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 future releases

We have formal 𝒜ℐ𝒫𝒮 releases on an annual basis. While we offer a full binary installation method for both the frozen and development versions for MacIntosh OS/X (PPC and Intel chips), Solaris, and Linux systems, all architectures can do a full installation from the source files. The current release is called `31DEC07` and is now "frozen." If you took a development copy of this version at some earlier date, you should use the "Midnight Job" (MNJ) to bring it up to date. You need to run a MNJ only once in 2008 to convert your copy of `31DEC07` into the frozen version. When patches to 2007 are announced, you may apply them with the MNJ. This *𝒜ℐ𝒫𝒮ℒetter* is intended to advise you of corrections and improvements in this release.

We have begun a new version, called `31DEC08`, which is now under development by the 𝒜ℐ𝒫𝒮 Group. You may fetch and install a complete copy of this version at any time. Having fetched `31DEC08`, you may update your installation whenever you want by running the MNJ which uses cvs, rsync, and transaction files to copy and compile the code selectively based on the code changes and compilations we have done. We expect users to take their source-only or binary version of `31DEC08` 𝒜ℐ𝒫𝒮 over the Internet (via *anonymous* ftp). Both versions require you to copy the installation procedure `install.pl` via `ftp`; the source-only version also requires you to ftp the 90-Mbyte `31DEC08.tar.gz` compressed tar file.

From `mnj.aoc.nrao.edu`, the MNJ will serve up 𝒜ℐ𝒫𝒮 incrementally — or as a whole — using the Unix tool `cvs` running with anonymous ftp. Binary MNJs also use the `rsync` tool. Linux sites will almost certainly have `cvs` installed; other sites may have installed it along with other GNU tools. Secondary MNJs will still be possible using `ssh` or `rcp` or NFS as with previous releases. We have found that `cvs` works very well, although it has one quirk. If a site modifies a file locally but in an 𝒜ℐ𝒫𝒮-standard directory, `cvs` will detect the modification and attempt to reconcile the local version with the NRAO-supplied version. This usually produces a file that will not compile or run as intended.

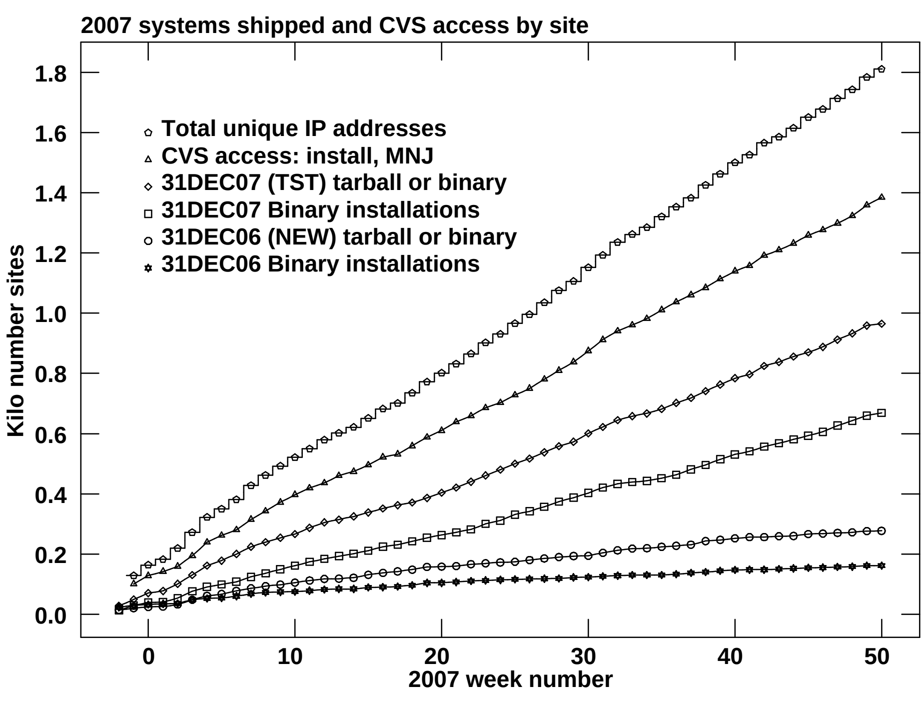
Installing a new version

If compiling locally, new releases must be installed from the tar ball for that release. If using the binary installation, a full new installation must also be done with `rsync`. The `cvs` system requires this. When installing a new *AIPS* release in a system that already has a previous release, we recommend that `install.pl` be used and that the previous release be left in place, at least until the installation has been seen to work. If you do this, then you will not have to re-edit the disk, printer, and tape lists and can simply skip all those pages in the `install.pl` menus. The old `$HOME/.AIPSRC` file may be left in place, but it will need to be edited. The lines giving the `DOWNLOADED` and `UNPACKED` parameters should be deleted and the `CCOMOPT` line should be changed to point to the current release rather than the previous one — the `-I` parameter really should be `-I$INC` but it gets its full path name instead. This forces a re-edit with each release. If you have made special versions of `UPDCONFIG` and `do_daily.`*host*, you should preserve them under new names and restore them after the install. If you have an odd set of *AIPS* versions, the `$AIPS_ROOT/AIPSPATH.*SH` files may need to be edited after the install to set the desired versions.

For Linux, Solaris Ultra, and MacIntosh systems, a binary installation could be available from CDrom, supported by `install.pl`. Alternatively, the frozen version may be installed with the binary installation method now present in `install.pl`. The ftp site for downloading files directly has been eliminated.

AIPS Distribution

We are now able to log apparent MNJ accesses, downloads of the tar balls and `rsync` accesses. We count these by unique IP address. Since dial-up and some university connections may be assigned different IP addresses at different times, this will be a bit of an over-estimate of actual sites. However, a single IP address is often used to provide *AIPS* to a number of computers, so these numbers are at the same time an under-estimate of the number of computers running current versions of *AIPS*. In 2007, a total of 277 different IP addresses downloaded the frozen form of `31DEC06` and 965 IP addresses downloaded `31DEC07` in tarball or binary form. Fully 1385 IP addresses accessed the NRAO cvs master. Each of these has at least installed `31DEC07` and 304 appear to have run the MNJ on `31DEC07` at least occasionally. The total number of unique IP addresses in these three lists was 1811. 161 sites accessed `31DEC06` in binary form, while 669 sites used the binary form of `31DEC07`. The attached figure shows the cumulative number of unique sites, cvs access sites, tar-ball/binary download sites and binary access sites known to us as a function of week in 2007. These numbers represent substantial increases over those for 2006.



Since the registration system, always under-utilized, has now been abandoned, we are left with analysis by IP address. The table below lists the IP addresses for 2007 by the final qualifier for shipments of `31DEC07`, `31DEC06`, and access to the cvs site. The numbers in the cvs column include those sites that install or run a midnight job for these releases. The comments come from what appears to be a semi-official list of Internet codes. Sorting is on the "unique" column, which counts unique IP addresses over the other three columns:

Code	`31DEC06`	`31DEC07`	cvs site	unique	Comments
net	19	110	353	403	Network
edu	35	220	300	373	US Educational
jp	29	58	69	88	Japan
uk	16	48	46	69	United Kingdom
de	7	25	37	53	Germany
com	11	29	31	49	US Commercial
in	12	32	10	38	India
es	5	23	30	34	Spain
nl	5	22	25	33	Netherlands
au	8	19	23	33	Australia
it	6	23	17	33	Italy
ca	2	23	22	31	Canada
org	3	13	19	24	Non-Profit Organization
pl	3	12	15	20	Poland
fr	7	11	11	17	France
za	4	12	7	17	South Africa
gov	5	10	11	15	US Government
mx	7	10	7	13	Mexico
ru	6	9	5	13	Russian Federation
br	1	7	9	13	Brazil
mil	0	11	7	12	US Military
ie	3	6	6	8	Ireland
se	1	5	3	7	Sweden
gr	1	1	4	6	Greece
tw	2	4	4	5	Taiwan
pt	0	4	5	5	Portugal
cn	2	2	2	4	China
be	1	2	2	3	Belgium
cl	0	2	2	3	Chile
pe	0	2	3	3	Peru
hu	0	1	2	2	Hungary
ua	0	2	0	2	Ukraine
arpa	1	0	0	1	Old style Arpanet
ar	1	0	1	1	Argentina
mu	1	0	0	1	Mauritius
il	0	1	1	1	Israel
no	0	1	0	1	Norway
fi	0	1	0	1	Finland
ch	0	1	0	1	Switzerland
eg	0	1	1	1	Egypt
lt	0	1	0	1	Lithuania
hn	0	0	1	0	Honduras
None	0	2	6	5	
Unknown	73	199	288	368	
Total	277	965	1385	1811	

Preview of coming attractions

The 31DEC08 release already contains a few minor changes that we decided were a bit risky or not needed in 31DEC07. There are counters of I/O transactions by ZMIO and ZFIO that can be displayed when tasks end by issuing the AIPS verb SETDEBUG to a value greater than zero. This will be of use when we re-examine imaging algorithms to try to reduce I/O to improve performance. The enormous data sets which the EVLA will produce require us to examine this issue closely. The task IMEAN has had the DOINVERS option added, which led to changes to IMSTAT as well. The *CookBook* is being reviewed thoroughly and updates, which will be available to all versions, will appear soon.

Improvements of interest to users in 31DEC07

We expect to continue publishing the *AIPSLetter* every six months along with the annual releases. There have been a number of changes in 31DEC07. In the last six months, we have developed new tasks TAPPE to append one version of a table to another version, TYSMO to edit and smooth system temperature tables, TYAPL to remove and/or apply system temperature corrections to *uv* data, FLOPM to reverse the spectral order of a data set with or without special fixes for a VLA issue, and HAFIX to determine if there is a time error in the (u, v, w) values in a data set. A stand-alone program REBYTE was created to convert the byte order of whole *AIPS* directories. This should ease users' transitions from Solaris and Mac PPC to Linux and Mac Intel computers. Described in the June 30, 2007 *AIPSLetter* were changes in 31DEC07 including new tasks OOSUB to apply a model to visibility data with spectral-dependent corrections, VLANT to correct phases for corrections in the antenna locations at the VLA, CUBIT (written by Judith Irwin) to fit models to full spectral cubes, and UVDI1 to subtract the average of one *uv* data set from another. New verbs include VLA, EVLA, VLBA and HSA which read an antenna table and place suitable antenna numbers on the *POPS* stack.

31DEC06 contains a revision of FILLM required to support the new data form which the VLA began producing on June 27, 2007. VLA users must upgrade their copy of *AIPS* to read these data. Also, 31DEC07 contains a significant change to FITAB. This task is used to fill the archive with partially processed data from the VLBA and more fully processed (pipelined) data from the VLA. Versions of *AIPS* prior to October 15, 2007 are unable to read these data.

31DEC04 and later releases use a new numbering scheme for magnetic tape logical unit numbers that is incompatible with previous versions. Thus all tape tasks and the server TPMON must be from 31DEC04 or later. Other than this, 31DEC07 is compatible in all major ways with the with the 15OCT98 and later releases. There are significant incompatibilities with older versions.

UV data input/output

FILLM

FILLM, the task that translates VLA on-line data into *AIPS*, was changed quite a bit during the first half of 2007; see the June 30 *AIPSLetter*. The most significant change in the last half of 2007 was the long overdue change in the recorded times to the center of the sample interval. Previously, the times differed from the center time by one-half of the on-line integration time (traditionally 10 seconds, but no longer limited to that). This affects usage of UVFIX which required a time offset to be applied, but now only for data filled by versions of FILLM prior to July 5, 2007. A message is written by FILLM warning you of this change.

Other changes in FILLM include correcting the help file to tell the truth about CPARM(2)=1, which only masks the $T_{\rm sys}$ fluctuating error condition, correcting the total bandwidth recorded in the source table, and correcting a mismatch in the default nominal sensitivity when it is recorded as zero. The new capability of FILLM to load correlation coefficients (rather than data corrected by system temperature) was enhanced by writing a header keyword to record the presence (or absence) of correlation coefficients and by writing correct weights for correlation coefficients. The weights for correlation coefficients are constant with scaling only for bandwidth and integration time.

FITAB

FITAB writes visibility data in the form of FITS binary tables rather than the old, and now mildly deprecated, random groups form. The fact that the details about the visibility data including numbers of samples, channels, IFs, polarizations, and the like are not available to the reading program until after it has had to swallow history, antenna, calibration, source, and other tables made construction of reading programs for this form difficult. When FITAB was first written, it was decided to take a short-cut and actually provide the needed information in the main header in the form of special *AIPS* HISTORY cards. Unfortunately, when a non-*AIPS* software package sees these data, it should save these history cards and re-emit them with output data and/or images. Then when *AIPS* re-encounters the data, these history cards are used even though they no longer correctly represented the data. Data reading programs were changed to reduce their use of HISTORY AIPS cards in some circumstances and so to reduce the likelihood of this error arising.

But, to avoid the error entirely, versions of FITAB after October 15, 2007 no longer take this short-cut. Corresponding versions of UVLOD, FITLD, and PRTTP were created to handle this more difficult case. VLBA data first appear in the archive not in raw correlator form but in a mildly processed form written by FITAB. The raw data arrive in the archive substantially later. Thus, VLBA users will need to update to the full frozen version of 31DEC07. Additionally, the *AIPS* VLA pipeline is being run on many VLA observations with its results available in the archive. The visibility data also use FITAB, so any users of these processed VLA observations from the archive will also need the last version of *AIPS*.

Calibration application

VLA u, v, w error

Deep wide-field 21-cm observations of a particular direction made at two widely-spaced epochs have revealed an apparent error in the VLA on-line computation of (u, v, w) used by *AIPS* in imaging and other operations. The error appears to have crept in sometime in 2004 and to have remained until the ModComps were replaced with modern computers and new software at the end of June 2007. The most probable nature of the error is an offset in time of 10 seconds between the recorded (u, v, w) and the correct ones. The new *AIPS* task HAFIX is available to you, if you wish, to study this error in your data. However, simply running UVFIX on your data set prior to imaging will correct any error. Be careful about the offset in time needed by UVFIX for data loaded by versions of FILLM prior to 31DEC07 July 5 (see above).

SPLIT and SPLAT errors

Several errors in the frequencies written by SPLIT and SPLAT when averaging channels in multi-channel data sets were discovered. A fairly recent error caused the frequency increments in the FQ table to be wrong when written by SPLAT and also to be wrong out of SPLIT when the initial increments were not identical. An error of long-standing was made by SPLIT when averaging channels with BCHAN > 1, while still writing a multi-channel output file. These errors can cause smearing when doing bandwidth synthesis imaging as well as an image scaling error. The two tasks also did not change the reference frequency when averaging all spectral channels (but not IFs) although that will cause a simple scaling error in imaging. There was also an error in the number of words copied which certainly caused some loss in accuracy of compressed data and, depending on compilers, could have caused rather more serious consequences.

TY tables

Amplitudes in interferometers with digital correlators are found by measuring a correlation coefficient and a system temperature and multiplying the two. Errors in the latter directly cause errors in the visibilities. During the VLA-EVLA transition, we have found “peculiarities” in the measured “nominal sensitivities” used to scale the correlation coefficients to visibilities in Jy. There are occasional, really bad, values and more noise than one would hope. There is an interactive editing task called SNEDT which will allow one to modify a TY table. However, for 31DEC07, we have written two new tasks. The first is TYSMO which copies a TY table to a new one while median-window filtering out the bad samples and replacing them and/or the good samples with time-smoothed values. The second is `TYAPL` which will remove one `TY` table from a visibility data set and replace it with another, presumably smoothed and edited, `TY` table. This, combined with `FILLM`'s new ability to write correlation coefficients rather than scaled visibilities, will allow new tools for the user to evaluate this crucial step in calibration.

Miscellaneous

3C147 21-cm calibrator model was installed in the usual place (`$AIPSTARS`). We now provide complete models for 3C48, 3C138, and 3C286 (at all VLA bands except for P and 4) and some models for 3C147 (K, L, Q, U).

3C286 X-band model had a mysterious error causing all Clean components to be shifted by one pixel.

UVAVG was changed to set time intervals for TB sorted data from the first sample of the interval. For BT data, it still uses its old method of using intervals which are integers times `YINC` within each day. The full set of calibration and flagging options was added and the `'SUBT'` operation was removed. The averaging buffer is now dynamic and so can handle any reasonable size data set.

CORER was changed to support calibration and flagging of the input data set.

TI2HA was changed to support calibration and flagging of the input data set, including allowing the input to be multi-source. Only one source may be output. `STUFFR` was changed to allow `DOCALIB` and `FLAGVER`, although both will use the highest version gain and flag tables in each input file if invoked.

AVSPC was given the full range of calibration and flagging functions.

DIFRL was given the full range of calibration and flagging functions.

NX tables are now created and populated by many of the above tasks as well as `UVCOP`, `FUDGE`, `UVMTH`, `UVLSF` and `FLGIT` as they proceed. This avoids the need to run `INDXR` under many circumstances.

BL tables were seldom used previously and so were overlooked when tables were edited for data selection while being copied. The VLA-EVLA transition has encouraged the use of `BLCAL` and thus led to this and other corrections affecting `BL` tables.

Polarization calibration application was found to have a serious error when the application task called the data read initialization for a second time. Fortunately, this error affected only equatorial telescopes (*i.e.*, WSRT) and so did not affect a large number of *AIPS* users.

Data editing

`OUTFGVER` is a new adverb which has appeared in most, if not all, visibility-data editing tasks. This allows the users to specify whether the new flags will be written to an existing flag table or to a new table which will also include any flags applied on input. If `OUTFGVER` if $<= 0$ or $> \mathtt{FG}_{\max}$, then a new flag table will be created with version $\mathtt{FG}_{\max} + 1$ and the input flag table (`FLAGVER`) if any will be copied to it along with any new flags. If `OUTFGVER` specifies an existing table, then `FLAGVER` is not copied to it even when `FLAGVER` $\neq$ `OUTFGVER`. Tasks `TVFLG`, `SPFLG`, `DEFLG`, `FLAGR`, `EDITR`, `EDITA`, `UVMLN`, `WETHR`, and `WIPER` were changed in this fashion. Other tasks which had more extensive changes are described below.

IBLED was changed to use `OUTFGVER` on single- and multi-source data. It no longer will apply flags and copy single-source data sets. The options `PREV BASELINE` and `FLAG ALL TIME` were added and the `FLAG INTERACTIV` option was made to work correctly. It now switches IFs with no question when possible. (`EDITR` remains the interactive editing task of choice in most circumstances.)

CLIP is the new name for `CLIPM`, which is the task users should have been using. It has the full calibration and flagging input options include `STOKES` which was previously omitted. It handles single- and well as multi-source files writing `OUTFGVER`. The old `CLIP` task was removed.

UVFLG was rewritten to support flagging by source elevation correctly. It now writes OUTFGVER with no input FLAGVER. Flagging in place was dropped, making adverbs BDROP, EDROP, and the previous APARM(1) through APARM(3) obsolete and thereby changing the meaning of the APARMs. Improved the writing of the history file including adding more information and removing mis-information.

FLGIT was given the adverb OUTFGVER, but will still write out a new edited data set when OUTFGVER ≤ 0.

EDITR and EDITA now both support OUTFGVER as do SCIMG and SCMAP which also use the edit class. NEXT ANTENNA and NEXT BASELINE were changed to get new antennas/baselines rather than recycle old ones. ENTER IF was made friendlier in crowded display modes.

CORER was made to support OUTFGVER and to offer the choice of printing or not and of write a flag table or writing out the edited data. It also acquired all the calibration and input flagging options.

Other *uv*-data changes

FLOPM is a new task written to handle a temporary error made in the VLA-EVLA transition in which sidebands were confused. This 'VLAE' mode, reverses the order of the spectral channels and the sign of the phase, but leaves everything else untouched. The default mode, which was requested by another user, reverses the order of the spectral channels and fixes all of the header and FQ table accordingly while not messing with the sign of the phase.

UVLSF was also changed in an attempt to assist with another transition difficulty, in this case with spectral aliasing on EVLA-EVLA baselines affecting narrow bandwidths. It will now fit up to fourth-order orthogonal polynomial baselines and has the option to add the continuum back to the spectral data. A long-standing error in flagging on rms was corrected.

DBCON was fixed for errors when converting one of the data sets to true Stokes when that data set is compressed.

OOSUB and UVSUB use CHANNEL to mean to subtract or divide the data of that channel but to copy all channels, leaving the rest unchanged. Clarified this in the code and documentation and fixed OOSUB to handle compressed data and copy tables.

MATCH was corrected to take header information for antenna, source, and frequency tables from the input file rather than the master file.

UVHOL was changed to handle polarization states other than the usual RR, LL, RL, LR. Options to average data to all the reference antennas and/or to average in time within a pointing were also added. Adverbs BCOUNT and UVRANGE were dropped and the default of BDROP was changed to zero.

UVDIF was changed to allow the two files to have different states of compression. It is still pretty fussy about which data sets it is willing to compare.

Averaging of visibility data was found to ignore weights in several OOP routines. Corrected this, which affects tasks CL2HF, UBAVG, SCIMG, and SCMAP.

Imaging and analysis

FLATN was corrected; it was writing out noise and weight images *squared* rather than with the correct scale.

COPIXEL was given the ERROR output adverb so that coordinates which are not on, or are illegal for, the image can return a suitable indicator without stopping a script.

Plotting

VPLOT has a new default `SYMBOL`, uses adverb `FACTOR` to scale the plotted symbols and optionally connect the symbols with lines, to offer hour angle, elevation, azimuth, and parallactic angle axes, to plot ratios of true `STOKES` types, to allow averaging for all axis types, and to do time averaging over normal rather than integer-step intervals (same correction as `UVAVG` above).

TVCPS has an option to read a full image from disk, rather than plot only the subimage which fits on the TV. It was fixed to make a correctly-colored plot when multiple images are involved.

Slice plots default to the min/max of the slice itself, but then used the full image max/min for scaling the plot internally. If the slice flux range is small compared to the image flux range, this causes no end of trouble. Changed all slice plots to ignore the image max/min, fixed them to pass the scaling information in the image catalog header, and fixed the TV slice plotting verbs to use the current size of the TV rather than its full size.

Miscellaneous

TAPPE is a new task to append two tables, then sort the result and eliminate duplicate rows. `TABED` with `OPTYPE 'COPY'` does a selective append operation, but does not do the sort and elimination steps.

REBYTE is a stand-alone program to convert a disk directory full of *AIPS* data files to the opposite byte order. Almost all of the conversion is done with full knowledge of the file formats. Only `PL` file headers and `TPUT/TGET` and `SAVE/GET` files are converted with the assumption that four printable characters in a row must be an actual character string. For floating-point variables, this has a 2% chance of being wrong. The `RUN WRTPROCS` procedures `WRTDISK` and `READISK` offer another approach, through FITS-disk files, to this conversion. They make no attempt to preserve plot and slice files nor the `TPUT/TGET` and `SAVE/GET` files. Note, however, that the `SAVE/GET` files may be preserved fully via `SG2RUN` with either approach.

Batch jobs in *AIPS* use particularly high *AIPS* numbers. Failures to move to base 36 which affected mostly batch were repaired and several more adverbs are now tested against local system limits rather than generic limits found in the help files. AP-using tasks are now allowed in batch queue 1.

gfortran is the GNU Fortran 90 compiler. It has not worked on *AIPS* in earlier tests, but version 4.2.1 was found to produce working load modules on an AMD computer. They run faster than those produced by g77 3.4.4, eliminating the slight advantage that the Intel compiler had on AMDs.

Linux kernels beginning with 2.6.19 (RedHat 2.6.9-55) and continuing until 2.6.23.1 (RedHat 2.6.9-61) had what appeared to be a race condition in the automounter. If an `open` occurred to mount a file system while it was being un-mounted due to a timeout, the file system could appear to be empty, leading to erroneous "file does not exist" *AIPS* error completions.

Patch Distribution for `31DEC06`

As before, important bug fixes and selected improvements in `31DEC06` and `31DEC07` can be downloaded via the Web beginning at:

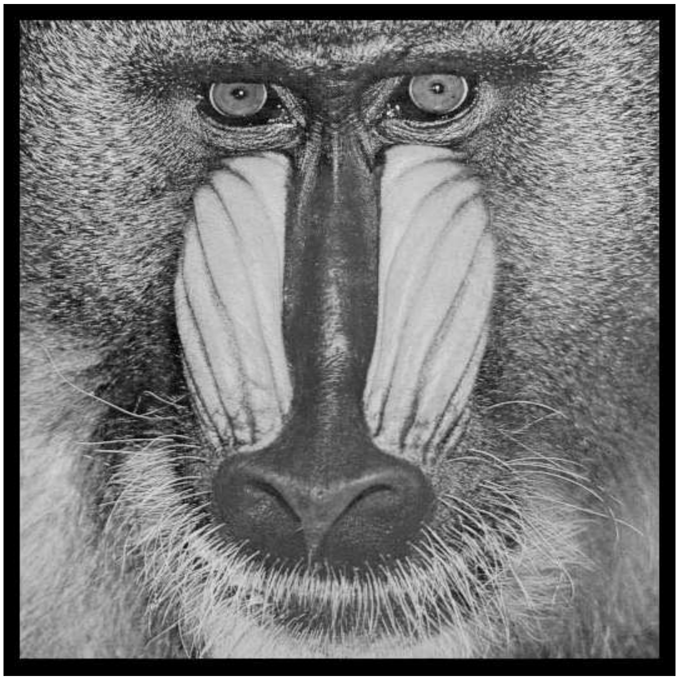
`http://www.aoc.nrao.edu/aips/patch.html`

Alternatively one can use *anonymous* `ftp` to the NRAO server `ftp.aoc.nrao.edu`. Documentation about patches to a release is placed on this site at `pub/software/aips/`*release-name* and the code is placed in suitable subdirectories below this. As bugs in `31DEC08` are found, they are simply corrected since `31DEC08` remains under development. Corrections and additions are made with a midnight job rather than with manual patches.

The patch system has changed because we now have binary installations. We now actually patch the master copy of the frozen version. This means that a MNJ run on `31DEC06` after the patches listed below will fetch the corrected code and/or binaries rather than failing. Similarly, patches announced for 31DEC07 during the next year will be available via MNJ as well as ftp. Installations of 31DEC06 and 31DEC07 after the patch date will contain the corrected code.

The 31DEC06 release is no longer available for installation. It had a number of important patches. They are

1. CALIB handled scan times badly when averaging within a scan *2007-01-02*
2. UPDCONTROL in the MNJ used obsolete syntax for sort *2007-01-10*
3. UVFIX did not contain the latest leap second *2007-02-27*
4. CLCOR operation SUND did not work *2007-02-27*
5. VBGLU did not handle the PC table STATE column correctly *2007-02-27*
6. CVEL had a bad call sequence which could cause an abort *2007-02-27*
7. SNSMO had a bad call sequence which could cause bad smoothing of rates including flagging them *2007-04-26*
8. UVFIX had a frequency error for uncompressed data only and CLCOR had a minor conceptual error both affecting phases after a position shift *2007-04-26*
9. BLCAL and UVFND set the integration time to one day, causing bad amplitude calibration when there were rates and delays *2007-04-26*
10. aips.l man page was lost *2007-05-04*
11. FILLM skipped a record at ends of file which could lose a data sample and possibly cause confusion if the mode changed *2007-05-24*
12. SPLIT lost the calibration flags when a source was not found so that later data did not have calibration applied *2007-06-10*
13. SNPLT lost data from phase plots of PC tables due to failure to check for wraps and got hour angles wrong by 6 hours *2007-06-14*
14. FILLM used a blank in the middle of some station names, confusing other software packages *2007-06-16*
15. BLAVG scaled by the sum of the weights once too often, giving bad output amplitudes very dependent on whether the weights were calibrated *2007-09-05*
16. FILLM used 2 different defaults for a nominal sensitivity recorded as 0.0. This led to bad weights. *2007-09-28*
17. SPLAT set the wrong IF frequencies whenever channels were averaged to make a multi-channel output. SPLIT had a similar error, but only when the channel increments were different in different IFs. *2007-10-15*
18. SPLIT set the wrong frequency reference pixel when averaging channels and BCHAN was not 1 and messed up the FQ offsets when the IF increments were not the same. *2007-10-23*
19. SPLIT and SPLAT copied and computed on too many correlators, leading to buffer overruns and less than optimal scaling for compressed data. *2007-11-06*



December 31, 2007

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