We all know how important good flats are for getting the most out of our images, so when I saw the advertisement for the Flip-Flat on Astromart, I was intrigued and thought it was really a novel idea. I jumped at the chance to take a look and test out the device. The unit is advertised as a robotic lens cap and flat field source for medium-sized refractors. According to their website, http://www.alnitakastro.com/, they have two sizes available. The size you need is determined by the size of the refractor; one is for 4-inch to 5.5-inch scopes, and the other for 5.6-inch to 7.6-inch scopes.

The box arrived with the Flip-Flat neatly packed in bubble wrap. The unit consists of a small black control box with a USB connector and an approximately 8-inch diameter flat disk, which is connected to the controller by an arm. The only connection to a computer is through the USB cable. Power is obtained through the USB interface; depending on your computer, you may need to have a powered hub. The disk has a black aluminum back with the Alnitak Astrosystems logo (future production runs will be plastic), and the front side is an opaque white plastic with an electroluminescent panel sandwiched in the middle. The white plastic is a diffuser for the EL panel. The demo unit came with a 10-foot USB cable and two long white nylon tie wraps for attaching the unit to the scope.

Installation

Installation was pretty straightforward. I went to their website and downloaded the manual and the installation software, as they were not provided on a CD with the product. After reading the manual, I installed the software, plugged the unit into the computer and got all the drivers installed. Once the driver is installed and the unit connected, the user has to bring up the Control Panel and the System Panel and determine the serial port number that Windows assigned to the Flip-Flat. Since I have numerous serial cables and boxes attached at various times, the assigned port on my system was 10. I then brought up the Flip-Flat Windows control program, as pictured in Figure 2 (next page).

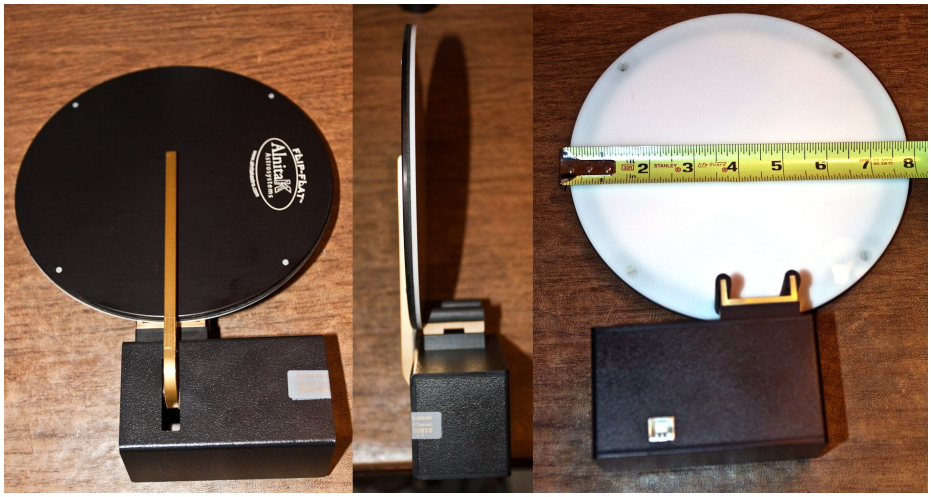

Figure 1: Flip-Flat before installation.

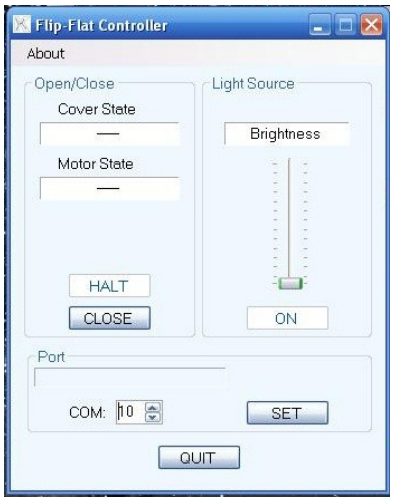

Figure 1: Flip-Flat Windows Controller

Once the correct serial port number is configured, all of the functions for the Flip-Flat become available. The lid can be opened or closed and the light/electroluminescent panel can be turned on and off. The light will only turn on when the lid is in the closed position. The light intensity can be varied by using the slider. Automated control is by the use of a program that uses command line arguments to set the Flip-Flat (more on this subject later). The user needs to note the serial port assignment as it will be used later to set up for automated flats.

Attaching the unit to the scope is pretty straightforward as well. The supplied tie wrap is threaded through the Flip-Flat unit and placed around the end of the scope, and the tie wrap is cinched down to hold the Flip-Flat in position (see Figures 3 and 4). The instructions recommend cutting off the extra length of the wrap that is not needed, but as I was testing a demo unit I did not trim it. The tie wrap is also reusable and the user can easily loosen it and reattach at a later date. The rubber feet on the control box gave it a firm and stable grip to the outside of the scope.

Initial testing

Using the Flip-Flat is pretty simple. My initial tests were done using MaximDL and the Flip-Flat Windows interface. The unit was closed and the light switched on, and I tried various settings on the intensity until I found the intensity that gave me a properly exposed flat using the Luminance filter and a one-second exposure. I like to take short flats so that the noise levels are not a problem and I try to reach an ADU count of at least 34,000. Typically, I take dusk or dawn flats, and because of time I am generally limited in the number of flat frames that I can capture. The Flip-Flat makes this a moot point. You can capture as many flats as you think you might need since you are now controlling the light.

The flats generated were very uniformly lit with a good even light. An example is shown in Figure 5. The EL panel does a good job and there were no color casts or gradients. I chose the Luminance filter as my baseline, as I figured that would be shortest exposure and any of the color filters would require a slightly longer exposure. I generally like to keep the flats under 30 seconds, or I will then need to capture darks to match. Once you have determined a brightness setting for your base filter, or for each filter if desired, you should note those values as you may need them when you automate the taking of flats.

Table 1: Batch files

Open.bat
ffcommand 10 o ffcommand 10 o
Close.bat
ffcommand 10 c ffcommand 10 c
Set_bright.bat
ffcommand 10 L ffcommand 10 b73
Light_off.bat
ffcommand 10 D

Automating Flats

Automation really depends on what software you are using to control and capture images. The major software packages are ACP from DC3 Dreams, CCDAutopilot 4

Figure 3 (left): Flip-Flat installed on Borg 125SD in closed position; Figure 4: Flip-Flat in open position, ready to image.

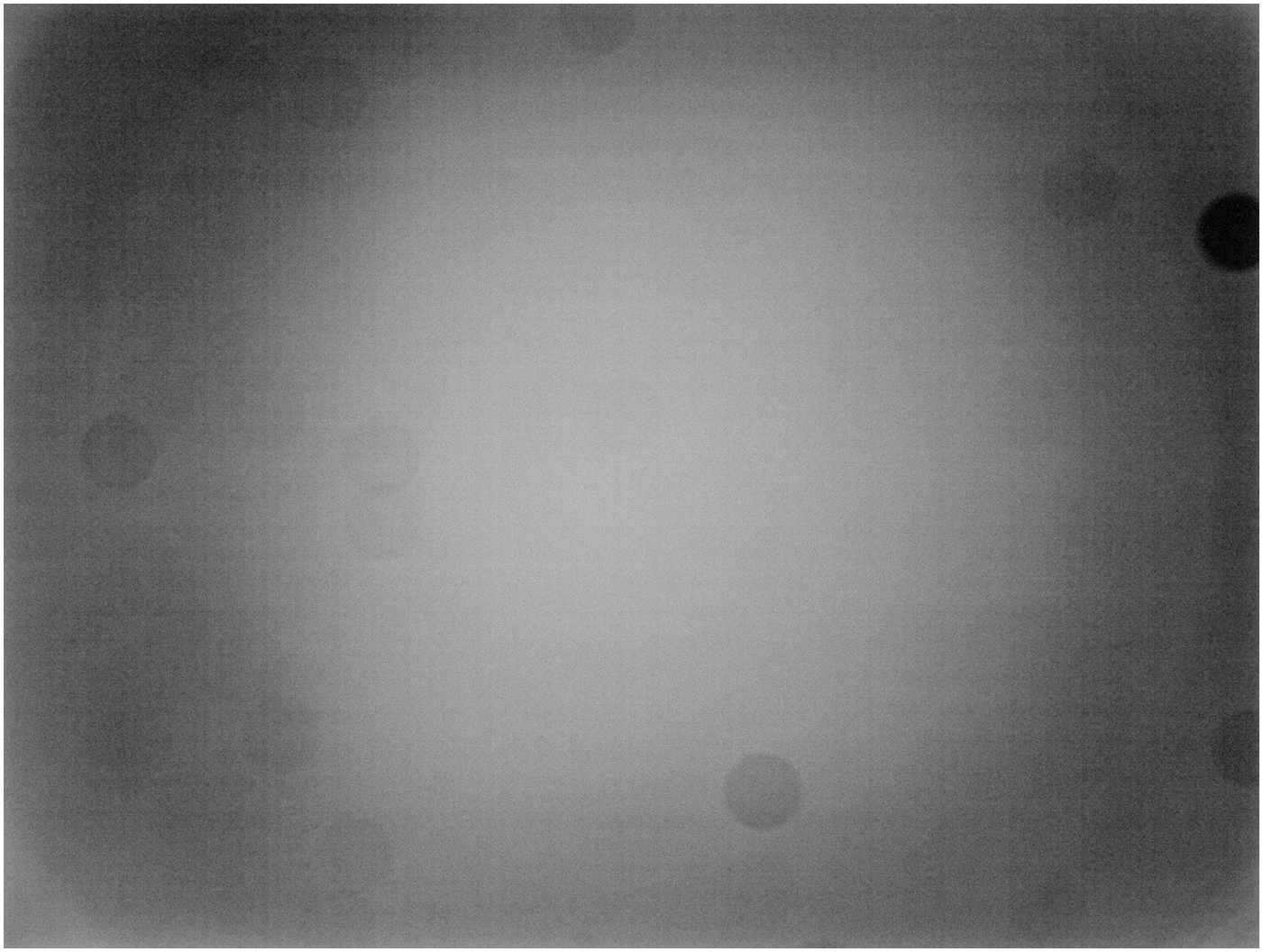

Figure 5: Flat captured by CCDCommander using MaximDL

from CCDWare and CCDCommander from Matt Thomas. I have and have used all three programs, and the Flip-Flat can be used with all three. *[Note: the soon to be released Maxim DL v5.07 will provide support for the Flip-Flat as well.]* All of these programs use the same utility to access the Flip-Flat, which is called ffcommand.exe. This is a command line application that is called with the following syntax: [c:<path>/ffcommand port number command]. So, as an example, for a port setting of 10, the command would be "ffcommand 10 C" for telling the unit on port 10 to close. The complete list of commands is in the manual, which you should find as a PDF document in the directory where the software was installed.

The most recent versions of CCD Autopilot 4, V4.15 and above, contain code to interact with the Flip-Flat directly. In the "Settings" window make sure to check the Flip-Flat box and enter the serial port assignment. In the "Flat Frames" window you can enter the desired ADU level, and then for each filter type you can set a Flip-Flat brightness; and then CCD Autopilot will determine the correct exposure to get the desired ADU level with the brightness level that is set.

CCDCommander also has a simple interface. The user should decide on a base value for brightness, like I did with the initial testing. This base value will be used and then CCDCommander will determine the correct exposure to reach the desired ADU for each filter selected. CCDCommander uses "Actions," which are the commands used in automated capture. The "Action" "Run External Program" will be used to turn on and off the Flip-Flat. What I did in using this program was to create a series of Windows batch files (".bat" files) that contain the Flip-Flat commands, which I then placed in the Flip-Flat directory. The first one opens the Flip-Flat, which would be used at the beginning of an imaging run, another closes the lid and turns on the light, another sets the brightness and the last one turns the unit off.

The table below lists some sample batch files and the commands that they contain. This is configured for a serial port of 10 for my system, but they would need to be set by the user to the serial port number assigned by Windows if it is different.

As you may note, the command is repeated, as I discovered that sometimes the controller doesn't see the first command, so a second one is sent to make sure the command is received. Once the unit is receiving commands, it should see all of them for that session.

To use these commands in CCDCommander, just select "Run External Program" at the desired action location and point to the batch file, and that will allow the flats to be automated.

Using the Flip-Flat in ACP requires a bit more effort. The user needs to go in, find the flat scripts and modify the script file to call up the ffcommand program and send the appropriate commands to the unit. This is not as easy to do as the previous two programs, but certainly is doable.

Updates

The Flip-Flat is user upgradeable if the firmware on the controller ever needs updating, however there is a minor catch. The serial port needs to be assigned to a port less than 10 for the updater to work correctly. The user should not have to do this very often, if ever, but the ability is there.

Conclusion

The Flip-Flat is a novel idea and it does work as advertised. The flats were nicely exposed and evenly illuminated. The installation was easy and straightforward. It is the only robotic solution to taking flats without resorting to shooting a panel at a distance after the observatory is closed up, or shooting a target or taking sky flats.

My only complaints are not really serious, but at least one does need some consideration. As installed, and without some sort of modification, I found that it really needs to be dark when the flats are taken to work right. In other words, it is difficult to use it in daylight hours. The Flip-Flat does not make a tight seal with the end of the refractor. Reflections and light leaks are a real possibility unless your observatory is very dark when closed up. There is a work around, of sorts; the user could cut a gasket of the right diameter and attach it to the Flip-Flat and maybe use some thin foam to form a seal and block any light. The edge of the white panel should probably also be taped or covered to prevent light from intruding. This fix would also help seal the unit to the end and help keep out dust and dirt. In particular, the California high desert where my observatory is located is a dusty environment and a seal would be needed to prevent dust from collecting.

I was also not entirely happy with the tie wrap attachment. It works acceptably, but it would have been neater with a small webbing strap with Velcro or something similar. It was just not aesthetically pleasing!

Overall this is a good piece of equipment that does work as advertised, and it is a unique and useful solution to the issue of taking automated flats. At $450, it is not a cheap piece of equipment, but it is the only thing of its kind out there that I have seen. It's worth a look to see if this fits your needs. ♦

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Video 1: Opening and closing the Flip-Flat (videos are only available in the Enhanced Edition of APIM)

Video 2: Illuminating the Flip-Flat