AIPSLETTER

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A newsletter for users of the NRAO
Astronomical Image Processing System

Written by a cast of *AIPS*

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General developments in *AIPS*

Current and next release

The April 15, 1999 release of Classic *AIPS* is now available. It may be obtained via *anonymous* ftp or by contacting Ernie Allen at the address given in the masthead. 15APR99 is also available on CDrom as well as the more traditional tape media. *AIPS* is now copyright ©1995 through 1999 by Associated Universities, Inc., NRAO's parent corporation, but may be made freely available under the terms of the Free Software Foundation's General Public License (GPL). This means that User Agreements are no longer required, that *AIPS* may be obtained via anonymous ftp without contacting NRAO, and that the software may be redistributed (and/or modified), under certain conditions. The full text of the GPL can be found in the 15JUL95 *AIPSLetter*. A convenient order form is found from our Web page at http://www.cv.nrao.edu/aips. A paper order form and the ftp address appear on the last page of this *AIPSLetter*.

The next release of *AIPS* will be 15OCT99. It is possible to get early access to, and remain current with, this release by running a "midnight job"; see the *AIPS* home page for further details. Note that this allows your site to receive the latest improvements and bug fixes, at the cost of also receiving the latest bugs. The latter can and will be fixed as rapidly as possible when the programmers are notified of them at daip@nrao.edu.

Highlights

There are only five new tasks and one new verb in this release. The most important new task is FITAB which should eventually replace FITTP for writing both *uv* and image data. The new verb, TAPES, will let you see the choices you have for both local and remote tape devices.

Because so many significant bugs have been found and corrected, we recommend that you seriously consider replacing whatever release of *AIPS* you are currently using with 15APR99. A long-standing error in gridded model subtraction and serious errors in the the *uv* gridding routines were fixed. A long list of problems, some subtle and some catastrophic, in the calibration application routines were also repaired. Users should check their data for bad bandpass solutions and bad phases when applying polarization calibration as well as more subtle affects due to the use of calibrations from not quite the right times. The gridded-model subtraction bug could produce low-level stripes in images, or even, in a well-chosen example, divergent deconvolutions. Read the following pages carefully to see if your data may have been affected.

Improvements of interest to users in 15APR99

The 15APR98 *introduced numerous changes which are not compatible with previous releases. Disk files written by previous versions are read transparently by* 15APR98 *and later releases (including* SAVE/GET *files), but users must not attempt to read disk files written by any of the modern versions with earlier versions.* 15APR98 *and later* AIPS *cannot start previous versions of tasks and the TV displays of the versions are incompatible. The TV displays of* 15OCT98 *and* 15APR98 *are also not fully compatible.* SAVE/GET *files for* 15OCT98 *and* 15APR99 *cannot be read by* 15APR98 *and earlier releases;* 15OCT98 *and later releases will translate old* SAVE/GET *files when they encounter them.*

General matters

FITAB

FITAB is a new *AIPS* task intended to replace FITTP (gradually). It has a number of advantages over FITTP and would replace it directly except that its output cannot be read by older versions of *AIPS* and by other software systems which do read *AIPS* random-groups *uv*-data format. The advantages of FITAB are:

- For images, FITAB allows the specification of the value of the least bit. Integer and floating output FITS files are very much more compressible if the least bit is controlled to have a value related to the image's rms (*e.g.*, rms/4). FITTP uses the full range of integer and floating output values and is, therefore, not particularly compressible. When shipping a FITS file over the Internet, it helps to make a smaller file via Gnu or Unix compression. FITAB will use the integer format appropriate to the selected least bit and image range when FORMAT 1 or 2 is requested.
- For *uv* data, FITAB writes out the data in a binary-tables form rather than in a random-groups form. This has the advantage that the data may be written in "compressed"" format identical to that used on disk inside *AIPS*. FITS files that take advantage of this option can be as much as three times smaller than those written by FITTP. Non-*AIPS* software is much more likely to understand binary tables rather than random groups, although some (*i.e.*, **difmap**) are able to read FITTP's random groups.
- For *uv* data, FITAB is able to break up the output into multiple files, each containing a "piece" of the *AIPS* file. Each of these files contain the full contents of many of the descriptive files (source, flag, index, antenna) as well as the corresponding time range for any calibration files (**CL**, **SN**, **IM**, **TY**, etc.). These tables appear in the files before the *uv* data. Each piece of an *AIPS* data set can be read and used individually or together with some or all of the other pieces. If parity error, or other problems like end of tape, affect the writing of a large file, recovery of some or all of the information is simplified with the new capability. FITAB can write multiple disk files for the multiple pieces and all FITS readers (FITLD, UVLOD, PRTTP) can read and understand multiple-piece disk and tape structures.

The main disadvantages of FITAB are:

- For *uv* data, FITAB's output is not understood by 15OCT98 and earlier versions of *AIPS*. It is also not understood so far by other software packages such as AIPS++, **difmap**, *et al.*
- For image data, a poor choice of least bit in FITAB can lead to a serious degradation in image quality.

TAPES

A new verb called TAPES was written to display information about which tape devices are available. If the REMHOST adverb is blank, it looks for information on the current computer, using the standard $NET0/TPDEVS.LIST file. If REMHOST specifies some other computer, then that computer is sought in the file instead. If it is not found there, then the verb attempts to acquire the information using the TPMON1 dæmon running on the remote host. If it is running and is at least a 15APR99 dæmon, then the remote TPDEVS.LIST file is read and the selected information returned. In this way, users do not have to remember which tape drive is which long after they have started up their AIPS session.

Serious FITTP bug on LINUX

When certain subroutines were compiled under the LINUX EGCS g77 Fortran compiler versions 1.1 and 1.1.1, seemingly random and non-deterministic errors were found to occur. Specifically, the routines `ZR32RL` and `ZRLR32` which translate floating-point values between local and FITS-standard format, were found to add one bit on occasion to one of the bytes of some of the values. This would often cause only a modest change in the value, but could turn the value into a 10^{30} if the bit happened to be in the exponent. Data written by `FITTP` and then read with `FITLD`, `UVLOD`, and `PRTTP` were most affected. Usually no error message would appear until the data read back were processed in some way *e.g.*, by `IMAGR`. Data files written with this bug are unrecoverable. Versions of the EGCS compiler prior to 1.1 do not have this problem. *AIPS* Z routines were changed to avoid any use of `INTEGER*2` at the end of December 1998 in `15APR99` and, so far as we know, there are now no problems in this release with the the EGCS compiler versions 1.1 and beyond. Users of `HF2SV` and `HFPRT` should be aware that the format supported by `HF` files requires `INTEGER*2` and so there may still be problems with these tasks if EGCS compilers are used.

Miscellaneous changes

XHELP has been improved. When you type `XHELP` *taskname*, the help file for the task will be displayed in your network browser. All adverb names that occur in the inputs and help sections of the file will be highlighted as links to the adverbs' help files.

RUN The `VERSION` adverb may now be used to point at run files belonging both to the login user and to user number 1.

COMPRESS This verb, which is the quick way to pick up new *POPS* symbols and to clean up procedure editing, had the unfortunate affect of making all character string values into upper-case letters. It now preserves case.

Batch A Y2K-like bug caused the start times for batch jobs started with a delay to be 1900 years too large. Batch jobs are sometimes vulnerable to `CTRL-C`'s and the like. They should be avoided when running tasks and batch jobs.

VLBI data processing

`FITLD`: Calibration transfer

All FITS export tapes written by the VLBA correlator after April 1, 1999 contain calibration and flagging information. `FITLD` will load these data automatically into `TY`, `PC`, FG, and `GC` tables. Each FITS file contains an independent copy of the calibration information so you will often end up with duplicated information. This may cause some *AIPS* tasks to fail. Therefore, if you process VLBA data, you should type `RUN MERGECAL` to define the `AIPS` procedure `MERGECAL`. You should then run the `MERGECAL` procedure on all VLBA data immediately after loading it to remove redundant calibration data. This function will eventually be incorporated into `FITLD`.

The calibration data from the VLBA correlator may be incomplete if you have used non-VLBA stations. Refer to `http://www.nrao.edu/vlba/html/OBSERVING/cal-transfer/cal-transfer.html` for procedures to follow in these circumstances. The Memo defining the FITS-IDI format including calibration transfer appears in this release and *AIPS* Memo No. 102.

`FITLD`: other changes

Many fixes have been incorporated into the `15APR99` version of `FITLD`. These include

- The `BIF`, `EIF`, `BCHAN`, and `ECHAN` adverbs are no longer used if they specify IFs and channels outside the range in the input file. Previously, they were used to select non-existent data.

- WTTHRESH can now be used to flag data within individual IFs rather than flagging entire visibility records.
- FITLD no longer fails if asked to append data to a file that does not contain data from the VLBA correlator.
- VLBA source positions are precessed to the observing date for the apparent coordinate columns of the source table.
- Explicit subarray numbers are no longer discarded in interferometry data interchange files.
- The way in which FITLD chooses an observing date has been improved so that it is less likely to omit an observing date from the header of an output file.
- The restrictions on the time order of data in a FITS-IDI file have been relaxed so that data may occur in any order within a single UV_DATA table provided that the table does not span a midnight boundary.

CLCOR

The *AIPS* task CLCOR corrects the CL table using several options. One of them is a correction for a shift of the source and/or antenna position (option "ANTP"). There were no complaints about this option while it was used for moderate shift (<1 asec). At the end of 1996, a problem was reported in a VLBA observation at 7mm-wavelength with a position shift of 10 asec. Phil Diamond carried out a test of CLCOR by correlating data at C band with a known shift of 5 asec in declination. He showed that the shifted data after being corrected by CLCOR coincided with the original data. Because some users continued to complain, it was decided to do a deeper analysis of the CLCOR correction for source position and to carry out the new test with bigger shift

Until now, CLCOR calculated the correction of delay and rate using only linear terms in the series as a function of the shift. So CLCOR could be in error because of disregarding the higher-order terms or because of the difference between the simple formulæ used by CLCOR and the more sophisticated formulæ of CALC used by the VLBA correlator. To eliminate the problem of the high terms, the new version of CLCOR calculates the correction of the delay and rate as the difference of the delay and rate in the shifted and original position. The accuracy of CLCOR was also improved when FITLD was modified to record the correct apparent source coordinates in the relevant columns of SU table.

Tests were carried out at wavelengths of 7mm and 6cm. The correlation was provided with shifted source coordinates as large as 20 asec. The known shift was then corrected in *AIPS* by the improved CLCOR, and the corrected data were compared with original un-shifted data. The tests and our error analysis show that CLCOR corrects delay and rate without visible errors in all practical cases. The error of the corrected phase is explained by the difference between CALC's and CLCOR's formulæ. The error in the phase correction by CLCOR is small if the product of baseline in λ by the shift in asec less than $3 \cdot 10^8$.

Miscellaneous changes

CookBook The VLBI chapter has been updated to include information of calibration transfer and phase re-referencing.

CVEL The Hanning smoothing of autocorrelation spectra was corrected and Hanning smoothing was made an option for both autocorrelation and cross-correlation data under control of APARM(9).

PCCOR The handling of Pcal tones which are not located symmetrically with respect to the edges of the IFs was corrected. This case now arises after recent changes to SCHED.

USUBA This task appears to be fragile for MkIII data in which antennas drop in and out rapidly without switching subarrays. The code was able to break the HP optimizer and so is now no longer complied with optimization on that architecture.

UVPOL This task converts *uv*-data having only one cross-hand polarization in a sample to a form that IMAGR will accept and make complex images and beams suitable for CXCLN. It was retaining data for which both cross-hand polarizations were flagged, which disturbed the weighting of the data in imaging. Now such data are dropped.

Fringe fitting

The performance of KRING was checked extensively with a newly developed test suite. A new SOLTYPE = 'NOFT' to disable the FFT stage was added. It allows KRING to perform only the least squares and behave just like CALIB except that it can also solve for rates, and single-band and multi-band delays. When a solution's SNR falls below the threshold, the solutions are now blanked. Bugs in FRING affecting loops over subarray and failed solutions in rate-only fits were corrected. The task MBDLY was found to fail or get the wrong answer a lot of the time and was found to use ony the first subarray and first frequency ID. It has been improved, but KRING is more reliable in finding multi-band delays.

Interferometric data handling

Ionospheric corrections

This release of *AIPS* includes a new task (TECOR) for correcting ionospheric delay and Faraday rotation. This task uses ionospheric data in IONEX format. This is a standard format for maps of ionospheric electron density that is used by the geophysical community. World-wide ionospheric data is available from the Crustal Dynamics Data Information System (http://cddisa.gsfc.nasa.gov) in IONEX format with a time resolution of 2 hours. NRAO plans to make data with higher time-resolution available for the continental United States in the near future. You will need a password to retrieve data from the CDDIS. Contact information is provided at the CDDIS web site.

In a related change, the task GPSDL has been renamed to APGPS (APply GPS) and has been upgraded to allow antenna selection and calculation of dispersive delays.

Calibration application package

For the 15OCT98 release, the calibration application package was generalized to allow calibration data to occur at different times for different antennas. Previously, they all had to occur at the same time, a requirement which caused real problems with some standard modes of VLBI observations. Unfortunately, there were a number of problems with the generalized routines which were found only after they were used on a wide variety of data. For this reason, users of 15OCT98 are encouraged to replace it with 15APR99.

Changes to the calibration application package included

- The ability to apply dispersive delays, when they are present in a CL table, was added to all calibration application tasks.
- An error made in 1992 caused flagged solutions to be ignored with the data then being calibrated with good solutions from (potentially much) earlier times. Now data, for which the solutions are blanked, are flagged as they should be.
- The ionospheric Faraday rotation and dispersive delay terms were not inserted properly into the interpolation tables under a variety of conditions.
- The interpolation routines did not check for blanked Faraday rotation values and hence made gross errors in applying polarization calibration. Note that a magic-value blank is around 10^8 on most machines.
- Data records were not dropped when all data were either previously flagged or flagged due to bad gain solutions.

- There is code designed to avoid computing interpolated solutions for every microscopic change in time or even for every data sample. This code had to be fixed since it failed to recognize that the tables to be interpolated had changed and it failed to interpolate often enough if one or more antennas had a big gap in time with no solutions.

- The bandpass application code contained the dubious assumption that auto-correlations after calibration would be centered about a value of 1.0 and, therefore, subtracted 1.0 to leave, in principle, just the signal from the sky in some sort of units. Unfortunately, the order of the gain and bandpass multiplications actually made the results be centered on values other than 0.0. The subtraction of 1.0 has been removed from the code, leaving autocorrelations with no automatic "baseline" subtraction.

- The logic by which the adverbs `QUAL`, `CALCODE`, and `SOURCES` selected sources produced confusing results when sources were de-selected (*i.e.*, `SOURCES = '-`*xxxx*`'`. The logic was changed so that `CALCODE` and `QUAL` are applied to select a list of possible sources from the source table and then `SOURCES` is applied to reduce the list.

Miscellaneous corrections and additions

BPASS had a very serious bug which was introduced in the `15APR98` release. When one polarization of an antenna was fully flagged, the solution for the other polarization was an erroneous constant for the first half of the channels.

CLINV is a new task which will make a `CL` or `SN` table which is the inverse in amplitude, phase, or both of an input table. The task was created to handle a situation in which a strong source near the antenna half-power point dominated the self-cal solutions. Pointing errors make these solutions incorrect for the other sources in the field and so the calibration needs to be removed after the strong source has been `UVSUB`ed.

FLGIT has a new option to remove data with excessive V polarization before median filtering or fitting baselines. It also has new controls on the levels at which data are flagged with respect to the rms.

SPLIT contained a bizarre bug which under a combination of circumstances could affectively destroy a source table. The number of channels written when frequency smoothing was changed to write as many as possible even if the last one does not get as many input channels averaged into it. If `DOUVC=-1`, as it should with channel-dependent weighting, then the weights will take care of this partial averaging.

UVCOP would occasionally write out fully flagged data even when instructed to avoid doing so. The tests for good data were tightened to include only the included IFs and channels.

EDITR and friends had an error that caused them to ignore times in which only one antenna or baseline occurred. This was most obvious when a single antenna or baseline was included in the editing.

UVINIT had a bug when it had to open a file already larger than 2 Gigabytes in order to append even more data.

Imaging

Miscellaneous imaging changes

Image size The maximum allowed image size was parameterized throughout *AIPS* and was increased to 16384. A number of bugs handling image size were corrected. If you have enough disk and time you are now allowed images up to 16384 on a side. You must have a system capable of handling files > 2 Gbyte if you need to Fourier transform such images.

FLATN The option to omit `EDGSKP` pixels around the edge of each image was added. The gridding was re-arranged to avoid excessive computations, greatly improving performance.

IMAGR and SCMAP

A considerable number of changes have been made to IMAGR and SCMAP to assist in their use. They include

- The adverb OBOXFILE was added to specify a text file in which are kept all of the Clean boxes currently in use. It is updated whenever boxes are changed with the TV display. Lines describing other parameters are kept as well, so OBOXFILE can be the same file as the BOXFILE used to provide the initial window and field parameters.
- The display routines no longer require that all Clean boxes appear on the display in full or in part although that is the default in setting the display window. The box-setting functions will work on whatever window is currently displayed, allowing you to look at every pixel in each part of the image if you want.
- Menu handling was improved to try to prevent changes in the window size from affecting correct menu reading.
- The color and intensity transfer functions are now initialized only at the beginning of the task. Any transfer function you have set will be retained at the next major cycle.
- OVERLAP 2 mode may be used without having to request DO3DIMAG.
- Cleaning with DO3DIMAG true will continue in OVERLAP < 2 modes until each image has had the same number of major cycles even if NITER is exceeded.

A number of significant bugs were found and corrected. They are

- The gridded model subtraction routines failed to scale the W term for any frequency difference between the first channel being used and the reference frequency. This tends to arise if BIF is not 1 and when the primary-beam correction option is invoked. The error is particularly prominent at low declinations with fields north or south of the pointing position. Multi-channel subtractions were handled correctly if the first channel is at the reference frequency. Note that this error appears to have been present since gridded model subtraction first appeared in *AIPS* and affects all tasks that do that operation.
- The 3D gridding routine had a gross error that would arise when it had to do multiple passes in the gridding and there was a gap between one swath in $|u|$ and the next. This error caused very bad intensity levels and other obvious defects in the images.
- A similar gridding bug in both routines arose when there were no samples in the very last swath of $|u| \approx 0$. Its affects were also obvious.
- The tests to decide whether data had to be sorted before weighting, gridding, or Cleaning were corrected for several minor flaws that could result in data not being sorted when it needed to be.
- The primary beam correction had a bug causing it to fail when DO3DIMAG was true. It also did not handle coordinates properly especially in the 3D case.
- Source tables contain frequency offsets for each source with respect to the frequency offsets in the FQ table. These are often small, but are not required to be. Unfortunately, they were ignored by most tasks except inside the calibration system and in SPLIT. Among other possible affects, this oversight caused a scaling error in images made by IMAGR from multi-source data sets. It would also make scaling errors when applying a model with CALIB, FRING, *et al.*

Modeling

UVCON

The new task UVCON was written to simplify simulation of *uv*-data for designing array configurations. It generates a *uv* database for an interferometric array whose configuration is specified by the user. Visibilities corresponding to a specified model and Gaussian noise appropriate for the specified antenna characteristics are calculated for each visibility. The output is a standard AIPS *uv*-data file. AIPS has several tasks which assist with this problem, but none of them are complete. They are UVSIM which simulates *uv*-data without a source model or noise, UVSUB adds a model to an existing *uv*-data file without simulation, UVMOD which adds noise and a simple model to an existing *uv*-data file without simulation, and DTSIM which simulates *uv*-data with only simple models and without noise. DTSIM is intended to test calibration defects in VLBI and is thus too complicated for the array design purposes. UVCON replaces a procedure which used AIPS tasks UVSIM, UVSUB, and UVMOD along with the PUTHEAD verb. The array geometry can be specified in three different coordinate systems: equatorial, local horizon, and geodetic. There is an option of using set of different frequencies to simulate better *uv* coverage. UVCON has been used successfully to simulate *uv*-data for ALMA (the new name for the MMA) and for the VLA upgrade and can be recommended for other projects.

SLIME

An updated version of SLIME, the interactive model-fitting "plug-in" for AIPS is now available. Pre-built packages are available for SPARC workstations running Solaris 2.5 or later and for ALPHA/AXP workstations running Digital UNIX 4.0. These packages have been built against the 15OCT99 version of AIPS but should work with any version of AIPS from 15APR98 onwards. The packages for 15OCT97 and earlier have been withdrawn.

This version fixes some memory leaks that caused SLIME to fail under Digital UNIX under some circumstances and offers improved messages that provide better advice on what to to if a least-squares solution fails to converge. In addition the Digital UNIX version no longer requires the GNU C++ runtime libraries to be installed.

The updated version of SLIME may be downloaded from the SLIME home page at
http://www.nrao.edu/~cflatter/SLIME/index.htm

Data analysis and display

UVHOL is a new task to perform the holography functions previously, but no longer, done by UVPRT. It selects the last NPOINTS samples of each dwell position (as indicated by the value of w) which is a more reliable method of selection than used previously.

PRTUV has a new set of options to specify the data scaling in order to avoid reading some of the data set to find the necessary scaling information.

KNTR has a new adverb NY to specify the number of frames in the y direction. The default is still to make as square a display as possible.

POSSM failed to plot bandpass functions produced by CPASS properly and wrote all over itself. It does better now.

DFTPL used data weights incorrectly in computing the rms and expected error.

XMOM now retains the first axis (making it the last 1-point axis) so that coordinate pairs will not be lost.

REBOX and FILEBOX now handle Clean boxes that are partially or fully off of the display area. The order of the boxes is retained and any that are fully visible may be changed.

XAS has displayed a funny line at the bottom of the screen for a very long time. A correction in the screen initialization routine has finally gotten rid of it.

Improvements in system matters in 15APR99

AIPS Manager related items

XHELP has a new cgi perl script that should be installed in a local form in the cgi area used by your computers. INSTEP1 now attempts to do this and explains the need to do so. Otherwise, XHELP fetches its data from Charlottesville.

LINUX EGCS g77 Fortran compilers ≥ 1.1 were found to make errors compiling routines containing INTEGER*2 statements. These compilers must not be used with versions of *AIPS* prior to 15APR99. Because of this problem, we re-issued the 15OCT98 CDrom of *AIPS* using serial numbers ≥ 100.

LINUX version of ZMOUN2 failed to close the device on a number of error conditions. When this happened, the device was locked until the AIPS process was terminated.

LINUX libraries were found to have a range of versions in which the getservbyname function left an open file behind. After about 80 TV opens/closes, the open file limit was hit and things stopped working. The latest libraries have corrected this bug, but we have left in a work-around since we have found that remembering the host and service rather than finding them each time is much faster, at least when they have to be found via yellow pages.

USUBA was found to be fragile in optimization and the optimizations had to be turned off for HP systems. This is done in the file $SYSUNIX/OPTIMIZE.LIS.

Programming considerations

Image size is parameterized in the PMAD.INC file with the maximum image dimension MAXIMG set to 16384 and the buffer size parameters MABFSS and MABFSL set to 16384 and 65536. All *AIPS* subroutines and tasks should now use this include to set buffer dimensions.

Table floating-point keywords are now all stored as double-precision values. Routines that read table keywords should test the type and handle the returned value properly in case it is a single or a double for a floating-valued keywords.

Frequency offsets are also a function of source in the source table and of time in the CL table. Both have been ignored widely, but it is not acceptable to ignore the first. After an INIT call to UVGET is made, the source offsets for each IF are found in the DSEL.INC common variable SFREQS(MAXIF). The call sequence to CHNCOP was changed to include this array. UVGET has always used the source offsets in setting the new reference frequency, but any output FQ table needs to take the offsets at each IF not just the first into account. SPLIT did all this correctly, but, until this release, most other tasks did not.

Recent *AIPS* Memoranda

The following new memorandum is available from the *AIPS* home page.

102 The FITS Interferometry Data Interchange Format
Chris Flatters
December 3, 1998
The FITS Interferometry Data Interchange (FITS-IDI) format is a variant of FITS that may be used to archive raw radio interferometry data and to transport it between institutions. It may be used to store both interferometry data and calibration data that is associated with it.

Improving AIPS Performance Under Solaris

Disk writing under Solaris 2.*x* is governed be a "write throttle" algorithm that tries to limit the amount of memory that can be consumed by buffered data waiting to be written to disk. If a process has more than a certain amount of data in the buffer waiting to be written to disk, Solaris will hold up that process until some of that data has been written out. The default value of this threshold is rather low and imposes a considerable penalty on AIPS which tends to write a lot of data to scratch files. Fortunately, this threshold can be changed.

If you have a Solaris system that is predominantly used by a single AIPS user and you have at least 100 megabytes of main memory, then you should see a significant improvement in performance if you add the following lines to `/etc/system` and reboot (you will need to do this as root).

```
set ufs:ufs_HW=6291456
set ufs:ufs_LW=4194304
```

Tests show improvements from about 10% to more than 30% in the `DDT` benchmark with higher-performance machines receiving the greater improvements. It is likely that the low default settings are largely responsible for the performance deficit observed running the `DDT` benchmark on UltraSPARC systems without using `/tmp` for scratch files.

If you process a lot of spectral line or VLBI data and you have a large amount of memory, then it is possible that you could benefit from even larger values of these settings but you should exercise caution when changing them and make sure that `ufs_HW` is always larger than `ufs_LW`.

If you have 64 megabytes of memory or less, changing these settings will not improve your performance significantly and may cause some degradation. If your system is often used by more than one person at the same time, then you should also avoid this change. When several programs are trying to write data at the same time, this change tends to increase the performance of programs with high data rates at the cost of programs with lower data rates. This may be unpopular with other users.

You can find more information about the write throttle in Chapter 8 of "Sun Performance and Tuning, 2nd Edn" by Adrian Cockcroft and Richard Pettit (Prentice Hall, 1998).

Patch Distribution

As before, important bug fixes and selected improvements in `15APR99` can be downloaded via the Web at:

`http://www.cv.nrao.edu/aips/15APR99/patches.html`

Alternatively one can use *anonymous* `ftp` on the NRAO cpu `aips.nrao.edu`. Documentation about patches to a release is placed in the anonymous-ftp area `pub/aips/`*release-name* and the code is placed in suitable subdirectories below this. Information on patches and how to fetch and apply them is also available through the World-Wide Web pages for AIPS. As bugs in `15APR99` are found, the patches will be placed in the `ftp`/Web area for `15APR99`. No matter when you receive your `15APR99` "tape," *you must* fetch and install these patches if you require them.

The `15OCT98` release had a number of important patches announced and probably should have had more. Repairs to the general calibration system are so complex that we hesitate to announce them even when they might be serious. The announced corrections were:

1. `FTPGET` incorrectly indicates `DA00` status. 1998-11-25.
2. Error in gridded Clean-component modeling. 1999-01-05.
3. Error in appending to very large UV data files. 1999-01-19.
4. Error in copying VLBI files in `FLGIT`. 1999-01-20.
5. Revised documentation for calibration transfer. 1999-03-30.

Progress on a world-coordinates standard

At the ADASS meeting held in Boston in the Fall of 1992 it was decided that a standard for conveying coordinate information within the FITS format needed to be developed. Eric Greisen was, in his absence, volunteered for the effort. Versions of possible standards authored by Greisen and Mark Calabretta (of the ATNF in Australia) appeared in 1993 (June AAS meeting in Berkeley) and in 1994 (September ADASS meeting in Baltimore). Other revisions through about 1996 were available off the World-Wide Web. The subject has languished for a while since then, but has now become serious due to agreements reached in principle at the November 1998 ADASS meeting in Champaign-Urbana. The paper is now divided into three parts: a general paper, a celestial-coordinates paper, and a spectral-coordinates paper. All three of these are available via the WWW and we encourage you to fetch and read them. When these are adopted — and something very much like them will become part of the FITS standard — they will affect the ways in which we think about astronomical data. For that reason alone, they are important and we solicit your comments (`egreisen@nrao.edu` and `mcalabre@atnf.csiro.au`). The papers are:

I. Representations of world coordinates in FITS, by Greisen and Calabretta (`ftp://ftp.cv.nrao.edu/NRAO-staff/egreisen/wcs.ps.gz`)

II. Representations of celestial coordinates in FITS, by Calabretta and Greisen (`ftp://ftp.cv.nrao.edu/NRAO-staff/egreisen/ccs.ps.gz`)

III. Representations of spectral coordinates in FITS, by Greisen (`ftp://ftp.cv.nrao.edu/NRAO-staff/egreisen/scs.ps.gz`)

AIPS on CDrom

Starting with `15APR98`, we have made *AIPS* available on CDrom. The initial tests using recordable CD's were very successful, and resulted in a CD with source code, two binary versions (Linux and Solaris), all `DDT` files, and a GNU-zipped version of the documentation (`TEXT`) area. It is possible to either perform a full installation on disk (*i.e.*, copying the binaries from CD to local disk), or to run from the CD. In the latter case, the "footprint" on the local disk is under 10 Megabytes! (This figure does not include user data, obviously.) Furthermore, the setup script was given the ability to switch between a "run from CD" installation and a "full" installation. The fact that 71 copies of the CDrom were distributed suggests that this functionality, and the availability of *AIPS* on this new medium, are of considerable use to the Astronomical Community.

AIPS Distribution

A total of 263 copies of the `15OCT98` release were distributed to 239 non-NRAO sites. Of these, 114 were in source code form and 149 were distributed as binary executables. This is about the same as that of `15APR98` (278 copies) and rather more than those of `15OCT97` (107 copies), `15OCT96` (222 copies), and `15APR97` (148 copies), perhaps reflecting the lower rate of developments in previous releases and the new capabilities of the 1998 releases.. The figures on computers using *AIPS* are affected by the percentage of *AIPS* users that register with NRAO. Of 239 non-NRAO sites receiving `15OCT98` only 82 (34%) have registered. We remind serious *AIPS* users that registration is required in order to receive user support. The first table below shows the breakdown of how the copies of `15OCT98` were distributed and includes both source-code distributions and binary distributions. The second table below is based on registered installations of `15OCT98`. It lists total numbers of computers and indicates that the distribution over operating systems was heavily weighted toward Solaris with Linux as a distant second. However, when asked about "primary" architecture, 45% of our users answered Solaris and 41% answered Linux. This indicates how far Linux has penetrated as the system used on the more powerful computers used by astronomers today. The third table gives information about the geographic distribution of the systems shipped.

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PC Linux	112	25	19	23	16	19
HP-UX	21	5	2	3	6	4
Dec Alpha	14	3	7	9	6	10
IBM /AIX	10	2	1	0	0	4
SunOS 4	3	1	4	14	5	13
SGI	3	1	3	1	1	5
Alpha Linux	1	0				
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