SDG8000A Series Arbitrary Waveform Generator

Quick Start

EN01B

Copyright Information

Contents

General Safety Summary

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

Use the Proper Power Cord

Only the power cord designed for the instrument and authorized by local government regulations should be used.

Ground the Instrument

The instrument is grounded through the protective earth conductor of the power cord. To avoid electric shock, please make certain the instrument is grounded correctly before connecting its input or output terminals.

Connect the Signal Cable Correctly

The potential of the signal cable ground is equal to the earth ground. Do not connect the signal wire to a high voltage.

Look Over All Terminal Ratings

To avoid fire or electric shock, please look over all ratings and sign instructions of the instrument. Before connecting the instrument, please read the manual carefully to gain more information about the ratings.

Use Proper Overvoltage Protection

Make sure that no overvoltage (such as that caused by a thunderstorm) can reach the product, or else the operator might be exposed to the danger of electrical shock.

Electrostatic Prevention

Operate in an electrostatic-protected area environment to avoid damages induced by static discharge. Always ground both the internal and external conductors of the cable to release a static charge before connecting.

Maintain Adequate Ventilation

Inadequate ventilation may cause an increase in temperature, which may eventually damage the instrument. Maintain suitable ventilation and inspect the fan and intake regularly.

Avoid Exposed Circuits and Components

Do not touch exposed contacts or components when the instrument's power is on.

Use Only the Specified Fuse

Do Not Operate Without Covers

Do not operate the instrument with covers or panels removed.

Safety Terms and Symbols

Terms in this manual. Terms may appear in this manual:

⚠ WARNING	Warning statements indicate the conditions and behaviors that could result in injury or loss of life.
⚠ CAUTION	Caution statements indicate the conditions and behaviors that could result in damage to this product or other properties.

Terms used in this product. These terms may appear in the product:

DANGER	Indicates direct injury or hazards that may happen.
WARNING	Indicates potential injury or hazards that may happen.
CAUTION	Indicates potential damage to the instrument or other property that may happen.

Symbols used in this product. These symbols may appear on the product:


Hazardous Voltage


Warning


Protective Earth Ground


Earth Ground


Power Switch

Allgemeine Sicherheitsübersicht

Lesen Sie die folgenden Sicherheitshinweise sorgfältig durch, um Verletzungen oder Schäden am Gerät und an den daran angeschlossenen Produkten zu vermeiden. Um mögliche Gefahren zu vermeiden, verwenden Sie das Gerät bitte wie angegeben.

Verwenden Sie ein geeignetes Netzkabel

Verwenden Sie nur das für das Gerät vorgesehene und im jeweiligen Land zugelassene Netzkabel.

Erden Sie das Gerät

Das Gerät ist über den Schutzleiter der Netzleitung geerdet. Um einen elektrischen Schlag zu vermeiden, vergewissern Sie sich bitte, dass das Gerät korrekt geerdet ist, bevor Sie die Eingangs- oder Ausgangsklemmen des Geräts anschließen.

Schließen Sie das Messkabel richtig an

Die Kabelschirmung (Masse) des Messkabels ist gleich dem Potential der Erde, schließen Sie das Messkabel also nicht an eine hohe Spannung an.

Überprüfen Sie die Nennwerte aller Klemmen

Um Feuer oder einen elektrischen Schlag zu vermeiden, beachten Sie bitte alle Angaben und Hinweise auf dem Gerät. Bevor Sie das Gerät anschließen, lesen Sie bitte das Handbuch sorgfältig durch, um weitere Informationen über die Nennwerte zu erhalten.

Verwenden Sie einen ordnungsgemäßen Überspannungsschutz

Stellen Sie sicher, dass keine Überspannung (z. B. durch ein Gewitter) an das Gerät gelangen kann, da sonst die Gefahr eines elektrischen Schlages besteht.

Schutz vor Elektrostatik

Betreiben Sie das Gerät in einer Umgebung, die vor elektrostatischer Entladung geschützt ist, um Schäden durch statische Entladung zu vermeiden. Erden Sie vor dem Anschließen immer sowohl den Innen- als auch den Außenleiter des Kabels, um statische Aufladung abzubauen.

Für gute Belüftung sorgen

Eine unzureichende Belüftung kann zu einem Temperaturanstieg führen, der schließlich das Gerät beschädigt. Sorgen Sie daher für eine gute Belüftung und überprüfen Sie regelmäßig die Ansaugung und den Lüfter.

Vermeiden Sie freiliegende Schaltkreise oder Komponenten

Berühren Sie keine freiliegenden Kontakte oder Bauteile, wenn das Gerät eingeschaltet ist.

Richtige Sicherung verwenden

Verwenden Sie nur die angegebene Sicherung.

Betreiben Sie das Gerät nicht ohne Abdeckungen

Betreiben Sie das Gerät nicht, wenn Abdeckungen oder Verkleidungen entfernt sind.

Betreiben Sie das Gerät nicht bei vermuteten Defekten

Wenn Sie vermuten, dass das Gerät beschädigt ist, lassen Sie es vor dem weiteren Betrieb von qualifiziertem Servicepersonal überprüfen. Jegliche Wartung, Einstellung oder Austausch, insbesondere von Schaltkreisen oder Zubehör, muss von SIGLENT autorisiertem Personal durchgeführt werden.

Nicht in feuchter Umgebung betreiben

Um einen Kurzschluss im Geräteinneren oder einen elektrischen Schlag zu vermeiden, betreiben Sie das Gerät nicht in feuchter Umgebung.

Betreiben Sie das Gerät nicht in explosionsgefährdeten Umgebungen

Um Schäden am Gerät oder Personenschäden zu vermeiden, ist es wichtig, das Gerät nicht in explosionsgefährdeter Umgebung zu betreiben.

Halten Sie die Produktoberflächen sauber und trocken

Um den Einfluss von Staub und/oder Feuchtigkeit in der Luft zu vermeiden, halten Sie die Oberfläche des Geräts bitte sauber und trocken.

Sicherheit bei der Handhabung

Bitte behandeln Sie das Gerät während des Transports vorsichtig, um Schäden an Tasten, Drehknopfschnittstellen und anderen Teilen auf den Bedienfeldern zu vermeiden.

Es dürfen nur Tastköpfe verwendet werden, die den Spezifikationen des Herstellers entsprechen

Das Gerät darf nicht so positioniert werden, dass es schwierig ist, die Trennvorrichtung (abnehmbarer Stecker) zu bedienen.

Wenn das Gerät auf eine Weise verwendet wird, die nicht vom Hersteller angegeben ist, kann der Schutz, den das Gerät bietet, beeinträchtigt warden.

Sicherheitsbegriffe und Symbole

Begriffe in diesem Handbuch. Diese Begriffe können in diesem Handbuch vorkommen:

⚠WARNUNG	Warnhinweise weisen auf Bedingungen oder Praktiken hin, die zu Verletzungen oder zum Verlust des Lebens führen können.
⚠ VORSICHT	Vorsichtshinweise weisen auf Bedingungen oder Praktiken hin, die zu Schäden an diesem Produkt oder anderen Gegenständen führen können.

Begriffe auf dem Produkt. Diese Begriffe können auf dem Produkt erscheinen:

GEFAHR	Weist auf direkte Verletzungen oder Gefahren hin, die auftreten können.
WARNUNG	Weist auf mögliche Verletzungen oder Gefährdungen hin, die auftreten können.
VORSICHT	Weist auf mögliche Schäden am Gerät oder an anderen Gegenständen hin, die eintreten können.

Symbole auf dem Produkt. Diese Symbole können auf dem Produkt erscheinen:


Hazardous Voltage


Protective Earth Ground


Warning


Terminal Ground


Power Switch

Wenn Sie solche Symbole auf dem Produkt finden, ziehen Sie das Handbuch zu Rate, um die Art der potenziellen Gefahr und die zu ergreifenden Maßnahmen zu erfahren

General Care and Cleaning

Care:

Do not store or leave the instrument in direct sunshine for extended periods.

To avoid damage to the instrument, please do not expose them to fog, liquid, or solvents.

Cleaning:

Please perform the following steps to clean the instrument.

1. Disconnect the instrument from all power sources and then clean it with a soft damp cloth.
2. Clean the loose dust on the outside of the instrument with a soft cloth.

To avoid damage to the surface of the instrument, please do not use any corrosive liquid or chemical cleansers.

Make sure that the instrument is completely dry before restarting it to avoid potential short circuits or personal injury.

General Inspection

- **Inspect the shipping container**

Keep the original shipping container and cushioning material until the contents of the shipment have been completely checked and the instrument has passed both electrical and mechanical tests.

The consigner or carrier will be responsible for damages to the instrument resulting from shipment.

SIGLENT will not provide free maintenance or replacement if the instrument has been damaged in shipment.

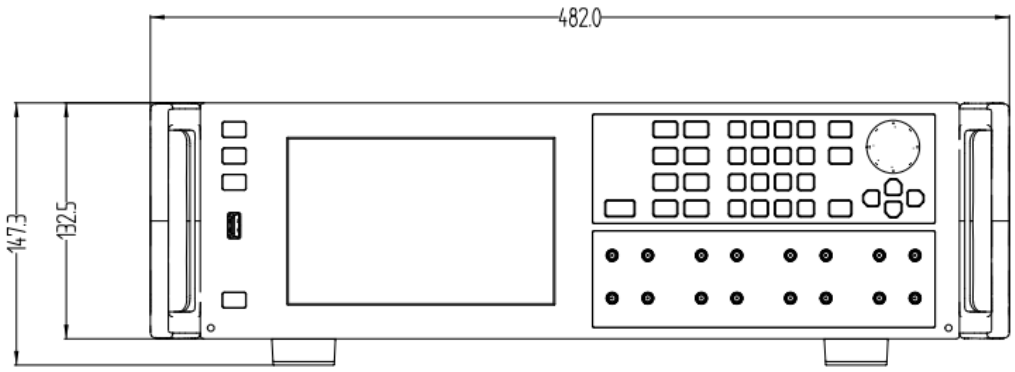
- **Inspect the instrument**

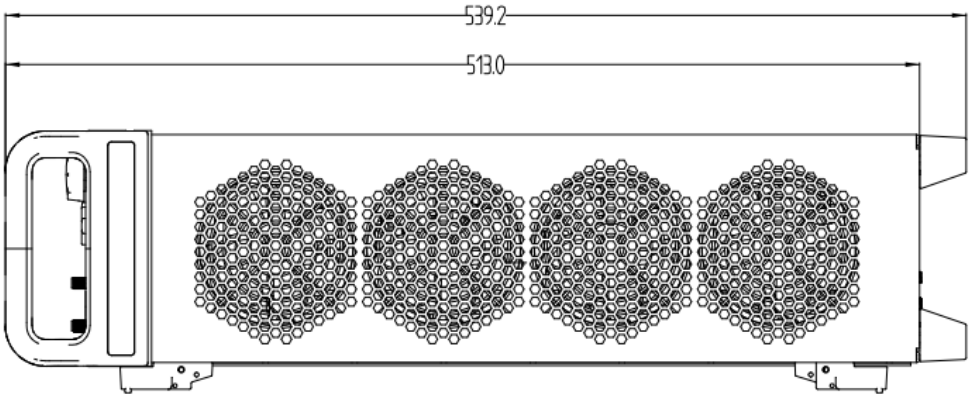
If there are instruments found damaged, defective, or have failed any electrical and / or mechanical tests, please contact SIGLENT.

- **Check the accessories**

Please check the accessories according to the packing list. If the accessories are incomplete or damaged, please contact your SIGLENT sales representative.

Mechanical Dimensions





Panel Introduction

Front panel

1. Power key: turns the signal generator on or off. When turned off, the generator enters standby mode.
2. USB host port: supports connection of USB storage devices for reading waveform or status files, or saving the current instrument status. It also supports connection of a USB keyboard or mouse.
3. Display area: displays menus, parameter settings, system status, and prompts for the current function. The signal source can be configured via touch operation.
4. Analog signal and marker signal output ports, with corresponding indicator lights.
5. Front panel buttons.

Number and unit keys, used to input the value and unit of the selected parameter. **Enter key** to confirm parameter modification; **ESC key,** used to cancel the modification; **Back key** to delete the last modified value.

Knob, which is used to increase (clockwise) or decrease (counterclockwise) the parameter value when setting parameters; When storing or reading files, turn the knob to select files.

Arrow keys to change the position of the cursor.

AWG, AFG, IQ, used to switch the working mode of the current channel, and when the corresponding key light is on, it indicates that the current channel is working in the corresponding mode.

Mod, Sweep, Burst function shortcut keys, which can quickly turn on or off the modulation/scanning/pulse train function. When the corresponding function is turned on, the corresponding key light is on.

Trig A, Trig B key, the front panel manually triggers the input function key.

All Off key, quickly close all channel outputs.

The Utility key can quickly enter the page of system settings and interface settings.

Home button, quickly return to the main interface.

Touch key, which turns on or off the touch function. When the touch function is turned on, the key light is on.

Rear panel

1. system input and output interfaces: including LAN interface, USB Host interface, external display interface, etc.
2. OCXO module installation area
3. Dynamic control input interface, through which the sequence to be played can be controlled.
4. USB device interface, through which a PC can be connected, and the signal generator can be controlled by the upper computer software EasyWaveX or user-defined programming.
5. AC power input, power input port of signal generator
6. Clock/sync signal/trigger signal input/output interface and external modulation signal input interface.

Quick Start

Adjusting the Support Feet

Adjust the support feet to tilt the front of the signal source upward, ensuring stable placement of the instrument and providing optimal viewing of the display for convenient operation.

Connect the power supply

The specification of the equipment that can input AC power is: 100-240 V 50/60 Hz. Please use the power cord provided in the attachment to connect this product with the power supply.

Power on

Press the power button on the front panel, and the device can be turned on.

Power off

When the device is turned on, press the power button on the front panel and confirm, and the device will be turned off.

Choice of language

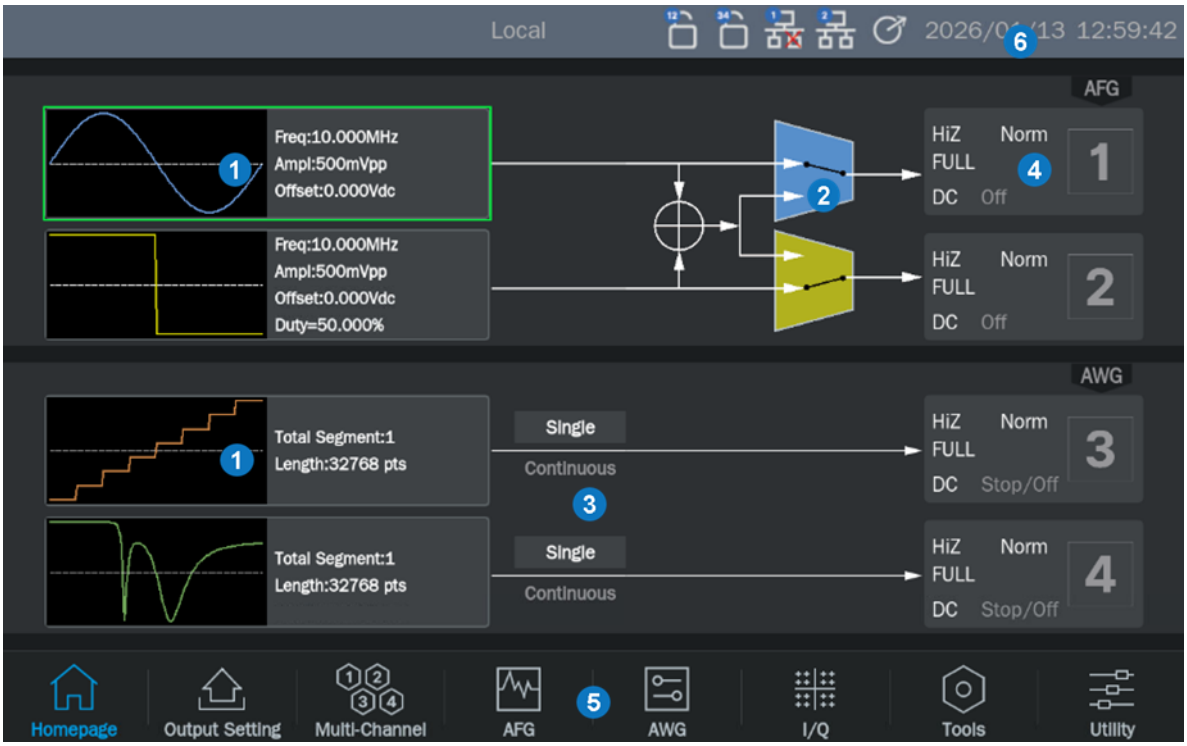
Utility → Setting → Language

View system information

Utility → System Info

User Interface

HOME PAGE



1. Waveform and parameter display area, which displays the currently selected waveform and corresponding waveform parameters of each channel.
2. Multi-channel output configuration area, multi-channel merging schematic diagram and settings. Click the alternative switch in the area to switch between single channel output and combined channel output (only supported by AFG mode).
3. Sequential operation mode indication (AWG mode)
4. Channel output and setting area, channel output parameter display and switch control. Click to open/close the channel.
5. Function shortcut selection area, which provides shortcuts to common function calls.
6. Information display bar, showing network connection status, clock status, etc.

Description of function shortcut selection button:

Home Page: Quick Return to Home Page

Output settings: enter the output settings page and set the output polarity, noise superposition, output filter, amplitude limit, overvoltage protection, etc.

Multi-channel setting: enter the multi-channel setting page to set the functions of channel merging,

channel tracking and coupling.

AFG: switch to AFG mode. If the currently selected channel is in AFG mode, enter the channel waveform parameter setting interface, otherwise switch the channel to AFG mode.

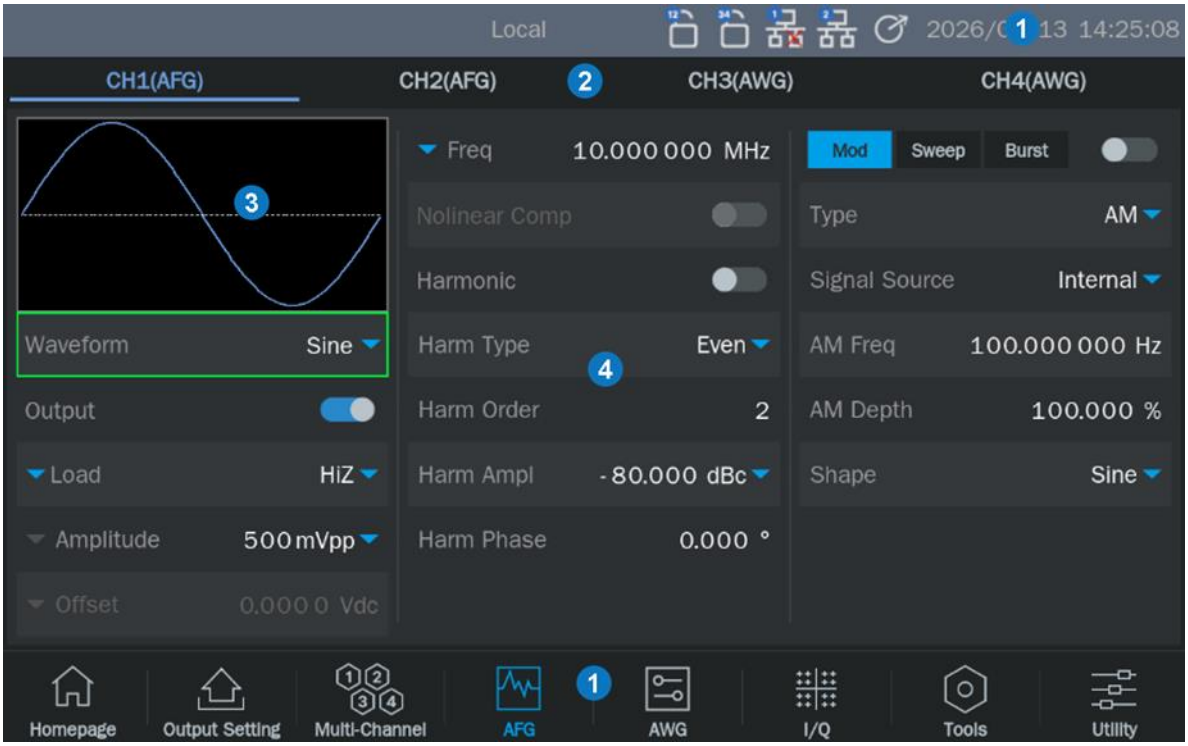
AWG: switch to AWG mode. If the currently selected channel is AWG mode, enter the serial wave setting interface, otherwise switch the channel to serial wave mode.

IQ: switch to IQ mode. If it is currently in IQ mode, enter the IQ waveform setting interface, otherwise it will switch to IQ mode.

Tools: It can enter multi-pulse and multi-tone output functions.

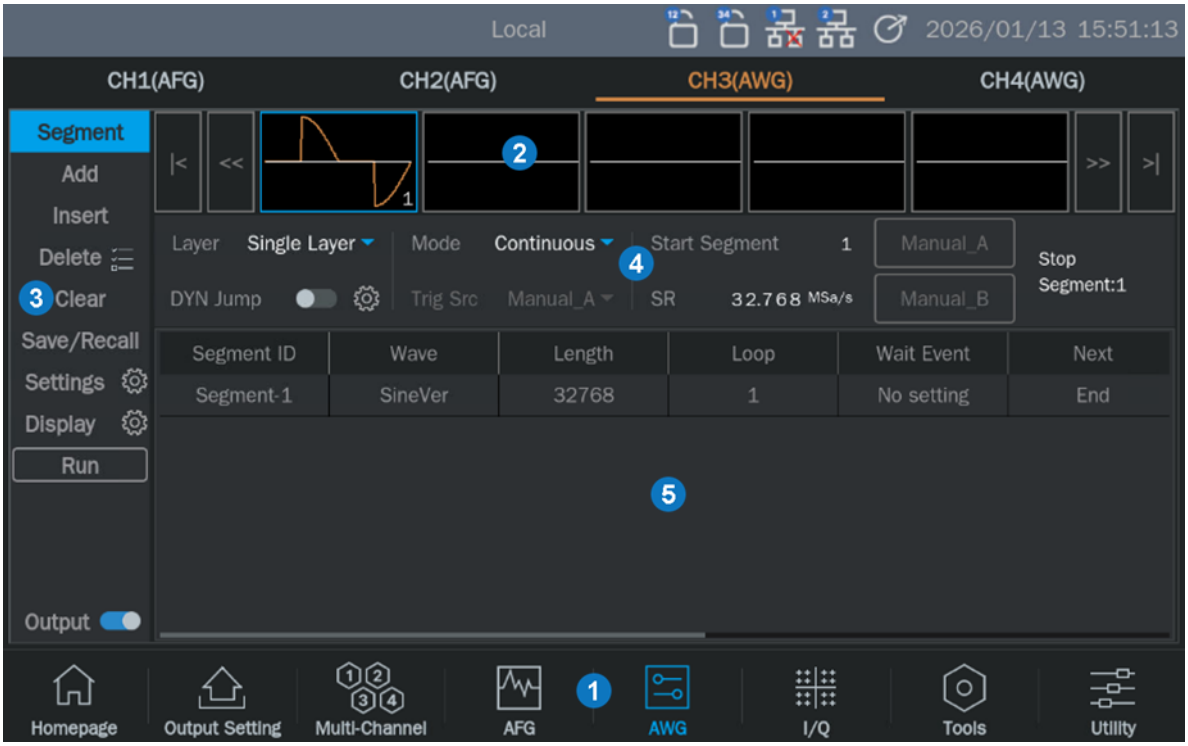
Utility: Enter the system information query, system settings, interface settings, file manager and other settings pages.

Parameter setting page (AFG)



1. The information display bar and function shortcut selection area are the same as the home page.
2. On the channel Tab page, you can select the corresponding channel for parameter configuration, and brackets after the channel number indicate the working mode of the current channel. For example, AFG indicates that the current channel is in AFG mode, while AWG indicates that the current channel is in AWG mode.
3. Waveform preview area, which displays the currently selected waveform. Click to select the output waveform.
4. Parameter setting box, with the parameter name on the left. If there is an icon in front of the parameter name, it means that the parameter has other replaceable parameters, such as "frequency" can be switched to "period". Click here to switch parameters. On the right is the parameter value. If there is a unit, the unit will be displayed at the same time. Click the parameter value area to set the parameter value through the virtual keyboard or the front panel keyboard; If the parameter value or unit is followed by an icon , it means that there are multiple options to choose from (for example, the unit of sine wave amplitude can be "Vpp", "Vrms" or "dBm"), click here to make a choice; If the parameter area is a switch icon , it means that the parameter has only two states of "On" and "Off". Click the icon to switch; If the parameter value is followed by an icon , it means that there are more detailed parameter settings. Click the icon to enter the corresponding next page.

Parameter setting page (AWG)



1. The information display bar and function shortcut selection area are the same as the home page.
2. Waveform preview area, which displays the currently selected waveform. Click to select the output waveform.
3. Sequence editing setting and output control area. The sequence is composed of multiple waveforms, and waveforms can be added/deleted or saved/loaded, and the channel output switch and sequence playback switch can be controlled.
4. Sequence running mode control and status display area, which can set sequence playing mode and display the currently played waveform segment.
5. Waveform parameter setting area, which can set the amplitude, length, number of cycles, trigger conditions and playing order of each waveform.

Basic Operations

This manual provides instructions for the basic operations of the instrument. For more advanced operations, please refer to the User Manual of the product.

AFG Basic Waveform Output

Basic operating instructions: the text with box indicates the corresponding key, such as Enter means Enter key; Characters on the gray background, such as Sine , indicate the corresponding function menu or parameter setting on the display screen.

Taking the output of 10 MHz and 500 mVpp sine wave as an example, the operation method of waveform output is explained.

1) Click the waveform display area of the corresponding channel on the main page to enter the parameter setting page. You can switch channels through the channel Tab page.
2) Select AFG in the function shortcut selection area. If the original channel is in non-AFG mode, it will switch to AFG mode. If the original channel is in AFG mode, it will enter the parameter configuration page.
3) Click the waveform preview area in the upper left corner, or click the waveform parameter setting box, and select Sine waveform in the pop-up menu;
4) Click the frequency parameter setting box, use the analog keyboard key to enter 1 , 0 , and then select the unit M ;
5) Click the amplitude parameter setting box, use the analog keyboard keys to enter 5 , 0 , 0 , and then select the unit M ;
6) Click the icon of the output control box on the screen. When the icon shows blue, the sine wave of 10 MHZ and 500 mVpp will be output. Connect the SMA interface of the corresponding channel to the oscilloscope, and the output waveform can be observed.

To output other waveforms, click on the waveform preview area and select the desired waveform. Different waveforms have different settable parameters. According to the selected waveform, various parameter setting boxes of the corresponding waveform will appear in the display area. By setting the parameters of the waveform, the corresponding waveform can be output. The main parameters of the basic waveform are shown in Table 1.

Table 1 Basic waveform parameters description

Parameter	description
Sine/Square/Pulse/Ramp/Noise/PRBS	
Frequency/Period	Set the frequency/period of the signal. The unit of frequency is Hz, and the unit of period is s. The relationship between the two is: frequency=1/period. Click the icon to switch between parameters.
Amplitude/High Level Offset/Low Level	Set the amplitude/offset of the signal to be linked with high/low levels. The amplitude value refers to the difference between the highest point (high level, unit V) and the lowest point (low level, unit V) of a signal. The supported units include Vpp, Vrms, and dBm (available when the load ≠ HiZ); The offset refers to the DC component superimposed on the signal waveform, measured in volts; The relationship between several parameters is: Amplitude value (Vpp) = high low level - low level Offset = (high level + low level)/2 Click the icon to switch between parameters.
Phase/Delay	The phase/delay of the signal is only meaningful when the dual channel phase mode is phase locked, used to set the phase relationship between two channels. The unit of phase is °, and the unit of delay is s. The relationship between the two is: Delay=- (period x phase/360 °) Click the icon to switch between parameters.
Square	
Duty	Set the ratio of the positive pulse width to the period of the square wave, The unit is %.
Pulse	
Width/Duty	Pulse width refers to the positive pulse width of a pulse, measured in seconds; Duty cycle refers to the ratio of positive pulse width to period, measured in%. The relationship between the two is: Pulse width= period x duty cycle Click the icon to switch between parameters.
Rise/Fall Edge	The rising edge refers to a rising time of 10% to 90%, and the falling edge refers to a falling time of 90% to 10%, both of which are measured in seconds. The rising and falling edges are independent of each other and can be set separately.
Ramp	
Symmetry	The ratio of the time and period during which a triangular wave is rising, The unit is %.
DC	
Offset	The "offset" parameter of the same sine wave, i.e. the DC level.
Noise	
Stdev	Standard deviation of noise sequence.
Mean	Mean value of noise sequence (mathematical expectation).
Bandwidth	-3dB bandwidth of noise.

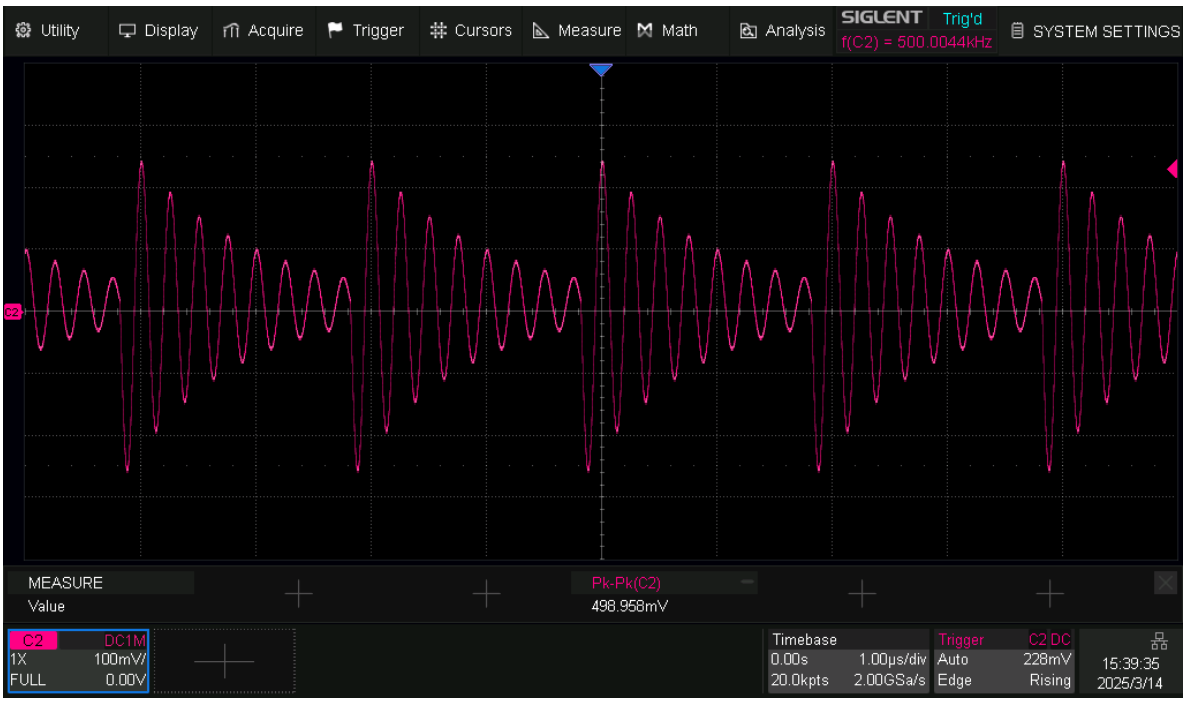
PRBS	
Bit Rate/Period	The bit rate/symbol period of PRBS sequence, with the unit of bit rate being bps and the unit of symbol period (UI) being s. The relationship between the two is: Bit rate=1/symbol period Click the icon to switch between parameters.
Length	PRBS-3~32 can be set, corresponding to lengths (2^3-1)~(2^32-1).
Edge	Refers to a rise time of 10% to 90% and a fall time of 90% to 10%, expressed in seconds. Setting both rising and falling edges simultaneously.

Arbitrary/sequence setting

SDG8000A can output instrument built-in waveform or user-defined arbitrary waveform. The built-in arbitrary waveform is stored in the internal nonvolatile storage area of the instrument. SDG8000A allows users to edit any waveform, and the maximum number of waveform points is 4 Gpts. The edited waveform can be stored in the internal or external memory of the instrument.

To output an arbitrary wave, you can follow the following steps.

1) Select the channel that needs to output any wave through the channel, such as CH3;
2) If the selected channel is not currently in AWG mode, click AWG to switch to AWG mode and enter the sequence wave setting page;
3) Click the cell under the "wave" column in the waveform preview area or the waveform parameter setting area, and in the pop-up window, click the source to select the built-in ; Click on the wave type to select the Engineering ; Select AttALT in the waveform list on the right;
4) Click the cell under the "Length" column in the waveform parameter setting area, and use the analog keyboard keys to enter 1 , 0 , 0 , 0 , and Enter ;
5) Click the cell under the "Amplitude" column in the waveform parameter setting area, use the analog keyboard key to enter 5 , 0 , 0 , and then select the unit M ;
6) Click the sampling rate in the operation mode control area, use the analog keyboard key to enter 5 , and then select the unit G ;
7) Click the icon of the output control box on the screen. When the icon shows blue, the channel will open. Then click the Run button on the screen to output an arbitrary waveform AttALT with an amplitude of 500 mVpp and a frequency of 500 kHz.



For arbitrary wave/sequence wave output, it is necessary to click the output switch and the run button after setting the parameters, and then the waveform will be output.

By changing the parameters of any wave/sequence wave, you can get the desired waveform. The main parameters of arbitrary wave/sequence wave are shown in Table 2.

Table 2 Description of Parameter Setting of Arbitrary Wave/Sequence Wave

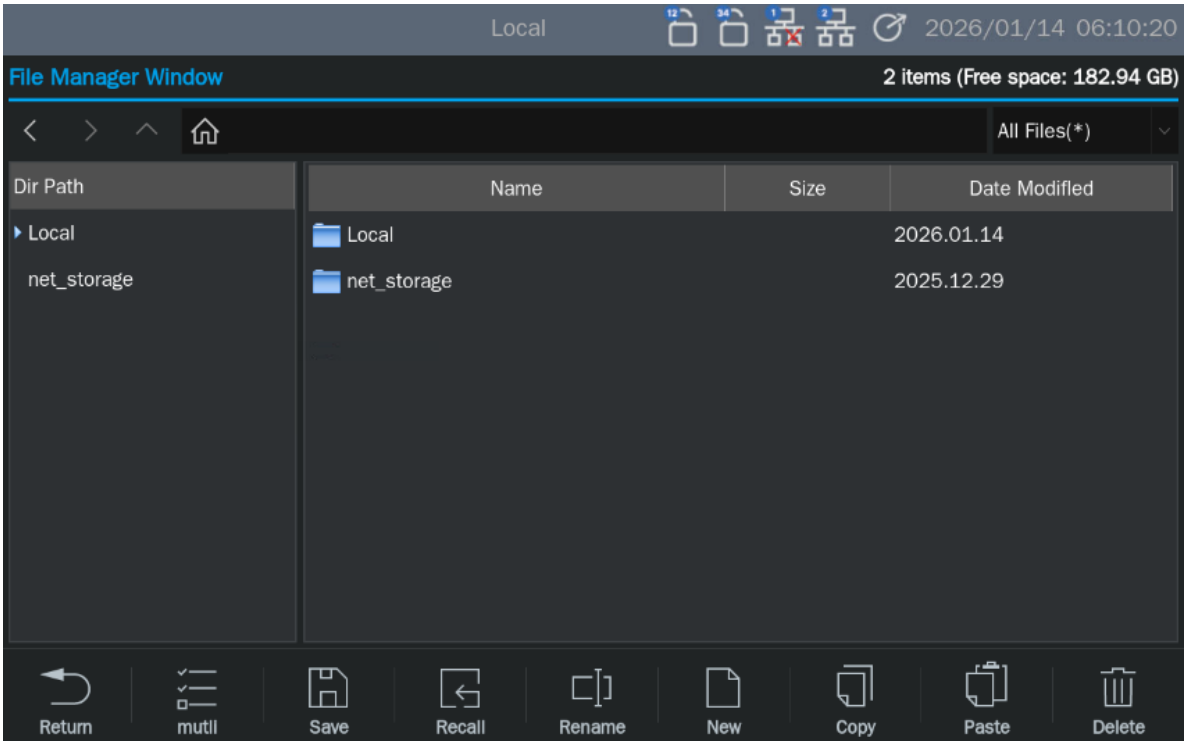
Parameter	description
SR	Sample rate ,the rate of waveform points output.
Amplitude/High Level Offset/Low Level	Same as the basic waveform.
Length	The length of the waveform. If the set length is different from the length of the waveform file, the original waveform file will be interpolated or decimated to fit the set waveform length.
Loop	The number of repetitions of the waveform segment
Wait Event	The trigger source of segment playback. When this trigger condition occurs, the waveform starts to play.
Next	Indicates the next segment to be played after the current segment has played a specified number of times.
Increasing	When the set segment length is greater than the original length of the waveform file, the waveform interpolation method.
Decreasing	When the set segment length is less than the original length of the waveform file, the waveform extraction method.
Interpolation	Refers to the interpolation method when waveform output.

Run Mode	Sequence playback mode, including Continuous, Trigged, Burst, Step, and Advanced mode.
Timer	Timing time when timer is triggered.
Trigger edge	For external trigger, the trigger edge can be selected in three ways:Rise Edge;Fall Edge and Both.
Trigger delay	Delay time from trigger to signal output
Hold Value	Level when there is no signal output

Save & Recall

SDG8000A supports storing and calling status files, waveform files and firmware upgrade files. The storage and calling locations include internal storage (Local), external USB storage devices (such as U disk) and network storage. Store and call operations are implemented through the file manager.

When setting the waveform data source, select the From File , enter the file management window, and select the corresponding waveform file.



Then select Recall to import the waveform file into the generator.

Troubleshooting

1. If the LCD screen remains black after pressing the power switch, perform the following checks:
   - Verify that the power supply is connected and powered on.
   - Restart the instrument.
   - If the issue persists, contact SIGLENT for assistance.

2. If the settings are correct but there is no waveform output, please follow the following steps to handle it:
   - Verify that the signal connection cable is properly connected to the Output port.
   - Ensure the cable is securely connected.
   - Confirm that the channel output and run switch are turned on.

More information

System information and instrument status can be accessed via the System menu bar. For further details, refer to the following documentation (available for download from the official SIGLENT website at http://www.siglent.com):

- **SDG8000A User Manual** – provides a detailed description of product functions.
- **SDG8000A Data Sheet** – outlines main features and technical specifications.
- **SDG8000A Programming Guide** – provides the programming command set.

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