Determining and Using New Encoder Ratios

This document describes the procedures to measure the incremental encoder ratio. And describes the steps to use the encoder ratio in the TCS.

Introduction

The incremental encoder ratio can be measured using the APE encoders as a reference. We move the TCS3 and record the APE postion and number of counts moved. This data is then used to determine the encoder ratios. This procdure can easily be done by hand. However, we have written a program to help with data collection, calculation, and data storage. This program is called encoder_util. Collecting this data can be done by the TO or Daycrew. Using the new encoder values require modification of the tcs3 source code, this is done by the tcs3 programmer.

The data collected for determining encoder ratios should be located in the directory /home/tcs3/data/encoders/.

Once new encoder ratio have been determined, the these value must be put into the TCS software. This would be done the by TCS programmer.

1. Using encoder_util

The encoder_util program guides you though the data collection, calculation, and data archival steps. The program works by asking you to do a series of 9 moves. At the end of each move, the APE and incremental counts are obtains. And the end, the encoder ratios for each move and an average is presented. Note the destination of the moves presented by the cal_encoder_ratio program are suggestions, you can use this program using your own destination points.

To run the program:

1. Position the telescope at Zenith and reinitize the TCS incremental encoder with the APEs: Do an APE.Set.PMAC from mcc1 in idle mode.
2. Open an xterm on t1, or ssh to t1 as to (`>ssh t1 –l to`).
3. cd to data/encoders:
   a. `> cd ~/data/encoders`
4. Type `encoder_util`
5. Perform the following commands:
   a. r.get – follow the on screen commands to collect the data.
      Lower the slew rate to 1400 as/s.
   b. r.show – view the data and ratios from the xterm.
   c. r.save – save the data to a file.

2. Programmer's Notes

The APE-Apos values also give you a good indication if the current encoder ratios are too larger or small.

A negative slope means ration are too small (new ratios should be larger).

A positive slope means the ration are too big (new ratios should be smaller).

The source code for the encoder_util is located in /home/tcs3/src/tcs3/encoder_util.
For tcs3, a link in ~/bin points to ~/src/tcs3/encoder_util/encoder_util.
For to, the execuable is installed in /home/to/bin.

To use the new encoder ratios, you will need to modifiy the TCS3 main code, recompile, and install the new version.

The TCS3 Main code is located in /home/tcs3/src/tcs3/main/VERSION.

The ./t3lib/t3_defines.h files contains the encoder ratio are a define, ie:

```
#define HA_DAS2CNT      (19.93064353)      // HA  arcsec to counts
#define HA_DCNT2AS      (1.0/HA_DAS2CNT)   //     counts to arcsec
#define DEC_DAS2CNT     (19.96953869)      // DEC arcsec to counts
#define DEC_DCNT2AS     (1.0/DEC_DAS2CNT)  //     counts to arcsec
```

You must modifiy theses values, recompile and re-install the tcs3. See the README.txt file in the main source directory.

The PMAC uses 20 cnt/as for some of its limits: velocity limit, acceleration limits, etc. There is no need to change these as long the as encoder ratios are about 20 cnt/sec.