

Addendum: Single-shot color imaging with CCDOPS:

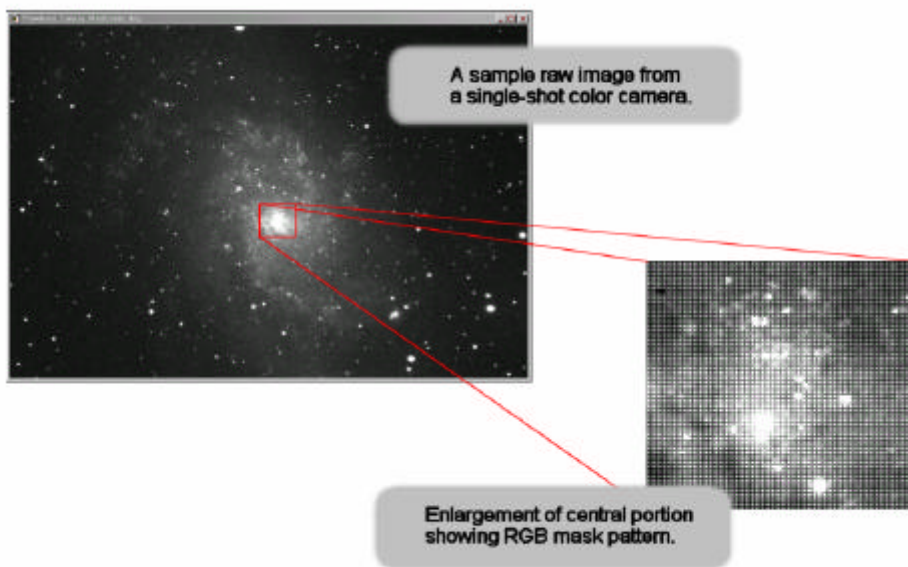
1. Acquiring images:

Congratulations on the purchase of your new SBIG single-shot color CCD camera! For the most part, your new color camera behaves like any other self-guiding SBIG camera. We recommend that you read the instruction manual that comes with your camera to learn how to connect your camera to a computer and take self-guided CCD images. Once you've read over that information, these instructions will help you use the new single-shot color features in CCDOPS to process your images.

Note: Single-shot color cameras cannot be used in Track & Accumulate mode. Care must also be taken when manually co-adding images to preserve the color data - do not use the X and Y offset functions in the Co-Add dialog box. See Section 3 for more details on why these functions will not work.

2. The raw single-shot color image:

The first thing you notice about the raw images from your single-shot color camera is that they are not in color! This is normal - the color data is being displayed as greyscale values in a raw single-shot color image:



You might also notice a grid or "screen door" pattern covering the raw image as well. This effect is also normal, and is caused by the RGB color mask that is covering the CCD. Make sure to save a copy of your raw images. If you make any mistakes or want to re-process the image later on, you will always want to have the raw image available to start over.

Note: Note that any adjustments made using the controls in the “Contrast” dialog box ONLY affect how image data is being displayed on screen – you are not making any permanent changes to your raw images.

You can perform the CCDOPS Dark Subtract, Flat Field, Flip, Rotate and Crop functions on single-shot color images, but do not use any of the other Utility menu functions. These can make changes to the raw image that will affect the final color balance.

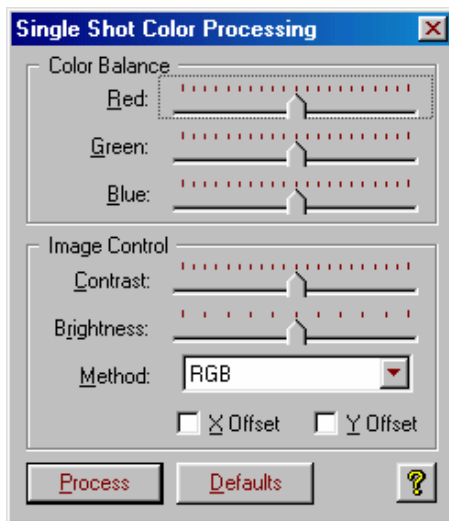
Tip: CCDOPS will display a warning message if you try to perform any processing steps that might affect the integrity of the color data.

If you are using any other CCD camera control software to acquire your single-shot color images, make sure to save them in either SBIG or FITS file format. You should not crop, resize, or flip the image (using 3rd party software) before importing it into CCDOPS for one-shot color processing.

3. Using the CCDOPS Single-shot color menu:

(If you want follow along with this example, a copy of the M33 raw image is available on the SBIG software CD-ROM in the Images folder.)

Open a raw single-shot color image in CCDOPS and select Utility → Single Shot Color → Color Process. This will open the Single Shot Color Processing dialog box:



For your first image, just click on the “Defaults” key (to center all the sliders) and select the “RBG” combine method from the drop-down menu. Click on “Process.” Now a full-color image will finally appear!

Experiment using the sliders to adjust the color balance, brightness and contrast. Each time you click on “Process” the image will update and display your changes.

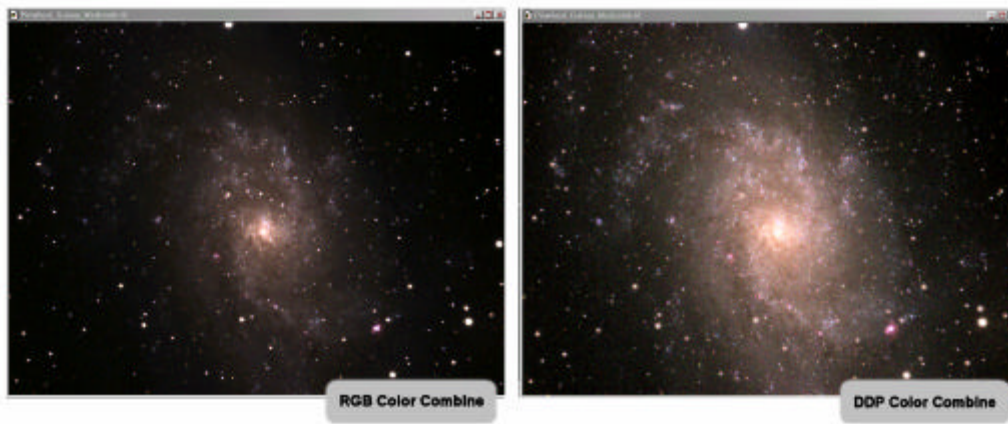
Tip: While in the Single Shot Color Processing dialog box, click on any slider, then use the keyboard right and left arrow keys to make fine adjustments.

The two single-shot color combination methods available are:

RGB: Standard three channel (R, G, B) color combination.

DDP: Applies a DDP filter to each channel (R, G, B) before combination.

Tip: Many galaxy and nebula images will benefit from the automatic DDP (Digital development) processing.



Because a single-shot color camera uses a color mask placed directly over the CCD surface, the software expects certain pixels to match up to specific color positions on the mask. If the image has been cropped or rotated (outside of CCDOPS) the software will no longer be able to associate the pixels with the correct red, green or blue values. During processing, this can cause an unusual color shift to appear.

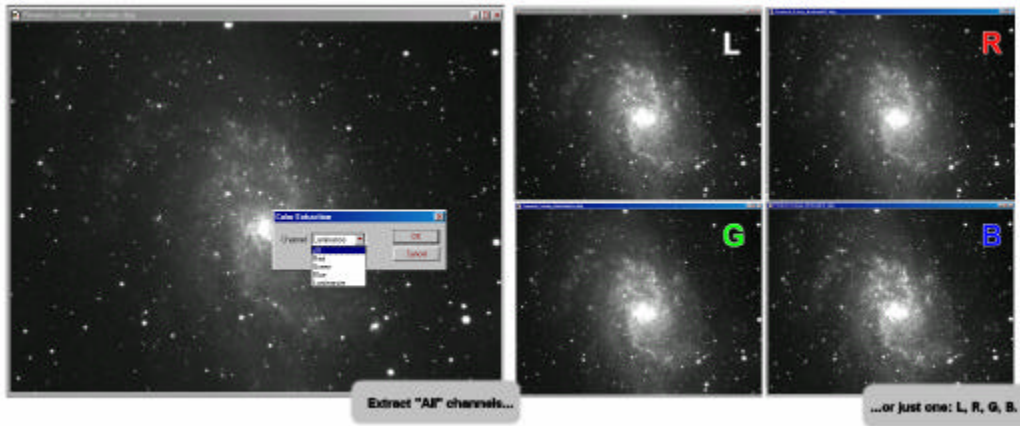
If this problem does occur, the X and Y offset boxes located in the Single Shot Color Processing dialog box can correct the misalignment. Try selecting one checkbox (X or Y) at a time, then click on “Process” until the color balance looks normal.

Note: This situation is most likely to occur if the raw image has been cropped or rotated before CCDOPS is used for color combination. This alignment problem is also the reason why precise registration of manually co-added images is so critical, and why Track & Accumulate imaging will not work with single-shot color cameras.

You can save the final color image as a TIFF file at any time by selecting File → Save As. Note that once the image is saved as a TIFF you won't be able to process it any further with CCDOPS. (You will still be able to open and view the image, however.)

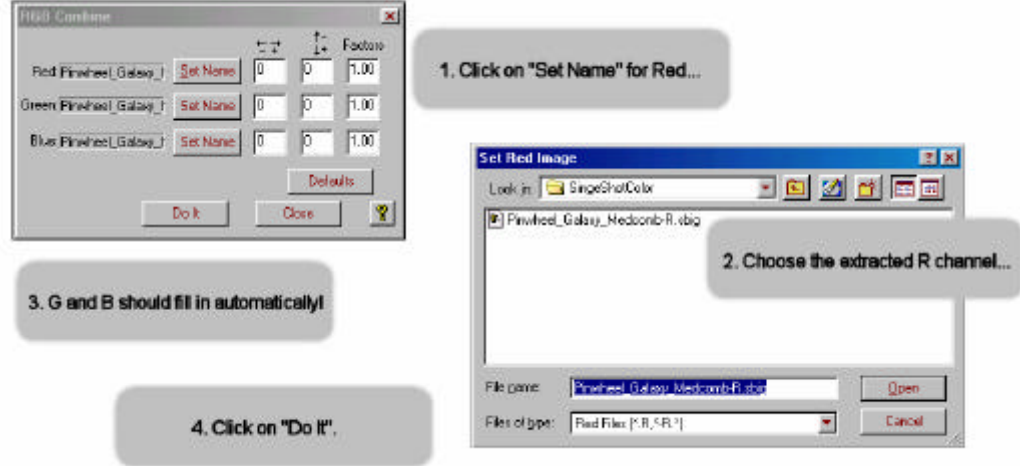
4. Advanced single-shot color processing:

Advanced users may desire additional control over the color processing steps. CCDOPS also offers you the option to extract individual color channels from the raw frame. With the raw frame open, select Utility → Single Shot Color → Extract Color Channel(s). The Color Extraction dialog box will open and give you the option to extract any (or all) of the individual color channels (Red, Green, Blue) and a synthesized Luminance (greyscale) channel:



Note: The individual color channels are extracted at full resolution by interpolating the data from the neighboring pixels.

Once the individual color channel images are saved to disk, you can combine them using any image processing software. An example using the standard CCDOPS “RGB Combine” (Utility → RGB Combine) feature is illustrated below:



The RGB Combine dialog box will still remain open after the color image is displayed, allowing you to adjust the color balance of the final image. Each time you click on “Do It” the image will update and display your changes.

Select File → Save As to save the final color image as a TIFF file.

If you have any problems or questions about your new camera, please don't hesitate to call or e-mail us. We hope that you enjoy single-shot color imaging!