Ten Things you Never Knew you Could Do with CCDOps

This web page shows you ten amazing things you can do with SBIG's CCDOps software that we bet you didn't even know about. CCDOps is constantly evolving to add new features and support new hardware and even we find it hard to keep up. We always appreciate your comments and suggestions and you would be surprised to find out how many make it in there. Keep up the good work and help us continue to make your CCD life easier.

Table of Contents:

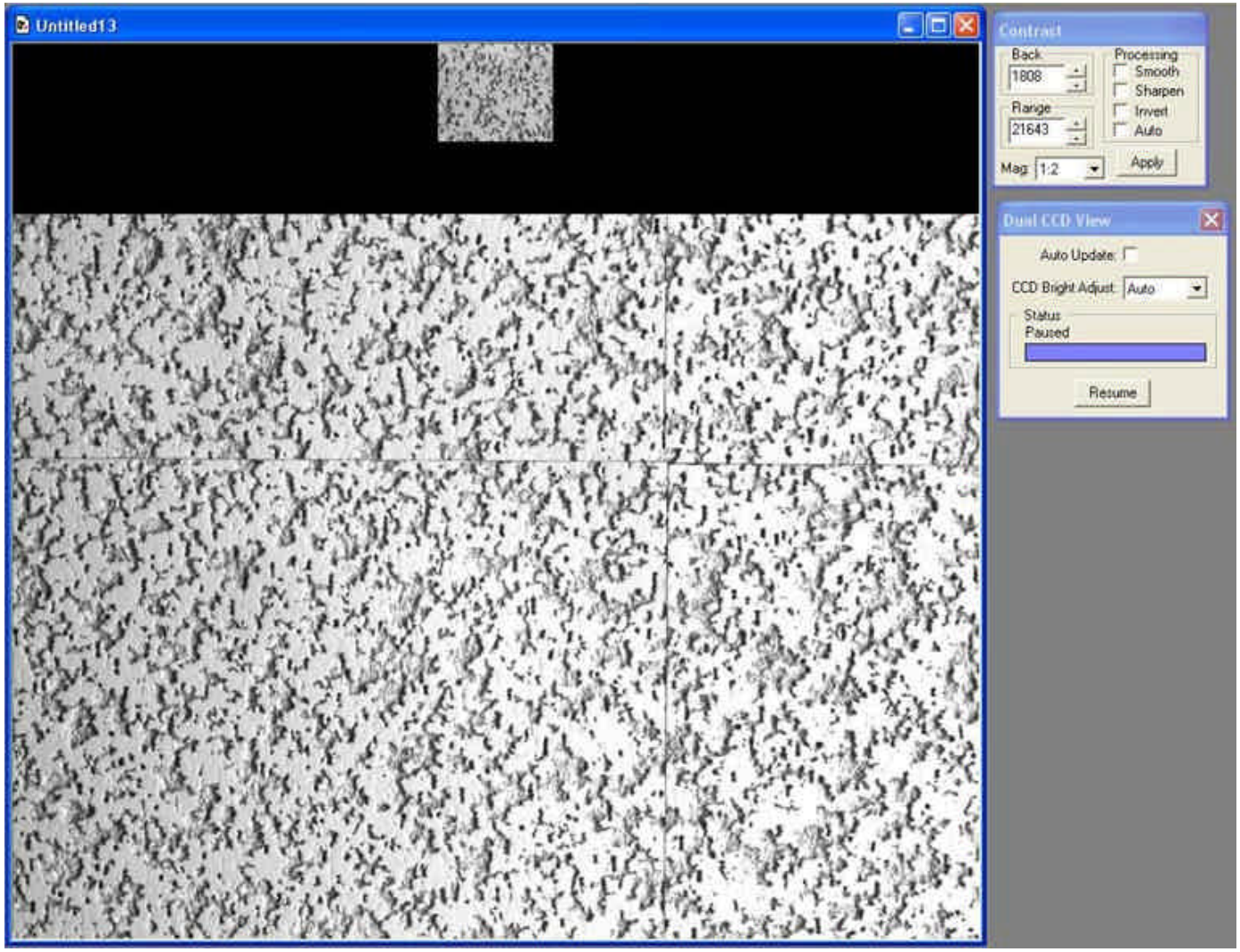
---

2. Dual CCD View

Back to Table of Contents

The Dual CCD View command from the Camera menu allows you to image with both Imaging and Tracking CCDs simultaneously. This is handy for framing the object of interest in the Imaging CCD while positioning the Guide Star on the Tracking CCD.

The screen capture below shows the Dual CCD View image with the Tracking CCD above the Imaging CCD. While the relative positions of the two images are correct there can be a magnification difference between them owing to the relative pixel sizes of the two CCDs.



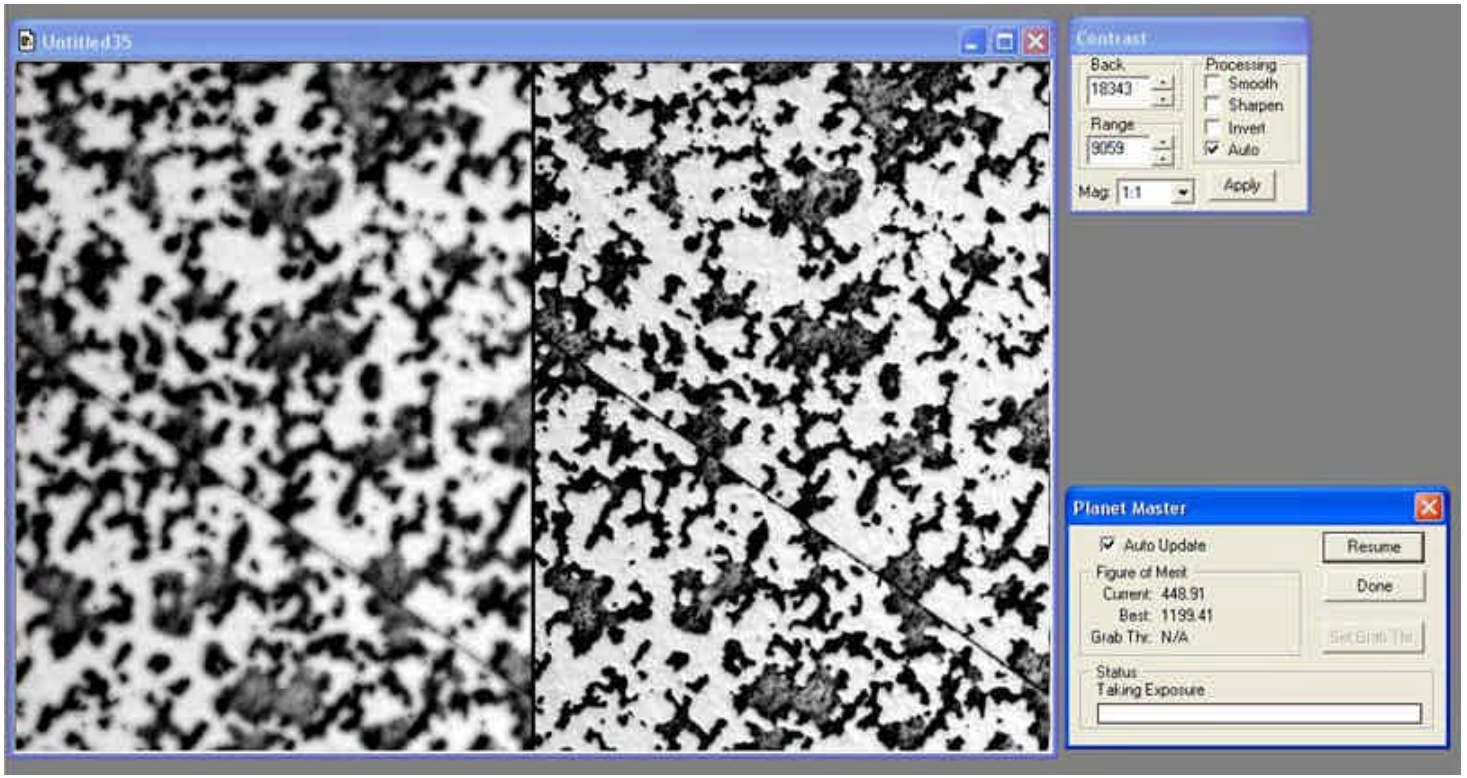
3. **Planet Master**

Back to Table of Contents

The **Planet Master** command in the **Camera** menu is the best thing since sliced bread for capturing images of Planets! **Planet Master** takes a sequence of images and grades each one with a **Figure of Merit (FOM)** related to the sharpness of the image. It then retains the image with the highest Figure of Merit.

The screen capture below shows what **Planet Master** looks like. The left half of the image shows the central portion of the current image in the sequence and the right half shows the central portion of the sharpest image. The **Planet Master** dialog to the right shows the **FOM** for both halves.

When you exit the command the image reverts to the full frame sharpest image. With **Planet Master** you also have the option of using a **Grab Threshold** where all images in the sequence above a specified **FOM** are saved to disk. This makes it very easy to capture a sequences of sharp images.



Click Here for further information on the Planet Master mode.

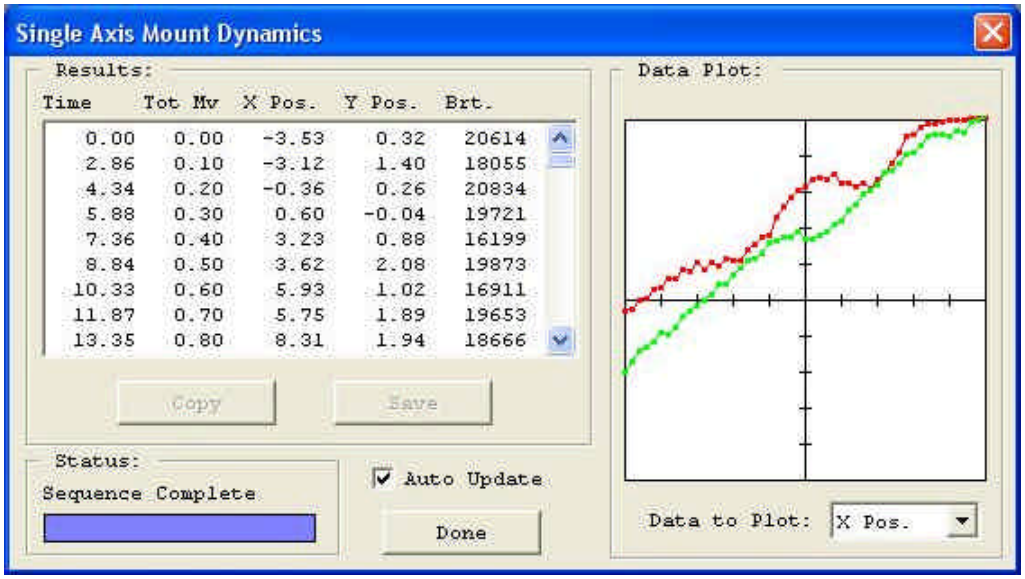
4. Single Axis Mount Dynamics

Back to Table of Contents

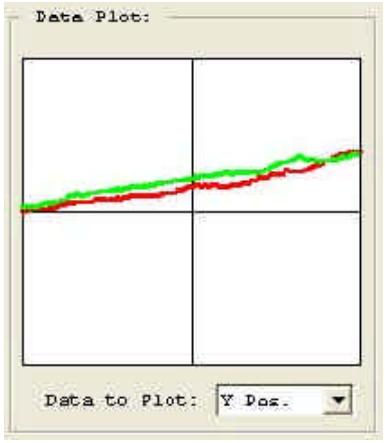
The **Single Axis Mount Dynamics** command in the Track menu allows you to measure the performance of your mount by measuring the **position of a star** after moving the mount forwards and backwards several times using the **Relays**. This will show you if your mount has backlash or takes uneven steps which can be invaluable for solving tracking problems.

To use the command orient your camera such that the long axis of the CCD is aligned with RA moves then focus and center an isolated, relatively bright star on the CCD (either CCD will work). Next invoke the Single Axis Mount Dynamics command and enter the Exposure time, duration of each relay move, total number of moves and then select which relays to activate.

While the command is acquiring data you'll be shown the dialog below. The data plot shows the telescope's actual position (vertical axis) vs. the relay commanded position (horizontal axis). The Green data is when the telescope is moving out and the Red data is for the telescope moving back.



For an absolutely perfect mount with perfect seeing you would see the Green and Red data superimposed upon each other with the plot angling up (or down). A typical mount's results are shown below:



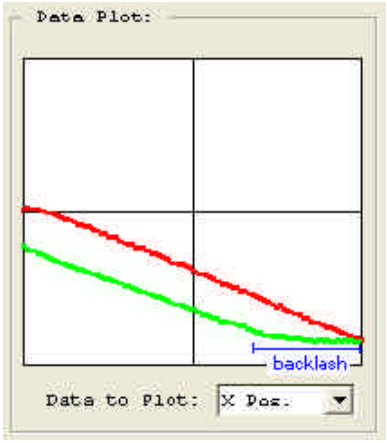
Other effects are described in the table below:

- **Seeing**

  As seen above, seeing causes the individual data points to deviate by a small amount from a straight line up or down as the seeing moves the star position.

- **Backlash**

  Causes the lines to assume an S-Shape with a vertical separation between the Read and Green data as the telescope doesn't move for the first few moves after the turn around as shown below:



- **Periodic Error**

  This tends to look like a sine wave superimposed on the otherwise linear data.

- **Jumpy Mount or Stiction**

  Causes discontinuities in the data as the mount moves much more than it should. This can be difficult to distinguish from seeing but will tend to cause a more jagged data plot.

5. Track and Accumulate with Single Shot Color Cameras

Back to Table of Contents

You didn't used to be able to do this and many people don't realize that **now you can** use SBIG's patented **Track and Accumulate** with Single Shot Color (SSC) cameras like the **ST-2000XCM**. **CCDOps** has been updated to recognize SSC cameras and Track and Accumulate will then make sure it co-aligns images correctly, taking into account the Bayer Color Filter Matrix applied to these cameras.

Nothing could be easier.

6. Filter Routines Specific to Single Shot Color Images

Back to Table of Contents

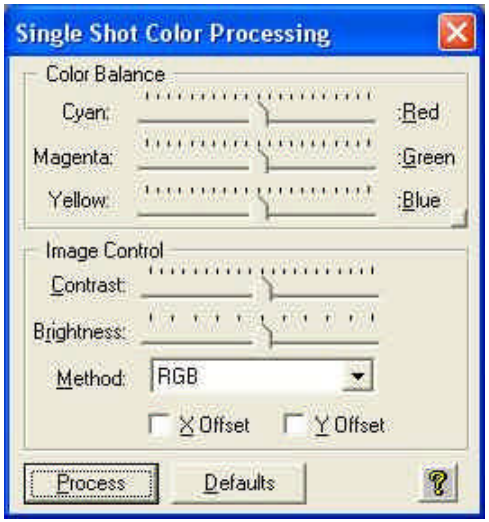
The raw images (monochrome, prior to conversion to color) from **Single Shot Color** cameras like the **ST-2000XCM** require special handling when it comes to filtering the images so that you don't co-mingle the color data in the filtering process. **CCDOps** has enhanced filtering routines in the **Smooth**, **Sharpen**, **Column/Row Repair**, **Kill Warm Pixels** and **Remove Cool Pixels** commands from the Filter sub-menu of the Utility menu.

As shown in the dialog below, these commands allow you to check a **Single Shot Color Image** checkbox that applies those enhancements to Single Shot Color images.

7. Easy Processing of Single Shot Color Images

Back to Table of Contents

Single Shot Color (SSC) cameras like the **ST-2000XCM** produce raw images that CCDOps displays as monochrome until they are color processed. The **Color Process** command in the Single Shot Color sub-menu of the Utility menu convents these raw images into color as shown in the dialog below:



Color processing of SSC images is easy. Start by clicking the **Defaults** button and selecting **RGB** for the **Method**. Tweak the image as described below:

- **Color Balance**

  Minor color corrections are achieved by the **Color Balance Sliders** at the top of the dialog. To make the image more Red (or less Cyan) move the top slider towards Red then hit the **Process** button. If there's a star or an area of the image you know is White you can **White Balance** on it by positioning the **Crosshair** over that area then right-click the mouse and select **Set White Balance**.

- **Brightness and Contrast**

  Use the Brightness and Contrast sliders to adjust the image and then hit the Process button to see the results.

- **Enhancements**

  Images of galaxies tend to have a lot of dynamic range and you may find it difficult to reveal the faint details in the

arms without causing the core to saturate. Try selecting the DDP method and hit the Process button. DDP compresses the dynamic range of the image. This may not look natural on all images but don't be afraid to try it.

An example is shown below. Move the mouse outside the image to see the RGB version then move the mouse onto the image to see the DDP version.

8. Easy RGB Color Processing

Back to Table of Contents

Processing RGB images involves the following steps:

0. Co-aligning the images
1. Normalizing the Sky Background
2. Setting the White Balance

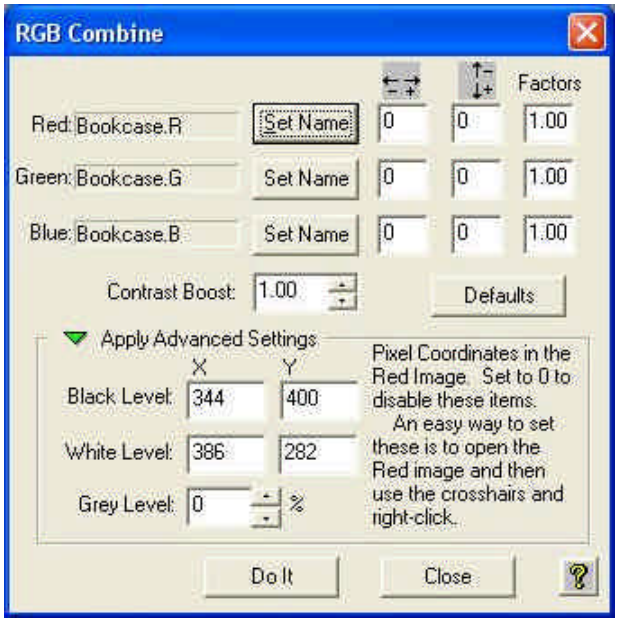
CCDOps makes this relatively easy. Here's a step-by-step procedure for quick and easy RGB Processing:

Co-align the images - Open the **Red**, **Green** and **Blue** images and then open the **Crosshairs**. Visually identify a common star or feature in the images to serve as an **alignment reference**. Starting with the **Red** image, position the Crosshair on the reference position, using the peak pixel brightness on a star for example, then right-click the mouse. Select the **Set RGB Red Position** item to mark the reference position. Do the same in the **Green** and **Blue** images, selecting the **Set RGB Green Position** and **Set RGB Blue Position** respectively. This tells CCDOps how it will co-align the images.

Normalize the Sky Background - Normalizing the Sky Background means making sure it comes out a neutral grey in the final image, not having a subtle color tint. Bring the **Red** image to the foreground and then position the Crosshair on an area of the image that represents the Sky Background, free of any stars or faint nebulosity. Right-click the mouse and select the **Set RGB Black Level**. This tells CCDOps how to normalize the sky background.

Set the White Balance - Again, bring the **Red** image to the foreground and then position the Crosshair over a star or area of the image that you feel represents the White Balance. If you get it wrong it's easy to adjust so don't worry about it. Once the Crosshair is positioned, right-click and select the **Set RGB White Level**. This tells CCDOps two things: how to set the color balance and how to set the contrast of the RGB image such that the star you identified comes out white (neutral color) and just saturates in the RGB image.

Now that the hard work is done you can close the Red, Green and Blue images and then invoke the **RGB Combine** command in the Utility menu. You'll be shown the dialog below. If the Advanced Setting section is not visible, click the green triangle to reveal it.



To finish the color processing do the following:

3. Identify the images

   Click the **Set Name** button to the right of the **Red** and navigate through your folders on your hard drive to find the **Red image**. **Double-click** the Red Image or select it and hit **Open**. If you used **CCDOps** to acquire the images they will be named **XXXX.r**, **XXXX.g** and **XXXX.b** and at this point CCDOps will fill in the names of the **Green** and **Blue** images for you. If not then click the **Set Name** button to the right of the **Green** and **Blue** and identify those images.

4. Initial RGB image

   Click the **DoIt** button to see the results of merging the Red, Green and Blue images into a single RGB image.

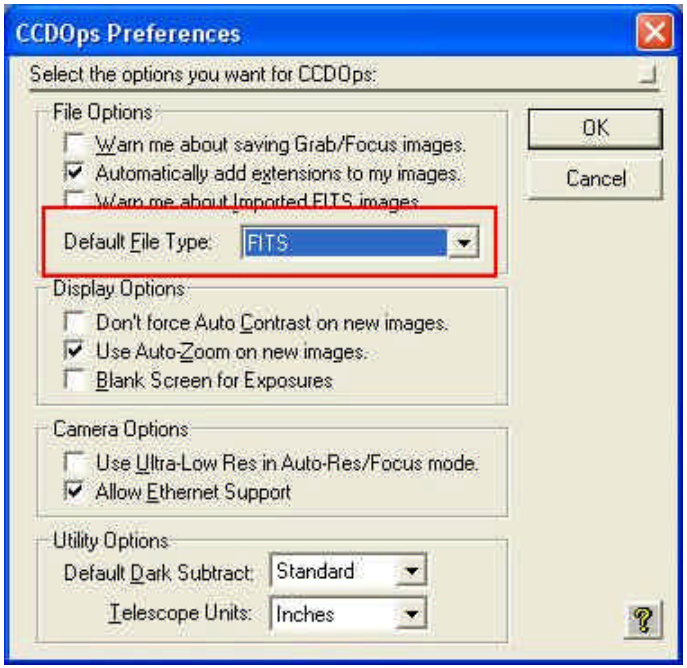
5. Tweak the parameters

- **Co-alignment** - Modify the Horizontal and Vertical adjustments edit fields to the right of each image to tweak the co-alignment. The easiest way to do this is to look at the outer fringes of stars my zooming in on the RGB image. If the stars have a Red tint to the right then you would reduce the Red Horizontal item by 1. After each adjustment hit the **Do It** button to see the results.
- **Color Balance** - Raise or lower the **Factors** column to adjust the Color Balance. For example, to make the image redder, raise the Red factor. Hit the **Do It** button to see the results.
- **Brightness and Contrast** - Raise or lower **Grey Level** item to adjust the Brightness and raise or lower the **Contrast Boost** item to adjust the image contrast. Hit the **Do It** button to see the results.

9. Save Images in FITS Format by Default

Back to Table of Contents

CCDOps allows you to save images in many formats including the high quality **16-bit SBIG Compressed**, **SBIG Uncompressed** and **FITS** formats. Using the **Preferences** command in the Edit menu you can set **CCDOps** to save images in the **FITS** format (or others) by default. This is shown in the **Preferences Dialog** below:

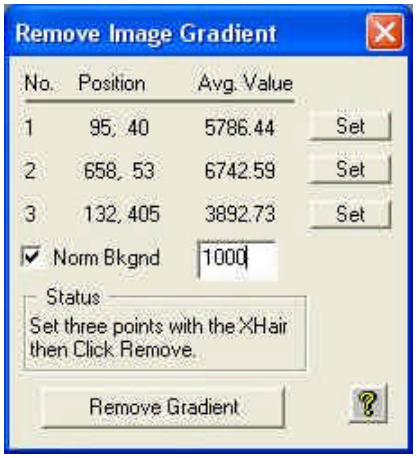


10. Remove Image Gradients

Back to Table of Contents

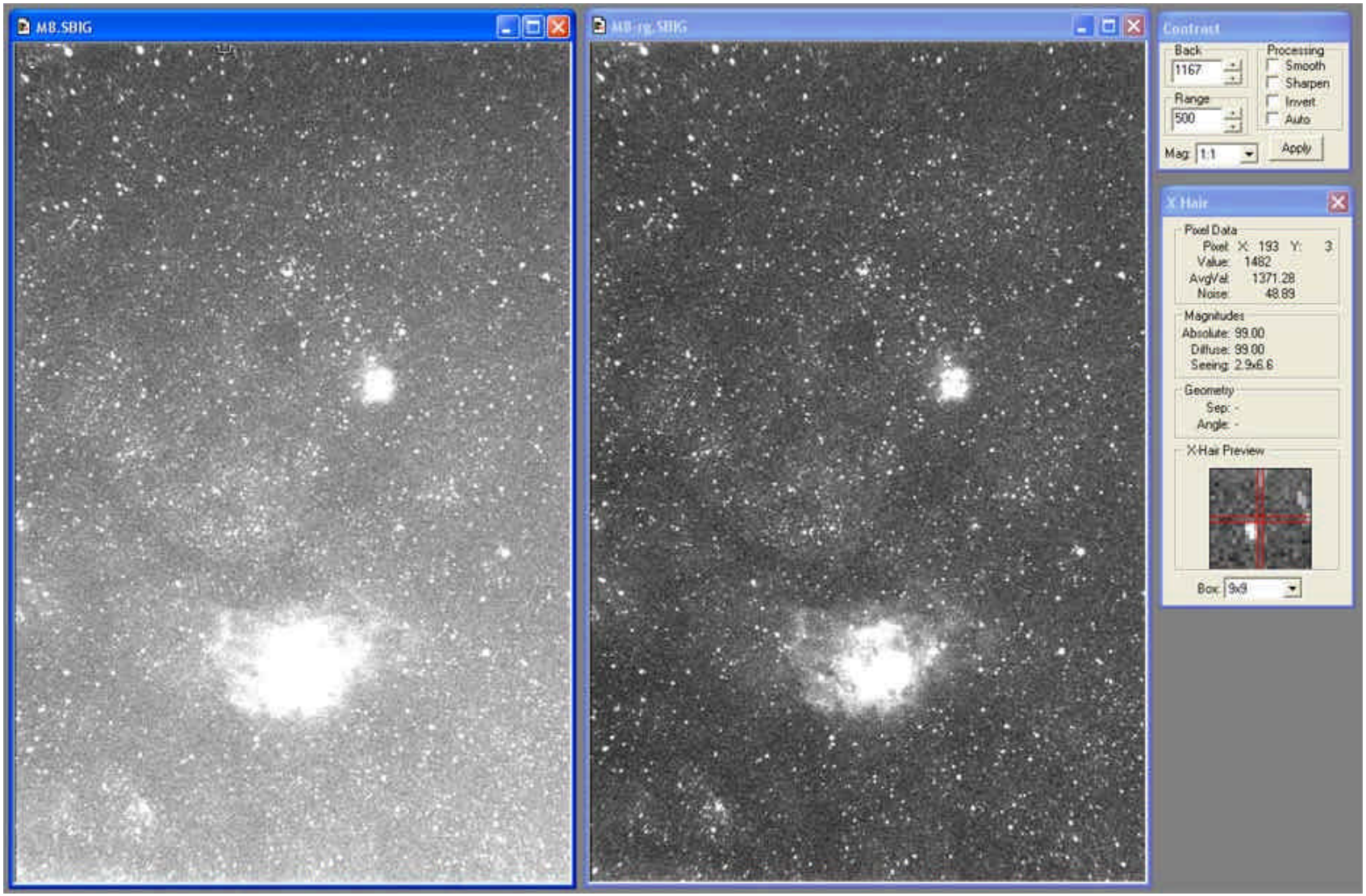
Image Gradients in wide field images due to varying sky brightness can drive you crazy! Especially when you really want to push the contrast to reveal dim nebulosity. **CCDOps** makes it easy to remove them using the **Remove Image Gradients** command in the Pixel Utilities sub-menu of the Utility menu.

After invoking the command the **Crosshairs** open up and you are shown the dialog below:



Using the **Crosshairs**, select **three points** in the image that represent the **Sky Background** level in three of the four corners of the image. After positioning and sizing the **Crosshair** to only include Sky Background **right-click** the mouse and select Point 1, 2 or 3 or click the **Set** button in the dialog. With the three points set, optionally click the **Norm Bkgnd** checkbox and enter a Background value. Doing this makes the **Sky Background** match the entered value (in ADUs) which can make it easier to patch together a **Mosaic of Images**. Finally click the **Remove Gradient** button to process the image.

The screen capture below shows what can be done on a typical image. The image on the left is from an ST-7 with a Wide Angle lens showing quite a bit of image gradient from top to bottom. The image on the right is after applying the **Remove Image Gradient** command. Both images are displayed with the same **Back** and **Range** settings in the **Contrast Dialog**.

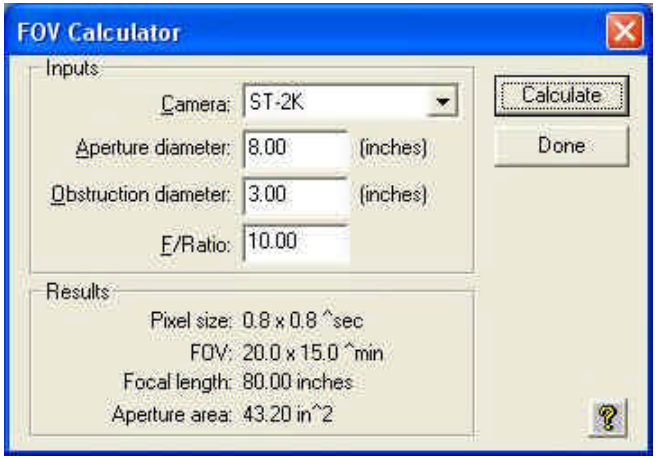


11. Calculate Field of View

Back to Table of Contents

Ever wonder what the **Field of View (FOV)** of your SBIG camera is on your telescope? Wonder no longer. Use the **FOV Calculator** command in the Misc menu. Select the type of SBIG camera you're using and enter your telescope's Aperture and F/Ratio then click the Calculate button.

The Pixel Size and CCD's Field of View are calculated and displayed as shown below:



Revised: November 18, 2004 at 2:27 pm
(c) 2004 - Santa Barbara Instrument Group