# NRS
## NOISE REDUCTION SYSTEM

The NRS Technology eliminates the need for separate satellite capacity in each direction of transmission by enabling both directions to share the same capacity. Compatible with any network configuration (Point-to-Point/ Point-to-Multipoint/ All TDM/TDMA platforms / SCPC symmetrical and asymmetrical/ MCPC/SCPC) where the transponder is in loop-back configuration. The NRS Technology can save up to 50% of the satellite capacity installed at the hub side only (based on link budget allowance). The NRS being modem agnostic allows use of existing modems. The NRS provides bandwidth savings and CAPEX & OPEX reductions as well as the possibility of a throughput increase while maintaining the utilized satellite bandwidth.

## FEATURES

**Supports C, X, Ku, and Ka bands Transponder Configuration**

- Uplink and Downlink under same beam (non cross-strapped transponder).
- Bent-pipe transponder (non regenerative)

**Operation Frequency** 70MHz, 140MHz, L band (950-1750 MHz)

**Bandwidth Supported (MHz)** 12, 18, 25, 36, 66, 72

**Remote:** SNMP & RS232, 19200, 8, N, 1; Windows-XP and 7 compatible M&C software supplied with NRS

**Monitor Parameters**

- Estimated Delay
- Signal levels at Hin, Ain and Rout ports
- Estimated Doppler Shift
- Delay and Doppler Variations

**Equalizer and Compensation (optional)**

- Frequency Slope Equalizer
- Group Delay Equalizer
- Distortion compensation for non-MPSK carriers
- Configurable output power
- True acquisition of a DVBS/DBVS2 carrier

**AUPC (optional):** NRS compensates the hub transmit signal level fade due to rain attenuation in order to maintain constant transmit at satellite

**Redundancy:** 1:1 (Optional)

**Spectrum Inversion:** Inbound signal

## NOISE CANCELLATION PROCESS

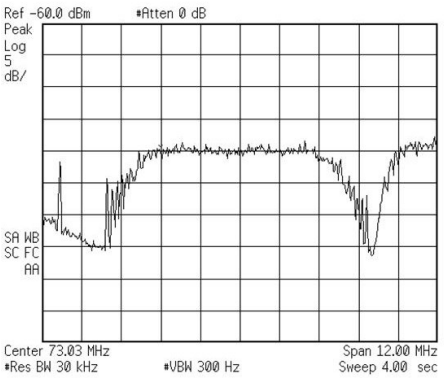
Modulator signal (H) uplinked to satellite is fed to NRS.

Satellite combines the desired signal (R) and H (which is 'noise' with regard to the desired signal) to form aggregate signal (A).

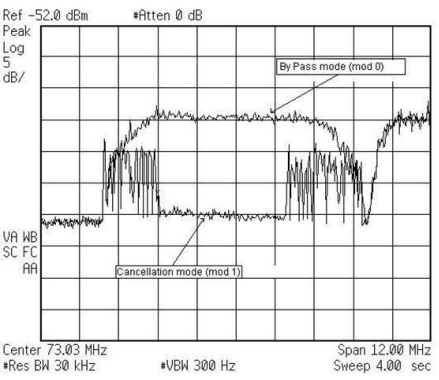
The aggregate signal (A) is downlinked from satellite and is also fed to NRS.

NRS cancels the "noise" component (i.e., H in A) and outputs R to demodulator.

**NRS INPUT**




**NRS OUTPUT**



# SPECIFICATIONS

## Firmware Configuration Options

- *NRS NODE* for SCPC Networks
- *NRS RAY* for TDM/TDMA Networks
- *NRS SECTOR/iSECTOR* for large links inc. inclined orbit

## Performance

*Processing Bandwidth:* 190 kHz to 72 MHz
*Cancellation:* 30 dB MIN, 35 dB typical
*Median Synchronization Time*

- < 15 s, from initial power on
- < 4.5 s, from interruption of $H_{in}$ signal > 0.5 s
- < 1.5 s, from interruption of $H_{in}$ signal < 0.5 s

*Maximum Number of H Carriers:* Up to 30 optional
*Maximum Number of R Carriers:* Any
*Maximum Delay Variation:* +/- 140 ns/s
*Maximum Amplitude Variation:* +/- 0.5 dB/s
*Maximum Frequency Variation:* +/- 21 Hz/s

## Input Signal Conditions

*Signal Format:*

- H: Continuous
- R: Any
- A: Combination of H & R

*Symbol Rate:* 1MBaud to 65MBaud (depending on model)
*Modulation Formats:* BPSK, QPSK, OQPSK, 8PSK, 16QAM, 16APSK, 32APSK, 64QAM
*SSB Phase Noise of A Signal:*

- –42 dBc/Hz at 10 Hz
- –72 dBc/Hz at 100 Hz
- –81 dBc/Hz at 1 kHz
- –90 dBc/Hz at 10 kHz and above

*Linear Distortion of $H_d$, relative to H:*

- Amplitude: 0.5 dB peak-to-peak over symbol rate bandwidth
- Group delay: 0.2 symbol periods peak-to-peak over symbol rate bandwidth

Dynamic Range of $H_{in}$ Signal: 30 dB
Dynamic Range of $A_{in}$ Signal: 30 dB composite
*Expected Path Delay:* 230—290 ms
*Ain Frequency offset from expected:* < 8kHz, 16kHz, 32kHz, 64kHz, 128kHz selectable
*Power Supply Voltage:* 100–240 VAC, 47–63 Hz, 50W
*Temperature:*

- Operating: 0 to 40ºC (32 to 104ºF)
- Storage: -25 to 85ºC (-13 to 185ºF)

## ELECTRICAL

| PORT | PARAMETER | VALUE |
|---|---|---|
| AC input | AC Power Input | 100 to 240VAC , 47 to 63Hz , 50W |
| J1 - USB | Interface | USB-B Male |
| J2 - Fault | Interface | RS232, DB9-Male |
| J3 - M & C | Interface | RS232, DB9-Male |
| J4 - $H_{out}$ | Output Impedance<br>Output Return Loss<br>Output Level | 75Ω, BNC -Female<br>> 10 dB<br>$H_{in}$-4 dB |
| J5 - $H_{in}$ | Center Frequency | 70 +/-18 MHz, user selectable in 1 kHz increments<br>140 +/-36 MHz, user selectable in 1 kHz increments |
| | Input Impedance<br>Input Return Loss<br>Input Level | 75Ω, BNC -Female<br>> 10 dB<br>0 dBm to-30 dBm |
| J6 - $A_{mon}$ | Output Impedance<br>Output Return Loss<br>Output Level | 75Ω, BNC -Female<br>> 10 dB<br>10 dB below $A_{in}$ |
| J7 - $A_{in}$ | Center Frequency | 70 +/-18MHz, user selectable in 1 kHz increments<br>140 +/-36 MHz, user selectable in 1 kHz increments |
| | Input Impedance<br>Input Return Loss<br>Input Level | 75Ω, BNC -Female<br>> 10 dB<br>-30 to-60 dBm |
| J8 - $R_{out}$ | Output Impedance<br>Output Return Loss<br>Output Level | 75Ω, BNC -Female<br>> 10 dB<br>-30 dBm to-50 dBm |
| J9 - $R_{mon}$ | Output Impedance<br>Output Return Loss<br>Output Level | 75Ω, BNC -Female<br>> 10 dB<br>10 dB below $R_{out}$ |

***Note:*** *L-band unit specifications may slightly differ from IF unit specifications. For e.g., In L-band unit, Input and output ports are N-type female with 50Ω impedance.*

## PROCESSING LATENCY

| Bandwidth range | NRS processing delay |
|---|---|
| 25-72 MHz | ≈ 48µs |
| 12.5-25 MHz | ≈ 76µs |
| 6.25-12.5 MHz | ≈ 138µs |
| 3.125-6.25 MHz | ≈ 260µs |
| 1.56-3.125 MHz | ≈ 502µs |
| 0.78-1.56 MHz | ≈ 1.2ms |
| 0.39-0.78 MHz | ≈ 2.2ms |
| 0.19-0.39 MHz | ≈ 4.2ms |
| <0.19 MHz | ≈ 8.0ms |

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