SAC10 Quick Setup Guide

Craig Stark
2/13/2006

To get things up and going you will need:
1. Your computer with a USB port
2. The SAC10 camera head
3. The SAC10 control box
4. The USB cable
5. The DB15 beige cable
6. The 12V power cable
7. The CD-ROM
8. A source of 12V power. This can be an external power supply (FYI, the 12V cable is center-positive), a car battery, a jump-start battery, etc. Make sure it is over 1A and regulated (if AC-driven). The typical 13.8V is fine, but don't try plugging your 18V computer power supply in here unless you like sending SAC more money.

**The first task is to install the software.**
1. Insert the CD into your CD/DVD drive. You'll be presented with the "Read Me" document. Read this, if you haven't. Next, open up My Computer (double-click on it on the desktop or Start, My Computer). Then, right-click on the CD and pull down "Install Software". (Alternatively, you can open the CD and click on setup.exe).
2. Follow the prompts. Feel free to just keep hitting "Next". This will install Nebulosity in the Program Files directory and it will install all the needed drivers there as well.
3. At the end, do not launch Nebulosity yet.

Next, we must install the drivers for the camera. The previous step put them on your hard drive, but Windows needs to know about the SAC10.
1. Connect the camera head and the control box with the DB-15 cable. Actually tighten the thumb-screws. No really. Tighten them and don't just leave them unattached. Really. Don't say I didn't warn you. Oh, and make sure you do this first – don't apply power before hooking the DB-15 (beige) cable first. Really. Don't do it.
2. Connect the control box's USB port (the D-shaped one near the power connector) to your computer's USB port.
3. Connect the 12V power to your power source. You should hear the fan on the camera start up.
4. At this point, you should hear the familiar Windows USB chimes. It will say that it has found a device (you'll see things like Generic USB hub, USB Serial, and FT8UXXXX).

5. The Found New Hardware Wizard should pop up now. When it asks whether to connect to Windows Update, tell it no. Do not let it connect to Windows Update in any way shape or form. It'll find the wrong driver and cause the camera to fail.

6. When it asks whether it should search for the best driver or not, tell it to Install from a specific location. Here, click on "Include this location in the search" and click Browse. Point it to c:\Program Files\Nebulosity (or wherever you told it to install Nebulosity in the previous section). [See the last page if this doesn't work for some reason.

7. Click on Next and it'll tell you what a horrible person you are if you use drivers that don't have the Windows Logo on them. Click on Continue Anyway and feel like a rebel.

8. You're done. If you plug the camera into a different USB port, you'll have to do this again, but instead of saying Install from a specific location, you can now tell it to use the Recommended approach of trying to find the best driver (as you've already told Windows now what the best driver is).
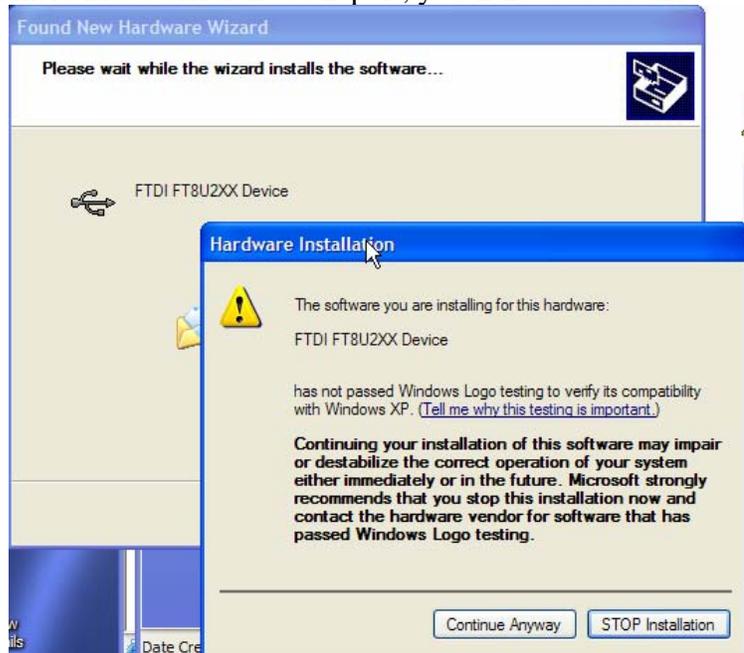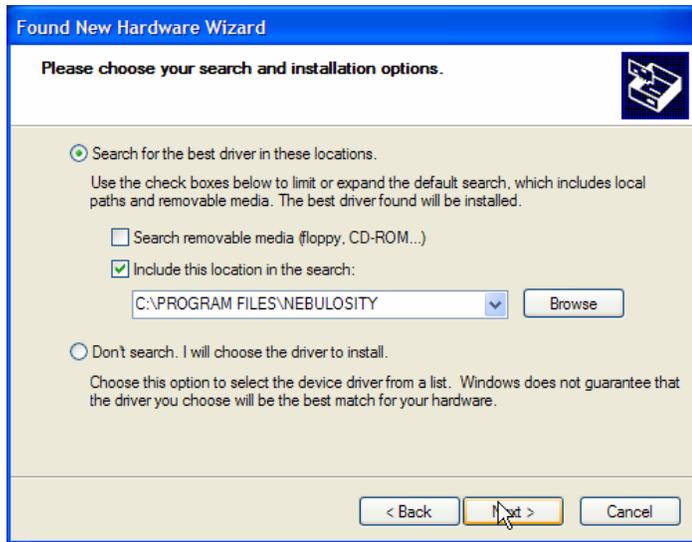
Note: If for some reason this failed, see the last page on installing the driver manually.

Now, it's time to start Nebulosity and test the camera. If you accepted the default options, you can simply go to the Start menu and go to Programs, Nebulosity or just click on the desktop icon. This can be done in daylight with no telescope attached.

Note: The Nebulosity manual can be found either by the Help menu inside Nebulosity or by opening the PDF document directly (it's in \Program Files\Nebulosity).

1. The first time you start Nebulosity, it will ask you for your license number. Enter it to register the program. If you don't, Nebulosity will function but not save any images.
2. In the Camera panel on the bottom of the window, it will currently read "No camera". Click on this pull-down menu and select SAC10. If all goes well, in the status bar (bottom-left) it should now say that it has connected to the SAC10. If it does not, shut down Nebulosity, unplug the camera's 12V power and USB, reconnect, and try again.
3. Once connected, it's time to take a quick exposure. Click on the Preview button and it will take a "zero second" long exposure. You should see it saying it's downloading the data in the middle of the status bar. When done, a relatively even image should appear on the screen and a histogram of the image should appear. If you've got the red lenscap from SAC on there, it should be a red image. If not, it'll likely be yellow-ish if you're indoors. This is normal.
4. Try setting the duration to 1s and doing it again. The histogram should show a brighter image and may even white out.
5. Aim the camera face-down into something like your desk to block the light and Preview again. The image should be dark. If it looks noisy, don't worry. The Auto-scale feature will have set the B and W sliders very close magnifying any noise in the image an incredible amount. Uncheck Auto scale and slide B to the left and W to the right and the image should be nice and dark.
6. Keep the B and W sliders at the extreme left and extreme right and try to shield the camera from most light (keep the red lenscap on, cover it with whatever is handy, etc). Verify that increasing exposure duration increases the brightness of the image by taking several Preview shots at various times. You may want to specify time in milliseconds rather than seconds. To do so, pull down the Preferences menu.
7. If all is checking out, read the Nebulosity manual.

Troubleshooting / Notes

I have problems connecting to the SAC10 in Nebulosity. It says it can't find it or it seems to loose the connection during capture. Did you screw down those thumbscrews on the DB15? You did this first before turning on the power to the camera, right? (If not, unplug everything, let it sit for a few minutes, and try again.) Assuming you did, the issue quite probably lies in your USB port. I know, it's worked just fine for you in the past on other devices, but it's true. We have found that a small number of ports aren't up to snuff and cause problems. The solution is a simple one – just use another USB port. A PCMCIA / PC-Card based port (I've tried several USB2.0 ones) works just fine and the camera becomes rock solid.

If not your USB port, there is another possibility. If you installed the drivers and for some reason Windows used an existing driver or went to Windows Update for one, you may have the wrong version of the "FTDI" driver installed. It will appear as a "Generic USB Serial" device if this is the case (right click on My Computer, Properties, Hardware, Device Manager, USB ports) rather than an FTD2XX device. If this happens, do the following:
1. Unplug the camera from your computer
2. Navigate into Program Files / Nebulosity
3. Run FTCLEAN and follow the instructions
4. Attach both ends of the DB15, apply power, and attach the USB cable

5. When prompted to locate a driver, follow the instructions at the end of this document for Installing the Driver Manually

When I zoom an image way out, it looks funny. The zoom algorithm in *Nebulosity* is a very fast but simple one that can cause this problem. Your pictures are just fine, however. If you're looking at a RAW image, when zoomed out, sometimes the image shows the red pixel, sometimes the green, and sometimes the blue. Since they're of different brightness, you can get odd results. If you're looking at a color image, a similar thing has happened but it stems from using the single-exposure rather than the double-exposure mode.

When I take test images indoors, they look all yellow. This is normal. Indoor incandescent lights are not "daylight color balanced". Take a photograph indoors without a flash and you'll see the same thing. Use a blue "color correction filter" (photographers use these a lot), add some blue to the color balance, or shoot an outdoor target and you'll be fine. Better yet, shoot astronomical targets!

My test images are all white or get a funny blue/cyan tint. Again, this is normal. If they're white, you're exposing too long. Under Preferences, select "Use msec not sec" and expose for short durations (e.g., 50ms). When you do so, you'll likely notice a blue tint. This is normal and you won't hit this with the exposure durations you use for DSOs. If you want to get rid of this, open the Advanced camera dialog and select either VBE or Double-read.

What settings should I use? Start off with the defaults for DSOs (gain and offset) for DSOs and expose as long as your mount tracks well. See the Nebulosity manual for more.

I think something is wrong with the images. A nice test of the camera is to take a pure dark frame as this will show up a lot of what might go wrong. To get a real dark, you need to have the camera connected for several minutes so it can cool down and you need to ensure that no photons make it to the CCD. An easy way to do this indoors is to:
1. Cover the nose of the camera tightly with tin foil and secure in place with a rubber band.
2. Cover the camera with another piece of foil. Don't seal it up, just cover it to shade it from any stray light.
3. Turn the lights off in the room.
4. Set Nebulosity up to save in RAW FITS format and to have a gain of 32 and an offset of 100
5. Take a 30s-120s exposure. The B and W sliders may get very close to each other and "stretch" the image a lot – so much that it looks ugly, but this can just be it zooming way in on the noise. Turn off the auto-scaling and adjust them so that they are 3000 or so apart from each other (their values are shown in the Status Bar). Does it still look ugly? Look at the histogram. If you took a 30s exposure, there should be a tight peak. If you're up at 120s, it will be a bit wider, but should only be, say 10% of the width of the histogram window. You'll notice hot pixels, of course, and you may see a bit of glow as well. This is normal. Large amounts of glow, odd noise patterns, wide histograms, etc. are not.

Installing the Driver Manually

OK, so something in your system didn't like installing things the way I laid out above. What to do? On Step 6 when it asks whether it should search for a driver (and you told it c:\program files\Nebulosity), you can also just tell it "Don't search I will choose the driver to install". When you do that, you should see this:
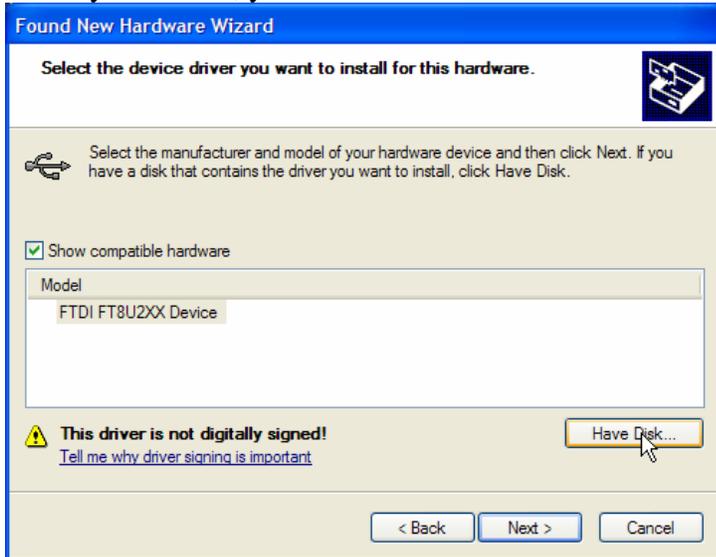
Click on Have Disk and your screen should pop open a small window (the one on the lower left) asking you where it is. Click on Browse and navigate to c:\program files\Nebulosity where you should have "FTD2XX.INF". Click on OK to close that window and OK to close the other two windows. Continue on with the installation.