

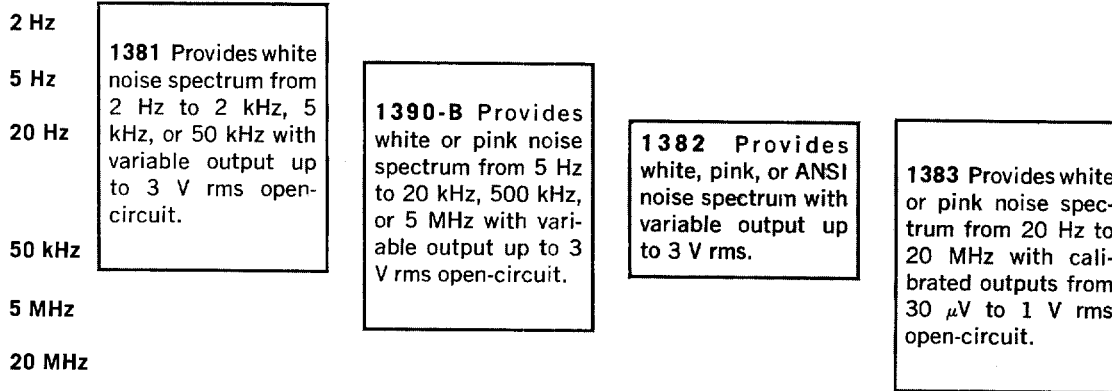
# Random-Noise Generators

Electrical noise is, by definition, any unwanted disturbance and its reduction in communications circuits is a constant aim of the engineer. Noise from a controlled source, however, is useful in studying the effectiveness of systems for detecting and recovering signals in noise. Well defined random noise is, moreover, a remarkably useful test signal that has, for many measurements, properties that are more useful than those of a single-frequency signal. Its wide spectrum sometimes permits one test with random noise to replace a series of single-frequency tests. Noise is also useful in simulating speech, music, or communications circuit traffic.

Noise is called random if its instantaneous amplitude at any future instant is unpredictable. Random noise is specified by its amplitude distribution and by its spectrum. Many types of naturally occurring electrical noise have the same distribution of amplitudes as do errors that

normally occur in experimental measurements — the normal or Gaussian distribution. In general-purpose noise generators the design objective is random noise that is Gaussian and has a uniform spectrum level over the specified frequency range.

The General Radio random-noise generators produce electrical noise at high output levels, each model having been designed for specific uses. The 1381 is useful for many audio-frequency applications, and also in vibration testing as its spectrum extends well into the subaudio range. The 1382 is intended for audio-frequency electrical, acoustical, and psychoacoustical applications. The 1390-B is useful at higher frequencies because its spectrum extends to 5 MHz. The 1383 generates wide-band noise of uniform spectrum level and is particularly useful for tests in video- and radio-frequency systems.



## 1381 and 1382 Random-Noise Generators

### GR 1381

- 2 Hz to 2, 5, or 50 kHz, Gaussian distribution
- adjustable clipping
- 3-V rms output

### GR 1382

- 20 Hz to 50 kHz, Gaussian distribution
- white, pink, or ANSI spectra
- 3-V rms output, balanced, unbalanced, or floating

**Predictably random** The 1381 and 1382 are companion instruments that generate truly random noise from a semiconductor source. Special precautions are taken to ensure a symmetrical, Gaussian amplitude distribution. Output level is adjustable from below 3 millivolts to 3 volts rms behind a 600-ohm source impedance. Each model is constructed in a 3½-inch-high, half-rack-

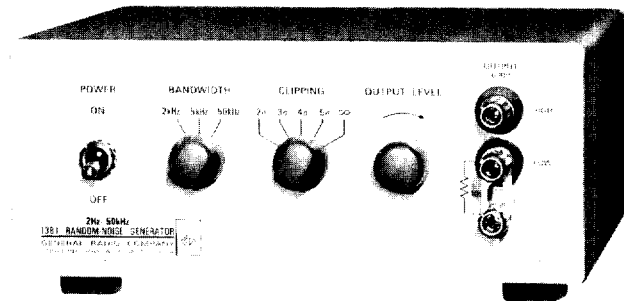
width cabinet, convenient for bench use and two can be mounted side-by-side in a relay rack.

Either of these noise generators can be used for simulation of noise in signal paths, as test-signal sources, or for demonstrations of statistical and correlation principles. The different features of the two offer a choice to match your needs.

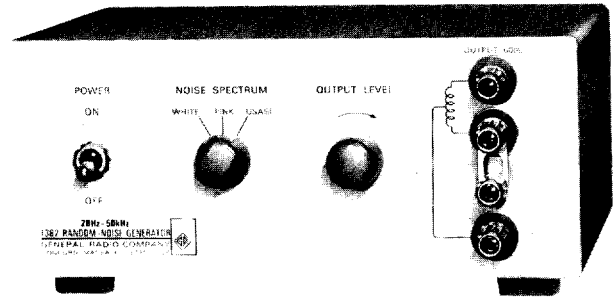
**Lowest frequency** The 1381 generates noise that is flat down to 2 Hz and is intended for random-vibration tests and for general-purpose use in the audio and sub-audio range. The upper-frequency limit (at -3 dB) can be switched to 2, 5, or 50 kHz. The output signal can be clipped symmetrically at 2, 3, 4, or 5 times the rms amplitude.

**Pink or white** The 1382 generates noise in the 20-Hz to 50-kHz band and is intended for electrical, acoustical, and psycho-acoustical tests. It offers three spectra, white (flat), pink (-3 dB per octave), and ANSI (see specifications). The output can be taken balanced or unbalanced, floating or grounded.

— See **GR Experimenter** for January 1968 and March-April 1969.



GR 1381



GR 1382

## 1381 and 1382 Random-Noise Generators (Cont.)

### SPECIFICATIONS

**Spectrum of 1381:** SHAPES: Flat (constant energy per hertz of bandwidth)  $\pm 1$  dB from 2 Hz to half of cutoff. CUTOFF FREQUENCY (down 3 dB): 2, 5, or 50 kHz, selected by switch. SPECTRAL DENSITY, at 3-V output level and for 1-Hz bandwidth: 64, 40, and 13 mV, approx, respectively for upper cut-off frequencies of 2, 5, and 50 kHz. SLOPE of amplitude vs frequency above upper cutoff: 12 dB/octave. See graph.

**Spectrum of 1382:** Choice of 3 shapes. WHITE NOISE (flat spectrum, constant energy per hertz bandwidth):  $\pm 1$  dB, 20 Hz to 25 kHz, with 3-dB points at approx 10 Hz and 50 kHz; PINK NOISE (constant energy per octave bandwidth):  $\pm 1$  dB, 20 Hz to 20 kHz; or ANSI NOISE, as specified in ANSI Standard S1.4-1961. See graph.

### Waveform:

Voltage	Gaussian Probability-Density Function	Amplitude-Density Distribution of 1381/1382
0	0.0796	$0.0796 \pm 0.005$
$\pm\sigma$	0.0484	$0.0484 \pm 0.005$
$\pm 2\sigma$	0.0108	$0.0108 \pm 0.003$
$\pm 3\sigma$	0.000898	$0.000898 \pm 0.0002$
$\pm 4\sigma$	0.0000274	$0.0000274 \pm 0.00002$

These data measured in "windows" of  $0.2\sigma$ , centered on the indicated values of voltage;  $\sigma$  is the standard deviation or rms value of the noise voltage.

**Clipping:** The output of the 1381 can be clipped internally to remove the occasional wide extremes of amplitude. Clipping, if desired, is adjustable to approx 2, 3, 4, or  $5\sigma$ . Such clipping has negligible effect on the spectrum or the rms amplitude.

**Output:** VOLTAGE:  $>3$  V rms max, open-circuit, for any bandwidth. CONTROL: Continuous adjustment from that level down approx 60 dB. IMPEDANCE: 600  $\Omega$ . Can be shorted without causing distortion. 1381 output is unbalanced; 1382 output is floating, can be connected balanced or unbalanced. TERMINALS: 1381 output at front-panel binding posts and rear-panel BNC connector; 1382 output at front-panel binding posts and rear-panel jacks for double plugs.

**Supplied:** Power cord, rack-mounting hardware with rack models.

**Power:** 100 to 125 or 200 to 250 V, 50 to 400 Hz, 6 W.

**Mechanical:** Convertible bench cabinet. DIMENSIONS (wx hxd): Bench, 8.5x3.87x9.87 in. (216x98x250 mm); rack, 19x3.5x9 in. (483x89x229 mm). WEIGHT: 7 lb (3.2 kg) net, 10 lb (4.6 kg) shipping.

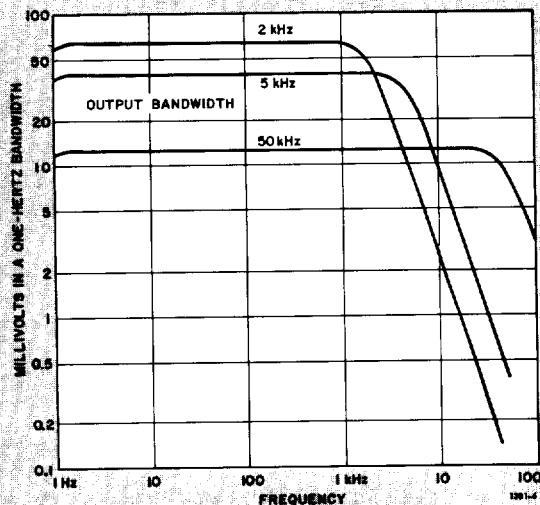
### Description

#### Random-Noise Generator

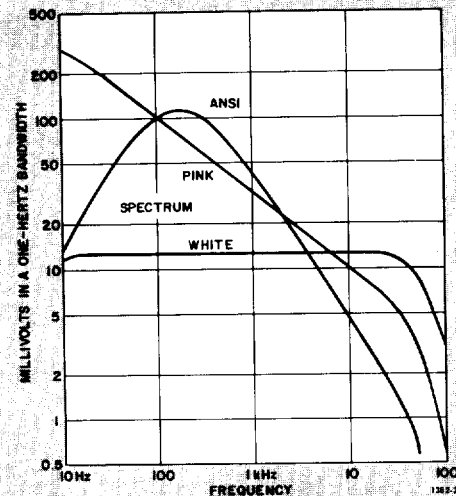
1381 (2 Hz to 50 kHz), Bench  
 1381 (2 Hz to 50 kHz), Rack  
 1382 (20 Hz to 50 kHz), Bench  
 1382 (20 Hz to 50 kHz), Rack

### Catalog Number

1381-9700  
 1381-9701  
 1382-9700  
 1382-9701



Type 1381



Type 1382