Beam alignment tool
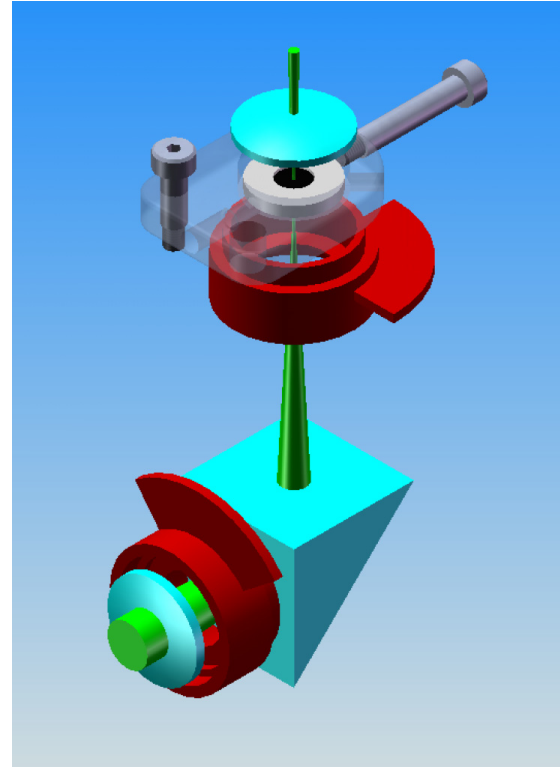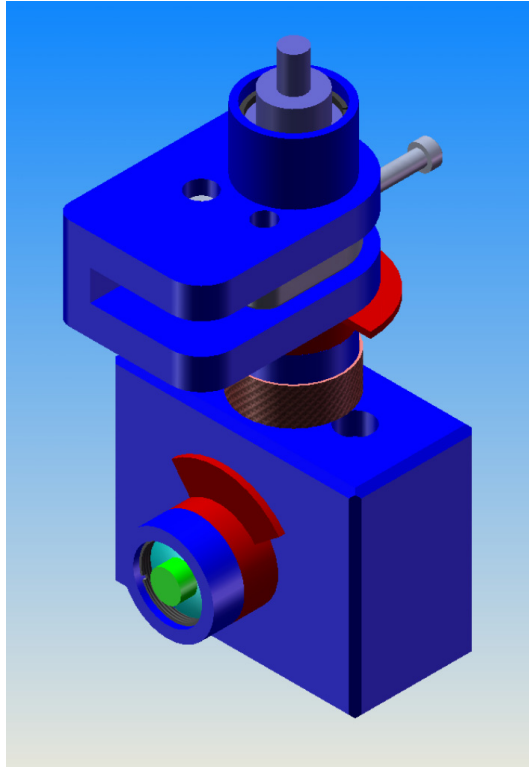
Prepared
For
L-A-Omega
Arlington, MA
By
L-A-Omega, Inc., 20 Central Street, Arlington, MA, 02476, USA
339-368-0041

BAT 7-2
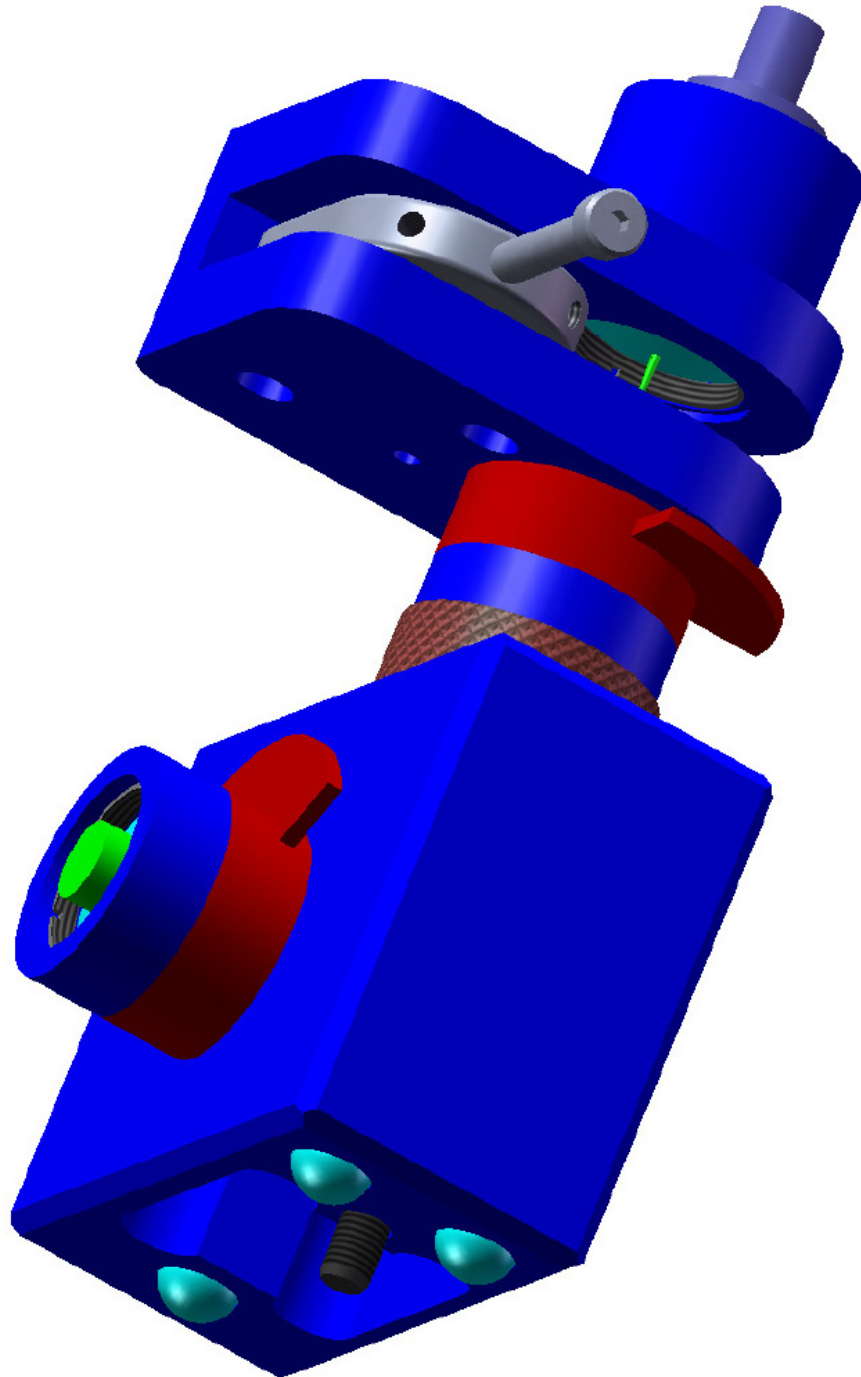
BAT exterior view and interior view

Pinhole swings on shoulder screw axis. Magnets hold pinhole arm in place. Pinhole may travel to larger beam diameter.

BAT bottom view

PY pinhole arm swung out of path.
Three stainless steel balls sit in kinematic base.
Fasten with single M6 socket head cap screw.
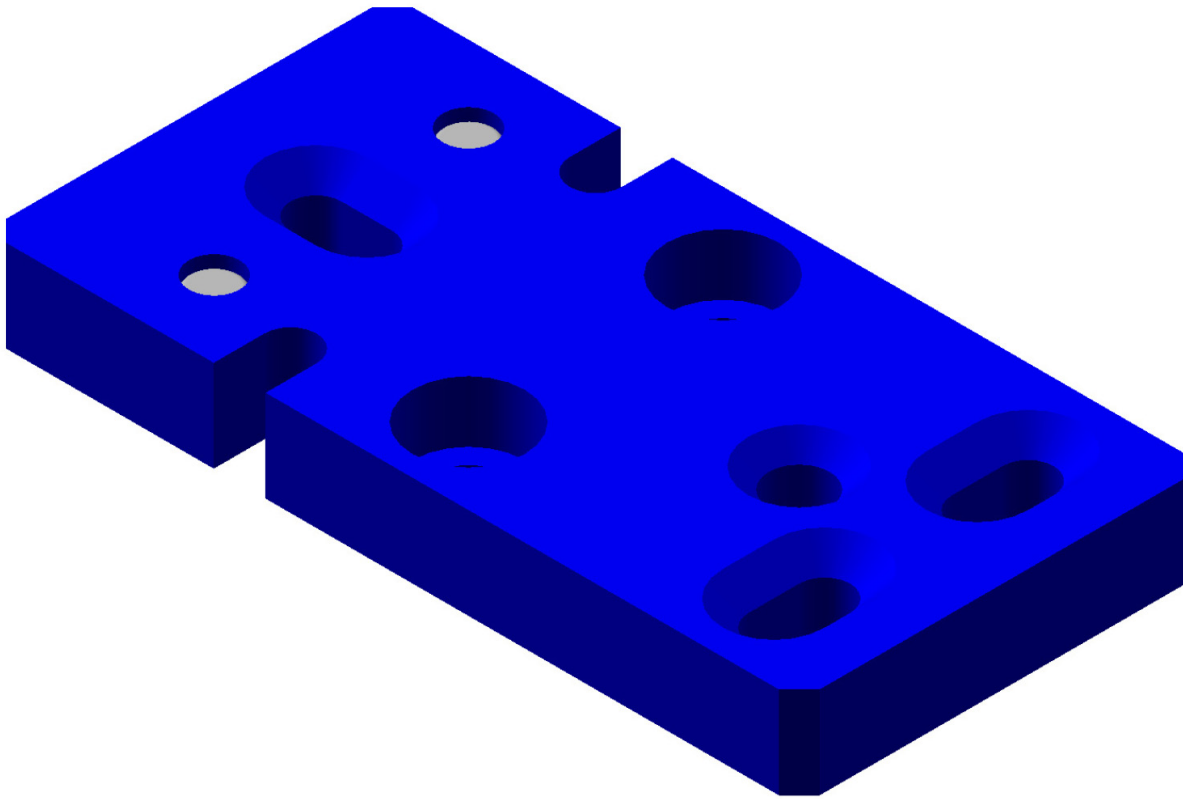
Kinematice base for M6 Breadboard 40mm height

Three slots provide seat for three spheres of BAT.
Plate for 1/4-20 breadboard available.
Prescription for base plate available upon request.

BAT Features

L-A-Omega has developed a beam alignment tool for laser systems. It quickly aligns a beam to an axis within the BAT via to turning mirrors. The angular repeatability is <1 mrad. The spatial repeatability is less than 5% of the Gaussian beam diameter.   The BAT quickly mounts to a kinematic base for excellent repeatability. Consistent delivery of multiple laser beams is made quick, easy, and consistent through application of a BAT from L-A-Omega.
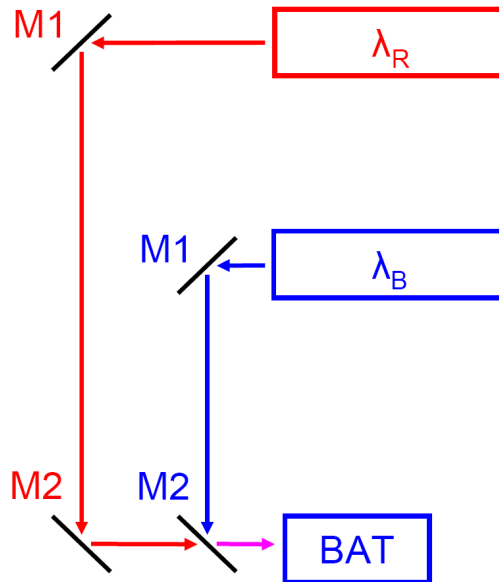
Specifications for BAT 7-2

XY accuracy: 5% of Gaussian beam-diameter (ϕ_B)
                0.1 mm as minimum
PY accuracy: 1.0 mrad (3.5 arcmin) beam-to-beam
                1.27 λ/ϕ_B as minimum
XY acceptance aperture: 18 mm in diameter
PY acceptance angle: 88 mrad (5.0°) off axis
Dimensions: 61 mm along input axis
                80 mm across input axis
                178 mm along axis of detector
Spectral range: visible & near-IR (350–1100 nm) as standard
                UV and IR by special request
Mount: Kinematic base for easy and stable insertion.

Background

The BAT was developed for safe, accurate, and easy alignment of laser beams. Two turning mirrors provide sufficient control of the spatial and angular features of the beam. A fist mirror is dedicated to the position XY. It directs the beam into the XY iris of BAT through feedback from the detector. A field lens behind the PY iris directs errant beams into the detector. A second mirror is dedicated to the pitch-yaw PY. It directs the beam into the PY iris of BAT. A pitch-yaw pinhole swings into to beam as a fine PY metric. Completion of this sequence aligns the beam to parallel within 1 mrad. The new spatial error ε' is reduced geometrically as

$$\varepsilon' = \varepsilon \frac{d_{M2B}}{d_{M1B}}$$

Wherein: ε is the initial spatial error, d_{M1B} is the distance from the first mirror to the BAT, and d_{M2B} is the distance from the second mirror to the BAT. See Opt. Eng. 36(5) 1414–1420 (1997) for derivation this formula. If the mirror placement defines the error reduction as at 0.3 or less, then just two to three iterations are required.

L-A-Omega Arlington, MA