
User's Guide

RIGOL

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VG1000 Series Function/Arbitrary Waveform Generator

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Safety Notices

Review the following safety precautions carefully before operating the instrument to avoid any personal injury or damage to the instrument or products connected to it.

To avoid the potential hazards, it is necessary to use the instrument in the manner specified in this user's guide.

The instrument should be serviced only by qualified personnel.

Avoid fire or personal injury.

Use the proper power line. Only the special power line of the products approved by the State should be used.

Ground the instrument. This generator is grounded through the protective terra conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to the earth ground. Make sure that the instrument is properly grounded before connecting the input or output terminals.

Observe all the ratings of the terminal. To avoid fire or shock, observe all the ratings and symbols marked in the instrument. Read the user's guide carefully before making connections to the instrument.

Do not operate without covers. Do not operate your generator without covers or panels.

Avoid circuit or wire exposed. Do not touch the exposed connections or components when the power is on.

Do not operate with suspected failures. If you suspect there is damage with this product, you have it inspected by qualified service personnel authorized by **RIGOL** before further operations.

Provide proper ventilation.

Do not operate in wet/damp conditions.

Do not operate in an explosive atmosphere.

Keep the product's surfaces clean and dry.

Safety Terms and Symbols

Terms in this guide. These terms may appear in this manual:



WARNING: Warning statements indicate the conditions or practices that could result in injury or loss of life.



CAUTION: Caution statements indicate the conditions or practices that could result in damage to this product or other property.

Terms on the product. These terms may appear on the product:

DANGER indicates an injury or hazard that may immediately happen.

WARNING indicates an injury or hazard that may not immediately happen.

CAUTION indicates that a potential damage to the instrument or other property might occur.

Symbols on the product. These symbols may appear on the Instrument:



**Hazardous
Voltage**



**Refer to the
Instructions**



**Protective
Earth
Ground**



**Chassis
Ground**



**Earth
Ground**

Instrument at a Glance

VG1000 Series Function/Arbitrary Waveform Generator adopts the direct digital synthesizer (DDS) technology, which can provide stable, high-precision, pure and low distortion sine signal. It can also provide 5MHz square waveform with fast rising and falling edges.

VG1000 includes two parts: VG1000 PC software and the instrument. The instrument is small size, light weight and easy to carry. Its combination of excellent system features, easiness in usage and versatile functions makes this generator a perfect solution for your job now and in the future.

Form the characteristics and specifications given below, you will understand how VG1000 can satisfy your measurement requirements.

- DDS technology provides precise, stable and low distortion output signal;
- 100MSa/s sampling rate, enable to edit arbitrary waveform with 14-bit, 4k points;
- Frequency characteristics:
 - Sine: 1 μ Hz ~ 20MHz;
 - Square: 1 μ Hz ~ 5MHz;
 - Ramp: 1 μ Hz ~ 150kHz;
 - Pulse: 500 μ Hz ~ 3MHz;
 - White Noise: 5MHz bandwidth (-3dB);
 - Arbitrary waveform: 1 μ Hz ~ 5MHz;
- Amplitude range : 2mVpp ~ 10Vpp (50 Ω);
4mVpp ~ 20Vpp (High Z);
- 10 standard waveforms:
 - Sine, Square, Ramp, Pulse, Noise, Sinc, Exponential Rise, Exponential Fall, Cardiac and DC;
- Abundant modulation function, and output various modulated waveform: AM, FM, PM, FSK;
- Linear, logarithm Sweep and Burst mode;
- High precision, wide band counter:
 - Measurements: frequency; period; duty cycle; positive/negative pulse width;
 - Frequency range: 100mHz ~ 200MHz (single channel);
 - Frequency resolution: 6bit/s;
- Abundant I/O: waveform output, synchronous signal output and counter signal input;
- Standard interface: USB Device and LAN interface

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Chapter 1 Getting Started

This chapter covers the following topics:

- General Inspection
- Equipment Connect and LAN Connect
 - Equipment Connect
 - LAN Connect
- The Front/Rear Panel and Software Interface
- Quick Start
 - To Set the Waveform
 - To Set Mod/ Sweep/Burst
 - To Set Count/Auto
 - To Set Trigger/Sync/Output
 - To Understand the Digital
 - To Understand the Menus

General Inspection

When you get a new VG1000 Series Function/Arbitrary Waveform Generator, you are suggested to take the following steps to inspect the instrument.

1. Inspect the shipping container for damage

If there are damages in the packing or foam, keep them until the whole machine and the accessories pass the electric and mechanical testing.

2. Check the accessories

Accessories supplied with the instrument are listed in chapter 5 "Appendix A: VG1000 Series Accessories".

If the contents are incomplete or damaged, please contract the local selling representative of **RIGOL**.

3. Inspect the instrument

In case any mechanical damage or defect, or if the instrument does not operate properly or pass performance tests, notify your **RIGOL** sales representative. If the shipping container is damaged, or the cushioning materials show signs of stress, notify the carrier of your **RIGOL** sales office. Keep the shipping materials for the carrier's inspection. **RIGOL** offices will arrange for repair or replacement at **RIGOL**'s option without waiting for claim settlement.

Equipment Connect and LAN Connect

Equipment Connect

Before you use **RIGOL** VG1000 Function/Arbitrary Waveform Generator, first please install the VG1000 PC software and connect the instrument to PC. The detailed steps are given in the followings:

1. Software Installation

You can get a VG1000 PC software installation CD in the accessories. You should insert the CD into the PC CD-ROM, and run the installation file "VG1000.exe" and follow the prompts to install PC software successfully.

2. Power Supply

Before using VG1000, you must connect power supply to the instrument. First, please insert the plug of the power cord into the power adapter jack. Then please insert the other end of the power adapter into power interface on the rear panel of the instrument. Finally, please connect electricity.

3. USB Connect and Drive

After the above steps completed, you should connect the PC to the instrument by USB interface. Please use the USB data wire in the accessories and insert it into the USB interface of PC and USB interface on the VG1000 rear panel. After that you will see a dialog box that guide you to install the USB interface drive program. For the details please see the followings:

- First, please select the second option in the below dialog box, then click the button **Next step** :

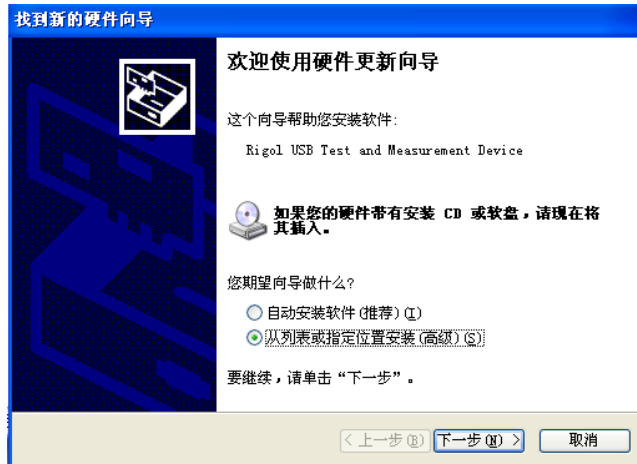


Figure 1- 1
The USB Drive Dialog Box

- Then, click the button **Browse** in the below dialog box and find the file that you have installed the VG1000 PC software in, after that choose the file named "USB Diver". Click the button **Confirm** → **Next step**. See Figure 1- 2.

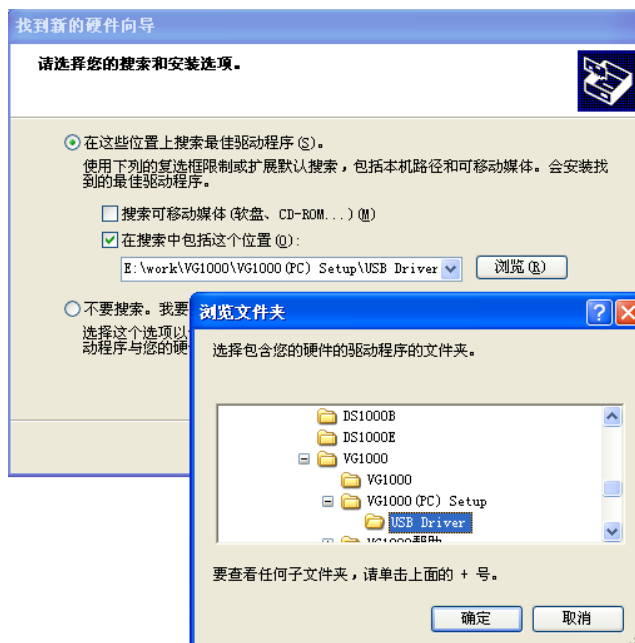


Figure 1- 2
The USB Drive Dialog Box

- Now, you will see a dialog box for searching the file of USB drive program:



Figure 1- 3
The Program Search Dialog Box

- After searching, please click **Complete** . USB drive is installed successfully.

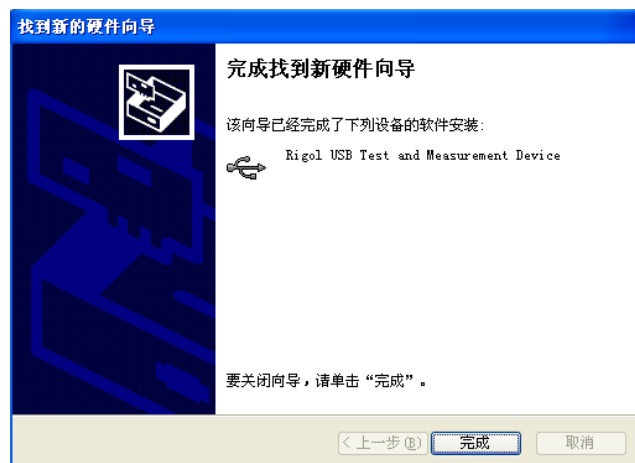


Figure 1- 4
The USB Drive Completion Dialog Box

LAN Connect

There is a LAN interface on the rear panel of VG1000, which help users to control VG1000 by local area network (LAN, Usually for remote control).

The followings are the detailed explanations:

1. Connect Network

First, LAN interface should be connected to network interface by a cable;

2. Set IP

Select **Utility** in the menus → select **Configuration** → select **LAN** . In IPSetup area, set IP address, IP mask and gateway. See Figure 1- 5. You can get IP automatically by selecting **DHCP** and **AUTOIP** , and also can set IP manually by selecting **MANUAL** .

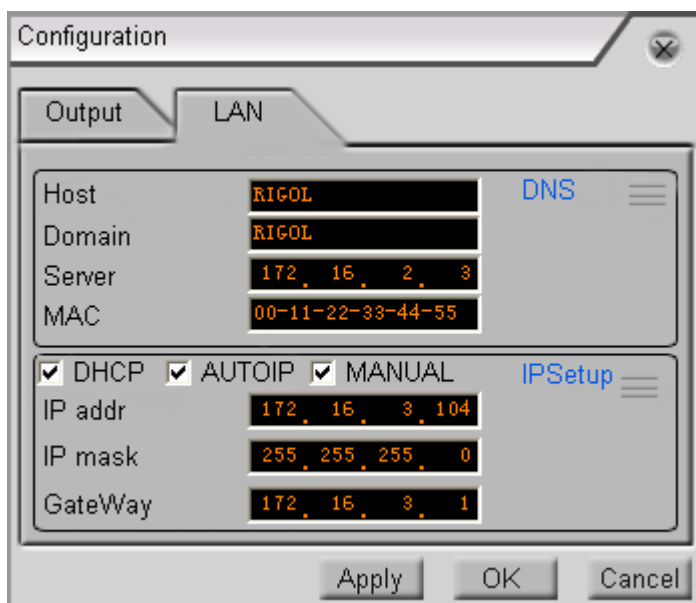


Figure 1- 5
The Setting IP Dialog Box

3. Control the Instrument

Finally, you should open the IE browser of the PC by which you control VG1000 and input the IP address you have got. You will see the following web page. See Figure 1- 6. Except for querying network state and network settings, the most important is that you can control VG1000 directly through the showing panel on the web page.

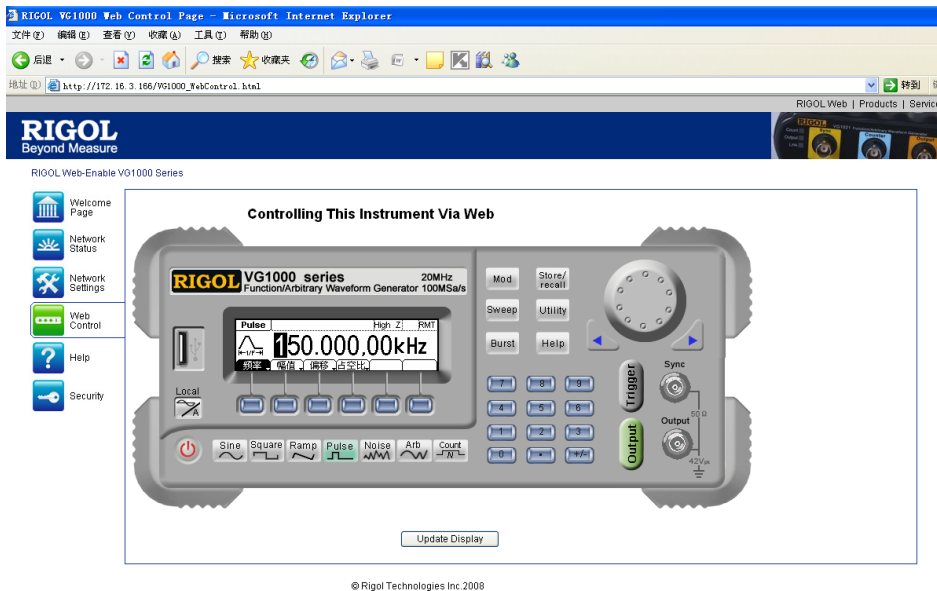


Figure 1- 6
The LAN Control Web Page

The Front/Rear Panel and Software Interface

When you get a new VG1000 series Function/Arbitrary Waveform Generator, first you need to know the front/rear panel on the instrument and the menus as well as the buttons' function on the software interface correctly. This chapter will make a brief introduction and description for the operation and the functions.

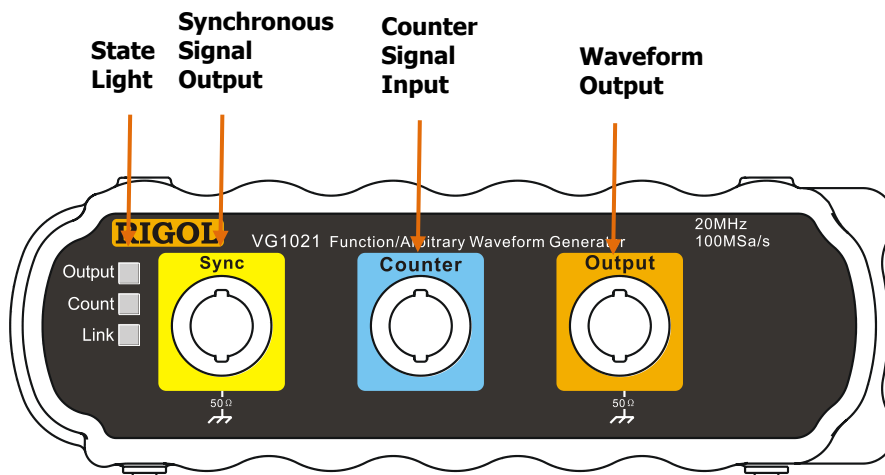


Figure 1- 7
The VG1000 Front Panel

Instructions of State Light

Output: the state light includes two states: when power is on, the light shows red; after all connections are completed, click and the light turns green. VG1000 can output waveform.

Count: after all connections are completed, click and the light shows green. The counter is on.

Link: when the PC software is also connected to the instrument, the light shows green.

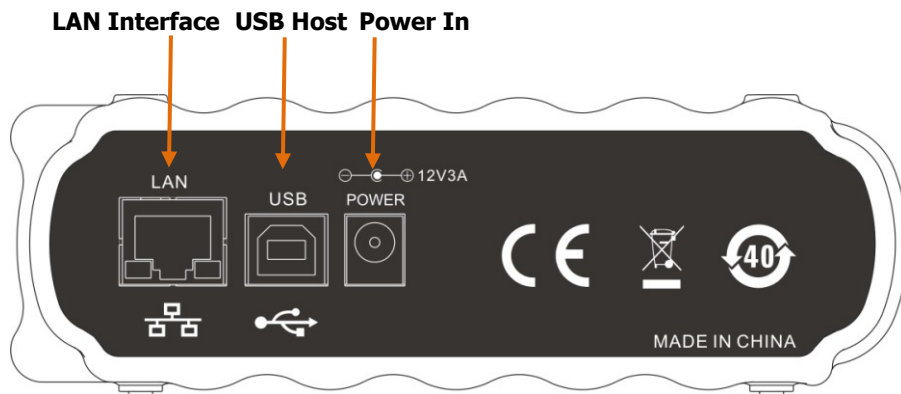


Figure 1- 8
The VG1000 Rear Panel

VG1000 PC software provides a simple and multi-functional interface for users. The Figure 1- 9 shows the main interface that is divided into 6 parts: the waveform selection area; the connection state indicator; the function and output control area; the parameters setting area; the menus area and the display area.

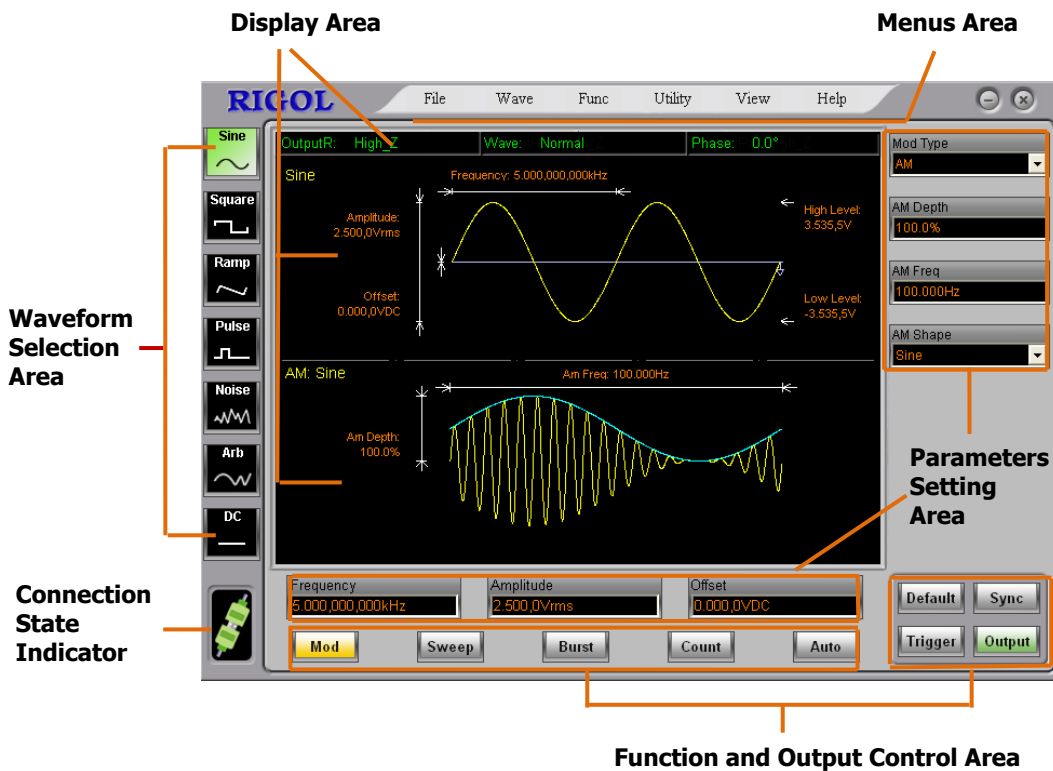




Figure 1- 9
The VG1000 Software Interface



- **Waveform selection area:** select the needed waveform by clicking the buttons in this area.
- **Functions and output control area:** set the needed functions and control output by clicking the buttons in this area. For example: waveform modulation, sweep frequency, burst, count and so on.
- **Parameters setting area:** set the waveform parameters by dblclick the parameter input area.
- **Menus area:** set system and select the needed functions and parameters by clicking the option in the menu area.
- **Display area:** display the waveform and the current settings in the middle of the interface.
- **Connection state indicator:** indicate the current connection state. The above figure indicates the instrument connected, and  indicates the instrument disconnected

NOTE: If you want to use **RIGOL** VG1000, please open the VG1000 software and click the connection state indicator. When showing , you just can use it.

Quick Start

To Set the Waveform

This part introduces the detailed operation methods of the buttons in the waveform selection area.

1. Click  , the button is turned into the active state  . The left upper of the display area shows "Sine". At this time, you can set the sine wave parameters in the parameter setting area. In the below parameters setting area, you can set frequency, amplitude and offset, and in the right area you can set period, high level and low level.

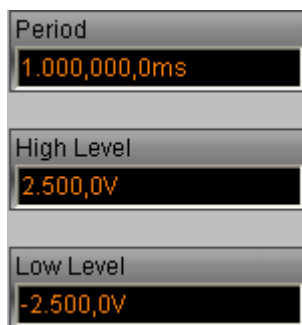


Figure 1- 10

The Right Parameters Setting Area

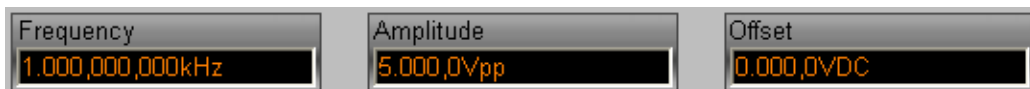


Figure 1- 11

The Below Parameters Setting Area

In Figure 1- 10 and Figure 1- 11, the sine parameters: the period is 1ms, the high level is 2.5V, the low level is -2.5V, the frequency is 1kHz, the amplitude is 5 Vpp, the offset is 0VDC.

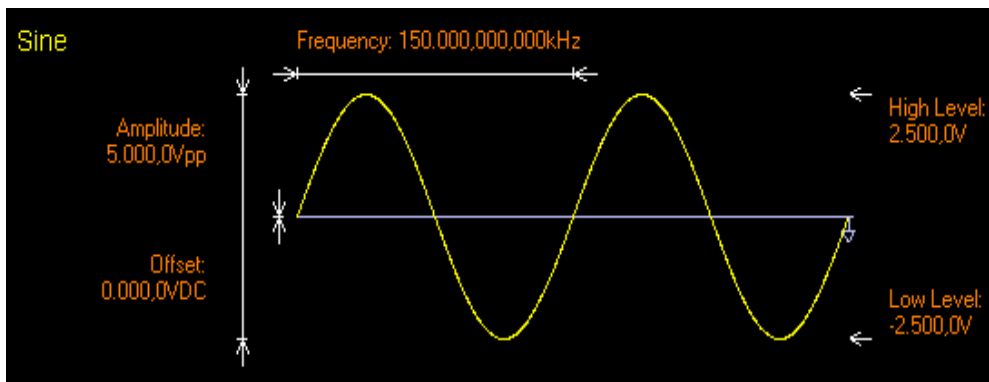








Figure 1- 12
The Sine Waveform

In Figure 1- 12, the yellow lines show the waveform, the white lines show the parameters, and the jacinth numbers shows the parameter values. When clicking the jacinth parameter, the corresponding white lines will twinkle.

2. Click , the left upper of the display area shows "Square". At this time, you can set the square wave parameters in parameter setting area. In the below parameters setting area, you can set frequency, amplitude and offset, and in the right area you can set period, high level, low level and duty cycle.
3. Click , the left upper of the display area shows "Ramp". At this time, you can set the ramp wave parameters in parameter setting area. In the below parameters setting area, you can set frequency, amplitude and offset, and in the right area you can set period, high level, low level and symmetry.
4. Click , the left upper of the display area shows "Pulse". At this time, you can set the pulse wave parameters in parameter setting area. In the below parameters setting area, you can set frequency, amplitude and offset, and in the right area you can set period, high level, low level, pulse duty and width .
5. Click , the left upper of the display area shows "Noise". At this time, you can set the noise wave parameters in parameter setting area. In the below parameters setting area, you can set amplitude and offset, and in the right area you can set high level and low level.
6. Click , the left upper of the display area shows "Arb". At this time, you can set the arbitrary wave parameters in parameter setting area. In the below parameters setting area, you can set frequency, amplitude and offset, and in the right area you can set period, high level and low level.

-
7. Click , the left upper of the display area shows "DC". At this time, you can set the DC wave parameters in parameter setting area. In the below parameters setting area, you can set offset.

To Set Mod/ Sweep/Burst

As shown in Figure 1- 13, there are three buttons below the interface which are used to set waveform modulation, frequency sweeping and generating burst.

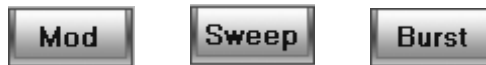





Figure 1- 13
The Mod/Sweep/Burst Buttons

1. Click  to output the modulated waveform. You can set parameters in parameters setting area. By setting mod type, depth, frequency and mod wave and so on, you can change the modulated waveform. VG1000 have AM、 FM、 FSK and PM mod types and can modulate sine, square, ramp and arbitrary wave (not pulse, noise and DC).
2. Click  to set sweep type, sweep time and trigger source and so on in the parameters setting area. Sweep sine, square, ramp and arbitrary wave (not pulse, noise and DC). In sweep mode, VG1000 can output waveform from start frequency to stop frequency.
3. Click , VG1000 can output the bursts of sine, square, ramp, arbitrary wave.

Term Explanation:

Burst: Output waveforms with set cycle numbers.

Burst can last for certain numbers of waveform cycles (N-Cycle Burst). It can be applied to all the waveform functions except Noisy and DC. Generally it is called BURST function within every Signal Generator.

To Set Count/Auto

As shown in Figure 1- 14, **Count** is used to turn on and off the counter.

Auto is used to automatically set the counter.



Figure 1- 14
The Count and Auto Buttons

1. After turning on counter, VG1000 can measure the signal from the counter input connector constantly and shows the counter measurement parameters below the display area. See Figure 1- 15.

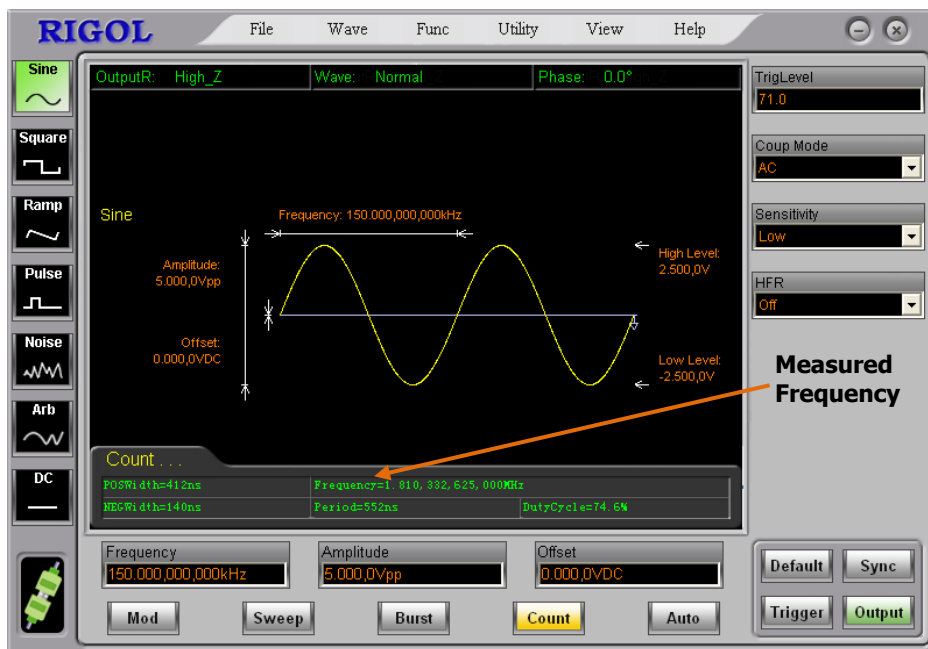


Figure 1- 15
The Count Measure Parameters Display


2. Click **Auto**, in counter mode, counter will automatically select sensitivity, trigger level according to the input signal; and the coupled mode is set as the AC-coupled.


To Set Trigger/Sync/Output


As shown in Figure 1- 16, there are four buttons below the interface, which are used to respectively set trigger, sync output and output control.

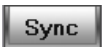



Figure 1- 16
The Trigger/Sync/Output Buttons

1. Click , you can select internal trigger or manual trigger. (Manual trigger is only used for frequency sweeping and N cycle burst)

The default is the internal trigger mode. In this mode, when selecting sweep or burst mode, VG1000 can output the burst constantly. At this time, click ,

the auto trigger is turned into the manual trigger. Click  each time, the manual trigger will generate a scan or a burst output. Continuing clicking the button will again trigger the signal generator.

2. Click , output the sync signal or not.
3. Click , output the waveform or not.

To Understand the Digital Calculator

To set parameters, please double click the parameter input area. Then a digital calculator will be shown for inputting a numerical value that you need. See Figure 1-17.

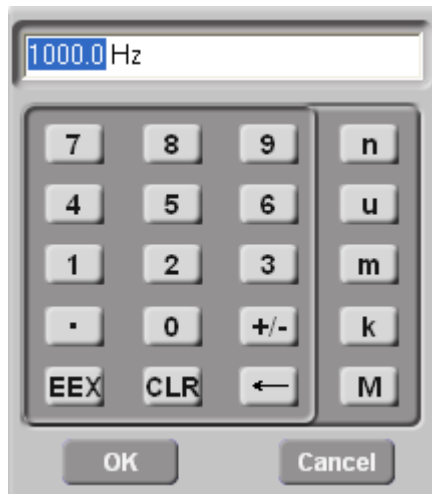





















Figure 1- 17
The Digital Calculator

In Figure 1- 17, the number buttons 0~9 and \cdot are used for inputting parameter values; \pm is used for turning positive/negative; **EEX** is used for inputting 10 N-power; **CLR** is used for cleaning out the input; \leftarrow is used for cleaning out the number before cursor or the selected number. Click **n**, **u**, **m**, **k**, **M** can multiply 10 ⁻⁹-power, ⁻⁶-power, ⁻³-power, 3-power, 6-power by the current numerical value and exits the digital calculator. Clicking **OK** exits the digital calculator and the current value in digital calculator is a new parameter. Clicking **Cancel** exits the digital calculator and the current parameter won't be modified.

To Understand the Menus

There are six menus on the top of VG1000 software interface, which respectively are **File**, **Wave**, **Func**, **Utility**, **View**, **Help**. Different item has different functions.

1. **File** includes  Save State,  Read State,  Sync and  Exit.  Save State and  Read State respectively save and read the current state, including waveforms, functions and parameters.  Sync is used to synchronize the settings in the VG1000 instrument and the PC software.  Exit exits the VG1000 software.
2. **Wave** includes  Sine,  Square,  Ramp,  Pulse,  Noise,  Arb, and  DC. The waveform options have the same functions with the buttons in waveform selection area.
3. **Func** includes **Modulate**, **Sweep**, **Burst** and **Count**. The four options have the same functions with , , , .
4. **Utility** includes **Configuration**, **Hardware Info** and **Initialization**. After clicking **Configuration** and **Hardware Info**, the configuration options and the hardware information will be shown as in Figure 1- 18, Figure 1- 19 and Figure 1- 20. The system information shows the instrument information including instrument models, instrument serial number, and software version. In addition to set the output configuration of the instrument, including positive/negative phase, phase shift and output resistance. You also can set the LAN configuration, including host name, domain name, servers, DHCP switch, IP address, mask and gateway. **Initialization** includes **Default** and **Last**, which respectively set the initial setting of the software as the default and the last.

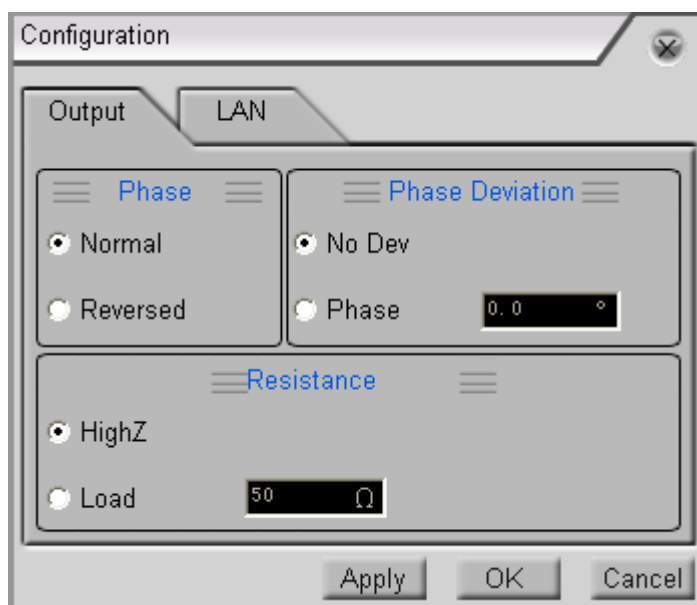


Figure 1- 18
The Configuration Output Dialog Box

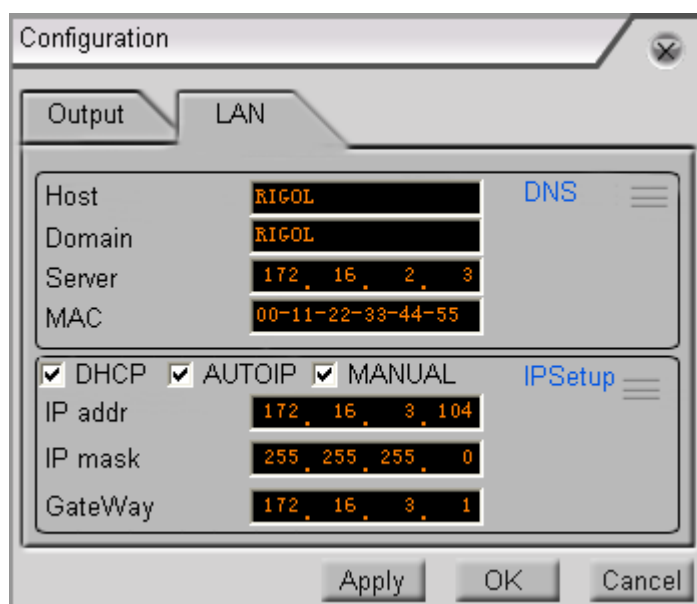


Figure 1- 19
The Configuration LAN Dialog Box

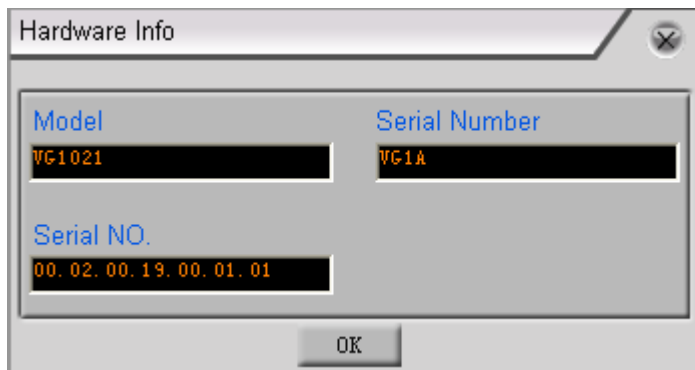








Figure 1- 20

The Hardware Information Dialog Box

5. **View** includes **Unit** , **Language** , **Decimal** and **Separator** . Clicking **Unit** sets the amplitude unit as Vpp or Vrms; clicking **Language** sets the software language as Chinese or English; clicking **Decimal** sets decimal as point or comma; clicking **Separator** sets separator on, off or space.

6. **Help** includes  Homepage ,  Help and  About . Clicking  Homepage can browse the **RIGOL** homepage; clicking  Help can see the VG1000 online help; clicking  About can see the VG1000 PC software version and the copyright information.

Chapter 2 Operating Your Generator

Up to now, you have got a brief understanding of every menu and button on the function area from software interface of VA1000 series. If you are not familiar with these operations, please read Chapter 1 "Getting Started" again. Next, we will introduce you to the details of every function and parameter step by step.


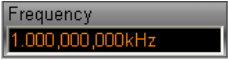

This chapter covers the following topics:

- To Set the Different Waveforms
 - To Set the Sine Waveform
 - To Set the Square Waveform
 - To Set the Ramp Waveform
 - To Set the Pulse Waveform
 - To Set the Noise Waveform
 - To Set the Arbitrary Waveform
- To Set the Counter
- To Output the Modulated Waveform
- To Output the Sweep Waveform
- To Output the Burst Waveform
- To Set the System Function

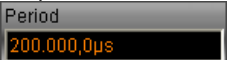
To Set the Different Waveforms

To Set the Sine Waveform

1. Set the Frequency/Period



Click  → dblclick  parameter input area → input the frequency value in digital calculator → click  to save.

Before setting parameters, the value shown in digital calculator is the default, or the last value. If the current value is effective for new waveform, it will be used

once more. When setting the period, please dblclick  parameter input area on the right setting area of Parameter to set.

2. Set the Amplitude

Click  → dblclick  parameter input area → input the amplitude in digital calculator → click  to save.

To set the high/low level, please dblclick  and  parameter input area on the right setting area of Parameter.

To set the amplitude unit as Vpp or Vrms, please click **View** and select the needed unit in the drop-down menu.

NOTE: With the change of Amplitude, High and Low Level are also changed; with the change of High and Low Level, Amplitude is also changed.




3. Set the Offset

Click  → dblclick  → input the offset in digital calculator → click  to save.

To Set the Square Waveform

The square parameters include: frequency/period, amplitude/high level, offset/low level and square duty cycle. By setting these parameters, VG1000 can output different square waveforms.

1. Set the Square Duty Cycle




Click  → dblclick  parameter input area → input the square duty cycle in digital calculator → click  to save.

About the method of setting other parameters, we have already introduced in previous part. If necessary, please refer to "to set the sine waveform".

To Set the Ramp Waveform

The ramp parameters include: frequency/period, amplitude/high level, offset/low level and symmetry. By setting these parameters, VG1000 can output different ramp waveforms.

1. Set the Symmetry


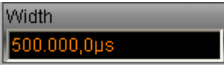

Click  → dblclick  parameter input area → input the symmetry in digital calculator → click  to save.

About the method of setting other parameters, we have already introduced in previous part. If necessary, please refer to "to set the sine waveform".

To Set the Pulse Waveform

The pulse parameters include: frequency/period, amplitude/high level, offset/low level and width/pulse duty. By setting these parameters, VG1000 can output different pulse waveforms.

1. Set the Width

Click  → dblclick  parameter input area → input the width in digital calculator → click  to save.

About the method of setting other parameters, we have already introduced in previous part. If necessary, please refer to "to set the sine waveform".

NOTE: With the change of Width, Pulse Duty is also changed.

To Set the Noise Waveform

The noise parameters include: amplitude/high level, offset/low level. By setting these parameters, VG1000 can output different noise waveforms.

About the method of setting other parameters, we have already introduced in previous part. If necessary, please refer to "to set the sine waveform".

To Set the Arbitrary Waveform

The arbitrary waveforms include five system built-in waveforms. The arbitrary wave parameters include: frequency/period, amplitude/high level and offset/low level. By setting these parameters, VG1000 can output different arbitrary waveforms.

1. Select the System Built-In Waveforms

Click  → click  drop-down arrow → select the needed waveform in drop-down list. See table 2-1.


Table 2- 1 The System Built-in Waveforms

Waveform	Explanation
ExpRise	Exponential Rise Waveform.
ExpFall	Exponential Fall Waveform.
NegRamp	Negative Ramp waveform.
Sinc	Sinc Function Waveform, $\text{Sinc} = \text{Sin}(x)/x$.
Cardiac	Cardiogram Waveform.

2. Select the waveform saved in volatile memory


Click  → click  drop-down arrow → select Volatile.

To Set the Counter



If you want to measure the frequency using VG1000, please click . Below the display area, you will see the counter measurement box, which shows the measured frequency, period, duty cycle and positive/negative width. The parameter area on the right side can be used to set the count parameters.

The measurement parameters of counter include: coupled mode, sensitivity, trigger level, HFR on/off. By setting the parameters, you can get the needed measurement value.



1. Set the Auto Measurement Mode

Counter can be used to measure the amplitude between 200mVpp and 5Vpp and the frequency between 100mHz and 200MHz for a signal. when above conditions are reached, click  to set trigger level, sensitive, switch of HFR, VG1000 can set the corresponding parameters automatically.

2. Set the Coupled Mode

Click  to turn on the count, then click  drop-down arrow and select AC or DC coupled mode.

3. Set the Sensitivity

Click  to turn on the count, then click  drop-down arrow and select High, Medium or Low.



4. Set the Trigger Level

The trigger level (-3V~+3V) is divided into 1000 parts, and every "0.1" denotes 6mV, that is the adjustment interval is 6 mV. For example: input "62.0", and the trigger level is: $-3V + (62.0 / 0.1) \times 6 \text{ mV} = 0.72V$.


Click  → dblclick  parameter input area → input the trigger level in digital calculator.

5. Set the HFR On/Off

The high frequency restrain function is used to measure the low frequency signals, and filter the high-frequency components so as to improve the measurement accuracy.

Click  to turn on the count, then click  drop-down arrow and select On/Off.

To Output the Modulated Waveform

By using , VG1000 can output the modulated waveforms. VG1000 can generate AM, FM, FSK or PM waveform. In different mod types, you can set the different parameters. In AM, you can set depth, frequency and modulating wave; in FM, you can set frequency deviation, frequency and modulating wave; in FSK, you can set hop frequency and FSK rate; in PM, you can set phase deviation, frequency and modulating wave.

The followings are the detailed introduction of the different parameters according to mod type.

1. The Amplitude Modulation (AM)

The modulated waveform is composed of the carrier and modulating wave. In AM, the amplitude of the carrier varies with the instantaneous voltage of the modulating wave.



Click  → click  drop-down arrow and select AM → the right parameter area shows the AM parameters.

Table 2- 2 Explanations of the AM Parameters

Parameter	Setting	Explanation
Mod Type	AM	Amplitude modulation.
AM Depth		Set the amplitude range.
AM Freq		Set the frequency of the modulating wave, the range: 2mHz ~ 20kHz.
AM Shape	Sine Square Triangle UpRamp DnRamp Noise Arb	Select the type of modulating wave.

Term Explanation

Modulation Depth

Set the amplitude range (also called “percentage modulation”). Modulation depth varies from 0% to 120%.

- When 0% modulating, the output amplitude is the half of the selected values.
- When 100% modulating, the output amplitude is the same with the selected values.

2. The Frequency Modulation (FM)

The modulated waveform is composed of the carrier and modulating wave. In FM, the frequency of the carrier varies with the instantaneous voltage of the modulating wave.

Click  → click  drop-down arrow and select FM → the right parameter area shows the FM parameters.

Table 2- 3 Explanations of the FM Parameters

Parameter	Setting	Explanation
Mod Type	FM	Frequency modulation.
Freq Dev		Set the frequency deviation between the modulating waveform and the carrier, the range: 1μHz~1kHz.
FM Freq		Set the frequency of the modulating waveform.
FM Shape	Sine Square Triangle UpRamp DnRamp Noise Arb	Select the type of modulating wave.

Term Explanation

Frequency Deviation

- The deviation should be equal to or less than the frequency of the carrier.
- The sum of the deviation and the carrier frequency should be equal to or less than maximum frequency of the selected function plus 100 kHz.

3. The Frequency Shift Key Modulation (FSK)

The FSK modulation is used to switch output frequency between two preselected frequencies (the Carrier Frequency and the Hop Frequency). The ratio of switching between these two frequencies is called the FSK rate.

Click  → click  drop-down arrow and select FSK → the right parameter area shows the FSK parameters.

Table 2- 4 Explanations of the FSK Parameters

Parameter	Setting	Explanation
Mod Type	FSK	Frequency shift key modulation.
Hop Frequency		Set the range of hop frequency, the range: 1μHz~5MHz.
FSK Rate		Set the alternated frequency between Carrier frequency and Hop frequency for an output frequency. The frequency range: 2mHz ~ 50kHz.

4. The Phase Modulation (PM)

The modulated waveform is composed of the carrier and modulating wave. In PM, the phase of the carrier varies with the instantaneous voltage of the modulating waveform.

Click  → click  drop-down arrow and select PM → the right parameter area shows PM parameters.

Table 2- 5 Explanations of the PM Parameters

Parameter	Setting	Explanation
Mod Type	PM	Phase modulation.
Phase Dev		Set the phase deviation between the modulating waveform and the carrier, ranging from 0° to 360°.
PM Freq		Set the frequency of the modulating wave. The range: 2mHz ~ 20kHz.
FM Shape	Sine Square Triangle UpRamp DnRamp Noise Arb	Select the type of modulating wave.

To Output the Sweep Waveform

In frequency sweep mode, VG1000 generates the vara signals from the start frequency to the stop frequency within specified sweep time. Sweeping waveform can be generated by sine, square, ramp or arbitrary waveforms (pulse, noise and DC are not allowed).





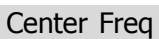
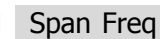
Click , the sweep parameters will be shown on the right parameter area and you can set the parameters according to your needs.

Table 2- 6 Explanations of the Sweep Parameters

Parameter	Setting	Explanation
Sweep Type	Linear	Set the output frequency with linear change.
	Log	Set the output frequency with logarithmic change.
Start Freq Center Freq		Set the start frequency.
		Set the center frequency.
Stop Freq Freq Span		Set the stop frequency.
		Set the frequency span.
Sweep Time		Set the sweep time between the start frequency and the stop frequency.
Trig Source	Internal	Internal: select internal source.
	Manual	Manual: start to sweep by clicking  .

1. Set the Sweep Frequency

Use  and  or  and  to set the range of the frequency.

- To sweep upward, set the start frequency lower than the stop frequency, or set the positive frequency span.
- To sweep downward, set the start frequency higher than the stop frequency, or set the negative frequency span.

2. Set the Sweep Time

Click  → dblclick  parameter input area → input the sweep time in digital calculator → click  to save.

To Output the Burst Waveform

By this function, VG1000 can generate bursts of different kinds waveforms and make waveforms keep on cycling (N-Cycles burst) according to specified times. All waveforms function could be used except Noise and DC.



Click , the burst parameters are shown on the right parameter area, you can set the burst waveform according to your need. See Table 2- 7.


Table 2- 7 Explanations of the Burst Parameter

Parameter	Setting	Explanation
Cyc Mode	Finite	Set finite burst cycle.
	Infinite	Set infinite burst cycle.
Cyc Number		Set the cycle number.
Burst Phase		Set the initial phase of a burst.
Delay		Set the delay time of a burst.
Trig Period		Set the period of a burst.
Trig Source	Internal	Internal: select internal source.
	Manual	Manual: start to sweep by clicking  .

N-Cycle contains the specific number of waveform cycles, and every burst is activated by a trigger event.

1. The Cycle Number

Set the number of waveform cycle in an N-Cycle (1 to 50,000 or Infinite).

If you select Infinite, then a continuous waveform will be generated which will not stop until a trigger event happens (Click  to stop).

- If necessary, the burst period will be increased to adapt to the specific number of cycles.0
- For an infinite-cycle burst, it is necessary to active by manual trigger.

2. The Burst Phase

Define the start and the stop point of burst for a waveform. The phase varies from -360° to $+360^{\circ}$, and the default is 0° . For an arbitrary waveform, 0° is the phase of the first waveform point.

3. The Burst Period

Set the time span between an N-Cycle burst to the next. If necessary, the period will be increased to allow the specific number of cycles in a burst.

$$\text{Burst Period} > \text{Period} \times \text{Cycle Number in a Burst}$$

4. The Delay

Set the delay time from outputting trigger to starting a N-Cycle burst. As one of the parameters of the specific burst period, Minimum delay should always be greater than 0s.

To Set the System Function

1. Set the Sync Output

VG1000 provides the sync output through the [Sync] connector on the Front Panel. All the standard output functions (except DC and Noise) have a corresponding synchronous signal. For some sync applications, it can be prohibited if users do not want to use them.

- In the default setting, the sync signal output is off, and the output voltage of the [Sync] connector is low level.
- In the waveform inverse mode, its sync waveform does not inverse.
- If the frequency of standard output function (except DC and Noise) is higher than 2MHz, the sync output will be turned off automatically.
- For sine, square, ramp and pulse signal, the sync signal is a square with 50% duty cycle. When the output is positive, the sync signal is TTL high level compared with 0 V voltage or DC offset; when the output is negative, the sync signal is TTL low level compared with 0 V voltage or DC offset.
- For an arbitrary waveform, the sync signal is a square with 50% duty cycle. When the first waveform point is generated, the sync signal voltage is TTL high level.
- For AM, FM and PM, the sync signal reference is the modulating signal (not the carrier signal). The sync signal is a square with 50% duty cycle. In the first half modulation period, the sync signal voltage is TTL high level.
- For FSK, the sync signal reference is the hop frequency, and the sync signal is a square with 50% duty cycle. For the hop frequency, at the hopping point, the sync signal voltage is TTL high level.
- For burst, when the burst starts, the sync signal is high level. At the specific point, when the cycle number ends, the sync signal turns low level (If the waveform has a relative starting phase, then intersections may occur). For an infinite burst, the sync signal is the same with the sync signal of the continuous signal.

2. Set the Output

Click **Utility** → select **Configuration** → select the output option, and set the output in the dialog box. See Table 2- 8.

Table 2- 8 Explanations of the Output Parameter

Parameter	Setting	Explanation
Output Resistance	Load	Set output resistance.
	High-Z	Set output connector as High Z.
Phase	Normal	Normal waveform output.
	Inverse	Inverse waveform output.
Phase Offset	No	The output waveform has no offset.
	Yes	The output waveform has offset.

- Set the Output Resistance
For the [Output] connector on the front panel, the Generator has a built-in 50 Ω series output impedance. If the actual load doesn't match the specified one, the amplitude and voltage offset displayed are incorrect. This function is used to match the displayed voltage with the expected one.
- The Inverse Waveform
No offset voltage will be changed while the waveform is inverted.
- The Phase Offset
Set the unit of phase offset as degree.

3. Set the LAN

Click **Utility** → select **Configuration** → select the LAN option to set the output in the dialog box. See Table 2- 9.

Table 2- 9 Explanations of the LAN Parameter

Parameter	Setting	Explanation
DNS	Host Name	Set the DNS host name.
	Domain Name	Set the DNS domain name.
	Server	Set the DNS server.
IP	DHCP ON/OFF	Set the DHCP on/off.
	IP Address	Set the IP address.
	IP Mask	Set the IP mask.
	Gateway	Set the gateway.

4. The Initial Setting

Click **Utility** → select **Initialization** → select **Default** or **Last** to set the initial setting of the software system as the default or the last.

5. Set the View

Click **View** → select **Language** or **Decimal** or **Separator**, and respectively set the system language (Chinese or English); decimal (comma or point); separator (on, off or space).

6. Resume the Factory Settings (the Default)

Click **Default** → click **OK**, and return the current settings to default.

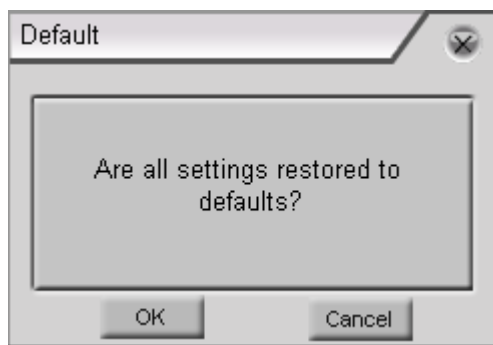


Figure 2- 1
Set the Default

The factory settings are shown as in Table 2- 10.

Table 2- 10 The Factory Settings

Output	Default
Function	Sine Wave
Frequency	1kHz
Amplitude/Offset	5.0 Vpp /0.0VDC
Unit	Vpp
Resistance	High Z
Auto Adjustment	On

Modulation	Default
Carrier	1kHz Sine Wave
Modulating Wave	100Hz Sine Wave
AM Depth	100%
FM Deviation	100Hz
FSK Hop Frequency	10Hz
FSK Frequency	100Hz
Modulation State	Off

Sweep	Default
Start/Stop Frequency	100Hz/1kHz
Time	1s
Mode	Linear
State	Off

Burst	Default
Frequency	1kHz
Count	1Cycle
Period	10ms
Initial Phase	0°
State	Off

Count	Default
Coupling	AC
Sensitivity	High
Trig Lev	71.0
HFR Off	Off

Chapter 3 Examples

To help users learn how to use VG1000 function/arbitrary waveform generator more efficiently, here we will give some examples in detail. All the examples given below use the default setting of the equipment.

This chapter covers the following topics:


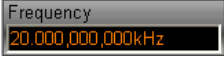

- Example 1: To Generate a Sine Wave
- Example 2: To Generate a Square Wave
- Example 3: To Generate a Ramp Wave
- Example 4: To Generate a Pulse Wave
- Example 5: To Generate a Noise Wave
- Example 6: To Generate an Arbitrary Wave
- Example 7: To Generate an AM Wave
- Example 8: To Generate an FSK Wave
- Example 9: To Generate a Linear Sweep
- Example 10: To Generate a Burst
- Example 11: To Measure the Frequency

Example 1: To Generate a Sine Waveform

How to generate a sine waveform with 20 kHz frequency, 2.5 mVpp amplitude and 0 VDC offset.

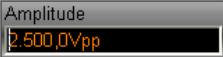

The operation steps:

1. Set the Frequency



Click  → dblclick  parameter input area → input 20 in digital calculator → click , and set the frequency as 20kHz.

2. Set the Amplitude


(1) Click **View** → select **Unit** → select  Vpp ;

(2) Dblclick  parameter input area → input 2.5 in digital calculator → click , and set the amplitude as 2.5Vpp.

3. Set the Offset

Dblclick  parameter input area → input 0 in digital calculator → click , and set the offset as 0VDC.

4. Output the Sine Waveform

After the frequency, amplitude and offset were set, click , the Generator would output the sine waveform as you specified. See Figure 3- 1.

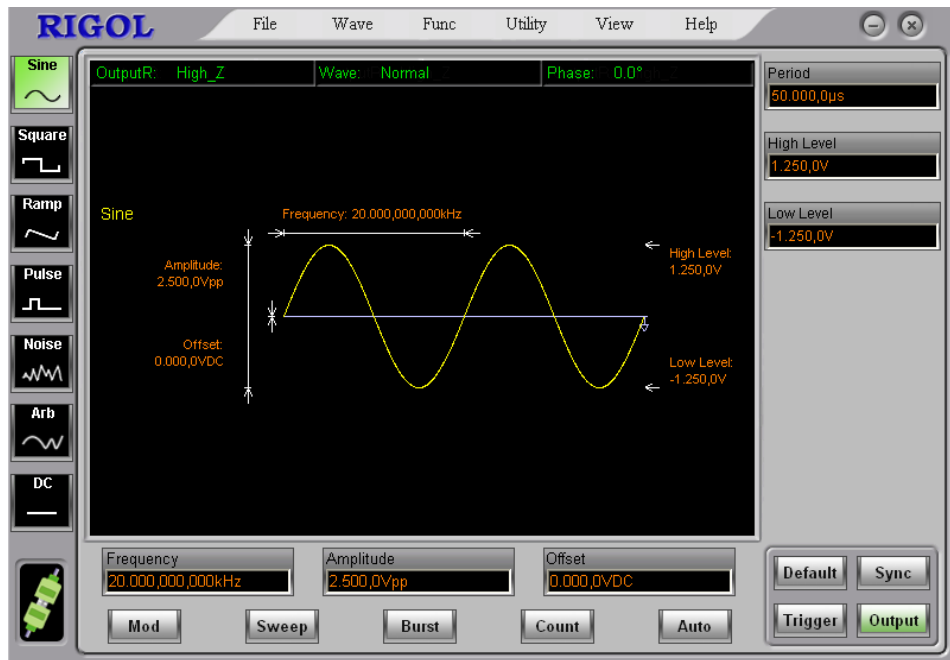





Figure 3- 1
The Sine Waveform

Example 2: To Generate a Square Waveform

How to generate a square waveform with 1MHz frequency, 2.0 Vpp amplitude, 10m VDC offset and 30% duty cycle.

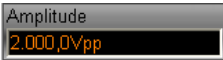

The operation steps:

1. Set the Frequency

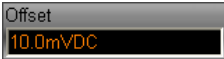

Click  → dblclick  parameter input area → input 1 in digital calculator → click , and set the frequency as 1MHz.

2. Set the Amplitude

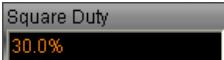

(1) Click **View** → select **Unit** → select  Vpp ;

(2) Dblclick  parameter input area → input 2 in digital calculator → click , and set the amplitude as 2Vpp.


3. Set the Offset

Dblclick  parameter input area → input 10 in digital calculator → click , and set the offset as 10mVDC.

4. Set the Duty Cycle

Dblclick  parameter input area → input 30 in digital calculator → click , and set the duty cycle as 30%.

5. Output the Square Waveform

After the frequency, amplitude, offset and duty cycle were set, click , the Generator would output the square waveform as you specified. See Figure 3- 2.

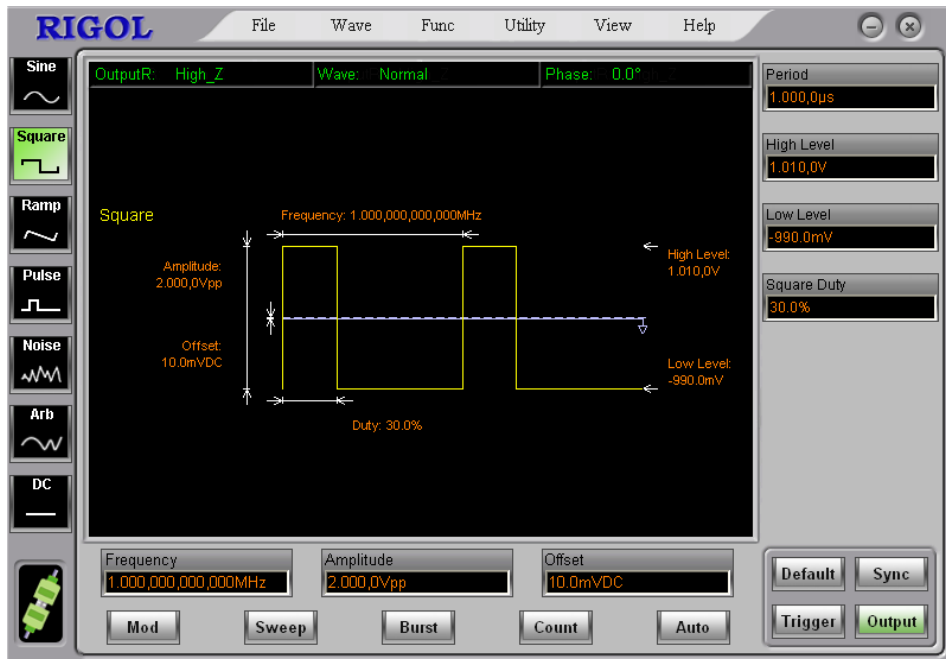



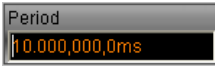

Figure 3- 2
The Square Waveform

Example 3: To Generate a Ramp Waveform

How to generate a ramp waveform with 10ms period, 100mVpp amplitude, 20mVDC offset and 80% symmetry.

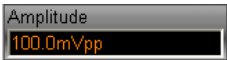

The operation steps:

1. Set the Period

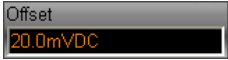

Click  → dblclick  parameter input area → input 1 in digital calculator → click , and set the period as 1ms.

2. Set the Amplitude



(1) Click **View** → select **Unit** → select  Vpp ;

(2) Dblclick  parameter input area → input 100 in digital calculator → click , and set the amplitude as 100mVpp.


3. Set the Offset

Dblclick  parameter input area → input 20 in digital calculator → click , and set the offset as 20mVDC.

4. Set the Symmetry

Dblclick  parameter input area → input 80 in digital calculator → click , and set the symmetry as 80%.

5. Output the Ramp Waveform

After the period, amplitude, offset and symmetry were set, click , the Generator would output the ramp waveform as you specified. See Figure 3- 3.

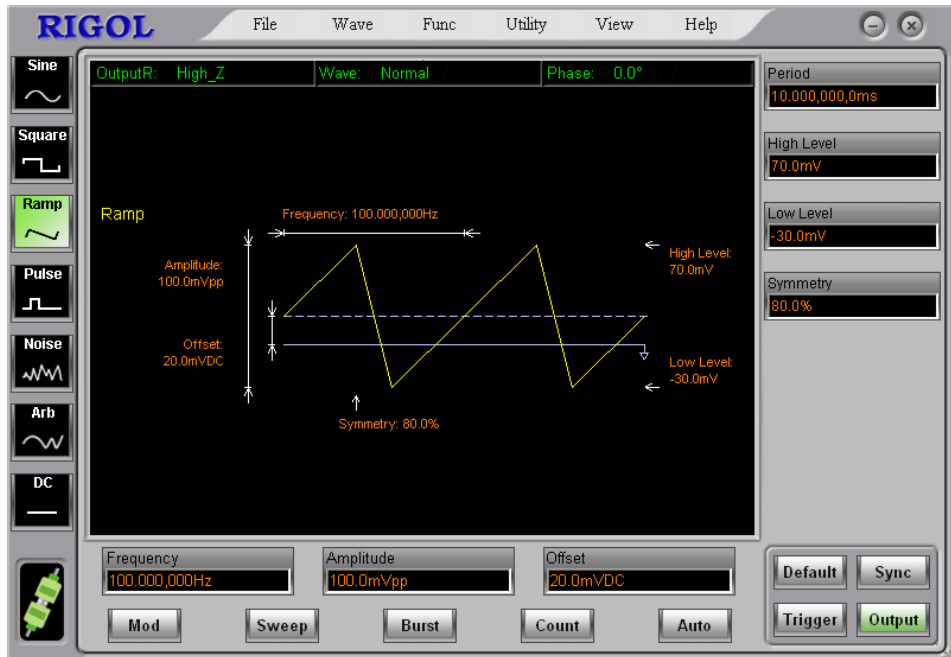





Figure 3- 3
The Ramp Waveform

Example 4: To Generate a Pulse Waveform

How to generate a pulse waveform with 5kHz frequency, 50mVpp amplitude, 5 mVDC offset and 20 μ s pulse width.

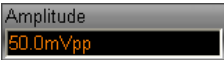

The operation steps:

1. Set the Frequency



Click  → dblclick  parameter input area → input 5 in digital calculator → click , and set the frequency as 5kHz.

2. Set the Amplitude



(1) Click **View** → select **Unit** → select  Vpp ;

(2) Dblclick  parameter input area → input 50 in digital calculator → click , and set the amplitude as 50mVpp.


3. Set the Offset

Dblclick  parameter input area → input 5 in digital calculator → click , and set the offset as 5mVDC.

4. Set the Width (Duty Cycle)

Dblclick  parameter input area → input 20 in digital calculator → click , and set the width as 20 μ s (duty cycle 10%).

5. Output the Pulse Waveform

After the frequency, amplitude, offset and width were set, click , the Generator would output the pulse waveform as you specified. See Figure 3- 4.

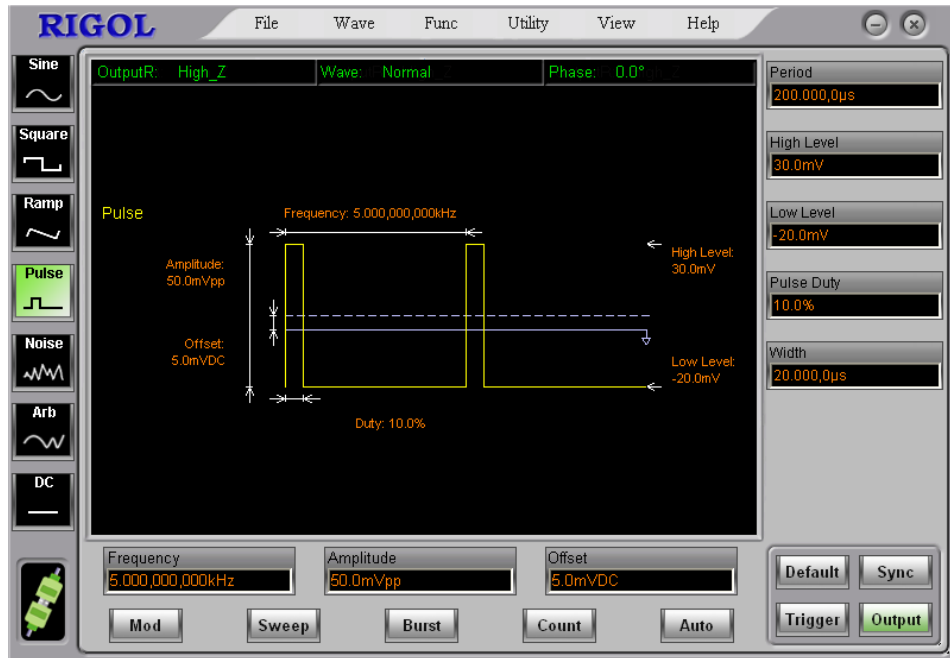


Figure 3- 4
The Pulse Wave

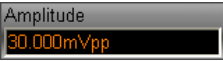

Example 5: To Generate a Noise Waveform

How to generate a noise waveform with 30mVpp amplitude and 10mVDC offset.




The operation steps:

1. Set the Amplitude

(1) Click **View** → select **Unit** → select  Vpp ;

(2) Dblclick  parameter input area → input 30 in digital calculator → click , and set the amplitude as 30mVpp.

2. Set the Offset

Click  → dblclick  parameter input area → input 10 in digital calculator → click , and set the offset as 10mVDC.

3. Output the Noise Waveform

After the amplitude and offset are set, click , the Generator would output the noise waveform as you specified. See Figure 3- 5 .

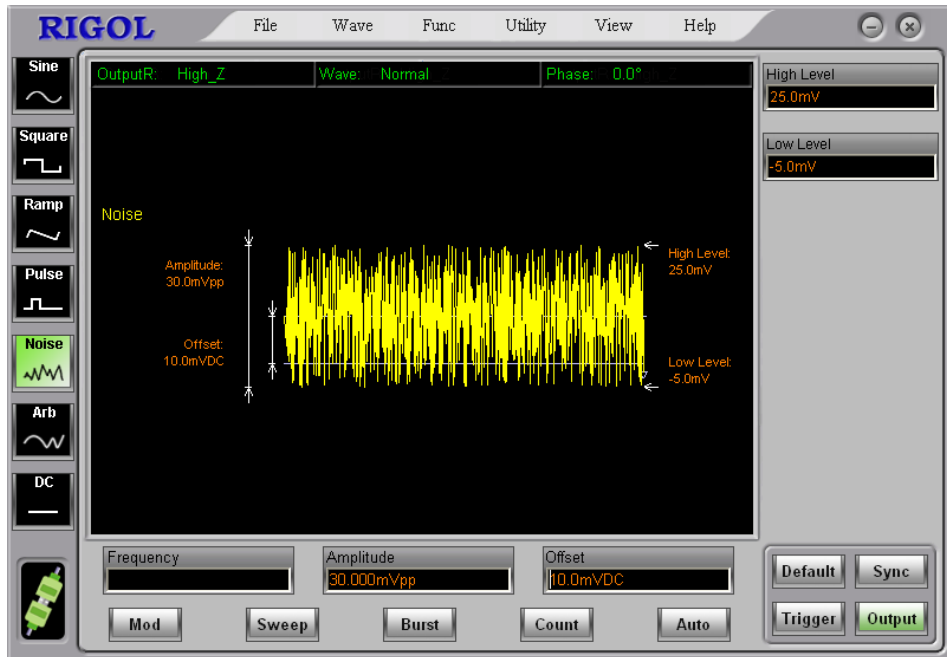


Figure 3- 5
The Noise Waveform

Example 6: To Generate an Arbitrary Waveform



How to generate an arbitrary waveform (Sinc) with 2MHz frequency, 5Vrms amplitude and 0 VDC offset.

The operation steps:

1. Select the System Built-in Waveform

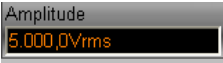

Click  → click  drop-down arrow → select Sinc.

2. Set the Frequency

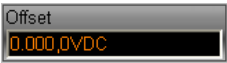

Dbldclick  parameter input area → input 2 in digital calculator → click , and set the frequency as 2MHz.

3. Set the Amplitude


(1) Click  → select  → select  Vrms ;

(2) Dbldclick  parameter input area → input 5 in digital calculator → click , and set the amplitude as 5Vrms.

4. Set the Offset

Dbldclick  parameter input area → input 0 in digital calculator → click , and set the offset as 0VDC.

5. Output the Arbitrary Waveform

After the waveform, frequency, amplitude and offset were set, click , the Generator would output the arbitrary waveform as you specified. See Figure 3- 6.

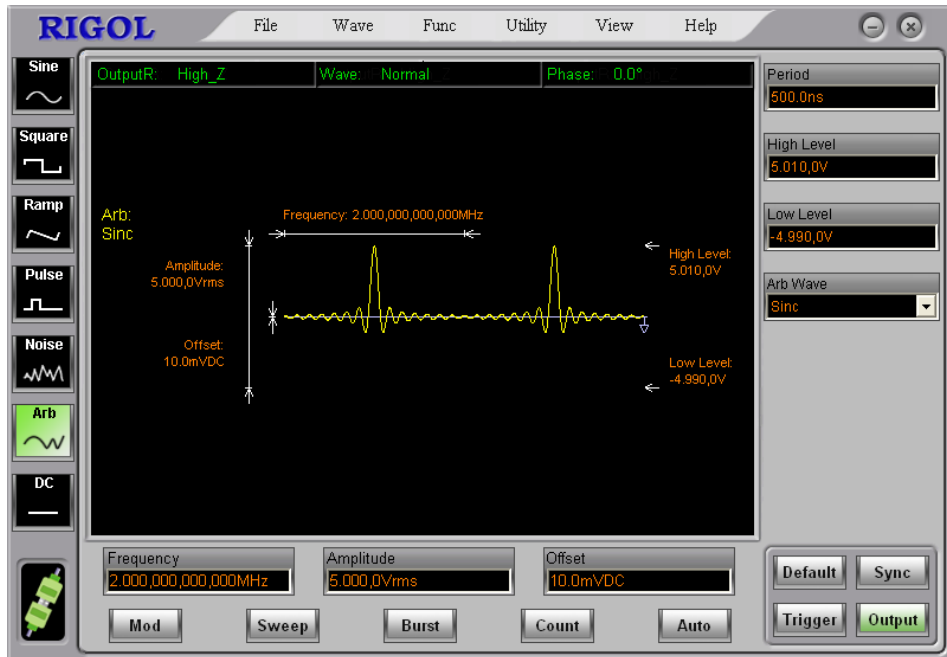



Figure 3- 6
The Sinc Waveform

Example 7: To Generate an AM Waveform

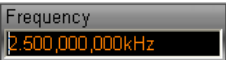

How to generate an AM waveform with depth of 70%. The Carrier is a sine wave with 2.5 kHz frequency, and the modulating Wave is a sine wave with 150 Hz frequency.

The operation steps:

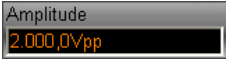

1. Select the Carrier Function

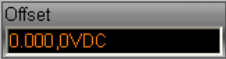

Click , and set the carrier function as sine.

2. Set the Frequency, the Amplitude and the Offset of the Carrier

(1) Dblclick  parameter input area → input 2.5 in digital calculator → click , and set the frequency as 2.5kHz;

(2) Click **View** → select **Unit** → select  Vpp ;


Dblclick  parameter input area → input 2 in digital calculator → click , and set the amplitude as 2Vpp;

(3) Dblclick  parameter input area → input 0 in digital calculator → click , and set the offset as 0VDC.

3. Select the Mod Type

Click  → click  drop-down arrow → select AM.

4. Set the Depth

Dblclick  parameter input area → input 70 in digital calculator

→ click , and set the depth as 70%.

5. Set the AM Frequency

Dbclick parameter input area → input 150 in digital calculator → click , and set the AM frequency as 150Hz.

6. Set the AM Shape

Click drop-down arrow → select Sine, and select sine as the modulating wave.

7. Output the AM Waveform

Click , the AM wave will be generated. See Figure 3- 7.

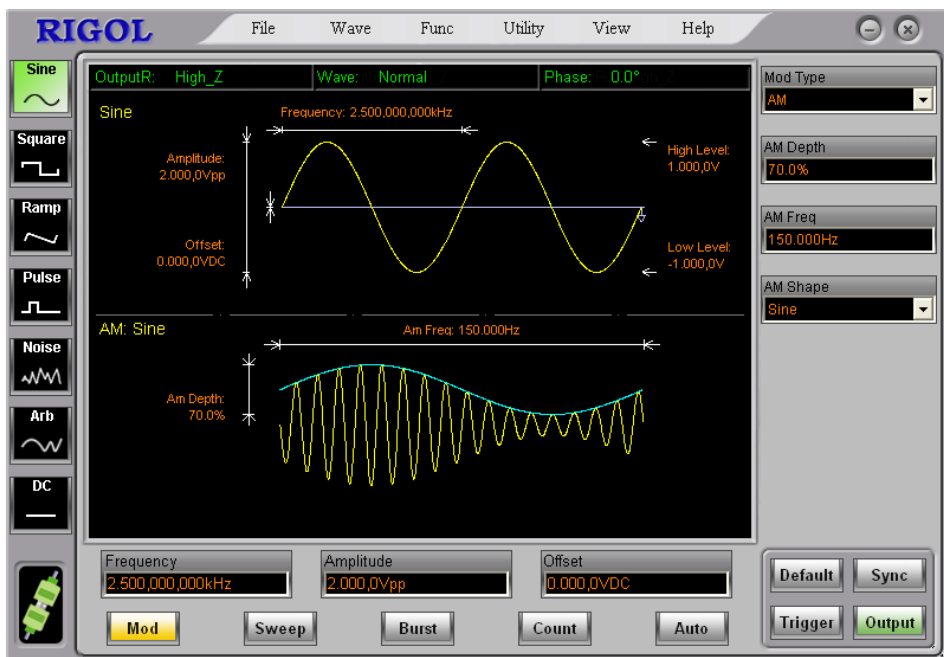



Figure 3- 7
The AM Waveform

Example 8: To Generate an FSK Waveform



How to generate an FSK waveform with FSK rate of 200Hz, The Carrier is a sine wave with 10 kHz frequency, and the hop frequency is 800 Hz.

The operation steps:

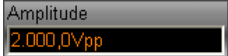

1. Select the Carrier Function

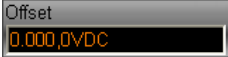

Click , and set the carrier function as sine.

2. Set the Frequency, Amplitude and Offset of the Carrier

(1) Dblclick  parameter input area → input 10 in digital calculator → click , and set the frequency as 10kHz;

(2) click **View** → select **Unit** → select  Vpp ;



Dblclick  parameter input area → input 2 in digital calculator → click , and set the amplitude as 2Vpp;

(3) Dblclick  parameter input area → input 0 in digital calculator → click , and set the offset as 0VDC.

3. Select the Mod Type

Click  → click  drop-down arrow → select FSK.

4. Set the FSK Rate

Dblclick  parameter input area → input 200 in digital calculator → click , and set the FSK rate as 200Hz.

5. Set the Hop Frequency

Dbclick parameter input area → input 800 in digital calculator → click , and set the hop frequency as 800Hz.

6. Output the FSK Waveform

Click , the FSK wave will be generated. See Figure 3- 8.

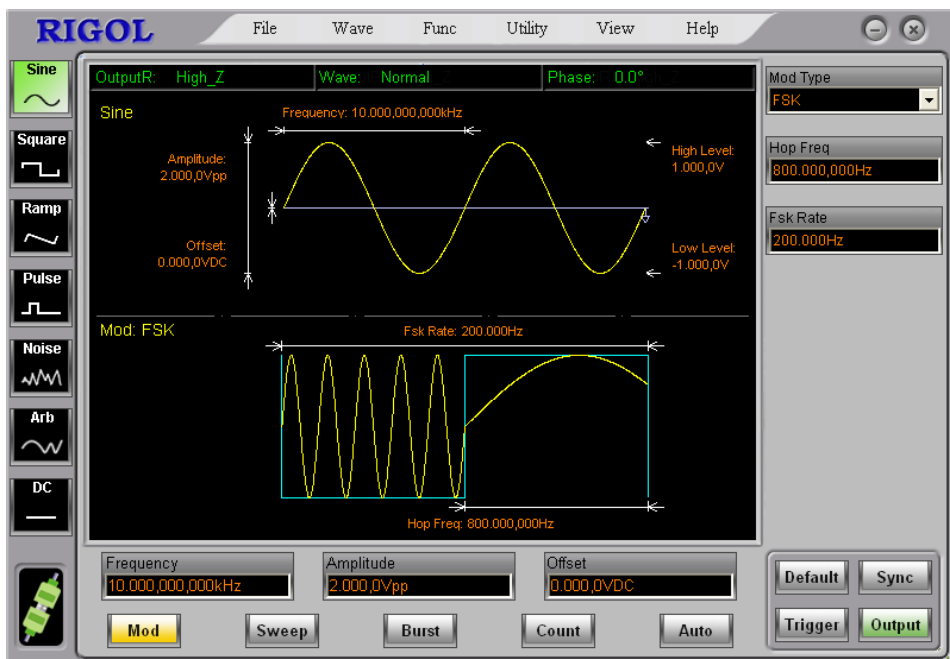



Figure 3- 8
The FSK Waveform

Example 9: To Generate a Linear Sweep

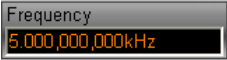

How to generate a sine sweep waveform whose frequency starts from 100Hz to 10kHz. Use the internal trigger mode, linear sweep, and the sweep time is 1s.

The operation steps:

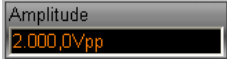

1. Select the Sweep Function



Click , and set the sweep function as sine.

2. Set the Frequency, the Amplitude and the Offset of the Sweep Function

(1) Dblclick  parameter input area → input 5 in digital calculator → click , and set the frequency as 5kHz;

(2) Click **View** → select **Unit** → select  Vpp ;


Dblclick  parameter input area → input 2 in digital calculator → click , and set the amplitude as 2Vpp;


(3) Dblclick  parameter input area → input 0 in digital calculator → click , and set the offset as 0VDC.

3. Select the Sweep Mode



Click  → click  drop-down arrow → select Linear.

4. Set the Sweep Time

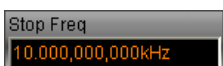

Dblclick  parameter input area → input 1 in digital calculator →

click , and set the sweep time as 1s.


5. Set the Start Frequency

Dbclick  parameter input area → input 100 in digital calculator
→ click , and set the start frequency as 100Hz.

6. Set the Stop Frequency

Dbclick  parameter input area → input 10 in digital calculator
→ click , and set the stop frequency as 10kHz.

7. Output the Sweep Waveform

Click , the linear sweep waveform from 100 Hz to 10kHz will be generated. See Figure 3- 9.

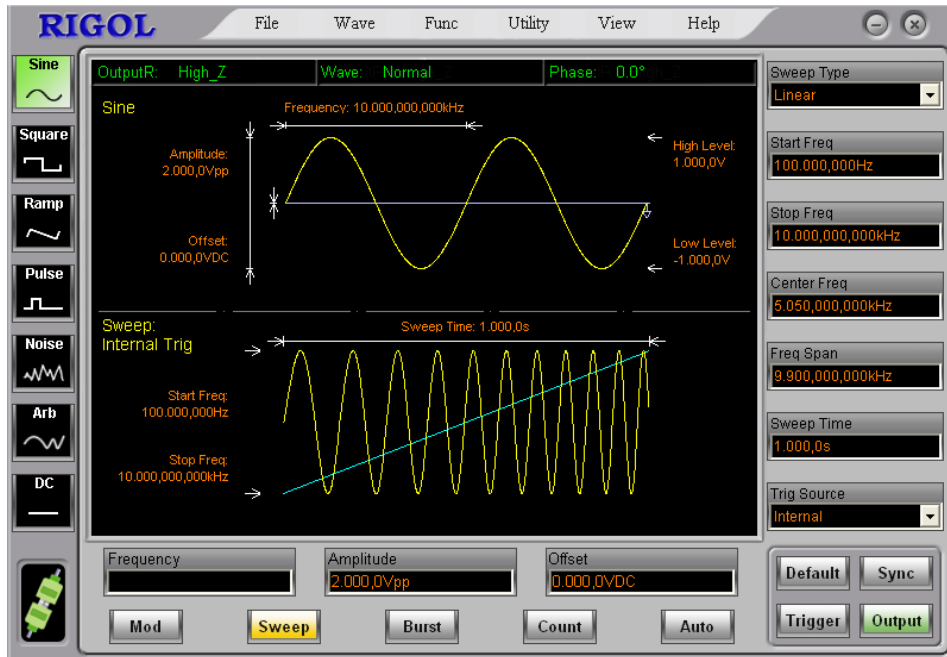


Figure 3- 9
The Linear Sweep Waveform

Instructions

If necessary, you can set the frequency Limits by setting the Center frequency and the frequency range. These parameters are similar to the start and stop frequency, which will provide more flexibility for you. To generate the same waveform, set the center frequency as 5.050 kHz and the frequency range as 9.900 kHz.

Example 10: To Generate a Burst

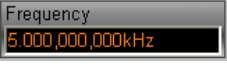

How to generate a burst waveform with 3 cycles. The period is 10ms. But you cannot change parameters in the default setting: internal source and 0 degree phase.

The operation steps:

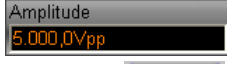

1. Select the Burst Function

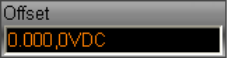
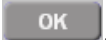
Click  and set burst function as square.

2. Set the Frequency, Amplitude and Offset of the Burst Function

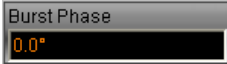

(1) Dblclick  parameter input area → input 5 in digital calculator → click , and set the frequency as 5kHz;

(2) Click **View** → select **Unit** →select  Vpp ;


Dblclick  parameter input area → input 5 in digital calculator → click , and set the amplitude as 5Vpp;

(3) Dblclick  parameter input area → input 0 in digital calculator → click , and set the offset as 0VDC.

3. Set the Initial Phase

Click **Burst** → dblclick  parameter input area → input 0 in digital calculator → click , and set the initial phase as 0.

4. Set the Cycle Number

Dblclick  parameter input area → input 3 in digital calculator

→ click **OK**, and set the cycle number as 3.

5. Set the Delay

Dblick **Delay** parameter input area → input 200 in digital calculator → click **u**, and set the delay as 200 μ s.

6. Output the Burst Waveform

Click **Output**, the burst of square waveform with 10ms and 3 cycles will be generated. See Figure 3- 10.

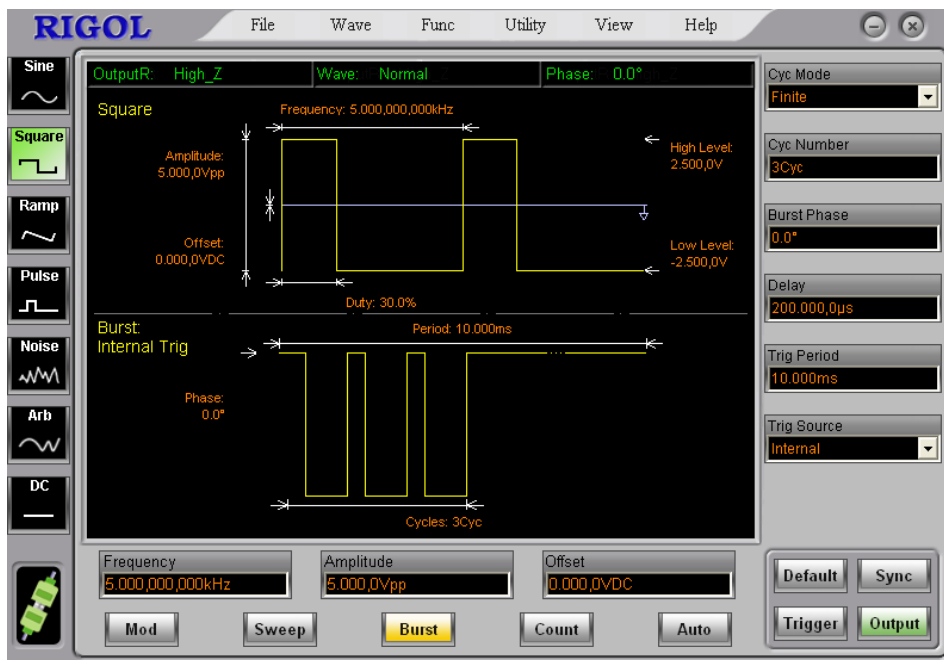



Figure 3- 10
The Burst Waveform

Example 11: To Measure the Frequency

How to measure the frequency of an unknown signal.

The operation steps:

1. Turn on counter


Click , and enter the frequency measure mode.

2. Connect the measured signal

Input the signal to be measured into the connector of the counter.


3. Set the Measurement:

■ The Auto Measure Mode


Click , and enter the auto measure mode. In this case, the coupled mode is AC coupled. The counter automatically adjusts the trigger level and the sensitivity until the display is steady.

■ The Manual Measure Mode


● Set the Trigger Level

Dblclick  parameter input area → input the right number in digital calculator, and set the right trigger level.


● Set the Coupled Mode

Click  drop-down arrow → select AC/DC, and set the needed coupled mode.

● Set the Sensitivity

Click  drop- down arrow → select Low/Medium/High, and set the needed sensitivity.

● Set HFR On/Off

Click  drop-down arrow → select On/Off, and set HFR on/off.

Here, POSWidth, NEGWidth, Frequency, Period, Duty Cycle are shown in counter box below the interface.

Chapter 4 Specifications

All the specifications are available for the VG1000 Series Function/Arbitrary Waveform Generator unless special statement. The following two conditions must be satisfied first to meet the standard of these specifications:

The instrument must be operated continuously for more than 30 minutes in the specified operating temperature.

All specifications are guaranteed unless marked "typical".

- Characteristics
- General Specifications

Characteristics

Frequency (VG1021)	
Waveforms	Sine, Square, Ramp, Pulse, Noise, Arb
Sine	1 μ Hz ~ 20MHz
Square	1 μ Hz ~ 5MHz
Ramp	1 μ Hz ~ 150kHz
Pulse	500 μ Hz ~ 3MHz
Noise	5MHz (-3dB)
Arb	1 μ Hz ~ 5MHz
Resolution	1 μ Hz
Accuracy	\pm 50ppm in 90 days \pm 100ppm in 1year 18 $^{\circ}$ C ~ 28 $^{\circ}$ C
Temperature index	< 5 ppm/ $^{\circ}$ C

Sine Wave Spectral Purity			
		< 1Vpp	> 1Vpp
Harmonic Distortion	DC ~ 1MHz	-55dBc	-45dBc
	1MHz ~ 5MHz	-55dBc	-40dBc
	5MHz ~ 20MHz	-50dBc	-35dBc
Total Harmonic Distortion	DC ~ 20kHz	< 0.2%	
Phase Noise	10kHz Offset	-108 dBc/Hz (Typical)	

Square Wave		
Rise/Fall Time	< 20ns (10% ~ 90%) (Typical, 1kHz, 1Vpp)	
Overshoot	< 5% (Typical, 1kHz, 1Vpp)	
Duty Cycle	1 μ Hz ~ 3MHz	20% ~ 80%
	3MHz (not contain) ~ 4MHz	40% ~ 60%
	4MHz (not contain) ~ 5MHz	50%
Asymmetry (below 50% Duty)	1% of period+ 50ns	

Cycle)	
Jitter	6ns + 100ppm of period (Typical, 1kHz, 1Vpp)

Ramp Wave	
Linearity (typical)	< 0.1% of peak output (Typical, 1kHz, 1Vpp, 100% Symmetry)
Symmetry	0% ~ 100%

Pulse Wave	
Pulse Width	2000s max period; 20ns min period; 1ns resolution
Overshoot	< 5%
Jitter	6ns + 100ppm of period

Arb Wave	
Waveform Length	4k points
Amplitude Accuracy	14 bits (including sign)
Sample Rate	100MSa/s
Minimum Rising /Falling Time	35ns
Jitter (RMS)	6 ns + 30ppm
Non-Volatile Storage (Total:10 Waveforms)	4 waveforms

Output	
Amplitude	2 mVpp ~ 10 Vpp (50 Ω) 4 mVpp ~ 20 Vpp (High Z)
Amplitude Accuracy (100kHz sine wave)	\pm (1% of setting + 1mVpp)
Amplitude Flatness (relative to 100 kHz sine wave, 5Vpp)	<100kHz 0.1dB
	100kHz ~ 5MHz 0.15dB
	5MHz ~ 20MHz 0.3dB

DC Offset	
Range (DC)	±5V (50Ω) ±10 V (High Z)
Accuracy	± (1% of the Offset Setting + 1mV)

Waveform Output	
Impedance	50 Ω typical
Protection	Short-circuit protected; Overload disables the output automatically

AM	
Carrier Waveforms	Sine, Square, Ramp, Arb (Except DC)
Source	Internal
Modulating Waveforms	Sine, Square, UpRamp, DnRamp, Triangle, Noise, Arb (2mHz ~ 20kHz)
Depth	0% ~120%
FM	
Carrier Waveforms	Sine, Square, Ramp, Arb (Except DC)
Source	Internal
Modulating Waveforms	Sine, Square, UpRamp, DnRamp, Triangle, Noise, Arb (2mHz ~ 20kHz)
Frequency Deviation	DC~ 5 MHz
PM	
Carrier Waveforms	Sine, Square, Ramp, Arb (Except DC)
Source	Internal
Modulating Waveforms	Sine, Square, UpRamp, DnRamp, Triangle, Noise, Arb (2mHz ~ 20kHz)
Phase Deviation	0 ~360°
FSK	
Carrier Waveforms	Sine, Square, Ramp, Arb (Except DC)
Source	Internal
Modulating Waveforms	50% duty cycle square (2mHz ~ 50kHz)

Sweep	
Carrier Waveforms	Sine, Square, Ramp, Arb (Except DC)
Type	Linear or Logarithmic
Direction	Up or Down
Sweep Time	1 ms ~ 500 s \pm 0.1%
Trigger Source	Internal/Manual

Burst	
Waveforms	Sine, Square, Ramp, Pulse, Noise, Arb (Except DC)
Types	Count (1 ~ 50,000 periods), infinite
Start Phase	-360° ~ +360°
Internal Period	1 μ s ~ 500s \pm 1%
Trigger Source	Internal/Manual

Sync Output	
Level	TTL-compatible
Pulse Width	> 50ns (typical)
Output Impedance	50 Ω (typical)
Maximum Frequency	2 MHz

Counter Specification			
Function	Frequency, period, positive/negative Pulse width, Duty cycle		
Frequency range	Single channel: 100mHz ~ 200MHz		
Frequency resolution	6 digits/second		
Voltage range and sensitivity (unmodulated signal)			
Auto mode:	1Hz ~ 200MHz	200 mVpp ~ 5 Vpp	
Manual mode	DC Coupling	DC offset range	\pm 1.5 VDC
		100mHz~100MHz	20mVrms ~ \pm 5 Vac+dc
		100MHz~200MHz	40mVrms ~ \pm 5 Vac+dc
	AC Coupling	1Hz~100MHz	50mVpp ~ \pm 5Vpp
100MHz~200MHz		100mVpp ~ \pm 5Vpp	

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Pulse width and Duty cycle measure	1Hz to 10MHz (100mVpp ~ 10Vpp)	
Input adjust	Input impedance	1M Ω
	Coupling mode	AC, DC
	High frequency restrain	High frequency noise restrain (HFR) on or off
	sensitivity	Low, Medium, High
Trigger mode	The trigger level can adjust manually/automatically	
	Trigger level range: $\pm 3V$ (0.1% ~ 100%)	
	Resolution: 6mV	

General Specifications

Power Supply	
Supply	AC/DC adapter AC input: 100 ~ 240 VACrms, 45 ~ 63Hz, CAT II DC output: +12V, 4Apeak
Consumption	< 40W

Environment	
Temperature Range	Operation: 10°C ~ +40°C
	Non-operation: -20°C ~ +60°C
Cooling Method	Fan cooling
Humidity Range	Below +35°C: ≤90% relative humidity
	+35°C~+40°C: ≤60%relative humidity
Height above sea level	Operation : below 2,000m
	Non-operation: below 15,000m

Instrument Specifications		
Dimension	Width	142.2mm
	Height	48.1mm
	Depth	215.4mm
Weight	Package excluded	684g
	Package Included	1585g

IP Protection
IP2X

Calibration Interval
One year suggested

Chapter 5 Appendix

Appendix A VG1000 Series Accessories

Standard Accessories:

- A Power Cord that fits the standard of the destination country.
- A Power Adapter that fits the safety certification standards of the destination country.
- A USB Data Wire.
- A set of VG1000 software (include a User's Guide).

Optional Accessories:

- A BNC Cable

NOTE:

- To avoid affecting the product performance, the length of USB data wire and LAN cable connected to the instrument should be less than 3m.
- All the accessories (standard and optional) can be purchased by contacting your local **RIGOL** office.

Appendix B: Warranty

RIGOL warrants its products' mainframe and accessories in materials and technics within the warranty period. During the period concerned, **RIGOL** guarantees the free replacement or repair of products which are approved defective.

To get repair service or obtain a copy of the whole warranty statement, please contact with your nearest **RIGOL** sales and service office.

RIGOL do not provide any other warranty items except the one being provided by this summary and the warranty statement. The warranty items include but not being subjected to the hint guarantee items related to tradable characteristic and any particular purpose. **RIGOL** will not take any responsibility in cases regarding to indirect, particular and ensuing damage.

Appendix C General Care and Cleaning

General Care

Do not store or leave the instrument in the place where it can be exposed to direct sunlight for long periods of time.



CAUTION: To avoid damage to the instrument, do not expose them to sprays, liquids, or solvents.

Cleaning

Check the instrument frequently according to the operation conditions; follow the steps below to clean the exterior surface of the instrument:

1. Wipe the dust on the outside of the instrument with a lint- free cloth.
2. Use a soft cloth dampened with water to clean the instrument. Please cut off the power. To avoid damage to the surface of the instrument, do not use any abrasive or chemical cleaning agent.



WARNING: To avoid any short-circuit or body damage because of the moisture, make sure that the instrument is dry before restarting.

Appendix D: Contact RIGOL

If you have any problem or requirement during using our products, please contact **RIGOL** Technologies, Inc. or the local distributors.

Domestic: Please call

Tel: (86-10) 8070 6688

Fax: (86-10) 8070 5070

Service & Support Hotline: **800 810 0002**

9:00 am –5: 00 pm from Monday to Friday

Or by e-mail:

Service@rigol.com

Or mail to:

RIGOL Technologies, Inc.

156# CaiHe Village, ShaHe Town, ChangPing District, Beijing, China

Post Code: 102206

Overseas: Contact the local **RIGOL** distributors or sales office.

For the latest product information and service, please visit our website:

www.rigolna.com.

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