

1.0 Why we check pointing and SEFDs before each experiment

An initial check of pointing serves to verify that several aspects of the system are working correctly.

1.1 Verify signal is getting from the front-end to the back-end

The very act of checking the pointing and SEFDs using the detectors in the DAR verifies that signal is getting to the back-end. Each channel should yield the expected sensitivity and beamwidth. See also 1.5.

1.2 Verify sensitivity

The SEFD is a very useful measure of the antenna's sensitivity. Verifying that you get the expected sensitivity demonstrates that many parts of the system have not failed since the last more thorough check.

1.3 Verify pointing is good

Verifying that the pointing is good demonstrates that nothing serious has happened to the antenna's control system since it was last checked.

1.4 Verify system time and date

Depending on the details of the antenna interface, checking the pointing verifies that the date and time in either the FS computer or the pointing computer or both are correct at some level. If not both, you should verify the other independently. An error of 1 day will cause an approximately 1° pointing error. An error of a few seconds may not be detected depending on the size of the beam.

1.5 Verify IFs aren't switched (many stations don't need this)

If you switch IFs depending on the experiment, verifying the beamwidths and SEFDs of each IF is good check that they are connected to the correct channels.

1.6 Things that can't be checked by pointing and SEFDs

These are some of the items that aren't verified by checking the pointing and SEFDs. They require some other means of verification that will typically be different at different stations.

1.6.1 Polarization

The sensitivity of the antenna is typically independent of the polarization.

1.6.2 Sub-band

If you have more than one IF for a given band it may be difficult to distinguish between them based on the measured beamwidth.

1.6.3 Time errors below the level detectable by the beam

Unless the beam is very small you not be able to detect errors of even one second in time, much less a fraction of a second.

2.0 Set-up

There are several steps that are needed to set-up pointing checks in the FS. These need to be done once only. After that, the steps in the following sections can be expected to work. Please see the ACP User Guide manual, Section 5, in Vol.2 of the FS Manuals for more information on installing the system.

2.1 "anten" must support modes 0-5 (plus 8 for non-standard detectors)

"anten" provides the basic interface between the FS and the antenna. The listed modes must be supported for "fivpt" and "onoff" to work. Please refer to the FS Manuals Vol. 2, Station Programs manual for more information on implementing "anten".

2.2 Set-up the ".rxg" files.

The ".rxg" files contain the gain calibration information for each band. It contains: LO values (or range if tunable), polarizations available, the gain curve, gain values (degrees per flux unit) for each polarization, and Tcal value as function of frequency for each polarization. , The set-up of these files is described in the default files in /usr2/fs/st.default/control/rxg_files (x.rxg and s.rxg). The part of the file name before the dot, ".", can be anything, but should be chosen to be mnemonic for the band or receiver. Please make copies of the default files in your /usr2/control/rxg_file directory and if necessary make additional copies for each band you expect to use. The names aren't important, but must be unique within the directory. The FS will read in all files with the extension ".rxg", up to 20 of them. The comments in the default files should be self explanatory, but here are a few hints. The lines you should probably edit are: (1) the LO values, this must match the values used in the "LO=..." command for the RX you will be using; (2) the polarizations available "lcp" and/or "rcp"; (3) the DPFU(s) if you know it, they can be estimated as the Tsys in Kelvin divided by the SEFD; (4) if you have a gain curve in the form of "ELEV POLY" or "ALTAZ POLY", you can enter the coefficients on the

appropriate line zeroth order term first, if you have no gain curve, leave the value as "1.0"; (5) the tcsl versus frequency table, if you have this information, if not, you can enter a single value in the band and the FS will use that for all frequencies; (6) do not put information for a given LO in more than one file, i.e., each LO should appear only once in all the files in the directory.

2.3 "ctlpo.ctl"

This control file specifies the sources that "aquir" will attempt to observe and what actions it will take for each.

2.4 Customize "point.prc"

This procedure library contains the pointing specific SNAP procedures that are needed by "aquir" and/or are otherwise general useful for pointing checks, especially with a dual S/X receiver.

2.4.1 The "initp" procedure should completely set-up system

This procedure is used to initialize the system before doing any pointing. It should fully set-up any equipment that is needed, including any station specific equipment.

2.5 Customize "parpo.ctl"

This file is used to control the editing of pointing data during the initial extraction of the data from the log.

2.6 Customize "mdlpo.ctl"

This file contains the standard FS pointing model. It is used by the pointing data analysis programs. If your "antcn" uses it also to calculate pointing corrections, the results of a pointing analysis are directly available to correct the pointing of your antenna.

2.7 "flux.ctl"

This file contains the source flux models. It should not need to be customized unless there are sources that you use that aren't included. If so, please send them to Ed (weh@ivscc.gsfc.nasa.gov) and we will add them to default version as well.

2.8 What if you have a non-standard detector

If you have a non-standard detector, you can be able to support it using mode 8 of "antcn". Two non-standard detectors, "u5" and "u6" are supported. The

implementation assumes you have some way to remove the signal from the detectors under computer control, e.g., by switching a large value of attenuation into the signal path. Please see the file `/usr2/fs/misc/stdnet.txt` for details on how to implement this. Please note that the "Use" section in this document is out of date as of the writing of this document, but will be updated soon (contact Ed, weh@ivscc.gsfc.nasa.gov). Please see the help file for the "user_device" SNAP command for how to define the parameters for the user devices for gain measurements.

2.9 What if you have no cal diode

If you have no noise diode, set the diode noise temperatures in the station procedure "caltemps" to a negative value. The absolute value of the specified noise temperatures will be assumed by the pointing programs to be the system temperature. The antenna temperature due to the source will be calculated on this assumption, however the SEFDs will be unaffected. A value of -100 is convenient. The result will be that antenna temperatures will come out in percent of the system temperature (which may vary for example with elevation).

3.0 Manual checks

This section describes how to perform manual checks once the system has been set-up as described in the previous section. This is described in more detail in ACP User Guide manual, Section 3, in Vol.2 of the FS Manuals. Start the FS and enter the following commands in order:

3.1 "proc=point"

This command selects the "point.prc" SNAP library. If you are using a pointing library with a different name, such as "vpoint.prc", enter that library's name instead

3.2 "initp"

This command runs the "initp" procedure, which should have been customized to set-up your equipment for pointing checks.

3.3 (source procedure)

Here you enter the name of the source that you want to use to check pointing. The procedure libraries "point.prc" has procedures with coordinates and S- and X-band fluxes for most of the useful Northern Hemisphere pointing sources. To see which are available, use the "dl" command in "pfmed", when "point" is the selected library.

3.4 "fivept"

This command runs the "fivpt" program to peak on a source. It does this by measuring the power level on two slices through the source. Normally you would wait for the source to be acquired before typing this command, but if the antenna isn't onsource, "fivpt" will wait for up to one minute for onsource to be achieved before giving up. When "fivpt" finishes normally it prints an "offset" record. If some very nominal checks of whether this was a good peak or not are passed, the "offset" record will have two ones "1 1" at the end signifying success. The first four parameters in the "offset" record are: (1) first axis coordinate, (2) second axis coordinate, (3) first axis offset, and (4) second axis offset. The "xoffset" record contains similar information, but reports the first axis offset corrected for cosine of the second axis coordinate (the "cross" offset) and the sigmas of the offsets (first axis offset also corrected).

3.5 "onoff"

This command runs the "onoff" program to measure SEFDs and other antenna performance parameters. If you execute it immediately after "fivpt" has finished, you will get a "peak" performance measurement.

3.6 (next source procedure)

If you wish to make another measurement, select a new source. If the "fivpt" program for some reason returned unrealistic offsets, you may want to remove them before trying peak on the next source. See the sectioned "When finished" (below) for how to remove the offsets.

3.7 When finished

If you do not want the most recent "fivpt" offsets to remain in use (typically for geodesy we don't), use "xyoff=0d,0d", "azelloff=0d,0d", or "radecoff=0s,0d" (or whatever offsets are desired) depending on the axis system of your antenna.

4.0 What "fivpt" does

A brief description of what "fivpt" does.

4.1 Measure Tsys off source to calibrate scale

This is the first step. It uses the noise diode to measure the system temperature off source. If there is no noise diode, indicated by "caltempX" < 0, then the negative of the specified diode temperature is assumed to be the temperature of the system off source.

4.2 Scan both axes

The source is scanned on two axes, nominally aligned with the telescopes natural coordinates. Typically nine measurements, 0.4 beamwidths apart, are taken.

The data are displayed in "lat" and "lon" records, These correspond respectively to the latitude-like and longitude-like coordinates of the antenna: EL/AZ, Y/X, and DEC/HA. The data in each record are: (1) the number of the point, (2) the seconds since the previous midnight of the scan (grows monotonically even if a scan spans another midnight), (3) the offset of the scanned axis, (4) the antenna temperature due to the source (above the system temperature), and (5) if the integration period is larger than one, the RMS scatter of the samples.

4.3 Fit Gaussian + offset + slope

The data for each axis are fit to a five parameter function consisting of a Gaussian (three parameters: peak offset, half-power beamwidth, and peak temperature) plus an offset and slope (in time). If the fit is nominally successful, the last parameter on the "XXXfit" line is positive.

4.4 Repeat if not well centered or a fit failed

For a typical set-up, if the peak for either axis is off by more than a half measurement step (this is perhaps too tight) or if the fit on either axis failed, the measurement will be repeated a second time. This assures that the source is roughly centered in the data set and is also helpful in the case of a weak source. For weak sources, if the beam is not well centered on the second axis scanned, the first axis scanned may not have enough signal from the source to find a clear peak.

4.5 Leave the telescope "peaked" on source

After the final scan, the offsets of the fitted peak are left in use. This is useful if you plan to run "onoff" next to find the "peak" performance. However, be careful after doing pointing checks to remove the last offsets before acquiring data, unless the source is strong and you will be acquiring data on that source in that part of the sky only (this is not the case for geodesy).

4.6 Sample "fivpt" output

```
9735612401440#fivpt#source cas-a      232109.0 +583230 1950.0 97/356.12:40:14
9735612401445#fivpt#site GILCREEK 147.4976 64.9784 0.00 xxxx 0 1.00 0.00
9735612401445#fivpt#fivept xyns -2 9 0.40 1 3u 19.0 0.0834 399.1
9735612401451#fivpt#origin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
9735612402363;calofffp
9735612402806;calonfp
9735612403043;calofffp
9735612403066#fivpt#tsys 336.447 36.913 61.922
9735612404069#fivpt#lat 1 45640. -0.1334 1.158
9735612404894#fivpt#lat 2 45648. -0.1001 2.183
9735612405769#fivpt#lat 3 45657. -0.0667 11.597
9735612410669#fivpt#lat 4 45666. -0.0334 29.098
```

```

9735612411569#fivpt#lat    5  45675.    0.0000    38.361
9735612412469#fivpt#lat    6  45684.    0.0334    28.832
9735612413369#fivpt#lat    7  45693.    0.0667    11.370
9735612414269#fivpt#lat    8  45702.    0.1001     2.556
9735612415094#fivpt#lat    9  45710.    0.1334     1.227
9735612415095#fivpt#latfit -0.00032  0.0994  38.3030  0.5406  0.0035  4
9735612415095#fivpt#laterr 0.00070  0.0020  0.5503  0.3844  0.0098  0.5838
9735612415968#fivpt#lon    1  45719.   -0.1971     1.177
9735612420869#fivpt#lon    2  45728.   -0.1479     3.239
9735612421694#fivpt#lon    3  45736.   -0.0986    12.508
9735612422569#fivpt#lon    4  45745.   -0.0493    29.294
9735612423394#fivpt#lon    5  45753.    0.0000    39.025
9735612424269#fivpt#lon    6  45762.    0.0493    30.376
9735612425169#fivpt#lon    7  45771.    0.0986    12.768
9735612425994#fivpt#lon    8  45779.    0.1479     2.594
9735612430869#fivpt#lon    9  45788.    0.1971     1.531
9735612430870#fivpt#lonfit 0.00110  0.1024  38.7746  0.6563 -0.0033  5
9735612430870#fivpt#lonerr 0.00111  0.0022  0.5846  0.4250  0.0108  0.6198
9735612430870#fivpt#perform 2.041    637.4    0.509    8.223
9735612431562#fivpt#offset 332.6681  47.5413  0.00110 -0.00032  1  1

```

5.0 What "onoff" does

The "onoff" program is a simple tool for measuring the SEFDs of the antenna in two detector channels simultaneously.

The following measurements are made, typically with two iterations for everything except the no signal case:

- 5.1.1 Power on source
- 5.1.2 Power on source with noise diode on
- 5.1.3 Power off source with noise diode on
- 5.1.4 Power off source with no signal for "zero"

A final set of power onsource and one source with noise diode on are included to make the measurement procedure symmetric in time.

5.2 Final results printed on one line for each detector: Gain Compression, Tsys, SEFD, Tcal in Janskys, Tcal ratio. For interpretation of the last two items, please see the notes for the **Antenna Gain Calibration** and **Pointing and Single Dish Amplitude Calibration** classes.

The results are printed in several forms to facilitate analysis depending on what is needed. You need to be careful of Tsys and Tcal ratio values on the accuracy of the "caltemp" values. The Compression, SEFD, and Tcal in Janskies do not depend on the "caltemp" values.

5.3 Sample final results from "onoff" output

```

2002.310.20:49:31.27#onoff# source      Az  El  De I P  Center  Comp  Tsys  SEFD  Tcal(j) Tcal(r)
2002.310.20:49:31.28#onoff#VAL cygnusa  273.4 52.0 1u 1 l  4969.99 0.2658 18.34 438.0 487.272 2.8850
2002.310.20:49:31.28#onoff#VAL cygnusa  273.4 52.0 2u 2 r  4969.99 0.2548 16.83 421.3 480.612 3.0234
2002.310.20:49:31.28#onoff#VAL cygnusa  273.4 52.0 3u 1 l  4977.99 0.2869 17.70 435.2 501.462 2.9690
2002.310.20:49:31.28#onoff#VAL cygnusa  273.4 52.0 4u 2 r  4977.99 0.2673 16.78 425.8 487.400 3.0661
2002.310.20:49:31.28#onoff#VAL cygnusa  273.4 52.0 5u 1 l  4985.99 0.3214 17.25 445.8 527.168 3.1212
2002.310.20:49:31.29#onoff#VAL cygnusa  273.4 52.0 6u 2 r  4985.99 0.3032 15.81 422.6 513.282 3.2289
2002.310.20:49:31.29#onoff#VAL cygnusa  273.4 52.0 7u 1 l  4993.99 0.3533 16.68 452.2 553.065 3.2745

```

2002.310.20:49:31.29#onoff#VAL	cygnusa	273.4	52.0	8u	2	r	4993.99	0.3353	15.39	431.3	537.976	3.3842
2002.310.20:49:31.29#onoff#VAL	cygnusa	273.4	52.0	9u	1	l	5001.99	0.3684	16.45	455.1	564.312	3.3411
2002.310.20:49:31.29#onoff#VAL	cygnusa	273.4	52.0	au	2	r	5001.99	0.3464	15.14	430.8	546.332	3.4368
2002.310.20:49:31.29#onoff#VAL	cygnusa	273.4	52.0	bu	1	l	5009.99	0.3959	15.67	454.0	591.040	3.4993
2002.310.20:49:31.30#onoff#VAL	cygnusa	273.4	52.0	cu	2	r	5009.99	0.3710	14.79	437.0	567.122	3.5676
2002.310.20:49:31.30#onoff#VAL	cygnusa	273.4	52.0	du	1	l	5017.99	0.4232	15.43	468.8	619.723	3.6691
2002.310.20:49:31.30#onoff#VAL	cygnusa	273.4	52.0	eu	2	r	5017.99	0.3912	14.57	444.4	585.618	3.6839
2002.310.20:49:31.30#onoff#	source	Az	El	De	I	P	Center	Comp	Tsys	SEFD	Tcal(j)	Tcal(r)

6.0 Automated measurements

This section describes what is needed for automated measurements. This is even easier than doing manual measurements. Start the FS and enter the following commands in order:

6.1 "proc=point"

This command selects the "point.prc" SNAP library. If you are using a pointing library with a different name, such as "vpoint.prc", enter that library's name instead.

6.2 "acquire"

This procedure starts the "aquir" program running. Typically "aquir" uses the "ctlpo.ctl" control file and the log is changed to "point.log". However both can be changed. For example, you could make a version that uses only the very strongest sources for a quick pointing check and returns the offsets to zero when stopped. Once started, "aquir" runs indefinitely until it is "kill"ed.

6.3 To stop: "kill"

The "kill" procedure will stop any of "fivpt", "onoff", and "aquir" that happen to be running. Typically it also changes the log back to "station.log". "kill" does not normally change the offsets back to zero. Follow the procedure under "Manual Checks" to do that.

7.0 Pointing Data Analysis: "pdplt"

This section describes the use of the "pdplt" program to analyze pointing data to determine a pointing model. The "pdplt" program is a Tcl/Tk application that provides a graphical front-end for the text based pointing data analysis programs. It is run by typing "pdplt" to a shell prompt. A brief sketch of some of its capabilities follows. More information can be found in the "pdplt" documentation available on the FS servers.

7.1 Selecting a New input file

To select the input file, click on the "File" main menu entry and then select "New". You can type just the name portion of a FS log file, by default it will look

in `/usr2/log` and add the `.log` extension. You can load a "point" log file even while pointing data is being written to it for a check of the results "so-far".

7.2 Selecting an existing input file

Click on the "File" main menu entry. There is an "Open" option that can be used to open an existing "xtrac" output file such as was saved by the "Save" option on this menu.

7.3 Examining sky coverage

The first plot that is shown is of sky coverage. This is done in the natural coordinates of your antenna assuming that the `parpo.ctl` control file has been set-up correctly. You can select which graph to look at using the "Graph" menu to select which graph to examine. The letters "n" and "p" can be used to move the next and previous graphs respectively (with wrap around at the ends). See the attached plot of sky coverage for a pointing data set from Tsukuba. Ideally, the entire sky should be covered more or less uniformly.

7.4 Points on the plots

Points that are included in the solution are shown as solid circles. Points that are deleted are shown as open circles. Information on individual points is displayed when the pointer comes over or near it. On the residual plots all included points are shown by default on the interior of the plots when they have been auto-scaled. Any points that lie outside the range of the plots are shown on the edge. Points are normally shown with one-sigma error bars, but these can be turned off.

7.5 Residuals, random versus outliers and non-random

Ideally the residuals of the pointing solution should appear to be a random scatter about zero offset with a Gaussian distribution for both offsets types against both axes (four plots). Two major reasons they might not be are: (1) so-called "blunder" points, which are just points that lie a lot farther from zero than other points in the vicinity, due for example, to some failure of "fivpt", and (2) systematic trends in the data, such as slope or sinusoid pattern in the residuals. To correct the former problem, you can remove a point by editing it out of the data, see "Editing Data" below. The latter problem usually has to be dealt with by changing the model, see "Changing the Model Parameters" below.

There are two attached plots show residuals for Tsukuba. In one plot, elevation offset versus elevation, the residual distribution is acceptably random. However, there is a hint of systematic effects at high elevations, probably due to Taurus-A. The other plot azimuth offset versus azimuth would not be acceptable except that the magnitude of the systematic is so small. Interestingly the large positive points in azimuth offset near 180° azimuth are for one source only, Taurus-A. It is not

clear how to remove this particular variation since it seems to be associated more with the source than the particular part of the sky involved. This is still being investigated. Fortunately it is small enough so that it is not a problem even if it isn't resolved.

7.6 Viewing individual sources

Individual sources can be highlighted by selecting them from the "Source" menu item. This is useful for identifying which points go with which sources and to see if there is any source specific systematic behavior. Using this feature is how the fact that Taurus-A sticks out was discovered in the Tsukuba data. Highlighting can be turned off by selecting the "No Source" option.

7.7 Viewing the raw data

When testing to see if a new pointing model is needed, it is useful as a first step to examine the raw data. You can select to view the raw data from the "Data" main menu. The choices on the menu are "raw data" and "residuals". If you select "raw data" the plots and statistics (see next sub-section) will refer to the raw data rather than the default residuals to the latest solution.

7.8 Statistics

The number points used and available are shown in the lower right of the display in the format used/available.

The average and RMS scatter of the residuals for both axes can be shown by selecting the "Statistics" menu item. If the average error for either axis isn't zero, for the residuals something is wrong. The RMS scatters for a good solution would typically be 10% or less of the half-power beamwidth.

7.9 Editing data

Strictly speaking data should never be edited. However, in the words of an applied math teacher I once had "real data is nasty stuff". In other words it has all sorts of "blunders" and errors that make some points simply invalid and mess up the results. The problem is that strictly speaking without *a priori* knowledge there is no way to tell for sure which points are blunder points and which are really telling you that there is something with your pointing model form. Fortunately, with pointing data, in most cases it does not matter. However, editing needs to be done conservatively in any event to be safe.

7.9.1 3-Sigma editing

One of the most defensible forms of editing when there are a lot of data is to apply a "X-sigma" criteria, "X" is usually 3. In other words if a residual

differs from zero by more than three times its sigma, it should be removed. For well distributed data, typically 1% are removed under a 3-sigma criteria. The "Edit" menu item has a "x-sigma" option to apply this criteria uniformly to all the data on both axes. Afterwards, the data should be reprocessed by selecting the "Reprocess" option on the "Edit" menu item. It may be necessary to iterate the X-sigma edit and reprocessing several times before the no more points are removed. This process will fail if the residuals do not have a Gaussian distribution, because in most such cases the editing will progressively remove more data on each step until there are no data left. If that happens, you need to investigate why the residuals do not have a Gaussian distribution. If possible this should be corrected, perhaps by changing the model. If not, you will need to stop after one or two iterations.

7.9.2 "Point and shoot" manual editing

A somewhat less defensible approach is to manually delete any points with residuals that differ significantly from zero relative to their error bars. This is a somewhat artistic process. It is needed sometimes to remove big outliers either because there aren't enough data to apply a 3-sigma criteria or some other reason. Since the plot limits include the extent of error bars on points it is sometimes helpful to delete points that have very large error bars. These points usually do not contribute anything significant to the solution. If their error bars are very large compared to the bulk of legitimate points it is likely that they are blunder points anyway. However you have to be careful of azimuth offsets that have large error bars at high elevations, these may be legitimate and significant. After manual deleting any points that need to be removed, be sure to reprocess the data using the "Reprocess" option.

To add or remove a point manually, place the pointer on or near it and click on it. The point selection is slightly sloppy because it was found to be hard to use otherwise. After editing out or adding back in points, be sure to reprocess the data using the "Reprocess" option on the "Edit" menu item. There is also a "Add all points" option on the "Edit" menu item to return all points to the solution.

7.10 Sigmas

Three types of sigmas are available for use or display in "pdplt". The default sigma, the *a priori*, is the most useful and is the only one that is normally needed. (You can stop reading this paragraph at this point and skip to the next sub-section unless you want to know more about this.) This value combines the effect of the raw observed sigma with the added noise for each axis that had to be applied to make the reduced Chi-square of the solution come out close to unity. This provides in some sense the best available estimate of the true sigmas of the input

data. The other types are: (1) "input", which is just the raw observation sigma and doesn't included an added noise contribution, this is useful mostly for curiosity and (2) *a posteriori* which is the sigma of the residuals after the solution, rather than of the input data. Ideally the *a posteriori* value should be used for all editing operations, but in practice it is difficult to explain what it is to people and for pointing data, except in situations with very sparse data, is virtually identical to the *a priori* sigma. If the data are sparse enough that there is a significant difference between the *a priori* and *a posteriori* sigma then there probably aren't enough data to make a good solution anyway. Consequently, the *a posteriori* sigma is mostly a curiosity as well.

7.10 Printing plots

Plots can be printed individually either directly to the printer or to a file. The output is PostScript. Select the "Print" option from the "File" menu option.

7.11 Saving the results

The results can be saved using the "Save" option from the "File" menu. The data, including any editing, is typically saved to file with a name of the form "xtrYYYY.DDD" in "/usr2/log/", where "YYYY.DDD" is the last digits of the year and day of the year. The date is taken from the log the data were extracted from. This file is the format of an "xtrac" program output file and can be read into "pdplt" again using the "Open" option in the "File" menu option. The results of the analysis are saved in a file of "errYYYY.DDD". This file is in the format of an "error" program output file. This file is used by in updating model step described below. The options for saving the data can be modified using the "I/O Setup" option from the "File" menu item.

7.12 Update the model with "update YYYY.DDD" and restart the FS

Once the analysis has been finalized and the results saved as described above, the model can be updated. Issue the command "update YYYY.DDD" while in a shell, where "YYYY.DDD" is suffix of the "errYYYY.DDD" file created when the results were saved. The suffix doesn't necessarily have to be in the format of "YYYY.DDD" as long as it is specified as the argument for "update" and agrees with the actual suffix to "err" in the file name. The "update" program will comment out the last model in "mdlpoctl" and append the new one. To begin using the new model, stop the FS and restart it (or do whatever is necessary to have the model read in if your "antcn" doesn't read it automatically at start-up). You should always do at least a quick pointing check to make sure that the new model is good before using it.

7.13 Changing model parameters

If during the analysis of the data, an unmodeled systematic is discovered, it is possible to modify the form of the model to remove this. The default model has several parameters beyond the basic eight. These can be turned on and off in the analysis by using the “Modify Parameters” item in the “Edit” main menu and then selecting “Reprocess” to see the results. Please note that making changes here does not permanently change the values used in the “mdlpo.ct1” file. It only changes parameters used for the current analysis session with pdplt. However, if you change the parameter settings, save the results of an analysis with them and then update the “mdlpo.ct1” file, the new model in the “mdlpo.ct1” file will use the new parameter configuration. This behavior is generally the most useful. For more information on the flags and their values and the parameters that are available, see the Pointing Model File manual (ACP Files) in Vol. 2 of the FS manuals. If the parameters that are available are not sufficient, they can be expanded.