User's Manual

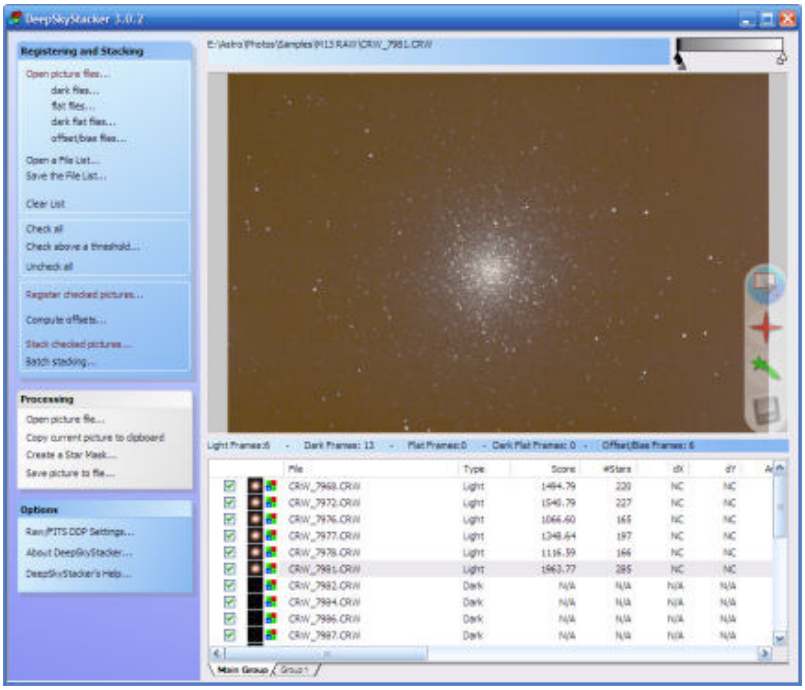
The command line User's Manual is available here

Introduction
Quick Start
Registering and Stacking Tab
Batch Stacking
Processing Tab
Create a Star Mask
The Picture List
Picture Preview (Stars and Comet editing)
RAW and FITS DDP Settings

Introduction

The purpose of this short manual is to explain the features and principles of DeepSkyStacker..

The user interface of DeepSkyStacker is quite simple and intuitive and all the main features and commands are readily available.



The user interface is divided into two areas:
To the left a set of tabs gives access to all the commands and features.
To the right a screen depending of the current tab that is used to configure and view.

To change the current tab you can click anywhere in the tab.

> If you are a beginner in astrophotography and you are wondering what are light, dark, flat and bias frames and how to create them you have a short explanation here.

Quick Start

You are just out of a busy night and you just have downloaded all your pictures (lights, darks, offsets and flats) to your PC.

The first step is to add all the pictures (accordingly to their type) to the list.
To do this you use the commands of the left area:
- add picture files
- add dark files
- add flat files
- add offset/bias files

Then you just launch the registering process, you check the "Stack after registering" box after entering the percentage of pictures that you wish to keep for the stacking process after the registering process.

If you are using raw files (which is highly recommended), you just check the Raw DDP settings and you start the registering process.
You can now go to sleep knowing that after a good night you will view the first results in the processing tab.
Note that even if your PC crashes after the stacking process, the result is automatically saved in a special file: AutoSave.tif.

Registering and Stacking Tab

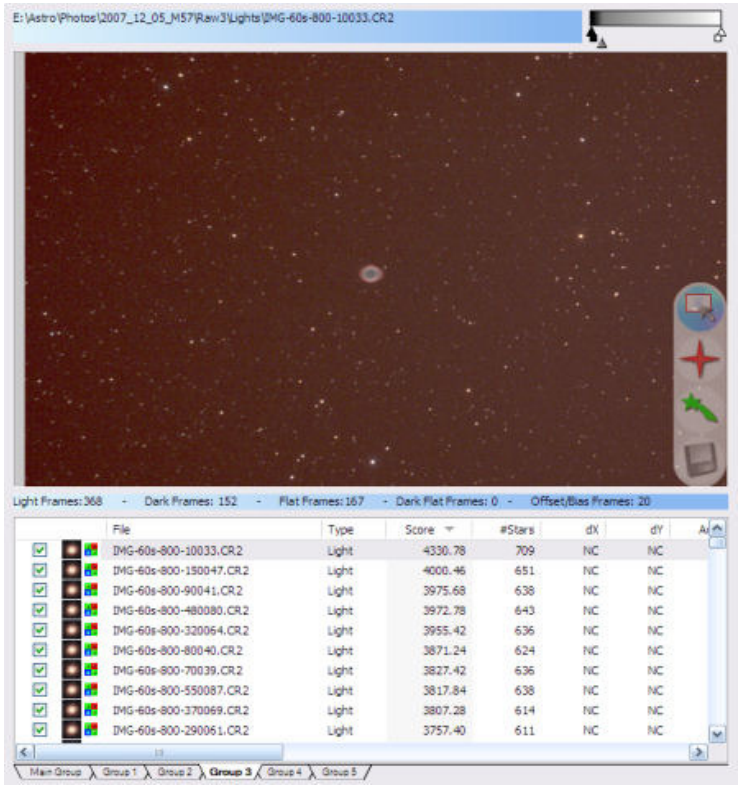
The Registering and Stacking Tab contains all the commands and features pertaining to the registering and stacking processes.

From this tab, you can add frame of each type (light, dark, flat and offset/bias) to the list, save and restore File Lists, preview images and start the

registering or stacking process

It is possible to add files to the list by simply dragging & dropping them from the file explorer.

The files type will then be asked before the files are added to the list.



The right area contains the Pictures List and the Picture Preview.

On the bottom of the picture list a line of tabs gives access to each file group. If you click on one group tab the files of the group are shown in the list.
To know more about the file groups you can consult the technical details here.

To the top and the right a slider may be use to change the gamma of the previewed image which may be useful to view faint objects.
Of course no modification is made to the real image as it is only a previewing trick.

It is possible to automatically launch the stacking process after the registering process by giving the percentage of light frames that will be kept. The best pictures, based on the score computed by the registering process, will then be stacked.

The "Compute offsets" feature may be used to compute the offsets and rotation angles between the pictures without starting the stacking process. Once computed the dX, dY and angle columns of the pictures list are populated with the computed offsets and rotation angles.
Note: it is not necessary to compute the offsets manually prior to the stacking process since the offsets and rotation angles are automatically computed just before the stacking process anyway.

The "Check above a threshold..." may be used to check all the pictures for which the score is greater than or equal to the given threshold value.

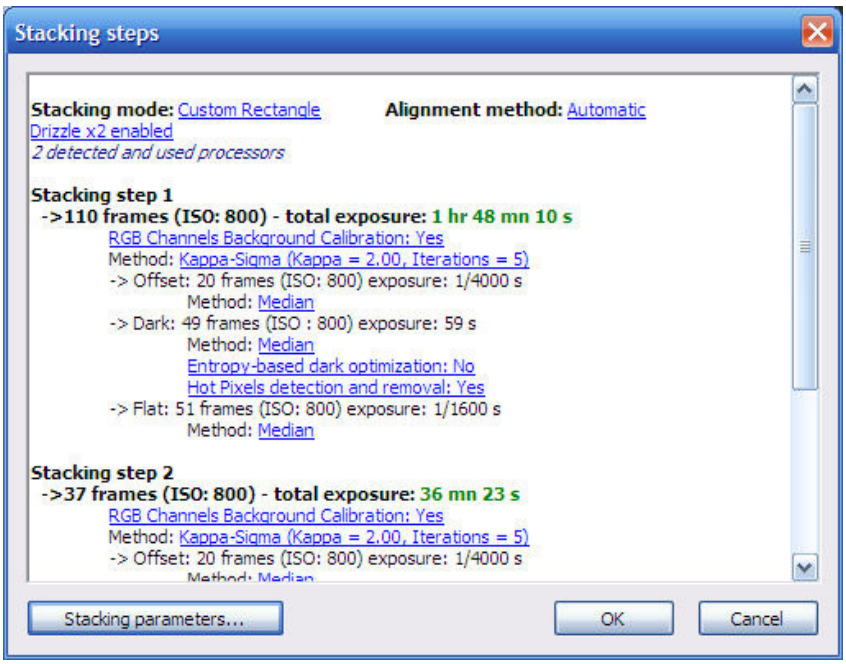
Before the stacking process a screen recapitulates the different steps.

It is important to know that the light frames will be automatically associated with their dark frames using ISO speed and exposure time.
Flat frames and Offset/Bias frames will be automatically associated regarding only the ISO speed.

In each case the best matching frames will be proposed and a warning will be issued if ISO speed and/or exposure time are not matching.

It is possible to temporarily "force" the ISO speed and exposure time by using the context menu of the files.

From this dialog you can also change the stacking methods for each type of picture by clicking directly on the link or on the "Stacking Parameters" button.

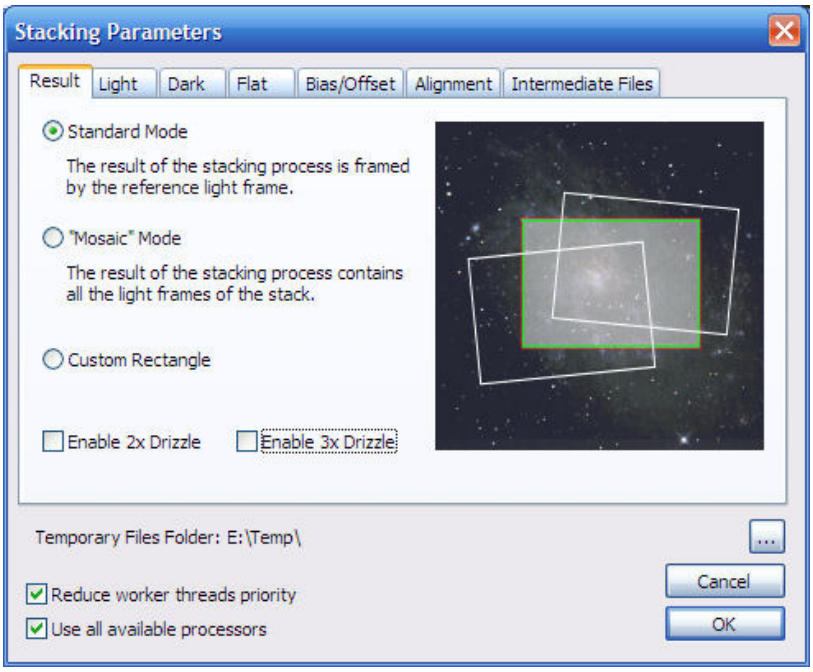


A new dialog is then opened, from which you can modify the folder into which are created the temporary files needed by the stacking process and all the settings controlling the stacking process.

The first tab is used to set the stacking mode among which the possibility to use a Custom Rectangle.

You should note that in all modes the offsets are computed from the reference frame, so it's not a true mosaic mode but a pseudo mosaic.

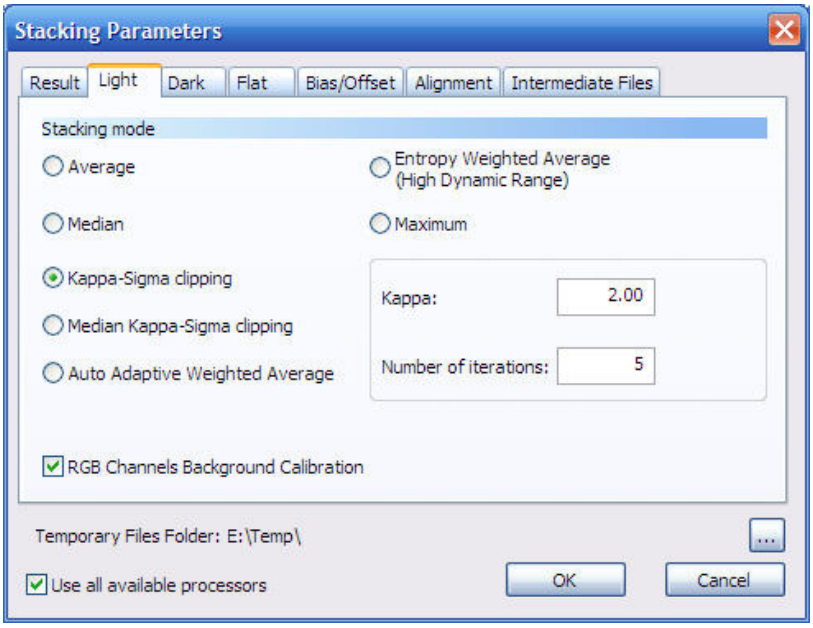
This is also where you can choose the Drizzle option when stacking.



The drizzle option creates image 4 or 9 times bigger.

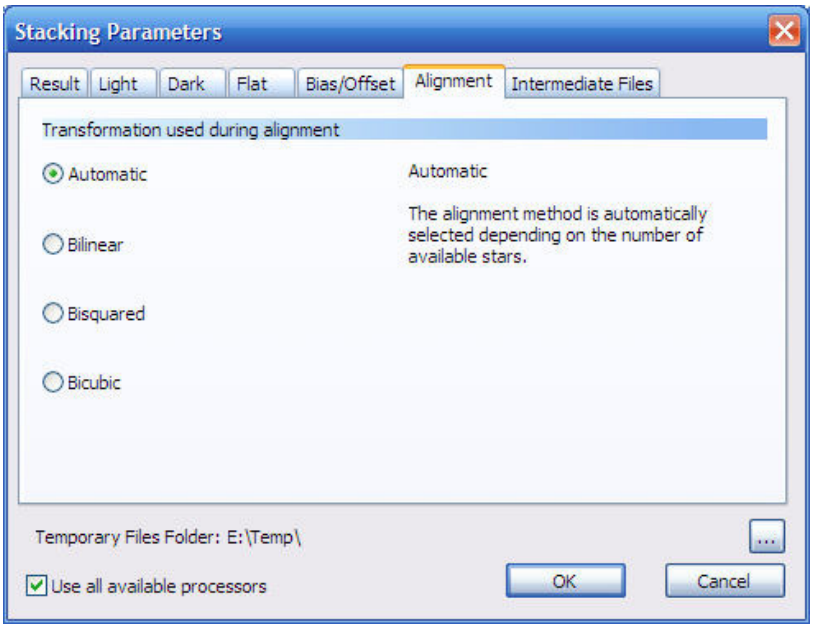
For already large DSLR images it can create very large images and DeepSkyStacker may need a lot of memory and disk space to process them.

The other light, dark, flat and bias tabs are used to modify the stacking method for each type of frame, and to activate the background calibration option for the light frames or the automatic detection and removal of hot pixels and bad columns detection and removal for the dark frames.



The Alignment tab may be used to change the alignment method used to align light frames.

You can choose Bilinear, Bisquared or Bicubic transformation or you can DeepSkyStacker select the best transformation based on the number of available stars.

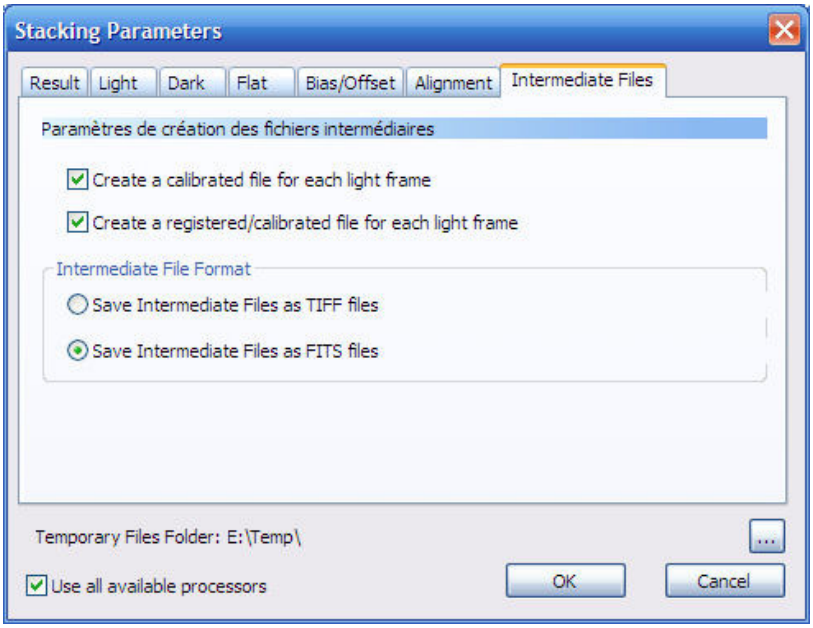


This tab is used to control the creation of intermediate files.

Two options may be used to create files containing intermediate images:

The first option may be use to create a file containing the calibrated image for each light frame.

The second option may be used to create a file containing the calibrated and registered image for each light frame.



The created files have the name and location of the matching light frame with a .cal.tif or .cal.fts extension for the calibrated images and .reg.tif or .reg.fts extension for the registered and calibrated images.

The files are always uncompressed TIFF or FITS files, monochrome or color, 8, 16 or 32 bit depending of the light frame bit depth.

When you check one of these options be sure to have enough free hard disk space to host all the created files.

This tab is to control the way the calibrated images are cleaned before stacking.

The goal is to detect and clean remaining hot or cold pixels after calibration.

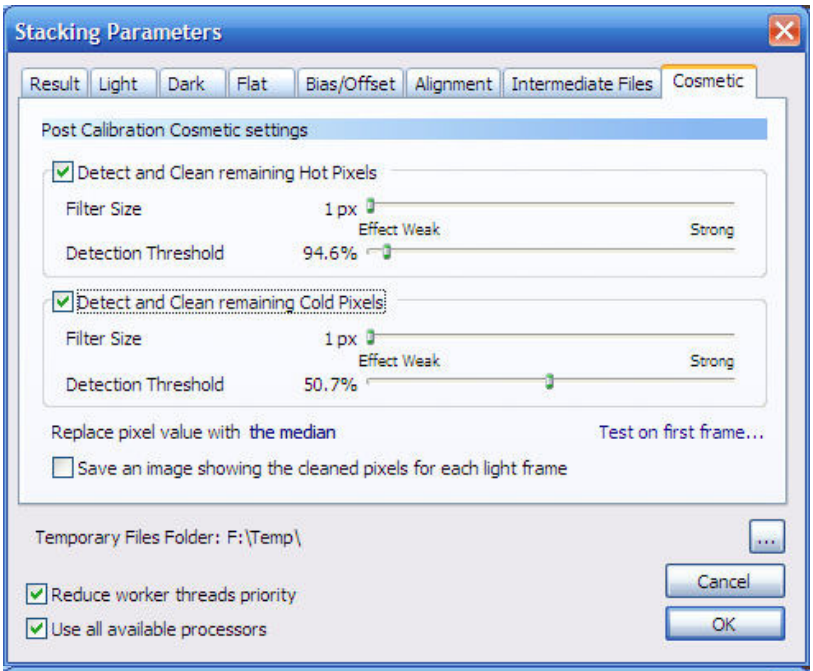
Checking these options may seriously alter the resulting image so use them with caution.

Two parameters are needed to define the behavior of the cosmetic cleaning.

The first parameter is the size of the filter used to detect and fix the hot/cold pixels. The larger the filter, the longer the processing time and the smoother the resulting image.

The second parameter is the threshold under which no correction is done (the pixel value remain the same).
A lower threshold means that more correction are done.

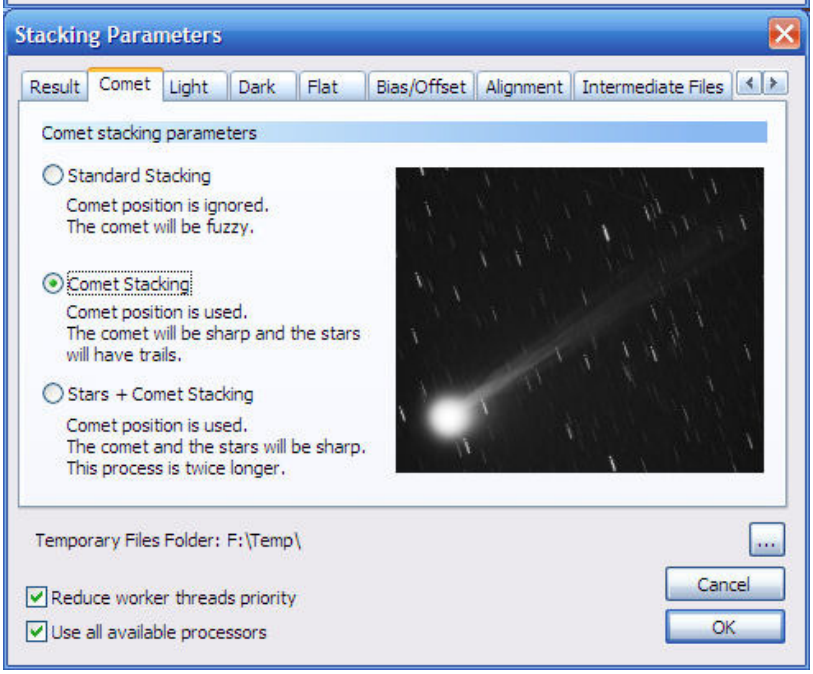
The last option may be checked to create an image showing the cleaned pixels for each light frame.
In this image, cleaned hot pixels are white, cleaned cold pixels are dark gray and all the other pixels are light gray.
The created files have the name and location of the matching light frame with a .cosmetic.tif or .cosmetic.fts extension as defined in the previous tab.



The Comet tab is available only when at least two light frames (including the reference light frame) have a comet registered.

In this case the Comet tab is used to select the comet stacking mode between the 3 available modes.

See the Comet Stacking topic in the Technical Details for information on how to use Comet Stacking.



After the stacking process, the resulting image is saved in the AutoSave.tif file which is created in the folder of the reference light frame..
If an Autosave.tif file already exists in the folder, an Autosave001.tif (002, 003, ...) is created.

Batch Stacking

The Batch Stacking dialog is used to create resulting images from more than one stack.

For example it may be used to create the resulting images from the red, green, blue and luminance images without the need to load each list then start manually the stacking process for each one.

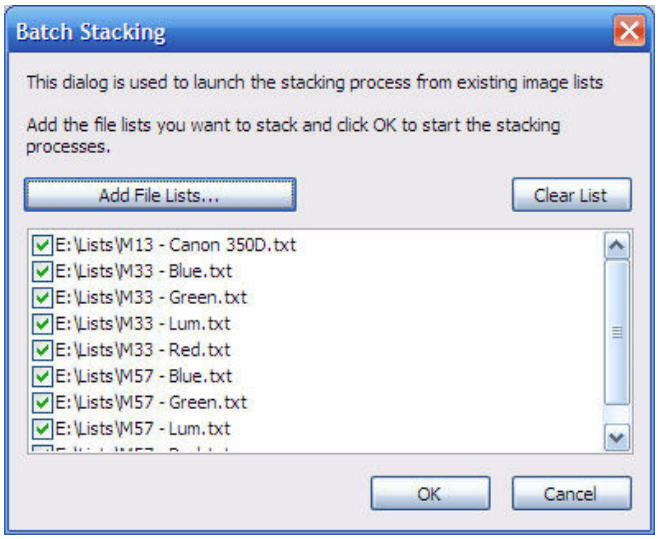
Of course it also may be used to stack any existing list.

You just need to add the file lists previously created by the Save File List command to the list. Each File List that is checked will be processed.

At the end of the stacking process, the output file name replaces the list name for each processed file list.

Notes:

- the stacking parameters (stacking method, alignment, cosmetic, ...) used by all the stacking processes are the same.
- It is not possible to define a custom rectangle for batch stacking.



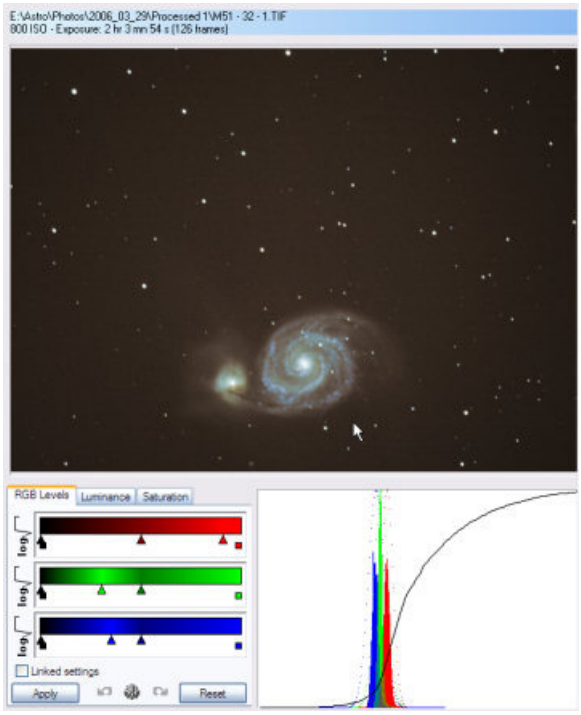
Processing Tab

The processing tab contains the commands and features pertaining to post processing.

I would like to remind here that DeepSkyStacker only allows simple processing treatments of the resulting picture in order to quickly view the result of the stacking process.
The heavy post processing should take place in another more specialized software.

The processing tab contains a preview of the RGB histogram and three sub tabs which are used to adjust the following settings::
- RGB levels
- Luminance curve
- Saturation

RGB levels and luminance curve adjustments are directly visible on the RGB histogram.



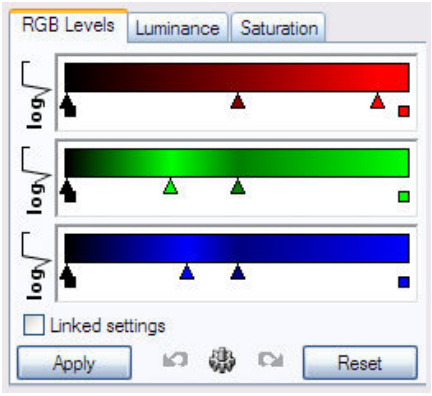
Adjusting the RGB Levels

The RGB levels adjustments are controlled by:
The kind a adjustment that you can modify by clicking on the adjustment name. The available adjustments are linear, square root, cubic root, logarithm, log(log), log(square root) and asinh..

The modifiable limits for each channel (left cursor for the minimum, right cursor for the maximum).

The modifiable offset for each channel (middle cursor).

The RGB levels adjustment may be done independently for each channel or for all the channels at the same time when the "Linked settings" option is checked..



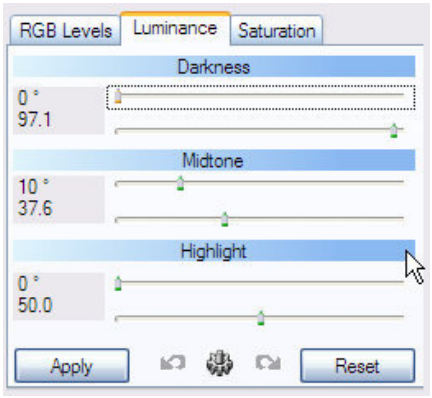
The simplest way to understand how the different parameters are working is to change them and look at the result on the histogram..

Adjusting the Luminance Curve

The luminance curve is controlled by 6 parameters.
- 2 for the darkness area.
- 2 for the midtone area
- 2 for the highlight area.

These parameters are controlling a Bezier curve used to transform the luminance.
Simply put the parameters are the angle and power of the curve for each point.

The advantage of using only 6 parameters is that on one hand it is possible to quickly view the result and on the other hand that it is possible to memorize the parameters to apply them on another picture.



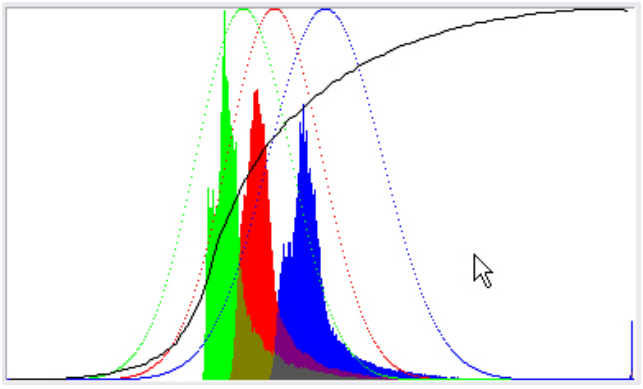
The simplest way to understand how the different parameters are working is to change them and look at the resulting the luminance adjustment curve (black curve) on the histogram.

Adjusting the Saturation
The saturation level adjustment is just a percentage of increasing or decreasing the saturation level.

RGB Histogram

The RGB histogram is used to visualize for each channel (R, G and B) the red, green and blue pixels distribution in the picture.
The black curve is the luminance adjustment curve.

Moreover, to help the equalization of the channels the Gaussian curve for each channel is drawn on top of the histogram.

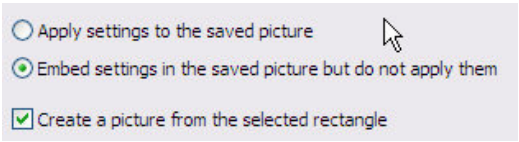


Saving/Loading adjustment parameters
Undo/Redo adjustment parameters
On the bottom of each tab a set of buttons is available:
- to apply the last modifications to the picture
- to undo the last applied modifications
- to redo the last undone modifications
- to reset all the values
- to access a dialog used to save/load a named set of parameters.

Loading a picture
DeepSkyStacker can load DSImage images (created only after the stacking process), TIFF images (8, 16 and 32 bit, gray levels or RGB) or FITS images (8, 16, 32 and 64 bit, gray levels or RGB).
At the end of the stacking process the AutoSave.tif picture is automatically loaded.

Saving the resulting picture

DeepSkyStacker can save the resulting image as 16 or 32 bit TIFF or FITS files using two methods::
- by applying the adjustments
- by not applying the adjustments (but storing them in the case of the TIFF file in order to continue the post processing the next time the image is loaded by DeepSkyStacker).



For more information about the saving methods you can read the faq.

Create a Star Mask

Using a Star Mask is often very useful during post-processing to use different processing techniques for the stars and for the rest of the image.
The Create a Star Mask feature may be used to create a variety of star masks that can be used later in any software you are using to post process (Photoshop, PixInsight, ...).

DeepSkyStacker is only creating star mask files. It is not using them in any way.
You can view this feature as a tool intended to provide quickly and simply a star mask file based on real star detection.

What is a star mask?

A star mask is a synthetic grayscale image on which each bright enough star is replaced by a round white area which is fading to black following a curve.

You can see an example of a star mask on the right.
Mouse over the text to see **the image** or **the star mask**.

Star Field

Star Mask Creation
To create a Star Mask you must load an image in the processing tab.

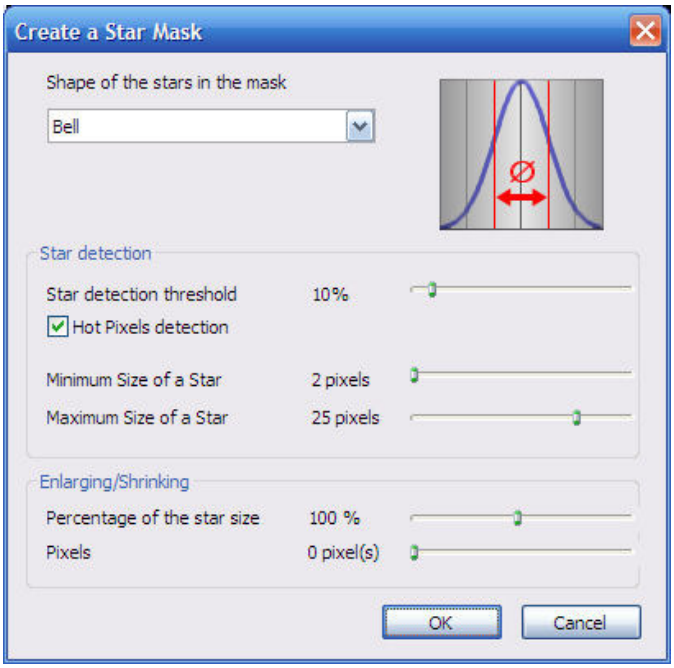
Then just click on the Create Star Mask... menu on the right and the dialog on the right will open.

From there you can change the shape of the stars in the mask, the star detection threshold and a few other parameters.

Once you are done, just click on the OK button and you will be asked to select a file (either a TIFF or a FITS file) in which the star mask will be saved.

The saved file is always a grayscale 16 bit image. It is not automatically loaded by DeepSkyStacker.

The star mask is always created from the image as you see it in DeepSkyStacker which means with the current adjustments applied.



The Picture List

The picture list, common to Registering and Stacking processes contains all the pictures used by the registering and stacking processes.
- Light frames
- Dark frames
- Flat frames
- bias/offsets frames

Only the checked pictures are used by the registering and stacking processes.

The list contains the following columns:

Checkbox	checked if the picture should be used
Path	Path to the picture file
File	Name of the picture file
Type	Picture type: Light Dark Flat Dark Flat Bias
Score	Picture score computed by the registering process or N/A for dark, flat and bias/offsets frames. When you have selected a frame as the reference frame using the context menu, the score is preceded by (*).
dX	X offset (in pixels) computed for the stacking process
dY	Y offset (in pixels) computed for the stacking process
Angle	Rotation angle (in °) computed for the stacking process
Date/Time	Date and Time of the file
Size	Size of the picture in pixel (Width x Height)

CFA	Yes if the picture is resulting from a Color Filter Array (CFA) which is the case of all the RAW pictures using a Bayer matrix.
Depth	Type (gray levels or RGB) and number of bits per channel of the picture.
Infos	Extra information about the picture (RAW with DSLR information, TIFF or Other)
ISO Speed	ISO Speed of the picture
Exposure	Exposure time of the picture
FWHM	FWHM: Full Width Half Maximum value. (in pixel) This is the average for all the detected stars
#Stars	Number of detected stars. When a comet position is set a +(C) is appended to the number of stars

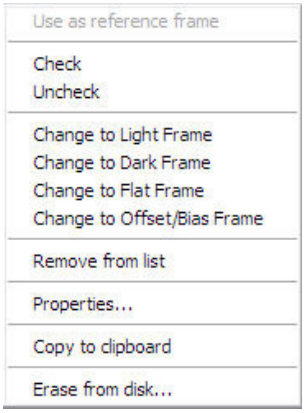
You can sort the list on any column by clicking on the column header (and by clicking again to reverse the sort order).

You can change the columns order and each column width. Everything is saved after each use of DeepSkyStacker. The column widths order will be reloaded the next time DeepSkyStacker is used.

You can preview a picture from the list by selecting it.
If the selected picture is a RAW file, the RAW DDP settings will be used to decode the RAW file before previewing it.

You can select multiple files in the list.

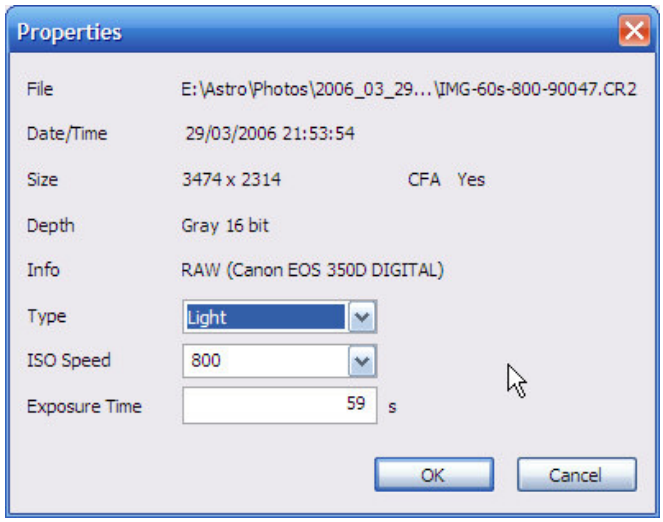
A context menu is available (mouse right button) to manually select the reference frame of the stack, change the file type, check or uncheck the files, remove the files from the picture list or view, edit the properties of the files copy the list content to the clipboard or definitively erase files from the disk.



If you select a reference frame that is not checked, the offsets will be computed from this reference frame even if the reference frame will not be stacked.

The properties dialog may be used to change the picture type, and temporarily (only for the current session) the ISO speed and exposure time of one or more pictures.

When changing the ISO speed and exposure time, no change is made to the real files. The values are only stored in memory for the duration of the current session.



Picture Preview

The picture preview is used to quickly view a picture from the picture list (Registering and Stacking Tabs) or to view the picture being processed (Processing Tab).

You can zoom in and zoom out by pointing the mouse and using the wheel. This is the only way to pan and to zoom.

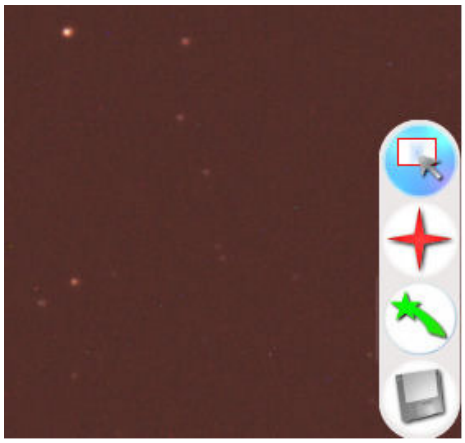
Star and Comet editing

When a light frame is selected in the registering and stacking tab it is possible:
- to edit the star positions
- to edit the comet position
- to create and edit (move/resize) a custom rectangle

You can select one of the above mode in the toolbar in the bottom right corner of the image.

The last item of the toolbar is used to save the changes.

Comet editing note:
The comet center may not be automatically detected by DeepSkyStacker.
To **force** the comet to a given position hold down the **Shift** key while positioning the comet center.



When used from the processing tab, the picture preview may be used to select a part of the image by drawing a rectangle directly on the picture.

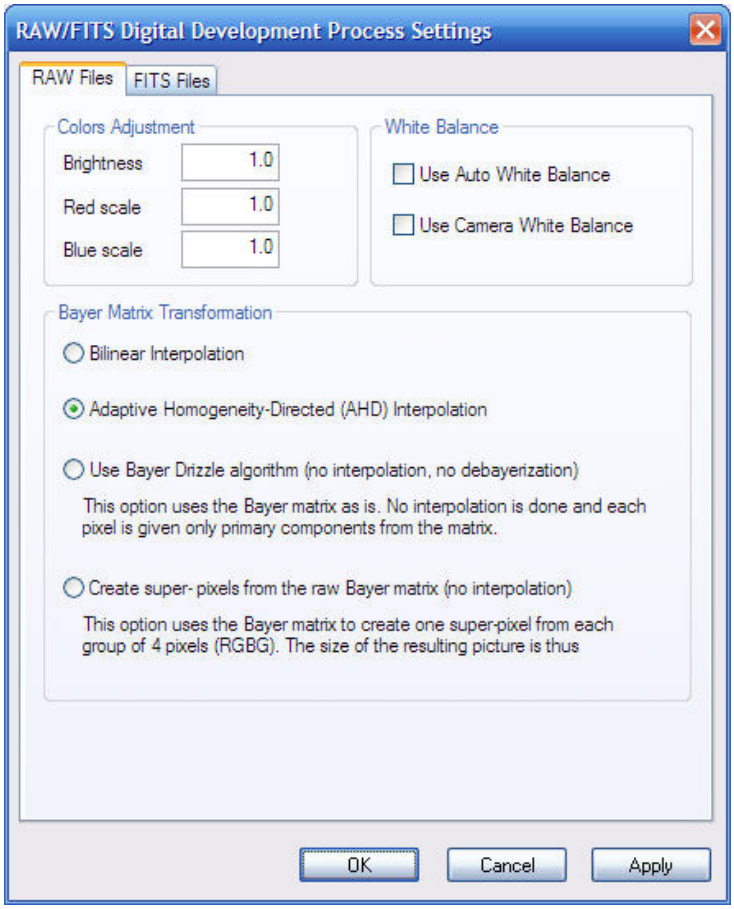
This rectangle is used on one hand to apply the adjustments only to this rectangle and on the other hand, optionally, to save only a part of the image.

If no rectangle is defined the adjustments are applied to the full image.

In all the cases, when the image is saved to disk the adjustments are applied to the full image.

Raw and FITS DDP settings

The Raw DDP settings dialog gives access to all the parameters used while developing a RAW file to transform it into a picture.



RAW Files

The parameters are:
- balance of the RGB channels
- white balance
- interpolation mode

These parameters are strictly those made available by DCRaw by Dave Coffin. For more information about how to use them you can consult his website.

About the channels balance it is very important to enter the good values used by your DSLR.

The values for the Red and Blue scales are relative to the Green.
The luminance adjustment applies to all three channels.

About the interpolation mode and the specific behavior of the Bayer matrix optimization, more information is available in the technical details.

FITS Files

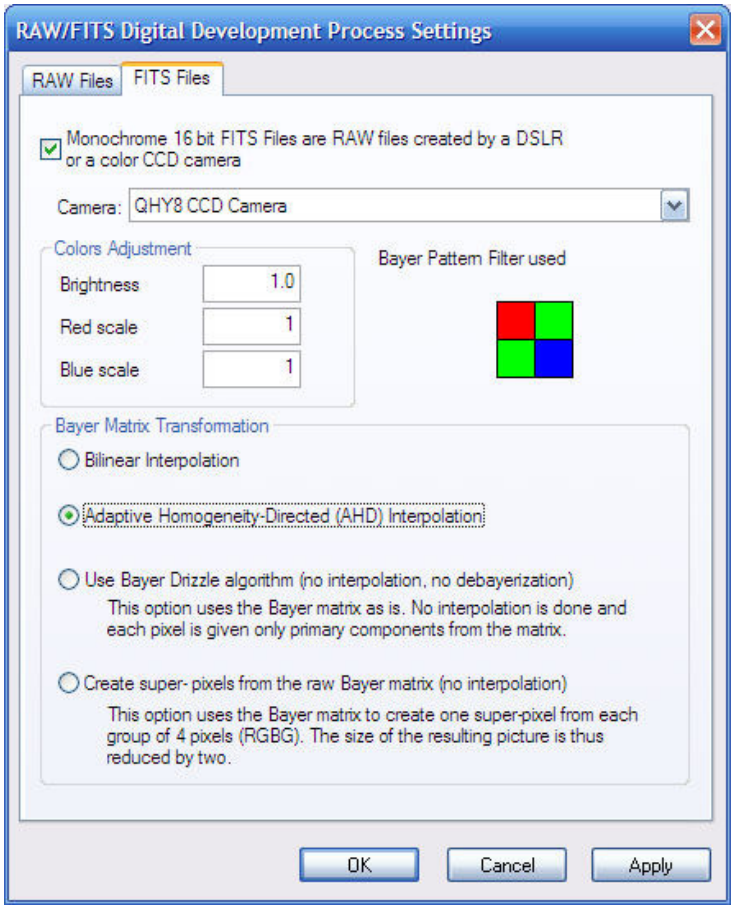
The only setting in this tab used for all FITS files is the Brightness value.
It may be used to scale up 12 bit images to 16 bits images (use a value of 16 to do so).

All the other settings are **only used** with 16 bit B&W FITS files created by a DSLR or a color CCD camera.

The first step is to select the DSLR or the CCD camera used to take the images from the list. This is necessary to use the correct Bayer Filter Pattern that will be used to decode the image transforming them from B&W to color images.

The parameters are:
- balance of the RGB channels
- interpolation mode

About the channels balance it is important to enter the values used by your DSLR or CCD camera.

The values for the Red and Blue scales are relative to the Green.
The luminance adjustment applies to all three channels.

About the interpolation mode and the specific behavior of the Bayer matrix optimization, more information is available in the technical details.