

# High Precision Pointing of the 16” LX200 GPS Using TheSky and TPoint

*TPoint is an add-on module to TheSky software astronomy package that allows pointing analysis and improvement for computer controlled telescopes. TPoint allows this improvement by fitting the telescope pointing errors to a geometric equation with six degrees of freedom to model inaccuracies in the orientation and alignment of the various optical and mechanical components of the telescope. TPoint also possesses the ability to add harmonic terms to the pointing solution in order to better model telescope tube and fork flexure. A well tuned model will place any object in the sky on the imaging CCD of the ST-9E with ease.*

## **Using TPoint with the 16” LX200GPS**

Under normal circumstances (*the telescope remaining on and in Sleep Mode*), syncing with the TPoint model is not needed. In this case, all that will need to be done is wake the telescope from Sleep Mode and connect TheSky with the telescope (*for details see the end notes*). However, if the telescope has lost power for some unknown reason or been turned off then the telescope will need to be synced with the current TPoint model. To do this:

1. Point the telescope to a bright star that is in its internal database and sync the hand controller to telescope by holding <ENTER> on the hand controller for two seconds and choosing yes.
2. Now, start TheSky either through the desktop icon or through Start Menu -> Programs -> TheSky -> TheSky. Connect TheSky to the telescope and center on the star that the telescope had just been synced on. In the ' Object Information' dialog, choose the ' Telescope' tab located on the end and push the ' Sync' button found at the bottom of the button.
3. A dialog will appear on screen asking which action to perform, select ' Perform a short mapping run' . This begins the process of fitting the current model to the observing parameters.
4. After clearing the dialog screen, return to the ' Telescope' tab of the ' Object Information' dialog and map the star by pressing the ' Map' button (red cross hairs with an offset white star). A dialog will pop up asking for you to confirm the map, push ' Ok' . This is the mapping routine that is used to sync the model.
5. Repeat step 4 for 8 to 10 stars distributed throughout the sky in *alt/az* to complete the updating of the TPoint model.
6. The telescope should now be able to point accurately through the computer.

## Usage Notes

- To connect the telescope to TheSky, select Telescope | Link | Establish, or alternatively click on the green telescope ' play' button located in the lowermost tool bar. To disconnect, select Telescope | Link | Disconnect, or click the red telescope ' stop' button.
- In some cases, after the slew command is sent from TheSky, the telescope failed to point in the appropriate place. This is not a failure of the TPoint model, but a failure in the telescope <-> TheSky communication. This easier way to fix this is to zoom in on the object of interest and use the hand controller of the telescope to move the telescope until the object is centered in the on screen cross hairs.
- The model works best when the telescope is weighed about the same as when the model was originally created, i.e., with the spectrometer attached to the back plate. For working with the ST-9E, no modification to the weight is needed, however, visual work will need to add an additional ~5-10 pounds to the back plate to maintain this initial weight. If pointing is not critical, for example on a public night, no modification to the weight is needed since the RMS of the pointing will still be smaller than the field of view of the 12mm eyepiece.
- Under certain circumstances, TheSky will generate an error saying that it cannot connect to the object server. This message is non-critical and can be ignored. The cause of this error is still unknown.
- Copies of TheSky and TPoint manuals are available in the observatory or on line at: <ftp://www.bisque.com/OutBox/Download/PDFs/>