MEADE'S 12" RCX400 TELESCOPE (PART 2)

For an overview of this telescope, see Part One of this article:
http://www.cloudynights.com/documents/meadercx1.pdf

INTRODUCTION

This portion of the review will concentrate on operation and setup of the instrument. I'll include a few low resolution images just to show how things look and to demonstrate that the telescope is capable of taking photos but I'll reserve in-depth discussion of its imaging capabilities for Part Three.

WEDGE INSTALLATION

Finally - I'm ready to take a look through this thing rather than just looking at it. I installed the RCX400 in the observatory in place of the 12" LX200 on the existing Superwedge (with assistance). Installation was a little easier than with the 12" LX200 despite the extra weight. Being able to park the optical tube between the forks lowers the center of gravity to a point much closer to the handles, making it less awkward. Because of the increased weight of the RCX models it's recommended to use the ½" X 13 center bolt in addition to the normal three wedge mounting bolts but I haven't yet drilled an extra hole in the wedge tilt plate so I used only the usual three bolts. I connected it to an LX200GPS-compatible power supply offered by Scopestuff. I also connected the autoguide port to my Shoestring Astronomy parallel port adaptor and the RS-232 port to the Dell PC in the observatory. It was very convenient not to have to install a dew heater and controller and the accompanying cables. I used the flexible dewshield I had been using with the 12" LX200.

FIRST LIGHT

As the wedge was already polar aligned I didn't use any of the alignment procedures offered by the Autostar II; instead I slewed to a convenient star, selected that star from the Object database, and performed a "synch". I then slewed the

telescope to point South and level (a position that permits the rolloff roof to clear and keeps the OTA out of my way), and established that as the “park” position. Next time I turn it on I won’t need to do any alignment at all. On a later session I’ll use and describe some of the alignment procedures provided.

First light was hindered by scattered clouds but I grabbed a look at the Moon as it passed through a gap. The supplied 24mm UWA eyepiece is quite a handful but delivered a nice view. Focus with this telescope is very smooth and easy. I found that I used only two of the supplied focuser motion speeds offered. Between the Moon and the clouds deep sky views were uninspiring so I decided to grab a couple of quick shots with the unmodified Canon 300D and call it a night. I decided to grab the Moon and M5. I quickly discovered that I had shifted the wedge during the equipment switch; DEC drift limited me to 30 second exposures. Remember that the DEC drive doesn’t operate in EQ mode unless commanded by autoguiding, so the telescope isn’t to blame for this. I’ll have to align the wedge before any more imaging attempts. I saved PEC programming and autoguiding setup for another time. The other thing I noticed right away was that the field is illuminated more evenly than in the 12" SCT; I’ll spend less time fighting gradients with this setup.

WEDGE ALIGNMENT

The RCX400 provides the same method of preliminary wedge alignment as the LX200GPS telescopes. The optical tube is placed “upside down” and the DEC axis set to 90 degrees while the RA is set to zero. The wedge align routine is then initiated, which points the optical tube to where Polaris would be if the wedge were aimed at the North celestial pole. The wedge is then adjusted to place Polaris in the center of the OTA’s field of view. This gives an initial position close enough to make drift alignment fairly quick. I then used K3CCDTools2 and the LPI to drift align the wedge. With the wedge properly adjusted, I was ready to measure periodic error, and to train the periodic error correction in preparation for imaging.

PERIODIC ERROR AND CORRECTION

I used K3CCDTools2 and the LPI to measure and characterize the periodic error. With the pixel size and focal length entered, this program can calculate the error in arcseconds, and display it graphically. The first night I tried it, the seeing was sufficiently

unstable that I was unsure of the result, and realized that PEC training would have been a waste of time. The following night things were much better so I proceeded. I tuned off the PEC function so I would be able to observe the uncorrected errors. I found that the periodic error was about plus and minus 15 arc seconds. It took the form of one large sinusoidal wave with a smaller bump superimposed on it. There were no abrupt transitions; this would probably have been easy to guide out with no other corrections. Instead, I decided to examine and use the built-in periodic error correction routine. I set the LPI up to autoguide via K3CCDTools2 and the telescope's autoguide port via the Shoestring Astronomy adaptor. After ensuring that the guiding was working fairly smoothly, I selected PEC training and let it proceed, even though I did observe that the guidestar was bouncing around a little due to seeing. After an interval, a "beep" informed me that the process was complete. I rechecked the periodic error and found that it had been reduced to a little better than plus and minus 5 arcseconds, with no abrupt transitions. Additional training sessions, or training during better seeing conditions might have reduced this a little more, but that's an easy error to autoguide out so I considered it good.

EQUATORIAL OPERATION

I powered the telescope down, selected a convenient alignment star, slewed to that star, and used the "synch" function to align the Autostar II controller. From this point, the telescope automatically slewed to every object I selected with the accuracy typical of the LX200 series telescopes; very pleasing. During later sessions, I was able to operate remotely from inside the house, secure in the knowledge that if I chose a different imaging target I'd be able to select it and go on shooting without any need to check or correct centering.

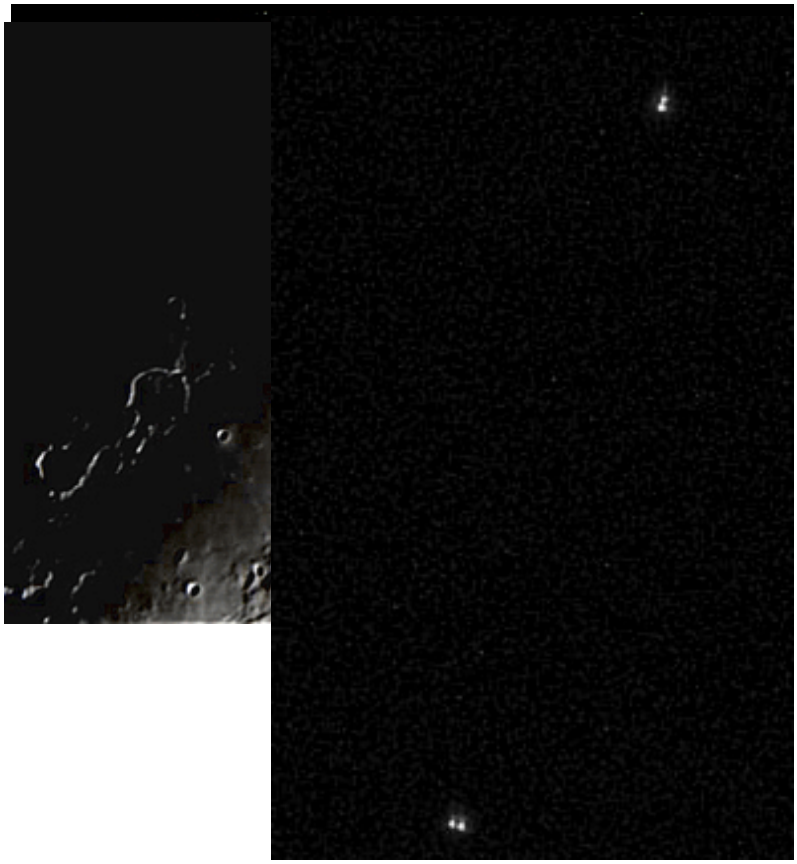
AUTOGUIDED IMAGING

Using the LPI and K3CCDTools2 (I just can't learn to love the Autostar Suite) plus a Lumicon Giant Easy Guider I was able to grab a few images using longer exposures. I'll go into more detail and show blowups in the next segment, but here are a couple of compressed images just for show. Please remember that these are shot at full resolution and compressing them down to a file size suitable for this article is an unkind way to treat an image. In Part Three, which will focus on imaging, links to full-size shots will be provided.

Here’s a shot of M51 showing the recently-discovered supernova (red arrow points to it). It was taken with the Canon 300D at Cassegrainian focus, seven shots of 5 minutes each at ASA800. They were adaptively added and stretched by DDP using Images

Plus, then fine-tuned in Photoshop.

LPI EXPERIMENTS



The next night I was able to get out to the observatory was also cloudy but I was able to do a few experiments. I used the LPI to grab a shot of the Straight Wall during a cloud gap.

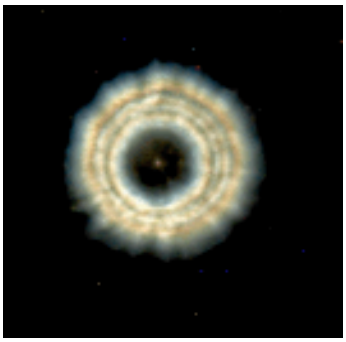
I then slewed over to the Double Double to see how the RCX handles the split. In the LPI it looks pretty nice.

Another easy double - Polaris.

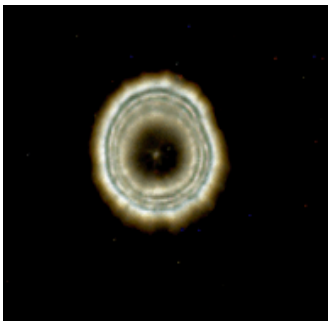
The star was dancing around quite a bit; probably a combination of a hot telescope and a hot roof to the North. I had to overexpose Polaris to get the companion, of course.

Next it was time to check in-focus and out-focus images. Here's Arcturus in focus (but boiling):

And here it is with the secondary shifted .3mm (according to the handbox) inside of focus:



...and with the secondary shifted .3mm (according to the handbox) outside of focus:



Not identical by any means, but probably reasonable for a Catadioptric.

BINOVIEWING

Because the RCX focuses by shifting a mirror (even though it's the secondary rather than the primary), it has a large focus range which is comparable to that of an SCT. I was sure that focusing a conventional binoviewer would be no problem but I've run out of range with some SCT's when using a binoviewer with a focal reducer. The Denkmeier Standard binoviewer with PowerxSwitch looked like a good fixture so I hooked that up to see how it did. With both arms extended (no optics between the binoviewer and the telescope) it focused normally. Switching to 2X magnification, it reached focus again. According to the handbox, the secondary had moved inward about 3.5mm to achieve focus. Switching to reducer mode (about .7X) I found that focus was again achievable, though going past focus to evaluate the range revealed that there wasn't much excess motion available. The secondary had moved about 5.5mm outward from the neutral focus position. The light path through the Denkmeier binoviewer is about as long (approximately 5") as the longest of the other popular units, while the current crop of Chinese imports are about an inch shorter. This tells me that any of the popular binoviewer sets available will come to focus without problems in the RCX.

IN THE FIELD

I took the RCX400 out to three different observing sites to evaluate it as a visual instrument. This gave me the chance to try the telescope under differing sky conditions and to do casual comparisons with a variety of other, nearby instruments. I was also able to go through the setup and alignment procedures multiple times, and to spend a number of hours at the eyepiece.

SETUP

A public function at our Club site gave me the first opportunity to take the RCX

out to the field. As can be seen in the photo, I continued to ignore the battery holders in the telescope, using instead my trusty jumpstart battery pack from Harbour Freight and a DC cable from Scopestuff. The tripod was easy to transport in four pieces and went together very easily at the site. Leleving the tripod was very quick using the provided clutch release levers - but after leveling was completed I disengaged them so nothing bad would happen if they were bumped later in the dark. The built-in center bolt spring again made installation of the telescope onto the tripod pretty easy, although this time I did manage to get the bolt to bind in its hole and not drop freely as it had in the dining room. I'm guessing I was pushing it off-center. Lifting the telescope from the tripod and setting down again cleared that problem. I didn't experience the same issue on later setups.

Setup and alignment from that point was the same as with an LX200GPS. First, I declutched it in azimuth and rotated it by hand (carefully!) to find a hard stop. I then rotated it to find the other. Placing it midway between the hard stops, I then rotated the base on the tripod until the control panel was facing South. To make sure everything was working properly I then selected "auto align" even though it wasn't yet dark. The telescope did the usual "Meade Mambo", checking level at three orientations, determining North and level, and obtaining a GPS lock. It noticed I was not at home, so I accepted the default name for the new location (the nearest town). Then it slewed to where it thought the first alignment star would be. I pressed "enter" to accept that guess and it proceeded to seek the second alignment star. Pressing "enter" again, I received the 'alignment successful" message. I powered it down and waited until dark for the next experiments.

OBSERVING - SESSION 1

Once it was sufficiently dark, I repeated the alignment procedure except that this time I centered the two alignment stars in the eyepiece before pressing "enter" each time. The rest of the evening I experienced the usual LX200 series accuracy; every object (if visible at all!) was well-centered. Sadly, the sky transparency was very poor

that night. For example, M51 was barely detectable in the eyepiece, and M13 was a faint fuzzy. Those of us who were set up settled for cruising open clusters and double stars. Among the other telescopes on the field that night were LX200GPS Schmidt-Cassegrains in the 10" and 14" apertures so those were the subjects of comparison. The RCX stood up to that competition very well. I thought the view of Polaris was the nicest, cleanest split I've ever seen - as sometimes happens the seeing was as good as the transparency was poor. Open clusters were as good as I've seen them in a compound telescope. M16 looked great even though the nebulosity wasn't there even in averted vision (although some observers appeared to be able to detect it in the RCX, I sure couldn't). Despite the slightly larger central obstruction, this telescope wasn't giving anything away to the SCT's in terms of contrast or detail. In this not-very-scientific comparo the RCX seemed to be putting up tighter star images than the Schmidts.

OBSERVING - SESSION 2

I was able to attend an informal star party hosted by some very friendly Cloudy Nights members. It was a good chance to spend a weekend using the RCX400 and the skies really cooperated this time. Although the first night was clouded out and the following day began with a rainstorm things cleared up nicely afterwards and the air had obviously been cleaned up by the precipitation. I installed my Thousand Oaks Hydrogen-alpha filter on the RCX, set the PST up next to it, and settled in for some solar viewing. The detail visible within larger prominences was far beyond anything my trusty 12" Meade SCT had ever shown me with the same filter. Of course, the PST with its narrower filter did a better job on surface details. This was the first RCX experience for the other party attendees and all seemed to enjoy it. Anyone who notices the strange-looking tripod in the above photograph is invited to read down a few more paragraphs for the explanation.

That night I turned on the dew heater and proceeded to do some observing under skies that, while not absolutely dark, were very transparent. I primarily used the 24mm UWA supplied with the RCX400 and it was a very enjoyable experience. As expected, the mount's accuracy was spot-on all night long after an automatic alignment. The 17 Ampere-hour battery that had operated the telescope most of the day nearly made it through the night as well despite lots of slewing and a fairly high dew heater

setting. It never quite gave out, but I began to notice the slew speed dropping a bit during the dew heater's "on" cycle so I connected a 7 Ampere-hour pack in parallel with the first (to avoid powering down and realigning) and went on for the rest of the night. As before, I had the consistent impression that the RCX was delivering tighter star images than the various SCT's that have been a part of my arsenal in the past. Other observers with SCT experience agreed.

Deep sky objects observed included galaxies, open clusters, globulars, and diffuse nebulae. All looked great in the RCX with the 32mm UWA. The only other EP I used for deep sky that night was my trusty 14mm UWA. The other object chosen was the Moon. Remembering how great the seeing had been the previous day, I grabbed the S-W 5-8mm Zoom eyepiece and cranked it all the way down to 5mm (nearly 500X) and the seeing (as well as the telescope) would have permitted more! Cruising the terminator was terrific. This was the first time I was reminded of a minor error someone made when loading the Jeep. Since I went alone, it MIGHT have been me. I had forgotten to load the head of that wonderful tripod! I had brought along an LX10 tripod to lend a fellow observer but was forced to rescind my offer so I could use it on the RCX. Being MUCH lighter than the correct tripod, it got a little shaky at 500X. Thanks are due to Cloudy Nights member Scott Horstman for permitting me to use his tripod and thus lose out on setting up the telescope he had planned to use with it.

By the way - this session was an excellent test for the internal dew heater. It was the dewiest night I can remember; early on, everything was dripping except the RCX corrector. Those who weren't running heat, despite smaller apertures, were either out of business or reaching for the hair dryers. I parked the telescope and shut down for a nap around 2:00 and when I came back the RCX had dewed up despite being pointed downward; I should have capped it. I guess that's one disadvantage of the integral dew heater; no way to keep it idling while the scope is powered down. The telescope otherwise recovered perfectly from park mode, with the great goto accuracy continuing without a sputter.

OBSERVING - SESSION 2

At the third session I was set up next to a UHTC-equipped, well-collimated 12" LX200GPS. After several hours to ensure proper cooldown (the air temperature was fairly stable) a number of A-B comparisons were made by myself and others, using a 31mm Nagler T5 in the SCT and a 26mm Nagler T5 in the RCX. This gave us very similar magnifications and fields of view with the same eyepiece design so any

differences in the views can be considered to be due to the designs of the telescopes. The SCT owner and I spent quite a while going back and forth between the telescopes with both aimed at various objects. The difference was subtle, but we both agreed the RCX was presenting tighter star images. The clincher was a tiny star grouping within NGC884 which definitely showed slightly better separation in the RCX. The SCT owner isn't ready to scrap his LX200GPS; as I said, the difference is subtle - but it puts to rest any concerns about the RCX design being inferior to the Meade SCT for visual use.

CONCLUSIONS

So - would I buy an RCX400? If I were shopping for a new forkmounted telescope, I well might. The 12" model reviewed here sells for $6900. That's a big step up from existing popular forkmounted catadioptrics under 16" in aperture. The corresponding 12" LX200GPS sells for about $4100. For the price difference you receive the RCX optical system, the internal USB hub and dew heater, an optical tube that parks between the forks, a MONSTER tripod, a very cool 24mm UWA eyepiece, and the ability to collimate easily while looking into an eyepiece or at a video monitor screen. I found the package to be very convenient as an imaging platform, also. The USB hub got rid of the usual tangle of USB cables and things just seemed to be easier for me to do than with the SCT's that have been in my observatory. For the record, this pier has previously been occupied by a CGE1100, a 14" LX200GPS, a 10" LX200GPS, and a 12" LX200 Classic.

COOL

LESS COOL

I. **great tripod**

II. **nice eyepiece**

III. **tight star images**

IV. **USB hub for cameras**

V. **internal dew heater**

VI. **extremely fine focuser**

VII. **remote collimation**

VIII. **great LX200 series performance**

IX. **internal fan**

X. **12" version weighs 91 pounds**

XI. **relatively pricy**

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