure a wizard while another program is running. For configuration details, see Chapter 5.



4.2.3 Experiment Manager

The Experiment Manager lists all user-created and saved wizards (experiments). From this menu, the user can run, edit, copy, export the experiment .cice file, import .cice files, delete experiments, and create queues. The list also displays the wizard type, selected chip, and creation date.



To edit an experiment, select it from the list and click Edit . This opens the Experiment Wizard where the user can modify run parameters, samples, and other settings. Carterra recommends saving any modified experiment with a new file name.

The Create Queue feature runs a group of experiments sequentially to increase unattended operation. Up to six experiments can be queued. The first experiment in the queue sets the interaction temperature and chip type for the entire queue. Conflicts are reported in the Validation window.

To create a queue, open Experiment Manager from the left task bar. Select the experiments to queue:

- Hold Ctrl and click to select non-adjacent experiments, or
- Hold Shift and click the first and last experiments to select a continuous range.

Click Create Queue to open the Create Queue window. Arrange experiments in the desired order, select intermediate priming options, review validation results, and click Run Queue to start the run.

Navigator validates each wizard before sending it to the Experiment Runner. For queued runs, Ultra evaluates the entire queue to estimate run time, sample usage, and buffer usage.

Example to create a queue: a three-experiment queue in which a 96-array is created using Surface Preparation Array, followed by kinetics and epitope binning using Analyte Injections and Dual-Analyte Injections, respectively.

1. Create the Surface Preparation Array experiment

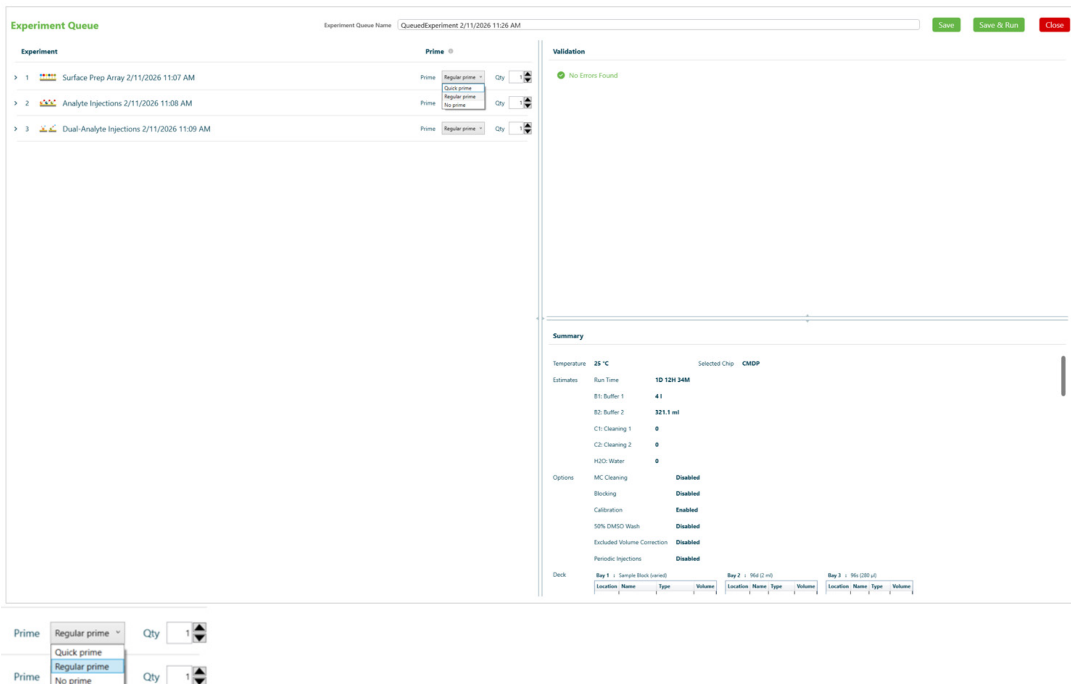
2. Create the Analyte Injections experiment

3. Create the Dual Analyte Injections experiment

4. On the Experiment Manager page, select the 3 experiments.

Create Queue

5. Review the queue for validation, experiment order, and select the type of intermediary primes. (A quick or regular prime will always be applied at the start of the queued experiment; intermediary primes are performed in addition to these primes.)

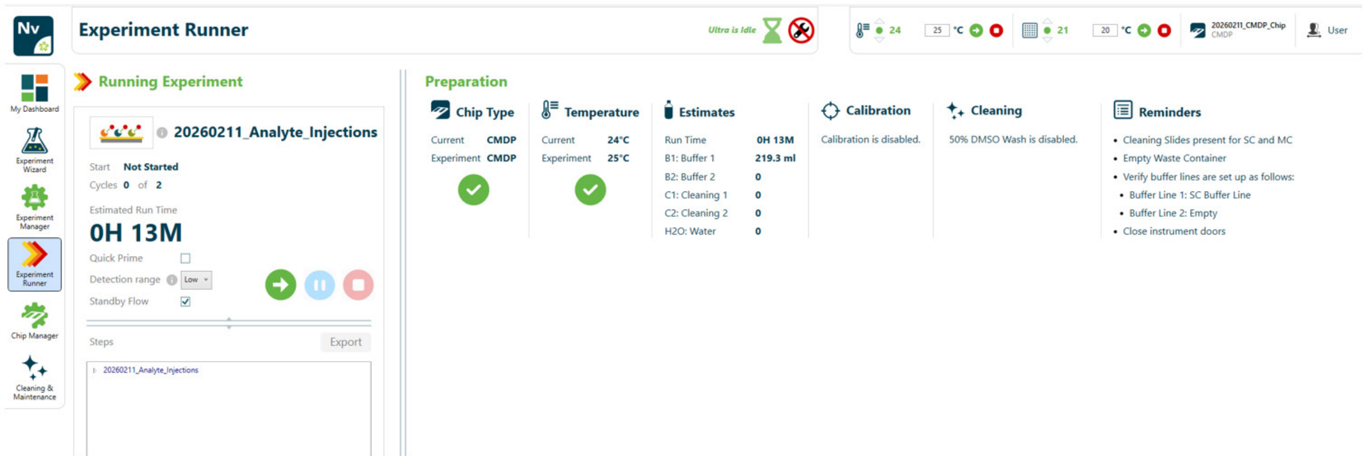


6. Save or Save & Run Queue.

Experiment Queue Name | QueuedExperiment 2/10/2026 11:38 AM | Save | Save & Run

4.2.4 Experiment Runner

Before an experiment begins, Navigator opens the Experiment Runner, where the user performs a final review of the planned experiment, including estimated run time and final reminders.



The top banner shows the current instrument status, current temperature, and chip status.

In the left panel, the user can select a Regular Prime (full prime) or enable Quick Prime. Quick Prime uses less buffer and is approximately one minute faster than a full Prime. A prime is required before every run and cannot be bypassed.

The user can also enable Standby Flow after the experiment is completed. Carterra recommends using Standby Flow between runs.

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Before starting a run, the user must set the Detection Range. This setting is based on the experiment baseline response and depends on chip type, solvent components, and coupling density. The available settings, Low, Medium, High, and Very High, correspond to increasing baseline response. Guidance for selecting the correct range is available by hovering over the Detection Range setting.

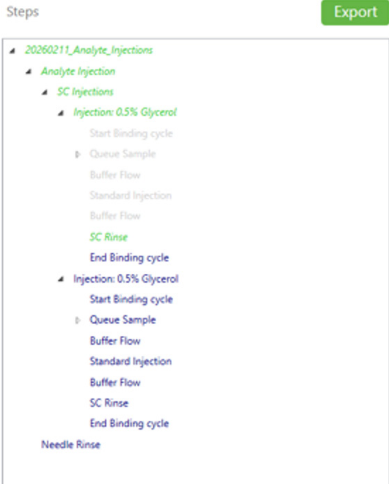
The right panel is the Preparation panel. See Section 5.4 for details.

After all required settings are configured, start the experiment by clicking the green arrow .

During an experiment, the Experiment Runner displays real-time information, including data from all 192 ROIs (updated every second), chip type, temperature, elapsed and estimated run time, and reminders.

Once the run starts, this window updates to show the run end time instead of an estimated run time as well as the current cycle number and total cycles.

The Steps text box displays cycle information. Click the triangle icons to expand details for each cycle. Expanding the current cycle lists all actions executed in that cycle and highlights the action in progress. Selecting previous cycle updates the sensorgram display on the right to show data collected during that cycle.



The large panel in the lower-right of the Experiment Runner displays real-time data from all 192 ROIs. To zoom, click and drag from the upper-left to the lower-right of the region of interest. To reset zoom, click and drag from the lower-right to the upper-left anywhere on the plot.

This window also provides tools to simplify viewing during a run. By default, Ultra assigns the 96 ROIs in Array Group A as Ligands and the 96 ROIs in Array Group B as References; ROIs in each group are numbered 01–96. Use the Ligands and References toggles to show or hide each group. Use Show All and Hide All to quickly adjust visibility.

Function of other buttons in Experiment Runner:

Button	Function
Clear ligands	Caution: This button clears the ligand information for the current chip. Subsequent data files will not include ligand information unless you perform a new ligand deposition. Use this button only when necessary.
	This button resets the zoom. It will reset the window to the standard viewing window centered on the collected data after being zoomed in or out.
	This button shows/hides the Y-align bar. The Y-align bar should be set during the baseline injections.
	This button zeroes the whole set of sensorgrams to the location of the y-align bar by applying the Y-align function.
	Use this button to subtract the default reference array (Array Group B) from the default ligand array (Array Group A).
	This button enables/disables scrolling. Scrolling refers to the viewing window moving the view to capture the data currently being collected in the experiment. If you want to zoom in or out on a specific part of the sensorgram while the experiment is running, it is advised to disable scrolling.
	This button enables/disables the gridlines in the viewing window.

4.2.5 Chip Manager

In the Chip Manager page, the user can (1) load a new chip, (2) reload a previously used chip, or (3) unload a chip. To load a new chip, enter the Name, Serial Number, and Chip Type; Comments are optional. The chip table tracks the number of times each chip has been loaded. Although chips can be reused on Ultra, Carterra recommends using a new chip for each experiment to maintain the highest data quality.

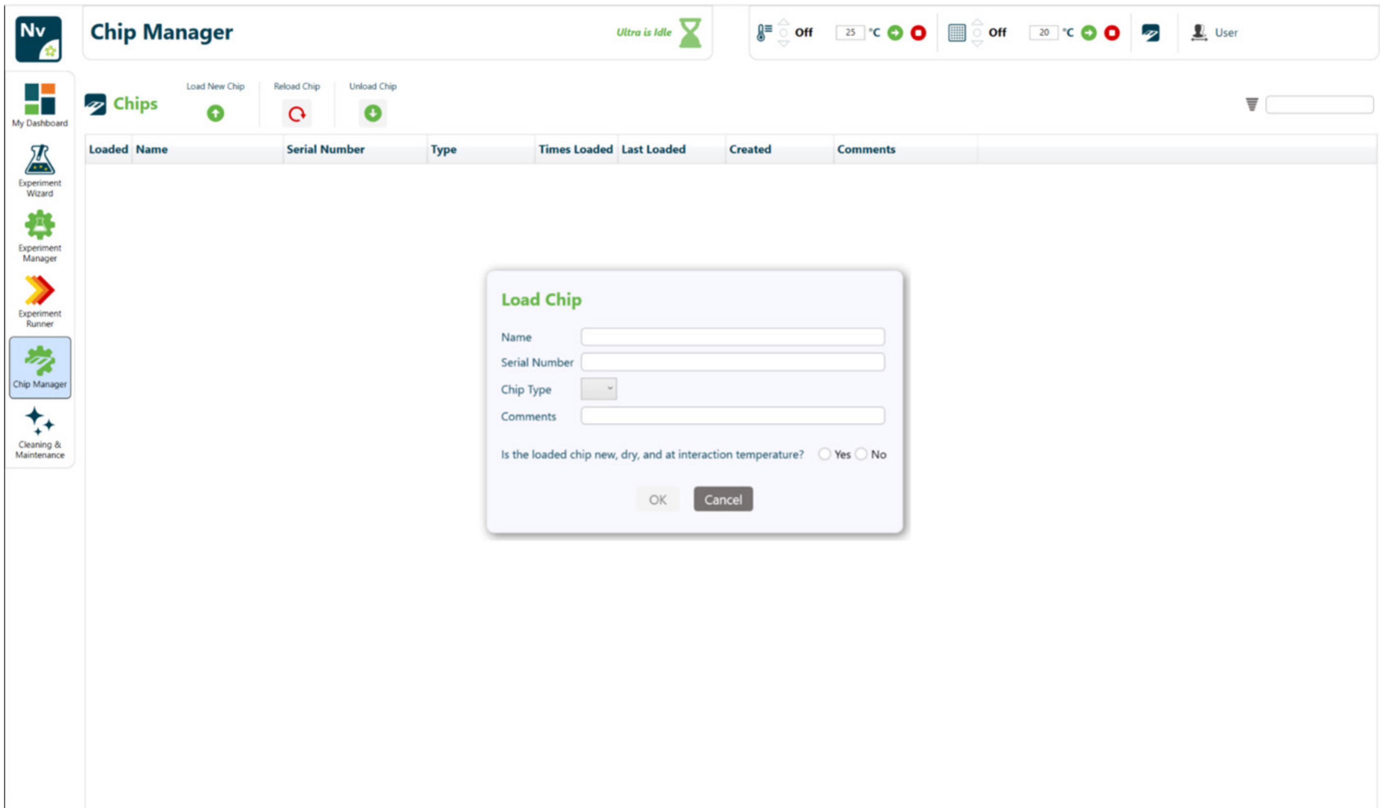
To load a new chip, remove the chip from the freezer and allow it to warm to room temperature for 30 minutes to prevent condensation on the optics during loading. If an old chip is loaded, click "Unload Chip".

Unload Chip

Slide the chip door completely to the left, firmly grip the old chip, and pull it straight out of the instrument. Once the previous chip has been removed, open the new chip. The carrier sits inside a transparent plastic cylinder that suspends the assembly, so the prism and chip do not touch the container during shipping. Grab the chip and gently squeeze the top and bottom of the cylinder to release the chip and pull it straight out of the packaging, taking care not to touch or scratch any of the optical components. Slide the chip cover door completely to the left if closed and align the edge of the chip with the grooves in Ultra's housing. Slowly slide the chip all the way into the instrument. The user will feel a small 'bump' as it reaches the back. Make sure to push past this bump to completely and firmly seat the chip. Close the chip door completely to the right.

Wait 30 minutes after placing the chip for it to equilibrate to the instrument temperature. Once thermal equilibration is achieved, click "Load New Chip":

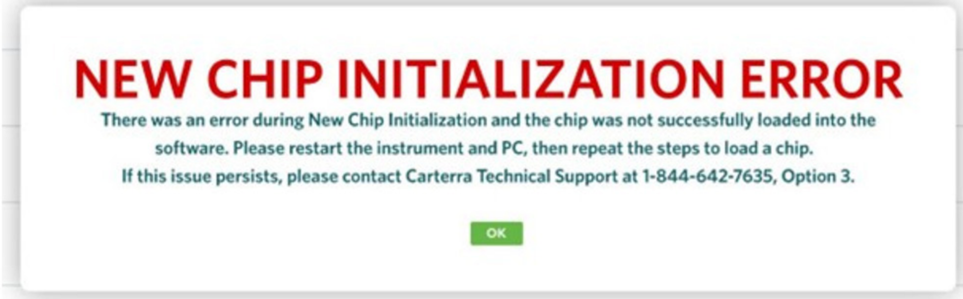
Load New Chip



The "Load New Chip" dialogue will appear, and the user can enter the chip name, serial number, comments, and select the chip type from the pull-down menu. Carterra highly recommends filling in a unique name, selecting the correct chip type, and entering the serial number. The load chip dialogue also asks whether the chip is new, dry, and at the interaction temperature. If the user can answer yes to all these questions and clicks the OK button, Ultra will perform a chip normalization procedure that provides for a uniform signal across the entire chip surface. Ultra performs this using the chip/air interface so no additional solutions or injections are required. This step can only be performed once, when the chip is new, dry, and at thermal equilibrium.

If your chip is being reused, select "No' to the question about the chip being new, dry, and thermally equilibrated. This will skip the normalization procedure, which could introduce artifacts into the optical correction if the chip surface is no longer uniform.

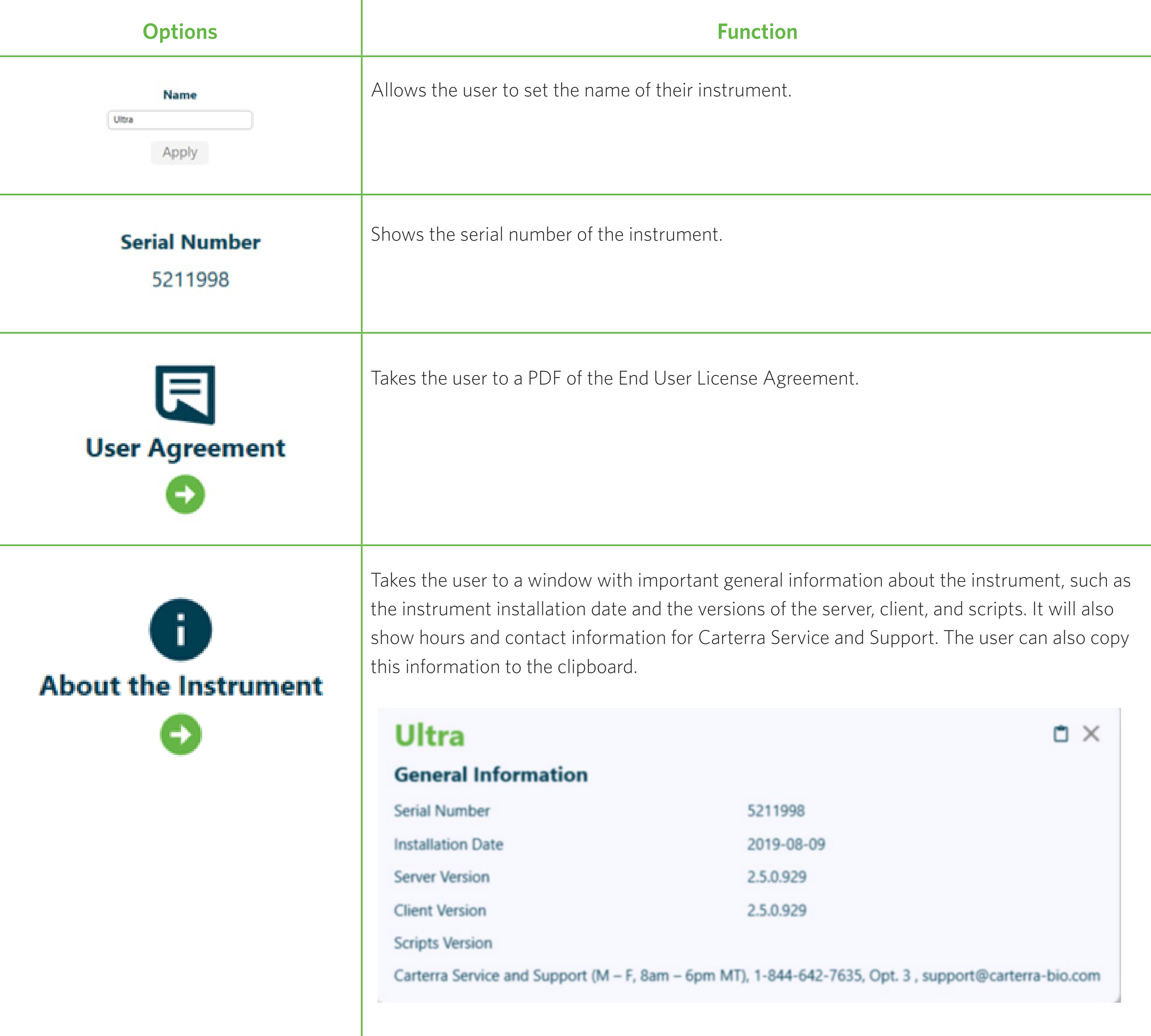
If there are issues during docking/normalizing of a chip, a warning will appear as shown below. If an error occurs, please retry the procedure one time. If the problem persists, please contact Customer Support.



4.2.6 Cleaning & Maintenance

The cleaning & Maintenance page contains functions for instrument management, cleaning, and support:

Instrument:



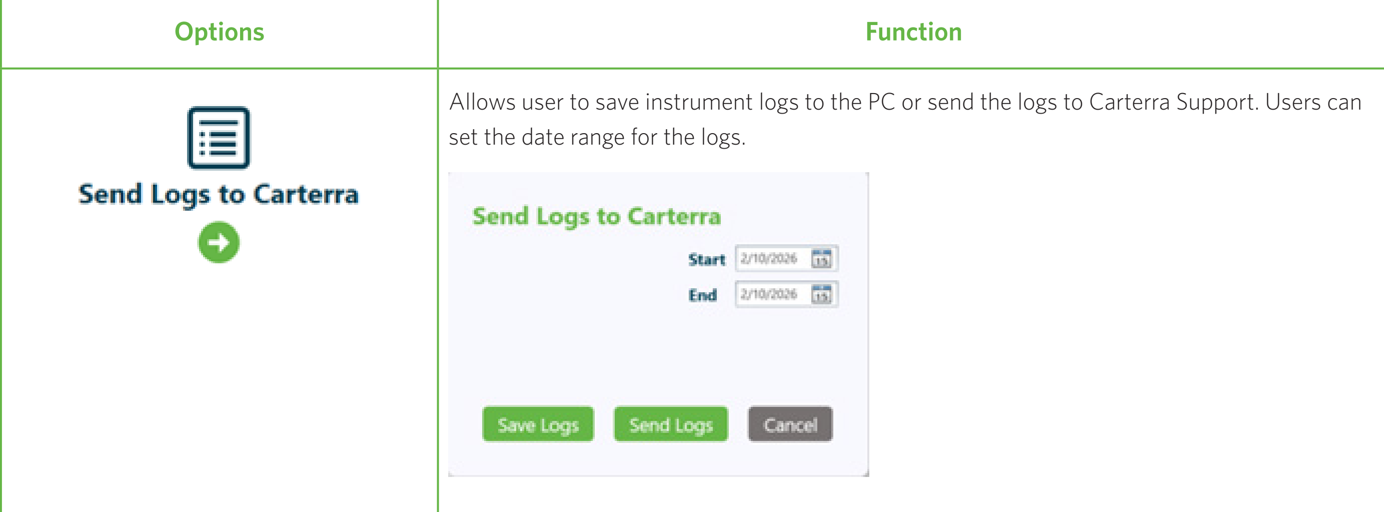
Options	Function
Name Ultra Apply	Allows the user to set the name of their instrument.
Serial Number 5211998	Shows the serial number of the instrument.
User Agreement	Takes the user to a PDF of the End User License Agreement.
About the Instrument	Takes the user to a window with important general information about the instrument, such as the instrument installation date and the versions of the server, client, and scripts. It will also show hours and contact information for Carterra Service and Support. The user can also copy this information to the clipboard. Ultra General Information Serial Number 5211998 Installation Date 2019-08-09 Server Version 2.5.0.929 Client Version 2.5.0.929 Scripts Version Carterra Service and Support (M – F, 8am – 6pm MT), 1-844-642-7635, Opt. 3 , support@carterra-bio.com

Cleaning:

Options	Function
Clean	The Clean procedure flows 3% Contrad, followed by a water rinse, through the internal fluidics of Ultra.
Sanitize	The Sanitize procedure flows 3% Contrad, water, 0.1% sodium hypochlorite, and one final water rinse through the internal fluidics of Ultra.
Sanitize + Sleep	The Sanitize + Sleep completes the same cleaning procedure as Sanitize but finishes by airing out the fluidic lines of Ultra. This only needs to be performed when there is an extended period of time in which Ultra will not be used.
Clean Waste Trays	The MC cleaning station (Waste Tray) can be accessed through the maintenance page for cleaning. Typically, these only need to be cleaned if residue buildup is apparent. The user can clean the MC cleaning station on their own using this function if they see build up. The waste station should be cleaned with distilled water. If there is visible residue build up on the SC waste station, customers should contact Carterra support to schedule a maintenance visit.
Bottle Line Flush	Flushes water followed by air through the buffer, water, and cleaning lines (B1, B2, H_2O, C1, and C2).

Logs:

Options	Function
Send Logs to Carterra	Allows user to save instrument logs to the PC or send the logs to Carterra Support. Users can set the date range for the logs.



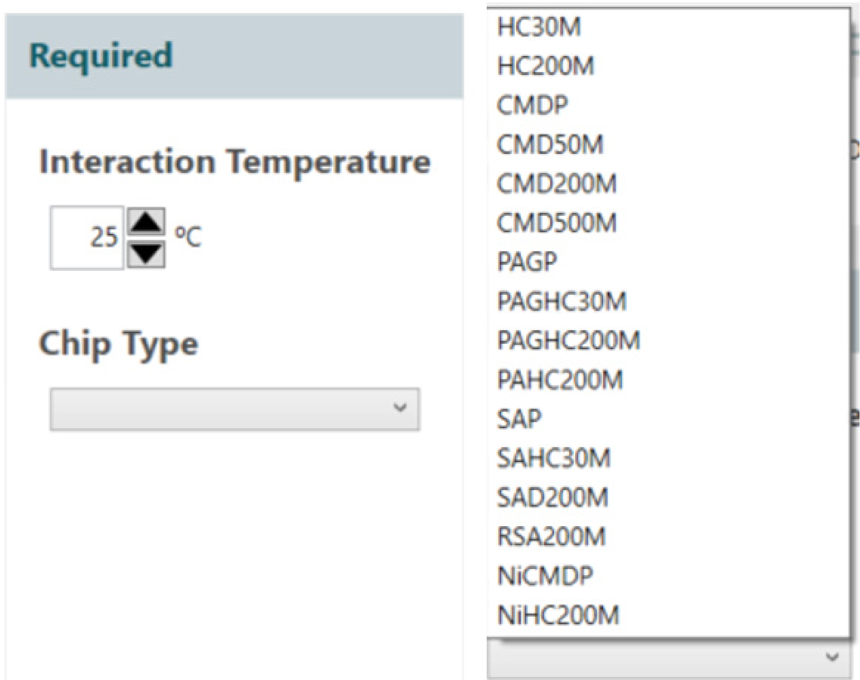
5. Creating and Running an Experiment

Building a method in the Navigator software is a simple process that starts with selecting the experiment type and navigating through a guided Wizard. Many of the same options are available for each experiment type and will be covered first. Later sections will cover the specific considerations for each Wizard option.

5.1 Common Setup Tabs

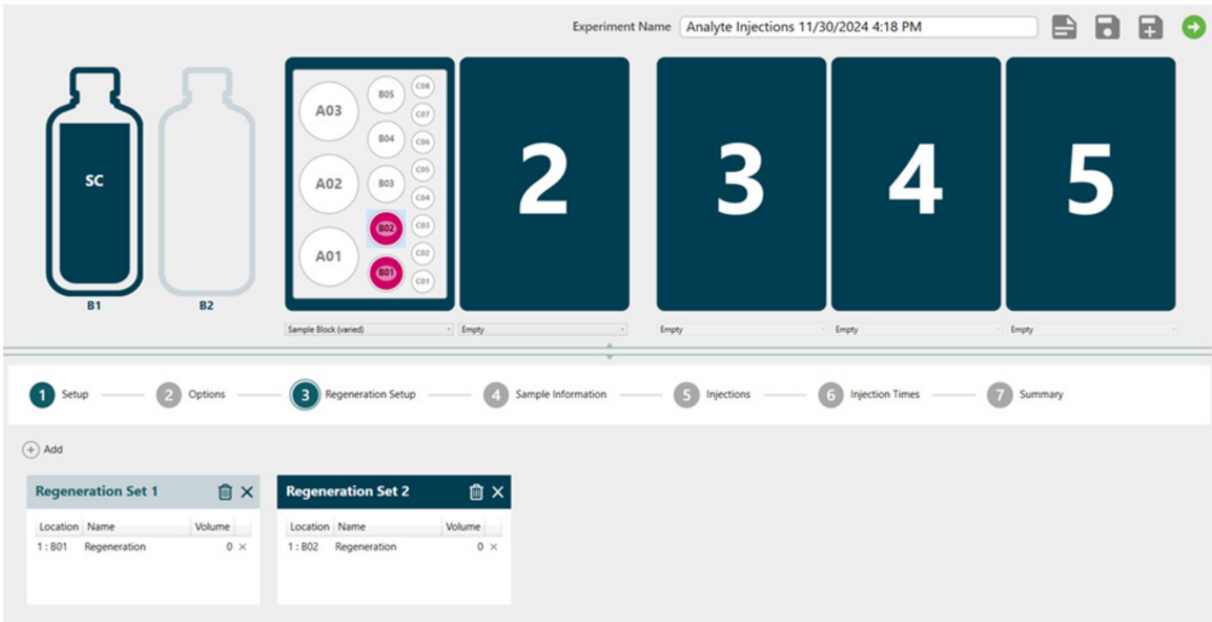
5.1.1 Interaction Temperature and Chip Type

The user must set the interaction temperature (enter a value or use the up/down controls) and select the chip type (from the drop-down list) in each wizard on the Setup tab. The chip type should match the chip type that will be loaded for the experiment.

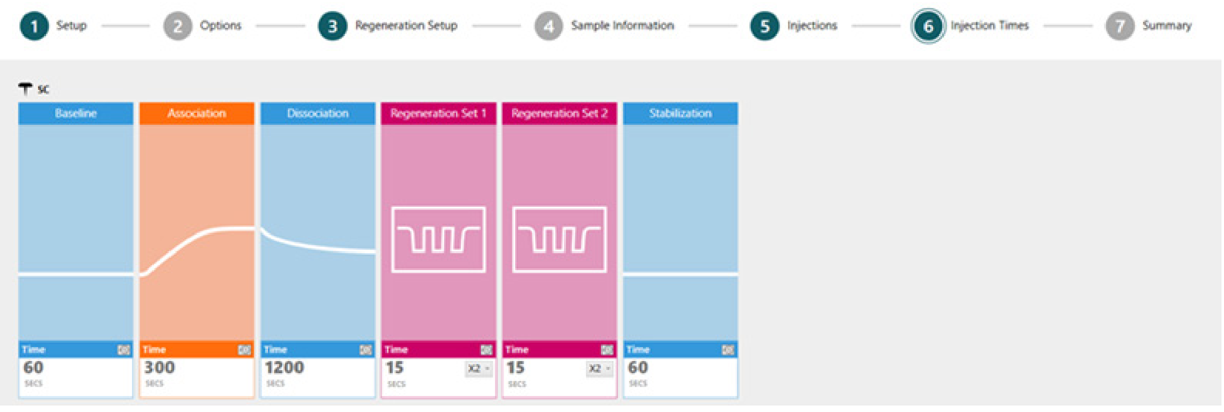


5.1.2 Regeneration Setup

Some analyte/ligand interactions do not fully dissociate and may require regeneration before subsequent analysis. To facilitate their separation, Ultra can inject regeneration solutions using the aSFC. These solutions may contain high/low pH buffers, higher salinity salts, additives, competitors, etc., alone or in combination, that facilitate the removal of the analyte from the ligand without damaging the ligand material.



In the Regeneration Setup tab, click the (+) Add button to add the first regeneration set. Multiple regeneration sets can be added in cases where several sequential regeneration solutions are needed. Populate the regeneration solution location by clicking on the regeneration set and then the position in the reagent block. Additional vials or wells assigned within a region set will be treated as additional volume capacity, with Ultra injecting the number of times a full piece of labware will allow before incrementing to the next tube (380 µL of regeneration reagent is required per regeneration set, the maximum number of regenerations per labware [independent of pulse count] is 3 for a 1.5 mL vial, 39 for a 15 mL vial, 131 for a 50 mL vial, and 5 for a well in a 2 mL plate.). Regenerations from additional sets add a separate regeneration step to each cycle. In the injection times section, the contact time and number of pulses (1, 2, or 3) can be set separately for each regeneration set.



5.1.3 Sample Information

In the sample information tab, the user needs to specify the name, location/bay, and type of tube or plate for each sample in the experiment. The user also has the option to include additional information about the samples such as concentration, molecular weight, refractivity, or molecular volume. There is also a column for any other notes that the user might want to include. All the sample information added in Navigator will automatically be transferred to the .sprdata file produced by the experiment. It is best practice to include as much information as possible in this step.

The sample information tab makes use of both the interactive sample deck layout cartoon and the interactive written sample deck layout:

1/2) Buffer Bottles and Lines: the bottles (1) are a visual indication of how many buffers are needed for the experiment and which side of the instrument the buffer will be delivered to. Buffer and buffer line positions can be selected from the buffer box (2).

3/4) Bay 1 Sample Block: Bay 1 can only be accessed by the aSFC. Bay 1 will usually contain the sample block to hold samples in tubes. Positions A01 to A03 allow for 50 mL Septa cap tubes. Positions B01 to B05 allow for 15 mL Septa cap tubes. Positions C01 to C08 allow for 1.5 mL Septa cap tubes. Some wizards allow for the sample block in bay 1 to be switched out for a plate if desired by the user. Depending on the wizard and options the user has selected, some of the sample names will autofill. These sample names can be changed/edited.

5) Sample Names/Information Options: All Bays have the following options for adding sample names and information.

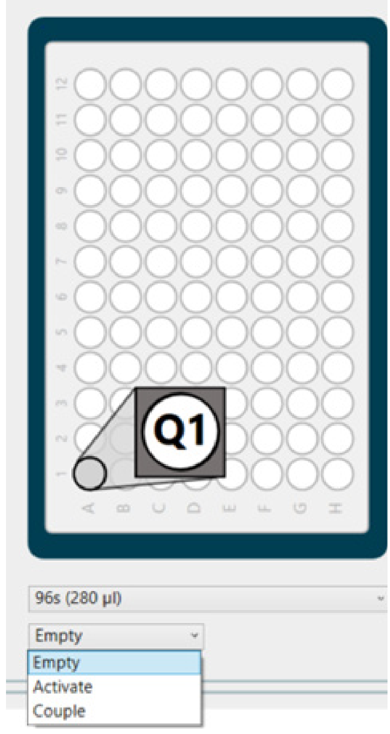
Button	Function
	Fill empty wells with Default well ID: this button will populate all empty sample names with the default bay/position (i.e. Sample Block location A01 will populate as 1A01).
	Copy sample information in template format to the clipboard: this button copies the sample information template to clipboard, which can then be pasted and edited in a spreadsheet. While sample names and information can be added directly in Navigator, this is an easy way to edit full plates of sample information all at once.
	Paste sample information from the clipboard in tab delimited format defined by the template: this button allows user to paste sample information from a spreadsheet that has been formatted using the sample information template. When copying and pasting information from another source into Navigator, make sure the column names are also included, or else the paste function will not work and induce an error message.
	Clear sample list: this button will delete all information in the sample list.

While sample information can be typed directly into Navigator, the user is encouraged to use the buttons above to copy the sample information template and edit it in Excel or another spreadsheet.

6-8) Bays: Bays 1 and 2 can only be accessed by the aSFC. Bays 3, 4, and 5 can only be accessed by the cPH. All Bays may have a drop-down menu listing all plate options that can be loaded in these positions (see below).

96s (280 µl)
96d (2 ml)
384d (240 µl)
384xd A (300 µl)
384xd B (400 µl)
Empty

Depending on the experiment, Bays 3, 4, and 5 may have additional drop-down menus. For example, in the Surface Prep Array Wizard, there is an additional drop-down menu below; for this experiment, these options are used to indicate which bays will hold the activation plate or the coupling (ligand) plate.



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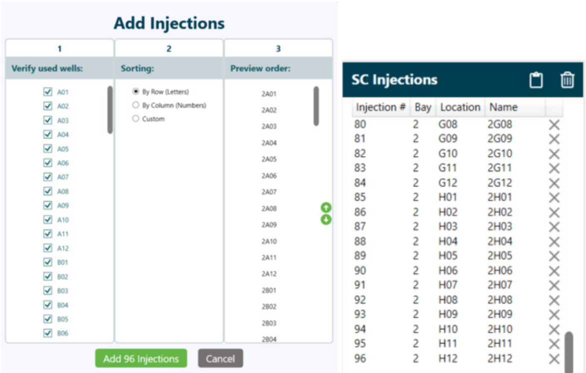
5.1.4 Injections

There are multiple options for injecting named samples in the Injections tab:

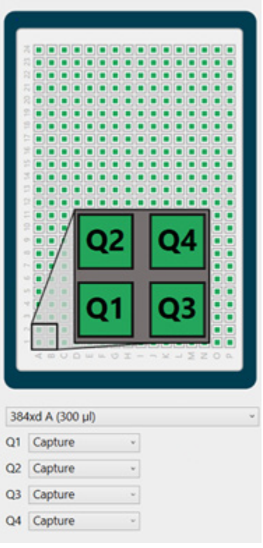
For a single injection, or just a few injections, the user can manually select the injections by clicking on each individual tube or well position. The order in which the injections are selected is how they will populate the injection set list. If an injection is selected in the incorrect order, click the X next to the sample name to delete it from the list. Select the trashcan button [trashcan icon] to delete the entire injection set list. Depending on the volume capacity of the injection location, tubes and wells can be selected for multiple injections.

If many injections are desired, the user can select multiple injections at once by lassoing many wells at once. Once the desired wells have been lassoed, an Add injections window will pop up. There are three columns. Column 1 lists and allows the user to validate all the wells to be used for injections. Column 2 allows the user to sort the injections. By default, the injections will be sorted by row, but the injections can also be sorted by column or by a custom injection list (see below). Column 3 allows the user to preview the order of the injections. Clicking the Add Injections button will populate the injection set.



Additionally, selecting the clipboard button [clipboard icon] in the injection set banner allows the user to paste in a custom injection list created in Excel or Google Sheets. The injection list must be formatted ([Bay] [Location]) to include the template column names.

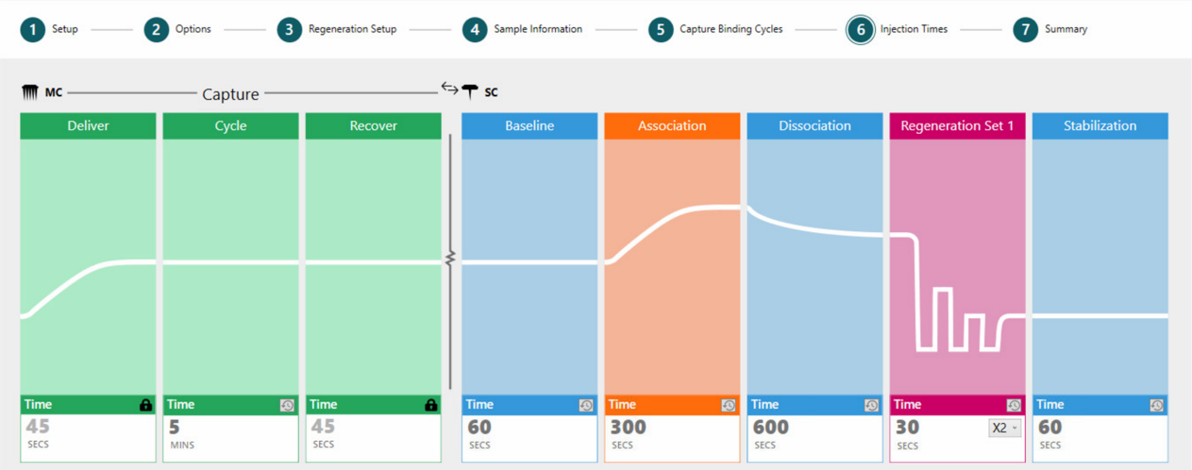
5.1.5 Plate Quadrants



384-well plates can be thought of as having four 96-well plates interlaced to fill the same dimensions. The Ultra's needle array is positioned to center on the wells of a 96-well plate and they can access all the wells of a 384-well plate by addressing the plate in 4 shifted positions. Navigator software refers to these plate positions as quadrants, so a quadrant represents all the positions the 96-needle array can access simultaneously. The quadrant pattern simply skips a well in both the row and columns direction, so wells A01, A03, A05.... C01, C03, C05 are all wells in Quadrant 1. Quadrant 2 starts at well A02, Quadrant 3 starts at B01, and Quadrant 4 starts at B02. 96-well plates are listed as Q1 or quadrant 1, as there is only 1 position for the 96 needles.

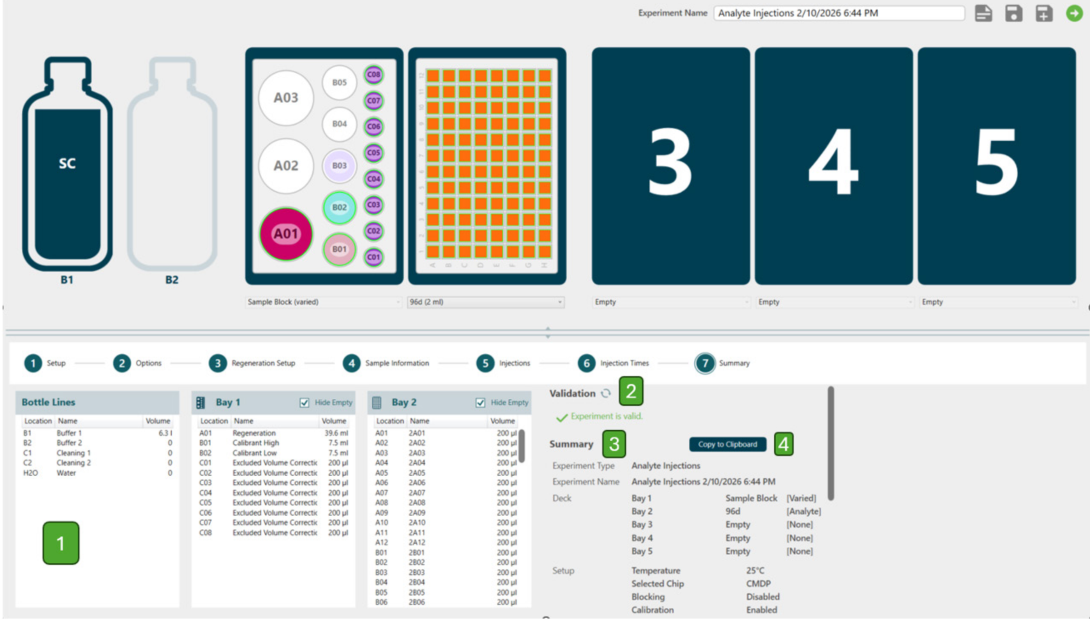
5.1.6 Injection Times

The user can set the time for each phase in a cycle in the injection times tab. Different injection types will be shown depending on the wizard and experiment options the user has selected. For some injections, including regeneration, there is a pulldown (shown below as 2x) indicating the number of times the regeneration pulse will be applied. The side of the instrument from which the injections are coming is specified in the top left corner (SC or MC).



5.1.7 Summary

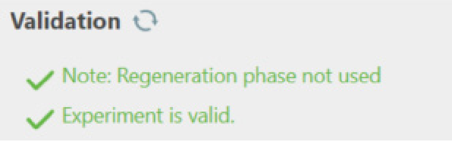
The summary tab summarizes and visually displays all vital experiment information and validates the experiment.



1. **Bottle Lines and Bay Summaries:** This is where a user can double-check which Buffer Lines and Bays are being used in the experiment. It lists the specific location, name, and required volumes of every buffer and sample used in the experiment.

2. **Validation:** If an experiment is valid and ready to run, this section will simply show a green message and check mark to indicate the experiment has been validated.

A green message other than "Experiment is valid" usually indicates that an optional step (such as regeneration) has not been selected for this experiment.

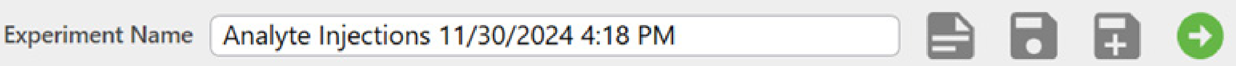


A red error message indicates that the experiment cannot be run until the changes in the message have been made. An orange message indicates that while the experiment can proceed without any changes, it might not run as intended. If changes are made, the validation status can be updated using the refresh button .

3. **Summary:** This is a written summary of the whole experiment, including the experiment type, the experiment name, labware in use, setup information, injection times, and estimates of experiment run time and buffer usage. The estimates section does not account for the time or buffer used during primes prior to the experiment starting. Any changes made to the experiment setup will result in the summary updating to reflect the changes.

4. **Copy to Clipboard button:** Clicking this button will copy all summary information to the clipboard for pasting into a spreadsheet.

5.1.8 Experiment actions



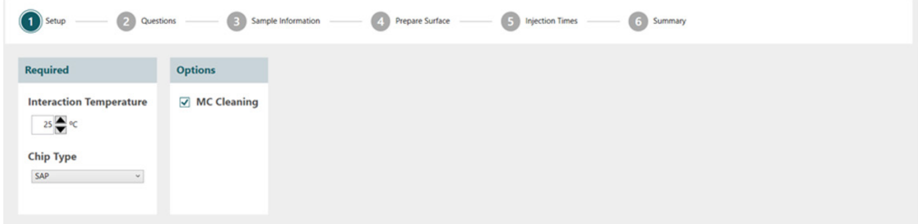
The experiment name is automatically populated based on the experiment wizard used to create the method. The user is encouraged to change the experiment names to include the experiment information. The buttons next to the experiment naming window are described in the table below.

Button	Function
	Show the experiment notes pane: this button will add a notes pane to the right side of all tabs of the experiment wizard.
	Overwrite the current experiment: this button will overwrite any saved changes made to a saved experiment method.
	Save the experiment as a new experiment: this button will save the experiment method as a new experiment in Experiment Manager.
	Send experiment to Experiment Runner: this button will save the experiment method and send it to the experiment runner if the experiment is valid. While hitting this button will save an experiment method, the user is always encouraged to save an experiment using the save/overwrite buttons prior to sending a method to the experiment runner.

5.2 Common Options

5.2.1 MC Cleaning

When available, MC cleaning performs additional cleaning of the multichannel head and fluidics using a solution from the C1 line to minimize sample-to-sample carryover. Enable this option when running MC across multiple cycles, especially when switching between different ligands with high concentrations. MC cleaning can be activated in the Wizard Setup tab. One MC cleaning consumes approximately 150 mL of MC Buffer and 130 mL of C1 Cleaning Buffer and adds about 9 minutes to the run time.



5.2.2 Calibration

In SPR experiments, the change in response is proportional to the change in refractive index of the solutions. However, this response isn't necessarily linear across the instrument's full dynamic range. The calibration procedure in Ultra restores full linearity for all 192 ROIs across the response range sampled by the calibration solutions, regardless of their relative coupling densities.

Ultra needs the user to provide two solutions and an empty mix tube for the calibration procedure. The "High" and "Low" calibrant solutions are comprised of running buffer aliquots whose refractive index is adjusted by the addition of high and low refractive index components to the experimental running buffer. These should be sufficiently high and low to span all the anticipated RI variance of all samples used in the run.

The user provides at least 7.5 mL of each of the high and low calibrant solutions in addition to an empty mix tube. When the calibration is executed, Ultra will draw samples of the high and low solutions in varying ratios, mix them in the mix tube, and inject them through the aSFC. The calibration procedure performs 12 injections, one each for the high and low solution and 10 intermediate mixed solutions. This procedure is the last to execute in an experiment and adds ~45 minutes to the runtime. Example solutions are given below. The below example produces 15 mL of each solution, providing enough for a second run and/or extra solutions for the Excluded Volume Correction procedure (see next section).

It is important that the calibrant series spans the full range of all observed data points throughout the rest of the experiment. If the calibration range was insufficient, prepare additional reagents with an appropriate range and execute an experiment wizard with at least one injection that includes the calibration procedure. The user can import these data into the calibration tab in Kinetics and Epitope.

Example solutions (for 15 mL of solution):

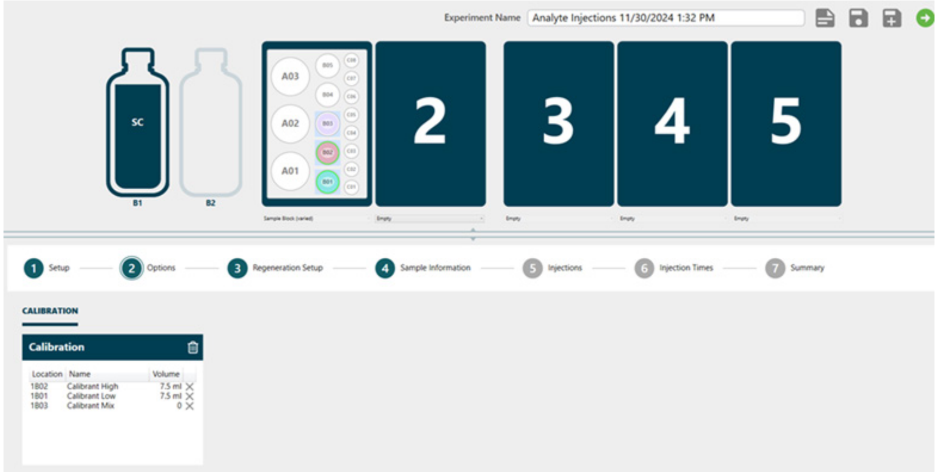
If using a non-DMSO running buffer:
Low RI = 4.5 mL water + 10.5 mL running buffer
High RI = 600 µL DMSO + 14.4 mL running buffer

If using a running buffer with DMSO:
Low RI = 4.5 mL Buffer-DMSO (0% DMSO) + 10.5 mL running buffer with DMSO
High RI = 600 µL DMSO + 14.4 mL running buffer with DMSO (makes a +4% DMSO solution)

Alternatives: +4% glycerol or + 1 M NaCl can be used in place of DMSO.

To perform calibration, check the "Calibration" box in the options menu when it's presented:

This will activate a "Calibration" box in the options menu:



The image above shows the "Options" submenu in a wizard setup. The user should click the calibration tab, then click the image of the sample block to indicate the desired locations for the Calibrant High, Calibrant Low, and Calibrant Mix tubes.

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5.2.3 Excluded Volume Correction (EVC)

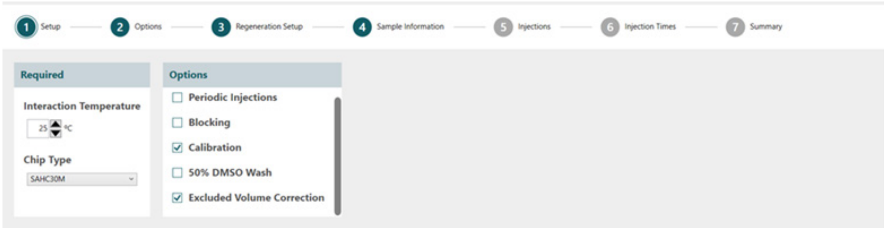
EVC corrects the difference in refractive index (RI) shift that arises between experimental and reference surfaces. This difference occurs because the deposited ligand material in the Ligand ROIs occupies space within the detection volume that, in the reference ROIs, is occupied by solvent leading to a larger buffer RI response than seen in occupied ligands. The deposited ligand molecules effectively exclude solvent molecules from entering the SPR detection region and therefore the excluded solvent molecules do not impact the bulk RI shift. As a result, ROIs with lower ligand density will show increased observed RI, and this difference in signal is unrelated to any binding event. When a reference ROI is subtracted from a ligand ROI during the referencing step of data processing, a negative signal may be produced if high refractive index buffers are being used and excluded volume correction is not properly applied. The magnitude of this effect is dependent on coupling densities and the degree of mismatch between the solvent components of an analyte solution and the running buffer. Solutions containing high refractive index components, such as DMSO and glycerol, are common examples of buffer systems requiring excluded volume correction. This correction is especially critical when kinetics are weak or absent. Without correction, binding responses and bulk RI shifts can overlap, making it difficult to distinguish genuine interactions from solvent effects.

To apply the EVC correction using Ultra, the user needs to provide a set of solutions spanning the RI range of the analytes in the experiment. For convenience, it is optimal to make 15 mL of the High Calibrant and Low Calibrant solutions (previous section), remove an aliquot, and dilute each 10% with the running buffer. This will ensure that the EVC solutions fall within the calibration range. The user is suggested to prepare at least 7 EVC solutions to construct a proper calibration curve, and the user will need at least 200 µL of each solution. An example for preparing these solutions is below:

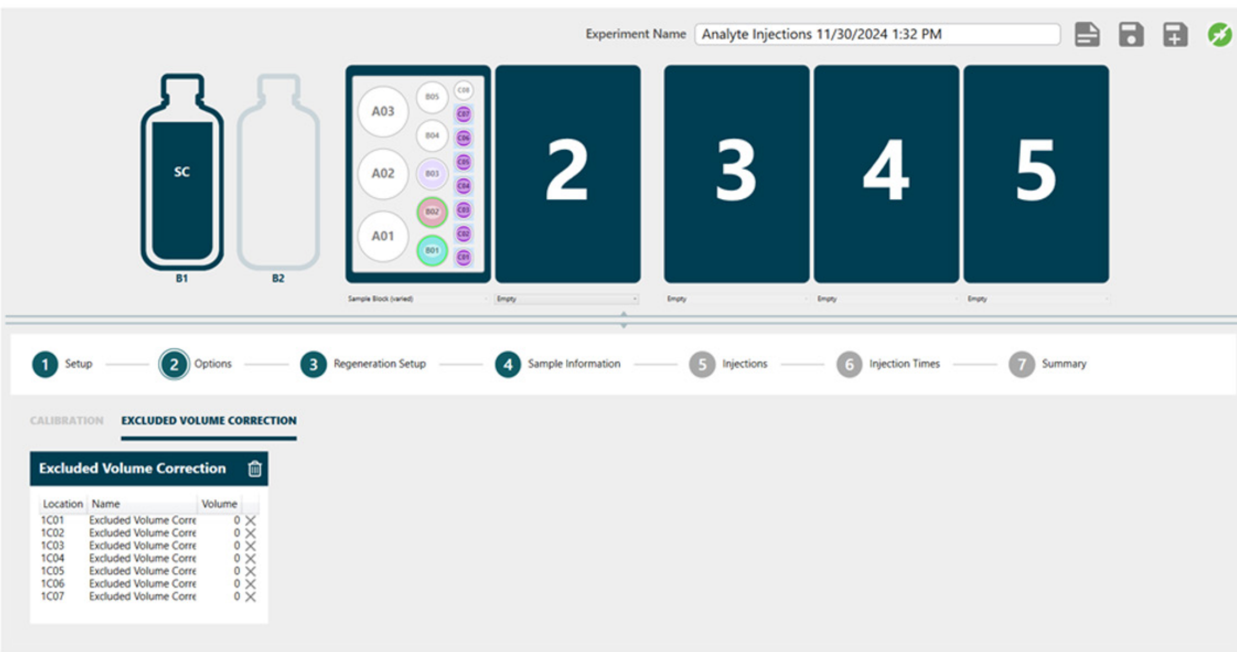
Place 7 labeled 1.5 mL screwcap vials (Simport Scientific #T341-4T and #T347AQX) compatible with the sample block in a holder. In tubes 2-6, place 300 µL of running buffer. In tube 1 place 600 µL of the High RI solution (after 10% dilution), and in tube 7 place 600 µL of the Low RI solution (after dilution). Remove 300 µL of the solution from tube 1 and dilute by thoroughly mixing with the solution in tube 2. Repeat this process by taking 300 µL from tube 2 and mixing with tube 3. Discard the extra 300 µL of solution in tube 3. Then mix 300 µL from tube 7 into tube 6, and then mix 300 µL of tube 6 into tube 5. Leave tube 4 alone as just running buffer and it will represent the zero-correction point when running buffer and EVC solution exactly match.

Analyte injections whose solvent RI falls outside the correction curve cannot be included. If this occurs, rerun the EVC protocol using the same chip and buffers from the prior experiment and a more appropriate range of EVC solutions. A separate EVC curve can be imported into the EVC dialogue in Kinetics and Epitope during data processing. (See the Kinetics and Epitope guides for more details.)

Users have the option to run the Excluded Volume Correction (EVC) by clicking that option in the Wizard Setup Tab as shown below:



When this option is selected, a submenu will appear in the option tab, allowing the user to specify the location and number of EVC solutions:



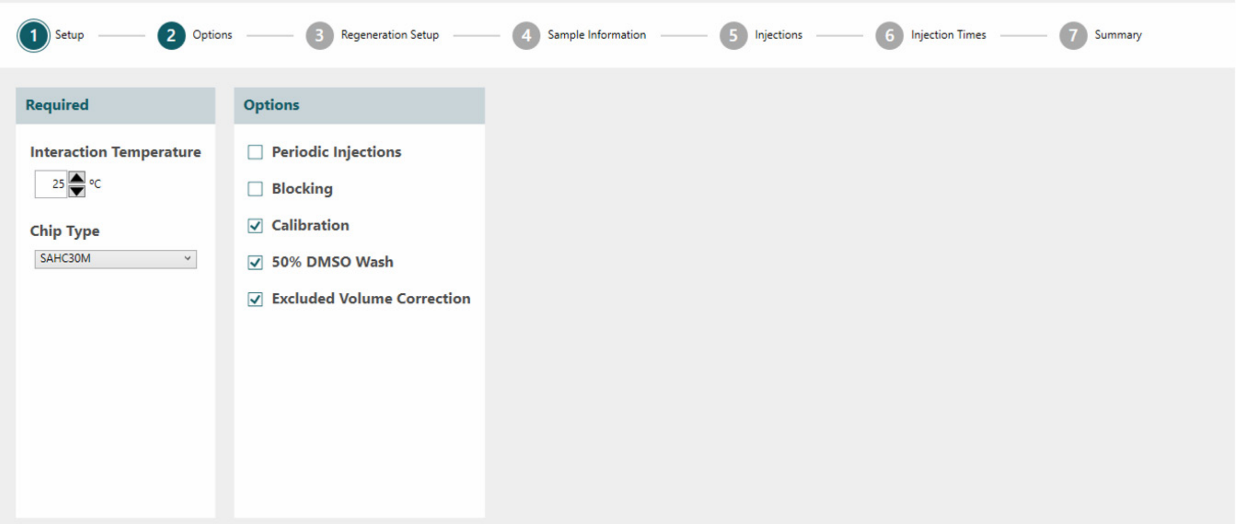
EVC injections must also be included in the Injections tab; otherwise, the EVC solutions won't be injected.

In the above case, seven solutions have been selected and populated into the 1.5 mL tube positions in the sample block. EVC can also be run from a microplate.

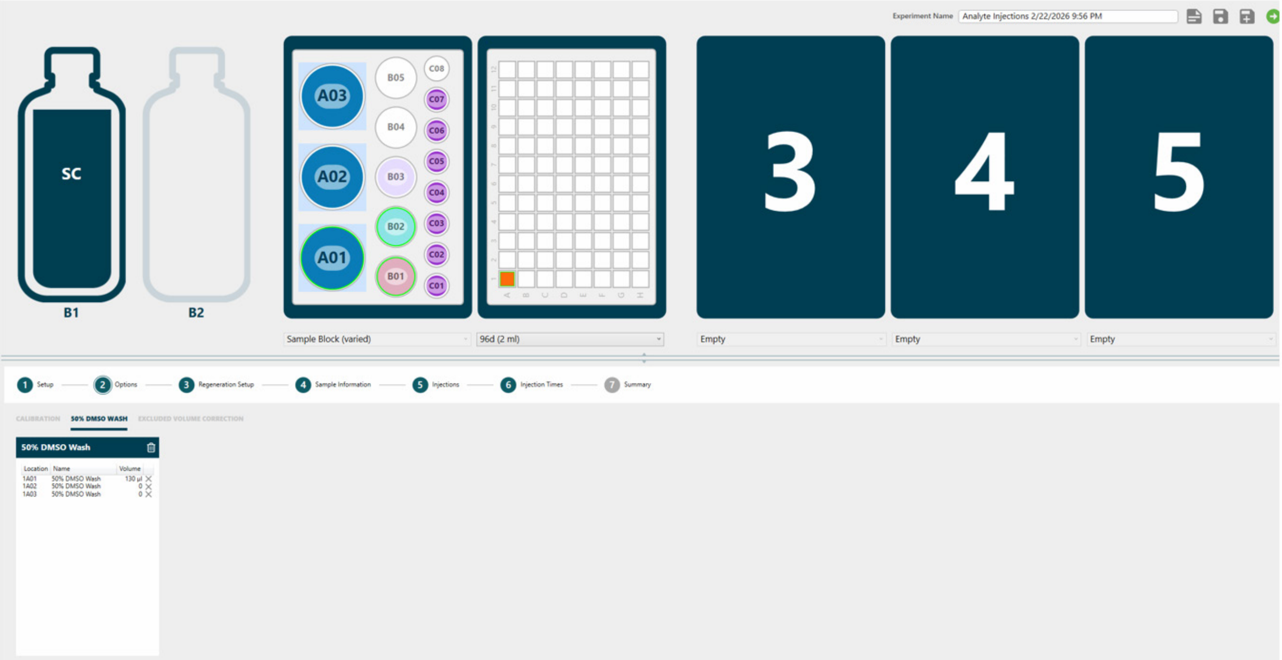
5.2.4 50% DMSO Wash

Ultra offers an extra cleaning procedure utilizing a user-provided cleaning solution. When activated, this procedure rinses the fluidic path of the SC side, excluding the aSFC and chip surface. This allows for a more stringent fluidic wash when the user is likely to encounter analyte carryover from injection to injection, which can cling to fluidic components such as the needle and tubing. The most frequent cleaning solution, especially in small-molecule work, is a 50% solution of DMSO. It is recommended to prepare this solution by mixing equal parts 100% DMSO with high purity water. Each cycle requires 130 µL of 50% DMSO, which adds approximately 2 minutes to the run time.

To activate the wash, check the 50% DMSO Wash box when available in Wizard Setup:

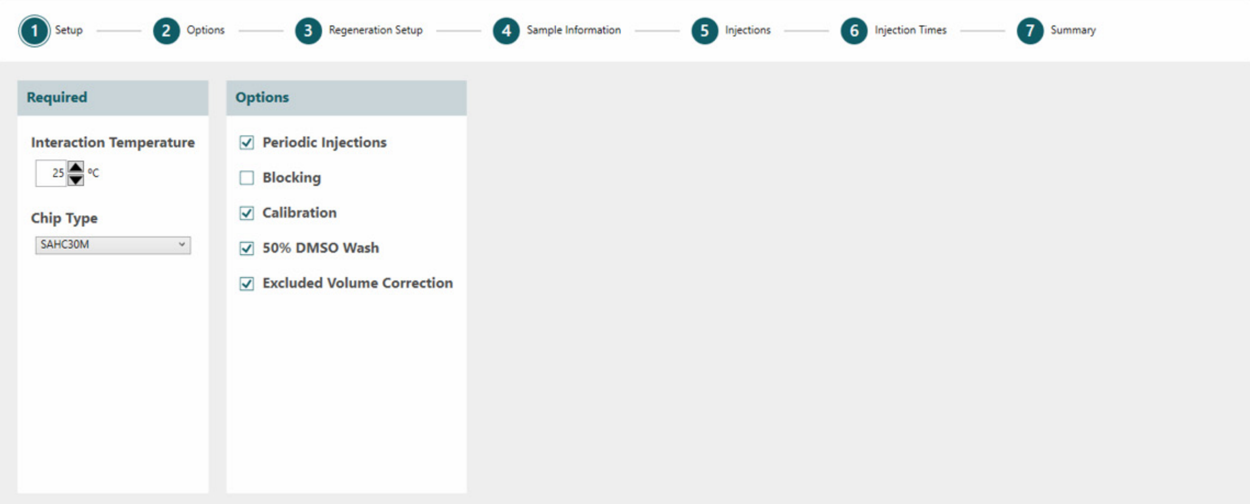


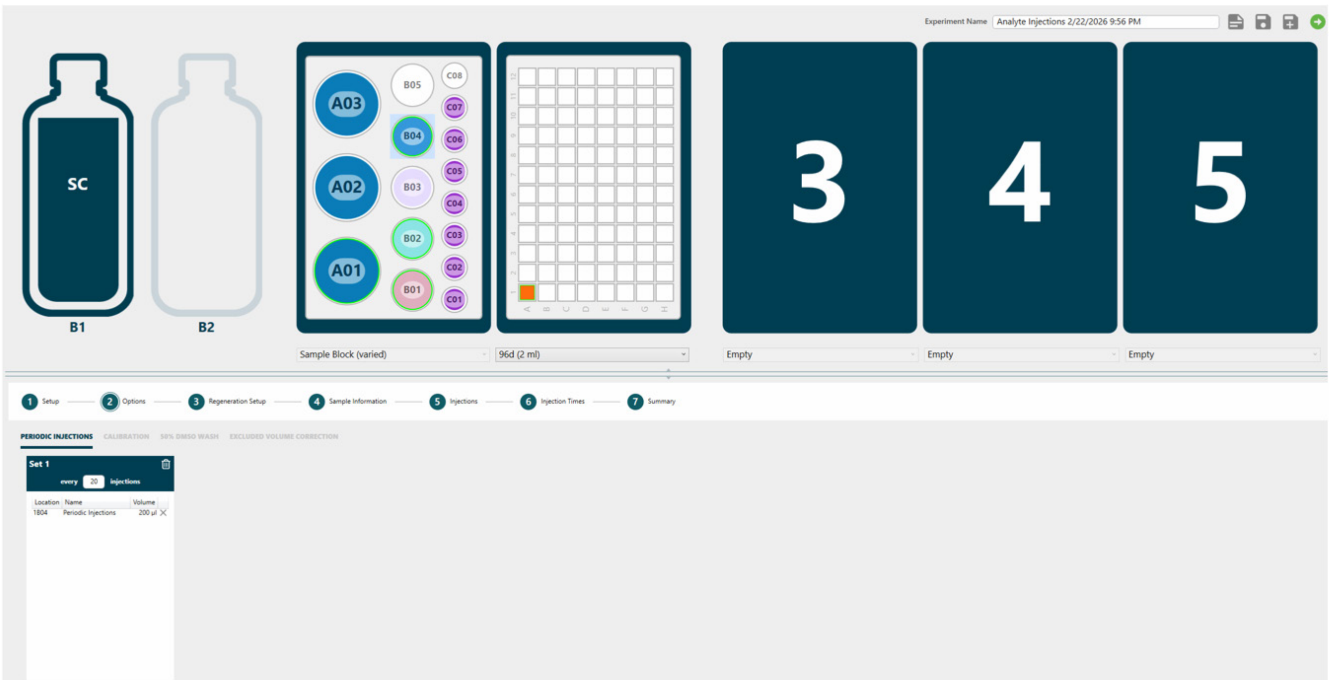
The wash solutions are drawn from tubes in the reagent rack. The locations can be specified in the Wizard Options tab. (In this example, all three 50 mL conical positions have been assigned as 50% DMSO wash.)



5.2.5 Periodic Injections

The Periodic Injection option directs Ultra to perform an analyte injection from a tube in the sample block at a regular interval specified in number of cycles. For example, in fragment screening it's useful to run a control injection every 10-20 cycles to ascertain the rate of decay of the various ligand proteins. 200 µL of sample will be used every time the cycle runs. Several different solutions can be specified, but each will be run at the same interval.



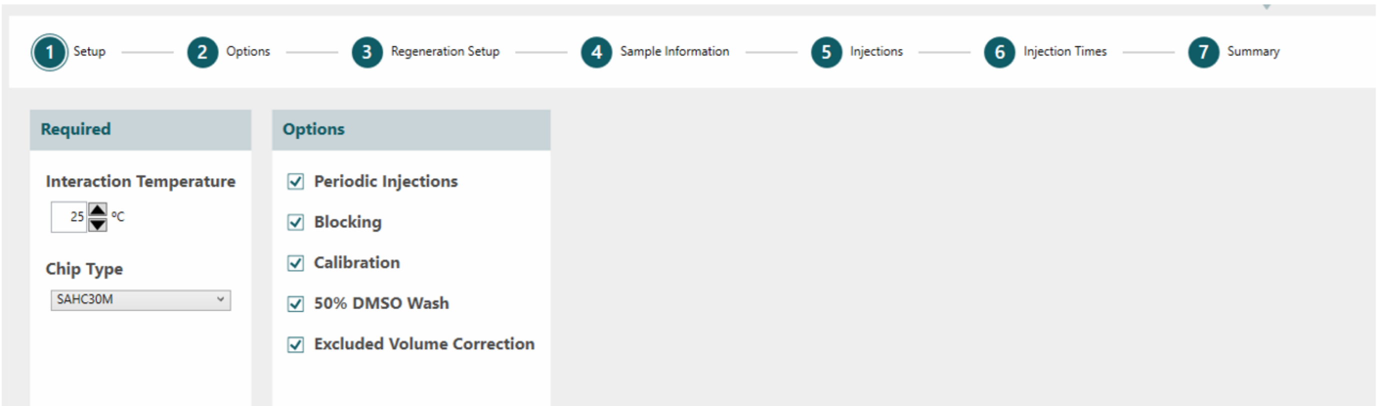


To activate periodic injections, select the Wizard Setup option. Under Wizard Options, the user can specify the periodic injection frequency and the sample location. These injections will automatically appear in Injection Sets in the correct interval once injections are chosen.

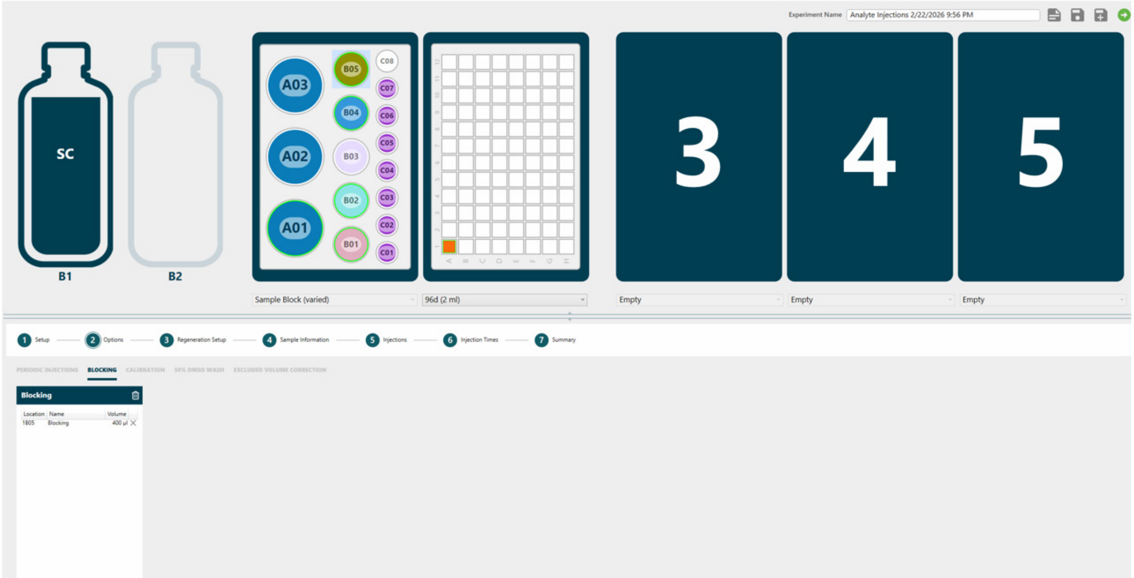
5.2.6 Blocking Injections

Blocking injections are useful in experiments where any unoccupied capture reagent could otherwise interact with subsequently injected analytes. For example, if the user captures and crosslinks antibodies via their Fc domain using an anti-human Fc antibody from crude samples, then a blocking injection of purified human IgG should be included before each epitope binning cycle to occupy any remaining free anti-human Fc sites and reduce non-specific interactions with analytes. 200 µL of the blocking solution is used for each cycle. The contact time is adjustable in the Injection Times tab.

The Blocking Injection option is activated by selecting that option in the Wizard Setup tab:



Details about the location of the blocking solution and required volumes can be found on the Wizard Options tab:



5.3 Wizard Options

There are 6 Wizard options in Navigator to let users build experiment methods:

Surface Prep Lawn	Coats the entire sensor chip surface with a uniform layer of biomolecules.
Surface Prep Array	Creates an array of discretely deposited biomolecule locations on the sensor chip surface.
Capture Kinetics	Enables multiple series (sets) of ligand capture and analyte injections for interaction analysis with one or more regeneration injections per set.
Analyte Injections	Injects analyte over an array for interaction analysis. One or more regeneration injections can be added to each cycle.
Dual-Analyte Injections	Sequentially injects 2 analytes without a wash step between them. One or more regeneration injec-tions can be added to each cycle.
Quantitation	This wizard used the cPH to measure the concentration of analytes in matrices.

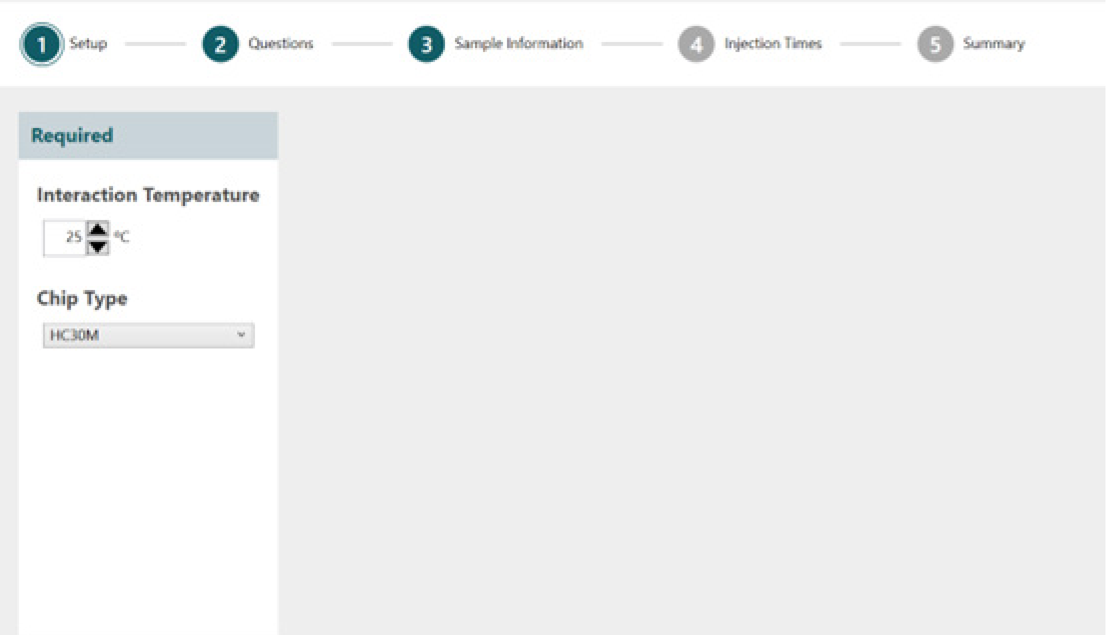
5.3.1 Surface Preparation Lawn

The Surface Preparation Lawn wizard coats, via coupled or captured, the entire sensor chip surface with a uniform layer of biomolecules. Typically, this uniform surface is then used to capture proteins/peptides/oligonucleotides using the Surface Preparation Array or capture kinetics wizard. In Surface Preparation Lawn, the aSFC docks on the sensor chip surface, primes the chip surface with the system running buffer, and passes SC injections across the surface. In doing so, biomolecules are covalently or noncovalently attached to the surface across all ROI and reference locations.

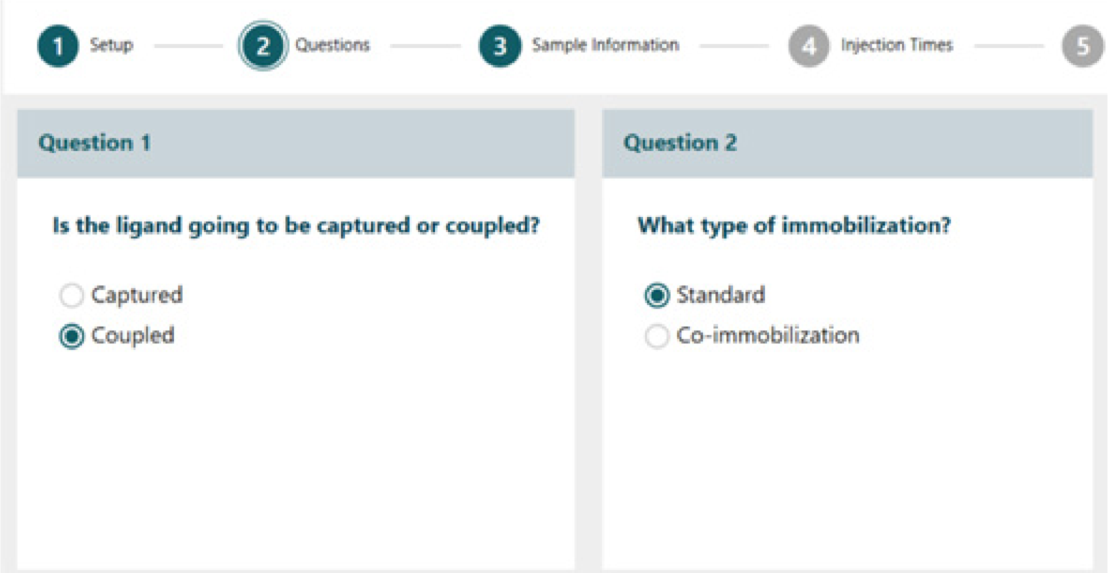
Immobilization can be done as a single injection, or co-immobilization can be performed when two biomolecules need to be immobilized serially. Using the capture option, the biomolecule can be captured on a pre-functionalized surface, such as a streptavidin surface, or the capture surface can be created as part of the application.

An example of setting up a standard amine coupling is provided below.

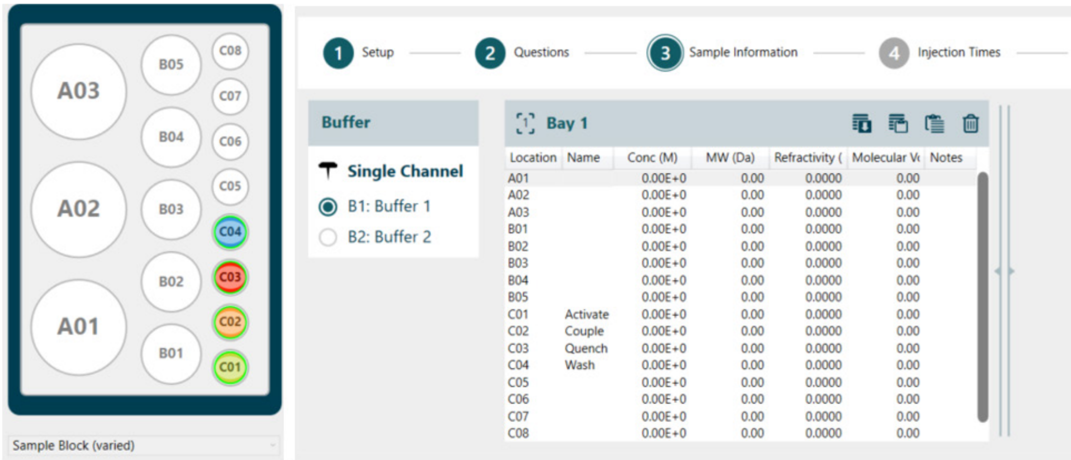
1. Choose the interaction temperature and chip type.



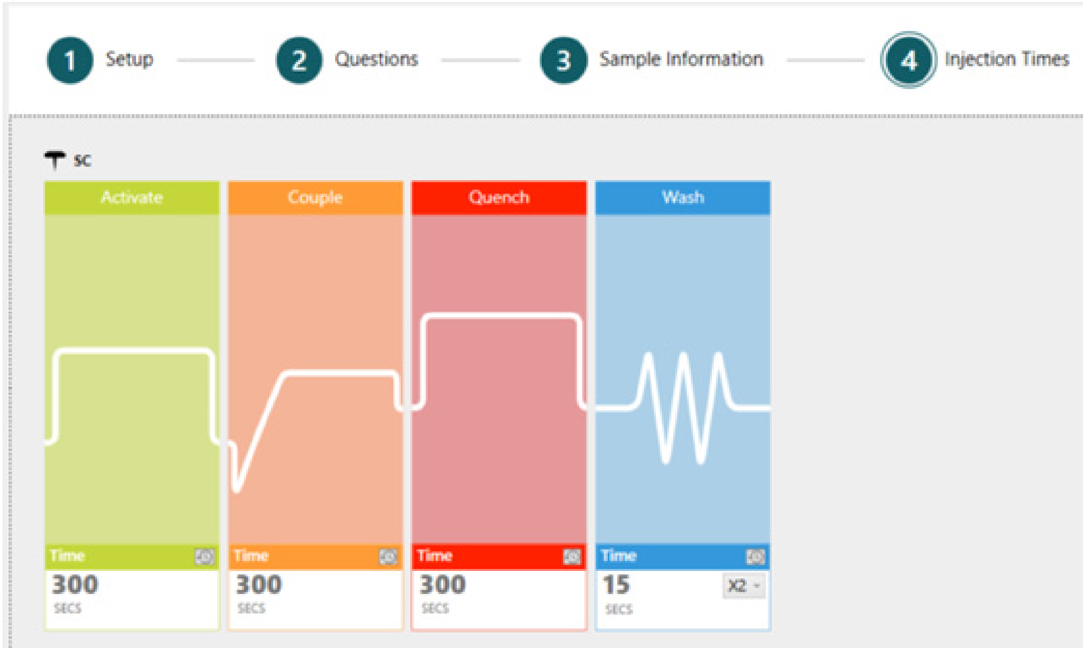
2. Select whether the ligand will be captured or coupled.



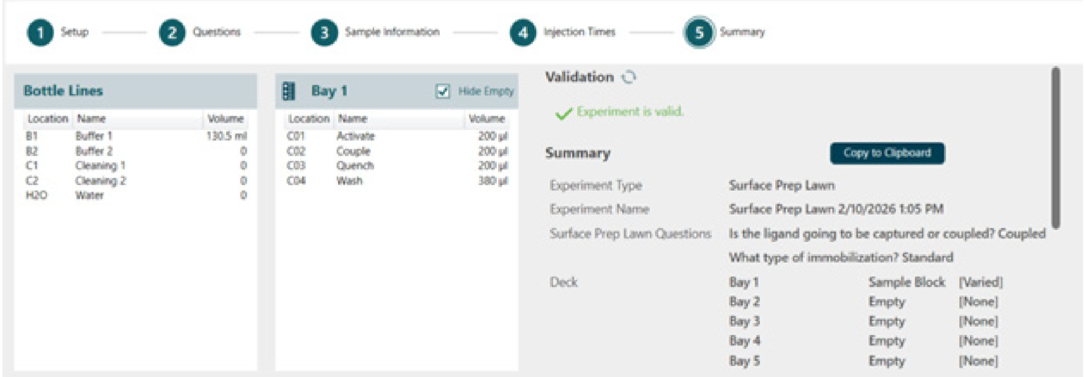
3. Enter or copy-paste sample information if desired. Default sample names are shown.



4. Set injection times. (Activate, Couple, Quench ≥ 30 s; Wash ≥ 15 s/pulse)

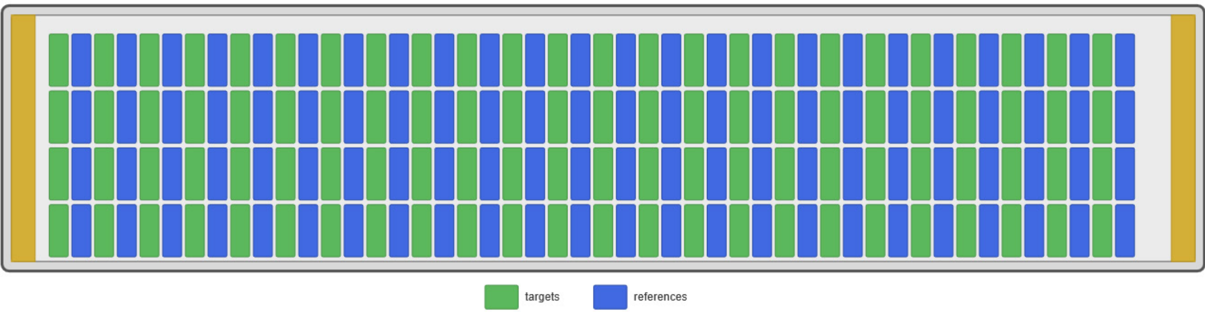


5. Review summary.



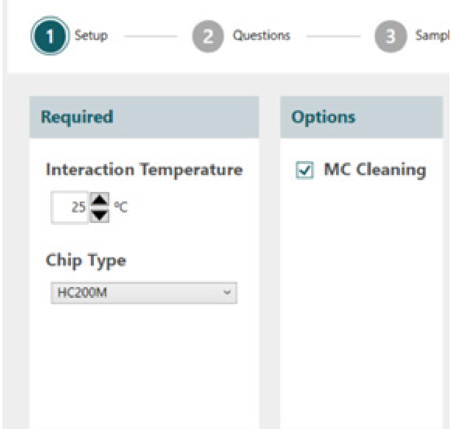
5.3.2 Surface Preparation Array

Surface Preparation Array uses the cPH to create an array of discretely deposited biomolecule locations on the sensor chip surface. There are 2 main approaches to creating an array in Navigator: 1) captured and 2) coupled. The cPH docks on the sensor chip surface at one of two available positions, and solutions/samples from Bays 3, 4, or 5 are drawn up using the 96 sampling needles and delivered to the sensor chip surface. The wizard can create an array of up to 192 unique ROIs on the surface by printing 2 nested blocks of 96. When creating a coupled array, the surface can be activated with either the SC or MC side of the instrument.

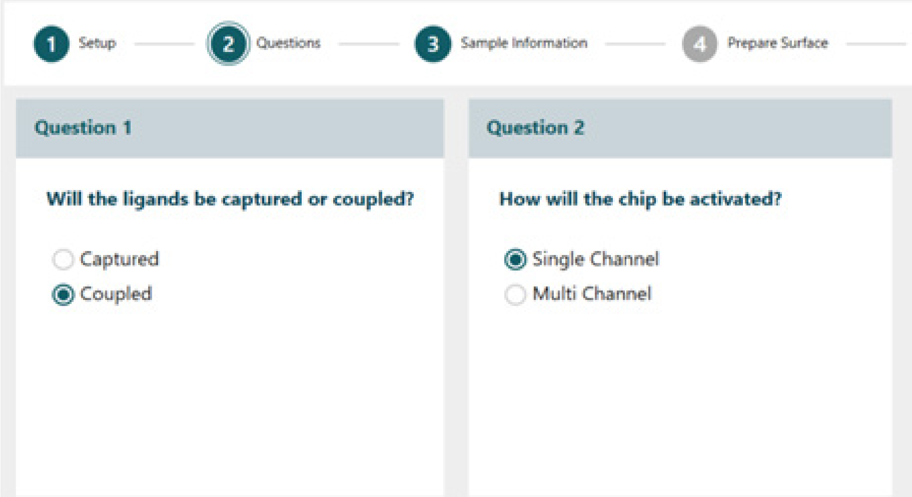


An example of creating a full 192 array with single channel activation is provided below.

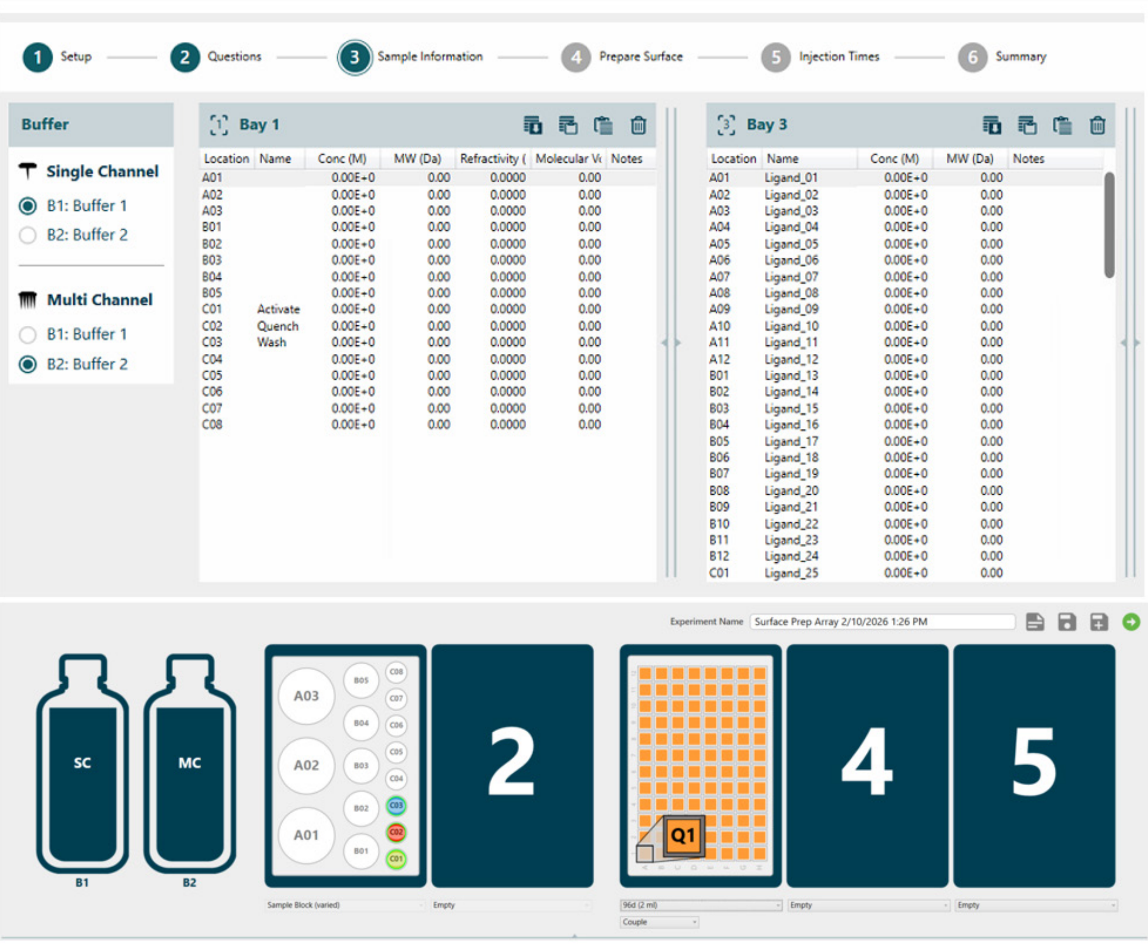
1. Choose the interaction temperature and chip type, as well as the optional MC cleaning.



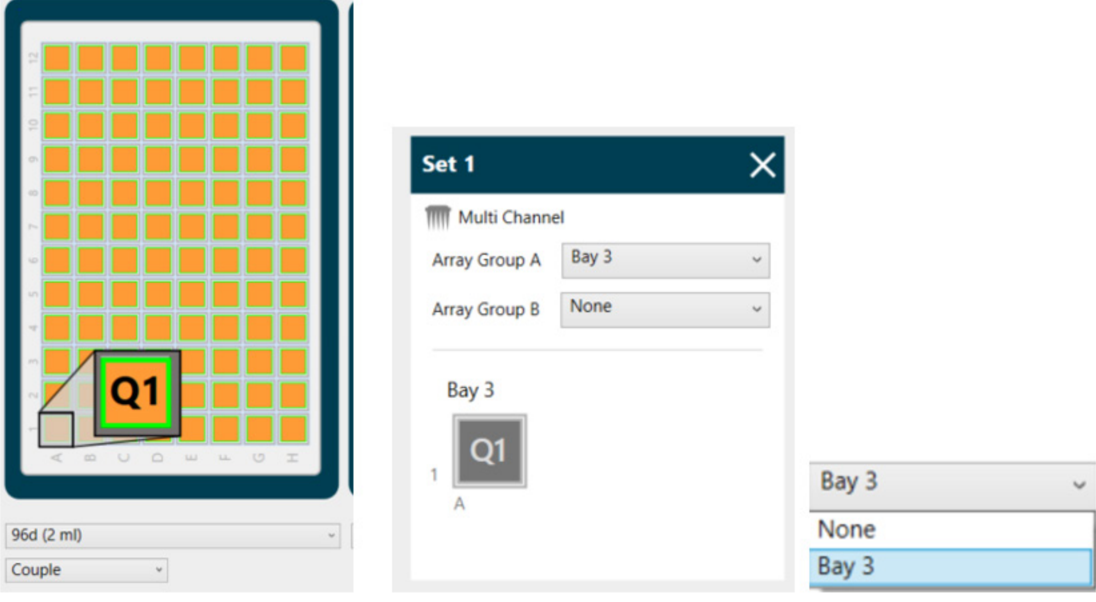
2. Select whether the ligands will be captured or coupled.



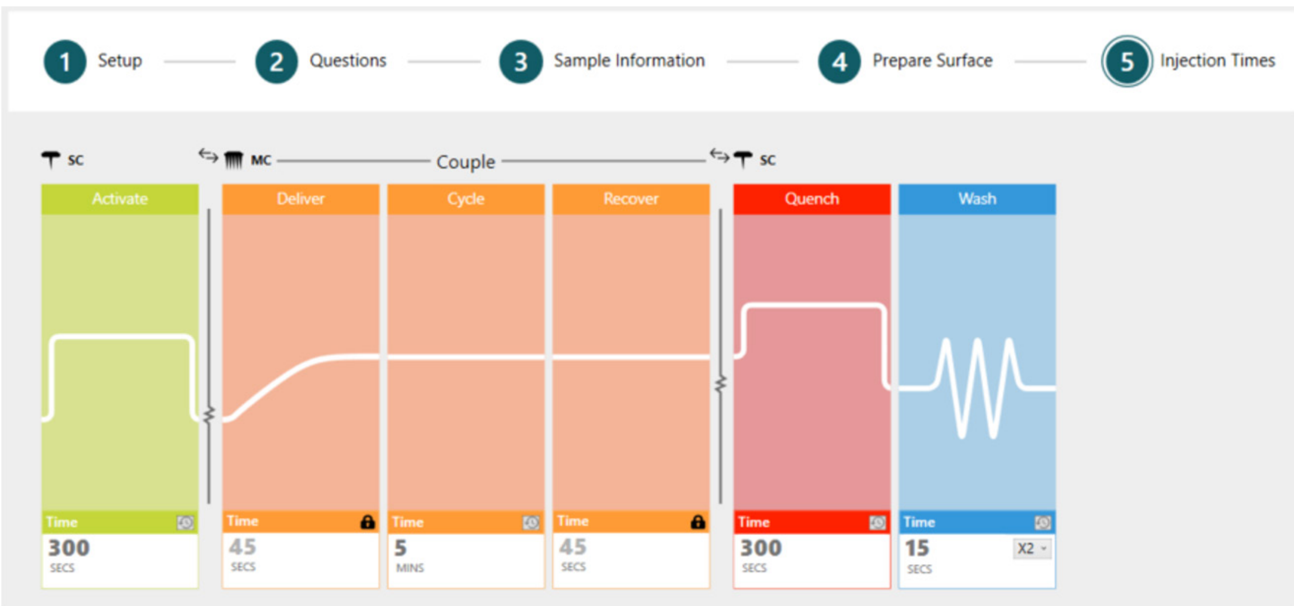
3. Enter or copy-paste sample information. The user will also have to select which bay the ligand array will come from.



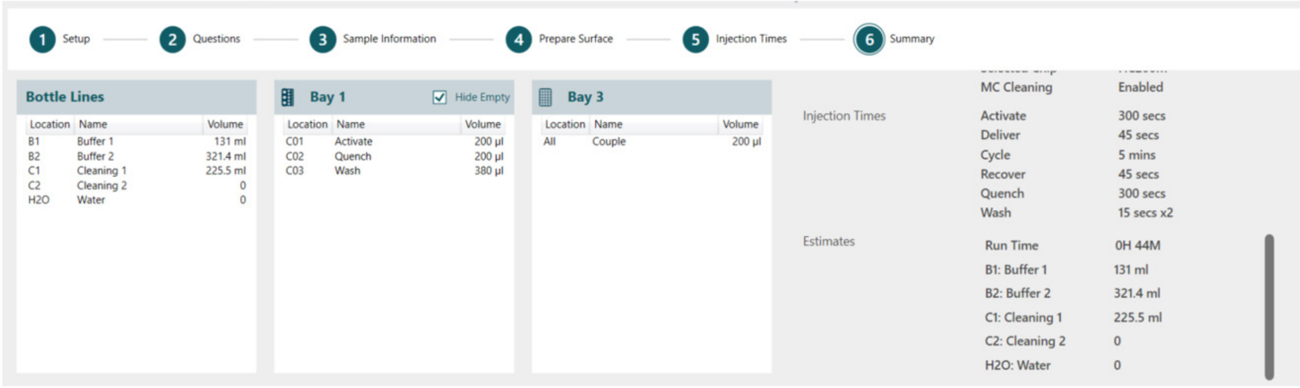
4. Select ligand deposition locations (Array Groups A and/or B).



5. Set injection times. (SC Activate or Quench ≥ 30 s; MC Couple – Deliver and Recover are fixed at 45 s, Cycle ≥ 1 min; SC Wash ≥ 15 s/ pulse.)



6. Review summary.



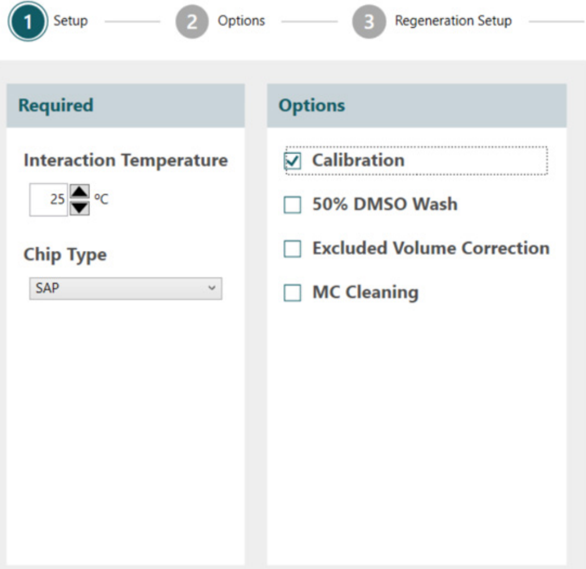
5.3.3 Capture Kinetics

The Capture Kinetics wizard enables the capture on an array followed by a series of analyte injections and one or more regeneration injections. In each Captured Kinetics "Set", the cPH docks on the sensor chip surface and captures an array of up to 192 locations, with samples being returned to the source plates when the array completes. Account for up to 20 µL of volume loss per capture step for ligand samples. Then the aSFC docks on the surface and delivers a series of analyte injections with a profile consisting of baseline, association, and dissociation. After all the analyte injections within a “Set” have been performed, there is an option to regenerate the surface and make it suitable for another Capture Kinetics "Set". Typically, a series of injections of buffer blanks followed by analyte titrations will be performed and these data can be fit to derive rate constants and affinities.

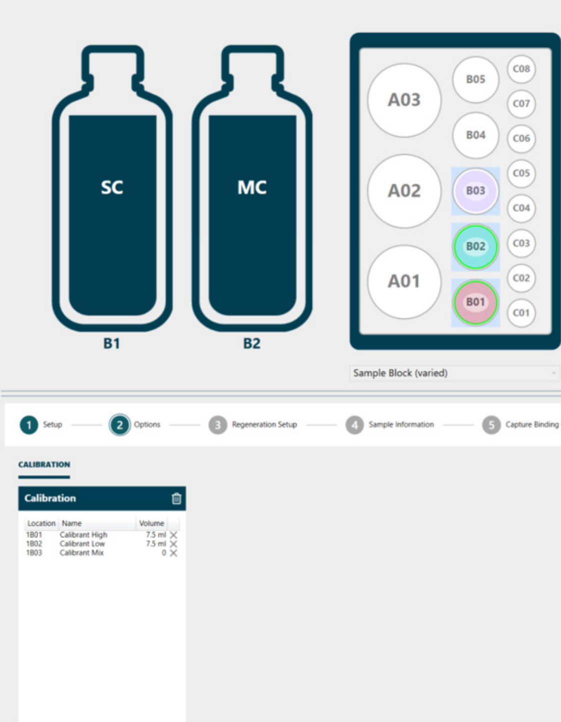
In Capture Kinetics, the building of an array is integrated with the SC injections. For each Kinetic Set, the MC injections create the array first, followed by all the SC injections in sequential order from the Single Channel Injections table. Multiple kinetic sets can be created to interrogate varous ligand/analyte combinations or when regeneration is desired following each analyte. Regeneration is an additional option in Capture Kinetics.

An example of captured kinetics is shown below. This example demonstrates a set of ligands against analyte titration.

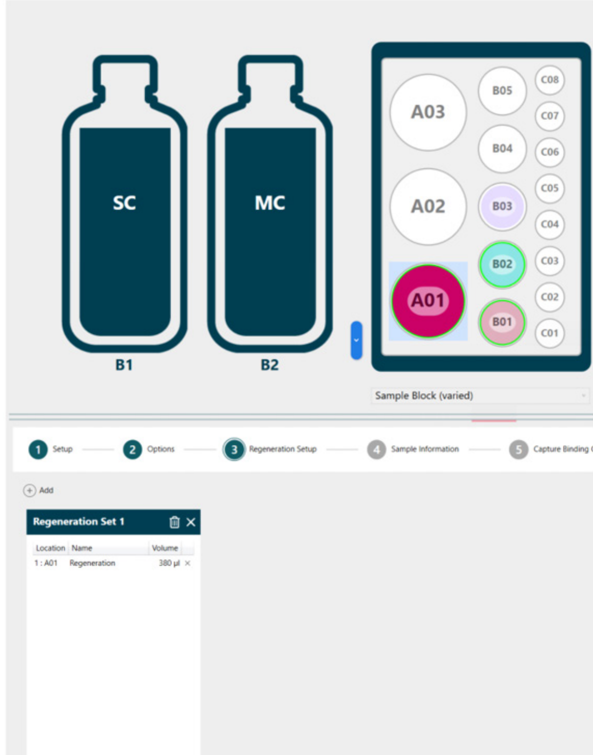
1. Set interaction temperature, chip type, and options. In this example, calibration is selected.



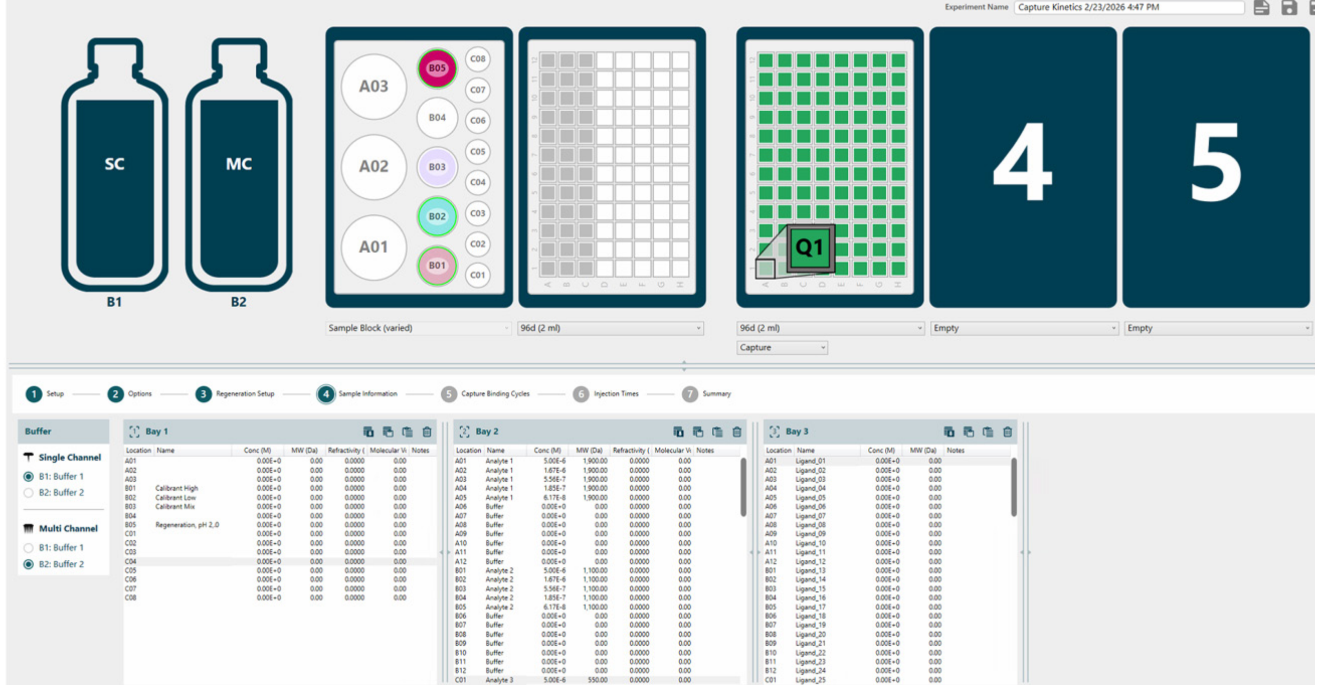
2. Select locations for the reagents needed for calibration.



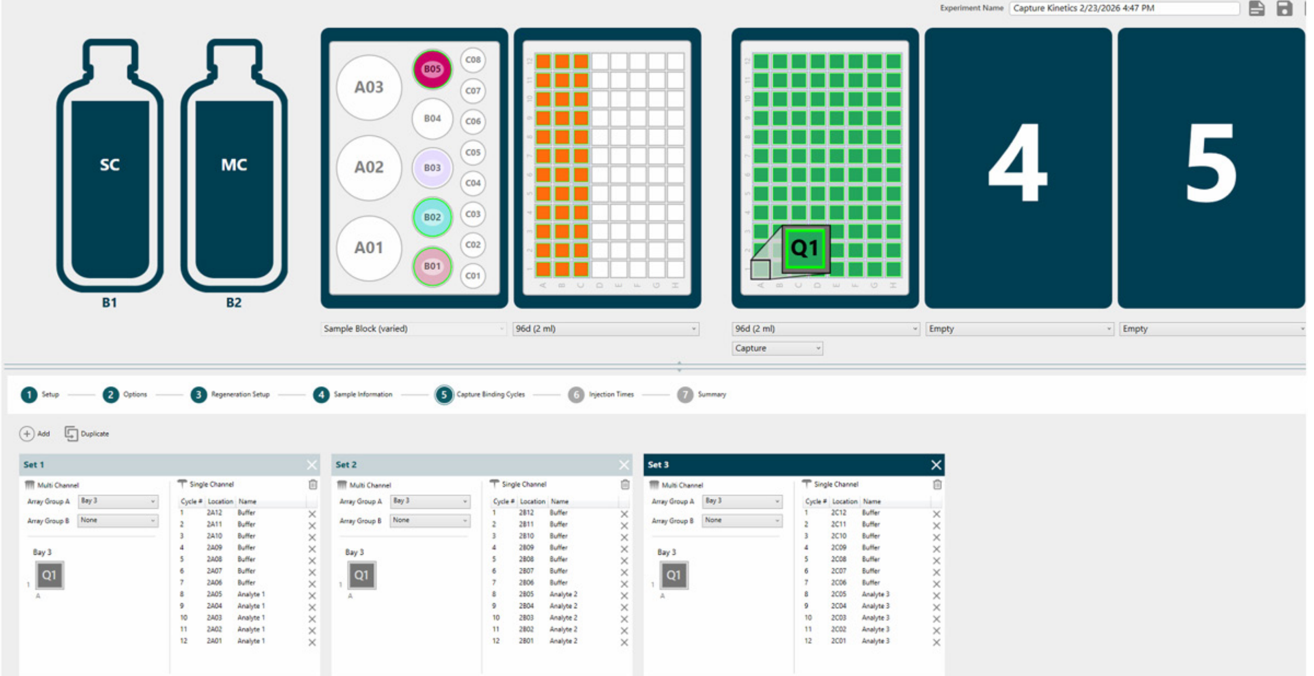
3. Set up regeneration. Click Add to add a regeneration set and select a location for the regeneration reagent.



4. Enter sample information or copy-paste injection information. The user will also have to select which bay the capture reagent will come from.

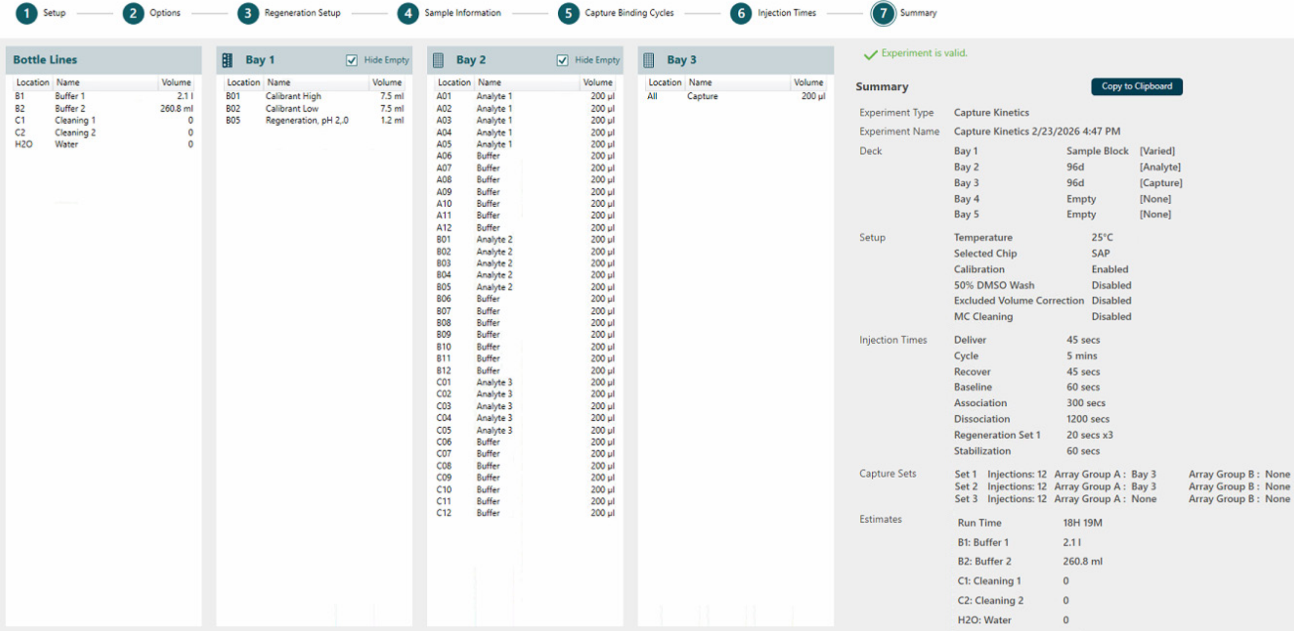


5. Define capture binding cycles. Create the capture kinetics sets for 96 ligands (MC) against a single antigen (SC) in Array Group A. Leave Array Group B empty to serve as a reference. For SC injections, click the sample positions in sequence on the virtual bays. Adding or duplicating a Set is allowed. In this example, a single plate of 96 ligands is tested against three different analytes over the course of three capture sets. Sets could be used to capture from different plates or plate quadrants across the different sets, increasing the number of ligands tested in an unattended run.



6. Set injection times. (MC Capture – Deliver and Recover are fixed at 45 s, Cycle ≥ 1 min; SC Baseline, Association, Dissociation, or Stabilization ≥ 30 s; SC Regeneration ≥ 15s/pulse.)

7. Review summary.

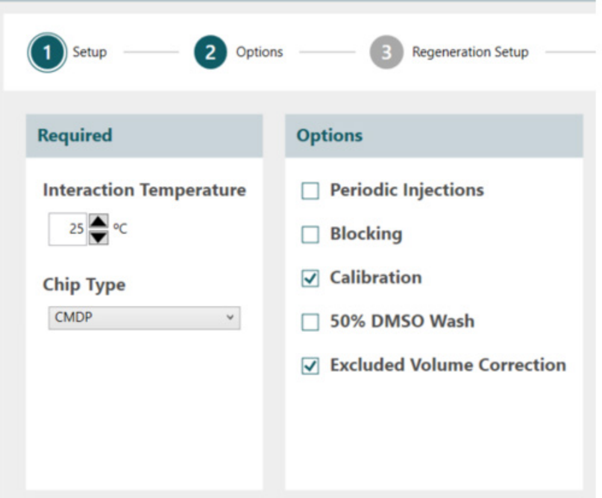


5.3.4 Analyte Injections

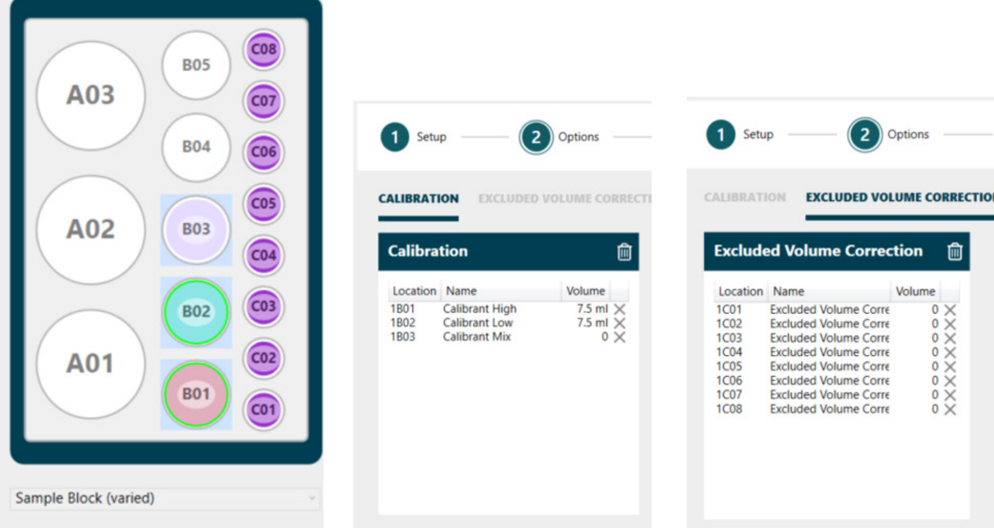
The Analyte Injections wizard injects a series of analytes. The array should have already been prepared using the Surface Preparation Array wizard. Unlike the Capture Kinetics wizard, there is no building of the array during the method. The aSFC docks on the sensor chip and delivers an injection profile consisting of baseline, association, and dissociation, with an option for regeneration. Samples are from any locations in Bay 1 or 2. The aSFC remains docked throughout the experiment. The analyte binding responses can then be fit to a kinetic model to determine rate constants and affinity or analyzed for any other binding features.

An example of Analyte Injections from a 96-well plate in Bay 2 is provided below.

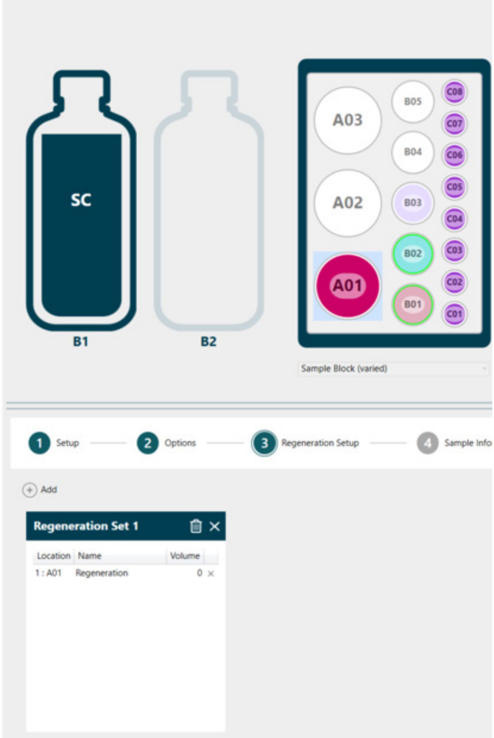
1. Set interaction temperature, chip type, and options. In this example, calibration and EVC are selected.



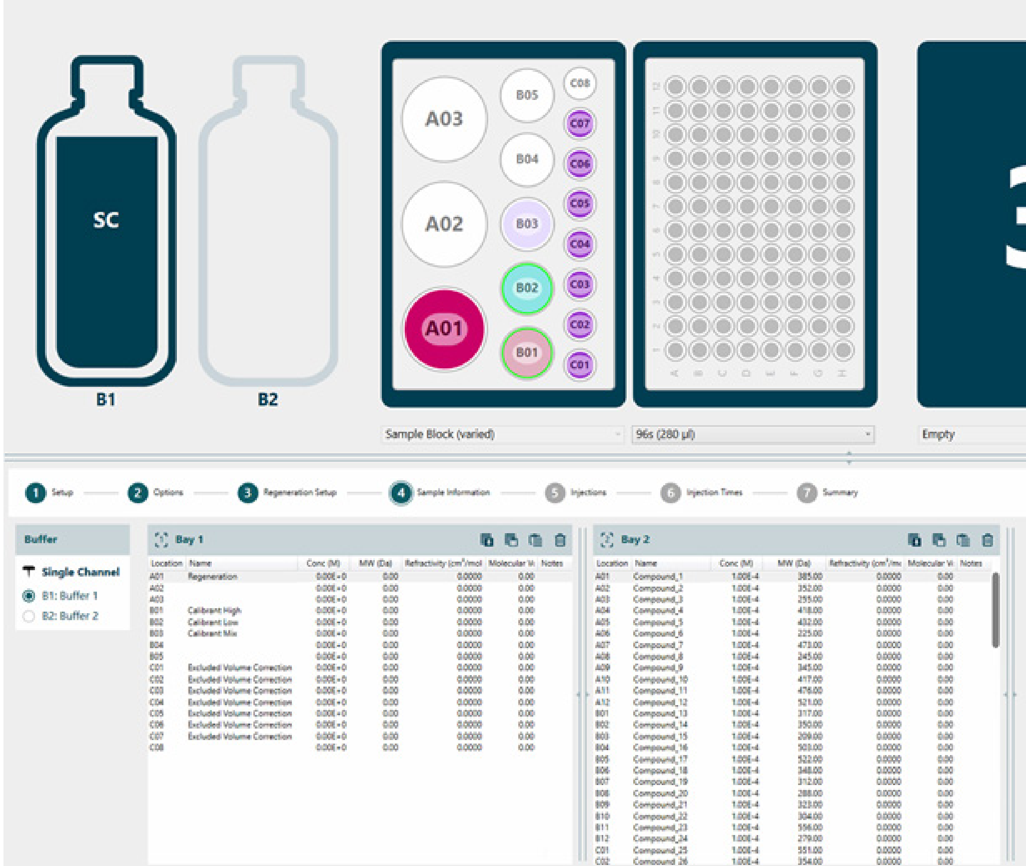
2. Select locations for the reagents needed for the selected options.



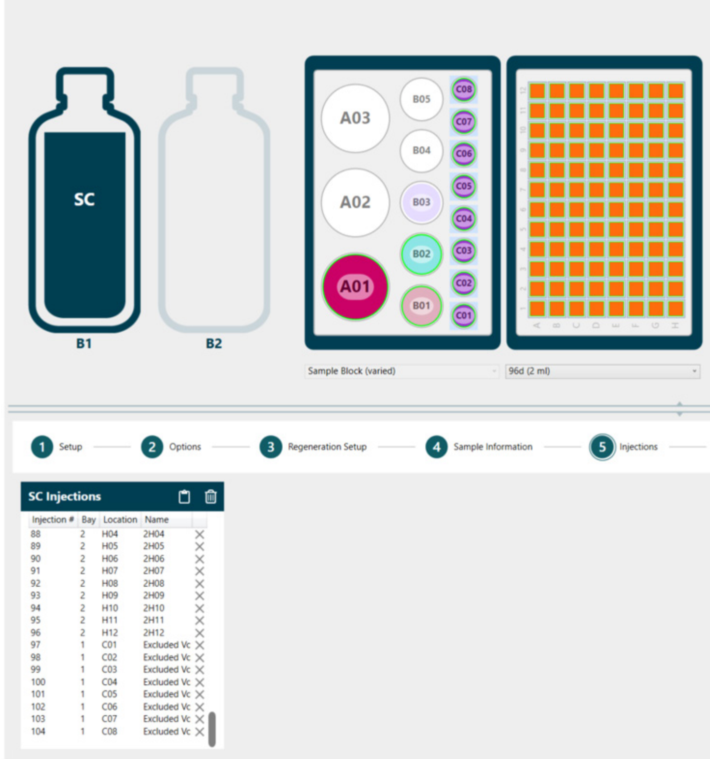
3. Set up regeneration.



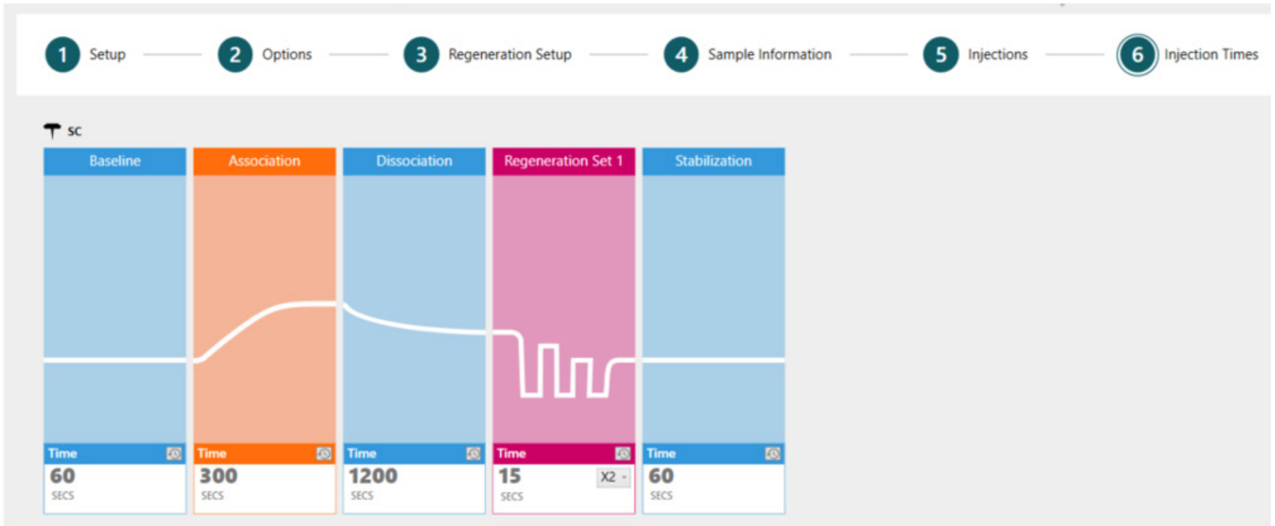
4. Enter sample information, or copy-paste injection information.



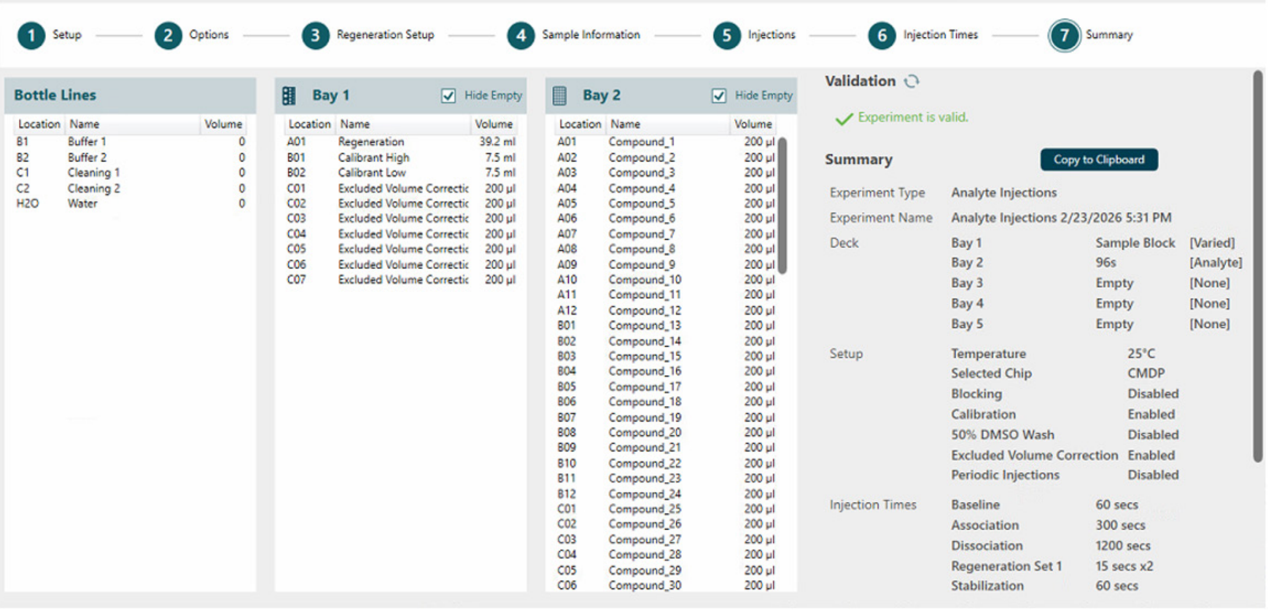
5. Set up SC injections. Click the sample positions in sequence on the virtual bays. Include the EVC injections at the end of the sequence.



6. Set injection times. (SC Baseline, Association, Dissociation, or Stabilization ≥ 30 s; SC Regeneration ≥ 15s/pulse.)



7. Review summary.

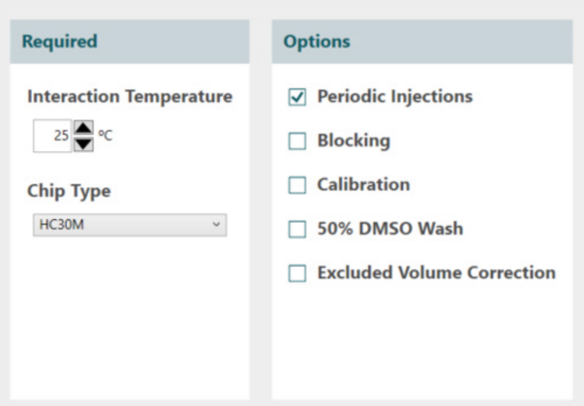


5.3.5 Dual-Analyte Injections

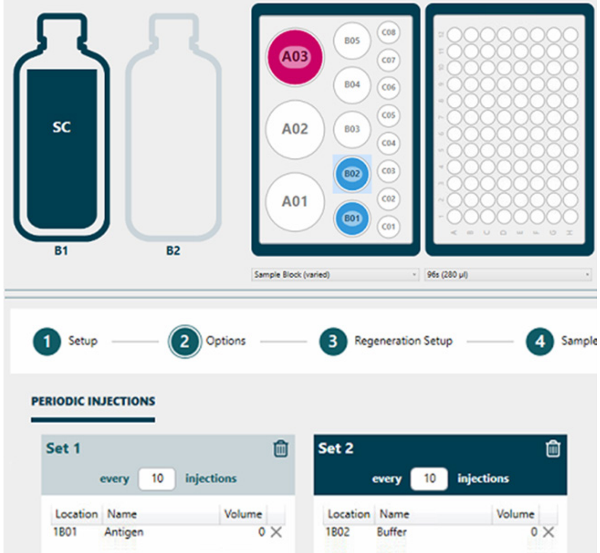
The dual-injection wizard allows the sequential injection of two analytes without a wash step between them. The most common use case is classical epitope binning. Classical Binning is a competitive epitope characterization technique where antibodies are assessed for their ability to bind to antigen already bound by other antibodies, often referred to as "sandwiching". Collectively, this data enables classification of antibodies based on whether they bind to similar regions of an antigen. Classical binning is set up using Bay 1 and/or Bay 2 for the sandwiching antibody, with the assumption that the array has been previously built using Surface Preparation Array. For every cycle, the antigen will be injected, followed by an antibody in the SC injection tables.

An example of a dual-analyte injection experiment for classical binning is shown below.

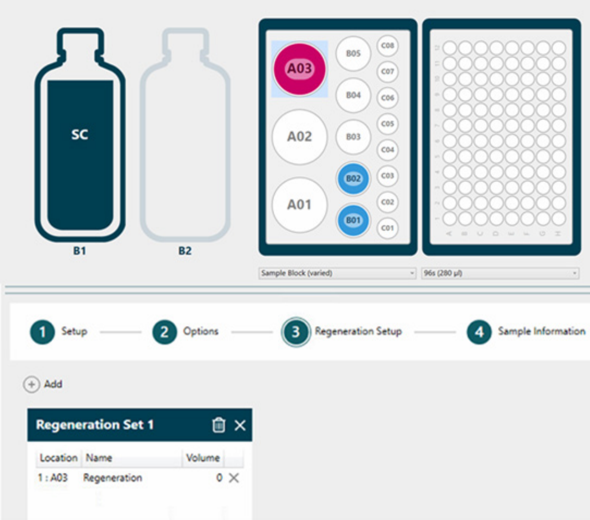
1. Set interaction temperature, chip type, and options. In this example, periodic injections is selected for antigen then buffer control cycles.



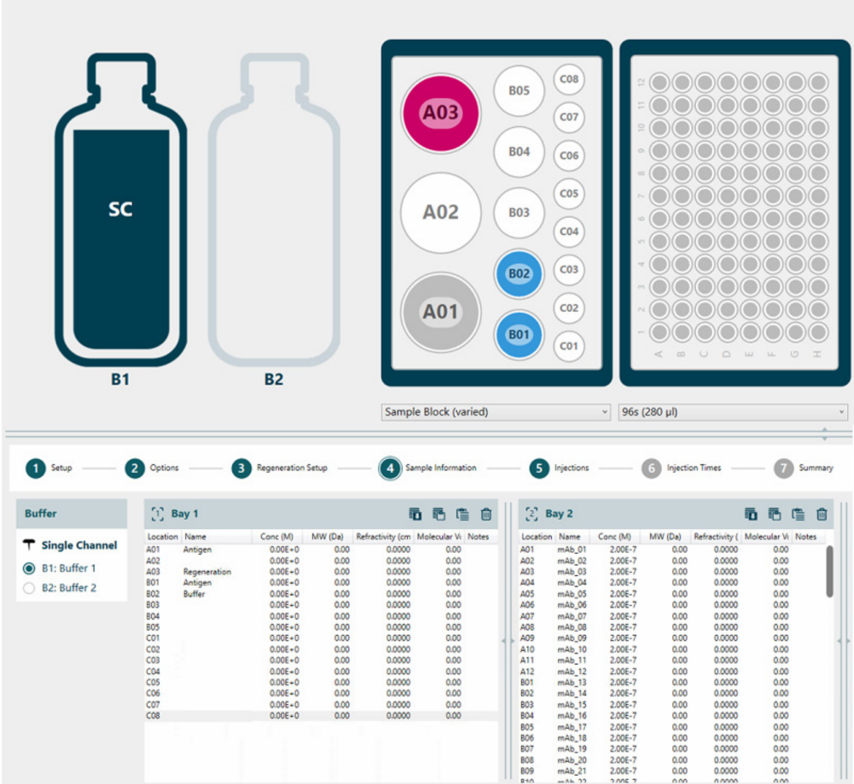
2. Select locations for the reagents needed for the selected options.



3. Set up regeneration.



4. Enter sample information, or copy-paste injection information.



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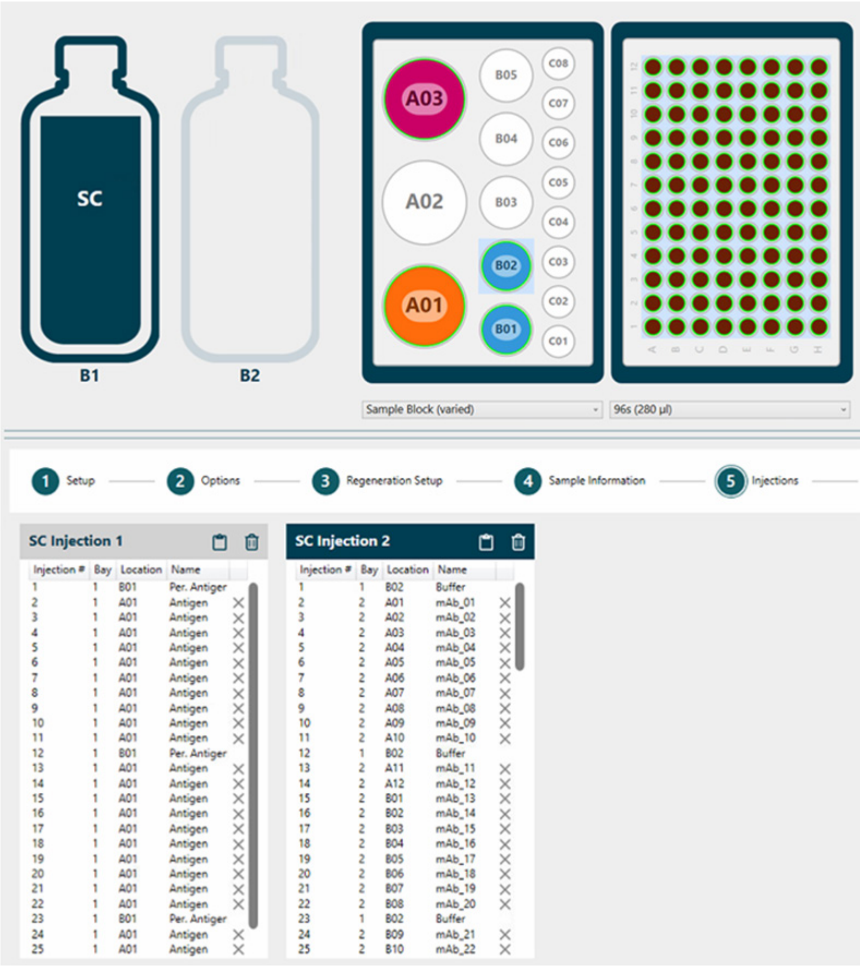
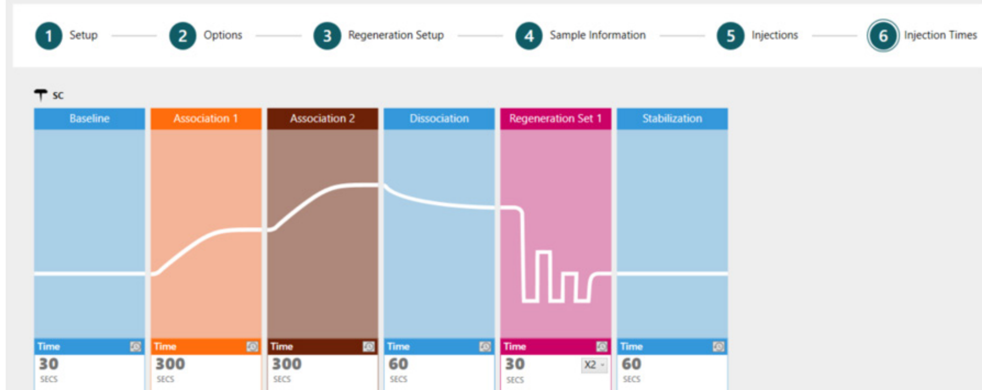
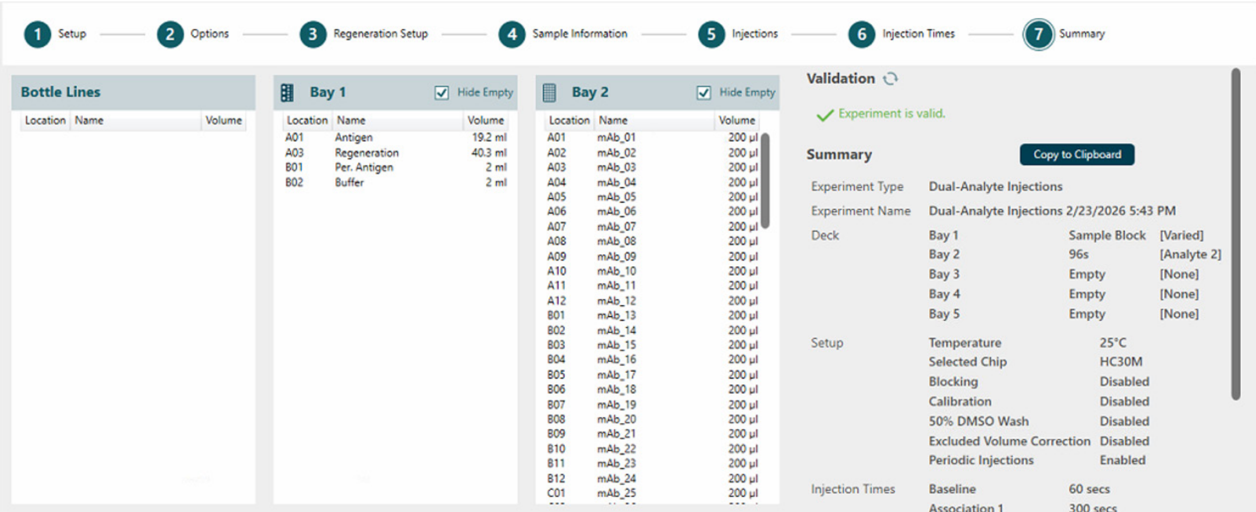
5. Select the injection order for each injection set.



6. Set injection times, including the amount of regeneration pulses desired. (All phases other than Regeneration ≥ 30 s; Regeneration ≥ 15 s/pulse.)



7. Review summary.

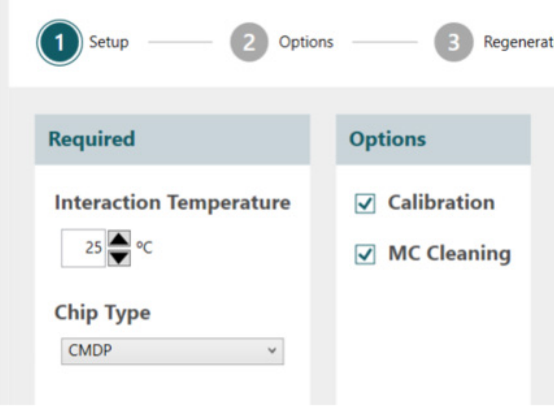


5.3.6 Quantitation

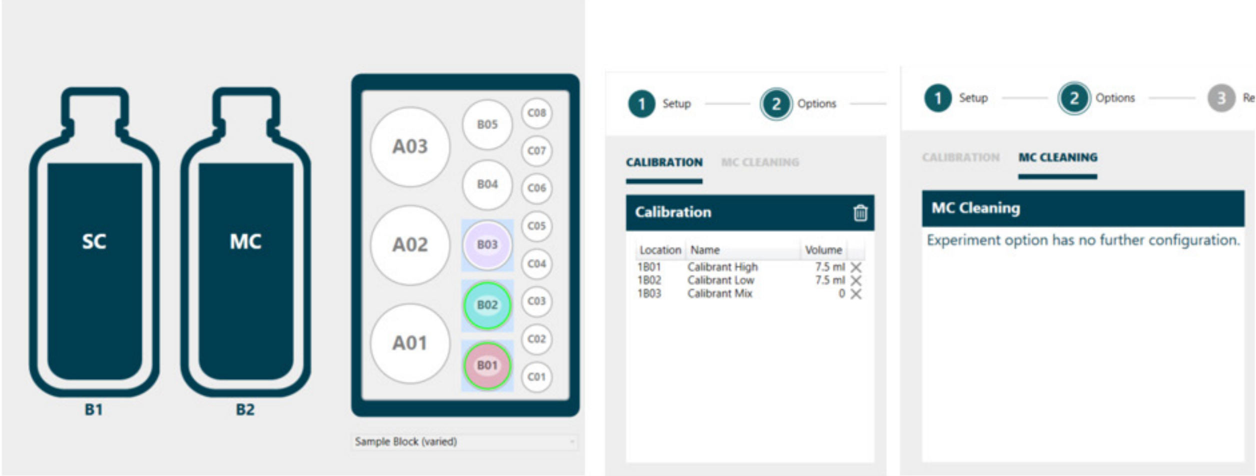
The Quantitation wizard is designed to estimate concentrations of analytes and can be performed in complex matrices such as supernatants. In this wizard, the cPH first docks onto the sensor chip with a uniform capture surface, which was either previously prepared using the Surface Preparation Lawn method or a premade surface such as Protein A, Protein A/G, or NTA. Then up to 96 samples, including a series of standards of known concentrations, are drawn up and cycled across the surface. At the end of the cycle, the samples are returned to the well plate and, optionally, the aSFC docks on the chip to regenerate the surface. Using either binding responses or slope, the known standards can then be used to calculate the concentrations of the unknown samples. Quantitation cycles are created by selecting Sets of 96 samples, up to 2 captures per cycle, followed by a regeneration of the surface. Using 384-well plates, up to 1152 unique samples (including standards) can be tested in the quantitation wizard.

An example of quantitation from a 96-well plate in Bay 3 is provided below.

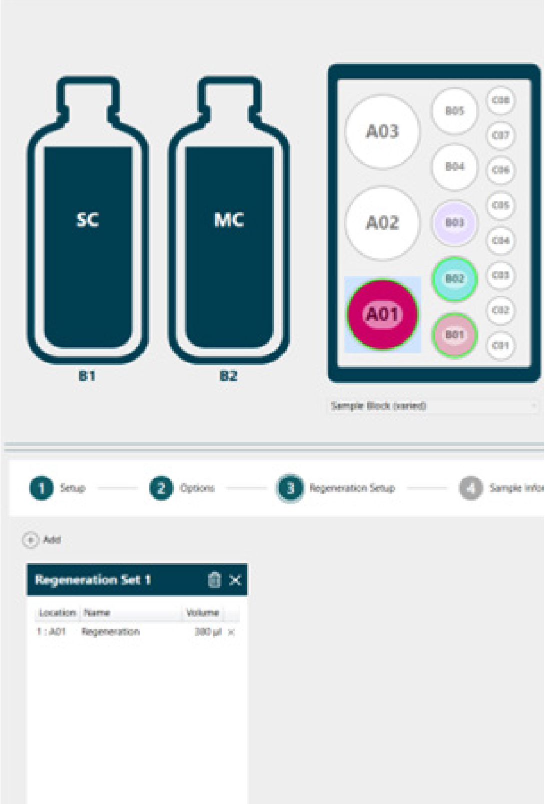
1. Set interaction temperature, chip type, and options of calibration and MC cleaning.



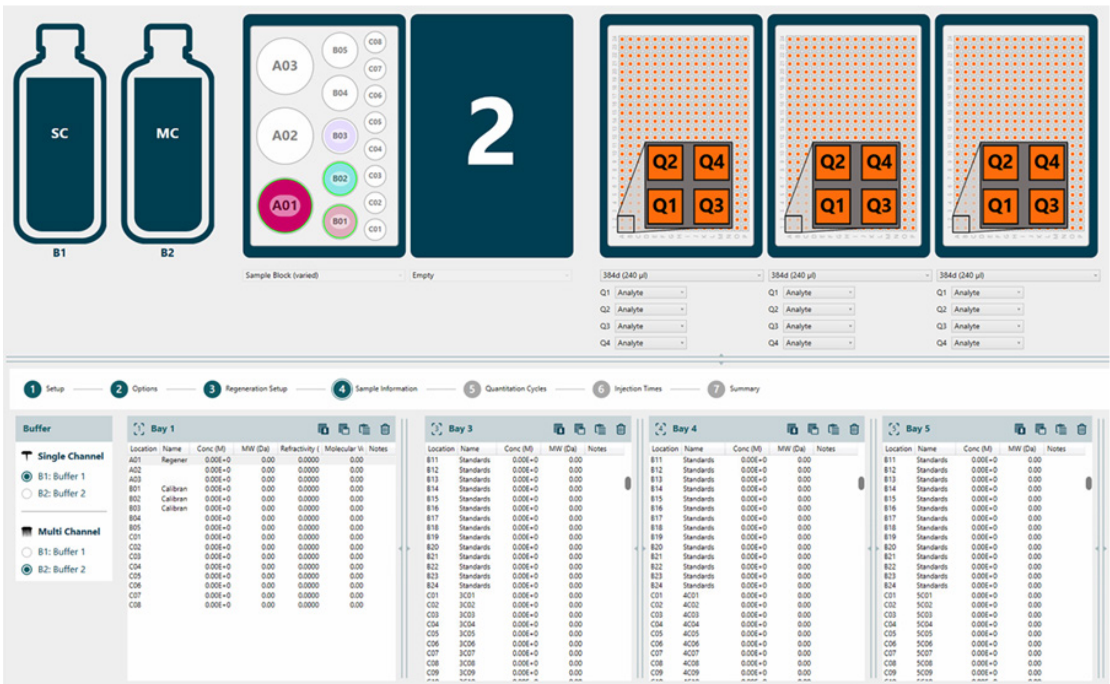
2. Select locations for the reagents needed for the selected options. MC cleaning requires no additional steps or selections. Calibration injections will be applied automatically.



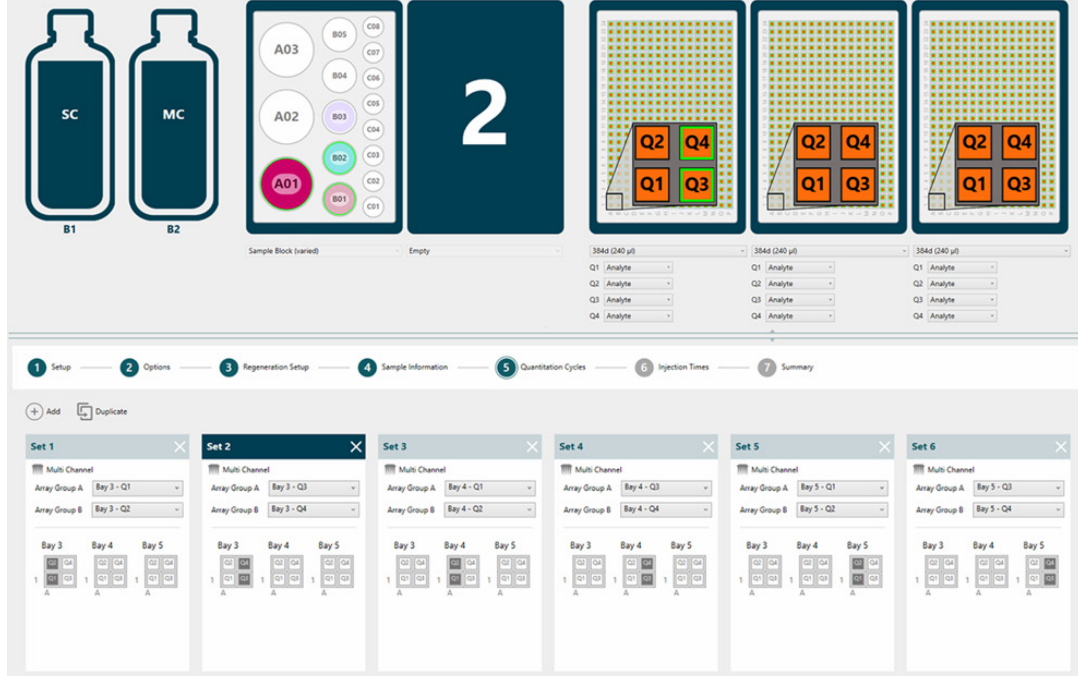
3. Set up regeneration.



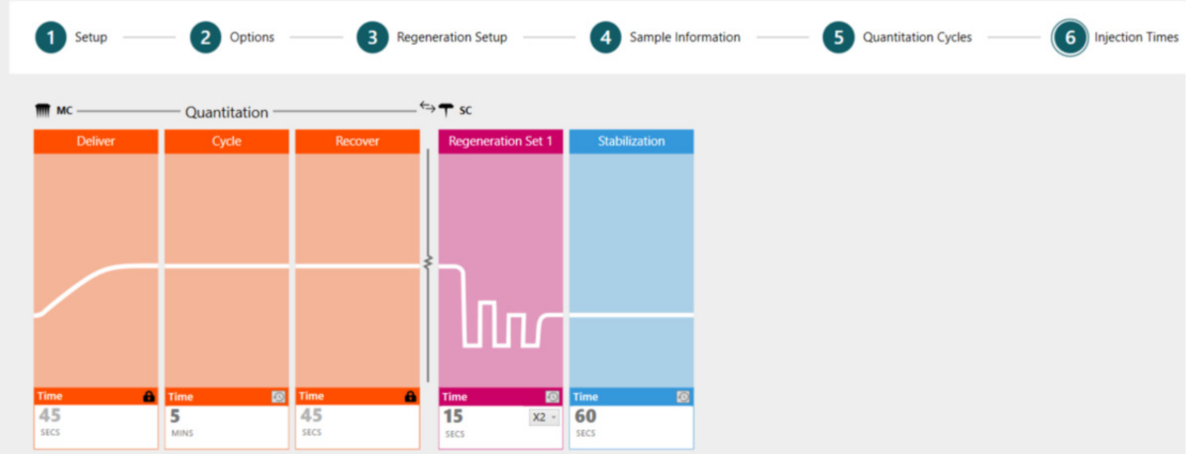
4. Enter or copy-paste injection information.



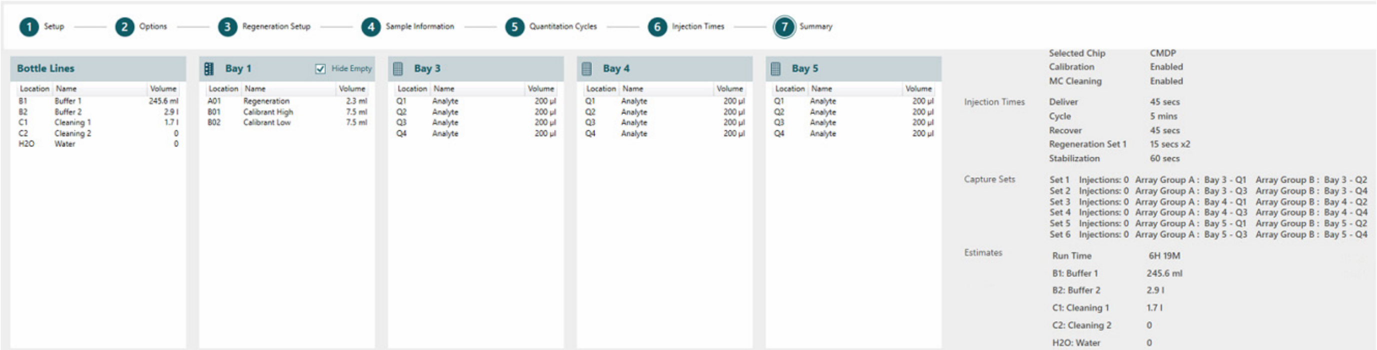
5. Set up quantitation cycles by selecting which Array Group (A or B) the analyte injections will come from.



6. Set up injection times. (MC – Quantitation: Deliver and Recover are fixed at 45 s, Cycle ≥ 1 min; SC Regeneration ≥ 15s/pulse, Stabilization ≥ 30 s.)



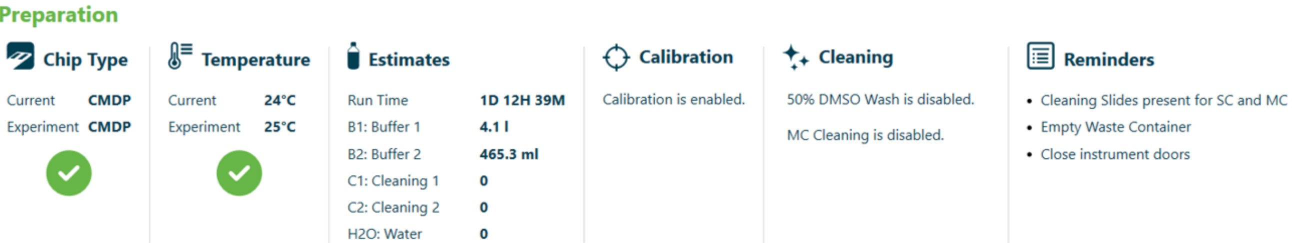
7. Review summary.



5.4 Running an Experiment

After a method is created, saved and sent over to the Experiment Runner via the Save and Run icon, the sample decks will move out into position for access to all 5 bays. At this point, it is appropriate to load all well plates and the sample block (if applicable). This is also a good time to check the waste stations for any salt accumulation that may warrant removing them for rinsing before running an experiment.

Before starting the experiment, check each of the steps from the Preparation panel (right side of Experiment Runner) to make sure that the specified chip, cleaning slides, and reagents are in place, empty the waste container, and check the temperature setting.



Once all reagents are in place, use the Run Experiment icon to start the experiment. The Pause button allows the current running experiment to be temporarily halted and takes effect at the conclusion of the current cycle. To restart from Pause, select the Run Experiment icon. To completely stop an experiment, select the Stop icon. Once the currently running actions are completed, this will end the experiment.

When the experiment is completed, depending on selections made during setup, either an Experiment Complete or Standby Flow pop-up banner will be present. Data from the experiment remains in the Experiment Runner chart at the conclusion of the experiment until the next experiment is loaded. Data is continuously saved to the .sprdata file in the Experiment Data folder. It can then be processed in the Kinetics or Epitope Data Analysis Software.

This message displayed at the top of the page while in Standby mode.

EXPERIMENT COMPLETE 20260211_Analyte_Injections Stop Standby Mode Close

Ultra has a feature called Maintenance Mode that actuates the instrument fluidics every two hours to ensure optimal performance. This action only occurs when the instrument is idle. Maintenance Mode takes approximately 3 min and moves the cPH to the cleaning slide location as well as placing the Multichannel needles in the waste block. "Maintenance Mode is Running" will be displayed on the upper view of Navigator. Please wait until this action completes before using the instrument.

6. Maintenance

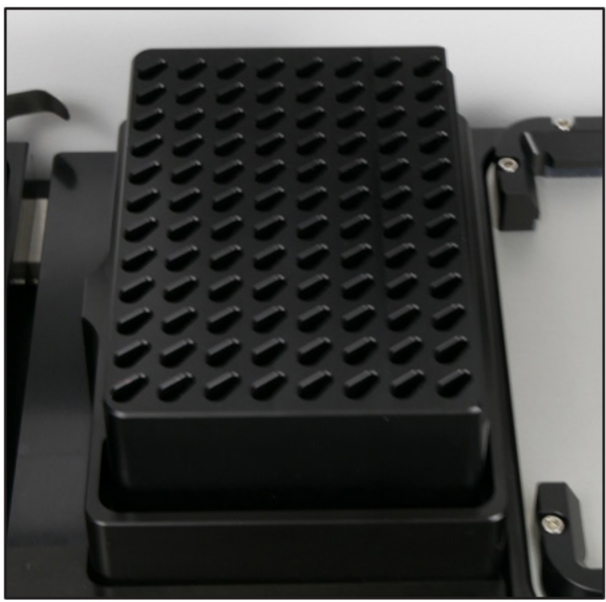
6.1 User Maintenance

Proper instrument maintenance is crucial to maintain instrument performance and the generation of quality data. Cleaning and Maintenance can be accessed through the side navigation panel of Navigator. Use the "Send Logs to Carterra" function to either save or send the logs during a user-defined period. Ultra should be cleaned regularly according to the Ultra Maintenance & Best Practices Guide. Failure to do so may result in poor data quality, instrument malfunctions, and voiding of warranty. Selecting the maintenance function from the list of options under the maintenance tab will allow the user to run each of the cleaning procedures.

6.2 Clean MC Cleaning Station

The MC cleaning station (Waste Tray) can be accessed through the maintenance page for cleaning. Typically, this only needs to be cleaned if residue buildup is apparent. The orientation is specific and the wash block is keyed, so use caution when removing and reinstalling to ensure proper orientation.

Use the software selections under cleaning to access the waste stations. Never put hands into the instrument to remove the waste stations until the software indicates it is safe to do so.



MC Cleaning Station (Waste Tray)

6.3 aSFC and cPH Cleaning Procedure

Users need to clean the face of the aSFC and cPH before starting their next experiments to ensure a proper seal of the aSFC gasket and to avoid stamping contaminates onto the chip surface from the cPH using the following procedure:

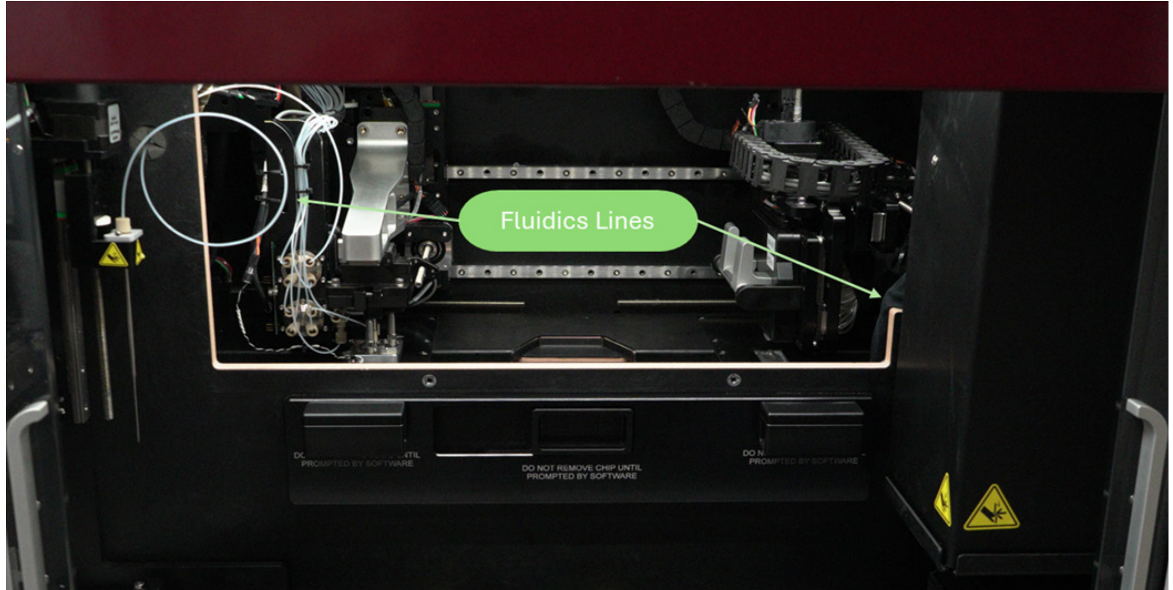
1. Make sure that no program is running and that standby flow has been turned off.

2. Ensure that the instrument status reads Instrument Idle, confirming that both the aSFC and cPH are undocked from the chip and cleaning slides.

3. Open the front doors and identify the black insulated panel covering the interior front wall, which is secured using four thumb screws. For convenience, the screws will not come out of the panel.

4. Loosen the screws until they detach from the inner wall. Be careful to hold the panel so it does not fall against the sample deck.

5. Carefully dislodge the panel and remove it from the interior, taking care not to catch the left or right side of it on the single-channel or multichannel tubing. Set the panel aside on a nearby bench. (Do not place it on top of the instrument.)



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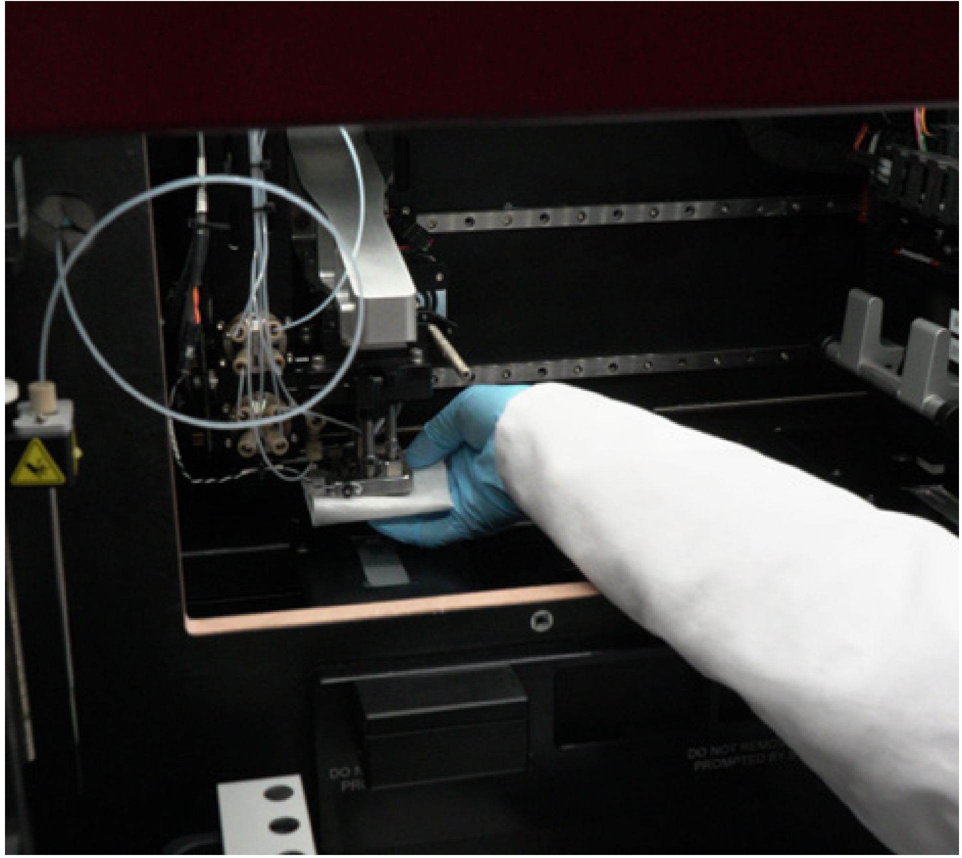
6. Use a 18 MΩ water-soaked TechniCloth (or lint-free) wipe to gently blot and wipe the underside/gasket of the aSFC and cPH to remove any salt buildup.



7. Reattach the panel to the front wall of the instrument using the thumb screws. Take care not to pinch the single channel or multichannel tubing between the panel and the instrument. Once the panel is attached, make sure the tubing is free and not under the panel.

8. Opening the instrument interior can disrupt thermal equilibrium. After closing the interior, allow sufficient time for the system temperature to re-equilibrate before starting high-quality data collection.

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7. Reference Information

7.1 Maintenance & Best Practices Guide, Troubleshooting and Support

The Maintenance & Best Practices Guide is available upon request from Customer Support. If you encounter any issues or would like assistance with troubleshooting procedures, contact Customer Support at support@carterra-bio.com or by calling 1-844-642-7635, Option 3.

7.2 Ultra Required Consumables

Ultra required consumables can be found at https://info.carterra-bio.com/hubfs/Downloads/Required%20Consumables.pdf

7.3 Chips

Chips can be found at https://carterra-bio.com/biosensor-chips/

7.4 Carterra Consumables Ordering Information

Consumables and reagents can be found at www.carterra-bio.com/store

7.5 Chemical Resistance of Wetted Parts

Concentrated organic solvents should not contact Ultra unless indicated in the table below. Long-term exposure to extremes of pH and/or high salt solutions should be avoided. Short term compatibility means the solutions can be used for injections for cleaning or maintenance. Long term compatibility means the solutions can be used for assays, including in the running buffer. They should never be used as an undiluted running buffer. Contact Carterra Technical Support for further questions on chemical compatibility.

Solution	Concentration	Exposure Limit
DMSO	5%	Long Term
DMSO	50%	Short Term
Glycerol	5%	Long Term
Sodium Chloride	1 M	Long Term
Sodium Chloride	3 M	Short Term
Contrad-70	3%	Short Term
Sodium Dodecyl Sulfate	0.5%	Long Term
Sodium Hypochlorite	<1%	Long Term
Magnesium Chloride	0.1 M	Short Term
Hydrochloric Acid	50%	Short Term
Phosphoric Acid	5 M	Short Term
Sodium Hydroxide	0.2 M	Short Term
Glycine	10 mM	Short Term

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