

Appendix C

Observation Logs

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This Appendix describes the *Observation Log Files*, also known as OMS or *jitter* files. These files record pointing, jitter, and other Pointing Control System (PCS) data taken during an HST observation. You can use them to assess the behavior of the HST spacecraft during your observation, and in particular, to evaluate the jitter of the spacecraft while it was taking data. Here we describe the contents and structure of the observation log files, how to retrieve them from the Archive, and how to work with the data they contain.

C.1 Observation Log Files

Observation log files associated with each HST dataset contain pointing and specialized engineering data taken during the observation. These data files are produced by the Observatory Monitoring System (OMS), an automated software system that interrogates the HST engineering telemetry and correlates the time-tagged engineering stream with HST's Science Mission Schedule (SMS), the seven-day command and event list that drives all spacecraft activities. This system reports the status of the instruments and observatory and flags discrepancies between planned and executed actions. OMS provides observers with information about guide star acquisition, pointing, and tracking that is not normally provided in the science headers.

The observation log files share the same rootname as the observation they are associated with, except for the final character, which for observation log files is always a "j" (see Appendix B for more on the names of HST data files). When

OMS was installed in October 1994, it initially generated files with the suffixes `cmh`, `cmj`, `cmi`, which contained header information, high time resolution pointing data, and three-second average pointing data, respectively (see Table C.1). OMS observation logs changed to the `jih/jid/jif` image format after August 1995, at which time the `cmi` table was renamed `jit` to keep the naming convention consistent. In the OMS version of August 1995, `cmj` tables were replaced with a jitter image, which is a two-dimensional histogram of jitter excursions during the observation. The suffixes of the GEIS jitter image are `jih` for the header and `jid` for the image data. The `jit` table accompanies the jitter image. The header file of the image replaces the `cmh` file but includes the same information with the addition of some image-related keywords.



A detailed description of the observation log files can be found on-line:
http://www.stsci.edu/ftp/instrument_news/Observatory/obslog/OL_1.html

Table C.1: OMS Observation Log Files

| Suffix | Contents |
|-------------------------------------|--|
| <i>October 1994 to August 1995</i> | |
| <code>cmh</code> | OMS header |
| <code>cmj</code> | High time resolution (IRAF table) |
| <code>cmi</code> | Three-second averages (IRAF table) |
| <code>_cmh.fits</code> | Archived FITS file of <code>cmh</code> |
| <code>_cmj.fits</code> | Archived FITS file of <code>cmj</code> |
| <code>_cmi.fits</code> | Archived FITS file of <code>cmi</code> |
| <i>August 1995 to February 1997</i> | |
| <code>jih/jid</code> | Two-dimensional histogram and header (GEIS) |
| <code>jit</code> | Three-second averages (IRAF table) ^a |
| <code>_jif.fits</code> | Archived FITS file which bundles the <code>jih/jid</code> files. |
| <code>_jit.fits</code> | Archived FITS file of <code>jit</code> . |
| <i>February 1997 onward</i> | |
| <code>_jif.fits</code> | Two-dimensional histogram (FITS) |
| <code>_jit.fits</code> | Three-second averages table (FITS) |

a. After May 11, 1995, the `jit` tables for exposures shorter than 6 seconds contain higher-resolution, one-second average pointing data.



Pointing and tracking information prior to October 1994 is not routinely available. Interested observers with data from this epoch, can send E-mail to help@stsci.edu.

Observation Log File Contents (October 1994 version)

Observation logs created between October 1994 and August 1995 contain:

- *rootnamej.cmh*: This ASCII header file contains the time interval, the rootname, averages of the pointing and spacecraft jitter, the guiding mode, guide star information, and alert or failure keywords. Figure C.1 shows a representative observation log header file.
- *rootnamej.cmj*: This table presents the data at the highest time resolution for the telemetry mode in use. It contains the reconstructed pointing, guide star coordinates, derived jitter at the instrument aperture, and guiding-related flags. The intent is: (1) to provide high-time resolution jitter data for deconvolution or for assessing small aperture pointing stability, and (2) to display the slew and tracking anomaly flags with the highest resolution. Table C.2 lists the table column heading, units and a brief definition.
- *rootnamej.cmi*: This table contains data that were averaged over three-second intervals. It includes the same information as the .cmj table and also includes orbital data (e.g., latitude, longitude, limb angle, magnetic field values, etc.) and instrument-specific items. It is best suited for a quick-look assessment of pointing stability and for studying trends in telescope or instrument performance with orbital environment. Table C.3 lists the table column heading, units and a brief definition.
- *rootnamej_cmi/j/h.fits*: The above three GEIS files are actually archived as FITS files. They may be worked with as such, or run through the STSDAS task **strfits**, to convert them.

Observation Log File Contents (August 1995 version)

The contents of observation log files created between August 1995 and February 1997 are as follows:

- *rootnamej.jih*: This GEIS header file, the analog to the cmh file, contains the time interval, the rootname, averages of the pointing and spacecraft jitter, the guiding mode, guide star information, and alert or failure keywords. Figure C.2 shows a representative observation log header file.
- *rootnamej.jid*: This GEIS image—a significant enhancement of the old cmj file—presents a two-dimensional histogram of the pointing fluctuations during the observation. You can display it to visualize the spacecraft stability during your observation, and is information for deconvolutions and PSF analyses.
- *rootnamej.jit*: This table, the analog to the cmi table, contains data that were averaged over three-second intervals. Its content is identical (see Table C.3).

- *rootnamej_jif.fits*: FITS file that is actually the de-archived product. This file can be converted to the *jih/jid* GEIS file via the **strfits** routine.
- *rootnamej_jit.fits*: The de-archived FITS file corresponding to the *jit* IRAF table. It can be converted via **strfits**.

Observation Log File Contents (February 1997 version)

The contents of observation log files created since February 1997 are as follows:

- *rootnamej_jif.fits*: The de-archived FITS file. Unlike the previous OMS epoch, this FITS file does not bundle a GEIS file and cannot be converted with **strfits**. This was done to more closely correlate the observation log files with the STIS and NICMOS FITS files with extensions and associations. OMS will normally put all associated observation logs into a single file, to correspond to the associated science exposures. However, if even one science exposure is orphaned (not associated) then an individual observation log FITS file will be produced for every exposure in that association. For a description of STIS and NICMOS association files, see Appendix B. All of the information contained in the old *cmh/jih* ASCII header is now available as keywords in the FITS files.
- *rootnamej_jit.fits*: The FITS file containing the table information. The comments for the *_jif* file apply here as well.

Table C.2: Contents of .cmj Table

| Parameter | Units | Description |
|-----------|------------|---------------------------------------|
| seconds | seconds | Time since window start |
| V2 dom | arcseconds | Dominant FGS V2 coordinate |
| V3 dom | arcseconds | Dominant FGS V3 coordinate |
| V2 roll | arcseconds | Roll FGS V2 coordinate |
| V3 roll | arcseconds | Roll FGS V3 coordinate |
| SI V2 | arcseconds | Jitter at aperture reference |
| SI V3 | arcseconds | Jitter at aperture reference |
| RA | degrees | Right ascension of aperture reference |
| DEC | degrees | Declination of aperture reference |
| Roll | degrees | Angle between North and +V3 |
| DayNight | 0,1 flag | Day (0) or night (1) |
| Recenter | 0,1 flag | Recentering status |
| TakeData | 0,1 flag | Vehicle guiding status |
| SlewFlag | 0,1 flag | Vehicle slewing status |

Figure C.1: A Representative .jih or .cmh Header

```

-----
SIMPLE = F / data conforms to FITS standard !
BITPIX = 32 / bits per data value !
DATATYPE= 'INTEGER*4' \ / datatype of the group array !
NAXIS = 2 / number of data axes !
NAXIS1 = 64 / length of the 1st data axis !
NAXIS2 = 64 / length of the 2nd data axis !
GROUPS = T / image is in group format !
GCOUNT = 1 / number of groups !
PCOUNT = 0 / number of parameters !
PSIZE = 0 / bits in the parameter block !
OMS_VER = '16.2C' \ / OMS version used to process this observation !
PROCTIME= '1994.133:06:24:18.35' / date-time OMS processed observation !
 / date-times format (yyyy.ddd:hh:mm:ss.ss)

 / IMAGE PARAMETERS
CRVAL1 = 0.0 / right ascension of zero-jitter pixel (deg)
CRVAL2 = 0.0 / declination of zero-jitter pixel (deg)
CRPIX1 = 32 / x-coordinate of zero-jitter pixel
CRPIX2 = 32 / y-coordinate of zero-jitter pixel
CTYPE1 = 'RA---TAN' \ / first coordinate type
CTYPE2 = 'DEC--TAN' \ / second coordinate type
CD1_1 = 0.0 / partial of ra w.r.t. x (deg/pixel)
CD1_2 = 0.0 / partial of ra w.r.t. y (deg/pixel)
CD2_1 = 0.0 / partial of dec w.r.t. x (deg/pixel)
CD2_2 = 0.0 / partial of dec w.r.t. y (deg/pixel)
COORDSYS= 'WFPC2' \ / image coordinate system
XPINC = 2.0 / plate scale along x (mas per pixel)
YPINC = 2.0 / plate scale along y (mas per pixel)
PARITY = -1 / parity between V2V3 frame and image frame
BETA1 = 134.72 / angle from +V3 to image +x (toward +V2)
BETA2 = 224.72 / angle from +V3 to image +y (toward +V2)

 / OBSERVATION DATA
PROPOSID= 05233 / PEP proposal identifier
PROGRMID= '288' \ / program id (base 36)
OBSET_ID= '02' \ / observation set id
OBSERVTN= '03' \ / observation number (base 36)
TARGNAME= 'NGC3379-PO' \ / proposer's target name
STARTIME= '1994.133:06:24:18.35' / predicted observation window start time
ENDTIME = '1994.133:06:39:18.35' / predicted observation window end time
SOGSID = 'U2880203' \ / SOGS observation name !

 / SCIENTIFIC INSTRUMENT DATA
CONFIG = 'WFPC2' \ / proposed instrument configuration
PRIMARY = 'SINGLE' \ / single, parallel-primary, parallel-secondary
OPERATE = '1994.133:06:22:46.91' / predicted time instr. entered operate mode
TLMFORM = 'PN' \ / telemetry format
APERTURE= 'UWFALL' \ / aperture name
APER_V2 = 1.565 / V2 aperture position in vehicle frame (arcsec)
APER_V3 = 7.534 / V3 aperture position in vehicle frame (arcsec)

 / SPACECRAFT DATA
ALTITUDE= 593.23 / average altitude during observation (km)
LOS_SUN = 106.08 / minimum line of sight to Sun (deg)
LOS_MOON= 77.11 / minimum line of sight to Moon (deg)
SHADOENT= '1994.133:05:11:29.00' / predicted Earth shadow last entry
SHADOEXT= '1994.133:05:42:45.00' / predicted Earth shadow last exit
LOS_SCV = 12.46 / minimum line of sight to S/C veloc. (deg)
LOS_LIMB= 58.0 / average line of sight to Earth limb (deg)

 / BACKGROUND LIGHT
ZODMOD = 22.3 / zodiacal light - model (V mag/arcsec2)
EARTHMOD= 20.2 / peak Earth stray light - model (V mag/arcsec2)
MOONMOD = 35.5 / moon stray light - model (V mag/arcsec2)
GALACTIC= -1.0 / diffuse galactic light - model (V mag/arcsec2)

 / POINTING CONTROL DATA
GUIDECMD= 'FINE LOCK' \ / commanded guiding mode
GUIDEACT= 'FINE LOCK' \ / actual guiding mode at end of GS acquisition
GSD_ID = '0084900235' \ / dominant guide star id
GSD_RA = 161.70720 / dominant guide star RA (deg)
GSD_DEC = 12.45407 / dominant guide star DEC (deg)

```

Figure C.2: Representative .jih or .cmh Header

```

GSD_MAG = 12.867 / dominant guide star magnitude
GSR_ID = '0085201189' / roll guide star id
GSR_RA = 161.93314 / roll guide star RA (deg)
GSR_DEC = 12.78141 / roll guide star DEC (deg)
GSR_MAG = 12.977 / roll guide star magnitude
GSACQ = '1994.133:06:31:02.92' / actual time of GS acquisition completion
PREDGSEP= 1420.775 / predicted guide star separation (arcsec)
ACTGSSEP= 1421.135 / actual guide star separation (arcsec)
GSSEPRMS= 3.8 / RMS of guide star separation (milli-arcsec)
NLOSSES = 0 / number of loss of lock events
LOCKLOSS= 0.0 / total loss of lock time (sec)
NRECENT = 0 / number of recentering events
RECENTR = 0.0 / total recentering time (sec)

/ LINE OF SIGHT JITTER SUMMARY
V2_RMS = 4.5 / V2 axis RMS (milli-arcsec)
V2_P2P = 51.6 / V2 axis peak to peak (milli-arcsec)
V3_RMS = 20.9 / V3 axis RMS (milli-arcsec)
V3_P2P = 267.3 / V3 axis peak to peak (milli-arcsec)
RA_AVG = 161.85226 / average RA (deg)
DEC_AVG = 12.58265 / average dec (deg)
ROLL_AVG= 293.01558 / average roll (deg)

/ PROBLEM FLAGS, WARNINGS and STATUS MESSAGES
/ (present only if problem exists)
ACQ2FAIL= ' / target acquisition failure
GSFAIL = 'DEGRADED' / guide star acquisition failure (*1)
TAPEDROP= ' / possible loss of science data
TLM_PROB= ' / problem with the engineering telemetry
TM_GAP = 404.60 / duration of missing telemetry (sec)
SLEWING = ' / slewing occurred during this observation
TAKEFLAG= 'F' / take data flag NOT on throughout observation
SIPROBnn= ' / problem with specified science instrument (*2)

```

END

notes

*1 - GSFAIL appears only once in a single header file.

The following table lists all current possible values for the GSFAIL keyword:

| | | |
|--------|----------|----------------------------------|
| GSFAIL | DEGRADED | / guide star acquisition failure |
| | IN PROGR | / guide star acquisition failure |
| | SSLEXP | / guide star acquisition failure |
| | SSLEXS | / guide star acquisition failure |
| | NOLOCK | / guide star acquisition failure |
| | SREXCS? | / guide star acquisition failure |
| | SREXCS1 | / guide star acquisition failure |
| | SREXCS2 | / guide star acquisition failure |
| | SREXCS3 | / guide star acquisition failure |
| | SREXCP? | / guide star acquisition failure |
| | SREXCP1 | / guide star acquisition failure |
| | SREXCP2 | / guide star acquisition failure |
| | SREXCP3 | / guide star acquisition failure |
| | UNKNOWN | / guide star acquisition failure |
| | VEHSAFE | / guide star acquisition failure |

*2 - The SIPROBnn keywords appear in the header file with nn = 01 - 99.

The following table lists all current possible values for the SIPROBnn keyword:

| | | |
|----------|-------------------|--|
| SIPROBnn | DCF_NUM unchanged | / This observation may not have been taken |
| | FOS Safing! | / This observation affected when FOS Safed! |
| | HRS Safing! | / This observation affected when HRS Safed! |
| | WFII Safing! | / This observation affected when WFII Safed! |
| | FOC Safing! | / This observation affected when FOC Safed! |
| | Shut | / FOS aperture door is not Open! |
| | FAILED | / FGS astrometry target acquisition failed |

Table C.3: Contents of .jit or .cmi Table, Three-Second Averaging

| Parameter | Units | Description |
|--------------|---------------------------|---------------------------------------|
| seconds | seconds | Time since window start |
| V2 dom | arcseconds | Dominant FGS V2 coordinate |
| V3 dom | arcseconds | Dominant FGS V3 coordinate |
| V2 roll | arcseconds | Roll FGS V2 coordinate |
| V3 roll | arcseconds | Roll FGS V3 coordinate |
| SI V2 AVG | arcseconds | Mean jitter in 3 seconds |
| SI V2 RMS | arcseconds | rms jitter in 3 seconds |
| SI V2 P2P | arcseconds | Peak jitter in 3 seconds |
| SI V3 AVG | arcseconds | Mean jitter in 3 seconds |
| SI V3 RMS | arcseconds | rms jitter in 3 seconds |
| SI V3 P2P | arcseconds | Peak jitter in 3 seconds |
| RA | degrees | Right ascension of aperture reference |
| DEC | degrees | Declination of aperture reference |
| Roll | degrees | Angle between North and +V3 |
| LimbAng | degrees | Angle between earth limb and target |
| TermAng | degrees | Angle between terminator and target |
| LOS_Zenith | degrees | Angle between HST zenith and target |
| Latitude | degrees | HST subpoint latitude |
| Longitude | degrees | HST subpoint longitude |
| Mag V1,V2,V3 | degrees | Magnetic field along V1, V2, V3 |
| EarthMod | V Mag/arcsec ² | Model earth background light |
| SI_Specific | – | Special science instrument data |
| DayNight | 0,1 flag | Day (0) or night (1) |
| Recenter | 0,1 flag | Recentering status |
| TakeData | 0,1 flag | Vehicle guiding status |
| SlewFlag | 0,1 flag | Vehicle slewing status |

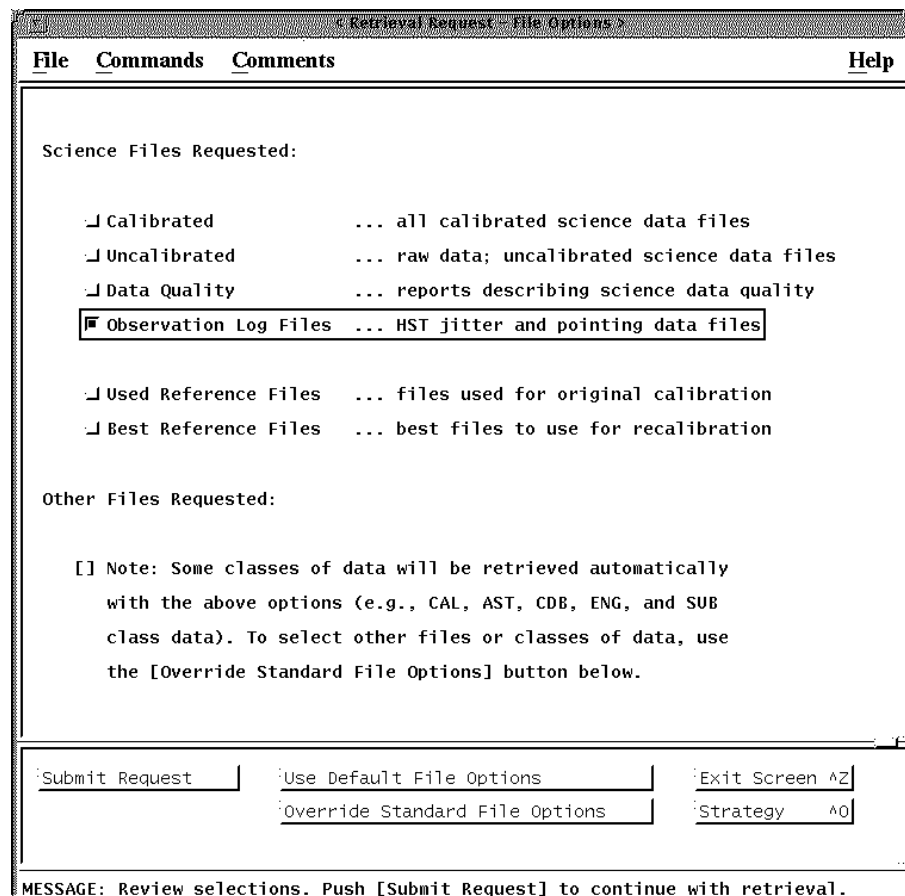
C.2 Retrieving Observation Logs

You can retrieve observation log files for data taken after October 20, 1994 from the HST Archive using StarView as described in Chapter 1. Unlike science data, which generally has a one-year proprietary period, observation log files become public as soon as they are archived.

The easiest way to get OMS files through StarView is to identify the observation of interest and proceed with your request as described in Chapter 1, until you reach the <Retrieval Request - File Options> screen, reproduced in Figure C.3. You can then check the Observation Log Files box, along with any other desired boxes, and continue with your request. StarView will then deliver the associated observation log files.

For observations logged between October 1994 to August 1995, you will be delivered the `cmi`, `cmj`, and `cmh` files in FITS form (e.g., `_cmi.fits`). Observations archived from August 1995 to February 1997 will return `_jif.fits` and `_jit.fits` files. These, and the earlier FITS files can be worked with as such, or converted to their GEIS counterparts via the STSDAS `strfits` task. However, as of February 1997, the `_jif.fits` and `_jit.fits` files are standard FITS files with extensions and cannot be converted to GEIS.

Figure C.3: Choosing Observation Log Files in StarView



Retrieval Request - File Options

File Commands Comments Help

Science Files Requested:

- Calibrated ... all calibrated science data files
- Uncalibrated ... raw data; uncalibrated science data files
- Data Quality ... reports describing science data quality
- Observation Log Files ... HST jitter and pointing data files
- Used Reference Files ... files used for original calibration
- Best Reference Files ... best files to use for recalibration

Other Files Requested:

[] Note: Some classes of data will be retrieved automatically with the above options (e.g., CAL, AST, CDB, ENG, and SUB class data). To select other files or classes of data, use the [Override Standard File Options] button below.

Submit Request Use Default File Options Exit Screen ^Z
Override Standard File Options Strategy ^O

MESSAGE: Review selections. Push [Submit Request] to continue with retrieval.

C.3 Using Observation Logs

Here are some simple examples of what can be learned from the observation log files. Note that for FITS format observation logs, current versions of STSDAS tools will handle the files with extensions properly. Keywords can be viewed with tools such as **imheader** or **hedit**, and data viewed, plotted, or displayed using the same tasks one might have for the GEIS files. For more information on FITS file structures, see Chapter 2.

C.3.1 Guiding Mode

Unless requested, all observations will be scheduled with FINE LOCK guiding, which may be one or two guide stars (dominant and roll). The spacecraft may roll slightly during an observation if only one guide star is acquired. The amount of roll depends upon the gyro drift at the time of the observation, the location during an orbit, and the lever arm from the guide star to the center of the aperture.

There are three commanded guiding modes: FINE LOCK, FINE LOCK/GYRO, and GYRO. OMS header keywords GUIDECMD (commanded guiding mode) and GUIDEACT (actual guiding mode) will usually agree. If there was a problem, they won't agree and the GUIDEACT value will be the guiding method actually used during the exposure. If the acquisition of the second guide star fails, the spacecraft guidance, GUIDEACT, may drop from FINE LOCK to FINE LOCK/GYRO, or even to GYRO, which may result in a target rolling out of an aperture. Check the OMS header keywords to verify that there was no change in the requested guiding mode during the observation.



Until new flight software (version FSW 9.6) came online in September 1995, if the guide star acquisition failed, the guiding dropped to COARSE track. After September 1995, if the guide star acquisition failed, the tracking did not drop to COARSE track. Archival researchers may find older datasets that were obtained with COARSE track guiding.

The dominant and roll guide star keywords (GSD and GSR) in the OMS header can be checked to verify that two guide stars were used for guiding, or in the case of an acquisition failure, to identify the suspect guide star. The dominant and roll guide star keywords identify the stars that were scheduled to be used, and in the event of an acquisition failure, may not be the stars that were actually used. The following list of cmh keywords is an example of two star guiding.

```

GSD_ID = `0853601369` / Dominant Guide Star ID
GSD_RA = 102.42595 / Dominant Guide Star RA (deg)
GSD_DEC = -53.41362 / Dominant Guide Star DEC (deg)
GSD_MAG = 11.251 / Dominant Guide Star Magnitude
GSR_ID = `0853602072` / Roll Guide Star ID
GSR_RA = 102.10903 / Roll Guide Star RA (deg)
GSR_DEC = -53.77683 / Roll Guide Star DEC (deg)
GSR_MAG = 12.426 / Roll Guide Star Magnitude

```

If you suspect that a target has rolled out of the aperture during an exposure, you can quickly check the counts in each group of the raw science data. As an example, the following IRAF commands can be used to determine the counts in each group.

```

cl> grlist z2o4040dt.d0h 1-24 > groups.lis
cl> imstat @groups.lis

```

Some observations can span several orbits. If during a multiple orbit observation the guide star reacquisition fails, the observation may be terminated with possible loss of observing time, or switch to other less desirable guiding modes. The GSACQ keyword in the cmh header will state the time of the last successful guide star acquisition.

```

GSACQ = `136:14:10:37.43` / Actual time of GS Acquisition Completion

```

C.3.2 Guide Star Acquisition Failure

The guide star acquisition at the start of the observation set could fail if the FGS fails to lock onto the guide star. The target may not be in the aperture, or maybe only a piece of an extended target is in the aperture. The jitter values will be increased because FINE LOCK was not used. The following list of cmh header keywords indicate that the guide star acquisition failed.

```

V3_RMS = 19.3 / V3 Axis RMS (milli-arcsec)
V3_P2P = 135.7 / V3 Axis peak to peak (milli-arcsec)
GSFAIL = `DEGRADED` / Guide star acquisition failure!

```

The observation logs for all of the following observations in the observation set will have the “DEGRADED” guide star message. This is not a Loss of Lock situation but an actual failure to acquire the guide star in the desired guiding mode. For the example above, the guiding mode dropped from FINE LOCK to COARSE TRACK.

```

GUIDECMD= `FINE LOCK` / Commanded Guiding mode
GUIDEACT= `COARSE TRACK` / Actual Guiding mode at end of GS acquisition

```

If the observational dataset spans multiple orbits, the guide star will be re-acquired, but the guiding mode will not change from COARSE TRACK. In September 1995, the flight software was changed so that COARSE TRACK is no longer an option. The guiding mode drops from two guide star FINE LOCK to one guide star FINE LOCK, or to GYRO control.

C.3.3 Moving Targets and Spatial Scans

A type 51 slew is used to track moving targets (planets, satellites, asteroids, and comets). Observations are scheduled with FINE LOCK acquisition, i.e., with two or one guide stars. Usually, a guide star pair will stay within the pickle during the entire observation set, but if two guide stars are not available, a single guide star may be used, assuming the drift is small or the proposer says that the roll is not important for that particular observing program. An option during scheduling is to drop from FGS control to GYRO control when the guide stars move out of the FGS. Also, guide star handoffs (which are not a simple dropping of the guide stars to GYRO control) will affect the guiding and may be noticeable when the jitter ball is plotted.

The jitter statistics are accumulated at the start of the observation window. Moving targets and spatial scan motion will be seen in the jitter data and image. Therefore, the OMS header keywords V2_RMS and V3_RMS values (the root mean square of the jitter about the V2 and V3 axis) can be quite large for moving targets. Also, a special anomaly keyword (SLEWING) will be appended to the OMS header stating movement of the telescope during the observation. This is expected for observing moving targets. The following list of .cmh header keywords is an example of expected values while tracking a moving target.

```

                                                    / LINE OF SIGHT JITTER SUMMARY
V2_RMS   =                               3.2 / V2 Axis RMS (milli-arcsec)
V2_P2P   =                               17.3 / V2 Axis peak to peak
(milli-arcsec)
V3_RMS   =                               14.3 / V3 Axis RMS (milli-arcsec)
V3_P2P   =                               53.6 / V3 Axis peak to peak
(milli-arcsec)
RA_AVG   =                               244.01757 / Average RA (deg)
DEC_AVG  =                               -20.63654 / Average DEC (deg)
ROLL_AVG =                               280.52591 / Average Roll (deg)
SLEWING  = `                               T' / Slewing occurred during this
observation
```

C.3.4 High Jitter

The spacecraft may shake during an observation, even though the guiding mode is FINE LOCK. This movement may be due to a micro-meteorite hit, jitter at a day-night transition, or for some other unknown reasons. The FGS is quite stable and will track a guide star even during substantial spacecraft motion. The target may move about in an aperture, but the FGS will continue to track guide stars and reposition the target into the aperture. For most observations, the movement about the aperture during a spacecraft excursion will be quite small, but sometimes, especially for observations with the spectrographs, the aperture may move enough that the measured flux for the target will be less than a previous group. Check the OMS header keywords (V2_RMS, V3_RMS) for the root mean square of the jitter about the V2 and V3 axis. The following list of .cmh header keywords is an example of typical guiding rms values.

```

/ LINE OF SIGHT JITTER SUMMARY
V2_RMS = 2.6 / V2 Axis RMS (milli-arcsec)
V2_P2P = 23.8 / V2 Axis peak to peak
(milli-arcsec)
V3_RMS = 2.5 / V3 Axis RMS (milli-arcsec)
V3_P2P = 32.3 / V3 Axis peak to peak
(milli-arcsec)

```

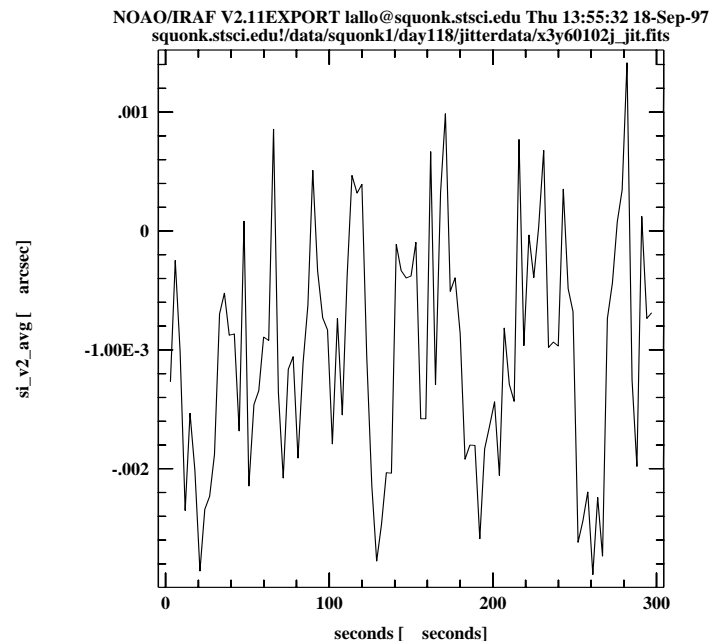
Recentering events occur when the spacecraft software decides that shaking is too severe to maintain lock. The FGS will release guide star control and within a few seconds reacquire the guide stars. It is assumed the guide stars are still within the FGS field of view. During the recentering time, INDEF will be written to the OMS table. Recentering events are tracked in the OMS header file.

Be careful when interpreting “Loss of Lock” and “Recentering” events that occur at the very beginning or at the end of the OMS window. The OMS window is larger than the observation window. These events might not affect the observation since the observation start time will occur after the guide stars are acquired (or re-acquired), and the observation stop time may occur before the “Loss of Lock” or “Recentering” event that occurred at the end of an OMS window.

The **sgraph** command in the **stdas.graphics.stplot** package will plot time vs. jitter along the direction of HST’s V2 axis (see Figure C.4):

```
cl> sgraph "x3y60102j_jit.fits seconds si_v2_avg"
```

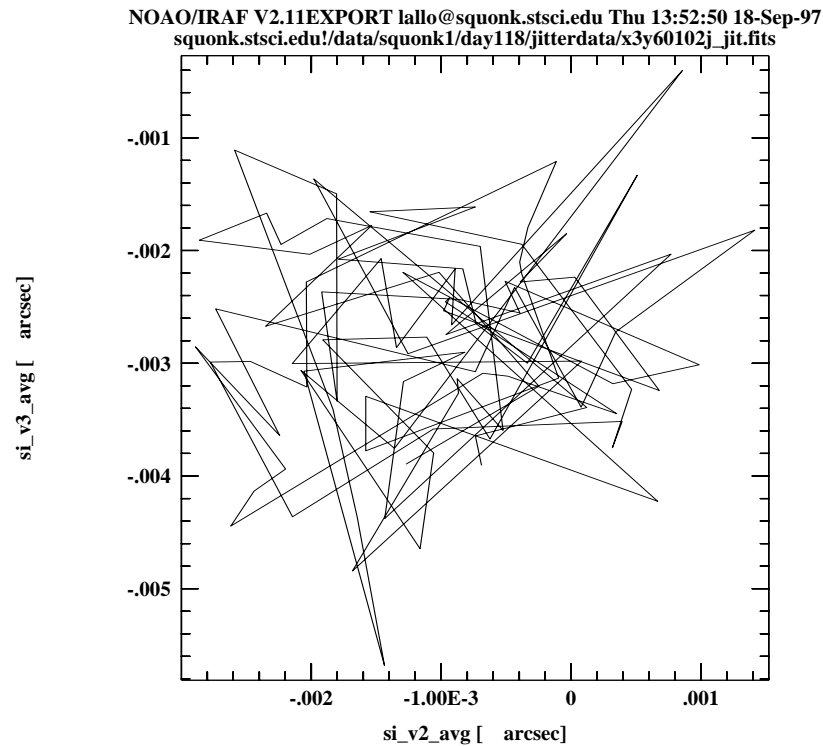
Figure C.4: Plotting Jitter Along V3 Axis



To get an idea of pointing stability, you can create a *jitter ball* by plotting jitter along the V2 axis vs. jitter along the V3 axis (see Figure C.5):

```
st> sgraph "x3660102j_jit.fits si_v2_avg si_v3_avg"
```

Figure C.5: Plotting V2 vs. V3 Jitter



The **tstatistics** task can be used to find the mean value of the `si_v3_avg` column—the amount of jitter (in arcseconds) in the direction of the V3. This value can be used to model jitter in a PSF. In this example, the mean jitter is ~ 3 mas, which is typical for post-servicing mission data:

Figure C.6: Averaging a Column with **tstatistics**

```
tt> tstat u26m0801j.cmi si_v3_avg
# u26m0801j.cmi si_v3_avg
# nrows      mean      stddev      median      min      max
  11 -0.003006443888  0.00362533  -7.17163E-4  -0.00929515  0.00470988
```



Understanding and interpreting the meaning of the table columns and header keywords is critical to understanding the observation logs. Please read the available documentation and contact the STScI Help Desk (help@stsci.edu) if you have any questions about the files. Documentation is available via the WWW at: http://www.stsci.edu/ftp/instrument_news/Observatory/obslog/OL_1.html

