



# Atik Horizon II Camera Manual

## Version 1.2 - November 2019

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## Introduction

Congratulations on your purchase of an Atik Horizon II 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 astro-imager in mind. Your Atik camera incorporates state-of-the-art design and materials, and will be your trusted astro-photography companion for a long time to come.

## Further Information

For easy installation instructions and useful information about how to take your first image, please refer to the Quick Start Guide included with your camera. Further information about our software can be found in our Documentation PDFs (Start Menu > Atik Cameras > Documentation), which are copied to your computer during the software installation. Further information, including a variety of tutorial videos, is available on our website at [www.atik-cameras.com](http://www.atik-cameras.com)

## What's in the Box



Your Atik Horizon box includes:

- Atik Horizon II CMOS Camera
- 2" Nosepiece and Cap
- USB3 Cable
- Car lighter style power cable
- CD with software and manuals
- Quick Start Guide
- Desiccant Port Tool

## Getting to know your camera

### Camera Parts



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

### Sensor

The sensor in the Atik Horizon II camera is a Panasonic MN34230 CMOS sensor.

The sensor plane is marked on the side of the front chamber.

### 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 Horizon II uses 12-bit analogue to digital converters.

## Power Consumption

Atik Cameras are designed to have low power consumption to improve performance in the field. Your camera is supplied with a power cable with a car light style plug which allows you to connection to most power tanks and battery packs available on the market today.

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.

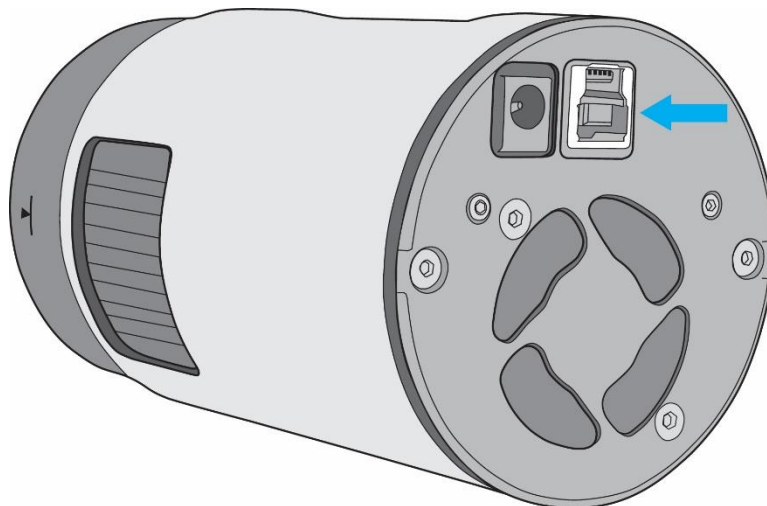
**WARNING** Mains power adaptors are intended for indoor or observatory use only. There is a risk of electric shock if the adaptor is used in damp environments or outside. If in doubt, do not use the adaptor and consult a trained electrician.

## USB Port

The Atik Horizon II 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 Horizon II 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 Horizon II 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 Horizon II is  $-40^{\circ}\text{C}$ . 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.

## Dark Frames

To get the most out of your Atik Horizon II for astrophotography, we recommend processing your images using dark frames. You can take dark frames by covering the front of the camera with a lens cap. Dark frames should be taken at the same temperature, exposure length and with the same gain and offset settings as your light frames.

A master dark should be generated by averaging a large number of individual dark frames. This can then be subtracted from the individual image sub frames during processing. Further information on using dark frames should be available in the manual of whichever image processing software you choose to use. Dark frames are not required for High Speed Imaging.

## 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 Horizon II 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 Horizon II 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 Horizon II 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 x2, 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 stars 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 or narrow band imaging 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. It's good for imaging with narrow band filters.

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.

In Artemis Capture, Dusk and Infinity, these are set in the Exposure window. In third party software, they can be set through the ASCOM set-up dialog.

## Additional Setting in Artemis Capture

**Pad Data** – The Atik Horizon II 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

	Horizon II
Image sensor	4/3 CMOS
Resolution	4644 x 3506
Pixel size (µm)	3.8 x 3.8
ADC	12 bit
Readout noise (Typ.)	~1e- at x30 gain
Cooling Delta	-40°C
Regulated cooler	Yes
Water assist	No
Max. exposure	Unlimited
Min. exposure	18µs
Gain Factor	Variable 1 – x 60
Full Well Capacity	~20,000e-
Dark Current	~0.016 e-/pix/sec at -10°C
PC Interface	USB2/USB3
Power requirements	12VDC, 2A
Back focus distance	13mm ±0.5
Thread on front	M42 x 0,75
Weight	525g
Mono or Colour	Either
Frames per second	<300 fps 150 x 150 pixels 8 fps full frame

The following table gives the angular resolution per pixel with certain focal lengths. The formula to calculate any other focal length is:

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

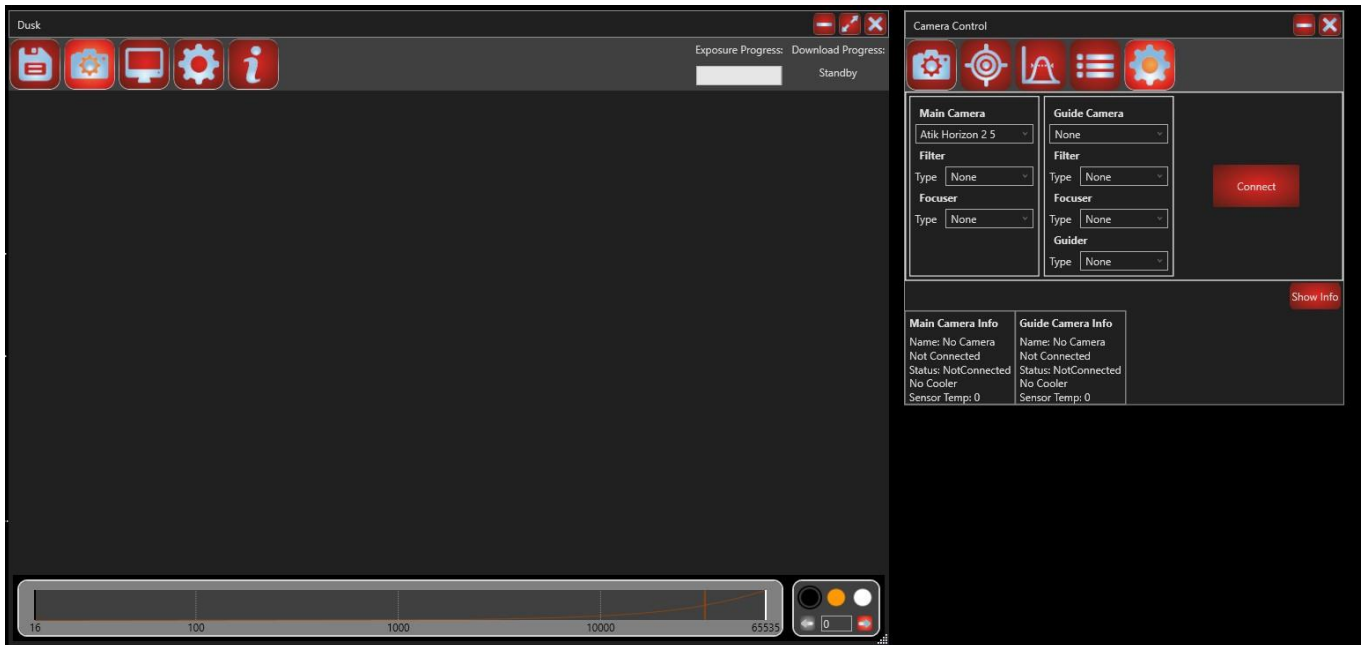
<b>Focal Length</b>	<b>Atik Horizon 2</b>
250	3.14
300	2.61
350	2.24
400	1.96
450	1.74
500	1.57
550	1.43
600	1.31
650	1.21
700	1.12
750	1.05
800	0.98
850	0.92
900	0.87




## High speed mode for the Horizon II

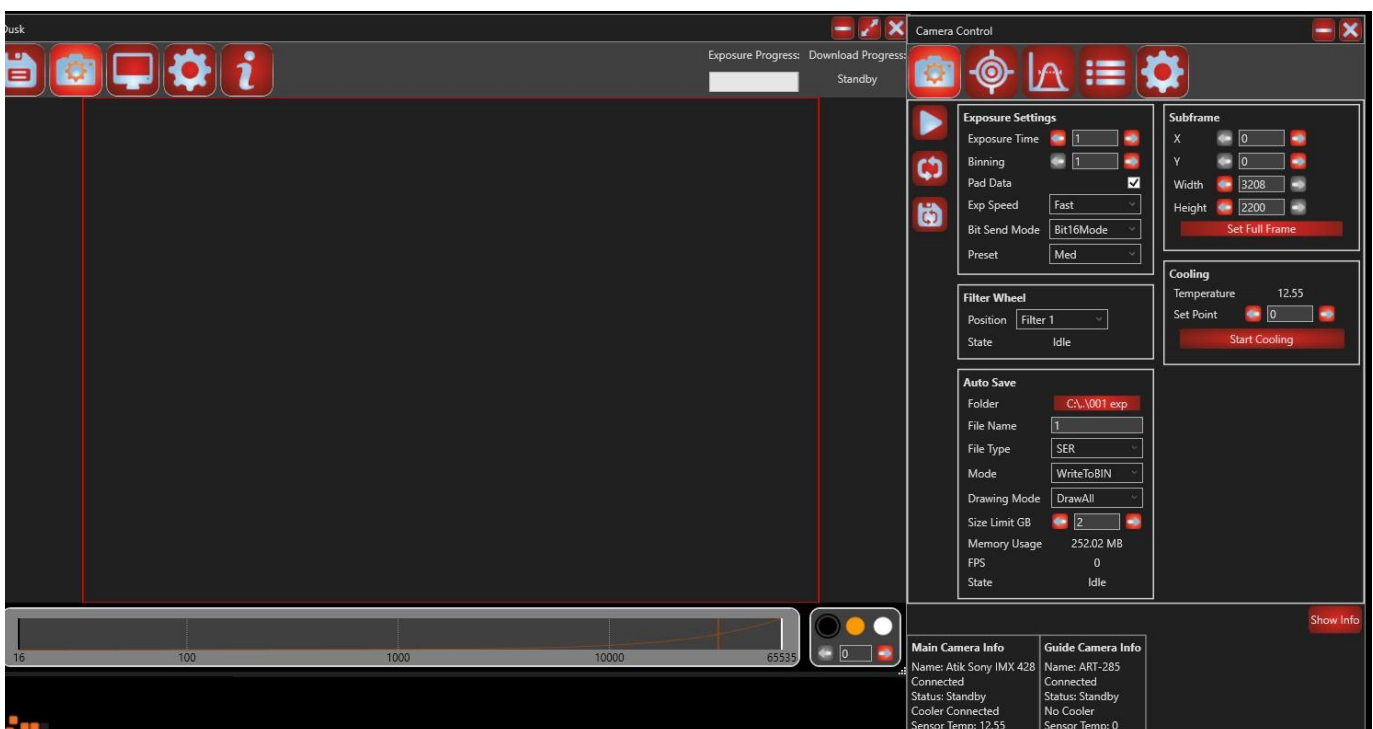
One of the new features of the updated Horizon II is a high frame rate function for planetary and lunar imaging.

Please note: Currently the fast mode will only work in Dusk, we are hoping to add 3<sup>rd</sup> party support in the future (November 2019). The Horizon II will not work in high speed mode with ASCOM.



Upon opening Dusk, select the Setup icon  with the Horizon II connected to power and USB3 you should see the screen above. The Horizon II should be automatically found and be displayed as the main camera. If it isn't click on the box drop down symbol and select the Camera camera and connect to the camera.

With the camera connected to Dusk select the 'Camera icon  and you will see the screen below.



## Exposure Settings box for high speed imaging

The functions of most of the options are explained in the Dusk manual. A basic setup for getting started with high speed imaging is shown in the screen shot below. 'Exp Speed' can be set to one of three settings. 'Fast' is for high speed imaging, 'Normal' is for normal imaging and 'Power save' is for normal imaging with maximum power saving. 'Bit Send Mode' can be either '12 bit' or '16 bit', you will get a higher frame rate in '12-bit mode'. Set the 'Gain pre-set' to your desired level and move on to the 'Auto Save' box.

## Auto Save box

Please see the Dusk manual for details on selecting a save folder, file name and numbering.

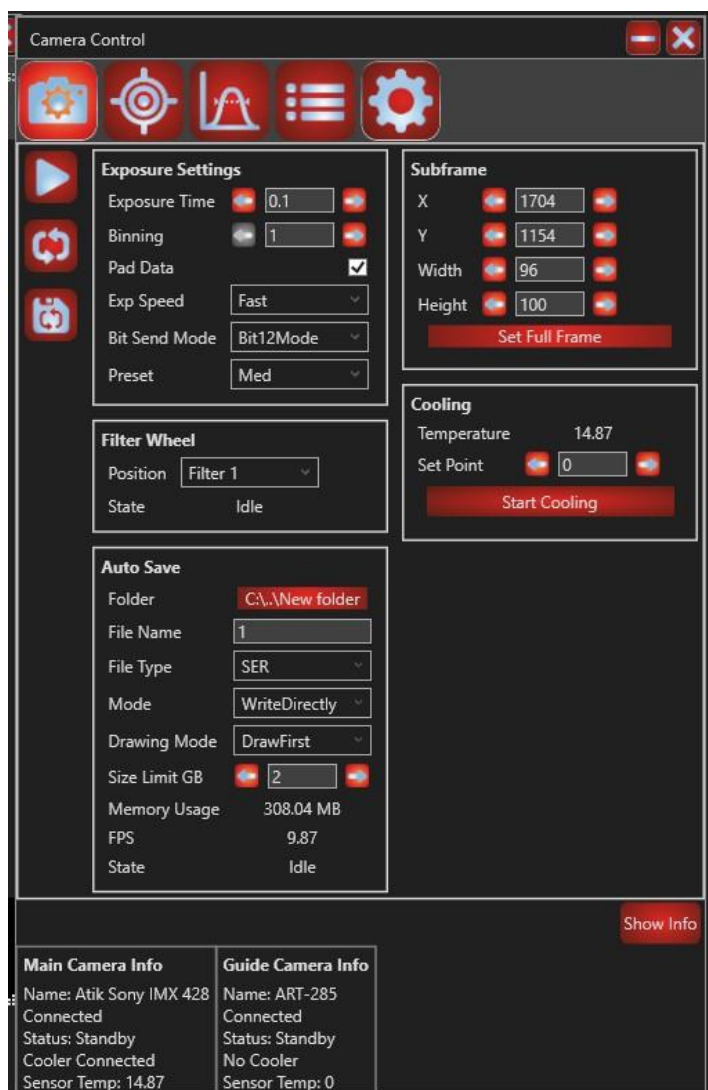
'File Type' allows you to select from two different formats. 'Fits' is the standard format for saving 16-bit astronomical images or 'SER' which is a format that is supported by a wide range of processing software used by high speed imaging programs.

'Mode' has two options. Selecting 'WriteToBIN' will allow the camera data to be written in a binary format for faster capture of the data stream from the camera. 'WriteDirectly' will write directly to the file format chosen, because there is a lot of data to write we recommend saving as 'WriteToBIN' or you could experience dropped frames and slow fps. Once capturing has finished the binary file will automatically be converted to a SER / Fits file and saved to the location specified in the 'Folder' path.

'Drawing Mode' allows you to select the screen drawing mode, 'DrawFirst' will display the first saved image on the screen and continue to save the camera data without refreshing the screen to allow for faster fps with less dropped frames. 'Draw all' will draw all frames to the screen for display but could slow down the fps. 'Draw every' allows you to specify the time between displayed frames. For example, entering 2 in the box that appears once 'Draw Every' is selected will draw 1 frame every 2 seconds allowing you to monitor the capture progress without slowing down the capture. If 'None' is selected no frames will be displayed on the screen.

'Size Limit GB' allows you to specify a capture maximum file size from 2GB up to 4GB. You can stop you capture before the limit is reached and your capture will be saved.

'Memory usage', 'FPS' and 'State' are information values for monitoring what is happening.



Please note: Due to the heat generated by the CMOS sensor when imaging at high speed you could see a fluctuation in the displayed temperature due to the enormous heat generated by the CMOS sensor when capturing at high frame rates.

## 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, SA  
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 [support@atik-cameras.com](mailto:support@atik-cameras.com)

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.