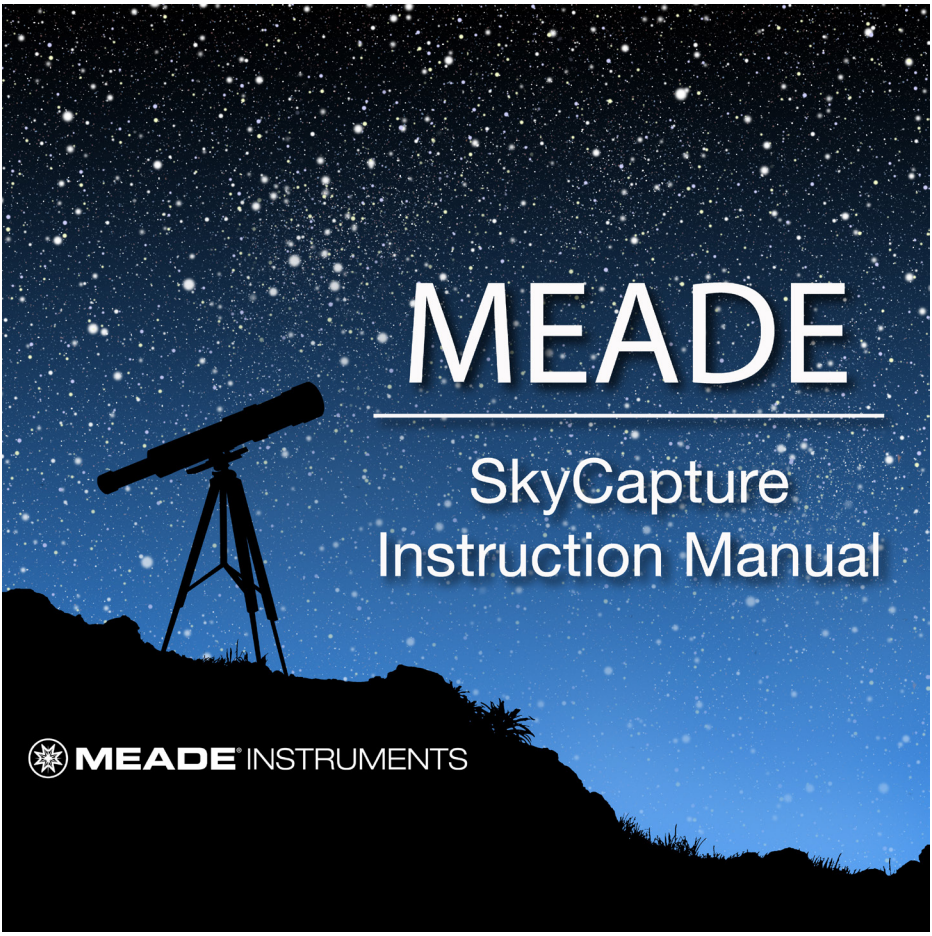

Note that while SkyCapture is supported in Windows, Mac OS X, and Linux operating systems, this instruction manual demonstrates usage in Windows only. Various screens and interfaces shown are Windows-specific. However, all camera controls and processing features are the same for each supported operating system.

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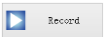
11.3 Start Record  F9 46
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1 Getting Started

1.1 How to Start SkyCapture

1. From the Windows Start Menu, locate SkyCapture and click it to start the application(Win XP/7/8/10);

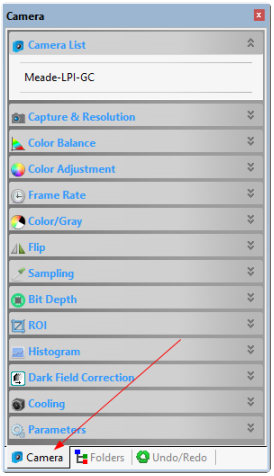
2. Click the Start button (At your screen bottom left corner) and a Start menu will bring up. Move your mouse over the menu and try to locate SkyCapture, click to start it (Win XP/7/8/10);

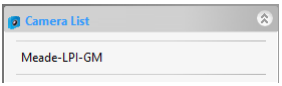
3. Double click on the desktop icon " " (If installed) to start SkyCapture;

1.2 How to start the camera

SkyCapture will detect all of the cameras that your computer has installed (for example, the MEADE-LPI-GM) and will list all the camera names under the Camera List group on the Camera Sidebar

Click the Camera Sidebar (If it is not activated) and the Camera List to expand the Camera List group (if not expanded).

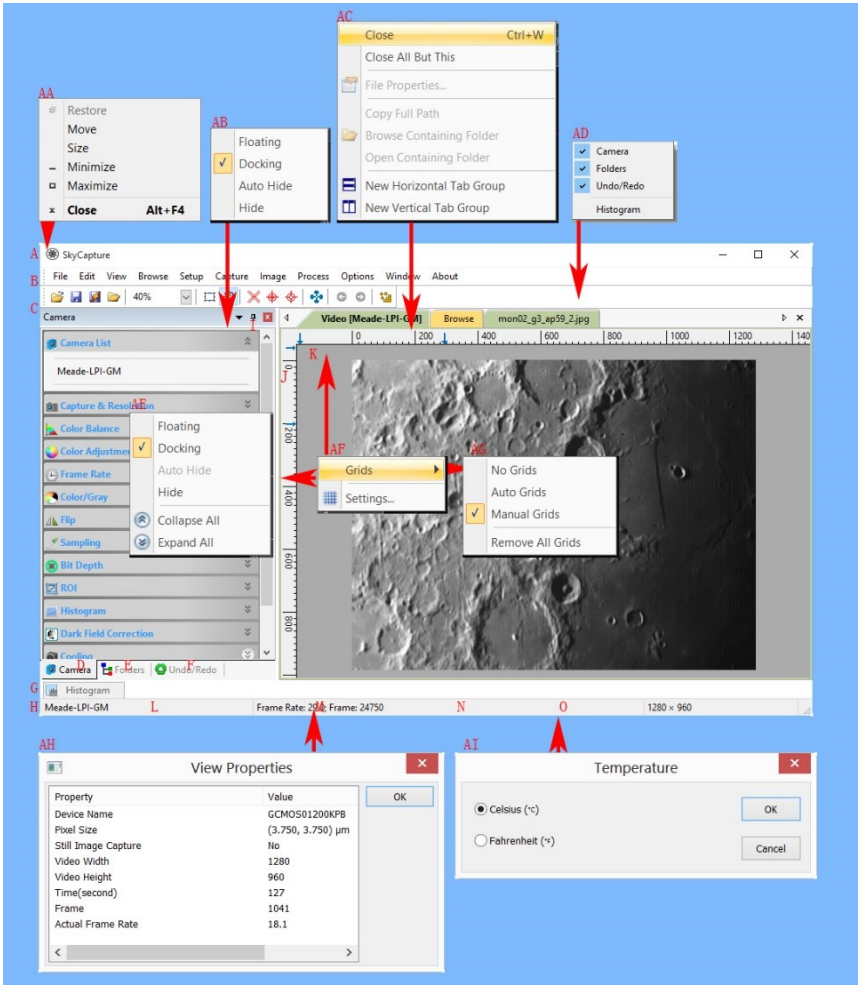




Click the camera name (MEADE-LPI-GM, for example) to start the video window and the camera will begin to stream the video. The video window will be associated with a name called "Video [MEADE-LPI-GM]" (i.e., its title bar name will be "Video [MEADE-LPI-GM]").

2 Video window GUI

2.1 Video window GUI



A:SkyCapture;

B: Menu;

C:SkyCapture toolbar;

D:Camera Sidebar ;

E: Folders Sidebar ;

F: Undo/Redo Sidebar ;

G: Histograme;

H: Statusbar;

I: Auto Hide button;

J: Horizontal ruler;

K: Vertical ruler;

L: Camera Name;

M: Frame Rate and Frames captured;

N: Current Video sizes;

O: Current Temperature;

AA: Title Bar right mouse button context menu;

AB: Sidebar right mouse button context menu;

AC: Video window right mouse button context menu;

AD: Toolbar right mouse button context menu

AE: Camera Sidebar right mouse button context menu;

AF: Horizontal Ruler or Vertical Ruler right mouse button context menu

AG: Grids submenu;

AH: Double-click bring up Video Properties dialog;

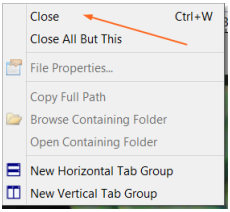
AI: Double-clicking bring up Temperature display style setup dialog;

2.2 How to close the video window

1 Double-clicking the tabbed video window title or clicking x on will close the video window directly;

2. Choose the Windows>Close All command to close the video window;

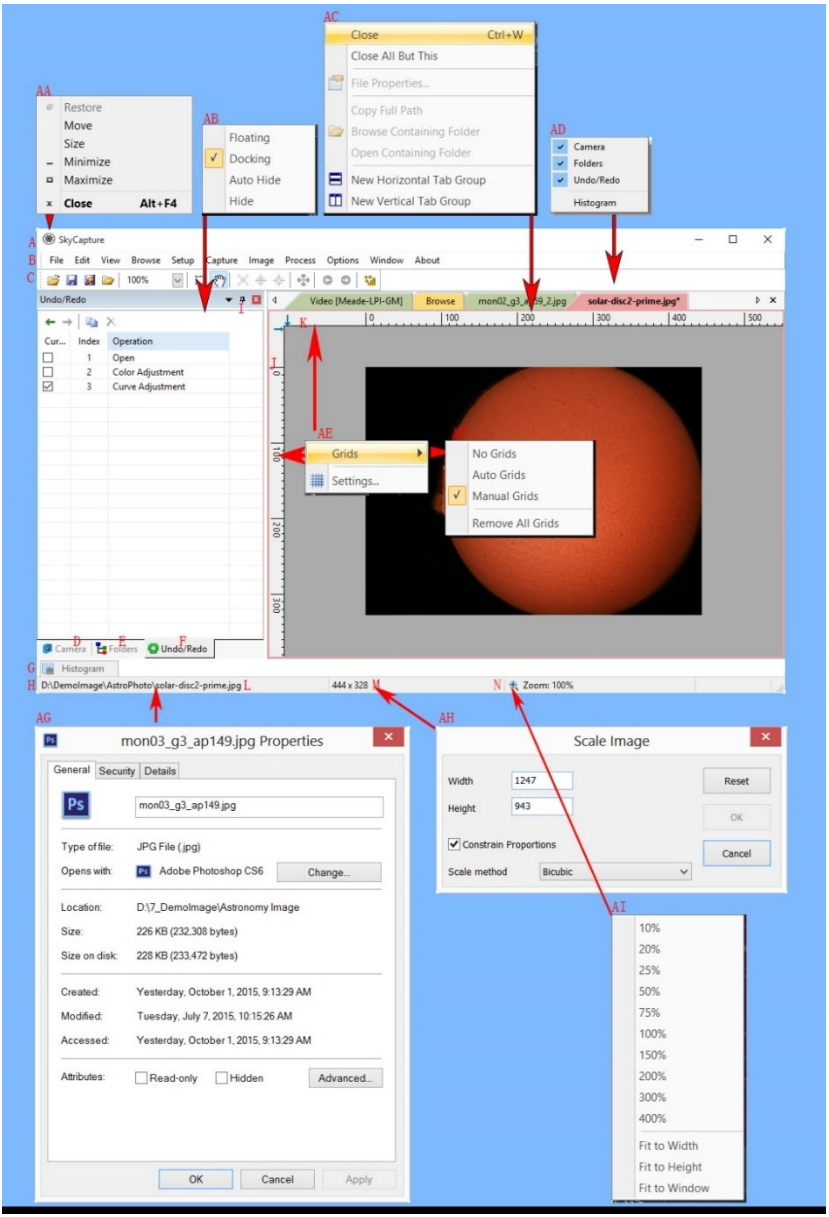
3. Click the right mouse button on the video window title to invoke the context menu and choose Close to close the video window;



4. Press Ctrl+W.

3 Image window GUI

3.1 Image window GUI



A: SkyCapture;

B: Menu;

C: SkyCapture toolbar

D: Camera Sidebar ;

E: Folders Sidebar ;

F: Undo/Redo Sidebar ;

G: Sidebar;

H: Statusbar;

I: Auto Hide button;

J: Horizontal ruler;

K: Vertical ruler;

L: The Opened file directory and name;

M: Image file resolution;

N: Image Zoom ratio double-clicking will zoom the image to 100%;

AA: Title Bar right mouse button context menu;

AB: Sidebar right mouse button context menu;

AC: Video window right mouse button context menu;

AD: Toolbar right mouse button context menu;

AE: Horizontal Ruler or Vertical Ruler right mouse button context menu;

AF: Grids submenu;

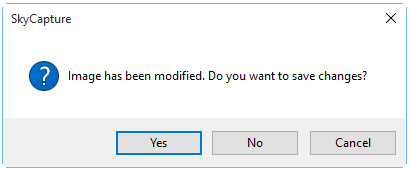
AG: Double-click bring up Video Properties dialog;

AH: Double-click bring up Scale Image dialog;

AI: Zoom ratio right mouse button context menu;

3.2 How to close the image window?

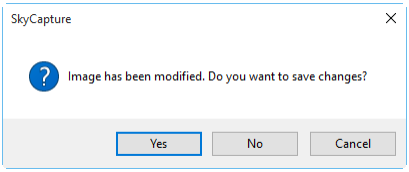
1. If you have modified an image before attempting to close it, double-clicking the tabbed image window title or clicking x on will bring up a SkyCapture dialog:



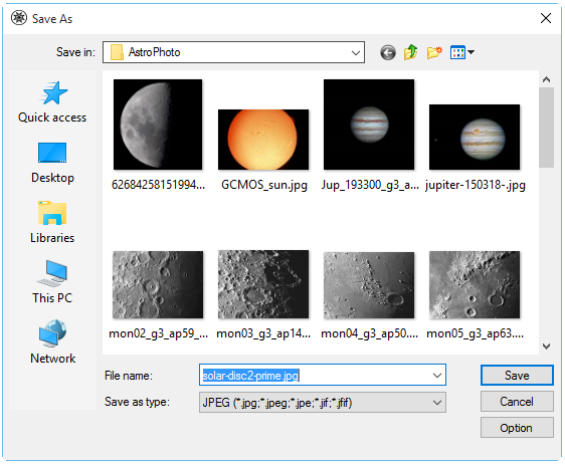
Clicking Yes will save the changes with its old name and close the window quickly, No

will close the file immediately with no changes and no warning, or Cancel will cancel the Close command and leave the window there with no changes;

2. If the Image window is snapped from the video window and with number as its title, double-clicking the tabbed image window title or clicking x on ▷ ✕ will bring up a warning SkyCapture dialog:



Clicking Yes will bring up the Save As dialog.



In the Save As dialog, choosing

Save in: Select the driver and folder to which you want your image file saved in the Save in combobox and enter the file name in the File name edit box;

Save: Click Save to save the captured image with the specified directory and file name;

Cancel: Click Cancel to close the Save As dialog and return to image window.

Click No on the SkyCapture dialog will close the file immediately with no changes and no warning.

Click Cancel on the SkyCapture dialog will cancel the Close command and return to image window.

3. Press Ctrl+W;

Choosing the Window>Close All command can also close the tabbed image window. Please check the Window>Close All for detail.

4 UI toolbar

When the camera is started or the image is opened (or captured), most of the icons on the toolbar will be enabled for the quick operation of the video or image window.

1: Open (Ctrl + O);

2: Save (Ctrl + S);

3: Quick Save (Quick Save);

4. Auto Capture (F7)

5. Batch Record(F10)

6: Zoom;(Ctrl+ or Ctrl-)

7: Video/Image Select;

8: Track(enabled only when the video/image size is larger than the window size);

9: Crosshairs for the star alignment;

10: Circle for the star alignment;

11:Circel with hole;

12: ST4 Test;

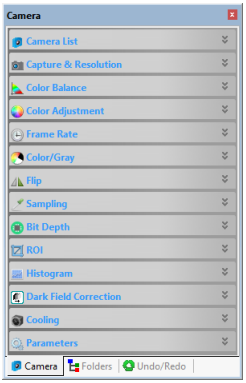
13: Previous Frame;

14: Next Frame;

15: Image Stitch;

16：Preferences (Shift+P)

5 Camera Sidebar

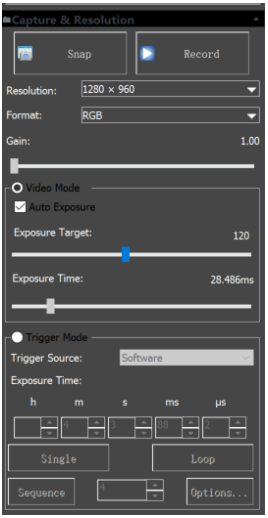


The Camera Sidebar is used for the control of camera, it includes many groups (14). The group can be expanded by a) clicking the group name or b) clicking the Double Down Arrow at the right end of the group name.

5.1 Camera List group

Camera List will list all of the cameras connected to the computer that support the SkyCapture application. Click the camera name will start the camera video window.

5.2 Capture & Resolution group



Snap: Continuously Snap images by clicking it;

Record: Record video stream with the supported formats;

Resolution: Set the video resolution;

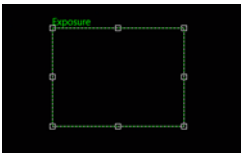
Format: Video format, could be RGB or Raw format;

Gain: If and only if the brightness is too low to meet the Exposure Time up limit, drag the Gain slide right until the video brightness is normal;

Video Mode: The application will continuously display the video in the Video window;

Auto Exposure: Uncheck the Auto Exposure box to switch the Auto Exposure mode to the Manual Exposure mode. The Exposure Target slider will be disabled in this mode;

When the Capture & Resolution group is expanded and the Auto Exposure button is checked，a green rectangle

	marked with "Exposure" will be overlaid on the video window. This marked region is a reference region for judging if the image average brightness reaches to the Exposure Target value. Drag the Exposure ROI to the darker area will increase the video brightness and drag it to the brighter area will decrease the video brightness; Uncheck the Auto Exposure box to switch the Auto Exposure mode to the Manual Exposure mode. The Exposure Target slider will be disabled in this mode;

Exposure Time: Drag the Exposure Time slider to the left or right until the image brightness is normal; The exact Exposure Time can also be entered by clicking the edit box at the right end of the Exposure Time. This will bring up a dialog called Exposure Time. You can type the number in the field to set the exact Exposure Time value.

Trigger Source: User can choose the Software or Hardware Trigger mode;

Exposure Time: Can be set in h(hour), m(minute), s(second), ms(millisecond) and us(microsecond) ;

Single: Snap a single image to the Video window(The Single button will change to the Stop button after it is clicked);

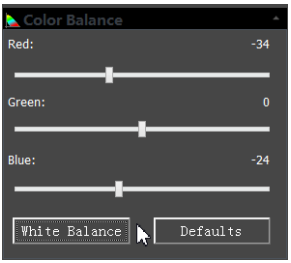
Loop: Continuously snap the image to the Video window until the Stop button is clicked(The Loop button will change to the Stop button after it is clicked);

Sequence: Snap a specified number of images to the separate Image windows (The Sequence button will change to the Stop button after it is clicked). After the process is finished or the Stop button is clicked, the Sequence capture will be stopped and the Stop button will changed to the Sequence button for the next clicking;

Options: This button will invoke a Sequence Options dialog and to set the Sequence Options such as show the snapped image in the window or save it to disk. User can also choose the Directory File prefix, File type etc. for the image file to save.

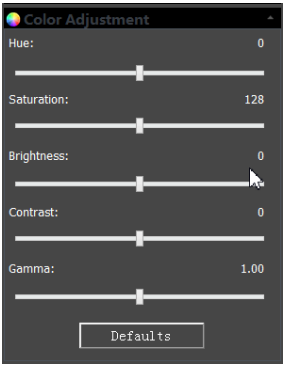
5.3 Color Balance group

1. Click the color balance bar to expand the color balance group and a red rectangular marked with white balance will be overlaid on the video window;
2. drag the red rectangle to a pure white or gray area and click the white balance button to establish the video white balance for future video streaming process;



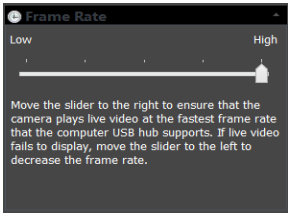
3. If the White Balance automatic setting result and the actual one still has deviation, drag the Red, Green or Blue slides to the left or right to manually correct the White Balance.

5.4 Color Adjustment group



1. Hue: Adjusts the Hue of the video. Drag the slider to the right to increase or drag to the left to decrease Hue;
2. Saturation: Adjusts the Saturation of the video. Drag the slider to the right to increase or drag to the left to decrease video Saturation;
3. Brightness: Adjusts the video Brightness. Drag the slider to the right to increase or drag to the left to decrease the video Brightness;
4. Contrast: Adjusts the video Contrast. Drag the slider to the right to increase or drag to the left to decrease the video Contrast;
5. Gamma: Adjusts the video Gamma. Drag the slider to the right to increase or drag to the left to decrease the video Gamma;
6. Defaults: Click the Defaults to clear all the changes and reset them to default ones;
7. All of your settings will be saved for future Color Adjustment group.

5.5 Frame Rate group



Drag the slider to the right (High) to ensure that the camera can run the video at the fastest Frame Rate that the computer's USB hub supports. If the video fails to display, drag the slider to the left (Low) to reduce the Frame Rate and this will enable the video to stream in a low speed mode.

5.6 Color/Gray group

If you wish to preview Color video, choose the "Color" button, otherwise, choose the Gray button. If you wish to preview Gray video, check the "Gray" button.

5.7 Flip group

If the video on the screen appears in different directions from what is viewed under the camera, check the "Horizontal" or "Vertical" box to set the video direction to the right one.

5.8 Sampling group

1. Bin: Pixel binning refers to the method of combining (averaging) pixels of blocks of neighboring same color pixels to resize the video to the lower resolution;

2. Skip: Also called "Decimation", means that a certain amount of pixels are not read out but skipped (horizontally, vertically or in both axes). This reduces resolution of the resulting video but introduces subsampling artifacts.

5.9 Bit Depth group

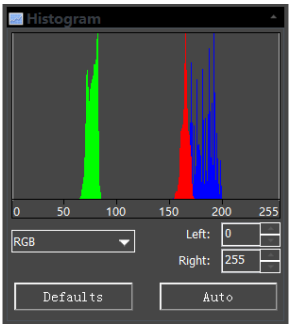
Switch between 8 bits and 12 bits. 8 bits is the basic Windows image format. 12bits will have higher image quality but moderate frame rate speed.

5.10 ROI group

ROI, Region of interest. This function can set the ROI on the video window. When the ROI group was expanded, a dotted rectangle with "Handles" will appear around the video window that will let you alter the ROI. Use mouse button to adjust the ROI size. If ROI is ok, click Apply will set the video to ROI size, Defaults will return to the original one.

5.11 Histogram group

1. A Histogram illustrates how pixels in an image are distributed by graphing the number of pixels at each color intensity level. The Histogram shows detail in the shadows (shown in the left part of the histogram), midtones (shown in the middle),



and highlights (shown in the right part). A Histogram can help you determine whether an image has enough detail to make a good correction;

2. This group shows the Histogram of current active video. Two vertical line markers show the upper and lower limits of the intensity levels. These markers can be dragged with mouse. If you are looking at a color image, the Histogram will reflect the RGB(red, green and blue channels histogram at the same time) R(red), G(green), and B(blue) values with lines of the same color;

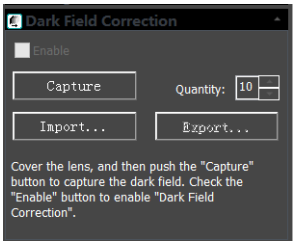
3. You can also enter directly the desired values in the Left or Right boxes below the Histogram chart for both Left and Right Histogram boundaries;

4. Click the "Refresh" button to update the Histogram display if the sample under observation is moved or changed;

5. Clicking the Defaults button will return the Left and Right Histogram boundaries to its original ones;

6. Click the Auto button to locate the two boundaries automatically to get the best video quality.

5.12 Dark Field Correction



To Enable the Dark Field Correction (or "Dark Frame Calibration"), one should capture the dark field image first. After the images are captured, the Enable button will be enabled. Check it will enable the Dark Field correction. Uncheck it will disable the Dark Field Correction.

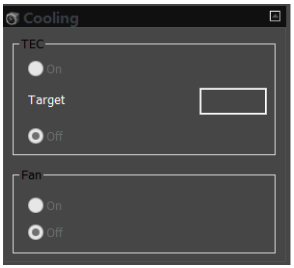
5.13 Cooling group

The Cooling group is only available for those who have TE-cooling hardware inside the camera.

TEC On: The Cooling will be enabled when this button is chosen;

TEC Target: The final temperature value wished;

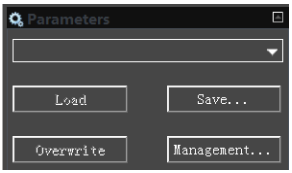
TEC Off: The Cooling will be disabled when this button is chosen;



Fan On: Open the fan will accelerate the cooling speed;

Fan Off: Stop the fan will lower the fan sound noise but decrease the cooling speed.

5.14 Parameters group



The Parameters group is used to save the camera control parameters set for further application.

Click Save will save the current camera control parameters with new parameter file and then the Load and Overwrite buttons will be enabled.

Click Load will load the saved camera control parameters;

Click Overwrite will overwrite the current camera control parameters to the current loaded active camera control parameters file;

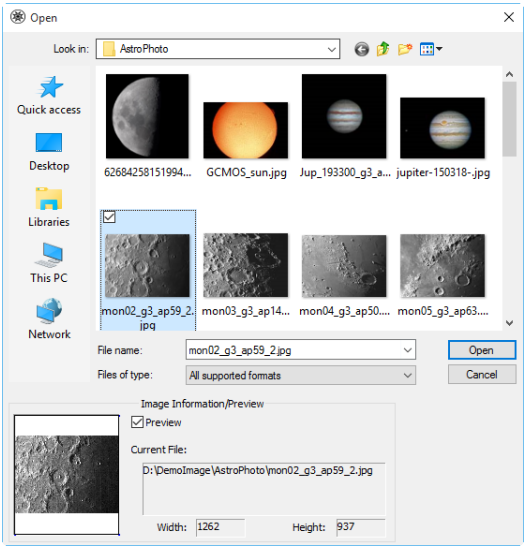
Click Management will invoke a Management dialog and in this dialog, one can manage all of the saved Parameter files.

6 File

6.1 Open Image••• Ctrl+O

Choose the File>Open Image••• command to open an existing image file. The Open Image••• command can also be used to preview an image in small size, or to view its statistics and information without actually opening the image itself. These capabilities can be used to quickly locate a particular image.

SkyCapture supports and can open many image formats. These are identified in the Files of type list box.



More than one image can be opened within SkyCapture simultaneously by a) with Ctrl + left mouse button method and b) Shift + left mouse button method to highlight the files to be opened. In this mode, the Preview window will be disabled.

When opening an image, SkyCapture places it into a new image window. It then becomes the active window.

Note: SkyCapture maintains, at the File>Recent Files submenus, a list of the last 4(Can be 1-8) opened files. Any of these files can be accessed by simply clicking on file name. If no files are listed in the File>Recent Files submenu, the Open Image••• command

must be used to open the file.

Also, the View>Browse(Ctrl+B) command can be used to view images in an Icon format under any selected directory. Brief information is given in the View>Browse menu.

File name: From this list box, select the name of the file want to open. Either the type of the file name (with its entire path, if it is not in the current folder), or selecting Files of type to obtain a list of File names. Double-clicking a file name in the large combo box (where both folder and file names are listed) will automatically open it.

Note: If just type in the File name, be sure that the Files of type field correctly identify the format of the file to open. Otherwise error messages will bring up when SkyCapture tries to open the file.

Files of type: In this list box, select the image format of the file to open. If one selects All supported formats, SkyCapture uses the file's extension to identify its format. SkyCapture supports the following file formats:

Window Bitmap(*.bmp,*.dib,*.rle)
JPEG(*.jpg,*.jpeg,*.jpe,*.jif,*.jfif)
Portable Network Graphics(*.png)
Tag Image File Format(*.tif, *.tiff)
Compuserve GIF (*.gif)
PCX（*.pcx）
Targa(*.tga)
PhotoShop(*.psd)
ICON(*.ico)
Enhanced Window Metafile(*.emf)
Window Metafile(*.wmf)
JBIG(*.jbg)
Wireless Bitmap(*.wbmp)
JPEG 2000 Standard(*.jp2)
JPEG 2000 Codestream(*.j2k)
Digital Negative (*.dng)
Ser (*.ser)
Fits(*.fit;*.fits)

If the image file does not use standard format-identifying extensions, the file in the File name field must be typed, and then select its format from the Files of type list box. Otherwise, SkyCapture will select a format based on the file name extension.

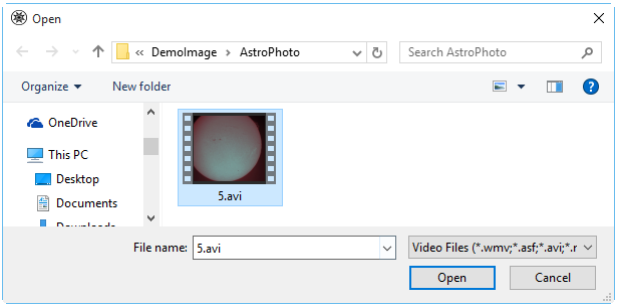
Preview: Click this button to preview image in small size. In preview mode, statistics and information about the image (i.e. image Width, Height and image location) will be displayed. The default is no Preview.

Current File: Current File location on your computer;
Width: Current File image width;
Height: Current File image height;

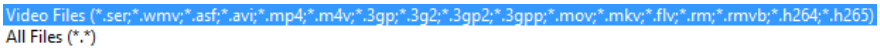
6.2 Open Video•••

The File>Open Video••• menu will be enabled only when there is no video file opened in the SkyCapture frame or no camera was opened.

1. Choose the File>Open Video••• command to open an existing video file;



2. Select the name of the file you want to open. If the file does not appear, select the option for showing all files from the Files of Type combobox. The video file type can be any one as shown below.



3. Click Open to open a video file, this will create a video window and begin to start the video stream. The video window will be associated a name called "Video [XXX.XXX]" (i.e., its title bar will display "Video [XXX.XXX]", here, XXX.XXX is the video file name).

4. Click Cancel to return to the application.

Note: Only a single video can be opened at a time. SkyCapture takes camera as a special video file, if the camera was opened, this menu will be disabled and the video file cannot be opened anymore.

6.3 Save Ctrl+S

Choose the File>Save command to immediately store the current window image to its file (the file name is listed on the window's title bar) while leaving the image still active in its window.

If the image is untitled or titled with a digit, SkyCapture will issue the File>Save As••• dialog automatically. The default "Save as type" will be "Window Bitmap (*.bmp,*.dib,*.rle)".

The File>Save command can be used to save the most recent changes to disk. It is often performed as a precautionary measure during lengthy or involved processes to reduce the amount of reprocessing that might be required in the event of a system failure or operational error. When an image is closed and not to save its changes is chosen, SkyCapture discards all changes made since the last File>Save operation.

Note: a).The File>Save command always saves the contents of the entire window, even if there is an AOI (Area of Interest) defined on it; b).The File>Save command will be disabled if the file is not changed or the changes have been saved.

6.4 Save As•••

Choose the File>Save As••• command to store the contents of the current window to a specified file format. At the end of a File>Save As••• operation, the image window will be associated with the new file and the new format (i.e., its title bar will display the new file name).

SkyCapture supported file save formats are:

Window Bitmap(*.bmp,*.dib,*.rle)
JPEG(*.jpg,*.jpeg,*.jpe,*.jif,*.jfif)
Portable Network Graphics(*.png)
Tag Image File Format(*.tif, *.tiff)

Compuserve GIF (*.gif)

PCX(*.pcx)

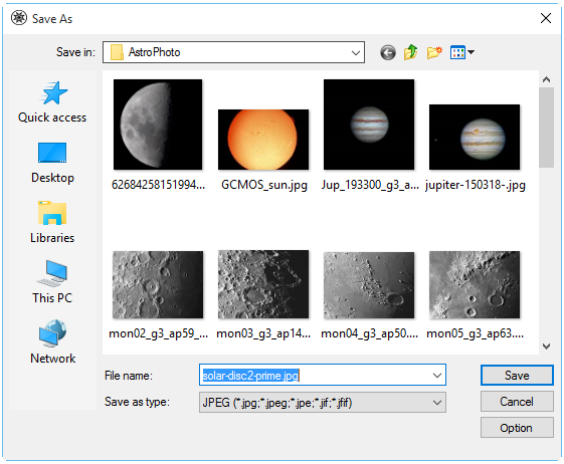
Targa(*.tga)

JBIG(*.jbg)

JPEG 2000 Standard(*.jp2)

JPEG 2000 Codestream(*.j2k)

Fits(*.fit)



Save in: Find the folder where the file wishes to be saved. A new folder may be created using the New Folders button;

File name: The file name to be saved. To specify the file's location, either enter its entire path (disk and folder), or specify its location using the Save in list box;

Save as type: In this list box, select the format in which the image wants to be saved. Save As••• is also used to convert a single image from one format to another. For example, if a TIFF file needs to convert to PCX format, open the TIFF image first, then choose Save As••• command with the PCX format to save it to a new file.

The default "Save as type" will be "Window Bitmap (*.bmp,*.dib,*.rle)". The Save As command has several important uses beyond simply storing an image to a new file name. Click Option to select the different parameters to encode the file.

6.4.1 Option for JPEG

For JPEG (*.jpg,*.jpeg,*.jpe,*.jif,*.jfif), Option has the following items:

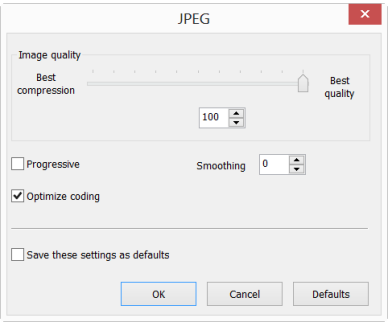


Image quality: If one save an image in JPEG format (*.jpg), one may adjust image quality in the edit box. The values range from 0 to 100. Default value: 75;

Progressive: The default is unchecked;

Optimize Huffman codes: The default is unchecked;

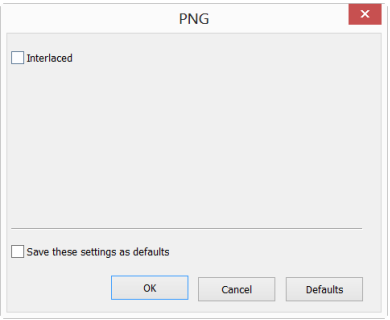
Smoothing: The values range between 0 and 100. Default value: 0;

Save these setting as defaults: When saving a file, the current settings will be saved as defaults for the next file save operation.

6.4.2 Option for PNG

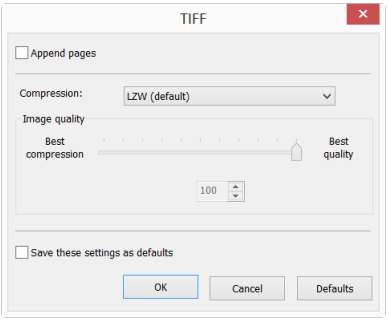
For Portable Network Graphics (*.png), Option has the following items:

Interlaced: The default is unchecked;
Save these setting as defaults: When saving a file, the current settings will be saved as defaults for the next file save operation.



6.4.3 Option for TIF

For Tag Image File Format (*.tif, *.tiff), the Option has the following items:



Appended pages: Determine whether the current image will be saved in multiple pages style or not;

Compressions: Specifies a method for compressing the composite image data. For saving a 32-bit TIFF file, one can specify that the file be saved with predictor compression, but have no option to use JPEG compression. Predictor compression offers improved compression by rearranging floating point values, and works with both LZW and ZIP compression;

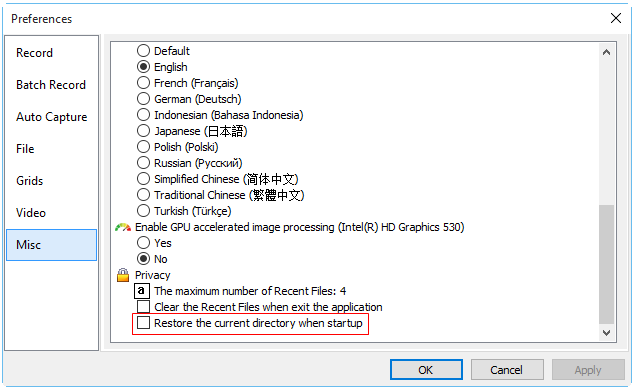
Image quality: If choosing Compressions as "JPEG", the Image quality can be adjusted by the slider bar. The values range between 0 and 100. Default value: 75;

Save these setting as defaults: When saving a file, the current settings will be saved as defaults for the next file save operation.

6.4.4 Option for the other formats

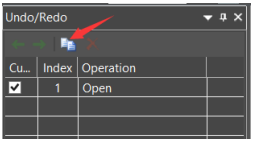
For Compuserve GIF (*.gif); PCX(*.pcx); Targa(*.tga); JBIG(*.jbg); FITS(*.fit) there is no Option.

Note: a) Detailed information of the above academic terminologies can be found in books about image processing and image compression or internet; b) The file saved directory can be restored for future use. To keep the directory unchanged when SkyCapture is started again, choose Options>Preferences••• command, click Misc page and check Restore the current directory when startup under the Privacy item.



6.5 Batch Save•••

The File>Batch Save••• menu will be enabled when a) an image is opened; b)an image is captured from the camera; c)an image window is created by choosing the File>Paste as New File command; d)an image window is copied from the Undo/Redo Sidebar with the copy button as show below:



6.5.1 Batch Save for a) style image window

If the image is modified, choosing the File>Batch Save••• command will save the file with its opened file name and file extension;

6.5.2 Batch Save for b), c) or d) style image window

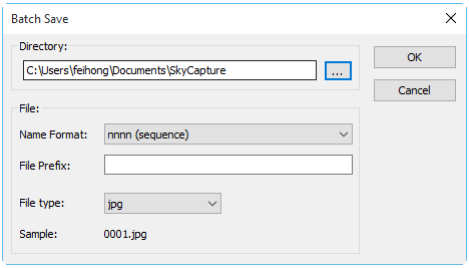
If the image window has been created with b), c) or d) style, choosing the File>Save As••• command to realize the file saving task will be time-consuming. The Batch Save••• command will runs File>Save As••• command with the name automatically specified according to the paradigm specified in the Batch Save dialog

To start the File>Batch Save••• command for b) style image window, you have to

1. Start the camera;

2. Snap at least an image first;

3. Choosing the File>Batch Save••• command will bring up a Batch Save dialog:



Directory: Enter the name of the drive and directory where your captured images will be saved. You may either type the path information, or use the Browse button to locate it from a standard Browse Folder dialog.

Name Format: The year, month, date, hour, minute and second or nnnn(sequence) are used to as part of the file name. If more files are saved with in a second, a (xx) suffix is attached to the end of Name Format to avoid the possible name conflict. For the nnnn(sequence) "Name Format", no suffix is needed.

File Prefix: Enter a file name prefix for Batch Save when generating files names for a series of images. This prefix will be combined with Name Format to form a final file name naming paradigm.

File Type: In this combobox, select the format you want the image to be saved (can be BMP, JPG, PNG, TIF, FIT). The parameters for encoding the file (For BMP or FIT format, there is no options). See Options>Preferences•••>File page, choosing the file format line and click Config••• button for more details. Or check the Options>Preference>File in Sec.14.1.4

Sample: The final file name is shown at the right of the Sample label for reference.

4. If the setting in the Batch Save dialog was finished, click OK button to begin the file batch save process or Cancel to cancel the Batch Save command and return to the application.

For the c) or d) style image window, only steps 3 and 4 are needed.

Note: a) In the process of the File>Batch Save••• command, the title on the image tab or image window will be modified with the file name paradigm in the Batch Save dialog. b) The File>Batch Save••• will perform no saving operation if the file is not modified or

unchanged.

6.6 Paste as New File

The File>Paste as New File menu will be enabled only when there is valid image data on the clipboard first (see the Edit>Copy menu). If there is no image data on the clipboard, the File>Paste as New File menu will be disabled.

Choose the File>Paste as New File command to place the contents of the clipboard image into a new image window, which becomes the active window.

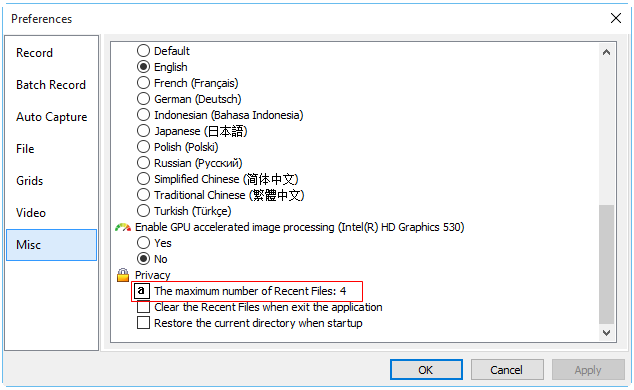
The new image type will be the same as that of the original image. SkyCapture will accept image data from other applications via the clipboard as long as it is in Windows Bitmap (DIB) format.

Note: SkyCapture will assign a digit to the Paste as New File command created image window's title bar.

6.7 Recent Files

SkyCapture maintains 4 (default) most recently opened document files under the Recent Files menu. Choosing one of these submenus will reopen that file immediately.

Note. a) The maximum number of Recent Files can be modified by choosing the Options>Preferences••• command and clicking the Misc page as shown below:



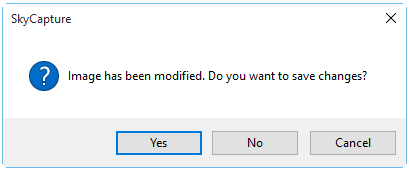
Here, clicking the 4 (default) edit box will allow you to enter the number of the Recent Files submenus that you want. The value ranges from 0 to 8, the default is 4; b) One can also check the Clear the Recent Files when exit the application to clear the Recent

Files after exit SkyCapture application.

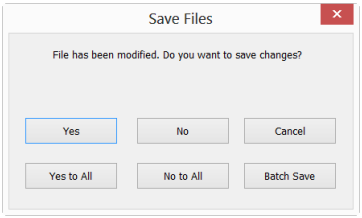
6.8 Exit

Choosing the File>Exit command will close the video window, all of the image windows and the Browse window. After all of the windows are closed, SkyCapture will end itself.

Note: If an image has been modified before attempting to Exit it, SkyCapture will issue a warning to ask if user want to save the image or not first.



If multiple images have been modified before attempting to Exit it, SkyCapture will issue Save Files dialog to direct the user to save changes in different ways.



See Window>Close All for details.

7 Edit

7.1 Cut Ctrl+X

The Edit>Cut menu will be enabled only when image file(s) in the Browse window is (are) selected.

7.1.1 Cut for the Browse window selected files

When the Browse window is active and the image files in the browse window are selected, the Edit>Cut command will be enabled. Choosing the Edit>Cut command will copy it to the clipboard. After the file(s) is(are) pasted, the file(s) will be deleted.

Note: The Edit>Cut command does not support image Cut operation in SkyCapture.

7.2 Copy Ctrl+C

7.2.1 Copy the selected area to the clipboard

In the video window or image window, choose the Edit>Copy command to Copy an video or image's selected area to the clipboard.

Note: When an image ROI is selected, the Edit>Copy menu will be enabled.

7.2.2 Copy for the Browse window selected files to the clipboard

When the Browse window is active and the image files in the Browse window are selected, the Edit>copy command will be enabled. Choosing the Edit>Copy command will then copy them to the clipboard.

Note: The copied files on the clipboard can be pasted into the Browse window by choosing the Edit>Paste or Browse>Paste shortcut command.

7.3 Paste Ctrl+V

If there is (are) image file(s) on the clipboard and the current active window is the Browse window, the Edit>Paste menu will be enabled.

7.3.1 Paste the clipboard files to the Browse window

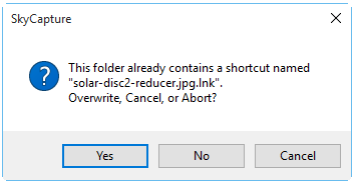
When the Browse window is active and the image files in the Browse window are selected, the Edit>Paste command will be enabled. Choosing the Edit>Paste command will paste the clipboard files to the Browse window.

Note: The Edit>Paste command does not support the image area Paste operation.

7.4 Paste Shortcut

This command is for the Browse window only. This menu will be enabled when files in the Browse window are selected and the Edit>Copy command is executed to copy the file shortcut to the clipboard. Choose this command will create the clipboard files Shortcut(in *.lnk format) in the current Browse window directory.

If the to be pasted *.lnk file has been existed in the current Browse window, SkyCapture will pop up a prompt dialog.



One can click Yes, No or Cancel to overwrite, abort or cancel the command.

7.5 Delete Delete

The Browse>Delete File menu will be enabled if the file(s) is (are) highlighted in the Browse window. This command is for the Browse window only.

You can Delete or remove one or more files from the Browse window. The steps are as follows:

7.5.1 For Browse Window file delete

1. Select one or more files by a) Clicking the displayed file icons, a single file will be highlighted; b) Clicking the file one by one with Ctrl + left mouse button, all of the clicked files will be highlighted; c) Clicking the displayed file icons, the first clicked file will be highlighted, clicking the end file with Shift + left mouse button, all of the files among the first and last will be highlighted. d) Dragging the mouse to draw a dotted line rectangle across the files you wish to delete, all of the files in the rectangle will be highlighted; e)Ctrl+A to select whole files in the Browse window.

2. a) Press the Delete key to delete the selected files; b) Click you right mouse button to bring up a context menu, choose the Delete command to delete the highlighted files.

A Confirm File Delete dialog will bring up.

In the Confirm File Delete dialog, click Yes to move the files to the desktop recycle bin, or No to cancel the Delete operation.

7.6 Image Select

The Edit>Image Select command can be used to mark ROI and Copy the selected ROI to the clipboard. This command is only used to select the image ROI.

Choosing the Edit>Image Select command will check this menu (or click on the toolbar will keep down) and the cursor will turn into "+". The ROI selection steps are described as below:

1. After the Edit>Image Select command is chosen, drag the mouse cursor across the image with the left button held down until the area is selected;

2. Release the left button and the area will be marked. Handles will appear on the area edge that will allow altering the selection after it is marked.

7.7 Select All Ctrl+A

7.7.1 Select all on the video/image window

When the video/image window is active, choosing the Select All command will select all pixels on the video/image within the canvas (shortcut: Ctrl+A).

7.7.2 Select all files in the Browse window

When the Browse window is active, choosing the Edit>Select All command will select all of the files in the Browse window under the specified directory in the Folders Sidebar.

7.8 Select None Ctrl+D

Deselect a) any selected area (ROI) on the image; b) the file listed in the Browse window.

7.8.1 Select None for video/image ROI

When a video or image area is selected, the Select None menu will be enabled. Choosing the Edit>Select None command will delete the dotted rectangle representing the

selected area (ROI).

7.8.2 Select None for Browse window

When the Browse window is active and the image files in the browse window are selected, the Edit>Select None command will be enabled. Choosing the Edit>Select None command will deselect all of the selected files in the Browse window.

8 View

8.1 Browse Ctrl+B

8.1.1 Open the Browse window

1. Choose the View>Browse menu or click the Browse toolbar button will open or active browse images under the specified directory in the Folders Sidebar;

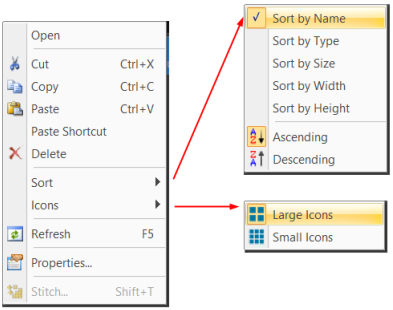
2. Click the Folders Sidebar to activate it and double-clicking the listed directory in the Folders Sidebar will create the Browse window.

After creating the Browse window, SkyCapture will display a Browse window that looks like windows explorer. The child window on the left part of the Browse window called Folders Sidebar is used to locate the directory on the hard disk. Images in the current directory are displayed in Large Icons or Small Icons mode on the right side of the Browse window.

Image file's order can be set in Ascending or Descending order according to Sort by Name, Type, Size, Width or Height et al.

8.1.2 Browse window right mouse button context menu

Clicking the right mouse button on the listed Icon in the Browse window will bring up a right mouse button context menu as shown below:



These context menu functions are described in

Edit>Cut Browse >Sort>Sort by Names Process>Stitch

Edit>Copy Browse >Sort>Sort by Type

Edit>Paste	Browse >Sort>Sort by Size
Edit>Paste	Browse >Sort>Sort by Width
Shortcut	Browse >Sort>Sort by Height
Edit>Delete	Browse >Sort>Ascending
	Browse >Sort>Descending
	Browse >Icon>Large Icons
	Browse >Icon>Small Icons
	Browse >Refresh
	Browse >Properties

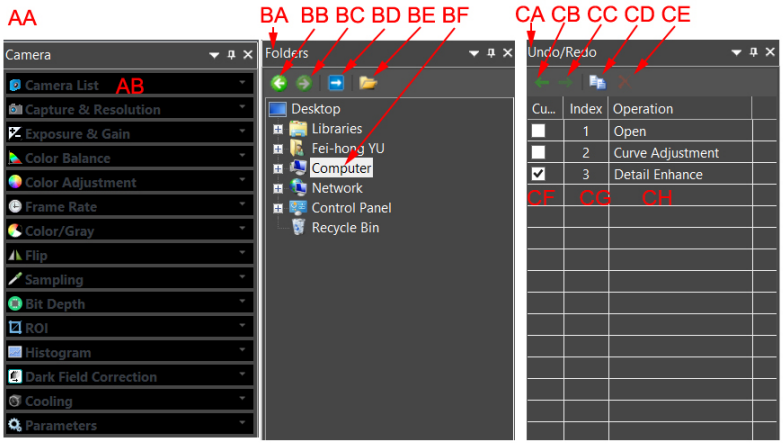
menus. Please check them for details.

Note: The Folders Sidebar and the Browse can be used to perform tasks such as creating new folders, renaming, moving, and deleting files. Individual file information and import data from digital cameras can also be displayed. Double-clicking the left mouse button on the icon will open the image as an active image in full size. See Image window GUI in Sec.3 for more details.

8.2 Sidebar

There are 3 Sidebars in the SkyCapture frame window in tabbed style. They are Camera Sidebar, Folders Sidebar and Undo/Redo Sidebar.

8.2.1 Sidebar overview



AA: Camera Sidebar;
AB: Camera Sidebar groups for the control of the camera.

BA: Folders Sidebar;
BB: Back to the previous folder;
BC: Forward to the next folder;
BD: Browsing the pictures under the application's file directory;
BE: Open the Browse window if it is not opened (Double-clicking on the selected directory will perform the same functions.);
BF: Folders to locate the Browse window's file directory.

CA: Undo/Redo Sidebar;
CB: Forward to the previous step;
CC: Backward to the next step;
CD: Operation Copy: Copy the highlighted operation in the Undo/Redo Sidebar to a new image window; User can also drag the selected operation in the Undo/Redo Sidebar to the window area to create a new image window;
CE: Remove the highlighted operations from the Undo/Redo list (This button will be enabled only when the operation(s) is (are) selected, the opened image(the first operation) cannot be removed;
CF: Indicating the Current operation displayed in the image window;
CG: Operation Index;
CH: Operation name.

8.2.2 Sidebar>Camera

The Camera Sidebar is mainly used for the control of camera, it includes many groups. Each group can be expanded by clicking the group name or the arrow button at the right of the group name.

Checking the Sidebar>Camera menu will activate/show it on sidebar group.

Please check Camera Sidebar in Sec.5 for details.

8.2.3 Sidebar>Folders

The Folders Sidebar is mainly used for the image Browse control.

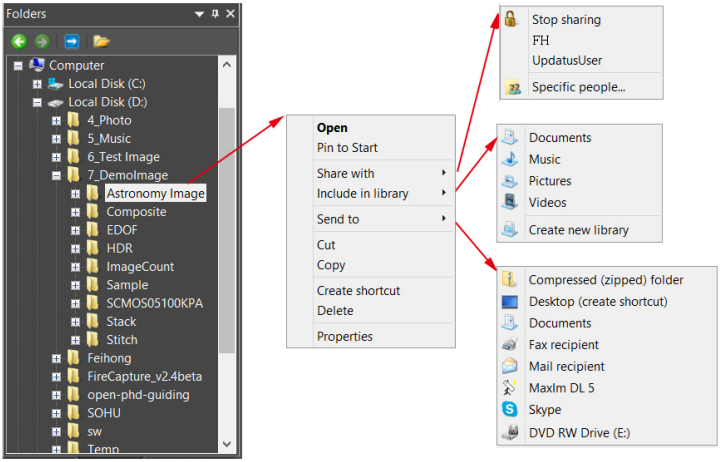
Checking the View >Sidebar>Folders menu will activate/show the Folders Sidebar.

Clicking its tree can navigate the file directories.

Double-clicking the directory in the Folders will create the Browse window. If there are image files under the directory that SkyCapture supports to Browse, the image files will be displayed in Large or Small icons mode.

Their orders can be set in Ascending or Descending styles according to Sort by Name, Type, Size, Width or Height et al.

Clicking the right mouse button on the directory will bring up the right mouse context menu as shown below:



Folders directory right mouse button context menu

This is the basic window explorer menu and will not be explained in this manual.

8.2.4 Sidebar>Undo/Redo

The Undo/Redo Sidebar is used to list the Undo/Redo operations for the Image and Process menus' command.

Checking the View>Sidebar>Undo/Redo menu will activate/show the Undo/Redo Sidebar.

8.3 Grid

The Grid menu has 5 submenus, they are:

8.3.1 Settings•••

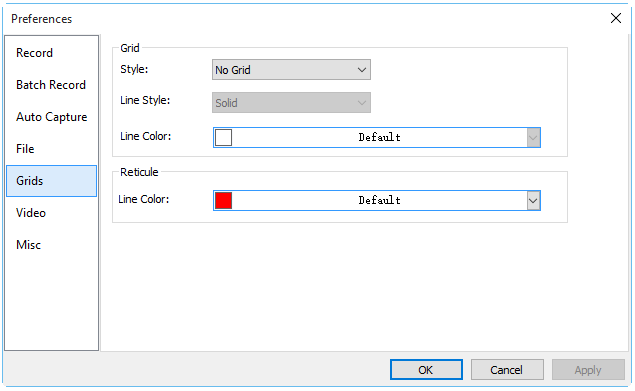
Choosing the View>Grid>Setting••• command, or choosing the Preference>••• command and clicking the Grids page realize the same function.

Choosing the Option>Preference>••• command and clicking the Grids page can set the Grid Style, Line Style, and Line Color for the Grid overlaid on the video and image window can also be set.

Style: The Grid Style can be No Grid, Auto Grid or Manual Grid. Default is No Grid;

Line Style: The Line Style for the grid can be Solid, Dash, Dot or DashDot et al. Default is Solid;

Color: The color of the grid line. Default is Red (255,0,0).



8.3.2 Grids>No Grids

Choosing this command will remove both Manual Grids and Auto Grids overlaid on the video/image window.

8.3.3 Grids>Auto Grids

Choose Grids>Auto Grids command to overlay the grids on the video/image automatically.

The Auto Grids can be set in the View>Grids>Setting••• menu.

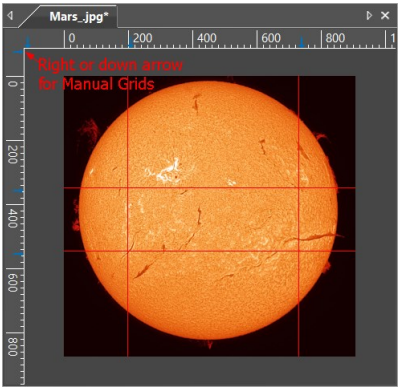
8.3.4 Grids>Manual Grids

Choosing this command will display two small Right Arrow and Down Arrow overlaid on

the top of the Vertical Ruler and on the left of the Horizontal Ruler as shown below:
Down Arrow: Move the mouse over the Down Arrow will show a horizontal drag icon. Drag the Down Arrow along the Horizontal Ruler to where ever you want. When it is dragging over the video/image, there will be a Vertical line appeared to let you judge where to release this line on the video/image. You can drag any lines to overlay them on the video/image.

The overlaid lines can be adjusted by dragging the specific Down Arrow again on Horizontal Ruler.

Right Arrow: Move the mouse over the Right Arrow will show a vertical drag icon. Drag the Right Arrow along the Horizontal Ruler to where ever you want. When it is dragging over the video/image, there will be a Horizontal line appeared to let you judge where to release this line on the video/image. You can drag any lines to overlay them on the video/image.



The overlaid lines can be adjusted by dragging the specific Right Arrow again on Vertical Ruler.

Choose the Grids>No Grid command to remove the Manual Grids overlaid on the video/image window. The menu will be checked.
Choose the Grids>Manual Grids command again (If it is unchecked) to display all the previous Manual Grids overlaid on the video/image window. The menu will be checked.

8.3.5 Grids>Remove All Grids

Remove (Delete) all of the Manual Grids or Auto Grids overlaid on the image/video window.

8.4 Best Fit Num *

Choose View>Best Fit command to automatically resize the video/image to fit in the window.

Note: Choosing this command will enable View>Actual Size menu.

8.5 Actual Size Num /

Note: This option will be disabled if the image is currently viewed at 100%. At any other zoom ratio, View>Actual Size will be enabled.

Choose View>Actual Size command to set the active image to its Actual Size (e.g. 100%).

8.6 Full Screen ESC

Choosing the View>Full Screen command will display the video window in full screen style. Press the ESC button will restore the video window.

8.7 Track

Note: If the video/image size is smaller than the window size. The track operation will be disabled.

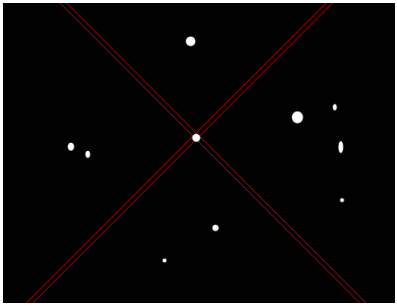
If the image's actual size is larger than the video/image window, check this command to position the video/image that does not fit entirely within in the video/image window. Its function is similar to the scroll bars. It is an alternative to using the arrows on the scroll bars for positioning the video/image within the window.

Checking the View>Track menu will change the cursor to and the button on the toolbar will be checked.

Then keep down the mouse button to drag the region of interest on the video/image to any location in the video/image window.

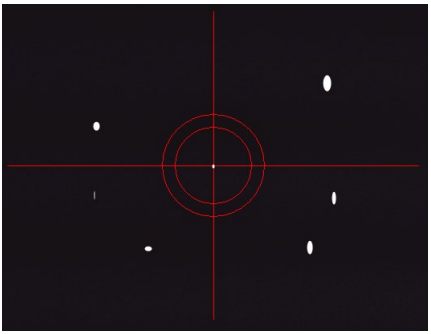
8.8 Crosshairs

Display the Crosshairs to locate the star in the video window. Click the left mouse button on the video window to move the Crosshairs to wherever interested.



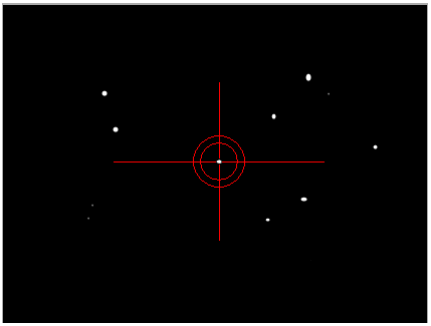
8.9 Circle

Display the Circle to locate the star in the video window. Click the left mouse button on the video window to move the Circle to wherever interested.



8.10 Circle with Hole

Display the Circle with Hole to locate the star in the video window. Click the left mouse button on the video window to move the Circle with Hole to wherever interested.



9 Browse

9.1 Sort

9.1.1 Sort>Sort by Names

This command is for the Browse window only.

Sort the image files in order of names in the Browse window.

9.1.2 Sort>Sort by Type

This command is for the Browse window only.

Sort the image files in order of file type in the Browse window.

9.1.3 Sort>Sort by Size

This command is for the Browse window only.

Sort the image files in order of file size in the Browse window.

9.1.4 Sort>Sort by Width

This command is for the Browse window only.

Sort the image files in order of image file width in the Browse window.

9.1.5 Sort>Sort by Height

This command is for the Browse window only.

Sort the image files in order of image file height in the Browse window.

9.1.6 Sort>Ascending

This command is for the Browse window only.

Sort the image files in order of the Ascending mode (i.e. 1, 2, 3 and 4) in the Browse window.

9.1.7 Sort>Descending

This command is for the Browse window only.

Sort the image files in order of the Descending mode (i.e. 4, 3, 2 and 1) in the Browse window.

The Sort settings are saved until they are changed. For example, if you sort images in the Browse window according to the Type, the images will remain sorted according to Type until the Sort settings are changed.

9.2 Icon

9.2.1 Icon>Large Icons

This command is for the Browse window only.

The Thumbnail mode displays small preview images; you can select different view modes in the Browse window.

Choosing the Icons>Large Icons will display the image files in Large Icon mode in the Browse window.

9.2.2 Icon>Small Icons

This command is for the Browse window only.

The Thumbnail mode displays small preview images; you can select different view modes in the Browse window.

Choosing the Icons>Small Icons will display the image files in Small Icon mode in the Browse window.

9.3 Refresh F5

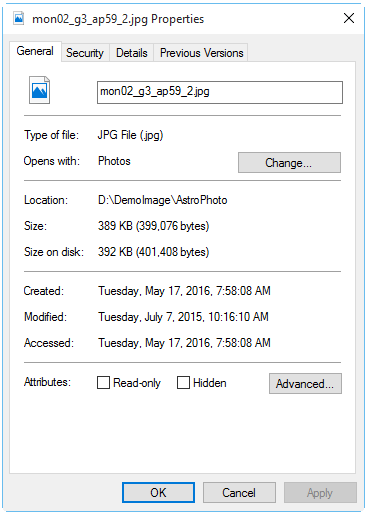
This command is for the Browse window only.

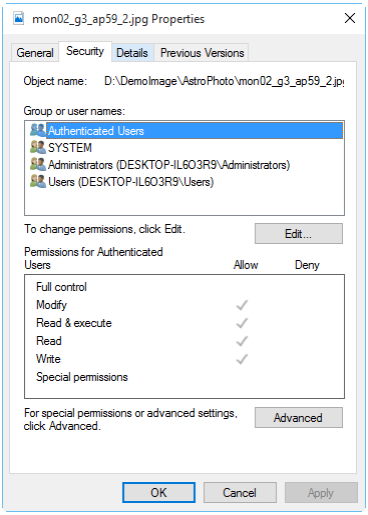
If the files under the Folders Sidebar's directory are altered outside of SkyCapture, after switch back to SkyCapture, one can Refresh the image files in the current directory to update the Thumbnails with Browse>Refresh command.

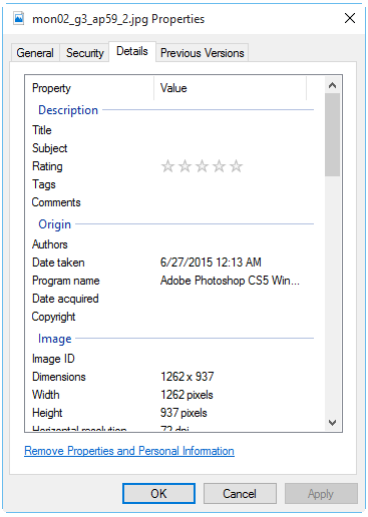
9.4 Properties●●●

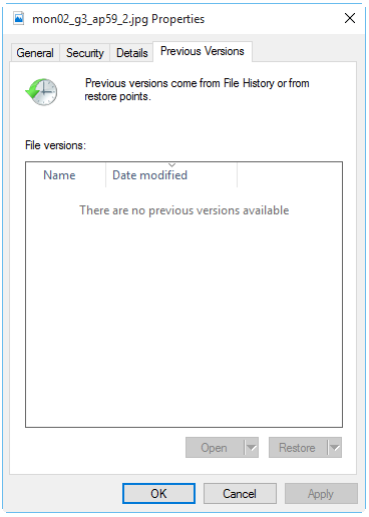
If an image file listed in the Browse window is highlighted. Choosing the Browse >Properties command or clicking the selected file in the Browse window with the right mouse button context menu Properties will bring up a Properties dialog as

shown below:









The file Properties dialog including 3 pages. They are General, Security and Details pages. These Property pages may depend on the operating system and we will not discuss it in this help manual.

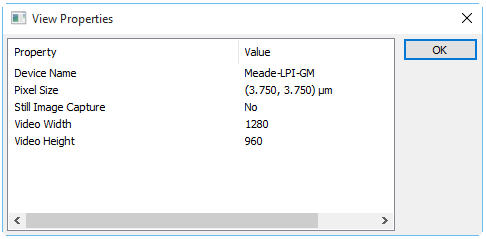
10 Setup

10.1 Start/Pause Pause

If the video in video window is playing, one can choose the Setup>Start/Pause command to pause the video and choose the Setup>Start/Pause command again to start the video again.

10.2 View Properties••• Shift+V

The Setup>View Property••• will help you to understand the camera hardware statistical properties. Choose the Setup>View Property••• command to invoke the View Property dialog as below:



The items in the dialog are described in the following:

Device Name: Readable string to identify the name of the camera device;

Pixel Size: The current camera pixel size;

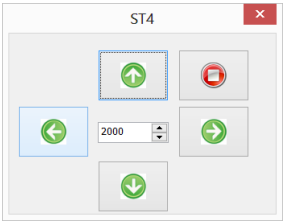
Still Image Capture: To identify whether or not the camera supports Still Image Capture. Still Image Capture is used for high resolution camera to capture an image with a different resolution from the video. This feature is mainly used to capture high resolution image under low resolution video to compromise between the frame speed and the image resolution;

Video Width: The actual video window video width;

Video Height: The actual video window video height;

10.3 ST4 Test

The Setup>ST4 Test command will invoke a ST4 dialog for the test of the guiding camera's ST4 port. Click the arrow key to test if it is OK. The central edit box can input the time for the test.

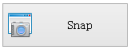


11 Capture

11.1 Capture Image F8

During the video preview, you can always choose the Capture>Image Capture command to capture the video image.

After the image is captured, the captured image will become the current active window. The Capture>Capture Image menu will be disabled. If you wish to capture image again, click the video window title to activate the video window and the Capture>Capture Image menu will be enabled again.

Note: a) The "Snap" button 

on the Camera Sidebar can continuously snap the image even if the video window is not activated. User can click this button on the Camera Sidebar to capture image in quick style; b) Only when the video window is active, the Capture>Capture Image menu will be enabled; c) If the Live and Snap resolutions are different, SkyCapture need to switch the resolution from Live to Snap resolution in the backstage to capture an image with Snap resolution. After the Snap is finished, SkyCapture will switch back to the Live resolution to continus the video stream process. This will take more time to capture a still image.

11.2 Auto Capture F7

Choosing the "Capture>Auto Capture" command or press the toolbar button will begin to capture the image from the video stream automatically.

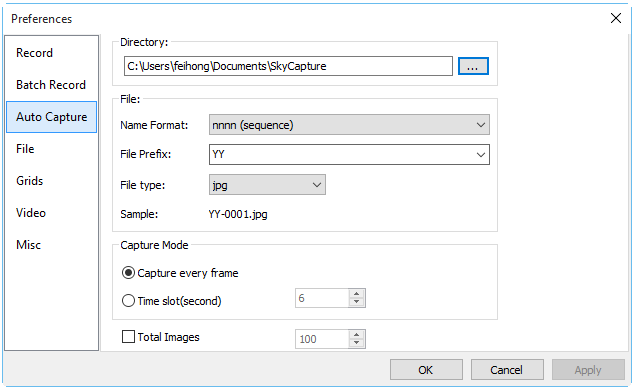
After begin to capture, the "Capture>Auto Capture" will changed to "Capture>Stop Capture" and the toolbar button will be checked.

Choosing the "Capture>Stop Capture" command or press the checked toolbar button will stop the auto capture process.

The "Capture>Stop Capture" menu will changed to "Capture>Auto Capture" and the

toolbar button will be unchecked.

The Auto Capture command needs to define some predefined parameters. This can be done in Options>Preferences•••>Auto Capture property page:



Directory: Enter the name of the drive and directory where the new image will be saved.

You may either type the path information, or use the Browse button to locate it from a standard Browse Folder dialog;

Name Format: The year, month, date, hour, minute and second or nnnn(sequence) are used as part of the file name. If more files are saved with in a second, a (xx) suffix is attached to the end of Name Format to avoid the possible name confliction. For the nnnn(sequence) Name Format, no suffix is needed.

File Prefix: Enter a file name prefix for Auto Capture when generating files names for a series of images. This prefix will be combined with Name Format to form a final file name according to the naming paradigm.

File Type: In this combobox, select the format in which you want the image to be saved (can be BMP, JPG, PNG, TIF, FIT);

Sample: The final file name is shown at the right of the Sample label for reference;

Capture every frame: Check this item will capture every frame in the video sequence;

Time Slot(second): Capture an image according to the time interval to (0-100S, default

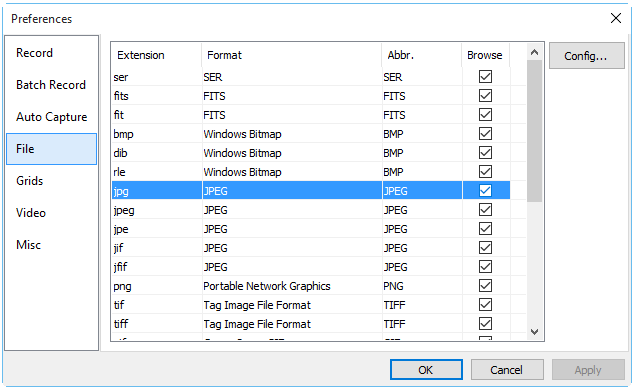
is 6);

Total Images: Checking Total Images will enable its edit box. You can enter the Total Images (1-9999, the default is 100) to be captured. SkyCapture will stop the Auto Capture process automatically when the Total Images are reached;

If Total Images is unchecked, SkyCapture will capture the images continuously until user choose the Capture>Stop Capture command again to stop the Auto Capture process.

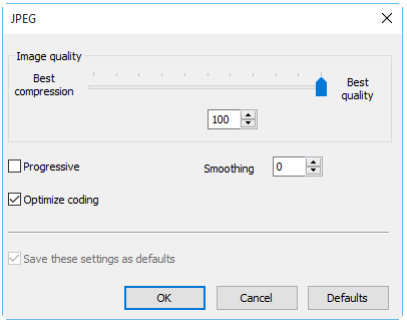
After the Auto Capture is started, the Capture>Auto Capture menu will be changed to the Capture>Stop Capture) menu. Choosing this command will stop the Auto Capture process.

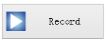
There are a variety of image format available (they are bmp, jpg, png, tif or fit) to save the captured image. For example, when choosing jpg format, the save options can be set in Options>Preferences•••>File property page. If the format has options need to be define, the Config••• button will be enable.



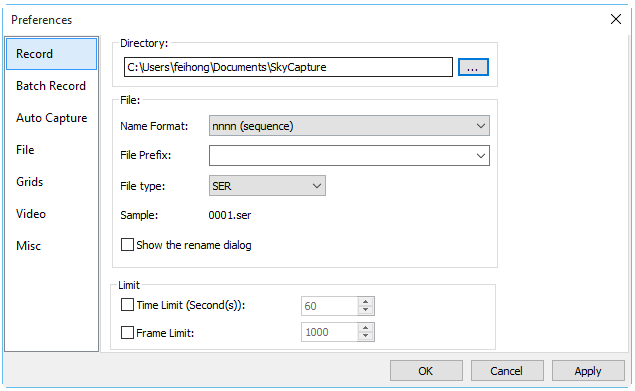
Clicking the Config••• button will pop up a dialog as bellow. Different format has different options.

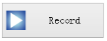
After all the parameters are set. Click OK will close the dialog and the parameters can be used for the Auto Capture command with no further setup to accelerate the capture process.



11.3 Start Record  F9

This command will begin to record the video according to the setup in Options>Preference>Record property page (See Sec.14.1.1)



1. You can a) choose the Capture>Start Record••• command; b) click "Record" button  on the Camera Sidebar ; c) use the shortcut key "F9" to start recording movies.

2. After the video record is started. The button on the Camera Sidebar will become . Clicking will stop the capture process, otherwise, it will stop untill the Time Limit in Options>Preference>Record page is

reached. After the video record process is finished. The

on the Camera Sidebar will become

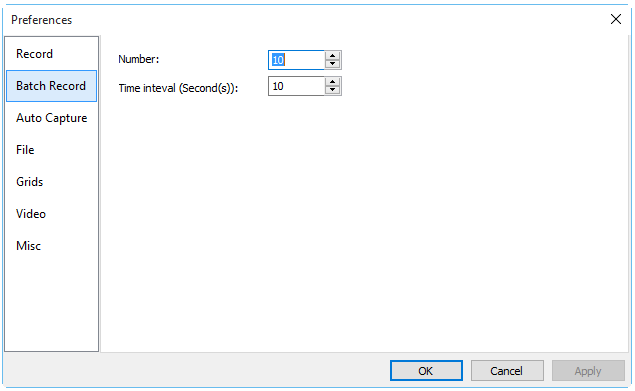
again for the future Record process;

User can choose the File>Open Video••• command to display the captured video file in the video window;

After the Capture>Start Record is in the process, the Capture>Batch Record or the Batch Record button on the toolbar will be disabled.

11.4 Batch Record (F10)

Begin to record the video in batch mode. This command will allow the user to record the video in a quick way. The Batch Record parameters is defined in the Options>Preferences•••>Record and Options>Preferences•••>Batch Record property pages (See Sec.14.1.1 and 14.1.2) for details.

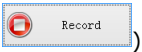


After the Batch Record is begin, the application will begin to record the 1st video until the stop condition is reached (see Options>Preferences•••>Record).

Then after the Time interval is reached in the Options>Preferences•••>Batch Record page, the application will begin to record the 2nd or the next video.

The Batch Record will stop until the Number is reached in the Options>Preferences•••>Batch Record page.

After the Batch Record is begin, the Capture>Start Record menu will changed to Capture>Stop Record menu (The

button on the Camera Sidebar will change to 

) and the Batch Record menu and toolbar button will be disabled. User can choose Capture>Stop Record menu or click the

button to stop the current recording process.

Note, this command will not stop the Batch Record process, after the condition of the Time interval in the Options>Preferences•••>Batch Record page is reached, the application will begin to record the next frame until the Number in the Options>Preferences•••> Batch Record page is reached.

To stop the whole Batch Record process, only when the previous record is stopped or finished and the next record does not begin, in this interval, the will be enable, click it will stop the whole Batch Record process.

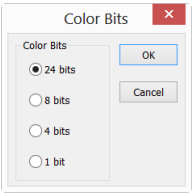
12 Image

12.1 Mode

12.1.1 Color Quantize•••

The Color Quantize••• command is widely used to change the image bit. SkyCapture supports the mutual changes among 24 bit, 8 bit, 4bit or 1 bit images.

When the Colour Bits dialog is opened, the default checked color bits is the current image's color bit. Check the desired bit and click OK to end the command. The image will converted to the selected color bits in the image window.



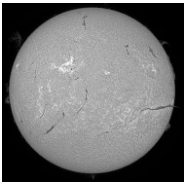
12.1.2 Gray Scale

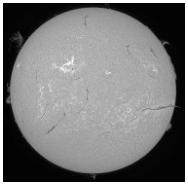
Choose the Gray Scale command to convert a color image (true color image or index color image) to a gray scale image. If the original image is 24 bit, the new image is 8 bit. Otherwise the bits of the image will not be modified.

12.1.3 Contrast Preserving Decolorization

Choose the Image>mode>Contrast Preserving Decolorization command can convert the color image into gray image with contrast preserved. The following pictures (a) is the original microscopic image, (b) is the gray image produced by traditional method, (c) is the gray image produced by Contrast Preserving Decolorization.

(a) Original microscopic image



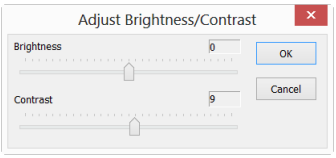


(b) Traditional method (c) Contrast Preserving Decolorization

12.2 Adjust

12.2.1 Brightness/Contrast•••

The Image>Adjustment>Brightness/Contrast••• command offers simple adjustments to the tonal range of an image. This command makes the same adjustment to every pixel in the image. The Brightness/Contrast command does not work with individual channels and is not recommended for high-end output because it can result in the loss of details about the image.



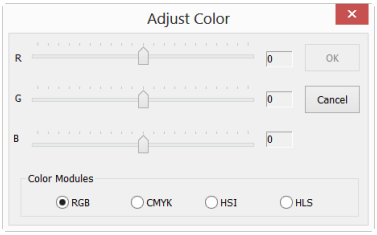
Brightness: Dragging the slider bar to the left decreases the level and dragging it to the right increases the level. The numbers on the right of the slider bar displays the Brightness value. Values can range from -100 to +100. Default is 0;

Contrast: Dragging the slider bar to the left decreases the level and dragging it to the right increases the level. The numbers on the right of the slider bar displays the Contrast value. Values can range from -100 to +100. Default is 0;

12.2.2 Color•••

Choose the Image>Adjustment>Color••• command to modify the overall mixture of the colors in an image.

There are four color modules: RGB, CMYK, HIS and HLS.

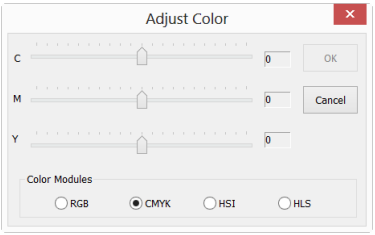


RGB: SkyCapture uses the RGB model. It assigns an intensity value to each pixel ranging from 0 (black) to 255 (white) for each of the RGB components in a color image. For example, a bright red color might have an R value of 246, a G value of 20, and a B value of 50. When the values of all three components are equal, the result is a shade of neutral gray. When the value of all components is 255, the result is pure white; when

the value is 0, pure black.

RGB images use 3 channels to reproduce up to 16.7 million colors on-screen. In addition to being the default mode for new SkyCapture images, the RGB mode is used by computer monitors to display colors. This means that when working in color modes other than RGB, such as CMYK, SkyCapture uses RGB mode for display on-screen. Although RGB is a standard color mode, the exact range of colors represented can vary, depending on the application or display device.

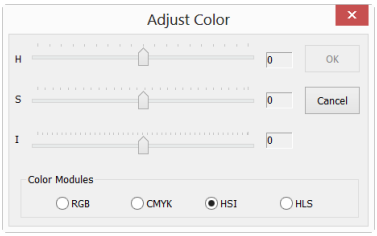
CMYK: The CMYK mode is based on the light-absorbing quality of ink printed on papers. As white light strikes translucent inks, certain visible wavelengths are absorbed while others are reflected back to the eyes.



In theory, pure cyan (C), magenta (M), and yellow (Y) pigments should combine to absorb all light and produce black. For this reason these colors are called subtractive colors. Because all printing inks contain some impurities, these three inks actually produce a muddy brown and must be combined with black (K) ink to produce a true black. (K is used instead of B to avoid confusion with blue.) Combining these inks to reproduce color is called four-color process printing.

The subtractive (CMY) and additive (RGB) colors are complementary colors. Each pair of subtractive colors creates an additive color, and vice versa.

HSI: Based on the human perception of color, the HSI model describes 3 fundamental characteristics of colors:

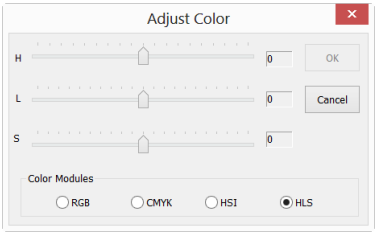


Hue is the color reflected from or transmitted through an object. It is measured as a location on the standard color wheel, expressed as a degree between 0° and 360°. In common use, Hue is identified by the name of the color such as red, orange, or green.

Saturation, sometimes called chroma, is the strength or purity of the color. Saturation represents the amount of gray in proportion to the hue, measured as a percentage from 0% (gray) to 100% (fully saturated). On the standard color wheel, Saturation increases from the center to the edge.

Intensity is the relative lightness or darkness of the color, usually measured as a percentage from 0% (black) to 100% (white).

HLS: The HLS model is very similar to the HLS color model. The main difference between them is the calculation used to produce the brightness value. In the HLS model, a pixel's brightness (L) is derived from its three (R, G and B) color values. In the HLS model, a pixel's brightness (L) is determined by the minimum and maximum values of its three color values.



The values beside the slider bar show the color changes in various color channels.

For RGB channel values, they are range from -100 to +100. Default is 0;

For CMYK channel values, they are range from -100 to +100. Default is 0;

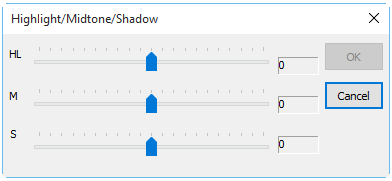
For HSI channel values, the H value can range from -180 to 180, the S value is range

from -275 to 275, and the I value is range from -442 to 442.Default is 0;

For HLS channel values, the H value is range from -180 to 180, the L value is range from -100 to 100, and the S value is range from -100 to 100. Default is 0;

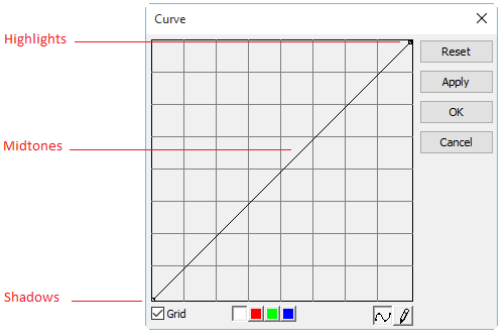
12.2.3 HMS•••

Choose the Image>Adjustment>HMS••• command to adjust the HL (Highlight), M (Midtone), and S(Shadow) parts of the image. Each part's value ranges from -100 to 100. This command is only available for 24 bits true color image.



12.2.4 Curve•••

Choose the Image>Adjust>Curve••• command to adjust the entire tonal range of an image. But instead of making adjustments using only three variables (Highlight, Midtone, Shadow), one can adjust any point on the curve along a 0-255 scale while keeping up to any other values constant. One can also use Curve to make precise adjustments for individual color channels on an image. The Curve dialog is shown below:



Horizontal Axis: The horizontal axis of the graph represents the original intensity values of the pixels (Input levels).

Vertical Axis: The vertical axis represents the new color values (Output levels). In the

default diagonal line, all of the pixels have identical Input and Output values.

Curve area: Area (specified with the blue rectangle) to setup a map between input and output;

a) When you open the Curve dialog you see, perhaps surprisingly, not a curve but a straight line. As a default, the input values are the same as the output, so there's no change;

b) By clicking in the center of the line and dragging upwards, we make our first curve. Raising the curve increases the overall brightness of the scene.

c) Conversely, clicking in the center and dragging downwards lowers the brightness, producing an image that's darker overall;

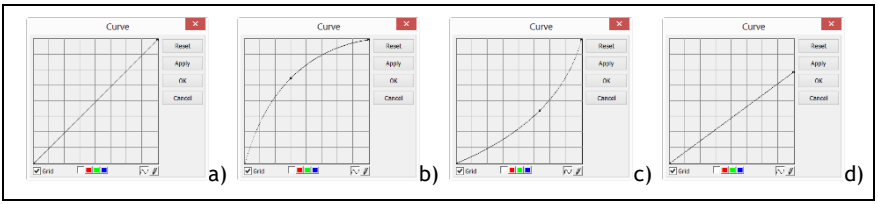
d) As well as clicking in the center, we can also adjust the endpoints. Clicking the top right point and dragging down limits the brightest part of the image, reducing contrast.

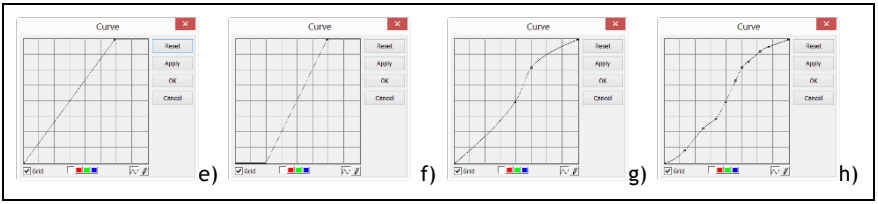
e) If we drag that top right point to the left rather than down, we produce the opposite effect—increasing the contrast of the image. This is a very useful and controllable quick fix;

f) By dragging the top and bottom points towards the center, we create a stylized, posterized effect that turns any photograph into more of a graphic object.

g) Click once in the center of the RGB curve to "pin" that midpoint; now drag just the top half of the curve to make this S shape, and the result is to increase the overall contrast.

h) You can add up to any control points to the curve, locking those values. To remove a control point, 1)drag it off the graph or 2)click the right mouse button on that point. You cannot delete the endpoints of the curve.





Grid: Check to overlay the grid on the Curve window;

Channel : To adjust the color balance of the image, check the channel(R, G or B) from the Channel button. Check the white button to select RGB channels at the same time, which is located on the left of the R (Red), G (Green) and B (Blue) buttons;

Curve : Click the Curve with your left mouse button, a spline curve (straight line) will setup the initial input-output relation. Click on the Curve will mark the Curve with a point. The point number can be any as long as it can be inserted on the Curve. Drag the marked point until the image looks satisfactory. The point can be deleted by move the mouse on it and click the right mouse button on it.

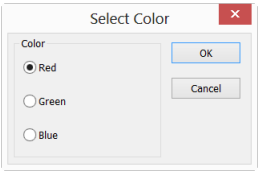
Pencil : Check the pencil button at the bottom of the dialog, and use your left mouse button to draw a new arbitrary Curve in the Curve area.

Reset: Click the Reset button will reset the Curve to the initial straight line.

Apply: Apply current Curve map on the image.

12.2.5 Filter Color•••

Choose the Image>Adjustment>Filter Color command to filter a special color channel from a color image. Check either Red, or Green, or Blue color to filter. For every pixel, if check Red color to filter, only information about the red channel will be discarded, and Green and Blue information will remain there.

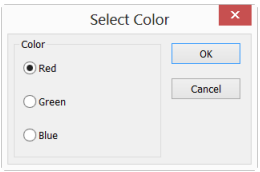


See Image>Extract Color••• for another color operation.

12.2.6 Extract Color•••

Choose the Image>Adjustment>Extract Color••• command to extract a special color channel from a color image. Check either Red or Green, or Blue color to extract.

For every pixel, if selecting Red color to extract, only information about the red channel will be kept, and Green and Blue information will be discarded.



See Image>Filter Color••• for another color operation.

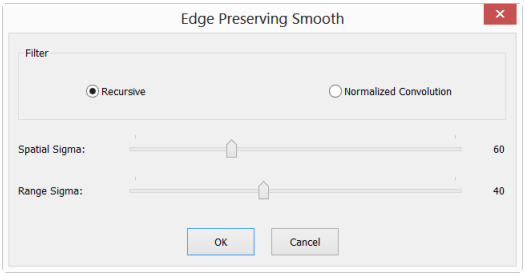
12.2.7 Invert

Choose the Image>Adjustment>Invert command to reverse the pixel values of the active image without going through the lookup table.

12.2.8 Edge Preserving Smooth•••

Edge Preserving Smooth is an image processing technique that smooth away textures whilst retaining sharp edges. Examples are the Bilateral filter, the Guided filter and Anisotropic diffusion.

Choose the Image>Adjust>Edge Preserving Smooth••• command can smooth the entire image and preserve the edge of image, as shown below:

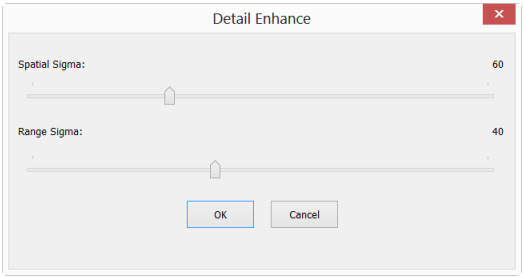


Edge Preserving Smooth function provide two kinds of filter including Recursive and Normalized Convolution filter, and the default filter is Recursive.

SkyCapture use Spatial Sigma and Range Sigma to define the filter kernel size. The bigger the two parameters, the stronger the image smoothed, vice versa.

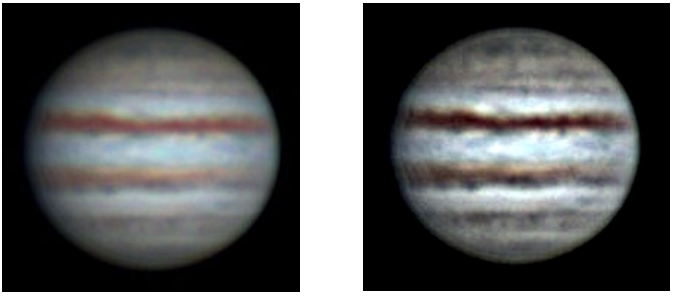
12.2.9 Detail Enhance•••

Choose the Image>Adjust>Detail Enhance••• command can enhance the detail in the image, as shown below:



SkyCapture choose Spatial Sigma and Range Sigma to define the kernal size of detail enhance algorithm. The bigger the 2 parameters, the stronger the enhanced image and vice versa.

The following picture is the detail enhanced image for reference with default parameter.



a)Original image and b)Enhanced image

12.3 Rotate

Choose the Image>Rotate command to rotate the entire image. One has the following submenus:

12.3.1 90(CW)

Rotate the image clockwise by a quarter-turn.

12.3.2 180(CW)

Rotate the image clockwise by 180 degrees.

12.3.3 270(CW)

Rotate the image clockwise by 270 degrees.

12.3.4 Arbitrary•••

Rotate the image by a specified angle. If choosing this option, enter an angle between 0 and 360 degrees in the angle text box, and check CW or CCW to rotate clockwise or counterclockwise. For the Arbitrary••• operation, it will invoke an Image Rotate dialog like below:

Degree: The degree that the image to be rotated.

CW: Rotates the image clockwise.

CCW: Rotates the image counterclockwise.

Quality: One can select one of the three methods for the image rotation among Nearest Neighbor, Bilinear, and Bicubic. The default is Bilinear.

12.3.5 Flip Horizontal

Reverses the image in the application area so that the top right corner of the original image is now the top left, and the top left corner of the original image is now the top right corner.

12.3.6 Flip Vertical

Reverses the image in the application area so that the top right corner of the original image is now the bottom right corner, and the top left corner of the original image is now the bottom left corner.

12.4 Crop Shift+C

Choose the Image>Crop command to remove the portions of an image that does not

want so that the focus is on the part of the image that is left. This document instructs users on how to Crop an image in SkyCapture.

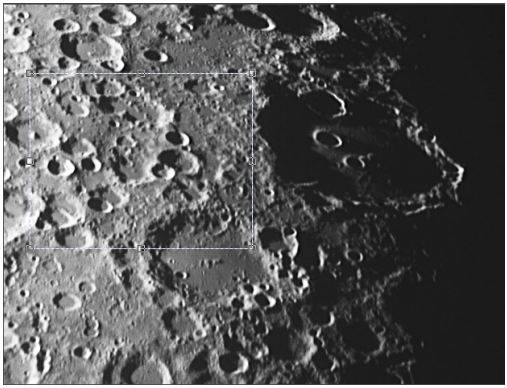
1. Choose the Open Image••• command to open an image to Crop;

2. Choose the Edit> Image Select command or click the Image Select button on the Toolbar, the cursor will change to a small cross.

3. Move the cursor over the image to the desired location, click the mouse button and hold it down to mark the first position.

4. Drag the mouse over the part of the image to be kept, a dotted rectangle appears around the selection and release the left mouse button.

5. Optional 1: To move the rectangle: a) Move the mouse over the selected area and when it becomes a move cursor, click and hold the left mouse button;b) Drag the selected area to the desired position.



6. Optional 2: To change the size of the rectangle: a) Put the mouse cursor on one of the handles that appear on the edges of the selected area; b) Click and hold the mouse button; c) Drag the box to the desired size.

Note: Each of the handles that appear on the edges of the box sizes the box differently.

7. To Crop the image, choose the Image>Crop command or press Shift+C buttons.

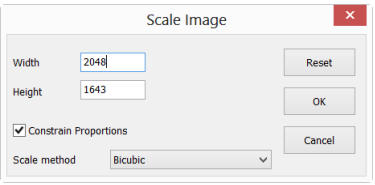
Note: If the selected area is on the video, choosing the Image>Crop command will

capture the selected area and display it on a new image window.

12.5 Image Scale•••

Choose the Image>Image Scale••• command to change the image to a specified size. This process actually changes spatial resolution by adding (replicating) or removing (decimating) pixels to achieve the specified dimensions.

Width and Height: When choosing the Image Scale command; the dialog displays the dimensions of the original image in pixels. The Width and the Height can be set on the new image by adding or removing pixels. If Constrain Proportions is checked, the Width and Height will stay proportionate to each other. If Constrain Proportions is unchecked, the Width and the Height can set independently, but this will distort the image.



Reset: Reset the image Width and Height to the original ones.

Constrain Proportions: To maintain the current proportions of pixel Width and Height, check Constrain Proportions. This option automatically updates the Width as the Height is modified, and vice versa. Otherwise, uncheck the Constrain Proportions button.

Scale method: There are 3 options for the Scale method. They are: Nearest Neighbor, Bilinear, and Bicubic. The default is Bilinear.

12.6 Histogram••• Shift+H

A Histogram illustrates how pixels in an image are distributed by graphing the number of pixels at each color intensity level. The Histogram shows whether the image contains enough detail in the Shadows (shown in the left part of the Histogram), Midtones (shown in the middle), and Highlights (shown in the right part) in order to make a good correction.

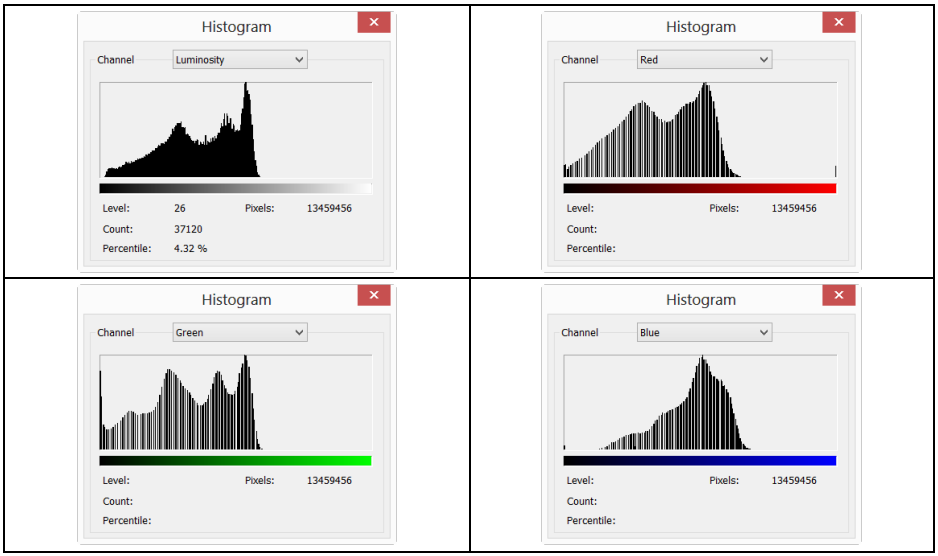
The Histogram also gives a quick picture of the tonal range of the image, or the image

key type. A low-key image has detail concentrated in the shadows, a high-key image has detail concentrated in the highlights, and an average-key image has detail concentrated in the Midtones. An image with a full tonal range has a number of pixels in all areas. Identifying the tonal range helps determine the appropriate tonal corrections.

Choose the Image>Histogram••• command to open the Histogram dialog as shown below.

Depending on the image's color mode, choose R, G and B, or Luminosity to view a composite Histogram of all the channels.

If the image is RGB true color, choose Luminosity to display a Histogram representing the luminance or intensity values of the composite channel.



If the image is RGB true color, choose R, G and B to display a composite Histogram of the individual color channels in color.

Do one of the following:

To view information about a specific pixel value, place the mouse pointer in the Histogram.

To view information about a range of values, click down the left mouse button and drag it in the Histogram to highlight the range.

The dialog displays the following statistical information below the Histogram:

Pixels: Represents the total number of pixels used to calculate the Histogram.

Level: Displays the intensity level of the area underneath the pointer.

Count: Shows the total number of pixels corresponding to the intensity level underneath the pointer.

Percentile: Displays the cumulative number of pixels at or below the level underneath the pointer. This value is expressed as a percentage of all of the pixels in the image, from 0% at the far left to 100% at the far right.

13 Process

13.1 Stitch••• Shift+T

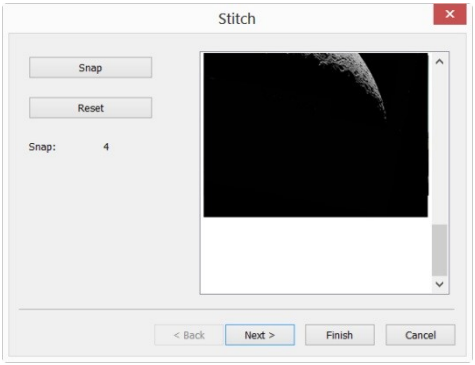
Image stitching or photo stitching is the process of combining multiple photographic images with overlapping fields of view to produce a segmented panorama or high-resolution image. Commonly performed through the use of computer software, most approaches to image stitching require nearly exact overlaps between images and identical exposures to produce seamless results. Some digital cameras can stitch their photos internally. Image stitching is widely used in today's world in applications such as "Image Stabilization" feature in camcorders which use frame-rate image alignment, high resolution photo mosaics in digital maps and satellite photos, medical imaging, multiple image super-resolution, video stitching and object insertion.

SkyCapture also integrated this function into it. It includes Video Stitch, Image Stitch and Browse Window Stitch.

13.1.1 Video Stitch

When the video window is active, choosing the Process>Stitch••• command will invoke the video Stitch dialog as below:

Capture Images



Snap: Click to capture image from camera. One should try to move the slide to a prop position to capture the desired images. In the moving process, the next image should have some overlaid area with the previous left or up image to ensure the success of the stitching process.

Reset: When an image or images is or are captured, the Reset button will be enabled, click Reset will remove it or them from the memory; It will be disabled when there is no captured image;

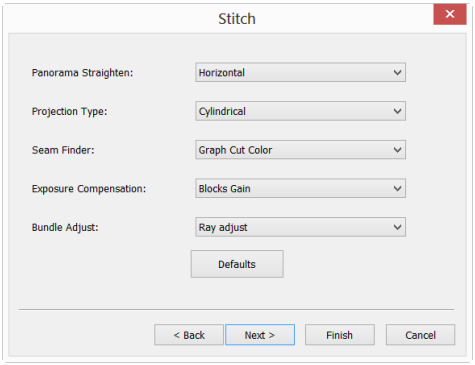
Snap: The captured images from the camera;

Cancel: Click to cancel the stitching process;

Next>: Click Next> will step to the next step;

Finish: Click Finish will accept the other Default setup and begin to stitch the captured images according to the above setup.

Stitching Method



Panorama Straighten: The image stitching direction. It can be Horizontal, Vertical and None. Default is Horizontal;

Projection Type: For image segments that have been taken from the same point in space, stitched images can be arranged using one of various map projections. SkyCapture including Plane, Cylindrical, Spherical, Fisheye, Stereographic, Mercator or Transverse Mercator map projections. The Default is Cylindrical;

Seam Finder: Seam Finder method, SkyCapture including None, Voronoi Diagram, Graph Cut Color or Graph Cut Color Grad. Default is Graph Cut Color;

Exposure Compensation: Exposure Compensation is required between images to minimize exposure differences. SkyCapture including None, Gain or Blocks Gain

Exposure Compensation method. Default is Blocks Gain;

Bundle Adjust: Bundle Adjustment can be defined as the problem of simultaneously refining the 3D coordinates describing the scene geometry as well as the parameters of the relative motion and the optical characteristics of the camera(s) employed to acquire the images, according to an optimality criterion involving the corresponding image projections of all points. SkyCapture including Ray adjust or Reprojection error adjust method. Default is Ray adjust;

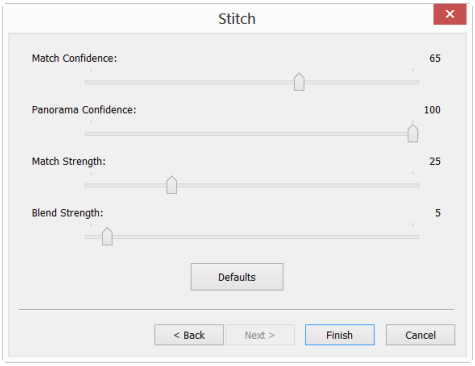
<Back: Click <Back will return to the previous setup page;

Next>: Click Next> will step to the next step;

Finish: Click Finish will accept the other Default setup and begin to stitch images according to the above setup;

Cancel: Click to cancel the stitching process;

Stitching Parameter



Match Confidence: 1~100, Default is 65;

Panorama Confidence: 1~100, Default is 100;

Match Strength: 0~100, Default is 25;

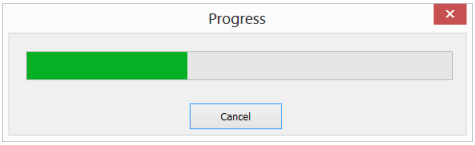
Blend Strength: 0~100, Defaults is 5;

Defaults: Click Defaults will set all the parameters to the Default ones.

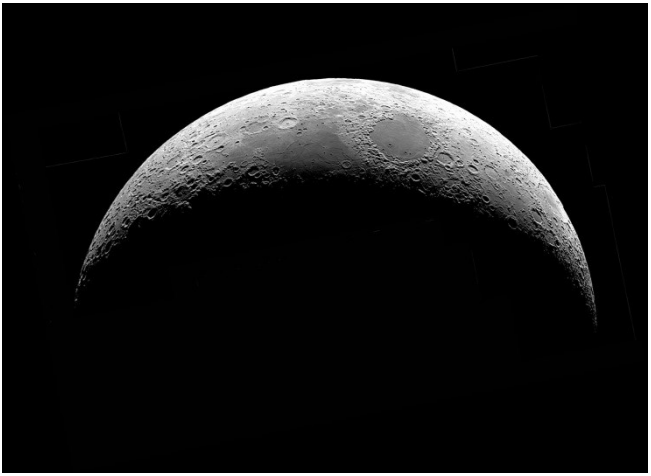
<Back: Click <Back will return to the previous step;

Finish: Click Finish will begin to stitch images according to the above setup. After the Finish button is clicked, SkyCapture will start to stitch and a progress dialog will be shown to indicate the progress of the process.

Cancel: Click to cancel the stitching process;



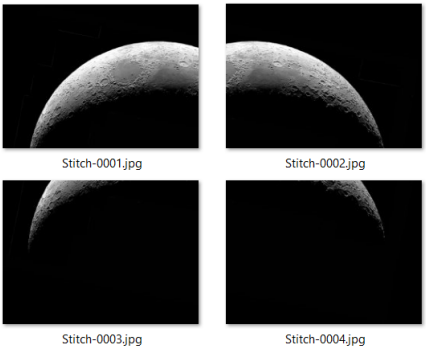
The final stitched image will be created in a new image window..



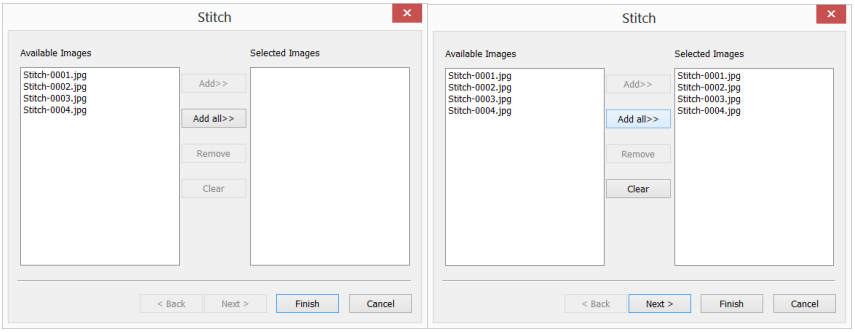
In the stitched image, there are some black areas; these are happened when there are translations among the edge images in both directions.

13.1.2 Image Stitch

If images are opened in SkyCapture, for example 0001.jpg, 0002.jpg, 0003.jpg, 0004.jpg are opened as shown below:



Choosing the Process>Stitch command will invoke the image Stitch dialog as shown below:



a) Available Images and b) Selected Images

Available Images: The images opened by SkyCapture；Here, 4 images are listed in the list box. One can click the image file name to select the files to be added to the Selected Images;

Selected Images: The images selected for stitching；Using Add>> to add the Available Images to this list box;

Add>>: When an image or images is or are selected and highlighted in the Available Images window, the Add>> will be enabled. Click Add>> will add it or them into the Selected Images list box；

Add All>>: Click Add All>> will add all of the Available Images into the Selected Images list box;

Remove: When an image or images is or are selected and highlighted in the Selected Images list box, the Remove button will be enabled, click Remove will remove it or them from the Selected Images list box;

Clear: Used to clear all of the images in the Selected Images list box. When no image in the Selected Images list box, it will be disabled;

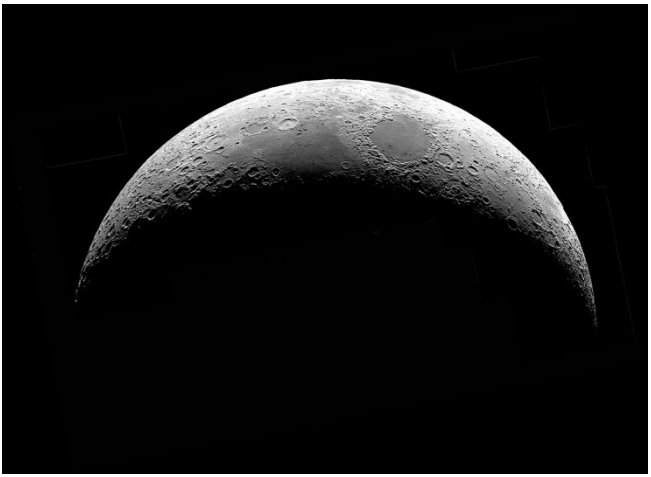
Cancel: Click to cancel the stitching process;

Finish: Click Finish will accept the other Default setup and begin to stitch the captured images according to the above setup;

Next>: Click Next> will step to the next step;

The other Next> steps are just the same as those of the Video Stitch process.

The final stitched image will be created in a new image window as shown below:



The Stitched image

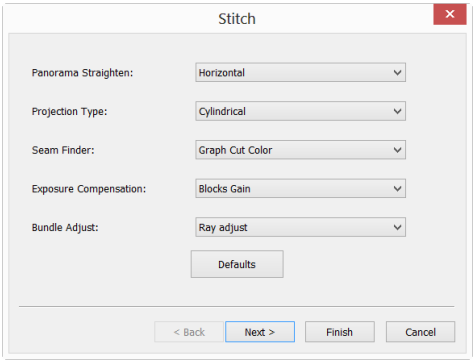
In the stitched image, there are some black areas; these are happened when there are translations among the edge images in both directions.

13.1.3 Browse Window Stitch

Click the Folders Sidebar to activate it. Double-click the right directory to show the images under the directory in the Browse window. Choosing the image files to be

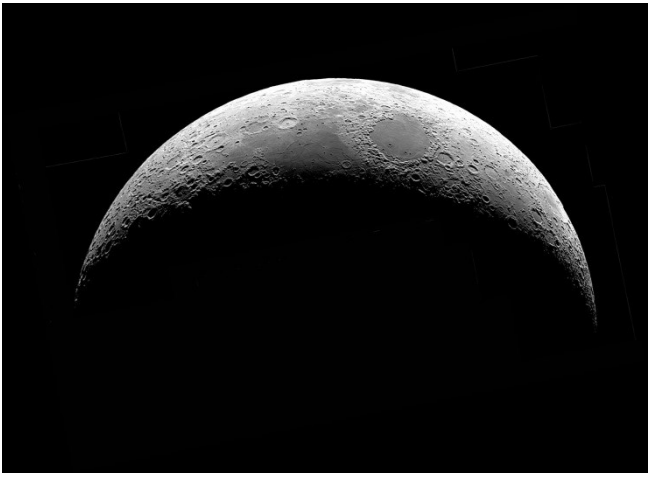
stitched and then clicking the right mouse button will display the context menu, choose the Stitch submenu to start the image stitch operation (One can also choosing Process>Stitch to do the same operation after the files are selected in the Browse window)

After the Stitch command is selected, a dialog called Stitch will pop up as shown below.



The Stitch dialog and the other Next> steps are just the same as those of Video Stitch. The final stitched image will look like below:

In the stitched image, there are some black areas; these are happened when there are translations among the edge images in both directions.



The stitched image

13.2 Denoise

SkyCapture provides 3 types of noise removal methods, Adaptive Wiener Filter, Bilateral Filter, Non Local Means. The processing speed of the 3 methods is from fast to slow, and the denoising quality is getting better and better. Each method is described in detail in the following:

13.2.1 Adaptive Wiener Filter

The Adaptive Wiener Filter can preserve more image details than those of median filter, mean filter, Gauss filter. The effect is more remarkable for additive noise (such as Gaussian noise) and multiplicative noise (such as Poisson noise).

For the Adaptive Wiener Filter algorithm, please find the details in the relevant literatures, here only to illustrate the improvement of Adaptive Wiener Filter over the classical Wiener filter.

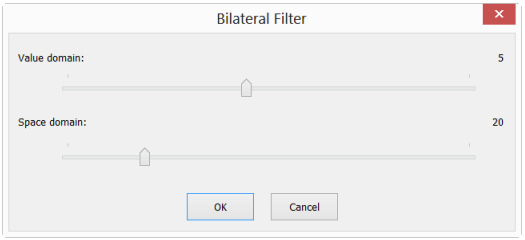
In the classical Wiener filter, the image noise intensity requires the user to manually input, but it is difficult to accurately enter the accurate value even for experienced users, because the value is usually very small, such as 0.0036781. Therefore in the development of the Adaptive Wiener Filter, the noise level is automatically calculated according to the image mean variance.

The process is quite simple, open an image, choose the Process>Denoise>Adaptive Wiener Filter to denoise the image.

13.2.2 Bilaternal Filter•••

The Bilateral Filter is a nonlinear filtering method that considers image spatial proximity, pixel value similarity, image spatial information and gray level similarity to achieve the purpose of edge preserving denoising. The Bilateral Filter has the simple, non-iterative, local characteristics. The Bilateral Filter is good to preserve image edge compare with Wiener filter or Gauss filter.

Choosing Process>Denoise>Bilateral Filter••• will pop-up dialog called Bilateral Filter as shown below:



Value domain: the range of neighborhood pixel in radius for considering, the greater the value, the slower process speed.

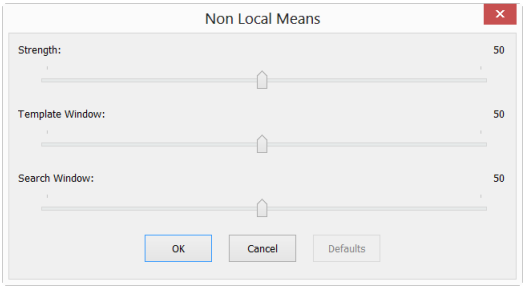
Space domain: Sigma value, the higher the value, the more effective the denoising effect.

13.2.3 Non Local Means•••

The traditional local mean filter is a pixels average method around the target pixel, but the Non Local Means is a weighted average method to average all of the image patches over the search window. The weight is determined according to the similarity between the target patch and neighborhood patches in the search window.

Compared to other famous denoising algorithms, such as Gaussian, Wiener filter, total variation and wavelet denoising, The Non Local Means method can get better effect.

Choosing Process>Denoise>Non Local Means••• will pop-up dialog called Non Local Means as shown below:



Strength: The denoising strength, the greater the value, the more removal the image noise, but will lose more details;

Template Window: The template block size, used to calculate the weight, the

recommended default value is 7;

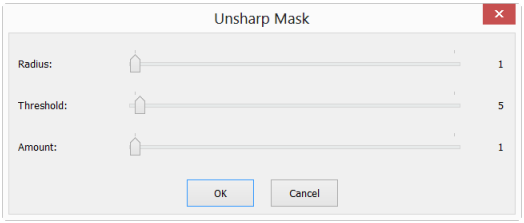
Search Window: The template patch search window size, used to calculate the weighted average value among image patches. Large value will increase the processing time. The recommended default value is 21.

13.3 Sharpen

13.3.1 USM•••

UnSharp Masking (USM) is an image sharpening technique, often available in digital image processing software. The "unsharp" of the name derives from the fact that the technique uses a blurred, or "unsharp", positive image to create a mask of the original image. The unsharped mask is then combined with the negative image, creating an image that is less blurry than the original one.

Open an image and then choose Process>Sharpen>USM••• command, a dialog will pop up as below.

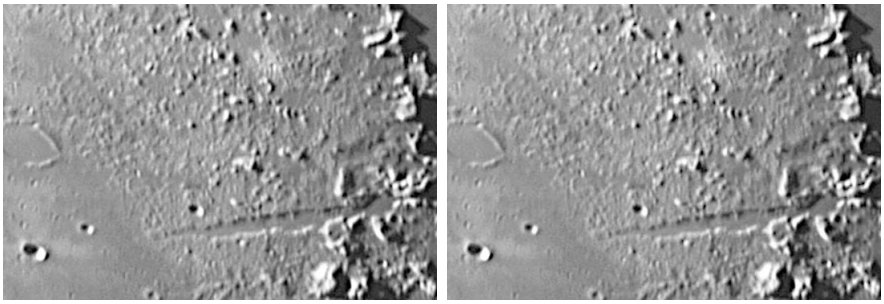


Radius: Affects the size of the edges to be enhanced, so a smaller radius enhances smaller-scale detail. Higher Radius values can cause halos at the edges. As a result, fine detail needs a smaller Radius. In addition, Radius and Amount interact; reducing one allows more of the other.

Threshold: Controls the minimum brightness change that will be sharpened. This parameter is important to prevent smooth areas from becoming speckled. The threshold setting can be used to sharpen more-pronounced edges, while leaving subtler edges untouched. Low values should sharpen more because fewer areas are excluded. Higher threshold values exclude areas of lower contrast.

Amount: is listed as a percentage, and controls the magnitude of each overshoot (how much darker and how much lighter the edge borders become). This can also be thought

of as how much contrast is added at the edges. It does not affect the width of the edge rims.

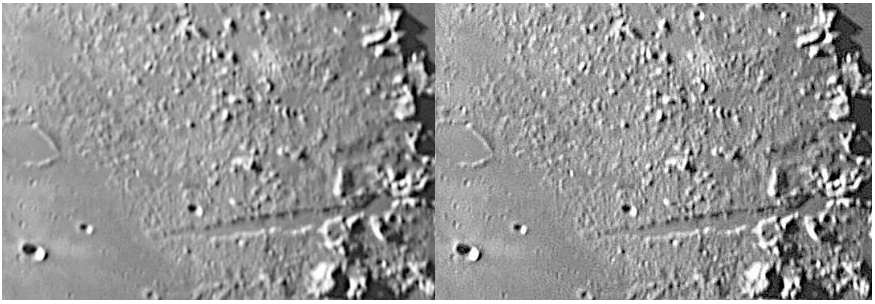


a) Original image; b) Sharpened image

13.3.2 Laplacian Sharpen

The Laplacian operator is an example of a second derivative method of enhancement. It is particularly good at finding the fine detail in an image. Any feature with a sharp discontinuity (like noise, unfortunately) will be enhanced by a Laplacian operator. Thus, one application of a Laplacian operator is to restore fine detail to an image which has been smoothed to remove noise.

Open an image and then choose Process>Sharpen>Laplacian Sharpen, no parameter is required for this method.



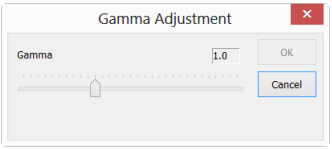
a) Original image; b) Sharpened image

13.4 Color Toning

13.4.1 Gamma•••

The Process>Color Toning>Gamma••• measures the brightness of midtone values

produced by a device (often a monitor). A higher gamma value yields an overall darker image.



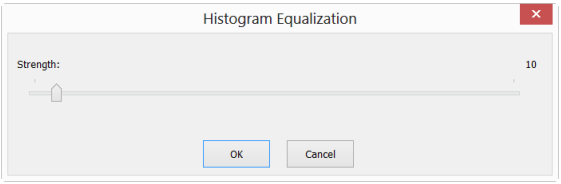
Preview: Check this button to display the real-time effects when one changes the slider bar's position. Default is checked;

Gamma: Dragging the slider bar to the left decreases the level, while moving it to the right increases the level. Values can range from 0 to 3.0. Default is 1.0.

13.4.2 Histogram Equalization••• Shift+Q

Adaptive histogram equalization (AHE) is a computer image processing technique used to improve contrast in images. It differs from ordinary histogram equalization (HE) in the respect that the adaptive method computes several histograms, each corresponding to a distinct section of the image, and uses them to redistribute the lightness values of the image. It is therefore suitable for improving the local contrast. However, AHE has a tendency to over amplify noise in relatively homogeneous regions of an image. A variant of adaptive histogram equalization called contrast limited adaptive histogram equalization (CLAHE) prevents this by limiting the amplification.

Please open an image and then choose Process>Color Toning >Histogram Equalization•••, a dialog should pop up as follows.



Strength: The Strength will affect the enhancement effect. The larger the value, the more obvious the effect.

a) Original image; b) Enhanced image

13.4.3 LCC•••

The Local Color Correction algorithm is computed in two steps:

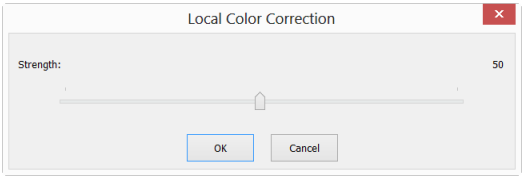
A mask image is computed from the input image.

The mask image is computed from the intensity component of the color image, defined as the average of R, G and B values i.e. I=(R+G+B)/3. The use of intensity information avoids distortions of the chroma. The mask image is obtained by inverting and then blurring the intensity component of the input image.

The input and mask images are combined to get the result.

The combination operation consists of a power function, where the exponent is computed using the mask value previously found. If the mask value is greater than 128, it will result in an exponent less than 1, while if the mask value is lower than 128, it will result in an exponent greater than 1. Moreover, if the mask value is precisely 128, the exponent will be 1, and it will have no effect on the input image. The operation is equivalent to a pixel-wise gamma correction.

Please open an image and then choose Process>Color Toning >LCC•••, a dialog should pop up as follows.



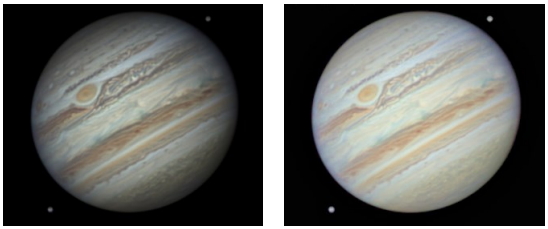
Strength：The strength will affect the enhancement effect. The larger the value, the more obvious the effect. Range:1~100, default is 50.

a) Original image; b) Enhanced image

13.4.4 AMSR

There are limited dynamic range problems when real world scenes are captured from a digital camera and displayed on monitors. Tone mapping algorithms are applied to image processing to reduce the dynamic range of an image to be displayed on low dynamic range devices. Multi-scale Retinex is one of the most popular methods for dynamic range compression, color constancy and color rendition. Here, we improve its performance by adopting the adaptive weight functions, named Adaptive Multi-scale Retinex (AMSR).

Please open an image and then choose Process>Color Toning>AMSR, the a) Original image; b) Enhanced image



a) Original image; b) Enhanced image

13.5 Deinterlace

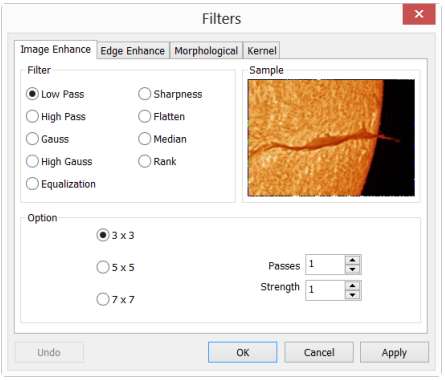
Deinterlacing is the process of converting interlaced image or video, such as interlace sensor into a non-interlaced form.

13.6 Filter••• Shift+I

Choose the Process>Filter••• command to apply one of SkyCapture's numerous filters on the active image. If you are not familiar with the process and effects of filtering, some discussions about spatial filtering should be reviewed. SkyCapture provides an extensive set of convolution and no convolution (morphological) filters. You can also create custom filter kernels and apply them with the Filter commands.

Choosing the Process>Filter••• command will open the Filter dialog. Each group of filters has its own property page or tab, where the Filter type and size can be selected. The filtered results are almost always written to the active image. The Edit>Undo command can be used to remove Filter operations that have been applied.

13.6.1 Image Enhance



Low Pass: Check this filter to soften an image by eliminating high-frequency information (this has the effect of blurring sharp edges). The Low Pass filter replaces the center pixel with the mean value in its neighborhood. The Low Pass filter can also be used to remove noise.

High Pass: Check this filter to enhance high-frequency information. The High Pass filter replaces the center pixel with a convolved value that significantly increases its contrast from its neighbors. The High Pass filter leaves only elements of high contrast.

Gauss: Check this filter to soften an image by eliminating high-frequency information using a Gauss function. This has the effect of blurring sharp edges. The operation of the Gauss filter is similar to the Low Pass filter, but it degrades the image less than the Low Pass filter.

High Gauss: Check this filter to enhance fine details. This operation is similar to the unsharp masking technique (see the Sharpen filter), but it introduces less noise into the image. It uses a Gaussian curve type of kernel. Available in 7x7 and 9x9 kernel sizes.

Equaliza-tion: This filter is used to enhance the contrast based on the histogram of the local neighborhood (See Option below).

Sharpness: Check this filter to enhance fine details, or refocus an image that is blurred. The sharpen filter sharpens the image using the unsharp masking technique.

Median: Check this filter to remove impulse noise from an image. The Median filter replaces the center pixel with the Median value in its neighborhood. It will also blur the image.

Rank: Check this filter to remove impulse noise from an image. The pixels in the kernel are ranked by order of intensity, and the pixel in that range at the rank percentage is chosen for comparison. For example, in a 5x5 kernel, there are 25 pixels. A rank percentage of 95% would choose second-brightest pixel for comparison. If the difference between the selected pixel and the center pixel is greater than the threshold value, the Rank filter replaces the value of the center pixel with the value of the selected pixel.

Option :1. If one of the Enhancement filters is checked, the following options will be displayed:

3 x 3: Check 3 x 3 kernel will produce a more subtle filtering effect.
5 x 5: Check 5 x 5 kernel will produce a moderate filtering effect.
7 x 7: Check 7 x 7 kernel will produces a more extreme filtering effect.

Passes: Set the filter applied times on the image. When a filter is applied multiple times, its effect is amplified by each pass. An image that has been softened by one pass of the Low Pass filter will be softened further by a second pass.

Strength: Enter an applied value from 1-10 that reflects how much of the filtering effect on the image.

A value of 10 specifies the full strength (100%) of the filtered result applied to each

pixel. Values less than 10 cut the full weight of the filter.

A value of 1 indicates that only 10% of the difference between the filtered pixel value and the original pixel value should be applied, a value of 2 indicates that 20% of the difference should be applied, and so forth.

Rank: This value specifies which pixel in the sorted array will be used to replace the center pixel. Pixels in the array will be sorted in ascending order. The pixels are indexed from 0 to Kernel Size x Kernel Size-1. In the pixel index 0 corresponds to the lowest pixel value.

The Rank will be specified in terms of a percentage of the indexes (Kernel Size x Kernel Size-1). A 50% Rank means the middle of the array. 0% rank means the lowest index (lowest gray value), and 100% rank means the highest index (highest gray value).

Option: 2. If the Equalization filter is checked, the options will relate to the histogram equalization. Local Histogram Equalization modifies the contrast of an image based on the pixel values in a small window surrounding each pixel.

Window: Image pixels statistics (min, max, histogram, mean, standard deviation, etc.) will be calculated on a small Window of the image. These measurements are then used to derive the local contrast for that area of the image. In short, an area of Window x Window around each pixel is all that is considered when modifying the intensities in the image. Larger Window produces smoother results, while small Window track small details more closely.

Best Fit: Choose the Best Fit button to optimize the values for the particular image. The results are achieved by stretching the local histogram to maximize the contrast between the brightest and darkest pixels in the local window region.

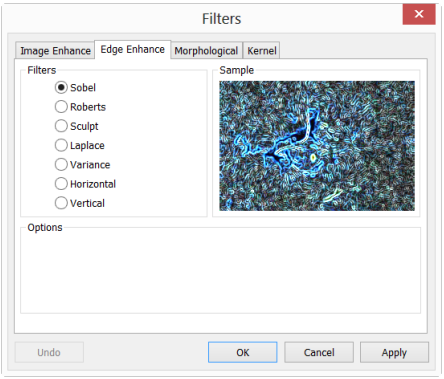
Linear: This option distributes the histogram linearly across the intensity scale. This function produces a high contrast image with the highest possible dynamic range.

Logarithmic: This option concentrates the histogram at the low end of the scale. This function produces a high contrast image with little dynamic image. It will tend to darken the image overall. It is useful for increasing the contrast in a very

light image.

Exponen-tial: This option concentrates the histogram at the high end of the scale. This function produces a high contrast image with little dynamic image. It will tend to lighten the image overall. It is useful for increasing the contrast in a very dark image.

13.6.2 Edge Enhance



Sobel : Check this filter to enhance just the principal edges in an image. The Sobel applies a mathematical formula to a 3x3 neighborhood to locate and highlight its edges.

Roberts: Check this filter to enhance fine edges in an image. The Roberts filter is not a convolution filter. It applies a mathematical formula upon a 4 x 4 neighborhood to produce its effect. The upper left pixel in the neighborhood is the one that is replaced.

Sculpt: Check this filter to apply a sculpted effect on the image.

Horizontal: Check this filter to detect and emphasize horizontal edges.

Vertical: Check this filter to detect and emphasize vertical edges.

Options : 1. If one of the Edge filters has been checked, the options will relate to kernel size and filtering strength. The following options will be displayed:

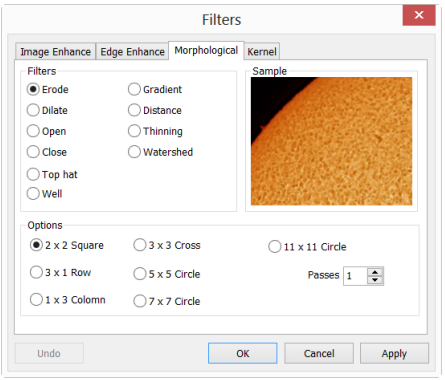
3 x 3: Check 3x3 kernels to produce a more subtle filtering effect.
5 x 5: Check 5x5 kernels to produce a moderate filtering effect.
7 x 7: Check 7x7 kernels to produce a more extreme filtering effect.

Passes: Enter the number of times that the filter will be applied to the image. When a filter is applied multiple times, its effect is amplified by each pass. An image that has been softened by one pass of the Image Enhancement Filter, will be softened further by a second pass.

Strength: Enter a value from 1-10 that reflects how much of the filtering effect to apply to the image. A value of 10 specifies that the full strength (100%) of the filtered result will be applied to each pixel. Values less than 10 cut the full weight of the filter - a value of 1 indicates that only 10% of the difference between the filtered pixel value and the original pixel value should be applied, a value of 2 indicates that 20% of the difference should be applied, and so forth.

Option 2. If Sobel or Roberts is checked, no options are available.

13.6.3 Morphological



Erode: Check this morphological filter if one wants to modify the size of objects in the image. The Erode filter erodes the edges of bright objects and enlarges the edges of dark ones.

Dilate: Check this morphological filter if one wants to modify the size of objects in the image. The Dilation filter dilates bright objects and erodes dark ones.

Open: Check this morphological filter if one wants to modify the shape of objects in the image. Assuming the image contains bright objects on a dark field, the Open filter will smooth object contours, separate narrowly connected objects, and remove small dark holes.

Close: Check this morphological filter if one wants to modify the shape of the objects in the image. Assuming the image contains bright objects on a dark field; the Close filter will fill gaps and enlarge protrusions to connect objects that are close together.

Tophat: Check this filter to detect and emphasize points, or grains, that are brighter than the background. There are 3 kernel sizes for this processing. Click the radio button to change the kernel size to the value that most closely matches the size of the grains to detect.

Well: Check this filter to detect and emphasize points, or grains, that are darker than the background. There are 3 kernel sizes for this processing. Click the radio button to change the kernel size to the value that most closely matches the size of the grains to detect.

Gradient: Check this filter to enhance edges in an image.

Watershed: Check this filter to separate objects that are touching. The Watershed filter erodes objects until they disappear, then dilates them again, but will not allow them to touch. The Watershed filter will not operate upon True Color images. If one wants to separate objects in a True Color image, he must first convert it to Gray Scale (see Process Frame: Image>Gray Scale).

Thinning: Check this filter to reduce an image to its skeleton. When choosing this filter, one must set the threshold that determines whether a pixel is part of the subject or part of the background (see Options below). The Thinning filter will not operate upon True Color images. If one wants to thin a True Color image, he must first convert it to Gray Scale.

Distance: The distance filter is used to show the distances of pixels within blobs to the outer boundaries of those blobs. After applying the distance filter, the background will be black (i.e. pixels with value 0). Only the area within the blobs will have non-zero values (will be white). The values of each pixel within the blob will be a count of the shortest distance from that pixel to the edge of the blob. Thus, all pixels along the blob's border will have a value of 1 (since they are one pixel away from the edge of the blob); pixels that are a distance of 2 from the border will have the value 2, and so on. This creates a distance map of the image. The Distance filter will not operate upon True Color images. If one wants to use the Distance filter with a True Color

image, he must first convert it to Gray Scale.

Options 1. If Erode, Dilate, Open, or Close filters is checked, the options will relate to the kernel size and shape. The following options will be presented:

2 x 2 Square: Check to use the 2x2 square kernel configurations.
3 x 1 Row : Check to use the 3x1 row kernel configuration.
1 x 3 Column : Check to use the 1x3 column kernel configuration.
3 x 3 Cross : Check to use the 3x3 cross kernel configuration.
5 x 5 Circle : Check to use the 5x5 circular kernel configurations.
7 x 7 Circle : Check to use the 7x7 circular kernel configurations. This is a two-pass filter, accomplished using a 5 x 5 circle followed by a 3x3 cross.
11 x 11 Circle : Check to use the 11 x 11 circular kernel configurations. This is a three-pass filter, accomplished using a 5 x 5 circle followed by another 5 x 5 circle, followed by a 3 x 3 cross.

Passes: Set the number of times iterate the filter.

Note: The circular kernels are especially effective on round objects (cells, grains and so on) because their circular configuration preserves the circular shape of the objects better than square configurations.

Option 2. If the Tophat, Well, or Gradient filter is selected, the options will relate to kernel size and shape. The following options will be presented:

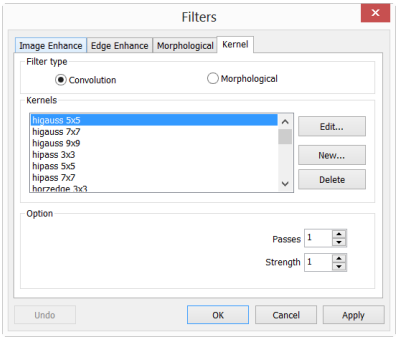
3 x 3: Check to use the 3x3 square kernel configurations.
5 x 5: Check to use the 5x5 square kernel configurations.
7 x 7: Check to use the 7x7 square kernel configurations.

Option 3. If Watershed, Thinning, or Distance filter is checked, the options will relate to the threshold. The following option will be presented:

Threshold: Enter a percentage value from 1-100 that specifies the intensity value to binarize the image. For example, a Threshold of 50% on a Gray Scale image would set all values ≤127 to 0 (black) and all values ≥128 to the maximum value for that image class (white).

13.6.4 Kernel

The Kernel page allows edit the kernel files for the morphological and convolution filters.



Note: The HiPass, LowPass, Laplacian and Unsharp kernel files are used by the HiPass, LowPass, Laplacian, and Sharpen options listed in the Image Enhancement Filters page dialog window (i.e. there is no difference between selecting one of these kernel files and selecting its Option button in the Filter window -- the 2 methods ultimately do the same thing). Because these kernel files are essential to the operation of these filtering options, they must not be deleted or renamed.

Filter type: Check to modify the kernel for a selected Filter type, either Convolution or Morphological filters.

Edit•••: Invoke the Edit Kernel dialog to modify the selected filter kernel.

Name•••: This combobox contains the name of the selected kernel file. If one wants to save the modified kernel file to the same file, leave it as it is. If one wants to save the file to a new location, enter the new filename here.

Kernel Size: Click the spin buttons or enter the number to change the size of the kernel. Either direction may take into account one to nine pixels. As one modifies the Kernel Size, the shape of the kernel representation changes accordingly. In the center of the dialog, there are white boxes containing coefficients that will be multiplied with each pixel that will be taken into account by the filter kernel. One can change any coefficient by clicking on it and adjust it as desired.

Fill: Click this button to fill every element of the kernel with a particular value. The Fill kernel dialog appears. One may enter a value between 0 and 10. Using the Fill button is useful for setting all coefficients to the same value. One may

then change the coefficients that require a different value.

Offset: The pixel whose value is being modified is usually the center-most pixel. One may, however, designate any pixel. SkyCapture signals the pixel to be changed by putting a box around it. Choose the X and Y Offset spin buttons to apply

New•••: Click to create a new filter kernel. The Edit Kernel dialog will appear. The functions of the dialog are the same way as the dialog for Edit••• described above), with the exception that the file name for the new kernel file must be provided.

Delete: Click to delete the selected filter kernel file.

Options: The choices in this group box will vary depending upon the kind of selected filter.

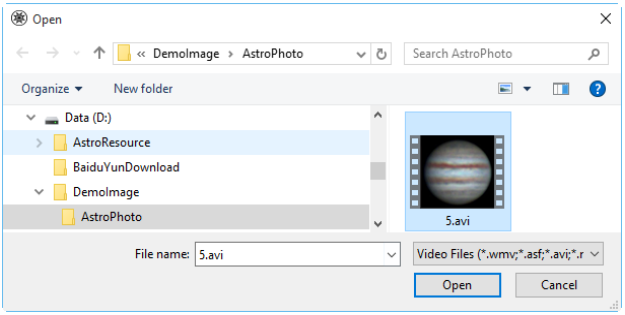
13.7 Image Stacking•••

The image-stacking method is a form of speckle imaging commonly used for obtaining high quality images from a number of short exposures with varying image shifts. It has been used in astronomy for several decades, and is the basis for the image stabilization feature on some cameras. The method involves calculation of the differential shifts of the images. This is easily accomplished in astronomical images since they can be aligned with the stars. Once the images have aligned, they are averaged together. It is a basic principle of statistics that variation in a sample can be reduced by averaging together the individual values. In fact, when using an average, the signal-to-noise ratio should be increased by a factor of the square root of the number of images.

Image stacking can also be used for biological microscope image and florescent microscope image to increase the image SNR and dynamical ranges; this is why we introduce image stacking into SkyCapture.

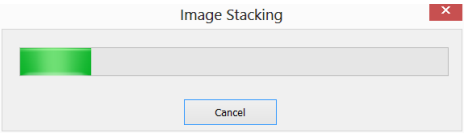
SkyCapture Image Stacking introduced advanced image matching techniques for rotated, shifted and scaled images. The user can record a short video to get a high quality stacked image at ease without considering the image rotation, shifting and scaling between a series of images in the video. The steps of Image Stacking are described as below:

1. Choose Processing>Image Stacking••• menu, a Windows Open dialog will pop up as shown below;

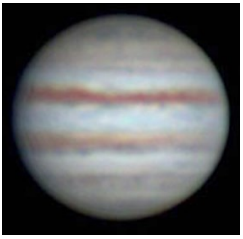


2. Choose the right video file recorded before in the Open dialog, here we can open "test.avi" for demonstration, click Open to open the avi file;

3. Then an Image Stacking dialog will pop up to show the progress of the each image's stacking progress.



4. If Cancel is pressed, the Image Stacking will be canceled. After the stacking is finished, a stacked image will be displayed in a new window for further application. The final image is shown as below. One can find the stacked image signal to noise ratio is greatly improved. From the stacked image has some black edges, this is because the images in the video is moved and in the stacking process, SkyCapture will added 0 to the image area that has no corresponding pixel in the reference image (we choose the first image in the video file as the reference image).



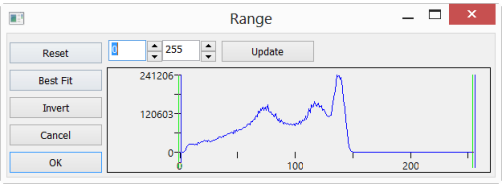
Note: a. SkyCapture support wmv，asf，avi，mp4，m4v，3gp，3g2，3gp2，3gpp，mov，

mkv，flv，rm，rmvb for Image Stacking operation; b) In the Image Stacking process, SkyCapture takes the first frame as the reference image, this means the first frame is very important and should be assure the first frame to be the right image scene and the subsequent frames have a greater overlap region with the first frame.

13.1 Range●●● Shift+R

The Process>Range●●● command allows set the intensity levels of the image to increase the contrast and enhance the display in low-light situations. Choose the Range command to open the Range dialog.

Two vertical markers show the upper and lower limits of the intensity levels. These markers can be moved with mouse through the drag and drop method. For a color image, the histogram will reflect the red, green, and blue values with corresponding colors lines.



Two Edit controls indicate the values of the intensity levels. Choose the spin buttons to increase or decrease these values. All values between 0 and the lower limit will be black and all values between the upper limit and the upper end of the scale will be white. These two edit control values corresponding to the two vertical markers show the upper and lower limits of the intensity levels. Defaults are o and 255 respectively.

Reset: The Reset button allows Reset the black and white levels to the high and low ends of the dynamic Range.

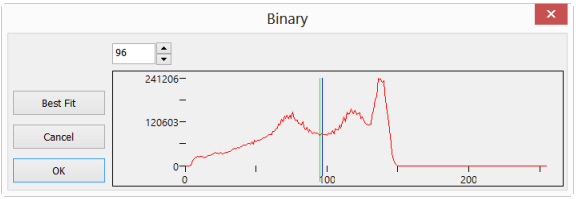
Best Fit: The Best Fit button automatically sets the intensity levels to the Best Fit. Best Fit instructs SkyCapture to optimize the brightness and contrast values for the particular image.

Invert: The Invert button reverses the color of the image.

Update: Update will refresh the display Range with the most current image information.

13.1 Binary●●● Shift+B

Binary is a kind of gray level process. If the gray of the pixel is greater than the given threshold, the pixel's color will be changed into white. Otherwise, the pixel's color will be changed into black. Although the process may lose some information, it is an important step of other processes.



The curve on the Binary dialog shows the gray distribution of the image.

The Line in the dialog indicates the threshold value. Drag the line to change the threshold, or change the value in the Line position edit box (in the top left corner of the dialog) to move the Line.

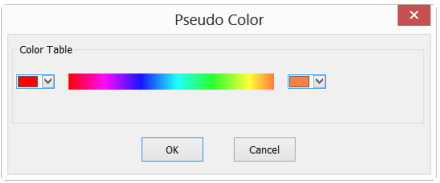
The Line position edit box shows the current position value of the Line; Modify the value will move the Line at the same time;

Click the "Best Fit" button to apply the auto threshold process to the image. It uses an automatic threshold to make the image Binary.

13.1 Pseudo Color•••

Note: Image must be in Gray Scale.

Choose the Pseudo Color command to "colorize" the active monochromatic image. This is used to highlight certain features in a gray scale image such as display all densities above a certain point in red, or, the imaging device recorded thermal information, all temperatures below a certain point can be revealed in blue color.



When Pseudo Color a monochromatic image, a special palette need to be build with which the monochromatic image is displayed. Pseudo Coloring an image does not modify the pixels' values in image bitmap (it does not convert image to true color or palette). It simply associates a Pseudo Color palette with the image that interprets the gray-level values in the image as color.

Pseudo Colored images are very similar in structure to palette class images, but they differ in a couple of important ways. First, the pixels' values in a Pseudo Colored image actually represent continuous-tone intensity information, whereas a palette image's pixels carry no intensity significance. Secondly, a palette image includes a palette table that is actually part of the image file.

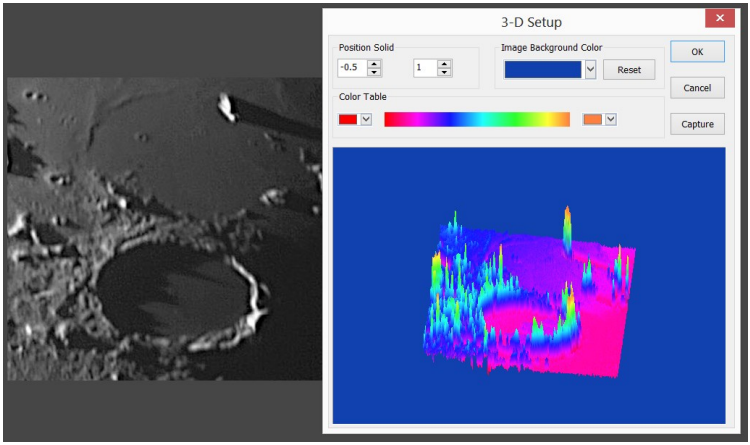
The colors used to map the gray values can be selected. The buttons at each end of the color strips (or) will bring up the color dialog separately, which allows select the start and end colors of the range.

13.1 Surface Plot•••

The Process>Surface Plot••• (or 3-D Plot) tool creates a 3-D representation of the intensity of an image. When choosing the Surface Plot command, keep in mind that X=image width and Y=image height, and Z=pixel gray value.

In the viewpoint window, the elevation and rotation of the image can be adjusted by

dragging the mouse on the image.



Position Solid: The left edit control indicates the relative position of the entire image in the viewpoint window, whose default value is 0.5. The right edit control indicates the relative height of the display of the Z scale, whose default value is 1.

Reset: Set the Position Solid's two edit controls to their default values.

Image Background Color: Choose this command to display a color dialog where one can adjust the background color of the viewpoint window.

Capture: Capture the active image in the viewpoint window as a new image.

Color Table: Select the colors to map the gray values found in the surface plot. The button at each end of the Color Table brings up the color dialog, which allows select the start and end colors of the range. (Please refer to Pseudo Color for more information)

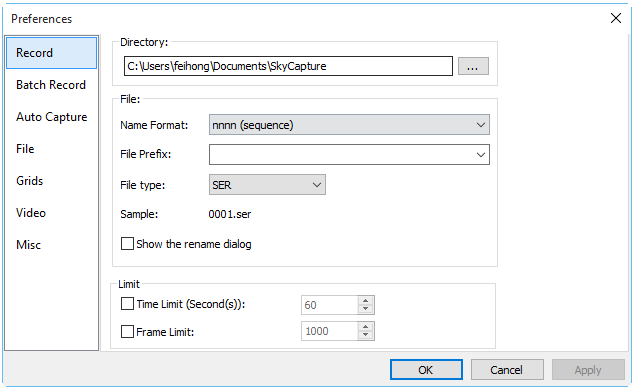
14 Options

14.1 Preferences•••

There are 7 pages for the Preference dialog. They are Record, Batch Record, Auto Capture, File, Grids, Video and Misc pages.

14.1.1 Record Page

The Record page can be used for the pre-setup of the Capture>Start Record command operation with no need to further specify the file directory, file name and file format. All those are specified in Options>Preferences•••>Record property page.



Directory: Enter the name of the drive and directory where the new image will be saved. You may either type the path information, or use the Browse button ... to locate it from a standard Browse Folder dialog;

Name Format: The year, month, date, hour, minute and second or nnnn(sequence) can be used as part of the file name. If more files are saved with in a second, a (xx) suffix is attached to the end of Name Format to avoid the possible name confliction. For the nnnn(sequence) Name Format, no suffix is needed;

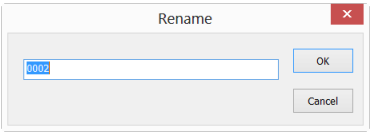
File Prefix: Enter a file name prefix for Capture>Start Record or Capture>Batch Record command when generating files names for video (Capture>Start Record) or a series of video (Capture>Batch Record). This prefix will be combined with Name Format to form a final file name naming paradigm;

File Type: In this combobox, select the format in which you want the image to be saved

(can be SER or AVI);

Sample: The final file name is shown at the right of the Sample label for reference;

Show the rename file dialog: The file name can be renamed according to whether or not this item's setup. When this item is checked, a Rename dialog will pop up after choosing capture>Start Record command or click the button on the toolbar. The new name can be specified here again according to the requirement;



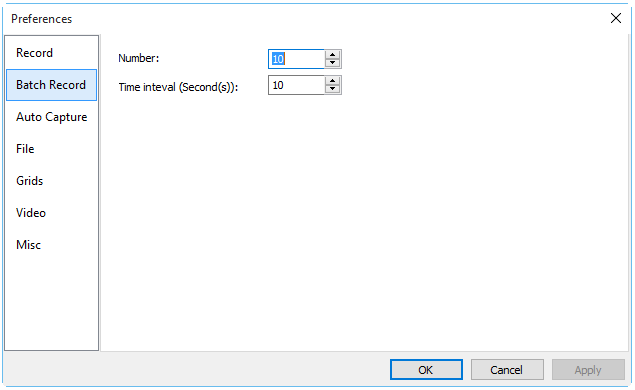
Limit>Time Limit(Secord(s)): The whole time for the record; the default is 60(1~3600s);

Limit>Frame Limit: The number of frames to be recorded; the default is 1000(1~1000000);

When both of them are checked, the video record will be stopped after one of the limits is reached.

14.1.2 Batch Record Page

The Batch Record page is used for the pre-setup of the Capture>Batch Record command. Choosing the Options>Preferences•••>Batch Record property page will invoke a dialog as shown below:



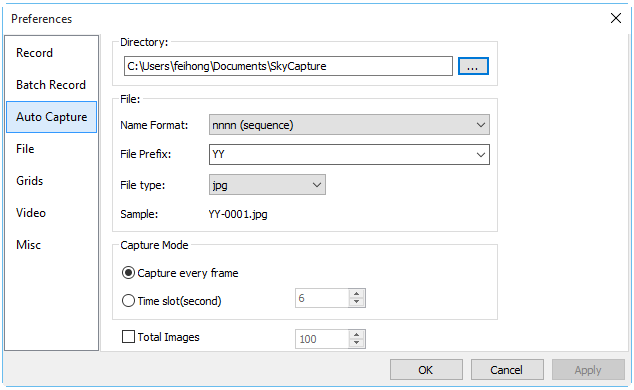
Number: The number of files to be recorded (2~10000, default is 10).

Time interval (Second(s): How long it will take to record the next video file (0~36000, default is 10);

The other record parameter can be defined in Options>Preferences•••>Record property page. Please check it for detail.

14.1.3 Auto Capture

The Auto Capture page is used for the setup for the Capture>Auto Capture command. This can be done in Options>Preferences•••>Auto Capture property page:



Directory: Enter the name of the drive and directory where the new image will be saved.

You may either type the path information, or use the Browse button ... to locate it from a standard Browse Folder dialog;

Name Format: The year, month, date, hour, minute and second or nnnn(sequence) are used as part of the file name. If more files are saved with in a second, a (xx) suffix is attached to the end of Name Format to avoid the possible name confliction. For the nnnn(sequence) Name Format, no suffix is needed.

File Prefix: Enter a file name prefix for Auto Capture when generating files names for a series of images. This prefix will be combined with Name Format to form a final file name according to the naming paradigm.

File Type: In this combobox, select the format in which you want the image to be saved

(can be BMP, JPG, PNG, TIF, FIT);

Sample: The final file name is shown at the right of the Sample label for reference;

Capture every frame: Check this item will capture every frame in the video sequence;

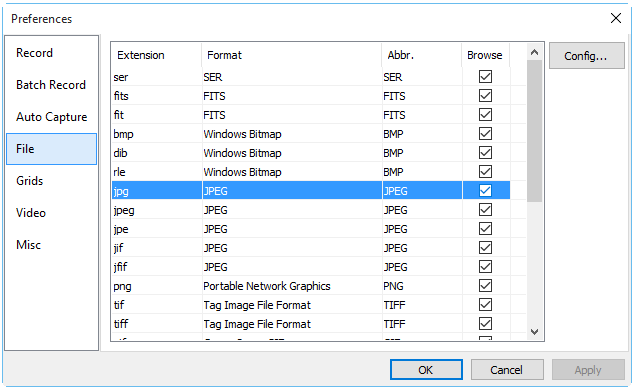
Time slot(second): Capture an image according to the time interval to (0-100S, default is 6);

Total Images: Checking Total Images will enable its edit box. You can enter the Total Images (1-9999) to be captured. SkyCapture will stop the Auto Capture process automatically when the Total Images are reached;

If Total Images is unchecked, SkyCapture will capture the images continuously until user choose the Capture>Stop Capture command again to stop the Auto Capture process.

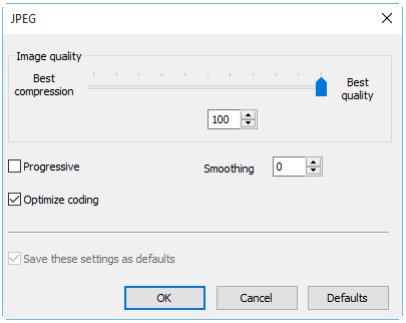
After the Auto Capture is started, the Capture>Auto Capture menu will be changed to the Capture>Stop Capture) menu. Choosing this command will stop the Auto Capture process.

There are a variety of image format available (they are bmp, jpg, png, tif or fit) to save the captured image. For example, when choosing jpg format, the save options can be set in Options>Preferences•••>File property page. If the format has options, the Config••• button will be enable.



Clicking the Config••• button will pop up a dialog as bellow. Different format has different options.

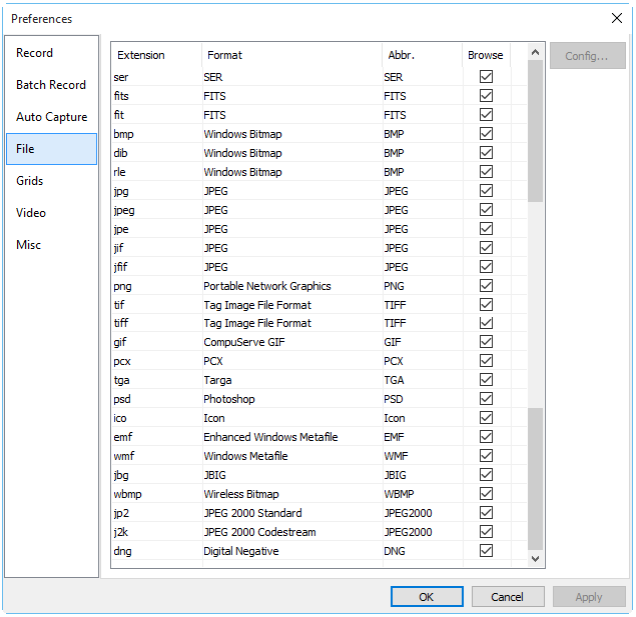
After all the parameters are set. Click OK will close the dialog and the parameters can be used for the Auto Capture command with no further setup.



See Options>Preference•••>File page for details.

14.1.4 File Page

One can check a file Extension for the specified file Format and its Abbr.(abbreviation), to determine whether or not it will be displayed in the Browse window or not (The checked Format can be displayed in the Browse window).



Extension: Used to identify the file extension;

Format: English full name of file formats;

Abbr.: File Format's abbreviation;

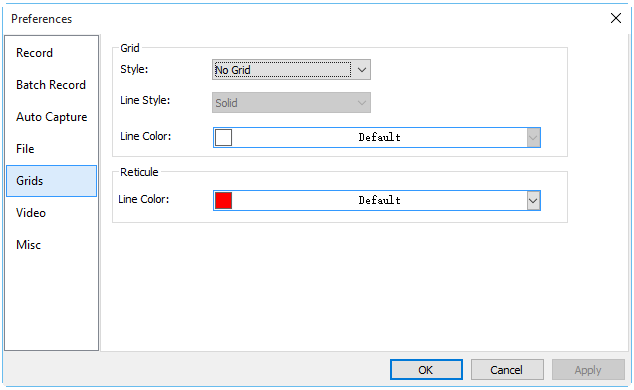
Browse: Check/uncheck to determine whether or not the file format can be displayed in the Browse window;

Config…: To configure the image file Save As Option for JPEG, Portable Network Graphics, Tag Image File Format, CompuServ, JPEG 2000 Standard, JPEG Codestream, GIF. For details, please refer to the Option button explanation in the File>Save As in Sec.6.4.

14.1.5 Grids Page

Choosing the View>Grid>Setting••• command, or choosing the Options> Preference>••• command and clicking the Grids page to realize the same function.

Choosing the Preference>••• command and clicking the Grids page can set the Grid Style, Line Style, and Line Color for the Grid overlaid on the video and image window can also be set.



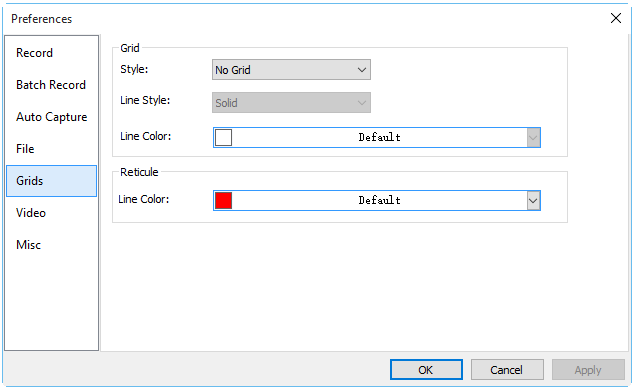
Grid Style: The Grid Style can be No Grid, Auto Grid or Manual Grid. Default is No Grid;

Grid Line Style: The Line Style for the grid can be Solid, Dash, Dot or DashDot et al. Default is Solid;

Grid Line Color: The color of the grid line. Default is Red (255,0,0).

14.1.6 Video Page

Choose the Options>Preference dialog and click Video to show the Video page. The Video page is used to set Date Time and Clarity Factor to overlay on the video window.



The Position, Background, Font Size, Font Weight of the Date Time, and Clarity Factor can be defined together. Their Colors can be defined separately.

Clicking the OK button and the Date Time, and Clarity Factor will be overlaid on the Video window.

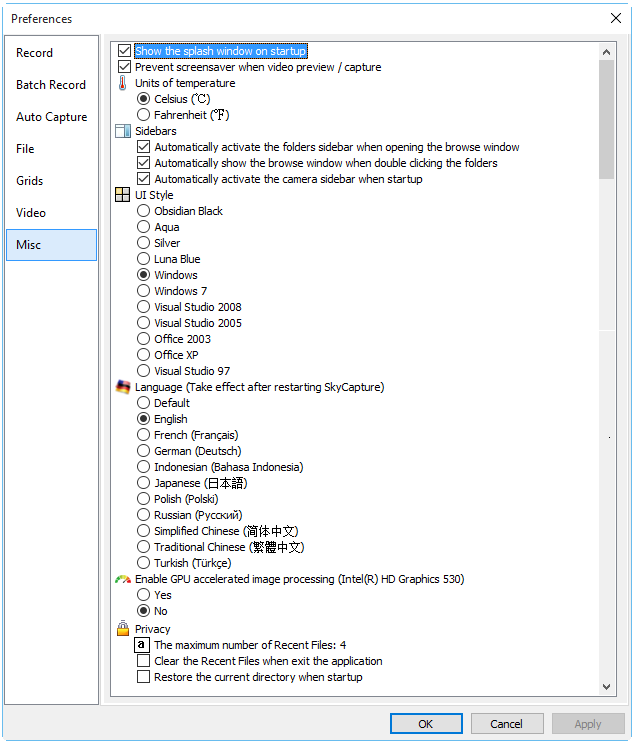
The Clarity Factor can tell if the sample is in good focused state or not. The larger the Clarity Factor, the better the sample focused.

14.1.7 Misc Page

The Misc page is mainly used for the control of the SkyCapture UI. It mainly includes:

1. Show the splash windows on the startup;
2. Prevent screensaver when video preview / capture
3.Units of temperature;
4. Sidebars;
5. UI Style;
6. Language;
7. Enable GPU accelerated image processing;
8. Privacy;

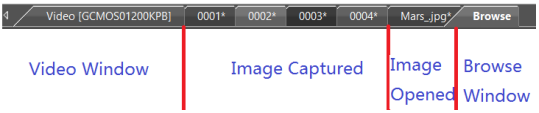
settings et al. They all are shown as below.



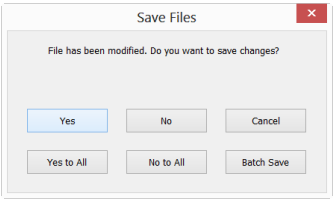
15 Window

15.1 Close All

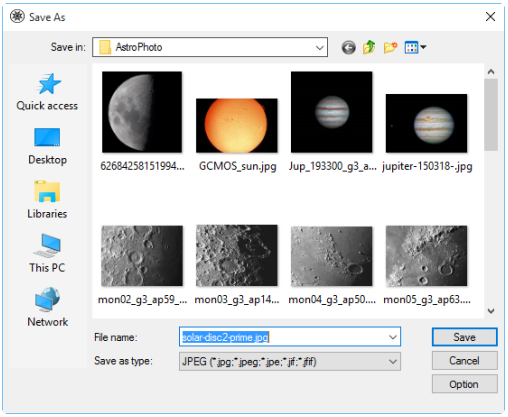
Choosing the Closes All command to close all of the pictures opened or captured inside SkyCapture frame. If you have made any modifications to the pictures or if you have captured some pictures from the camera, choosing the Close All will let you finish the saving operations quickly.



If the above image windows exist, choosing the Window>Close All command will bring up a Save Files dialog as below:



1. Clicking Yes on the Save Files dialog will close the Video , Browse, Image windows directly that are not changed without ask anything. If there are newly created Image window, SkyCapture will bring up a Save As dialog to prompt user to enter the File name to save file.



If Save or Cancel is clicked in the Save As dialog, SkyCapture will return to the Save Files dialog to continue the next file close operation;

2. Clicking No on Save Files dialog will close the current image window without saving operation and return to the Save Files dialog to continue the next file operation;

3. Clicking Cancel will cancel the Save Files dialog without doing anything;

4. Clicking Yes to All on Save Files dialog will always bring up a Save As dialog to let you enter the File name to save files one by one until all of the files are saved;

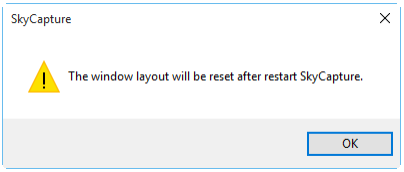
5. Clicking No to All on Save Files dialog will close all of the image windows without saving them;

6. Clicking Batch Save on Save Files dialog will transfer the save process to File>Batch Save••• command. Please check the File>Batch Save••• menu for details;

Note: If you have a lot of pictures opened and have made some modifications on them and want to close them quickly without saving anything, you may uses this command and choose Step 5. All the images will be closed instantly, no warning will be given.

15.2 Reset Window Layout

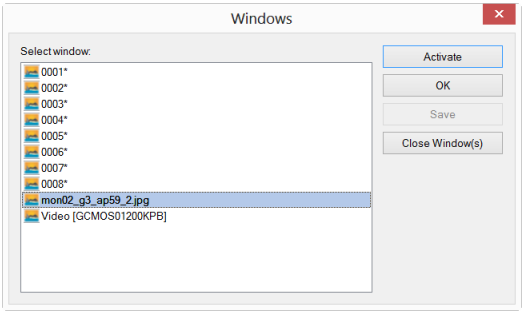
Choosing Window>Reset Window Layout will reset the SkyCapture window layout to the original one. The reset will be effective after restart.



15.3 Windows•••

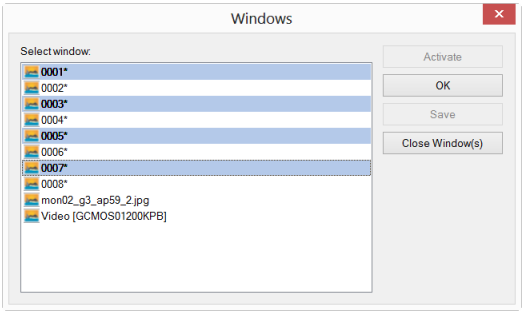
Choosing the Window>Windows••• will open a dialog box that lets you manage the currently opened windows.

The dialog allows you to manage large lists of open windows by assigning them into groups. Let us say you have 10 windows opened, but want to close 4 of them scattered through the list.



1. Choose the Window>Windows••• command;

2. Select the windows you want to close. Hold Ctrl or Shift key to select more than one at a time. Here, 4 items are selected;



3. Click Close Window(s) button, those 4 selected windows will be closed, leaving the other files or captures available for editing;

4. User can use this command to switch to the checked window on a list by hitting Activate (or "bring up" from an icon multiple windows).

16 Help

16.1 Help Contents F1

Choose the Help>Help Contents command to load SkyCapture help file. The help file is in Portable Document Format (PDF).

PDF is a file format used to represent documents in a manner independent of application software, hardware, and operating systems. Each PDF file encapsulates a complete description of a fixed-layout flat document, including the text, fonts, graphics, and other information needed to display it. In 1991, Adobe Systems co-founder John Warnock outlined a system called "Camelot" that evolved into PDF.

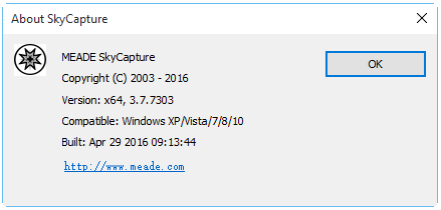
While the PDF specification has been available free of charge since at least 2001, PDF was originally a proprietary format controlled by Adobe. It was officially released as an open standard on July 1, 2008, and published by the International Organization for Standardization as ISO 32000-1:2008. In 2008, Adobe published a Public Patent License to ISO 32000-1 granting royalty-free rights for all patents owned by Adobe that are necessary to make, use, sell and distribute PDF compliant implementations.

If your computer still does not install the PDF reader, please try to download it from:

http://www.adobe.com/downloads/

16.2 About●●●

Display the related information about SkyCapture, including SkyCapture version, Compatible, Built date and its developer's www etc.



Clicking on the URL link will direct you to the address of the application supplier. If you have any problem with the camera or application, please feel free to contact your supplier.

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