GPS/GNSS Simulator

NavX®-NCS Professional Simulators
Flexibility | Scalability | Usability

Turning our test expertise into your success.

IFEN’s Multi-GNSS, Multi-Frequency and Multi-RF Constellation Simulators are pushing the boundary in flexibility, scalability and usability.
The NavX®-NCS Professional is a high-end, powerful but easy to use satellite navigation testing and R&D device. It is fully capable of multi-constellation / multi-frequency simulations of Global Navigation Satellite System (GNSS) based safety-of-life, spacial and professional applications. The NavX®-NCS Professional is the leading solution on the market providing all L-band frequencies for GPS, GLONASS, Galileo, BeiDou, QZSS, SBAS and beyond in one box. The outstanding performance features of the NavX®-NCS Professional are beyond the capabilities of any other signal generator on the market today. Furthermore, the extra complexity and cost of using additional signal generators or intricate architectures involving several hardware boxes is avoided, while improving reliability without compromising on functionality.

Benefits

- **Future-Proof Investment**
  The NavX®-NCS Professional hardware can generate all existing GNSS signals including the already available Galileo and BeiDou-2 signals and also cope with modulation and signal structures yet to be developed. Thus, the NavX®-NCS Professional is an assured investment for years to come.

- **No Testing Down-Time**
  Because we know that time is money the NavX®-NCS Professional can, unlike other existing simulators, be quickly and simply upgraded by a software license. No need to send your simulator back to us. Tell us what you need, and in a matter of minutes you’ll be up and running with a new GNSS system, frequency option, etc.

- **Unique RF Output Structure**
  As an option up to 4 fully independent but also phaseable RF outputs can be installed. Today or subsequently, along with your requirements. The (possibly fifth) original output delivers a monitor RF signal that summarizes all others.

- **Remote Motion Data / Hardware in the Loop**
  The high-performance signal generation empowers 6 degrees of freedom (6DOF) Remote Motion Data streaming in real-time. NavX-NCS’s interface is therefore fully capable of Hardware in the Loop (HIL) applications.

- **Custom Made ... for You**
  You can configure the NavX®-NCS Professional with just what you require today. No need to be tied to features you may never need. Add new capabilities as your testing requirements grow.

- **Remote control capability via Ethernet control interface**
  Remote control capability via Ethernet control interface allows users to control the NavX®-NCS Professional from any remote location.

- **1 PPS out and 10 MHz reference in / out**
  The NavX®-NCS Professional provides a 1 PPS output and 10 MHz reference input/output for synchronization purposes.

- **Remote control capability via Ethernet**
  Remote control capability via Ethernet allows users to control the NavX®-NCS Professional from any remote location.

- **Extension of signal capability by software**
  The NavX®-NCS Professional enables users to extend signal capability through software.

- **12 - 108 signal channels**
  With up to 108 signal channels, current multi-GNSS receivers can be tested with just one NavX®-NCS Professional. For more demanding applications with up to 216 signal channels, two NavX®-NCS Professional devices can easily be synchronized.

- **Advanced graphical user interface (GUI)**
  The high-performance signal generation empowers 6 degrees of freedom (6DOF) Remote Motion Data streaming in real-time. NavX-NCS’s interface is therefore fully capable of Hardware in the Loop (HIL) applications.

- **Antenna patterns**
  The NavX®-NCS Professional supports various antenna patterns for different applications.

- **Extensive signal propagation modelling**
  The NavX®-NCS Professional includes comprehensive signal propagation modelling for advanced testing requirements.

- **Space and user segment**
  Space and user segment capabilities are provided for precise simulation of GNSS environments.

- **Flexible user trajectory generation**
  The NavX®-NCS Professional offers flexible user trajectory generation capabilities for realistic testing scenarios.

- **Full constellation, user and vehicle**
  The NavX®-NCS Professional supports full constellation, user, and vehicle simulations.

- **Intuitive operation allows easy configuration and control**
  The intuitive operation of the NavX®-NCS Professional allows for easy configuration and control of the simulator.

- **External event trigger input**
  The NavX®-NCS Professional supports external event trigger input for precise synchronization.

- **Antenna Diversity**
  Two antennas of the same type but with different orientation at the same receiver.

- **Heading Determination**
  Two antennas with the same orientation at one receiver.

- **Differential GNSS**
  Static reference receiver and mobile rover.

- **Dual Tracking**
  Two antennas with different gain patterns optimized for special visibility at the same receiver.

- **Multi-RF Applications**
  Discover the perfect test solution for all types of GNSS Multi-RF applications. The innovative Multi-GNSS Multi-RF option sets new standards in the field of satellite constellation simulation. Designed to deliver maximum flexibility, users are no longer faced with limitations.

- **Attitude Determination**
  3 or 4 antenna based attitude determination.

- **Formation Flying**
  Spacecraft formation flying with up to 4 spacecrafts.

- **Radio Occultation (RO) and Precise Orbit Determination (POD)**
  A 3 antenna approach with Dual-Frequency and Multi-GNSS capability.

- **CRP Applications**
  Test your steered antenna beam array applications with 4 antennas for multipath mitigation, interference suppression, anti-spoofing and more. You need more than 4 antennas for your sophisticated CRPA application? Ask us for a solution.
NavX®-NCS Professional Datasheet

GPS/GNSS Navigation Constellation Simulator

Supported GNSS and Augmentation System Capability
- GPS (L1, L2/L2C, L5; C/A & P-Code)
- GLONASS (G1, G2; C/A & P-Code)
- Galileo (E1 BOC/CBOC, E5ab AltBOC, E6; OS, CS, Sol., PRS-Noise)
- BeiDou (B1, B2; Open Service)
- QZSS (L1; C/A, SAIF & IMES)
- SBAS (L1, L5; EGNOSS, WAAS, MSAS, GAGAN)

Configuration and Control
- Time, date and user position
- Support of user trajectories
- Pre-configured simulations available
- Low-latency, high-rate remote control capability

Space and User Segment
- Import of YUMA and legacy (AGL) almanac files
- Import of RINEX navigation files
- Import of navigation message content from file
- Definition of orbit parameters per satellite
- Single-step constellation generator
- Simulation of feared events
- Definition of satellite clock characteristics
- Definition of antenna patterns
- Definition of various user vehicle motion models (6DOF)
- Definition of arbitrary elevation masks

Signal Propagation
- Definition of terrain obstructions
- Configuration of various multipath scenarios
- Definition of tropospheric and ionospheric influences

User Trajectories
- Predefined user trajectories available
- Import of NMEA files

Analysis and Interactive Control
- Display and monitoring of simulation data during run-time
- Interactive control of signal parameters during run time
- Export of various simulation data to file

Frequency Bands
- GPS L1: 1,575.42 MHz
- GPS L2/L2C: 1,227.60 MHz
- GPS L5: 1,176.45 MHz
- Galileo E1: 1,575.42 MHz
- Galileo E5ab: 1,171.79 MHz
- Galileo E6: 1,278.75 MHz
- GLONASS G1: 1,602.00 MHz
- GLONASS G2: 1,246.00 MHz
- BeiDou B1: 1,561.10 MHz
- BeiDou B2: 1,207.14 MHz
- QZSS L1: 1,575.42 MHz
- SBAS L1: 1,575.42 MHz
- SBAS L5: 1,176.45 MHz

Modulation Schemes
- BPSK, QPSK, BOC, CBOC, FDMA
- AltBOC, Tri-Phase Interplex (CASM)

Hardware Flexibility
- Up to 9 carriers in a single chassis
- Up to 108 physical channels per chassis
- One to four independent RF outputs per chassis (for simulation of multiple antennas simultaneously)

Signal Dynamics
- Max. velocity (LOS) ± 22,800 m/s
  (± 600 m/s)*
- Max. acceleration ± 1,570 m/s²
- Max. jerk ± 15,600 m/s³

Signal Accuracy
- Pseudorange < 1.0 mm RMS
- Pseudorange rate < 1.0 mm/s RMS
- Interchannel bias zero
- Intermodule bias ± 1.0 ns

Signal Quality
- Spurious (max.) < -70 dBc
- Harmonics (max.) < -100 dBc
- Phase noise (max.) < 0.005 rad RMS
- Frequency stability (24h) < ± 5 x 10⁻¹⁰

Nominal RF Signal Levels
- RF signal output (max.) -90 dBm
- RF signal output (min.) -170 dBm
- RF monitoring port -60 dBm
  (Not affected by optional internal noise generator)

Signal Level Control
- Dynamic Range 80.0 dB
- Resolution 0.1 dB
- Accuracy ± 0.1 dB

Internal Noise Generator (Optional)
- Noise Level (max.) -110.0 dBm
- Noise Level (min.) -174.0 dBm
- Resolution 0.1 dB
- Accuracy ± 0.1 dB

Signal Specifications

Supported GNSS and Augmentation System Capability
- GPS (L1, L2/L2C, L5; C/A & P-Code)
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- Galileo (E1 BOC/CBOC, E5ab AltBOC, E6; OS, CS, Sol., PRS-Noise)
- BeiDou (B1, B2; Open Service)
- QZSS (L1; C/A, SAIF & IMES)
- SBAS (L1, L5; EGNOSS, WAAS, MSAS, GAGAN)

Hardware Features

Input Interfaces
- Power supply 85 – 264 VAC, 40-70 Hz
- Ethernet control RJ45
- 10 MHz reference (sine wave) BNC
- Hardware trigger input BNC

Output Interfaces
- 1 - 5 RF signal outputs (front side) N
- RF monitoring port (rear panel) SMA
- 10 MHz reference (sine wave) BNC
- 1 Pulse Per Second (1 PPS) BNC

Plug-In Signal Generation Engines
- MERLIN up to 9 modules
- Channels per engine 12

Physical Parameters Simulator Chassis
- Mounting 19” rack mounting, 2 HU
- Size (H x W x D) 86 x 483 x 570 mm
  (3.4” x 19” x 22.6”)
- Weight < 10 kg (< 31 lb)
- Power consumption < 120 W
- Operating Temperature -10°C to +55°C
- Storage Temperature -40°C to +70°C

Controller PC
- Controller PC HW INTEL based
- Operating System MS Windows® 7
- Control SW NCS Control Center

* Limited velocity for Export License Free (LF) due to German Export Control

Comprehensive user trajectory generation

Outstanding data visualization
For All Your GNSS Test Needs
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