QUESTAR 3.5" DUPLEX (1976)

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History of Questar

Questar Corporation was founded in 1950 by the inventor of the 3.5” telescope, Lawrence Braymer. L. Braymer lived in Solebury, Bucks County and was an illustrator by trade. His wife, Marguerite Braymer, an advertising executive, was his active partner in the development of the company. Braymer had a passion for fine art and artistic detail and loved astronomy. He designed, applied for and received a patent in 1948 for what is now referred to as “*The Questar, the finest small telescope ever made*”. His design was revolutionary in its compactness, durability and portability.

Questar was on the cutting edge with its unique design and innovative application opportunities. The initial design of the astronomical telescope evolved to encompass the microscope and surveillance lines of optical and scientific instruments.

Over 200 parts comprise the Questar Astronomical Telescope. Every part of each telescope, microscope or surveillance instrument was inspected, tested and assembled to the minute quality tolerances upon which the standard of the industry has been set.

Natural evolution and new technology helped to establish the next generation of instruments: the Questar 7”, Questar Birder and the Questar Field Model. Today Questar is known worldwide and has set the highest standard for optical performance. In the 1960’s, Questar optical systems were introduced for industrial use in many US government projects such as the Gemini space program. First in space, images of the earth taken through a Questar made and continue to make headlines. In 2002, Questar introduced the new Lightweight Titanium 7” and the QMAXTM Solar Spectrometer.

"The Questar is a tool that is appealing to the eye - a work of art and mechanical excellence whose performance and durability tend to keep its owner loyal. Over many years I have come to own and use more than thirty telescopes; at any given time, I may own about five instruments. With my interest in so many areas of astronomy no one or two telescopes can serve all my needs well. As I moved from one telescope to another, I learned their strengths and weaknesses, and I sought improvement. However, while other telescopes have come and gone the one that has outlasted the others, been used the most, and which I envision retaining as long as I am able to move is my Questar”.

A Questar is very easy to transport and set up. It is that component in my logic that supports my "the best telescope is the one that gets used" philosophy. A Questar can be set up from its carrying case, Pole Aligned and tracking on a planet in about three minutes. For extended travel I rarely choose a telescope other than my Questar. Sure, the Questar is not as "good" as my larger superb telescopes in terms of what I can see or image. However, my 7 lb. (3.2 kg) Questar with its compact tracking mount is a tool that does what it does more often, better and quicker than any other similar compact telescope on the market, and it looks better while doing so!"

Martin Cohen, Director of Company Seven

The American made Questar has since 1954 been acclaimed as an elegant and refined practical tool for astronomy: *the Rolls-Royce of compact telescopes*. The fundamental attributes attracting such praise remains the same today as it was: performance, convenience, and reliability. The Questar is among the last of few products in production over the recent decades where no practical or aesthetic aspect has been compromised in order to cut costs. This arguably remains the best balance of essential attributes in the carry-on portable class of telescope (Figure 1).

The Questar telescopes were available in several apertures, each with several configurations, and each configuration with a good selection of options for visual and imaging applications. Questar is a distinguished line admired worldwide since the introduction in May 1954 of their first early production telescopes for their high performance, ease of use, their innovations, and for their uncompromising high quality of workmanship and materials.

Figure 1- Early Production Questar 3 ½ Telescopes: 1954 and 1955.

Questar Models

The **Questar Standard 3 ½"** has for nearly sixty years been regarded as the finest compact personal telescope in the world. The Questar Questar Standard 3 ½" was manufactured to high industrial levels of perfection and durability. They were made to provide more than a lifetime of rewarding service and many Questars from the early 1950's remain in service to this day. It has been for many aspiring astronomers the "Holy Grail" of compact telescopes (Figure 2).

The **Questar Field Model** or **Birder** are basically a Questar 3 ½" Optical Tube Assembly only. These are best suited to those who need the utmost in light weight and compact high magnification performance. Common applications include birding and nature watching. These serve well as a rugged and compact high resolution Ultra-telephoto lens, or in astronomy as a high magnification photo-guide telescope (Figure 3).

The Questar **Duplex Model** is a Questar 3-½" Optical Tube Assembly mounted to the Questar Fork Mount in a manner which allows the easy disjoining of optical tube from the mount. This Questar can be used as either a portable telescope or as an ultra-telephoto lens (as the Field Model) without the

need to carry the extra bulk of a fork mount. And yet this arrangement still offers the owner an extremely portable tracking telescope when the tube is "docked" into the fork mount (Figure 4).

Figure 2- Questar 3 ½” Standard telescope.

Figure 3- Questar 3 ½” Field Model or Birder telescopes.

Figure 4- Questar 3 ½” Duplex.

The **Questar 7”** telescope was introduced in 1967, with the first optics set being completed for Questar on 1967 at manufacturing facilities nearby Company Seven in Maryland. These were limited production handcrafted instruments, with production over time averaging about 25 instruments per year (Figure 5).

Figure 5- Questar 7”.

The QUESTAR 12” was introduced in 1976. By the mid 1970's research in laser transmission and reception was increasing the need for larger aperture yet robustly constructed optical systems. Among the markets for these new instruments was Light Detection and Ranging (LIDAR), and missile tracking for film recording of rocket launches. Questar had up to this time offered systems with apertures as large as 7 inches (180mm), but competing products were coming available in 8 to 10 inch and larger apertures. So Questar began work on a larger optical system, settling on 12” (300mm) for production with hopes of marketing this new system for applications involving Geomatics, geography, geology, geomorphology, seismology, remote sensing and atmospheric physics. The instrument seemed to be a natural choice too for astronomical uses by advanced amateurs and schools (Figure 6).

Figure 6- Questar 12”.

The Questar I own is a beautiful 1976 Duplex 3 ½” model (Serial number: 6-CV-DP-6377-B) (Figure 7 and 8).

Specifications:

1. Duplex 3.5" with Cervit Mirror (Zerodur), Broadband and Low-Reflection Coatings
2. Manufactured: 1976 | Returned for full factory service: April 1985
3. Fitted, velvet-lined carrying/storage case with key (leather covered w/door pouches)
4. Eyepiece and Filter Case (laminated wood w/foam lining)
5. Brandon eyepieces; 8mm, 12mm, 16mm, 24mm and 32mm
6. Screw-in front lens cap
7. Three legs for tabletop use
8. Solar filter
9. Synchronous Electric Clock Drive (110v)
10. Power cord for the Synchronous Electric Clock Drive
11. Plain blue dew cap/barrel cover (no star chart or moon map)
12. Factory Instruction Manual
13. Nikon Camera Adaptor/Camera Coupling Set
14. Image Erector (straight-through viewing)
15. Davis & Sanford (now Tiffen) Heavy Duty Factory Tripod

Figure 7 – Questar Duplex 3 ½” model (Serial number: 6-CV-DP-6377-B), 1976.

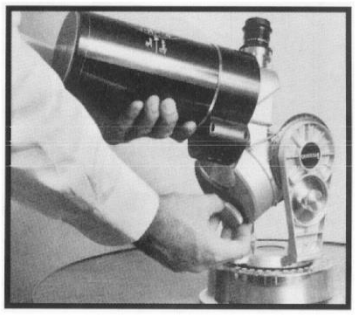
Figure 8 – Questar Duplex 3 ½” model (Serial number: 6-CV-DP-6377-B), 1976.

QUESTAR®
The Optical Innovators

Questar Duplex

3.5" Telescope

Specification Sheet

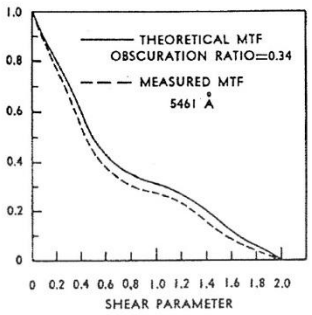


The Questar Duplex is the most versatile Questar instrument because its design permits it to be separated into two parts. The barrel, which is actually the Field Model with moon map and star chart added, can be carried separately in its own case for field trips. When the two parts are assembled, the Duplex has every feature of the fully mounted Questar Standard astronomical telescope. To separate the barrel from the mounting, hold it in one hand, and release the knurled screw under the collar which supports it. The screw attaches to the _-20 hole in the bottom support of the barrel which is used also to connect it to a tripod.

The Duplex includes lens cap, removable optical tube assembly with mounting holes for most tripods, 16mm (80-120X) and 24mm (53-80X) eyepieces, built-in finder (4X & 6X), Barlow lens for eyepiece port, star-diagonal prism, 110 VAC synchronous electric drive. Continuous 360 ° slow motion controls 25:1 with manual override slip clutch on both axis, Declination clamp, setable right ascension and fixed declination setting circles, finder solar filter and carrying case. Velvet lined case has door pouches that hold one eyepiece, 1.5" aperture solar filter, electric cord, powerguide hand control and legs for converting to table-top polar equatorial position. A 1/4-20 mounting hole centrally located on base can be used to attach most tripods. 30-45 ° legs are standard. Special order for other latitudes. Questar barrel has moon map and perpetual star chart; the latter pulls forward to form dew cap. Weight less than 8 lbs., in carrying case 15 lbs. Shipping weight 31 lbs. in specially designed packing and drum. *(Specify voltage and latitude)*

TYPE:	Maksutov Cassegrain Catadioptric. No coma, astigmatism or spherical aberrations.
CLEAR APERTURE:	3.5 inches, 89mm (Center Obscuration, 27.9mm)
FOCAL LENGTH:	Basic Visual 50.5 inches, f/14.4, 1300mm
FOCAL LENGTH:	Camera close, 56 inches, f/16, 1400 mm
FOCAL LENGTH:	Camera with Ext. Tubes, 64 inches, f/18, 1600mm
FINDER LENS:	4" Fl., 4x and 8x, Field 12° and 8°
POWERS:	Powers are eyepiece dependent and can range from 40x to 270x with Questar Brandon eyepieces
POWERS LIMIT:	Resolves 1 sec. Arc at 50feet EFL
FIELD OF VIEW:	Photographic model, 1°30min, visual field of view 1.1° to .16°
LENS:	BK7, $MgFl_2$ coated, passes UV to 3300 A, IR to 1 micron, parfocal
MIRROR:	F2, Pyrex®, Zerodur® or Quartz. AlSiO coated 3.800" dia. (All Questars for UV or IR on special order)
SPECIAL COATINGS:	On special order, broad-band dielectric coating applied to the mirror, which increases its reflectivity. To both sides of front lens, a very low reflection coating is then applied which reduces the light loss at each surface to less than 1/10 of 1%. It transmits all frequencies of the visible spectrum and improves total light grasp by approximately 22%
EYEPIECES:	24 mm Brandon, 45° ap. Field; 16 mm 4 lens Brandon, 45°Ap. Field, optional eyepieces of 8mm, 12mm, 32mm
AMPLIFYING/BARLOW LENS:	Minus 43.9 mm FL
ERECTING SYSTEM:	Star Diagonal type, 90° BK7, $MgFL_2$ coated
BARREL ASSEMBLY:	Barrel: forged aluminum, machined full length
LENS CELL:	Aluminum 24S-T4, black anodized
REAR CLOSURE PLATE:	Stainless steel CENTRAL TUBE - precision machining and alignment after assembly.

DEWCAP:	Internally black-flocked Synthane seamless tube 1/32" thick, to which is bonded a pre-rolled aluminum sheet
FOCUSING MECHANISM:	Mirror thimble, stainless steel sliding tube. Slides on stainless, fixed, light-baffle tube, with front-end insert tube of .010" wall thickness. Conical ss spring-loaded. Focus rod ss 303, ground shaft, 56 T.P.I. precision ground threads
KNOBS:	Aluminum 24S-T4, corrosion-resistant, hand-turned on turret lathe, stainless steel shafts and levers.
EQUATORIAL MOUNT:	Aluminum sand casting, virgin alloy 356-T6 heat treated. Toolroom hand-turned and polished. Highly corrosion-resistant. Jig-bored and precision threaded for legs. Bottom flange 7" o.d. Fits tripods with _-20 threads
TURNTABLE OR LOWER FORK BASE:	Sand casting same alloy, toolroom turned, jig-bored and precision-reamed, aircraft polyurethane painted
LEGS:	Aluminum 61 S-T3, centerless-ground and threaded, anodized. Center leg adjustable. Butyl rubber tips
SYNCHRONOUS DRIVE MOTOR:	_ R.P.M. 110V. 60 cycles, other cycles, voltages and direction of rotation available. Sealed, lubricated gear train, 2.7 watts
RIGHT ASCENSION GEAR:	Bronze, 4" diameter, and 4" diameter teflon-facing bearing surfaces
SIDE ARMS, INNER FORK BRACKETS, CONTROL BOX:	Die castings of corrosion-resistant aluminum alloy 13, toolroom turned, milled, jig-bored, tapped and reamed. Special painted aluminum and clear-urethane protected
FINDER MIRROR CAGE:	stainless steel, brushed satin finish
ALTITUDE OR DECLINATION CIRCLE:	3-15/16" diameter, 301 s.s., cemented and riveted to bracket ring assembly, 1° divisions with etched and filled markings
CLAMP:	Bakelite padded s.s. stud clamps dec. circle to side arm
AZIMUTH OR R. A. CIRCLE:	6" diameter, anodized aluminum, silk-screened, graduated to 1° and 4 min of time. May be set as celestial clock. Manual slow-motion independent of drive
SLOW MOTIONS:	Continuous 360° rotation, safety clutch held. Permits control to a few seconds of arc. Absolutely free of backlash, lag, or play. Ratio 31 to 1
TUBE & MOUNT INTERFACE:	Dual axial alignment pins, precision milled mounting surface and _-20 thread knob with knurled O.D.
DIMENSIONS:	Height, upright, 14". With barrel horizontal, 11" high and long. Weight, 6.7 pounds



TYPICAL MTF FOR QUESTAR 3½-INCH

Typical Questar 3½ and Seven Modulation Transfer Function (MTF) as obtained with a shearing interferometer and expressed as a function of the shear parameter, S. To express the MTF as a function of the spatial frequency, R, in lines per millimeter, the following relationship can be used:

$$R = \frac{SD}{2\lambda f}$$

where S = shear parameter, λ = wavelength, f = focal length, and D = clear aperture.

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Sources:

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