



a division of Aplegen, Inc.

ST-i

Planet Cam and Autoguider



- Low noise, high sensitivity CCD - Monochrome or Color
- Internal mechanical shutter for automatic dark frames
- Electronic shutter for short exposures
- Up to 21 frames per second in focus mode
- 16 bit A/D
- Eyepiece size body (1.25" diameter)
- Low cost
- Lightweight - only 2.2 oz.
- Powered from USB Port

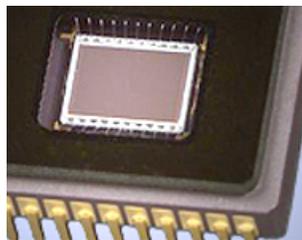
- Standard Guider Output Port
- Front end threaded for standard 1.25" filters
- CCDOPS Autoguiding and Imaging Software with Planet Master™
- CCDSoftV5 Autoguiding and Imaging Software

The ST-i Planet Cam and Autoguider adds features unavailable in other compact cameras. It is a high performance compact camera, an excellent guider, and a very capable Planet Camera. The body is light weight, no larger than many 1.25" eyepieces. In fact, it is 1.25" in diameter, 3.5" long and weighs only 2.2 ounces. The camera receives both control signals and power from the USB port of your computer. For guiding, a standard, opto-isolated, autoguider output port is located in the back panel, shown below.

Features

Kodak KAI-340 CCD – Mono or Color

The ST-i is built on the high quality, low noise, Kodak CCD. The KAI-340 CCD has a measured read noise of only 9e- in the ST-i camera. This is the same CCD used as the guiding sensor in the new STX series cameras and the AllSky-340 cameras. The array is 648 x 484 pixels at 7.4 microns square. Anti-blooming is standard. The ST-i uses the Class 1 version of this CCD with 0 column defects, 0 cluster defects, 0 dead pixels, and 0 saturated pixels, all according to Kodak specifications. On-chip binning is available for 14.8u pixels if desired, and various sub-frame modes may be used to speed-up the focus and download rates. A full frame high res image will update at the rate of approximately 5 frames per second. In addition to full-frame, half-frame and quarter-frame modes, the user may select a sub-frame region of interest (ROI) of any size located anywhere on the CCD. In focus mode, using a 20 x 20 pixel box the update rate is greater than 20 frames per second. This sensor is available in monochrome or color.



Electronic and Mechanical Shutters

This sensor has an electronic shutter allowing exposure times as short as 0.001 seconds. Most other eyepiece sized cameras rely on this type of "global" shutter alone due to the difficulty and cost of building an additional mechanical shutter into the

camera body. However, the ST-i camera includes a mechanical shutter enabling automatic dark frames generation. This feature alone dramatically improves the performance of the ST-i, particularly when used as an autoguider. The ability to automatically take and subtract a dark frame results in a very smooth background against which detection of dim stars is more reliable. Finally, while some inexpensive guiders save cost by using low cost 8 bit or 10 bit electronics, the ST-i camera uses a high quality 16-bit A/D for superior resolution of the full dynamic range of the CCD, greater than 70 dB.

16-bit frame rates using ST-i and desktop computer

Focus Mode	Full Frame	Half Frame	Quarter Frame	20 x 20
High Res 1x1	5.8 fps	10.6 fps	16 fps	21 fps
Medium Rex 2x2	10.6 fps	16 fps	21 fps	21 fps
Autograb Mode	Full Frame	Half Frame	Quarter Frame	20 x 20
High Res 1x1	4.6 fps	7.4 fps	9.7 fps	n/a
Medium Rex 2x2	7.3 fps	9.9 fps	11.9 fps	n/a

Focus = recorded using 0.001s exposure as reported by CCDOPS
 Autograb = Ave. of 100 uncompressed frames saved to disk using 0.001s exposure

Planetary Imaging

Planet Master Commands in CCDOPS

The Planet Master command is used to take the sharpest images of planets or other objects. It takes a sequence of images, grading them for sharpness and keeps the sharpest

one. Typically you would take short exposures, knowing that throughout the sequence a stable period of seeing will give a clear image.

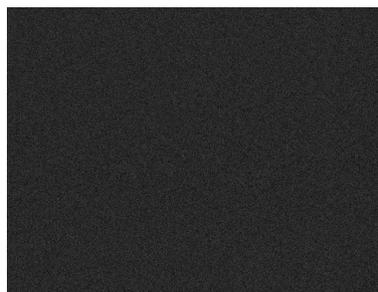
- The image shown is split in half. On the left half of the image is the central half of the current image. On the right side is the central half of the sharpest image.
- The Planet Master command beeps twice each time a sharper image is acquired.
- When you're all done hit the Done key and the Sharpest image will be shown.
- The dialog also shows you the current sharpness and the best sharpness in terms of a Figure of Merit (FOM).
- If the object is too bright even with the shortest exposures you may find placing an aperture mask over the telescope or using neutral density filters will get the brightness in range.
- If you Enable the Auto Grab feature, and you want to be able to view the images later with CCDOPS, make sure you select SBIG Compressed, Uncompressed or FITS for the Type. Otherwise CCDOPS will not be able to view the saved images.
- If you have Enabled the Auto Grab feature any image that is saved will show be displayed in the Planet Master window for a brief period of time before the split image is displayed. The image will appear to flip back and forth between the full image that is saved and the Split Image showing the Current and Best FOM images.

The Grade Image By Sharpness

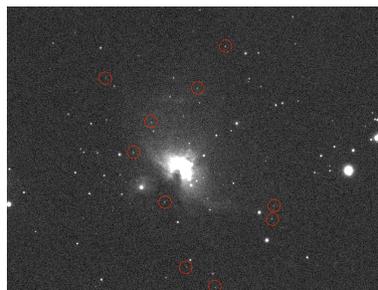
The Grade Image By Sharpness command in the Utility menu allows grading a set of already acquired images. It's like an Off-Line version of the Planet Master command. Many planetary imagers like to average several of their best exposures. This requires taking a large number of images in a short time and then examining each image for the best of the lot of the best few of the lot. In this case the imager might prefer to use the Autograb function of CCDOPS to capture as many images in as short a period of time as possible. Planets rotate! PlanetMaster software may then be used to automatically examine a series of images and assign a Figure of Merit for sharpness to each one. Then only the best of the lot can be selected for averaging.

Guiding Sensitivity

A sample 1 second dark minus dark frame is shown below followed by a 1 second light minus dark frame of the Orion Nebula region. The 1 second light frame, taken with an 60mm guide scope, shows numerous potential guide stars fainter than 11th magnitude, and many more 10th magnitude or brighter.



1 second dark minus dark frame at room temperature (+25 C)



1 second light minus dark frame through 60mm scope showing numerous stars fainter than 11th Mag.

Standard ST-i includes

- Camera with 1.25" threaded front plate (threaded for standard 1.25" filters)
- 15' (4.6 meter) USB 2.0 cable
- Tracking interface cable
- CCDOPS Software with PlanetMaster™
- CCDSoftV5 Software
- TheSky v. 5, Level II
- Custom Hard Carrying Case
- Manuals on CDROM

Optional Accessories

- 1.25" UV/IR blocking filter (recommended for color camera)
- 1.25" to C-mount lens adapter
- C-mount to Nikon or Canon FD 35mm lens adapter
- Detachable tripod mounting ring (threaded for 1/4-20 bolt)
- 100mm FL, f/2.8 lens (for guiding)



ST-i compared to typical 1.25" eyepiece

Rear Panel

ST-i comes with cables and software in custom carrying case

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