



# SDG100X Series Function/Arbitrary Waveform Generator

## Quick Start





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# General safety Summary

Carefully read the following safety precautions to avoid any personal injuries or damages to the instrument and any product connected to it. To avoid potential hazards, please use the instrument as specified.

**Any service on this instrument should be performed by qualified repair personnel only.**

**Avoid exposing this instrument to fire.**

**Always use a proper power line voltage.**

Power this instrument only with the specified power line voltage approved by local regulations.

**Ground the Instrument.**

The instrument is grounded through the protective ground conductor of the power line. To avoid electric shock, the ground conductor must be connected to the ground. Make certain the instrument is grounded correctly before connecting its input or output terminals.

**Connect the signal wire correctly.**

The potential of the signal wire ground is equal to the earth potential, Remove do not connect the signal wire to a high voltage. Do not touch the exposed contacts or components.

**Observe all terminal ratings.**

To avoid fire or electric shock, please observe all ratings and labels on the instrument. Before connecting the instrument, please read the manual carefully to gain more information about the ratings.

**Do not operate** any instrument that is suspected of being defective.

If you suspect that the product is damaged, please have it checked by qualified technical personnel.

Avoid contact with exposed circuits or wires.

Do not touch exposed contacts or components when the instrument is powered 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 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 used on the instrument.** Symbols may appear on the instrument:



Hazardous  
Voltage



Warning



Protective  
Earth Ground



Chassis  
Ground



Power  
Switch

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# Adjust the Handle

When using the instrument, users can adjust the handle to a needed position which makes it easier to operate and observe.

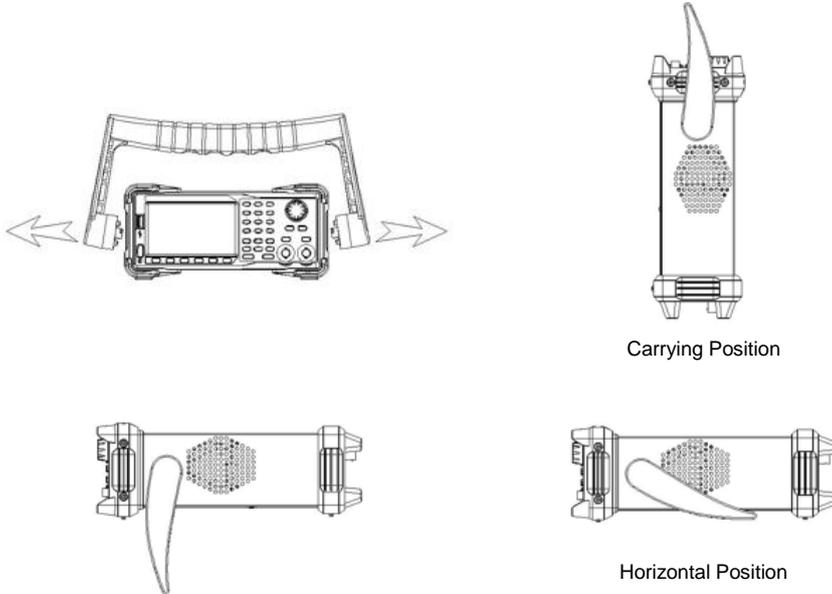
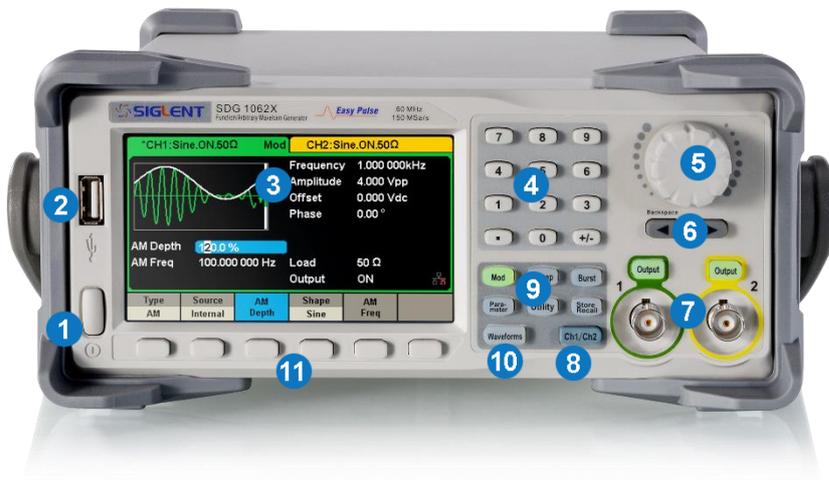


Figure 1 Adjust the Handle

# The Front Panel

The figure below shows the SDG1000X's front panel layout::



1. Power Switch
2. USB Host
3. User Interface
4. Numeric Keyboard
5. Knob
6. Arrow Keys
7. CH1/CH2 Control/ Output Port
8. Channel Select Key
9. Function Keys
10. Waveform Option key
11. Menu Keys

Figure 2 SDG1000X Front Panel

**1. Power Switch**

This switch is used to turn on/off the SDG1000X. When the power switch is off, SDG1000X is in the power off state.

**2. USB Host**

SDG1000X supports U-Disk using FAT format. It is used to read waveforms or state files from a U-Disk or store the current state of the instrument to the U-Disk. Users can update the firmware through a U-Disk.

**3. User Interface**

SDG1000X has a 4.3 inch TFT-LCD screen, which displays current function menu, parameter settings, system state, prompts, etc. For detailed information, please refer to "User Interface".

**4. Numeric Keyboard**

Consists of numbers from 0 to 9, radix points "." and symbol keys "+/-", which are used to input parameters.

Note: To enter a negative number, you need to enter a symbol "-" at first.

**5. Knob**

Used to increase (clockwise) or decrease (counterclockwise) the current numerical value when setting parameter values.

The knob is also used to switch characters in the soft keyboard when inputting a file name.

When saving or reading files, rotate the knob to choose a position to save a file or choose a file to be read; press the knob to open a selected folder or file.

When choosing **Waveforms** → **Page 1/2** → **Arb** → **Arb Type** → **Built-in** rotate the knob to select a desired built-in or stored waveform.

**6. Arrow Keys**

When using the knob to set parameters, the arrow keys can be used to select the digit to be modified.

When using the numeric keyboard to set parameters, the left arrow key is used as a Backspace function.

When inputting a file name, they are used to move the position of the cursor.

## 7. Channel Control Area

### CH1 Control/Output Key

The **Output** key on the left is used to turn on/off the CH1 output.

The nominal output impedance of the BNC connector is 50Ω.

When pressing **Output** (the key backlight turns on), the connector outputs the waveform according to the current configuration of CH1.

### CH2 Control/Output Key

The **Output** key on the right is used to turn on/off the CH2 output.

The nominal output impedance of the BNC connector is 50Ω.

When pressing **Output** (the key backlight turns on), the connector outputs the waveform according to the current configuration of CH2.



#### CAUTION:

Overvoltage protection of CH1 and CH2 will take effect once any of the following conditions is met. When overvoltage protection occurs, a message will be displayed and the output is disabled.

- The absolute value of input voltage is higher than 11V±0.5V when the amplitude of the generator is higher than or equal to 2Vpp or the DC offset is higher than or equal to |3VDC|.
- The absolute value of input voltage is higher than 4V±0.5V when the amplitude of the generator is lower than 2Vpp and the DC offset is lower than |3VDC|.

Choose **Utility** → **Page 1/2** → **OverVoltage Protection** to turn on/off the function.

## 8. Channel Select Key

This key is used to switch the current selected channel between CH1 and CH2.

## 9. Function Keys

### **Mod** ---- Modulation

This key is used to enable the modulation screen and allow for several types of modulation. It generates AM, DSB-AM, FM, PM, ASK, FSK and PWM modulated signals.

- Both "Internal" and "External" modulation sources are supported.
- The corresponding key backlight will turn on when this function is selected.

### **Sweep** ---- Sweep

This key is used to generate sweeping frequency signals of Sine, Square, Ramp and Arbitrary.

- The Sweep mode supports "Linear" and "Log" sweep profiles.
- Sweep supports "Internal", "External" and "Manual" trigger sources.
- The corresponding key backlight will turn on when this function is selected.

### **Burst** ---- Burst

This key is used to generate burst signals of Sine, Square, Ramp, Noise and Arbitrary functions.

- The Burst mode supports "NCycle", "Gated" and "Infinite" burst modes.
- Noise can only be used to generate gated burst.
- This mode supports "Internal", "External" and "Manual" trigger sources.

The corresponding key backlight will turn on when this

### **Parameter** ---- Parameter Setting

Users can switch directly to the parameter setting interface by pressing the key.

- The corresponding key backlight will turn on when this function is selected.

### **Utility** ---- Utility Functions and System Settings

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

- Press this key and then press the help softkey to obtain built-in help information about the product.
- The corresponding key backlight will turn on when this function is selected.

### **Store/Recall** ---- **Store and Recall**

Store/recall the instrument's state or arbitrary waveform data edited by users.

- Supporting the file management system, users can perform general file operations.
- In addition to the built-in nonvolatile memory (C disk), an external U-Disk (D disk) can also be used.
- The corresponding key backlight will turn on when this function is selected.

## **10. Waveform Option**

The backlight of Waveforms will turn on when this function is selected. The user can choose Sine, Square, Ramp, Pulse, Noise, DC and Arb.

### **Waveforms** ---- **Sine**

Provides sine waveform output which ranges from 1  $\mu$ Hz to 60 MHz.

- "Frequency/Period", "Amplitude/High level", "Offset/Low level" and "Phase" of the sine waveform can be modified.
- The Harmonics function can also be accessed.

### **Waveforms** ---- **Square**

Provides square waveform output which ranges from 1  $\mu$ Hz to 60 MHz.

- "Frequency/Period", "Amplitude/High level", "Offset/Low level", "Phase" and "DutyCycle" of the square waveform can be modified.

### **Waveforms** ---- **Ramp**

Provides ramp waveform output which ranges from 1  $\mu$ Hz to 500 kHz.

- "Frequency/Period", "Amplitude/High level", "Offset/Low level", "Phase" and "Symmetry" of the ramp waveform can be modified.

### **Waveforms** ---- **Pulse**

Provides pulse waveform output which ranges from 1  $\mu$ Hz to 12.5 MHz.

- "Frequency/Period", "Amplitude/High level", "Offset/Low level", "Pulse Width/DutyCycle", "Rise/Fall" and "Delay" of the pulse waveform can be modified.

#### **Waveforms** --- Noise

Provides White Gaussian Noise output with a bandwidth of 60 MHz.

- “Stdev” and “Mean” of the noise signal can be modified.

#### **Waveforms** --- DC

Provides DC signal output with level up to  $\pm 10$  V into HighZ load or  $\pm 5$  V into 50 $\Omega$  load

- “DC Offset” of the DC signal can be modified.

#### **Waveforms** --- Arb

Provides arbitrary waveform output which ranges from 1  $\mu$ Hz to 6 MHz.

- Built-in waveforms include Cardiac, Gausspuls, ExpRise and ExpFall, etc. In addition, the waveform stored in the U-Disk can be output.
  - Users can edit arbitrary waveforms through EasyWaveX and download them to the instrument.
- “Frequency/Period”, “Amplitude/High level”, “Offset/Low level” and “Phase” of the arbitrary waveform can be modified.

### 11. Menu Keys

These keys correspond to the menu displayed above them on the display. Press any key to activate the corresponding menu.

# The Rear Panel



Figure 3 SDG1000X Rear Panel

**1. Counter**

BNC connector. The input impedance is  $1M\Omega$ . This connector is used to accept the signal measured by the frequency counter

**2. Aux In/Out**

BNC connector. The function of this connector is determined by the current operating mode of the instrument.

- Sweep/Burst trigger signal input port of external trigger.
- Sweep/Burst trigger signal output port of internal/manual trigger.
- Burst gating trigger input port.
- Synchronization output port. When synchronization is on, the port can output a CMOS signal with the same frequency as basic waveforms (except Noise and DC), arbitrary waveforms, and modulated waveforms (except external modulation).
- AM, DSB-AM, FM, PM, ASK, FSK, PSK and PWM external modulation signal input port.

**3. 10 MHz Clock Input / Output Port**

BNC connector. The function of this connector is determined by the type of the clock source.

- If the instrument is using its internal clock source, the connector outputs the 10 MHz clock signal generated by the crystal oscillator inside the generator.
- If the instrument is using an external clock source, the connector accepts an external 10 MHz clock source.

**4. Earth Terminal**

The Earth Terminal is used to ground the instrument.

**5. AC Power Supply Input**

SDG1000X can accept two different types of AC input power.

AC power: 100-240V, 50/60Hz or 100-120V, 400Hz

Fuse: 1.25A, 250V

**6. USB Device**

Used when connecting the instrument to an external computer to allow waveform editing ( i.e., EasyWaveX) and remote control.

**7. LAN Interface**

Through this interface, the generator can be connected to a computer or network for remote control. An integrated testing system may be built, as the generator conforms to the VXI-11 class standard of LAN-based instrument control.

# User Interface

SDG1000X can only display parameters and waveform of one channel at a time. The picture below shows the interface when CH1 is selected and AM modulation of a sine wave function is selected. The information displayed may vary depending on the function selected.

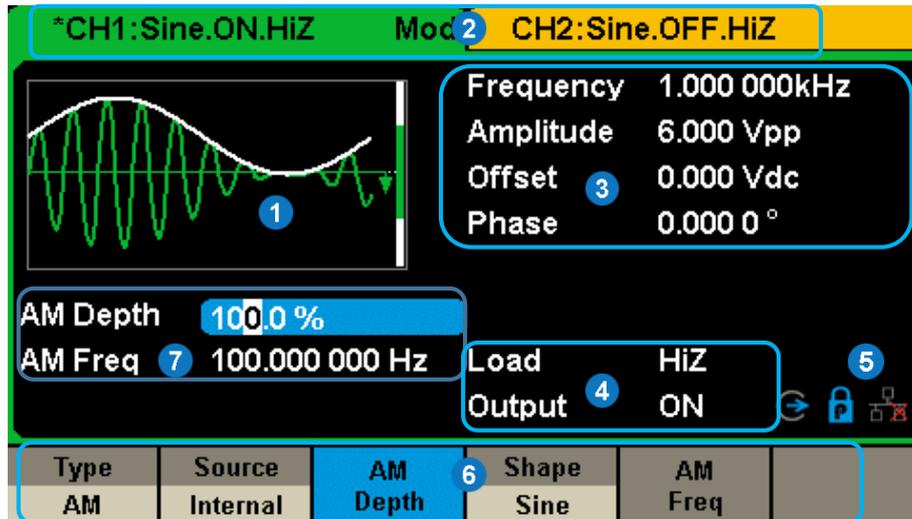


Figure 4 User Interface

1. **Waveform Display Area**

Displays the currently selected waveform of each channel.

2. **Channel Status Bar**

Indicates the selected status and output configuration of the channels.

3. **Basic Waveform Parameters Area**

Shows the current waveform parameters of each channel. Touch this area of the screen to highlight the parameter you want to configure and use number keys or knob to change the parameter value.

4. **Channel Parameters Area**

Displays the load and output settings of the currently selected channel.

**Load** ----Value of the output load, as selected by the user.

Press **Utility** → **Output** → **Load**, then use the softkeys, number keys or knob to change the parameter value; or continue pressing the corresponding output key for two second to switch between High Impedance and 50 Ω.

**High Impedance:** display HiZ.

**Load:** display impedance value (the default is 50 Ω and the range is 50 Ω to 100 kΩ).

**Note:** This setting does not actually change the instrument's output impedance of 50 Ω but rather is used to maintain amplitude accuracy into different load values.

**Output** ----Channel output state.

Display the output status of the current channel.

5. **Status Icon**

SDG1000X will show different prompt messages based on the current network status.



This mark indicates LAN connection is successful.



This mark indicates there is no LAN connection or LAN connection is unsuccessful.

### Phase Mode Icon



Indicates "Phase Locked" mode, in which both DDS reset when changing frequency. Phase deviation between CH1 and CH2 is maintained.



Indicates "Independent" mode, in which no DDS resets when changing frequency. Phase deviation between CH1 and CH2 is random.

The independent mode is recommended when the smoothest manual frequency transitions are required.

Choose **Utility** → **Page 1/2** → **Phase Mode** to choose the mode.

### Clock Source Icon



Indicates the clock source is internal



Indicates the clock source is external



Indicates the clock source is external, but not available

### 6. Menu

Shows the menu corresponding to the displayed function. For example, Figure 4 shows the parameters of "AM modulation".

### 7. Modulation Parameters Area

Shows the parameters of the current modulation function. After selecting the corresponding menu, use number keys or knob to change the parameter value.

# Use Built-In Help System

To obtain built-in help information of the product, please press **Utility** → **System** → **Page1/2** → **help** , use the knob to choose the help item you want, finally press **Select** to obtain help information.

The common help information is listed as the following:

1. System information.
2. Generating a standard waveform.
3. Generating an arbitrary waveform.
4. Generating a modulated waveform.
5. Sweep function.
6. Burst function.
7. Store/Recall.
8. Synchronizing multiple instruments.
9. Restoring factory settings.
10. Technical support.

# Introduction of EasyWaveX

The SDG1000X series includes arbitrary waveform editing software called EasyWaveX. This software is a platform for easily creating, editing, and transferring waveforms to the generator. It provides 12 standard waveforms such as Sine, Square, Ramp, Pulse, Noise, DC and Multi Pulse, which meets most engineers' basic needs. In addition, it provides several ways of manual drawing, point-to-point line drawing and arbitrary point drawing. EasyWaveX allows for fast and easy creation of complex waveforms.

The main interface of EasyWaveX is shown in the following figure.

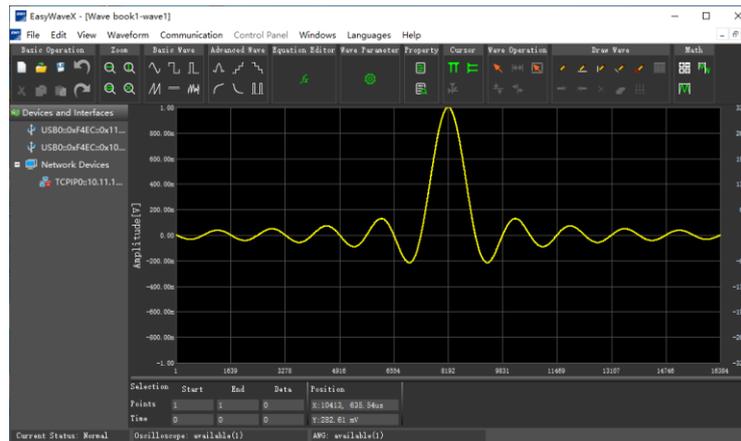


Figure 5 EasyWaveX Interface

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