Avionics

GPSG-1000

GPS/Galileo Portable Positional Simulator

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
- SBAS satellites simulated:
  - WAAS/EGNOS L1, L5
- Static or multi-leg dynamic positional simulation via route & waypoint entry system
- 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
- Digital noise generation for direct connect testing of receiver
- Large color touch-screen display with simple user interface
- Remote control interface Ethernet
- A-GPS Option (Aeroflex 4400 support)**

* Phase III software release

** Contact factory for availability

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

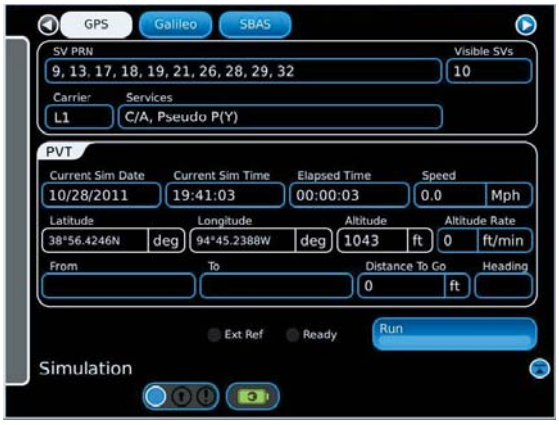
The six channel GPSG-1000 configuration provides 3D positional simulation with five channels for RAIM operation and one channel may be allocated to SBAS simulation.

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, two or three channels may be allocated to SBAS simulation.

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.

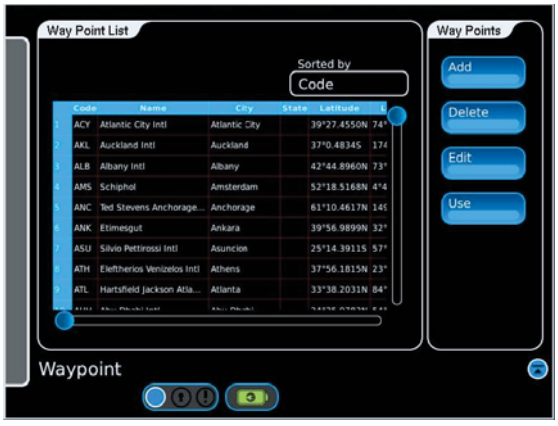
Signal Fading and Dynamic Signal Amplitude and Simulator RF level may be applied to all satellites.

SBAS

SBAS satellites WAAS/EGNOS are automatically allocated based on simulated position. The user can select the number of SBAS SVs that can be allocated and can selectively turn off individual SVs.

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 99 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.

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 and SBAS.

File

The file management system is partitioned via a tab selection scheme. File management is provided for almanacs, routes and simulator settings. Facilities include loading, storage, and naming of files.

A-GPS (Assisted GPS) – Option**

The A-GPS option allows the GPSG-1000 to be used in conjunction with the Aeroflex 4400 CDMA Mobile Phone Tester, to provide a comprehensive test of the mobile phone built-in GPS receiver using the A-GPS protocols.

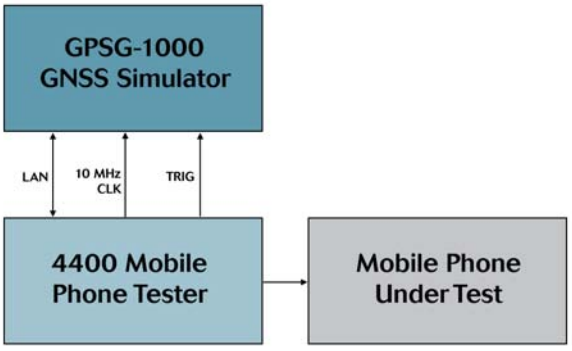
The GPSG-1000 provides a predefined scenario 62.5 min, or 5 navigation messages in length. Three data files are created after an initial real-time run of the simulation, which are provided over the Ethernet interface via a set of remote commands. The files are:

Acquisition: Time stamped data

Processed Navigation Data: Time stamped almanac and ephemeris data in engineering units

Raw Navigation Data: (5 messages) used for sensitivity assistance

The GPSG-1000 can store the scenarios and the relevant files generated in simulator memory using the settings storage facility provided in the GPSG-1000 GUI.



The 4400 utilizes the three file types, which are in a time stamped format, for creating assistance data that is sent to the phone under test upon request. The 4400, via the Ethernet interface, can arm the GPSG-1000 simulation and provide a hardware trigger of the simulation. The GPSG-1000 external 10 MHz clock is provided by the 4400, allowing the synchronization of the RF simulation with the data used in the simulation, stored in the 4400 memory.

For more information about the Aeroflex 4400, please use the following link:

http://www.aeroflex.com/ats/products/product/Communications_Test/Cellular_Parametric_Test/4400_Mobile_Phone_Tester_Series~756.html#

** Contact factory for availability

GENERAL SPECIFICATIONS

USER INTERFACE

Display

12” color LCD, sunlight readable with back light

Controls

Touch screen

ANTENNA COUPLER

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

Impedance

50 Ω

SWR

1.3:1 maximum

Connector

TNC x 2

Coupling

AC (maximum DC input 50 V)

GENERATOR

GPS Frequencies

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

L1C: 1575.42 MHz*

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))*

Glonass (future use)

1602 MHz (center)

Accuracy

Same as master oscillator

Inter Channel Bias

Zero (digital design)

* Phase III software release

Frame Sync Output

LVTTL

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 ±5.0 kHz, 1 Hz increment

Amplitude Offset

Sets SV carrier amplitude offset from main attenuator setting ±15 dB in 1 dB increments.

Step Error

Sets SV pseudo range error ±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

TBC

Symbol Rate

TBC

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

* Phase III software release

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

±1000 Kts (514 m/s)

Maximum Relative Acceleration

±50 m/s²

Maximum Relative Jerk

±20 m/s³

Maximum Altitude

60,000 ft.

Error Models

Atmospheric

** Contact factory for availability

Positional Simulation Accuracy

Pseudorange

<0.1 m

Pseudorange Rate

±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

±2 dB accuracy into 50 Ω (AC coupled) standard cable, 4 dB loss

Signal Quality

Spurious

<-35 dBc over the bandwidth (40 MHz)

Harmonics

<-45 dBc

*A-GPS OPTION***

Simulation run time 62.5 min (5 navigation messages)

Simulation Trigger

LVTTL Input

Simulation Data Files

Acquisition (time stamped)

Processed Navigation Data - almanac and ephemeris (time stamped)

Raw Navigation Data

MASTER OSCILLATOR

Frequency

10 MHz nominal

Temperature Stability

±0.05 ppm

Aging Rate

±0.3 ppm/yr, ±2.5 ppm/ 10 yr.

Uncertainty

±1 ppm

External Reference Input

Input Level

0.25 to 6.0 Vp-p

Input Impedance

50 ohm nominal

Input Frequency

10.0 MHz ±10 Hz

External Reference Output

Output Level

1.5 Vp-p nominal into 50 Ω

Output Frequency

10.0 MHz nominal

BATTERY

14.8V 6.6Ah Lithium Ion

Battery Temperature Range for Charging

0° to 45°C

ENVIRONMENTAL

Test Set Certifications

Operational Temperature

-20° ≤ T ≤ 55° C

Storage Temperature

-30° ≤ T ≤ 71° C

Operational Humidity

MIL-PRF-28800F Class 2

Storage Humidity

MIL-PRF-28800F Class 2

Altitude

≤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

VERSIONS, OPTIONS AND ACCESSORIES

Ordering Number	Description
87339	GPSG-1000 6 Satellite Simulator
87715	GPSG-1000 12 Satellite Option
89475	GPSG-1000 A-GPSG 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.
89023	Maintenance Manual (CD)**

** Contact factory for availability

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AEROFLEX
A passion for performance.

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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.

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