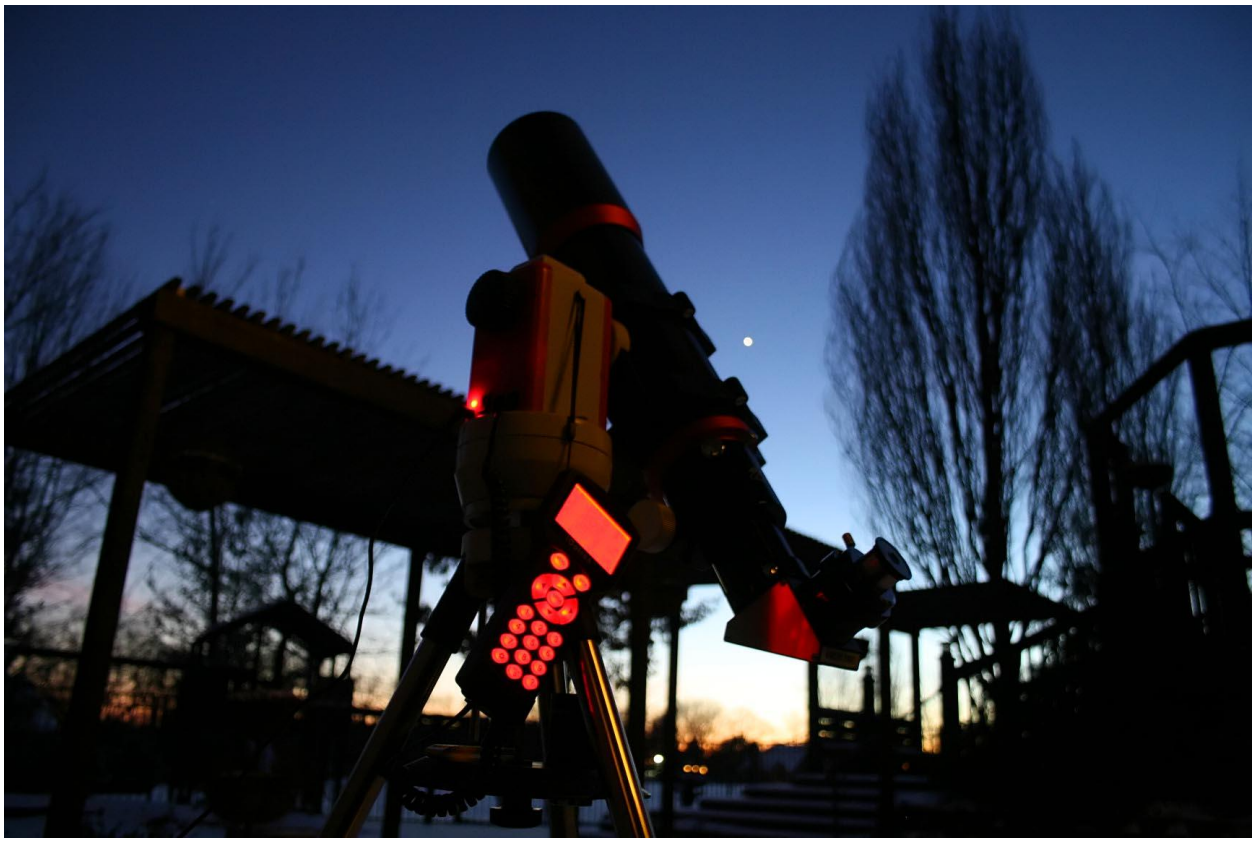
Review of the iOptron SmartStar A "Cube" Mount

February, 2012 Brian D. Ottum, Ph.D. Michigan



This is a review of the iOptron SmartStar A mount. I purchased the mount for $422 (including delivery) from Amazon in January of 2012. The purpose of the purchase was to get a lightweight "grab-n-go" mount that has a motor drive. Not having a motor drive became a real problem when I was showing hundreds of people solar prominences last summer (while I volunteered at Bryce Canyon National Park). I'd have to take the time to nudge the scope between visitors, often butting heads with the overly eager. The need for a drive will be critical this spring when I return to Bryce to help serve the crowds of visitors viewing the May 20 annular solar eclipse and the June 5 transit of Venus.

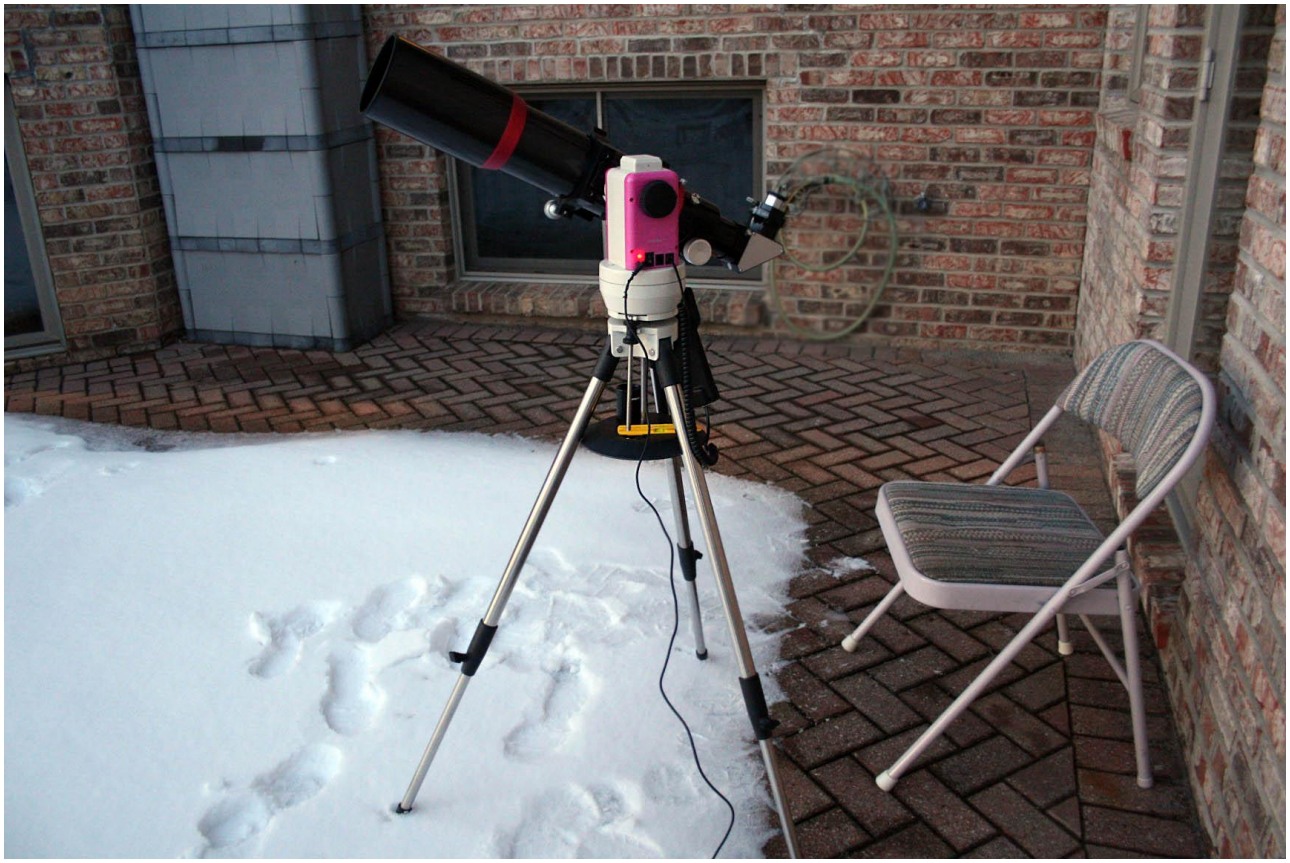
In nearly 40 years of serious observing, I've owned many scopes. Pertinent to this review, I have a GO TO Starmaster 14.5" and a GO TO Gemini drive system.

Before purchasing, I did extensive Google searches and read many reviews and experiences with the various iOptron "Cube" products and their derivatives. Being a Sky & Telescope "Product of the Year," the Cube has generated a lot of interest and sales. It offers a lot of technology for a low price.

However, the reviews are decidedly mixed. Folks complain about shaky tripods, poor documentation, buggy software and poor pointing accuracy. To be fair, many folks deal with the negatives, modify the mount and become enthusiastic supporters.

Out of the many iOptron mount options, I picked the SmartStar A because it is the lightest, and also has the unique ability to tilt up and emulate an equatorial mount. It could possibly replace the AstroTrac 320 lightweight drive that I have and use for widefield astrophotography. Also, it could be used for both my hydrogen alpha Lunt scope and my 4" APO refractor, replacing the Astro-Tech Voyager alt-az mount (which has a stripped azimuth gear and a totally unresponsive manufacturer – another story for another time).

I was advised that the SmartStar A has a recommended 12lb maximum payload. My two refractors are below that. The larger iOptrons can carry more. But I decided to get the SmartStar A anyway, since this is to be a lightweight travel mount.



OUT OF THE BOX

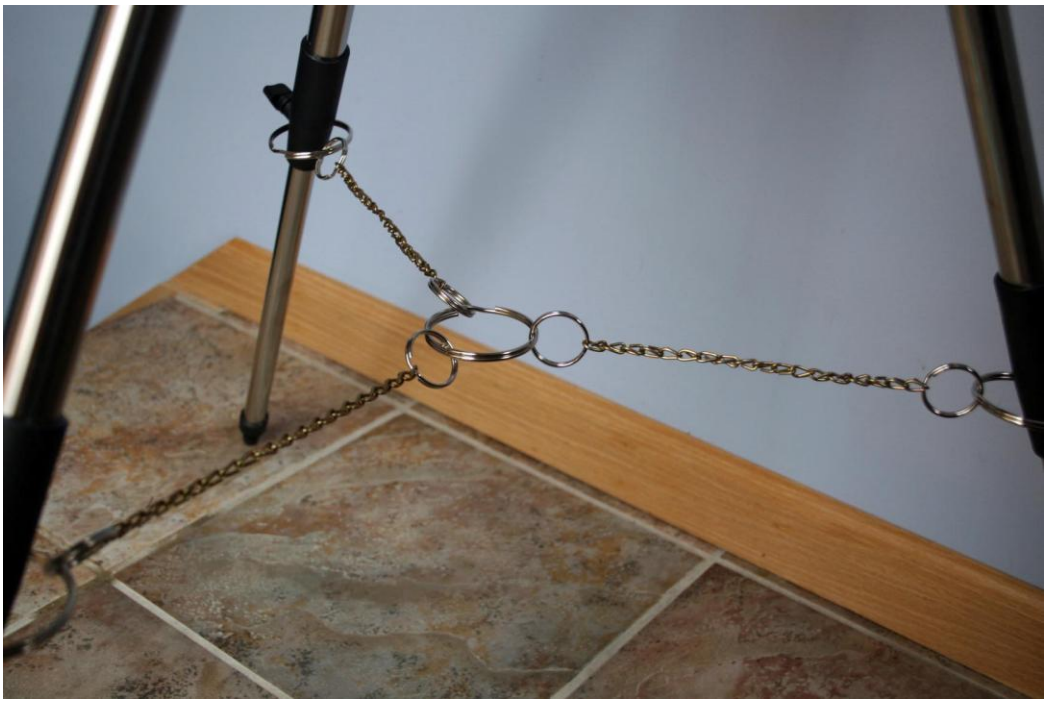
The mount arrived less than a week after ordering. The first thing that struck me was the shortness of the tripod. Yes, I had been warned in the online reviews. This tripod is inappropriate for viewing while standing. However, I am fine with a sitting-only mount. That's the only way newcomers get a comfortable and satisfying view.

The second thing that struck me is how tiny the mount is. It's a small cube, with pink accents. Yes, I know I will get ribbing for a pink telescope mount. But I went with the pink over the other colors because it is a more welcoming look to attract visitors in front of the national park visitor center.

The third thing that struck me is the total lack of an owner's manual. There's just a quick start guide that only hits the high points (and is fraught with misspellings and poor grammar). Luckily, I had already searched and downloaded the .pdf manual from ioptron.com (which also suffered from poor writing).

SETTING IT UP

It just takes a minute to put it all together. After setting up the tripod I saw what others had been complaining about. There is nothing from stopping the tripod legs from "splaying" outward as you tighten the eyepiece tray/spreader plate. What a poor design! So I immediately went to ACE hardware and bought $14 worth of chain and rings. I have to thank David Rogers for sending me pictures of his modification. This really helped tighten up the legs and increase tripod stability.

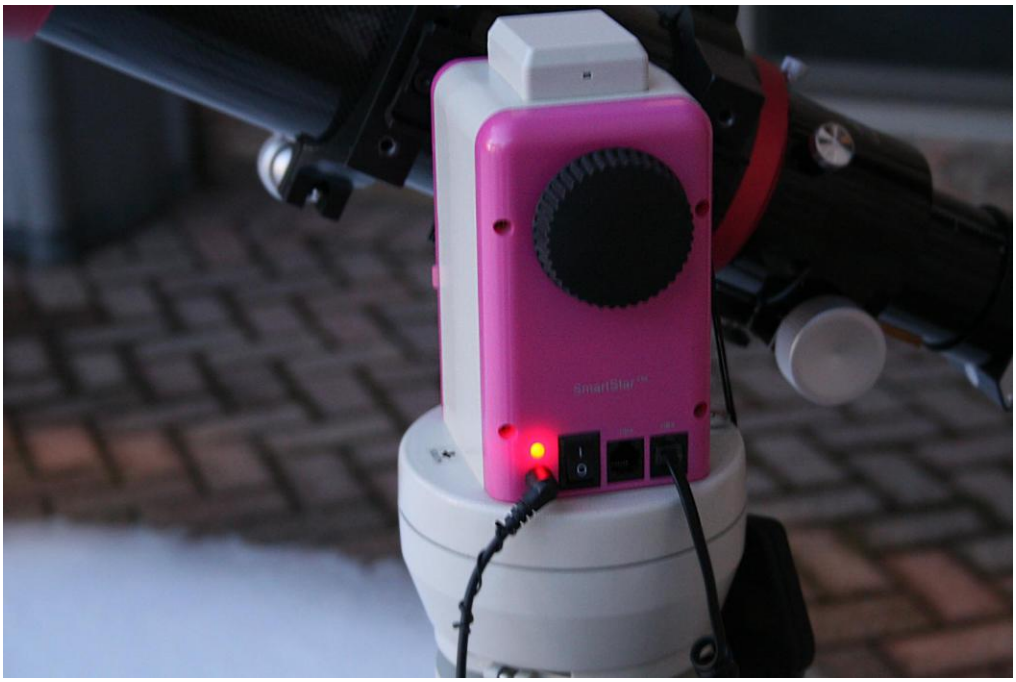


The manual advises to do initial setup and “playing” with the mount inside during the daytime. This is good advice, given that this computerized mount is highly complex and not intuitive. But since I’ve got experience with a couple other computerized mounts, I was able to get up to speed on this one.

I mounted my 4” APO refractor using a Vixen-style dovetail plate and immediately saw that it was going to tax this little cube. The altitude tightening knob really needs to be cranked to secure the scope. This is another issue cited in online reviews. The clutch is insufficient and tends to slip.

FIRST NIGHT OUT

Unlike most times after buying a new piece of equipment, it was clear the night after arrival. (I’m in Michigan, so a clear and comfortable January night is highly unusual.) So I carried the scope and mount onto the deck, and plugged in the mount using the included A/C adapter. The mount powered up quickly, and the internal GPS automatically acquired satellites within a minute, requiring no button pushing. In addition to lat/long, the GPS feeds the correct time to the mount. All I had to do was a “1 star align.” The mount tracked Venus & Jupiter @ 130X for over half an hour! I was very pleased. The sound of the tracking motors inside seemed a bit loud, but comforting. On the other hand, the slewing motors are like a coffee grinder (but no different than what you hear from other mass-produced mounts).



A NIGHT OF THOROUGH TESTING

About a week later I decided to do a really critical evaluation. So I carried the scope+mount outside, set it in place on the patio and plugged it into an outlet using an extension cord (7:23pm). The first step is to point the mount's "South" arrow to the south. This is an imprecise exercise because the arrow is short and the mount lacks long lines for sighting. The second step in aligning is ensuring the iOptron is leveled, so I fiddled with the leg heights until the bubble level was centered. The manual suggests using an additional "torpedo" level, but this is difficult because there are no large flat surfaces on the iOptron. So you gotta trust the bubble. A torpedo level on the top surface shows that the bubble is pretty accurate (but is the top surface exactly parallel to the aximuth axis?). The last step of setting up is to aim the telescope as perfectly vertical as possible. The small torpedo level was used to level the mounting ring (which I hope is 90 degrees from the scope's optical axis). "Southing" and leveling and "verticaling" took until 7:28pm.

I turned on the mount switch and watched the hand controller display until "GPS OK" appeared. Wow, it took only about a minute to acquire the satellites (where my car GPS often takes a couple minutes). I pressed "2 Star Alignment," the best possible in alt-az mode. The first star it suggested was Aldebaran, so I pressed "enter" and it quickly slewed to the star. I was using a 30mm eyepiece, yielding nearly a 3 degree field. Aldebaran appeared near the center of the field of view. Yay! I changed slewing speeds to something slower, and carefully centered Aldebaran in the center of the field and hit enter again. The display suggested the second star was Alpheratz, so I hit enter and it slewed to this star in Andromeda, on the other side of the meridian. (The computer offers you a list of bright stars, but does not factor in the first one, so you only see stars that are up and located a good distance away from the first one. This means you may select a second star that is right next to the first one, then the computer tells you that it's too close for a good alignment.) I was miffed to NOT see Alpheratz in the eyepiece. Even an eyepiece with a whopping 3 degree field! So I sighted along the refractor tube to slew slightly to the right – I was about 3 degrees off of the star. Then saw the star in the scope and centered it precisely, hit enter. Two star alignment is done at 7:32pm.

So now it was time to test the accuracy of the alignment and the computer pointing. The computer contains an impressive list of objects, including all Solar System, Messier, NGC, IC, major stars, SAO double stars, variables, etc. I selected M31 and slewed. Andromeda galaxy was smack-dab in the middle! Yee hah (7:35). Then on to Venus, located about half a degree from the center, still very good (7:37). Then a very difficult object to find – a first quarter moon ;-). It was located about a degree above the center of the field of view but still well within the 3 degree field (7:38). Then nearby Jupiter, also offset about a degree up (actually north, 7:39pm). M45, the Pleiades were positioned about a degree up from the center of the field of view, and perfectly acceptable to me. The wide field view was great (7:42).

Why not try a star? So I selected “stars” and was presented with a numbered list. The numberings went up with the alphabetical list of hundreds of the brighter named stars. Of course, these numbers mean nothing. You have to repeatedly press the down arrow to go down the list to find the star you want. This is very tedious. Gloved hands do NOT make this easy. The numbers mean NOTHING, so why are they there? Later, I discovered that I could enter a high number (like 050) to jump down the list. But not intuitive or easy. Star 061 is Betelgeuse so I slewed there. It appeared near the top right edge of the field of view, nearly 1.5 degrees from the center. Acceptable but concerning (7:43).

Then I decided to do a rapid fire tour of the bright clusters in Auriga – M36, M37 and M38. All appeared at the upper right edge of the field of view (ending at 7:49). The double star Castor was also positioned in the eyepiece, albeit at the edge. This was a difficult test because Castor was rising low in the East, opposite Alpheratz, the second alignment star. I decided to “nudge” the scope in the vertical so that Castor appeared in the center. Then selecting M35, the mount placed it perfectly in the center. Then back to the moon, which appeared also close to the center. Jupiter perfectly centered at 7:55.

So my initial experience is that this tiny cube works quite well to position objects in a wide field eyepiece, after a careful initial alignment.

After this experience, I carefully manipulated the scope while “locked.” I could feel that the altitude was quite locked down and tight. However, there is about a 1 degree “play/slop/backlash” in the

altitude gear. This is the source of the pointing inaccuracy that I observed. This is also the reason it was hard to keep objects centered when trying to change eyepieces or focus.

TRACKING TEST

I put the scope on Jupiter at 130X and watched it carefully for half an hour. The drive kept it in the 0.6 degree field of view easily during that time. But I could see tiny drift down and to the right (which is undoubtedly due to my imprecise "Southing," leveling and "verticaling" the scope at the beginning). No surprise.

As I sat and carefully watched the 4 moons and cloud bands, I saw the wind hit the scope and make it move around a bit. But wait. There was no wind. So I sat very still and watched very intently. Sure enough, there is a periodic "jump" in the drive about every 3-4 seconds. You could hear it coming by listening to the motor drive. Jupiter would jump up 5"- 10" every 3-4 seconds. Then I remembered reading about this in the online forums. Others were getting very bent out of shape about the "jumps," and were told by the manufacturer to update their firmware. So I watched carefully for another 10 minutes. I concluded that this is a minor (but significant) annoyance, and that right now I thought I could live with it. But I will investigate that firmware update.

I contacted iOptron support about this issue. It took about 2 days for them to reply to my email. After a couple back-and-forths, I realized that I knew more about the mount than did my support person. The only useful thing I found out was that I was running firmware 8104 V90701W, the most stable version. Not great product support.

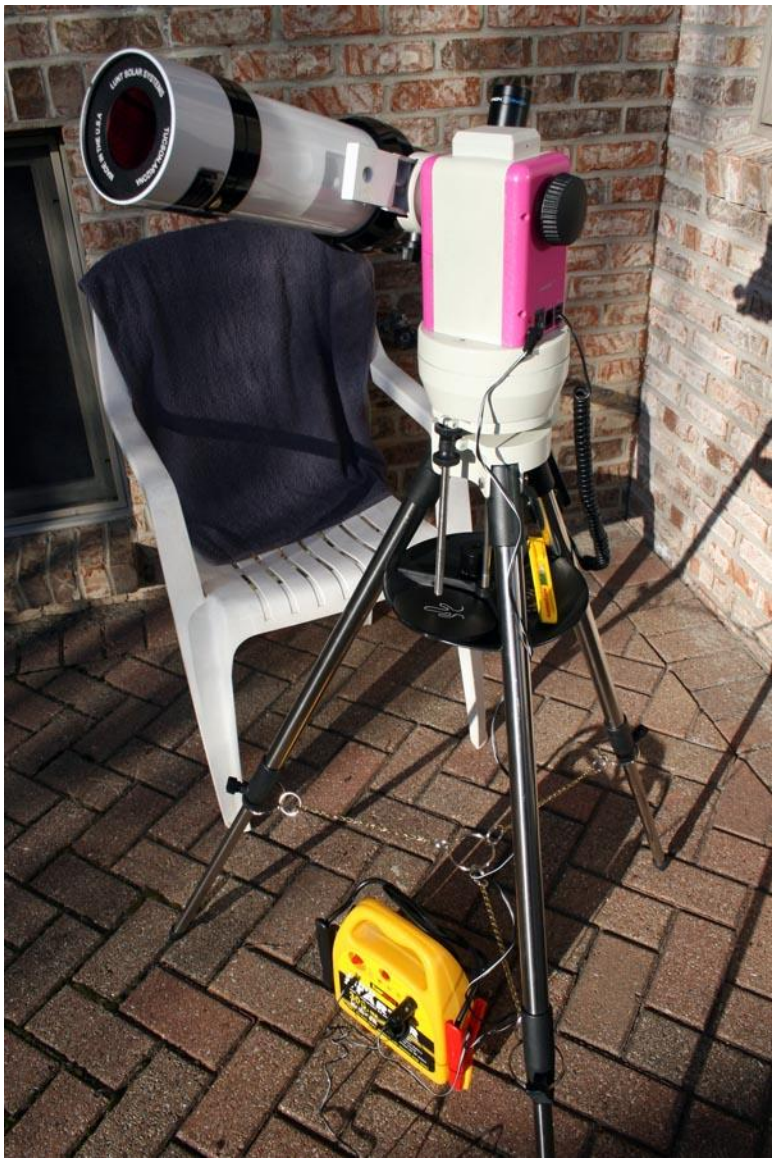
MODIFICATIONS TO ELIMINATE THE ALTITUDE "PLAY"

Another owner, "Paul C.", advised me to carefully remove the mount's cover and take a look at the altitude gears. I saw that once the mount was locked in altitude, any pushing of the telescope caused the entire altitude gear housing (plastic) to twist and flex. This is undoubtedly the cause of the 1° vertical play. So I cut a wood pencil to the proper length and pressed it between the plastic gear housing and the inside of the metal case. A pencil happened to be the perfect width to stop the flex. Now the "play" nearly gone, which should result in better pointing accuracy and easier focusing.

One other modification recommended by David Rogers was to replace the nylon altitude clutch washer with a larger one. I did that and the scope is much easier to lock tight.

RE-TESTING AFTER MODIFICATIONS

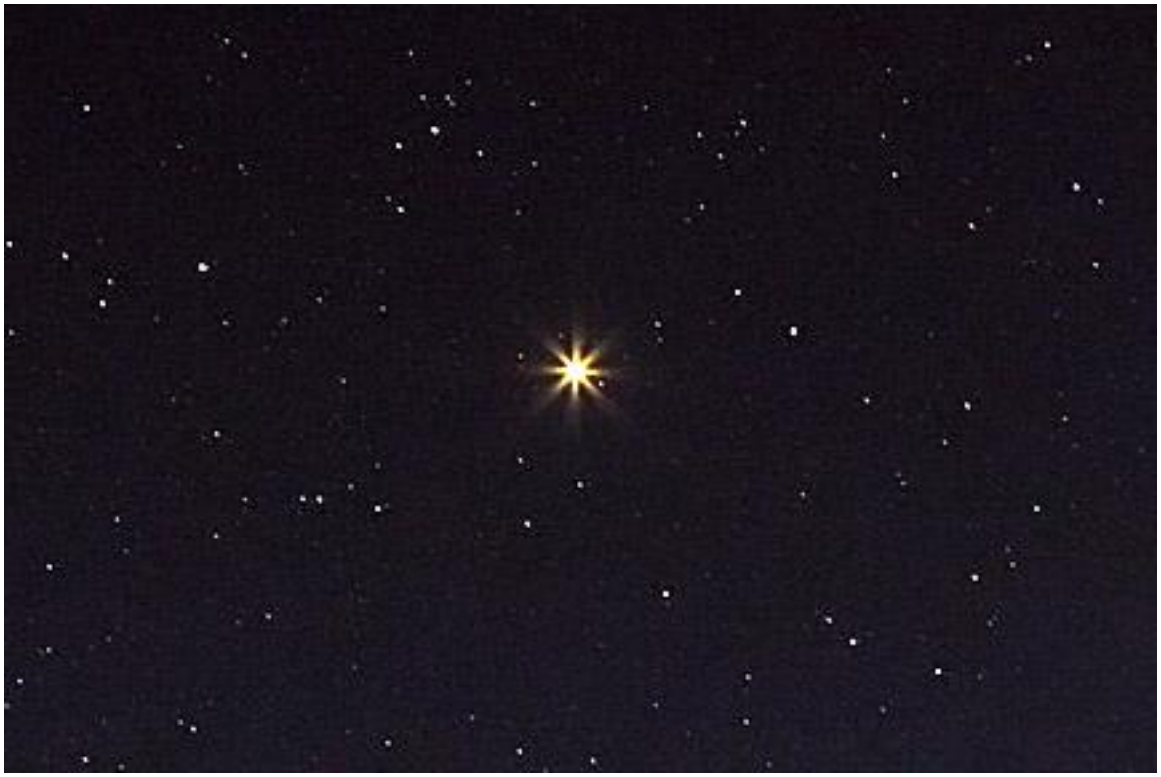
I placed my Lunt hydrogen alpha scope on the mount and took it out into the [rare] clear winter day. After “southing,” leveling, and “verticaling” I powered up the mount and it acquired the GPS satellites in about a minute. I selected the sun and the mount gave me a loud warning “beep!” with a stern warning on the hand controller. But once selected, the mount slewed to the sun, centering it PERFECTLY in the 40X eyepiece. Conveniently, the mount automatically switches to the solar tracking rate when you slew to the sun. The altitude/vertical “slop” is now completely gone. Changing eyepieces and focusing is a breeze, as the object stays in the field of view. Also, I could not detect any big periodic “jumps” every 3-4seconds while at 90X. So it appears that my two modifications did the trick. (Also, using a 12V battery supply worked just fine with the mount.)

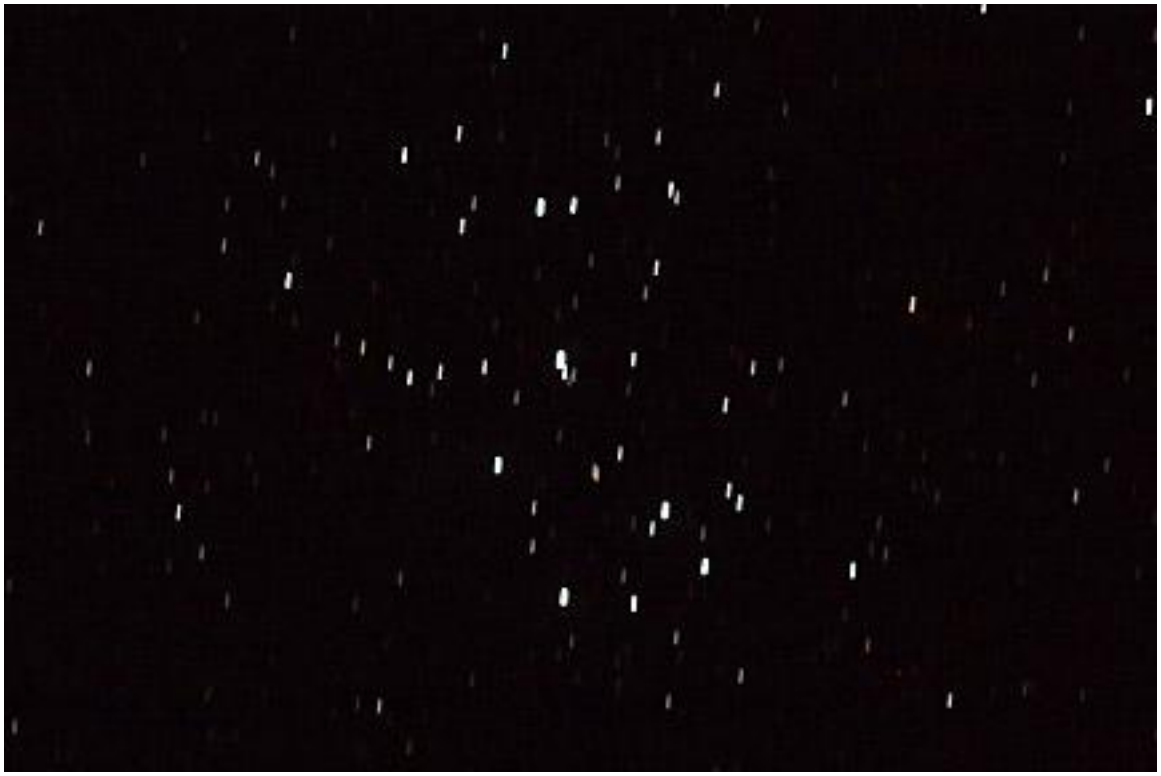


DETAILED ASTROPHOTOGRAPHY TESTING

The third purpose for this mount, other than solar viewing during the day and refractor viewing at night, is wide field astrophotography. The goal is to have a highly portable drive that is accurate enough to take 2 minute exposures with my Canon 20Da and 200mm lens (plus the wider angle lenses which require a LOT less tracking accuracy). So one night I set up the mount in "equatorial" mode by simply tilting the mount and locking it in place. Polar alignment is not quick, but quite effective. You roughly point the mount to Polaris, point the camera toward Polaris, align on one bright star, align on another bright star in another part of the sky, then press "enter." The display tells you how far off of the true north celestial pole both in altitude and azimuth (albeit using confusing terms like "Altitude: 82mins higher" – does that mean too high or that I need to go higher?). Adjusting altitude is easy, just a few turns of the tilt screws. Azimuth changes are tough, as you have to carefully pick up the tripod and rotate either easterly or westerly by a tiny bit. This iterative operation became easier for me once I found out that my 200mm lens gives a 4° altitude x 6° azimuth view of Polaris. So after the 3rd iteration, when the mount told me I was a degree too high and two degrees too west, I could look through the camera to monitor my adjustments. It might have been funny watching me crane my neck to peer through the viewfinder as I hunched over the tripod, attempting to carefully rotate it. I stopped the process once I was aligned within a degree of the pole. The polar alignment took a half hour.

I took a variety of 30 second exposures with the camera, and the results were mixed. Most shots had very good tracking, with pinpoint stars (see Betelgeuse below). However, when the camera was pointed near the zenith (the Pleiades), there was a large tracking error in the R.A. I conclude that this is simply a counterbalance error – the drive is slipping. So I have ordered the optional iOptron counterweight which should fix the problem. The tiny Dec/altitude "jumps" that I saw visually did show up in some of my Orion shots, but they were almost imperceptible.





So I conclude that this mount can be used for good 200mm astrophotography (if the counterweight fixes the slippage), and perfect for anything of shorter focal length.

NOT A MOUNT FOR BEGINNERS

This is a mount that is priced and marketed for beginners. However, it is a poor choice for beginners because it is such a complex and non-intuitive product. I've seen online evidence of folks making mistakes with the mount and getting frustrated. As a result, there are an unusually high number of newer "cubes" and "towers" for sale on Astromart. Here are the key drawbacks that will stump beginners:

- No manual included – have to search, download and print your own
- Manual is poorly written
- Product support is slow and poor
- Hand controller display is jammed with numbers (and they even boast about it)
- Have to precisely balance the telescope, not described in manual
- Alignment requires knowing the names and positions in the sky of obscure stars (this is a huge problem – how many beginners know where Alpheratz is?)
- Tripod is unstable and susceptible to dangerous falls (unless you install stability like I did)
- The "play" in the altitude gears will prevent folks from finding objects, prevent easy eyepiece changes, and prevent easy focusing (unless one takes the mount apart and makes the modifications)
- The power cord wraps around the cube as it slews to new objects, eventually causing damage (unless you monitor the situation)
- Updating the firmware is a 30-step process, with the very real chance of wiping out the mount's brain

This mount is analogous to a first generation piece of software. New and powerful, but full of bugs and rough edges. The opposite of what Apple would do (however, an "iMount" would cost $1,200).

MY OVERALL ASSESSMENT

This mount seems like it will meet my needs well. It is inexpensive, considering all the things it can do. It is small and extremely portable. It quickly finds and keeps objects within the field of view. It can accommodate my solar scope during the day, and my 4" refractor at night. I can fix or accommodate its shortcomings.

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