



Using RadSoft with the a-Sphere

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David Dana, 2015-8-11

RadSoft is software designed for operating HOBI Labs' HydroRad radiometers. It was written before the a-Sphere existed, but the a-Sphere is based on the same spectrometer and firmware as the HydroRads. This allows the a-Sphere to masquerade as a HydroRad, and to use RadSoft's powerful real-time data displays and graphical file manager. RadSoft cannot calibrate a-Sphere data, but it is often the best tool for collecting and monitoring a-Sphere data in real time.

About Calibration files

RadSoft requires a calibration file to be associated with any instrument connected to it, and will prompt you to select a calibration the first time you to your a-Sphere. It cannot read or interpret standard a-Sphere calibration files, but there are two ways around this:

1. Use RadSoft's default calibration file, which allows it to display raw data from any instrument.
2. Hobi Instrument Services can provide a RadSoft-compatible version of the a-Sphere calibration. This does not provide calibrated absorption, but enables normalizing an a-Sphere's data by either its in-air or pure-water baseline. This is useful for checking drift, or while collecting new baselines. Please contact Hobi Services to request such a file for your a-Sphere.

Installation

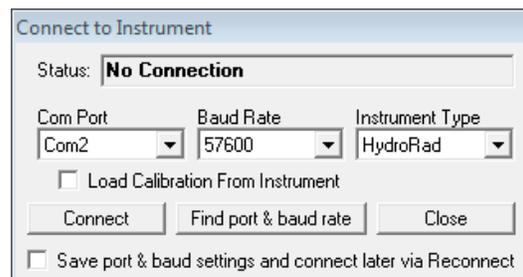
The RadSoft installer is downloadable from <http://www.hobiservices.com/software>. Simply run the installer on any version of Windows since Windows 95.

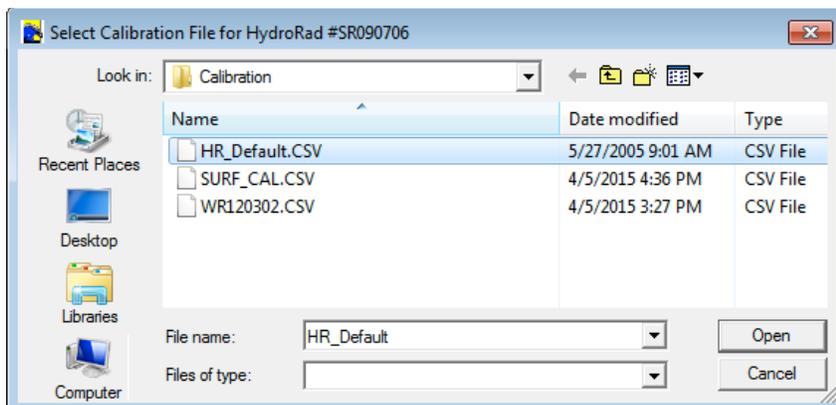
Connecting

Apply power to the a-Sphere and connect it to a serial port or USB-serial adapter on your computer. In the RadSoft Desktop window, select Connect from the File menu.

In the **Connect to Instrument** dialog, do not select the **Load Calibration From Instrument** option, which will fail with the a-Sphere. Select the appropriate Com Port and Baud Rate if you know them. If not, click **Find port & baud rate**.

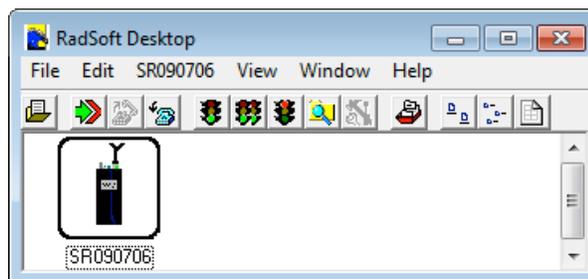
Once the instrument is detected, RadSoft will inform you that you must select a calibration file, and present a dialog box for selecting it:





If you have a .CSV cal file for your a-Sphere, select that. If not, select HR_Default.CSV. If HR_Default.CSV does not appear, be sure the dialog is showing the folder My Documents\ RadSoft\ HydroRad\ Calibration. If you select the default file, you can ignore a message that the serial number does not match.

Once the connection is active, an icon representing the a-Sphere will appear in the **RadSoft Desktop** window. Note the first sneaky trick that allows the a-Sphere to work with RadSoft: it pretends its serial number starts with “SR” instead of “SP”. This makes RadSoft think it is a type of HydroRad.



Terminal Window

To open a terminal window that shows all communication between the a-Sphere and the computer, double-click on the instrument icon, or select View->Show Item Window. You can type commands to the a-Sphere directly into the terminal window.

Data Display Options

When your a-Sphere is connected, the RadSoft desktop will include a menu named with the a-Sphere’s serial number. Most of its commands do not apply to the a-Sphere, except **Set up Acquisition...**, which opens the following dialog box. The RadSoft Processing tab offers several options, especially “calibration levels,” that are useful for real-time display of a-Sphere data.

Calibration Levels

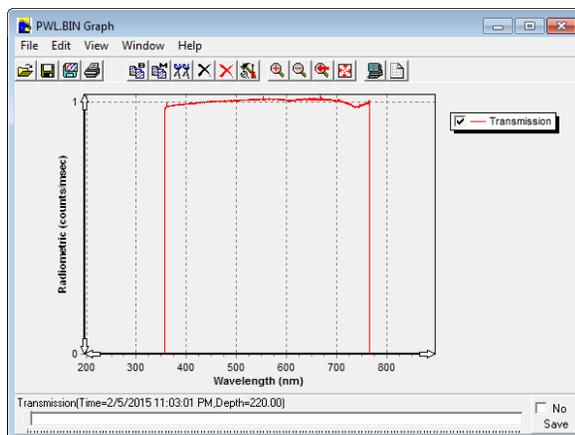
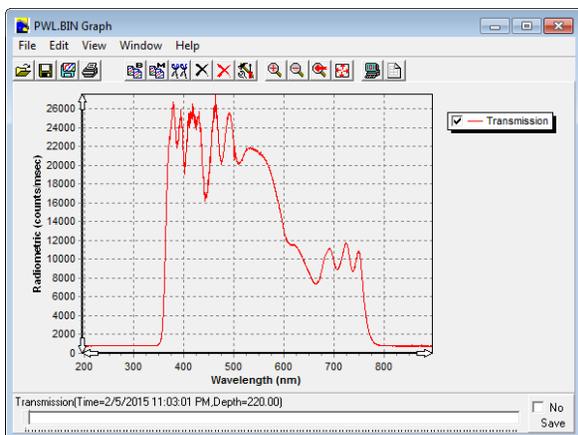
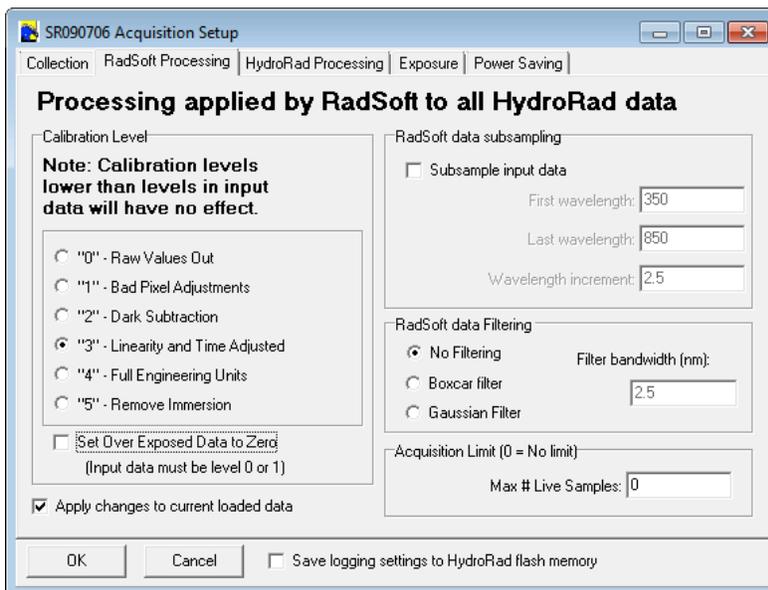
Although RadSoft cannot calculate absorption, the calibration steps it applies to HydroRad data are also useful with the a-Sphere. **Note: these only apply if you have selected an appropriate calibration file; with the default calibration file, RadSoft displays raw data regardless of the selected calibration level.** The most useful

calibration level are:

0 – Raw values with no processing applied.

4 – For the HydroRad, this displays fully processed radiometric data, but for the a-Sphere, this displays signals normalized to the pure-water values contained in the calibration file. This is useful for monitoring how the pure-water response of the a-Sphere has changed since the calibration, and for checking the cleanliness of the sphere. When the a-Sphere is perfectly stable and clean and filled with perfectly pure water, the values should be 1 for all pixels.

5 – For the HydroRad, this is the same as level 4, but without the immersion corrections that apply when its light collectors are used in water. For the a-Sphere, this displays signals normalized to the air reference values contained in the calibration file. This is useful for checking the instrument stability and cleanliness when pure-water measurements are not practical. When the a-Sphere is perfectly stable, clean, empty and dry, the values should be 1 for all pixels.



A pure water spectrum displayed in two ways: raw level 0 data (left) and level 4 data (right)

Subsampling and Filtering

RadSoft can also provide simple spectral processing. Subsampling is not generally useful or advisable for a-Sphere data. In special cases you may wish to apply RadSoft's

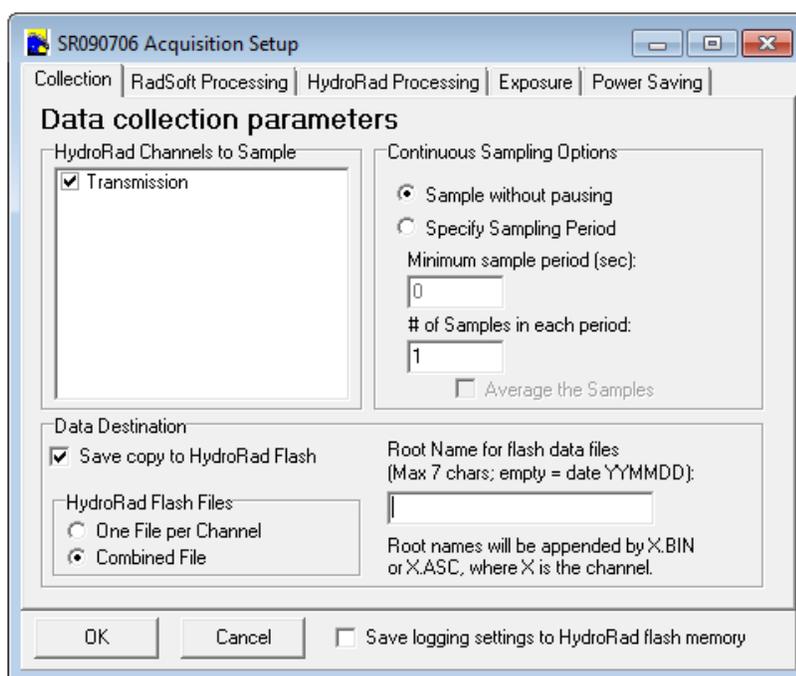
spectral filtering, but for most a-Sphere applications you should select the “No Filtering” option.

Collecting and Saving Data

You can use RadSoft’s acquisition controls (the **Acquire One Sample**, **Acquire Continuous Samples**, and **Stop Sampling** commands on the **File** menu, or their equivalent buttons on the toolbar) to trigger data collection from the a-Sphere, or you can send commands to the a-Sphere directly from the terminal window. The **Collection** tab of the **Set Up Acquisition** dialog box provides appropriate controls.

Although RadSoft is capable of storing a-Sphere data directly onto the host PC, it produces files that are not directly compatible with the standard IGOR Pro functions used for calibrating a-Sphere data.

Therefore if you wish to process any data collected with the a-Sphere through RadSoft, it is best to set up RadSoft to store the data on the a-Sphere itself, then offload the files later (see below). Do this by checking the **Save copy to HydroRad Flash** checkbox on the **Collection** tab, selecting



the **Combined File** option, and specifying a “Root Name” no longer than 7 characters. The Root Name will be the name of the file stored on the a-Sphere.

You should also select the **Auto All** option on the **Exposure** tab, to ensure that the a-Sphere always picks a suitable integration time.

Transferring Files To and From the a-Sphere

RadSoft includes a “File Explorer” that presents an interface similar to Windows Explorer for moving files to and from the a-Sphere. To open it, select **Device Explorer** from the **File** menu, or click on the corresponding button in the toolbar. After the explorer window opens (which may take a number of seconds, depending on how many files are on the a-Sphere), you can drag files to a Windows Explorer window, or to your desktop.

You can also drag text files (but not binary files), into RadSoft's explorer window to copy them to the a-Sphere.

Keep in mind that file transfers take place at the current baud rate of the a-Sphere. Since a-Sphere files can easily grow to multiple megabytes, it is advisable to set the a-Sphere baud rate as high as possible, usually 115,200 or 57,600 baud, before transferring data files. At 9600 baud, a megabyte of data will take almost 20 minutes to transfer. At 115,200 baud, it will take about 90 seconds (which is still much slower than USB or a high-speed internet connection).