

The Arbitrary/Function Generator

Basic Features & Functions

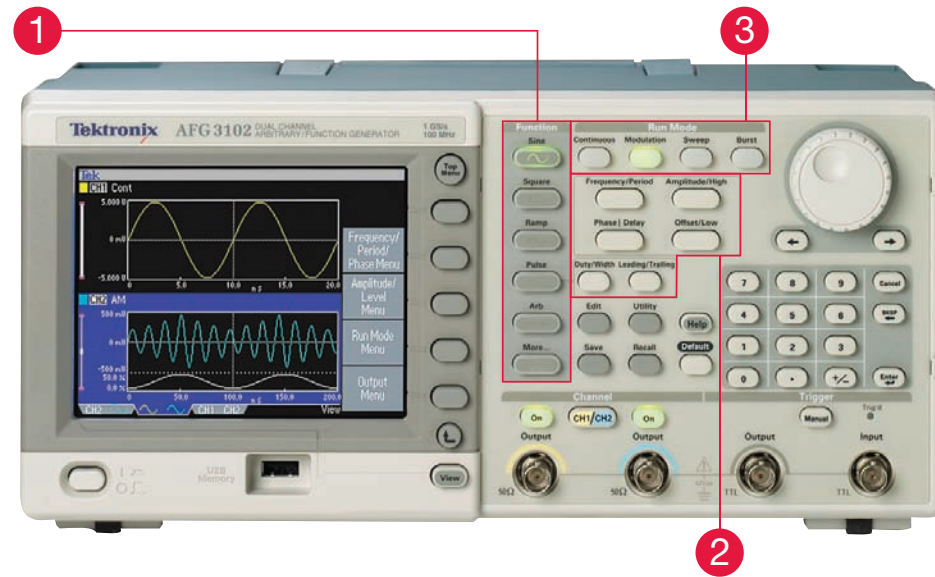
Capturing Your Signal: Easy as 1, 2, 3

1. Choose your signal type
2. Define your signal parameters
3. Select the Run mode

AFG3000 Series Arbitrary/Function Generator

With 12 standard waveforms, arbitrary waveform capability, and signal impairment options, the AFG3000 Series supports a wide range of application needs with one instrument.

- 10 MHz to 240 MHz models
- One or two channels
- Sample rates up to 2 GS/s
- Amplitudes up to 20 Vpk-pk

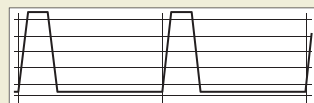
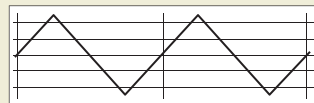
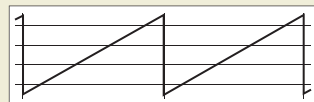
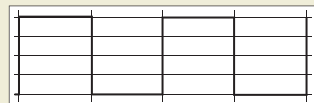
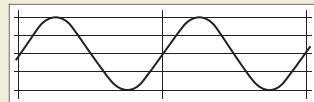


1 Basic Signal Types

Function generators typically offer a range of signal types. Here are the most common:

Basic Waveforms

- **Sine Wave**
A curved wave shape defined by the mathematical sine function.
- **Square Wave**
A wave shape consisting of repeating square pulses.
- **Sawtooth Wave**
A waveform that ramps up slowly, then falls off quickly.
- **Triangle Wave**
A waveform with symmetrical rise and fall times.
- **Pulse Wave**
A waveform with a fast rising edge, a period of time at a constant amplitude, and a fast falling edge.



Arbitrary Waveforms

When you need a unique waveform, an arbitrary waveform generator allows you to define your waveform. Performance terms and considerations for choosing a generator are:

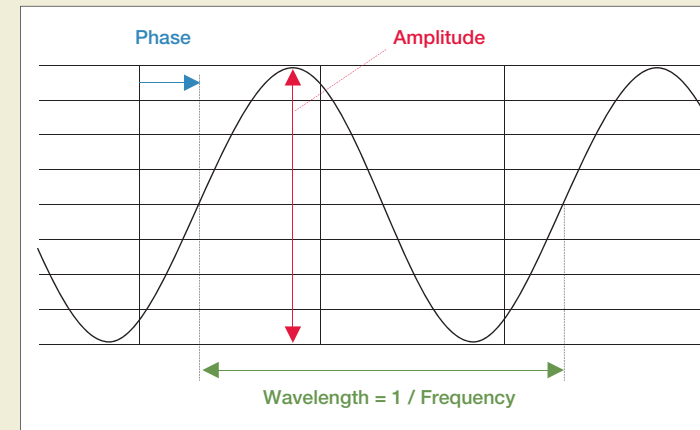
- **Arbitrary Waveform**
A waveform defined by the user rather than by the intrinsic nature of the signal generator.
- **Sample Rate**
The maximum clock or sample rate at which the signal source can operate.
- **Memory Depth**
The number of data points used to record a waveform, which determines the maximum amount of waveform data (equivalent to time).
- **Bandwidth**
The frequency range of the signal source; usually defined as the frequency at which a sinusoidal signal is attenuated by 3 dB.
- **Vertical (Amplitude) Resolution**
The smallest voltage increment that can be programmed in a signal source; the binary word width, in bits, of the instrument's digital to analog converter, which defines amplitude accuracy and distortion of the waveform.

2 Signal Parameters

Following are the common signal parameters that you must define for your waveform:

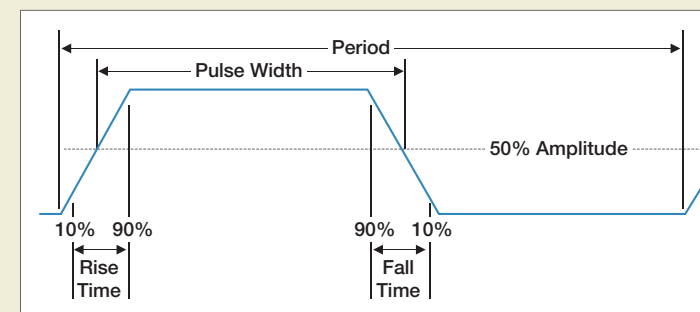
Waveform Characteristics

- **Amplitude**
A measure of the voltage "strength" of a waveform. Amplitude is constantly changing in an AC signal.
- **Frequency**
The number of times a full waveform cycle repeats in one second, measured in Hertz [Hz]. Frequency equals 1 divided by period or wavelength.
- **Phase**
Time placement of a cycle relative to a reference waveform or point in time.



Pulse Characteristics

- **Rise Time**
Amount of time required for a pulse edge to transition from low to high level.
- **Fall Time**
Amount of time required for a pulse edge to transition from high to low level.
- **Pulse Width**
Amount of time the pulse takes to go from low to high and back to low again, measured at 50% of full voltage.

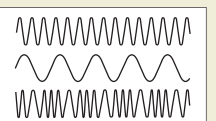
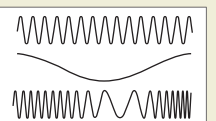
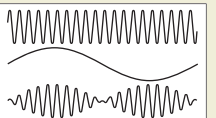


3 Run Modes

To generate your signal as defined by your selected signal type and signal parameters, simply choose Continuous mode. Or, you can choose to modulate your signal. Common modulation types are:

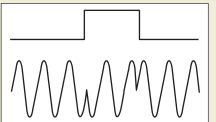
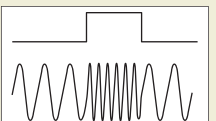
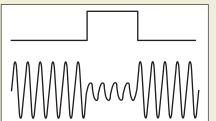
Signal Modulation

- **Amplitude Modulation (AM)**
A type of analog modulation in which amplitude variations embed lower-frequency information into a carrier signal of higher frequency.
- **Frequency Modulation (FM)**
A type of analog modulation in which frequency variations embed lower-frequency information into a carrier signal of higher frequency.
- **Phase Modulation (PM)**
A type of analog modulation in which phase variations embed lower-frequency information into a carrier signal of higher frequency.



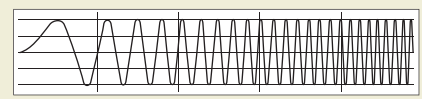
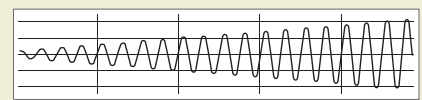
Signal Shift Keying

- **Amplitude Shift Keying (ASK)**
A type of digital modulation in which the digital modulating signal causes the carrier to switch between two amplitudes.
- **Frequency Shift Keying (FSK)**
A type of digital modulation in which the carrier switches between two frequencies.
- **Phase Shift Keying (PSK)**
A type of digital modulation in which the carrier switches between two phase settings.



Swept Waveforms

- **Amplitude Sweep**
A waveform that increases in amplitude over some period of time.
- **Frequency Sweep**
A waveform that increases in frequency over some period of time.



To find which Arbitrary/Function Generator is right for you, visit us at: www.tektronix.com/afg3000