

# Geo-PNT

## Master Clock + GPS Aided INS Combined in a Single Box

- GPS-aided inertial navigation and timing
- High performance internal timebase and IMU in case of loss of GPS
- Software configurable timing interfaces
- NTP network synchronization protocol
- Precise 1 PPS, 10 MHz and other timing signals
- Easy integration thanks to small footprint and low power consumption
- Ruggedized form factor (MIL-STD-810G)



★ Optimizes Size, Weight & Power (SWaP), Integration and Cost



### Applications

- **Airborne**
  - Observation payload (radars, optronics, electronic warfare)
  - Flying test bench
  - Flight analysis
  - Tactical UAV navigation
- **Ground**
  - Satcom on the move
  - Anti IED jamming systems
  - Mobile radios and C3I
  - Robotics
- **Marine/Naval**
  - Sensor support (radars, sonars, optronics, electronic warfare)
  - Communication networks
  - Offshore/DSO platforms
  - Buoys

### Accurate Timing, Position and Attitude in a Single Box

Geo-PNT is an innovative and efficient solution for applications that need precise navigation data, as well as accurate time reference. It combines a high performance, versatile, GPS master clock with an accurate inertial navigation system that delivers time, position and attitude under all circumstances, including temporary loss of GPS, typical of dynamic platforms. It minimizes size, weight and power (SWaP) due to the integration of positioning and timing that are typically achieved by two independent subsystems.

### High Performance Time Server

Geo-PNT maintains an accurate internal timescale with very low power consumption via a low-phase noise OCXO (contact the factory about CSAC). Precise time and frequency signals are available as 1 PPS, unmodulated IRIG B timecode, 10MHz, and NMEA time-of-day messages. An NTP server provides accurate time distribution over an IP network.

### High Performance GPS Aided INS

Geo-PNT provides extremely accurate positioning and orientation measurements, even in GPS denied environments. Measurement data is logged internally and streamed at a high output rate through a serial or LAN interface. Geo-PNT is available with several GPS receiver and IMU configurations.

### Geo-PNT Configurations

Non ITAR Configurations	GPS Receiver	IMU
<b>Tactical</b>	L1 Standalone	Internal Quartz MEMS M-G352 or M-G362
<b>Tactical-RTK</b>	L1/L2, RTK enabled	Internal Quartz MEMS M-G352 or M-G362
<b>Advanced</b>	L1/L2, RTK enabled	External FOG KVH1750 (other IMU on demand)
ITAR Configurations	GPS Receiver	IMU
<b>Tactical-RTK SAASM</b>	L1/L2 SAASM, RTK enabled	Internal Quartz MEMS M-G352 or M-G362
<b>Advanced SAASM</b>	L1/L2 SAASM, RTK enabled	External FOG KVH1750 (other IMU on demand)

## Timing

### Output Signals

- DCLS: x3 configurable digital outputs (1PPS, IRIG B002), 3.3V, 50Ω
- RS232: x1 NMEA ToD message (GPZDA, GPRMC)
- Frequency: 10 MHz, sine, 0 dBm in 50Ω
- Network: NTP server(v3, v4)

### Management

- 10/100bT LAN interface
  - Web User Interface (status, configuration, log, SW update)
  - SNMP

## Time and Frequency Performances

Performances	OCXO	CSAC
<b>Timebase Performances</b>		
<b>Relative Frequency Variation with Aging:</b>		
- 24 hours	5.10 <sup>-10</sup>	-
- One month	-	3.10 <sup>-10</sup>
- One year	5.10 <sup>-8</sup>	1.10 <sup>-9</sup>
<b>Relative Frequency Variation with Temperature (-40°C +85°C)</b>	± 5.10 <sup>-8</sup>	± 5.10 <sup>-8</sup>
<b>Relative Frequency Variation with Acceleration (any axis)</b>	± 1.10 <sup>-9</sup> /g	-
<b>Phase Noise on 10 MHz Output:</b>		
@ 10 Hz	-110dBc/Hz	-70dBc/Hz
@ 100 Hz	-120dBc/Hz	-113dBc/Hz
@ 1 kHz	-140dBc/Hz	-128dBc/Hz
@ 100 kHz	-150dBc/Hz	-140dBc/Hz
<b>System Performances</b>		
<b>Frequency Accuracy Averaged Over 24 hour when Locked on GNSS</b>	3.10 <sup>-12</sup>	1.10 <sup>-12</sup>
<b>Phase (1 PPS) Drift in Holdover (no reference available)</b>		
- 4 hours	1.5 μs	0.2 μs
- 24 hours	30 μs	1.3 μs
- 7 days	1 ms	30 μs
<b>Phase (1 PPS) accuracy to UTC</b>	±50 ns (1σ)	±50 ns (1σ)

## Geo-PNT IMU Performance

Configuration	IMU	Parameter	Accelerometer	Gyroscope
<b>Tactical, Tactical-RTK, Tactical-RTK SAASM</b>	Internal M-G352	Range	±6 g	±450°/sec
		Bias stability (in-run)	< 0.1 mg	6°/hr
		Random walk	0.04 (m/sec)/√hr	0.2°/√hr
	Internal M-G362	Range	±3 g	±150°/sec
		Bias stability (in-run)	< 0.1 mg	3°/hr
		Random walk	0.04 (m/sec)/√hr	0.2°/√hr
<b>Advanced, Advanced SAASM</b>	External KVH 1750	Range	±10 g	±490°/sec
		Bias stability (in-run)	< 0.05 mg	0.05°/hr
		Random walk	0.07 (m/sec)/√hr	<0.012°/√hr

## Position Accuracy\*

Configuration (GPS receiver)	Standalone Mode Horizontal / Vertical Accuracy	Differential Mode Horizontal / Vertical Accuracy
<b>Tactical (L1 only)</b>	1.5 m / 2.5 m	-
<b>Tactical-RTK (L1/L2) Tactical-RTK SAASM</b>	1.5 m / 2.5 m	0.05 m / 0.1 m
<b>Advanced (L1/L2) Advanced SAASM</b>	1.0 m / 2.0 m	0.05 m / 0.1 m

## Dynamic Attitude Accuracy\*

Configuration (IMU)	Standalone Mode Roll-pitch / Heading Accuracy	Differential Mode Roll-pitch / Heading Accuracy
<b>Tactical (internal IMU)</b>	±0.2° / ±0.5°	-
<b>Tactical-RTK, Tactical-RTK SAASM (internal IMU)</b>	±0.2° / ±0.5°	±0.1° / ±0.3°
<b>Advanced, Advanced SAASM (KVH1750)</b>	±0.05° / ±0.1°	±0.01° / ±0.05°

NOTE: Accuracy must be measured once dynamic alignment is completed.

## Output Rates Through Serial or RS232 Interface

Configuration (IMU)	Navigation Data Output Rate
<b>All Tactical Configurations</b>	125 Hz
<b>All Advanced Configurations</b>	100 Hz

\*Accuracy is dependent upon GPS satellite system performance, ionospheric conditions, GPS blockage and other factors

## Technical Specifications

### Data Recording/Logging

- Navigation solutions (position, velocity, acceleration, attitude, angular rate, ...)
- Raw GPS and IMU data (for post processing)
- Full diagnostics

### External IMU Support

- KVH 1750 is standard in Advanced configurations.
- Geo-PNT configurations can be proposed with:**
  - Honeywell HG1900
  - Honeywell HG1700
  - Honeywell HG9900
  - Litton LN200
  - Other IMU's on request

### Safety and Diagnostics

- Internal safety and monitoring systems
- Internal BIT with operator notification

### Operational Readiness

- Cold Start : 60 s
- 1 PPS/Time-of-Day: 60 s

### Monitoring

- Power/status LEDs
- Remote/local status, configuration, event log, software update through web pages

### Environmental

- Temperature in Operation: -40°C to +65°C
- Temperature in Storage: -45°C to +85°C
- Humidity: 95% RH, non condensing
- Altitude: 35,000 ft
- Mechanical (MIL-STD-810G):
  - Vibrations : 7.7 g rms, 20 to 1000 Hz
  - Shocks : 20 g, 11 ms

### Physical

- Size: 120 x 100 x 55 mm (4.7" x 3.9" x 2.2")
- Weight: 0.75 kg (1.7 lbs)
- Mounting: On a plate, 4 through holes

### Power

- Input Voltage: 10-30 VDC
- Tactical Configurations: 9 W typ
- Advanced Configurations: 13 W typ