Pointing Run Procedures

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Introduction

This document is intended as a checklist for generating a new set of TCS3 pointing coefficients, and is not intended to be a tutorial for new users.   Should be done by an experienced TO or TCS3 program.

Doing pointing run require proficiently in unix, operation the TCS3. In the case of encoder ratios, be able to update the software.

In general, the procedure are to:

1. Run a benchmark with current map.
2 . Do a pointing run to collect data for analysis by **tpoint**. Then enter the new coefficients generated by
   tpoint into the system.
2. Run a benchmark with the new map. (Make sure it not worse)
3. Make the new coefficients the defaults for the TCS.

The resulting pointing tpoint data is located in /home/tcs3/data/tpoint/YYMMDD.
And index.html file is created as a log for the run and for the techgroup report. The best way to do a new pointing run is to copy the index.html into a new directory and follow along.
The link http://irtfweb.ifa.hawaii.edu/~tcs3/tcs3/data/tpoint
Previous run were log under the history section: ie, ~/public_html/tcs/tcs3/history/YYMM.

Before Starting:
1. It would be a good ideal to generate new encoder ratios. This can be done during the day.
2. Have SPEX in the center, and use SPEX collimation values.
3. At Zenith, re-read the APE to initialize the PMAC position. (In idle mode, do APE.Set.PMAC).
4. Insure the chopper is ON and in the center position.
5. Print the check list (Appendix A) and follow it.

1. General Procedures for collecting bench mark and pointing data.

Go to Zenith, enter idle mode, do a 'Ape.Set.PMAC'.

Enter tracking mode, peak up on a zenith star, and do the "pt.save" or (initialize pointing)

Use the 'Pointing' tab on mcc2.

Path to /home/tcs3/data/tpoint/YYMMDD
Set Filename to point.dat (if benchmarks, use b1.dat, b2.dat, etc)
Set Pattern to Grid for pointing run. (If benchmarks, select Benchmark13).
Set Separation to 13 (for a grid of 70 stars)
Set Caption to "pointing run" (optional, this is just a comment field)
Press the "Open File" button.
Press "Next & Slew" to go to the 1st star.
Repeat the following steps for all stars:
        After slew, put star on cross hairs.
        Press the "Add Star" button. (with "Do Map" and "Do Next & Slew" check).

2. Generate new pointing coefficients:

Log in to t1 as tcs3 to run tpoint:

```
ssh -l tcs3 t1
cd /home/tcs3/data/tpoint/YYMMDD        # cd to the correct directory.
tpoint tpoint.log                       # name the log file.
```

At the tpoint "*" prompt, enter these commands:

```
indat  pointing.dat
call  irtf
fit
call  e9
gc p point.ps
outmod point_coeff.txt
quit
```

A bad data point will mess up the fit, do a 'SLIST' command to show the star list. From this output you can identify any bad points. Delete the line, and repeat the above commands. Do this until you get better that 15as RMS.

Examine the displayed results and perform other fitting if needed (see tpoint documentation). If any changes are made, be sure to reissue the "call e9", "gc p point.ps", and "outmod point_coeff.txt" commands so that all the new data is saved.
Type "quit" to exit tpoint

Convert .ps file to a .pdf for easy viewing.
```
ps2pdf pointing.ps
```

3. Enter the new pointing coefficients into the TCS

Edit the .tcs-init and replace the old coefficients value with the new one.
Type 'die' on the mcc to termination the TCS, then restart.
Update both the /home/to/current/ic and TCS3 development version of the .tcs-init file.

Appendix A – Check list

Before the RUN

[ ] Day Crew should clean/inspect gears and encoders.
[ ] Measure the encoder ratios. Update TCS3 if deemed necessary.

Beginning of Run.

[ ] spex in the center; Check balance
[ ] Check collimation numbers; if chopper (ON and Centered)

Benchmark1

[ ] Ape.Set.PMAC at Zenith
[ ] Initialize pointing at a Zenith Star
[ ] Collect data using 'b1.dat' and Benchmark13 pattern.

Pointing Data

[ ] Ape.Set.PMAC at Zenith
[ ] Initialize pointing at a Zenith Star
[ ] Collect data using 'point.dat' and GRID with 13 degree separation (70 starts)

Tpoint.

[ ] Calculate new coefficients
[ ] Update default copy of .tcs-init
[ ] Update development copy of .tcs-init
[ ] Re-start TCS software to run with new pointing map coefficients.

Benchmark2

[ ] Ape.Set.PMAC at Zenith
[ ] Initialize pointing at a Zenith Star
[ ] Collect data using 'b2.dat' and Benchmark13 pattern.
[ ] Check b1 vs b2; Use the appropriate coefficients

Post-Run

[ ] Complete your report in /home/tcs3/data/tpoint/YYMMDD
[ ] Update coeff_history.xls

Appendix B – Other Notes

1. Another way of compare the old map vs new tpoint coefficient is to use tpoint and plot the old map using your new data. An example:

- `indat p1.dat`   Read in data
- `call irtf`   setup standard IRTF parameters
- `fit`   Fit to new map
- `ih XX.XX`   Replace new map with coefficient from old map
- `id XX.XX`
- …
- `TX XX.XX`
- `Fix`   Prevent terms from being changed.
- `Fit`   Fit the terms.

1. What are the 9 standard plots? The *G ydata xdata* generates the plots. There is a summary of the 9 standard plots (left to right, top to bottom):

N	G-command	X	Y
1.	G X H	east-west error	hour angle
2.	G D D	declination error	declination
3.	G Z Z	zenith error	zenith
4.	G X D	east-west error	declination
5.	G D H	declination error	hour angel
6.	G P H	ha/dec nonperpendicularity	hour angle
7.	GSCAT E	scatter plot of errors	
8.	GDIST	plot distribution of the pointing errors	
9.	GMAP	Cartesian cylindrical plot.	

Appendix C – Pointing Measurement - Taking a benchmark 13 dataset.

The TO maybe asked to take a measurement of the pointmap by taking a benchmark13 data set
The procedures are as follows:

1. GO Zenith, Stop the TCS, and do an APE.Set.PMAC

2. Start tracking, peak up on a zenith star, and do a pt.save
   Leave the off-axis mirror (smokey) in the IN position.

3. On MCC2, go to the Pointing tab

   - Set **Path** to /home/tcs3/data/tpoint/benchmark
   - Set **Filename** to YYMMDD-inst.date, where 'inst' indicates what instrument in the observing MIM position.
       o Example for spex on 2017-03-24: **170324-spex.dat**
       o Example for ishell on 2017-03-26: **170326-ishell.dat**
   - Set **Pattern** to 'Benchmark13'
   - Ignore **Separation**, and **Caption** inputs.

4. Start collecting data:

   1. Press **Open File** button to start.
   2. Press "**Next & Slew**" to slew to the 1st star.
   3. Repeat the following steps for all stars:
       o After the slew, put star on cross hairs.
       o Press the "**Add Star**" button.

5. Send an email to denault@hawaii.edu saying the benchmark was successful taken (or not).

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