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LS - 20

LIQUID SAMPLER

SYSTEM

Operating Manual

Lighthouse Worldwide Solutions

Liquid Sampler LS-20

Operating Manual

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LWS Part Number: 248083344-1 Rev 4



EU DECLARATION OF CONFORMITY

Manufacturer's Name: Lighthouse Worldwide Solutions, Inc.

Manufacturer's Address: Lighthouse Worldwide Solutions, Inc.
1221 Disk Drive
Medford, OR 97501 USA

Declares that the product:

Product Name: Liquid Sampler
Model Number(s): LS-20, LS-60

Conforms to the following Product Specifications:

<u>SAFETY</u>	EN61010-1:2001	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use Part 1: General Requirements IEC 61010-1:2000
	CAN/CSA C22.2 No. 1010.1-1992	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use, Part 1: General Requirements
<u>LASER SAFETY</u>	IEC 60825-1 Am. 2 IEC 60601-2-22 (Laser Notice 50)	Guidance on Laser Products: Conforms to FDA 21 CFR Chapter 1 Subchapter 1
<u>EMC</u>	EN61326	Electrical Equipment for Measurement, Control and Laboratory Use EMC Requirements Part 1: General Requirements Includes Amendment A1:1998; IEC 61326:1997 + A1:1998

UL 61010A-1 - UL Standard for Safety Electrical Equipment for Laboratory Use; Part 1: General Requirements
Replaces UL 3101-1

Supplementary information

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC amended by Directive 93/68/EEC and the EMC Directive 89/336/EEC amended by Directive 93/68/EEC and carries the CE marking accordingly.

Fremont, CA. March 7, 2008

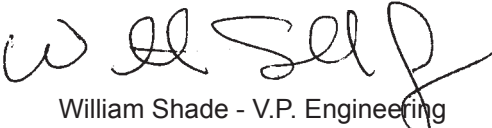

William Shade - V.P. Engineering

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About this Manual

This manual describes the detailed operation and use of the Lighthouse *LS-20 Liquid Sampler system*.

Software License Agreement

SOFTWARE PROGRAM: LIGHTHOUSE LS-20 LIQUID SAMPLER SYSTEM

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Lighthouse Worldwide Solutions
Tel: 800 945 5905 (Sales and Service)
541 770 5905 (Outside of USA)

Text Conventions

Note: *A note appears in the sidebar to give extra information regarding a feature or suggestion*

WARNING: A warning appears in a paragraph like this and warns that doing something incorrectly could result in personal injury, damage to the instrument or loss of data.

The following typefaces have the following meanings:

<i>italics</i>	Represents information not to be typed or interpreted literally. For example, <i>file</i> represents a file name. Manual titles are also displayed in italics.
boldface	Introduces or emphasizes a term.
Courier font	Indicates command syntax or text displayed by the diagnostic terminal.
Bold Courier	Indicates commands and information that you type. You can use uppercase or lowercase letters; in this manual, commands are shown in uppercase.
<i>Helvetica Italics</i>	Indicates a comment on a command or text output.

Hexadecimal numbers are shown with the word "hex" or with a small "h" following the digits. For example:

hex 0D
0Dh

Additional Help

For more information about the Lighthouse Liquid Sampler **LS-20**, contact Lighthouse Worldwide Solutions:

Service and Support
 Tel: 800-945-5905 (USA Toll Free)
 Tel: 541-770-5905 (Outside of USA)
techsupport@golighthouse.com

1

General Safety

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 .*



Figure 1-1 Example of Laser Warning Label

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Introduction

Overview

This operating manual describes how to use the Lighthouse *LS-20 Liquid Sampler System* or *LS-20*.

The *LS-20* provides up to eight particle-size channels starting at 1.0 microns with a flow of 20 ml/min. A microprocessor controls all sampler functions. Count data is displayed as cumulative or differential count.

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.

Description

Ergonomically designed, Lighthouse *LS-20 Liquid Sampler System* is the newest and most advanced liquid sampler on the market.

Data is gathered and printed through the use of the included *LS-20* Software.

The *LS-20* Software allows the user to:

- Set the Sample Volume.
- Configure the number of samples taken.
- Save reports as Portable Document Format (PDF) files.
- Save your data for historical data review.

LIQUID SAMPLER Specifications

Size Ranges:	1.0 - 50.0 μ m; 1.0 - 200.0 μ m
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 22.2 x 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% non-condensing

Table 2-1 Specifications

The manufacturer recommends that your Lighthouse instrument be 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 **LS-20 Liquid Sampler System** has been thoroughly tested at the factory and includes a sample beaker and sample tubing for your convenience. Please review and perform **LS-20** set up and configuration as outlined in the **Read Me First** document enclosed in the shipping container and included on the CD.

Unpacking

It is presumed that, when the product was received, the shipping container was inspected for damage and that any container damage was reported to the shipper immediately. If the container appeared to be undamaged, the **LS-20** sampler and **Control Unit** were carefully inspected for broken parts, scratches, dents and other damage before use. Damage of the product shall be reported 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.

Return Shipping Instructions

Should it become necessary to return the **LS-20** or its Control Unit to the factory for any reason, contact Lighthouse Customer Service or visit our web site, www.golighthouse.com/rma, and obtain a Return Merchandise Authorization (RMA) number. Reference this number on all shipping documentation and purchase orders. After receipt of the RMA number, follow the shipping instructions on page 3-2.

Note: *Whenever the LS-20 must be returned for servicing, the Control Unit must accompany it.*

WARNING: *If the sampler is damaged during a return shipment due to inadequate user packing, the warranty may be voided and all repairs may be charged to the customer.*

Shipping Instruction Details

1. Use the original containers, nozzle caps and packing materials whenever possible. If your instrument contains a battery, remove it before packing the instrument. If the battery needs to be shipped, package it separately and refer to www.golighthouse.com/rma for detailed instructions.
2. If the original 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 wrapping the product in “bubble pack”, surrounding with shock-absorbent material and placing in a double-wall carton may work as substitutes. The instrument should not rattle around when the carton is vigorously shaken. If the instrument is damaged during shipment due to inadequate user packing, the warranty may be voided and all repairs required billed to the customer.
3. Seal container securely. Mark “FRAGILE” and write the Return Merchandise Authorization (RMA) number on any unmarked corner.
4. Return the instrument to the address provided by your Lighthouse representative or the RMA website.

Setup Requirements

The *LS-20* system includes a *Control Unit*, which has the operating software installed and pre-configured - no software installation or set up (other than run settings) is required.

Computer Required

The *LS-20* is supplied with a pre-configured *Control Unit*. All functions are controlled by the *Control Unit* running the *LS-20* Software.

Each time the program starts, a new data storage file is created and count data is recorded into this continually updated file. A report is generated at the end of a count run. Each file will have a unique name based on the current date and time.

WARNING: *Do NOT change the Control Unit's default printer from the PDF Writer or reports will not be generated.*

Printer Setup

The System, as shipped, has PDF Writer as the **Default Printer** and generates reports in PDF file format - this must not be changed or the reports will not be generated. Contact your IT department to set up a network printer. Use the printer manufacturer install program to set up a local printer. Do NOT set either as the default printer.

Running the LS-20 Software

The program starts automatically when the *Control Unit* is started or the user may use Programs | Lighthouse Worldwide Solutions | LS-20 | LS-20 icon to run from the Start menu.

Sampler Set Up

WARNING: To extend the LS-20's laser life, power the sampler OFF during periods of inactivity.

Figure 3-1 and Figure 3-2 illustrate a successful program startup screen. From this screen, the operator performs the following operations:

- Log onto program
- Select COM Port, change syringe size, check sensor status or change data format
- Load and edit recipes
- Start or Stop sampling
- Flush the sensor
- View data
- Raise and lower the platform
- Change Stirring speed

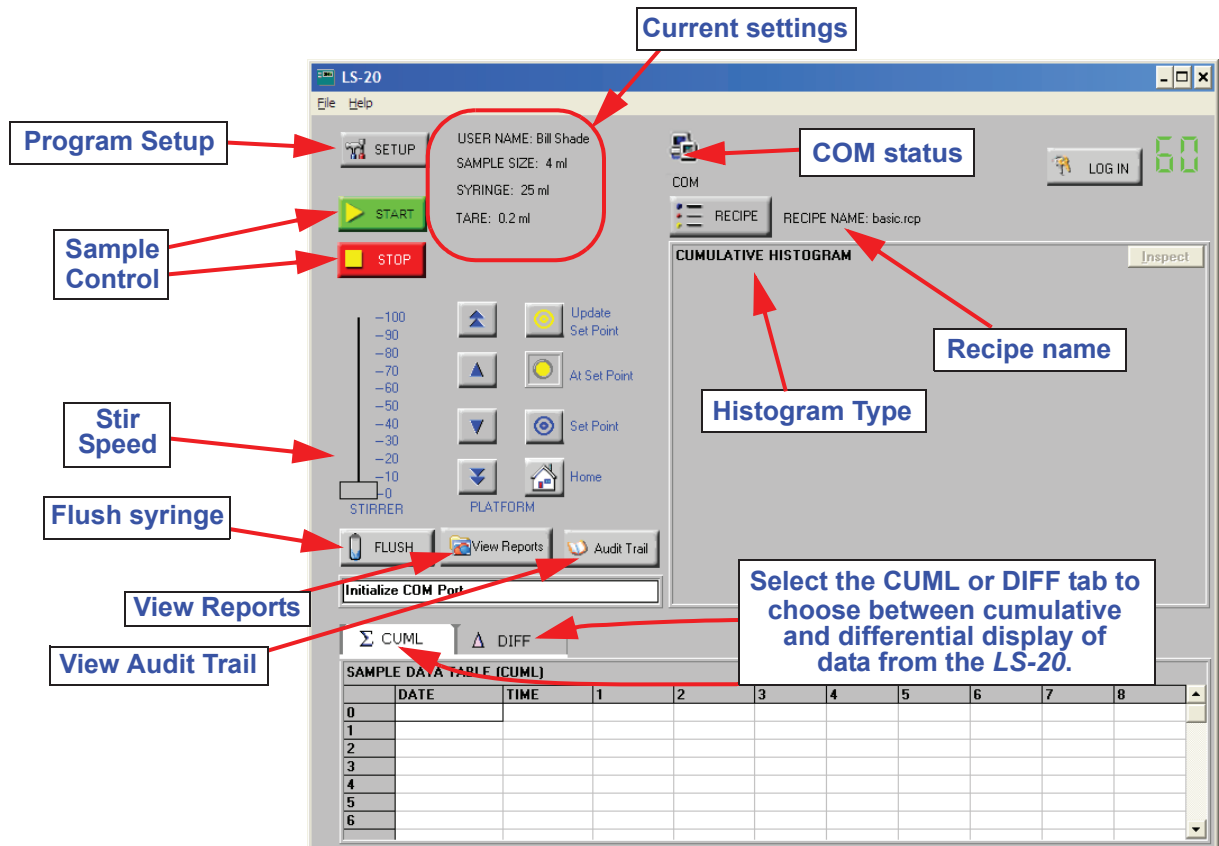


Figure 3-1 Program Start Screen View 1

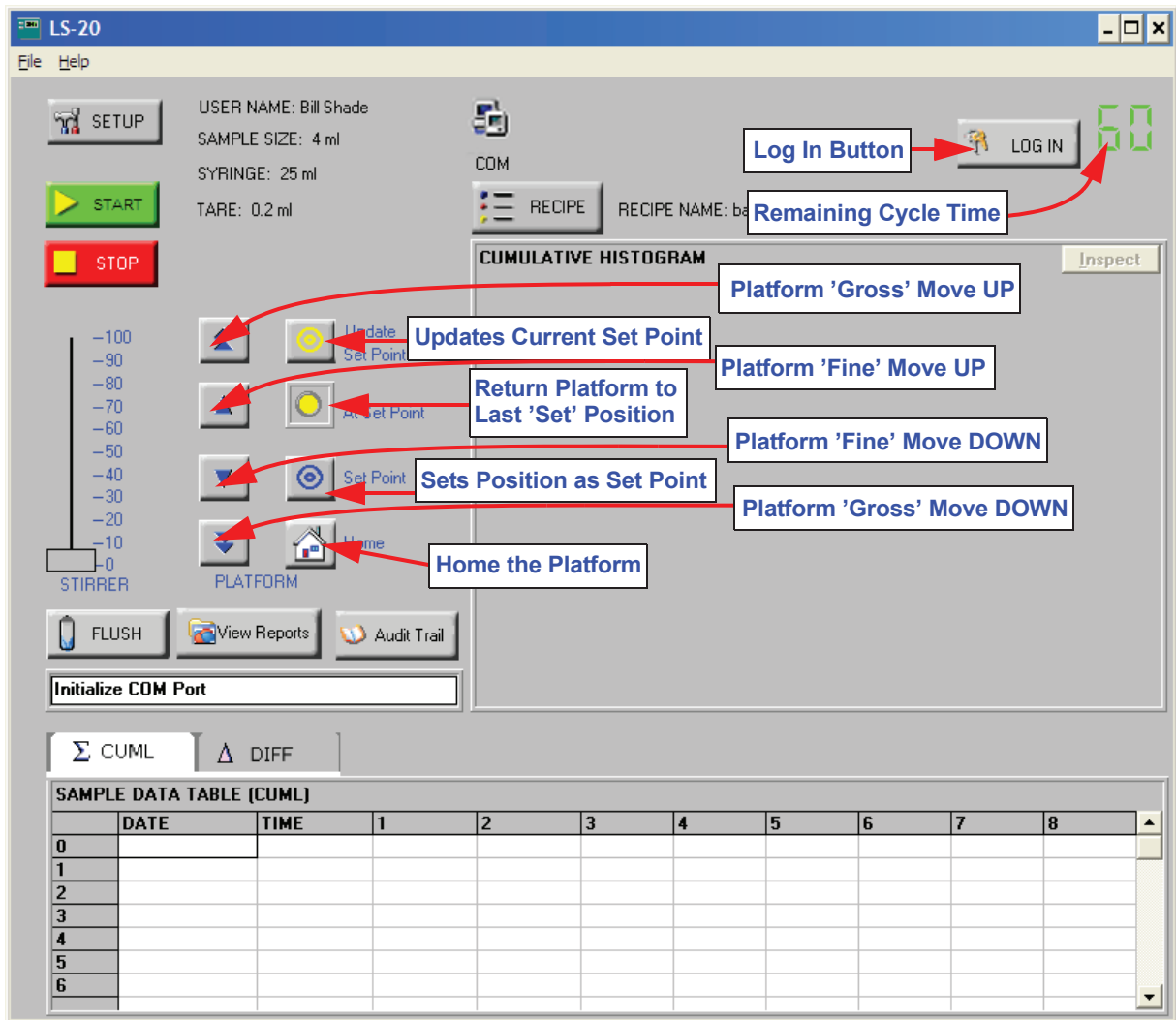


Figure 3-2 Program Start Screen View 2

Note: *The sampler power switch should be switched OFF during periods of non-use.*

Each of the screen sections and buttons will be discussed in the order they will likely be used when the Control Unit is first powered on.



SETUP Menu

Clicking this button displays the SETUP Screen. Depending on the class of user logged on, the ICONS displayed will be different. Figure 3-3 shows the Administrator Setup screen, Figure 3-4 shows the Maintenance Setup screen and Figure 3-5 shows the User Setup screen.

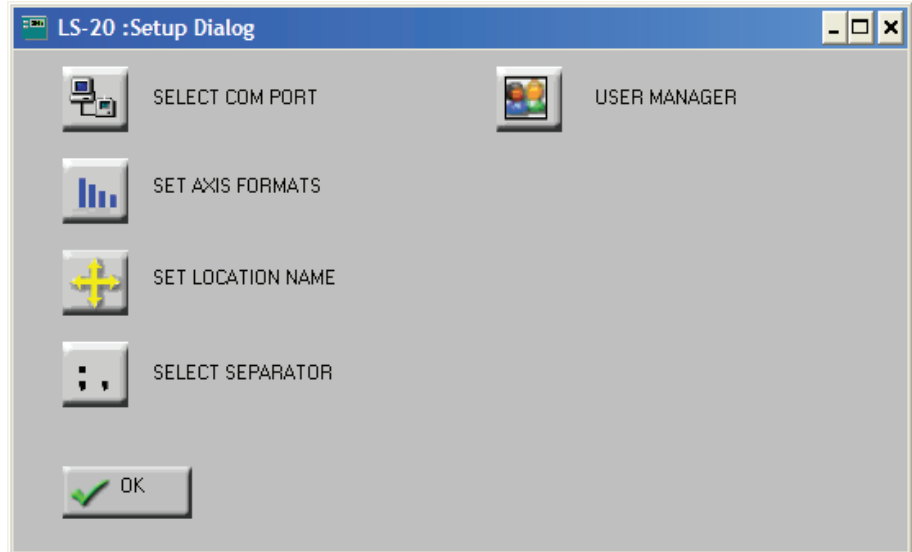


Figure 3-3 Administrator Setup Dialog Screen

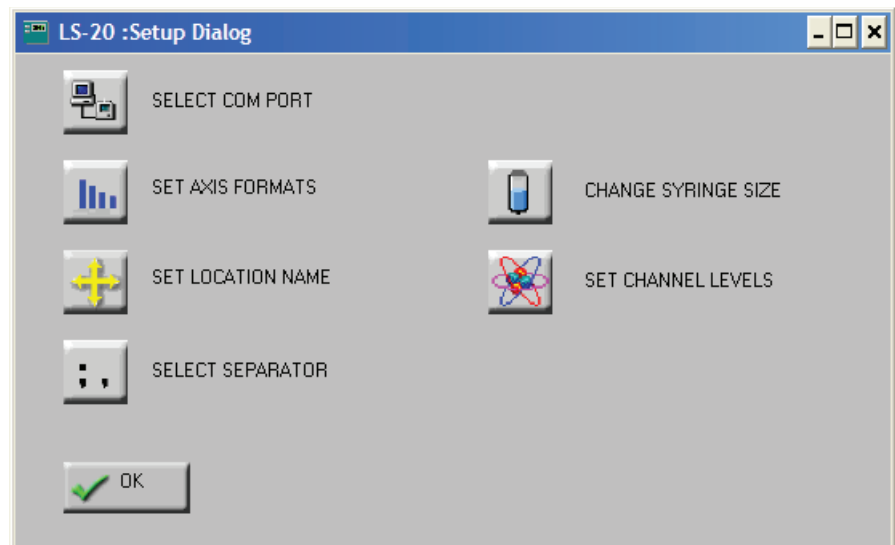


Figure 3-4 Maintenance SETUP Dialog Screen

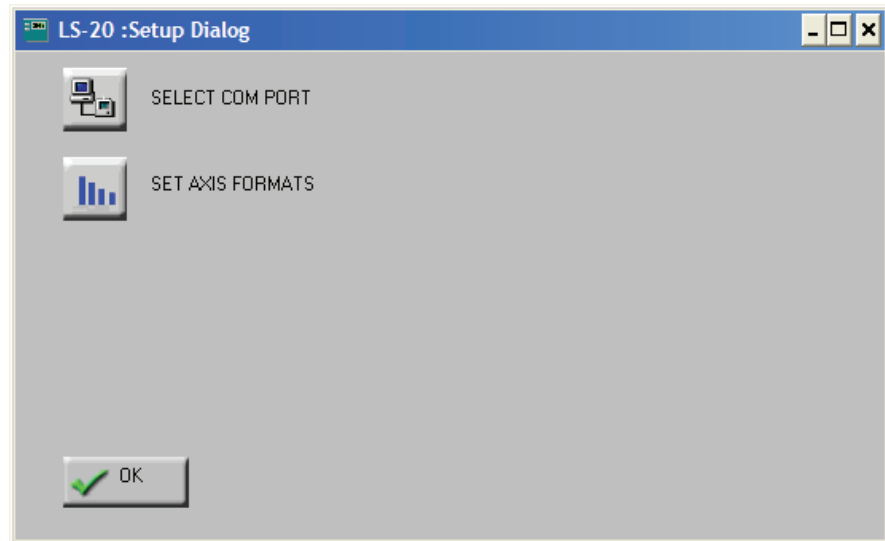


Figure 3-5 User SETUP Dialog Screen

All SETUP screen buttons will be explained but the buttons that will be displayed will depend on the user logged onto the system.



SELECT COM PORT

WARNING: *Do NOT set the COM port to '3' or a conflict will result between the touchpad and instrument. This is a factory setting that should not be changed except when advised by Lighthouse support personnel.*

This is a factory setting and should not be changed by the end-user unless there is a communication conflict or the adapter cable or *Control Unit* is changed. The button allows changing of the COM port and uses COM addresses of 1 through 9.



Figure 3-6 COM Port Dialog Screen



SET X-AXIS FORMAT

This button enables changes to the format of the data displayed on the Histogram screen (see Figure 3-7).

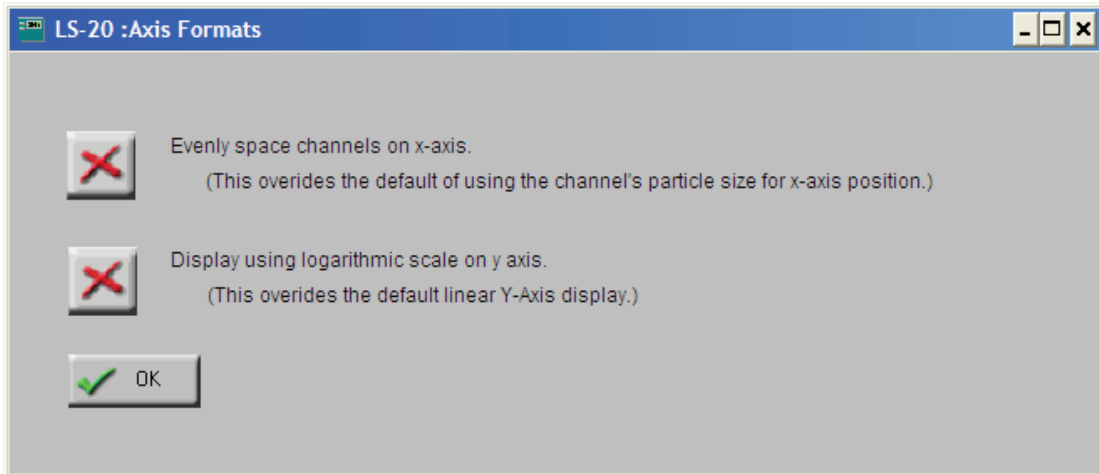
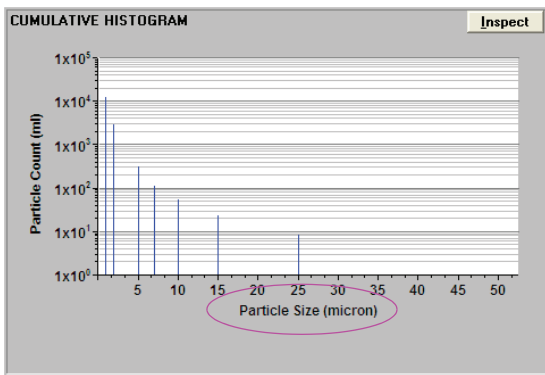


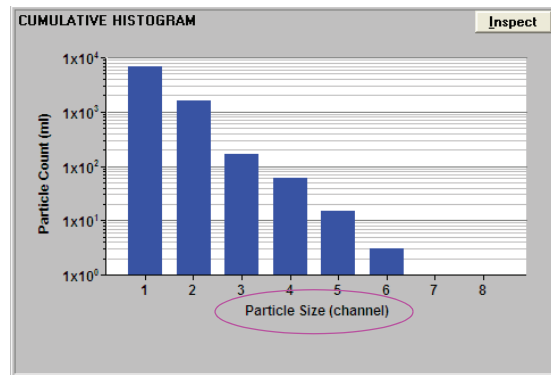
Figure 3-7 X-Axis Setting Screen



Clicking the button will change its state from a red X (disabled) to a green check mark (enabled) and vice versa. Clicking the OK button will save the settings and return the user to the SETUP Menu. The two screens are compared below:



X-Axis disabled



X-Axis enabled

Figure 3-8 Histogram Screen X-Axis Comparison



INSPECT

The Inspect button becomes active when data is displayed in the histogram window and allows capture of that data. From the new "Copy" window, the contents may be viewed, printed or copied to the Clipboard application, as shown in Figure 3-9.

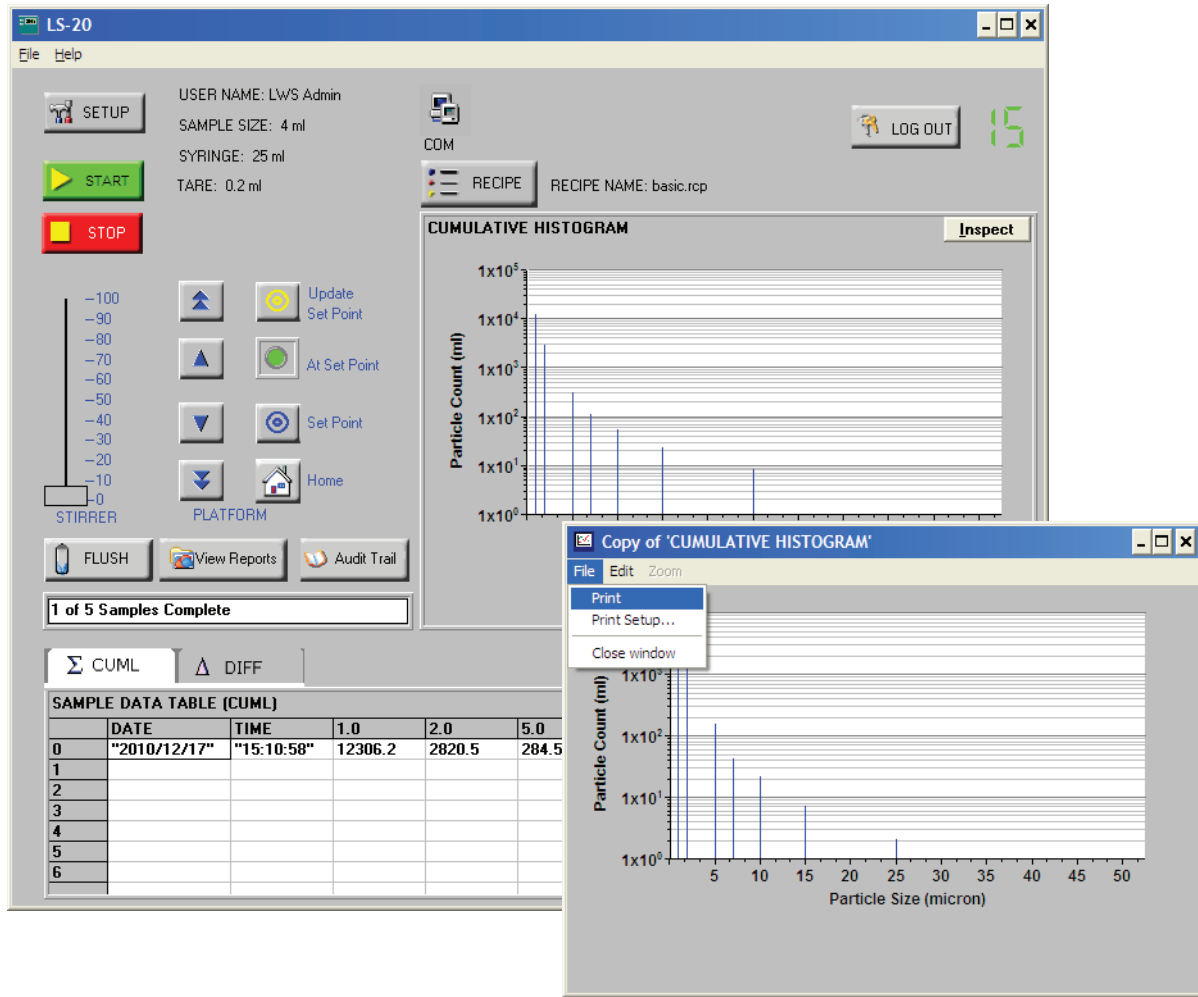


Figure 3-9 MAIN Screen With INSPECT Window active



CHANGE SYRINGE SIZE

This button allows the operator to change the syringe between two sizes - 10 and 25 ml. The following screens appear:

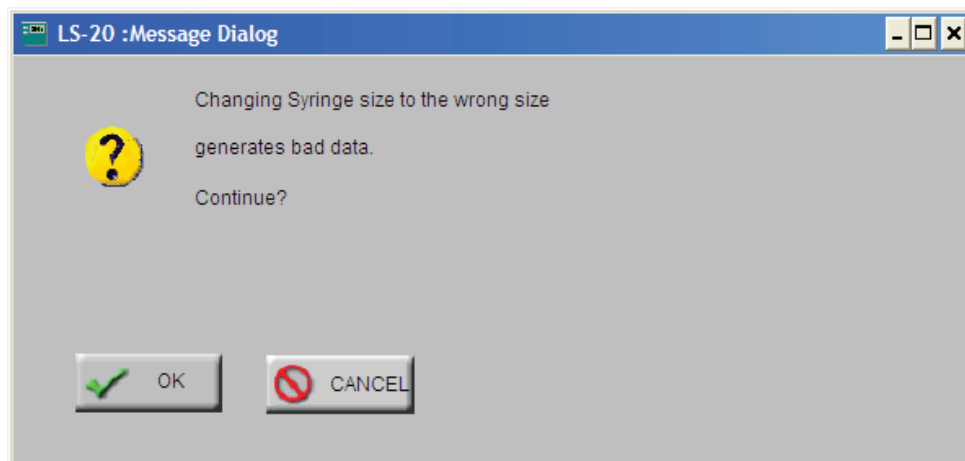


Figure 3-10 Syringe Change Warning Screen

Click OK to acknowledge and proceed or Cancel to return to the SETUP screen.

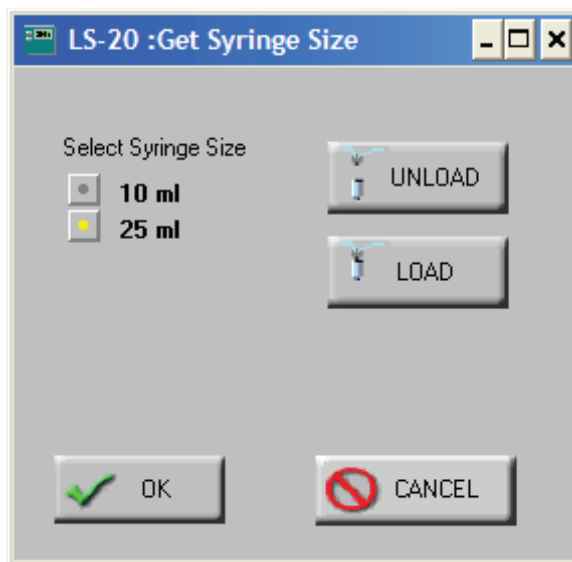


Figure 3-11 Get Syringe Size Screen

Select the size by clicking on the square next to the desired size. Clicking the OK button will return to SETUP screen, make the change in the software settings and update the sampler.



UNLOAD

This button enables removal of the syringe by moving 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.



LOAD

This button brings the plunger all the way back up to its 'home' position and then cycles it through the reset sequence.

Click the OK button to return to the SETUP screen after confirming that the size is correct. Cancel will cancel the operation and return to the SETUP Dialog Screen.



SEPARATOR

Changes the character used to separate data fields in exported data.



When exporting the file in a csv format, this button sets the data field separator as a comma. This supports US comma-delimited reporting through programs such as Microsoft™ Excel®.



This button sets the data field separator to a semicolon as used in Europe.



SET LOCATION NAME

This enables setting a name for the *LS-20* as a "location" name, such as "Chem Lab", that can be useful in reports. Figure 3-12 illustrates the default naming scheme (numbers) shown when first opened.

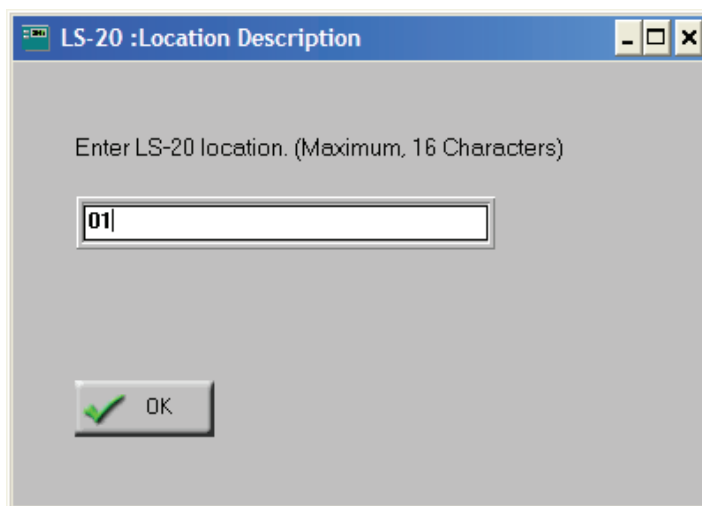


Figure 3-12 Location Description Window



SET STIRRER LIMITS

This button opens the window shown in Figure 3-13. Setting the stirrer limits prevents over-agitating and possibly foaming the sample, which may cause false counts.

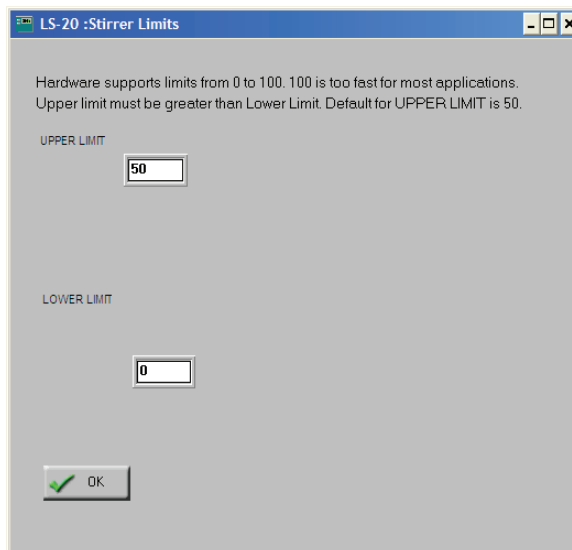


Figure 3-13 Stirrer Limits Screen



USER MANAGER

This button opens the window shown in Figure 3-14. The factory-set default Administrator user name is LWS and password is LWLWS; user name and password are case-sensitive.

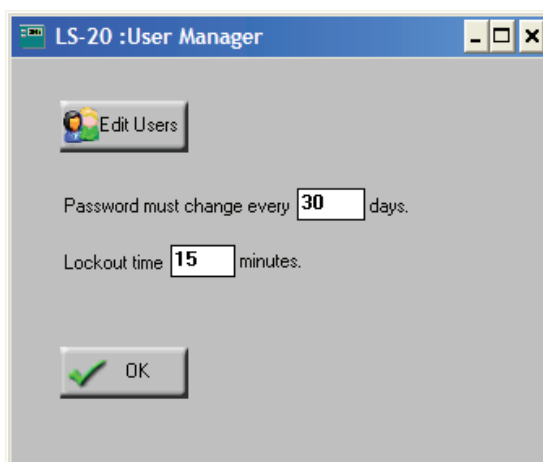


Figure 3-14 User Manager Screen

Password must change every allows setting a value from 0 to 9999 days, where 0 is OFF and the user passwords never need changing. Passwords that change periodically help to prevent compromise of a system's security.

Lockout time (in) minutes sets the “idle” time before the user must log back in using their password. Click OK to close this dialog screen, save the settings and close the dialog box with no further action. If a user needs to be added or their account needs to be changed, proceed to **EDIT USERS**.



EDIT USERS

This button puts the administrator into the Edit Users screen:

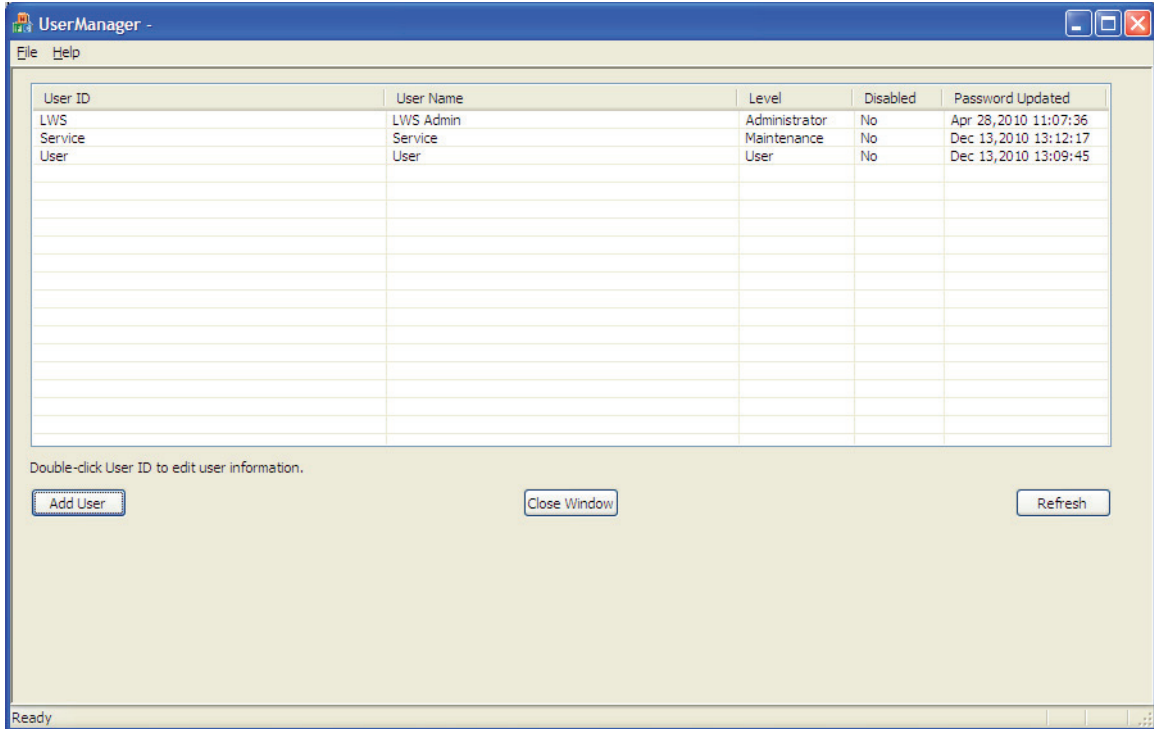


Figure 3-15 User Manager Screen

To edit an account, double-click **User ID**.

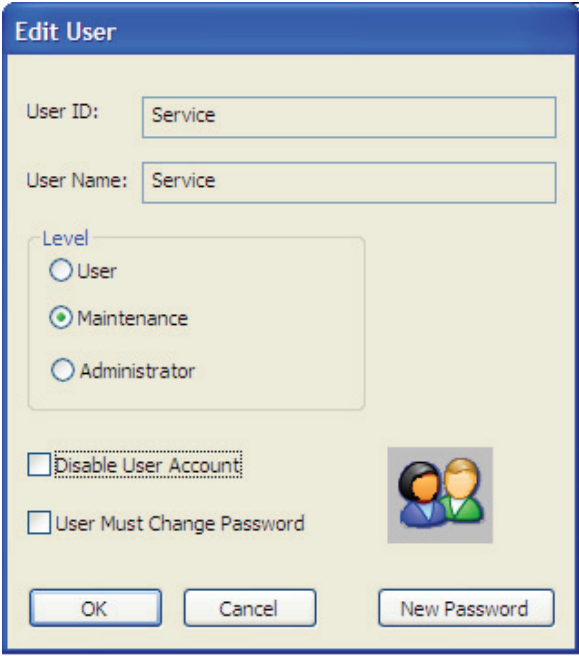


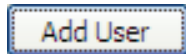
Figure 3-16 User ID Edit Screen

The **User ID** may not be changed or deleted, only disabled. The security level assigned and the account password may be changed at this screen.

Checking the **Disable User Account** immediately disables the user account.

Checking the **User Must Change Password** checkbox will require the user to change their password at the next log in.

Clicking the **New Password** button will allow changing the password from this screen.



ADD USER

Opens the Add User Screen (Figure 3-17). Select **User**, **Maintenance** or **Administrator** for the **Level** and type the **User ID** (log on ID), **User Name**, a six-character user **Password** (twice) and click OK. The **User ID** does not have to match the **User Name**. The **User ID** and **Password** are case-sensitive so typing a capitalized **User ID** requires the user to duplicate the capitalization.

 A screenshot of the "Add User" dialog box. The dialog has a blue title bar with the text "Add User". Below the title bar are four text input fields: "User ID:", "User Name:", "Password:", and "Retype Password:". Below these fields is a "Level" section with three radio button options: "User" (which is selected), "Maintenance", and "Administrator". To the right of the radio buttons is a small icon of two people. At the bottom of the dialog are two buttons: "OK" and "Cancel".

Figure 3-17 Add User Screen

When the user logs in for the first time, the program may require the password be changed. The same password may be reused if desired.

The security **Level** of **User** (Figure 3-5) is limited to working with sampling, only. The **Administrator** level (Figure 3-3) may make changes to program settings and add users. The **Maintenance** level (Figure 3-4) has access to *LS-20* "maintenance" functions, such as changing the syringe.

Recipes

Recipes contain the parameters used during sampling, such as sample size, prime amount and alarm thresholds and can be opened, edited and saved to meet different sampling requirements. They are saved with the rcp file extension.



RECIPE ACTION SCREEN

This button opens the Recipe Screen (Figure 3-18).

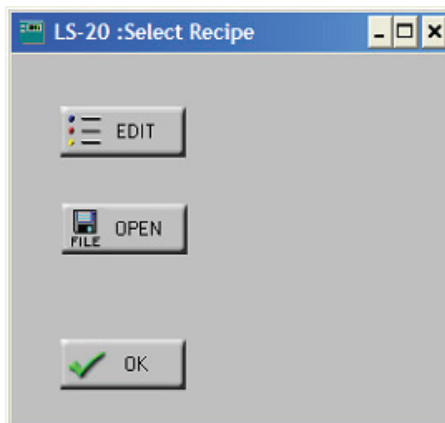


Figure 3-18 Select Recipe Dialog Screen



OPEN

This button shows recipe files that have been saved in the default folder, C:\LS20\Recipes. Basic.rcp is the file opened when the software starts and the file to which the software saves the current settings when it shuts down.

It is suggested that, if changes need to be made, that they be saved prior to sampling. **OPEN** only opens a recipe.

To edit a file, the **EDIT** button must be used and the recipe saved as the same filename or as a different filename to make it unique.

An exception to the save option is the SystemDefault.rcp file - it is a copy of the basic.rcp and may be opened and saved as basic.rcp if the original file gets damaged, deleted or needs to be reset to factory defaults. It cannot be re saved as the same filename.

Contact Lighthouse Technical Support for additional information.



EDIT

The **EDIT** button acts on the currently active recipe. Editing a recipe displays Figure 3-19:

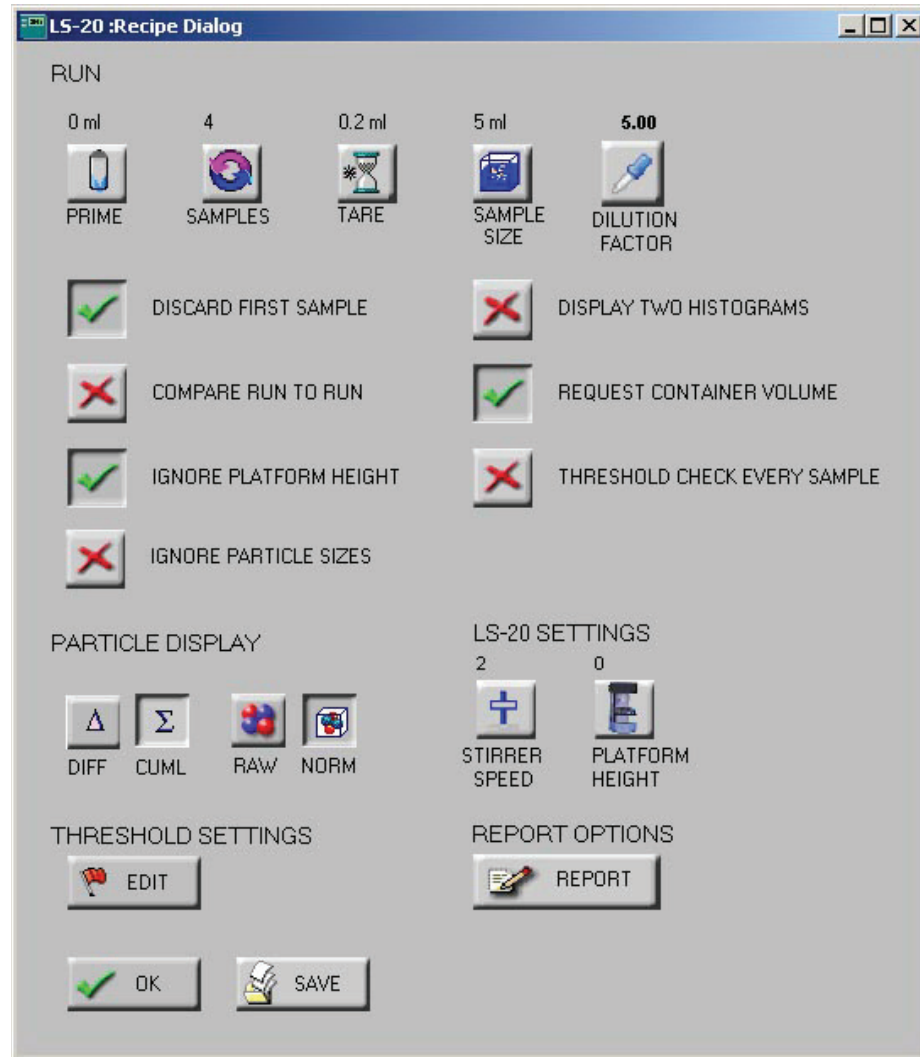


Figure 3-19 Recipe Dialog Screen

The settings shown in Figure 3-19 are program defaults.



PRIME

This sets the quantity of liquid run through the sensor to be discarded. This action clears air bubbles from the sensor and is also intended to purge the sensor of previous sample residues. If the input tube is less than 10 inches long, a Prime value of 1.0 ml will clear the previous sample. 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. It is intended to empty the sensor of the liquid from previous samples.



SAMPLES

The SAMPLES button specifies the number of samples to be taken during the test cycle. The default value is 5.



TARE

The TARE button allows changing default value in the software of 0.2 ml; it should not be changed unless instructed by Lighthouse Technical Support. TARE is added to each syringe cycle, during which counting does not take place. TARE volume is ignored and not counted at the beginning of every syringe of liquid.



SAMPLE SIZE

This button allows changing the volume of the sample in ml from the default value of 4 ml. Counting takes place on this volume of liquid.



DILUTION FACTOR

This is the ratio of fluid added to the sample for dilution. Values from 1 to 99.99 may be used, where a value of '1' means the sample has not been diluted. See Figure 3-20.

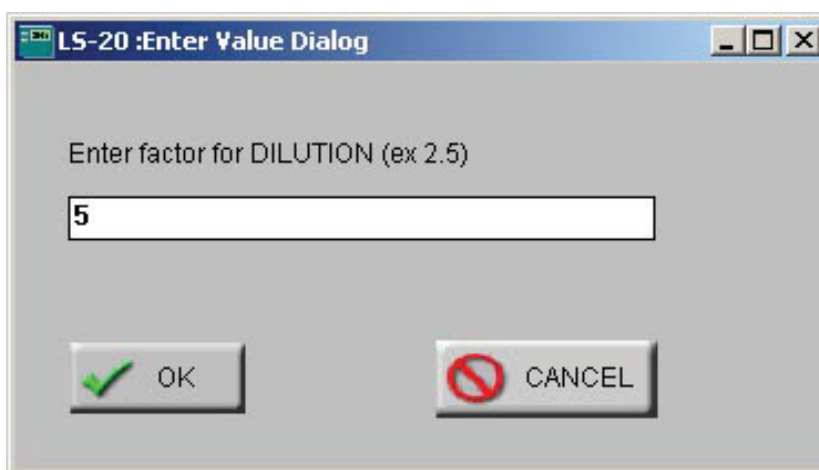


Figure 3-20 Dilution Value Entry Box

DISCARD FIRST SAMPLE

The default setting for this is “enabled” so that the first sample gets discarded and not used in the count process. The sensor will be on but the software does not display the first sample’s data or use it in calculations. The Prime value should be set to 0 (zero) when DISCARD FIRST SAMPLE is enabled.

COMPARE RUN TO RUN

This enables a Run-to-Run comparison of the data.

IGNORE PLATFORM HEIGHT

This causes the software to ignore the platform’s height, which enables the user to place samples on the platform that do not need to be raised, such as the beaker has no detection ring or samples are all the same size and ignoring the height saves time.

THRESHOLD CHECK EVERY SAMPLE

When enabled, the sensor alarm thresholds are checked after each sample’s counts have been read and processed. If thresholds are exceeded, the alarm icon appears next to the COM status on the MAIN screen.

DISPLAY TWO HISTOGRAMS

Shows Counts by Channel and Size on MAIN screen for comparison.

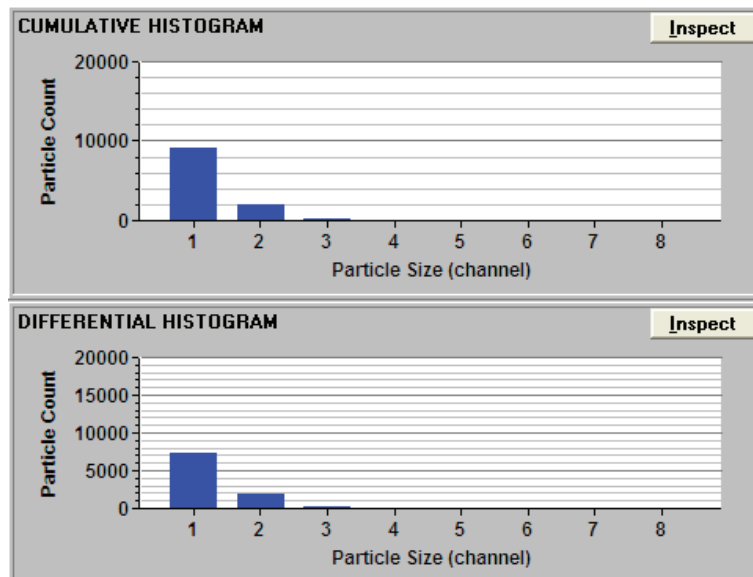


Figure 3-21 Cumulative and Differential X-Axis Evenly Spaced

REQUEST CONTAINER VOLUME

This setting causes the program to prompt the user for the sample container volume prior to sampling and include the label in reports.

PARTICLE DISPLAY



DIFF/CUML

The sampler generates cumulative data. Particle size data for a specific channel contains counts for that size and larger. Selecting differential will only display counts for each particle size and not sum the counts of higher particle sizes. These buttons select between the two.



RAW/NORM

RAW data is particle counts for a specific channel size. NORMalized data is particles per milliliter. These buttons switch between the two.

LS-20 SETTINGS



STIRRER SPEED

The user can configure and save a desired stir speed for a specific liquid as parameter of a recipe. From the Main window, change stir rate, then edit recipe and click the **STIRRER SPEED** button at the Recipe Dialog screen. The screen setting may not change, but saving the recipe will save the stir speed.

When the user opens that particular recipe, the stirrer will begin stirring at the recipe stored speed. The default value is 0.



PLATFORM HEIGHT

This sets the platform height. If a recipe requires a specific size beaker, the height can be set to a height that prevents the beaker from being jammed and shattered. When the recipe is run, the platform will raise to the saved height. The edge-detect will override a height that could result in a shattered beaker if the beaker has an opaque edge guard, such as those supplied by Lighthouse.

THRESHOLD SETTINGS



EDIT

This button allows editing of the Alarm thresholds (Figure 3-22). Enter the particle count the sampler will use for triggering an alarm. The channel sizes displayed are factory-configured for the Sampler.

WARNING: *Changes to the threshold voltage for a given channel may prevent the Sampler from alarming on that channel.*

For enabled Particle size channels, enter a minimum and maximum value for the alarm. Use zero if a minimum value is not desired. Do not change channel voltages for channels that are used in recipes. To verify that a recipe's thresholds have not been changed since the creation of that recipe, OPEN then edit the recipe and check the threshold values.

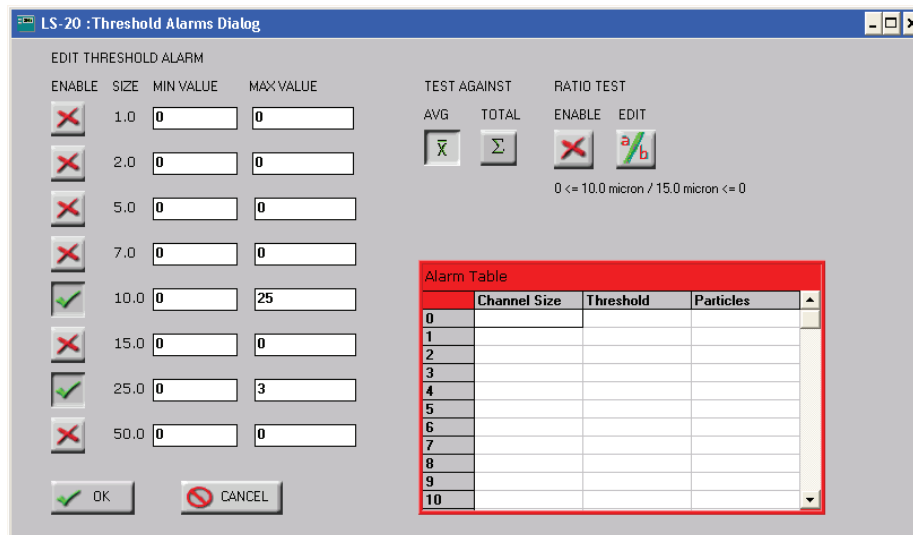


Figure 3-22 Threshold Alarms Dialog Screen



AVG or TOTAL

Select **AVG** to compare to the run's average counts per sample.

Select **TOTAL** to compare to the run's total counts per sample.



RATIO TEST

Enable **Ratio** tests to perform ratio of counts tests. The **EDIT** button allows editing of the test parameters, as shown in Figure 3-23.

Editing RATIO TEST Parameters

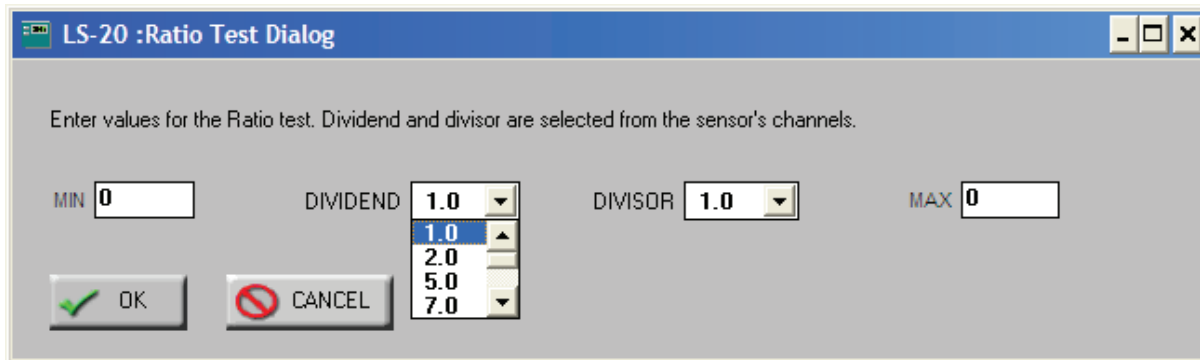


Figure 3-23 Ratio Test Dialog Screen

Editing allows changing the values in **MIN**, **DIVIDEND**, **DIVISOR** and **MAX**. Use the **ENABLE** button to use the test definitions. When **OK** is clicked, the equation that will be used appears below the **ENABLE** button.

Click **CANCEL** to return to the previous screen without making any changes.

REPORT OPTIONS

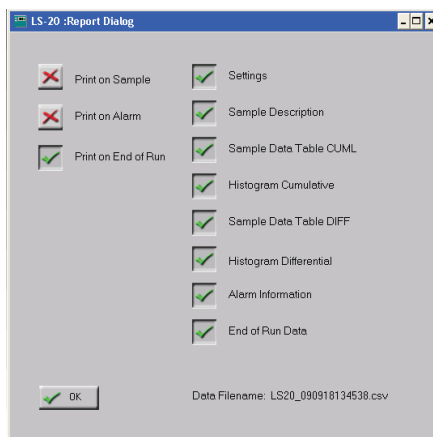


Figure 3-24 Report Dialog Screen

PRINT ON SAMPLE

This choice prints every time a sample is taken.

PRINT ON ALARM

This choice prints whenever an alarm condition occurs.

PRINT ON END OF RUN

This choice prints at the end of a sample run, rather than every time a sample is taken.

DATA AVAILABLE TO REPORTS

Settings

Includes the LS-20 settings in the reports

Sample Description

Includes the Sample Description, if any.

Sample Data Table CUML

Includes the Sample Data Table in CUML mode.

Histogram Cumulative

Includes the data Histogram in Cumulative mode.

Sample Data Table DIFF

Includes the Sample Data Table in Differential mode.

Histogram Differential

Includes the data Histogram in Differential mode.

Alarm Information

Includes any alarm data.

End of Run Data

Includes End of Run data.

Click the **OK** button to close the dialog screen and return to the Edit Recipe screen.



SAVE

The **SAVE** button saves the recipe settings and will prompt for a filename. Basic.rcp file will be overwritten every time the software exits. Saving as a different filename preserves unique settings but will not preserve Basic.rcp.

The recipe can be saved under a different folder, if needed. Doing so, however, will prevent the recipe from “automatically” being seen when the **OPEN** button is clicked, which normally views the *C:\LS20\Recipes* folder.



FLUSH and DONE

The **FLUSH** button runs a non-counting cycle that will continue until the **DONE** button is clicked. This allows the user to clean the *LS-20* of impurities that may have become lodged within the sensor body. Use purified water as a starting point for flushing as this usually resolves counting issues. If not, using purified salt water will. Click the **FLUSH** button to start the flush and the **DONE** button to end it.

WARNING: *Do NOT activate the FLUSH sequence if the sample tube has been removed, the output tube is disconnected or loose, or if there is no suitable flushing liquid available to be pumped through the sensor.*

Heed safety guidelines while handling the sample tube, beakers and output tube at all times. Do NOT flush sensor with caustic or corrosive chemicals - flush only with DI water or purified salt water as required.

If counting errors cannot be resolved by flushing with DI water two or three times, cleaning with the purified salt water solution is required, followed by another DI water flush. If this does not resolve the issues, contact Lighthouse Technical Support at 1-800-945-5905 or 1-541-770-5905 for calling from outside of the USA.

Backing Up System Data

As with all computers, regular backups are critical. Should the system “crash”, become damaged and data is no longer accessible or data files become corrupted for whatever reason, a data backup is the only tool that can restore lost data. When a system computer has to be replaced or its hard drive wiped, the ability to restore its data is invaluable.

To back up the LS-20 system data and settings, make sure the LS20 program is not running then copy the *C:\LS20* folder to another destination, such as a Flash drive, USB CD-RW or external USB hard drive.

Restoring the System

If you have received a System Recovery disk, store it in a safe place. When this disk is used, ALL data on the system will be erased and the system restored to its original as-shipped condition. Your data will still have to be restored to continue as if nothing had happened.

The System Recovery disk must be used to boot the system, which requires a **USB DVD** drive, to perform a full restore of the system's original as-shipped state.

WARNING: *The System Recovery disk will erase ALL data - make sure a proper backup of your data has been performed **BEFORE** continuing the process. There is **NO** recovery from this operation once it is started.*

1. Have the disk in the drive prior to turning the Control Unit on.
2. As the system is booting, it displays the message to press <F12> to change boot order - press <F12>.
3. From the displayed list, choose the USB DVD drive by moving the highlight bar to that choice and pressing <Enter>.
4. The system will boot from the disk and prompt for your choice to restore the system to original as-shipped condition and will warn that the action will erase all data. Accidental erasure of the system has no inexpensive recovery process - proceed with care.

Count data that has not been backed up will be permanently erased.

WARNING: *Failure to heed warnings regarding data erasure prior to a system restore that results in data loss is not the responsibility of Lighthouse Worldwide Solutions and is not covered by the warranty. Recovery of client data from a system that has been restored to the factory state is not the responsibility of Lighthouse Worldwide Solutions and is not covered by the warranty.*

Changing the Syringe

WARNING: *When a change of the syringe size must be performed, the Liquid Sampler must be power-cycled to load the new parameters. If this is not done, accurate data counts cannot be guaranteed.*

To perform this operation, from the **MAIN** screen, click the **SETUP** button, **CHANGE SYRINGE SIZE**, then the **UNLOAD** button.

Syringe Removal

Figure 3-25 illustrates the syringe and valve body parts.

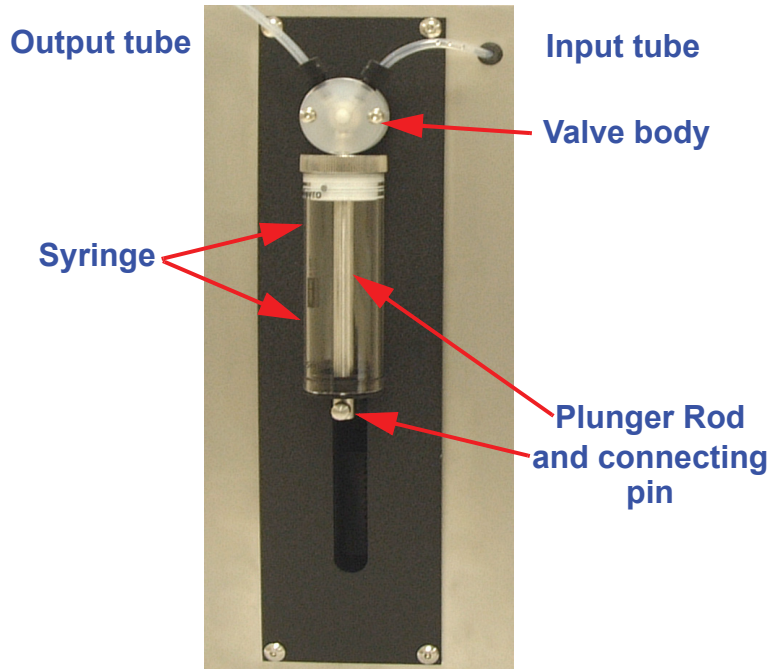


Figure 3-25 Syringe and Pump Detail

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.



UNLOAD

This moves the syringe activator to the bottom of the syringe, allowing the syringe to be removed. 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.



Figure 3-26 Removing Syringe Mounting Pin

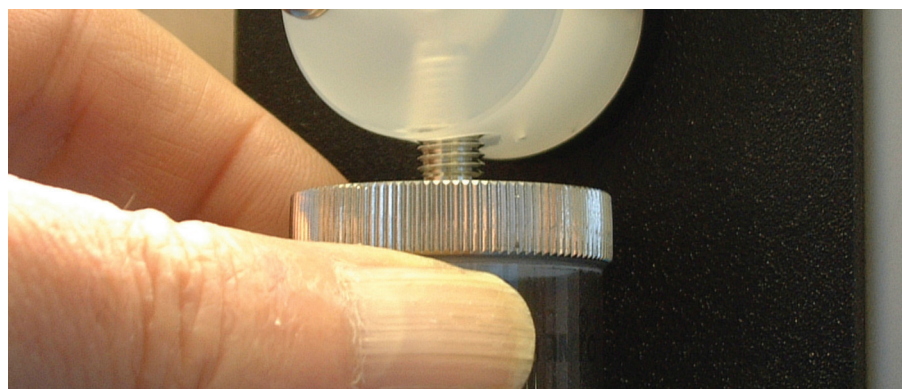


Figure 3-27 Unscrewing Syringe Cylinder

Carefully unscrew the syringe cylinder from the valve body in a counter-clockwise 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.

WARNING: *Extreme care must be taken to prevent cross-threading while installing the syringe. Failure to heed this warning may cause irreparable damage to the valve body and void the warranty.*

Syringe Install

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 in Figure 3-28. 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.

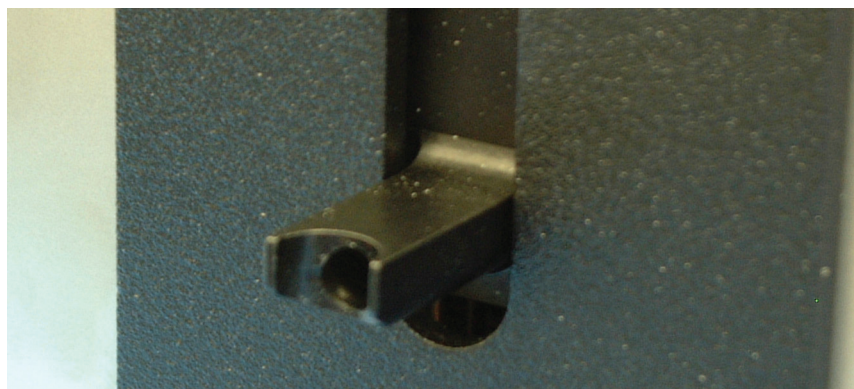


Figure 3-28 Actuator Arm Detail



Figure 3-29 Plunger Rod and Actuator Arm Detail

Installing the replacement syringe requires the same or greater level of care as that required for removal.



Figure 3-30 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 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.



LOAD

After the syringe replacement, this 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 back up to zero itself.

Running a Sample

After the *LS-20* system is readied for operation with a default recipe set up, prepare a sample to be run. Use the supplied Pyrex glassware or a comparable container. Make sure that the top edge has a light-blocking material added to signal the sensors where the container edge is.

Place the stirrer into the sample and place sample tube into the container. Put the container onto the sample platform. If the end of the tube is not fully submerged in the liquid, raise the platform by using the Gross or Fine platform movement arrows (refer to Figure 3-31).

If the stirrer speed is not set up in the recipe, move the slider to a desired position. Make sure the speed does not create bubbles or excessive turbulence. Click the Start button.

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

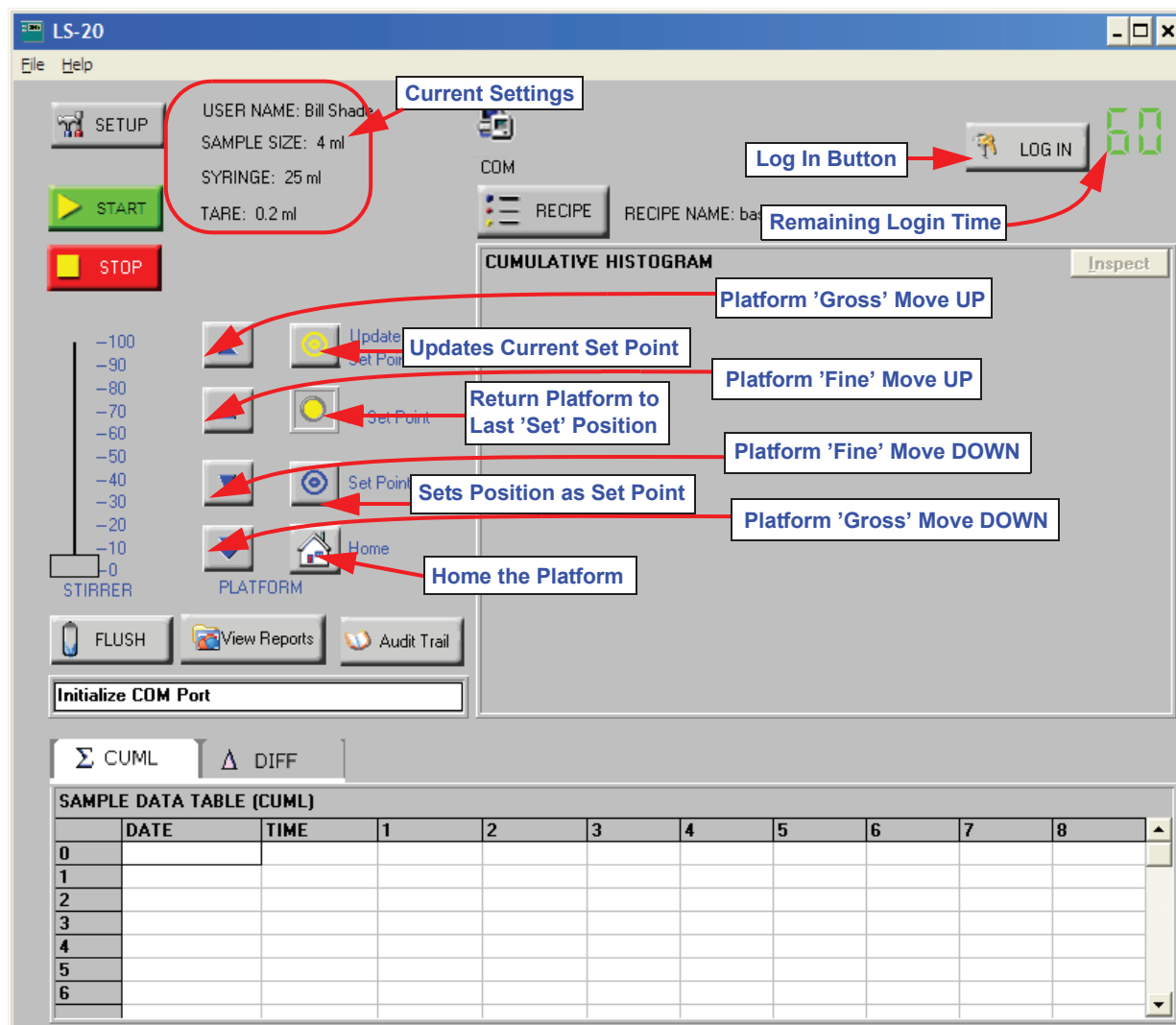


Figure 3-31 Software Main screen

Sample Tube Handling

Handle the Sample Tube carefully to prevent touching the portion of the tube that will be immersed in the sample. Contaminating the tube will invalidate the counts. To move the end of the sample tube out and allow placement of a beaker on the platform, press the tube outward at the top-most point near the ferrule nut. This will cause the tube to deflect outwardly and allow removal or placement of a beaker. Take care to not bend the tube so as to kink it or it will have to be replaced.

Replacing the Sample Tube

Refer to Figure 3-32. The *LS-20* sample tube may be removed by carefully unscrewing the ferrule nut and firmly pulling straight down on the tube. It may require a slight side-to-side motion to dislodge it from the fitting.

WARNING: *Care should always be exercised when handling the sample tube. Avoid touching the area of the tube that may come in contact with the sample or the sample will be contaminated.*

Install the new tube being careful to not over-tighten the ferrule nut - this can strip the threads, requiring replacement of the nut. Be careful to not cross-thread the ferrule nut or it will need to be replaced.

Run a **FLUSH** cycle with purified water and a normal count sample.

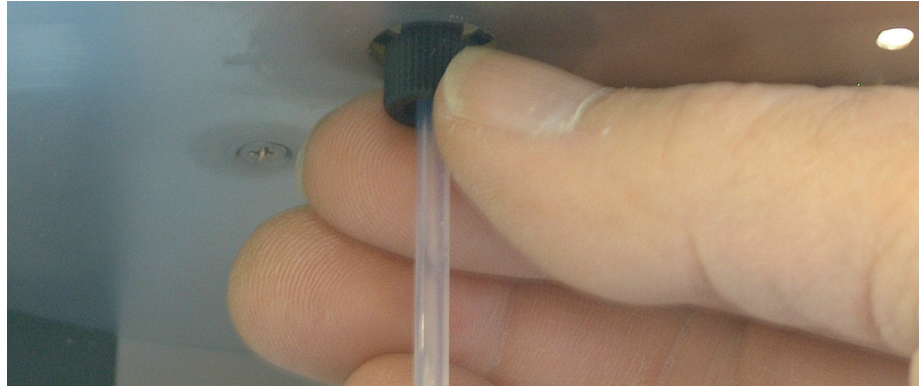


Figure 3-32 Loosening Sample Tube Ferrule Nut

Cleaning the Sensor

Cleaning the sensor is performed whenever counts appear to be unusually low, or zero, in the smaller channel sizes; verify that channel voltages have not been adjusted so that counts are disabled.

Run Sample Using Purified Water

Run several samples, if needed, using purified water and the **FLUSH** function. This helps to clear the Sample tube of contaminants that may have collected within the tube and sensor. Run a normal sample and check for pass or fail. If the system passes, return the *LS-20* to operation.

If it doesn't pass, try up to five **FLUSH** runs, each with a normal count, until a clean run is achieved. After a successful normal count, return the *LS-20* to service.

Run Sample Using Purified Salt Water

If, after five **FLUSH** runs, normal counts continue to fail, replace the sample solution with purified water and 20% salt mix. Run two **FLUSH** samples with this solution followed by two runs of purified water. Run a normal count and if it fails, try one more cycle in this manner. If the *LS-20* passes the normal count, return it to service. If the *LS-20* still fails, contact Lighthouse Technical support.

A 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. The length of warranty for pumps in hand held Liquid Samplers is one (1) year. Batteries and accessories with all products are warranted for one (1) year. Control Unit carries a one-year warranty. 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 COMMERCIALY 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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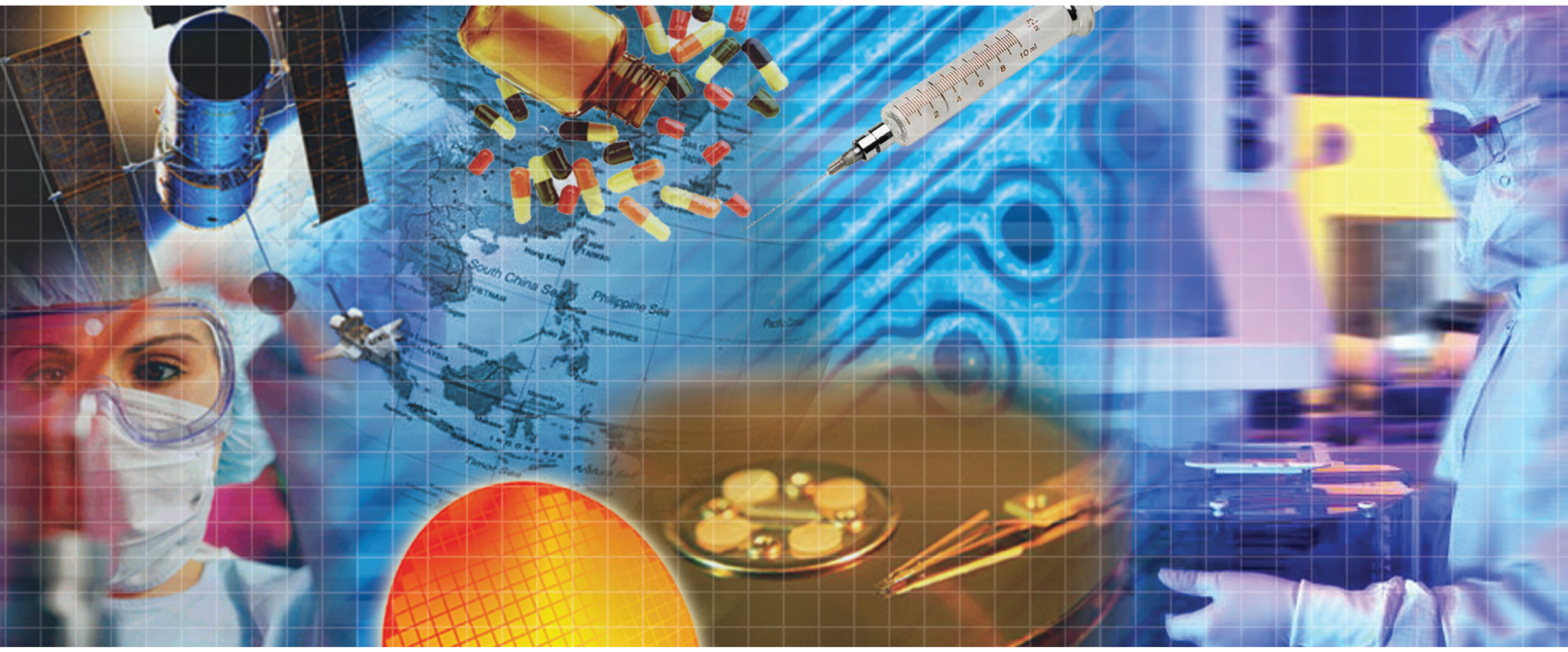
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Service and Support
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