The Trimble APX-20 UAV is a GNSS-Inertial OEM solution designed to reduce the cost and improve the efficiency of mapping from small Unmanned Aerial Vehicles (UAVs). Comprised of small, low power, precision GNSS and inertial hardware components and POSPac UAV post-mission Differential GNSS-Inertial office software, the APX-20 UAV eliminates the need to survey extensive Ground Control Points (GCP’s), and reduces the amount of sidelap required to be flown per flight. The innovative APX-20 UAV features a precision, survey grade GNSS receiver and dual inertial measurement units; one embedded onto the GNSS-inertial board and one as an external unit mounted on the sensor to be georeferenced. With this feature the APX-20 UAV automatically supports integration on gimballed platforms without requiring an external interface to an autopilot or the mount itself.

High Performance GNSS-Inertial Solution with Dual IMU’s

The APX-20 UAV brings all the benefits of direct georeferencing to UAV platforms:

- Turn your UAV into a professional mapping solution
- Ultra-fast image georeferencing for faster map production and delivery
- Reduced number of ground control points, saving time and money
- Consistent, reliable, highly accurate results
- Increased collection area per flight for greater productivity
- Redundant navigation solution to autopilot for enhanced safety

Key Features

- High-performance Direct Georeferencing solution for improved efficiency and accuracy of mapping from small Unmanned Aerial Vehicles
  - Reduce/eliminate GCP’s
  - Reduce sidelap
  - Accurate LiDAR/Camera georeferencing
  - Seamless workflow with gimballed platforms
- Compact OEM module complete with survey-grade multi-frequency GNSS receiver and embedded and external IMU’s
- Applanix IN-Fusion™ GNSS-Inertial and SmartCal™ compensation technology for superior position and orientation performance
- POSPac UAV Differential GNSS Inertial post-processing software for highest accuracy georeferencing
- RTK real-time position for precision landing and real-time mapping applications
- Supports all common RTK corrections such as CMR, CMR+, RTCM
**TECHNICAL SPECIFICATIONS**

**System Summary**
- Advanced Applanix In-Fusion™ GNSS-Inertial integration technology
- Dual IMU with solid-state MEMS inertial sensors with Applanix SmartCal™ compensation technology
- Advanced Trimble Maxwell Custom GNSS survey technology
- 336 Channels
  - GPS: L1 C/A, L2C, L2E, L5
  - GLONASS: L1 C/A, L2 C/A, L3 CDMA
  - BeiDou: B1, B2
  - Galileo: E1, E5A, E5B, E5A/BOC
  - QZSS: L1 C/A, L1S, L1C, L2C, L5, L5E
  - SBAS: L1 C/A, L5
  - MSS L-band: Trimble RTX, OmniSTAR
- High precision multiple correlator for GNSS pseudorange measurements
- Unfiltered, unsmoothed pseudorange measurements data for low noise, low multipath error, low time domain correlation and high dynamic response
- Very low noise GNSS carrier phase measurements with <1 mm precision in a 1 Hz bandwidth
- Proven Trimble low elevation tracking technology
- 100 Hz position, roll, pitch and heading output
- IMU data rate 200 Hz for both internal and external IMU
- Navigation output format: ASCII (NMEA-0183), Binary (Trimble GSOF)
- Supported Reference input: CMR, CMR+, sCMRx, RTCM 2.1, 2.2, 3.0, 3.1
- Support for POSPac UAV post-processing software (included)
- No export permit required

**LAN INPUT/OUTPUT**

All Ethernet functions are supported through dedicated IP address (Static or DNS) simultaneously.

TCP/IP and UDP
- ASCII and Binary data streaming (Time tag, PPS sync, status, position, attitude, velocity, track and speed, dynamics, performance metrics, GNSS data)

HTTP
- Web based Control software (GUI) for easy system configuration and low rate display. Support for all common browsers (IE, Safari, Mozilla, Google Chrome, Firefox)

**SERIAL INPUT/OUTPUT**

RS232 level port
- TTL level (3.3 V) port

Parameters
- ASCII and Binary data streaming (Time tag, PPS sync, status, position, attitude, velocity, track and speed, dynamics, performance metrics, GNSS data), reference input (CMR, CMR+, sCMRx, RTCM), configuration messages

**OTHER INPUT/OUTPUT**

PPS (pulse-per-second) Time Sync Pulse output
- Event Input (2) Two time mark of external events
- TTL 3.3 V pulses, max rate 50 Hz
- Digital I/O (3) LED drivers with dedicated functionality for systems integrators

**LOGGING**

**Internal Logging**
- 6 GByte Flash memory

**External Logging**
- USB 2.0 Device port

Parameters
- Time tag, status, position, attitude, velocity, track and speed, dynamics, performance metrics, raw IMU data (200 Hz), raw GNSS data

**INERTIAL MEASUREMENT UNITS (IMUS)**

<table>
<thead>
<tr>
<th>IMU Type</th>
<th>Range (°)</th>
<th>Temperature (°C)</th>
<th>Power</th>
<th>Size (mm)</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal on-board IMU/99</td>
<td>+/- 60g, +/- 350dps</td>
<td>-40 to +75</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>External IMU82</td>
<td>+/- 10g, +/- 490dps</td>
<td>-40 to +85</td>
<td>4.75 to 36 VDC (4W max)</td>
<td>61 x 68 x 65 (L x W x H)</td>
<td>330</td>
</tr>
</tbody>
</table>

**PERFORMANCE SPECIFICATIONS**

Unmanned Airborne Vehicle Applications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>POSPac UAV</th>
<th>RTX</th>
<th>PP-RTX</th>
<th>Post-Processed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position (m)</td>
<td>1.5 - 3.0</td>
<td>0.02 - 0.05</td>
<td>0.03 - 0.06</td>
<td>0.02 - 0.05</td>
</tr>
<tr>
<td>Velocity (m/s)</td>
<td>0.05</td>
<td>0.015</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Roll &amp; Pitch (°)</td>
<td>0.03</td>
<td>0.025</td>
<td>0.015</td>
<td>0.015</td>
</tr>
<tr>
<td>True Heading (°)</td>
<td>0.10</td>
<td>0.08</td>
<td>0.035</td>
<td>0.035</td>
</tr>
</tbody>
</table>

**PHYSICAL CHARACTERISTICS**

- Size: 67 L x 60 W x 34 H mm
- Weight: 90 grams
- Power: Wide range input 9-30 V DC, typical power consumption of 4W at room temperature
- Connectors: I/O: 44 Pin Header Samtec TMM-122-03-S-S-MW (mating part FCI 90311-044LF)
- Antenna Port: Connector: MMCX receptacle
- Output Voltage: 3.3 V DC to 5 V DC
- Maximum Current: 400 mA
- Minimum Input Signal Strength: 32 dB (> 35 dB Recommended)

**ENVIRONMENTAL CHARACTERISTICS**

- Temperature: -40 deg C to +75 deg C (Operational)
- Mechanical Shock: -55 deg C to +85 deg C (Storage)
- Operating Humidity: 5% to 95% R.H. non-condensing at +60 deg C
- Maximum Operating Limits: 200 Hz Navigation solution (Position, Velocity, Orientation, Rates, Accelerations)
- Full support for UAV dynamic models
- Single Base Differential GNSS-Inertial processing
- Forward and reverse processing with optimal Smoother with support for Applanix SmartBase virtual reference station module
- Support for PP-RTX

**ADDITIONAL ACCESSORIES**

- Evaluation Kit (Development Board)
- POSPac UAV Office Software
- APX-20 POSPac UAV Office Software
- Post-processed Differential GNSS-Inertial SW for APX-20
- 200 Hz Navigation solution (Position, Velocity, Orientation, Rates, Accelerations)
- Applanix In-Fusion GNSS-Integration technology
- Full support for UAV dynamic models
- Single Base Differential GNSS-Inertial processing
- Forward and reverse processing with optimal Smoother with support for Applanix SmartBase virtual reference station module
- Support for PP-RTX

Specifications subject to change without notice.

1 Developed under a License of the European Union and the European Space Agency
2 Typical performance. Actual results are dependent upon satellite configuration, atmospheric conditions and other environmental effects
3 Typical survey mission profile. Max RMS error. Heading error will increase for low speed rotor applications and when hovering.
4 Requires base station and radio link, sold separately
5 POSPac UAV, short base line operation
6 Sensor bandwidth (3 dB amplitude) ~ 50 Hz
7 Sold separate
8 There is no official GLONASS L3CDMA or Galileo E6 ICD. The current tracking capability is based on publicly available information. Full receiver compatibility cannot be guaranteed.
9 Not including external IMU
10 Performance based upon external IMU
11 POSPac UAV/MMR, Post-processed CenterPoint® RTX™, typical mission performance subscription sold separately. The accuracy is subject to quality of GNSS, durational data set, and regional coverage.

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