

RAT NOTES – TEC 200 F9 Triplet Apochromat – 09/01/04

Source: <http://sci.tech–archive.net/Archive/sci.astro.amateur/2004–09/0364.html>

From: Ratboy99 (*ratboy99_at_aol.comet*)

Date: 09/02/04

Date: 02 Sep 2004 04:44:56 GMT

RAT NOTES – TEC 200 MM F9 TRIPLET APOCHROMAT – 09/01/04

Well, it's been a long journey to get all the way from my first 8" SCT, to the Televue Ranger, through three Dobs, and another 2 (8" – again, and 11") SCT's, of course interspersed with three (or four) more refractors, and finally here – my very own 8" APO refractor.

Why don't I just save the suspense and say it up front:

Holy Cow!

I first inquired about this scope with TEC 23 months ago. Received it last Monday, not bad actually, given the apparent dynamics of creating such an instrument.

The outer box looked more as if it had been kicked by UPS all the way from Colorado rather than being driven here by truck, but the scope was well packed in bubble wrap in an inner box with another outer layer of peanuts, which protected it completely. Once opened it appeared to be unharmed.

Some time ago, I received the mount; a Losmandy Titan. I had a few weeks playing around with it using my 6" Tak as a guinea pig. It is a nice big mount and I figured that it would be adequate to the task. As it turns out, there are some idiosyncrasies (as well as something of a learning curve) to it. I am still waiting to get a pair of stainless steel worm covers, as the supplied aluminum ones are subject to expansion / contraction when the scope is subjected to changes in temperature. It is a nice fit for visual use with the big OTA.

Here's a good place for a side note: One thing I realized when it came time to set up this monster, is that I am damned glad that I have already owned and become well acquainted with 2–3 EQ mounted refractors. I still remember the time I took a dive in the snow to catch the AP Traveler as it accidentally slid out of the dovetail plate. This is not one of those scopes that I am going to be taking a dive for; I can barely lift it. The listed weight of the OTA is in the ~50 lb range. I've been consistently eating my Wheaties and lifting weights

so that I would be up to the task when it came time to hoist it onto the mount (I'm 6'3" 205 lbs, and I bench 3 sets of 8 @ 165 lb, and curl 3 sets of 10 @ 40 lb each arm – 3x week).

Anyway, after I got the box opened and the rings in place on the mount, I went about the matter of lifting the OTA into the rings. I'm glad it is only 50 lbs, because it feels like 70. I am able to carry it up the step ladder into the heavens and lift it gingerly into the rings, and have so far done so twice, but I will probably try to rig up some sort of hoist for moving it between the mount and the case, because it is a bit too precarious to balance for my taste. I fully intend to NOT damage the scope, so I need to come up with procedures that do not take 90% of my strength to execute.

After the scope was on the mount, I commenced to worry.

I must have tightened every knob 3 times. I was particularly concerned (read paranoid) that the dove plate was not properly set in the dovetail assembly. I worried about this until the day before yesterday, when I was mounting the scope for the second time (even though that first night, I visually confirmed using a flashlight that it was properly seated). I also immediately ordered a case for the OTA from Scopeguard. But I still don't know which is worse, leaving it on the mount or moving back and forth to the case all the time.

Another good side note: Why would it be necessary to have mounted it twice in a few days? I'll tell you why: The doorway for rolling the mount out had an opening that was 74" high. I say "was" because after that first night of sitting on the ground (on my butt) to observe the Zenith, I decided that I would be needing to enlarge the door again (for the second time). I spent two days brushing up on my rudimentary carpentry skills by adding a third, top door opening on hinges that gave an additional 10" of available height (87" total). Now I have to climb even higher to get the thing on the mount.

So I took the scope down, mount and all, and reassembled it with the legs further extended. Now at the Zenith, a 7 mm Pentax hangs about 33" off the ground at focus. Not bad, I can pretty much look in while seated on a low bench (read inverted milk crate). Closer to the Horizon, I pretty much need to be standing, unless I am willing to crank my neck, or better still, stand my Air Chair precariously "on top" of the milk crate. Not a bad solution, as I have decent balance, and if I were to fall off at least the scope would not be in much peril, as the mount would surely be capable of receiving my form in motion without the OTA so much as moving from its target.

Appearance:

I don't have all the measurements in front of me, but it is around 5.5 feet long with the dew shield retracted. The paint is white with a durable, rough texture. This will be very effective in hiding finger prints and also makes the tube less slippery when it has dew on it (I handle the tube using "rubber dot" type photo gloves for grip and to keep oils off of the assembly). It incorporates a black anodized, high quality Feathertouch dual-speed focuser. The lens cell is nicely appointed with the technical specifications of the lens

(F=200 mm, F/L=1800 mm, etc, etc) laser-engraved thereupon. Very Nice.

The lens itself is pretty amazing. I wish I knew more about how a lens cell is designed to compensate for temperature changes. I am also curious to see at just how cold of an ambient temperature that this telescope can be used and still maintain its figure. We typically see substantial periods where the thermometer at night appears to be perpetually stuck at 5 degrees F. It would be nice if the scope would be able to handle such a cold temp, but there was no guarantee given that it would at the time I placed my order.

Speaking of which, I would have, for the sake of long term maintenance, preferred to have ordered an air-spaced unit, as being non-technical, I am superstitiously distrustful of the long term utility of an oil spaced objective. Just the same I have been assured to my satisfaction that it is a non-issue. It was also the only option available to me at the time that I could afford, so it is what it is.

It is possible to see something of how the cell is constructed, but as I said, being non-technical, it is difficult, even looking through clear glass, to see clearly what is going on there.

Did I mention the glass? 200 mm of clear aperture!aaah!

It is a big lens to an amateur such as myself. Perhaps I shall dispense with waxing poetic about the coatings rendering the glass "invisible." I will only say that the coatings are considerably lighter than on the 6" Tak (which has a very dark coating), they are more like the coatings on the Traveler, if I were going to pick an equivalent.

As eluded to before, the dew shield is of the sliding variety, it is nice and snug and I assume that it will move smoothly after it has been operated a few more times. The lens cap is of aluminum and attaches directly (as opposed to "screwing on", and is held in place with foam spacers – very nice, actually). The interior of the tube is flat black and supports 4 baffles. The inside of the focuser tube is lined with black felt. The 2" focuser cap is laser engraved with the TEC logo and the logo also appears on the focuser. There are two decal lettering type labels on opposite sides of the baffle reading "TEC APO 200 ED." With the baffle extended and the focuser engaged the overall length is in excess of 6 feet, it is a most imposing instrument sitting up on top of the Titan mount.

At any rate, I still need to pinch myself, as I must surely be dreaming.

First Light:

So after a couple days, I had it together enough (and the weather had cleared enough) for me to take it out for first light. First light ended up being Polaris, using a 31 mm Nagler. The view consisted of a bright star with bright, undulating spikes; on bright stars at low power my eyes are crap, highly astigmatic. It was apparent as being a double star, something the scope would see a lot of over the next few nights. I used the opportunity to attach a new

Telrad, and get it aligned. I was in business. I had a look around; M13 – washed out by the near Full Moon, the near Full Moon – way too low to the horizon and stuck in the muck – seeing was horrible, and then Vega for false color (still having a hard time really being able to see any at all "in focus").

And then of course the double–double. Well, at 257x, that thing was incredible. (Don't ask me what the hell I was doing at 257x, I don't think I've used less than that practically the whole time I've used it – except to locate objects!) I had never quite noticed how apparent the magnitude difference was with the one pair – the pair that is parallel in line with the larger grouping of all four stars. The Airy Disks were quite apparent and surrounded by 1–2 faint and symmetrical diffraction rings. The outer one was fainter, and came and went with the seeing.

By this time I have recognized the folly of trying to scrutinize "out of focus" star patterns with APO refractors. I'm no expert, but I do know that the phenomenon of bringing all of the colors together to the same focus, but never being able to quite do it completely is known as spherochromatism, and that these colors interfere with each other when out of focus, and that I can basically throw out Suiter's star testing book of pretty fresnel patterns when it comes to evaluating Spherical Aberration in such an animal. Except, perhaps, for the "in focus" images in the book.

I have become something of a backyard expert at evaluating optics via the star test method by simply leaving the stars "in focus"(!). It doesn't take a rocket scientist to know that if the energy is properly concentrated in the Airy Disk, and the seeing is good that the remaining diffraction rings will be few and faint. Through experience, I have seen otherwise, so it is pretty easy to evaluate SA in an optic using such a method, once it is based on personal experience.

Spherical Aberration? Coma? Astigmatism? What are those? We'll have none of that here. This lens is one (or is that 12?) of a kindâ€¦

Another side note: I have spent a great deal of time trying to determine what would be the perfect aperture for my location. A good part of this has been conjecture along with testing my eyes, to see exactly what it takes to see all a given aperture has to offer. There is much information, as well as disinformation on the Internet regarding maximum and minimum useful powers. I like the oft repeated maxim that for low power it is best to use the highest power possible that frames the object being observed. That is why I finally ponied up for the 31 mm Nagler, and especially the pair of 24 mm Pans for my Binoviewer, which will not yield much of a wider fov than my 32 mm Plossls, but are certain to give a darker sky background with its attendant increase in contrast, and hence, fainter objects visible.

As for high power, I don't know why it is, but I am coming to the conclusion that I can see all that an objective has to deliver to the image plane at 30x per inch of aperture. I have revisited this rule of thumb over and over, in one telescope after another. That (30 x per inch) is where the Airy Disk becomes

visible to my eye in the scope, and that is where I can see the full resolution of the instrument.

This is an important point. My eyes have some floaters (flotsam and jetsam floating in the vitreous humor), the larger exit pupil I can use, the more clearly I can see. Also, contrast decreases with increased magnification. Being a Jupiter watcher, using the lowest magnification that will reveal all the detail that an instrument can resolve, will also maintain the highest level of low contrast detail visible in that fully resolved image. Seeing, also, may limit the high power utility of an aperture, and by matching the aperture and its full resolution to the environment, care may be taken to insure that the instrument is well suited for its purpose. In a nutshell, the largest aperture that can get under the local seeing.

That said, I have often had some difficulty pushing much past 225x on Jupiter (my favorite object) at my house in the Rockies, and I have come to theorize that I can fully resolve a 7.5" aperture at that magnification, so going much beyond 8" is going to yield diminishing returns for observing Planets. Diminishing returns on various respects: Cost, portability, seeing limitations (BTW, I do use an 18" Newt for DSO's so please don't get the wrong idea). Now 8" is not generally considered an overwhelming amount of aperture for Planets, so this explains why, for my purposes, I decided to go with a refractor.

Being limited as to maximum aperture useful for the application I could then concentrate on getting everything possible from that 8" of aperture. At 8" aperture, I can see resolve what the scope has to show at 250x, as will be demonstrated later. By keeping it down to 250x, I can theoretically squeeze more low contrast out of the system than running at a higher magnification.

Did I mention yet? This is a nice scope, it's a keeper.

Second light:

So, I go out a couple of nights ago and think I'll try for a couple of test objects. I spent some bedtime reading looking over close doubles in the Night Sky Observer's Guide (nice books by the way), and came up with a couple of appropriate candidates in Cygnus.

Siegfried and Bob were both over (Siegfried is caretaker for a 9" Clark Refractor, Bob has the second 8"er that is coming to this state (!), pretty amazing when you consider that out of the 12, several of which are shipping out of the country, that two would be coming here.

We were looking at stars and splitting a lot of doubles with the new TEC APO.

Needless to say, the Gemini GOTO was giving me fits, and a motor stalled. So I finally decided to just push it to the objects and save for later trying to figure out whether my problems were the mount or just my inexperience with it. Sidereal tracking was still working fine throughout the evening. Glad I still know how to star hop.

Ended up with Otto Struve 403 at .8 arcsec, and Otto Struve 410 at .6 arcsec (according to The Night Sky Observer's Guide, both around mag 7, both are in Cygnus).

Both split ****clean**** (no figure 8's or any of that crap), for all three of us (so I do have witnesses), at both 257x and 450x.

Unbelievable! That .6 arcsec double is the closest double that I myself have ever seen, and starting to push the theoretical limit for an 8"er, if I have my facts straight.

Even more amazing is that they both split clean for me at the 257x, there we are again at that magic ~30x per inch of aperture. Even at 450x, I could not see them much better, if anything they were a bit more disturbed by the seeing conditions at that extreme high power.

Another side note:

One thing that I have noticed is that it has taken me an inordinate amount of time to get my facts straight regarding optics. For one thing, I think the reason I was finally successful with the .6 arcsec double is that I chose one that wasn't so bright that it's diffraction pattern would overwhelm the separation of the Airy Disks. This and the fact that the stars were quite equal in brightness, which helped them to split clean. What a stroke of luck that I get a new scope, and sometime in the first week I am given the gift of sub-arc second seeing. I mean this thing split .6 mm like it was butter. It never even occurred to me, after all the hundreds of observations that I have now made, that this might be the exception, and not the rule. It just seemed so natural.

Third Light:

Well, I had a lot of other questions still remaining, how about stray light, sky background darkness, contrast, etc? I brought out my old faithful 10" F6 Zambuto Dob (Protostar 3 vane diagonal and quartz mirror, flocked tube), to do a side by side. I let both instruments cool down for two hours. By some freak of nature, the seeing cooperated for one more night. Not quite as good as last night, but still pretty damn good. Let's have a look at that Otto Struve 410 at .6 arcsec again. In the 8"er, there it was again, plain as day. Two tiny Airy disks, the outside surrounded by the faintest diffraction ring, absolutely beautiful.

Now to try it with the Dob. Got collimated, Found the star with a 22 mm Nagler, switched to the 6 mm Radian (255x), holy cow, there it is; split!

I spent the better part of an hour carefully comparing one scope to the other. I have come to the same conclusion as many others regarding diminishing returns as more money is spent on a telescope. In a nutshell, in my case, was it worth it?

Absolutely, emphatically, Yes.

There was perhaps a (WAG) 20% improvement in the aesthetic quality of the split double star. While in the 8" the stars were tiny, hard Airy disks, in the Newt they had something of a TV screen appearance to them. The diffraction rings were interrupting in such a way as to appear to make fine lines in the image. The star was still split clean, but it didn't have quite the same quality at all as the image in the refractor.

Attempts to distinguish differences in background skyglow, contrast, light grasp, etc., quickly became an exercise in futility. Simple matters like trying to match magnifications and eyepiece designs became burdensome.

Then, my 45 year old bones began to make a further observation. The Dob ain't that comfortable to use, it wobbles a bit at 255x, the objects fly across the fov (I have a tracking platform, but reallyâ€¦!), "go find that star again", "yuck, that focuser", balance is an issueâ€¦!

I sat at the EQ mount and operated the hand paddle on the mount and the 10:1 focuser. What a joy, what comfort, what a view! And that focuser!

IF I lived at a better location (again we are concurring with conventional wisdom on the subject, and this is a big IF), I could perhaps see the utility of going for a large Cat type scope on an EQ for observing the Planets. Something like a 12" Mak would be great.

As to using a Newt such as my 10" F6 on an EQ mount, I somehow doubt that it would work very well for myself, being awkward and uncomfortable. Sorry to say, I am even starting to like my couch more these days (but it ain't over yet!)

Don't get me wrong, I am all for bang for the buck. And I like ALL telescopes, but I did want to drop this note and express just how pleased I am with this latest acquisition. Like I said before, I still can't believe that it is really here. It is safe to say that for 1/10 of the price a person, willing to accept some minor disadvantages and inconveniences, can get 90% to where it is (however, to my own consternation, 90% doesn't always cut it for me when it comes to eking out that final 5% of subtle detail in Jupiter's belts that I am Always Looking For). And like I said, if I lived elsewhere, it might be a different story).

By all means, it is very easy to enjoy this hobby to a very high level with very modest means. But for me, with my years long quest for the perfect Jupiter scope (well OK, I like the Moon, Saturn and Mars, too), I think I may have finally found Telescope Heaven. This may very well be the closest thing to a perfect 8" aperture that I have ever seen.

I can understand now what S&T meant, when they worked my patience over a while back while I was waiting, by saying the only thing they didn't like about the 140 was that they had to send it back after the testing was done. Fortunately for me, I don't have to send this one back.

Yet another side note:

Going through this latest comparison has put me in a bit of a sticky situation. For one thing, seeing the .6 arcsec star for the first time in my 10" right beside the 8" forced me to accept that I have to constantly remain open to learning about how these things work. Picking the fainter double (not buying the 8" refractor) was what really did the trick. I am seeing how different eyepieces affect background sky glow (and there are some differences out there, even among premium makes), I am further realizing that unless I properly clean the diagonal, it might be adding some scatter to the image. I am realizing that there are intangibles, such as comfort at the eyepiece, stability of the mount, the ability for a scope to stay put while changing eyepieces and remain balanced, the ability for the mount to track and keep a star centered for when I wander away and then come back later, that all have a bearing on what one is able to see.

For the longest time I was content to simply nudge my Dob slowly across the sky. Now I just see aberrations wherever I look, even in my own eyes. So this is where the road to becoming a critical observer leadsâ€¦

I went through the same kind of thing one other time, when I was first getting started. I originally was so taken by the stars that I would just lie out in the yard and look up. Once I became obsessed with learning the constellations and my way around the sky, for a time, it became a burden. I didn't want to know anymore, I wanted to go back to ignorance, and just enjoy the sky for its beauty. I passed through the other side of that dilemma and now am quite comfortable both with the beauty, and knowing just a speck of what it is that I am enjoying.

I feel the same way about telescopes now. As most of you here likely already know, this is not a new thing for me. I have obsessed over telescopes for years. I think (at least I hope) that I am finally reaching the point where I can see the 8" APO and the 10" Dob for the apple and orange that they truly are.

I have done countless side by sides between all of my scopes, especially the 6" APO and the 10" Dob.

I truly feel that this time between the 8" APO and the 10" Newt, there will be just the one night of comparison, I give up.

A friend asked me if it was "worth the wait." Yes, it was worth the wait. This scope is finally good enough for me just the way it is, and I feel no compulsion to put it (or myself) through any more rigorous and ridiculous comparisons, or to spend another moment going over it with a fine toothed comb. It has passed its side by side, and its first nights out under the stars with flying colors. IOW, so far, so good and "good enough," for that matter.

I even think I might have got more than I paid for, as odd as that may sound.

Last side note:

I think that sometimes it is possible to create an instrument that performs well on the bench, but the mechanics handicap its performance in the field. Based on what I have seen with this instrument so far under the night sky, I must say that it appears to be fully performing as well in the field, as it must have done on TEC's optical testing bench. The specs to which it was reportedly manufactured were exceedingly high, and for these specs to translate so well to my eye under the night sky at 40 degrees F and dropping, is a profound accomplishment; my hat is off to TEC.

As far as this humble test pilot can ascertain so far, this telescope appears to be essentially a perfect instrument.

Did I already say it? I'll say it again; I think I have finally found Telescope Heaven.

Very impressive, TEC guys,

I can hardly wait for Jupiter...

rat

~()>

email: remove 'et' from .com(et) in above email address