



# GSG-55

## GPS 16-channel Simulator

- Versatile 16-channel GPS signal generator with pre-configured test scenarios
- Operates with StudioView™ for easy trajectory creation via Google Maps
- SBAS (WAAS, EGNOS) simulation
- Configurable multipath simulation
- White noise generator for receiver SNR testing
- Fully operational via front-panel, web-based remote control, or SCPI protocol
- Multiple interfaces for remote control
- Affordable, powerful, and easy-to-use



The GSG-55 is a GPS constellation simulator that expands on the set of features of the popular GSG-54, adding 16-channel simulation, SBAS simulation and white noise generation. These new features make the GSG-55 capable for in-line production testing, including navigational fix and position testing, for engineering and development of even more applications than the GSG-54.

### Easy to Use

The GSG-55 user can configure scenarios on-the-fly without the need for an external PC and pre-compilation phase. Via the front panel, the user can swiftly modify parameters such as user position, time and specify output powers in carrier-to-noise ratio instead of absolute output power. Utilizing the white noise generation extends the usability and flexibility. And using the optional StudioView™ software facilitates easily created scenarios via a Google Maps interface.

### Flexibility

The GSG-55 16-channel simulator makes it possible to simulate all the visible satellites for the receiver under test. In addition, other channels can be used for SBAS simulation of EGNOS or WAAS satellites, or for simulating multipath. If more channels are required, simply synchronize two or more units via the external 1PPS sync signal to generate 32, 48, ..., channel simulation. Some restrictions apply.

GSG-55 is shipped with several multipath scenarios where the receivers' response to an increased multipath environment can be analyzed. It also has a set of built-in trajectories (static, configurable circle, and rectangular as defined in 3GPP TS 25.171) or the user can upload their own trajectories in NMEA standard format. The user can upload their own ephemeris data in standard RINEX format or re-use the default data for any time periods. GSG-55

can even automatically download historical RINEX, WAAS and EGNOS data from official websites, as needed.

### Connectivity Extends Ease of Use and Flexibility

The GSG-55 can be controlled via an Ethernet network connection, USB or GPIB. A built-in web interface allows complete operation of the instrument through front panel controls. With the optional GSG StudioView™ PC Software, you can build, edit, and manage the most complex scenarios, including building trajectories via Google Maps, independent of the GSG-55, for later upload.

### Suitable for Testing Timing Receivers

Besides the variety of built-in navigation/positioning tests, the GSG-55 is also suited for accurate testing of timing GPS-receivers. The GSG-55 can be equipped with an ultra-high-stability OXCO timebase for precision timing of the satellite data, or use external synchronization from a 10 MHz reference from e.g. a Cesium or Rubidium clock. A built-in 1-pps output, synchronized to the generated satellite data, allows comparison with the 1-pps signal from the timing receiver under test.

### The Affordable Test Solution

The GSG-55 is a perfect fit for a wide-variety of test cases including: Test of simulated movements (user trajectories).

- Test of receivers' sensitivity to loss of satellites, multi-path, leap seconds, and atmospheric conditions.
- Fast production test of sensitivity and positioning receivers' accuracy (conducted or over-the-air).
- Test of timing receiver accuracy.
- Test of receivers' dynamic range.
- Test of receivers' susceptibility for noise (SNR limit testing).
- Test of leap second transition.

## Input and Output Specifications

### RF Signal GPS L1

**Connector:** Type N female

**Frequency:** 1575.42 MHz (L1)

**Number of output channels:** 16

**Channel configuration:**

16 GPS satellites

Up to 3 WAAS or EGNOS satellites

(instead of 1-3 GPS satellites)

White noise channel

**Data format:**

50 bits/s, GPS frame structure

250 bits/s, SBAS

**PRN codes:** 1 to 210

**Spurious transmission:** <-40 dBc

**Harmonics:** <-40 dBc

**Output signal level:** -65 to -160 dBm;

0.1 dB resolution down to -150 dBm;

0.3 dB down to -160 dBm.

**Power accuracy:**  $\pm 1.0$  dB

**Pseudorange accuracy:** 1mm

**Inter-channel bias:** Zero

**Inter-channel range:** >54 dB

**Limits:**

- Altitude: 18,240 m (60,000 feet)
- Acceleration: 4.0 g
- Velocity: 515 m/s (1000 knots)
- Jerk: 20 m/s<sup>3</sup>

Order GSG-55E to extend these limits to:

- Altitude: 20,200 km
- Acceleration: No limit
- Velocity: 20,000 m/s (38874 knots)
- Jerk: No limit

**White noise signal level:** -50 to -160 dBm

0.1 dB resolution down to -150 dBm;

0.3 dB down to -160 dBm.

$\pm 1.0$  dB accuracy

### External Frequency Reference Input

**Connector:** BNC female

**Frequency:** 10 MHz nominal

**Input signal level:** 0.1 to 5Vrms

**Input impedance:** >1k $\Omega$

### Frequency Reference Output

**Connector:** BNC female

**Frequency:** 10 MHz sine

**Output signal level:** 1Vrms in to 50  $\Omega$  load

### External Trigger Input

**Connector:** BNC female

**Frequency:** TTL level, 1.4V nominal

### TPPS Output

**Connector:** BNC female

**Output signal level:**

approx. 0V to +2.0V in 50  $\Omega$  load

**Accuracy:** Calibrated to  $\pm 10$  nSec of RF timing mark output

### Built-in Timebase

**Internal Timebase – Standard OCXO**

**Ageing per 24 h:** < $5 \times 10^{-9}$

**Ageing per year:** < $2 \times 10^{-7}$

**Temp. variation 20...26°C:** < $2 \times 10^{-8}$

**Short term stability (Adev @1s):** < $1 \times 10^{-10}$

**Optional Internal Timebase (option 40/54)**

**Ultra-High-Stability OCXO**

**Ageing per 24 h:** < $3 \times 10^{-10}$

**Ageing per year:** < $1.5 \times 10^{-8}$

**Temp. variation 20...50°C:** < $2.5 \times 10^{-9}$

**Temp. variation 20...26°C:** < $4 \times 10^{-10}$  typ.

**Short term stability (Adev @1s):** < $5 \times 10^{-12}$

### Auxiliary Functions

#### Interface

GPIB (IEEE-488.2), USB 1.X or 2.X (USB-TMC-488), Ethernet (100/10 Mbps)

#### Settings

**Predefined scenarios:** 12;

User can change date, time, position, trajectory, number of satellites, satellite power level and atmospheric model

**User defined scenarios:** Unlimited

**Trajectory data:** NMEA format (GGA or RMC messages, or both), convert from other formats with GSG StudioView™ (see separate datasheet)

### General Specifications

#### Certifications

**Safety:** Designed and tested for Measurement Category I, Pollution Degree 2, in accordance with EN/IEC 61010-1:2001 and CAN/CSA-C22.2 No. 61010-1-04 (incl. approval)

**EMC:** EN 61326-1:2006, increased test levels per EN 61000-6-3:2001 and EN 61000-6-2:2005

#### Dimensions

**WxHxD:** 210 x 90 x 395 mm (8.25" x 3.6" x 15.6")

**Weight:** approx. 2.7 kg (approx. 5.8 lb)

### Optional Antenna

**Frequency:** 1575.42  $\pm 2$ MHz

**Impedance:** 50  $\Omega$

**VSWR:** <2:1 (typ)

**Connector:** SMA male

**Dimensions:** 12 mm diameter x 38 mm length

### Environmental

**Class:** MIL-PRF-28800F, Class 3

**Temperature:** 0°C to +50°C (operating); -40°C to +70°C non-condensing @

<12,000 m (storage)

**Humidity:**

5-95 % @ 10 to 30°C

5-75 % @ 30 to 40°C

5-45 % @ 40 to 50°C

### Power

**Line Voltage:** 90-265 Vrms, 45-440 Hz

**Power Consumption:** <25 W

### Ordering information

#### Basic Models

**GSG-55:** GPS 16-channel simulator; with standard OCXO timebase

**GSG-55E:** GPS 16-channel simulator; extended limits, export restrictions apply

#### Included with instrument

- User manual and GSG StudioView software (30-day trial) on CD
- RF cable, 1.5 m
- SMA to Type N adapter
- USB cable
- Certificate of calibration
- 3-year warranty

#### Built-in Options

**Option 40/54:** Ultra-high-stability OCXO instead of standard OCXO

#### Optional Accessories

**Option 01/70:** Helix Antenna

**Option 22/90:** Rack-mount kit

**Option 27H:** Heavy-duty hard transport case

**Option 90/54:** Calibration Certificate with Protocol

**Option 95/05:** Extended warranty to 5 years

**OM-54:** Users Manual (printed)

**GSG StudioView PC Software:** License key enables full functionality, one key required per machine (file transfer functionality is available without a key)