



MULTIPLE MIRROR TELESCOPE OBSERVATORY

Smithsonian Astrophysical Observatory and Steward Observatory, University of Arizona

MMTO Tech Memo 84-19

August 13, 1984

From: A. Poyner

Subject: Simplified Precession Routine for the Mount Computer.

The general precession routine of the mount computer has been modified to simplify operator entry of the various parameters required. The most conspicuous change is the removal of "tomorrow's Besselian Day Numbers". The current Besselian Day Numbers ("today's") are used throughout, with no interpolation. The difference in coordinates is not significant - in fact, the interpolation previously provided had never been used.

Also included is the provision for including the precessed Apparent Place coordinates in a catalog.

This precession routine is in addition to a general precession routine available on the Instrument Computer. Coordinates precessed on the instrument computer can be transmitted via the data link to the mount computer and written to a catalog in preparation for an observing run. Though this routine is not as accurate as the routine on the mount computer, it is adequate for visible stars and does not require the entry of Besselian Day Numbers. See the I-Ret User's Manual for operating instructions. There is also a special precession routine on the mount computer that precesses 1950 coordinates to the current epoch.

Operating instructions for the modified mount computer general precession routine are attached. It is intended that these instructions will become one part of a revised Mount Control Program Documentation, which will be designed to be updated periodically.

GENERAL PRECESSION ROUTINE OF THE MOUNT COMPUTER

1. Overview

The mount control program incorporates a routine to perform precession from one epoch to another. The routine is accessed via a "menu" which leads the operator through the entry of the required parameters by means of a series of questions. The operator is able to:

1. Precess coordinates from one mean Epoch to another mean Epoch for epochs between 1900.0 and 2000.0. Proper motion can be included if desired.
2. Precess coordinates from a mean Epoch at the mid-point of a year to any date within that year, to obtain apparent place of the object and topocentric position, which is apparent place corrected for diurnal aberration. Topocentric position is what you need to actually point the telescope at the object.

2. Operational Procedure

To precess a set of coordinates from some mean epoch to apparent and topocentric coordinates for the current date, type:

ad-precess (which means "menu-driven precession")

Note that if you wish to obtain apparent place for some other date, you have to set it before calling the precession routine, type (say)

27 jan 1977 ad epoch to set the date to 1/27/77.

The precession routine will output the following text, shown in bold type, and will wait for you to respond with the appropriate parameters when asked for them.

PRECESS FROM ONE MEAN EPOCH TO ANOTHER MEAN EPOCH.

The following steps are for the mean coordinates of the starting epoch.

Enter right ascension of object to the nearest
0.01 second of time: (xx:xx:xx.xx) -----

Enter the RA, in exactly the format specified.

Enter declination of object to the nearest
0.1 second of arc: (yy:yy:yy.y) -----

Enter starting epoch to the nearest tenth
of a year: (zzzz.z) -----

Is there any proper motion for the object? (Y/N) _____

If you respond with "Y", the following two questions will be asked:

Enter the proper motion in right ascension in seconds of time per century: (x.xxxx) _____

Enter the proper motion in declination in seconds of arc per century: (y.yyy) _____

Final Epoch for MEAN Coordinates -

(To precess to current Apparent Place, enter the mid-point of the current year, e.g. 1984.5)

Enter final epoch to nearest tenth of a year: (xxxx.x) _____

Note that you almost always will want to precess to current apparent and topocentric coordinates.

The program will now compute and output the mean place:

The mean precess coordinates from initial to final epoch are: (Mean RA) (Mean DEC)

PRECESS FROM MEAN EPOCH TO APPARENT PLACE

Today's Besselian Day Numbers are:

A - (day number A)
 B - (" " B)
 C - (" " C)
 D - (" " D)
 E - (" " E)

Are the Besselian Day numbers for today correct? (Y/N) _____

Check the numbers against the Besselian Day numbers in the Astronomical Almanac. The Almanac lists them for 0.0 hours of every day. Thus, if you are setting up ready for observing tonight, tomorrow's Day numbers will be the closest. The first time that you precess after booting the program, the numbers always will be wrong. After that, you can precess other objects without re-entering the numbers. If you answer N to the above question, the program will prompt you:

Select by letter (A - E) the Besselian Day number you wish to modify: (Type "Q" when finished) _____

Enter A through E in turn, and enter the Day numbers when prompted, in exactly the format specified. Note

that E requires 4 decimal places, while all the others have only 3. After each entry, the list of numbers will be displayed. If you mistype one, simply re-enter it. When all are correct, type "Q" to end.

The program will then compute and then display the apparent place and topocentric coordinates.

The apparent place for the object is:
(apparent RA) (apparent DEC)

The topocentric place for the object is:
(topocentric RA) (topocentric DEC)

Do you wish to seek this object? (Y/N) -----

If you wish to slew the telescope to the object at this time, answer Y. Otherwise, answer N and either note the calculated coordinates, or enter them in a catalog as detailed below.

This completes the precession function.

3. Entering the coordinates in a catalog

If you used the precession routine in preparation for observing later, it may be useful to you to store the coordinates as a catalog entry which can be recalled at the appropriate time.

The following procedure will set up the catalog entry.

First, a catalog has to be specified if you have not already done so. For this purpose, the Small Star Catalog or possibly the Large Star Catalog will be used. To select a catalog type:

set-catalog

and select the appropriate catalog when prompted to do so.

If you are setting up a new catalog, typing:

new-catalog

with the Small Catalog selected will initialize it. If the Large Catalog is selected, the program will erase and format all records in a file called STARS. If you do this, USE A NEW DISK or you will wipe out someone's catalog!

You are now ready to enter the coordinates that you just precessed. Type:

nnn penter Source Name where nnn is a number.

This will make a catalog entry number nnn with a name "Source Name" and the current topocentric coordinates you just calculated. When you are ready to send the telescope to this source, type:

nnn cseek

You can now precess other sources and enter them in the catalog using just the "penter" command, above. When you have finished entering everything, type:

flush

to insure that all the entries are written out to the catalog diskette.