

fishcamp engineering

105 W. Clark Ave.
Orcutt, CA 93455
TEL: 805-937-6365
FAX: 805-937-6252
bobtek@fishcamp.com

Date: 29 December, 2007
From: Bob Piatek
To: Starfish guide camera users

Subject: Documentation for the Starfish Camera plug-in for MaxIm DL.

The Starfish camera can be used as a guide camera under Diffraction Limited's MaxIm DL camera control software. Before MaxIm DL will recognize the Starfish camera connected to your computer, you will need to copy the camera plug-in for the Starfish to the MaxIm DL directory on your hard drive. The camera plugin file is named "CCDPlugFishcamp.dll". The default installation directory for the current version of MaxIm DL is:

"C:\Program Files\Diffraction Limited\MaxIm DL V4"

Copy the camera plugin to this directory. You should see it along with all of the other camera plugins that MaxIm DL supports afterwards.

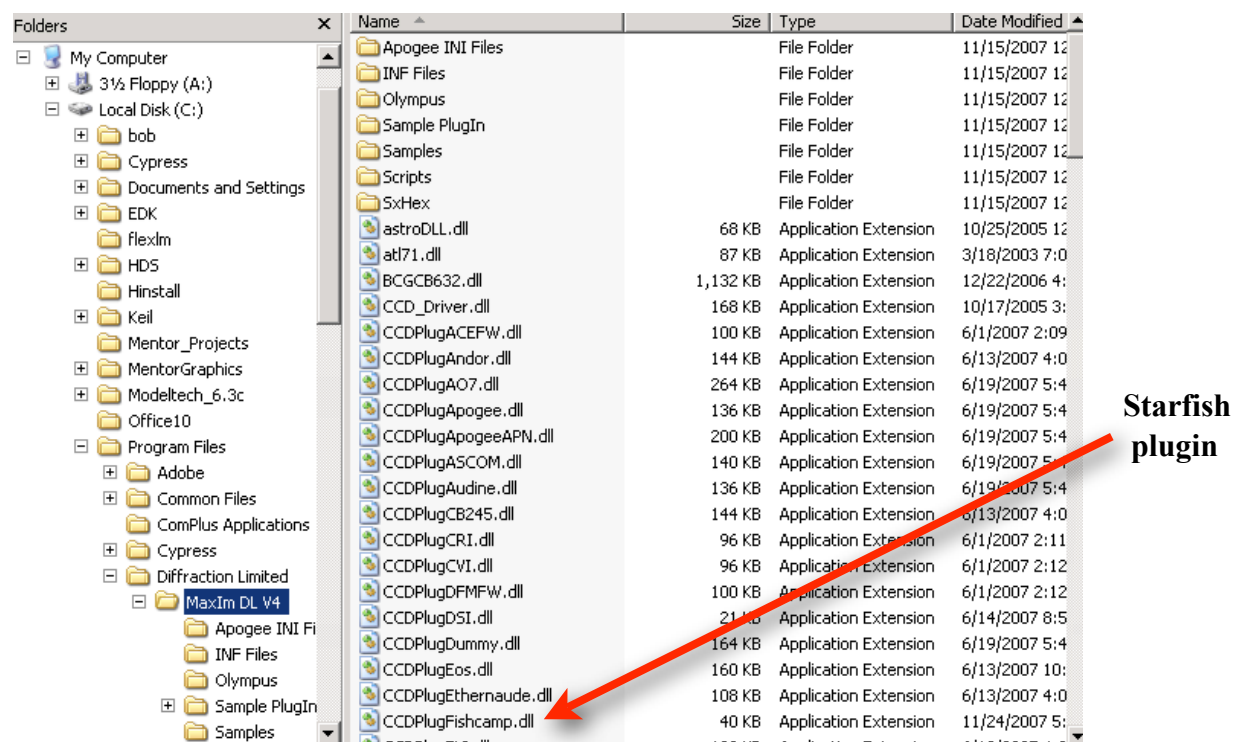


Figure 1. Windows Explorer view of MaxIm DL directory

After the plugin is properly copied to the MaxIm DL program folder, connect the camera to a USB port on your computer and launch MaxIm DL. After the program starts up, bring up the camera control window. You can do this by pressing the CCD Control icon in MaxIm DL's toolbar.

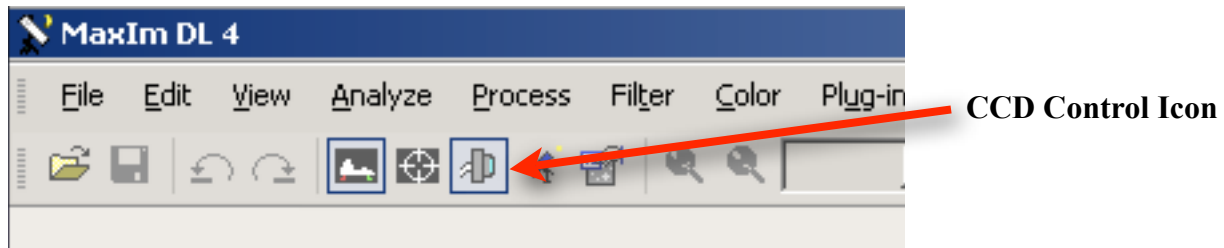


Figure 2. MaxIm DL CCD Control Icon.

MaxIm DL will open the camera control window which will allow you to select the Starfish camera as you desired camera to work with. It will also allow you to setup various parameters of the Starfish software.

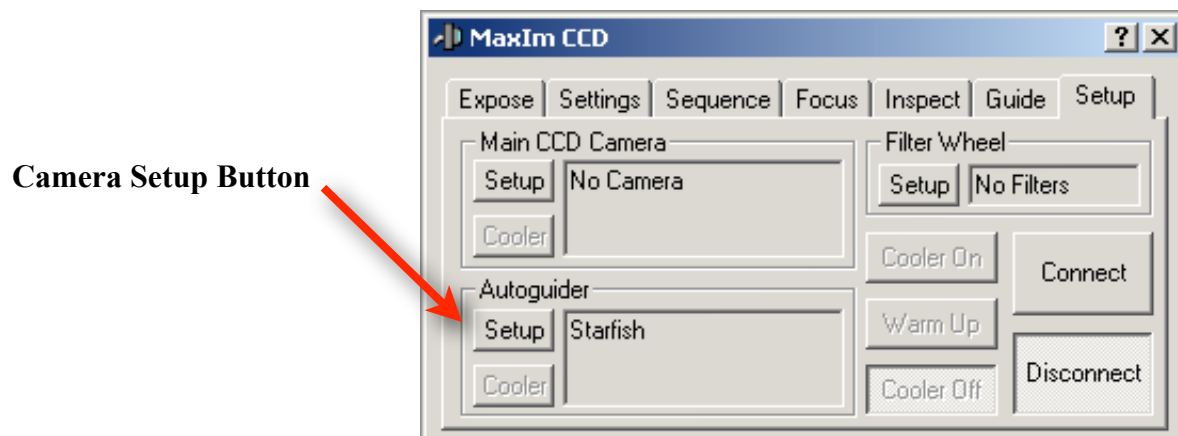


Figure 3. MaxIm DL Camera Control window.

Pressing the "Setup" button in the camera control window will bring up a dialog box that allows you to select the Starfish camera as your desired camera. In the above view we press the "Setup" button in the Autoguider portion of the view since we wish to use the Starfish as our auto guide camera.

The following picture shows the dialog box that will be displayed when you press the ‘Setup’ button.

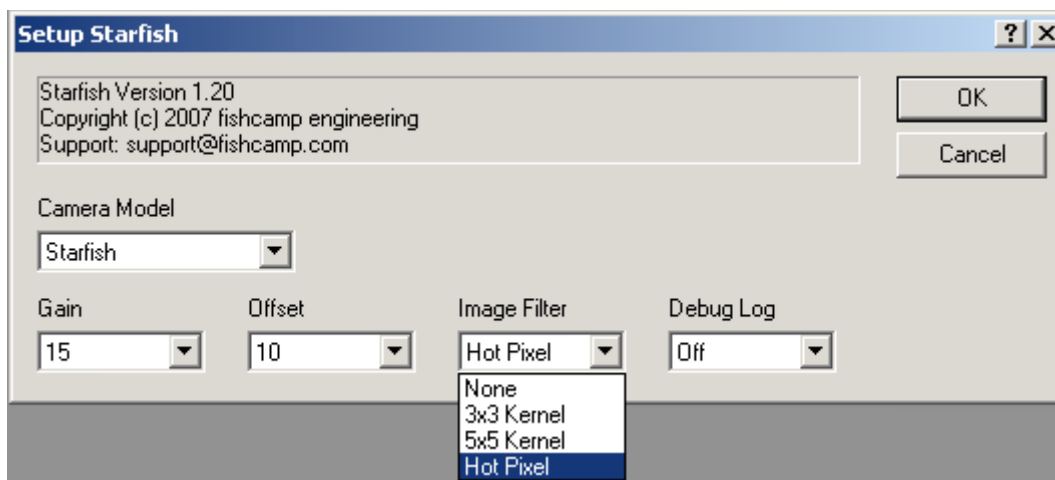


Figure 4. Camera Setup dialog box.

The camera setup dialog allows you to specify a camera to be controlled by MaxIm DL. You do this by selecting the desired camera in the pop-up box under the heading “Camera Model”. In this case you will select the ‘Starfish’ entry. If the Starfish camera is not in the list of choices, then you probably did not install the starfish camera plugin properly in the MaxIm DL directory.

After selecting the Starfish camera, the dialog box will display the version of the plugin being used along with our copyright notice. Four popup boxes will be displayed along the bottom of the setup dialog. These allow you to set various operational parameters for the camera. The following explains the four popups and their affect on the camera.

Gain - This popup allows you to set the gain of the Starfish camera. The gain setting controls the sensitivity of the camera. Higher sensitivity will allow you to see fainter stars for a given exposure time and thus will provide more suitable guide stars in the field of view of your guide scope. Higher gain settings also increases the noise content of the image but this will not significantly affect your guide performance. I recommend that you set the gain to maximum unless you have a very bright guide star and can get away with a lower gain setting.

The Gain can be set in a range of from 1 to 15 where 1 is the lowest setting and 15 is the highest setting. You should try to get a pixel intensity of around 45k counts for your guide star. Through a combination of Exposure time setting and Gain setting, you should be able to achieve this. This will give you the best signal to noise ratio for the image of your guide star and will provide for best star position calculations.

Offset - This popup will allow you to set the offset of the Starfish camera. The offset setting controls the baseline or black level of the image from the camera. In general you should leave this control set to 10 which is the lowest available setting.

Image Filter - This popup allows you to specify some, post capture, image processing operations for the Starfish camera. These operations are applied to the image right after the picture is taken by the camera. You can specify one of four choices:

- **None** - No image processing is done. The raw image from the camera is what is captured.
- **3x3 Kernel** - This is a 3x3 kernel filter that will replace every pixel in the image with the average of the surrounding pixels in a 3 by 3 grid. Thus that name '3x3 Kernel'. This filter will tend to suppress any pixel outliers but will also tend to blur the image.
- **5x5 Kernel** - This is a more aggressive version of the 3x3 kernel filter. The operation is performed over a 5 by 5 grid of pixels.
- **Hot Pixel** - This filter will be best to use when you wish to map out all hot pixels on the image sensor. This is most beneficial when taking exposures of 1 second or more in duration since that is when the hot pixels will appear. The filter will map out a pixel if its intensity is 20% greater than the brightest surrounding neighbor pixel. Any hot pixel discovered will be replaced by the average of the neighboring pixels.

Debug Log - This popup allows you to enable or disable the logging feature of the camera's software. When enabled, the software will create a log file on your computer's disk drive that will contain a diary of all of the events being handled by the camera while it is being used.

The log file will be created in its default location:

C:\Program Files\fishcamp\starfish_log.txt

This file is a simple text file that can be viewed by the WordPad application. Each entry in the log will include a time-stamp along with some information about the event.

After you have completed setup of the camera, press the "OK" button in the dialog box.

Connect to the Camera

Next, you will need to tell MaxIm DL to connect to the camera so that you can start using it. You do this in the Camera Control window with the "Connect" button. Pressing the "Connect" button will initiate communication with the camera. This can take up to 10 seconds to complete since the computer will need to load software to the camera's on-board processor during the operation. After communication is established, the camera control window will show basic status of the camera in the view.

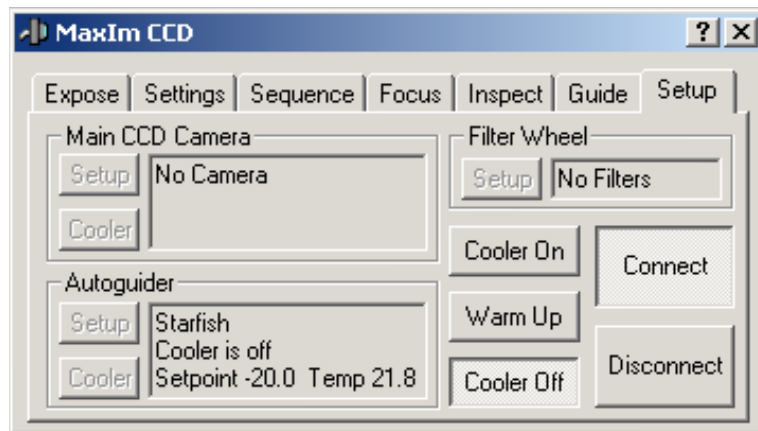


Figure 5. Camera control window showing Starfish camera status.

Next you will want to go to the Focus tab view and start taking pictures to allow you to adjust the focus of the camera. One thing I would recommend is to set the screen stretch in MaxIm DL to 'Range' for best visual display of the star field. MaxIm DL's default screen stretch is "Medium" which is a pretty aggressive screen stretch. This may be good for the high dynamic range image from your primary imaging camera but a better setting would be the "Range" setting for the Starfish camera.

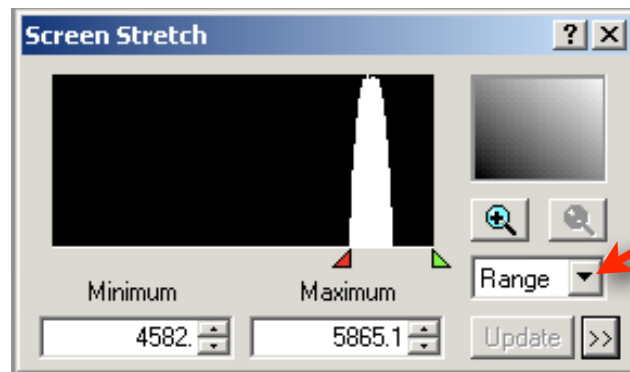


Figure 6 - MaxIm DL Screen Stretch window.

For additional information on operating MaxIm DL, please refer to the documentation that came with the software.

Change list:

- 1.00 - 1/15/07
 - Initial release

- 1.10 - 11/26/07
 - Bug fixes for problem with various USB chipsets.
 - Added debug log capability

- 1.20 - 12/3/07
 - Added Image processing options:
 - 3x3 kernel filter
 - 5x5 kernel filter
 - Hot Pixel filter

- 1.21 - 12/5/07
 - Bug fix to routine that looks for the camera firmware file

- 1.30 - 12/08/07
 - fixed software bug where the 'abort exposure' call wasn't being handled.