



# Constellator™

multi-constellation & multi-frequency GNSS Simulator

## The flagship GNSS simulator that grows with your needs For DESIGN, VALIDATION and PRODUCTION

The history of Constellator™ started more than 20 years ago with the first simulator for Galileo. Its singularity lies in the tight coupling of SDR (Software Defined Radio) and state-of-the-art RF Analog front-end.

Today, RTGS4 represents Syntony's 4th generation of simulators. It has been designed to meet the highest requirements in terms of fidelity, performance, flexibility and ease of use at an affordable cost.

### Powerful & High-Fidelity

- ▶ Realtime, Multi-constellation and Multi-frequency  
GPS, Galileo, GLONASS, QZSS, IRNSS/NavIC, BeiDou, SBAS, Encrypted signals.
- ▶ Powerful with up to 660 L1 C/A equivalent signals  
Use Constellator to its full potential with 32, 240 or 660 signals.
- ▶ From simple trajectories to complex extreme dynamics  
Create trajectories in seconds, on earth, in the air or even in space.
- ▶ Hardware-in-the-loop with zero effective latency  
Even with 6 DoF, at 1 000 Hz iteration rate and with 3 simultaneous frequencies.

### Extremely configurable for advanced simulations

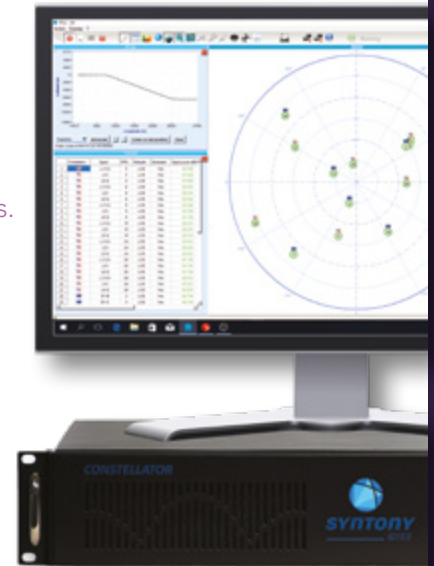
- ▶ Rich multipath and terrain obscuration, with one click presets  
Leverage our library of customizable models (urban, suburban, highway...).
- ▶ Advanced troposphere & ionosphere 3D models  
UNB, Klobuchar, Nequick, Customizable grid.
- ▶ On the fly scenario modifications & extensive simulation options  
Easily test the effect of errors in satellite position, clock and messages.
- ▶ Leverage extensive testing reports in realtime as a source of truth data  
Leverage 25+ environment variables and 20+ variables per satellite in view.
- ▶ Ready for interference, jamming and spoofing tests  
Use one or multiple simulators for advanced integrity tests, even for CRPA.

### Easy to setup and use

- ▶ Simple local or remote control & quick integration  
User-friendly GUI or control via commands.
- ▶ Smooth hardware setup, ready for multi-antenna or multi-receiver  
Interfaces: 10 MHz Clock reference (IN & OUT), triggers, PPS IN & OUT.
- ▶ Extensive documentation, scenario library available & local support  
User guides, ICD, Python script examples & .xls tools for data structure.

### Built to evolve with your testing requirements

- ▶ Software-defined-radio architecture allowing remote updates  
Most of new signals and features are software updates only.
- ▶ Do you need a specific feature? We are flexible & can build it custom.  
Space agencies & industry leaders already benefit from our custom services.



#### SPACE & DEFENSE



#### AVIATION



#### TELECOM & 5G



#### AUTOMOTIVE





# Constellator™

## RTGS4 - Specifications

### SIMULATION

#### Constellations & Signals

GPS	L1 C/A, L1 C, L2 C, L5, L1P(Y), L2P(Y)
Galileo	E1, E5a, E5b, E6
GLONASS	L1OF, L1OC, L2OF, L2OC, L3OC
QZSS	L1 C/A, L1C, L2C, L5
IRNSS/NavIC	L5, S
BeiDou	B1I, B1C, B2a, B3I
SBAS	L1, L5 (EGNOS, WAAS, GAGAN, MSAS, SDCM, SNAS)
Other signals or features	L1P(Y), L2P(Y), IRNSS RS signals through PRN Link option

#### Performance

Channels extension	Up to 660 equivalent L1 C/1 signals
RF Channels	Up to 7 independent RF outputs
HWIL Refresh Rate	up to 1 000 Hz
Pseudorange Accuracy	<1 mm for all bands simultaneously

### SIMULATOR

#### Connectivity

RF Output Connector	3xSMA Mono-Band and 1xN female Multi-Band
Int. 10 MHz Reference Output	BNC female
Ext. 10 MHz Reference Input	BNC female
External Trigger In/Out	BNC female, TTL Level, 5V DC, Configurable Timing & Pulse widths
PPS in, PPS out	BNC female, 1Hz rate, PPS-In 5 Volts, PPS-out 3 Volts, +/- 5 ns from RF output
GUI/Network Connector	RJ45 (1Gb/s)
Dedicated HWIL Connector	RJ45 (1 Gb/s)
PRN Link	RJ45 (10 Gb/s)



### HARDWARE

	2U	4U
Package	2U	4U
Size (W x H x D)	430 x 88 x 510 mm / 17 x 3.5 x 20 in	430 x 177 x 472 mm / 17 x 7 x 18.5 in
Weight	12 kg / 26.5 lb	20 kg / 44 lb
Input Voltage Range	100 to 240 V AC +/-10%	100 to 240 V AC +/-10%
Input Frequency Range	50 to 60 Hz	50 to 60 Hz
Power Consumption	120 W	120 W
Operating Temp. Rang	+10 to +40 °C	+10 to +40 °C
Storage Temp. Range	-20 to +70 °C	-20 to +70 °C

### RF FRONT END

#### RF Output

Frequency Range	From 1 100 MHz to 1 610 MHz and from 2 450 to 2 550 MHz
RF Bandwidth	20 up to 25 MHz
RF Power (@50 Ohm)	From -55 to -110 dBm 0.1 dB resolution +/- 0,1 dB Power Accuracy
Output VSWR	< 1.3
Supported VSWR	∞ (permanent)

#### RF Quality

Harmonic Spurious	< -65 dBc min
Non-harmonic Spurious	< -55 dBc (SF dependent)
RMS Jitter	104 fs
Group Delay Variation	< 15ns @ BW = 55 MHz
Group Delay Stability	< 10ps/°C @ BW = 55 MHz
Phase Noise	<5.10 <sup>-3</sup>

#### Synthesizer - Internal 10 MHz Reference

Signal	Sinus
Stability	5.10 <sup>-9</sup> from +10°C to +40°C
Aging	0.2 ppb/day and 10 ppb/year
Allan Variance (1s)	2x10 <sup>-12</sup>

#### Synthesizer - Internal 10 MHz Reference Output

Signal	Sinus
Impedance	50 Ohm
Level	6 dBm

#### Standard Dynamics Extended Dynamics

Altitude	<100 km	No limitation
Acceleration	No limitation	No limitation
Velocity	< 600 m/s	No limitation
Jerk	No limitation	No limitation

Whether the objective of your GNSS appliance is to protect critical infrastructures and/or become a business driver, RTGS4 is speeding up your time to market by saving time, money and testing efforts.

Each instrument comes with 1 Multi RF output and 3 Mono RF outputs, simulating up to 32, 240 or 660 L1 C/A equivalent signals.

More RF outputs can be added to RTGS4-14 and 24 units, up to 16 RF outputs or more. Interference signals are generated through JINN Server, deeply coupled with RTGS4-1x and RTGS4-2x instruments.

### Base configurations



RTGS4-02	RTGS4-12	RTGS4-14	RTGS4-24
<ul style="list-style-type: none"> <li>Standard 2U unit</li> <li>32 signals,</li> <li>Constellator Simulation Software</li> <li>2 Constellations, 2 Bands</li> </ul>	<ul style="list-style-type: none"> <li>Standard 2U unit</li> <li>240 signals,</li> <li>Constellator Simulation Software</li> <li>(Signals &amp; Bands to be added individually)</li> </ul>	<ul style="list-style-type: none"> <li>Standard 4U unit</li> <li>240 signals,</li> <li>Constellator Simulation Software</li> <li>(Signals &amp; Bands to be added individually)</li> </ul>	<ul style="list-style-type: none"> <li>Standard 4U unit</li> <li>660 signals,</li> <li>Constellator Simulation Software</li> <li>(Signals &amp; Bands to be added individually)</li> </ul>

Constellator's singularity lies in the **tight coupling of SDR (Software Defined Radio) and state-of-the-art RF Analog front-end**. Top-end processing performance and superior RF quality are now met into a COTS appliance with utmost flexibility in simulation control.

### Options

RTGS4_Constellations	GPS, Galileo, GLONASS, QZSS, IRNSS/NavIC, Beidou
RTGS4_Bands	L1, L2, L5, S-Band, L1C, L2C, L1P, L2P
RTGS4_SBAS	L1, L5 (EGNOS, WAAS, GAGAN, MSAS, SDCM, SNAS)
RTGS4_Dynamics	Standard Dynamics limits in Altitude, Acceleration, Velocity, Jerk for simulated trajectories
RTGS4_Ext.Dynamics	Dynamics limits extended for simulated trajectories > 600 m/s (requires Export Licence)
RTGS4_Dynamic Trajectory Replay	User-defined precise trajectory input (binary format) - conversion tools included
RTGS4_HWIL	Hardware-in-the-loop feature supporting real time vehicle trajectory data (receiver position, dynamic and attitude from the test-rig in real time) up to 100 times per second (100 Hz refresh rate, zero-effective latency)
RTGS4_HWIL_Ext	Hardware-in-the-loop feature supporting real time vehicle trajectory data (receiver position, dynamic and attitude from the test-rig in real time) up to 1 000 times per second (1 000 Hz refresh rate, zero-effective latency)
RTGS4_Space	All Space trajectories configuration (Keplerian parameters, or initial position and velocity), Altitude > 100 km, Earth-tangent masking, Space dedicated 3D ionospheric models, GNSS transmitting antenna gain patterns, specific for each signal & satellites, to model side lobes (Extended Dynamic option mandatory)
RTGS4_PRN Link	Input card for encrypted signals (GPS-L1P(Y), L2P(Y), IRNSS RS or any other encrypted signal on demand)
RTGS4_JINN	External Interference Server generating continuous waveforms, narrowband and wideband interferences as well as pulsed interferences (e.g. DME, JTIDS and Radar)
RTGS4_CRPA	Controlled radiation pattern antenna (CRPA) simulation up to 16 elements

# The future of navigation is software

Since 2015, Syntony has become a leader in the GNSS industry. Syntony offers unique location solutions allying Software-Defined Radio (SDR) and state-of-the-art RF Analog front-end.

Easy to setup and use, the Syntony solutions are built to evolve with our clients needs, and inherit from 20 years of R&D and collaboration with space agencies and industry leaders.

## For more information

Visit our website:  
**[syntony-gnss.com](http://syntony-gnss.com)**

Contact us:  
**[contact@syntony.fr](mailto:contact@syntony.fr)**



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## Syntony Offices



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Certifications Safety

EN/IEC 61010-1:2010  
ROHS, 2011/65/EU

Emissions

EN 61326-1:2013  
FCC Part 15 : 2016 – Verification  
(Section 2.902 47 CFR)