

## PolaRxS: Ultra Low Noise GNSS Receiver for Ionospheric Scintillation Monitoring

*PolaRxS is a multi-frequency multi-constellation receiver dedicated to ionospheric monitoring and space weather applications. Designed around a state-of-the-art ultra low noise Oven-Controlled Crystal Oscillator (OCXO) and Septentrio's latest multi-frequency tracking engine, PolaRxS provides unbeaten measurement noise level while featuring proven simultaneous high-quality GPS, GLONASS and Galileo tracking next to a range of innovative features such as AIM+, adaptive interference analysis and mitigation, APME+, advanced multipath mitigation or LOCK+ for exceptional sensitivity and tracking stability under high dynamic conditions. Post-correlation phase and signal intensity are made available at up to 100Hz for direct use or post-processed by the provided graphical user interface to derive and log TEC and scintillation indices.*

### Tracking all visible signals

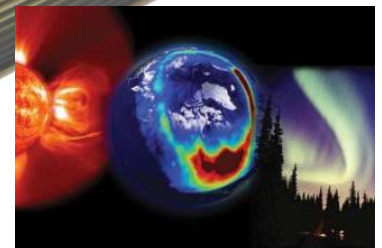
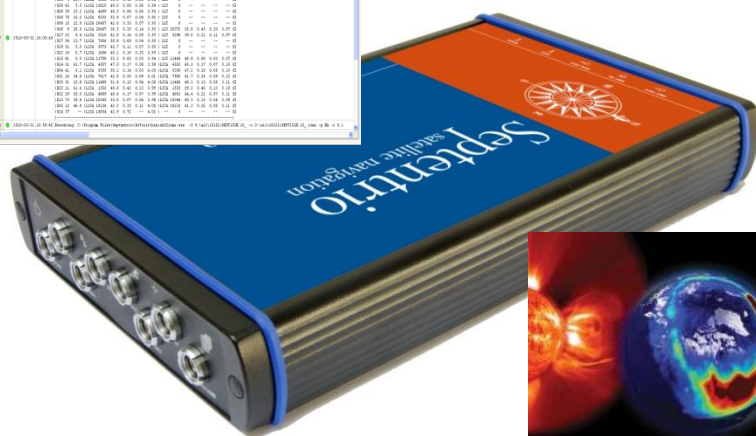
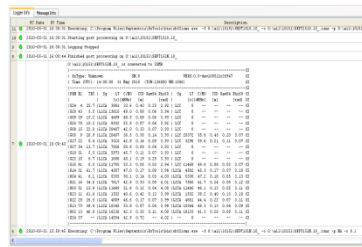
PolaRxS is a receiver powered by Septentrio's next generation L1, L2, L5, E5ab/AltBOC GPS/GLONASS/Galileo/SBAS receiver engine. Built around the 136 channel multi frequency multi constellation GReCo3 ASIC, PolaRxS is designed for high-performance multi-frequency applications.

### Ultra low measurement noise

Coupled with a state-of-the-art Oven-Controlled Crystal Oscillator (OCXO), the receiver provides an extensive set of GNSS measurements, including signal phase and intensity at up to 100 Hz, with a phase noise standard deviation ( $\phi_{60}$ ) as low as 0.03 rad.

### GNSS+™ technology

Septentrio's A Posteriori Multipath Estimator (APME+), unique in its ability to tackle short-delay multipath, further enhances the quality of the measurement data while proprietary LOCK+ tracking technology guarantees robust tracking of rapid signal dynamics such as encountered during scintillation events. Advanced interference analysis and mitigation by notch filtering enables installation in difficult radio environment.



### Convenient GUI and logging tool

As with all Septentrio GNSS receivers, an intuitive Graphical User Interface - RxControl - is provided for data logging and remote control. Specifically for Space Weather and ionosphere monitoring applications, the logging tool is extended for continuous TEC and scintillation indices (ISMR) logging and monitoring. Available ISMR indices include the S4,  $\sigma_{\phi}$ , spectral

slope and SI indexes for all satellite constellations and frequency bands.

### Rugged housing and multiple interfaces

PolaRxS is enclosed in a robust waterproof aluminum housing fit for operating outdoor in the most difficult environments. The housing provides a multitude of interfaces including USB, Ethernet and on board logging.



## POLARXS TECHNICAL SPECIFICATIONS

### FEATURES

- Multi-frequency L1/L2/L5/E5abAltBoc code/carrier tracking of GPS, GLONASS and GALILEO signals
- COMPASS ready
- 136 hardware channels for simultaneous tracking of all visible satellites in GPS GLONASS and GALILEO constellations
- Ultra Low noise Oven Controller Crystal Oscillator (OCXO)
- Raw data output (code, carrier phase and intensity, navigation data)
- A Posteriori Multipath Estimator technique (APME)
- GNSS+ pack containing
  - APME+ A Posteriori Multipath Estimation
  - LOCK+ Ultra stable tracking of highly dynamic signals
  - AIM+ interference monitoring and adaptive interference mitigation
- Includes up to 3 SBAS channels (EGNOS, WAAS, other)
- 100 Hz IQ measurements
- 2 Event markers
- Innovative and flexible power management under user control
- On-Board data logging (2GB)
- 4 hi-speed RS-232 serial ports
- 1 Ethernet port
- 1 full speed USB port
- Highly compact and detailed Septentrio Binary Format (SBF) output
- NMEA v2.30 output format, up to 100 Hz
- RTCM v2.2, 2.3, 3.0 or 3.1
- Compact IP65 housing
- Includes intuitive GUI (RxControl) and ISMR specific logger, detailed operating and installation manual

### PERFORMANCE

<b>Position accuracy</b> <sup>1,2,3,6</sup>		
	Horizontal	Vertical
Standalone	1.3 m	1.9 m
SBAS	0.6 m	0.8 m
DGPS	0.5 m	0.9 m
<b>Velocity Accuracy</b> <sup>1,2,3</sup>		
	Horizontal	Vertical
	0.8 cm/s	1.3 cm/s
<b>Maximum Update rate</b>		
		100 Hz
<b>Time accuracy</b> <sup>3</sup>		
1PPS		10 nsec
Event accuracy		<10nsec
<b>Measurement precision</b> <sup>1,3,5</sup>		
$\sigma_{\phi}$ over 60min ( <i>phi60</i> )		0.03rad
<b>C/A pseudoranges</b>		
		5 cm (GPS) <sup>6</sup>
		0.16 m (GPS) <sup>7,8</sup>
		7 cm (GLO) <sup>6</sup>
		0.25 m (GLO) <sup>7,9</sup>
E1 pseudoranges		8 cm (GALILEO) <sup>7,8</sup>
L5/E5a		6 cm (GALILEO) <sup>7,8</sup>
GPS L2 pseudoranges <sup>7</sup>		0.1 m
GLONASS P pseudoranges <sup>7</sup>		0.1 m
L1 carrier phase		1 mm
L2 carrier phase		1 mm
L5/E5a carrier phase		1.3 mm
L1/L2/L5 doppler		0.1 Hz
<b>Time to first fix</b>		
Cold start <sup>10</sup>		< 45 sec
Warm start <sup>11</sup>		<20 sec
Re-acquisition		Avg. 1.2 s
<b>Tracking performance (C/N<sub>0</sub> threshold)</b> <sup>12,13,15</sup>		
Tracking		26 dB-Hz
Acquisition		33 dB-Hz
Acceleration <sup>16</sup>		10 g
Jerk <sup>17</sup>		4 g/s

- 1 Hz measurement rate
- 2 Performance depends on environmental conditions
- 3 1σ level
- 5 C/N<sub>0</sub> = 45 dB-Hz
- 6 Smoothed
- 7 Non-smoothed
- 8 Multipath mitigation disabled
- 9 Multipath mitigation enabled
- 10 No information available (no almanacs, no approximate position)
- 11 Ephemeris and approximate position known
- 12 95%
- 13 Max speed 600 m/sec
- 14 Fixed ambiguities
- 15 Depends on user settings of tracking loop parameters
- 16 During acquisition
- 17 During tracking

### PHYSICAL AND ENVIRONMENTAL

<b>PRO size</b>	250 x 140 x 37 mm
<b>weight</b>	980 g
<b>Input voltage</b>	9-30 VDC
<b>Antenna LNA Power Output</b>	
Output voltage	+ 5VDC
Maximum current	200 mA
<b>Power consumption</b>	6W typical
<b>Operating temperature</b>	-40 to +60 °C
<b>Storage temperature</b>	-40 to +85 °C
<b>Humidity</b>	5% to 95% (non condensing)
<b>Connectors</b>	
Antenna	TNC female
Power	ODU 3 pins female
COM1	ODU 7 pins female
COM2	ODU 7 pins female
COM3/4/USB	ODU 7 pins female
IN	ODU 7 pins female
OUT	ODU 5 pins female
Ethernet	ODU 4 pins female
Power button	

### OTHER SEPTENTRIO PRODUCTS

**AsteRx1** - Compact single-frequency GNSS receiver platform, offering top-quality GPS and Galileo code and carrier phase data and single frequency positioning (including GPS DGPS and L1-RTK) at up to 50 Hz.

**AsteRx2e** - Compact dual-frequency GPS/GLONASS receiver platform, offering top-quality GPS code and carrier phase data and dual-frequency positioning (including DGPS and L1/L2-RTK) at up to 25 Hz.

**AsteRx2eH** - A unique single-board dual-frequency multi-antenna GPS/GLONASS receiver in a waterproof aluminum housing, that can be connected to 2 antennas for various machine control, heading and other multi-antenna applications.

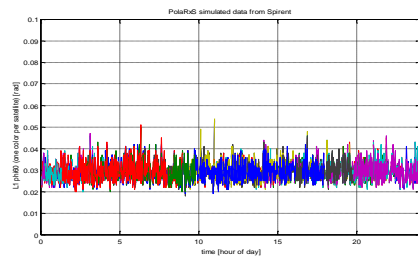
**AsteRx3** - Compact multi-frequency GPS/GLONASS/Galileo receiver platform, offering access to all current and modernized signals and constellations, and powered with Septentrio GNSS+ suite of advanced tracking and positioning algorithms.

**AsteRxi** - IMU assisted Compact Dual-frequency GNSS receiver platform, offering a 50Hz RTK position based on integrated IMU and GNSS measurements. In addition attitude information such as heading, pitch and roll are provided even in shadowed environments where conventional GNSS receivers fail.

**PolaRx3e/3eG/3eTR** - A family of versatile high-accuracy dual-frequency GNSS receivers for precise positioning and navigation applications. Next to high-quality GPS measurements, it provides GLONASS dual-frequency data as well as modernized GPS (L2C). PolaRx3eG provides access to the new and upcoming Galileo signals whereas PolaRx3eTR is a dedicated GPS/GLONASS/GALILEO Timing/Reference receiver.

**PolaNt\*** - A lightweight precise positioning and survey single or dual-frequency GPS or GPS/GLONASS antenna for use with the PolaRx family.

**PolaNt\*\_MC** - A lightweight sturdy precise positioning and survey single or multi-frequency GPS or GPS/GLONASS L-band antenna for use with the AsteRx and PolaRx family.



Specifications subject to change without notice. Certain features and specifications may not apply to all models.

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