wxAstroCapture

Manual and How To …

V 0.3

20090928/BM/CA

Content

- What it is …
  - Features and Functions
  - Supported Environments
  - Supported Capture Devices
  - Supported IO Devices
  - Output Formats
- Basic User Interface
  - The Menu Bar
  - The Tool Bar
  - The Status Line
  - The Preview Area
  - Using Sub Frames
- Connecting a Camera
  - Properties of a Camera
  - Web Cam Properties
- Capturing Images
  - Web Cam Exposures
- More on Feature Tabs
  - The complete Rec Feature Tab
  - Guide to Guiding
  - Batch Jobs

… Cont'd

- Options – Settings
  - Video Capture
  - Container & File Names
  - LE Control Port
  - Guiding Port (also in Guiding)
- Options – Guiding
  - Calibration
  - Interface
  - Guide Port (also in Settings)
- Options – FITS Header
- Tips & Tricks
- References & Links

What it is …

- Program to capture images from a variety of cameras
- Intended field of use – amateur astronomy
- Runs on Linux and Win computers
- Free to use (but not Open Source)
- Created and maintained by two guys from Norway and Switzerland
- Supporting group: http://tech.groups.yahoo.com/group/wxAstroCapture/

Features and Functions

- Preview image stream
- Preview long exposure image stream
- Capture images from the stream into a variety of supported formats
- Guide a telescope mount through parallel or serial ports
- Guide calibration support
- Access to guiding control parameters
- LRGB Histogram of the video stream
- Supports a variety of image storage options
- Supports a variety of FITS keywords
- Time stamping of captured images
- Zoom and pan of the preview stream
- Define and capture sub frames
- Supports properties of webcams – save and load property profiles
- Supports binning of Art/ATIK cameras
- Batch processing of image capture jobs
- Preview Recticle

Supported Environments

- MS Windows:
  - Win XP SP2 and SP3
  - Win Vista 32bit and 64bit
- Linux:
  - Kubuntu 8.04, 8.10, 9.10 32bit and 64bit builds
  - OpenSUSE Linux 10.3, 11.1 32bit and 64bit builds
  - Deb and RPM packages may run on other distributions

Supported Capture Devices

- Webcams:
  - Philips Vesta and ToUCam CCD cameras
  - Similar SAA8116 chip based cameras from Logitech and other manufacturers
  - Long Exposure modified web cameras
  - On Win capture devices supporting the WDM driver model may work
  - On Linux capture devices hooking into the PWC or UVC driver may work
- Artemis / ATIK:
  - Artemis Model 285/429 and similar ATIK models
  - ATIK 16IC.. (hopefully will work at some point in time, but not yet)

Supported IO Devices

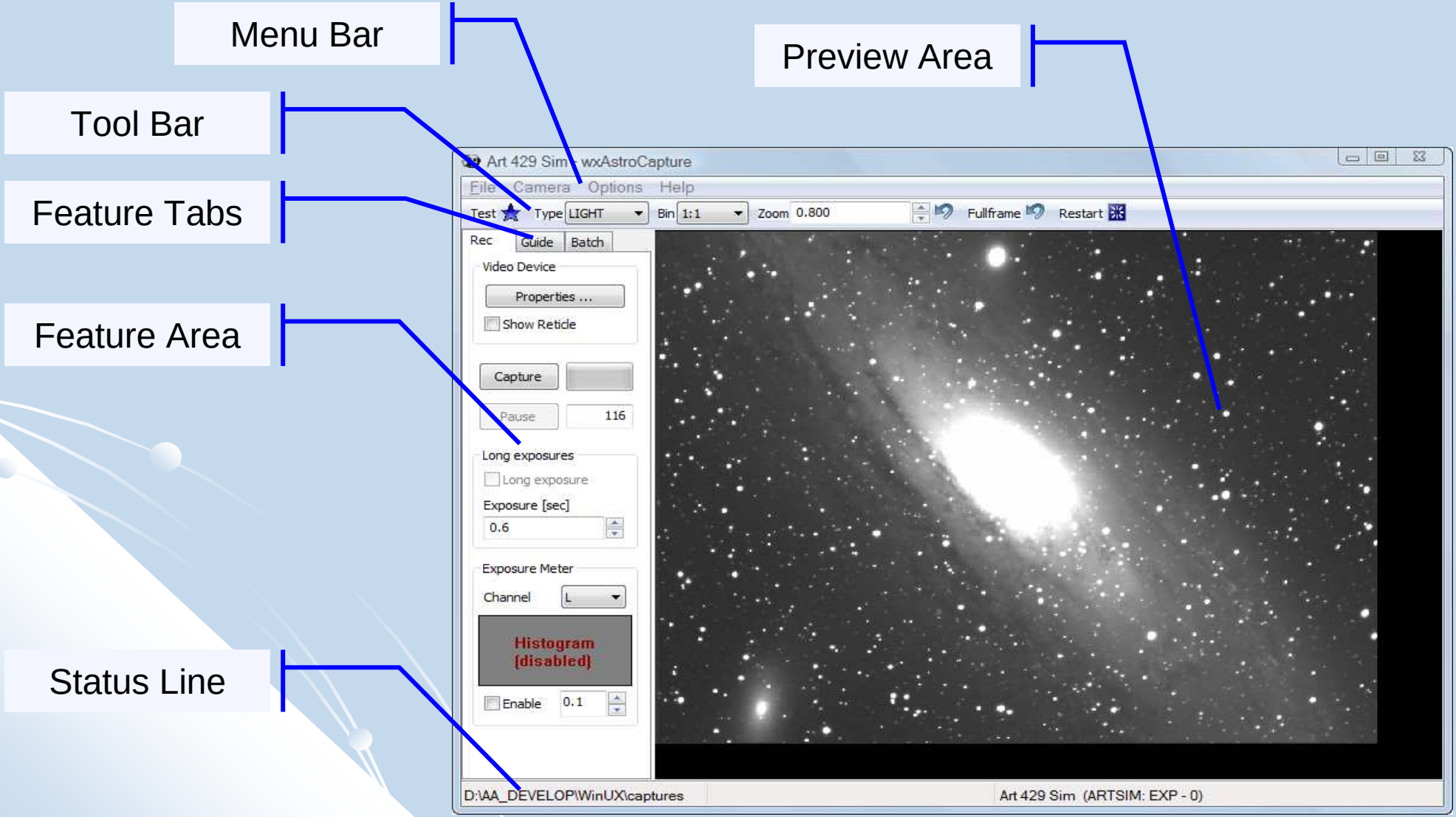
- Long Exposure IO Port
  - Parallel port (original port – not trough USB)
    - Configurable for Frame1/2, Shutter, Amp
  - Serial port (original and various USB models)
    - Configurable RTS and DTR for Frame and Amp
  - Shoestring LXUSB
- Guiding IO Port
  - Parallel port (original port – not trough USB)
    - Configurable for ST4 style interface – 4 signals
  - Serial port RS232 - protocols for various mounts
  - Shoestring GPUSB

Output Formats

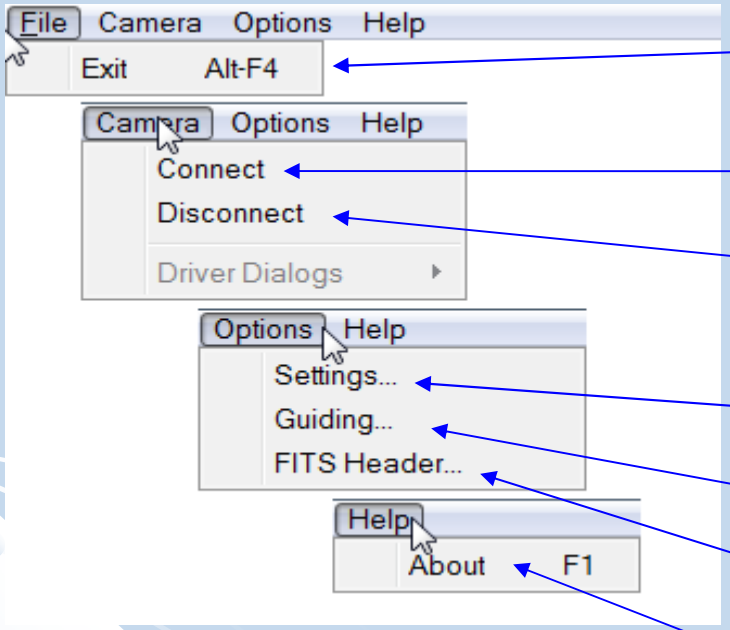
- AVI Video
  - Uncompressed video stream
    - YUV 4:2:2 – YUV2, YUYV, YVYU, UYVY
    - YUV 4:2:0 – I420, YUI2, IYUV
    - RGB24 – RGB bitmap stream (for webcam capturing)
- FITS image format
  - 16 bit FITS image
    - 1 plane (BW)
    - 3 planes (RGB)

Note: the individual format depends on the capture device – in general the format with the least compression is used

Basic User Interface



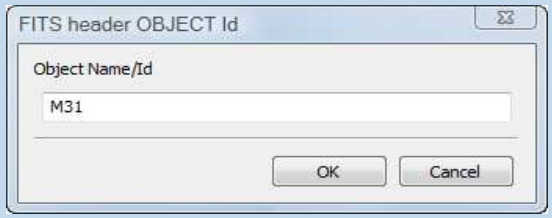
The Menu Bar



- Leave wxAstroCapture
- Connect a camera
- Disconnect the camera
- Open the Settings Window
- Open the Guiding Window
- Open the FITS Window
- Show the About Box

The Tool Bar

Define the FITS keyword ‘OBJECT’



Reset sub frame to full frame

Restart exposure cycle

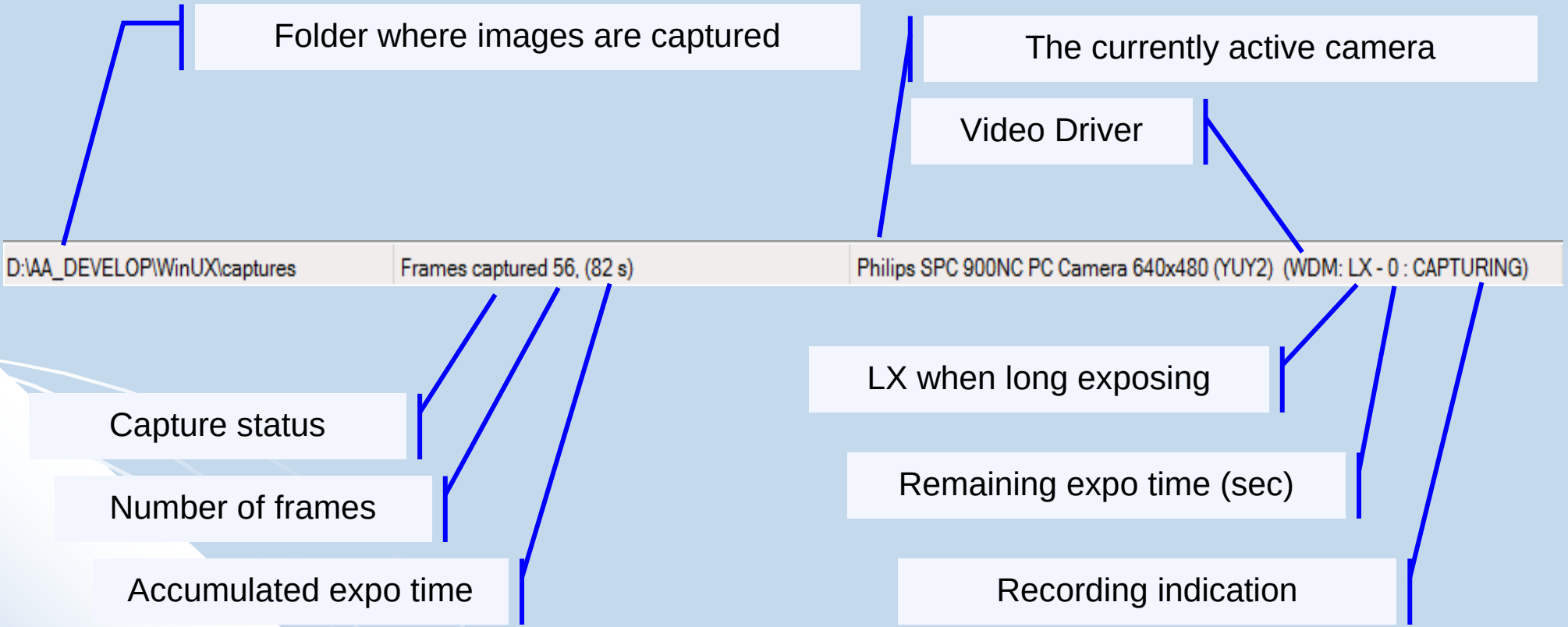
Reset Zoom to 1.0

Define the preview zoom level (Scroll wheel)

Set the binning for Art/ATIK cameras

Define the type of exposure (FITS keyword)

The Status Line

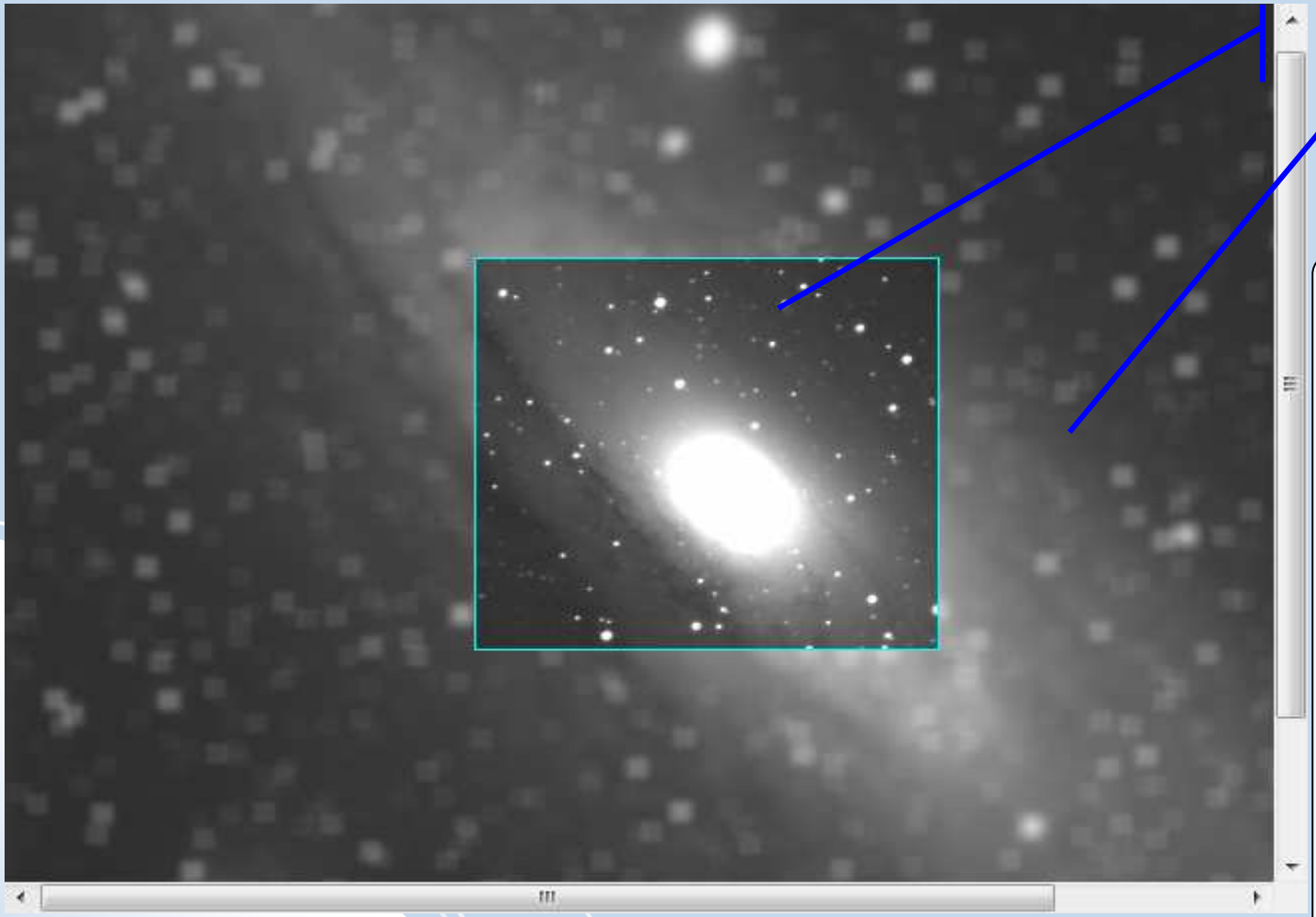


The Preview Area

Scroll bar

- Click into the preview area and then use the scroll wheel to zoom in and out
- If the image gets larger scroll bars help to navigate
- Left click and drag to move the image around

Using Sub Frames



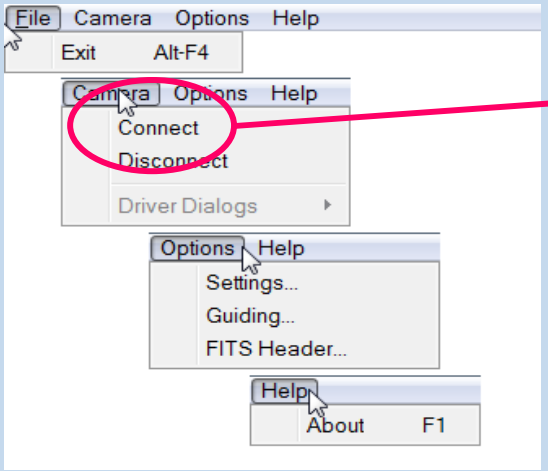
Active sub frame

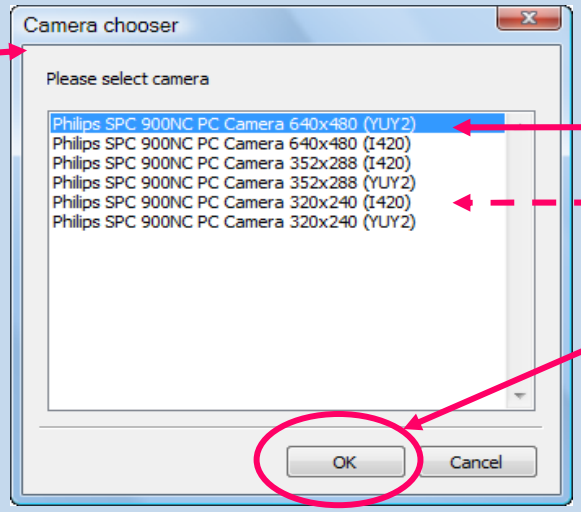
Inactive area (blurred)

- Click into the preview area then right click and drag the green preview rectangle to the desired size and position
- Release the mouse
- The chosen sub frame gets a blue frame and the inactive part of the image gets blurred

Note: sometimes it needs a second attempt to get it working, with long exposure or Art/ATIK cameras the sub frame will only appear after the next capture cycle – so be patient and try a bit around

Connecting a Camera



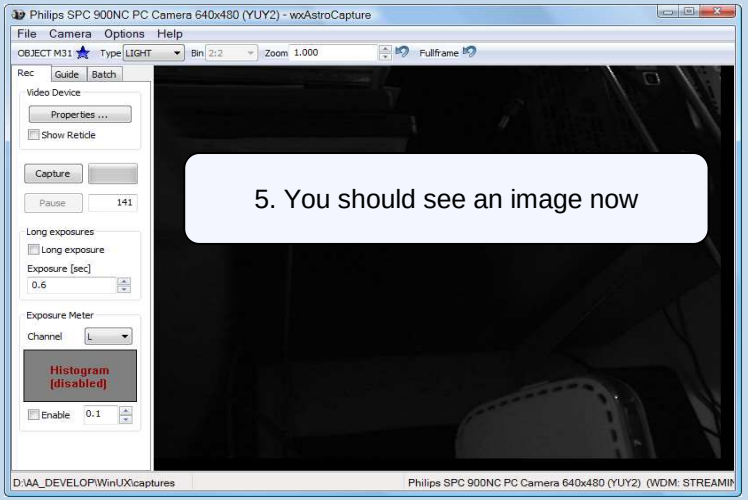


1. Use the Camera menu

2. Then Connect

3. Chose one of the entries

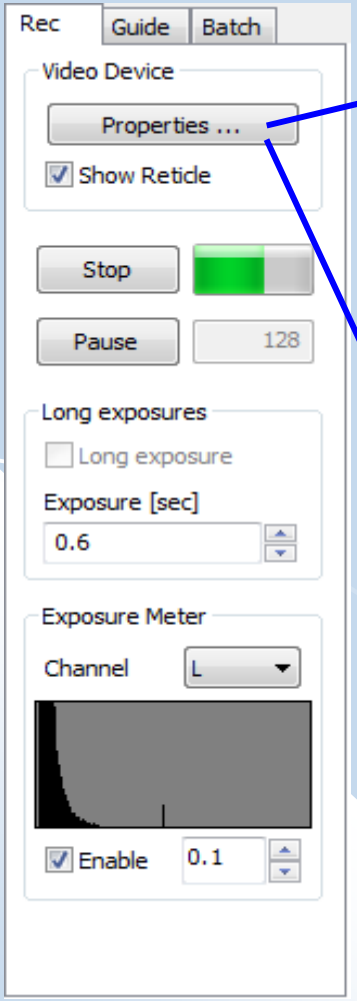
4. Either click OK
Or double click the entry



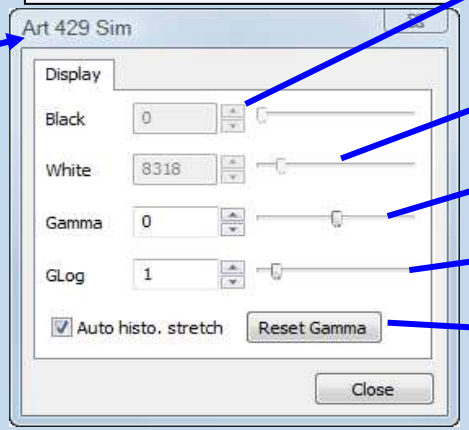
5. You should see an image now

Properties of the camera

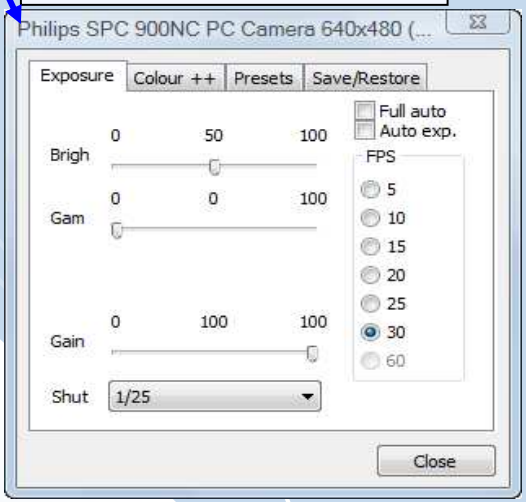
The Rec Feature Tab



Art/ATIK Properties



Webcam Properties



Black level (if Auto is off)

White level (if Auto is off)

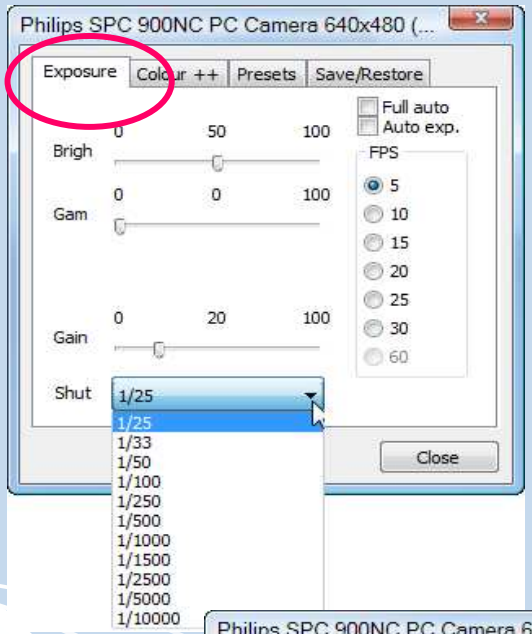
Gamma level (-10 .. +10)

GammaLog level (0 .. +10)

Reset Gamma to zero level

See next page …

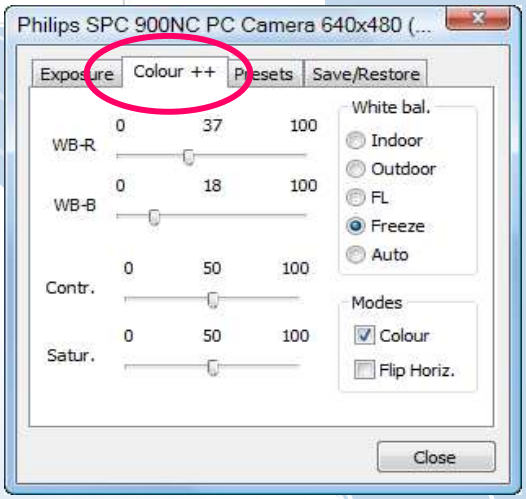
Web Cam Properties

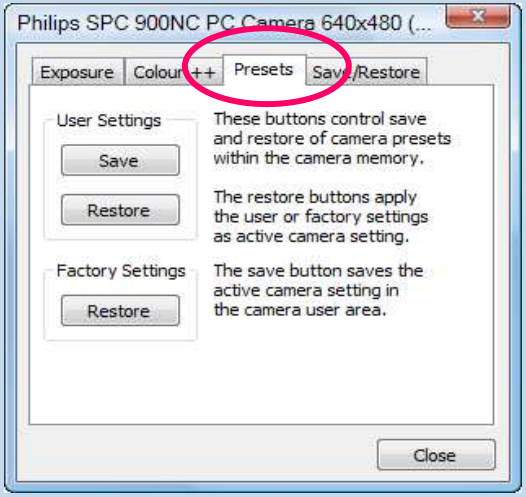


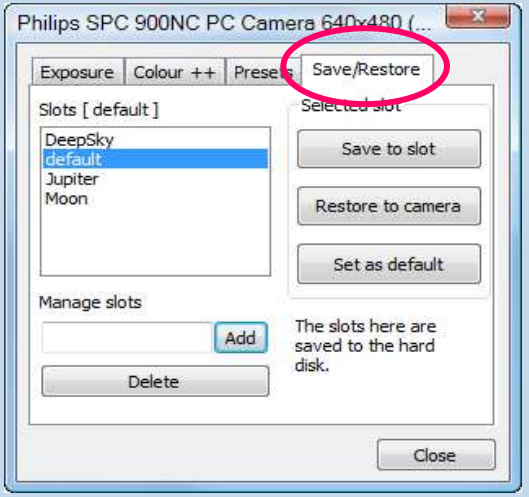
4 Tabs here: Exposure; Colour, Presets, Save/Restore

To be used at discretion
Save/Restore provides ‘Slots’ to store favorite settings
- To create a new Slot first type a name then click Add
- Use it by selecting one then Save to or Restore from Slot
- Select one and make it default so it is loaded when the camera connects

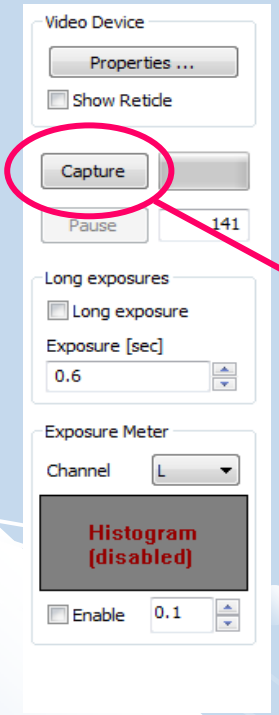
Note: Presets are saved with the camera name
i.e. the one that shows up when connecting



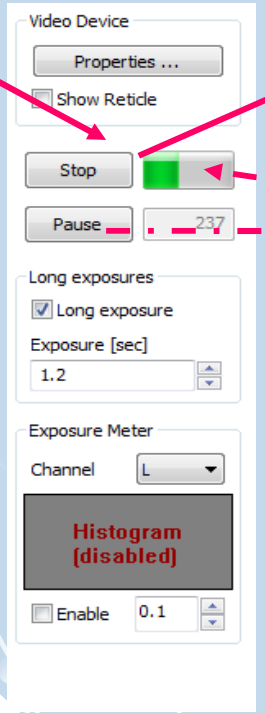


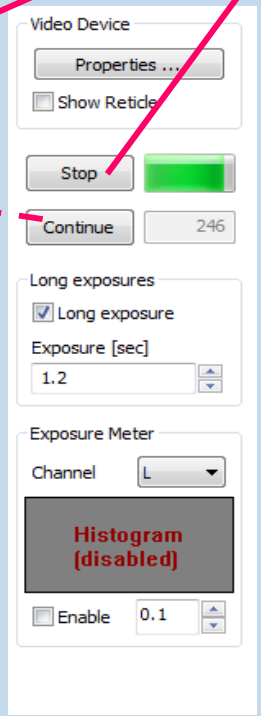


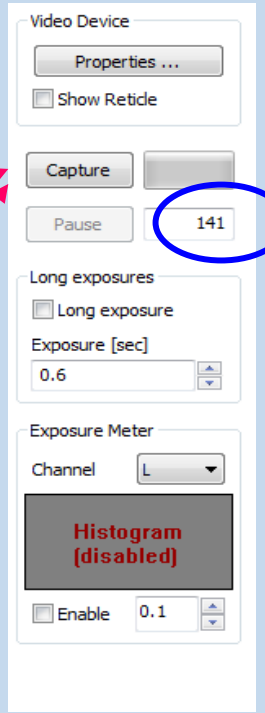
Capturing Images



Click Capture to start recording
Either Stop
or Pause recording
From Pause – Resume or Stop

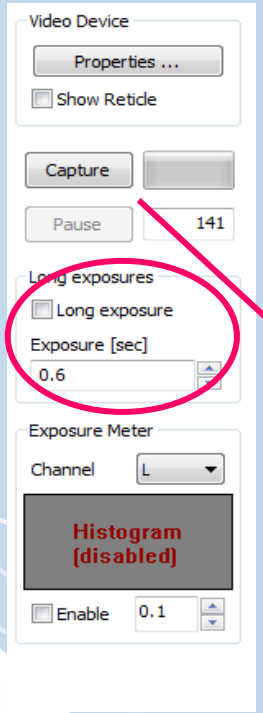




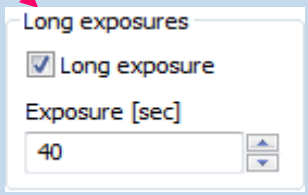


Note: The image counter can be changed only when not recording

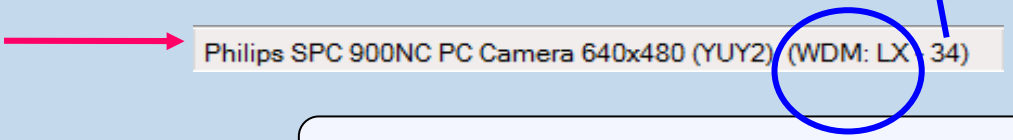
Web Cam Exposures



Web cams may be modified for long exposure (LE)
- The means to control long exposure are in 'Options – Settings – LX-Port Control'
- Once properly setup check the box to run LE imaging
- The exposure time is set in the field (either type or click the spinner)
- Uncheck to retire the LE mode

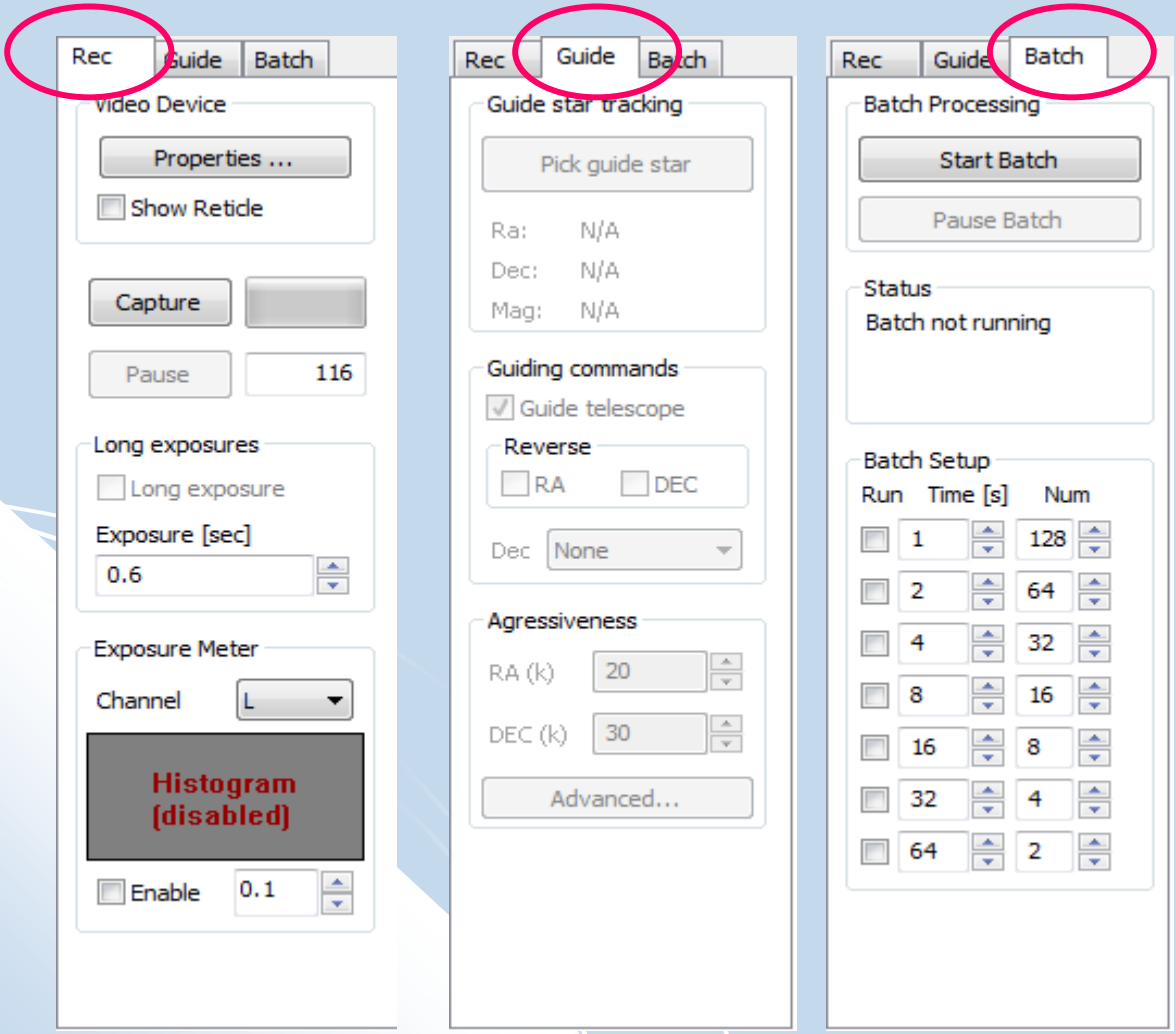


The Status Line shows the remaining expo time
Here it is 34 seconds



Note: LX means Long Exposure here
Otherwise it reads ..:STREAMING
Note: WDM will be V4L2 when using Linux
It is the used driver (video4linux2)

More on Feature Tabs

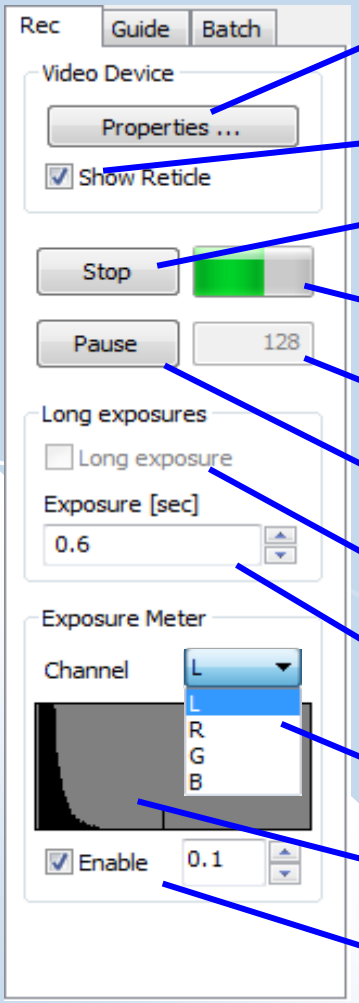


Rec:
Provides access to capture features

Guide:
Provides access to guiding features

Batch:
Contains the batch job items

The complete Rec Feature Tab



Opens the camera Properties (the content depends on the camera type)

Switches the preview recticle on and off

Start and Stop capturing images to the disk

Capture activity indicator

Next image number (can be changed when not capturing)

Pause / Resume capturing (into the same store)

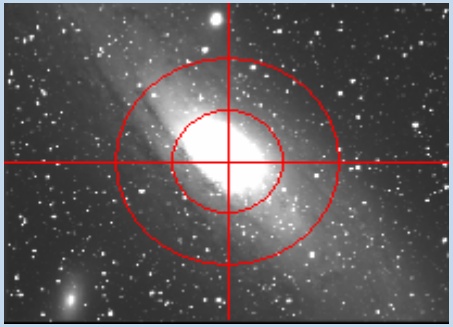
Switches long exposure on and off (only webcams)

Exposure time

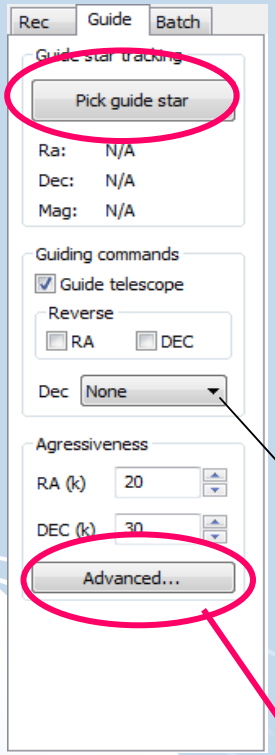
Histogram channel chooser

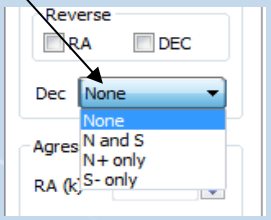
Histogram display

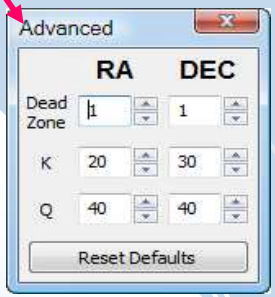
Switches the histogram display on and off



Guide to Guiding







Guiding starts with setting the guider interface in ‘Options – Guiding’ …
Once prepared click ‘Pick Guide Star’ and move the mouse into the preview area
- Click a bright star to define the guiding target
- Now the program calculates the delta an sends the guide commands
- Uncheck ‘Guide Telescope’ to rest guiding
- Check the RA / DEC boxes to reverse the direction of the commands
- It is possible to disable DEC guiding or guide in only a specified direction
- Guiding can be controlled by adjusting the aggressiveness

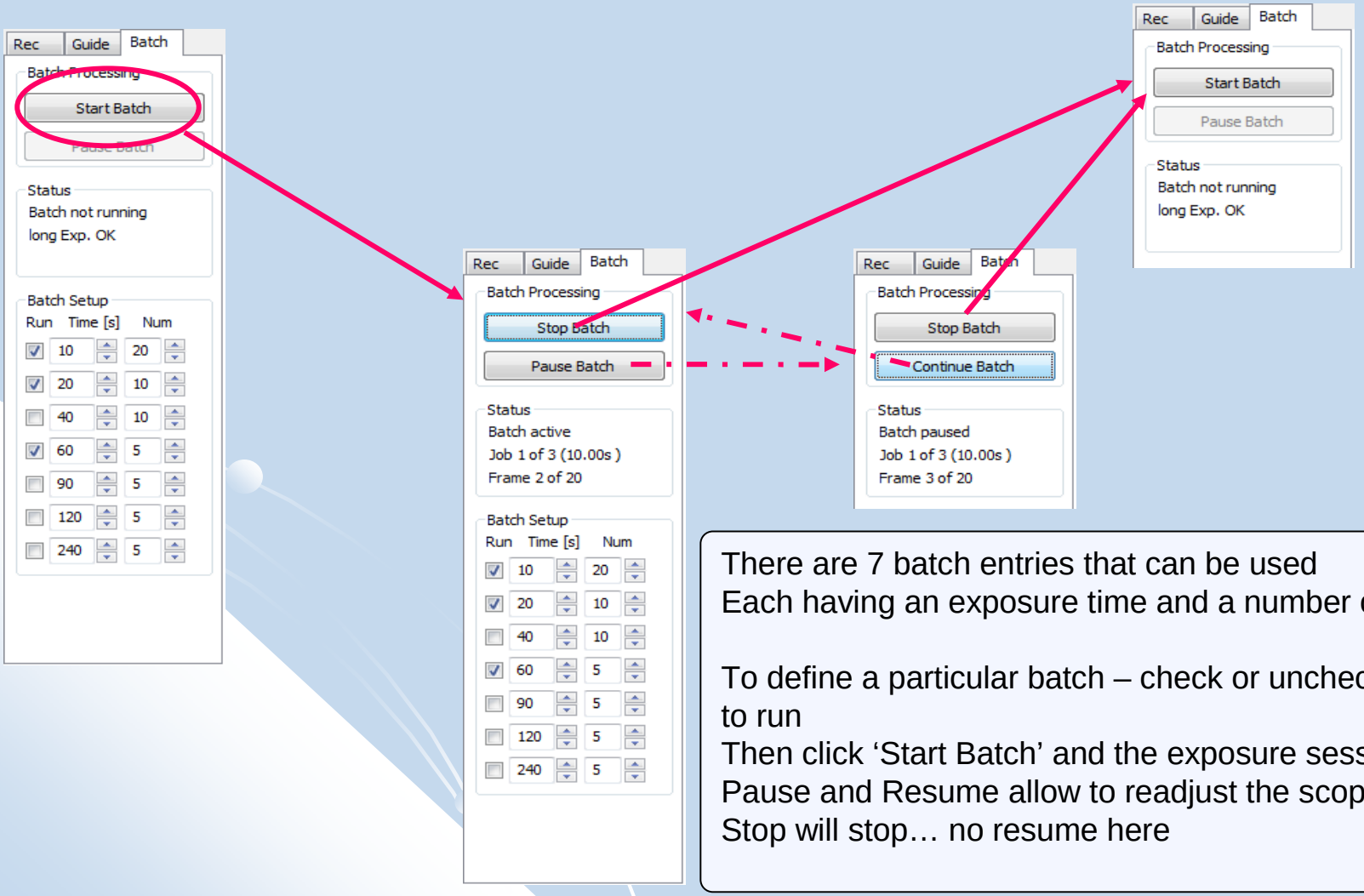
Aggressiveness and Advanced Parameters: Aggressiveness is how fast the telescope tries to compensate for measured tracking errors. The K and Q factors are used for computing the required RA and DEC compensating guide pulse lengths (in [ms]) from measured errors in arc seconds:

$PulseLength_{RA} = K_{RA} * err_{RA} + Q_{RA}$

$PulseLength_{DEC} = K_{DEC} * err_{DEC} + Q_{DEC}$

Q is the minimum pulse length and K is a scaling factor [ms/arcsec] causing longer guide pulses for larger errors. Larger values of K and Q will increase aggressiveness. Spend some time with these parameters to find the balance between a smooth behavior and fast response for your mount.
The “Dead Zone” indicates the minimum guiding error (in arc seconds) before any guiding will happen.

Batch Jobs



There are 7 batch entries that can be used
Each having an exposure time and a number of images to take

To define a particular batch – check or uncheck the entries you want to run
Then click ‘Start Batch’ and the exposure session will start
Pause and Resume allow to readjust the scope/camera if needed,
Stop will stop… no resume here

Image Capture Basics

Image capturing or recording to the hard disk can be defined in some ways to achieve the most desired format for further processing.

The two basic types supported by wxAstroCapture is AVI stream and FITS image

AVI records images in one stream file and there each image with 8bit luminance depth – it is therefore only available with web cams. The AVI stream is left uncompressed.

AVI subtypes are RGB24 where a stream of bitmaps (Win BMP type) is recorded.
The second subtype is YUV where an Y-image is recorded with full resolution, the colour information is recorded into the U and V channels at a lower resolution.

FITS images are recorded with the Art/ATIK cameras (where AVI is not available) or for web cam recording of long exposure series. FITS images can be recorded in folders or into a compressed ZIP file.

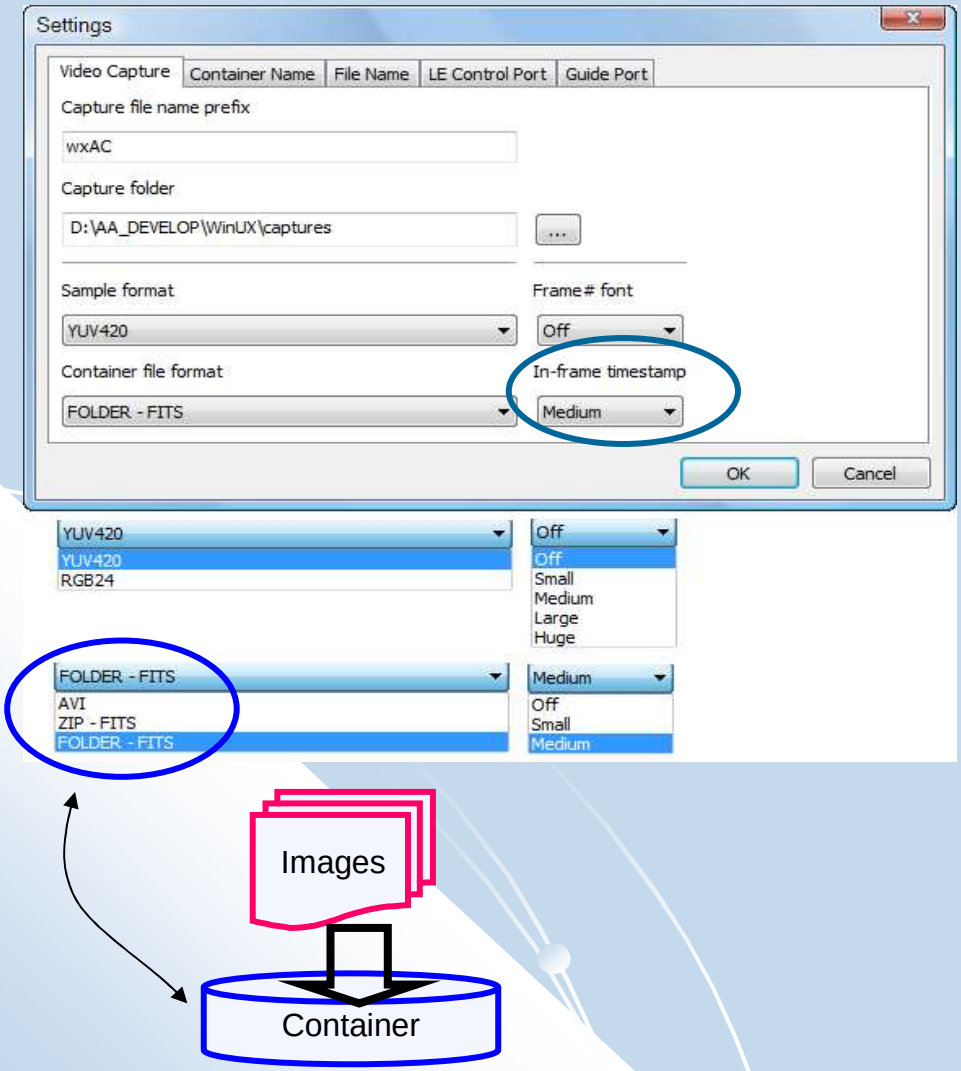
FITS images are recorded with 16bit depth per channel (note webcams will only give max 8bit data per channel).
FITS supports the use of standard 'Keywords' recording some parameters of the capture process. wxAstroCapture provides a selection of such keyword & editable values.

If YUV is set only the Y channel is recorded to FITS
If RGB is set colour information is recorded for web cams

EXAMPLE – FITS HEADER

```
SIMPLE  =                    T
BITPIX  =                   16 /U_SHORT, # bits storing pix values
NAXIS   =                    2 /2d plane image
NAXIS   =                    3 /3x 2d planar rgb color image
NAXIS1  =                  640 /# of pixels/row
NAXIS2  =                  480 /# of rows (also # of scan lines)
BSCALE  =            1.000000 /real = fits-value*BSCALE+BZERO
BZERO   =            32768.00 /real = fits-value*BSCALE+BZERO
TIMESYS = 'UTC' /Time system used
SWCREATE= 'wxAstroCapture V 1.6-4'
DATE-OBS= '2009-09-27T13:10:30.121' /UTC of start exposure
EXPTIME =           0.2240000 /Total integration time (s)
FRAMENO =                 141 /Frame sequence number
OBJECT  = 'OBJECT M31' /Object of observation
IMAGETYP= 'LIGHT' /LIGHT, BIAS, FLAT or DARK
CAMSETUP= '77;49;..;50;..;0;1;0;3;36;17;0;1;0;0;19;0;0;0;0;'
END
```

Options – Settings – 1
Video Capture



The ‘Prefix’ is used for filenames – see next

The ‘Capture folder’ defines where recording goes

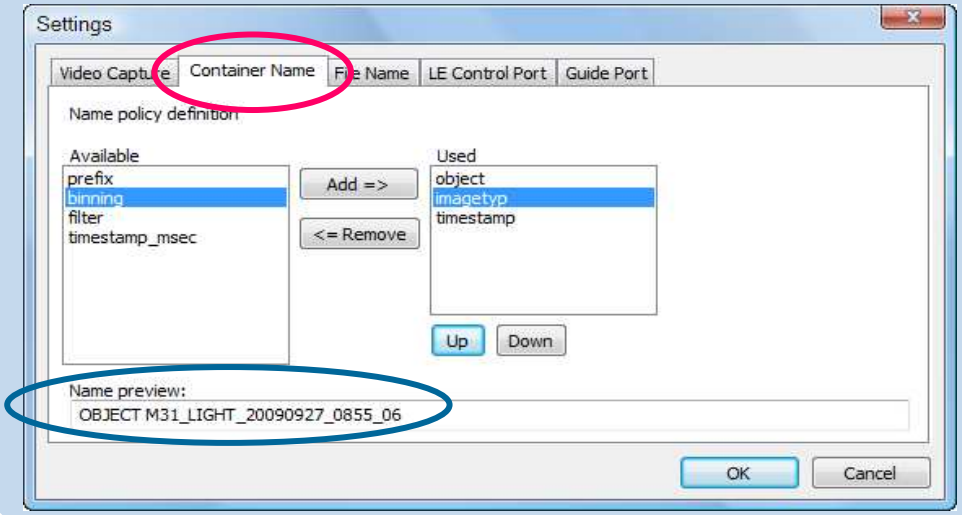
‘Sample format’:
RGB24 records colour information as bitmap
YUV420 records in a variety of Luminance/Color formats depending on the camera, driver.

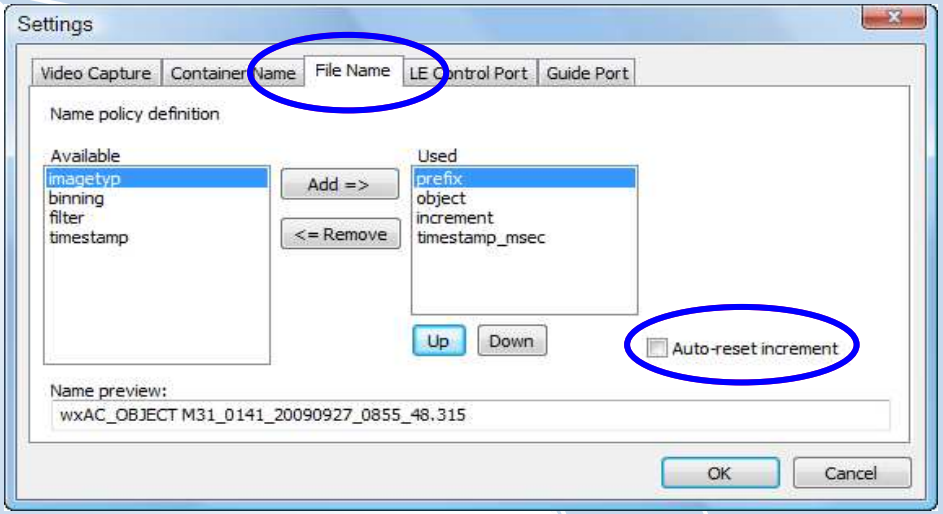
‘Frame# font’ define the size of the record counter shown in the preview while capturing.

‘Container file format’ The container concept is that whatever takes a bunch of images is a container.
So a container is either an AVI file, a ZIP file or a regular disk folder that takes one series of captured images.

‘In-frame timestamp’ If enabled then each image recorded is tagged with the millisecond UTC timestamp when the exposure started (based on the PC clock)

Options – Settings – 2
Container & File Names





As mentioned in 1) there is a container that will hold the images recorded for one capture session.

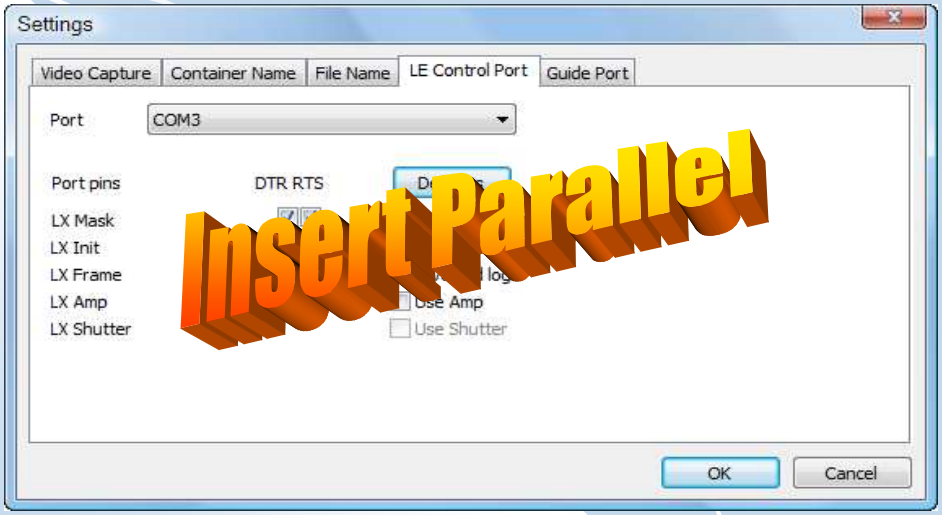
The 'Container Name' (AVI or ZIP filename, or disk folder) can be composed from a variety of items known to the program.

Click on entry and 'Add' or 'Remove' it from the 'Used' section, click an entry in 'Used' and let it Up and Down move to define the sequence – the preview shows how it will look like in the end. One of the timestamps has to remain in 'Used' otherwise it would lead to ambiguity and overwritten files.

The same logic applies to the 'File Name' that is the name each file carries when recorded (AVI streams cannot not use this one as individual frames are not named)

Check 'Auto-reset increment' if the image counter should be reset for each capture session.

Options – Settings – 3
LE Control Port



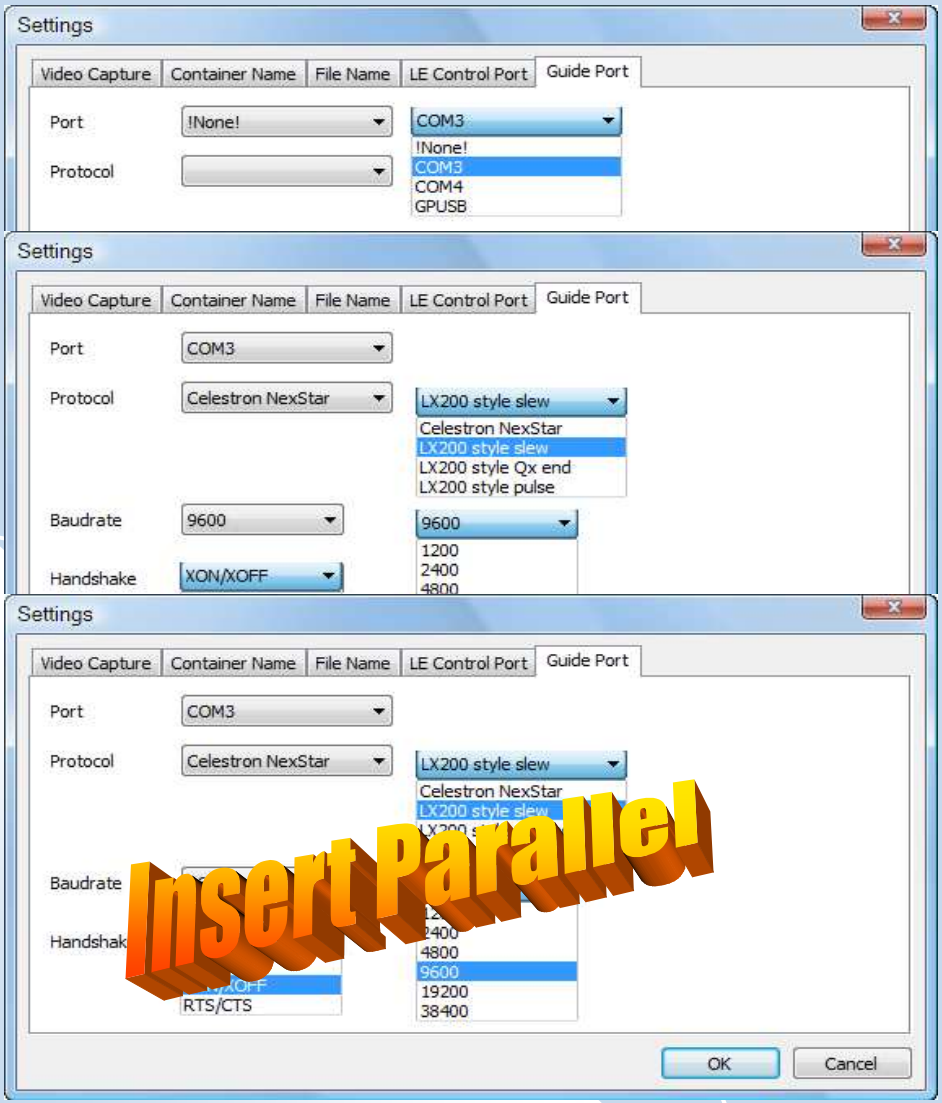
Setting the port to control the long exposure (LE) for web cams.

Depending on the system none or various ports are available to chose as control port for LE.
Basic types are:
- Serial Port (RTS, DTR line)
- Parallel Port (chose from 8 pins)
- LXUSB Port (all set here)

'Defaults' will always set the lines according to well known modifications – click this one if you don't know.
Check 'Use Amp' if the amplifier mod is available.
Check 'Use Shutter' if the shutter line is wired on the parallel port (the program runs a shutter cycle to empty the CCD after each exposure)

'Masking' means that other lines are not touched and are available to e.g. guiding when using the parallel port. → So make sure only the used lines are masked otherwise strange things will happen…

Options – Settings – 4
Guiding Port



Setting the port to where the guiding telescope is connected to. Also available in Options – Guiding.

Depending on the system none or various ports are available to chose as control port for LE.

Basic types are:
- Serial Port (Speed, Handshake)
- Parallel Port (chose from 8 pins)
- GPUSB Port (all set here)

‘Protocol’ some guiding protocols are at hand.

The parallel and the GPUSB ports only support a ST4 style 4 wire hardware guiding. Setup is similar to the LX parallel port setup (don’t forget the masking)

For the serial port there is:
- Celestron NexStar
- LX200 style with slewing commands with #Q as stop
- LX200 style with additional #Qx(wesn) stop command
- LX200 style with ‘undocumented’ pulse commands

Options –

FITS Header

Tips & Tricks

References & Links