thermoscientific

UV-Visible

GENESYS Family Spectrophotometers

User Guide

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GENESYS Spectrophotometers

This user guide applies to the following spectrophotometers:

- Intermediate capability models – the Thermo Scientific™ GENESYS™ 50 platform – with sample compartments configured for single samples only:
  - GENESYS™ 40 Vis
  - GENESYS 50 UV-Vis
- Advanced capability models – the GENESYS™ 150 platform – with sample compartments configured for:
  - single samples
  - multi-cell changer option
  - Peltier thermostatted cell holder option
  - fiber optic probe option
- GENESYS™ 140 Vis
- GENESYS 150 UV-Vis
- GENESYS™ 180 UV-Vis
- BioMate™ 160

Note There is also a GENESYS™ 30 Vis that shares the sample compartment configuration of the GENESYS 50 platform but offers a user experience with a tactile rubber keypad, high resolution non-touch color 5-inch screen and simplified software. The GENESYS 30 has a separate dedicated user guide

Considerations

This document uses the following conditions:

DANGER Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE Follow instructions with this label to avoid damaging the system hardware or losing data.

Note Contains helpful supplementary information.

Site Preparation and Safety

Before using the system, read the site preparation and safety manual on the documentation media provided. Always follow the safety precautions in that manual and in this document when using the system.

Operating Precautions

WARNING Do not operate this system without following the safety precautions described in this manual and the documentation that came with your system.

The spectrophotometer contains precise optical components. Handle it carefully and follow these precautions.

- Do not allow moisture to leak into the instrument interior
- Wipe off spilled chemicals immediately
- Do not drop the instrument
- Protect the instrument from mechanical shock
- Protect the instrument from dust

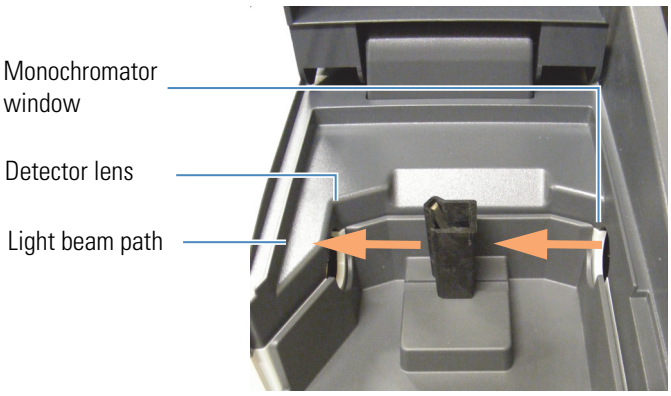
Spectrophotometer Basics - GENESYS 40 and GENESYS 50

Remove all tape from the exterior of the instrument and inside the sample compartment.

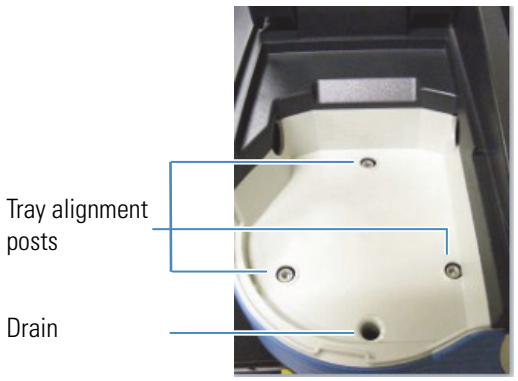
Sample Compartment - GENESYS 40 and GENESYS 50

High durability constant torque hinges hold the lid at any angle

Magnet at front holds lid closed to exclude light when door is lowered



Window and lens protect interior optics from spills and vapors.

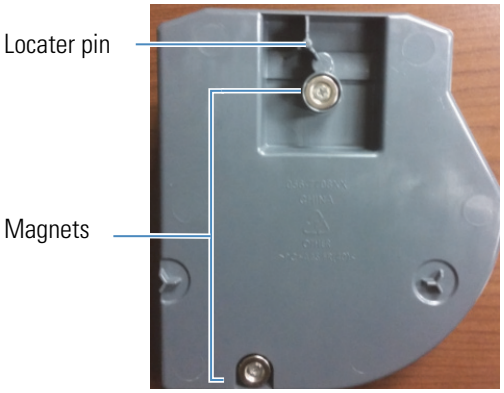


Sample holder tray aligns to posts on baseplate.

Excess spills drain to benchtop.

Single Cell Holder - GENESYS 40 and GENESYS 50

Standard 10 mm cuvette holder



Underside of a single cell holder

Tray features

- Able to contain spills up to 150 mL
- Can be removed by pulling up on the cell holder
- Can be washed in the sink or a dishwasher - dry promptly!

NOTICE

- Clean the tray with water and mild detergent. Ethanol and iso-propyl alcohol can be used if necessary but do not soak the tray in alcohols.
- Do not allow acetone, chlorocarbons or other aggressive organic solvents to contact the tray. The PC-ABS plastic will soften and discolor.

Removal – grasp cell holder and lift up and forward

Insertion – allow front magnet to engage. Lower cell holder into place, allowing back magnet to guide and engage

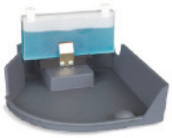
Optional Sample Holders - GENESYS 40 and 50

Cell holder trays equipped to position other kinds of cells and samples are available. They insert and remove in the same way as the standard cell holder.

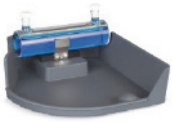
Test tube holder

Tall test tube adapter

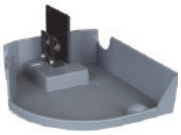
Long path rectangular cell holder



Long path cylindrical cell holder



Filter holder



Accessory kit for hose entry/exit

Cell Holder Replacement - GENESYS 40 and 50

Thermostatted cell holder and **Adjustable filter holder** accessories are supplied without a tray.

Loosen the captive screw at the base of the cell holder to remove it. Attach the new sample holder in the same way.

Note The Accessory Kit for Hose Entry/Exit is required to support use of the thermostatted cell holder. See Lid Removal and Replacement for additional installation instructions.

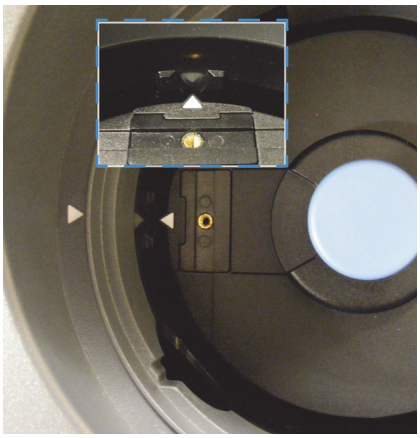
Spectrophotometer Basics - GENESYS 140, GENESYS 150, GENESYS 180 and BioMate 160

Remove all tape from the exterior of the instrument and inside the sample compartment.

Sample Compartment - GENESYS 140, GENESYS 150, GENESYS 180 & BioMate 160

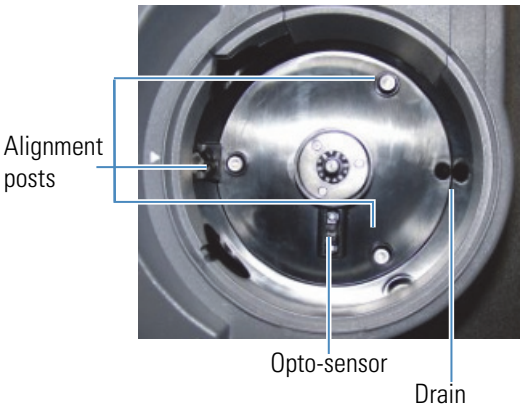
High durability constant torque hinges hold the lid at any angle

Magnet at front holds lid closed to exclude light when door is lowered



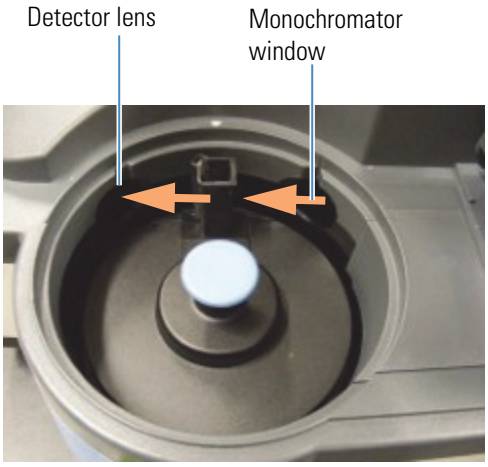
Align arrow on sample holder base with arrow on sample compartment and groove on sample compartment wall.

Window and lens protect interior optics from spills and vapors.



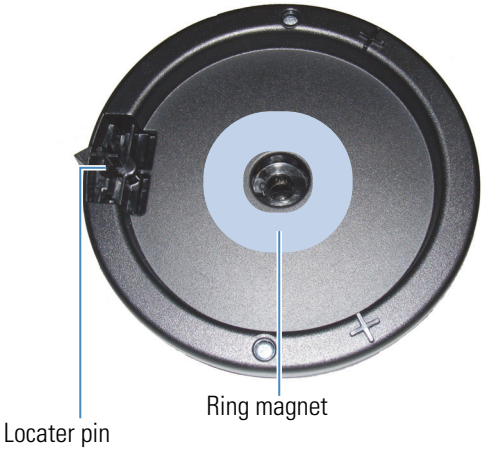
Sample holder aligns to posts on baseplate and groove.

Excess spills drain to benchtop. Opto-sensor is used for positioning cell changer.



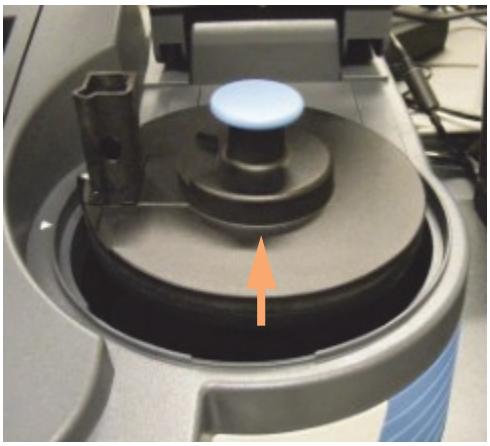
Single Cell Holder - GENESYS 140, GENESYS 150, GENESYS 180 & BioMate 160

Standard 10 mm cuvette holder

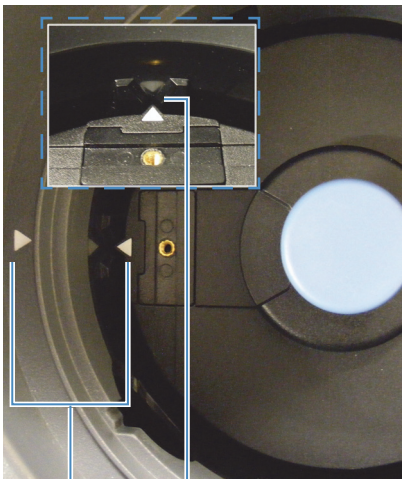


NOTICE

- Clean cell holders by wiping with a solution of mild detergent. Ethanol and isopropyl alcohol can be used if necessary but do not submerge the cell holder in liquid.
- Do not allow acetone, chlorocarbons or other aggressive organic solvents to contact the cell holder or base. The PC-ABS plastic will soften and discolor.



Removal—grasp blue knob and lift straight up



Insertion—align arrow on left side of sample compartment with arrow on sample holder accessory. Lower cell holder into place. Magnet holds accessory down. Pin under accessory base aligns cell holder in beam and prevents rotation.

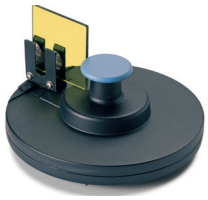
Optional Single Sample Holders - GENESYS 140, GENESYS 150, GENESYS 180 and BioMate 160

Cell holder trays equipped to position other kinds of cells and samples are available. They insert and remove in the same way as the standard cell holder.

Long path rectangular cell holder

Long path cylindrical cell holder

Filter holder



Disposable 50 µL Microcell Holder

Beckman cell holder

Peltier Thermostatted cell holder

Note Water thermostatted cell holders are not supported on this platform. See the Peltier Thermostatted Cell Holder accessory.

Disposable 50 µL Microcell Holder – GENESYS 140, GENESYS 150, GENESYS 180 and BioMate 160

Disposable plastic microcells with 50 µL chambers located at a Z-height of 8.5 mm and centered on the cell are supported by this accessory. At time of writing of this user guide, the Eppendorf™ UVette™ is the only brand supported, but see the insert with the accessory for updates. Cuvettes made by BrandTech™ are not supported because of poor manufacturing reproducibility in these cells.

Note Plastic microcells are not as transparent as quartz, especially at very short wavelengths. The combination of absorption by the cell and masking of the spectrophotometer beam required to restrict it to the 2.5 mm tall cell window reduces the energy passing through these cells. Photometric performance will be lower with these cells than with full size quartz cells.

Beckman Cell Holder – GENESYS 140, GENESYS 150, GENESYS 180 and BioMate 160

Beckman™ pioneered the use of a special type of microcell with volumes of 100 µL or less. These very short cells require a special holder to accommodate them at the appropriate Z-height for the cell and to mask off part of the spectrophotometer beam to ensure that light only passes though the sample, and not over it.

Peltier Thermostatted Single Cell Holder – GENESYS 140, GENESYS 150, GENESYS 180 and BioMate 160

The accessory holds a single cell at a temperature between 20° and 60 °C with a precision of ≤0.2 °C and an absolute accuracy of ±0.5 °C.

Note The specification for absolute accuracy is limited by the accuracy of the thermocouple used in construction of the device. ±0.3° C is the specification of a superior quality thermocouple. Beyond this specification the cost of the thermocouple becomes exponentially higher and use of a calibrated thermocouple becomes a necessity if exceptionally high accuracy is a requirement.

In our tests, using a calibrated thermocouple probe, we generally find the temperature of the solution in the cuvette to fall within ±0.3 °C of the programmed absolute temperature.

The temperature measured and reported by the device is the temperature of the metal cell-holder block. The temperature of stirred liquid in a full size quartz cell will reach the same temperature as the cell holder block after approximately 6 minutes when heating from 23 °C to 35 °C. This is only a guide. Performance will vary if:

- The initial temperature is different
- The final temperature is below room temperature
- The cuvette is not stirred
- The cuvette is not made of glass or quartz
- The cuvette is a micro-cuvette

The experimental parameters for controlling the Peltier thermostatted cell holder include an equilibration time. This is a “wait time” between when the cell holder block reaches the target temperature and when the absorbance measurement is made. We strongly recommend that you place the probe of a digital thermometer or thermocouple of sufficient accuracy and precision in the liquid in a cell under what will be normal experimental conditions, and bring a quantity of appropriate matrix (solvent or buffer) to temperature in the cell holder while monitoring the temperature to determine performance under your experimental conditions. A white paper describing important considerations and limitations in thermostatting experiments is included with this documentation set. Refer to *Introduction to Temperature Control* for additional details.

In brief, however:

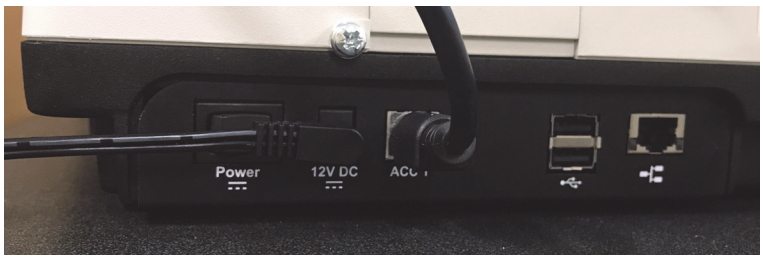
- Quartz conducts heat six times faster than plastic – samples in quartz cells come to temperature much faster than they do in plastic cells.
- A full size cell takes approximately 66% more time to reach equilibrium temperature if it is not stirred.
- Liquid in unstirred plastic cells did not heat to within 0.6 °C of the cell holder block temperature when heating in our experiments.
- Plastic microcells and semi-microcells have significantly reduced surface contact with the walls of the cell holder block compared to full size plastic cells or glass/quartz reduced volume cells. If using a reduced volume plastic cell it is essential that you perform some experiments to determine the appropriate equilibration time setting.

Installing the Accessory

Align white arrows as shown.

Lower the cell holder into the sample compartment so that the V engages with the groove on the side of the sample compartment and the hold-down magnet engages

Connect cables as shown.



- The power supply is identical to the instrument power supply
- Operate this accessory with the sample compartment lid open
- Do not close the sample compartment lid while the accessory is running
- Optional – the sample compartment lid can be removed while using this accessory

See "Peltier Configuration" on page 74 of this guide for instructions on configuring your method to use this accessory.

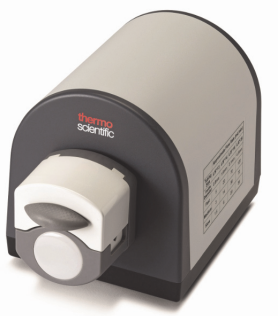
Sipper Accessory - GENESYS 140, GENESYS 150, GENESYS 180 and BioMate 160

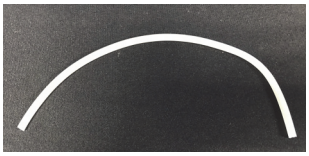
Introduction to Sipper Use

A detailed introduction to sippers and how they can be used to get the best results in different situations is provided in a separate document (English language only) included in the documentation media with this user guide.

Components of the Sipper System

Complete sipper systems come with the following components

Item	Photograph
Sipper pump	
Sample compartment insert with gooseneck	

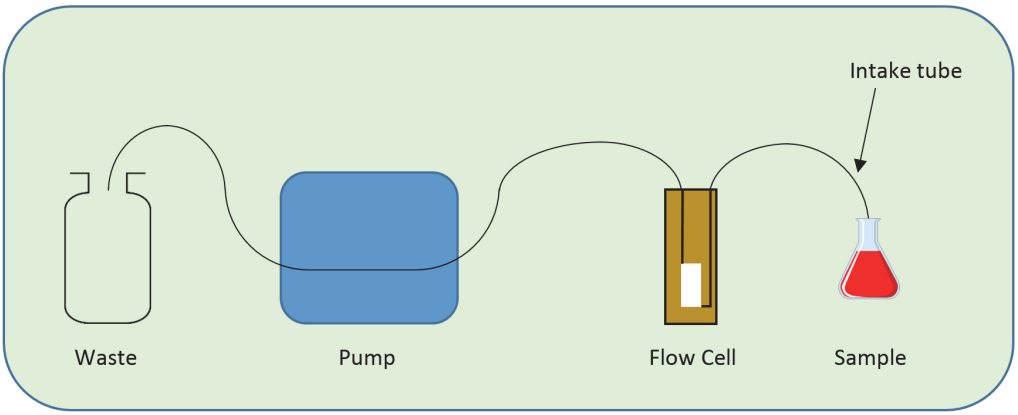
Item	Photograph
30 cm Silicone pump tubing (#16 size – 1.6 mm wall, 1.6 mm inside diameter)	
3 m PTFE transfer tubing	
1 Flow cell, 160 µL volume with screw connector set	
Smaller volume flow cells are available but the smaller window size cuts off some of the spectrophotometer beam, reducing photometric performance. If the absorbance values measured are below 1.0, however, this will not make a noticeable impact on data quality.	
Connector package	
The connectors supplied are designed for use with the # 16 tubing supplied. They can also be used with smaller # 14 tubing with extra effort. To use larger # 25 tubing please purchase a larger connector separately.	

Compatibility of the GENESYS Sipper with tubing sold by us for use with spectrophotometer sippers.

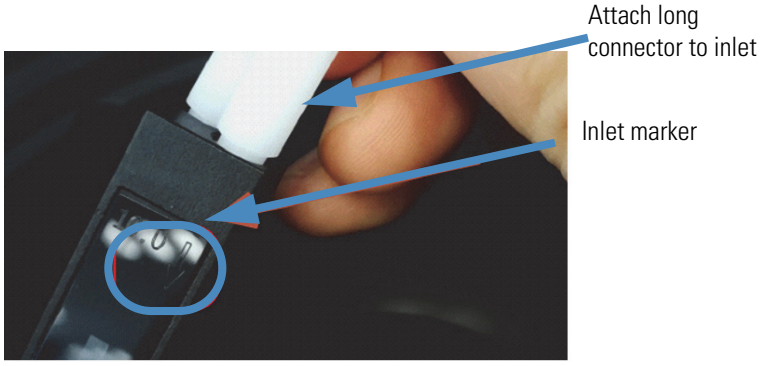
Material / Size	# 13	# 14	# 16	# 25
Silicone	✓	✓	✓	✓
C-Flex	X	✓	✓	✓
Viton	X	X	✓	✓
ChemDurance Bio[a]	X	X	X	X

[a] Chemdurance Bio tubing is suitable for use with the Smart Sipper for Evolution spectrophotometers

Connecting the Sipper Tubing



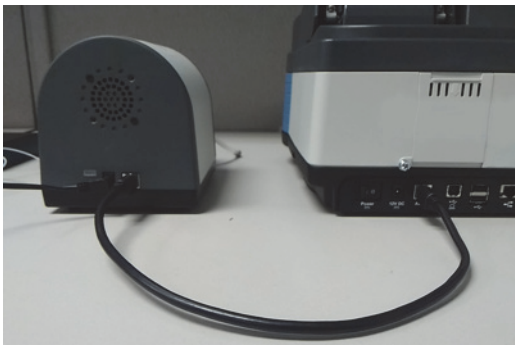
1. Connect screw connectors to flow cell.



2. Attach the gooseneck tube.

3. Lower the cell holder into the sample compartment so that the V engages with the groove on the side of the sample compartment and the hold-down magnet engages.

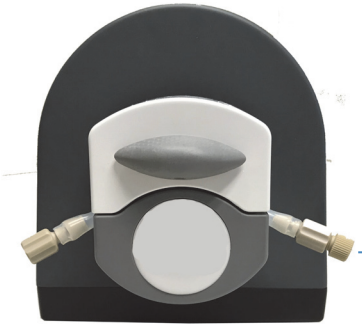
4. Position sipper pump and connect cables.



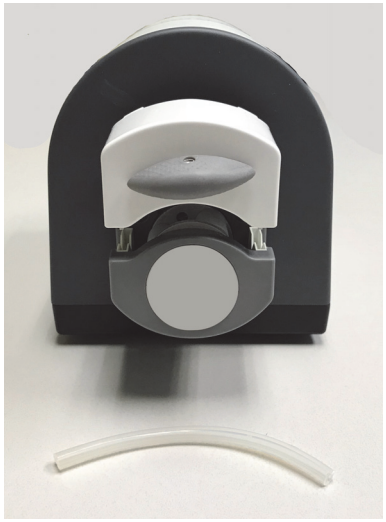
Note The power supply for the pump is identical to the power supply for the spectrophotometer. There is no risk or danger to connecting “the wrong one”.

5. Decide where the waste container will be placed.
   - If very close to the pump, run the pump tubing directly to the waste container.

6. If farther, run (less expensive) PTFE transfer tubing from the pump-head tubing to the waste container.



7. Determine the length of pump tubing required for your configuration. Minimum recommended length of pump tubing is 10 cm.
8. Cut a suitable length of pump head tubing and lay it on the bench in front of the pump.



9. Place the flow cell in the cell holder with the windows in the beam (facing to the front and back).

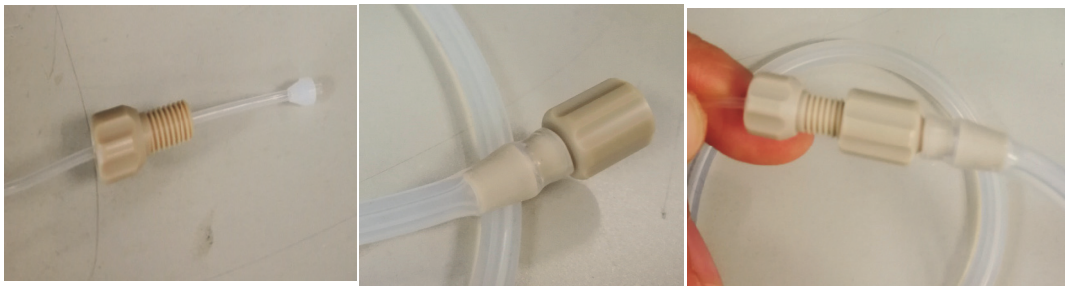
10. Route the PTFE cell connector tubing from the inlet (long connector) through the gooseneck.

    Refer to separate *Introduction to Sipper Use* for detailed information.

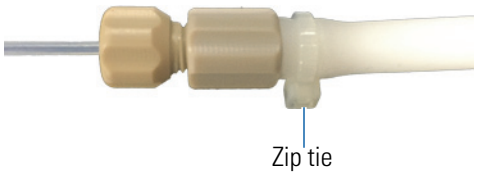
11. Route the PTFE cell connector tubing from the outlet (short connector) to the pump.

12. Trim all cell connector tubing to an appropriate length for your use scenario.

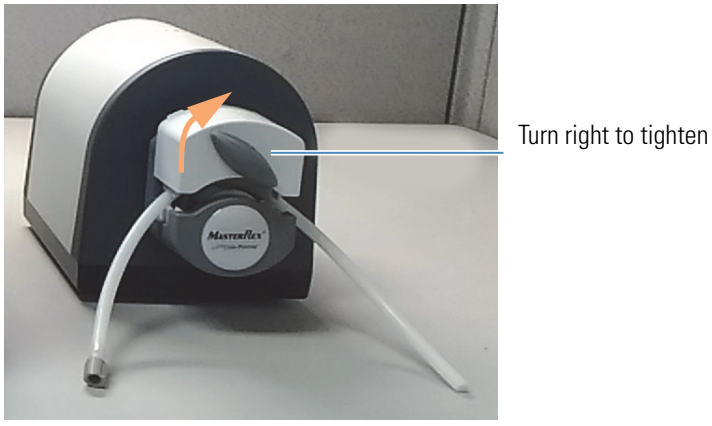
13. Attach the pump-head tubing to the PTFE tubing using the couplers.



Secure the connections with zip-ties if using high pump speeds or tubing larger than the size supplied.



14. Install the pump-head tubing into the pump head as shown.



15. Test the system for leaks.

    Use the table on the pump to choose a pump speed suitable to the volume that you wish to pump in your procedure.

> **Note** Accuracy of the volume delivered decreases as pumping speed and tubing size increase.

Program a custom sequence to sip at the chosen speed for 60 seconds, or longer if necessary. Place the inlet tube in a beaker of clean solvent and pump for long enough to completely fill the system with solvent and deliver it to the waste container.

Repeat the sip sequence while observing the PTFE tubing between the flow cell and the pump. There should be no bubbles in the tubing. If there are, check the tubing connections to the flow cell.

Remove the flow cell from the cell holder and check it for solvent leaks.

Check the connections between the PTFE tubing and the pump-head tubing for solvent leaks.

16. Follow the process to calibrate the sipper.

    Failure to deliver a consistent volume can be an indicator of an air leak at the connection between the cell outlet tubing and the pump-head tubing.

Controlling the Sipper from Software

Two sipper control modes:

1. Uncalibrated – Define pump time at all stages.
2. Calibrated – Define pump volume at each pumping stage.

Sipper parameters are stored in the experimental method. Sipper control is supported only in Quant, Fixed and Scan modes.

See "Sipper Configuration" on page 68 for instructions on programming the sipper.

Sipper setup controls

Selection	Definition
Sip	Pump in the forward direction (from the inlet tube towards the flow cell and pump)
Settle	Time to wait for the liquid to stop moving before making a measurement
Air gap	Pump air in the forward direction to push liquid through the system
Rinse	Pump rinse solution in the forward direction
Return	Pump in the reverse direction (from the pump and flow cell towards the inlet tube)

Selection	Definition
Measure	Record the absorbance
Prompt	Display an on-screen prompt to tell the user what to place at inlet tube for the next step in the sequence

Uncalibrated vs. calibrated sipper operation

Customers whose existing SOPs are based on a prior sipper system that did not support calibration for volume pumped can continue to use time-based pumping in uncalibrated methods.

In general, calibrating the system for volume delivered is the preferred method. Once calibrated, the system will pump the specified volume at each step.

Fiber Optic Coupler and Probe (UV Vis systems only)

NOTICE Fiber optic cables can suffer damage when bent with too small a radius. A small radius can also lead to light loss and reduction of performance even if it does not lead to physical damage. The recommended minimum bend radius when working is 20cm.

Note The fiber optic probes that we supply are equipped with a shorter than normal collar at the SMA connector. This helps to maximize the bend radius of the input fiber. Probes purchased from other vendors will generally have a 25 mm long collar at the SMA connector. This will make them difficult to install and may result in an unacceptably small bend radius to the fiber as it exits the collar. If you wish to use a third-party probe, we recommend that you specify a 13 mm collar.

Assembly

Assemble the fibers to the coupler as shown in the photograph.

1. Loosen the three thumb screws on the top cover and remove it from the coupler.

2. Remove the protective plastic covers from the ends of the fibers.

   Save these covers and re-attach them if you remove the probe.

3. Slide the tips of the SMA connector into the receivers and tighten the nuts hand tight.

   Do not use tools to tighten the nuts further.

4. Loosen the hold-down thumb-screw, place the fibers under it, and tighten it down to hold the fibers in place.

   Do not over-tighten. Be sure to route the cables as shown in the photograph above. This routing pattern maximizes the bend radius.

> **Note** The routing distance for the input and output fibers is slightly different so there will be a small excess loop between the junction nut and the coupler. This is normal and correct.

5. Re-attach the top cover to the coupler.

6. Remove the black rubber cover from the pick-up lens. Be careful not to touch the lens with your fingers.

7. Lower the coupler into the sample compartment with the white arrows aligned.

8. Ensure that the probe tip is tight. It screws on and off in the expected way.

Operation

The recommended operation wavelength range is from 220 nm to 1100 nm. Although the fibers are solarization resistant they can suffer cumulative damage (they become opaque) when used at very short wavelengths. Damage to the fibers due to solarization is not covered under warranty.

Two configurations are recommended:

1. Place the probe in a clamp and bring the container with the solution up to it.
2. Hold the probe in your hand and place it into the container with the solution.

Configuration 1

Measure the blank solution first and then measure the sample(s) – exactly as you would if you were making measurements with cuvettes.

It is **VERY** important to avoid having an air bubble in the tip when making a measurement. Air bubbles will result in completely incorrect measurement values. Tap the probe with your finger to knock air bubbles out if using configuration 1. “Shake” the probe back and forth quickly and/or tap it with your finger to knock air bubbles loose if using configuration 2. Do not tap the probe on the side of the container. This could damage the tip or the container.

Probe Tips with Different Pathlengths

While tips with other pathlengths can be purchased for the dip probe we do not recommend their use with the GENESYS systems and have not tested other configurations. Longer pathlengths typically lead to greater light-loss in the tip, reducing photometric range. Shorter pathlengths are more prone to trapping air bubbles in the tip and it is more difficult to shake them loose.

Performance

Fiber optic couplers and probes “cost” light in a spectrophotometer system. Having less light intensity in the system means not being able to deliver the same photometric performance with the fiber probe system that the instrument can deliver with cuvettes in a dark sample compartment. Do not perform the performance verification tests when using the fiber optic probe system.

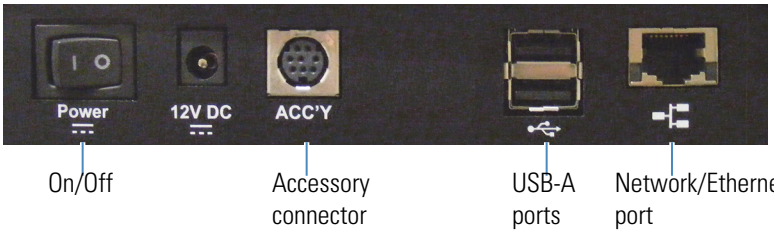
As a guide, in our tests, we found the system to very resistant to room lighting conditions and to deliver good linearity to approx. 1.8A and an upper limit of measurement of 2.2A. If performing quantitative analysis with this accessory and measuring above 1A we recommend that users choose a quadratic (second order) fit for the curve and work in an operational range below 1.8A.

Troubleshooting

Problem	Cause	Solution
Readings are unexpectedly high or low with no consistency to the error	Air bubbles in the tip during sample measurement	Inspect the gap in the tip prior to making a measurement. Take steps to remove any bubbles.
	Inconsistent small bend radius	Use a large bend radius and keep it consistent
All readings are “off” by a uniform amount	Air bubble in the tip during blank measurement	Inspect the gap in the tip prior to making the blank measurement. Take steps to remove any bubbles.
Change in photometric performance – depressed ABS readings or maximum ABS reading	Bend radius too small	Configure your experimental setup to use a large and consistent bend radius
	Damaged optical fiber	Follow the recommendations above. Record a blank and scan from 1100 nm to 220 nm with deionized water. Save the spectrum. The spectrum should be essentially flat with < ±0.05A baseline noise. Large spikes or discontinuities are common signs of fiber damage. Try using a different probe if you have one available. Contact Us
Probe does not work at all – no signal	Cover over pick-up lens on coupler	Remove the lens cover.
	Broken fiber	Replace the probe.
	Tip loose, damaged or missing	Remove and inspect the tip. Ensure that the mirror is present and clean. Attach the tip and re-test the system.
	Coupler not inserted correctly	Remove and re-insert the coupler
	SMA connector not properly secured	Remove and re-attach the SMA connectors inside the fiber coupler. Ensure that the nuts are not cross threaded.

Spectrophotometer Basics – All Models

Electrical Connections



- Power toggle switch
- 12V DC—connect the cable from the power supply here
- Accessory connector—connect the data cable from the Peltier Thermostatted Cell Holder or Sipper Pump (optional accessories) here
- USB-A ports—see Optional Accessories below
- Network/Ethernet port—connect a standard Ethernet (RJ45-RJ45) cable between this port and a network port to communicate with the building network

A single USB-A port is located on the front (GENESYS 40 or GENESYS 50) or the side (GENESYS 140, GENESYS 150, GENESYS 180 and BioMate 160) and a pair of USB-A ports is located on the main connector panel (pictured).

Optional Accessories

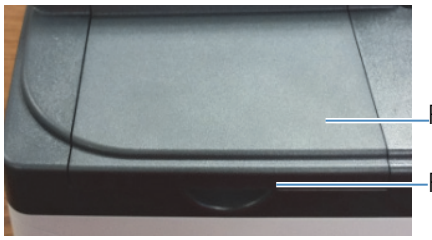
The USB ports support the following peripheral devices:

- Special cable to PC to run the instrument from VISION*lite* software
- Standard keyboard
- Mouse or touchpad
- Dongle for wireless keyboard/mouse
- Printer
- USB flash memory device
- Barcode reader

Printer

1. Remove the printer housing cover.

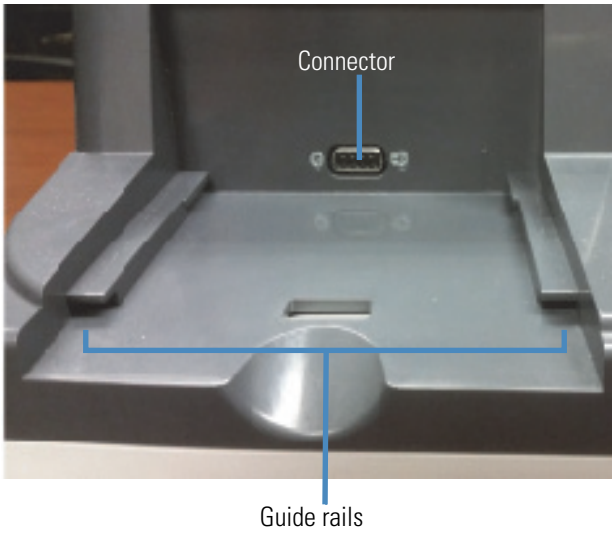
   Use the finger hold, pull towards you and lift.



2. Load paper into the optional printer.

3. Insert printer into GENESYS spectrophotometer.

Back of GENESYS



Bottom of printer

a. Align the guide rail on the printer with the guide rail on the GENESYS spectrophotometer.

b. Push the printer forward until the connectors are fully connected.

You will hear a snap when the connectors have engaged properly.

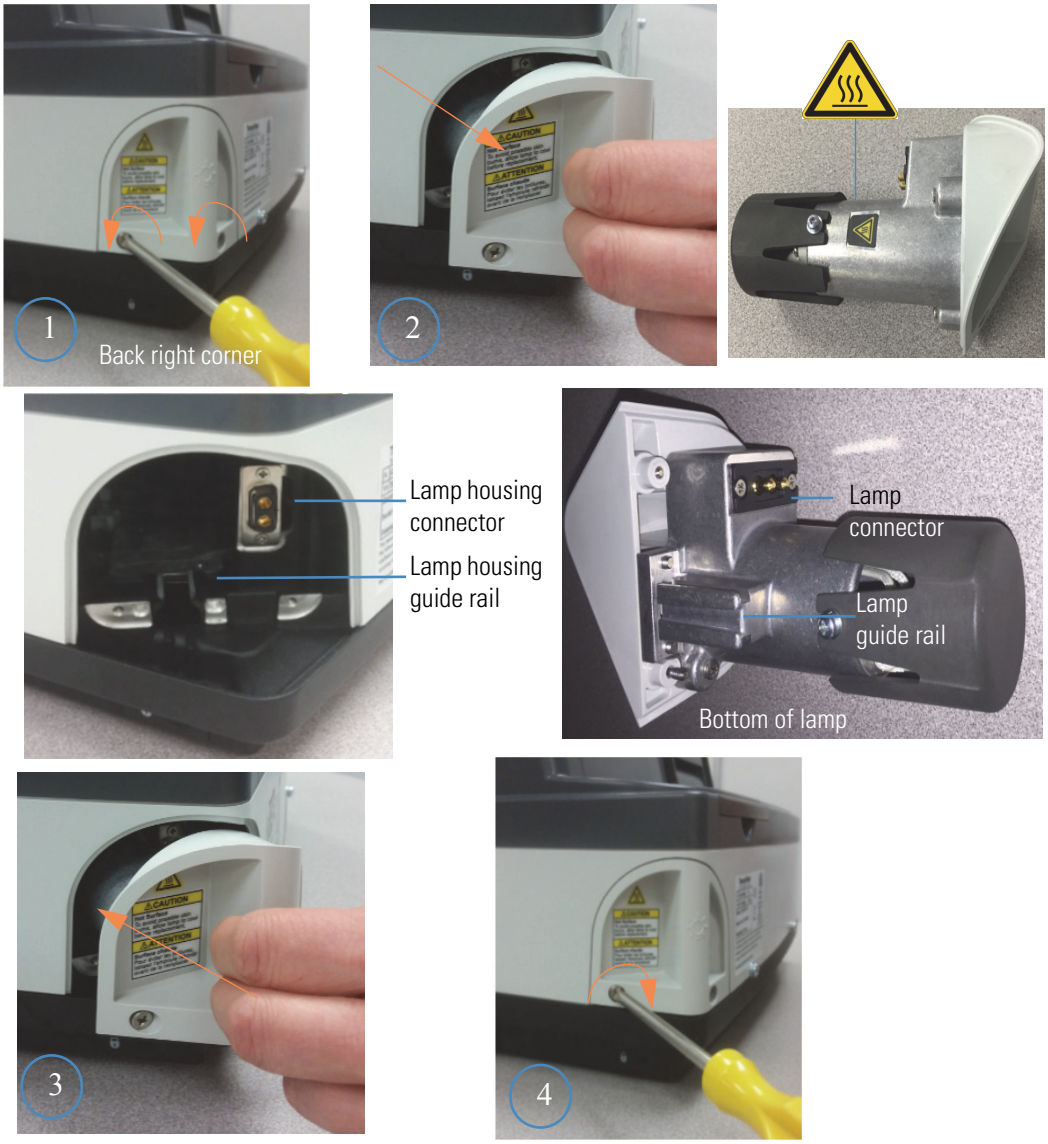
Slide forward

Printer fully engaged

Halogen Lamp

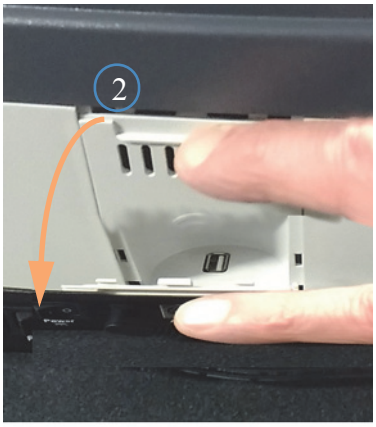
The lamp source lifetime is approximately 1,000 hours.

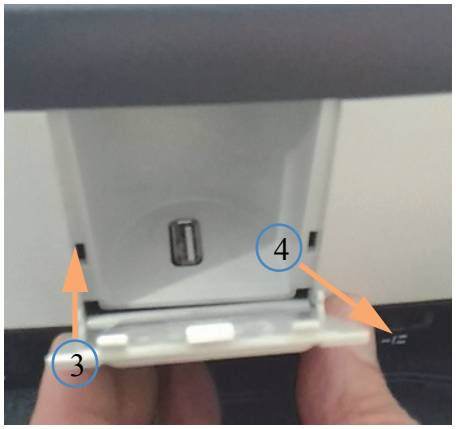
❖ **To replace the halogen lamp**

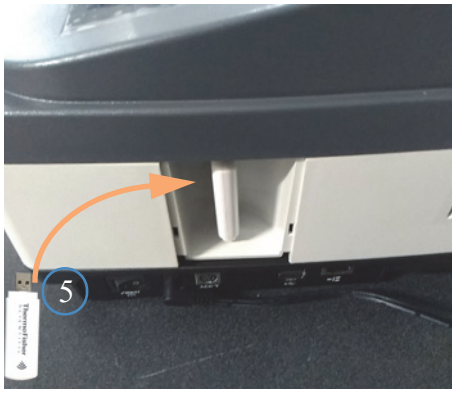


GENESYS 40 shown. GENESYS 140 is similar.

WiFi Transceiver







1. Print to a wireless printer in the room.
2. Connect to a WiFi router.

NOTICE Prevent damage to the instrument. Remove the WiFi Transmitter from the instrument and package it separately when shipping the instrument – for example to our depot for service.

Lid Removal and Replacement

Loosen single Phillips/Cross screw as shown and lift lid assembly upwards. Attach new lid in same way.

Lid removal may be required or desired when:

- Installing the Accessory Kit for Hose Entry/Exit on GENESYS 40 or GENESYS 50
- Using the Peltier Thermostatted Cell Holder accessory for the 100 series models
- Using the sipper accessory for the 100 series models
- Using the fiber optic probe accessory for the 100 series models
- Using the 8-cell changer for the 100 series models
- Replacing a damaged lid

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GENESYS On-board Software

GENESYS On-board Software Home Screen and Navigation

See Performance Verification Tests and Reports

When an application is selected, the user is directed to an “Application Home” screen.

On this screen, when available, existing methods can be loaded, new methods created or existing methods modified or edited.

Getting Started

This section provides an overview of the basic operations within an application.

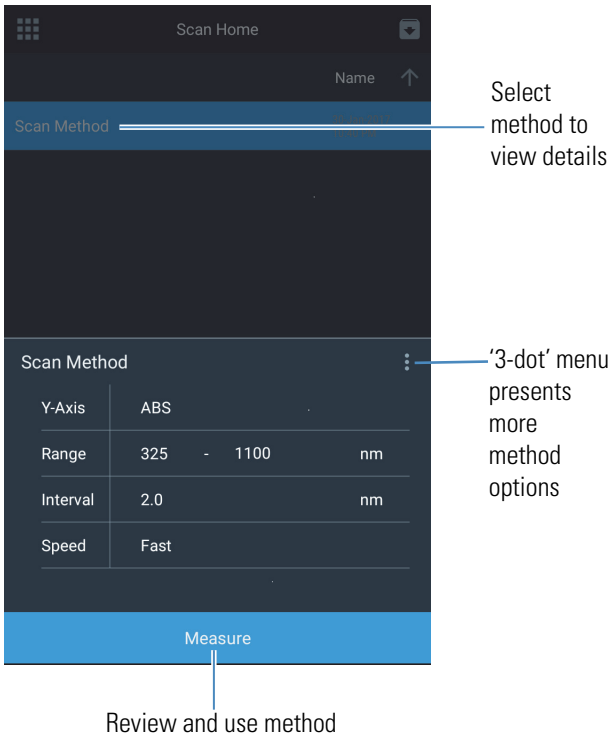
For detailed explanation of parameters within each application and advanced functionality, please see the appropriate section in this manual.

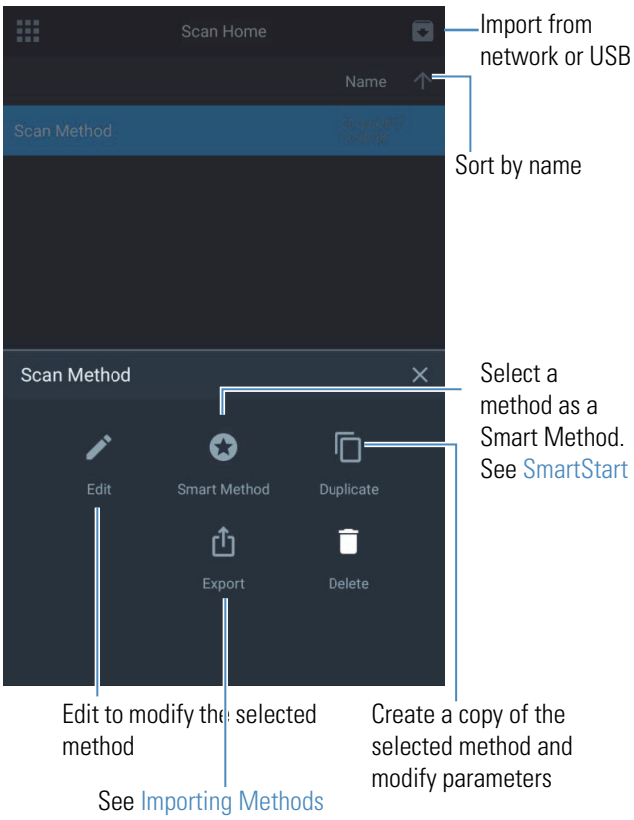
Typically, the Thermo Scientific™ GENESYS™ On-board applications have the following structure and workflows:

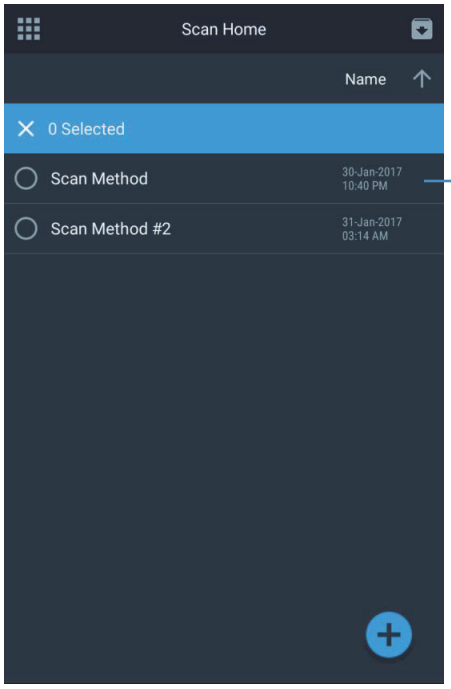
- Application Home
  - View and select methods
  - Export/Import/Data methods
  - Select for Smart mode
- Setup
  - Setup parameters
  - Configure accessories
  - Perform calibration for Quant
- Experiment Execution
  - Perform Blank, begin measurement
  - Edit sample names
  - Select sample-specific actions, where applicable
- Data Analysis and Actions
  - View and analyze data
  - Export/print
  - Save/discard

Application Home

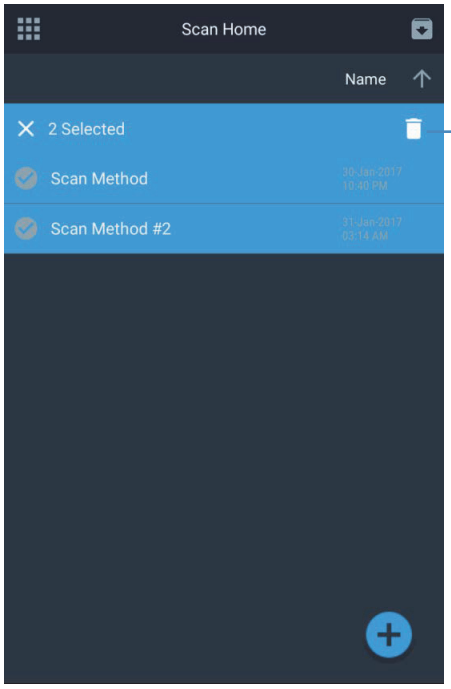
This section uses the Scan application as an example. See the specific application section for detailed explanation of parameters and options.





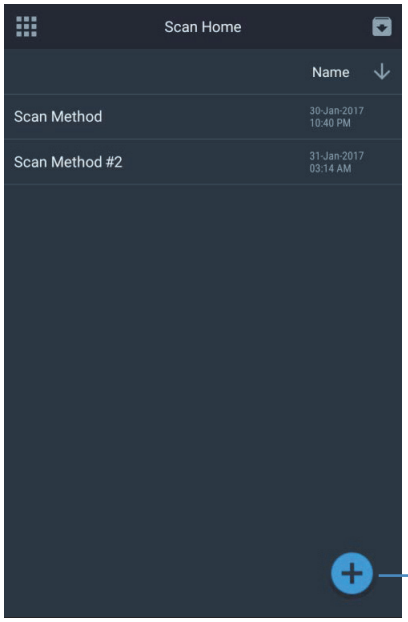


Long tap to select multiple methods

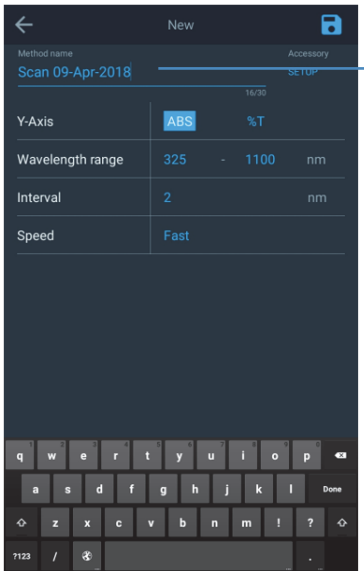


Delete

Creating A New Method



Create new method



Edit method name

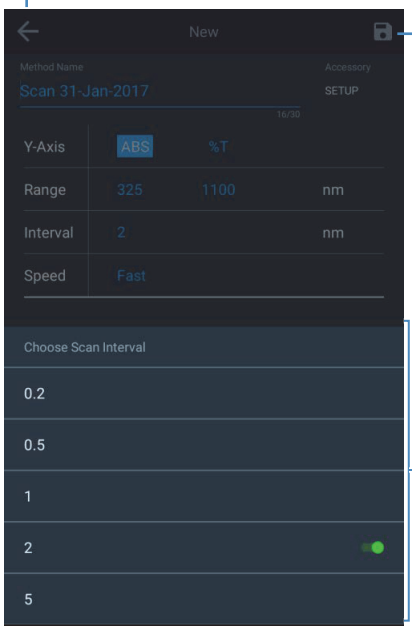
See Accessory Setup

All blue text and buttons are editable

Go to previous page

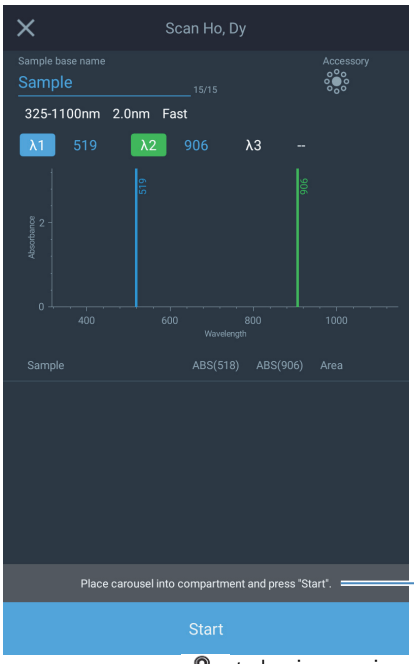
Blue save icon indicates unsaved changes.

to save



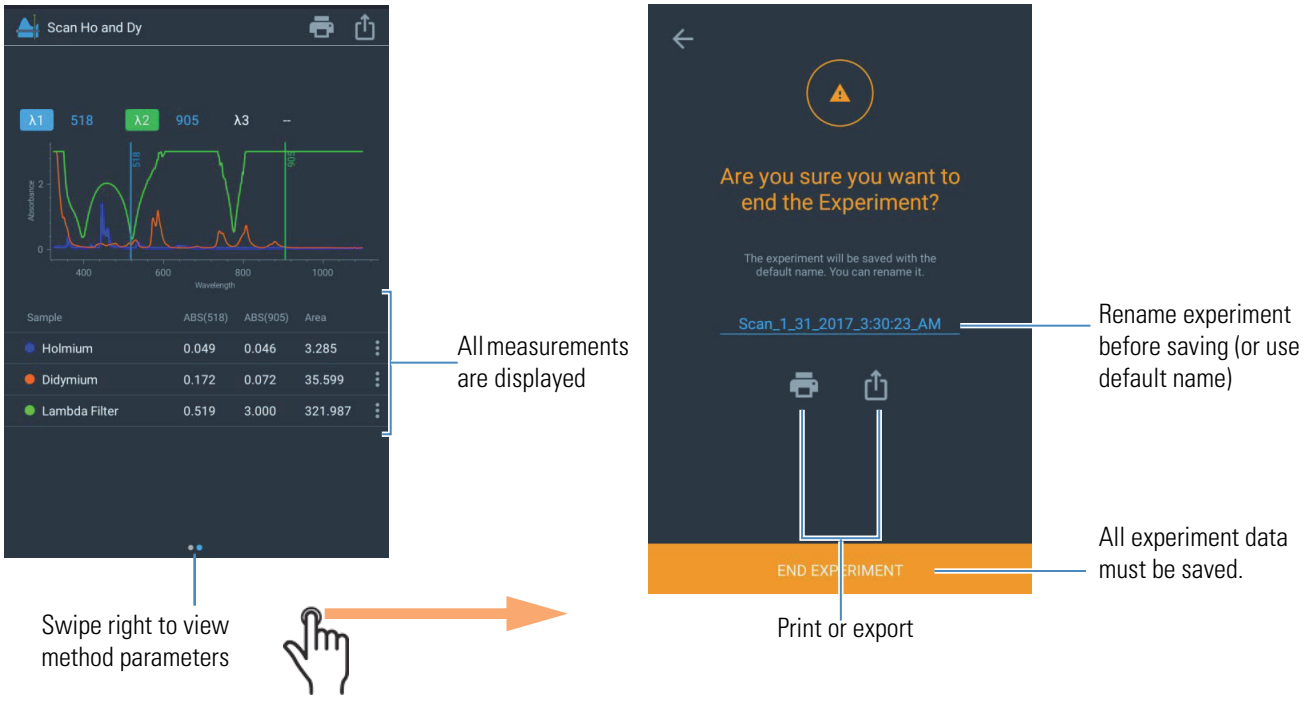
All parameter options are presented in a slide up menu

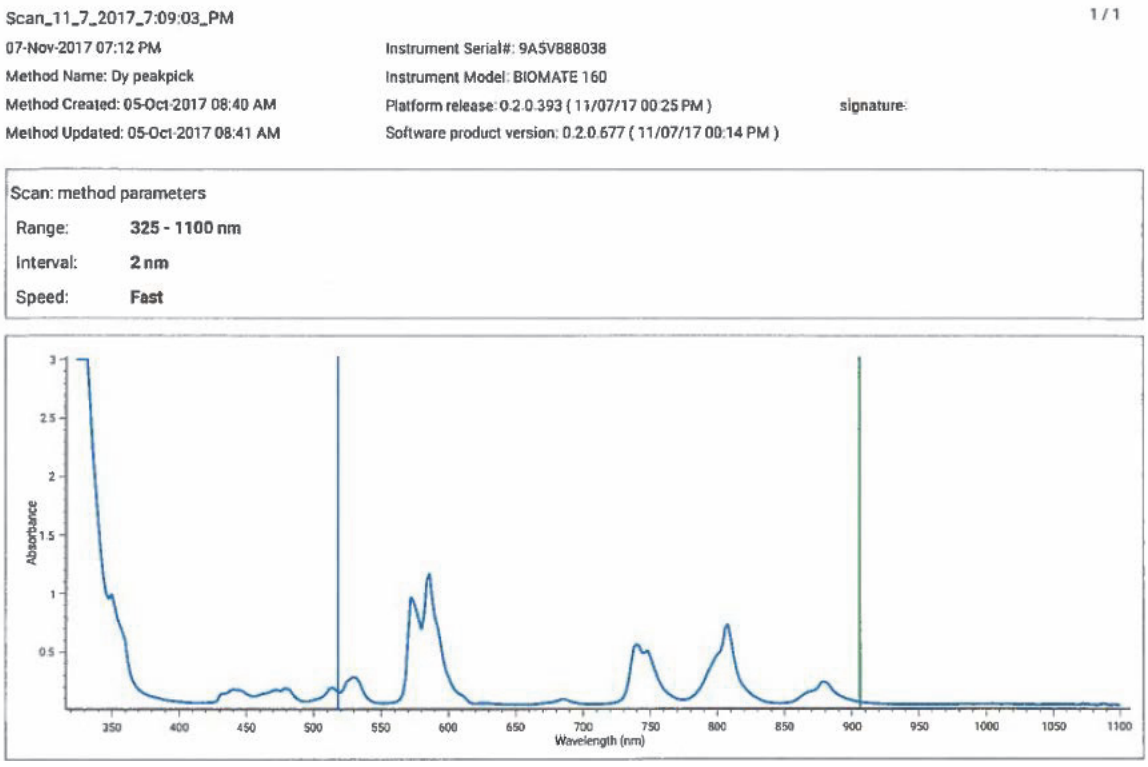
Experiment Execution



Follow prompts

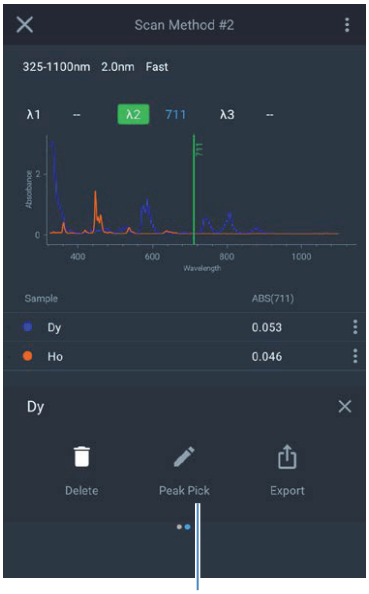
to begin experiment



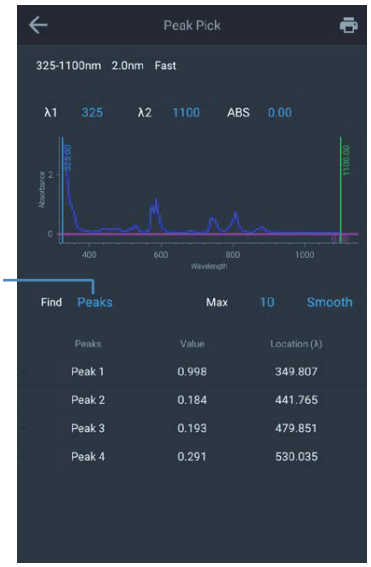


Example of a printed report. See Printer Setup and Wi-Fi Printing for details.

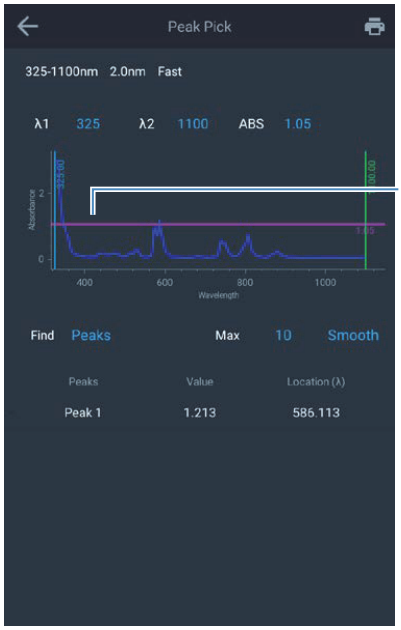
Data Analysis and Actions



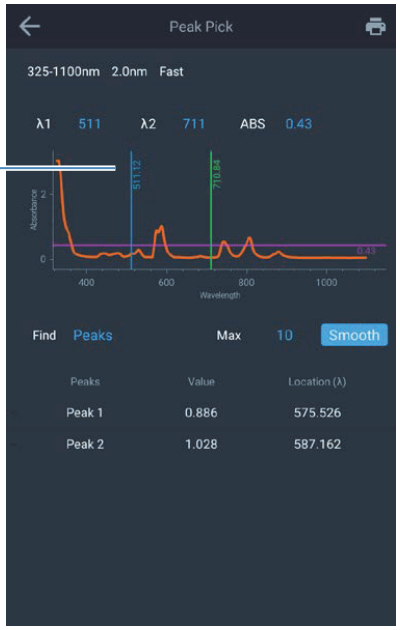
Select Peak Pick



Peaks, Valleys or both



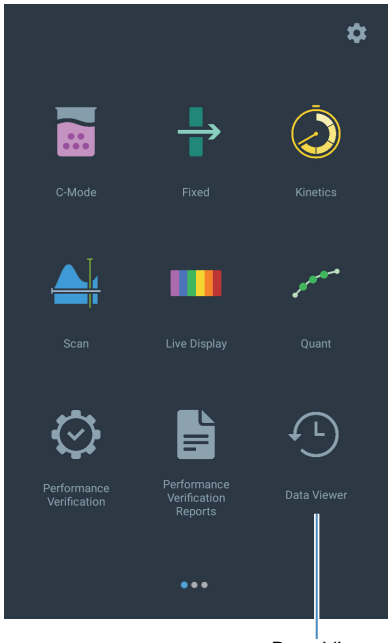
Adjust ABS scale to specify lower limit



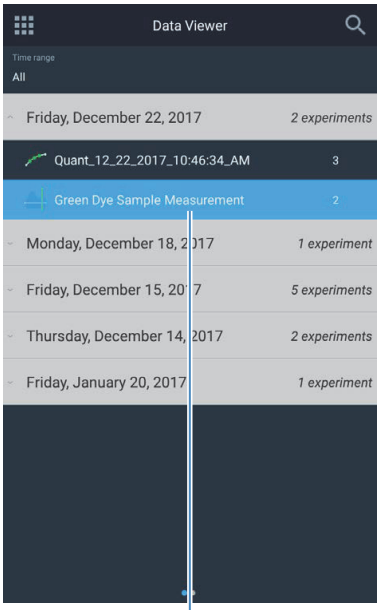
Adjust Lambda cursors to specify peak detect range

See Scan Application for detailed information on options and parameters.

Viewing Saved Experiment Data



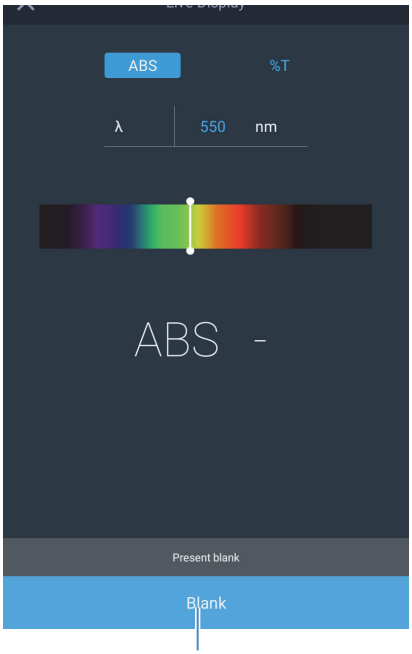
Data Viewer



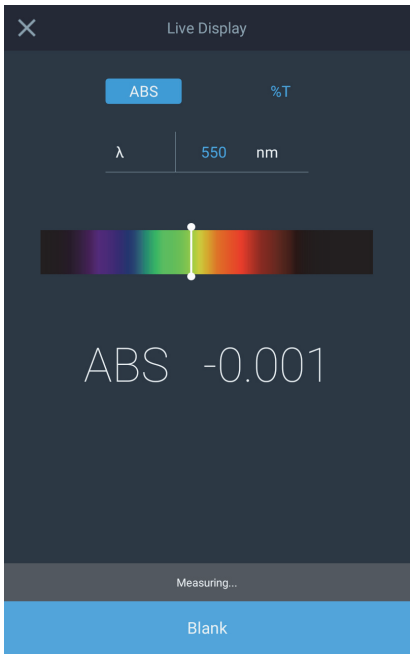
Select experiment data by name

Live Display Application

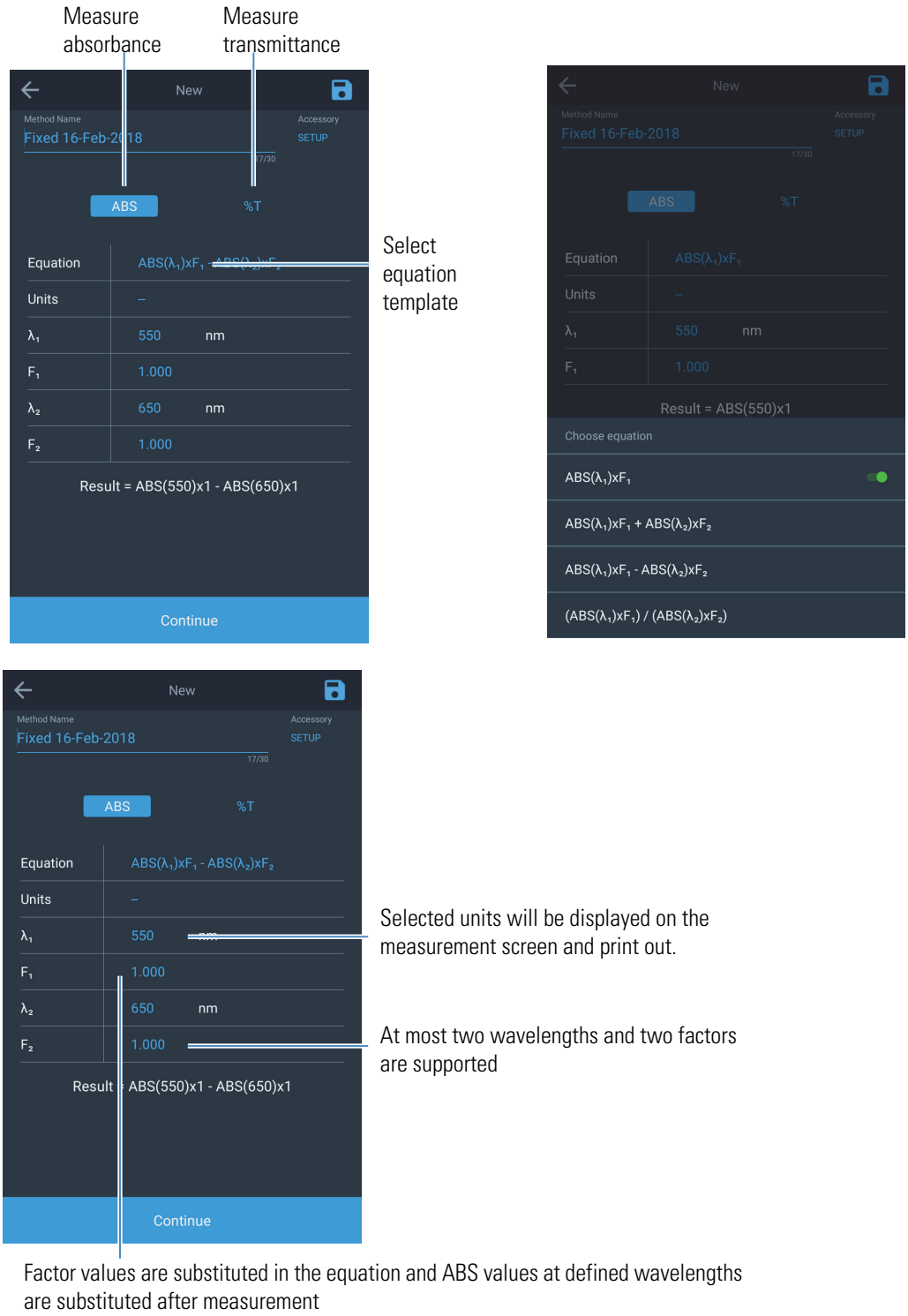
In the live display mode, the instrument performs continuous absorbance measurements automatically.



The instrument must be blanked first



Fixed Application



Follow the prompts to complete measurement. When an equation type with two wavelengths is selected, the instrument will acquire measurements at the two selected wavelengths.

Scan Application

Scan range:

Between 190 nm and 1100 nm for UV-Vis

Between 325 nm and 1100 nm for Vis instruments

Interval:

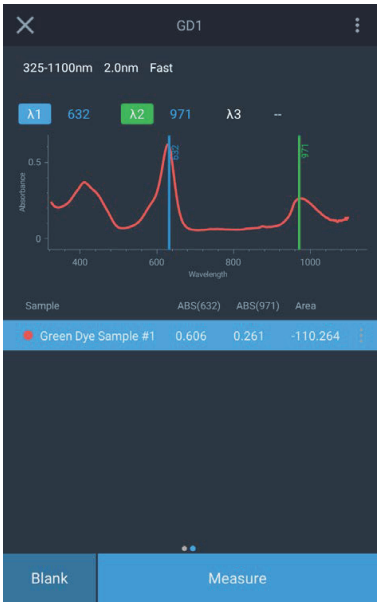
Specifies how frequently the instrument will acquire a measurement.

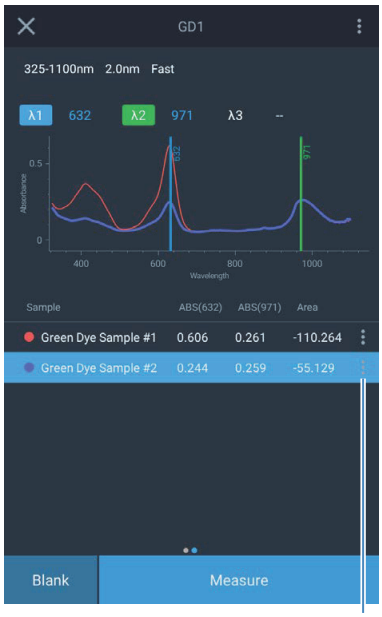
In this illustration, data will be captured every 2 nm.

Fast, Medium, Slow scan speeds limit the number of data interval options offered

Speed	Interval Options
Fast	5 nm, 2 nm
Medium	5 nm, 2 nm, 1 nm
Slow	5 nm, 2 nm, 1 nm, 0.5 nm, 0.2 nm, 0.1 nm[a]

[a] 0.1 nm interval option is available only on GENESYS 180 instruments

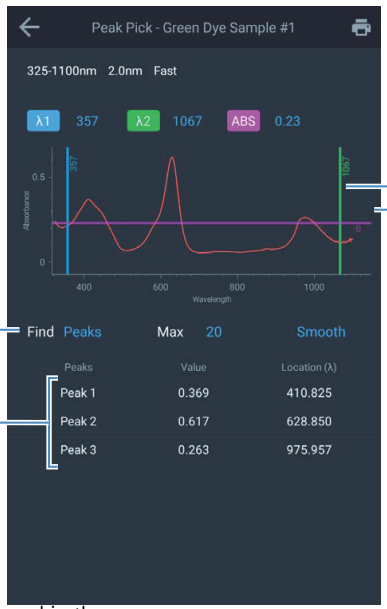




To view more sample data options

to run Peak Pick

Analyzing First Sample

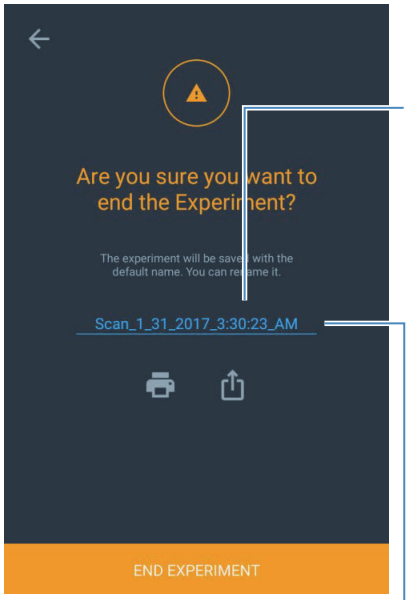


Adjust wavelength cursors to narrow regions of interest

Show peaks, valleys or both

Three peaks found in the region above the ABS cursor and between wavelength cursors

Adjust ABS cursor to narrow region of interest



Find the experiment in the Data Viewer using this name

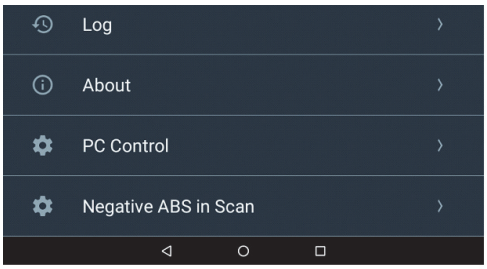
Rename data

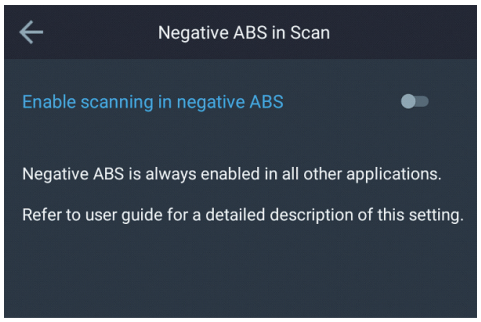
All data must be saved for data integrity. If a custom name is not provided, the software assigns a default name.

Negative and Positive Absorbance in Scan

The GENESYS instruments can measure negative absorbance. However, measurement of negative absorbance in the Scan application requires that this feature be enabled. This setting must be disabled again to measure positive absorbance.

Note Toggling this setting is required only to measure negative absorbance in the Scan application.

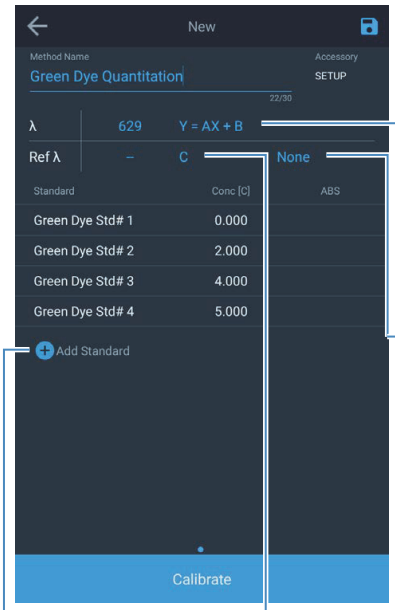




Quant Application

Calibrated and Uncalibrated Quant Methods

When method is saved after a standard curve is calibrated, the method is saved as a calibrated method. Since the standard curve is already available, it is possible to proceed directly to the sample measurement screen

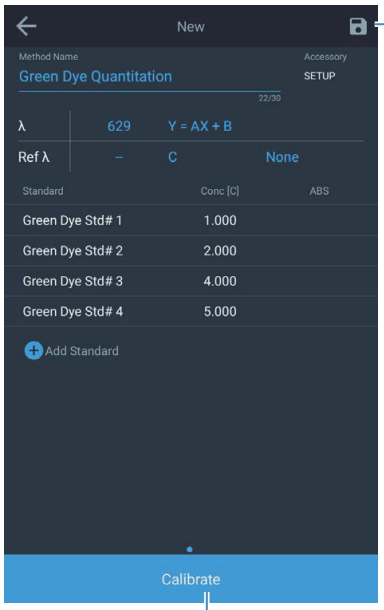


The equation type used to fit the standard measurement data is determined by this equation

Select if 1 or 2 replicates are needed

Add standards and select curve type

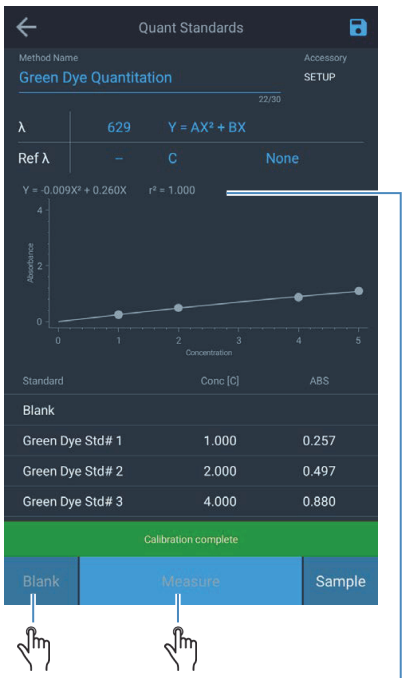
Selects units in which the sample measurements are displayed and printed



Save method

Once sufficient unique standard concentration values are provided, the calibrate button is enabled.

The number of unique standard concentration values are determined from the equation of the curve type.

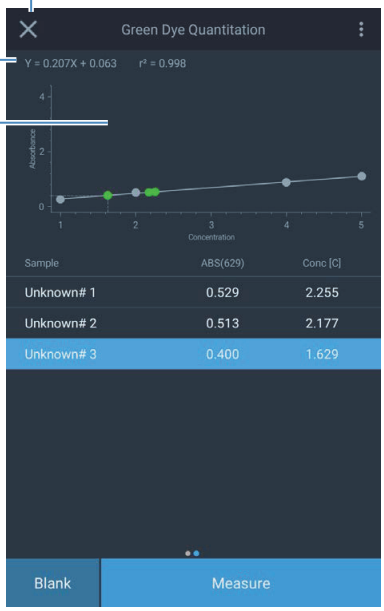


Equation and r-square calculated

Measure is enabled after all standards are measured

Change curve type to find new fit. R-squared value is re-calculated

after sample measurement is complete

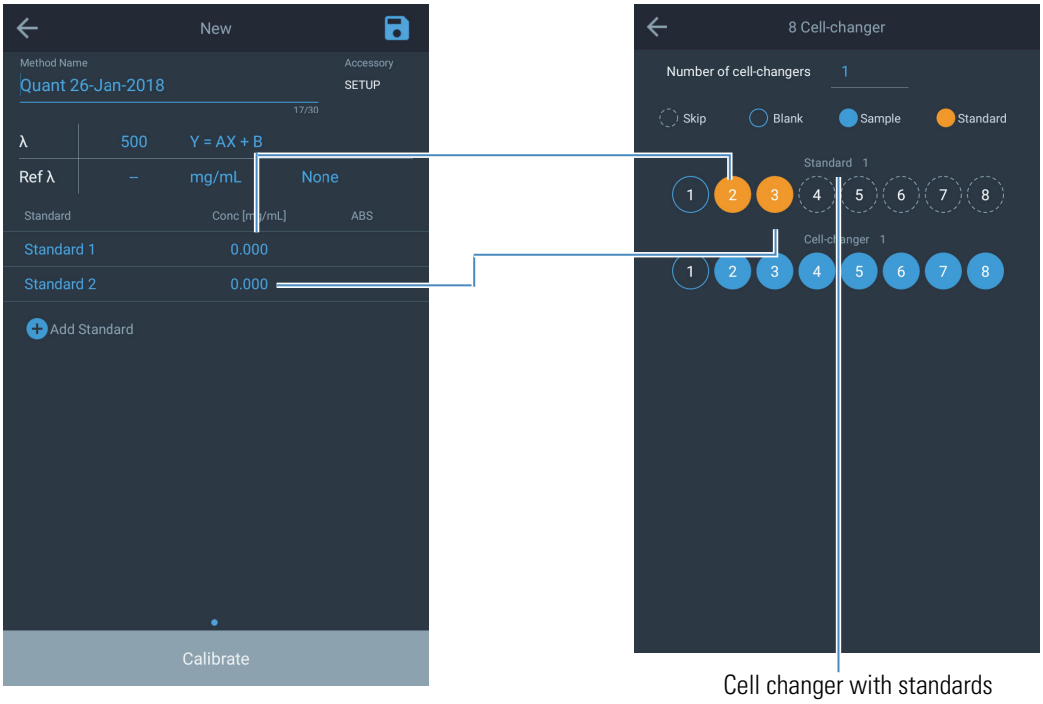


New sample

Add standards and select curve type

Cell Changer Setup in Quant

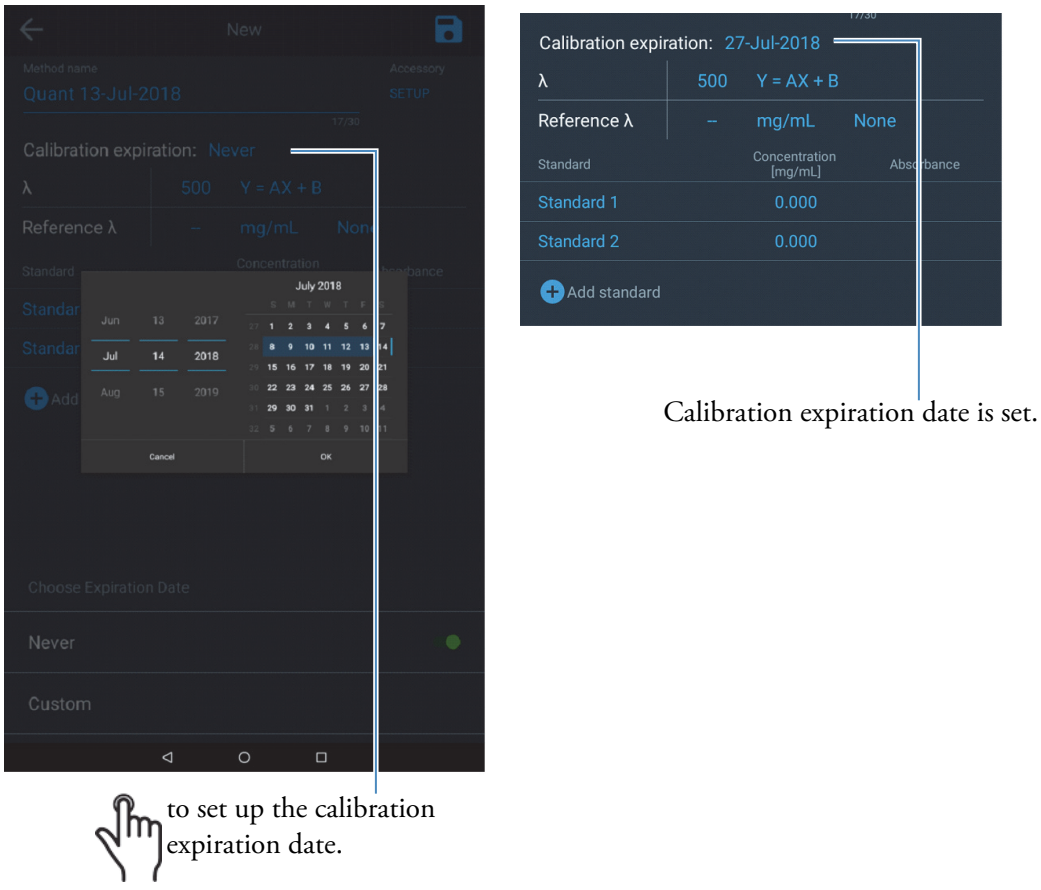
When configuring the cell changer in Quant, the first cell changer will always be configured with standards. The number of standards can only be configured on the Quant Home page. The first cell in the standards cell changer will always be blank.



For details on how to setup a cell-changer, see Cell Changer Configuration.

Quant Calibration Expiration

Standard operating procedures (SOPs) often require that a method be recalibrated at a certain time in future. The GENESYS instruments may be configured to void the calibration curve for a method at a date in future. On expiration, the method would require to be re-calibrated before proceeding to measure.

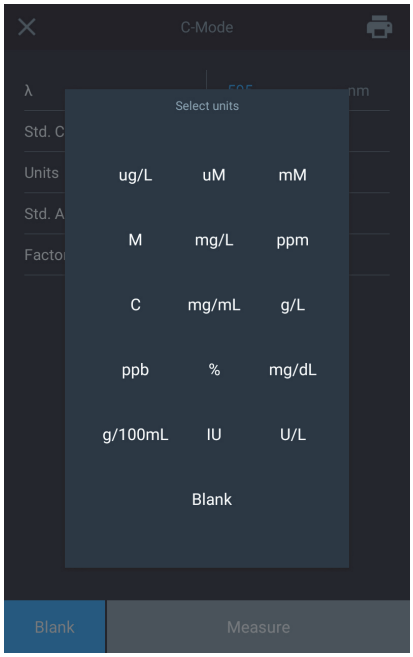


The instrument checks for the expiration date once each day – either at 12:00 AM or at the time the instrument is first powered up on a certain day. Changing the system time after the expiration date is configured, may cause the instrument to enforce re-calibration of the method at incorrectly. It is therefore suggested that the all expiration dates be verified when the system time is changed.

C-Mode

In C-Mode, the instrument determines a calibration factor based on the concentration and absorbance measurement of a standard. The instrument then performs continuous absorbance measurements to automatically determine the concentration of samples based on this factor.

Enter Std. Concentration

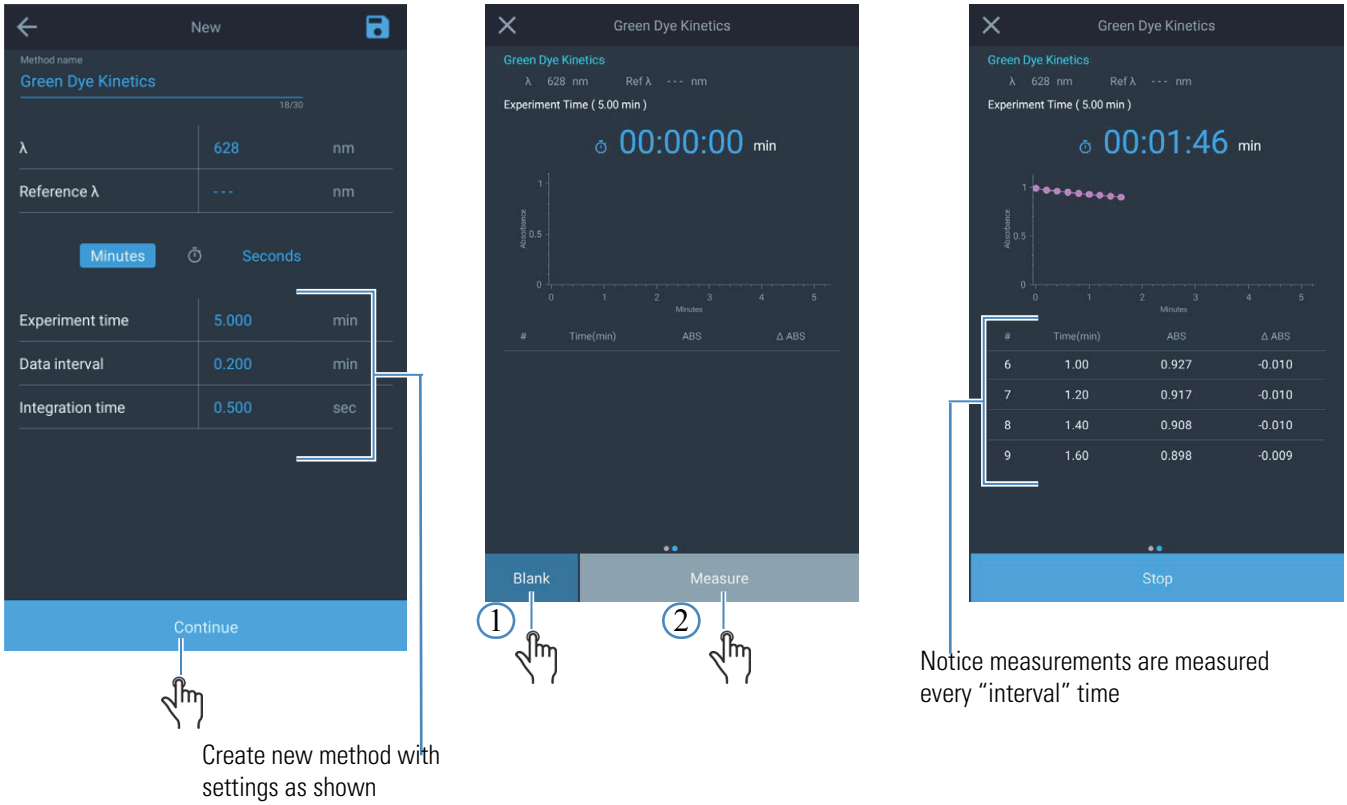


The calibration factor will be saved from the standard measurement

The instrument will take continuous measurements and the concentration of the current sample will be displayed.

Kinetics Application

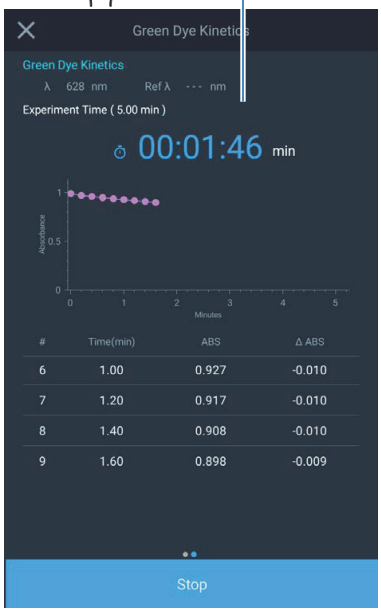
Operation of the Kinetics Application is best explained by walking through an example.



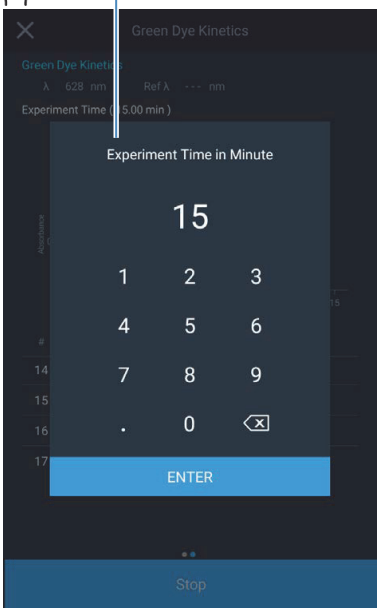
Create new method with settings as shown

Notice measurements are measured every “interval” time

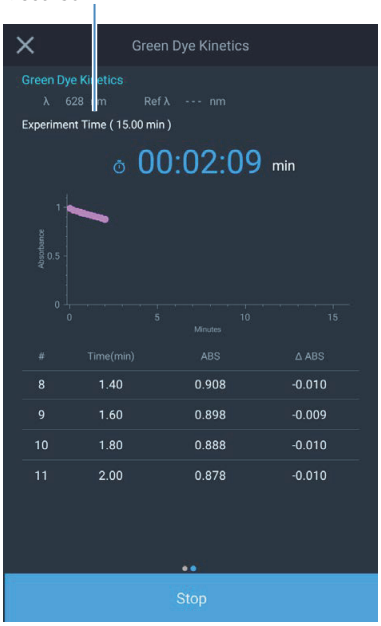
clock to add more time



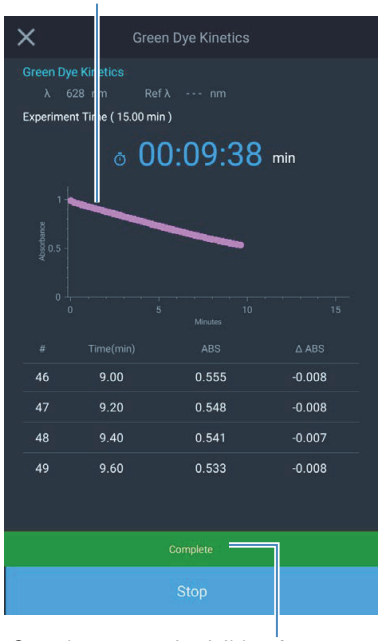
to update experiment run time



The experiment run time is updated and chart scaled

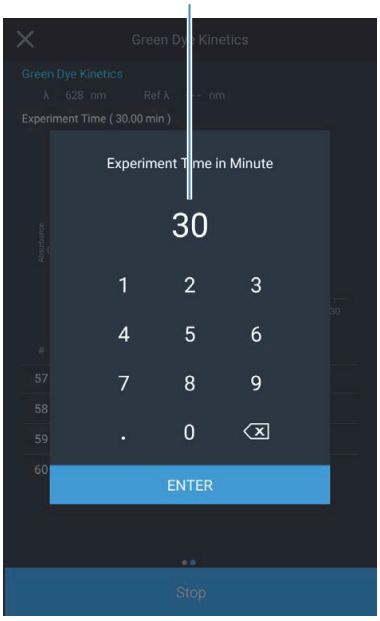


Experiment run time may be extended any number of times before experiment run time expires

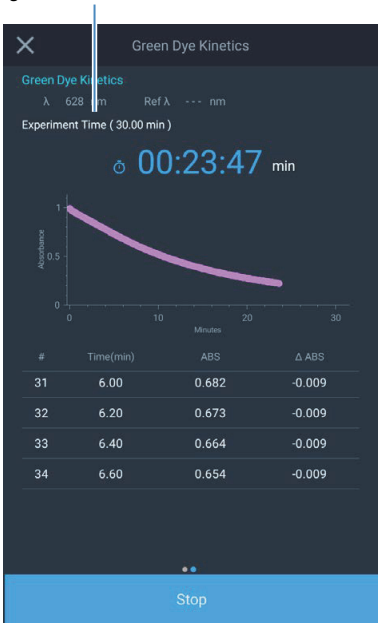


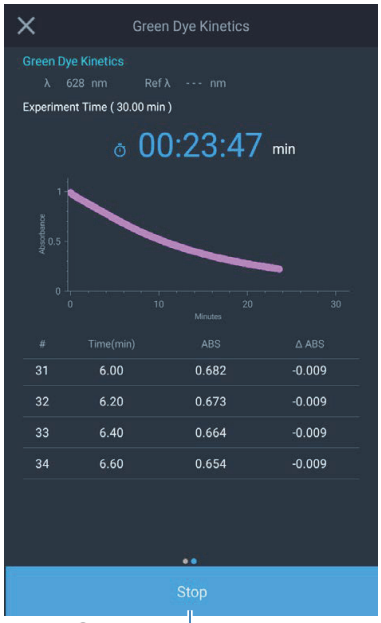
Complete popup is visible after every measurement is complete

Extend again



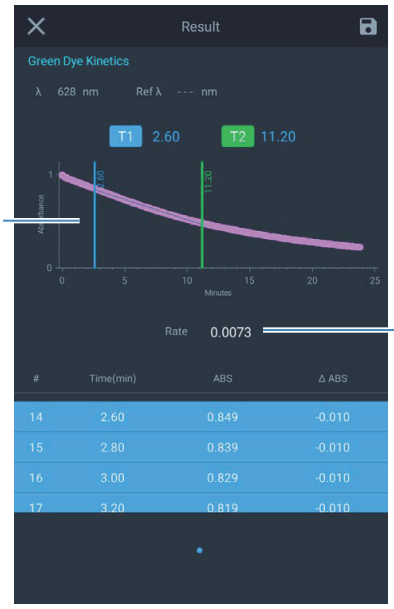
Experiment time and chart are updated again





Stops the experiment immediately

Adjust cursors

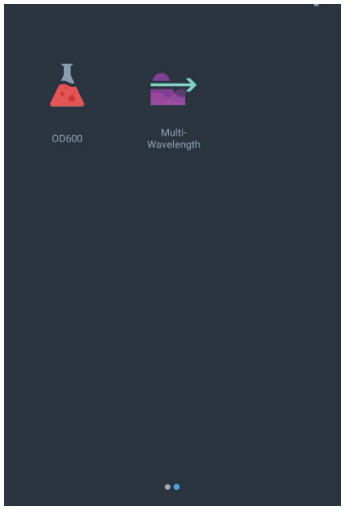


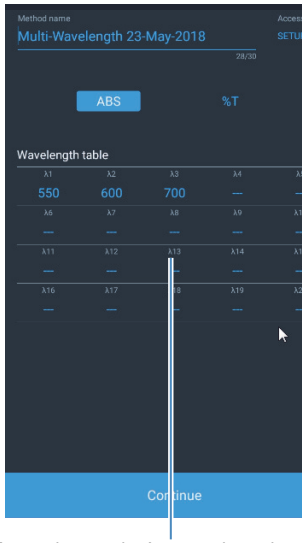
After data acquisition is complete, the **Results** page is displayed. The linear rate of reaction is calculated.

Slide the cursors to adjust the region where rate is calculated.

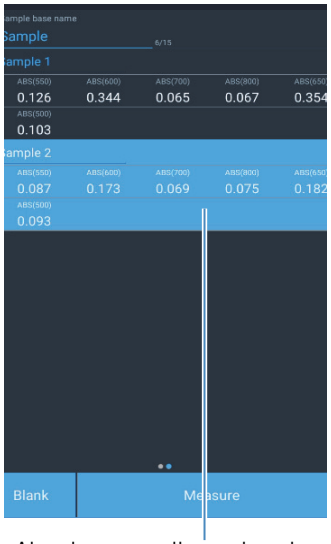
Multi-Wavelength Application

The Multi-wavelength application allows measurement of absorbance values at up to 25 discrete wavelengths sequentially.





Enter the analysis wavelengths



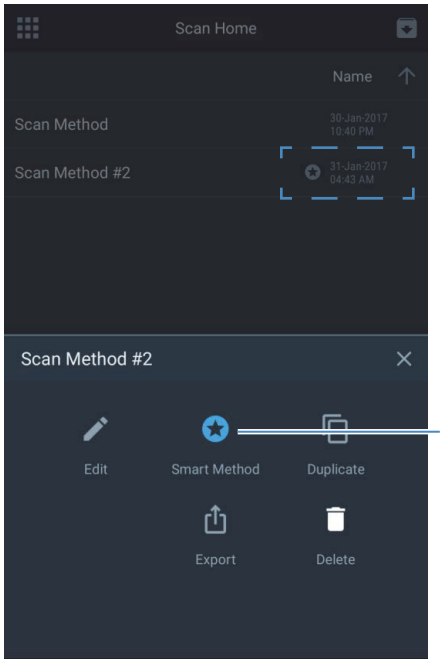
Absorbance at all wavelengths is displayed in the grid

SmartStart

SmartStart™ allows creation of shortcuts to favorite methods on the Home screen.

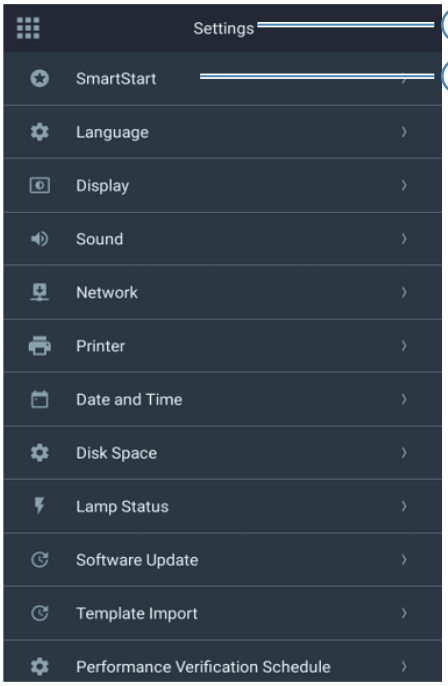
The Home screen will only show favorite methods.

Configuring and Switching to SmartStart Mode



Mark method as Smart Method

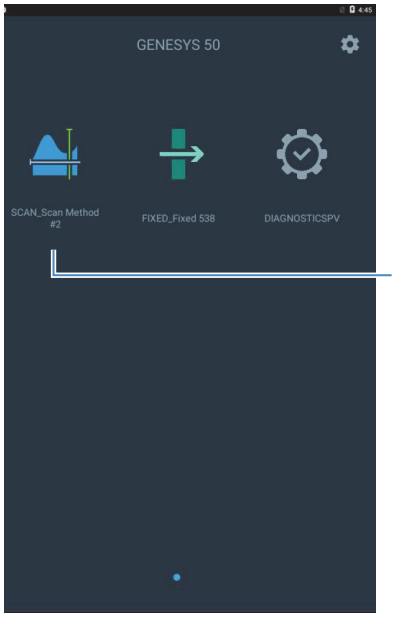
Toggle to unselect.



1 Go to Settings

2

3



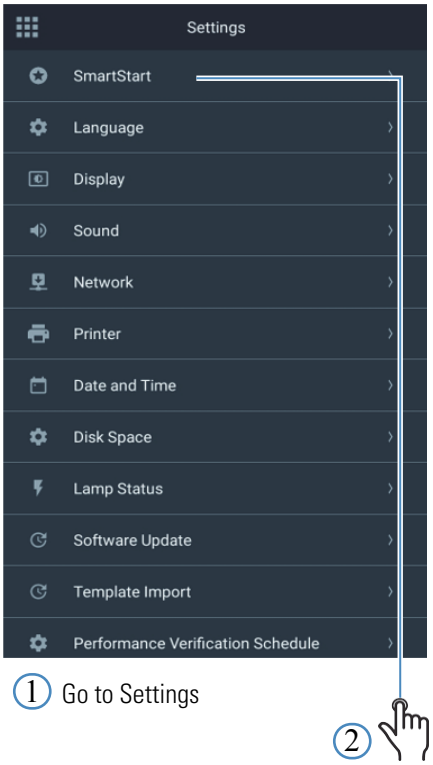
Instrument in Smart mode

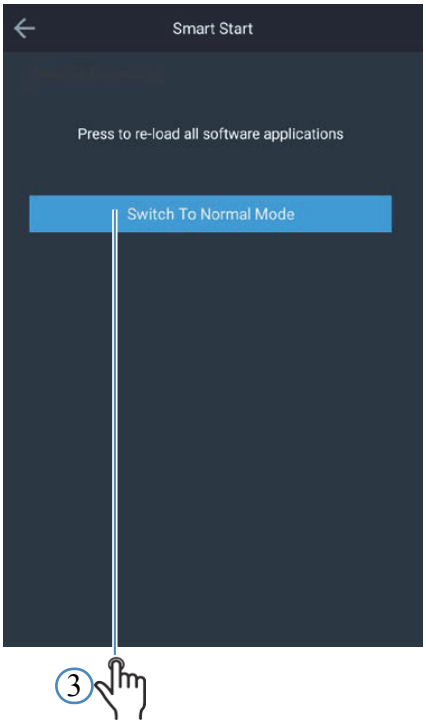
Only Smart Methods displayed

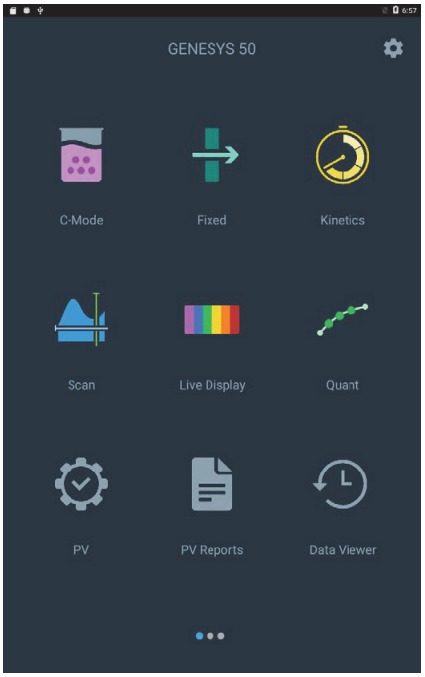
Password Control

The on-board software allows setting up a password for the SmartStart mode. Once a password for Smart Start is setup, this user will be prompted to enter this password to exit the SmartStart mode. This allows administrators to configure methods and present only these methods to users and at the same time prevent modifications to these methods.

Exiting SmartStart Mode



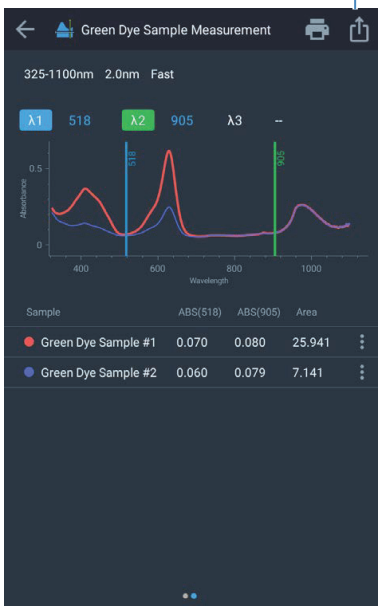




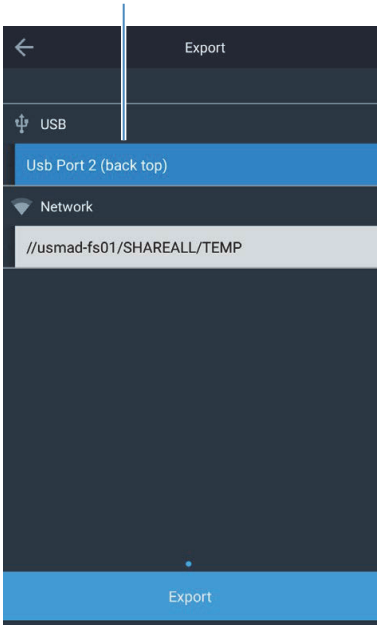
Normal Mode

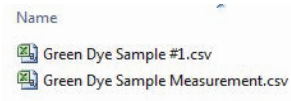
Importing Methods

Export



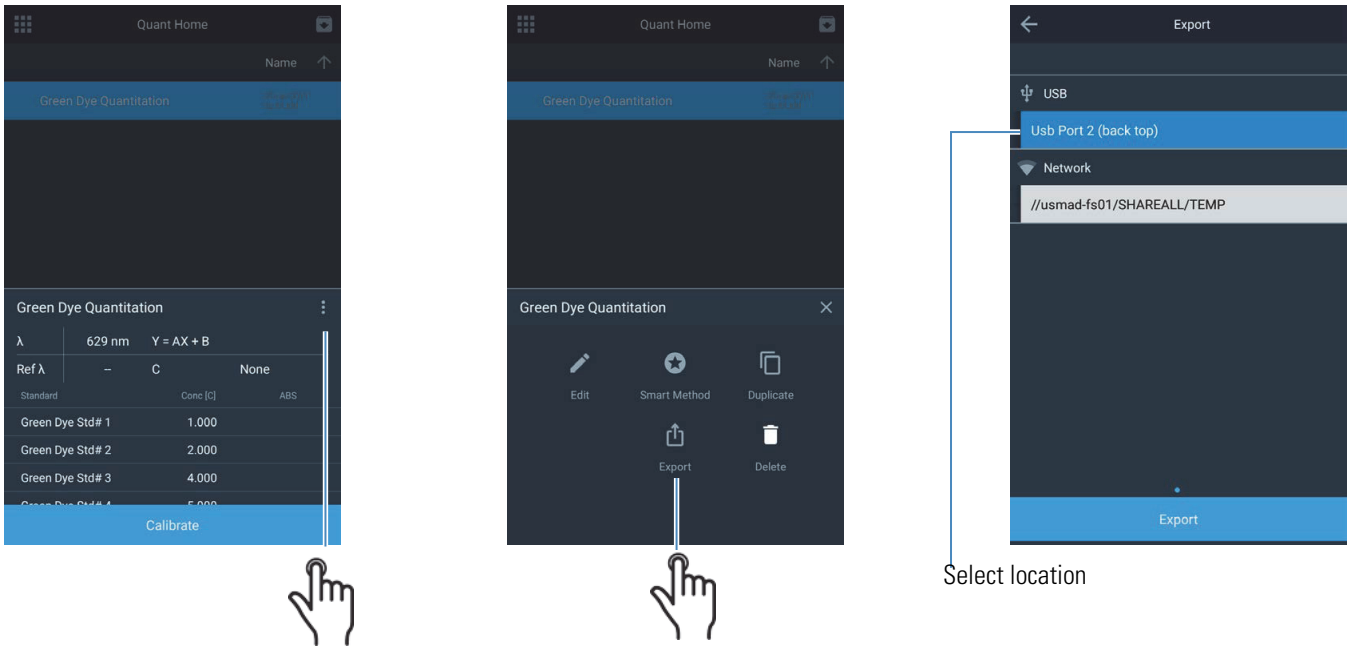
Select USB port with flash drive

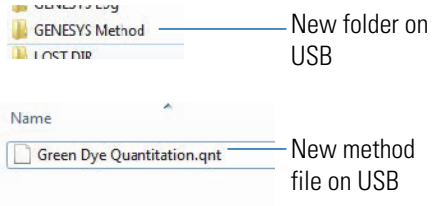




Wavelength(nm)	Green Dye Sample #1(Abs)	Green Dye Sample #2(Abs)
1100	0.134	0.138
1098	0.135	0.133
1096	0.137	0.137
1094	0.12	0.125
1092	0.14	0.14
1090	0.124	0.131
1088	0.127	0.127
1086	0.121	0.125
1084	0.121	0.115
1082	0.12	0.12
1080	0.113	0.118
1078	0.119	0.116
1076	0.116	0.122
1074	0.12	0.118
1072	0.111	0.115
1070	0.118	0.118
1068	0.112	0.117
1066	0.121	0.117

Exporting Data and Methods





Performance Verification Tests and Reports

GENESYS instruments are preconfigured with default Performance Verification Tests. These tests cannot be deleted or edited.

Running Performance Verification Tests

Running a performance verification test is similar to running any other experiment method. Follow the on-screen instructions.

Customized Performance Verification Tests

Some Performance Verification Tests can be customized to meet specific verification requirements of users. To customize a test, it must first be duplicated.

Often, standard operating procedures require performance verification of instruments periodically. Test such as Stray Light, Wavelength Accuracy and Photometric Accuracy require specific sets of filters and standards. The default performance verification tests are designed to work with specific standards and filters See Table1. However, these tests can be duplicated and customized to work with standards of choice.

Table 1. Description of each test and if it may be duplicated

Performance Verification Test	Description	Can Duplicate?
Wavelength Accuracy Xenon	This test verifies the wavelength axis performance of the spectrophotometer. Scans and locates known xenon emission peaks and verifies that they are found accurately to within the specification for the instrument.	No
Drift at 500 nm	Measures absorbance at 500 nm at 1 minute intervals for an hour. Measured at 0A (open beam). Blanks and reports maximum deviation from zero. Compares result to specification for the instrument. Result should be less than the specification.	No
Noise 0A at 500nm Noise 1.0A at 500 nm Noise 2.0A at 500 nm	Records 60 ABS measurements at 1 second intervals. Returns RMS (root mean square) of data set as noise value and compares specification for the instrument. Insert 1A or 2A nominal absorbance neutral density glass filter for those measurements. Result should be less than the specification. Note: Noise in the GENESYS instruments is so low that the result is reported with more than the usual 3 decimal digits.	No
Baseline Flatness 1000 to 200 nm	Measures any systematic deviation from perfect zero when scanning across the common wavelength range. Data is smoothed to remove the impact of noise (noise can be measured separately). Result is the maximum deviation from zero and is compared to the specification for the instrument. Result should be less than the specification.	No

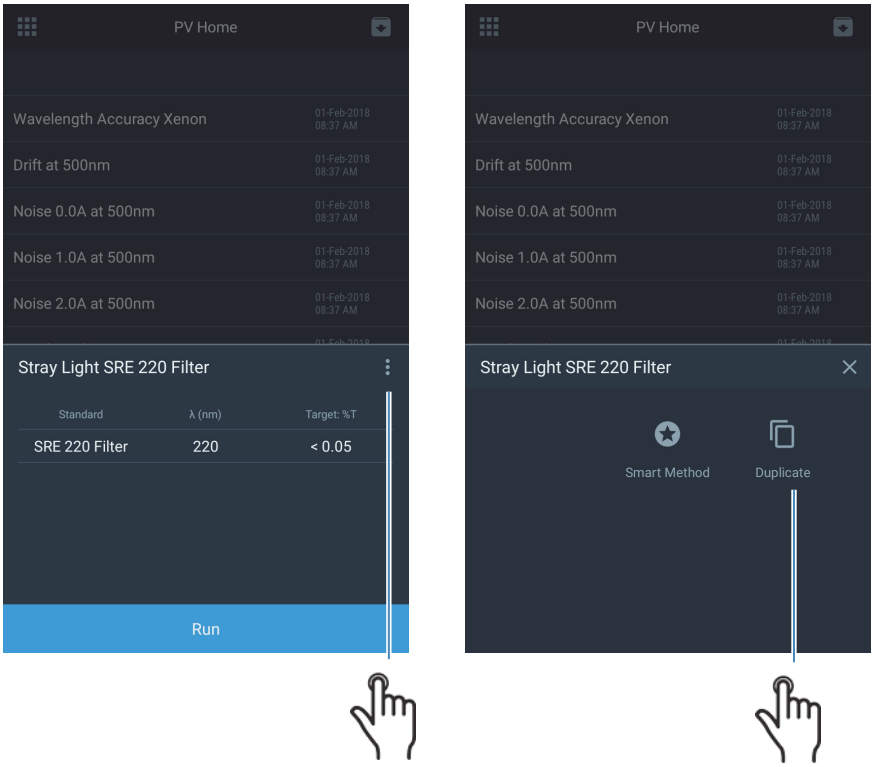
Performance Verification Test	Description	Can Duplicate?
Stray Light SRE 220 filter (UV-Vis models)	Measures stray light at the specified wavelength.	Yes
Stray Light SRE 400 Filter (Vis models)	The filter is a long pass filter that cuts on slightly above the test wavelength. At the test wavelength it should be entirely dark – i.e. 0%T. Longer wavelengths pass through the filter, therefore any transmittance measured at 220 nm is actually photons of longer wavelength that are “stray light”. Sources of stray light include second order effects imperfections in the grating, and imperfections or dirt on mirrors. The measured transmittance is compared to the specification for the instrument. Test measures transmittance at the specified wavelength. Result should be less than the specification.	

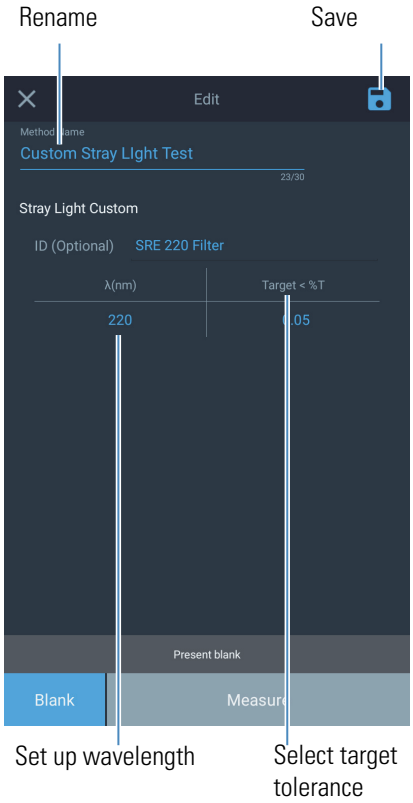
Performance Verification Test	Description	Can Duplicate?
Wavelength Accuracy	This test verifies the wavelength axis performance of the spectrophotometer. Use this test with a calibrated wavelength filter such as a holmium or didymium glass filter. User enters the peak wavelengths and calibration uncertainty from the calibration certificate. The instrument scans across the relevant wavelength range and locates the center of the peak. Reported wavelength should agree with certificate wavelength to within the sum of the instrument specification and the calibration uncertainty.	Yes
Photometric Accuracy	This test verifies the photometric (absorbance) performance of the spectrophotometer. Use this test with one or more calibrated absorbance filter(s) such as those found in the SPECTRONIC Standards 2 Kit to test accuracy in the visible region. Use calibrated potassium dichromate solution cells, metal on quartz filters, or other recognized calibrated standard materials for the UV region.[a] Multiple filters calibrated at the same wavelengths but different absorbance values can be configured in a single test. User enters • calibration wavelengths • certificate absorbance values • calibration uncertainty value from the calibration certificate. User also enters the performance specification for the absorbance value being tested from the specification sheet for the instrument.[b] The instrument measures and reports the absorbance at each specified wavelength. A 1s integration time is used. Reported absorbance should agree with certificate absorbance to within the sum of the instrument specification for that absorbance level and the calibration uncertainty.	Yes

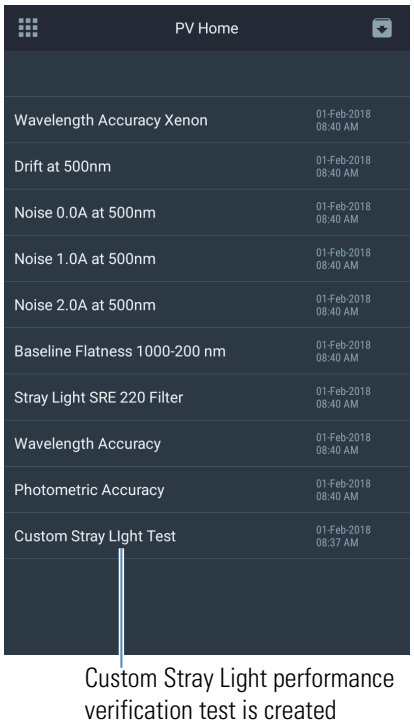
[a] We recommend against use of didymium glass "dual standard" filters calibrated for both wavelength peaks and photometric accuracy. Customers have reported difficulty in reproducing calibration values for this type of standard although their instruments do reproduce the calibration values for other, more widely accepted and recognized standards. Customers who call for support because an instrument fails a photometric accuracy test with a didymium photometric standard may be required to verify photometric accuracy with a different standard before return shipment for warranty service is authorized.

[b] Future releases of software may include a look-up table that populates the instrument specification based on the user-entered certificate absorbance value.

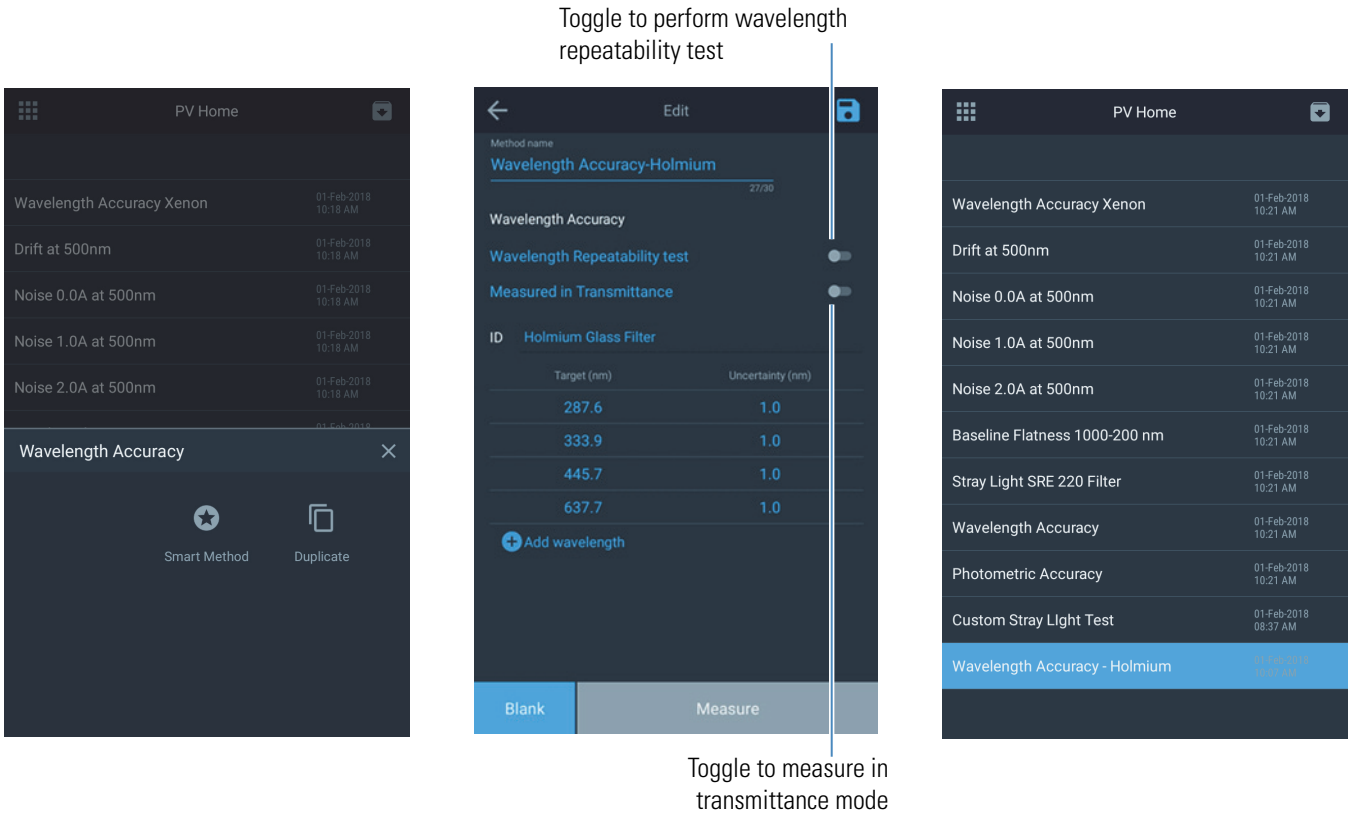
Customizing Stray Light Test




Rename
Save
Edit
Method Name
Custom Stray LIght Test
23/30
Stray Light Custom
ID (Optional)
SRE 220 Filter
λ(nm)
Target < %T
220
Present blank
Blank
Set up wavelength
Select target tolerance


PV Home
Wavelength Accuracy Xenon
01-Feb-2018 08:40 AM
Drift at 500nm
01-Feb-2018 08:40 AM
Noise 0.0A at 500nm
01-Feb-2018 08:40 AM
Noise 1.0A at 500nm
01-Feb-2018 08:40 AM
Noise 2.0A at 500nm
01-Feb-2018 08:40 AM
Baseline Flatness 1000-200 nm
01-Feb-2018 08:40 AM
Stray Light SRE 220 Filter
01-Feb-2018 08:40 AM
Wavelength Accuracy
01-Feb-2018 08:40 AM
Photometric Accuracy
01-Feb-2018 08:40 AM
Custom Stray LIght Test
01-Feb-2018 08:37 AM
Custom Stray Light performance verification test is created

Customizing Wavelength Accuracy Test



Customizing Photometric Accuracy Test

A typical standards kit for photometric accuracy comes with a Certificate of Calibration. This section illustrates how to configure a photometric accuracy test for custom standard kits.

ThermoFisher
SCIENTIFIC

5225 Verona Road, Bldg.1
Madison, WI 53711 USA

www.thermo.com

Certificate of Calibration

SPECTRONIC Standards 2 Kit 840-253100

Submitted to:
THERMO FISHER SCIENTIFIC
5225 VERONA ROAD
MADISON, WI 53711
USA

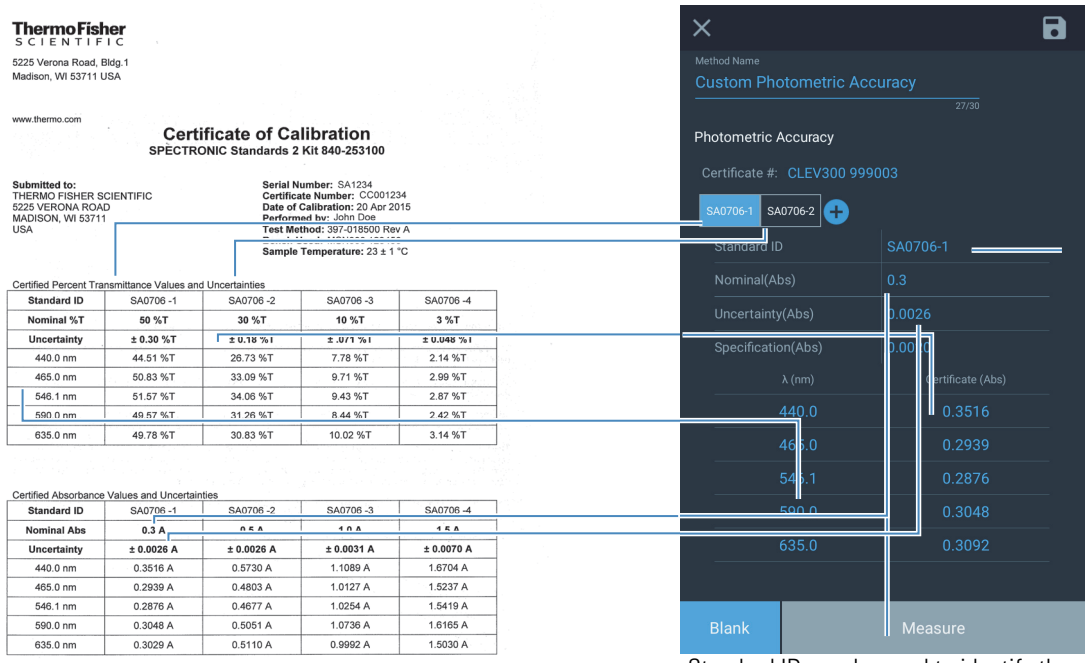
Serial Number: SA1234
Certificate Number: CC001234
Date of Calibration: 20 Apr 2015
Performed by: John Doe
Test Method: 397-018500 Rev A
Bench Used: MSN000 123456
Sample Temperature: 23 ± 1 °C

Certified Percent Transmittance Values and Uncertainties

Standard ID	SA0706 -1	SA0706 -2	SA0706 -3	SA0706 -4
Nominal %T	**50 %T**	**30 %T**	**10 %T**	**3 %T**
Uncertainty	**± 0.30 %T**	**± 0.18 %T**	**± .071 %T**	**± 0.048 %T**
440.0 nm	44.51 %T	26.73 %T	7.78 %T	2.14 %T
465.0 nm	50.83 %T	33.09 %T	9.71 %T	2.99 %T
546.1 nm	51.57 %T	34.06 %T	9.43 %T	2.87 %T
590.0 nm	49.57 %T	31.26 %T	8.44 %T	2.42 %T
635.0 nm	49.78 %T	30.83 %T	10.02 %T	3.14 %T

Certified Absorbance Values and Uncertainties

Standard ID	SA0706 -1	SA0706 -2	SA0706 -3	SA0706 -4
Nominal Abs	**0.3 A**	**0.5 A**	**1.0 A**	**1.5 A**
Uncertainty	**± 0.0026 A**	**± 0.0026 A**	**± 0.0031 A**	**± 0.0070 A**
440.0 nm	0.3516 A	0.5730 A	1.1089 A	1.6704 A
465.0 nm	0.2939 A	0.4803 A	1.0127 A	1.5237 A
546.1 nm	0.2876 A	0.4677 A	1.0254 A	1.5419 A
590.0 nm	0.3048 A	0.5051 A	1.0736 A	1.6165 A
635.0 nm	0.3029 A	0.5110 A	0.9992 A	1.5030 A



ThermoFisher SCIENTIFIC
5225 Verona Road, Bldg.1
Madison, WI 53711 USA

www.thermo.com

Certificate of Calibration
SPECTRONIC Standards 2 Kit 840-253100

Submitted to:
THERMO FISHER SCIENTIFIC
5225 VERONA ROAD
MADISON, WI 53711
USA

Serial Number: SA1234
Certificate Number: CC001234
Date of Calibration: 20 Apr 2015
Performed by: John Doe
Test Method: 397-018500 Rev A
Sample Temperature: 23 ± 1 °C

Certified Percent Transmittance Values and Uncertainties

Standard ID	SA0706 -1	SA0706 -2	SA0706 -3	SA0706 -4
Nominal %T	50 %T	30 %T	10 %T	3 %T
Uncertainty	± 0.30 %T	± 0.18 %T	± 0.071 %T	± 0.048 %T
440.0 nm	44.51 %T	26.73 %T	7.78 %T	2.14 %T
465.0 nm	50.83 %T	33.09 %T	9.71 %T	2.99 %T
546.1 nm	51.57 %T	34.06 %T	9.43 %T	2.87 %T
590.0 nm	49.57 %T	31.26 %T	8.44 %T	2.42 %T
635.0 nm	49.78 %T	30.83 %T	10.02 %T	3.14 %T

Certified Absorbance Values and Uncertainties

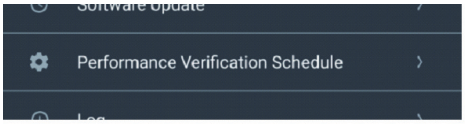
Standard ID	SA0706 -1	SA0706 -2	SA0706 -3	SA0706 -4
Nominal Abs	0.3 A	0.5 A	1.0 A	1.5 A
Uncertainty	± 0.0026 A	± 0.0026 A	± 0.0031 A	± 0.0070 A
440.0 nm	0.3516 A	0.5730 A	1.1089 A	1.6704 A
465.0 nm	0.2939 A	0.4803 A	1.0127 A	1.5237 A
546.1 nm	0.2876 A	0.4677 A	1.0254 A	1.5419 A
590.0 nm	0.3048 A	0.5051 A	1.0736 A	1.6165 A
635.0 nm	0.3029 A	0.5110 A	0.9992 A	1.5030 A

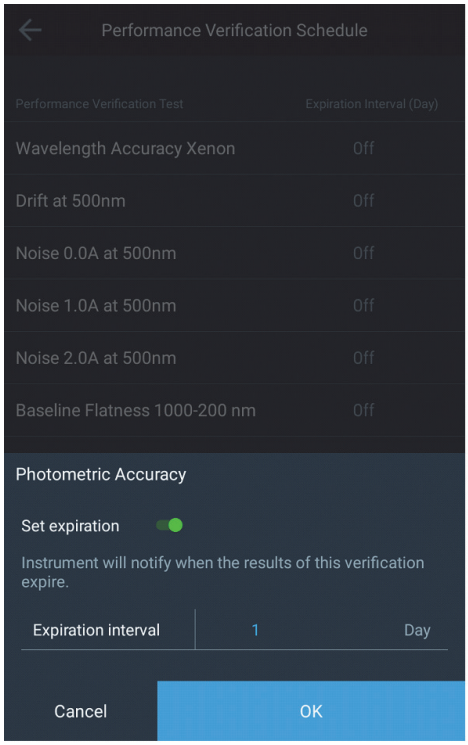
Standard ID may be used to identify the corresponding filter in a filter set

Standard ID may be used to identify the corresponding filter in a filter set

Performance Verification Schedule

Standard operating procedures (SOPs) often require that performance of analytical instruments be verified at regular intervals of time. The Performance Verification Schedule setting allows configuration of such an interval. This option can be accessed under the settings menu.





Expiration interval can be set in number of days. When set, the instrument will display a notification indicating the results of the corresponding verification test have expired. The time interval is relative to the currently configured instrument date. The instrument checks for the expiration date once each day – either at 12:00 AM or at the time the instrument is first powered up on a certain day. Changing the system time after a verification schedule is configured, may cause the instrument to display the expiration notification. It is therefore suggested that the all expiration dates be verified when the system time is changed.

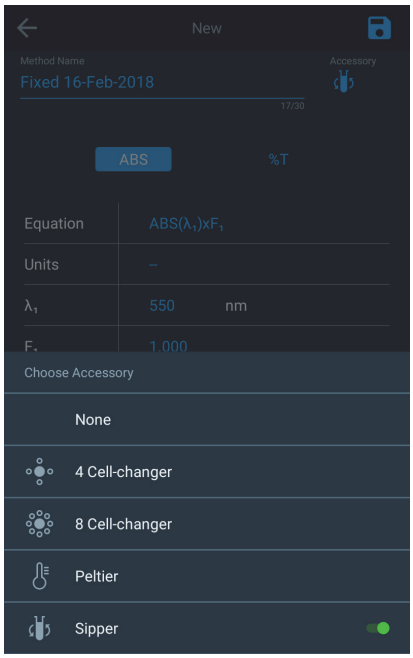
Accessory Setup

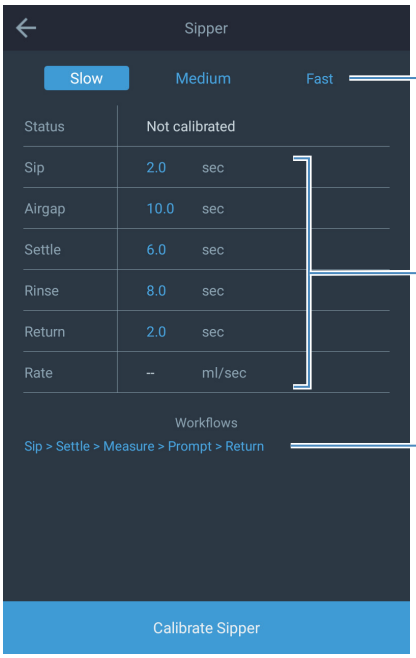
Cell Changer Configuration

Cell changer setup in the **Scan Application** is used as an example in this section. However, the same steps can be followed for all other applications.

Cell changer setup in Quant requires a few extra steps. See Cell Changer Configuration.

Sipper Configuration





Fast, Medium, Slow
Set up the speed of the sipper for an uncalibrated sipper.

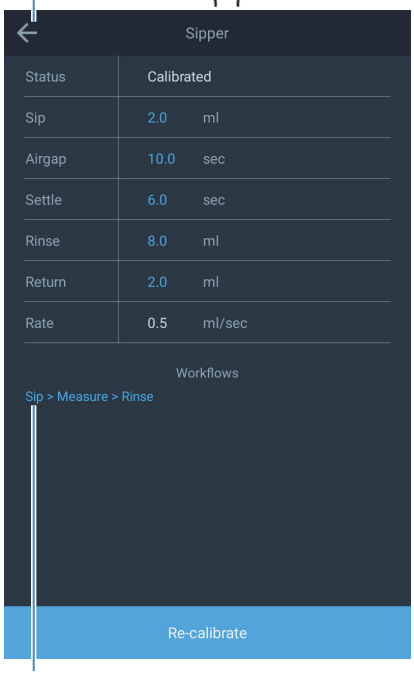
These parameter set the time for which the sipper performs this step.

The parameters are applied only when the corresponding step is used in a workflow.

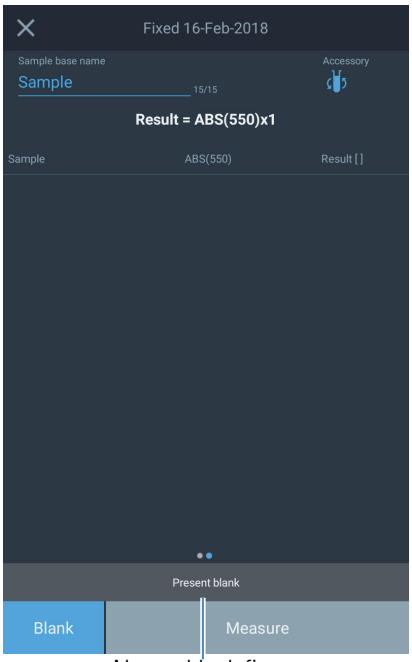
See "Custom Workflows" on page 73

Measurements

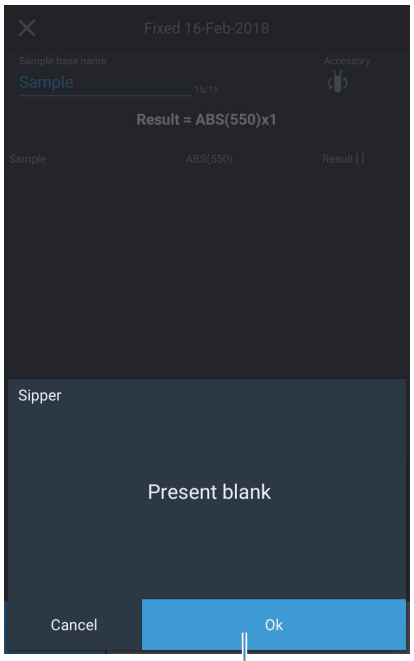
After configuration,



Configured workflow is Sip, Measure and Rinse

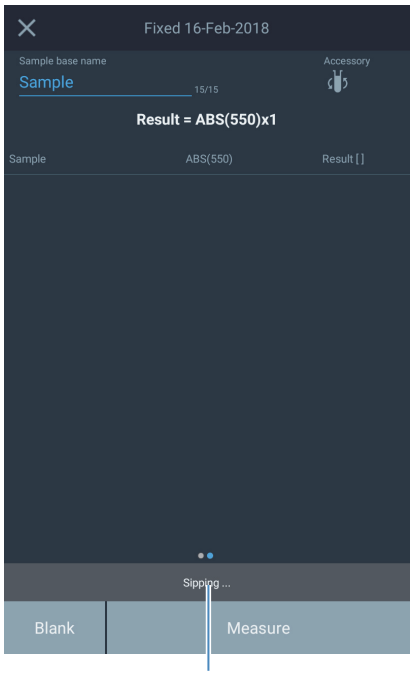


Always blank first

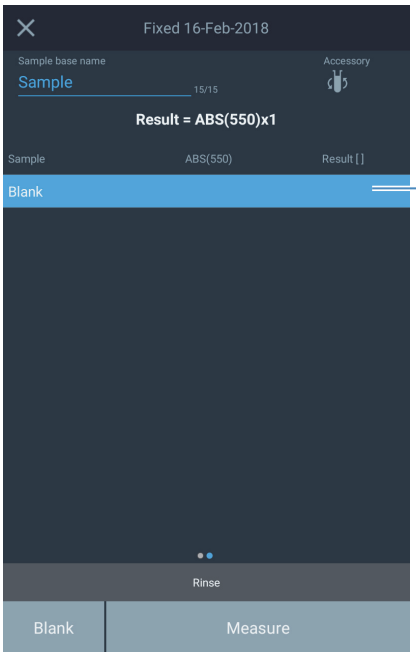


Sipper prompts to allow setting up the blank

when ready



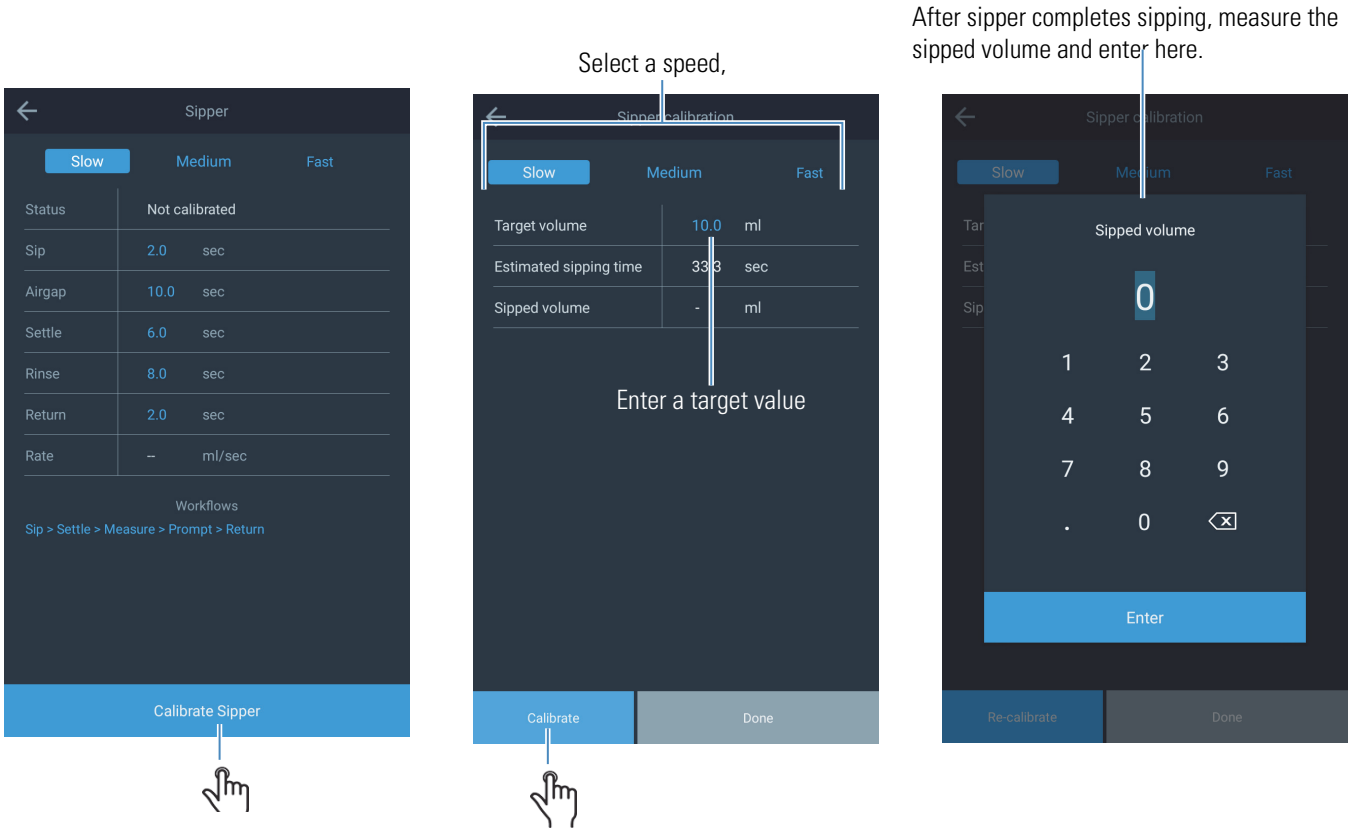
Message provides information and next steps of current state

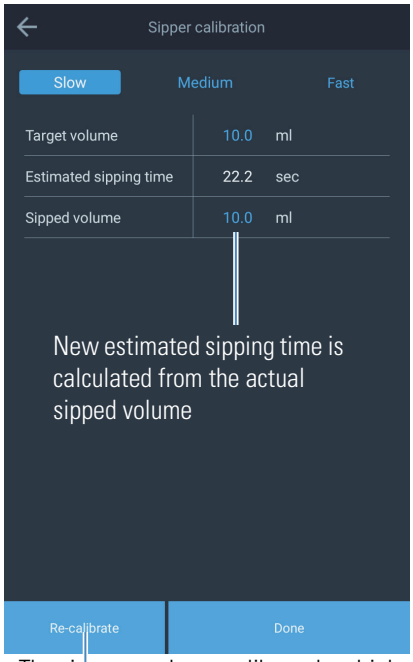


After sipping, a measurement is made and the rinse stage begins.

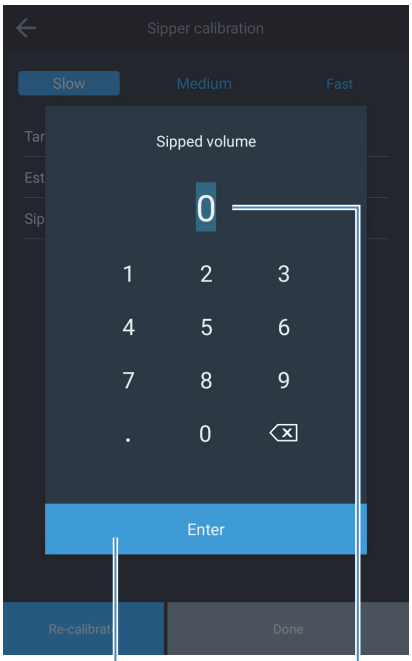
Calibrated Sipper

By default, the sipper is configured in an uncalibrated mode. Calibrating a sipper allows precise control over the volume of the liquid drawn.



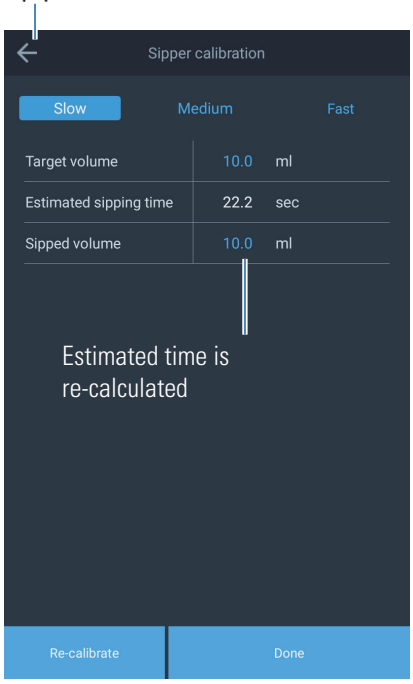


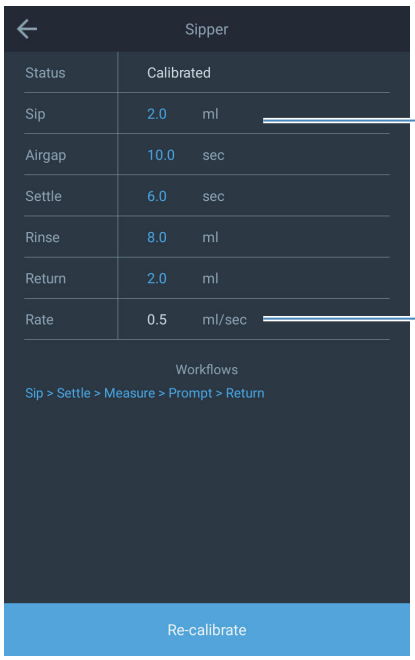
The sipper may be re-calibrated multiple times



1 Enter new measured volume

after calibration is satisfactory





Volume values may be used for setting stage parameters

Parameters can now be set in volume

A rate is calculated

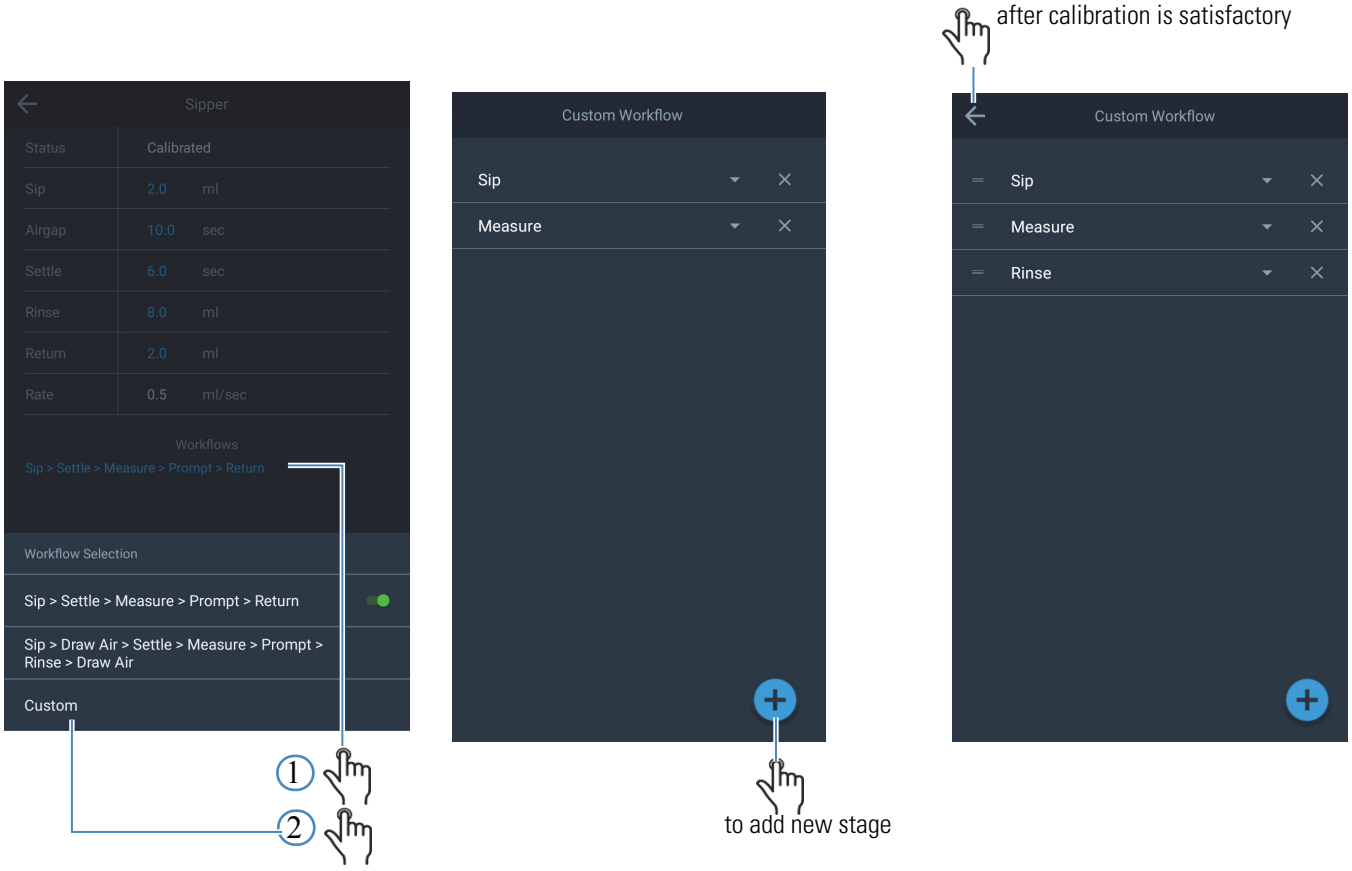
Calibrating the Sipper

The sipper calibration aims to pump 10 mL or a different volume that you specify. We recommend 10 mL as a good choice for most applications. You will require a method to determine how much volume has been pumped. We suggest one of two:

- Pump out of a filled 25 mL graduated cylinder. Note the volume on the scale before and after pumping. Calculate the volume pumped by subtraction.
- Pump out of a weighed beaker or flask. Weigh the beaker again after pumping and calculate the volume pumped by multiplying the difference in mass by the density of the solvent. The density of water can be taken as 1.00 g/mL for most purposes. However, if you require particularly high precision in pumping small volumes you may wish to use purified water and the literature value for density of water at the temperature used.

Custom Workflows

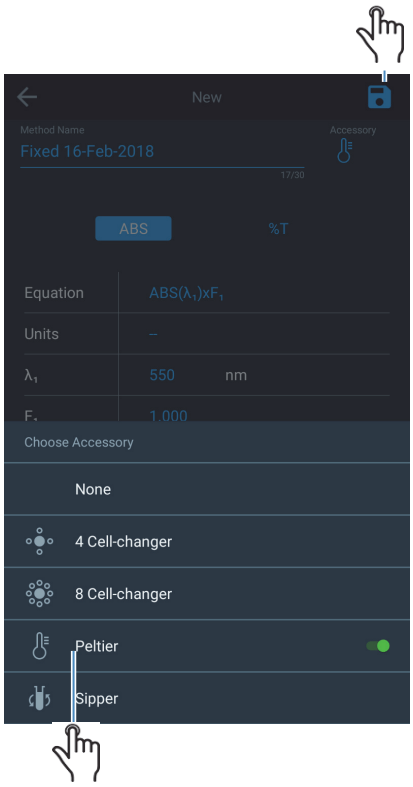
If an SOP calls for a specific workflow, the sipper configuration offers customization of workflow.



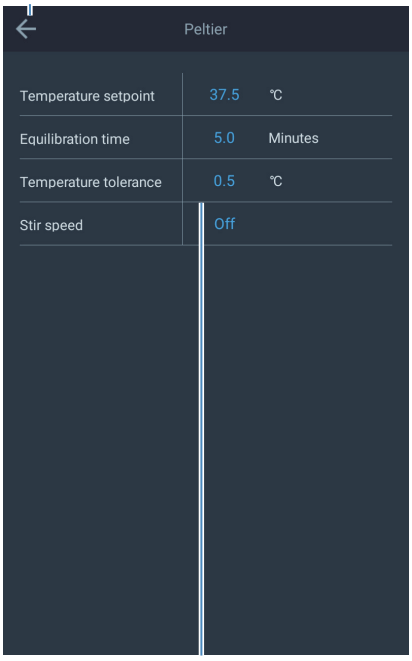
The workflow will now be saved with the method and will execute with the method.

Note If the instrument does not detect a sipper, a warning will be displayed. This warning will disappear once a sipper is connected.

Peltier Configuration



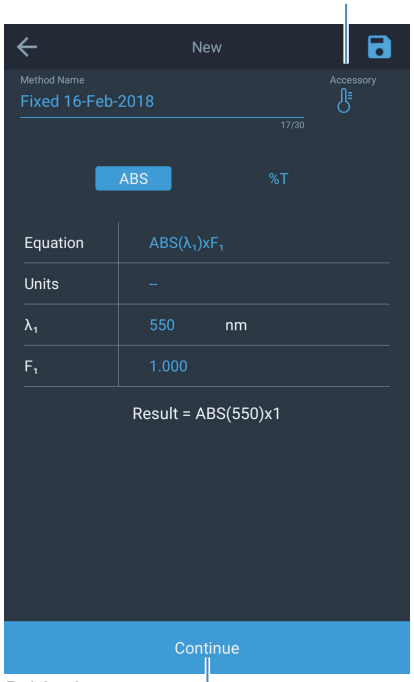
after setting parameters



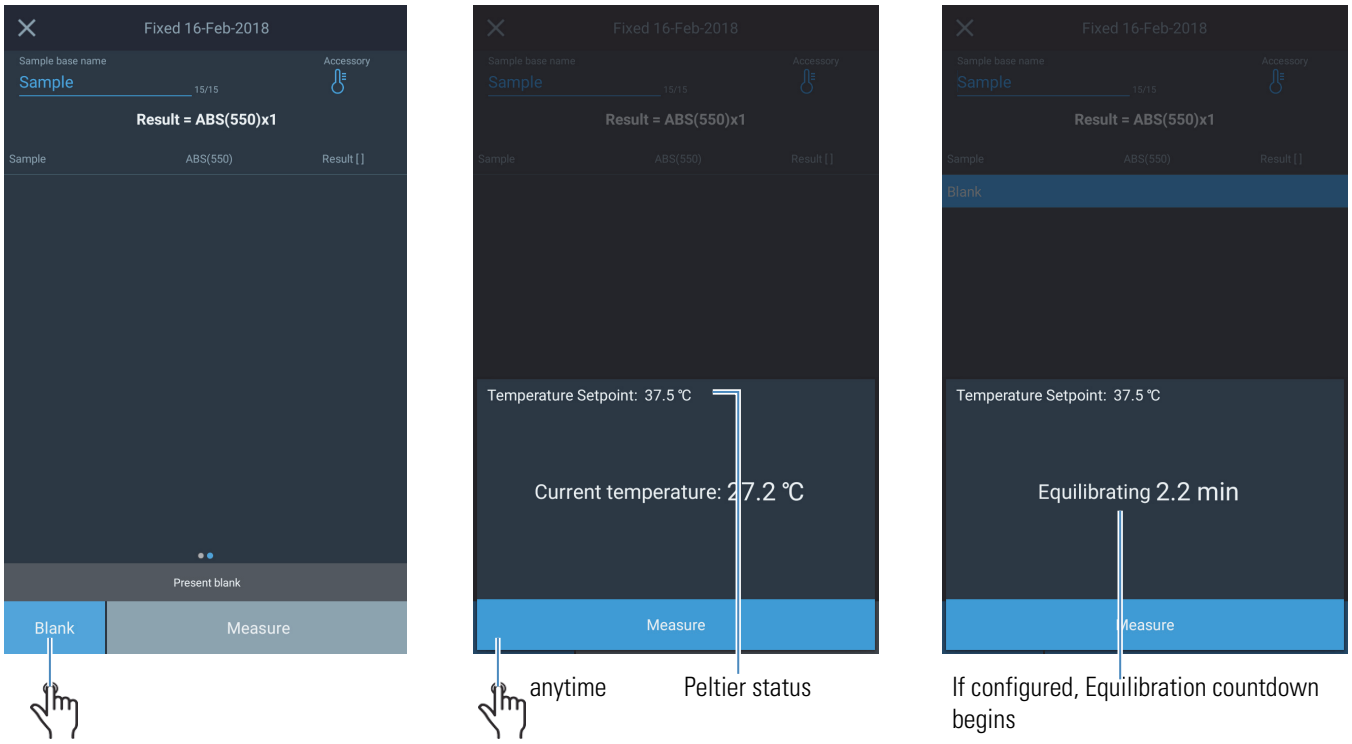
Explanation of parameters is provided

Equilibration time in minutes:

anytime to review configuration parameters



Peltier is setup



Temperature setpoint:

The instrument starts measurement when the block temperature of the Peltier reaches the temperature setpoint.

Equilibration time in minutes:

Heat transfer from the block to the sample is not instantaneous; the equilibration time acts as delay between when the block temperature reaches the setpoint and when the instrument begins measurement.

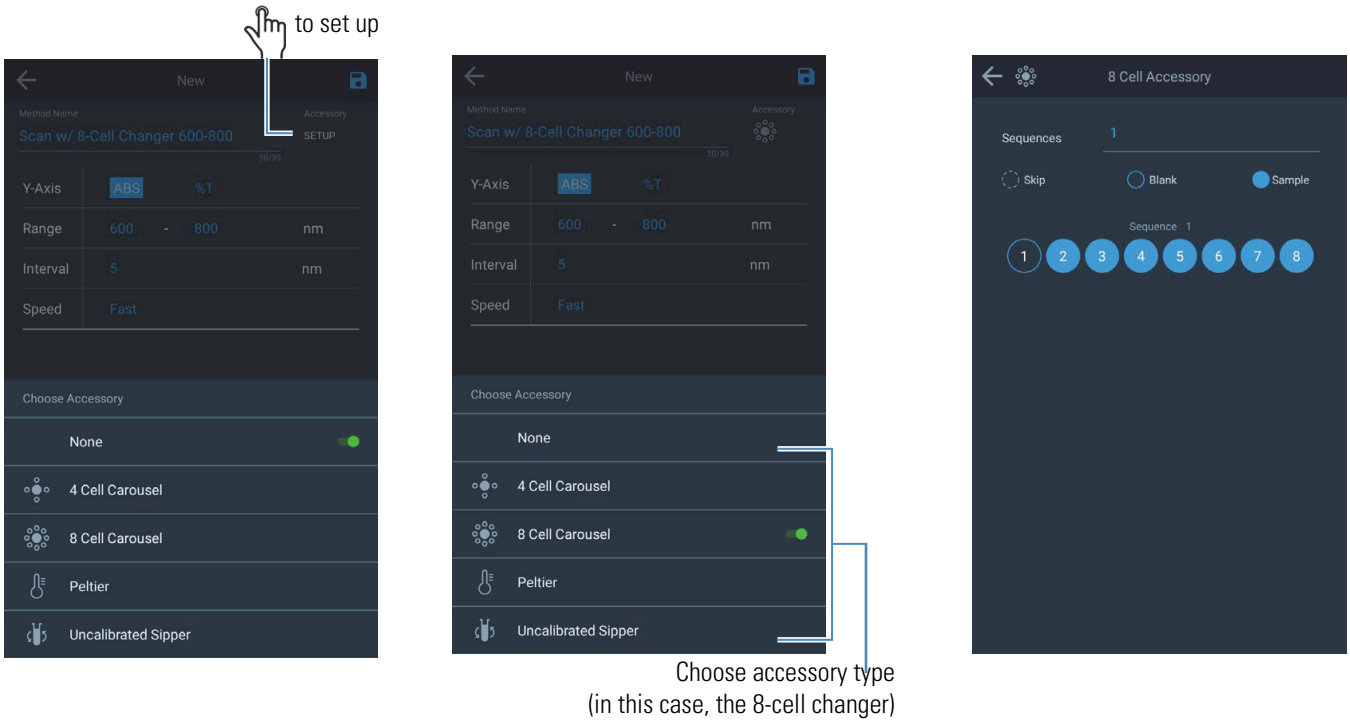
Temperature tolerance:

The instrument begins measurement as soon as the Peltier block temperature falls within the temperature tolerance range about the temperature setpoint.

Stir speed:

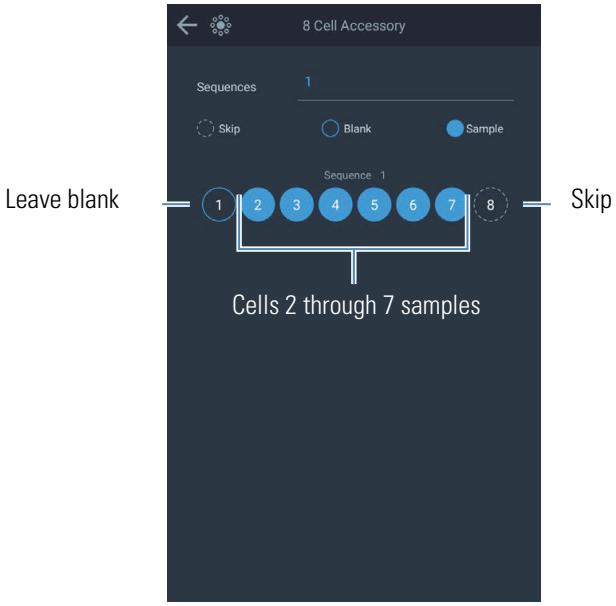
This parameter ranges from off to 10 and sets the speed at which the stirrer rotates.

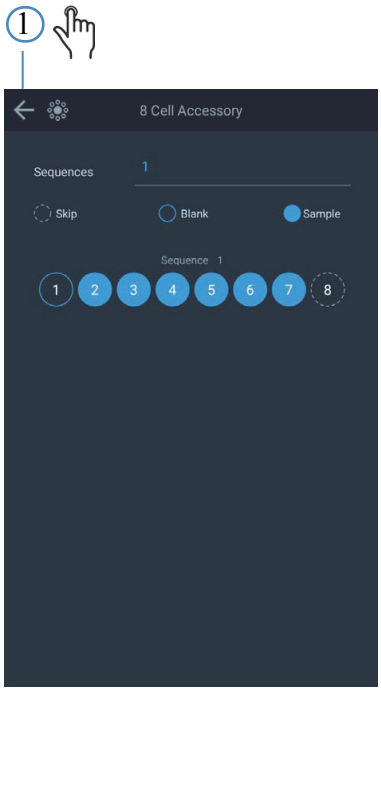
Accessory Configuration in Scan

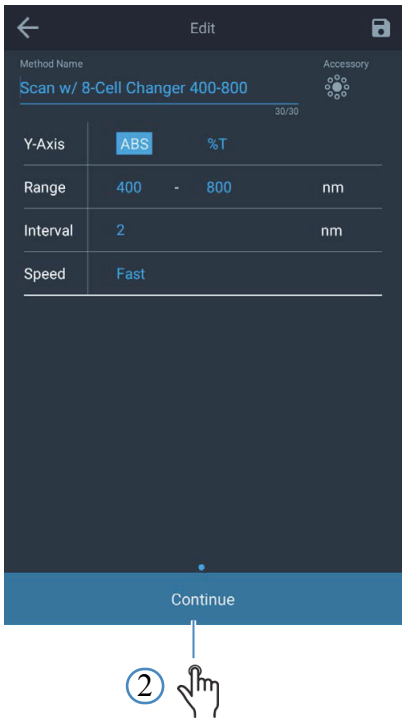


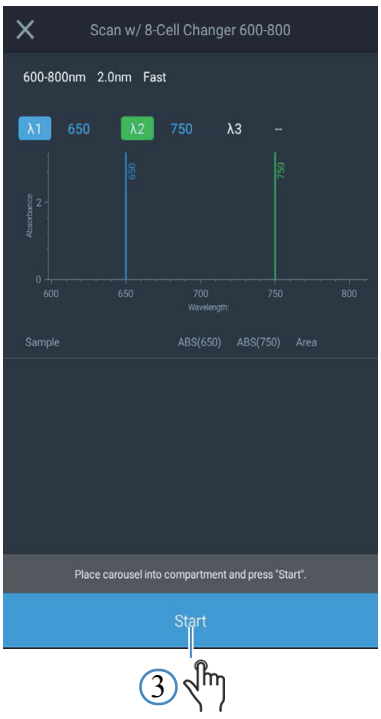
Prepare cell changer

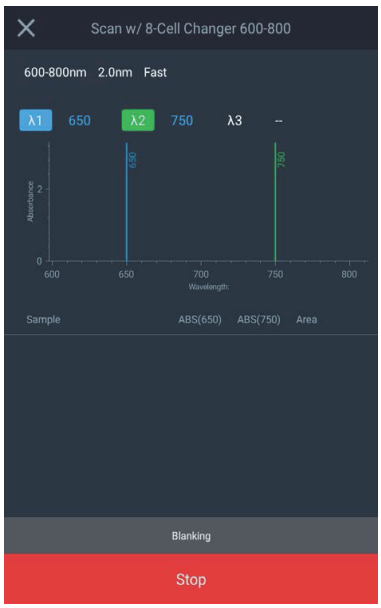
Match cell configuration to cell changer configuration







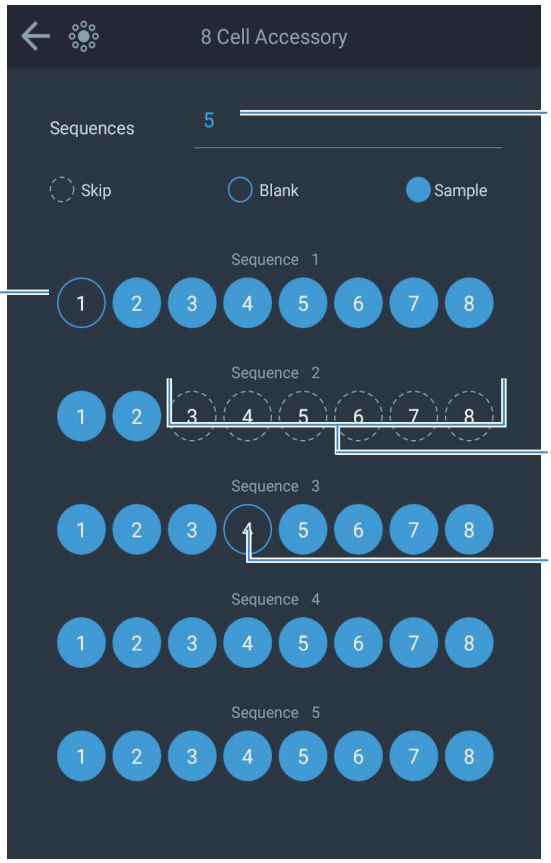




Remember, first cell always blank

Remember, first cell always blank

Perform scan analysis on any sample



after replacing cell changer

Next cell changer will start #2 appended

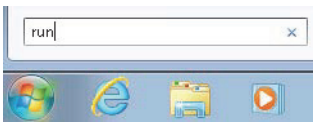
Measurement will stop after first cell changer.

Computer Configuration for VISIONlite

Before installing Thermo Scientific™ VISION*lite*™ software, uninstall all previous installed versions of VISION*lite*. There are instances where installing the latest VISION*lite* over an existing installation could cause unexpected behavior.

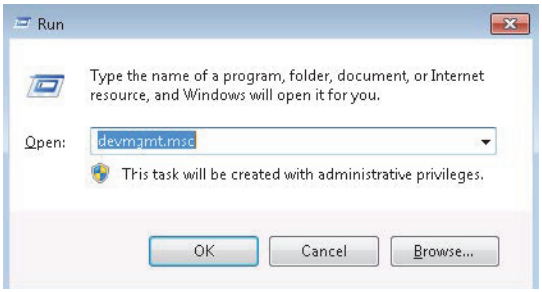
1. Select the correct instrument type during the installation process.
2. After installing VISION*lite*, connect the USB cable to the computer.

   Your computer will now begin to search for a compatible driver for the cable. This driver is installed by VISION*lite*, and should be automatically discovered by Microsoft™ Windows™.
3. If you do not see the message indicating the drivers were installed successfully, follow the following steps to resolve this.
   a. In Windows click **Win** and type **Run** in the search box; click **ENTER**.

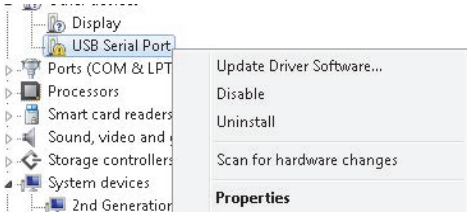
   b. In the **Run** dialog box, type **devmgmt.msc**; click **OK**.

   The Device Manager program will open.

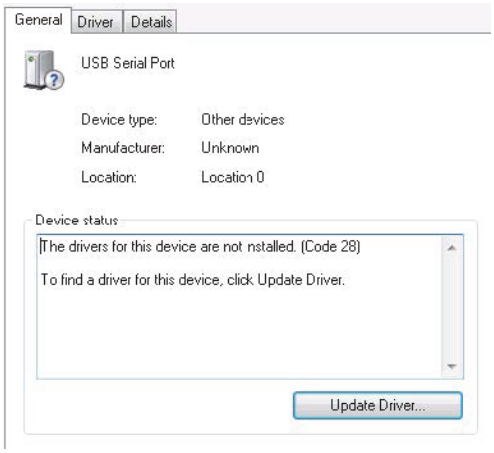


c. On the Device Manager screen, right-click the **USB Serial Port**.

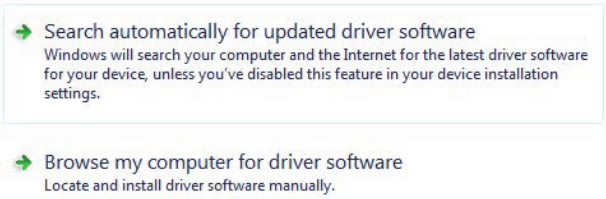
You may see a different name under the **Other devices**. Right-click on the one with the yellow exclamation icon and click **Properties**.



d. On the properties screen, click **Update Driver…**



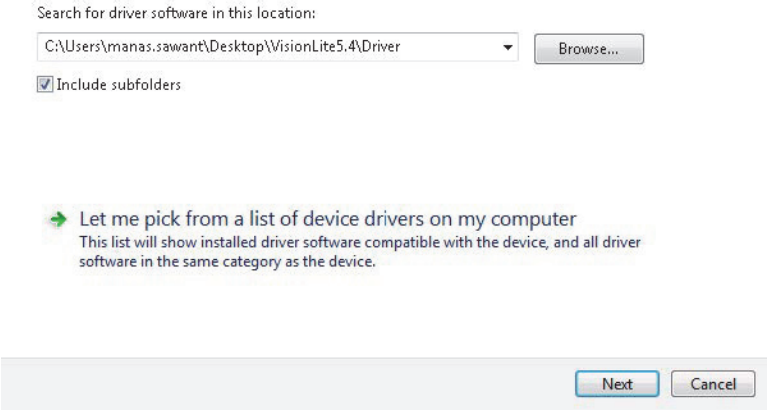
e. Click **Browse my computer for driver software**.



f. On the next screen, check the **Include subfolders** box; click **Browse**….

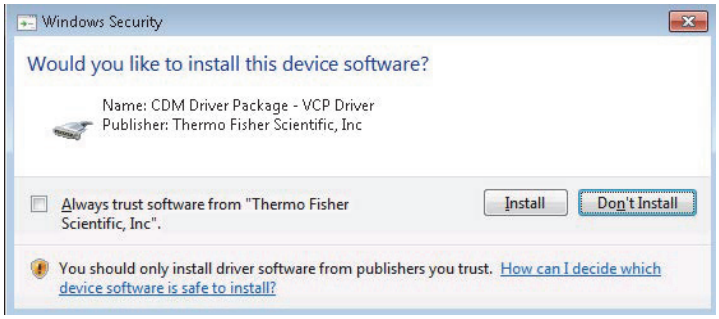
g. Browse to the **VisionLite5.5** folder and select the **Driver** folder.

h. Click **OK**; click **Next** on the following screen.

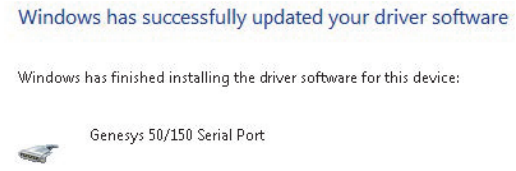


4. The computer will now begin to search for the drivers.

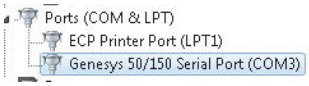
   Once it finds it, click **Install**.



   An installation successful message will be shown.



   You can verify the successful installation in the Device Manager.



5. Close all windows and restart VISION*lite*.

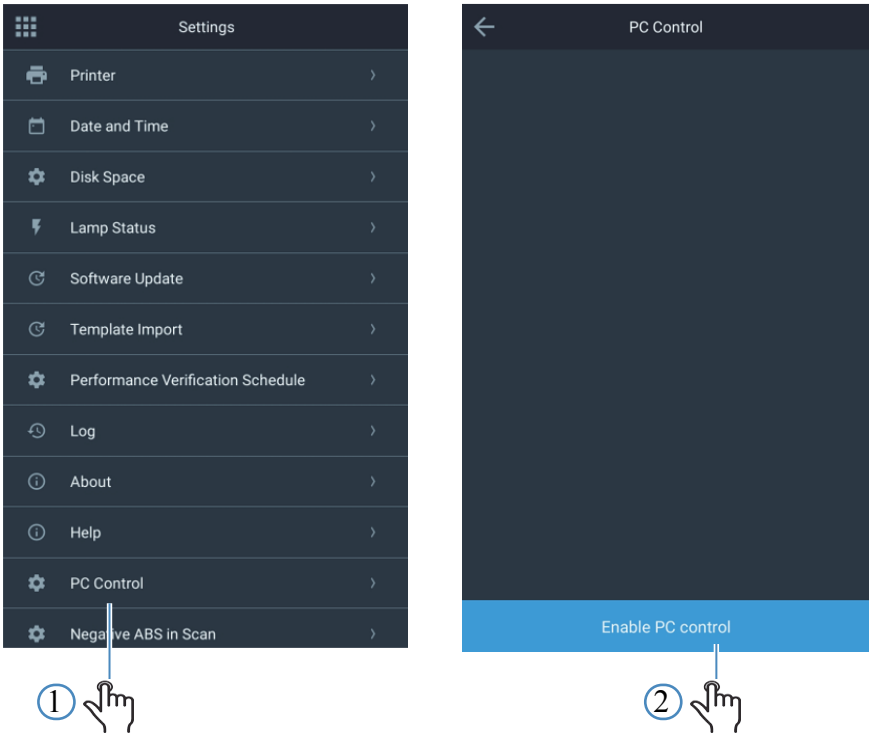
   VISION*lite* should be able to connect to the instrument successfully.

Connecting to VISIONlite

VISION*lite*™ is a PC based software developed by Ascanis and provides the ability to control the GENESYS instruments via a USB cable. VISION*lite* needs to be purchased separately and a quote may be provided https://www.thermofisher.com/us/en/home/technical-resources/contact-us.699-129900.html . More information on the capabilities of the software may be obtained at https://www.thermofisher.com/order/catalog/product/699-129900.

After installing VISION*lite*, connect the special cable provided with the VISION*lite* for GENESYS package between a USB port on the instrument and one on the PC.

Enable the VISIONlite Mode



When in this mode, the PC will display a notification indicating a GENESYS instrument has been detected. VISION*lite* has now connected to the instrument and can be used to capture data and perform advanced calculations.

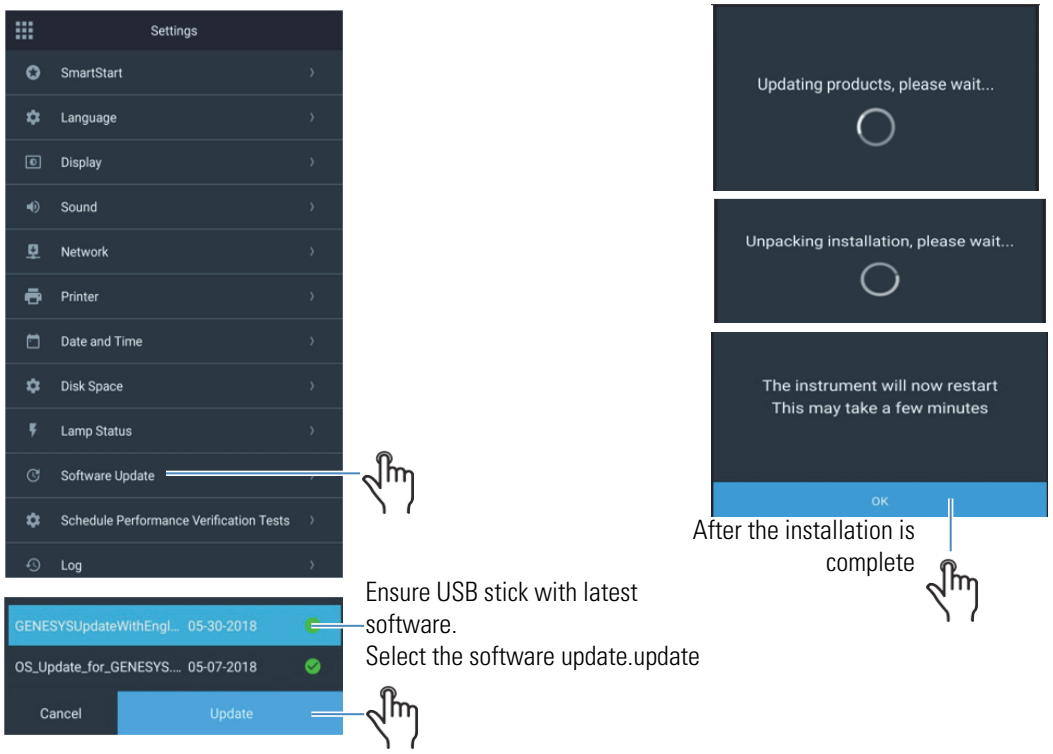
Warning Messages

The GENESYS instruments provide users information during the startup process. Below are some common messages you may notice and the action that could resolve the issue.

Warning message	Action to correct the error
Initialization failed	Restart the instrument
No cell changer is detected	Place cell changer in the compartment
Wavelength calibration failed	Restart the instrument
Dark current measurement failed	Restart the instrument
Beam is blocked	Ensure the beam is not blocked and restart

Updating Software

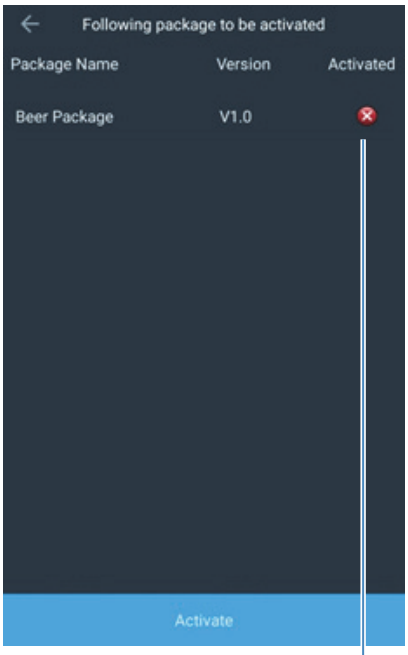
The latest software can be downloaded on www.thermofisher.com. Navigate to the GENESYS Spectrophotometers section by searching for GENESYS. Under the Quick links section is the **GENESYS On-board Software Download** link.



Activating Analyzer Methods

Any additional analyzer methods will be located on an included USB drive. Insert this USB drive into any USB port on the instrument and navigate to **Settings** followed by **Software Update** to activate the methods.

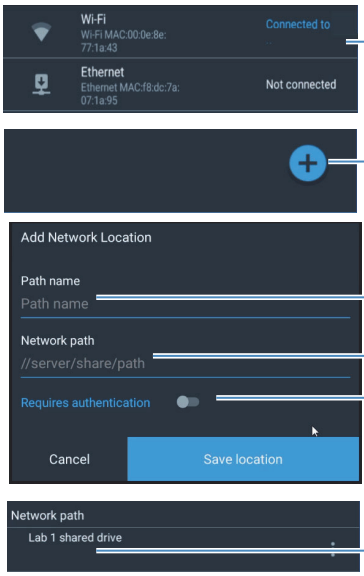
Select Update Analyzer Methods



A green check mark will appear then the methods package is activated

Setting up Network Paths

When connected to a Wi-Fi or a wired network connection, the instrument can export methods and measurement data to a network location. Multiple network paths may be configured through the Network settings page. Exporting data to a network drive requires setting up the network path first. Once network path is configured, it is saved locally on the instrument for retrieval later.



Ensure the instrument is connected to a network

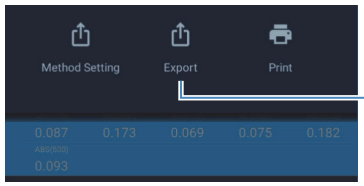
to add a new network path

Enter a simple name for the path

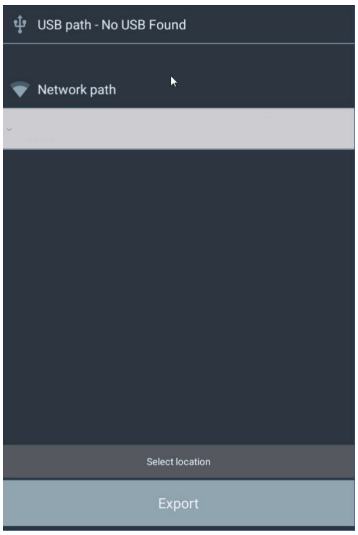
Enter the network path. Note the path format requires '/'

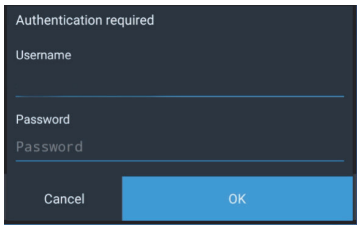
Select if the network path requires authentication. Enter the user name in the form **Domain/Username** format.

The network path will display here

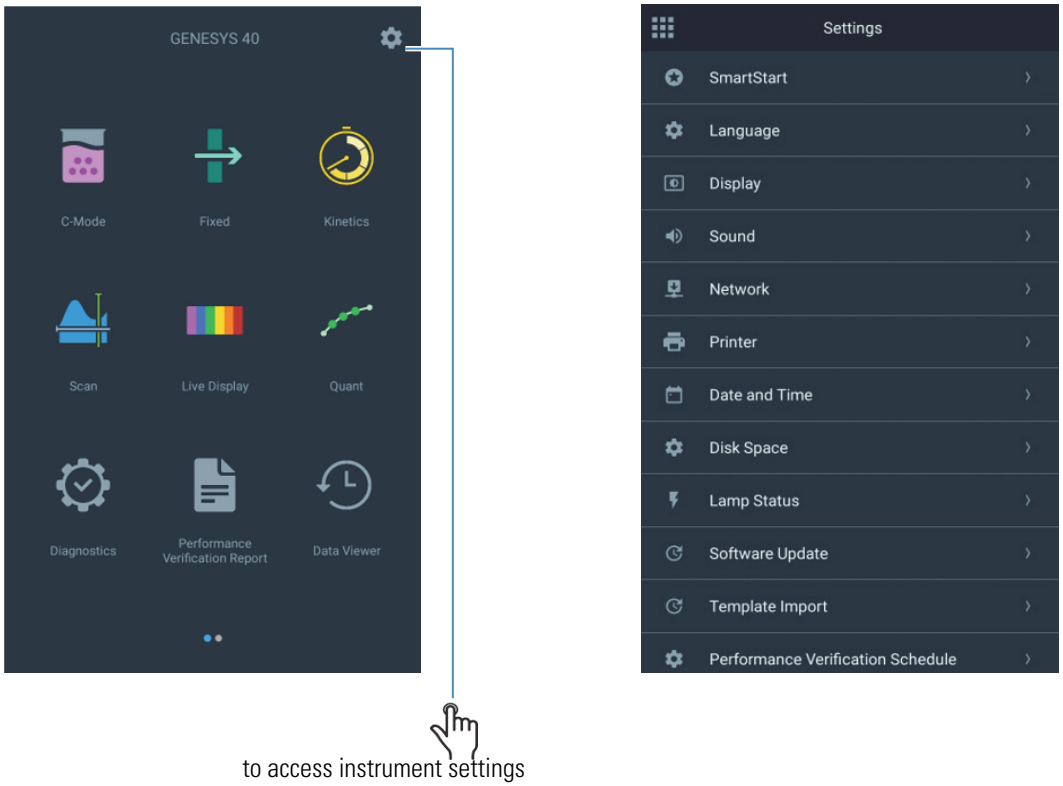


to export experiment data or a method to the network





Settings

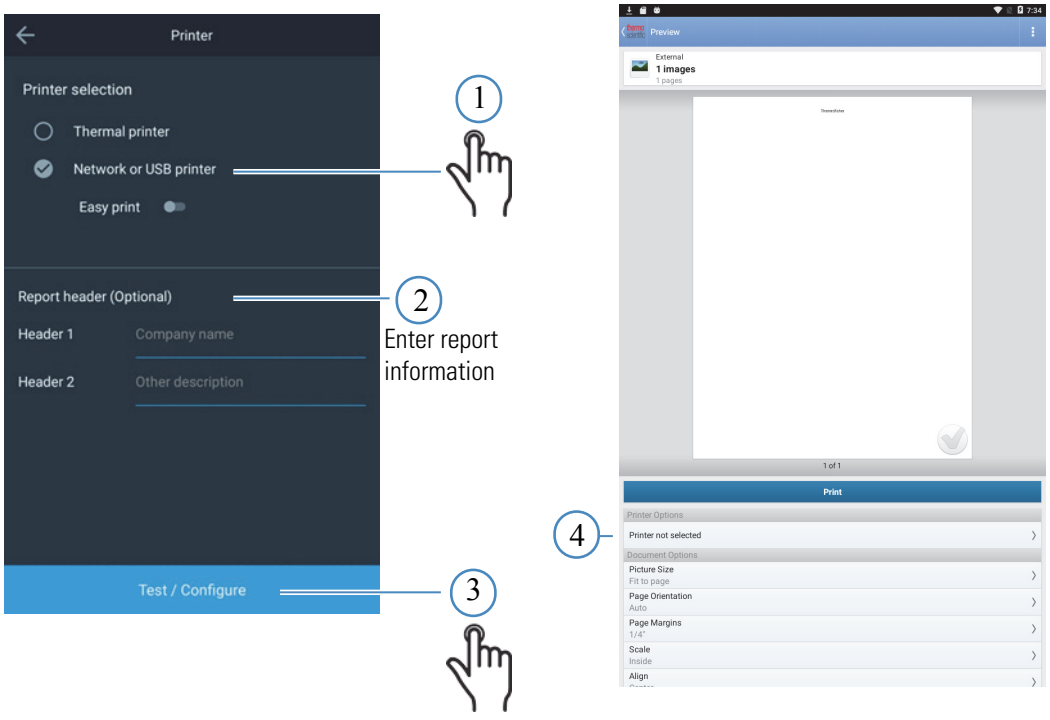


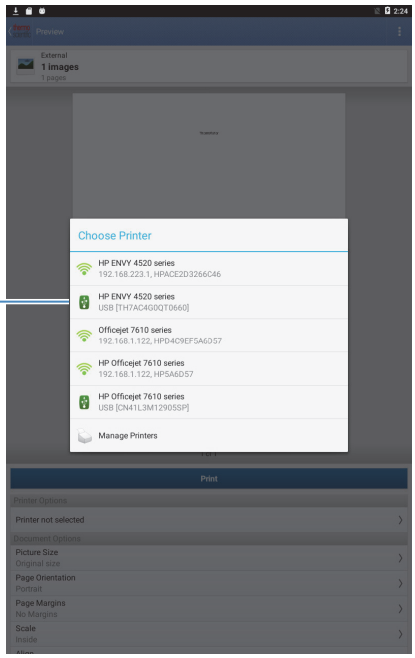
Setting	Description
Smart Start	See "SmartStart" on page 55
Languages	Selecting a language will set up the locale settings including Date-Time format and number format. Multiple languages are supported.
Display	Adjust brightness and toggle screen saver.
Sounds	Toggle touch sound.
Network	Set up the network path.
Printer	Set up printing. See "Printer Setup and Wi-Fi Printing" on page 88
Date and Time	Set up the date and time.
Disk Space	Displays the remaining available instrument memory.
Lamp Status	Provides the remaining lamp life in percent.
Software Update	See "Updating Software" on page 83
Template Import	Use to import method templates.

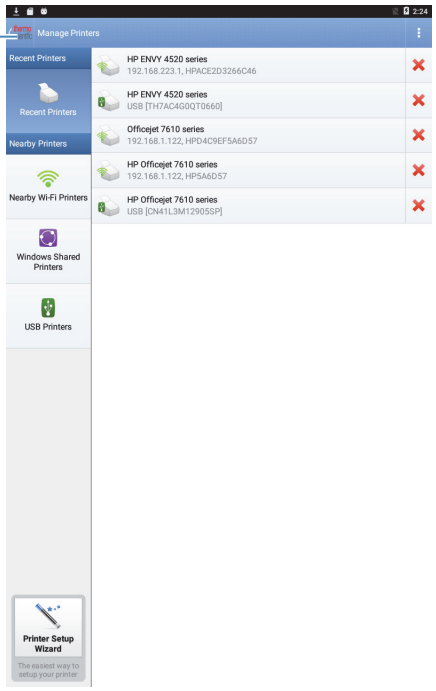
Setting	Description
Performance Verification Schedule	See “Performance Verification Schedule” on page 66
Log	Export instrument logs to a USB or a network location. Provide these logs when asked during service or support.
About	This screen provides information about the instrument. Provide this information when requested during service or support.
Help	Visit for link to technical support
PC Control	Enable connection to VISION*lite*.
Negative ABS in Scan	Toggle to enable negative absorbance in the Scan method. See “Negative and Positive Absorbance in Scan” on page 46.

Printer Setup and Wi-Fi Printing

Setting Up USB Printer

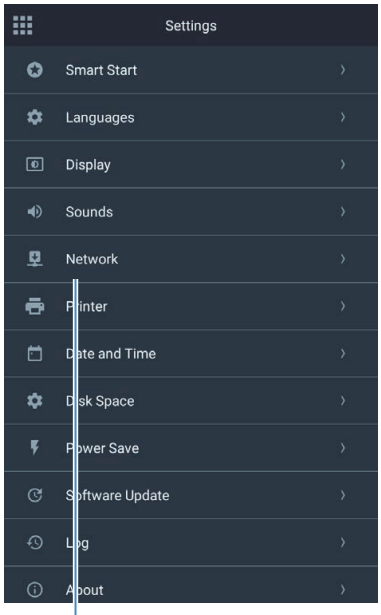




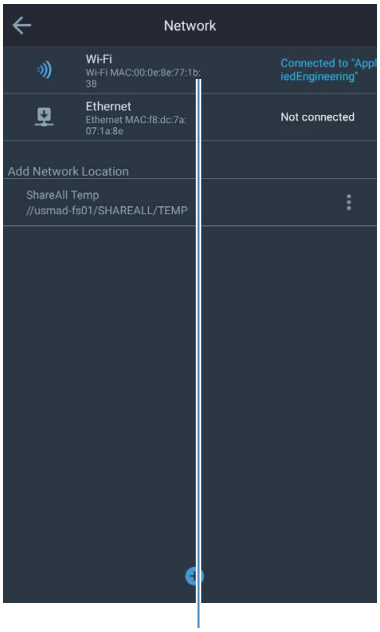


6

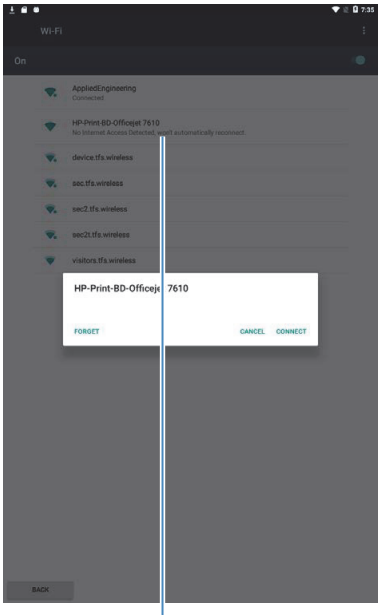
5 Select USB printer indicated by the USB symbol



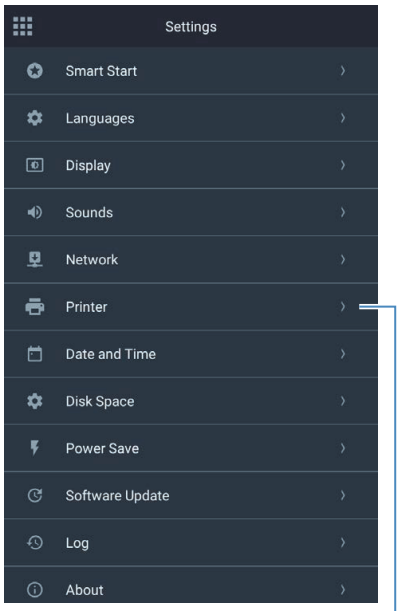
Settings > Network



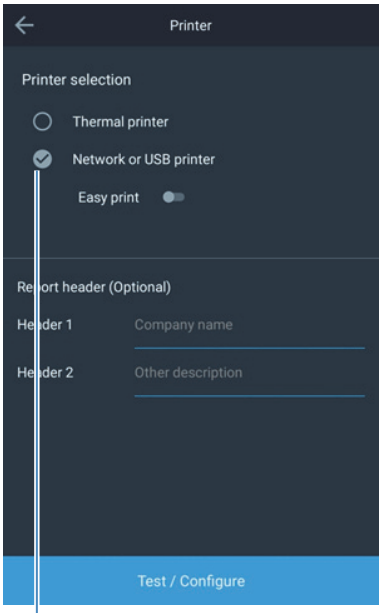
Select the printer "SSID"



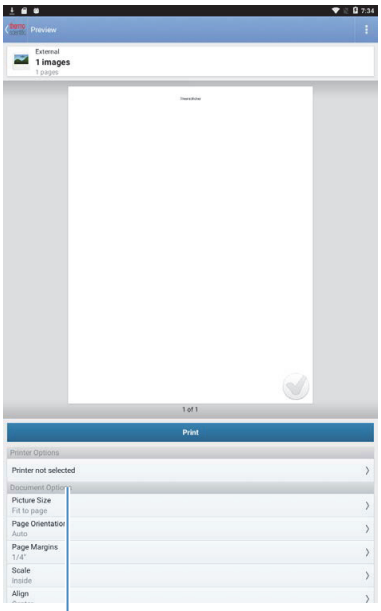
Connect to printer SSID or SSID of the network to which the printer is connected.



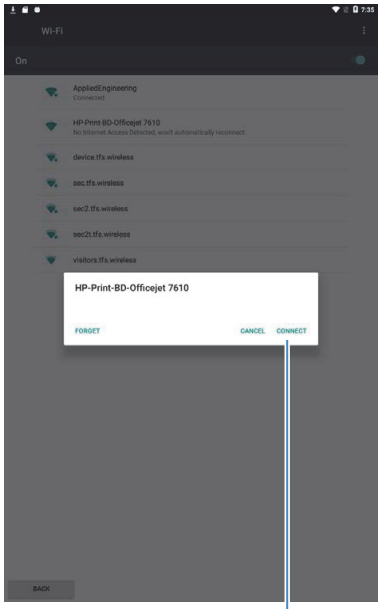
Set up the printer



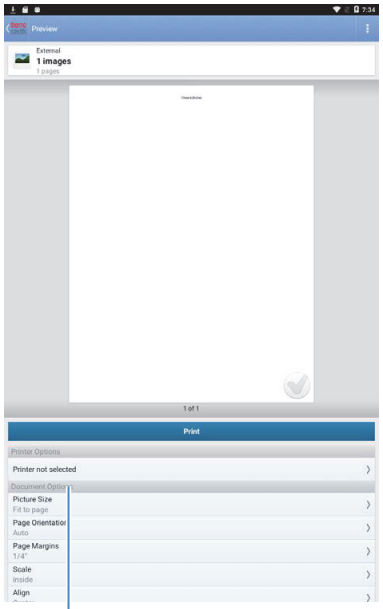
Select printer



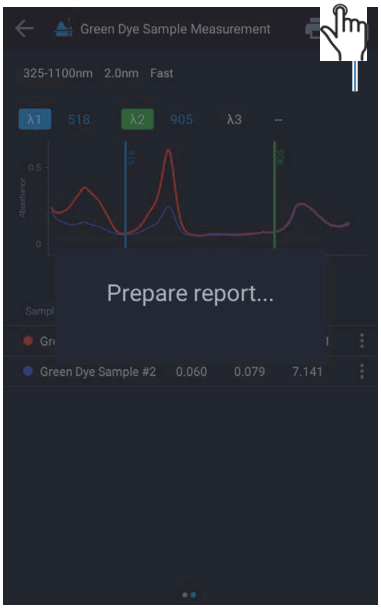
Select printer model

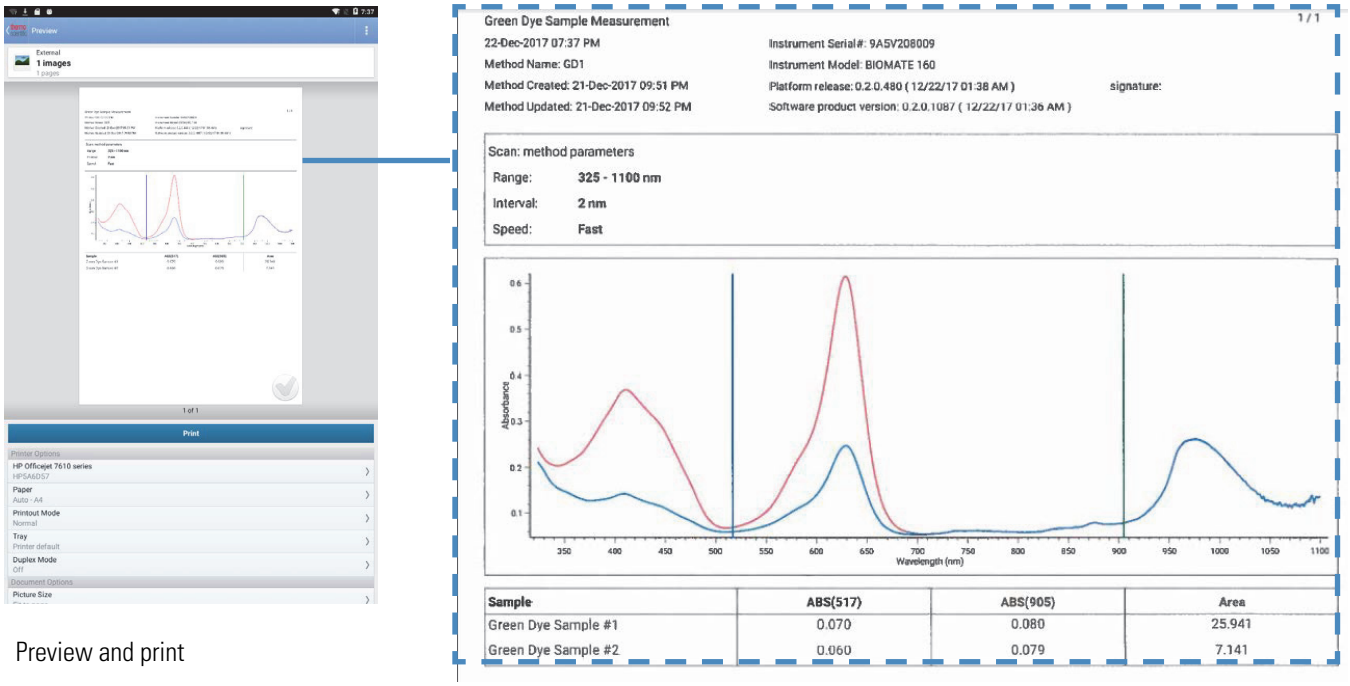


Connect



Preview and print

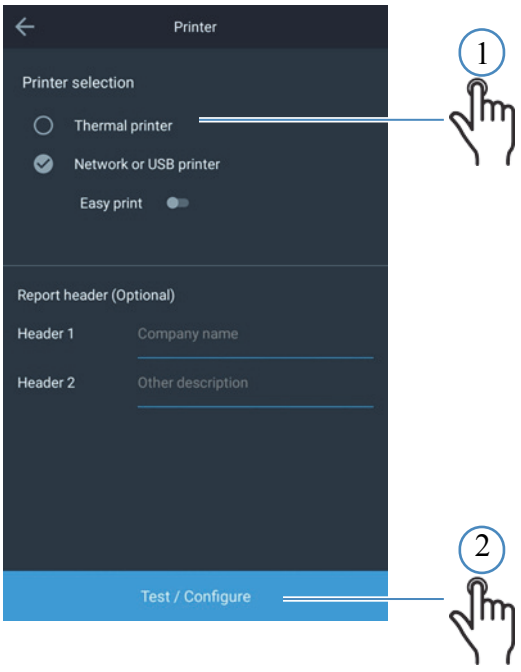


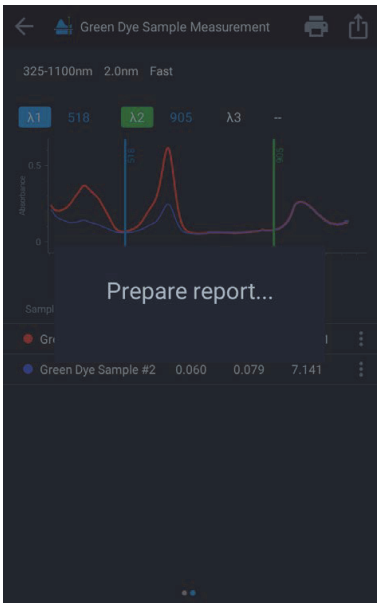


Preview and print

Setting Up Thermal Printer

Confirm the Thermal Printer is installed on the instrument. See Printer for installation instructions.





The print option in all applications will only print to the printer configured under settings. repeat the steps and re-configure the printer.

Access Control

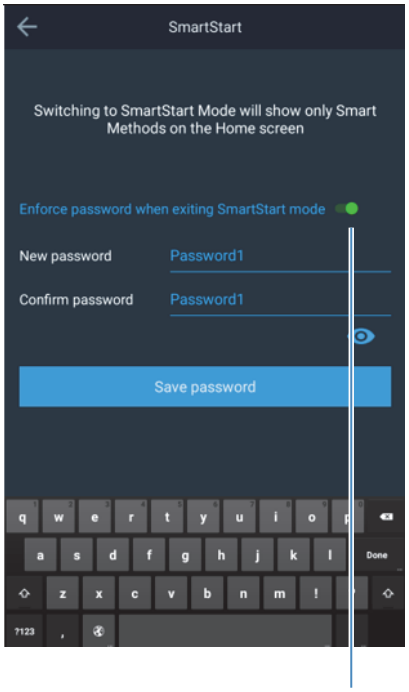
This feature is available v1.2 of software and beyond

The on-board software allows setting up a password for the SmartStart mode. Once a password for SmartStart is setup, this user will be prompted to enter this password to exit the SmartStart mode. This allows administrators to configure methods and present only these methods to users and prevent modifications to these methods.

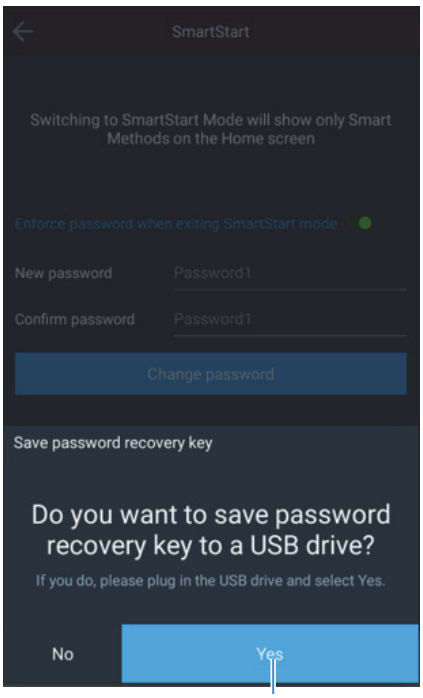
Please go through this section fully.

Setting Password

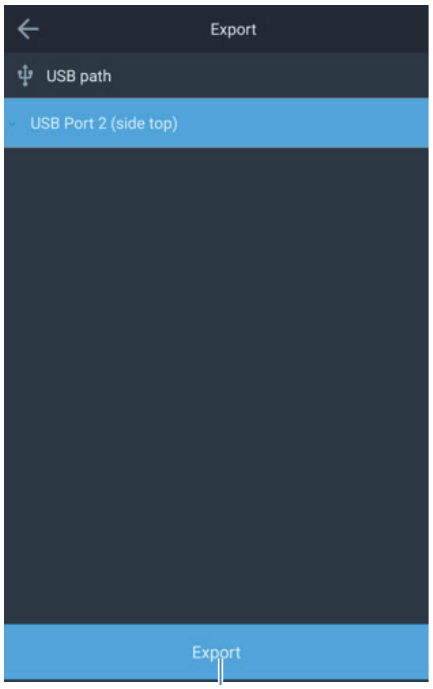
Enter the SmartStart menu through the instrument Settings page.



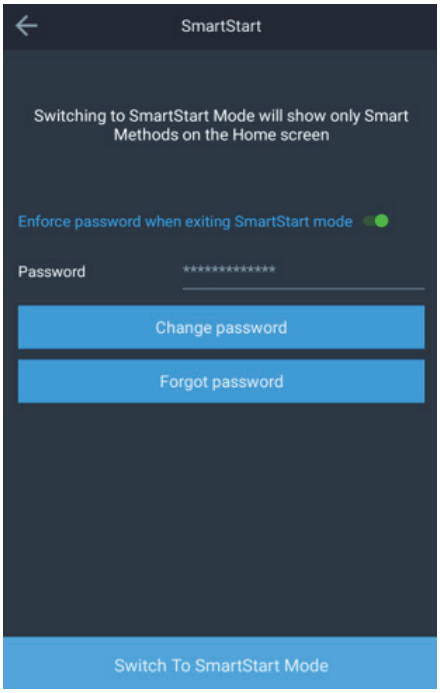
Enable password, enter new password, and confirm it.



Generate a recovery key onto a USB drive. This key is required to reset the password.

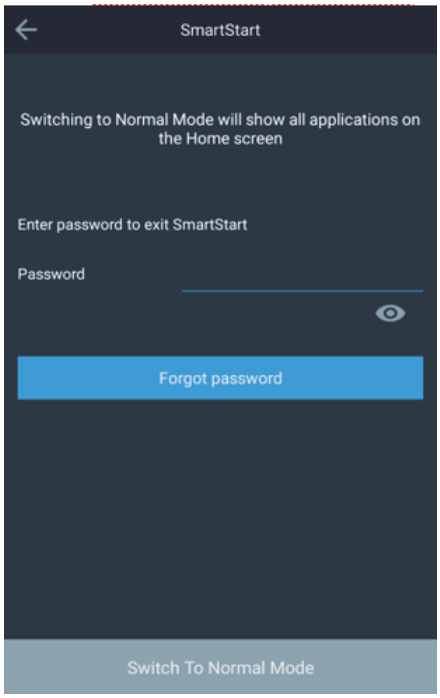


Generate a recovery key onto a USB drive. This key is required during the password reset process and therefore should be kept safely by the administrator.



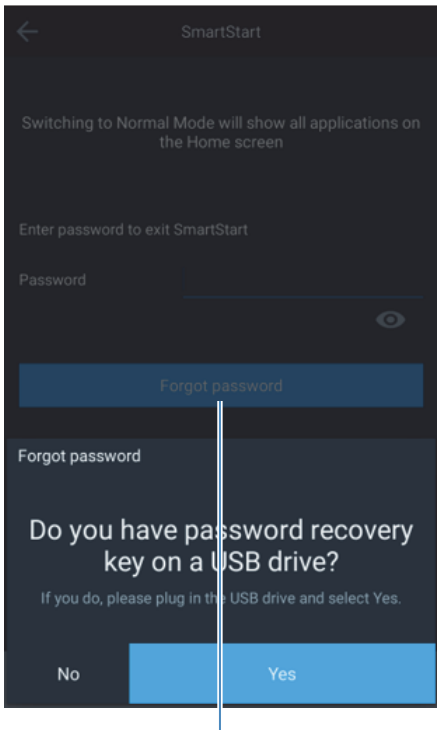
The password is now set and you may switch to SmartStart

You may exit SmartStart through **Settings > SmartStart**

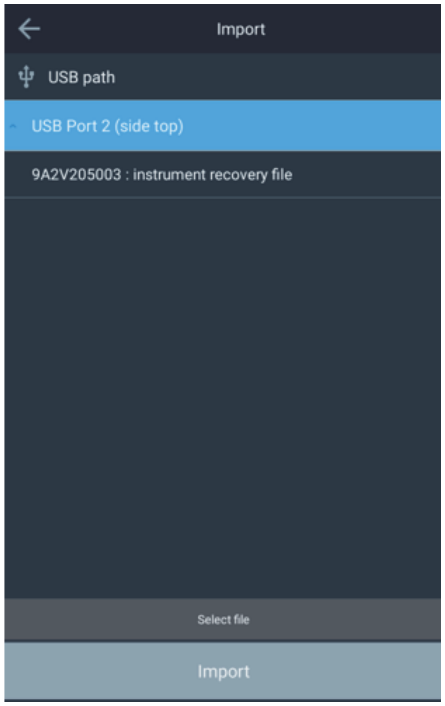


You will now be prompted to enter a password to enter the Normal mode.

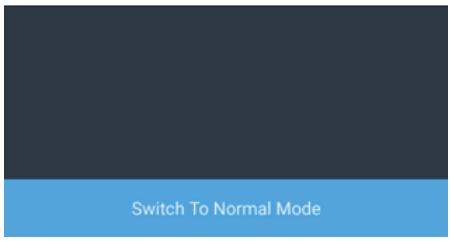
Forgot Password



to reset the instrument after a forgotten password.



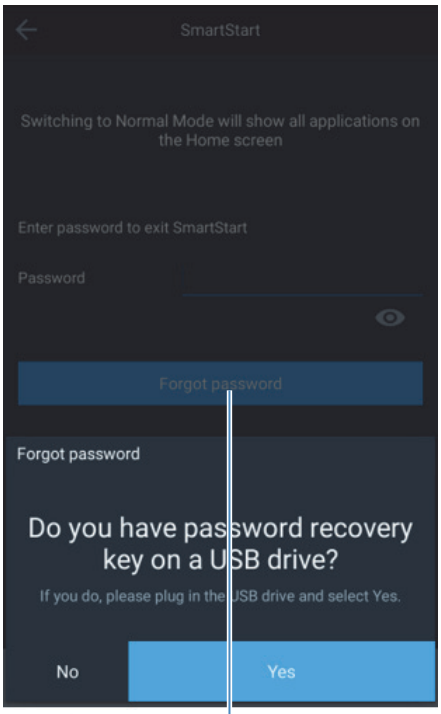
The password recovery file generated during the password set process above is required to reset the instrument. Insert the USB drive with the recovery file in the root folder.



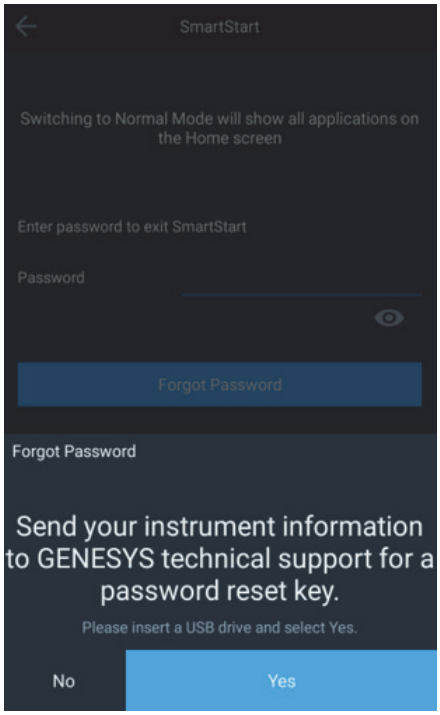
The instrument can now be switched to Normal Mode.

Lost Recovery File

If a recovery file is lost, the instrument reset process involves sending an instrument generated file to the GENESYS Technical support team. To request a master password reset process, visit the website below and complete the technical support form and attach the file generated by the instrument following the instructions below.



to reset the instrument after a forgotten password.



If you have misplaced the recovery file, tap **NO** when prompted for the file.

The instrument will generate a new password recovery file. This file is required by the technical support team to unlock the instrument.

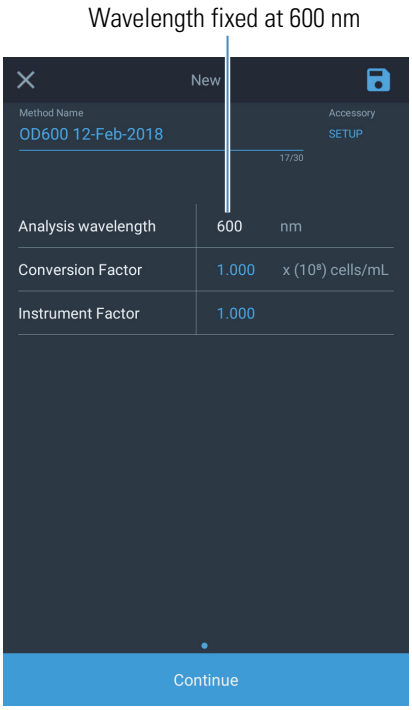
To begin the master instrument password reset process, first fill in the web form at the address above and then attached the newly generated file to the form.

After the verifying credentials, the technical support team will deliver a password reset file. Save this file into the root folder of a USB drive and follow the Forgot Password process.

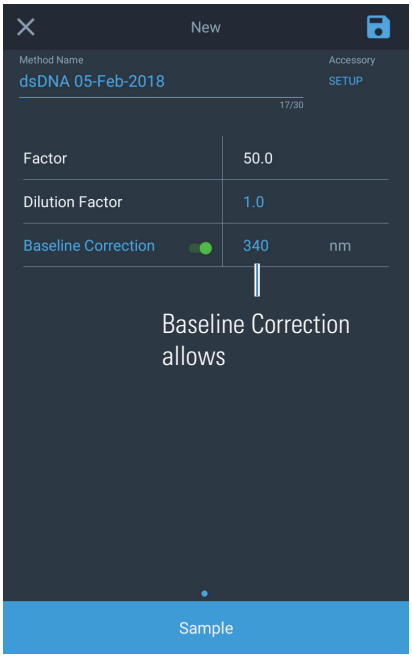
BioMate 160 Applications

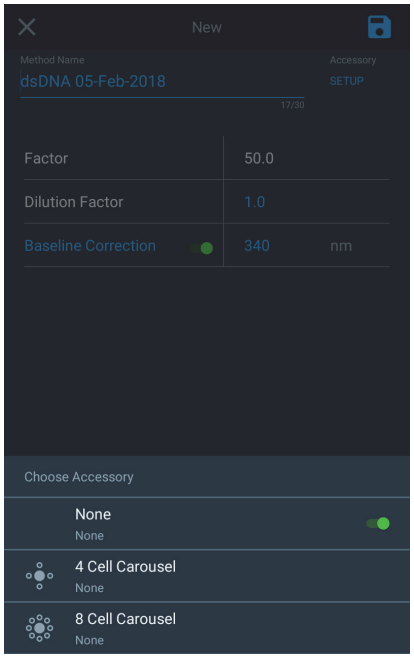
All applications described here are only available on the BioMate 160 instrument.

OD600



dsDNA



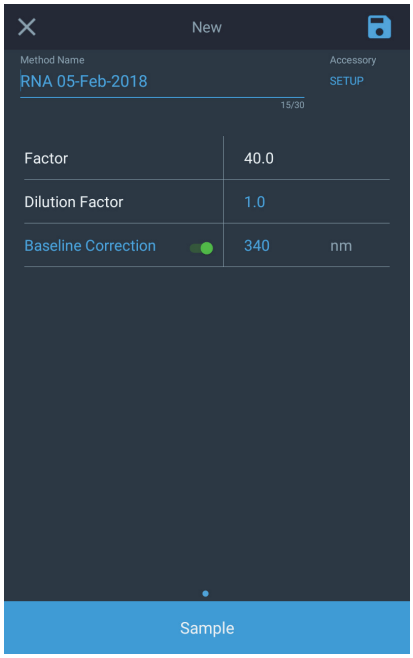


The reference wavelength setting allows the user to correct for any baseline shift caused by scatter from particulates suspended in the sample. This is a relatively common phenomenon in samples that are derived from lyophilized tissue samples. Choose a reference wavelength close to the measurement wavelength(s) where the absorbance of the sample is expected to be zero. The instrument will record the actual absorbance at this wavelength and subtract that value from the "raw" absorbance at the measurement wavelength(s) before performing calculations with that/those data. 340 nm is a commonly accepted reference wavelength for DNA measurements.

Example calculation using a reference wavelength:

$$260/280 \text{ ratio} = \frac{(A_{260}-A_{240})}{(A_{280}-A_{240})}$$

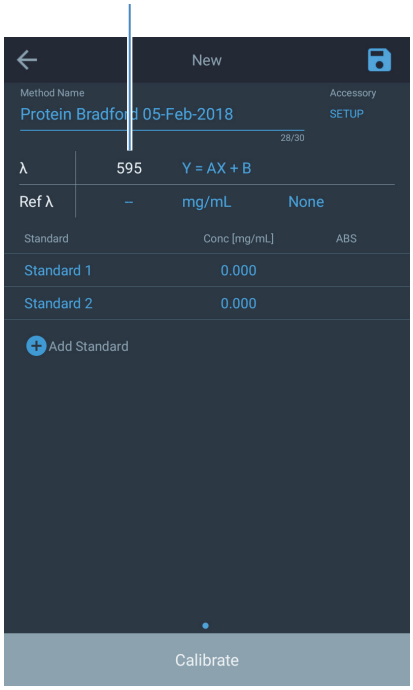
RNA



Protein BCA

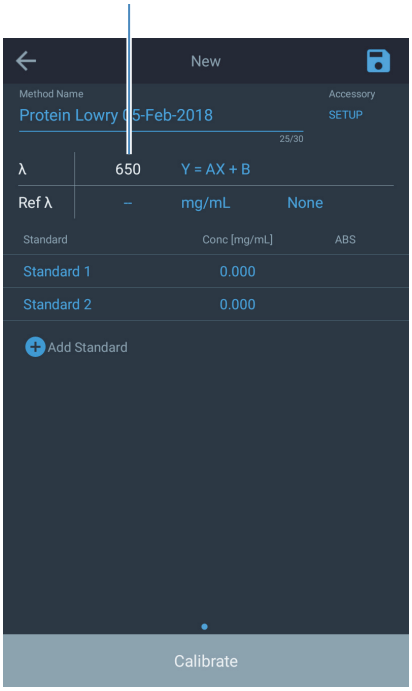
Protein Bradford

Protein Bradford method is performed at a wavelength of 595 nm. The workflow is similar to Quant application.



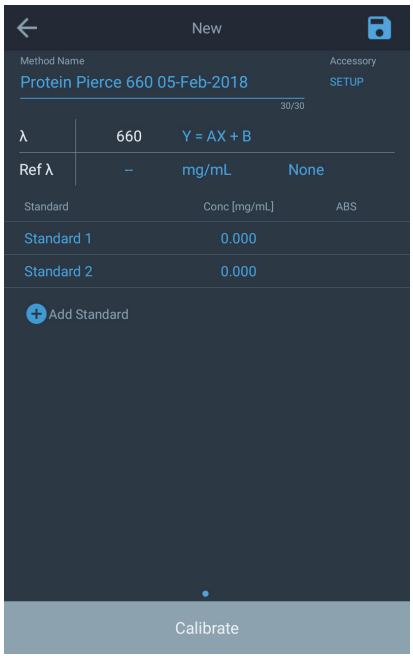
Protein Lowry

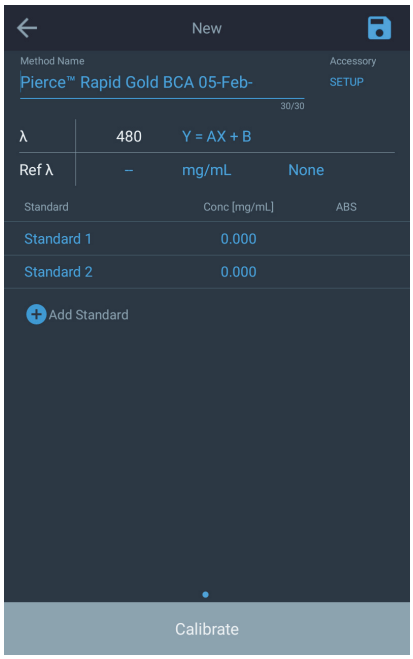
Protein Lowry method is performed at a wavelength of 650 nm. The workflow is similar to Quant application.



Protein Pierce 660

Protein Pierce 660 method is performed at a wavelength of 660 nm. The workflow is similar to Quant application.



Protein Rapid Gold BCA

Protein Rapid Gold BCA method is performed at a wavelength of 660 nm. The workflow is similar to Quant application.