

CENTER FOR REMOTE SENSING, INC.

## Dual Frequency Multichannel RF Signal Simulator for C/A, P(Y), and M-codes (GPSS-DF-003-04/GPSS-DF-004-04)



The GPS Signal Generator from CRS, Inc. provides live RF signals at navigational frequencies ( $L_1$  and  $L_2$ ) suitable for Hardware in the Loop (HWIL) signal generation.

These self-contained units provide high-fidelity multichannel C/A, P(Y), and M code (optional) signals at  $L_1$  and  $L_2$  bands. They allow control over all aspects of the signal generation, including PRN, Power Level, Doppler, and signal/message content, etc.

Almost unlimited user motions can be specified. A user-friendly GUI allows various complex motions with high dynamics and with 20,000 g to be specified. It allows a variety of environmental and receiver antenna models. All of these are done with a minimum of latency (< 5 ms).

The signal generator utilizes the software-based architecture hallmark of CRS's other simulators and receivers. It provides unprecedented accuracy and flexibility, and offers unlimited vertical and horizontal upgrades.

The flexibility is reflected in the supplied software that allows an operative interactive mode or fully integrated mode using the supplied 'C' programming libraries. It supports synchronization to other systems. All the signals and internal signal structure can be monitored in real-time.

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**Advancing Technology**

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# RF Signal Simulator

- Performance
  - ⊕ Flexible Software-based Design
    - ↳ 12 to 24 independent channels
    - ↳ GPS – L<sub>1</sub> and L<sub>2</sub>: all C/A, P(Y), M, and L<sub>2</sub>C signals
    - ↳ SBAS – support at L<sub>1</sub>, WAAS, EGNOS
- High Accuracy
  - ⊕ Code: < 1 mm
  - ⊕ Differential Phase: < 0.1 mm
- Complex Scenarios
  - ⊕ High Dynamics – suitable for EKV, satellite, projectiles, aircrafts (200 km/s; 20,000 g)
  - ⊕ Arbitrary motion (6 DOF)
  - ⊕ Independent controls over all aspects of antennas and platforms
- HWIL control – latency between 2 to 5 ms
- Comprehensive Models
  - ⊕ Constellation
    - ↳ Full Control; definition and modeling
    - ↳ Navigation message bits, HOW, TLM, and sub-frame error data.
  - ⊕ Waveforms
    - ↳ Full controls (independent) over waveform errors, nav bits
    - ↳ Clock errors
  - ⊕ Environment
    - ↳ Ionosphere/Troposphere/Scintillation
  - ⊕ Antenna
    - ↳ Gain and Phase (3-D), Real-time, Lever Arms
  - ⊕ Multipath
    - ↳ Dynamic
  - ⊕ Terrain Obscuration
    - ↳ Dynamic
  - ⊕ Platform
    - ↳ Body Models
    - ↳ Platform Motion Models
- Operation and Control
  - ⊕ Manual
    - ↳ Menu-based
    - ↳ Script file based
    - ↳ Interactive (Real-time)
  - ⊕ HWIL
    - ↳ Real-time execution (2 ms latency)
  - ⊕ Remote Control
    - ↳ External control via Ethernet
- Real-time Display
  - ⊕ Satellite Constellation
  - ⊕ Ground Trajectory
  - ⊕ User motion parameters (6 DOF)
  - ⊕ Individual Antennas
- Other Facilities
  - ⊕ Comprehensive Logging
  - ⊕ Remote Control via Ethernet
  - ⊕ Mission Planning Mode
  - ⊕ Digital Output
  - ⊕ 1 PPS in/out
  - ⊕ 10 MHz / 10.23 MHz operation
  - ⊕ Large Dynamic Range ~ 80 dB / 120 dB

## SIGNAL DYNAMICS

- **Velocity:** ± 600 km/s
- **Acceleration:** ± 200,000 m/s<sup>2</sup>
- **Jerk:** ± 200,000 m/s<sup>3</sup>

## RF OUTPUT

- -130 dBm at 50 ohms
- **Dynamic Range:** 80 dB
- **Level Resolution:** 0.1 dB
- **Level Accuracy:** ± 0.1 dB RSS
- **Spurious (max):** < -50 dBc
- **Harmonics (max):** < -60 dBc
- **Phase Noise (max):** < 0.02 Rad RMS
- **VSWR:** 1.5:1

## CLOCK

- **Internal:** 1 X 10<sup>-10</sup>/day
- **External Input:** 10 MHz

## WAVEFORM

- GPS C/A code with data at 50 bps
- GPS P code

## OPTIONAL

- GPS (L<sub>5</sub> Upgradable)
- GLONASS – all signals in L<sub>1</sub>, L<sub>2</sub>
- Galileo – all signals (L<sub>1</sub>, E5, and E6)
- Jammer – 24 independent jammer signals with selectable waveforms and dynamics
- LAAS

## THE MOST ADVANCED NAVIGATION SIMULATION

- *Comprehensive*
- *Accurate*
- *Flexible*
- *Versatile*
- *User Friendly*
- *Modular*