

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
HAYSTACK OBSERVATORY
WESTFORD, MASSACHUSETTS 01886

Telephone: 508-692-4764
Fax: 617-981-0590

27 October 1993

TO: Mark IV/EVN Correlator Development Group
FROM: Alan R. Whitney
SUBJECT: Detailed format of Mark III and Mark IV track-frame header

The Mark III and Mark IV tape-header formats are identical except for the auxiliary-data information. The auxiliary-data field in each case contains 64 bits (16 hex numbers). Both are protected by the 12-bit CRC code in the header block (as is the time code).

The VLBA auxiliary-data field is defined in VLBA specification document A5600N003, 16 November 1990. The VLBA aux-data field is similar to the Mark III/IV aux-data fields; however it is important to note that, unlike the Mark III/IV case, the VLBA aux-data field is not protected by a CRC code.

Mark III

The Mark III auxiliary data field is common across all tracks and can be written as 16 hex digits (in the order written to tape):

vvwxwxyzFFaabb

where

vv:	hex 'FF' for forward calibration (odd passes) hex 'FE' for reverse calibration (even passes) hex 'FD' for uncalibrated position Note: In the VLBA emulation of Mark III, 'vv' is binary-encoded to be the VLBA track number (4-31, corresponding to Mark III tracks 1-28)
wxyz:	0000-3999 positive micron positions (bcd encoded) 4000-7999 negative micron positions (bcd encoded); (4000, 7999 indicate positions of 0, -3999 respectively)
FF:	hex characters FF
aa:	Formatter status and error flags bit 7 time sync error bit 6 primary power fail bit 5 framing error

	bit 4	timing error
	bits 3-2	input source
	bits 1-0	formatter mode
bb:	bits 7-0	hardware ID

The first 48 bits of the aux-data (ttwxwxyzFF) are user-defined; the last 16 bits (aabb) are fixed by the Mark III formatter. The apparently-peculiar encoding of head position is an attempt to remove DC bias from the aux-data field, which sometime causes decoding problems on older playback drives at the correlators.

Note: The VLBA system has the capability of emulating the Mark III system, but includes the capability of writing track-specific identification information in the aux-data area of each data frame. When operating in this mode, the Mark III aux-data field defined as 'vv' above is written as a binary-encoded VLBA track number, which is equal to the Mark III track number plus 3. The remainder of the aux-data field is identical to the above description, except that 'aa' is always zero and 'bb' seems to be zero at most VLBA stations.

Mark IV

Unlike the Mark III header, the Mark IV header contains some track-specific identification information, in addition to some information common across all tracks. We can write the aux-data field as 16 hex characters in the form (and in the order written to tape):

hhhhhhhhrrsstuu

where

hhhhhhhh:	bits 31-16	nominal headstack 1 position in microns
	bits 15-0	nominal headstack 2 position in microns; encoded same as Mark III header characters 'wxyz'
rr:	bits 7-6	(<i>track specific</i>); headstack number (0-3 corresponds to headstacks 1-4)
	bits 5-0	(<i>track specific</i>); track number (2-33 BCD, corresponding to VLBA track numbers); msb-to-lsb
ss:	bits 7-0	(<i>track-specific; frame-specific if barrel-roll active</i>); A/D identifier (i.e. sampler number); msb-to-lsb
tt:	Formatter status and error flags	
	bit 7	time sync error
	bit 6	internal clock error
	bit 5	processor time-out error
	bit 4	communication error
	bit 3	spare
	bit 2	spare
	bit 1	track-roll enabled
	bit 0	sequence suspended
uu:	bits 7-0	system ID; msb-to-lsb

Comments

The Station Unit should have the capability of capturing the aux-data field and supplying its contents to the user on demand. In addition, some of the information in the header, particularly with regard to nominal headstack position, can be used to advantage in the SU to assist in proper positioning of the playback headstacks.