

# AsteRx-i S UAS

GNSS/INS positioning and attitude receiver for easy UAS integration



UAV



Mapping



Automation



Logistics



Autonomous

**AsteRx-i S UAS delivers 3D orientation and continuous centimeter positioning even in areas without GNSS signals (coasting). This multi-frequency GNSS receiver offers the possibility of an onboard IMU (Internal Measurement Unit) or an externally tethered IMU.**

## KEY FEATURES

- ▶ **Reliable and accurate GNSS/INS positioning down to the cm level**
- ▶ **3D attitude/orientation - heading, pitch and roll**
- ▶ **Ultralight, low power and compact**
- ▶ **AIM+ interference monitoring and mitigation system**
- ▶ **High-update rate, low-latency positioning and attitude**
- ▶ **Robust calibration for wide temperature ranges**
- ▶ **44 pins I/O connector for autopilots such as Pixhawk**

## Reliability and interference robustness

Septentrio's multi-constellation, multi-frequency, accurate and reliable RTK is further enhanced by a powerful GNSS/INS integration. Benefiting from a GNSS heading initialization, AsteRx-i S UAS provides 3D attitude and positioning for the POI (point of interest).

It features Advanced Interference Mitigation (AIM+) technology which can suppress the widest variety of interferers, from simple continuous narrowband signals to the most complex wideband and pulsed jammers.

## Designed for UAS

Designed around demanding requirements for size, weight and power consumption, the AsteRx-i S UAS is ideal for optical inspection and photogrammetry. Consuming typically 2 W with a total weight of under 60 g, it is ideal for UAVs where space and payload are at a premium. The 4.5-30V input power range allows powering the receiver directly from the UAS power bus. The versatility of its design and the wide range of connection interfaces extend the AsteRx-i S UAS applicability to automation, robotics and logistics.

## Ease of integration

Mounted on a UAS-tailored carrier board, the AsteRx-i S UAS integrates seamlessly into light UAV and robotics platforms. The IMU offers a simple, bolt-on, plug-and-play solution, designed for easy testing and integration. Septentrio's open interfaces and software tools (WebUI, RxTools) make the integration, configuration and control of the AsteRx-i S UAS seem effortless.

## FEATURES

### GNSS technology

The AsteRx-i S UAS supports tracking of the following signals:

- ▶ GPS: L1, L2
- ▶ GLONASS: L1, L2
- ▶ Galileo<sup>1</sup>: E1, E5b
- ▶ BeiDou<sup>1</sup>: B1, B2
- ▶ SBAS: EGNOS, WAAS, GAGAN, MSAS, SDCM (L1)
- ▶ QZSS: L1, L2

### Septentrio's patented GNSS+ technologies

- ▶ **AIM+** unique anti-jamming and monitoring system against narrow and wideband interference
- ▶ **APME+** a posteriori multipath estimator for code and phase multipath mitigation
- ▶ **LOCK+** superior tracking robustness under heavy mechanical shocks or vibrations
- ▶ **IONO+** advanced scintillation mitigation

RAIM (Receiver Autonomous Integrity Monitoring)  
RTK-INS (rover)<sup>1</sup>

### Formats

Septentrio Binary Format (SBF), fully documented with sample parsing tools  
RTCM v2.x and v3.x (input only)  
CMR and CMR+ (input only)  
NMEA 0183 v2.3, v3.01, v4.0 (output only)

### Interface board

Wide range power supply input  
On-board logging on micro-SD card (max 32 GB)  
Plug compatible with Pixhawk and ArduPilot  
1 PPS output  
Ethernet  
USB OTG  
2 Event markers for camera shutter synchronisation  
Push-button start/stop logging on the SD-card  
SDIO interface for logging (covers µSD, SD, eMMC)

### Connectivity

- 1 Hi-speed serial ports (LVTTTL)
- 1 Hi-speed RS232
- 44 PIN connector I/O, SAMTEC TMM-122-03-S-S-MW
- 1 Full-speed micro USB device port

## SUPPORTING COMPONENTS

Embedded Web UI with full control and monitoring functionality.

RxTools, a complete and intuitive GUI tool set for receiver control, monitoring, data analysis and conversion.

GNSS receiver communication SDK. Available for both Windows and Linux.

### Optional accessories

- ▶ Antennas
- ▶ GeoTagZ re-processing software and SDK library for Unmanned Systems

## PERFORMANCE

### Integrated position accuracy<sup>2,3</sup>

	Horizontal	Vertical
Standalone	1.2 m	1.9 m
SBAS	0.6 m	0.8 m
DGPS	0.4 m	0.7 m

### RTK-INS<sup>2,3,4</sup>

Horizontal accuracy	0.6 cm + 0.5 ppm	
Vertical accuracy	1 cm + 1 ppm	
Initialisation	7 s	

### Integrated attitude accuracy<sup>2,3,4</sup>

	Non RTK mode	RTK mode
Heading	0.3°	0.2°
Pitch/roll	0.04°	0.02°

### INS velocity<sup>2,3,4</sup>

	Non RTK mode	RTK mode
Velocity	0.05 m/s	0.02 m/s

### Position accuracy after outages

Outage duration (s)	Horizontal error (RMS)	Vertical error (RMS)
5	0.1 m	0.03 m
10	0.3 m	0.05 m
30	3.0 m	0.24 m

### Attitude accuracy after outages

Outage duration (s)	Heading error (RMS)	Pitch/Roll error (RMS)
5	0.23°	0.06°
10	0.25°	0.07°
30	0.3°	0.12°

## IMU performance

### Gyroscope performance

Input range	± 450°/s
Bias in-run instability	7°/hr
Random walk / noise density	0.15°/√hr

### Accelerometer performance

Input range	±16 g
Bias in-run instability	0.014 mg
Random walk / noise density	57 µg/√Hz

### Maximum update rate

Integrated position	100 Hz
Latency	<20 ms

### Post-processing:

GNSS measurements	2 Hz
IMU raw data	200 Hz

### Time precision

PPS out	5 ns
Event accuracy	< 20 ns

### Time to first fix

Cold start <sup>5</sup>	< 45 s
Warm start <sup>6</sup>	< 20 s
Re-acquisition	avg 1.2 s

### Tracking performance (C/N0 threshold)<sup>7</sup>

Tracking	20 db-Hz
Acquisition	33 db-Hz

## PHYSICAL AND ENVIRONMENTAL

### AsteRx-i S UAS

Size	47.5 × 70 × 20 mm 1.87 × 2.75 × 0.79 in
Weight	60 g / 2.1 oz
Input voltage	5 VDC or 4.5–30 VDC

### Antenna

Antenna connectors	2 × U.FL
Antenna supply voltage	3 - 5.5 VDC
Maximum antenna current	200 mA
Antenna gain range	15-45 dB

### System power consumption

Typical configuration	2W <sup>8</sup>
Onboard logging	0.3 W

### Environment

Operating temperature	-40° C to +85° C -40° F to +185° F
Storage temperature	-40° C to +85° C -40° F to +185° F
Humidity	5% to 95% (non-condensing)
Vibration	MIL-STD-810G
Certification	RoHS, WEEE

<sup>1</sup> Optional feature

<sup>2</sup> Open-sky conditions

<sup>3</sup> RMS levels

<sup>4</sup> Baseline < 40 Km

<sup>5</sup> No information available (no almanac, no approximate position)

<sup>6</sup> Ephemeris and approximate position known

<sup>7</sup> Depends on user settings of tracking loop parameters, Max speed 600 m/s

<sup>8</sup> Preliminary data



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