

National Radio Astronomy Observatory
Charlottesville, Virginia

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To: VLBA and VLA Computer Groups
From: R. C. Walker
Subject: Calibration Software

New calibration software will be needed soon for both the VLBA and the VLA. The VLBA is a new instrument that will require a reasonably complete software package when the processor produces its first data in 1987. At the same time the DEC10 that is used for all VLA calibration (sometimes in conjunction with the Pipeline) is an old machine that probably will need to be replaced in a few years. The VLA software is sufficiently tied to the DEC10 that it cannot be directly transferred to a new machine. The VLBA and the VLA are similar instruments so one software package should be able to serve the needs of both. Therefore we plan to write a general purpose calibration package and are considering forming a joint VLA/VLBA project to do the job. A joint project would minimize duplication of effort and minimize the number of systems that users need to learn. Most of the work probably would be done at the VLA by a combination of VLA and VLBA personnel. Location at the VLA would allow the maximum interaction with the instruments and with the existing VLA calibration system. Discussion of this project has already begun within the context of the VLBA Post-Processing Group.

The calibration software could be developed either as a new package or as a part of AIPS. A new package would probably require several years before significant application code is available. There is a risk that the VLBA could begin to produce data that cannot be analyzed. AIPS is a successful package that already has many of the desired functions and can acquire those that are missing reasonably quickly, certainly long before the VLBA begins to produce data. It is also a package with which most users are familiar so there will be no learning barrier. The use of AIPS will bring the calibration and mapping software into the same package, which will be valuable when the calibration is iterative. This will be important for the VLBA for which nearly all calibrators will be resolved and will need to be mapped before being used to determine gains. The use of AIPS, which is designed to be portable to machines other than the VAX's on which it is currently used at most sites, should allow the package to be installed on much larger computers when they become available. This will be important to the spectral line users whose data sets are too large to be analyzed comfortably on VAX's. The current concept is that the core of the AIPS group, including the ultimate control of the AIPS standards, should remain in Charlottesville. The calibration project would be primarily a source of new applications code.

There are a number of changes and enhancements to AIPS along with specifications of details such as the contents of the data records etc. that will be needed before much code can be written. Some discussion of these matters has occurred in the VLBA Post-Processing group (see VLBA Memos 370, 371, and 379 by Bill Cotton) and a mechanism for setting specifications has been established. However, before much software is written, a broadly based group needs to review the requirements of a general purpose calibration package and the basic design of the package needs to be established. To this end, I have solicited (through Gareth Hunt, in some cases) the documents described below on various aspects of the system. These documents should be prepared by the mid October. Written responses can then be generated where appropriate. Once everyone has time to digest the written material, we will have a meeting to discuss the results and set any styles and standards that are needed. That meeting will occur in early November. Please try to make the documents complete but concise! Be sure to point out any areas where there is uncertainty in what should be done.

The documents should be distributed by two mechanisms. In order to reach members of the VLBA project, especially those involved who are outside of NRAO, they should be sent out as VLBA Memos. Second, in order to reach people inside NRAO quickly and conveniently, they should be placed in an area on the Charlottesville VAX that will be established for the purpose. That area will be called: UMA3:[AIPS.CALIB]

SOLICITED DOCUMENTS:

Below is a list of the documents that we need along with persons that have agreed to provide them. Below each item is an incomplete list of topics that should be covered.

1. Methods. (Cotton)
 - New data type for pre-calibrated data?
 - Multiple source per file vs. subdirectory structure.
 - Use of gain tables.
 - Indexing?
 - Possible use of write-only media (eg optical disk).
 - How to deal with very large data sets.
2. VLBA Fringe Processor Output (Benson)
 - What information will be passed?
 - What is the archive medium/format?
 - What will be the normal path to AIPS.
3. VLA On Line System Output. (Hunt)
 - What will be passed?
 - What is the data path to AIPS (Modcomp tape reading task?)?
4. Detailed specification of the gain tables (Cotton with input from Hunt)
 - What gains are kept?
 - How to handle antenna and correlator dependent numbers?

5. Data content. (Cotton, Benson, Walker, Romney, Hunt)
 - What numbers should be kept.
 - How to maintain geodetic/astrometric accountability.
 - What level flagging is needed.
6. User interface, new features. (Greisen, Palmer, input from Walker, Hunt and others)
 - Data selection.
 - Tabular data input - table manipulation.
7. AIPS standards - any changes now or future? (Greisen, Wells)
 - Fortran 77 features.
 - Graphics standards (GKS?)
8. Lessons from the DEC10 package. (Hunt)
9. Relationship to the Pipeline. (Hunt)
10. List of functions needed. (Cotton plus most of group)
11. Special spectral line needs. (Palmer and Van Gorkom for VLA, Walker, Benson, and Romney with input from SAO for VLBI)
12. Special geodesy needs. (Ken Johnston, Charlottesville group with help from some combination of Goddard, JPL, NGS, and NRL)
14. Special needs for planetary observations. (?)
 - Circular polarization.
 - Moving objects.
15. Special needs for solar observations. (?)
 - Moving objects.
 - Short term phenomina.
16. Phased array needs. (Crane)
17. Flagging. (Cotton, Romney, someone at VLA)
 - Displays, methods.
 - Nature of flags:
 - How many levels?
 - Where stored?
 - Separate flag table for unmodified uv data sets?
 - Unflagging.
18. Requests and suggestions from users.
 - Richard Simon
 - Anyone else willing to write something down.