



# 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

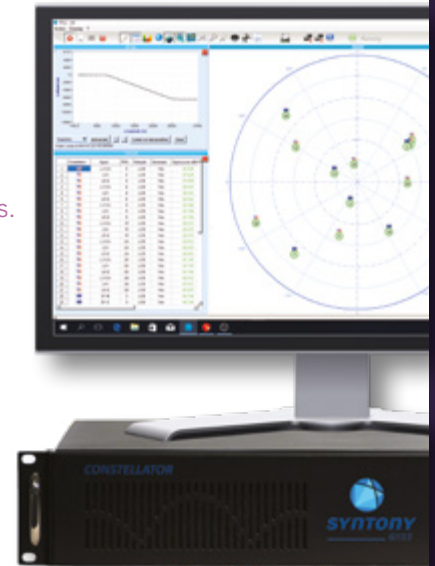
- ▶ Rich multipath and terrain obscuration, with one click presets  
Leverage our library of customizable models (urban, suburban, highway...).
- ▶ Advanced troposphere & ionosphere 3D models  
UNB, Klobuchar, Nequick, Customizable grid.
- ▶ On the fly scenario modifications & extensive simulation options  
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	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
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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 to ensure safety and efficiency to its customers.

Syntony's solutions are competitive, exclusive and performant. Syntony know-how was inherited from 20 years of R&D and collaboration with industry leaders.

## For more information



Visit our website:

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

Or contact us:

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

** [@Syntony\\_GNSS](https://www.linkedin.com/company/Syntony_GNSS)**

## Syntony Offices



**TOULOUSE - PARIS - NEW YORK - SAN FRANCISCO - MONTREAL**



### 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)

### Warranty & Support

1 year warranty for all instruments, both hardware and software including software updates, phone and email support. Warranty extension & Maintenance Contract are available on demand.