

# GPSG-1000

GPS/Galileo Portable Positional Simulator

AEROFLEX



Versatile time-saving portable test set for GPS/GALILEO receivers

- GPS signals simulated: L1, L1C\*, L2C\*, L5\*
- Galileo signals simulated: E1, E5\*\*, E5a\*\*, E5b\*\*
- Simultaneous GPS/Galileo simulation
- WAAS/EGNOS SBAS simulation
- Static and dynamic simulations via NMEA-0183 File Record and Playback
- 6 or 12 channel configurations available with upgrade path (RAIM supported)
- Programmable space vehicle (SV) parametrics and health
- User or built-in GPS receiver referenced time and date
- PVT data available via RS-232
- User Defined Data Transferable between Linked GPSG units
- Remote control interface Ethernet

\* For tracking of L1C, L2C or L5 signals some receivers require synchronized L1 transmissions.

\*\* For tracking of E5 signals some receivers require synchronized E1 transmissions.

## General

The GPSG-1000 is a single carrier, multi-channel simulator designed to be software upgradable.

## Applications

- General testing of civil GPS and Galileo receivers
- Limited testing of military GPS receivers, L1 C/A code or L1 (P)Y pseudo code only



## Channels

The six channel GPSG-1000 configuration provides 3D positional simulation with five channels for RAIM operation and one channel may be allocated to SBAS simulation.

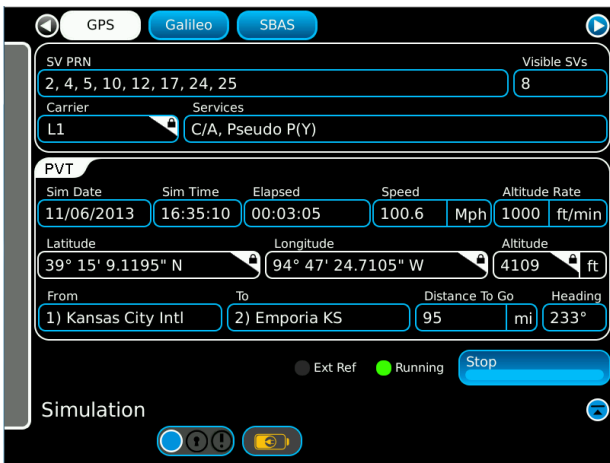
The twelve channel GPSG-1000 configuration provides the same capability as the six channel unit, plus six additional channels. This allows any combination of visible SVs to be selected. One or two channels may be allocated to SBAS simulation.

For the very latest specifications visit [www.aeroflex.com](http://www.aeroflex.com)

## Simulation

The Simulation page shows the selected GNSS signals generated and provides a PVT (Position, Velocity and Time) display. The data displayed also includes the current waypoint leg, heading and distance to go.

In the Static mode of operation, a 3D position may be user entered in Latitude/Longitude/Height format. Almanac data is derived either from the built-in L1 C/A Code GPS receiver or via an external file load. Positional simulation may also be synchronized to UTC via the receiver.

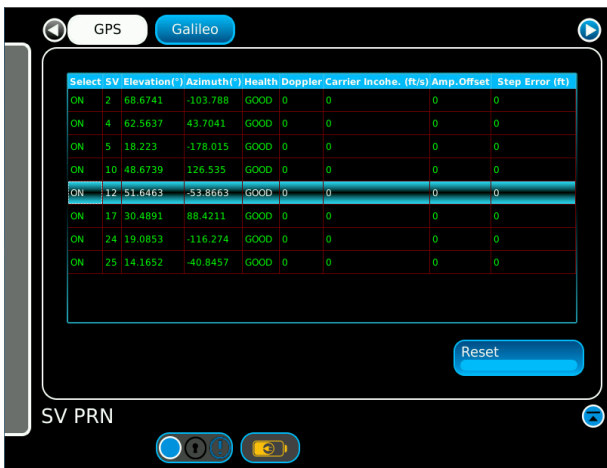


## SV Selection

All GPSG-1000 configurations allow GPS and Galileo satellites to be mixed. SVs are allocated automatically for optimal geometry according to simulated position. The user may turn off individual SVs, to create scenarios with poor geometry for RAIM testing.

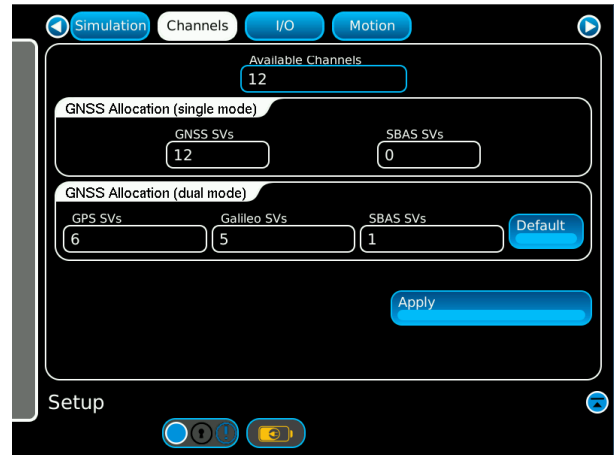
Each SV may have Doppler, Amplitude, Step Error and Code Carrier Coherence parameters deviated from nominal and Satellite Health set.

Signal Fading and Dynamic Signal Amplitude and Simulator RF level may be applied to all satellites.



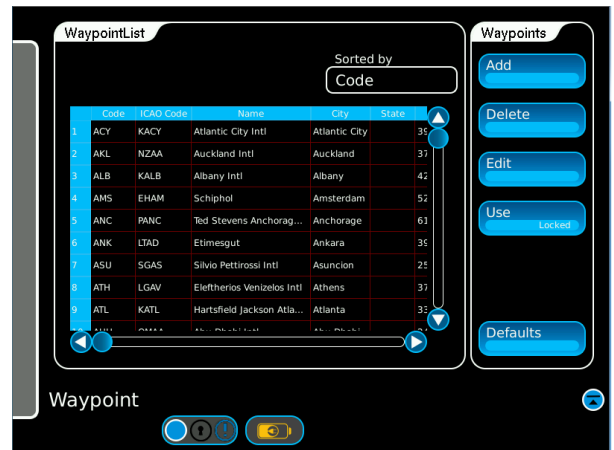
## SBAS

SBAS satellites WAAS/EGNOS are automatically allocated based on simulated position. The user can select the number of SBAS SVs that will be allocated during the positional simulation.



## Waypoints

Waypoints may be created and stored in Latitude/Longitude/Altitude form or automatically recalled from the provided waypoint data base organized by an airport or city. Waypoints may be selected for inclusion in a route in dynamic mode or as a single position in static mode.



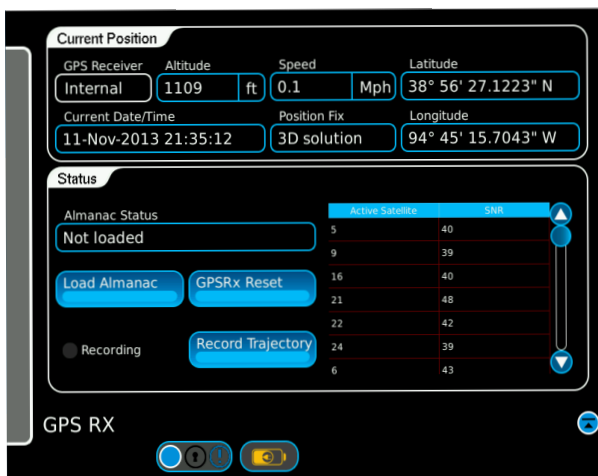
## Routes

In the Dynamic position mode of operation, the Route page may be used to sequentially enter user defined route points. Routes comprising of up to 10,000 route points, may be saved and recalled under a user entered route name, using the route file management system. Route points can be reordered, edited or deleted. 3D position data comprising Latitude, Longitude and Altitude may be manually entered, or selected from the waypoints page. Additional parameters that define a route point are Speed, Linear Acceleration and Altitude Rate. Turns may be executed at the route point, utilizing a user defined Turn Radius. Realistic turns are maintained to 10G. Routes may be defined to playback once, or continuously in an endless loop.



## Record and Playback

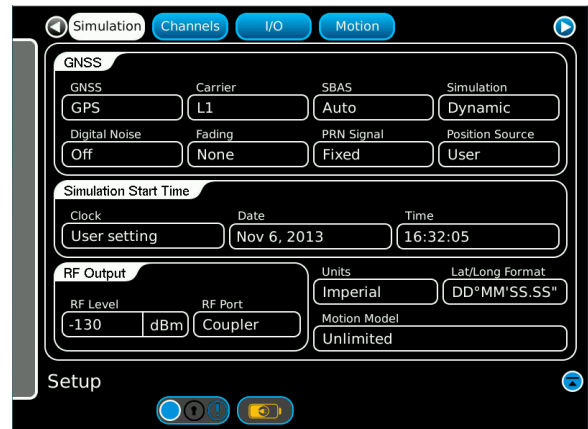
Data files can be created and played using the GPSG-1000 and its internal GPS receiver. The location of the unit in three dimensional space, time, date, and individual SV power information can be recorded as it is moved from point to point. This data can then be played back through the unit's trajectory simulation mode. The unit's trajectory simulation mode will also accept files containing NMEA 0183 messages for playback, giving the user the flexibility to use their own receiver to record data for playback.



## Setup

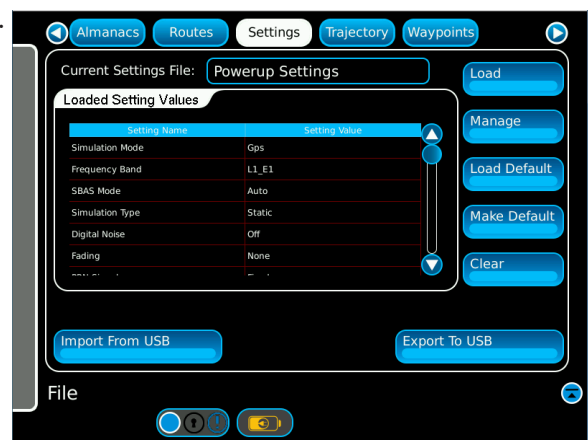
The Setup page is partitioned via a tab selection scheme to allow control for Simulation, Almanac, Channels and I/O.

The simulation tab provides controls for GNSS System Selection and Carrier, also Digital Noise, Multipath (fading) model selection, PRN RF Signal levels, Position Source, Simulation Type, SBAS, System Units, Motion Model selection, and Lat/Long Format selection.



## File

The file management system is partitioned via a tab selection scheme. File management is provided for almanacs, routes, trajectory, waypoints, and simulator settings. Facilities include loading, storage, and naming of files. Files for almanacs, routes, simulator settings, trajectory data and waypoints may be imported/exported to allow sharing between GPSG-1000 units.



# GENERAL SPECIFICATIONS

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## USER INTERFACE

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### Display

12" color LCD, sunlight readable with back light

### Controls

Touch screen

## ANTENNA COUPLER

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### Antenna Coupler

Cavity, patch

### Coupling

21 dB typical at 1575.42 MHz

### Isolation

>25 dB at 1575.42 MHz

>30 dB typical at 1575.42 MHz

## DIRECT CONNECTION PORTS

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### Impedance

50  $\Omega$

### SWR

1.3:1 maximum

### Connector

TNC x 2

### Coupling

AC (maximum DC input 50 V)

## GENERATOR

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### GPS Frequencies

L1: 1575.42 MHz (C/A, pseudo P(Y), SBAS)

L1C: 1575.42 MHz

L2: 1227.60 MHz (pseudo P(Y))

L2C: 1227.60 MHz

L5: 1176.45 MHz (New Civil SoL)

### Galileo Frequencies

E1: 1575.420 MHz (pseudo-PRS, [pseudo-G/NAV]), (OS, CS, SoL, [I/NAV])

E5: 1191.795 MHz center frequency

E5a: 1176.45 MHz (OS, (F/NAV))

E5b: 1207.14 MHz (CS, SoL, (I/NAV))

### Accuracy

Same as master oscillator

### Inter Channel Bias

Zero (digital design)

## Frame Sync Output

LVTTTL

## Channels

1-6, 1-12 SV simulation, selectable

GPS: PRN=1 to 32

Galileo: PRN=1 to 36

SBAS: PRN=120 to 138.

Positional simulation via menu entry of Latitude and Longitude or positional offset and waypoint.

## Positional Simulation

Static: Via user entry of Latitude/Longitude/Altitude or selectable from waypoint database.

Dynamic: Create, store and recall routes consisting of multiple route points.

## User Defined Doppler Error

Selectable frequency offset  $\pm 5.0$  kHz, 1 Hz increment

## Amplitude Offset

Sets SV carrier amplitude offset from main attenuator setting  $\pm 15$  dB in 1 dB increments.

## Step Error

Sets SV pseudo range error  $\pm 10$  km in 1 m increments (used for RAIM testing)

## Satellite Health

Allows selection of GOOD or BAD

## Code Carrier Coherence

Sets frequency variation between code carriers

Range 2 m/S

Increment 1 mm/S

## GPS CODES

### L1 C/A

#### Code Rate

1.023 Mc/s

#### Primary Sequence Length

1023 bits

#### Modulation

BPSK

#### Symbol Rate

50 sps

### SBAS

WAAS/EGNOS L1, L5

### L2C

#### Code Rate

0.5115 Mc/s

#### Sequence Length

10230/767250 bits

#### Modulation

BPSK

#### Symbol Rate

50 sps

**L1 P(Y) (not encrypted)****Code Rate**

10.230 Mc/s

**Sequence Length**

15345000 bits

**Modulation**

BPSK

Note: Long random codes simulated

**L1C****Code Rate**

10.230 Mc/s

**Sequence Length**

10230 bits

**Modulation**

BOC (1, 1)

**L5****Code Rate**

10.230 Mc/s

**Sequence Length**

10230 bits

**Modulation**

QPSK

**GALILEO SERVICES****E1****Pseudo G/NAV**

Long random codes simulated

**Code Rate**

2.5575 Mc/s

**Sequence Length**

25575 bits

**Symbol Rate**

100 sps

**Modulation**

Interplex/CBOC

**Sub Modulation**

BOC (15,2.5)

Note: PRS not supported

**E1****OS**

Complete implementation (I/NAV)

**CS**

Null message content (pseudo I/NAV)

**SoL**

Compliant, no integrity alerts (I/NAV)

**Code Rate**

1.023 Mc/s

**Sequence Length**

4092 (primary) x 1 (secondary) bits

**Symbol Rate**

250 sps

**Modulation**

Interplex/CBOC

**Sub Modulation**

CBOC(6,1,1)

**E5a****OS**

Complete implementation (F/NAV)

**Code Rate**

10.23 Mc/s

**Sequence Length**

10230 (primary) x 20 (secondary) bits

**Symbol Rate**

50 sps

**Modulation**

ALTBOC

**Sub Modulation**

None

**E5b****OS**

Complete implementation (F/NAV)

**CS**

Null message content (pseudo I/NAV)

**SoL**

Compliant, no integrity alerts (I/NAV)

**Code Rate**

10.23 Mc/s

**Sequence Length**

10230 (primary) x 4 (secondary) bits

**Symbol Rate**

250 sps

**Modulation**

ALTBOC

**Sub Modulation**

None

## Almanac

Obtainable from built-in GPS receiver or external file load in .alm format.

## NAV Data

Navigation data is computed in real-time to match the simulation.

## Positional Simulation

### Maximum Relative Velocity

$\pm 1000$  Kts (514 m/s)

### Maximum Relative Acceleration

$\pm 98$  m/s<sup>2</sup>

### Maximum Relative Jerk

$\pm 20$  m/s<sup>3</sup>

### Maximum Altitude

100,000 ft.

## Error Models

Atmospheric

## Positional Simulation Accuracy

### Pseudorange

<0.1 m

### Pseudorange Rate

$\pm 0.01$  m/s (RMS) with respect to master oscillator

## RF Output Level

### Direct

-93 to -155 in 1 dB step

### ANT Coupler

-68 to -130 in 1 dB step

$\pm 2$  dB accuracy into 50  $\Omega$  (AC coupled) standard cable, 4 dB loss

## Signal Quality

### Spurious

<-35 dBc over the bandwidth (40 MHz)

### Harmonics

<-45 dBc

## MASTER OSCILLATOR

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### Frequency

10 MHz nominal

### Temperature Stability

$\pm 0.05$  ppm

### Aging Rate

$\pm 0.3$  ppm/yr,  $\pm 2.5$  ppm/ 10 yr.

### Uncertainty

$\pm 1$  ppm

## External Reference Input

### Input Level

0.25 to 6.0 Vp-p

### Input Impedance

50 ohm nominal

## Input Frequency

10.0 MHz  $\pm 10$  Hz

## External Reference Output

### Output Level

1.5 Vp-p nominal into 50  $\Omega$

### Output Frequency

10.0 MHz nominal

## BATTERY

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14.4V 6.75Ah Lithium Ion

### Battery Temperature Range for Charging

0° to 45°C

## DC INPUT

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11-32 VDC

75 W max.

5 A max.

## ENVIRONMENTAL

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### Test Set Certifications

#### Operational Temperature

$-20^\circ \leq T \leq 55^\circ$  C

#### Storage Temperature

$-30^\circ \leq T \leq 71^\circ$  C

#### Operational Humidity

MIL-PRF-28800F Class 2

#### Storage Humidity

MIL-PRF-28800F Class 2

#### Altitude

$\leq 10,000$  feet

#### Vibration Limits

MIL-PRF-28800F Class 2

#### Shock, Functional

MIL-PRF-28800F Class 2

#### Transit Drop

MIL-PRF-28800F Class 2

#### Drip Proof

MIL-PRF-28800F Class 2

#### Dust

MIL-PRF-28800F Class 2

#### Salt

MIL-PRF-28800F Class 2

#### Explosive Atmosphere

MIL-STD-810F Method 511.4, Procedure 1

#### Safety Compliance

UL-61010:2001

#### CSA 22.2 No 1010.1

#### WEEE

## ROHS

## EMC

### Emissions

MIL-PRF28800F Class 2

EN 61326:1998 Class A

EN 61000-3-2

EN 61000-3-3

### Immunity

MIL-PRF28800F Class 2

EN 61326:1998 Class A

## External AC-DC Converter Certifications

### Safety Compliance

UL 1950 DS

CSA 22.2 No. 234

VDE EN 60 950

EMI/RFI Compliance FCC Docket 20780 Curve "B"

EMC EN 61326

## Transit Case Certifications

Drop Test FED-STD-101C Method 5007.1

Paragraph 6.3, Procedure A, Level A

Falling Dart Impact ATA 300 Category I

Vibration, Loose Cargo FED-STD-101C Method 5019

Vibration, Sweep ATA 300 Category I

Simulated Rainfall MIL-STD-810F Method 506.4 Procedure II of 4.1.2

FED-STD-101C Method 5009.1 Sec 6.7.1

Immersion MIL-STD-810F Method 512.4

## ENVIRONMENTAL (SUPPLIED EXTERNAL AC TO DC CONVERTER)

### Use

Indoors

### Altitude

≤10,000 feet

### Operating Temperature

5°C to 40°C

### Storage Temperature

-20°C to 71°C

## PHYSICAL CHARACTERISTICS

### GPSG-1000

#### Height

10.63 in. (27.0 cm)

#### Width

13.97 in. (35.5 cm)

#### Depth

3.425 in. (8.7 cm)

#### Weight (Test set only)

<10 lbs. (4.5 kg)

### ANTENNA COUPLER

#### Height

7.54 in. (191.5 cm)

#### Width

7.46 in. (189.5 cm)

#### Depth

7.46 in. (189.5 cm)

(Note: Maximum antenna height accommodated 1.5 in)

#### RF Gasket

Flexible seal

#### Connector

TNC

#### Positioning

By hand or with optional 8ft placement pole via hook.

#### Placement Security

Weighted peripheral bag

#### Multiple GPS Antenna Support

Supports two to three GPS antennas using optional antenna coupler kits.



## VERSIONS, OPTIONS AND ACCESSORIES

Order Number	Description
87339	GPSG-1000 6 Satellite Simulator
87715	GPSG-1000 12 Satellite Option

### Standard Accessories

88493	Transit case (qty 1)
67374	Power supply
87636	Antenna coupler
90113	RX Antenna
90114	Cable, coax 50 ft.
62302	Power cord (U.S)
64020	Power cord (European)
88037	Operation Manual (CD)
88038	Getting Started Manual (paper)

### Optional Accessories

87040	External battery charger
86196	Spare battery pack
90106	Kit, Antenna coupler placement pole 8 ft.
91136	Kit, CPLR Dual GPS Antenna System
91137	Kit, CPLR Triple GPS Antenna System
89023	Maintenance Manual (CD)

#### CHINA Beijing

Tel: [+86] (10) 6539 1166  
Fax: [+86] (10) 6539 1778

#### CHINA Shanghai

Tel: [+86] 21 2028 3588  
Fax: [+86] 21 2028 3558

#### CHINA Shenzhen

Tel: [+86] (755) 3301 9358  
Fax: [+86] (755) 3301 9356

#### FINLAND

Tel: [+358] (9) 2709 5541  
Fax: [+358] (9) 804 2441

#### FRANCE

Tel: [+33] 1 60 79 96 00  
Fax: [+33] 1 60 77 69 22

#### GERMANY

Tel: [+49] 89 99641 0  
Fax: [+49] 89 99641 160

#### INDIA

Tel: [+91] 80 [4] 115 4501  
Fax: [+91] 80 [4] 115 4502

#### JAPAN

Tel: [+81] (3) 3500 5591  
Fax: [+81] (3) 3500 5592

#### KOREA

Tel: [+82] (2) 3424 2719  
Fax: [+82] (2) 3424 8620

#### SCANDINAVIA

Tel: [+45] 9614 0045  
Fax: [+45] 9614 0047

#### SINGAPORE

Tel: [+65] 6873 0991  
Fax: [+65] 6873 0992

#### TAIWAN

Tel: [+886] 2 2698 8058  
Fax: [+886] 2 2698 8050

#### UK Stevenage

Tel: [+44] (0) 1438 742200  
Fax: [+44] (0) 1438 727601  
Freephone: 0800 282388

#### USA

Tel: [+1] (316) 522 4981  
Fax: [+1] (316) 522 1360  
Toll Free: 800 835 2352

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Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.