

# StarTools Main Window Use

StarTools' Main Window Use

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## Purpose:

- To load the initial image(s), select modules to apply, change the mask, undo changes, and save the desired result.

## When to use:

- At the start of processing to load the files(s).
- To select the next module to apply (see below for example workflow).
- Between modules to set a mask or undo some changes.
- To turn Tracking off towards the end of the workflow.

## Workflow:

See the [Quick Start Tutorial](#) for a quick generic workflow.

## Full Workflow Example:

AutoDev-(Band/Lens)-Bin-Crop-Wipe-AutoDev (or Develop)-(Decon/Sharp/Contrast/HDR/Flux/Life)-Color-(Filter)-Denoise-{Layer/Magic/Heal/Repair/Synth}  
Key: {...} optional modules

## Method:

1. Open a file with the Open button, or combine multiple files with the LRGB button. See [Open](#)
2. In turn, select the modules you want to apply (see above for example workflow).
3. Turn Track off. Denoise at this stage.
4. Select any remaining modules required.
5. Save the desired result.

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### [Open](#)

Used to open single monochrome or colour images:

- StarTools reads FITS, PNG and uncompressed TIFF files.
- StarTools works best with images that are linear and without pre-processing apart from registration and stacking
- The image should not have had any stretching, noise reduction, colour balancing or deconvolution.
- For more information see Background Notes.
- After loading you are prompted about the image source. This will affect how you open the image in StarTools:
  - If it is a (stacked) RAW monochrome image - select 'Linear, was not Bayered or is white balanced'.
  - If it is a (stacked) RAW white-balanced colour image - select 'Linear, was not Bayered or is white balanced'.
  - If it is a (stacked) RAW colour image that is not white balanced - select 'Linear, was Bayered, is not white balanced'.
  - If it is a JPEG or video source use 'Modified and not linear'.

### [LRGB](#)

Used to merge multiple files - such as those representing Luminance, Red, Green, and Blue channels - or those representing the Hubble palette.  
See separate [LRGB module description](#) for details on how to use it.

### [Save](#)

Saves the current image:

- To save as a 16-bit TIFF file use the extension .tiff or .tif
- To save as a JPEG file use the extension .jpg

### [Undo](#)

- Undoes the effects of the previous module.

### [Modules](#)

The modules are all accessed by clicking the corresponding button to the left of the image area.

Click on the module name below to get the notes on how to use that module. These notes do not describe the only way to use StarTools and experimentation is encouraged.

- [Band](#) - Remove banding.
- [Lens](#) - Correct for lens defects.
- [Bin](#) - Reduce resolution - improve signal to noise ratio.
- [Crop](#) - Crop image edges.
- [Wipe](#) - Remove Gradient, light pollution and vignetting.
- [AutoDev](#) - Automated global stretching.
- [Develop](#) - Global stretching.
- [Decon](#) - Recover detail from seeing-limited data.
- [Contrast](#) - Optimise Local contrast.
- [HDR](#) - Optimise Localised dynamic range.
- [Sharp](#) - Sharpen detail.
- [Flux](#) - Automatic feature recognition and manipulation.
- [Life](#) - Light diffraction modelling.
- [Color](#) - Correct and Adjust Colour.
- [Filter](#) - Manipulate features based on colour.
- [Denoise](#) - Reduce noise.
- [Layer](#) - Versatile pixel level manipulation.
- [Heal](#) - Remove unwanted features.
- [Magic](#) - Control star appearance.
- [Repair](#) - Repair star defects.
- [Synth](#) - Augment or replace stars.
- Rotate - Rotate image.
- Mirror H - Make mirror image horizontally.
- Mirror V - Make mirror image vertically.

### [Mask](#)

For general instructions on using the mask see [Mask Module Use](#).

## Track

Turns off tracking and provides an opportunity to do the final Denoise - See [Tracking](#).

## Restore

Allows us to return to the image at a previous stage in the processing - but with the option, for example, of reverting to Linear data but keeping Deconvolution intact - even though that was done after the global stretch.

- Original - revert to the original Linear, Binned and Cropped image.
- Linear, Wiped - revert to the linear image after being Binned, Cropped and Wiped.
- Linear, Wiped, Deconvolved - revert to the Linear image after being Binned, Cropped, Wiped, and Deconvolved.
- Globally Stretched, Wiped, Deconvolved - revert to the image after being Binned, Cropped, Wiped, Globally stretched, and Deconvolved.

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## Background Notes:

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## Preprocessing Images for StarTools

- StarTools works best with images that are Linear and without preprocessing apart from registration and stacking.
- No stretching, noise reduction, colour balancing or deconvolution.
- When stacking, use median or some form of sigma clipping with more than 10 sub-frames.
- If using DeepSkyStacker (DSS):
  - In 'Register Checked Pictures...' - 'Stacking parameters...' button:
    - 'Light' tab: Change calibration from 'Per Channel Color Calibration' or 'RGB Channels Calibration' to 'No Background Calibration'.
    - 'Result' tab: Uncheck 'Align RGB Channels in Final Image'.
  - In Options - Settings... - 'RAW/FITS DDP Settings...' - 'RAW Files' tab:
    - Uncheck 'Use Auto White Balance'.
    - Uncheck 'Use Camera White Balance'.
    - Uncheck 'Set black point to 0'.
  - When saving the stacked image - in the save dialog choose:
    - Save as type: 'TIFF Image' or 'FITS image', '16 bit/ch' or '32 bit/ch - integer' (a 32-bit file is twice the size of a 16-bit file).
    - Compression: 'None' and Options: 'Embed adjustments...' - otherwise you will have problems processing using StarTools.
  - For other settings see the topic DSS settings for StarTools.
  - DSS always white balances - unless you preprocess with DCRAW using this method: 'Eliminating white balancing when using DSS'.
- If using Regim:
  - See [Using Regim with StarTools](#).
- If using PixInsight:
  - Rejection algorithm: Sigma clipping or Winsorized Sigma Clipping.
  - No white balance.  
Don't use BackgroundNeutralization or ColorCalibration processes.
  - Save as:- TIFF: 16-bit, or FITS: either 16-bit unsigned integer or 32-bit unsigned integer.
  - StarTools can take over before you use DynamicCrop or DynamicBackgroundExtension (DBE) processes. See the topic [Welcome, Pixinsight Users!](#) for advice on how to use

StarTools as an alternative to PixInsight for post-processing.

- If using Nebulosity:
  - Align and Combine: Standard Deviation based stacking: Sigma-clip.
  - Don't do post processing such as Digital Development, Adjust Color Background or Auto Color Balance.
  - Edit menu - Preferences:
    - 'Save as compressed FITS' - unticked,
    - 'Save in 32-bit floating point' - unticked, 'Scale to 15 bit (0-32767) at Save' - unticked.
    - 'Manually Override color reconstruction' - Tick - stops white balancing - set Manual Demosaic Setup.
    - 'Demosaic (Debayer) method' - Bilinear.
  - Save as:- TIFF: uncompressed 16-bit (File - Save 16 bit/color TIFF File), or FITS: uncompressed 16-bit integer (File - Save Current File).
- If using MaximDL:  
During the Stack process:
  - Color tab: Use Defaults (1:1:1) colour balance, Don't do post processing such as 'Auto equalize background'.
  - Combine tab: Combine Method: Sigma-clip.
  - Save as:- TIFF: uncompressed 16-bit, or FITS: uncompressed, either 16-bit int or 32-bit int.

## StarTools Log File

Every time you process an image, the processing steps are saved to a log file named StarTools.log in the StarTools program folder.

It contains entries for:

- StarTools version used.
- Date processed.
- Source file name and location.
- Modules used along with the associated parameter values.
- Saved file name and location.

It is very useful if you want to recreate a processing workflow or to help with troubleshooting.

For versions earlier than v1.3.5 it was saved in the folder where the source image file is located.

## The importance of not White Balancing (Color balancing) when pre-processing.

With White Balanced (Color Balanced) images the R, G and B channels are scaled differently:

- This makes it impossible to derive an accurate luminance channel for the separate processing of luminance and colour data.

- Noise levels are changed - Noise cannot be tracked as accurately.
- Scaling of R,G and B can cause clipping - impacting the ability to extract detail in the highlights.

#### File formats for Preprocessed files:

Notes on the choice of file format and bit-depth when saving files after pre-processing:

- To avoid any possible loss of data it is best to save as 32-bit Integer FITS if you have the memory/processing power/disk space. See the topic ['DSS save as choice'](#).
- However, most of the time you will not notice the difference if you save as 16-bit TIFF/FITS.
- Most applications will use the output from StarTools and not the preprocessed output. StarTools output is 16-bit TIFF (or JPEG).
- If you want to use the preprocessed output with applications other than StarTools - choose TIFF or FITS depending the applications you use.
  - FITS is standard for astronomical applications. It can be read by Startools, PixInsight and FITS Liberator but not MS Windows' own apps. and Photoshop requires a plug-in.
  - TIFF files (uncompressed) can be viewed by MS Windows' own apps, StarTools, PixInsight and PhotoShop (but see below).
- Saving as 32-bit may capture a little more detail than 16-bit in some cases but further post processing (e.g.in StarTools) takes more processing power and memory, and the files are up to double the size.
- If using 32-bit - choose 32-bit integer over 32-bit rational unless it is not supported by one of the applications you need to use (see below).
- The file formats read by common applications are as follows:
  - StarTools uses 64-bit integer arithmetic internally - using integer avoids mapping issues.
  - StarTools and PixInsight read 16-bit, 32-bit integer and 32-bit rational files.
  - FITS Liberator reads 16-bit, 32-bit integer and 32-bit rational FITS format files.
  - PhotoShop does not read 32-bit integer files.
  - Nebulosity does not read 32-bit TIFF or 32-bit integer FITS files.
- Any intermediate pre-processed files are normally stored as 32-bit - don't change this.

#### Debayering/Interpolation methods

A brief summary of major methods:

- Nearest neighbour - uses value of nearest pixel.
- Bi-linear interpolation - average of the 4 nearest diagonal pixels of same colour (R,G or B) - a good choice if there is noise.
- VNG - Variable Number of Gradients - noise in each frame can cause the VNG algorithm to introduce artefacts and 'bleeds' the noise to surrounding pixels as described in the topic ['Using debayered integrated images'](#).
- PPG - Patterned Pixel Grouping - fewer artefacts than VNG.
- AHD - Adaptive Homogeneity-Directed - causes artefacts especially if there is noise. Don't use unless the subs have a high SNR.
- Bi-cubic interpolation - uses 16 neighbour pixels of the same colour.

If you are unsure which to choose - select bi-linear interpolation if available.

External References:

[Comparison of Demosaicing Algorithms](#)  
[Good Interpolation Introduction](#)

#### De-bayering Artefacts

Artefacts are caused by errors in estimating the 'missing' colours.

Look out for the following effects in debayered colour images:

- Zipper effect - at edges.
- False Colour - usually at edges - fringing.
- Halo - at edges.
- Aliasing - interference pattern.
- Mazing - fine parallel lines confuse demosaic algorithm producing an effect that looks like a rectangular maze.
- Blurring.

Ref: [Examples](#) Example 1: Maze, Example 3: Moire interference pattern.

#### Thanks

Many thanks to Ivo for his feedback and tireless support. Thanks also to others who have contributed.