

Using a Parallel Port Camera

Over the years I have been amazed to read magazine advertisements for astronomical cameras. The increase in the level of quality, sophistication and automation from year to year has been astounding. So has the increase in price tags! There are low end cameras that really are affordable for amateurs and take tremendous images, but the high quality ones that take the “magazine” type images, just flat out cost a lot of bucks! It is really funny when a camera that costs over 5000 dollars is listed as “low cost.” Over the years I have been very fortunate to have a lot of equipment donated to me or sold way under market value. Unfortunately that does not always happen so sometimes you just have to look for a bargain.

Each person ultimately decides what “low cost” is, but for the vast majority of people that I know in the hobby of astronomical imaging even a 1000 dollar camera is a bit much. Usually, for many of us, it is difficult to buy a 1500 dollar telescope and a few premium eyepieces. When you add in laptops, 2nd mounts and various and sundry other things (filters, flip mirrors, etc.) we end up having a lot of money tied up in our hobby. If we are married then the cost doubles since we are often asked “I get to spend the same amount that you spent on your new camera for me, right?” How can we achieve quality imaging in astronomy without selling our children as indentured servants or mortgaging our retirement?

There is a line of affordable cameras by ZWO. I own 2, the ZWO120MC (color) and the ZWO120MM (monochrome) these cameras are less than 300 dollars and are appearing on the used market for less. The color camera is primarily good for planetary imaging but is hard to use for Deep Space Objects. The monochrome can be used for DSO’s or guiding. Unfortunately, these particular cameras do not have actual physical shutters or cooling so doing precise calibration for science applications is possible but much more complicated. The cooled version of these cameras (still no physical shutter) start moving the price up to the 1000 dollar or more range. So again what do we do?

One of the obvious answers is to use old, but still serviceable technology. For this article we will discuss two old parallel port CCD cameras, the ST-7E and the ST-8E, made by “Santa Barbara Instrument Group.” “SBIG” is now owned by Diffraction Limited but they still fully support these old cameras with legacy software and manuals on their website. So why are these solid alternatives for the budget conscience astronomer?



ST-7E and Case



ST-8E and ZWO120MM (Monochrome camera)



The St-8E, AR102 Telescope, T60 with docking station and Sirius Mount discussed later in the article. Note the cheap Xbox game controller to control the mount.

The first factor is the cost. On Astromart used ST-7E's and ST-8E's go for 100 to 300 dollars respectively. To buy the same type of quality equipment today is much more expensive. In fact when the ST-8E camera came out it was selling, just for the camera alone, for 5,999 dollars. The ST-7E was 1,999 dollars. Looking at today's SBIG ST cameras, an equivalent purchase to a ST-8E is the STX-16803 at 9,995 dollars. Granted the STX has a bigger sensor, faster upload (USB) and the guiding chip (for the internal guider) has a sensor as big as an old ST-7E camera sensor, but you also pay much more for these features than you do for a used ST-E series camera. The old ST-10E (6,995 dollars) was the top of the line for SBIG at one time and the equivalent camera today is around 25,000 to 35,000 dollars depending on the quality of the chip! Ultimately, the new cameras give you better images, bigger chips, lower noise and faster uploads but at a price.

The second quality is durability. These old cameras are built like a tank. Made from stout metal, they are rugged and take years of continual use very well. A rogue 120 mph wind picked up my telescope mount, camera and telescope, hurled it against a fence, broke the mount, scratched the telescope but the ST-7E came through without a ding or mark! The negative to this durability is their weight. The cameras are listed as 2.2 pounds but weigh more if a CFW-8 filter wheel and filters are added. This is not a big burden for an 8 inch or larger Schmidt Cassegrain, but some of the smaller refractors or imaging newtonians require interesting counter balancing or focus adjustments. A Robo-focus or moonlite focuser needs an added external spring to make sure the motor moves the focus throughout the full range due to the weight of the camera. Using an ST-7E on an 8" Newtonian reflector also required a large weight sticking out on the opposite side of the tube on the opposite end from the camera...but it still worked!

The third factor is quality. Most small end cameras do not have the sensitivity, shutter or overall quality of the old ST cameras. This higher quality in a modern camera will take a much larger outlay of cash for similar specs. Plus, because of the electronics reliability and quality temperature control, calibration can be very accurate. This is handy for those of you that do science with your equipment.

So what are the negatives? Obviously using a parallel port camera is the biggest negative. Today's computers either no longer support or don't even have the type of parallel port that you need for a parallel port camera! On an old desktop computer, single core (Pentium), 32 bit OS the average time to upload a 765x510 image on the built in LPT port was 45 seconds. On a more modern computer setup it takes around 14 seconds for the same upload. The ST-8E with a 1534 x 1020 image takes 67 seconds on the newer computer. For those who desire a modern, high speed, "plug it in and forget it" type of camera; a parallel port camera is obviously not for you. Especially since focusing takes a special technique and more time than a USB camera.

The second big negative is that you have to use a 32 bit operating system. This negates much of the power of the multi-core, 4 gigabyte plus computers. 32 bit operating systems can only use 3 Gb in windows. So when you use a multiple core high RAM system you are wasting memory. The last SBIG driver checker will only support a 32 bit system for a parallel port model. This is kind of confusing since the name of the program is SBIG 64 bit Driver Checker. For an LPT (parallel port) camera it will only load a 32 bit driver for a 32 bit operating system otherwise it will tell you that it cannot load the drivers. You do have to configure the port with this software by scrolling up to LPT1 in the configuration menu. The SBIG 64 bit Driver Checker program can be found on the Diffraction legacy page.

However, this last factor is one of the reasons that a SBIG ST camera is so affordable! Many do not have time or interest to try and figure out modern ways around most of these negatives so these cameras sell for pennies on the dollar of what they would if they were a USB system. Plus up until recently the chips

were pretty much the same for the parallel port models as the USB models. Add to that the factor of the ready availability of older, cheap, but still serviceable computers, programs and accessories, the ST parallel port cameras are a viable alternative for the cost conscious astronomer.

So what do you need to run a parallel port camera? If you have a laptop or a desktop with Windows XP or 7 and a parallel port you are set. However, if you want to run the mount and other software you sometimes run into memory issues. My old HP ZE4400 laptop often runs into a problem and drops the camera drivers in the middle of a run. My first thought was an address issue but after experimentation it seems to be too many things running at the same time for the memory and processor. This old of a computer will only take 1 to 2 Gb of memory max with a single core processor. One solution is to use two computers, one for the camera and one for the mount. Usually though, a desktop unit with more than 2 GB's of memory will handle the load especially if it is a single core with hyper-threading technology. The way I was able to work around the memory issue in the old ZE4400 is to eliminate everything but what is needed to run the scope and camera. Still it would be nice to use a more modern multicore computer.

Enter the Lenovo T60 Windows 7, 32bit, laptop and docking station. This laptop was purchased 4 years ago on Ebay for around 125 dollars. With a further investment of a 30 dollar 500 Gb HDD and 11 dollar 1 Mb expansion memory the cost topped out about at 175 dollars. This was 4 years ago and these units are now down to less than 100 dollars on eBay or amazon. However, the T60 no longer has a parallel port. With a dual core processor the laptop should have enough processing power to run multiple programs easily. It turns out that the docking station for this model computer comes with expansion USB ports, HDMI port, VGA port, a serial port and a parallel port! The big concern was how expensive this station would be and whether it ran the parallel port with the right hardware to use a camera. The docking station was 17.99 shipped from Amazon. This is a used unit but I could not see any signs of usage at all on the station. It even came with a locking key. Just a FYI, some companies call their docking stations port replicators.

There are other laptops and docking stations that will suffice but you have to do a little research first. You do not want to "upgrade" to Windows 8 or 10! These Windows programs no longer support a parallel port. Windows 7 is the last version of windows to include parallel support for electronics that need an LPT. The USB to parallel adapters will only work for printers and cannot be used for a parallel port camera. Many of the old laptops and desktops that use XP or Windows 7 are also slower, single core systems. They will work but sometimes it is frustrating to have to use something that uploads so slow.

What about a desktop with a parallel port? Windows XP and a single core computer with hyper-threading technology ran a system with the ST-7E, plus 5 software programs to control the mount and camera for 2 years without any issues. It continued to run fine when it was upgraded to Windows 7 though it still took upwards of 45 seconds to upload an ST-7E image. One of the big improvements you can do is add a PCI parallel port card. If you pay attention the fine print and buy one that comes with software to work with windows XP through 10, 32 bit programs, you can theoretically run it with the newer OS. I was not able to try this on my Lenovo 64 bit windows 7 computer, which is the only desktop I have for astronomy because it is a small form factor and my card is a full size card. My experience is only with XP and 7 on a 32 bit OS. However, it cuts the camera (ST-7E) upload time from 45+ seconds using the native LPT port, to 14 seconds even on a single core desktop. This is still not USB speed but it helps. For 2 years the 45 second upload was used and though it is annoying it did work well.

Let's talk about using a newer laptop (but a desktop would work as well and have a similar procedure) to control a ST-8E camera and scope. The first step is to hook up your laptop power supply to the docking station power port. Seat the laptop on the station. Turn on the laptop using the button on the station. Attach the parallel cable from the camera to the docking station, as well as plug in and connect the separate camera power supply. Attach the ST-4 guiding cable from the camera to the mount. Attach your USB cable from the mount (or hand controller) to the laptop. A mouse also makes things much easier if you have the USB space. Attach the Xbox game controller (My Sirius mount did not come with a Hand controller so I control the mount with EQASCOM and EQMOD and need a game paddle for easy movement) to control the telescope movement like a hand paddle for professional scopes. The plus with this setup is that you can program in much more functionality than a typical hand controller. Once everything is fully booted and ready to go, open (in my case), TheSky Pro 6 on your desktop. There are numerous other planetarium programs that will work as well. ASCOM is used to tie everything together and you can add a patch so that TheSky 6 Pro runs the mount through the EQASCOM program. Set up the mount through a setup window on TheSky and then click on connect the telescope. To control the camera there are at least 3 choices. The cheapest is CCDops from SBIG, it is free but does not have more than just basic camera controls. If you are lucky to get a licensed version of CCDSoft v 5 with your used camera you will be set. Otherwise the cost will vary for buying this program on the used market. CCDSoft is still the best software to run a SBIG parallel port camera from, as far as I am concerned. You can also download the legacy drivers and use Maxim DL 5 to control the camera. Some do prefer Maxim for the parallel port cameras but I have found that CCDSoft just seems to be easier to use, for parallel port SBIG cameras.

Once you set up and connect the camera you have several ways to control the camera, focuser and mount. Software Bisque had an old control program that came with CCDSoft and there are some newer incredibly flexible but expensive ones as well. For my needs I have found that CCDCommander works very well. In fact with my scopes that have a moonlite or robo-focus it works very well to automatically focus, even with multiple filters. The cost is around 100 dollars.

If it takes 14+ seconds to upload an image with the ST-7E or 67 seconds with the ST-8E, how do you focus? In CCDSoft you take a 1x1 binned image, draw a small box around the star, or stars, you want to focus on and viola, you can upload very quickly and focus. The typical procedure for CCDSoft is to start the process with a 3x3 bin for the ST-7E and 9x9 for the ST-8E then focus it as close as you can. This will get you close enough when you switch to a 1x1 bin, You then move to the 1x1 bin and draw a box around the star or stars mentioned above, then focus. My typical procedure is to find 2 stars of around 7-8 magnitude and focus them with a 2 second exposure. There are several ways to achieve focus using software in CCDSoft but my typical method is to zoom to 200% in the image and see when the star takes up the fewest pixels. When it does, it is focused. On my more serious scopes I use the built in focus control with CCDSoft or Maxim DL 5 using Focusmax or Moonlite. With CCDCommander this works very well. I typically pick out a magnitude 4-5 star to use the automated routine with. The Maxim DL focusing program works just as well as Focusmax or other focusing software.

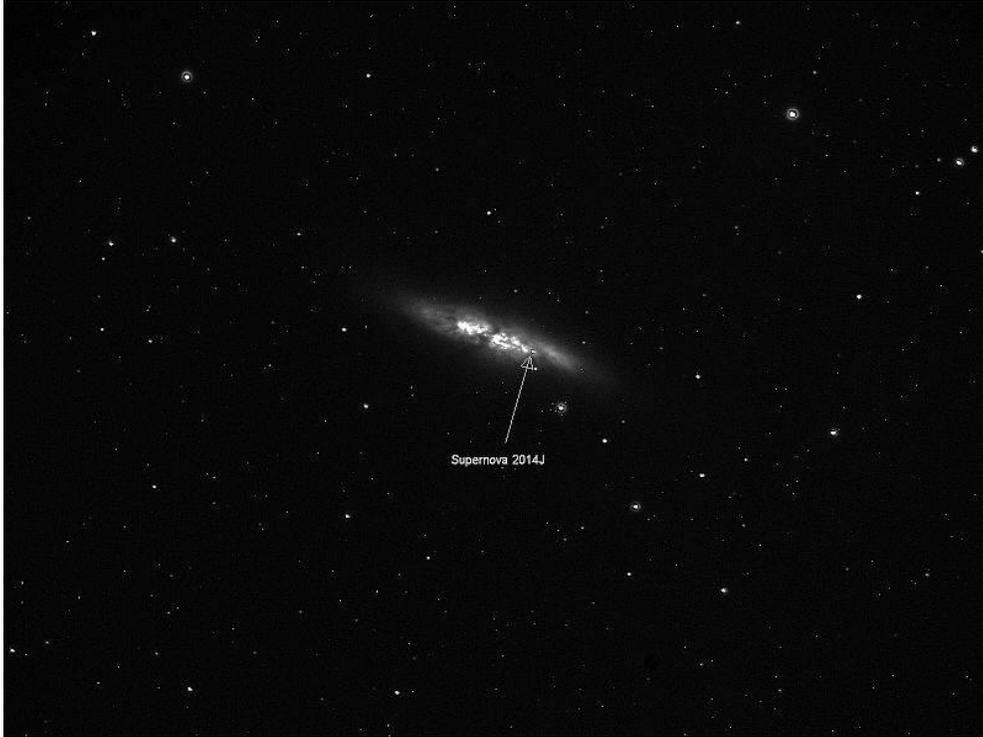
All of this is great but what do the images look like? Here are some examples from my own image archive.



M 81 galaxy with the ST-7E, Sirius mount and Astrotech 8" F/4 newtonian.



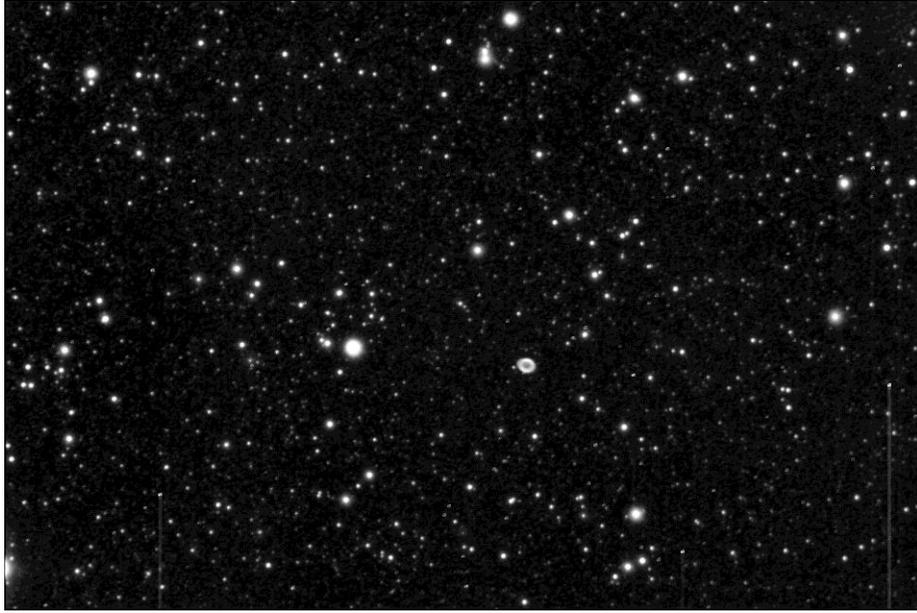
M 13 with the ST-8E, Sirius mount and the AR102 Refractor, no filters.



Supernova 2014J in M81 with the Astrotech 8" F/4 and ST-7E



Pleiades Cluster with the ST-7E, Sirius mount and Astrotech 8" F/4 Newtonian/



M 57 with the ST-8E, Sirius mount and the AR102 telescope. Notice the wide field!

The technology may be old but the quality and usability are still first class. It is a way to get into serious imaging for pennies on the dollar. These old cameras are definitely not superior to the modern cameras but can still provide the quality and reliability you need for solid performance and the cost won't break the bank!