Function/Arbitrary Waveform Generators
25 MHz - GX 1025
50 MHz - GX 1050

User's manual

Contents

General Instructions

Introduction

You have just purchased a **GX 1025** or **GX 1050 Function / Arbitrary Waveform Generator** and we appreciate your confidence.

Precautions

To obtain the best service:
- read this notice carefully,
- respect the safety instructions.

Failure to respect the warnings and/or usage instructions may damage the device and/or installations and may be dangerous for the user.

Symbols used on the instrument

Warning: Risk of danger.
Refer to the operating manual to find out the nature of the potential hazards and the action necessary to avoid such hazards.

Application or withdrawal not authorized for non-insulated conductors carrying dangerous voltage levels.

Earth

Selective sorting of waste for recycling electric and electronic materials. In accordance with the WEEE 2002/96/EC directive: must not be treated as household waste.

USB host

European conformity

Frame or chassis terminal

Environment

Temperature	Operation 0°C ~ 40°C
	Storage -20°C ~ 60°C
Cooling method	natural cooling down
Temperature range	below + 35°C ≤ 90 % relative humidity
	+ 35°C ~ + 50°C ≤ 60 % relative humidity
Altitude	Operation: below 2000 m
	Storage: below 2000 m
Pollution degree	2

General Instructions (contd.)

Definition of measurement categories

Overvoltage category ll is for equipment intended to be supplied from the building wiring. It applies both to plug-connected equipment and to permanently connected equipment.

Overvoltage category lll is for equipment intended to form part of a building wiring installation. Such equipment includes socket outlets, fuse panels, and some mains installation control equipment.

Overvoltage category IV is for equipment installed at or near the origin of the electrical supply to a building, between the building entrance and the main distribution board. Such equipment may include electricity tariff meters and primary overcurrent protection devices.

Guarantee

This equipment is guaranteed for all manufacturing and parts defects in compliance with the general terms and conditions which are available on request

During the warranty period (1 year), the instrument may only be repaired by the manufacturer who reserves the right to make the decision to either repair or replace all or part of the appliance. In the event of a return of the equipment to the manufacturer the shipping charge from the customer to the manufacturer is at the customer's expense.

The guarantee does not apply in the following conditions:

- inappropriate use of the equipment or use with incompatible equipment
- one or more changes made to the equipment without prior explicit authorisation from the manufacturer's technical department
- an intervention is made on the instrument by a person not approved by the manufacturer
- the adapting to a specific application that is not part of the definition of the instrument or in the operating guide
- damage caused by a mechanical shock, by dropping the instrument or by flooding.

Maintenance, repairs, metrological checks

The device includes no parts that can be replaced by the operator. All operations must be carried out by competent approved personnel.

For checks and calibrations, contact one of our accredited metrology laboratories (information and contact details available on request), at our Chauvin Arnoux subsidiary or the branch in your country.

Cleaning, safety measures

- No interventions are authorised inside the instrument.
- Turn the instrument off (remove the power supply cable).
- Clean using a damp cloth and soap.
- Never use abrasive products or solvents.
- Dry quickly using a dry cloth or an air blower at max. 80°C.
- Be sure not to obstruct the ventilation holes.

Description of the instrument

Introduction

This Function/Arbitrary Waveform Generator adopts the direct digital synthesis (DDS) technology, which can provide stable, high-precision, pure and low distortion signals. Its combination of excellent system features, easiness in usage and versatile functions makes this generator a perfect solution for your job now and in the future.

This generator has a clear and simple front-panel. The user-friendly panel layout and instructions, versatile terminals, direct graph interface, built-in instructions and help system have greatly simplified the operation process, with the help of which, users do not have to spend a great deal of time learning and familiarizing the operation of the generator before they can use it proficiently. The built-in AM, FM, PM, ASK, and FSK modulation functions generate modulated waveforms at ease, without the help of a separate modulating source. USB I/O is a standard accessory, while GPIB is optional. Remote instructions meet the SCPI specification requirements.

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

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

	GX 1025	GX 1050
Sine	1 µHz to 25 MHz	1 µHz to 50 MHz
Square	1 µHz to 25 MHz	1 µHz to 25 MHz
Ramp	1 µHz to 300 kHz	1 µHz to 300 kHz
Pulse	500 µHz to 10 MHz	500 µHz to 10 MHz
White Noise	25 MHz bandwidth (- 3 dB)	50 MHz bandwidth (- 3 dB)
Arbitrary	1 µHz to 5 MHz	1 µHz to 5 MHz

- 5 standard waveforms: Sine, Square, Ramp, Pulse, Noise
- Self-defined arbitrary waveform
- Multiple modulation function, various modulated waveform: AM, FM, PM, ASK, FSK, Sweep and Burst.
- Multiple I/O: external modulation source, external 10 MHz reference input, external trigger source, waveform output, synchronous signal output.
- Support USB storage device. Software updating could also be performed using USB devices.
- Up to 16k sample points of internal waveform depth, which can rebuild or simulate any complex waveform.
- Remote control is realized using the USB.
- Multiple interfaces: USB host & device, GPIB (IEEE-488) (option).
- English language user interface and built-in help system.

Description of the instrument (contd.)

Front panel
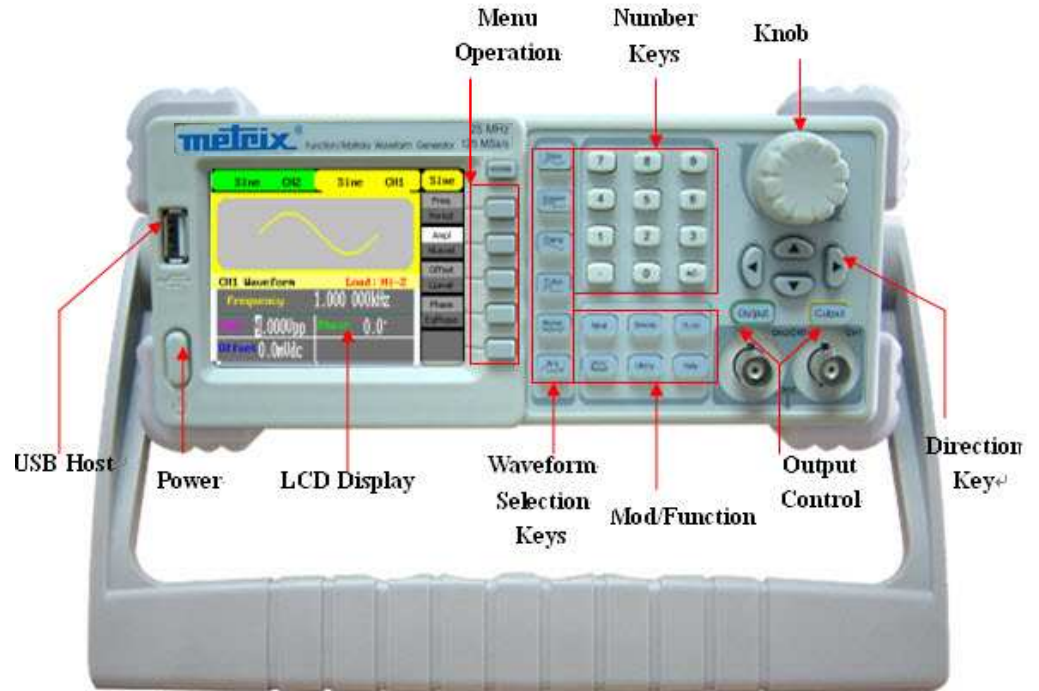
Rear panel
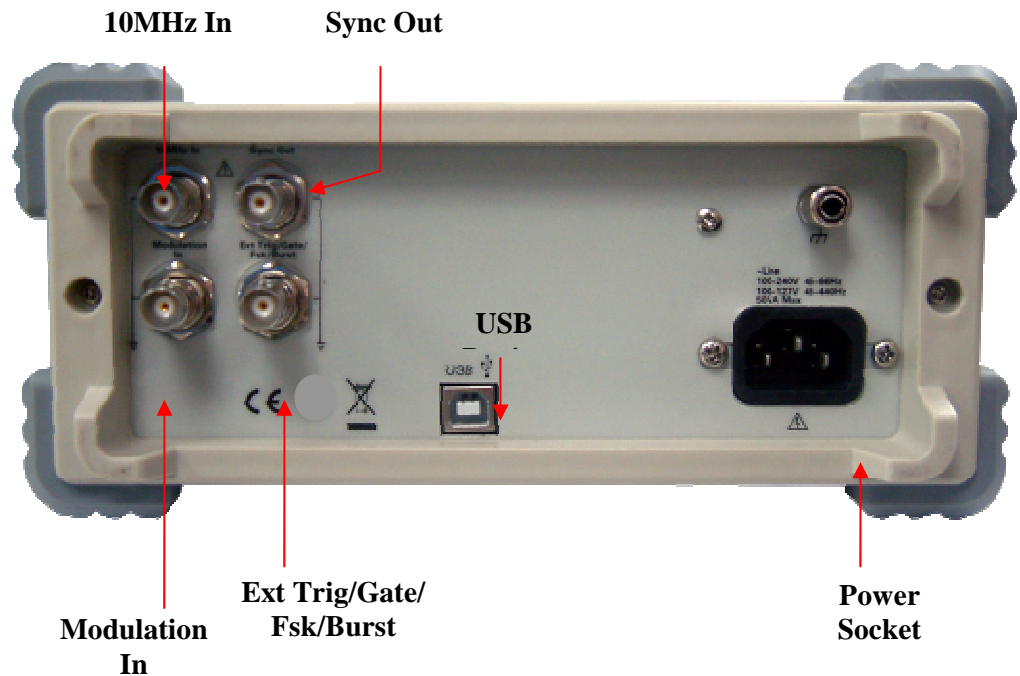
⚠️ *The external input voltage can't be over 12 Vpp, otherwise instrument gets damaged.*

Description of the instrument (contd.)

**Handle
Adjustment**

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

Viewing Position and Carrying Position :
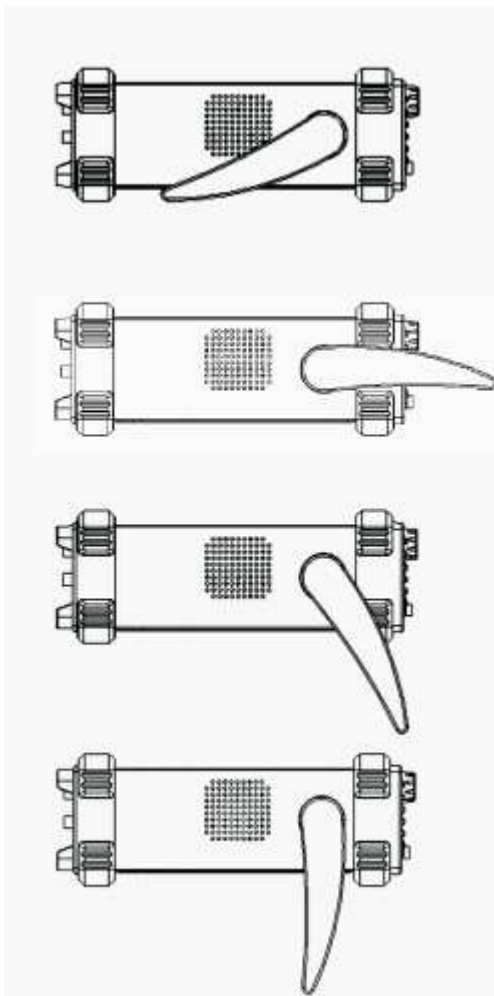
Description of the instrument (contd.)

Display Interface   Sine Wave is the default display signal :

Waveform Display Window

Parameter Display and Editing Window

Operation Menu: Different functions have different menus
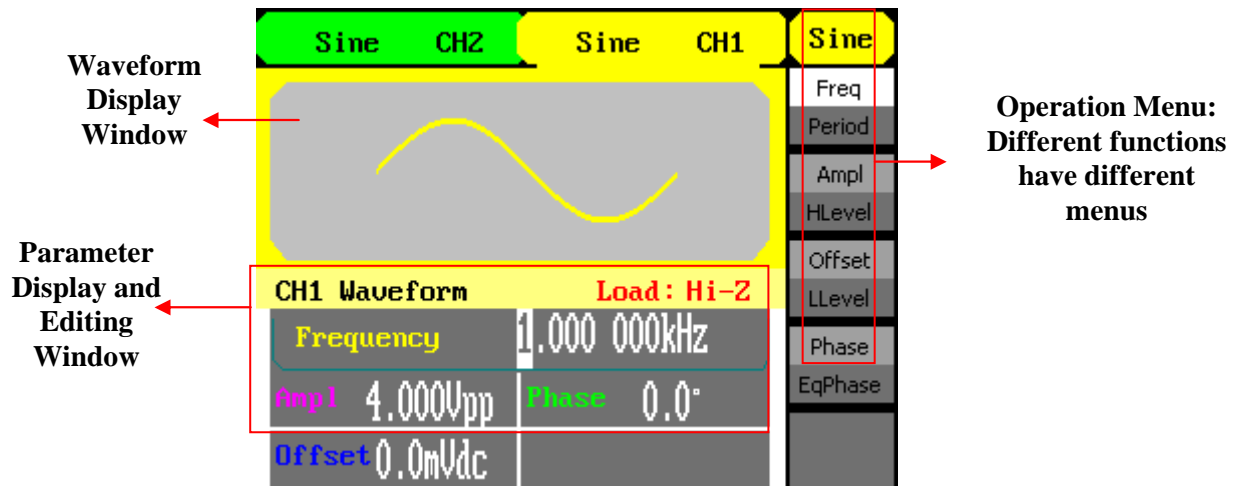
Getting Started

1. To set a waveform   On the operation panel, there is a set of buttons with waveform icon.

See below.

The exercise below will help you familiarize with the waveform selection settings.

Step 1

Press ![Sine button] Sine and the waveform window will display sine waveform.

The generator can generate sine signal with a frequency from 1μHz to 25 MHz (GX 1025), or 50 MHz (GX 1050).

By setting frequency/period, amplitude/high level, offset/low level, sine signal with different parameters can be generated.
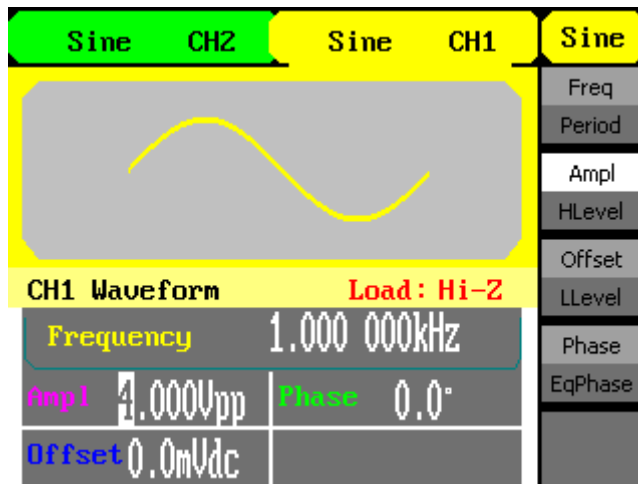
As shown, the default signal parameters are : 1 kHz frequency, 4.0 Vpp amplitude and 0 Vdc offset.

Getting Started (contd.)

1. To set a waveform (contd.)

Step 2

Press [Square] Square and the waveform window displays square waveform.

The generator can generate square signal with a frequency from 1μHz to 25MHz and variable duty cycle.
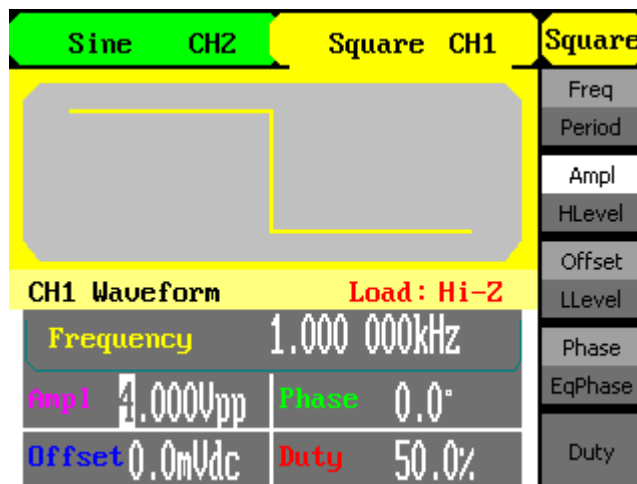
A shown, the default signal parameters are: 1 kHz frequency, 4.0 Vpp amplitude, 0 Vdc offset and 50% duty cycle.

Step 3

Press [Ramp] Ramp button, and the waveform window displays ramp waveform. The generator can generate ramp signal with a frequency of from 1μHz to 300 kHz and variable symmetry.
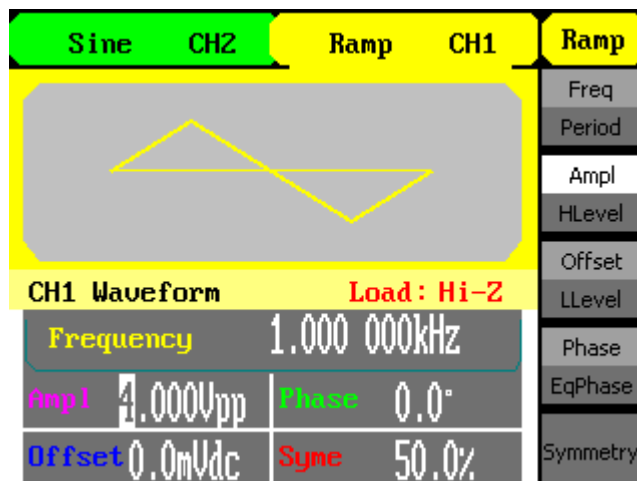
As shown, the default signal parameters are: 1 kHz frequency, 4.0 Vpp amplitude, 0 Vdc offset and 50% symmetry.

Getting Started (contd.)

1. To set a waveform (contd.)

Step 4

Press [Pulse] Pulse button, and the waveform window displays pulse waveform.

The generator can generate pulse signal with a frequency from 500 µHz to 5 MHz and variable pulse width and delay.
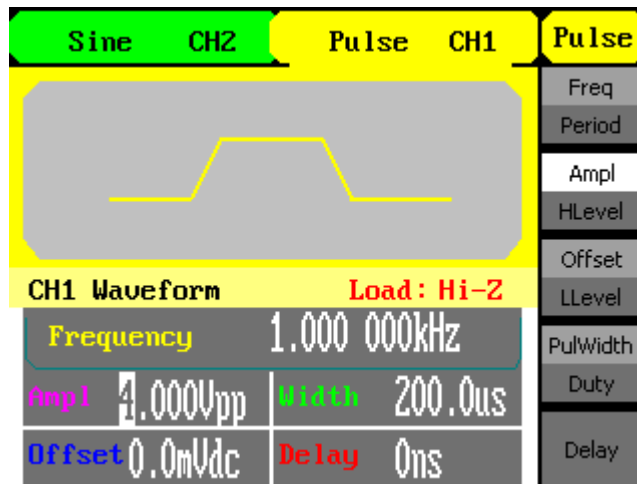
As shown, the default signal parameters are: 1 kHz frequency, 4.0 Vpp amplitude, 0 Vdc offset, 200 µs pulse width.

Step 5

Press [Noise] Noise button, and the waveform window displays noise waveform. The instrument generator can generate noise signal with a band width up to 50 MHz.
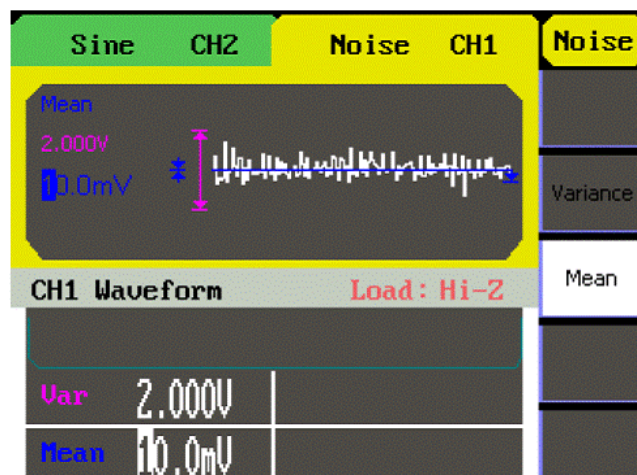
As shown, the default signal parameters are: 4.0 Vpp amplitude and 0 Vdc offset.

Getting Started (contd.)

1. To set a waveform (contd.)

Step 6

Press ⌒⌒ Arb button, and the waveform window displays arbitrary waveform. The generator can generate repeatable arbitrary waveform signals with at most 16 K points and 5 MHz frequency.

Sine CH2	Arb CH1	Arb
		Freq
		Period
		Ampl
		HLevel
		Offset
CH1 Waveform	Load: Hi-Z	LLevel
Frequency	1.000 000kHz	Phase
Ampl 4.000Vpp	Phase 0.0°	EqPhase
Offset 0.0mVdc		1/2 ↓
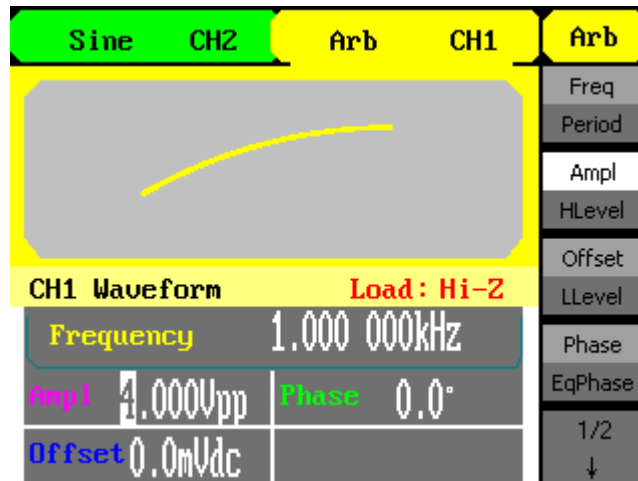
As shown, the default sine signal parameters are: 1 kHz frequency, 4.0 Vpp amplitude and 0mVdc offset.

Getting Started (contd.)

2. To set Modulate /
Sweep / Burst

[Mod] [Sweep] [Burst] : those three buttons on the front panel are used for modulation, sweep and burst settings.
The instructions below will help you familiarize with the setting of these functions.

Step 1

Press [Mod] Mod button, and the modulated waveforms will be generated. The modulated waveform can be changed by modifying the parameters such as type, internal/external modulation, depth, frequency, waveform, etc. The generator can modulate waveform using AM, FM, PM, ASK and FSK. Sine, square, ramp or arbitrary waveforms can be modulated (pulse, noise and DC can not be modulated).
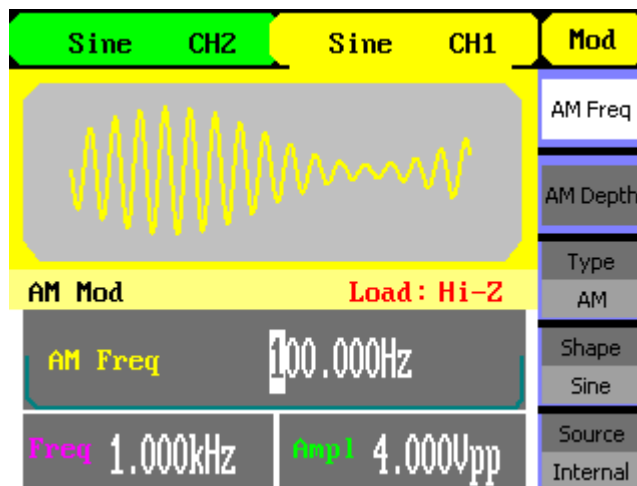
Step 2

Press [Sweep] Sweep button, sine, square, ramp or arbitrary waveform can be swept (pulse, noise and DC can not be swept).

In the sweep mode, the generator generate signal with variable frequencies.
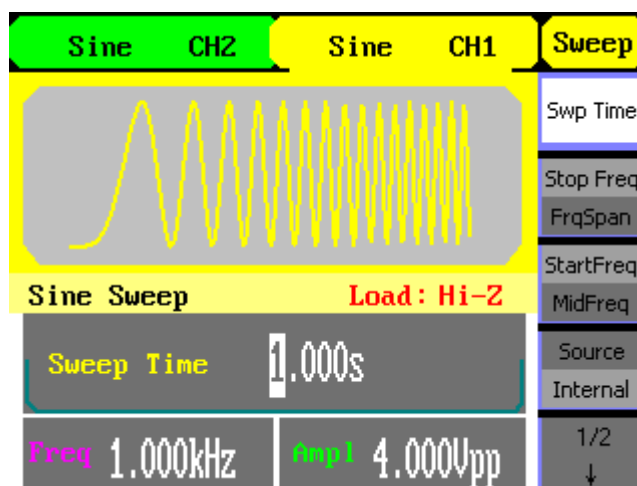
Getting Started (contd.)

**2. To set Modulate /
Sweep / Burst**

(contd.)

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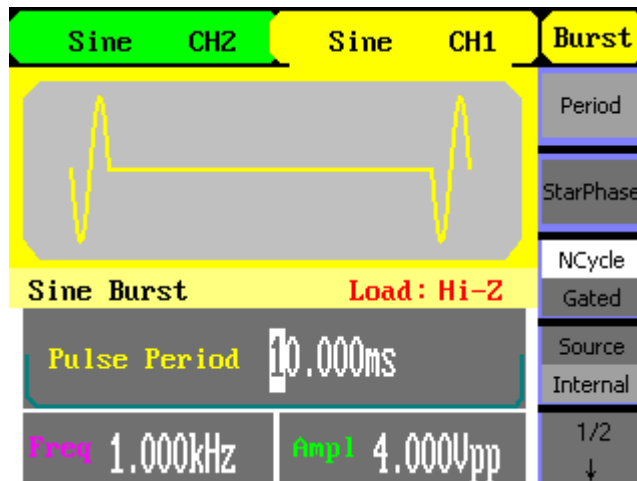
Term Explanation

Burst Output waveforms with set cycle times.

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

3. To set Output

Those two buttons ⬚Output ⬚Output on the right side of the
operation panel are used to output control. The instruction below will help
you familiarize with these functions.

Press Output button, activate or deactivate the output signal.

Getting Started (contd.)

4. To use Digital Input As shown below, there are three sets of buttons on the operation panel, which are direction button, the knob and the keypad. The instruction below will help you familiarize with the digital input function.

1. The up and down keys are used to shift parameters and the left and right keys are used to shift digits.

2. Keypad is used to directly set the parameters value.

3. Knob is used to change a signal digit value whose range is 0~9. Clockwise to increase 1.

5. To Use Store/Utility Function Those three buttons on the operation panel are used to call the store/recall, utility and help function. The instruction below will help you familiarize with these functions.

1. The button is used to store waveform data and configure information.

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

Functional Description

1. To Set Sine Signals

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

The parameters of sine waveforms are :

- frequency/period
- amplitude/high level
- offset/low level
- phase/EqPhase

Different sine signals are generated by setting these parameters. As shown, in the soft key menu, select Freq.

Cursor is located in the frequency parameter area in the parameter display window, and users can set the frequency value here.

Sine parameters display interface
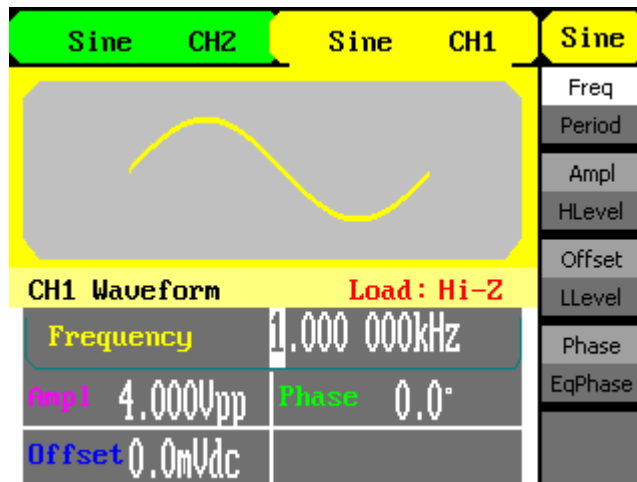
Menu Explanations of Sine waveform

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

Functional Description (contd.)

***To Set the Output
Frequency/Period***

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

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

2. Input the desired frequency.

    Use the keypad to input the parameter value directly, and press the corresponding button to select the parameter unit. Or you can use the direction button to select the digit you want to edit, and then use the knob to change its value.

Setting the Frequency
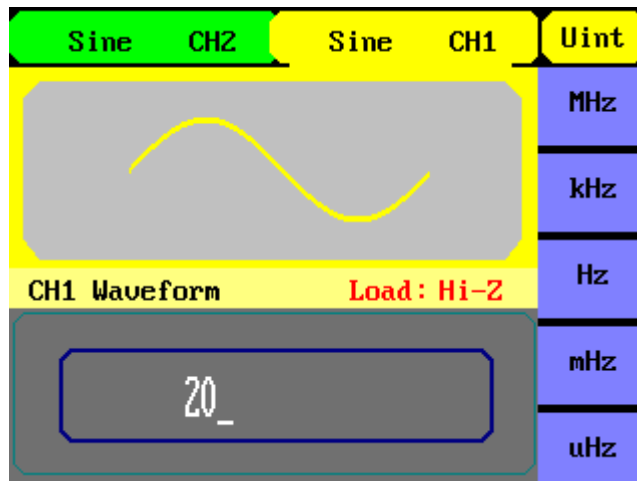
☞ ***When using the keypad to enter the digit, you can use the left direction button to move the cursor backward and delete or change the value of the previous digit.***

Functional Description (contd.)

*To Set the Output
Amplitude*

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

   The amplitude shown on the screen when the instrument is powered is the default value or the set value beforehand. When changing the function, if the current value is valid for the new waveform, it will be used sequentially. If you want to set the waveform by high level or low level, press the Ampl/HLevel or Offset/LLevel button again, to switch into the high level or low level parameter (the current operation is displayed in inverse color).

2. Input the desired Amplitude

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

*Setting the
Amplitude*
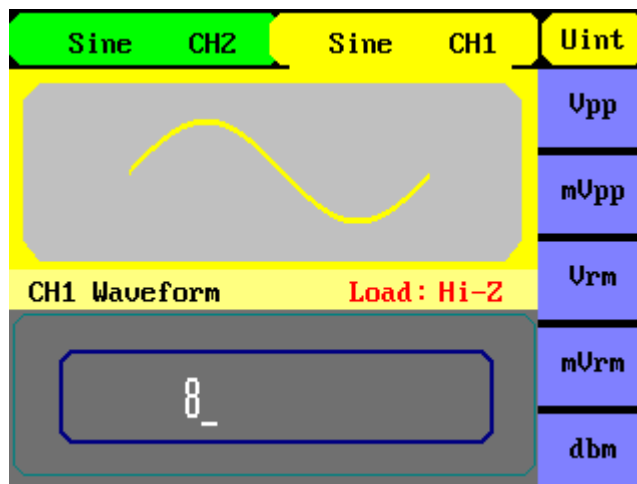
Functional Description (contd.)

To Set the DC Offset

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

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

2. Input the desired Offset

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

Setting the DC Offset
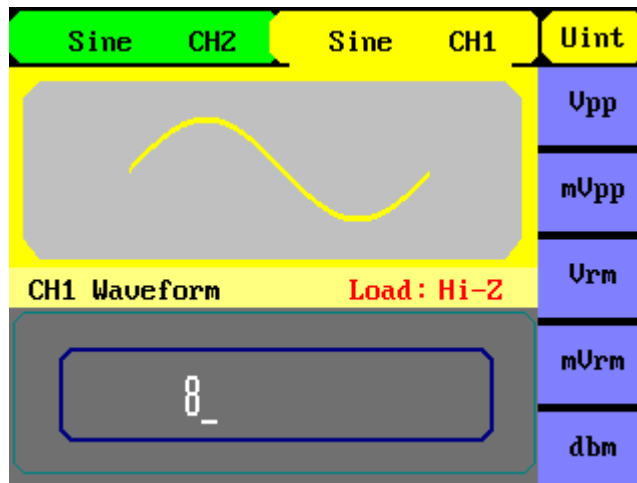
Functional Description (contd.)

2. To Set Square Signals
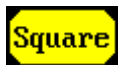
 Press this button to call the Square operation. The square waveform parameters are set by using the Square operation menu.

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

Square Parameter Display Interface
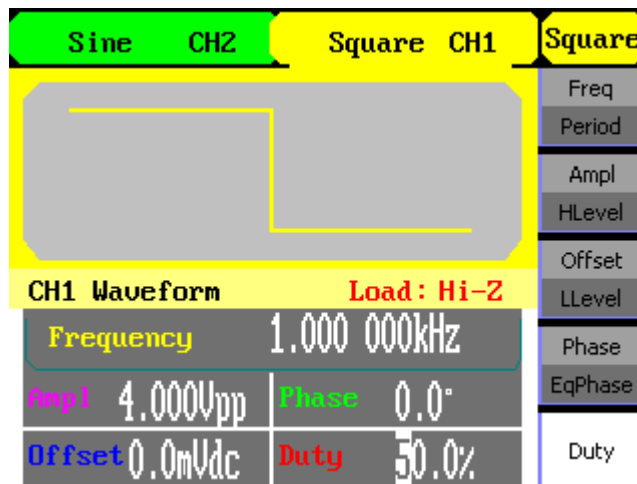
Menu Explanations of Square Waveform

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

☝ ***Duty Cycle: The percentage that the high level takes up the whole period.***
Please Note : for the Frequency   ***Duty Cycle Value***
Below 10 MHz :   ***20% to 80%***
From 10 MHz to20 MHz (included) :   ***40% to 60%***
Higher than 20 MHz :   ***50%***

Functional Description (contd.)

To Set the
Duty Cycle

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

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

Setting the
Duty Cycle
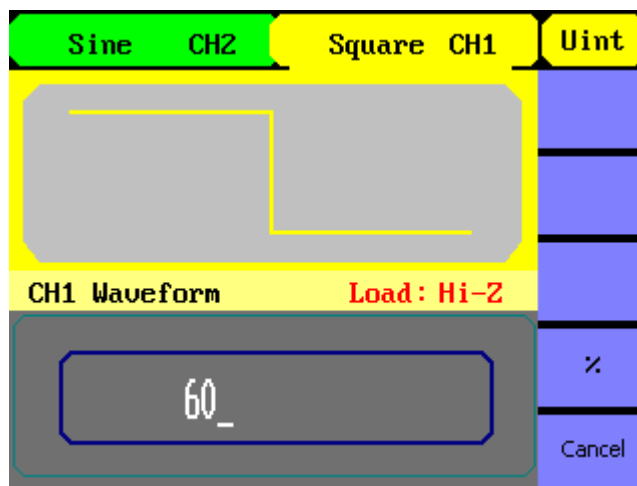
Functional Description (contd.)

3. To Set Ramp Signals

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

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

Ramp Parameter Display Interface

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

☞ **Symmetry: Percentage that the rising period takes up the whole period. Input Range: 0 ~ 100%.**

Functional Description (contd.)

To Set the
Symmetry

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

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

2. Input the desired Symmetry

    Use the keypad or the knob to input the desired value, choose the unit, and press the corresponding button. The generator will change the waveform immediately.

<u>Setting the</u>
<u>Symmetry</u>
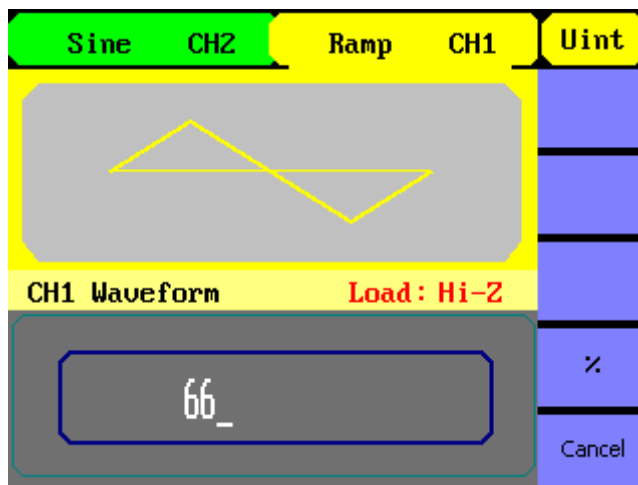
# Functional Description (contd.)

**4. To Set Pulse
Signals**

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

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

*Pulse Parameter
Display Interface*
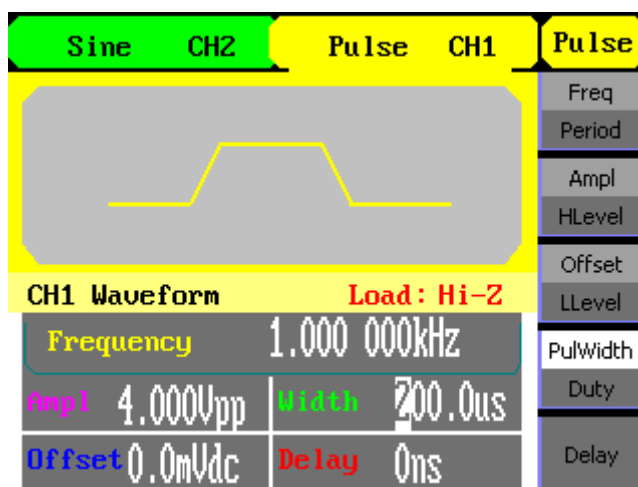
Function Menu	Explanation
Freq/	Set the signal frequency or period;
Period	The current parameter will switch at a second press.
Ampl/	Set the signal amplitude or high level; The current
HLevel	parameter will switch at a second press.
Offset/	Set the signal offset or low level;
LLevel	The current parameter will switch at a second press.
PulWidth	Set the signal pulse width or duty;
/Duty	The current parameter will switch at a second press.
Delay	Setting the delay for pulse waveform.

☞ ***Pulse Width:***

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

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

Functional Description (contd.)

To Set the
Pulse Width

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

   The pulse width shown on the screen when the instrument is powered is the default value or the set value beforehand. When changing the function, if the current value is valid for the new waveform, it will be used sequentially.

2. Input the desired Pulse Width

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

Setting the
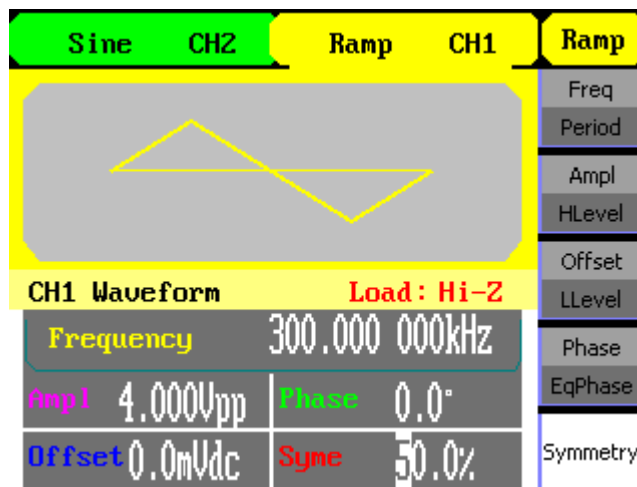*Pulse Width*
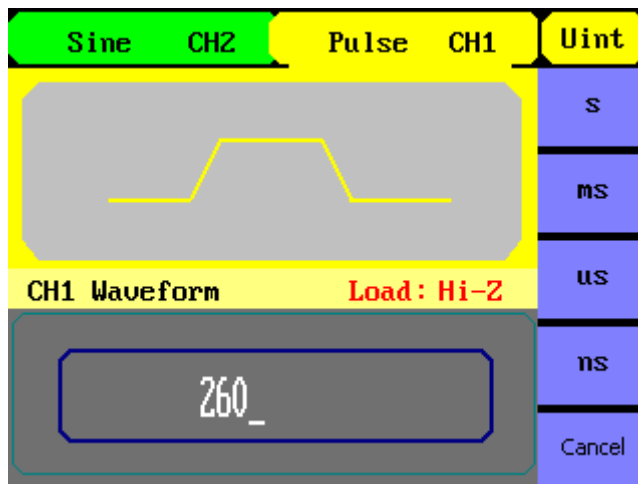
Functional Description (contd.)

To Set the Delay

1. Press Pulse → Delay, to set the delay.

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

2. Input the desired delay

   Use the keypad or the knob to input the desired value, choose the unit, and press the corresponding button. The generator will change the waveform immediately.

Setting the Delay
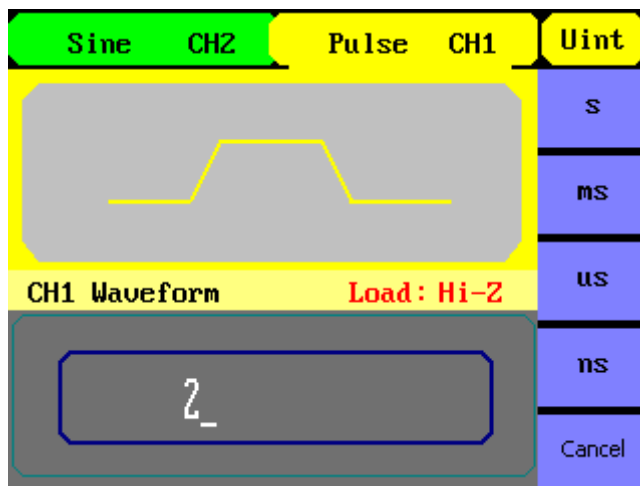
Functional Description (contd.)

5. To Set Noise Signals

Noise

Press this button to call the gaussian white noise operation. The noise waveform parameters are set by using the noise operation menu.

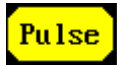The parameters for noise waveforms are: amplitude/high level and offset/low level. As is shown below, in the soft key menu, select Offset, Cursor is located in the Offset parameter area in the parameter display window, and users can set the offset value here. Noise is non-regulated signal which has no frequency or period.

Noise Parameter display Interface
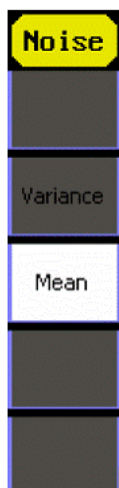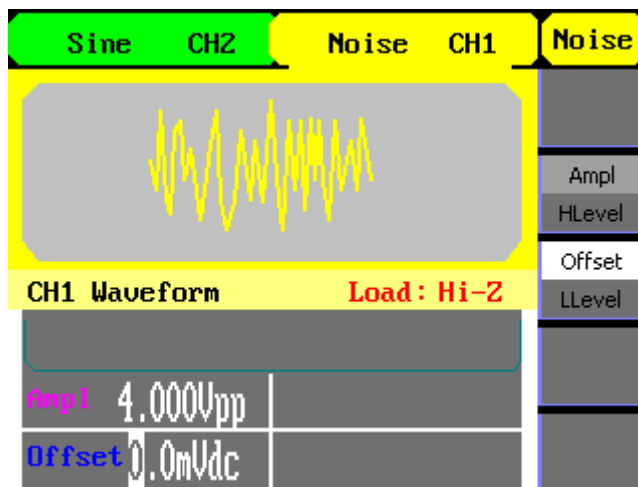
Function Menu	Explanation
Variance	Set the signal Variance
Mean	Set the signal mean

Functional Description (contd.)

6. To Set Arbitrary Signals

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

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

Arb Parameter Display Interface
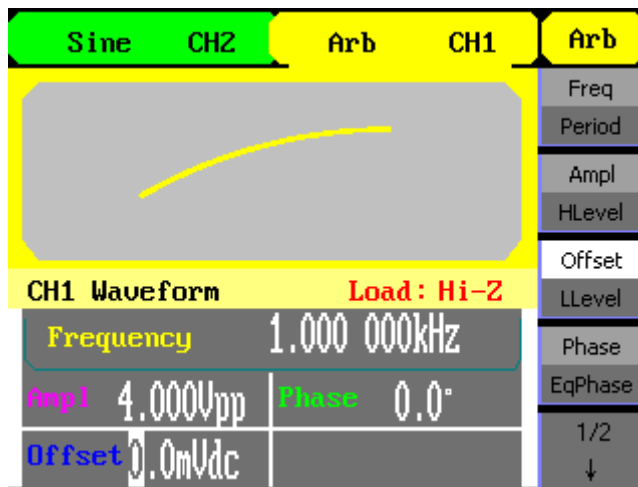
Menu Explanations of Arb Waveform   1/2

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

Functional Description (contd.)

6. To Set Arbitrary Signals (contd.)

Menu Explanations   2/2
of Arb Waveform

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

To Select the built-in Arbitrary Waveform

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

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

Function Menu	Explanation
Built-In	Select one of the 48 built-in arbitrary waveforms.
Store Wforms	Select one of arbitrary waveforms stored in the non-volatile memory.
Cancel	Cancel the current operation, and return to the upper menu. (the followings are the same and will not be explained).

Functional Description (contd.)

a) To Select the Built-in Waveform

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

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

Common Built-In Arbitrary Waveform interface

StairUp	StairDn	StairUD	PPulse
NPulse	Trapezia	UpRamp	DnRamp

Menu Explanations of Common Built-In Arbitrary Waveform

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

Functional Description (contd.)

Math Built-In Arbitrary Waveform Interface

ExpFall	ExpRise	LogFall	LogRise
Sqrt	Root3	X^2	X^3
Sinc	Gaussian	Dlorentz	Haversin
Lorentz	Gauspuls	Gmonpuls	Tripuls

Menu Explanations of Math Built-in Arbitrary Waveform

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

Functional Description (contd.)

Project Built-In
Arbitrary Waveform
interface

Cardiac	Quake	Chirp	TwoTone
SNR			

Menu Explanations of
Project Built-in
Arbitrary Waveform

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

Functional Description (contd.)

Winfun/Triangle Built-
In Arbitrary Waveform
interface

Hamming	Hanning	Kaiser	Blackman
Gaussian	Triangle	Haris	Bartlett
Tan	Cot	Sec	Csc
Asin	Acos	Atan	ACot

Menu Explanations of
Winfun/Triangle Built-
in Arbitrary Waveform

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

Functional Description (contd.)

b) To Select the Stored Waveform

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

As is shown below, use the direction keys or knob to choose the corresponding arbitrary waveform and press Choice.

Stored Wform Display Interface

Sine	CH2	Arb	CH1	Arb
WAVE1	WAVE2			Stored Wforms

CH1 Wavefrom   Load: Hi-Z

Frequency	1.000 000kHz	
Ampl **4**.000Vpp	Phase 0.0°	Cancel
Offset 0.000Vdc		Select
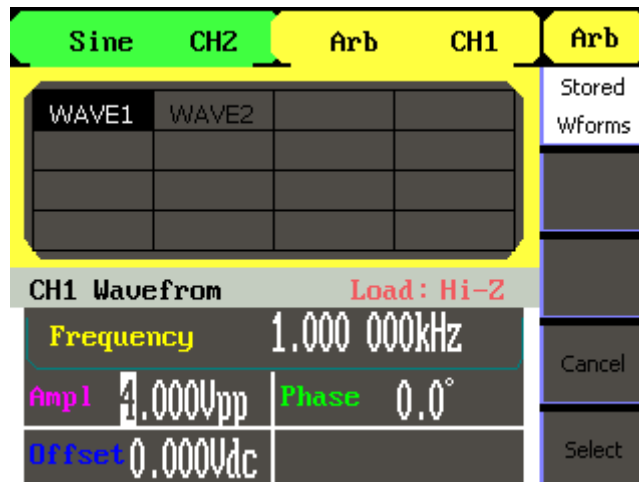
Functional Description (contd.)

7. To Generate the Modulated Waveform

| Mod |

Use this button to generate modulated waveform. The Generator can generate AM, FM, ASK, FSK and PM modulated waveforms. Modulating parameters vary with the types of the modulation :

- In AM, users can set the source (internal/external), depth, modulating frequency, modulating waveform and carrier waveform

- In FM, users can set the source (internal/ external),frequency deviation, modulating waveform and carrier waveform

- In ASK, users can set the source (internal/external), modulating waveform and carrier waveform

- In FSK, users can set the source (internal/external), frequency range, key frequency, modulating waveform and carrier waveform

- In PM, users can set the source (internal/external),phase deviation, modulating frequency, modulating waveform and carrier waveform.

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

Display Interface of Modulated Waveform Parameter

Modulating Frequency

Carrier Frequency
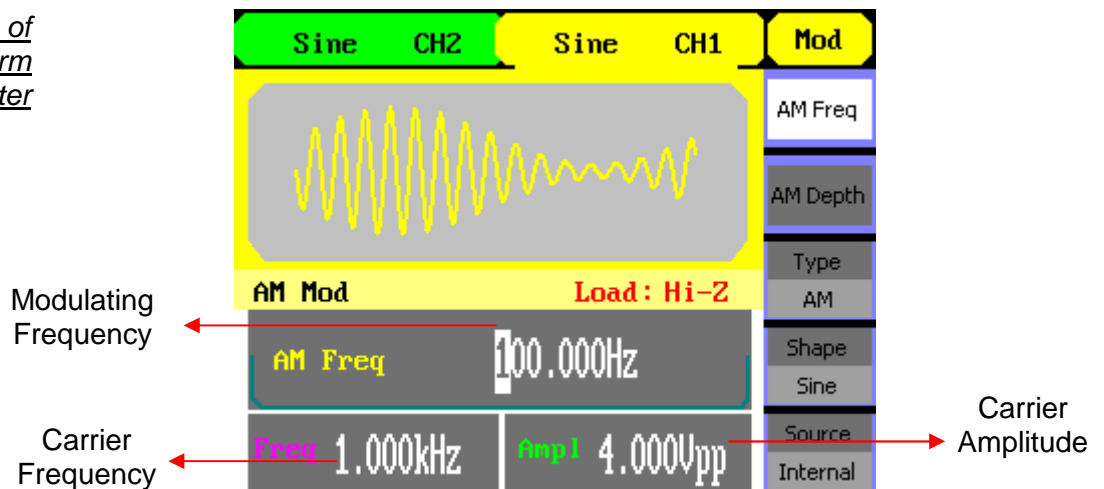
Carrier Amplitude

Functional Description (contd.)

AM

The modulated waveform consists of two parts: the carrier waveform and the modulating waveform. In AM, the amplitude of the carrier waveform varies with the instantaneous voltage of the modulating waveform.

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

Function Menu	Settings	Explanation
AM Freq		Set the modulating waveform frequency. Frequency range: 2mHz~20kHz (internal source only).
AM Depth		Set the amplitude range.
Type	AM	amplitude modulation.
Shape	Sine Square Triangle UpRamp DnRamp Noise Arb	Choose the modulating waveform. To change the carrier waveform parameter, press Sine, Square etc.
Source	Internal	The source is internal
	External	The source is external. Use the [Modulation In] connector in the rear panel.

☞ *Modulation Depth*

The amplitude range (also called "Percentage Modulation"). Modulation depth varies from 1 % to 120 %.

● *In the 0% modulation, the output amplitude is the half of the set one.*
● *In the 100% modulation the output amplitude is the same with the set one.*

For an external source, the depth of AM is controlled by the voltage level of the connector connected to the [Modulation In]. ± 6 V corresponds to the currently set depth 100 %.

Functional Description (contd.)

FM

The modulated waveform consists of two parts: the carrier waveform and the modulating waveform. In FM, the frequency of the carrier waveform varies with the instantaneous voltage of the modulating waveform.

Setting Interface of
FM Waveform
Parameter
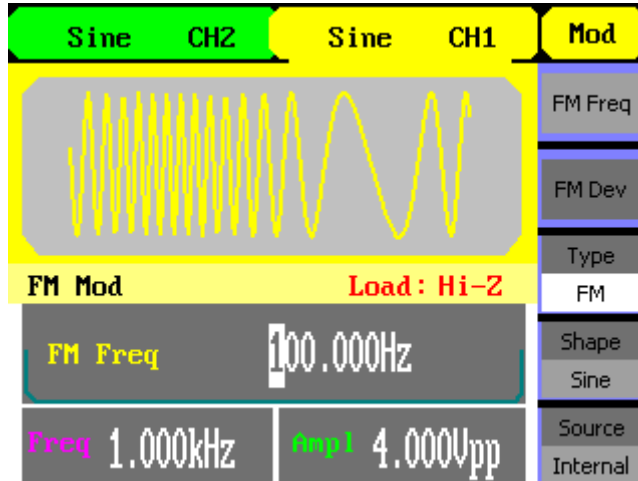
Press Mod → Type → FM , to enter the following menu.

Function Menu	Settings	Explanation
FM Freq		Set the modulating waveform frequency. Frequency range 2mHz~20kHz (internal source only).
FM Dev		Set the maximum frequency deviation
Type	FM	Frequency modulation
Shape	Sine Square Triangle UpRamp DnRamp Noise Arb	Choose the modulating waveform. To change the carrier waveform parameter, press Sine, Square etc.
Source	Internal	The source is internal
	External	The source is external. Use the [Modulation In] connector in the rear panel.

☞ *Frequency Deviation*
● *The deviation should be equal to or less than the carrier waveform frequency.*
● *The sum of the deviation and the carrier frequency should be equal to or less than maximum frequency of the selected function.*
● *For an external source, the deviation is controlled by the voltage level of the connector connected to the [Modulation In]. + 6 V corresponds to the selected deviation and -6V to the negative selected deviation.*

Functional Description (contd.)

ASK

ASK is a form of modulation that represents digital data as variations in the amplitude of a carrier wave. The amplitude of an analog carrier signal varies in accordance with the bit stream(modulating signal) keeping frequency and phase constant.

Setting Interface of ASK Waveform Parameter
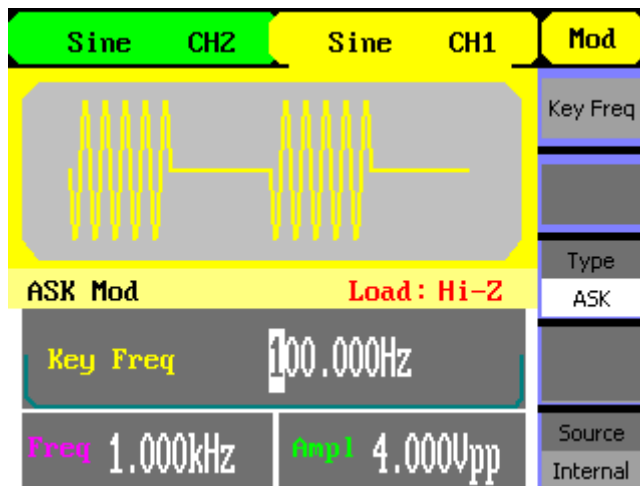
Press Mod → Type → ASK , to enter the following menu.

Function Menu	Settings	Explanation
Key Freq		Set the frequency at which the output amplitude shifts between the carrier amplitude and zero (internal modulation only): 2mHz~50kHz.
Type	ASK	Amplitude shift keying modulation.
Source	Internal	The source is internal
	External	The source is external, Use the [Ext Trig/Gate/Fsk/Burst] connector in the rear panel.

Functional Description (contd.)

FSK

The FSK Modulation is a modulation method, the output frequency of which switches between two the pre-set frequencies (carrier waveform frequency and the hop frequency). The frequency at which the output frequency switches is called the key frequency. The key freq is determined by the internal frequency generator or the signal voltage level offered by the Ext Trig/Gate/Fsk/Burst connector in the rear panel:

Setting Interface of FSK Waveform Parameter
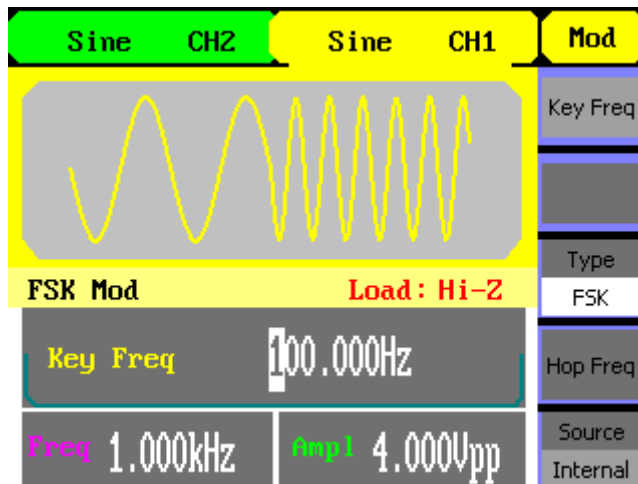
Press Mod → Type → FSK, to enter the following interface.

Function Menu	Settings	Explanation
Key Freq		Set the frequency at which the output frequency shifts between the carrier frequency and the hop frequency (internal modulation only): 2mHz~50KHz.
Type	FSK	Frequency shift keying modulation
Hop Freq		Set the hop frequency
Source	Internal	The source is internal.
	External	The source is external. Use the [Ext Trig/Gate/Fsk/Burst] connector in the rear panel.

Functional Description (contd.)

PM

The modulated waveform consists of two parts: the carrier waveform and the modulating waveform. In PM, the phase of the carrier waveform varies with the instantaneous voltage level of the modulating waveform.

Setting Interface of PM Waveform Parameter
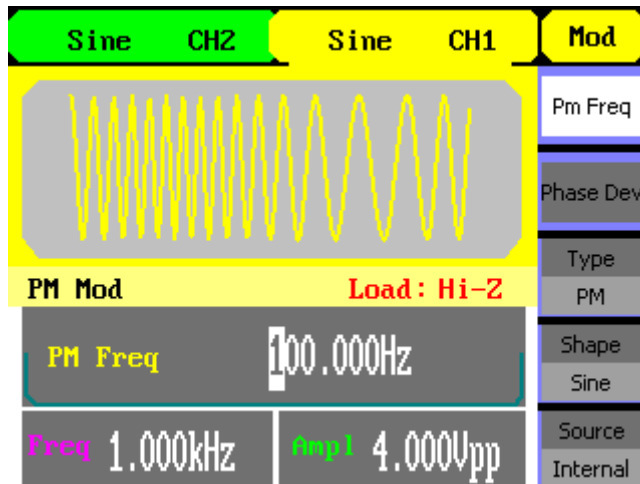
Press Mod → Type → PM, enter the following interface.

Function Menu	Settings	Explanation
PM Freq		Set the modulating waveform frequency. Frequency range: 2mHz~20kHz (internal source only).
Phase Dev		Set the phase deviation between the modulating waveform and the carrier waveform, ranging from 0°to 360°
Type	PM	Phase modulation
Shape	Sine Square Triangle UpRam DnRam Noise Arb	Choose the modulating waveform. To change the carrier waveform parameter, press Sine, Square etc.
Source	Internal	The source is internal.
	External	The source is external. Use the [Ext Trig/Gate/Fsk/Burst] connector in the rear panel.

Functional Description (contd.)

8. To Generate Sweep

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

Setting Interface of Sweep Waveform Parameter
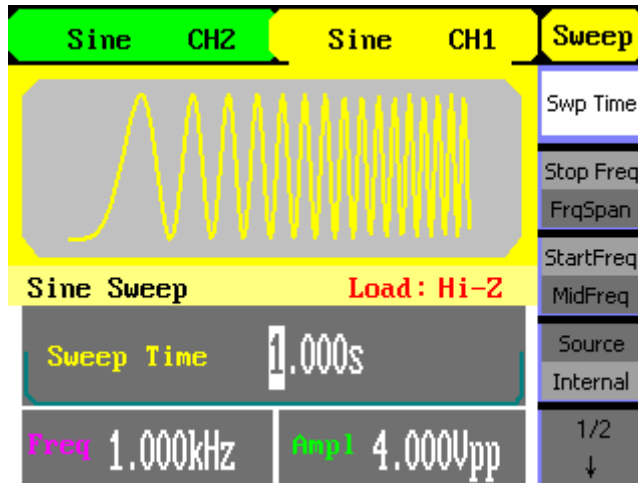
Sweep Press this button to enter the following menu. Set the waveform parameters by using the operation menu.

Function Menu	Settings	Explanation
Swp Time		Set the time span of the sweep in which the frequency changes from the start frequency to stop frequency.
Stop Freq Freq. Span		Set the stop frequency of the sweep; Set the frequency span of the sweep.
Start Freq Mid Freq		Set the start frequency of the sweep; Set the center frequency of the sweep.
Source	Internal	Choose internal source.
	External	Choose external source, use the [Ext Trig/Gate/Fsk/Burst] connector in the rear panel.
	Manual	Set the start and stop time by hand.

Functional Description (contd.)

Sweep Frequency Setting

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

Function Menu	Settings	Explanation
Trig Out	Open	Set signal triggered at rise edge;
	Off	Turn off trigger setting.
Linear/		Set the sweep with linear spacing;
Log		Set the sweep with logarithmic spacing.
Direct	↑	Sweep upward;
	↓	Sweep downward.

Functional Description (contd.)

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

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

Setting Interface of Burst Waveform Parameter
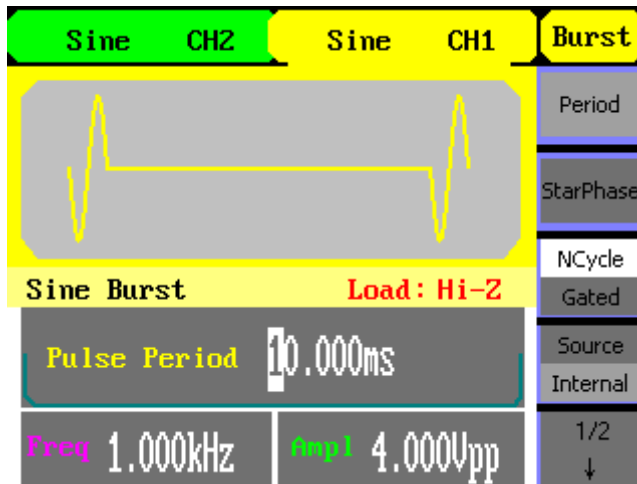
Set the N-Cycle Burst

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

Function Menu	Settings	Explanation
Period		Set the burst Period
Start Phase		Set the start phase of the burst
N Cycle		Use the N-Cycle mode
Gated		Use the Gated mode
Source	Internal	Choose internal source
	External	Choose external source, use the [EXT Trig/Gate/Fsk/Burst] connector in the rear panel
	Manual	Choose external source, set the start time by hand

Functional Description (contd.)

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

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

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

Set the N-Cycle Burst
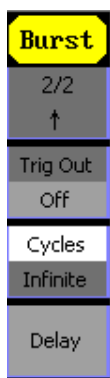
Function Menu	Settings	Explanation
Trig Out	⬏	Signal Triggered at Rise Edge
	⬎	Signal Triggered at Fall Edge
	Off	Turn off Trigger Setting
Cycles/		Set the number of the bursts in a N-Cycle
Infinite		Set the number of the bursts in a N-Cycle
		to be infinite
Delay		Set the delay time before the burst starts

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

If you choose Infinite, then a continuous waveform will be generated which will not stop until a trigger event happens.
- If needed, Burst Period will increase to cater to the specific number of cycles.
- For an infinite-cycle burst, external or manual trigger is needed to activate burst.

Delay   Set the time delay between the trigger input and the start of the N-Cycle burst. The minimum delay is 240ns.

Set the Gated Burst   Press Burst → Gated, to enter the following interface.

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

Functional Description (contd.)

10. To Store and Recall

Store

Press this button to enter the following interface. You can save or recall the state or data documentation inside the generator. The status file and data file on the U Disk are also allowed to rebuild or delete. File names can only be English.

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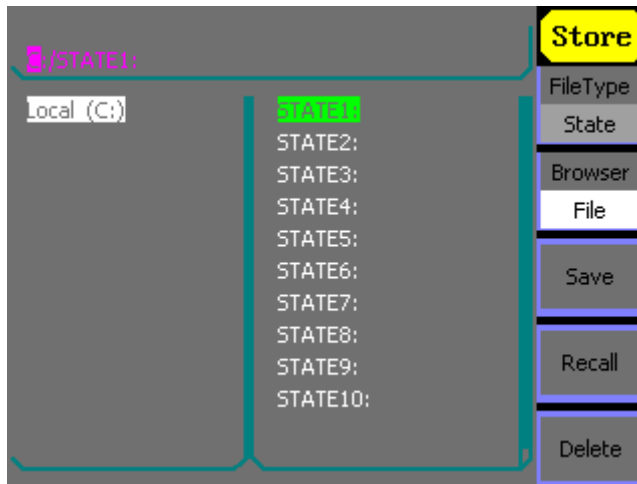
	Function Menu	Settings	Explanation
	File Type	State	The setting of the generator;
		Data	Arbitrary waveform file;
		All File	All kinds of files.
	Browser	Path	Shift between the path;
		Directory	Directory and file.
		File	
	Save		Save the waveform to the appointed place.
	Recall		Recall the waveform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

About the browser

The directory selection shift is done by the direction keys. In the directory mode, pressing the right key will open the lower directory while the left key will fold the directory. Up and down key are used to shift between the directories; in the Path mode, right key stands for the lower directory, left key upper, up key route, and down key the lowest or the stroll bar between the files.

Functional Description (contd.)

To Save the
Instrument State

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

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

1. Choose the file type to store

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

2. Choose the location of the file.

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

3. Name the file and save it

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

To Save Data

Users are allowed to store data document in any of the 10 non-volatile memories. If the place is already occupied, new document will cover the old one. The procedures for data storage are given as followed:

1. Choose the file type to store

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

2. Choose the location of the file.

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

3. Name the file and save

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

To Use USB
Storage

As is shown hereafter, the storage location is divided into: The internal storage Local(C :) and the U Disk storage U Disk (A :). At the left side of the front panel, there is a USB interface. When a USB storage is connected, the storage menu will show "Mobile Disk (A:)". Otherwise, the default location is the internal location Local(C :).

Functional Description (contd.)

To Use the USB Storage

1. Install the Mobile Disk

   Insert the Mobile Disk into the USB interface on the front panel, and the screen will show "Detect a Mobile Disk", and storage menu will show "Mobile Disk (A :)"

2. Choose the Mobile Disk

   Press Browser → Directory, move the cursor with the up or down direction key to select "Mobile Disk (A :)". Press the right key to open the lower directory, use the up and down direction key to choose the file "SDG1000". Use the right key to open the lower directory, and up and down key to select the file "Workspace". Input the file name and save.

3. Remove the Mobile Disk

   Remove the Mobile Disk from the interface. The system will inform you "The Mobile Disk is removed", and the "Mobile Disk (A :)" in the storage menu will disappear.

☞ **Mobile Disk can only be U Disk; portable hard disk is not supported.**

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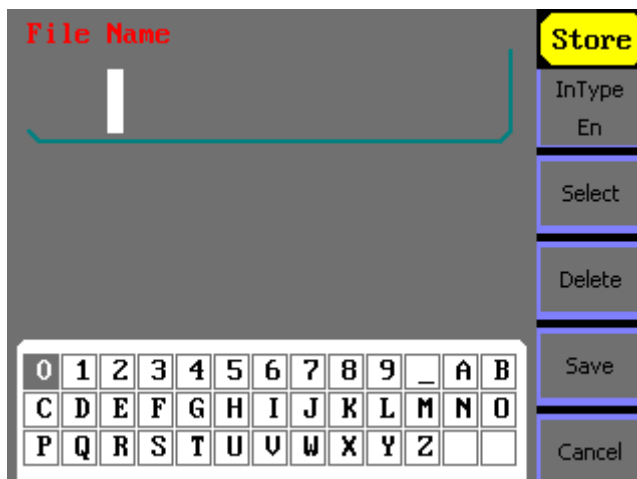
Functional Description (contd.)

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

English Input   The English input interface is as shown below ; to save a file named "NEWFILE", follow the steps :

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

(2) Input the file name" NEWFILE".

Use the Knob to adjust the cursor's horizontal position and the up and down key to adjust the vertical position. Select the Character "N" and press Select. Repeat this until you have inputted "NEWFILE".

(3) Edit the File Name

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

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

Functional Description (contd.)

11. To Set the Utility Function

With the Utility Function, you can set the parameters of the generator such as: DC On/Off, Sync On/Off, Output Parameter, Interface Parameter, System Setting and Testing Parameter. The DC switch offers the options of DC output or Arbitrary Waveform Output. Sync Switch offers the option to choose the Sync Signal or not. Output Setting provides the parameter setting for Load/Impedance and Normal/Inverse. The System Setting provides the setting for Language, Display, Beep, Screen Guard, Format, Power System Configure and default setting; Test provides the self-testing and calibration function.

Press this button, to enter the Utility Menu. Its functions are listed below
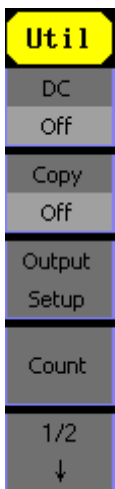
Function Menu	Settings	Explanation
DC	On	Set the output waveform to be DC
	Off	Set the output waveform to be arbitrary.
Copy	On	Copy settings of the source channel to the other's.
	Off	Set the copy function disabled
Output Setup		Set the output parameter
Count		Frequency counter
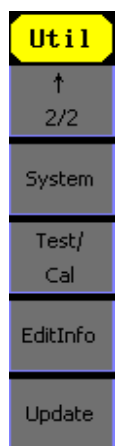
Function Menu	Settings	Explanation
System		Set the system configuration
Test/Cal		Test and calibrate the instrument
Edit Info		Information of the system
Update		Update function

Functional Description (contd.)

To Set the DC Output

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

DC Setting Interface
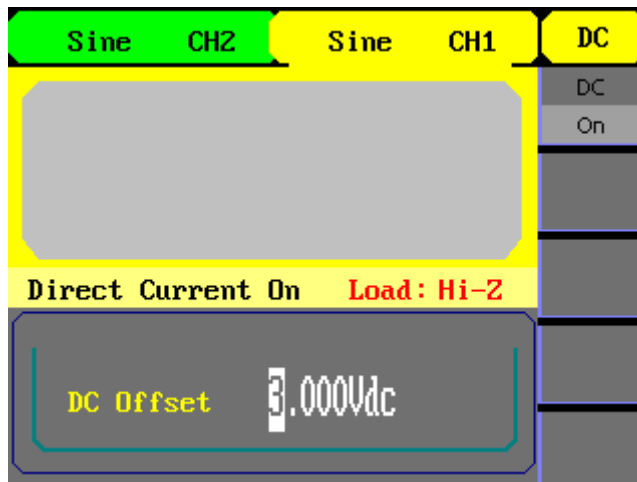
DC Offset

Set the DC voltage level.

To Shift into the Arbitrary Waveform Output

1. Press Utility → DC → DC Off, to close DC output and return to arbitrary waveform output.

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

To copy the settings

Press Utility → Copy → On, to copy the settings to the other's channel.

To Set Output Parameter

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

Functional Description (contd.)

	Function Menu	Settings	Explanation
	Load		Set the load connected to the Output Connector;
	High Z		Set the load connected to the Output Connector to be High Z.
	Normal		Normal output;
	Invert		Inverse output.
	Sync	On	Open Sync output;
		Off	Close Sync output.
	Done		Finish operation.

1. To Set the Output Load

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

Step for setting the load:

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

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

Set the Output Load
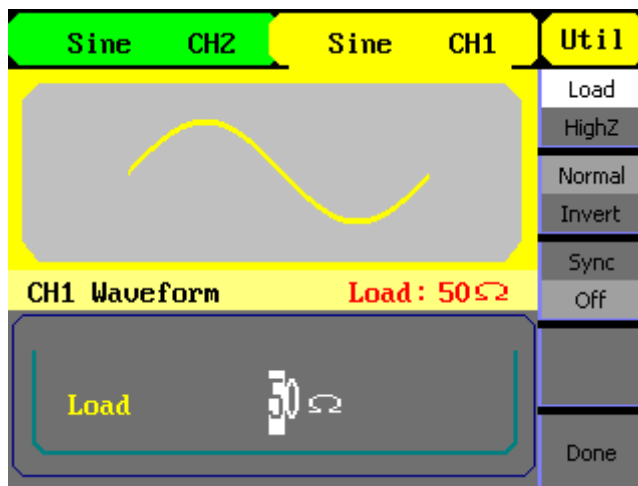
Functional Description (contd.)

2. To Set the Invert Waveform

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

3.To Set the Sync Output

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

- In the default setting, the Sync signal should be connected to the [Sync] connector (activated). When the Sync Signal is disabled, the output voltage of the [Sync] connector is level low.

- In the Inverse Mode, the Waveform that corresponds to the Sync Signal does not inverse.

- The Sync Signal is a Pulse Signal with fixed positive pulse width, which is more than 50ns.

- For non-modulated waveform, the Sync Signal reference is the carrier..

- For internal modulating AM, FM and PM, the Sync signal reference is the modulated signal (not the carrier signal).

- For ASK and FSK, the Sync Signal Reference is the keying Frequency.

- For a Sweep, when the sweep starts, the Sync Signal becomes TTL Level High. The Sync frequency equals the specific Sweep time.

- For the Burst, when the burst starts, the Sync Signal is Level High.

For the External Gated Burst, the Sync Signal follows the External Gated Signal.

To measure the frequency

The generators have included a frequency counter which could measure frequency from 100mHZ to 200MHZ.

Press Utility → Count, to enter the following interface.

Functional Description (contd.)

*Menu Explanations
of Frequency
Counter*

Function Menu	Explanation
Freq	Measure frequency.
Period	Measure period.
Duty/	Measure duty.
TrigLev	Set the trigger level voltage.
PWidth/	Measure positive width;
NWidth	Measure negative width.
Setup	Set the count configuration.

*Menu Explanations
of Setup*

Function Menu	Settings	Explanation
Mode	DC	Set the coupling mode to DC;
	AC	Set the coupling mode to AC.
Default		Set count settings to default.
HFR	On	Open the high frequency rejection filter.
	Off	Close the high frequency rejection filter.

To Set the System

Press Utility → System , to enter the following interface.

*Menu Explanations
of System Setup*

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

Functional Description (contd.)
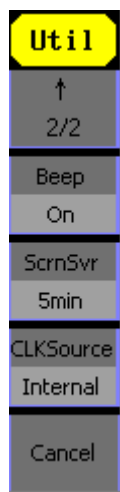
Function Menu	Settings	Explanation
Beep	On	Open beep;
	Off	Close beep.
ScrnSvr	1min	Activate the screen saver program. screen saver will be on if no action is taken within the time that you have selected. Press any button the resume.
	5min	
	15min	
	30min	
	1hour	
	2hour	
	5hour	
	Off	Deactivate the screen saver program.
Clock	Internal	Choose the system clock source.
	External	

Power On Choose the configuration setting when the machine is powered.

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

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

Functional Description (contd.)

1. Set the Format

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

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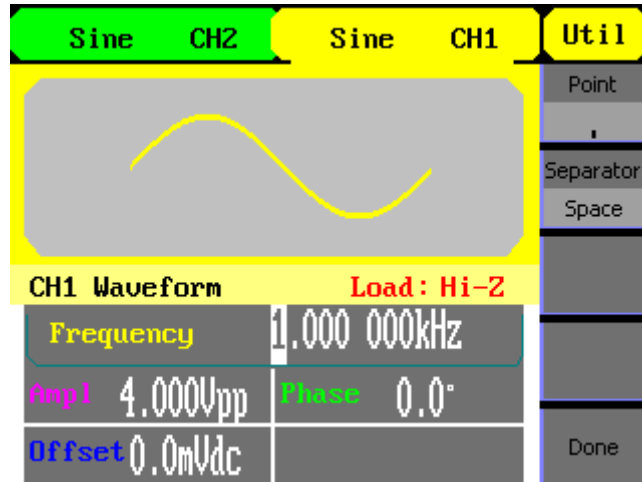
Function Menu	Settings	Explanation
Point	. ,	Using dot to represent point; Using comma to represent point.
Separator	On Off Space	Enable the Separator; Close the Separator; Use Space to separate.

Functional Description (contd.)

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

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

Frequency   1,000,000kHz

(2) ⬧ as point, press → Separator → On, the example is as followed:

Frequency   1,000.000kHz

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

Frequency   1.000000kHz

(4) ⬧ as point, press Separator → Off, the example is as followed:

Frequency   1,000000kHz

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

Frequency   1.000 000kHz

(6) ⬧ as point, press Separator → Space, the example is as followed:

Frequency   1,000 000kHz

Functional Description (contd.)

2. Language Setup

The generators offer one language (English).

3. To Return to Default Setting

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

Factory Default Setting

Output	Default
Function	Sine Wave
Frequency	1kHz
Amplitude/Offset	4Vpp/0Vdc
Phase	0°
Terminals	High Z

Modulation	Default
Carrier	1kHz Sine Wave
Modulating	100Hz Sine Wave
AM Depth	100□
FM Deviation	500Hz
Key Freq	100Hz
Key Freq	100Hz
FSK Hop Frequency	1MHz
Phase Deviation	180°

Sweep	Default
Start/Stop Frequency	100Hz/1.9kHz
Sweep Time	1S
Trig Out	Off
Mode	Linear
Direction	↑

Burst	Default
Period	10ms
Phase	0°
Count	1Cycle
Trig	Off

Trigger	Default
Source	Internal

Functional Description (contd.)

12. Test/Cal

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

*Test/Cal function
Menu*
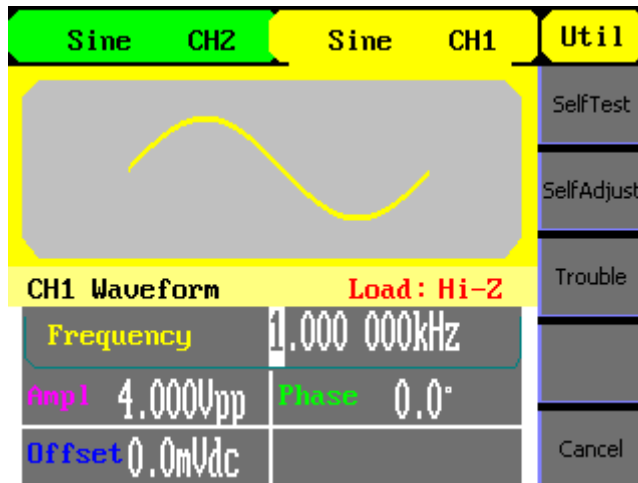
*Menu Explanations
of Test Setting*

Function Menu	Explain
Self -Test	Perform system self-test

*Menu Explanations
of Self Test*

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

Function/Arbitrary Waveform Generators

Functional Description (contd.)

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

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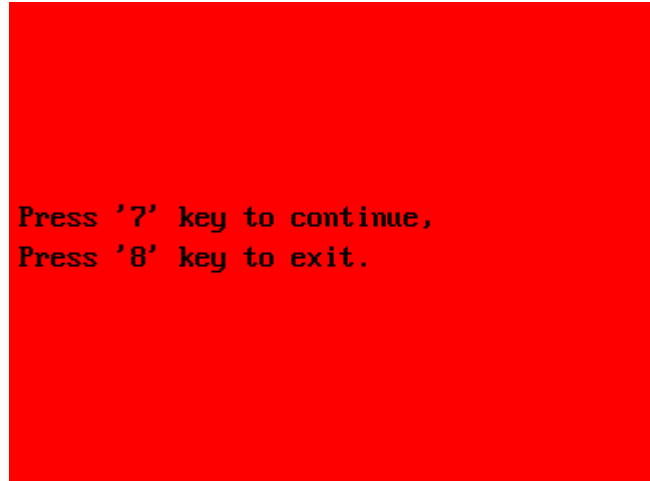
2. Key Test   Select "keyboard Test" to enter the keyboard test interface, the on-screen lathy rectangle shapes represent the front panel keys. The shapes with two arrows beside them represent the front panel knobs. Test all keys and knobs and you should also verify that all the backlit buttons illuminate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

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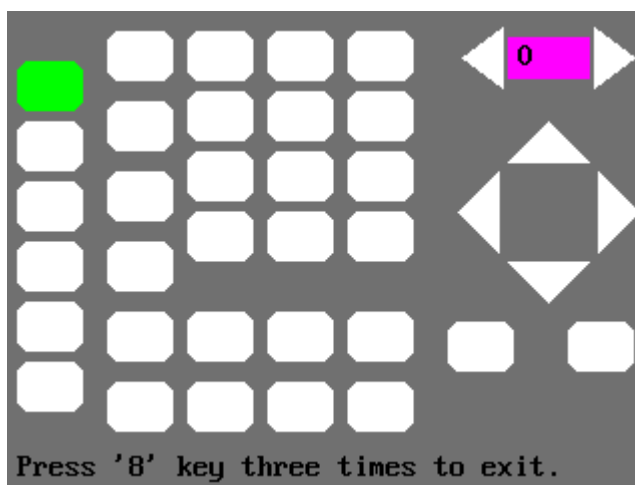
Functional Description (contd.)

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

Led Test Interface
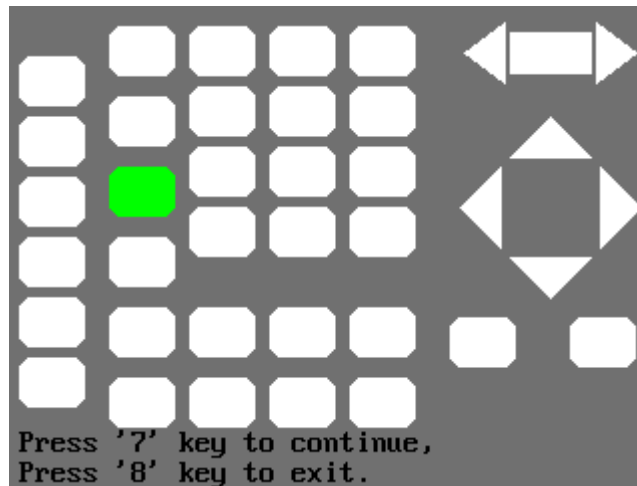
13. Edit Information

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

Edit Info Interface
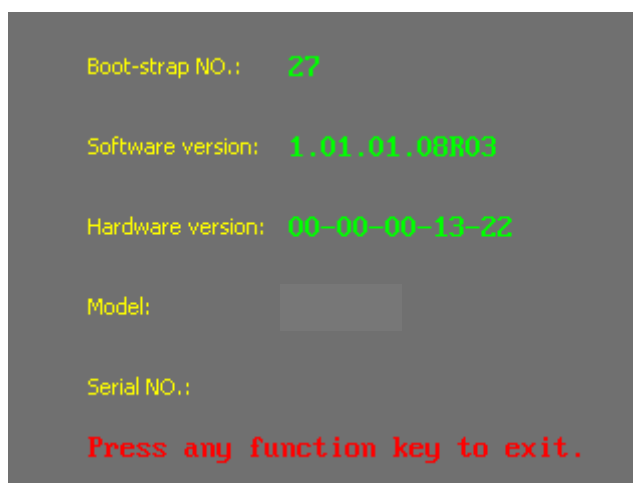
Functional Description (contd.)

14. Updating Firmware

■ Using USB flash drive update firmware

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

1. Insert the USB flash drive containing the file. ADSs into the USB connector on the front panel of the generator.

2. Press the "UTIL" button to access the "UTILITY menu".

3. Select the button (next page) 2 / 2.

4. Press the select "Update" menu.

5. Select the file. ADS to update and press "RECALL" and restart the instrument.

☞ *Don't cut off the power during product is being updating.*

15. How to use the Built-in Help System

Press « Help » to enter the following insterface :
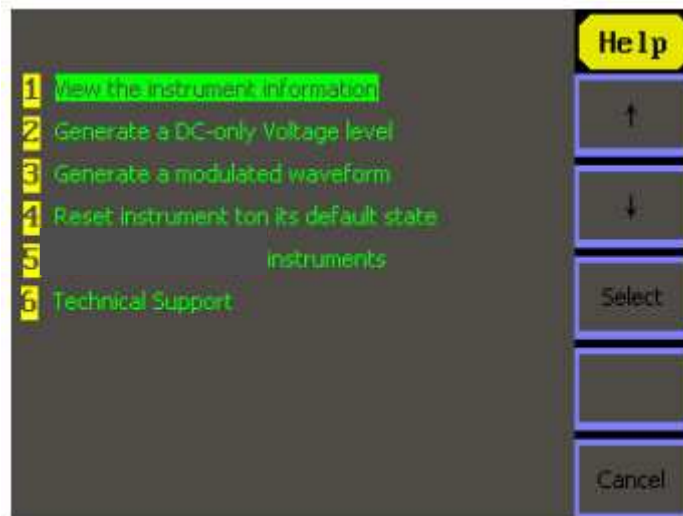
Function Menu	Explain
↑	Cursor upward to select.
↓	Cursor downward to select.
Select	Select to read the information.

Applications

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

> ➢ **Steps:**

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

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

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

When the frequency, amplitude and offset are set, the wave generated is shown below :

Sine Waveform
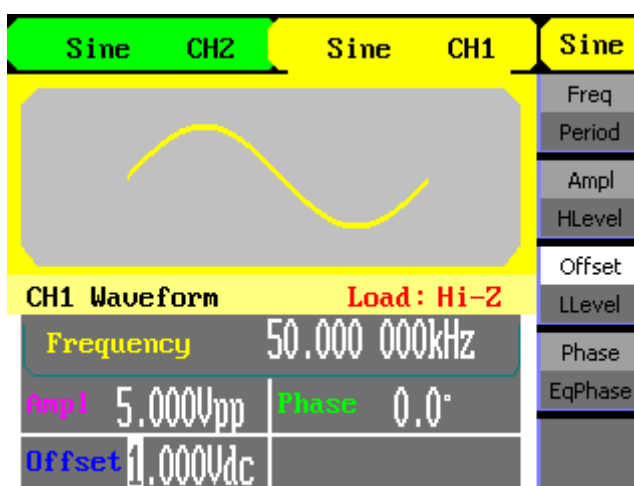
Applications (contd.)

2. Generate a Square Wave

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

➢ **Steps:**

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

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

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

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

When the frequency, amplitude, offset and duty cycle are set, the wave generated is shown below :

Square Waveform
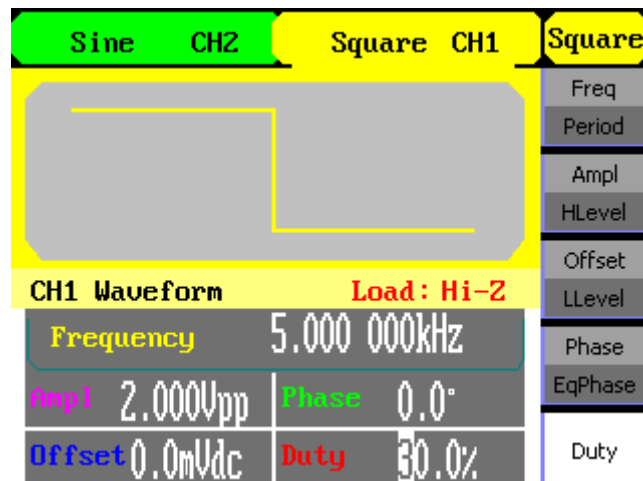
Applications (contd.)

3. Generate a Ramp Wave

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

> ➢ **Steps:**

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

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

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

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

- Set the symmetry
1. Press Symmetry to choose Symmetry which will display in white color.

2. Input "30" from the keyboard and choose the unit "30%". The symmetry is set to be 30%.

When the period, amplitude, offset, phase and symmetry are set, the wave generated is shown below :
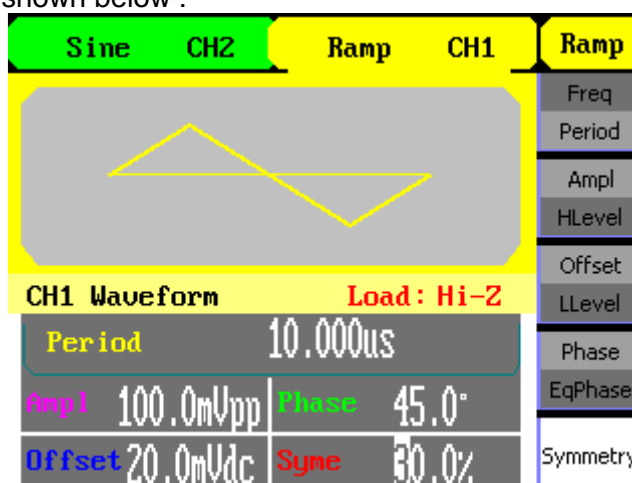
Applications (contd.)

4. Generate a Pulse Wave

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

➢ **Steps:**

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

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

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

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

● Set the Delay
1. Press Delay and choose Delay which will display in white color.
2. Input "20" from the keyboard and choose the unit "ns". The delay is set to be 20ns.

When the frequency, high level, low level, pulse width and delay are set, the wave generated is shown below :
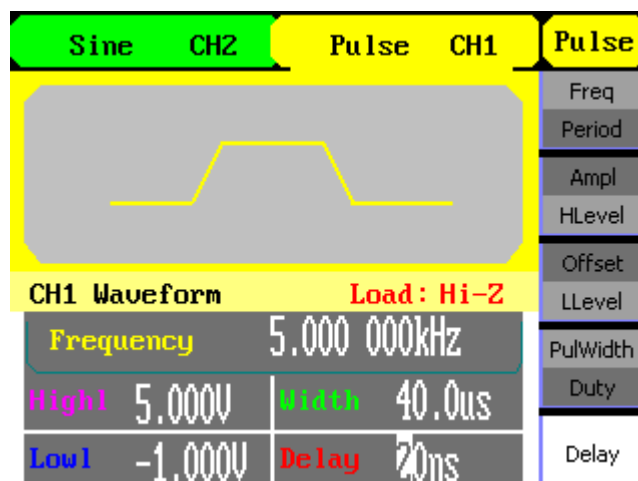
Applications (contd.)

5. Generate a Noise Wave

Generate a noise waveform with 50mVpp amplitude and 5mVdc offset.

> **Steps:**

- Set the Amplitude
1. Press Noise →Ampl and choose the Ampl which will display in white color.
2. Input "50" from the keyboard and choose the unit "mVpp". The amplitude is set to be 50 mVpp.

- Set the Offset
1. Press Offset to choose Offset which will display in white color.
2. Input "5" from the keyboard and choose the unit "mVdc". The offset is set to be 10mVdc.

When the amplitude and offset are set, the wave generated is shown below:
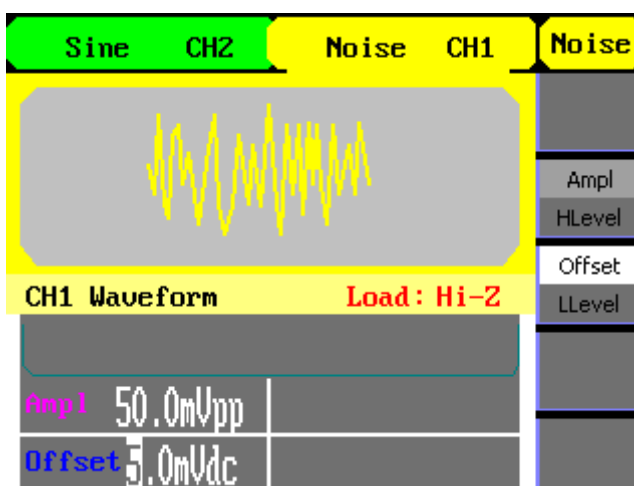
Applications (contd.)

6. Generate an Arbitrary Wave

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

➢ **Steps:**

● Set the type of the arbitrary waveform.
1. Press Arb →(1/2↓) →LoadWform to choose the built-in waveform..
2. Press BuiltIn→Math. There are sixteen math arbitrary waveforms.
3. Choose Sinc, and press Choice to enter Arb Main Menu.

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

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

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

When the arbitrary waveform's type, frequency, amplitude and offset are set, the wave generated is shown below :

Sine CH2	Arb CH1	Arb
		Freq
		Period
		Ampl
		HLevel
		Offset
CH1 Waveform	Load: Hi-Z	LLevel
Frequency	5.000 000MHz	Phase
Ampl 2.000Vrm	Phase 0.0°	EqPhase
Offset 0.0mVdc		1/2 ↓
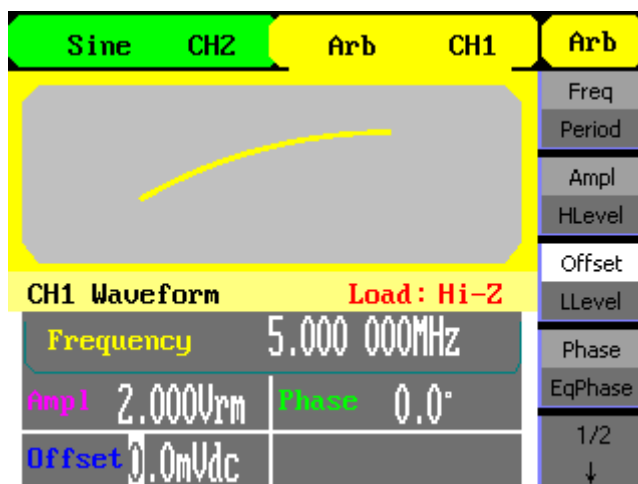
Applications (contd.)

7. Generate a Sweep Linear Wave

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

➢ **Steps:**

● Set the sweep function:
  Press Sine, and choose the sine waveform as the sweep function.

  The default setting of the source is internal.

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

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

● Set the start frequency
  Press Start Freq, Input "100" from the keyboard and choose the unit "Hz" to set start freq 100Hz.

● Set the end frequency
  Press End Freq, Input "10" from the keyboard and choose the unit "kHz" to set stop freq 10 kHz.

● Set the Sweep Mode
  Press (1/2↓) → Linear, and choose Linear.

When all parameters above are set, the linear sweep wave generated is show below :
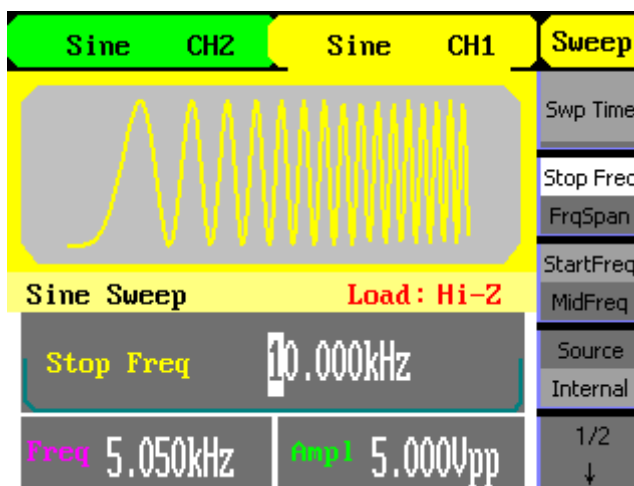
Applications (contd.)

8. Generate a Burst Wave

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

> **Steps** :

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

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

- Set the sweep mode.
  Press Burst → N Cycle , choose N Cycle Mode.

- Set the burst period
  Press Period, input "3" from the keyboard and choose the unit "ms" to set the period 3ms.

- Set the start phase
  Press Start Phase, input "3" from the keyboard and choose the unit "°" to set the start phase 0°.

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

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

When all parameters above are set, the wave generated is shown below:
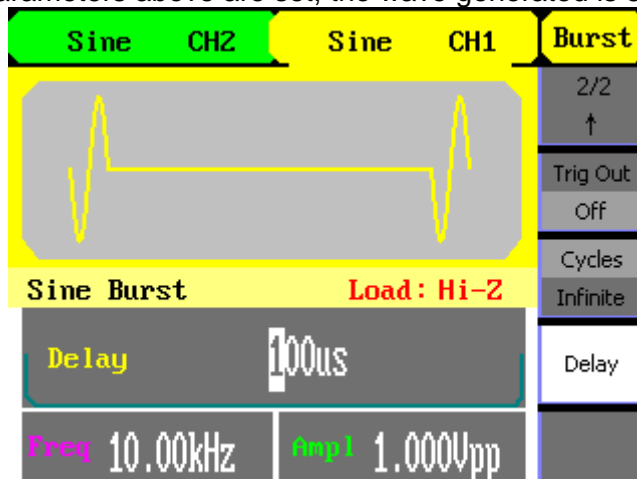
Applications (contd.)

**9. Generate an AM
Wave**

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

➢ **Steps:**

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

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

When all parameters above are set, the wave generated is shown below :
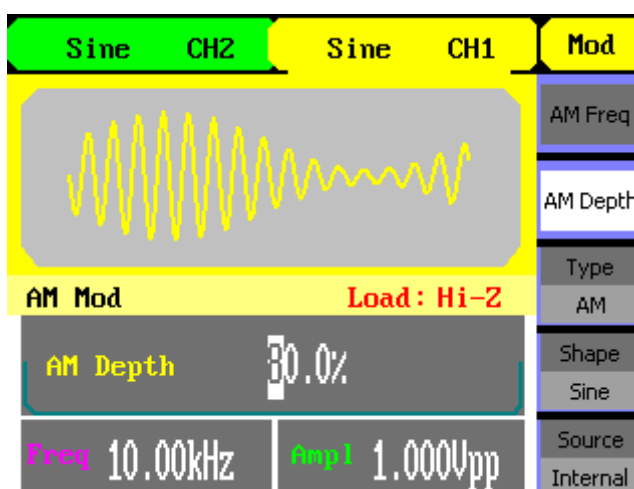
Applications (contd.)

10. Generate a FM Wave

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

➢ **Steps:**

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

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

When all parameters above are set, the wave generated is shown below :

Applications (contd.)

11. Generate a PM Wave

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

➢ **Steps:**

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

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

When all parameters above are set, the wave generated is shown below :
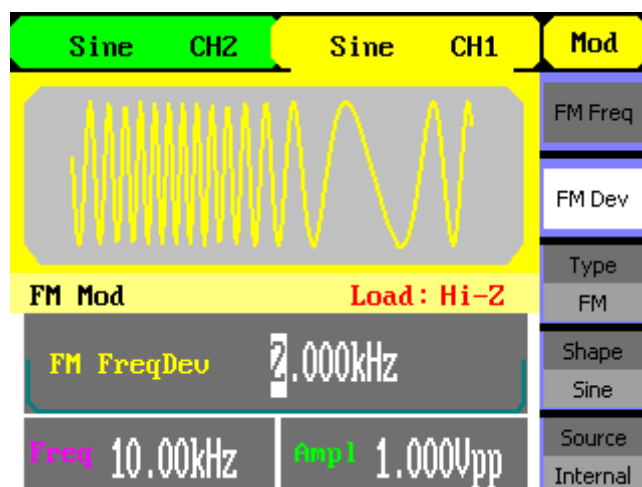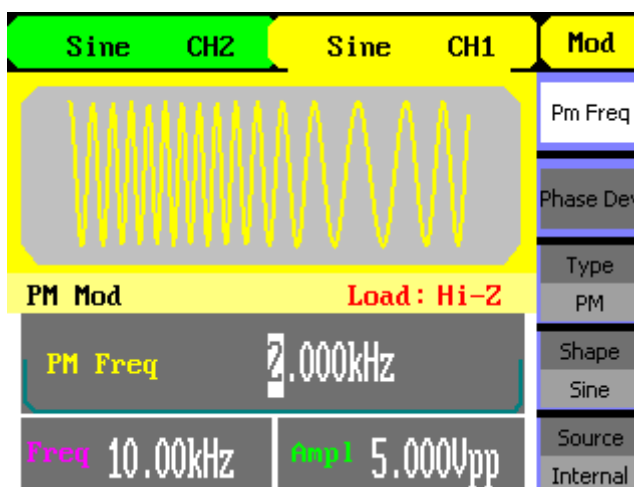
Applications (contd.)

12. Generate a FSK Wave

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

➢ **Steps:**

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

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

When all parameters above are set, the wave generated is shown below :
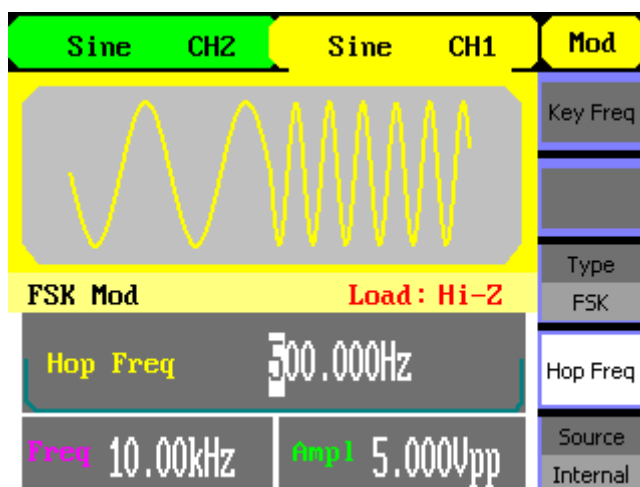
Applications (contd.)

13. Generate an ASK Wave

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

> ➤ **Steps:**

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

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

When all parameters above are set, the wave generated is shown :
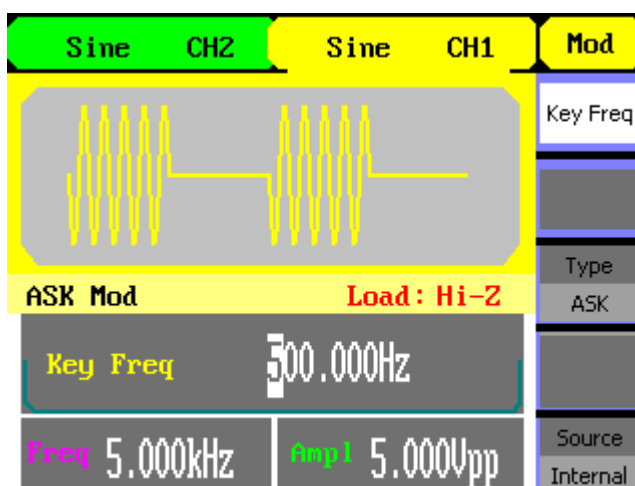
Technical Specifications

To satisfy these specifications, the following conditions must be met first:

1. The instruments have been operating continuously for more than 30 minutes within specified operating temperature range (18℃ ~ 28℃).
2. You must perform the Self Cal operation if the operating temperature changes by more than 5℃.

☞ *All specifications are guaranteed except noted "typical value".*

Models	GX 1025	GX 1050
Max. output frequency	25 MHz	50 MHz
Output channels	2	
Sample rate	125 MSa/s	
Arbitrary waveform length	16 kpts	
Frequency resolution	1 µHz	
vertical resolution	14 bits	
Waveform	Sine, Square, Triangular, Pulse, Gaussian Noise 48 types of arbitrary waveform	
Sine	1 µHz ~ 25 MHz	1 µHz ~ 50 MHz
Square	1 µHz ~ 25 MHz	1 µHz ~ 25 MHz
Pulse	500 µHz ~ 5 MHz	500 µHz ~ 5 MHz
Ramp/Triangular	1 µHz ~ 300 kHz	1 µHz ~ 300 kHz
Gaussian white noise	25 MHz (-3 dB)	50 MHz (-3 dB)
Arbitrary waveform	1 µHz ~ 5 MHz	1 µHz ~ 5 MHz
Modulation	AM / FM / PM / FSK / ASK / PWM / Sweep / Burst	
Amplitude range	2 mVpp ~ 10 Vpp (50 Ω) 4 mVpp ~ 20 Vpp high impedance	
Other functions	Frequency counter: max. frequency 200 MHz	
Standard interface	USB Host & Device	
Optional interface	GPIB (IEEE-488)	
Dimension	W x H x D = 229 mm x 105 mm x 281 mm	

Technical Specifications (contd.)

Frequency Specifications

Waveform	GX 1025	GX 1050
Sine	1 µHz ~ 25 MHz	1 µHz ~ 50 MHz
Square	1 µHz ~ 25 MHz	1 µHz ~ 25 MHz
Pulse	500 µHz ~ 10 MHz	500 µHz ~ 10 MHz
Ramp/Triangular	1 µHz ~ 300 kHz	1 µHz ~ 300 kHz
Gaussian white noise	25 MHz (-3 dB)	50 MHz (-3 dB)
Arbitrary waveform	1 µHz ~ 5 MHz	1 µHz ~ 5 MHz
Resolution	1 µHz	
Accuracy	within 1 year ± 100 ppm	
Temperature coefficient	< 5 ppm / °C	

Sine Wave Spectrum Purity

Harmonic Distortion	CH1		CH2	
	≤ 1 Vpp	> 1 Vpp	≤ 1 Vpp	> 1 Vpp
DC - 1 MHz	-55 dBc	-45 dBc	-55 dBc	-45 dBc
1 MHz - 5 MHz	-55 dBc	-40 dBc	-55 dBc	-40 dBc
5 MHz - 25 MHz	-50 dBc	-35 dBc	-50 dBc	-35 dBc
Total harmonic waveform distortion	DC ~ 20 kHz 1 Vpp < 0.2 %			
Spurious signal non-harmonic	DC ~ 1 MHz < -70 dBc 1 MHz ~ 10 MHz < -70 dBc + 6 dB / spectrum phase			
Phase noise	10 kHz Offset -108 dBc / Hz typical value			

Technical Specifications (contd.)

Square Wave

Rise / fall time 10 % ~ 90 % typical value 1 kHz 1 Vpp	< 12 ns
Overshoot	< 5 % typical value 1 kHz 1 Vpp
Duty Cycle	
1 µHz ~ 10 MHz	20 % ~ 80 %
10 MHz excl. ~ 20 MHz	40 % ~ 60 %
20 MHz excl. ~ 25 MHz	50 %
Asymmetric 50 % Duty Cycle	Cycle 1% + 20 ns typical value 1 kHz 1 Vpp
Jitter	6 ns + cycle 0.1% typical value 1 kHz 1 Vpp

Triangle / Ramp Wave

Linearity	< Peak value output 0.1 % typical value 1 kHz 1 Vpp, symmetric 100 %
Symmetry	0 % to 100 %

Pulse Wave Specification

Pulse width	max. 2000s min. 20 ns min. resolution 1 ns
Rise/Fall time 10 % ~ 90 % typical value 1 kHz 1 Vpp	same as square waveform
Overshoot	< 5 %
Jitter	6 ns + cycle 100 ppm

Arbitrary Waveform Specification

Waveform length	16 kpts
Vertical resolution	14 bits include symbol
Sample rate	125 MSa/s
Min. Rise / Fall time	20 ns typical value
Jitter RMS	6 ns + 30 ppm typical value
Storage in non-volatile RAM memory	10 waveforms

Technical Specifications (contd.)

Output Specification

Output	CH 1	CH 2
Amplitude	2 mVpp ~ 10 Vpp 50 Ohm ≤ 10 MHz 2 mVpp ~ 5 Vpp 50 Ohm > 10 MHz 4 mVpp ~ 20 Vpp high impedance ≤ 10 MHz 4 mVpp ~ 10 Vpp high impedance > 10 MHz	2 mVpp ~ 3 Vpp 50 Ohm 4 mVpp ~ 6 Vpp high impedance
Vertical accuracy	≤ ± (5 % + 1 mVpp) of setting value	
Amplitude flatness (compared to 100 kHz sine waveform 5 Vpp)	0.1 dB for f < 100 kHz	
	0.15 dB for 100 kHz ≤ f ≤ 5 MHz	
	0.3 dB for f > 5 MHz	

DC Offset

Range DC	CH 1	CH 2
Range DC	5 V (50 Ohm) 10 V (high impedance)	1.5 V (50 Ohm) 3 V (high impedance)
Offset accuracy	≤ ± (5 % + 1 mV) setting offset value	≤ ± (5 % + 1 mV) setting offset value

Waveform Output

	CH 1	CH 2
Impedance	50 Ohm (typical value)	50 Ohm (typical value)
Protection	short-circuit protection	short-circuit protection

Technical Specifications (contd.)

Modulation

AM Modulation CH1 / CH2

Carrier	Sine, Square, Ramp, Arbitrary except DC
Source	Internal / External
Modulation waveform	Sine Square RAMP, Noise Arbitrary 2 mHz ~ 20 kHz
Modulation depth	0 % ~ 120 %

FM Modulation CH1 / CH2

Carrier	Sine, Square, Triangle, Arbitrary except DC	
Source	Internal / External	
Modulation waveform	Sine, Square, Ramp, Triangle, Gaussian Noise, Arbitrary 2 mHz ~ 20 kHz	
Frequency deviation	**GX 1025**	0 ~ 12.5 MHz
	GX 1050	0 ~ 25　 MHz

PM Modulation CH1 / CH2

Carrier	Sine, Square, Triangle, Arbitrary except DC
Source	Internal / External
Modulation waveform	Sine, Square, Ramp, Triangle, Gaussian Noise, Arbitrary 2 mHz ~ 20 kHz
Deviation	0 ~ 360 °

FSK Modulation CH1 / CH2

Carrier	Sine, Square, Triangle, Arbitrary except DC
Source	Internal / External
Modulation waveform	50 % duty square waveform 2 mHz ~ 50 kHz

ASK Modulation CH1 / CH2

Carrier	Sine, Square, Triangle, Arbitrary except DC
Source	Internal / External
Modulation waveform	50 % duty square waveform 2 mHz ~ 50 kHz

Technical Specifications (contd.)

Modulation (contd.)

PWM Modulation CH1 / CH2

Frequency	500 µHz ~ 20 kHz
Source	Internal / External
Modulation waveform	Sine, Square, Ramp, Triangle, Arbitrary (except DC)
External modulation amplitude	-6 ~ +6 V corresponding modulation depth 0 % ~ 100 %

Sweep CH1 / CH2

Carrier	Sine, Square, Ramp, Triangle, Arbitrary (except DC)
Type	linear / logarithmic
Direction	Up / down
Sweep time	1 ms ~ 500 s ± 0.1 %
Trigger source	Manual, external, internal

Burst CH1 / CH2

Waveform	Sine, Square, Ramp, Pulse, Arbitrary (except DC)
Type	Count 1 ~ 50,000 cycles infinite Gated
Start/Stop phrase	0° ~ 360°
Internal cycle	1 µs ~ 500 s ± 1%
Gated trigger	External trigger
Trigger source	Manual , External or Internal

Technical Specifications (contd.)

Rear Panel Connector

External modulation	± 6 Vpk = 100% modulation depth 5 kΩ input impedance
External trigger	TTL compatible

⚠ ***The external input voltage can't be over 12 Vpp, otherwise instrument gets damaged.***

Trigger Input

Voltage level input	TTL compatible
Slope	Up or down (optional)
Pulse width	> 100 ns
Input impedance	> 10 kΩ, DC coupling
Response time	Sweep < 500 µs typical value
Burst	< 500 ns typical value

Trigger Output

Voltage level	TTL compatible
Pulse width	> 400 ns typical value
Output impedance	50 Ω typical value
Max. frequency	1 MHz

SYNC Output

Voltage level	TTL compatible
Pulse width	> 50 ns typical value
Output impedance	50 Ω typical value
Max. frequency	2 MHz

Technical Specifications (contd.)

Frequency Counter

Measurement	Frequency, Cycle, Positive / negative pulse width, duty cycle	
Frequency range	Single Channel: 100 mHz ~ 200 MHz	
Frequency resolution	6 bits/s	
Voltage range and sensitivity	non-modulated signal	
Auto	1 Hz ~ 200 MHz 200 mVpp ~ 5 Vpp	
Manual	DC coupling	DC deviation range ± 1.5 V_{DC}
		100 mHz ~ 100 MHz 20 mVrms ~ ± 5 V_{AC+DC}
		100 MHz ~ 200 MHz 40 mVrms ~ ± 5 V_{AC+DC}
	AC coupling	1 Hz ~ 100 MHz 50 mVpp ~ ± 5 Vpp
		100 MHz ~ 200 MHz 100 mVpp ~ ± 5 Vpp
Pulse width and duty measurement	1 Hz ~ 10 MHz (100 mVpp ~ 10 Vpp)	
Input adjustment	Input impedance 1 MΩ	
	Coupling methods AC, DC	
	High-frequency inhibition High-frequency noise inhibition (HFR) open or close	
	Sensitivity 3 levels : low, middle, high	
Trigger method	Trigger voltage level range ± 3 V (0.1 ~ 100) %	
	Resolution 6 mV	

General Specifications

Display

Display type	3.5' TFT - LCD
Resolution	320 × RGB × 240
Contrast typical value	350:1
Backlight intensity (typical value)	300 cd/m^2

Power

Voltage	100 ~ 240 VAC$_{RMS}$ 45 ~ 440 Hz CATII
Consumption	< 30 W
Fuse	1 A / 250 V

Environment

Temperature	Operation 0℃ 40℃
	Storage -20℃ 60℃
Cooling method	natural cooling down
Temperature range	below + 35°C ≤ 90 % relative humidity
	+ 35°C ~ + 40°C ≤ 60 % relative humidity
Altitude	Operation: below 2000 m
	Storage: below 2000 m

Others

Dimension	Width	229 mm
	Height	105 mm
	Depth	281 mm
Weight	N.W.	2.8 kg
	G.W.	4.2 kg

IP protection	IP20
Calibration Cycle	1 year

Supply

Accessories

delivered with the instrument

- CD user's manual
- Certification
- CD inc. SX-GENE and USB Driver computer software system
- SX-GENE software and Driver USB available on Internet Site Support : http://www.chauvinarnoux.com/SUNSUPPORT/SUPPORT/page/pageSupportLog.asp
- Power cord that fits the standard of destination country
- USB cable

accessories

- Cable mains/EURO.1.5m elbowed.................................. AG0416
- Cable BNC-BAN (x 2) cable with rear connection AG1066-Z
- Cable L1 BNC.M-BNC.M (x 2) HX0106
- Adapter BNC.M-F4 (x 2) HX0107
- Adapter BNC.M-F4 (x 5) HA2002
- TE.BNC.M-BNC.F (x 3) blister HA2004-Z
- Extender BNC.F-BNC.F (x 3) HA2005

options

- ETHERNET Interface
- GPIB Interface