NOISE GENERATING INSTRUMENT

N C 6 1 0 9

USER MANUAL

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- 2nd Copy -

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CONTENTS

1. SPECIAL INSTRUCTIONS

SELECTION OF LINE VOLTAGE AND FUSES
1. Remove Power Cord. 2. Open access door to power entry module with a small screwdriver. 3. Pull fuse carrier out. Replace fuse with required one. (Fuse size marked on rear panel). 4. Pull voltage select wheel out and rotate until correct voltage appears in the window when access door is closed. (DO NOT attempt to rotate wheel in place.) 5. Replace fuse carrier into right hand side slot (this is the only active side) with the white arrow facing to the right. Close access door.
THIS INSTRUMENT IS SUPPLIED WITH A FUSE FOR THE VOLTAGE SELECTED

ALL SIGNAL AND CONTROL CABLES CONNECTED SHOULD NOT EXCEED 3 Meters (9 Feet) IN LENGTH.

2. SPECIFICATIONS:

FREQUENCY RANGE	: 100 Hz - 1.0 GHz
OUTPUT POWER	: 10 mW
NOMINAL IMPEDANCE	: 50 Ohms
OUTPUT CONNECTOR	: BNC (F)
FLATNESS	: +/- 2.0 dB
STORAGE TEMPERATURE	: -20 to +85 Degrees C
OPERATING TEMPERATURE	: -10 to +60 Degrees C
RELATIVE HUMIDITY	: 95 percent
ATTENUATION	: 110 dB
POWER REQUIREMENTS	: 220 VAC
POWER DISSIPATION	: Less than 10 Watts
SIZE	: 8.5" x 5.0" x 12.5"
RE-CALIBRATION PERIOD	: 1 Year

3. PARTS LIST

TYPE	PART NUMBER
POWER SUPPLY	HB-28-1.0
NOISE SOURCE	NC6109A
ATTENUATOR (1 dB/Step)	50R-019
ATTENUATOR (10 dB/Step)	50R-043
SWITCH LENS	31-951.9
SWITCH LAMP	31-963.1
AC RECEPTACLE/EMI FILTER	6EDL4
FUSE	0.50 Amp
LINE CORD	17250
OUTPUT CONNECTOR	BNC (F)

4. OPERATION

The NC6000 series is an all solid state noise generating instrument. When the unit is turned on, it supplies white gaussian noise over the full band specified in section 2.

The front panel attenuator allows adjustment of the noise output in 1 dB steps. (0.1 dB steps if your instrument is ordered with this option). Termination of the output is non-critical; the instrument will tolerate any VSWR.

IMPORTANT!
FOR PROPER OPERATION - THIS INSTRUMENT REQUIRES A 30 MINUTE WARM-UP PERIOD PRIOR TO OPERATION.

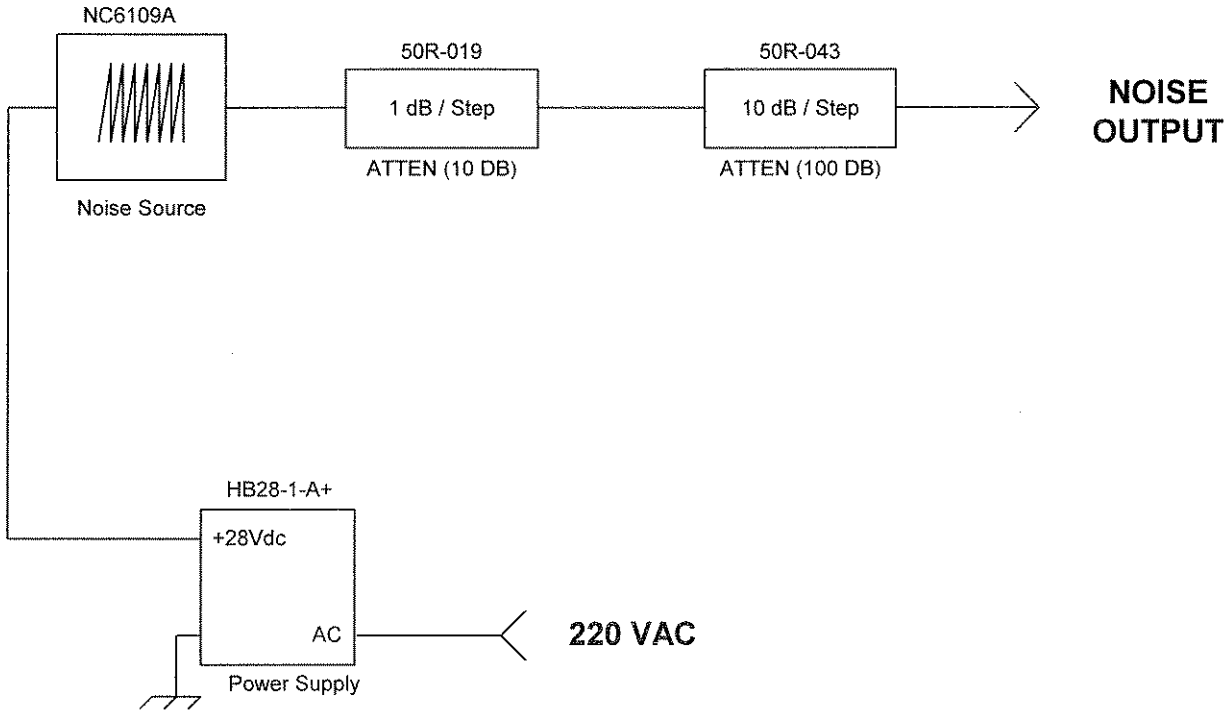
5. DESCRIPTION

The NC 6000 series is an all solid state instrument in which noise is generated by means of a semiconductor noise diode. The diode's output is then amplified to the instrument output level. All amplification is accomplished by means of linear stages, operated to allow white gaussian noise output.

The instrument enclosure is of rugged design. The side panels are made of diecast aluminum. Structural integrity is assured by means of internal support beams which include pull down feet.

The circuit (see block diagram) consists of the noise module powered by means of a lightly loaded power supply. The noise power goes to a step attenuator(s) before reaching the output connector.

Block Diagram - NC6109



7. TECHNICAL REFERENCE

NOISE: What Is It ?

Noise plays an important role in the RF and Microwave environment because it is virtually a universal test signal. Noise is produced by random fluctuations of electrons traveling through a resistor, and the average power and amplitude of the noise(noise power) is proportional to the temperature of the resistor. Noise diodes are used to produce noise levels above thermal noise. This thermal noise is white and may have a Gaussian amplitude distribution.

Noise/Com's noise diodes are manufactured and screened for performance characteristics that make them useable for broadband noise generation with flat response. All Noise/Com diodes deliver symetrical White Gaussian Noise and flat output power density over the specified frequency range. Each diode is burned-in for 168 hrs., meets MIL-STD-202, and is hermetically sealed. Noise/Com diodes are available in a wide variety of package styles, frequencies, and in special configurations upon request.

NOISE: Where and How is it used ?

Noise can be used to characterize both components and systems and can be applied to a variety of measurement applications. It is used to evaluate the performance of communications systems, for EMI testing, as a source for built-in test equipment (BITE), and for secure communications systems. Noise can also be used in military jamming systems to confuse enemy radar or communications, and in threat- simulation systems to imitate signals from enemy transmitters. In a radar, noise can obscure returns from an enemy target, and limit the effective range of the radar. In digital communications, excessive noise can cause a high Bit-Error Rate (BER), resulting in the transmission and reception of false information.

By using noise as a test signal, systems can be evaluated for dynamic range and sensitivity, and calibrated for maximum performance.

NOISE PARAMETERS DEFINED

Noise Factor is defined as the additive noise produced by a receiving system.

$$\text{Noise Factor} = \frac{\text{Signal-to-noise ratio at input}}{\text{Signal-to-noise ratio at output}}$$

Noise Figure is the most widely measured noise parameter. It is defined as 10 x log(noise factor). An ideal receiver would be capable of detecting a signal at -174 dBm/Hz at room temperature, and would have no additive noise. Its noise figure would therefore be 0 dB. It is desirable to maintain the lowest possible noise figure so that the transmitted power can be minimized.

Y-factor method is the ratio of resultant noise powers at the output of DUT (device under test) when applying two known levels of noise to the input. It is used with calibrated input noise levels to calculate noise figure or effective input noise temperature.

ENR (Excess Noise Ratio) is the ratio of the output noise power relative to thermal noise of the termination at 290K. It is given by:

$$ENR(dB) = 10 \times \log \frac{T1 - T0}{T0}$$

where T1 is the effective noise temperature of the energized noise source, and T0 is the reference termination at 290 K.

The power spectral density of white noise is constant over frequency. This implies that noise power is proportional to bandwidth. Therefore, if the measurement bandwidth is doubled, the detected noise power will double (an increase of 3 dB). Noise voltage increases as the square root of bandwidth. For this reason, noise is usually described in dBm/Hz or Voltage over sqr root of frequency. The Total power in a measurement bandwidth (BW) is;

$$P(dBm) = Noise\ (dBm/Hz) + 10 \log(BW)$$

in 50 Ohms systems:

$$P(milliwatt) = \frac{VxV\ (rms)}{(50)} \times 1000$$

$$10 \log(P) = 20 \log\ (Vrms) + 10 \log \frac{1000}{50}$$

$$P(dBm) = 20 \log\ (Vrms) + 13$$

8. CALIBRATION & SERVICE

Noise Com, Inc. certifies that its products meet published specifications at the time of shipment from the factory. Noise Com, Inc. further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by the institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

Your Noise Generating Instrument should be returned to Noise Com, Inc. periodically for adjustment and calibration. One year after purchase, and at least once a year thereafter is highly recommended to re-assure your instrument's accuracy. Favorable 3-years Calibration Service Contracts are available. For further information:

* * * Call Noise Com, Inc. at (201) 261-8797 * * *

Your Noise Generating Instrument may be returned to Noise Com, Inc. for service. Prior to sending, please call us at (201) 261-8797 for details.

9. WARRANTY

All Noise Com products are warranted against defects in materials and workmanship for a period of one year from the date of shipment. Noise Com, Inc. will, at its option, repair or replace products that prove to be defective during the warranty period, provided they are returned to Noise Com. Repairs necessitated by misuse of the product are not covered by this warranty. NO OTHER WARRANTIES ARE EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. NOISE COM IS NOT LIABLE FOR CONSEQUENTIAL DAMAGES.