SOURCE CARD FORMATS

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July 8, 1976

The source card formats specified in VLA Computer Memorandum 123 have turned out to be somewhat inconvenient. We are in the process of making major changes in both the formats of the cards and in the data structures. Memorandum 123 is now obsolete, and information concerning formats and structures should be taken from this memorandum.

The data structures defined in this memo are rather complicated, and it is not expected that the reader will be able to absorb the information in a single coup d'oeil. The attention of the novice observer is directed to the format of the source request card. The operations staff will be more interested in the data structures and in the parameter files. The cards beginning with // are of interest to the sophisticated observer, and give him the power to override defaults and to take several nonstandard observing options.

The "new source" programs read card images from disk. However, instead of sequential files, as previously implemented, we use the data organization used by the Modcomp Source Editor (SEDIT). This organization is similar to the IBM 360 OS partitioned data sets in that the individual "members" of the set (called "files" below) may be accessed by user programs by name, in a fashion independent of their detailed location on disk. The Source Editor program, SEDIT, can be used to manipulate individual members (remove, rename, catalog new member), card images within the member (delete, add, replace) or character fields within a single or successive card images (change characters, overlay field).

The files (by name) we plan to have are given below.

1. File ARRAY

    Card 1 - Time, read by a Fortran 3F15.0 statement, giving dUT1/dTAI in seconds per day, MJD upon which this linear rate projects to UT1=UTC, and TAI-UTC.

Card 2 - Coordinates of the Pole, 2F15.0, x and y relative to CIO, seconds of arc. These two cards are directly copied from the Time Service Announcements Series 7. If it is desired, the pole position may be extrapolated linearly by including dx/dt, dy/dt (seconds of arc per day) and the epoch of the x, y given (MJD), in formats 3F15.0.

Card 3 - Control functions. The first few columns contain information which will be used for the control of the new line/continuum correlator. That correlator will have four, more or less independent, quadrants. Each of these quadrants will be assigned, for control purposes, to a subarray. Any other subarray attempting to specify a correlator mode will be ignored. Similarly, for bandwidth selection purposes, each of the IF's will be assigned to a subarray, which will have sole control of the correlator bandwidth. It should be noted that the filter bandwidths of all the antennas are controlled by the subarray to which they are attached. Columns 1-4 contain the controlling subarray for each quadrant of the correlator, and columns 6-9 contain the controlling subarray for each IF (A-D). Also on this card, column 11 = T means turn on de-icing switches, and column 12 = T requests using estimated values of refraction instead of measured values from the weather station.

2. File SUB1, SUB2, etc.

There is one file for each subarray. The first card contains the name of the file containing the observation request cards. The name is left adjusted starting in column 1. More than one file may be specified on this card, the names to be separated by spaces. If more than one file is specified, when the observations in the first file are complete, the programs will automatically continue with the next. They will indicate that a file has been completely used by replacing its name on this card by form characters. Note, though, that it is not deleted from disk except by operator action.

The remaining cards in this file give the default LO settings (if not specified in the observation request file). There is a card for each band, giving the AB and CD bands in the first two characters, and the identifier LO in columns 3, 4. The tuning digits (if L, K, or KU Band) are in columns 5 and 6. The two first LO frequencies in GHz, format 2F7.1, are in columns 7-13 and 14-20. The synthesizer frequencies, in MHz,

format 4I5, end in column 40. Default 150 MHz synthesizer settings are
in columns 41-60 (2F10.4) The name of a file from which the receiver
parameters are to be extracted is given, left adjusted starting in
column 61 (see paragraph 5 below). Left adjusted in column 71 is the
name of a file in which the secondary rotation and focus are to be found
(see paragraph 4). External LO frequencies may be defaulted with a
card identical to the //LI card (see paragraph 6) except that the bands
are given in columns 1 and 2.

3.   File ANTENNAS

    For each antenna there is a Card 1 giving antenna ID (I5, ending
in column 5), antenna DCS address (I5, ending in column 10), station
ID (3 characters, ending in column 15), the four delay lines to which
the respective IF's are connected (4I5, ending in column 35). Column 40 = T
indicates that observation at elevations greater than 90° is forbidden.
    Card 2 gives the antenna ID (I2) and the baseline parameters: BX,
BY, BZ, Delay Constant, axis intersection defect, F13.4, 3F15.4, F10.4,
all in nanoseconds.
    The first two numbers on the card are antenna ID and the arm
reference azimuth in degrees. Then in Modcomp Free Format, there are
seven azimuth constants and five elevation constants.
    The antenna ID's given on these three cards are for checking only.
The cards for a given antenna must be together.

4.   Subreflector Files (arbitrary name)

    These files have one card for each antenna, giving antenna ID (I5),
collimation error, azimuth and elevation, 2F5.2, ending in column 15,
secondary rotation setting, ending in column 30, the focus curve F_0 +
F_1 (focus = F_0 + F_1 sin h) 2F5.1, to column 40.
    Column 44 = T indicates transfer switch is to be thrown. Column 45 = T
indicates use as a reference antenna for interferometer mode pointing.
Columns 49 and 50 give the required state of the AB and CD 5 GHz attenuators
(F or blank = out T = in). Columns 52-55 give the state of the low gain
switches in the frequency converters (F or blank - high gain, T = low
gain).
    Columns 47, 48 indicate paramp on/off. Columns 57-60 are the four
front end auxiliary switches (T = on). Columns 64, 65 indicate noise
tube on and noise tube switching.   Columns 67-70 are the alternate
input switches.

5. IF Parameter Files (arbitrary name)

There are four cards per antenna. Antenna ID is in columns 1-4,
I4 Format. IFID is one character in column 5. IF peculiar delay in
nanoseconds F10.4, to column 15, IF peculiar phase in degrees, F5.1,
to column 20. Gain curve E_0-E_3, 4F5.4 to column 40. Net efficiency
is:

$$E = E_0 + (\sin h - 1)\ E_1 + \cos h\ E_2 - (\csc h - 1)\ E_3$$

E_0 is zenith efficiency, E, and E_2 describe surface deterioration with
elevation; E_3 describes atmospheric absorption. Noise tube temperature,
degrees, is given in columns 41-45, F5.3. IF peculiar delay should
be specified as a positive number to avoid errors at system startup
time.

6. Source Files (arbitrary name)

There are several card types in this file. Identity cards begin
with /., and identify the observer and program. The next four characters
must contain the observer ID, and the program identification number
ends in column 13.

Most of the cards in this file will be source request cards. The
source name, eight characters, ends in column 8, with a numerical
qualifier ending in column 13. The stop time or duration, ending in
column 22, is read with an Al, I2, 2I3 format (hours, minutes, seconds
of sidereal time). A dollar sign in column 14 means that the time is
a duration. Otherwise, it is an LST time. The RA is read by a 2I3,
F8.4 format. Hours end in column 25, minutes in column 28, seconds
in column 36. The declination has sign in column 38, degrees ending
in column 40, minutes in column 43, and seconds in column 50. The epoch
code is given in column 51. Blank means standard equinox 1950, D means
apparent position of date, Y means standard equinox of year in columns
52-55, C means standard equinox of 2000. Bands are given for AB and
CD paramps respectively in columns 56 and 57. Mode is given in columns
59 and 60. Modes currently implemented are:

> blank - Interferometer continuum observation
>
> Pc - Single dish pointing with IF c
>
> Ic - Interferometer pointing with IF c
>
> TF - test front ends
>
> D - find delay center

The bandwidth codes for the four IF's are given in columns 65-68 for line modes; the feature velocity is given in columns 69-80. Cards starting with // contain further information, and apply only to the card which they immediately follow. The types are //LO cards, which set synthesizers (frequency set cards), //LI cards also set synthesizers, mostly for line observation, and //AN cards select the azimuth and elevation ranges for the observation (wrap select card). //PM cards supply the information necessary to track planets.

A frequency set card (//LO) is identical in format to the default LO setting card from the SUBn file, and is used instead of it.

The line LO card (//LI) will also be used to indicate observations with external LO's whose frequencies are otherwise unknown to the system, and so contains a line/continuum indicator (L or C) in column 10. The default bandwidth codes (if not specified on the source card) are found in columns 6-9. Column 11 contains a velocity system indicator (T = topocentric, H = heliocentric, L = LSR). Column 12 indicates units (V or blank = km/sec, F = kHz) of the velocity of the feature to be centered in the band. The correlator mode code appears in columns 14-16. Columns 21-24 contain a code for the line transition of interest. If the code is blank, the line rest frequency must be entered, in MHz, in columns 25-40. An external LO frequency in MHz is given in columns 1-60.

A cable wrap card (//AN) has two columns for each antenna. These are determined by antenna ID (not antenna address); that is, columns 5 and 6 belong to antenna 1, 7 and 8 to antenna 2, etc. A "U" in the odd numbered columns means to use elevations greater than 90° if possible, a "D" means to use less than 90°, and a blank means don't care. The even numbered columns are consulted if two azimuths (differing by 360°) are possible. "R" requests the clockwise and "L" the CCW rotation. A blank means don't care. It is not necessary to specify each antenna. An entire arm or the whole array can be specified. Beginning in column 71, one may have the arm ID, followed by the above two characters, for all three arms. The "A" arm is the whole array. The wrap specifications are ignored if the antenna is not on the subarray currently being processed. The order of precedence is: 1. (highest priority) the "don't exceed 90°" bit from the ANTENNAS file; 2. specified wrap for this antenna; 3. specified wrap for this arm; 4. (lowest priority) shortest move.

A planetary motion card (//PM) contains dRA/dt, ddec/dt, 2F10.3, in seconds of time per day and seconds of arc per day, and the epoch of the position given on the source request card. This epoch must be given in UT. The UT date of the epoch must be the same as the UT date of the observation (care must be taken over this point). The epoch is read with a 3I3 format (seconds ending in column 29).

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VLA PROJECT

SUPPLEMENT TO
VLA COMPUTER MEMO NO. 131

CHANGES IN CARD FORMATS

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February 1977

1. On a 1. card, a $ in column 14 signals that this is a 24 hour
    program freshly started, and that it should skip to an
    appropriate time automatically.

2. A card containing /REW may be used at the end of a file full
    of cards with durations specified, meaning "rewind this file",
    i.e., "do this file until further notice." It can also be
    used at the end of a 24 hour stoptime deck. Using it at the
    end of a stoptime deck less than 24 hours may result in doing
    something other than what you intended. In particular, putting
    it at the end of a stoptime deck shorter than 12 hours will
    blow its mind.

3. Band names are now operator definable by an ALIAS card. That
    is, in the subarray file, a card saying '21ALLL' would mean
    that a source card with '21' in the band field would be
    processed as if it had contained 'LL'. The card may appear
    early in the subarray file, in which case the default LO card
    should begin 'LLLO', or at the end, in which case the LO card
    should begin '21LO'.

4. A //* card may be included in the source deck for comments --
    it will be printed on the printer when encountered, but affects
    nothing else. The asterisk must be followed by a blank.