Geo-APNT™ - Assured Positioning, Navigation and Timing

✓ Available with SAASM or Commercial GPS Receivers
✓ Anti-Jam Antenna
✓ PTP Grandmaster (IEEE 1588 v2)
✓ NTP server (v3, v4)
✓ Precise 1 PPS, 10 MHz and other timing signals
✓ Support for MEMS, FOG, RLG, and Navigation grade IMU’s
✓ Support for RTK and PPK

High-Accuracy Navigation System
Geo-APNT offers a fully-integrated GPS-aided inertial navigation solution supporting a wide range of IMU grades and provides a high-performance trusted positioning and navigation capability.

• Proven performance in wide range of application areas
• Available with SAASM or Commercial GPS
• Centimeter-level position accuracy with RTK and PPK
• In-motion dynamic alignment
• Support for low, medium and high-dynamic platforms
• GPS/IMU Post-processing support with Geodetics’ RTD-Post

High-Performance Time Server
Geo-APNT maintains an accurate internal timescale with very low power consumption via a low-phase noise OCXO (other oscillator options available upon request). Precise time and frequency signals are available as 1 PPS, unmodulated IRIG B timecode, 10 MHz, and NMEA time-of-day messages.

• PTP grandmaster (IEEE 1588 v2)
• Network: NTP server (v3, v4)
• DCLS: digital outputs (1PPS, IRIG B002, PPO, ALARM), 3.3V, 50Ω
• RS232: x1 NMEA ToD message (GPZDA, GPRMC)
• Frequency: 10 MHz, sine, 0 dBm in 50Ω

Geo-APNT™ Assured Position, Navigation and Timing (Master Clock) in a Single Box

Geo-APNT: Applications
Airborne
• Observation payload
  ✓ Radar
  ✓ 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
  ✓ Radar, Sonar
  ✓ Optronics
  ✓ Electronic warfare
  • Communications networks
  • Offshore / DSO platforms

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Geo-APNT™ Assured Position, Navigation and Timing (Master Clock) in a Single Box

Technical Specifications

Data Recording / Logging
- Navigation solutions (position, velocity, acceleration, attitude, angular rate, …)
- Raw GPS and IMU data (for post-processing with RTD-Post)
- Full diagnostics

External IMU Support
- Fiber Optic Gyro is standard in Advanced configurations. Built-in support for:
  - Honeywell HG1900, HG1700, HG9900
  - Litton LN200
  - Other IMU’s available upon 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

Power
- Input Voltage: 10-30 VDC
- Tactical Configurations: 9 W typical,
  Advanced Configurations: 13 W typical

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):
  Vibration: 7.7 g rms, 20 to 1000 Hz
- Shock: 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 holes

Other IMU’s available upon request.

Geo-APNT IMU Performance (External)*

<table>
<thead>
<tr>
<th>Configuration</th>
<th>IMU Type</th>
<th>Parameter</th>
<th>Accelerometer</th>
<th>Gyroscope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced, Advanced SAASM</td>
<td>Fiber Optic Gyro</td>
<td>Range</td>
<td>±10g</td>
<td>±490°/sec</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bias Stability (in-run)</td>
<td>&lt; 7.5 mg</td>
<td>1°/hr.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Random walk</td>
<td>0.07 (m/sec)/hhr</td>
<td>0.012/vhr.</td>
</tr>
<tr>
<td>Advanced</td>
<td>Ring Laser Gyro</td>
<td>Range</td>
<td>±37g</td>
<td>±1074°/sec</td>
</tr>
<tr>
<td>SAASM</td>
<td></td>
<td>Bias Stability (in-run)</td>
<td>&lt; 1 mg</td>
<td>1°/hr.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Random walk</td>
<td>0.001 (m/sec)/hhr</td>
<td>0.125/vhr.</td>
</tr>
</tbody>
</table>

* Built-in Support for Honeywell HG1900, HG1700, HG9900, Litton LN200. Other IMU’s available upon request.

Timing

Output Signals
- PTP grandmaster (IEEE 1588 v2)
- Network: NTP server (v3, v4)
- DCLS: configurable digital outputs (1PPS, IRIG B002, PPO, ALARM), 3.3V, 50Ω
- RS232: x1 NMEA ToD message (GPZDA, GPRMC)
- Frequency: 10 MHz, sine, 0.0 dBm in 50Ω

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

Time and Frequency Performance

<table>
<thead>
<tr>
<th>Performance</th>
<th>Oscillator Level I</th>
<th>Oscillator Level II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time-base Performance</td>
<td>24 hours / One year</td>
<td>24 hours / One year</td>
</tr>
<tr>
<td>Relative Frequency Variation with Aging (based on 30-day aging)</td>
<td>1x10^-12 / 1x10^-20</td>
<td>0.5x10^-12 / 0.5x10^-20</td>
</tr>
<tr>
<td>Relative Frequency Variation with Temperature (-40°C +75°C)</td>
<td>±5x10^-12</td>
<td>±2x10^-12</td>
</tr>
<tr>
<td>Phase Noise on 10 Mhz. Output</td>
<td>@10 Hz</td>
<td>@100 Hz</td>
</tr>
<tr>
<td>@1 Hz</td>
<td>-120dBc/Hz</td>
<td>-120dBc/Hz</td>
</tr>
<tr>
<td>@10 Hz</td>
<td>-144dBc/Hz</td>
<td>-145dBc/Hz</td>
</tr>
</tbody>
</table>

Other oscillators available upon request

Position Accuracy*

<table>
<thead>
<tr>
<th>Configuration (GPS Receiver)</th>
<th>Standalone Mode Horizontal/Vertical Accuracy</th>
<th>Differential Mode Horizontal/Vertical Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tactical (L1 only)</td>
<td>1.5 m / 2.5 m</td>
<td>-</td>
</tr>
<tr>
<td>Tactical-RTK (L1/L2)</td>
<td>1.5 m / 2.5 m</td>
<td>0.05 m / 0.1 m</td>
</tr>
<tr>
<td>Tactical-RTK SAASM</td>
<td>1.5 m / 2.5 m</td>
<td>0.05 m / 0.1 m</td>
</tr>
<tr>
<td>Advanced (L1/L2)</td>
<td>1.0 m / 2.0 m</td>
<td>0.05 m / 0.1 m</td>
</tr>
<tr>
<td>Advanced SAASM (external FOG)</td>
<td>1.0 m / 2.0 m</td>
<td>0.05 m / 0.1 m</td>
</tr>
</tbody>
</table>

Dynamic Attitude Accuracy*

<table>
<thead>
<tr>
<th>Configuration (IMU)</th>
<th>Standalone Mode Roll-Pitch / Heading Accuracy</th>
<th>Differential Mode Roll-Pitch / Heading Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tactical (internal IMU)</td>
<td>±0.2° / ±0.5°</td>
<td>-</td>
</tr>
<tr>
<td>Tactical-RTK</td>
<td>±0.2° / ±0.5°</td>
<td>±0.1° / ±0.3°</td>
</tr>
<tr>
<td>Advanced SAASM (internal IMU)</td>
<td>±0.05° / ±0.1°</td>
<td>±0.01° / ±0.05°</td>
</tr>
<tr>
<td>Advanced SAASM (external FOG)</td>
<td>±0.05° / ±0.1°</td>
<td>±0.01° / ±0.05°</td>
</tr>
</tbody>
</table>

NOTE: Accuracy must be measured once dynamic alignment is complete

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

Geo-APNT IMU Performance (Internal)

<table>
<thead>
<tr>
<th>Config.</th>
<th>IMU</th>
<th>Parameter</th>
<th>Accelerometer</th>
<th>Gyroscope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tactical, Tactical-RTK, Tactical-RTK SAASM</td>
<td>MEMS 1</td>
<td>Range</td>
<td>±3g</td>
<td>±150°/sec</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bias Stability (in-run)</td>
<td>&lt; 0.1 mg</td>
<td>3°/hr.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Random walk</td>
<td>0.04 (m/sec)/hhr</td>
<td>0.2/vhr.</td>
</tr>
<tr>
<td>Tactical, Tactical-RTK, Tactical-RTK SAASM</td>
<td>MEMS 2</td>
<td>Range</td>
<td>±3g</td>
<td>±200°/sec</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bias Stability (in-run)</td>
<td>&lt; 0.1 mg</td>
<td>2.2°/hr.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Random walk</td>
<td>0.04 (m/sec)/hhr</td>
<td>0.09/vhr.</td>
</tr>
<tr>
<td>Tactical, Tactical-RTK, Tactical-RTK SAASM</td>
<td>MEMS High-Performance</td>
<td>Range</td>
<td>±4g, ±10g</td>
<td>±450°/sec</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bias Stability (in-run)</td>
<td>&lt; 0.05 mg</td>
<td>0.8°/hr.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Random walk</td>
<td>0.02 (m/sec)/hhr</td>
<td>0.06/vhr.</td>
</tr>
</tbody>
</table>