TO: VLBA data acquisition group

FROM: A.E.E.Rogers and J.C.Webber

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SUBJECT: Data acquisition modes - Revision of memo #102

Revision

Owing to a constraint in recorder controller which allows the selection of formatter 1 or 2 by group only (see memo #97 for group definition) the mode tables in memo #102 can not be supported. We have revised the tables in this version of the memo.

Introduction

The VLBA data acquisition system is very flexible and data could be recorded in a large number of modes. We recommend, however, that at least initially very few modes be supported with the generous use of intelligent software defaults to simplify operations.

Some definitions

I.F. channel - The receiver I.F. selected by a baseband converter. Can be A, B, C, or D. (The assignment of each I.F. to given receiving band and polarization being made in the electronic receiving system.)

Baseband converter number - The physical slot number in which a baseband converter resides 1 through 8.

Formatter number - Eventually each site will have 2 data acquisition racks and rack #1 contains formatter #1 and rack #2 contains formatter #2.

Formatter track number - The "wire pair" number coming out of the formatter, 0 through 35.

Recorder track number - The physical head number on the high density headstack 0 through 35. Numbers increase toward the recorder deckplate.

Stack number - The headstack number on the recorder. Presently the VLBA has only one.

Index number - An index of the position of the headstack relative

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to the face of the recorder deckplate.

Pass numbers - The number of the recording pass, i.e., pass #1 is
the first forward recording pass and pass #2 is
the first reverse pass. If all the heads in the
headstack are enabled each pass will have to have
a different index number to avoid writing over
previously recorded data. However, modes which
only enable groups of tracks may have several
passes with the same index number.

Physical location of a recorded track

The physical location of a recorded track on the tape for
the MKIIIA format is given by:

pos=(index#-1)*pass spacing + (recorder track#-1)*head pitch
+ constant

where: head pitch = 698.5 microns
pass spacing= 55   microns
constant   = 1892 microns for forward passes
= 2590(=1892+698) microns for even passes
pos   = position of the center of 38 micron track

Note: this positions head 16 at index=7 to the physical
center of the 1-inch tape.

Tape track attributes

A given track on the recorded tape (tape track) will have the
following attributes (with ranges or examples in ()):

VLBA station #	(e.g., Pietown)
Frequency band	(e.g., S - band)
Polarization	(e.g., RCP)
I.F. channel	(A through D)
Formatter #	(1 or 2)
Baseband converter(BBC)#	(1 through 8)
BBC frequency	(e.g. 700.99 MHz)
Sideband	(upper or lower)
Bit type	(sign or magnitude)
Bandwidth	(e.g., 4 MHz)
Format	(e.g., Mk III A)
Muliplex mode	(e.g. 1:1)
Track roller mode	(e.g. off)
Sample rate	(e.g., 8 MHz)
Recording speed	(e.g., 270 I.P.S.)
Formatter trk	(e.g., 17)
Recorder trk	(e.g., 4)
Index #	(e.g., 1)
Pass #	(e.g., 1)

and the following are some of the constraints.

1)   All tape tracks in a given pass must have the same index #,
      recording speed, sample rate, track roller mode, multiplex
      mode, format and station.

2)   All parameters must be within the range of capabilities of
      the VLBA (see project book)

3)   There is a fixed hardwired correspondence between formatter
      track and recorder track given in VLBA acq. memo #97.

      An essential subset of the track attributes are encoded into
the auxiliary data field   - see acq. memo # 91 for proposed
format.

Initial MkIII compatibility mode

The only data acquisition mode proposed to date is the MkIIIA
compatibility mode proposed in acq. memo #97. This mode provides
the largest bandwidth simultaneously available with stations that
have MkIII recorders on the assumption that the VLBA site has
only 4 baseband converters (out of a maximum of 8 possible) and
only one DAR (out of the 2 that are planned).

MkIII Astrometric/geodetic mode (VLBA mode C -revised Jan 88)

In order to evaluate the performance of VLBA it will be highly
desirable to implement a mode which is compatible with the
present MkIII astrometric/geodetic mode which uses 14 upper
sideband channels (8 at X and 6 as S) at 2 MHz bandwidth. This
mode needs 2 DARs (each with 2 sampler modules) and a total of 14
baseband converters.

MkIII Conv	VLBA BBC	MKIII Trk F	Trk R	FORM Trk F	Trk R	VLBA Trk F	REC Trk R	FORM #
U1	U1 S	15	16	24	08	18	19	1
U3	U2 S	17	18	25	09	20	21	1
U5	U3 S	19	20	26	10	22	23	1
U7	U4 S	21	22	27	11	24	25	1
U9	U5 S	23	24	28	12	26	27	1
U11	U6 S	25	26	29	13	28	29	1
U13	U7 S	27	28	30	14	30	31	1
U2	U1 S	01	02	17	01	04	05	2
U4	U2 S	03	04	18	02	06	07	2
U6	U3 S	05	06	19	03	08	09	2
U8	U4 S	07	08	20	04	10	11	2
U10	U5 S	09	10	21	05	12	13	2
U12	U6 S	11	12	22	06	14	15	2
U14	U7 S	13	14	23	07	16	17	2

VLBA recorder groups 0 and 2 will be enabled for forward passes, and groups 1 and 3 for reverse passes.

Since the 2 formatters need different channel to track assignments we will call this mode C1 for formatter #1 and C2 for formatter #2. In practice the assignments could remain constant with the group enables changing.

MKIII mode A (VLBA mode A -revised Jan 88)

If there are 2 racks at Pietown for astrometric/geodetic experiments, it would also be useful to implement a mode which is compatible with Mark III mode A which uses both upper and lower sidebands of 14 converters. This mode gives 56 MHz of compatible bandwidth at 2 MHz bandwidth/trk and 112 MHz at 4 MHz/trk.

MkIII Conv	VLBA BBC	MkIII Trk	VLBA FORM Trk	VLBA REC Trk	FORM #	VLBA GRP
U1	U1 S	01	17	04	1	G0
L1	L1 S	15	24	18	1	G2
U3	U2 S	03	18	06	1	G0
L3	L2 S	17	25	20	1	G2
U5	U3 S	05	19	08	1	G0
L5	L3 S	19	26	22	1	G2
U7	U4 S	07	20	10	1	G0
L7	L4 S	21	27	24	1	G2
U9	U5 S	09	21	12	1	G0
L9	L5 S	23	28	26	1	G2
U11	U6 S	11	22	14	1	G0
L11	L6 S	25	29	28	1	G2
U13	U7 S	13	23	16	1	G0
L13	L7 S	27	30	30	1	G2
U2	U1 S	02	01	05	2	G1
L2	L1 S	16	08	19	2	G3
U4	U2 S	04	02	07	2	G1
L4	L2 S	18	09	21	2	G3
U6	U3 S	06	03	09	2	G1
L6	L3 S	20	10	23	2	G3
U8	U4 S	08	04	11	2	G1
L8	L4 S	22	11	25	2	G3
U10	U5 S	10	05	13	2	G1
L10	L5 S	24	12	27	2	G3
U12	U6 S	12	06	15	2	G1
L12	L6 S	26	13	29	2	G3
U14	U7 S	14	07	17	2	G1
L14	L7 S	28	14	31	2	G3

All groups will be enabled in both directions. As in mode C this mode should be A1 and A2.

MKIII mode B (VLBA mode B)

This mode can be supported with one rack and one formatter in VLBA mode A with VLBA groups 0 and 1 enabled for forward passes i.e. VLBA mode A1. The reverse passes should have groups 1 and 3 enabled i.e. VLBA mode A2.