Using the DataBank for Direct Concentration Calibration of the Cyclops-7

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Background Information

The Turner Designs Cyclops Submersible Sensor is an accurate single-channel detector that can be used for many different applications. It is designed for integration into systems from which it receives power and delivers a voltage output proportional to the concentration of the fluorophore of interest in water. This voltage output is interpreted as a Relative Fluorescence Unit (RFU) that is reported as qualitative data. Relative Fluorescence Units can be correlated to actual concentrations by calibrating the Cyclops with standards of known concentrations.

The DataBank Datalogger is an interpretive meter and self contained datalogger that powers the Cyclops. Data can be stored and downloaded to a PC. Cyclops calibration is simplified through a graphical interface on the PC and results are graphically displayed.

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The Cyclops can be used in one of three modes:

1. Uncalibrated - Raw Fluorescence Mode

Values in the Raw Fluorescence Mode are referred to as "Relative Fluorescence Units" (RFU). It is important to note that these values are <u>not</u> blank subtracted or scaled to a standard. They are relative values.

2. Uncalibrated - Raw Fluorescence Blank Subtracted Mode

Values in the Raw Fluorescence Blank Subtracted Mode are noted as RFUB.

These values are blank subtracted to account for background fluorescence that may be present in the sampling conditions but are <u>not</u> scaled to a standard. They are relative values.

3. Direct Concentration Mode

Values reported in the Direct Concentration Mode are blank subtracted and scaled to a standard solution that has a predetermined standard value.

This presentation will step through using the DataBank to do a Direct Concentration calibration of the Cyclops to ensure values are reported as Blank Subtracted Concentrations in your units of choice.


A Turner Designs Cyclops Explorer or a digital volt meter can also be used to calibrate the Cyclops.

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The tools required for this example are:

- DataBank with pre-wired Cyclops-7 pigtail cable, DataBank USB Interface and Power Cable (P/N 021-2903) and computer with DataBank GUI software.

- Cyclops-7 configured with Rhodamine optics.

- Two glass containers and a non-reflective black surface. The containers should be large enough to ensure that the sensor face can be submerged with more than 3 inches above the bottom of the container and more than 2 inches clearance between the circumference of the sensor and the inside surface of the container.

- If you want, you can use a shade cap as an optical backstop for the sensor. If you do, a smaller volume container can be used, as long as the shade cap and sensor face can be submerged. If using the shade cap, you do not need a non-reflective black surface.

- Deionized or ultrapure water

- Rhodamine Calibration Standard - 100ppb concentration.

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The first step is to prepare your blank for calibration:

Fill your glass container with deionized or ultrapure water and set aside. Fill the container full enough that there are more than 3 inches of water from the bottom. This will ensure that you are able to completely submerge the optical face of the sensor and still have the recommended 3 inches of water above the bottom of the container.   If you are using the shade cap you want to be sure that there is enough water to fully submerge the shade cap as well as the optical face of the sensor.

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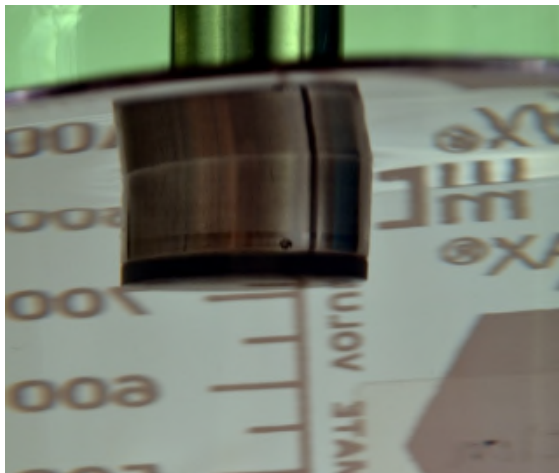
Next you need to prepare your Rhodamine Calibration Standard:

Fill another glass container with the Rhodamine Calibration Standard and set aside.

This container should also be filled with roughly the same volume of standard as the

blank container.

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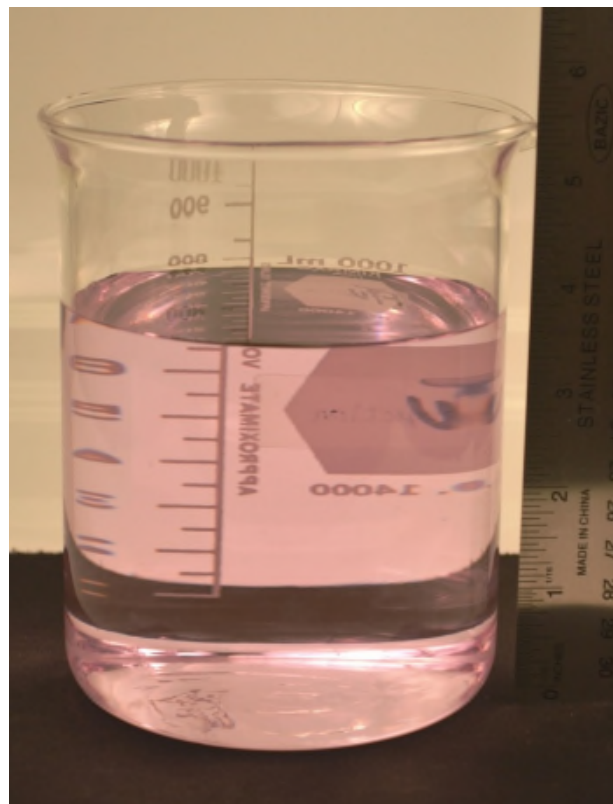
DataBank Setup

This presentation assumes that you have installed the USB cable and DataBank GUI Software onto a computer. DataBank GUI Software is available on the Turner Designs Website:

DataBank Software

NOTE: Some customers may receive error messages when installing the DataBank software.

This occurs because the install process looks for program files that already exist on Windows computers.

If you don't have the required files for the install process to complete, they will automatically be installed.

If newer versions of program files used for the install process are found on your computer, you will get

a prompt asking if you would like to Abort, Retry, or Ignore. We suggest hitting ignore so your current files

remain intact. You may need to click Ignore three times during the install.

DataBank GUI Software and Firmware install instructions

DataBank USB cable installation instructions

NOTE: If you connect the DataBank and you get the message "DataBank not found" the computer may have

assigned the USB to a COM Port greater than COM8. The DataBank only searches ports 0-8, and it is best to

use 5-8 (inclusive) for USB. Please follow the instructions to reassign the USB.

NOTE: If you are unable to get the driver to install on your computer or continue to have issues, please refer

to this page for the most current VCP drivers: http://www.ftdichip.com/Drivers/VCP.htm

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Next you need to connect the Cyclops to the DataBank and start the DataBank GUI:

Connecting the sensor to the DataBank's Cyclops-7 pigtail cable. Be sure to align the pins carefully and tighten the locking sleeve to secure the sensor.

Press the DataBank's Power button and the unit will turn on.

Confirm the Cyclops sensor is connected properly and powered by the DataBank by checking to see that the LED is illuminated. If you are using a PTSA, Crude Oil, Refined Fuels, FDOM, Optical Brighteners, or Tryptophan Cyclops with a UV LED, *do not look directly at the optical face of the sensor as it may cause damage to your eye.* Hold a white sheet of paper in front of the optical face. You should see blue light on the sheet of paper indicating the UV LED is functioning properly.

Cyclops Application	Light Source
Tryptophan	Deep UV LED
Refine Fuels	
PTSA	UV LED
Crude Oil	
Optical Brighteners	
CDOM/FDOM	
Fluorescein Dye	Blue LED
Chl *a in vivo*	
Phycoerythrin (Marine Cyanobacteria)	Green LED
Rhodamine Dye	
Phycocyanin (Freshwater Cyanobacteria)	Yellow LED
Turbidity	IR LED

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Next, select the parameter group (1-16) you wish to calibrate by pressing the DataBank's Select button to scroll through the parameter groups. For our example we are selecting parameter group 7.

Connect the DataBank to a PC that has DataBank GUI Software using the interface cable provided. **Be sure the DataBank is not connected to an external power source when connecting to the GUI.**

Begin the DataBank GUI Software and wait for a connection. The DataBank is connected to the PC when the serial number and software version are displayed in the upper left hand corner of the screen.
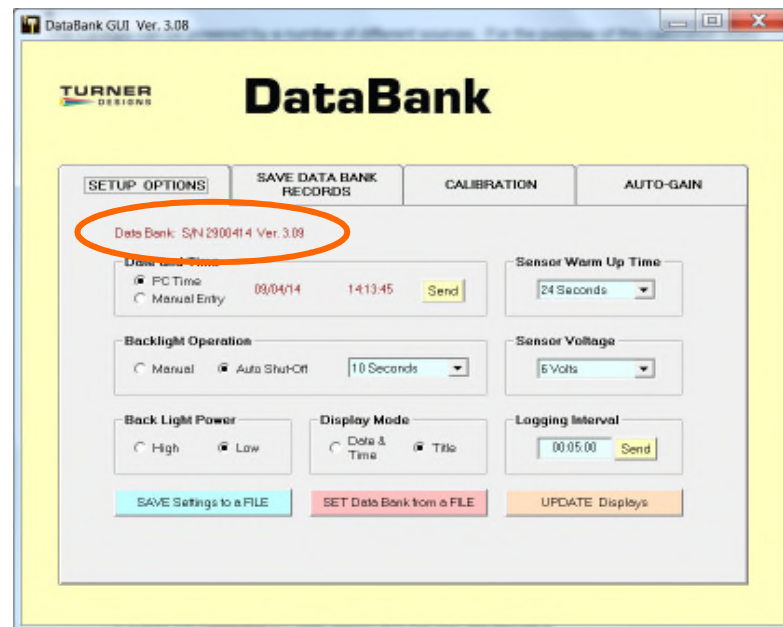
Once a connection has been established between the DataBank and the Cyclops you can proceed with the calibration.

Click the Calibration tab in the DataBank Software.

Choose the parameter group you wish to calibrate from the pull down menu – this should be group 7 that was chosen during setup.

Name the parameter group by typing into the available box and **hitting enter on the keyboard**. If you do not hit enter the name of the calibration will not be saved. Users can enter up to 16 characters. For our example we are typing in Rhodamine.
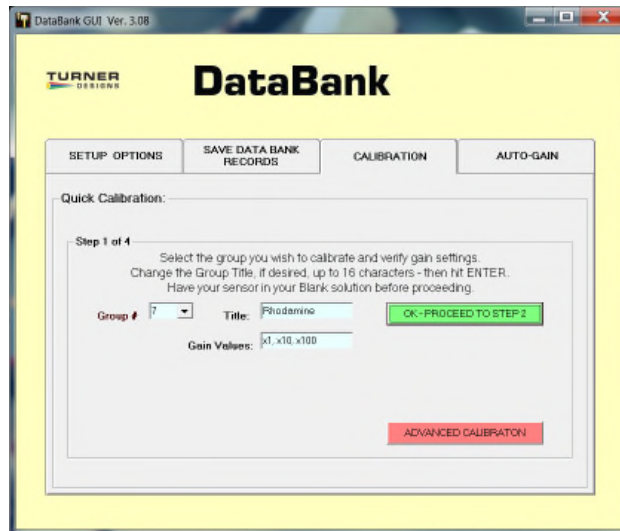
Cyclops sensors can be used to collect data in any of 3 gain settings. Each gain setting has its own range of concentrations

- The 100x gain is the most sensitive and is used for very low concentration detection, but offers the smallest overall range.

- The 10x gain is the most appropriate to use if you are unsure of what is best for your specific samples. This gain has good minimum detection limit as well as a good detectable range of concentrations.

- The 1x gain is the least sensitive and is recommended for utilizing the complete range of the instrument.

The DataBank has an Auto Gain feature. When selected the DataBank will automatically select the best gain for the sample being read. For this example we will select Auto Gain.

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To set the DataBank to Auto Gain, click the Auto Gain tab and set the gain values using the Cyclops-7 Default Setting button.
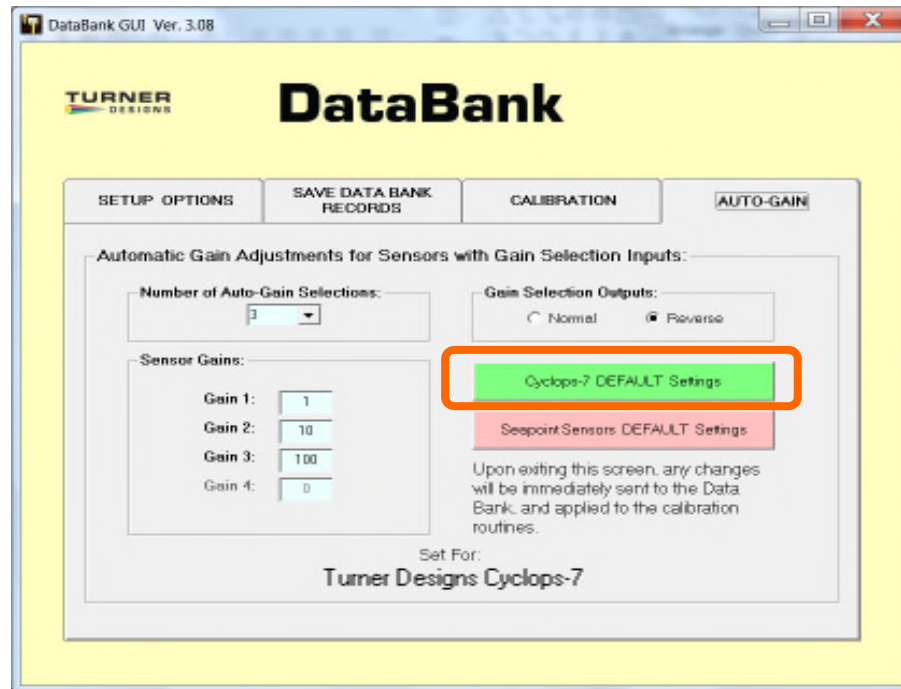
The DataBank display should show Low, Med, or High in the top right hand corner.
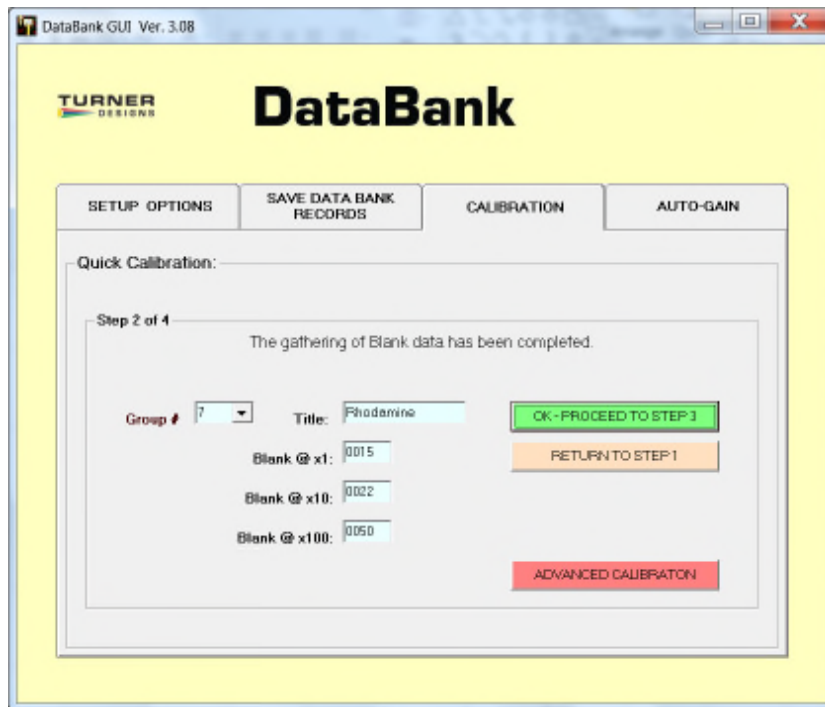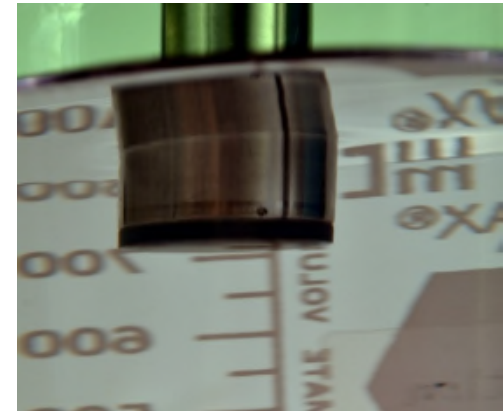
Gain values may also be entered manually depending on sensor type.

Now proceed with the calibration.

Click the Calibration tab. Following the instructions on the screen place the sensor in your blank solution. Be sure the optical face is fully submerged.
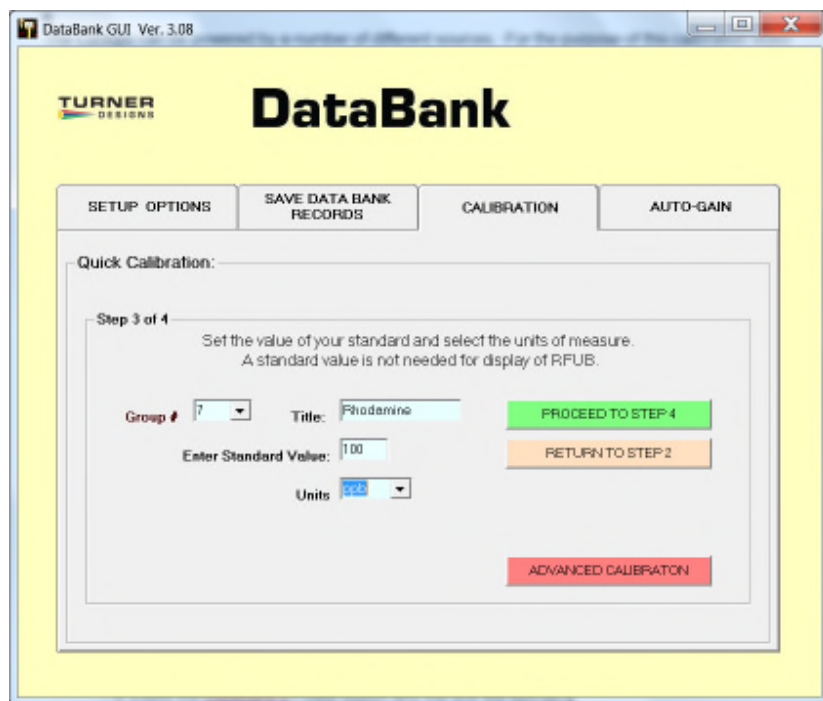
Click "OK – proceed to step 2".

The Software will start measuring the blank signal for each gain.

When blanking has finished click "OK – proceed to step 3".

Put your sensor in a standard solution of a known concentration.

Enter the concentration value of your standard solution in the Enter Standard Value box.
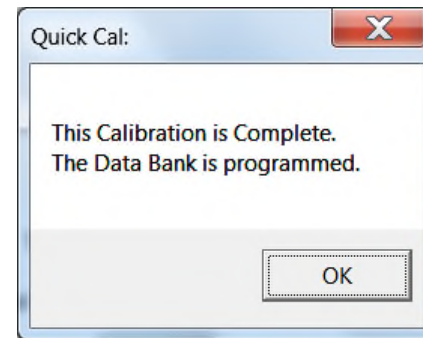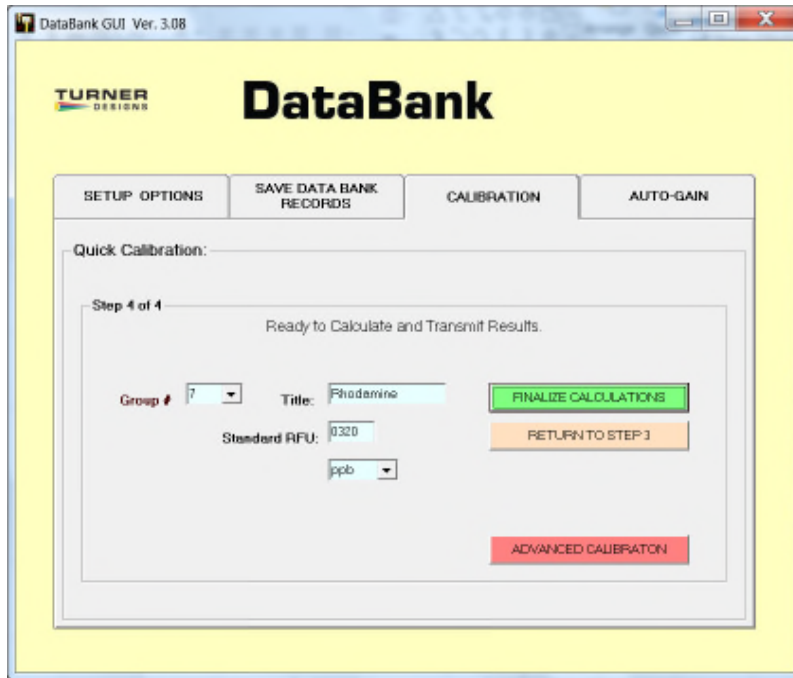For our example we are entering 100.

From the pull down menu choose units of measure or manually enter units of choice;
maximum 4 characters. Be sure not to choose RFUB. We are choosing ppb for our example.

Click "Proceed to step 4".

The Software will start measuring the standard solution's signal.
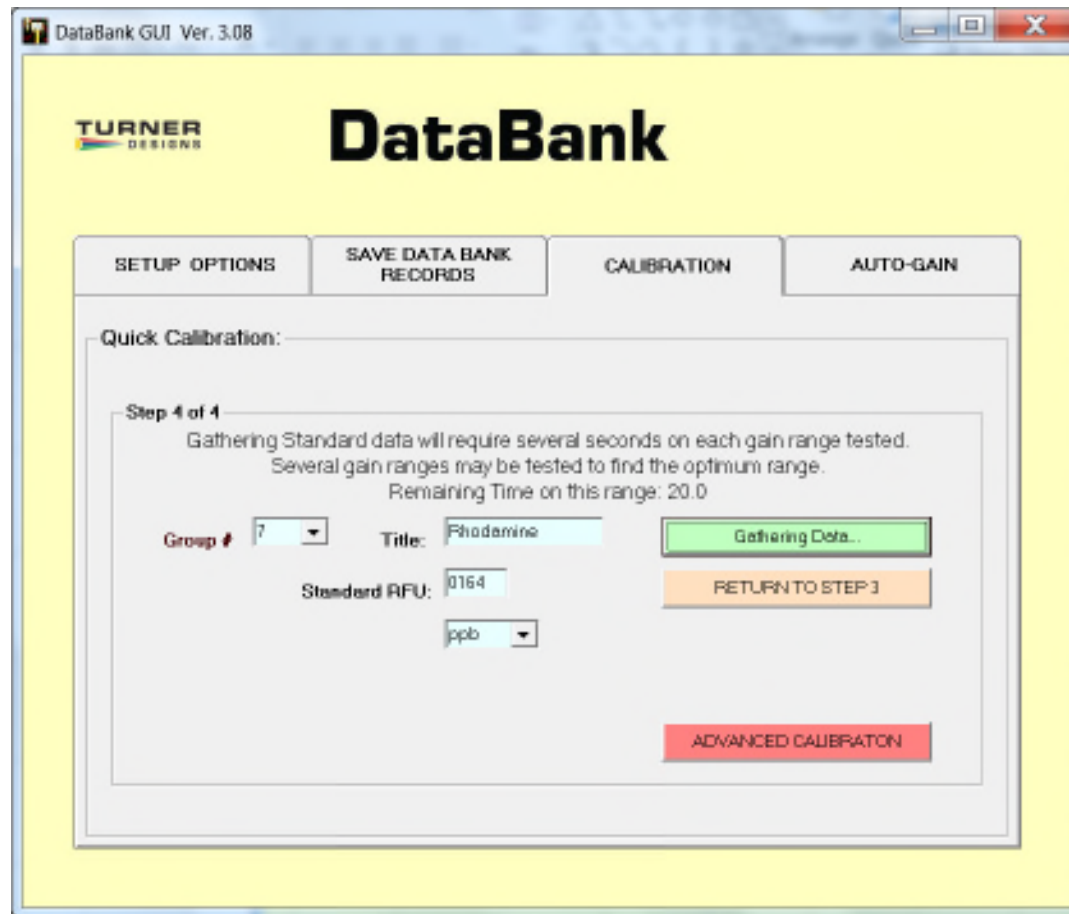
When the DataBank finishes gathering data click "Finalize Calculations".

When the calibration is complete Click OK in the popup window.

The DataBank is now ready for use with the Cyclops and you may begin measuring samples. Values will be reported in ppb units that are blank subtracted and scaled to a standard solution that was used for calibration.

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