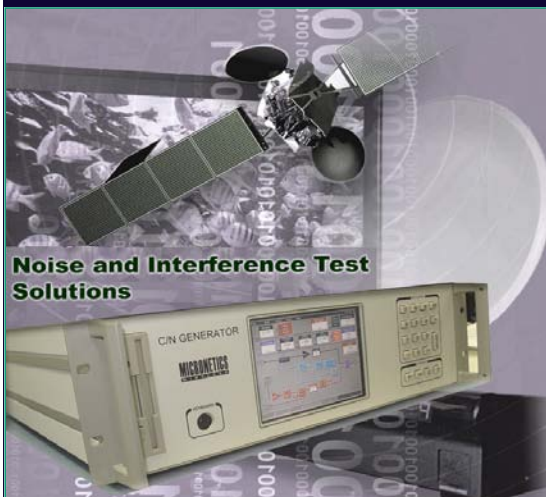# CNG DTV SERIES

CARRIER TO NOISE GENERATORS FOR BER OF DTV OVER SATELLITE

Noise and Interference Test Solutions

Description:

Micronetics CNG DTV Series of Noise Generators are specifically designed for IF loop back testing, such as that called out in ATSCa80. The CNG DTV provides calibrated, accurate C/N ratios for generating BER performance of DTV modems.

† True Gaussian nosie for accurate tests agains BER curves based on Gaussian PDF

† Self calibration for accurate S/N ratios

† Field calibration feature reduces downtime and cost of ownership

CNG DTV SERIES OUTPUT CHARACTERISTICS

Frequency Range

50 to 90 MHz, 100 to 180 MHz, 850 to 2250 MHz

RF Specifications

Noise Generator:

Noise Spectral Density:	-85 dBm/Hz *(min for 70/140 band)*
	-98 dBm/Hz *(min for L-band)*
Noise Crest Factor:	15 dB (min)
Noise Flatness: **+**	0.8 dB/400 MHz

**Signal Path:**

Amplitude Range	*See Chart 1*
Signal Input Impedance:	50 ohm (OPT003 for 75 ohm)
Insertion Loss:	model/option dependent
Input VSWR:	1.5:1 (max)
Connector:	Choose Type N, BNC or SMA
Attenuator (optional)	0 - 100 in 0.1 dB Steps

Combined Output Path

Modes of Operation:	E_b/N_O, C/N, C/N_O
Eb/No***** step size:	0.1 dB
Eb/No Accuracy:	0.15 dB RSS
Eb/No Ratio Range:	Depends on input signal level, data rate
Eb/No Ratio Range limits:	Dynamically displayed on screen/ GPIB bus
Output Impedance:	50 ohm (OPT003 for 75 ohm)
Connector:	Type N, BNC or SMA

+ *Flatness is defined as the overall window of the difference between the highest and lowest amplified peaks across the band.*

* *E_b/N_O encompasses C/N, C/N_O ratio modes.*
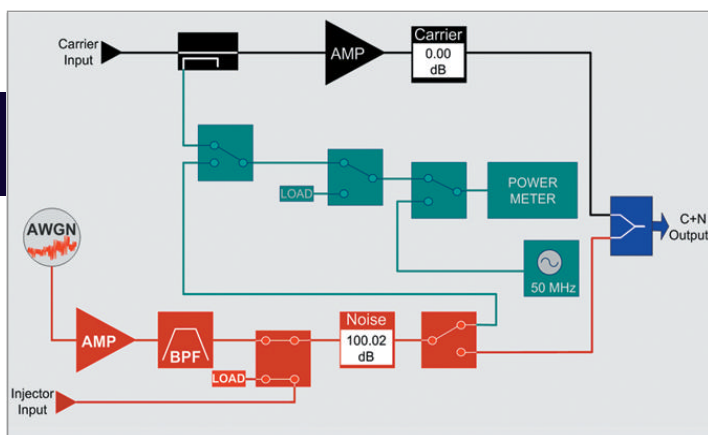
General Specifications

Operation interfaces:
  Front Panel keypad, keyboard, IEEE-488 interface

Display:
  Active Matrix Color LCD

19" Rack Mount:
  Included as standard

Computer Hardware:
  3.5" Floppy, PC keyboard

Software Upgrades:
  Via 3.5" floppy disk.

Dimensions:
  20" x 17" x 5.25" (3U rack)

Weight:
  18 kg (max)

Shipping weight:
  22 kg (max)

Shipping dimensions:
  24" x 24" x 9.5"

MICRONETICS
TEST SOLUTIONS

CNG DTV Series

Chart 1 All values in dBm CNG-DTV	Configuration	Range Total Signal In	Range Ideal Signal In	Range Total Signal Out	Range Ideal Signal Out	In max (No Damage)	Insertion Loss
notes:	Plain	-37 to 0	-30 to -7	-44 to -7	-37 to -37	+20	7 dB
Output range @ 0 dB carrier Attenuation	Opt001/002	-37 to 0	-30 to -7	-46 to -9	-39 to -39	+20	9 dB
	Opt003	-37 to 0	-30 to -7	-37 to -0	-30 to -7	+12	0 dB
	Opt004	-67 to -30	-60 to -37	-76 to -39	-51 to -46	0	9 dB
	Opt004A	-67 to 0	-67 to -7	-76 to −9	-69 to −9	+12	9 dB

Interpreting Chart 1:

The matrix above gives both the input and output ranges in dBm for each CNG model with each of the standard options. There are two sets of ranges, one is the ideal range for highest accuracy and the other is the total or functional range. The reason for the two sets is that the very complex signals such as 256 QAM, Faded CDMA base station receive signals, and 7/8 coded QPSK have a very high peak factor and large time constant. The built-in power meter can accurately measure these, but over a narrower dynamic range than less complex signals. The built-in power meter does have powerful signal processing and curve fitting algorithms to accurately measure complex signals. Micronetics chose these limited ideal ranges based on extensive data taken over many modulation schemes and data rates. We chose to be conservative because the CNG instruments are universal to any modulation type, the output corresponds to the input signal amplitude range less any insertion loss from input to output. If the carrier signal attenuator option is ordered, The output signal range corresponds to the 0 dB attenuation setting of the carrier attenuator. Obviously the overall output range is much greater corresponding to the range at the 0 dB setting plus 99 dB.

Standard Options

OPT001: *Make Before Break Carrier Path Attenuator* This allows the user to change the amplitude in the signal path without losing lock; especially useful in modem loop back testing where a break in the IF connection from the modulator to the demodulator requires the entire test to be reset. Along with the actual hardware, this option allows reverse setting of E_b/N_o which is defined as fixing the noise to a constant amplitude and adjusting the signal amplitude. Some test protocols require this method for generating waterfall curves. The range of the attenuation is 100 dB with a step size of 0.1 dB.

OPT002: *Standard Carrier Path Attenuator* This is similar to OPT001 but the attenuator will briefly break circuit when changing amplitude potentially causing the system to lose lock. This attenuator is less costly so if losing lock when adjusting the carrier signal amplitude is not a concern, than this may be preferable. This option does allow for reverse E_b/N_o setting. This option is typically selected for two primary reasons:

1) When the receive section requires a much lower signal amplitude than the transmit amplitude (i.e., the transmit amplitude is -20 dBm and the test requires the receive amplitude to be -80 dBm)
2) For R&D and qualification where it may be desired to run waterfall curves over several different carrier amplitude ranges to fully characterize a design. This option is also selected as purely a convenience if in the overall test system if there are no other ways to adjust the signal path amplitude.

OPT003: *Zero Carrier Path Loss* This option utilizes a high 3rd order intercept, low distortion amplifier in the signal through path to make up for the instrument's typical carrier path loss. This loss is caused by a combination of the path components which include the coupler that sends a portion of the signal to the power meter, the combiner which adds noise to the signal, the attenuator (if ordered) and the impedance transformer (if ordered). The magnitude of the loss is from 5 to 12 dB depending on the model and option package ordered. Generally, if the loss does not pose a problem, this option should probably not be ordered. Despite the high quality amplifier used, it is better not to have any unnecessary active devices in the test signal path.

OPT004: *Coupled Carrier Path Low Noise Amplifier* This option calls out a low noise amplifier in the coupled carrier path. This does not affect the test signals through path. It is selected if weak signal levels will be used going into the CNG carrier input port. The embedded power meter in the CNG units can accurately measure input signals corresponding to an optional input range of about from -30 dBm to -7 dBm. This option boosts the coupled signal path 30-35 dB for an accurate input range of -12 dBm to -62 dBm, and is typically selected for mobile telecom or terrestrial radio applications in which the noise is added to the RF signal. This is opposed to satellite modem loop back testing in which the noise is injected at IF, such as at 70/140 MHz. Mobile telecom test protocols typically use weaker signals (from -25 dBm to -60 dBm). In addition noise is often added after multi-path fading simulation such as in the case of IS-95 or 3GPP CDMA phone/base-station receive testing.

OPT004A: *Coupled Carrier Path LNA Bypass Switch* This option is selected to increase the dynamic range of the input signal. It is only ordered if OPT004 is also ordered. It allows signals to be accurately measured from -62 to +10 dBm. The default switch position is in the bypass state.

OPT005: *Interfering Signal Input for C/I Mode* This mode allows the user to set C/I ratios as well as C/N or E_b/N_o ratios. The interfering signal is generated externally and connected to the injector input port of the CNG. When selected, a transfer switch substitutes the interference signal for the noise signal. This option is typically not used in Satellite applications but is sometimes used in mobile telecommunications where the interfering signal simulates adjacent channel interference.

OPT006: *Impedance* 75 Ohm impedance instead of 50 Ohm.

OPT006A: *Switchable Impedance* 75 Ohm impedance 50 Ohm impedance switchable.

OPT007: *RS/232 Interface* This option allows the CNG to be operated remotely using an RS/232 serial connection.