Q5800 User's Guide

Doc p/n 34683145

Rev. B │ January 2017

Preface

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Domestic

9,274,041; 9,234,829; 9,176,041; 8,867,034; 8,661,878; 8,384,895; 8,079,250; 7,518,720; 7,495,761; 7,385,694; 7,307,717; 7,237,431; 7,184,141; 7,019,834; 6,873,411; 6,707,043; 6,455,850; 6,452,179; 6,104,483; 2,640,059; 2,340,097.

Foreign

163,024; 141,344; P5707513; EP1105710B1; AU2003257512B2; AU199953978B2.

Warranty

Spectro Scientific warrants to the original purchaser only, that all Spectro Scientific portable instruments will be free from defects in material or workmanship for a period of one year from date of invoice.

SPECTRO SCIENTIFIC'S SOLE OBLIGATION AND YOUR EXCLUSIVE REMEDY under this Limited Warranty and, to the extent permitted by law, any warranty or condition implied by law, shall be the repair or replacement of parts, without charge, that are defective in material or workmanship and that have not been misused, carelessly handled, abnormal conditions or operation, accidents or acts of God, or misrepaired by persons other than Spectro Scientific or Authorized Service Provider.

To make a claim under this Limited Warranty, you must return the complete portable instrument, transportation prepaid, to Spectro Scientific Factory Service Center or Authorized Service Location.

The determination of whether any product has been subject to misuse or abuse will be made solely by Spectro Scientific. If a hardware defect arises and a valid claim is received within the limited warranty period, at its option and to the extent permitted by law, Spectro Scientific will either

(1) repair the hardware defect at no charge, using new parts or refurbished parts that are equivalent to new in performance and reliability or

(2) exchange the product with a product that is new or refurbished that is equivalent to new in performance and reliability and is at least functionally equivalent to the original product, or

(3) refund the purchase price of the product.

Spectro Scientific may request that you replace defective parts with user-installable new or refurbished parts that Spectro Scientific provides in fulfillment of its warranty obligation. A replacement product or part, including a user-installable part that has been installed in accordance with instructions provided by Spectro Scientific, assumes the remaining warranty of the original product.

After an issue with the unit has been verified, the offending module where the issue originates should be returned to the factory for repair by authorized Spectro personnel.

For Authorized Service Locations, please contact Spectro Scientific Technical Support, +1- 978-431-1130 or support@spectrosci.com.

Document Conventions

There are three types of instructions that appear in this manual. They are there to protect the user and the device and also to emphasize key points or instructions.

STOP	A procedure or practice that may cause damage to the device or physical injury.

⚠	A procedure or practice with a direct impact on measurements or test result output.

	A procedure or practice worthy of special note - a time-saving tip, for example.

Safety Information

Improper use may circumvent safety protections and could potentially cause harm to the user.

Do not remove any of the labels; these are there to maintain compliance with FDA regulations and would constitute a re-manufacturing of the device and void the warranty.

Read and understand the following safety information.

Emergency Response Information

Complete and keep this information with the analyzer at all times.

Spectro Scientific Device Serial Number _____

The company Radiation Safety Officer (RSO) is _____

RSO Telephone Number_____

Local Fire Department_____

Local or State Police Department_____

Regulatory Agency Emergency Number_____

Personal Safety

Follow your company's safety policies when handling samples of hazardous materials.

Precautions may include wearing a protective apron or lab coat, gloves and/or safety glasses.

Radiation Safety

	This device produces x-ray radiation. It is recommended that operators receive radiation safety training prior to using the instrument.

The Q5800 contains a miniature X-ray tube to generate x-rays. This device does not contain radioactive material.

The X-ray tube is shielded by a variety of materials to control X-ray radiation leakage. The tube is mounted into the XRF tower and the housing is closed with tamper-resistant fasteners.

The Q5800 X-ray beam is collimated through an aperture that is approximately 3.5 mm (0.14 in) in diameter. The aperture is part of the beam collimator assembly and cannot be removed once it is in the housing.

Radiation Profile

The radiation profile provided with each device illustrates the effectiveness of the shielding concept which meets the leakage specification set in 21 CFR 1020.40.

See Radiation Survey Form on page 70.

Fail-Safe Mechanisms

The Q5800 is designed with the following safety mechanisms:

- Primary Power Switch: This is an illuminated push button switch on the back of the display.
- Electronic Circuit Redundancy: A safety logic circuit checks all functions of the XRF before allowing the X-ray tube to energize.
- X-ray Fluorescence Key Switch: This is a key switch located on the rear of the XRF tower which controls the high voltage to the X-ray tube.

No X-rays can be generated unless this switch is turned 90° clockwise:

OFF   **ON**

- The yellow indicator LED on the XRF tower will light when the key switch is in the **On** position:

The indicator is of a multiple LED design decreasing the likelihood that a failure will go unnoticed by the operator. Current sensing by the safety circuit ensures that the X-ray tube will not energize if the lamp does not light.

> ⚠ After a period of unuse, the XRF module will hibernate and the yellow LED will go out. The module can be recovered from prompts in the user interface.

- Red LED X-ray On indicator LED: When the system is energized, and all the safety conditions are met, the X-ray tube is energized and the red LED lamp on the XRF tower will light:

The indicator is of a multiple LED design decreasing the likelihood that a failure will go unnoticed by the operator. Current-sensing means the X-ray tube will not energize if the lamp does not light.

Spectro Scientific Contact Numbers:

Main Number (U.S.) (+1) - 978-486-0123

Technical Support: (U.S.) (+1) - 978-431-1130

Main Number (China) 8610.6785.7242

Customer Responsibilities

- Test the Q5800 every six months (or according to scheduled maintenance) and log the test results. If the unit fails any of these tests, call Spectro Support.
- Maintain a record of use, installation and any service calls. Keep these records somewhere safe where you can locate them when asked. As the Q5800 relies on an electrically generated source of X-rays, store the records for five years or until the unit is transferred or decommissioned. Keep those records for later inspections from the state.
- When transferring the Q5800 to another location/person, have them register it with the state (if applicable) and show you they have permission to own it. Report the transfer to the state's Radiation Control Bureau and to Spectro Scientific.
- Report the theft/loss of the unit to the appropriate authorities, and then call Spectro Scientific.

State Registration

Q5800 customers should contract their local Regulatory Authority to determine if any regulatory requirements apply for the possession and use of the unit. The device may need to be registered with the local regulatory authority and a fee may apply. Additional requirements such as training may also apply.

Transportation Safety

There are no X-ray specific U.S. Department of Transportation (DOT) or International Air Transport Association (IATI) radiation regulations regarding shipping the device.

The device should be over-packed for shipping to protect the sensitive measuring equipment inside the analyzer.

Physical Damage

Have the unit checked regularly and maintain it in undamaged condition.

Damage to the XRF tower may constitute a radiation risk from compromised shielding surrounding the X-Ray tube.

If any of the following conditions are observed:

- Obvious physical damage to the XRF tower
- The instrument is intact but there is indication of a potentially unsafe condition such as a cracked case
- Load door mechanism failure
- Indicator light(s) remain flashing after a measurement is terminated

Then you should follow these steps:

1. Turn off the device.
2. Disconnect the power supply and remove the battery. The X-Ray tube cannot produce X-Rays while the battery and power supply are disconnected
3. Notify your Radiation Safety Officer (RSO) or the responsible individual at your company or institution.
4. You or your RSO should call Spectro Scientific for additional information and guidance. Do not leave the device unattended or abandon it.

Regulatory Requirements

The device complies with all Standards requirements.

- IEC 61010-1 Issued: 2010/06/10 Ed: 3 Safety Requirements for Electrical Equipment for measurement, Control, and Laboratory Use - Part 1: General Requirements; Corr. 1: 2011, Corr. 2: 2013.
- CAN/CSA-C22.2 No. 61010-1-12, Third Edition Issued: 2012/05/11 Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements
- UL 61010-1 Issued: 2012/05/11 Ed: 3rd 2012 Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements
- Test clause: Cl. 12.2.1.3 at 100 mm distance, radiation leakage test
- MIL-PRF-28800F Performance Specification – Test equipment for use with electrical and electronic equipment, General specification For DOD.
- Test Clause: 4.5.5.4.2 for Class 2 per client request.

Document Revision Information

This table provides information on changes in the latest software release:

Rev	Date	Changes
A	May 2014	Initial release
B	January 2017	New design for user interface.
		The Result Trending feature has been discontinued.
		The Data Review chapter for details of synchronizing databases using Fluid Manager has been added.
		Maintenance and troubleshooting information has been added.
		Safety information has been revised.
		Repurposed all documents to aggregate all information on a per-test basis. This will assist users who are not using all tests and want test-specific information.
		Patent information has been added to the Preface.
		Parts list table has been updated.
		Users can create customized User Fluids from the Q5800.
		End User License Agreement (EULA) added.
		Assets can be created using Fluid Manager and copied to the Q5800.
		FluidScan Background measurements are now taken with the cell out of the measurement slot.
		After a failed Verification using FL310 Check fluid, FluidScan users are prompted to run three complete measurements with a clean cell both in and out of the measurement slot.
		The Comprehensive Water Solution license is supported. FluidScan tests on oils from the Turbine and other Industrial fluid categories will display Total Water in the output: Dissolved Water plus Free Water in ppm.
		Instructions for homogenizing samples for Total Water testing have been added.

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Table of Contents

1   Getting Started

This chapter provides step-by-step instructions for setting up the Q5800.

The Q5800 is a portable device consisting of four discrete modules to provide a comprehensive analysis of lubricant and machinery condition in the field.
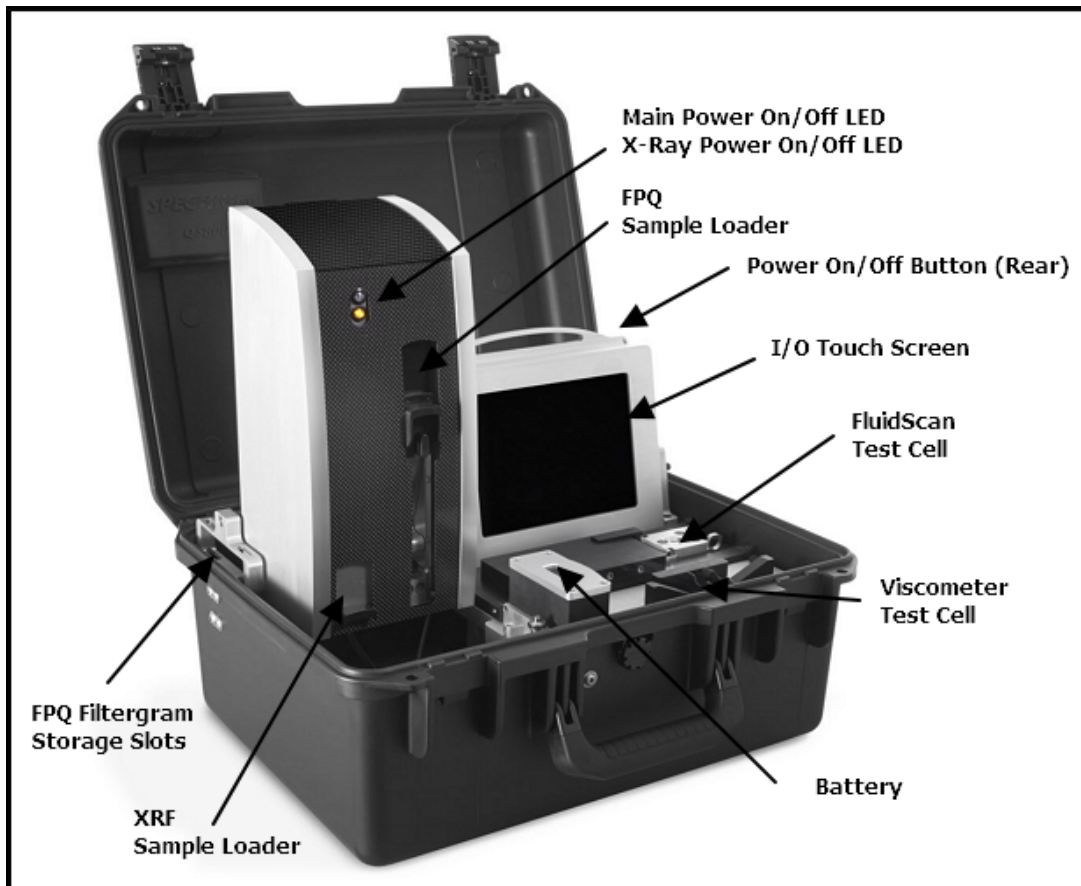
- Kinematic Viscometry (Viscometer module): Measures fluid viscosity i.e. its resistance to flow.
- Fluid Condition Analysis (FluidScan module): Measures fluid contamination or degradation due primarily to the presence of organic compounds and water.
- Filter Particle Quantifier (FPQ module): Determines sample particles of 4 µm and bigger in size.
- Particulate Elemental Analysis (XRF module): Measures the concentration of metals in the particles collected from the FPQ.

The Q5800 addresses two issues of interest to users:
- The health of an in-service fluid: how much has it degraded over time, and when will it need to be replaced, for example.
- The health of an asset - an engine or transmission - from which the fluid sample came. Are the seals or bearings showing signs of wear, for example.

In both cases, the tests are the same - only the data are treated differently.

New fluids can be defined directly from the touchscreen or from Fluid Manager, which is software running on an external computer of some kind.

However, new assets can only be defined using Fluid Manager (see the "Fluid Manager User's Guide" for more information.)

Once they have been defined, you need to download the properties to the Q5800.

It is not necessary to subject samples to all four tests, and tests can be performed in any order or in parallel *except* for the XRF module. The fluid sample must go through the FPQ module first.

However; whenever the device management screens call for a default mode, it defaults to the following order of operations:

1. Viscometer
2. FluidScan
3. FPQ module
4. XRF module

Consequently, the manual also follows the same module order.

Unpacking the Q5800

Check the contents of the package against the packing slip and the table below. Notify Spectro Scientific immediately if there are any discrepancies.

## Ordering Testing Supplies and Replacement Parts

Use the following part numbers to order parts and accessories from Spectro Scientific:

CONSUMABLES	
34682166	Verification standards (qty 6)
34682210	Felt wick, consumable (6 pack) (qty 1)
34683101	Q5800 Consumables Kit (100 samples)
34683104	Q5800 Consumables Kit (500 samples)
34683142	FPQ Filtergrams (25 pack) (qty 1)
34683143	FPQ waste container (3 pack) (qty 1)
34683167	Q5800 Consumables Kit (100 samples) with Prescient Data Evaluation (qty 1)
34683168	Q5800 Consumables Kit (500 samples) with Prescient Data Evaluation (qty 1)
FL310	IR Check Fluid 5 ml (qty 1)
P-11160	3 ml Luer syringe (100 pack) (qty 1)
PV1012	60 µl disposable Pipettes (100 pack) (qty 1)
	Non-Abrasive Cleaning Pad kit (100 pack) (qty 1)

OPTIONAL ACCESSORIES	
A5052ZM-DM A5052ZM-IN	52ZM Stereo Zoom Microscope, 115 VAC, 1 Ph, 60 Hz 52ZM Stereo Zoom Microscope, 220 VAC, 1 Ph, 50 Hz
34682120	Backpack

Opening the Case

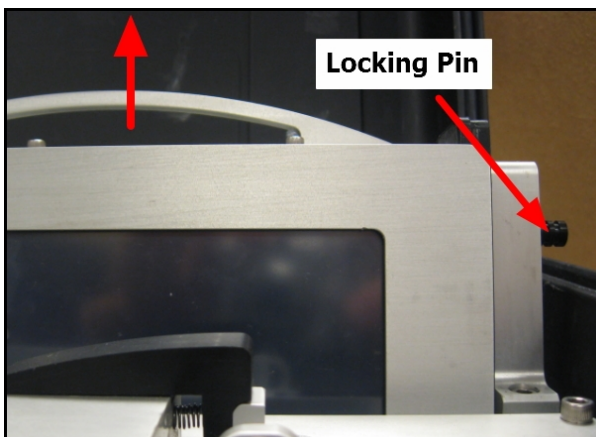There are holes (A) to the left of the latch (B) for a padlock if required.
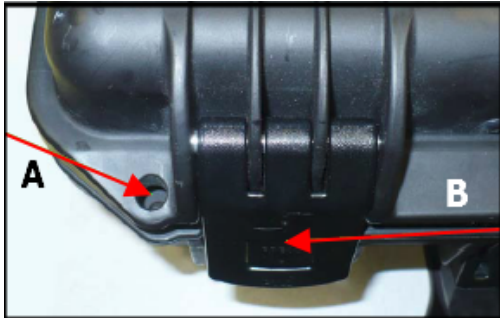
1. Place the case on a flat solid surface.
2. Release the lid by pressing at (B) on both latches and use both hands to lift the lid.

# Raising/Lowering the PC Module Screen

Grasp the PC module handle and slide it up until the locking pin on the side locks:

Before lowering the screen, make sure any USB or RJ-45 connectors have been unplugged, then pull the locking pin out and slide the screen down.

Raising the FPQ/XRF Tower

Flip the FPQ/XRF tower upright. It does not have a locking mechanism - it will stay in place by itself at any angle. Push down firmly to close.
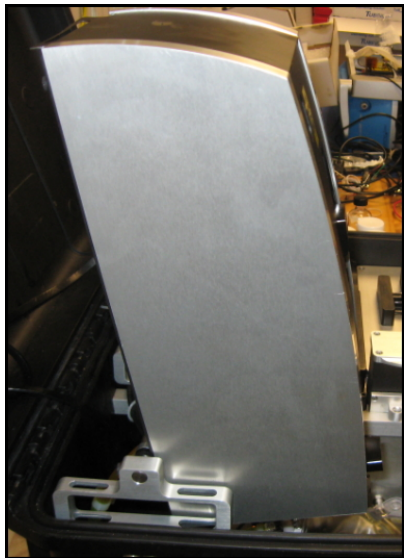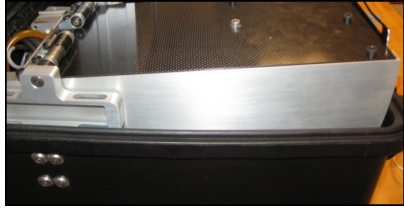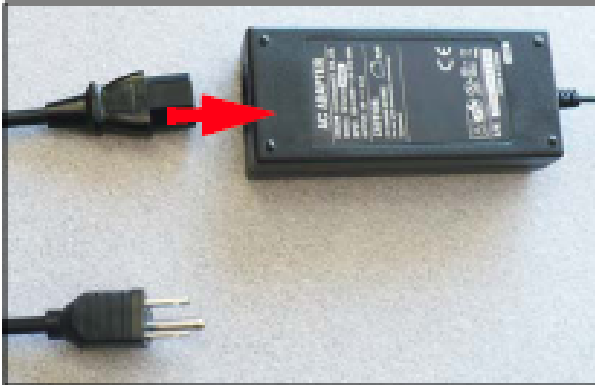
Applying Power to a Q5800

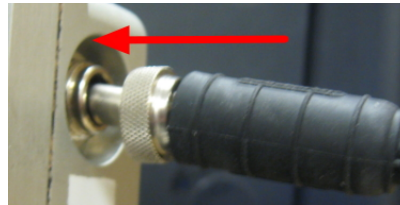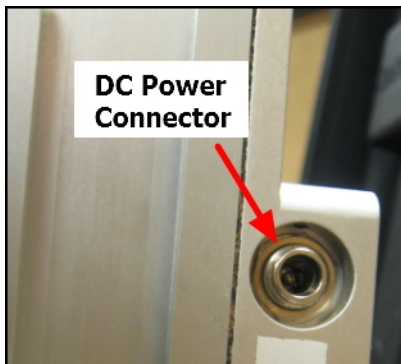The Q5800 can operate using utility power or rechargeable battery.

A fully-charged battery will provide ~6 hours of continual use.

Spectro Scientific supplies a power adapter appropriate for the country where the device will be used.
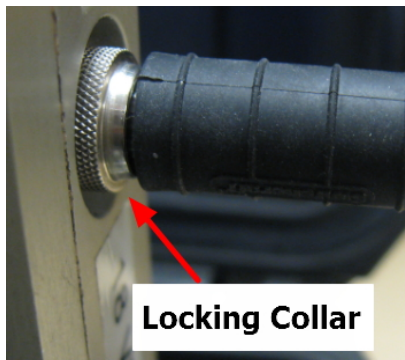
1. Connect the power cable to the voltage converter:

2. Push the DC output plug into the connector on the right side of the PC module:

3. Rotate the locking collar clockwise to secure the connector:

4. Plug the adapter into an AC power source such as a generator or utility power socket.

5. To power up the system, press the power button on the upper-right **rear** of the PC module screen and hold it for ~3 seconds.

6. The power button has an LED that lights up when power is applied:

OFF   **ON**

Log In/Out and Shutdown

Follow these steps to log in and out or shut down the device.

> The default username is "default user" and the default user password is "efas"
>
> After installation, new user accounts with passwords should be created; see Adding a New User on page 11.

1. Log in with your user name and password. The software keyboard shown below will appear whenever you press in any blank input field. Otherwise, you can click the down arrow in the Username field and select a login name If the Admin has assigned you one:

2. Press Continue to open the Main Menu:
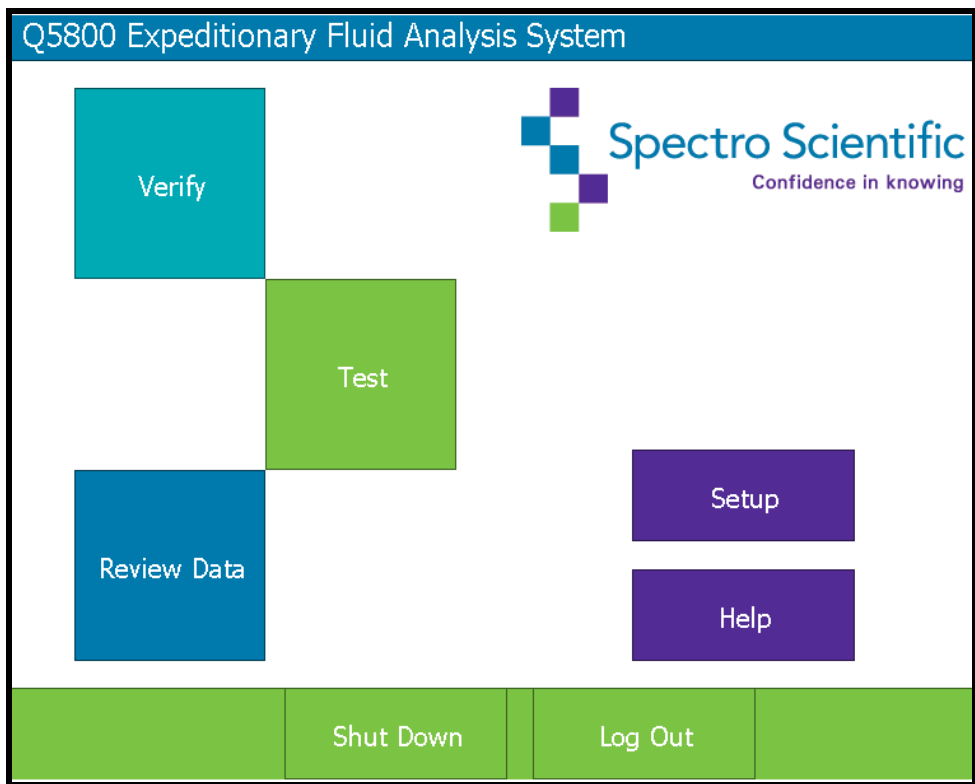
Once inside the menu structure, you can press the Main Menu button to return to the Main Menu where you can log out without shutting the program down, or you can shut the program down:

Setting System Date and Time
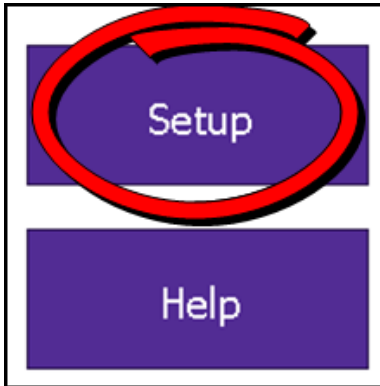
Follow these steps to set the local Date and Time.

> ⚠️ Date and timestamps are maintained by a 3.3-volt battery located on the internal circuit-board. This battery needs to be replaced periodically - refer to Replacing the Internal Battery on page 63 in the Troubleshooting section.

1. From the Main Menu, press the Setup button:

2. The Setup Menu opens. Press the Set Date/Time button:
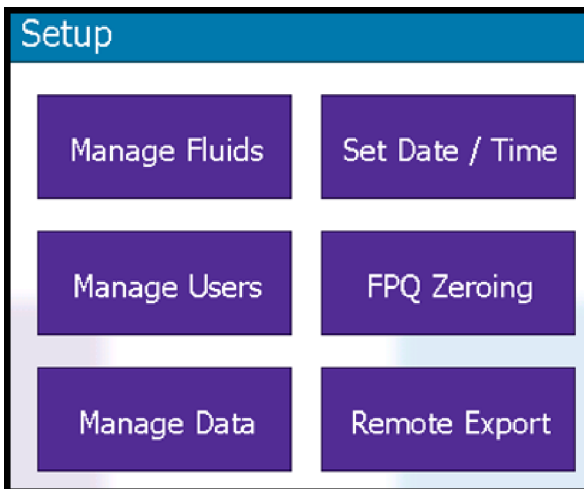
3. The Set Date/Time screen opens. Scroll down to the correct time zone and press to select it.

The Date/Time field will update automatically; to edit this field, press the left and right arrows.
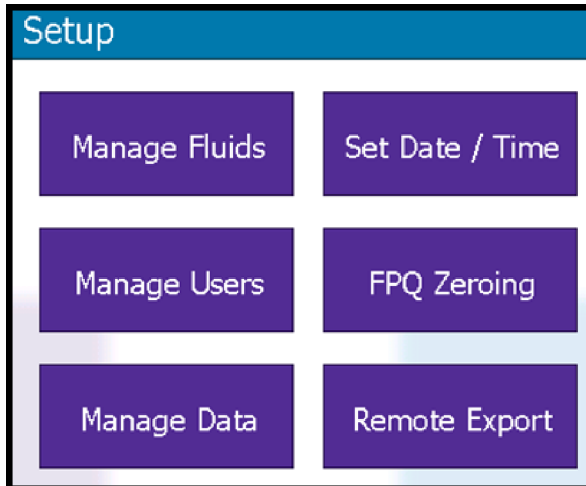
4. Press Save when you are done.

Managing Users

⚠️ It is recommended that only users trained in radiation safety and the proper use of the device are added to the system and given a user name and password.

1. From the Main Menu, press the Setup button.
2. The Setup Menu opens; press the Manage Users button:

Adding a New User

1. From the Manage Users screen, press the New User button.
2. When you touch the New User Name field, a software keyboard displays so you can make your entries.
3. Press the Save button.

Editing an Existing User

1. From the Manage Users screen, press the Edit User button.
2. Select the user to edit. When you touch the Edit User field, a keyboard displays so you can make your entries.
3. Press the Save button.

Retiring a User

1. From the Manage Users screen, press the Retire User button.
2. Select the user to retire.
3. Press the Retire button to remove the user and return to the Main Menu

Reinstating a Retired User

1. From the Manage Users screen, press the Unretire User button.
2. Select the user to reinstate.
3. Press the Reactivate button to reactivate the user and return to the Main Menu.

Deleting a User

1. From the Manage Users screen, press the Delete User button.
2. Select the user to delete
3. Press the Delete button to delete the user and return to the Main Menu.

XRF Module High Voltage Supply

Two keys are supplied with the device. There is a key switch located on the rear of the XRF tower which controls the high voltage to the X-ray tube.

No X-rays can be generated unless this switch is turned 90$^{\text{o}}$ clockwise:

OFF   **ON**

2 Verifying Modules

This chapter provides the information you need to verify the modules:

You should verify the modules:

- When you first receive the device
- At regular intervals based on usage - we recommend at weekly intervals as a minimum
- Whenever the device is moved to a new location
- Whenever you feel test results are so extreme that the device calibration is suspect

Testing Supplies

The following are supplied with the device:

- Disposable 60 μl pipettes for adding test fluids to the Viscometer or FluidScan modules
- Filtergram - particle filters for the FPQ and XRF modules
- 3 ml capacity syringes for use with the FPQ module
- Non-abrasive lint-free wipes for general cleaning
- Bottle of IR Check Fluid FL310 (red fluid)
- Bottle of Q5800 Verification Standard fluid (clear fluid)

Verifying the Viscometer

Follow these steps to verify the Viscometer module:

Cleaning the Viscometer

Cleaning must be carried out before verifying the device and also between used fluid tests.

Follow these steps to clean the module:

1. There is a safety latch on top of the module. Slide this away from the test cell (toward the back of the case) to free the test cell.
2. Grasp the test cell tabs and lift the cell until you can separate and open the plates:
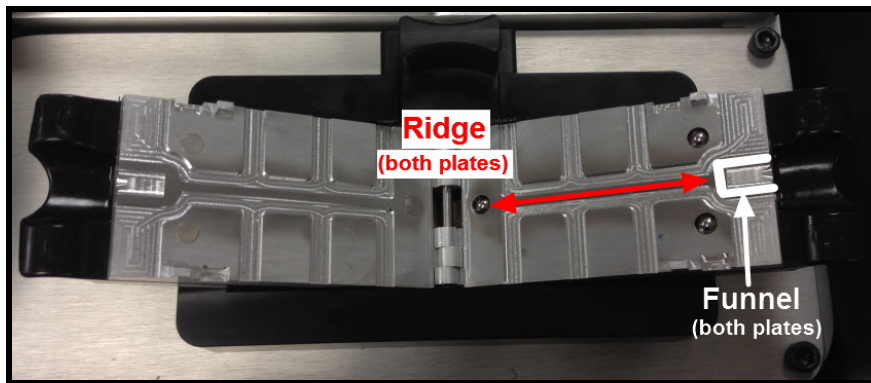
> Consistency in cleaning technique will produce the best repeatability. Always use a fresh non-abrasive cleaning pad (supplied) for each cleaning.
>
> The Ridge and Funnel (above) are the only areas that need to be cleaned (below):

3. Take a cleaning pad and fold it in half.
4. Using moderate pressure, wipe along the ridge that runs along the center of each cell toward the funnel. The funnel is the hole in the center of the plates when they are clamped together.
5. Wipe inside the funnel area.
6. Fold the cleaning pad in half again and repeat 4-5 times.
7. Repeat the cleaning procedure on the other plate.

Conditioning the Viscometer

Before verifying the module, condition the device with some of the Q5800 Verification Standard fluid, as follows:

1. Draw some clean fluid into a 60 µl pipette. The amount is not critical, and you can use as much as is necessary, including the overflow bulb contents.

2. Using the pipette like a pen, apply a small amount of the fluid to the flow path and fluid entry funnel of each plate.
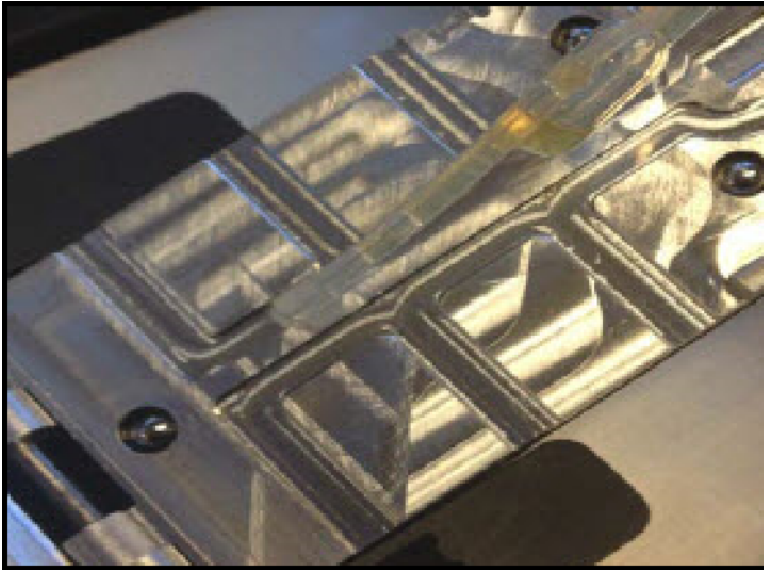

3. Correctly dispose of the pipette.
4. Clean the plates again.
5. Close the test cell and lower it into the device. There is a mechanical "click" that indicates when the test cell is properly seated.
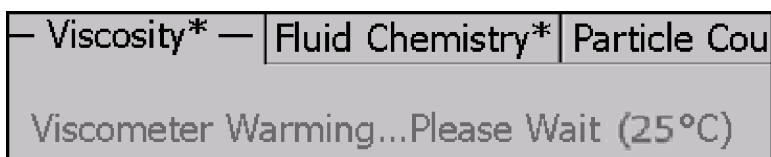
You are now ready to verify the Viscometer module.

Verification Procedure

1. Locate the bottle of Q5800 Verification Standard fluid in the supply kit.
2. From the Main Menu, press the Verify button:
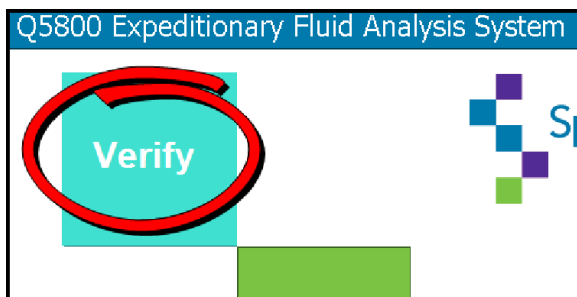
The screen opens at the Viscosity tab by default:

 The Start button is disabled until the Viscometer reaches 40°C. You may need to wait for the Viscometer to warm up:
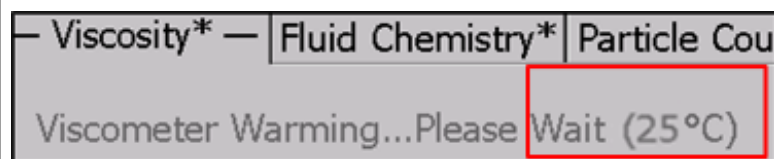
Be aware that warming can only take place when the cell is closed and inserted into the viscometer housing.

The colder the ambient temperature, the longer the warming process will take. We recommend that you use and store the device in a heated place.

 We recommend you pre-fill the pipette with the Standard fluid so you are ready to dispense it as soon as you press the Start button. Otherwise the whole sample may not be read.

3. Using a new 60 µl single-use pipette, squeeze the bulb, dip the end of the pipette into the bottle and slowly release the bulb to draw in the fluid. Some will collect in the overflow bulb - this is normal.

 The "leg" of the pipette is the required 60 µl - do not try to empty the overflow bulb into the viscometer funnel.

4. Remove the pipette, and wipe the exterior of the pipette with a lint-free wipe. Inspect the leg containing 60 µl of fluid for bubbles. If bubbles are present, discard the pipette and prepare another.

5. Press the Start button. The viscometer is ready to load when you see the "Dispense Sample Now" message.

6. Insert the tip of the pipette into the funnel opening. Only the very tip should be inside the funnel; the "wings" should be resting on the plates at the top of the funnel:
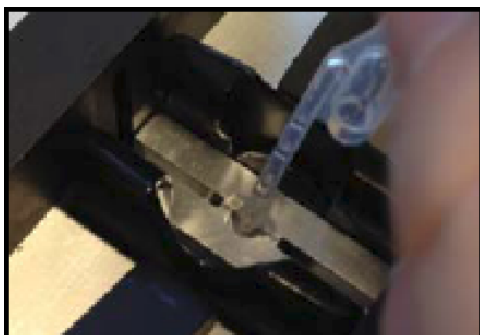
7. Gently squeeze the bulb to dispense the 60 µl fluid sample over a ~3 - 5 second period .

8. The viscosity measurement will automatically start.

    Either

The Viscosity Acceptable message displays similar to this example:

– Viscosity* - 100% —	Fluid Chemistry*	Particle Count*	Elements*	
Verify Complete...Viscosity Acceptable				
Visc: 9.23 cSt, V100: 2.35 cSt @ 12:56:49 PM				

You can continue to

    Or

The Viscosity Unacceptable message displays similar to this example:

– Viscosity* - 100% —	Fluid Chemistry*	Particle Count*	Elements*	
Verify Complete...Viscosity Unacceptable...Condition Plates and Repeat				
Visc: 9.23 cSt, V100: 2.35 cSt @ 12:56:49 PM				

9. Condition the plates again and repeat the measurement.

Consistently low results indicate the cell plates have oil remaining after cleaning. Clean the plates again with more pressure applied to the cleaning pad. Consistently high results indicate:

- the cell plates are dry and need to be conditioned again
- excessive pressure is being applied during the cleaning process. Clean the plates again, but use less pressure on the cleaning pad.

If the results continue to be substantially different from the Standard, contact Technical Support for more information.

Verifying the FluidScan

Follow these steps to verify the FluidScan module.

Cleaning the Sample Cell

The sample cell must be cleaned with the non-abrasive cleaning pads supplied with the Q5800 before you verify the FluidScan, take a background measurement or test any fluids.

Using Cleaning Solvents

We do NOT recommend routinely using volatile solvents like IPA or heptane to clean the window. The sample cell is not sealed and solvent vapors left behind will escape into the optical path and absorb IR light that will cause the cell to read dirty even though it may be perfectly clean.

In some very rare cases it may be necessary to use an oil solvent like heptane to remove stubborn residue from the window if it cannot be removed using a wipe. In this case we recommend leaving the sample cell open to dry for between 2 and 3 minutes.

1. Slide the black safety latch on top of the module to the left and hold it:
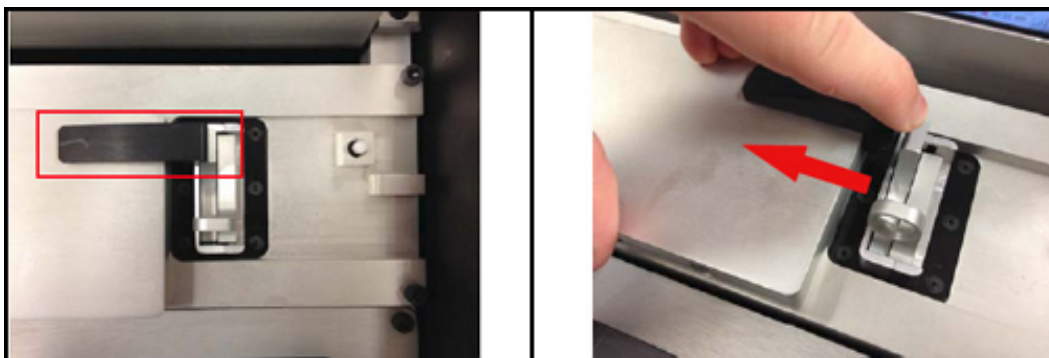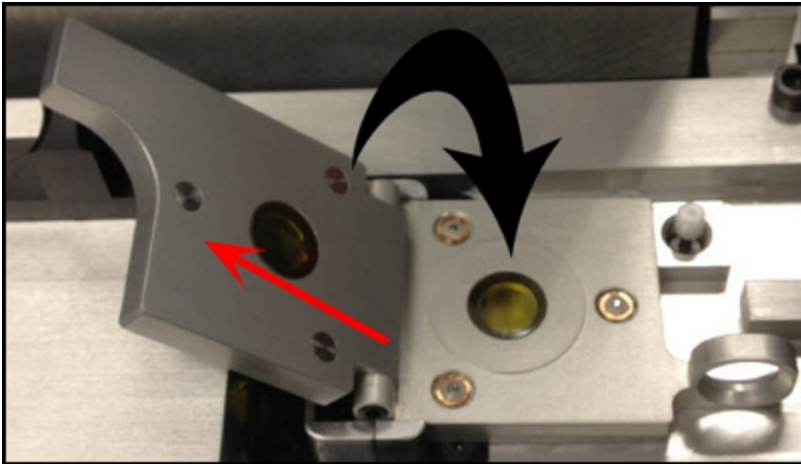

2. Pull the sample cell straight up from its position inside the housing:

3. Lay the cell flat. Magnets will hold the cell in the horizontal position.

4. Grasp the top cell plate and separate the cell plates:

5. Clean the two cell halves with a clean non-abrasive pad (supplied).
6. Close the cell but do not return it to the slot in the FluidScan housing.

⚠️ The Background measurement is taken with the cell out of the measuring head.

7. Press the Fluid Chemistry tab:
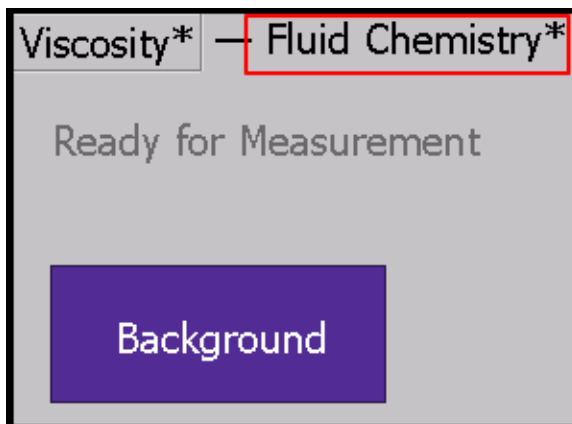
8. Press the Background button to start the Background measurement.

📝 You might see a message that the Spectrometer windows are still dirty. Make sure the cell is out and wait a few seconds - the message should change to "Clean."

9. Follow the prompts to finish the Background measurement.
10. Draw some of the red FL310 check fluid into a disposable pipette.
11. Open up the test cell and place 2-3 drops on the glass on the bottom half.
12. Close the cell.

When closing the cell, the best practice at all times is to leave the right side held by the magnets and lower the top half down onto the bottom half.

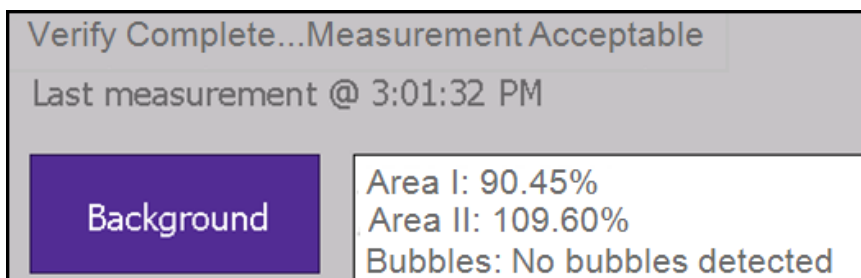This prevents the fluid running off the glass and it allows the magnets to seal the cell properly

13. Return the cell to the slot and press Start. The Measurement in Progress screen displays.
14. Once the measurement is completed, wait while the properties are calculated.

Either

The Measurement Acceptable message displays similar to this example:

Verify Complete...Measurement Acceptable

Last measurement @ 3:01:32 PM

Background

Area I: 90.45%
Area II: 109.60%
Bubbles: No bubbles detected

To be acceptable, both Area I and Area II need to be between 90% and 110% and there can be no bubbles.

You can continue to verify the FPQ module.

Or

The Measurement Unacceptable message displays similar to this example:

Verify Complete...Measurement Unacceptable...Clean Cell and Repeat

Last measurement @ 3:01:32 PM

Background

AREA I: 46.35 %
AREA II: 46.84 %
Bubbles: Sample Has Bubbles!
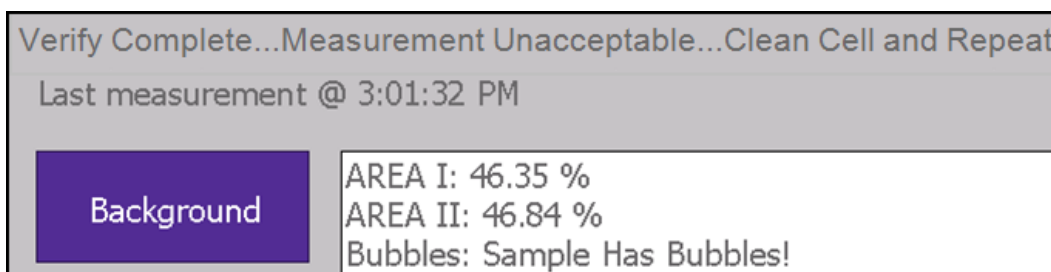
If this happens, you will be prompted to run a series of 3 complete measurements with a clean cell first in the measuring slot and then out of the slot.

Then run a fresh sample of the FL310 check fluid.

If the results continue to be substantially different from the IR Check Fluid specification, contact Technical Support for more information.

Verifying the FPQ Module

Follow these steps to verify the FPQ module:

> Press the Help button to access a number of videos describing how to prepare Filtergrams.

1. Raise the black locking clasp:

2. Pull the syringe mechanism forward until the loading hole is exposed:

3. Locate the bottle of the clear Q5800 Verification Standard fluid. Shake the bottle vigorously for a minimum of 30 seconds to disperse the particles.
4. Draw 3 ml of fluid into a clean syringe.
5. Use a non-abrasive pad to remove all fluid from the exterior of the syringe.
6. Press the syringe firmly into the loading hole until the shoulders are flush against the stop.
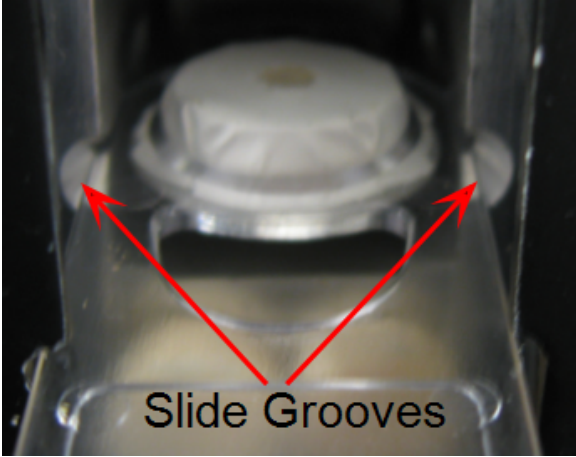
> Be sure to rotate the syringe so that the shoulders are oriented as shown below. Otherwise, they will pinch when the door closes.
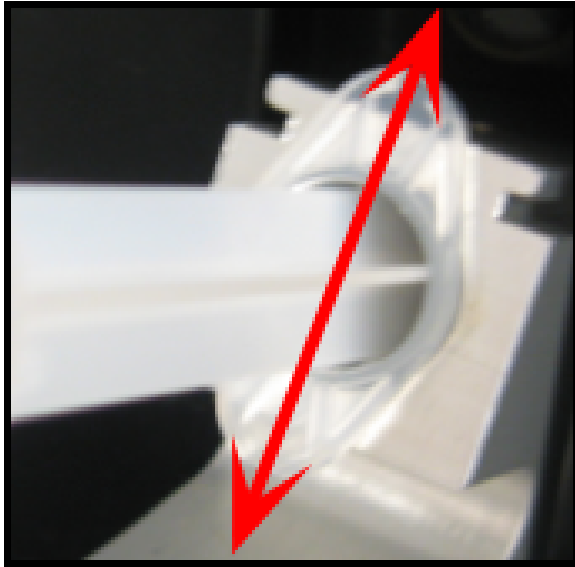
7. With the door open, insert a clean Filtergram into the slot beneath the syringe until it stops against the back of the slot:

⚠️	Make sure the Filtergram is loaded with the raised side up (not the "bump" side).

8. Close the fluid loading mechanism and snap the clasp down to lock it in place.
9. Press the Particle Count tab:

Viscosity*	Fluid Chemistry*	— Particle Count* —	Elements*

Install Filtergram and Syringe...Press Start to Proceed
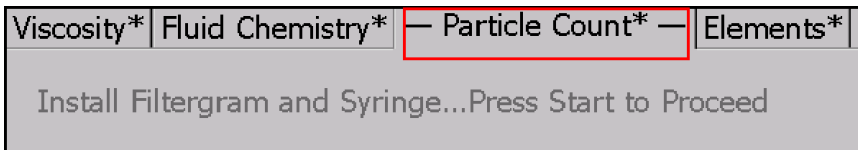
10. Press the Start button. The measurement progress and the particle count will increment in real time similar to this example:

Measurement in Progress...Please Wait (0%)

Start

Oil Lock Speed: 14 "/s /1K
Particle Count >4μm: 55995 p/ml

11. When the measurement is complete, the Particle Count tab will change to 100% and the final particle count will be calculated.

Either

The Particle Count Acceptable message displays similar to this example:

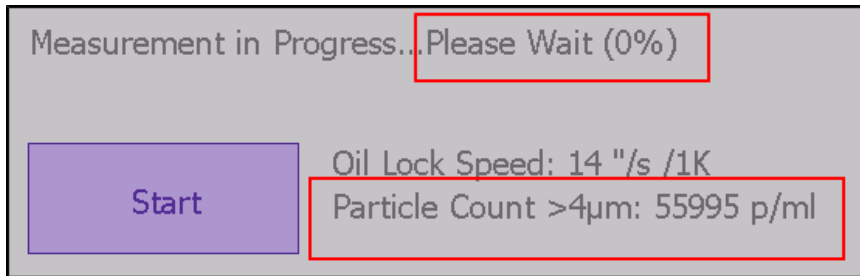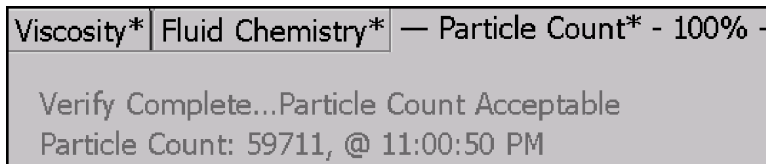Viscosity* | Fluid Chemistry* — Particle Count* - 100% –

Verify Complete...Particle Count Acceptable
Particle Count: 59711, @ 11:00:50 PM

You can continue to verify the FPQ module.

Or

The Particle Count Unacceptable message displays similar to this example:

Measurement » Fluid: EFAS Verify Fluid

Viscosity* | Fluid Chemistry* — Particle Count* - 100% — | Elements*

Verify Complete...Particle Count Unacceptable...Shake Fluid Vigorously
Particle Count: 3475, @ 5:05:40 PM
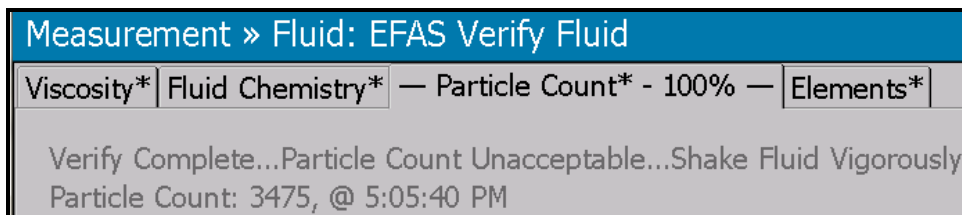
If this happens, shake the bottle vigorously for an additional two minutes and repeat the test. If measured results are still out of limits, open a new bottle and shake vigorously for five minutes and repeat.

If the validation repeatedly fails to detect particles, contact Technical Support for help.

Removing the Filtergram

Open the door before trying to remove the Filtergram or it will be destroyed.

1. Raise the black locking clasp.
2. Pull the door open quickly to relieve any pressure so you can remove the Filtergram.
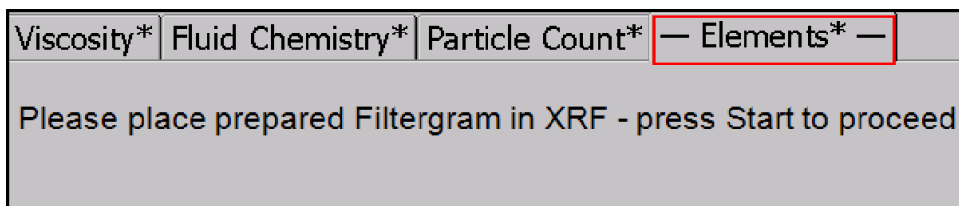
> ⚠️ Set this Filtergram aside - it will be used to verify the XRF module.

3. Before removing the syringe, pull the plunger about half way out while keeping the tabs pressed snugly against the metal block. This sucks most of the left-over oil out of the analyzer orifices and reduces carryover to the next sample.
4. Slide the filtergram out of it's slot and place an absorbent wipe against the hole at the back of the sample area. Be very careful to **not** touch the raised front of the filtergram as this contains your particles for XRF elemental analysis. Remove the Filtergram.
5. Pull the syringe holder as far forward as it will go, then wipe the residual oil from the o-ring that is at the bottom of the holder. This will reduce carryover to the next sample.
6. Close and lock the FPQ syringe mechanism.

Verifying the XRF Module

Follow these steps to verify the XRF module:

1. Press the Elements tab:

Viscosity*	Fluid Chemistry*	Particle Count*	— Elements* —

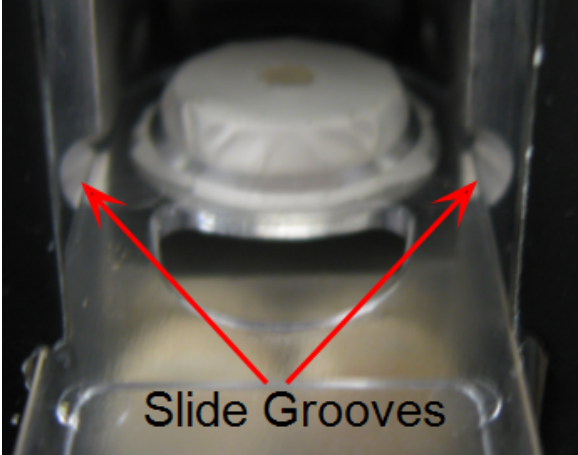Please place prepared Filtergram in XRF - press Start to proceed

2. Lift the XRF door:

3. Insert the Filtergram you made during the FPQ verification process.

> Make sure the Filtergram is loaded with the raised side up (not the "bump" side) exactly as you inserted it into the FPQ module. Slide it in as far as possible until you hit the stop at the end of the channel.
>
>
>
> Slide Grooves

4. Lower the door and press Start.

> The red LED indicates the X-ray tube is energized:
>
>
>
> Do not open the door to the XRF module while the red LED is lit. The LED will go out once the test is finished.

5. **Either**

If the measurement acceptable message displays, you are done with the verification for all modules.

> **Or**

If the measurement is unacceptable, create a new Filtergram and try again.

If it fails again, open a fresh bottle of the clear Q5800 Standard fluid, shake it vigorously for five minutes and prepare another Filtergram. If this fails, contact Technical Support.

6. Remove the Filtergram and dispose of it properly.

3   Testing In-Service Oil Samples

This chapter describes how to test in-service oils and other lubricants.

Fluid samples can be tied to a physical asset like an engine or a compressor by identifying the asset with a unique ID: a serial number, for example. Results are typically used to monitor the operating condition of the asset.

Fluid samples are also tested when you want to know the current condition of the fluid, but you are less interested in the operating condition of the machinery from which the fluid was taken.

The actual testing screens are the same except for the bar at the top of the screen:

By Asset ID:

Measurement » Asset: X0518-SILA-H 112			
— Viscosity* —	Fluid Chemistry*	Particle Count*	Elements*

By Fluid Name:

Measurement » Fluid: Castrol Duratec L			
— Viscosity* —	Fluid Chemistry*	Particle Count*	Elements*

Testing Supplies

You will need a sample of used in-service fluid plus the following:

- Disposable 60 µl pipettes
- 3 ml syringe
- Non-abrasive lint-free wipes

- Clean Filtergram

Refer to Ordering Testing Supplies and Replacement Parts on page 3 to order more supplies.

Building an Asset Structure

> This is required only if you are measuring samples associated with an asset like an engine or transmission.
>
> Building an asset structure can only be done using Fluid Manager - the assets are then exported to the Q5800. There is more information on how to do this in the "Fluid Manager User's Guide."

For the purposes of this exercise, the following asset structure was created in Fluid Manager:

Level	Descriptor Level	Asset Descriptor
1	Area	Bulldozer Excavator
2	Equipment	Engine
3	Point	Drain Plug

The following assets were created:

Asset Descriptor	Asset Name	Serial Number
Bulldozer	D-10	123
	D-10	456
	D-10	789
Excavator	D-8	ABC
	D-8	DEF

D-10 is an engine used in bulldozers. D-8 is an engine used in excavators. The structure was created this way because it is more important to track the asset - the engine - than the asset descriptor.

The D-10 with the serial number 123 could be in Bulldozer 1 for the April sample, but transplanted to Bulldozer 10 for the June sample.

As long as there is a unique identifier, this engine can be tracked for its entire life span, regardless of how or where it might be used.

Working with Presets

The next two sections describe all the steps involved in locating and selecting either an Asset or a Fluid before you finally get to measuring oil samples.

If you have an asset or a fluid that you measure frequently, you can create a preset for it that appears as an option in the Test Menu as in this example for a preset called zxc-daily:
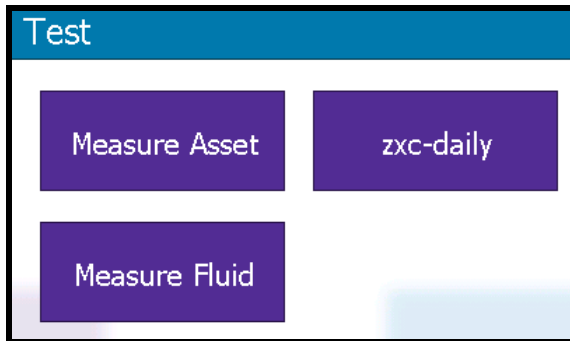
> There two available preset slots. You can overwrite them as necessary.
>
> See Assigning User Fluids to Presets on page 54.

If you press the preset button, you will always bypass all of the scrolling and selecting options described in the next two sections and you will go directly to the fluid sampling screen where you can click the tab for the module you want to run first: Viscometer, FluidScan or FPQ (Particle Count). The FPQ must be run before the XRF module (Elements).
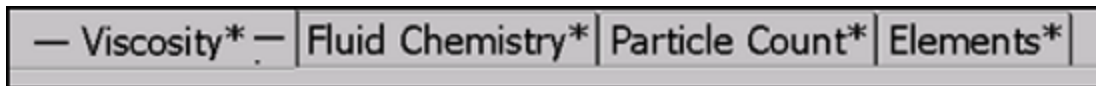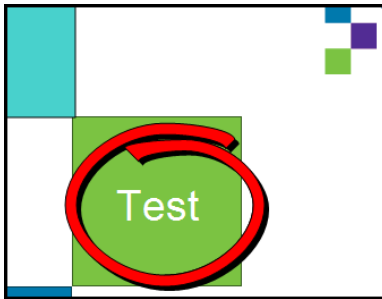

Throughout these examples the Viscometer module is run first, so if you created a preset you can press the preset button and skip down to Measuring Samples with the Viscometer Module on page 33.

Selecting an Asset

Follow these steps to select an asset:

1. From the Main Menu, press the Test button:

2. Press the Measure Asset button to open the Select screen. The screen displays the asset descriptors that were exported from Fluid Manager:
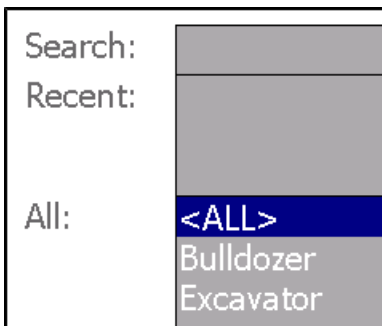
        <All> is selected by default, so press the Continue button. The Engine descriptor is listed:
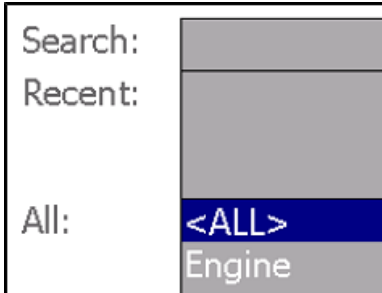
3. <All> is selected by default; select Engine and press the Continue button.
4. The Drain Plug descriptor is listed:
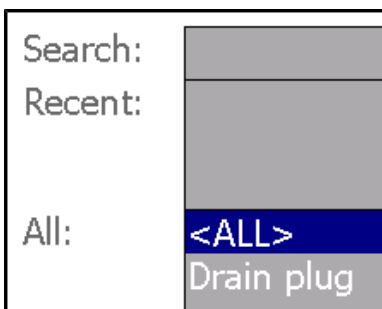
5. <All> is selected by default; select Drain Plug and press the Continue button. The five assets you copied over using Fluid Manager are listed:

6. For this example, select the first D-10 engine. The Serial Number is displayed by default:

Optional: enter none, one, or more of the following:

- Sample ID number (optional - but extremely useful when measuring fluids associated with assets if you plan on saving and reviewing the results later)
- Number of working hours on the fluid
- Number of hours on the physical asset
- Amount of oil added since last change

7. For this example, enter Measurement #1 in the Sample ID field and press Continue.

   A tab representing each module opens:

With the exception of the XRF module (the Elements tab) you can work in any order, or measure samples in parallel.

However, the Viscosity tab is active by default; so for the purposes of this manual the viscosity test will be done first.

Selecting a Fluid

Follow these steps to select a fluid:
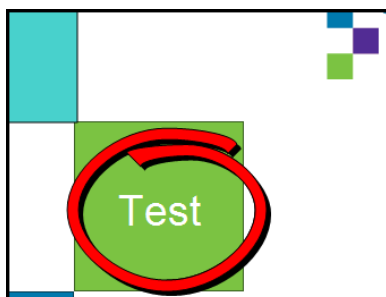
1. From the Main Menu, press the Test button:

2. Press the Measure Fluid button. This opens the Select screen which displays all commercial and any User fluids in the database, similar to this example below:

⚠️	You can only measure fluids that are pre-loaded into the Fluid Manager software and synchronized with the Q5800. The fluids listed depends on which library or libraries are installed and whether or not any User fluids were created.
📝	Some users create customized User fluids and possibly never use any commercial fluids - see Custom Fluid Management on page 48. To hide - but NOT to permanently delete - all the commercial fluids, press the User Fluids Only check-box in the lower left corner.
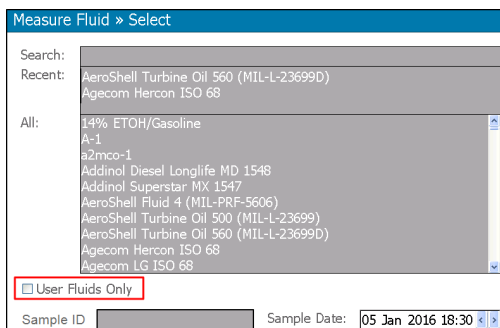
3. Select a fluid.

If your fluid was tested recently, you might find it in the Recent field. Otherwise, either use the Search function to find your fluid, or you can scroll down to it. Then press to select it.

Optional - Sample ID number (optional - but extremely useful if you plan on saving and reviewing the results later).

Optional - Accept the default date (which is today); otherwise, click the arrows to adjust the date.

4. Press Continue. The four operation tabs open as follows:

— Viscosity* — | Fluid Chemistry* | Particle Count* | Elements*

With the exception of the XRF module (the Elements tab) you can work in any order, or measure samples in parallel.

However, the Viscosity tab is active by default; so for this example the viscosity test will run first.

See Measuring Samples with the Viscometer Module on page 33

Measuring Samples with the Viscometer Module

The viscometer measures the kinematic viscosity of fluids.

| ⚠️	You **must** clean and/or condition the module before testing samples. See Verifying Modules on page 13
	You **may need** to verify the module if the conditions are appropriate. See Verifying the Viscometer on page 14
	Any changes must be updated and synchronized with Fluid Manager. See the "Fluid Manager User's Guide" for more information.

Whether you selected an Asset, a Fluid or a Preset, the Viscosity tab opens active by default:

⚠️	The Start button is disabled until the Viscometer reaches 40C. You may need to wait for it to warm up - see the "Viscometer Warming" message below.
	Note that **warming can only take place** when the cell is fully inserted into the module housing. The colder the temperature, the longer the warming process will take. We recommend that you use and store the device in a heated location.
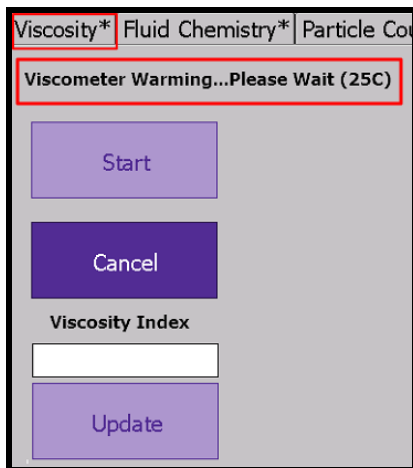
1. Using a new 60 µl single-use pipette, squeeze the bulb, dip the end of the pipette into the used oil and slowly release the bulb to draw in the fluid. Some will collect in the overflow bulb - this is normal.

2. Remove the pipette from the fluid, wipe the exterior of the pipette with a lint free wipe. Inspect the leg containing 60 µl of fluid for the presence of bubbles. If bubbles are present, discard and repeat with a fresh pipette.

⚠️	The "leg" of the pipette is the required 60 µl - do not try to empty the overflow bulb into the viscometer funnel.

3. Place the very tip of the pipette inside the funnel and rest the "wings" on the plates at the top of the funnel, and press Start.

4. Smoothly push (not squirt) the oil into the funnel over approximately 2-3 seconds (depending on viscosity).

5. The result displays similar to this example:
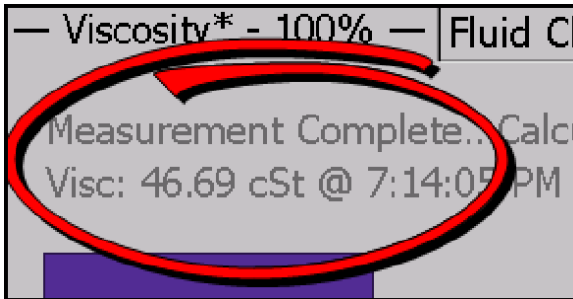
Optional: Use the Viscosity Index and display an estimated value at 100C.

Press in the Viscosity Index field to open a keyboard and enter the Viscosity Index. For this example, use 1.81:
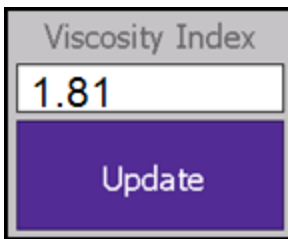
Press Update to display both the actual and the estimated results similar to this example:
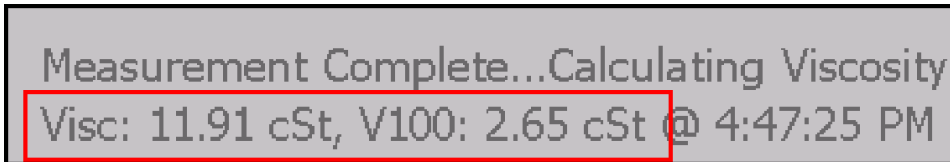
6. Continue to the next module. You can either test a sample with the FluidScan or with the FPQ module. For this example, run the FluidScan module next; see

Your results are not yet saved. The expectation is that you will complete all four tests before saving them all together. Until they are saved, you can repeat tests on any module by clicking the module tab. Be aware that this will overwrite any unsaved data for that module.

Measuring Samples with the FluidScan Module

The FluidScan module measures fluid chemistry and water contamination.

⚠️ You **might need** to verify the module; see Verifying the FluidScan on page 18.

1. Remove the test cell from the measuring slot, clean it, but do not return the cell to the slot.

⚠️ The Background measurement is taken with the cell out of the measuring head.

2. Press the Fluid Chemistry tab.
3. Press the Background button to start the Background measurement.

📝 You might see a message that the Spectrometer windows are still dirty. Make sure the cell is out and wait a few seconds - the message should change to "Clean."

4. Follow the prompts to finish the Background measurement.
5. After the background measurement is done, place 2 - 3 drops of oil on the cell glass and return the cell to the measuring position inside the test head.
6. Press OK to start the measurement.

   Based on your license(s), the fluid category, and other configured options, results will display similar to this example:

```
AW Additive: 207.01 %
Bubbles: No Bubbles Detected
Fuel Dilution: 0.00 %
Glycol:  0.61 %
Nitration: 24.42 abs/cm
Oxidation: 18.32 abs/0.1mm
Soot:  0.04 %wt
Sulfation: 33.15 abs/0.1mm
TBN: 10.73 mgKOH/g
Water: 5339.01 ppm
```

> ⚠️ Your results are not yet saved. The expectation is that you will complete all four tests before saving them all together. Until they are saved, you can repeat tests on any module by clicking the module tab. Be aware that this will overwrite any unsaved data for that module.
>
> Proceed to the next module. This has to be the FPQ module in order to prepare a Filtergram for testing with the XRF module.

Total Water - Dissolved Water plus Free Water

All fluids from all fluid categories will return a measurement for **Water** - which is dissolved water peaks only, from 50-100 ppm to the saturation point - 5339 ppm in the above example.

Total Water (which requires the Comprehensive Water Solution license) will report the actual ppm total for Dissolved Water plus Free Water for levels detected from 300 - 65,000 ppm for all fluids in the Turbine categories, and from 1000 - 65,000 ppm for other industrial fluid categories like gear oil.

However, Total Water - even if you have the appropriate license - is not supported for all categories. For example, no oils from any of the Engine categories will display a Total Water test result.

Homogenizing Samples

Total Water testing **requires** a homogenized sample. Spectro Scientific has a range of suitable portable and tabletop homogenizers that are supplied with the appropriate license.

These approved homogenizers mix the sample far more effectively than shaking alone, even though the samples might outwardly look the same.

Please refer to the homogenizer user manual for general operating instructions.

Note: Although you can use the homogenizer hand-held, we recommend you use a stand.

1. Collect an oil sample and shake it well for 30 seconds.
2. Fill a Spectro-provided 20 ml sample bottle to a depth of 1/3 - 1/2 the fluid height (~4 cm (1.5 in)) for best results. The bottle geometry has been selected to provide the most uniform sample homogenization to ensure the best measurement repeatability.

3. Insert the tip of the probe into the fluid making sure the hole (arrowed) is below the fluid level and the tip is above the bottom of the bottle:
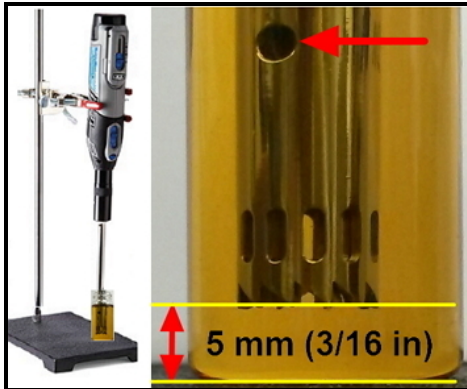
4. Homogenize on high power for ~60 seconds while swirling the sample bottle around the tip to capture all sample fluid. A sample with water contamination looks similar to this:

5. Turn the homogenizer off, remove the tip from the sample, and dry it with a lint-free pad.

   If you are testing samples of a similar oil type, wiping the tip and blotting it dry with a lint-free pad is sufficient cleaning.

   If you are testing different oil types, or if you are storing the homogenizer (even if only overnight) rinse the tip with alcohol before blotting it dry.

6. Let the sample sit for about 60 seconds before analysis.

| ⚠ | Do not let a homogenized sample sit for more than 30 minutes otherwise you must homogenize it again. |

The testing method is the same as any other FluidScan test described in this section.

Measuring Samples with the FPQ Module

The Fluid Particle Quantifier (FPQ) provides a count of any contaminant particles of 4 µm in size and larger.

1. For this example, assume that you have already run the Viscometer and FluidScan modules.
2. Press the Particle Count tab:
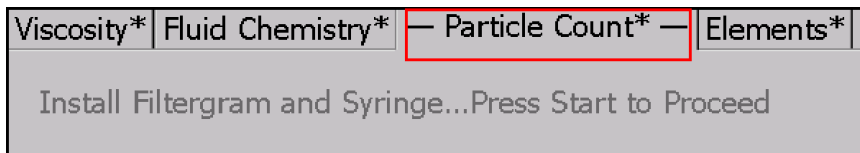
Viscosity*	Fluid Chemistry*	— Particle Count* —	Elements*

Install Filtergram and Syringe...Press Start to Proceed

1. Raise the black locking clasp:

2. Pull the syringe mechanism forward until the loading hole is exposed:

3. Insert a clean Filtergram into the slot beneath the syringe:

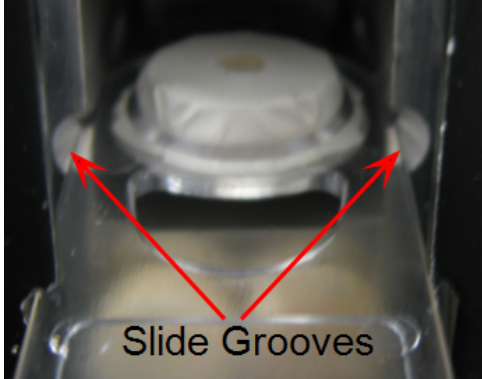⚠️ | Make sure the Filtergram is loaded with the raised side up (not the "bump" side).
Push until it reaches the stop at the back of the slot.

Slide Grooves

4. Draw 3 ml of fluid into a clean syringe.
5. Use a non-abrasive pad to remove all fluid from the exterior of the syringe.
6. Press the syringe firmly into the loading hole until the shoulders are flush against the stop.

📝 | Be sure to rotate the syringe so that the shoulders are oriented as shown below.
Otherwise, they will pinch when the door closes.
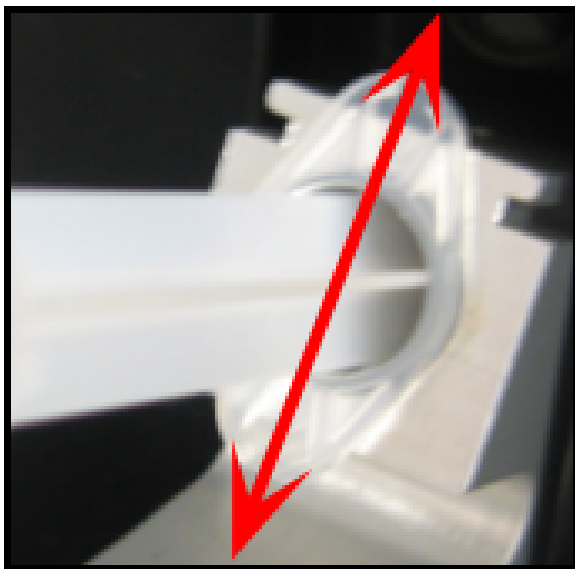
7. Close the fluid loading mechanism and snap the clasp down to lock it in place.
8. Press Start.

	Depending on the contamination level, the module may not use all 3.0 ml in the syringe - it will only dispense enough to ensure an accurate measurement when the Filtergram goes through the XRF module. The actual amount used in the sample will appear in the Volume (ml) field. In this example, it only needed 2.6 ml (see below).
	You might want to write this number on the Filtergram with an indelible pen. If you store it to run it through the XRF module later (rather than immediately running it) you will need to update the Volume field on the Elements tab.
	If you do not do this, the count will be based on the wrong sample volume, and the results will not be accurate.

9. When the measurement is complete, the results will display similar to this example:

Viscosity* | Fluid Chemistry* | — Particle Count* - 100% —

Measurement Complete
Particle Count: 25178, @ 9:16:37 AM

Start

Oil Lock Speed: 22 "/s /1K
Particle Count >4µm: 25178 p/ml

Cancel

Volume (ml)

2.6

10. Press Save to return to the Main Menu.
11. Open the FPQ door and remove the Filtergram being careful not to touch or disturb particles captured on the filter.

	To remove the Filtergram, the door must be open otherwise the Filtergram will be destroyed.

12. Remove the syringe and dispose of it properly.

	Your results are not yet saved. The expectation is that you will complete all four tests before saving them all together. Until they are saved, you can repeat tests on any module by clicking the module tab. Be aware that this will overwrite any unsaved data for that module.

Continue with the XRF measurement.

Measuring Samples with the XRF Module

The XRF module analyzes particles trapped by the FPQ and detects their elemental properties.

	There is a key switch located on the rear of the XRF tower which enables the high voltage to the X-ray tube. Two keys are supplied with the device. No X-rays can be generated unless this switch is turned 90° clockwise:
⚠	**OFF** **ON**

Yellow warning light: Indicates the key switch has enabled the high voltage to the X-ray tube.

	After a period of idleness, the XRF module goes dormant and the yellow LED will go out even though power is applied and all is working correctly. If this happens, you will be prompted to "wake" the module from the user interface as part of the test process.
⚠	

Yellow and Red warning lights simultaneously: Indicates the module is powered up **and** X-rays are being generated.

STOP	Do not open the door when the red light is on.

For this example, you have already run the Viscometer, FluidScan and FPQ modules and you have a new Filtergram from the FPQ module.

1. Press the Elements tab:

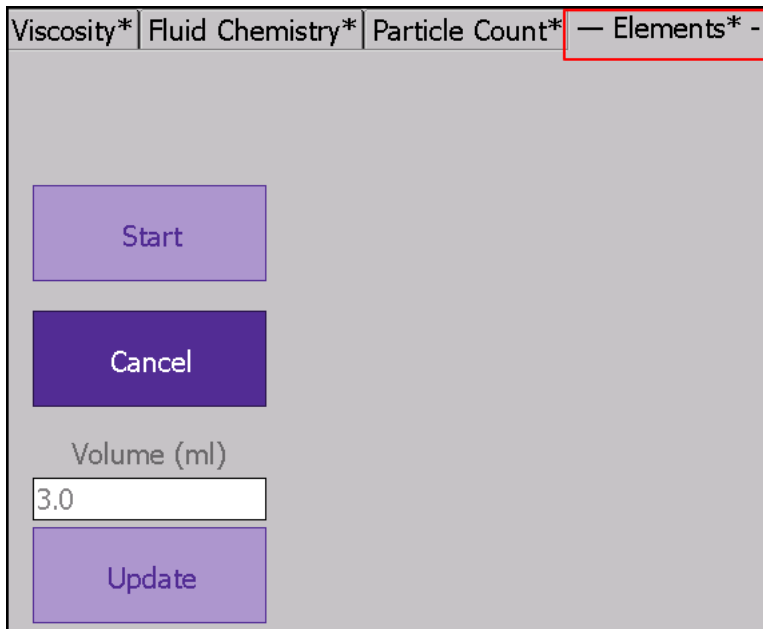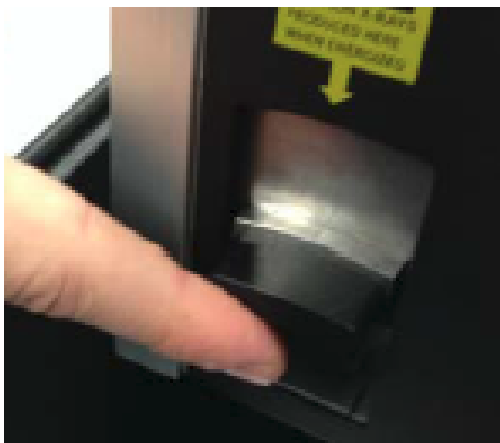| Viscosity*	Fluid Chemistry*	Particle Count*	— Elements* -

Start

Cancel

Volume (ml)

3.0

Update

2. Lift the XRF door:

3. Insert the Filtergram you made with the FPQ module:

Make sure the Filtergram is loaded with the raised side up (not the "bump" side) exactly as you inserted it into the FPQ module. Push until it reaches the stop at the back of the slot.
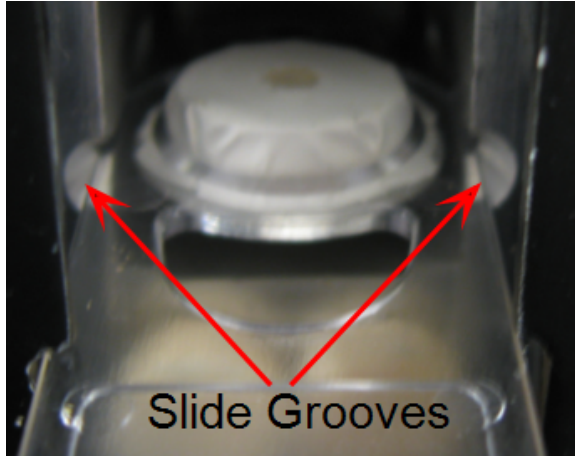
4. Press Start to begin the measurement process.

The red light means the X-ray tube is energized. It will go out once the test is done.

5. After the test, a list of detected elements is displayed similar to this example:

If you tested a Filtergram where the FPQ module used less than the 3.0 ml sample, **AND** it was a Filtergram that came from storage (**not** a Filtergram you just removed from the FPQ module as in this example) enter the volume used for the sample in the Volume field. Then press the Update button and then Start.

The XRF will run the sample again and generate a new output. The results will always be higher when the volume is adjusted down.

Start
Cancel
Volume (ml)
2.6
Update

Elements Detected

Al: 0.00 ppm
Si: 0.00 ppm
Ti: 0.00 ppm
Cr: 77.53 ppm
Fe: 100.08 ppm
Ni: 142.34 ppm
Cu: 0.00 ppm
Zn: 0.00 ppm
Pb: 0.00 ppm
Mo: 0.00 ppm
Ag: 0.00 ppm

You have completed a test for each module, but your results are still not yet saved. Until they are saved, you can repeat tests on any module by clicking the module tab. The new result will overwrite any unsaved data, but it will not be saved yet.

See Saving the Test Results on page 45.

Saving the Test Results

When you are satisfied with the results for all four modules, press the Continue button in the bottom right corner. The Review Data screen opens similar to this example:

- A module in red means at least one parameter tested above the high alarm threshold.
- A module in yellow means at least one parameter tested between the low alarm threshold and the high alarm threshold.
- A module in white means all parameters tested below the low alarm threshold.

Optional: You can review each module by clicking the + sign to open it up similar to this example:

Either press the Main Menu button to abandon all measurements, press the Back button to retest the sample on one or more modules, or press the Save button. You can review the results after saving them; see below:

Reviewing the Test Results

 You can only view results for measurements that you saved.

1. From the Main Menu, press the Review Data button:
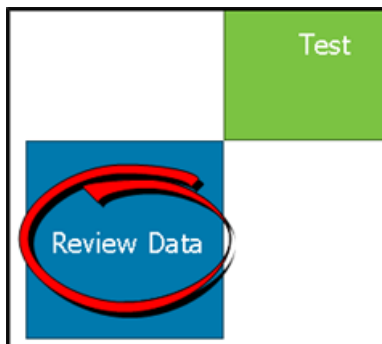
2. The Select screen opens similar to the example below. If there are any asset measurements in the system they will display in the Assets Measured section. Any fluid measurements will display in the Fluids Measured section. You may need to use the scroll bars to scroll down to see the entire list.

    For this example, there are 3 results for the asset X0518-XX25-KE 250 over 6 days:

3. You can select any result in either list to see the result in isolation. But if you want to see if there is a trend in the results over an extended time period you need to select the first result in a sequence. In the example above that would be the result from March 1.

4. Press the March 1 result and press Continue. The Review Data screen will open similar to this example:

Sample ID: Sample #1
01 Mar 2016 14:33

⊞ Viscosity
⊞ Fluid Chemistry
⊞ Particle Count
⊞ Elements

5. Click the + symbol next to the module results you want to see. For this example, select Fluid Chemistry - the results will display similar to this example:

⊞ Viscosity
⊟ Fluid Chemistry
    AW Additive: 90.53 %
    Fuel Dilution: 0.00 %
    Glycol: 0.14 %
    Nitration: 47.07 abs/cm
    Oxidation: 23.35 abs/0.1mm
    Soot: 0.66 %wt
    Sulfation: 17.68 abs/0.1mm
    TBN: 7.91 mgKOH/g
    Water: 19112.82 ppm

White means results are below the low alarm threshold.

Yellow means results are between the low and high alarm thresholds.

Red means results are above the high alarm threshold.

To see if there is a trend developing, review the other 2 results for this asset. For this example, the Glycol measurement was 0.14% on March 1. Suppose the result on March 2 showed the Glycol result was 3.2% and on March 6 the Glycol result was 8.7%.

This upward trend over time shows that there is antifreeze in the oil and it's getting steadily worse. This could very well indicate a cracked cylinder head gasket.

4   Custom Fluid Management

This chapter provides the information you need to create and manage custom "User Fluids."

Testing Supplies

You will need a small amount of the fluid you want to create as a User Fluid. The sample must be clean and from an uncontaminated supply.

You also need these items from the Consumables kit:

- Disposable 60 µl pipettes
- Non-abrasive lint-free wipes

Refer to Ordering Testing Supplies and Replacement Parts on page 3 for information about ordering supplies.

Creating a New User Fluid

> ⚠️ You may need to verify the FluidScan Module first - see Verifying the FluidScan on page 18.

You might want to create User fluids for a variety of reasons, such as customizing properties or alarms to better suit your application. In this example, a User fluid will be created, then the alarm limits for water will be adjusted.

1. From the Main Menu, press the Setup button to open the Setup Menu.
2. Press the Manage Fluids button. The User Fluid Management Menu opens:
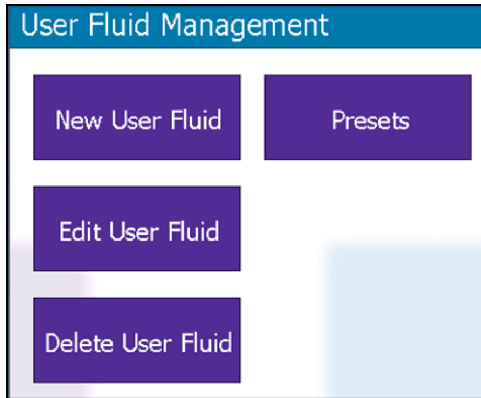
3. Press the New User Fluid button.

   The cleanliness check starts. You should see a "Cell is Clean" message.

   If the cell is still dirtyclean the cell until the Cell is Clean message appears.

4. Press the Run Bkg button to start the background measurement.

5. When the background measurement is complete, press Continue.

You are now ready to add a fluid sample to the sample cell and begin the measurement.

1. At the prompt, open the sample cell.

2. Draw the clean fluid into a pipette and add 2 - 3 drops to the cell window until the window is completely covered.

3. Close the cell.

When closing the cell, the best practice at all times is to leave the side held by the magnets flat and swing the other half down to meet it.

The two halves are separated by a spring piston and you should allow the magnets to close the halves to create a proper seal around the sample. This takes ~3 seconds and it will ensure the integrity of your samples.

---

4. Lift the closed cell and lower it back into the FluidScan housing.

5. Press the Start button.

The FluidScan checks the entire database for fluids that most closely match the chemistry of your User fluid sample.

It may be that there are several fluids in the database that have the same high score. This is because many fluids have the same chemical composition - the FluidScan does not distinguish brand from brand. The high score need not necessarily be a 10.0 - anything above a 7.0 is considered a "highly probable" match.

Suppose there are four fluids that match with a 9.0 high score. To know which one to choose as the base chemistry for your User fluid, you need to find the fluid with the properties you want to measure.

If you are looking at a gear oil as the base chemistry for your customized fluid, measuring TAN might be an important property. There might be only one high scoring result with TAN as a property, so you would choose that fluid as the base chemistry for your User fluid.

If there is more than one top scorer with the TAN property, you can pick whichever brand you want - you are only interested in the chemistry.

In this case, only one match is found:

Index	Score	Family	Properties
0	9.5	Reciprocating Engine	Lubricant Condition: Amt Dis...

Matched Fluids

6. Press Continue.
7. Add a name for the new fluid. Press inside the Fluid Name field to open a software keyboard. For this example, create a fictional name: La Paz Ferry Summer Diesel.
8. Press OK to save and add the fluid to the database. The saved fluid will now be displayed in the list of choices available when selecting a fluid to measure at test initiation.
9. You will be returned to the User Fluid Management Menu.

Editing a User Fluid

Follow these steps to edit an existing user fluid. There are various reasons you might want to do this: for example, when moving equipment from one weather extreme to another where your additives or alarms might change to deal with the new environment.

1. From the Main Menu, press the Setup button to open the Setup Menu

2. Press the Manage Fluids button to open the User Fluid Management Menu:

3. Press the Edit User Fluid button to open the Select Fluid to Edit screen

User Defined:	Castrol Transmax Mercon V 216
	Delivery - Nome Region
	SB IR check
	La Paz Ferry Summer Diesel

4. Select the fluid name and press Continue. For this example, select La Paz Ferry Summer Diesel.

5. The Select Properties screen for this fluid opens, similar to this example. You will need to scroll down to see the bott om of the list:

Select Properties » Fluid: La Paz Ferry Summer Diesel

Edit Fluid Name: La Paz Ferry Summer Diesel

☑ All Properties

Property	Units
☑ Ag	ppm
☑ Al	ppm
☑ Amt Dispensed	ml
☑ AW Additive	%
☑ Bubbles	Bubbles
☑ Cr	ppm

If you only want to edit the fluid name, you can do that here and press Continue.

Otherwise you can edit from one to all properties. For this example, you want to edit only the Water property and change the points where low, medium and high alarms will be triggered.

6. Press the All Properties check-box to deselect all properties.

7. Scroll down to the Water property and press it to select it.

8. Press Continue to open the Specify Alarm Limits screen similar to this example:

Property	Low	High	Units
Water	N/A	N/A	ppm

☐ Check Lower Limits   ☐ Check Upper Limits

Lower Warning: 0.00   Upper Warning: 0.00

Lower Limit: 0.00   Upper Limit: 0.00

Update

9. Press the Check Lower Limits check-box.
10. The Lower Limit for an alarm must be equal to or less than the Lower Warning. For this example, enter 4000 in the Lower Limit field and enter 5000 in the Lower Warning field.
11. Press the Check Upper Limits check-box.
12. The Upper Limit for an alarm must be equal to or greater than the Upper Warning field. For this example, enter 9000 in the Upper Warning field and enter 10,000 in the Upper LImit field:

☑ Check Lower Limits   ☑ Check Upper Limits

Lower Warning: 5000.00   Upper Warning: 9000.00

Lower Limit: 4000.00   Upper Limit: 10000.00

Update

13. Press the Update button and confirm the Low and High Alarms are set correctly:

Property	Low	High	Units
Water	4000.00	10000.00	ppm

14. Press Continue to open the Adjust Property Values screen similar to this example:

Adjust Property Values » Fluid: La Paz Ferry Summer Diesel

Property	Value	Units	
Water	349	ppm	

Calculated Value: 349

Measurement Value: 349.00

Update

Deleting a User Fluid

Follow these steps to delete an existing user fluid.

⚠️ You can't delete a fluid if there are measurements applied to it

1. From the Main Menu, press the Setup button to open the Setup Menu.
2. Press the Manage Fluids button to open the User Fluid Management Menu.
3. Press the Delete User Fluid button.
4. Select the fluid to delete and press Continue.
5. Press Yes to confirm you want to delete the fluid. There is no confirmation dialog box - you are returned to the User Fluid Management menu.

Assigning User Fluids to Presets

Presets are useful because if you are measuring the same fluid or asset time after time, you don't have to search for it. For example, if you want to run a control sample every shift or every day, this becomes a one-button operation.

Two presets are available as a convenience to the user. They can be overwritten as required.

1. From the Main Menu, press the Setup button to open the Setup Menu.
2. Press the Manage Fluids button to open the User Fluid Management Menu.
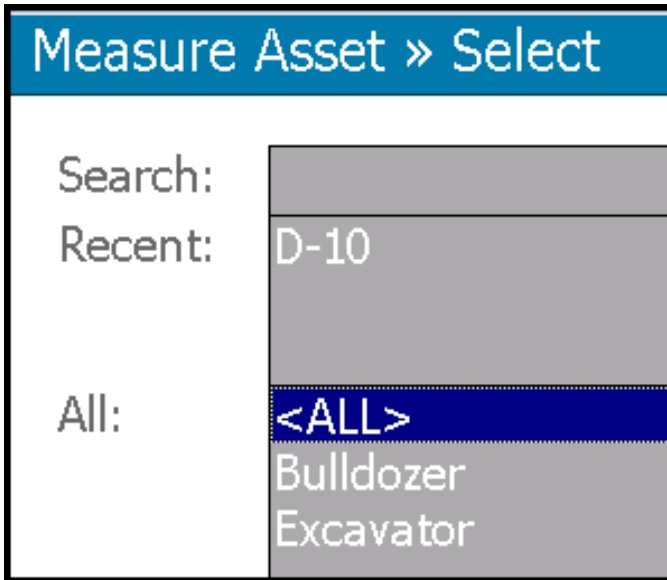3. Press the Presets button.

    The Measurement Presets screen opens:

Measurement Presets

Set frequently used assets or fluids to save time initiating measurements:

Preset #1 - Empty

Short Name: [   ]   Sample ID: [   ]

[Select Asset]   [Select Fluid]   [Clear Preset]

Preset #2 - Empty

Short Name: [   ]   Sample ID: [   ]

[Select Asset]   [Select Fluid]   [Clear Preset]

---

4. Press either Preset 1 or Preset 2, whichever is empty.

    If necessary, you can select a preset to overwrite by pressing the Clear Preset button for the appropriate preset.

    For each preset you can choose either Select Asset or Select Fluid, as follows:

Assigning an Asset to a Preset

1. Press Select Asset to open the Measure Asset - Select screen:
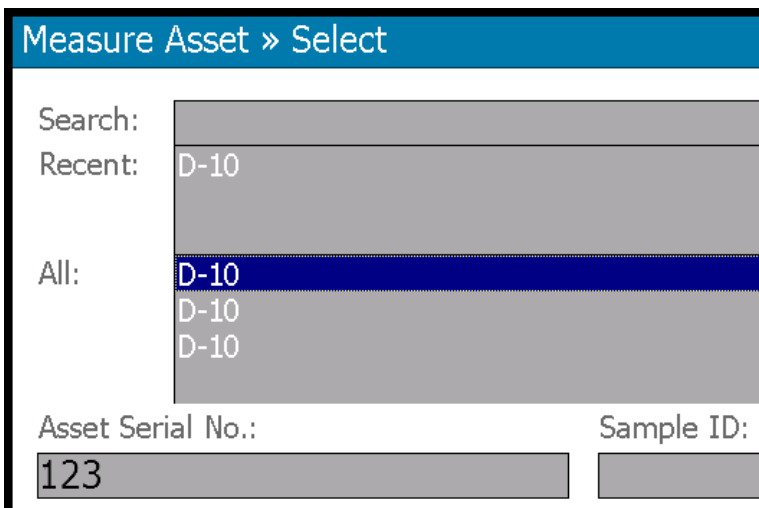
2. For this example, select Bulldozer and press Continue.
3. Select Engine and press Continue.
4. Select Drain Plug and press Continue to open the Measure Asset - Select screen:

> You can have multiple assets all with the same name, as in this example, as long as each is identified by a unique identifier such as a serial number. The Asset Serial No: field shows the serial number for each asset by default. Select a Sample ID later.

5. For this example, select the D-10 asset with the serial number 123 and press Continue.

6. Create a short name - for this example use D-10 serial 123:

Set frequently used assets or fluids to save time initiating measurements:

Preset #1 - Asset: D-10

Short Name: D-10 Serial 123   Sample ID:

7. Press Save to return to the User Fluid Management Screen.

Now whenever you press the Test button, you will see this preset has its own button:

Test

Measure Asset   D-10 Serial 123

Measure Fluid

Assigning a Fluid to a Preset

For this example, use the fictional La Paz Ferry Summer Diesel, as follows:

1. Press Select Fluid to open the Select Fluid screen similar to this:

Measurement Preset #1 » Select Fluid

Search:
Recent: La Paz Ferry Summer Diesel
         fluid1
         Delivery - Nome Region
All: 14% ETOH/Gasoline
         Addinol Diesel Longlife MD 1548
         Addinol Superstar MX 1547

For whatever reason, suppose this fluid was measured recently so it appears in the Recent list. It saves having to search for it or scroll down to it.

2. Press La Paz Ferry Summer Diesel to select it and press Continue.

3. Create a short name - for this example use LP Summer:

Set frequently used assets or fluids to save time initiating measurements:

Preset #1 - Fluid: La Paz Ferry Summer Diesel

Short Name: LP Summer   Sample ID:

4. Press Save to return to the User Fluid Management Screen.

Now when you press the Test button, this preset will have its own button:

Test

Measure Asset   LP Summer

Measure Fluid

5   Managing Data and Databases

This chapter provides information about how to manage databases:

Synchronizing Data with Fluid Manager

Whenever you make changes to the fluid database in either Fluid Manager or in the Q5800, you must synchronize the data so that both databases contain the same updated information.

Refer to the "Fluid Manager User's Guide" for more information.

> ⚠️ You must re-synchronize after a testing session - **even if you are connected to Fluid Manager** - to get a valid result.

When Fluid Manager is connected, if it detects any unsynchronized information, the Sync button will flash red until you sync up:
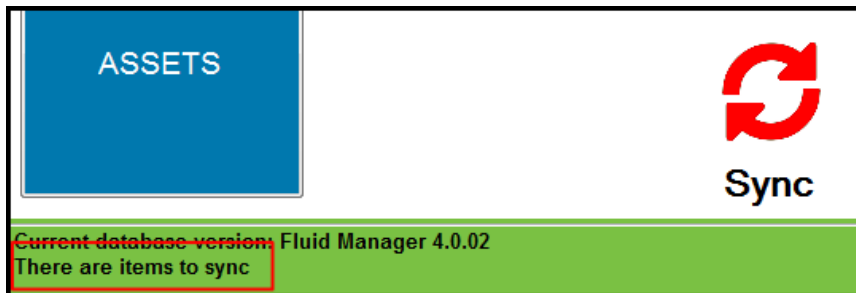
You must be at the Main Menu or be logged out when synchronizing data to avoid damage to the database.

Do not disconnect your device while synchronization is in process. It could result in damage to the database and software.

Exporting the Database to a USB Data Stick

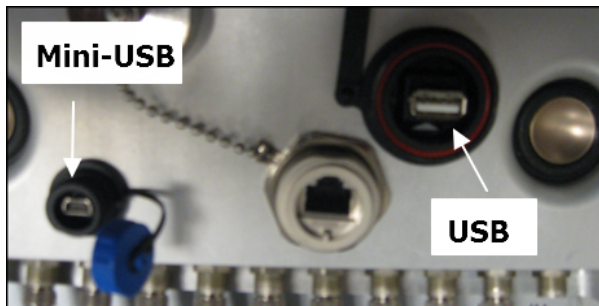1. Remove the cap covering the USB port on the back of the screen:

2. Connect a data stick to the USB port
3. From the Main Menu, press the Setup button.
4. From the Setup Menu press Manage Data.
5. Press Export Database.
6. The database will export and you will see a Database Successful message.
7. Click OK to return to the Database Management screen.
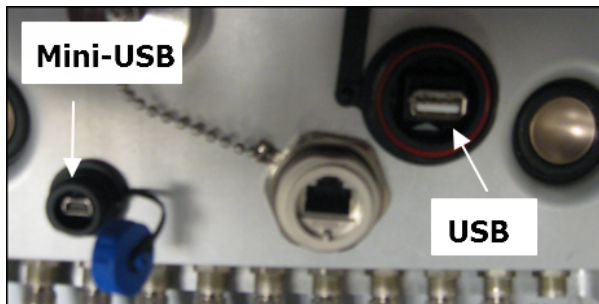
Importing a Database from a USB Data Stick

1. Remove the cap covering the USB port on the back of the screen:

2. Connect a data stick to the USB port
3. From the Main Menu, press the Setup button.
4. From the Setup Menu press Manage Data.
5. Press Import Database.

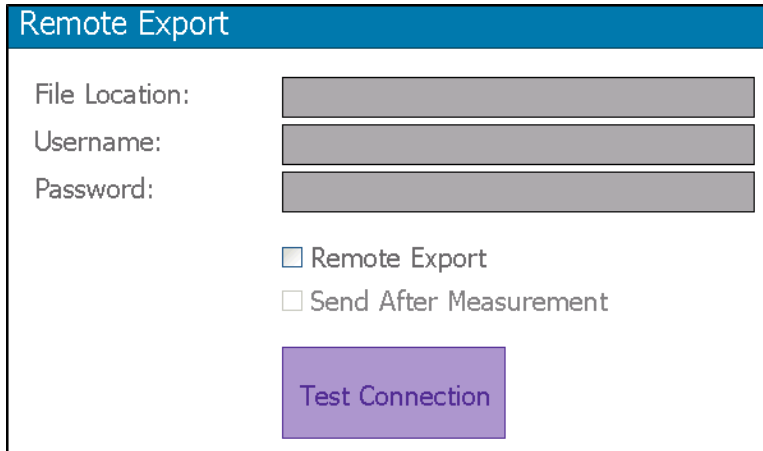| STOP | You will be asked to confirm that you want to import a database and overwrite the existing database. This will be your final opportunity to cancel. |

6. Press yes. The database will import and you will see a Database Successful message.
7. Click OK to return to the Database Management screen.

Exporting Data to a Networked Location

You can use this feature to send information to a networked location such as an FTP server.

1. From the Main Menu, press the Setup button.
2. From the Setup Menu press the Remote Export button.

    The remote Export screen opens similar to this example:

Remote Export

File Location:

Username:

Password:

☐ Remote Export
☐ Send After Measurement

Test Connection

3. Enter the remote file location; for example ftp://255.255.255.255
4. Enter a user name and password.

Optional - press the Remote Export checkbox - this activates the Test Connection button and the Send After Measurement check-box. Use this if you want to send a batch of reports all at one time.

Optional - press both check-boxes.

5. OR click BOTH check-boxes, Press the Send After Measurement check-box if you want to send reports automatically one at a time whenever test data is saved.

6   **Troubleshooting**

This section describes various issues that might arise in the field, and how you might fix them.

Contacting Technical Support

Contact Technical Support at (+1) 978-431-1120.

You should have the following information available to open a ticket:

- Serial Number

  You can locate the serial number and other information that might be useful to your support engineer by pressing the Help button on the Main Menu:

```
Q5800 Serial: 5800-0011                          System Status

Viscometer Serial: visc14        System Time:
FluidScan  Serial: HH0099          10 February 2016 15:03
FPQ        Serial: 0011          Storage Remaining:
XRF        Serial: 10-watt 3       371.44 MB (80%)
                                 Temperature: 29.6 °C
Viscometer F/W: 1.7.3            Voltage: 16.75 V (100%)
FluidScan  F/W: 1.7             FPQ Bag Count: 2
FPQ        F/W: G
XRF, FPGA  F/W: 1.0.1.12, 11

CE OS Build 2.3.0.0
Software Ver.: 4.0.0.6
Database Ver.: 4.0.02
SA       Ver.: 1.64.11.48
```

- Location
- Responsible contact information
- Full description of the problem with pictures or video where possible

Replacing the Rechargeable Battery

The battery is located to the left of the Viscometer:
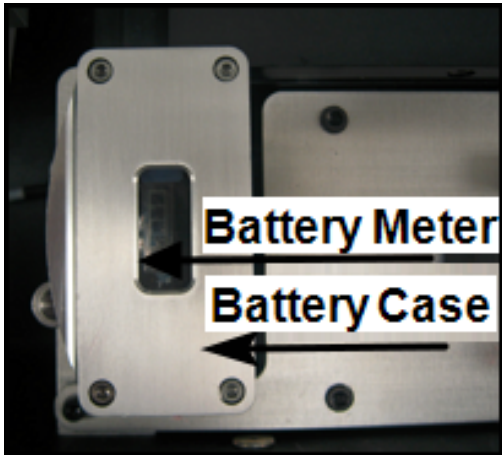
Replacement batteries may be purchased direct from Spectro Scientific.

Follow these steps to remove and replace the battery:

> ⚠️ Use a grounding strap such as a wrist-strap to avoid possible short-circuit damage.

> 🛑 **STOP** The battery is **not** hot-swappable.

1. Shut down the system.
2. Disconnect the power source.
3. Remove the cable at the bottom of the battery by turning the locking collar to the left to loosen it fully, then gently pulling the cable free.
4. Press the button on top of the lock pin and lift the battery over the locator stud and out of the case:
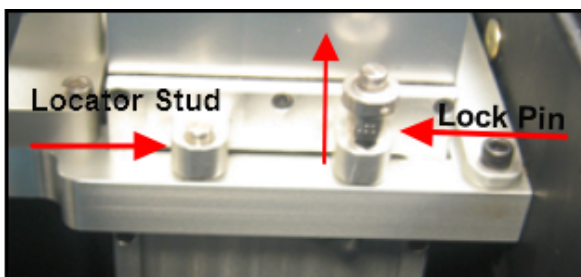
Installing a new battery is the reverse of this procedure.

Replacing the Internal Battery

Date and time stamps are maintained by a 3-volt lithium battery that needs to be replaced periodically when it no longer holds charge.

Follow these steps to replace the internal battery:

> ⚠️ Use a grounding strap such as a wrist-strap to avoid possible short-circuit damage.

1. Pull the retaining pin located on the right side rail and slide the monitor up until it is clear of the rails.

> 📝 Do not disconnect the 11 connectors on the bottom of the monitor.
>
> You will need to lay the monitor flat with the glass side down, so we advise you cover the the viscometer and FluidScan modules with some thick padding.

2. Using a 7/64-inch Allen wrench, remove the screws around the back side perimeter and set them aside.

> ⚠️ Remove the back panel cautiously as there are some short wire connections inside.

3. Lift the back cover to expose the circuitry:

> 📝 There is no need to disconnect anything to access the battery.

The battery is of the round "coin" type. It is located directly on the circuit board along the top edge closest to the handle and to the left relative to how you are looking at the circuit board:

3V Lithium Battery
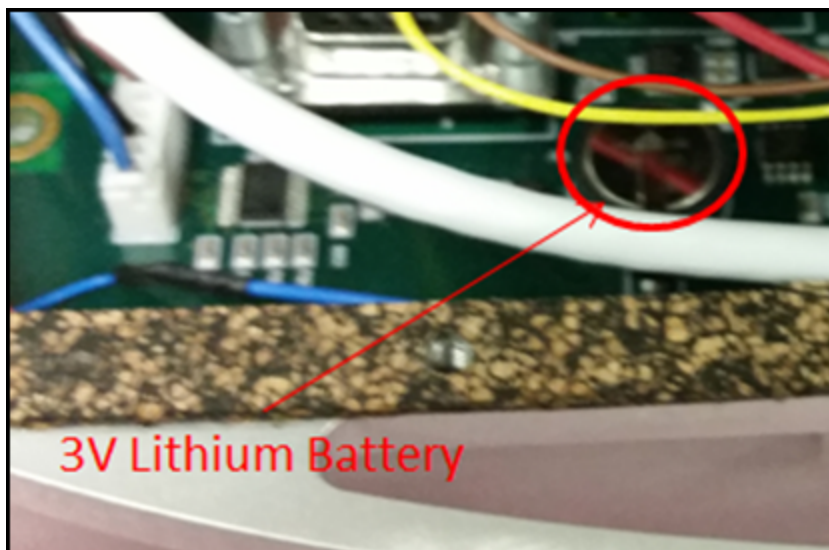
	A battery is available from Spectro Scientific. Use part number P-10721.

4. Use a non-conductive tool to pry the old battery loose and press in the replacement.
5. Replace the back cover and return the screen to its normal location.

Draining the FPQ Waste Fluid Bag

Depending on the amount of FPQ module use, you will occasionally need to drain the waste fluid bag.

The bag is located underneath and behind the XRF measuring tower.

|	You will see an on-screen prompt if you need to empty the bag.
	Typically a bag which is getting close to full will exert back pressure on the system, so after changing the bag it is a good idea to zero the pressure sensors. See FPQ "Initial Pressure Too High" Warning on page 65

Follow these steps to drain the waste bag:
1. Turn the valve 90° to close the valve and prevent accidental spillage from the bag:
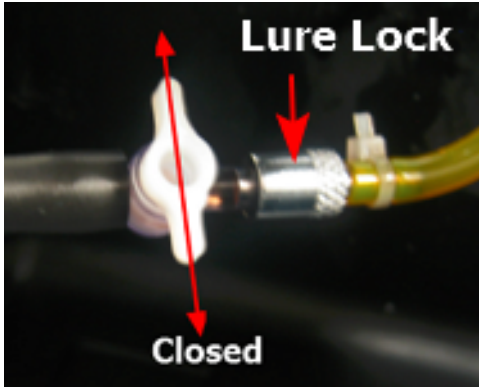
2. Remove the bag by turning the Lure lock anti-clockwise and pulling the tube out:
3. Drain the bag into a waste container.
4. Replace the tube and tighten the Lure lock.
5. Turn the valve through 90° to open the tube into the bag:
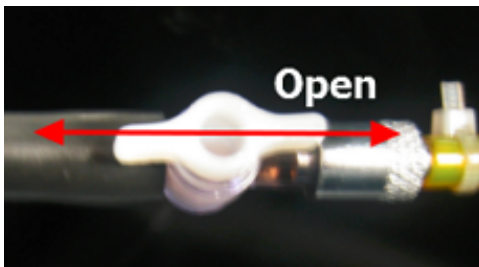
FPQ "Initial Pressure Too High" Warning

There are pressure sensors in the FPQ module that might occasionally cause the following message to appear:
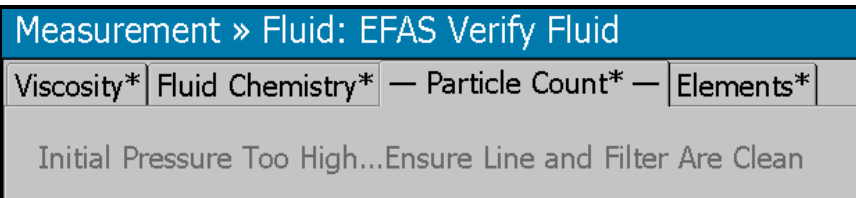
Follow these steps to zero out the pressure and clear the message:
6. From the Main Menu, press the Setup button.
7. The Setup Menu opens. Press the FPQ Zeroing button.
8. The FPQ Zeroing screen opens:

FPQ Zeroing

Zero Bag Count

Zero Pressure

Optional - If you are keeping a running total of the number of bags you have emptied, you can reset the number to zero by pressing the Zero Bag Count button.

9. Press the Zero Pressure button. See Draining the FPQ Waste Fluid Bag on page 64 for instructions on removing and draining the bag.

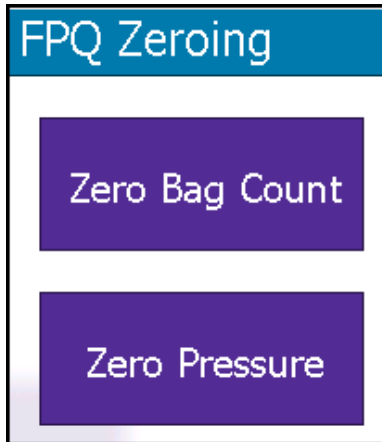10. Before you connect the bag back up to the oil line, you need to blow out the oil tube. Load a clean Filtergram and a syringe filled only with air into the FPQ module and press the Run FPQ button to force the air out of the syringe and through the tube.

11. Wait for the module to finish with the first syringe, then reset the syringe and press the Run FPQ Again button to force more air through the fluid line. The following message will display:

```
Inspect drain line and ensure most of the oil is removed. If
any oil remains, repeat the syringe purge or press Continue
to zero the sensors.
```

12. Assume for this example that the oil line is now clean. Install the bag as described in Draining the FPQ Waste Fluid Bag on page 64.

13. Press Continue to zero the sensors. A timer will display, and you will see a message that the sensors were properly zeroed. Press the Save button, then press the Main Menu button.

Fluid Pooling in Transit Case

It is inevitable that small amounts of oil will drip into the transit case through repeated testing. However if you notice excessive fluid pooling in the bottom of the transit case check the following:

• Make sure the waste bag is not overflowing. If it needs emptying, follow the procedure in this guide.

• Make sure the bag is not punctured or leaking from the oil inlet seal. If this is the case, replace the bag or the tube or both.

• Make sure the valve or Lure lock is not leaking. If it is, replace it.

A   Specifications

PRODUCT INFORMATION	
Part Number	Q5800 EFA Comprehensive (All)
Applications	Mineral and synthetic lubricants including gear, engine, transmission, hydraulics, turbine as well as military, marine and mining applications.
Operating Mode	Single test or multi-parameter analysis
Output:	
Elemental (ppm):(dependent on fluid type)	Silicon (Si); Aluminum (Al); Chromium (Cr); Titanium (Ti); Iron (Fe); Nickel (Ni); Lead (Pb); Copper (Cu); Tin (Sn); Molybdenum (Mo); Silver (Ag); Zinc (Zn); Vanadium (V)
Fluid Chemistry:	TAN, TBN, Oxidation, Nitration, Sulfation (Abs/.1mm); Water (ppm); Glycol (% by weight); Soot (% by weight); Incorrect fluid (% by weight) Antioxidant Depletion (% remaining); Antiwear Depletion (% by weight)
Viscosity:	Kinematic viscosity at 40°C (cSt)
Particle Count:	Particles > 4 µm/ml on filtergram
Methodology	ASTM D7889; Mod ASTM D7279 (visc); Mod ISO 21018-3 (Particle Count)

PRODUCT INFORMATION	
Repeatability	Viscosity: +/- 5%
	Fluid Chemistry: per ASTM D7889
	Particle Count: per ASTM D7467
	Elemental: reliant on particle count
Calibration	Factory, Verification Standards: NIST traceable verification standards provided

ELEMENTAL MODULE	
Detector	10 mm2 SDD Detector; peltier cooled
Resolution	145 eV at 100,000 Cps
Excitation Source	X-ray tube with Rhodium target; max voltage 45kV

OPERATIONAL SPECIFICATIONS	
Sample Volume Required (all tests)	Less than 5 ml per sample
Sample Time Required	Viscosity: 20 secs to 10 mins, dependent on grade
	Fluid Chemistry: less than 60 secs
	Particle Count: 20 secs to 3 minutes, sample dependent
	XRF: 2 minutes
Solvents/Reagents	None
Ambient Operating Temperature	-10° to +50°C (all modules w/o viscosity)
	With viscosity: 0° to 40°C
Operational Humidity	RH< 80% non-condensing
Ambient Altitude	Up to 5,000 meters (16,404 feet)

USER INTERFACE SPECIFICATIONS	
Instrument Controller OS	Windows CE 6.0
Display	Fixed angle color touchscreen display
Data Storage	Internal flash memory (SD Card Expansion) Optional USB thumb drive
Data Transfer	Ethernet, mini USB
Security	Password protected
Data Entry	Touchscreen/ Fluid Manager Desktop Software (Asset loading and synchronize)
Communication	WIFI (optional); Bluetooth (optional)

POWER REQUIREMENTS	
Battery Power Source	Exchangeable lithium-ion battery pack
Charge Power	AC 110/240 V, 50/60 Hz, 10 watts
Typical Runtime	4-6 hours
Typical Recharge Time	2.5 hours

MECHANICAL SPECIFICATIONS	
Dimensions	48 cm (L) x 39 cm (W) x 23 cm (H); 19.2" x 15.2" x 9"
Weight	16.5 kg (36.4 lbs); 20 kg (44.4 lbs with backpack and power supply)

COMPLIANCE
CENELEC EN 60610-1:2010

B Radiation Survey Form

The following is a blank sample of the Radiation Survey Form supplied with every Q5800 based on the unique serial number.

Spectro Scientific **Radiation Survey Form**		Rev Date	Document No

Survey Date	Technician	Meter S/N
Calibration Due	Q5800 S/N	Background (μrem/hr)

Background Corrected Readings

Left Side	μrem/hr
Right Side	μrem/hr
Top	μrem/hr
Bottom	μrem/hr
Front	μrem/hr
Rear	μrem/hr

As tested @ 5 cm (2.0 in) instantaneous rate along the sides of the tower.
Taken with a Thermo Eberline B20 meter with an H*(10) flattener.
To be used with Work Instruction: WI RS0001 Rev C 11-20-14