

SDG6000X Series

Pulse/Arbitrary Waveform Generator

Service Manual

SM0206X-E01A



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SIGLENT guarantees this product conforms to the national and industrial standards in China as well as the ISO9001: 2008 standard and the ISO14001: 2004 standard. Other international standard conformance certification is in progress.

General Safety Summary

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

Only qualified technician should perform service procedures

Use Proper Power Line

Use only the special power line of the instrument that approved by local state.

Ground the Instrument

The instrument grounds through the protective earth 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, 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 observe all ratings and sign instructions 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 have a qualified service personnel check it.

Avoid Circuit or 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 immediately happen.

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

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

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



**Hazardous
Voltage**



**Protective
Earth Ground**



Warning



Earth Ground



**Power
Switch**

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Overview of this Document

This document is for the SDG6000X series arbitrary waveform generator, which will be mostly referred to as “the generator” for short in the following text. The main contents described in this manual are:

The SDG6000X Series Generator at a Glance

This section introduces the main technology characteristics for the SDG6000X generator.

The Front Panel at a Glance

This section introduces briefly all of the buttons and the knob on the front panel.

The Rear Panel at a Glance

This section introduces the ports for easy communication on the rear panel.

Specification

Chapter 1 lists the generator’s specifications.

Quick Start

Chapter 2 describes how to prepare the generator for use and helps to familiarize you with a few of its front-panel features.

Calibration

Chapter 3 provides calibration, verification and adjustment procedures for the generator.

Assembly Procedures

Chapter 4 provides disassembly procedures to help in gaining an understanding of the structure of the generator in preparing to install or replace any needed modules or troubleshoot faults that might be encountered during operation.

Troubleshooting

Chapter 5 provides troubleshooting procedures for the internal circuit boards, as well a quick guide for solving general problems. Before any operation, please read the ESD Precautions to avoid personal injuries or damage to the generator.

Maintenance

Chapter 6 provides information on maintenance, daily care and inspection of the instrument. The contact information is included at the end of the chapter in

case of some unsolvable problems that might be encountered.

The Different SDG6000X Models Addressed by this Manual

All the description for function and performance in this document are according to the SDG6052X series generator, and apply to all generators in this series. The SDG6000X series contains the following types:

Type	Analog Bandwidth	Channels
SDG6022X	200 MHz	2
SDG6032X	350 MHz	2
SDG6052X	500 MHz	2

The SDG6000X Series Generator at a Glance

SIGLENT's SDG6000X is a series of dual-channel Pulse/Arbitrary Waveform Generators that feature up to 500 MHz maximum bandwidth, maximum sample rate of 2.4 GSa/s and 16-bit vertical resolution. They also include proprietary TrueArb and EasyPulse technology that helps to solve the weaknesses inherent in traditional DDS generators when generating arbitrary, square and pulse waveforms. In addition, the SDG6000X is a multi-function device which can generate Noise, IQ signals and PRBS patterns. These features enable the SDG6000X to provide a variety of high fidelity and low jitter signals, meeting the growing requirements of complex waveform synthesis.

Characteristics

The powerful feature set for the SDG6000X generator family includes:

- ◆ Dual-Channel, 500 MHz maximum bandwidth, 20 Vpp maximum output amplitude, high fidelity output with 80 dB dynamic range
- ◆ High-performance sampling system with 2.4 GSa/s maximum sampling rate and 16-bit vertical resolution.
- ◆ Multi-function signal generator that delivers:

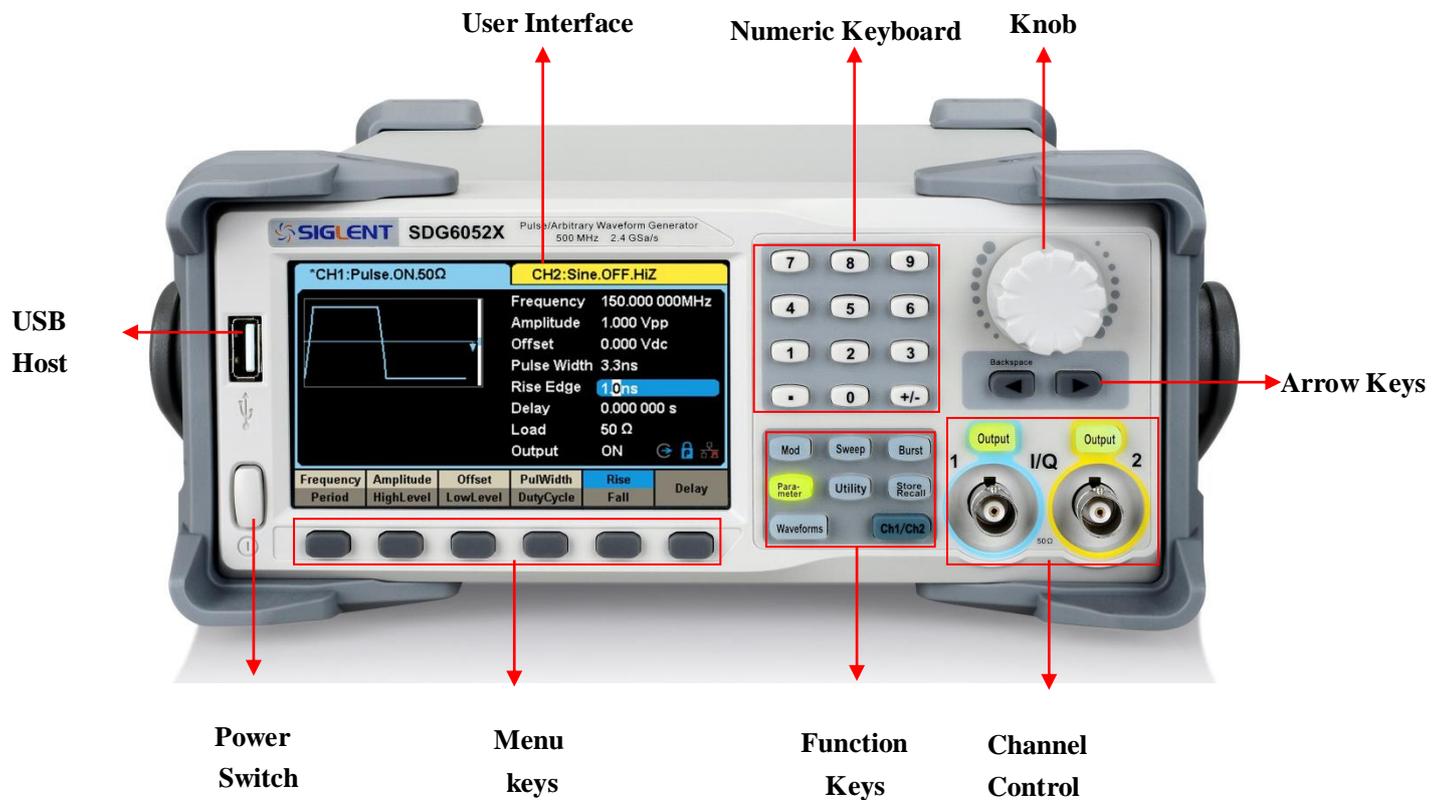
	Continuous Wave Generator	Up to 500 MHz sine wave, supporting sweep and user-defined harmonics. Low cost replacement of RF signal generators below 500 MHz.
	Pulse Generator	Up to 150 MHz Pulse, with adjustable width, rising edge and falling edge; 3.3 ns minimum width and 1 ns minimum edge across the full frequency range
	Function/Arbitrary Waveform Generator	Basic Function/Arbitrary Waveform Generator with modulation, sweep, burst and waveform combining functions.
	IQ Signal Generator (optional)	Base Band and IF IQ signal generation with symbol rates between 250 Symb/s ~ 37.5 MSymb/s
	Noise Generator	Up to 500 MHz bandwidth White Gaussian Noise with adjustable bandwidth
	PRBS Generator	Up to 300 Mbps PRBS3 ~ PRBS32 with bit rate and edge adjustments

- ◆ Sweep and Burst function
- ◆ Harmonic function

- ◆ Waveforms Combining function
- ◆ Channel Coupling, Copy and Tracking function
- ◆ High precision Frequency Counter
- ◆ 196 kinds of built-in arbitrary waveforms
- ◆ Standard interfaces: USB Host, USB Device (USBTMC), LAN (VXI-11, Socket, Telnet).
- ◆ Optional interface: GPIB
- ◆ 4.3" touch screen display for easier operation

Note: All the specifications described in this manual refer to the SDG6052X.

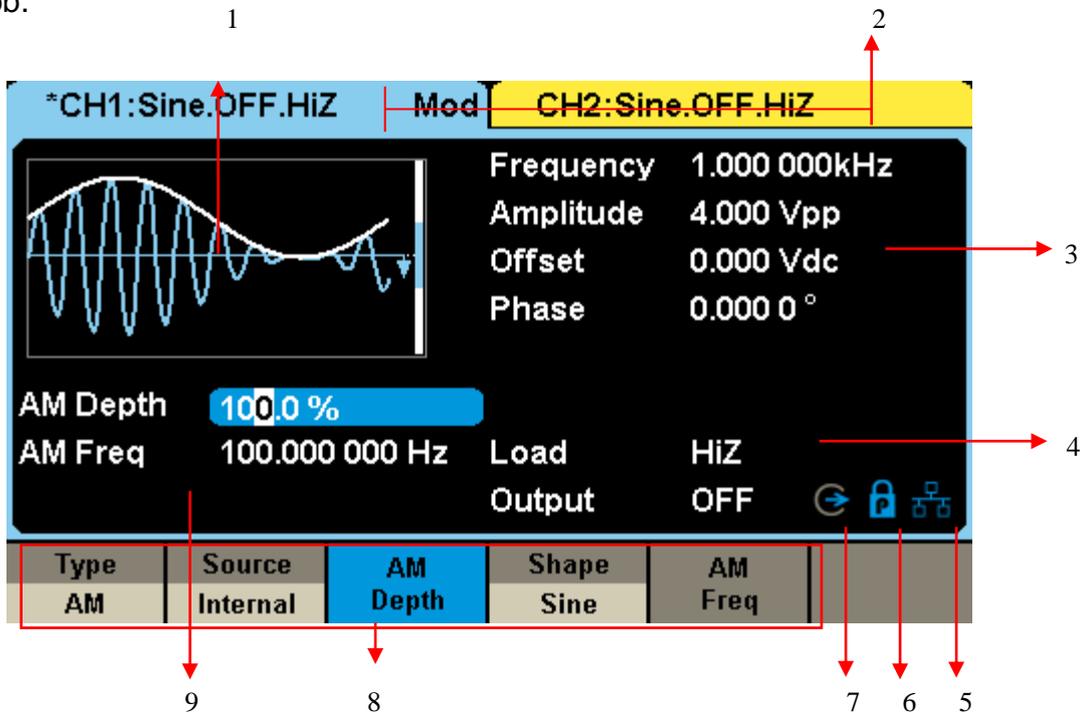
The Front Panel at a Glance



The User Interface at a Glance

The SDG6000X displays parameter and waveform information of one channel at a time. The picture below shows the interface when CH1 is selected. In this example, the waveform is an AM modulated sine wave. The information displayed may vary depending on the function selected.

The entire screen of the SDG6000X is a touch screen. You can use your finger or a touch pen to control the instrument. Most functions and selections can be chosen using the touch screen in a similar manner to the front panel keys and knob.



1. Waveform Display Area

Displays the currently selected waveform of each channel. Click on the screen here, then the "Waveforms" button will be highlighted.

2. Channel Status Bar

Indicates the selected status and output configuration of the channels. Click on the screen here to switch to the corresponding channel. Click here again, shortcut menu of front panel's function keys will be shown: Mod, Sweep, Burst, Parameter, Utility and Store/Recall.

3. Basic Waveform Parameters Area

Shows the current waveform parameters of each channel. Click the parameters to be set, and the parameters will be selected and highlighted. Then 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.

Select the corresponding parameter to highlight it, and then use the softkeys, number keys or knob to change the parameter value; or press the corresponding output key for two seconds to switch between High Impedance and 50 Ω .

High Impedance: Displays HiZ, and assumes a load impedance of 1 M Ω .

Load: Displays the set impedance value. The default is 50 Ω and the range is from 50 Ω to 100 k Ω .

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

Output ----Channel output state.

Click on the screen here or pressing corresponding channel output control button, the current channel can be turned on/off.

5. LAN Status Icon

SDG6000X 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.

6. Mode Icon

The display will show different prompt messages based on the current phase mode.



This icon indicates current phase mode is Phase-locked.



This icon indicates current phase mode is Independent.

7. Clock Source Icon

The display will show different prompt messages based on the current clock source.



This mark indicates the current clock source is from the internal TCXO.



This mark indicates the current clock source is from an external clock source.

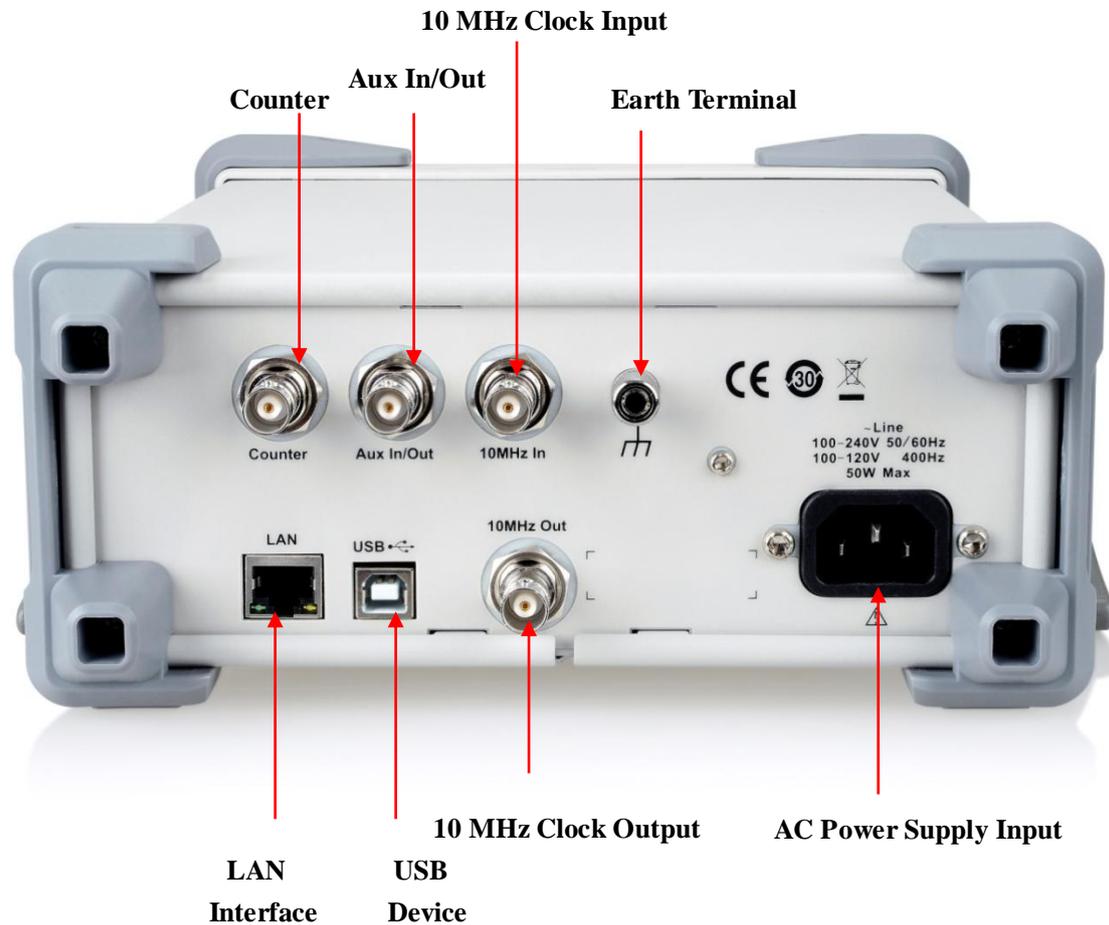
8. Menu

Shows the menu corresponding to the selected function. Click menu options on the screen to select and set the corresponding parameters.

9. Modulation Parameters Area

Shows the parameters of the current modulation function. Click on the screen here or select the corresponding menu, and use number keys or knob to change the parameter value.

The Rear Panel at a Glance



WARNING: For protection from electric shock, the grounding power cord must not be defeated. If only a two-contact electrical outlet is available, connect the instrument's chassis ground screw (see above) to a good earth ground.

Chapter 1 Specifications

All specifications apply to both channels. Unless otherwise stated, all specifications are not guaranteed unless the following conditions are met:

- The generator has been working continuously for at least 30 minutes in a specified temperature range (18 °C ~ 28 °C)
- The generator is within the valid calibration period.

Frequency Characteristics					
Parameter	Min.	Typ.	Max.	Unit	Condition&Note
Resolution	1μ			Hz	
Initial accuracy	-1		+1	ppm	25 °C
	-2		+2	ppm	0~40°C
1 st -year aging	-1		+1	ppm	25 °C
10-year aging	-3.5		+3.5	ppm	25 °C

Sine Characteristics					
Parameter	Min.	Typ.	Max.	Unit	Condition&Note
Frequency	1 μ		500M	Hz	SDG6052x
	1 μ		350M	Hz	SDG6032x
	1 μ		200M	Hz	SDG6022x
Harmonic distortion			-65	dBc	0 dBm, 0~1 MHz (Included)
			-60	dBc	0 dBm, 1~60 MHz (Included)
			-50	dBc	0 dBm, 60~100 MHz (Included)
			-40	dBc	0 dBm, 100~200 MHz (Included)
			-30	dBc	0 dBm, 200~300 MHz (Included)
		-28	dBc	0 dBm, above 300 MHz	
Total Harmonic Distortion			0.075	%	0 dBm, 10 Hz ~ 20 kHz
Non-harmonic spurious			-60	dBc	0 dBm, ≤350 MHz
			-55	dBc	0 dBm, >350 MHz
Output Range Note	2 m		20	V _{pp}	≤ 40 MHz, HiZ load
	2 m		10	V _{pp}	40 MHz ~ 120 MHz (included), HiZ load
	2 m		5	V _{pp}	120 MHz ~ 160 MHz (included), HiZ load
	2 m		3	V _{pp}	160 MHz ~ 350 MHz (included), HiZ load
	2 m		1.28	V _{pp}	above 350 MHz, HiZ load

Sine Characteristics					
Order			10		
Type	Even, Odd, All				

Note :The specification will be divided by 2 while applied to a 50Ω load.

Pulse					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Frequency	1 μ		150 M	Hz	SDG6052X, SDG6032X
	1 μ		80 M	Hz	SDG6022X
Pulse Width	3.3			ns	
Pulse width resolution	100			ps	
Pulse width accuracy			±(0.01 % + 0.3 ns)		
Rise time (setting range)	1 n			s	SDG6052X, SDG6032X 10% ~ 90%
	2 n			s	SDG6022X 10% ~ 90%
Fall time (setting range)	1 n			s	SDG6052X, SDG6032X 90% ~ 10%
	2 n			s	SDG6022X 90% ~ 10%
Rise time (specified range)	2 n			s	10% ~ 90%. Overshoot, jitter, output range and pulse width accuracy specifications are only guaranteed in specified rise/fall times range
Fall time (specified range)	2 n			s	
Rise/fall times resolution	100			ps	
Overshoot			3	%	100 kHz, 1 Vpp, 50 Ω load , 2 ns edge
Duty cycle	0.001		99.999	%	Limited by frequency setting
Duty cycle resolution	0.001			%	
Jitter (rms) cycle to cycle			100	ps	1 Vpp, 50 Ω load
Output Range Note	2 m		20	Vpp	≤ 20 MHz, HiZ load , 2 ns edge , ≥ 10 ns width
	2 m		10	Vpp	20 MHz ~ 120 MHz (included), HiZ load , 2 ns edge , ≥ 10 ns width
	2 m		5	Vpp	120 MHz above , HiZ load , 2 ns edge , ≥ 10 ns width

Note :The specification will be divided by 2 while applied to a 50 Ω load.

Square					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Frequency	1 μ		120 M	Hz	SDG6052X, SDG6032X

	1 μ		80M	Hz	SDG6022X
Rise /fall times		2	2.4	ns	10% ~ 90%, 1 Vpp, 50 Ω load
Overshoot			3	%	100 kHz, 1 Vpp, 50 Ω load
Duty cycle	10		90	%	Limited by frequency setting
Jitter (rms) cycle to cycle			100	ps	1 Vpp, 50 Ω load
Output Range	2 m		20	Vpp	\leq 20 MHz, HiZ load
	2 m		10	Vpp	Above 20 MHz , HiZ load

Note :The specification will be divided by 2 while applied to a 50 Ω load.

Ramp					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Frequency	1 μ		5	Hz	
Symmetry	0		100	%	
Linearity			1	%	Percentage of peak output, 1 kHz, 1 Vpp, 50% symmetry
Output Range	2 m		20	Vpp	
Note					

Note :The specification will be divided by 2 while applied to a 50 Ω load.

Noise					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Bandwidth (-3dB)		500		MHz	SDG6052X
		350		MHz	SDG6032X
		200		MHz	SDG6022X
Bandwidth setting range	80		BW	MHz	BW is the max. frequency
Output Range	2 m		1.084	Vrms	Mean = 0
Note					Bandwidth limit = OFF

Note :The specification will be divided by 2 while applied to a 50 Ω load.

Arbitrary Wave					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Frequency setting range	1 μ		50 M	Hz	
Waveform length	2		20 M	pts	
Sampling rate	1 u		300 M	Sa/s	TrueArb mode
		1.2 G		Sa/s	DDS mode

Arbitrary Wave					
Vertical resolution		16		bit	
Rise/fall times		2.6		ns	10% ~ 90%, 1Vpp step signal , DDS mode
Jitter (rms) cycle to cycle			100	ps	1 Vpp, 50 Ω load , TrueArb mode
Output Range	2 m		20	Vpp	≤ 20 MHz, HiZ load
Note	2 m		10	Vpp	Above 20 MHz , HiZ load

Note :The specification will be divided by 2 while applied to a 50 Ω load.

DC					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Output Range	-10		10	V	HiZ load
	-5		5	V	50 Ω load
Accuracy	±(1%+2 mV)				HiZ load

IQ (optional)					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Symbol rate	250		37.5M	Symb/s	Limited by the oversampling factor
Vertical resolution	16			bit	
Modulation type	2ASK, 4ASK, 8ASK, BPSK, QPSK, 8PSK, DBPSK, DQPSK, D8PSK, 8QAM, 16QAM, 32QAM, 64QAM, 12 8QAM, 256QAM, 2FSK, 4FSK, 8FSK, 16FSK, MSK, Multi-Tone, custom				Supported by EasyIQ software
Pattern	PN7, PN9, PN15, PN23, User file, Custom				Supported by EasyIQ software
Output Range	1m		0.5	Vrms	$\sqrt{I^2+Q^2}$, 50 Ω load
Carrier frequency			500 M	Hz	SDG6052X
			350 M	Hz	SDG6032X
			200 M	Hz	SDG6022X

PRBS					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Bit rate	1 u		300 M	bps	SDG6052X, SDG6032X
	1 u		160 M	bps	SDG6022X

PRBS					
Sequence length	2m-1, m = 3, 4, ... , 32				
Rise/fall times	1 n		1 u	s	SDG6052X, SDG6032X. 10% ~ 90%, 1 Vpp, 50 Ω load
	2 n		1 u	s	SDG6022X. 10% ~ 90%, 1 Vpp, 50 Ω load
Output Range Note	2 m		20	Vpp	≤ 40 Mbps, HiZ load ,
	2 m		10	Vpp	40 ~ 240 Mbps (included), HiZ load
	2 m		5	Vpp	Above 240 Mbps , HiZ load

Note :The specification will be divided by 2 while applied to a 50 Ω load.

Output					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Accuracy	±(1%+1mVpp)				10 kHz sine, 0 V offset
Amplitude flatness	-0.3		+0.3	dB	50Ω load, 0.5 Vpp, compare to 1 MHz Sine
Output impedance	49.5	50	50.5	Ω	100 kHz sine
Output current	-200		200	mA	
Crosstalk			-60	dBc	CH1=CH2=0 dBm, Sine, 50 Ω load
Protection	Current limiting, Over voltage protection				
Current-limit threshold		±200		mA	
Overvoltage protection threshold	±3.5	±4	±4.5	V	The amplitude of the generator <3.2 Vpp and the DC offset < 2 VDC
	±10.5	±11	±11.5	V	The amplitude of the generator ≥ 3.2 Vpp or the DC offset ≥ 2 VDC

Modulation					
AM					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Carrier	Sine, Square, Ramp, Arb				
Modulation source	Internal/External				
Modulation wave	Sine, Square, Ramp, Noise, Arb				

Modulation					
Modulation depth	0		120	%	
Modulation frequency	1 m		1 M	Hz	While modulation source is "Internal"
FM					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Carrier	Sine, Square, Ramp, Arb				
Modulation source	Internal/External				
Modulation wave	Sine, Square, Ramp, Noise, Arb				
Frequency deviation	0		0.5*BW		BW is the max. frequency. Limited by frequency setting
Modulation frequency	1 m		1M	Hz	While modulation source is "Internal"
PM					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Carrier	Sine, Square, Ramp, Arb				
Modulation source	Internal/External				
Modulation wave	Sine, Square, Ramp, Noise, Arb				
Phase deviation	0		360	°	
Modulation frequency	1 m		1 M	Hz	While modulation source is "Internal"
ASK					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Carrier	Sine, Square, Ramp, Arb				
Modulation source	Internal/External				
Modulation wave	Square with 50% duty cycle				
Keying frequency	1 m		1 M	Hz	While modulation source is "Internal"
FSK					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Carrier	Sine, Square, Ramp, Arb				
Modulation source	Internal/External				
Modulation wave	Square with 50% duty cycle				

Modulation					
Keying frequency	1 m		1 M	Hz	While modulation source is "Internal"
PSK					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Carrier	Sine, Square, Ramp, Arb				
Modulation source	Internal/External				
Modulation wave	Square with 50% duty cycle				
Keying frequency	1 m		1 M	Hz	While modulation source is "Internal"
PWM					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Carrier	Pulse				
Modulation source	Internal/External				
Modulation	Sine, Square, Ramp, Noise, Arb				
Modulation frequency	1 m		1 M	Hz	While modulation source is "Internal"
Pulse width deviation resolution	3.3			ns	

Burst					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Carrier	Sine, Square, Ramp, Pulse, Noise, Arb				
Type	Count (1-1000000 periods), Infinite, Gated				
Carrier frequency	2 m		BW	Hz	BW is the max. output frequency
Start/Stop phase	0		360	°	
Internal period	1 μ		1000	s	
Trigger source	Internal, External, Manual				
Gated source	Internal/External				
Trigger delay			100	s	

Sweep					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Carrier	Sine, Square, Ramp, Arb				
Type	Linear, Logarithmic				
Direction	Linear: Up, Down, Up & Down Logarithmic: Up, Down				

Carrier frequency	1 μ		BW	Hz	BW is the max. output frequency
Sweep time	1 m		500	s	
Trigger source	Internal, External, Manual				

Frequency Counter					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Function	Frequency, Period, Positive/Negative Pulse Width, Duty Cycle				
Coupling	AC, DC, HF REJ				
Frequency range	100 m		400 M	Hz	DC coupling
Input amplitude	1		400 M	Hz	AC coupling
	100mVrms		± 2.5 V		DC coupling , < 100 MHz
	200mVrms		± 2.5 V		DC coupling , 100 MHz ~ 200 MHz
	500mVrms		± 2.5 V		DC coupling , Above 200 MHz
	100mVrms		5 Vpp		AC coupling , < 100 MHz
	200mVrms		5 Vpp		AC coupling , 100 MHz ~ 200MHz
	500mVrms		5 Vpp		AC coupling , Above 200 MHz
Input impedance		1 M		Ω	

Reference Clock					
10 MHz Input					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Frequency		10 M		Hz	
Amplitude	1.4			Vpp	
Input impedance	5			k Ω	AC coupling
10MHz Output					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Frequency		10 M		Hz	Synchronized to internal reference clock
Amplitude	2	3.3		Vpp	HiZ load
Output impedance		50		Ω	

Auxiliary In/Out					
Trigger Input					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
V _{IH}	2		5.5	V	
V _{IL}	-0.5		0.8	V	

Auxiliary In/Out					
Input impedance	100			k Ω	
Pulse width	100			ns	
Response time			100	ns	Sweep
			600	ns	Burst
Trigger Output					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
VOH	3.8			V	IOH = -8 mA
VOL			0.44	V	IOL = 8 mA
Output impedance		100		Ω	
Frequency			1	MHz	
Sync Out					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
VOH	3.8			V	IOH = -8 mA
VOL			0.44	V	IOL = 8 mA
Output impedance		100		Ω	
Pulse width		26.7		ns	
Jitter		3.3		ns	Peak to peak
Frequency			10	MHz	
Modulation Input					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Frequency	0		50	kHz	
Input impedance	10			k Ω	
Amplitude @ 100% modulation depth	11	12	13	V _{pp}	

General					
Power					
Parameter	Min	Typ	Max	Unit	Condition
Voltage	100 - 240 V _{rms} (\pm 10%), 50 / 60 Hz 100 - 120 V _{rms} (\pm 10%), 400 Hz				
Power consumption		32.5	50	W	Dual channels, Sine, 1 kHz, 10 V _{pp} , 50 Ω load
Display					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Color depth		24		bit	

General					
Contrast Ratio		350:1			
Luminance		300		cd/m2	
Touch Screen Type	Resistive				
Environment					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Operating temperature	0		40	°C	
Storage temperature	-20		60	°C	
Operating humidity	5		90	%	≤ 30 °C
	5		50	%	40 °C
Non-operating humidity	5		95	%	
Operating altitude			3048	m	≤ 30 °C
Non-operating altitude			15000	m	
Calibration					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Calibration		1		year	
Mechanical					
Parameter	Min.	Typ.	Max.	Unit	Condition & Note
Dimensions	W×H×D = 260.3 mm×107.2 mm×295.7 mm				
Net weight		3.5		kg	
Gross weight		4.6		kg	
Compliance					
LVD	IEC 61010-1:2010				
EMC	EN61326-1:2013				

Chapter 2 Quick Start

One of the first things you will want to do with your new generator is to become acquainted with the front panel. We have written the exercises in this chapter to prepare the instrument for use and to help you get familiar with some of its front-panel operations. This chapter is divided into the following sections:

- To Prepare the Generator for Use
- To Adjust the Carrying Handle
- To Set the Output Frequency
- To Set the Output Amplitude
- To Set a DC Offset Voltage
- To Set the Duty-Cycle of a Square Waveform
- To Set the Symmetry of a Ramp Waveform
- To Configure a Pulse Waveform
- To Configure a Noise Waveform
- To Set the DC Voltage
- To Output a Built-In Arbitrary Waveform
- To Use the Built-In Help System

To Prepare the Generator for Use

1. Check the list of accessories

Accessories supplied with the instrument are listed below. If anything is missing or damaged, please contact your nearest **SIGLENT** Sales Office.

- A Quick Start Guide
- A Certification of Calibration
- A Warranty Card
- A power cord designed for use in the destination country
- A USB cable
- A BNC cable

2. Connect the power cord and turn on the generator

The instrument will run a short power-on self-test, which takes several seconds.

The generator powers up in the sine wave function at 1 kHz with an amplitude of 4 V peak-to-peak (CH1). At power-on, the Output connector is disabled. To enable the Output connector, press the **Output** key.

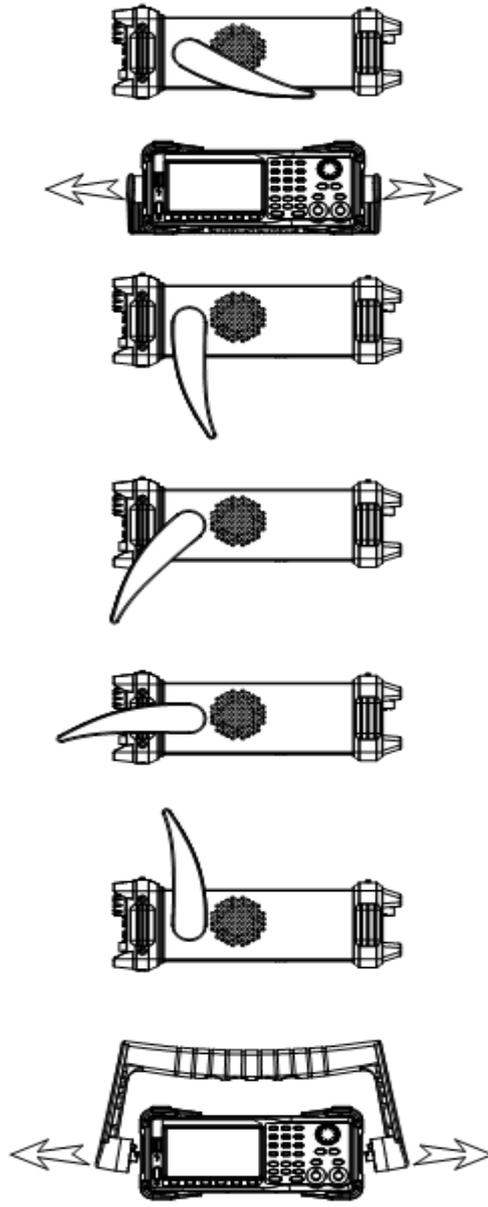
If the generator does not turn on, verify that the power cord is firmly connected to the power socket on the rear panel. Also, make sure that the generator is connected to a power source that is energized.

Then, verify that whether the generator is turned on.

Note: If the power-on self-test fails, the generator may stop and display a black screen. For solutions, please contact the nearest **SIGLENT** sales office or return the generator to **SIGLENT** for service.

To Adjust the Carrying Handle

To adjust the handle position of SDG6000X, please grip the handle by the sides and pull it outward. Then, rotate to the desired position.



To Set the Output Frequency

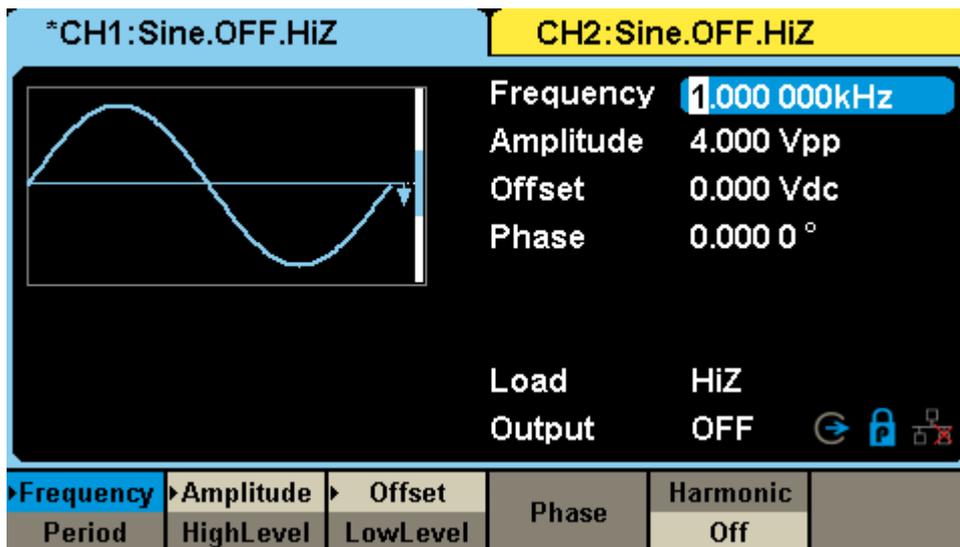
The following steps show how to change the frequency to 20 kHz.

1. Press the **Parameter** softkey

Press the **Parameter** softkey to enter the parameter setting interface. The waveform parameters including Frequency/Period, Amplitude/HighLevel, Offset/LowLevel and Phase are ready to modify using the numeric keypad.

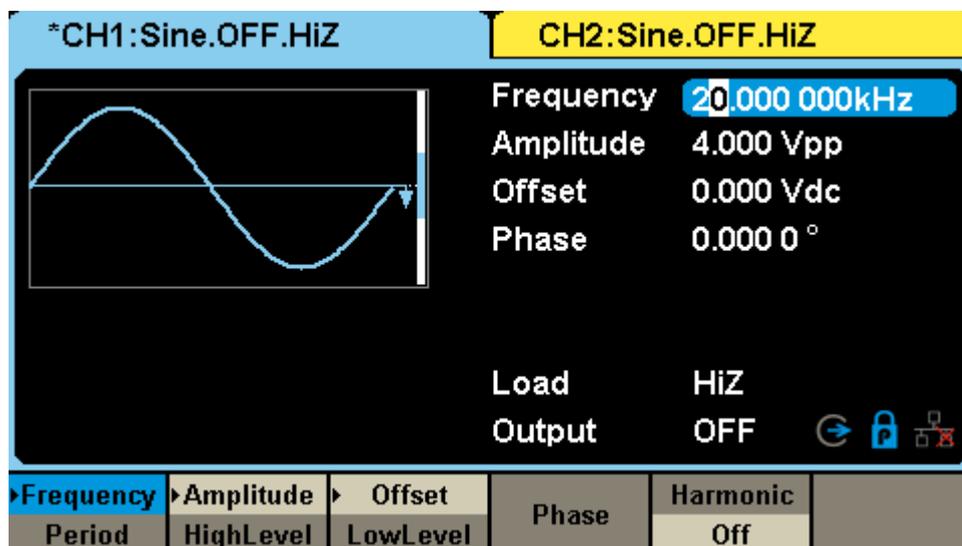
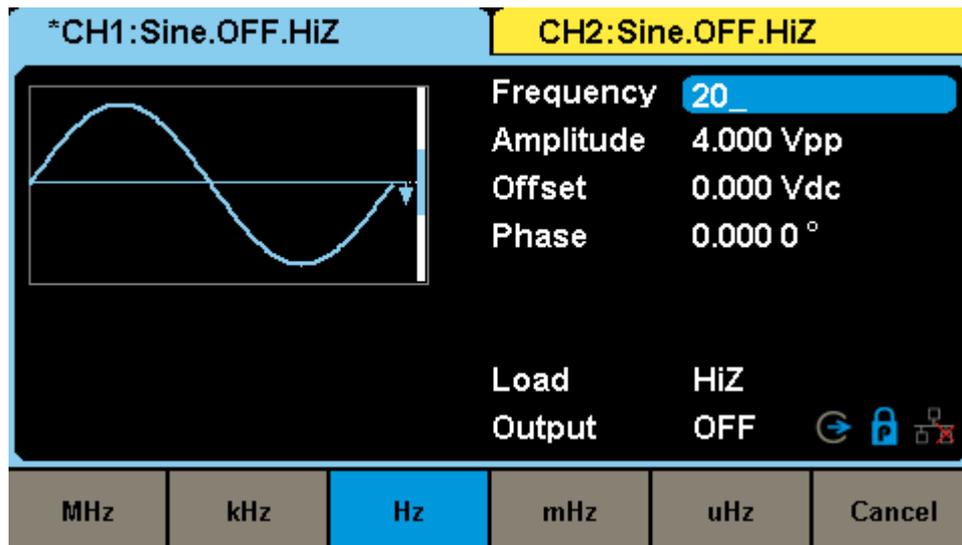
2. Press the **Frequency/Period** softkey

The displayed frequency is either the power-on value or the frequency previously selected. When changing the waveform type, the same frequency is used if the current value is valid for the new waveform. To set the period, press the softkey again to switch to the period parameter.



3. Input the desired frequency

Use the digital keypad to input the value directly. Enter the value “20”, then press the corresponding softkey to select the desired unit. For example, press kHz.



Note: The desired numerical value can be modified using the knob and direction keys.

To Set the Output Amplitude

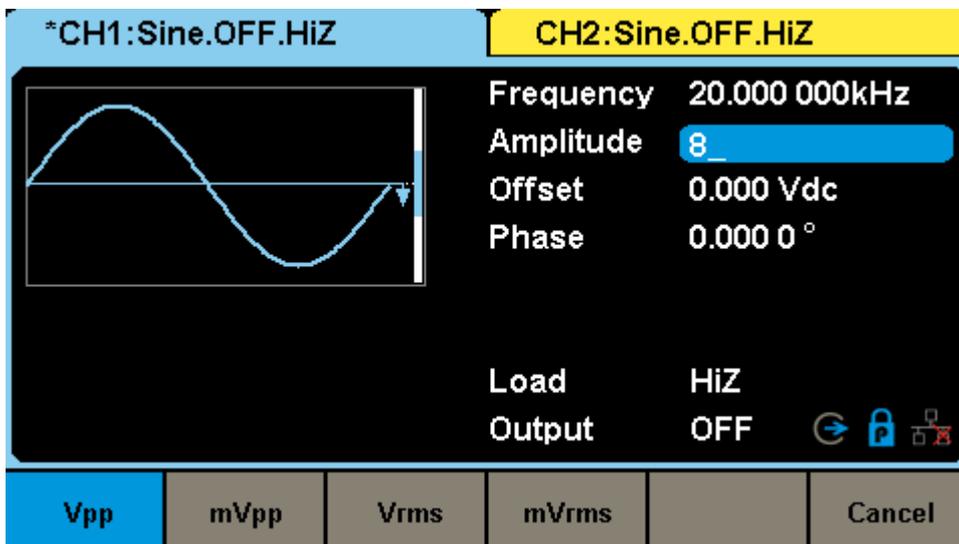
The following steps describe how to change the amplitude to 8 Vpp.

1. Press the **Amplitude/HighLevel** softkey

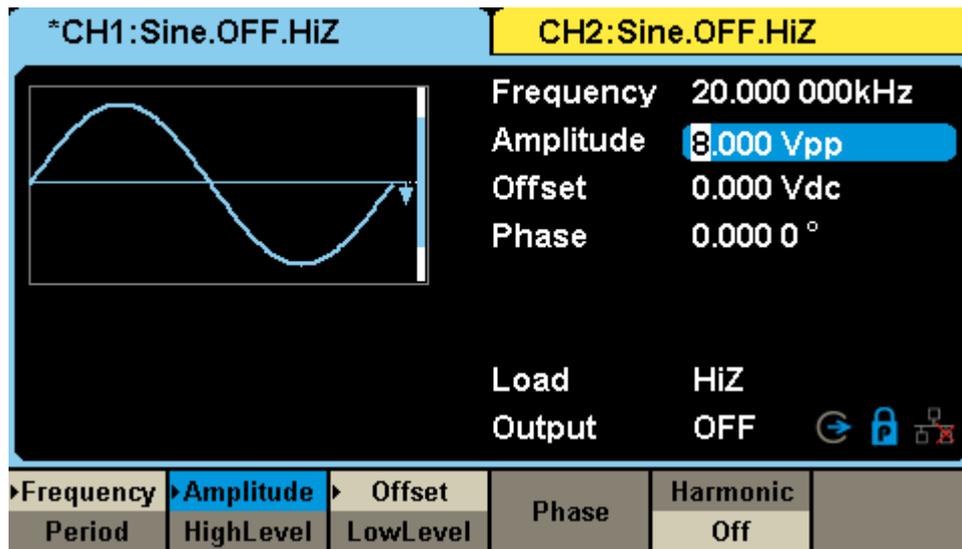
The displayed amplitude is either the power-on value or the amplitude previously selected. When changing the waveform type, the same amplitude is used if the current value is valid for the new waveform. To set the HighLevel for the waveform, press the softkey again to switch to the HighLevel parameter.

2. Input the desired amplitude

Use the digital keypad to input the value directly, enter the value “8”.



Then press the corresponding softkey to select the desired unit. For example, press **Vpp**.



To Set the DC offset

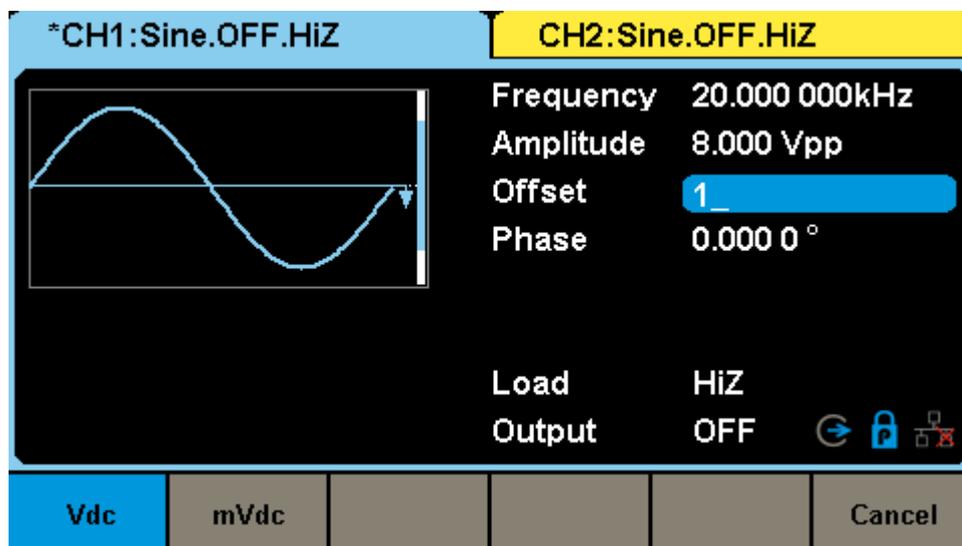
The following steps describe how to change offset to 1 Vdc.

1. Press the **Offset/LowLevel** softkey

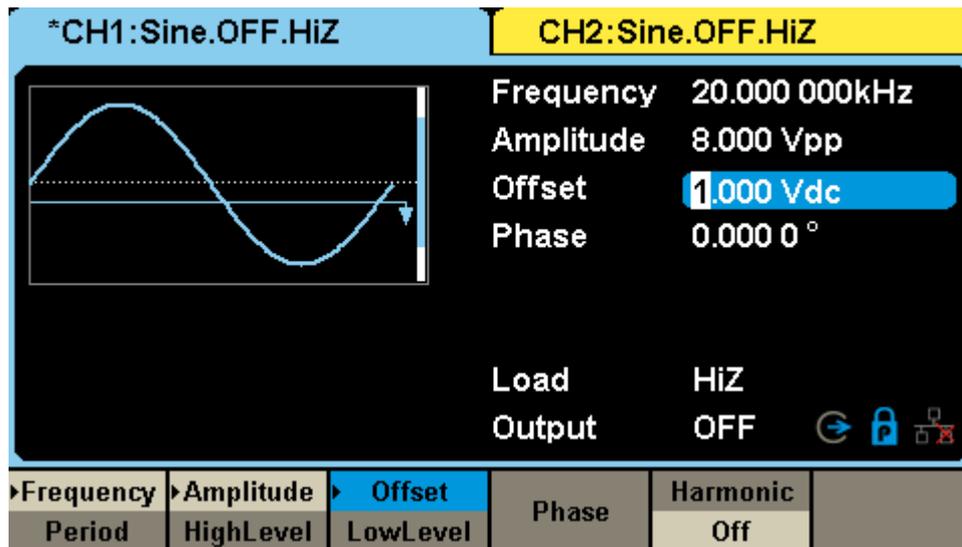
The displayed offset is either the power-on value or the offset previously selected. When changing the function, the same offset is used if the current value is valid for the new waveform. To set the LowLevel for the waveform, press the softkey again to switch to the LowLevel parameter.

2. Input the desired offset

Use the digital keypad to input the value directly, enter the value “1”.



Then press the corresponding softkey to select the desired unit. For example, press **Vdc**.



Note: The desired numerical value can be modified using the knob and direction keys.

To Set the Duty Cycle of a Square Waveform

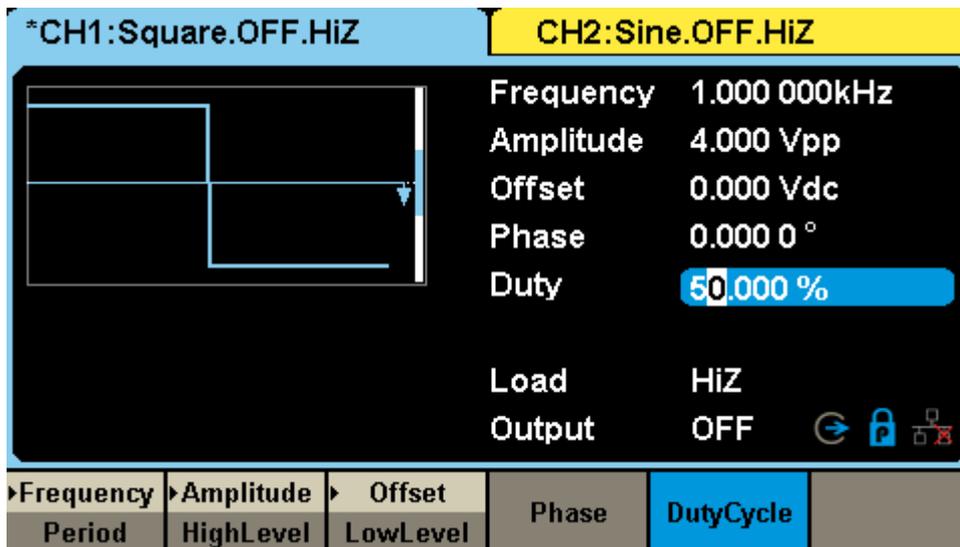
At power-on, the default duty cycle for square wave is 50%. The duty cycle setting range is limited by the “Frequency/Period” setting. The following steps show how to change the duty cycle to 80%.

1. Select the square wave function

Press **Waveforms** → **Square** to select the square function and then select the desired output frequency to 1 kHz.

2. Press the **DutyCycle** softkey

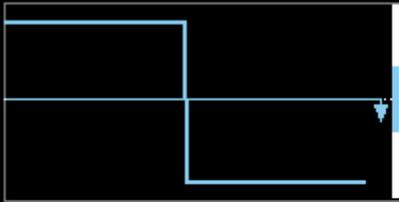
The displayed duty is either the power-on value or the percentage previously selected.



3. Input the desired duty

Use digital keypad to input the value directly, enter the value “80”, then press the corresponding softkey to select the desired unit “%”.

***CH1:Square.OFF.HiZ** **CH2:Sine.OFF.HiZ**



Frequency 1.000 000kHz
Amplitude 4.000 Vpp
Offset 0.000 Vdc
Phase 0.000 0°
Duty 80_

Load HiZ
Output OFF

% Cancel

To Set the Symmetry of a Ramp Waveform

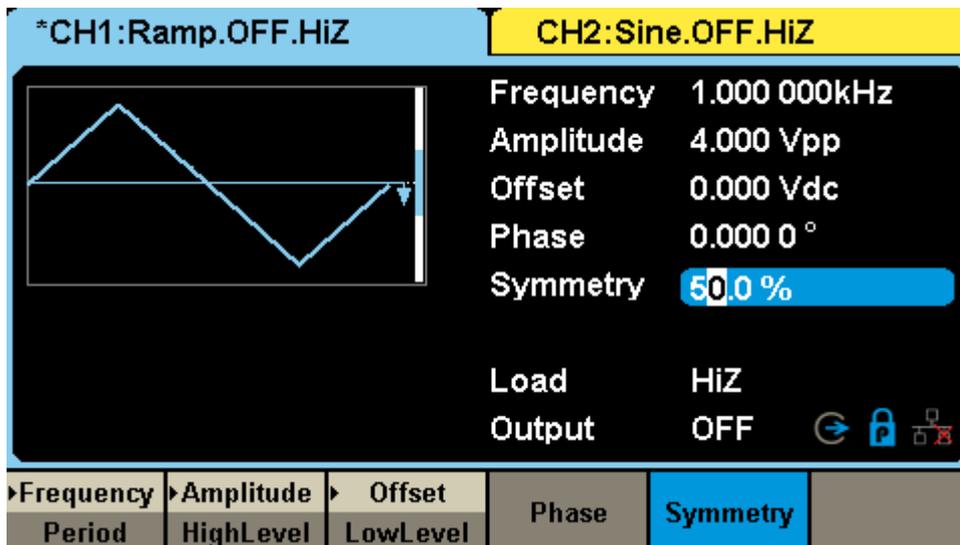
At power-on, the Symmetry for Ramp wave is 50%. The symmetry can be adjusted between 0% and 100%. The following steps describe the procedure to set the symmetry to 60%.

1. Select the Ramp wave function

Press **Waveforms** → **Ramp** to select the pulse function and then select the desired output frequency to 1 MHz.

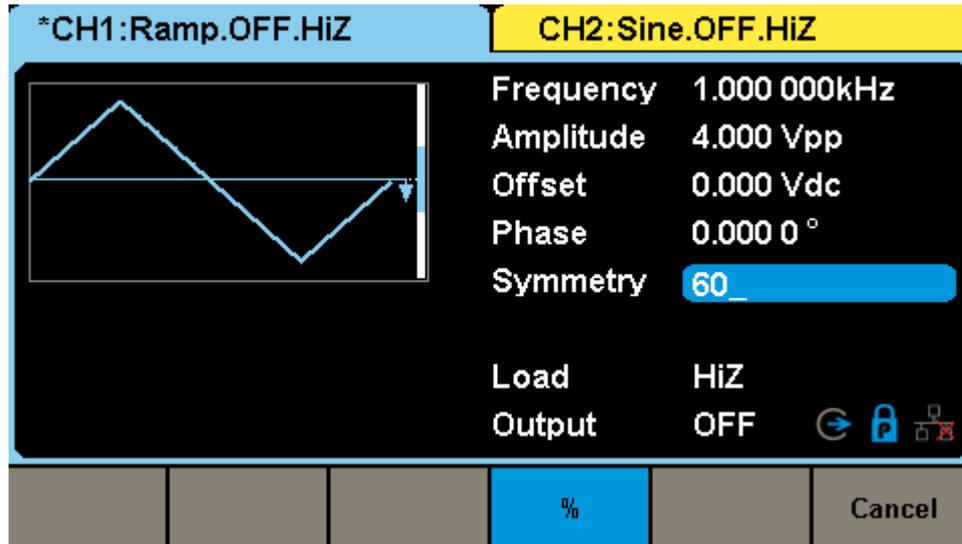
2. Press the **Symmetry** softkey

The displayed symmetry is either the power-on value or the percentage previously selected.



3. Input the desired symmetry

Use digital keypad to input the value directly, enter the value “60”, then press the corresponding softkey to select the desired unit “%”.



To Generate a Pulse Waveform

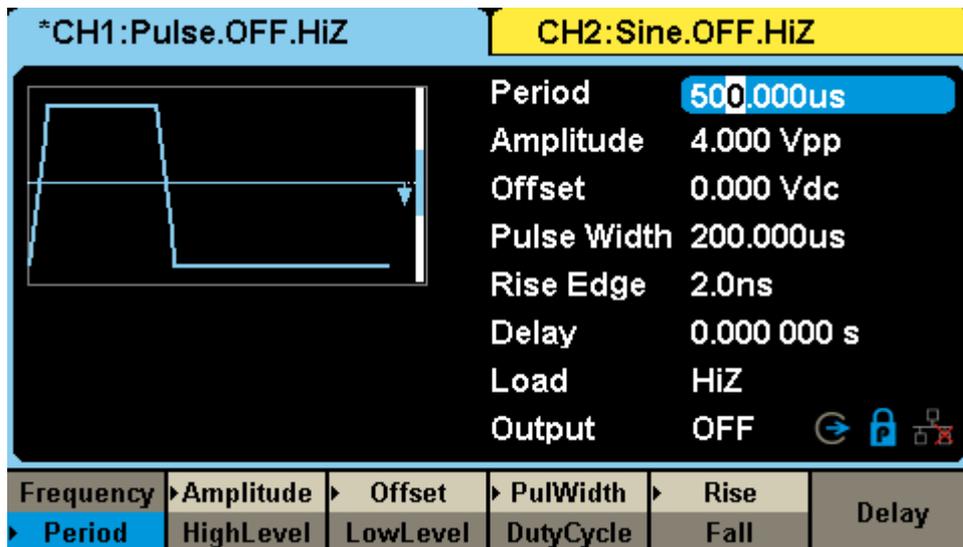
The generator can be set to output a pulse waveform with variable width, edge time and delay time. The following steps show you how to generate a 500 μs period pulse waveform with a pulse width of 100 μs , rise time of 8 ns and delay time of 50 ns.

1. Select the pulse function

Press **Waveforms** → **Pulse** to select the pulse function and output a pulse waveform with the default parameters.

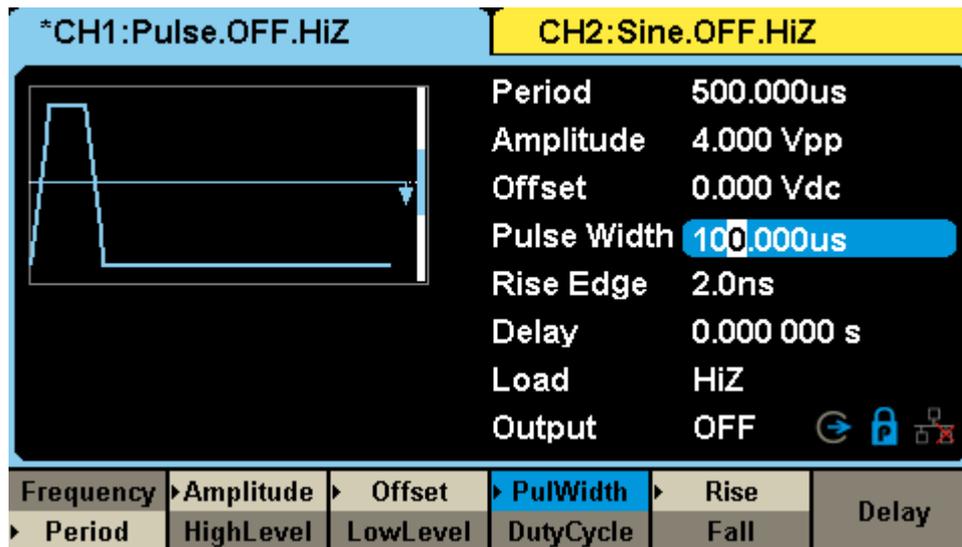
2. Set the Pulse period

Press the **Frequency/Period** softkey twice and then set the period to 500 μs .



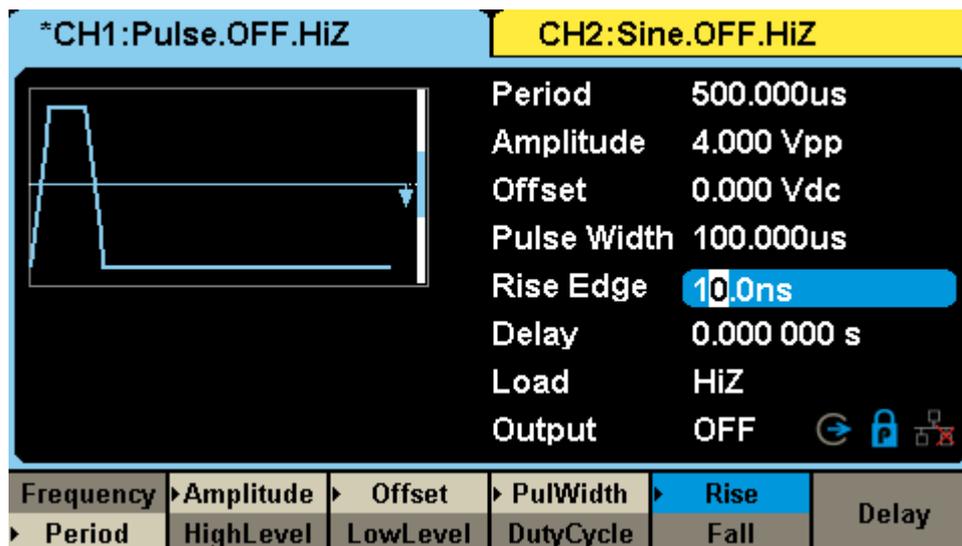
3. Set the Pulse Width

Press the **PulWidth/Duty** softkey and then set the pulse width to 100 μs . The pulse width represents the time from the 50% threshold of the rising edge to the 50% threshold of the next falling edge.



4. Set the Edge Time

Press the **Rise/Fall** softkey and then set the rising edge to 10ns.



5. Set the Pulse Delay

Press the **Delay** softkey and then set the delay time to 50 ns.

*CH1:Pulse.OFF.HiZ

CH2:Sine.OFF.HiZ



Period 500.000us

Amplitude 4.000 Vpp

Offset 0.000 Vdc

Pulse Width 100.000us

Rise Edge 10.0ns

Delay 50.0ns

Load HiZ

Output OFF ↻ 🔒 🗑️

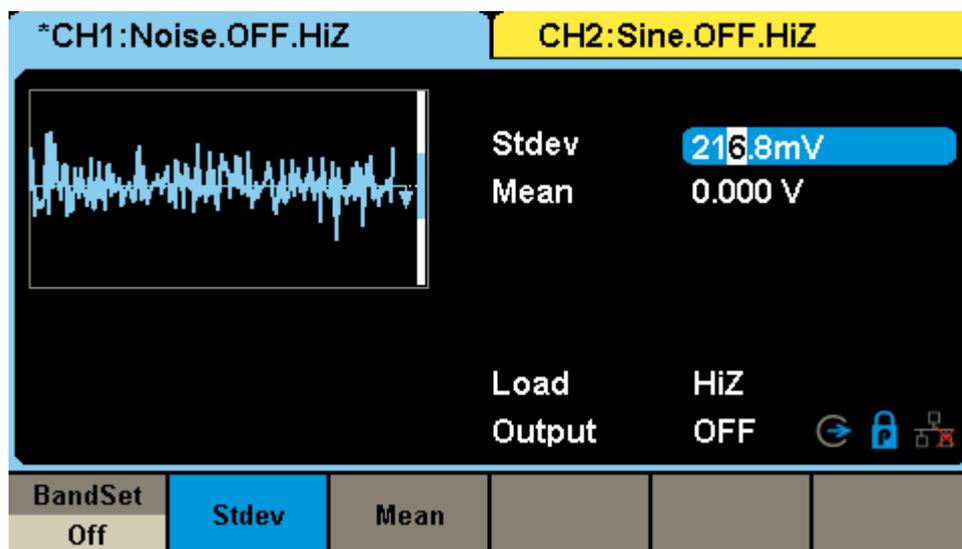
Frequency	▶ Amplitude	▶ Offset	▶ PulWidth	▶ Rise	Delay
▶ Period	HighLevel	LowLevel	DutyCycle	Fall	

To Generate a Noise Waveform

The generator can be set to output a noise waveform with an adjustable Stdev and Mean. The following steps show you how to generate a noise waveform with 500mV Stdev and 1mV Mean.

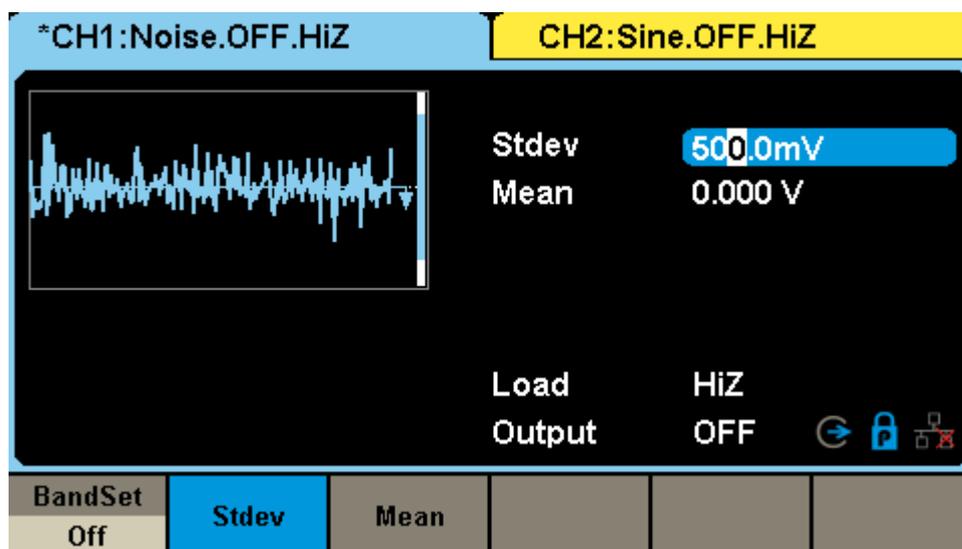
1. Select the Noise function

Press **Waveforms** → **Noise** to select the noise function and output a noise waveform with the default parameters.



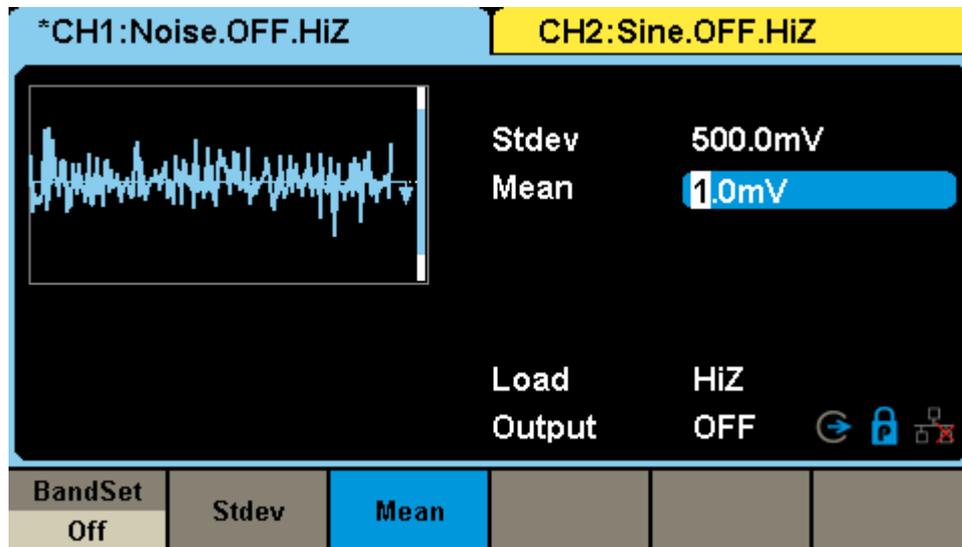
2. Set the Stdev

Press the **Stdev** softkey and then set the Stdev to 500 mV.



3. Set the Mean

Press the **Mean** softkey and then set the mean to 1 mV.

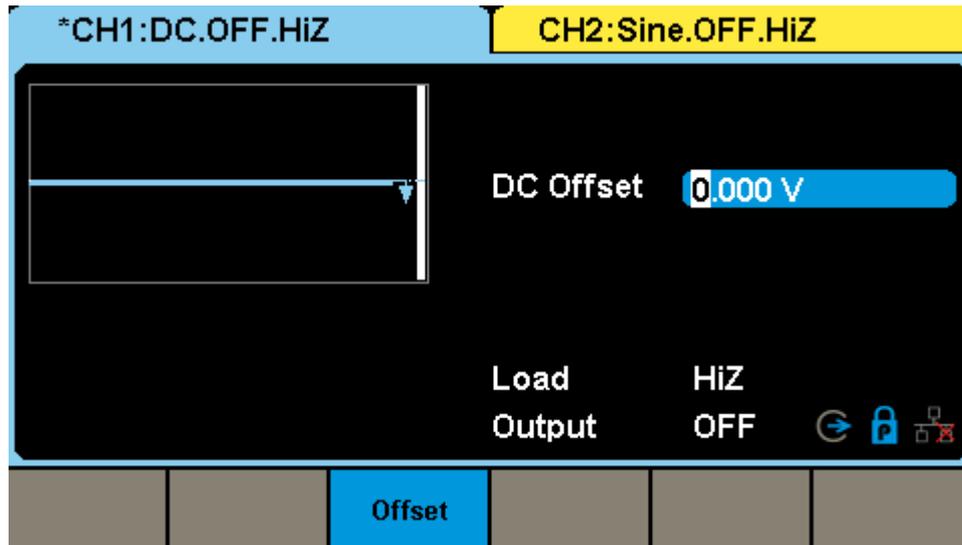


To Set the DC Voltage

The following steps show how to set a dc voltage with +1 Vdc.

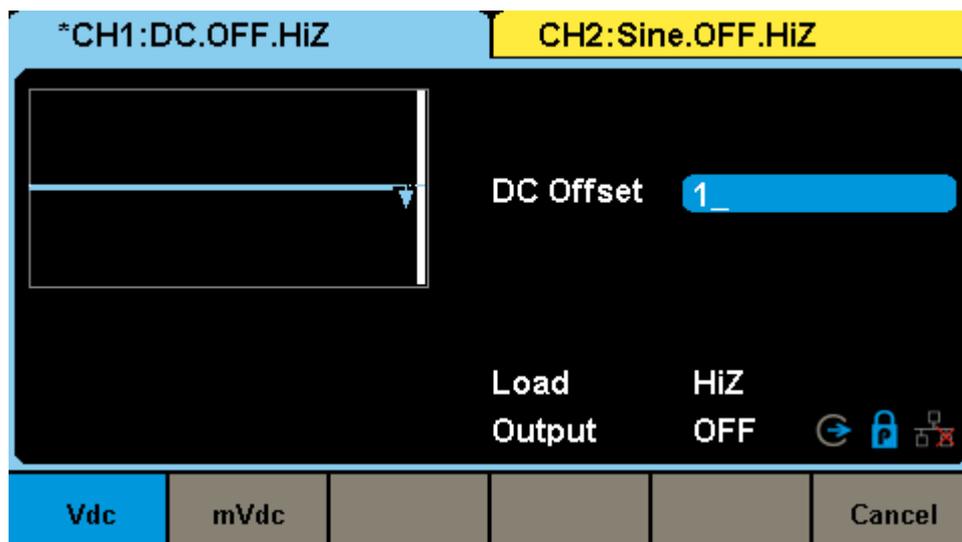
1. Select the DC function

Press **Waveforms** → **Page 1/2** → **DC** to select the DC function.

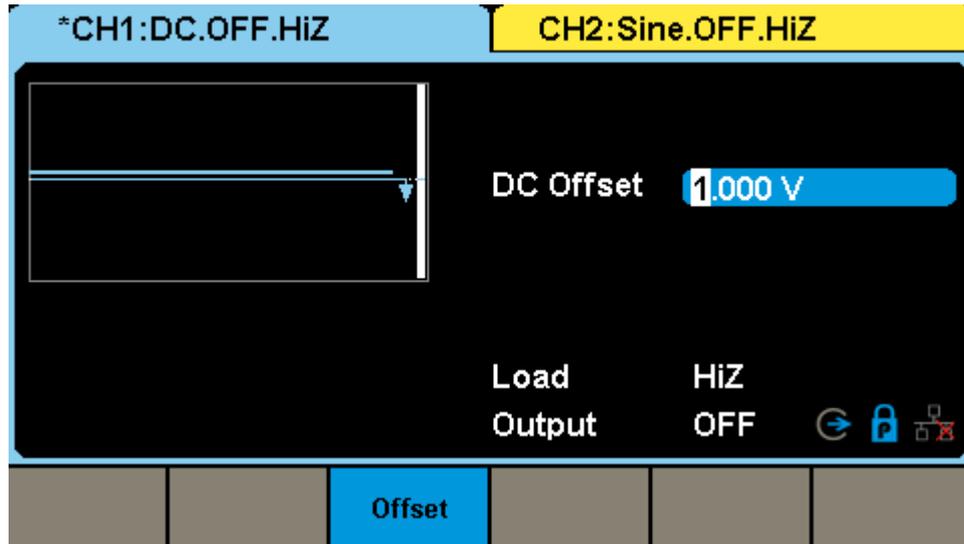


2. Set the DC Offset

Use the digital keypad to input the value directly, enter the value "1".



Then press the corresponding softkey to select the desired unit. For example, press **Vdc**.

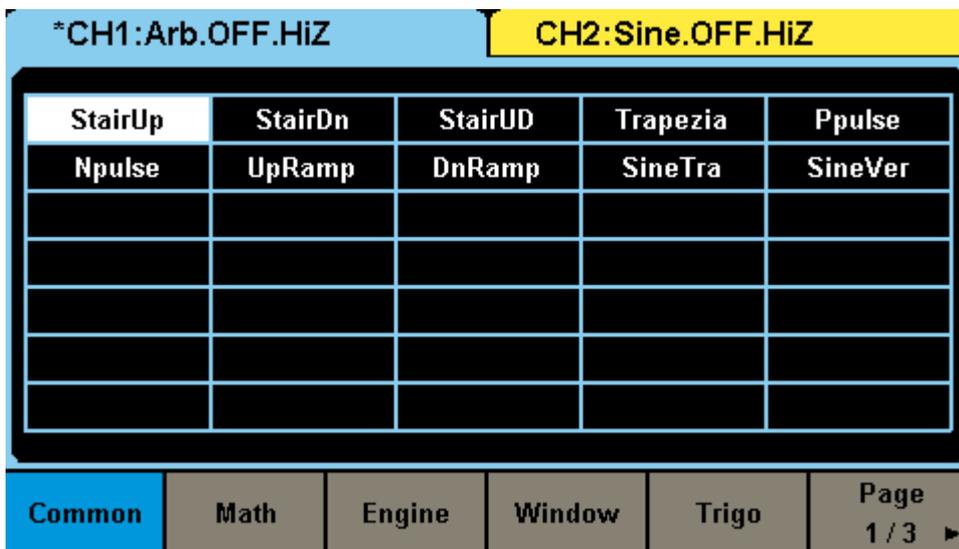


To Output a Built-In Arbitrary Waveform

There are approximately 200 built-in arbitrary waveforms stored in non-volatile memory. The following steps show how to output the built-in “exponential fall” waveform from the front panel.

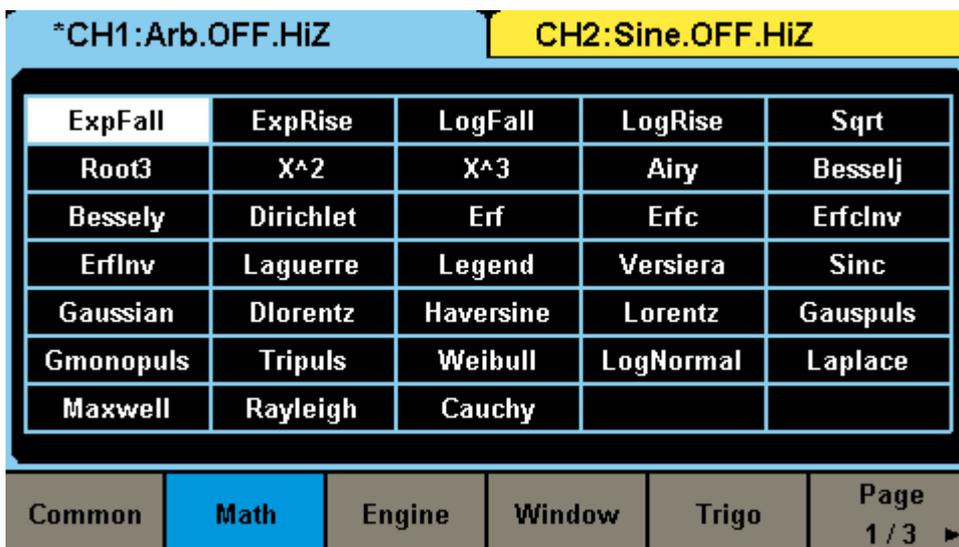
1. Set the arbitrary waveform function

Press **Waveforms** → **Page 1/2** → **Arb Type** → **Built-In** to enter the arbitrary waveform setting interface.



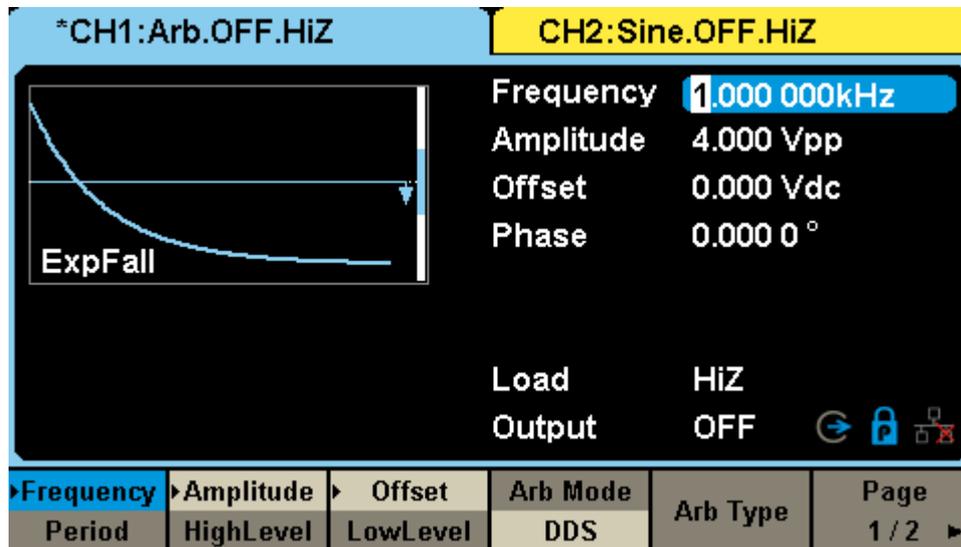
2. Set the Math waveform

Press the **Math** softkey to display the mathematic waveforms as below.



3. Output the exponential fall waveform

Rotate the knob to select the ExpFall waveform and press the knob. The waveform is output with the present settings unless they are changed.

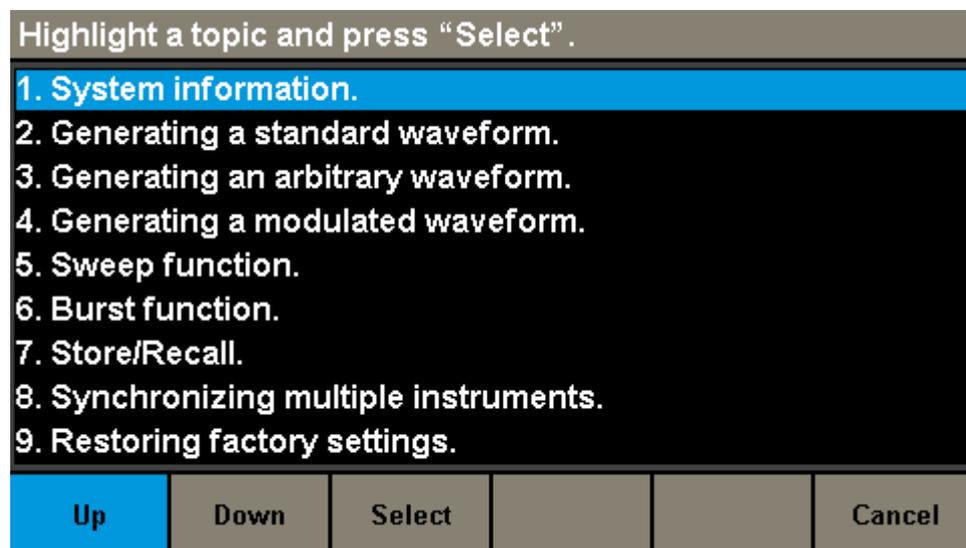


To Use the Built-In Help System

The built-in help system is designed to provide context-sensitive assistance of some functions. A list of help topics is also available to assist you with several operations.

1. Read the help information

Press **Utility** → **System** → **Page 1/2** → **Help** to enter the following interface. You will see a list of help topics as below. Use Up and Down keys, then press Select to choose a Help topic.



2. Press "Cancel" or any function button to exit the help system

Chapter 3 Calibration

This calibration procedure contains performance verification procedures and adjustment procedures. After receiving a generator, it is recommended that you confirm whether the performance accords with the specifications. If not, perform the appropriate adjustments.

Calibration Interval

The instrument should be calibrated on a regular interval determined by the measurement accuracy requirements of your application. A 1-year interval is adequate for most applications. Accuracy specifications are valid only if adjustment is made at regular calibration intervals. Accuracy specifications are not valid beyond the 1-year calibration interval. SIGLENT does not recommend extending calibration intervals beyond 2 years for any application.

Adjustment is Recommended

Specifications are valid only within the period from the last adjustment. Whatever calibration interval you select, **SIGLENT** recommends that re-adjustment should always be performed within the calibration interval. This is necessary to ensure the accuracy of the performance data measured during the calibration interval.

Automating Calibration Procedures

The complete verification and adjust procedures can be automated with the use of appropriate automated test instrumentation. The complete instrument configurations specified for each test may be programmed via the remote interface. Verification data can then be read back from the instrument into a test program and compared to the appropriate test limit values.

The instrument can also be adjusted from the remote interface. Remote adjustment is similar to the local front-panel procedure. A PC can be used to perform the adjustment by first selecting the required function and range. The adjustment command is sent to the instrument and then the adjustment is initiated over the remote interface.

Recommended Test Equipment

The test instrumentations recommended for the performance verification and adjustment procedures is listed below. If the exact instrument is not available,

substitute with the instrument of equivalent accuracy.

Instrument	Requirements	Recommended Model
Digital Multimeter (DMM)	DC volts accuracy: 100 ppm resolution: 100 μ V	SDM3055
Power Meter	Frequency: 10 KHz to 6 GHz	Agilent U2004
Frequency Counter	Accuracy: 0.5 ppm	

Test Considerations

For optimum performance, all procedures should comply with the following recommendations:

- Updating SDG's firmware to the newest version is strongly recommended.
- Assure that the calibration ambient temperature is stable and between 18°C and 28°C. Ideally, the calibration should be performed at 23°C \pm 1°C.
- Assure ambient relative humidity is less than 80%.
- Allow a 30-minute warm-up period before verification or adjustment.
- Keep the measurement cables as short as possible, consistent with the impedance requirements.
- Use a 50 Ω coaxial cable.

Performance Verification Test

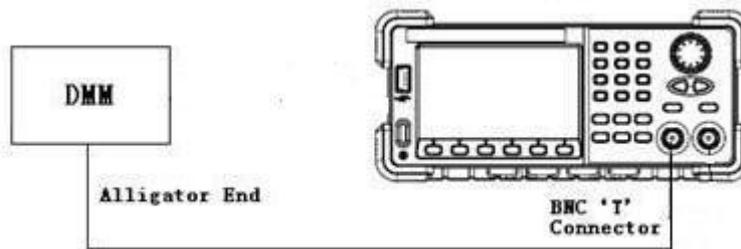
The performance verification tests are recommended as acceptance tests upon receipt of the instrument. The acceptance test results should be compared to the specifications given in chapter 1. After acceptance, repeat the performance verification tests within every calibration interval.

If the instrument fails performance verification, adjustment or repair is required.

DC Output Verification

This test checks if the DC offset listed in the table below is within the spec range using a DMM.

1. Set the DMM to measure DC voltage. Connect the DMM to the CH1 output of the generator as shown below.



2. Turn on CH1 and select the DC waveform.
3. Set the instrument to each output value described in the table below and measure the output voltage with the DMM. Be sure the generator output load is set to High-Z and the output is enabled.

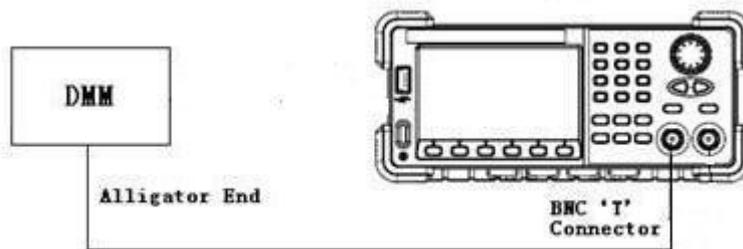
DC Offset	CH1	CH2	Spec Range $\pm (1\%+2 \text{ mV})$
0 mV			-2 mV ~ 2 mV
10 mV			7.9 mV ~ 12.1 mV
100 mV			97 mV ~ 103 mV
1 V			0.988 V ~ 1.012 V
3 V			2.968 V ~ 3.032 V
10 V			9.898 V ~ 10.102 V
-10 mV			-12.1 mV ~ -7.9 mV
-100 mV			-103 mV ~ -97 mV
-1 V			-1.012 V ~ -0.988 V
-3 V			-3.032 V ~ -2.968 V
-10 V			10.102 V ~ -9.898 V

4. Remove the BNC cable to CH2 output and perform the same verification as CH1.
5. Compare the measured voltage to the spec range shown in the table above.

AC Amplitude Verification

This test checks the ac amplitude output accuracy at the frequency of 10 kHz using a DMM.

1. Turn on the generator and choose CH1 as the operating channel.
2. Connect the DMM and generator as shown below.



3. Select a 10 kHz Sine waveform of the generator and set the amplitude to the values listed below in sequence.

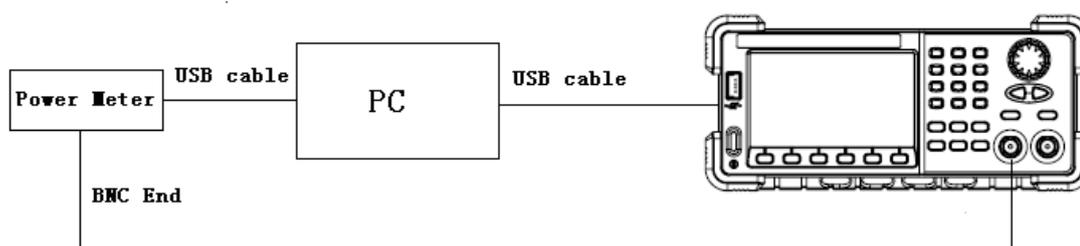
Amplitude (Vpp)	CH1 (Vpp)	CH2 (Vpp)	Spec Range $\pm (1\% +1 \text{ mVpp})$
11			10.889~11.111
5.6			5.543~5.657
2			1.979~2.021
0.9			0.89~0.91
0.4			0.395~0.405
0.142			0.13958~0.14442
0.064			0.06236~0.06564
0.022			0.02078~0.02322
0.01			0.0089~0.0111
0.004			0.00296~0.00504

4. Remove the BNC cable to CH2 output and perform the same verification as CH1.
5. Compare the value measured from the DMM to the spec range shown in the table above.

Frequency Response Verification

This test checks if the amplitude flatness is within the spec range using a Power Meter.

1. Turn on the generator and choose CH1 as the operating channel. Set the Load to 50 Ω .
2. Connect the Power Meter, PC and generator as shown below.



3. Select Sine waveform of the generator and set the amplitude to 0.5 Vpp and frequency to the values listed below in sequence.

Frequency	CH1 (dBm)	CH2 (dBm)	Spec Range (dBm)
1 MHz			-2.3412~-1.7412
5 MHz			-2.3412~-1.7412
10 MHz			-2.3412~-1.7412
50 MHz			-2.3412~-1.7412
100 MHz			-2.3412~-1.7412
150 MHz			-2.3412~-1.7412
200 MHz			-2.3412~-1.7412
250 MHz			-2.3412~-1.7412
300 MHz			-2.3412~-1.7412
350 MHz			-2.3412~-1.7412
400 MHz			-2.3412~-1.7412
450 MHz			-2.3412~-1.7412
500 MHz			-2.3412~-1.7412

4. Remove the BNC cable to CH2 output and perform the same verification as CH1.

5. Compare the value measured from Power Meter to the spec range shown in the table above.

General Adjustment Procedure

The following explains how to adjust the SDG6000X series generator for optimum operating performance.

- **Channel Adjustment** which includes four steps: feedback channel adjustment, channel self adjustment, vertical accuracy calibration and frequency counter calibration.
- **Feedback Channel Adjustment** which acts as a standard calibration module, providing the accuracy assurance for Self Adjust.
- **Channel Self Adjustment** which includes internal control channel adjustment and signal channel adjustment.
- **Vertical Accuracy Calibration** which calibrates the amplitude at 10 kHz frequency.
- **Frequency Counter Calibration** which calibrates the trigger level of the counter.
- **Frequency Response Adjustment** which could properly compensate the amplitude as the frequency increases.
- **TimeBase Calibration** which calibrates the output frequency accuracy.

Software Environment

1. Python

Make sure you have installed Python 2.7 in your computer. The following modules of Python are required as well: PyVISA, PyQt4 and PyWin32.

2. Microsoft Office

As test reports are saved as '.xls', it is necessary that you are working with MS Office 2003 or higher version.

3. NI VISA

The Python module, PyVISA, is based on VISA I/O library which can be derived from NI VISA.

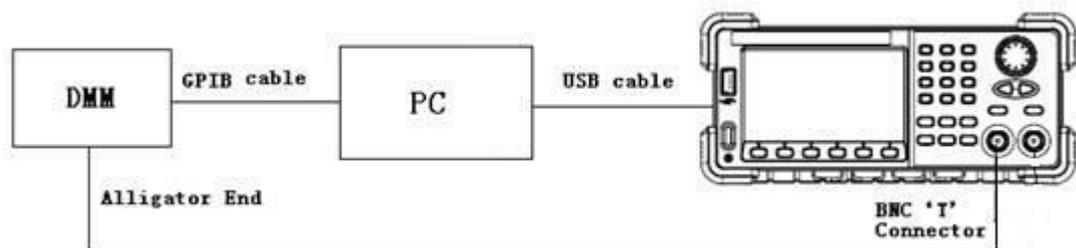
Warming up

Before performing the adjustment procedures, let the generator and other test equipment warm up for at least 30 minutes in an ambient temperature between 18 °C and 28 °C. Adjustments performed prior to warm-up or beyond this temperature range may result in poor performance.

Channel Adjustment

The channel adjustment includes four parts: feedback channel adjustment, channel self adjustment, vertical accuracy calibration and frequency counter calibration.

1. Turn on the generator.
2. Connect the DMM, PC and SDG6000X generator as shown below:



3. Double click and run the script ChannelAdjust.py prepared previously. Then Change the channel connection according to the prompt message.

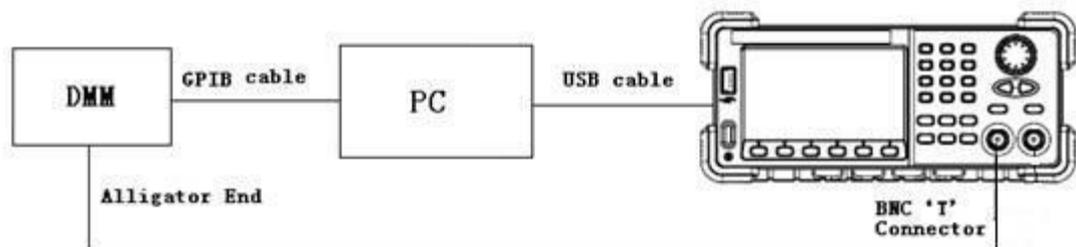
Note:

If there is a problem in the process of the channel adjustment, you can separately perform the four parts mentioned above. After the feedback channel adjustment has been completed, perform a self adjustment.

Feedback Channel Adjustment

The internal feedback channel receives the feedback signal from all the other analog channels when perform self adjustment. This adjustment must be performed prior to Self Adjust to make sure it is performed based on the best adjusting accuracy.

1. Connect the DMM, PC and SDG6000X generator as shown below:



2. Double click and run the script **FeedbackAdjust.py** prepared previously. The CH1 will be automatically turned on upon running of the script.

Channel Self Adjustment

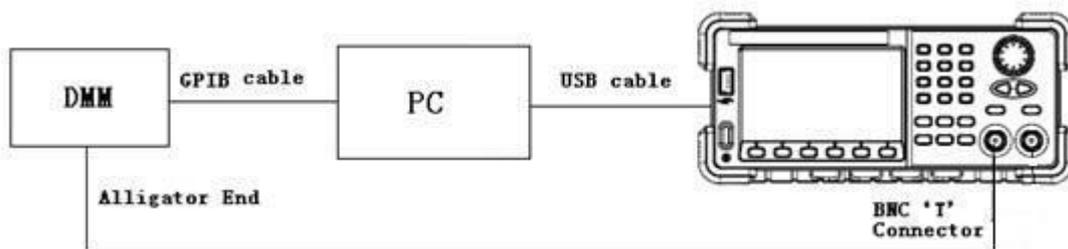
This adjustment is for internal control channel and signal channel. Through feedback circuits of the feedback channel and signal channel, this adjustment helps to obtain the actual working performance of components from signal channels.

1. After the feedback channel adjustment is completed, disconnect the two BNC cables on CH1 and CH2.
2. Input the password "123654" under the system info interface to show the SelfCal menu and perform the self adjustment.
3. Once the "Self Adjust" begins, the generator turns to adjustment interface and the progress bar displays on the screen. In about 20 seconds it will reach 100%, which indicates completing of the self-adjust. The progress bar will disappear automatically after 2 seconds.

Vertical Accuracy Calibration

This adjustment routine is designed to calibrate the amplitude at a 10 kHz frequency, using a DMM with high precision. The SDG6000X begins this portion of the calibration after the completion of the self adjustment. It calibrates the Sine wave with a 10 kHz frequency and selects several amplitudes to calibrate. Compare the measured amplitude with the standard to obtain a set of compensation values.

1. Connect the DMM, PC and SDG6000X generator as shown below:

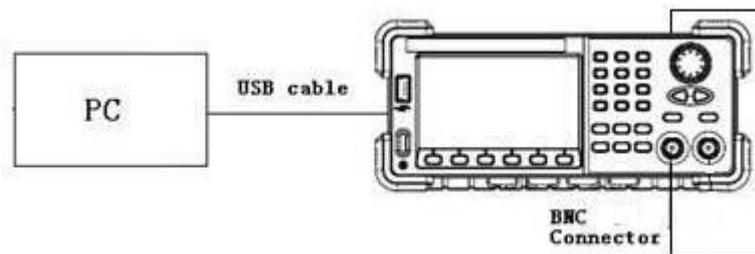


2. Double click and run the script **VertAccCalib.py** prepared previously.
3. Change the channel connection according to the prompt message.

Frequency Counter Calibration

This adjustment routine is designed to calibrate the trigger level of the counter to obtain more accurate measured values.

1. Connect the PC and SDG6000X generator with a USB cable and connect the CH1 at the front panel to the counter port at the rear panel with a BNC cable, as shown below:

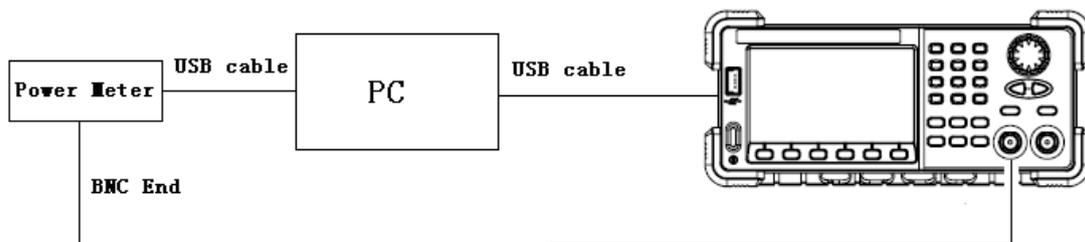


2. Double click and run the script **FreqCounterCal.py** prepared previously.

Frequency Response Adjustment

This adjustment routine is designed to obtain the actual frequency response characteristics of the analog channel, and as necessary, to perform appropriate compensation. Since the waveform amplitude will decrease as the input frequency increases, it is essential to compensate the amplitude to match the frequency. This adjustment should be performed after the channel adjustment.

1. Turn on the generator and connect it to the PC using a USB cable.
2. Connecting the USB end of the Power Meter to the USB port of the PC, upon which the Power Meter indicator light will be brightened. Only after the indicator light goes out from red, should it be connected to the generator output.

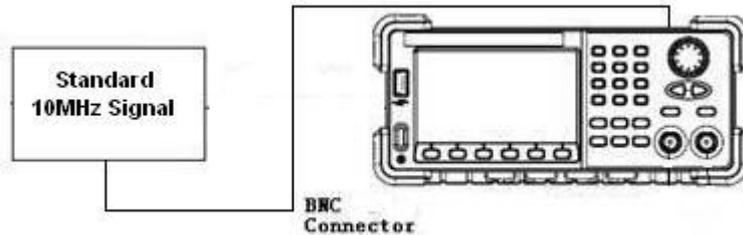


3. Run the script **FrqRespCalib.py** prepared previously. In approximately 10 seconds the prompt message will display on the screen to indicate the operator to connect the Power Meter. After the generator completes the adjustment for CH1, the prompt message displays on the screen will prompt the operator to remove the BNC cable to CH2 to go on the adjustment.
4. After the two-channel adjustment is completed, please disconnect all the connections.

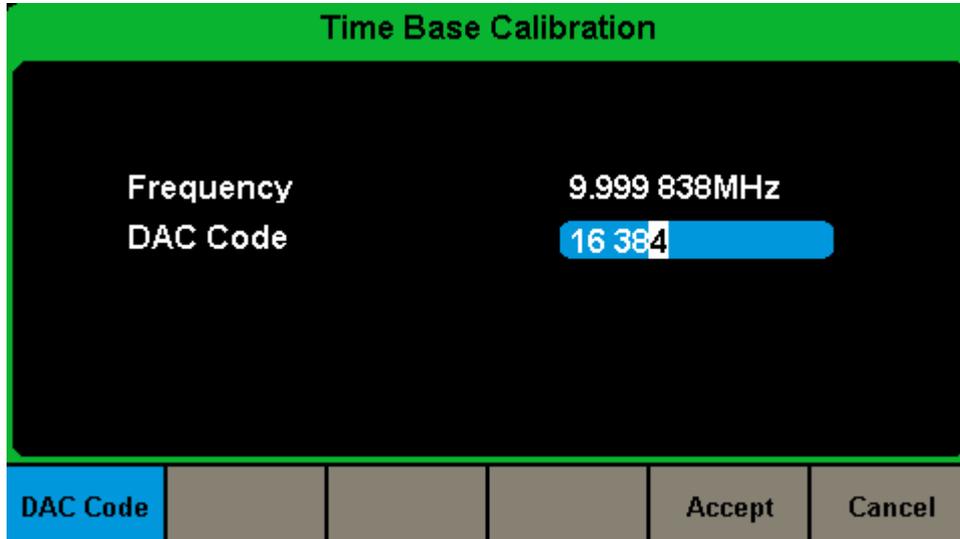
TimeBase Calibration

This adjustment routine is designed to calibrate the output frequency accuracy through adjusting the DAC code.

1. Connect the counter port at the SDG6000X's rear panel to a high accuracy 10 MHz signal with a BNC cable, as shown below:



2. Press **Utility** button on the front panel and select **System** → **Page 1/2** → **System Info**. Use the number keyboard to input "123654". Then select the **TimeBase Calibration** softkey. The timebase calibration interface is shown as the following.



3. Use the numeric keyboard or knob to adjust the DAC code to make the measured frequency to be closer to 10 MHz and select **Accept** to save the configuration.

Chapter 4 Assembly Procedures

This chapter describes how to remove the major modules from the SDG6000X series generator. To install the removed modules or replace new modules, please follow corresponding operating steps in reverse order.

The following subjects are addressed in this chapter:

- **Security Consideration** which describes security information needed to consider while operating.
- **List of Modules** in which the modules to remove are listed.
- **Required Tools** which describes the tools needed to perform the procedures.
- **Disassembly Procedures** which describes in detail how to remove and install the modules.

Security Consideration

Only qualified personnel should perform the disassembly procedures. Whenever possible, disconnect the power supply before removing or replacing modules. Otherwise, personal injuries or damages to the components may occur.

Avoid Electric Shock Hazardous voltages exist on the LCD module and power supply module. To avoid electrical shock, disconnect the power cord from the generator, and then wait at least three minutes for the capacitors in the generator to discharge before beginning the disassembly.

Preventing ESD Almost all electrical components can be damaged by electrostatic discharge (ESD) during handling. Component damages can occur at electrostatic discharge voltages as low as 50 volts. The following guidelines will help preventing ESD damage when servicing the instrument or any electronic device.

- ◆ Disassemble instruments only in a static-free work area.
- ◆ Use a conductive work area to reduce static charges.
- ◆ Use a conductive wrist strap to reduce static charge accumulation.
- ◆ Minimize handling.

- ◆ Keep replacement parts in original static-free packaging.
- ◆ Remove all plastic, foam, vinyl, paper and other static-generating materials from the immediate work area.
- ◆ Use only anti-static solder suckers.

List of Modules

The following removable modules are listed in the order of performing disassembly procedures.

Number of Module	Module
1	Handle
2	Metal Shell and Rear Cabinet
3	Front Cabinet
4	Display Module
5	Main Body

Required Tools

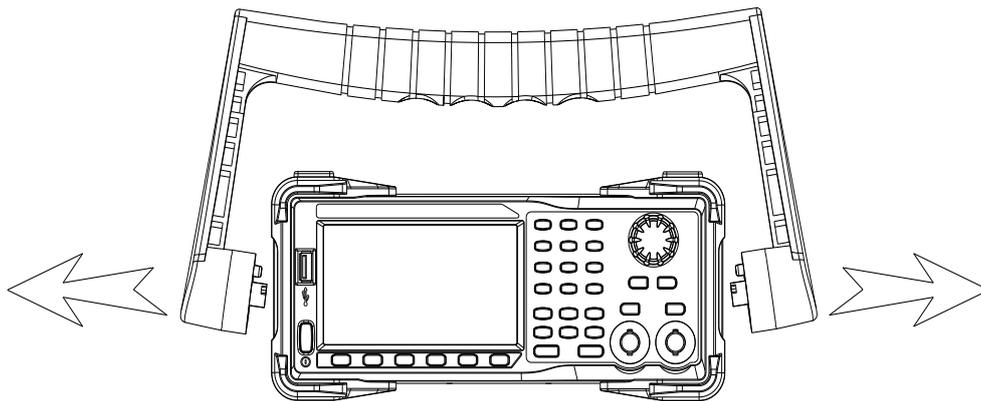
Use these tools to remove or replace the modules in the generator:

- T10 and T15 Torx screwdriver

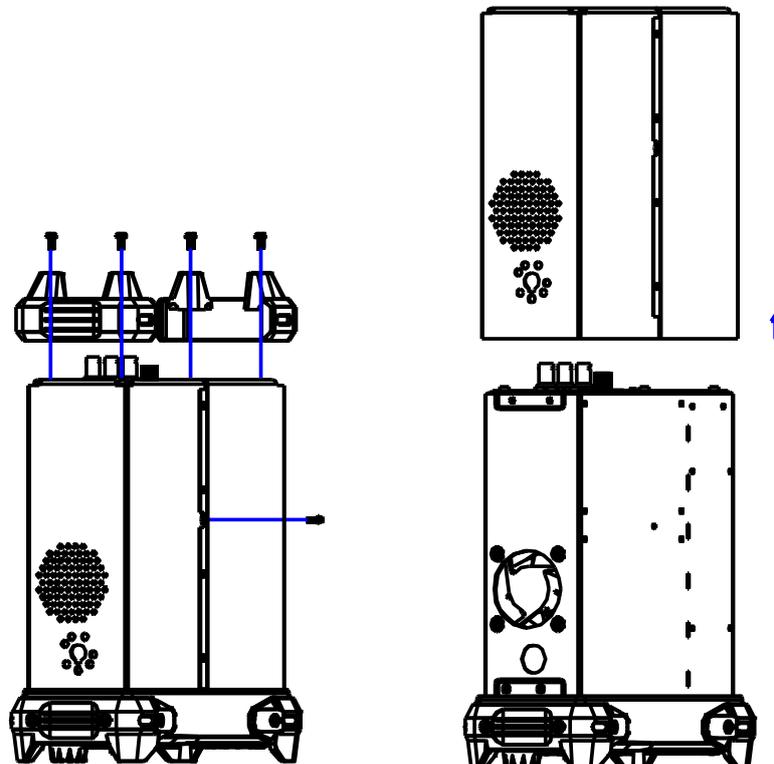
Disassembly Procedures

This section describes how to remove and install the generator's modules listed above in detail. Complete disassembly will be best achieved through the following operating steps.

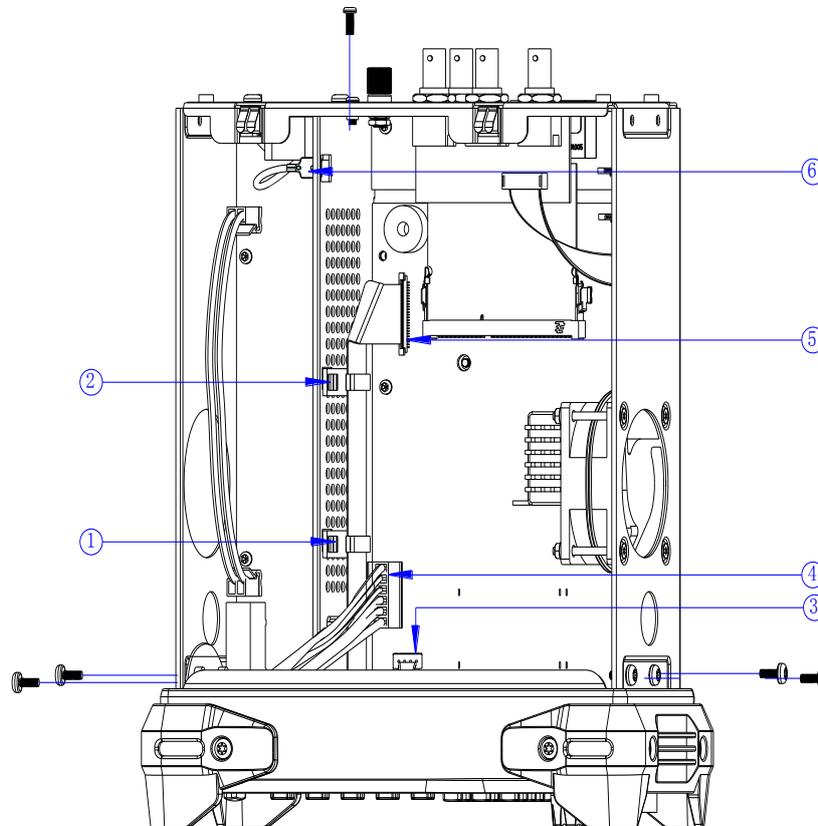
1. Pull out the handle firmly from the two sides of the generator.



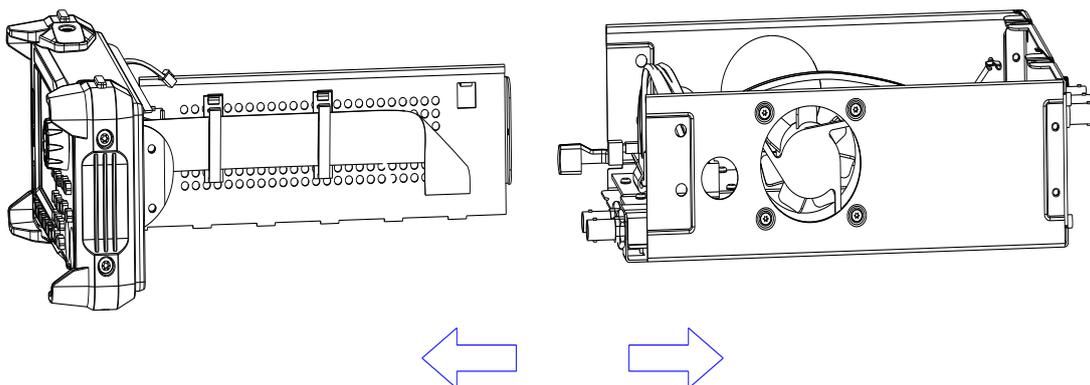
2. After removing 4PCS screws of the pad and 1PCS screw at the bottom of the generator's case, remove the metal shell carefully from the main body to avoid being scratched.



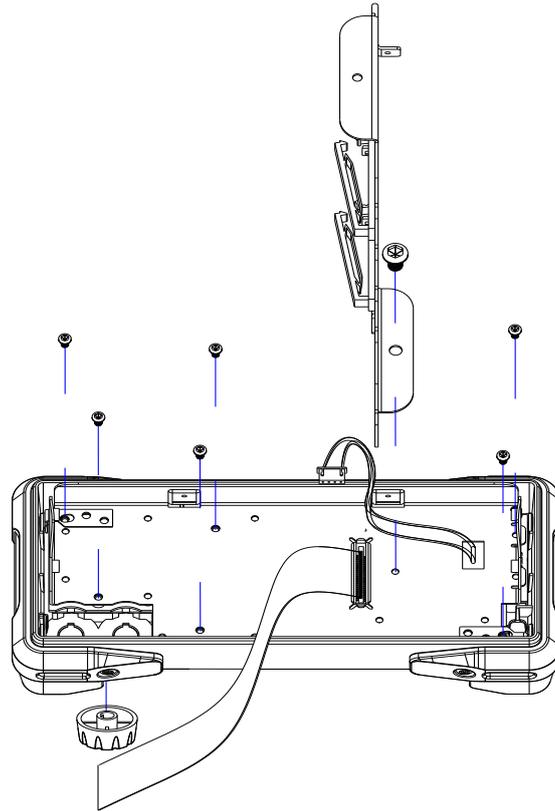
3. Open the cable clamp as ①② shows and pull out the cable as ③④⑤⑥ shows, and then remove the 5PCS screws as shown in the following figure.



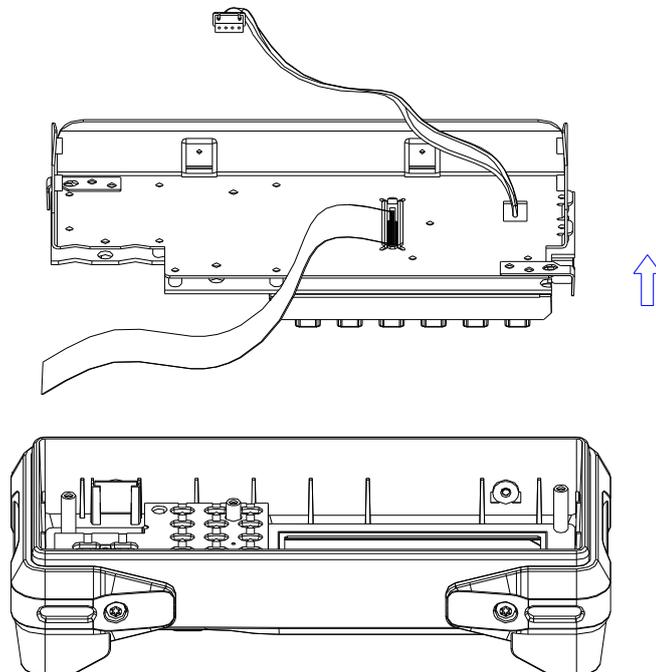
4. Separate the front panel from the main body of the generator.



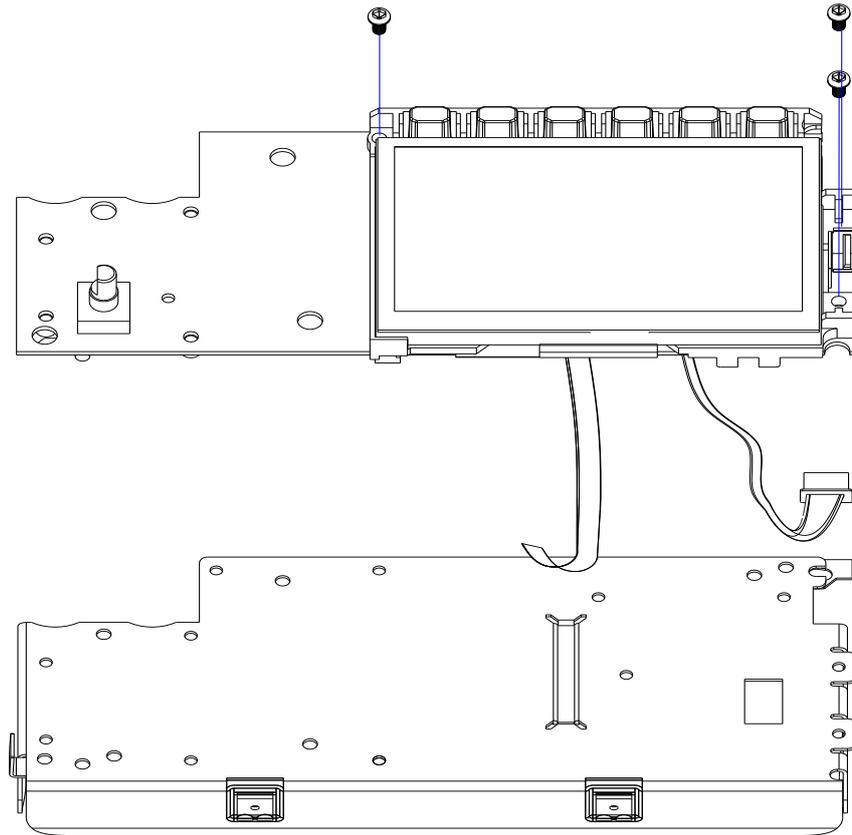
5. Pull out the knob and then remove the screws attaching the hardware partition plate and the front cabinet screws.



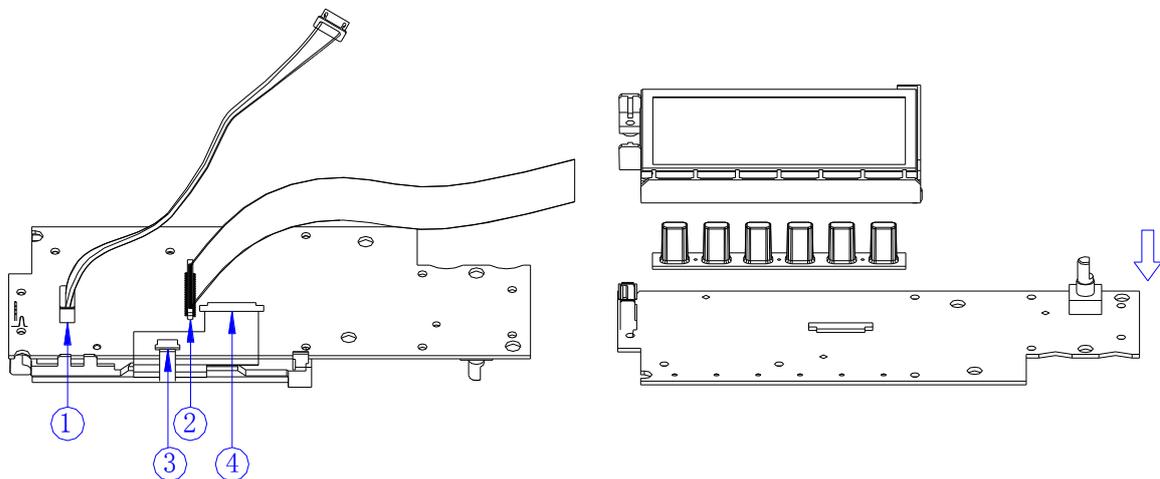
6. Remove the keypad circuit board assembly.



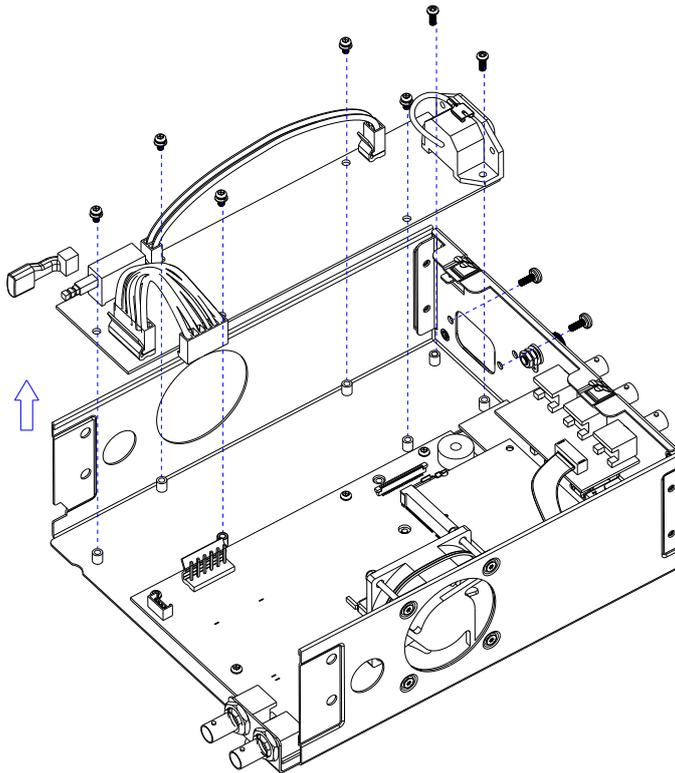
7. Remove the 3PCS screws holding the screen bracket and remove the metal front panel.



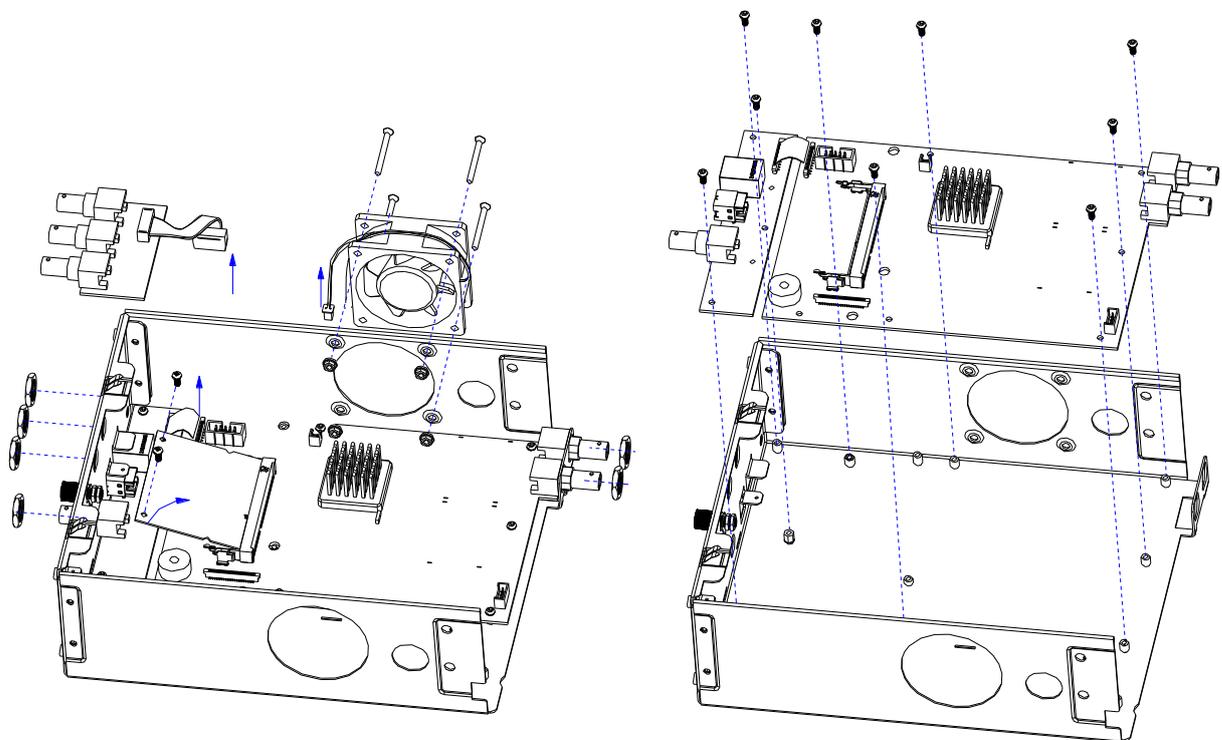
8. Pull out the connecting cable according to the index number as shown in the following figure and remove the keyboard.



9. Remove all the 9 screws affixed to the power supply board using the T10 Torx screwdriver. Separate the power supply board carefully from the main body of the generator in order to avoid being scratched by the sharp metal edge.



10. Pull out the connecting cable as shown in the following figure and then remove the fan, rear interface board, channel board and main board.



Note:

To assemble the generator, please follow these same steps in reverse order.

Chapter 5 Troubleshooting

The internal structure of the generator consists of the main board, channel board, power supply board, key and LCD board, and two interface boards. They are linked through cables or connectors. This chapter explains the main troubleshooting procedures for these boards (mainly main board and channel board) by measuring the corresponding test points and checking the signals of connectors on them, thus to help in determining the cause of the failure that has been encountered while operating the SDG6000X.

ESD Precautions

While performing any internal test of the generator, please refer to the following precautions to avoid damages to its internal modules or components resulting from ESD.

- Handle circuit boards by their edges as much as possible.
- Avoid handling of static-sensitive modules if not necessary.
- Wear a grounded antistatic wrist strap to drain the static voltage from your body while touching these modules.
- Operate static-sensitive modules only in static-free areas. Avoid handling modules in areas that allow anything capable of generating or holding a static charge.

Required Equipments

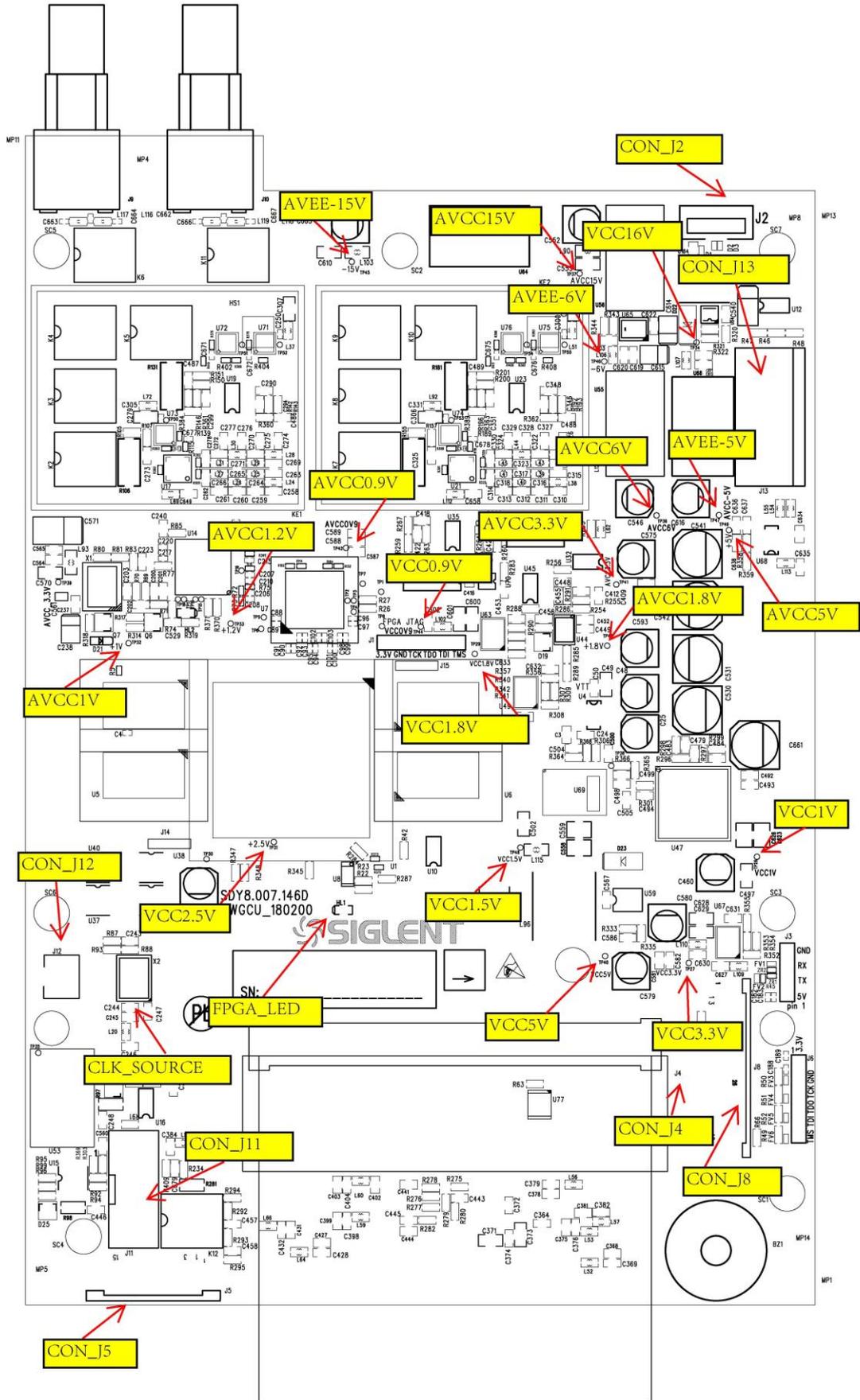
The equipment listed in the table below is required to troubleshoot the generator.

Table 5-1 Required Equipments

Equipment	Critical Specifications	Example
Digital Multimeter	DC Accuracy $\pm 0.015\%$	SDM3055
Oscilloscope	300 MHz Bandwidth	SDS2304X

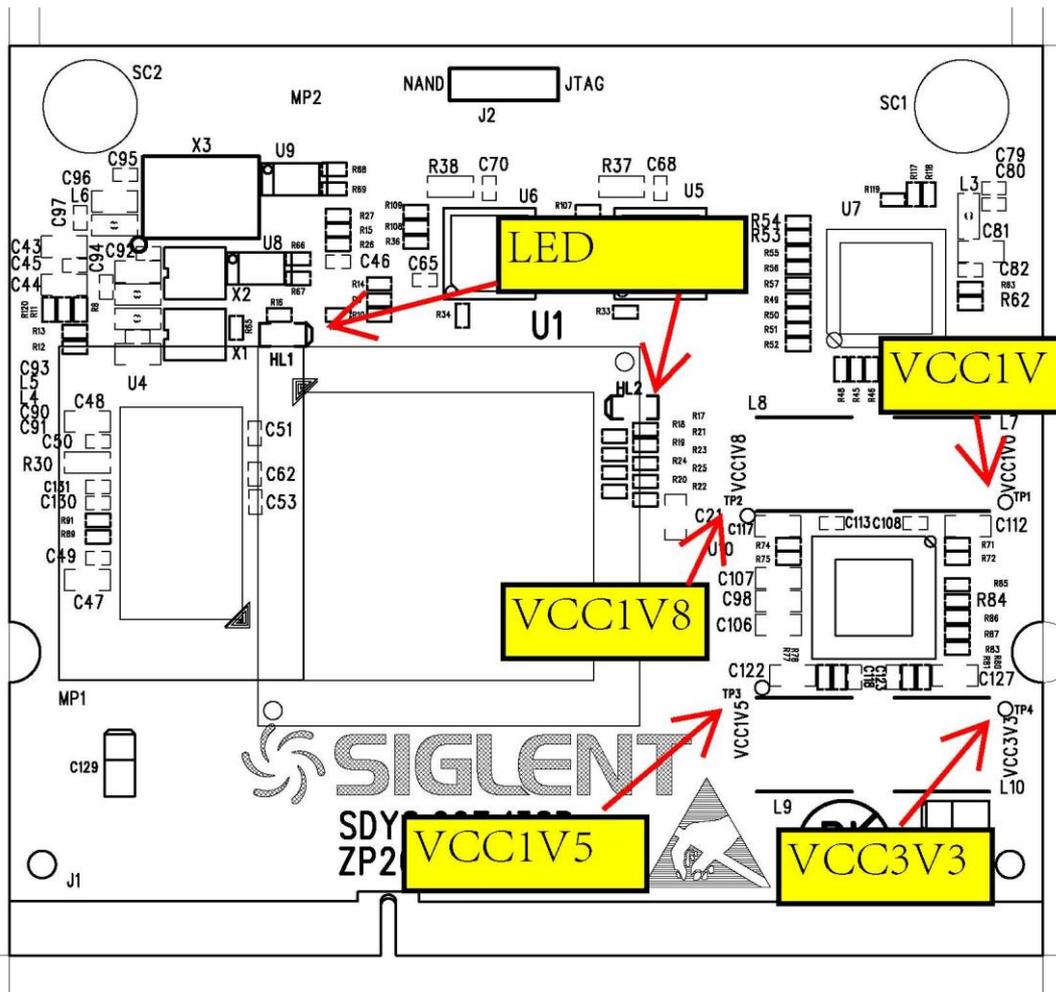
Channel Board Drawing

The channel board is a signal conditioning board for generating analog signal. It mainly deals with the adjusting of signal parameters such as frequency, amplitude, and so on. Please refer to the following drawing to quickly locate the test points on the channel board for easy resolution of any problems encountered.



Main Board Drawing

The main board is the control center of the generator that contains an ARM CPU system. It completes the GUI function, controlling and configuration function of the channel board as well as the user interface. Please refer to the following drawing to quickly locate the test points on the main board for easy resolution of any problems encountered.



Check the Power Supply

Before performing the power supply testing procedure, please make sure that the generator is grounded correctly through the protective lead of the power cord. Take care not to touch or even disassemble the power supply module without any safety precautions to avoid electric shock. Here are procedures for testing the power supply:

1. Disconnect the power cord of the generator and then check whether the fuse is good.
2. Connect the power cord and then turn on the generator. Focus on the Power Connector (J13) on channel board, which contains 6 pins, from Pin 1 to Pin 6. Since two of the six pins are ground wires, test the other four pins that are marked respectively with blue, yellow, red and white, using a digital multimeter, to check whether the voltage value is within the corresponding specified range. The voltage parameters to be tested are listed in the table below:

Table 5-2 Test Voltages of Power Connector

Voltage value	Pins	Error limit
20 V	VH+(red)	±10%
-20 V	VH-(white)	±10%
6.5 V	VL+(yellow)	±10%
-6.5 V	VL-(blue)	±10%

3. If each tested voltage value is within the corresponding specified range listed in the table above, then the power supply is working normally. Otherwise, please go to step 4.
4. Disconnect the power connector and redo step 3. Because of the removal of the load, each voltage value error limit increases by approximately 20 percent.

Table 5-3 Test Voltages of the Connector After Disconnected

Voltage value	Pins	Error limit
20 V	VH+(red)	±30%
-20 V	VH-(white)	±30%
6.5 V	VL+(yellow)	±30%
-6.5 V	VL-(blue)	±30%

If each tested voltage value is within the specified range listed in the table above, then some abnormality of the load is most likely causing the power supply problem. Continuous checking or even replacing the channel/main board is required for further test.

If there is at least one voltage value that is out of the specified range, then the power supply module appears to be problematic and a replacement will be required. For safety, please use qualified technical personnel to disassemble the power supply module.

Note: *The main power supply provides an input fuse to protect against the danger of fire in the event of a failure of the power supply circuitry. However, this fuse will not fail ("open" or "blow") in normal power supply operation except when a significant overload occurs. Replace the entire main power supply if the input fuse fails.*

Check the Channel Board

If it is desired to remove the channel board from the metal shelf inside the generator, please place it on a clean, insulated mat. Here are the procedures for testing the channel board:

1. Several types of connectors are used on the channel board. make certain that all of these connectors are connected properly.
2. After checking these connectors, then connect the generator to AC power and power it on. Check if the voltage values at all test points are within the specified range using a digital multimeter. The voltage parameters to be tested are listed in table 5-4:

Voltage Checking

Test the voltage points on the channel board in the table below. To locate the test points, please refer to the drawing of the channel board. If each tested voltage value is not within the corresponding spec range referring to table 5-4, the channel board is defective. Please return it to the factory for repair or contact SIGLENT.

Table 5-4 Test Voltages of the Channel Board

Test point	Voltage value	Error limit
AVEE-15V	-15 V	±5%
AVCC15V	15 V	±5%
VCC16V	16 V	±5%
AVEE-6V	-6 V	±5%
AVCC6V	6 V	±5%
AVEE-5V	-5 V	±5%
AVCC0.9V	0.9 V	±5%
AVCC1.2V	1.2 V	±5%
VCC0.9V	0.9 V	±5%
AVCC3.3V	3.3 V	±5%
AVCC1.8V	1.8 V	±5%
AVCC5V	5 V	±5%
AVCC1V	1 V	±5%
VCC1.8V	1.8 V	±5%

VCC1V	1 V	±5%
VCC1.5V	1.5 V	±5%
VCC2.5V	2.5 V	±5%
VCC5V	5 V	±5%
VCC3.3V	3.3 V	±5%

10 MHz Clock Source Checking

There is a TXCO generating a 10 MHz 3.3 V LVCOMS clock source to the entire channel board. Please check it referring to the marked point on the channel board drawing.

FPGA Checking

To check if the FPGA is working properly, please observe the test point marked with FPGA_LED on the channel board drawing. The LED light blinks at a 2 Hz rate in normal operation. If it does not light cannot be lighted or blinks at an incorrect frequency, then the FPGA may be fault.

Connector Checking

Table 5-5 Connectors of the Channel Board

Connector	Function
CON_J4	Communication between the main board and the channel board.
CON_J5	Communication between the channel board and the interface board.
CON_J13	Power supply of the channel board.
CON_J2	USB HOST
CON_J8	Communication between the channel board and the Key and LCD board.
CON_J12	Power supply of the fan.

Table 5-5 explains the function of all the connectors on the channel board. It is important to ensure that all the connections are tight.

Check the Main Board

The main board is the control center of the generator where an Arm CPU is located. Please refer to chapter 4 if you wish to separate it from the channel board.

Voltage Checking

Test the voltage test points on the main board and compare to the table below. If each tested voltage value is within the corresponding specified range, then the main board is working normally. If the voltages are out of the specified range, please return it to the factory for repair or contact SIGLENT.

Table 5-6 Test Voltages of the Main Board

Test point	Voltage value	Error limit
VCC1V	1 V	±5%
VCC1V8	1.8 V	±5%
VCC1V5	1.5 V	±5%
VCC3V3	3.3 V	±5%

ARM CPU System Checking

Observe the LED lights on the main board, which indicate the working state of the ARM CPU system. If the LED lights blink at a regular rate, then the corresponding codes have been loaded successfully and the chip is in an operating state. Otherwise, there may be a problem.

Quick Guide for General Failures

The general hardware failures are described in the following. This information may help in determining the cause of some general hardware failures:

1. No start-up after pressing the power button:

- (1) Check if the power cord is correctly connected.
- (2) Check if the power button is operating correctly.
- (3) Check whether the fuse has burned out. If the fuse is blown, please replace with a fuse of the same rating.
- (4) Check if the connection between the power supply and the channel board is tight.
- (5) If the instrument still does not work normally, please contact SIGLENT.

2. Starts up with a dark screen:

- (1) Check the connection between the power supply and the channel board.
- (2) Check the connection between the keypad circuit board and the channel board.
- (3) If the instrument still does not work normally, please contact SIGLENT.

3. No response after pressing any button, or abnormal display of the screen:

- (1) Check the connection between the keypad circuit board and the channel board.
- (2) If the instrument still does not work normally, please contact SIGLENT.

4. The output voltage amplitude measured is higher or lower than expected:

- (1) Check the connection between the generator and the load.
- (2) Check if the impedance set in generator matches the input impedance of the load.
- (3) If the instrument still does not work normally, please contact SIGLENT.

Chapter 6 Maintenance

Maintain Summary

SIGLENT warrants that the products it manufactures and sells are 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 that 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 case shall **SIGLENT** be liable for indirect, special or consequential damages.

Repackaging for Shipment

If the unit must be returned to **SIGLENT** for service or repair, be sure to:

1. Attach a tag to the unit identifying the owner and indicating the required service or repair.
2. Place the unit in its original container with appropriate packaging material for shipping.
3. Secure the container with strong tape or metal bands.

If the original shipping container is not available, place your unit in a container which will ensure at least 4 inches of compressible packaging material around all sides for the instrument. Use static-free packaging materials to avoid additional damage to your unit.

SDG6000X Series

Pulse/Arbitrary

Waveform Generator



About SIGLENT

SIGLENT is an international high-tech company, concentrating on R&D, sales, production and services of electronic test & measurement instruments.

SIGLENT first began developing digital oscilloscopes independently in 2002. After more than a decade of continuous development, SIGLENT has extended its product line to include digital oscilloscopes, function/arbitrary waveform generators, digital multimeters, DC power supplies, spectrum analyzers, isolated handheld oscilloscopes and other general purpose test instrumentation. Since its first oscilloscope, the ADS7000 series, was launched in 2005, SIGLENT has become the fastest growing manufacturer of digital oscilloscopes. We firmly believe that today SIGLENT is the best value in electronic test & measurement.

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