Noisecom

UFX-EbNo Series
Precision SNR Generator

Count on the noise leader

UFX-EbNo Series Precision E_b/N_o (C/N) Generators

The UFX-EbNo is a fully automated instrument that sets and maintains a highly accurate ratio between a user-supplied carrier and internally generated noise, over a wide range of signal power levels and frequencies.

The UFX-EbNo gives system, design, and test engineers in the cellular/PCS, satellite and military communication industries a cost-effective means of obtaining higher yield through automated testing, plus increased confidence from repeatable, accurate test results.

Features

Multiple Operating Modes
The UFX-EbNo provides five operating modes: carrier-to-noise (C/N), carrier-to-noise density (C/N_o), bit energy-to-noise density (E_b/N_o), carrier-to-interferer (C/I), and power meter. The instrument can also be used as a precision noise generator.

Custom Configurations
The UFX-EbNo is available in a variety of configurations to meet your specific testing needs. Applications include: military communications, WCDMA, SATCOM, NASA TDRSS, CableTV, HDTV, IS-95, CDMA, TSMA, UMTS, GPRS L-band modems, Milstar, Inmarsat, Intelsat, and general purpose.

Direct Display of E_b/N_o, C/N, C/I, or C/N_o
The 4 x 20 VFD screen provides simultaneous readout of all significant input and output signal levels relating to the chosen operating mode, including carrier-to-noise ratios.

Accuracy of 0.2 dB RSS
A special, large-dynamic-range power meter measures both the signal and the noise, which allows the UFX-EbNo to set the desired ration to within ±0.2 dB. Special configurations can provide improved accuracy.

Bit Rate Entry of 1 bps to 999 Mbps and above
In bit energy-to-noise density testing (E_bN_o), the instrument automatically calculates noise density based on the userspecified bit rate.

Variable Output Power
Output power is user-specified and can be set within the range of -55 dBm to +5 dBm.

True RMS Power Meter
The digital power meter is custom designed to cover the frequency range of the particular instrument. It can measure signals and noise accurately with Gaussian Noise crest factors up to 18 db.

Direct Testing at both RF and Microwave Frequencies
In configurations that cover two separate frequency ranges, measurements can be made directly without the need for special conversion circuitry.

Optional Tracking Feature
This function is intended for users with an unstable input signal source who wish to perform accurate long-term testing at a specified E_b/N_o ratio. The tracking option works as an automated gain control (AGC) device, correction for input signal drift up to 0.2 dB resolution. The carrier output level is kept constant and, therefore, so is the E_b/N_o ratio.

Setting Precision C/N Ratios

The UFX-EbNo accurately sets carrier-to-noise ratios using the substitution calibration method. This method eliminates the effects of any non-linearity in the measuring device, in this case the power meter. This is done by setting the signal and the noise to the same power level at the power meter input. (See the functional block diagram). The noise power is then offset by the desired ratio. The primary source of inaccuracy within the unit is the attenuator that varies the noise power, and Noisecom uses the most accurate components available. Secondary effects such as thermal drift are negligible since the noise and the power are measured within a very short time frame.

Active components in the instrument that could be attributed to long-term drift are common to both the signal and noise path, so variations in these components do not affect the calibrated ratio. The unit's linear phase and amplitude signal path ensures that the desired signal passes through undistorted.

Since the UFX-EbNo automatically compensates for parameters like bit rates and bandwidth, taking measurement is as simple as pressing a button. Operating modes, function and parameters are set using the front panel controls.

Meter – In this mode, the instrument functions as a true RMS power meter, and uses various averaging methods to ensure more accurate readings.

Measurements are made through couplers, allowing the signal to pass through to the output connector unaltered by the meter circuitry.
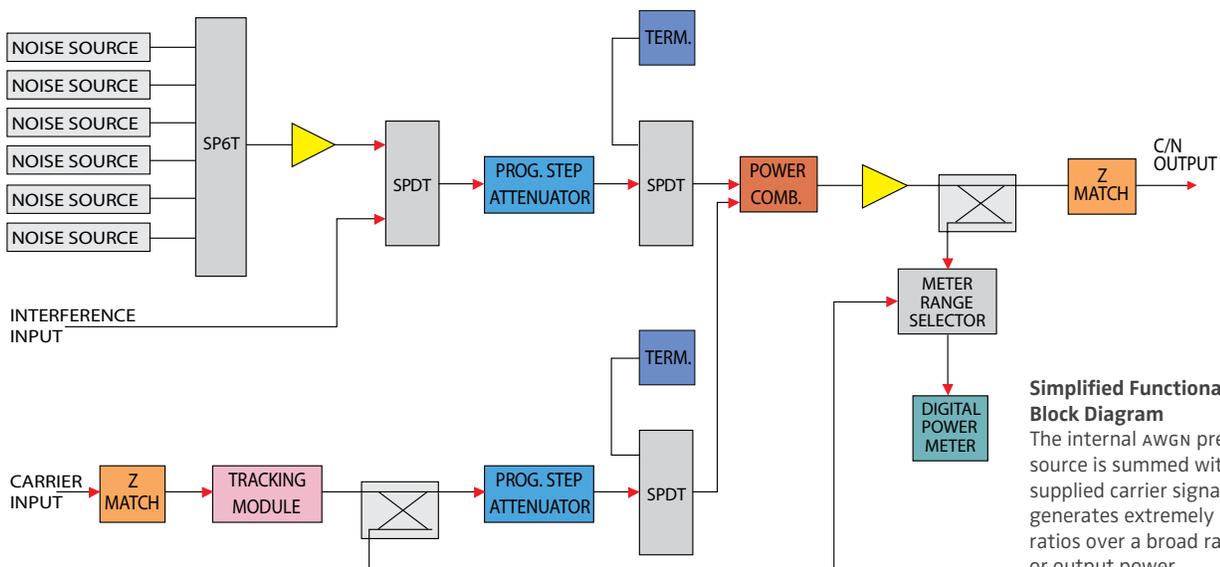
E_b/N_o – The instrument automatically sets up a desired E_b/N_o quickly and accurately. Based on the user-specified carrier output level, output E_b/N_o ratio, and bit rate, the instrument automatically calculates the required noise density.

C/N – This mode sets the specified carrier output level and the total noise power in the system bandwidth to the desired ratio.

C/N_o – To obtain a specific C/N_o ratio, set the instrument to E_b/N_o mode and enter zero for the bit rate. All other functions are the same as the Eb/No mode.

GEN – The instrument can also function as a precision noise generator. Simply select the mode and enter the required noise density. The unit's internal noise source provides the desired signal.

Status Indicators and Display Screen – Front panel indicators and the 4 x 20 VFD display provide constant feedback on the instrument state and settings.

Data Entry and Function Selection – Instructions and data are easily entered through the front panel keypad. The instrument can also be controlled through the standard rear panel IEEE-488-2, optional Ethernet, TCP/IP, or optional RS-232C, RS-422 or RS-423 interfaces.

Simplified Functional Block Diagram
The internal AWGN precision noise source is summed with the user supplied carrier signal. The unit generates extremely precise E_b/N_o ratios over a broad range of input or output power.

Specifications

Operating modes
  Carrier-to-noise (C/N), carrier-to-noise density (C/N$_o$), bit energy-to-noise density (E$_b$/N$_o$), carrier-to-interferer (C/I), noise generator, power meter

Carrier Path

Input power range	-55 dBm to +5 dBm
Maximum input power	+21 dBm (with no damage)
Output power range	-55 dBm to +5 dBm
Nominal gain	±1.0 dB
Gain resolution	0 to -60 dB in 0.1 dB steps
Gain flatness	±0.2 dB for 70 MHz ±20 MHz
	±0.3 dB for 140 MHz ±40 MHz
	±0.4 dB for others
Group delay	±0.20 ns/40 MHz for frequencies above 20 MHz
Third-order intercept point	+29 dBm typical
Tracking range (Ubopt01)	+4 dB to -4 dB
Tracking update rate	100 milliseconds, nominal

Noise path

Output power range	-55 dBm to +5 dBm
Flatness	
±0.2 dB/40 MHz	±0.3 dB/80 MHz
±0.4 dB/200 MHz	±0.5 dB/300 MHz
Attenuation range	60 dB in 0.25 dB steps (0.1 dB steps with Ubopt06)
Ratio accuracy	±0.2 dB RSS, ±0.3 dB WCU
Power meter range	-55 dBm to +5 dBm
Power meter accuracy	±0.5 dB
Power meter averaging	10 to 65,535. Each sample requires approximately 2.2 ms
Control	Local and IEEE-488
Baud rate (Ubopt04)	

  150, 300, 600, 1200, 2400, 4800, and 9600 to be used with optional serial interface ports (8 data bits, no parity, 1 stop bit)

Interferer input	-4 dBm ±2 dB, frequency range is equal to the noise bandwidth
RF connectors	BNC-75 Ω below 800 MHz, N-type female 50 Ω above 800 MHz
DC on RF connectors	0 volts, maximum

Primary power

Voltage	85 to 264 VAC
Frequency	47 to 63 Hz
Consumption	2 amps, maximum
Fuse	2 A
Operating temperature	0° to 50° C
Dimensions	17″ W x 5.25″ H x 17.5″ D

Options

UEopt01	Automatic gain control to maintain constant carrier power level
UEopt03	50 Ω input and output impedance**
UEopt04	RS-232C, RS-422, or RS-423 interface***
UEopt05	230 VAC, 50 Hz
UEopt09	Ethernet, TCP/IP remote interface

Ordering Information

Model Number*	Frequency Range	Applications
UFX-EbNo-45	5 to 90 MHz	General Purpose
UFX-EbNo-70	50 to 90 MHz	General purpose/SATCOM
UFX-EbNo-IF1	50 to 90 MHz	Intelsat, SATCOM
	100 to 180 MHz	
UFX-EbNo-IBS/IDR	50 to 90 MHz	Intelsat, SATCOM
	68 to 72 MHz	
	100 to 180 MHz	
UFX-EbNo-255	240 to 270 MHz	SATCOM
UFX-EbNo-370	350 to 390 MHz	NASA TDRSS
UFX-EbNo-CATV	50 to 860 MHz	Cable TV in 4 bands
UFX-EbNo-750	650 to 850 MHz	Iridium, LTE
UFX-EbNo-892	822 to 962 MHz	IS-95 (CDMA), IS-136 (TDMA)
UFX-EbNo-892/1850	822 to 962 MHz	Dual-band CDMA
	1710 to 1990 MHz	
UFX-EbNo-1200	950 to 1210 MHz	L-band modems
	1190 to 1450 MHz	
UFX-EbNo-1545	1530 to 1560 MHz	Inmarsat
UFX-EbNo-1850	1710 to 1990 MHz	J-STD-008 (CDMA)
UFX-EbNo-2050	1900 to 2200 MHz	Wideband CDMA
UFX-EbNo-2442	2400 to 2484 MHz	802.11b Wireless LAN
UFX-EbNo-5500	5000 to 6000 MHz	802.11a Wireless LAN
UFX-EbNo-WiMAX	3400 to 5800 MHz	802.16 WiMax
UFX-EbNo-20000	18 to 22 GHz	Military Custom Frequency Ranges to 44 GHz

Specification values apply following a 30 minute warmup

*   Call Noisecom for custom configurations
** Below 800 MHz, standard impedance is 75 Ω. Above 800 MHz, 50 Ω is assumed.
***In addition to standard IEEE-488-2

Wireless Telecom Group
Boonton   Microlab   Noisecom   Willtek