



# Trimble AP20

## EMBEDDED GNSS-INERTIAL SYSTEMS FOR CONTINUOUS MOBILE POSITIONING AND DIRECT GEOREFERENCING APPLICATIONS

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.

### Key Features

- ▶ Proven GNSS-Aided Inertial technology from Trimble Applanix
- ▶ Centimeter level mobile positioning accuracy
- ▶ Industry leading continuous positioning performance in GNSS denied environments
- ▶ Full position and orientation solution for direct georeferencing of remote sensing systems
- ▶ Fully supported for all dynamic environments: terrestrial, airborne and marine



## INERTIAL MEASUREMENT UNIT (IMU)

Type	Class	Temperature (c)	Power	Size (L x W x H) mm	Weight (kg)	Data Rate (Hz)
IMU-17	MIL	-40 - +71	10-34 Vdc, 8 W (max)	158 x 158 x 124	2.5	100
IMU-42	COM	-20 - +55	+5 Vdc, 8 W (max)	85 x 85 x 66	0.68	200
IMU-82	COM	-40 - +85	4.75 - 36 Vdc, 4 W (max)	61 x 68 x 65	0.33	200

## PERFORMANCE SPECIFICATIONS<sup>1</sup> (RMS ERROR)

Airborne Applications				
	SPS	RTX <sup>2</sup>	PP-RTX <sup>4,5</sup>	SmartBase Post-Processed <sup>4</sup>
Position (m)	1.5 H	<0.1 H	0.03 H	0.02 H
	3.0 V	<0.2 V	0.06 V	0.05 V
Velocity (m/s)	0.05	0.05	0.01	0.01
Roll & Pitch (deg)	0.03	0.02	0.015	0.015
True Heading <sup>2</sup> (deg)	0.10	0.08	0.035	0.035
Marine Applications, No GNSS Outages				
	SPS	DGPS	IARTK <sup>7</sup>	Post-Processed <sup>4</sup>
Position (m)	1.5-3.0	0.50-2.0	0.02-0.10	0.02-0.05
Velocity (m/s)	0.05	0.05	0.01	0.01
Roll & Pitch (deg)	0.03	0.03	0.02	0.015
True Heading <sup>2</sup> (deg)	0.05	0.05	0.05	0.025
Terrestrial Applications <sup>8</sup> , No GNSS Outages				
	SPS	VBS <sup>9</sup>	IARTK <sup>7</sup>	Post-Processed <sup>4</sup>
Position (m)	1.5-3.0	0.10-0.50	0.02-0.05	0.02-0.05
Velocity (m/s)	0.05	0.01	0.01	0.005
Roll & Pitch (deg)	0.03	0.02	0.02	0.015
True Heading <sup>2</sup> (deg)	0.2	0.2	0.1	0.05
True Heading <sup>2</sup> (deg)	0.05	0.05	0.05	0.025
Terrestrial Applications <sup>8</sup> , 60 second GNSS outage				
	SPS	VBS <sup>9</sup>	IARTK <sup>7</sup>	Post-Processed <sup>4</sup>
Position (m)	5.5	0.61-2.5	0.35-1.27	0.13-0.32
Position <sup>5</sup> (m)	4.5	0.61-0.88	0.35-0.69	0.13-0.24
Roll & Pitch (deg)	0.03	0.02	0.02	0.02
True Heading <sup>2</sup> (deg)	0.2	0.2	0.1	0.06
True Heading <sup>2</sup> (deg)	0.07	0.07	0.07	0.03

<sup>1</sup> Typical performance. Actual results are dependent upon satellite configuration, atmospheric conditions and other environmental effects  
<sup>2</sup> Typical mission profile, max RMS error  
<sup>3</sup> Trimble RTX service, typical airborne results, subject to regional coverage. Subscription sold separately  
<sup>4</sup> POSPac MMS  
<sup>5</sup> Post-processed CenterPoint RTX, typical mission performance. Subscription sold separately  
<sup>6</sup> With GAMS option, 2 m baseline  
<sup>7</sup> Applanix IN-Fusion Inertially-Aided RTK, typical results  
<sup>8</sup> With DMI option  
<sup>9</sup> Virtual Base Station corrections  
<sup>10</sup> 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  
<sup>11</sup> Developed under a License of the European Union and the European Space Agency

## 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: Simultaneous L1 C/A, L2C, L2E, L5
  - GLONASS: Simultaneous L1 C/A, L2 C/A, L2 P, L3 CDMA<sup>10</sup>
  - BeiDou: B1, B2
  - Galileo: Simultaneous L1 BOC, E5A, E5B, E5AltBOC<sup>11</sup>
  - QZSS: L1 C/A, L1 SAI, L2C, L5
  - SBAS: Simultaneous L1 C/A, L5
  - L-Band: OmniSTAR VBS, HP, XP and G2, Trimble CenterPoint RTX
- 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 Distance Measurement Indicator (DMI) input
- Support for optional GNSS Azimuth Measurement System (GAMS™)
- Support for optional POSPac Mobile Mapping Suite post-processing software

## INPUT/OUTPUT

**LAN**  
 Parameters..... Time tag, status, position, attitude, velocity, track and speed, dynamics, performance metrics, raw IMU data (200 Hz), 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 output (1 - 200 Hz)  
 Secondary Port ..... Buffered TCP/IP protocol output for data logging to external device (1 - 200 Hz)

### 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 (\$INGST), Attitude (\$PASHR), 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 (6) ..... Six time mark of external events. TTL pulses > 1 ms width, max rate 100 Hz

## 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 QSH-060-01-L-D-DP-A-RT1  
 Power..... Samtec TFM-105-12-S-D-LC  
 Antenna..... MMCX receptacle

## ENVIRONMENTAL CHARACTERISTICS

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

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