



# Yost Labs 3-Space Sensor™ Mini Bluetooth



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

## Product Overview

The Yost Labs 3-Space Sensor™ Mini Bluetooth is a small, high-precision, high-reliability, low-cost, wireless, dual mode bluetooth/LE, SMT Attitude and Heading Reference System (AHRS) / Inertial Measurement Unit (IMU) which uses triaxial gyroscope, accelerometer, and compass sensors in conjunction with advanced processing and a proprietary on-board quaternion-based orientation filtering algorithms to determine orientation relative to an absolute reference in real-time.

Orientation can be returned in absolute terms or relative to a designated reference orientation. The gradient descent calibration process and high update rates increase accuracy and greatly reduce and compensate for sensor error. The Yost Labs 3-Space Sensor system utilizes QGRAD2™ sensor fusion along with an advanced dynamic confidence algorithm and advanced on-board magnetometer auto-calibration that work together to ensure optimal accuracy and precision across a wide range of operating conditions.

The Yost Labs 3-Space Sensor Miniblueetooth sensor features are accessible via a well-documented open communication protocol that allows access to all available sensor data and configuration parameters. With dual-mode bluetooth and versatile commands allow access to 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). Embedded pedestrian tracking algorithm allows path capture for wearable or carried sensors.

With a 4-hour, rechargeable Lithium-Ion battery, the Yost Labs 3-Space Mini Bluetooth is the perfect hand-held, wireless orientation and motion sensing solution.

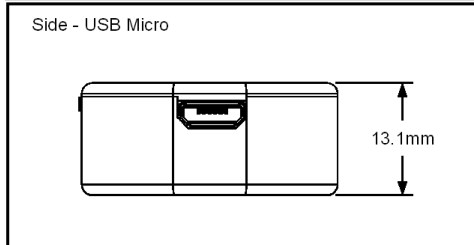
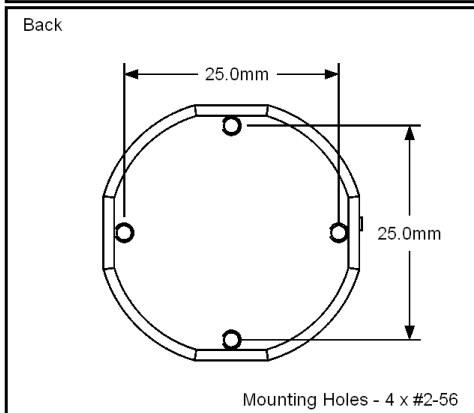
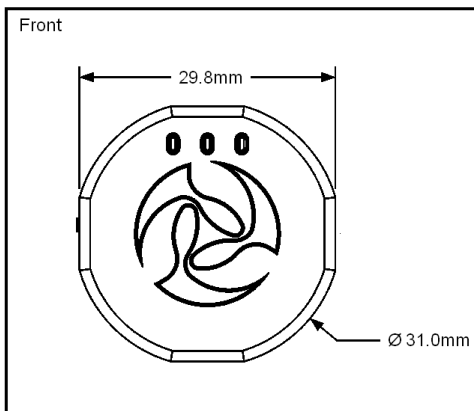
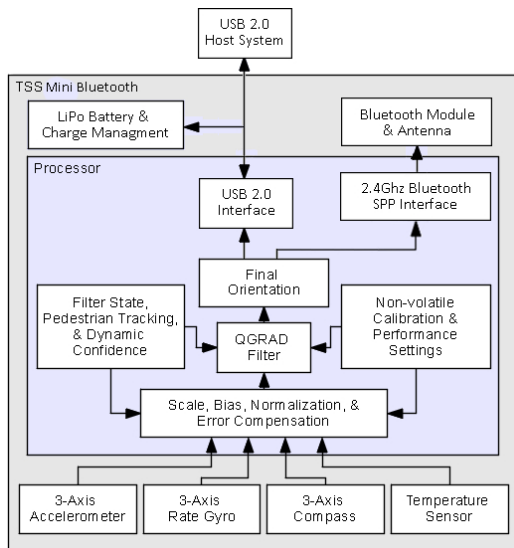
## Applications

- Robotics
- Motion capture
- Positioning and stabilization
- Personnel / pedestrian navigation and tracking
- Unmanned air/land/water vehicle navigation
- Education and performing arts
- Healthcare monitoring
- Gaming and motion control
- Virtual reality and immersive simulation

## Key Features

The Yost Labs 3-Space Sensor Embedded Mini Bluetooth 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, cased, high-performance dual mode bluetooth/LE AHRS at 30mm x 30mm x 13mm and 9 grams
- Impressive 4 hour battery life for wireless communication with up to 60 meters range
- Open Source API Available
- Fast sensor update and filter rate allow use in real-time applications, including stabilization, virtual reality, pedestrian tracking, real-time immersive simulation, and robotics
- Advanced on-board magnetometer auto-calibration allows the sensor to quickly adapt to changing magnetic environments
- Highly customizable orientation sensing with options such as tunable filtering, oversampling, and orientation error correction
- Advanced integrated QGRAD2™ filtering allows sensor orientation outputs at up to 1750Hz while automatically reducing 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
- Embedded pedestrian tracking
- Flexible communication options: Bluetooth 4.0, Bluetooth LE, and USB 2.0
- Miniature hand-held casing with LED output
- Upgradeable firmware
- Programmable interrupt capability
- Development kit available



## Specifications

General	
Part number	TSS-MBT
Dimensions	30mm x 30mm x 1.3mm (0.63 x 0.59 x 0.067 in.)
Weight	9 grams (0.32 oz)
Supply voltage	+3.3v ~ +6.0v
Power consumption	32-72mA @ 3.3v
Communication interfaces	USB 2.0, Bluetooth 4.0, Bluetooth LE
Filter update rate <sup>1</sup>	Up to 1750Hz with QGRAD2 AHRS
Orientation output	absolute & relative quaternion, Euler angles, axis angle, rotation matrix, two vector
Other output	raw sensor data, corrected sensor data, normalized sensor data, temperature, pedestrian tracking path.
Bluetooth Range	Up to 60 meters with Bluetooth LE
Shock survivability	5000g
Temperature range	-40C ~ 85C (-40F ~ 185F)
Sensor	
Orientation range	360° about all axes
Orientation accuracy <sup>2</sup>	±1.5° for dynamic conditions & all orientations
Orientation resolution	<0.08°
Orientation repeatability	0.085° for all orientations
Accelerometer scale	±2g / ±4g / ±8g / ±16g selectable
Accelerometer resolution	16 bit
Accelerometer noise density	90µg/√Hz
Accelerometer sensitivity	0.000061g/digit-0.000488g/digit
Accelerometer temperature sensitivity	±0.01%/°C
Gyro scale	±125/±245/±500/±1000/±2000 °/sec selectable
Gyro resolution	16 bit
Gyro noise density	0.000006°/sec/√Hz
Gyro bias stability @ 25°C	11°/hr average for all axes
Gyro sensitivity	0.004375°/sec/digit for ±250°/sec 0.070°/sec/digit for ±2000°/sec
Gyro non-linearity	0.2% full-scale
Gyro temperature sensitivity	±0.03%/°C
Compass scale	±49.152 Ga
Compass resolution	16 bit
Compass sensitivity	1.5 mGa/digit
Compass non-linearity	±0.0003 mGa/°C

1. Depends upon communication mode and filter mode.  
2. Average value when calibrated.

Specifications are subject to change.  
Version: 2.2.1



630 Second Street  
Portsmouth, Ohio 45662 USA  
Voice: 740-876-4936  
Email: sales@yostlabs.com

[www.YostLabs.com](http://www.YostLabs.com)

Patents Pending  
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