VLB ARRAY MEMO No. 175

Tables of Contents for VLBA Station Observing Logs and Processor Log Files.

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I. Introduction.

The VLBA network of antenna control computers, array control computer, processor control computer and analysis computer will require a system of log files that contain information about observing and processing parameters. We have started to discuss the contents of these log files in previous memos : 128 (Vandenberg), 133 (Pearson), 163 (Reid) and 167 (Cotton). The entire log file system breaks down into four separate files or systems of files :

a) Observing Schedules - created by the observer and modified by the array control center (#163);
b) Station Monitor Logs - generated at the VLBA stations during observing runs, and containing telescope, front end, back end, recorder configurations and site engineering data;
c) Processor Output Logs - containing all parameters used by the processor model;
d) Standard Model File - contains all constants and model coefficients used by the processor, array control computer and post-processing data analysis systems.

In this memo, I have listed likely parameters that should be kept in the station, processor and standard model log files.

II. The Station Monitor Logs

The station monitor log files will serve several purposes :

a) to provide immediate information to the array operators about site configurations;
b) to allow the array operators (and array control computer) to monitor crucial site performance parameters;
c) to provide information to the processor during real-time fringe checks;
d) later, to provide the processor with scan start and stop times, good/bad data flags, and to provide information for post-processing editing and calibration.

The station monitor log files will require a flexible data format. The rates of change of the monitored parameters fall into three categories :

a) slowly varying (record one value daily);
b) once per observing scan (record values every 5 to 30 minutes);
c) rapidly or irregularly varying parameters (we may need to sample and record values faster than once per minute).

The number of category 'c' parameters will be fairly large. However, a fair fraction of them need be sampled rapidly only when they are changing rapidly (e.g., wind, ambient temperature). Parameters such as system temperaure must be adaquately tracked if they are to be useful in calibrating the visibility data. The station computer could test rapidly and regularly sampled parameters for statistically significant changes from the last values written in the monitor log file. When such a variation is detected, only then would a new value be written in the monitor log. A flexible format such as FITS might be a good choice for the station monitor log files.

Contents of Station Monitor Files.

Slowly Varying Parameters :

C*8	Station ID
7*32*R*4	Noise tube values, per freq and per IF channel
n*R*4	Pointing coefficients used
R*4	T sys cycle times
C*80	Manually entered comments

Parameters Entered Once per Scan :

C*8	Observing program ID
C*8	Observer's name
I*4	Observer's ID number
C*8	Source name
I*4	Year
I*4	Day number
R*8	RA used to point
R*8	DEC used to point
R*4	UT start of scan, good data begins
R*4	UT end of scan, good data ends
I*4	Observing frequency band code
C*8	Video tape ID
32*R*8	I.F. channel freqs (R.F. on sky)
I*4	I.F. switching cycle mode
32*I*4	I.F. bandwidths used
32*I*4	I.F. channel polarizations

Rapidly or irregularly varying parameters :

R*4	UT of sampled parameter
32*R*4	T sys per I.F. channel
2*R*4	Pointing deviations
32*I*4	R.F. interference monitor flag per I.F. channel
R*4	Wind velocity
R*4	Wind direction

R*4	Ambient temperature
R*4	Surface pressure
R*4	Surface relative humidity
C*16	Precipitation comments
R*4	Water vapor radiometer
6*R*4	Atmos extinction (raw tipping scan data)
32*R*8	Instrumental delay per I.F. band (cable cal.)
R*4	Transmitted time minus station clock
32*R*4	I.F. power levels
32*R*4	L.O. power levels (I.F. - video conv. L.O.'s)
32*R*4	Video power levels
32*R*4	L.O. frequencies read from counters
32*I*4	L.O.'s locked/unlocked flags
32*I*4	I.F. attenuation applied and/or I.F. gain setting
40*I*4	Good data / bad data flags per I.F. channels per recorder track

III. The Processor Output Log File.

There will be two quite separate data streams coming out of the VLBA processor: the auto- and cross-correlation data records with minimal data record headers (AIPS), and everything else. The 'everything else' should include details of the processor model used for the current data set. The processor computer should pass sufficient model constants, coefficients and specifications into the data base of the current data set. It must be possible to re-calculate the processor model completely and exactly.

The contents of the AIPS catalog header file and antenna extension files are listed in Cotton's memo 167. The AIPS files as they are now would be able to provide a fairly complete description of a VLBA observing configuration. Currently, AIPS is being used for continuum VLBI data reduction and is quite effective. In the immediate future, we intend to support VLBI editing and calibration within AIPS; some minor modifications to AIPS will be made. In the near future, we will bring into AIPS certain algorithms necessary for VLBI spectral line reduction. AIPS should then evolve into a very useful VLBI processing system well before the VLBA begins to operate. In order to accomodate astrometric and geodetic VLBA experiments, AIPS will have to be able to carry lengthy descriptions of the VLBA processor model. In the current scheme of AIPS files, we could rather easily design one or more extension files for the processor model(s).

IV. The Standard Model File.

Listed below are values required for calculation of the processor model. This file will also be accessed by the array scheduling program and possibly post-processing tasks. The standard model file will serve as a repository for simple constants (insuring all programs use the same value of pi for example), source and station coordinates and model

coefficents and parameters.

Contents of the Standard Model File

Constants

all R*8	pi,2*pi,pi/2, c, sidereal rate, seconds per day, rad/degree, rad/arcsec, rad/sec time, Gauss's constant, accel. gravity at earth surface, GM of sun and moon, seconds per a.u., earth's equat. radius, earth flattening const., earth mass / moon mass, univ. grav. const., J2000 precession const.

Station entries

3*R*8	Station x,y,z
3*R*8	Center of coordinate system
3*R*8	Directions of coordinate system vectors
I*4	Telescope mount type
3*R*4	Telescope axis offsets
n*R*4	Pointing coefficients
m*R*4	Coefficients describing phase center motion with respect to pointing direction
3*R*4	Geodetic coordinates (lat,long,elev MSL)
2*R*4	Antenna slew rates
4*R*4	Antenna limit stops

Source entries

C*8	Source name (IAU)
C*8	Alias
R*8	RA(epoch)
R*8	DEC(epoch)
R*8	Epoch
C*16	Position reference
R*8	Pulsar period
R*8	Pulsar spin down rate
R*4	Pulsar dispersion

Model Coefficients

Atmosphere

2*R*4	Wet and dry atmosphere scale heights
R*4	Conversion factor - atm. pressure to dry path length
R*4	Conversion factor - part. pres. water vapor to wet path length

Ionosphere

2*R*4	Geomagnetic pole latitude and longitude
R*4	Height of top of ionosphere

Precession Model
Polar Motion
Earth Tides
Earth Rotation Rates
Solar Corona
General Relativity
Solar System Bodies