The Trimble AP20 GNSS-Inertial System is an embedded GNSS-Inertial OEM board set plus Inertial Measurement Unit (IMU) in a compact form factor. It is designed to give system integrators the ability to harness the best in GNSS multi-frequency positioning technology, with the superior capabilities of inertial data for continuous mobile positioning in poor signal environments, and for the orientation of imaging sensors.

The Trimble AP20 features a high-performance precision GNSS receiver and the industry leading Applanix IN-Fusion™ GNSS-Inertial integration technology running on a powerful, dedicated Inertial Engine (IE) board. This flexible, modular design ensures the ability to perform full high-powered GNSS-inertial processing without sacrificing performance, and an upgrade path to next generation GNSS boards as they become available.

PERFORMANCE YOU CAN TRUST
Whether it be guiding autonomous vehicles to winning finishes in the DARPA Urban challenge, motion compensating multibeam sonar to meet IHO standards, or georeferencing airborne laser scanners to centimetre level accuracy from high in the sky, Trimble GNSS with Applanix inertial technology has a proven track record of performance without compromise. With Trimble AP products you know exactly what positioning performance you will get for your mobile application.
TRIMBLE AP20 GNSS-INERTIAL OEM SYSTEM

TECHNICAL SPECIFICATIONS

- Advanced Applanix IN-Fusion™ GNSS-Inertial integration technology
- Advanced Trimble Maxwell® 6 Custom GNSS survey technology (two chipsets)
- 220 Channels: (per chipset)
  - GPS: L1 C/A, L2, L2E (Trimble method for tracking unencrypted) L5
  - GLONASS: L1 C/A and unencrypted P code, L2 C/A and unencrypted P code, L3 CDMA³
  - GALILEO®: L1 CBOC, E5A, E5B, E5A+BOC³
  - QZSS: L1 C/A, L1C, L1 SAIF, L2C, L5, LEX¹¹
  - SBAS: L1 C/A (EGNOS/MSAS), L1 C/A and L5 (WAAS)
  - L-Band: Omnisar VBS, HP, XP and G2
- 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
- Support for optional GNSS Azimuth Measurement System (GAMSTM)
- Support for optional Distance Measurement Indicator (DMI) input
- Proven Trimble low elevation tracking technology

INPUT/OUTPUT

LAN
Parameters
- Time tag, status, position, attitude, velocity, track and speed, dynamics, performance metrics, raw IMU data (100 or 200 Hz, IMU dependent), raw GNSS data (5 Hz)

Display Port
- Low rate UDP protocol output (1 Hz)

Control Port
- TCP/IP input for system commands

Primary Port
- Real-time TCP/IP protocol output (up to IMU data rate)

Secondary Port
- Buffered TCP/IP protocol output for data logging to external device (up to IMU data rate)

Internal Logging, 4 GByte (up to IMU data rate)
Parameters
- Time tag, status, position, attitude, velocity, track and speed, dynamics, performance metrics, raw IMU data (100 or 200 Hz, IMU dependent), raw GNSS data (5 Hz)

RS232 Input
Parameter
- AUX GPS Input (RTK, SBAS), CMR, CMR+, RTCM v2.x, RTCM v3.x

RS232 NMEA Output (1 – 50 Hz)
Parameter
- Position ($INGGA), Heading ($INHDT), Track and Speed ($INVTG), Statistics ($PSHR), Time and Date ($INZDA), Events ($EVT1, $EVT2)

Other I/O
1 pulse-per-second
- Time Sync output, normally high, active low pulse (configurable)

Event Input (2)
- Two time mark of external events. TTL pulses > 1 msec width, max rate 100 Hz

PERFORMANCE SPECIFICATIONS¹ (RMS ERROR)

Airborne Applications

<table>
<thead>
<tr>
<th></th>
<th>SPS</th>
<th>DGPS</th>
<th>XPR³</th>
<th>Post-Processed⁴</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position (m)</td>
<td>1.5 – 3.0</td>
<td>0.5 – 2.0</td>
<td>0.1 – 0.5</td>
<td>0.05 – 0.3</td>
</tr>
<tr>
<td>Velocity (m/s)</td>
<td>0.05</td>
<td>0.050</td>
<td>0.010</td>
<td>0.010</td>
</tr>
<tr>
<td>Roll &amp; Pitch (deg)</td>
<td>0.03</td>
<td>0.020</td>
<td>0.020</td>
<td>0.015</td>
</tr>
<tr>
<td>True Heading² (deg)</td>
<td>0.10</td>
<td>0.100</td>
<td>0.080</td>
<td>0.035</td>
</tr>
</tbody>
</table>

Marine Applications, No GNSS Outages

<table>
<thead>
<tr>
<th></th>
<th>SPS</th>
<th>DGPS</th>
<th>IARTK⁵</th>
<th>Post-Processed⁶</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position (m)</td>
<td>1.5 – 3.0</td>
<td>0.5 – 2.0</td>
<td>0.10</td>
<td>0.02 – 0.1</td>
</tr>
<tr>
<td>Velocity (m/s)</td>
<td>0.05</td>
<td>0.050</td>
<td>0.010</td>
<td>0.010</td>
</tr>
<tr>
<td>Roll &amp; Pitch (deg)</td>
<td>0.03</td>
<td>0.020</td>
<td>0.020</td>
<td>0.015</td>
</tr>
<tr>
<td>True Heading (deg)</td>
<td>0.05</td>
<td>0.050</td>
<td>0.050</td>
<td>0.025</td>
</tr>
</tbody>
</table>

Terrestrial Applications², No GNSS Outages

<table>
<thead>
<tr>
<th></th>
<th>SPS</th>
<th>VBS²</th>
<th>IARTK⁵</th>
<th>Post-Processed⁶</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position (m)</td>
<td>1.5 – 3.0</td>
<td>0.1 – 0.5</td>
<td>0.02 – 0.05</td>
<td>0.02 – 0.05</td>
</tr>
<tr>
<td>Velocity (m/s)</td>
<td>0.05</td>
<td>0.010</td>
<td>0.010</td>
<td>0.050</td>
</tr>
<tr>
<td>Roll &amp; Pitch (deg)</td>
<td>0.03</td>
<td>0.020</td>
<td>0.020</td>
<td>0.015</td>
</tr>
<tr>
<td>True Heading (deg)</td>
<td>0.05</td>
<td>0.050</td>
<td>0.050</td>
<td>0.025</td>
</tr>
</tbody>
</table>

Terrestrial Applications³, 1 km or 1 minute GNSS Outage

<table>
<thead>
<tr>
<th></th>
<th>SPS</th>
<th>VBS²</th>
<th>IARTK⁵</th>
<th>Post-Processed⁶</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position (m)</td>
<td>1.5 – 3.0</td>
<td>0.61 - 2.5</td>
<td>0.35 - 1.27</td>
<td>0.13 - 0.32</td>
</tr>
<tr>
<td>Roll &amp; Pitch (deg)</td>
<td>0.03</td>
<td>0.020</td>
<td>0.020</td>
<td>0.020</td>
</tr>
<tr>
<td>True Heading (deg)</td>
<td>0.20</td>
<td>0.200</td>
<td>0.100</td>
<td>0.060</td>
</tr>
<tr>
<td>True Heading (deg)</td>
<td>0.07</td>
<td>0.070</td>
<td>0.070</td>
<td>0.030</td>
</tr>
</tbody>
</table>

PHYSICAL CHARACTERISTICS

Board Set
- Size: 130 L x 100 W x 39 H mm (nominal)
- Weight: 0.28 kg (nominal)
- Power: 10 – 28 Volts DC, 20 Watts (max, with GAMS option)
- Connectors: I/O: Samtec OSH-060-01-L-D-DP-A-RT1
- Power: Samtec TFM-105-12-S-D-LC
- Antenna: MMIC receptorce

ENVIRONMENTAL CHARACTERISTICS

Temperature
- -40 deg C to +75 deg C (Operational)
- -55 deg C to +85 deg C (Storage)

Inertial Measurement Unit (IMU)

<table>
<thead>
<tr>
<th>Type</th>
<th>Class</th>
<th>Temperature</th>
<th>Power</th>
<th>Size (L x W x H) mm</th>
<th>Weight</th>
<th>Data Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMU-17</td>
<td>MIL</td>
<td>-40 deg C to + 71 deg C</td>
<td>10 - 34 Vdc, 8 W (max)</td>
<td>158 x 158 x 124</td>
<td>2.5 kg</td>
<td>100 Hz</td>
</tr>
<tr>
<td>IMU-42</td>
<td>COM</td>
<td>-20 deg C to + 55 deg C</td>
<td>+ 5 Vdc, 8 W (max)</td>
<td>85 x 85 x 66</td>
<td>0.68 kg</td>
<td>200 Hz</td>
</tr>
</tbody>
</table>

¹ Typical performance. Actual results are dependent upon satellite configuration, atmospheric conditions and other environmental effects
² Typical mission profile, max RMS error
³ Omnisar XP service, typical airborne results, subject to regional coverage. Subscription sold separately.
⁴ POSPac MMS
⁵ With GAMS option, 2 m baseline
⁶ Applanix IN-Fusion Inertially-Aided RTK, typical results
⁷ With DMI option
⁸ Virtual Base Station corrections
⁹ There is no public GLONASS L3 CDMA ICD. The current capability in the receivers is based on publicly available information. As such, Trimble cannot guarantee that these receivers will be fully compatible with a future generation of GLONASS satellites or signals.
¹⁰ Developed under a License of the European Union and the European Space Agency.
¹¹ Pilot observable.

Specifications subject to change without notice.