TRIMBLE AP+ 60 AIR

NEXT GENERATION EMBEDDED GNSS-INERTIAL SOLUTION FOR ROBUST AIRBORNE POSITIONING AND DIRECT GEOREFERENCING

POWERFUL ENOUGH FOR USE ON CREWED PLATFORMS YET SMALL ENOUGH FOR USE ON UNCREWED AERIAL VEHICLES (UAVS)

The Trimble AP+ Air GNSS-inertial system is comprised of next-generation compact, low-power hardware, featuring dual embedded survey-grade GNSS chipsets, an onboard inertial measurement unit (IMU), an external IMU, and the all-new Applanix IN-Fusion+ GNSS-aided inertial firmware.

INTEGRATE ONCE, USE MANY

The "Integrate once, use many" concept means a single hardware platform can be used to build a complete range of mapping payloads, from UAV to crewed aircraft, using the same design. This consistency saves costs associated with design and integration.

The Trimble AP+ Air is configurable to support the Direct Georeferencing accuracy demands of everything from low-flying UAVs to high-altitude crewed platforms. Compatible with photogrammetric cameras, LiDAR, hyperspectral and multispectral cameras, Synthetic Aperture Radar and virtually any other type of airborne remote sensor, the

Trimble AP+ Air is a powerful, compact, and versatile solution. Easily integrated with any type of platform, AP+ Air saves significant costs in all types of surveys.

THE BEST SOLUTION JUST GOT BETTER

The Trimble AP+ Air OEM solution is fully supported by the industry-leading Applanix POSPac MMS post-processing software, featuring Post-Processed Trimble CenterPoint® RTX™ for centimeter position accuracy without base stations, making it the ultimate solution for integrators wishing to produce a highly efficient airborne mapping system. For LiDAR integrators, the Trimble AP+ Air OEM is fully compatible with the POSPac MMS LiDAR QC Tools for UAV.

Key Features

▶ "Integrate once, use many" concept means a single platform can be used to build a complete range of mapping payloads, from UAV to crew operated aircraft, using the same design, which saves costs

▶ Reduced SWAP
  • 54% smaller footprint, 64% lighter, 75% less power

▶ Next generation, survey-grade GNSS receiver

▶ Dual inertial support (onboard and external) for simple gimbal mount support

▶ Two antenna heading support

▶ Next generation In-Fusion+ Aided-Inertial Firmware

▶ Completely configurable, from entry-level UAV applications, all the way up to high-accuracy solutions for high altitude LiDAR mapping

®**Trimble**

AP+ 60 AIR

TECHNICAL SPECIFICATIONS

System Summary
- Applanix IN-Fusion™ GNSS-inertial integration technology
- Onboard IMU with solid-state MEMS inertial sensors and Applanix SmartCal™ compensation technology
- High performance external IMU
- Advanced Trimble Maxwell Custom GNSS survey technology with 2 x 336 tracking channels
- Optional Dual Antenna, GAMS (GNSS Azimuth Measurement System) included
- Primary Antenna
  - GPS: L1 C/A, L2C, L2E, L5
  - GLONASS: L1 C/A, L2 C/A, L3 CDMA[6]
  - BeiDou: B1, B1C, B2, B2A, B2B, B3[8]
  - Galileo[7]: E1, E5A, E5B, E5AltBOC, E6[6]
  - IRNSS: L5
  - QZSS: L1 C/A, L1S, L1C, L2C, L5, LEX
  - SBAS: L1 C/A, L5
  - MSS L-Band: Trimble RTX
- Secondary Antenna:
  - GPS: L1 C/A, L2C, L2E, L5
  - GLONASS: L1 C/A, L2 C/A, L3 CDMA
  - BeiDou: B1, B1C, B2, B2A, B2B, B3[8]
  - Galileo[7]: E1, E5A, E5B, E5AltBOC, E6
  - IRNSS: L5
  - QZSS: L1 C/A, L1S, L1C, L2C,L5,LEX
  - SBAS: L1 C/A, L5
- High-precision multiple correlator for GNSS pseudorange measurements
- Unfiltered, unsmoothed pseudorange measurements data with low noise, low multipath error, low time domain 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
- Real-time GNSS L1, SBAS positioning mode
- Real-time 100 Hz position, attitude output, dual IMU 200 Hz data rate logging
- Navigation output format: ASCII (NMEA-0183), binary (Trimble GSOF)
- RTK license support for Reference Inputs CMR, CMR+, sCMRx, RTCM 2.1, 2.2, 3.0, 3.1, 3.2, sold separately
- Supported by POSPac MMS
- No export permit required

LAN INPUT/OUTPUT

All Ethernet functions are supported through dedicated IP address (static or DNS) simultaneously including web-based control GUI access and real-time data streaming

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), configuration messages
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 ports (baud rates up to 460,800)	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
USB 2.0 Device Configuration	ASCII and Binary data streaming (time tag, PPS sync, status, position, attitude, velocity, track and speed, dynamics, performance metrics, GNSS data), configuration messages

1 Typical performance. Actual results are dependent upon satellite configuration, atmospheric conditions and other environmental effects.
2 Typical mission profile, max RMS error (GAMS not required).
3 Real-time Trimble CenterPoint® RTX™ correction service, typical airborne results, subject to regional coverage. Subscription sold separately, requires RTK license.
4 POSPac MMS, Single Base station or SmartBase.
5 POSPac MMS, Post-processed CenterPoint® RTX™, typical mission performance subscription sold separately. The accuracy is subject to quality of GNSS, data set duration, and regional coverage.
6 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.
7 Developed under a License of the European Union and the European Space Agency.
8 The hardware of this product is designed for BeiDou B3 compatibility (trial version) and its firmware will be enhanced to fully support such new signal as soon as officially published ICD becomes available.
9 Does not include external IMU.
10 Performance based upon external IMU.
11 May require local gravity model to achieve full accuracy.
12 Subject to regional coverage.

OTHER INPUT/OUTPUT

PPS (pulse-per-second)	Time synchronization
Event Input (2)	Two time marks for external events, TTL 3.3V, 50 Hz max rate
Digital I/O (3)	LED drivers with dedicated functionalities for system integrators
External IMU Interface	Dedicated signals for external IMU support

LOGGING

Internal Logging	6 GB flash memory
External Logging	USB 2.0 host configuration support for removable USB device
Parameters	Time tag, status, position, attitude, velocity, track and speed, dynamics, performance metrics, raw IMU data (200 Hz), raw GNSS data (5 Hz)

PERFORMANCE SPECIFICATIONS

Absolute Accuracy Specifications (RMS)[1,10]

Airborne Application					
	SPS	SBAS[11]	RTX[3]	Post-Processed-RTX[5]	Post-Processed[4]
Position (m)	1.5 H 3 V	0.50 H 0.85 V	0.04 H 0.08 V	0.03 H 0.06 V	0.02 H 0.05 V
Velocity (m/s)	0.030	0.030	0.030	0.005	0.005
Roll & Pitch (deg)	0.005	0.005	0.003	0.0025[11]	0.0025[11]
True Heading[2] (deg)	0.030	0.025	0.010	0.005	0.005

PHYSICAL CHARACTERISTICS

Size[9]	100x60x21 mm
Weight[9]	100 g
Power[9]	7W max, 8-34V DC or 3.3V DC
Connectors	Samtec LSHM-140-03.0-L-DV-A-N
Antenna Port	2 x MMCX receptacle
	Output Voltage: Primary 7.5 VDC
	Secondary 5 VDC
	Maximum Current: 400 mA
	Minimum Input Signal Strength: 32 dB (>35 dB recommended)

ENVIRONMENTAL CHARACTERISTICS

Temperature	-40°C to +75°C (Operational)
	-55°C to +85°C (Storage)
GNSS Operating Limit	515 m/sec, 18,000 m

ADDITIONAL ACCESSORIES

Evaluation Kit	Includes development board, power supply, and short antenna cables (sold separately)

INERTIAL MEASUREMENT UNITS (IMUS)

Type	Range	Temp °C (Operational)	Power	Size (L x W x H) mm	Weight (kg)
Internal Onboard IMU-79	+/-6 g +/-350 dps	-40 to +75	n/a	n/a	n/a
External IMU- 57	+/-10 g +/-490 dps	-40 to +60	8 to 36V DC 15W max	179 x 126 x 127	2.6

Specifications subject to change without notice.

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TRANSFORMING THE WAY THE WORLD WORKS

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