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# C-FLUOR Data Logger

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## USER'S MANUAL

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# WARRANTY

## Limited Warranty

Precision Measurement Engineering, Inc. (“PME”) warrants the following products to be, as of the time of shipment, free from defects in materials or workmanship under normal use and conditions for the period indicated below corresponding to the product. The warranty period commences on the original date of purchase of the product.

Product	Warranty Period
Aquasend Beacon	1 year
miniDOT Logger	1 year
miniDOT Clear Logger	1 year
miniWIPER	1 year
miniPAR Logger (Logger only)	1 year
Cyclops-7 Logger (Logger only)	1 year
C-FLUOR Logger (Logger only)	1 year
T-Chain	1 year
MSCTI (excludes CT/C-sensors)	1 year
C-Sense Logger (Logger only)	1 year

For valid warranty claims made and covered defects existing during the applicable warranty period, PME will, at PME’s option, repair, replace (with the same or then most similar product) or repurchase (at purchaser’s original purchase price), the defective product. This warranty extends solely to the original end-user purchaser of the product. PME’s entire liability and the sole and exclusive remedy for product defects is limited to such repair, replacement or repurchase in accordance with this warranty. **This warranty is provided in lieu of all other warranties express or implied, including, but not limited to warranties of fitness for a particular purpose and warranties of merchantability.** No agent, representative, or other third party has any authority to waive or alter this warranty in any way on behalf of PME.

## WARRANTY EXCLUSIONS

The warranty does not apply in any of the following circumstances:



- I) The product has been altered or modified without PME's written authorization,
- II) the product has not been installed, operated, repaired, or maintained in accordance with PME's instructions, including, where applicable, use of proper grounding to an earth ground source,
- III) the product has been subjected to abnormal physical, thermal, electrical, or other stress, internal liquid contact, or misuse, neglect, or accident,
- IV) the product failure occurs as a result of any cause not attributable to PME,
- V) the product is installed with ancillary devices such as flow sensors, rain switches, or solar panels that are not listed as compatible with the product,
- VI) the product is installed in a non-PME specified enclosure or with other incompatible equipment,
- VII) to address cosmetic issues such as scratches or surface discoloration,
- VIII) operation of the product in conditions other than that for which the product was designed,
- IX) the product has been damaged due to events or conditions such as caused by lightning strikes, power surges, unconditioned power supplies, floods, earthquakes, hurricane, tornados, vermin such as ants or slugs or intentional damage, or
- X) products provided by PME, but manufactured by a third-party company, which products are subject to the applicable warranty extended by their manufacturer, if any.

**There are no warranties that extend beyond the above limited warranty. In no event is PME responsible or liable to purchaser or otherwise for any indirect, incidental, special, exemplary, or consequential damages, including, but not limited to, lost profits, loss of data, loss of use, business interruption, loss of good will, or cost of procuring substitute products, arising out of or in relation to the product, even if advised of the possibility of such damages or losses. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.**

#### **WARRANTY CLAIM PROCEDURES**

A warranty claim must be initiated within the applicable warranty period by first contacting PME at [info@pme.com](mailto:info@pme.com) to obtain an RMA number. The purchaser is responsible for proper packaging and return shipment of the product to PME (including shipping expense and any related duties or other costs). The issued RMA number and purchaser's contact information must be included with the returned product. PME is NOT liable for loss or damage of the product in return transit and recommends that the product be insured for its full replacement value.

All warranty claims are subject to PME's testing and examination of the product to determine if the warranty claim is valid. PME may also require additional documentation or information from the purchaser to evaluate the warranty claim. Products repaired or replaced under a valid warranty claim will be shipped back to the original purchaser (or its designated distributor) at PME's expense. If the warranty claim is found to be not valid for any reason, as determined by PME in its sole discretion, PME will notify the purchaser at the contact information provided by the purchaser.



## SAFETY INFORMATION

### Bursting Hazard

Should water enter the C-FLUOR Logger and come into contact with the enclosed batteries, then the batteries may generate gas causing the internal pressure to increase. This gas will likely exit via the same location where the water entered, but not necessarily. The C-FLUOR Logger is designed to release internal pressure as the end cap is unscrewed, prior to the disengagement of the end cap threads. If internal pressure is suspected, then treat the C-FLUOR Logger with extreme caution.



# CHAPTER 1: QUICK START

## 1.1 Add Calibration Info and Go

PME will provide C-FLUOR Loggers with or without a C-FLUOR sensor installed. The sensor comes with a factory calibration that must be entered into the Logger. If PME has supplied the Logger with a sensor already installed, there will be a PDF of the sensor calibration coefficients located on the Logger and PME will have installed this calibration. If you are installing the sensor then you must install the sensor calibration before the system can be used. The Logger itself is set to measure temperature and concentration once every 10 minutes and record 1 file of measurements daily. At one measurement every 10 minutes the C-FLUOR Logger will operate for over a year.

At the end of the deployment period, you need only to open the Logger and connect it to a HOST device via USB. The C-FLUOR Logger will appear as a 'Local Disk' drive. Your temperature and sensor measurements, together with a time stamp indicating the time the measurement was made, are recorded in text files in the folder having the serial number of your C-FLUOR Logger. These files can be copied onto any Windows or Mac HOST computer.

This Manual and other software are supplied in files on the C-FLUOR Logger. Your Logger will contain these files and folders:

- **7800-528824 FOLDER** is an example of the folder on your Logger. This folder will be named "7800-xxxxxx" where xxxxxx is the serial number of your Logger. This folder will contain measurements recorded by the Logger.
- **CALIBRATIONS FOLDER** will contain copies of the Turner calibration of the installed sensor if PME installed the sensor. Otherwise, this folder will initially be empty. If you perform calibration of the logger/sensor the results will be stored here.
- **CFLUOR CONTROL** allows you to see the state of the Logger as well as set the recording interval.
- **CFLUOR PLOT** allows you to see plots of the recorded measurements.
- **CFLUOR CONCATENATE** gathers all the daily files into one CAT.txt file.
- **MANUAL** (this document)
- **IN VIVO CHLOROPHYLL** is a Turner document that discusses the measurement of chlorophyll.

When not connected to USB, your C-FLUOR Logger will record measurements if the Recording Control Switch is in the **Record** position. If you wish to stop recording, switch the Recording Control Switch to the **Halt** position.

**Follow these steps to start the deployment, logging C-FLUOR output and Temperature once each 10 minutes:**

1. Install your sensor onto the Logger if required as described in Chapter 3.



2. Enter calibration coefficients as described in Chapter 2, C-FLUOR Control program if installing a sensor.
3. Open the C-FLUOR Logger (if not already open from computer connection) as described in Chapter 3.
4. Switch the Recording Control Switch to the Record position. The LED will flash green 5 times. The C-FLUOR Logger will now record a measurement of time, battery voltage, temperature, and sensor output every 10 minutes (or at some other interval you may have set using C-FLUOR Control).
5. Inspect the o-ring seal for debris and install a desiccant pack.
6. Close the C-FLUOR Logger by screwing the white housing back onto the black end cap.
7. Deploy the C-FLUOR Logger.

**Follow these steps to end the deployment:**

1. Recover the C-FLUOR Logger
2. Clean and dry all accessible surfaces.
3. Open the C-FLUOR Logger as described in Chapter 3.
4. Switch the Recording Control Switch to the Halt position. The LED will flash red 5 times. You may also leave the switch in Record position. In either position the logger will stop recording when connected via USB.
5. Connect to a Windows HOST computer via USB. The C-FLUOR Logger will appear as a 'Local Disk' drive.
6. Copy the folder having the same serial number as the C-FLUOR Logger (example 7800-191770) to the host computer.
7. (Suggested, but optional) Delete the measurement folder or the measurements within this folder, but NOT C-FLUOR Control or the other .jar programs or manual.
8. (Optionally) run the C-FLUOR Plot program to see a plot of measurements.
9. (Optionally) Run the C-FLUOR Concatenate program to gather together all the daily files of measurements into one CAT.txt file.
10. If no more recording is desired, insure the Recording Control Switch is set to Halt, otherwise leave it set or set it to Record to begin recording after USB disconnection.
11. Disconnect the C-FLUOR Logger from the USB connection.
12. Inspect the o-ring seal for debris and install a fresh desiccant pack.
13. Close the C-FLUOR Logger by screwing the white housing back onto the black end cap.

*Remove the batteries if storing the C-FLUOR Logger for extended periods.*



## 1.2 A Few Details

The previous section gives instructions for sampling at 10-minute intervals. However, there are a few additional details that will enhance use of the C-FLUOR Logger.

### SENSOR GUARD

Turner C-FLUOR sensors are optical devices that operate by sending colored light into the water and observing how much light returns. The field of view available to these sensors is quite important in establishing their response. PME's C-FLUOR Logger is supplied with a sensor cover that not only protects the sensor from damage but also establishes the field of view. This cover has slots near where it covers the sensor so that exterior water can enter and be sensed. The guard must be used for measurements in the field.

### SAMPLING RATE

The C-FLUOR Logger records measurements at equal time intervals. The default time interval is 10 minutes. However, it is also possible to instruct the C-FLUOR Logger to record at different intervals. This is accomplished by connecting the logger to a computer with Java and using the C-FLUOR Control program supplied for this purpose. Recording intervals must be 1 or more minutes and must be less than or equal to 60 minutes. Intervals outside this range will be rejected by C-FLUOR Control. (Contact PME for other recording intervals.)

Please refer to Chapter 2 for instructions on operating the C-FLUOR Control program.

### TIME

All C-FLUOR Logger times are UTC (formerly known as Greenwich Mean Time (GMT)). The C-FLUOR Logger internal clock will drift in the < 10 ppm range (<about 30 seconds/month) so you should plan to connect it occasionally to a host computer having an internet connection. The C-FLUOR Control program will automatically set time based on an internet time server.

Please refer to Chapter 2 for instructions on operating the C-FLUOR Control program.

### FILE INFORMATION

The C-FLUOR Logger software creates 1 file daily on the C-FLUOR Logger's internal SD card. The number of measurements in each file will depend upon the sample interval. Files are named by the time of the first measurement within the file based on the Logger's internal clock and expressed in YYYY-MM-DD HHMMSSZ.txt format. For example, a file having the first measurement on September 9, 2014 at 17:39:00 UTC will be named

2014-09-09 173900Z.txt.

Files can be uploaded from the C-FLUOR Logger by connecting the Logger to a HOST computer and by using the HOST computer to copy/past the files from Logger to some HOST computer



storage. Each measurement within a file has a time stamp. The time stamp format is Unix Epoch 1970, the number of seconds that have passed since the first moment of 1970. This may be inconvenient in some cases. If so, the C-FLUOR Concatenate software not only concatenates all the measurement files but also adds more readable statements of the time.

Please refer to Chapter 2 for instructions on operating the C-FLUOR Concatenate program.

The C-FLUOR Logger requires time and battery energy to work through the file directory on the SD card to allocate new file space. A few hundred files on the SD card is not a problem, but as the number of files grows large into the thousands the Logger may suffer decreased battery life or other performance problems. Please, at the earliest convenient time, copy recorded files to a HOST computer and delete them from the Logger. Also, do not use the Logger to store files unrelated to Logger operation.

## 1.3 Overview and General Maintenance

### CLEANING THE SENSOR

The sensor may be cleaned by unscrewing the black sensor guard and gently wiping the optical face.

### BATTERY LIFE

The C-FLUOR Logger consumes battery power mostly from the C-FLUOR sensor, but also slightly from simply keeping track of time, writing files, sleeping, and other activities. The C-FLUOR Logger will record approximately 200,000 total samples and will operate for 130 days at 1-minute sample rate or well over a year for 10 minutes or greater) when powered by the battery pack (2 X alkaline 'C' cells) supplied by PME.

Keep a general record of the C-FLUOR Logger's number of samples recorded. It is not possible to accurately determine the charge state of the battery pack from measurements of its terminal voltage. If you have a general idea of the number of samples already obtained on a battery, then you can make a guess as to how many more samples remain. Err on the side of caution.

The 2 X 'C' battery pack holds the batteries very tightly. The holder itself is glued to the aluminum chassis. Take care when changing batteries that the glue joint is not broken. Always use the paper tube supplied with the C-FLUOR to contain the batteries. Use only new batteries as replacements.

### COIN CELL BATTERY LIFE

The C-FLUOR Logger uses a coin cell for backup of the clock when the power is switched off. This coin cell will supply roughly 5 years of clock operation, but this is only required if the 'C' cell batteries are removed. Should the coin cell discharge it must be replaced with a new one. Coin cells are not user replaceable. Contact PME for back-up battery replacement.



## O-RING AND SEAL

When the cover is screwed on, it passes along the o-ring located in the end cap several revolutions. Keep this o-ring lightly lubricated with silicone grease or oil compatible with Buna-N o-ring material.

It is important to keep the o-ring free of debris. Failure to do so can lead to a breaching of the seal and water entry into the Logger housing. Wipe off debris with a lint free clean cloth. PME recommends Kimtech Kimwipes for this application. Next, re-lubricate the o-ring.

When the C-FLUOR Logger is opened after deployment, a small number of water drops are deposited on the inner surface of the o-ring. When the pressure housing is screwed back on, these drops become trapped inside the C-FLUOR Logger. Be sure to carefully dry the o-ring and adjacent surfaces (especially underneath) prior to closing the C-FLUOR Logger. Re-lube the o-ring at this time. Remove any debris from the drying process. Install a new desiccant pack after removing any water.

## CLOSING THE LOGGER

The Logger is much more difficult to open than to close. Screw the white logger housing onto the black cap until the housing touches the cap. No further tightening is necessary.

## LED INDICATIONS

The C-FLUOR Logger performs various tests as it begins logging operations. If any test fails, the software flashes the LED light and re-conducts the test. In general, if a test fails once it will continue to fail and the LED light will continue to flash. The following table gives the number of flashes and the reason these flashes appear.

LED	Reason
1 Green Flash	Normal. Presented immediately after new batteries are installed. Indicates that the CPU has started its program.
1 Green Flash	Occurs at the time of sampling for sample intervals of 1 minute or less.
5 Green Flashes	Normal. Indicates that C-FLUOR is beginning to record measurements. This indication appears in response to switching the Recording Control Switch to "Record."
5 Red Flashes	Normal. Indicates the C-FLUOR is ending recording of measurements. This indication appears in response to switching the Logger Control Switch to "Halt."
Continuously Green	Normal. Indicates the C-FLUOR is connected to a HOST computer via the USB connection.
Continuously Flashing Red	SD card write error. Try removing/reinstalling batteries. Contact PME.



## CALCULATION OF ENGINEERING UNITS

Engineering units are calculated from voltage measurements of the sensor and from calibration information entered into the Logger (see Chapter 2). The result of calibration is the following information:

Name	Definition
Offset	Offset measured with pure water
Calcoef	Calibration coefficient in units per Volt

Engineering units are computed by using the following formula:

$$\text{Concentration} = (\text{Measured Voltage} - \text{Offset}) \times \text{Calcoef}$$

## CLOSING AND OPENING

Close and open the C-FLUOR Logger like you would a flashlight: open by unscrewing the white cylinder from the black end cap. Close by screwing the white cylinder on. When closing, do not tighten the white cylinder. Just screw it on until it makes contact with the black end cap. See Chapter 3 for more instructions.

## STORAGE WHEN NOT IN USE

Remove the 'C' batteries.

## JAVA

C-FLUOR programs depend on Java and require Java 1.7 or higher. Update Java at <https://java.com/en/download/index.jsp>



## CHAPTER 2: SOFTWARE

### 2.1 Overview and Software Installation

The C-FLUOR arrives with the files described in Chapter 1. These files are located on the root directory of the C-FLUOR Logger. PME suggests you leave these programs where they are on the Logger, but you may copy them to any folder on your HOST computer's hard drive.

C-FLUOR Control, C-FLUOR Plot, and C-FLUOR Concatenate are Java language programs that require the HOST computer to have the Java Runtime Engine V1.7 (JRE) or later installed. This engine is commonly required for internet applications and will likely already be installed on the HOST computer. You can test this by running C-FLUOR Plot. If this program displays its graphical user interface, then the JRE is installed. If not, then the JRE can be downloaded via internet from:

[http://www.java.com/en/download/windows\\_xpi.jsp](http://www.java.com/en/download/windows_xpi.jsp)

At this time the C-FLUOR Logger is supported on the Windows operating systems but may also operate on Macintosh and perhaps Linux.

### 2.2 C-FLUOR Control

The C-FLUOR Control program provides these services:

- It enables time setting (based on internet timeserver clock, not user set).
- It enables sample interval setting.
- It enables installing sensor calibration information.

Turner C-FLUOR sensors are factory calibrated. A C-FLUOR Calibration Certificate is provided by Turner Designs and a PDF copy is located on the Logger storage if PME installed this sensor. C-FLUOR Control software installs the offset and calibration coefficient for the sensor. An example of the calibration certificate is show below:



#### C-FLUOR Calibration Certificate

**Product: Analog; In Vivo Chlorophyll/Blue**

**Serial Number: 21200117**

**Date and Time: Jul 29, 2019; 13:50:25**

C-FLUOR Probes are factory calibrated. Each C-FLUOR has a specific Calibration Coefficient and Offset. This C-FLUOR's calibration values can be used with the equation below to convert measured voltage to concentration estimates:

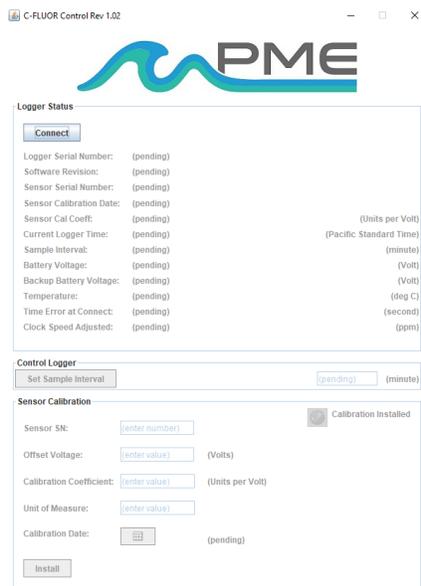
**Offset = 0.0152 Volts (Offset measured with pure water)**

**Calibration Coefficient = 23.6349 (µg/L per volt)**

**Concentration = [(Measured Voltage - Offset) x Calibration Coefficient]**



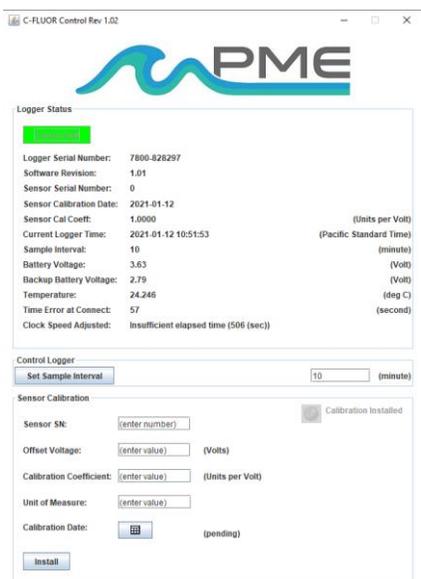
Begin program operation by clicking “CFLUORControl.jar”. The program presents the screen shown below:



The C-FLUOR Logger must be connected to USB at this time. When correctly connected the Logger will display a constant green light.

Click the Connect button. The software will contact the Logger. If the connection is successful, the button will turn green and display “Connected”. The Serial Number and other parameters will be filled in from information taken from the Logger.

If the HOST computer is connected to the internet, the current difference between an internet time server’s time and the Logger’s internal clock will be displayed. And, if more than a week has passed since time was last set, the Logger clock will be set, and a check mark icon will appear. If the HOST computer is not connected to the internet no time services will occur.



The current Logger sample interval will be displayed next to the Set Sample Interval button. If this interval is acceptable the interval need not be set.

To set the interval, enter an interval not less than 1 minute and not greater than 60 minutes. Click the Set Sample Interval button. Shorter (seconds) and longer (hours) intervals are available. Contact PME.

C-FLUOR Loggers support various Turner C-FLUOR sensors. The sensor type is shown on a small tag inside the logger if PME has installed the sensor.

If installing a sensor, enter the sensor serial number from the calibration certificate.

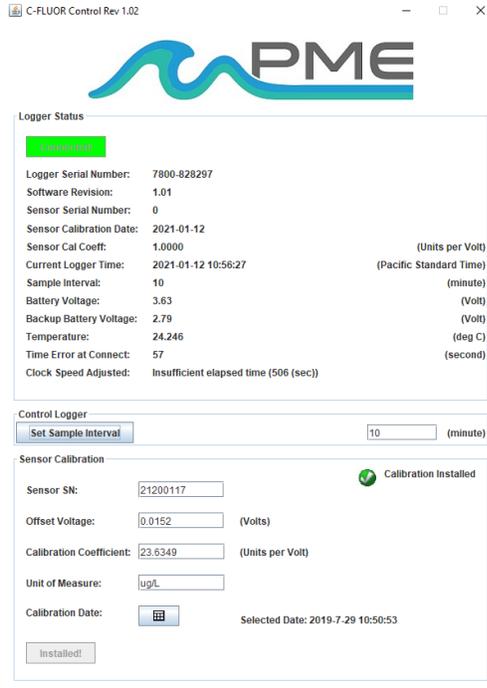
Enter the unit of measure that is appropriate for sensor being installed.

Enter the offset value from the Turner calibration certificate.

Enter the calibration coefficient from the Turner calibration certificate.

Click on the Install button.





When this is completed the Install button is grayed out and the Calibration Installed text and check mark light up.

## 2.3 C-FLUOR PLOT

The C-FLUOR Plot program provides the service of plotting C-FLUOR Logger files.

Begin program operation by clicking on “CFLUORPlot.jar”. Software presents the screen shown below:



C-FLUOR Plot plots the files recorded by the C-FLUOR Logger. The software reads all Logger files in a folder, except the CAT.txt file.

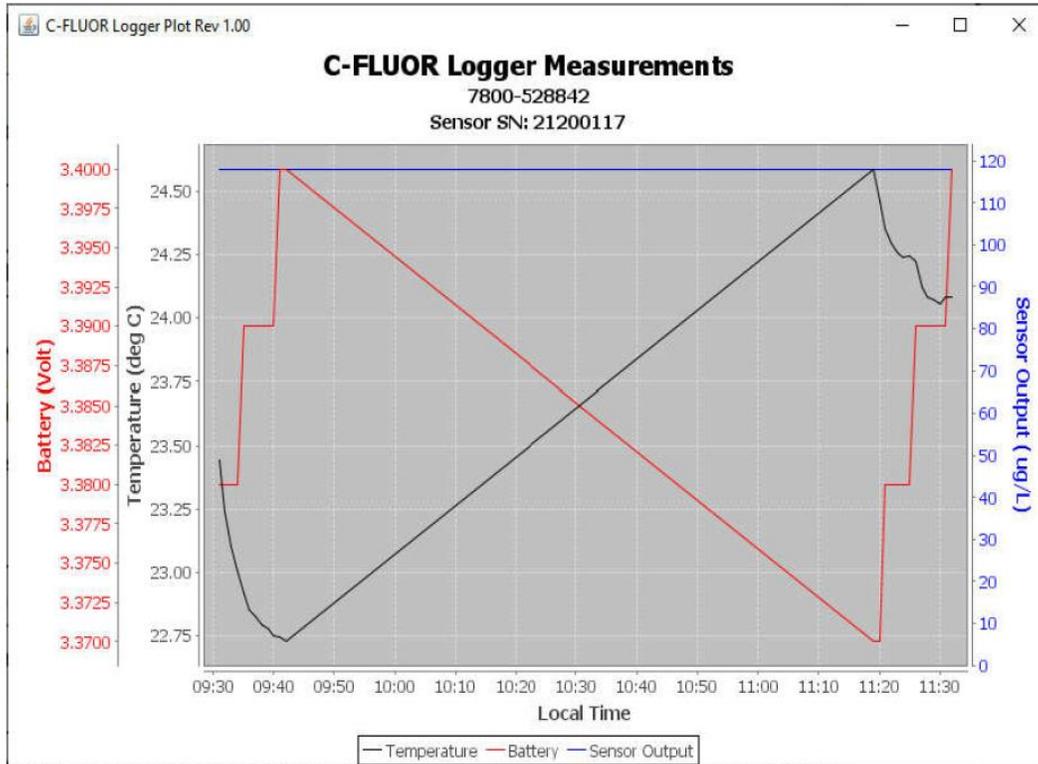
Notice that the software has automatically suggested the C-FLUOR Logger SD card as the Data Folder. You may accept this or click “Select DATA Folder” to find some other source for the plot.

DATA folders MUST ONLY contain files written by the C-FLUOR Logger operating system. This folder can be on the SD card from the C-FLUOR or it can be from a copy of this on your HOST computer’s hard drive.

A few thousand measurements can be plotted directly from C-FLUOR Logger SD. However, it is best to copy large measurement sets to the HOST computer and select them there since file access to the Logger is slow.

Press ‘Plot’ to begin measurement processing. The software reads all C-FLUOR Logger data files and the DATA presents a plot of the measurements similar to the plot shown below.





You may zoom this plot by drawing a square from upper left to lower right (click and hold left mouse button) that defines the zoom region. To zoom completely out, attempt to draw a square from lower right to upper left. The mouse will scroll the image if the CTRL key is held down. Right click on the plot for options such as copy and print.

The software may be run multiple times at the same time (select Data Folder, press Process, select new DATA Folder, press Process...). In this case it produces multiple plots. Presently the plots are presented exactly on top of each other and so when a new plot appears it is not obvious that the old plot is still there. It is. Just move the new plot to see it. Closing any plot closes all Java windows.

End C-FLUOR Plot by closing the window.

The software can be re-run at any time. If an already processed DATA Folder is selected, the software simply reads the measurement files again.

Special note: plotting of sample sets of more than 200K samples may consume all memory available to the host computer's Java. CFLUORPlot will present a partial plot and freeze in this case. A simple solution is to separate the files into multiple folders and plot each folder individually.

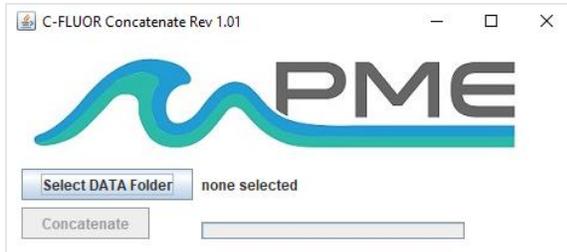


## 2.4 C-FLUOR Concatenate

The C-FLUOR Concatenate program provides these services:

- It gathers together all C-FLUOR Logger files in the DATA folder in time sequence.
- It translates the Logger time stamp into two additional formats.
- It writes all times and measurements into a single CAT.txt file in the DATA Folder.

Begin program operation by clicking on “CFLUORConcatenate.jar”. Software presents the screen shown below.

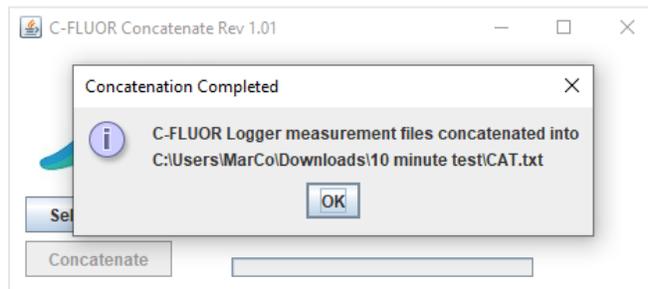


C-FLUOR Concatenate concatenates the files recorded by the C-FLUOR Logger. The software reads all Logger files in a folder, except the CAT.txt file. Software translates Logger time stamps into two additional formats and saves the result in a CAT.txt file in the DATA Folder.

Notice that the software has automatically suggested the C-FLUOR Logger SD card as the DATA Folder. You may accept this or click Select DATA Folder to find some other source for the plot.

DATA folders MUST ONLY contain files written by the C-FLUOR Logger. This folder can be on the SD card from the C-FLUOR or it can be from a copy of this on your HOST computer's hard drive.

A few thousand measurements can be concatenated directly from C-FLUOR Logger SD. However, it is best to copy large measurement sets to the host computer and select them there since file access to the Logger is slow.



Press ‘Concatenate’ to begin measurement processing. The software reads all C-FLUOR Logger data files in the DATA Folder. These are written to the same folder. Software presents a dialog window when the process is completed.

Click OK. The C-FLUOR Concatenate software can be re-run at any time.

End C-FLUOR Concatenate operation by closing the window.



The CAT.txt file will resemble the following:

```
C7 Logger Concatenated Data File
Logger: 7800-528842
Sensor SN: 21200117
Concatenation Date: 2019Nov04 13:51:05 PST
```

Unix Timestamp, (Second),	UTC Date & Time, (none),	Pacific Standard Time, (none),	Battery, (Volt),	Temperature, (deg C),	Sensor (ug/L)
1572888660,	2019-11-04 17:31:00,	2019-11-04 09:31:00,	3.380000,	23.445000,	117.808000
1572888720,	2019-11-04 17:32:00,	2019-11-04 09:32:00,	3.380000,	23.245000,	117.804800
1572888780,	2019-11-04 17:33:00,	2019-11-04 09:33:00,	3.380000,	23.103000,	117.804900
1572888840,	2019-11-04 17:34:00,	2019-11-04 09:34:00,	3.380000,	23.002000,	117.806500
1572888900,	2019-11-04 17:35:00,	2019-11-04 09:35:00,	3.390000,	22.919000,	117.805100
1572888960,	2019-11-04 17:36:00,	2019-11-04 09:36:00,	3.390000,	22.852000,	117.803200
1572889020,	2019-11-04 17:37:00,	2019-11-04 09:37:00,	3.390000,	22.827000,	117.804300
1572889080,	2019-11-04 17:38:00,	2019-11-04 09:38:00,	3.390000,	22.793000,	117.804000
1572889140,	2019-11-04 17:39:00,	2019-11-04 09:39:00,	3.390000,	22.777000,	117.806600
1572889200,	2019-11-04 17:40:00,	2019-11-04 09:40:00,	3.390000,	22.751000,	117.806000
1572889260,	2019-11-04 17:41:00,	2019-11-04 09:41:00,	3.400000,	22.743000,	117.804300
1572889320,	2019-11-04 17:42:00,	2019-11-04 09:42:00,	3.400000,	22.726000,	117.804000
1572889380,	2019-11-04 17:43:00,	2019-11-04 09:43:00,	3.400000,	22.710000,	117.804000
1572889440,	2019-11-04 18:19:00,	2019-11-04 11:19:00,	3.370000,	24.588000,	117.806100
1572889500,	2019-11-04 19:20:00,	2019-11-04 11:20:00,	3.370000,	24.463000,	117.804900
1572889560,	2019-11-04 19:21:00,	2019-11-04 11:21:00,	3.380000,	24.355000,	117.804500
1572889620,	2019-11-04 19:22:00,	2019-11-04 11:22:00,	3.380000,	24.296000,	117.804100
1572889680,	2019-11-04 19:23:00,	2019-11-04 11:23:00,	3.380000,	24.255000,	117.806200

## CHAPTER 3: C-FLUOR LOGGER

### 3.1 Overview

All of the C-FLUOR Logger measurements pass from the sensors onto the SD card it contains. Files are transferred to a HOST computer via USB connection where the C-FLUOR Logger appears as a “Local Disk” drive. Measurements may be plotted by C-FLUOR Plot and files concatenated by C-FLUOR Concatenate. The C-FLUOR Logger itself is controlled by C-FLUOR Control. Customers are required to open the Logger each time measurements are transferred to the HOST computer. This chapter describes the Logger’s internal features.

### 3.2 Opening and Closing the Logger



The Logger circuitry is contained in a waterproof housing that must be opened. The housing is opened by unscrewing the white pressure housing from the black end cap. The black end cap is what the sensor guard and white pressure housing screw into. It’s knurled for an easier grip by hand. Turn the pressure housing counterclockwise relative to black end cap. Close by reversing this procedure after being sure that the o-ring is free from debris. If debris is found, then wipe it off with a clean lint free cloth. PME recommends Kimtech Kimwipes for

this application. Lubricate the o-ring occasionally with oil or grease intended for Buna-n o-ring material.

*Always install fresh desiccant when closing up the Logger. Moisture buildup can cause issue with the electronics.*



The Logger is much more difficult to open than to close. Screw the white logger housing onto the black cap until the housing touches the cap. No further tightening is necessary. Further tightening can lead to the Logger being very difficult to open back up.

Please attempt to handle the C-FLUOR Logger only by the aluminum chassis, without touching the circuit card.

The area by the o-ring and black end cap threads may have some drops of water after deployment. Dry off any water present. Failure to do so could lead to problems with the circuit board in the future.

When closing the C-FLUOR Logger inspect the o-ring and interior of the white cylinder for debris, lubricate the o-ring, install a fresh pack of desiccant, and screw the white cylinder onto the black end cap until the cylinder just touches the end cap. Do not Tighten! The C-FLUOR Logger tends to get a little tighter during deployment.

If you cannot open the C-FLUOR Logger by yourself, find another person with strong hands. This person should grip the black end cap while you turn the white pressure housing. If two people cannot open the Logger, tooling can be used to grip the black end cap while the white pressure housing is rotated counterclockwise.

*Caution: Never grip the sensor or the sensor or sensor retainer to open or close the Logger. Twisting the sensor or sensor retainer could potentially break a seal that could flood the Logger with water. Only grip the white pressure case and the knurled surface on the black end cap.*

### 3.3 Electrical Connections and Controls

Removal of the cover reveals the Logger's connections and controls, shown below.



The **LED Light** is an LED that can display either red or green light. This is used to indicate the different features described in Chapter 1 in this manual.

The **Logger Control Switch** controls the Logger mode:

- **RECORD:** When the switch is in this position the Logger is recording measurements.
- **HALT:** When the switch is in this position the Logger is not recording and is sleeping at low power.

The **USB Connection** allows communication between the Logger and an external HOST computer. When connected, the Logger is in HALT mode regardless of the Logger Control Switch position. When disconnected, the Logger mode is controlled by the Logger Control Switch position. The switch position may be changed while the USB is connected.

The **Main Batteries** (2 X "C" at right of picture above) provide main power to the C-FLUOR Logger. Note the positive (+) terminal.



*Caution: Improper replacement of the batteries will damage the C-FLUOR Logger.*

### 3.4 Battery Replacement

Carefully remove both “C” cells, noting the direction of the (+) terminals. Take care not to break the glue connection between the holder and the aluminum chassis. These both are oriented towards the Logger circuit board. Insert new ‘C’ cells into the paper tube and re-install the pair into the battery holder. When replacing batteries use only fresh batteries. Don’t mix battery types. If one battery differs in type or charge level from the other and the C-FLUOR Logger runs them to full discharge, then one battery may leak.

*Please be aware that the warranty will become void if the batteries are installed backwards.*

### 3.5 Sensor Installation

If the Logger was ordered with a sensor, it will already be installed.

The small circular black clip will be found installed on the Logger-Sensor connector. This can be removed by unscrewing it from the connector, and then gently prying open the ‘C’ clip center piece. See picture below.

Screw one side of the clip fully on to the sensor. Screw the opposite side fully onto the connector as shown in the picture below.



Be sure both are fully screwed on. If either is not, the clip will hold the sensor in a position where it may not make full contact with the connector.

Spray silicone lubricant on the male pins of the sensor. Wipe off any excessive lubricant.

NOTE: A light coat of silicone spray should be used on the rubber of the male pins of the bulkhead to aid in sealing. The manufacturer recommends 3M Silicone Lubricant Spray. DO NOT use silicone lubricant containing acetone or WD-40, it will destroy the connectors.

The recommended spray can be purchased here:

<https://www.msdirect.com/product/details/33010091?item=33010091>

Plug the sensor fully into the connector as shown in the picture below.





The clip faces will mate. Note that if the clip is not fully screwed onto the connector it will still appear as shown in the picture above, but the sensor may not be making complete reliable contact with the Logger.

Snap the remaining clip part onto the clip to secure the sensor to clip connection.

Slide the sensor support (middle-right in first picture) over the sensor and screw into the black end cap. Next screw the sensor guard (middle left in first picture) onto the sensor support. The completed assembly is shown in the picture below.

When exchanging the sensor, reverse the process steps given above.



*The sensor connector is itself threaded into the Logger end cap. This connector is tightened, but since the logger end cap is plastic there is a limit to how tightened this connector can be made. If the connector unscrews water can enter the logger and cause permanent damage. Be observant when installing sensors. When installed, the sensor should not be able to be rotated. Take care not to unscrew the sensor and watch the sensor when unscrewing the sensor support since the o-ring will apply a slight loosening rotation to the sensor. Should the sensor/connector become loose discontinue use of the logger and contact PME.*

### 3.6 Notes

This section collects general notes concerning the instrument.

Do not use harsh solvents on any of the logger plastic parts. In particular, do not use acetone on the sensor guard. This part is constructed of ABS plastic and will dissolve if exposed to acetone.

Re-calibration of the sensor can be accomplished by returning the sensor to Turner Designs or to PME. You can also re-calibrate the sensor yourself if you have the proper calibration standards. PME can provide re-calibration software. Contact PME.

**Enjoy your new C-FLUOR Data Logger!**

