User's Guide

RIGOL

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DG2000 Series Function/Arbitrary Waveform Generator

DG2041A

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 guide.

The instrument should be serviced only by qualified personnel.

Avoid Fire or Personal Injury

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

Insert or draw properly. Do not insert draw when the probe and the testing lead are connected with the power.

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 that marked on the instrument. Read the user guide carefully before making connections to the instrument.

Do not operate without Covers. Do not operate your generator with covers or panels removed.

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 be immediately happen.

WARNING indicates an injury or hazard that may be 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** |

The Introduction of DG2000 Series

RIGOL DG2000 Series Function/ Arbitrary Waveform Generator adopt the direct digital synthesizer (DDS) technology, which can provide stable, high-precision, pure and low distortion sine signal. It can also provide 40MHz square waveform with fast rising and falling edges. 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.

DG2000 Series Function/ Arbitrary Waveform Generator have clear and simple Front-Panel. The user-friendly panel layout and instructions, versatile terminals, direct graph interface, built-in instructions and help system have greatly simplified the operation process. Thus, users do not have to spend a great deal of time learning and familiarizing the operation of the generator before they can use it proficiently. The built-in AM, FM, PM, PWM and FSK modulating functions generate modulated waveform at ease, without the help of a separate modulating source. The USB I/O, LAN and GPIB are the standard configuration. Remote instructions meet the SCPI specification requirements.

From the characteristics and specifications given below, you will understand how DG2000 can satisfy your measurement requirements.

- 16+2 channels digital output module (optional) together with the analogue channel can rebuild the most commonly used mixed signal in daily practice.
- DDS technology provides precise, stable and low distortion output signal.
- 10 standard waveforms:
  Sine, Square, Ramp, Pulse, Noise, Sinc, Exponential Rise, Exponential Fall, Cardiac and DC.
- 100MSa/s sampling rate, enable to edit arbitrary waveform with 14-bit, 512K points.
- Frequency characteristics:
  Sine/ Square: 1μHz to 40 MHz
  Ramp: 1μHz to 400 kHz
  Pulse: 500μHz to 16MHz
  White Noise: 20MHz bandwidth (-3dB)
  Arbitrary waveform: 1μHz to 12MHz

- Amplitude range: 2mV$_{pp}$ to 10V$_{pp}$ (50 Ω)

  40mV$_{pp}$ to 20V$_{pp}$ (High Z)
- Abundant modulation function, various modulated waveform: AM, FM, PM, PWM and FSK.
- Linear, logarithm Sweep and Burst mode.
- Abundant I/O: External Modulation Source, External 10 MHz Reference Input, External trigger source, waveform output, synchronous digital signal output, Internal 10 MHz Reference output.
- Support USB storage device; store and read waveform configure parameters or the edited arbitrary waveform with USB devices. System Updating could also be performed by using USB devices.
- Remote control is realized by using the LAN.
- Standard interface: USB Host & Device, RS-232, GPIB.
- Graph interface which shows the signal setting directly.
- Chinese/English user interface.
- Embedded Chinese/English Help System.
- Support Chinese/English Input.

Note:

All the specifications described in this guide are according to DG2041A.

Content

Chapter 1   Getting Started

This chapter covers the following topics:

- General Inspection

- Handle Adjustment

- The Front/Rear Panel

- The DG2000 User Interface

- To Set a Waveform

- To Set Modulate/ Sweep/Burst

- To Set Trigger/Output

- To Use Digital Input

- To Use Store/Utility/Help Function

General Inspection

When you get a new DG2000 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 passing the electric and mechanical testing.

2. Check the accessories.

Accessories supplied with the instrument are listed in chapter 6 "Appendix A: DG2000 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.

Handle Adjustment

To adjust the handle position of DG2000 Function/ Arbitrary Waveform Generator, please grip the handle by the sides and pull it outward. Then, make the handle rotate to the desired position. The operating methods are shown below in figure 1-1 and figure 1-2.
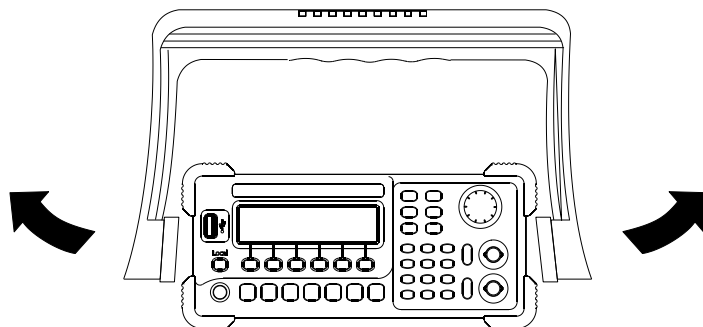
Figure 1-1 The Method of Adjusting the Handle
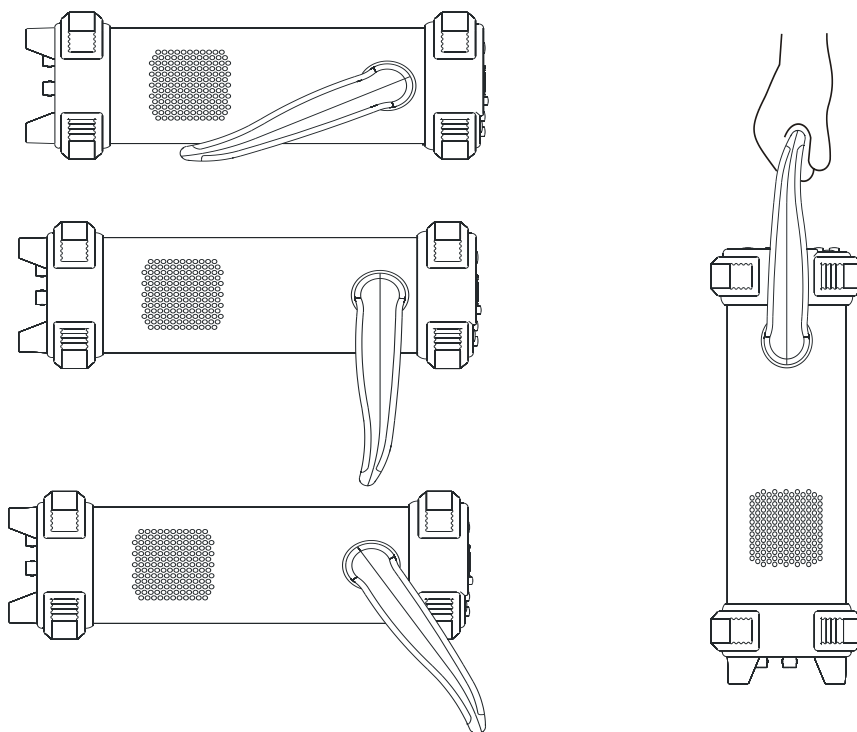
Figure 1-2 The Viewing Positions and Carrying Position

The Front/Rear Panel

When you get a new DG2000 Series Function/ Arbitrary Waveform Generator, first you need to know how to operate the front/ rear panel correctly. This chapter will make a brief introduction and description for the operation and functions of the Front/ Rear Panel.

The Front Panel at a Glance

The DG2000 Series Function/ Arbitrary Waveform Generator has clear and simple front panel. See figure 1-3 and figure 1-4. The Front Panel has a knob, functional keys and menu buttons. The 6 grey buttons below the screen are menu buttons, with the help of which, you can choose different options on the current menu. The rests are the functional keys, with which you can enter different function menus or obtain specific functional applications directly.
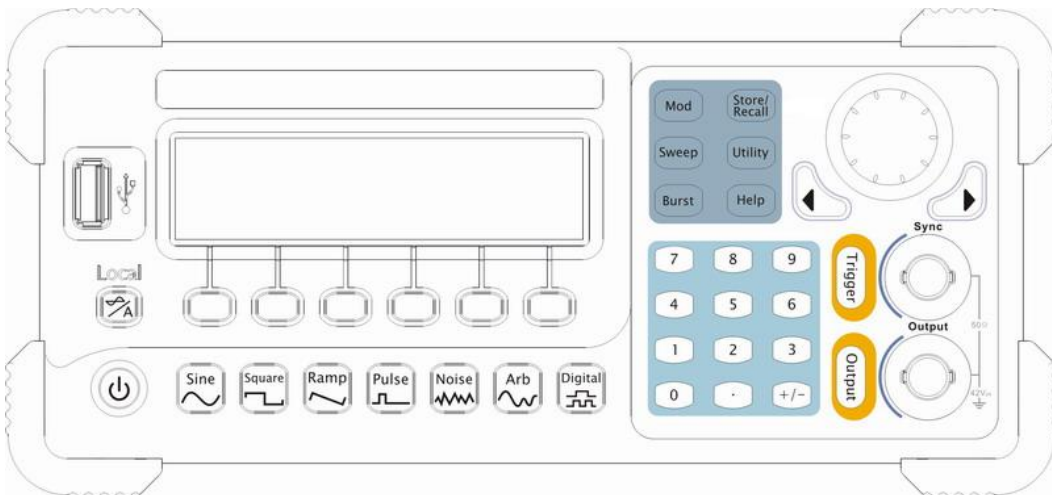
Figure 1-3 The Front Panel of DG2000 Series

Figure 1-4 The Front Panel Operation Instruction of DG2000 Series

NOTE: The [Output] connector and [Sync] connector on the front panel can be only used for the signal output. If they are used for input, it may make the circuit burned and the instrument in trouble.

The Rear Panel at a Glance
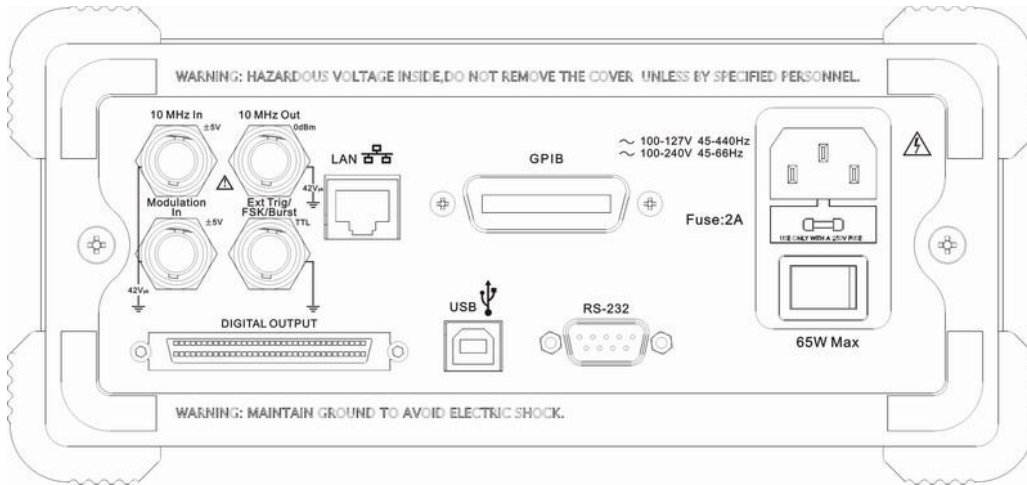
Figure 1-5 The Rear Panel of DG2000 Series
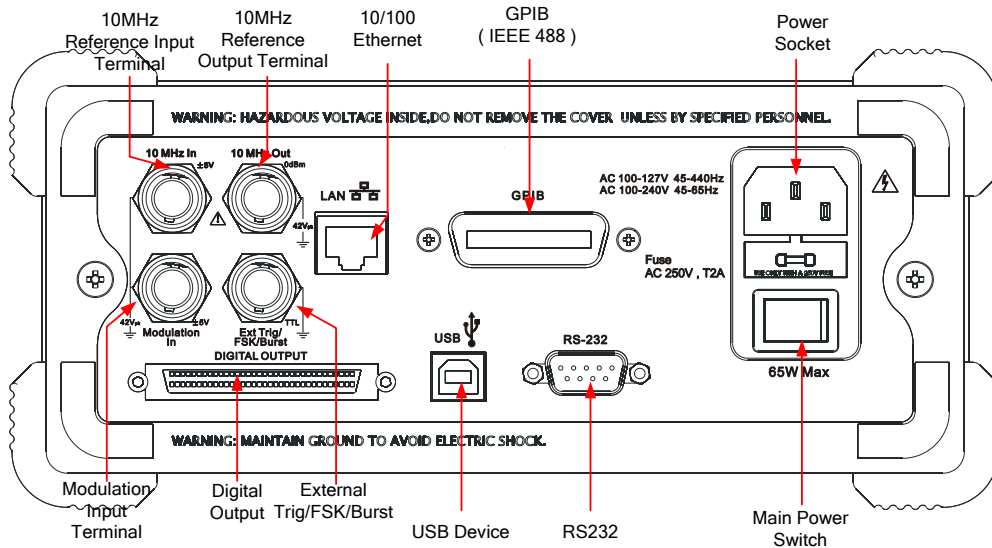
Figure 1-6 The Rear Panel Operation Instruction of DG2000 Series

The DG2000 User Interface

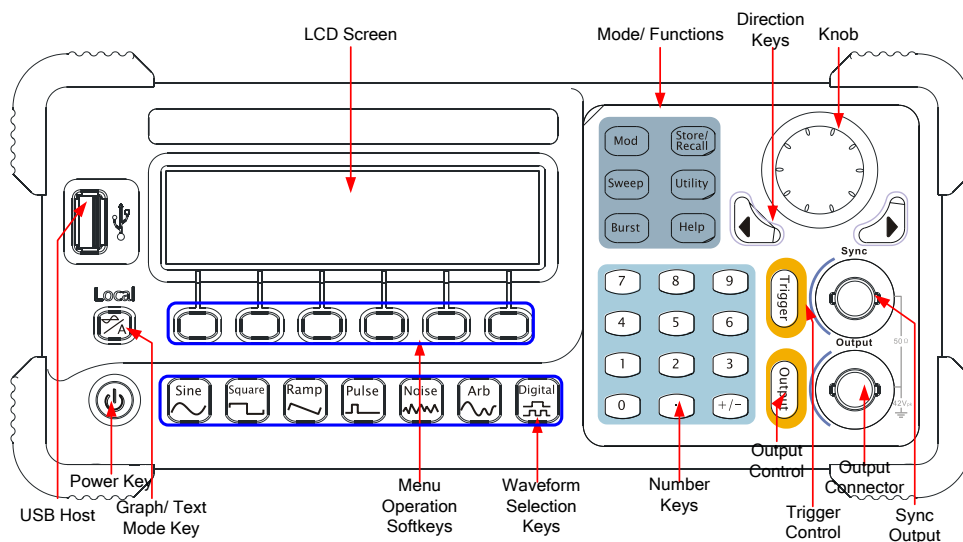DG2000 Series Function/ Arbitrary Waveform Generator provides two display modes: Menu and Graph. Under the Menu display mode, the display interface is divided into 4 parts: state, waveform icon, operation menu, and parameter display. See figure 1-7. Under the Graph display mode, you can check the current waveform parameters in the graphics. The display interface is also divided into 4 parts: state, parameter display, display menu button and waveform display. See figure 1-8. The operation menu will appear at the bottom of the screen when you press any menu button. These two display modes can be switched to each other by pressing the $\curvearrowright$ /A button.
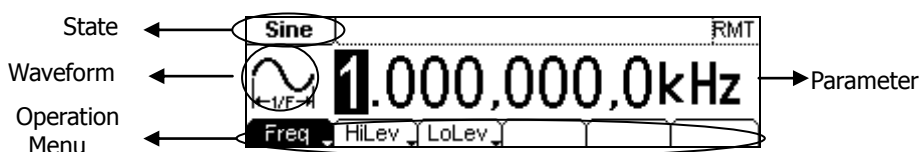
Figure 1-7 The Interface Instruction of Menu Mode
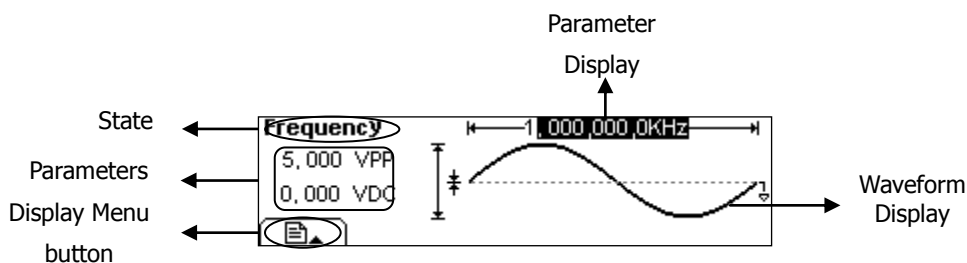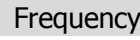
Figure 1-8 The Interface Instruction of Graph Mode

Note：

The signs for the buttons in this manual are the same as the panel buttons. Please note that the signs for the functional buttons on the operation panel are represented by squared words, such as Sine, which represents the transparent functional key with Sine on it on the front panel, while the menu buttons are represented by shadow words such as Frequency , which means the "Frequency" option in the Sine menu.

To Set a Waveform

At the left of the operation panel, there is a set of buttons with waveform icon. See figure 1-9. The exercise below will help you familiarized with the waveform selection settings. The instructions of the waveform setting are all carried out in the Menu Display Mode.

Figure 1-9 The Waveform Selection Buttons

1. Press Sine button, and the waveform icon turns into Sine with a "Sine" typeface in the state area. DG2000 Series Generator can generate Sine signal with frequency from 1μHz to 40MHz. By setting Frequency/Period, Amplitude/ High Level, Offset/ Low level, the Sine signal with different parameters can be generated.

Figure 1-10 The Sine Waveform in the Menu Display Mode

As shown in figure 1-10, the default signal parameters are: 1kHz Frequency, 5.0 V_{pp} Amplitude and $0V_{dc}$ Offset.

2. Press Square button, and the waveform icon turns into Square with a "Square" typeface in the state area. DG2000 Series Generator can generate Square signal with frequency from 1μHz to 40MHz and variable duty cycle. By setting Frequency/Period, Amplitude/ High Level, Offset/ Low level, and Duty Cycle, the Square signal with different parameters can be generated.

Figure 1-11 The Square Waveform in the Menu Display Mode

As shown in figure 1-11, the default signal parameters are: 1kHz Frequency, 5.0

Vpp Amplitude, 0 Vdc Offset and 50% Duty Cycle.

3. Press Ramp button, and the waveform icon turns into Ramp with a "Ramp" typeface in the state area. DG2000 Series Generator can generate Ramp signal with frequency from 1μHz to 400 kHz and variable Symmetry. By setting Frequency/Period, Amplitude/ High Level, Offset/ Low level, and Symmetry, the Ramp signal with different parameters can be generated.

Figure 1-12 The Ramp Waveform in the Menu Display Mode

As shown in figure 1-12, the default signal parameters are: 1kHz Frequency, 5.0 Vpp Amplitude, 0 Vdc Offset and 50% Symmetry.

4. Press Pulse button, and the waveform icon turns into Pulse with a "Pulse" typeface in the state area. DG2000 Series Generator can generate Pulse signal with frequency from 500μHz to 16MHz and variable Pulse Width and Edge Time. By setting Frequency/Period, Amplitude/ High Level, Offset/ Low level, Pulse Width and Edge Time, the Pulse signal with different parameters can be generated.
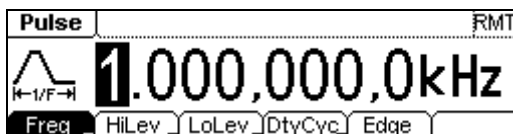
Figure 1-13 The Pulse Waveform in the Menu Display Mode

As shown in figure 1-13, the default signal parameters are: 1kHz Frequency, 5.0 Vpp Amplitude, 0 Vdc Offset, 20% Duty Cycle and 50ns Edge Time.

5. Press Noise button, and the waveform icon turns into Noise with a "Noise" typeface in the state area. DG2000 Series Generator can generate Noise signal with Band Width up to 20MHz. By setting Amplitude/ High Level, Offset/ Low level, the Noise signal with different parameters can be generated.
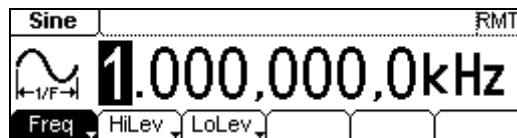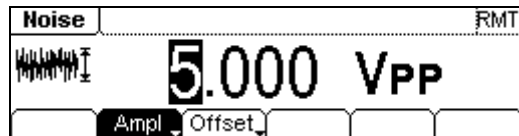
Figure 1-14 The Noise Waveform in the Menu Display Mode

As shown in figure 1-14, the default signal parameters are: 5.0 V_{pp} Amplitude and 0 V_{dc} Offset.

6. Press Arb button, and the waveform icon turns into Arb with an "Arb" typeface in the state area. DG2000 Series Generator can generate repeatable arbitrary waveform signals with at most 512K points and 12MHz frequency. By setting Frequency/Period, Amplitude/ High Level, Offset/ Low level, arbitrary waveform signals with different parameters can be generated.
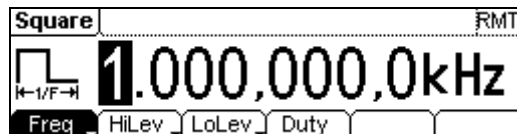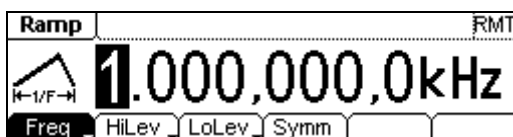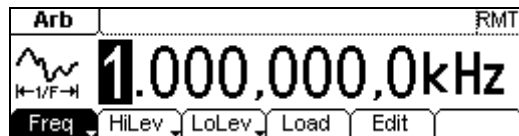

Figure 1-15 The Arbitrary Waveform in the Menu Display Mode

As shown in figure 1-15, the default Exponential Rise Signal parameters are: 1kHz Frequency, 5.0 V_{pp} Amplitude and 0 V_{dc} Offset.

7. Press Digital button, and enter the interface of Logic Signal Output Module. For the detailed explanations, please refer to User's Guide of DG2000 Logic Signal Output Module.

To Set Modulate/ Sweep/Burst

As shown in figure 1-16, there are three buttons on the front panel, which are used for Modulating, sweeping and bursting settings. The instructions below will help you familiarize with the setting of these functions.
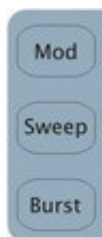
Figure 1-16 The Modulate/ Sweep/ Burst button

1. Press Mod button, and a Modulated waveforms will be generated.
   Parameters are set by using the menu buttons. The modulated waveform can be changed by changing the parameters such as Type, Internal/External Modulation, Depth, Frequency, Waveform, etc.
   DG2000 Series can modulate waveform by using AM, FM, PM, PWM and FSK. Sine, Square, Ramp or Arbitrary waveforms can be modulated (Pulse, Noise and DC cannot be modulated).

Figure 1-17 The Modulated Waveform in the Menu Display Mode

2. Press Sweep button, Sine, Square, Ramp or Arbitrary waveform can be swept (Pulse, Noise and DC can not be swept).
   In the Sweep Mode, DG2000 Series generate signal with variable frequencies.

Figure 1-18 The Sweep Waveform in the Menu Display Mode

3. Press Burst button, Burst for Sine, Square, Ramp, Pulse or Arbitrary waveform can be generated (Noise can only be used in the gated Burst).
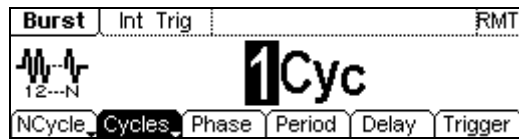
Figure 1-19 The Burst Waveform in the Menu Display Mode

Term Explanation

Burst：Output Waveforms with set cycle times

Burst can last for certain times of waveform cycle (N-Cycle Burst) or be controlled by external gated signals (Gated Burst). Burst applies to all kinds of waveforms, but noise can only be used in gated burst. Generally it is called BURST function within every Signal Generator.

To Set Trigger/Output

As shown in figure 1-20, there are two buttons on the right side of the operation panel, which are used to set Trigger and Output Control. The instruction below will help you familiarize with these functions.

Figure 1-20 The Trigger/Output Button

1. Press Trigger Button, choose internal/external or manual Trigger (Manual Trigger can only be used in Sweep and N-Cycle Burst)
   - The default setting for Trigger is "Internal". In this mode, when the Sweep or Burst Mode is also selected, the Generator will continuously generate burst. At this time, press Trigger button, the instrument will shift from the "Automatic" Trigger mode into "Manual" Trigger mode.
   - When the generator uses the" External" Trigger Mode, if the Sweep or the Burst Mode is selected, the signal will be continuously generated. At this time, press Trigger button, the instrument state will not change, and it will show the information "The instrument has already been triggered".
   - Every time you press the Trigger button, "Manual" Trigger will start a sweep or generate a burst. Press the button again, and the generator will be triggered again.

2. Press Output Button, activate or deactivate the output signal.
   If an overload message is shown, disconnect the external equipment from the output terminals and press Output button, reactivate the output terminal.

To Use Digital Input

As shown in figure 1-21, there are two groups of buttons on the operation panel, which are the direction button, the knob and the keypad. The instruction below will help you familiarize with the Digital Input Function.
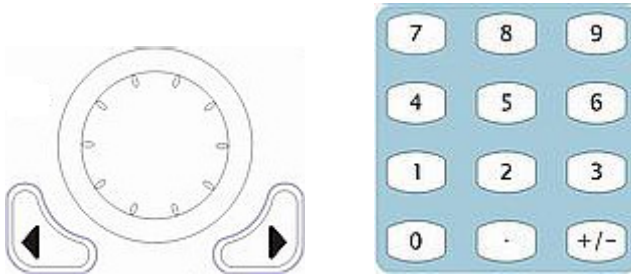
(1) Direction Key and the Knob   (2) Keyboard

Figure 1-21 The Front Panel Digital Input

1. Use the Direction keys to move the cursor left or right. Rotate the knob to change a digit (clockwise to increase 1), and the range of digit is 0~9.

2. Use the Keypad to set the parameters values of the waveforms, which can change its value directly.

To Use Store/Utility/Help Function

As shown in figure 1-22, there are three buttons on the operation panel, which are used to call the store/recall, utility and help function. The instruction below will help you familiarize with these Functions.

Figure 1-22 The Store/Recall, Utility and Help Button

1. The Store/Recall Button is used to store waveform data and configure information.

2. The Utility Button is used to set the auxiliary system function, change the output configure parameters, interface setting, system setting information or perform the instrument self-test and read the calibration information, etc.

3. The Help Button is used to see the help information.

Operation Instruction
To get help：
To get help on any key of the front panel, press the key and last for 1 second, then the help message will appear.
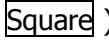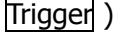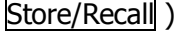
Chapter 2   Operating Your Generator

Up to now you have got a brief understanding of the front/rear panel, every function control area and keys of DG2000 series. You should also know how to set your function/arbitrary waveform generator. If you are not familiar with these operations, please read Chapter 1 "Getting Started" again.

This chapter covers the following topics:

- Menu/Graph Mode   (⌐/ A)

- Setting Sine Signal   (Sine)

- Setting Square Signal   (Square)

- Setting Ramp Signal   (Ramp)

- Setting Pulse Signal   (Pulse)

- Setting Noise Signal   (Noise)

- Setting Arb Signal   (Arb)

- Settig Logic Signal Output   (Digital) *

- Output Modulated Signal   (Mod)

- Output Sweep Signal   (Sweep)

- Output Burst Signal   (Burst)

- Trigger   (Trigger)

- Store/Recall   (Store/Recall)

- Utility Setting   (Utility)

- Help System   (Help)

You are suggested to read this chapter carefully so as to understand DG2000 Series Generator's versatile waveform setting Functions and the other operation methods.

*Note: For the operation instruction of Logic Signal Output, please refer to User's Guide of DG2000 Logic Signal Output Module.

The Menu/Graph Mode

To activate the Graph Mode

Press $\boxed{\curvearrowright/\text{A}}$ to enter the Graph Mode. The name of the current selection parameter is shown on the top left corner of the screen, and its value is shown in inverse color. See figure 2-1.
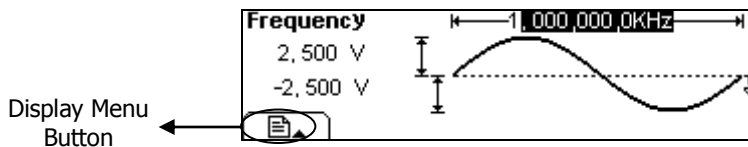
Figure 2-1 The Graph Mode Interface

To Select the Desired Parameter

To select the specific parameters, please press any menu button and the operation menu will pop out. Press the corresponding button to set the parameter. For example, if you want to change the frequency, press any menu button and select $\boxed{\text{Freq}}$ menu. The direction button will help you find your desired parameter and change its value with the knob or the keypad, see figure 2-2. Under the Graph Mode, the parameters will still switch at a second press on the button, such as $\boxed{\text{Amp/HiLev}}$.
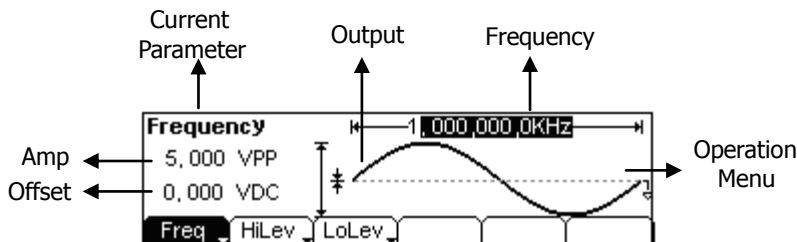
Figure 2-2 Setting the parameters in the Graph Mode

To Quit the Graph Mode

To quit the Graph Mode, press the $\boxed{\curvearrowright/\text{A}}$ again and return the Menu Mode.

To Set Sine Signals

In the Menu Mode, press Sine button to call the Sine operation. The top left corner of the screen will show the name of the current waveform, see figure 2-3. The output Sine waveform parameters are set by using the Sine operation menu.

The parameters for Sine waveforms are: Frequency/ Period, Amplitude/ High Level, Offset/ Low Level. Different Sine Signals are generated by setting these parameters. As is shown in figure 2-4, select   Freq   in the operation menu and the frequency parameter will show in the parameter area. then Users can change the frequency value by using the direction button and the knob or the keypad.

Output Waveform

Operation Menu: Controlled and Operated by menu button

Sine   RMT

1.000,000,0kHz   Current
                                         Parameter

Freq   HiLev   LoLev
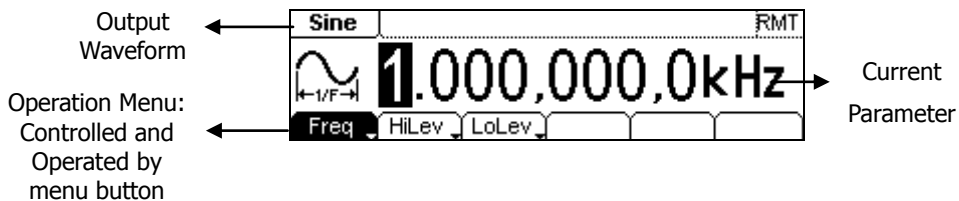
Figure 2-3 The Setting Interface of Sine Signal Parameter

Freq   HiLev   LoLev

Figure 2-4 The Operation Menu

Table 2-1 The Menu Explanations of Sine Signal

Function Menu	Settings	Explanation
Frequency/ Period		Setting the signal frequency or period; the current parameter will switch at a second press.
Amplitude/ High Level		Setting the signal Amplitude or High Level; the current parameter will switch at a second press.
Offset/Low Level		Setting the signal Offset or Low Level; the current parameter will switch at a second press

To Set the Output Frequency/Period

1. Press Sine → Freq/Period → Freq , to set the frequency parameter.
    The frequency shown on the screen is the default value when the instrument is powered or the set value beforehand. When setting the function, if the current value is valid for the new waveform, it will be used sequentially. If you want to set the period for the waveform, press Freq/Period button again, switch to the Period parameter (The current operation is displayed in inverse color).

2. Input the Desired Frequency.
    Use the keypad to input the parameter value directly, and press the corresponding button to select the parameter unit. Or you can use the direction button to select the digit you want to edit, and then use the knob to change its value.
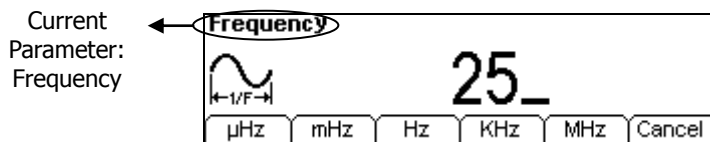
Figure 2-5 Setting the Frequency

Instruction:
When using the keypad to enter the digit, you can use the Left direction button to move the cursor backward and delete or change the value of the previous digit. When using the knob to input, use the direction buttons to select the digit you want to edit and rotate the knob to change its value.

To Set the Output Amplitude

1. Press Sine → Ampl/HiLev → Ampl , to set the amplitude.
   The amplitude shown on the screen is the default value when the instrument is powered or the set value beforehand. When changing the function, if the current value is valid for the new waveform, it will be used sequentially. If you want to set the waveform by high Level or Low Level, press Ampl/HiLev or Offset/Lolev again, switch to HiLev or LoLev parameter (The current operation is displayed in inverse color).

2. Input the Desired Amplitude
   Use the keypad or the knob to input the desired value, choose the unit, and press the corresponding button.

Current
Parameter:
Amplitude

Amplitude

80_

mVPP | VPP | mVRMS | VRMS | | Cancel
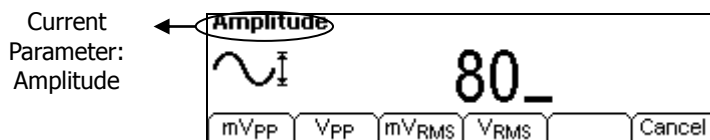
Figure 2-6 Setting the Amplitude

To Set the DC Offset

1. Press Sine → Offset/LoLev → Offset , to set the offset.
    The offset shown on the screen is the default value when the instrument is powered or the set value beforehand. When changing the function, if the current value is valid for the new waveform, it will be used sequentially.

2. Input the Desired Offset
    Use the keypad or the knob to input the desired value, choose the unit, and press the corresponding button.
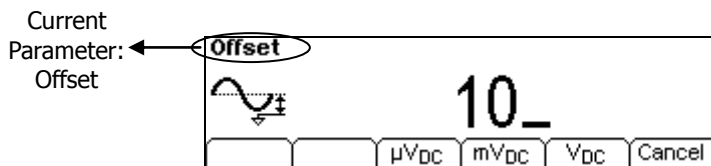
Figure 2-7 Setting the Offset

In the Graph Mode, the waveform is shown in figure 2-8.
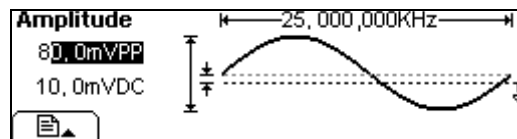
Figure 2-8 The Waveform Parameter in the Graph Mode

Notes: the Setting of any waveform for DC Offset is the same as sine wave, so we will not cover this topic hereon.

To Set Square Signals

Press Square button, in the Normal Mode, the operation menu will appear at the bottom of the screen, see figure 2-9. Set the Square parameters by using the operation menu.

The parameters for Square waveforms are: Frequency/ Period, Amplitude/ High Level, Offset/ Low Level and Duty Cycle. See figure 2-10. In the operation menu, select Duty, and the corresponding parameter will be displayed in inverse color for which users can make a change.

Figure 2-9 The Setting Interface of Square Signal

Figure 2-10 The Operation Menu

Table 2-2 The Menu Explanations of Square Signal

Function Menu	Settings	Explanation
Frequency/ Period		Setting the signal frequency or period; the current parameter will switch at a second press.
Amplitude/ High Level		Setting the signal Amplitude or High Level; the current parameter will switch at a second press.
Offset/Low Level		Setting the signal Offset or Low Level; the current parameter will switch at a second press
Duty Cycle		Setting the Duty Cycle for Square Waveform

Term Explanation:

Duty Cycle: The percentage that the High Level takes up in the whole Period.

Please Note : for the Frequency	Duty Cycle Value
Below 8MHz:	20% to 80%
From 8MHz to 16MHz (included):	40% to 60%
Higher than 16MHz:	50%

To Set the Duty Cycle

1. Press Square → Duty , to set the Duty Cycle.
    The Duty Cycle shown on the screen is the default value when the instrument is powered or the set value beforehand. When changing the function, if the current value is valid for the new waveform, it will be used sequentially.

2. Input the Desired Duty Cycle
    Use the keypad or the knob to input the desired value, choose the unit, and press the corresponding button. The Generator will change the waveform immediately.

Current Parameter: Duty Cycle
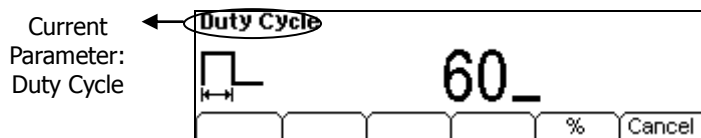
Figure 2-11 Setting the Duty Cycle

In the Graph Mode, the waveform is shown in figure 2-12.
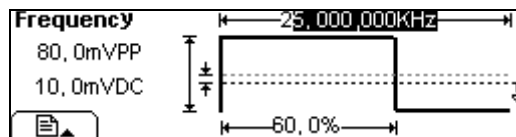
Figure 2-12 The Waveform Parameter in the Graph Mode

To Set Ramp Signals

Press Ramp button, in the Normal Mode, the operation menu will appear at the bottom of the screen, see figure 2-13. Set the Ramp parameters by using the operation menu.

The parameters for Ramp waveforms are: Frequency/ Period, Amplitude/ High Level, Offset/ Low Level and Symmetry. See figure 2-14. In the operation menu, select Symm , and the corresponding parameter will be displayed in inverse color for which users can make a change.

Figure 2-13 The Setting Interface of Ramp Signal

Figure 2-14 The Operation Menu

Table 2-3 The Menu Explanations of Ramp Signal

Function Menu	Settings	Explanation
Frequency/ Period		Setting the signal frequency or period; the current parameter will switch at a second press.
Amplitude/ High Level		Setting the signal Amplitude or High Level; the current parameter will switch at a second press.
Offset/Low Level		Setting the signal Offset or Low Level; the current parameter will switch at a second press
Symmetry		Setting the Symmetry for Ramp Waveform

Term Explanation:
Symmetry: The percentage that the Rising Period takes up in the whole Period.
Input Range: 0~100%

To Set the Symmetry

1. Press Ramp → Symm , to set the Symmetry.
    The Symmetry shown on the screen is the default value when the instrument is powered or the set value beforehand. When changing the function, if the current value is valid for the new waveform, it will be used sequentially.

2. Input the Desired Symmetry.
    Use the keypad or the knob to input the desired value, choose the unit, and press the corresponding button. The Generator will change the waveform immediately.

Current
Parameter:
Symmetry
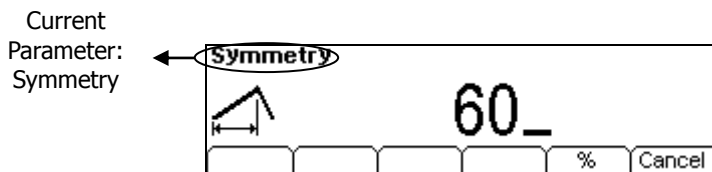
Figure 2-15 Setting the Symmetry

In the Graph Mode, the waveform is shown in figure 2-16.
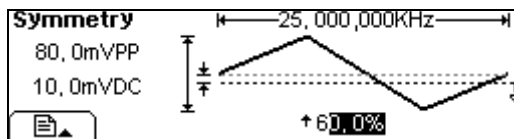
Figure 2-16 The Waveform Parameter in the Graph Mode

To Set Pulse Signals

Press Pulse button, in the Normal Mode, the operation menu will appear at the bottom of the screen, see figure 2-17. Set the Pulse parameters by using the operation menu. The parameters for Pulse waveforms are: Frequency/ Period, Amplitude/ High Level, Offset/ Low Level, Pulse Width/Duty Cycle and Edge Time. See figure 2-18. In the operation menu, select Width , and the corresponding parameter will be displayed in inverse color for which users can make a change.

Figure 2-17 The Setting Interface of Pulse Signal

Figure 2-18 The Operation Menu

Table 2-4 The Menu Explanations of Pulse Signal

Function Menu	Settings	Explanation
Frequency/ Period		Setting the signal frequency or period; the current parameter will switch at a second press.
Amplitude/ High Level		Setting the signal Amplitude or High Level; the current parameter will switch at a second press.
Offset/Low Level		Setting the signal Offset or Low Level; the current parameter will switch at a second press.
Width/ Dty Cyc		Setting the signal Pulse Width or Duty Cycle; the current parameter will switch at a second press.
Edge		Setting the Edge Time for Pulse Waveform.

Term Explanation:

Pulse Width:

Positive Pulse Width: the time span between thresholds of 50% of the rising edge amplitude to the next 50% of the falling edge amplitude;

Negative Pulse Width: the time span between thresholds of 50% of the falling edge amplitude to the next 50% of the rising edge amplitude.

Edge Time:

The time span between the thresholds of the 10% to 90% of the rising edge amplitude is called Rising Time.

The time span between the thresholds of the 10% to 90% of the falling edge amplitude is called Falling Time.

The Rising Time and the Falling Time together are called Edge Time.

To Set the Pulse Width

1. Press Pulse → Width , to set the Pulse Width.
    The Pulse Width shown on the screen is the default value when the instrument is powered or the set value beforehand. When changing the function, if the current value is valid for the new waveform, it will be used sequentially.

2. Input the Desired Pulse Width
    Use the keypad or the knob to input the desired value, choose the unit, and press the corresponding button. The Generator will change the waveform immediately.

Current
Parameter:
Pulse Width
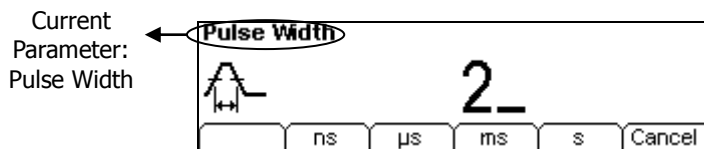
Figure 2-19 Setting the Pulse Width

To Set the Edge Time

1. Press Pulse → Edge , to set the Edge Time.
    The Edge Time shown on the screen is the default value when the instrument is powered or the set value beforehand. When changing the function, if the current value is valid for the new waveform, it will be used sequentially.

2. Input the desired Edge Time
    Use the keypad or the knob to input the desired value, choose the unit, and press the corresponding button. The Generator will change the waveform immediately.

Current
Parameter:
Edge Time
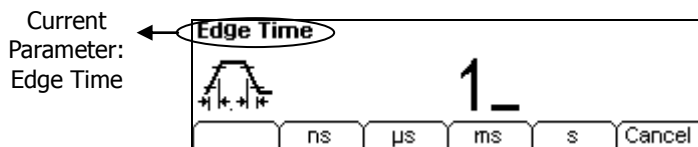
Figure 2-20 Setting the Edge Time

In the Graph Mode, the waveform is shown in figure 2-21.
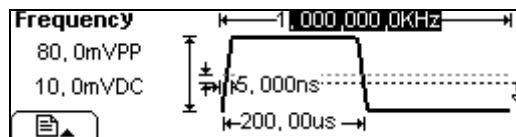
Figure 2-21 The Waveform Parameter in the Graph Mode

Instruction:
The system has the default setting that the Rising and Falling edge time are the same.

To Set Noise Signals

Press Noise button, in the Normal Mode, the operation menu will appear at the bottom of the screen, see figure 2-22. Set the Pulse parameters by using the operation menu. The parameters for Noise waveforms are: Amplitude/ High Level and Offset/ Low Level. See figure 2-23. In the operation menu, select Ampl , and the corresponding amplitude will be displayed in inverse color for which users can make a change for the the amplitude of Noise. And Noise signal has no frequency or period.

Figure 2-22 The Setting Interface of Noise Signal
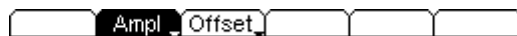
Figure 2-23 The Operation Menu

Table 2-5 The Menu Explanations of Noise Signal

| Function Menu	Settings	Explanation
Amplitude/ High Level		Setting the signal Amplitude or High Level; the current parameter will switch at a second press.
Offset/Low Level		Setting the signal Offset or Low Level; the current parameter will switch at a second press.

In the Graph Mode, the waveform is shown in figure 2-24.

Figure 2-24 The Waveform Parameter in the Graph Mode

To Set Arbitrary Signals

Press Arb button, in the Normal Mode, the operation menu will appear at the bottom of the screen, see figure 2-25. Set the Arbitrary Waveform parameters by using the operation menu.

Arbitrary Signals are divided into two categories: the built-in optional system waveforms and the user-defined arbitrary waveforms. The parameters for Arbitrary Waveforms are: Frequency/ Period, Amplitude/ High Level and Offset/ Low Level. See figure 2-26. In the operation menu, select Freq , and the corresponding frequency will be displayed in inverse color for which users can make a change.
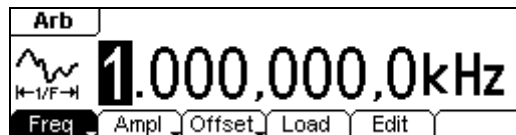
Figure 2-25 The Setting Interface of Arbitrary Signal
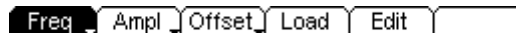
Figure 2-26 The Operation Menu

Table 2-6 The Menu Explanations of Arbitrary Signal

Function Menu	Settings	Explanation
Frequency/ Period		Setting the signal frequency or period; the current parameter will switch at a second press.
Amplitude/ High Level		Setting the signal Amplitude or High Level; the current parameter will switch at a second press.
Offset/Low Level		Setting the signal Offset or Low Level; the current parameter will switch at a second press.
Load		Select the built-in Arbitrary Signal for Output.
Edit		Create and Edit Arbitrary Waveform.

To Select the built-in Arbitrary Waveform

There are five built-in Arbitrary Waveforms and user-defined Arbitrary Waveforms in the Generator. To select one of them, following the instructions below:

Press Arb → Load , to enter into the interface shown below.

Figure 2-27 The Operation Menu

Table 2-7 The Selection Menu of Built-in Arbitrary Waveform

Function Menu	Settings	Explanation
Built-in		Select one of the five built-in Arbitrary Waveforms (See Table 2-8)
Stored		Select one of Arbitrary Waveforms stored in the Non-volatile memory.
Volatile		Select one of Arbitrary Waveforms stored in the Volatile memory. When a new waveform is created, the old one will be erased.
Delete		Delete one of the Arbitrary Waveforms stored in the Non-volatile memory. The five Built-in Waveforms can not be deleted.
↰		Cancel the current operation, and return to the upper menu. (The followings are the same)

Instructions:
- When there is no waveform stored in the Non-Volatile Memory, the Stored Menu and the Delete Menu will hide.
- When there is no waveform in the Volatile Memory, the Volatile menu will hide.

1. To Select the Built-in Waveform

Press [Arb] → Load → BuiltIn , and enter into the following interface.

Figure 2-28 The Operation Menu

Table 2-8 The Built-in Arbitrary Waveforms Menu

Function Menu	Settings	Explanation
ExpRise		Select the built-in Exponential Rise Waveform
ExpFall		Select the built-in Exponential Fall Waveform
NegRamp		Select the built-in Negative Ramp Waveform
Sinc		Select the built-in Sinc Waveform. Sinc＝Sin(x)/x
Cardiac		Select the built-in Cardiac Waveform

In the Graph Mode, the waveform is shown in figure 2-29.
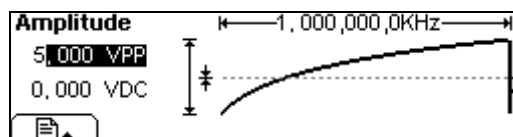
Figure 2-29

The Waveform Parameter in the Graph Mode (Exponential Rising Waveform)

2. To Select the Stored Waveform

Press $\boxed{\text{Arb}}$ → $\boxed{\text{Load}}$ → $\boxed{\text{Stored}}$, and enter the following interface. Select the desired waveform document which will be displayed in inverse color and press $\boxed{\text{Recall}}$ to recall it from the memory.

Figure 2-30 The Operation Menu

Table 2-9 The Stored Arbitrary Waveform Menu

Function Menu	Settings	Explanation
Disk	Local	Select display route for the system information
	U Disk (When U Disk is connected)	
Type	State	Setting of the Generator
	Data	Arbitrary waveform file
	All	All types of documentation
Recall		Recall the waveform or Setting information in the specific position in the memory.
Store		Save the waveform to the appointed place(See Table 2-24)
Remove		Remove any waveform that has been stored in the memory

Instructions:
When there is no waveform stored in the $\boxed{\text{Arb1}}$、$\boxed{\text{Arb2}}$、$\boxed{\text{Arb3}}$ and $\boxed{\text{Arb4}}$, this menu will hide (The followings is the same and will not explain again)

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3. **To Remove the Waveform**

Press Arb → Load → Store , and enter the following interface. Select the waveform documentation to be deleted which will be displayed in inverse color, and then press Remove to delete it.

►Local	State	ARB1: a1
UDisk	►Data	ARB2:
	All	ARB3:
Disk	Type	Recall	Store	Remove	↰

Figure 2-31 The Operation Menu

Table 2-10 The Menu Explanations of Waveform Removal

Function Menu	Settings	Explanation
Disk	Local	Select display route for the system information
	U Disk (When U disk is connected)	
Type	State	Setting of the Generator
	Data	Arbitrary waveform file
	All	All types of documentation
Recall		Recall the waveform or Setting information in the specific position in the memory.
Store		Save the waveform to the appointed position
Remove		Remove any waveform that has been stored in the memory

To Edit the Arbitrary Waveform

The Generator allows users to edit Arbitrary Waveforms, which can create any new waveform by initializing points. The operation steps are as follows:

Press Arb → Edit , enter the interface shown below.
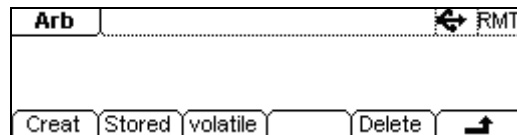
Figure 2-32 The Operation Menu

Table 2-11 The Menu Explanations of Waveform Edition

Function Menu	Settings	Explanation
Creat		Create a new waveform, and erase the waveform in the Volatile memory.
Stored		Edit the waveform stored in the non-Volatile memory
Volatile		Edit the waveform stored in the Volatile memory
Delete		Delete one of the Arbitrary Waveforms stored in the Non-volatile memory. But The five Built-in Waveforms can not be deleted.

Instructions:
- When there is no waveform stored in the Non-Volatile Memory, the Stored Menu and the Delete Menu will hide.
- When there is no waveform in the Volatile Memory, the Volatile menu will hide.

1. To Create a New Waveform

Press Arb → Edit → Creat , to set the overall parameters for the waveform. The setting interface is shown in figure2-33 and the menu in table 2-12.
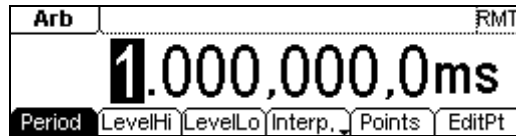
Figure 2-33 The Interface of setting the new waveform parameters
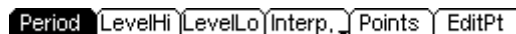
Figure 2-34 The Operation Menu

Table 2-12 The Explanations of Waveform Parameters

Function Menu	Settings	Explanation
Period		Setting the Period for the Waveform
LevelHi		Setting the Level High for the Waveform
LevelLo		Setting the Level Low for the Waveform
Interp On/ Off		Activate the linear Interpolation between the defined points Deactivate the linear Interpolation between the defined points
Points		Set the number of points when Initializing the waveform
EditPt		Start the Waveform Editor

To Set the Point Number

Press   Points , set the number of the initializing points.
When a new waveform is created, the waveform editor will firstly create a waveform with two points. The Waveform Editor connects the last point to the Voltage Level of point #1 to create a continuous waveform automatically. A waveform with most 512K points can be created.
In the default setting, the voltage of point #1 is High Level, the time is at 0 s, while the voltage of point #2 is Low Level and the time is the half of the set Cycle period.

To Set the Interpolation

Press   Interp , if you select   Interp On , and the points will be connected with beelines; otherwise, the voltages between the two consecutive points will not change, and the waveform looks like a step-up one.

To Edit the Waveform Points

Press Arb →   Edit   →   Creat   →   EditPt , the waveform can be defined by setting the time and voltage for each point. The interface is given as follows:
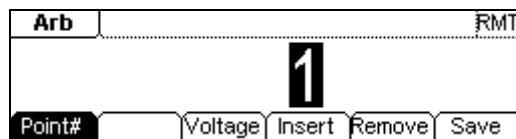
Figure 2-35 The Operation Menu

Table 2-13 The Menu Explanations of Waveform Edition

Function Menu	Settings	Explanation
Point#		Select the point to be edited
Time		Set time for the Selected point
Voltage		Set Voltage for the Selected point
Insert		Insert a new point between the defined points. Use the "Time" and "Voltage" to define the new point.
Remove		Remove the current point
Save		Save the created waveform to the non-Volatile Memory.

Instruction:
The time for the last definable point should be less than the cycle period of the waveform.

Save the Waveform to the Non-Volatile Memory

Press Arb → Edit → Creat → EditPt → Save , enter the following interface. Select the desired waveform document to be saved, which will be displayed in inverse color and press Save to save it to the specific place.

Figure 2-36 The Operation Menu

Table 2-14 The Menu Explanations of Saving New Waveform

Function Menu	Settings	Explanation
Disk	Local	Select display path for the system information
	U Disk (When a U disk is connected)	
Type	State	Setting of the Generator
	Data	Arbitrary waveform file
	All	All types of documentation
Recall		Recall the waveform or Setting information in the specific position in the memory.
Store		Save the waveform to the appointed position
Remove		Remove any waveform that has been stored in the memory

Instruction

To save the Arbitrary Waveform:

In the Non-volatile Memory, each waveform storage position can only save one waveform. If a new one is stored, the old one will be erased.

- For a waveform containing points below 128K, the current position will be used.
- For a waveform containing points from128K to 256K, two sequential position will be used.
- For a waveform containing points from256K to 512K, All the 4 position will be used.

In the Graph Mode, the waveform is shown in figure 2-37.
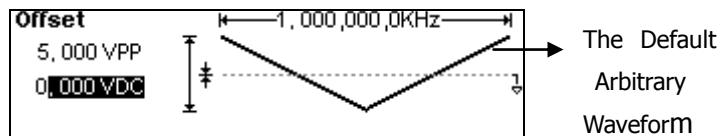
Figure 2-37 The Waveform Parameter in the Graph Mode

2. To Edit the Stored Waveform

Press $\boxed{\text{Arb}}$ → $\boxed{\text{Edit}}$ → $\boxed{\text{Store}}$, enter the following interface. Select the desired waveform document to be edited, which will be displayed in inverse color and press $\boxed{\text{Recall}}$ to recall and edit it in the Volatile memory.

```
┌─────────┬───────┬──────────────────────────┐
│▶Local   │ State │ ARB1: a1                 ║│
│ UDisk   │▶Data  │ ARB2:                    ║│
│         │ All   │ ARB3:                     │
├──────┬──────┬──────────┬───────┬──────────┬──┤
│ Disk │ Type │ Recall   │ Store │ Remove   │ ⬆│
└──────┴──────┴──────────┴───────┴──────────┴──┘
```

Figure 2-38 The Operation Menu

Table 2-15 The Menu Explanations of Editing Stored Waveform

Function Menu	Settings	Explanation
Disk	Local	Select display path for the system information
	U Disk (When a U disk is connected)	
Type	State	Setting of the Generator
	Data	Arbitrary waveform file
	All	All types of documentation
Recall		Recall the waveform or Setting information in the specific position in the memory.
Store		Save the waveform to the appointed position.
Remove		Remove any waveform that has been stored in the memory

3. To Delete a Waveform

Press Arb → Edit → Delete , to delete a waveform. Select the desired waveform to be deleted which will be displayed in inverse color and press Remove to delete it.

Instruction
The Ultrawave software can be used to edit the user-defined waveform, and you can download it from the official website www.rigolna.com.

To Generate the Modulated Waveform

Use the Mod button to generate modulated waveform. DG2000 Series can generate AM, FM, FSK, PM or PWM modulated waveforms. The modulation parameters should be set in different types of modulation. For example, in AM, users can set the Source (Internal/ External), depth, Modulating Frequency, Modulating Waveform and Carrier Waveform; in FM, users can set the Source (Internal/ External), Frequency Deviation, Modulating Waveform and Carrier Waveform; in FSK, users can set the Source (Internal/ External), Hop Frequency, FSK Rate, Modulating Waveform and Carrier Waveform; while in PM, users can set the Source (Internal/ External), Phase Deviation, Modulating Frequency, Modulating Waveform and Carrier Waveform, etc.

We will explain how to set these parameters in details according to different types of Modulation.
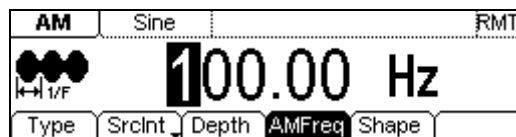
Figure 2-39 The setting Interface of Modulated Waveform

AM

The modulated waveform consists of two parts: the Carrier Waveform and the Modulating Waveform. In AM, the Amplitude of the Carrier Waveform varies with the instantaneous voltage of the modulating waveform. The Parameters for the AM are shown in table 2-16.

Figure 2-40 The Setting Interface of AM Waveform

Press Mod → Type → AM , enter the following interface.

Figure 2-41 The Operation Menu

Table 2-16 The Menu Explanations of the AM Parameters

Function Menu	Settings	Explanation
Type	AM	Amplitude Modulation
SrcInt SrcExt	Internal	The Source is Internal
	External	The Source is External. Use the [Modulation In] connector in the Rear panel.
Depth		Set the amplitude range
AMFreq		Set the modulating waveform frequency. Frequency Range: 2mHz~20kHz (Only Internal).
Waveform	Sine Square Triangle UpRamp DnRamp Noise Arb	Press the function key Sine , Square etc to choose different Shape of waveform.

Note: When choose the external modulation, the menu Depth , AMFreq and Shape will hide.

In the Graph Mode, the waveform is shown in figure 2-42.

Figure 2-42 The Waveform Parameter in the Graph Mode

Term Explanation
Modulation Depth
The Amplitude Range (also called "Percentage Modulation"). Modulation Depth varies from 0% to 120%.
● In the 0% Modulation, the output amplitude is the half of the set one.
● In the 100％ Modulation, the output amplitude is the same with the set one.
● For an external source, the depth of AM is controlled by the voltage level of the connector connected to the [Modulation In]. +5V corresponds to the currently set depth 100%.

FM

The modulated waveform consists of two parts: the Carrier Waveform and the Modulating Waveform. In FM, the Frequency of the Carrier Waveform varies with the instantaneous voltage of the modulating waveform. The Parameters for the FM are shown in figure 2-43.

Figure 2-43 The Setting Interface of FM Waveform

Press Mod → Type → FM , enter the following interface.

Figure 2-44 The Operation Menu

Table 2-17 The Menu Explanations of the FM Parameters

Function Menu	Settings	Explanation
Type	FM	Frequency Modulation
SrcInt SrcExt	Internal	Choose the Internal source.
	external	Use the rear [Modulation In] linker to select the external source.
Deviat.		Set the Frequency Deviation between the Modulating Waveform and the Carrier Waveform.
FMFreq		Set the modulating waveform frequency. Frequency Range: 2mHz~20kHz (Only Internal).
Shape	Sine Square Triangle UpRamp DnRamp Noise Arb	Press the function key Sine , Square etc to choose different Shape of waveform.

Note: When choose the external modulation, the menu FMFreq and Shape will hide.

In the Graph Mode, the waveform is shown in figure 2-45.

Figure 2-45 The Waveform Parameter in the Graph Mode

Term Explanation
Frequency Deviation
- The Deviation should be equal to or less than the Carrier Waveform Frequency.
- 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.
- For an External Source, the Deviation is controlled by the ±5V voltage Level of the Connector connected to the [Modulation In]. +5V adds to the selected Deviation, lower external voltage generates less deviation, while negative voltage reduces the modulated signal frequency below the corresponding carrier's.

FSK

The FSK Modulation is a modulation method, the output frequency shifts between the two pre-set frequencies (Carrier Waveform Frequency and the Hop Frequency). The Frequency for the Output Frequency to shift from the carrier waveform frequency to and from the Hop frequency is called the FSK rate. The frequency by which the output frequency shift from each other is determined by the Internal Frequency generator or the Signal Voltage Level offered by the [Ext Trig/FSk/Burst] connector in the rear panel:

- If you choose the Internal Modulation, the frequency at which the output frequency shifts between the carrier frequency and the Hop frequency is determined by the set FSK rate.
- If you choose External Modulation and overlook the FSK rate, the output frequency is determined by the Voltage Level of the [Ext Trig/FSk/Burst] connector on the rear panel. If the Voltage Level is low, then generate the carrier frequency; when the voltage level is High, generate the Hop frequency.
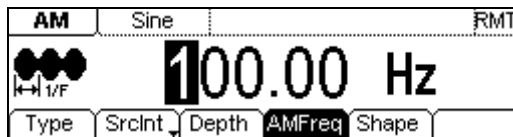

Figure 2-46 The Setting Interface of FSK Waveform

Press Mod → Type → FSK , enter the following interface.

Figure 2-47 The Operation Menu

Table 2-18 The Menu Explanations of the FSK Parameters

Function Menu	Settings	Explanation
Type	FSK	Frequency Shift Keying Modulation
SrcInt SrcExt	Internal	Choose the Internal source.
	external	Use the rear [Ext Trig/FSk/Burst] connector to choose the external source.
HopFreq		Set the Hop Frequency Range: 1μHz~40MHz.
FSK Rate		Set the frequency at which the output frequency shifts between the carrier frequency and the Hop frequency (OnlyInternal): 2mHz~100kHz.

Note: When choose the external modulation, the menu | FSkRate | will hide.

In the Graph Mode, the waveform is shown in figure 2-48.
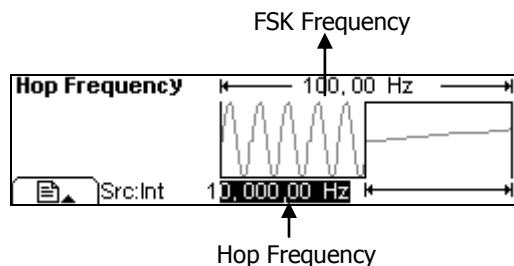
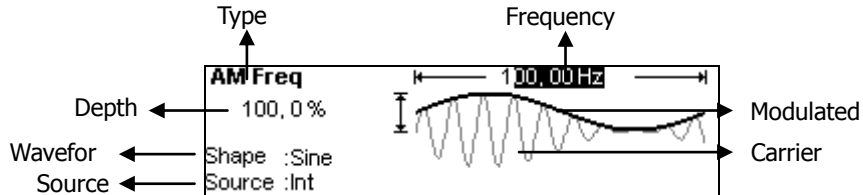Figure 2-48 The Waveform Parameter in the Graph Mode

PM

The modulated waveform consists of two parts: the Carrier Waveform and the Modulating Waveform. In PM, the Phase of the Carrier Waveform varies with the instantaneous voltage Level of the modulating waveform. The Parameters for the PM are as shown in figure 2-49.
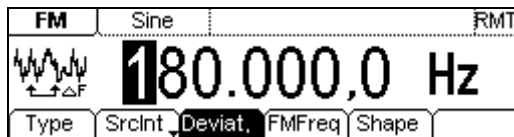

Figure 2-49 The Setting Interface of PM Waveform

Press Mod → Type → PM , enter the following interface.

Figure 2-50 The Operation Menu

Table 2-19 The Menu Explanations of the PM Parameters

Function Menu	Settings	Explanation
Type	PM	Phase Modulation
SrcInt SrcExt	Internal	Choose the Internal source.
	external	Use the rear [Modulation In] connector to choose the external source.
Deviat.		Set the Phase Deviation between the Modulating Waveform and the Carrier Waveform, ranging from 0° to 360°
Freq		Set the modulating waveform frequency. Frequency Range: 2mHz~20kHz (Only Internal).
Shape	Sine Square Triangle UpRamp DnRamp Noise Arb	Press the function key Sine, Square etc to choose different Shape of waveform.

Note: When choose the external modulation, the menu PMFreq and Shape will hide.
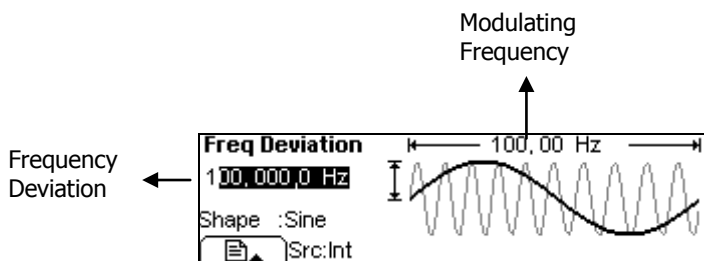
In the Graph Mode, the waveform is shown in figure 2-51.
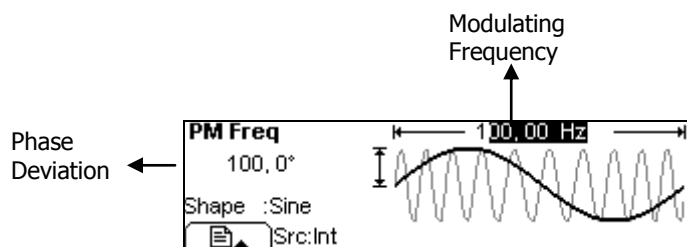
Figure 2-51 The Waveform Parameter in the Graph Mode

PWM

The modulated wave is composed of the carried wave and the modulation wave. In the PWM (Pulse-Width Modulation), the pulse width of the carried wave varies with the instantaneous voltage Level of the modulating waveform. The Parameters for the PWM are shown in figure 2-52.
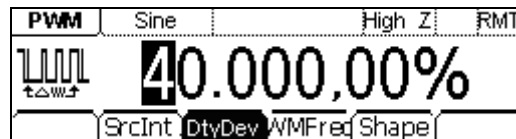
Figure 2-52 The Setting Interface of the PWM Waveform

The PWM function is only for modulating the Pulse wave. Once in the other wave interface, press Mod you may discover the softkey PWM can not be used while choosing the modulation type, it can enter the PWM interface only by pressing Mod Once in the Pulse interface.

Press Pulse and enter the PWM interface, then press Mod, enter the following menu.

Figure 2-53 The operation menu

Table 2-20 The Menu Explanations of the PWM Parameters

Function Menu	Settings	Explanation
Type	PWM	Pulse Width Modulation
SrcInt SrcExt	Internal	Choose the Internal source.
	external	Use the rear [Modulation In] connector to choose the external source.
DtyDev WidDev		Set the offset of the PWM.
PWMFreq		Set the frequency of the modulation wave with the range: 2mHz~20kHz (Only Internal).
Shape	Sine Square Triangle UpRamp DnRamp Noise Arb	Press the function key Sine, Square etc to choose different Shape of waveform.

Note: When choose the external modulation, the menu WMFreq and Shape will hide.

In the Graph Mode, the waveform is shown in figure 2-54.
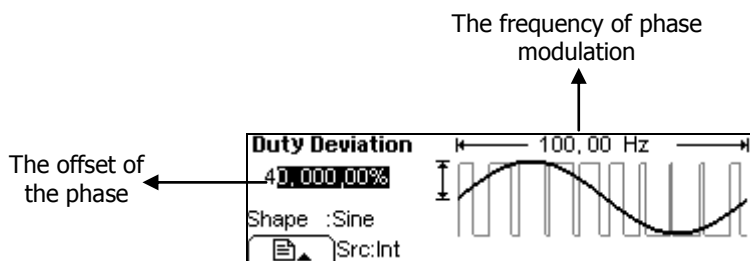
Figure 2-54 The Waveform Parameter in the Graph Mode

Instructions:
- The max range of DtyDev is the minimum in (duty, 1 - duty);
- The max range of WidDev is the minimum in (width, period - width).

To Generate Sweep

In the frequency sweep mode, the function generator "sweep" from the start frequency to the stop frequency at the sweep rate you specify. Sweeping can be generated by Sine, Square, Ramp or Arbitrary Waveforms (Pulse, Noise and DC are not allowed).

Figure 2-55 The Setting Interface of Sweep Waveform

Press Sweep button, in the Normal Mode, the operation menu will appear on the bottom of the screen, see figure 2-56. Set the Waveform parameters by using the operation menu.

Figure 2-56 The Operation Menu

Table 2-21 The Menu Explanations of the Sweep Parameters

Function Menu	Settings	Explanation
Linear/ log		Set the Sweep frequency with linear change Set the Sweep frequency with logarithmic change
Start/ Center		Set the Start Frequency of the Sweep Set the Center Frequency of the Sweep
Stop Span		Set the Stop Frequency of the Sweep Set the Frequency Span of the Sweep
Time		Set the Time Span of the Sweep for which the Frequency changes from the Start Frequency to Stop Frequency.
Trigger	Source	Int: Choose Internal Source Ext: Choose External Source, use the [Ext Trig/FSk/Burst] connector in the rear panel Manual: Choose External Source, set the start and stop time by hand
	TrigOut	⌐⎺: Signal Triggered at Rise Edge ⎺⌐: Signal Triggered at Fall Edge Off: Turn off Trigger Setting
	⬑	Finish Setting

Sweep Frequency Setting

Use Start and Stop or Center and Span to set the range of the frequency. Press the button again to switch to each other.

- To Sweep upward, set the Start Frequency lower than the Stop Frequency, or set a positive frequency interval.
- To Sweep downward, set the Start Frequency higher than the Stop Frequency, or set a negative frequency interval.

In the Graph Mode, the waveform is shown in figure 2-57.
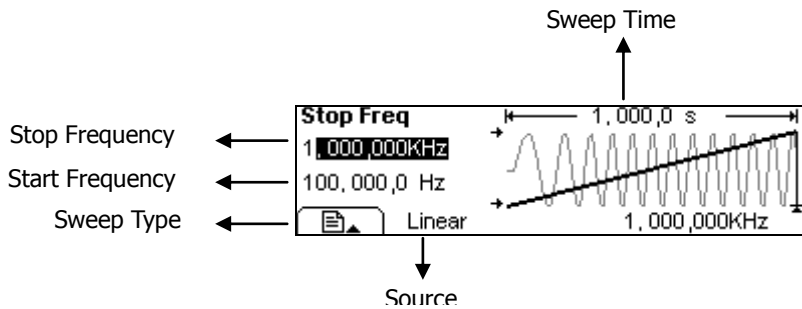
Figure 2-57 The Waveform Parameter in the Graph Mode

To Generate Burst

Burst Function can generate versatile waveforms in burst, which can last specific times of waveform cycle(N-Cycle Burst), or when the external gated signals(Gated Burst) is applied, any waveform could be used. But noise can only be used in Gated Burst.

Press Burst button, in the Normal Mode, the operation menu will appear on the bottom of the screen, see figure 2-58. Set the Waveform parameters by using the operation menu.
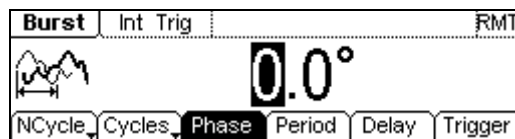
Figure 2-58 The Setting Interface of Burst Waveform

Set the N-Cycle Burst

Press Burst → NCycle , enter the following menu.

NCycle Cycles Phase Period Delay Trigger
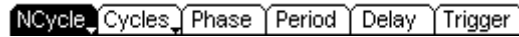
Figure 2-59 The Operation Menu

Table 2-22 The Menu Explanations of N-Cycle Burst

Function Menu	Settings	Explanation
N-Cycle		Set the N-Cycle Mode
Cycles/ Infinite		Set the Number of the bursts in a N-Cycle Set the Number of the bursts in a N-Cycle to be infinite
Phase		Set the Start Phase of the Burst
Period		Set the Period of the Burst
Delay		Set the Delay of the burst
Trigger	Source	Int: Choose Internal Source Ext: Choose External Source, use the [Ext Trig/FSk/Burst] connector in the rear panel Manual: Choose External Source, set the start and stop time by hand
	TrigOut	⌐̄ : Signal Triggered at Rising Edge ⌐̄ : Signal Triggered at Falling Edge Off: Turn off Trigger Setting
	⊐	Finish Setting

N-Cycle/ Gated

N-Cycle has specific number of waveform cycles, and every burst is activated by a trigger event. Gated burst controls burst by external source.

Cycle Number

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

If you choose Infinite, then a continuous waveform will be generate which will not stop until a trigger event happens (Trigger button is pressed).

● If needed, Burst Period will increase to cater to the specific number of cycles.
● For a frequency greater than 25MHz, only a bust with infinite cycles is allowed.
● For an infinite-cycle Burst, External or Manual Trigger is needed to activate burst.

Phase

Define the Start and the Stop Point in a waveform. The phase varies from -360° to +360°, and the default setting is 0°. For an Arbitrary Waveform, 0° is the phase of the first waveform point.

Period

Set the time span between an N-Cycle Burst and the next. If necessary the period will increase to reach the specific number of cycles in a burst.

Burst Period> Period X Burst Number

Delay

Set the Time Delay between the Trigger Input and the Start of the N-Cycle Burst. The minimum delay is a function of the specific burst period, and should always be greater than 0.

In the Graph Mode, the waveform is shown in figure 2-60.
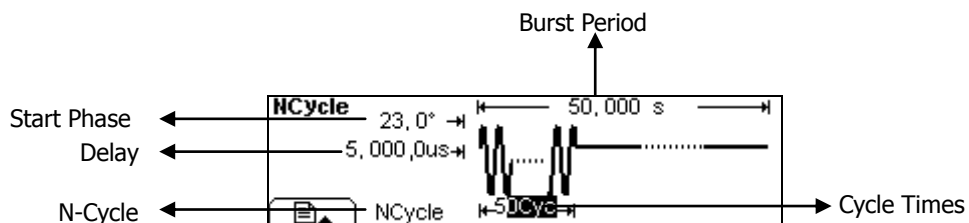
Figure 2-60 The Waveform Parameter in the Graph Mode

Set the Gated Burst

Press Burst → Gated , enter the following menu.

Figure 2-61 The Operation Menu

Table 2-23 The Menu Explanations of Gated Burst

Function Menu	Settings	Explanation
Gated		Set the Gated Mode
Polarity	Pos Neg	Set the Polarity of the Gated Signal
Phase		Set the Start Phase of the Gated Signal

In the Graph Mode, the waveform is shown in figure 2-62.
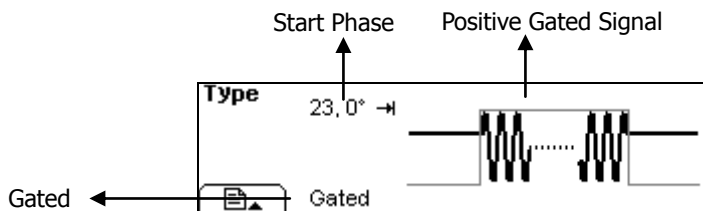
Figure 2-62 The Waveform Parameter in the Graph Mode

To Store and Recall

Press Store/Recall button, and the operation menu will appear at the bottom of the screen. You can save or read the State or Data Documentation in the Generator or build and delete documentation in the U Disk. File names can either be Chinese or English.

Figure 2-63 The Save and Read Interface

Figure 2-64 The Operation Menu

Table 2-24 The Menu Explanations of Store and Recall

Function Menu	Settings	Explanation
Disk	Local	Choose display route for the system information
	U Disk (When U Disk is connected)	
Type	State	Setting of the Generator
	Data	Arbitrary waveform file
	All	All types of documentation
Recall		Recall the waveform or Setting information in the specific position in the memory.
Store		Save the waveform to the appointed position.
Remove		Remove any waveform that has been stored in the memory

About the Disk

Use the Disk button to choose Local or U Disk (When U Disk is connected).

To Save the Instrument State

Users are allowed to store the instrument state in any one of the 4 Non-Volatile Memories. When the power is on again, the instrument will return to the state before it was powered off. The state storage will "memorize" the selected function (including the Arbitrary Waveform), Frequency, Amplitude, DC Offset, Duty Cycle, Symmetry, and other modulation parameters used.

To Save the Instrument State, following the steps:
1. Choose the file Type to store
    Press Store/Recall → State , and set the storage type as "State".

2. Choose the location of the file.
    There are four positions in the local STATE1, STATE2, STATE3 and STATE4, and you can choose one of them by rotating the knob.

3. Name the file and Save it
    Press Store button, enter the self-defined name. Press Store to finish.

To Save Data

Users are allowed to store data document in any of the 4 Non-Volatile Memories. If the position is already occupied, the new document will cover the old one. To save the data, following the steps:

1. Set the file Type to store
   Press Store/Recall → State → data , and choose "data" as the storage type.

2. Choose the location of the file.
   There are four positions in the local ARB1, ARB2, ARB3 and ARB4, and you can choose one of them by rotating the knob.

3. Name the file and Save it
   Press Store button, enter the self-defined name. Press Store to finish.

The interconnection of DG2000 and DS1000

We have introduced the interfaces of DG2000 to you before, and mentioned the USB Host Interface. And now, we will introduce how to use this interface to connect DG2000 with DS1000 (oscilloscope) to realize the nondestructive data Transmission.

1. Connect DG2000 with DS1000 to sample data;
2. Connect the USB Host Interface of DG2000 with the USB Device Interface of DS1000. View the waveform in DS1000, following the steps below:

View the Acquired Waveform
Press Store/Recall button, enter the following menu.

Figure 2-65 The operation menu

Rotate the knob, choose CH2: ON
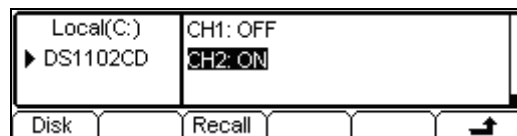
Figure 2-66 Choose the channal

The pre-setting for data reading is finished, and we are going to view the waveform DS1000 acquired.
Press Read , and DG2000 will store the waveform that DS1000 acquired in the Volatile Memory.

To export the waveform acquired

Press Arb → Load → Volatile , to load the waveform just read.

Figure 2-67 The operation menu
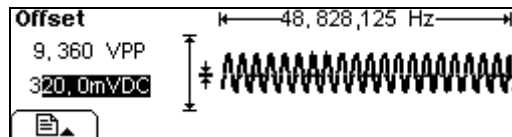
Figure 2-68 Load the waveform

Notes：The frequency shown in DG2000 may be different greatly from that you imagine. This is because that DG2000 considers the acquired 512K points as a period. If you want to get the real period of the generated waveform, you have to multiple the frequency value shown on DG2000 with the number of the real period in this false period.
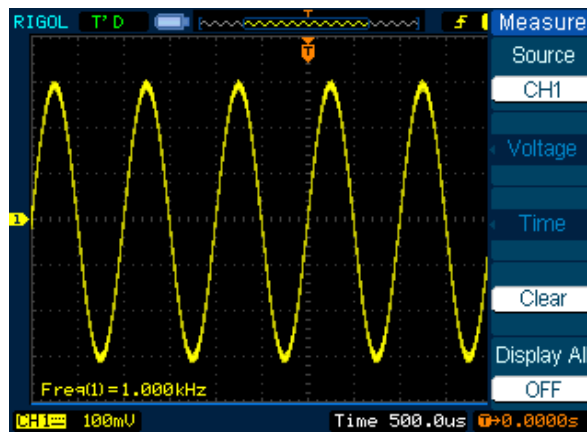
Figure 2-69 The Waveform Display in DS1000

As shown in the figure above, this is the waveform shown on another DS1000 by the above operation. Please note that the frequency shown on this instrument is the same as the expected one.

To Use USB storage

As shown in figure 2-70, the storage location is divided into: the inherent storage (Local) and the U Disk storage(U Disk). At the left side of the front panel, there is a USB interface. When a USB storage is connected, the storage menu will show "U Disk ". The default location is the local storage.

Figure 2-70 The Interface of USB Storage

1. Install the Mobile Storage
   Insert the mobile memory to the USB interface on the front panel, and the screen will show "↔".

2. Choose the Mobile Memory
   Press Disk , move the cursor upward or downward to select "U Disk". Choose Type to be "data" and press Store , enter the file name and then press Store to save the file.

3. Uninstall the Mobile Storage
   Remove the U Disk from the Interface and the system will inform you that the U Disk has been removed, and the "U Disk" Sign will disappear.

Note: DG2000 supports the flash U disk in the format of FAT (less than 1G) and FAT32 (less than 2G).

To Save a File

Press Store/Recall → Store , enter the following interface. Enter the self-defined file name in the "File Name" frame. Below the frame is the input keypad. Use the direction button to select the desired character. When the character is in inverse color, press Select to input it.

Figure 2-71 The File Storage Interface
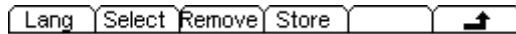
Figure 2-72 The Operation Menu

Table 2-25 The Menu Explanations of File Storage

Function Menu	Settings	Explanation
Lang	EN	English Input
	CN	Chinese Input
Select		Select the current character
Remove		Delete the current character
Store		Store the file with the current name
↵		Cancel the current operation

1. English Input

The English Input Interface is shown in figure 2-73, to save a file named as "NewFile", following the steps below:
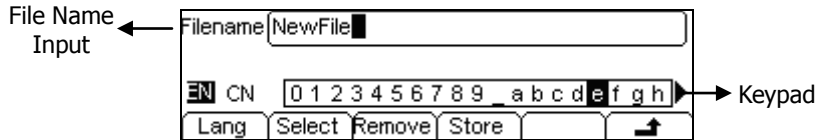
Figure 2-73 The English Input Interface

(1) Press Lang → EN , enter the English Interface;

(2) Input the file name" NewFile".
Use the Knob to adjust the cursor to the right character, and press Select .
Repeat this until you have selected all the characters needed. Press +/- to choose the majuscule or lowercase.

(3) Edit the File Name
When you have entered a wrong character, move the cursor to the wrong character and press Remove to delete it. And then reenter the file name.

(4) Press Store , to finish and save the file.

2. Chinese Input

The Chinese Input Interface is shown in figure 2-74. To save a new file, follow the steps below:

Figure 2-74 The Chinese Input Interface

(1) Press Lang → CN , enter the Chinese Input Interface.

(2) Press " +/- "to choose the lowercase, and input the spell of the Chinese.

(3) Input the file name : "新文件"
Use the Knob to adjust the cursor to the right character, and press Select ,
input "Xin". In the Input Menu, choose the Chinese character you need with the help of the page controller and the 1~9 button on the keypad.

(4) Edit the wrongly input
When a file name is wrong, move the cursor to the character and press Remove to delete it and reenter the file name.

(5) Press Store to finish and save the file.

Notes: The length of file name user can edit is up to 25 characters or 11 Chinese characters (The file can be stored in U-disk or non- volatile memories, but the length of file name has the limit). The length limit in non-volatile memories is 12 characters or 6 Chinese characters; the limit in U-disk is 39 characters or 19 Chinese characters.
If surpass the length limit, N/A is shown.

To Set the Utility Function

With the Utility function, you can set the parameters of the Generator such as: DC On/Off, Sync On/Off, Output Parameter, Interface Parameter, System Setting and Testing Parameter. The DC switch offers the options of DC output or Arbitrary Waveform Output. Sync Switch offers the option to choose the Sync Signal or not. The Output setting provides the parameter setting for Load/Impedance, Range, Normal/ Inverse and Phase. The Interface Setting offers the storage and load of the configure parameter setting for GPIB (IEEE-488), LAN, RS232 or USB remote control. The System Setting provides the setting for Language, Display, Beep, Screen Guard, Format, Power System Configure and default setting. The test setting provides the self-testing and calibration storage as well as the password and safety switch.

Press Utility to enter the Utility Menu. Its functions are listed below in table 2-26.

DC Off | Syncoff | Output | I/O | System | Test/Cal
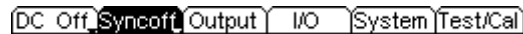
Figure 2-75 The Operation Menu

Table 2-26 The Menu Expanations of Utility System Setting

Function Menu	Settings	Explanation
DC On/ Off	On	Set the output waveform as DC
	Off	Set the output waveform as Arbitrary.
Sync On/ Off	On	Activate the Sync Signal of the [Sync] Connector on the front panel.
	Off	Deactivate the Sync Signal of the [Sync] Connector on the front panel.
Output		Set the Output parameter (Table 2-27)
I/O		Set the I/O (Table 2-28)
System		Set the System Configuration (Table 2-33)
Test/Cal		Test and Calibrate the instrument (Table 2-37)

Instruction

Sync Switch Setting：

When the amplitude is low relatively, you can reduce the distortion of the output signal by prohibiting the Sync Signal. And the current storage is in the Non-Volatile Memory.

To Set the DC Output

Press Utility → DC On/Off → DC On , enter the following interface.

Figure 2-76 The DC Setting Interface

DC Offset
Set the DC Voltage Level.

To Shift into the Arbitrary Waveform Output
(1) Press Utility → DC On/Off → DC Off , close the DC output and return the
    output of the Arbitrary Waveform.

(2) Press any functional button, and the waveform output setting turns to the output
    of arbitrary waveform. The DC option is turned off automatically.

In the Graph Mode, the waveform is shown in figure 2-77.
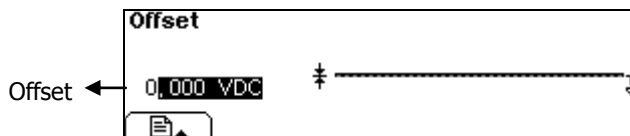
Figure 2-77 Waveform Parameter in the Graph Mode

To Set the Sync Output

The Generator provides Sync output through the [Sync] Connector on the Front Panel. All the standard output functions (except DC and Noise) have a corresponding Sync Signal. For some Sync applications, they can be prohibited if users do not want to use them.

● In the default setting, the Sync Signal should be connected to the [Sync] Connector (activated). When the Sync Signal is prohibited, the output voltage Level of the [Sync] Connector is Low.

● In the Inverse Mode, the Sync Signal does not Inverse.

● For Sine, Square, Ramp and Pulse Signal, the Sync Signal is a Square Signal with 50% Duty Cycle. When the output is positive, the Sync Signal is TTL High Level compared to 0 V Voltage or DC Offset; when the output is negative, The Sync Signal is TTL Low Level compared to 0 V Voltage or DC Offset.

● For Arbitrary Waveform, the Sync Signal is a Square Waveform with 50% Duty Cycle. At the time when the first output waveform point is generated, the Sync Signal Voltage is TTL High Level.

● For AM, FM and PM in Internal Modulation, the Sync Signal reference is the Modulated Signal (not the Carrier Signal). The Sync Signal is a Square Waveform with 50% Duty Cycle. In the first half modulation period, the Sync Signal is TTL High Level. For External Modulation, the Sync Signal reference is the Carrier Signal (not the Modulated Signal). The Sync Signal is also a Square Waveform with 50% Duty Cycle.

● For FSK, the Sync Signal Reference is the Hop Frequency, and the Sync Signal is a Square Waveform with 50% Duty Cycle. For the Hop Frequency, at the hopping point, the Sync Signal is TTL High Level.

● For the 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, it may be not zero intersections). For an infinite burst, the Sync Signal is the same as the Sync Signal of the continuous Signal.

- For the External Gated Burst, the Sync Signal follows the External Gated Signal. But, please note that this signal will not turn Level Low until the last period end (If the Waveform has a relative starting phase, it may be not zero intersections).

To Set Output Parameter

Press Utility → Output , enter the following menu.

Load Range Normal Phase ⬆
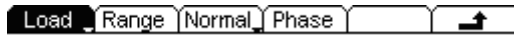
Figure 2-78 The Operation Menu

Table 2-27 The Menu Explanations of Output Setting

Function Menu	Settings	Explanation
Load High Z		Set the Load connected to the Output Connector. Set the Load connected to the Output Connector as High Z.
Range		Allow the Instrument to choose the best Amplifier/ Attenuator
Normal Inverse		Waveform Normal Output Waveform Inverse Output
Phase		Set the Phase Offset of the Output Waveform

1. To Set the Output Load

For the [Output] Connector on the Front panel, the Generator has a built-in 50Ω series output impedance. If the actual load does not match the set one, the amplitude and offset displayed are incorrect. This function is used to match the displayed voltage with the expected one.

Steps for setting the Load value:

(1) Press Utility → Output → Load , enter the following interface.
Please note that the Load Parameter shown on the right bottom is the default when the power is on or the pre-set load value. If the current value is valid for the output, then the current value can be used.

(2) Input the desired Load Value.
Use the Keypad or the Knob to enter the desired value and choose the unit: Ω or KΩ, press the corresponding button.
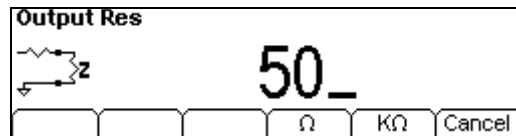
Figure 2-79 Set the Output Load

Instruction

DG2000 Series have a fixed 50Ω Series impedance no matter what the value has set for this parameter.

If the real load is different from the set one, the displayed voltage will not equal with the real voltage.

2. To Set the Inverse Waveform

Press Utility → Output → Inverse , to set the inverse Waveform output.

No offset voltage will change while the waveform is inversed. An inversed waveform will be displayed in the Graph Mode.
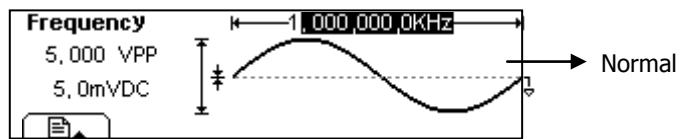
Figure 2-80 The Normal Waveform
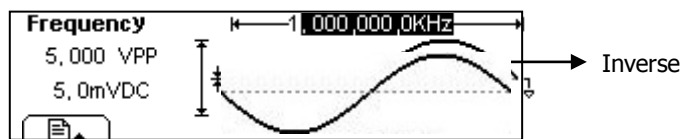
Figure 2-81 The Inverse Waveform

3. To Adjust the Phase

Press Utility → Output → Phase, enter the following interface.

Set the Phase with the unit of degree.
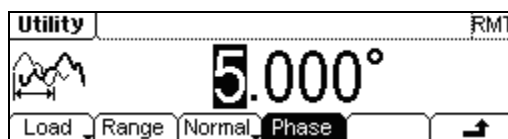
Figure 2-82 Set the Phase

To Set the I/O

Press ⬚Utility → ⬚I/O, to set the I/O. See figure 2-83.
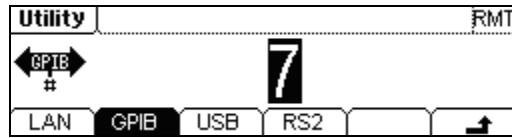
Figure 2-83 The Setting Interface of the I/O

Table 2-28 The Menu Explanations of Setting I/O

Function Menu	Settings	Explanation
LAN		Set the LAN configuration parameter
GPIB		Set the GPIB Address
USB		See USB equipment address
RS232		Set the RS232 Interface

Set the GPIB address as any value within 0 ~ 30. The default setting is "7". The Address is stored in the Non-Volatile Memory, and will show when the power is on. The I/O Setting offers the Storage and Load of the configuration parameter setting of the GPIB（IEEE-488）, RS232 or LAN which are used for remote control.

1. To Set LAN

You can configure the IP Address, the DNS setting or check the current network configuration by setting the LAN interface.

Press Utility → I/O → LAN , enter the following interface.

```
Utility |                                    RMT


IPsetup |  DNS  |  Info  |          |          |    ⬏
```
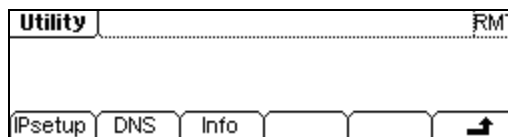
Figure 2-84 The Operation Menu

Table 2-29 The Menu Explanations of LAN Setting

Function Menu	Settings	Explanation
IP setup		Set the corresponding parameter for IP
DNS		Set the corresponding parameter for DNS
Info		The current setting information about the host

IP Setup

Press Utility → I/O → LAN → IPSetup , enter the following interface.

```
Utility |                                    RMT
   168.254.0.112
DHCPoff  IPaddr  IPmask  Gateway |        |    ⬏
```

Figure 2-85 The Interface of IP Setup

Table 2-30 The Menu Explanations of IP Setup

Function Menu	Settings	Explanation
DHCP On/Off	On	Open the DHCP setting, allot the IP address dynamically
	Off	Close the DHCP setting, set the IP address manually
IP addr		Set the IP address
IP Mask		Set the IP Mask
Gate Way		Set the Gate Way

Instruction

Open the DHCP：

Press DHCPon , allot the IP address dynamically. At this time, the IPAddr , IPmask and Gate way menu will hide.

DNS

Press Utility → I/O → LAN → DNS , enter the following interface.

Figure 2-86 The Setting Interface of DNS

Table 2-31 The Menu Explanations of Setting DNS

Function Menu	Settings	Explanation
Host	/	Set the Host Name
Domain	/	Set the Domain
Server	/	Set the Server Address

Host Name

Set the Host Name, it consists of letter, number and dash ("-"). Consult with your network administrator for the Host name you need. Use the knob and the direction button to select the character to set the host name (you can only use the keypad to enter the number). The Host name will be stored in the Non-Volatile Memory.

Domain Name

Set the Domain Name with letter, number, dash ("-") and dot ("."). Consult with your network administrator for the Domain name you need. Use the knob and direction button to select the character to set the domain name (you can only use the keypad to enter the number and dot). The Domain name will be stored in the Non-Volatile Memory.

Info

Press Utility → I/O → LAN → Info , the current system information is shown below.

```
SubMask    : 255.255.255.0
Default Gate: 168.254.0  .1
DNS Server : 0  .0  .0  .0
```
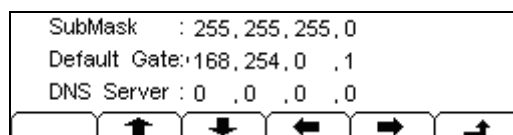
Figure 2-87 The System Information

Instruction

If the DHCP is enabled and you want to use the DNS address that the DHCP Server returns, please set the Server to be "0.0.0.0".

2. To Set GPIB

The range of the GPIB interface address is 0~30, and the default value is "7".

Press Utility → I/O → GPIB , enter the interface below.
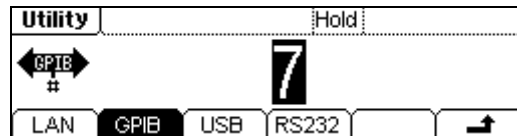
Figure 2-88 The Interface of Setting the GPIB

3. To Set RS232

Make sure that the Baud Rate and the Parity match the computer. Besides, make sure that the RS232 cable is connected correctly. The I/O setting is stored in the Non-Volatile Memory, and will show when the power is on.

Press Utility → I/O → RS232 , enter the following interface.
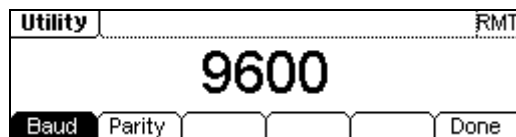
Figure 2-89 The Setting Interface of Setting RS232

Table 2-32 The Menu Explanations of Setting RS232

Function Menu	Settings	Explanation
Baud		Set the RS232 Baud Rate
Parity		Set the RS232 Parity and the data digit

Baud Rate
Set the RS232 Baud Rate. Make sure that the Baud Rate matches the computer. The optional rates are: 115k, 57.6k, 38.4k, 19.2k, 9600, 4800, 2400, 1200. The default setting is 9600. The current setting is stored in the Non-Volatile Memory.

Parity
Set the Parity and the data digit of RS232. Make sure that the parity matches the computer. The optional settings are: Odd, Even and No Parity. The default setting is "No Parity". The current setting is stored in the Non-Volatile Memory.

To Set the System

Press Utility → System , enter the following interface.
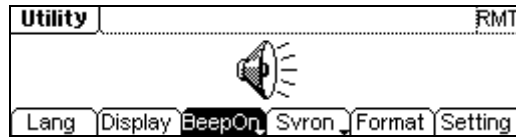
Figure 2-90 The Operation Menu

Table 2-33 The Menu Explanations of System Setting

Function Menu	Settings	Explanation
Lang		Set the System Language
Display		Set the parameter for the Screen Display
Beep On/Off	On	Open Beeper
	Off	Close Beeper
Svr on/off	On	Activate the Screen Guard function. Screen Guard will be on if no action is taken within 3 minutes. Press any button to return the display screen.
	Off	deactivate the Screen Guard function
Format		Set the data format
Setting	PowOn	PowOn: When the power is on, all the setting will return to the default value. Latest: When the power is on, all the setting will return to the latest setting.
	Default	Return all the setting into the default
	Timer	Choose the clock source as internal/external

Key points:
Power On
The Setting is used when the instrument is powering on.
Two choices are available: the default setting and the latest. Once selected, the setting will be used when the instrument restarts.

Beep
Activate or deactivate the sound when an error occurs from the front panel operation or the remote interface operation. Activate or deactivate any sound made by the button or knob on the front panel.

1. Language Setting

The DG2000 Series Generator supports two languages: Chinese and English.
To Select Language, press Utility and then Lang to select the language.
Press Utility → System → Lang , change the current language.

Figure 2-91 The Interface of Language Setting

2. Display Control

Press Utility → System → Display , enter the following interface.
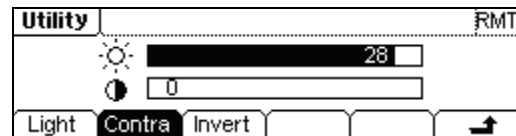
Figure 2-92 The Interface of Display Setting

Table 2-34 The Menu Explanations of Display Setting

Function Menu	Settings	Explanation
Contra		Set the Display Contrast Parameter
Light		Set the Display Light Parameter
Invert		Set the Invert Display

3. Set the Format

Press Utility → System → Format , enter the following interface.
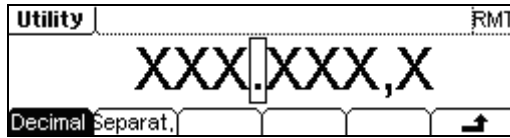
Figure 2-93 The Interface of Data Format Setting

Table 2-35 The Menu Explanations of Data Format Setting

Function Menu	Settings	Explanation
Decimal	.	Using dot as decimal
	,	Using comma as decimal
Separat.	No	Close the Separate.
	Space	Use Space as separator
	On	Enable the Separator function

According to the different choice of the decimal and the separator, the format can have various forms:

(1) Set • as decimal, press Separat. → On , the example is given as follows:
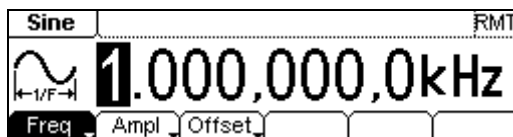
Figure 2-94 Set the data format

(2) Set , as decimal, press Separat. → On , the example is given as follows:
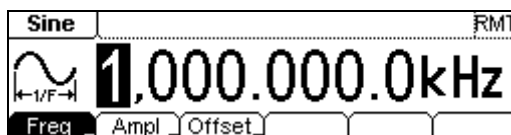
Figure 2-95 Set the data format

(3) Set • as decimal, press Separat. → No , the example is given as follows:
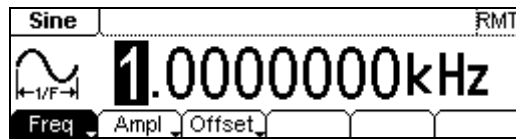
Figure 2-96 Set the data format

(4) Set 〕 as decimal, press Separat. → No , the example is given as follows:
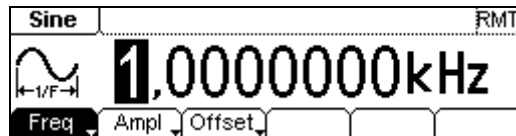
Figure 2-97 Set the data foramt

(5) Set • as decimal, press Separat. → Space , the example is given as follows:
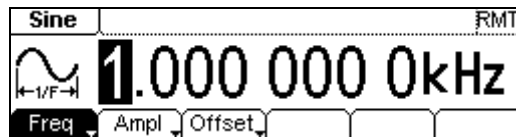
Figure 2-98 Set the data format

(6) Set 〕 as decimal, press Separat. → Space , the example is given as follows:
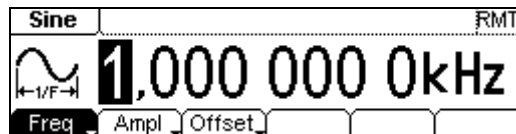
Figure 2-99 Set the data format

4. **To Return to Default Setting**

Press Utility → System → Setting → Default , return the default setting of
the system:

Table 2-36 The Factoruy Default

Output	**Default**
Function	Sine Wave
Frequency	1kHz
Amplitude/Offset	5 V$_{pp}$ /0 V$_{dc}$
Terminals	High Z

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

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

Burst	**Default**
Frequency	1kHz
Count	1Cycyle
Period	10ms
Phase	0°

System	Default
*Power-down Recall	*Disabled
Display	On
Error Array	Clear Error
Storage State and any	No change

Trigger	Default
Source	Internal

Remote I/O Configuration	Default
*GPIB Address	*7
*I/O	*GPIB（IEEE－488）
*Baud Rate	*9600 Baud
*Parity	*No (8 bits)

The parameter with an asterisk（*）is stored in the Non-Volatile Memory.

Test

Press Utility → Test/Cal , enter the following interface.

Figure 2-100 The Interface of Setting Test

Figure 2-101 The Operation Menu

Table 2-37 The Menu Explanations of Setting Test

Function Menu	Settings	Explanation
Test		Perform System Self-Test
Info		See the information for Calibration times and other related ones
PassWd		Input the password for Secure calibration
SecOn/ SececOff	On	Turn On Secure Setting, disables the calibration by anyone
	Off	Turn Off Secure Setting, enables the calibration by anyone
Cal		See the calibration times and the edition information

Test

Press Utility → Test/Cal → Test , to perform self-test. When the instrument is on, the system will perform the self-test automatically. This limited test can check if the instrument could work normally. To perform a general test needs15 seconds. If all the tests have been passed, you can use the generator freely. If the general test has been passed, the screen will show "Self-Test Passed"; if not, it will also tell you self-test failed and display the error message.

1. **Calibration**

   The information consists of the calibration counting and the edition.
   Please note that the generator has been calibrated before it leaved the factory,
   When you turn on a new instrument, the default number of the calibration is 0.You
   can get the information of the latest version on the company's
   website:http://www.rigol.com.

2. **Password**

   This function is used to prevent unauthorized or accidental calibration to the
   generator. When the generator is firstly shipped to the user, it is secured. You have
   to unlock it before calibrating the instrument.

Figure 2-102   The Operation Menu

How to Use the Built-in Help System

You can get a help for every button on the front panel by using the built-in help system. Or you can get help about the operation of the front panel buttons with the Help List. Press Help enter the following interface.
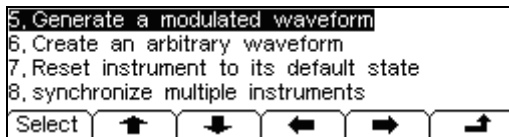
Figure 2-103 The Help Interface

Figure 2-104 The Operation Menu

Table 2-38 The Menu Explanations of Help System

Function Menu	Settings	Explanation
Select		Select and read the Information
⬆		Page Up
⬇		Page Down
➡		Cursor Downward to select
⬅		Cursor Upward to select
⬏		Exit the help menu

1. **View the last message**

   View the last message

2. **View the remote Command error queue**

   View the remote command error queue in the remote operation.

3. **Get HELP on any key**

   To get context-sensitive help on any front-panel key or menu softkey, press and hold that key for a few times.

4. **Generate a DC-only Voltage level**

   (1) Press Utility and select   DC On .
   (2) Press Offset, then enter the desired voltage level.
   (3) Choose   DC On/Off   →   DC Off , or press any function key to resume the normal waveform operation.

5. **Generate a modulated Waveform**

   (1) Configure the Carrier waveform by selecting the waveform shapes, frequency, amplitude, etc. Pulse can only be modulated using PWM; Noise and DC can not be modulated.
   (2) Configure the modulating waveform by pressing the Mod key.
   (3) To change the Carrier parameter, press the lighted function key (Sine, Square etc).
   (4) To turn off the modulation, press the lighted Mod key.

6. **Create an arbitrary waveform**

   (1) Press Arb and choose " Create New ".
   (2) Enter the desired period, voltage limit, and the number of points and then press " Edit Points ", the first two points are defined for you.
   (3) Rotate the knob to select the desired point for editing and then use   Time   and   Voltage   to define the point. Press   Insert Point   to insert additional points as needed.
   (4) The waveform editor connects the last point to the voltage level of point #1 to create a continuous waveform. Make sure that the time value of the last point less than the specified period.
   (5) Pres   End/Store   to store the waveform and exit the waveform editor.

7. **Reset instrument to its default state**

(1) Press �Utility⌝ to enter the utility function.

(2) Choose ⌝ System ⌝ → ⌝ Setting ⌝ ；

(3) Select ⌝ Default ⌝ to reset the instrument as its default state.

8. Synchronize multiple instruments

By using the external I/O of the generator, connect the instrument to the other kinds of instruments, to perform the synchronous control.

9. RIGOL Technology Support

To obtain technical support, contract the local **RIGOL** Support Center or go to **RIGOL** website: www.rigol.com.

Consult Chapter 6 for more details.

Chapter 3　Application & Examples

To help the User grasping how to use the Function/ Arbitrary Waveform Generator more efficiently, here we will giver some examples in detail.

Example 1: To Generate a Sine Wave

How to generate a Sine Waveform with 20 kHz frequency, 2.5 V_{pp} Amplitude and 0 V_{dc} Offset.

The operation steps:
1. Set the Frequency.
   (1) Press Sine → Freq/Period and choose Freq which will display in reverse color;
   (2) Enter "20" from the keypad and choose the unit "kHz". The Frequency is set as 20 kHz.

2. Set the Amplitude.
   (1) Press Ampl/ HiLev to choose Ampl which will display in reverse color.
   (2) Enter "2.5" from the keypad and choose the unit "V_{pp}". The Amplitude is set as 2.5V_{pp}.

3. Set the Offset.
   (1) Press Offset /LoLev to choose Offset which will display in reverse color.
   (2) Enter "0" from the keypad and choose the unit "V_{dc}", The Offset is set to be 0 V_{dc}.

When the Frequency, Amplitude and Offset were set, the generated waveform is shown in figure 3-1.
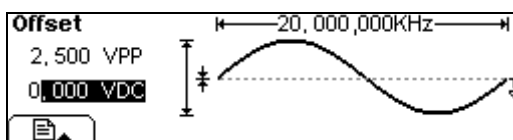
Figure 3-1 The Sine Waveform

Example 2: To generate a Square Wave

How to generate a Square waveform with 1MHz Frequency , 2.0 V$_{pp}$ Amplitude, 10m V$_{dc}$ Offset and 30%Duty Cycle.

The operation steps:
1. Set the Frequency.
    (1) Press Square → Freq/Period and choose Freq which will display in reverse color.
    (2) Enter "1" from the keypad and choose the unit "MHz" to set the Frequency as 1MHz.

2. Set the Amplitude.
    (1) Press Ampl/ HiLev and choose Ampl which will display in reverse color.
    (2) Enter "2" from the keypad and choose the unit "V$_{pp}$" to set the Amplitude as 2 V$_{pp}$.

3. Set the Offset.
    (1) Press Offset /LoLev to choose Offset which will display in reverse color.
    (2) Enter "10" from the keypad and choose the unit "mV$_{dc}$" to set the Offset as 10m V$_{dc}$.

4. Set the Duty Cycle.
    (1) Press Duty which will display in reverse color.
    (2) Enter "30" from the keypad and choose the unit "%" to set the Duty Cycle as 30%.

When the Frequency, Amplitude Offset and Duty Cycle were set, the generated waveform is shown in figure 3-2.
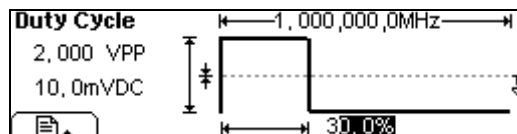
Figure 3-2 The Square Waveform

Example 3: To generate a Ramp Wave

How to generate a Ramp waveform with Period of 10ms, Amplitude of 100mV$_{pp}$, Offset of 20mV$_{dc}$ and Symmetry of 80%.

The operation steps:
1. Set the Period.
    (1) Press Ramp → Freq/Period and choose Freq which will display in reverse color.
    (2) Enter "10" from the keypad and choose the unit "ms" to set the Period as 10ms.

2. Set the Amplitude.
    (1) Press Ampl/ HiLev and choose Ampl which will display in reverse color.
    (2) Enter "100" from the keypad and choose the unit "mV$_{pp}$" to set the Amplitude as 100mV$_{pp}$.

3. Set the Offset.
    (1) Press Offset /LoLev to choose Offset which will display in reverse color.
    (2) Enter "20" from the keypad and choose the unit "mV$_{dc}$" to set the Offset as 20mV$_{dc}$.

4. Set the Symmetry.
    (1) Press Symmetry which will display in reverse color.
    (2) Enter "80" from the keypad and choose the unit "%" to set the Symmetry as 80%.

When the Frequency, Amplitude Offset and Symmetry were set, the generated waveform is shown in figure 3-3.
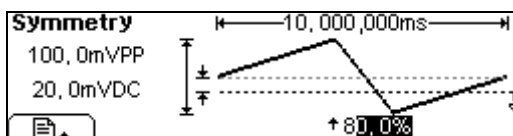
Figure 3-3 The Ramp Waveform

Example 4: To generate a Pulse Wave

How to generate a Pulse waveform with 5kHz Frequency, 50mV High Level, -5mV Low Level, 20µs Pulse Width and 10ns Edge Time.

The operation steps:
1. Set the Frequency.
   (1) Press `Pulse` → `Freq/Period` and choose `Freq` which will display in reverse color.
   (2) Enter "5" from the keypad and choose " kHz" to set the Frequency as 5 kHz.

2. Set the High Level.
   (1) Press `Ampl/ HiLev` and choose `HiLev` which will display in reverse color.
   (2) Enter "50" from the keypad and choose the unit "mV$_{pp}$" to set the High Level as 50mV$_{pp}$.

3. Set the Low Level.
   (1) Press `Offset /LoLev` to choose `LoLev` which will display in reverse color.
   (2) Enter "-5" from the keypad and choose the unit" mV$_{dc}$" to set the Low Level as -5mV.

4. Set the Pulse Width.
   (1) Press `DtyCyc/Width` and choose `Width` which will display in reverse color.
   (2) Enter "20" from the keypad and choose the unit "µs" to set the Pulse Width as 20µs.

5. Set the Edge Time.
   (1) Press `Edge` which will display in reverse color.
   (2) Enter "10" from the keypad and choose the unit "ns" to set the Edge Time as 10ns.

When the Frequency, High Level, Low Level, Pulse Width and Edge Time were set, the generated waveform is shown in figure 3-4.
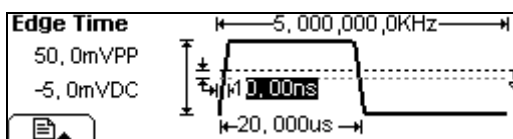
Figure 3-4 The Pulse Waveform

Example 5: To Generate a Noise Wave

How to generate a Noise waveform with 30mV$_{pp}$ Amplitude (50Ω) and 10mV$_{dc}$ Offset.

The operation steps:

1. Set the Output Load.
   Press Utility → Output → Load/High Z → Load , set the output load as 50Ω.

2. Set the Amplitude.
   (1) Press Ampl/ HiLev and choose Ampl which will display in reverse color.
   (2) Enter "30" from the keypad and choose the unit "mV$_{pp}$" to set the Amplitude as 30mV$_{pp}$.

3. Set the Offset.
   (1) Press Offset/ LoLev to choose Offset which will display in reverse color.
   (2) Enter "10" from the keypad and choose the unit" mV$_{dc}$" to set the Offset as 10mV$_{dc}$.

When the Amplitude and Offset were set, the generated waveform is shown in figure 3-5.
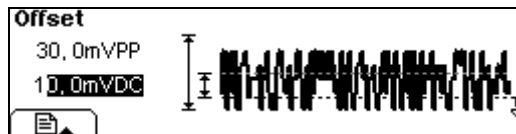
Figure 3-5 The Noise Waveform

Example 6: To generate Arbitrary Waveform

How to generate an arbitrary waveform (Sinc) with 8MHz Frequency, 5V$_{rms}$ Amplitude and 0 V$_{dc}$ Offset.

The operation steps:
1. Set the Type of the Arbitrary Waveform.
   (1) Press $\boxed{\text{Arb}}$ → $\boxed{\text{Load}}$, to choose the built-in waveform.
   (2) Press $\boxed{\text{BuiltIn}}$ → $\boxed{\text{Sinc}}$, there are five built-in arbitrary waveforms. Choose Sinc, and press any key to return the Main Menu of $\boxed{\text{Arb}}$.

2. Set the Frequency.
   (1) Press $\boxed{\text{Freq/Period}}$ and choose $\boxed{\text{Freq}}$ which will display in reverse color.
   (2) Input "8" from the keypad and choose the unit "MHz" to set the Frequency as 8MHz.

3. Set the Amplitude.
   (1) Press $\boxed{\text{Ampl/ HiLev}}$ and choose $\boxed{\text{Ampl}}$ which will display in reverse color.
   (2) Enter "5" from the keypad and choose the unit "V$_{rms}$ " to set the Amplitude as 5 V$_{rms}$.

4. Set the Offset.
   (1) Press $\boxed{\text{Offset /LoLev}}$ to choose $\boxed{\text{Offset}}$ which will display in reverse color.
   (2) Enter "0" from the keypad and choose the unit "V$_{dc}$" to set the Offset as 0 V$_{dc}$.

When the Type of the Arbitrary Waveform, Frequency, Amplitude and Offset were set, the generated waveform is shown in figure 3-6.
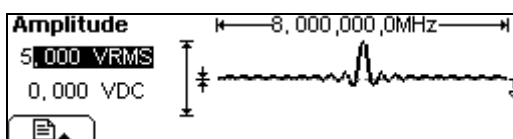
Figure 3-6 The Sinc Waveform

Right now, the selected waveform is appointed to $\boxed{\text{Arb}}$. This waveform will be generated once the key is pressed. Press $\boxed{\text{Arb}}$ to make sure which kind of waveform is selected.

Example 7: To Create an Arbitrary Waveform

How to create an arbitrary Waveform as the below figure (the Self-Defined Waveform is Ramp).
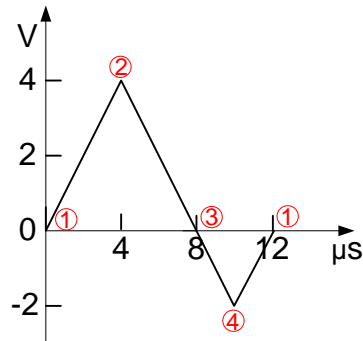
Figure 3-7 The Arbitrary Waveform

The operation steps:

1. Create a new Waveform:
   Press Arb → Edit → Creat , to activate the waveform editing function. The waveform is defined by setting the time and voltage of the points.

2. Set the period.
   (1) Press Period which will display in reverse color.
   (2) Input "12" from the keypad and choose the unit "μs" to set the Period as 12μs.

3. Set the Voltage Limit.
   (1) Press LevelHi , and enter "4" from the keypad, choose the unit "V", to set the High Level as 4V.
   (2) Press LevelLo , and enter "-2" from the keypad, choose the unit "V", to set the low Level as -2V.

4. Set the Number of the initializing Points
   Set the Initializing Point Number as "4".

5. Choose the Interpolation Method.
   Press Interp. → Interpation On , to perform linear connection between the points.

6. Edit the Waveform Points.
    Edit the Voltage and Time of the points to define a waveform. Insert or delete the point If needed.
    Press Points , use the knob or the keypad to shift among the different point. The voltage and time of the points are defined below in table 3-1.

    Table 3-1 The Setting of Time and Voltage of the points

Point	Time	Voltage
1	0s	0V
2	4µs	4V
3	8µs	0V
4	10µs	-2V

7. Save the Waveform.
    Press Save , to store the waveform in one of the 4 Non-Volatile Memories.
    Press Store , to store the finished waveform in the Volatile Memory. Only one self-built waveform can be stored. If a new one is stored, the old one will be erased.

    The waveform is generated by the steps above. The waveform is shown in figure 3-8.
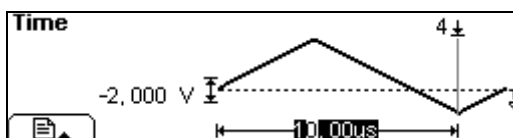
Figure 3-8 The Self-Defined Ramp Waveform

Example 8: To Generate an AM Waveform

How to generate an AM Waveform with depth of 70%, the Carrier wave 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. Choose the Carrier Function:
   Press Sine , and choose the Sine Waveform as the Carrier Wave.
   The default setting of the Source is internal.

2. Set the Frequency, Amplitude and Offset.
   (1) Press Period/Freq and choose Freq which will display in reverse color. Enter "2.5" from the keypad and choose the unit "kHz" to set the Frequency as 2.5kHz.
   (2) Press Ampl/HiLev and choose Ampl which will display in reverse color. Enter "2" from the keypad and choose the unit "V$_{pp}$" to set the Amplitude as 2 V$_{pp}$.
   (3) Press Offset/LoLev and choose Offset which will display in reverse color. Enter "0" from the keypad and choose the unit "V$_{dc}$" to set the Offset as 0 V$_{dc}$.

3. Set the Modulation Type AM.
   Press Mod → Type → AM , Please notice that the message shown on the top left side of the screen is "AM".

4. Set the Modulation Depth
   Press Depth , use the keypad to enter "70", choose the unit "%", setting the Modulation Depth as 70%.

5. Set the AM Frequency
   Press Freq , use the keypad to enter "150", choose the unit "Hz", setting the AM Frequency as 150Hz.

6. Choose the Modulating Waveform.
   Press Shape → Sine , to choose Sine Waveform as the Modulating Waveform.
   Please note that the State Message on the top left side of the screen shows "Sine".

At this time, the instrument generates the specified AM waveform. The Waveform is shown in figure 3-9.
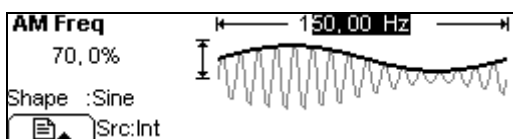
Figure 3-9 The AM Waveform

7. Turn off the Modulation Function.
   Press the lighted Mod Key to turn off the Modulation Function.

Example 9: To Generate an FSK Waveform

How to generate a FSK Waveform with FSK Rate of 200Hz, the Carrier Wave is a Sine Wave with 10 kHz Frequency, and the hop Frequency is 800 Hz.

The operation steps:

1. Choose the Carrier Function:
   Press Sine, and choose the Sine Waveform as the Carrier Function.
   The default setting of the Source is Internal.

2. Set the Frequency, Amplitude and Offset.
   (1) Press Period/Freq and choose Freq which will display in reverse color. Enter "10" from the keypad and choose the unit "kHz" to set the Frequency as 10 kHz.
   (2) Press Ampl/HiLev and choose Ampl which will display in reverse color. Enter "2" from the keypad and choose the unit "V$_{pp}$" to set the Amplitude as 2V$_{pp}$.
   (3) Press Offset/LoLev and choose Offset which will display in reverse color. Enter "0" from the keypad and choose the unit "V$_{dc}$" to set the Offset as 0 V$_{dc}$.

3. Set the Modulation Type FSK.
   Press Mod → Type → FSK, choose FSK. Please notice that the message shown on the top left side of the screen is "FSK".

4. Set the FSK Rate
   Press FSKRate, use the keypad to enter "200", choose the unit "Hz", setting the FSK Rate as 200Hz.

5. Set the Hop Frequency
   Press HopFreq, use the keypad to enter "800", choose the unit "Hz", setting the Hop Frequency as 800Hz.

   At this time, the instrument generates the specified FSK waveform. The Waveform is shown in figure 3-10.
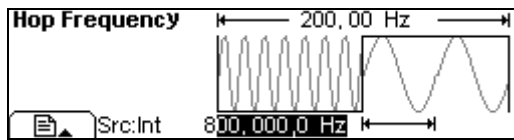
Figure 3-10 The FSK Waveform

6. Turn off the Modulation Function.

    Press the lighted Mod Key to turn off the Modulation Function.

Example 10: To generate a PWM Waveform

How to generate a PWM waveform with the modulate frequency 150Hz, the offset 25%. And the carried wave is a pulse waveform with the frequency 1 kHz, the offset 25% and the edge time 9ns.

The operation steps:

1. choose the shape of carried wave
   Press Pulse, choose pulse as the carried wave. The default type of source is the internal.

2. To set the frequency, amplitude and offset of the carried wave.
   (1) Press Freq/Period to choose Freq which will display in reverse color, then use the keyboard enter "1" and choose the unit "kHz" to set the frequency as 1 kHz.
   (2) Press Ampl/Hile to choose Ampl which will display in reverse color, then use the keyboard enter "5" and choose the unit "V_{pp}" to set the amplitude as 5 V_{pp}.
   (3) Press Offset/Lolev to choose Offset which will display in reverse color, then use the keyboard enter "0" and choose the unit "V_{dc}" to set the offset as 0 V_{dc}.
   When you have set all the parameters, you can observe the carried wave you have just set in the figure display mode.

3. Choose PWM as the modulate type
   Press Mod in the pulse wave interface and enter the Pulse-Width Modulation.

4. To set the duty and offset
   Press DtyDev and use the keyboard enter "25", then choose the unit "%" to set the duty offset as 25%.

5. To set the frequency of modulation
   Press Freq and use the keyboard enter "150", then choose the unit "Hz" to set the frequency of the modulation as 150Hz.

6. Choose the type of the modulation wave
   Press Shape → Sine , choose sine wave as the modulation wave .

Now the signal generator will export the PWM wave according to your setting, the figure is shown below.
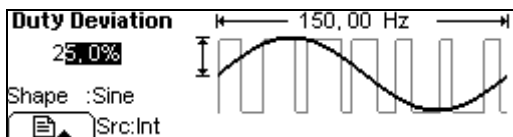
Figure 3-11 The PWM Waveforrn

7. Close the modulation function
    Press Mod and the modulation function will be closed.

Example 11: 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. Choose the Sweep Function:
    Press Sine, and choose the Sine Waveform as the Sweep Function.
    The default setting of the Source is Internal.

2. Set the Frequency, Amplitude and Offset.
    (1) Press Period/Freq and choose Freq which will display in reverse color. Enter "5" from the keypad and choose the unit "kHz" to set the Frequency as 5 kHz.
    (2) Press Ampl/HiLev and choose Ampl which will display in reverse color. Enter "2" from the keypad and choose the unit "V$_{pp}$" to set the Amplitude as 2 V$_{pp}$.
    (3) Press Offset/LoLev and choose Offset which will be displayed in reverse color. Enter "0" from the keypad and choose the unit "V$_{dc}$" to set the Offset as 0 V$_{dc}$.
    You can view the Sweep Waveform in the Graph Mode.

3. Set the Sweep Mode.
    Press Mod → Linear/Log and choose Linear. Please notice that the message shown on the top left side of the screen is "Linear".

4. Set the Sweep Time
    Press Time , use the keypad to enter "1", choose the unit "s", to set the Sweep Time as 1s.

5. Set the Start Frequency
    Press Start , use the keypad to enter "100", choose the unit "Hz", to set the Start Frequency as 100Hz.

6. Set the Stop Frequency
    Press Stop , use the keypad to enter "10", choose the unit "kHz", to set the Stop Frequency as 10 kHz.

At this time, the instrument generates the specified Sweep waveform whose

frequency starts from 100Hz and stops at 10 kHz. The Waveform is shown in figure 3-12.
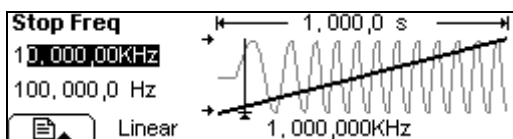
Figure 3-12 The Sweep Waveform

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 to be 5.050 kHz, the frequency range is 9.900 kHz.

Example 12: To generate a Burst Waveform

How to generate a Burst Waveform with the 3 Cycle. The period is 10ms. But you can not change parameters in the default setting: Internal Source and 0 degree Start Phase.

The operation steps:

1. Choose the Burst Function:
    Press Square, and choose the Square Waveform as the Burst Function.
    The default setting of the Source is Internal.

2. Set the Frequency, Amplitude and Offset.
    (1) Press Period/Freq and choose Freq which will display in reverse color. Enter "5" from the keypad and choose the unit "kHz" to set the Frequency as 5 kHz.
    (2) Press Ampl/HiLev and choose Ampl which will display in reverse color. Enter "5" from the keypad and choose the unit "V_{pp}" to set the Amplitude as 5 V_{pp}.
    (3) Press Offset/LoLev and choose Offset which will display in reverse color. Enter "0" from the keypad and choose the unit "V_{dc}" to set the Offset as 0 V_{dc}.
        You can view the Burst Waveform in the Graph Mode.

3. Set the Burst Mode.
    Press Burst → NCycle to choose N-Cycle Mode. Please note that the message shown on the top left side of the screen is "N Cycle".

4. Set the Burst Period
    Press Period , use the keypad to enter "10", choose the unit "ms" and set the Period as 10 ms (Please note the icon).

5. Set the Start Phase
    Press Phase , use the keypad to enter "0", choose the unit "°", setting the Start phase as 0°.

6. Set the Burst Cycles
    Press Cycles , use the keypad to enter "3", choose the unit "Cyc", setting the Burst Cycle as 3.

7. Set the Delay

   Press Delay, use the keypad to enter "200", choose the unit "μs", setting the Burst Delay as 200μs.

At this time, the instrument generates the specified 3- Cycle Burst waveform with a period of 10ms. The Waveform is shown in figure 3-13.
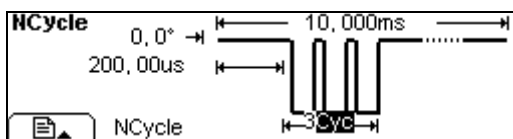
Figure 3-13 The Burst Waveform

Chapter 4   Prompt messages & troubleshooting

Prompting Messages

Common Prompt Messages

Need Help? Press and hold down any key.
Prompt Message 1. While using the instrument, users can get help by using the method shows above.

Settings are restored from last power-down.
Prompt Message 2. To inform the user that all the settings have been restored and you can operate the instrument normally.

Selected interface is USB, no USB device detected!
Prompt Message 3. When the instrument is powered, it detects that the current I/O is USB, and informs the user that no new USB device is detected.

No Changes.
When the waveform parameter is being altered, if the user cancels the operation, the message will prompt.

Selected arb is **
Inform the user that the selected arbitrary waveform type is the built-in ExpRise / ExpFall / NegRamp / Sinc / Cardiac waveform or the waveform that the user built. To change it, press Load → BulitIn , Stored or Volatile .

Please Wait…
It takes time to save or recall the data, and this message is to tell the user to wait.

First, set the general waveform parameters.
To inform the user, set the general waveform parameter first. Then set the parameters for each point.

Edit the existing waveform parameters.
Perform the waveform edit operation, and inform the user that operation can be taken to edit the current waveform parameter.

The selected arbitrary waveform is Volatile.
Inform the user that the selected waveform is Volatile.

Restore all instrument settings to factory defaults?

If user wants to reset the instrument to the default setting, the system will prompt this message, to confirm the operation and avoid accidental mistake.

All settings are restored to factory defaults:

When all the settings of the instrument have been reset to the default state, this message will prompt to inform the user.

Storing waveform, please wait...

Inform the user that the saving operation is in process.

Waveform has been stored as required.

Save the waveform to the specific position according to the user request. Once the waveform is saved, this message prompts.

Performing Self-Test, Please wait...

When the Self-Test is performing, this message will prompt to inform the user to wait for a momemt.

Self-Test Passed.

When the Self-Test is finished, the result will be reported to the user. If the Self-test has been passed, this message will prompt.

The instrument now is UNSECURED.

Inform the user that the password is correct and the user can calibrate the instrument now. The instrument is unsecured.

Instrument triggered.

The manual trigger mode is activated, and the expected burst or sweep will generate.

Selected modulating arb is **：

Inform the user of the information about the selected modulating waveform.

Calibration Count＝0，Reversion＝04040109：

Inform the user of the Calibration times and the version. Before the instrument is shipped, it has already been calibrated. When you power a new instrument, the default calibration times is 0. The latest version can be get at the company's website: http:// www.rigol.com.

Calibrating, Please wait...

In the Calibration menu, inform the user to wait when the instrument is preparing to calibrate.

File doesn't exist!

When deleting the file, to inform the user that the file does not exist.

Complete. Waveform setting have been changed:

Inform the user that the file has been recalled and display the set waveform.

Complete. Waveform data have been changed:

Inform the user that the file has been recalled and display the set arbitrary waveform's data.

Please select type.

When storing the file and the storage type is "all", inform the user to choose the storage type.

Insufficient space. Fail to Save.

If the file to be stored is too large, and the Non-Volatile Memory does not have enough space, the new file can not be stored. This is to inform the user that the storage operation failed.

Fail to read file.

If there is no file in the place the user selects, no file can be read and this message is to inform the user that the file recall operation failed.

Please select a valid File.

If the selected place is empty when recall or delete a file, this message will appear.

Delete the file?

Confirm the deletion operation, in case of accidental operation.

Cover the file?

If the current place has already been used when the user wants to store the file, this message will appear to confirm the operation. If the user continues, the old file will be covered. Press "Yes" to continue; Press "Cancel" to reselect the place.

Can't Write this File to system.

This message appears when the operation of burning menu or programs into the system from the U Disk fails.

File is too big.

If the menu or programs are too large to be burnt into the system from the U Disk, this message will appear to inform the user that the operation fails.

Invalid File, Fail to update.

When using the U Disk to update the system, if the updating file is void, this message will appear to inform the user that the system updating operation can not be performed.

Updating is completed. Restart the instrument.

If the updating of the System is successful by using the U disk, this message will appear. The instrument has to be restarted to update the settings. It also informs the user that if a technical problem occurs after the updating, contact the **RIGOL** technician for support.

Invalid code.

When the user is updating the system, if the system updating operation password is wrong, this message will appear.

Valid code. System update is permitted.

When the user is updating the system, if the system updating operation password is

correct this message will appear.

Wave file will cover.

If the arbitrary waveform to be stored is larger than 128K, other places will be used to store the waveform.

Mobile disk installation is error!

U disk installation failed, and the system could not identify it.

Error Messages

Incorrect secure code, please try again.
Users have to enter the correct password before they calibrate the instrument. If the password is incorrect, this message will appear to inform the user enter the password again.

Please first complete step**：
Before the instrument is calibrated, if the user wants to perform the selected calibration procedure, this is to inform the user to start from step**.

Select units to enter value or press CANCEL.
When a parameter is input, inform the user "Choose the parameter unit" to finish changing the parameter or press Cancel button to cancel the current operation.

Trigger ignored, OUTPUT is off.
If groups of GET commands or * Trigger are received, the system will ignore the grouped GET commands to secure the right source.

Instrument is in remote mode. Press Local.
If the instrument is in the Remote Mode, the front panel will be nullified. Press Local (also ⌒/A), to shift the instrument mode into local, so that the front panel can work.

Initial # of points upper limit=524,288
The upper limit of the initial points is 524,288. If the specified waveform has more than 524,288 points, the system will adjust the number to 524,288 automatically.

Conflict Settings

Turned off infinite burst.
Infinite burst is allowed only when the source is external or manual. The upper limit of the burst cycle is 50,000.

Trigger source changes to Ext/Manual.
Only when the External or Manual Trigger Source is selected, the infinite burst is allowed.

Burst period increased to fit entire burst.
The PRI of Period is higher than that of the Burst Period. As long as the burst period does not reach its maximum, the generator will increase the burst period to cater to the need of the specific burst cycle or waveform frequency.

Burst count reduced.
If the burst period has reached its maximum, reduce the burst count to meet the need of the specified waveform frequency.

Trigger delay reduced to fit entire burst.
Trigger delay will be reduced to fit the current burst period and burst count. Trigger delay is the time between the time trigger is received and the start of the burst.

Sorry, unable to N-cycle burst with noise.
Noise can not be used in the trigger burst mode; it can only be used in the gated burst.

Triggered burst not available for noise.
Noise can not be used in the trigger burst mode; it can only be used in the gated burst.

Trigger ignored -OUTPUT is off.
When the OUTPUT is disabled, the Trigger Output will be disabled automatically.

Trigger output connector used by FSK.
If the FSK is activated and the Source is external, no "Trigger Output" is allowed.

Trigger output connector used by burst gate.
If the gated burst mode is activated and the burst is also activated, no "Trigger Output" is allowed.

Frequency is set maximum for Arb.
The maximum frequency for the arbitrary waveform is 12MHz. when a waveform of higher frequency is changed to the arbitrary waveform, the system will adjust the frequency to 12MHz automatically.

Frequency is set maximum for Pulse.
The maximum frequency for the pulse is 8MHz. when a waveform of higher frequency is changed to the pulse waveform, the system will adjust the frequency to 16MHz

automatically.

Frequency is set maximum for ramp.

The maximum frequency for Ramp is 400kHz. When a waveform of higher frequency is changed to the Ramp waveform, the system will automatically adjust the frequency to 400kHz.

Frequency is set maximum for Burst.

For an internal burst, the minimum frequency is 2mHz, and the maximum is 8MHz. The generator will adjust the frequency to be compatible with the currently specified one automatically.

Frequency is set minimum for Burst.

For an internal burst, the minimum frequency is 2mHz, and the maximum is 8MHz. The generator will adjust the frequency to be compatible with the currently specified one automatically.

Frequency is set minimum for FM.

When the FM is activated, the minimum carrier frequency output is 1µHz. The generator will adjust the frequency to be compatible with the currently specified one automatically.

Sorry, unable to modulate Noise.

Noise, Pulse and DC can not be modulated using AM, FM, PM or FSK methods.

Sorry, unable to modulate DC.

Noise, Pulse and DC can not be modulated using AM, FM, PM or FSK methods.

Sorry, unable to sweep Pulses.

Pulse, Noise and DC can not be used to generate sweep signals.

Sorry, unable to sweep Noise.

Pulse, Noise and DC can not be used to generate sweep signals.

Sorry, unable to sweep DC.

Pulse, Noise and DC can not be used to generate sweep signals.

Modulation has been turned off to allow Pulse.

Pulse, noise and DC are not allowed to generate modulated waveform. So the modulation has to be turned off to allow Pulse.

Modulation has been turned off to allow Noise.

Pulse, noise and DC are not allowed to generate modulated waveform. So the modulation has to be turned off to allow Noise

Modulation has been turned off to allow DC.

Pulse, noise and DC are not allowed to generate modulated waveform. So the modulation has to be turned off to allow DC

Sweep has been turned off to allow Pulse.

Pulse, noise and DC are not allowed to generate Sweep waveform. So the modulation

has to be turned off to allow Pulse.

Sweep has been turned off to allow Noise.

Pulse, noise and DC are not allowed to generate Sweep waveform. So the modulation has to be turned off to allow Noise.

Sweep has been turned off to allow DC.

Pulse, noise and DC are not allowed to generate Sweep waveform. So the modulation has to be turned off to allow DC.

Manual Trigger only for Sweep, N-Cycle Burst.

Manual Trigger is only used for Sweep and N-Cycle Burst.

Trigger Source has been changed to Manual.

When Trigger is enabled, the source type turns from internal to manual.

Pulse width was reduced by period.

For a pulse waveform, the generator will adjust the waveform parameter automatically to fit the need of the pulse according to the order below: Edge time-Pulse Width-Period. In this case, the generator will reduce the pulse width to cater to the need of the period. The Edge Time is already set to the minimum value.

Edge Time was reduced by period.

For a pulse waveform, the generator will adjust the waveform parameter automatically to fit the need of the pulse according to the order below: Edge time-Pulse Width-Period. In this case, the generator will reduce the Edge Time to cater to the need of the period.

Amplitude (V$_{rms}$) upper limit =3.536V$_{rms}$

For example: if a square wave with the amplitude of 5 V$_{rms}$ connects to a 50 ohm resistance was turned into a sine waveform, then the generator will change the amplitude to 3.536 V$_{rms}$ automatically.

Offset has changed due to Amplitude.

In DC voltage function, voltage level is adjusted through the change of the offset, and the current amplitude will be ignored. When changing to the other function, the generator will adjust the offset voltage to fit the current amplitude setting.

Deviation has been changed due to carrier frequency.

The Carrier frequency should always be greater than or equal to the deviation frequency. If the carrier frequency is set less than the deviation frequency, when FM is activated, the generator will adjust the deviation frequency to the value automatically that the current carrier frequency allows.

Duty cycle is limited at a higher frequency.

If the waveform is set Square and the frequency is set to a value which does not allow the current Duty Cycle, the Duty Cycle will adjust to the value automatically that the current frequency allows. For example, if the current Duty Cycle is 70%, and the

frequency is changed to 30 MHz, the Duty Cycle will be changed to 50%.
For a frequency less than 8 MHz, the Duty Cycle range is 20% to 80%.
For a frequency between 8MHz and 16 MHz, the Duty Cycle range is 40% to 60% ;
For a frequency greater than 16 MHz, the Duty Cycle is 50%.

Other parameters were modified.
For the Pulse Waveform, the generator will adjust the following parameters automatically in the order below to generate the pulse waveform: Edge time- Pulse Width-Period. When the period changes, the Edge Time and Pulse Width will also change according to the period.

Burst type has been changed to N-Cycle.
When the Trigger Source is turn from External/ Manual to Internal, the Burst Mode should be changed to N-Cycle.

Sorry, unable to burst DC.
The generator can not use DC Voltage function to generate Burst.

Burst has been turned off to allow DC.
The generator can not use DC to generate Burst. So the Burst is turned off.

Data Overflow

Sine Wave frequency upper limit=40MHz

The Sine wave frequency upper limit is 40MHz. If the specified frequency is higher than 40MHz, the system will adjust the frequency to 40MHz automatically.

Sine Wave frequency lower limit= 1µHz

The Sine wave frequency lower limit is 1µHz. If the specified frequency is lower than 1µHz, the system will adjust the frequency to 1µHz automatically.

Square Wave frequency upper limit=40MHz

The Square wave frequency upper limit is 40MHz. If the specified frequency is higher than 40MHz, the system will adjust the frequency to 40MHz automatically.

Square Wave frequency lower limit=1µHz

The Square wave frequency lower limit is 1µHz. If the specified frequency is lower than 1µHz, the system will adjust the frequency to 1µHz automatically.

Ramp Wave frequency upper limit= 400kHz

The Ramp wave frequency upper limit is 400kHz. If the specified frequency is higher than 400kHz, the system will adjust the frequency to 400kHz automatically.

Ramp Wave frequency lower limit= 1µHz

The Ramp wave frequency lower limit is 1µHz. If the specified frequency is lower than 1µHz, the system will adjust the frequency to 1µHz automatically.

Pulse Wave frequency upper limit=16MHz

The Pulse wave frequency upper limit is 16MHz. If the specified frequency is higher than 16MHz, the system will adjust the frequency to 16MHz automatically.

Pulse Wave frequency lower limit= 500µHz

The Pulse wave frequency lower limit is 500µHz. If the specified frequency is lower than 500µHz, the system will adjust the frequency to 500µHz automatically.

Arb Wave frequency upper limit= 12MHz

The Arb wave frequency upper limit is 12MHz. If the specified frequency is higher than 12MHz, the system will adjust the frequency to 12MHz automatically.

Arb Wave frequency lower limit= 1µHz

The Arb wave frequency lower limit is 1µHz. If the specified frequency is lower than 1µHz, the system will adjust the frequency to 1µHz automatically.

Sine Wave period upper limit= 1Ms

The Sine Wave Period upper limit is 1Ms. If the specified period is greater than 1Ms, the system will adjust the period to 1Ms automatically.

Sine Wave period lower limit= 25ns

The Sine Wave Period lower limit is 25ns. If the specified period is less than 25ns, the system will adjust the period to 25ns automatically.

Square Wave period upper limit= 1Ms

The Square Wave Period upper limit is 1Ms. If the specified period is greater than 1Ms, the system will adjust the period to 1Ms automatically.

Square Wave period lower limit= 25ns

The Square Wave Period lower limit is 25ns. If the specified period is less than 25ns, the system will adjust the period to 25ns automatically.

Ramp Wave period upper limit= 1Ms 。

The Ramp Wave Period upper limit is 1Ms. If the specified period is greater than 1Ms, the system will adjust the period to 1Ms automatically.

Ramp Wave period lower limit= 2.5μs 。

The Ramp Wave Period lower limit is 2.5ns. If the specified period is less than 2.5ns, the system will adjust the period to 2.5ns automatically.

Pulse Wave period upper limit= 2Ks 。

The Pulse Wave Period upper limit is 2Ks. If the specified period is greater than 2Ks, the system will adjust the period to 2Ks automatically.

Pulse Wave period lower limit= 62.5ns 。

The Pulse Wave Period lower limit is 62.5ns. If the specified period is less than 62.5ns, the system will adjust the period to 62.5ns automatically.

Arb Wave period upper limit= 1Ms 。

The Arb Wave Period upper limit is 1Ms. If the specified period is greater than 1Ms, the system will adjust the period to 1Ms automatically.

Arb Wave period lower limit= 83.3ns 。

The Arb Wave Period lower limit is 83.3ns. If the specified period is less than 83.3ns, the system will adjust the period to 83.3ns automatically.

Amplitude upper limit= **

Different mode has different amplitude upper limit; amplitude upper limit may vary in the same mode if the load is different.

Amplitude lower limit= **

Different mode has different amplitude lower limit; amplitude lower limit may vary in the same mode if the load is different.

High level upper limit = **

Different mode has different High Level upper limit; High Level upper limit may vary in the same mode if the load is different.

Low level lower negative limit=**

Different mode has different High Level lower limit; High Level lower limit may vary in the same mode if the load is different.

High level must be greater than Low level.

High level must always be greater than Low level. If the high level is set less than the

low level, the generator will set the low level 1 mV less than the high level automatically.

**Duty Cycle upper/lower limit = ** **

In the Square mode, different frequency range corresponds to different Duty Cycle limit.

For a frequency lower than 25MHz, the range is from 20% to 80%;

For a frequency between 25 ~ 50MHz, the range is from 40% to 60%;

For a frequency higher than 50MHz, the Duty Cycle is set to be 50%.

Symmetry upper limit = 100.0%.

In the Ramp mode, the Symmetry upper limit is 100%. If the specified symmetry is greater than 100%, the system will adjust the symmetry to 100% automatically.

Symmetry lower negative limit = 0.0%.

In the Ramp mode, the Symmetry lower limit is 0.0%. If the specified symmetry is less than 0.0%, the system will adjust the symmetry to 0.0% automatically.

Pulse Width is limited by Period.

The Pulse Width should be less than the difference of the period and the Edge Time. Pulse Width< period- 1.6×Edge Time.

Edge Time is limited by Period

The specified Edge Time should be in the specified period. The generator will adjust the Edge Time to meet the need of the period. Edge Time < 0.625×Pulse Width.

Pulse width lower limit = 12ns

In the Pulse mode, the Pulse width lower limit is 12ns. If the specified pulse width is less than 12ns, the system will adjust the pulse width to 12ns automatically.

Edge Time lower limit = 5ns.

In the Pulse mode, the Edge Time lower limit is 5ns. If the specified Edge Time is less than 5ns, the system will adjust the Edge Time to 5ns automatically.

**Offset upper limit= ** **

Different mode has different Offset upper limit; Offset upper limit may vary in the same mode if the load is different.

**Offset lower negative limit = ** **

Different mode has different Offset lower limit; Offset lower limit may vary in the same mode if the load is different.

Initial # of points upper limit = 524,288

The number of initial points upper limit is 524,288. If the specified waveform has more than 524,288points, the system will adjust the point number to 524,288 automatically.

Initial # of points lower limit=2.

The default initial point number is 2, the lower limit of the initial points. If the specified initial point is less than 2, the system will adjust the number to 2 automatically.

Point # lower limit=1.

When the user is editing the point, if the input number is less than 1, the system will inform the user to start from point #1.

Currently on the last defined point.

When the user is about to edit the last defined point, this message will prompt.

Deviation cannot exceed Carrier Frequency.

The carrier Frequency should always be higher than or equal to the deviation frequency.

Frequency Deviation lower limit = 5.0Hz.

Frequency deviation lower limit is 5.0Hz. If the specified Frequency deviation is lower than 5.0Hz, the system will adjust the Frequency deviation to 5.0Hz automatically.

FM Frequency upper limit =20kHz

FM Frequency upper limit is 20kHz. If the specified FM Frequency is higher than 20kHz, the system will adjust the FM Frequency to 20kHz automatically.

FM Frequency lower limit = 2mHz

FM Frequency lower limit is 2mHz. If the specified FM Frequency is lower than 2mHz, the system will adjust the FM Frequency to 2mHz automatically.

Deviation plus Carrier cannot exceed maximum.

The sum of the Carrier frequency and the deviation frequency should be lower than or equal to the selected maximum frequency plus 100kHz.

AM Depth upper limit = 120.0%.

The AM Depth upper limit is 120.0%. If the specified AM Depth is greater than 120.0%, the system will adjust the AM Depth to 120.0% automatically.

AM Depth lower limit = 0.0%.

The AM Depth lower limit is 0.0%. If the specified AM Depth is less than 0.0%, the system will adjust the AM Depth to 0.0% automatically.

AM Frequency upper limit = 20kHz

The AM Frequency upper limit is 20kHz. If the specified AM Frequency is higher than 20kHz, the system will adjust the AM Frequency to 20kHz automatically.

AM Frequency lower limit = 2mHz

The AM Frequency lower limit is 2mHz. If the specified AM Frequency is lower than 2mHz, the system will adjust the AM Frequency to 2mHz automatically.

Hop Frequency upper limit = **

Different Source types have different Hop Frequency upper limit. If the Carrier is a Square or Sine wave, the Hop Frequency upper limit is 400MHz; If the Carrier is a Ramp wave, the Hop Frequency upper limit is 400kHz; If the Carrier is an Arb wave, the Hop Frequency upper limit is 12MHz.

Hop Frequency lower limit = 1μHz

The Hop Frequency lower limit is 1μHz. If the specified Hop Frequency is lower than 1μHz, the system will adjust the Hop Frequency to 1μHz automatically.

FSK Rate upper limit = 100kHz

The FSK Rate upper limit is 100kHz. If the specified FSK Rate is greater than 100kHz, the system will adjust the FSK Rate to 100kHz automatically.

FSK Rate lower limit = 2mHz

The FSK Rate lower limit is 2mHz. If the specified FSK Rate is less than 2mHz, the system will adjust the FSK Rate to 2mHz automatically.

Phase deviation upper limit=360°

The Phase deviation upper limit is 360°. If the specified Phase deviation is greater than 360°, the system will adjust the Phase deviation to 360° automatically.

Phase deviation lower limit= 0°

The Phase deviation lower limit is 0°. If the specified Phase deviation is less than 0°, the system will adjust the Phase deviation to 0° automatically.

PM Frequency upper limit= 20kHz

The PM Frequency upper limit is 20kHz. If the specified PM Frequency is higher than 20 kHz, the system will adjust the PM Frequency to 20kHz automatically.

PM Frequency lower limit= 2mHz

The PM Frequency lower limit is 2mHz. If the specified PM Frequency is lower than 2mHz, the system will adjust the PM Frequency to 2mHz automatically.

Start Frequency upper limit = **

Different Source types have different Start Frequency upper lower. If the Carrier is a Square or Sine wave, the Start Frequency upper limit is 400MHz; if the Carrier is a Ramp wave, the Start Frequency upper limit is 400kHz; if the Carrier is an Arb wave, the Start Frequency upper limit is 12MHz.

Start Frequency lower limit = 1μHz

The Start Frequency lower limit is 1μHz. If the specified Start Frequency is lower than 1μHz, the system will adjust the Start Frequency to 1μHz automatically.

Stop Frequency upper limit = **

Different Source types have different Stop Frequency upper limit. If the Carrier is a Square or Sine wave, the Stop Frequency upper limit is 400MHz; if the Carrier is a Ramp wave, the Stop Frequency upper limit is 400kHz; if the Carrier is an Arb wave, the Stop Frequency upper limit is 12MHz.

Stop Frequency lower limit =1μHz

The Stop Frequency lower limit is 1μHz. If the specified Stop Frequency is lower than 1μHz, the system will adjust the Stop Frequency to 1μHzautomatically.

Center Frequency upper limit = **

Different Source types have different Center Frequency upper limit. If the Carrier is a

Square or Sine wave, the Center Frequency upper limit is 34MHz; If the Carrier is a Ramp wave, the Center Frequency upper limit is 400kHz; If the Carrier is an Arb wave, the Center Frequency upper limit is 12MHz.

Center Frequency lower limit = 1μHz

The Center Frequency lower limit is 1μHz. If the specified Center Frequency is lower than 1μHz, the system will adjust the Center Frequency to 1μHz automatically.

Frequency span upper limit = **

With different Source type modes and center frequencies, the frequency span upper limits vary.

Frequency span lower limit = **

With different Source type modes and center frequencies, the frequency span lower limits vary.

Sweep Time upper limit = 500.00s

The Sweep Time upper limit is 500.00s. If the specified Sweep Time is greater than 500.00s, the system will adjust the Sweep Time to 500.00s automatically.

Sweep Time lower limit = 1.0ms

The Sweep Time lower limit is 1.0ms. If the specified Sweep Time is less than 1.0ms, the system will adjust the Sweep Time to 1.0ms automatically.

Phase upper limit= +360.0º

The Phase upper limit is +360.0**º**. If the specified Phase is greater than +360.0**º**, the system will adjust the Phase to +360.0 **º** automatically.

Phase lower negative limit= - 360.0º

The Phase lower negative limit is -360.0**º**. If the specified Phase is less than -360.0**º**, the system will adjust the Phase to -360.0**º** automatically.

# of Cycles upper limit = 1,000,000 Cyc

The Cycle upper limit is 500,000Cyc. If the specified Cycle is greater than 500,000Cyc, the system will adjust the Cycle to 500,000Cyc automatically.

# of Cycles lower limit = 1Cyc

The Cycle lower limit is 1Cyc. If the specified Cycle is less than 1Cyc, the system will adjust the Cycle to 1Cyc automatically.

Trigger Period upper limit = 500.00s

The Trigger Period upper limit is 500.00s. If the specified Trigger Period is greater than 500.00s, the system will adjust the Trigger Period to 500.00s automatically.

Trigger Period lower limit = 62.5μs

The Trigger Period upper limit is 62.5μs. If the specified Trigger Period is less than 1.0μs, the system will adjust the Trigger Period to 62.5μs automatically.

Delay upper limit = 40s

The Delay upper limit is 40s. If the specified Delay is greater than 40s, the system will

adjust the Delay to 40s automatically.

Delay lower limit = 0.0000s

The Delay lower limit is 0.0000s. If the specified Delay is less than 0.0000s, the system will adjust the Delay to 0.0000s automatically

Load Impedance upper limit =10kΩ

The Load Impedance upper limit is 10kΩ. If the specified Load Impedance is greater than 10kΩ, the system will adjust the Load Impedance to 10kΩ automatically.

Load Impedance lower limit = 1Ω

The Load Impedance lower limit is 1Ω. If the specified Load Impedance is less than 1Ω, the system will adjust the Load Impedance to 1Ω automatically.

Start Phase upper limit = 360.0 Degree

The Start Phase upper limit is 360.0°. If the specified Start Phase is greater than 360.0°, the system will adjust the Start Phase to 360.0° automatically.

Start Phase lower limit = -360.0 Degree.

The Start Phase lower limit is -360.0°. If the specified Start Phase is less than -360.0°, the system will adjust the Start Phase to -360.0° automatically.

(****denotes the parameter, the content of which will vary according to the setting.**)

Troubleshooting

1. **If the screen does not turn on even if the generator is on, please follow the steps below:**
   (1) Check if the power is correctly connected.
   (2) Check if the power switch is really on.
   (3) Restart the instrument after taking the above steps.
   (4) If it does not work correctly, contact **RIGOL** for our service.

2. **If the settings are correct but no waveform is generated, please follow the steps below:**
   (1) Check if the Signal Line is correctly connected to the Output terminal.
   (2) Check the BNC if it works correctly.
   (3) Check the Output button, if it is turned on.
   (4) Press Utility → System → Setting → PowOn → Latest when all the above steps have been finished. Restart the computer.

Chapter 5   Specifications

All the specifications apply to the DG2000 Series Function/ Arbitrary Waveform Generator unless specified statement. To meet these specifications, two conditions must be satisfied first:

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

■   You must perform the "Self-Cal" operation through the Utility menu if the operating temperature changes by more than $5\,^{\circ}\mathrm{C}$.

All specifications are guaranteed unless marked "typical"

Specifications

Frequency Characteristic	
Waveforms	Sine, Square, Ramp, Triangle, Pulse, Noise, DC, Arb
Sine	1µHz to 40MHz
Square	1µHz to 40MHz
Pulse	500µHz to 16MHz
Ramp	1µHz to 400kHz
White Noise	20MHz bandwidth (-3dB) (typical)
Resolution	1 µHz
Accuracy	Within 90 days: ±50 ppm Within 1 year: ±100 ppm 18°C ~ 28°C
Temperature index	< 2 ppm/°C

Sine Wave Spectral Purity	
Harmonic Distortion	**< 1 V_{pp}** **> 1 V_{pp}** DC to 20 kHz -70 dBc -70 dBc 20 kHz to 100 kHz -65 dBc -60 dBc 100 kHz to 1 MHz -50 dBc -45 dBc 1 MHz to 10 MHz -40 dBc -35 dBc
Total Harmonic Distortion	DC to 20 kHz, 1V_{pp} <0.2%
Spurious (non-harmonic)	DC to 1 MHz < -70 dBc 1 MHz to 10 MHz < -70 dBc + 6 dB/octave
Phase Noise (10kHz offset)	−115 dBc/Hz (typical)

Square Wave Characteristic	
Rise/Fall Time	< 13 ns (10% to 90%) (typical, 1kHz, 1V_{pp})
Overshoot	< 2% (typical)
Duty Cycle	20% to 80% (to 8 MHz) 40% to 60% (to 16 MHz) 50% (>16 MHz)
Symmetry (below 50% Duty Cycle)	1% of period+ 5ns
Jitter	1ns + 100ppm % of period

Ramp Wave Characteristics

Linearity	< 0.1% of peak output (typical, 1kHz, 1V$_{pp}$, symmetry 100%)
Symmetry	0% to 100%

Pulse Wave Characteristics

Pulse Width	2000s max period;12ns min period; 1ns resolution
Variable Edge Time	5ns to 1ms
Overshoot	< 2%
Jitter	1ns + 100ppm % of period

Arb Wave Characteristics

Frequency Range	1μHz to 12MHz
Waveform Length	2 to 512 K points
Amplitude Accuracy	14 bits (including sign)
Sample Rate	100MSa/s
Minimum Edge Time	35ns (typical)
Jitter (RMS)	6 ns + 30ppm
Non-Volatile Storage	4 waveforms

Output Characteristics

Amplitude[1]	20 mV$_{pp}$ ~ 10 V$_{pp}$ (50 Ω)	
	40 mV$_{pp}$ ~ 20 V$_{pp}$ (High Z)	
Amplitude Accuracy (100 kHz sine wave)	± (1% of setting + 1 mV$_{pp}$)	
Amplitude Flatness (sine wave relative to 100 kHz, 5 V$_{pp}$)	< 100kHz	0.1 dB
	100kHz to 5 MHz	0.15 dB
	5 MHz to 40 MHz	0.3 dB

DC Offset

Range (peak AC+DC)	±5V (50Ω)
	±10 V (High Z)
Offset Accuracy	± (2% of |the Offset Setting|+ 0.5% of the Amplitude + 2mV)

Waveform Output

Impedance	50 Ω (typical)

Isolation	42 Vpk max. to Earth
Protection	Short-circuit protected; Overload disables the waveform output automatically
AM Modulation	
Carrier Waveforms	Sine, Square, Ramp, Arb
Source	Internal/ External
Modulating Waveforms	Sine, Square, Ramp , Noise, Arb (2mHz to 20kHz)
Depth	0% ~ 120%
FM Modulation	
Carrier Waveforms	Sine, Square, Ramp, Arb
Source	Internal/ External
Modulating Waveforms	Sine, Square, Ramp, Noise, Arb (2mHz to 20kHz)
Frequency Deviation	DC to 20MHz
PM Modulation	
Carrier Waveforms	Sine, Square, Ramp, Arb
Source	Internal/ External
Modulating Waveforms	Sine, Square, Ramp, Noise, Arb (2mHz to 20kHz)
Phase Deviation	0 to 360°
FSK Modulation	
Carrier Waveforms	Sine, Square, Ramp, Arb
Source	Internal/ External
Modulating Waveforms	50% duty cycle square (2mHz to 100kHz)
PWM Modulation	
Carrier Waveforms	Pulse
Source	Internal/ External
Modulating Waveforms	Sine, Square, Ramp, Noise, Arb (2mHz to 20kHz)
Deviation	pulse width: 0% to 100%
Sweep	
Carrier Waveforms	Sine, Square, Ramp, Arb
Type	Linear or Logarithmic
Sweep Time	1 ms to 500 s ± 0.1%
Source	Internal/External/Manual
Burst	
Waveforms	Sine, Square, Ramp, Pulse, Noise, Arb
Types	Count (1 to 50,000 periods), infinite, gated
Start Phase	-360° to +360°
Internal Period	1 μs – 500 s ± 1%
Gate Source	External Trigger

Trigger Source	Internal/External/Manual

Rear Panel Connector	
External AM Modulation	± 5 Vpk = 100% modulation 5kΩ input impedance
Input/Output Frequency Range	10MHz ± 500Hz
Input/Output Voltage Range	80mV$_{pp}$~10V$_{pp}$/0dBm　(typical)
Input/Output Impedance	2kΩ/50Ω (typical), AC coupled
Time	<1s
External Trigger	TTL-compatible

Trigger Input	
Input Level	TTL-compatible
Slope	Rising or falling (selectable)
Pulse Width	> 100 ns
Input Impedance	> 10 kΩ, DC coupled
Linear Sweep	< 500 μs　(typical)
Latency Sweep	< 500 ns　(typical)

Trigger Output	
Level	TTL-compatible into >1kΩ
Pulse Width	> 400ns　(typical)
Output Impedance	50Ω　(typical)
Maximum Rate	1 MHz

Notes[1]:

- The amplitude range (50Ω):
  The output frequency >10MHz, the amplitude range: 20mV$_{pp}$ ~ 5V$_{pp}$;

- The amplitude range (High Z):
  The output frequency >10MHz, the amplitude range: 40mV$_{pp}$ ~ 10V$_{pp}$.

General Specifications

Display	
Type	Black and White LCD Screen
Resolution	256 Horizontal x 64 Vertical
Grey Degree	4 Degree Grey Level
Contrast (typical)	150 : 1
Light (typical)	300 nit

Power	
Supply	100-240 VAC$_{RMS}$，45-440Hz，CAT II
Consumption	Less than 50W
Fuse	2A，T Level ，250V

Environment	
Temperature Range	Operation：10℃～+40℃
	Non-operation：-20℃～+60℃
Cooling	Natural cooling
Humidity Range	Below +35℃：≤90％ relative humidity
	+35℃～+40℃：≤60％relative humidity
Height Range	Operation : below 3,000m
	Non-operation: below 15,000m

Instrument Specifications		
Dimension	Width	232mm
	Height	108mm
	Depth	288mm
Weight	Package excluded	2.7Kg
	Package Included	4Kg

IP Protection
IP2X

Calibration Interval
One year suggested

Chapter 6   Appendix

Appendix A DG2000 Series Accessories

Standard Accessories:
- A Power Cord that fits the standard of the destination country.
- A USB Cable.
- A Quick Guide.
- A resource CD (including User's Guide)

Optional Accessories:
- BNC cable.
- RS-232 cable.

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 LCD screen can be exposed to direct sunlight for long periods of time.

⚠ **CAUTION:** To avoid damage to the instrument or probes, 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.rigol.com.

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