CELEBRATING 40 YEARS 1978 - 2018

The Messenger

Mexborough & Swinton Astronomical Society

SPECIAL

ZWO ASI 071 MC PRO

Special Edition

This is a special Messenger Manual on the Societies new ZWO ASI 071 MC PRO camera for use at the observatory by our curator, Tony Morris



ZWO ASI 071 MC PRO – The fun starts

1 Introduction

As many of you know the society was successful in obtaining funding for a ZWO ASI 071 PRO imaging camera, so to help you make efficient use of the next clear night here are a few pointers to get you imaging quickly.

2 Some basic information regarding the camera

The camera is based on the Sony CMOS sensor part number IMX071. This is usually used in DSLR cameras. It has a count of 16 Million Pixels in a 4944 by 3284 array, each pixel has a size of 4.78µm. The Bayer colour matrix is formatted as a Red, Green, Green, Blue (RGGB), this is important to know when post processing your images in some software.

The maximum download speed at full resolution is quoted as 10 frames per second at full resolution over USB3 but USB2 is also supported, unfortunately the camera frame rate and download will be slower if you use USB2. The exposure range is 64µs-2000s. If you do not need all the area of the chip to be used a feature called Region of Interest (ROI) is supported where you may use a small portion of the sensor to get a much faster frame rate and smaller files, this is very useful for planetary imaging.

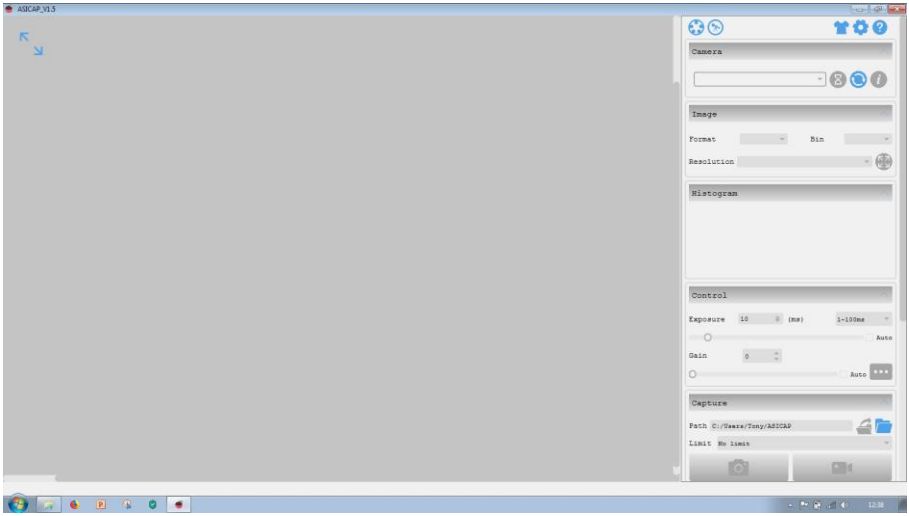
Whereas normal webcams and their cousins are normally 8 bit devices which can render images with 256 levels per colour the MC PRO can render images with 14 bits or 16384 levels of colour, a much finer gradation. This of course comes with a penalty of larger files sizes and more stress on your computer. The camera can also be switched into 8 bit mode but why waste its capabilities!

3 Software

To control the camera, you will need the following software: -
Go to: - https://astronomy-imaging-camera.com/software-drivers
Download for Microsoft windows: -

- ASI Cameras driver version 3.0.0.5
- ASICAP

The driver **must** be installed first, trust me as I did it the wrong way round on one of my machines, not recommended.
Other tabs on the software page allow you to get software for your Mac or Linux computer as required.
Once installed and tested at ***home*** you should be greeted with a screen like this when ASICAP is launched.



To view the huge video files this camera produces in 14 bits you will need the following SER player software: -
https://sites.google.com/site/astropipp/ser-player
Download the relevant package for your computer and install it.

Download the relevant package for your computer and install it.

You are ready to use the camera

However, to get good focus on stars you can take advantage of the high frame rates available and our Bahtinov masks. There is also software to analyse how good the focus is, this is called Bahtinov Grabber which may be download from here: -
You will also need ASCOM first (this is a windows interface for astronomical equipment which many vendors use)
https://ascom-standards.org/Downloads/Index.htm
and then Bahtinov grabber
http://www.njnoordhoek.com/?p=660

You may of course have your own favourite camera control software, check that it can control the ASI 071 before you miss the one and only clear night for months!

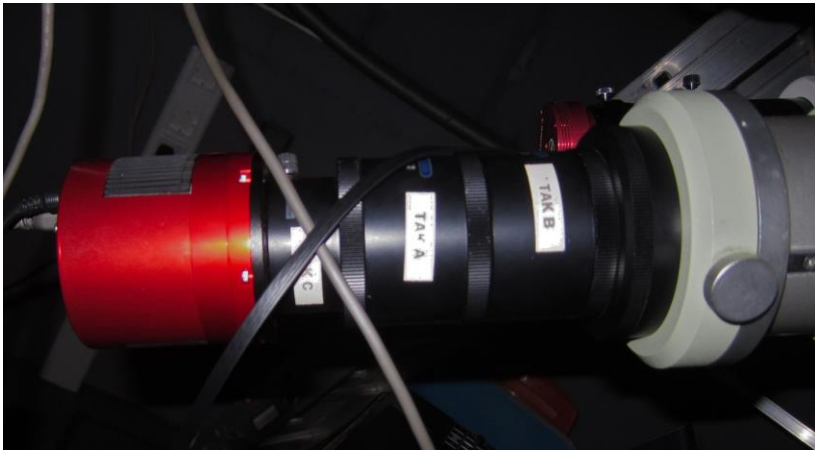
4 Connection to the TOA 130

To connect the camera to the TOA130 at the observatory the following adapters are screwed in to the front of the camera in this order, I would also advise on the use of the Astronomik light pollution filter which is seen below to the left-hand side. It screws into the front of the 16.5mm adapter.

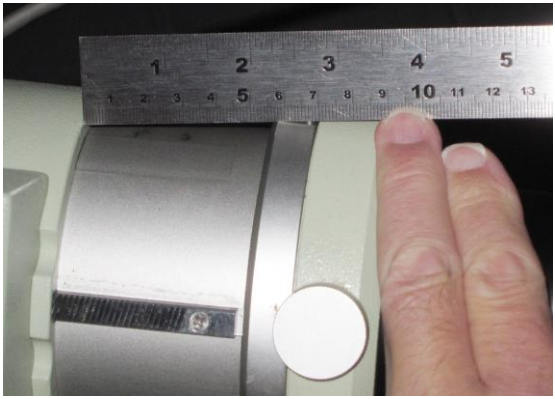


The same setup may be used for the C14.

Please ensure the dust cap is always put back on the camera body as soon as the camera is not in use. The dust cap is the object with the red seal stopping the camera rolling off the observatory workbench. These cameras roll easily as they have a smooth cylindrical body so be careful where you place it.
The camera mounts onto the TOA 130 as shown.Using tubes TAK A,B and C. The camera is pushed all the way into TAK C and nipped up securely.



The focuser is racked out to 70mm measured from the green focuser body to the green ring of the camera rotator, this distance will give you a good starting point for fine focus tuning.



The rear of the camera has the following markings and connection ports. The TOA130 has a camera rotator so the camera may be pushed home and secured in any orientation. However, it should be considered good practice to align the *ASI017 MC Pro* text parallel with the TOA 130 focuser shaft. This will facilitate quicker framing alignment with your chosen target as the Paramount RA and DEC movements will be seen directly as X and Y movements of the image on the imaging chip. Once fully aligned the camera may be rotated as desired.



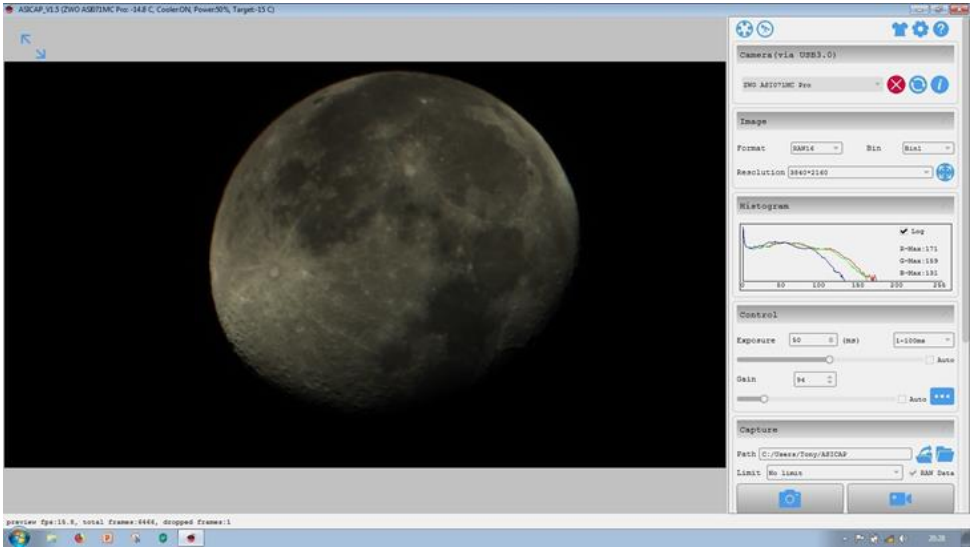
5 Computer and Power supply connection

The blue USB3 port (top right) should be connected directly to your computer first and then connect the dedicated 12V power supply to mains socket on the front of the column and then the camera.

PLEASE be careful as the camera power supply lead and USB3 leads are not very long and they could easily pull tight when the Paramount slews.

I will get better cables in the near future**.** Your computer should now install the drivers for the camera and you should be able to connect ASICAP to the camera.

Here is first light!



Settings
Camera = ZWO ASI071MC Pro
Image = RAW16, Bin 1
*Resolution set to 3849*2160 (from the drop-down resolution menu).*
*By dropping the resolution to 3849*2160 this still covered the lunar image but allowed faster frame rates for visual focussing and video capture.*
Exposure 50ms.
Gain= 94.
The cooling was set to -15°C on the camera information screen
Capture = where you want to store the images.
The Camera and Video camera icons trigger image capture of either still or video sequences.
WARNING the video files are massive.

6 Critical Focus

To get critical focus of deep space objects use the Bahtinov mask and Bahtinov grabber software. Point the TOA130 at a bright star and adjust the gain and or exposure to get a bright image of the star (but not overexposed) and focus the

image on screen with your eye. Then place the Bahtinov mask on the front of the TOA130 dew shield and launch the grabber software. You need to tell the software the focal length of the scope you are using 1Meter for the TOA130, 0.130 for the diameter of the objective and 4.78µm pixels for the camera. You then need to place the Bahtinov grabber view window over the bright star and the grabber will display the current focus. Adjust the focuser with the fine focus control and watch the focus error numbers in the Bahtinov grabber display get as close to zero as possible. Bahtinov grabber will also indicate when critical focus is achieved. The same process can be used on the C14.
This method is much more robust than looking as star sizes or using FWHM techniques.
Shown on back page is the diffraction pattern of a bright star and the associated grabber display

7 Final thoughts

The high frame rates and image sizes generated mean that your PC needs to be in good
health and running as quickly as possible. If you have a traditional hard disk that spins please defragment it. Make sure your PC has as few programmes running in the background as possible.

The camera is easy to use and has produced some nice images of the moon on first light.
Feel free the adjust the settings especially the gain and exposure settings. A high gain is similar to turning up your DSLR's ISO, you will get an image quicker but it will not have as much dynamic range as a low ISO or low gain setting.
Thanks to Andrew K-V for assistance in setting the camera up on first light
Have Fun

Tony Morris