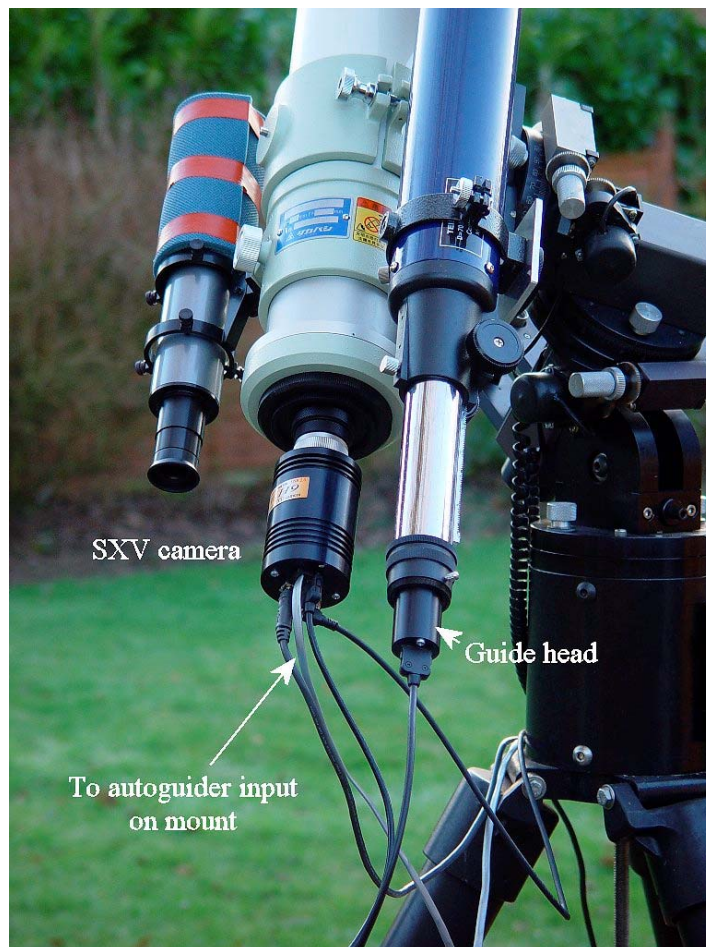


### Using the add-on autoguider:

A very useful accessory is the add-on autoguider head, which takes its power and control signals directly from the SXV camera, via the 18 way socket on its rear panel. The autoguider is only 1.25" in diameter and has a video style 'CS' mount thread in its nose, so video lenses may be attached. The guider may be used with either an off-axis prism assembly mounted in front of the SXV camera, or with a separate guide telescope, rigidly mounted alongside your imaging telescope. I personally use it with a 70mm aperture, F10, inexpensive refractor as a guide 'scope, but a shorter focal length lens will make more guide stars available in any given region of sky (See the picture below).

To use the autoguider, first orient it so that the connector plug is roughly parallel to the declination axis of your mount. This is not absolutely essential, as the training routine will learn the angle of the head and compensate for it, but it is easier to understand the motion of the guide star if the guider frame is aligned with the RA and Dec axes. Now connect the head to the SXV camera, using the 18 way connector lead, including the port divider box, if it is to be used.

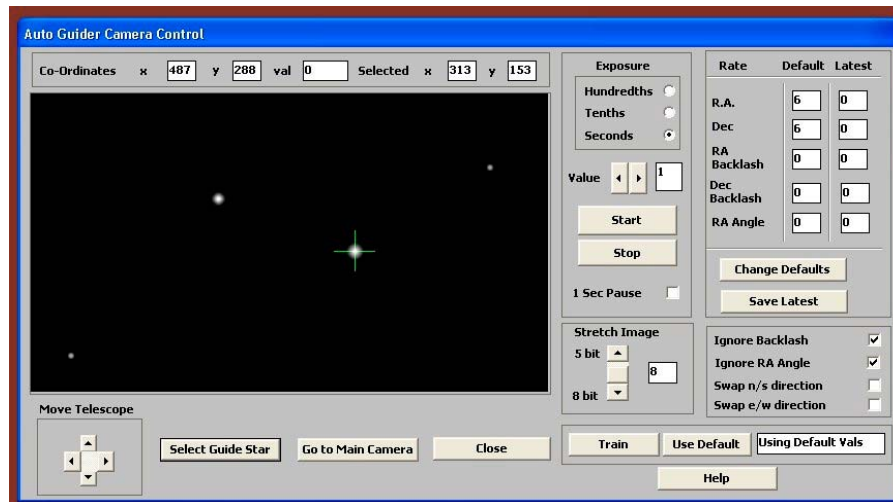
The recommended way of connecting the autoguider output to the mount is to use an RJ11 telephone lead between the socket on the SXV camera and the autoguider input of your mount. This output is 'active low' (i.e. the control relays pull the guider inputs down to zero volts when applying a guide correction) and matches most of the autoguider inputs on commercial mounts. If 'active high' inputs are needed, or a very low control voltage drop is essential, then you will need to add a Starlight Xpress 'relay box' between the guider output and the input to the mount. Please contact your local distributor if a relay box is required. Some mounts (Vixen, for example) use a similar guider input socket, but have re-arranged connections. Details are given on our web pages at the end of the 'STAR2000' section.



The autoguider installed on a 70mm refractor guide 'scope in the author's garden

To use the autoguider, please proceed as follows:

- 1) Having started the SXV-H9 software, open the autoguider control panel by clicking on the autoguider menu button.



The autoguider control panel with a guide star selected

- 2) Press the 'Start' button and a series of 1 second exposure guider images will begin to appear in the picture frame. If the images look too dim, use the 'Stretch Image' slider to increase its contrast and brightness until the noise begins to be visible.
- 3) If you haven't focused the guider lens or 'scope, move the mount until a bright star is visible on the guider image and then adjust the focus until it is as sharp as possible.
- 4) At this point, you may want to test the guiding control by pressing the manual 'Move Telescope' buttons at the bottom left corner of the control panel. You can watch the position of any stars in the guider image and confirm that they move in response to the buttons. The movement should be slow if the correct guiding rate is selected on your mount (typically 2x sidereal). Adjust this, if necessary.
- 5) Move the mount until the required object for imaging is properly framed in the main CCD image (leave the guider menu and use the main camera control panel, as necessary).
- 6) Re-open the guider control panel, start imaging and try to locate a clearly visible guide star. If necessary, make adjustments to the guide telescope or off-axis guider until one is found.
- 7) Press 'Stop' and then press 'Select Guide Star'. Use the mouse to left click on the selected star and a green cross will highlight it and the co-ordinates will appear in the text boxes above the image window.
- 8) The various guiding rate defaults, listed on the right-hand side of the control panel, are unlikely to be perfect for your particular telescope and mount. You have the option of manually selecting values, or asking the software to attempt to determine what they should be. This is done by pressing the 'Train' button and waiting for the software to complete a sequence of automatic moves and calculations. The training will also determine the angle at which the guide camera is oriented with respect to the RA and Dec axes. If you do not wish to train the system at this time, the default values of 6 pixels per second will serve as a starting point.
- 9) Now press 'Go to main camera' and the guider control panel will be replaced by the camera control panel. Set the required exposure time for the image (say 5 minutes) and press the 'Autoguide next image' button. The autoguider window will reappear and, after a few seconds, you should see error values appearing in the text windows at the top. The guide star will be fairly close to the green cross, although not necessarily accurately centred, and you should see the power/ guide LED on the rear of the camera brighten and change colour with each correction.
- 10) If the star begins to drift away from the cross, despite the corrections being made, the chances are that the N/S and/or E/W directions are set wrongly. Judge which axis is incorrectly set by

observing the direction of the drift and then stop the exposure by pressing 'Esc'. Open the guider control panel and check the appropriate swap box(es). After this operation, you will probably need to find the guide star again by taking a guider image and reselecting the star, as before. Now return to the main camera menu and try the 'Autoguide next image' button again.

- 11) Once guiding is taking place without problems, the main exposure can be allowed to finish and, if all is well, you should see an image with tiny circular stars.

If the stars are not circular, you may need to alter the guiding parameters, or investigate the rigidity and drive performance of your mount. A lot of information can be deduced by watching the behaviour of the guide star in the guider frame. If it is continually moving between two locations, either side of the green cross, then the RA or Dec pixels per second value is set too low. The higher these values are set, the gentler the guiding becomes. Too low a value will cause an over-aggressive correction to be made and result in oscillation of the star position between two points.

Another source of guiding errors can be an accurately balanced telescope mount! Good balance can result in the telescope mount 'bouncing' between the gear teeth as corrections are made. A simple fix is to add a weight of about 0.5kg (1 pound) on the eastern end of the declination axis, so that there is always some pressure acting against the gear teeth.

Getting a good result from an autoguider will often entail a lot of detective work to eliminate the sources of gear error, telescope flexure, mirror shift etc., but the final result is well worth the effort!

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