

# RANGE INSTRUMENTATION OPTICS MULTI-FOCAL LENGTH TELEPHOTO LENS (RIO-512)

**BAE Systems Range Instrumentation Optics: Model RIO-512 provides a new state-of-the-art approach to a high resolution, large aperture, multi-focal length lenses with three precision configurable focal lengths all in a single telescope package.**

The RIO-512 provides selectable focal lengths of 50/100/200 inches at speeds of f4/f8 and f16 respectively. When mounted on a customer's tracking mount, the RIO-512 is an ideal complement to any sensor suite, producing high quality imagery with high speed or low speed digital cameras. The telescope optical design is a highly corrected Catadioptric system that is fully athermalized. Mechanically, it is rugged, sealed against harsh outdoor environments and has excellent boresight stability. The system was designed around the detection and tracking of a 275 mm target at 40 km. For that target, the system yields an approximate 3-pixel image horizontally at 10/20/40 km with 50/100/200 inch focal length teleconverters installed.

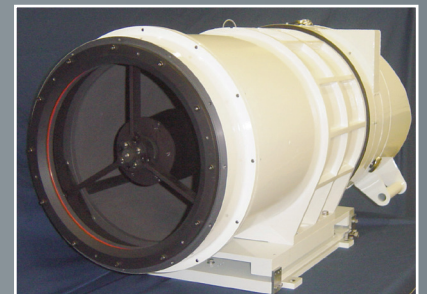
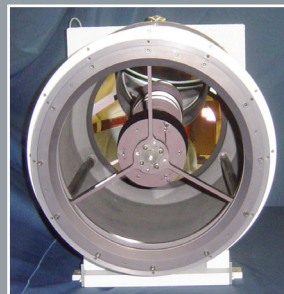
The lens design allows focusing from 500 meters to infinity, while maintaining boresight shift to less than 10 arc-seconds. The lens is provided with an integral camera focus platform specifically designed to operate over extreme temperature ranges and maintain very accurate boresight alignment.

A unique feature of the RIO-512 allows very easy change of focal length by the operator without removing the lens from the pedestal. Each RIO-512 can be supplied with three refractive teleconverter modules that are installed and exchanged without the use of tools while using gloved hands for extreme cold applications. The lens is provided with a separate teleconverter module for 50-inch/F4, 100-inch/F8 and 200-inch/F16 configurations. The RIO-512 can be provided with an optional XY boresight plate and mounted to any optical tracking mount using adapter plates. The RIO-512 provides both Metric and High Speed (HS) image performance in a single package. The camera head eliminates local RAM and broadcasts the frame data via high-speed digital video paths (Camera Link

Interface) directly to a permanent storage BAE Systems digital video recorder (DVR) provided separately. This technology also eliminates the possibility of data loss that is inherent in RAM based designs if power is removed or even momentarily interrupted before the frames have been properly archived to permanent media. When used with the BAE Systems DVR using frame synchronization, both 30 fps and high speed video frames are selectable and retrievable post mission while 30 fps data is transmitted over an Ethernet network for realtime viewing during mission operations.

## KEY FEATURES

- Small central obstruction providing superior MTF performance
- Telescope designed for today's small image format found with digital high speed cameras
- Pre-mission configurable for 50/100/200 inch focal length
- Images 275mm target at 40km.



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INSPIRED WORK

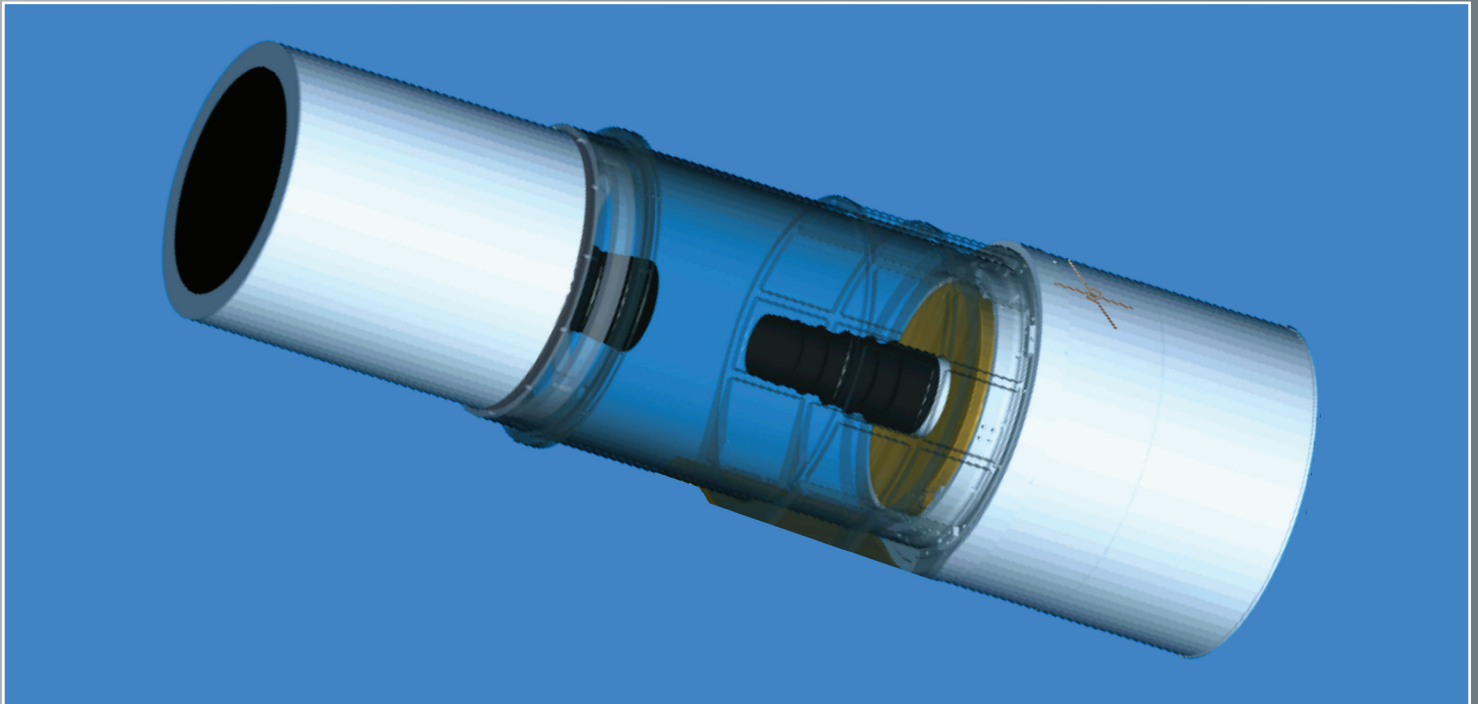
## ABOUT US

At BAE Systems, Inc. in the United States, our employees design and deliver advanced defense, aerospace and security solutions that keep the nation at the forefront of modern technology. Our pride and dedication show in everything we do, from innovative electronic systems to intelligence analysis and cyber operations, from combat vehicles and weapons to the maintenance and modernization of ships, aircraft and critical infrastructure.

## FOR MORE INFORMATION

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## TYPICAL SYSTEM CONFIGURATION



### LENS DESIGNED FOR THE FOLLOWING ON-AXIS MTF:

- F4 / 50 Inches: 42 line pairs at 68% contrast
- F8 / 100 Inches: 42 line pairs at 52% contrast
- F16 / 200 Inches: 42 line pairs at 30% contrast
- Focal Length: 50 / 100 / 200 inch configurable
- Field of View: 0.69°, 0.35° and 0.17°(h) @t 50/100/200 inches f/4, f/8, f/16 @ 50/100/200 inches
- 12 Inch Aperture
- IFOV: 9.4, 4.7 and 2.4  $\mu$ rad @ 50/100/200 inches
- Monochrome or Color
- Metric Camera: High Speed / Resolution  
- 1280 x 1000 @ 30 fps to 510 fps in multiples of 30 Hz.
- Pixel Size: 12  $\mu$ m x 12  $\mu$ m
- Sensor Size: 15.36(h) mm x 12.29(v) mm
- Dynamic Range: 59 dB
- Spectral Range: 0.42 to 1.1 microns
- Shutter: 4  $\mu$ s / 32 ms
- Video Output: Camera Link Digital Output
- Filter wheel: 5 positions available for any customer specified 3mm thick, 1/10 wave filter
- Ambient Operating Temperature: -30°C to +35°C
- Ambient Non-Operating Temperature: -45°C to +50°C
- Relative Humidity During Operation: 0 to 100 percent, without condensation
- Relative Humidity During Non-Operation: 0 to 100 percent, with condensation
- Weight: 200 lbs.

The above diagram shows the interior structures of the telescope, the teleconverter module and the high speed camera focus platform assembly.