User Manual

SDG800 Series Function/Arbitrary Waveform Generator

UM02008-E02B

Declaration

General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

To Avoid Fire or Personal Injury

- **Use proper power line. Only the special power line of the products approved by the state should be used.**
- **Ground the instrument. This generator is grounded through the protective terra conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to the earth ground. Make sure that the instrument is properly grounded before connecting the input or output terminals.**
- **Observe all the ratings of the terminal. To avoid fire or shock, observe all the ratings and symbols that marked on the instrument. Read the user guide carefully before making connections to the instrument.**
- **Do not operate without Covers. Do not operate the product 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 should have it inspected by qualified service personnel authorized by SIGLENT 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.**
- **Not position the equipment so that it is difficult to operate the disconnecting device (detachable plug)**

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

This product has been tested to the requirements of CAN/CSA-C22.2 No. 61010-1, second edition, including Amendment 1, or a later version of the same standard incorporating the same level of testing requirements.

Not to use the product for measurements within other measurement categories, such as CAT II, CAT III, CAT IV.

Not to use the equipment for measurements on mains circuits, not to use the equipment for measurements on voltage exceed the voltage range describe in the manual.

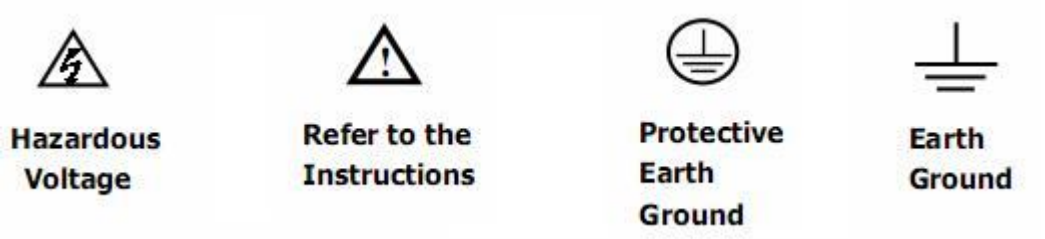
Only probe assemblies which meet the manufacturer's specifications shall be used.

The Responsible body or operator should refer to the instruction manual to preserve the protection afford by the equipment. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Any parts of the device and its accessories are not allowed to be changed or replaced, other than authorized by the manufacturer of his agent.

Safety Terms and Symbols

Terms in this guide, these terms may appear in this manual:



Terms on the product, terms below may appear on the product:

DANGER: Indicates an injury or hazard that may immediately happen.

WARNING: Indicates an injury or hazard that may not immediately happen.

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

Symbols on the product: Symbols as followed may appear on the product:

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.

Introduction of SDG800 Series

The manual covers the following three types of SDG800 Series Function/Arbitrary Waveform Generators: SDG830,SDG810, SDG805.

SDG800 Series Function/Arbitrary Waveform Generators adopt the direct digital synthesis (DDS) technology, which can provide stable, high-precision, pure and low distortion signals. 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.

SDG800 Series Function/Arbitrary Waveform Generator has a 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, with the help of which, 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, DSB-AM,FM, PM, ASK, FSK and PWM modulation functions generate modulated waveforms at ease, without the help of a separate modulating source. USB I/O is a standard accessory, while GPIB is optional. Remote instructions meet the SCPI specification requirements.

From the characteristics and specifications given below, you will understand how SDG800 can satisfy your requirements.

- **DDS technology provides precise, stable and low distortional output signal.**
- **3.5'TFT color LCD display.**
- **125MSa/s sampling rate, 14-bit resolution.**
- **Frequency characteristics:**

  Sine: 1μHz to 30MHz

  Square: 1μHz to 10 MHz

  Ramp: 1μHz to 300kHz

  Pulse: 500μHz to 5MHz

  White Noise: 10MHz bandwidth (-3dB)

  Arbitrary: 1μHz to 5MHz
- **5 standard waveforms: Sine, Square, Ramp, Pulse, Noise**
- **Self-defined arbitrary waveform**
- **Multiple modulation function: AM, FM, PM, ASK, FSK, PWM, DSB-AM, Sweep and Burst.**
- **Multiple interfaces: USB host & USB device(USBTMC)**
- **Support USB storage device. Software updating could also be performed using USB devices.**
- **Up to 16k sample points of internal waveform depth, which can rebuild or simulate any complex waveform.**
- **2 languages (English and Chinese) user interface and built-in help system.**

Note:

All the specifications described in this guide are according to SDG830. If you need to know the particular specifications about the other types, please see datasheet..

Catalogue

1. Getting Started

This chapter covers the following topics:

- General Inspection
- Handle Adjustment
- The Front/Rear Panel
- To Set a Waveform
- To Set Modulate/Sweep/Burst
- To Set Output
- To Use Digital Input
- To Use Store/Utility/Help Function

1.1. General Inspection

When you get a new SDG800 Series Function/Arbitrary Waveform Generator, you are suggested to take the following steps to inspect the instrument.

1. **Inspect the shipping container for damage.**

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

2. **Check the accessories.**

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

   If the contents are incomplete or damaged, please notify your sales representative.

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 sales representative. If the shipping container is damaged, or the cushioning materials show signs of stress, notify the carrier as well as your sales office. Keep the shipping materials for the carrier's inspection. Offices will arrange for repair or replacement at their option without waiting for claim settlement.

1.2. Handle Adjustment

To adjust the handle position of SDG800 Function/Arbitrary Waveform Generator, please grip the handle by the sides and pull it outward. Then, make the handle rotate to the desired position.

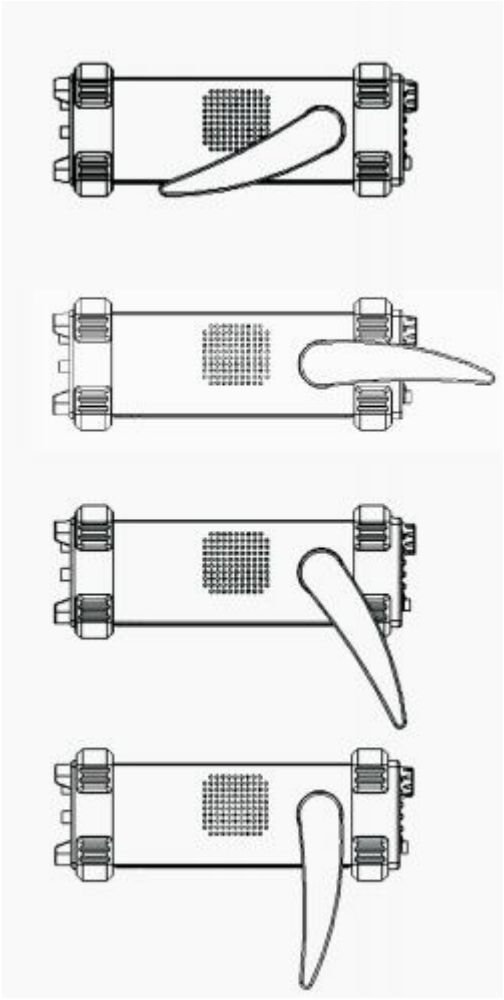


Figure 1- 1 Viewing Position and Carrying Position

1.3. The Front/Rear Panel

When you get a new SDG800 Series Function/Arbitrary Waveform Generator, first you need to understand 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 SDG800 Series Function/Arbitrary Waveform Generator has a clear and simple front panel. See Figure 1- 2 and Figure 1- 3. The front panel has a knob and functional keys. The 5 blue grey buttons on the right side of the screen are menu buttons (named F1 to F5 from up to down) with the help of which, you can enter different functions menu or have direct specific applications. The signal input and output interfaces are set at the front and rear panels which can help generating multiple arbitrary waveforms. The various interfaces can meet the need of the multiple interface communications.

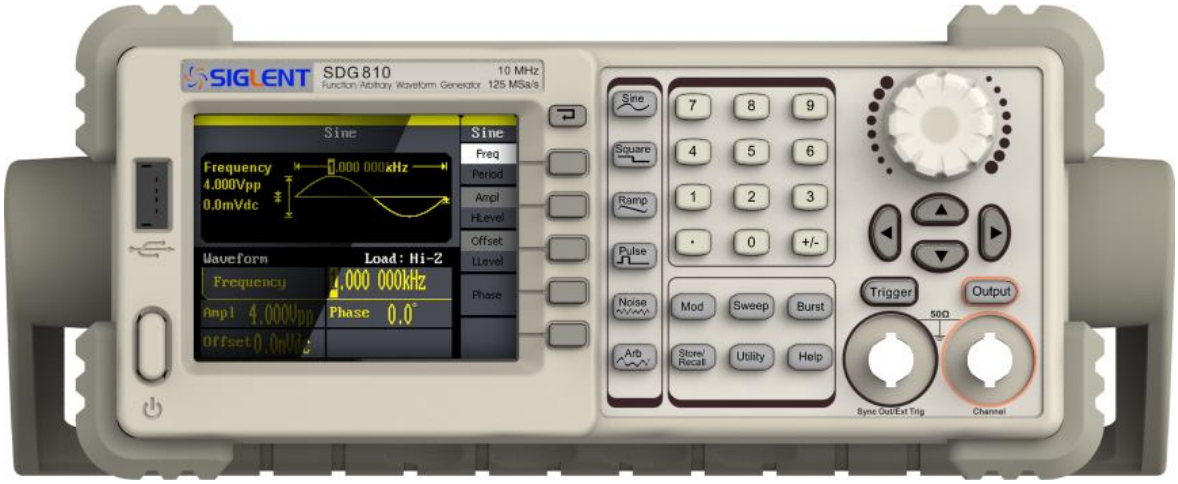


Figure 1- 2 SDG800 Series

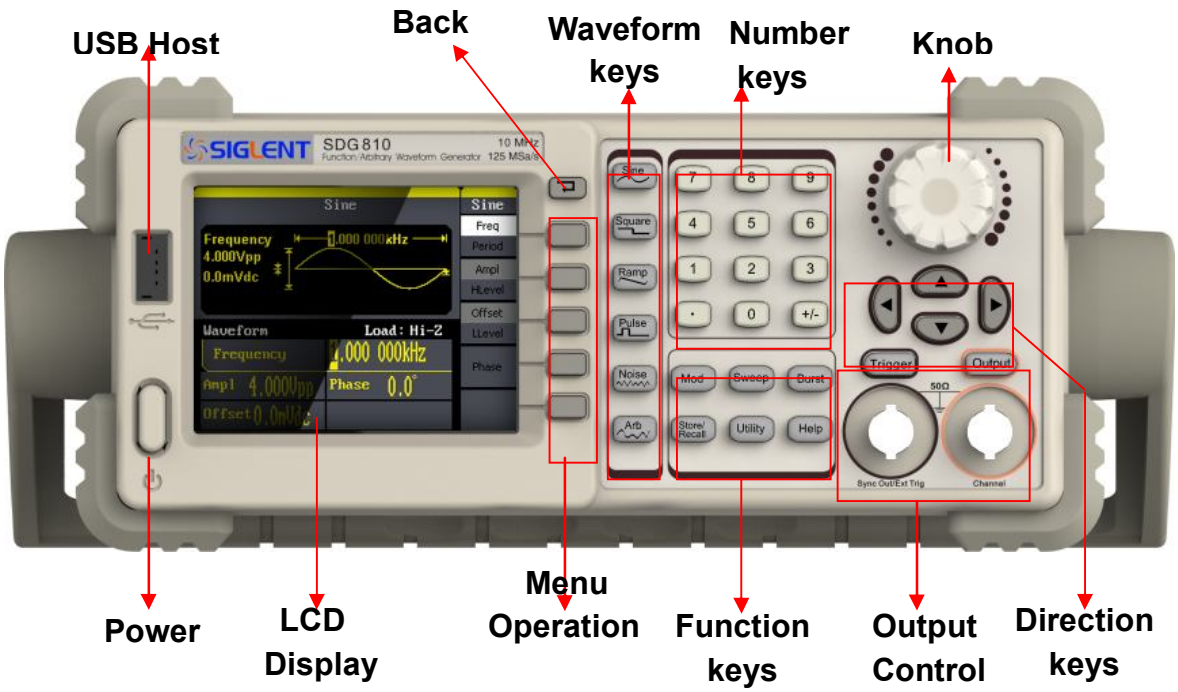


Figure 1- 3 Front Panel of SDG800 Series

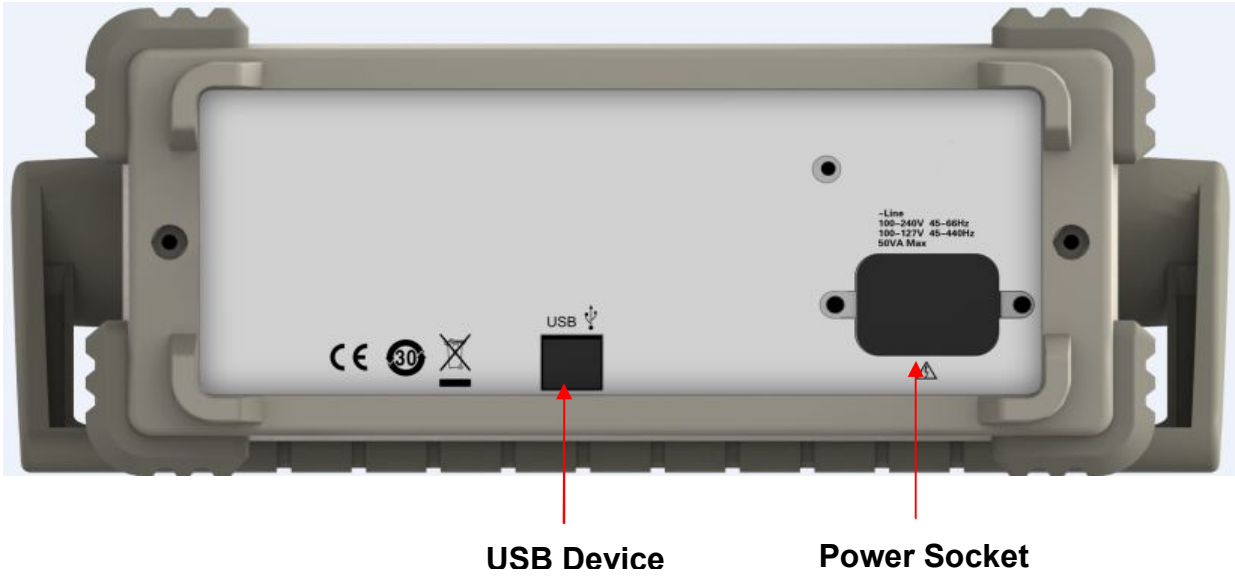


Figure 1- 4 Rear Panel of SDG800 Series

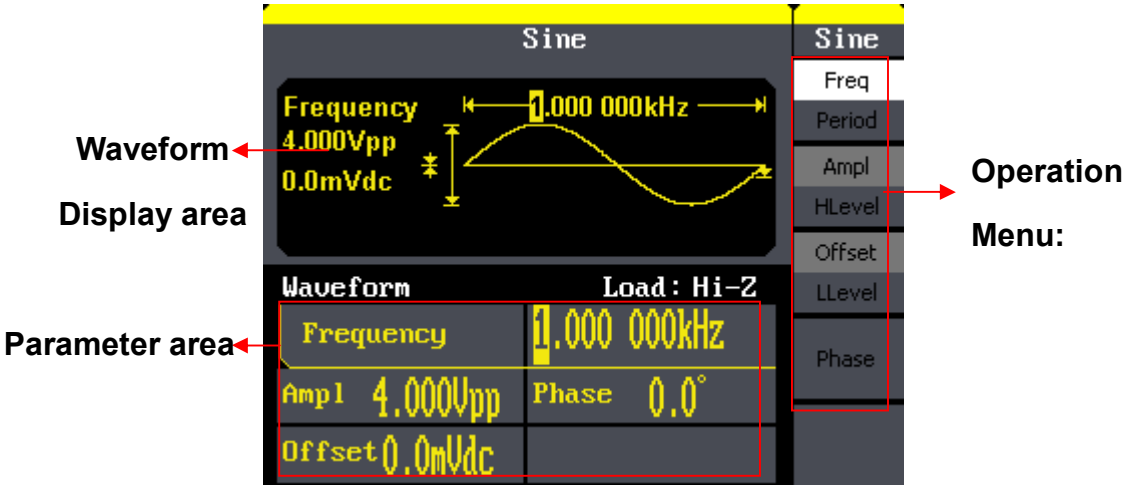


Figure 1- 5 Display Interface (Sine Wave is the default display signal)

Character definitions in this User Manual:

The signs for 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 brighten words such as Freq, which means the frequency option in the Sine menu.

1.4. To Set a Waveform

On the operation panel, there is a set of buttons with waveform icon. See Figure 1- 6. The exercise below will help you familiarize with the waveform selection settings.

Figure 1- 6 Waveform Selection Buttons

1. Press Sine button and the waveform window will display sine waveform. SDG800 Series Generator can generate sine signal with a frequency from 1μHz to 30MHz. By setting frequency/period, amplitude/high level, offset/low level, sine signal with different parameters can be generated.

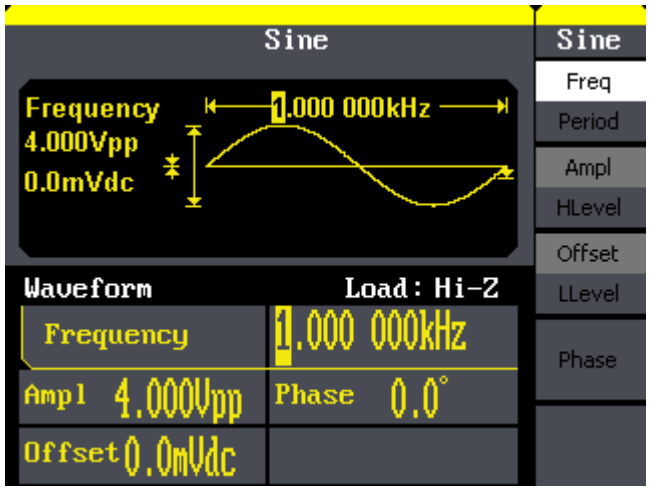


Figure 1- 7 Sine Signal Display Interface

As is shown in Figure 1- 7, the default signal parameters are: 1kHz frequency, 4.0Vpp amplitude and 0Vdc offset.

2. Press Square button, and the waveform window displays square waveform. SDG800 Series Generator can generate square signal with a frequency from 1μHz to 10MHz and variable duty cycle.

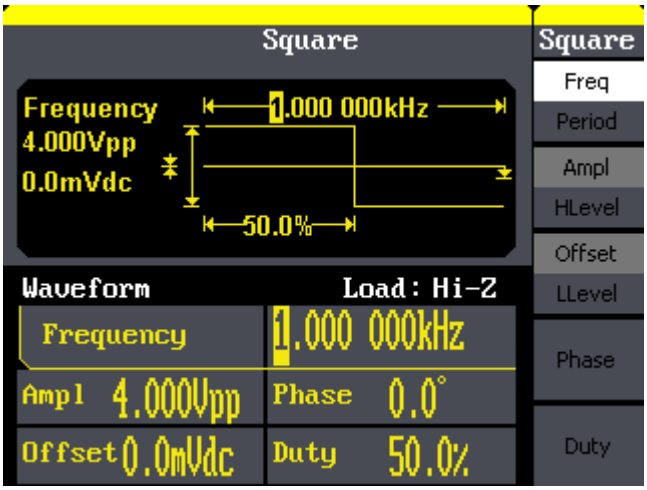


Figure 1- 8 Square Signal Display Interface

As is shown in Figure 1- 8, the default signal parameters are: 1kHz frequency, 4.0Vpp amplitude, 0Vdc offset and 50% duty cycle.

3. Press Ramp button, and the waveform window displays ramp waveform. SDG800 Series Generator can generate ramp signal with a frequency of from 1μHz to 300kHz and variable symmetry.

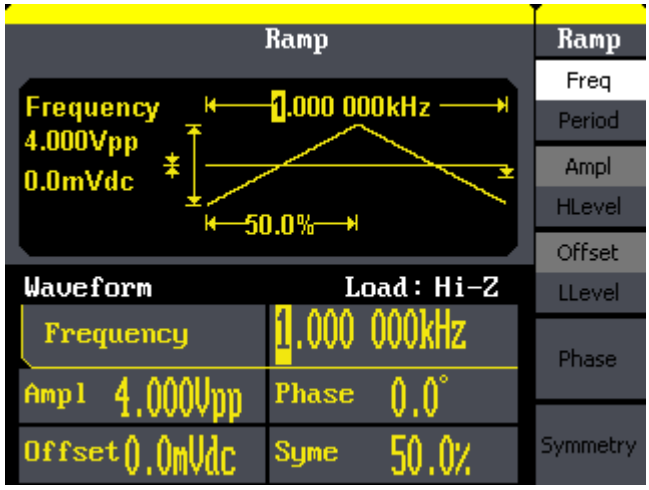


Figure 1- 9 Ramp Signal Display Interface

As is shown in Figure 1- 9, the default signal parameters are: 1kHz frequency, 4.0Vpp amplitude, 0Vdc offset and 50% symmetry.

4. Press Pulse button, and the waveform window displays pulse waveform. SDG800 Series Generator can generate pulse signal with a frequency from 500μHz to 5 MHz and variable pulse width and delay.

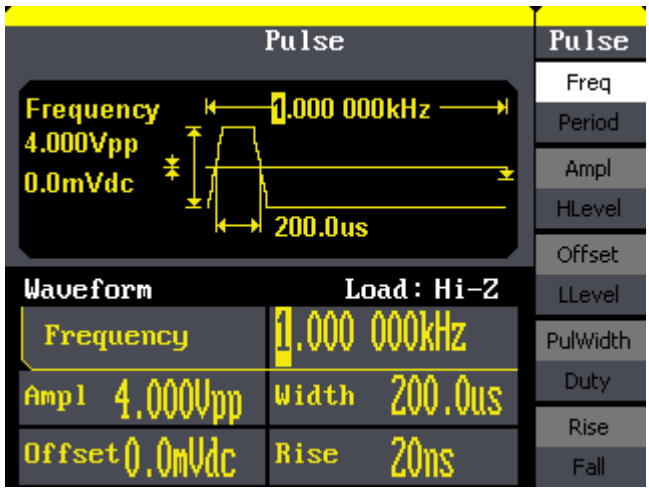


Figure 1- 10 Pulse Signal Display Interface

As is shown in Figure 1- 10, the default signal parameters are: 1kHz frequency, 4.0Vpp amplitude, 0Vdc offset, 200μs pulse width.

5. Press Noise button, and the waveform window displays noise waveform. SDG800 Series Generator can generate noise signal with a band width up to 10MHz.

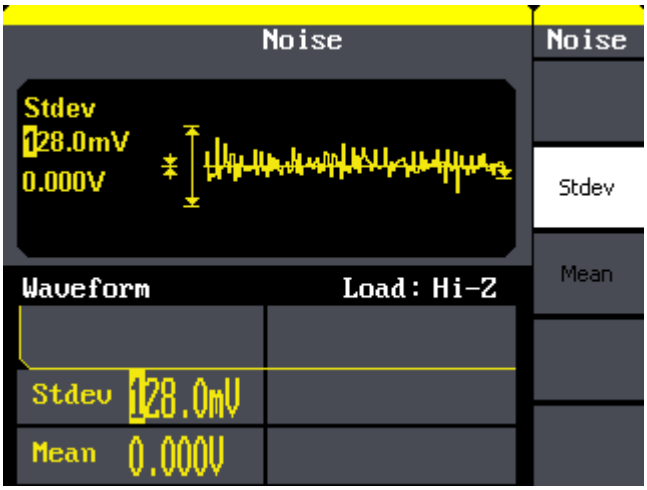


Figure 1- 11 Noise Signal Display Interface

As is shown in Figure 1- 11, the default signal parameters are: 128mV stdev and 0mV Mean.

6. Press Arb button, and the waveform window displays arbitrary waveform. SDG800 Series Generator can generate repeatable arbitrary waveform signals with at most 16K points and 5MHz frequency.

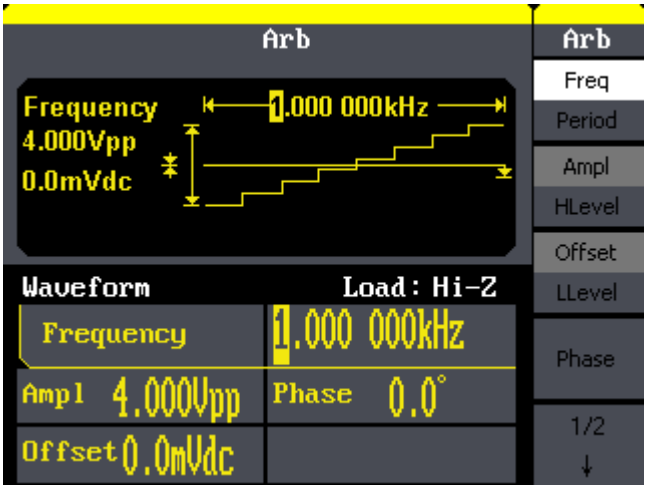


Figure 1- 12 Arbitrary Waveform Signal Display Interface

As is shown in Figure 1- 12, the default signal parameters are: 1kHz frequency, 4.0Vpp amplitude and 0mVdc offset.

1.5. To Set Modulate/Sweep/Burst

As shown in Figure 1- 13, there are three buttons on the front panel, which are used for modulation, sweep and burst settings. The instructions below will help you familiarize with the setting of these functions.

Figure 1- 13 Modulate/Sweep/Burst Button

1. Press Mod button, the modulated waveforms will be generated. The modulated waveform can be changed by modifying the parameters such as type, internal/external modulation, depth, frequency, waveform, etc. SDG800 Series can modulate waveform using AM, FM, PM, ASK, FSK, PWM and DSB-AM. Sine, square, ramp and arbitrary waveforms can be modulated (pulse, noise and DC can not be modulated).

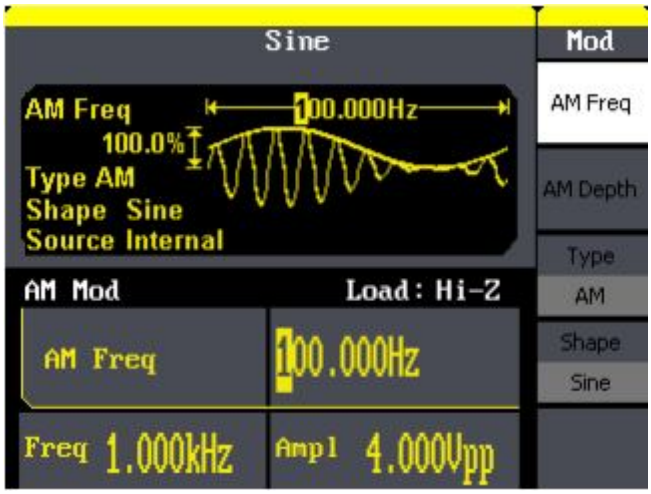


Figure 1- 14 Modulated Waveform Display Interface

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, SDG800 Series generate signal with variable frequencies.

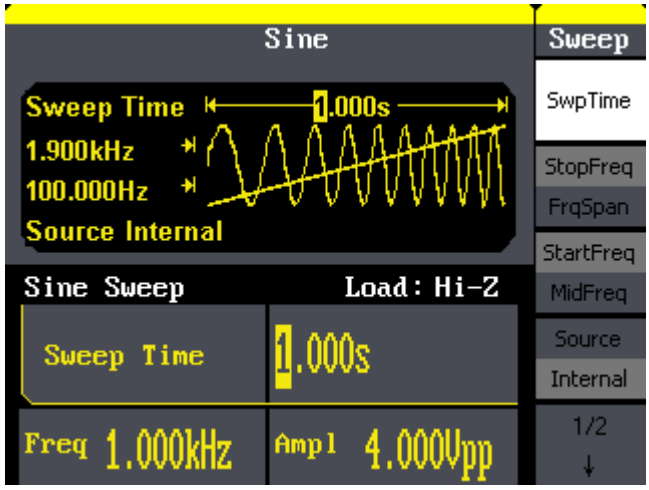


Figure 1- 15 Sweep Waveform Display Interface

3. Press Burst button, burst for sine, square, ramp, pulse or arbitrary waveform can be generated.

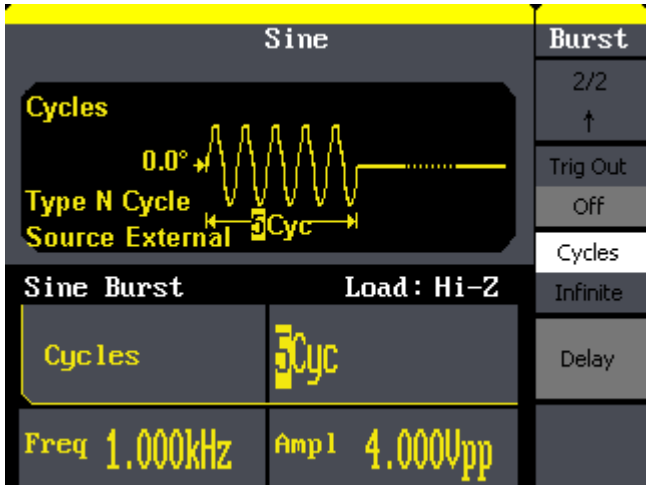


Figure 1- 16 Burst Waveform Display Interface

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.

1.6. To Set Output

As is shown in Figure 1- 17, there are two buttons on the right side of the operation panel, which are used to output/trigger control. The instruction below will help you familiarize with these functions.

Figure 1- 17 Output Buttons

Press Output button, activate or deactivate the output signal.

1.7. To Use Digital Input

As is shown in Figure 1- 18, there are three sets of buttons on the operation panel, which are direction button, the knob and the keypad. The instruction below will help you familiarize with the digital input function.

Figure 1- 18 Front Panel Digital Input

1. The up and down keys are used to shift parameters and the left and right keys are used to shift digits.
2. Keypad is used to directly set the parameters value.
3. Knob is used to change a signal digit value whose range is 0~9.

1.8. To Use Store/Utility/Help Function

As is shown in Figure 1- 19, 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- 19 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 read the help information.

2. Operating Your Generator

Up to now you have got a brief understanding about SDG800 series with the front/rear panel, every function control area and keys. You should also know how to set your Function/Arbitrary Waveform Generator for your usage. If you are not familiar with these operations, you are suggested to read chapter one 'Getting Started' again.

This chapter covers the following topics:

- Setting Sine Signal (Sine)
- Setting Square Signal (Square)
- Setting Ramp Signal (Ramp)
- Setting Pulse Signal (Pulse)
- Setting Noise Signal (Noise)
- Setting Arb Signal (Arb)
- Output Modulated Signal (Mod)
- Output Sweep Signal (Sweep)
- Output Burst Signal (Burst)
- Store/Recall (Store/Recall)
- Utility Setting (Utility)
- Help System (Help)

You are suggested to read this chapter carefully so as to understand SDG800 Series Generator's versatile waveform setting functions and more operation methods.

2.1. To Set Sine Signals

Press Sine button to call the sine operation. The sine waveform parameters are set by using the sine operation menu.

The parameters of sine waveforms are: frequency/period, amplitude/high level, offset/low level and phase. Different sine signals are generated by setting these parameters. As is shown in Figure 2- 1, in the soft key menu, select Freq. Cursor is located in the frequency parameter area in the parameter display window, and users can set the frequency value here.

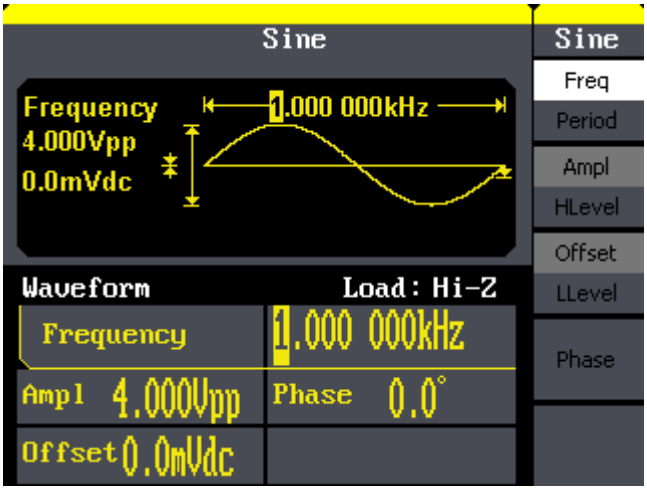


Figure 2- 1 Sine Parameter Display Interface

Figure 2- 2

Table2- 1 Menu Explanations of Sine Waveform

Function menu	Explanations
Freq/ Period	Set the signal frequency or period; The current parameter will be switched at a second press.
Ampl/ HLevel	Set the signal amplitude or high level; The current parameter will be switched at a second press.
Offset/ LLevel	Set the signal offset or low level; The current parameter will be switched at a second press.
Phase	Set the phase of the signal;

To Set the Output Frequency/Period

1. Press Sine →Freq, to set the frequency parameter.

   The frequency shown on the screen when the instrument is powered is the default value 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, to 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.

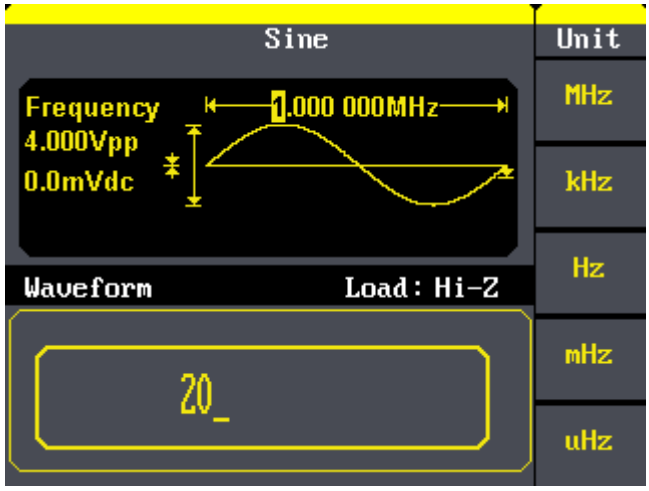


Figure 2- 3 Setting the Frequency

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.

To Set the Output Amplitude

1. Press Sine →Ampl, to set the amplitude.

   The amplitude shown on the screen when the instrument is powered is the default value 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 the Ampl/HLevel or Offset/LLevel button again, to switch into the high level or low level 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.

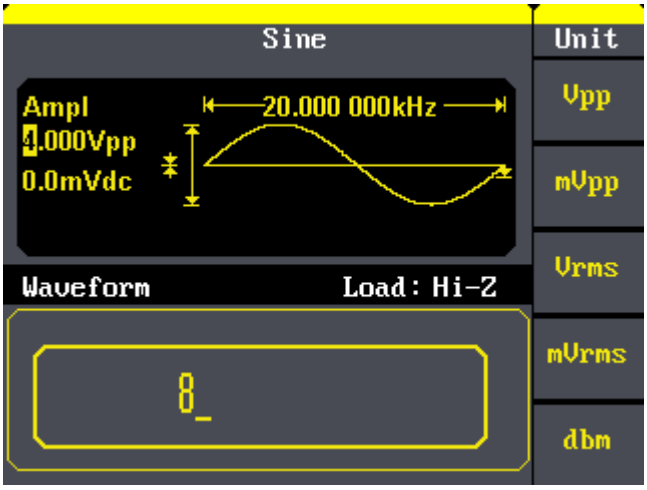


Figure 2- 4 Setting the Amplitude

To Set the Output Offset

1. Press Sine →Offset, to set the offset.

The offset shown on the screen when the instrument is powered is the default value 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.

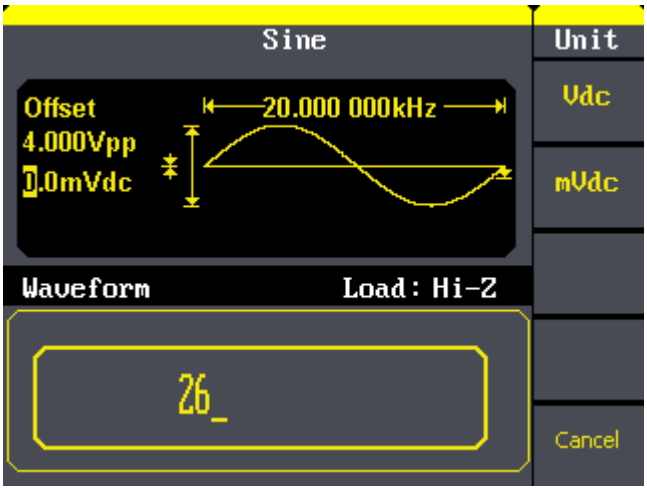


Figure 2- 5 Setting the Offset

2.2. To Set Square Signals

Press Square button to call the Square operation. The square waveform parameters are set by using the Square operation menu.

The parameters of Square waveforms are: frequency/period, amplitude/high level, offset/low level, phase and duty. As is shown in Figure 2- 6, select Duty. Cursor is located in the duty parameter area in the parameter display window, and users can set the duty value here.

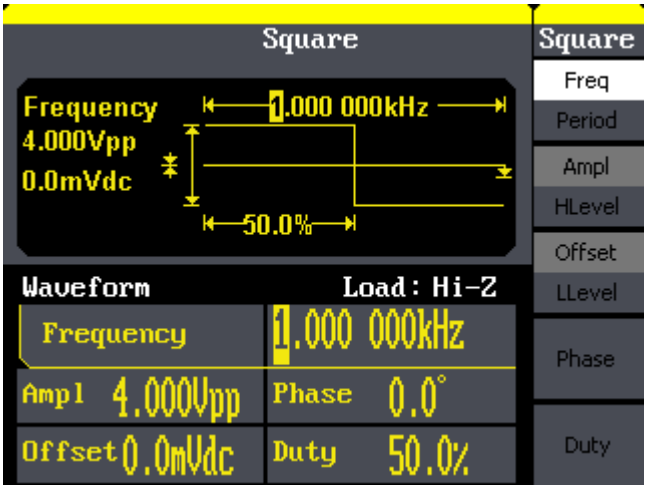


Figure 2- 6 Square Parameter Display Interface

Figure 2- 7

Table2- 2 Menu Explanations of Square Waveform

Function Menu	Settings	Explanation
Freq/ Period		Set the signal frequency or period; The current parameter will be switched at a second press.
Ampl/ HLevel		Set the signal amplitude or high level; The current parameter will be switched at a second press.
Offset/ LLevel		Set the signal offset or low level; The current parameter will be switched at a second press.
Phase		Set the phase of the signal;
Duty		Set the duty cycle for square waveform.

Term Explanation:

Duty Cycle: The percentage that the high level takes up the whole period.

Please Note : for the Frequency	Duty Cycle Value
Below 10MHz:	20% to 80%

To Set the Duty Cycle

1. Press Square →Duty, to set the duty cycle.

   The duty cycle shown on the screen when the instrument is powered is the default value 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.

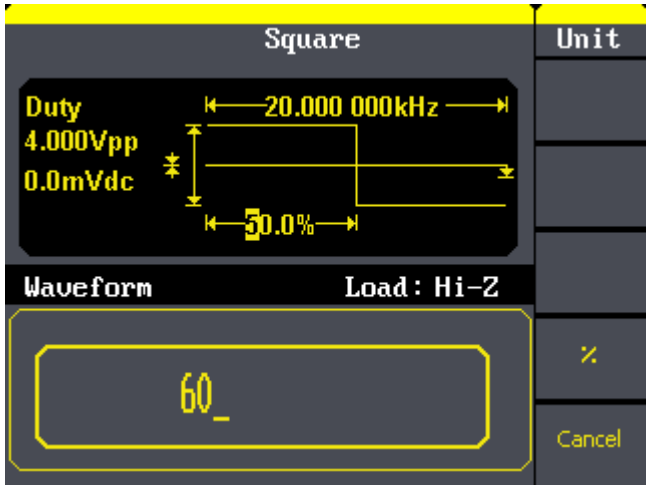


Figure 2- 8 Setting the Duty Cycle

2.3. To Set Ramp Signals

Press Ramp button to call the ramp operation. The ramp waveform parameters are set by using the ramp operation menu.

The parameters for ramp waveforms are: frequency/ period, amplitude/ high level offset/ low level, phase and symmetry. As is shown in Figure 2- 9, in the soft key menu, select Symmetry. Cursor is located in the symmetry parameter area in the parameter display window, and users can set the symmetry value here.

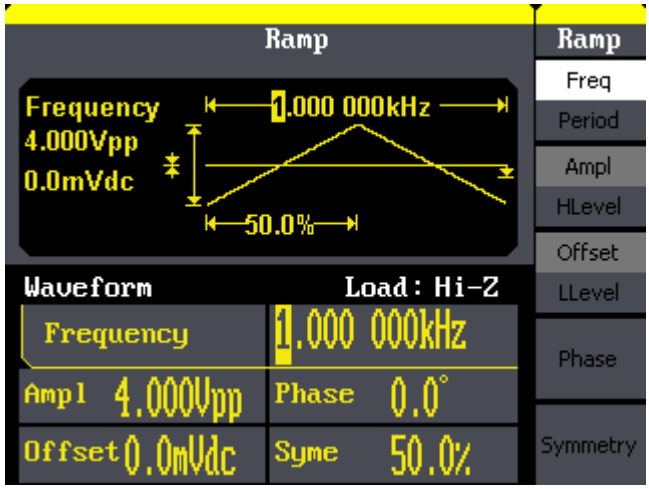


Figure 2- 9 Ramp Parameter Display Interface

Figure 2- 10

Table2- 3 Menu Explanations of Ramp Waveform

Function Menu	Settings	Explanation
Freq/ Period		Set the signal frequency or period; The current parameter will be switched at a second press.
Ampl/ HLevel		Set the signal amplitude or high level; The current parameter will be switched at a second press.
Offset/ LLevel		Set the signal offset or low level; The current parameter will be switched at a second press.
Phase		Set the phase of the signal;
Symmetry		Set the symmetry for ramp waveform.

Term Explanation:

Symmetry: The percentage that the rising period takes up the whole Period.

Input Range: 0~100%.

To Set the Symmetry

1. Press Ramp →Symmetry, to set the symmetry.

   The symmetry shown on the screen when the instrument is powered is the default value 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.

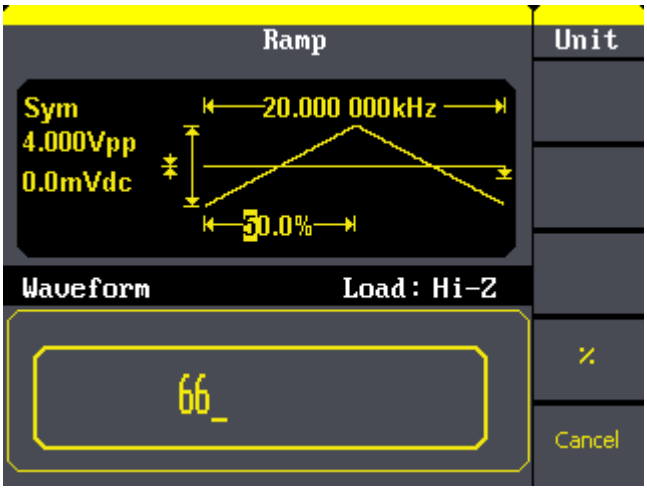


Figure 2- 11 Setting the Symmetry

2.4. To Set Pulse Signals

Press Pulse button to call the pulse operation. The pulse waveform parameters are set by using the pulse operation menu.

The parameters for pulse waveforms are: frequency/period, amplitude/high level, offset/low level, pulse width/Duty and Rise/Fall. As is shown in Figure 2- 12, in the soft key menu, select PulWidth. Cursor is located in the pulse width parameter area in the parameter display window, and users can set the pulse width value here.

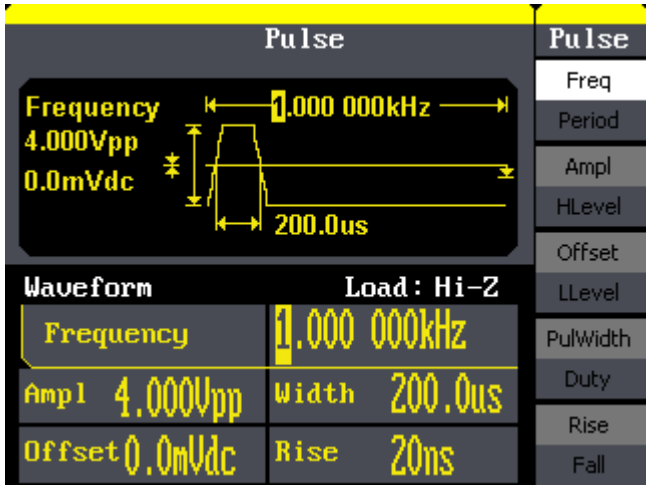


Figure 2- 12 Pulse Parameter Display Interface

Figure 2- 13

Table 2- 4 Menu Explanations of Pulse Waveform

Function Menu	Explanation
Freq/ Period	Set the signal frequency or period; The current parameter will be switched at a second press.
Ampl/ HLevel	Set the signal amplitude or high level; The current parameter will be switched at a second press.
Offset/ LLevel	Set the signal offset or low level; The current parameter will be switched at a second press.
PulWidth /Duty	Set the signal pulse width or duty; The current parameter will be switched at a second press.
Rise / Fall	Setting the rising edge for pulse waveform. Setting the falling edge 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.

To Set the Pulse Width

1. Press Pulse →PulWidth, to set the pulse width.

   The pulse width shown on the screen when the instrument is powered is the default value 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.

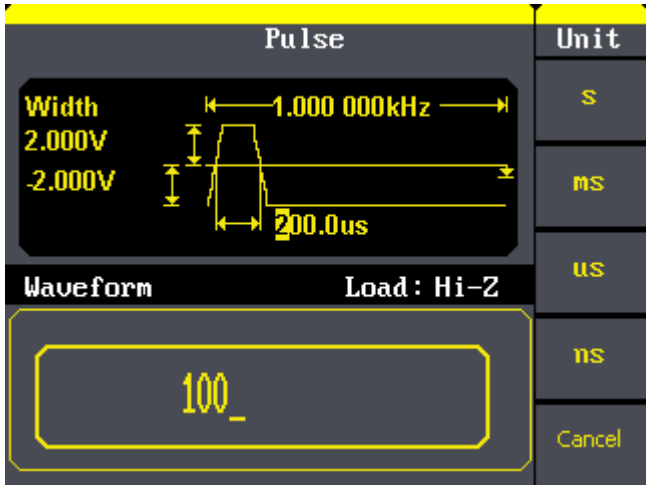


Figure 2- 14 Setting the Pulse Width

To Set the Rising Edge

1. Press Pulse →Rise, to set the Rise edge.

   The rising edge shown on the screen when the instrument is powered is the default value 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 rising edge

   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.

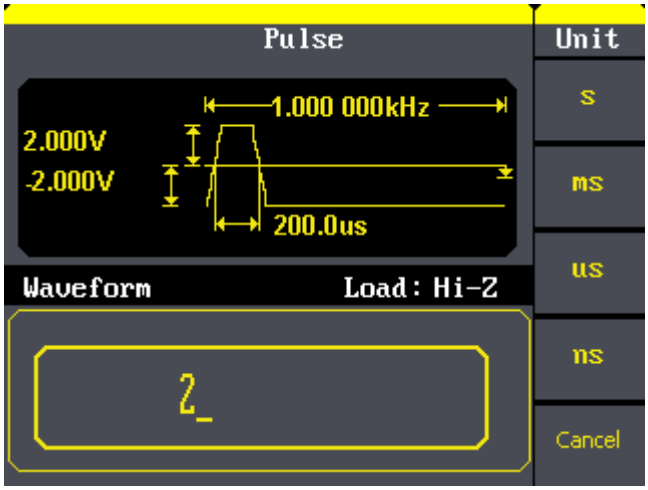


Figure 2- 15 Setting the Rise edge

2.5. To Set Noise Signals

Press Noise button to call the Gaussian White noise operation. The noise waveform parameters are set by using the noise operation menu.

The parameters for noise waveforms are: Stdev and mean. As is shown in Figure 2- 16, in the soft key menu, select Stdev, Cursor is located in the Stdev parameter area in the parameter display window, and users can set the Stdev value here. Noise is non-regulated signal which has no frequency or period.

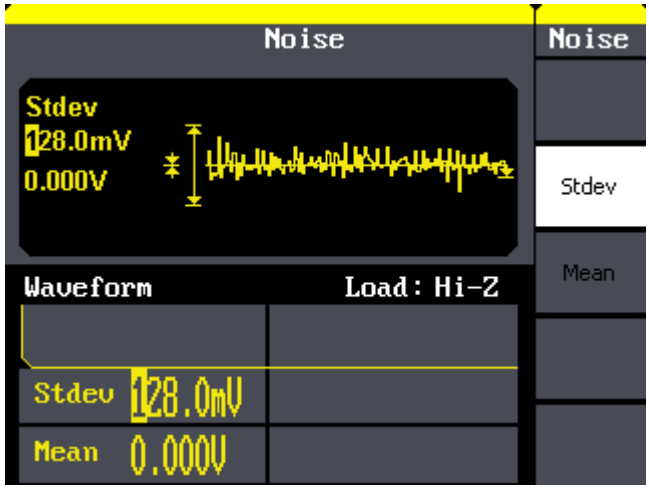


Figure 2- 16 Noise Parameter Display Interface

Figure 2- 17

Table 2- 5 Menu Explanations of Noise Waveform

Function Menu	Settings	Explanation
Stdev		Set the signal standard deviation
Mean		Set the signal mean

2.6. To Set Arbitrary Signals

Press Arb button to call the Arb operation. The Arb waveform parameters are set by using the Arb operation menu.

The Arb signal consists of two types: the system built-in waveform and the user-definable waveform. The parameters for Arb waveforms are: frequency/period, amplitude/high level, offset/ low level and phase.

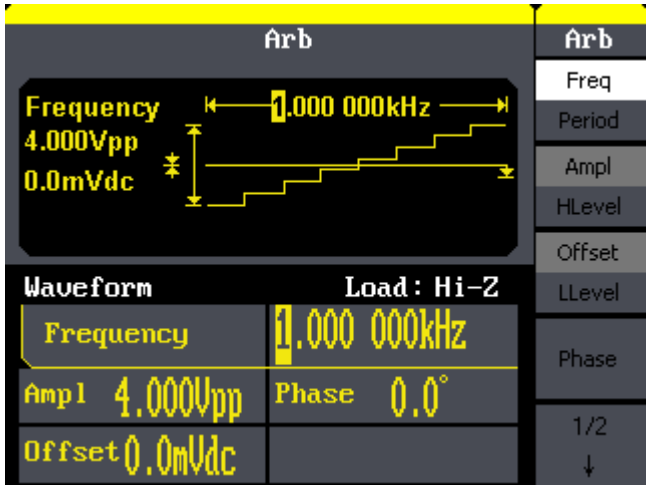


Figure 2- 18 Arb Parameter Display Interface

Figure 2- 19

Table 2- 6 Menu Explanations of Arb Waveform (Page 1/2)

Function Menu	Settings	Explanation
Freq/ Period		Set the signal frequency or period; The current parameter will be switched at a second press.
Ampl/ HLevel		Set the signal amplitude or high level; The current parameter will be switched at a second press.
Offset/ LLevel		Set the signal offset or low level; The current parameter will be switched at a second press.
Phase		Set the phase of the signal;

Figure 2- 20

Table 2- 7 Menu Explanations of Arb Waveform (Page 2/2)

Function Menu	Settings	Explanation
Load Wform		Select the built-in arbitrary signal as output.

To select the built-in Arbitrary Waveform

There are forty-eight built-in Arbitrary Waveforms and user-definable Arbitrary Waveforms inside the Generator. To select one of them, follow the instructions below:

Press Arb →Load Wform, to enter the interface below.

Figure 2- 21

Table 2- 8 Menu Explanations of Built-in Arbitrary Waveform

Function Menu	Settings	Explanation
Built-In		Select one of the 46 types built-in arbitrary waveforms.
Stored Wforms		Select one of arbitrary waveforms stored in the non-volatile memory.
Cancel		Cancel the current operation, and return to the upper menu (the followings are the same and will not be explained).

1. To Select the Built-in Waveform

Press Arb →Load Wform->Built-In, and enter the following interface.

As is shown in Figure 2- 22, there are five kinds of arbitrary waveform.

Figure 2- 22

Table 2- 9 Menu Explanations of Built-In Arbitrary Waveform

Function Menu	Settings	Explanation
Common		Select common waveform.
Math		Select math waveform.
Project		Select project waveform.
Winfun/ Triangle		Select windows function /triangle waveform.
Select		Validate the built-in waveform.

Figure 2- 23 Common Built-In Arbitrary Waveform interface

Table 2- 10 Menu Explanations of Common Built-In Arbitrary Waveform

Function Menu	Settings	Explanation
StairUp		Select the built-in stair up waveform.
StairDn		Select the built-in stair down waveform.
StairUD		Select the built-in stair up and down waveform.
PPulse		Select the built-in positive pulse waveform.
NPulse		Select the built-in negative pulse waveform.
Trapezia		Select the built-in trapezoid waveform
UpRamp		Select the built-in up ramp waveform.
DnRamp		Select the built-in down ramp waveform.

Figure 2- 24 Math Built-In Arbitrary Waveform Interface

Table 2- 11 Menu Explanations of Math Built-in Arbitrary Waveform

Function Menu	Settings	Explanation
ExpFall		Select the built-in exponential fall waveform.
ExpRise		Select he built-in exponential rise waveform.
LogFall		Select the built-in logarithmic fall waveform.
LogRise		Select the built-in logarithmic rise waveform.
Sqrt		Select the built-in square root waveform.
Root3		Select the built-in Root3 waveform.
X^2		Select the built-in X^2 waveform.
X^3		Select the built-in X^3 waveform.
Sinc		Select the built-in sinc waveform; Sinc＝sin(x)/x.
Gaussian		Select the built-in gaussian waveform.
Dlorentz		Select the built-in D-lorentz waveform.
Haversin		Select the built-in haversine waveform.
Lorentz		Select the built-in lorentz Waveform.
Gauspuls		Select the built-in gaussian-modulated sinusoidal pulse waveform.
Gmonpuls		Select the built-in Gaussian monopulse waveform.
Tripuls		Select the built-in triangle pulse waveform.

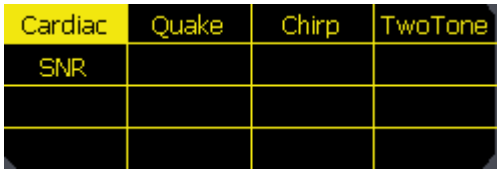


Figure 2- 25 Project Built-In Arbitrary Waveform interface

Table 2- 12 Menu Explanations of Project Built-in Arbitrary Waveform

Function Menu	Settings	Explanation
Cardiac		Select the built-in electrocardiogram (ECG) signal waveform.
Quake		Select the built-in loma prieta earthquake waveform.
Chirp		Select the built-in swept-frequency cosine waveform.
TwoTone		Select the built-in two tone signal waveform.
SNR		Select the built-in sin wave with white noise waveform.

Figure 2- 26 Winfun/Triangle Built-In Arbitrary Waveform interface

Table 2- 13 Menu Explanations of Winfun/Triangle Built-in Arbitrary Waveform

Function Menu	Settings	Explanation
Hamming		Select the built-in hamming window waveform.
Hanning		Select the built-in hanning window waveform.
Kaiser		Select the built-in kaiser window waveform.
Blackman		Select the built-in blackman windows waveform.
Gaussian		Select the built-in gaussian window waveform.
Triangle		Select the built-in triangle window waveform.
Hairs		Select the built-in hairs window waveform.
Bartlett		Select the built-in bartlett window waveform.
Tan		Select the built-in tangent waveform.
Cot		Select the built-in cotangent waveform.
Sec		Select the built-in secant waveform.
Csc		Select the built-in cosecant waveform
Asin		Select the built-in inverse sine waveform.
Acos		Select the built-in inverse cosine waveform.

Atan		Select the built-in tangent waveform.
Acot		Select the built-in inverse cotangent waveform.

2. To Select the Stored Waveform

Press Arb →Load Wform->Stored Wforms, and enter the following interface.

As is shown in Figure 2- 27, use the direction keys or knob to choose the corresponding arbitrary waveform and press Select.

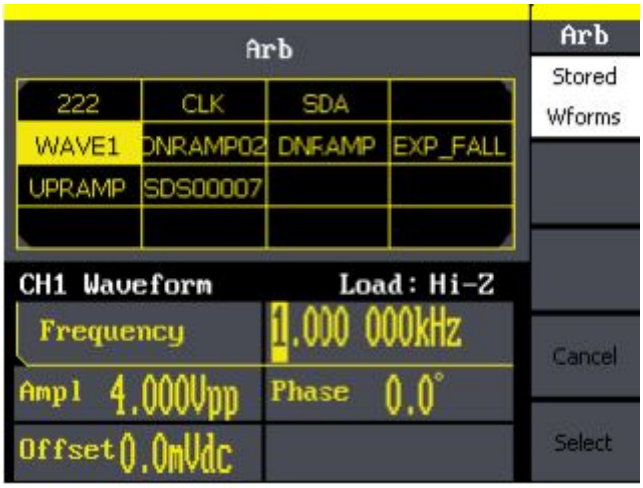


Figure 2- 27 Stored Wform Display Interface

2.7. To Generate the Modulated Waveform

Use the Mod button to generate modulated waveform.SDG800 Series can generate AM, FM, ASK, FSK, PM, PWM and DSB-AM modulated waveforms. Modulating parameters vary with the types of the modulation. In AM, users can set the depth, modulating frequency, modulating waveform and carrier waveform; In FM, users can set themodulating frequency, frequency deviation, modulating waveform and carrier waveform; In ASK, users can set the Key Freq and carrier waveform; In FSK, users can set the key frequency, Hop Freq and carrier waveform; In PM, users can set the phase deviation, modulating frequency, modulating waveform and carrier waveform.

We will cover how to set these parameters in details according to the modulation types.

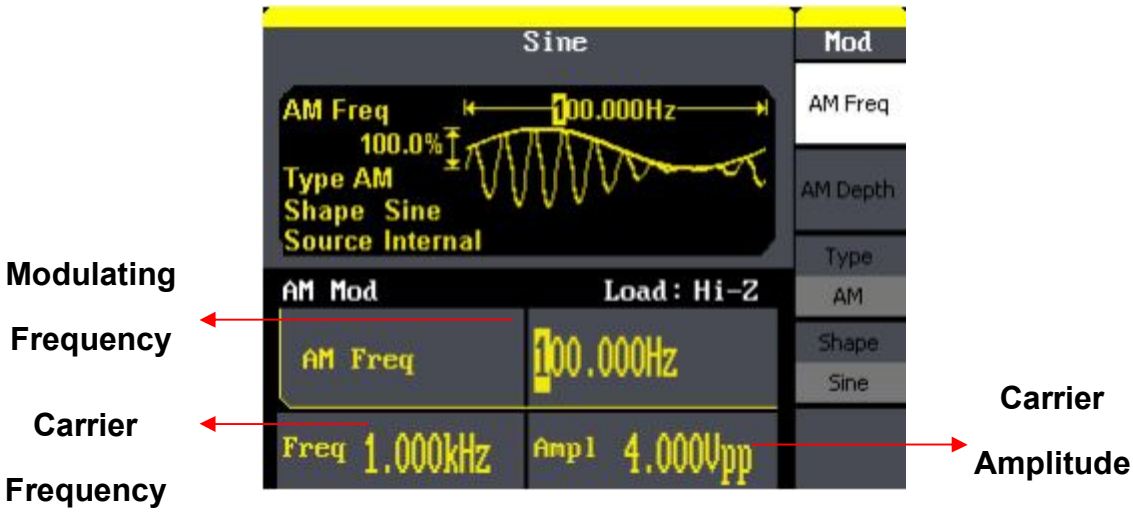


Figure 2- 28 Display Interface of Modulated Waveform Parameter

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 in Figure 2- 29

Press Mod →Type→ AM, to enter the following menu.

Figure 2- 29

Table 2- 14 Menu Explanations of the AM Parameters

Function Menu	Settings	Explanation
AM Freq		Set the modulating waveform frequency. Frequency range: 2mHz~20kHz (internal source only).
AM Depth		Set the amplitude range.
Type	AM	Amplitude modulation.
Shape	Sine Square Triangle UpRamp DnRamp Noise Arb	Choose the modulating waveform. To change the carrier waveform parameter, press Sine, Square, Ramp, Arb

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.**

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 as shown in Figure 2- 30.

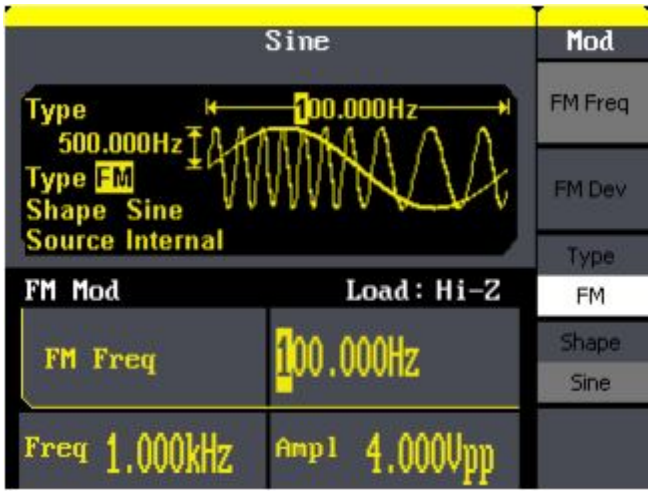


Figure 2- 30 Setting Interface of FM Waveform Parameter

Press Mod →Type→ FM, to enter the following menu.

Figure 2- 31

Table 2- 15 Menu Explanations of the FM Parameters

Function Menu	Settings	Explanation
FM Freq		Set the modulating waveform frequency. Frequency range 2mHz~20kHz (internal source).
FM Dev		Set the maximum frequency deviation
Type	FM	Frequency modulation
Shape	Sine Square Triangle UpRamp DnRamp Noise Arb	Choose the modulating waveform. To change the carrier waveform parameter, press Sine, Square, Ramp, Arb

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.**

ASK

ASK is a form of modulation that represents digital data as variations in the amplitude of a carrier wave. The amplitude of an analog carrier signal varies in accordance with the bit stream (modulating signal), keeping frequency and phase constant. The parameters for the ASK are as shown in Figure 2- 32

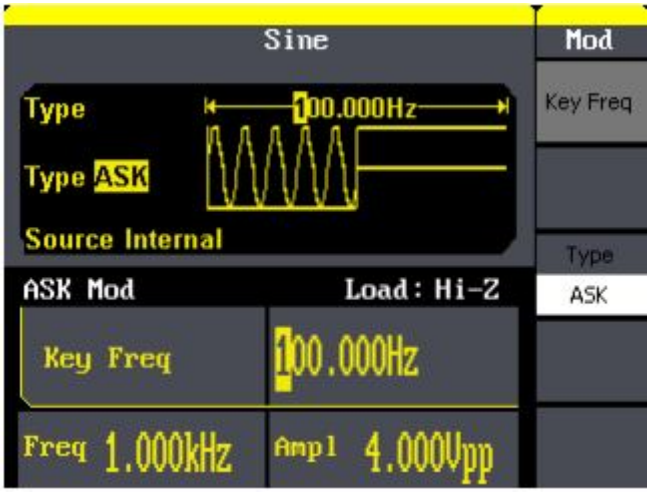


Figure 2- 32 Setting Interface of ASK Waveform Parameter

Press Mod →Type→ ASK, to enter the following menu.

Figure 2- 33

Table 2- 16 Menu Explanations of the ASK Parameters

Function Menu	Settings	Explanation
Key Freq		Set the frequency at which the output amplitude shifts between the carrier amplitude and zero (internal modulation only): 2mHz~50kHz.
Type	ASK	Amplitude shift keying modulation.

FSK

The FSK Modulation is a modulation method, the output frequency of which switches between two the pre-set frequencies (carrier waveform frequency and the hop frequency). The frequency at which the output frequency switches is called the key frequency.

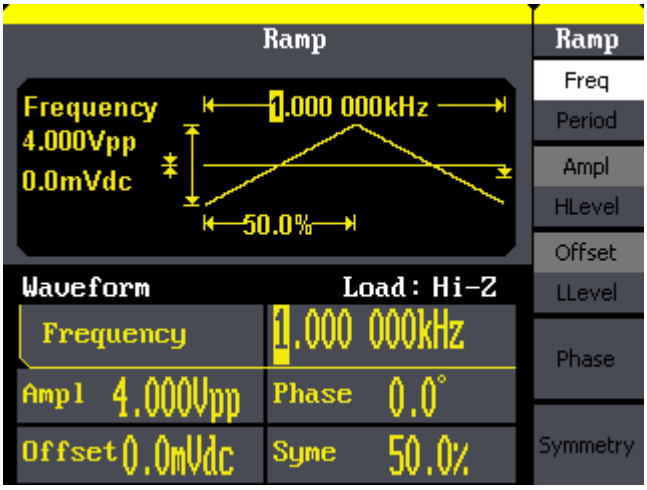


Figure 2- 34 Setting Interface of FSK Waveform Parameter

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

Figure 2- 35

Table 2- 17 Menu Explanations of the FSK Parameters

Function Menu	Settings	Explanation
Key Freq		Set the frequency at which the output frequency shifts between the carrier frequency and the hop frequency (internal modulation only): 2mHz~50kHz.
Type	FSK	Frequency shift keying modulation.
Hop Freq		Set the hop frequency.

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- 36.

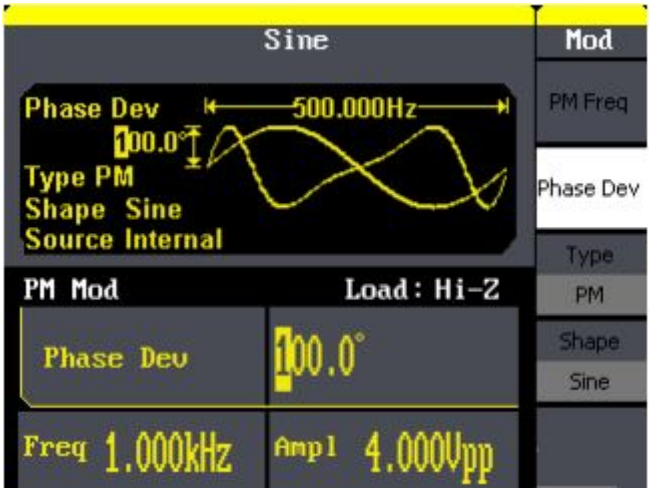


Figure 2- 36 Setting Interface of PM Waveform Parameter

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

Figure 2- 37

Table 2- 18 Menu Explanations of the PM Parameters

Function Menu	Settings	Explanation
PM Freq		Set the modulating waveform frequency. Frequency range: 2mHz~20kHz
Phase Dev		Range from 0° ~ 360°.
Type	PM	Phase modulation
Shape	Sine Square Triangle UpRamp DnRamp Noise Arb	Choose the modulating waveform. To change the carrier waveform parameter, press Sine, Square, Ramp, Arb

PWM

The modulated waveform consists of two parts: the carrier waveform and the modulating waveform, the carrier waveform is only pulse. In PWM, the pulse width of pulse varies with the instantaneous voltage of the modulating waveform. The parameters for the FM are as shown in Figure 2- 38.

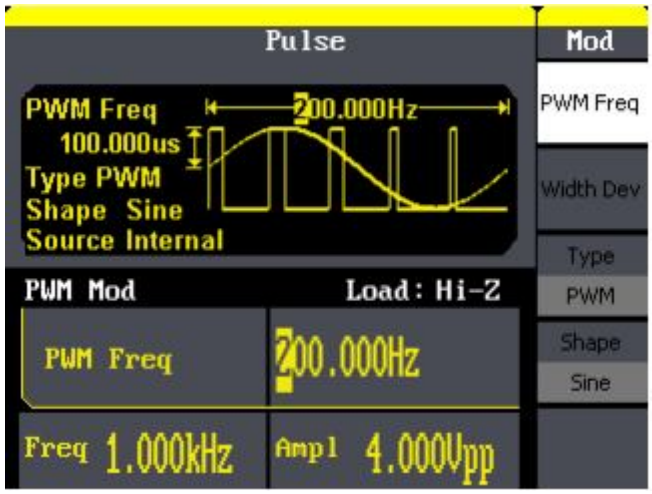


Figure 2- 38 Setting Interface of PWM Waveform Parameter

Press Mod→ Pulse →PWM, to enter the following menu.

Figure 2- 39

Table 2- 19 Menu Explanations of the PWM Parameters

Function Menu	Settings	Explanation
PWM Freq		Set the modulating waveform frequency. 2mHz~20kHz
Width Dev Duty Dev		Set the width or Duty range.
Type	PWM	Amplitude modulation.
Shape	Sine Square Triangle UpRamp DnRamp Noise Arb	Choose the modulating waveform. The carrier waveform is pulse.

DSB-AM

Press Mod→ Type →DSB-AM. The parameters for the DSB-AM are as shown in Figure 2- 40.

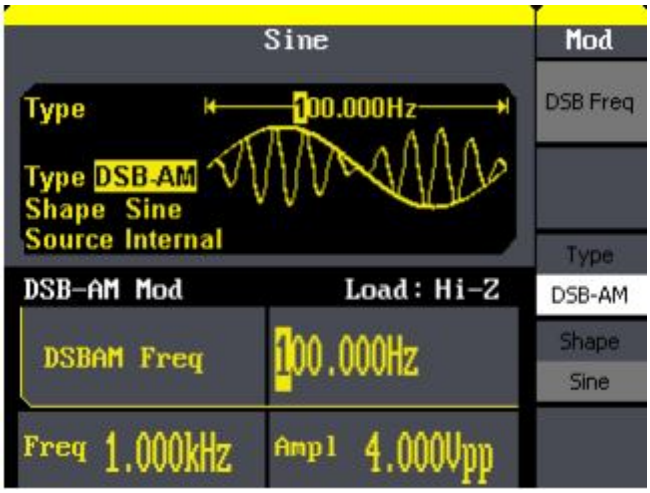


Figure 2- 40 Setting Interface of DSB-AM Waveform Parameter

Figure 2- 41

Table 2- 20 Menu Explanations of the DSB-AM Parameters

Function Menu	Settings	Explanation
DSB Freq		Set the modulating waveform frequency. Frequency range: 2mHz~20kHz
Type	DSB-AM	Amplitude modulation.
Shape	Sine Square Triangle UpRamp DnRamp Noise Arb	Choose the modulating waveform. To change the carrier waveform parameter, press Sine, Square, Ramp, Arb

2.8. To Generate Sweep

In the frequency sweep mode, the function generator 'steps' from the start frequency to the stop frequency at the sweep time you specify. Sweep can be generated by sine, square, ramp or arbitrary waveforms (pulse, noise and DC are not allowed).

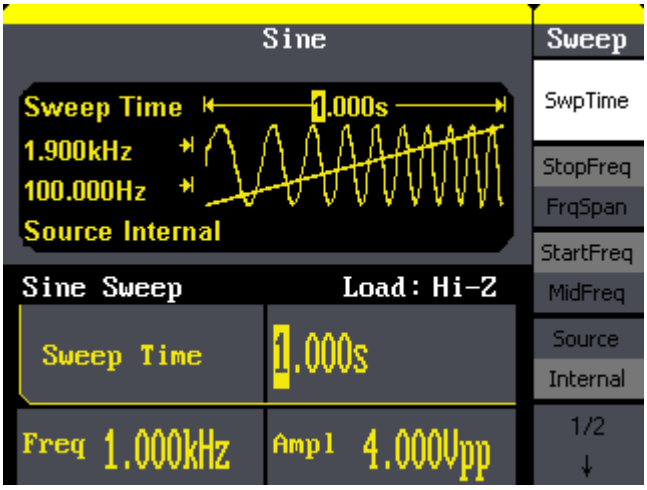


Figure 2- 42 Setting Interface of Sweep Waveform Parameter

Press Sweep button to enter the following menu. Set the waveform parameters by using the operation menu.

Figure 2- 43

Table 2- 21 Menu Explanations of Waveform Sweep (Page 1/2)

Function Menu	Settings	Explanation
Swp Time		Set the time span of the sweep in which the frequency changes from the start frequency to stop frequency.
Stop Freq Freq Span		Set the stop frequency of the sweep; Set the frequency span of the sweep.
Start Freq Mid Freq		Set the start frequency of the sweep; Set the center frequency of the sweep.
Source	Internal	Choose internal source.
	External	Choose external source.
	Manual	Set the start and stop time by hand.

Sweep Frequency Setting

Use start freq and stop freq or center freq and freq span to set the range of the frequency. Press the button again to switch between each other.

Figure 2- 44

Table 2- 22 Menu Explanations of Waveform Sweep (Page 2/2)

Function Menu	Settings	Explanation
Linear/ Log		Set the sweep with linear spacing; Set the sweep with logarithmic spacing.
Direct	↑ ↓	Sweep upward; Sweep downward.

2.9. To Generate Burst

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

Press Burst button to enter the following interface. Set the waveform parameters by using the operation menu.

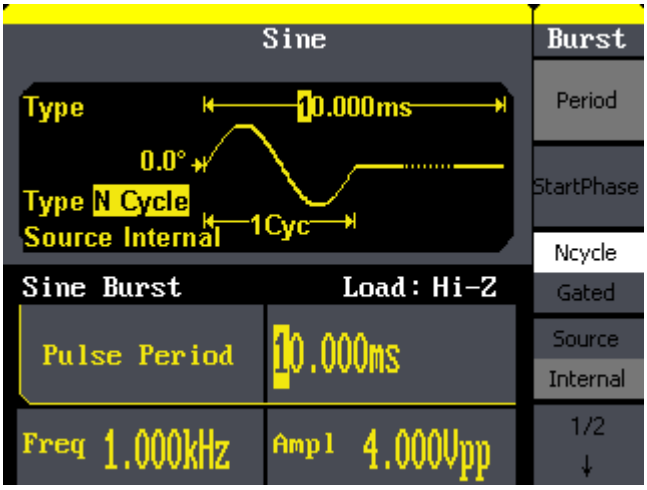


Figure 2- 45 Setting Interface of Burst Waveform Parameter

Set the N-Cycle Burst

Press Burst → N Cycle, to enter the following interface.

Figure 2- 46

Table 2- 23 Menu Explanations of the N-Cycle Parameters(Page 1/2)

Function Menu	Settings	Explanation
Period		Set the burst Period.
Start Phase		Set the start phase of the burst.
NCycle Gated		Use the N-Cycle mode. Use the Gated mode.
Source	Internal	Choose internal source.
	External	Choose external source.
	Manual	Choose external source, set the start time by hand.

Burst Period

Set the time span between an N-Cycle burst and the next. If necessary the period will increase to allow the specific number of cycles in a burst. Burst Period>Carrier Period × Burst Number

Start Phase

Define the start point in a waveform. The phase varies from 0° to 360°, and the default setting is 0°. For an Arbitrary Waveform, 0° is the first waveform point.

N-Cycle/Gated

N-Cycle has specific number of waveform cycles, and every burst is activated by a trigger event. Gated burst use external source to control burst as when to be activated.

Figure 2- 47

Table 2- 24 Menu Explanations of the N-Cycle Parameters (Page2/2)

Function Menu	Settings	Explanation
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.
Delay		Set the delay time before the burst starts.

Cycles

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 generated which will not stop until a trigger event happens.

- **If needed, Burst Period will increase to cater to the specific number of cycles.**
- **For an infinite-cycle burst, external or manual trigger is needed to activate burst.**

Delay

Set the time delay between the trigger input and the start of the N-Cycle burst.

The max delay is 240ns.

Set the Gated Burst

Press Burst →Gated, to enter the following interface.

Figure 2- 48

Table 2- 25 Menu Explanations of the Gated Burst Parameters

Function Menu	Settings	Explanation
NCycle Gated		Set the NCycle mode; Set the gated mode.
Polarity	Positive Negative	Set the polarity for the gated signal.

2.10. To Store and Recall

Press Store/Recall button to enter the following interface. You can save or recall the state documentation inside the generator. The state file on the U Disk is also allowed to recall or delete. File names can only be English. User can only recall or delete the data documentation you save via CSV of the Oscilloscopes.

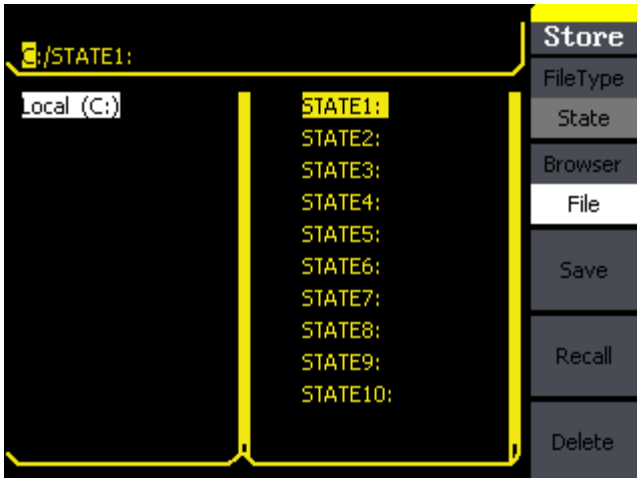


Figure 2- 49 Save and Read Interface

Figure 2- 50

Table 2- 26 Menu Explanations of Save and Recall (Page 1/2)

Function Menu	Settings	Explanation
File Type	State Data	The setting of the generator; Arbitrary waveform file;
Browser	Directory File	Shift between the directory and file.
Save		Save the waveform to the appointed place.
Recall		Recall the waveform or setting information in the specific position of the memory.
Delete		Delete the selected file.

About the browser

The directory selection shift is done by the direction keys. In the directory mode, pressing the right key will open the lower directory while the left key will fold the directory. Up and down key are used to shift between the directories;

To Save the Instrument State

Users are allowed to store the instrument state in any of the 10 non-volatile memories. The state storage will 'memorize' the selected function (including the arbitrary waveform, frequency, amplitude, DC offset, duty cycle, symmetry, and other modulation parameter used.)

To save the instrument state, the procedures are given as followed:

1. Choose the file type to store

   Press Store/Recall →Type→ State, and choose state as the storage type.

2. Choose the location of the file.

   There are ten positions in the Local(C :), choose anyone of them by rotating the knob.

3. Name the file and save it

   Press Save button, enter the desired name. Press Save to finish.

To Use USB Storage

As is shown in Figure 2- 51, the storage location is divided into: The internal storage Local(C :) and the U Disk storage USB Device (A :). At the left side of the front panel, there is a USB interface. When a USB storage is connected, the storage menu will show 'USB Device (A:)'. Otherwise, the default location is the internal location Local(C :).

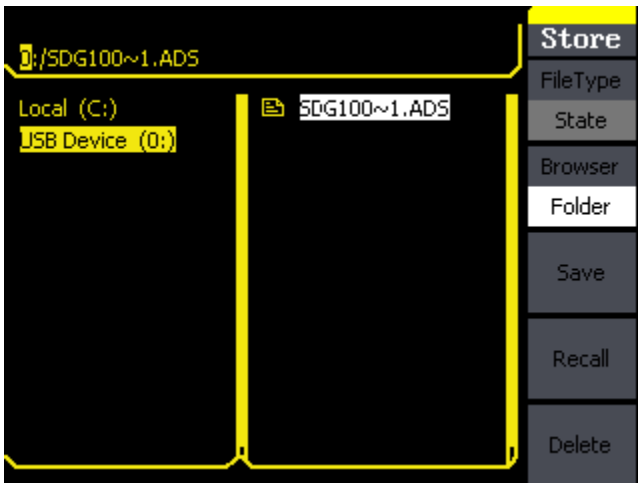


Figure 2- 51 USB Storage Interface

1. Install the USB Device

   Insert the USB Device into the USB interface on the front panel, and the screen will show 'USB flash device plug in', and storage menu will show 'USB Device (A :)'

2. Choose the USB Device

   Press Browser->Directory, move the cursor with the up or down direction key to select 'USB Device (A :)'. Press the right key to open the lower directory, use the up and down direction key to choose the file 'SDG800'. Use the right key to open the lower directory, and up and down key to select the file 'Workspace'. Input the file name and save.

3. Remove the USB Device

   Remove the USB Device from the interface. The system will inform you 'USB flash device plug out', and the 'USB Device (A :)' in the storage menu will disappear.

Note: USB Device can only be used by U Disk; portable hard disk is not supported.

To Save a File

Press Store/Recall →Store, to enter the following interface. Enter the desired file name in the 'File Name' frame. In the middle of the figure below is the input keypad, used to edit the file name. Use the up and down direction keys and knob to select the desired character; use the left and right direction keys to edit the input file name.

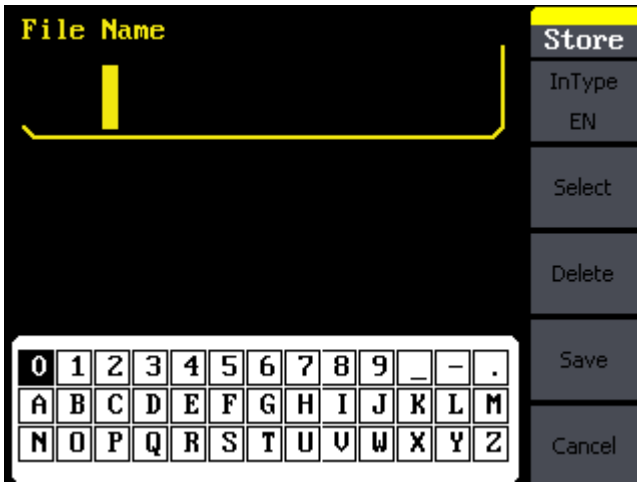


Figure 2- 52 File Storage Interface

Figure 2- 53

Table 2- 27 Menu Explanation of File Storage

Function Menu	Settings	Explanation
Input Type	En	English input.
Select		Select the current character.
Delete		Delete the current character.
Save		Store the file with the current name

1. English Input

The English input interface is as shown in Figure 2- 54, to save a file named 'NEWFILE', follow the steps below:

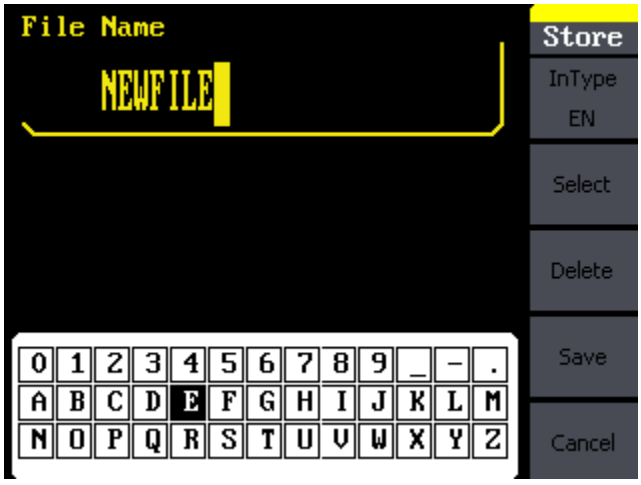


Figure 2- 54 English Input Interface

(1) Press InType->En, to enter the English interface.

(2) Input the file name' NEWFILE'.

Use the Knob to adjust the cursor's horizontal position and the up and

down key to adjust the vertical position. Select the Character ‘N’ and press Select. Repeat this until you have inputted ‘NEWFILE’.

(3) Edit the File Name

When you have entered a wrong character, move the cursor to the wrong character to be deleted and press Delete to remove it. Reenter the file name.

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

2.11. 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. Output Setting provides the parameter setting for Load/HighZ and Normal/Inverse. The System Setting provides the setting for Language, Display, Beep, Screen Guard, Format, Power System Configure and default setting; Test provides the self-testing and calibration function.

Press Utility button, to enter the Utility Menu. Its functions are listed below in Figure 2- 55

Figure 2- 55

Table 2- 28 Menu Explanations of Utility System Setting (Page1/2)

Function Menu	Settings	Explanation
DC	On Off	Set the output waveform to be DC. Set the output waveform to be arbitrary.
Output Setup		Set the output parameter.
Sync		Set the sync output

Figure 2- 56

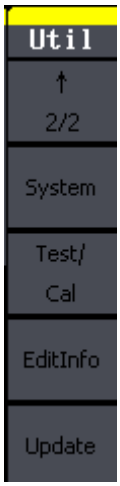


Table 2- 29 Menu Explanations of Utility System Setting (Page2/2)

Function Menu	Settings	Explanation
System		Set the system configuration.
Test/Cal		Test and calibrate the instrument.
EditInfo		Information of the system.
Update		Update function.

To Set the DC Output

Press Utility →DC→DC On, to enter the following interface. Please note that there is a 'DC On' sign at the middle left of the screen.

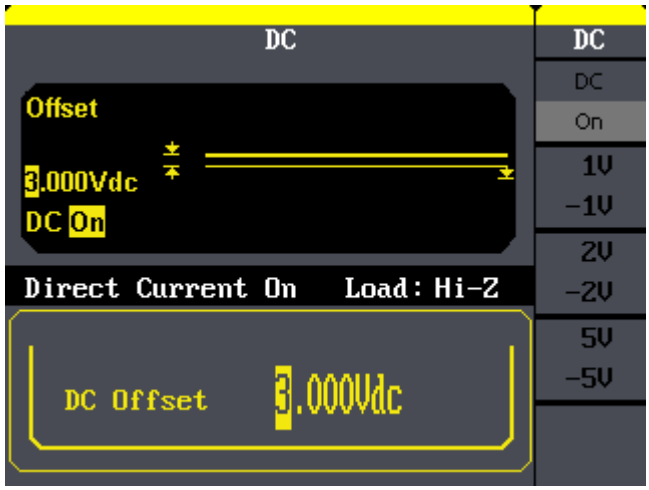


Figure 2- 57 DC Setting Interface

DC Offset

Set the DC voltage level.

To Shift into the Arbitrary Waveform Output

1. Press Utility →DC→DC Off, to close DC output and return to arbitrary waveform output.
2. Press any functional button, and the waveform output setting turns into the arbitrary waveform output. The DC output is turned off automatically.

To Set IO

Press Utility →IO Setup, to set the IO interface. The equipment stands for RAW protocol and TMC protocol, user may setup corresponding protocol by IO Setup.

To Set Output Parameter

Press Utility →Output Setup, to enter the following interface.

Figure 2- 58

Table 2- 30 Menu Explanations of Output Setting (Page 1/2)

Function Menu	Settings	Explanation
Load HighZ		Set the load connected to the Output Connector; Set the load connected to the Output Connector to be HighZ.
Normal Invert		Normal output; Inverse output.

1. To Set the Output Load

For the [Output] connector on the front panel, the generator has a built-in 50Ω series impendence. If the actual load does not match the set one, the displayed amplitude and offset will be incorrect. This function is used to match the displayed voltage with the expected one.

Steps for setting the load:

Press Utility →Output Setup→ Load, to enter the following interface.

Please note that the load parameter shown on the right bottom is the default setting when the power is on or the pre-set load value. If the current value is valid for the output, then current value will be used.

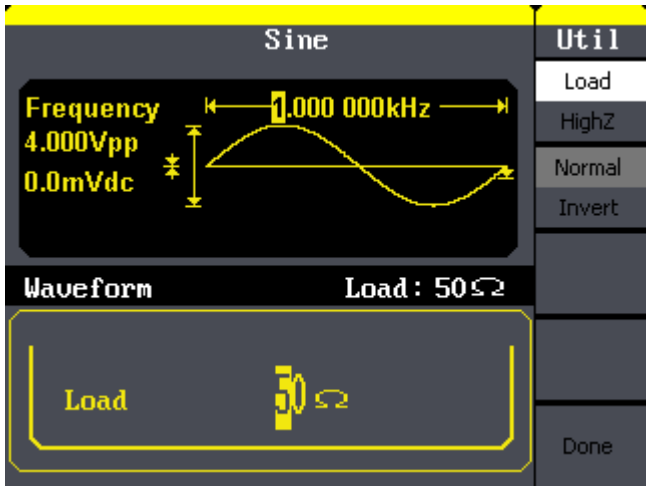


Figure 2- 59 Set the Output Load

Instruction

SDG800 Series has a fixed 50Ω Series Impendence. No matter what value the set parameter is, if the real load is different from the set one, the displayed

voltage will not equal the real voltage.

2. To Set the Invert Waveform

Press Utility →Output Setup→ Invert, to set the Inverse Waveform Output. When the waveform is inverse, no offset will change.

3. To Set the Sync Output

The generator provides Sync output through the [Sync] connector on the rear panel. All standard output functions (except DC and Noise) have a corresponding Sync signal. For some applications, they can be disabled if users do not want to use it,

- **In the default setting, the Sync signal should be connected to the [Sync] connector (activated). When the Sync Signal is disabled, the output voltage of the [Sync] connector is level low.**
- **In the Inverse Mode, the Waveform that corresponds to the Sync Signal does not inverse.**
- **The Sync Signal is a Pulse Signal with fixed positive pulse width, which is more than 50ns.**
- **For non-modulated waveform, the Sync Signal reference is the carrier.**
- **For internal modulating AM, FM and PM, the Sync signal reference is the modulated signal (not the carrier signal).**
- **For ASK and FSK, the Sync Signal Reference is the keying Frequency.**
- **For a Sweep, when the sweep starts, the Sync Signal becomes TTL Level High. The Sync frequency equals the specific Sweep time.**

- **For the Burst, when the burst starts, the Sync Signal is Level High.**
- **For the External Gated Burst, the Sync Signal follows the External Gated Signal.**

To Set the System

Press Utility → System, to enter the following interface.

Figure 2- 59

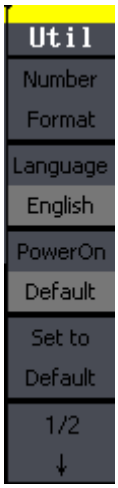


Table 2- 31 Menu Explanations of System Setup (Page 1/2)

Function Menu	Settings	Explanation
Number format		Set the number format.
Language		Set the display language.
Power On	Default Last	All the settings return to default when powered; All the settings return to the last one when powered.
Set to Default		Set all the settings to default.

Figure 2- 60

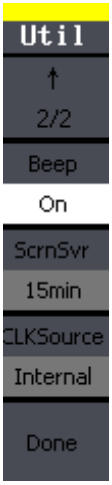


Table 2- 32 Menu Explanations of System Setup (Page 2/2)

Function Menu	Settings	Explanation
Beep	On Off	Open beep; Close beep.
ScrnSvr	1min 5min 15min 30min 1hour 2hour 5hour	Activate the screen saver program. Screen saver will be on if no action is taken within the time that you have selected. Press any button the resume.
	Off	Deactivate the screen saver program.

Key points:

Power On

Choose the configuration setting when the machine is powered.

Two choices are available: the default setting and the latest. Once selected, the setting will be used when the instrument is powered.

Beep

Activate or deactivate the sound when an error occurs from the front panel or the remote interface. Activate or deactivate any sound made by the button or knob on the front panel. The current setting is stored in the non-volatile memory.

1. Set the Format

Press Utility →System→ Number Format, to enter the following interface.

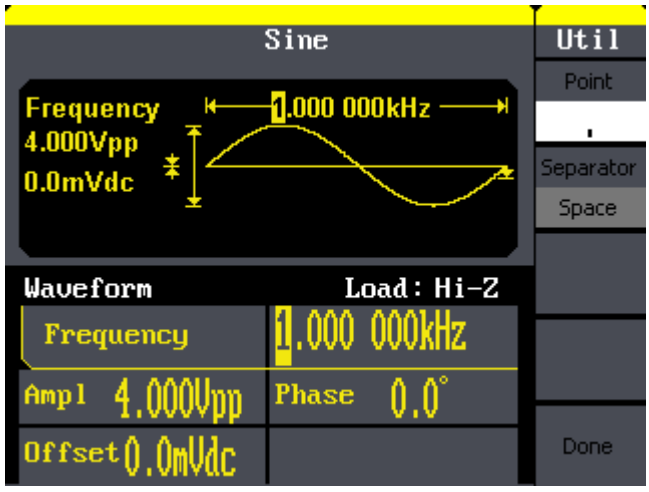


Figure 2- 61 Set the number Format

Figure 2- 62

Table 2- 33 Menu Explanations of Setting the Number Format

Function Menu	Settings	Explanation
Point	• ,	Using dot to represent point; Using comma to represent point.
Separator	On Off Space	Enable the Separator; Close the Separator; Use Space to separate.

According to the different choices of the point and the separator, the format can have various forms.

(1) • as point, press Separator->On, the example is as followed:

Figure 2- 63 Set Format

(2) , as point, press ->Separator->On, the example is as followed:

Figure 2- 64 Set Format

(3) • as point, press Separator->Off, the example is as followed:

Figure 2- 65 Set Format

(4) , as point, press Separator->Off, the example is as followed:

Figure 2- 66 Set Format

(5) • as point, press Separator->Space, the example is as followed:

Figure 2- 67 Set Format

(6) , as point, press Separator->Space, the example is as followed:

Figure 2- 68 Set Format

2. Language Setup

The SDG800 Series Generator offers two languages (English and Simplified Chinese) for user to choose.

To Select Language, press Utility and then Language to select the language.

The Procedure is as followed:

Press Utility →System→ Language, to change the language.

3. To Return to Default Setting

Press Utility →System→ Set to Default, to set the system to the default setting. The default settings of the system are as followed:

Table 2- 34 Factory Default Setting

Output	**Default**
Function	Sine Wave
Frequency	1kHz
Amplitude/Offset	4Vpp/0Vdc
Phase	0°
Terminals	High Z
Modulation	**Default**
Carrier	1kHz Sine Wave
Modulating	100Hz Sine Wave
AM Depth	100%
FM Deviation	500Hz
Key Freq	100Hz
Key Freq	100Hz
FSK Hop Frequency	1MHz
Phase Deviation	180°
Sweep	**Default**
Start/Stop Frequency	100Hz/1.9kHz
Sweep Time	1S
Trig Out	Off
Mode	Linear
Direction	↑
Burst	**Default**
Period	10ms
Phase	0°
Count	1Cycle
Trig	Off
Trigger	**Default**

Source	Internal

2.12. Test/Cal

Press Utility →Test/Cal, to enter the following menu.

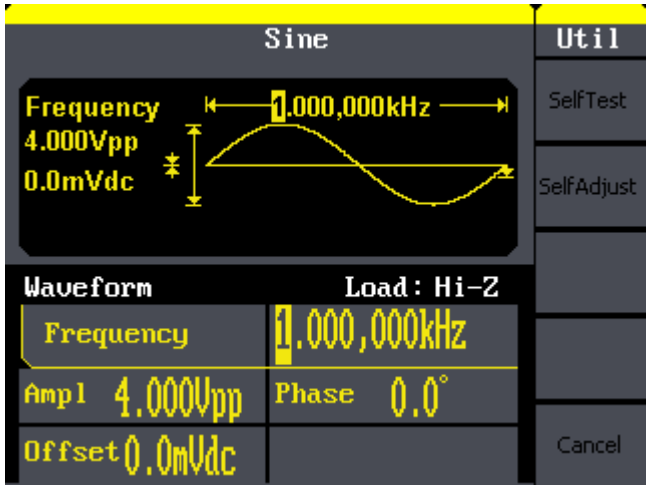


Figure 2- 69 Test/Cal function Menu

Figure 2- 70

Table 2- 35 Menu Explanations of Test Setting

Function Menu	Settings	Explain
SelfTest		Perform system self-test.
SelfCal		Do self calibration

SelfTest

Press Utility →Test/Cal →SelfTest, to enter the following menu.

Figure 2- 71

Table 2- 36 Menu Explanations of Self Test

Function Menu	Settings	Explain
Scr Test		Run screen test program.
Key Test		Run keyboard test program.
LED Test		Run LED test program.

1. Scr Test

Select Scr Test to enter the screen test interface. The clew words 'Press '7' Key to continue, Press '8' Key to exit' is displayed. You could press the '7' for test.

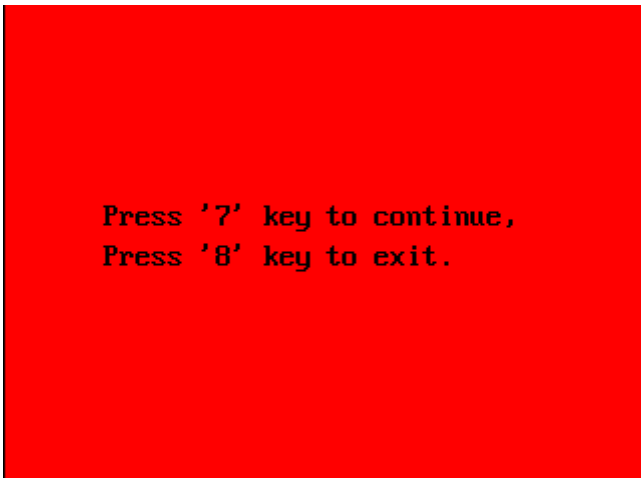


Figure 2- 72 Screen Test Interface

2. Key Test

Select ‘keyboard Test’ to enter the keyboard test interface, the on-screen lathy rectangle shapes represent the front panel keys. The shapes with two arrows beside them represent the front panel knobs. Test all keys and knobs and you should also verify that all the backlit buttons illuminate correctly.

Note:

- **When you operate, the screen would display the white (color LCD).**
- **The tested button or knobs corresponding area would display green (color LCD).**
- **At the bottom of the screen display ‘Press ‘8’ Key Three Times to exit’ information prompt to show that press ‘8’ three times for quitting the test.**

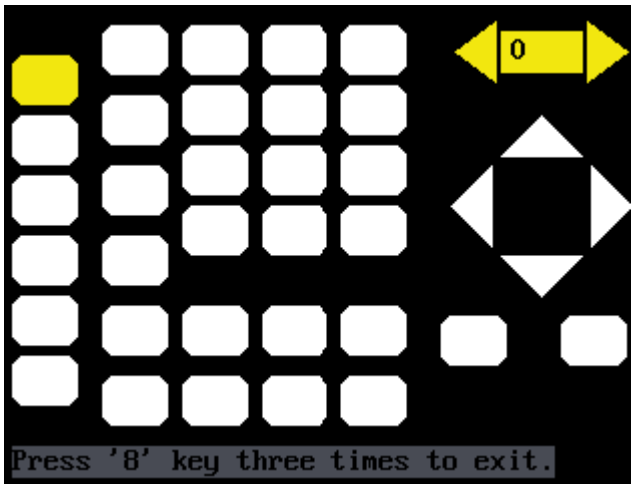


Figure 2- 73 Key Test Interface

3. LED Test

Select ‘LED Test’ to enter the lighten interface, the on-screen lathy rectangle shapes represent the front panel keys; the shapes with two arrows beside them represent the front panel knobs. The clew words ‘Press ‘7’ Key to continue, ‘Press ‘8’ Key to exit’ is displayed, You could press the ‘7’ button continuously for testing, when buttons are lighted ,the corresponding area on the screen would display green(color LCD).

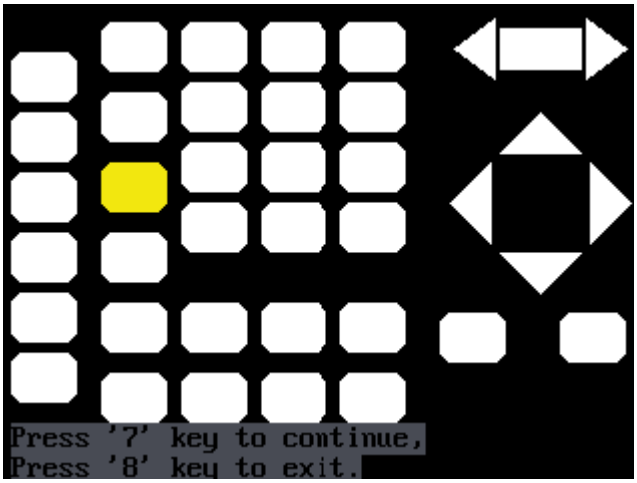


Figure 2- 74 Led Test Interface

SelfCal

Press Utility →1/2→Test/Cal →SelfCal, to enter SelfCal, as is shown in Figure 2- 5

SelfCal: do self calibration, environment you use the generator changes, system may calibrate data based on change of current environment

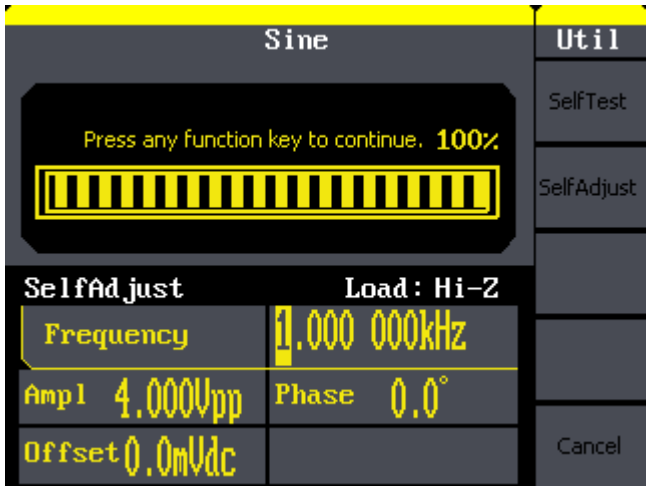


Figure 2- 75 SelfCal Interface

2.13. Edition Information

Press the EditInfo option button of the Utility Menu to view the generator's hardware and software configuration.

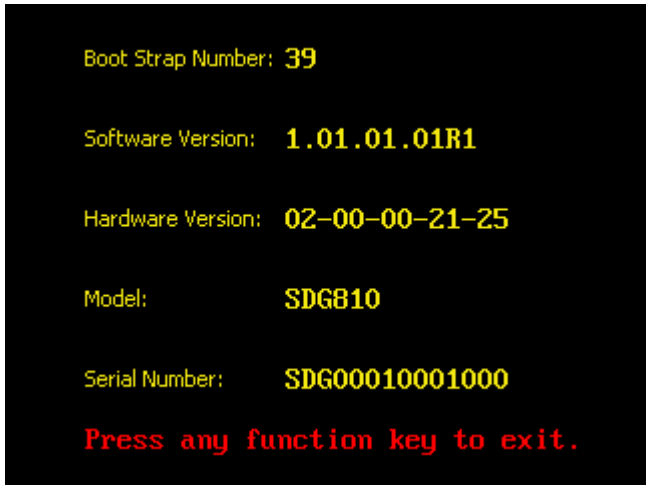


Figure 2- 76 Edit Info Interface

Edition Information introduce

Boot-strap No:

The times of boot-strap

Software version:

Software version of current equipment

Hardware version:

02-00-00-21-25 represents ordinally: PCB version, BOM version, Daughter card version, FPGA version, CPLD version.

Model:

Contains information of brand of product, series, bandwidth.

For example: SDG810 represents SIGLENT's 800 series function/arbitrary

waveform generator, the bandwidth is 10MHz.

Serial No:

Bit 1-6 represent maker and series of the product. Bit 7-10 represent production date. Bit 11-14 represent serial number of product.

For example: SDG00004130008 represents the eighth generator made by SIGLENT in the fourth quarter of 2013.

2.14. Updating Firmware

Using USB flash drive update firmware

The software of the generator can be updated directly via USB flash drive. This process takes about two minutes. Follow the next steps:

1. Insert USB flash drive with firmware procedure to USB host interface on the front panel of the generator.
2. Press the Utility button to enter the 'Utility Menu'.
3. Press '1/2 ↓ ' option button to enter the second page of 'Utility Menu'.
4. Press the 'Update' option button.
5. Press 'Brower' option button to select 'Directory', then select the 'USB Device (A:)' through direction key.
6. Press 'Brower' option button to select 'File', then select the 'XXXX.ADS' file by direction key.
7. Press the 'Recall' option button to updating.
8. After accomplish update, restart the generator.

Note: Don't cut off the power during product is being updating.

2.15. How to Use the Built-in Help System

You can get a particularly 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 to enter the following interface.

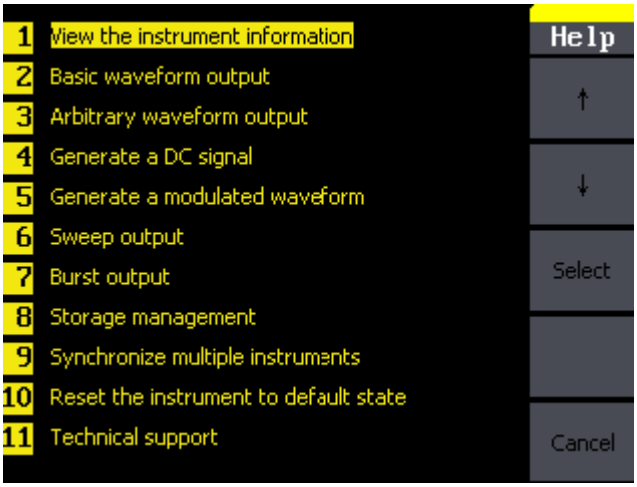


Figure 2- 77 Help Menu

Figure 2- 78

Table 2- 37 Help Menu Explanations

Function Menu	Settings	Explanation
↑		Cursor upward to select.
↓		Cursor downward to select.
Choice		Select to read the information.

3. Application and Examples

To help the user master how to use the Function/ Arbitrary Waveform Generator more efficiently, we will describe some examples in detail. All the examples below use the default setting of the instrument except especial explanations.

This chapter includes the following topics:

- **Example 1: Generate a Sine Wave**
- **Example 2: Generate a Square Wave**
- **Example 3: Generate a Ramp Wave**
- **Example 4: Generate a Pulse Wave**
- **Example 5: Generate a Noise Wave**
- **Example 6: Generate an Arbitrary Wave**
- **Example 7: Generate a Sweep Wave**
- **Example 8: Generate a Burst Wave**
- **Example 9: Generate an AM Wave**
- **Example 10:Generate a FM Wave**
- **Example 11:Generate a PM Wave**
- **Example 12:Generate a FSK Wave**
- **Example 13:Generate an ASK Wave**
- **Example 14:Generate a PWM Wave**
- **Example 15:Generate a DSB-AM Wave**

3.1. Example 1:Generate a Sine Wave

Generate a sine wave with 50kHz frequency, 5Vpp amplitude and 1Vdc offset.

➢ **Steps:**

- **Set the frequency.**

1. Press Sine →Freq and choose frequency which will display in white color.
2. Input '50' from the keyboard and choose the unit 'kHz'. The frequency is set to be 50kHz.

- **Set the amplitude.**

1. Press Ampl to choose Ampl which will display in white color.
2. Input '5' from the keyboard and choose the unit 'Vpp'. The amplitude is set to be 5Vpp.

- **Set the Offset.**

1. Press Offset to choose Offset which will display in white color
2. Input '1' from the keyboard and choose the unit 'Vdc'. The offset is set to be 1Vdc.

When the frequency, amplitude and offset are set, the wave generated is shown in Figure 3- 1;

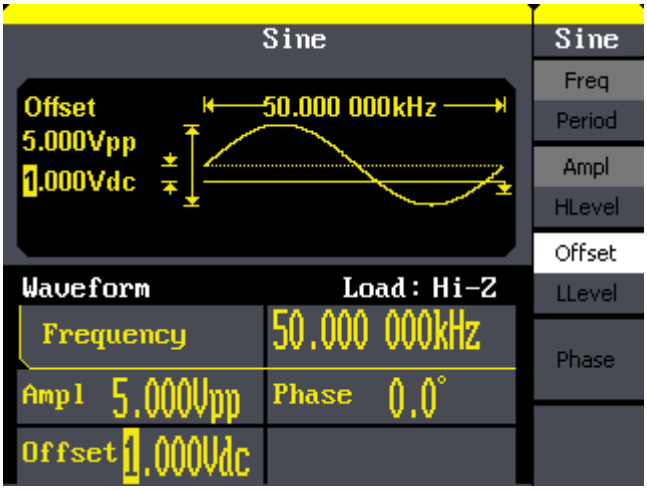


Figure 3- 1 Sine Waveform

3.2. Example 2:Generate a Square Wave

Generate a square wave with 5kHz frequency, 2Vpp amplitude, 0Vdc offset and 30% duty cycle.

➢ **Steps:**

- **Set the frequency.**

1. Press Square →Freq and choose Frequency which will display in white color.
2. Input '5' from the keyboard and choose the unit 'kHz'. The frequency is set to be 5kHz.

- **Set the amplitude.**

1. Press Ampl to choose Ampl which will display in white color.
2. Input '2' from the keyboard and choose the unit 'Vpp'. The amplitude is set to be 2Vpp.

- **Set the offset.**

1. Press Offset to choose Offset which will display in white color
2. Input '0' from the keyboard and choose the unit 'Vdc'. The Offset is set to be 0Vdc.

- **Set the duty**

1. Press Duty to choose Duty which will display in white color
2. Input '30' from the keyboard and choose the unit '%'. The duty is set to be 30%.

When the frequency, amplitude, offset and duty cycle are set, the wave generated is shown in Figure 3- 2.

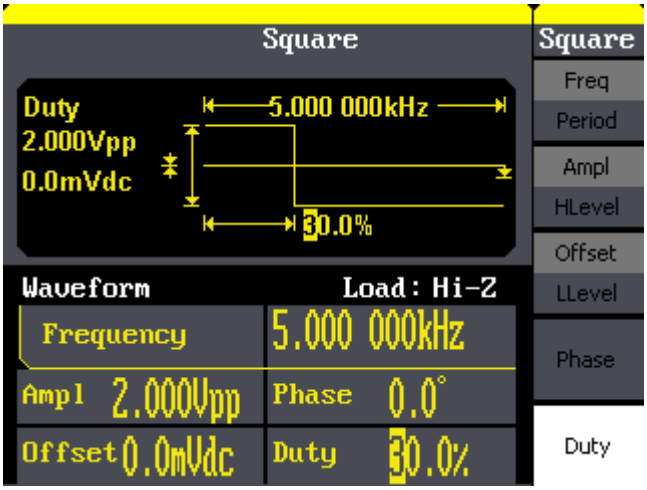


Figure 3- 2 Square Waveform

3.3. Example 3:Generate a Ramp Wave

Generate a ramp wave with 10μs period, 100mVpp amplitude, 20mVdc offset, 45°phase and 30% symmetry.

➢ **Steps:**

- **Set the period.**

1. Press Ramp →Freq and choose Period which will display in white color.
2. Input '10' from the keyboard and choose the unit 'μs'. The period is set to be 10μs.

- **Set the amplitude.**

1. Press Ampl to choose Ampl which will display in white color.
2. Input '100' from the keyboard and choose the unit 'mVpp'. The amplitude is set to be 100mVpp.

- **Set the offset.**

1. Press Offset to choose Offset which will display in white color
2. Input '20' from the keyboard and choose the unit 'mVdc'. The offset is set to be 20mVdc.

- **Set the phase**

1. Press Phase to choose Phase which will display in white color
2. Input '45' from the keyboard and choose the unit ' °'. The phase is set to be 45°.

- **Set the symmetry**

1. Press Symmetry to choose Symmetry which will display in white color.
2. Input '30' from the keyboard and choose the unit '30%'. The symmetry is set to be 30%.

When the period, amplitude, offset, phase and symmetry are set, the wave generated is shown in Figure 3- 3:

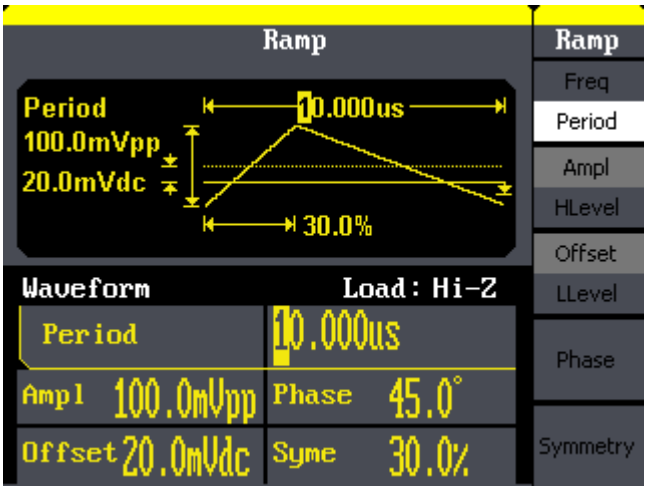


Figure 3- 3 Ramp Waveform

3.4. Example 4:Generate a Pulse Wave

Generate a pulse wave with 5kHz frequency, 5V high level, -1V low level, 40μs pulse width and 20ns delay.

➢ **Steps:**

- **Set the frequency.**

1. Press Pulse → Freq and choose Freq, which will display in white color.
2. Input '5' from the keyboard and choose the unit 'kHz'. The frequency is set to be 5 kHz.

- **Set the high level**

1. Press Ampl and choose the HLevel which will display in white color.
2. Input '5' from the keyboard and choose the unit 'V'. The high level is set to be 5V.

- **Set the low level**

1. Press Offset and choose the LLevel which will display in white color.
2. Input '-1' from the keyboard and choose the unit 'V'. The low level is set to be -1V.

- **Set the pulse width**

1. Press PulWidth and choose PulWidth which will display in white color.
2. Input '40' from the keyboard and choose the unit 'μs'. The pulse width is set to be 40μs.

- **Set the Rising Edge**

1. Press Rising Edge and choose Rising Edge which will display in white color.
2. Input ‘20’ from the keyboard and choose the unit ‘ns’. The delay is set to be 20ns.

When the frequency, high level, low level, pulse width and delay are set, the wave generated is shown in Figure 3- 4

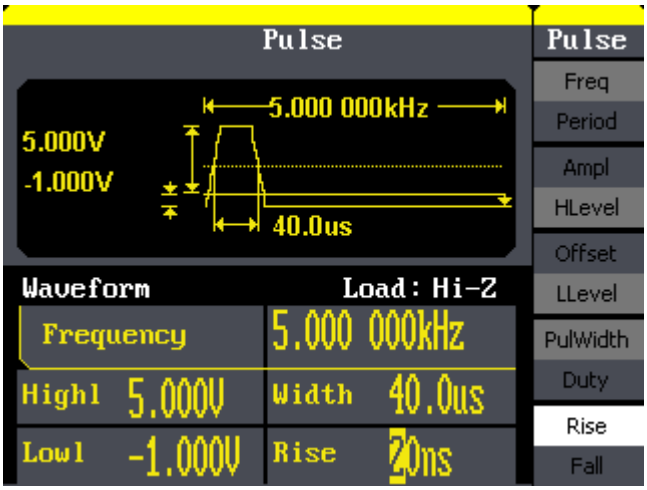


Figure 3- 4 Pulse Waveform

3.5. Example 5:Generate a Noise Wave

Generate a noise waveform with 2V stdev and 1 V mean.

➢ **Steps:**

- **Set the stdev**

1. Press Noise →Stdev.
2. Input '10' from the keyboard and choose the unit 'mV'. The amplitude is set to be 10 mV.

- **Set the mean**

1. Press Mean.
2. Input '5' from the keyboard and choose the unit 'mV'. The offset is set to be 5 mV.

When the amplitude and offset are set, the wave generated is shown in Figure 3- 5

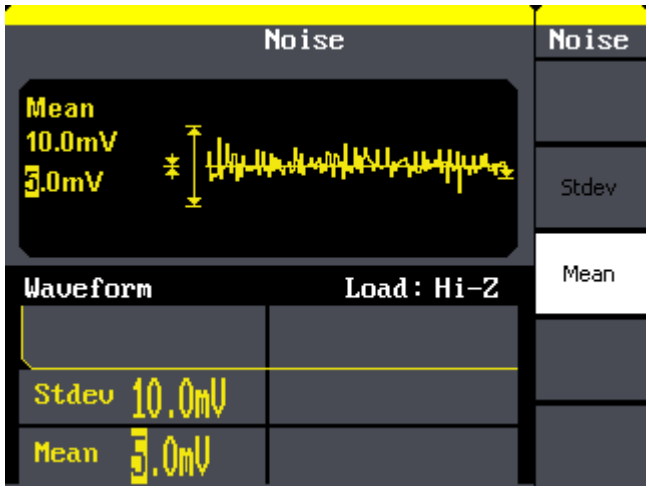


Figure 3- 5 Noise Waveform

3.6. Example 6:Generate an Arbitrary Wave

Generate an arbitrary waveform (Sinc) with 5MHz frequency, 2Vrms amplitude and 0Vdc offset.

➢ **Steps:**

- **Set the type of the arbitrary waveform.**

1. Press Arb → (1/2↓) →Load form, to choose the built-in waveform..
2. Press Built-In→ Math, There are sixteen math arbitrary waveforms.
3. Choose Sinc, and press Select to enter Arb Main Menu.

- **Set the frequency.**

1. Press Freq and choose Frequency which will display in white color.
2. Input '5' from the keyboard and choose the unit 'MHz'. The frequency is set to be 5MHz.

- **Set the amplitude**

1. Press Ampl to choose Ampl which will display in white color.
2. Input '2' from the keyboard and choose the unit 'Vrms'. The amplitude is set to be 2Vrms.

- **Set the offset**

1. Press Offset to choose Offset which will display in white color.
2. Input '0' from the keyboard and choose the unit 'Vdc'. The offset is set to be 0Vdc.

When the arbitrary waveform's type, frequency, amplitude and offset are set,

the wave generated is shown in Figure 3- 6:

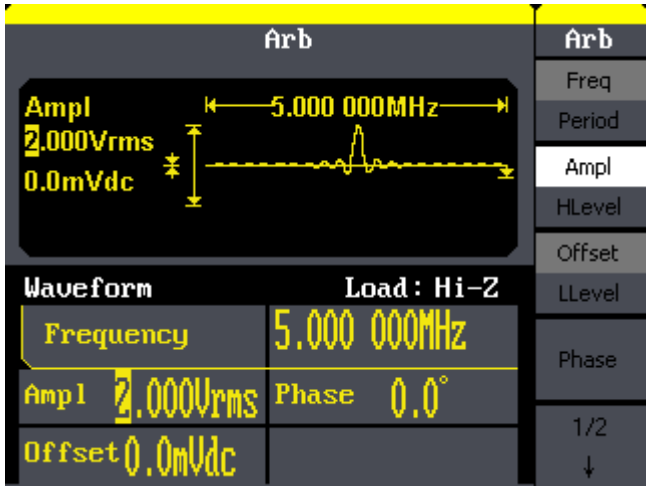


Figure 3- 6 Sinc Waveform

3.7. Example 7:Generate a Sweep Linear Wave

Generate a sine sweep waveform whose frequency starts from 100Hz to 10kHz. Use internal trigger mode, linear sweep, and the sweep time is 2s.

➢ **Steps:**

- **Set the sweep function:**

  Press Sine and choose the sine waveform as the sweep function.

  The default setting of the source is internal.

- **Set the frequency, amplitude and offset.**

1. Press Freq and choose Freq which will display in white color. Input '5' from the keyboard and choose the unit 'kHz' to set the frequency 5kHz.
2. Press Ampl to choose Ampl which will display in white color. Input '5' from the keyboard and choose the unit 'Vpp' to set the amplitude 5Vpp.
3. Press Offset to choose Offset which will display in white color. Input '0' from the keyboard and choose the unit 'Vdc' to set the offset 0Vdc

- **Set the sweep time.**

  Press Sweep →Sweep Time, Input '2' from the keyboard and choose the unit 's' to set sweep time 2s.

- **Set the start frequency**

  Press Start Freq, Input '100' from the keyboard and choose the unit 'Hz' to set start freq 100Hz.

- **Set the end frequency**

  Press Stop Freq, Input '10' from the keyboard and choose the unit 'kHz' to set stop freq 10kHz.

- **Set the Sweep Mode**

  Press (1/2↓) →Linear, and choose Linear.

When all parameters above are set, the linear sweep wave generated is shown in Figure 3- 7

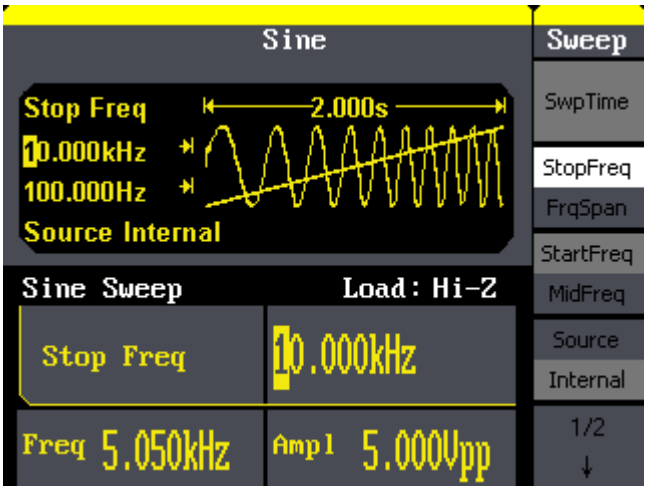


Figure 3- 7 Sweep Waveform

3.8. Example 8:Generate a Burst Wave

Generate a burst waveform of 5 cycles. The period is 3ms. Use internal trigger and 0 degree phase.

➢ **Steps:**

- **Set the sweep function:**

  Press Sine, and choose the sine waveform as the burst function. The default setting of the source is internal.

- **Set the frequency, amplitude and offset**

1. Press Freq and choose Freq which will display in white color. Input '10' from the keyboard and choose the unit 'kHz' to set the frequency 10kHz.
2. Press Ampl to choose Ampl which will display in white color. Input '1' from the keyboard and choose the unit 'Vpp' to set the amplitude 1Vpp.
3. Press Offset to choose Offset which will display in white color. Input '0' from the keyboard and choose the unit 'Vdc' to set the offset 0Vdc

- **Set the sweep mode.**

  Press Burst →N Cycle, choose N Cycle Mode.

- **Set the burst period**

  Press Period, input '3' from the keyboard and choose the unit 'ms' to set the period 3ms.

- **Set the start phase**

  Press Start Phase, input '0' from the keyboard and choose the unit ' °' to

set the start phase 0°.

- **Set the burst cycles**

  Press (1/2↓) →Choose Cycles, Input '5' from the keyboard and choose the unit 'Cycle' to set the burst cycle 5.

- **Set the delay**

  Press Delay, and input '100' from the keyboard and choose the unit 'μs' to set the delay 100μs.

When all parameters above are set, the wave generated is shown in Figure 3- 8:

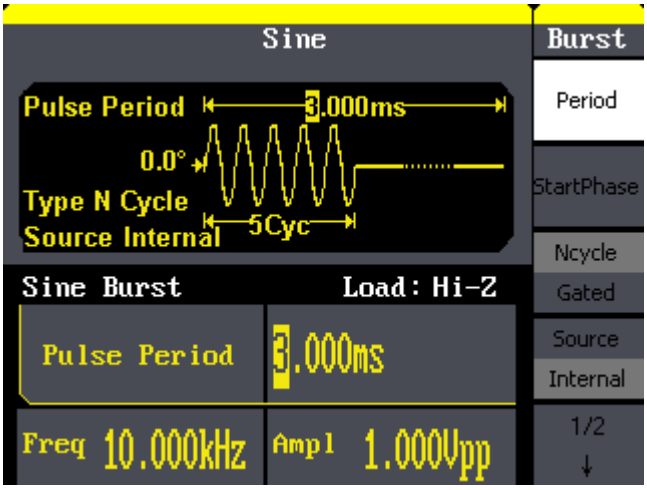


Figure 3- 8 Burst Waveform Output

3.9. Example 9:Generate an AM Wave

Generate an AM waveform with 80% depth. The carrier is a sine wave with 10kHz frequency, and the modulating wave is a sine wave with 200Hz frequency.

➢ **Steps:**

- **Set the frequency, amplitude and offset of the carrier wave.**

1. Press Sine, and choose the sine waveform as the carrier wave
2. Press Freq and choose Freq which will display in white color. Input'10' from the keyboard and choose the unit 'kHz' to set the frequency 10kHz
3. Press Ampl and choose Ampl which will display in white color. Input'1' from the keyboard and choose the unit 'Vpp' to set the amplitude 1Vpp.
4. Press Offset and choose Offset which will display in white color. Input'0' from the keyboard and choose the unit 'Vdc' to set the offset 0Vdc.

- **Set the modulation type AM and parameters.**

1. Press Mod →Type → AM, choose AM. Please notice that the message shown on the middle left side of the screen is 'AM'.
2. Press AM Freq, input'200' from the keyboard and choose the unit 'Hz' to set the AM freq 200Hz.
3. Press AM Depth, input'80' from the keyboard and choose the unit '%' to set the AM depth 80%.
4. Press Shape →Sine, to choose sine wave as the modulating waveform.

When all parameters above are set, the wave generated is shown in Figure 3- 9:

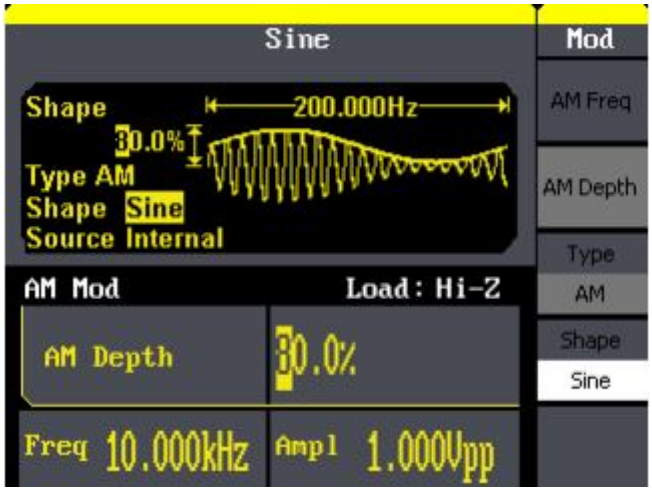


Figure 3- 9 AM Waveform

3.10. Example 10:Generate a FM Wave

Generate a FM waveform, the carrier is a sine wave with 10kHz frequency, and the modulating wave is a sine wave with 1 Hz frequency, 2kHz frequency deviation.

➢ **Steps:**

- **Set the frequency, amplitude and offset of the carrier wave.**

1. Press Sine and choose the sine waveform as the carrier wave
2. Press Freq and choose Freq which will display in white color. Input'10' from the keyboard and choose the unit 'kHz' to set the frequency 10kHz
3. Press Ampl and choose Ampl which will display in white color. Input'1' from the keyboard and choose the unit 'Vpp' to set the amplitude 1Vpp.
4. Press Offset and choose Offset which will display in white color. Input'0' from the keyboard and choose the unit 'Vdc' to set the offset 0Vdc.

- **Set the modulation type FM and parameters.**

1. Press Mod →Type → FM, choose FM. Please notice that the message shown on the middle left side of the screen is 'FM'.
2. Press FM Freq, input '1' from the keyboard and choose the unit 'Hz' to set the AM Freq 1Hz.
3. Press FM Dev, input '2' from the keyboard and choose the unit 'kHz' to set the FM deviation 2kHz.
4. Press Shape →Sine, to choose sine wave as the modulating waveform.

When all parameters above are set, the wave generated is shown in Figure

3- 10:

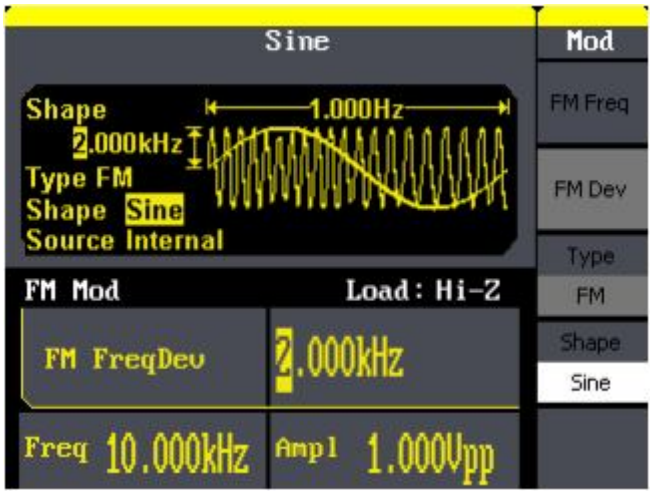


Figure 3- 10 FM Waveform

3.11. Example 11:Generate a PM Wave

Generate a PM waveform, the carrier is a sine wave with 10kHz frequency, and the modulating wave is a sine wave with 2kHz frequency, 90°phase deviation.

➢ **Steps:**

- **Set the frequency, amplitude and offset of the carrier wave.**

1. Press Sine , and choose the sine waveform as the carrier wave
2. Press Freq and choose Freq which will display in white color. Input'10' from the keyboard and choose the unit 'kHz' to set the frequency 10kHz
3. Press Ampl and choose Ampl which will display in white color. Input'5' from the keyboard and choose the unit 'Vpp' to set the amplitude 5Vpp.
4. Press Offset and choose Offset which will display in white color. Input'0' from the keyboard and choose the unit 'Vdc' to set the offset 0Vdc.

- **Set the modulation type PM and parameters.**

1. Press Mod →Type → PM, choose PM. Please notice that the message shown on the middle left side of the screen is 'PM'.
2. Press PM Freq, input '2' from the keyboard and choose the unit 'kHz' to set the PM freq 2kHz.
3. Press Phase Dev, input '90' from the keyboard and choose the unit ' °' to set the phase deviation 90°.
4. Press Shape →Sine, to choose sine wave as the modulating waveform.

When all parameters above are set, the wave generated is shown in Figure 3- 11:

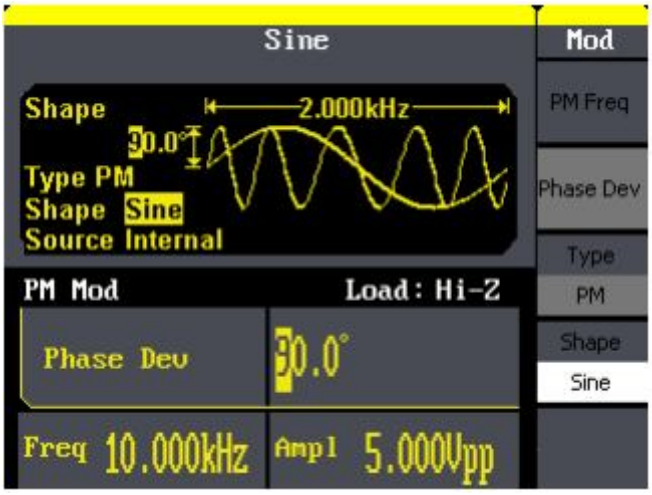


Figure 3- 11 PM Waveform

3.12. Example 12:Generate a FSK Wave

Generate a FSK waveform with 200Hz key frequency. The carrier is a sine wave with 10kHz frequency, and the hop frequency is 500Hz.

➢ **Steps:**

- **Set the frequency, amplitude and offset of the carrier wave.**

1. Press Sine , and choose the sine waveform as the carrier wave
2. Press Freq and choose Freq which will display in white color. Input'10' from the keyboard and choose the unit 'kHz' to set the frequency 10kHz
3. Press Ampl and choose Ampl which will display in white color. Input'5' from the keyboard and choose the unit 'Vpp' to set the amplitude 5Vpp.
4. Press Offset and choose Offset which will display in white color. Input'0' from the keyboard and choose the unit 'Vdc' to set the offset 0Vdc.

- **Set the modulation type FSK and parameters.**

1. Press Mod →Type → FSK, choose FSK. Please notice that the message shown on the middle left side of the screen is 'FSK '.
2. Press Key Freq, input'200' from the keyboard and choose the unit 'Hz' to set the key frequency 200 Hz.
3. Press Hop Freq, input '500' from the keyboard and choose the unit 'Hz' to set the hop frequency 500Hz.

When all parameters above are set, the wave generated is shown in Figure 3- 12:

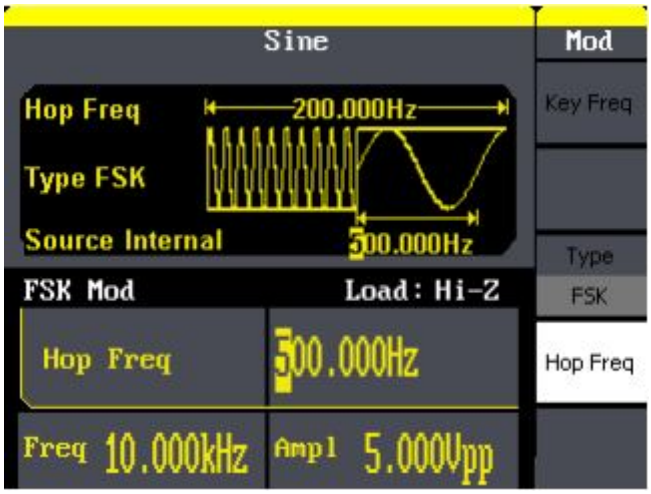


Figure 3- 12 FSK Waveform

3.13. Example 13:Generate an ASK Wave

Generate an ASK waveform with 500Hz key frequency. The carrier is a sine wave with 5kHz frequency.

➢ **Steps:**

- **Set the frequency, amplitude and offset of the carrier wave.**

1. Press Sine, and choose the sine waveform as the carrier wave
2. Press Freq and choose Freq which will display in white color. Input '5' from the keyboard and choose the unit 'kHz' to set the frequency 5kHz
3. Press Ampl and choose Ampl which will display in white color. Input '5' from the keyboard and choose the unit 'Vpp' to set the amplitude 5Vpp.
4. Press Offset and choose Offset which will display in white color. Input '0' from the keyboard and choose the unit 'Vdc' to set the offset 0Vdc.

- **Set the modulation type ASK and parameters.**

1. Press Mod →Type → ASK, choose ASK. Please notice that the message shown on the middle left side of the screen is 'ASK '.
2. Press Key Freq, input '500' from the keyboard and choose the unit 'Hz' to set the key freq 500 Hz.

When all parameters above are set, the wave generated is shown in Figure 3- 13

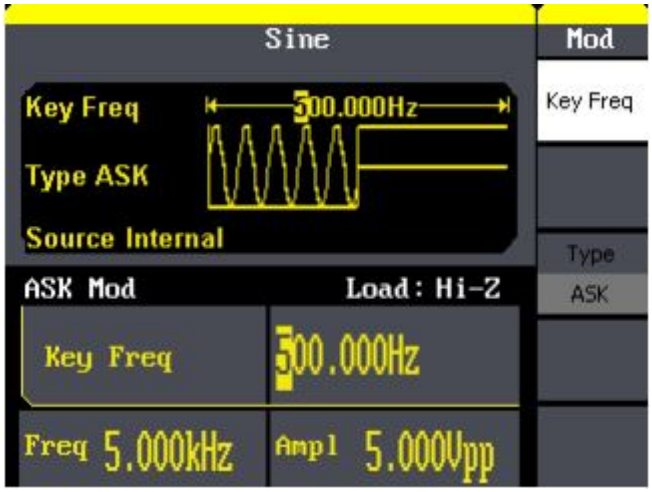


Figure 3- 13 ASK Waveform

3.14. Example 14: Generate a PWM Wave

Generate a PWM waveform with 200Hz key frequency. The carrier is a pulse wave with 5kHz frequency.

➢ **Steps:**

- **Set the frequency, amplitude and offset of the carrier wave.**

1. Press Pulse, and choose the Pulse waveform as the carrier wave
2. Press Freq and choose Freq which will display in white color. Input '5' from the keyboard and choose the unit 'kHz' to set the frequency 5kHz
3. Press Ampl and choose Ampl which will display in white color. Input '5' from the keyboard and choose the unit 'Vpp' to set the amplitude 5Vpp.
4. Press Offset and choose Offset which will display in white color. Input '0' from the keyboard and choose the unit 'Vdc' to set the offset 0Vdc.
5. Press PulWidth and choose PulWidth which will display in white color. Input '40' from the keyboard and choose the unit 'us' to set the PulWidth 40us

- **Set the modulation type PWM and parameters.**

1. Press Mod →Type →PWM, Please notice that the message shown on the middle left side of the screen is 'PWM '.
2. Press PWN Freq, input '200' from the keyboard and choose the unit 'Hz' to set the key freq 200 Hz.
3. Press Width Dev, input '20' from the keyboard and choose the unit 'us' to set the Width Dev 20us

When all parameters above are set, the wave generated is shown in Figure 3- 14

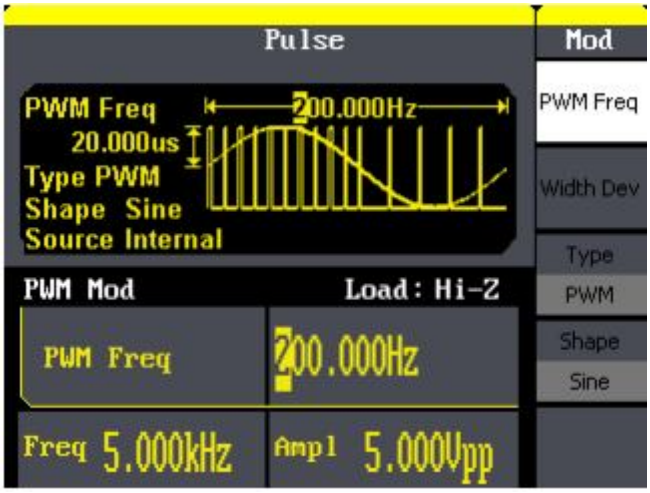


Figure 3- 14 PWM Waveform

3.15. Example 15: Generate a DSB-AM Wave

Generate a DSB-AM waveform with 100Hz key frequency. The carrier is a sine wave with 2kHz frequency.

➢ **Steps:**

- **Set the frequency, amplitude and offset of the carrier wave.**

1. Press Sine, and choose the sine waveform as the carrier wave
2. Press Freq and choose Freq which will display in white color. Input '2' from the keyboard and choose the unit 'kHz' to set the frequency 2kHz
3. Press Ampl and choose Ampl which will display in white color. Input '4' from the keyboard and choose the unit 'Vpp' to set the amplitude 4Vpp.
4. Press Offset and choose Offset which will display in white color. Input '0' from the keyboard and choose the unit 'Vdc' to set the offset 0Vdc.

- **Set the modulation type DSB-AM and parameters.**

1. Press Mod →Type →DSB-AM, choose DSB-AM. Please notice that the message shown on the middle left side of the screen is 'DSB-AM '.
2. Press DSB Freq, input '100' from the keyboard and choose the unit 'Hz' to set the key freq 100Hz.

When all parameters above are set, the wave generated is shown in Figure 3- 15

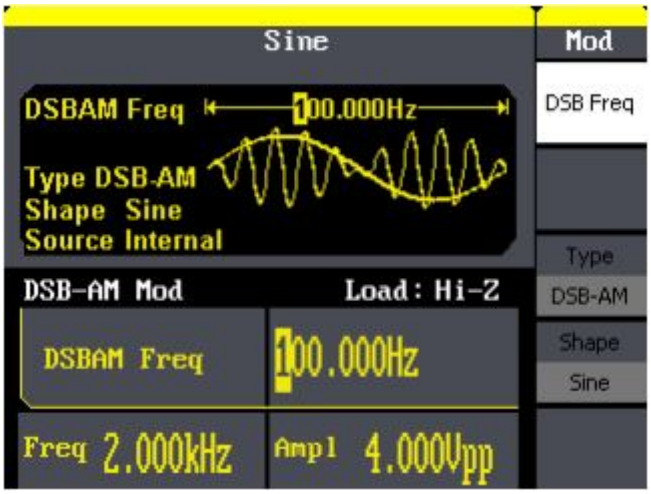


Figure 3- 15 DSB-AM Waveform

4. Troubleshooting

General Inspecting

After receiving a new SDG800 Series Function/Arbitrary Waveform Generator, please inspect the instrument as followed:

1. **Inspect the shipping container for damage**.

   Keep the damaged shipping container or cushioning material until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically.

2. **Inspect the whole instrument**.

   In case there is any mechanical damage or defect, or the instrument does not operate properly or fails performance tests, notify the SIGLENT sales representative.

   If the shipping container is damaged, or the cushioning materials show signs of stress, notify the carrier as well as the SIGLENT sales department. Keep the shipping materials for carrier's inspection.

3. **Check the accessories**.

   Accessories supplied with the instrument are listed below. If the contents are incomplete or damaged, notify the SIGLENT sales representative.

   Standard Accessories:

   - A Quick Start
   - A Certification and Guaranty Card
   - A CD(including EasyWave computer software system)
   - A Power Cord that fits the standard of destination country
   - A USB Cable

Troubleshooting

1. After the waveform generator is powered on, the screen remains dark, please do the following steps:

(1) Check the power cable's connection.

(2) Ensure the power switch is turned on.

(3) After the inspections above, restart the waveform generator.

(4) If the generator still doesn't work after the checking, please connect with SIGLENT company

2. If there is no signal wave output after setting the parameters, please do as following steps:

(1) Check whether the BNC cable has connected with output channel or not.

(2) Check whether the output button have been turned on or not.

5. Service and Support

Maintain summary

SIGLENT warrants that the products that it manufactures and sells will be free from defects in materials and workmanship for a period of three years from the date of shipment from an authorized **SIGLENT** distributor. If a product proves defective within the respective period, **SIGLENT** will provide repair or replacement as described in the complete warranty statement.

To arrange for service or obtain a copy of the complete warranty statement, please contact your nearest **SIGLENT** sales and service office.

Except as provided in this summary or the applicable warranty statement, **SIGLENT** makes no warranty of any kind, express or implied, including without limitation the implied warranties of merchantability and fitness for a particular purpose. In no event shall **SIGLENT** be liable for indirect, special or consequential damages

Contact SIGLENT

MTR Add: 3/F, Building 4, Antongda Industrial Zone, Liuxian Road,

68 District, Baoan District, Shenzhen, P.R. CHINA

Service Tel: 0086 755 3661-5186

Post Code: 518101

E-mail:sales@siglent.com

http://www.siglent.com

6. Appendix

Appendix A: Accessories

SDG800 Series Function/ Arbitrary Waveform Generator Accessories:

Standard Accessories:

- A Quick Start
- A Calibration Certificate
- A CD(including EasyWave computer software system)
- A Power Cord that fits the standard of destination country
- A USB Cable

Appendix B: Daily Maintain and Cleaning

Daily Maintain

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

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

Cleaning

If this instrument requires cleaning, disconnect it from all power sources and clean it with a mid detergent and water. Make sure the instrument is completely dry before reconnecting it to a power source.

To clean the exterior surface, perform the following steps:

1. Remove loose dust on the outside of the instrument with a lint-free cloth. Use care to avoid scratching the clear plastic display filter.
2. Use a soft cloth dampened with water to clean the instrument.

WARNING: To avoid damage to the surface of the instrument, do not use any abrasive or chimerical cleaning agents.

Quick Start

SDG800 Series
Function/Arbitrary Waveform Generator

QS02008-E02A

Copyright

General Safety Summary

Carefully read the following safety precautions to avoid person injury and prevent damage to the instrument and any products connected to it. To avoid potential hazards, please use the instrument as specified.

Only qualified technician should perform service procedures

To Avoid Fire or Personal Injure

Use Proper Power Line
Use only the special power line of the instrument which approved by local state.

Ground the Instrument
The instrument grounds through the protective terra conductor of the power line. To avoid electric shock, the ground conductor must be connected to the earth. Make sure the instrument is grounded correctly before connect its input or output terminals.

Connect the Signal Wire Correctly
The potential of the signal wire is equal to the earth, so do not connect the signal wire to a high voltage. Do not touch the exposed contacts or components.

Look Over All Terminals' Ratings
To avoid fire or electric shock, please look over all ratings and sign instruction of the instrument. Before connecting the instrument, please read the manual carefully to gain more information about the ratings.

Not Operate with Suspected Failures
If you suspect that there is a damage of the instrument, please let a qualified service personnel check it.

Avoid Circuit or Wire Exposed Components Exposed
Do not touch exposed contacts or components when the power is on.

Do not operate in wet/damp conditions.

Do not operate in an explosive atmosphere.

Keep the surface of the instrument clean and dry.

Safety Terms and Symbols

Terms used on the instrument. Terms may appear on the instrument:

DANGER: Indicates an injury or hazard that may be immediately happen.

WARNING: Indicates an injury or hazard that may be not immediately happen.

CAUTIO: Indicates that a potential damage to the instrument or other property might occur.

Symbols used on the instrument. Symbols may appear on the instrument:

Hazardous Voltage

Protective Earth Ground

Warning

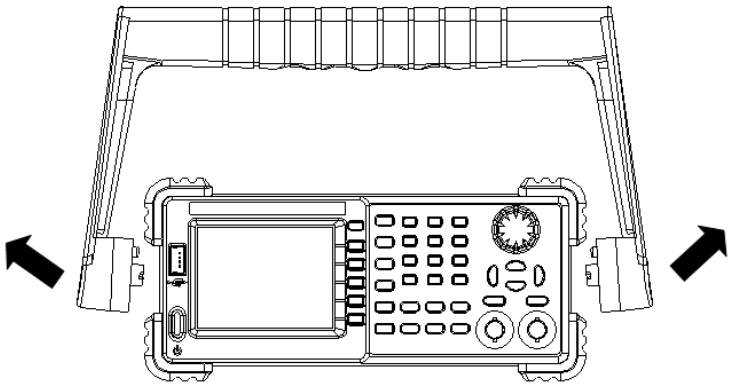
Earth Ground

Power Switch

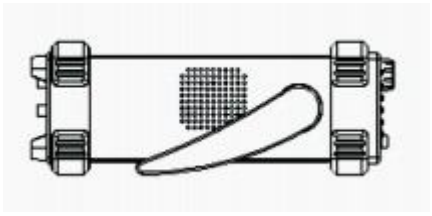
Content

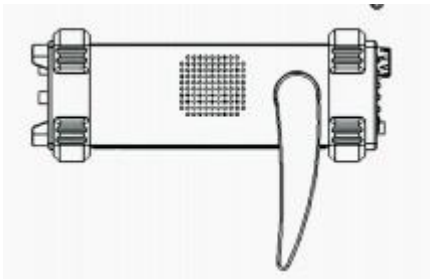
Adjustment Handle

When using the instrument, SDG800 permits users to adjust the handle to a needed position which make it easier to operate and observe.

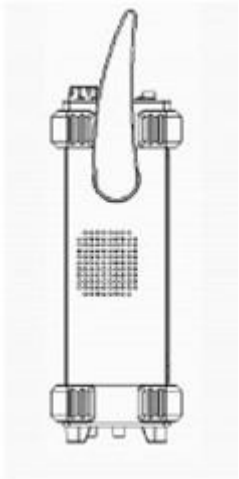


Adjustment Handle





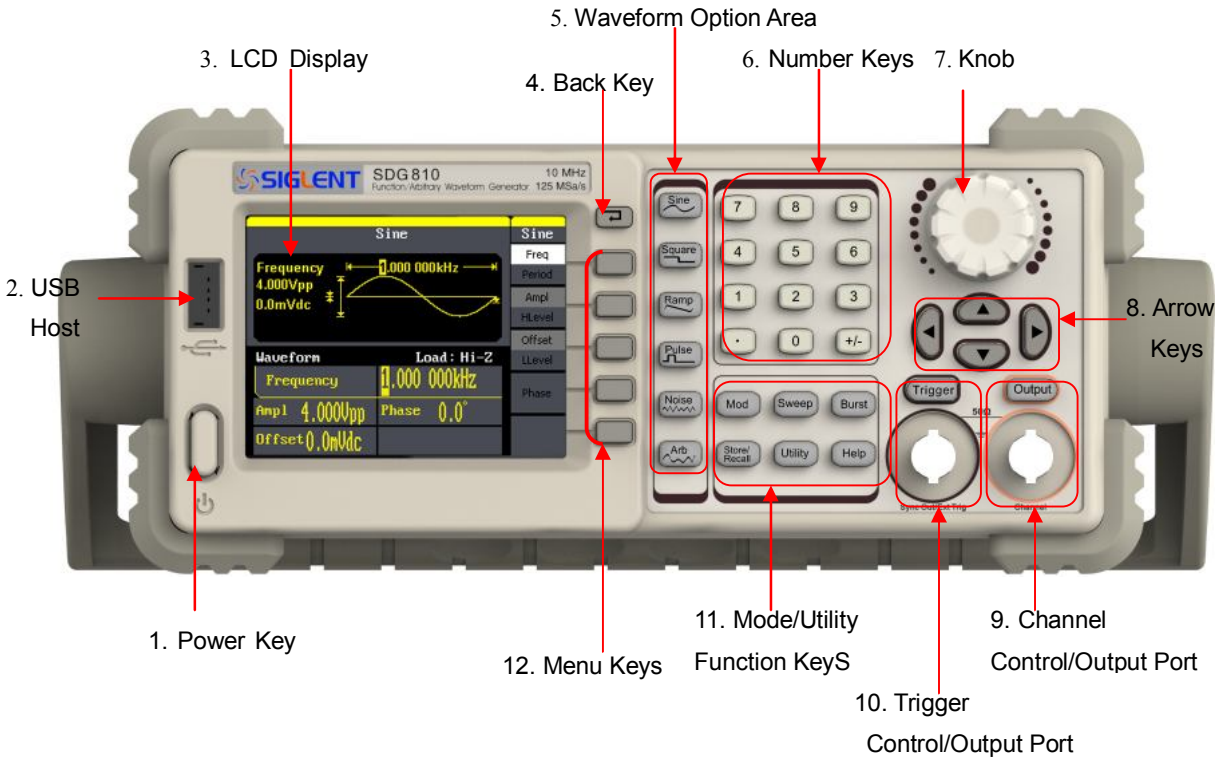
Horizontal Position



Carrying Position

The Front Panel

The picture below shows SDG800 front panel composition:



1. **Power Key**
   This key is used to turn on/off the SDG800. When the power key is off, the SDG800 is under power off state.

2. **USB Host**
   SDG800 supports USB disk of FAT format. It's used to read waveforms or status files from a U disk or save current instrument status to a U disk.

3. **LCD Display**
   SDG800 has a 320*240 TFT color LCD display, which can display current function menu, parameter settings, system state, promptings and so forth.

4. **Back Key**
   This key is used to return to the last opertion menu.

5. Waveform Option Area

Sine ----Sine Waveform

Provide sine waveform output and its frequency ranges from 1μHz to 10MHz.

- The backlight of the key lights when the key is being chosen.
- The "Frequency/Period", "Amplitude/High level", "Offset/Low level", "Phase" of the sine waveform can be adjusted.

Square----Square Waveform

Provide square waveform output and its frequency ranges from 1μHz to 10MHz.

- The backlight of the key lights when the key is being chosen.
- The "Frequency/Period", "Amplitude/High level", "Offset/Low level", "Phase" and "Duty" of the square waveform can be adjusted.

Ramp----Ramp Waveform

Provide frequency ranges from 1μHz to 300KHz ramp waveform output.

- The backlight of the key lights when the key is being chosen.
- The "Frequency/Period", "Amplitude/High level", "Offset/Low level", "Phase" and "Symmetry" of the ramp waveform can be adjusted.

Pulse----Pulse Waveform

Provide frequency ranges from 500μHz to 5MHz pulse waveform output.

- The backlight of the key lights when the key is being chosen.
- The "Frequency/Period", "Amplitude/High level", "Offset/Low level", "Pulse width/Duty" and "Rise/Fall" of the pulse waveform can be adjusted.

Noise----Noise Signal

Provide 10MHz bandwidth Gauss white noise output

- The backlight of the key lights when the key is being chosen.
- The "Variance" and ""Mean" of the noise signal can be adjusted.

Arb ----Arbitrary Waveform

Provide frequency ranges from 1μHz to 5MHz arbitrary waveform output.

- It can output 46 kinds of waveforms: Sinc, index rose, exponential decline, tangent, cotangent, inverse trigonometric, Guass and so on. Besides, it can output the arbitrary waveforms in the U disk.
- Users can on line edit (16Kpts) or edit through EsayWave arbitrary waveform and down load them to the instrument.

- The backlight of the key lights when the key is being chosen.
- The “Frequency/Period”, “Amplitude/High level”, “Offset/Low level”, “Phase” of the arbitrary waveform can be adjusted.

6. Number Keys

Those keys, including numbers from 0 to 9, radix points “.”, symbol keys “+/-”, are used to input parameters. Pay attention: when you need to input a negative, you should input a symbol “-” before you input the numbers.

7. Knob

It is used to increase (clockwise) or decrease (anticlockwise) current outstanding numerical value when setting parameters.

8. Arrow Keys

When using knob to set parameters, it is used to switch the place of numerical value.

When inputting a file name, it is used to move the position of cursor.

When saving or reading files, it is used to choose a position to save a file or choose a file to be read.

9. Channel Control/Output Key

Output This key is used to turn on/off Channel output.

BNC connector and its nominal output impedance is 50Ω

When turn on **Output** (backlight is light), the connector output waveform with current scheme.

10. Trigger Control/Output Key

Trigger This key is used to generate a manual trigger signal in the burst mode.

This BNC connector is the Sweep/Burst trigger signal input port of external trigger.

11. Mode/Utility Function Keys

Mod

This key is used to output modulated waveforms and provide several kinds of mode modulate and digital modulate manners. It generates AM, AM-DSB, FM, PM, ASK, FSK and PWM modulated signals.

- It supports Internal modulate source.
- The key backlight lights when the function key is being chosen.

Sweep

- This key is used to generate “sine waveform”, “square waveform”, “sawtooth waveform” and “arbitrary waveform” sweep signals.
- It supports “Linear” and “Log” two kinds of sweep manners.
- It supports “Internal” , “Manual” and “External” three kinds of trigger source.
- The backlight of the key lights when the key is being chosen.

Burst

This key is used to generate “sine waveform”, “square waveform”, “sawtooth waveform” and “arbitrary waveform” burst output.

- It supports “NCycle”, “Gated” and “Infinite” three kinds of burst modes.
- Noises also can be used to generate gating burst.
- It supports “Internal” , “Manual” and “External” three kinds of trigger source.
- The backlight of the key lights when the key is being chosen.

Store/Recall

Through this key users can save/recall instrument state or arbitrary waveform datum edited by users.

- As it supports file management system, users can do normal file operations.
- Besides a nonvolatile memory (C disk) inside, a U disk (D disk) can also be outside connected.
- The backlight of the key lights when the key is being chosen.

Utility

This key is used to set some system parameters and check version information.

- The backlight of the key lights when the key is being chosen.

Help

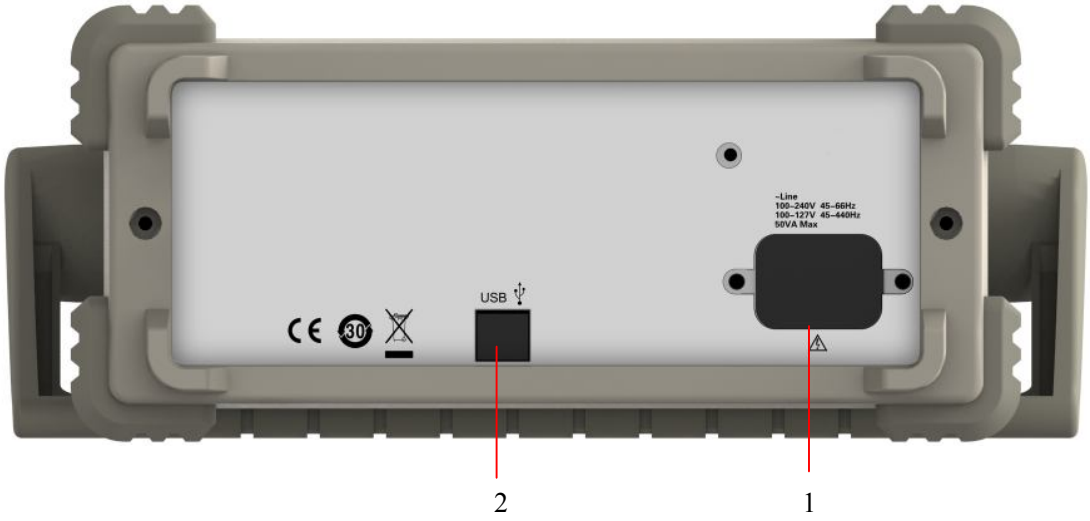
Press this key to obtain build-in help information about the product.

- The backlight of the key lights when the key is being chosen.

12. Menu Keys

Those keys are corresponding one by one to the left menu, press any key to activate corresponding menu.

The Back Panel

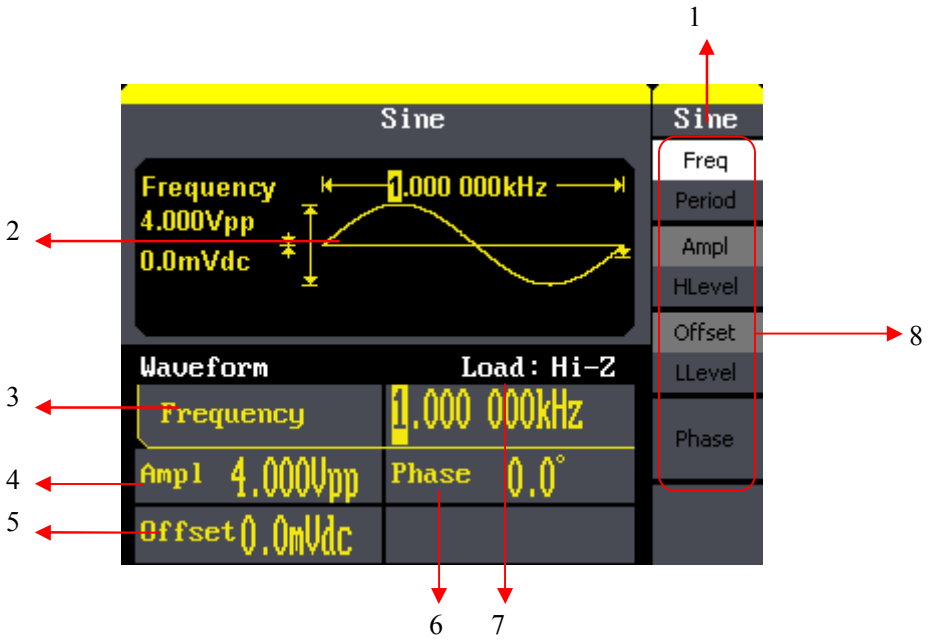


1. **AC Power Supply Input**
   SDG800 can input two different kinds of specification AC power supply.
   AC power: 100—240V, 50/60 Hz or 100—127V, 50/60/440 Hz;
   Fuse: 1.25AL, 250V

2. **USB Device**
   Connect the instrument to a computer through the port, and use software EasyWave to control the SDG800.

User Interface

SDG800 can only display one channel's parameters and waveform. The picture below shows the interface when choosing sine waveform. The interface will have some difference when current function is different.



1. **Current Function**
   Display current function name. For example: "sine" shows that sine waveform function is being chosen.

2. **Waveform Display Area**
   It shows each channel's current waveform.

3. **Frequency**
   It shows each channel's current waveform's frequency. After press corresponding Freq menu, use number keys or knob to change the parameter value.

4. **Amplitude**
   It shows each channel's current waveform's amplitude. After press corresponding Ampl menu, use number keys or knob to change the parameter value.

5. **Offset**
   It shows each channel's current waveform's DC offset. After press corresponding Offset menu, use number keys or knob to change the parameter value.

6. **Phase**
   It shows each channel's current waveform's phase value. After press corresponding Phase menu, use number keys or knob to change the parameter value.

7. **Load**
   It shows each channel's load scheme.
   High Resistance: display "Hi-Z" Load: display default "50Ω"

8. **Menu**
   It shows the corresponding operation menu of the current function which is being chosen. For example: the picture above shows the function menu of "Sine" waveform.

Using Built-In Help System

To obtain build-in help information of the product, please press **Help** key first, then use arrow keys to choose the help item you want, last press Select to obtain help information.

Press Help key to open the common help information below:

1. View the instrument information.
2. Basic waveform output.
3. Arbitrary waveform output.
4. Generate a modulated waveform.
5. Sweep output.
6. Burst output.
7. Storage management.
8. Generate a DC-only signal.
9. Synchronize multiple instruments.
10. Reset the instrument to its default state.
11. Technical support.

Contact SIGLENT

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QS02008-E02A

Programming Guide

SDG Series
Function/Arbitrary
Waveform Generator

Catalogue

1 Programming Overview

This chapter introduces how to build communication between SDG series function/arbitrary waveform generator and the PC. It also introduces how to remote control.

1.1 Build communication

1.1.1 Install NI-VISA

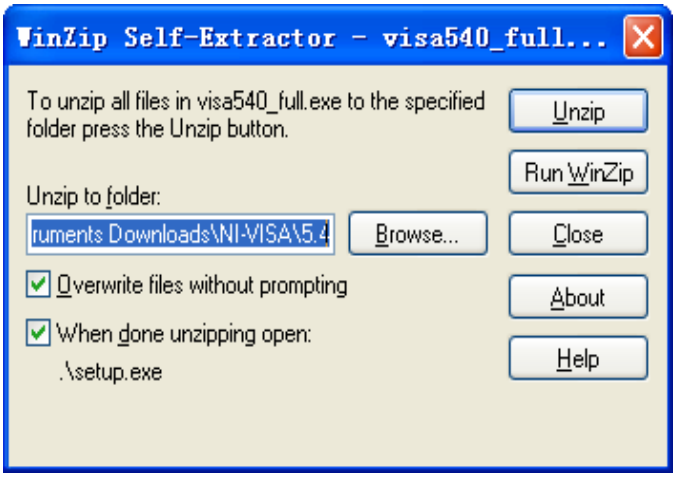
Before programming, you need to install NI-VISA, which you can download from the NI-VISA web site. About NI-VISA, there are full version and Run-Time Engine version. The full version include NI device driver and a tool named NI MAX that is a user interface to control the device. The Run-Time Engine version which is much smaller than the full version only include NI device driver.

For example, you can get NI-VISA 5.4 full version from: http://www.ni.com/download/ni-visa-5.4/4230/en/.

You can also download NI-VISA Run-Time Engine 5.4 to your PC and install it as default selection. This installation process is similar with the full version.

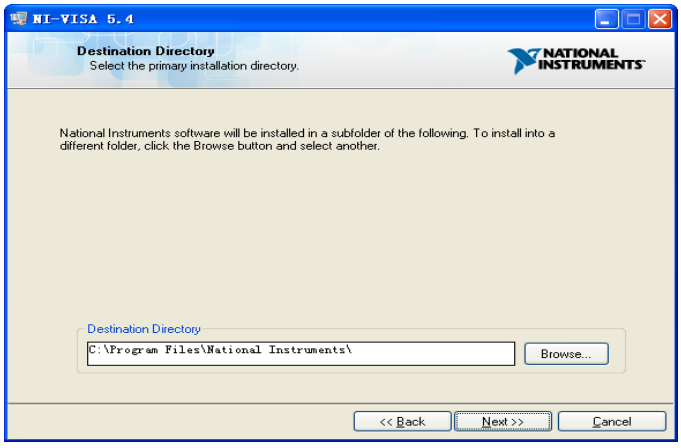
After you downloaded the file you can follow the steps below to install it:

i. Double click the visa540_full.exe, dialog shown as below:

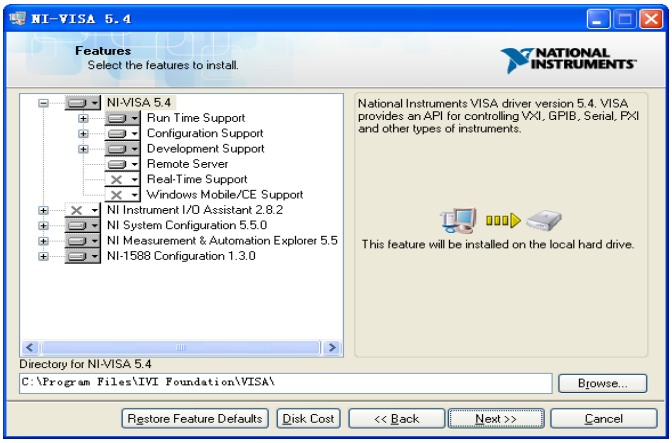


ii. Click Unzip, the installation process will automatically launch after unzipping files. If your computer needs to install .NET Framework 4, its Setup process will auto start.

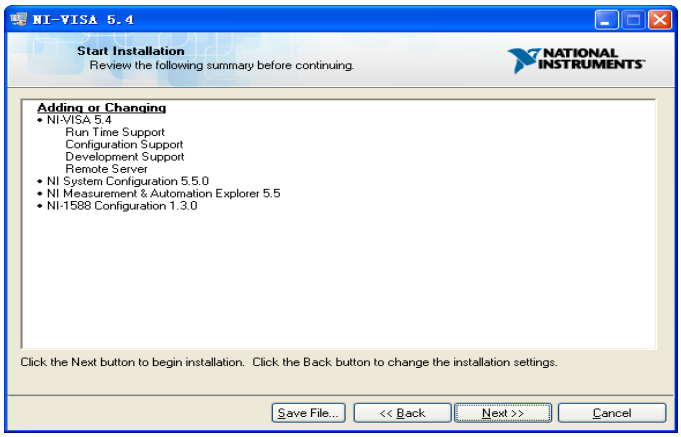
iii. The NI-VISA installing dialog is shown above. Click Next to start the installation process.



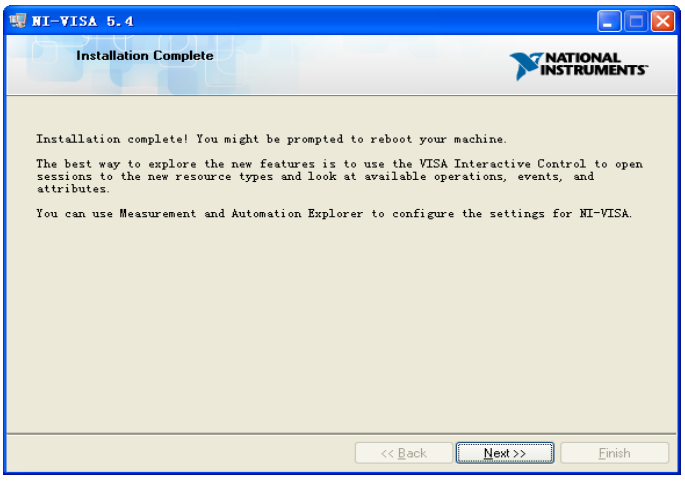
Set the install path, default path is “C:\Program Files\National Instruments\”, you can change it. Click Next, dialog shown as above.



iv. Click Next twice, in the License Agreement dialog, select the “I accept the above 2 License Agreement(s).”,and click Next, dialog shown as below:



v. Click Next to run installation.

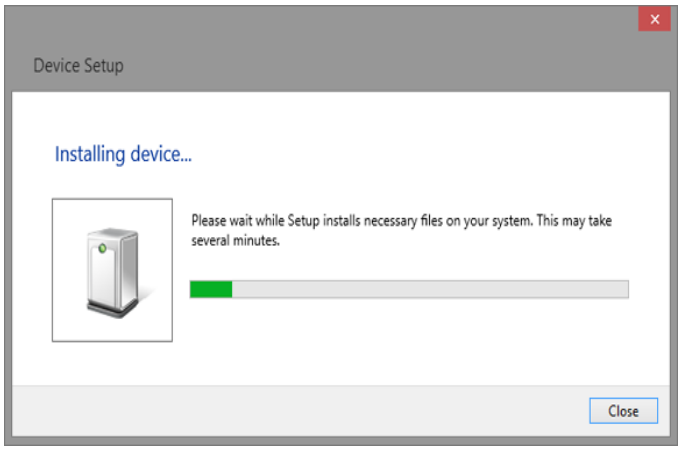


Now the installation is complete, reboot your PC.

1.1.2 Connect the instrument

Depending on your specific model your function/arbitrary waveform generator may be able to communicate with a PC through the USB or LAN interface. This manual takes the USB as an example. But some examples may involve LAN.

a. Connect the function/arbitrary waveform generator and the USB Host interface of the PC using a USB cable. Assuming your PC is already turned on, turn on your SDG and your PC will display the “Device Setup” screen as it automatically installs the device driver as shown below.



b. Wait for the installation to complete and then proceed to the next step.

1.2 How To Remote Control

1.2.1 User-defined Programming

Users can use SCPI commands to program and control the function/arbitrary waveform generator. For details, refer to the introductions in "**Programming Examples**".

1.2.2 Send SCPI Commands via NI-VISA

You can control the SDG remotely by sending SCPI commands via NI-VISA software.

2 Introduction to the SCPI Language

2.1 About Commands & Queries

This section lists and describes the remote control commands and queries recognized by the instrument. All commands and queries can be executed in either local or remote state.

Each command or query, with syntax and other information, has some examples listed. The commands are given in both long and short format at “COMMAND SYNTAX”and “**QUERY SYNTAX**”, and the subject is indicated as a command or query or both. Queries perform actions such as obtaining information, and are recognized by the question mark (?) following the header.

2.2 How They are Listed

The descriptions are listed in alphabetical order according to their short format.

2.3 How They are Described

In the descriptions themselves, a brief explanation of the function performed is given. This is followed by a presentation of the formal syntax, with the header given in Upper-and-Lower-Case characters and the short form derived from it in ALL UPPER-CASE characters. Where applicable, the syntax of the query is given with the format of its response.

2.4 When can They be Used

The commands and queries listed here can be used for SDGxxxx Series Function/Arbitrary Waveform Generators.

2.5 Command Notation

The following notations are used in the commands:

< > Angular brackets enclose words that are used placeholders ,of which there are two types: the header path and the data parameter of a command.

:= A colon followed by an equals sign separates a placeholder, from the description of the type and range of values that may be used in a command instead of the placeholder.{ } Braces enclose a list of choices, one of which must be made.

[ ] Square brackets enclose optional items.

… An ellipsis indicates that the items both to its left and right may be repeated for a number of times.

2.6 Table of Command & Queries

Short	Long Form	Subsystem	What Command/Query does
*IDN	*IDN	SYSTEM	Gets identification from device.
*OPC	*OPC	SYSTEM	Gets or sets the OPC bit (0) in the Event Status Register (ESR).
*CLS	*CLS	SYSTEM	Clears all the status data registers.
*ESE	*ESE	SYSTEM	Sets or gets the Standard Event Status Enable register (ESE).
*ESR	*ESR	SYSTEM	Reads and clears the contents of the Event Status Register (ESR).
*RST	*RST	SYSTEM	Initiates a device reset.
*SRE	*SRE	SYSTEM	Sets the Service Request Enable register (SRE).
*STB	*STB	SYSTEM	Gets the contents of the IEEE 488.2 defined status register.
*TST	*TST	SYSTEM	Performs an internal self-test.
*WAI	*WAI	SYSTEM	Wait to continue command.
DDR	DDR	SYSTEM	Reads and clears the Device Dependent Register (DDR).
CMR	CMR	SYSTEM	Reads and clears the command error register.
CHDR	COMM_HEADER	SIGNAL	Sets or gets the command returned format
OUTP	OUTPUT	SIGNAL	Sets or gets output state.
BSWV	BASIC_WAVE	SIGNAL	Sets or gets basic wave parameters.
MDWV	MODULATEWAVE	SIGNAL	Sets or gets modulation parameters.
SWWV	SWEEPWAVE	SIGNAL	Sets or gets sweep parameters.
BTWV	BURSTWAVE	SIGNAL	Sets or gets burst parameters.
PACP	PARACOPY	SIGNAL	Copies parameters from one channel to the other.
ARWV	ARBWAVE	DATA	Changes arbitrary wave type.
SYNC	SYNC	SIGNAL	Sets or gets synchronization signal.
NBFM	NUMBER_FORMAT	SYSTEM	Sets or gets data format.
LAGG	LANGUAGE	SYSTEM	Sets or gets language.
SCFG	SYS_CFG	SYSTEM	Sets or gets the power-on system setting way.
BUZZ	BUZZER	SYSTEM	Sets or gets buzzer state.

SCSV	SCREEN_SAVE	SYSTEM	Sets or gets screen save state.
ROSC	ROSCILLATOR	SIGNAL	Sets or gets state of clock source.
FCNT	FREQCOUNTER	SIGNAL	Sets or gets frequency counter parameters.
INVT	INVERT	SIGNAL	Sets or gets polarity of current channel.
COUP	COUPLING	SIGNAL	Sets or gets coupling parameters.
VOLTPRT	VOLTPRT	SYSTEM	Sets or gets state of over-voltage protection.
STL	STORELIST	SIGNAL	Lists all stored waveforms.
WVDT	WVDT	SIGNAL	Sets and gets arbitrary wave data.
VKEY	VIRTUALKEY	SYSTEM	Sets the virtual keys.
SYST:COMM:LAN:IPAD	SYSTEM:COMMUNICATE:LAN:IPADDRESS	SYSTEM	The Command can set and get system IP address.
SYST:COMM:LAN:SMAS	SYSTEM:COMMUNICATE:LAN:SMASK	SYSTEM	The Command can set and get system subnet mask.
SYST:COMM:LAN:GAT	SYSTEM:COMMUNICATE:LAN:GATEWAY	SYSTEM	The Command can set and get system Gateway.
SRATE	SAMPLERATE	SIGNAL	Sets or gets sampling rate. You can only use it in TrueArb mode
HARM	HARMonic	SIGNAL	Sets or gets harmonic information.
CMBN	CoMBiNe	SIGNAL	Sets or gets wave combine information.

3 Commands and Queries

3.1 IEEE 488.2 Common Command Introduction

IEEE standard defines the common commands used for querying the basic information of the instrument or executing basic operations. These commands usually start with "*" and the length of the keywords of the command is usually 3 characters.

3.1.1 IDN

DESCRIPTION

The *IDN? query causes the instrument to identify itself. The response comprises manufacturer, model, serial number, software version and firmware version.

QUERY SYNTAX

*IDN?

RESPONSE FORMAT

*IDN, <device id>,<model>,<serial number>,
<software version>, <hardware version>.

<device id>:=“SDG” is used to identify instrument.
<model>:= A model identifier less than 14 characters, should not contain the word “MODEL”.
<serial number>:Each product has its own number, the serial number can labeled product uniqueness.
<software version>:= A serial numbers about software version.
<hardware version>:=The hardware level field, should contain information about all separately revisable subsystems. This information can be contained in single or multiple revision codes.

EXAMPLE

Reads version information.
*IDN?
Return:
*IDN SDG, SDG5162, 120465, 5.01.02.05, 02-00-00-21
-24(It may differ from each version)

Notes:

1)

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
<hardware version>	yes	yes	no	yes	no

2) Explain for <hardware version>:value1- value2- value3- value4- value5.

value1: PCB version.

value2: Hardware version.

value3: Hardware subversion.

value4: FPGA version.

value5: CPLD version.

3.1.2 OPC

DESCRIPTION The *OPC (Operation Complete) command sets the OPC bit (bit 0) in the standard Event Status Register (ESR). This command has no other effect on the operation of the device because the instrument starts parsing a command or query only after it has completely processed the previous command or query.
The *OPC? query always responds with the ASCII character 1 because the device only responds to the query when the previous command has been entirely executed.

COMMAND SYNTAX *OPC

QUERY SYNTAX *OPC?

RESPONSE FORMAT *OPC 1

3.1.3 CLS

DESCRIPTION The *CLS command clears all the status data registers.

COMMAND SYNTAX *CLS

EXAMPLE The following command causes all the status data registers to be cleared:
*CLS

3.1.4 ESE

DESCRIPTION

The *ESE command sets the Standard Event Status Enable register (ESE). This command allows one or more events in the ESR register to be reflected in the ESB summary message bit (bit 5) of the STB register.
The *ESE? query reads the contents of the ESE register.

COMMAND SYNTAX

*ESE <value>
<value> : = 0 to 255.

QUERY SYNTAX

*ESE?

RESPONSE FORMAT

*ESE <value>

EXAMPLE

The following instruction allows the ESB bit to be set if a user request (URQ bit 6, i.e. decimal 64) and/or a device dependent error (DDE bit 3, i.e. decimal 8) occurs. Summing these values yields the ESE register mask 64+8=72.
*ESE?
Return:
*ESE 72

RELATED COMMANDS

*ESR

3.1.5 ESR

DESCRIPTION

The *ESR? query reads and clears the contents of the Event Status Register (ESR). The response represents the sum of the binary values of the register bits 0 to 7.

QUERY SYNTAX

*ESR?

RESPONSE FORMAT

*ESR <value>
<value> : = 0 to 255

EXAMPLE

The following instruction reads and clears the content of the ESR register:
*ESR?
Return：
*ESR 0

RELATED COMMANDS *CLS, *ESE

3.1.6 RST

DESCRIPTION The *RST command initiates a device reset. The *RST recalls the default setup.

COMMAND SYNTAX * RST

EXAMPLE This example resets the signal generator:
*RST

3.1.7 SRE

DESCRIPTION The *SRE command sets the Service Request Enable register (SRE). This command allows the user to specify which summary message bit(s) in the STB register will generate a service request.
A summary message bit is enabled by writing a '1' into the corresponding bit location. Conversely, writing a '0' into a given bit location prevents the associated event from generating a service request (SRQ). Clearing the SRE register disables SRQ interrupts.
The *SRE? query returns a value that, when converted to a binary number represents the bit settings of the SRE register. Note that bit 6 (MSS) cannot be set and it's returned value is always zero.

COMMAND SYNTAX *SRE <value>
<value> : = 0 to 255

QUERY SYNTAX *SRE?

RESPONSE FORMAT *SRE <value>

EXAMPLE The following instruction allows a SRQ to be generated as soon as the MAV summary bit (bit 4, i.e. decimal 16) or the INB summary bit (bit 0, i.e. decimal 1) in the STB register, or both are set. Summing these two values yields the SRE mask 16+1 = 17.
*SRE?
Return:

*SRE 17

3.1.8 STB

DESCRIPTION

The *STB? query reads the contents of the 488.2 defined status register (STB), and the Master Summary Status (MSS).
The response represents the values of bits 0 to 5 and 7 of the Status Byte register and the MSS summary message.
The response to a *STB? query is identical to the response of a serial poll except that the MSS summary message appears in bit 6 in place of the RQS message.

UERY SYNTAX

*STB?

RESPONSE FORMAT

*STB <value>
<value> : = 0 to 255

EXAMPLE

The following reads the status byte register:
*STB?
Return:
*STB 0

RELATED COMMANDS

*CLS, *SRE

3.1.9 TST

DESCRIPTION

The *TST? query performs an internal self-test and the response indicates whether the self-test has detected any errors. The self-test includes testing the hardware of all channels.
Hardware failures are identified by a unique binary code in the returned <status> number. A “0” response indicates that no failures occurred.

QUERY SYNTAX

*TST?

RESPONSE FORMAT

*TST <status>
<status> : = 0 self-test successful

EXAMPLE

The following causes a self-test to be performed:
TST?
Return(if no failure):
*TST 0

RELATED COMMANDS *CAL

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
TST	no	yes	yes	yes	yes

3.1.10 WAI

DESCRIPTION The *WAI (WAIT to continue) command, requires by the IEEE 488.2 standard, has no effect on the instrument, as the signal generator only starts processing a command when the previous command has been entirely executed.

COMMAND SYNTAX *WAI

RELATED COMMANDS *OPC

3.1.11 DDR

DESCRIPTION The DDR? query reads and clears the contents of the device dependent or device specific error register (DDR). In case of a hardware failure, the DDR register specifies the origin of the failure.

QUERY SYNTAX DDR?

RESPONSE FORMAT DDR <value>
<value> : = 0 to 65535

EXAMPLE DDR?
Return:
DDR 0

The following table gives details：

Bit	Bit Value	Description
15...14		Reserved
13	8192	Time-base hardware failure detected
12	4096	Trigger hardware failure detected
11		Reserved
10		Reserved
9	512	Channel 2 hardware failure detected
8	256	Channel 1 hardware failure detected

7	128	External input overload condition detected
6…4		Reserved
3		Reserved
2		Reserved
1	2	Channel 2 overload condition detected
0	1	Channel 1 overload condition detected

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000x
DDR	yes	yes	no	yes	no

3.1.12 CMR

DESCRIPTION The CMR? query reads and clears the contents of the command error register (CMR) .See the table below which specifies the last syntax error type detected by the instrument.

QUERY SYNTAX CMR?

RESPONSE FORMAT CMR <value>
<value> : = 0 to 14

EXAMPLE CMR?
Return:
CMR 0

Value	Description
0	
1	Unrecognized command/query header
2	Invalid character
3	Invalid separator
4	Missing parameter
5	Unrecognized keyword
6	String error
7	Parameter can’t allowed
8	Command String Too Long
9	Query cannot allowed
10	Missing Query mask
11	Invalid parameter
12	Parameter syntax error
13	Filename too long
14	Directory not exist

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
CMR	yes	yes	no	yes	no

3.2 Comm_Header Command

DESCRIPTION This command is used to change the query command returned format. “SHORT” parameter returns short format. “LONG” parameter returns long format. “OFF” returns nothing.

COMMAND SYNTAX CHDR (Comm_HeaDeR) <parameter>
<parameter>:= {SHORT,LONG,OFF}

QUERY SYNTAX CHDR (Comm_HeaDeR)?

RESPONSE FORMAT CHDR <parameter>

EXAMPLE Set query command format to long.
CHDR LONG

Read query command format.
CHDR?
Return:
COMM_HEADER LONG

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
CHDR	yes	yes	no	yes	no

3.3 Output Command

DESCRIPTION Enable or disable the output of the [Output] connector at the front panel corresponding to the channel.
The query returns “ON” or “OFF” and “LOAD”, “PLRT” parameters.

COMMAND SYNTAX <channel>:OUTP (OUTPut) <parameter>
<channel>:={C1, C2}
<parameter >:= {a parameter from the table below}

Parameters	Value	Description

ON	---	Turn on
OFF	---	Turn off
LOAD	<load>	Value of load (default unit is ohm)
PLRT	<NOR, INVT>	Value of polarity parameter

< load>:= {please see the note below.}

QUERY SYNTAX <channel>: OUTP(OUTPut)?

RESPONSE FORMAT <channel>: OUTP <load>

EXAMPLE

Turn on channel one.
C1: OUTP ON

Read channel one output state.
C1: OUTP?
Return:
C1: OUTP ON, LOAD, HZ, PLRT, NOR

Set the load to 50.
C1: OUTP LOAD, 50

Set the load to HZ.
C1: OUTP LOAD, HZ

Set the polarity normal.
C1: OUTP PLRT, NOR

Set the polarity inverted.
C1: OUTP PLRT, INVT

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
<channel>	no	yes	yes	yes	yes
LOAD	50, HZ	50~10000, HZ	50~100000, HZ	50, HZ	50~100000, HZ

3.4 Basic Wave Command

DESCRIPTION Sets or gets basic wave parameters. In SDG1000X if turn on wave combine, you can't set wave to square. Combining a square waveform is not possible.

COMMAND SYNTAX <channel>:BSWV(BaSic_WaVe) <parameter>
<channel>:={C1, C2}
<parameter>:= {a parameter from the table below}

Parameters	Value	Description
WVTP	<type>	Type of wave
FRQ	<frequency>	Value of frequency. If wave type is Noise or DC, you can't set this parameter.
PERI	<period>	Value of period. If wave type is Noise or DC, you can't set this parameter.
AMP	<amplitude>	Value of amplitude. If wave type is Noise or DC, you can't set this parameter.
OFST	<offset>	Value of offset. If wave type is Noise or DC, you can't set this parameter.
SYM	<symmetry>	Value of symmetry. Only when wave type is Ramp, you can set this parameter.
DUTY	<duty>	Value of duty cycle. Only when wave type is Square and Pulse, you can set this parameter.
PHSE	<phase>	Value of phase. If wave type is Noise or Pulse or DC, you can't set this parameter.
STDEV	<standard deviation >	Value of Noise wave standard deviation. Only when wave type is Noise, you can set this parameter.
MEAN	<mean>	Value of Noise wave mean. Only when wave type is Noise, you can set this parameter.
WIDTH	<width>	Value of width. Only when wave type is Pulse, you can set this parameter.
RISE	<rise>	Value of rise time. Only when wave type is Pulse, you can set this parameter.
FALL	<fall>	Value of fall time. Only when wave type is Pulse, you can set this parameter.
DLY	<delay>	Value of delay. Only when wave type is Pulse, you can set this parameter.
HLEV	<high level>	Value of high level. If wave type is Noise or DC, you can't set this parameter.
LLEV	<low level>	Value of low level. If wave type is Noise or DC, you can't set this parameter.
BANDSTATE	<bandwidth	State of noise bandwidth switch. Only when wave type

	switch >	is Noise, you can set this parameter.
BANDWIDTH	<bandwidth value>	Value of noise bandwidth. Only when wave type is noise, you can set this parameter.

Note: if the command doesn't set basic wave type, WVPT parameter will be set to current wave type.

where: <type>:={SINE, SQUARE, RAMP, PULSE, NOISE, ARB ,DC}
<frequency>:= {Default unit is "Hz". Value depends on the model.}
<amplitude>:= {Default unit is "V". Value depends on the model.}
<offset>:= {Default unit is "V". Value depends on the model.}
<duty>:= {0% to 100%. Value depends on frequency.}
<symmetry> :={ 0% to 100%}
<phase>:= {0 to 360,In SDG2000X/SDG1000X,if you set 400,it will set 40(400-360)}
< standard deviation >:= {Default unit is "V". Value depends on the model.}
<mean>:= {Default unit is "V". Value depends on the model.}
<width>:= {Max_width < (Max_duty * 0.01) * period and Min_width > (Min_duty * 0.01) * period.}
<rise>:= {Value depends on the model.}
<fall>:= {Value depends on the model.}
<delay>:= {Unit is S. Maximal is Pulse period, minimum value is 0.}
<bandwidth switch >:= {ON,OFF}
<bandwidth value>:= {value between 20MHz and 120MHz}

QUERY SYNTAX <channel>: BSWV (BaSic_WaVe)?
<channel>:={C1, C2}

RESPONSE FORMAT <channel>:BSWV<type>,<frequency>,<amplitude>,<offset>, <duty>,<symmetry>, <phase>,<variance>,<mean>,<width>, <rise>, <fall>, <delay>.

EXAMPLE Change channel one wave type to ramp.
C1: BSWV WVTP, RAMP

Change frequency of channel one to 2000 Hz.
C1: BSWV FRQ, 2000

Set amplitude of channel one to 3Vpp.
C1: BSWV AMP, 3

Read channel basic wave parameters from device.
C1: BSWV?
Return:
C1: BSWV WVTP, SINE,FRQ,100HZ,PERI,0.01S,AMP,2V,

OFST,0V,HLEV,1V,LLEV,-1V,PHSE,0

Set noise bandwidth value of channel one to 100MHz
C1: BSWV BANDWIDTH, 100000000

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
<channel>	no(single channel)	yes	yes	yes	yes
RISE	yes	no	yes	yes	yes
FAL	yes	no	yes	yes	yes
DLY	no	yes	yes	yes	yes
BANDSTATE	no	no	yes	no	no
BANDWIDTH	no	no	yes	no	no

3.5 Modulate Wave Command

DESCRIPTION Sets or gets modulation parameters.

COMMAND SYNTAX <channel>:MDWV(MoDulateWaVe)<parameter>
<channel>:={C1, C2}
<parameter>:= {a parameter from the table below}

Parameters	Value	Description
STATE	<state>	Turn on or off modulation. Note: if you want to set or read other parameters of modulation, you must set STATE to ON at first.
AM, SRC	<src>	AM signal source.
AM, MDSP	<mod wave shape>	AM modulation wave. Only when AM signal source is set to INT, you can set the parameter.
AM, FRQ	<AM frequency>	AM frequency. Only when AM signal source is set to INT, you can set the parameter.
AM, DEPTH	<depth>	AM depth. Only when AM signal source is set to INT, you can set the parameter.
DSBAM, SRC	<src>	DSBAM signal source.
DSBAM, MDSP	<mod wave shape>	DSBAM modulation wave. Only when AM signal source is set to INT, you can set the parameter.
DSBAM, FRQ	<DSB-AM	DSBAM frequency. Only when AM signal

	frequency>	source is set to INT, you can set the parameter.
FM, SRC	<src>	FM signal source.
FM, MDSP	<mod wave shape>	FM modulation wave. Only when FM signal source is set to INT, you can set the parameter.
FM, FRQ	<FM frequency>	FM frequency. Only when FM signal source is set to INT, you can set the parameter.
FM, DEVI	<FM frequency deviation >	FM frequency deviation. Only when FM signal source is set to INT. you can set the parameter.
PM, SRC,	<src>	PM signal source.
PM, MDSP	<mod wave shape>	PM modulation wave. Only when PM signal source is set to INT, you can set the parameter.
PM, FRQ	<PM frequency>	PM frequency. Only when PM signal source is set to INT, you can set the parameter.
PWM, FRQ	<PWM frequency>	PWM frequency. Only when carrier wave is PULSE wave, you can set the parameter.
PWM, DEVI	<PWM dev>	Duty cycle deviation. Only when carrier wave is PULSE wave, you can set the parameter.
PWM, MDSP	<mod wave shape>	PWM modulation wave. Only when carrier wave is PULSE wave, you can set the parameter.
PWM, SRC	<src>	PWM signal source.
PM, DEVI	<PM phase offset>	PM phase deviation. Only when PM signal source is set to INT, you can set the parameter.
ASK, SRC	<src>	ASK signal source.
ASK, KFRQ	<ASK key frequency>	ASK key frequency. Only when ASK signal source is set to INT, you can set the parameter.
FSK, KFRQ	<FSK key frequency>	FSK key frequency. Only when FSK signal source is set to INT, you can set the parameter.
FSK, HFRQ	<FSK hop frequency>	FSK hop frequency.
FSK, SRC	<src>	FSK signal source.
PSK, KFRQ	<FSK key frequency>	PSK key frequency. Only when PSK signal source is set to INT, you can set the parameter.
PSK, SRC	<src>	PSK signal source.
CARR, WVTP	<wave type>	Carrier wave type.

CARR, FRQ	<frequency>	Value of carrier frequency.
CARR, AMP	<amplitude>	Value of carrier amplitude.
CARR, OFST	<offset>	Value of carrier offset.
CARR, SYM	<symmetry>	Value of carrier symmetry. Only ramp can set this parameter.
CARR, DUTY	<duty>	Value of duty cycle. Only square and pulse can set this parameter.
CARR, PHSE	<phase>	Value of carrier phase.
CARR, RISE	<rise>	Value of rise time. Only Pulse can set this parameter.
CARR, FALL	<fall>	Value of fall time. Only Pulse can set this parameter.
CARR, DLY	<delay>	Value of carrier delay. Only PULSE can set this parameter.

Note: If carrier wave is Noise you can't set to turn on modulation.
If you want to set AM, FM, PM, CARR and STATE the first parameter have to be one of them.

where: <state>:={ON, OFF}
<src>:= {INT, EXT}
<mod wave shape>:={SINE, SQUARE, TRIANGLE, UP RAMP, DNRAMP, NOISE, ARB}
<am frequency>:= {Default unit is "Hz". Value depends on the model.}
<depth>:= {0% to 120%}
<fm frequency>:= {Default unit is "Hz". Value depends on the model.}
<fm frequency deviation > :={ 0 to carrier frequency, Value depends on the difference between carrier frequency and bandwidth frequency.}
<pm frequency> :={ Default unit is "Hz", Value depends on the model.}
<pm phase deviation >:= {0 to 360.}
<pwm frequency>:= {Default unit is "Hz", Value depends on the model. }
<pwm dev>:= { Default unit is "%",value depends on carrier duty cycle}
<ask key frequency>:= {Default unit is "Hz", Value depends on the model.}
<fsk frequency>:= { Default unit is "Hz", Value depends on the version.}
<fsk jump frequency>:= { the same with basic wave frequency}
<wave type>:={SINE ,SQUARE, RAMP, ARB, PULSE }
<frequency> :={ Default unit is "Hz", Value depends on the model.}
<amplitude> :={ Default unit is "V", Value depends on the model.}
<offset> :={ Default unit is "V", Value depends on the model.}
<duty>:= {0% to 100 %.}
<symmetry>:={ 0% to 100%}
<rise>:= {Value depends on the model.}
<fall>:= {Value depends on the model.}
<delay>:= {Default unit is "S".}

Note:
There are some parameters Value depends on the model, You can read version datasheet to get specific parameters

QUERY SYNTAX

<channel>: MDWV (MoDulateWaVe)?
<channel>:={C1, C2}

RESPONSE FORMAT

<channel>:MDWV <parameter>
<parameter> :={ Return all parameter of the current modulation parameters.}

EXAMPLE

Set channel one modulation type to AM.
C1: MDWV AM

Set modulation shape to AM, and set AM modulating wave type to sine wave.
C1: MDWV AM, MDSP, SINE

Read channel one modulation parameters of which STATE is ON.
C1: MDWV?
Return:
C1:MDWV STATE,ON,AM,MDSP,SINE,SRC,INT,FRQ,100HZ,
DEPTH,100,CARR,WVTP,RAMP,FRQ,1000HZ,AMP,4V,OFST,0V,PHSE,
0, SYM, 50

Read channel one modulate wave parameters of which STATE is OFF.
C1: MDWV?
Return:
C1: MDWV STATE, OFF

Set channel one FM frequency to 1000Hz
C1: MDWV FM, FRQ, 1000

Set channel one carrier shape to SINE.
C1: MDWV CARR, WVTP, SINE

Set channel one carrier frequency to 1000 Hz.
C1: MDWV CARR, FRQ,1000

RELATED COMMANDS

ARWV, BTWV, SWWV, BSWV

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000x
<channel>	No(single channel)	yes	yes	yes	yes
[type], SRC	no(only internal source)	yes	yes	yes	yes
CARR, DLY	no	yes	yes	yes	yes
CARR, RISE	yes	no	yes	yes	yes
CARR, FALL	yes	n o	yes	yes	yes

[type]:={AM, FM, PM, FSK, ASK, DSBAM, PWM}

3.6 Sweep Wave Command

DESCRIPTION Sets or gets sweep parameters.

COMMAND SYNTAX <channel>SWWV(SweepWaVe) <parameter>
<channel>:={C1, C2}
<parameter>:= {a parameter from the table below}

Parameters	Value	Description
STATE	<state>	Turn on or off sweep. Note: if you want to set or read other parameters you must set STATE to ON at first.
TIME	<time>	Value of sweep time.
STOP	<stop frequency>	Value of stop frequency.
START	<start frequency>	Value of start frequency.
TRSR	<trigger src>	Trigger source.
TRMD	<trigger mode>	State of trigger output. If TRSR is EXT, the parameter is invalid.
SWMD	<sweep mode>	Sweep style.
DIR	<direction>	Sweep direction.
EDGE	<edge>	Value of edge. Only when TRSR is EXT, the parameter is valid.
MTRIG	<manual trigger>	Make a manual trigger. Only when TRSR is MAN, the parameter is valid.
CARR, WVTP	<wave type>	Carrier type.
CARR, FRQ	<frequency>	Value of carrier frequency.
CARR, AMP	<amplitude>	Value of carrier amplitude.
CARR, OFST	<offset>	Value of carrier offset.
CARR, SYM	<symmetry>	Value of carrier symmetry, Only Ramp can set this parameter.
CARR, DUTY	<duty>	Value of carrier duty cycle. Only Square can set this parameter.
CARR,	<phase>	Value of carrier phase.

PHSE		

Note: If carrier is Pulse or Noise you can't turn on sweep.
If you want to set CARR and STATE, the first parameter has to be one of them.

where:

<state>:= {ON, OFF}
<time>:= { Default unit is "S". Value depends on the model.}
<stop frequency> :={ the same with basic wave frequency}
<start frequency> :={ the same with basic wave frequency}
<trigger src>:= {EXT, INT, MAN}
<trigger mode>:= {ON, OFF}
<sweep mod>:= {LINE, LOG}
<direction>:= {UP, DOWN}
<edge>:={RISE, FALL}
<wave type>:={SINE ,SQUARE, RAMP, ARB}
<frequency> :={ Default unit is "Hz". Value depends on the model.}
<amplitude> :={ Default unit is "V". Value depends on the model.}
<offset> :={ Default unit is "V", Value depends on the model.}
<duty>:= {0% to 100 %.}
<symmetry>:={ 0% to 100%}

Note:
There are some parameters Value depends on the model,
You can read version datasheet.

QUERY SYNTAX

<channel>: SWWV (SWeepWaVe)? <channel>:={C1, C2}

RESPONSE FORMAT

<parameter> :={ Return all parameters of the current sweep wave.}

EXAMPLE

Set channel one sweep time to 1 S.
C1: SWWV TIME, 1

Set channel one sweep stop frequency to 1000 Hz.
C1: SWWV STOP, 1000

Read channel one sweep parameters of which STATE is ON.
C2: SWWV?
Return:
C2: SWWV STATE, ON, TIME, 1S, STOP, 100HZ, START, 100HZ, TRSR, MAN,TRMD, OFF, SWMD, LINE, DIR, UP, CARR, WVTP, SQUARE,

FRQ, 1000HZ, AMP, 4V, OFST, 0V, DUTY, 50, PHSE, 0

Read channel two sweep parameters of which STATE is OFF.
C2: SWWV?
Return:
C2: SWWV STATE, OFF

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
<channel>	no(single channel)	yes	yes	yes	yes
TRMD	no	yes	yes	yes	yes
EDGE	no	yes	yes	yes	yes

3.7 Burst Wave Command

DESCRIPTION Sets or gets burst wave parameters.

COMMAND SYNTAX <channel>BTWV(BursTWaVe) <parameter>
<channel>:={C1, C2}
<parameter>:= {a parameter from the table below}

Parameters	Value	Description
STATE	<state>	Turn on or off burst. Note: If you want to set or read other parameters of burst, you must set state to ON at first.
PRD	<period>	Value of burst period. When carrier is NOISE wave, you can't set it. When GATE was chosen, you can't set it (but in SDG2000X, you can).And when trigger source is EXT, you can't set it.
STPS	<start phase>	Start phase of carrier. When carrier is NOISE or PULSE wave, you can't set it.
GATE_NCYC	<gate Ncycle>	Set the burst mode to GATE or NCYC. When carrier is NOISE, you can't set it.
TRSR	<trigger source>	Set the trigger source.
DLAY	<delay>	Value of delay. When carrier is NOISE wave, you can't set it. When NCYC is chosen you can set it.
PLRT	<polarity>	Value of polarity. When GATE is chosen you can set it. When carrier is NOISE, it is the only parameter.
TRMD	<trig mode>	Value of trigger mode. When carrier is NOISE wave, you can't set it. When NCYC is chosen you can set it. When TRSR is set to EXT, you can't set it.

EDGE	<edge>	Value of edge. When carrier is NOISE wave, you can't set it. When NCYC is chosen and TRSR is set to EXT, you can set it.
TIME	<circle time>	Value of Ncycle number. When carrier is NOISE wave, you can't set it. When NCYC is chosen you can set it.
MTRIG	<manual trig>	Manual trigger. When TRSR is set to MAN, it can be set.
CARR, WVTP	<wave type>	Value of carrier type.
CARR, FRQ	<frequency>	Value of carrier frequency
CARR, AMP	<amplitude>	Value of carrier amplitude.
CARR, OFST	<offset>	Value of carrier offset.
CARR, SYM	<symmetry>	Value of symmetry. Only Ramp can set this parameter.
CARR, DUTY	<duty>	Value of duty cycle. Only Square or Pulse can set this parameter.
CARR, PHSE	<phase>	Value of carrier phase.
CARR, RISE	<rise>	Value of rise edge. Only when carrier is Pulse, the Value is valid.
CARR, FALL	<fall>	Value of fall edge. Only when carrier is Pulse, the Value is valid.
CARR, STDEV	<standard deviation >	Value of standard deviation. Only when carrier is Noise, the Value is valid.
CARR, MEAN	<mean>	Value of mean. Only when carrier wave is Noise, the Value is valid.
CARR, DLY	<delay>	Value of delay. Only when carrier is Pulse, the parameter is valid

Note: If you want to set CARR and STATE, the first parameter has to one of them

where:

<state>:= {ON, OFF}
<period>:= {Default unit is "S". Value depends on the model.}
<start phase>:= {0 to 360}
<gate ncycle>:= {GATE, NCYC}
<trigger source>:= {EXT, INT, MAN}
<delay>:= {Default unit is "S", Value depends on the model.}
<polarity>:= {NEG, POS}
<trig mode >:= {RISE, FALL, OFF}
<edge>:= { RISE, FALL}
<circle time> :={ Value depends on the Model ("INF" means infinite).}

<wave type>:={SINE ,SQUARE, RAMP, PULSE, NOISE, ARB}
<frequency> :={ Default unit is "HZ". Value depends on the model.}
<amplitude>:= {Default unit is "V". Value depends on the model.}
<offset>:= {Default unit is "V". Value depends on the model.}
<duty>:= {0% to 100%.}
<symmetry> :={ 0% to 100%}
<phase>:= {0 to 360}
< standard deviation >:= {Default unit is "V". Value depends on the model.}
<mean>:= {Default unit is "V". Value depends on the model.}
<width> :={ Max_width < (Max_duty * 0.01) * period and Min_width > (Min_duty * 0.01) * period.}
<rise>:= {Value depends on the model.}
<fall>:= {Value depends on the model.}
<delay>:= {Default unit is “S”.}

Note:
There are some parameters Value depends on the model,
You can read version datasheet to get specific parameters.

QUERY SYNTAX

<channel>: BTWV (BursTWaVe)? <parameter>
<channel>:={C1, C2}
<parameter>:=<period>……

RESPONSE FORMAT

<channel>:BTWV <type>,<state>,<period>……

EXAMPLE

Set channel one burst period to 1S.
C1: BTWV PRD, 1

Set channel one burst delay to 1s
C1: BTWV DLAY, 1

Set channel one burst to infinite
C1: BTWV TIME, INF

Read channel two burst parameters of which STATE is ON.
C2: BTWV?
Return:
C2: BTWV STATE,ON,PRD,0.01S,STPS,0,TRSR,INT,TRMD,OFF,TIME,1,DLAY,2.4e-07S,GATE_NCYC,NCYC,CARR,WVTP,SINE,FRQ,1000HZ,AMP,4V,OFST,0V,PHSE,0

Read channel two burst parameters of which STATE is OFF.
C2: BTWV?
Return:
C2: BTWV STATE, OFF

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
<channel>	no(single channel)	yes	yes	yes	yes
TRMD	no	yes	yes	yes	yes
EDGE	no	yes	yes	yes	yes
CARR, DLY	yes	yes	yes	yes	yes
CARR, RISE	yes	no	yes	yes	yes
CARR, FALL	yes	no	yes	yes	yes

3.8 Parameter Copy Command

DESCRIPTION Copies parameters from one channel to another.

COMMAND SYNTAX PACP(ParaCoPy) <destination channel>, <src channel>
< destination channel>:= {C1, C2}
<src channel>:= {C1, C2}
Note: the parameters C1 and C2 must be set to the device together.

EXAMPLE Copy parameters from channel one to channel two.
PACP C2, C1

RELATED COMMANDS ARWV, BTWV, MDWV, SWWV, BSWV

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
PACP	no	yes	yes	yes	yes

3.9 Arbitrary Wave Command

DESCRIPTION Sets and gets arbitrary wave type.

COMMAND SYNTAX <channel> ARWV(ArbWaVe) INDEX,<value1>, NAME,<value2>
<channel>:={C1, C2}
< value1>: the table below shows what the index number mean.)
< value2>: see table below.

QUERY SYNTAX <channel>: ARWV (ARbWaVe)?
<channel>:={C1, C2}

RESPONSE FORMAT <channel>:ARWV <index>

EXAMPLE Set StairUp arbitrary wave output by index.
C1:ARWV INDEX, 2

Read system current wave.
ARWV?
Return:
ARWV INDEX,2,NAME,StairUp

Set Cardiac arbitrary wave output by name.
ARWV NAME, Cardiac

<table>:

Index	Name	Index	Name	Index	Name	Index	Name
0	Sine	12	Logfall	24	Gmonopuls	36	Triang
1	Noise	13	Logrise	25	Tripuls	37	Harris
2	StairUp	14	Sqrt	26	Cardiac	38	Bartlett
3	StairDn	15	Root3	27	Quake	39	Tan
4	Stairud	16	X^2	28	Chirp	40	Cot
5	Ppulse	17	X^3	29	Twotone	41	Sec
6	Npulse	18	Sinc	30	Snr	42	Csc
7	Trapezia	19	Gaussian	31	Hamming	43	Asin
8	Upramp	20	Dlorentz	32	Hanning	44	Acos
9	Dnramp	21	Haversine	33	Kaiser	45	Atan
10	Exp_fall	22	Lorentz	34	Blackman	46	Acot
11	Exp_rise	23	Gauspuls	35	Gausswin	47	Square

About the table: This table is just an example, the index may depend on the model, you can execute “STL?” command to get them accurately.

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
<channel>	no(single channel)	yes	yes	yes	yes

INDEX	yes	yes	yes(only built-in wave)	yes	yes(only built-in wave)
NAME	yes	yes	yes(user define wave)	yes	yes(user define wave)

3.10 Sync Command

DESCRIPTION Sets synchronization signal.

COMMAND SYNTAX <channel>: SYNC <parameter>
<channel>:={C1, C2}
<parameter>:= {ON, OFF}

QUERY SYNTAX <channel>: SYNC?
<channel>:={C1, C2}

RESPONSE FORMAT <channel>:SYNC <parameter>

EXAMPLE Turn on sync function of channel one.
C1: SYNC ON

Read state of channel one sync.
C1: SYNC?
Return:
C1: SYNC OFF

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
SYNC	no	yes	yes	yes	yes

3.11 Number Format Commend

DESCRIPTION Sets or gets number format.

COMMAND SYNTAX NBFM(NumBer_ForMat) <parameter>
<parameter> :={ a parameter from the table below.}

Parameters	Value	Description
PNT	<pnt>	Point format
SEPT	<sept>	Separator format

Where:
<pnt>:= {Dot, Comma}.
<sept> :={ Space, Off, On}.

QUERY SYNTAX NBFM (NumBer_ForMat)?

RESPONSE FORMAT NBFM <parameter>

EXAMPLE Set point format to DOT.
NBFM PNT, DOT

Set Separator format to ON.
NBFM SEPT,ON

Read number format.
NBFM?
Return:
NBFM PNT, DOT, SEPT, ON

3.12 Language Command

DESCRIPTION Sets or gets system language.

COMMAND SYNTAX LAGG(LAnGuaGe) <parameter>
<parameter>:={EN, CH, RU}

QUERY SYNTAX LAGG (LAnGuaGe)?

RESPONSE FORMAT LAGG <parameter>

EXAMPLE Set language to English.
LAGG EN

Read language
LAGG?
Return:
LAGG EN

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
RU	no	yes	no	no	no

3.13 Configuration Command

DESCRIPTION Sets or gets the power-on system setting..

COMMAND SYNTAX SCFG(Sys_CFG)<parameter>
<parameter>:= {DEFAULT, LAST}

QUERY SYNTAX SCFG (Sys_CFG)?

RESPONSE FORMAT SCFG <parameter>

EXAMPLE Set the power-on system setting to LAST.
SCFG LAST

3.14 Buzzer Command

DESCRIPTION Turns on or off the buzzer.

COMMAND SYNTAX BUZZ(BUZZer) <parameter>
<parameter>:= {ON, OFF}

QUERY SYNTAX BUZZ (BUZZer)?

RESPONSE FORMAT BUZZ <parameter>

EXAMPLE Turn on the buzzer.
BUZZ ON

3.15 Screen Save Command

DESCRIPTION Turns off or sets screen save time (default unit is minutes).

COMMAND SYNTAX SCSV (SCreen_SaVe) <parameter>
<parameter>:= {OFF, 1, 5, 15, 30, 60, 120, 300 }

QUERY SYNTAX SCSV (SCreen_SaVe)?

RESPONSE FORMAT SCreen_SaVe <parameter>

EXAMPLE Set screen save time to 5 minutes.
SCSV 5

Read the current screen save time.
SCreen_SaVe?
Return:
SCSV 5MIN

3.16 Clock Source Command

DESCRIPTION Sets or gets the clock source.

COMMAND SYNTAX ROSC (ROSCillator) <parameter>
<parameter>:= {INT, EXT}

QUERY SYNTAX ROSC (ROSCillator)?

RESPONSE FORMAT ROSC <parameter>

EXAMPLE Set internal time base as the clock source.
ROSC INT

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
ROSC	no	yes	yes	yes	yes

3.17 Frequency Counter Command

DESCRIPTION Sets or gets frequency counter parameters.

COMMAND SYNTAX FCNT(FreqCouNTer) <parameter>
<parameter>:= {a parameter from the table below}

Parameters	Value	Description
STATE	<state>	State of frequency counter.
FRQ	<frequency>	Value of frequency. Can't be set.
PW	<position width>	Value of positive width. Can't be set.
NW	<negative width>	Value of negative width. Can't be set.
DUTY	<duty>	Value of duty cycle. Can't be set.
FRQDEV	<freq deviation>	Value of freq deviation. Can't be set.
REFQ	<ref freq>	Value of reference freq.

TRG	<triglev>	Value of trigger level.
MODE	<mode>	Value of mode.
HFR	<HFR>	State of HFR.

where: < state >:={ON, OFF}
<frequency>:= {Default unit is "Hz". Value range depends on the model.}
< mode >:={AC, DC}
<HFR>:={ON, OFF}

QUERY SYNTAX FCNT (FreqCouNTer)?

RESPONSE FORMAT FCNT < state ><frequency><duty><ref freq><triglev><position width><negative width>
<freq deviation><mode><HFR>

EXAMPLE

Turn frequency counter on:
FCNT STATE,ON
Set reference freq to 1000Hz:
FCNT REFQ,1000
Query frequency counter information:
FCNT?
Return:
FCNT STATE,ON,FRQ,10000000HZ,DUTY,59.8568,REFQ,1e+07HZ,TRG,0V,PW,5.98568e-08S,NW,4.01432e-08S,FRQDEV,0ppm,MODE,AC,HFR,OFF

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
FCNT	no	yes	yes	yes	yes

3.18 Invert Command

DESCRIPTION Sets or gets polarity of current channel.

COMMAND SYNTAX <channel>:INVT(INVerT) <parameter>
<channel>:={C1, C2}
<parameter>:= {ON, OFF}

QUERY SYNTAX <channel>: INVT (INVerT)?
<channel>:={C1, C2}

RESPONSE FORMAT <channel>:INVerT <parameter>

EXAMPLE

Set C1 ON:
C1: INVT ON

Read the polarity of channel one.
C1: INVT?
Return:
C1: INVT ON

Notes:
1.

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
<channel>	no(single channel)	yes	yes	yes	yes

2. The <channel> is a selectable parameter. If channel is not set, default is current channel.

3.19 Coupling Command

DESCRIPTION Sets or gets channel coupling parameters. You can only set coupling value when trace switch off.

COMMAND COUP (COUPling)<parameter>
SYNTAX <parameter>:= {a parameter from the table below}

Parameters	Value	Description
TRACE	<trace>	Trace switch
STATE	<state>	State of channel coupling.
BSCH	<bsch>	Value of base channel.
FDEV	<frq_dev>	Value of f frequency deviation.
PDEV	<pha_dev>	Value of position phase deviation.
FCOUP	<fcoup>	Value of frequency coupling switch
FRAT	<frat>	Value of frequency coupling ratio
PCOUP	<pcoup>	Value of phase coupling switch
PRAT	<prat>	Value of phase coupling ratio
ACOUP	<acoup>	Value of amplitude coupling switch
ARAT	<arat>	Value of amplitude coupling ratio
ADEV	<adev>	Value of amplitude coupling deviation

where:

<trace>:={ON, OFF}
< state >:={ON, OFF}

< bsch >:= {CH1, CH2}
< frq_dev >:={ Default unit is “Hz”, value range depends on the model}
< pha_dev >:={ Default unit is “° ”value range depends on the model }
<fcoup>,<acoup>,<pcoup>:={ON, OFF}
<frat>,<prat>,< arat >:={a ratio value. value range depends on the model }
<adev>:={ a deviation value. value range depends on the model }

QUERY SYNTAX COUP (COUPling)?

EXAMPLE Set SDG5000 coupling state on
COUP STATE,ON

Set SDG5000 frequency deviation value 5Hz
COUP FDEV,5

Set SDG2000x amplitude coupling ratio
COUP ARAT,2

Query SDG2000X coupling information.
COUP?
Return:
COUP\sTRACE,OFF,FCOUP,ON,PCOUP,ON,ACOUP,ON,FDEV,5HZ,
PRAT,1,ARAT,2\n

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
TRACE	no	no	yes	no	yes
STATE	yes	yes	no	yes	no
BSCH	yes	yes	no	yes	no
FCOUP	no	no	yes	no	yes
FRAT	no	no	yes	no	yes
PCOUP	no	no	yes	no	yes
PRAT	no	no	yes	no	yes
ACOUP	no	no	yes	no	yes
ARAT	no	no	yes	no	yes
ADEV	no	no	yes	no	yes

3.20 Voltage Overload Command

DESCRIPTION Sets or gets state of over-voltage protection.

COMMAND SYNTAX VOLTPRT<parameter>
<parameter>:= {ON, OFF}

QUERY SYNTAX VOLTPRT?

RESPONSE FORMAT VOLTPRT<parameter>

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
VOLTPRT	no	yes	yes	no	yes

3.21 Store List Command

DESCRIPTION This command is used to read the stored wave data names if the store unit is empty; the command will return “EMPTY” string.

Note: M50~ M59 is user defined memory. The name will return what you defined. if you do not define an arbitrary name, it will return “EMPTY”(It is depends on the model).

QUERY SYNTAX STL (StoreList)? BUILDIN, USER

EXAMPLE Read all arbitrary data saved in the device.
STL?
Return:
STL M0, StairUp, M1, StairDn, M2, StairUD, M3, Trapezia, M4, ExpFall, M5, ExpRise, M6, LogFall, M7, LogRise, M8, Sqrt, M9, X^2, M10, Sinc, M11, Gaussian, M12, Dlorentz, M13, Haversine, M14, Lorentz, M15, Gauspuls, M16, Gmonopuls, M17, Cardiac, M18, Quake, M19, TwoTone, M20, SNR, M21, Hamming, M22, Hanning, M23, Kaiser, M24, Blackman, M25, GaussiWin, M26, Harris, M27, Bartlett, M28, Tan, M29, Cot, M30, Sec, M31, Csc, M32, Asin, M33, Acos, M34, Atan, M35, ACot, M36, EMPTY, M37 …..

Read built-in wave data.
STL? BUILDIN
Return:
STL M0, Sine, M1, Noise, M10, ExpFal, M11, ExpRise, M12, LogFall, M13, LogRise, M14, Sqrt, M15, Root3, M16, X^2, M17, X^3, M18, Sinc, M19, Gussian, M2, StairUp, M20, Dlorentz, M21, Haversine, M22, Lorentz, M23, Gauspuls,

M24, Gmonopuls, M25, Tripuls, M26, Cardiac, M27, Quake, M28, Chirp, M29, Twotone, M3, StairDn, M30, SNR, M31, Hamming, M32, Hanning, M33, kaiser, M34, Blackman, M35, Gausswin, M36, Triang, M37, Harris, M38, Bartlett, M39, Tan, M4, StairUD, M40, Cot, M41, Sec, M42, Csc, M43, Asin, M44, Acos, M45, Atan, M46, Acot, M47, Square, M5, Ppulse, M6, Npulse, M7, Trapezia, M8, Upramp, M9, Dnramp

Read wave data defined by user.
STL? USER
Return:
STL
WVNM,sinec_8M,sinec_3000000,sinec_1664000,ramp_8M, sinec_2000000,sinec_50000,square_8M,sinec_5000,wave1, square_1M

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
BUILDIN	no	no	yes(get built-in wave)	no	yes(get built-in wave)
USER	no	no	yes(get user defined wave)	no	yes(get user defined wave)

3.22 Arbitrary Wave Data Command

DESCRIPTION Sets and gets arbitrary wave data.

COMMAND SYNTAX < channel>:WVDT <address>,<parameter>
<channel>:={C1, C2}
<address>:={Mn}(The “n” value is based on the model, but SDG2000X/SDG1000X User define wave don’t have it(see notes table below).)
<parameter>: see the table below.

Parameters	Value	Description
WVNM	<wave name>	Wave name.
TYPE	<type>	Wave type.
LENGTH	<length>	Wave length, the value depends on the product(SDG800 /SDG1000: 16kb;SDG5000:16kb,512kb;SDG2000X/SDG1000X: 8b~8M)

FREQ	<frequency>	Wave frequency.
AMPL	<amplifier>	Wave amplifier.
OFST	<offset>	Wave offset.
PHASE	<phase>	Wave phase.
WAVEDATA	<wave data>	Wave data.

QUERY SYNTAX

For all the arbitrary wave of SDG800/1000/5000 and the built-in wave of SDG2000X /SDG1000X：
WVDT? Mn

For SDG2000X / SDG1000X user define wave：
WVDT? USER,<wave name>
<wave name>:={The name of user define wave}

EXAMPLE

Send wave1 to the M55 address of SDG1000.
C1:WVDT M55,WVNM,wave1,TYPE,5,LENGTH,16KB,WAVED
ATA, xxxxxxxx

Send wave1 to SDG2000X.
C1:WVDT WVNM,wave1,TYPE,5,LENGTH,16384B,FREQ,1000,
WAVEDATA, xxxxxxxx

Query SDG1000 built-in wave command.
WVDT? M2
Return:
WVDT\sPOS,\sM2,\sWVNM,\sstairup,\sLENGTH,\s32KB,\sTYPE,\s5,
\sWAVEDATA,\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\
80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\
00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\
80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\
00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\
80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\
00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\
80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\
00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\80\00\
……

Query SDG2000X user define wave (wave1) command.
WVDT? USER,wave1
Return:
WVDT\sPOS,\s/Local,\sWVNM,\swave1,\sLENGTH,\s1048576B,\sTYPE,\s6,
\sWAVEDATA,\00\00\00\00\00\00\00\00\00\00\00\00\00\00\00\00\FE\

FF\FE\FF\FE\FF\FE\FF\FE\FF\FE\FF\FE\FF\FE\FF\FD\FF\FD\FF\FD\FF\
FD\FF\FD\FF\FD\FF\FD\FF\FD\FF\FC\FF\FC\FF\FC\FF\FC\FF\FC\FF\FC\
FF\FC\FF\FC\FF\FA\FF\FA\FF\FA\FF\FA\FF\FA\FF\FA\FF\FA\FF\FA\FF\
F9\FF\F9\FF\F9\FF\F9\FF\F9\FF\F9\FF\F9\FF\F9\FF\F8\FF\F8\FF\F8\
FF\F8\FF\F8\FF\F8\FF\F8\FF\F8\FF\F7\FF\F7\FF\F7\FF\F7\FF\F7\FF\
F7\FF\F7\FF\F7\FF\F6\FF\F6\FF\F6\FF\F6\FF\F6\FF\F6\FF\F6\FF\F6\
FF\F6\FF\F6\FF\F6\FF\F6\FF\F6\FF\F6\FF\F6\FF\F6\FF\F5\FF\F5\FF\
……

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
Mn	(0<=n<=59): M0~M49: build in wave (32KB). M50~M59: can store user defined wave (32KB)	(0<=n<=59): M0~M49: build in wave (32KB). M50~M59: can store user defined wave (32KB)	(0<=n<=196): M0~M196: all of them are building in waves (32KB). user defined waves have not this index.	(0<=n<=68): M0~M35: build in wave (32KB). M36~M59: User define wave (32KB). M60~M67: User defined wave(1024KB)	(0<=n<=196): M0~M196: all of them are building in waves (32KB). user defined waves have not this index.
USER	no	no	yes(get user defined wave)	no	yes(get user defined wave)

3.23 Virtual Key Command

DESCRIPTION The Command is used to send simulate a operation of pressing key on front panel.

COMMAND SYNTAX VKEY (VirtualKEY) VALUE,<value>,STATE,<sate>
<value>:= {a parameter from the table below.}
<state>:=<0,1>(“1” is effective to virtual value, and “0” is useless)

EXAMPLE VKEY VALUE,15, STATE,1
VKEY VALUE,KB_SWEEP, STATE,1

Note:

KB_FUNC1	28	KB_NUMBER_4	52
KB_FUNC2	23	KB_NUMBER_5	53
KB_FUNC3	18	KB_NUMBER_6	54
KB_FUNC4	13	KB_NUMBER_7	55

KB_FUNC5	8	KB_NUMBER_8	56
KB_FUNC6	3	KB_NUMBER_9	57
KB_SINE	34	KB_POINT	46
KB_SQUARE	29	KB_NEGATIVE	43
KB_ RAMP	24	KB_LEFT	44
KB_PULSE	19	KB_RIGHT	40
KB_NOISE	14	KB_UP	45
KB_ARB	9	KB_DOWN	39
KB_MOD	15	KB_OUTPUT1	153
KB_SWEEP	16	KB_OUTPUT2	152
KB_BURST	17	KB_KNOB_RIGHT	175
KB_WAVES	4	KB_KNOB_LEFT	177
KB_UTILITY	11	KB_KNOB_DOWN	176
KB_PARAMETER	5	KB_HELP	12
KB_STORE_RECALL	70	KB_CHANNEL	72
KB_NUMBER_0	48		
KB_NUMBER_1	49		
KB_NUMBER_2	50		
KB_NUMBER_3	51		

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
KB_FUNC1	no	no	yes	yes	yes
KB_STORE_RECALL	yes	yes	yes	no	yes
KB_HELP	yes	yes	no	no	no
KB_CHANNEL	no	yes	yes	no	yes
KB_SINE	yes	yes	no	no	no
KB_SQUARE	yes	yes	no	no	no
KB_ RAMP	yes	yes	no	no	no
KB_PULSE	yes	yes	no	no	no
KB_NOISE	yes	yes	no	no	no
KB_ARB	yes	yes	no	no	no
KB_UP	yes	yes	no	no	no
KB_DOWN	yes	yes	no	no	no

3.24 IP Command

DESCRIPTION The Command can set and get system IP address.

COMMAND SYNTAX SYST:COMM:LAN:IPAD
(SYSTem:COMMunicate:LAN:IPADdress)
<parameter1>.<parameter2>.<parameter3>.<parameter4>

<parameter1>:={a integer value between 1 and 223}
<parameter2>:={a integer value between 0 and 255}
<parameter3>:={a integer value between 0 and 255}
<parameter4>:={a integer value between 0 and 255}

QUERY SYNTAX SYST:COMM:LAN:IPAD
(SYSTem:COMMunicate:LAN:IPADdress)?

EXAMPLES Set IP address to 10.11.13.203
SYSTem: COMMunicate: LAN:IPADdress 10.11.13.203

Get IP address.
SYST:COMM:LAN:IPAD?
Return:
"10.11.13.203"

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
SYST:COMM:LAN:IPAD	no	no	yes	no	yes

3.25 Subnet Mask Command

DESCRIPTION The Command can set and get system subnet mask.

COMMAND SYNTAX SYST:COMM:LAN:SMAS (SYSTem:COMMunicate:LAN:SMASk)
<parameter1>.<parameter2>.<parameter3>.<parameter4>

<parameter1>:={a integer value between 0 and 255}
<parameter2>:={a integer value between 0 and 255}
<parameter3>:={a integer value between 0 and 255}
<parameter4>:={a integer value between 0 and 255}

QUERY SYNTAX SYSTem:COMMunicate:LAN:SMASk?

EXAMPLES Set subnet mask to 255.0.0.0
SYSTem:COMMunicate:LAN:SMASk 255.0.0.0

Get subnet mask
SYSTem:COMMunicate:LAN:SMASk?
Return:
"255.0.0.0"

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
SYST:COMM:LAN:SMAS	no	no	yes	no	yes

3.26 Gateway Command

DESCRIPTION The Command can set and get system Gateway.

COMMAND SYNTAX SYST:COMM:LAN:GAT(SYSTem:COMMunicate:LAN:GATeway) <parameter1>.<parameter2>.<parameter3>.<parameter4>

<parameter1>:={a integer value between 0 and 223}
<parameter2>:={a integer value between 0 and 255}
<parameter3>:={a integer value between 0 and 255}
<parameter4>:={a integer value between 0 and 255}

QUERY SYNTAX SYSTem:COMMunicate:LAN:GATeway?

EXAMPLES Set Gateway to 10.11.13.5:
SYSTem:COMMunicate:LAN:GATeway 10.11.13.5

Get gateway:
SYSTem:COMMunicate:LAN:GATeway?
Return:
"10.11.13.5"

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
SYST:COMM:LAN:GAT	no	no	yes	no	yes

3.27 Sampling Rate Command

DESCRIPTION Sets or gets sampling rate. You can only use it in TrueArb mode.

COMMAND SYNTAX

<channel>:SRATE(SampleRATE) MODE <parameter1>, VALUE, <parameter2>
<channel> :=<C1, C2>
<parameter1> :=< DDS, TARB>
<parameter2> :={ a integer value between 1e-6 and 75000000, (default unit is Sa/s)}

QUERY SYNTAX <channel>: SRATE?

EXAMPLES Get the channel one sample rate value
C1: SRATE?
Return:
C1: SRATE MODE, DDS
Set channel one to TureArb mode.
C1: SRATE MODE, TARB

Set channel one sample rate value to 1000000Sa/s.
C1: SRATE VALUE, 1000000

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
<channel>	No(single channel)	yes	yes	yes	yes
SRATE	no	no	yes	no	no

3.28 Harmonic Command

DESCRIPTION Sets or gets harmonic information. The command can be used by SDG2000X/SDG1000X.and the channel current basic wave must be sine.

COMMAND SYNTAX

<channel>:HARM(HARMonic) HARMSTATE,<value1>, HARMTYPE, < value2>, HARMORDER,< value3>, <parameter>, <value4>, HARMPHASE, < value5>

< value1>:= <ON, OFF>
< value2>:= <EVEN, ODD, ALL>
< value3>:= {an integer value.}
<parameter> :=< HARMAMP, HARMDBC>
< value4>:= {an integer value.}
< value5>:= {an integer value.}

QUERY SYNTAX <channel>: HARM (HARMonic)?
<channel>:={C1, C2}

EXAMPLES Set the channel one harmonic switch on.
C1: HARMHARMSTATE, ON

Get the channel one harmonic information.

C1: HARM?
Return:
C1:HARM HARMSTATE, ON,HARMTYPE, EVEN,HARMORDER, 2, HARMAMP, 0V, HARMPHASE, 0

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
HARM	no	no	yes	no	yes

3.29 Waveform Combining Command

DESCRIPTION Sets or gets waveform combining information. The command can be used by SDG2000X/SDG1000X.

COMMAND SYNTAX <channel>:CMBN (CoMBiNe) <parameter>
<channel>:={C1, C2}
<parameter>:= {ON, OFF}

QUERY SYNTAX <channel>: CMBN (CoMBiNe)?
<channel>:={C1, C2}

EXAMPLES Turn on the waveform combining of channel one.
C1:CMBN ON
Query the waveform combining state of channel two.
C2:CMBN?
Return:
C2:CMBN OFF

Note:

Parameter/command	SDG800	SDG1000	SDG2000X	SDG5000	SDG1000X
CMBN	no	no	yes	no	yes

4 Programming Examples

This chapter gives some examples for the programmer. In these examples you can see how to use the NI-VISA lib and the commands which have been described before this chapter to control our devices. By the examples' guide, you can develop more functions application as you want. This example is developed by Visual Studio project.

Main topics of this part:

- Example of Vc++
- Example of VB
- Example of MATLAB
- Example of LabVIEW

4.1 Example of VC++

Environment: Win7 32bit system, Visual Studio

The functions of this example: use the NI-VISA, to control the device with USBTMC or

TCP/IP access to do a write and read.

Follow the steps to finish the example:

1、 Open Visual Studio, create a new VC++ win32 console project.

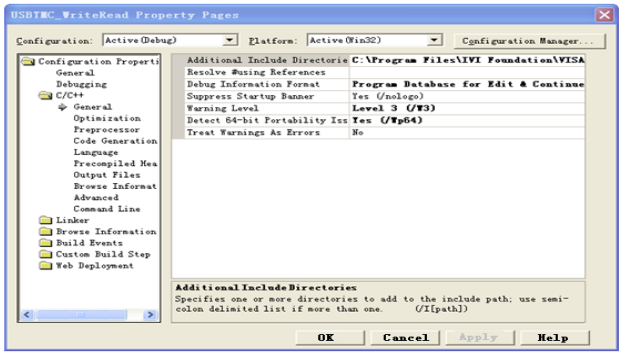
2、 Set the project environment to use the NI-VISA lib, there are two ways to use NI-VISA, static or automatic:

2.1 Static: find files: visa.h, visatype.h, visa32.lib in NI-VISA install path. Copy them to your project, and add them into project. In the projectname.cpp file, add the follow two lines:

```
#include "visa.h"
#pragma comment(lib,"visa32.lib")
```

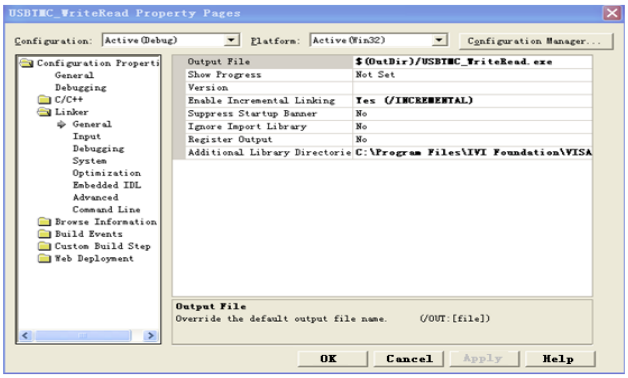
2.2 Automatic:

Set the .h file include directory, the NI-VISA install path, in our computer we set the path is : C:\Program Files\IVI Foundation \VISA\WinNT\include. Set this path to project---properties---c/c++---General---Additional Include Directories: See the picture.

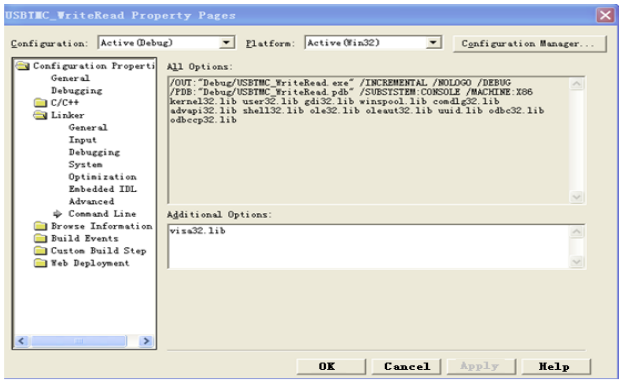


Set lib path set lib file:

Set lib path: the NI-VISA install path, in our computer we set the path is : C:\Program Files\IVI Foundation\VISA\WinNT \lib\msc. Set this path to project---properties---Linker---General---Additional Library Directories: as seen in the pictures below.



Set lib file:project---properties---Linker---Command Line---Additional Options: visa32.lib



Include visa.h file: In the projectname.cpp file:

#include <visa.h>

3、Add codes:

3.1 USBTMC access code.

Write a function Usbtmc_test:

```
int      Usbtmc_test()

{

   /* This code demonstrates sending synchronous read & write commands */
```

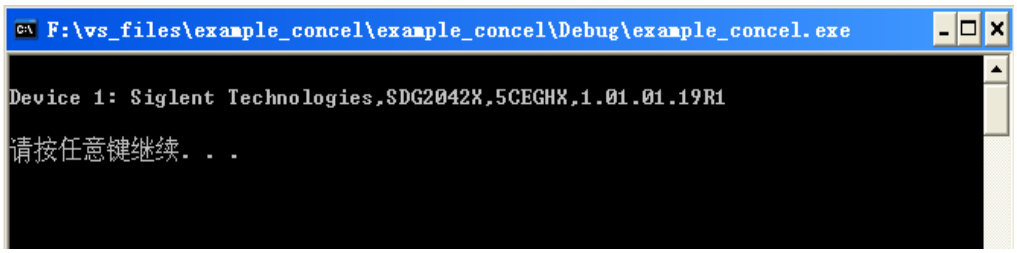
```
/* to an USB Test & Measurement Class (USBTMC) instrument using         */
/* NI-VISA                                                              */
/* The example writes the "*IDN?\n" string to all the USBTMC            */
/* devices connected to the system and attempts to read back            */
/* results using the write and read functions.                          */
/* The general flow of the code is    */
/*       Open Resource Manager                */
/*       Open VISA Session to an Instrument                             */
/*       Write the Identification Query Using viPrintf                  */
/*       Try to Read a Response With viScanf                            */
/*       Close the VISA Session               */
/*********************************************************************/
ViSession    defaultRM;
ViSession    instr;
ViUInt32    numInstrs;
ViFindList    findList;
ViUInt32    retCount;
ViUInt32    writeCount;
ViStatus    status;
char  instrResourceString[VI_FIND_BUFLEN];
unsigned    char  buffer[100];
char  stringinput[512];
int     i;
/** First we must call viOpenDefaultRM to get the manager
* handle.    We will store this handle in defaultRM.*/
status=viOpenDefaultRM (&defaultRM);
if (status<VI_SUCCESS)
{
        printf ("Could not open a session to the VISA Resource Manager!\n");
```

```
        return      status;
    }
    /* Find all the USB TMC VISA resources in our system and store the    number of resources in the system
in numInstrs.                          */
    status = viFindRsrc (defaultRM, "USB?*INSTR", &findList, &numInstrs, instrResourceString);
    if (status<VI_SUCCESS)
    {
        printf ("An error occurred while finding resources.\nHit enter to continue.");
        fflush(stdin);
        getchar();
        viClose (defaultRM);
        return      status;
    }
    /** Now we will open VISA sessions to all USB TMC instruments.
    * We must use the handle from viOpenDefaultRM and we must
    * also use a string that indicates which instrument to open.    This
    * is called the instrument descriptor.    The format for this string
    * can be found in the function panel by right clicking on the
    * descriptor parameter. After opening a session to the
    * device, we will get a handle to the instrument which we
    * will use in later VISA functions.    The AccessMode and Timeout
    * parameters in this function are reserved for future
    * functionality.    These two parameters are given the value VI_NULL.*/
    for (i=0; i<numInstrs; i++)
    {
        if (i> 0)
            viFindNext (findList, instrResourceString);
        status = viOpen (defaultRM, instrResourceString, VI_NULL, VI_NULL, &instr);
        if (status<VI_SUCCESS)
```

```
        {
            printf ("Cannot open a session to the device %d.\n", i+1);
            continue;
        }
        /* * At this point we now have a session open to the USB TMC instrument.
        * We will now use the viPrintf function to send the device the string "*IDN?\n",
        * asking for the device's identification.    */
        char * cmmand ="*IDN?\n";
        status = viPrintf    (instr, cmmand);
        if (status<VI_SUCCESS)
        {
            printf ("Error writing to the device %d.\n", i+1);
            status = viClose (instr);
            continue;
        }
        /** Now we will attempt to read back a response from the device to
        * the identification query that was sent.    We will use the viScanf
        * function to acquire the data.
        * After the data has been read the response is displayed.*/
        status =    viScanf(instr, "%t", buffer);
        if (status<VI_SUCCESS)
            printf ("Error reading a response from the device %d.\n", i+1);
        else
            printf ("\nDevice %d: %s\n", i+1 , buffer);
        status = viClose (instr);
}
/** Now we will close the session to the instrument using
* viClose. This operation frees all system resources.                    */
status = viClose (defaultRM);
```

```
    system("pause");        // pause to keep off the console flashed.
    return 0;
}
```

Result:



3.2 TCP/IP access code.

Write a function TCP_IP_Test:

```
int  TCP_IP_Test(char *pIP)
{
    char  outputBuffer[VI_FIND_BUFLEN];
    ViSession    defaultRM, instr;
    ViStatus     status;
    ViUInt32     count;
    ViUInt16     portNo;
    /* First we will need to open the default resource manager. */
    status = viOpenDefaultRM (&defaultRM);
    if (status<VI_SUCCESS)
    {
        printf("Could not open a session to the VISA Resource Manager!\n");
    }
    /* Now we will open a session via TCP/IP device */
    char  head[256] ="TCPIP0::";
    char  tail[] ="::INSTR";
    char  resource [256];
    strcat(head,pIP);
    strcat(head,tail);
```

```
    status = viOpen (defaultRM, head, VI_LOAD_CONFIG, VI_NULL, &instr);
    if (status<VI_SUCCESS)
    {
            printf ("An error occurred opening the session\n");
            viClose(defaultRM);
    }
    status = viPrintf(instr, "*idn?\n");
    status = viScanf(instr, "%t", outputBuffer);
    if (status<VI_SUCCESS)
    {
            printf("viRead failed with error code: %x \n",status);
            viClose(defaultRM);
    }else
            printf ("\ndata read from device: %*s\n", 0,outputBuffer);
    status = viClose (instr);
    status = viClose (defaultRM);
   system("pause");
    return 0;
}
```

Run result.

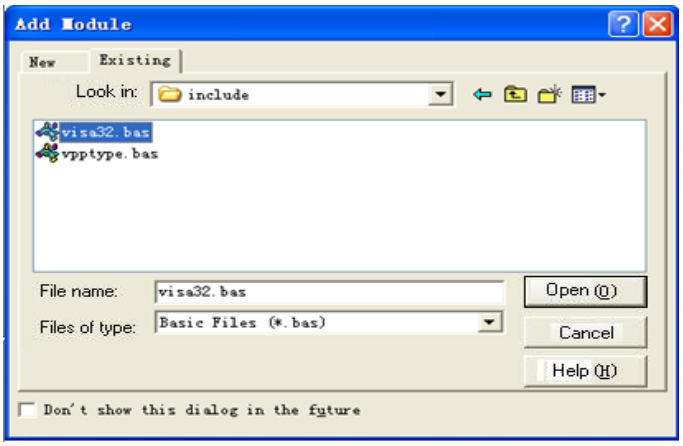
4.2 Example of VB

Environment: Win7 32bit system, Microsoft Visual Basic 6.0

The function of this example: Use the NI-VISA, to control the device with USBTMC and TCP/IP access to do a write and read.

Follow the steps to complete the example:

1. Open Visual Basic, build a standard application program project (Standard EXE)
2. Set the project environment to use the NI-VISA lib, Click the Existing tab of Project>>Add Existing Item. Search for the visa32.bas file in the include folder under the NI-VISA installation path and add the file.



This allows the VISA functions and VISA data types to be used in a program.

3. Add codes:

3.1、USBTMC access code.

Write a function Usbtmc_test:

```
Private Function Usbtmc_test() As Long

    ' This code demonstrates sending synchronous read & write commands

    ' to an USB Test & Measurement Class (USBTMC) instrument using

    ' NI-VISA

    ' The example writes the "*IDN?\n" string to all the USBTMC

    ' devices connected to the system and attempts to read back

    ' results using the write and read functions.

    ' The general flow of the code is

    '       Open Resource Manager

    '       Open VISA Session to an Instrument

    '       Write the Identification Query Using viWrite

    '       Try to Read a Response With viRead

    '       Close the VISA Session

    Const MAX_CNT = 200
```

```
Dim defaultRM As Long
Dim instrsesn As Long
Dim numlnstrs As Long
Dim findList As Long
Dim retCount As Long
Dim writeCount As Long
Dim status As Long
Dim instrResourceString As String * VI_FIND_BUFLEN
Dim Buffer As String * MAX_CNT
Dim i As Integer

' First we must call viOpenDefaultRM to get the manager
' handle. We will store this handle in defaultRM.
status = viOpenDefaultRM(defaultRM)
If (status < VI_SUCCESS) Then
    resultTxt.Text = "Could not open a session to the VISA Resource Manager!"
    Usbtmc_test = status
    Exit Function
End If

' Find all the USB TMC VISA resources in our system and store the
' number of resources in the system in numInstrs.
status = viFindRsrc(defaultRM, "USB?*INSTR", findList, numlnstrs, instrResourceString)
If (status < VI_SUCCESS) Then
    resultTxt.Text = "An error occurred while finding resources."
    viClose (defaultRM)
    Usbtmc_test = status
    Exit Function
End If
```

```
' Now we will open VISA sessions to all USB TMC instruments.
' We must use the handle from viOpenDefaultRM and we must
' also use a string that indicates which instrument to open.    This
' is called the instrument descriptor.    The format for this string
' can be found in the function panel by right clicking on the
' descriptor parameter. After opening a session to the
' device, we will get a handle to the instrument which we
' will use in later VISA functions.    The AccessMode and Timeout
' parameters in this function are reserved for future
' functionality.    These two parameters are given the value VI_NULL.
For i = 0 To numInstrs
    If (i > 0) Then
        status = viFindNext(findList, instrResourceString)
    End If
    status = viOpen(defaultRM, instrResourceString, VI_NULL, VI_NULL, instrsesn)
    If (status < VI_SUCCESS) Then
        resultTxt.Text = "Cannot open a session to the device " + CStr(i + 1)
        GoTo NextFind
    End If

    ' At this point we now have a session open to the USB TMC instrument.
    ' We will now use the viWrite function to send the device the string "*IDN?",
    ' asking for the device's identification.
    status = viWrite(instrsesn, "*IDN?", 5, retCount)
    If (status < VI_SUCCESS) Then
        resultTxt.Text = "Error writing to the device."
        status = viClose(instrsesn)
        GoTo NextFind
```

```
        End If


        ' Now we will attempt to read back a response from the device to
        ' the identification query that was sent.  We will use the viRead
        ' function to acquire the data.
        ' After the data has been read the response is displayed.
        status = viRead(instrsesn, Buffer, MAX_CNT, retCount)
        If (status < VI_SUCCESS) Then
            resultTxt.Text = "Error reading a response from the device." + CStr(i + 1)
        Else
            resultTxt.Text = "Read from device: " + CStr(i + 1) + " " + Buffer
        End If
        status = viClose(instrsesn)
NextFind:
    Next i


    ' Now we will close the session to the instrument using
    ' viClose. This operation frees all system resources.
    status = viClose(defaultRM)
    Usbtmc_test = 0
End Function
```

3.2、TCP/IP access code.

Write a function TCP_IP_Test:

```
Private Function TCP_IP_Test(ip As String) As Long
    Dim outputBuffer As String * VI_FIND_BUFLEN
    Dim defaultRM As Long
    Dim instrsesn As Long
    Dim status As Long
    Dim count As Long
```

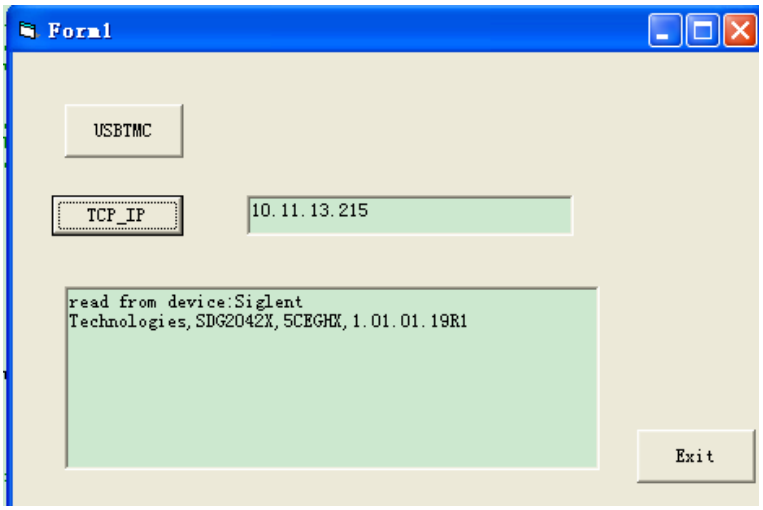
```
' First we will need to open the default resource manager.
status = viOpenDefaultRM(defaultRM)
If (status < VI_SUCCESS) Then
    resultTxt.Text = "Could not open a session to the VISA Resource Manager!"
    TCP_IP_Test = status
    Exit Function
End If

' Now we will open a session via TCP/IP device
status = viOpen(defaultRM, "TCPIP0::" + ip + "::INSTR", VI_LOAD_CONFIG, VI_NULL, instrsesn)
If (status < VI_SUCCESS) Then
    resultTxt.Text = "An error occurred opening the session"
    viClose (defaultRM)
    TCP_IP_Test = status
    Exit Function
End If

status = viWrite(instrsesn, "*IDN?", 5, count)
If (status < VI_SUCCESS) Then
    resultTxt.Text = "Error writing to the device."
End If
status = viRead(instrsesn, outputBuffer, VI_FIND_BUFLEN, count)
If (status < VI_SUCCESS) Then
    resultTxt.Text = "Error reading a response from the device." + CStr(i + 1)
Else
    resultTxt.Text = "read from device:" + outputBuffer
End If
status = viClose(instrsesn)
```

```
    status = viClose(defaultRM)
    TCP_IP_Test = 0
End Function
```

3.3、Button control code:

```
Private Sub exitBtn_Click()
    End
End Sub
Private Sub tcpipBtn_Click()
    Dim stat As Long
    stat = TCP_IP_Test(ipTxt.Text)
    If (stat < VI_SUCCESS) Then
        resultTxt.Text = Hex(stat)
    End If
End Sub
Private Sub usbBtn_Click()
    Dim stat As Long
    stat = Usbtmc_test
    If (stat < VI_SUCCESS) Then
        resultTxt.Text = Hex(stat)
    End If
End Sub
```

3.4、Run result:



4.3 Example of MATLAB

Environment: Win7 32bit system, MATLAB R2010b

The function of this example: Use the NI-VISA, to control the device with USBTMC or TCP/IP access to do a write and read.

Follow the steps to complete the example:

Open MATLAB, modify the current directory. In this demo, the current directory is modified to D:\USBTMC_TCPIP_Demo.

Click File>>New>>Script in the Matlab interface to create an empty M file

Add codes:

1.1 Write a function Usbtmc_test.

```
function USBTMC_test()
% This code demonstrates sending synchronous read & write commands
% to an USB Test & Measurement Class (USBTMC) instrument using
% NI-VISA

%Create a VISA-USB object connected to a USB instrument
vu = visa('ni','USB0::0xF4EC::0xEE38::0123456789::INSTR');

%Open the VISA object created
fopen(vu);

%Send the string "*IDN?",asking for the device's identification.
fprintf(vu,'*IDN?');
```

```
%Request the data
outputbuffer = fscanf(vu);
disp(outputbuffer);

%Close the VISA object
fclose(vu);
delete(vu);
clear vu;

end
```

```
12      %Send the string "*IDN?",asking for the device's identification.
13 -    fprintf(vu,'*IDN?');
14
```

```
Siglent Technologies,SDG2042X,5CEGHX,1.01.01.19R1

Siglent Technologies,SDG2042X,5CEGHX,1.01.01.19R1

Siglent Technologies,SDG2042X,5CEGHX,1.01.01.19R1

Siglent Technologies,SDG2042X,5CEGHX,1.01.01.19R1

fx >>
```

1.2 TCP/IP access code.

Write a function TCP_IP_Test:

```
function TCP_IP_test( IPstr )
% This code demonstrates sending synchronous read & write commands
% to an TCP/IP instrument using NI-VISA

%Create a VISA-TCPIP object connected to an instrument
%configured with IP address.
vt = visa('ni',['TCPIP0::',IPstr,'::INSTR']);

%Open the VISA object created
fopen(vt);

%Send the string "*IDN?",asking for the device's identification.
fprintf(vt,'*IDN?');

%Request the data
outputbuffer = fscanf(vt);
disp(outputbuffer);

%Close the VISA object
```

```
fclose(vt);
delete(vt);
clear vt;

end
```

```
11
12      %Send the string "*IDN?",asking for the device's identification.
13 -    fprintf(vt,'*IDN?');
1 usage of "TCP_IP_test" found
>>
>> TCP_IP_test('10.11.13.215')
Siglent Technologies,SDG2042X,5CEGHX,1.01.01.19R1

fx >>
```

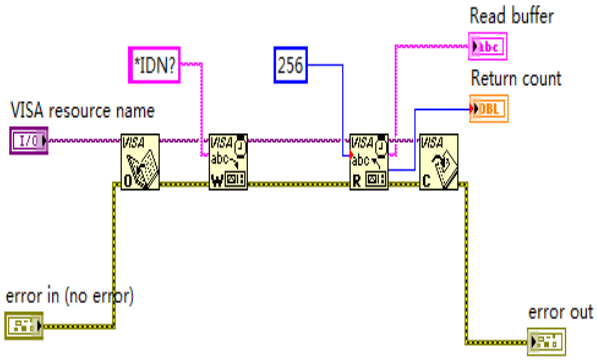
4.4 Example of LabVIEW

Environment: Win7 32bit system, LabVIEW 2011

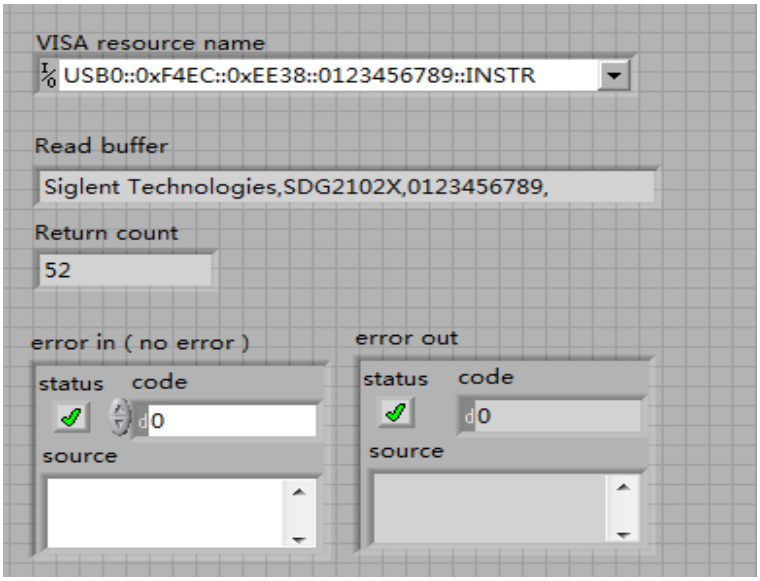
The functions of this example: use the NI-VISA, to control the device with USBTMC and TCP/IP access to do a write and read.

Follow the steps to complete the example:

1、 Open LabVIEW, create a VI file.
2、 Add controls. Right-click in the **Front Panel** interface, select and add **VISA resource name**, error in, error out and some indicators from the Controls column.
3、 Open the **Block Diagram** interface. Right-click on the **VISA resource name** and you can select and add the following functions from VISA Palette from the pop-up menu: **VISA Write**, **VISA Read**, **VISA Open** and **VISA Close**.
4、 Connect them as shown in the figure below



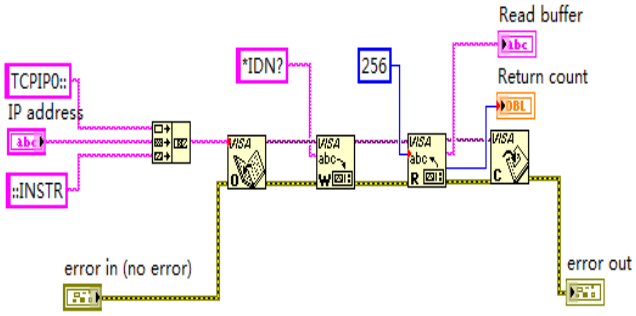
5、 Select the device resource from the VISA Resource Name list box and run the program.



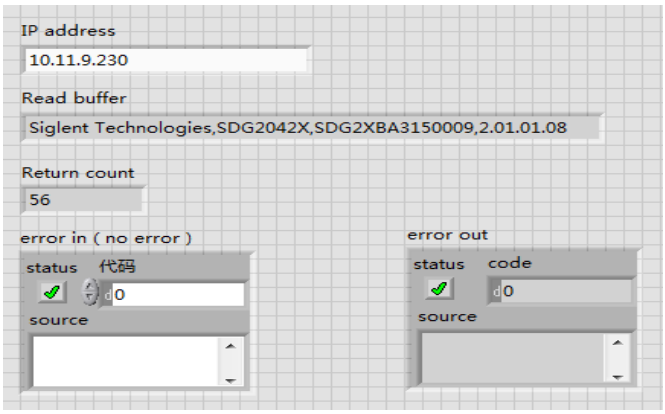
In this example, the VI opens a VISA session to a USBTMC device, writes a command to the device, and reads back the response. In this example, the specific command being sent is the device ID query. Check with your device manufacturer for the device command set. After all communication is complete, the VI closes the VISA session.

6、Communicating with the device via TCP/IP is similar to USBTMC. But you need to change VISA Write and VISA Read Function to Synchronous I/O. The LabVIEW default is asynchronous I/O. Right-click the node and select Synchronous I/O Mod>>Synchronous from the shortcut menu to write or read data synchronously.

7、 Connect them as shown in the figure below



8、 Input the IP address and run the program.



Note: you can obtain the source code of above examples, please visit SIGLENT website at www.siglent.com.

5 Index

N

NBFM NUMBER_FORMAT

O

OUTP OUTPUT

P

PACP PARACOPY

R

ROSC ROSCILLATOR

S

SCFG Sys_CFG
SCSV SCREEN_SAVE
SWWV SWEEPWAVE
SYNC SYNC
STL STORELIST
SYST:COMM:LAN:IPAD SYSTEM:COMMUNICATE:LAN:IPADDRESS
SYST:COMM:LAN:SMAS SYSTem:COMMunicate:LAN:SMASk
SYST: COMM: LAN:GAT SYSTem:COMMunicate:LAN:GATeway
SRATE SAMPLERATE

W

WVDT WVDT

V

VOLTPRT VOLTPRT
VKEY VIRTUALKEY