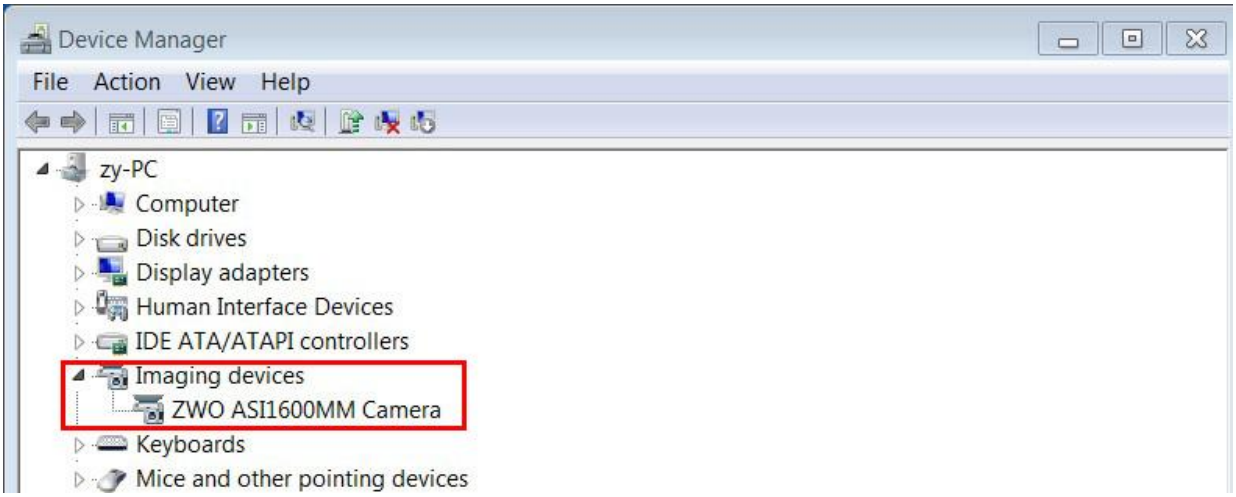
T7C/M Astro Camera Astronomy Planetary

Quick Guide

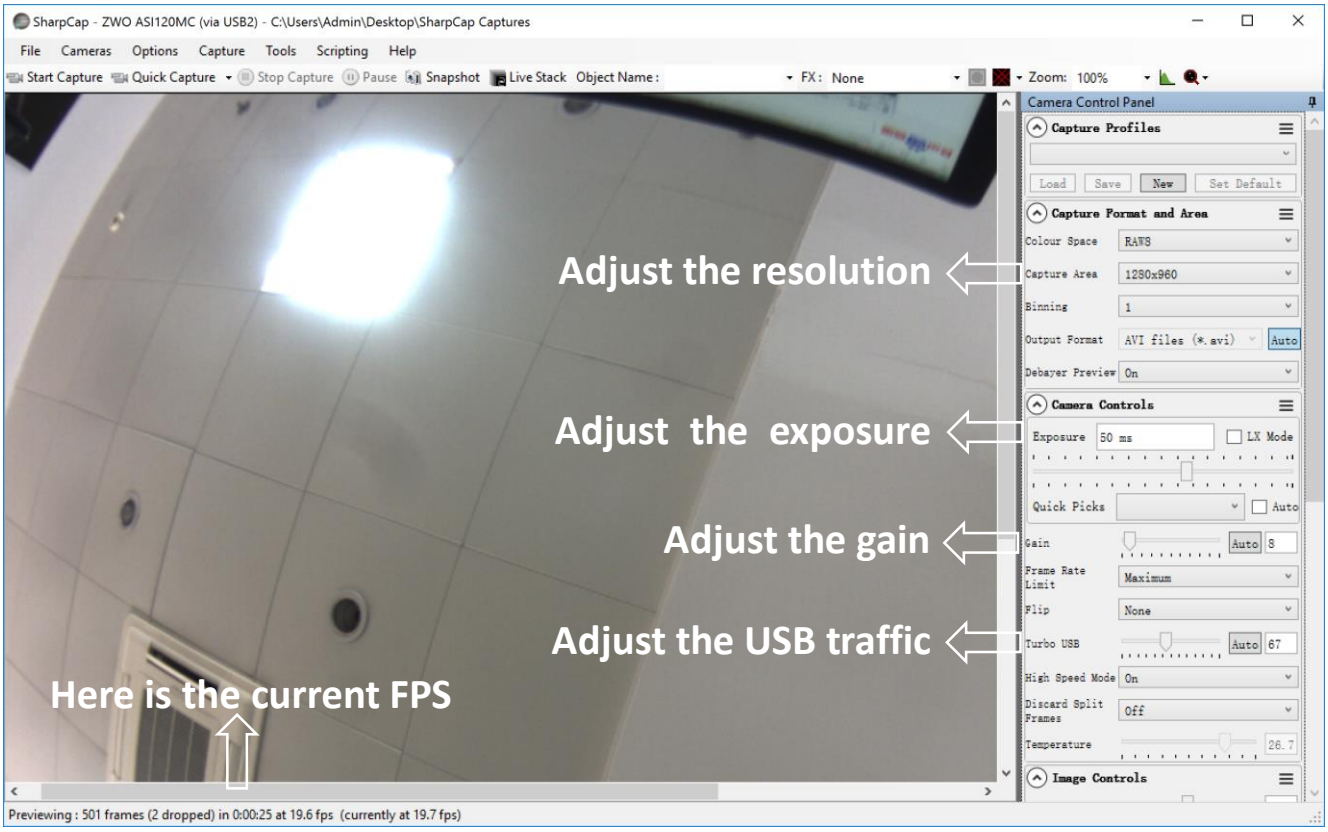
This guide is brief summary of the ƛyãǘl·ƭƭl·ǘƛƻƴLJNƻƻŎŜŘdzNƻŜ ǘƻ ƎŜǘ ȅƻdz dzLJ l·yŘ NƻdzyƴƴƛyƎ ǿƛǘK ȅƻdzNƻ yŜǿ Ŏl· YŜNƻl·ɸ tƭŜl·ăŜ ōŜ ădzNƻŜ ǘƻ read the user manual for more complete instructions.

M0 Driver and software installation (Windows)

1. Download and install “Cameras driver” from our website https://astronomy-imaging-camera.com/software/ or CD-ROM.
   After plugging in the camera, you will see your ZWO camera model listed under the “imaging devices” category of the Device Manager if the driver is installed successfully.



2. Download and install SharpCap (image capture software) from our website or CD-ROM. Choose your camera model from the camera menu. Then you can see the preview video. Keep in mind that you will only see some brightness in the preview video without lens or scope.



More detailed user manual can be found at our website:
https://astronomy-imaging-camera.com/manuals/

Connecting the camera to the telescope

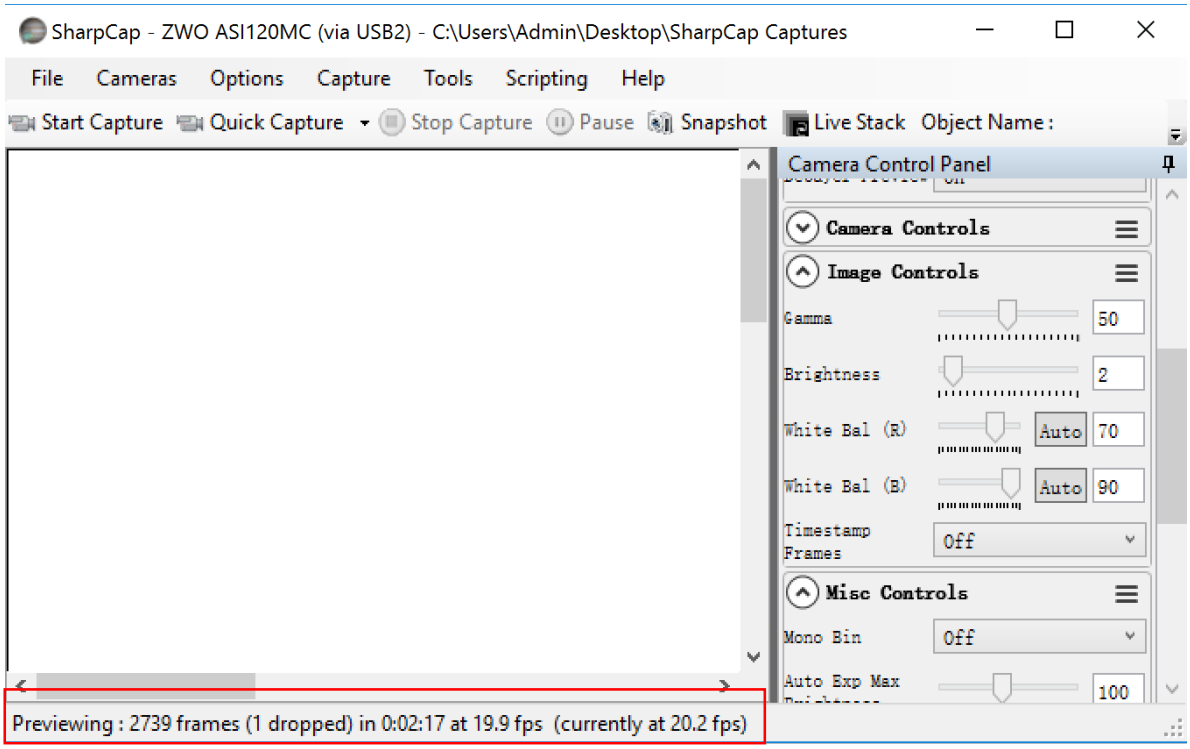
The following cameras include an all sky lens:

Please remove the lens before attaching the camera to your telescope.

Take off the lens	Screw the 1.25”nose-piece
Focus through the eyepiece	Replace the eyepiece with camera
Connect the USB2.0/3.0 cable	Refocus so camera image is sharp

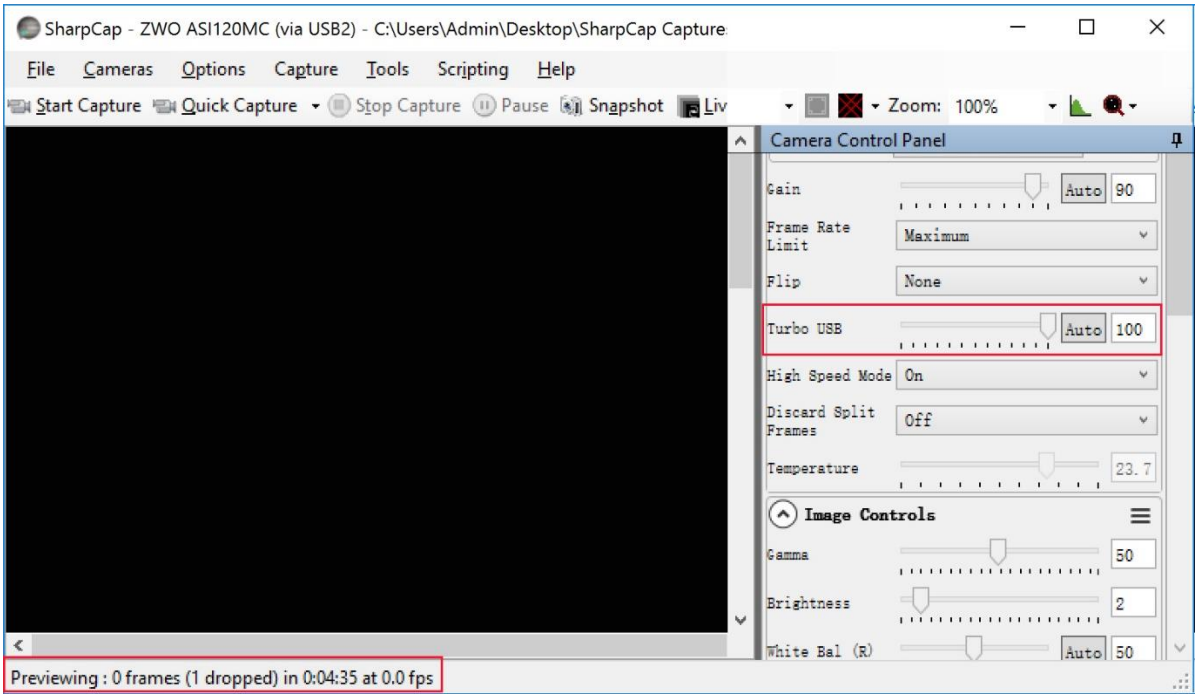
Trouble shooting:

1. The preview image is completely white but the fps is normal.



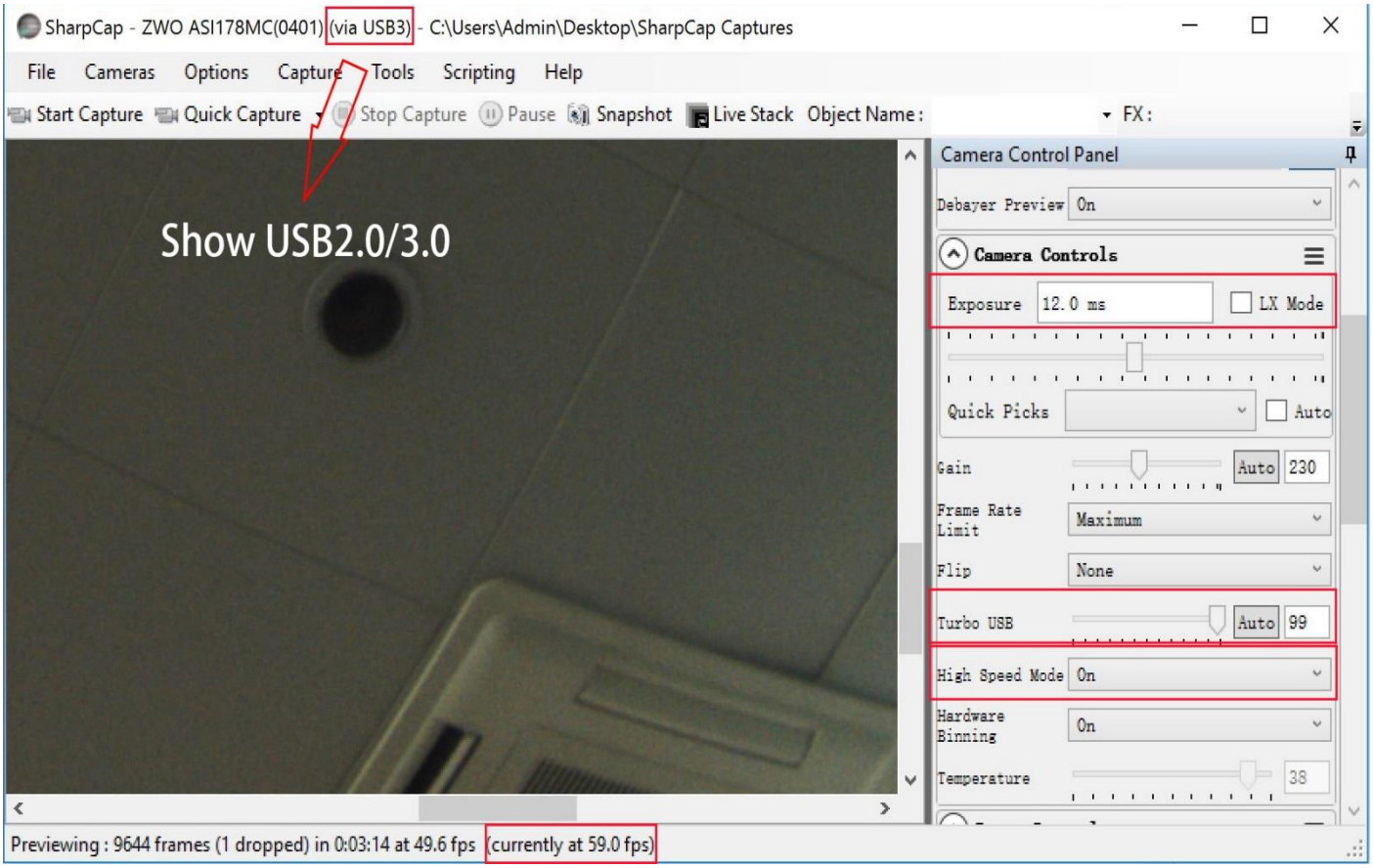
The camera is over exposed, please reduce the exposure and/or gain. Keep in mind that you can only see brightness without lens or scope

2. The preview screen is black and the fps is “0”.



Please try to slow down the capture speed by reducing the “Turbo USB”. Also try connecting the camera to your PC directly without a USB hub or extender if reducing “Turbo USB” still does not work.

3. The camera can`t preview at the FPS declared in the specifications.

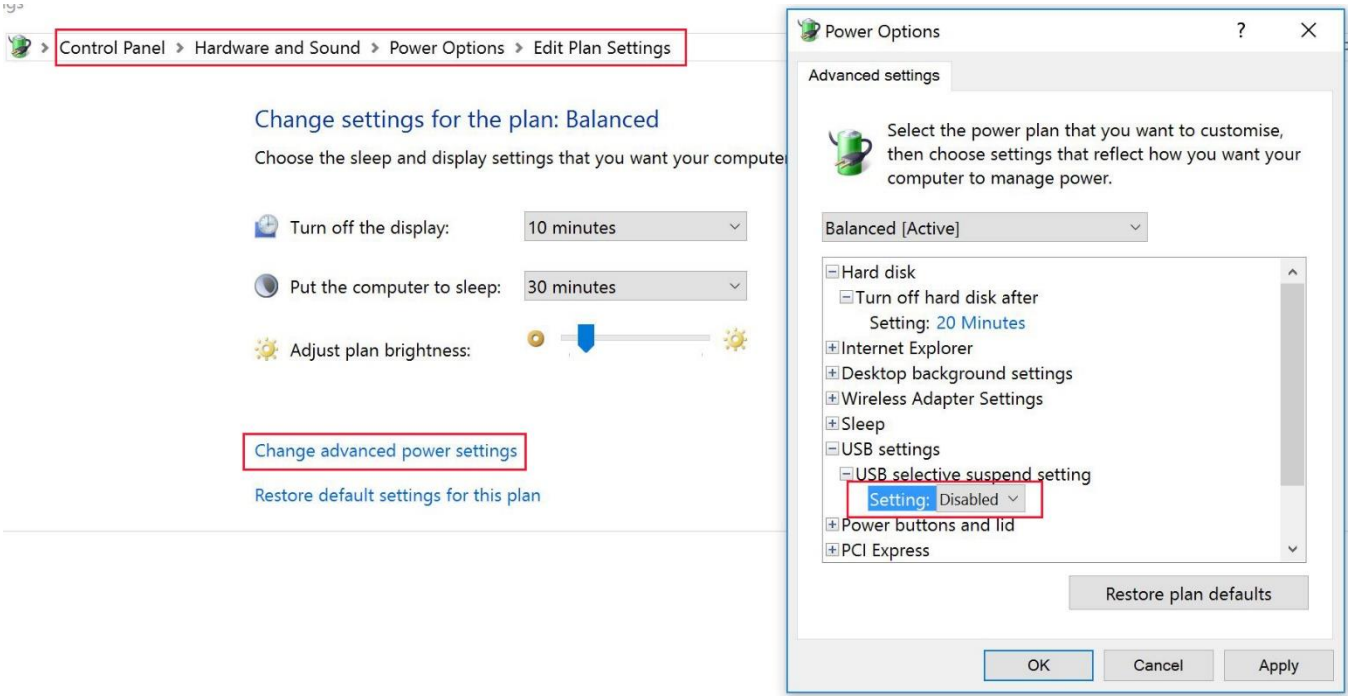


1) Please make sure the camera is connected to USB3.0 host if it's a USB3.0 camera. Check that the camera is recognized as "via USB3.0". Please try to update the computer`s USB Host Controller driver if not.
2) Make sure that the "High Speed Mode" is On.
3) Adjust "Turbo USB", we recommend 80-90%. This value depends on your computer, higher means faster.
4) Don`t forget the exposure time affects FPS too. In general your exposure time needs to be shorter than 1/FPS rate. For example, the FPS will decrease to 1FPS when the exposure time is 1 second.

4. The camera can preview at 60fps but drops to 20fps when recording.

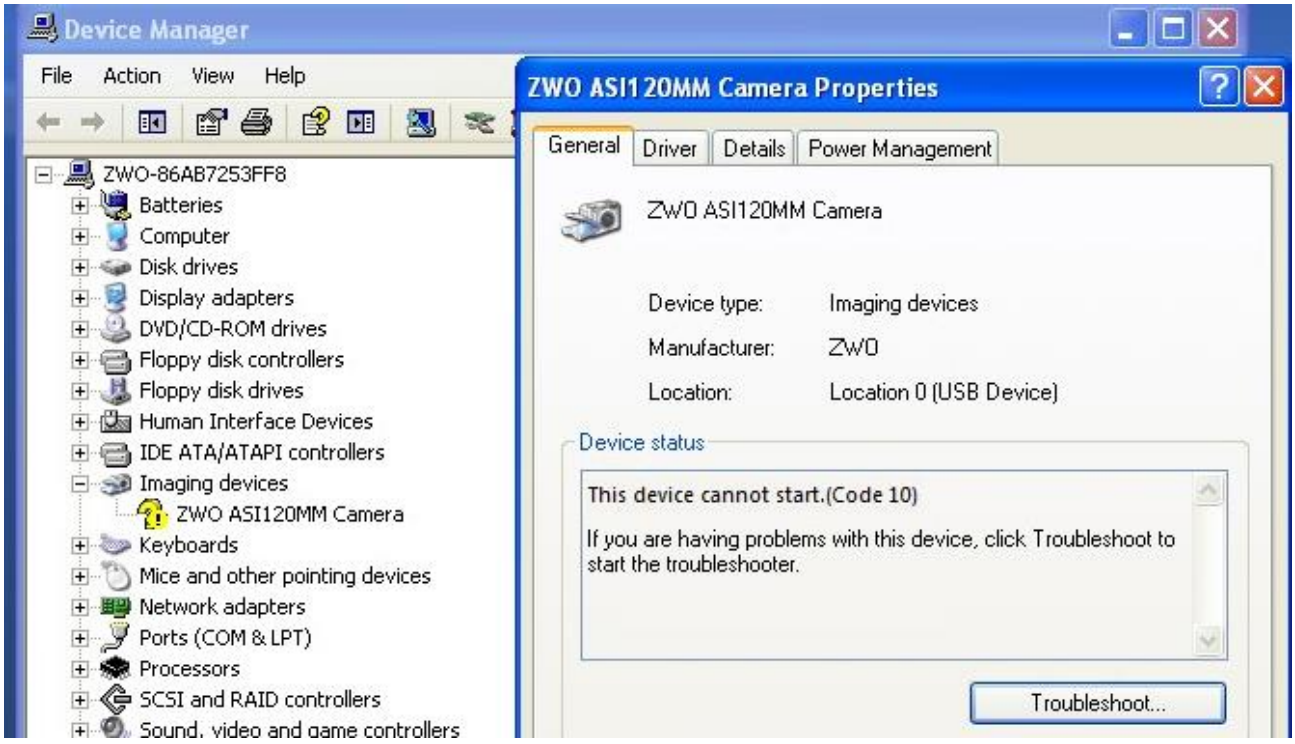
This is because your hard disk drive cannot match the speed of the camera. Most ASI cameras are very fast and require up to 400M/s data transfer speed. But most hard disk driver can only run at 40-50M/s.
We recommend you can exchange your HDD with one fast SSD and try to capture the data in raw format instead of RGB24 if you use one color camera.

5. The camera cannot run continually on a laptop without external power



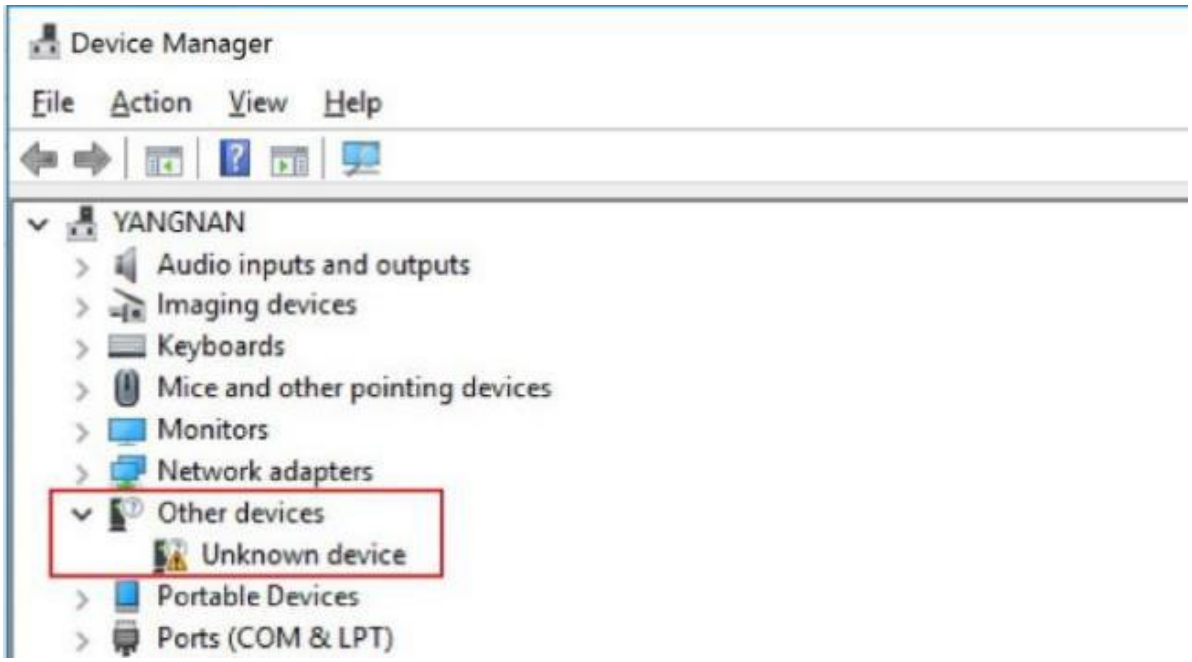
This is because of the power save mode of your laptop, you need to disable power saving of USB port.

6. There is a yellow hint with the camera model name and error code 10.



You may have this problem with our USB2.0 cameras, please try another USB Port or PC, then you can upgrade the firmware of this camera on the good PC. The original firmware is more stable and faster. Download this upgrade tool from our website http://astronomy-imaging-camera.com/software/FWTool.zip

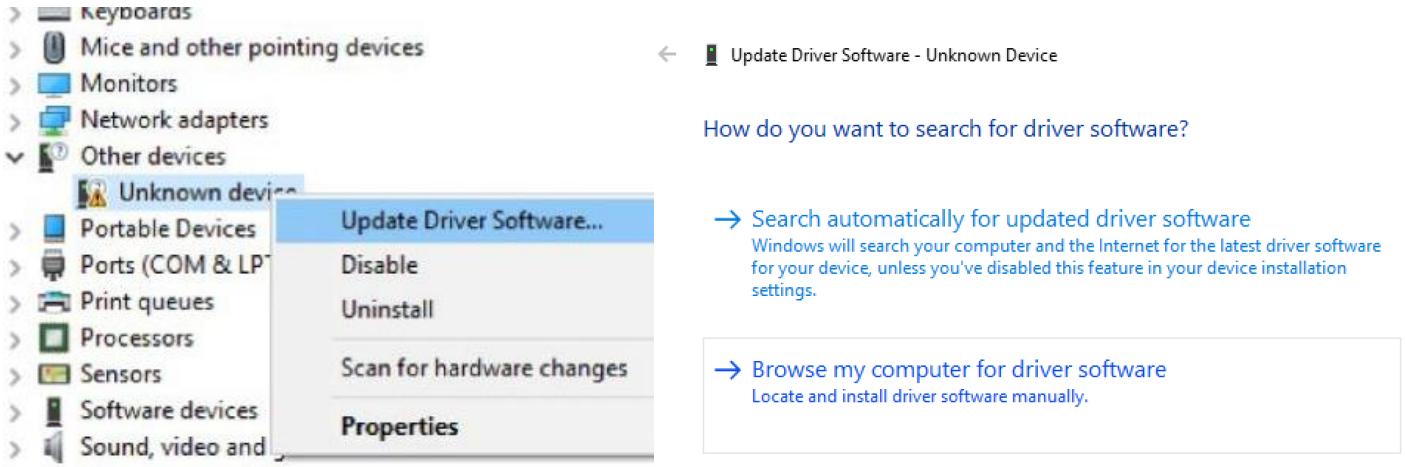
7. Unknown device shown under the device manager after plugging in the camera.



This is because the driver in not installed or installed properly, please try to close all anti-virus software and re-install the driver.
You can also update the driver manually if re-installation still does not work.

Right click the “Unknown device”, choose the “Update Driver Software” and point to the driver directory. Normally the driver directory is :

C:\Program Files (x86)\ZWO Design\ZWO_USB_Cameras_driver.



2. Camera Models and Sensor Type

There are 2 types of T7 Camera Astronomy Planetary models:

Models	Mono or Color	Interface	Sensor
T7M	Mono	USB2.0	AR0130CS
T7C	Color	USB2.0	AR0130CS

Why do I choose T7 Camera Astronomy Planetary?

It is mostly used for planetary imaging. It can also be used for deep sky imaging up to a certain level. This new version comes with an ST4 Auto guider Port, so you may now use it both for imaging and guiding.

Monochrome camera sensors are capable of higher details and sensitivity than color sensors, but you need additional accessories such as filters. The post-processing is more complicated too. So color camera is often recommended for beginner of astrophotographer.

3. What's in the box?

T7 Camera Astronomy Planetary

–T7C Color 1.2 Mega Pixel Astronomy Camera
–150° Lens Adapter for use as an all-sky camera
–C-Mount and Extend Tube
–1 m long USB cable
–1 m long ST4 guider cable
–Quick guide

T7 Camera Astronomy Planetary

4. Camera technical specifications

Sensor	1/3″ CMOS AR0130CS
Resolution	1.2Mega Pixels 1280×960
Pixel Size	3.75μm
Max FPS at full resolution	T7C/M 35FPS(12bitADC)
Shutter	Rolling shutter
Exposure Range	64μs-2000s
Read Noise	4.0e~6.6e
QE peak	Almost 80%
ADC	12 bit
Interface	USB2.0
Adapters	1.25″ / M42X0.75
Supported OS	Windows, Linux & Mac OSX
Power consumption	100ma@5V (T7C/M)
Working Temperature	-5°C~45°C
Storage Temperature	-20°C~60°
Working Relative Humidity	20%~80%
Storage Relative Humidity	20%~95%

5. QE Graph & Read Noise

QE and Read noise are the most important parts to measure the performance of a camera.
Higher QE and Lower read noise are needed to improve the SNR of an image.
T7C/M is a very fast and sensitive USB2.0 camera. Up to 35FPS under 1280x960 full resolution! With a peak almost 80%, beyond ICX618 and with no FPN (Fixed pattern Noise)! Long time exposure supported up to 2000s.

Mono sensor

AR0130CS

SPECTRAL CHARACTERISTICS

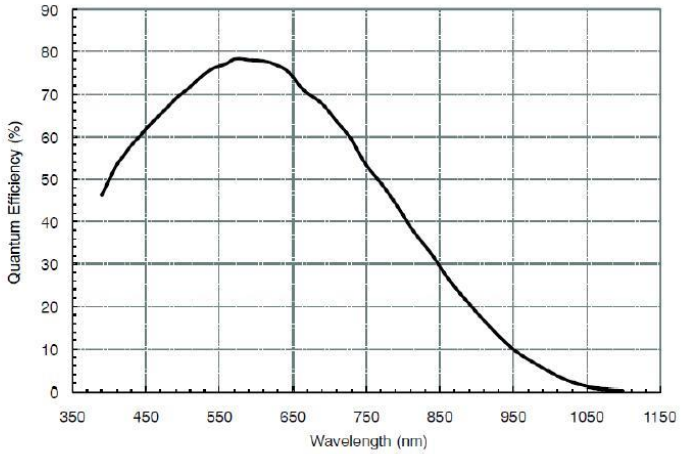
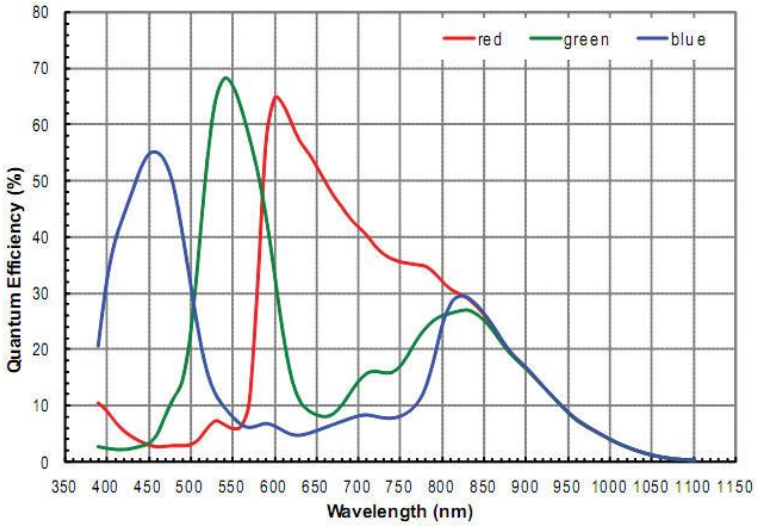


Figure 26. Quantum Efficiency – Monochrome Sensor

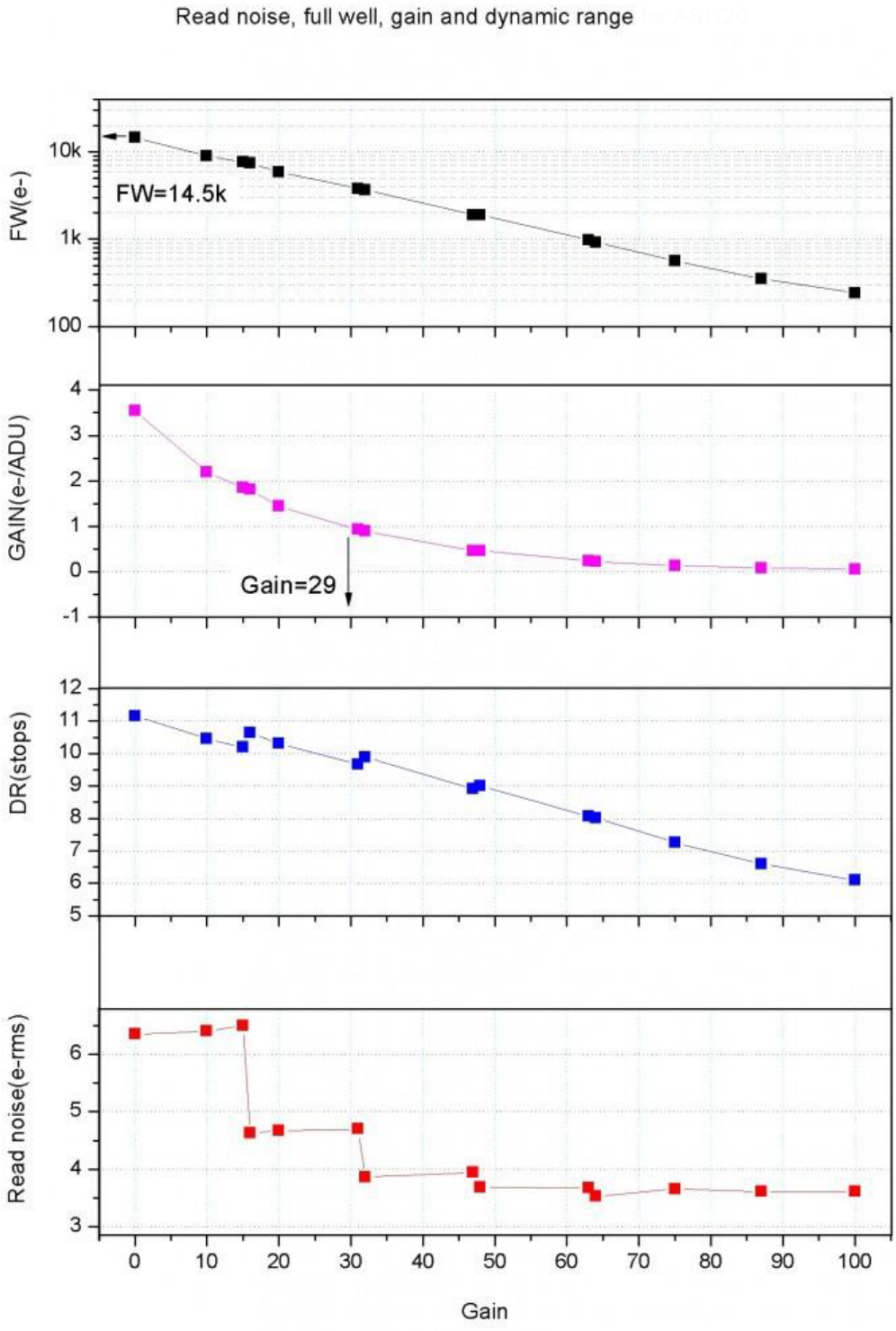
Color sensor

Figure 24: Quantum Efficiency – Color Sensor



Read noise includes pixel diode noise, circuit noise and ADC quantization error noise, and the lower the better.

Depending on your target, you can set the gain lower for higher dynamic range (longer exposure) or set the gain higher for lower noise (such as short exposure or lucky imaging).

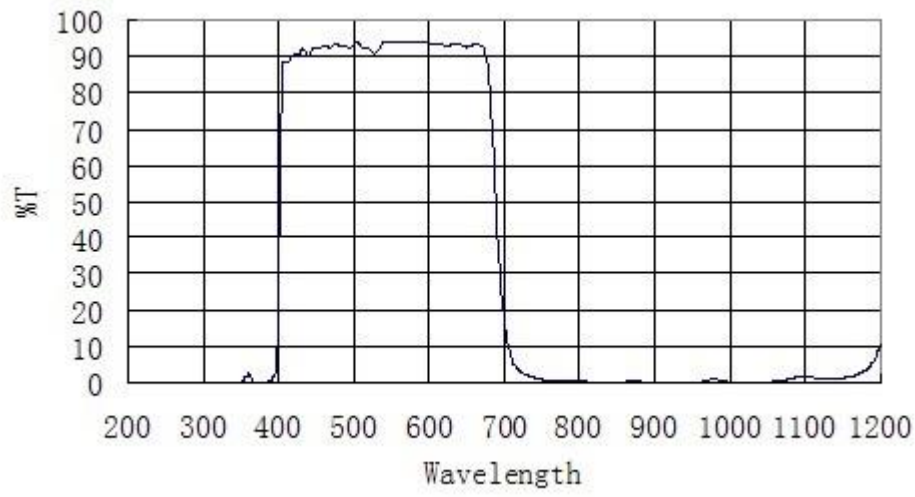


6. Getting to know your camera

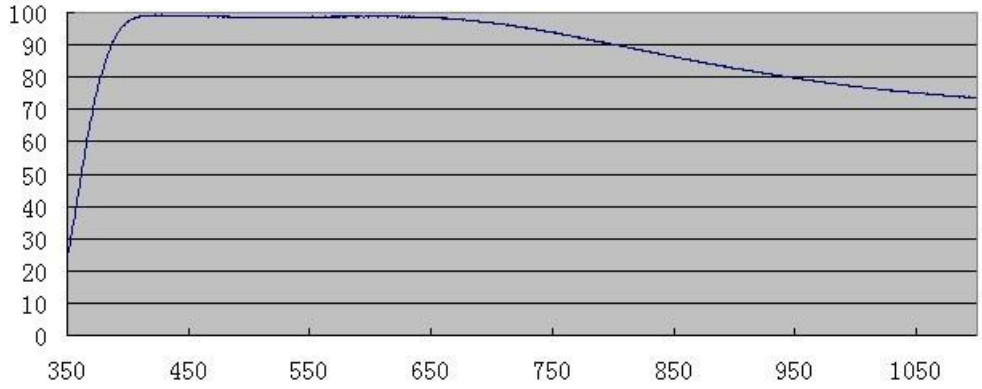
6.1 Protect Window

There is a D21 IR-CUT protect window in the T7C/M camera to prevent the sensor from humidity and dust. Diameter is 21mm and 1.1mm thick.

Transmission chart of the UV IR-CUT filter



T7C/M camera come with the D21 AR protect window. Transmission chart of the AR filter



6.2 Analog to Digital Converter (ADC)

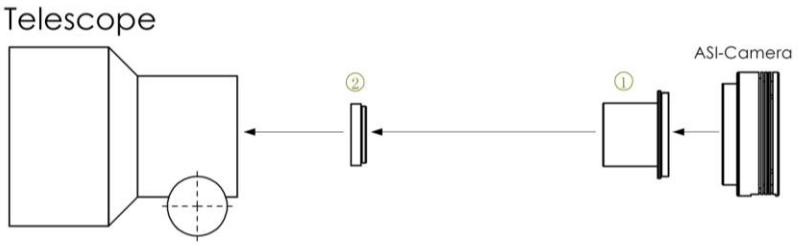
The T7C/M camera records in 12bit ADC. This camera also supports ROI (region of interest) shooting, and this smaller ROI has faster fps.
Here is the maximum speed of T7C/M camera running at 12bit ADC .

Resolution	T7C/M camera (12bit)
1280X960	35FPS
1280X720	46FPS
1280X600	55FPS
1280X400	80FPS
960X960	46FPS
1024X768	54FPS
1024X600	69FPS
1024X400	101FPS
800X800	66FPS
800X640	74FPS
800X512	102FPS
800X400	108FPS
800X320	158FPS
640X560	98FPS
640X480	113FPS
512X440	123FPS
512X400	135FPS
480X320	165FPS
320X240	215FPS

7. How to use your camera

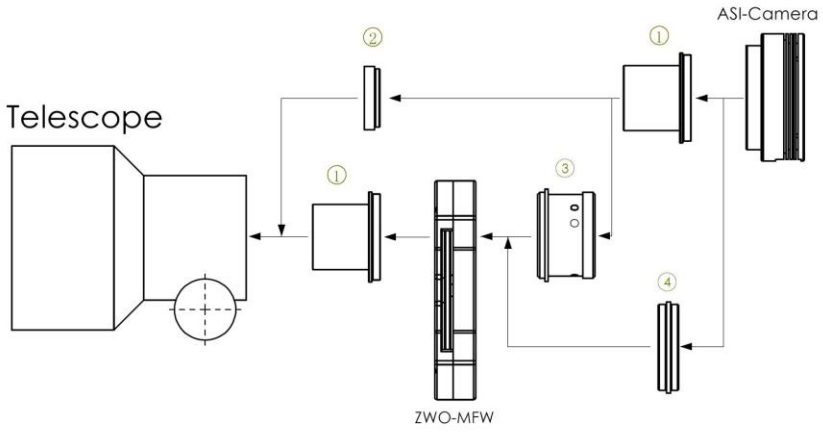
You can refer to the connecting drawing blow:

Color camera connecting drawing:



1. 1.25” T-Mount
2. 1.25”filter(optional)

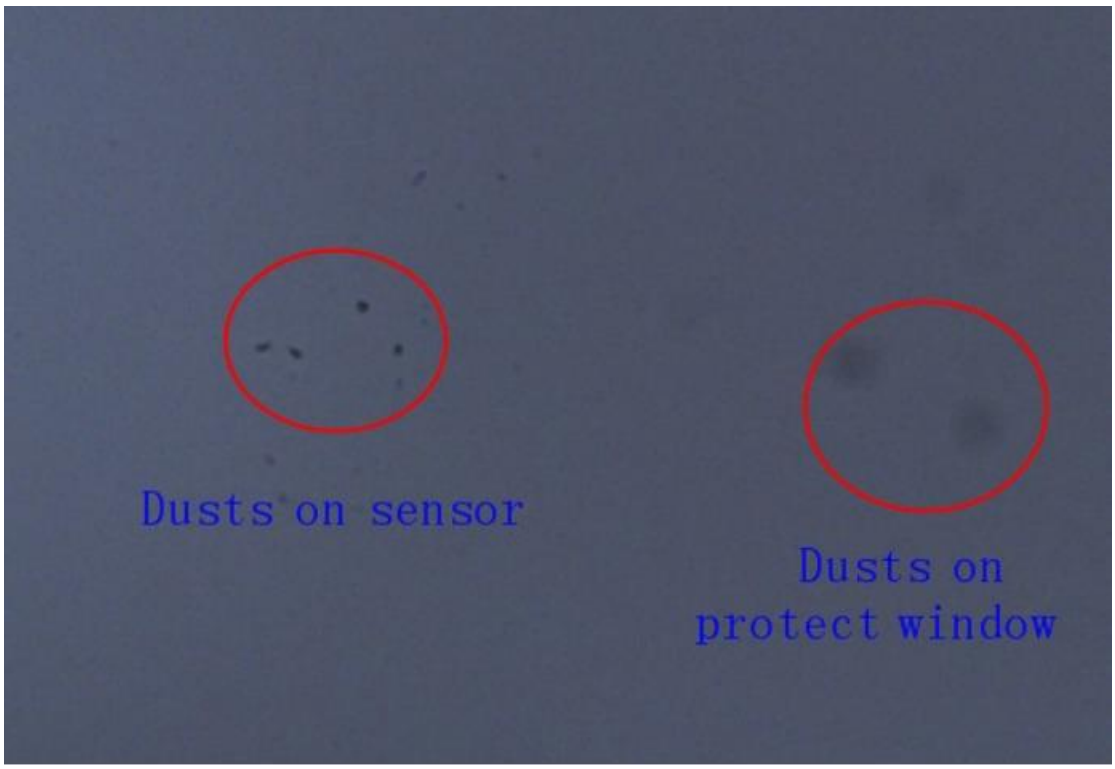
Mono camera connecting drawing:



1. 1.25” T-Mount
2. 1.25” filter(optional)
3. M42-1.25” adapter
4. M42-M42（Male screw thread）

8. Clean the camera and redry desiccant

The camera comes with an AR protect window, which can protect the sensor from dust and humidity. Should you need to clean the sensor, it's better to do so during the daytime. To see the dust, you just need to setup your telescope and point it to a bright place. A Barlow is required to see these dusts clear. Then attach the camera and adjust the exposure to make sure not over exposed. You can see an image like below if it's dirty.



The big dim spot on the image (at right) are the shadows of dust on the protect window.
The very small but very dark spot in the image (at left) are the shadows of the dusts on the sensor.
The suggested way to clean them is try to blow them away with a manual air pump. To clean the dust on the sensor you will need to open the camera chamber.

9. Servicing

For software upgrades please refer to “Support-manual and software” on our official website.
https://astronomy-imaging-camera.com/
Repairs and servicing are available by emailing info@zwoptical.com

For customers who bought the camera from your local dealer, dealer is responsible for the customer service.

10. Warranty

We provide 1-year warranty for our products. We offer repair service or replacement for free if the camera doesn’t work within warranty period.
After the warranty period, we continue to provide repair support and service on a charged basis.

This warranty does not apply to damage that occurred as a result of abuse or misuse, or caused by a fall or any other transportation failures after purchase.
Customer must pay for shipping when shipping the camera back for repair or replacement.