Familiarization of Arbitrary Function Generator

By

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Introduction

Arbitrary Function Generator the name itself tells that the equipment can Generate different waveforms with variable frequency and amplitude.

Tektronix AFG1022 is capable of generating square, triangle, sine, ramp And user defined signals. Its frequency variation can be achieved upto 25 Mhz.

The output amplitude can be varied from 0 to 20 Vp-p.

The equipment have 6 digit frequency resolution, AFG 1022 is a dual output signal generator capable of generating two signals simultaneously With different signal parameters.

The following figure illustrates the front panel of arbitrary function generator,

Arbitrary Function Generator comes with display screen, the screen provides the information of the signal generated and its electrical parametes.

1. Tells about the manufacturer information with model number, The information in purple area tells about the maximum frequency it can generate and the signal sampling rate per second (more the sampling rate better the accuracy).

2. Its the power button to switch ON the equipment.

3. As we discussed earlier this is dual channel signal generator, two signals can be coupled to the equipment. The equipment has BNC female at output side. The button just above the bnc is ON/OFF button through which user can eanble or disable the output signal.

4. Its second ouput channel the functionality is similar as explained above.

5. Its a toggle buttton through which user can switch between channel 1 and channel 2. The selected channels signal parameters appears on the screeen.

6. by clicking both button user can access the signal parameters of both the channels on the screen.

Something Interesting

In June 1928, the General Radio 403, was the first commercial signal generator ever marketed. It supported a frequency range of 500Hz to 1.5MHz. Also, in April 1929, thefirst commercial frequency standard was marketed by General Radio with a frequency of 50KHz.

7. User can generate different signals using Mod button ex. Amplitude modulation, Frequency modulation, sweep signal, Burst signal etc. The following figure appears at Mod menu.
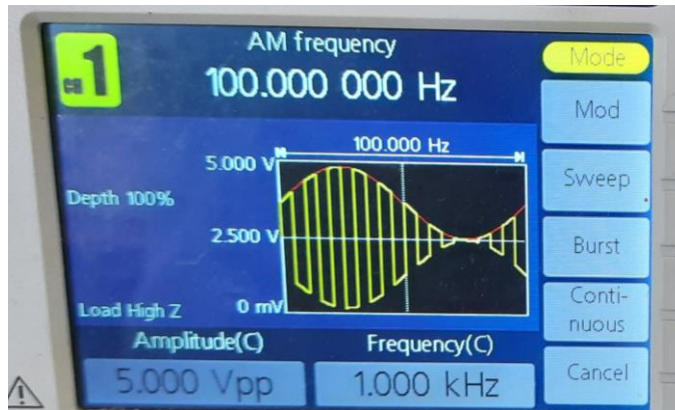
a. The first menu from top right is Mod, user can generate different modulations Like amplitude modulation, frequency modulation etc. Here user can set the carrier and modulating signal parameters. The below image represents the menu of Mod window.
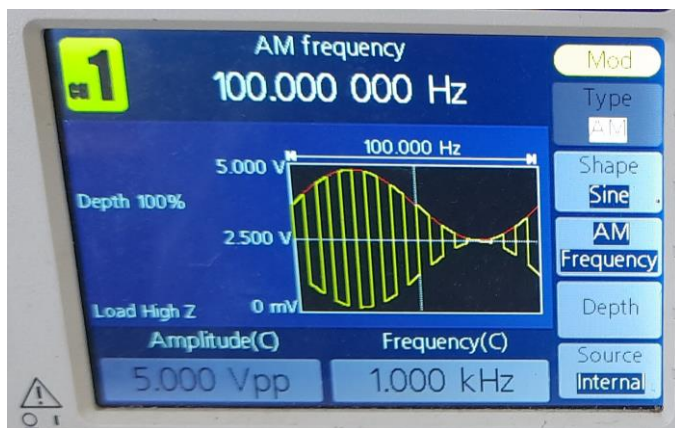
b. Sweep signal can be generated using the sweep menu, here the user have access to sweep time, start frequency and stop frequency etc of sweep signal, the menu window of sweep signal is illustrated below.
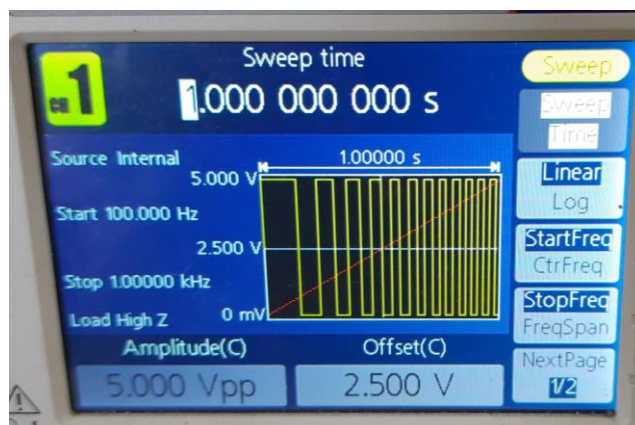
c. The instrument can output a burst using standard waveforms such as sine, square, ramp, and pulse, or arbitrary waveforms. The instrument allows you to use the following two types of burst mode:

Triggered burst mode :A specified number (burst count) of waveform cycles are output when the instrument receives a trigger input from the internal trigger source, an external trigger source, a remote command, or the Manual Trigger button.

Gated burst mode : The instrument outputs a continuous waveform when an effective gate signal is applied externally, when the Manual Trigger button is depressed, when a remote command is applied, or during 50% of the selected internal trigger interval.

The menu window of sweep signal is illustrated below.
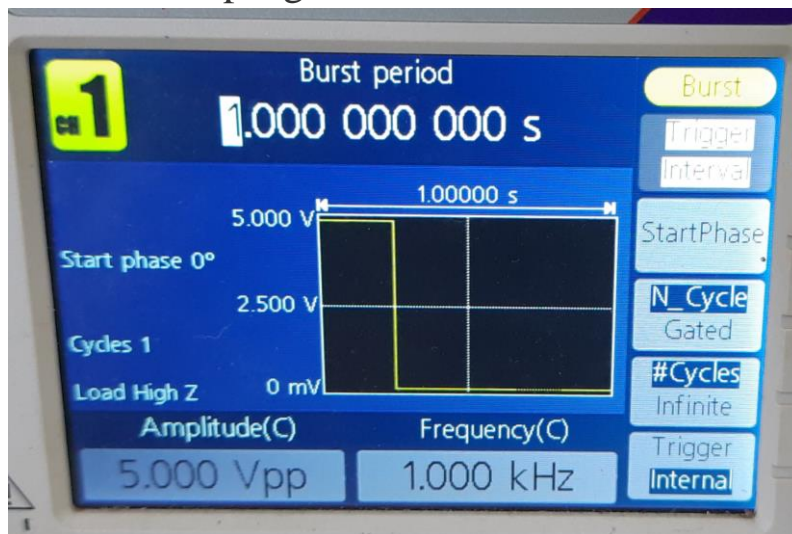
d. Continious signals are commonly used option in AFG, user can generate sine, ramp, square and pulse etc using the continious signal menu. The menu widow of continious signal is illusttrated below,

1. In the continious mode window user can edit the parametes of signal, In the above picture the button at the bottom are the types of signals which can be generated using continious mode option. Selected signal appears with yellow light.

2. From the top right in the above picture, user gets different acces to parameters. The selected signal apperas on the screen for user reference.

 d. Cancel button, pressing will take back to home screen.

 8a. As discussed earlier the menu provides access to different signals, The first is sine. User can generate sine function with thr frequency variation from 1 µHz to 25 MHz with 0 to 20 volt peak to peak amplitude.

8b. Square signal can be generated by pressing the square button, here user can generate the signal frequency from 1 µHz to 12.5 Mhz 0 to 20 volt peak to peak amplitude.

8c. Ramp signal with the signal frequency from 1 µHz to 1 MHz 0 to 20 volt peak to peak amplitude can be generated.

8d. Pulse signals play vital role in digital circuits, AFG 1022 can generate pulse signal from 1 µHz to 12.5 Mhz with 0 to 20 volt peak to peak amplitude.

8e. AFG 1022 provides option for user to generate arbitrary signal from 1 µHz to 10 Mhz.

8f. AFG 1022 has a built-in noise generator with amplitude from 0 to 15Vp-p.

9. The push buttons are used a select buttons, each button responds to menu appears adjacent to it.

10. AFG 1022 is programmable so here, the user can directly enter the signal parameters using the keypad. It reduces the time taken in scrolling.

11. The knob is used in scrolling the menu and also the various parameters of signal. Its the alternate to keypad in setting frequency and amplitude to some user desired level.

12. Option for USER to connect USB pendrive to save the signal files into the USB memory device to be saved with the extension TFS. You can recall the stored setups from a file in the USB memory device. For the smooth operation of USB, it should be formatted in FAT32 file system.

Something Interesting

In 1973, for about 20 years the familiar HP 608 vacuum-tube signal generator had been the first choice instrument for critical RF testing.

a. The Utility option provide the access to Display Setup, Counter Setup etc. The front menu of the utility is illustrated below

Display Setup : user have access to very the brightness of the screen and can change the screen saver.

Counter : Press Counter to display the Counter submenu. Connect the signal to the connector [Ref Clk/Counter In] on the rear panel. Press Settings to display the submenu.

Output Setup : Press Output Setup to set output load value. Press CH1Load or CH2Load to toggle 50 Ω and High Z. At 50 Ω status, use the general purpose knob to adjust the value on the current cursor and use to / move cursor. Use the numeric keypad to adjust the parameters and then choose proper unit. The load range is 1 Ω to 10 KΩ. Please go to next page for more detail.

System: User can change the language and can reset the equipment using factory reset option.

Setup : User can save setups of the instrument as files in the internal memory or on an external USB memory device. You can save up to 32 instrument setups in the instrument internal memory. To save more setups, use a USB memory device. Setup files saved to a USB memory device are saved with the extension TFS. You can recall the stored setups from a file in the internal memory or in a USB memory device.

b. Help menu : At any point if user have doubt on using AFG 1022, help button can be pressed to briefly familiarize the options of AFG 1022. The below window illustrate the help menu of AFG 1022.
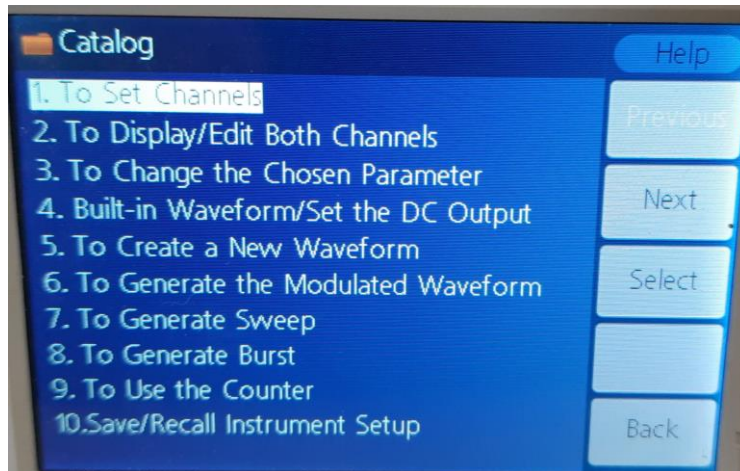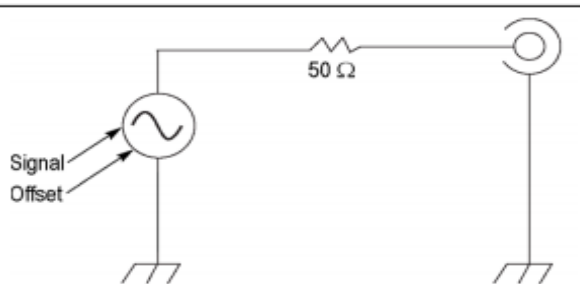

Output Setup : The following illustrations show the equivalent output circuits:

A change to the load impedance (L) will affect the output window (maximum and minimum levels) for a sine waveform as follows.

- L = 50 Ω: -5 V to +5 V (10 V$_{p-p}$)
- L = High Z: -10 V to +10 V (20 V$_{p-p}$)

The default setting for Keysight function generators is to display the desired voltage as though terminated into a 50 Ohm load. When a high impedance device, such as an oscilloscope is used to measure the output of the function generator, the waveform appears to be twice the voltage set on the display of the oscilloscope. Please setup the correct load for right application.

------- Thank You -------