

Application Note - Flat Fielding Track and Accumulate Images

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This Application Note gives the step by step procedure for flat field correcting images taken using the Track and Accumulate command. Flat field correcting images allow the user to remove the effects of CCD response non-uniformity (typically less than a few percent) and optical vignetting which for some optical systems can be as much as a 50% effect from center to edge.

Our CCDops software allows flat field correcting images using the Flat Field command, but some preparation must be made to use that command with Track and Accumulate images. Essentially you must prepare a special flat field correction image for Track and Accumulate images. This special preparation is necessary to have the same set of alignment and co-addition operations apply to the flat field file that have occurred in acquiring the Track and Accumulate image. In general, the following procedure should be followed when flat field correction of Track and Accumulate images is desired:

1. Take a normal flat field image using the Grab command. Try to adjust the illumination and/or exposure so that the build up of light in the image yields pixel values around 1/3rd of saturation on your camera, typically 20,000 counts or so¹. You don't want to exceed the antiblooming knee which starts to kick in around 4000 counts.

Note: You will have to take a new flat field image anytime you change the optical configuration of your telescope such as removing and replacing the optical head in the eyepiece holder.

2. Save the flat field image on your disk using the Save command. In the following discussions this flat field file will be referred to as FLAT.
3. Take your Track and Accumulate image using the Track and Accumulate command and save it on the disk using the Save command. In the following discussions this Track and Accumulate image file will be referred to as IMAGE.
4. Immediately after saving the IMAGE, use the Save Track List command to save the Track and Accumulate Track List. The track list is a file that describes what alignment operations were done to the individual components of IMAGE to achieve the end result. In the following discussions this track list file will be referred to as TRACK.
5. Repeat steps 3 and 4 as many times as desired for all the objects you wish to image, each time choosing a set of corresponding new names for the IMAGE and TRACK files.
6. You will now create a combined flat field image for each Track and Accumulate image you captured. Invoke the Add by Track List command in the Utility menu. The software will present a file directory box asking you to select the Track List saved in step 4 above. Select the TRACK file corresponding to the image you wish to correct. The software will load the TRACK file and present you with another file directory dialog showing all the images. Select the appropriate FLAT image. The software will align and co-add the FLAT image using the same operations it performed on the Track and Accumulate image. Finally save the combined flat field image using the Save command. In the following discussions this combined flat field image will be referred to as

¹ The older ST-5C and ST-237 are 14 bit cameras and saturate at ~16,000 counts. With these cameras your target illumination should be ~5,000 counts.

COMBINED-FLAT. Repeat this step for each of the TRACK files using a corresponding name for the COMBINED-FLAT image.

7. You will now flat field correct the Track and Accumulate image with the combined flat field image. Use the Open command to load the IMAGE file, then use the Flat Field command. The software will present you with a file directory dialog where you should select the corresponding COMBINED-FLAT image. After the software has finished correcting the image, you can view the results and save the flat field corrected image with the Save command. This image will be referred to as the CORRECTED-IMAGE file. Repeat this step for each of the IMAGE files using the corresponding COMBINED-FLAT image.