FluoroQuik Fluorometer

User's Manual

Version 1.3.0.00

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1. FluoroQuik Fluorometer

1.1 Overview

The FluoroQuik fluorometer is a portable instrument designed for multipurpose fluorescence measurements with two excitation/emission optical channels built in one unit. The instrument is simple to use, light in weight, and can be powered by either DC power adaptor or AA batteries, making it an excellent choice for field studies and laboratory measurements.

1.2 Key Features

a. Using either 200-µL PCR tubes or glass mini-tubes (model-A), 500-µL micro-centrifuge tubes (model-B), or 1-cm square cuvette (model-C).
b. LCD touch-screen display.
c. User-friendly software with “touch and test” operation.
d. Measure Channel#1 and Channel#2 signals on a sample simultaneously, and automatically calculate the Ratio of Channel#1/Channel#2.
e. USB interface for data management.
f. Compact and robust.
g. Larger than 5 logs of dynamic range (after proper calibration procedure).

1.3 Included Parts

a. The FluoroQuik fluorometer.
b. 5VDC/2A power adapter.
c. Standard-USB-to-mini-USB cable.
d. Operation manual and USB driver/data management software disk.
e. Depending on the model, a carrying case, sample tubes, and/or transfer pipets may be included.

2. System Operation

2.1 Principle of Operation

The FluoroQuik Fluorometer uses a single-wavelength light source to excite the sample which, as a result, emits a fluorescent signal of specific wavelength detected by the internal photo sensor. Assuming the reading by the photo sensor, represented by RFU (Relative Fluorescence Unit), is linearly proportional to the concentration of the sample, it can be used to calculate the nominal concentration of the sample when the fluorometer is properly calibrated.

As shown in Figure 1, during the calibration process, a "Blank" tube (zero concentration) and a "Standard" tube (known concentration) are separately measured by the fluorometer to obtain the RFU readings. The RFU readings and the concentration values are then used to generate a "linear calibration curve" which is stored in the non-volatile memory of the fluorometer. During the measurement operation, the sample's RFU is used to calculate the unknown concentration using interpolation or extrapolation based on the stored linear calibration curve.

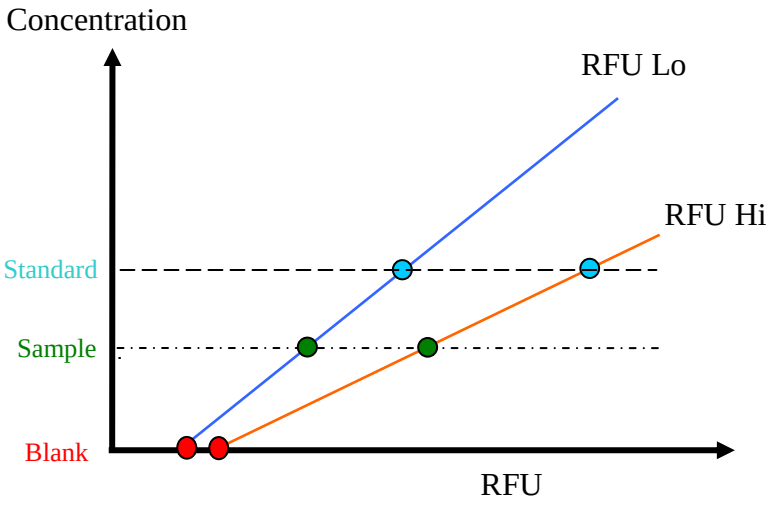


Figure 1

Note that in order to extend the measurable concentration range, two levels of excitation power are used during the calibration and measurement steps, and two different RFU readings ("RFU Hi" and "RFU Lo") are obtained. When the sample's concentration is too high and the fluorescent signal saturates the photo sensor, the fluorometer automatically uses the "RFU Lo"

reading (and the associated linear calibration curve) to calculate the sample concentration, hence extending the upper measurement range.

In this dual-channel fluorometer, there are two independent excitation/emission wavelength pairs (Channel #1 and Channel #2) whose calibration curves are independently defined by the user during the calibration procedure.

2.2 Power Up

The FluoroQuik Fluorometer can be powered by four AA batteries or the supplied power adapter (5VDC/2A). After connecting to power, switch the ON/OFF button on the upper-right of the unit to turn on the fluorometer. After a flash of welcome screen, the screen automatically turns into the "**Main Menu**", as shown in Figure 2. (In some models whose calibration function is inactivated because the calibration curves are generated in factory, the [Calibrate] selection will not show, and you can skip Section 2.3 Calibration.)

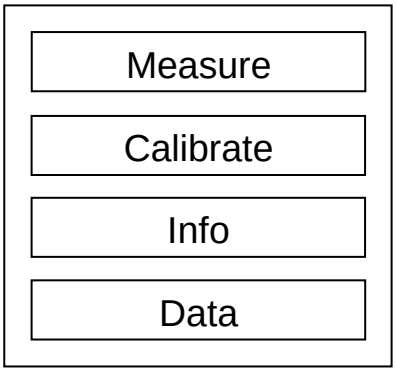


Figure 2. **Main Menu** screen

2.3 Calibration

a. In order to measure the concentration of unknown samples, a calibration procedure needs to be performed to obtain the linear calibration curves as described in Sec. 2.1. But if such calibration has been done before, you can skip this calibration step and go to Sec. 2.4 to perform sample measurement, even if the fluorometer has been turned off because the calibration curves are stored in the on-board non-volatile memory.

b. Touch "**Calibrate**" tab on the "**Main Menu**" screen. A confirmation screen asking "Create new calibration?" will show in order to prevent unintentional calibration steps. Touch "**Return**" if you don't intend to perform the calibration, otherwise touch "**Continue**" to

enter the channel selection screen. In the screen you can select the channel number on which you want to calibrate your standard. Note that depending on the model purchased, different channel names may show on the screen to indicate the specific measurement target/application of the fluorometer.

c. Now you enter the "**Calibrate**" screen similar to Fig. 3. Put in the Blank tube in the sample chamber and close the cap. Touch "**Blank**" to take the blank value.

d. After the Blank is read, the screen will become one as shown in Fig. 4.

e. To set the nominal value of the Standard tube to calibrate the fluorometer, use the "<" and ">" arrow keys on the second row to move the underline to select the digit you want to change, and use the "+" or "–" keys to increase or decrease the value of the underlined digit. (A zero standard value is not allowed to perform the next step.)

f. Put the Standard tube in the chamber and touch the "**Measure**" tab to take the measurement. After a few seconds, "**Calibration Finished**" will show on the screen. Press "**Return**" to go back to "**Main Menu**".

g. If the Standard measured value is equal or less than the Blank, an error message "**Reading Too Low!**" will show. Prepare the right Blank or Standard and measure again.

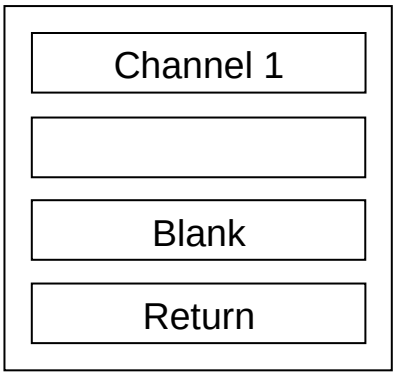


Figure 3. **Calibrate** screen

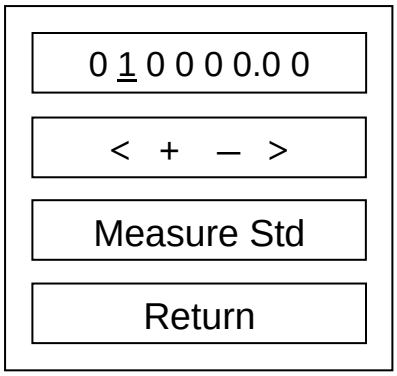


Figure 4. **Standard setting** screen

2.4 Measurement

a. Refer to Section 2.3 for calibration procedures if the fluorometer has not been calibrated. (In some models where the calibration is inactivated, the calibration is done in the factory.)

b. Touch "**Measure**" tab on the "**Main Menu**" screen to enter the measurement selection screen as shown in Fig. 5. In the screen you can select "**Sample**", which will measure a

sample and calculate the nominal concentration value using the linear calibration curve stored in the fluorometer. "**Blank**" will perform another blank operation on both channels using a new Blank tube. You can also touch "**RFU**" to enter the "Relative Fluorescence Unit" measurement screen and select "**Ch1 RFU Hi**", "**Ch1 RFU Lo**", "**Ch2 RFU Hi**", or "**Ch2 RFU Lo**" option, whose measurement, as described in Section 2.1, gives you the "Relative Fluorescence Unit" that is produced by "High" or "Low" optical excitation power of the selected channel, respectively.

c. Prepare sample tube (and blank tube if to be used), referring to Section 3.

d. If the fluorometer has been calibrated before, the Blank value is already stored in the fluorometer. But for low-concentration sample measurement, it is recommended that a new "Blank" is performed at this step. Insert the blank tube into the testing chamber and secure the cap, and touch "**Blank**". The next screen will prompt you to place a blank tube in the testing chamber, before you can press "**Measure**" to take the blank reading. The screen shows "Blank completed" and you can press "**Return**" to go back to the previous screen.

e. Insert the sample tube and touch the "**Sample**" tab for the sample measurement. The next screen will prompt you to place a sample tube in the testing chamber, before you can press "**Measure**" to take the sample reading. The measurement result will be displayed on the "**Result**" screen in a few seconds, as shown in Figure 6, where the measured concentration of both channels, plus the Ratio of Channel#1/Channel#2, are shown.

f. If the reading of a channel is too high and saturates the photo-detector, an "**Over**" message will display for that channel. Same will be displayed for the Ratio if the result is higher than 999.99.

g. If you want to save the measurement data in the fluorometer's on-board memory, you can touch the "**Save**" tab. The data will be saved in the memory, and the stored data sequential number is displayed on the next screen for your record.

h. Touch "**Return**" to go back to the previous screen. Touch "**Measure**" tab again will repeat the sample measurement.

i. If batteries are used as the power source, and the voltage has dropped too low and the accuracy of the measurement may be affected, a "**Battery Low**" warning message will

show on the bottom of the screen during measurement. The batteries should be replaced as soon as possible.

j. Touch "**Return**" tab will return to "**Measure**" screen, and touch "**Return**" again will go back to the "**Main Menu**".

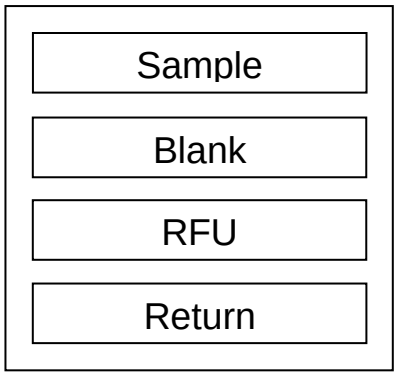


Figure 5. **Measure** screen

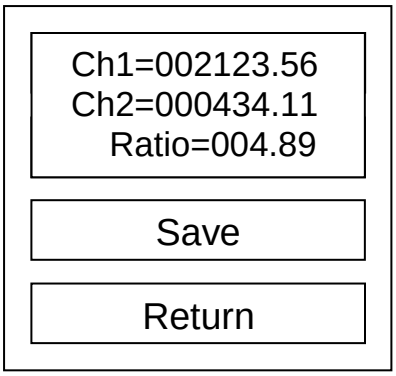


Figure 6. **Result** screen

2.5 Data Retrieval

a. Touch "**Data**" tab on the "**Main Menu**" screen will let you select the Channel# (or Ratio) in which you want to inspect the data. After selection, the "**Data**" screen now shows similar to Fig. 7. The first row shows the saved data, and the second row shows the data sequential number. You can touch the left and right arrow key to change the data number to inspect other saved data.

b. If you want to erase the saved data, touch "**Erase All**" and confirm the action in the next screen. The data of both channels and the Ratio will be erased after confirmation.

c. Touch "**Return**" tab will return to "**Main Menu**" screen.

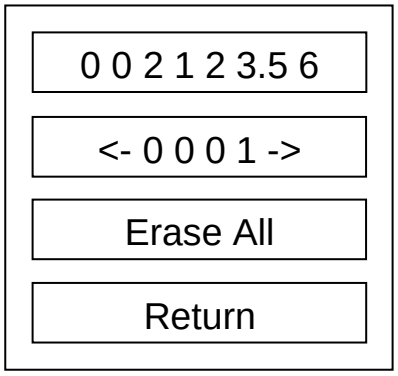


Fig. 7 "**Data**" screen

3. Sample Preparation and Measurement Tips

a. Prepare Standard and Sample solution within the concentration range that can be read by the fluorometer. You can use the "**RFU Hi**" or "**RFU Lo**" mode in the "**Measure**" function to measure the sample if you are not certain. It is also better that the Standard doesn't saturate the RFU Hi reading in order to maximize sensitivity.
b. Make sure the sample tube is clean internally before you put in the solution, and the outside of the tube is clean and dry. Any materials on the outside of the tube may cause measurement error.
c. If glass mini-tube, PCR tube, or micro-centrifuge tube is used, fill the tube with at least 200μL sample solution. For 1-cm cuvette, 1mL sample solution is needed.
d. Make sure no bubbles are in the sample solution.
e. Due to the poor tube-wall consistency of plastic tubes, if PCR tube or micro-centrifuge tube is used, align the cap-lip with the chamber mark so each time the measurement is consistent.
f. Allowing more than 10 seconds between each measurement can minimize the thermal build-up of the light source and maintain the measurement consistency.
g. Due to the possible variation of back-ground level produced by different sample tubes, for very low concentration measurements, you can use the same tube to perform the "Blank" reading, then remove the blank solution and fill with sample solution to perform the "Sample" reading. This technique can ensure the consistent back-ground level to achieve optimal sensitivity.

4. Maintenance

a. Avoid over-filling the test tube and contaminate the outside wall of the tube. If the contamination is transferred to the inside wall of the test chamber, it may cause increased signal level and hence reading error. If this happens, use a cotton swab with clean water or alcohol and gently clean the inside wall of the test chamber.
b. The touch screen can be periodically cleaned with alcohol or mild detergent.
c. If the meter will not be used for a while, remove the battery from the battery compartment before put into storage.
d. Always turn off the meter after use if the battery power is used.

5. Fluorometer Data Manager Application Program

5.1 System Requirement

The minimum requirements for the computer are listed below:

OS: Microsoft Windows 2000/XP/Vista/Windows 7/8/10

RAM: 512 MB, recommend 1GB or higher

USB Port: USB 2.0 or higher

(Always use the optical disk provided with the purchased fluorometer to ensure compatibility.)

5.2 Software Installation

a. In order to use Fluorometer Data Manager application program, you need to have the .NET framework version 2.0 or higher version installed on your computer. You may already have the .NET framework installed on your PC, especially if you have already installed other applications, which were built with one of the Visual Studio 2005 .NET languages. If you do not yet have it, the .NET framework can be freely downloaded from Microsoft's website. Users of Windows Vista and Windows 7/8/10 may not need to install the .NET framework, as it comes pre-installed as part of the OS. Sometimes the operating system may automatically ask you to download and install the .NET framework when you connect the computer to the fluorometer USB port. Just follow the instruction and install the feature.

b. You also need to install the Microsoft Visual C++ Redistributeable Package "**vcredist.exe**", which is included in the installation package. Double click “vcredist_x86.exe” and follow the instructions displayed during the installation, as shown in Figure 8. Users of Windows 7/8/10 do not need to install the Microsoft Visual C++ Redistributeable Package, as it comes pre-installed as part of the OS.

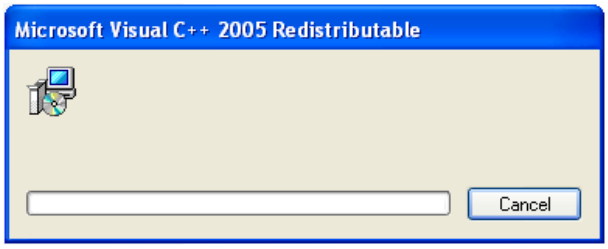


Figure 8. Install Microsoft Visual C++ 2005 Redistributable package

c. Double click "**Setup.exe**" in the installation package and follow the instructions displayed during the installation to install "**FluorometerDataManager.exe**" on the host computer, as shown in Figure 9. By default the data manager program will be installed in the directory: C:\Program Files (x86)\Fluorometer\Data Manager - User\. A "Data Manager - User (Active)" shortcut will also be created on the computer Desktop.

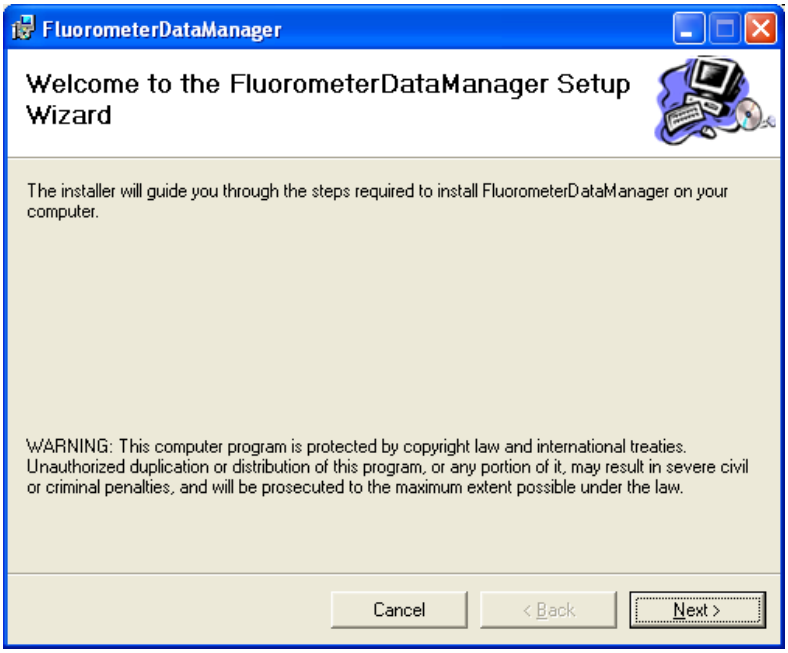


Figure 9. Install Handheld Fluorometer Data Manager

d. Connect the fluorometer to the USB port of the host computer with a USB cable.

e. If the computer recognizes the new USB device, you can skip the remaining installation steps and go to Section 5.4 and use the Data Manager software. Otherwise continue to the next step.

f. The "**Found New Hardware Wizard**" window will pop up, as shown in Figure 10. Select "**No, not this time**" and click "**Next**" button.

g. If the "**Found New Hardware Wizard**" window does not pop up, go to Step k to install USB driver manually.

h. In the next window, as shown in Figure 11, select "**Install from a list or specific location (Advanced)**", then click "**Next**" button.

i. In the next window, as shown in Figure 12, check "**Include this location in the search**". Click "**Browse**" to find in the folder of installation CD "**\USB Device Drivers**". Then click "**Next**" button.

j. In the next window, as shown in Figure 13, Windows will search and download the USB driver for the fluorometer into the operating system.

k. In the next window, as shown in Figure 14, click "**Finish**" button to complete the USB driver's installation.

Figure 10. "Found New Hardware Wizard" window, step 1

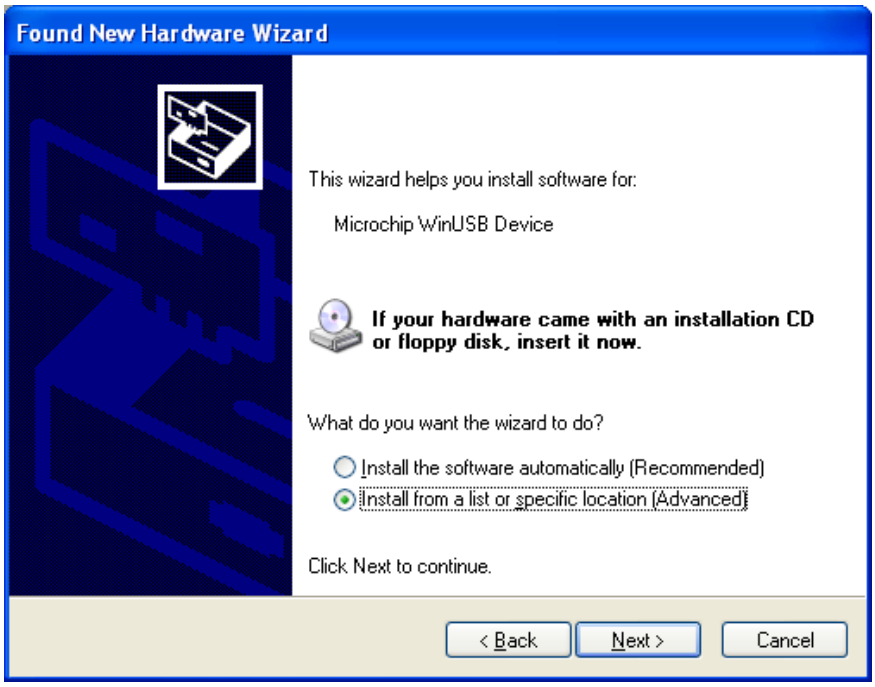


Figure 11. "Found New Hardware Wizard" window, step 2.

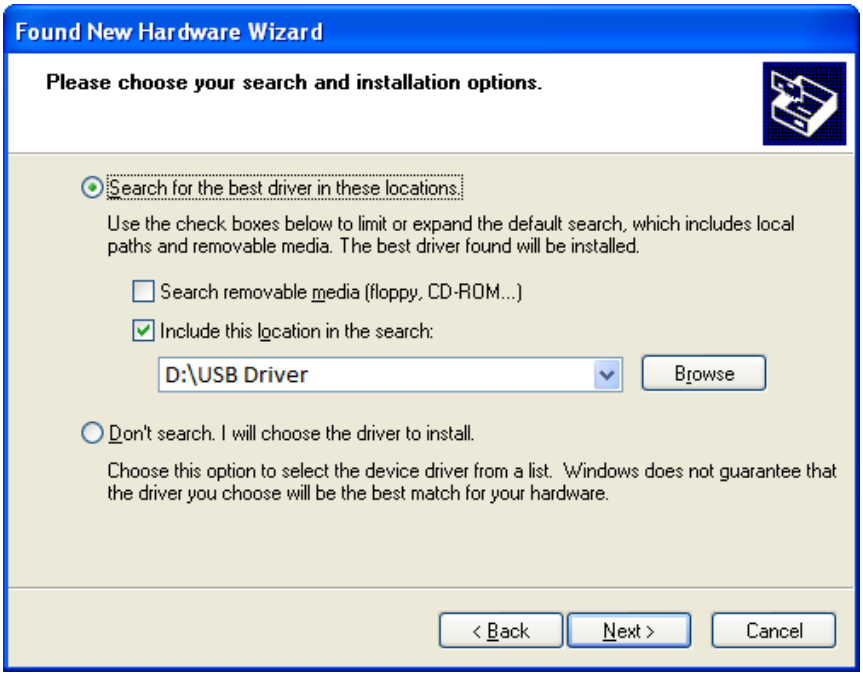


Figure 12. "Found New Hardware Wizard" window, step 3.

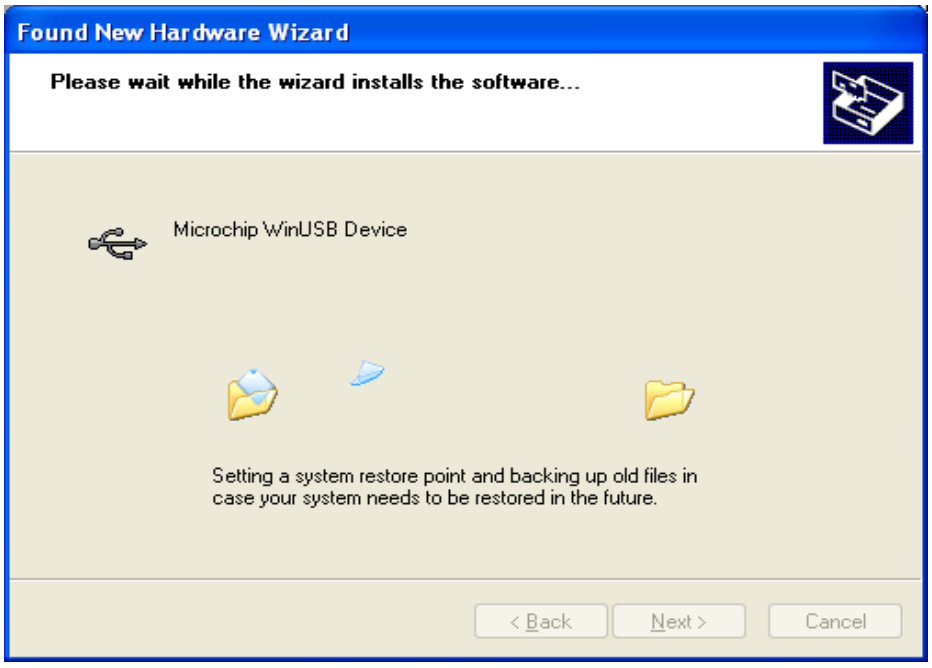


Figure 13. "Found New Hardware Wizard" window, step 4.

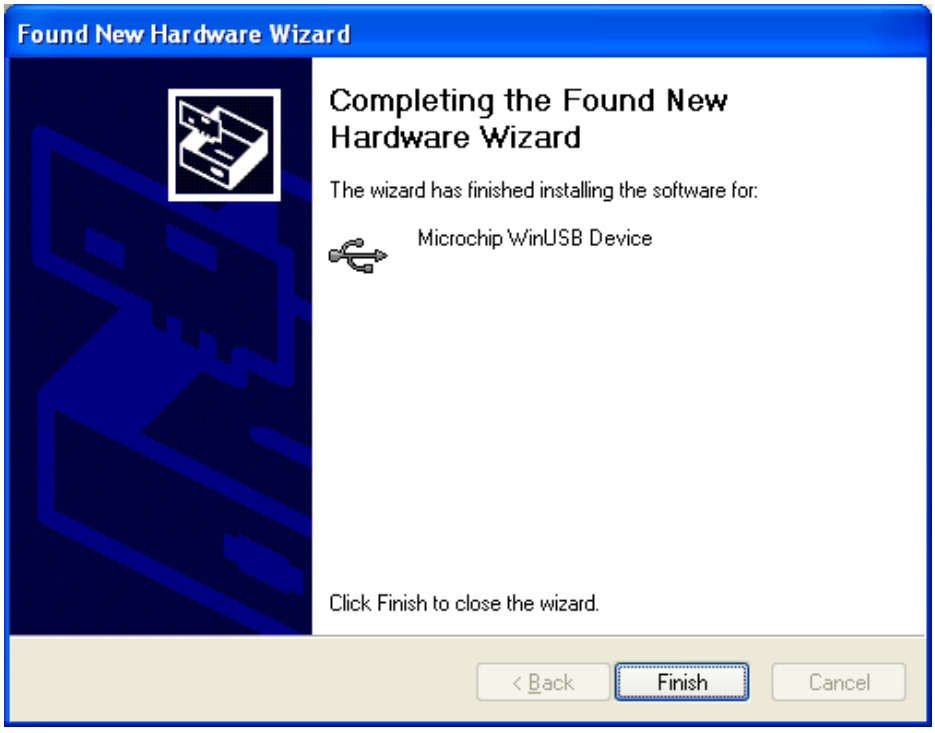


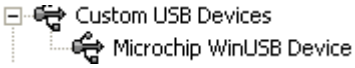
Figure 14 "Found New Hardware Wizard" window, step 5.

l. If "**Found New Hardware Wizard**" window does not pop up, try to jump to Sec. 5.4 to start the Application Program and see if the fluorometer can be recognized by the computer.

If not, click 

, select 

tab, right click to get drop-down menu, select "**Manage**" tab to bring up "**Computer Management**" window.

m. Expand tab "**Device Manger**" and then "**Universal Serial Bus controllers**", right click 

to bring up drop-down menu, select "**Update Driver…**" tab to invoke "**Hardware Update Wizard**" window. Follow the instructions from Step e to Step k to install USB driver.

n. After the USB driver installed successfully, the "**Computer Management**" window will show as Figure 15.

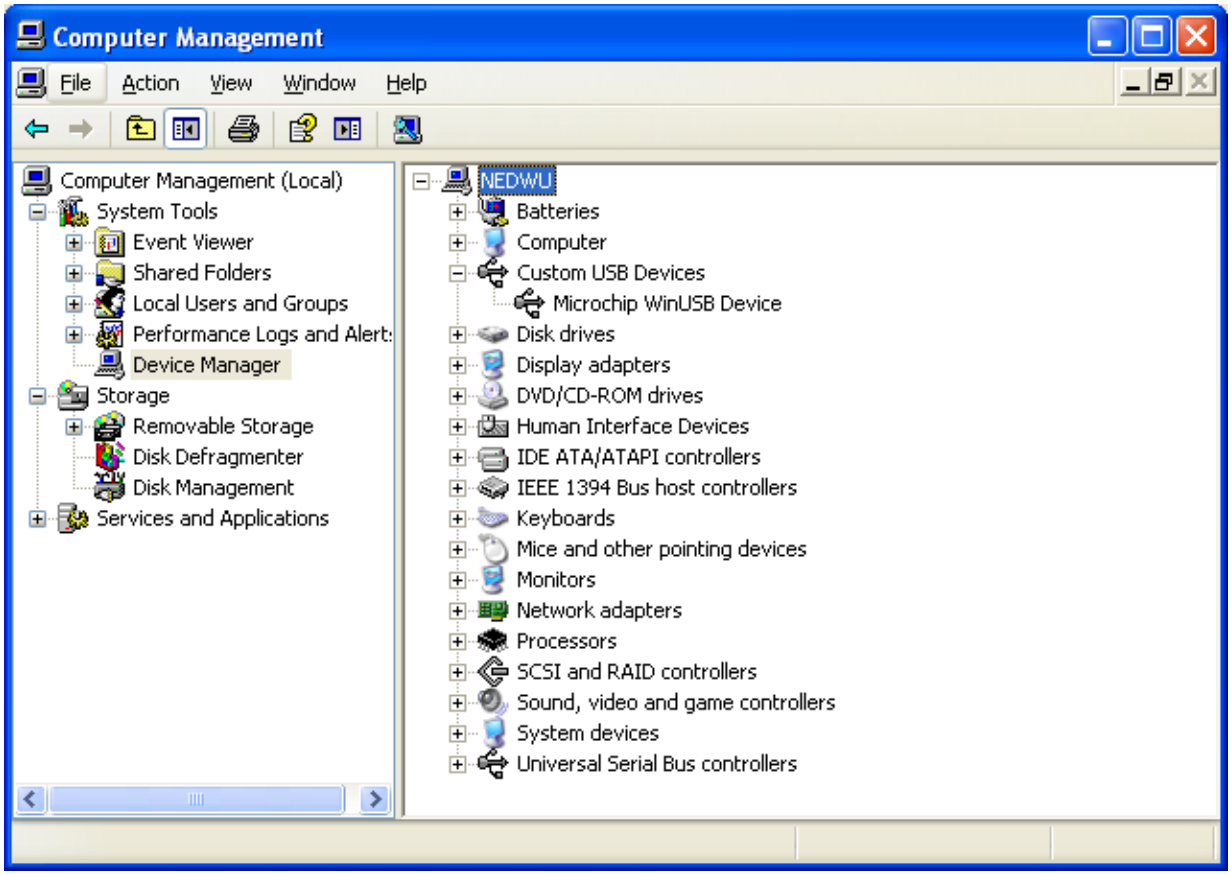


Figure 15. "Computer Management" window.

5.3 Uninstall the Handheld Fluorometer Application Program

a. Click 

, and then click 

to get "**Control Panel**" menu.

b. Double click Add or Remove Programs tab in the "**Control Panel**" menu to get "**Add or Remove Programs**" window, as shown in Figure 16.

c. Find "**FluorometerDataManager**" tab and click "**Remove**" button to uninstall the application program from the host computer.

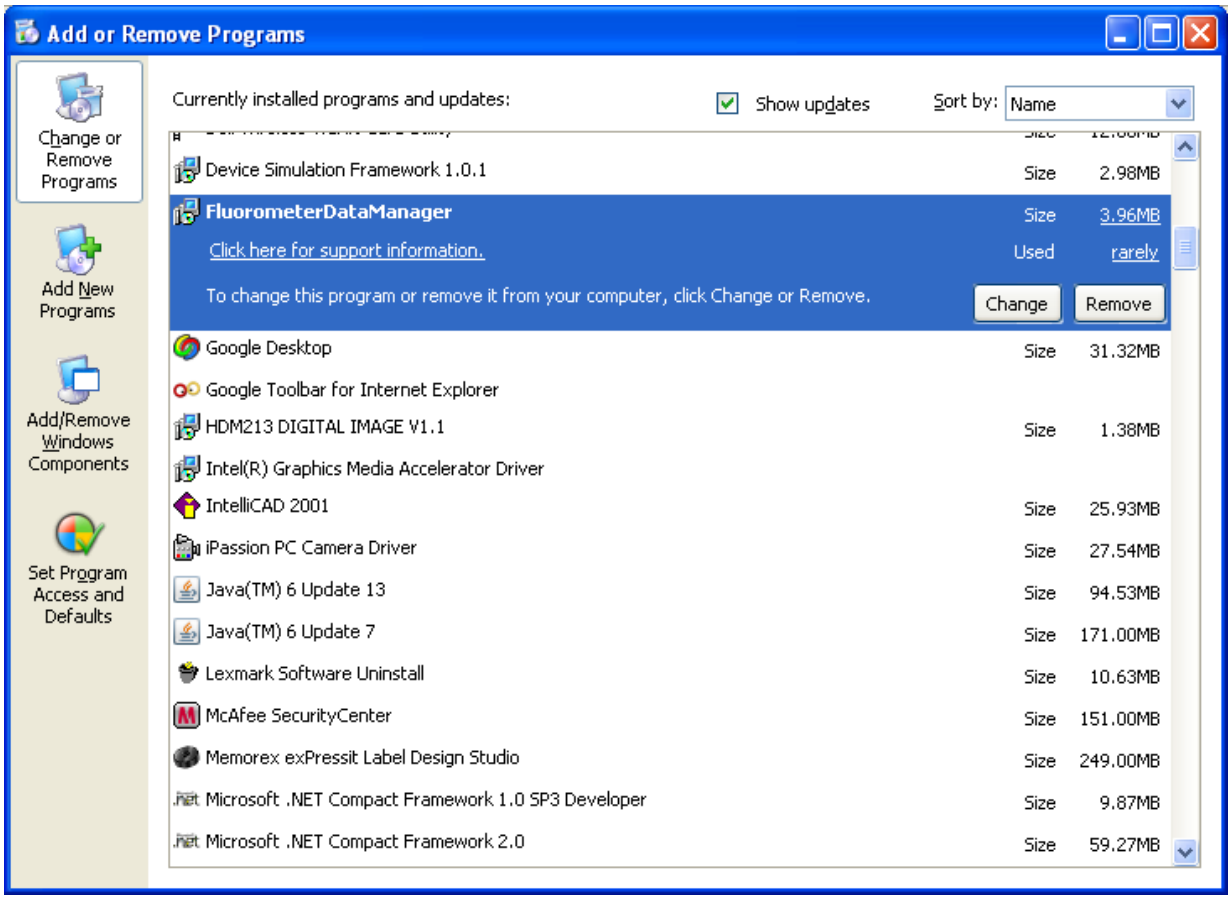


Figure 16. Uninstall Handheld Fluorometer application program

5.4 Handheld Fluorometer Application Program

a. Double click "**Data Manager - User (Active)**" shortcut icon on Desktop to bring up "**Handheld Fluorometer Data Manager**" window, as shown in Figure 17.

b. Click "**Connect**" button to set up the USB communication between the fluorometer and the host computer. After connected successfully, "**Read All Data**", and "**Erase All Data**" buttons are enabled.

c. Click "**Read All Data**" button to read and display all saved data in the fluorometer as shown in Figure 18. The example shows that Channel#1 has 2 data points and Channel#2 has 3 stored in the memory.

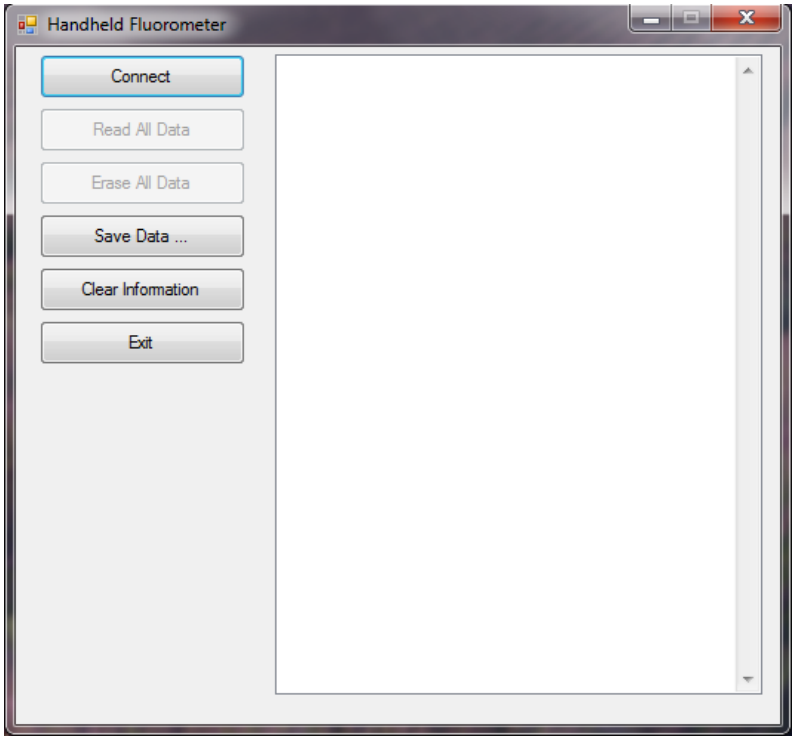


Figure 17. Fluorometer Data Manager window.

d. Click "**Erase All Data**" button to erase all saved data in the fluorometer.
e. Click "**Save Data**" button to bring "**Save As**" window as shown in Figure 19. Type in the file name to save data into *.csv format file which can be opened in Microsoft Excel spreadsheet.
f. Click "**Clear Information**" button to clear all contents shown in the Window.
g. Click "**Exit**" button to terminate Handheld Fluorometer Data Manager application program.

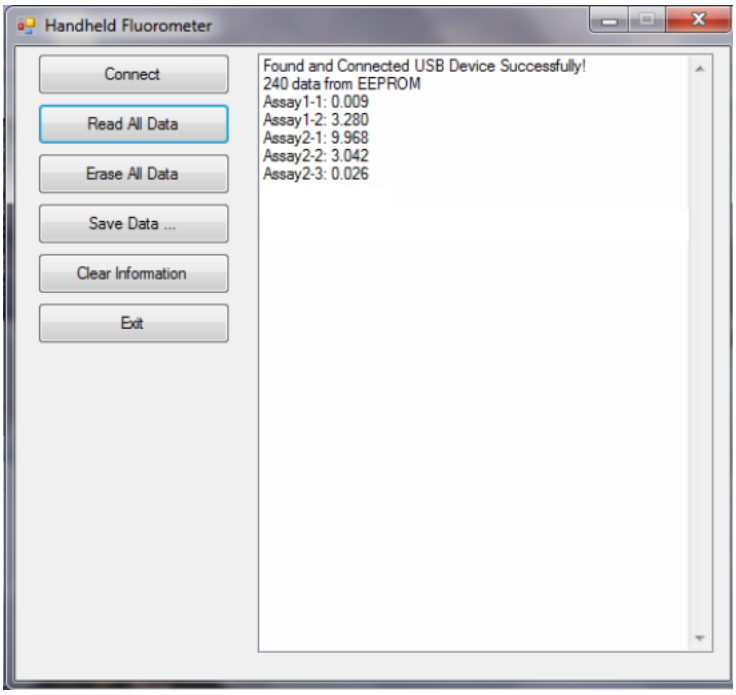


Figure 18. Access and manage saved data

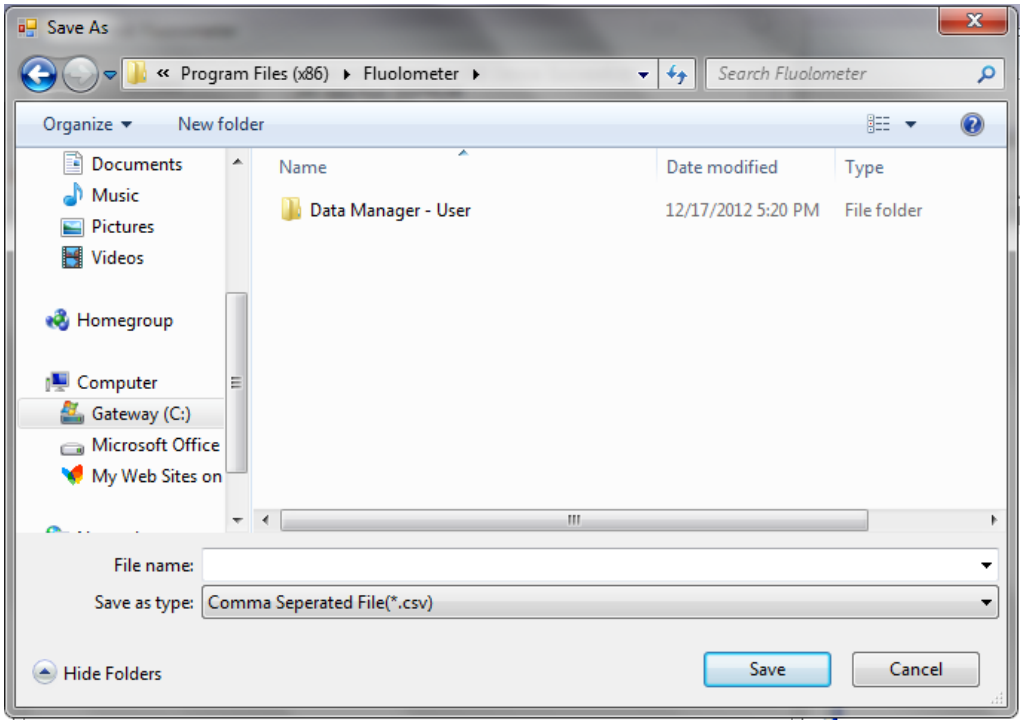
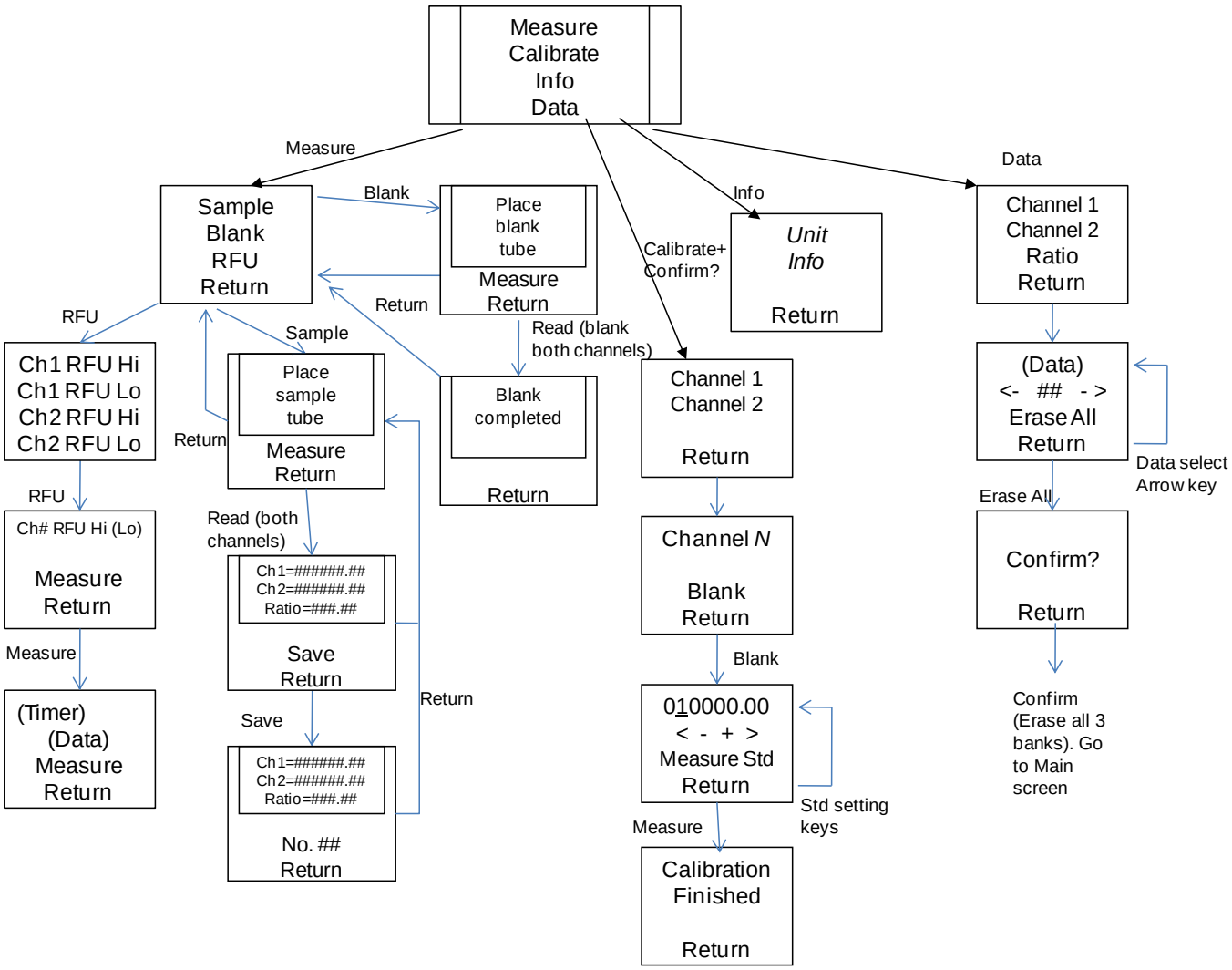


Figure 19. Save As window

6. Technical Specifications

	Specifications
Power Supply	4x AA batteries or 5VDC adapter
User Interface	LCD Touch Screen
Data Output	Mini-USB Port 80 data points per channel or ratio storage
Sample Tube (Required sample volume)	Model A: 200-µl PCR tube (200-µl), or glass min-tube (200-µl) Model B: 500-µl micro-centrifuge tube (200-µl) Model C: 1-cm cuvette (1-ml)
Warm-Up Time	Less than 10 seconds
Dimensions	185mm x 90mm x 35mm
Weight	10 oz (0.28kg)

7. Menu Tree


Measure
Calibrate
Info
Data
Measure
Blank
Info
Data
Sample
Blank
RFU
Return
Place
blank
tube
Measure
Return
Unit
Info
Return
Channel 1
Channel 2
Ratio
Return
Calibrate+
Confirm?
Return
RFU
Sample
Read (blank
both channels)
Ch1 RFU Hi
Ch1 RFU Lo
Ch2 RFU Hi
Ch2 RFU Lo
Place
sample
tube
Measure
Return
Blank
completed
Return
Channel 1
Channel 2
Return
(Data)
<- ## - >
Erase All
Return
Data select
Arrow key
Return
RFU
Read (both
channels)
Erase All
Ch# RFU Hi (Lo)
Measure
Return
Ch1=######.##
Ch2=######.##
Ratio=###.##
Save
Return
Channel N
Blank
Return
Confirm?
Return
Measure
Return
Save
Blank
(Timer)
(Data)
Measure
Return
Ch1=######.##
Ch2=######.##
Ratio=###.##
No. ##
Return
010000.00
< - + >
Measure Std
Return
Std setting
keys
Confirm
(Erase all 3
banks). Go
to Main
screen
Measure
Calibration
Finished
Return