NORTHEAST RADIO OBSERVATORY CORPORATION
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To: VLBA Acquisition and Correlator Groups
From: A. R. Whitney
Subject: Tape Synchronization at VLBA Correlator

The purpose of this memo is to explain, mostly by means of example, the proposed method of tape synchronization at the VLBA correlator.

The following assumptions are made (see VLBA Acquisition Memos 19,20):

1. All DPS's, as well as the correlator, have knowledge of a common "wall-clock" time. This "wall-clock" time has a resolution sufficient to resolve a single bit at 16 Mbits/sec.

2. Each DPS can be commanded to synchronize its output data stream with respect to the wall clock. Wall-clock references may be made to the second-of-time level, while tape-time references may be made to the data-frame level. For example, a request from the control computer might be -- "Please synchronize your tape so that at wall-clock second tick 3328 the data sample taken at 08:22:07.350 UT is provided."

3. In addition, each DPS may be commanded to apply an additional delay offset to be computed (by the DPS) from a polynomial series supplied from the control computer. For example, a request from the control computer might be -- "At tape-time 08:20:10.000 UT, and for the next 10 seconds thereafter, use this set of polynomial coefficients to compute the delay offset." Starting at the specified tape time, the DPS will use delay offsets computed from these coefficients, and will update the computation at appropriate intervals. These coefficients will remain in use until a new set is provided. Typically a single set of coefficients will remain valid for several seconds (up to 10 seconds, perhaps). Should an updated set of coefficients fail to arrive before the designated period of use has expired, data following that time will be flagged as invalid.

Note that, because these DPS actions are commanded to take place at wall-clock times in the future, the actual time of communications to the DPS is non-critical and is allowed to be asynchronous wrt DPS and correlator operations.

The following hypothetical example is intended to illustrate the communications that might take place between the control computer and a single DPS during tape startup and synchronization:

Wall-Clock (secs)	Control Computer	DPS
3000	(Assume tape is initially stopped)	
3001	What is your current footage-counter reading? ---------->	
	<----------	5183
3002	What is the last 'tape-time' you read, and corresponding tape footage? ----->	
	<----------	10:24:03.500 UT @5123
	(Control computer now knows precisely where tape is sitting and can make a considered request for tape synchronization.)	
3003	Please synchronize your tape so that at wall-clock second tick 3010 the data sample taken at 10:24:30.000UT is provided. ---------->	
3004	Starting at tape-time 10:24:30.000 UT and for the period of 10 seconds thereafter, please use the following set of polynomial coefficients to compute a delay offset ---------->	
	(At second tick 3010, or as soon thereafter as the tape is properly synchronized by the DPS, the 'data-valid' flags to the correlator will become TRUE and the correlator will begin processing.)	
3012	Starting at tape-time 10:24:40.000 UT and for the period of 10 seconds thereafter, please use the following set of polynomial coefficients to compute a delay offset ---------->	
	.	
	.	
	.	
	etc	

This is a very simplified example. In practice, detailed dynamic DPS status information and additional DPS utility controls will be available to the control computer.