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, ± 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

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**

![Graphical User Interface](image)

**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.

**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:

<table>
<thead>
<tr>
<th>Model</th>
<th>70 MHz IF</th>
<th>140 MHz IF</th>
<th>36 MHz (1dB)</th>
<th>72 MHz (1 dB)</th>
<th>100 MHz (1 dB)</th>
<th>125 MHz (3 dB)</th>
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<tbody>
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<td>HSDS-70-36</td>
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<td>HSDS-140-125</td>
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Specifications:

General
- Number of channels: Infinite, but 1-4 per chassis
- Input level: -20 dBm ± 1 dB (nominal)
- Output level: -20 dBm ± 1 dB
- Gain: 0 dB typical
- VSWR: 1.5 : 1 Max, 1.25 : 1 Typical
- Temperature Range: 25° C nominal +/- 5° C
- Signal-to-Noise Ratio: ≥ 30 dB
- Spurious: ≤ -50 dBc in-band
- Bypass mode delay: ≤ 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: ± 1 MHz
  (Higher ranges available)
- Maximum rate of change: ± 10 kHz/sec
- Maximum acceleration: ± 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: ±0.1 dB at IF

Rain Fade
- Profile attenuation range: 0 dB to 39.99 dB
- Profile resolution: ± 0.001 dB
- End point accuracy: ± 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: ± 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
  - Operating environment Temperature: 5° to 40° C
  - Humidity range: 20 to 80% RH
- Dimensions 21” D x 19” W x 7.0” H
  (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

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HSDS Series Satellite Delay Simulator