

NSFCAM's GSP Based Timer Support

1. How does NSFCAM time stamp its data?

The NSFCAM IC Computer, camic, is equipped with a AITG-PC. The AITG-PC is a Synchronizable Time Generator for the PC ISA Bus by KSI, A division of Odetics. The AITG performs time and synchronization functions referenced to an input time code signal. An IRIG-B signal must be provided from a GPS Receiver/Antenna in order for the AITG to synchronize its internal clock. There is no propagation delay programmed in to compensate for cable delays.

When NSFCAM starts a GO sequence it reads the time to be stored in the FITS headers. Remember, the OBSTIME in the FITS header is when the GO sequence was started.

The IC can obtain this Time of Data Acquisition from 2 source: The PC's internal system clock, or the AITG-PC Timer board. The command GPSTIME {off | on} controls which time source is used.

When On, the AITG is used.

When OFF, the PC clock is used.

NSFCAM's defaults to GPSTIME ON.

2. How to determine if the GPS is on/working?

The simplest way is to compare the AITG time to the actually time (referenced to another clock). When the PC boots, the AITG begins at day 0, time 00:00:00. So unless it sync up to the GPS receiver's time code, it should be very apparent that the time is wrong. Also, if you look on the back of the camic computer, the GPS board provides 2 LEDs:

Red LED indicates No Time Code Signal is present.

Green LED indicates a Valid Time Code Signal is present.

If the RED led is on, please check to make sure the IRIG input is connect to the IRIG-B output from the GPS Receiver.

Here are 2 ways to compare the PC's system clock with the AITG:

1. If the camic on running. Go to the IC console and view the Time in the upper – right corner. The current time is displayed. If the label says 'GPSTime', then the AITG used used as the time source. If the label says 'PC Time', the PC's system clock is used.

You can toggle between the two sources using the GPSTIME { off | on } command.

2. If you wish to compare the PC's system clock and the GPS clock, login on to the camic computer and run the ShowAITGTime. Here is an example:

```
%ShowAITGTime
GPS UT: rc=0 yday=294 18:29:09.773166
UnixUT: yday=294 18:29:09.731333
UnixLocal: 08:29:09.731333
```

The GSP UT displays the time from the GPS (in UTC).

The UnixUT displays the time from the Unix system clock (in UTC).

The UnixLocal is just the UnixUT convert to local time.

3. Is the system clock on the PC accurate?

Sort of...

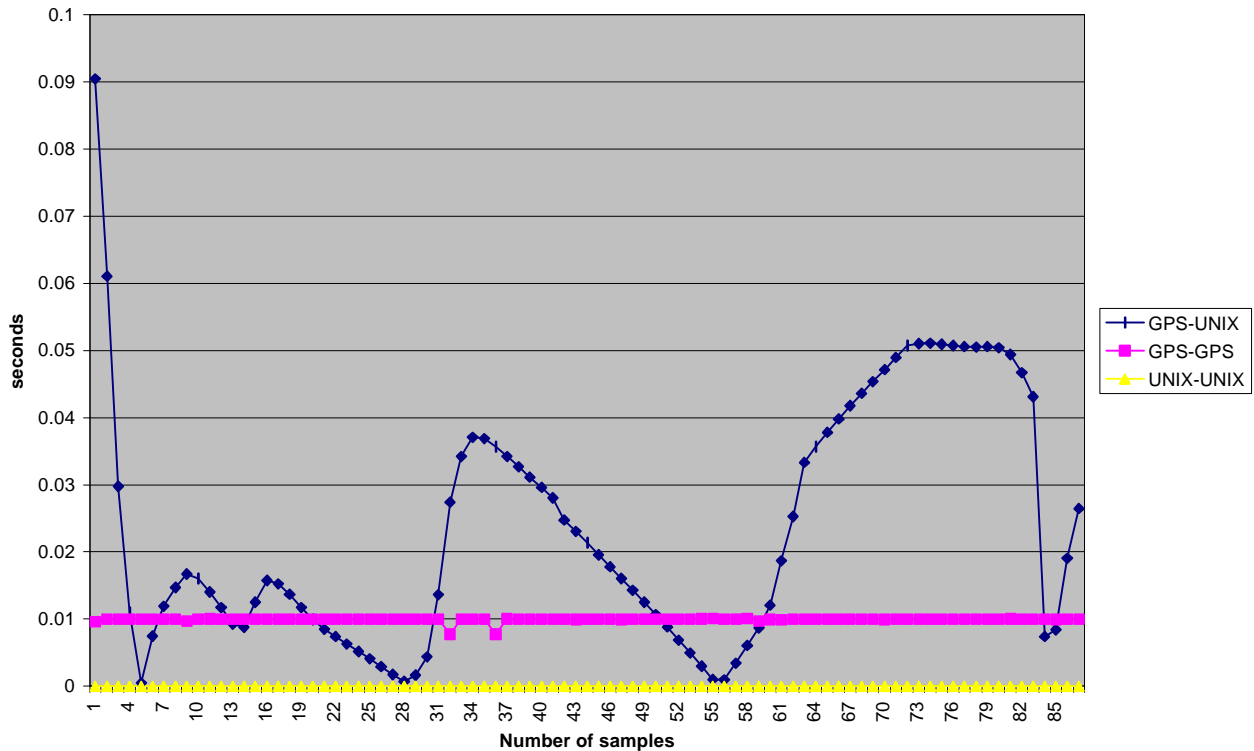
The NSCAM system clock can provide accurate timing information good to about 50 microseconds when: (1)NTP (and the internet) is working, and (2) had sufficient time sync up to it servers.

The IBM PC has a well deserved reputation for being inaccurate, and by **itself** should not be relied on for accurate time information. However, it is possible to improve the accuracy using software. First the Linux OS provide more timing resolution normally provided in a DOS/Window environments. Also the camic computer runs NTP. The Network Time Protocol (NTP) provides a mechanism to synchronize time on computers across an Internet. Some information on NTP can be found at <http://www.ccd.bnl.gov/xntp>.

The following Graph illustrates 3 set of measurements:
(The raw data appended to the end of this document).

1. GPS-UNIX – Difference between GSP and UNIX time (successive reads). Samples taken 10 minutes intervals (600 seconds).
2. GSP-GSP – Difference between two successive reads from the AITG board. Samples taken 10 seconds apart.
3. UNIX-UNIX – Difference between two successive read from the Unix System Clock. Samples taken 10 seconds apart.

Comparing NFSCAM GPS & UNIX Time Clocks



RAW Data from graph: Comparing NSFCAM GSP & UNIX Time Clocks.

```
00.090439 00.009600 00.000003
00.061098 00.009981 00.000003
```

00.029771	00.009984	00.000002
00.010992	00.010009	00.000003
00.000432	00.009976	00.000003
00.007479	00.009979	00.000002
00.011872	00.009981	00.000003
00.014673	00.009975	00.000003
00.016716	00.009727	00.000004
00.016028	00.009987	00.000004
00.014008	00.010032	00.000004
00.011728	00.009981	00.000004
00.009248	00.009983	00.000003
00.008768	00.009958	00.000003
00.012515	00.009982	00.000003
00.015744	00.009982	00.000002
00.015250	00.009987	00.000002
00.013710	00.009981	00.000003
00.011743	00.009983	00.000003
00.009936	00.009983	00.000003
00.008478	00.009956	00.000003
00.007389	00.009982	00.000004
00.006277	00.009985	00.000004
00.005184	00.009982	00.000004
00.004089	00.009980	00.000004
00.002925	00.009983	00.000003
00.001742	00.009982	00.000003
00.000724	00.010011	00.000003
00.001642	00.009982	00.000002
00.004351	00.009983	00.000003
00.013605	00.009984	00.000003
00.027438	00.007759	00.000004
00.034206	00.009977	00.000003
00.037093	00.009965	00.000003
00.036906	00.009984	00.000004
00.035691	00.007754	00.000003
00.034202	00.010042	00.000004
00.032704	00.009986	00.000004
00.031141	00.009977	00.000003
00.029602	00.009976	00.000003
00.028030	00.009979	00.000003
00.024752	00.009979	00.000002
00.023058	00.009951	00.000003
00.021348	00.009976	00.000003
00.019585	00.009977	00.000003
00.017802	00.009978	00.000003
00.016040	00.009947	00.000003
00.014296	00.009978	00.000004
00.012500	00.009978	00.000004
00.010650	00.009983	00.000004
00.008781	00.009979	00.000004
00.006849	00.009978	00.000004
00.004914	00.009979	00.000003
00.002955	00.010012	00.000003
00.001000	00.010115	00.000003
00.000962	00.009984	00.000004
00.003405	00.009986	00.000003
00.006059	00.010122	00.000003
00.008683	00.009700	00.000004

00.012075	00.009947	00.000004
00.018701	00.009884	00.000004
00.025293	00.009982	00.000004
00.033304	00.009956	00.000004
00.035651	00.009983	00.000004
00.037808	00.009971	00.000003
00.039840	00.009976	00.000003
00.041796	00.009981	00.000003
00.043614	00.009983	00.000002
00.045379	00.009984	00.000002
00.047155	00.009945	00.000003
00.048940	00.009981	00.000002
00.050740	00.009979	00.000003
00.051015	00.009981	00.000003
00.051069	00.009979	00.000003
00.050907	00.009981	00.000002
00.050754	00.009981	00.000002
00.050577	00.009981	00.000003
00.050550	00.009979	00.000003
00.050614	00.009978	00.000003
00.050401	00.009980	00.000003
00.049393	00.010014	00.000004
00.046720	00.009982	00.000004
00.043150	00.009979	00.000002
00.007420	00.009981	00.000002
00.008439	00.009955	00.000003
00.019081	00.009981	00.000003
00.026457	00.009981	00.000003