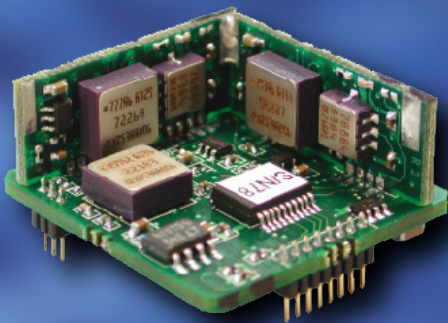


Sensors **Crista IMU**

The Crista Inertial Measurement Unit (IMU) is a small, three axis inertial sensor that provides high resolution angular rate and acceleration data via a serial interface. The standard serial interface provides temperature compensated rate and acceleration readings. The user controls data update rate and over-sample averaging of output data. A GPS Pulse-Per-Second (PPS) input signal interface allows time correlation of IMU and GPS data. The OEM Sensor Head is also available as a stand alone unit.



Crista OEM Sensor Head



Crista IMU

Key Features

- Small form factors to fit easily into customer applications
- Inexpensive. Uses available automotive grade MEMS sensors
- Used in other CCT products. Tried and tested solution
- Provides raw rate and acceleration data to support customer algorithms
- Calibration of gain, temperature bias, acceleration affects, and alignment
- Software driver support and integration documentation provided as with other CCT products

Specifications

	Crista IMU	Crista OEM Sensor Head	
Electrical	Supply Voltage	4.4 - 8 Volts	4.4 - 8 Volts
	Power	0.5 W (typical) 0.75 W (max)	0.2 W (typical)
Mechanical	Size	2.05 inches x 1.55 inches x 1.00 inches	1.10 inches x 1.15 inches x 0.59 inches
	Weight	36.8 grams (1.3 oz)	7.0 grams (0.25 oz)
Gyros	Range	$\pm 300^\circ / \text{sec}$	
	¹ Scale Factor Error	$< 3^\circ / \text{sec}$ (@ 25 °C)	
	In-Run Bias Error		
	Fixed temperature	$< 0.2^\circ / \text{sec}$ (warmed up)	
	Over temperature	$< 0.6^\circ / \text{sec}$	
	Linear Acceleration Effects	$0.2^\circ / \text{sec} / \text{G}$ typical ; $1.5^\circ / \text{sec} / \text{G}$ max uncorrected	
	Noise (1 σ , no over-samples)	$< \pm 0.7^\circ / \text{sec}$	
	² Cross Axis Rate Error	2.6 % uncorrected	
	A/D Measurement Resolution	$0.0155^\circ / \text{sec}$	
	Converted data rate resolution	$0.009^\circ / \text{sec}$ (max rate = $300^\circ / \text{sec}$)	
Bandwidth	2 nd order LPF Fc=100 Hz.		
Accelerometers	Range	$\pm 10 \text{ G}$	
	Scale Factor Error	$< 100 \text{ mG}$ (0.98 m/s^2) (@ 25 °C)	
	In-Run Bias Error		
	Fixed temperature	$< 25 \text{ mG}$ (0.245 m/s^2)	
	Over temperature	$< 51 \text{ mG}$ (0.500 m/s^2)	
	Turn-on to Turn-on Bias	$< 30 \text{ mG}$ (0.295 m/s^2)	
	Noise (1 σ , no over-samples)	$< \pm 12 \text{ mG}$ (0.120 m/s^2)	
	² Cross Axis Rate Error	2.6 % uncorrected (Includes alignment and off axis acceleration)	
	A/D Measurement Resolution	0.62 mG	
	Converted data rate resolution	0.30 mG (max rate = 10 G)	
Bandwidth	Passive LPF, Fc=100 Hz		
Environmental	Operating Temperature	-40C to +70C (Calibrated Temperature Range)	
	Max Acceleration	500 G	

¹ Based on room ambient temperature. Nonlinearity from best fit straight line. Typically much better at lower rates / accelerations.

² Includes alignment and off axis acceleration.

Features



The Navigator is a GPS/INS navigation system that combines a GPS receiver and a six degree-of-freedom IMU in a miniature sensor package. The GPS and IMU measurements are fused by an Extended Kalman Filter (EKF) to provide optimal estimates of the platform's position, velocity, and attitude, regardless of GPS solution availability. Applications include fixed-wing aircraft, helicopters, lighter-than-air, land vehicles, water surface vessels, and static platforms.

Key Features

- Light-weight, small form factor
- EMI-shielded carbon fiber enclosure
- Single 37-pin vehicle interface micro-D connector
- Programmable output rate up to 60 Hz
- Position/velocity output in ECEF or geodetic frame
- Attitude output as quaternion or Euler angles
- Total-state EKF algorithm
- Optional, platform-specific, non-holonomic constraints (NHC) for improved attitude accuracy
- Interface to optional external magnetometer for improved heading observability

Specifications

Mechanical

- Size: 130 x 59 x 19 mm (5.1 x 2.34 x 0.76 inches)
- Weight: 80 grams

Electrical

- Supply Voltage: 4.8 to 20 V
- Power Consumption: 2 W

Data I/O: Communication: RS-232

Output Rate: User-configurable: max 60 Hz

Position

- Output Type: User-configurable: ECEF or geodetic
- Accuracy SEP1 : 5.0 m
- Resolution: 0.03 m

Velocity

- Output Type: User-configurable: ECEF or NED
- Accuracy (1 σ)²: 0.5 m/s
- Resolution: 0.01 m/s

Acceleration

- Output Type: XYZ vehicle frame
- Random Walk: 0.06 m/s/ \sqrt{h}
- Bias Instability: 4 m/s/h
- Resolution: 0.003 m/s²

Attitude

- Output Type: User-configurable: quaternion or Euler angles
- Roll and Pitch Accuracy: (1 σ)³: 0.6 ° with platform specific NHC. 1.0 ° unconstrained

Heading Accuracy (1 σ)⁴: 1.8 ° with platform-specific NHC. 2.4 ° unconstrained

Resolution: 0.006 °

Angular Rate

- Output Type: XYZ vehicle frame
- Random Walk: 2.5 °/ \sqrt{h}

Bias Instability⁵: 80 °/h

Resolution: 0.01 °/s

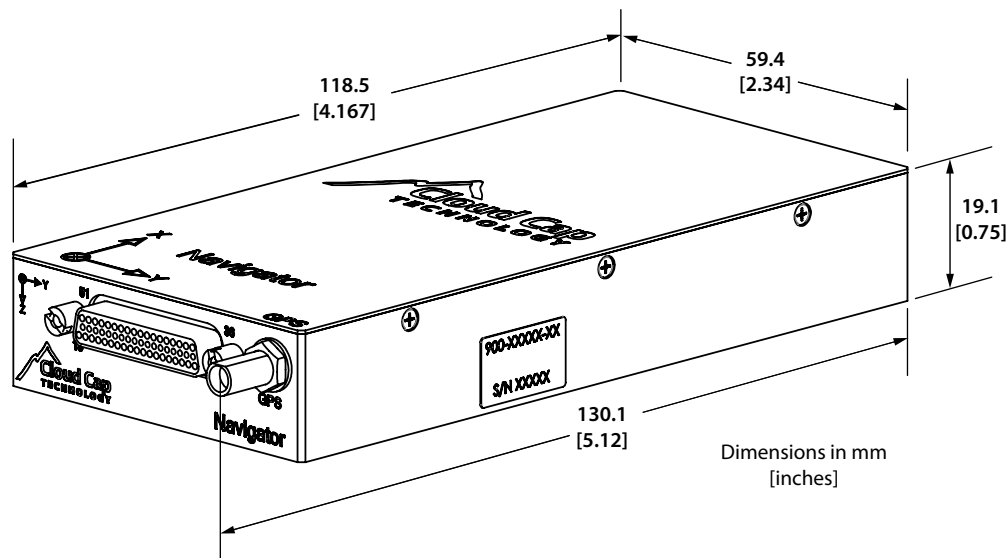
Operational Limits

- Temperature Range: -40 ° C to +70 ° C
- Altitude: 50,000 m

Speed: 515 m/s

Angular Rate: 300 °/s

Acceleration: 60 m/s²



1 Position accuracy when GPS solution is available, given as spherical error probable. In case of temporary GPS outage, position accuracy is subject to velocity random walk.

2 Velocity accuracy when GPS solution is available. In case of temporary GPS outage, velocity accuracy is subject to acceleration random walk and attitude accuracy.

3 Attitude accuracy when GPS solution is available. In case of temporary GPS outage, attitude accuracy is subject to acceleration and angular rate bias instability.

4 Heading accuracy when GPS solution is available and the vehicle is accelerating. If the vehicle is not accelerating, or in case of temporary GPS outage, heading accuracy is subject to angular rate random walk.

5 Angular rate biases are consistently removed when GPS solution is available and the vehicle is accelerating.