

FireCapture plugin for Solar Scintillation Seeing Monitor

User's manual

v0.92

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Introduction

The FireCapture plugin “SSSMon” provides the possibility of automated image recording sessions based on the current seeing. For seeing measurement a Solar Scintillation Seeing Monitor is necessary.

Two types of seeing monitors are supported by this plugin: an Arduino based DIY device and a commercially available device.

A circuit diagram and build instructions for an inexpensive DIY device can be found in this document: ["An Inexpensive Solar Scintillation Seeing Monitor Circuit with Arduino Interface"](#) (Note: I am not the author of the document and the hardware is not my development - credits to the original author!).

SSSMon also supports the Solar Scintillation Seeing Monitor “SSM” available from [AiryLab](#).

The plugin provides the following functionality:

- SSSMon measures the current seeing
- Recording is started if seeing reaches configured minimum quality
- Frames are rejected as long as long as seeing is worse than configured value
- Recording is stopped after configured time
- After recording is stopped and after a configured pause time, a new recording run can be started automatically
- The maximum number of recording runs is configurable
- Display and save plot of seeing measurements

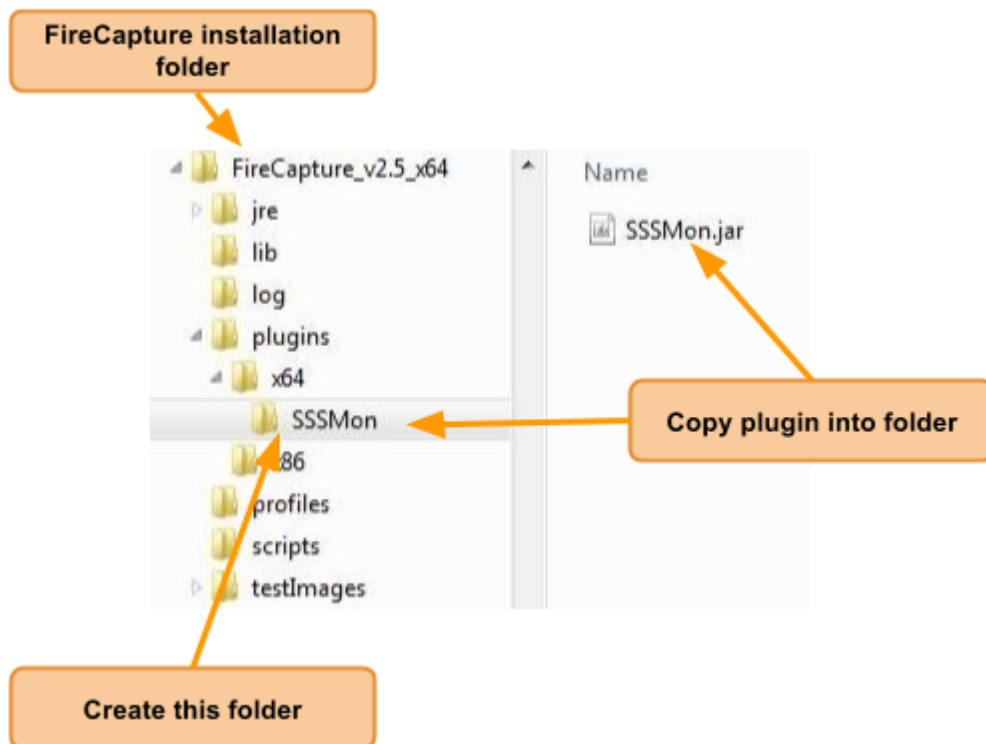
Special thanks to Torsten Edelmann for providing the great imaging software FireCapture with plugin interface. Thanks to Robert Pudlo and Clancy Cochran for testing the SSSMon software. Thanks to E. J. Seykora for providing the basic Information, schematic of the DIY device and for kindly answering my questions.

Thanks to [AiryLab](#) for providing the necessary information to support the AiryLab SSM.

This plugin incorporates [JFreeChart](#), a great and free Java chart library.

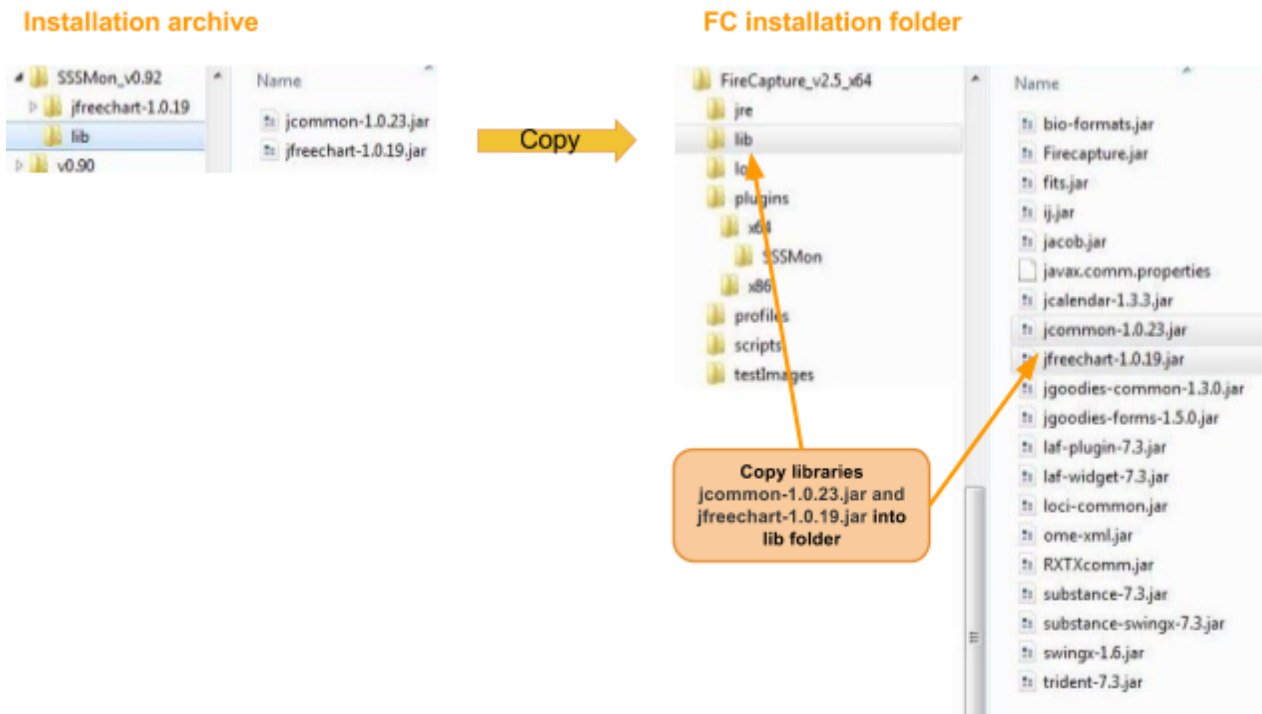
Installation

- Read file readme.txt for required software versions
- Create a folder named SSSMon in folder
<FC installation folder>\plugins\x86 or
<FC installation folder>\plugins\x64 (depending on Windows version)

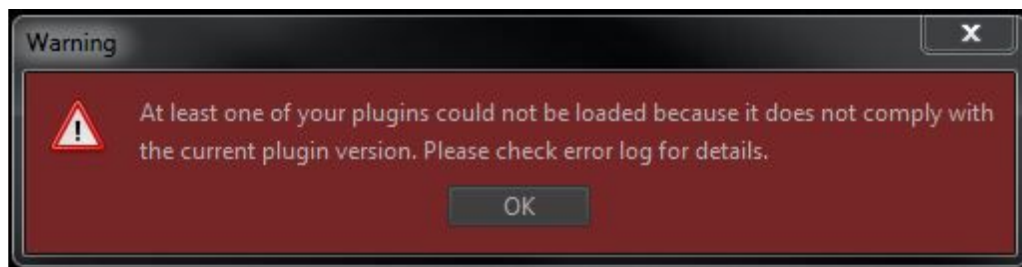


- Copy SSSSSMon.jar into this folder

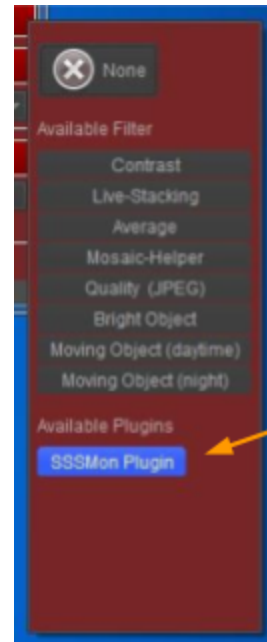
- Copy files jcommon-1.0.23.jar and jfreechart-1.0.19.jar from the lib folder of the installation archive into the lib folder of the FC installation folder:



- Start FireCapture
- If the following message appears, the plugin version is not compatible to the FireCapture version:



- Select SSSMon plugin in section PreProcessing (press button “None” if no plugin is selected)



Press to open plugin list

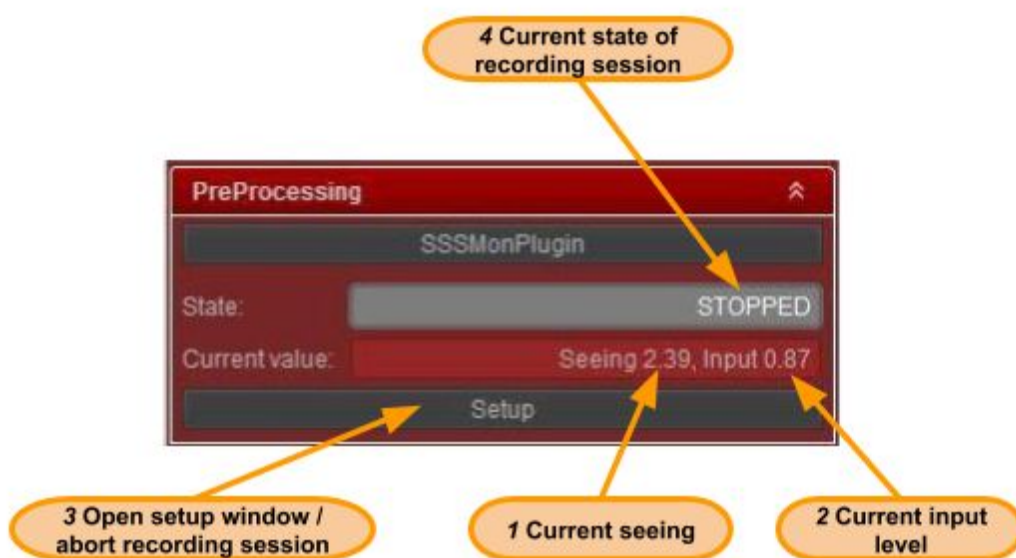
Select plugin

- Connect SSSMon device
Note: You need to install special firmware for the DIY SSSMon device adapted to this plugin. This modified firmware is provided at http://www.joachim-stehle.de/sssm_eng.html

Note: The sources of the library JFreeChart included in the installation archive are not required for the plugin.

Plugin Interface

If the SSSMon plugin is selected, the plugin interface is displayed in section “PreProcessing” of the FireCapture window.



1 Current seeing

Current seeing measured by the SSSMon device.

Note: Lower values mean better seeing!

2 Current input level

Light intensity level measured by the SSSMon device. The sensitivity of the device must be adjusted to input levels higher than 0.5. It is strongly recommended to keep the input level smaller than 1.0 for precise measurements.

3 Setup/Stop button

Press button to open setup window. During execution of recording sessions, the button is labeled “Stop” and can be pressed to abort the recording session.

4 State of recording session

Press button to open setup window. During execution of recording sessions, the button is labeled "Stop" and can be pressed to abort the recording session.

STOPPED	No recording session scheduled
READY	Recording session active, waiting for seeing better than trigger threshold
PRE_RUN	Seeing is currently better than trigger threshold, waiting for configured stabilization time with seeing always better than trigger threshold (see section "Setup")
RUNNING	Recording running
PAUSED	Captured frames are temporarily discarded caused by seeing worse than configured discard threshold (see section "Setup")
POST_RUN	Recording run finished, waiting for configured delay between runs until next recording run

Setup

Open setup window by pressing button "Setup" in plugin interface. Select COM port of SSSMon device and press button "Connect".

Note:

During first connect the FireCapture screen might freeze for some seconds while serial driver DLL is loaded.

Press "OK" to apply changes.



1 COM port

Select COM port for connection with SSSMon device.

2 Connect/Disconnect button

Connect opens COM port, connects to SSSMon device and changes button text to "Disconnect". Connection can be closed by pressing "Disconnect".

3 Trigger threshold

Minimum seeing quality for start of a recording run (Note: smaller values mean better seeing).

4 Stabilization time

Minimum time (in seconds) of seeing better than trigger threshold until recording run is started. Using this value prevents from starting a recording run by short “spikes” of good seeing. For immediate start configure 0s.

5 Discard threshold

Discard threshold during recording run. Frames are discarded while seeing is worse than this value during recording run. This offers the possibility to configure a kind of hysteresis or seeing range between the trigger threshold and the threshold for discarding frames.

6 Max recording time

This is the maximum time span between the first recorded frame and the last recorded frame in one recording run. If the seeing becomes worse than the discard threshold during recording, the total recording time of the captured file is smaller than the maximum recording time.

7 Delay between runs

Delay time between recording runs.

8 Max run count

Maximum number of recording runs.

9 Audio signal at start

If enabled, an audio signal (sound) is played when a recording run starts.

10 Write frame log

If enabled, a log file is written with seeing values for each captured frame (see section “SSSMon Log File”).

11 Samples/Measure

The latest firmware of the DIY monitor device calculates two seeing values. One value is calculated of 2000 samples (about 2 values per second) and one value of 10000 samples (about 1 value per 2.5-3 seconds). 2000 samples provide faster reaction times but might ignore scintillation with lower frequencies.

Note: This option is ignored for the AiryLab SSM device.

12 Chart button

Press button to open chart window with plot of seeing values.

The example setup in the figure above will start recording as soon as seeing is 2.0 or less for 10 seconds (smaller value means better seeing). The recording is stopped after 45 seconds. Captured frames are discarded as long as the seeing is worse than 2.5. After each recording run there is a minimum delay of 5 minutes (300 seconds) until the next recording might start (if the seeing is then at least 2.0 for 10 seconds again). A maximum of 10 recording runs is executed.

Start and Stop Recording Sessions

The start and stop buttons of the FireCapture section “Capture” are used to start and stop recording sessions.



1 Start button

Press button to start recording session.

2 Stop button

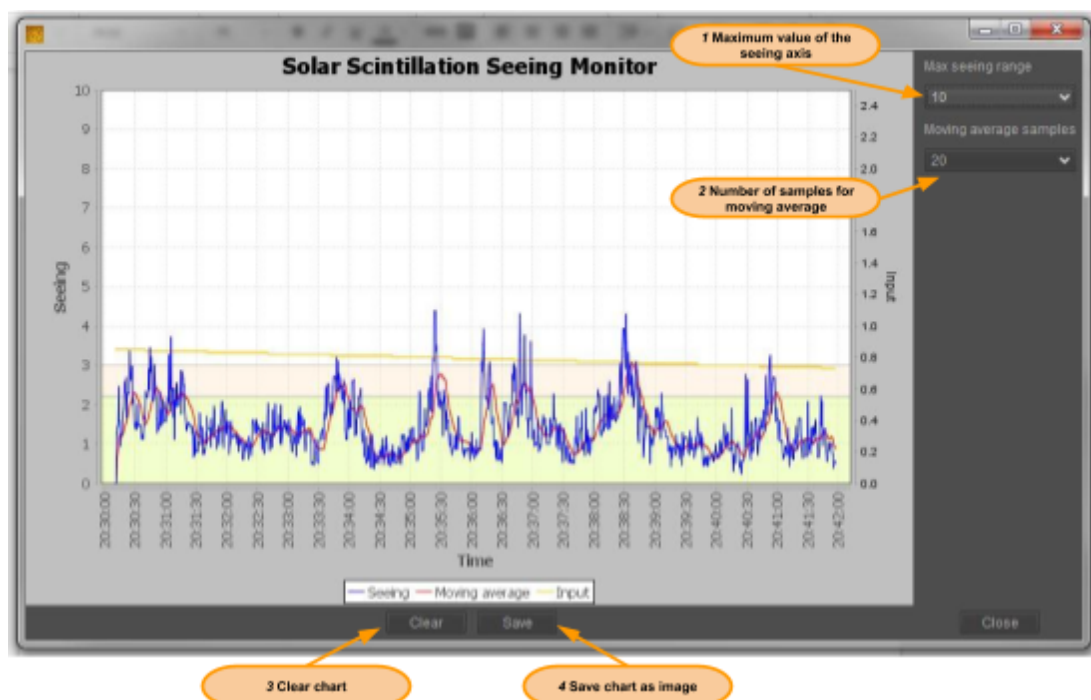
Press button to stop recording session. This button is enabled only during an active recording run. During waiting times (waiting for better seeing or delay between recording runs) this button is disabled. In these cases press button “Stop” in SSSMon plugin to stop the recording session.

Seeing chart

The main part of the chart windows shows the measurement values plotted on a time axis. Three lines are plotted:

- Seeing (blue)
- Moving average of seeing (red)
- Input (Light intensity, yellow)

The green area of the chart covers seeing better than the configured trigger threshold while the orange area covers seeing better than the configured discard threshold.



1 Max seeing range

Set maximum value of the seeing axis. By default the maximum is set to 10 (the maximum value of measurement range). Setting to smaller values offers the possibility to zoom the seeing axis.

2 Moving average samples

An additional plot is drawn with a moving average of the latest seeing values to provide a smoother plot. Select the number of values used for calculation of the moving average.

3 Clear button

Clears the chart.

4 Save button

The current chart can be saved as JPEG image file. Press “Save” button to open file save dialog.

Log Files

FireCapture Log File

The plugin adds three lines into the FireCapture log file recorded for each recorded file:

“SSSMon best seeing”: Best seeing during recording run

“SSSMon average seeing”: Average seeing during recording run

“SSSMon threshold”: Configured trigger threshold for start of recording run

SSSMon Log File

The SSSMon log file contains for each captured frame the frame number, the latest seeing value and the intensity input level at the time when this frame was captured. The log file is written in CSV format and can be imported into other software like Excel.

Writing of the log file can be enabled or disabled in the setup dialog.

The log file is stored in the SSSMon plugin folder.

Hints

- The plugin assigns suffix “_SSSM” to the file names of captured files.
- Install sensor of SSSMon device close to the scope lens. The sensor is very sensitive to local seeing. If e.g. the sensor is placed on a table in the sunlight, the seeing caused by the heat from the table causes significant changes of the measurement. I have attached the sensor to the objective lens of the telescope.
- The seeing monitor device mainly measures seeing caused by atmospheric turbulence at lower levels (near ground). It is less sensitive to seeing caused by higher atmospheric levels (e.g. caused by jet streams).

More Information

- Description of the original monitor device: ["An Inexpensive Solar Scintillation Seeing Monitor Circuit with Arduino Interface"](#).
- [Latest versions of SSSMon plugin, arduino sketch and additional software](#)
- [FireCapture website](#)
- Thread at SolarChat describing the development of the DIY monitor device: [DIY Solar Scintillation Seeing Monitor with FC support](#)
- Solar scintillation and the monitoring of solar seeing, Seykora, E. J., Solar Physics (ISSN 0038-0938), vol. 145, no. 2, p. 389-397
- AiryLab [Solar Scintillation Monitor](#)

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Contact

Comments, error reports and suggestions for improvement are welcome. Please report to

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