Hollis Electronics HSDS series is a high technology, low-cost solution for Earth Station to Satellite Link Simulation.

Key Features of the HSDS:

- ➢ **Infinite Number of Independent Channels** *(1-4 per chassis)*
- ➢ **Delay Doppler with Continuous Phase**
- ➢ **Frequency Doppler**
- ➢ **Independent Digital Noise Generators (1 per channel)**
- ➢ **Internal Digital Power Meter (1 per channel)**
- ➢ **Rain Fade**
- ➢ **Supports simulations for GEO, MEO, LEO, and MOLNIYA satellites.**
- ➢ **SatProfile, an application to aid in building data simulation files.**

Using state-of-the-art digital signal processor (DSP) technology, all HSDS models provide improved satellite link simulation for more confidence in test results. With its internal digital power meter and built-in noise generator, this single instrument provides accurate and repetitive fading and carrier-to-noise setting ability in one box. The HSDS is an ideal instrument for creating realistic scenarios for closed loop testing of satellites, ground equipment and mobile transceivers.

Center frequency *	70 or 140 MHz
Operating bandwidth (1dB) *	36, 72, 100, or 125 MHz
Nominal input level	-20 dBm
Input dynamic range	12 Bits
Nominal gain from input to output	0 dB, $\pm$ 1 dB
Return Loss	14dB Max, 19dB Typ
Characteristic impedance (input and output)	50 Ohms
Connector type	BNC (female)
Spurious (one full hop or one half hop)	≤ -50 dBc
Signal-to-Noise ratio (one full hop or one half hop)	≥ 30 dB
Bypass mode delay	≤ 5 us

* HSDS model dependent. Refer to Specifications page for specific details.

Highlights:

- Independent channel simulators and AWGN noise generators in one instrument

- Fully digital implementation using the latest DSP technology resulting in high accuracy and repeatability

- Real-time dynamic step changes are supported with high resolution

- Delay Modes; Bypass, Linear/Limit Profile, Linear/Cyclic Profile and Fixed

- Satellite orbit simulation; delay change & frequency shift

- Maximum inclined orbit simulation with smooth transition delays and no signal distortion

- Satellite movement is simulated with continuous delay changes

- Simulate 2 Half Hops (Up/Down Link) or 1 Full Hop (Round Trip)

- Controlled with a simple set of commands via Ethernet.

HSDS Series

Test Configurations:

2 Half Hops - Separately Simulate Up & Down Links

1 Full Hop - Simulate Round Trip Delay to/from Satellite

Applications:

Earth Terminal Testing

Satellite Payload Testing

Satellite Systems Integration

Mobile Transceiver Testing

Carrier-to-Noise Generator (CNG)

SATPROFILE

SATPROFILE is a graphical user interface to complement the standard HSDS user interface. SATPROFILE aids users in generating satellite profile data files for LEO, MEO, MOLNIYA, and GEO satellite orbits to be used as input to the HSDS satellite simulator. SATPROFILE also provides minimum and maximum values for Frequency Doppler, Delay, and Rate of Change for GEO satellites.

SATPROFILE GRAPHIC USER INTERFACE
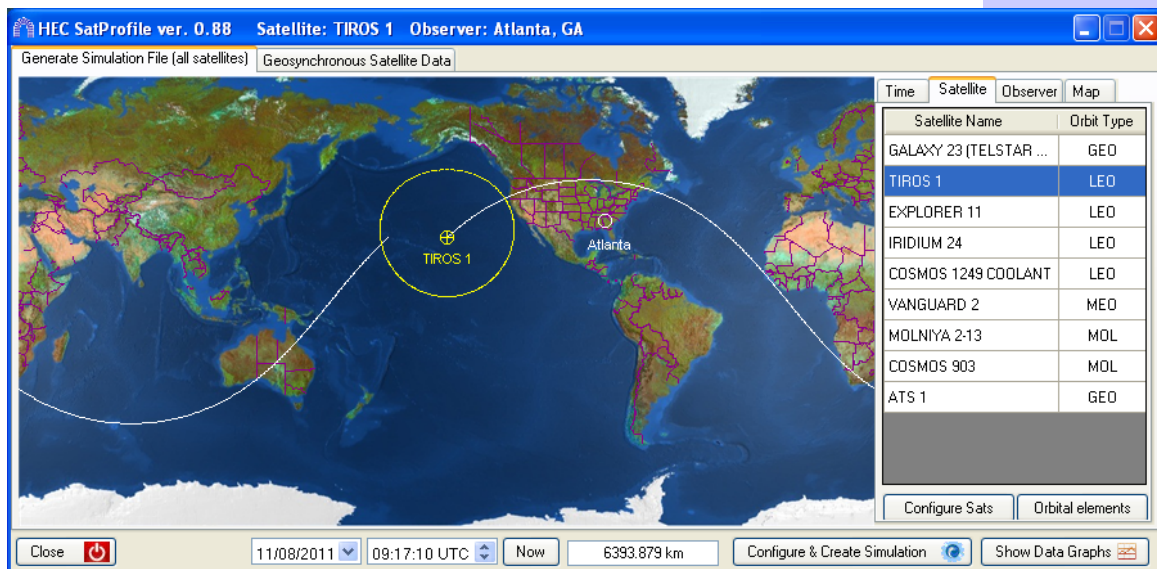
Features

- Satellite simulation file creation
- Ability to select future satellite pass
- Eight (8) different noise profiles
- Rain fade
- Set signal attenuation & noise level

- Pre-configured Data:
  - Satellites:
    - 600+ *(standard)*
    - 3,000+ *(possible)*
  - Observers: 1,602
- Ability to add custom data

- Graphical Earth map
- Animated satellite path
- Ground tracks
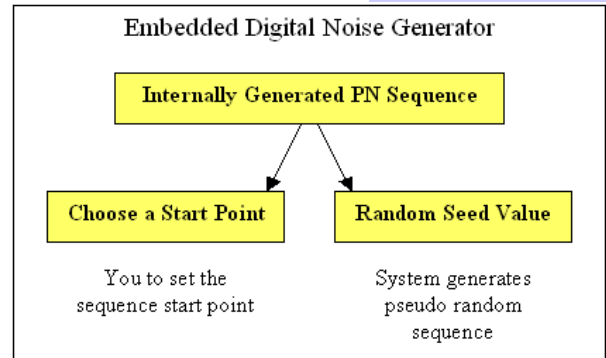- Set time to real-time, arbitrary time, or animated

SATPROFILE is an optional program and is sold separately.
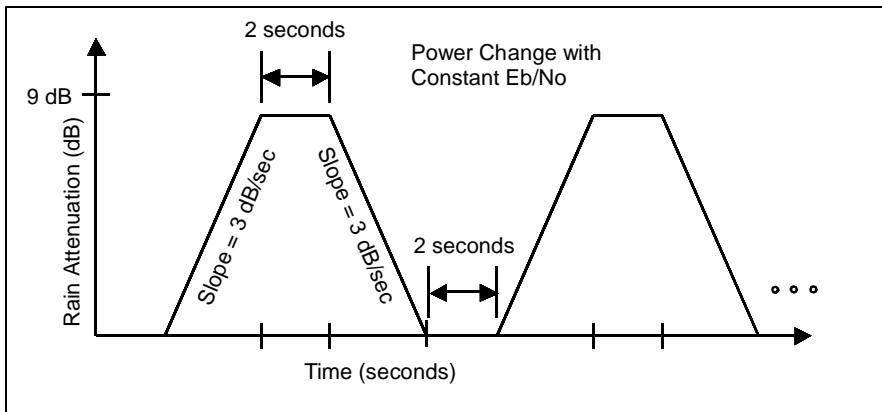
Built-in Digital Noise Generators

The Digital Noise Generator allows generation of various forms of noise impairments to test the robustness of system design.

The advantage of Digital Noise is that the accuracy of the signal to noise ratio is not affected by the analog discrepancies introduced by RF amplifiers and other components in the RF chain eliminating the need for periodic calibration. The noise and signal are combined digitally where the noise is perfectly flat and the signal power level is measured digitally. This means that any variations in the frequency response in the system after the noise is added to the signal, affects both the signal and the noise equally.

By using the digital output attenuator on the HSDS and the digital attenuator of the digital noise source the operator has complete flexibility over setting the Eb/No or SNR. The operator has a choice of setting an SNR or Eb/No. Since the noise is added digitally to the digitized signal, accuracy and repeatability are greatly improved.

Embedded Digital Noise Generator

Internally Generated PN Sequence

Choose a Start Point

Random Seed Value

You to set the sequence start point

System generates pseudo random sequence

Rain Fade Specifications

The minimum specifications of the Rain Fade Simulator are:

Profile Attenuation range	0 to 39.99 dB
Profile Resolution	± 0.001 dB
Profile End Point Accuracy	± 0.01 dB
Maximum Rate of Change	30 dB/ms
Digital Step Size	0.001 dB
Profile Concatenation Limit:	10
Sweeps:	Single or continuous
Step dB change range	0 to 39.99 dB
Step Change Accuracy	± 0.1 dB

HSDS Models:

Model	70 MHz IF	140 MHz IF	36 MHz (1dB)	72 MHz (1 dB)	100 MHz (1 dB)	125 MHz (3 dB)
HSDS-70-36	*		*			
HSDS-140-36		*	*			
HSDS-140-72		*		*		
HSDS-140-100		*			*	
HSDS-140-125		*				*

Specifications:

General

Number of channels:	Infinite, but 1-4 per chassis
Input level:	-20 dBm $\pm$ 1dB (nominal)
Output level :	-20 dBm $\pm$ 1dB
Gain:	0 dB typical
VSWR:	1.5 : 1 Max, 1.25 : 1 Typical
Temperature Range:	25° C nominal +/- 5° C
Signal-to-Noise Ratio:	$\geq$ 30 dB
Spurious:	$\leq$ -50 dBc in-band
Bypass mode delay:	$\leq$ 5µs
Connector type:	Type BNC
Impedance:	50 ohm

Delay Doppler

Minimum Range:	5 us to 2.1 seconds*
Minimum step size:	Continuous
Accuracy:	Based on 10MHz reference

Frequency Doppler

Doppler range:	$\pm$ 1 MHz (*Higher ranges available*)
Maximum rate of change:	$\pm$ 10 kHz/sec
Maximum acceleration:	$\pm$ 10 kHz/Sec^2
Digital step size:	1 Hz
Profile types:	Linear limit, linear cyclical, sinusoidal
Sweep:	Single or continuous

Digital Noise Generator (AWGN)

PN sequence	Random (60 hr. repeat intervals)
Distribution density	Gaussian
Crest factor	16.7 dB
C/N	
Max Noise Power Level	-113 dBm/Hz (IF,assuming unity gain)
Resolution:	0.01 dB
Accuracy:	$\pm$0.1 dB at IF

Rain Fade

Profile attenuation range:	0 dB to 39.99 dB
Profile resolution:	$\pm$ 0.001 dB
End point accuracy:	$\pm$ 0.01 dB
Maximum rate of change:	39.99 dB/ms
Digital step size:	0.001 dB
Profile concatenation limit:	10
Sweeps:	Single or continuous
Step dB change rate:	0 to 39.99 dB
Step change accuracy:	$\pm$ 0.1dB

* Slightly less maximum delay for systems with > 80 MHz BW

System Specifications

Power Requirements

Voltage	100-120 VAC 220-250 VAC, auto sensing
Frequency	47-60 Hz

Operating environment

Temperature	5° to 40° C
Humidity range	20 to 80% RH
Dimensions	21" D x 19" W x 7.0" H
19 inch 4U chassis	(534mm D x 483 mm W x 178 mm H)
Weight	30 lbs. (13.6 kg)
Control interfaces	Ethernet

Special Features

The HSDS is a single card design which can be integrated directly into a customers system. Contact HEC for more information.

Ordering Information

HSDS-XXX-YYY-Z

Base Model
- XXX   Interface Frequency (MHz)
- YYY   Bandwidth (MHz)
- Z   Number of Channels

All Units include:
- Delay Doppler, Frequency Doppler, Rain Fade
- Internal Digital Power Meter(s)
- Digital Noise Generator(s)
- Ethernet Control

Options:
- # of Channels
- Bandwidth
- 75 ohm Impedance
- Input/Output Connector Type
- Without Noise Source
- SatProfile GUI
- RF Band Support via Converters
- Non-linearity Simulation