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PME LI-192 MiniPAR Sensor Logger User Manual

Contents

PME LI-192 MiniPAR Sensor Logger

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:

1. The product has been altered or modified without PME's written authorization,
2. 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,
3. the product has been subjected to abnormal physical, thermal, electrical, or other stress, internal liquid contact, or misuse, neglect, or accident,
4. the product failure occurs as a result of any cause not attributable to PME,
5. 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,
6. the product is installed in a non-PME specified enclosure or with other incompatible equipment,
7. to address cosmetic issues such as scratches or surface discoloration,
8. operation of the product in conditions other than that for which the product was designed,
9. 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
10. 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 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 miniPAR Logger and come into contact with the enclosed batteries 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 miniPAR Logger is designed to release internal pressure, as the black end cap is unscrewed, prior to the disengagement of the black end cap threads. If internal pressure is suspected, then treat the miniPAR Logger with extreme caution.

QUICKSTART

The Quickest Start Possible

Your miniPAR Logger has arrived completely ready to go. It is set to measure and record PAR, temperature, time, battery voltage, and XYZ acceleration, once every 10 minutes and write one file of measurements daily. Open the miniPAR Logger and move the Logger Control Switch to the "Record" position. In this condition, the miniPAR Logger will record measurements for a year before the internal batteries are expended. You must re-close the miniPAR Logger prior to deploying it. Be sure to make sure the o-ring seal is free of debris before installing the outer case.

At the end of the deployment period, open the miniPAR Logger and connect it to a HOST computer via the USB connection. The miniPAR Logger will appear as a 'thumb drive'. Your temperature, XYZ acceleration, and PAR measurements, together with a time stamp indicating the time the measurements were made, are recorded in text files in the folder having the serial number of your miniPAR Logger. These files can be copied onto any Windows or Mac HOST computer. This Manual, and other software programs, are also recorded on the miniPAR Logger.

- MINIPARCONTROL PROGRAM: Allows you to see the state of the miniPAR Logger as well as set the recording interval.
- MINIPAR PLOT PROGRAM: Allows you to see the plots of the recorded measurements.
- MINIPAR CONCATENATE PROGRAM: Gathers all the daily files into one CSV (comma-separated values) CAT.txt file.

Your miniPAR Logger will return to recording measurements after you disconnect the USB connection. If you wish to stop recording, then move the Logger Control Switch to the "Halt" position. You may move the Logger Control

Switch at any time.

Follow these steps to start the deployment, logging PAR, T, and XYZ acceleration once every 10 minutes:

1. Open the miniPAR Logger by unscrewing the white pressure housing from the black end cap. It opens like a flashlight. Remove the white pressure housing completely. Inside you will see the circuit pictured below:

2. Move the Logger Control Switch to the "Record" position. The LED will flash green 5 times. The miniPAR Logger will now record a measurement of time, battery voltage, temperature, PAR, and 3 axis acceleration every 10 minutes (or at some other interval you may have set using the miniPARControl program). The logger will start recording measurements at the start of the next minute.
3. Inspect the o-ring seal for debris.
4. Close the miniPAR Logger by screwing the white pressure housing back onto the black end cap.
5. Deploy the miniPAR Logger.

Follow these steps to end the deployment:

1. Recover the miniPAR Logger
2. Clean and dry all accessible surfaces. Be careful of the white "dot" on the PAR sensor.
3. Open the miniPAR Logger by unscrewing the white pressure housing from the black end cap. Remove the white pressure housing completely, taking care that water does not drip onto interior surfaces of circuits or other items inside the miniPAR Logger.
4. Connect to a Windows HOST computer via the USB connection. The miniPAR Logger will appear as a 'thumb drive'.
5. Copy the folder having the same serial number as the miniPAR Logger (example 7530-1234) to the HOST computer.
6. Suggested, but optional) Delete the measurement folder, but NOT the miniPARControl program or the other .jar programs.
7. (Optional) Run the miniPARControl program to see the state of the miniPAR Logger such as battery voltage or to select a different recording interval. miniPARControl will also update the time if the logger has drifted in time.
8. (Optional) Run the miniPARPlot program to see a plot of measurements.
9. Optional) Run the miniPARConcatenate program to gather all the daily files of measurements into one CAT.txt file.
10. . If no more recording is desired, move the Logger Control Switch to "Halt", otherwise leave it set to "Record" to continue recording measurements.

11. Disconnect the miniPAR Logger from the USB connection.

12. Inspect the o-ring seal for debris.

13. Close the miniPAR Logger by screwing the white pressure housing back onto the black end cap.

Remove the batteries if storing the miniPAR Logger for extended periods.

A Few Details
The previous section gave instructions for sampling at 10-minute intervals. However, there are a few additional details that will enhance use of the miniPAR Logger.

RECORDING INTERVAL
The miniPAR Logger measures and records time, battery voltage, temperature, PAR, and 3-axis acceleration at equal time intervals. The default time interval is 10 minutes. However, it is also possible to instruct the miniPAR Logger to record at different intervals. This is accomplished by running the miniPARControl.jar program supplied with the miniPAR Logger. 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 the miniPARControl program. Contact PME for other recording intervals.
Please refer to Chapter 2 for instructions on operating the miniPARControl program.

AVERAGE
Beginning with operating system Rev 1.05 miniPAR Loggers implement averaging of the sensed PAR. This averaging is implemented to reduce the noise that light flicker nearby the surface can generate in the recorded measurements. Each recorded PAR value results from the average of 30 readings of PAR, taken over a 5 second period. This averaging consumes additional battery energy. However, the 10-minute sampling interval for a year is still possible. The amount of averaging can be changed. miniPAR Loggers that have operating systems prior to Rev 1.05 can be upgraded. Contact PME.

TIME
All miniPAR Logger times are UTC (formerly known as Greenwich meantime (GMT)). The miniPAR 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 miniPARControl program will automatically set time based on an Internet time server.
Please refer to Chapter 2 for instructions on operating the miniPARControl program.

FILE INFORMATION
The miniPAR Logger software creates 1 file daily on the miniPAR 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 miniPAR 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 miniPAR Logger by connecting it to a HOST computer. Use the HOST computer's copy/paste functions to move the files from the miniPAR Logger to the HOST computer. Each measurement within the files 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, then the miniPARConcatenate program not only concatenates all the measurement files, but also adds more readable statements of the time stamp. Please refer to Chapter 2 for instructions on operating the miniPARConcatenate program.
The miniPAR 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 miniPAR Logger may suffer decreased battery life or other performance problems. Please, at the earliest convenient time, copy the recorded files to a HOST computer and delete them from the miniPAR Logger's SD card. Also, do not use the miniPAR Logger to store files unrelated to the miniPAR Logger's operation.

CLEANING THE SENSOR

Contact Li-Cor for instructions for cleaning the PAR sensor. The white pressure housing and black end cap can be gently scrubbed.

AA ALKALINE BATTERY LIFE
Alkaline batteries will perform slightly worse than lithium, especially at low temperatures. Alkaline batteries are superior to lithium in one way; you can determine how much battery life remains by measuring the battery terminal voltage. For short deployments of a month or two, then alkaline batteries will provide adequate performance. For longer deployments, or for deployments in cold environments, then substitute lithium batteries.

AA LITHIUM BATTERY LIFE
The miniPAR Logger consumes battery power mostly from the measurement of PAR and temperature, but also a small amount from simply keeping track of time, writing files, sleeping, and other activities. The following table shows the approximate endurance of the miniPAR Logger when powered by the Energizer L91 AA lithium / ferrous disulfide batteries:

Sample Interval (Minutes)	Main AA Battery life (Months)	Number of Samples
1	1	50K (approx.)
10	>12	50K (approx.)
60	>12	25K (approx.)

Keep a general record of the miniPAR Logger's number of samples. It is not possible to accurately tell the charge state of a lithium battery by measuring its terminal voltage. If you have a general idea of the number of samples already obtained on a battery, then you can make an educated guess as to how many more samples remain. The numbers in the table above are, at the time of this writing, based upon extrapolations of testing current demanded from batteries. The 1-month performance at 1 minute is very likely. Performance at longer sample intervals will be much longer, but how long is difficult to predict. In any event, these AA batteries are easily available and relatively inexpensive compared to the cost of the miniPAR Logger. PME suggests you replace the batteries often, especially before any long (months) measurement deployments.

Monitor battery terminal voltage. You cannot tell from terminal voltage of a lithium battery how long the battery will last, but you can tell if it will die soon. The Low Drain Performance plot below gives an estimate of terminal voltage for both lithium and alkaline batteries. Your measured voltage will be 2X what is shown below since there are two batteries in series within the miniPAR Logger. You can operate batteries down to about 2.4 Volts (for two in series, 1.2 Volts on the graph below). Your batteries are dead if the measurement of each battery adds to less than 2.4 Volts.

You may also use alkaline AA batteries such as Duracell Coppertop. They will not last nearly as long, especially at low temperatures, but will likely be adequate for several weeks at the 10- minute interval. Alkaline batteries may leak if severely discharged.
When replacing batteries use only fresh batteries. Do not mix battery types. If one battery differs in type or charge level from the other and the miniPAR Logger runs them to full discharge, then one battery may leak.

Err on the side of caution when planning your deployment.
The recommended battery is the Energizer L91 lithium battery. For more information, including the performance at low temperatures, click this link: **http://data.energizer.com/PDFs/l91.pdf**

Low Drain Performance
50mA Continuous (21°C)
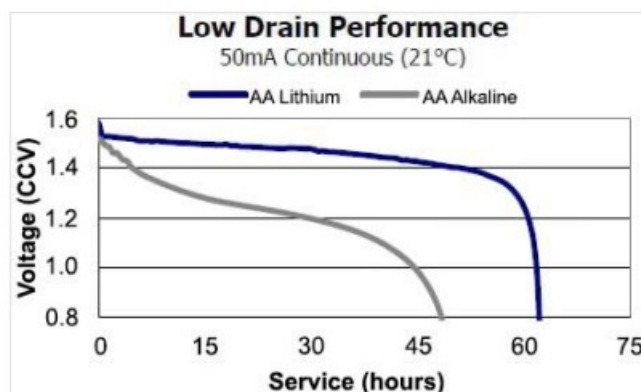
The figure below gives a general idea of terminal voltage vs. lifetime. Service life in hours is incorrect since miniPAR Logger draws far less than 50 mA continuously, but the general shape of the voltage vs. time gives an estimate of life remaining. This plot is taken from the manufacturer's specification. The plot is for a single battery. Double the voltages shown to give the terminal voltage as measured in the picture above. The miniPAR Logger halts operation at a total of 2.4 Volts.

COIN CELL BATTERY LIFE
The miniPAR Logger uses a coin cell battery for backing up the clock when the AA batteries are removed. This coin cell battery will supply many years of clock operation. Should the coin cell battery discharge, then it must be replaced by PME. Contact PME

RECALIBRATION
The miniPAR Logger will maintain its calibration without the necessity of adjustment by the user. The miniPAR Logger should be returned to PME for re calibration. We suggest that this be done yearly. We do not calibrate the miniPAR ourselves; we disassemble it and send the PAR sensor to Li-Cor for re-calibration. Follow Li-Cor's suggestion on how often their sensors need to be calibrated.

O-RING AND SEAL
When the miniPAR Logger is opened after deployment, a small number of water drops are deposited on the inner surface of the o-ring. When the white pressure housing is screwed back onto the black end cap, these drops can become trapped inside the miniPAR Logger. Be sure to carefully dry the o-ring and adjacent surfaces (especially underneath) prior to closing the miniPAR Logger. Re-lubricate the o-ring at this time.

LED INDICATIONS
The miniPAR Logger indicates its operation with its LED. The table below presents LED indications:

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 miniPAR Logger is beginning to record measurements. This indication appears in response to switching the Logger Control Switch to "Record."
5 Red Flashes	Normal. Indicates the miniPAR Logger is ending recording of measurements. This indication appears in response to switching the Logger Control Switch to "Halt."
Continuously Green	Normal. Indicates the miniPAR Logger is connected to a HOST computer via the USB connection.
Continuously Flashing Red	SD card write error. Try removing/reinstalling batteries. Contact PME.

VERIFYING CALIBRATION
Compare miniPAR recordings to a light standard if available. The sensor can be covered with aluminum foil to get a zero point.

CLOSING AND OPENING
Close and open the miniPAR Logger like you would a flashlight; open by unscrewing the white pressure housing from the black end cap. Close by screwing the white pressuring housing on to the black end cap. When closing, do not tighten the white pressure housing. 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 batteries. Keep the black end covered with the cap supplied by PME. If the cap is lost, then cover the black end cap with aluminum foil. There may be a calibration effect of ambient lighting so attempt to keep ambient light from reaching the sensing foil as much as possible.

JAVA
miniPAR programs depend on Java and require Java 1.7 or higher. Update Java at
https://java.com/en/download/index.jsp

SOFTWARE

Overview and Software Installation
The miniPAR Logger arrives with these files on the SD card:

- miniPARControl.jar program allows you to see the state of the miniPAR Logger as well as set the recording interval.
- miniPARPlot.jar program allows you to see the plots of the recorded measurements.
- miniPARConcatenate.jar program gathers all the daily files into one CAT.txt file.
- Manual.pdf is the manual.

These files are located on the root directory of the miniPAR Logger.

PME suggests you leave these programs where they are on the miniPAR Logger, but you may copy them to any folder on your HOST computer's hard drive. miniPARControl, miniPARPlot, and miniPARConcatenate programs

are Java language programs that require the HOST computer to have the Java Runtime Engine V1.7 (JRE) or later versions 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 the miniPARPlot program. If this program displays its graphical user interface, then the JRE is installed. If not, then the JRE can be downloaded via the Internet from **http://www.java.com/en/download/windows_xpi.jsp** At this time, the miniPAR Logger is supported on the Windows operating systems but may also operate on Macintosh and perhaps Linux.

miniPARControl

Begin program operation by clicking "miniPARControl.jar". The program presents the screen shown below:

The miniPAR Logger must be connected to the HOST computer via the USB connection. When correctly connected, the miniPAR Logger's LED will display a constant green light. Click the "Connect" button. The program will contact the miniPAR Logger. If the connection is successful, then the button will turn green and display "Connected". The Serial Number and other parameters will be filled in from the information taken from the miniPAR Logger. If the HOST computer is connected to the Internet, then the current difference between an Internet server's time and the miniPAR Logger's internal clock will be displayed. If more than a week has passed since time was last set, then the miniPAR Logger's clock will be set and the checkmark icon will appear. If the HOST computer is not connected to the Internet, then no time services will occur.
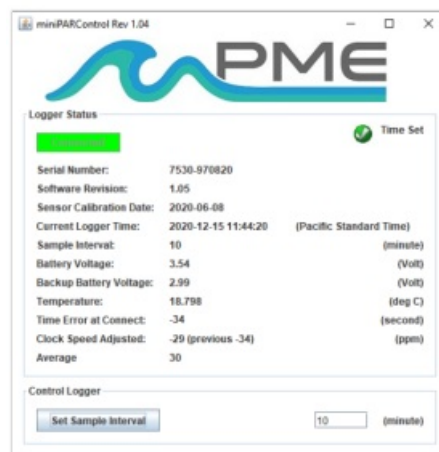
The current miniPAR Logger's sample interval will be displayed next to the "Set Sample Interval" button. To set the interval, enter an interval not less than 1 minute and not greater than 60 minutes. Click the "Set Sample Interval" button. Shorter and faster intervals are available. Contact PME. If this interval is acceptable, then the interval need not be set. End the miniPARControl program by closing the window. Disconnect the miniPAR Logger's USB cable. Upon disconnection of the USB cable, the miniPAR Logger will begin logging or remain halted as indicated by the position of the Logger Control Switch.

miniPARPlot

Begin the program operation by clicking "miniPARPlot.jar". The program presents the screen shown below.

The miniPARPlot program plots the files recorded by the miniPAR Logger. The program reads all the miniPAR Logger files in a folder, except the CAT.txt file. Select the folder that contains the files recorded by the miniPAR Logger. If the miniPARPlot program is run directly from the miniPAR Logger, then the program will suggest the folder that is located on the miniPAR Logger's SD card.

You may accept this by clicking "Plot", or you may click "Select DATA Folder" to browse to your HOST computer's hard drive. If the number of measurements recorded is small, for example a few thousand, these can conveniently be plotted directly from the miniPAR Logger's storage. However, it is best to copy large measurement sets to the HOST computer and select them there. The file access to the miniPAR Logger is slow. The miniPAR Logger's measurement folders must NOT contain any files besides those the miniPAR Logger recorded and the CAT.txt file. Click "Plot" to begin plotting. The program reads all the miniPAR Logger's data files in the selected folder. It concatenates these and presents the plot shown below.
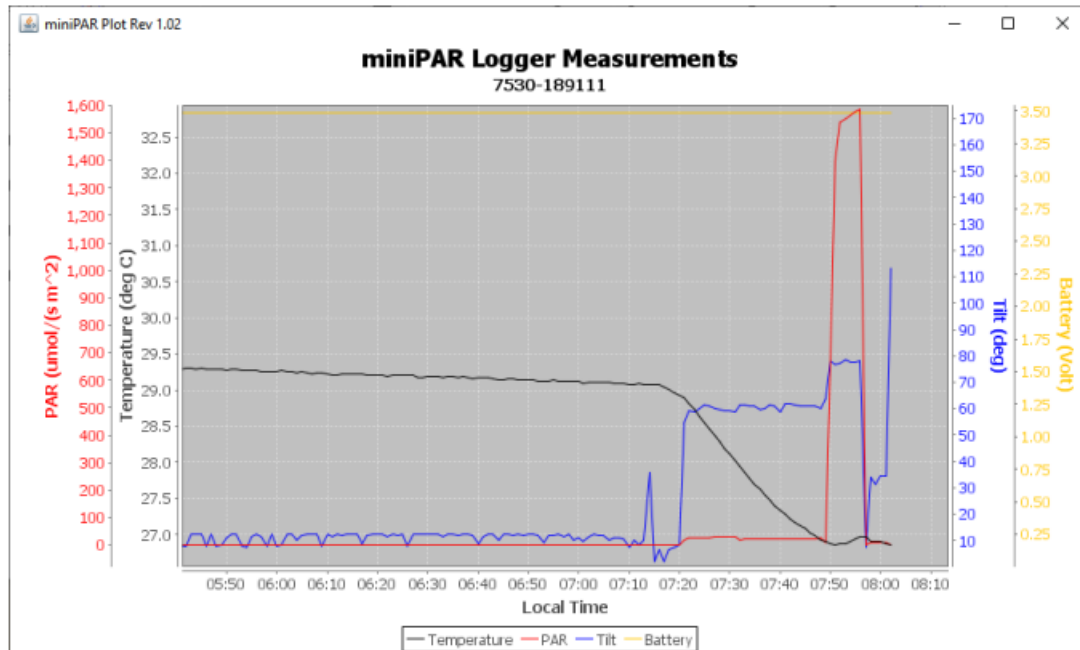
You may zoom this plot by drawing a square from upper left to lower right (click and hold left mouse button) that defines the zoom region. To zoom completely out, attempt to draw a square from lower right to upper left. Right click on the plot for options such as copy and print. The plot can be scrolled with the mouse while the Control key is held depressed. Copies of the plot can be obtained by right clicking on the plot and selecting Copy from the pop-up menu. Different DATA Folders can be selected during one session of the program. In this case, the software produces multiple plots. Unfortunately, the plots are presented exactly on top of one other 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 previous plots.

The program can be re-run at any time. If an already processed DATA Folder is selected, then the program simply reads the miniPAR Logger's measurement files again. End the miniPARPlot program by closing the window. Special note: plotting of sample sets of more than 200K samples may consume all the memory available to the JRE. The miniPARPlot program 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. A special miniPARPlot that sub-samples can be provided by PME. Please contact PME in this case.

miniPARConcatenate

Begin the program operation by clicking "miniPARConcatenate.jar". The program presents the screen shown below.
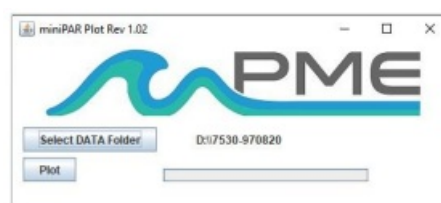
The miniPARConcatenate program reads and concatenates the files recorded by the miniPAR Logger. This program produces a CAT.txt file in the same folder as selected for the data. The CAT.txt file contains all the original

measurements and contains two additional statements of time. CAT.txt is CSV (comma-separated values) file and can easily be imported into Excel and other database files.

Select the folder that contains the files recorded by the miniPAR Logger. If the miniPARPlot program is run directly from the miniPAR Logger, the program will suggest the folder located on the miniPAR Logger. You may accept this by clicking "Concatenate", or you may click "Select DATA Folder" to browse your HOST computer's hard drive. If the number of measurements recorded is small, for example a few thousand, then these can conveniently be plotted directly from the miniPAR Logger's storage. However, it is best to copy large measurement sets to the HOST computer and select them there. The file access to the miniPAR Logger is slow.

- The miniPAR Logger measurement folders must NOT contain any files besides those the miniPAR Logger recorded and the CAT.txt file.
- Click "Concatenate" to begin concatenating files and create the CAT.txt file.
- The CAT.txt file will resemble the following:

End the miniPARConcatenate program by closing the window.

MINIPAR LOGGER

Overview
All miniPAR Logger measurements are saved in files on the SD card inside the miniPAR Logger. The files are transferred to a HOST computer via a USB connection where the miniPAR Logger appears as a "thumb drive". Measurements may be plotted by the miniPARPlot program and files concatenated by the miniPARConcatenate program. The miniPAR Logger itself is controlled by the miniPARControl program. Customers are required to open the logger each time measurements are transferred to the HOST computer. This chapter describes the miniPAR Logger's internal features.

Opening and Closing the miniPAR Logger
The miniPAR Logger's circuitry is contained in a waterproof housing that must be opened. Unscrewing the white pressure housing from the black end cap opens the miniPAR Logger. This is similar to opening a flashlight. Turn the white pressure housing counterclockwise relative to the black end cap. Close the miniPAR Logger 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 silicone oil intended for buna-N o-ring material.

When closing the miniPAR Logger, inspect the o-ring and the interior of the white pressure housing for debris. Lubricate the o-ring, and screw the white pressure housing onto the black end cap until the white pressure housing just touches the black end cap. Do not tighten! The miniPAR Logger tends to get a little tighter during deployment. If you cannot open the miniPAR Logger by yourself, then find another person with strong hands. This person should grip the black end cap while the other person turns the white pressure housing.

Electrical Connections and Controls

Removal of the cover reveals the miniPAR Logger's connections and controls, shown here. The LED Light is a LED that can display either red or green light. This is used to indicate the different features described in Chapter 1 of this manual. The Logger Control Switch controls the miniPAR Logger's mode:

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

The USB Connection allows communication between the miniPAR Logger and an external HOST computer. When connected, the miniPAR Logger is in HALT mode regardless of the Logger Control Switch position. When disconnected, the miniPAR Logger's 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 AA on side opposite to pictured side above) provide main power to the miniPAR Logger. Note the positive (+) terminal. Batteries are described in Chapter 1 of this manual.

Battery Replacement
Be sure that the replacement batteries are compatible with the miniPAR Logger. PME recommends Energizer L91 AA size lithium batteries or Duracell AA size alkaline batteries.

- **http://data.energizer.com/PDFs/l91.pdf**
- **http://ww2.duracell.com/media/en-**
- US/pdf/gtcl/Product_Data_Sheet/NA_DATASHEETS/MN1500_US_CT.pdf

    Caution: Improper replacement of the batteries will damage the miniPAR Logger.

Follow these steps:

1. Move the miniPAR Logger's Control Switch to the "Halt" position.
2. Remove the depleted batteries noting the position of the (+) terminal.
3. Switch minPAR to RECORD, then back to HALT. Wait 1 minute.
4. Use only new, fully charged batteries, both of the same type.
5. Install fresh batteries with the (+) position the same as the removed batteries. The (+) position is also marked on the inside of the battery holder.
6. The miniPAR Logger's LED Light should flash to indicate that the software is beginning operation within a second or two after you complete the battery installation. At this time the logger will enter the mode selected by the Logger Control Switch (which should initially be "Halt" from Step 1).

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

Documents / Resources

PME LI-192 MiniPAR Sensor Logger [pdf] User Manual
LI-192 MiniPAR Sensor Logger, LI-192, MiniPAR Sensor Logger

References

- 〰 **Sensors & Systems for Monitoring Water Parameters | PME**
- 〰 **Sensors & Systems for Monitoring Water Parameters | PME**

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