

Calibration and Positioning Of IR Camera for Laser Gated Imaging

Laser Gated Imaging technology is widely used in military applications such as security and surveillance systems, where identification of target objects at long range is critical. A pulsed laser is used as an illuminator and reflected light is captured in a camera with a short 'gated' exposure. The gated exposure allows object information at specific distances to be determined.

A Newport customer manufactures vehicle mounted Laser Gated Imaging systems for border security and surveillance forces. The system can provide vision through smoky conditions for rescue operations and gunshot signature identification in combat scenarios. A pulsed Er-YAG laser (1.54 μm , 1 to 10 kHz repetition rate) is used for target illumination and the camera is triggered on the TTL output of the laser system. The laser is equipped with a variable beam expander to vary the illumination cone and galvo mirror is used to guide the beam through an angular range of 90 degrees. The system is typically mounted on truck which is in slow motion or stationary at times. Due to the inevitable vibration caused by the truck engine, achieving motion stability is critical for the camera positioning system.

The original Newport solution was built from the following standard products: Newport Research Series table top with isolators, Newport RT series rotation stage, BGM goniometric cradle and MM4005/4006 motion controller. The RT and BGM stages were subsequently replaced by RVS and BGS stages and the MM4005/4006 was upgraded to an ESP301 controller.

The IR camera is mounted on a goniometric gimbal assembly with Newport BGS80PP stage on top of an RVS80PP rotation stage. As the laser beam is turned in small incremental steps with the scanning mirror, the RVS80PP stage moves the camera in synch with the mirror. At the target position, the RVS80PP stage stops momentarily and the BGS80PP moves to scan the beam in the FOV of the IR camera in small incremental steps. Each frame of the camera is recorded and played at video frame rate.

- [RVS80PP Rotation Stage](#)

- [BGS80PP Goniometric Cradle](#)

- [ESP301 Motion Controller](#)

- [RS2000-48-8 Optical Table](#)

- Er-YAG Eye safe laser, SWIR camera and galvo mirror (customer supplied)

Key Specifications:

BGS80PP

Minimum Incremental Motion	0.0002 °
Reversal Value (Hysteresis) Typical	0.004 °
Absolute Accuracy, Typical	0.06 ° or ± 0.03 °

RVS80PP

Minimum Incremental Motion	0.0002 °
Uni-directional Repeatability, Guaranteed	0.002 °
Reversal Value (Hysteresis), Guaranteed	0.005 °
Absolute Accuracy, Guaranteed	0.02 ° or ± 0.01 °

There were difficult challenges the Newport Motion team had to overcome for the successful completion of the customer's application. As the system will be used outdoors, mounted on a truck and exposed to harsh environmental conditions, a rugged and reliable motion platform was important for robust performance. Another key requirement was high repeatability to enable capturing the reflected light for long range calibration and measurement. The Newport solution proved successful thanks to the Newport Motion team's expertise, high performance motion products, and vibration control capabilities.

