SKY & TELESCOPE Test Report
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Dennis di Cicco

The Paramount MX

The latest German equatorial telescope mount from Software Bisque brings a new level of sophistication to robotic astronomy.

ALL PHOTOGRAPHS BY THE AUTHOR

From my perspective as a reviewer, the new Paramount MX from Software Bisque is a little bit of a paradox. On one hand, it's a very nice German equatorial mount so outwardly classic in its execution that even instrument maker Joseph Fraunhofer, who proposed the design almost 200 years ago, would instantly recognize the MX for what it is were he alive today. On the other hand, buried beneath its surface is a technology so sophisticated that the mount's performance is beyond anything Fraunhofer could have dreamed possible.

The dividing line between what a German equatorial mount can do in theory and what the MX does in practice is almost nonexistent. Much of this performance is due to the software supplied with the MX, and that's one thing that helps set this mount apart from any of the other beautifully engineered German equatorial mounts made today. This software includes *TheSkyX Professional,* Software Bisque's flagship planetarium program, and *TPoint,* a spinoff of the computer code Patrick Wallace developed to control the pointing and tracking of some of the world's most advanced professional telescopes.

The Paramount MX easily handled 70 pounds of gear, including this 12-inch f/3 Riccardi-Honders astrograph. The author helped Arne Henden test this scope for the American Association of Variable Star Observers's next-generation photometric survey.

I don't have room to even list all the features of the Paramount MX and its software, let alone describe them in detail. There is, however, lots of information on the **bisque.com** website, and after extensively testing the MX we borrowed for this review, I have no reason to dispute a word of what's claimed for these products. That's not to say that the MX doesn't come with a few caveats, as I learned while using the MX in my suburban-Boston backyard observatory last winter and spring.

You Can Take it With You

The Paramount MX is Software Bisque's first mount designed to be portable. In addition to an optional field tripod ($2,000), it has a polar-alignment bore scope ($295) that threads into the MX's polar axis. I didn't test this setup, but I know from past experiences that well-made polar scopes can quickly assist users in achieving alignment in the field that is accurate enough for even demanding imaging applications. Furthermore, the MX's precision altitude and azimuth adjustments will make easy work of nudging the MX to get the polar scope properly targeted on the sky.

The MX without its counterweight shaft tips the scales at 50 pounds (23 kg), which makes it relatively easy for one person to handle. My setup involved an optional base plate ($180) that I attached to one of my observatory piers. The MX simply connects to this plate with four hand knobs. I was amazed to find that I could remove and replace the mount on this base plate and maintain polar alignment to within an arcminute or two. This would be a huge benefit for someone who wants to set up a permanent pier but needs to remove the mount between observing sessions.

The downside to using the MX in the field is its 48-volt DC power requirement. The mount comes with an 80-watt universal AC adapter, and Software Bisque recently introduced a 48-volt rechargeable battery ($600) that will power the mount for "many night's operation between charges." Although I mainly ran the MX with its AC adapter connected to house current, I also successfully tried the AC adapter connected to an inexpensive AC inverter (rated for 100 watts) plugged into my car's 12-volt power outlet.

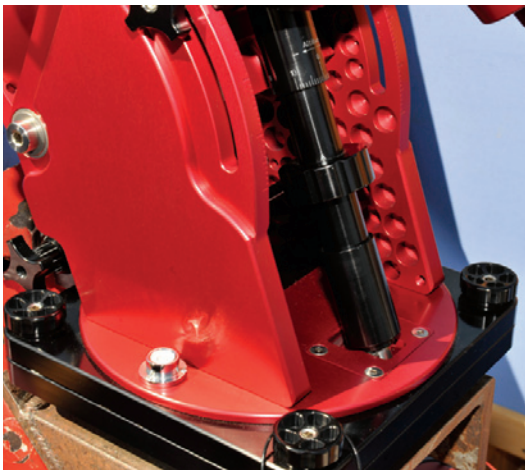
What we liked:

- Precision mechanical construction
- Extraordinary pointing and tracking accuracy
- Exceptional integration with included software

What we didn't like:

- Although the mount's basic operation is easy to learn, mastering all of the MX's features is time consuming

You can run the mount without it being attached to a computer, though you won't find this capability highlighted in the MX's literature. You'll have to live with a default sidereal tracking rate and no Go To pointing, but you can still slew the mount around the sky with its joystick hand controller, and the auto-guider input still works. Leaving the computer home may strip away most of the MX's brainpower, but in reality you'll still be left with a better portable German equatorial mount than any marketed to previous generations of amateur astronomers and astrophotographers. Furthermore, Software Bisque has announced plans to soon release a basic version of *TheSky* for Apple's iPhone, iPod Touch, and iPad, which will allow wireless control of the MX's Go To pointing and other basic functions without a separate computer connection.

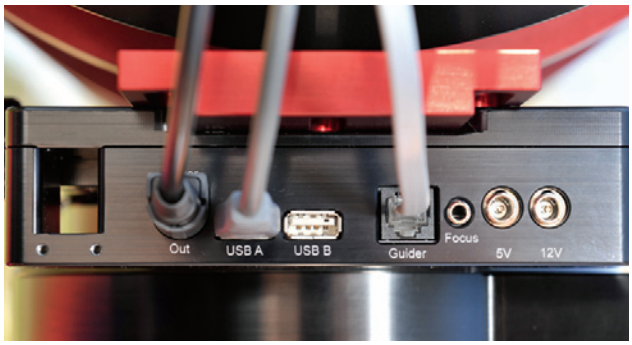


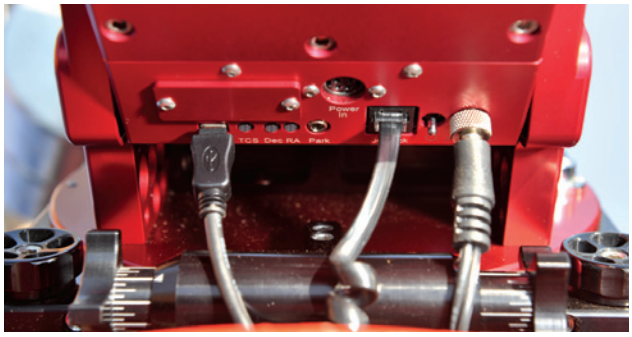
Precision-calibrated adjustments for the MX's azimuth and altitude make quick work of accurately polar aligning the mount whether you are using the optional polar-axis bore scope or software that comes standard with the mount.

The MX's hand box is very basic, offering four programmable slewing speeds for the joystick control (which looks like a large button in this view). A built-in red LED map light is operated by the rocker switch just below the author's thumb. The pending release of software for Apple's iPhone, iPod Touch, and iPad will let these devices wirelessly control the mount's Go To pointing.

The Real Brains of the Operation

The power of the MX is unleashed when the mount is connected to a computer. Any relatively modern Mac or Windows PC should do. Initially I had some concern that my 4-year-old, run-of-the-mill HP laptop running Windows *Vista* wouldn't be up to the task, mainly because of its older graphics capabilities. But it worked just fine. Its low-resolution display (1,280 by 800 pixels) got rather crowded with dialog boxes at times, but never to the point

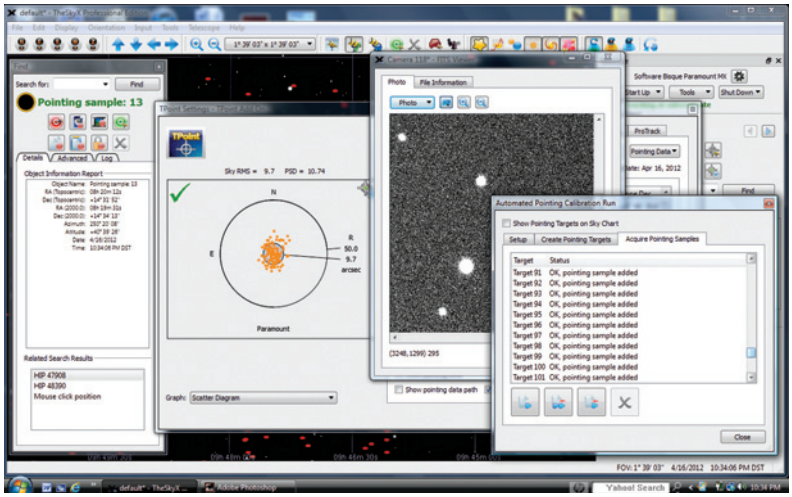




Internal cables and a variety of electrical connections on the MX's telescope saddle (*top*) and polar-axis housing (*above*), as well as provision for additional internal cabling, enable users to set up imaging systems without wires dangling from a telescope.

of being a handicap. People using the MX in an observatory should consider a computer with dual monitors: one for the various dialogs and the other for the sky chart.

Controlling the MX via *TheSkyX* planetarium software is very straightforward. You set up the program to display your sky overhead, select any object (night or day), and a single mouse click slews the MX (and whatever is mounted on it) to the object and begins tracking it. This includes most Earth-orbiting satellites, which is impressive and a whole topic unto itself.



As explained in the accompanying text, the low-resolution display on the author's 4-year-old laptop computer became crowded with dialog boxes at times, but never to the point of being a problem while controlling the mount.

With the exception of the satellite-tracking feature, the click-and-point aspect of the MX is certainly nothing new. There are many Go To telescopes and planetarium programs that can be coupled to do the same thing. Indeed, you can use *TheSkyX* to control most of today's popular Go To telescopes. Where the MX rises above the others is its powerful integration with the software and, of course, its precision. I'll get back to these in a minute, but first a few words about *TheSkyX*.

I don't know if anyone has compiled a list of all the planetarium programs available today, but the number has to be staggering. Recently I tallied more than 60 made for smartphones alone! Very few, however, can challenge *TheSkyX* for top billing on any list. And there are good reasons why. *TheSkyX* is the current manifestation of planetarium software that Steve Bisque introduced as *The_Sky* in the early 1980s. Three decades and untold man-years of development have created a program so rich in features that I can't imagine any one person knowing how to use them all. Simply put, if you're an amateur astronomer and you can think of something that you'd like to do with planetarium software, then you can probably do it with *TheSkyX*. This includes controlling an entire observatory.

The downside of this vast resource is the learning curve that goes with it. Although I have dabbled with dozens of planetarium programs, I had never become proficient with any of the computer-based ones before starting this review. As such, I decided to keep a record. My first night easily had me up and running with *TheSkyX* and the basics of using it to control the MX. But I had logged a bit more than 20 hours sitting in front of the computer alone or with it attached to the MX before I stopped keeping records because the learning curve had begun to flatten out. Your mileage may vary depending on your level of computer savvy and what features of *TheSkyX* you delve into. For example, I spent more than 30% of my learning curve focusing on the advanced features of *TPoint*. And while I expect that most MX owners will use this program, you can learn its basic functions relatively quickly.

In a nutshell, *TPoint* is the computer power driving the MX's precision pointing. After mapping as few as six stars, *TPoint* can compensate for problems such as polar-alignment errors to deliver Go To pointing that will always center targets within your telescope's field of view. *TPoint* will also tell you how far off your polar alignment is and the number of "ticks" on the MX's adjustment knobs you need to make to achieve accurate alignment.

That's just the simple stuff. Deeper down, *TPoint* can create advanced mathematical models that compensate for a multitude of pointing "errors" involving everything from telescope flexure to atmospheric refraction. A *TPoint* feature called ProTrack uses these models to feed a continuous stream of tiny corrections to the MX's drive motors

***TPoint* software supplied with the MX offers unprecedented tracking accuracy. This view of the famous Whirlpool Galaxy, M51, is a stack of thirteen 10-minute unguided exposures made through the Sky-Watcher Quantum 120-mm f/7 refractor reviewed on page 34 of last month's issue.**

(both right ascension and declination) that deliver unprecedented tracking accuracy over extended periods. This is the stuff that would have made Fraunhofer's head spin.

There are several ways to map stars with *TPoint* and the MX. I started out using a simple crosshair eyepiece and stars that I manually selected from the *TheSkyX's* graphic display. The MX slewed my telescope to the star, I centered it on the crosshair with the joystick controller, and I mapped it with a mouse click. The more stars mapped the better. I typically used three dozen stars with this manual method, and that was enough to deliver pointing accuracy on the order of 15 arcseconds. Yep, you read that right, 15 *arcseconds*. That means that the MX wouldn't just center Jupiter in the eyepiece, it could actually pinpoint which quadrant of Jupiter's disk I wanted. But wait, it gets better.

The MX, *TheSkyX,* and *TPoint* can work as a team when you have a CCD camera attached to your scope. The whole *TPoint* calibration can be automated from the selection of stars, to the taking of images, to mapping where the scope is pointed. With the setup shown on page 64, I automatically mapped about 125 stars in less than an hour. (Trees and clouds are no problem, since the software simply ignores "misses.") This gave a mind-boggling pointing accuracy better than 10 arcseconds and allowed ProTrack to make 20 back-to-back 10-minute unguided exposures with every one a keeper. If I hadn't done it myself, I'm not sure I'd believe it could be done!

If you have a permanent setup, you can probably go many months before an update of a *TPoint* calibration would be beneficial — any given model should work well from night to night as long as you don't make major changes to your equipment setup. Furthermore, you don't even need to "sync" the MX on a celestial target to use *TPoint's* accuracy from one observing session to the next. The mount has a built-in homing position that is accurate to better than 1 arcsecond. As such, just powering up the mount and homing it puts it in accurate sync with the sky anytime day or night. This is particularly valuable for remote setups, since the mount can be easily synced after power interruptions or computer glitches without the need for a person being present.

On several occasions I used this feature to surprise visitors. In the middle of the day I'd open the observatory roof, connect my laptop to the MX, and power everything up. I'd home the MX, click on a bright star on *TheSkyX's* display, and let the MX head off to its target. When the mount stopped slewing, and without ever checking the view myself, I'd tell my visitors to look into the eyepiece. I wish I had a camera to capture their expressions as they looked up from the telescope — showing people stars in a daytime sky, not to mention the ease of doing it, obviously made it seem as if I was flirting with magic.

Is there a downside to using *TPoint*? Apart from the learning curve that goes with exploiting the full potential of the software, the only one I can think of involves human nature and the polar-alignment features. It's extraordinarily tempting to use *TPoint* and the MX's altitude and azimuth adjustments to aim for polar-alignment perfection, especially since the first iteration of the process can often get you within 3 or 4 arcminutes of the celestial pole. But stifle the urge unless you really feel there's a need to have better alignment (and I'm open to people telling me why they would). In my case, trying for sub-arcminute polar alignment was like chasing ghosts — changes in my steel pier and the MX itself due to thermal expansion and contraction varied the polar alignment by about an arcminute during nightly temperature variations. How I discovered that is a story for another time.

The folks at Software Bisque have spent years perfecting robotic observing with their various programs and telescope mounts. The Paramount MX currently stands at the pinnacle of the company's success. Whether your interest is robotic gathering of research data or pretty astronomical images, and whether your telescope is in your backyard or on another continent, the MX can do it. And even if you're "old school" like me and enjoy being with your equipment while observing, the MX offers an experience that won't soon be forgotten. Please pardon the pun, but the MX is an incredible gem. ✦

If S&T *senior editor* ***Dennis di Cicco*** *wasn't sure exactly where the north celestial pole was before working on this MX review, he's convinced he knows where it is now.*