

Phoebe 3



Sun photometer

User manual



June 2016

21, avenue de Fondreyre - 31200 TOULOUSE CEDEX - FRANCE

Tél. : 05 62 24 48 92 - Fax : 05 62 24 26 46 - email : contact@tenum.fr

This manual is not a contractual document and the information contained herein are subject to change without notice.
Please read this manual carefully before using your photometer.

Summary

Introduction.....	4
Revisions.....	5
1 Starting with PHOCEA.....	6
1.1 Batteries.....	6
1.2 Power ON.....	6
1.3 Operating cycles.....	7
1.3.1 Measuring cycle.....	7
1.3.2 Data copy cycle.....	7
1.3.3 User parameter cycle.....	7
1.4 Main Display description.....	8
1.5 SD card copy.....	9
1.6 Shutdown.....	10
1.7 Optical.....	10
2 PC software.....	11
2.1 Downloading and install.....	11
2.2 Start the software.....	11
2.3 Monitoring.....	12
2.4 Measuring sequence.....	12
2.5 Reading results.....	14
2.5.1 Reading raw data by USB.....	14
2.5.2 Converting raw data into csv data (text file).....	14
2.5.3 Display data curves.....	15
2.5.4 Data erasing.....	16
3 Appendix.....	17
3.1 Install with Windows.....	18
3.1.1 Installing USB-FTDI driver.....	18
3.1.2 PC_PHOCEA software installation.....	18
3.2 Data format.....	19
3.2.1 Raw data.....	19
3.2.2 CSV format.....	20

Introduction

This document allows you to take control of the photometer PHOCEA and make measurements with a scientific value. Its use is suited to the terrain and can be start by novice people.

Phoceia is the new generation of sunphotometer dedicated of measuring the resultant light during solar eclipse to determine solar diameter with greatest accuracy.

The first generation was named PICALI and was used for solar eclipse in French Polynesia during summer 2010.

PHOCEA use a new photodiode, more sensible and a digital converter 24bits tall.

Technical characteristics

- 100 measures per second generated with the GPS native 100Hz clock.
- Digital converter : 24bits depth : [0 to 16777215] light number.
- Each measure is dated with the number of centi-second from midnight.
- More 4 hours of records with inboard flash memory
- Data download by USB with PC_PHOCEA (Software free supply by Tenum) or by inserting SD card in the photometer.
- Possibility to schedule a measurement session several days in advance.
- A 4-line LCD display informs the user about the operating steps of the photometer and its programmed parameters.
- The Phoceia is equipped with a 31.75 mm diameter baffle to the standards of astronomy instruments, which allows the installation of a wide choice of optical filters.
- The 200 x 100 x 40 mm enclosure features a Kodak pitch thread for attaching to any type of tripod.
- The photometer is powered by 4 AA 1.5V batteries.

In the first part, we will guide you in using the photometer.

The second part presents the use of PC software and downloading data.

Part Appendix lists the specifications of the device.

Revisions

Version 1.0 – May 2017

- Initial document

1 Starting with PHOCEA

1.1 Batteries

The photometer uses 4 AA batteries located under the hatch at the rear of the unit.



The implementation is facilitated by first placing the side '+' of the battery into place.

You can also use rechargeable batteries

1.2 Power ON



The photometer is turned on by pressing for 2 seconds on the center button.

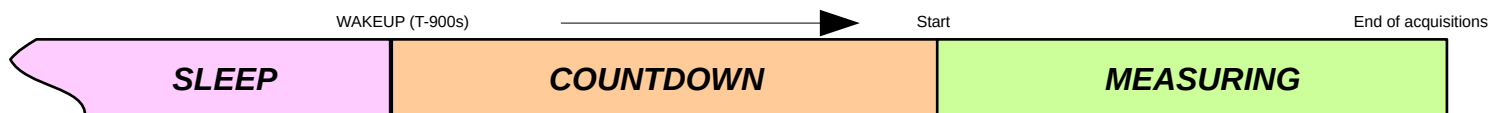
As soon as the text appears, you can release the button and the unit is in operation.

1.3 Operating cycles

Photometer operating mode is based on three main cycles. Note that you can not pass from a cycle to another.

1.3.1 Measuring cycle

It is a cycle to start measuring at programmed time during a determined time.



If the start date is at more 15 minutes from now, the photometer enters a sleep mode.

If the start date is at less 15 minutes from now, the photometer stays alive and waits for GPS data and leap second reception to synchronize its clock. A countdown is displayed to the start.

If the start date is past, the photometer displays a message and waits for shutdown by user.

Measures of light are taken 100 times a second (100Hz). This frequency is generated by GPS-synchronized clock. You can also compare measures from different devices, as the GPS time synchronization is a global reference.

1.3.2 Data copy cycle

User can copy raw data from flash memory to a SD card.

The SD card must be formatted in FAT32 standard.

The firmware writes a *.dat* file on SD card.

1.3.3 User parameter cycle

When you plug the USB to connect to a computer, and start the PC software, the photometer enters Configuration Mode.

In this mode, the user can change start date/time and length (duration) of measuring.

The user can also download memory data of photometer via USB link into a raw data type file (*.dat*). (See annexes).

This is in Configuration Mode, that you can erase all photometer flash memory, and only in this mode.

1.4 Main Display description

After turning the welcome page, the photometer displays main informations :

□□GPS□<<□□□□□#0001□□	GPS Status – Photometer id – Conf mode
2017/02/24□□10:34:13	Real time, Countdown and Events
2017/08/21□□18:25:00 LEN:00h30□□MEM:02h30	Configuration parameters

Date format : Year/Month/Day
Time format : Hour:Minutes:Seconds

with detailed :

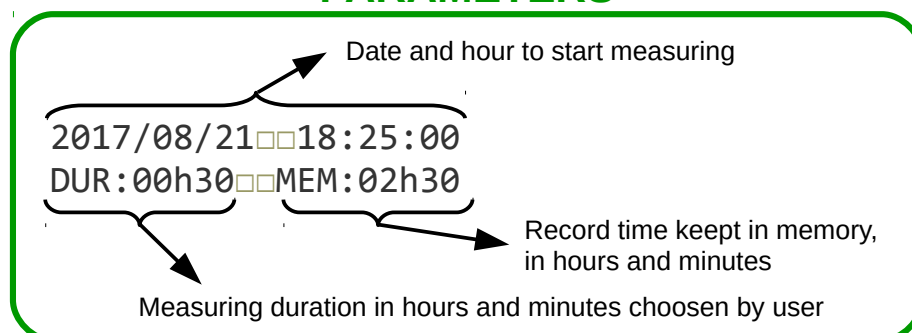
STATUS

GPS□>>	}	GPS is not yet locked to produce a location
GPS□<<		
GPS□3D		GPS produce a location but time is not yet U.T.
GPS□3D+18		GPS produce a location and time is U.T. (GPS time + Leap second, here +18sec)
#0001□□		Photometer unique id number
#0001**		Photometer id number and in parameters mode

EVENTS

2017/02/24□□10:34:13	Present date and hour in U.T.
□□GO□TO□SLEEP□in□5s□	Countdown before sleeping mode
□□START□in□12mn20s□□	Countdown before acquisition start
□□□□MEASURING□□□□□	Measuring in progress
□□□□TERMINATED□□□□□	Measuring complete

PARAMETERS



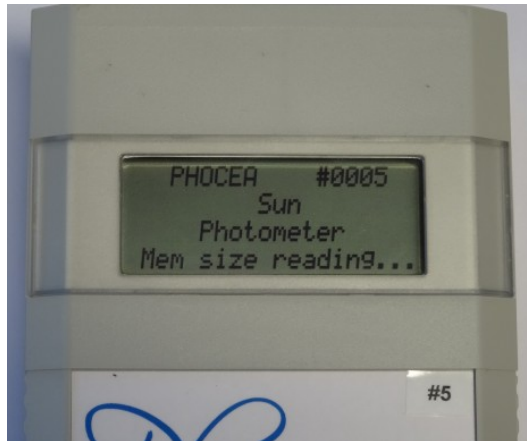
1.5 SD card copy

Here is the procedure to copy flash memory data to a SD card :

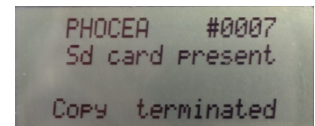
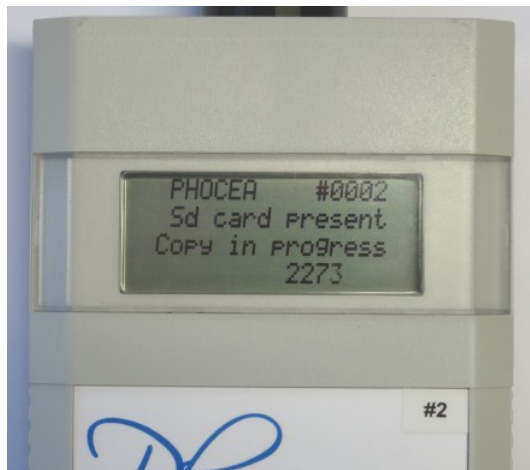
Power off the device.

Power on the photometer by pressing the central button.

Wait during 'Mem size reading' LCD message and insert SD card in its support (to the back side of the photometer).



The system detect SD card and copy data with a count down display on the screen. Do not eject SD card before the end of the countdown.



SD data format => read Data Format in the annexes.

1.6 Shutdown

To turn off the photometer must be left long press the button to the message: **Stop in progress...** Release the button and the photometer is turned off.



When the user disconnect 'Configuration mode' with PC Software, the photometer is automatically turn off (to start with new parameter).

1.7 Optical

Your photometer is an optical measuring instrument and should not hinder the path of sunlight to the sensor.



We deliver the photometer with a 31.75 mm diameter baffle to the standards of astronomy instruments, which allows the installation of a wide choice of optical filters



2 PC software

2.1 Downloading and install

The PC software is used to do configuration of the photometer (Start date, duration of measuring) download data from photometer and process measurements is freely available on our web site.

We have written Windows, and are preparing a Linux version.

We guest you to read tutorial sheet of each operating system you can found in annexes section of this user manual.

Before starting the program, it is imperative connect the photometer to a PC and turn it on.



2.2 Start the software

Double-click the program icon on windows to start the program.



Once the operation is successful, the screen displays the 'About...' tab :



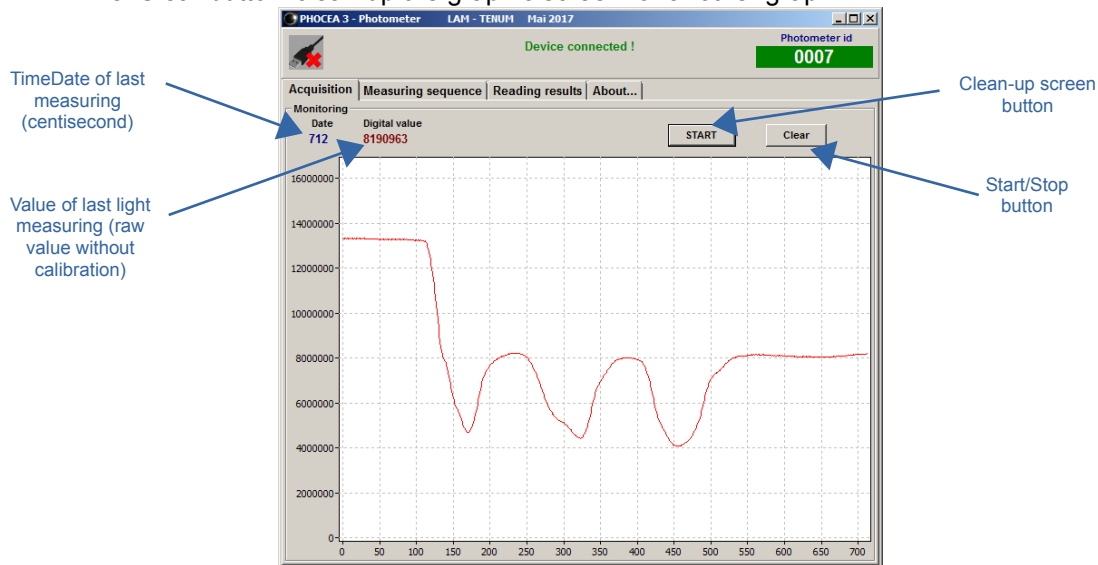
2.3 Monitoring

The monitoring tool perform automatically real-time measurements.

Light data are displayed by drawing curve and numbers.

To start, press the 'Start button' which become 'Stop button' to stop monitoring.

The 'Clear button' clean up the graphic screen for another graph.



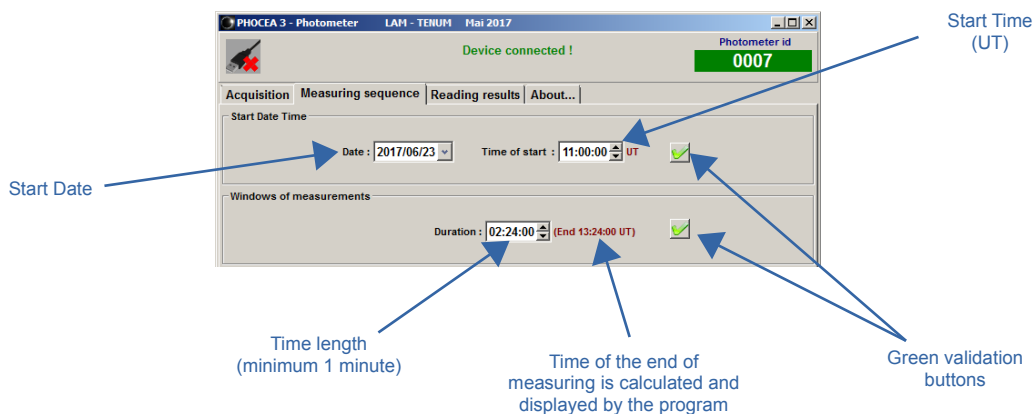
On ordinate (vertical axis), we have the measurements of light (numbers coded on 24bits) and on the abscissa the centi-second (100th of second).

2.4 Measuring sequence

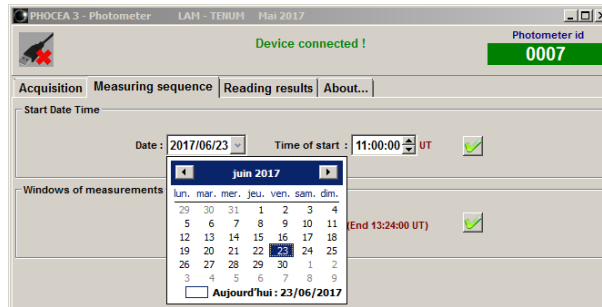
The second tab is dedicated to the configuration of photometer for measuring campaign.

Three essential parameters can be configured :

Start date, Start time and length of measures (duration).



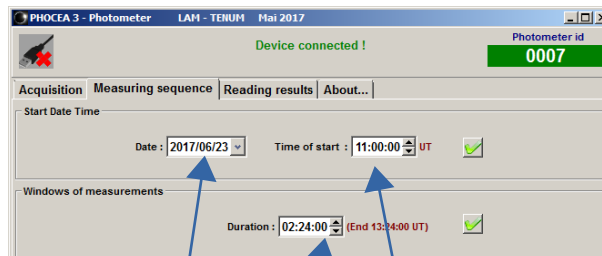
Date parameter : a calendar help your choice



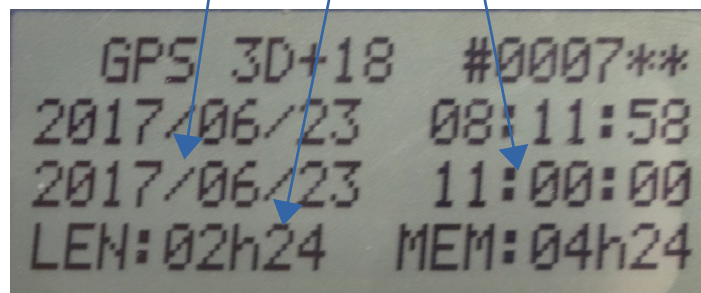
If the time length is greater than photometer memory capacity, the sentence 'Out of memory' is displayed :



Once parameters are OK for you, you send it by clicking on small green validation buttons.



Once parameters are sent, you can verify on photometer screen the right configuration :



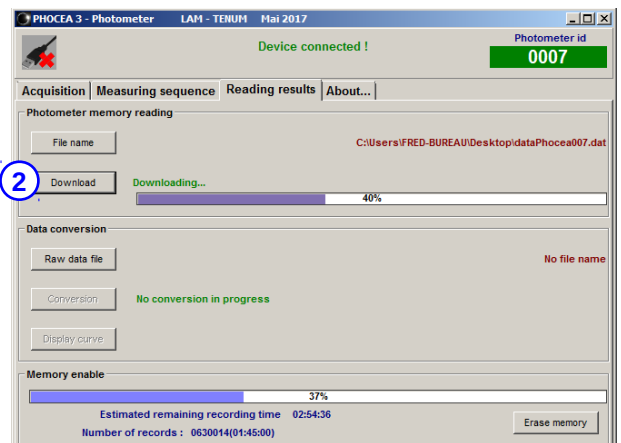
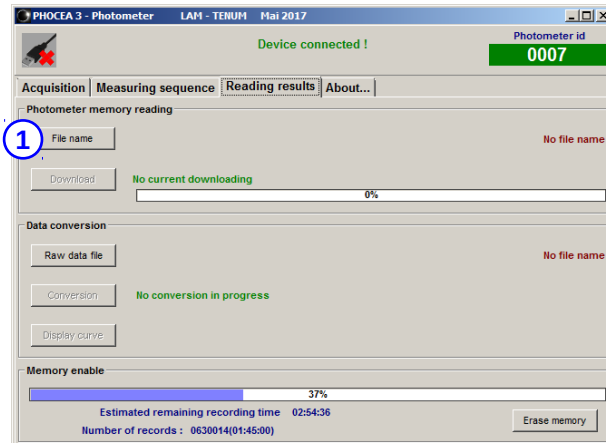
2.5 Reading results

2.5.1 Reading raw data by USB

Downloading data is proposed in **Reading results** tab of the software .

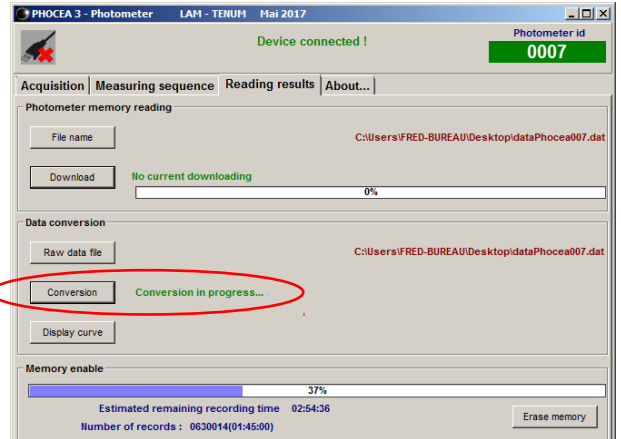
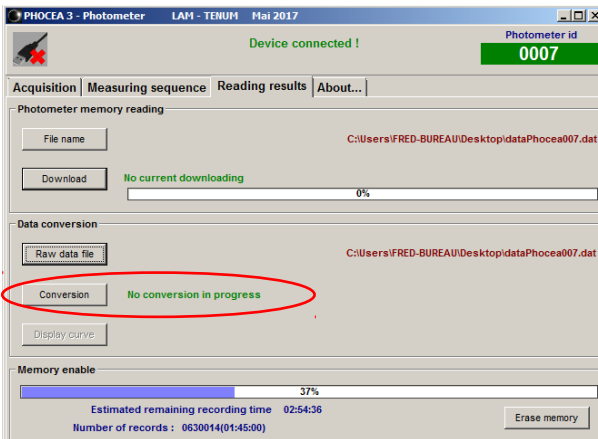
First, you have to click on the **File name** button to determine the raw data file that will be created before fill it with downloaded light data.

Then, click on Download button to transfer data from photometer memory to your file (here named : **dataPhoceaa007.dat**).



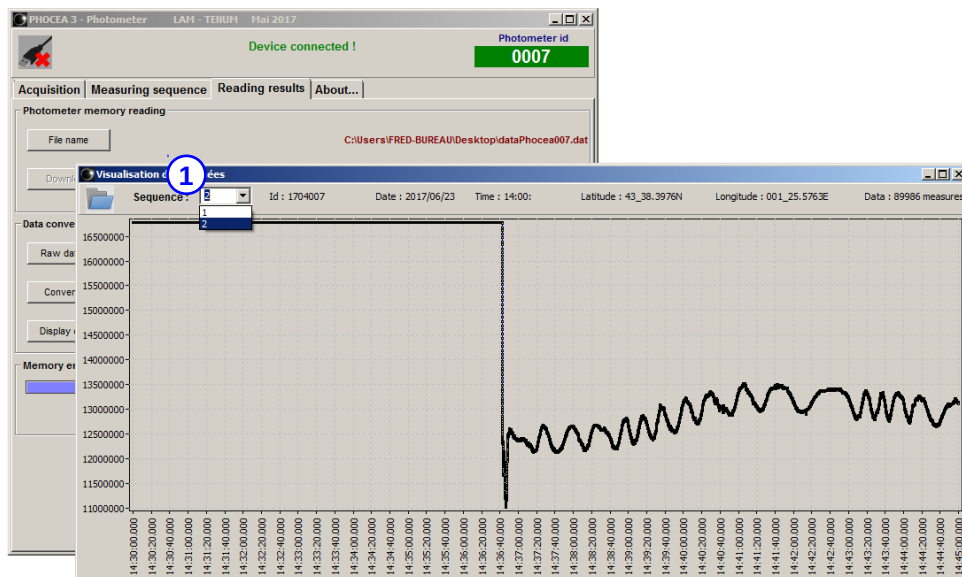
2.5.2 Converting raw data into csv data (text file)

Once the **.dat** file is creating, you have to convert it into **.csv** file to facilitate his use by scientists.



2.5.3 Display data curves

It is possible to display entire data downloaded and converted in another window by clicking on the display button :



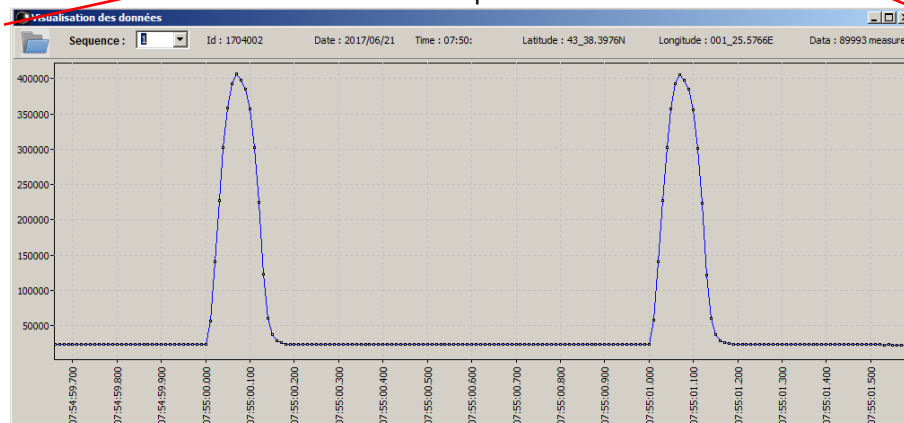
If you have programmed several sequences of measuring, they appear in the Sequence ComboList **1**

Zooming is also possible by enclosing with the mouse button pressed the party to zoom.

Operation to the top left point to the bottom right under :



and release the mouse button: zoom is performed :

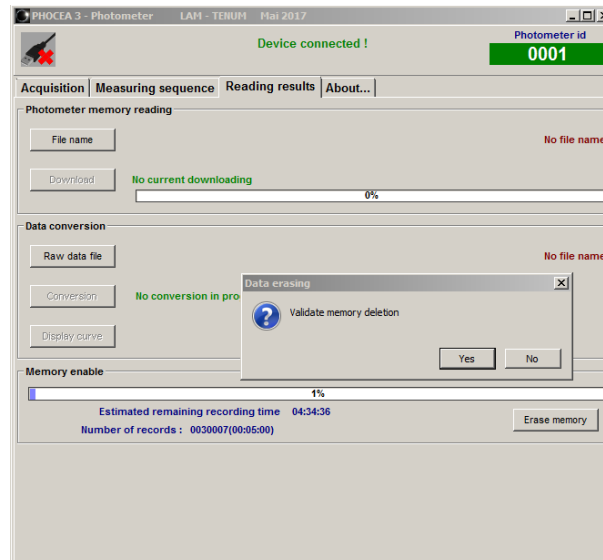


2.5.4 Data erasing

The button Erase memory must be use to delete all data in the entire memory of the photometer.

The program asks you to confirm If your answer is OK, erasure is performed.

Warning : erasing operation is final.



3 Appendix

3.1 Install with Windows

This software has been tested with success under Windows® XP, 7 et 8.

Start by downloading the archive file : PC_Phocea_windows.zip from our website

<http://www.tenum.fr/index.php?page=phocea>

Open the archive and extract the PC_Phocea folder on your desktop.

Folder contents :

```
PC_PHOCEA_setup.exe
CP210x_Windows_Drivers
```

3.1.1 Installing USB-CP210x driver

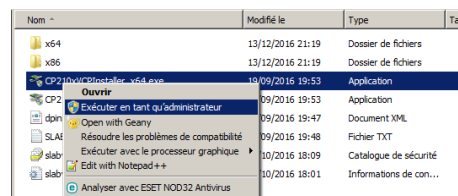
This must be done before connecting for the first time the photometer to the PC via the USB port and Phocea before starting the program.

We will install a driver that transforms the USB port to a virtual serial port.

This requires run as administrator, the CP210x Driver file :

CP210xVCPInsta11_x64.exe If your Windows is 64bits

CP210xVCPInsta11_x32.exe If your Windows is 32bits



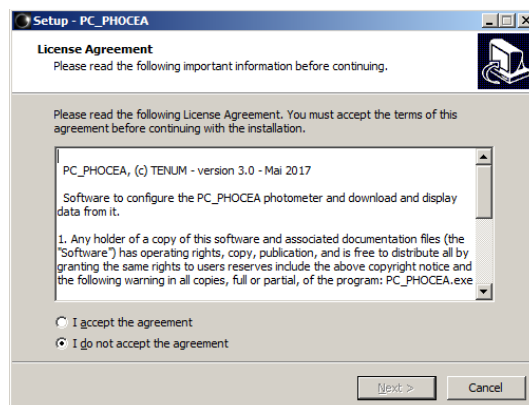
Mouse right button on the CP210x driver icon.

Driver website :

<http://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers>

3.1.2 PC_PHOCEA software installation

Just click on the PC_PHOCEA_setup.exe and follow the prompts to install the program



3.2 Data format

3.2.1 Raw data

You can find raw data in memory and in files with '.DAT' extension (SD card copy and Data USB downloading).

Address	hexadecimal data	ASCII format
00000	fb bb bb bb bb bb bb bb	û»»»»»»»»»»
00008	fb 31 37 30 34 30 30 35	û1704005
00010	fb 31 37 30 36 32 32 5f	û170622_
00018	fb 31 33 30 30 00 00 5f	û1300.._
00020	fb 34 33 33 38 33 39 38	û4338398
00028	fb 34 4e 5f 30 30 31 32	û4N_0012
00030	fb 35 35 37 36 37 45 5f	û55767E_
00038	fb 4b 12 c0 00 21 ad b4	ûk.Å. !-´
00040	fb 4b 12 c1 00 21 01 26	ûk.Å. !.&
00048	fb 4b 12 c2 00 21 67 c4	ûk.Å. !gÄ
00050	fb 4b 12 c3 00 21 dc 98	ûk.Å. !Ü.
00058	fb 4b 12 c4 00 21 81 da	ûk.Å. !.ú

Synchro data line to distinguish different sessions of measures.

Synchro byte for reading procedure in flash memory

ASCII text packet for session identification :

1704 : Manufacturing date (april 2017) and 005 : id number of the device.

170622 : Day of start measuring (June 22th 2017)

1300 : Time of start measuring (13h00 UT) (*)

43383984N : Latitude position : 43°38.3984'N (degrees and decimal minutes)

001255767E : Longitude position : 001°25.5767E (degrees and decimal minutes)

Measuring data

First measure (first line)

\$4B12C0 = 4920000 centi-second from midnight that is 13:40:00 UT (*)

\$00 : Synchro byte

\$21ADB4 = 2 207 156 light numerical value

(*) Bug : Minutes of start time are bugged... (version june 2017)

3.2.2 CSV format

Text file Data obtained after a download and a conversion :

```
Id : 1704007
Date : 2017/06/22
Time : 13:00:
Latitude : 43_38.3984N
Longitude : 001_25.5767E
4920000;02207156
4920001;02162982
4920002;02189252
4920003;02219160
:
:
:
```