Continuous Solar Seeing Measurement System

CSSMS

Installation and user manual

April 12th, 2021

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1 CSSMS installation

The system is made of two parts, a control box and a sensor mounted to a ball support that allows any orientations. The sensor cannot be detached from the control box, and in located 50 cm apart.

Fig. 1 Complete system without cables to computer and power supply, left main control box and right the sensor made of photodiode and green filter.

The system works outdoor, it is weather-tight and can withstand wind, rain and snow. it will prevent all intrusion of insects, even the smallest one. Nevertheless, the system is not submersible into water.

The base plate to attach the box and the sensor is not provided.

1.1 Control Box installation

The box has two fixing brackets on the side which allows to fix the system on a wall or other robust surface. It is also possible to fix it on a vertical surface, in that case have the 2 connectors downward. Bracket hole diameter are 6mm or ¼ ''. Attachment screws are not provided because their types are defined accordingly to the material where the box will be located.

Fig. 2 Control box

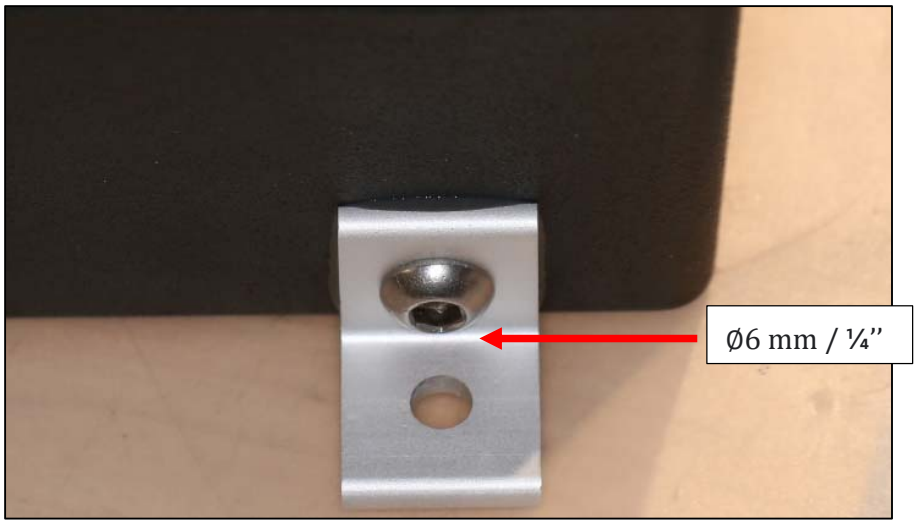


Fig. 3 Fixing brackets

Take care of the coaxial cable at the output of the box, it is short and fragile. Do not stretch it to the maximum length or/and avoid to twist it.

Connector keying and different number of pins are preventing connection errors. However, user must look at the number of connector pins at the end of the cord before connecting the camera, in order to avoid forcing the pins and damage the camera connector.

Fig. 4 Control box connectors side

Connector	Role	Gender (camera side)
#1	USB connector	Male 5 pins
#2	Power connector	Male 2 pins

USB connector (#1)

This is tied up to a 6 pins connector. Please connect the CSSM first and then connect to PC second. The cable that goes to the PC is 20m length.

Power connector (#2)

This is tied up to a 2 pins connector. This is 24V power supply. This is a 20m cable.

The 2 waterproof connectors (USB connector and Power connector) connect as follows:

- Identify the number of connector pins of the system, its type (male / female)
- Identify the number of pins of the connector cord and match.
- Identify the key pin inside the camera connector and the key at the connector cord side.
- Apply a rectilinear motion. **If insertion force strength persists, please repeat steps for locating the pin number and key. Excessive force applied to connector can cause the destruction of the connector or a bad connection can damage the system. In case of damage due to trials to attach cable to the wrong connector kind, warranty could be canceled.**

Fig. 5 Connectors' definition

Turn the connector a little bit, when you fell the two parts of the connector are facing, then the connector can be pushed into its counterpart. **You should never force it; it should be gentle!**

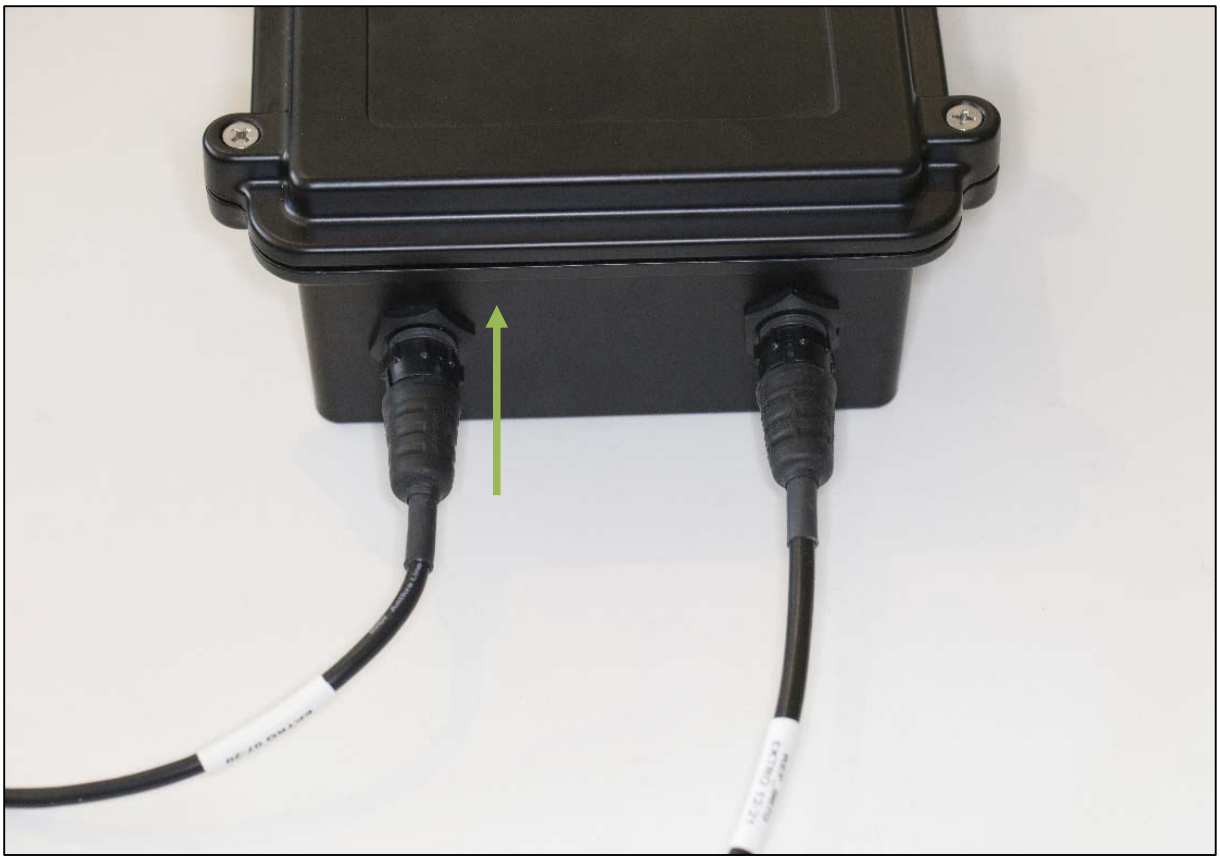


Fig. 6 Connector attachment step #1: go straight with proper key orientation

When the connector is correctly pushed you can turn the locking ring clockwise to attach it.

Fig. 7 Connector attachment step #2: rotate clockwise to have to lock the ring to prevent the cable from detaching

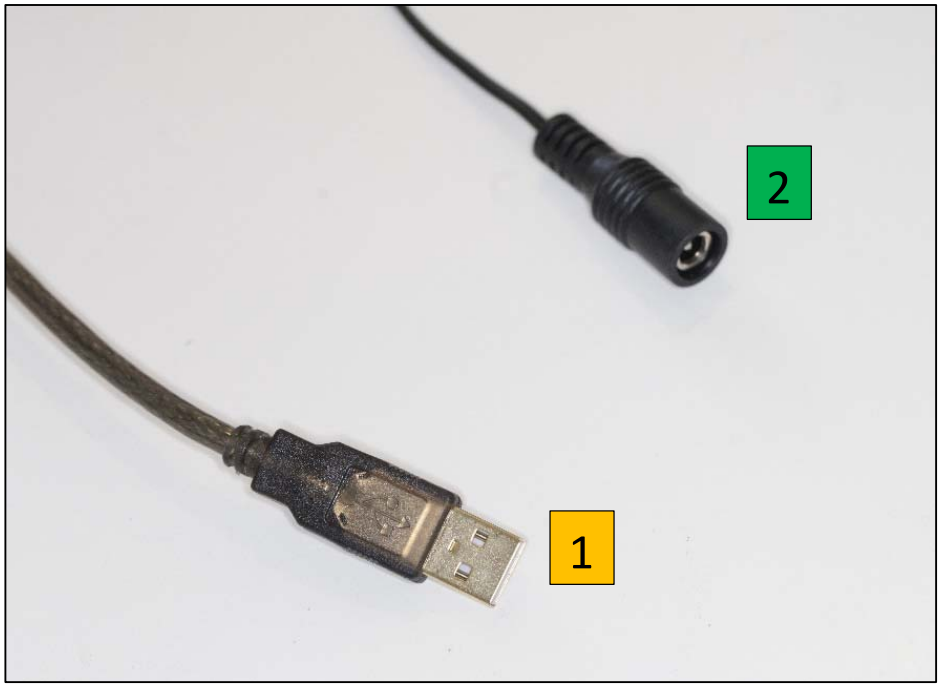


Fig. 8 Connectors opposite side from box

When the connector is correctly pushed you can turn the locking ring clockwise to attach it. On the other side connector #2 goes to the 24V/1.5A power supply, and connector #1 goes to any USB port of your PC. This is an USB 2.0 Link.

1.2 Sensor installation

The sensor is a photodiode placed into a waterproof casing in the backside of a special green filter (see below filter transmission) it peaks at 550 nm.
The sensor is placed on a mount head ball that can allow any angle of sight. This angle of sight is set once for all, depending on the latitude of the place and north/south directions.

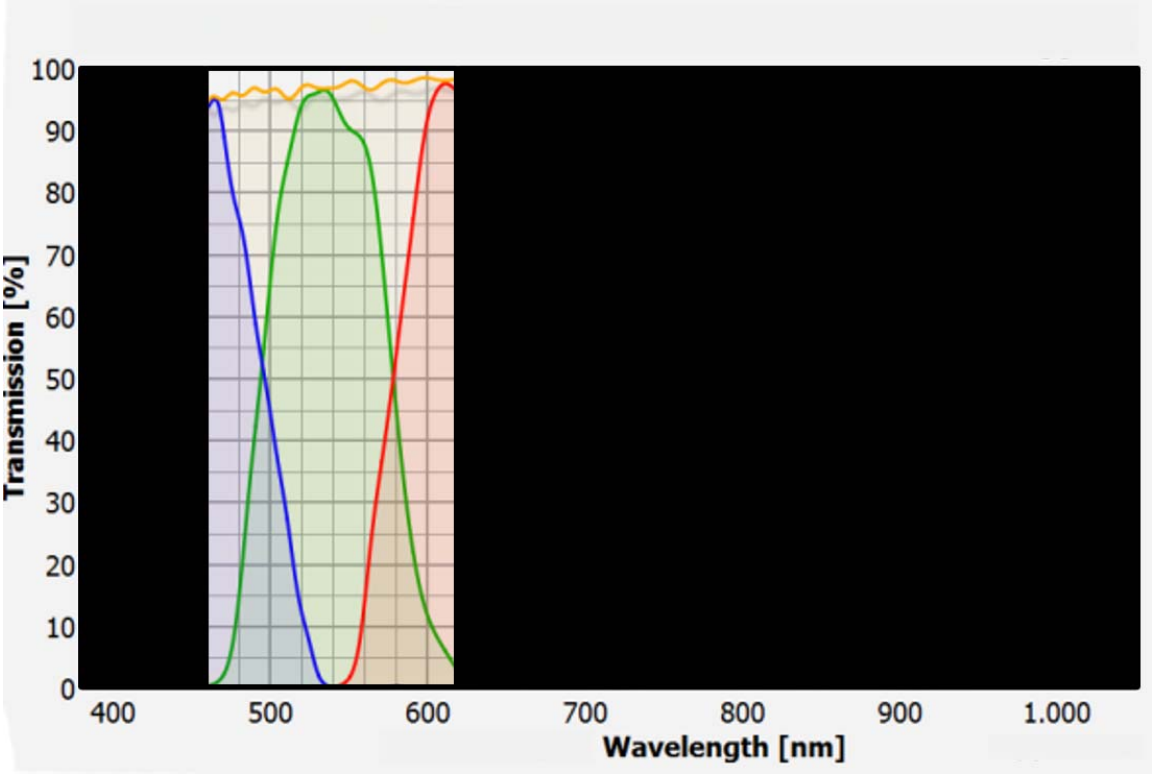


Fig. 9 Green filter transmission plot

It should face the SUN, more particularly the South (for northern hemisphere operation) or the North (for southern hemisphere operation) direction. The angle of the sensor with respect to horizontal plane is equal to 90° minus Latitude place angle.

For instance, if latitude is 30° North, it should be put aiming South in azimuth and at 60° angle of elevation from the horizontal plane.
Positioning accuracy is not critical, and +/- 5° error can be accepted.

Ensure that no building will hide the Sun during its path from sunrise to sunset. Also think, that over the course of the year the Sun position is changing, extreme values are from winter solstice to summer solstice.

The base of the ball support has a female thread 3/8'' 16 TPI UNC thread, allowing to attach it in a permanent position nearby the control box. Please, be sure both axis (azimuth and elevation) are tightened very firmly, so that it does not move over the course of the time because of the wind or the effect of the rain.

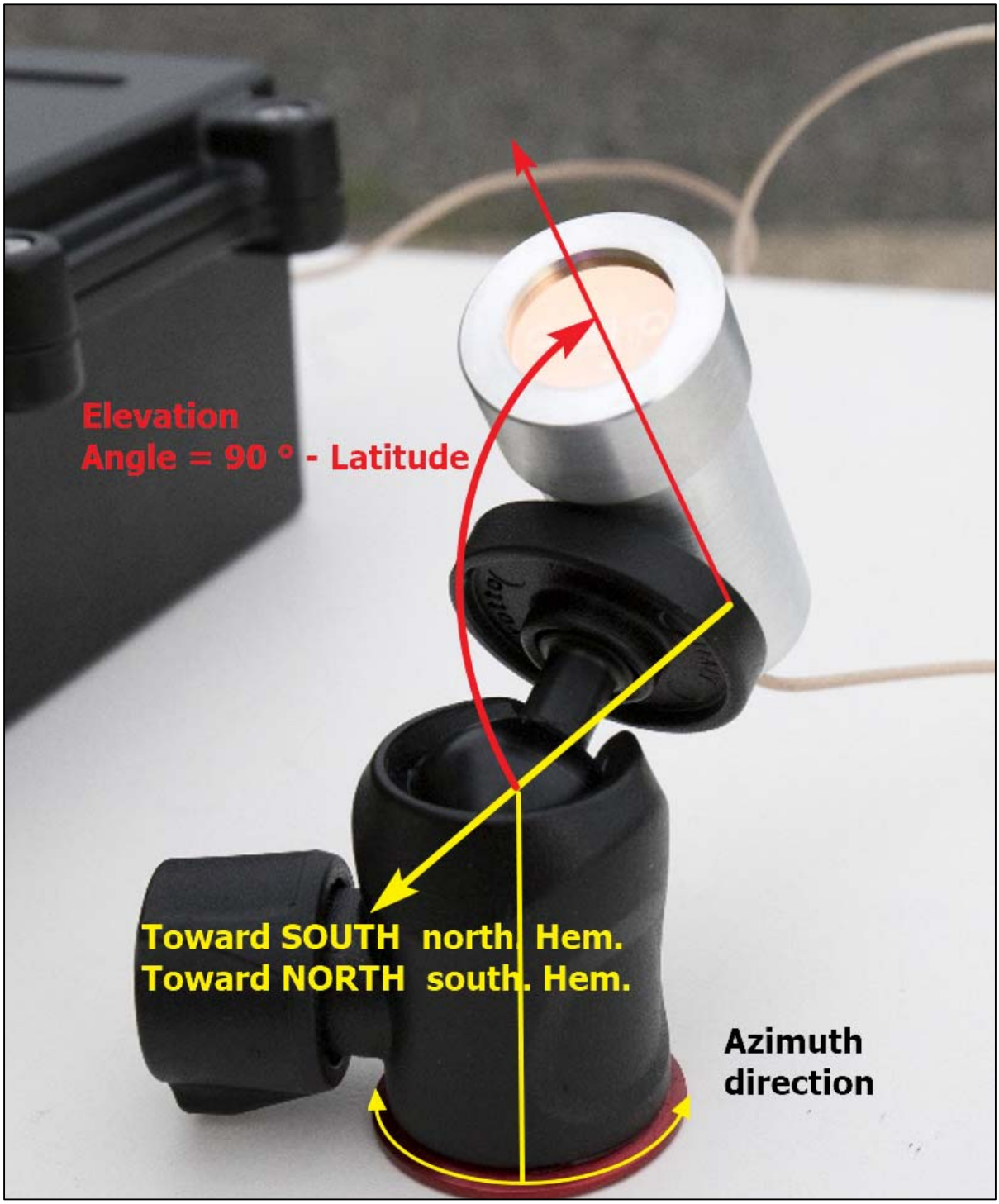


Fig. 10 Photodiode/sensor angle azimuth is set to north (or south) axis and elevation to 90° - latitude of the observing place.

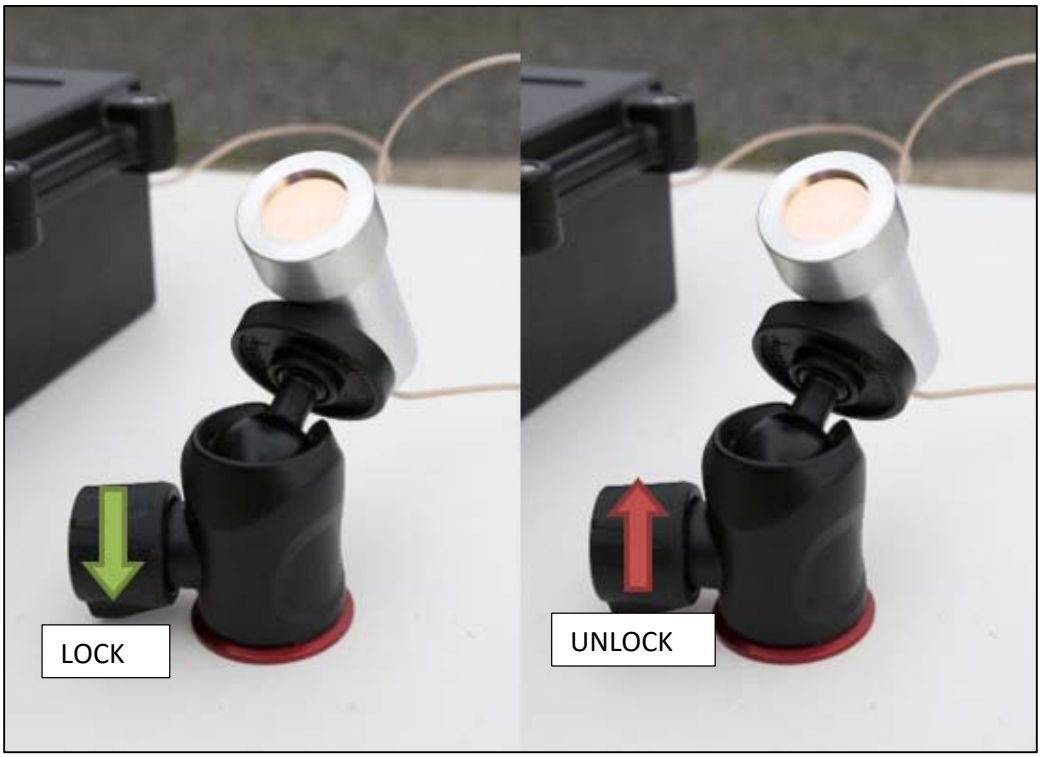


Fig. 11 Locking / Unlocking process of the elevation angle ball

System installation is complete and ready to go.

Important: the system works daytime, but does not provide any seeing data when Sun is hidden by clouds.

2 Software

Latest product software can be found in our web site:

http://www.alcor-system.com/common/CSSMS/software/CSSMS_Installer.exe

2.1 System requirement and operating system

Hardware requirement (Minimum) for CSSMS V1

- PC with AMD or Intel CPU, (with passmark index above 2000)
  - Intel Core i3-4012Y @ 1.50GHz (passmark index : 2000)
- 2 GB Memory
- 50 GB hard disk. Software requires 20 MB for installation, but storage must be granted for images.

Operating system requirement

- Windows 10, 8, and 7. 32- or 64-bits OS.
  May work with windows XP, but no support will be provided for this deprecated OS.

2.2 installation software

Warning, to make this installation it is important to connect the device first and only after install the software, this operation allows to change device's name to see if it's correctly connected. If you miss this step to check whether your device is connected or not could be more difficult.

The system is powered and connected, run **CSSMS_Installer.exe**, it will install all the software required for this device. The next screen copy shows you how installation runs.

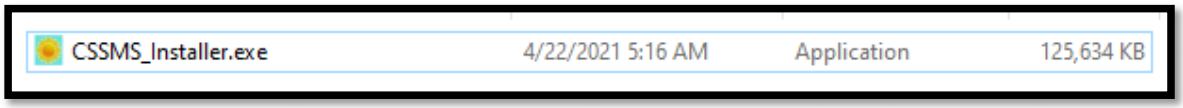


Fig. 12 Setup software

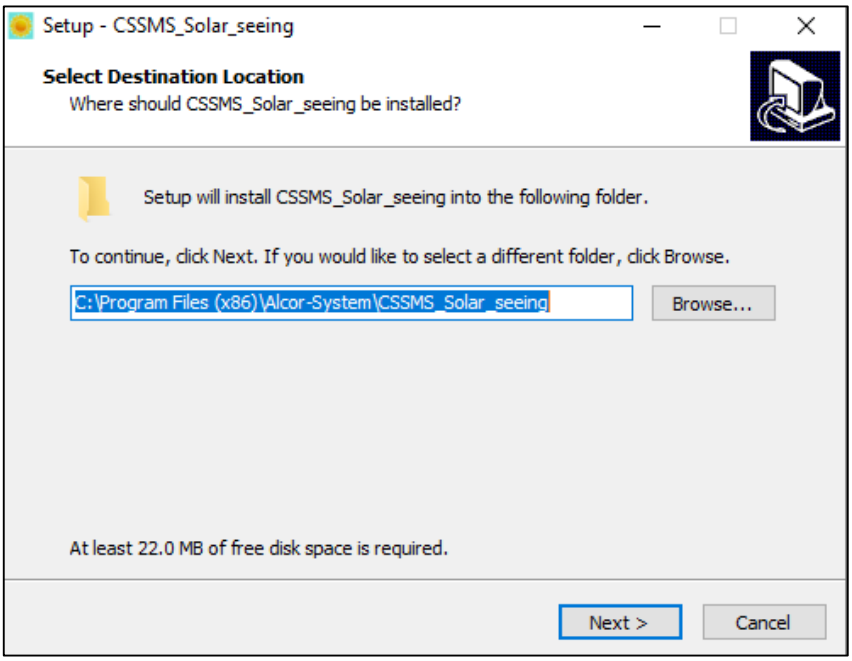


Fig. 13 Software folder definition

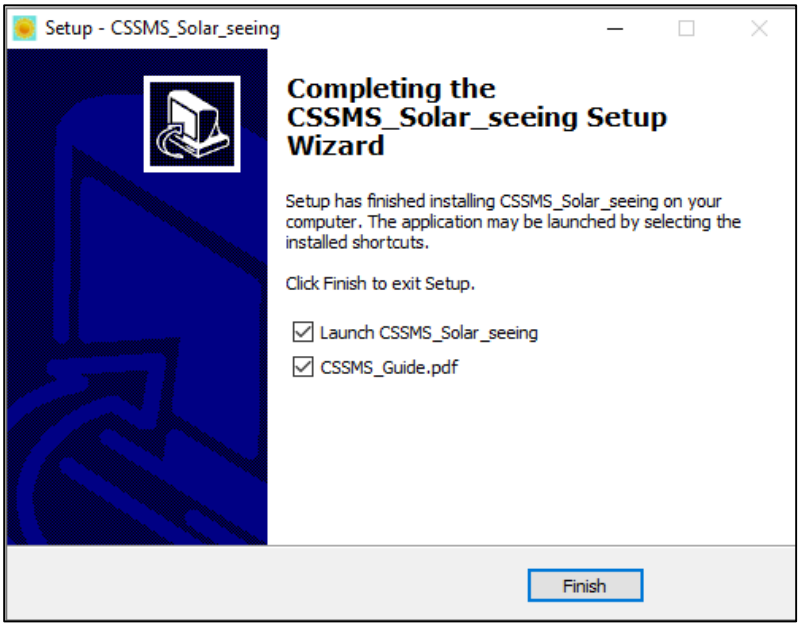


Fig. 14 Last installation step

At the end of the installation, two program icons on your desktop must appear. The first one is the main application which allows to use the CSSMS system. The second application icon is a java application which allows to carry out hardware update (if needed).

Fig. 15 Icons

Application files can be found at "**C:\Program Files (x86) \Alcor-System\CSSMS_Solar_seeing**".

This folder is meant to allow firmware updates

"**C:\Program Files (x86) \Alcor-System\CSSMS_Solar_seeing\Bootloader_App**"

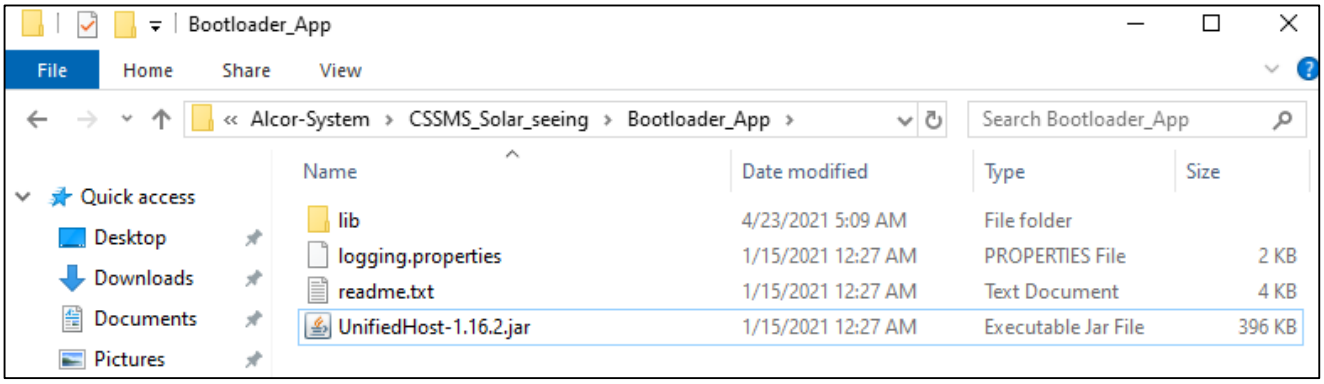


Fig. 16 Files needed for upgrading system firmware

This system uses HID, Human Interface Device, so **no specific driver needs to be installed**. The device in Windows's Device Manager named as "***CSSMS Seeing Monitor Device***" can be found in the HID list of devices. This shows that the CSSMS system is tied to the PC properly.

Fig. 17 Device Manager

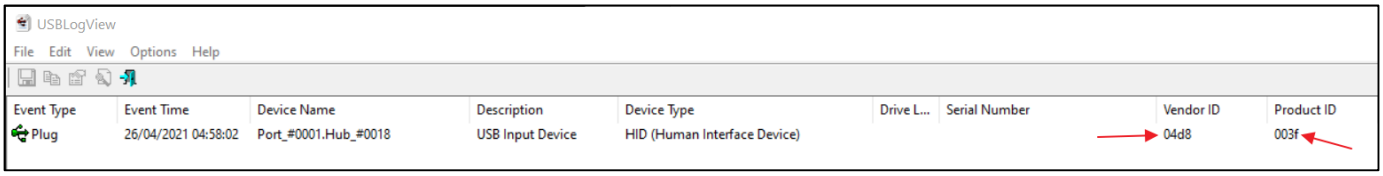
To check that the product is properly connected to the PC, PID and VID figures can be retrieved and checked.

PID : Product ID must be 003F
VID : Vendor ID must be 04D8

There is a quite useful software, that can help to check whether the CSSMS device has connected properly.

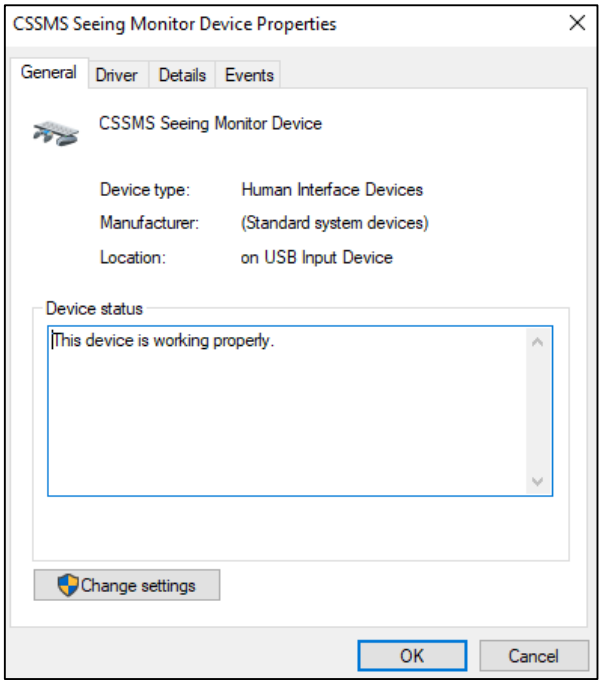
https://www.nirsoft.net/utils/usb_log_view.html

It can be installed and will help out to be sure the device is properly recognized. On USB connect this line should be added

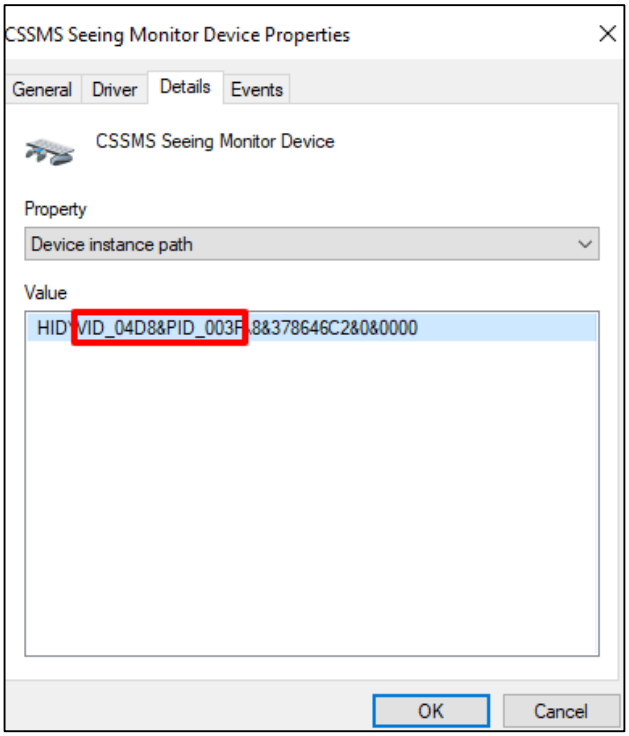


Vendor ID and Product ID are equal to the figures above.

Otherwise, another method can be used. Device manager properties must be opened and user have to search which one has the **PID/VID** figures written above.



In ***"Details"*** then ***"Device instance path"*** the **PID/VID** of your device can be found and check whether it matches or not.



Browse all HID devices that are listed in the device manager, until the good one is found.

Under Windows 10, after 30 to 60 seconds, if your device is correctly connected, this message should appear (at the bottom right of the screen)

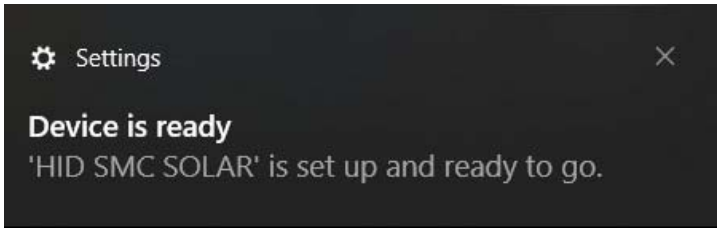


Fig. 18 Device Connection ack message

Important: If the CSSMS device is not recognized by Windows, the application, on startup seeks for the CSSMS, and if not detected will display an error message and close himself.

Control box USB cable must be connected both side, and powered properly prior starting the software that performs measurements.

2.3 Software User Interface

This software has 5 panels

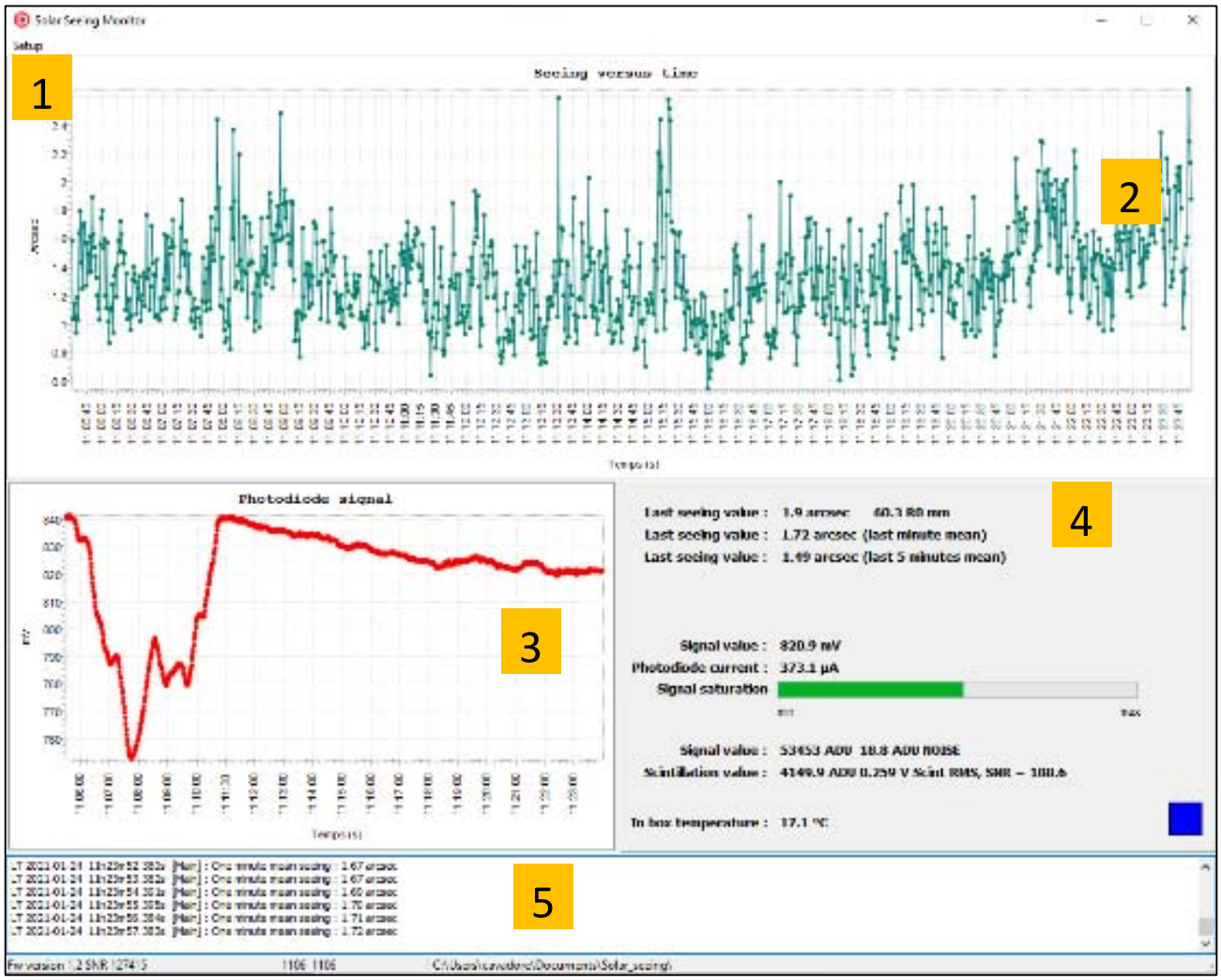


Fig. 19 Main program panel

Part #1	Setup Menu
Part #2	Seeing plot versus time
Part #3	Photodiode / SUN mean signal chart
Part #4	Seeing figure and other information
Part #5	Log output

- Part 1: Setup Menu

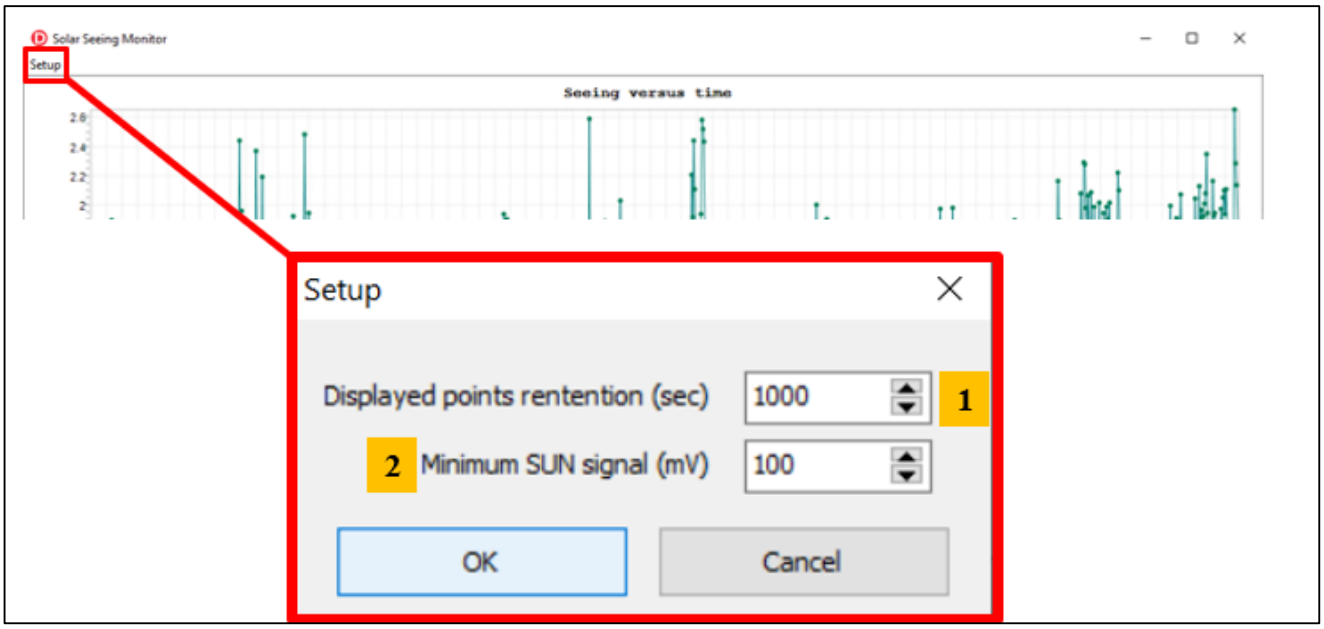


Fig. 20 Setup menu

1: Time span which can be plotted, before graphics will scroll horizontally.

2: Minimum of Sun signal to allow seeing data to be computed.

- Part 2: Seeing plot versus time

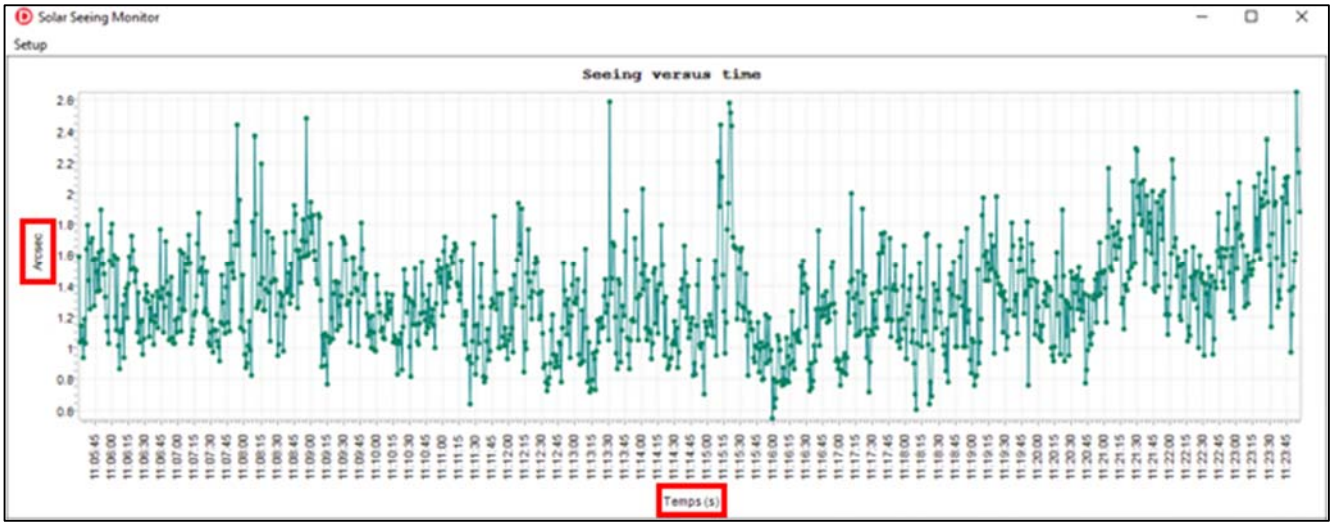


Fig. 21 Seeing versus time

This plot shows the seeing (expressed in arcsec) measured by the system over the time. One measurement point is added each second of time (based on 25 000 measurements per sec of SUN's scintillation).

A good "seeing" figure is below 2 arcsec. This is a seeing figure computed in compliance with the Fried's theory definition of seeing.

NOTE : the seeing computed by this system, **is from the line of sight of the SUN and the photodiode**, this is not zenithal equivalent seeing.

- Part 3: Photodiode signal

This part shows the signal received by the photodiode versus time. Y axis shows the voltage of the photodiode in mV.
This mean SUN signal can change with atmosphere transparence, and especially with clouds presence. Also with SUN position, because the sensor does not track the SUN. Photodiode and SUN angle is changing with the course of the time. If thin clouds are present, level can be above threshold but seeing figure will be close to zero, and thus not valid also.
Under a given threshold, no seeing measurement are performed. This threshold can be set by the user.

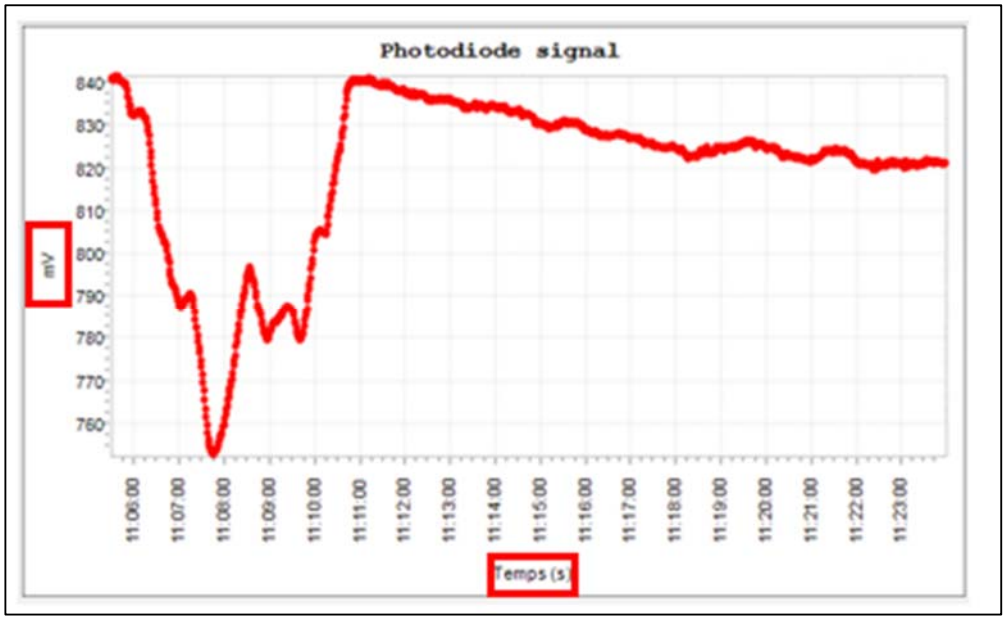


Fig. 22 Photodiode mean SUN signal

- Part 4: Information

This part shows the main information about the system.

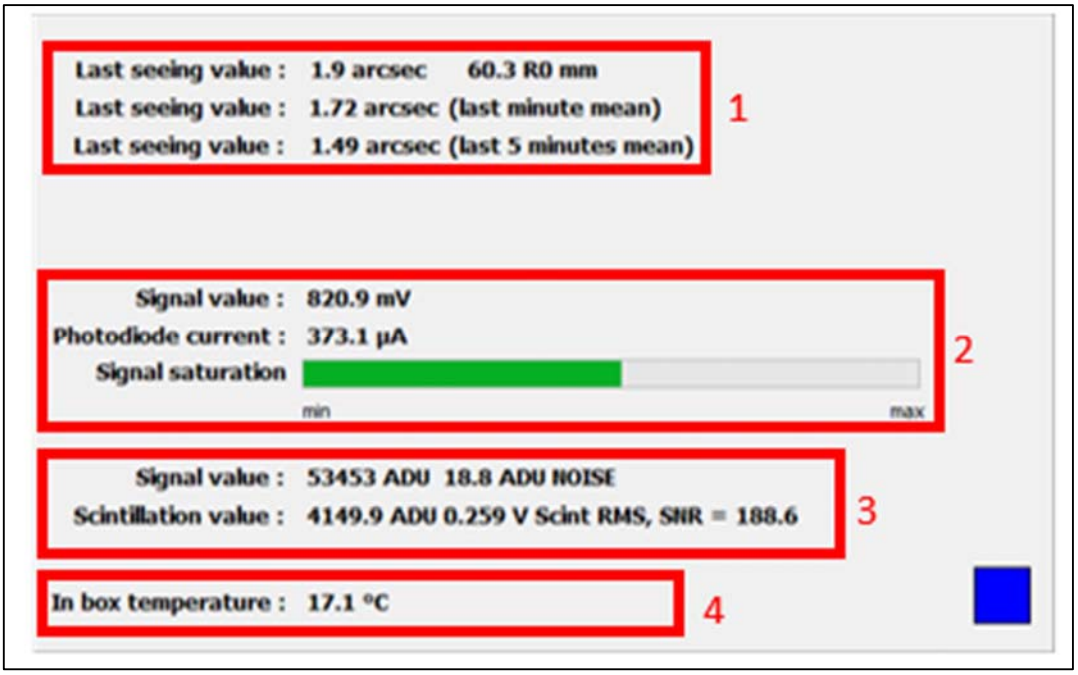


Fig. 23 system Information

Last Seeing figure measured, last minute mean and last 5 min mean (1).
Information about photodiode, reflecting mean SUN signal (2).
Advanced information, with noise levels, mostly used for debugging purposes (3).
Last measured temperature inside the box (4).

- Part 5: Log panel

The log panel writes information that the software can display. This is for debugging purposes.

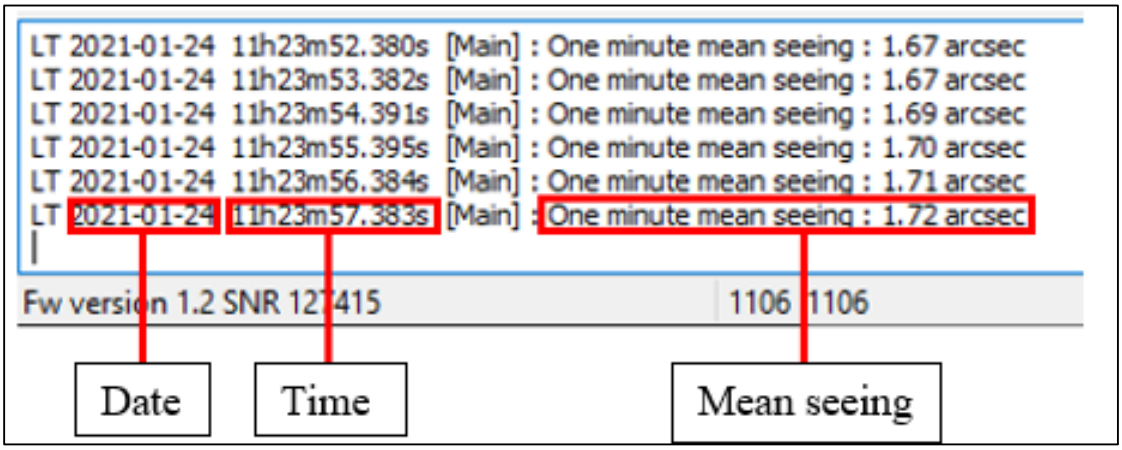


Fig. 24 Log

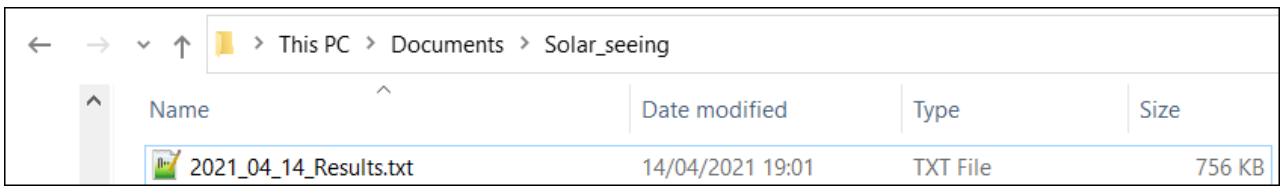
2.3.1 Recorded data

The software records all the seeing data into a text file and appends new data to this file. This is the folder where the measurements are stored

C:\Users\[Logged user name]\Documents\Solar_seeing

This is a simple ASCII text file and can be opened with any software such as notepad++, excel, or other software called "***YYYY_MM_DD_result.txt***". The filename is set so that one file is produced per day.

Where YYYY is the current year i.e 2021 … MM is the month of the year from 01 to 12, and DD is from 01 to 31 (depending on the month).



Here is the ascii data, edited with notepad++ each line is a measurement (once a second).

The first line will provide information of each column and is self-explanatory.

C:\Users\cavadore\Documents\Solar_seeing\Results.txt - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

change.log | notes.txt | Results.txt

Local Date	UTC Date	Julian Day	Signal (mV)	Seeing Arcsec	Fried R0 mm
24/01/2021 11:06:35	24/01/2021 10:06:35	2459238.9212388	804.6	1.26	90.3
24/01/2021 11:06:36	24/01/2021 10:06:36	2459238.9212505	804.3	1.18	96.3
24/01/2021 11:06:37	24/01/2021 10:06:37	2459238.9212621	804.1	1.34	84.9
24/01/2021 11:06:38	24/01/2021 10:06:38	2459238.9212736	803.4	1.02	111.3
24/01/2021 11:06:39	24/01/2021 10:06:39	2459238.9212852	802.7	1.17	97.3
24/01/2021 11:06:40	24/01/2021 10:06:40	2459238.9212968	802.4	1.20	94.3
24/01/2021 11:06:41	24/01/2021 10:06:41	2459238.9213084	802.2	1.36	83.4
24/01/2021 11:06:42	24/01/2021 10:06:42	2459238.9213199	801.7	1.13	100.8
24/01/2021 11:06:43	24/01/2021 10:06:43	2459238.9213315	800.7	1.32	85.7
24/01/2021 11:06:44	24/01/2021 10:06:44	2459238.9213431	799.4	1.76	64.4
24/01/2021 11:06:45	24/01/2021 10:06:45	2459238.9213547	798.5	1.32	85.9
24/01/2021 11:06:46	24/01/2021 10:06:46	2459238.9213662	797.8	1.38	82.0
24/01/2021 11:06:47	24/01/2021 10:06:47	2459238.9213778	796.0	1.10	103.0
24/01/2021 11:06:48	24/01/2021 10:06:48	2459238.9213893	795.0	1.26	90.1
24/01/2021 11:06:49	24/01/2021 10:06:49	2459238.9214011	793.7	1.69	67.2

3 System maintenance

It is advisable to clean from time to time (say three time a year), the top of the SUN sensor, to avoid accumulation of unwanted dusts or atmospheric contaminants that will dim the signal. Use alcohol, and clean and soft tissue. The input window is quite resilient to scratches (hard coating).

Fig. 25 SUN sensor

4 Trouble shooting

This section aims at providing hints to solve issues.

4.1 System does not deliver any measurements

The USB port driver might be non-connected or outdated, please update USB port driver. Also change USB port on your PC, sometime some USB are slightly damaged (ESD) with the course of the time.

If the issue persists, please contact us, the long 20 m USB extender cable might be also damaged, check that no damage has occurred on this cable (no small animal has started to eat the USB cable for instance).

5 Product terms of use

The use of this product is solely for getting seeing figure in the line of sight of the SUN, entertaining, educational or scientific purposes.

Use of this product involving people's lives is the responsibility of the user and in no way ALCOR SYSTEM will be held liable for injuries to persons or property theft as the use of this system described in this manual.

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