Avionics

GPS-101 GPS Satellite Simulator

An innovative approach for verifying the operational integrity of installed Global Positioning Satellite (GPS) systems

- Verify operational integrity of GPS receivers quickly
- Selectable Satellite Vehicle (SV) and Navigation (NAV) Data
- Adjustable RF levels from -85 dBm to -145 dBm in 1 dB steps
- Doppler control allows the operator to select a positive or negative carrier frequency shift of approximately 4 kHz
- Stored GPS Almanac with real time clock
- Direct connect to receiver or via antenna coupler
- Battery operated portability

Aeroflex is a leader in the design, manufacture and marketing of Avionics test systems.

The IFR GPS-101 Global Positioning Simulator provides accurate and repeatable testing of Global Positioning Satellite (GPS) receivers. The GPS-101 achieves this testing capability by simulating a Global Positioning Satellite and generating a specific Satellite Vehicle (SV) and Navigation (NAV) data pattern. Coupled with remotely loaded GPS almanac information and RF levels/frequency control, the GPS-101 provides a portable test solution for verifying the operational integrity of GPS systems.

The GPS-101 verifies the operational integrity of:
- An integrated GPS receiver - antenna system (e.g. a hand held unit) with built-in test modes accessible by transmitting special satellite (SV) numbers and navigational (NAV) data word that will cause an indication or received signal strength.
- An installed GPS receiver with remote antenna system.
- Any GPS receiver or installation capable of indicating that a single satellite with appropriate navigation data was detected.

Operation
The GPS-101 provides dedicated front panel keys for all primary functions. Selected parameters are displayed on a wide viewing angle, high contrast, backlit LCD display.

**MODE KEYS**

**RF LVL**
The RF level can be adjusted from -85 to -145 dBm in 1 dB steps via slew wheel control to verify GPS.

**DPLR**
The doppler control allows the operator to select a positive or negative carrier frequency shift of approximately 4 kHz to verify receiver acquisition and lock performance.

**SV**
Selects the satellite vehicle to be simulated (1 through 37). The almanac data is utilized to display an asterisk alongside the selected satellite vehicle if the satellite is unhealthy or not available.

**RF CONT**
The RF control selects the modulating source for the 1575.42 MHz
generator. The selections are RFOFF: turns carrier off, RFCW: unmodulated carrier, RFON: C/A code and NAV data (spread spectrum signal), RFEXT: external BPSK modulation through AUX I/O connector and RFSQR: 511.5 kHz square wave modulation (maintenance purposes).

**SETUP:**
Provides access to menus for setting RS-232/422 communications port parameters, test set operational characteristics and self test.

**TEST:**
Selects one of three stored NAV data patterns. (Three data patterns reserved for future use)

1. **T1**: NAV data that contains programmable almanac information and GPS week and time of week fields. The almanac data is valid for a 30 day period and may be downloaded in 'YUMA' ASCII text format via the RS-232 port. Current almanac data is available from the U.S. Coastguard Internet Web Site. The GPS-101 has an internal real time clock that keeps UTC time and is programmable by the user.

2. **T2**: NAV data pattern that contains fixed GPS week and time of week.

3. **T3**: Fixed 11001100.. repeating test pattern.

Select Keys: Moves cursor to selected field/parameter.
Display Keys: Contrast setting keys and display backlight on/off key.
ESC Key: Returns to main operation screen.
Slew Wheel: Allows rapid data slewing.

---

**SPECIFICATION**

**GENERATOR**

- **Frequency**
  - 1575.42 MHz

- **Accuracy**
  - Same as Master Timebase

- **Doppler**
  - Selectable frequency offset ±4.0 kHz

- **Offset Accuracy**
  - See Master Oscillator

- **Channels**
  - Single SV simulation, selectable from 1 to 37

- **Phase Modulation**
  - BPSK

- **PRN Code**
  - C/A code = 1.023 MHz, 1023 bit gold code

- **NAV Data**
  - 50 Hz, Programmable test pattern, built-in patterns

---

**Output Level**
- -85 to -145 dBm in 1 dB steps, ±2 dB accuracy into 50 Ω (AC Coupled) Standard Cable, 4 dB loss

**Spurious**
- <-40 dBc over the bandwidth (20 MHz)

**External Modulation Input**
- TTL

---

**MASTER OSCILLATOR**

**Standard Timebase**

- **Frequency**
  - 10 MHz nominal (see note)

- **Temperature Stability**
  - ±1 ppm

- **Ageing Rate**
  - ±1 ppm/yr, ±5 ppm/10 yr

- **Uncertainty**
  - ±1 ppm

**Option Timebase**

- **Frequency**
  - 10 MHz nominal (see note)

- **Temperature Stability**
  - ±0.1 ppm

- **Ageing Rate**
  - ±0.1 ppm/yr

- **Uncertainty**
  - ±0.1 ppm

- Note: Internal timebase frequency is a function of timebase calibration, ageing rate, temperature stability and uncertainty.

**External Reference Input**

- **Input Level**
  - 0.25 to 6.0 Vp-p

- **Input Impedance**
  - 150 Ω nominal

- **Input Frequency**
  - 10.0 MHz

**External Reference Output**

- **Output Level**
  - 1.5 Vp-p nominal into 50 Ω

- **Output Frequency**
  - 10.0 MHz nominal

---

**COUPLER**

- **Coupling**
  - -20 dB typical at 1575.42 MHz

- **Assumes**
  - 4.77 dB patch antenna gain and 4 dB cable loss
Isolation
>25 dB at 1575.42 MHz
>30 dB typical at 1575.42 MHz

GENERAL
Calibration Interval
1 year
AC Input
90 to 120 VAC, 50 to 400 Hz
200 to 240 VAC, 50 to 60 Hz
Battery Operation Time
120 minutes minimum, 360 minutes nominal
AC Power Consumption
<50 W maximum, <40 W typical
Battery Charge Time
Unit Operating
8 hours for full charge @ 115 VAC, 60 Hz
Unit non-operating
6 hours for full charge @ 115 VAC, 60 Hz
Operating Temperature
-20° to +55°C
Storage Temperature
-20° to +70°C
Humidity
95% (±5%), non-condensing
+10° to +30°C
Dimensions
292 mm wide; 131 mm high; 412 mm deep, does not include handle.
11.4 in. wide; 5.1 in. high; 16.1 in. deep, does not include handle.
Weight
9 kg (20 lbs.) maximum (with battery) does not include lid and lid contents

CONNECTOR TYPES
RF Output
TNC, Female
Auxiliary Port
25-pin D-Sub, Male
RS-232 "REMOTE" (COMM 1)
9-pin D-Sub, Male, PC compatible
RS-232/422 "RECEIVER" (COMM 2)
25-PIN D-Sub, Male, PC compatible
FCC Type Accepted, CFR47 Part 87.
Complies with UL/CSA/EU Product Safety Standards

VERSIONS AND ACCESSORIES
When ordering please quote the full ordering number information.

Ordering Numbers
Versions
101-110 GPS-101 Global Positioning System Ramp Test Set,
110 VAC operation
101-220 GPS-101 Global Positioning System Ramp Test Set,
220 VAC operation
Accessories
OPT 1 0.1 ppm High Stability Time Base

All Aeroflex Avionics products delivered with Factory Certificate of Calibration
As we are always seeking to improve our products, the information in this document gives only a general indication of the product capacity, performance and suitability, none of which shall form part of any contract. We reserve the right to make design changes without notice. All trademarks are acknowledged.


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