



## PRECISION NOISE GENERATOR

### Pseudo-random pink and white noise

Model 8057A



8057A

The Hewlett-Packard 8057A Precision Noise Generator is an audio frequency noise generator producing pseudo-random signals, available at binary and Gaussian distribution outputs. These signals are repeated noise patterns of known content and duration. Both white and pink noise with an equal rms value can be selected by push buttons. By producing a defined rms value, the high stability of the output level allows the use of a directly calibrated attenuator with 0.1 dB resolution. This makes the 8057A a highly accurate noise source.

The basis of the 8057A is a clock-controlled binary waveform generator arranged so that the transitions between output levels can occur only on "beats" of an internal clock. Alternately, the waveform generator can be timed by an external clock of frequency up to 1 MHz. Hence, the bandwidth can be varied externally. A predictable noise pattern can be produced by applying a trigger to the gate input.

A shift register and a digital-to-analog converter together form a low-pass digital filter. This filtering mechanism converts the family of two-level outputs from the shift register into a multi-level signal having a Gaussian probability density function and a nearly rectangular power spectrum. Crest factors up to 3.5 give a remarkably close fit to the Gaussian distribution. The unique feature of the digital filter produces a bandwidth which is directly proportional to the clock frequency.

Outputs from the 8057A are available at a fixed amplitude of 10 volts (binary) and 3.126 volts rms (Gaussian). A precision step attenuator provides control of the Gaussian output in 0.1, 1, and 10 dB steps from 129.9 down to 20 dB above 1  $\mu$ V rms. Push buttons allow an output impedance selection of 50 or 600  $\Omega$ . A positive 2  $\mu$ s trigger pulse available from a rear-panel connector indicates the period of the noise pattern. Hewlett-Packard also manufactures Model 3722A Noise Generator (Page 363).

### Specifications

#### Gaussian output

##### White noise

**Frequency spectrum:** dc to 26 kHz ( $-3$  dB point) (with external clock, upper frequency limit is equal to 1/20th of external clock frequency). Effective bandwidth: 27 kHz. Spectrum is flat within  $\pm 0.3$  dB up to 15 kHz and more than 25 dB down at 52 kHz.

**Power density:**  $362 \times 10^{-6}$  V<sup>2</sup>/Hz.

**Crest factor:** 3.5.

**Probability density:** near Gaussian.

##### Pink noise

**Frequency spectrum:** 3 dB/octave decreasing from 2 Hz to 20 kHz. Accuracy:  $\pm 0.5$  dB up to 15 kHz;  $+0$  dB,  $-1$  dB at 20 kHz.

**Crosspoint from white and pink noise frequency spectrum:** 2.5 kHz.

**Period of noise pattern:** approx. 2 sec. (for external clock: 1 048 575 x clock period)

**Amplitude (open circuit):** 3.126 V rms or 129.9 dB above 1  $\mu$ V.

**Amplitude attenuator:** 0.1; 1 and 10 dB steps from 129.9 to 20 dB above 1  $\mu$ V. Overall attenuator accuracy:  $\pm 0.5$  dB.

**Output impedance:** 50  $\Omega$  or 600  $\Omega \pm 3\%$ .

**Zero drift:**  $< \pm 30$  mV from 32° to 122°F (0° to 50°C).

#### Binary output

**Output signal:** pseudo-random binary sequence. Clock rate: 520 kHz (or external clock) Sequence length: 1 048 575 Bit.

**Amplitude (open circuit):** 10 V  $\pm 10\%$ .

**Output impedance:** approx. 600  $\Omega$ .

**Rise, fall time:**  $< 50$  nsec.

**Trigger output** (Positive trigger pulse indicates period of the noise pattern).

**Trigger pulse amplitude:** approx. 10 V.

**Output impedance:** approx. 1 k $\Omega$ .

**Trigger pulse width:** 2  $\mu$ sec (or equal to clock period of external clock frequency).

**External clock input:** only for white noise output. (Pink noise should not be used with external clock. Overloading amplifiers distorts output).

**Positive clock pulses:** min. +2 V; max. +20 V amplitude.

Sine wave at least 4 V peak to peak.

**Maximum clock rate:** 1 MHz.

**Minimum pulse width:** 15 nsec.

**Input impedance:** approx. 1 k $\Omega$ .

**Gate input:**  $-1$  V to  $+2.8$  V or connected to ground disables Noise Output. (Gate input connected to ground: Output current approx. 2.5 mA).  $+4.5$  V to 12 V or not connected enables Noise Output.

#### General:

**Power:** 115 V or 230 V  $+10\%$ ,  $-15\%$ , 50 Hz to 400 Hz, 14 VA.

**Dimensions:** standard HP  $\frac{1}{2}$  module; 6" high,  $7\frac{3}{4}$ " wide, 11" deep (155 x 190 x 27 mm).

**Weight:** net 6 $\frac{1}{2}$  lb (3,25 kg), shipping 8 lb (4 kg).

**Price:** 8057A, \$775 (\$675 at factory on West Germany).

**Option 01:** without attenuator, subtract \$100.