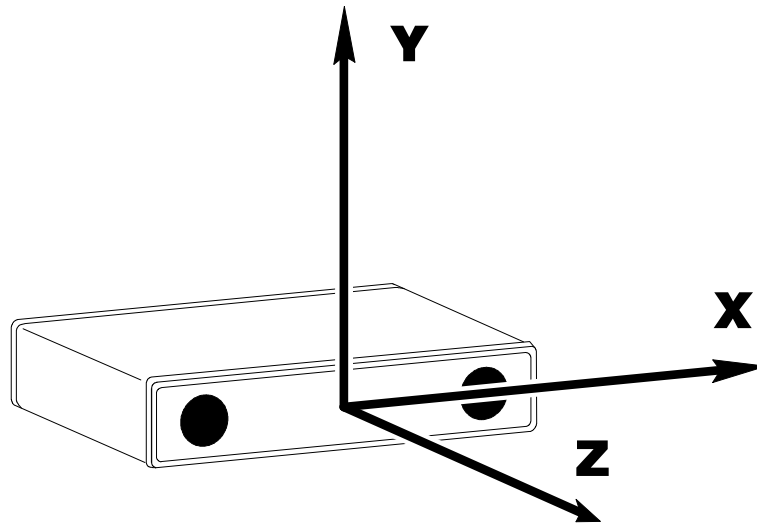


DynaSight™

Product Description



854 Greenview Dr., Grand Prairie, TX 75050
Voice: 972-606-8740 FAX: 972-606-8741

DynaSight™ Product Description

The **DynaSight** sensor is a miniature, low power optical radar with integrated signal processing that performs non-contact position measurements in three dimensions. A central application for the sensor is in measuring the position of the human head with respect to a real-time graphics display. Such a sensor is a key element in emerging concepts for the *symbiotic* computer workstation: the workstation watches the viewer, while the viewer interacts with the workstation.

The DynaSight sensor is considered to be an enabling technology for several immediate applications:

- Dynamic true-perspective displays that adapt in real time to the instantaneous three-dimensional positions of the viewer's eyes.
- Head-controlled pointing systems that augment the mouse and provide cursor positioning in three dimensions. With an appropriate software driver, the user can switch from dynamic-perspective operation to "head-mouse" operation at the press of a keyboard hot-key, and pointer-based selections can be performed while maintaining the hands at home position on the keyboard.
- Interactive "virtual window" stereoscopic displays. DynaSight interoperates with a wide range of stereoscopic viewing devices.
- Computer access for persons with physical disabilities, including high-level quadriplegics.

The DynaSight sensor also serves as a development tool for emerging applications that are being actively researched:

- Autostereoscopic displays that independently address each of the viewer's eyes, without a requirement for 3-D glasses.
- Secure displays that limit the visibility of confidential information to a single viewer.
- Phased-array audio systems that automatically tune to the instantaneous positions of the user's mouth and ears.

DynaSight Technology

The DynaSight is a compact electro-optic sensor with integrated signal processing that performs three-dimensional measurements to passive, non-tethered targets. The sensor package is roughly the size and shape of a trade paperback book. Sensor operations are invisible and eye-safe. Target search and track are entirely automatic, and no special lock-on procedures are required. A two-color LED on the front of the sensor indicates the tracking status to the user.

In a typical application, the DynaSight sensor is mounted just above the viewable area of a real-time graphics display. The sensor's field-of-view is a nominal 75 degree cone, and the sensor is pointed such that this field covers the comfortable range of head/eye positions for the user of the display.

The DynaSight sensor operates by measuring and reporting on the three-dimensional movements of a tiny target that is referenced to the user's forehead. The disposable target is entirely passive, has a flexible adhesive-backed substrate, and weighs less than ten milligrams. It can be positioned on eye glasses or stereoscopic goggles or, quite typically, it can simply be placed on the user's forehead. The target does not obscure vision or interfere with activities. Also, larger high performance targets are available that allow measurements at a sensor-to-target range of up to twenty feet.

Measurements are reported in an asynchronous RS-232 serial format with user-selectable communication parameters. The DynaSight offers an efficient native data format that provides measurements in easy-to-use absolute Cartesian coordinates. The DynaSight's optical transmitter can be easily synchronized for operation with time-sequential stereoscopic viewing devices. This insures, for example, that the sensor will not interfere with communications to infrared-activated stereoscopic glasses.

The DynaSight sensor can also be configured to emulate and/or filter the outputs from existing serial devices, including the Microsoft serial mouse and the Mouse Systems serial mouse. Any one of sixteen pre-set power-up configurations can be selected by means of a switch at the rear of the unit, and four of these power-up configurations can be modified by Origin Instruments to service the individual requirements of specific customers. A variety of additional special-purpose sensor configurations are selectable after sensor power-up, using a simple serial protocol. For example, several special configurations are available that allow some of the sensor's integrated false target rejection capabilities to be traded for a modest reduction in data latency. Alternate configurations also allow the sensor to operate with an active electro-optic targets, such as an external laser designator or an array of infrared light emitting diodes.

Key System Features of the DynaSight 3-D Measurement System

Passive, non-tethered targets. The DynaSight sensor is capable of operation with passive, wireless, retroreflective targets. These miniature targets are low in cost, disposable, and unobtrusive. They can be easily positioned on head-mounted displays, stereo glasses, medical instrumentation, or even directly on the human body.

Active infrared targets. The DynaSight sensor can also operate with infrared LED's or infrared laser designators as targets. For special applications, active targets allow reduced integration time and a broader working field-of-view at the target.

Self-contained operation. The DynaSight sensor integrates all of the required optical transmitters and receivers, analog and digital signal processors, multiple power supplies, and communication devices into a small, compact device no larger than a trade paperback book. However, the sensor's optical head is also designed such that it can be separated from the electronics package as an aid to unusual installation requirements.

Easy set-up. The DynaSight sensor is calibrated as an integral unit at the time of manufacture, and it depends on no external instrumentation in making its measurements. Reporting can thus commence in a sensor-referenced coordinate system immediately after power-up.

Autonomous operation. The sensor is user-friendly in that no special lock-on procedures are required. Target search and tracking functions are entirely automatic, and reporting commences within a fraction of a second after the target(s) enter the sensor's field-of-view.

Design-for-manufacture. The sensor makes excellent use of integrated electronics technologies to provide unprecedented measurement accuracy in a low-cost implementation. The sensor's optical configuration is fixed during manufacture, and absolute spatial accuracy is achieved by an exhaustive calibration with automated test equipment (ATE) at a specially designed optical calibration station. The resulting calibration tables are stored in Flash EPROM memory within each sensor, in a format optimized for real-time calculations. This manufacturing approach allows the use of low-cost optical components, and it provides automatic correction for any misalignment, magnification variations, or optical nonlinearities. The built-in ATE interface for calibration also provides a high-coverage test interface for sensor electronic subsystems.

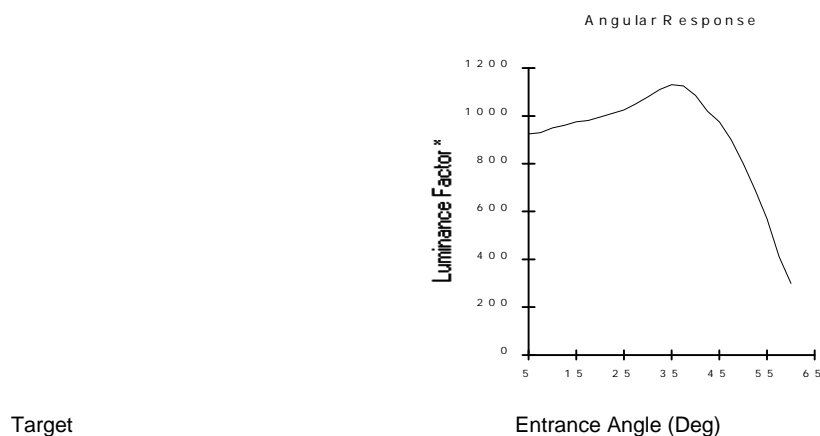


Figure 1. Retroreflective Target and Angular Response



Figure 2: The DynaSight Sensor



Figure 3: A Typical DynaSight Application

Technical Specifications

Size:	18.6 x 14.5 x 3.9 cm (7.3 x 5.7 x 1.5 in)
Operating Wave Band:	Near Infrared
Field of Regard:	75° Azimuth x 75° Elevation
Measurement Update Rate:	65 Hz Maximum for Passive Targets 65 Hz Maximum for Active Targets
Lock-on Delay:	0.3 Second Typical
Operating Range:	0.1 to 1.5 meters for 7 mm Passive Targets 0.3 to 4 meters for 25 mm PassiveTargets 1 to 6 meters for 75 mm Passive Targets 0.1 to 18 meters for Active Targets
Measurement Resolution:	0.1 mm Cross Range Typical* 0.4 mm Down Range Typical*
Absolute Accuracy:	2 mm Cross Range Typical* 8 mm Down Range Typical*
Power Requirements:	14V AC @ .6 amp (Wall Transformer For 115V AC Supplied)
Electrical Interface:	Dual RS-232C With DB-9 Connectors (Cable and DB-25 adapter are Supplied)
Default Data Format:	8 Bytes per Measurement/Target Update X, Y, Z in 16-bit Two's Complement Format 0.05 mm per Least Significant Bit
Alternate Data Format:	16/18 Bytes per Measurement Update 0.001 inch per Least Significant Bit Compatible with Logitech 6-D format

*Measurement parameters are RMS values and are quoted for 7mm target at 80cm range under normal florescent room lights. Values will vary with operating range and target diameter, and to some extent with ambient illumination and target position in the field of regard. Measurement resolutions of 0.05mm in three axes are achieved at 40cm range, and resolution is significantly reduced at range extremes.

Three-dimensional measurements are reported in a Cartesian coordinate system with origin at a fiducial mark on the DynaSight sensor.

The DynaSight sensor can be adapted to a wide variety of video display monitors. A flat ledge of at least 10 cm (4 inch) depth is recommended at the top of the monitor to insure mechanical stability. Threaded inserts are provided on the base of the sensor so that mounting accessories can be developed for unusual installations.

For More Information Contact:

Origin Instruments Corporation
854 Greenview Drive
Grand Prairie, TX 75050
USA
Voice: 972-606-8740
FAX: 972-606-8741
Email: info@orin.com
Web: <http://www.orin.com>

