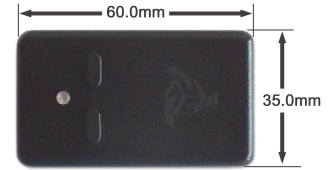


YEI 3-Space Sensor™ Data-logging

Miniature High-Performance Attitude & Heading Reference Systems / Inertial Measurement Units



Product Overview

The YEI 3-Space Sensor™ Data-logging integrates a miniature, high-precision, high-reliability, Attitude and Heading Reference System (AHRS) / Inertial Measurement Unit (IMU) with a micro-SD card storage device and a rechargeable lithium-polymer battery solution into a single low-cost end-use-ready unit. The Attitude and Heading Reference System (AHRS) uses triaxial gyroscope, accelerometer, and compass sensors in conjunction with advanced processing and on-board quaternion-based Kalman filtering algorithms to determine orientation relative to an absolute reference in real-time.

Orientation can be returned or stored in absolute terms or relative to a designated reference orientation. The proprietary multi-reference vector mode increases accuracy and greatly reduces and compensates for sensor error. The YEI 3-Space Sensor Data-logging system also utilizes a dynamic sensor confidence algorithm that ensures optimal accuracy and precision across a wide range of operating conditions.

When attached to a USB 2.0 host, the YEI 3-Space Data-logging unit can enumerate as both a virtual COM port and a USB mass-storage device. The virtual COM port allows access to real-time sensor data and configuration parameters and the mass-storage device allows access to logging & config options and captured sensor data. Versatile commands provide for raw sensor data, normalized sensor data, and filtered absolute and relative orientation outputs in multiple formats including: quaternion, Euler angles (pitch/roll/yaw), rotation matrix, axis angle, two vector(forward/up).

Applications

- Robotics performance analysis
- Motion capture
- Information gathering
- Personnel / pedestrian tracking
- Unmanned air/land/water vehicle tracking
- Education and performing arts
- Healthcare monitoring
- Asset tracking
- Vibration analysis and monitoring
- Event detection and monitoring

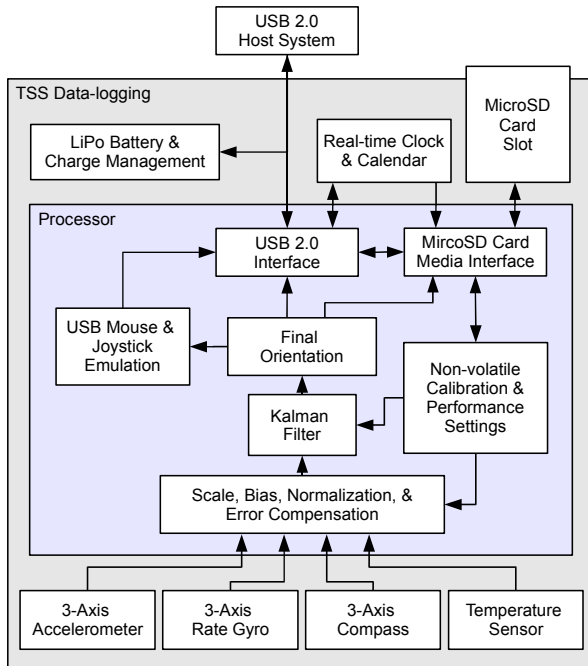
Key Features

The YEI 3-Space Sensor Data-logging has many features that allow it to be a flexible all-in-one solution for your orientation sensing needs. Below are some of the key features:

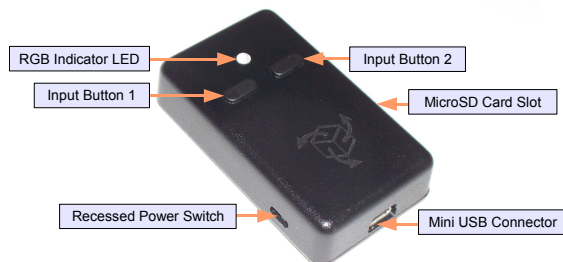
- Small self-contained high-performance data-logging AHRS at 35mm x 60mm x 15mm and 28 grams
- Integrated Lithium-Polymer battery and charge control allows battery life of 5+ hours at full performance
- Fast sensor update and filter rate allow use in highly dynamic applications, including motion capture, performance & motion analysis, and navigation
- Highly customizable orientation sensing with options such as tunable filtering, oversampling, and orientation error correction
- Advanced integrated Kalman filtering allows sensor to automatically reduce the effects of sensor noise and sensor error
- Robust open protocol allows commands to be sent in human readable form, or more quickly in machine readable form
- Orientation output format available in absolute or relative terms in multiple formats (quaternion, rotation matrix, axis angle, two-vector)
- Absolute or custom reference axes
- Access to raw sensor data
- MicroSD card allows for data-logging applications, USB allows for real-time applications
- Flexible data logging configuration allows customization of logged data and allows event-based and time-based logging options
- Built-in clock/calendar provides for fully time-stamped event logging at high resolution
- USB communication through a virtual COM port
- Enumeration as USB mass-storage device makes access to logged data easy
- Upgradeable firmware
- RGB status LED, two programmable input buttons
- Available in either hand-held or strap-down packaging

High-reliability MEMS technology combined with advanced processing and quaternion-based Kalman filtering algorithms maintain accurate orientation outputs across a wide range of performance conditions.

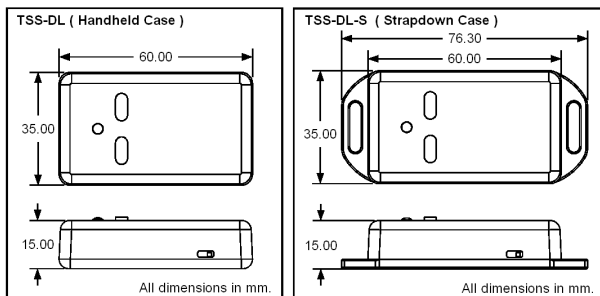
Block Diagram



Hardware Overview



Case Dimensions



Specifications

General	
Part number	TSS-DL (Handheld Sensor Unit) TSS-DL-S (Strapdown Sensor Unit)
Dimensions	35mm x 60mm x 15mm (1.38 x 2.36 x 0.59 in.)
Weight	28 grams (0.98 oz)
Supply voltage	+5v USB
Battery technology	rechargeable Lithium-Polymer
Battery lifetime	5+ hours continuous use at full performance
Communication interfaces	USB 2.0
Storage media	MicroSD card
Filter update rate	up to 200Hz with full AHRS functionality up to 1000Hz in IMU mode
Orientation output	absolute & relative quaternion, Euler angles, axis angle, rotation matrix, two vector
Other output	raw sensor data, normalized sensor data, temperature, date/time.
Shock survivability	5000g
Temperature range	-40C ~ 85C (-40F ~ 185F)
Sensor	
Orientation range	360° about all axes
Orientation accuracy	±2° for dynamic conditions & all orientations
Orientation resolution	<0.08°
Orientation repeatability	0.085° for all orientations
Accelerometer scale	±2g / ±4g / ±8g selectable
Accelerometer resolution	14 bit
Accelerometer noise density	99µg/√Hz
Accelerometer sensitivity	0.00024g/digit for ±2g range 0.00048g/digit for ±4g range 0.00096g/digit for ±8g range
Accelerometer temperature sensitivity	±0.008%/°C
Gyro scale	±250/±500/±2000 °/sec selectable
Gyro resolution	16 bit
Gyro noise density	0.03°/sec/√Hz
Gyro bias stability @ 25°C	11°/hr average for all axes
Gyro sensitivity	0.00875°/sec/digit for ±250°/sec 0.01750°/sec/digit for ±500°/sec 0.070°/sec/digit for ±2000°/sec
Gyro non-linearity	0.2% full-scale
Gyro temperature sensitivity	±0.016%/°C
Compass scale	±1.3 Ga default. Up to ±8.1 Ga available
Compass resolution	12 bit
Compass sensitivity	5 mGa/digit
Compass non-linearity	0.1% full-scale

Specifications are subject to change. Version: 1.0.3