



USER GUIDE

RBR*solo* RBR*duet*

rbr-global.com

Table of Contents

1	Ruskin	6
2	Revision history	7
3	Warranty statement	8
4	Introduction	9
5	Installation	10
5.1	Install Ruskin on a PC	10
5.2	Install Ruskin on a Mac	11
5.3	Update Ruskin	12
5.4	Uninstall Ruskin	12
6	Provide your feedback	14
7	Quick start	15
7.1	Deploy an instrument	15
7.2	Simulating an RBRsolo/duet	16
7.3	View information about a logger	16
7.4	Recover an instrument and download data	17
8	Configure a logger	18

8.1	Communicating with the logger	18
8.2	Scheduling a RBRsolo/duet	19
8.3	Stop logging	20
8.4	Waves and Tides solo and duet	21
8.5	Autoranging and fixed gain	23
8.6	Deployment	23
9	Download	25
9.1	Download data from the logger	25
9.2	File naming convention	25
10	Calibration tab	27
11	Update firmware	28
12	Datasets	32
12.1	Open a stored dataset	32
12.2	Analysis tab	32
12.3	Overview	34
12.4	Channels	35
12.5	File info tab	38
12.6	Plot view	39
12.7	Exporting datasets	47
13	User calibration	49

13.1	N-Point calibration	49
13.2	Oxyguard DO calibration	50
13.3	Turbidity calibration	52
14	Preferences	56
14.1	Specify location for log files	56
14.2	Specify Language selection	56
14.3	Using advanced sampling controls	57
14.4	Derived channels - RBRsolo-RBRduet	57
14.5	Specifying plotting preferences	59
15	Logger Hardware	63
15.1	Opening and closing the logger solo duet	63
15.2	Changing the batteries solo duet	64
15.3	Installing desiccant solo duet	65
16	LED behaviour	67
17	Maintenance and repairs	68
17.1	Instrument calibration	68
17.2	O-rings solo duet	68
17.3	Repairs	70
17.4	Support kits	71
18	Appendices	72

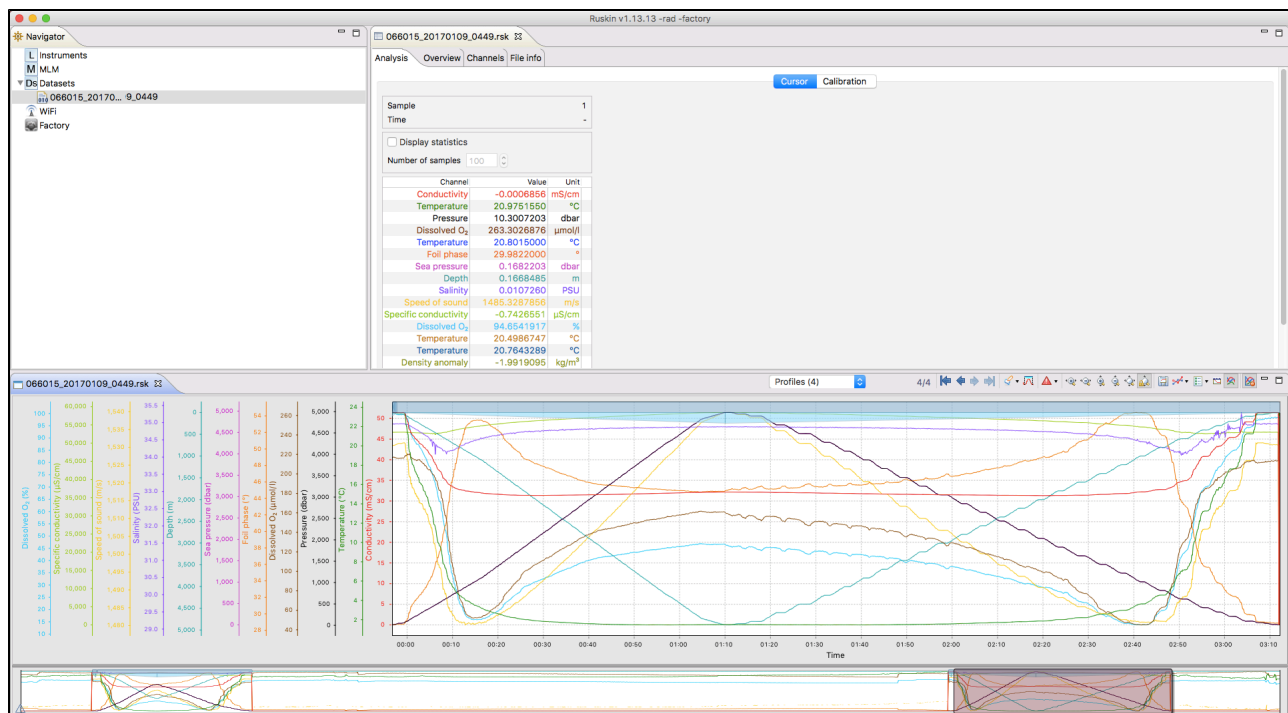
18.1	When to replace the batteries	72
18.2	Appendix B - O-ring specifications	72
18.3	Appendix C - Event and Error Stamps	72
18.4	Appendix D - wave deployment planning	74

1 Ruskin

Ruskin is the RBR software that manages your RBR loggers to provide all the data necessary to do your work. Ruskin provides a graphical user interface that makes using the loggers easy. You can use Ruskin to do the following:

- configure, schedule and enable multiple loggers
- download data after logging
- graphically view data sets
- export data in various formats
- change the calibration coefficients for your logger

Ruskin can be used on PC and Mac.



2 Revision history

Revision No.	Release Date	Notes
1.0	01-Sep-2012	Original
2.0	01-Oct-2014	Adding RBR <i>solo</i> D and DO and RBR <i>duet</i> support
B	12-Sept-2017	Final revision for compact loggers



3 Warranty statement

All data loggers manufactured by RBR Ltd. are warranted against defects in workmanship or original parts and materials for one year. Third party sensors (not manufactured by RBR) are limited to the warranty provided by the original manufacturer.

Units suffering from such defects will be repaired or replaced at the discretion of RBR Ltd., provided that the problem has appeared during normal use of the instrument for the purpose intended by us. The liability of RBR Ltd. extends only to the replacement cost of the instrument. The customer will bear all costs of shipment to us for repair; all other costs, including return shipment, will be borne by RBR Ltd.

This warranty does not cover consumables or normal wear and tear, nor does it cover damage caused by negligent use or mishandling. Attempted modification or repair of any unit without the prior consent of RBR Ltd. will immediately void any warranty in force.

Users are expected to maintain a regular program of calibration.

We reserve the right to grant or refuse warranty repairs at our discretion if we consider that there are reasonable grounds for doing so.

4 Introduction

This document introduces you to Ruskin and helps you to use it effectively from the start. It is specifically written for the RBR *solo* and RBR *duet* loggers - our smallest one and two channel loggers.

You can access the Ruskin User Guide on the USB data stick provided when you purchase a logger, from the Help menu in Ruskin, and on the RBR web site, at www.rbr-global.com.

Release notes are automatically displayed each time you install an updated version of Ruskin. The most recent release notes are also available from the Help menu in Ruskin.

For information about operating and maintaining your data logger, see the Logger Hardware section. It helps explain how to change the battery and change desiccant, including other useful information, such as inspecting and replacing O-rings.

5 Installation

5.1 Install Ruskin on a PC

You can install Ruskin on a PC that runs the Windows 7, 8, 8.1, or 10 operating system.

The minimum requirements for Ruskin are:

- OS = Windows 7
- Processor speed = 1.4GHz
- RAM required = 1GB
- Display resolution = 1024x768 recommended
- HDD space for installation = 300MB

Steps

1. Connect the data stick included with your instrument to a USB port.
2. Navigate to the folder Ruskin Installation and double click on the file `RuskinSetup.exe`.
3. Follow the installation wizard. By default, Ruskin will be installed to `C:\RBRRuskin`.
4. The logger uses a USB interface to communicate with Ruskin.
At the end of the installation, a prompt will appear asking, "Would you like to install the logger driver at this time?"
5. Click **Yes** to install the drivers.



You may need to run the setup application as an administrator to install the driver correctly.

A shortcut to Ruskin appears on the desktop and in a **Start** menu folder called RBRRuskin.



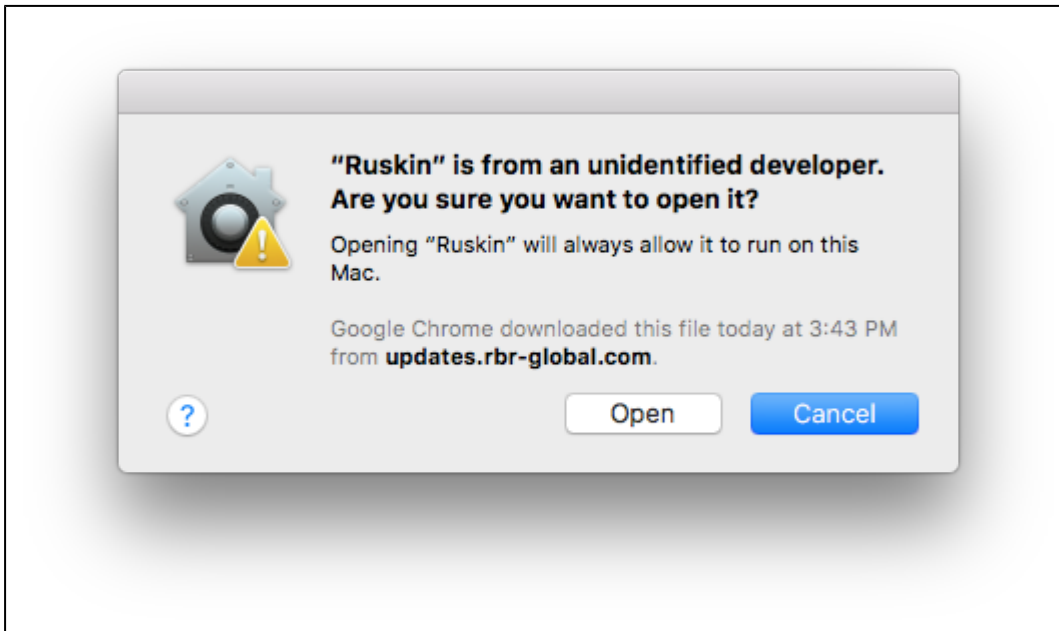
Please note that the most recent version of Ruskin can be found at <https://rbr-global.com/products/software>

5.2 Install Ruskin on a Mac


You can install Ruskin on a Mac running OS X 10.5 (Leopard) or later.

Steps

1. Insert the USB data stick in the appropriate USB port.
2. Navigate to the folder OSX and double click on the file `Ruskin.dmg`.
3. When the disk image window opens, drag the Ruskin icon into the applications directory and wait for the copy to complete.
4. To open Ruskin for the first time navigate to your applications directory, locate Ruskin, right click on the icon, and select Open.
5. The dialogue box shown below will prompt you to authorize the opening of Ruskin.



It may be required that you navigate to **System Preferences > Security & privacy** to allow apps downloaded from **“Anywhere”** to complete the installation.

 Although you can specify a different folder for the working directory for the software, we recommend that you use the default **Applications** folder.

A folder named RBRuskin appears in the Applications folder.


You may want to drag the Ruskin.app application to the Dock.

5.3 Update Ruskin

To take advantage of new features and bug fixes, ensure that you are using the most recent version of Ruskin.


It is not necessary to uninstall an older version of Ruskin before installing a newer version. The installation program deletes the older files before installing the newer ones. It does not delete any Ruskin data files or log files.

The most recent version of Ruskin is always available on the RBR website (www.rbr-global.com). However, if you already have an older version of Ruskin installed, Ruskin automatically notifies you that a newer version is available when you start Ruskin. You can check to see if a new version is available from within Ruskin navigating to the menu **Help > Check for updates**. If you have a broadband connection, we recommend that you follow the installation instructions that appear on your computer. Otherwise, request a USB stick from RBR.

 If you do not have a broadband connection and/or are unable to install the Ruskin updates, update notifications are available via email. To receive these notifications, send an email to: support@rbr-global.com subject: "Ruskin update request".

5.4 Uninstall Ruskin

If you no longer need to manage RBR instruments from your computer, you can uninstall Ruskin.

 Removing Ruskin will not delete your data files or your diagnostic logs.

It is not necessary to uninstall an older version of Ruskin before installing a newer version. The installation program deletes the older files before installing the newer ones. For more information, see [Update Ruskin \(page 12\)](#).

Windows 7, 8, 8.1, or 10

Go to **Start > Control Panel > Programs**, and under **Programs and Features**, click **Uninstall a program**. In the list, locate **Ruskin** – click **Ruskin** to highlight it, and then click **Uninstall**.

OS X 10.5 or later

Move the RBRRuskin folder from **Applications** to the **Trash**.

6 Provide your feedback

You can get in touch with RBR in several different ways:

- Send us an email. For a technical question, write to support@rbr-global.com. For general inquiries, use info@rbr-global.com.
- Send us a bug report from within Ruskin itself. Use the **Help** menu > **Comment on Ruskin**. This allows you to include the diagnostic logs, and any other files (RSK datasets, screenshots) that will help us reproduce the problem and help you as quickly as possible.

Steps

1. From the **Help** menu, click **Comment on Ruskin**.
The Feedback to RBR dialog box appears.
2. Enter your identification information, for example, email address and name, and then summarize your comments.
3. Provide a detailed description and add any attachments, if required.
4. Click **Submit** to submit the report.

7 Quick start

7.1 Deploy an instrument

Before you begin using your RBR loggers, you may want to experiment with the simulated loggers that are included in Ruskin. For instructions on simulating a logger, see [Simulating a logger \(page 16\)](#).

When you are ready to use your own RBR loggers, we recommend that you follow the following steps to ensure that you measure exactly what you want on the first attempt.

Steps

- If you are using the logger for the first time, you can use either the default preferences or specify your preferences to apply to all your loggers. For more information, see [Preferences \(page 56\)](#). You can change these preferences at any time.
- Connect your logger locally through your computer's USB port. The logger should appear in the **Navigator** view after a few seconds.
- Click the logger that you want to use. Ensure that it contains the sensors you expect to find on the logger by viewing the **Information** tab in the **Properties** view on the right side of the Ruskin window. For more information, see [View information about a logger \(page 16\)](#).

If you want to see live data sampled every few seconds but not saved, select the **Fetching** button in the toolbar located above the **Plot** view. The **Plot** view is located at the bottom of the Ruskin window.



You must specify your preferences regarding these features before you enable the schedule. For more information, see [Configure a logger \(page 18\)](#).

- If you want to view or modify calibration coefficients, click the **Calibration** tab. For more information, see [Calibration tab \(page 27\)](#).
- Click the **Setup** tab > **Schedule** tab to schedule the logger to take samples when and as often as you want within the limits of your logger.

For more information, see [Scheduling a logger \(page 19\)](#).

Ruskin prevents you from enabling a schedule that exceeds the memory capacity of the logger. Ruskin also shows the estimated battery usage required to use your logger as scheduled. You should seriously consider this information before you enable the schedule.

- If you want to download data, click the **Download** tab to download all the data saved since your schedule was enabled. For more information, see [Download \(page 25\)](#). The focus changes to the new dataset in the **Navigator** view, and the static data appears in the **Plot** view. You can now export the downloaded data to a file in Excel, Matlab, engineering text, or raw text formats. You can also save the image as a PDF or PNG file for viewing outside Ruskin.

7.2 Simulating an RBRsolo/duet

Ruskin can simulate most logger types that RBR produces, including the *RBRsolo* *RBRduet*. We recommend that you experiment with your type of simulated logger before enabling a schedule for your actual RBR logger. This practice will probably save you time in the long run, by ensuring you are familiar with the options available.

Steps

1. From the **Instruments** menu, click **Simulate instrument**. The Configure Simulated Instrument dialog box appears.
2. Under Logger type, select the **Compact Instruments** tab and select the appropriate options.
3. Click **OK**. The simulated logger appears under Instruments in the **Navigator** window.
4. Click the new simulated logger. You can work with this logger the same way as you work with a real RBR logger, including: configuring, calibrating, logging, and downloading data.. Multiple loggers, both real and simulated, are listed in your **Navigator** window.



If you want to remove a simulated logger, right-click it and click **Remove simulated instrument**. You can also use the Instruments menu.

7.3 View information about a logger

You can view static information about a logger at any time as follows:

In the **Navigator** view, click the appropriate logger.

The **Setup** tab in the **Properties** window on the right side of Ruskin identifies the logger, its logger details such as model, serial number, generation, firmware version and battery status.

Logger details	Schedule
Model: RBRsolo T	Logger status Not enabled
Generation: Late 2012	Logger clock 2017-07-05 14:25:34 (UTC+0.00) UTC sync Local sync
Serial: 907576	Start logging 2017-07-05 2:23 PM <input type="checkbox"/> Start immediately
Firmware: 1.110	Sampling <input type="radio"/> Period <input checked="" type="radio"/> Rate 2Hz
Battery:	End logging 2017-11-11 (~129.2 days, limited by battery) <input checked="" type="checkbox"/> Fresh battery
Enable logging Use last setup Memory used: 0% Download...	

7.4 Recover an instrument and download data

When the deployment is complete recover your instrument and follow these steps to download your data.

Flooded loggers may be under pressure and opening a logger may be dangerous - take precautions when opening a logger

Steps

- Start Ruskin
- Carefully open the logger by unscrewing the pressure housing
- Insert the micro USB connector into the logger (see [Communicating with the logger \(page 18\)](#)) and connect cable to your computer
- The logger appears in the navigator window and select the **Download** tab and select **Download...** (see [Download \(page 25\)](#))
- Save the file to a preferred location
- Evaluate your data (see [Analysis \(page 32\)](#))

8 Configure a logger

Before you enable a logger schedule, you can configure the logger to suit your requirements.

The instructions to configure a |tide or |wave logger are different than the standard loggers and can be found in [Waves and Tides](#). (page 21)

If your logger schedule is already enabled when you decide to change the configuration you must stop running the schedule, make your changes, and enable the schedule again. However, any data stored so far on the logger will be lost.



You can preserve the data by downloading it to a file before you enable the schedule again.

The **Setup** tab contains the **Enable**, and **Use last setup** buttons. When you click **Enable**, the logger setup parameters are stored to the logger and the schedule is enabled.

Use last setup is intended for configuring multiple loggers using the same schedule. For example, to set up three |tide loggers with exactly the same parameters, set one logger up and enable it; connect the second and third logger and when you click **Use last setup** button, these two loggers will be set up with the same parameters as the first logger. This includes the logger clock time, start and end logging times, sampling period (or rate), gating condition, and tide or wave sampling parameters for |tide or |wave loggers.

8.1 Communicating with the logger

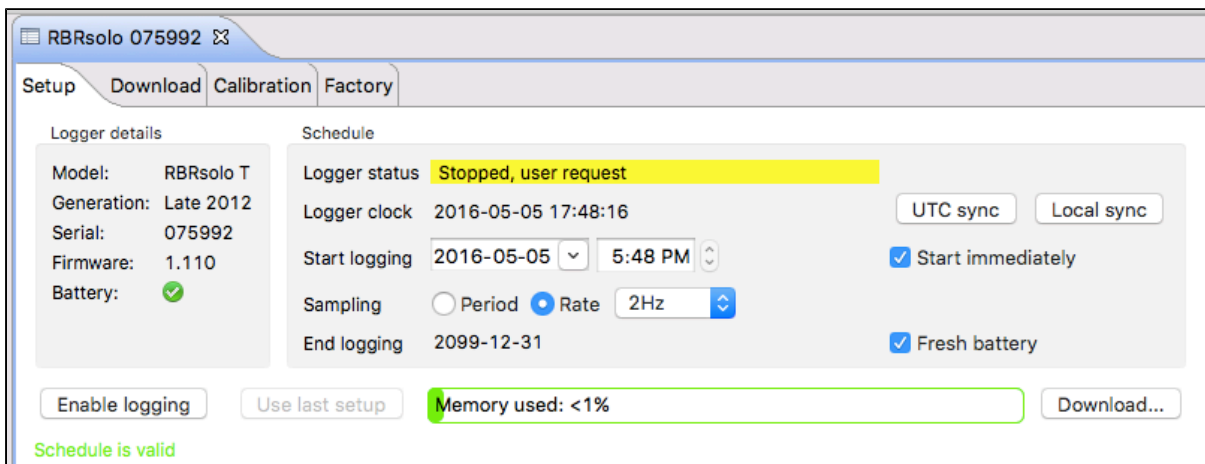
To establish communication between the RBR *solo* or RBR *duet* and a computer, open the instrument (see [Opening and closing the logger](#) (page 63)) and remove the housing. There is a micro-USB connector located on the back side of the logger. The supplied interface micro-USB cable is plugged into this connector and the other end is attached to the USB port on your computer.

8.2 Scheduling a RBRsolo/duet

You can schedule your RBR*solo* or RBR*duet* to start at a specified time and sampling rate. Ruskin indicates any unattainable conditions in the defined schedule at the bottom of the Schedule tab, and the Enable button is grayed out.

Steps

1. Connect your logger locally to computer's USB port. The logger should appear in the Navigator view after a few seconds.
2. While the logger you want is highlighted in the Navigator view, click the Setup tab in the Properties view.



3. Click either **UTC sync** to synchronize the logger with Coordinated Universal Time, or **Local sync** to synchronize the logger with your local PC clock.
4. In the **Start Logging** boxes, specify the date and time that you want to start running the schedule or select the **Start immediately** check box.



If you select and then clear the **Start immediately** check box, you can then manually modify the current date and time instead of the original values.

5. Specify the interval between samples using either the **Period** or **Rate** option. The Period option allows you to set the sampling interval in units of seconds. The Rate option allows you to select between 1 Hz or 2 Hz frequencies.



All profiling loggers (known as |fast) have the ability to sample faster than 2Hz. For example |fast16 loggers sample at rates of 2,4,8 or 16Hz. All |tide loggers can average at rates of 2,4,8 or 16Hz. All |wave loggers can sample at rates of 2, 4,8 or 16Hz

6. An estimated end logging is shown at the bottom of the Setup tab based on the sampling interval set. Check to ensure this date is beyond the end date of your planned deployment. If you place your cursor over the end logging date, a message box will appear indicating whether your deployment is battery or memory limited.
7. If the logger you are scheduling has had a fresh battery inserted, select the **Fresh battery** box. Ruskin has the capability to calculate the remaining battery life available for a used battery based on the number of samples that have been taken. The RBR*solo* and RBR*duet* keep track of the number of previously stored samples to determine the battery use. Selecting and deselecting the Fresh Battery check box allows you to see the difference between a fresh battery and a used battery.



If you select the **Fresh battery** box and enable the logger the previously stored sample count is reset. In this case it is assumed that a fresh battery is installed.


8. To enable the logger to start sampling immediately or in the future click **Enable logging**. A message appears informing you that the memory will be erased.
9. Select **Cancel** if you need to download the previously sampled data or press **Erase and enable logging** to enable the logger.

8.3 Stop logging

Logging stops on its own when one of the following occurs:


- The end logging time is reached.
- The power is removed.
- The logger memory is filled.
- The logger battery is depleted.

To manually stop the logger In the **Properties** view, click **Setup** tab and select **Stop logging**.

 Whether or not you make any changes to the schedule or the configuration, before running the schedule again, a warning appears that the contents of memory will be erased. If you want to save the data stored so far on the logger, you must download the data to a file before proceeding. You can do this from **Properties** view > **Setup** tab and select **Download**. For more information about downloading a file, see [Download \(page 25\)](#).

8.4 Waves and Tides solo and duet

8.4.1 Tides

 This section applies to the RBR *solo* D |tide and |wave and RBR *duet* T.D |tide and |wave loggers


|tide loggers use averaging to remove wave data from the pressure measurements. |wave loggers can be set up to operate like |tide loggers.

From the **Setup** tab select the radio button "Tide" to enable the tide measuring regime.


- In **Sampling regime** specify how fast you want pressure readings to be taken. Select **Period** for 1s or slower and **Rate** for sub-second sampling rates.
- In **Sampling** specify the **Tidal averaging** duration (how long to average) and specify the **Tidal measurement period** (the interval between averages).

In the above example the averaging rate is set to 2Hz and the averaging duration is 1 minute and this measurement is repeated every 15 minutes.

8.4.2 Waves

 This section applies to the RBR*solo*D |wave and RBR*duet*T.D |wave

A |wave logger records both wave and tide information, and the configuration is different from other loggers. For additional information on planning a wave deployment, please refer to [Appendix D - |wave deployment planning](#).

 All |wave loggers automatically calculate tide data by averaging the wave burst data. There is no setup required to determine tide information with the wave logger.

From the **Setup** tab select the radio button "Wave" to enable the wave measuring regime.

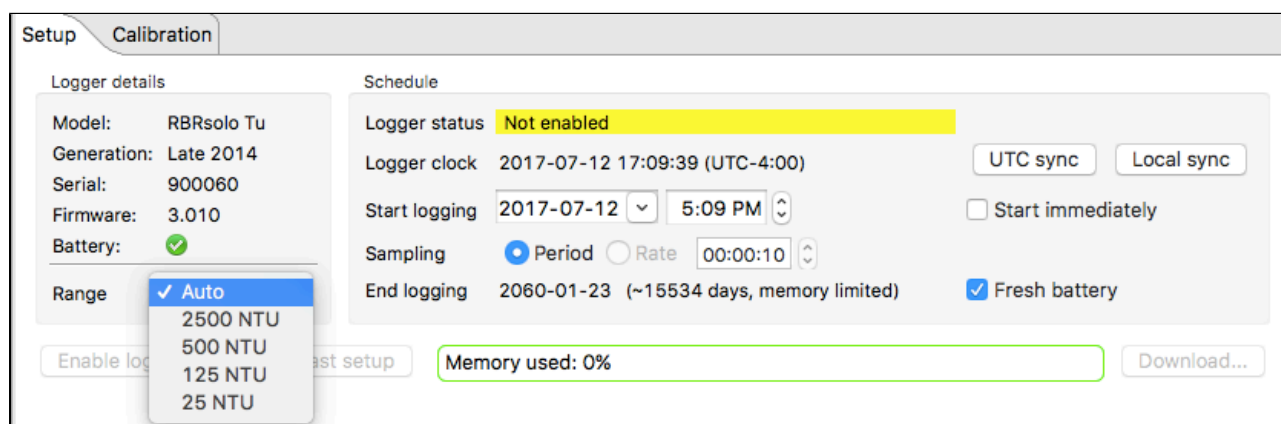
- In **Sampling regime**, specify how fast you want pressure readings to be taken. Select **Period** for 1s or slower and **Rate** for sub-second sampling rates.
- In **Wave duration (samples)**, select the number of samples that you want to take during a wave burst. The range is between 512 and 32768 samples.
- In **Wave measurement period**, enter the interval between the bursts.
- In **Instrument altitude (m)**, enter the number of meters above the sea or river bed where the logger will be secured in place. This value is used when making wave bandwidth estimates.

- In **Mean depth of water (m)**, enter the total expected depth of the water where the logger will be deployed. This value is used to estimate the range of wave frequencies and periods that can be resolved. Ruskin calculates the actual depth from the measured pressure data post-deployment.


8.5 Autoranging and fixed gain

Turbidity sensors are capable of autoranging. The logger can change the gain setting on the front-end amplifiers in order to select the most appropriate range based on the environment being measured. The logger can also set the gain on the sensor to a fixed value selected by the user, rather than allowing the logger to select the gain as it measures.

From the setup tab under logger details there is a drop down menu where the Range of the sensor can be specified. Seapoint turbidity sensors are capable of autoranging (automatic gain setting) or having a fixed range of 2500, 500, 125 or 25 NTU.



Range change events are displayed in the **Plot** view when the **Display diagnostic** is selected

from the **Events** button, , located in the **Plot** view toolbar. Range change events are displayed as RANGE XX Units where XX indicates the current range and units are the units of the sensor – typically NTU for turbidity sensors and g/l for fluorometers. For fast sampling where the change may be occurring over a number of samples the event is displayed as RANGE CHG and is followed by the final range event.

8.6 Deployment

Once you have ensured that the batteries are fresh, inspected the O-rings and programmed the logger (see Configure a logger), the instrument is ready to be deployed.

There are four precautions you should take to avoid damaging the logger and maximise the deployment autonomy:

1. Pay attention to the maximum pressure rating. All loggers with pressure sensors are individually rated to a maximum depth/pressure. This is indicated by the label which is placed on the logger's sensor end cap. Loggers which do not have a pressure sensor do not have this label, but are limited by the maximum depth/pressure rating of either the logger housing itself or of the sensors.
2. Avoid physical stress to the logger. Any type of clamp or bracket which concentrates the stress to the logger body is not recommended for use in logger mooring, mounting, and/or other deployment. Stress due to improper mounting may cause the logger to leak, resulting in the loss of valuable data or permanent damage to the electronics. RBR can provide proper mooring and mounting clamps suited to your specific application.
3. Use desiccant. If the logger is closed up in a warmer environment than the deployment environment, internal condensation can result. Since condensation may cause the circuitry to malfunction, the installation of desiccant prior to deployment is strongly advised.
4. Orientation on a mooring. Due to battery capacity potentially being sensitive to cell orientation, it is best to mount the logger with the sensor end facing down when deployed. Even if batteries that are minimally sensitive to cell orientation are used (e.g. Tadiran), it is always good practice to mount the loggers in this manner in the event that any brand of battery is employed.

9 Download

9.1 Download data from the logger

You can download data from a logger at any time. If you stop running a schedule, you must download the data before you restart the schedule to prevent the data stored so far from being lost. It is not possible to start logging without erasing the memory contents.

Steps

1. Select the **Setup** tab and click **Download**.

The **Save as RSK** dialog box appears.

2. Specify a location and a name for the data file.

By default, the RSK file name uses the Ruskin file naming convention. For more information about the naming convention, see File naming convention below.

3. The name of the new dataset appears and is highlighted automatically in **Navigator** view > **Datasets**.

The **Properties** view changes to the new dataset and contains the following tabs: **Analysis**, **Overview**, **Channels**, and **File Info**. All the data that was stored on the logger at the time of the download is automatically plotted in the **Plot** view.



Downloading data again while the same schedule continues to run, picks up the same data plus any data stored since the last download.

You can add a comment after downloading a dataset.

9.2 File naming convention

In Ruskin, by default, the name of a data file is composed of the following information:

- The first six digits represent the logger serial number.
- The next eight digits represent the current year, month, and day.
- The next four digits represent the current time to the minute.

- The file extension indicates the file format and should not be changed. If you change it, the file extension that you specify becomes part of the name, and the required extension is appended.

For example, the file named 911936_20090522_1613.rsk contains data for a logger with a serial number of 911936 whose data was downloaded in 2009 on May 22 at 4:13 pm.

10 Calibration tab

The Calibration tab displays the calibration coefficients for each channel (sensor) present and the date and time of the last calibration.

Time	Parameter	C0	C1	C2	C3
2017-07-06 10:32:26	Temperature	3.5000000E-03	-250.00000E-06	2.7000000E-06	23.000000E-09

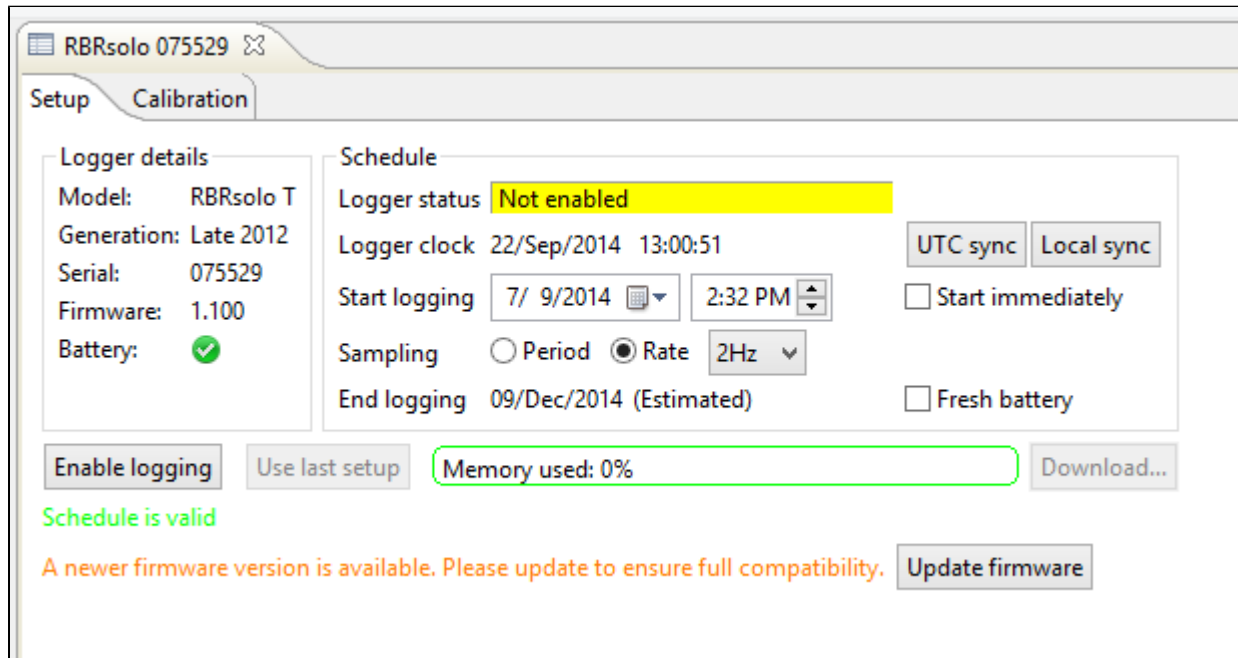
Check calibration expiry

You can request a calibration quote for your logger by selecting **Request calibration quote** and sending the information directly to RBR Ltd. In the **Calibration** tab, click **Request calibration quote**, and when the **Request calibration** dialog box appears, enter the appropriate information. Make sure to verify that all information is correct before sending the request. You can edit any of the coefficients and use **Store calibration** to save the new coefficients to the logger. Use **Revert calibration** to recover to the original coefficients if you have not already selected **Store calibration**.

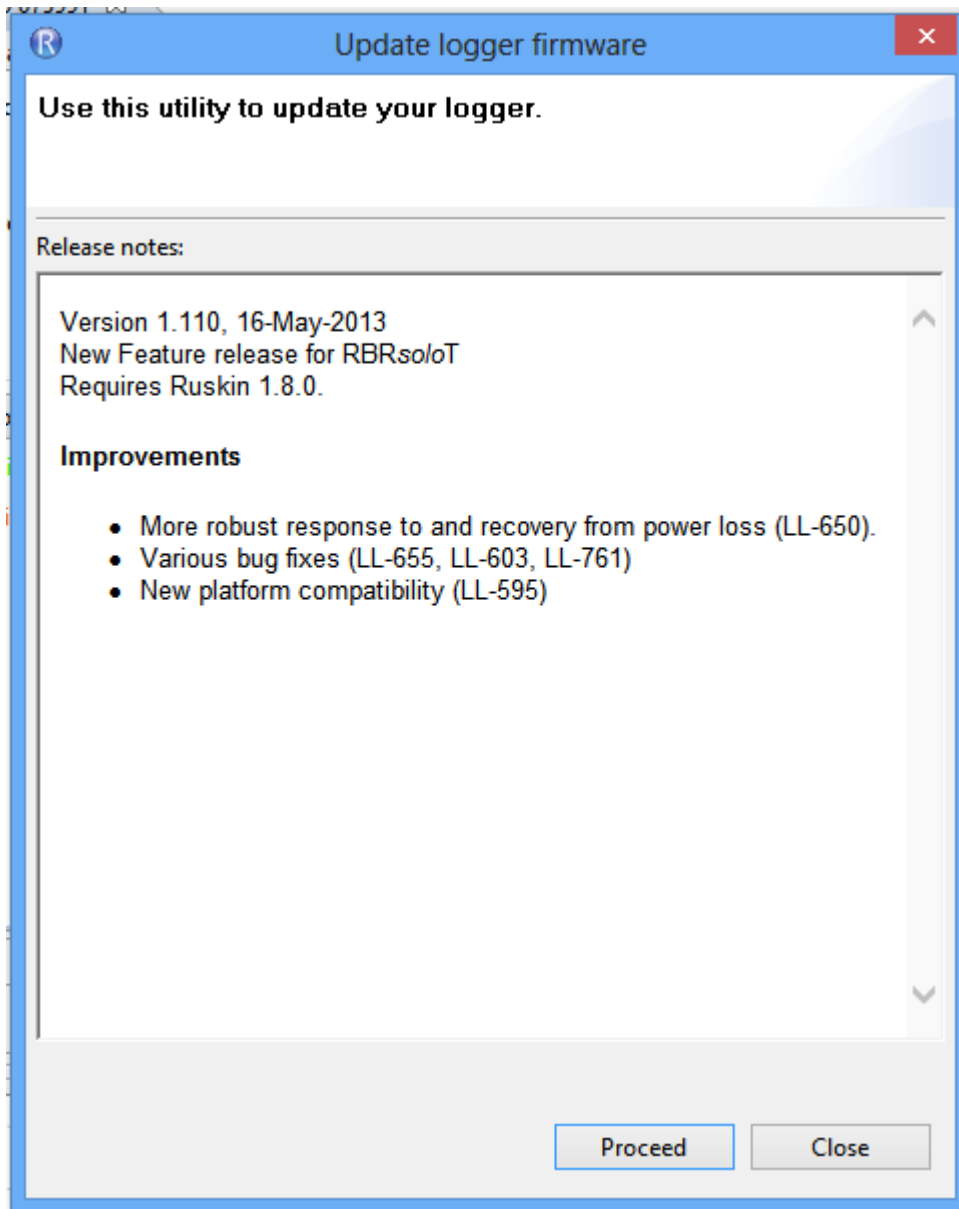
Calibration coefficients are calculated for each sensor, and the coefficients are stored in the logger. Calibration certificates are provided for each sensor and contain the both the calibration equation and the coefficients. Hard copies are provided with each shipment, and the documents are contained inside the shipping box. Please refer to the calibration certificates for the coefficients and residuals. RBR can replace lost or misplaced calibration certificates.

11 Update firmware

Instrument firmware upgrades can be performed from within Ruskin on a Windows-based computer without having to return the instrument to the factory. Ruskin automatically checks to see if a newer version of firmware is available and displays a message in the Information tab



Click the **Update firmware** button to upgrade the logger firmware. The following screen will appear:



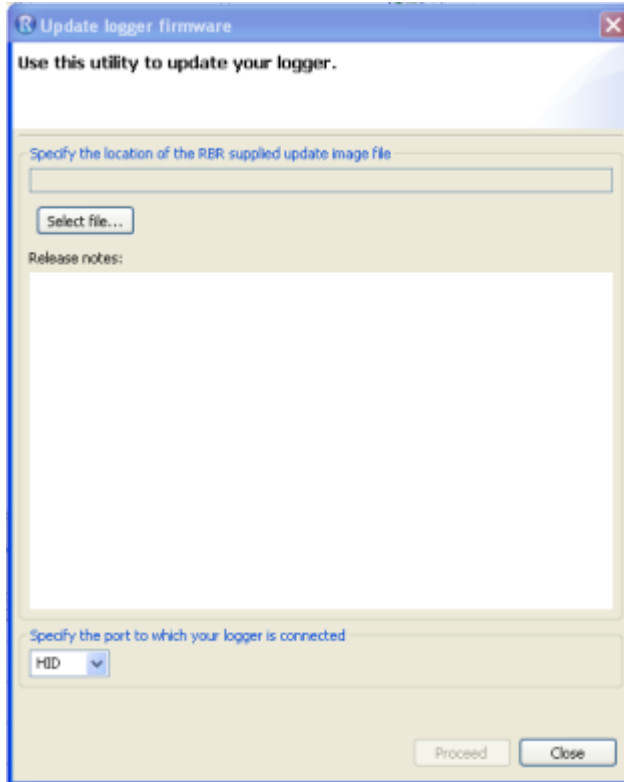
Do not disconnect the logger until the process is fully completed. Disconnecting the logger during this process may render the logger inoperable.

If for some reason RBR needs to supply a version of firmware version the following method is used to manually update the logger firmware.



Contact RBR for instructions before proceeding. This method of updating the firmware should only be attempted with the assistance of RBR.

Click the **Instruments** menu > **Update logger firmware**.



Do not use the HID port to upgrade your logger firmware. Use the COM port instead.

Steps

1. In the **Instruments** menu, click **Update logger firmware**.
The Update logger firmware dialog box will appear.
2. Click **Select file** and browse to the location of the firmware update file provided by RBR.
The file will have the extension **.rbfw**.

3. Use the drop down list to select the COM port of the logger.

If you have multiple instruments connected and do not know the correct COM port to use, in the **Navigator** view click **L Instruments**. The **Connections** view appears and you can see the port being used in the Port column of the table. To close the **Connections** view, select the X.

4. Click **Proceed** to start the firmware upgrade.

A progress bar shows the status of the upgrade. Once the firmware upgrade is complete, the message *Update completed successfully* appears at the top of the dialog box.

5. If the upgrade doesn't complete successfully, click **Proceed** again to retry until successful.



Occasionally the upgrade will succeed but the logger disappears from the **Navigator** view. If this occurs, disconnect your logger from the USB port and then reconnect to re-establish communication.

6. Click **Close**.

12 Datasets

12.1 Open a stored dataset

You can open any stored dataset to explore its contents.

Steps

1. Click **File** menu > **Open dataset**.
2. Double-click the .rsk file that contains the data that you want to view.
3. The name of the dataset appears and is highlighted automatically in the **Navigator** view. The **Properties** view changes to the dataset. The data in the file is automatically plotted in the **Plot** view.



To close a dataset, right-click its name in the **Navigator** view and click **Close dataset**. Or use **File > Close dataset**



Ruskin performs an integrity check that is intended to make sure that older data files are compatible with newer versions of Ruskin software. This information is displayed in [File info \(page 38\)](#). If the file requires updating the message indicates the issue with the file, and how long an update will take.

RBR strongly recommends that all files that have issues be updated.

12.2 Analysis tab

The **Analysis** tab contains information and settings for configuring the calibration information and to display statistical information. You must already have an open dataset to view and configure these settings. For information about how to open a dataset, see [Download \(page 25\)](#).

12.2.1 Cursor tab

When a file is selected and plotted the analysis tab can be selected to display information about the dataset channels and their values.

Channel	Value	Unit
Temperature	21.9032993	°C
Pressure	55.1626636	dbar
Sea pressure	45.0301636	dbar
Depth	44.6629588	m

This table reports the value at each sample number when selected in the plot referenced to the vertical black cursor.

The sample number and time of the sample are displayed.

Selecting **Display statistics** gives you the ability to determine the average value and standard deviation over a range of samples. Change the number of samples in the average by using the spin buttons. The grey bar that appears on the plot view is the range of the samples in the average.

Analysis Overview Channels File info

Sample 5255 - 5285
 Time 2016-10-27 11:41:37.000 - 2016-10-27 11:42:07.000 (UTC+0.00)

Display statistics
 Number of samples 30

Channel	Value	Avg	Std	Unit
Temperature	21.9032993	21.9032974	0.0001577	°C
Pressure	55.1626636	57.9591548	2.0948127	dbar
Sea pressure	45.0301636	47.8266548	2.0948127	dbar
Depth	44.6629588	47.4366456	2.0777302	m

Copy selection

12.2.2 Calibration tab

When a file is selected and plotted for re-calibration the calibration tab can be selected to assist with calculation calibration coefficients, see [User calibration \(page 49\)](#) .

12.3 Overview

When a file is selected and plotted the overview tab can be selected to display general information about the dataset.

The screenshot shows the 'Overview' tab of the Ruskin software interface. At the top, there are four tabs: 'Analysis', 'Overview' (selected), 'Channels', and 'File info'. Below the tabs is a 'File name' field containing the path: /Users/jtaylor/Desktop/074520_20161027_1455P.rsk. The main area is divided into three columns: 'Dataset', 'Logger', and 'Schedule'. Each column contains several input fields with values. Below these columns is a 'Comment' section with a large text area and a 'Save comment' button.

Dataset	Logger	Schedule
# of samples: 16899	Model: RBRduet	Gate: none
# of events: 2	Serial: 74520	Start time: 2016-10-27 10:14:03 (UTC+0.00)
# of diagnostics: 0	Firmware: 2.010	End time: 2016-10-27 17:12:55 (UTC+0.00)
# of errors: 0		Period: 00:00:01

Comment

Save comment

This is also the form on which you can enter a comment for the dataset and then press Save comment to save it.

12.4 Channels

The **Channels** tab display three additional tabs: **Information**, **Calibration**, and **Parameters**.

The **Information** tab displays the measured parameter, the sensor manufacturer and the range setting. The type of derived channels and how it is calculated is displayed in a separate table.

The **Calibration** tab displays the calibration coefficients for each sensor.

The **Parameters** tab displays the values of the parameters, default values if other required parameters are required and the method used to calculate the derived channels.

12.4.1 Information tab

The Information tab displays the measured parameters, the sensor manufacturer and the range setting (if applicable). It also shows any derived channels that are available, and a description of the methodology used in the calculation of that derived parameter.

Analysis Overview **Channels** File info

Information Calibration Parameters

Measured channels

#	Parameter	Sensor	Range
1	Temperature (°C)	RBR	None
2	Pressure (dbar)	RBR	None

Derived channels

#	Parameter	Notes
3	Sea pressure (dbar)	Removes atmospheric pressure
4	Depth (m)	Seawater derivation

12.4.2 Calibration Tab

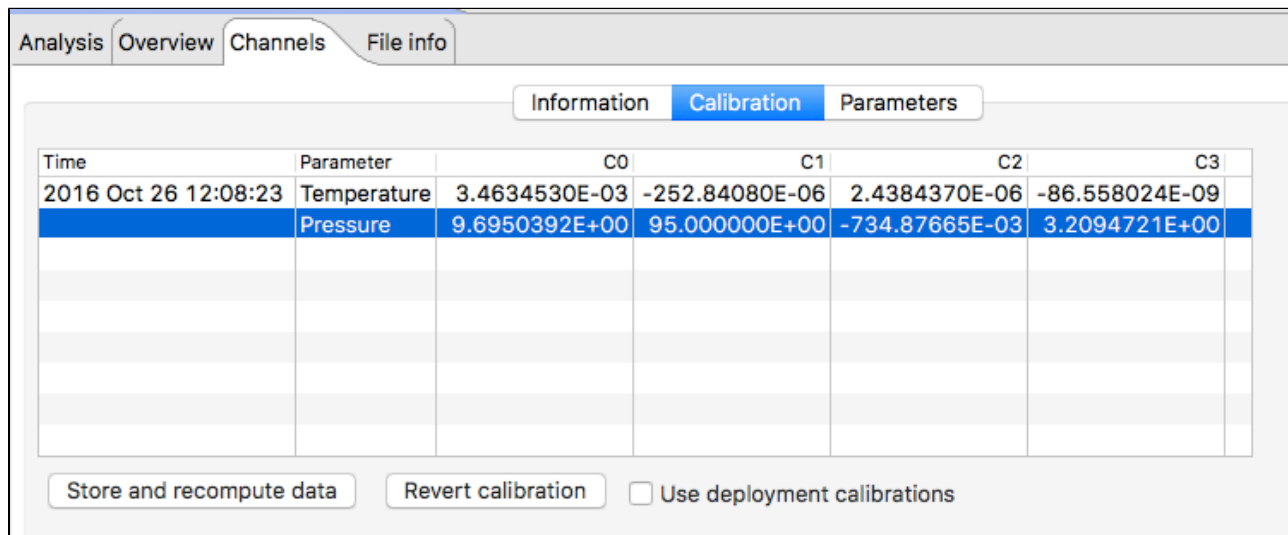
The Calibration Tab displays the calibration coefficients and temperature correction coefficients (as applicable) for each channel (sensor) and the date and time of the last calibration.

Analysis Overview Channels **File info**

Information Calibration **Parameters**

Time	Parameter	C0	C1	C2	C3
2016 Oct 26 12:08:23	Temperature	3.4634530E-03	-252.84080E-06	2.4384370E-06	-86.558024E-09
2016 Oct 27 15:07:39	Pressure	9.6950392E+00	90.428560E+00	-734.87665E-03	3.2094721E+00

Store and recompute data Revert calibration Use deployment calibrations



You can edit any of the coefficients and use "Store and recompute data" to recalculate the dataset. Use "Revert calibration" to recover to the original coefficients if you have not already selected "Store and recompute data". To recover the original calibration coefficients edit one of the values and click in another cell the "Use deployment calibrations" check box becomes active and unchecked, check the checkbox to restore the coefficients used by the logger and then press "Store and recompute data" to save the coefficients.

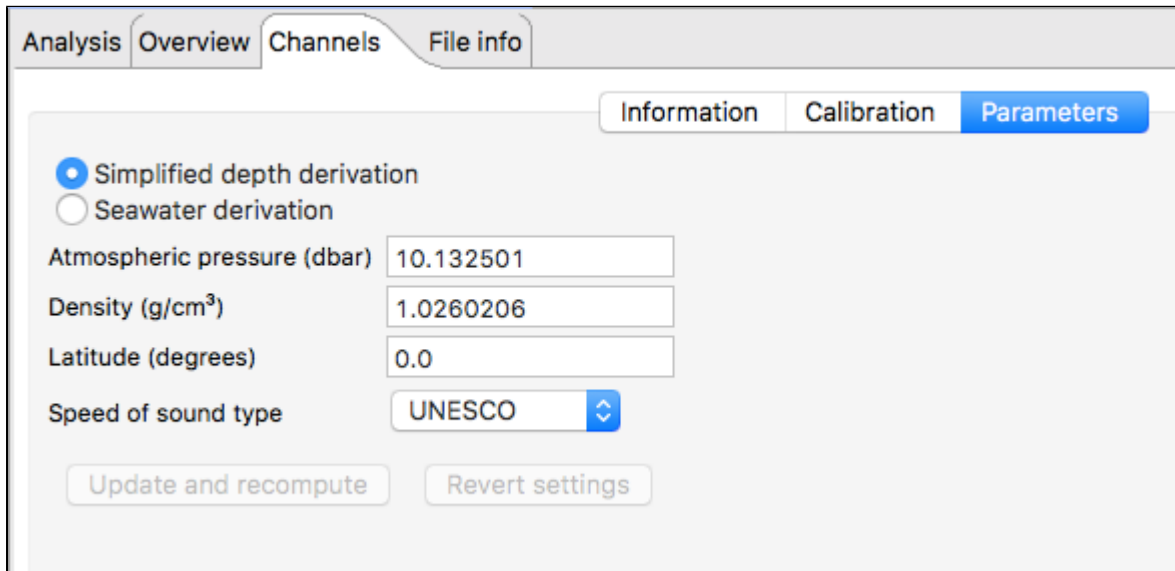
12.4.3 Parameters tab

When a file is selected and plotted, the **Parameters** tab can be selected to display the parameters used to calculate any applicable derived channels.

The tab reports the relevant derived channel information for the sensors on the logger. The parameters can be edited to change the derived channel calculation. Once a parameter is modified, the **Update and recompute** and **Revert settings** buttons become active.

Revert settings rereads the RSK file and populates the form with the parameters from the file. **Update and recompute** writes the new parameters to RSK file and re-displays newly calculated data.

The following example is for a CTD and dissolved oxygen logger where you can change the calculation parameters to calculate the derived channels:



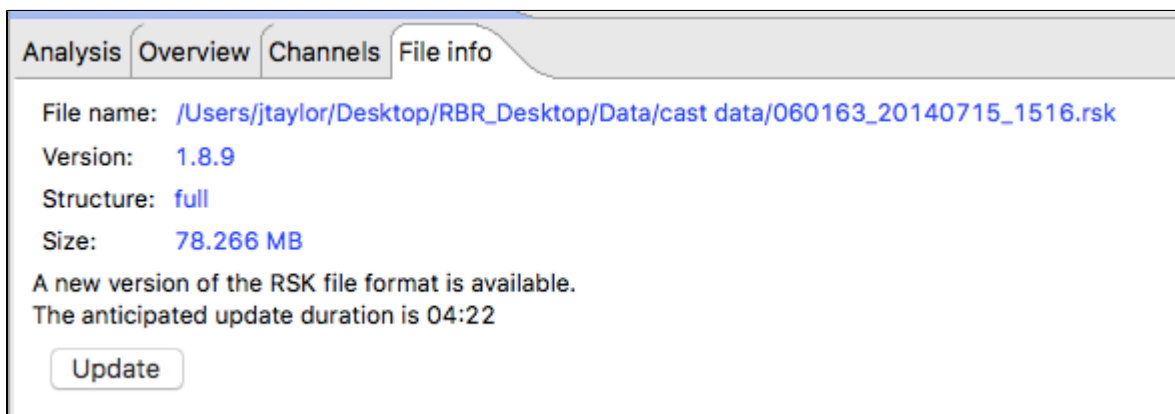
Selecting the Seawater derivation in the Parameters tab results in a depth calculation based on UNESCO Technical paper 44.

The depth derivation equations can be found under the menu item **Options** menu > **Preferences** > **Derived Channels** > **Depth** tab.

For wave loggers you can change the wave calculation by adjusting how the depth is calculated and by adjusting the instrument altitude.

12.5 File info tab

When a file is selected and plotted the **File info** tab can be selected to display information about the file.



Files created by older versions of Ruskin must be updated to ensure compatibility. Failing to do so may result in odd graphical display and incorrect reporting of the sample values.

If the message *A new version of the RSK file format is available.* appears, click **Update**. The update process may take some, however, Ruskin does estimate the time with the message *The anticipated update duration is <time period>*.


12.6 Plot view

You can use the **Plot** view to view a graphical display of data in datasets or live data. When viewing live data, the logger must still be attached.

A toolbar at the top of the **Plot** view contains various buttons to help you customise, explore, and export the graphical display.

Each channel appears as a different colour in the graphical display. These colours are specified for all graphical displays in **Options** menu > **Preferences** > **Plotting** and can be changed only there. You can also change other defaults affecting the **Plot** view in **Preferences**. For information, see [Specifying plotting preferences \(page 59\)](#)



Scaling of the data is based on the on the minimum and maximum value sampled for each channel - sometimes there are erroneously high or low values that may make the real data appear incorrect. Use the vertical zoom  to increase the scale of the data displayed.

You can click a particular time (location) in the plot to view each channel value and related statistics at that time. A vertical black line marks the place. The **Cursor** tab panel above displays the channel values, units, the sample number, and the time that the data was measured.

For datasets only, you can select the **Display statistics** check box to view the average value and standard deviation for each channel based on the number of samples that you specify.

If you want to copy the data to the clipboard and then paste it into another application, select a row, a column, a cell or click on the word channel for the entire table and then click **Copy**.

The graphical display for each dataset appears on its own tab in the **Plot** view. The dataset file name appears at the top of the tab. The icons differentiate at a glance the live data from the datasets.



✓ If a graphical display does not appear, click the **Line style** button and ensure that either **Draw lines** or **Draw markers** is selected.

12.6.1 Thumbnail view

Large data sets can take a long time to display on older systems, and to facilitate data viewing, large files may be down sampled and displayed in a thumbnail view. This view is presented below the main **Plot** view and contains a sliding window. The data within the window is displayed in the **Plot** view. This window may be repositioned by using the next and previous keyboard arrow keys, or dragging it using the mouse, or double-clicking to position the window in the appropriate location in the thumbnail view. The sliding window reports the date and time at the center of the window when selected and moving. The **Plot** view for large files is limited to displaying about 20,000 samples.



12.6.2 Live data

You can use the **Plot** view to view a graphical display of samples being fetched at the default speed for your logger type.

The graphical display for live data for each logger appears on its own tab in the **Plot** view. The logger model and serial number appear at the top of the tab. The icons differentiate at a glance the live data from the datasets.

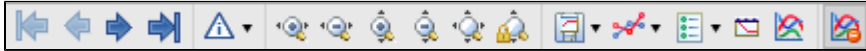
✓ If a graphical display does not appear, click the **Start live plot** or **Resume live plot** button. If the graphical display still does not appear, click the **Line style** button and ensure that either **Draw lines** or **Draw markers** is selected.

12.6.3 Plot Tools







Live data toolbar







Dataset toolbar







Zoom tools for datasets and live data







Purpose	Button	How to use
Compress or expand data horizontally	Horizontal zoom in  Horizontal zoom out 	Click the appropriate button to zoom in or out. The expansion or contraction is centered on the vertical black line in the plot. If no line exists, the focus is in the center.
Compress or expand data vertically	Vertical zoom in  Vertical zoom out 	Click the appropriate button to zoom in or out. The expansion or contraction is centered on the vertical black line in the plot. If no line exists, the focus is in the center.
Return to the original view	Reset zoom 	Click the button to return to the original view of the graphical display.
Return to the original range	Auto ranging 	Click the button to return to the original range of the graphical display




Other tools for datasets and live data

Purpose	Button	How to use
Show or hide a legend in the plot	Show legend /Hide legend 	Click this button to toggle between showing and hiding a legend at the bottom of the plot.
Save an image of the graphical display to a file	Export plot 	Click the button and then specify a file type (PDF or PNG), location, and name for the file that will contain an image of the graphical display currently in the Plot view. If you want the legend to be included, first click the show legend button.
Show lines or markers for each channel	Line style 	Click the button and then click Draw lines , Draw markers , or both. If you click neither, no graphical display appears in the Plot view.
Show lines or markers for each channel	Show /hide channels 	Click the button and select which channels to show in the Plot view. You can choose to show or hide specific channels used by your logger, or all the channels of a particular type, such as measured, derived, depth, or temperature. Tip: If you want to view the uncalibrated data for measured channels in the form of a voltage ratio instead of as engineering units, select Toggle raw channels .
Show events, diagnostic events		Click the button and select Display dataset events , Display diagnostic events or Display dataset errors . A green icon indicates no errors, and a red icon indicates error events exist and a yellow icon indicates that diagnostic events exist. Refer to Appendix C - Event and Error Stamps

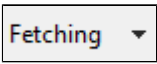


Purpose	Button	How to use
and errors in the graphical display	Display any dataset events or errors 	<p>(page 72) for a description of the events and errors. Dataset events appear on the x-axis as a vertical grey line with a stamp to indicate the type of event, such as STP for a stop event in a dataset.</p>
Show or hide data panel (streaming and fetching - live data)		<p>Click to hide the tab called Main that is referred to as the Data panel. This tab shows how many samples the logger has collected, the time and date, and a table that helps to easily view the information collected. If you select a row in the table, you can copy that row using the Copy row button. The row is saved to the clipboard where you can then paste the row into a text editor or word processing program.</p> <p>If you want to copy just one cell, click the cell you want to copy, and click the Copy cell button.</p> <p>Note: The Copy row button changes to Copy cell when you select a cell in the table.</p>
Minimize the Plot view		<p>Click the button to place the Plot view as an unopened view in the margin of the Ruskin window.</p> <p>Tip: To restore the Plot view to its former size, click the restore button in the margin.</p>
Maximize the Plot view		<p>Click the button to expand the Plot view to the full size of the Ruskin window.</p> <p>Tip: To restore the Plot view to its former size, click the Restore button in any margin that contains an unopened view.</p>

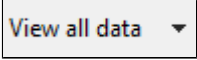



Tools only for datasets

Purpose	Button	How to use
Select a channel to place on the y-axis	Set domain axis 	Click the button to reorganize the graphical display so that the selected channel from the drop down menu becomes the vertical, or y-axis, and all other channels are plotted along the horizontal, or x-axis. Tip: Click the maximize button to more easily view the graphical display.
Show or hide thumbnail	Show/hide thumbnail 	Click the button to toggle between showing and hiding the thumbnail view
Toggle depth plot	Depth Plot 	Toggle between time domain and depth domain
Show or hide axes	Show/hide axes 	Click the button to toggle between showing and hiding the vertical axes to the left of the plot.
Select rendering options	Rendering options 	Click on the button and select Dots , Lines , Markers , or Lines and Markers .
Move to the next annotation	Next Annotation 	Click to move plot view to the next annotation
	Previous Annotation	Click to move plot view to the previous annotation

Purpose	Button	How to use
Move to the previous annotation		
Move to the last annotation	Last Annotation 	Click to move plot view to the last annotation
Move to the first annotation	First Annotation 	Click to move plot view to the first annotation

Tools for live data

Purpose	Button	How to use
Toggle between fetching samples at the default speed and viewing streamed data	Live plot mode 	The logger supports either streaming or fetching data. Fetching is the action of asking the logger to take a reading and report it. Ruskin displays the fetched data every 1-2 seconds. Fetching is disabled if the logger is enabled. In streaming mode, Ruskin receives streamed data from the logger at the sampling rate set during the logger configuration.
Start, stop, or restart the flow of data in the Plot view	Resume live plot  Suspend live plot 	Click the button to start, stop, or restart the flow of data in the Plot view. If you click the Suspend live plot button, the graphical display is frozen. If you click the Resume live plot button, the flow of current data resumes. In the Plot view, data is not recorded during the time that the live plot is suspended. However, data continues to be stored on the logger as scheduled.

Purpose	Button	How to use
View chart display by time or all data	View all data 	Click the button to display a drop down list of time span options to display the data by time period. For example, display 2 minutes of data. You can also choose to display all of the data collected.
Show or hide axes	Show/hide axes 	Click the button to toggle between showing and hiding the vertical axes to the left of the plot.
Delete the data in the Plot view	Clear plot 	Click the button if you want to delete all the data in the Plot view for all channels. Note: Any data stored on the logger is preserved.
Save the data in the live plot	Save live plot 	Click the button to save the data in the plot.

12.6.4 Keyboard Shortcuts

To navigate in the plot a number of keyboard shortcuts are available.

- Move to the next sample: Arrow Right (Next arrow)
- Move to the previous sample: Arrow Left (Previous arrow)
- Double click to zoom in to the range of the annotation
- Zoom a region: Press and hold shift key and then click the left mouse button and drag the window that appears.
- Pan: Press and hold the Ctrl key and then and then click the left mouse button and drag the mouse left or right or up or down across the plot.
- Shift arrow moves by a minimum of 10 samples or 10% of the current displayed data

To navigate in the thumbnail view

- Anywhere you click you will centre the master overlay

- You can click and drag from the centre of the master to pan
- If you click on the edge of the master overlay the cursor will change and you can resize the window
- Scroll to zoom the master overlay
- Your data cursor will show up in the thumbnail view, but it can only be updated from the main plot

12.7 Exporting datasets

You may want to share your data with others or analyse your data using other software. You can export data as a text file, which can then be imported into many applications, or export it in a particular format for analysis in Microsoft Excel, Matlab MAT or OceanDataView.

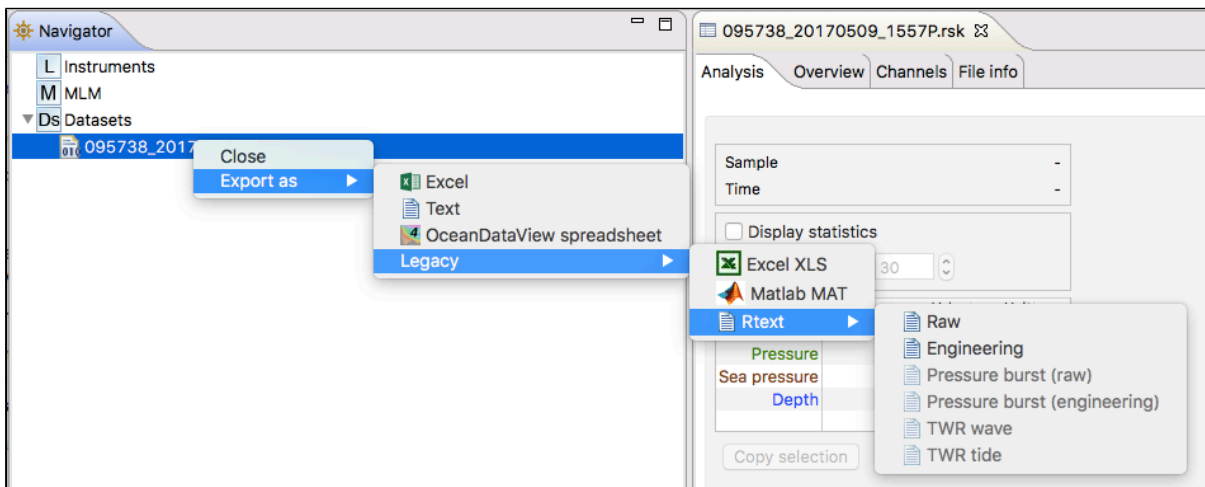
The Raw, Engineering and Pressure burst file format depends on the logger type and sensors in use.

The Raw format contains decimal voltage ratios which un-calibrated readings. The Engineering format contains the data in the units of the sensor; these are calibrated sensor readings. The Pressure burst is the file of pressure burst readings and is only applicable to |wave loggers. The Engineering file contains all the data presented in the **Plot** view and in the case of |wave loggers the wave analysis data as well. In a |wave Engineering file there are two parts to this file – the plot view data and the wave analysis.


You must already have downloaded the data to a dataset or opened an existing dataset.


Steps

1. Right-click the dataset whose data you want to export, and hover to **Export as** to open a submenu, or use **File** menu > **Export dataset**.



2. Select the appropriate export format (Excel, Text, OceanDataView or one of our Legacy formats). Under the Legacy formats you will find exports for Excel, Matlab, and Rtext files (**Raw**, **Engineering** or **Pressure burst**). TWR file formats apply to the older loggers and are not available for Logger2.

 Exports to Matlab may fail if the RSK file size exceeds 20MB. Alternatively, an RSK file can be imported directly into Matlab with our toolkit [RSKtools](http://www.rbr-global.com) that is available for download from our website at www.rbr-global.com. The RSK file is a single file database based on SQLite that allows us to have very large files with high-speed access to any part of the dataset.

 Large files may not export completely into any of these formats. Large files should be converted to .txt and processed after the fact. The Excel export is limited to 65000 rows

3. Specify a location and a name for the data file.
4. Click **Save**.

13 User calibration

Change calibration coefficients

Sensors such as the dissolved oxygen sensor that can be field calibrated will require you to update the calibration coefficients for these channels periodically. You may also need on occasion to manually enter new coefficients, although this is not recommended for factory calibrated sensors (for example T or D) unless instructed by RBR.

Steps

You can view static information about an instrument at any time as follows:

1. In the **Navigator** view, under the **Instruments** list, click the appropriate logger.
2. Click **Analysis** tab > **Calibration** tab to show the current calibration coefficients.
3. To manually change a coefficient, click on the appropriate entry in the table (C1, C2, C3, etc.). The current entry will be highlighted, and the new value can be typed.
4. If a two point calibration has been performed, and calculated coefficients have been copied, right click on either the **Time** or **Parameter** entry for the parameter you wish to modify. Select **Paste to selected row** from the drop-down menu.
5. Click **Store calibration** to write the calibration coefficients to the logger.
6. If you need to revert to previous coefficients, click **Revert calibration**.



If you do not click **Store calibration**, the coefficients will not be written to the instrument, and will be lost once your session is closed.

13.1 N-Point calibration

Sensors such as Dissolved Oxygen ([Oxyguard \(page 50\)](#)) or [turbidity \(page 52\)](#) generate a voltage output that is proportional to the value of the parameter being measured. To calibrate these sensors, Ruskin offers an N-point calibration method to generate calibration coefficients.

13.2 Oxyguard DO calibration



The Oxyguard DO sensor has a true zero point and therefore it can be calibrated using the single-point calibration method using a reading at 100% oxygen concentration only. The 100% calibration should be performed at the expected temperature and salinity of the deployment environment.

If the logger has a pH/ORP sensor and Oxyguard DO sensor, it is advisable to ensure that the pH/ORP and Reference sensors are submerged in the water during measurement.

Equipment

1. Two Large mouth beakers
2. Sodium sulphite Na_2SO_3
3. Aquarium air pump
4. Magnetic stirrer

Preparing solutions

Reference Point 1 solution – Oxygen saturated solution at expected temperature and salinity of deployment environment.

1. Fill the large beaker with 2 L of water. And install magnetic stirrer.
2. Bubble air through the water using an air pump (an aquarium air pump would work).
3. Switch ON the air-pump and the magnetic stirrer.

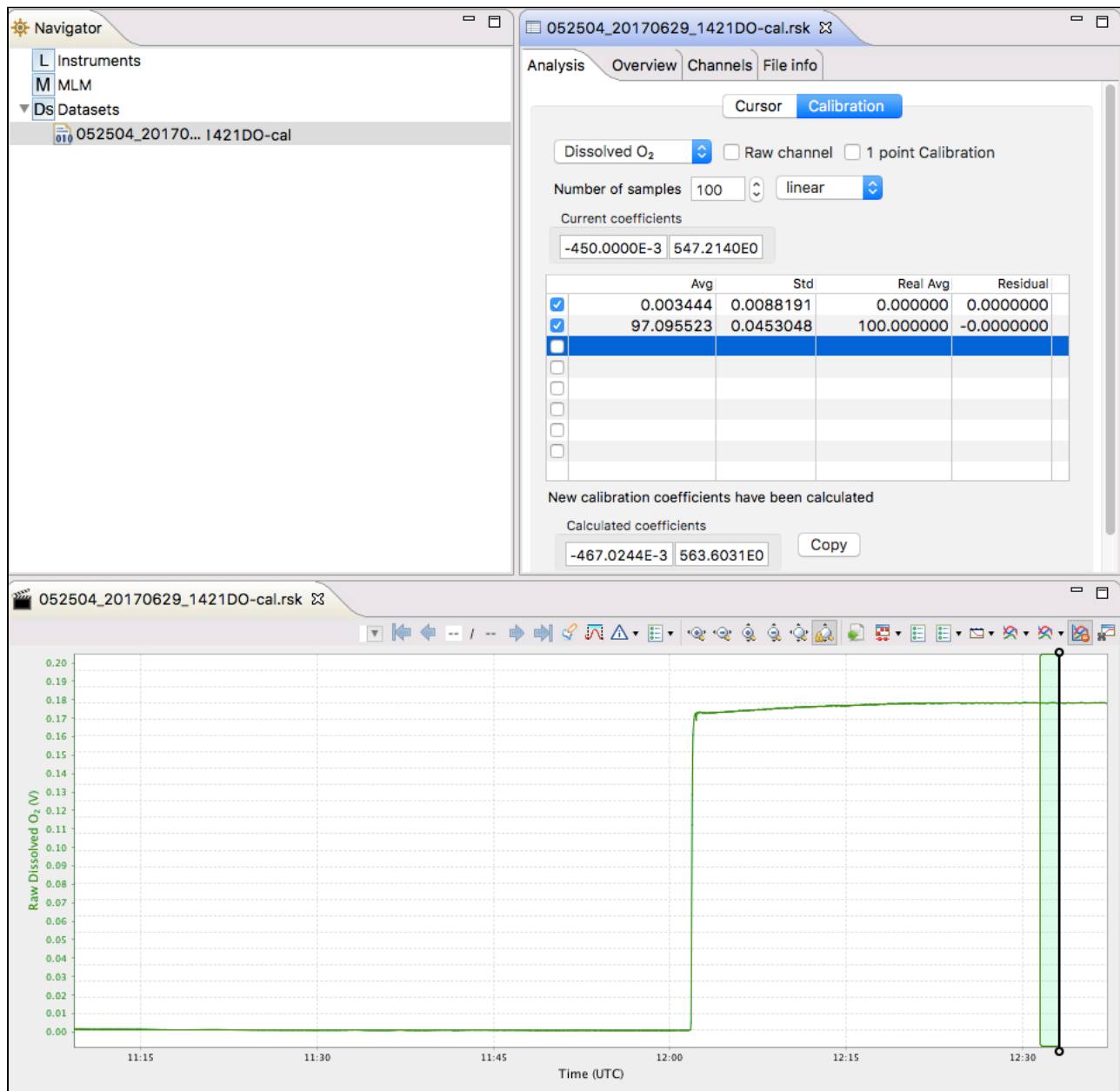
Reference Point 2 solution – Dissolved oxygen concentration of zero

1. In a beaker, dissolve approximately 5 tsp of sodium sulfite (Na_2SO_3) into 500 mL tap water.
2. Mix the solution thoroughly with a magnetic mixer. The solution will be oxygen-free after 15 minutes.

Steps

1. In Ruskin, configure the instrument to sample at a fast rate, between 6 Hz and 3 seconds.

2. Use **Sync to PC** to ensure the logger clock is synchronized to the PC clock, and ensure the end time is set so that the logger will keep sampling until calibration is complete.
3. Submerge the dissolved oxygen sensor in the Reference Point 1 solution for at least 15 minutes near the stirrer so that it is in the best mixed area of the bath.
4. Take sample readings for at least 15 minutes for the 100% calibration point, making note of the time that the sample is being measured.
5. Submerge the dissolved oxygen sensor in the Reference Point 2 solution for at least 15 minutes for the 0% calibration point, making note of the time that the sample is being measured.
6. Retrieve the data from the data logger as per the steps in [Download \(page 25\)](#).
7. The calibration data should now be displayed in the **Plot** view. In the **Properties** view, go to **Analysis** tab > **Calibration** tab.
8. Select the dissolved oxygen sensor type from the drop-down list.
9. The **Number of Samples** spinner box is automatically set to **100**.
This value is the number of sample points Ruskin will average the calibration coefficients for the sensor. Typically, this value should be in the range of 50 to 100 samples.
10. Click on a stable point in the **Plot** view corresponding to 100% oxygen. In the table in the first row, under **Real Avg**, enter 100 and press enter.
11. Select the check box in the second row in the table, then click on a stable point in the **Plot** view corresponding to 0% oxygen. In the table in the second row, under **Real Avg**, enter 0 and press enter.
12. Ruskin automatically calculates the calibration coefficients, and these values appear in **Calculated coefficients**. Clicking the **Copy** button saves the new calibration coefficients to the clipboard.
13. Follow the steps in [Change calibration coefficients \(page 27\)](#) to update the coefficients for this sensor in the data logger.



13.3 Turbidity calibration

The Seapoint turbidity sensor is calibrated with a two-point calibration technique. The calibration should be performed under fluorescent lighting.

Equipment (entire logger submerged)

- 4000-FTU Formazin standard – 500 ml

- Distilled water – 5 L
- Black-walled, wide-mouth container (large enough to hold the logger)
- Volumetric flask 1000 ml, class A
- Volumetric flask 200 ml, class A
- Stir stick



If you plan to submerge only the sensor, you can decide on the container volume and adjust the solution volumes appropriately.

Steps (preparing solutions)

1. In Ruskin, configure the data logger to sample using a 10 second sampling interval and set the sensor to autoranging - see [Autoranging and fixed gain \(page 23\)](#).
2. Use **Sync to PC** to ensure the logger clock is synchronised to the PC clock, and ensure the end time is set so that the logger will keep sampling until calibration is complete.
3. Flush the sensor, container and glassware with distilled water and dry them.
4. Fill the black wall container with 5000 ml distilled water using the large volumetric flask.
5. Set the sensor in the container until the sensor is fully submerged in the distilled water.



The distance from the sensor's windows to the container wall must be at least 20 cm. If possible, place a dark cover on the calibration container and avoid direct light on the container.

6. Record the data in distilled water for five minutes.
This is the zero-turbidity calibration point.
7. Fill the 500 ml volumetric flask with Formazin Standard. Remember to gently shake the bottle before opening the Formazin solution.
8. Add 500 ml Formazin Standard to the black wall container with distilled water, and gently mix the solution with a stirring stick.
9. Calculate the value of the standard turbidity solution at calibration point according to following formula:



Calculating dilution

$$Tu_{STD} = Tu_{STK} * V_{TOT} / (V_{DW} + V_{TOT}) = 363.63 \text{ FTU}$$

Where:

Tu_{STD} = turbidity of the standard solution (FTU)

Tu_{STK} = 4000FTU – turbidity of the stock solution

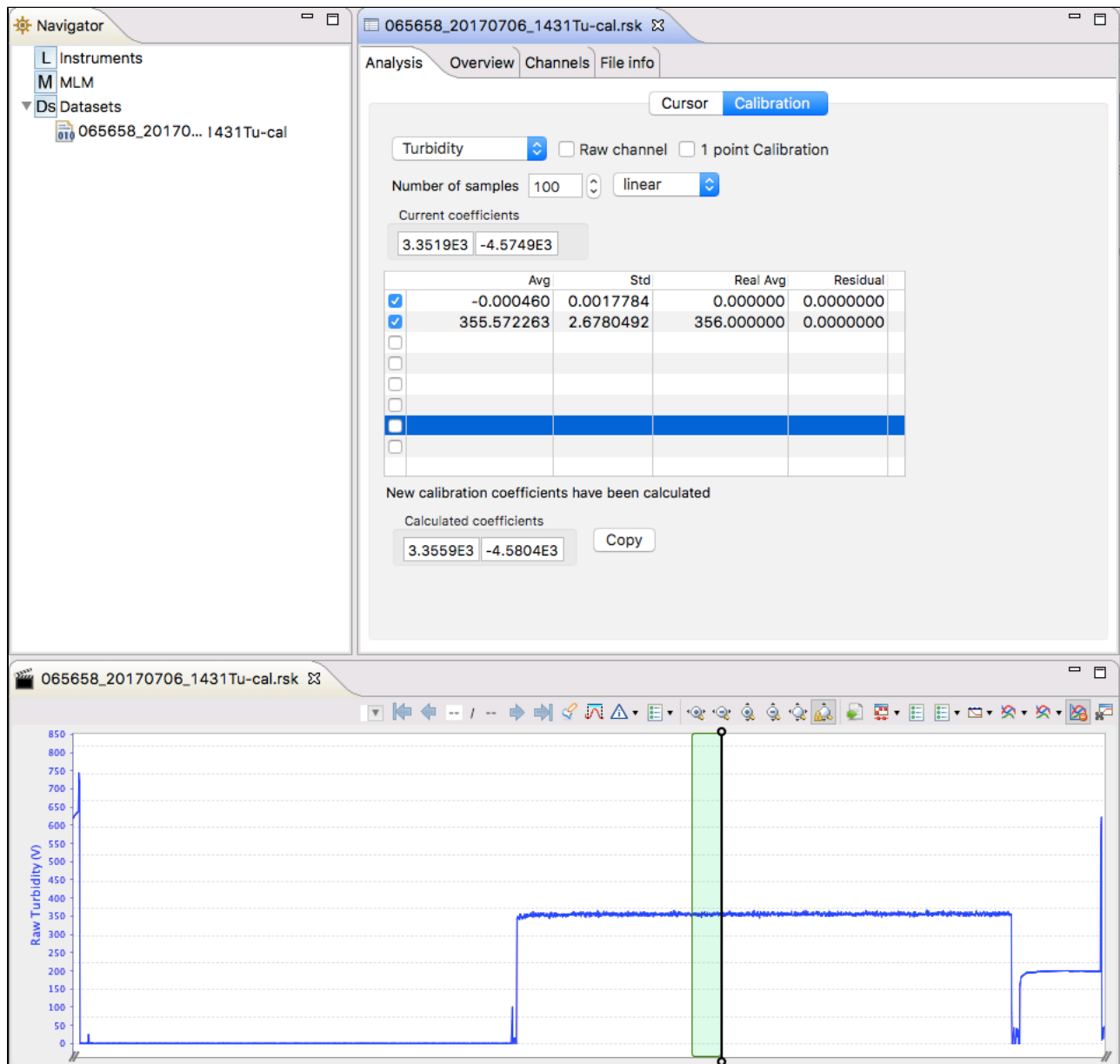
V_{TOT} = 500 ml volume of stock solution at calibration point (ml)

V_{DW} = 5000 ml - initial volume of distilled water

10. After five minutes, remove the logger from the calibration container and wash the sensor head under regular tap water.
11. Retrieve the data from the data logger as per the steps in [Download \(page 25\)](#).
12. The calibration data should now be displayed in the **Plot** view. In the Properties view, go to **Analysis** tab > **Calibration** tab.
13. Select the **Tu sensor** type from the drop-down list.
14. The **Number of Samples** field is automatically set to **100**.
This value is the number of sample points Ruskin will average calculate the calibration coefficients for the sensor. Typically, this value should be in the range of 50 to 100 samples.
15. Click on a stable point in the **Plot** view corresponding to 0 NTU. In the table in the first row, under **Real Avg**, enter 0 and press enter.
16. Select the check box in the second row in the table, then click on a stable point in the **Plot** view corresponding to reading of your turbidity solution. In the table in the second row, under **Real Avg**, enter the value of your turbidity solution and press enter.
17. Ruskin automatically calculates the calibration coefficients, and the values appear in **Calculated coefficients**. Clicking the **Copy** button saves the new calibration coefficients to the clipboard.
18. Follow the steps in [Change calibration coefficients \(page 49\)](#) to update the coefficients for this sensor in the data logger.



By using the above formula and changing the volume of distilled water and Formazin solution, you can prepare different calibration points or different volumes for checking linearity of the turbidity sensor or getting close to real turbidity value of standard turbidity solution.



14 Preferences

Ruskin sets global preferences that require no changes in many situations. However, as you learn more about what Ruskin can do, you may want to change some of these defaults to better suit your requirements. The global preferences include:

- where to store output files
- plotting preferences
- configuring derived channels
- calculating derived channels when sensors are missing

You can change these preferences at any time.

14.1 Specify location for log files

You can control where log files are stored by default. Specify these locations before downloading any data.

Steps

1. From the **Options** menu, click **Preferences**.
2. In the list on the left side, click **General**.
3. In **File location**, type a directory name in the **Directory for log files** text box, or click **Browse** to locate the directory where you want to store log files.



Log files are used when you request RBR support.

4. Click **Apply** or **OK**.

You can change where future log files are stored by default at any time. The change takes effect immediately.

14.2 Specify Language selection

Steps

1. From the **Options** menu, click **Preferences**.
2. In the list on the left side, click **General**.
3. In **Language selection**, select a language from the list.
4. Click **Apply** or **OK**.

14.3 Using advanced sampling controls

Steps

1. From the **Options** menu, click **Preferences**.
2. In the list on the left side, click **General**.
3. In **Sampling control**, select **Enable advanced sampling controls** check box to change from the simple control.
4. Click **Apply** or **OK**.



Simple control: provides a default list of fixed values

Advanced control: provides the user the ability to enter any values.

14.4 Derived channels - RBRsolo-RBRduet

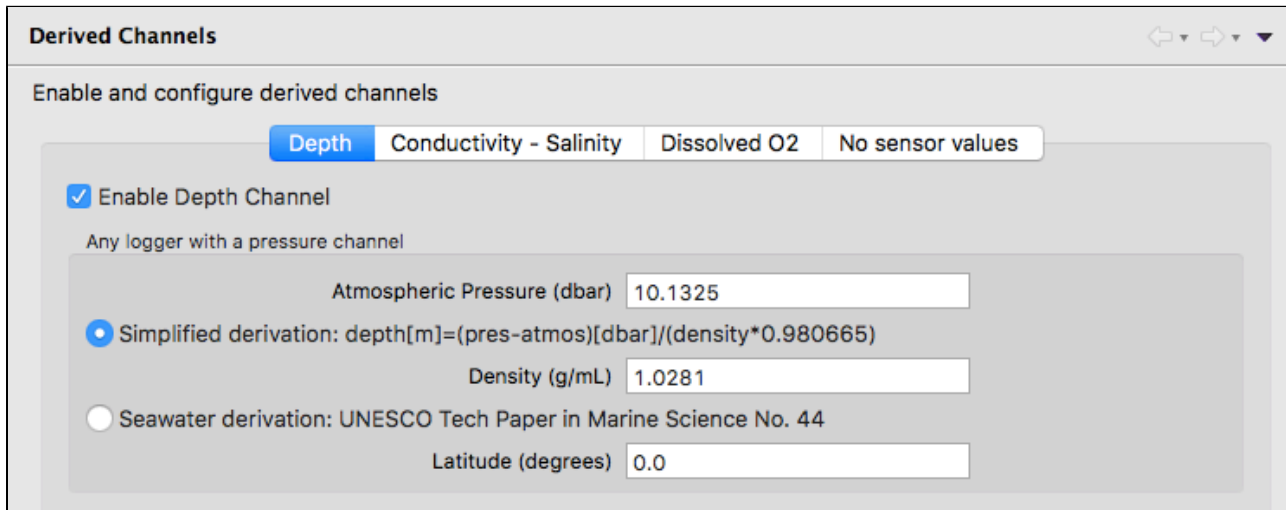


Ruskin calculates all the possible derived channels for that specific logger.

The RBRsolo D and the RBR *duet* T.D measure pressure and from that sea pressure and depth is derived. The RBR *solo* DO measures percent dissolved oxygen saturation and from that dissolved oxygen concentration may be derived.

14.4.1 Depth channel

To set up the initial values to derive depth and sea pressure select the menu item **Options**, then select **Preferences**, then select **Derived channels** and select the **Depth** tab. Enable the depth channel and select the appropriate calculation methods and edit the default parameters.

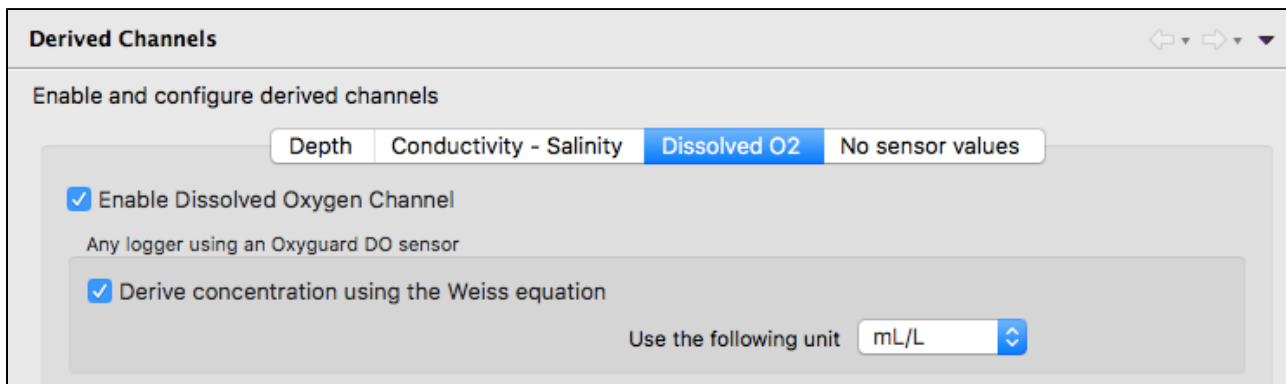


Enter the average expected Atmospheric pressure and the expected density of the water (default values are populated). There are two methods to calculate depth - select the appropriate method using the radio buttons. Sea Pressure is calculated by subtracting the Atmospheric pressure.

 For downloaded files, use the dataset [Parameters tab](#) to edit the parameters to derive the channel.

14.4.2 Dissolved Oxygen concentration

To set up the initial values to derive dissolved oxygen concentration select the menu item **Options**, then select **Preferences**, then select **Derived channels** and select the **Dissolved O2** tab. Enable the Dissolved Oxygen channel and select the desired concentration units ($\mu\text{Mol/L}$, mg/L or mL/L) from the drop down list.







For downloaded files, use the dataset [Parameters tab](#) to edit the parameters to derive the channel.

14.5 Specifying plotting preferences

You can specify how you want the graphical display in the **Plot** view to behave by default. With the exception of choosing colours for each channel, these preferences can be overridden for a particular graphical display in the **Plot** view.

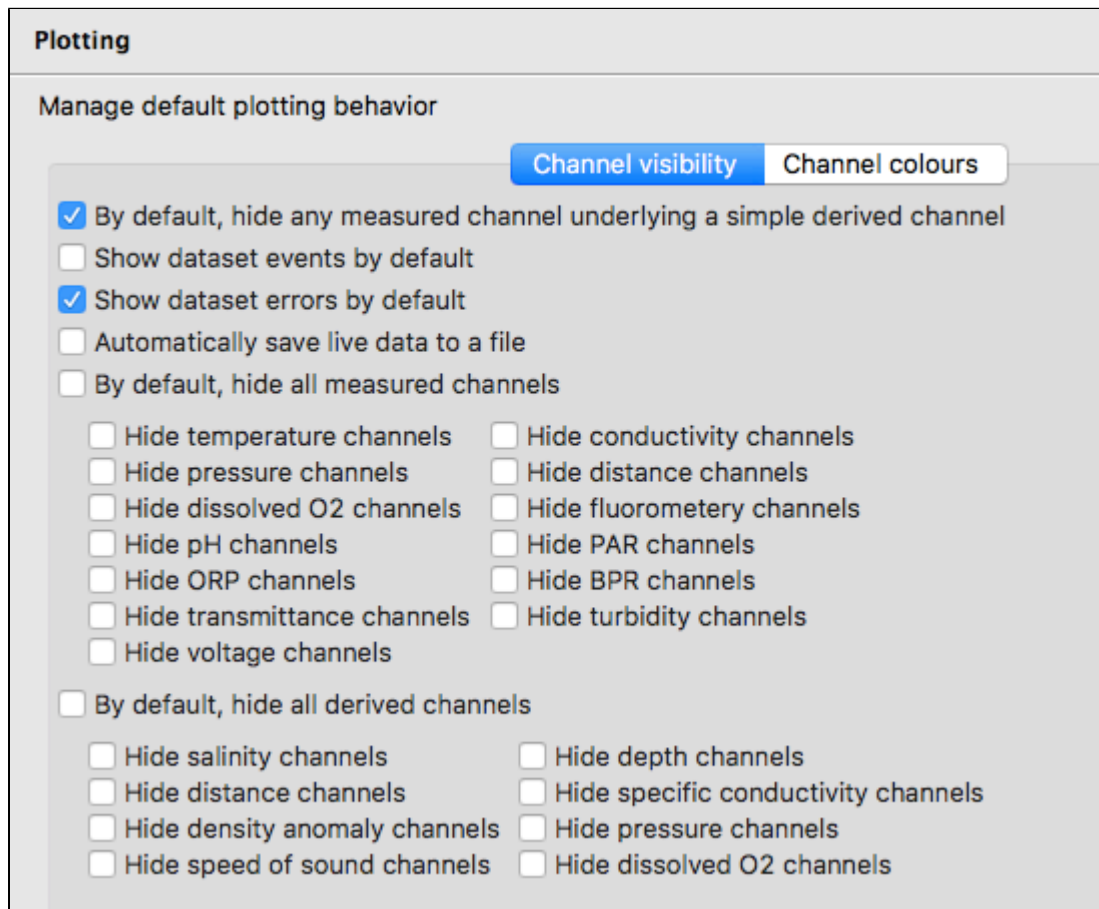


You can click **Apply** to save your changes without closing the dialog box.

14.5.1 Channel visibility tab

The **Channel visibility** tab displays many options to hide or show specific information in the **Plot** view. These settings are applied when displaying a dataset in the **Plot** view. Some information in this tab is enabled by default. When you select any of the check boxes in this tab, the action is immediate.

Channel visibility tab with default settings



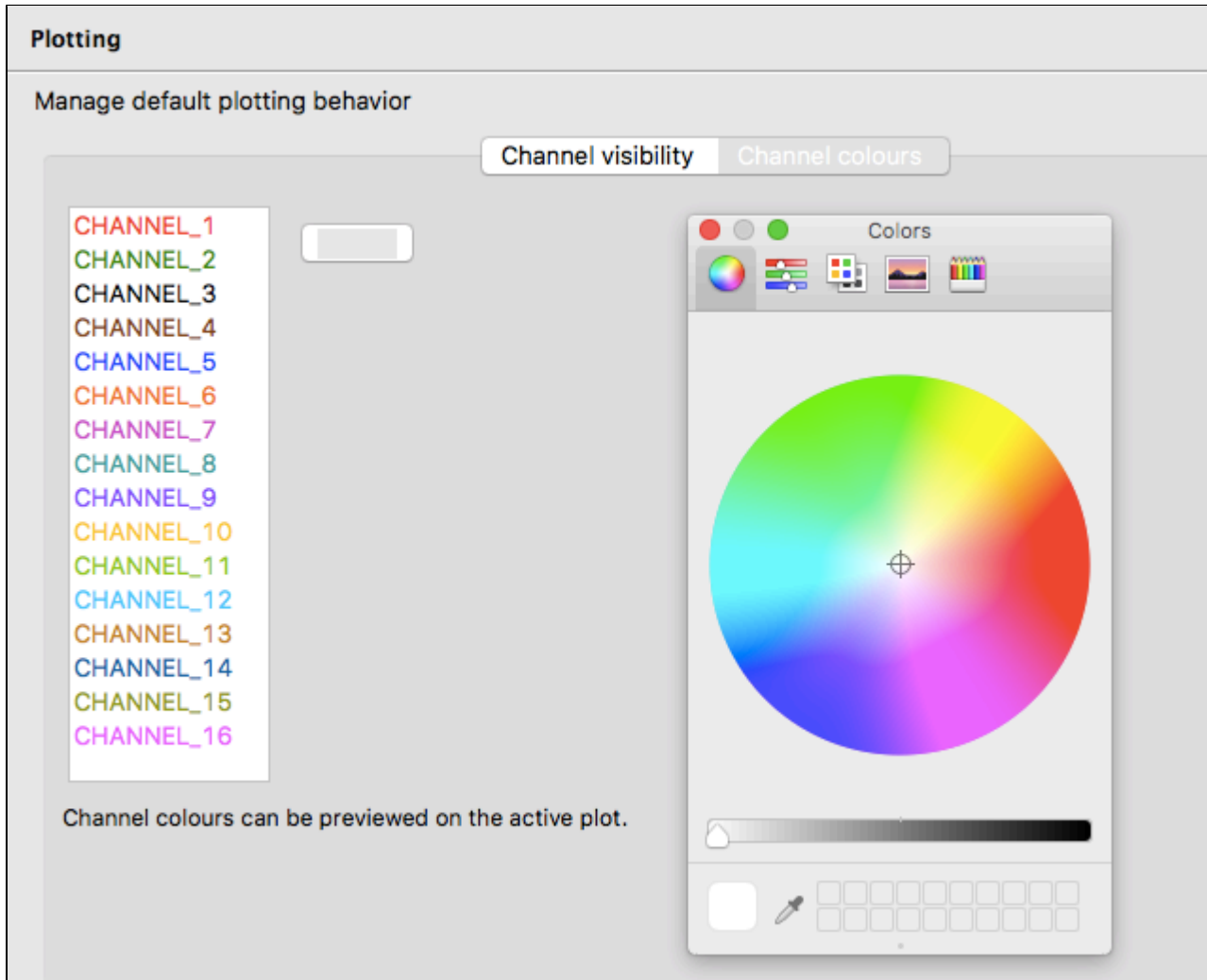
Steps

1. From the **Options** menu, click **Preferences**.
2. In the list on the left side, click **Plotting**.
3. On the **Channel visibility** tab, select the check box for the information you want hidden. Events appear at the x-axis as a vertical grey line with brief text to indicate the type of event, such as STP for a stop event in a dataset. Refer to [Appendix C - Event and Error Stamps \(page 72\)](#) for a list of the event types.
4. To hide all measured channels, select **By default, hide all measured channels** check box.
5. To hide all derived channels, select **By default, hide all derived channels** check box.
6. To show information, clear the check box beside the information you want shown.

14.5.2 Channel colours tab

The **Channel colours** tab allows you to choose a different colour for each channel that is shown for information currently running in **Plot** view, or from an opened dataset. If there is no colour available that you like, you can create your own colour. When you select a colour, the new colour is immediately updated by Ruskin.

Channel colours tab with the **Colour** dialog box to customize a colour for a channel



Steps

1. From the **Options** menu, click **Preferences**.
2. In the list on the left side, click **Plotting**.

3. Click the **Channel colours** tab.
4. In the channels listed, click the channel you want to change the colour for.
5. Click the colour box that appears beside the channel list.
6. With the colour dialog box open, select a colour from the **Basic colour** area.
7. Select **OK** to apply the colour to the channel.
8. To create a custom colour:
 - a. Repeat steps 4 and 5.
 - b. Click **Define Custom Colours** and then choose a colour.
 - c. Click **Add to Custom Colours** to add the new colour to **Custom colours**.
 - d. Click **OK** to apply the new custom colour to the channel.

15 Logger Hardware

15.1 Opening and closing the logger solo duet

To open an RBR *solo* or RBR *duet* logger, unscrew the sensor end counter-clockwise while holding on to the yellow housing. Once fully unscrewed, the housing can be carefully slid away from the sensor endcap, revealing the sensor carriage.

The sensor carriage contains the battery compartment, desiccant holder and USB port (Figs. 1 and 2).



Closing the logger is exactly the reverse of opening it. Remember to keep the O-rings clean and avoid scratching the O-ring mating surfaces. Carefully inspect the O-rings, before deploying the logger. Do not use excessive force when tightening the end sensor end; hand-tight is quite sufficient, as the seal depends upon the O-rings, not the end cap tightness.

15.2 Changing the batteries solo duet

RBR *solo* and RBR *duet* data loggers are powered by one (1) AA size 3.6V lithium thionyl chloride cell.



The logger will not operate with alkaline or zinc-chloride 1.5V AA batteries, you must use 3.6V lithium thionyl chloride cells. The instrument will not operate with rechargeable batteries.

RBR recommends using Tadiran brand batteries only (part# TL-4903) in your logger. Generally, lithium thionyl chloride cells sensitive to orientation, and if the logger is placed with the positive end facing downward (logger sensor pointing up), it will suffer from decreased capacity and reduced battery life. Tadiran cells are minimally sensitive to this orientation effect.

To remove the battery, use either your finger or a blunt tool to push the battery from its holder using the keyhole opening (Fig. 3) on the back of the carriage.



Fig. 3 Opening for battery removal

To insert the battery, press the battery into the battery holder, ensuring it is correctly oriented with the negative terminal placed towards the electronics (Fig. 4 and 5). The label in the logger indicates proper battery placement.



Fig. 4 Battery orientation label

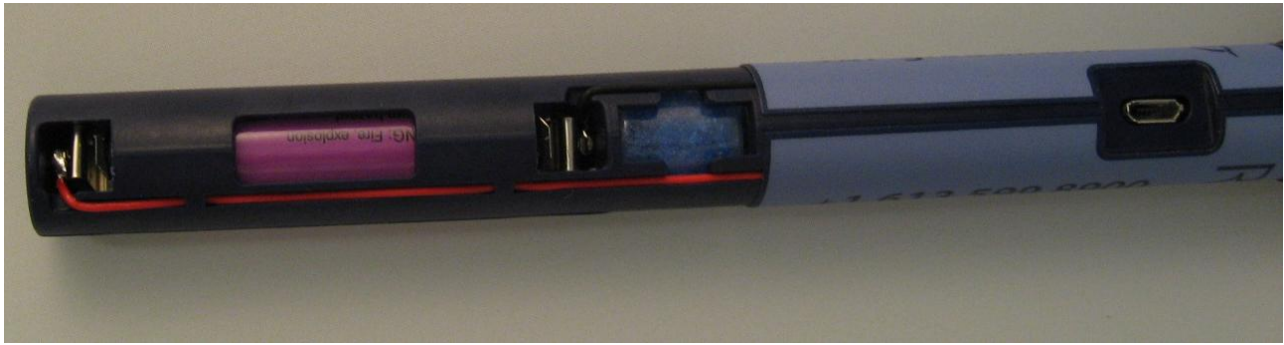


Fig. 5 Battery holder with battery

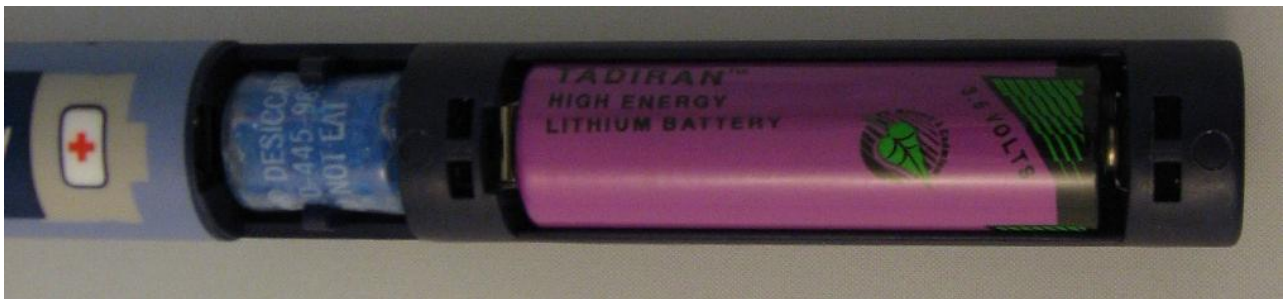
15.3 Installing desiccant solo duet

The RBR*solo* has a dedicated location for placement of desiccant in the sensor carriage, which will accommodate one (1) Dricap desiccant capsule (part # 02-01207AG35).

To remove the desiccant, use your finger or a pen to push through the small hole in the carriage and eject the desiccant.



Insert a fresh desiccant capsule into the desiccant holder, ensuring that it is secure.



16 LED behaviour

Your RBR *solo* or RBR *duet* has a red LED located next to the USB connector. The LED will flash in various patterns depending on the state of the instrument, as follows:

Action	LED Response
Connect download cable	Lights for one second
Disconnect download cable from programmed logger (either logging or pending)	Blinks slowly for 6 seconds - 2 times per second
Click Enable button and confirm memory erase	Blinks rapidly for 5 seconds two times - 5 times per second

Newer models

RBR *solo* and RBR *duet* manufactured from late 2014 onward have the LED disabled. The generation of your logger can be seen in the **Setup** tab under logger details.

17 Maintenance and repairs

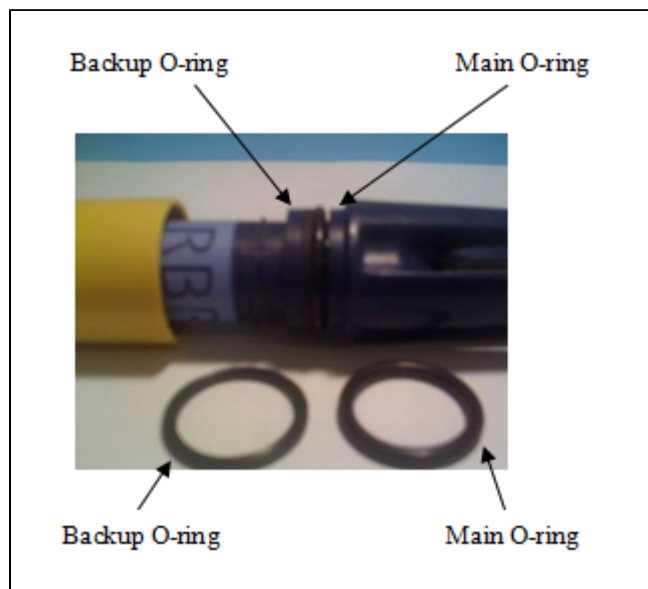
17.1 Instrument calibration

We recommend that you verify the calibration of your data logger before any critical deployment, periodically once a year, or if you suspect the calibration to be out of specifications. Discuss your calibration needs with RBR. In some cases, you will be recommended to return the instrument to RBR to have it checked and re-calibrated. Please contact us for our current calibration fees.

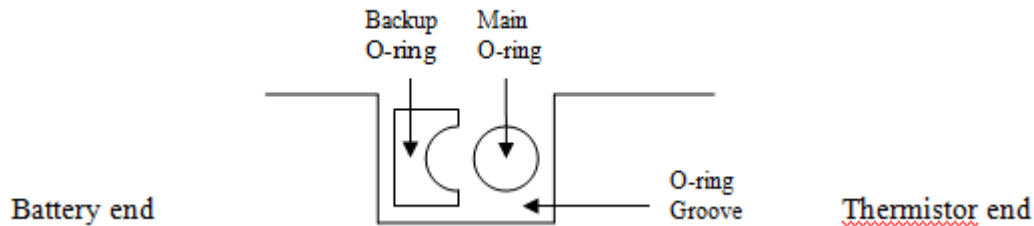
17.2 O-rings solo duet

The single most important item of maintenance on any RBR submersible data logger is care of the O-rings. Any kind of water leak can damage the circuitry beyond repair and cause complete data loss. Every logger's seal depends upon its O-rings, not the end cap tightness. Proper O-ring maintenance, therefore, is crucial. The RBRsolo and RBR *duet* use two O-rings. One is the main O-ring and the other is the backup O-ring. Both O-rings are required to ensure that the logger does not become flooded. The correct placement and orientation of the two O-rings is critical to maintaining depth rating integrity.

The backup O-ring is flat on one side, and cupped on the other. When installing, the grooved side must be located towards the main O-ring.



Before you remove the O-rings from the RBRsolo or RBR *duet*, make yourself familiar with their orientation and location. Inspect the new O-rings provided in the loggers support kit – there are two types. The back-up O-ring is a flat O-ring with a concave channel on one side. The main O-ring is round.



Inspecting O-rings

Give particular attention to the following areas:

- The surface of the O-ring itself
- The mating surface on the inside of the case between the threads and the open end
- The inner surfaces of the groove in the end cap where the O-ring sits

Any dirt present should be removed by wiping thoroughly with a soft, lint-free cloth. When cleaning, never use any material or tool which could scratch the O-ring or any of its mating surfaces. If any dirt is present in the O-ring groove, then the O-ring should be removed as described below to allow thorough cleaning of the groove. If an O-ring needs to be removed for any reason, it should be replaced.

If the O-ring is scratched, cut, distorted, perished or defective in any other way it must be replaced. If any of the surfaces of the O-ring groove are scratched, pitted or otherwise damaged, the logger may need to be returned to RBR for refurbishment: please contact us for advice support@rbr-global.com.

Replacing an O-ring

1. Lever the O-ring from its groove. Use a soft plastic or wood tool; do not use a metal screwdriver or any other tool which may scratch the surfaces of the O-ring groove: doing so will probably render the end cap useless. Slide the O-ring out of its groove and off the logger. The O-ring may need to stretch quite a bit as it is pushed off; this requires some effort but can be done by hand.

2. Thoroughly clean the O-ring groove, taking great care not to scratch or damage it in any way. Inspect it carefully, and contact us for advice if it appears damaged. Apply a light film of silicone grease to all three inside surfaces of the groove, being careful not to trap any dirt, hairs or lint.
3. Select the proper O-ring and make sure it is not damaged. Lubricate it with a very light film of silicone grease to ease its installation. The correct order and orientation is as follows (assuming the o-rings have been removed): Install the main O-ring first by sliding it over the electronics housing (it is too small to fit over the sensor cap). Install the back up o-ring making sure that the concave part faces toward the sensor end and will mate with the main o-ring. The flat part of the backup o-ring must mate flat with the O-ring backing wall. Make sure there are no twists in either O-ring.
4. When the new O-ring is in place, inspect it once more for scratches and dirt, and wipe away any silicone grease deposited on the end cap.

Many experienced users of oceanographic equipment replace all O-rings before every deployment as a matter of routine. The cost of an O-ring is negligible compared with the cost of the instrument and its deployment. Routine replacement of O-rings, therefore, is cheap insurance.

17.3 Repairs

We support all instruments and software that we manufacture. First line support is always available by phone, fax or e-mail. Please contact us immediately if you are experiencing problems with your RBR product. It is very important to contact us before returning your instrument, as some difficulties can be easily solved on-site by the user. Please have the model and serial number of the unit handy when you contact us at support@rbr-global.com.

There are no user-repairable parts of the logger. Any attempt at repair, whether successful or not, without prior authorization from RBR Ltd. will void the warranty. If it is necessary to return the product to RBR for an upgrade, repair, or calibration; please review the detailed shipping information on our website www.rbr-global.com before returning the unit.

In the unlikely event of an instrument requiring service at RBR, contact us for an RMA number and please use the following shipping address:

RBR Ltd
 95 Hines Road Unit 5
 Kanata, Ontario
 CANADA K2K 2M5

Telephone +1 (613) 599-8900

For those who are shipping from outside of Canada, you will need to clearly mark the waybill and any other customs paperwork with the following:

"Canadian goods being returned to manufacturer for repair. NOT A SALE."

Please state the instrument value on the waybill as closely as possible to the current market value based on the original purchase price less depreciation. Please contact RBR if you have any questions about the instrument value. Send the unit using your own preferred method (prepaid). However, we suggest that you do not use Ground Service, since customs brokerage charges will be billed incorrectly.

Units repaired under warranty will be returned prepaid by RBR. Warranty repairs are decided on a case by case basis.

Standard Repair Charges (Non-warranty)

Our minimum repair charge is \$150 CAD. This charge covers a comprehensive initial check, including verification calibration and sensor functionality. Minor repairs are also covered by this basic fee. If further repair work or re-calibration is necessary, a quotation will be issued to the customer. Once we have received authorization to proceed, the repair shall be completed and the instrument returned as soon as possible. Please note that any units returned with low (or no) batteries will have new batteries installed, and the costs will be added to the repair invoice.

17.4 Support kits


To simplify maintenance of your data logger, RBR sells support kits with enough O-rings, and silicone grease for 5 deployments. Please contact RBR for more information or to place an order.

18 Appendices

18.1 When to replace the batteries

Compared to the cost of deployment, the cost of a new set of batteries is close to negligible. We highly recommend that the batteries be replaced before every deployment unless there is no doubt that they have sufficient capacity.

Battery voltage does not decrease linearly and is therefore not an accurate indicator of battery capacity. However, if the logger software indicates a yellow or red battery icon on the setup screen, the batteries should be replaced.

 When in doubt, replace the batteries

18.2 Appendix B - O-ring specifications

Each logger has two user replaceable O-rings located near the sensor end above the thread. We strongly recommend that the O-rings be replaced regularly: before every deployment, after changing batteries, or at least once a year.

RBR *solo* and RBR *duet*: #2-115 N70 O-ring, 8-115 N90 backup ring

18.3 Appendix C - Event and Error Stamps

The following is a list of event/error stamps that may be displayed in the data set.

TIMESTAMP - Time synchronization event, is used to ensure timing synchronization, whenever there is a possibility that the actual date/time of a sample according to the logger's internal calendar /clock does not match what is expected in the normal sampling sequence.

USER STOP - Sampling stopped by user, is used to indicate that a command to stop sampling occurred.

UNKNOWN - An unknown error has occurred, is used to indicate that the error has occurred in the logger and the cause of the error is unknown.

ERROR ## - Change event (system restart where logger clock is no longer valid), is used to indicate an internal error has occurred in the logger.

RESTART ## - Warm startup event (clock and programmed parameters are valid/unharmful), indicates a system restart, in which all programmed parameters are valid.

GAIN### - gain change event

Below is a description of all the different event stamp types ## which could be encountered. Some of these are quite common, while others indicate very rare fault conditions. Some may also occur together in various combinations, with no sample data between them.

Error##	code	comment
00	eDATA_ERROR_CATCH_ALL	generic/unknown/unexpected error
01	eDATA_ERROR_EOC	A/D *EOC bit was set (should always = 0)
02	eDATA_ERROR_DMY	A/D *DMY bit was set (should always = 0)
03	eDATA_ERROR_MODULE_ADDR	invalid address used for RBR channel
04	eDATA_ERROR_OVERFLOW	too much data to send to front end
05	eDATA_ERROR_BUS_BUSY	access to internal bus denied
06	eDATA_ERROR_TX_FAIL	timeout sending command
07	eDATA_ERROR_RX_TIMEOUT	timeout receiving response
08	eDATA_ERROR_PARSING	generic failure to interpret response
09	eDATA_ERROR_NO_SAMPLE	no sample was started
10	eDATA_ERROR_IN_PROGRESS	sample acquisition still in progress
11	eDATA_ERROR_FAILED	sample process failed somewhere

12	eDATA_ERROR_AVERAGE	average computation error (no valid samples)
13	eDATA_ERROR_REPLY_SHORT	front end reply contains fewer characters than expected
15	eDATA_ERROR_UNABLETOCOMPUTE	unable to compute derived/cross channel

18.4 Appendix D - |wave deployment planning

The following provides a guideline to establish a coherent deployment for |wave loggers.

The |wave logger should be fixed to a suitable support below the surface of the water, such as a dock or other rigid mooring. The logger must not be able to move in the water. The figure below offers a view of the logger fixed to a dock with a definition of the different water heights.

- Mean depth of water: an estimate of the average water depth, used for the initial prediction of expected wave frequencies that can be detected. Ruskin will use the actual depth measured by the logger for its calculations.
- Instrument altitude: The actual height of the logger above the seabed. This is defined by the deployment, and the logger must be physically affixed at this height during the installation.

Given the height of the logger above seabed and the depth of logger as measured during the deployment, the total depth of water can be calculated.

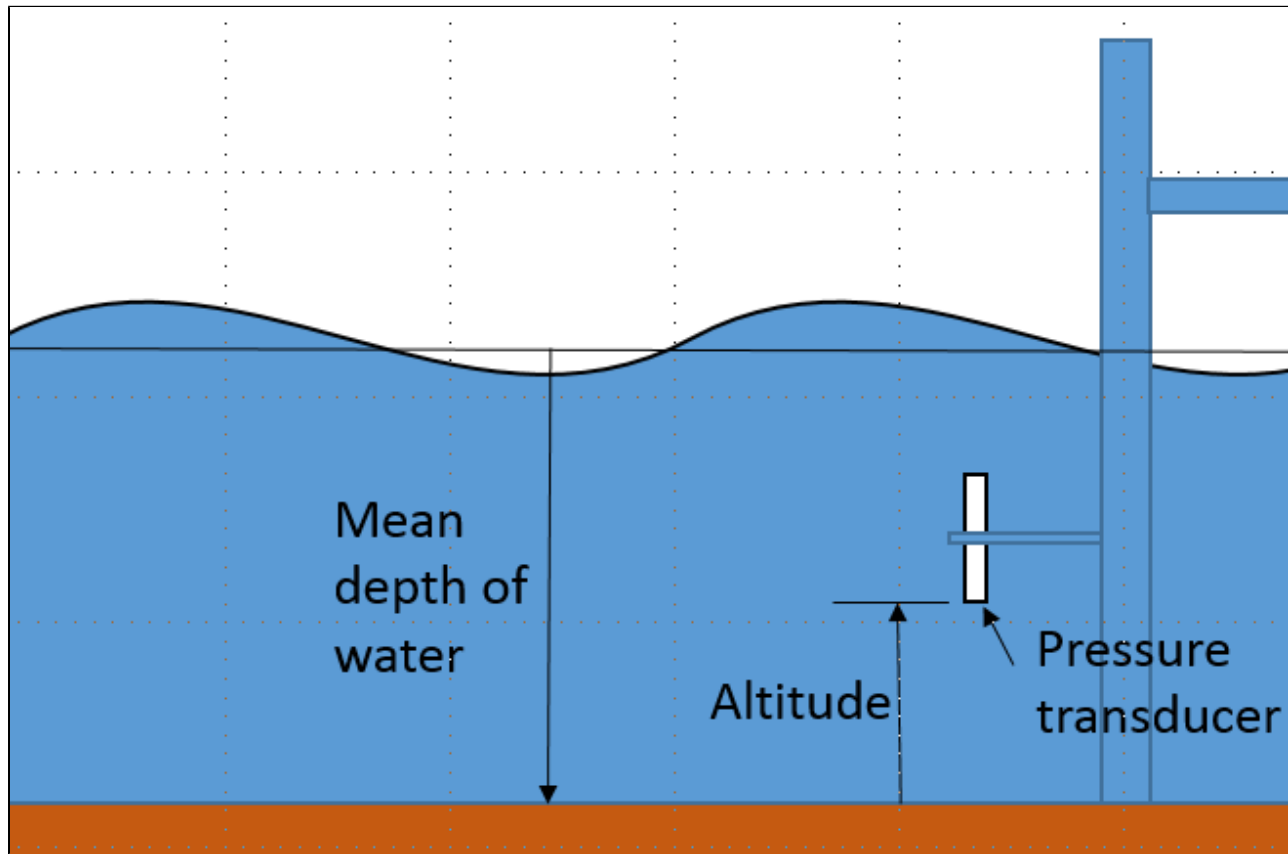


Figure 1. Logger positioning

18.4.1 |wave logger positioning

For deployment planning, refer to Figure 1. Ruskin needs to know the expected mean depth of water (in metres) and the expected altitude (height) of the logger above the seabed to provide an estimate of the frequencies and periods of the wave that the logger is be able to measure. The logger measures water depth/pressure by means of a pressure transducer. The physics of what a pressure transducer can 'see' at depth depends on the height of water above the transducer *as well as* the amount of water below the transducer. High frequencies attenuate very quickly with depth. Figure 2 shows the attenuation with depth as a function of wave period in seconds (*period* = $1/\text{frequency}$). This graph demonstrates that the placement of the logger is critical in determining frequencies/periods of the wave data to be captured by the logger. The pressure transducer may be placed in any orientation.

The basic rule is to place the logger as close to the surface of the water without the possibility that the logger will emerge from the water either because of large waves or low tides.

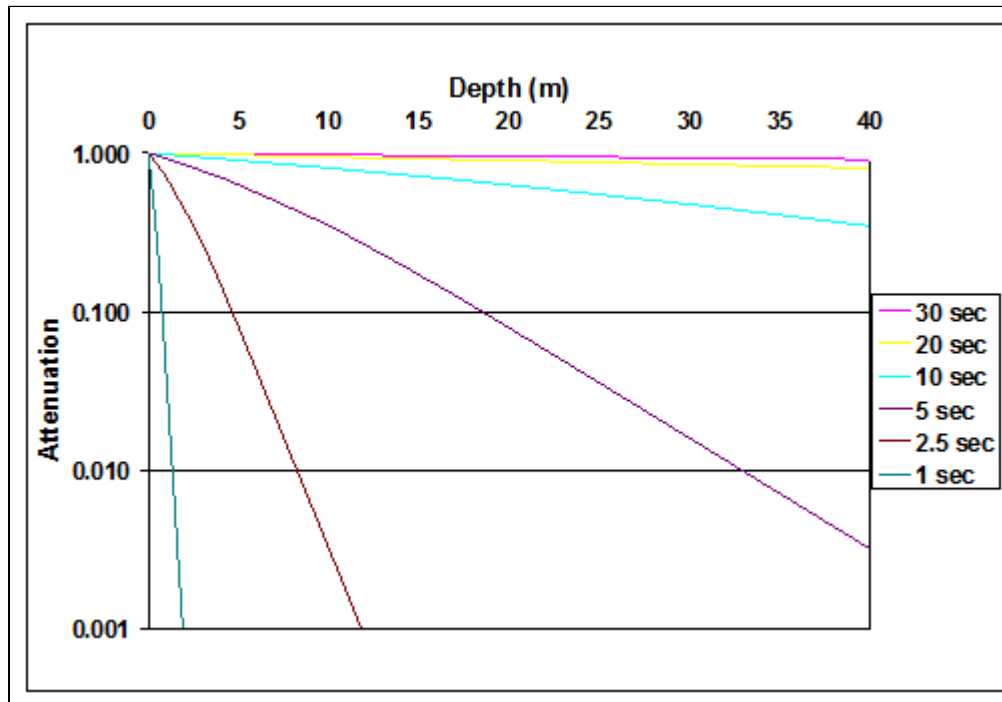


Figure 2. Wave attenuation as a function of depth for various wave periods.

This step in the deployment configuration requires that the 'expected mean depth of water', that is the total depth of water known from experience with the measurement site, and the 'expected altitude of the logger above seabed', a definition to be given to the diver, be entered. Note that on data retrieval the second value will be added to the measured depth of water above the logger when performing all wave calculations.

When waves are enabled, the logger takes multiple pressure readings in a burst which allows for the reconstruction of the surface wave time series. There are three parameters which define the wave data:

Measurement speed : this defines the sampling rate or period for individual pressure readings used.

Wave calculations. The rate possibilities are 1Hz and 2Hz, and for newer models (mid 2014 and later) 4Hz, 8Hz, and 16Hz.

The sampling rate defines several elements of the data capture:

1. The highest possible frequency visible in the data is limited to $\frac{1}{2}$ the sampling frequency. However, this mathematical limit can not usually be achieved because of the attenuation characteristics shown above.

2. The sampling frequency defines the resolution of the frequency spectrum which can be calculated from the wave data;
3. The sampling frequency, together with the burst length, define the lowest frequency which can be assessed in a wave burst.

Wave measurement period: this defines how often wave bursts are collected.

Burst Length: this defines the number of samples in a wave burst. It must be a power of 2 and is chosen from the list: 512, 1024, 2048, 4096, 8192, 16384, and 32768. The longest wave period to be assessed is defined by: burst length/sampling frequency

The wave parameters work together to define the range of wave information which can be calculated as well as the memory and battery usage.