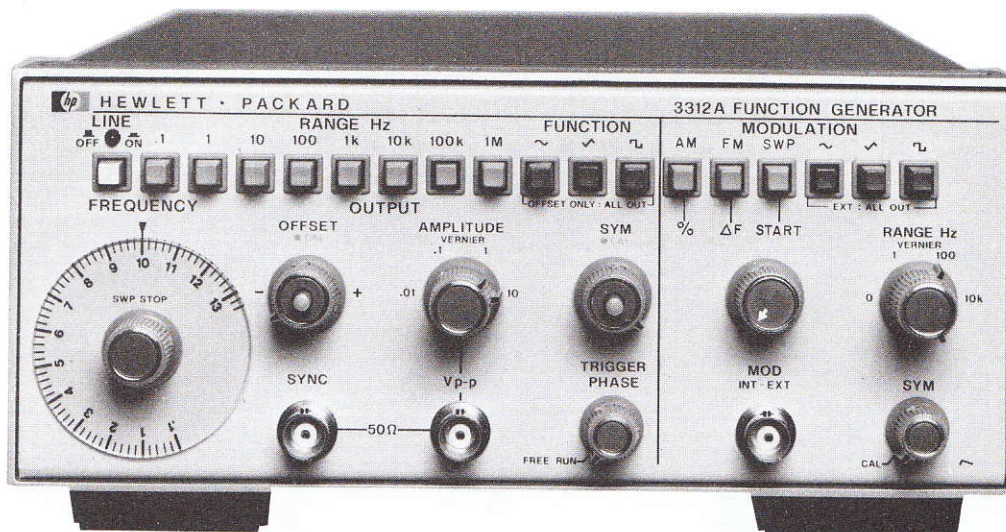


# OSCILLATORS & FUNCTION GENERATORS

## Function generator

Model 3312A

- AM, FM, sweep, trigger, gate and burst



### Description

Hewlett-Packard's 3312A 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 $\Omega$ .

Hewlett-Packard's 3312A is an effective low cost solution for generating a multitude of functions.

### 3312A Specifications

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

#### Frequency characteristics

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

**Dial accuracy:**  $\pm 5\%$  of full scale.

**Square wave rise or fall time (10% to 90%):** <18 nsec.

**Aberrations:** <10%.

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

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

**Sine wave distortion:** <0.5% THD from 10 Hz to 50 kHz. >30 dB below fundamental from 50 kHz to 13 MHz.

#### Output characteristics

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

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

**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:**  $\pm 10$  volts, continuously adjustable, independent of variable attenuator setting. Instantaneous ac voltage + Vdc offset must be between  $\pm 10$  V (not terminated) or  $\pm 5$  V (terminated with 50 $\Omega$ ) in the 1:1 attenuator position.

#### 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 pulse variable symmetry.

**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 100 Hz, 90:10 ramp, and 0 Hz (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:  $+90^\circ$  to  $-80^\circ$ .

**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  $(0.1 < f < 10) \times \text{range setting}$ .

**Linearity:** the frequency versus voltage curve will be linear within 0.5% over a 100:1 frequency range.

**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 Hz to 440 Hz;  $\leq 25$  VA.

**Size:** 102 H  $\times$  213 W  $\times$  377 mm D (4"  $\times$  8 $\frac{3}{8}$ "  $\times$  14 $\frac{3}{16}$ ").

**Weight:** net, 3.8 kg (8 lbs, 6 oz). Shipping, 5.9 kg (13 lbs).

### 3312A Function Generator