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USER GUIDE

LS liquid batch samplers

Lighthouse

Distributed by AKRIBIS



LS-20/60

LIQUID BATCH SAMPLER



Operators Manual

LS Software Version 2.4

LIGHTHOUSE WORLDWIDE SOLUTIONS

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Lighthouse Worldwide Solutions

Liquid Batch Sampler

LS-20 and LS-60





Operators Manual

LS Software Version 2.4

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ABOUT THIS MANUAL

GENERAL SAFETY

Warnings and cautions are used throughout this manual. Familiarize yourself with the meaning of a warning before operating the sampler. All warnings will appear in the left margin of the page next to the subject or step to which it applies. Pay close attention to each warning message. Take extreme care when performing any procedure preceded by or containing a warning.

LASER SAFETY INFORMATION

WARNING: The use of controls, adjustments, or performance of procedures other than those specified within this manual may result in exposure to invisible (infrared) radiation that can quickly cause blindness. As a general precaution, avoid any possible exposure to laser radiation by honoring manufacturer seals and warranty stickers.



Example of Laser Warning Label

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SOFTWARE LICENSE AGREEMENT

SOFTWARE PROGRAM: LIGHTHOUSE LS-20 LIQUID SAMPLER SYSTEM

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INTRODUCTION

This operating manual describes how to use the ***LS-20 and LS-60 Liquid Sampler Systems***.

Following a quality standard of reliability and dependability, Lighthouse Worldwide Solutions developed the **LS-20 and LS-60 Liquid Samplers** (referred to in this document often as the **Liquid Sampler** and meaning either the LS-20 or the LS-60) using the latest in laser optical particle counter technology. The Lighthouse Liquid Sampler has an integrated syringe sampler and optical particle counting system. Its easy-to-use Windows based user interface is designed to meet the international regulatory standards of EP (Europe), JP (Japan), CP (China), KP (Korea) as well as USP 788 requirements. The Liquid Sampler uses a high accuracy syringe pump flow control system and a high sample volume sensor. With sample volumes adjustable from 1 to 1000 milliliters (10 mL syringe), it is a perfect tool for multiple batch sampling applications.

The ***LS-20*** uses a laser-diode light source and collection optics for particle detection. Particles suspended in liquid block (obscure) light from a focused laser beam. The photo detection electronics count the particles and determine their sizes based on how long the light is obscured. Results are displayed as particle counts in the specified size channel. The ***LS-20*** provides up to eight particle-size channels starting at 1.0 microns with a flow of 20 ml/min.

Data is gathered using the included LS Software. Data is automatically recorded from up to eight particle size channels, in real time, in graph and tabular form.

The graphical user interface of the LS Software makes the LS-20 and LS-60 easy to configure and operate. All reports can be preconfigured and printed at the touch of a button.

The LS Software allows the user to:

Set the Sample Volume
Configure the number of samples taken
Display count data as cumulative or differential values
Create sample recipes for repeated use
Export reports as Portable Document Format (PDF) or Comma Separated Value (CSV)
Custom label names

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LS-20 SPECIFICATIONS

Size Range:	1.0 - 50.0 µm
Channel Configuration:	1.0, 2.0, 5.0, 7.0, 10.0, 15.0, 25.0, 50.0 µm
Number of Channels:	8
Flow Rate:	20 ml per minute
Fluid Viscosity	Range: 0-10 cP
Channel sizes:	User Selectable
Syringe sizes:	Standard - 25 mL; Optional Accessory - 10 mL
Laser Source:	Laser diode
Maximum Sample:	1 Liter
Calibration:	NIST Traceable
Wetted Parts:	PFA, Quartz, Kalrez, Kel F, Stainless Steel 4406 or 4571
Communication Modes:	RS-232, RS-485 MODBUS (via proprietary cable)
Supporting Software	LS-20 Software
Enclosure	Stainless Steel
Power:	Unit: +24VDC; AC/DC, Adapter: 100-240V, 50-60Hz
Dimensions	12.875"(L) x 8.75"(W) x 14.75"(H) [32.7 x 22.2x 37.5 cm]
Weight	20.5 lb. (9.3 kg) (LS-20 Sampler)
Operating Temp/RH	50°F to 104°F (10°C to 40°C) / 20% to 95% non-condensing
Storage Temp/RH	14°F to 122°F (-10°C to 50°C) / Up to 98% noncondensing

LS-20 Specifications

Lighthouse recommends that your LS-20 instrument is calibrated annually by a Certified Lighthouse Service Provider, to ensure it continues to perform within specification.

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LS-60 SPECIFICATIONS

Size Ranges:	0.1-0.5µm; 0.2-2.0µm; 0.3-3.0µm; 0.5-100µm; 2.0-140µm
Channels Configurations:	0.1, 0.15, 0.2, 0.25, 0.3, 0.35, 0.4, 0.5 µm 0.2, 0.3, 0.4, 0.5, 0.7, 1.0, 1.3, 2.0 µm 0.3, 0.5, 0.7, 1.0, 1.3, 2.0, 2.5, 3.0 µm 0.5, 1.0, 2.0, 5.0, 10.0, 25.0, 50.0, 100.0 µm
Number of Channels:	8
Flow Rate:	60 ml per minute
Syringe sizes:	Standard - 25 mL; Optional Accessory - 10 mL
Laser Source:	Laser diode
Maximum Sample:	1 Liter
Calibration:	NIST Traceable
Wetted Parts:	Teflon (PFA), Quartz, Kalrez, Kel F, Polypropylene
Communication Modes:	RS-232, RS-485 MODBUS (via proprietary cable)
Supporting Software	LS Software
Enclosure	Stainless Steel
Power:	Unit: +24VDC; AC/DC Adapter: 100-240V, 50-60Hz
Dimensions	12.875"(L) x 8.75"(W) x 14.75"(H) [32.7 x 22.2x 37.5 cm]
Weight	20.5 lb (9.3 kg)
Operating Temp/RH	50°F to 104°F (10°C to 40°C) / 20% to 95% non-condensing
Storage Temp/RH	14°F to 122°F (-10°C to 50°C) / Up to 98% noncondensing

LS-60 Specifications

Lighthouse recommends that your LS-60 instrument is calibrated annually by a Certified Lighthouse Service Provider, to ensure it continues to perform within specification.

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OPERATING THE SAMPLER

OVERVIEW

The Lighthouse ***Liquid Sampler*** has been thoroughly tested at our factory and includes sample tubing and a sample beaker, for your convenience.

Please review and follow the LS-20 or LS-60 Liquid Sampler set up and configuration steps that are outlined on the printed **Read Me First** document and on the USB key included in the instrument shipping box.



LS-20 with beaker



LS-60 with beaker

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UNPACKING

When the LS-20/LS-60 is first received, inspect the outside of the shipping container for any damage that may have occurred during shipping. If any damage to the shipping container is found, report the damage to Lighthouse immediately. If the container is undamaged, next carefully inspect the Liquid Sampler itself for any broken parts, scratches, or dents. Report any damage found on the instrument to Lighthouse Technical Support before proceeding. Verify the contents of the shipment against the shipping list. If anything appears to be missing, immediately contact your local sales representative or Lighthouse Worldwide Solutions at 1+ 800-945-5905, 1+ 541-770-5905 or techsupport@golighthouse.com. Keep the shipping container and all packing material for reshipment of the sampler for annual calibration.

RETURNS AND YOUR RMA NUMBER

Should it become necessary to return the instrument to the factory for any reason, please contact Lighthouse Customer Service, or visit our web site, www.golighthouse.com/rma, and obtain a Return Merchandise Authorization (RMA) number. Reference the RMA number on all shipping documentation and purchase orders. After receiving an RMA number, follow the shipping instructions below.

SHIPPING INSTRUCTIONS

If the LS-20 or LS-60 needs to be returned to the factory for any reason, please follow the shipping instructions below.

1. Use the original shipping containers, nozzle caps and packing materials whenever possible.

2. If the original shipping containers or packing materials are not available, you may contact Lighthouse to purchase replacement containers, packing materials and nozzle caps. It is not recommended, but when an approved shipping container is not available, the instrument may be wrapped in “bubble pack”, surrounded by shock absorbent material, and placed in a double-walled shipping carton. However, if the shipping container is vigorously shaken, the instrument should not rattle inside it. If the instrument is damaged during shipping because of inadequate user packing, the instrument’s warranty may be voided and all required repairs will be billed to the customer.

3. Seal the shipping container securely. Mark the container “FRAGILE” and write the Return Merchandise Authorization (RMA) number on any unmarked corner of the shipping container.

4. Return or ship the instrument to the address provided by your Lighthouse representative or the RMA website.

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RUNNING THE LS SOFTWARE

To operate the LS Software, it must be installed on a computer and the instrument must be connected to the computer USB port using the included USB to RS-232 cable.

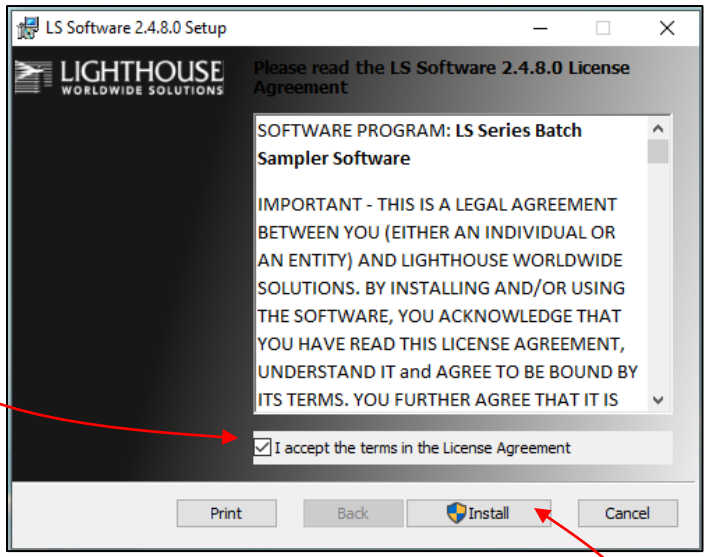
All the Liquid Sampler instrument functions are controlled by the LS Software. There are no control buttons on the instrument itself, other than the power on/off switch on the back of the instrument.

Once the user has installed the LS Software, the user can click on the LS Software desktop short-cut icon to start the software and operate the Liquid Sampler.

LS SOFTWARE INSTALLATION (COMPUTER REQUIRED)

The LS Software Installer file name is **LS Software Installer 2.4.X.msi**. The file is provided on a USB key or available by download. Copy the installer file to your computer root directory and double click to install the LS Software.

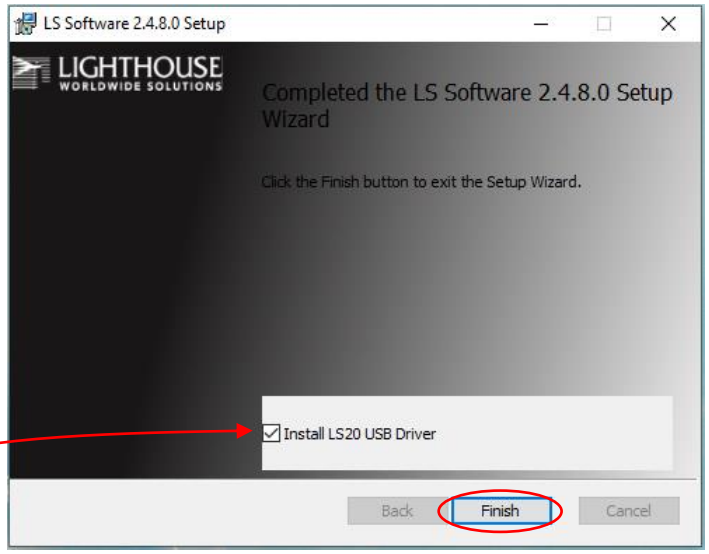
- Read the License Agreement and then click to accept the terms in the license agreement.



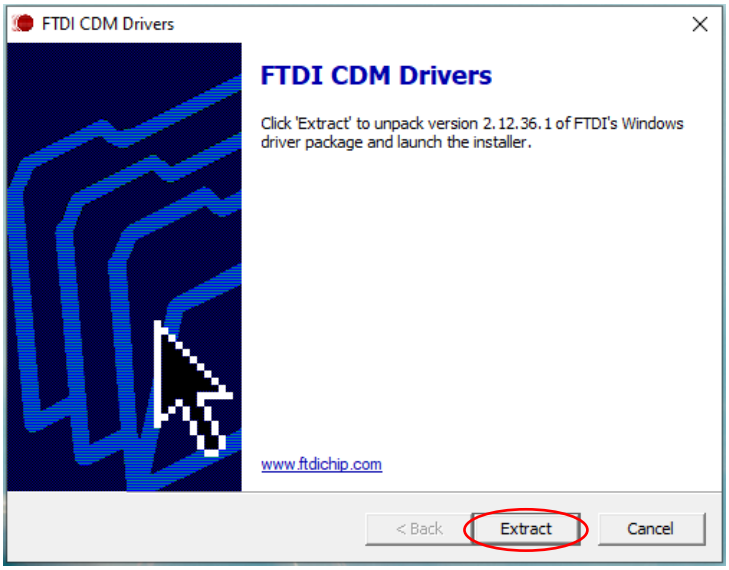
LS Software Installation Screen

- Press the Install button to start installation of the LS Software.

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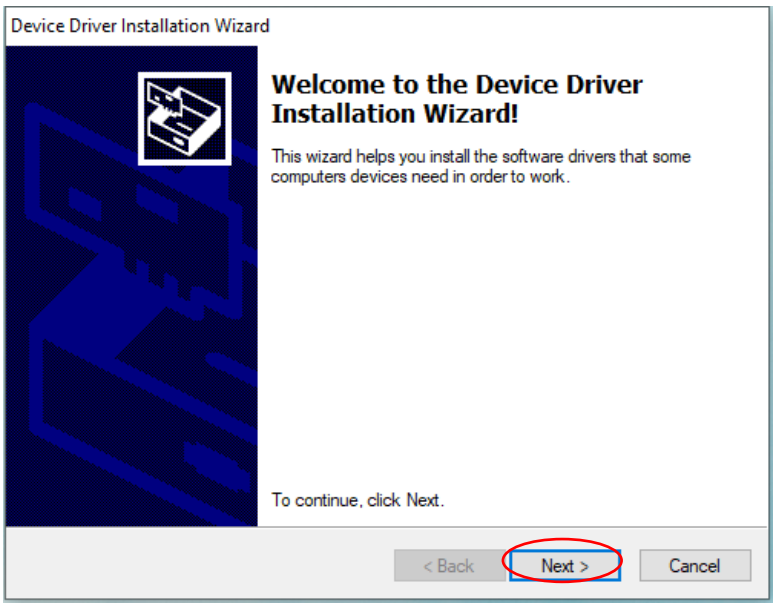


- Click to Install the LS-20 USB Driver.
- Click Finish button to exit the LS Software Setup Wizard and install the LS-20 USB Driver.

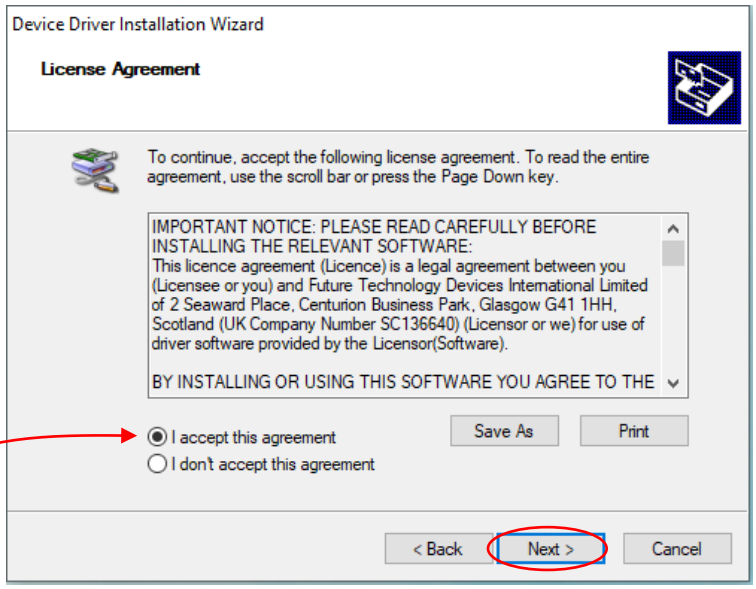


- Click on Extract to extract the FTDI CDM Drivers.

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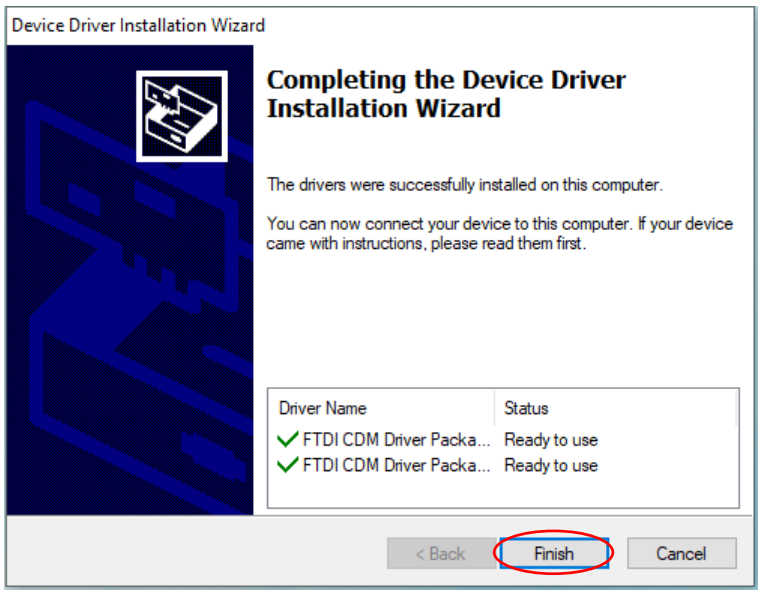


- Click on Next to install the device drivers.



- Click to accept the License Agreement.
- Click Next to continue and install the device driver.

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- Click Finish to complete the device driver installation and close the window.

The LS Software, by default, will be installed on the computer in the folder:

C:\Program Files (x86)\Lighthouse Worldwide Solutions\LS Software

Sub folders created:

\Drivers
\Recipes
\x64
\x86

Files in LS Software root folder:

LS20 Application
LS20.exe
Sqlite3.dll

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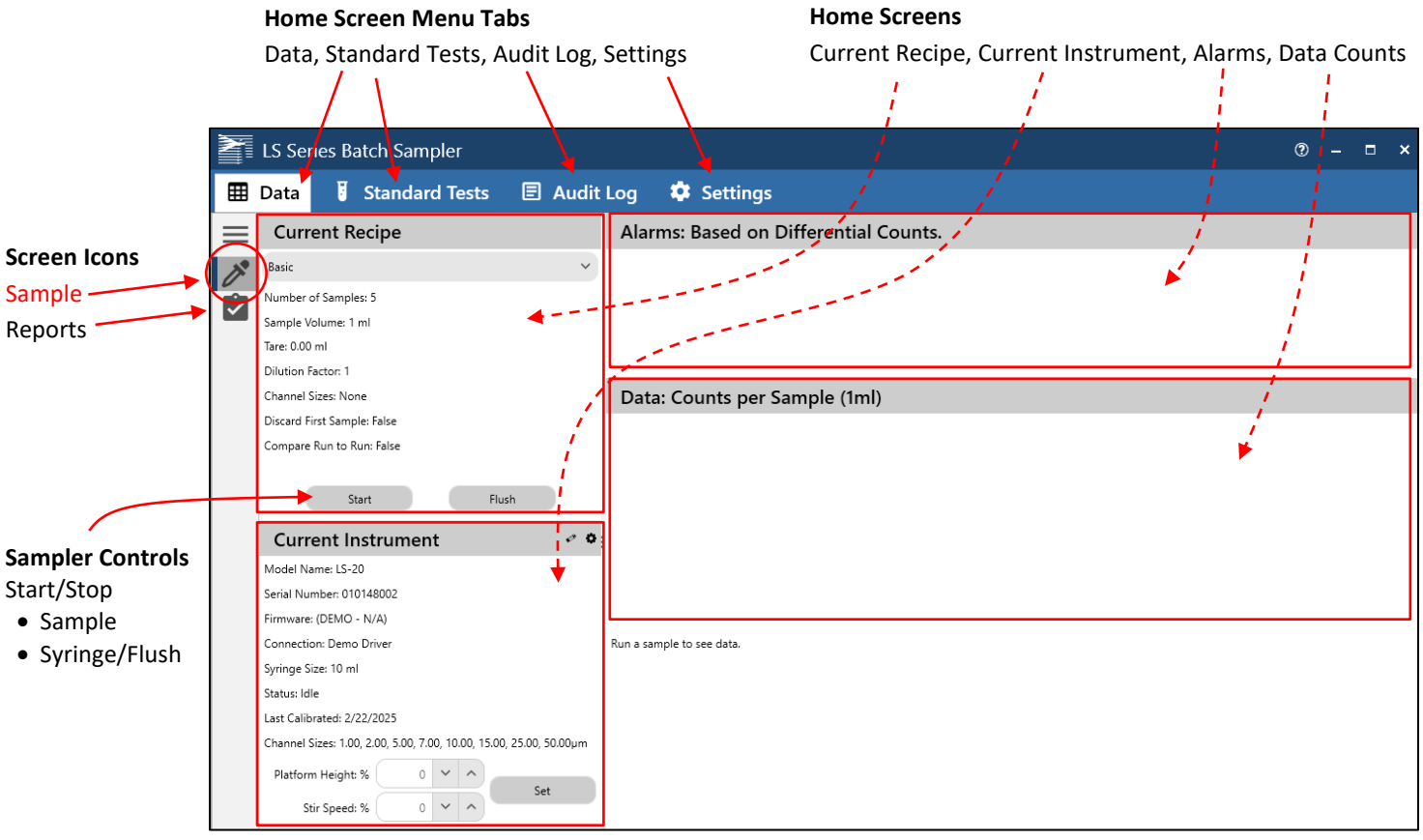
LS SOFTWARE USER INTERFACE

HOME PAGE

- The Home Page displays the current selected instrument and recipe sample settings. The Note Standard Tests tab will only be available for LS-20 instrument connections. Standard Tests tab will not be available for LS-60 instrument connections.

- The Data and Alarm windows display real time particle count and threshold alarms for the current or last sampled recipe.

- While running a sample recipe the Home Page will display Data Counts and Threshold alarm limits in real time.



LS Software Home Page

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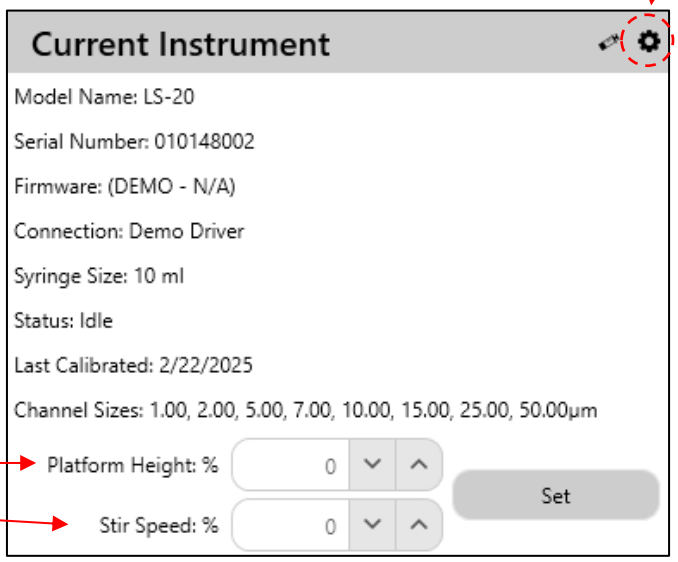
CURRENT INSTRUMENT

The Current Instrument screen allows the operator to connect to the Liquid Sampler instrument via Serial communication. The currently connected instrument parameters will display on the Current Instrument screen.



Click on the Communication Settings gear icon to set up a serial connection.

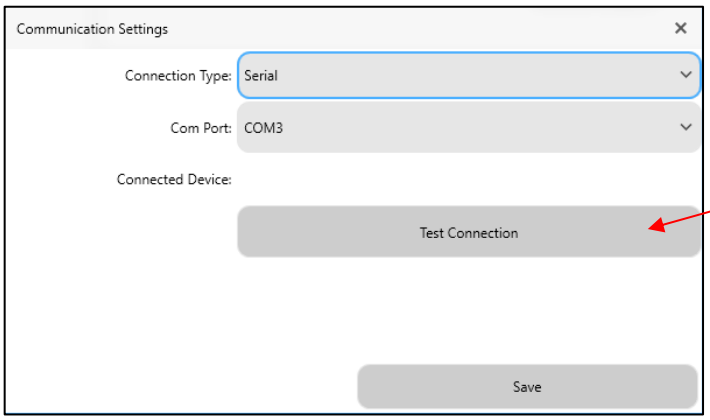
- Model Name
- Serial Number
- Firmware
- Connection
- Syringe Size
- Status
- Last Calibrated Date
- Channel Sizes
- Platform Height %
- Stir Speed



Current Instrument Screen

INSTRUMENT SETTINGS – SERIAL CONNECTION

Connect instrument to computer with the included USB to RS-232 serial communication cable.



Select Serial from the Connection Type list

Select an available Com Port from the list.

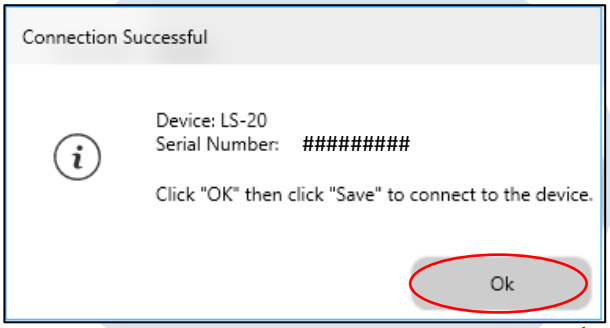
Click on Test Connection

If connection is successful, click Save to save serial connection to the instrument.

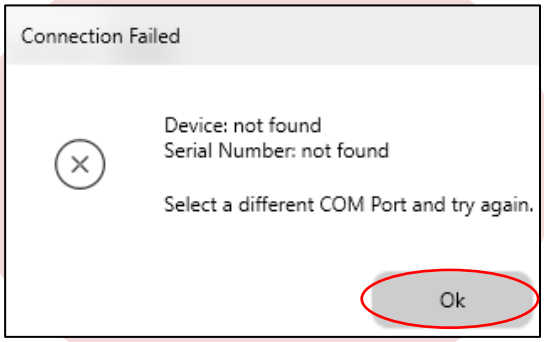
Communication Settings

The LS Software will test the connection to the instrument and display Connection Successful or Connection Failed message.

- Press Ok to acknowledge connection successful.

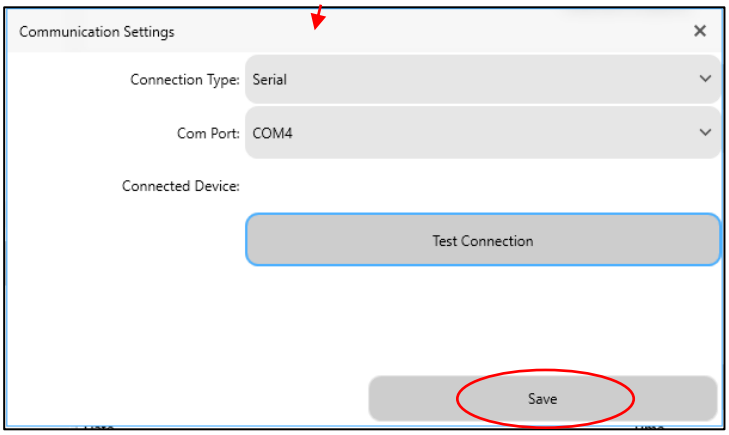


Connection Successful Message



Connection Failed Message

- Press Save to connect the device.



Communication Settings

Note: Connection Type "Demo" is a demonstration mode only and IS NOT a connection to a real instrument.

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PLATFORM HEIGHT %

From the Current Instrument Window, the user can adjust the Platform Height % in real time. After pressing the Set button, the Platform Height will adjust to the new setting. If a recipe requires a specific size beaker, the Platform Height can be set and saved in the recipe to accommodate that beaker size. When the recipe is run, the platform will raise to the saved height. When the beaker has an opaque edge guard, the LS software edge detector will sense the beaker's edge and override a platform height that could result in a shattered beaker.

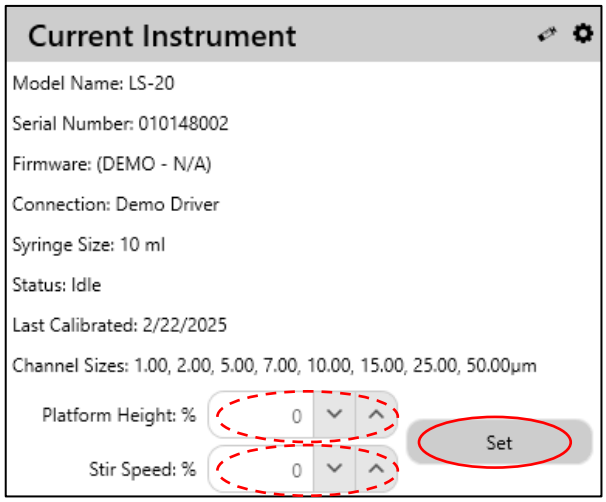
Light blocking edge guard detects and will stop the platform rising past the top of the beaker.

Warning: Without the light blocking edge guard a beaker can break and shatter and spill the contents from extending the platform riser beyond the height of the beaker.



STIRRER SPEED %

From the Current Instrument Window, the user can select the Stir Speed %. After pressing Set, the Stirrer will start stirring. Note below 30% the stirrer bean may not spin depending on the viscosity of the fluid.

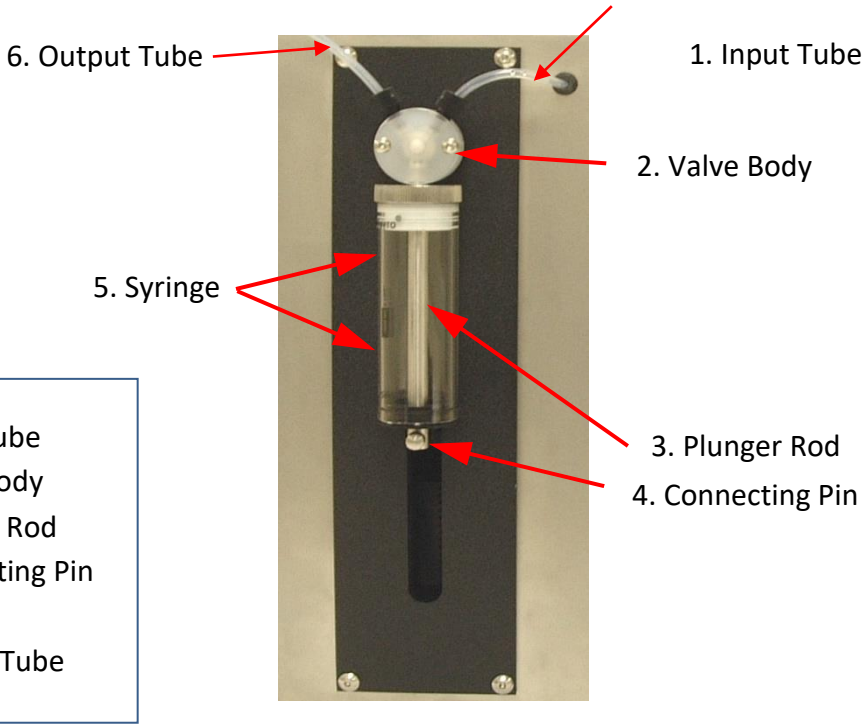


THE SET BUTTON

After pressing the Set button, the LS platform height and stir speed settings will be saved with the selected recipe. When a recipe is run the platform height and stir speed will adjust to the settings from the saved recipe.

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CHANGING THE SYRINGE AND VALVE BODY PARTS:



1. Input Tube
2. Valve Body
3. Plunger Rod
4. Connecting Pin
5. Syringe
6. Output Tube

Syringe and Pump Detail
(25 ml syringe example)

Plunger Rod & Actuator Arm

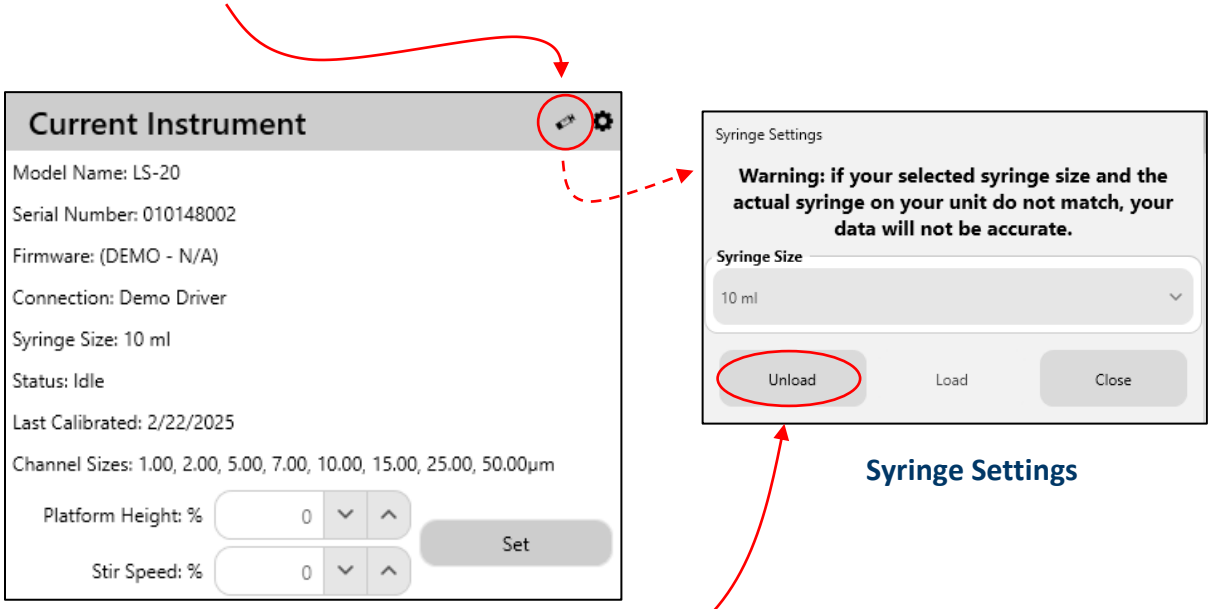
The plunger rod actuator arm extends out from the sampler through the vertical slot and is machined to accept the rod end. A threaded hole in the arm accepts the pin.

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UNLOAD SYRINGE

The Current Instrument screen Syringe Settings button allows the operator to Load and Unload the syringe. The LS Software supports two syringe sizes: 10 ml and 25 ml.

Click on the Syringe Settings button to change the syringe size.



Syringe Settings

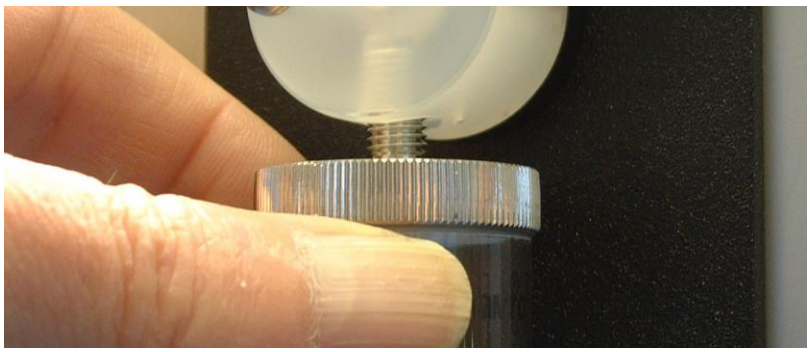
Select Unload

Clicking on the Unload Button moves the plunger mechanism all the way to the bottom of its stroke. The bottom pin can then be removed, and the syringe unscrewed from the valve. Removing the bottom pin requires care to prevent damage to the pin's threads. When the pin has been removed from the plunger rod, the syringe body can be unscrewed from the valve.



Removing Syringe Mounting Pin

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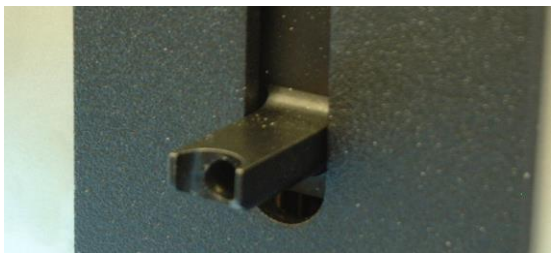


Unscrewing Syringe Cylinder

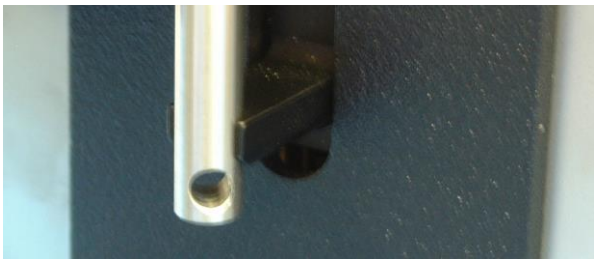
Carefully unscrew the syringe cylinder from the valve body in a counterclockwise manner. Use extreme care while doing this to prevent damage to the valve and the plunger. After removal, carefully store the syringe and plunger together in a container for safe keeping.

LOAD SYRINGE

Reinstalling the original or installing a replacement syringe requires care to prevent damage to the valve body or syringe. A suggested procedure is to align the plunger rod in the actuator arm cradle as shown. This provides an alignment guide so the syringe will be vertical while threading it into the valve body. Threading should be relatively easy so if it feels like the syringe is binding, stop, unscrew, and then try again taking extra care. A cross-threaded valve body must be replaced at the factory.



Actuator Arm Detail



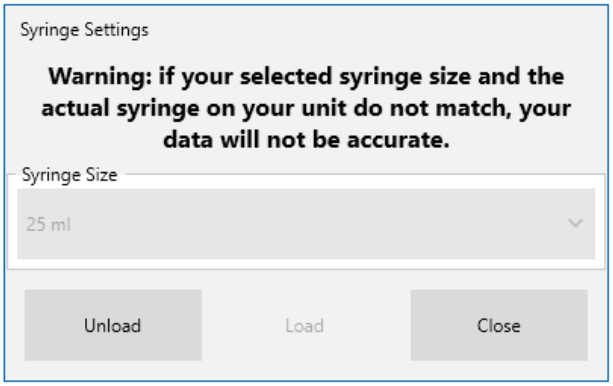
Plunger Rod and Actuator Arm Detail

Take great care installing or removing the syringe.

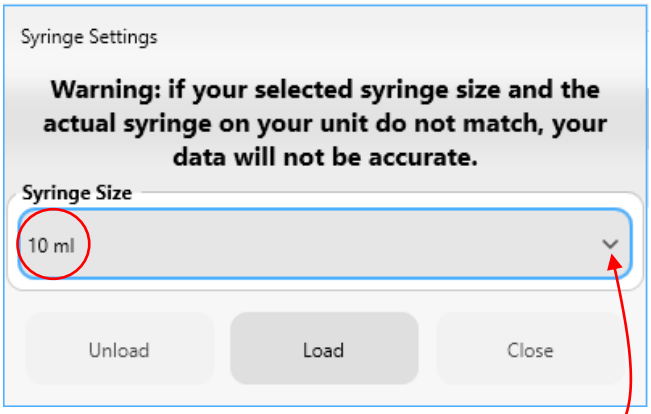
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REINSTALLING PLUNGER ROD PIN

After the syringe has been threaded into the valve body, carefully pull, and turn the plunger rod, as needed, to mate it to the actuator arm. Carefully install the attachment pin, to mate it to the actuator arm. Carefully install the attachment pin, taking care to not cross-thread it. Hand-tighten the pin and then hand-tighten the syringe. Doing this, in this order, keeps the rod and syringe in alignment.



Syringe Size Settings Screen



Select Syringe Size 10ml or 25ml

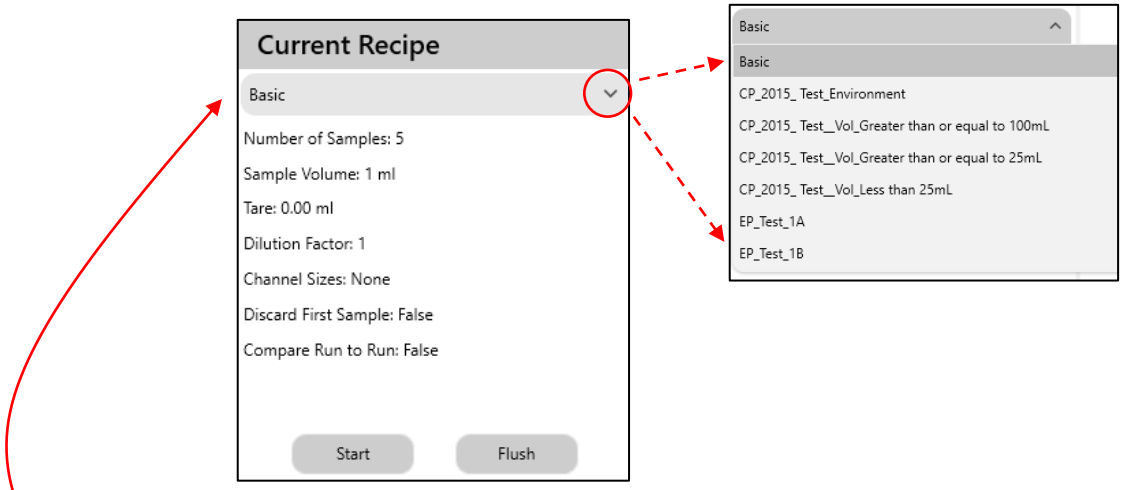
Select Load

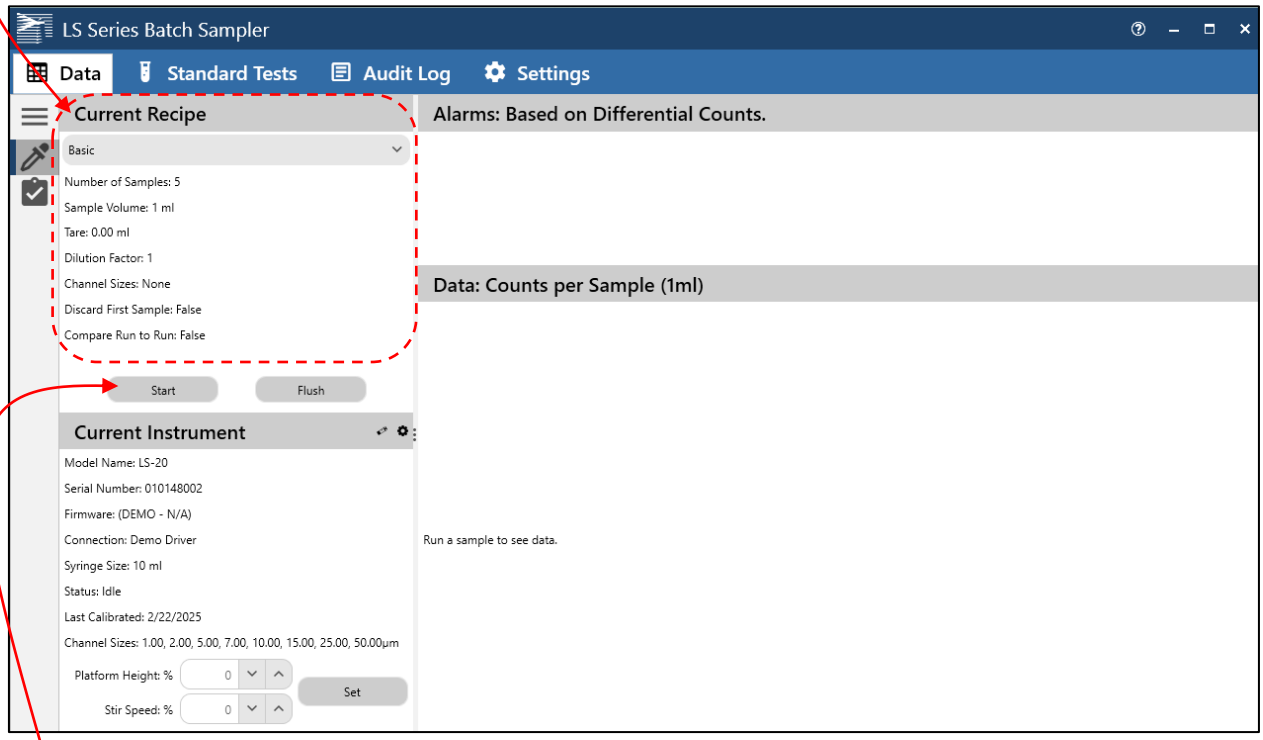
After successfully changing syringe size and selecting the matching Syringe Size (10 ml / 25 ml), press the Load button. The Load button brings the plunger actuator back up to the top position. Once at the top, the syringe will go through the reset sequence of pulling down, then moving back up to zero itself.

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CURRENT RECIPE WINDOW

- From the Home Screen Current Recipe window, select a Recipe from the pull-down list.
- The selected recipe settings will display in the Home Screen Current Recipe window.



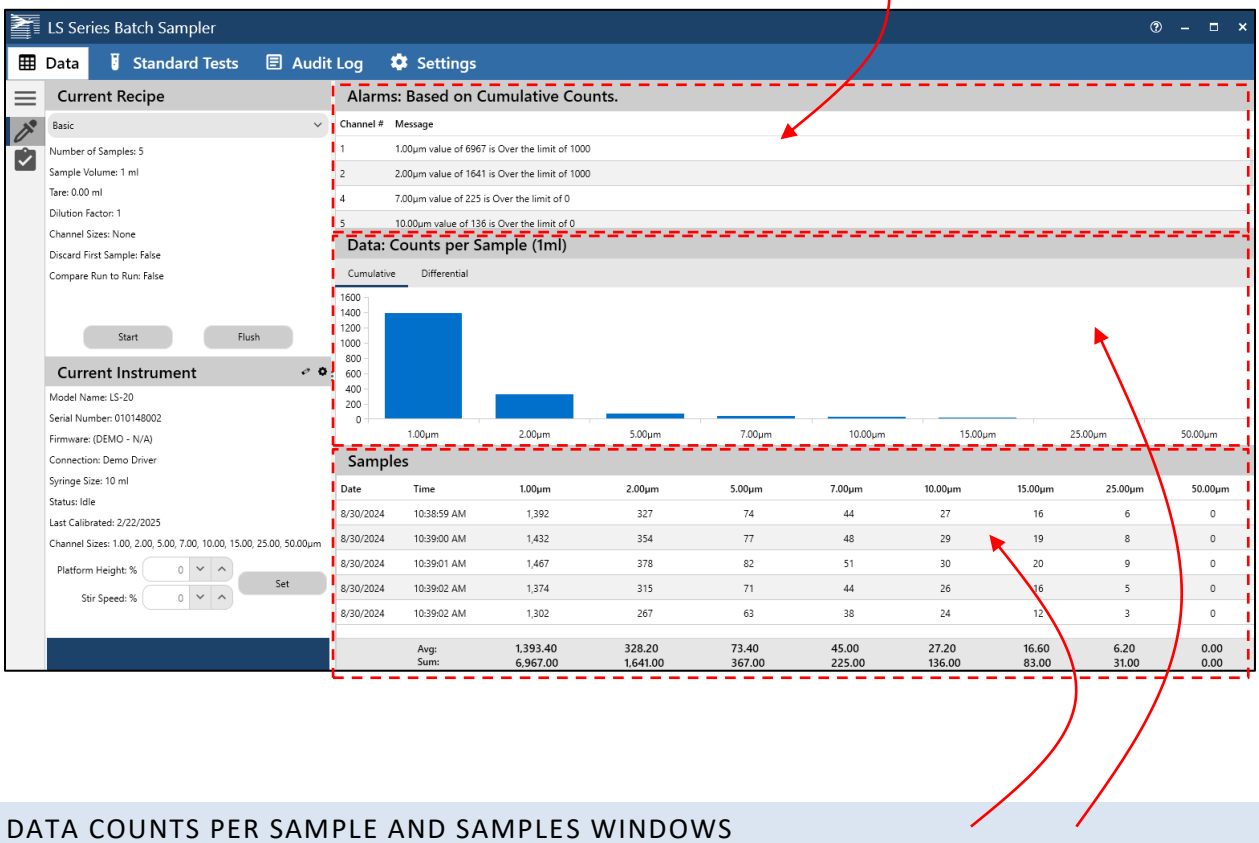


- Press Start to start the selected recipe sampling.

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ALARMS WINDOW

When the user clicks the “Start” button and runs a recipe, if the recipe includes enabled alarm thresholds, the status of the alarm limits will be displayed in the Alarms window.



DATA COUNTS PER SAMPLE AND SAMPLES WINDOWS

When a recipe sample is running, data counts will be displayed in the Data and Sample portions of the Home screen Sample Page. Selecting a Recipe will not display data. Only while running and after running a sample will data be displayed on the screen.

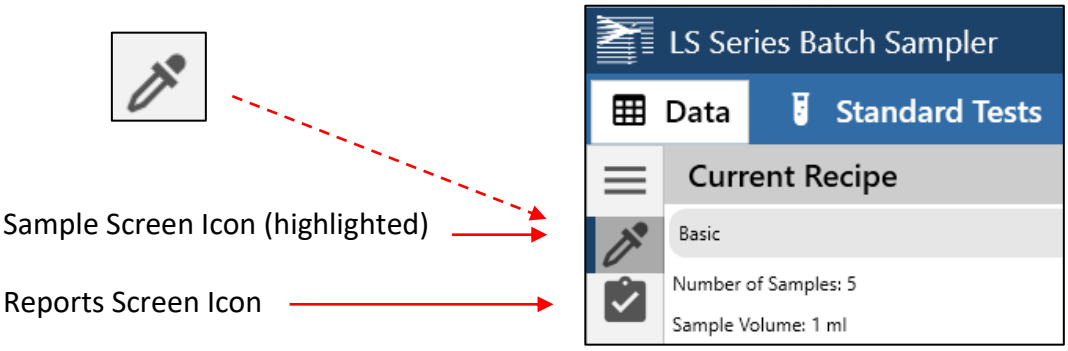
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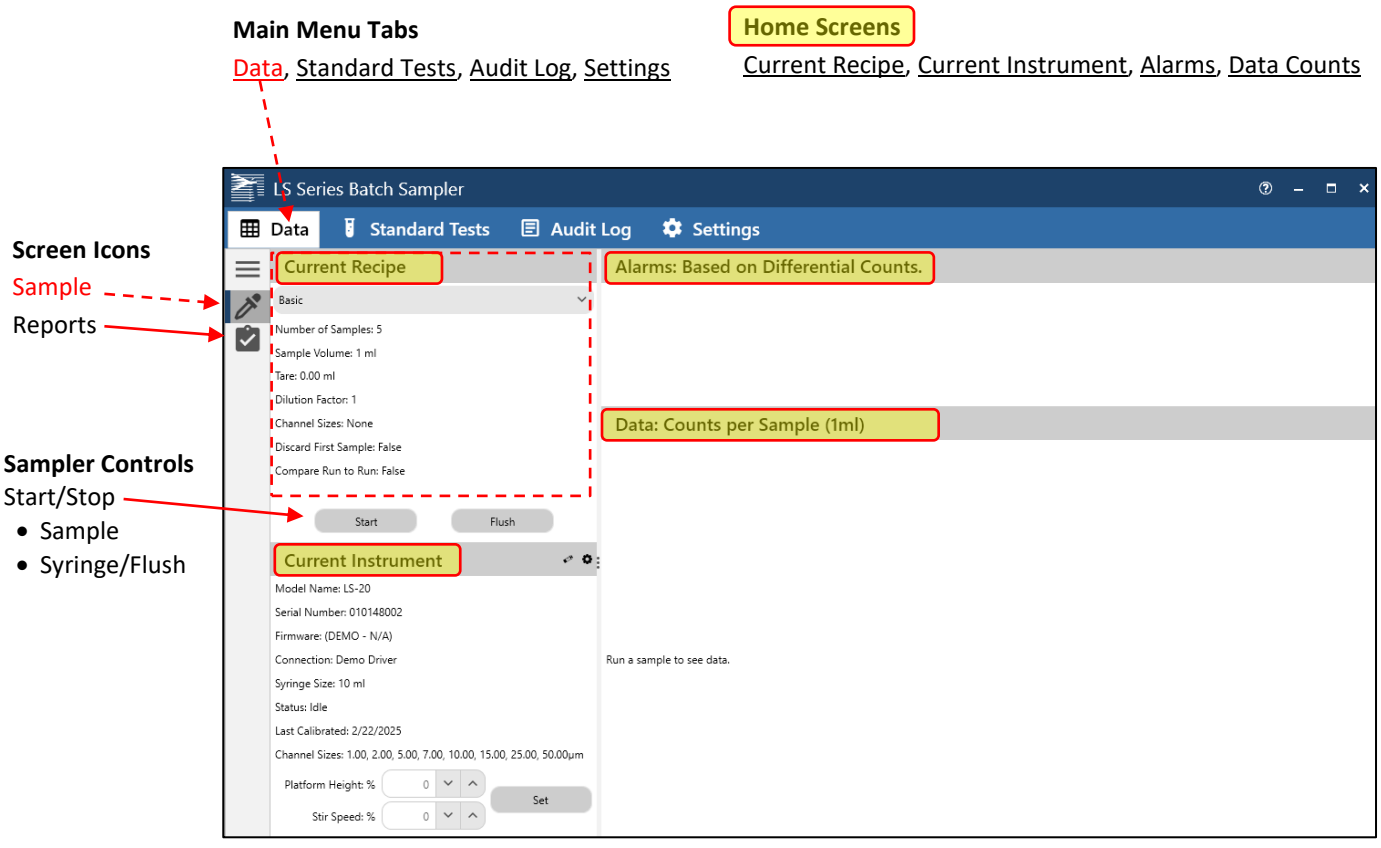
MAIN MENU - DATA TAB

SAMPLE SCREEN

The Data Tab includes icon buttons for the Sample and Report screens.

Press the Sample icon button to view the Sample Screen.





Main Menu – Data Tab – Sample Screen

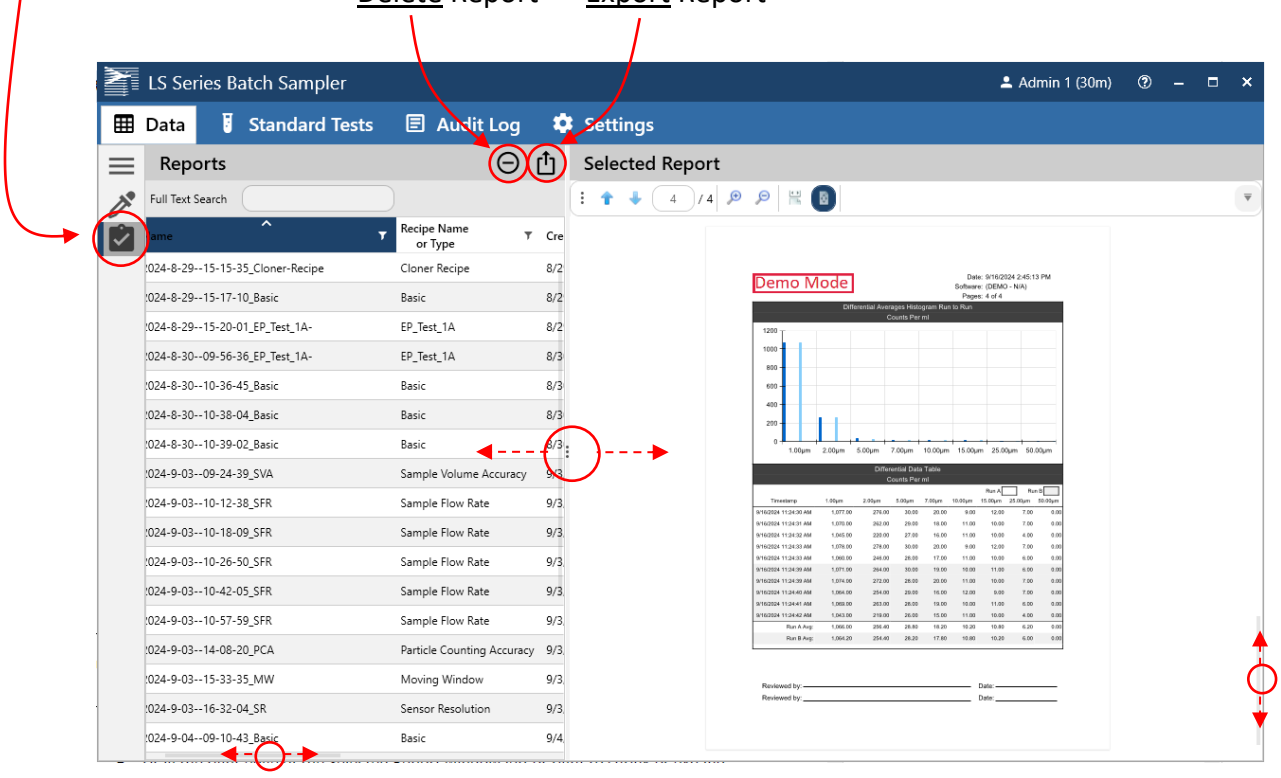
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REPORTS SCREEN

The Reports Screen displays a split screen with a list of available reports on the left window frame and the selected report full page print view on the right screen.



- Press the Reports icon button to view the Reports Screen.



Reports Screen

To resize the display windows:

- Drag the split screen (3 dots) right or left to expand or shrink the reports list.
- Drag the right edge of the Selected Report window left or right to shrink or expand Selected Report print view.
- Drag the slider bars right and left to view the full width of the report list and the selected report windows.

To choose different view options on the selected report:

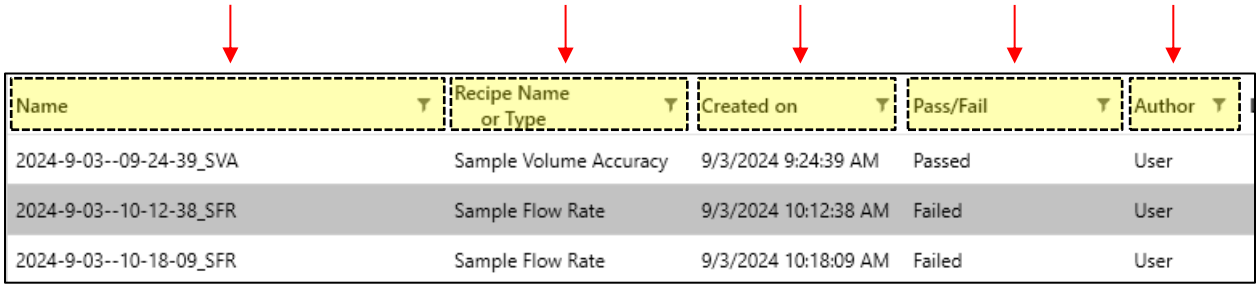
- Press the up/down arrows to page up/down on the selected report.
- Press the zoom in/out buttons to zoom in/out on the selected report.
- Press the fit to window or full-page view buttons respectively.



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SORT REPORT LIST

- Click on the column header to sort the report list by that column.

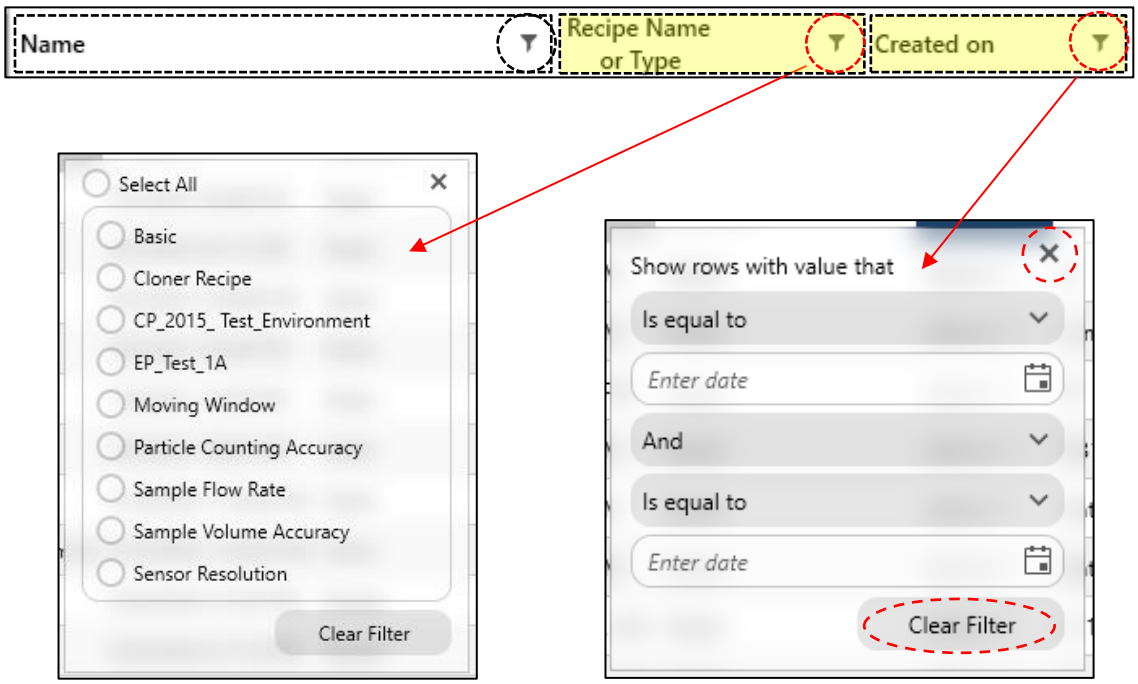


Name	Recipe Name or Type	Created on	Pass/Fail	Author
2024-9-03--09-24-39_SVA	Sample Volume Accuracy	9/3/2024 9:24:39 AM	Passed	User
2024-9-03--10-12-38_SFR	Sample Flow Rate	9/3/2024 10:12:38 AM	Failed	User
2024-9-03--10-18-09_SFR	Sample Flow Rate	9/3/2024 10:18:09 AM	Failed	User

FILTER REPORT LIST



- Filter the reports list by clicking on the filter icon next to any column header.
- A filter pop up window will appear and prompt for filter criteria to be entered.



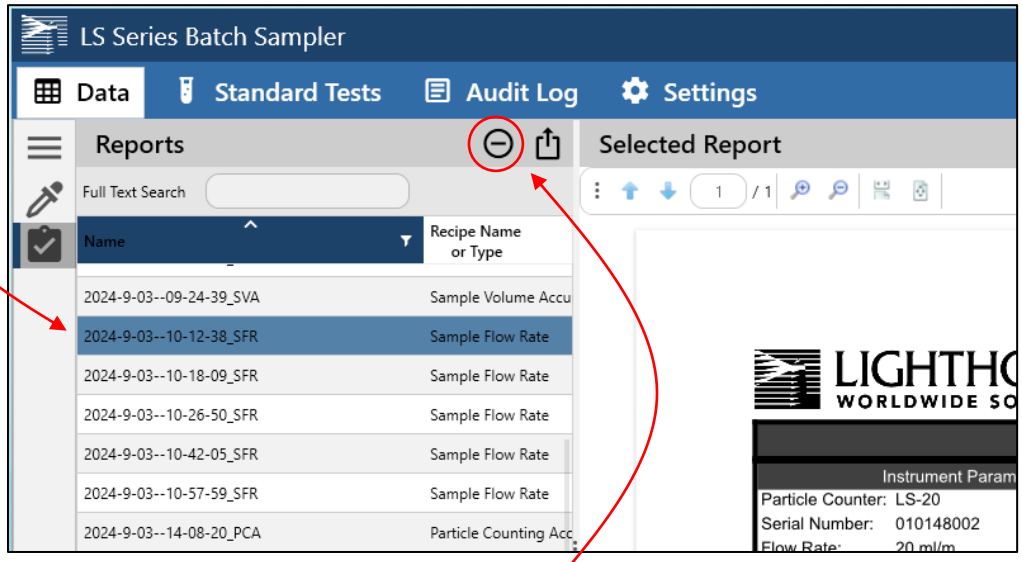
- Select criteria to filter on. Note for text filters, a selection list will pop up. For numeric filters, a numeric input will pop up. Select the filter parameters and close the pop-up box by pressing the x button on the top right corner of the pop-up window.
- Note columns with active filters will display a light blue filter icon.
- To clear the filter criteria, select the filter button and press the Clear Filter button.

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DELETE REPORT

To Delete a report:

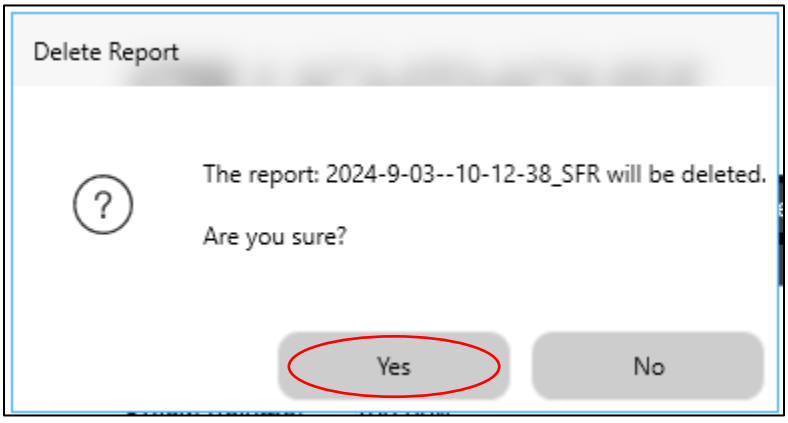
- Select the report to delete and it will highlight blue as selected.





- Press the Delete Report icon button.

- The Delete Report confirmation window will popup.



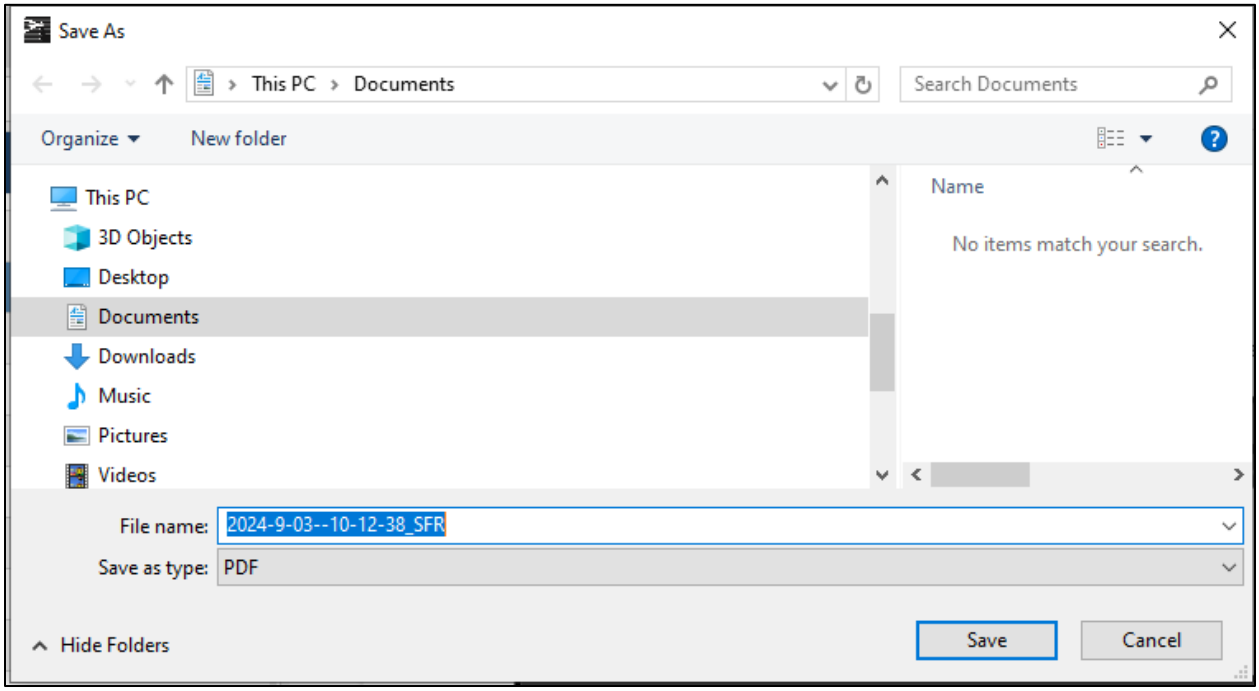
- Click on Yes to delete the selected report or No to cancel.

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EXPORT REPORT



- To export a report, press the Export Report icon button.
- The “Save As” window will popup.



- Select the file location to save the exported Report.
- Press Save to save the exported report.
- The exported report will be saved to the location assigned.

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SAMPLE REPORT

Demo Mode

Date: 9/6/2024 1:35:38 PM
Software: (DEMO - N/A)
Pages: 1 of 3

Instrument Parameters		Sample Parameters	
Particle Counter:	LS-20	Sample Volume:	1 ml
Serial Number:	010148002	Samples:	5
Channel Sizes:	1.00, 2.00, 5.00, 7.00, 10.00, 15.00, 25.00, 50.00µm	Recipe Name:	Basic
Flow Rate:	20 ml/m	Username:	Admin 1
View Volume:	100.00%	Tare:	0.00 ml
Last Calibrated:	3/6/2024	Dilution Factor:	1.00
Syringe:	10 ml	Batch	Batch B1
		Lot	Lot L1
		User Entry	User 1
		Enabled Option(s)	Compare Run To Run

Acceptance Criteria

Threshold Test: Cumulative
Counts Per: Average particle counts per ml

Alarm Limits:
0 <= 1.00µm <= 1000
0 <= 2.00µm <= 0
0 <= 5.00µm <= 0
0 <= 7.00µm <= 0
0 <= 10.00µm <= 0
0 <= 15.00µm <= 0
0 <= 25.00µm <= 0
0 <= 50.00µm <= 0

Status: Failed
1.00µm value of -17 is Under the limit of 0
2.00µm value of -10.8 is Under the limit of 0
5.00µm value of -1.8 is Under the limit of 0
7.00µm value of -1 is Under the limit of 0
15.00µm value of -0.8 is Under the limit of 0

End of Run Data:
Timestamp: 9/6/2024 1:35:38 PM

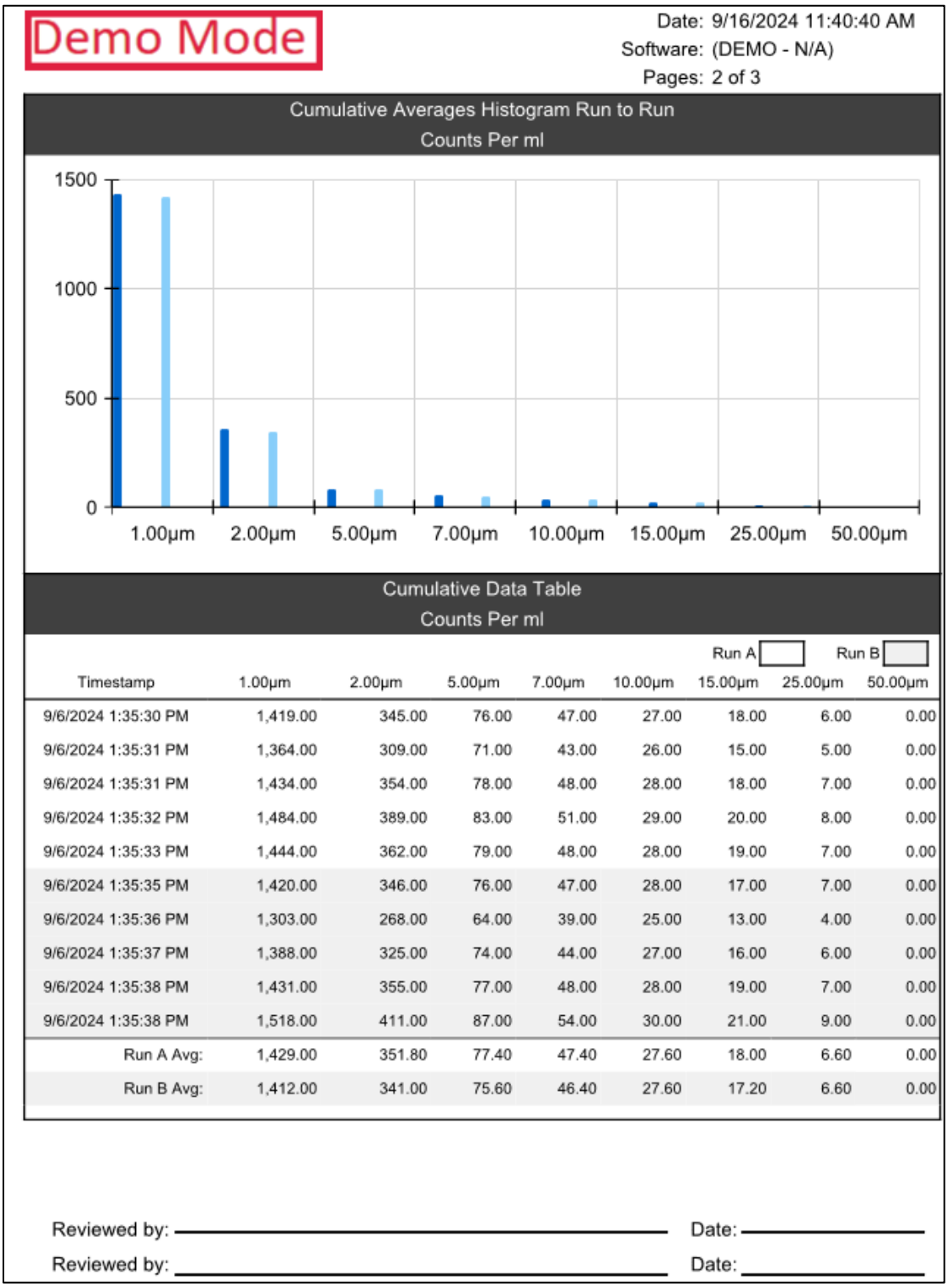
1.00µm	2.00µm	5.00µm	7.00µm	10.00µm	15.00µm	25.00µm	50.00µm
-17	-10.8	-1.8	-1	0	-0.8	0	0

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Sample Report Page 1

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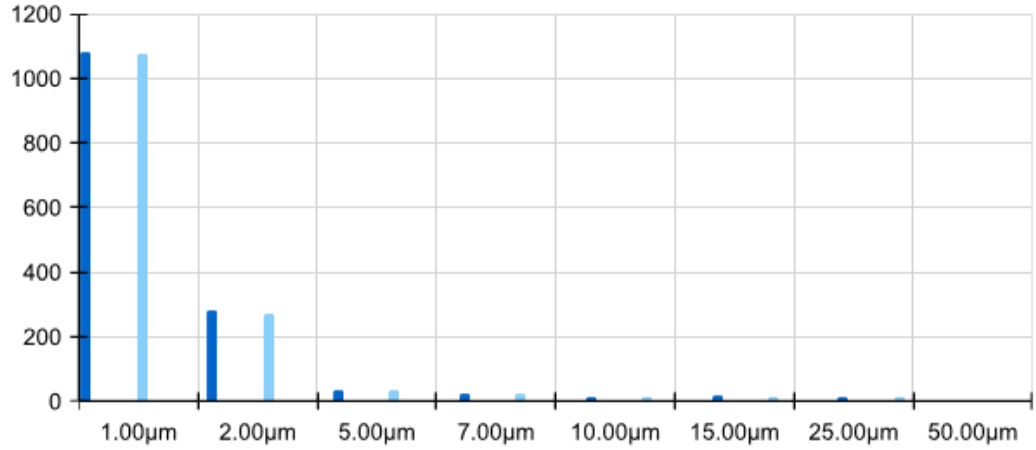
Sample Report page 2

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Demo Mode

Date: 9/16/2024 11:40:40 AM
Software: (DEMO - N/A)
Pages: 3 of 3

Differential Averages Histogram Run to Run
Counts Per ml



Differential Data Table
Counts Per ml

Run A Run B

Timestamp	1.00µm	2.00µm	5.00µm	7.00µm	10.00µm	15.00µm	25.00µm	50.00µm
9/6/2024 1:35:30 PM	1,074.00	269.00	29.00	20.00	9.00	12.00	6.00	0.00
9/6/2024 1:35:31 PM	1,055.00	238.00	28.00	17.00	11.00	10.00	5.00	0.00
9/6/2024 1:35:31 PM	1,080.00	276.00	30.00	20.00	10.00	11.00	7.00	0.00
9/6/2024 1:35:32 PM	1,095.00	306.00	32.00	22.00	9.00	12.00	8.00	0.00
9/6/2024 1:35:33 PM	1,082.00	283.00	31.00	20.00	9.00	12.00	7.00	0.00
9/6/2024 1:35:35 PM	1,074.00	270.00	29.00	19.00	11.00	10.00	7.00	0.00
9/6/2024 1:35:36 PM	1,035.00	204.00	25.00	14.00	12.00	9.00	4.00	0.00
9/6/2024 1:35:37 PM	1,063.00	251.00	30.00	17.00	11.00	10.00	6.00	0.00
9/6/2024 1:35:38 PM	1,076.00	278.00	29.00	20.00	9.00	12.00	7.00	0.00
9/6/2024 1:35:38 PM	1,107.00	324.00	33.00	24.00	9.00	12.00	9.00	0.00
Run A Avg:	1,077.20	274.40	30.00	19.80	9.60	11.40	6.60	0.00
Run B Avg:	1,071.00	265.40	29.20	18.80	10.40	10.60	6.60	0.00

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Sample Report page 3

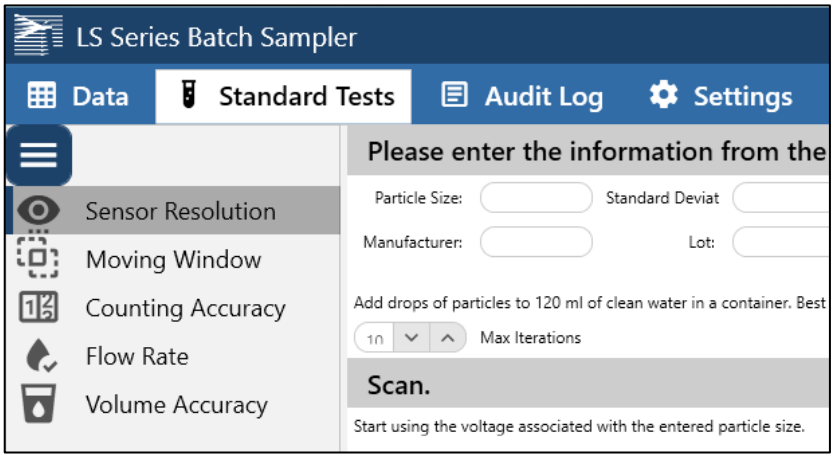
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STANDARD TESTS

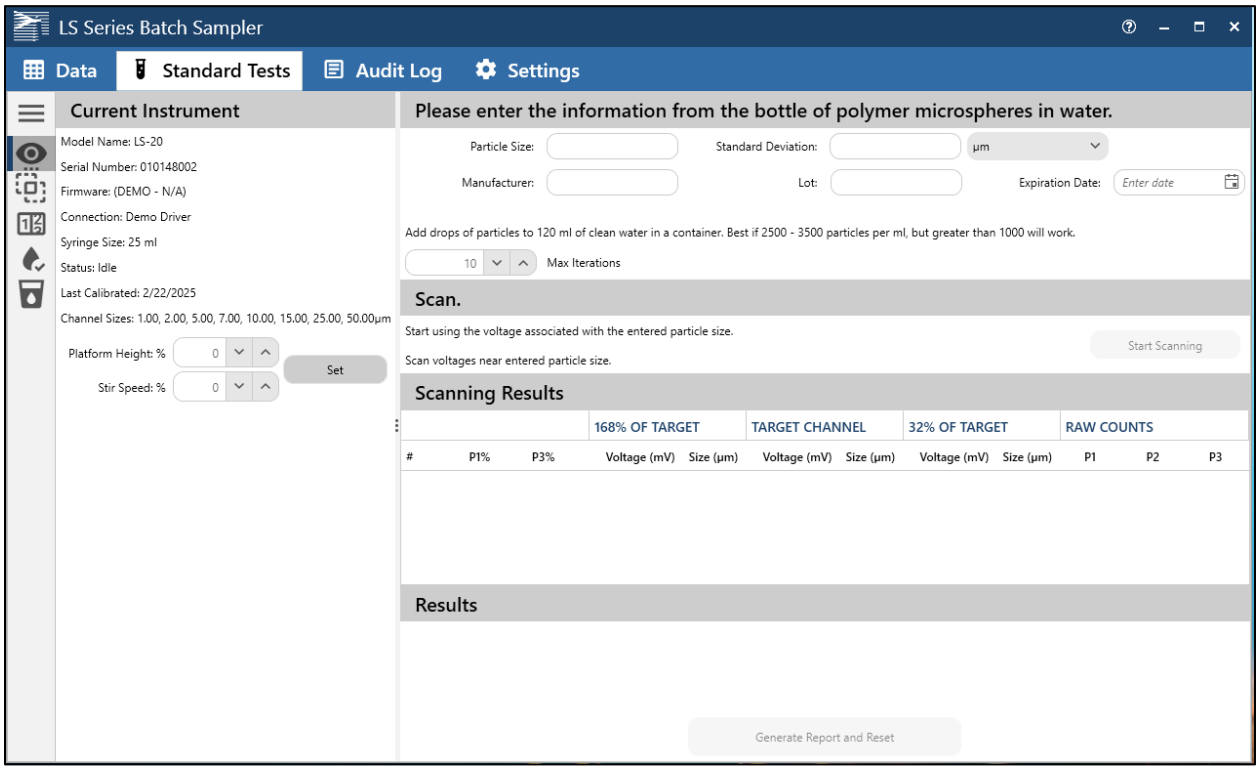
The LS Software Standard Tests tab is not available to “User” level logged in accounts. Only logged in users with an “Admin” or “Maintenance” level account will see the Standard Tests tab on the Main screen. Note if users are disabled then the Standard Tests tab will be available on the Main screen.

The Standard Tests include:

Sensor Resolution
Moving Window
Counting Accuracy
Flow Rate
Volume Accuracy

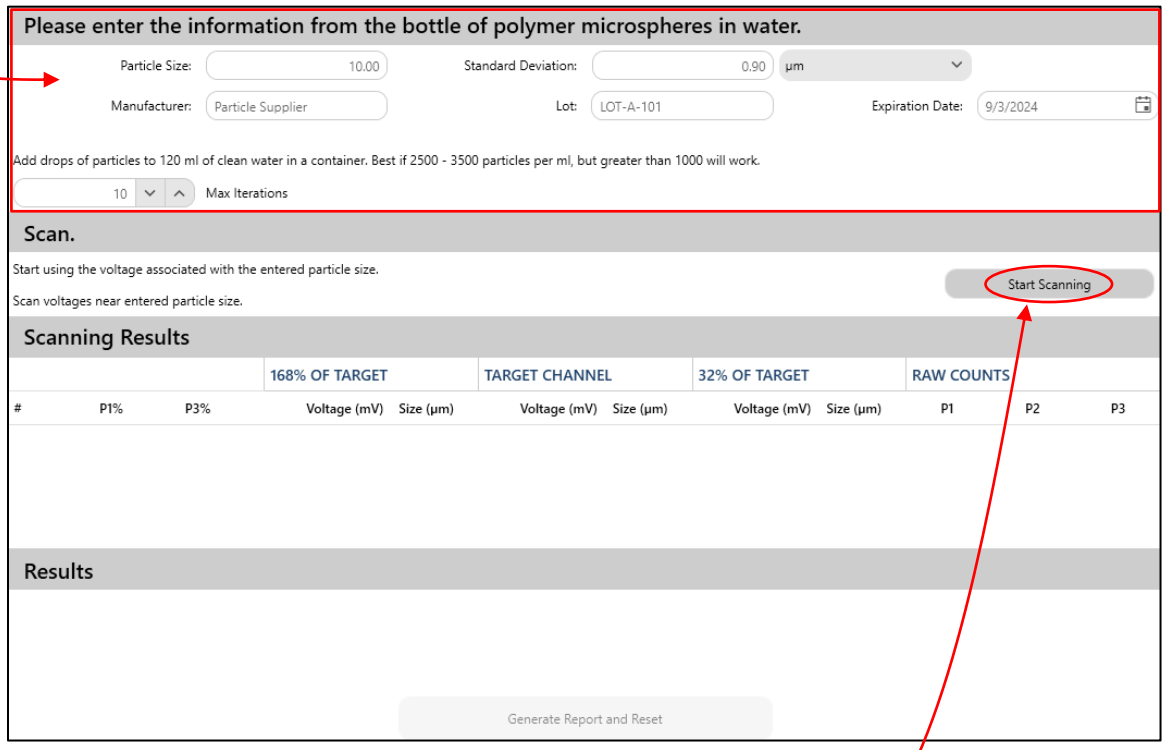


SENSOR RESOLUTION



Enter the Information from the bottle of polymer microspheres in water.

- Enter Particle Size
- Enter Standard Deviation
- Select Unit size
- Enter Manufacturer
- Enter Lot #
- Enter liquid particle expiration date

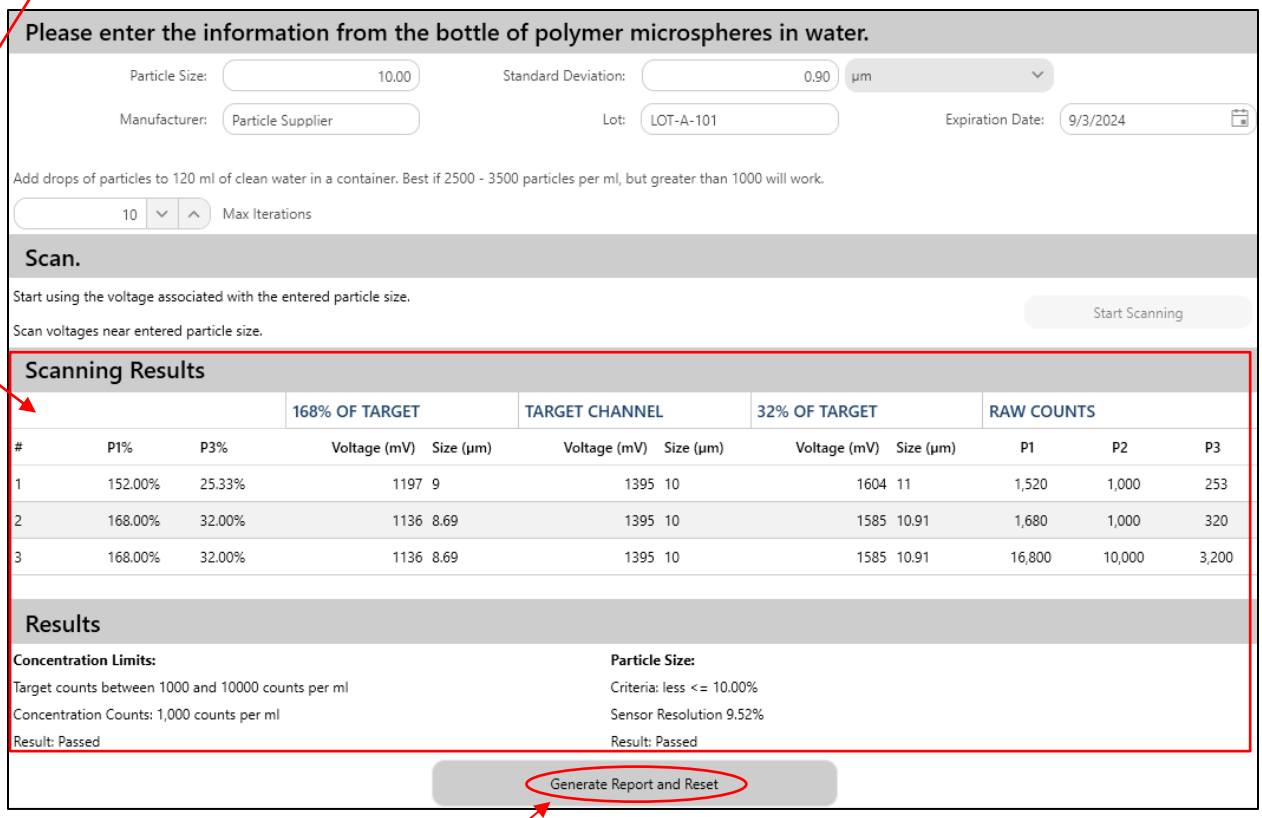


Sensor Resolution Screen

- Press Start Scanning to start scanning.

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- Scanning Results will display.



- Press Generate Report and Reset to generate the report.

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LIGHTHOUSE WORLDWIDE SOLUTIONS

Date: 9/18/2024 10:35:36 AM
Software: (DEMO - N/A)
Pages: 1 of 1

Sensor Resolution Test Report

Instrument Parameters		Test Parameters	
Particle Counter:	LS-20	Username:	Admin 1
Serial Number:	010148002	Manufacturer:	Particle Supplier
Flow Rate:	20 ml/m	Particle Size:	10.00µm
View Volume:	100.00%	Std Dev:	0.9 µm
Last Calibrated:	9/18/2024	Lot ID:	LOT-A-101
Syringe:	10 ml	Expiration Date:	September 2024

Samples Taken

			168% of Target		Target		32% of Target		Raw Counts		
#	P1%	P2%	Voltage (mV)	Size (µm)	Voltage (mV)	Size (µm)	Voltage (mV)	Size (µm)	P1	P2	P3
1	152.00%	25.33%	1,197	9.00	1,395	10.00	1,604	11.00	1,520	1,000	253
2	168.00%	32.00%	1,136	8.69	1,395	10.00	1,585	10.91	1,680	1,000	320
3	168.00%	32.00%	1,136	8.69	1,395	10.00	1,585	10.91	16,800	10,000	3,200
#	P1%	P2%	Voltage (mV)	Size (µm)	Voltage (mV)	Size (µm)	Voltage (mV)	Size (µm)	P1	P2	P3
			168% of Target		Target		32% of Target		Raw Counts		

Test Results

Concentration Limits:

Target counts between 1000 and 10000 counts per ml
Concentration Counts: 1,000 counts per ml
Result: Passed

Sensor Resolution:

Criteria: less <= 10.00%
Sensor Resolution 9.52%
Result: Passed

Tester: _____ Date: _____

Witness: _____ Date: _____

Sensor Resolution Report

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MOVING WINDOW

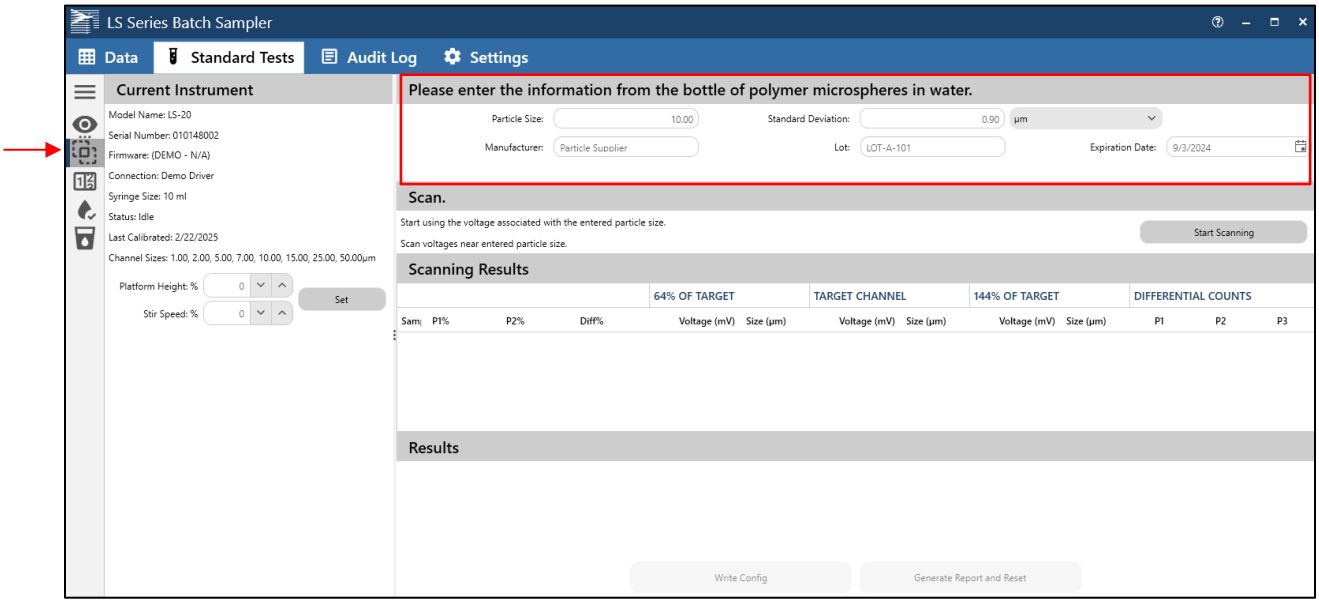
Use the Moving Window to confirm the calibration is correct and tweak the calibration if necessary. This test requires certified size standard particles. This test works best if a stirrer bean is used to keep the particles suspended. This test will not work for channel 1 calibration's particle size (1.0µm or 1.5µm).



Press the Moving Window icon from the Standard Tests tab off the Main Screen

The Value in P2 should be above 1000 but below 3000 for particle sizes 25µm and under. When the particles are larger, the P2 value can be less ~500, and the stirrer bean should be set to a faster speed. Add particles or water then run MW until you see a good result in P2.

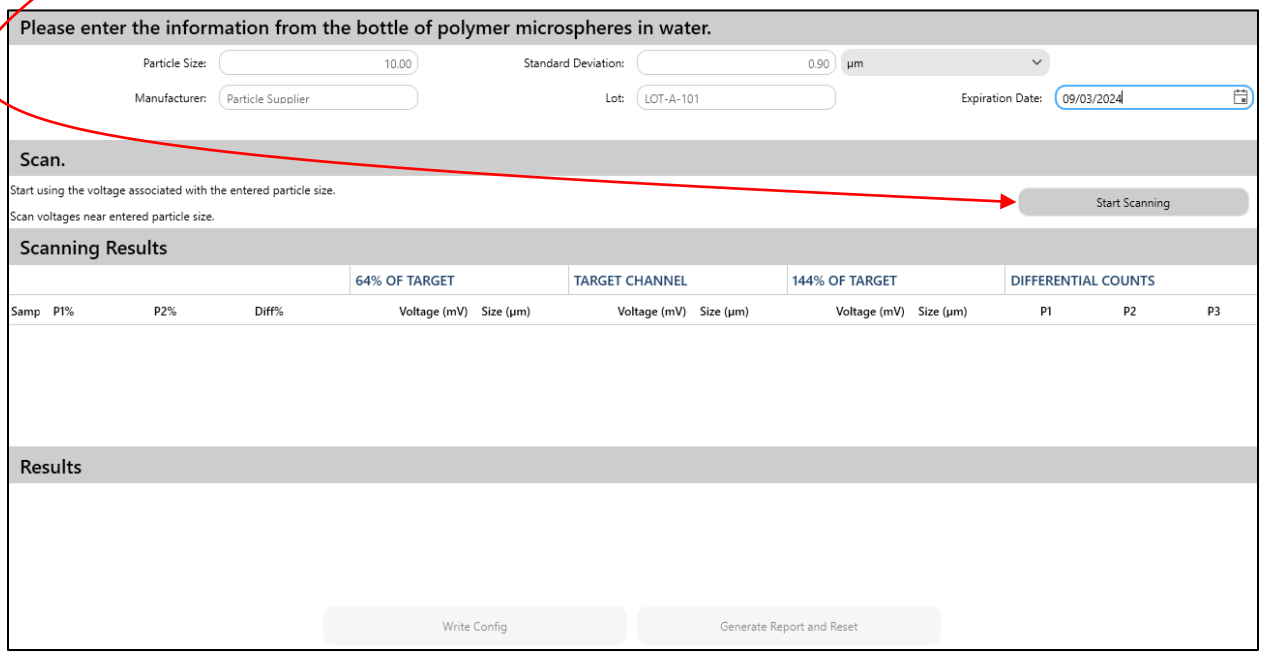
- Enter the **Particle Size**: (µm) The voltage associated with this particle size will be used.
- Enter the **Standard Deviation**: (µm)
- Enter the **Manufacturer**: (Particle supplier company name)
- Enter the **Lot number**: (Lot number of the particles manufactured)
- Enter the **Expiration Date**: (of the polymer microspheres in water).



Moving Window Standard Test Screen

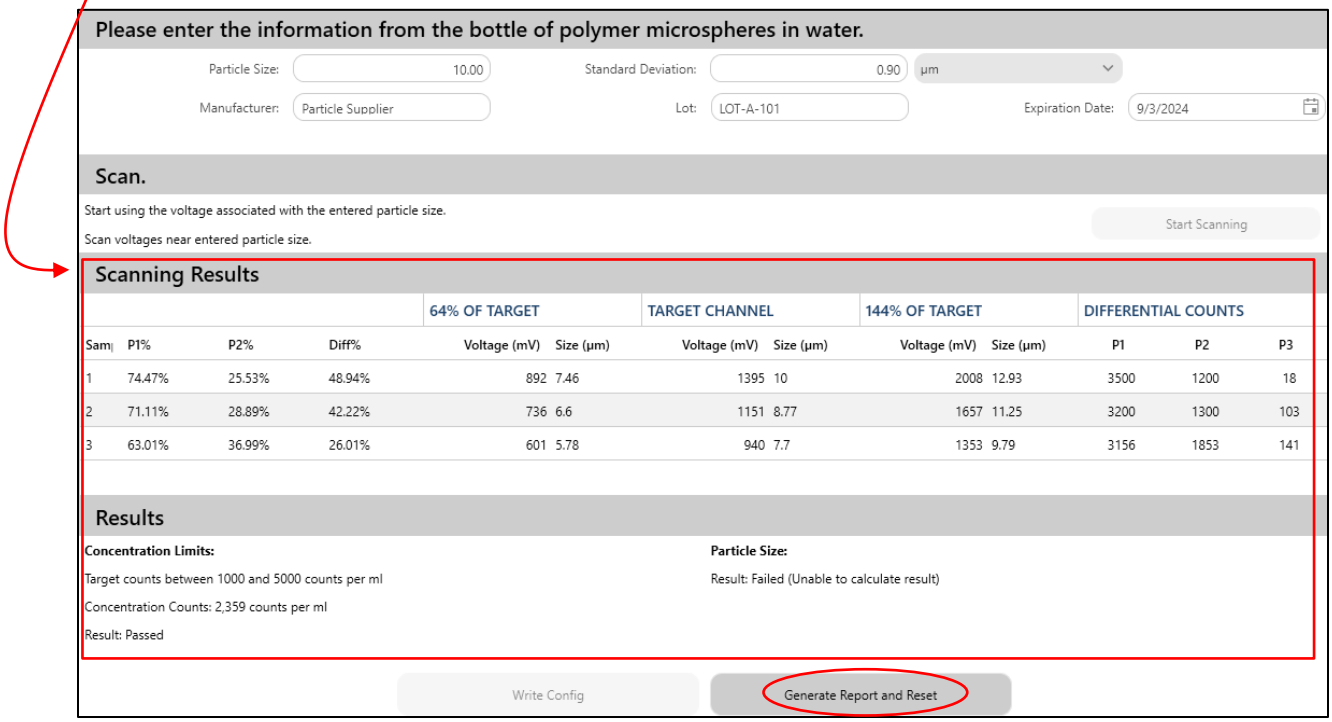
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- Click on the Start Scanning button to start the Moving Window Test.



Moving Window Test Results

- Scanning Results will display.



- Click on the Generate Report and Rest button to view the Moving Window Report .pdf file.

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LIGHTHOUSE WORLDWIDE SOLUTIONS

Date: 9/18/2024 10:39:49 AM
Software: (DEMO - N/A)
Pages: 1 of 1

Moving Window Test Report

Instrument Parameters		Test Parameters	
Particle Counter:	LS-20	Username:	Admin 1
Serial Number:	010148002	Manufacturer:	Particle Supplier
Flow Rate:	20 ml/m	Particle Size:	10.00µm
View Volume:	100.00%	Std Dev:	0.9 µm
Last Calibrated:	9/18/2024	Lot ID:	LOT-A-101
Syringe:	10 ml	Expiration Date:	September 2024

Samples Taken

				64 % of Target		Target		144% of Target		Diff Counts		
#	P1%	P2%	Diff %	Voltage (mv)	Size (µm)	Voltage (mV)	Size (µm)	Voltage (mV)	Size (µm)	P1	P2	P3
0	74.47%	25.53%	48.94%	892	7.46	1395	10.00	2008	12.93	3500	1200	18
0	71.11%	28.89%	42.22%	736	6.60	1151	8.77	1657	11.25	3200	1300	103
0	63.01%	36.99%	26.01%	601	5.78	940	7.70	1353	9.79	3156	1853	141
#	P1%	P2%	Diff %	Voltage (mV)	Size (µm)	Voltage (mV)	Size (µm)	Voltage (mV)	Size (µm)	P1	P2	P3
				64 % of Target		Target		144% of Target		Diff Counts		

Test Results

Concentration Limits:

Target counts between 1000 and 5000 counts per ml
Concentration Counts: 2,359 counts per ml
Result: Passed

Particle Size:

Result: Failed (Unable to calculate result)

Tester: _____ Date: _____

Witness: _____ Date: _____

Moving Window Test Report

The Moving Window Test Report contains details about the test, the criteria used to determine the result, and the result.

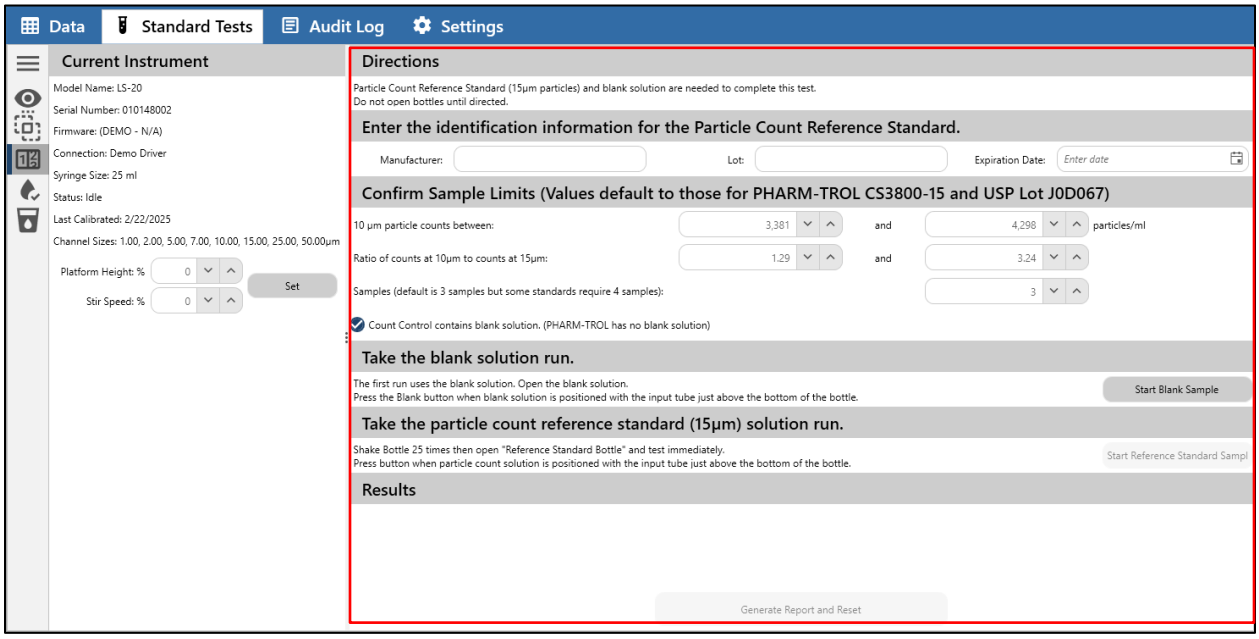
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COUNTING ACCURACY

This test requires USDA bottles of 15 micron NIST traceable polymer microspheres, with known particle counts. This test confirms the LS-20 can count the correct number of particles and sort them into the correct channel bins. The test criteria comes from USP standards. Other particle count vendors may have different count/ml limits and 10µm/15µm particle count ratio targets.



Press the Counting Accuracy icon from the Standard Tests tab off the Main Screen.

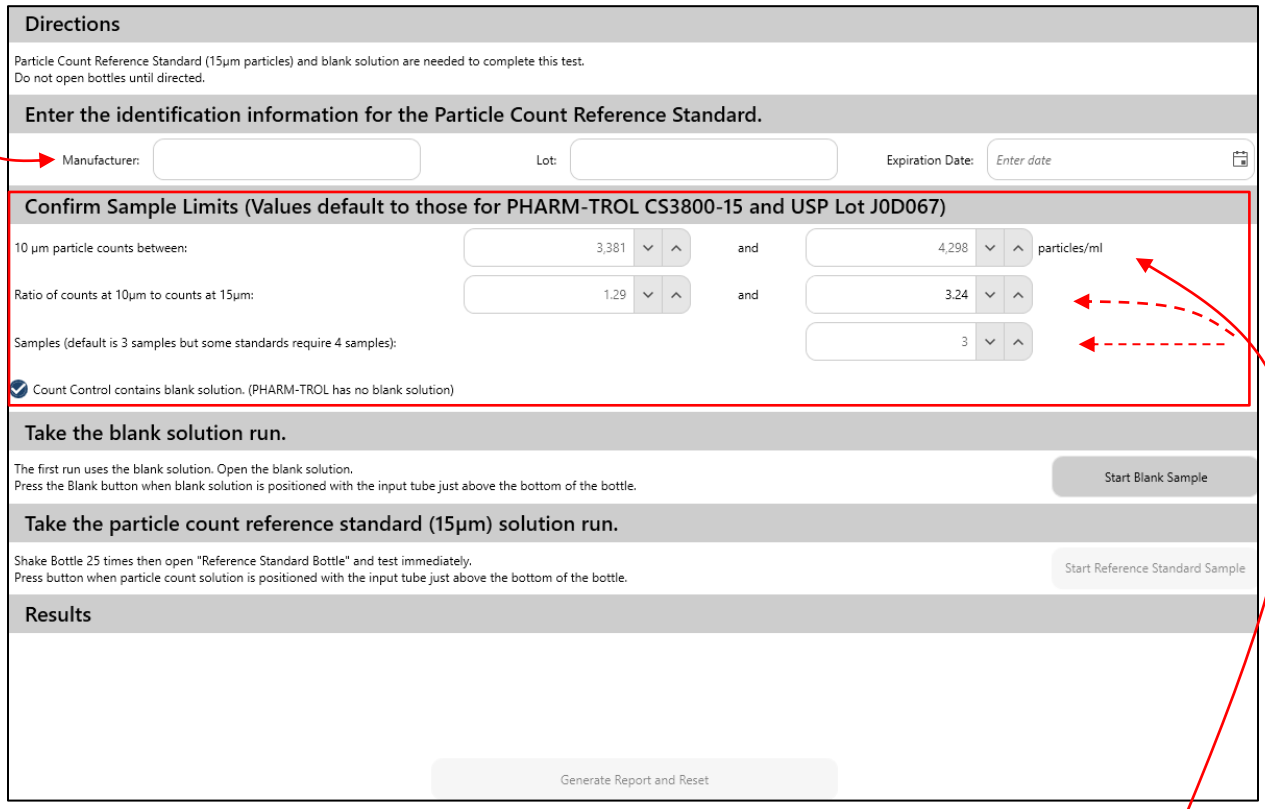


Counting Accuracy Standard Test

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Enter the identification information for the Particle Counts Reference Standard.

- Enter the particle count Manufacturer name.
- Enter the Lot ID number.
- Enter the particle fluid Expiration date .



Counting Accuracy Screen

Confirm Sample limits (Values default to PHARM-TROL CS3800-15 and USP Lot J0D067)

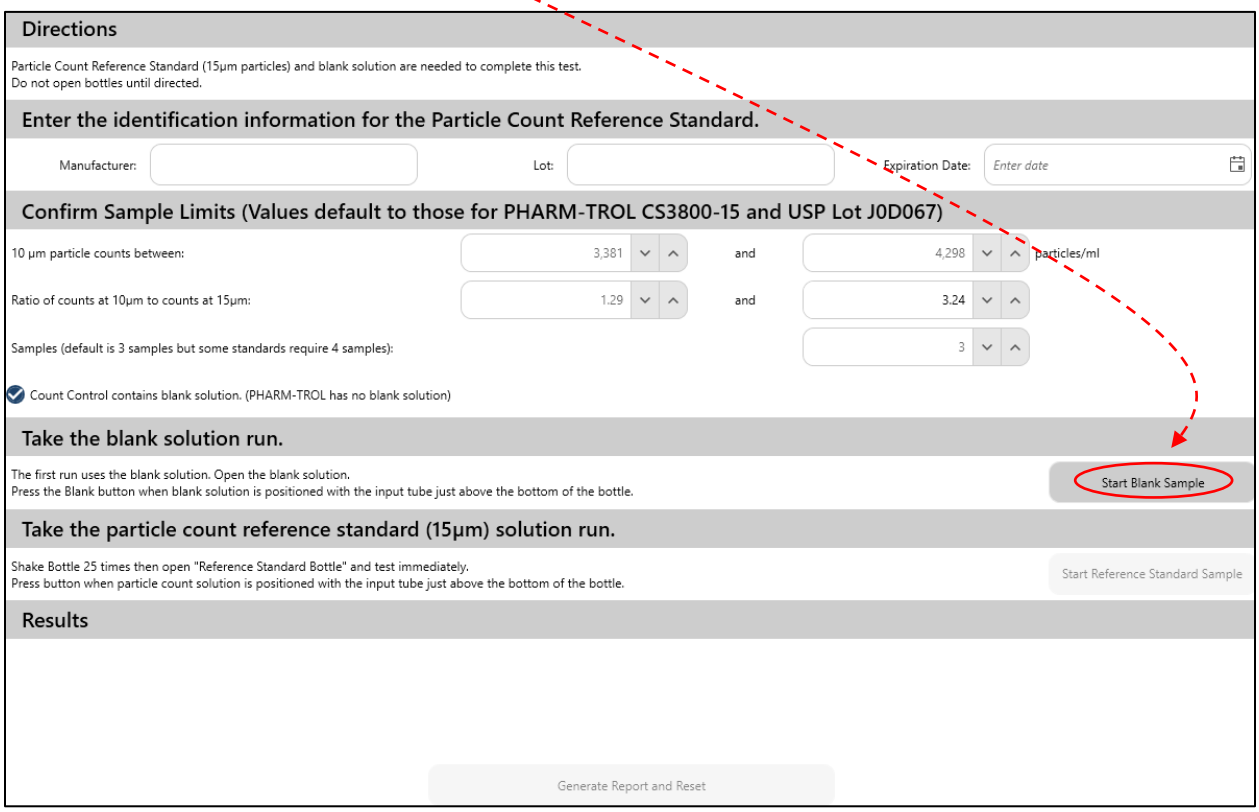
- Confirm or change the 10 µm particle count limits for low and high.
- Confirm or change the Ratio of count limits, for 10 µm - 15 µm counts low and high.
- Confirm or change number of samples (default is 3).

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Take the blank solution run

The Count Control radio button must be checked if including a blank solution run. The first run uses the blank solution. Open the blank solution and position it on the platform with the input tube just above the bottom of the bottle.

- Click to enable the Count Control with blank solution.
- Press the Start Blank Sample button to start the blank sample.



Counting Accuracy Screen

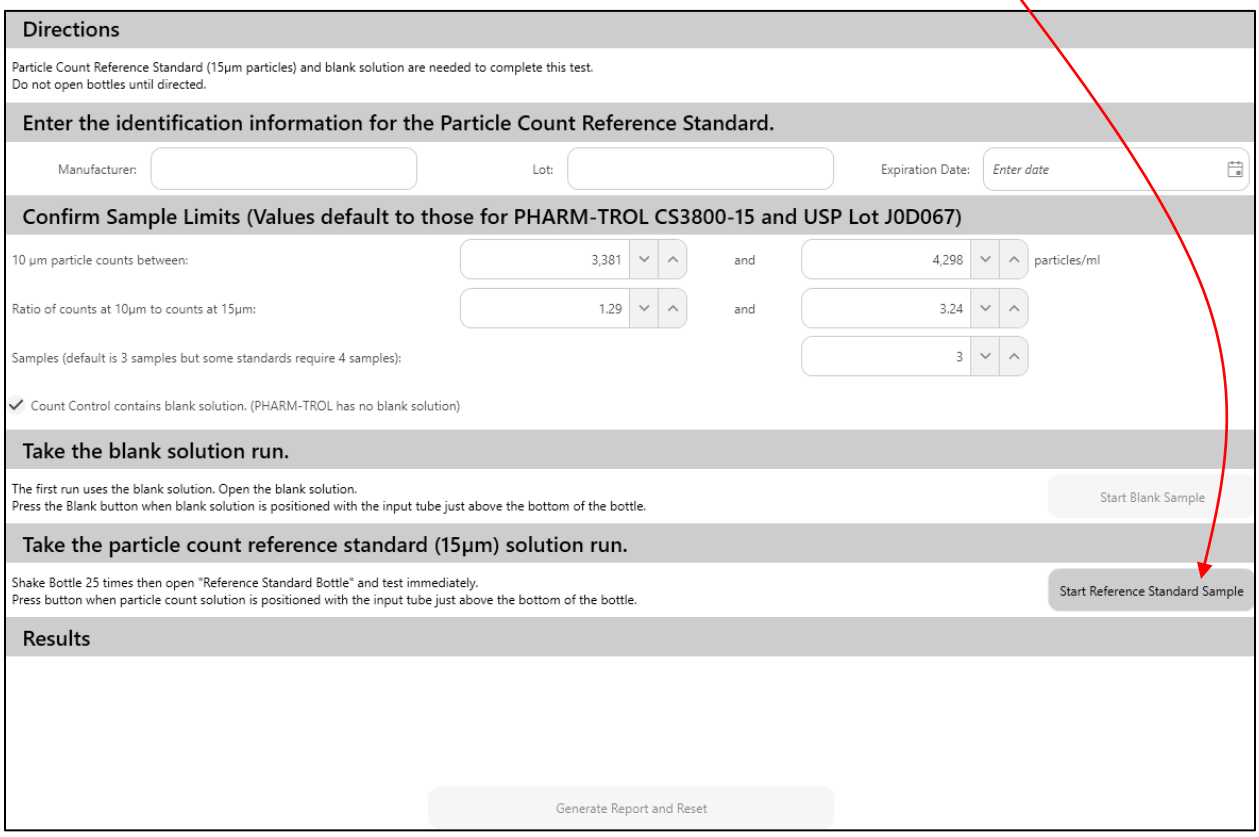
- The Blank Sample test will finish and Reference Standard sample will become selectable.

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Take the particle count reference standard 15 µm solution run.
Shake the bottle 25 times and then let it sit for 5 minutes. Then open the "Reference Standard Bottle" and be ready to test immediately. Place the bottle on the platform with the input tube just above the bottom of the bottle.

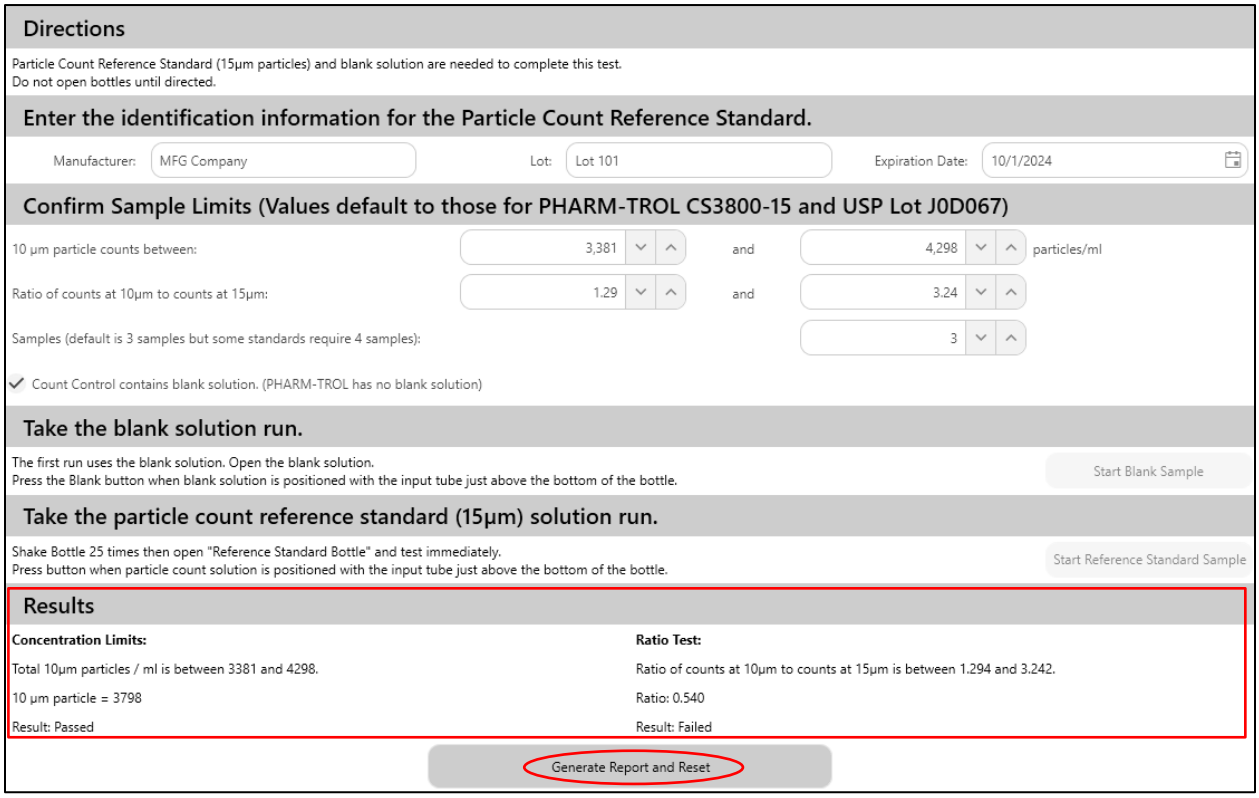
Note a non-USP count standard may have additional requirements about how fast the included stirrer needs to spin, how long it needs to spin, or how close to the bottom of the bottle the input hose needs to be positioned. Follow these additional requirements.

- Press the Start Reference Standard Sample button to start the run.



Start Reference Standard Sample

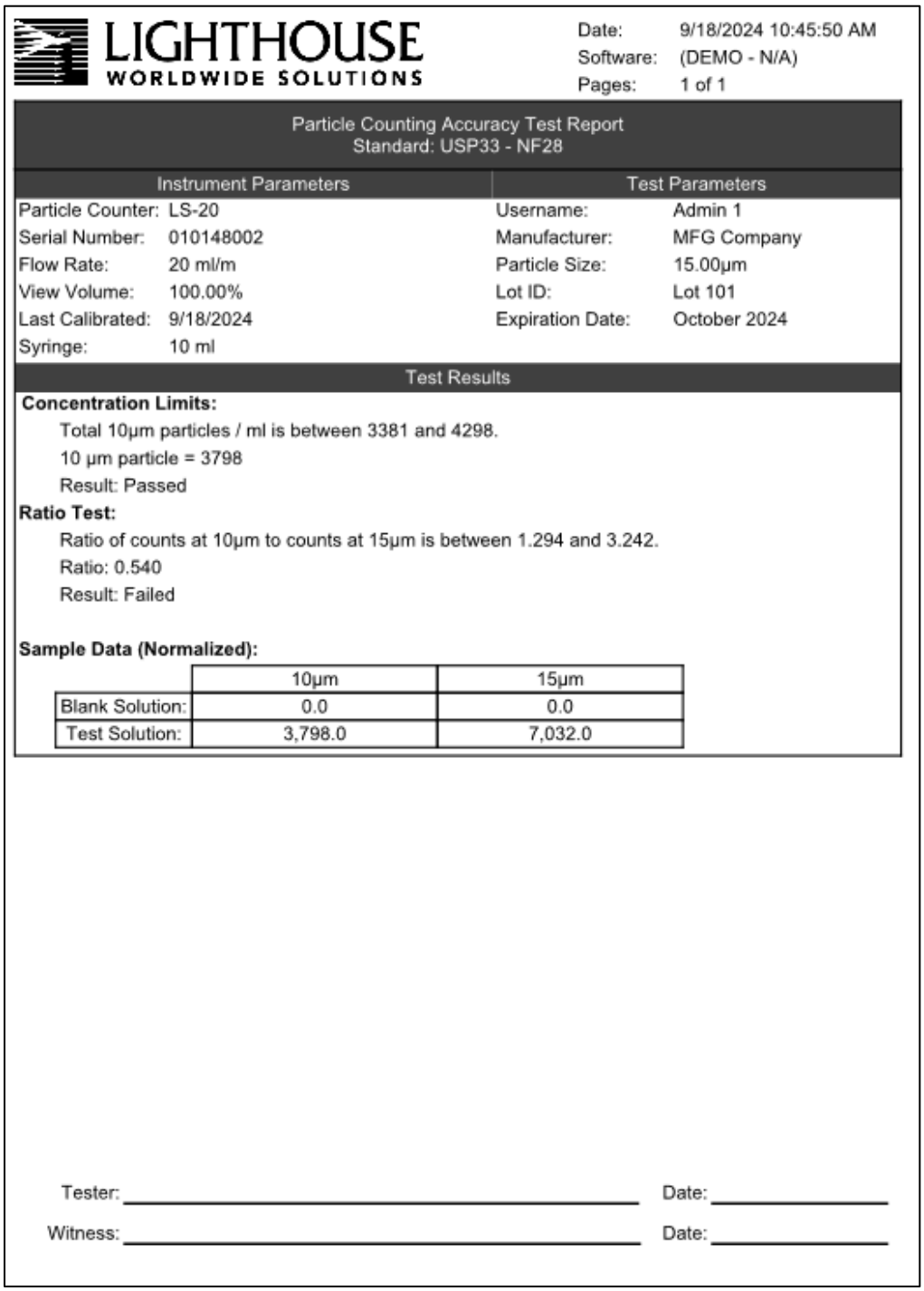
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Counting Accuracy Test Results

- Results are displayed when the test is complete.
- Next - Press the Generate Report and Reset button.

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Date: 9/18/2024 10:45:50 AM
Software: (DEMO - N/A)
Pages: 1 of 1

Particle Counting Accuracy Test Report
Standard: USP33 - NF28

Instrument Parameters		Test Parameters	
Particle Counter:	LS-20	Username:	Admin 1
Serial Number:	010148002	Manufacturer:	MFG Company
Flow Rate:	20 ml/m	Particle Size:	15.00µm
View Volume:	100.00%	Lot ID:	Lot 101
Last Calibrated:	9/18/2024	Expiration Date:	October 2024
Syringe:	10 ml		

Test Results

Concentration Limits:

Total 10µm particles / ml is between 3381 and 4298.
10 µm particle = 3798
Result: Passed

Ratio Test:

Ratio of counts at 10µm to counts at 15µm is between 1.294 and 3.242.
Ratio: 0.540
Result: Failed

Sample Data (Normalized):

	10µm	15µm
Blank Solution:	0.0	0.0
Test Solution:	3,798.0	7,032.0

Tester: _____ Date: _____

Witness: _____ Date: _____

Particle Counting Accuracy Test Report

The Particle Counting Accuracy Test Report contains details about the test, the criteria used to determine the result, and the result.

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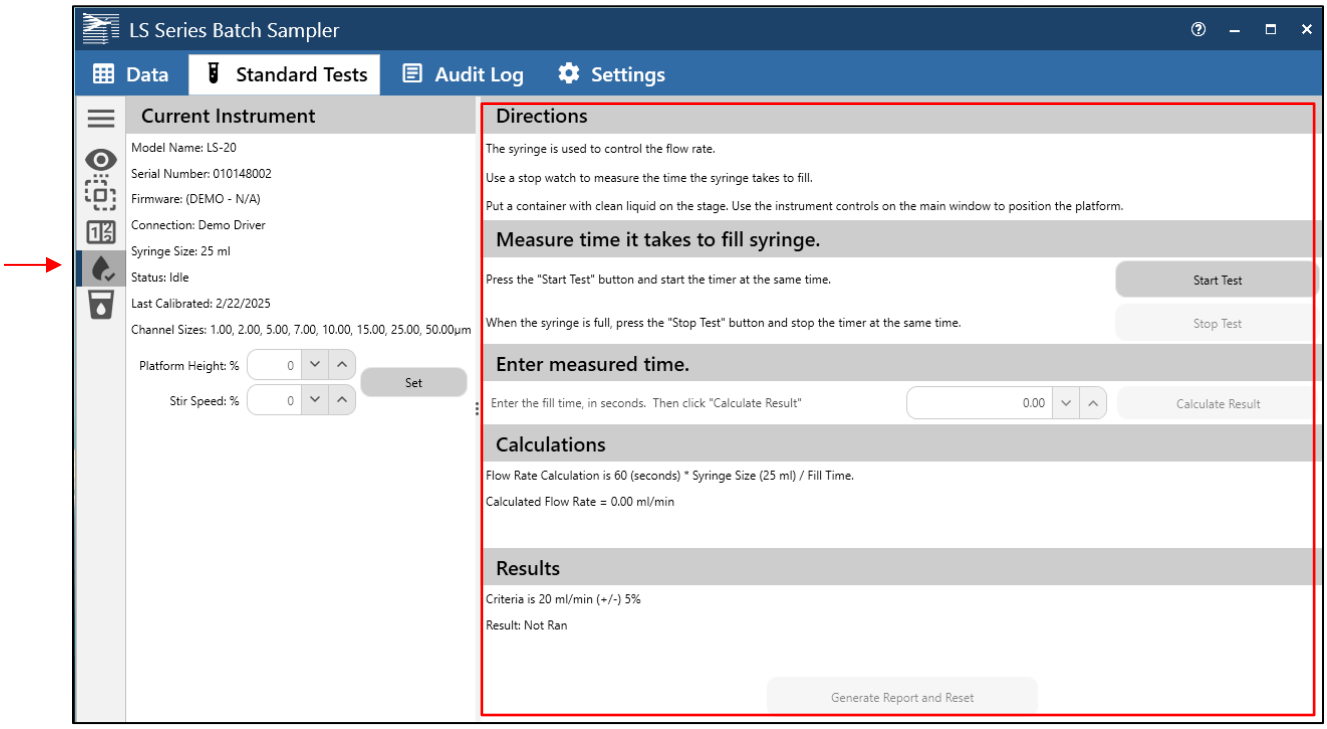
FLOW RATE

The Sample Flow Rate test measures the LS-20's flow rate, which is controlled by the syringe. The LS-20's 25 ml syringe should take 75 seconds to fill when the flow rate is 20 ml/min. Follow the directions on the Sample Flow Rate Test screen to complete the test.



Press the Flow Rate icon from the Standard Tests tab off the Main Screen.

- A calibrated stopwatch must be used to validate the test.

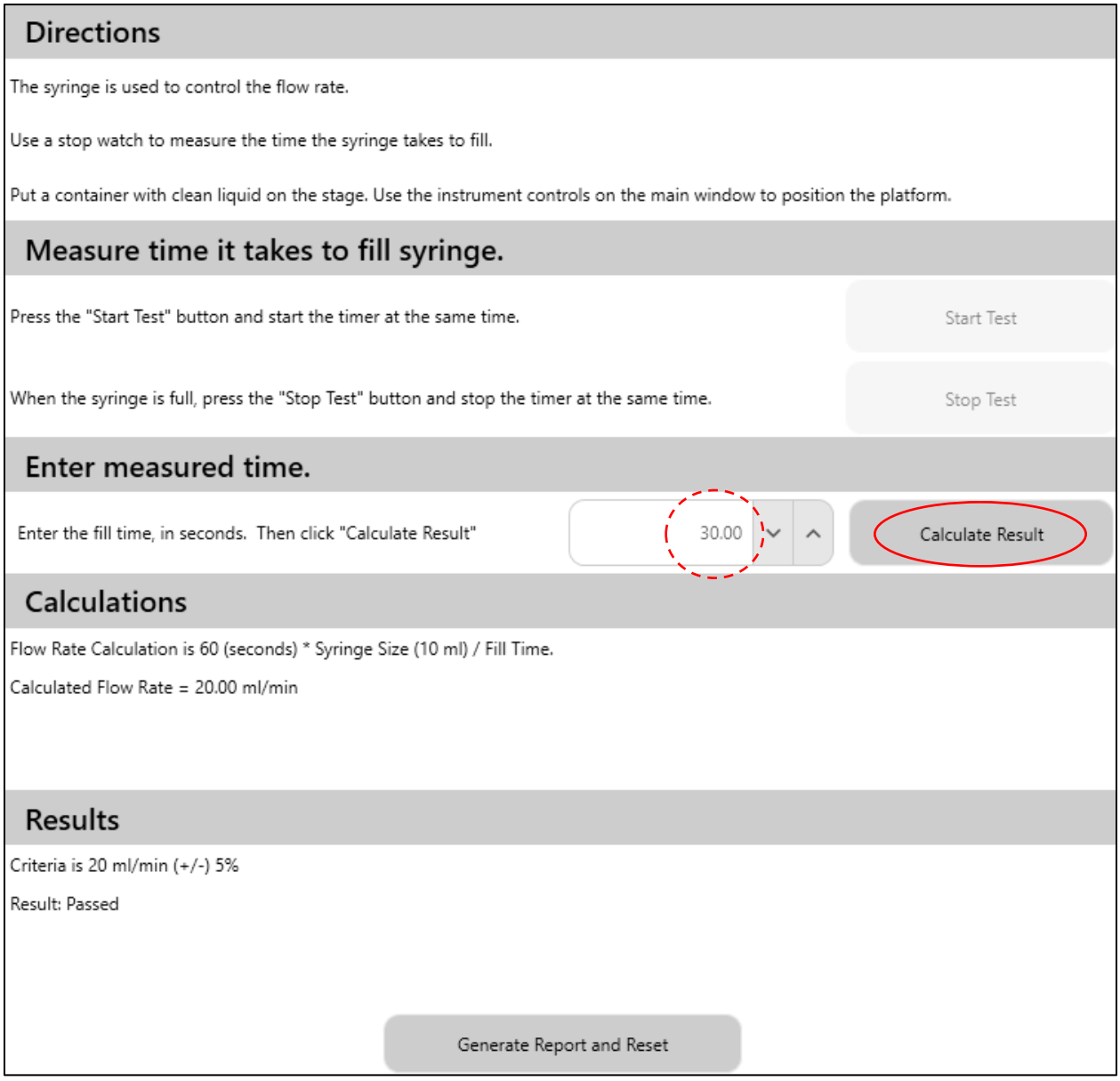


Flow Rate Standard Test Screen

The syringe is used to control the flow rate. Use a stopwatch to measure the time the syringe takes to fill. Put a container with clean liquid on the stage. Use the Instrument controls on the main window to position the platform.

- Press the "Start Test" button and press the timer start at the same time.
- When syringe is full, press "Stop Test" button and press stop timer at the same time.

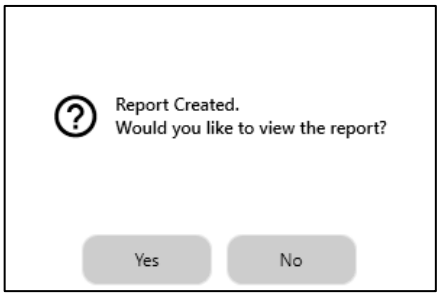
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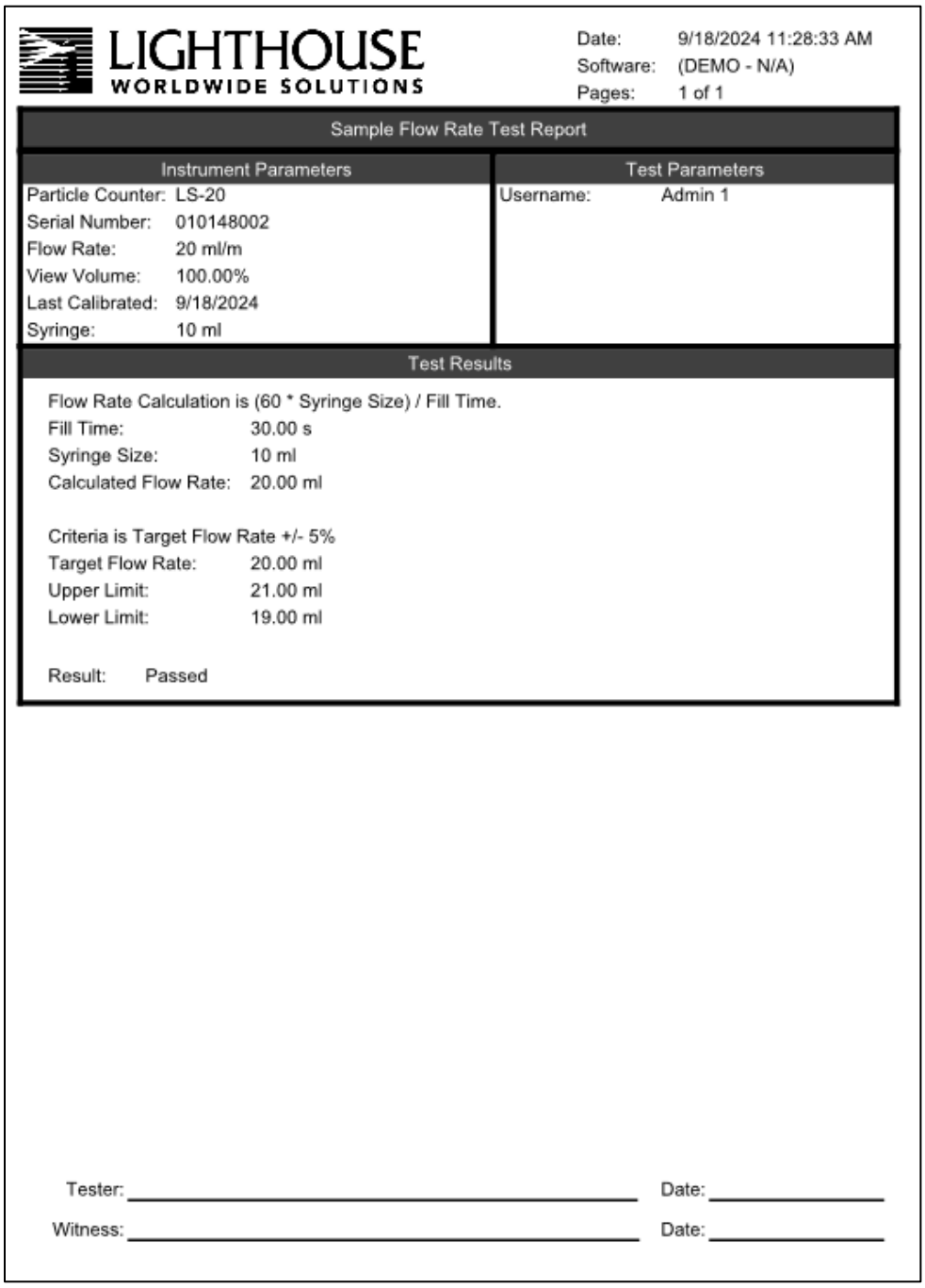
Sample Flow Rate Test Screen

After clicking the Start Test and Stop Test buttons and calculating the fill time with timer:

- **Enter measured time:** enter the fill time in seconds
- **Calculations:** Click on the Calculate Result button.
- **Results:** Press the Generate Report and Reset button.
- Click Yes to view report or No to cancel.



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Date: 9/18/2024 11:28:33 AM
Software: (DEMO - N/A)
Pages: 1 of 1

Sample Flow Rate Test Report

Instrument Parameters		Test Parameters	
Particle Counter:	LS-20	Username:	Admin 1
Serial Number:	010148002		
Flow Rate:	20 ml/m		
View Volume:	100.00%		
Last Calibrated:	9/18/2024		
Syringe:	10 ml		

Test Results

Flow Rate Calculation is (60 * Syringe Size) / Fill Time.

Fill Time:	30.00 s
Syringe Size:	10 ml
Calculated Flow Rate:	20.00 ml

Criteria is Target Flow Rate +/- 5%

Target Flow Rate:	20.00 ml
Upper Limit:	21.00 ml
Lower Limit:	19.00 ml

Result: Passed

Tester: _____ Date: _____

Witness: _____ Date: _____

Sample Flow Rate Test Report

- The Sample Flow Rate Test Report contains details about the test, the criteria used to determine the result, and the result.
- Sample Flow Rate Test report names end in "_SFR.pdf".

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VOLUME ACCURACY

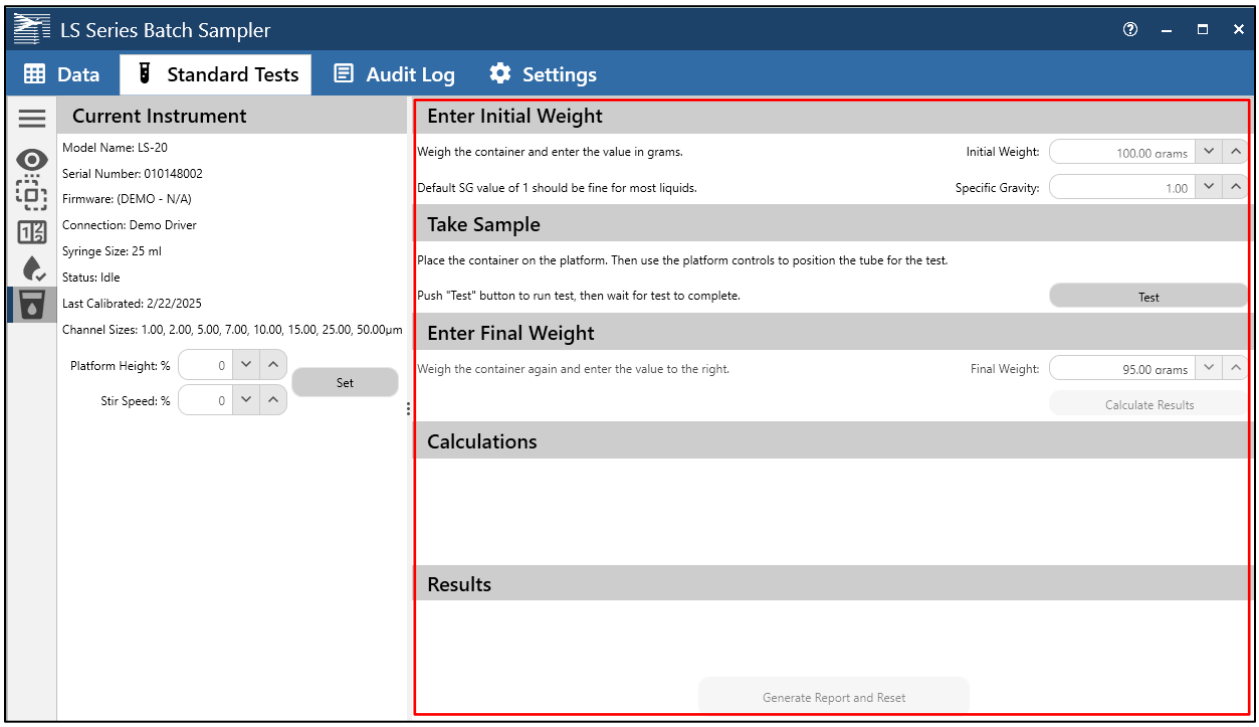
The Volume Accuracy test confirms that the sample volume is accurate.



Press the Volume Accuracy icon from the Standard Tests tab off the Main Screen.

- Users will need a calibrated digital scale that can measure the weight of the container and the liquid with an accuracy of 0.01g.
- Measure the weight of the container before and after performing a 5 ml sample (the sample size is read from the recipe when the test runs)
- Enter the values in the ***Initial Weight*** and ***Final Weight*** boxes.

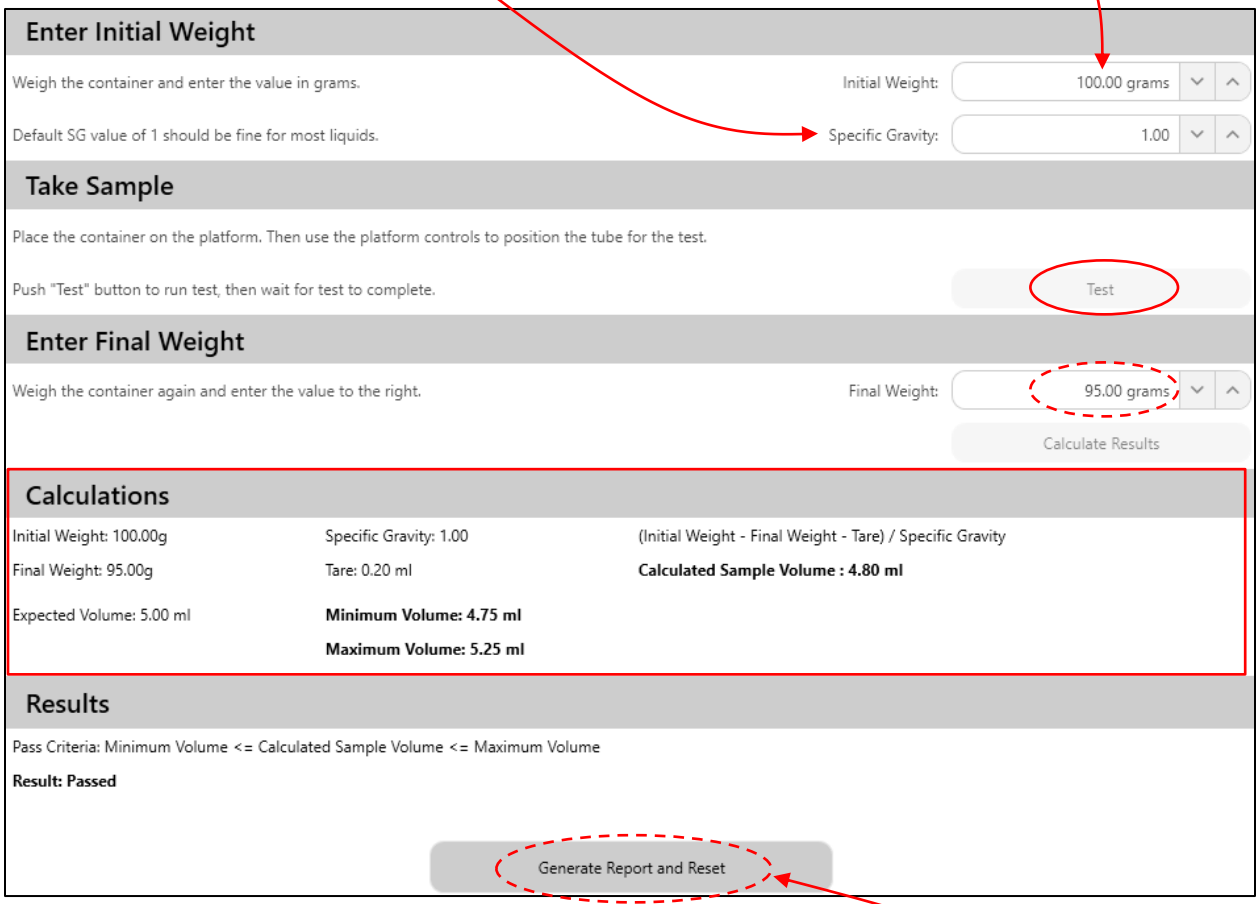
Note, it may be easier to use a 150 ml container to limit the total weight. A Pyrex 150 ml beaker (No. 1000) weighs just under 70 g. Note: 1 ml weighs 1 gram.



Volume Accuracy Test Screen

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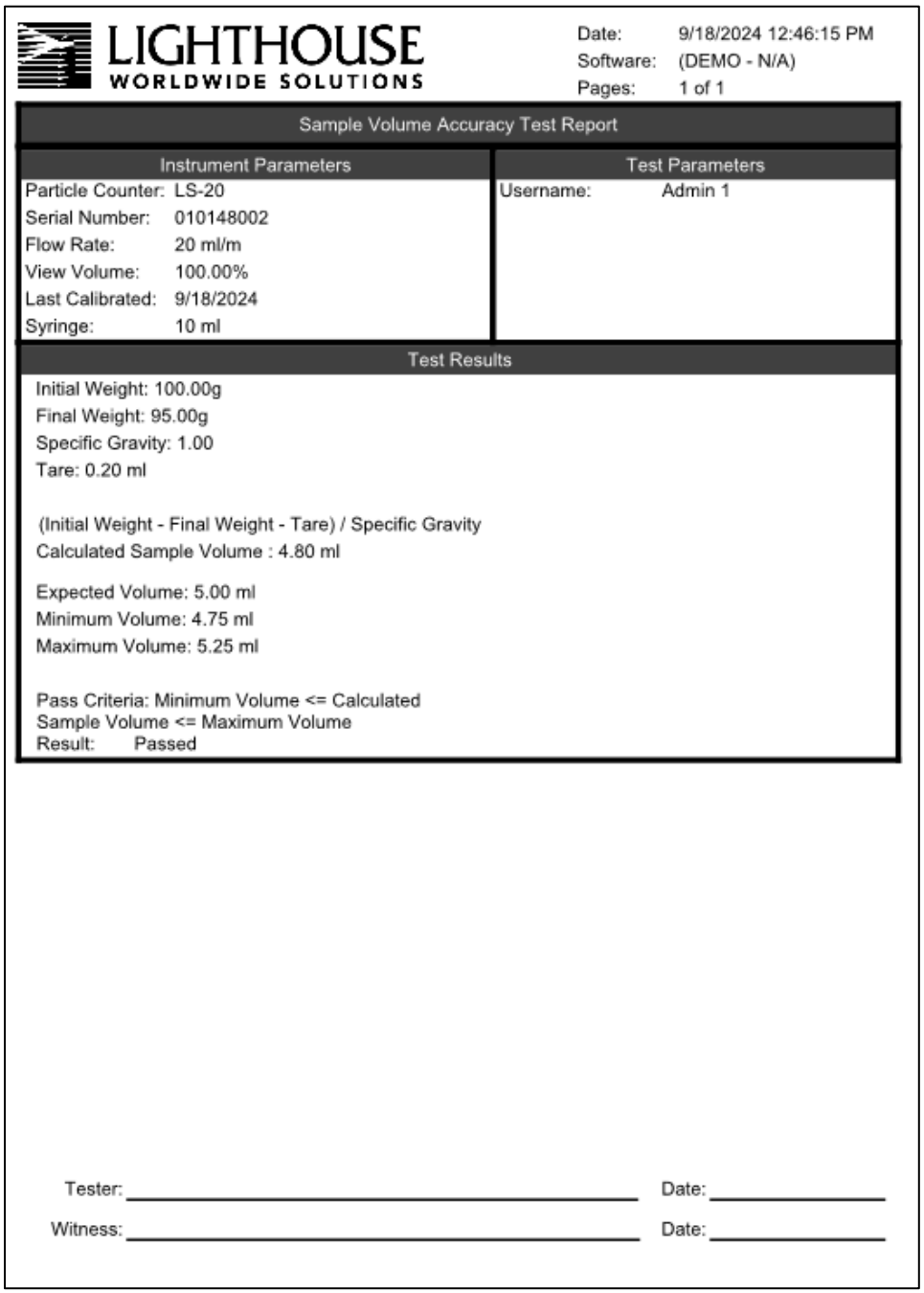
- **Enter the Initial Weight.**
- **Enter the Specific Gravity**.



Volume Accuracy Test Screen

- **Take Sample:** place sample on platform, position tube, press TEST.
- **Enter Final Weight:** enter the weight of sample after test.
- **Calculations:** The resulting calculations will display on the screen.
- **Results:** Click on the Generate Report and Reset button to view report.

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WORLDWIDE SOLUTIONS

Date: 9/18/2024 12:46:15 PM
Software: (DEMO - N/A)
Pages: 1 of 1

Sample Volume Accuracy Test Report

Instrument Parameters		Test Parameters	
Particle Counter:	LS-20	Username:	Admin 1
Serial Number:	010148002		
Flow Rate:	20 ml/m		
View Volume:	100.00%		
Last Calibrated:	9/18/2024		
Syringe:	10 ml		

Test Results

Initial Weight: 100.00g
Final Weight: 95.00g
Specific Gravity: 1.00
Tare: 0.20 ml

(Initial Weight - Final Weight - Tare) / Specific Gravity
Calculated Sample Volume : 4.80 ml

Expected Volume: 5.00 ml
Minimum Volume: 4.75 ml
Maximum Volume: 5.25 ml

Pass Criteria: Minimum Volume <= Calculated Sample Volume <= Maximum Volume
Result: Passed

Tester: _____ Date: _____

Witness: _____ Date: _____

Volume Accuracy Test Report

The Volume Accuracy Test Report contains details about the test, the criteria used to determine the result, and the result.

Sample volume accuracy report names end in "_SVA.pdf".

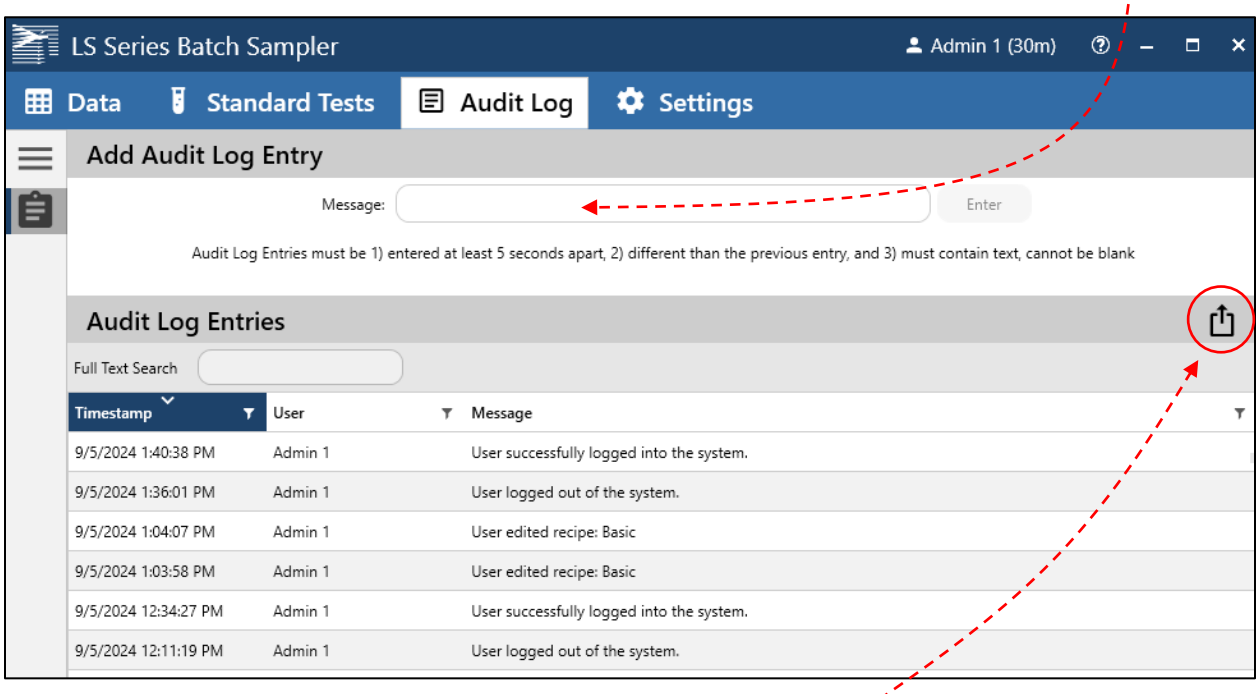
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AUDIT LOG

The LS Software automatically records when user's login to the LS Software; when recipe changes were made and by whom; when samples were run; and when standardization reports were run in its Audit Log. Each Audit Log entry includes the timestamp, username, and message describing the action completed.



Users can view the Audit Log by clicking on the Audit Log icon on the left side of the Home Screen. Users can sort the Audit Log entries by clicking on a column header timestamp, user, or message. Users may enter a custom audit log message. The message entry must be different than the previous entry, must contain text and cannot be blank.



Audit Log Screen



Click on the Icon: "Export audit log list to a new report" and the LS Software will create a .pdf report file of the Audit Trail records. Note "Allow users to enter audit trail logs" must be enabled from the User Settings screen to display the Add Audit Log Entry Message.

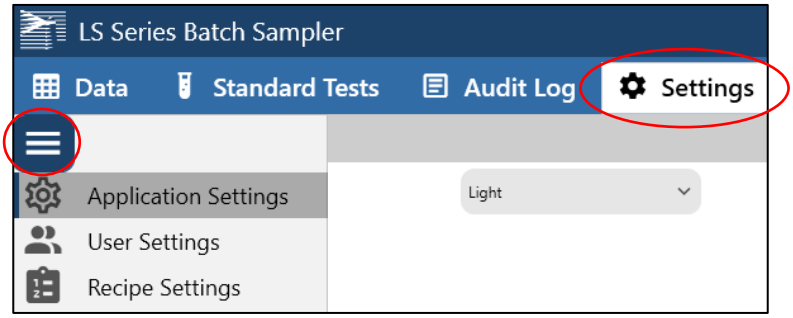
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SETTINGS

From the Main Menu, select the Settings tab. This will display the Settings Menu Bar.

Press the hamburger button to expand or collapse the Settings Menu Bar.

- Application Settings
- User Settings
- Recipe Settings.



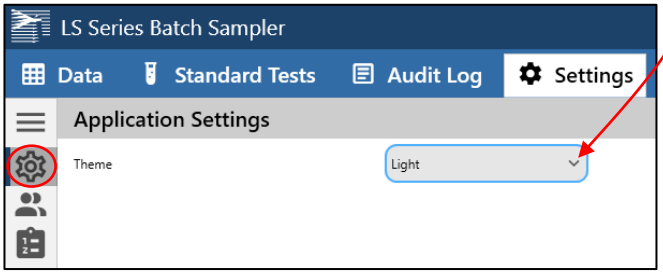
Settings Menu Bar Expanded

APPLICATION SETTINGS - THEME

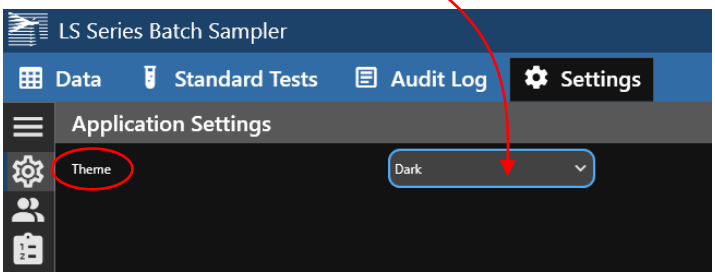
The Settings Tab includes an Application Settings Screen to select Theme: Light or Dark.

- Select Light or Dark screen background from the pull-down list.





Light Theme



Dark Theme

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USER SETTINGS

The LS Software can operate with users enabled or disabled. When users are enabled the LS Software will require a login username and password to run. Additionally, LS Software feature use is restricted by the User Level assigned. When users are disabled, no login will be required, and full use of the LS Software will be available to the operator.

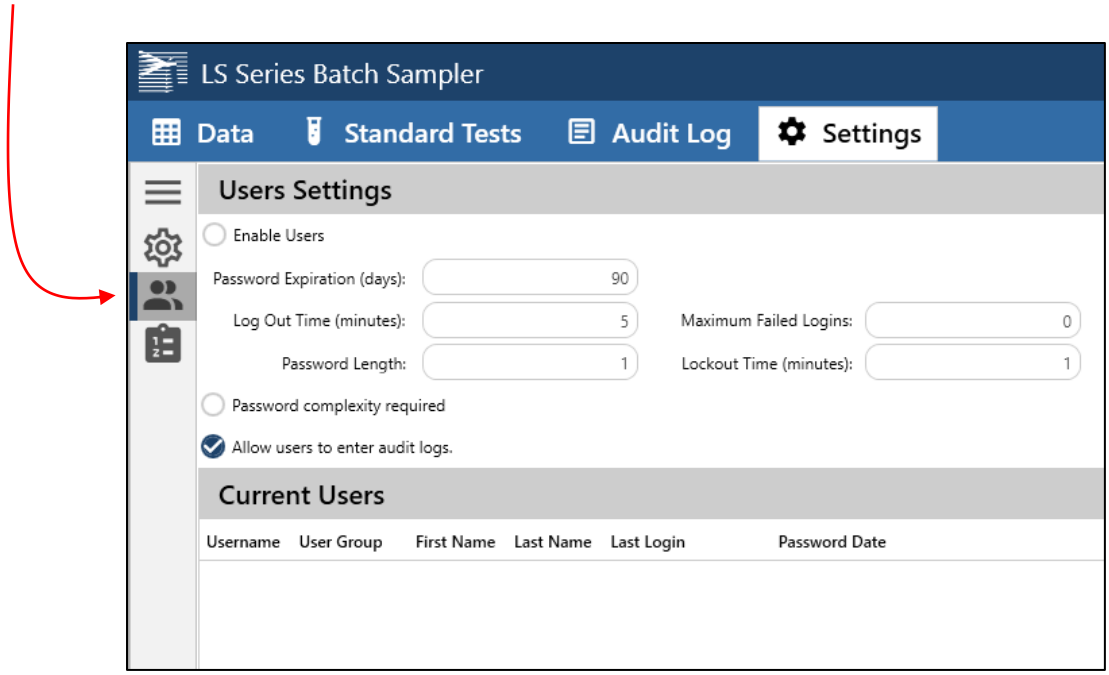
When the LS Software is first installed Users will be disabled and LS Software can be started without any login. In this state the operator can easily set up Users. To require all operators to login when they start the LS Software at least one Admin level user must be created initially. When the Enable Users, button is enabled a pop-up login window will display and require an Admin level user to login and confirm. All users will be prompted to change password during the first login.

Each user account is assigned to one of three different User Levels:

- Admin
- User
- Maintenance

Permissions vary per user level. See the "User Level Feature Matrix" chart below for details about which features are available for Admin, User, and Maintenance level users.

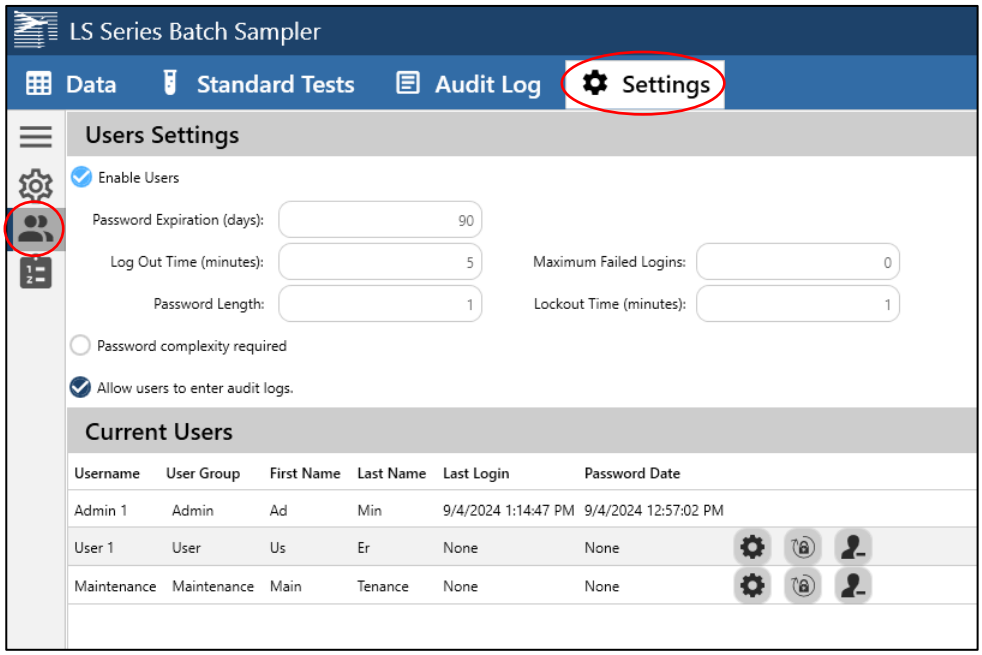
The Settings Tab includes a User Settings Screen.



User Settings Screen

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User Settings will be locked when Enable Users is disabled. No edits may be made to the User Settings unless Users are Enabled, and an Admin level user is logged in. Once logged in at the Admin User level, click on the Settings Tab button and then click on the User Settings Icon to display and edit the User Settings.



User Settings Screen

- Enter **Password Expiration** (days). This is the number of days after which a user must change their password. Enter 0 (zero) days to turn off password expiration.
- Enter the **Log Out Timer** (minutes). *Time until a user is automatically logged out.*
- Enter **Maximum Failed Logins**. *Number of failed logons attempts before lockout.*
- Enter **Password Length**. *Minimum length for passwords to be valid.*
- Enter **Lockout Time** (minutes). *Minutes a user account stays locked out*
- Select **Password complexity** required. *Password's input must meet complexity requirements, or the following error message will display:*



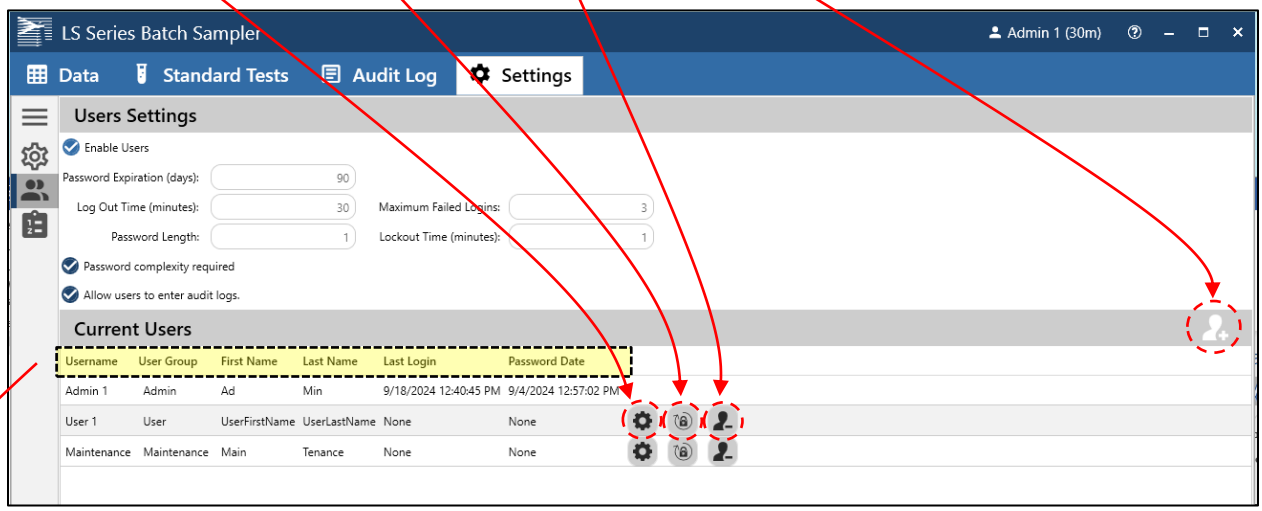
"Passwords must contain at least 3 of the following: Uppercase, Lowercase, Number, Special Character"

- Select Allow users to enter audit logs.

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A list of Current Users will be displayed with column headings including:

- Edit User, Change Password, Delete User and Add User.



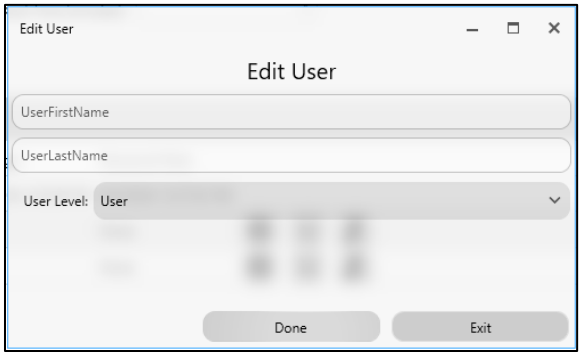
Current Users List Column Headings (click top of column to sort on that column)

- Username (login username)
- User Group (Admin, User or Maintenance)
- First Name
- Last Name
- Last Login (last user logged in)
- Password Date (last date the password was changed).

EDIT USER



- Edit User: Click to change the User First Name, Last Name or User Level.



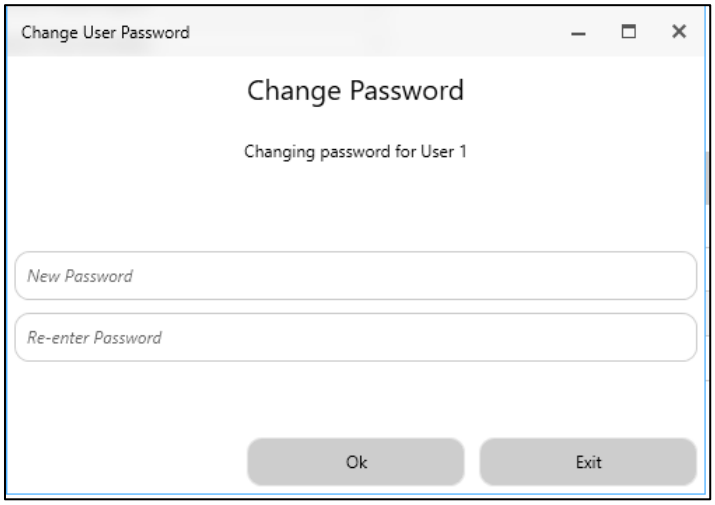
Edit User Screen

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CHANGE PASSWORD

- Change Password: Click to change the selected user password. Enter New Password.



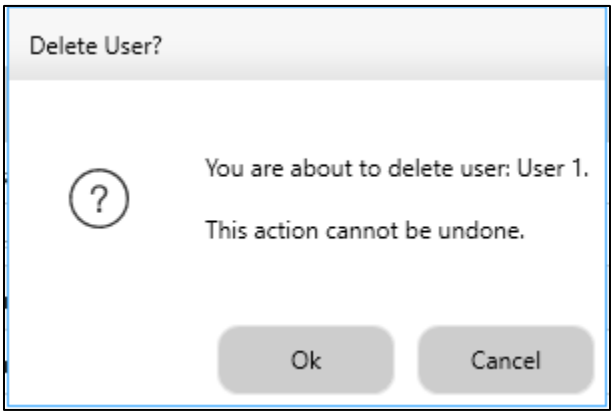


Change Password Screen

DELETE USER

- Delete User: Click to delete user. Click OK to delete or Cancel to cancel.





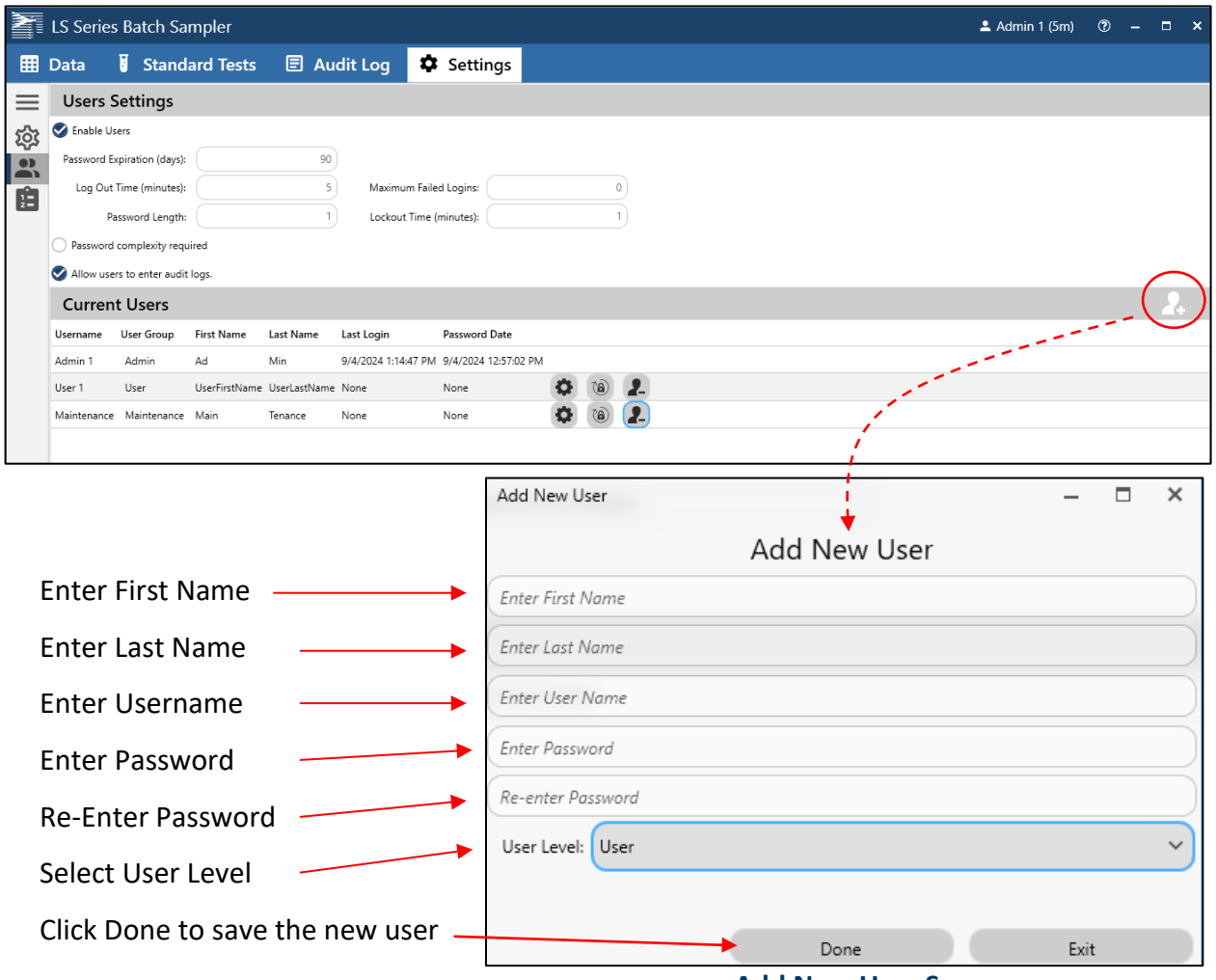
Delete User Password Screen

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ADD USER



- Click on the Add User Icon to display the Add New User screen.



Enter First Name

Enter Last Name

Enter Username

Enter Password

Re-Enter Password

Select User Level

Click Done to save the new user

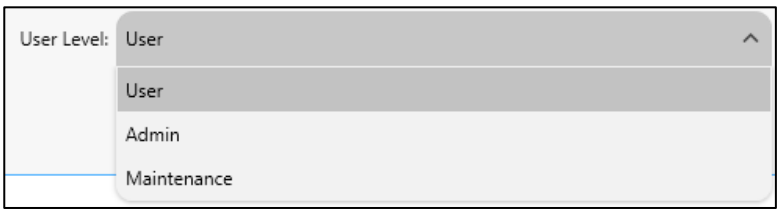
Add New User Screen

USER LEVELS

There are 3 user levels available in the LS Software system:

Select User Level

- User
- Admin
- Maintenance.



Select User Level Screen

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USER FEATURE MATRIX

The three User Levels can access the following LS-20 Software functions.

	Run Recipe	Add/Edit Recipe	Reports	Edit Users	Audit Trail	Syringe Size	Standardization
Users	✓	-	✓	-	✓	-	-
Admin	✓	✓	✓	✓	✓	✓	✓
Maintenance	✓	✓	✓	-	✓	✓	✓

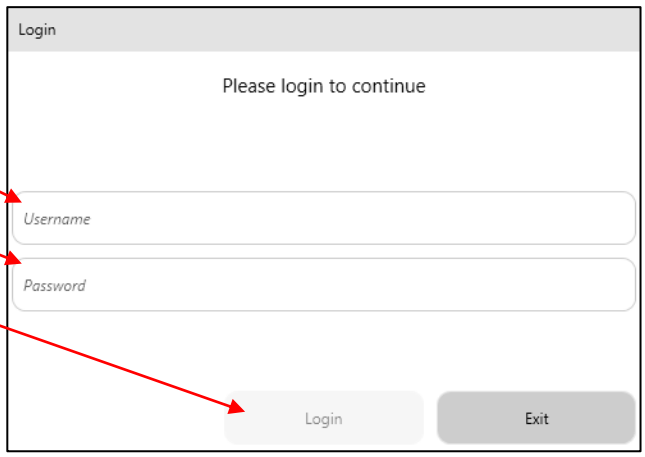
User Level Feature Matrix

LOGIN "ADMIN" LEVEL USER

Enter Admin Username

Enter Password

Click on Login



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RECIPE SETTINGS – AVAILABLE RECIPES

The LS Software saves sample settings as Recipes in its database. Recipes store the batch liquid sample settings; report settings, channel sizes, threshold, and alarm settings necessary to run the desired batch sample. Recipes can be exported to a .RCP file and saved on a local hard drive or USB key. Additionally, Recipes can be imported into the LS Software from a .RCP file on a local hard drive or USB key.

The LS Software installs with the following 18 recipe standards:

STANDARD RECIPES

CP – Chinese Pharmacopeia

- CP_2015_Test Environment
- CP_2015_Test_Vol_Greater than or equal to 100mL
- CP_2015_Test_Vol_Greater than or equal to 25mL
- CP_2015_Test_Vol_Less than 25mL

EP – European Pharmacopeia

- EP_Test_Environment
- EP_Test_1A
- EP_Test_1B

JP – Japanese Pharmacopeia

- JP_11_Test_Environment
- JP_11_Test1A_
- JP_11_Test1B_

KP – Korean Pharmacopeia

- KP_61_Test_Environment
- KP_61_Test_1A_
- KP_61_Test_1B_

USP – United States Pharmacopeia

- USP_43_788_Environment Test
- USP_43_788_Test 1A
- USP_43_788_1B
- USP_43_789 for containers with Volume greater than or equal to 25mL
- USP_43_789 for containers with Volume less than 25mL

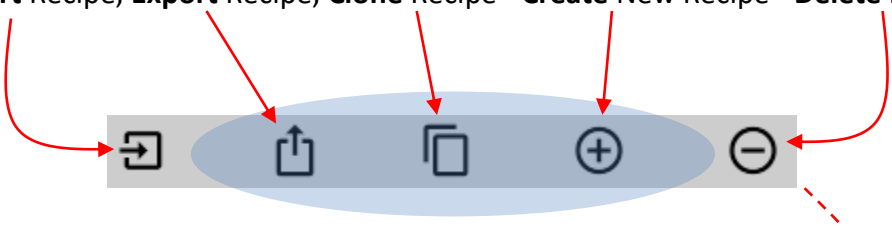
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BASIC RECIPE

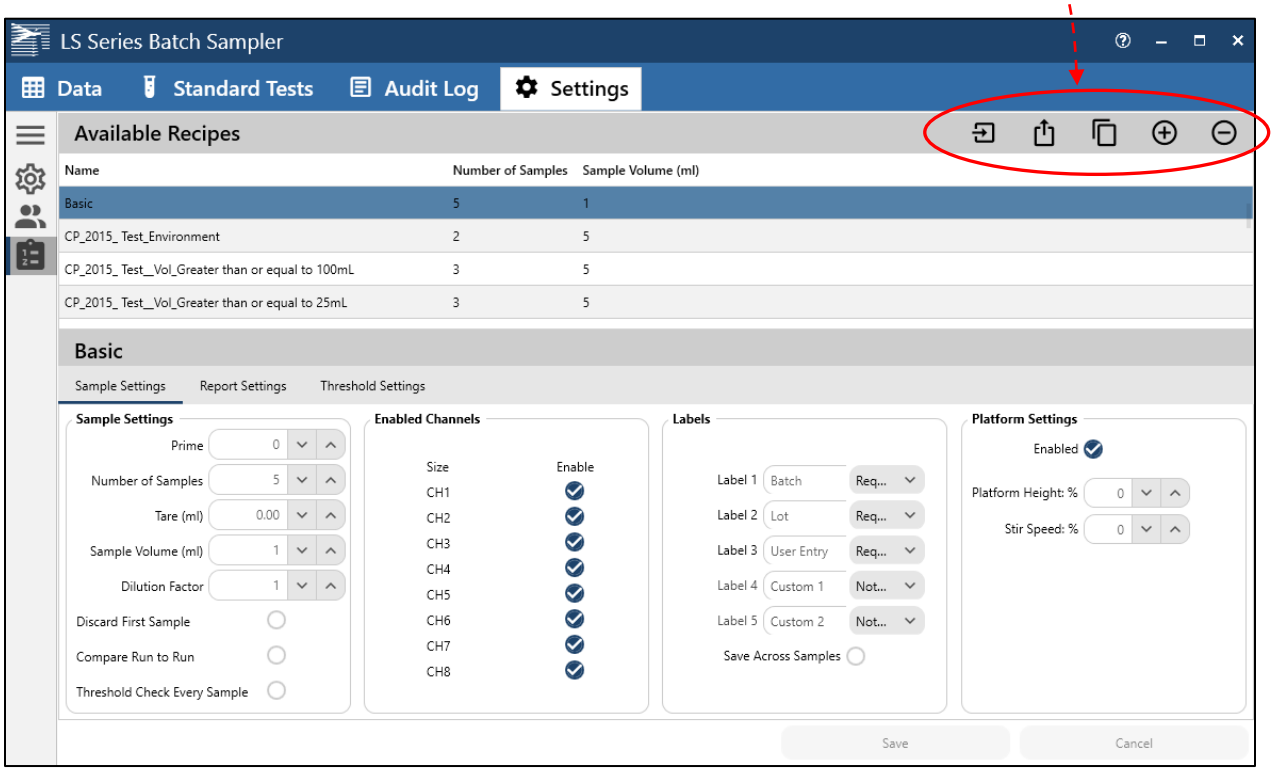
The LS Software is initially installed with a default recipe file named Basic (basic.rcp).

The LS Software allows the user to;

Import Recipe, **Export** Recipe, **Clone** Recipe - **Create** New Recipe - **Delete** Recipe



Import, Export, Clone, Add, or Delete Recipe



Recipe Settings Screen

All recipe files will be saved in the LS Software Database. Exported recipe files can be saved on your local hard drive folder with a .rcp file extension. To Edit a Recipe, the user must be logged in as an Admin group level user or Enable Users must be disabled from the Users screen. User level login will only allow the user to run a recipe but not to edit the recipe sample settings.

IMPORT A RECIPE

To import a recipe into the LS Software database:

- Select the import button.
- After selecting the Import button your computer File Open window will pop up to allow you to select the .rcp file from any connected hard drive or attached USB key.
- Find and Select the Recipe file (.rcp) you wish to import in the LS Software.
- Press the Open button and the selected recipe will be imported and displayed on the Available Recipes screen.

EXPORT A RECIPE

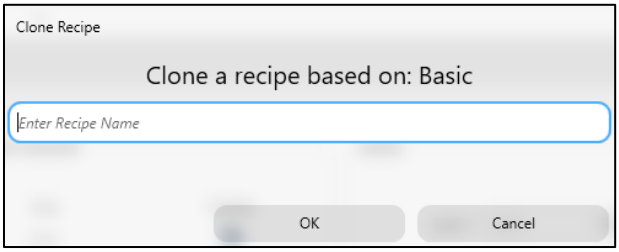
To export a recipe from the LS Software database:

- Select a recipe and that recipe will highlight blue indicating it has been selected.
- Select the Export button to export the highlighted recipe.
- After selecting the Export button your computer File Save window will pop up to allow you to name and save your exported .rcp file to a connected hard drive or USB key.
- Save the exported recipe file (.rcp) on your hard drive or a connected USB key.
- This exported recipe file can be imported into the LS Software system on any other computer.

CLONE A RECIPE

To clone and rename a selected recipe:

- Click the “Clone the selected recipe” button.
- The Clone Recipe Name screen will display.
- Enter new recipe name.
- Press “OK” button.
- The new recipe name will appear on the recipe lists.

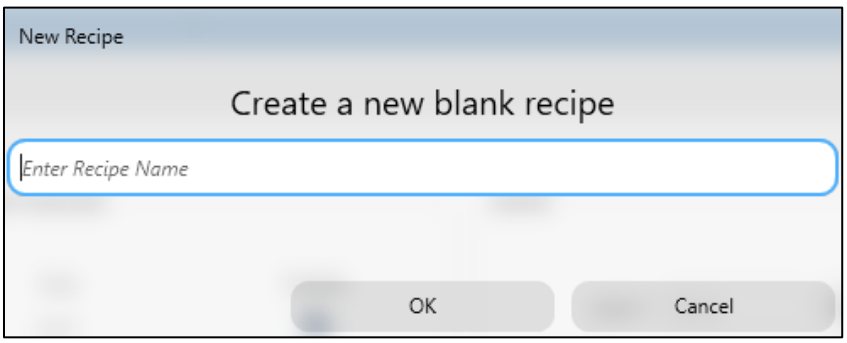


Clone and rename a Recipe

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CREATE A NEW RECIPE

- Click the “Create a new recipe” button to add a new blank recipe.

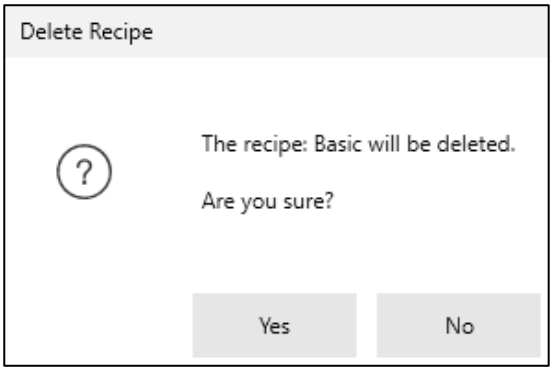


New Recipe

Enter a new recipe name and click OK. After entering a new recipe name and pressing OK, the new recipe will be highlighted as the current recipe. The new recipe can now be edited and customized for Sample, Report and Threshold settings. Note: you cannot technically “rename” a recipe. You can clone a recipe and give a new name to that recipe.

DELETE A RECIPE

- Select recipe name to be deleted. It will highlight blue indicating it has been selected.
- Click on the Delete button to delete the highlighted recipe.
- The Delete Recipe confirmation screen will display.
- Click on Yes to confirm delete selected recipe or click on No to cancel.



Delete Recipe Confirmation Screen

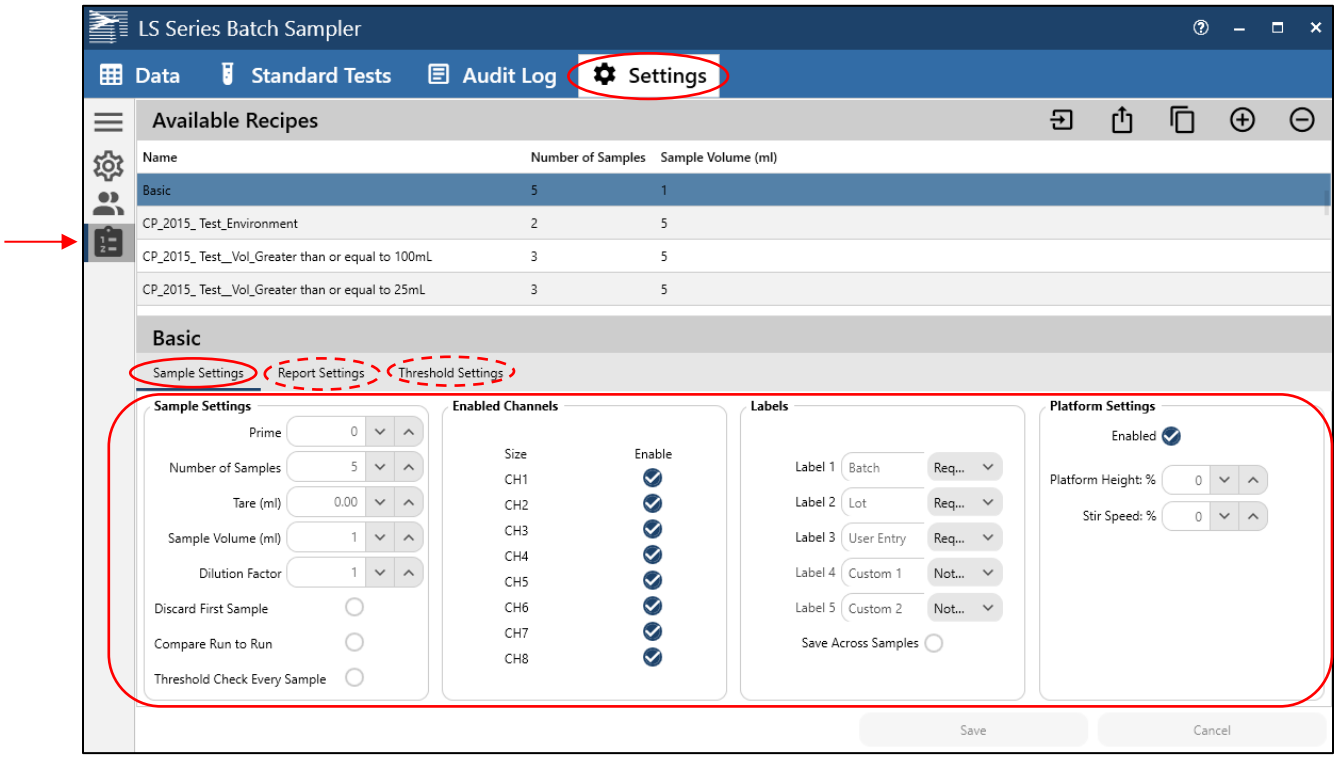
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RECIPE - SAMPLE SETTINGS

To edit a recipe, select the Settings Tab and the Recipe Settings Icon. The Recipe Settings Screen will display. Select an Available Recipe to edit. Click on the recipe and it will highlight blue indicating it is the selected recipe. The default recipe "Basic" is selected below.

The selected Recipe Settings can be edited from the 3 menu tabs below:

- Sample Settings
- Report Settings
- Threshold Settings

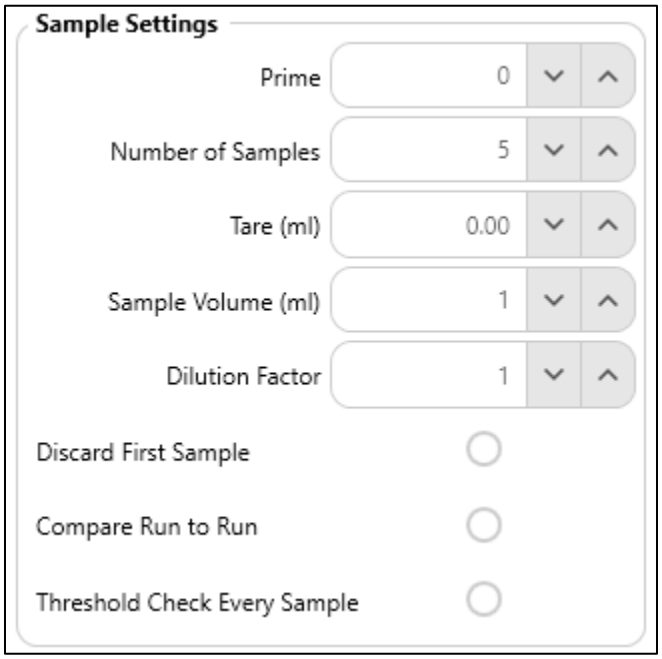


Recipe Sample Settings Screen

- Edit the Sample Settings, Enabled Channels, Labels and Platform Settings.

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The selected recipe's saved settings will be displayed on the Sample Settings, Report Settings, and Threshold Settings tabs in the lower section of the Edit Recipes screen. Note, to edit a recipe, the user must be logged in as an Admin user, or user logins must be disabled.



Recipe Sample Settings

PRIME

The Prime field sets the quantity of liquid (in ml) to run through the sensor and discard before starting samples. This clears air bubbles from the sensor and is also intended to purge the sensor of residue left from previous sample. If the LS-20's input tube is less than 10 inches long, a Prime value of 1.0 ml is sufficient to clear the previous sample from the instrument.

The Prime value should be set to 0 (zero) when DISCARD FIRST SAMPLE is enabled. The Prime amount is added to the beginning of each run, during which counting does not take place.

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NUMBER OF SAMPLES

Enter the number of samples to be taken during the test cycle of the recipe.

TARE (ML)

The TARE button allows the user to change the LS software's internal default of 0.2 ml. Tare should not be changed unless instructed by Lighthouse Technical Support. TARE is added to each syringe cycle. The TARE volume is ignored and not counted at the beginning of every syringe of liquid.

SAMPLE VOLUME (ML)

This Sample Volume field allows the user to change the volume of the sample, in ml, from the default value of 4 ml. Counting takes place on this volume of liquid.

DILUTION FACTOR

The Dilution Factor field allows the user to set the ratio of fluid added to the sample for dilution. Values from 1 to 99.99 may be used. A Dilution Factor of '1' means the sample has not been diluted. A dilution factor of 2 means the sample has been diluted in half. With a dilution factor of N the expected fluid dilution will be $1/N^{th}$.

Dilution Factor	**N**	**1**	**2**	**5**	**10**
Fluid Dilution	1/Nth	0	½	$1/5^{th}$	$1/10^{th}$

Dilution Factor Fluid Dilution Calculation Matrix

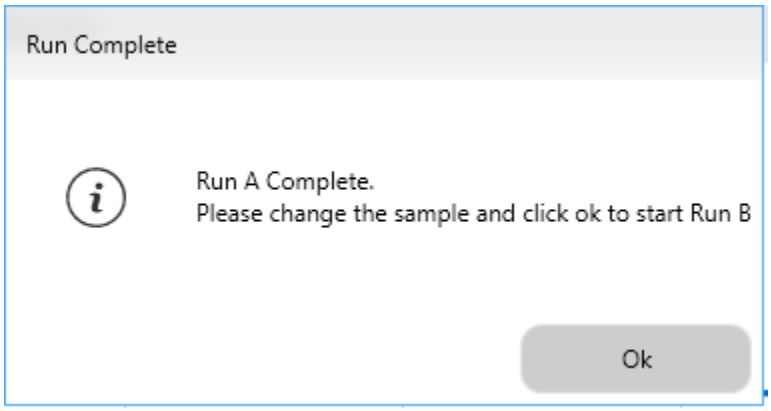
DISCARD FIRST SAMPLE

When Discard First Sample is enabled and saved in a recipe, the LS Software will discard the first sample data that is sampled from the Recipe. The Prime value should be set to 0 (zero) when Discard First Sample is enabled.

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COMPARE RUN TO RUN

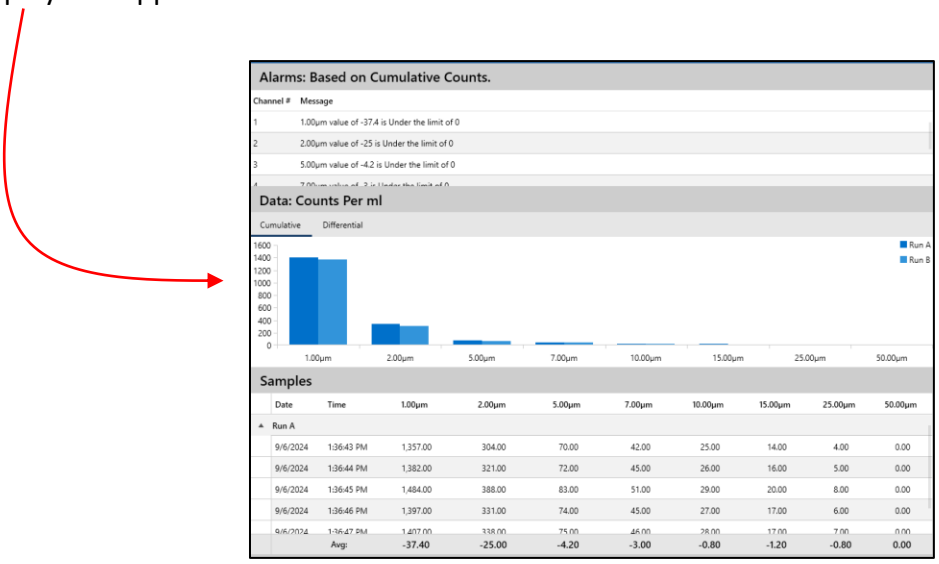
Enabling Compare Run To Run enables a Run-to-Run comparison of the data. After all samples are complete for the first run, the "Run A Complete" message will be displayed.



Run A Complete Message

- Change the sample to be compared, and click OK to start Run B.

The Recipe sampling will repeat for Run B. The Alarm Screen, Data Screen and Status Bar will display and append Run B results.



After Run B completes the Report (yyyy-mm-dd-hh-mm-ss_Recipe Name) file will be created and will include comparisons of Run A to Run B. The report can be found from the Main Screen Data Tab, Reports screen.

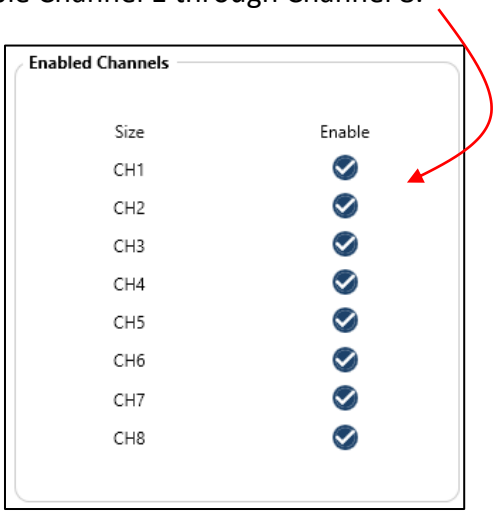
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THRESHOLD CHECK EVERY SAMPLE

When Threshold Check Every Sample is enabled, the sensor alarm thresholds are checked after each sample's counts have been read and processed. If the sample's data exceeds the recipe's set thresholds, alarms will be displayed on the Alarms screen after each sample is completed.

ENABLE CHANNELS

- Click to enable or disable Channel 1 through Channel 8.



LABELS

- Enter label names (Batch, Lot, User Entry…) for up to 5 labels.
- Click and select label name Required, Optional, or Not Available.
- Click on Save Across Samples to save labels entered as default.



Sample Labels

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PLATFORM SETTINGS

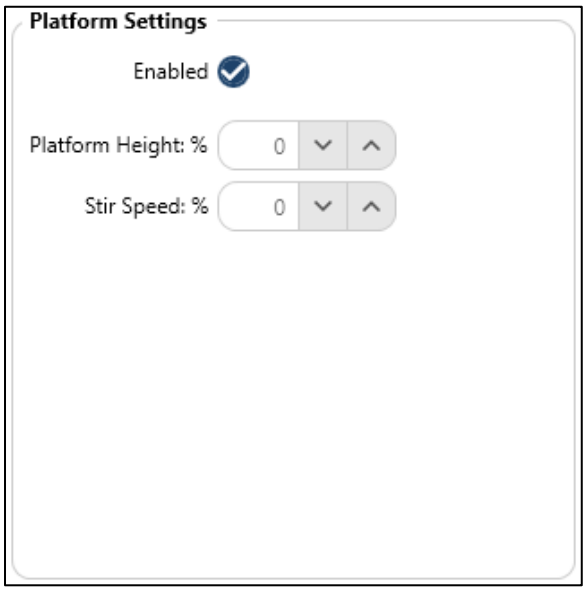
The LS-20 platform height can be adjusted to fit your beaker size and tubing length. The sample intake tube must be situated below the surface of the liquid to sample the liquid. The LS-20's platform height % can be set and saved in a recipe to accommodate your beaker size. When the recipe is run, the platform will raise or lower to the saved recipe height.

STIRRER SPEED

If the sample liquid in the beaker needs to be stirred, the user can select a Stir Speed % and save on the Current Instrument section of the LS Software screen. After pressing the Set button next to the Stir Speed field, the LS-20's Stirrer will start stirring.

Platform Height & Stirrer Speed are saved in the Sample Settings of a Recipe.

- Click to enable platform settings. If disabled then there will be no preset height.
- Click to set the platform height % up or down.
- Click to set the stir speed % up or down.



Edge Guard

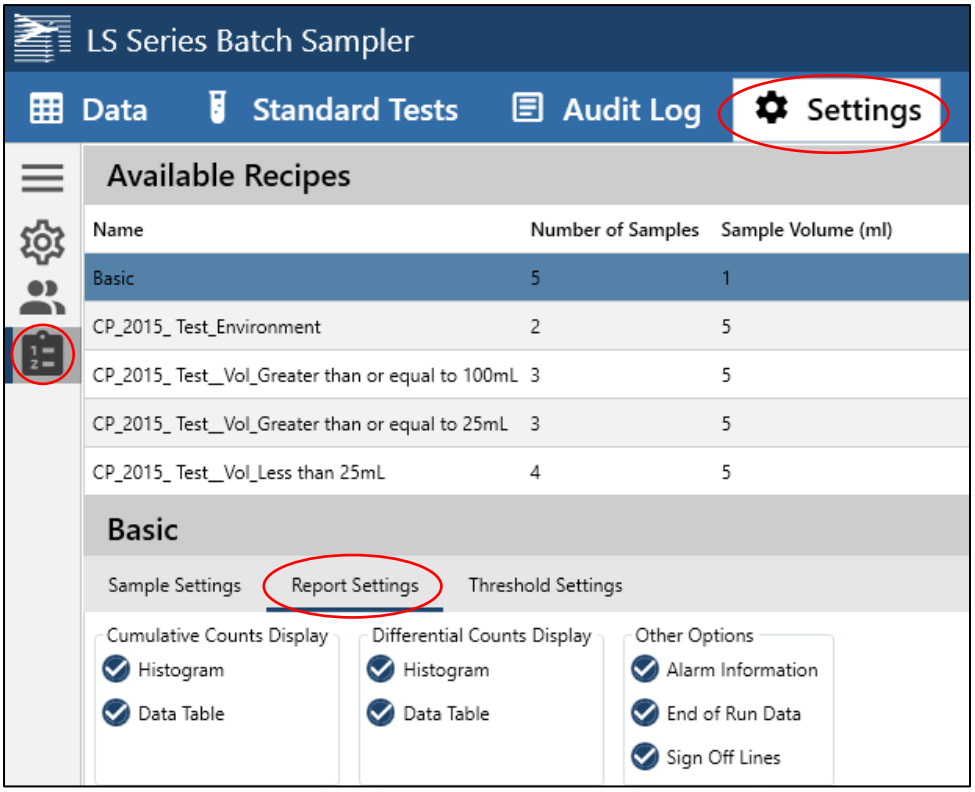
The LS-20 instrument has an edge guard detector and will prevent crushing your glass beaker if the platform is raised too high. To protect against the risk of crushing the glass beaker keep an opaque edge guard on your sample beaker when in use with the LS-20. If the platform height is set too high, it will be stopped when the edge detector senses the top of the rising beaker.

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RECIPE - REPORT SETTINGS

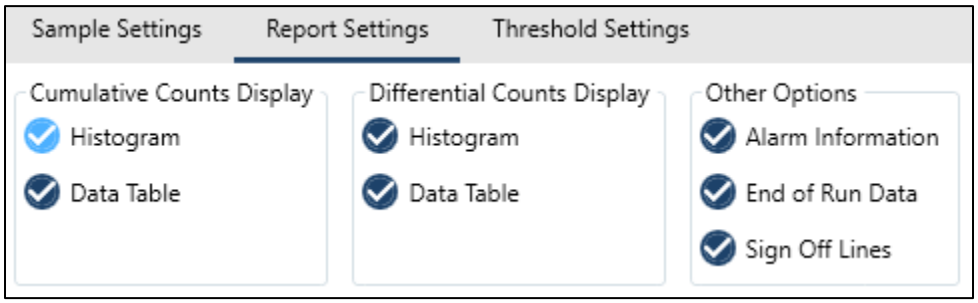
To edit a recipe's report settings:

- Click on the Settings Tab
- Click on the Recipe Settings Icon
- Click on the Report Settings button.



- Select an available recipe, it will highlight blue indicating it is selected.
- Click on the Report Settings button.

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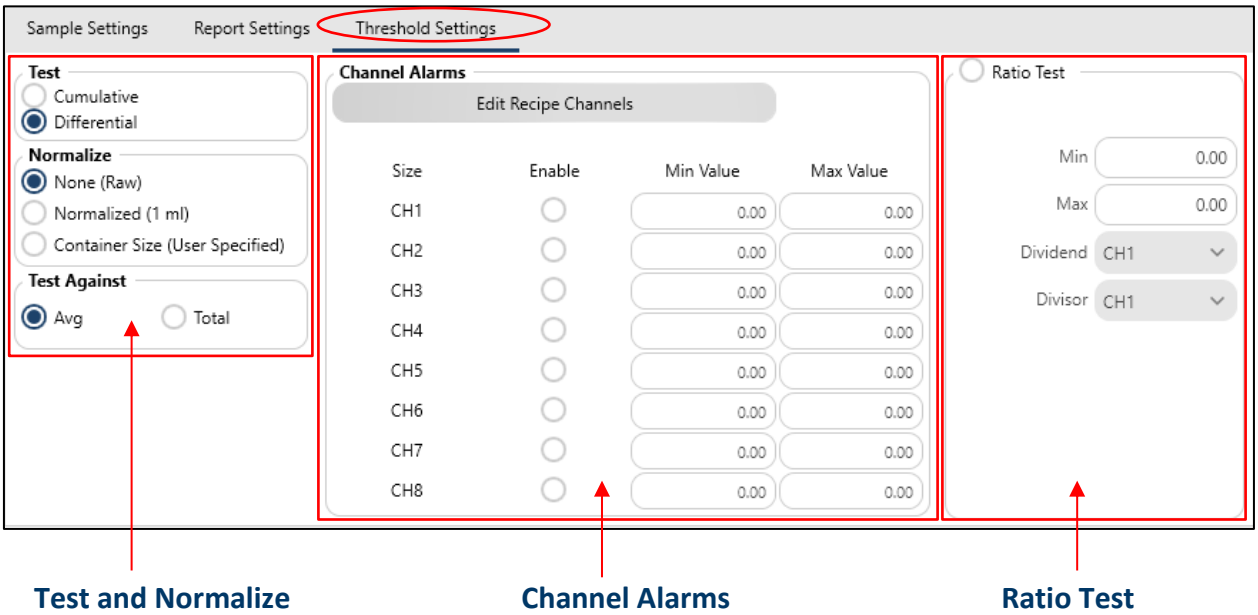
Recipe: Report Settings

- Enable Histograms and Data Tables for Cumulative and/or Differential Counts. These will be displayed on screen and saved to the sample report.
- Enable Alarm Information to display any alarm data on the screen and save to the report.
- Enable End of Run Data to display the end of run data on the screen and saved to the report.
- Enable Sign Off Lines to include signature lines on the saved report.

RECIPE - THRESHOLD SETTINGS

To edit a recipe's threshold settings:

- Click on the Settings Tab and then click on the Recipe Settings Icon
- Select an available recipe and click on the Threshold Settings sub-tab. The selected recipe's saved Threshold settings will be displayed.



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TEST CUMULATIVE / DIFFERENTIAL

Cumulative or Differential

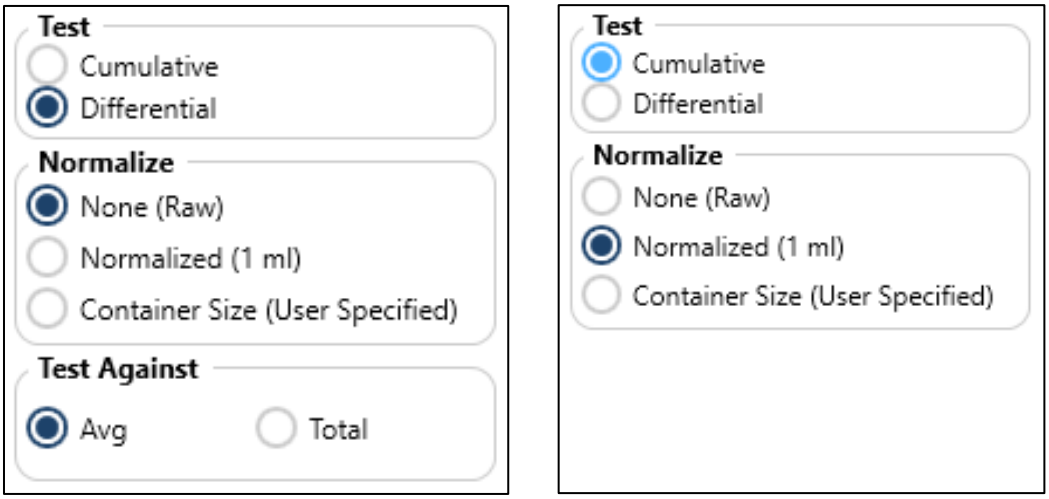
Users can select to display data in either Cumulative or Differential mode by clicking on the Cumulative or Differential buttons. By default, the sample is displayed as cumulative data. That is, particle size data for a specific channel contains counts for that size and larger. Selecting differential will display counts for each particle size only and not also the sum the counts of higher particle sizes.

- **Test** *Select Cumulative or Differential.*
- **Normalize** *Select One of the following three options:*
  None (Raw): Raw data = the particle counts for a specific size.
  Normalized (1 ml): Normalized data = particles per milliliter.
  Container Size: Normalized to user input Container Size and # of Containers.
- **Test Against:** Select to test limits against either the samples' averages or the samples Totals.

Note If Normalize None is selected, then Test Against will display options for Avg and Total

- Click on Avg or Total to test against the Average or the Total counts.

If Normalize None is NOT selected, then Test Against will not display.



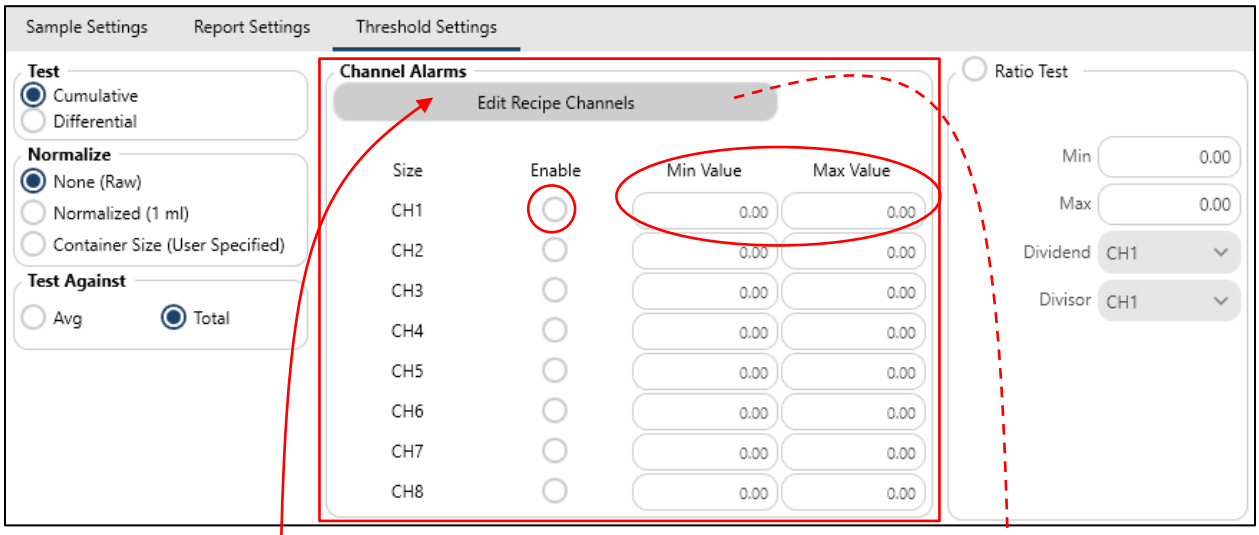
Threshold Settings - Test

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CHANNEL ALARMS

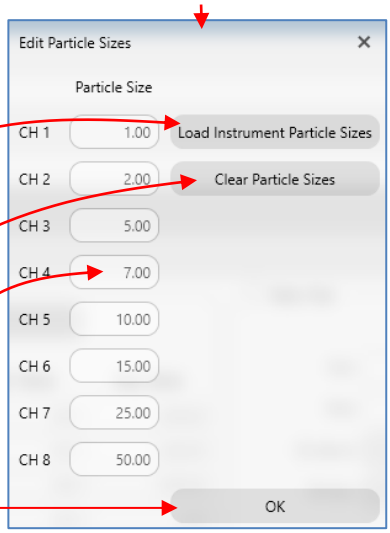
Click on Enable check box next to each Channel Size to enable from 1 up to 8 channels.

- Enter Minimum and Maximum Alarm Values for desired particle channel sizes.
- Use Zero if a minimum value is not desired.
- The channel sizes saved in the recipe will be used in the instrument at sample time.



Channel Alarms

- Click to Edit Recipe Channel particle sizes.



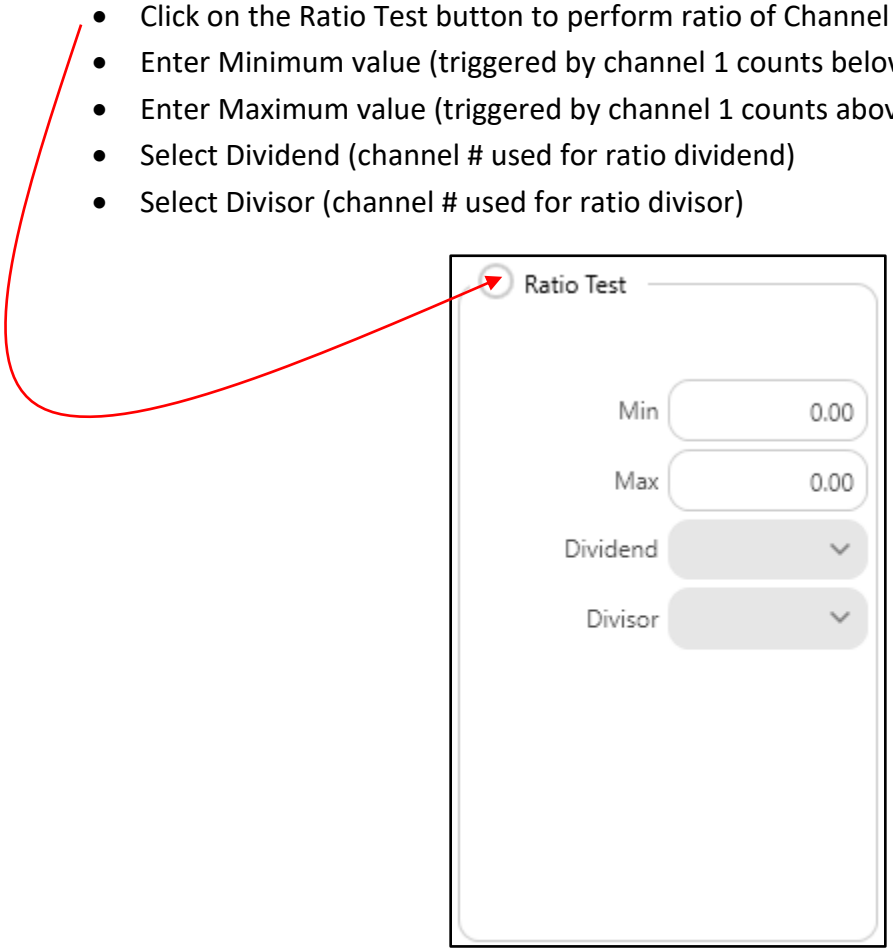
- Click to Load Instrument Particle Sizes.
- Or click to Clear Particle Sizes.
- Click on the particle size to enter specific size.
- Click OK.

Edit Recipe Channels

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RATIO TEST

- Click on the Ratio Test button to perform ratio of Channel 1 counts.
- Enter Minimum value (triggered by channel 1 counts below the Minimum)
- Enter Maximum value (triggered by channel 1 counts above the Maximum)
- Select Dividend (channel # used for ratio dividend)
- Select Divisor (channel # used for ratio divisor)



Ratio Test Window

- Once any edit has been made to a recipe on the Recipe Settings screen then a message will appear saying:

  "You have unsaved changes. Please save them or cancel the changes before continuing."



- Press the Save button to save the current settings or press Cancel to cancel.

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TAKING A SAMPLE

RUNNING A SAMPLE

After the LS-20 system is readied for operation, the LS Software is started and a recipe is selected, prepare a sample to be run.

To prepare a sample, use the supplied Pyrex glassware or a comparable container. Make sure that the top edge of the beaker or container has light-blocking material added on to it so that the LS-20's sensors can detect where the top edge of the container is.

Light blocking edge guard detects and will stop the platform rising past the top of the beaker.

Warning: Without the light blocking edge guard a beaker can break and shatter from extending the platform riser beyond the space of the beaker.



Place the LS-20's stirrer into the sample and place sample tube into the container. Put the container onto the LS-20's sample platform. If the end of the tube is not fully submerged in the liquid in the container, use the LS Software to raise the LS-20's platform height so that the tube is fully submerged in the liquid to be sampled.

If a stirrer speed is not saved in the recipe, move the Stirrer Speed slider to a desired position. Make sure the speed of the stirrer does not create bubbles or excessive turbulence.

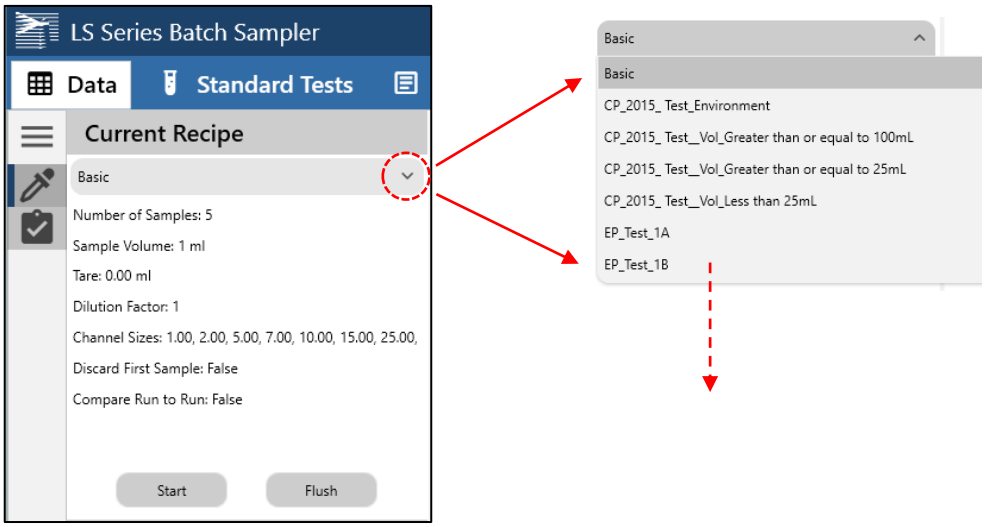
Click the Start button in the LS Software to start running the recipe.

When the entire recipe's sample(s) are completed, a confirmation box will appear. The data can be reviewed on the screen.

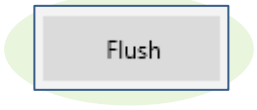
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START RECIPE SAMPLE

In the LS Software, select a Recipe from the Current Recipe Screen pull down list.



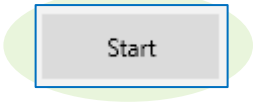
FLUSH BUTTON

Press the Flush Button to initiate flushing of the syringe. → 

Note: The syringe will flush continuously until stopped by the user.

Press the Stop button to stop the flushing of the syringe. → 

START / STOP BUTTON

Press the Start button to start sampling the selected recipe. → 

Or Press the Stop button to stop sampling the current recipe. → 

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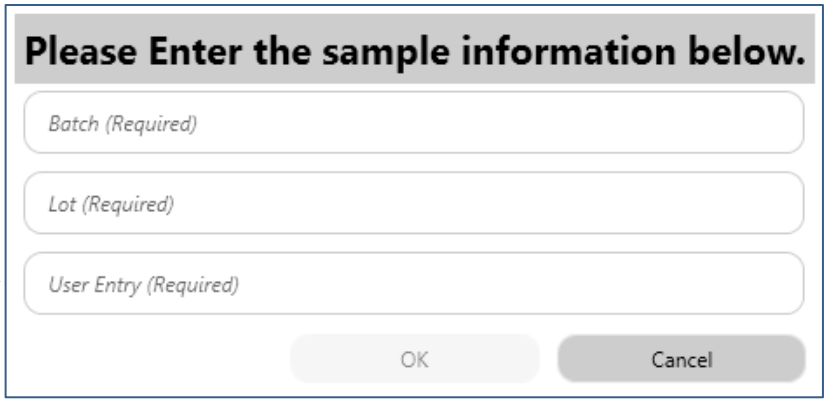
USER PROMPT FOR BATCH ID, LOT ID, USER ENTRY

When a recipe is run, the user will be prompted to enter the Batch ID, Lot ID, and User Entry comments. These can be set as Optional, Required or Not Available in the Recipe Labels section of the Settings - Available Recipes screen. In addition, the label names can be edited.

Prompts set to "Required" must be entered by the user when the recipe is run. Prompts set to "Optional" will be available for the user to enter a value but not required. If a prompt is set to "Not Available" the field will not be displayed when the user starts the recipe.

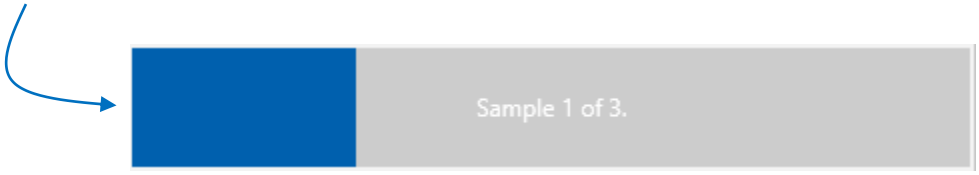
Sample Labels:

Batch ID
Lot ID
User Entry



User Prompt Input Screen for Recipes

The Sample Status Bar will display Sample (Current) of (Total).



Sample Status Bar

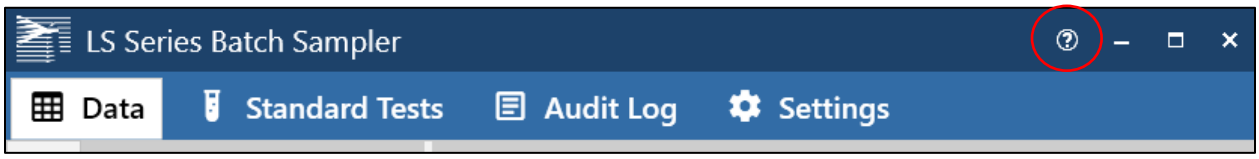
- When the recipe sampling has completed a Report file will be created and saved.
- Select Home screen Data tab, Report Icon to display the Reports Screen. Select the most recent report to view samples that were just run.

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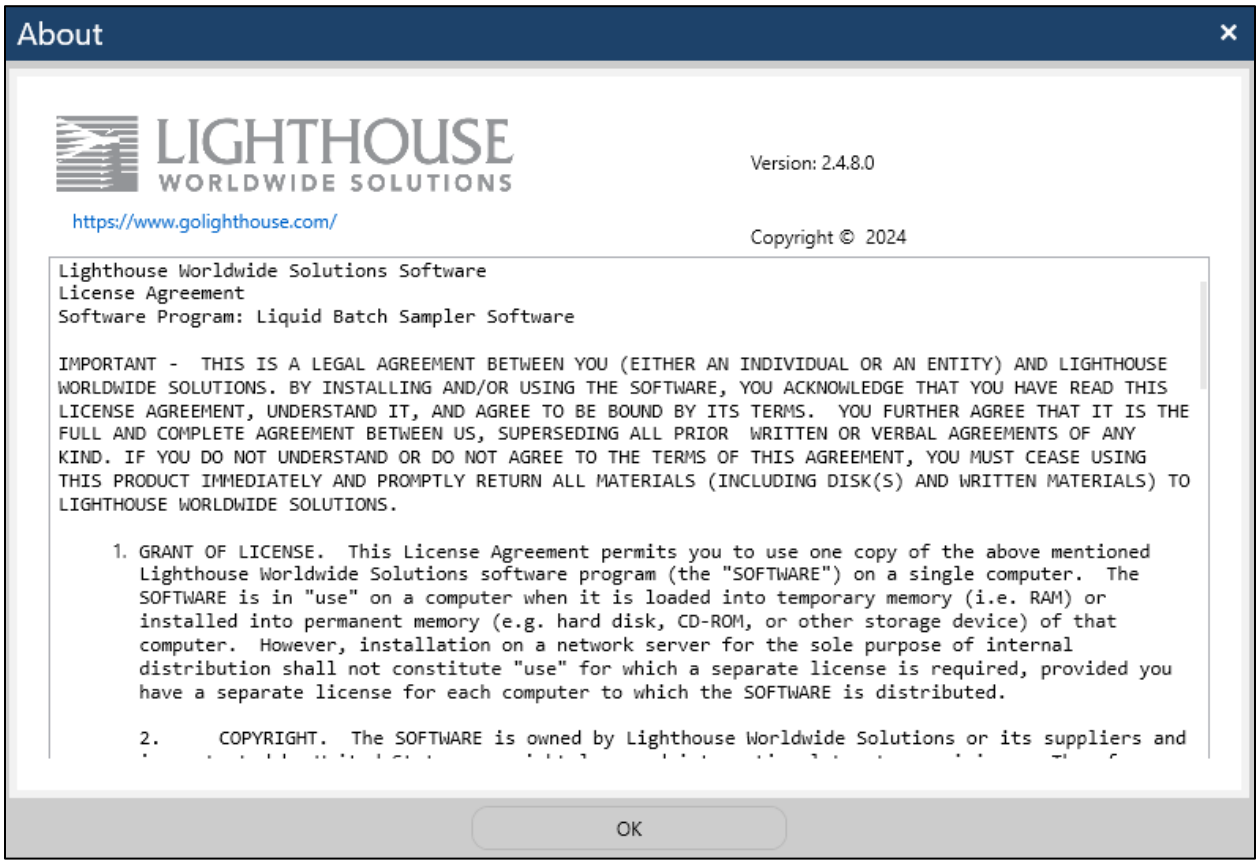
ABOUT SCREEN

The About Screen includes information about the LS-20/LS-60 hardware and the LS Software.

Click on the (?) question mark to open the About screen.



The About screen displays the version of the LS Software, its copyright date, and Lighthouse Worldwide Solution's software license agreement. Scroll to the bottom of the page to read the entire license agreement.



About Screen for LS Software

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LIMITED WARRANTY

LIMITATION OF WARRANTIES:

A. Lighthouse Worldwide Solutions (LWS) warrants that all equipment shall be free from defects in material and workmanship under normal use for a period of two years from date of shipment to Buyer except that LWS does not warrant that operation of the software will be completely uninterrupted or error free or that all program errors will be corrected. Buyer shall be responsible for determining that the equipment is suitable for Buyer's use and that such use complies with any applicable local, state, or federal law. Provided that Buyer notifies LWS in writing of any claimed defect in the equipment immediately upon discovery and any such equipment is returned to the original shipping point, transportation charges prepaid, within two years from date of shipment to Buyer and upon examination LWS determines to its satisfaction that such equipment is defective in material or workmanship, i.e. contains a defect arising out of the manufacture of the equipment and not a defect caused by other circumstances, including, but not limited to accident, misuse, unforeseeable use, neglect, alteration, improper installation, improper adjustment, improper repair, or improper testing, LWS shall, at its option, repair or replace the equipment, shipment to Buyer prepaid. LWS shall have reasonable time to make such repairs or to replace such equipment. Any repair or replacement of equipment shall not extend the period of warranty. If the Instrument is modified or in any way altered without the explicit written consent of LWS then the warranty is null and void. This warranty is limited to a period of two years, except as noted below, without regard to whether any claimed defects were discoverable or latent on the date of shipment. Batteries and accessories with all products are warranted for one (1) year. Fuses and purge filters carry no warranty. If a third party battery is used in the product, the product warranty is null and void. If the battery is charged by a third party battery charger the battery warranty is null and void.

B. If Buyer shall fail to pay when due any portion of the purchase price or any other payment required from Buyer to LWS under this contract or otherwise, all warranties and remedies granted under this Section may, at LWS's option, be terminated.

C. THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER REPRESENTATIONS, WARRANTIES AND COVENANTS, EXPRESS OR IMPLIED WITH RESPECT TO THE EQUIPMENT AND ANY DEFECTS THEREIN OF ANY NATURE WHATEVER, INCLUDING AND WITHOUT LIMITATION WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. LWS SHALL NOT BE LIABLE FOR, AND BUYER ASSUMES ALL RISK OF, ANY ADVICE OR FAILURE TO PROVIDE ADVICE BY LWS TO BUYER REGARDING THE EQUIPMENT OR BUYERS USE OF THE SAME. UNDER NO CIRCUMSTANCES SHALL LWS BE LIABLE TO BUYER UNDER ANY TORT, NEGLIGENCE, STRICT LIABILITY, OR PRODUCT LIABILITY CLAIM AND BUYER AGREES TO WAIVE SUCH CLAIMS. LWS's SOLE AND EXCLUSIVE LIABILITY AND BUYERS SOLE AND EXCLUSIVE REMEDY, FOR ANY NONCONFORMITY OR DEFECT IN THE PRODUCTS OR ANYTHING DONE IN CONNECTION WITH THIS CONTRACT, IN TORT, (INCLUDING NEGLIGENCE), CONTRACT, OR OTHERWISE, SHALL BE AS SET FORTH IN THE SUBSECTION A HEREOF AS LIMITED BY SUBSECTION B HEREOF. THIS EXCLUSIVE REMEDY SHALL NOT HAVE FAILED OF ITS ESSENTIAL PURPOSE (AS THAT TERM IS USED IN THE UNIFORM COMMERCIAL CODE) PROVIDED THAT THE SELLER REMAINS WILLING TO REPAIR OR REPLACE DEFECTIVE EQUIPMENT (AS DEFINED IN SUBSECTION A) WITH A COMMERCIALLY REASONABLE TIME AFTER RECEIVING SUCH EQUIPMENT. BUYER SPECIFICALLY ACKNOWLEDGES THAT SELLER'S PRICE FOR THE EQUIPMENT IS BASED UPON THE LIMITATIONS OF LWS'S LIABILITY AS SET FORTH IN THIS CONTRACT.

WARRANTY OF REPAIRS AFTER INITIAL TWO (2) YEAR WARRANTY:

A. Upon expiration of the initial two-year warranty, all parts and repairs completed by an authorized Lighthouse repair technician are subject to a six (6) month warranty.

B. Other than the above, LWS makes no warranty of any kind, expressed or implied, except that the products manufactured and sold by LWS shall be free from defects in materials and workmanship and shall conform to LWS's specifications; Buyer assumes all risk and liability resulting from use of the products whether used singly or in combination with other products. If sampler is modified or in any way altered without the explicit written consent of LWS, the warranty is null and void.

C. WARRANTY REPAIRS SHALL BE COMPLETED AT THE FACTORY, BY AN AUTHORIZED SERVICE LOCATION, BY AN AUTHORIZED SERVICE TECHNICIAN, OR ON SITE AT BUYER'S FACILITY BY A LIGHTHOUSE AUTHORIZED EMPLOYEE. BUYER PAYS FREIGHT TO FACTORY; SELLER WILL PAY STANDARD RETURN FREIGHT DURING THE WARRANTY PERIOD. BUYER MAY SELECT A FASTER METHOD OF SHIPMENT AT ITS OWN EXPENSE.

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