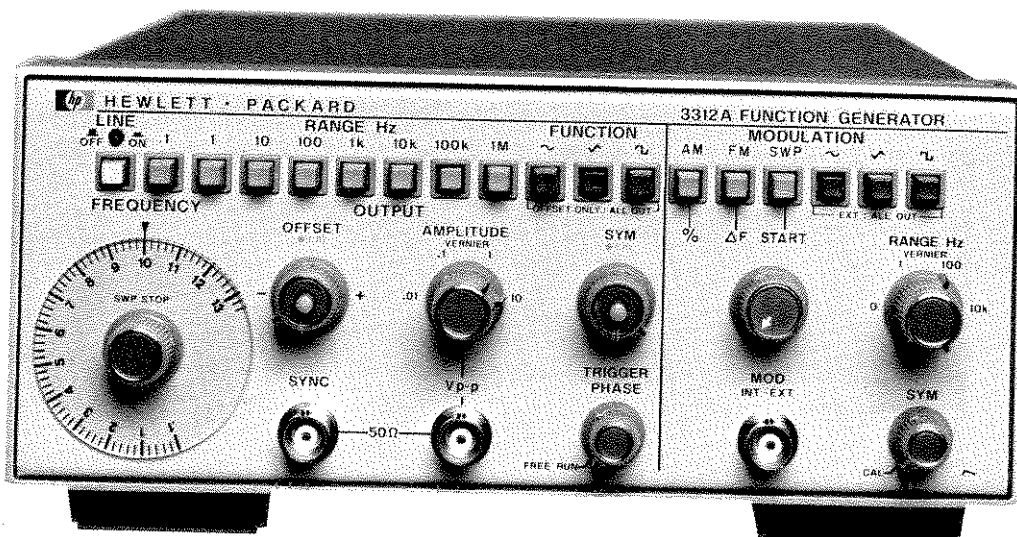


# FREQUENCY, FUNCTION & WAVEFORM SYNTHESIZERS

Function Generator

Model 3312A

- Two function generators in one instrument
- AM-FM, sweep, trigger, gate and burst



HP 3312A

## Description

Hewlett-Packard's 3312 A Function Generator combines two separate, independent function generators with a modulator section in one compact instrument.

The main generator can—via pushbutton control—be triggered by the modulation generator to provide sweep functions, AM, FM or tone burst.

Ten V p-p into 50  $\Omega$  provides adequate power for most applications. The output attenuator has a range of more than 10,000:1 so clean low-level signals from 10 V to 1 mV p-p into 50  $\Omega$  can be obtained. The main generator includes dc offset up to 10 volts p-p into 50  $\Omega$ .

The HP 3312A is an effective low cost solution for generating a multitude of functions.

## Specifications

**Output waveforms:** sine, square, triangle,  $\pm$  ramp, pulse, AM, FM, sweep, triggered and gated.

### Frequency Characteristics

**Range:** 0.1 Hz to 13 MHz in 8 decades ranges.

**Dial accuracy:**  $\pm 5\%$  of full scale. Unspecified in Uncal Mode.

**Square wave rise or fall time (10% to 90%):** <20 ns.

**Aberrations:** <10%.

**Triangle linearity error:** <1% at 100 Hz.

**Variable symmetry:** 80:20:80 to 1 MHz.

**Sine wave distortion:** <0.5% (-46 dB) THD from 10 Hz to 50 kHz. (10 kHz range maximum). >30 dB below fundamental from 50 kHz to 13 MHz, at full-rated output.

### Output Characteristics

**Impedance:** 50  $\Omega \pm 10\%$ .

**Level:** 20 V p-p into open circuit, >10 V p-p into 50  $\Omega$  at 1 kHz.

**Level flatness (sine wave):**  $\pm 3\%$  from 10 Hz to 100 kHz at full rated output (1 kHz reference).  $\pm 10\%$  from 100 kHz to 10 MHz.

**Attenuator:** 1:1, 10:1, 100:1, 1000:1 and >10:1 continuous control.

**Attenuator error:** <5%.

**Sync output:** impedance: 50  $\Omega \pm 10\%$ , >1 V p-p square wave into open circuit. Duty cycle varies with symmetry control.

**DC offset:** variable up to  $\pm 10$  volts. Instantaneous ac voltage + Vdc offset cannot exceed  $\pm 10$  V (open circuit) or  $\pm 5$  V (terminated 50 ohm).

### Modulation Characteristics

**Types:** internal AM, FM, sweep, trigger, gate or burst; external AM, FM, sweep, trigger, gate or burst.

**Waveforms:** sine, square, triangle, ramp or variable symmetry pulse.

**Frequency range:** 0.01 Hz to 10 kHz.

**Output level:** >1.0 V p-p into 10 k $\Omega$ .

### Amplitude Modulation

**Depth:** 0 to 100%.

**Modulation frequency:** 0.01 Hz to 10 kHz (internal). DC to >1 MHz (external).

**Carrier 3 dB bandwidth:** <100 Hz to >5 MHz.

**Carrier envelope distortion:** <2% at 70% sine wave modulation with  $f_c = 1$  MHz,  $f_m = 1$  kHz.

**External sensitivity:** <10 V p-p for 100% modulation.

### Frequency Modulation

**Deviation:** 0 to  $\pm 5\%$  (internal).

**Modulation frequency:** internal: 0.01 Hz to 10 kHz; external: DC to >50 kHz.

**Distortion:** <-35 dB at  $f_c = 10$  MHz,  $f_m = 1$  kHz, 10% modulation.

### Sweep Characteristics

**Sweep width:** >100:1 on any range.

**Sweep rate:** 0.01 Hz to 10 kHz, 90:10 ramp, and 0 Hz Range (provides manual setting of "Sweep Start" without modulation generator oscillating).

**Sweep mode:** repetitive linear sweep between start and stop frequency settings. Retrace time can be increased with symmetry control.

**Ramp output:** 0 to >-4 p-p into 5 k $\Omega$ .

### Gate Characteristics

**Start/stop phase range:** +90° to -80°.

**Frequency range:** 0.1 Hz to 1 MHz (useful to 10 MHz).

**Gating signal frequency range (external):** dc to 1 MHz, TTL compatible.

### External Frequency Control

**Range:** 1000:1 on any range.

**Input requirement:** with dial set at 10, 0 to -2 V  $\pm 20\%$  will linearly decrease frequency >1000:1. An ac voltage will FM the frequency about a dial setting within the limits (0.1 < f < 10) x range setting.

**Linearity:** 0.5% of Fmax for Fmax  $\leq 1$  MHz 5.0% of Fmax for Fmax > 1 MHz. Deviation is from a best fit straight line. VCO frequency span  $\leq 100:1$ .

**Input impedance:** 2.8 k $\Omega \pm 5\%$ .

### General

**Operating temperature:** 0°C to +55°C; specifications apply from 0°C to 40°C.

**Storage temperature:** -40°C to +75°C.

**Power:** 100 V, 120 V, 220 V, 240 V  $\pm 5\%$ , -10%, switchable; 48 W to 440 Hz;  $\leq 25$  VA.

**Size:** 102 mm H x 213 mm W x 377 mm D (4" x 8.4" x 14.8").

**Weight:** net, 3.8 kg (8.4 lb). Shipping, 5.9 kg (13 lb).

HP 3312A Function Generator

\$1,450