

# Supplement Manual

This is a supplement manual describing the new features of Autostar Envisage version 4.0. The First part of this manual describes the detailed usage of Drizzle as well as all other new features of the software. The Second part of this manual describes the new Drizzle feature, what it is, and the basic settings.

## Autostar Envisage V4.0

If you are a first time user you should read the basic manual located on the CD called "Meade Deep Sky Imager: The Basics".

Along with Drizzle there are other new features to the software. They are :

- Multiple Imager Operation. Envisage will now support any number of DSI's and one LPI. You can now use a separate guide scope and DSI as well as have one for prime focus and wide field. Any of the imagers can be selected for guiding. The only limitation is computer speed and memory. A 2Ghz machine with 512 Meg of memory can easily run 3 DSI's.
- Change Stretch on Completed Images. When an image is completed you can now alter the histogram stretch values and save them in the final image. Just pull down the file->save menu and the image will be saved in the current file time. You can also change the file type in Save Proc... and then save again in the new type.
- Image Files imager type. You can now rerun images through Drizzle or shift and combine by using the Image Files tab. simply use the Add button and browse to the files you want to use and select them in the order you want. Then click on the first file in the list and it will appear in the corresponding Image File tab like a live image from a camera. Draw a box around one or two stars if you want de-rotation and press the start button. The image will start building and automatically stop when all the file images have been processed. It is recommended that the file type FITS3P be used for the image files because you will get the full 16 bits from the DSI.

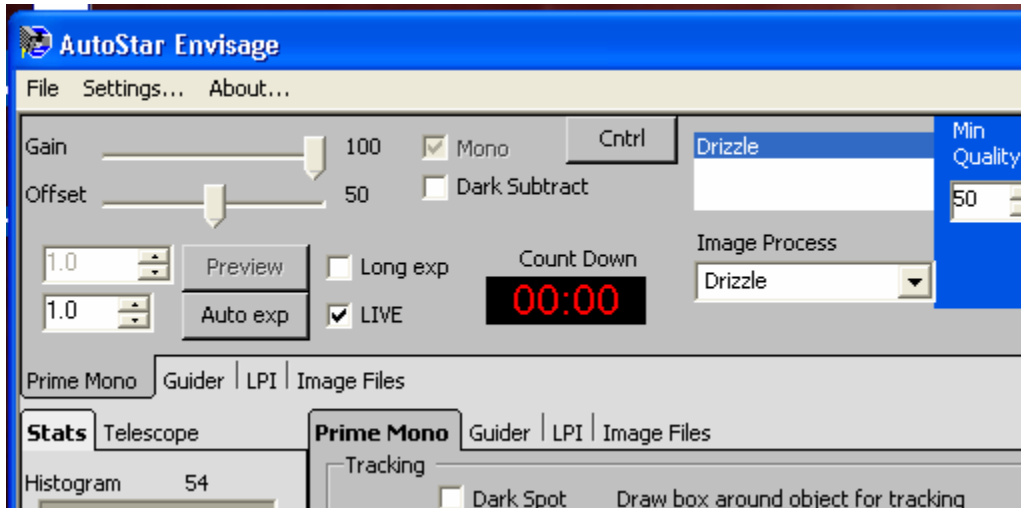
### Detailed Instructions

If you were running a previous version of the software it is recommended that you delete all your old dark frames. Do this with windows explorer, the default directory is C:\Meade Images\Darks.

### Imager Naming

The new software will prompt you to name your Deep Sky Imager the first time you run Envisage with the imager plugged in. Keep the name short and descriptive, this name will stay with that imager even on a different computer. The name is used to identify the imager when using multiple imagers. It is also used for dark frames. If you have more than one imager it is important to give a unique name to each of them. You can change the name in the "Cntl" dialog when using the Pro or the Color dialog when using the original Deep Sky Imager.

## Imager Tabs



There is now an imager tab for each imager connected to the computer. The tab name is the same as the imager name and when it is selected the corresponding live tab with the same name will be selected automatically. When a live tab is selected then the corresponding imager tab will be selected also. There is an extra imager tab called "Image Files" this is a virtual imager that can be loaded with files and then those images can be sent through the Drizzle process as though they came from the imager. This way you can re run the drizzle process with new settings for different results.

## Drizzle Tutorial

The following tutorial assumes that you have the imager on the telescope pointed at a Deep Sky object properly focused and that dark frames have been taken up to the longest desired exposure time.

### Recommended settings

**File Type -> FITS3P**

**Save Options -> Save All Uncombined Images**

The above settings are highly recommended. FITS3P will save the full dynamic range of the imager and "Save All..." will allow you to run the images back through drizzle offline allowing you to try different settings. These settings are found by pressing the Save Proc... button on the imager tab.

**Select "Drizzle" from the "Image Process" dropdown menu.**

**Enter a name in the Object Name box.**

**Set Min Quality and Evaluation Count as desired.**

**Press the Settings button see the Drizzle Resolutions section of this document for a description of these settings.**

These settings are not critical if you used the recommended settings above because you will be able to run the images back through drizzle off line.

### Start autotracking

Follow the directions in the manual on page 31 and set up your Meade Telescope for autotracking/Guiding. Be sure the Imager pull down in the Telescope tab is set to the imager you are using for drizzle. The imagers are identified by name.

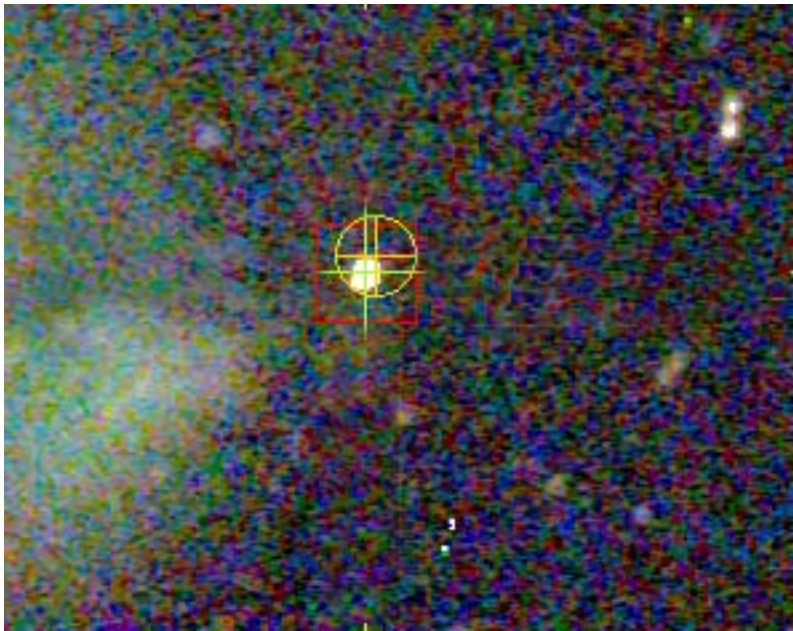
**Select 2 stars**

The first star selected will be the shift star this is the position that will be shifted for subsequent images. This is also the star that will be used for telescope tracking. The second star is to determine the rotation angle from the first star. It is important to pick stars that are close to the center. Keep the selection within the middle third of the image, this way the telescope control will have maximum shift space. The telescope control will not shift the selected stars out of the image. When you run the images off line you can select different stars. If your telescope is polar mounted and well aligned you can use a single star, this will give you the maximum field of view possible.

### **Press Start**

Envisage will create a new tab and put the drizzled image there. Be patient, depending on your drizzle settings and the speed of your computer it may take 20-30 seconds after the count down for the first image to appear. The image may be bigger than your screen, in this case scroll bars will appear on the right and bottom.

### **Telescope Tracking**



If you select the live image you will see your selected stars and a yellow circle with a cross. This is the target position. If your star was on the yellow cross when Start was pressed then the yellow cross will be in the upper right corner. Once the star reaches the first target position the yellow cross will move to the lower right corner. The target position will move to the next position each time the selected star reaches it. The next position is the lower left corner and the last position is the upper left corner. Once the star reaches the last position imaging will stop. But the telescope will continue to track on the last position. During imaging you can change the target position by pressing the "Set Target" button and then clicking on the desired target position on the live image.

### **Final Stretch**

Once the image is complete you can touch up the histogram stretch and shadow enhance settings and then save the final result by selecting File->Save from the menu.

## Offline Processing

A great new feature of Autostar Envisage 4.0 is the ability to run your images back through the Drizzle process. To do this bring up the program without the imager plugged in, this is in order to lighten the load on your computer. You will then see the "Image Files" tab on the top.

### Add images

Press the Add button in the Image Files tab on the top. The familiar Open dialog will appear. Navigate to the directory where the images are. Select the first image of the sequence and then scroll to the last image. Hold the shift key down and click on the last image. All the filenames from the first to the last should be selected. Now press Open. After a few seconds the files should appear in the "file name" list box.

### Select images

Select the first image in the list and after a few seconds it should appear in the live display. You can use the arrow keys and go up and down the list and the image will appear. Inspect each image and click on the Remove button to take the bad images out of the list. This will not delete the image from your hard drive.

### File Type -> (what ever you want your final image type to be)

This setting is up to you. The FITS file types will save the full dynamic range but the others are more user friendly.

### Save Options -> Normal

This is the only setting that is valid, the other settings are ignored.

### Select "Drizzle" from the "Image Process" dropdown menu.

### Enter a name in the Object Name box.

### Set Min Quality and Evaluation Count to 0 and 1 respectively.

With these settings every image will be used in the final composite image. This is acceptable because you have eliminated all the bad images in a prior step.

### Press the Settings button see the Drizzle Resolutions section and the sections following it for a description of these settings.

These settings can be experimented with each time you re-run the process.

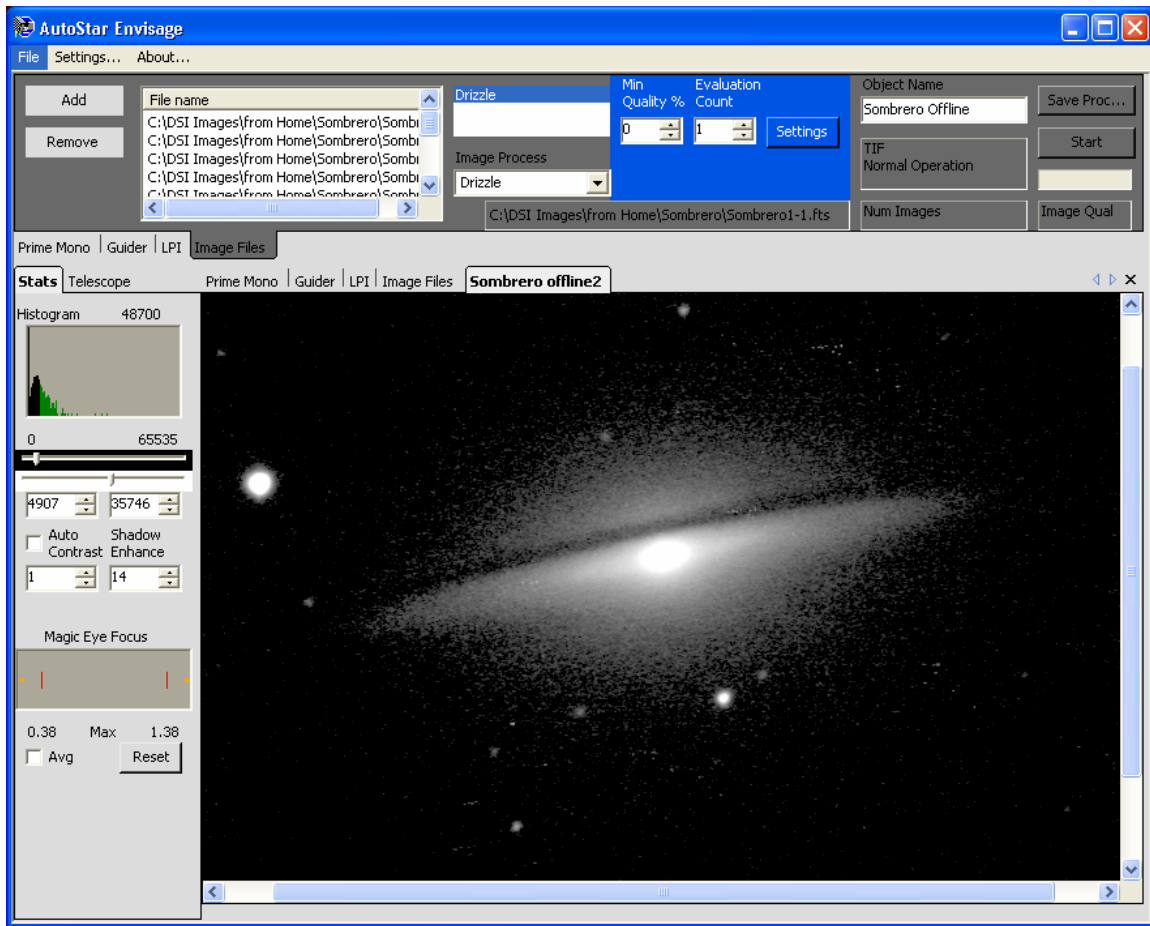
### Select 2 stars

Click on the first file and then select the tracking stars. They don't have to be the same ones selected when the images were taken. After the selection you can use the arrow down key to check the tracking of the 2 stars.

### Press Start

Envisage will create a new tab and put the drizzled image there. Be patient, depending on your drizzle settings and the speed of your computer it may take 20-30 seconds for the first image to appear. The image may be bigger than your screen, in this case scroll bars will appear on the right and bottom. The current file name is displayed in the status box below the drizzle settings. The system will stop when all the files have been processed.

## Final Stretch



Once the image is complete you can touch up the histogram stretch and shadow enhance settings and then save the final result by selecting File->Save from the menu. The file will always be saved to your default image directory. If you want to save in a different format then press the Save Proc... button and set the file type then select File->Save from the menu.

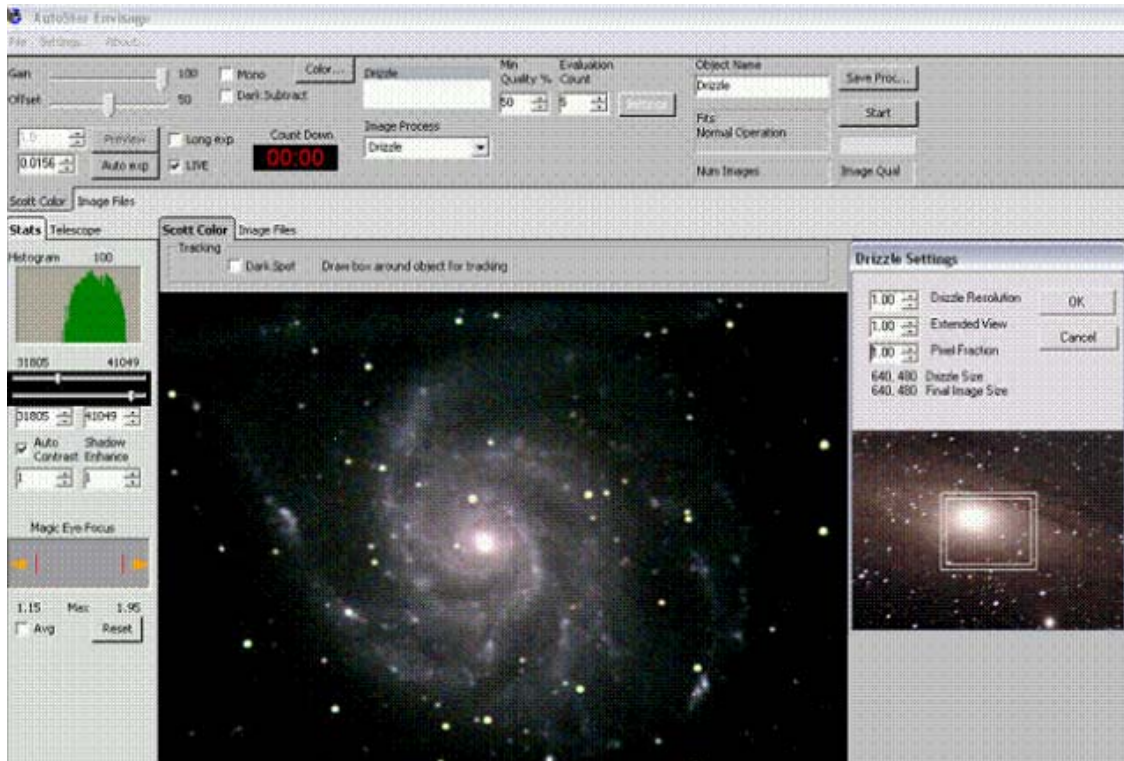
### Stretch any file

By selecting File->Open you can load any image file and perform a histogram stretch and shadow enhance(gamma) and then save the file in the currently selected file type by selecting File->Save. The file is always saved in the default image directory which is C:\Meade Images by default.

## Drizzle, Detailed Description

Developed by NASA for the Hubble Space Telescope, Drizzle has features that can dramatically increase the resolution and field of view of the Deep Sky Imager's CCD chip. When the object being imaged would normally call for a bigger chip camera, the astrophotographer can enable the Drizzle feature, which can produce an effective 4.9 mega pixel camera from the Deep Sky Imager's 640x480 CCD chip, but only with Meade AutoStar controlled telescopes. It may seem that we are exaggerating, so here are the numbers: If a user selects Drizzle and inputs the value of 2 in the Drizzle 'Extended View' setting (effectively making a 2x2 mosaic), and a value of 2 in the 'Drizzle Resolution' (which takes multiple undersampled dithered shots of the object and reconstructs the image at higher resolution), they will end up with a picture that is 2560 pixels by 1920 pixels or 4,915,200 pixels. The uncompressed RAM file (in FITS format) will be approximately 10 megabytes. Drizzle is not simply enlarging the image as in interpolation. We move the telescope which in turn moves the image across the CCD sensor to perform seamless precision mosaics.

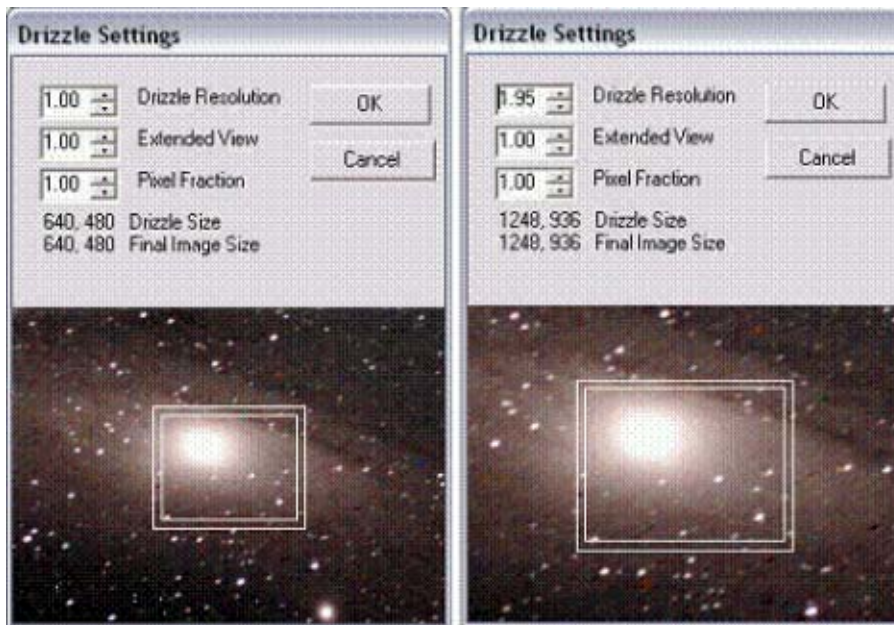
Below is a screen shot of Deep Sky Imager's image capture software called 'AutoStar Envisage' with the Drizzle Settings dialog box opened:



In the Drizzle Settings dialog box you have three options, 'Drizzle Resolution', 'Extended View', and 'Pixel Fraction'. Here is what happens as you change each setting:

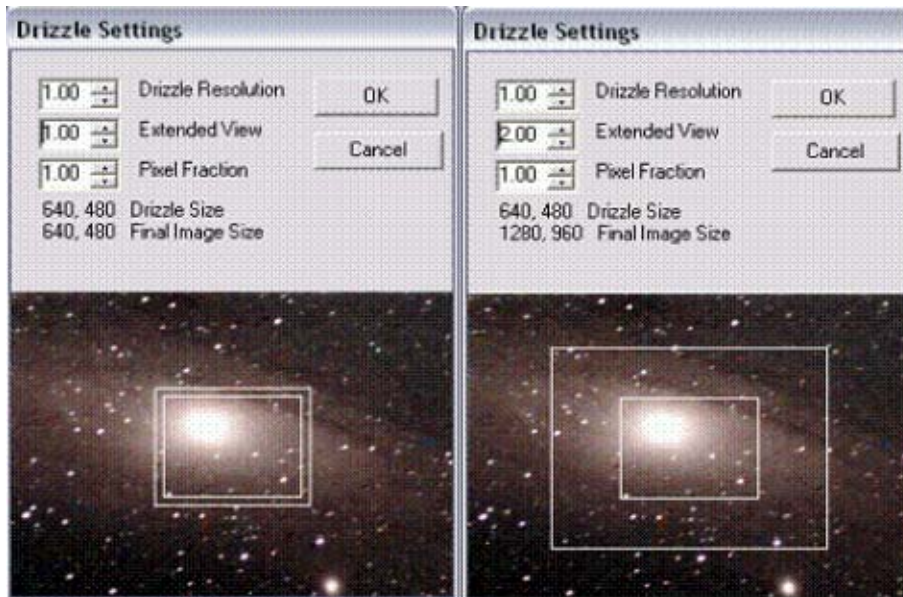


## Drizzle Resolution:



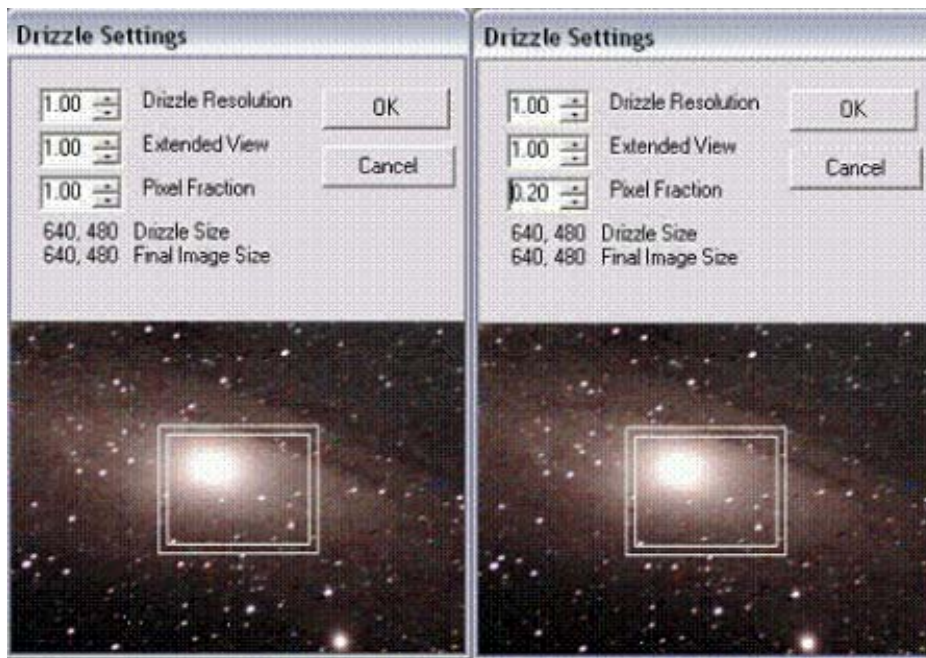
By increasing the Drizzle Resolution number (maximum value 2), the image resolution is higher creating bigger image scale. It looks like the image is simply enlarged, but in fact by taking multiple undersampled dithered shots of the object it reconstructs the image at higher resolution. Notice the Drizzle Size increase from 640x480 to 1248x936, and the final image size being 1248, 936. To accomplish this increase in resolution, we move the AutoStar controlled telescope a small amount and take an image, again and again reading out fractions of each pixel and then reconstructing the image.

## Extended View:

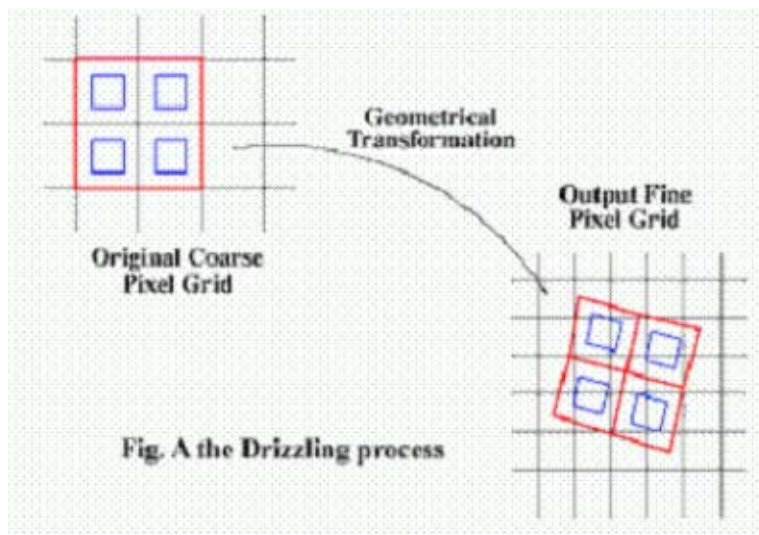


By increasing the value to a maximum of 2 (effectively making a 2x2 mosaic) Here we move the telescope in small precision movements, pause to take an image, and then repeating the action to make a seamless mosaic. This increases the true field of view of the image. Notice the outer frame has increased showing the effective field coverage and the file size has changed from 640, 480 to 1280, 960

## Pixel Fractions:

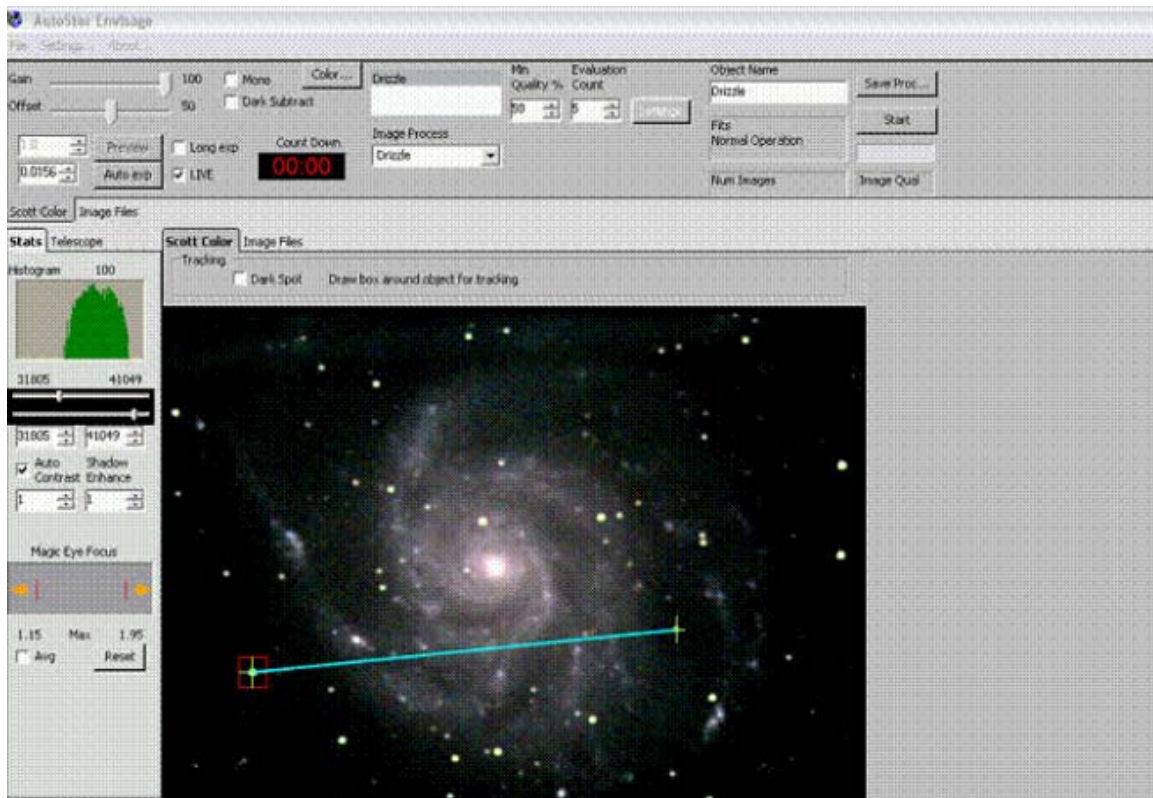


By adjusting the Pixel Fraction size to a value smaller than 1 (minimum setting is .20), it sets the size of the pixel fraction that is downloaded from each pixel as the exposure is made. Using a smaller pixel fraction will increase the image resolution. While the final image size does not change with finer settings, the final image will be sharper. See the diagram with the smaller blue pixel fraction within each single pixel outlined in red in the illustration below:





## Field De-Rotation:



Instead of just tracking and stacking images by following the movements of one star, the Deep Sky Imager's Envisage Software with Drizzle will track and stack images locked on two stars, and can correct for image rotation that occurs if the telescope is tracking in the Altazimuth configuration, or in a roughly polar aligned telescope. Using this feature, you can do a quick alignment of your Meade telescope in Altaz, turn on the Deep Sky Imager, select Drizzle, and draw a box around each of two stars in the field. The resulting image will not show rotational star trails.