

## Precision BER versus C/N Testing using AWGN



### Features

- ◆ C/N, C/No, Eb/No, and C/I modes
- ◆ 1 or 2 independent RF channels
- ◆ Continuous input power monitoring
- ◆ Uninterrupted signal path during calibration cycle
- ◆ IEEE-488.2 interface

### Applications

*Typical applications for the CNG include:*

- ◆ Development, qualification, and verification testing
  - ◆ Cellular, PCS CATV and SATCOM testing
  - ◆ Bit error rate/SINAD testing
  - ◆ Channel impairment tests
  - ◆ Manufacturing test

The CNG series from dBm is a complete line of fully automated carrier to noise generators that sets and maintains a highly accurate ratio between a user-supplied carrier and internally generated white Gaussian noise. The instruments operate over a wide range of power levels and are compatible with both digital and analog modulation formats. The modular design of the CNG provides one or two totally independent RF channels to allow simplex, diversity or duplex testing. Precise carrier-to-noise (C/N) or carrier to interference (C/I) ratios may be programmed and the CNG will measure the carrier signal and accurately adjust the power of the internal AWGN source to maintain the desired ratio. The models are available for Cellular, PCS, CATV and SATCOM test applications.

The CNG gives system, design, and test engineers in the wireless communications industry a cost effective means of obtaining higher yields through automated testing, plus increased confidence from repeatable accurate test results. Solid state components ensure high reliability, test speed, and durability. And by using the substitution method, errors due to power measurement linearity are eliminated. The CNG series meets or exceeds the requirements of wireless equipment testing standards that require noise and interference emulation.

The CNG has the capability to allow users the option to input interference signals. The instrument will measure carrier power, noise power and interference power and will accurately set carrier-to-noise (C/N) and carrier-to-interference (C/I) ratios.

The instrument is available in a variety of configurations to meet your specific testing needs. Applications include the interference conditions required by all 2<sup>nd</sup> and 3<sup>rd</sup> generation cellular and PCS standards. In addition specific models are available for L-band, S-band and IF (70MHz and 140MHz) modem testing.

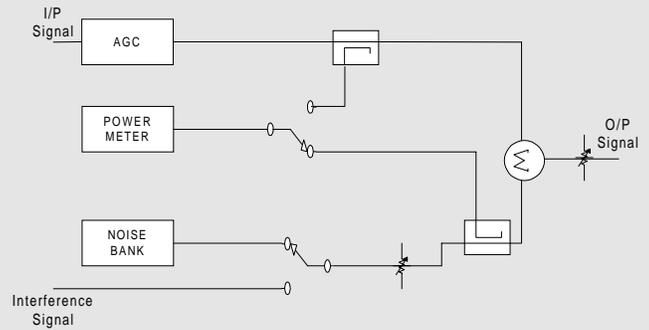
#### Accuracy of 0.2dB RSS

An extremely stable AWGN source, utilizing the noise of a thermal termination avoids the typical amplitude distortion errors found in noise diode implementations. This innovative design coupled with the use of an extremely precise power meter optimized for measuring high crest factor noise signals, assure excellent accuracy and repeatability in setting ratios.

The CNG automatically compensates for bit rate, signal bandwidth, duty cycle and power level settings, making measurements as simple as pressing a button. The instrument can automatically track and remove input signal variations to maintain a precise ratio.

## Setting Precise C/N Ratio

The input RF signal is combined with an internal Additive White Gaussian Noise source. When a ratio calibration is performed, the signal and the noise power are measured consecutively. Using the substitution method, the noise power is set very accurately relative to the signal power by offsetting the noise attenuator. This attenuator uses a proprietary thermally stabilized solid state design that compensates for variations that occur over frequency attenuation setting and ambient temperature. The noise attenuator resolution is 0.015 dB. The output attenuator is used to set the operating level at the output of the instrument.



*The internal AWGN source is summed with the user supplied carrier signal.  
The CNG generates precise Eb/No ratios over a broad range of settings.*

## Modular construction - Ease of Maintenance

The CNG series is totally modular in construction. Each sub-assembly is factory calibrated making drop-in field replacements simple. To solve the problem of attenuator accuracy and reliability, dBm has designed self-compensating attenuators that automatically correct for frequency and setting variations.

Benefits include ease of calibration and lower product support costs during the life of the product.



*Modular subassembly*

## Optimized for ATE Applications

The CNG may be used either as a stand-alone instrument for product development/verification testing or integrated into an ATE system for production test. Solid state attenuators are used where applicable to dramatically extend the reliability and operational life of the instrument and increase its execution speed, making it ideally suited for high volume production test applications.

# Specifications

Operating Mode	C/N, C/No, Eb/No, C/I noise disabled, signal disabled
Displayed parameters	ratio, bit rate, duty cycle, frequency, averaging rate, averaging factor, output power, input power, delta input power

## Carrier Path

RF input power	-50 dBm to +0 dBm
RF output power	- 110 dBm to +0 dBm*
Input duty cycle	1% to 100%
Nominal gain	0 dB (@attenuation = 0 dB)
Gain resolution	1 dB
Gain flatness	< +/- 0.05 dB per 1.23 MHz bandwidth < +/- 0.2 dB per 40 MHz bandwidth
Group delay	+/- 0.20 ns per 40 MHz bandwidth
Tracking range	+/- 5 dB minimum
Channel-to-Channel isolation	> 100 dB
Residual output noise	< -149 dBm/Hz
Impedance	50 ohms
VSWR	1.5:1 maximum
Connectors	Type N female

\* Signal path gain is 0 dB with CNGopt02

## Noise Output

Power	0 dBm to -110 dBm
Flatness	< +/- 0.2 dB per 40 MHz
Amplitude resolution	0.125 dB
Crest factor	18 dB minimum

## Measurement

C/N ratio accuracy	+/- 0.2 dB RSS
Averaging factor	10 to 999
Averaging rate	5 to 999 Hz
Absolute accuracy	+/- 0.5 dB

## Control and interface

Local interface	Front panel keypad & display
Remote interface	IEEE-488.2
Save/Recall	10 states

## Primary power

Voltage	90-264 VAC autoranging
Frequency	48-66 Hz
Consumption	100 VA, maximum
Fuse	2A, slow-blow

Ambient operating temp	0° to 50° C
Dimensions	17" W x 5.25" H x 21" D

Model	Nominal full scale noise density	Passband flatness	Noise band	Application
CNG-1-70/140	-84 dBm/Hz	0.5 dB p-p	50 -180 MHz	SATCOM
CNG-2-70/140	-84 dBm/Hz	0.5 dB p-p	50 -180 MHz	SATCOM
CNG-1-26/180	-85 dBm/Hz	0.5 dB p-p	26 -180 MHz	SATCOM/Cable
CNG-2-26/180	-85 dBm/Hz	0.5 dB p-p	26 -180 MHz	SATCOM/Cable
CNG-1-5/1005	-93 dBm/Hz	1.0 dB p-p	5-1005 MHz	Cable TV
CNG-2-5/1005	-93 dBm/Hz	1.0 dB p-p	5-1005 MHz	Cable TV
CNG-1-800/1000	-84 dBm/Hz	0.5 dB p-p	800 - 1000 MHz	Cellular
CNG-1-870/1750	-84 dBm/Hz	0.5 dB p-p	800 - 1750 MHz	L-band SATCOM
CNG-1-800/2400	-84 dBm/Hz	0.5 dB p-p	800 - 2400 MHz	Cellular/PCS
CNG-1-1700/2400	-84 dBm/Hz	0.5 dB p-p	1700 - 2400 MHz	Cellular/PCS
CNG-1-2200/2700	-84 dBm/Hz	0.5 dB p-p	2200 - 2700 MHz	PCS
CNG-1-800/2700	-84 dBm/Hz	0.5 dB p-p	800 - 2700 MHz	Cellular/PCS

Specifications subject to change without notice.

- Contiguous frequency band, one or two channels available
- Frequency tunable, 80 MHz instantaneous bandwidth

## Ordering Information

Model	Description	Application
CNG-1-70/140	Single channel 50 - 180 MHz	SATCOM
CNG-2-70/140	Dual channel 50 - 180 MHz	SATCOM
CNG-1-26/180	Single channel 26 - 180 MHz	SATCOM/Cable
CNG-2-26/180	Dual channel 26 - 180 MHz	SATCOM/Cable
CNG-1-5/1005	Single channel 5 -1005 MHz	Cable TV
CNG-2-5/1005	Dual channel 5 -1005 MHz	Cable TV
CNG-1-800/1000	Single channel 800-1000 MHz	Cellular
CNG-1-870/1750	Single channel 870-1750 MHz	L-band SATCOM
CNG-1-800/2400	Single channel 800-2400 MHz	Cellular/PCS
CNG-1-1700/2400	Single channel 1700-2400 MHz	Cellular/PCS
CNG-1-2200/2700	Single channel 2200-2700 MHz	PCS
CNG-1-800/2700	Single channel 800-2700 MHz	Cellular/PCS

Options	Description
CNGopt01	Tracking - Automatic Gain Control to maintain constant output carrier power
CNGopt02	Delete output attenuator (unity gain signal path)

### *Distributor*



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