

Fibre Acquisition and Autoguider User Instructions (Draft)

1 Prerequisites

The UDAS autoguider camera must be running on the DAS computer.

The AF2 system must be running on the AF2 control computer.

The TCS must be running on the TCS computer.

The OCSCorbaDramaBridge must be running on the Linux ICS computer. This starts up as part of the main observing system.

The connection status of the autoguider camera, AF2, and TCS is shown in the status bar at the bottom of the Fibre Guider control panel. If any of these systems are not connected, they will be displayed in RED.

1.1 DS9 Display Tool

The ds9 display tool must be running for the Fibre Acquisition tool to display images from the autoguider camera.

The acquisition tool also requires that the AF2 guide fibres are marked with annulus regions on the display tool. The requirements for the setting of the guide fibre regions are as follows:

1. The regions marking the guide fibres must be of shape "Annulus".
2. Each annulus region must be centred on the guide fibre centre position.
3. Each annulus region must have the text parameter set to the number of the fibre. For example, the region centred on guide fibre 16 must have the text field set to "16".

Note: The region .reg files used for the November 2012 AF2 run are of the correct format to work with the fibre acquisition tool. Only the centring of the regions on the guide fibres is needed.

2 Starting the Fibre Acquisition/Autoguider Software

(The SDSU autoguider should be started in the usual way with obsys, startobssy, startag.)

Start the Fibre Guider by typing the following command on the autoguider computer:

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fibreguider &
```

This starts up the Fibre Guider control window and connects to the ds9 display tool, the autoguider camera, the AF2 system and the TCS. If any of these cannot be contacted, its status will be shown in RED in the status bar.

Note: The SDSUAutoguider can be left running, but should not be used for taking camera images simultaneously with the Fibre Guider.

3 Controls

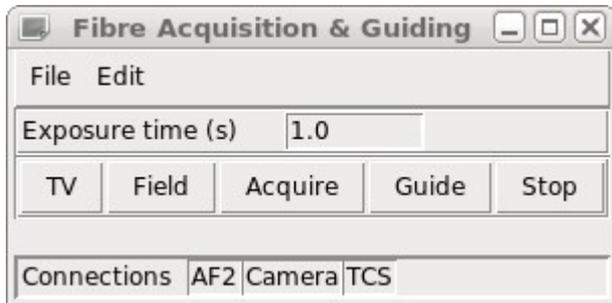


Illustration 1: Main Control Panel

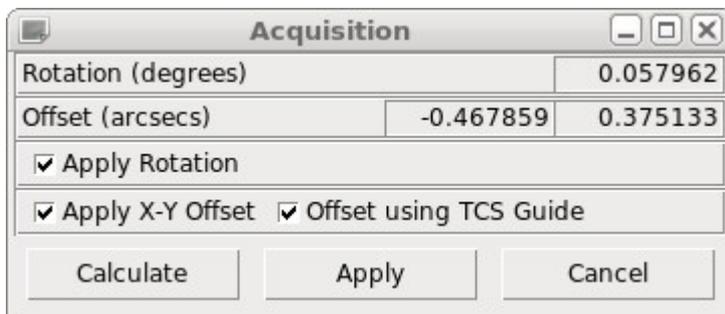


Illustration 2: Acquisition Control Panel

3.1 Exposure time

Sets the autoguider camera exposure time in seconds.

3.2 Field

Pressing the Field button takes an image from the camera and displays the image on the ds9 display tool. The centroid positions of any stars are marked on the display with a green cross.

3.3 TV

Pressing the TV button displays a series of images from the camera on the ds9 display tool. Press the Stop button to stop the TV mode.

3.4 Acquire

Pressing the Acquire button opens the Acquisition dialogue window. The Acquisition window shows the Calculate button and the Apply button.

The Calculate button takes an image from the camera, and uses the relative positions of the Guide fibres and the Guide stars, to calculate the optimum telescope rotation and offset to centre the Guide stars on the Guide fibres.

The optimum rotation and offset required to centre the Guide stars onto the centres of the guide fibres is displayed in the Acquisition dialogue window.

The Apply button applies the calculated rotation and offsets to the TCS using the TCS "tweak" command.

Use the "**Apply Rotation**" check button to enable or disable the applying of TCS rotation offsets. Use the "**Apply X-Y Offset**" check button to enable or disable the applying of TCS translation offsets.

Use the "**Offset Using TCS Guide**" check button to enable or disable the applying of TCS translation offsets using the TCS "guide" command.

Note: The "Offset using TCS guide" option is included for test purposes in case the calculated offsets are not in the correct direction, and will probably be removed in future releases.

3.5 Guide

Pressing the Guide button sets the autoguider taking images from the camera. For each image, guide star centroids are found and marked on the display tool, and the optimum telescope offset is calculated and sent to the TCS serial port. Press the Stop button to stop the Guide mode.

While guiding, the Acquisition window will continue displaying the measured telescope translation offsets and rotation.

3.6 Disable Fiducial Fibres

Use the **Edit-Preferences** menu to disable any fiducial fibres which you do not wish to use for acquisition or guiding purposes.

Fiducial fibres will be automatically disabled for acquisition or guiding purposes if:

1. No fiducial object is detected on the fibre.
2. The fibre is not positioned on the field plate within the observable field.

4 Procedure for Acquiring an AF2 Science Field

1. Roughly acquire the fiducial stars onto the fiducial fibres. Ensure that 3 or more fiducial stars are visible on the fibres.
2. Press the **Acquire** button to open the Acquisition dialogue window.
3. Press the **Calculate** button. Once the measurement of offset and rotation has been completed, the required translation offsets and rotation will be displayed above the control buttons in the Acquisition dialogue window.
4. Enable or disable the "Apply x-y offset" and "Apply rotation" check buttons as required.
5. Press the **Apply** button to send the required offsets and rotation to the TCS using the TCS "tweak" command. Alternatively, the "tweak" command can be issued manually at the TCS, to set the required offsets and rotation.
6. After the TCS rotation and offsets have been applied, press the **Calculate** button again to

- remeasure the offsets and rotation.
7. If the measured offsets and rotation are still large, repeat steps 5 and 6 above until they are within the required range (e.g. rotation < 0.005 degrees, offsets < 0.1 arcsecs)

Disable any fiducial fibres/stars that appear to be unsuitable for acquisition or guiding purposes using the **Edit-Preferences** menu.

5 Acquisition Method Software Description

The following provides a basic description of the method the software uses to calculate the optimum rotation and translation to position the fiducial objects onto the centres of the fiducial fibres.

1. An image is acquired from the camera, and the centroids of any objects detected are calculated.
2. The physical (field-plate) positions in microns of the fiducial fibres are read from the AF2 instrument.
3. The centre positions in TV co-ordinates of the fiducial fibres are read from the ds9 display.
4. The positions of the object centroids relative to the centres of the fibres are converted to physical (field-plate) co-ordinates in microns, so that each fiducial fibre has 2 sets of co-ordinates, the position of the centre of the fibre, and the position of the centroid of the fiducial object on the fibre.
5. The software forms the 2 sets of co-ordinates, the object positions, and the object target positions, into a matrix. The software then uses Singular Value Decomposition (SVD) methods to compute the 3x3 transformation matrix containing the optimal translation and rotation to transform the object co-ordinates onto the object target co-ordinates.
6. The translation and rotation values of the SVD transformation matrix are then converted into TCS parameters that can be used to apply the correction offsets and rotation to the TCS.

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