

ACIS

Advanced CMOS
Imaging Systems

**Atik ACIS Camera Manual
for OEM applications**
Version 1 – February 2020



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Introduction

Congratulations on your purchase of an Atik ACIS camera. This manual will help you get the most out of your Atik Camera so please take the time to read it thoroughly and you'll soon be ready to discover new worlds.

Atik Cameras provide exceptional value for money, superior performance and unparalleled ease of use. They are the result of extensive research and development; each one having been designed and built with the requirements of the most demanding end user in mind. Your Atik camera incorporates state-of-the-art design and materials, and will be your trusted imaging companion for a long time to come.

What's in the Box

Your Atik ACIS box includes:

- Atik ACIS CMOS camera
- Dust cap
- USB3 cable
- Quick start guide
- Desiccant port tool
- Please note software and manuals are available online at

<https://www.atik-cameras.com/software-downloads/>

Getting to know your camera



Camera Parts

- 1 Desiccant port
- 2 2.1mm centre-positive 12V DC input
- 3 USB 2/USB 3 Port

Sensor

The sensor in the Atik ACIS camera is a Sony IMX428 CMOS sensor.

Optical Window

The optical window is quartz with BBAR coatings on both sides to negate problems with reflections in your images.

Analog to Digital Converter (ADC)

The Atik ACIS uses 12-bit analogue to digital converters.

Power Consumption

Atik Cameras are designed to have low power consumption to improve performance in the field. If you would like to run the camera from a 110/220V mains supply, make sure it's of good quality with a 2.1mm type plug, centre positive and capable of supplying a minimum of 2.5 amp.

WARNING Mains power adaptors are intended for indoor use only. There is a risk of electric shock if the adaptor is used in damp environments. If in doubt, do not use the adaptor and consult a trained electrician.

USB Port

The Atik ACIS can be used with either a USB 3.0 or USB 2.0 cable. Your camera comes with USB3 lead, any good quality USB2 lead will work to give you the flexibility to choose whichever suits your set up and your imaging requirements best.

The Atik ACIS features a 256mb DDR III image buffer to ensure fast image transfer from sensor to memory and low amp glow. The type of USB (2 or 3) connection determines the speed of transfer between this buffer to the PC. For high speed, you can use USB 3.0 or for a lighter more flexible cable use USB 2.0. The type of connection does not affect image quality.

The USB 3.0 cable is connected as shown below, and can be connected to either a USB 3.0 or USB 2.0 port on your PC. Please note that USB 3.0 transfer speeds will only be reached when connecting the cable to a USB 3.0 port on your PC.

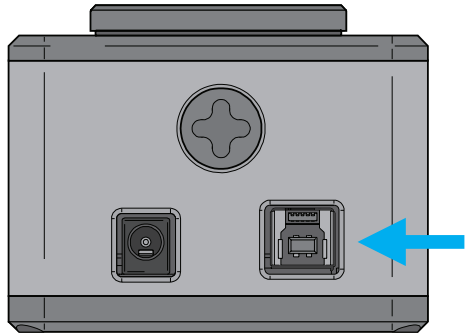
Cooling

The Atik ACIS has a regulated cooling system, meaning that the CMOS sensor can be kept at your desired temperature throughout an imaging session. This

also makes it easy to take dark frames at the same temperature as your light frames.

The cooling delta of the Atik ACIS is -35°C . Please note that the cooling delta is how far below the ambient temperature the camera can achieve, rather than a fixed temperature it can cool to. This means the best temperature to image at will depend on your environment, and we recommend using a repeatable, stable temperature, rather than simply the maximum the camera can reach on a given night.

After switching on the camera, it's advisable to allow up to 5 minutes before taking images so that the temperature can stabilise. At the end of an imaging session, turn off the cooling and allow a few minutes before disconnecting the camera so that it can complete its warm up sequence.



Binning

Binning is a technique where groups of pixels are added together, with the result being a brighter image. The CMOS sensor in the Atik ACIS only supports binning in software. This is where the pixel values are added together after image acquisition, as opposed to hardware binning where pixels are combined on the sensor.

Gain and Offset

Your Atik ACIS allows you to change the gain and offset settings for the camera. In very simple terms, this is analogous to the volume control on a radio. The greater the gain, the easier it is to detect faint signals; however, less detail might be seen in the brighter ones.

The full well depth (i.e. maximum signal) of the Atik ACIS is around $20,000e^{-}$, which we map to a pixel value of 65,535. By increasing the gain, we reduce the full well depth, which has the effect of making the images appear brighter. Using a gain of $\times 2$, the full well depth is around $10,000e^{-}$. This $10,000e^{-}$ now gives a pixel value of 65,535, which makes the image appear twice as bright. The read noise, or how 'grainy' the background looks, will also increase. However, this increases a little less than two times.

The useful range for gain is up to x30. Here, the image is 30 times as bright, but the full well depth is only ~650e-. This means bright objects will saturate very quickly. Although it may look bad due to the small full well depth, the read noise will only be about 1/3 of what it was at x1 gain. These kinds of settings are very useful for very dim objects if you don't mind the bright objects saturating.

Gain Pre-sets

We provide three gain pre-sets, and the option to use your own custom settings. The pre-sets are:

Low - Best for normal imaging. It is the best setting for detail in brighter objects and when individual images have high dynamic range.

Medium - A compromise of low and high. It's very useful if your mount is unguided and you need to take a lot of shorter exposures.

High - Best for sensitivity on dim objects, but sacrifices detail in some of the brighter parts.

Custom - You can also experiment with using your own gain and offsets. As mentioned, we find gain settings up to x30 are useful, depending on the situation, but above this the full well depth becomes incredibly low.

Offset for Advanced Settings

The offset is a voltage added to all pixels. It's used to ensure the digitised pixel values remain above zero while maximising dynamic range. It can set between 0 and 511, with the default setting as the Low pre-set values.

Additional Settings.

Pad Data – The Atik ACIS sensor creates a 12-bit image, however, as images are usually stored as 16-bit images, this means we have a choice as to which bits the image uses. The 'Pad Data' setting allow you to choose between these options. With the checkbox ticked, the image will be stored in the upper 12-bits, with all pixel values being multiples of 16 (from 0 to 65535). With the checkbox unchecked, the image is stored in the lower 12-bits, meaning that all pixels will fall into the range 0 to 4095.

We would generally recommend keeping the 'Pad Data' checkbox ticked. However, if you are binning, you can increase the dynamic range of the image by keeping the checkbox unticked. For example, in 2x2 binning, each pixel is the sum of four individual pixels, each with a value between 0 and 4095. As a consequence, the binned image will have pixels in the range of 0 to 4 x 4095 (= 16,380).

Even Illumination – The ‘Even illumination’ determines how the sensor is cleared between images. With the checkbox unchecked, the whole sensor is cleared immediately before the exposure begins. This results in a less-noisy image. However, as the image takes around 67ms to read out, you may see a slight gradient in the image. This is only likely to be an issue if you are using a short exposure time (less than a second) or imaging a very bright object. With the checkbox checked, the image is cleared at the same rate as the image is read. This results in each pixel being exposed for the same length of time, but will result in a noisier image.

We recommend keeping this option unchecked unless you are taking short, bright exposures.

Replacing the Desiccant

Your camera includes a high-performance molecular sieve desiccant tablet which is used to avoid condensation inside the CMOS chamber. Although this desiccant will last a long time it may eventually need replacing or recharging, in which case please follow the instructions below:

- To replace the desiccant, open the desiccant port with the supplied plastic tool and a screwdriver and take out the used tablet.
- To recharge the desiccant, place the tablet in an electric oven at 200°C for 2 hours. Take the tablet out the oven (CAUTION: the tablet will be very hot) and allow it to cool down.
- Place the recharged tablet back in the camera, replace the port cover and tighten (no need to over-tighten). Wait 24 hours before connecting the camera again.

We recommend leaving the camera in a warm, dry environment with the port open while you are recharging the tablets to ensure any remaining moisture can dry out.

You will notice that there is a filter inside the desiccant chamber. The purpose of this is to avoid contamination of the chamber when the desiccant is being replaced. The filter is very fragile and should not be touched.

TECHNICAL SPECIFICATIONS OF ACIS SERIES			
	ACIS 2.4	ACIS 7.1	ACIS 12.3
Sensor	Sony IMX249 CMOS	Sony IMX428 CMOS	Sony IMX304 CMOS
Resolution H	1936 x pixels	3208 x pixels	4096 x pixels
Resolution V	1216 x pixels	2208 x pixels	3008 x pixels
Pixel size	5.86 µm	4.5 µm	3.45 µm
Readout Noise	6.6e- (Typical) at low gain	3e- (Typical) at low gain	2.4e- (Typical) at low gain
ADC	12 bit	12 bit	12 bit
Cooling	T(amb)-35°C (Regulated)	T(amb)-35°C (Regulated)	T(amb)-35°C (Regulated)
Water assist	No	No	No
Back Focus	12.5 mm ±0.5	12.5 mm ±0.5	12.5 mm ±0.5
Max exposure	Unlimited	Unlimited	Unlimited
Min exposure	0.001s	0.001s	0.001s
Gain factor	Variable	Variable	Variable
Full well capacity	~33,000e-	~20,000e-	~11,000e-
Thread on front	M42 x 0.75	M42 x 0.75	M42 x 0.75
Weight	Approximately 530g	Approximately 530g	Approximately 530g
Dark current	~0.62 e-/pix/sec at -10°C	~0.03 e-/pix/sec at -10°C	~0.027 e-/pix/sec at -10°C
Interface	USB 3.0	USB 3.0	USB 3.0
Power	12VDC 2A (Centre positive)	12VDC 2A (Centre positive)	12VDC 2A (Centre positive)
Mono or colour	Either	Either	Either
Shutter type	Global shutter	Global shutter	Global shutter
Frames per second	Up to 175 FPS (with region of interest) and 28 FPS full frame.		

The formula to calculate focal length is:

$(\text{Pixel Size } (\mu\text{m}) / \text{Focal Distance (mm)}) * 206.3 = \text{angular resolution (arcseconds/pixel)}$

Declaration of Conformity

EU Declaration of Conformity

This product carries the CE Mark in accordance with the related European Directive. CE marking is the responsibility of:

Perseu,
R. Dr. Agostinho Neto, 1D
2690-576 Sta Iria da Azoia Portugal



Critical Applications

This product is not designed for any “critical applications”. “Critical applications” means life support systems, medical applications, connections to medical devices, commercial transportations, nuclear facilities or systems or any other applications where product failure could lead to injury to persons or loss of life or catastrophic property damage.

This product is not a toy.

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Disposal of the Camera

When no longer required do not dispose of this electronic device with general household waste. To minimise pollution and protect the environment the camera should be recycled. Local recycling drop off points available under the Waste from Electrical and Electronic Equipment (WEEE) regulations which will accept the camera. For further information contact Perseu SA at the above address, or the shop from which the camera was bought.



Servicing and Repairs

Repairs, servicing and upgrades are available through your local dealer or by emailing contacting our technical support team through our [contact page](#) Please note that modifications to the camera and/or accessories which are undertaken without the manufacturer’s written permission will void the warranty.

Warranty

The equipment is guaranteed against defective design, manufacture or materials for a period of one year from the date of purchase.

This means that Atik Cameras will repair or replace the equipment at its sole option, at no charge to the purchaser for parts or for labour, if the fault is reported within the guarantee period, provided however that Atik Cameras is able to duplicate the defect or problem at its facilities. This warranty does not apply to damage that occurred as a result of abuse or misuse, abnormal service or handling, damage which may have been caused either directly or indirectly by another product, or if the equipment has been altered or modified in any way, or if the damage was caused by repairs or service provided or attempted by anyone other than Atik Cameras. This warranty does not include or provide for incidental or consequential damages.

To exercise your rights under this warranty, you must return the equipment to the dealer from whom it was purchased together with proof of purchase and a clear description of the fault. If it's not possible to return the equipment to your dealer, you should contact Atik Cameras. Equipment returned to Atik Cameras must be sent in appropriate packaging and at your expense (insurance is recommended), together with proof of purchase, a return address and a clear description of the fault.

This does not affect your statutory rights.