Time-Stamp Verification with - SEXTA

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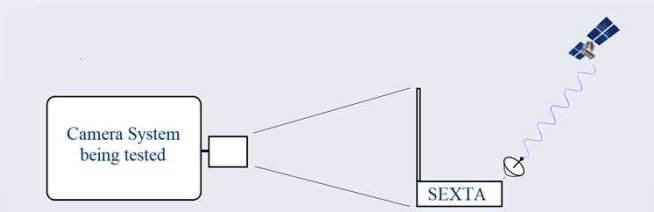
Southern EXposure Time Analyzer - SEXTA

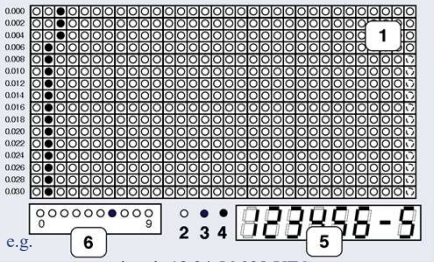
SEXTA is a time-stamp verification device that can be used with any camera and recorder, and offers temporal resolution of 2 msec UTC.

SEXTA-Reader is an application to load FITS (and other file format) image files, and will decode the LED display and provides exposure information for both the SEXTA display and the FITS header. It allows for the examination image sequence continuity and inter-frame dead time, as well as batch processing, output to .csv file.

SEXTA uses inexpensive, off-the-shelf components, requires minimal assembly and requires no high-voltage components or connections. The source code, wiring diagrams and applications are provided to aid the successful construction and use of the device.

SEXTA schema





1. DMD panel of 500 LEDs.
2. 1pps LED
3. DMD-Lock LED
4. Almanac-OK LED
5. A 7-segment LED array to indicate HH:MM:SS UTC and the number of satellites in the GPS fix
6. An array of ten LEDs to indicate the last digit of UT integer seconds 0-9

e.g.

exposure start time is 12:34:56.038 UTC

exposure end time is 12:34:56.070 UTC

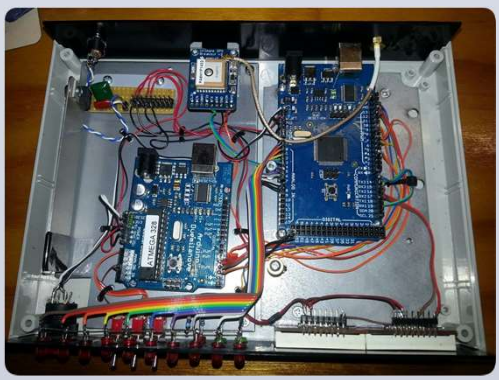
The system has 5 satellites in the fix, the almanac is current and the DMD panel is locked to GPS-1pps.

The image does not contain a UT integer boundary, so the 1pps LED is not lit.

Example of SEXTA construction

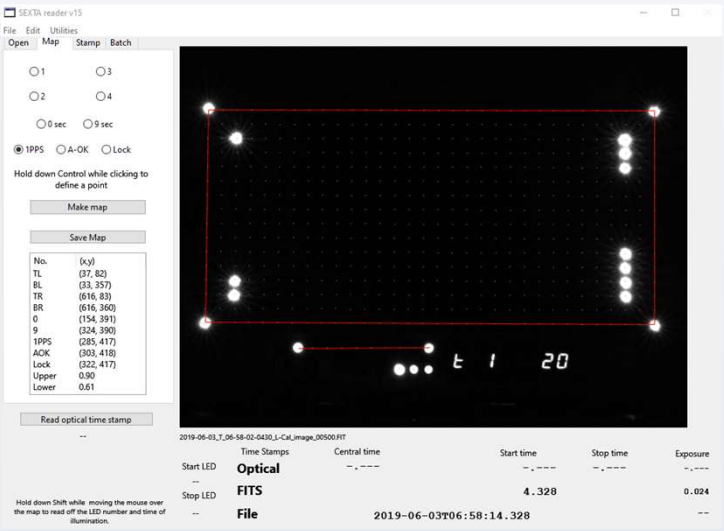
SEXTA - main components

- Arduino MEGA
- Arduino Duemilanova
- PA6H GPS receiver
- 2x Sparkfun 7-Segment LED Array
- 11x red LEDs
- 2x green LEDs
- Lots of hookup wire and superglue ;-)

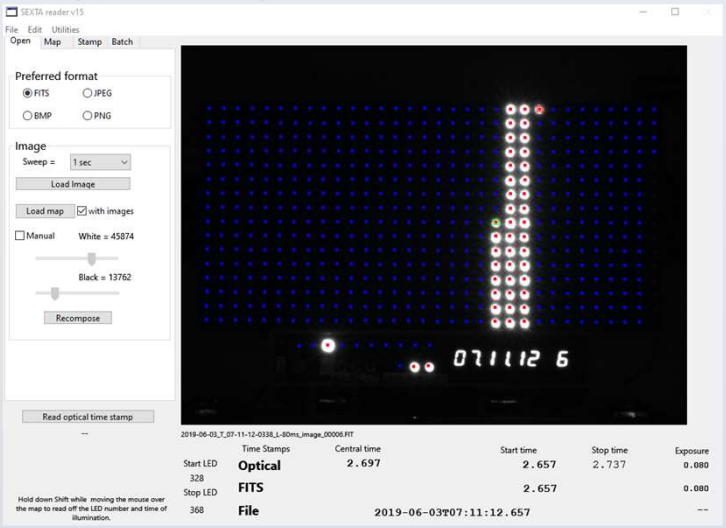


SEXTA-Reader Analysis

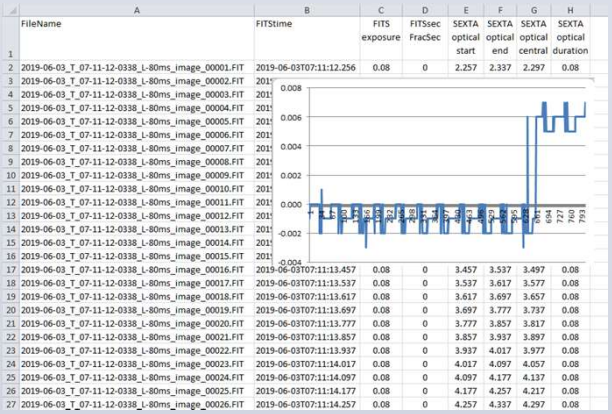
A calibration image of SEXTA startup illuminates reference LEDS so a map can be defined



SEXTA display is decoded and compared to FITS-Header time.



Batch processing of images allows analysis of many minutes or hours of running.



	A	B	C	D	E	F	G	H
1	FileName	FITStime	FITS exposure	FITSsec FracSec	SEXTA optical start	SEXTA optical end	SEXTA optical central	SEXTA optical duration
2	2019-06-03_T_07-11-12-0338_L-80ms_image_00001.FIT	2019-06-03T07:11:12.256	0.08	0	2.257	2.337	2.297	0.08
3	2019-06-03_T_07-11-12-0338_L-80ms_image_00002.FIT	2019						
4	2019-06-03_T_07-11-12-0338_L-80ms_image_00003.FIT	2019						
5	2019-06-03_T_07-11-12-0338_L-80ms_image_00004.FIT	2019						
6	2019-06-03_T_07-11-12-0338_L-80ms_image_00005.FIT	2019						
7	2019-06-03_T_07-11-12-0338_L-80ms_image_00006.FIT	2019						
8	2019-06-03_T_07-11-12-0338_L-80ms_image_00007.FIT	2019						
9	2019-06-03_T_07-11-12-0338_L-80ms_image_00008.FIT	2019						
10	2019-06-03_T_07-11-12-0338_L-80ms_image_00009.FIT	2019						
11	2019-06-03_T_07-11-12-0338_L-80ms_image_00010.FIT	2019						
12	2019-06-03_T_07-11-12-0338_L-80ms_image_00011.FIT	2019						
13	2019-06-03_T_07-11-12-0338_L-80ms_image_00012.FIT	2019						
14	2019-06-03_T_07-11-12-0338_L-80ms_image_00013.FIT	2019						
15	2019-06-03_T_07-11-12-0338_L-80ms_image_00014.FIT	2019						
16	2019-06-03_T_07-11-12-0338_L-80ms_image_00015.FIT	2019						
17	2019-06-03_T_07-11-12-0338_L-80ms_image_00016.FIT	2019-06-03T07:11:13.457	0.08	0	3.457	3.537	3.497	0.08
18	2019-06-03_T_07-11-12-0338_L-80ms_image_00017.FIT	2019-06-03T07:11:13.537	0.08	0	3.537	3.617	3.577	0.08
19	2019-06-03_T_07-11-12-0338_L-80ms_image_00018.FIT	2019-06-03T07:11:13.617	0.08	0	3.617	3.697	3.657	0.08
20	2019-06-03_T_07-11-12-0338_L-80ms_image_00019.FIT	2019-06-03T07:11:13.697	0.08	0	3.697	3.777	3.737	0.08
21	2019-06-03_T_07-11-12-0338_L-80ms_image_00020.FIT	2019-06-03T07:11:13.777	0.08	0	3.777	3.857	3.817	0.08
22	2019-06-03_T_07-11-12-0338_L-80ms_image_00021.FIT	2019-06-03T07:11:13.857	0.08	0	3.857	3.937	3.897	0.08
23	2019-06-03_T_07-11-12-0338_L-80ms_image_00022.FIT	2019-06-03T07:11:13.937	0.08	0	3.937	4.017	3.977	0.08
24	2019-06-03_T_07-11-12-0338_L-80ms_image_00023.FIT	2019-06-03T07:11:14.017	0.08	0	4.017	4.097	4.057	0.08
25	2019-06-03_T_07-11-12-0338_L-80ms_image_00024.FIT	2019-06-03T07:11:14.097	0.08	0	4.097	4.177	4.137	0.08
26	2019-06-03_T_07-11-12-0338_L-80ms_image_00025.FIT	2019-06-03T07:11:14.177	0.08	0	4.177	4.257	4.217	0.08
27	2019-06-03_T_07-11-12-0338_L-80ms_image_00026.FIT	2019-06-03T07:11:14.257	0.08	0	4.257	4.337	4.297	0.08

References and Contact details

Paper - http://arxiv.org/abs/1503.05705

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