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Celestron's CGX Mount

This highly versatile German equatorial mount can fill the needs of many visual observers and astrophotographers.

▲ The main pieces of Celestron's CGX mount include a 44-pound equatorial head, 19-pound tripod, and a pair of 11-pound counterweights. It takes less than 5 minutes to assemble the CGX in the field.

Celestron CGX Equatorial Mount

U.S. Price: $2,199
Celestron.com

What We Like:
Excellent design and construction
Great performance
Capable of remote operation

What We Don't Like:
No through-the-mount wiring for telescope accessories

IT WASN'T THAT LONG AGO when you could count the major manufacturers of stand alone telescope mounts on the fingers of one hand, and "advanced-electronics" meant a clock drive powered by a synchronous AC motor. Not so now. Today there's a huge selection of mounts from dozens of manufacturers in North America, Europe, and Asia. They range from tiny trackers made for cameras to behemoths designed for observatory installations and the largest amateur telescopes. And even many of the "simplest" mounts feature motor drives with computerized Go To pointing. This is all good news, since a solid mount with Go To drives and smooth tracking goes a long way toward making a night under the stars a pleasant experience.

I suspect that the new CGX mount from Celestron has caught the eye of many amateurs. It's a mid-weight German equatorial rated for a 55-pound (25-kg) load, and on paper it looks to be ideal for compact telescopes and astrographs up to about 12-inch aperture. To see if this is indeed true, I spent several months last summer testing a CGX that we borrowed from Celestron for this review. I used it with 85- and 101-mm refractors, an 8-inch Schmidt-Cassegrain telescope (SCT), and a relatively heavy 11-inch astrograph.

ALL IMAGES BY BY DENNIS DI CICCO

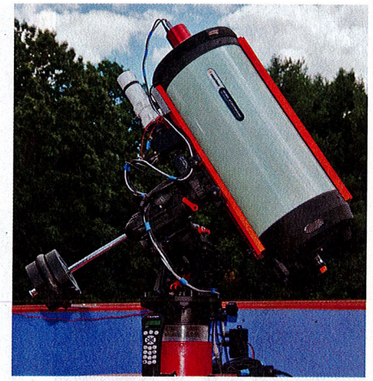
Out of the Box

Even as I began unpacking the CGX from its shipping cartons, it was obvious the mount was designed by people experienced with German equatorial mounts in the field. I had a dozen entries in the "pros" column of my notes before finishing the initial assembly. They ranged from little things like extension marks on the tripod legs and a locking collar on the power-input plug, to significant features like ergonomically excellent lifting handles on the equatorial head and a tripod design that lets you easily set the head on the tripod (sans counterweights) and let go without fear of the head falling off before it's secured with three cap screws.

Other positive features apparent during the initial assembly included a solid tripod spreader that also serves as an eyepiece holder and small accessory tray. It can be loosened slightly and turned, allowing the tripod legs to be folded up without having to entirely remove the spreader — something I found particularly convenient. The mounting saddle accepts wide (Losmandy-style) and narrow (Vixen-style) dovetail bars. All the hand knobs are large, making it easy to tighten or loosen them. There's only one size cap screw involved with setting up the mount, and the corresponding hex wrench clips into a holder underneath the carrying handle on the base. But it's worth noting that the cap screws are metric, so you'll want to keep track of them and the hex wrench so they don't get mixed in with the odd assortment of English hardware that typically accompanies many observers into the field.

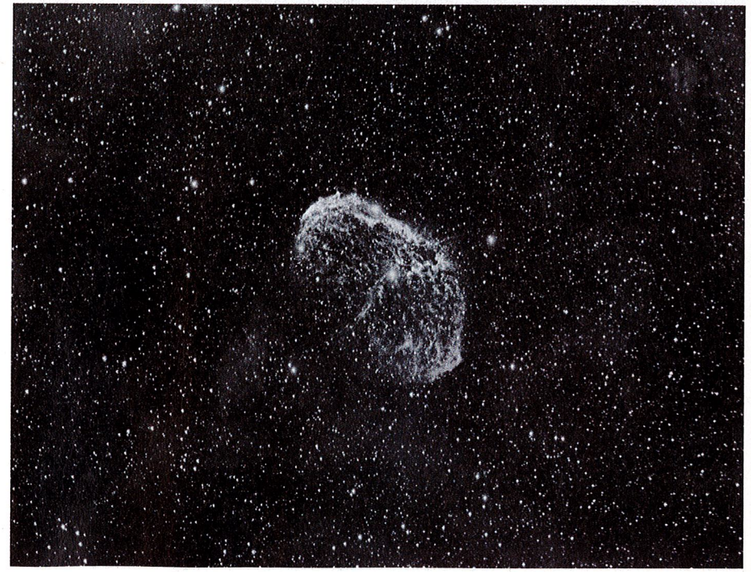
Apart from the various electrical connections on the fixed part of the polar-axis housing, wiring for the motor drives is internal; there are no loose wires hanging from the mount to snag as you slew the CGX around the sky. That's good news, but on the downside the CGX lacks through-the-mount wiring for equipment on the mount. As such, power cables and computer connections for cameras and the like must be run externally, and that's always a concern, especially for setups run remotely. I've had good results using internal wiring on other mounts, but Mike Rice, who maintains dozens of remotely operated telescopes at his New Mexico Skies Observatory, avoids it. He says that internal wiring usually adds extra cables and connections to a setup, and when problems arise, cables are often the culprits.

The CGX requires a 12-volt DC power source capable of delivering 4 amps. It comes with a power cord having a cigarette-lighter plug but no AC adapter. An optional adapter ($70) is available, but I had no problems running the CGX with a power supply scavenged from an old laptop. Another optional accessory I found unnecessary is the polar-alignment scope ($140), which attaches to the mount's declination-axis housing. Setting the polar-axis elevation with the mount's built-in scale and eyeballing it north was sufficient for visual observing, since the Go To software in the NexStar+ hand control compensates for moderate offset from the celestial pole once the CGX is initialized with a star alignment.

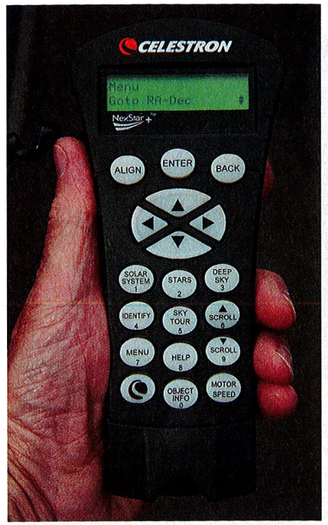


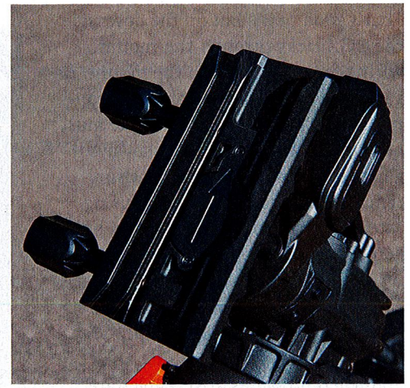
▲ The CGX is rated for telescopes up to about 55 pounds. It worked well for astrophotography with this 40-pound setup (that required an additional 10-pound counterweight) in the author's backyard observatory. As explained in the text, the mount was typically run remotely from his house a few hundred feet away.

The software also has an easy-to-use method for achieving good polar alignment. The process begins by centering a selected star in an eyepiece (preferably one with a reticle). The mount then automatically offsets a calculated amount from the star, and you manu-



▶ This 88-minute exposure of the Crescent Nebula, NGC 6888, in Cygnus was made with the setup pictured above. It's a stack of 22 consecutive, 4-minute, autoguided exposures through a hydrogen-alpha filter. The CGX's smooth tracking and precise response to commands from the autoguider made every exposure in the sequence a keeper.





▲ The CGX saddle accepts both Losmandy- and Vixen-style dovetail bars.

◀ Clearly marked keys and a straightforward menu system make it relatively easy to master the basic operation of the CGX with its NexStar+ hand control.

ally shift the azimuth and altitude of the polar axis to re-center the star in the eyepiece. I used this method for all my astrophotography with the CGX and found it to be very good. But I have some advice that isn't in the manual or given in the alignment instructions that scroll across the hand control's display. Your alignment star should be near the meridian and celestial equator, and tightening the locks on the mount's altitude and azimuth adjustments should be done in small steps, since the mount is likely to move slightly in the process, requiring tweaks to the adjustments to keep the alignment star centered as the locks are fully tightened.

Visual Tests

Initially I set up the CGX in my driveway and used it on a handful of nights for visual observing with the 101-mm refractor and 8-inch SCT. There's no need to repeat instructions here for initializing the mount for Go To operation, since they are clearly spelled out in the manual, as well as (and perhaps more importantly) on the hand control as you work through the procedure. Suffice it to say the process is fast and easy, but the large selection of alignment stars available is only shown by name on the hand control. Even novices should be comfortable with Arcturus, Regulus, Vega, and the like, but other stars such as Alsciaukat, Rukbah, and Wasat might well leave veteran skygazers scratching their heads. I always managed to initialize the CGX with familiar stars even under the restricted view of the sky I have from my driveway. Nevertheless, having decent star charts handy, such as those in *Sky & Telescope's Pocket Sky Atlas,* is a good idea.

For visual observing the CGX proved first rate. The mount is solid and certainly capable of handling an 11- or 12-inch SCT. Slewing is smooth and very quiet, and the mount responded precisely and without backlash when I pressed the direction keys on the hand control. All the celestial-object databases we've come to expect with Go To telescopes are available from the hand control, and even the Sun is included in the solar system listing. The hand-control's illuminated and clearly labeled keys, combined with scrolling instructions for the mount's various functions and menus that are relatively straightforward, kept the learning curve for the CGX quite reasonable.

While I didn't control the CGX for visual observing with any external planetarium software, including the version of *Starry Night* supplied with the mount, I expect it would be virtually identical to the positive experience Rod Mollise had testing the Celestron NexStar Evolution telescope (*S&T:* May 2017, p. 60).

Astrophotography

For astrophotography tests, I cobbled together an adapter to attach the CGX to one of the piers in my backyard observatory. I used the software-assisted method mentioned earlier to polar align the mount. The result wasn't perfect alignment, but it was more than adequate for 10-minute exposures with an optical system working at an image scale of 1.4 arcseconds per pixel. Furthermore, the mount was plug-and-play compatible with an SBIG autoguider operating through *MaxIm DL* software. The system worked so flawlessly from the outset that I never bothered refining the polar alignment or training the CGX's periodic-error correction.

This bodes well for anyone considering the CGX for portable astrophotography, since it should take as little as 15 minutes or so in a twilight sky to get the mount sufficiently polar aligned and ready for long-exposure photography. I especially like the CGX's fine-adjustment control on the polar-axis elevation. It is precise and easy to operate even when the mount is fully loaded with a telescope and counterweights — something that's been a problem with other mounts I've used.

Remote Observing

I can't always keep up with the features of every Go To mount available today, but to the best of my knowledge

▲ This articulating mechanism on the CGX's polar-axis adjustment provides precise control of the mount's elevation even when it is loaded with a heavy telescope and counterweights.

▲ Cables for power, the hand control, a USB computer connection, and an autoguider all attach to this fixed module on the polar-axis housing. Thanks to internal wiring there are no dangling cables for the motor drives. But, as detailed in the accompanying text, there is no provision for internal wiring for equipment mounted on the CGX.

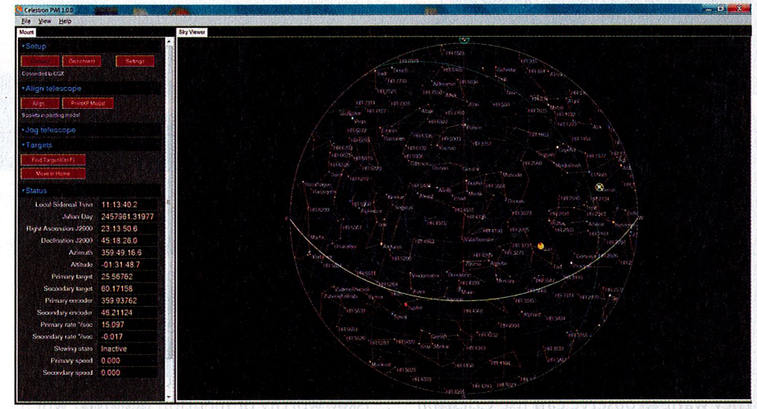
the CGX is the lowest-cost mount that is fully capable of remote operation. Almost since the dawn of Go To technology in amateur telescopes, mounts have included functions that let you park (or sleep or hibernate) them and resume observing at a later date without needing to initialize them to the sky again. On the surface this sounds like all that's necessary for a remote setup, but it is only if something doesn't go wrong such as a power failure, computer crash, or any of a multitude of other things that can bedevil a computer-controlled system. To fully qualify for remote observing, a mount needs the ability to recover from glitches and know where it's pointing a telescope without the need for a human to be present at the scope. Mounts that can do this either need a precise homing ability or absolute position encoders. The CGX has the former.

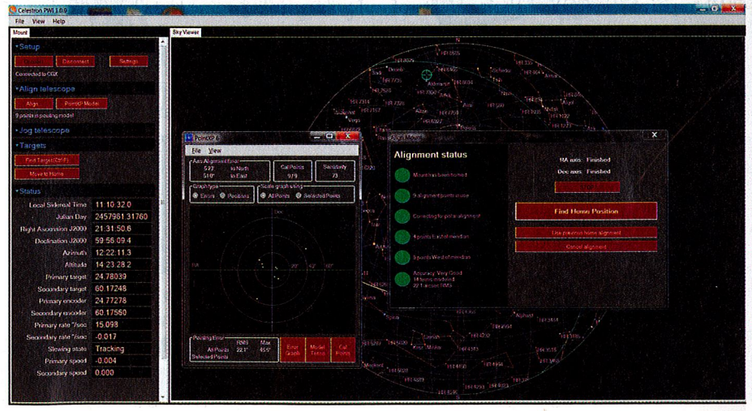
I spent a number of nights running the CGX from start to finish without setting foot outside the house. The mount was controlled by a laptop computer in the observatory running *Celestron PWI* software supplied with the mount. I connected to the laptop with convention remote-access software (*TeamViewer* from **teamviewer.com**) and controlled power to the mount and telescope cameras via internet-accessible power outlets. Even though I was only a few hundred feet from the observatory, I could easily have been any place on Earth with an internet connection.

The whole remote start-up process was fast and very straightforward. I'd power up the mount and cameras, launch the *Celestron PWI* program, and connect to the CGX mount. (The camera and autoguider were operated with *MaxIm DL* running simultaneously on the same laptop.) Once the mount was connected to *Celestron PWI,* I'd command it to move to its home position (with the scope pointed north on the meridian above the pole), after which I could begin observing. Everything worked beautifully.

To test the robustness of the system, I purposely crashed the mount and/or laptop by killing the power. In every case I simply powered the equipment back up and repeated the start-up process. The CGX always moved to its home position regardless of where it was pointing when the system crashed.

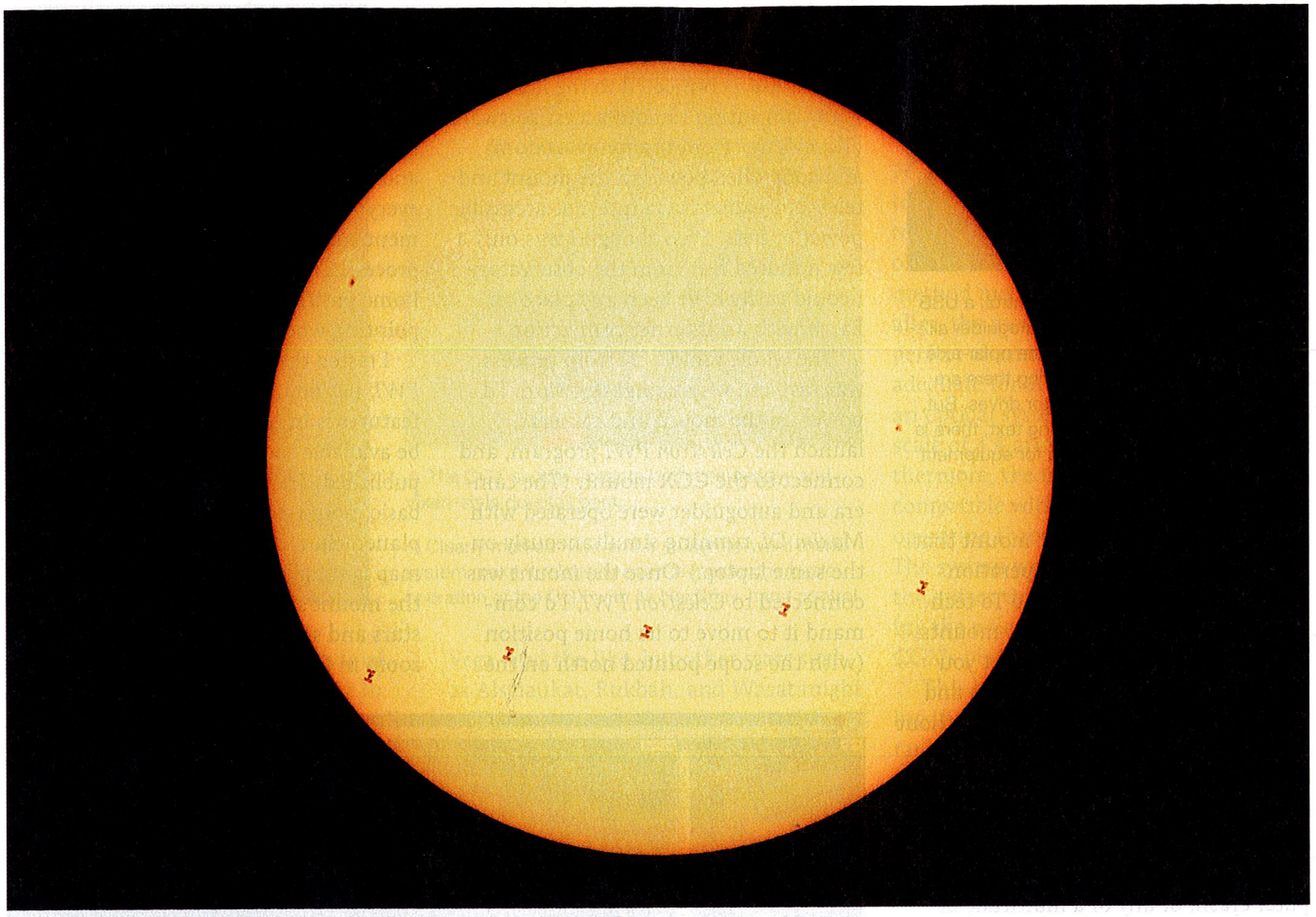
I tested the initial version of *Celestron PWI,* but an update with additional features is in the works and should be available soon after this review is published. The version I tested is very basic mount-control software. It is not a planetarium program. The displayed star map is simply a snapshot of the sky over the mount showing relatively bright stars and solar system objects. You can't zoom in for more detail, but you can





▶ ▲ The author used the *Celestron PWI* software included with the mount for all of his remote observing. It is a robust but basic mount-control program and not planetarium software. The star chart is a "snapshot" of the current sky over the CGX, and you cannot zoom in for more detail than is seen here.

▶ The author especially liked *Celestron PWI*'s easy-to-use procedure for creating and saving a pointing model that improves the CGX's Go To accuracy for current and future observing.



▲ This composite image of the International Space Station crossing the Sun's disk last June 21st might not have happened were it not for the CGX's quick startup capability and the Sun being included in its list of solar system targets. A last-minute change in the weather gave the author barely 5 minutes to open his observatory and set up for a burst of five exposures with a Nikon D700 DSLR attached to an 85-mm refractor operating at f/14.

click on the objects shown to select them as Go To targets. There is, however, a good search function for deep-sky targets and the like. Objects selected from the search results are then shown on the star chart, and you can slew to them. As such, anyone who knows what they want to observe can use *Celestron PWI* to point the CGX at their objects of interest. You can also slew to any celestial coordinates that you input.

The software has an extremely nice and easy-to-use method for building a pointing model that improves the Go To accuracy. You simply select any star shown on the map, center it in the telescope's field of view, and click one button to add it to the model. Do this for half a dozen stars on both sides of the meridian, and you likely have a model with pointing accuracy much better than 1 arcminute over the whole sky. You can then save this model and reload it for future observing sessions.

Smooth Sailing?

I had very few problems while testing the CGX. One bump in the road occurred while loading the *Celestron PWI* software, but it very likely arose because of software previously installed on my laptop computer. The only mount issue worthy of mention occurred when I was running some tests by observing stars in a noontime sky on a very hot day (ambient temperature near 100°F) and after the mount had been baking in direct sunlight for more than an hour. A command to home the scope sent the mount to the correct position for the right-ascension axis, but not declination. A few more tries and the right-ascension homing failed as well. I shut the CGX down, only to find that everything was back to normal when I resumed testing that evening. The homing never failed after that day, leading me to suspect that extreme heat was the issue. Not surprising given that parts of the mount in direct sunlight were almost too hot to touch when the problem occurred.

Small issues aside, the CGX fully lived up to my expectations. Indeed, it proved to be the nicest Celestron mount I've yet tested. And it also delivered on its under-promoted potential for remote observing at an unprecedented low cost. It's a mid-weight German equatorial that I can strongly recommend.

■ **DENNIS DI CICCO** has covered astronomical equipment in the pages of *Sky & Telescope* for more than 40 years.