East Tester®

ET3325 Function/ Arbitrary Waveform Generator

User Manual

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Contents

Introduction to ET3325 Function/ Arbitrary Waveform Generator

ET3325 function/arbitrary waveform generator is equipped with direct digital synthesis (DDS) technology which enables output signal to be stable and accurate.

Instrument output channel sets CH1 channel output and CH2 channel output. CH1 channel is major output channel for output of all the following functions; CH2 channel is an auxiliary channel for output of basic waveform and arbitrary wave.

Key Features

- 3.5-inch 480×320TFT LCD with clear graphic interface
- Chinese / English menu available
- Press key for help and information
- File management supporting USB flash disk and local storage
- ET3325 output with the highest output frequency is ET3310 Model is 10MHz, ET3325 Model is 25MHz,ET3340 Model is 40MHz, ET3360 Model is 60MHz and ET 3370 Model is 70MHz.
- Sampling rate: 160MSa/S, vertical resolution: 12 bit and storage depth: 16k
- 5 basic waveforms and 32 arbitrary waveforms in-built
- Pulse wave output set in edge time
- Internal/external AM, FM, PM, ASK, FSK and PSK modulation function
- Output of linear/logarithmic frequency sweep and burst waveform
- Frequency meter of high precision of 200MHz
- With RS232 interface, USB Device, USB Host interface supporting USB flash disk storage
- Multi-functional arbitrary waveform editing software equipped

Product Model

has ET3360 models, namelyET3310, ET3325, ET3340, ET3360 and ET3370. The manual takes ET3340 as an example, in which specifications have covered all the functions and performances of ET3325.

1. Quick Start

1.1 Introduction to Front and Rear Panels

This section describes front and rear panels of for your quick understanding of function and usage.

Front panel includes liquid crystal, keys and output terminal and so on. Keys include: Function/mode, reusable keys, numeric keys and direction keys/knobs.

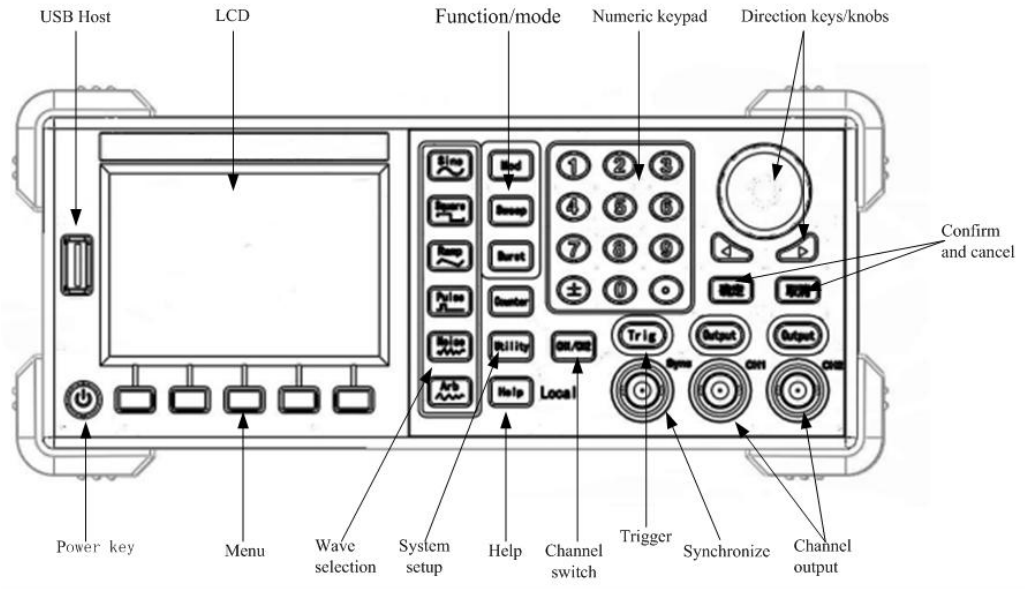


Figure 1-1 Front panel

The rear panel consists of input terminal, communication interface and power interface.

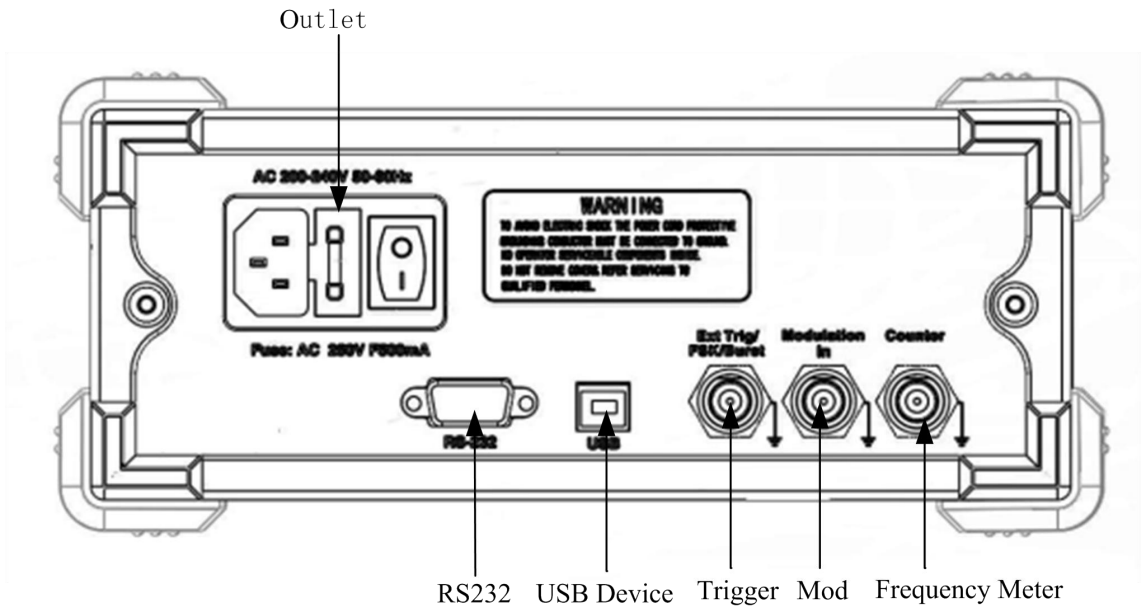


Figure 1-2 Rear Panel

1.2 Introduction to Interface

Basic operation interface is shown in Figure 1-3.

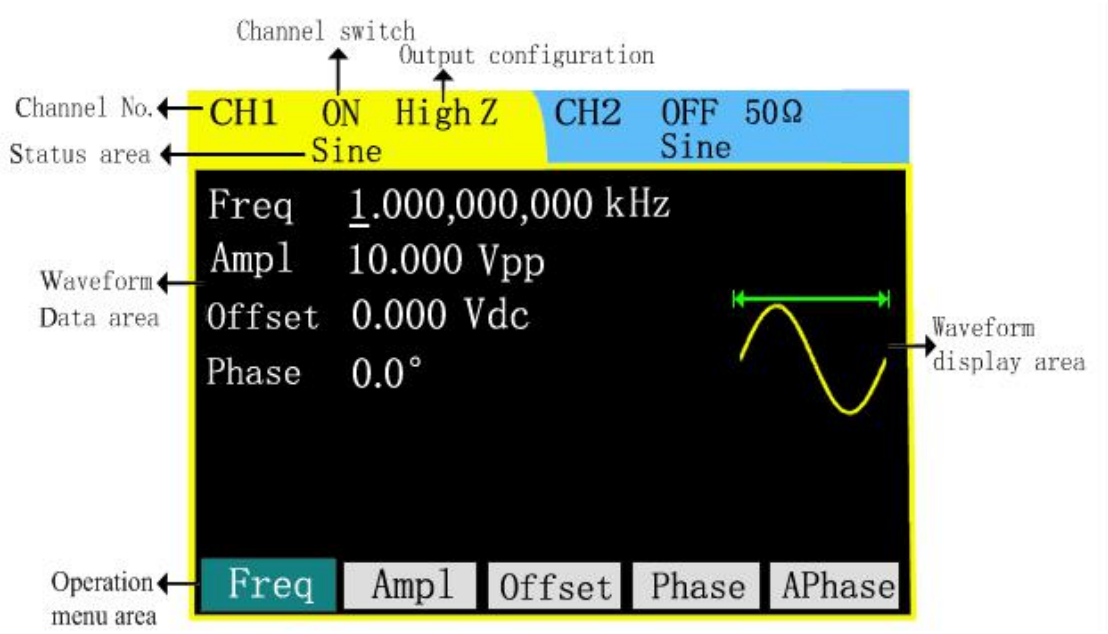
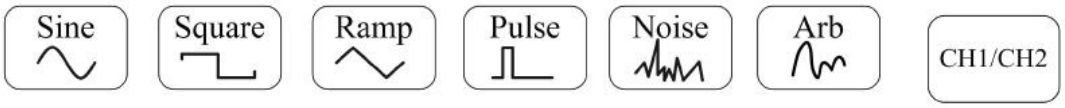


Figure 1-3 Interface

1.3 Waveform Setup

There is a series of keys with waveform displaying on the right of the operation panel, which are sine wave, square wave, ramp wave, pulse wave, noise wave and arbitrary wave. There is a common key as well: switch of CH1/CH2 channels.

The following routine will guide you gradually familiar with the setup of these keys.



Waveform keys Channel switch

Figure 1-4 Key Selection

1. Press 

, waveform display area will turn to sine signal and show Sine in the status area. Sine waves of different parameter values are accessible through the setup of frequency/cycle, amplitude/high-level, offset/low-level and phase.

2. Press 

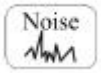
, waveform display area will turn to square signal and show Square in the status area. Square waves of different parameter values are accessible through the setup of frequency/cycle, amplitude/high level, offset/low level, duty cycle and phase.

3. Press 

, waveform display area will turn to ramp signal and show Ramp in the status area. Ramp waves of different parameter values are accessible through the setup of frequency/cycle, amplitude/high-level, offset/low-level, symmetry and phase.

4. Press 

, waveform display area will turn to pulse signal and show Pulse in the status area. Pulse waves of different parameter values are accessible through the setup of frequency/cycle, amplitude/high-level, offset/low-level, symmetry and rising/trailing edge.

5. Press 

, waveform display area will turn to noise signal and show Noise in the status area. Noise waves of different parameter values are accessible through the setup of amplitude/high level and offset/low level.

6. Press 

, waveform display area will turn to arbitrary signal and show Arb in the status area. Arbitrary waves of different parameter values are accessible through the setup of frequency/cycle, amplitude/high-level, offset/low-level and phase.

7. Press 

to switch channels. The selected channel is for parameter setup. Background color of liquid crystal changes in compliance with the switch of channels.

1.4 Output Setup

As shown in Figure 1-5, there are ET3325 Output keys at the bottom right of the front panel for channel output control andET3310 Trig key for trigger output. The following examples will offer you guidance on these functions.

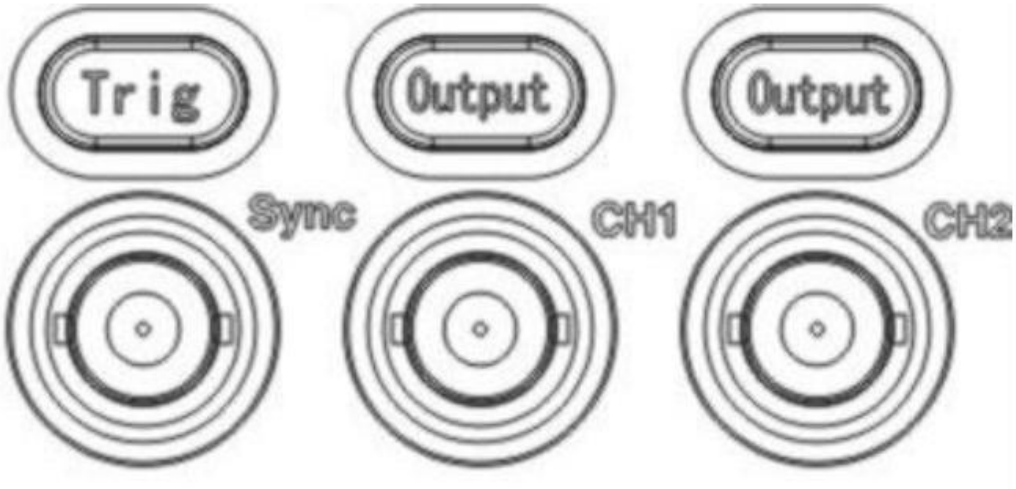


Figure 1-5 Channel Output

1. Press Output to start or forbid output signal of output connector in the front panel. The channel pressed Output displays ON and is lit.
2. When sweep and burst output, if Channel 1 is in output status and trigger is manual, trigger outputs signal for once if pressing the trigger key. For non-manual trigger, manual trigger would realized by pressing the trigger key.

1.5 Modulation/Frequency Sweep/Burst Output Setup

ET3340 keys on the right side of waveform are for the output of modulation, frequency sweep and burst respectively, which function is for Channel 1 only. The following specifications will offer you guidance on the setup of these functions.

Figure 1-6 Keys of Modulation/Frequency Sweep/Burst

1. Press 

to output modulated waveform. Change output waveform through the change in parameters such as type, internal modulation/external modulation, depth, frequency and

modulated wave.

Modulation types include AM, FM, PM, ASK, FSK and PSK. Modulating signals include sine wave, square wave, ramp wave, up-ramp and down-ramp.

2. Press Sweep to conduct frequency sweep on sine wave, square wave, ramp wave, pulse wave or arbitrary waveform.

In the frequency sweep mode, the frequency of output waveform is in constant change from the start frequency to the stop frequency at a sweep rate.

3. Press Burst and it will generate burst waveform of sine wave, square wave, ramp wave, pulse wave or arbitrary waveform.

1.6 Introduction to Digital Input

As shown in Figure 1-7, ET3325 sets of keys are on the front panel, which are numeric keypad, left-right direction keys and knobs and confirmation/cancellation key. The following specifications will offer you guidance on the use of digital input.

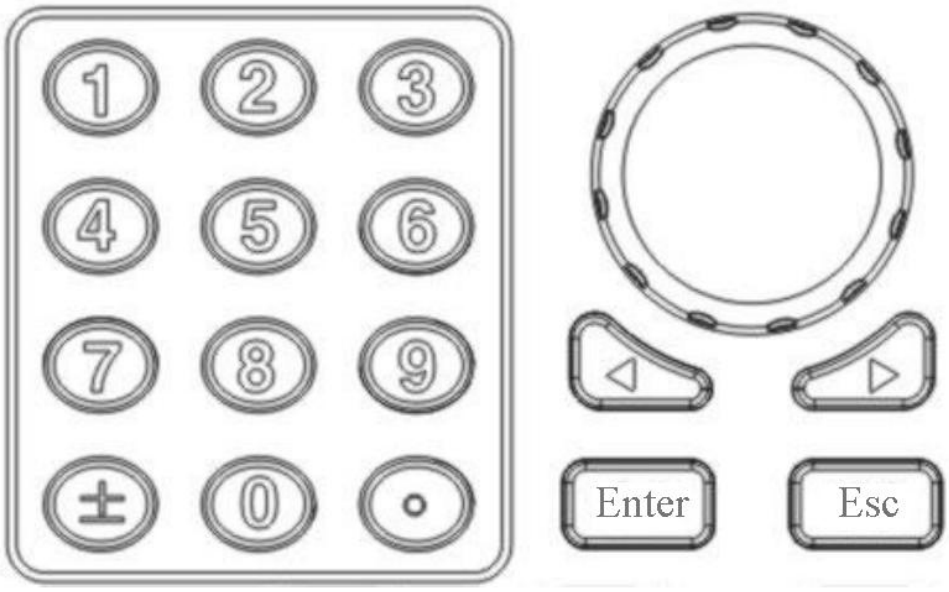


Figure 1-7 Numeric keypads, direction keys and knobs and confirmation/cancellation key

Direction keys

Switch of digits and system setup interface for menu selection. The left key is applicable to backspace under numeric keypad input.

Knobs

- Digit Alternation. Make a clockwise rotation to plus 1 and an anticlockwise ONE/10MHZ to minus 1 if the change is within the range of 0~9.
- Switch of internal waveform type, system setup interface for selection of menu and characters input of file name.

Numeric keypad

Input the desired value directly and alter the size of parameters.

1.7 Introduction to Functions of Frequency Meter/System Setup/Help

As shown in Figure 1-8, ET3340 keys are below keys of modulation/frequency sweep/burst on the front panel to set frequency meter, system setup and help respectively. The following specifications will offer you guidance on the setup of these functions.

Figure 1-8 Keys of Frequency Meter/System Setup/Help

1. Press Counter to check the current measured value of the frequency meter.
2. Press Utility to set output parameters of Channel 1 and 2, buzzer switch, language switch, file storage, interface information and system information; execute instrument calibration and system update.
3. Press Help to check assistance information list.

2. Advanced Operation Instructions

You have acquired preliminary knowledge on the functions of keys and knobs of all functional areas on the front panel of ET3340 and are able to make basic operation on function/arbitrary waveform generator through previous introduction.

This section is introduction to basic waveform setup, arbitrary waveform setup, modulating waveform setup, frequency sweep waveform setup, burst waveform output, and use of frequency meter, system function setup and assistance in use.

2.1 Basic Waveform Setup

2.1.1 Sine wave setup

Press 

and operation menu of sine wave will be displayed at the bottom of the screen. Channel basic information is displayed on the upper left, including channel switch, output impedance and name of current waveform. Set output waveform of sine wave through its operation menu.

Parameters of setup sine wave include frequency/cycle, amplitude/high-level, offset/low-level and phase. Different sine waves are obtained through alteration of these parameters. As shown in Figure 2-1, select Frequency in the operation menu and cursor will be in the location of frequency parameter in the parameter display area, in which user could alter the frequency value of sine wave through numeric keypad, direction keys or knobs.

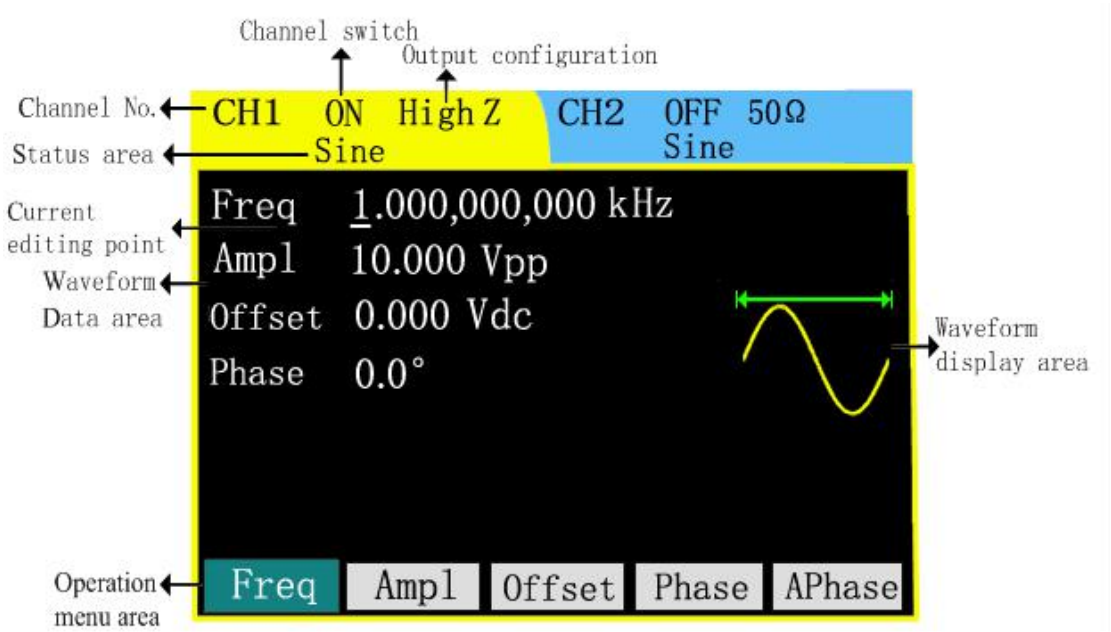


Figure 2-1 Display Interface of Setup of Sine Wave Parameters

Table 2-1 Sine Waveform Menu Description

Functional menu	Setup	Description
Frequency/cycle	——	Set waveform frequency or cycle
Amplitude/high-level	——	Set waveform amplitude or high-level
Offset/low-level	——	Set waveform offset or low-level
Phase	——	Set initial phase of sine wave

Note: 1. The in-phase in the operation menu is applicable to the synchronization in TWO/25MHZ-channel output only. It is unnecessary for single-channel waveform.

2. The "——" in setup column represents no setup item, hereinafter inclusive.

Set output frequency/cycle

1. Press 

→frequency to set frequency parameter value.

The displayed frequency is either the power-on default value or the frequency previously selected., Use the current value if the frequency value is valid for the new waveform when changing parameters. To set waveform cycle, press the softkey of Frequency once again and switch to the Cycle softkey (current option is in inverse display).

2. Enter the desired frequency value.

Use the numeric keypad to enter the desired parameter value. Select the unit desired by frequency and press the softkey corresponding to the desired units. Or use left-right key to specify the digit of parameter value to be amended and use knobs to alter the digit.

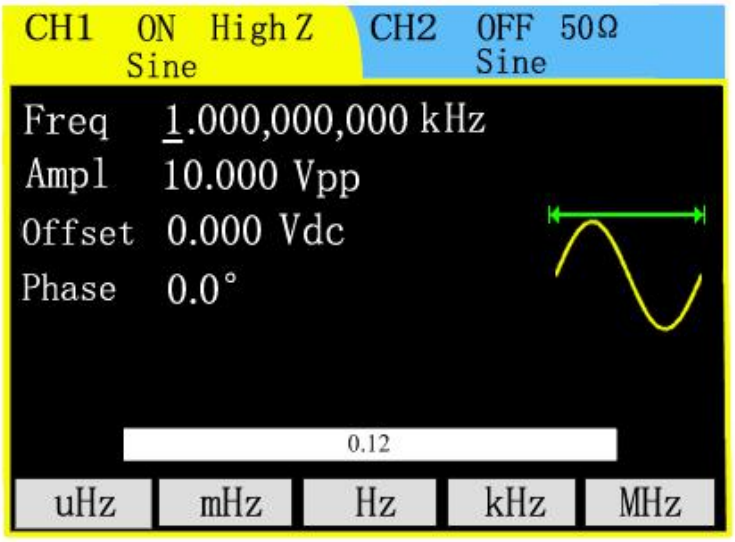


Figure 2-2 Input Frequency Parameters

Note:

- To input value through numeric keypad, use left direction key for backspace to delete previous digit; press the cancellation key to cancel digit input for misoperation.
- To input value through knobs, use direction keys to alter the digit with the subscript of horizontal bar for tracking. Then turn the knob to alter the digit to obtain the desired value.

Set output amplitude

1. **Press** 

→amplitude to set the parameter value of amplitude.

The displayed amplitude is either the power-on default value or the amplitude previously selected. Use the current value if the amplitude is valid for the new waveform when changing parameters. To use high/low level to set amplitude, press the softkey of Amplitude or Offset once again and switch to the softkey of High-level and Low-level (current option is in inverse display).

2. Enter the desired amplitude

Use numeric keypad or knobs to enter the desired parameter value. Select the unit desired by amplitude and press the softkey corresponding to the desired unit.

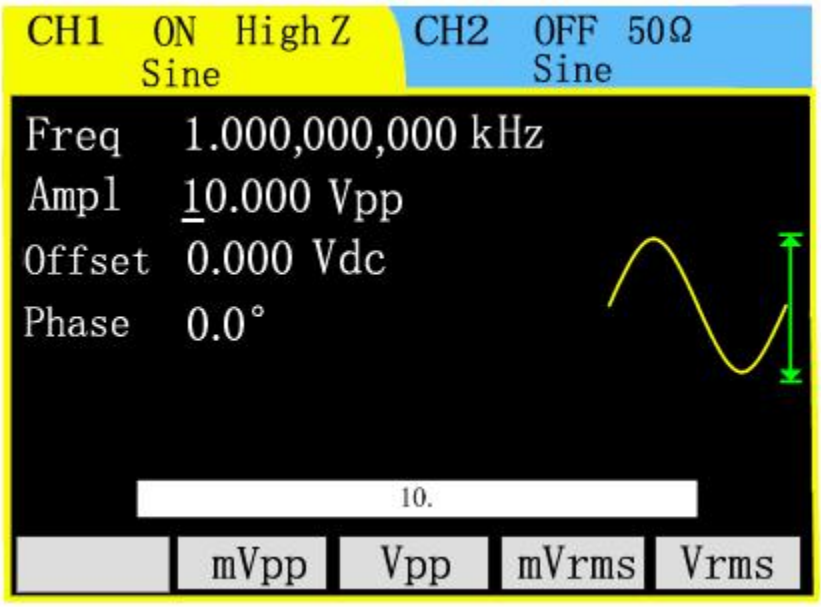


Figure 2-3 Setup Parameter Value of Amplitude

Note:

The maximum amplitude will turn to 5Vpp if frequency is higher than 20MHz under 50 Ω output.

Set offset voltage

1. Press 

→offset to set parameter value of offset voltage.

The displayed offset voltage is either the power-on default value or the offset previously selected. Use the current value if the offset is valid for the new waveform when changing parameters.

2. Enter the desired amplitude

Use numeric keypad or knobs to enter the desired parameter value. Select the unit desired by offset and press the softkey corresponding to the desired unit.

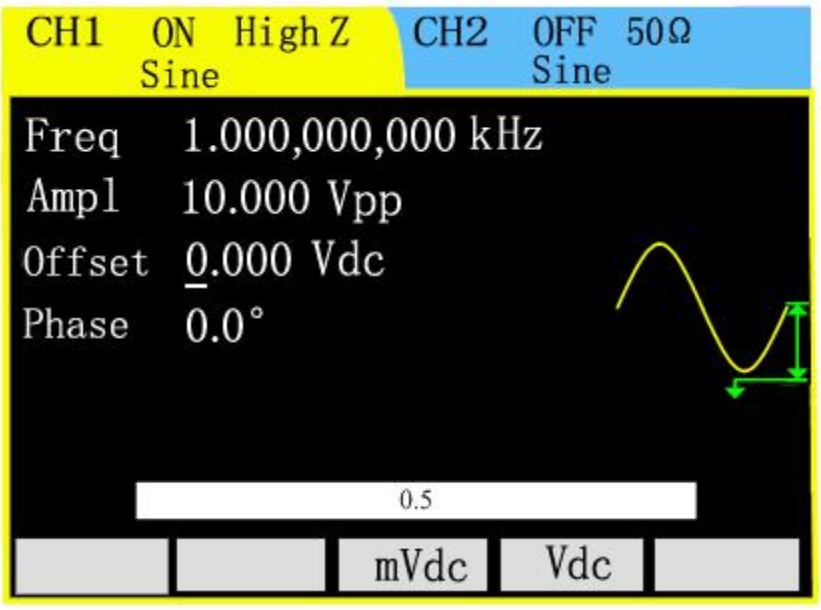


Figure 2-4 Setup Parameter Value of Offset

Set initial phase

1. Press →phase to set parameter value of initial phase.

The displayed initial phase is either the power-on default value or the phase previously selected. Use the current value if the phase is valid for the new waveform when changing parameters.

2. Enter the desired amplitude

Use numeric keypad or knobs to enter the desired value and then select the unit.

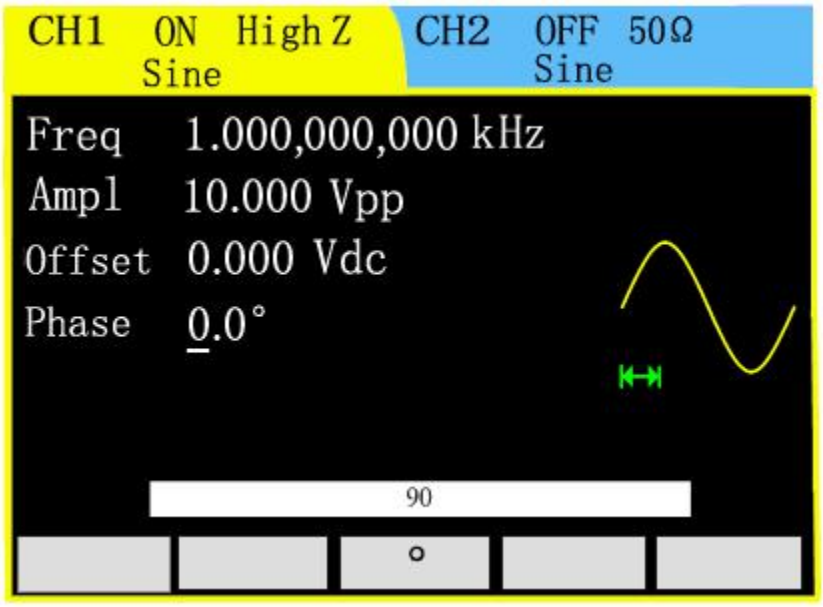


Figure 2-5 Setup Parameter Value of Initial Phase

2.1.2 Square wave setup

Press and the operation menu of square wave will be displayed at the bottom of the screen. Use operation menu of square wave to set its output waveform parameters.

Major parameters of square wave include frequency/cycle, amplitude/high level, offset/low level, duty cycle and phase. Different square waves are obtained by altering these parameters. As shown in Figure 2-6, select **duty cycle** in the menu of softkey and the parameter value corresponding to duty cycle will be selected in the parameter display area, in which users could alter the value of duty cycle of square wave.

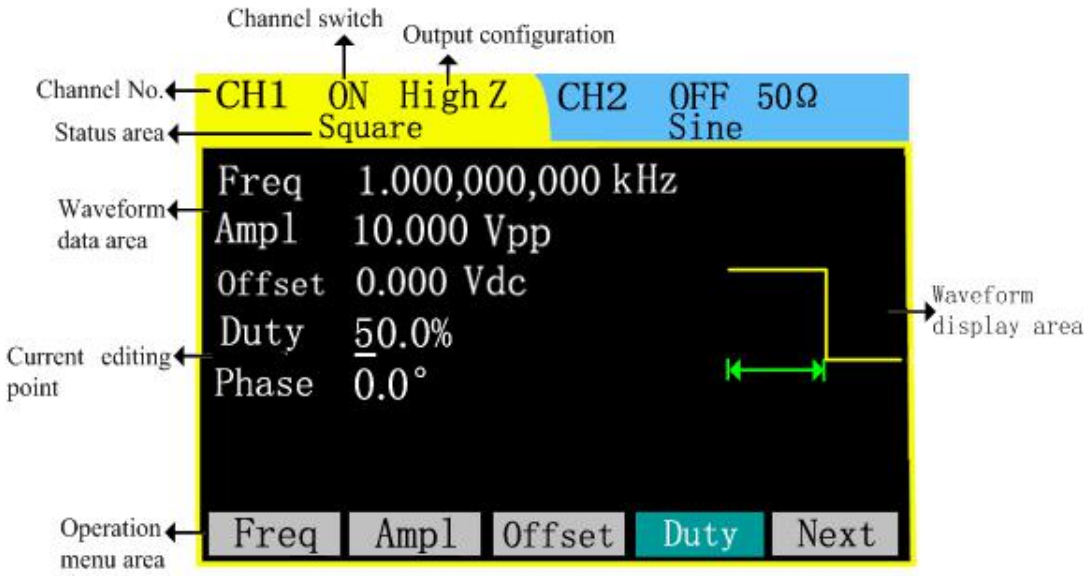


Figure 2-6 Display Interface of Setup of Square Wave Parameters

Table 2-2 Square Waveform Menu Description

Functional Menu	Setup	Description
Frequency/cycle	——	Set waveform frequency or cycle
Amplitude/high-level	——	Set waveform amplitude or high-level
Offset/low-level	——	Set waveform offset or low-level
Duty cycle	——	Set duty cycle of square wave
Phase	——	Set initial phase of waveform

Note:

Duty cycle: the percentage of square wave high level in the whole cycle.

≤100kHz: 1%~99%

100 kHz~5MHz: 20%~80%

5MHz~10MHz: 40%~60%

Set duty cycle

1. Press 

→duty cycle to set the parameter value of duty cycle.

The displayed duty cycle is either the power-on default value or the value previously selected. Use the current value if it is valid for the new waveform when changing parameters.

2. Enter the desired duty cycle

Use numeric keypad or knobs to enter the desired parameter value. Select the unit desired by duty cycle and press the softkey corresponding to the desired unit. Signal generator will immediately adjust duty cycle and output square wave in the desired value.

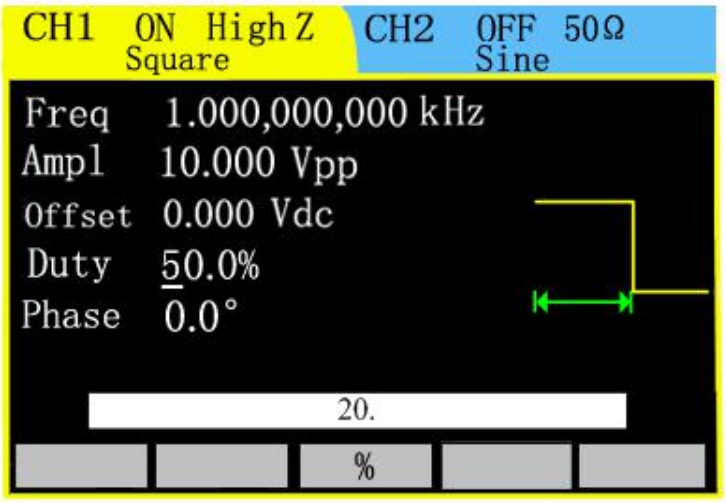


Figure 2-7 Setup Parameter Value of Duty Cycle

2.1.3 Set ramp wave

Press 

and the operation menu of ramp wave will be displayed at the bottom of the screen. Use operation menu of ramp wave to set its output waveform parameters.

Major parameters of ramp wave include frequency/cycle, amplitude/high level, offset/low level, symmetry and phase. Different ramp waves are obtained by altering these parameters. As shown in Figure 2-8, select Symmetry in the menu of softkey and the parameter value corresponding to symmetry will be selected in the parameter display area, in which users could alter the value of symmetry of ramp wave.

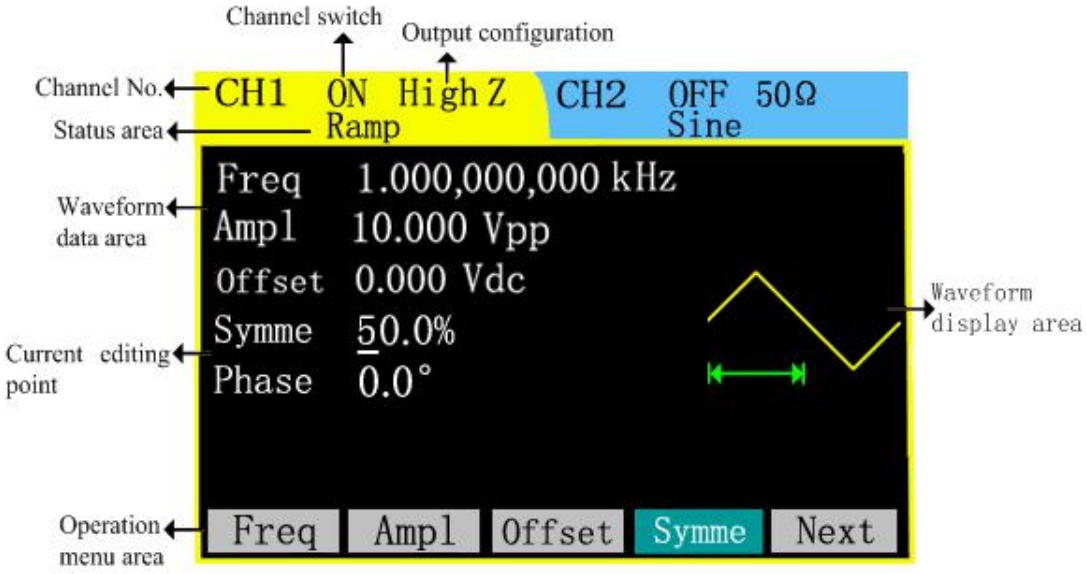


Figure 2-8 Display Interface of Setup of Parameter Values of Ramp Waveform

Table 2-3 Ramp Waveform Menu Description

Functional menu	Setup	Description
Frequency/cycle	——	Set waveform frequency or cycle
Amplitude/high-level	——	Set waveform amplitude or high-level
Offset/low-level	——	Set waveform offset or low-level
Symmetry	——	Set symmetry of ramp wave
Phase	——	Set initial phase of waveform

Note:

Symmetry: the percentage of setup ramp waveform in rise in the whole cycle.

Range: 0~100%

Set symmetry

1. Press 

→symmetry to set parameter value of symmetry.

The displayed symmetry is either the power-on value or the percentage previously selected. Use the current value if it is valid for the new waveform when changing parameters.

2. Enter the desired symmetry

Use numeric keypad or knobs to enter the desired parameter value. Select the unit desired by symmetry and press the softkey corresponding to the desired unit. Signal generator will immediately adjust symmetry and output ramp wave in the desired value.

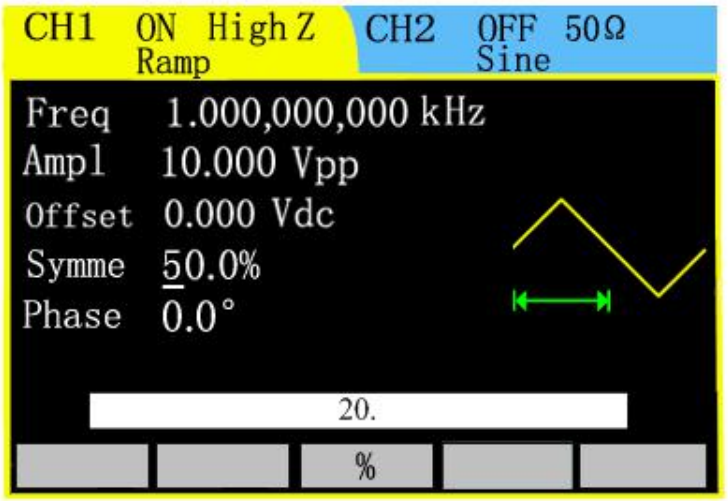


Figure 2-9 Setup parameter value of symmetry

2.1.4 Set pulse wave

Press and the operation menu of pulse wave will be displayed at the bottom of the screen. Use operation menu of pulse wave to set its output waveform parameters.

Major parameters of pulse wave include frequency/cycle, amplitude/high-level, offset/low-level, pulse width/duty cycle and rising edge/falling edge. Different pulse waves are obtained by altering these parameters. Specific interface is shown in Figure 2-10

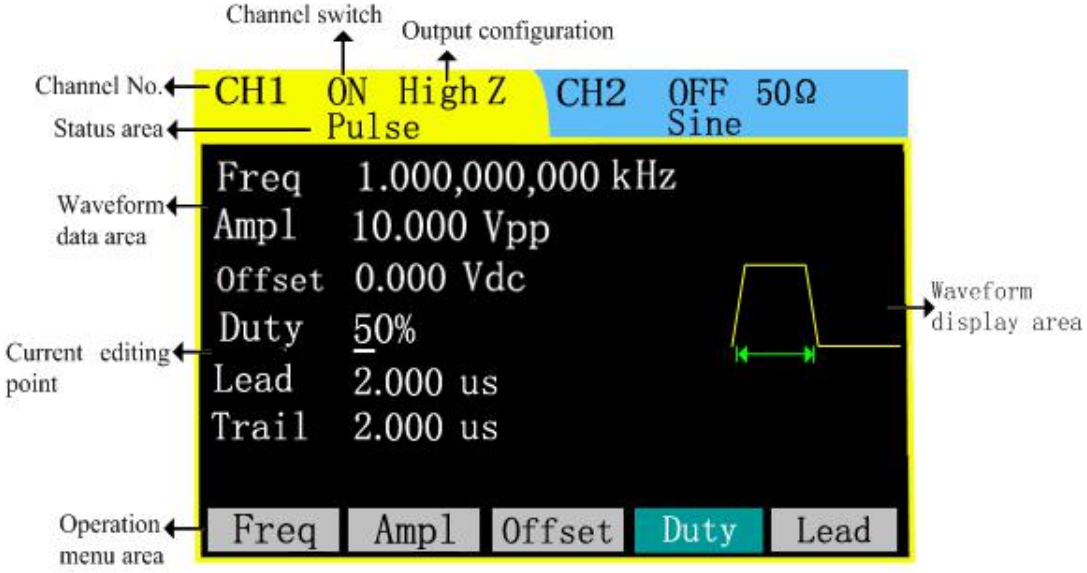


Figure 2-10 Interface for Setup of Pulse Waveform Parameters

Table 2-4 Pulse waveform menu description

Functional menu	Setup	Description
Frequency/cycle	——	Set waveform frequency or cycle
Amplitude/high-level	——	Set waveform amplitude or high level
Offset/low-level	——	Set waveform offset or low-level
Duty cycle/pulse width	——	Set duty cycle or pulse width of pulse wave
Rising edge/falling edge	——	Set rising and falling edge of waveform

Note:

Pulse width: it represents the interval time from the 50% threshold value in the range of rising edge and to the 50% threshold value in the range of next falling edge.

Set pulse width

1. Press 

→duty cycle/pulse width→pulse width.

The displayed pulse width on screen is either the power-on default value or the pulse width previously selected. Use the current value if it is valid for the new waveform when changing parameters.

2. Enter the desired pulse width.

Use numeric keypad or knobs to enter the desired parameter value. Select the unit desired by pulse width and press the softkey corresponding to the desired unit. Signal generator will immediately adjust pulse width and output pulse wave in the desired value.

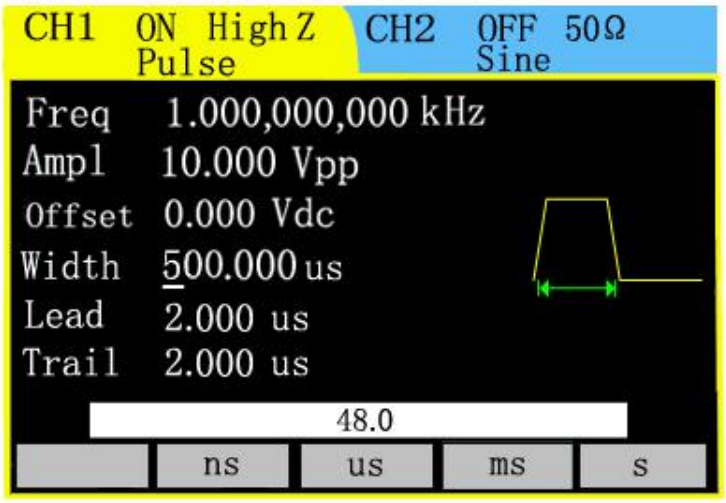


Figure 2-11 Setup Parameter Value of Pulse Width

Note:

1. Pulse width is restricted by minimum pulse width and pulse period

Minimum pulse width: 20ns;

Pulse width ≥ minimum pulse width;

Pulse width ≤ pulse period-minimum pulse width

2. Pulse duty cycle is restricted to minimum pulse width and pulse period

Pulse duty cycle ≥ 100 × minimum pulse width ÷ pulse period

Pulse duty cycle ≤ 100 × (1- minimum pulse width ÷ pulse period)

3. Pulse width is pertinent to the setup of duty cycle

ONE/10MHZ will vary based on the variation of the other. For example, current cycle is 1ms, pulse is 500us and duty cycle is 50%, duty cycle will turn to 20% after pulse width is set to 200us.

Set rising/falling edge

1. Press 

→leading edge.
2. Enter the desired pulse rising edge.

3. Press 

→rising /falling edge→falling edge.
4. Enter the desired pulse falling edge.

2.1.5 Set noise wave

Press 

and the operation menu of noise wave will be displayed at the bottom of the screen. Use operation menu of noise wave to set its output waveform parameters.

Major parameters of noise wave include: amplitude/high level and offset/low level. Different noise waves are obtained by altering these parameters. Noise is random signal without frequency and periodicity. Specific interface is shown in Figure 2-12.

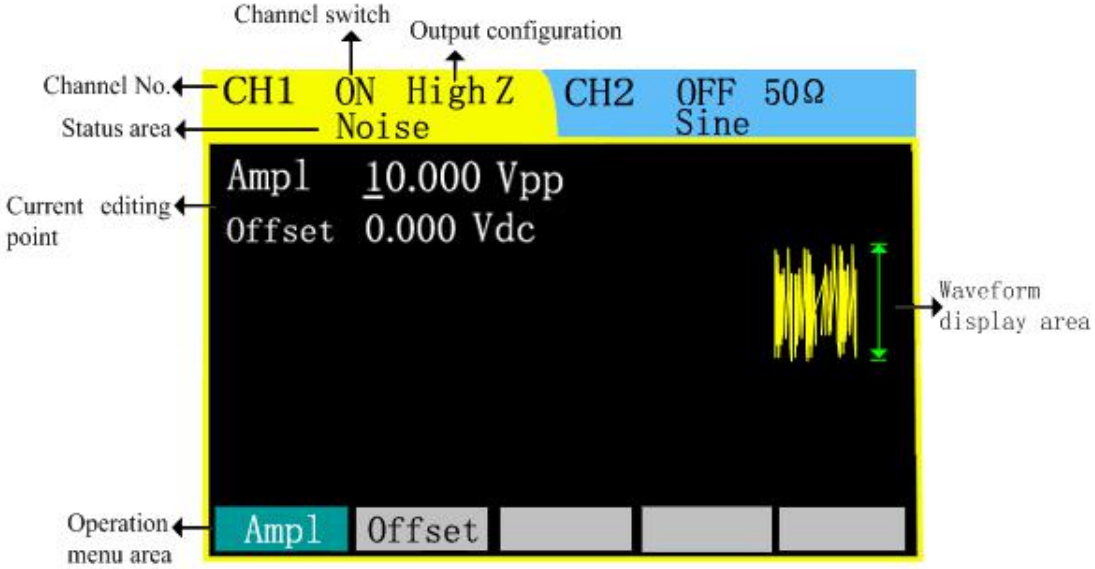


Figure 2-12 Display Interface for Setup of Parameter Values of Noise Waveform

Table 2-5 Noise Waveform menu Description

Functional menu	Setup	Description
Amplitude/high-level	——	Set waveform amplitude or high-level
Offset/low-level	——	Set waveform offset or low-level

2.1.6 Set arbitrary wave

Press  and the operation menu of arbitrary wave will be displayed at the bottom of the screen. Use operation menu of arbitrary wave to set its output waveform parameters.

Major parameter of arbitrary waveform include: frequency/period, amplitude/high-level, offset/low-level and phase. Different arbitrary waves are obtained by altering these parameters. Specific interface is shown in Figure 2-13.

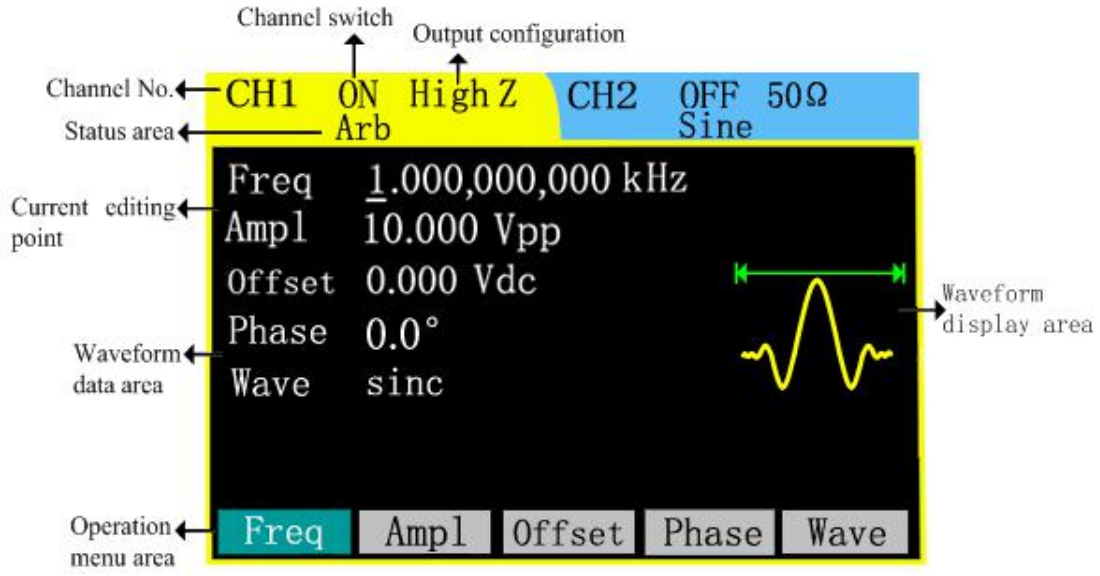


Figure 2-13 Display Interface for Setup of Parameter Values of Arbitrary Waveform

Table 2-6 Arb Waveform Menu Description

Functional menu	Setup	Description
Frequency/Period	——	Set waveform frequency/period
Amplitude/High-level	——	Set the waveform amplitude/high-level
Offset/Low-level	——	Set the waveform offset/low-level
Phase	——	Set arbitrary wave initial phase

Waveform	——	Load, create and edit the user arbitrary wave

Arbitrary wave loading

Thirty ET3325 arbitrary waves are built in the signal generator which also provides 10 nonvolatile storage locations and arbitrary waveform the storage user defined.

To select ET3310 of the arbitrary waves, press Arb → Waveforms → Load and enter the following interface.

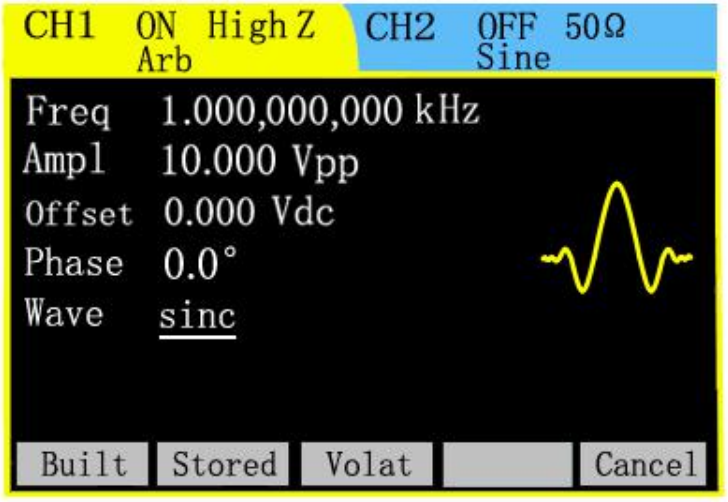


Figure2-14 Arbitrary Wave Loading

Table 2-7 Loading Arbitrary Wave Selection Menu Description

Functional menu	Setup	Description
Built-in	——	Select ET3310 of the 32 kinds of arbitrary waves built-in
Storage	——	Select arbitrary waveforms stored in the nonvolatile storage.
Volatile wave	——	Select arbitrary waveforms stored in the volatile storage, and the old wave will be overwritten when a new ET3310 stored in.
Cancel	——	Cancel arbitrary wave loading

Note:

When there are no waveforms stored in the volatile storage, volatile wave is not optional.

Select built-in waveforms

1. Press  → Waveforms →Loading →Built-in and enter the following interface.

2. Position the desired waveform by the knobs or direction keys.

3. Select the waveform.

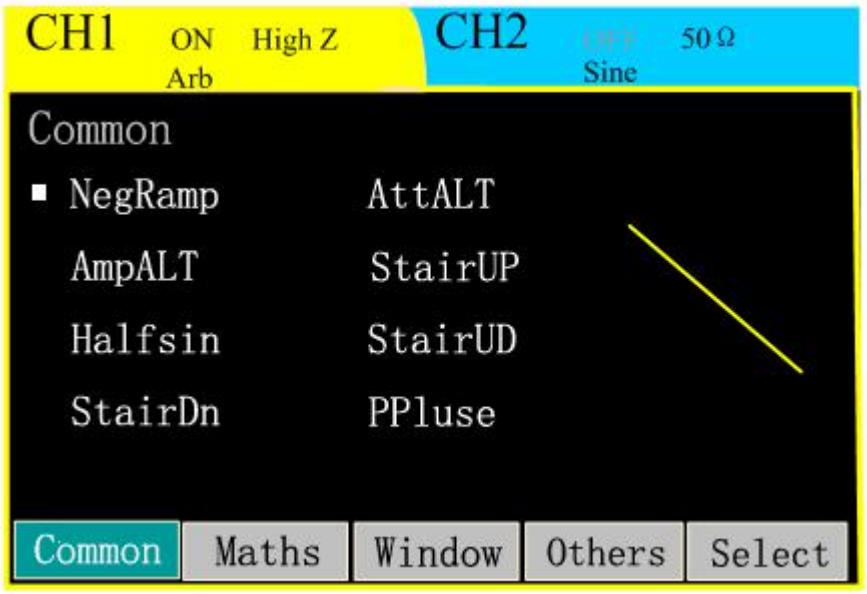


Figure 2-15 Built-in Arbitrary Waves

Table 2-8 Built-in Waveforms of Arbitrary Waveform

Functional menu	Setup	Description
Common	NegRamp/AttALT/AmpALT/StairUP/ Halfsin/StairUD/StairDn/PPluse	Select common waveforms
Mathematics	ExpRise/ExpFall/Tan/Cot/ Sqrt/Arb_X2/Sinc/Gauss	Select common mathematical functions
Window functions	Boxcar/Barlett/Triang/Blackman/ Hamming/Hanning/Kaiser	Select common window functions
Others	DC/Composite/Tanh/Coth/Gamma/ Legendre/chebyshev/Bessel/StepResp	Select other waveforms
Selection	——	Select the selected waveform

Choose stored arbitrary waveforms

1. Press Arb → Waveforms →Loading → Storage and enter the following interface.

2. Choose the way of local or U disk.

3. Position the desired waveform by the knobs or direction keys.

4. Read waveform data.

Figure 2-16 Read Stored Waveforms

Table 2-9 Stored Arbitrary Waveform Menu Description

Functional menu	Setup	Description
Mode	Local/U-disk	Switch storage mode
Read	——	Read the stored arbitrary waveform.
Storage	——	Store the arbitrary waveforms stored in the volatile storage.
Delete	——	Delete the stored arbitrary waveform desired.
Cancel	——	Cancel stored arbitrary wave reading.

Create user-defined waveforms

Signal generator can edit arbitrary waveform, and users can create any new waveforms by point initialization operations. Specific operations are as follows.

Press Arb → Waveforms → Creation and enter the following interface

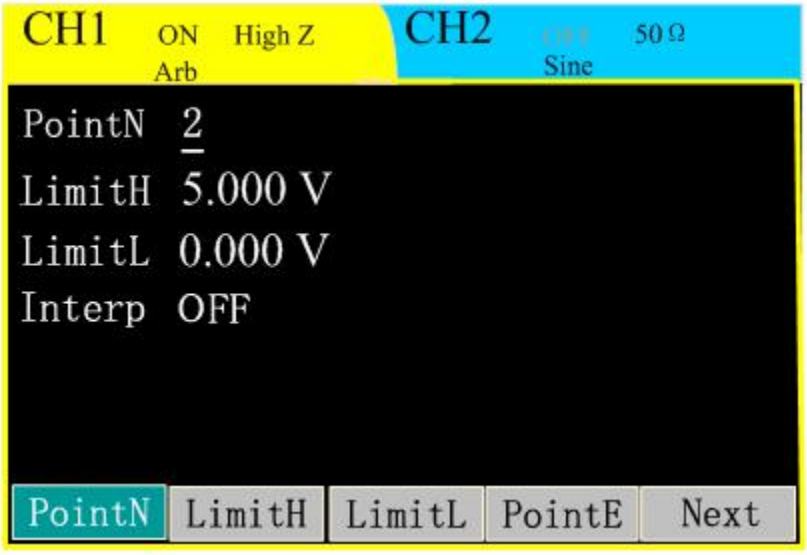


Table 2-17 User Arbitrary Waveform Creation Interface

Table 2-10 Arbitrary Waveform Creation Menu Description

Functional menu	Setup	Description
Points	——	Set the points of waveforms needing edit.
Upper limit	——	Set a creating point voltage upper limit.
Lower limit	——	Set a creating point voltage lower limit.
Point edit	——	Start waveform editor
Storage	——	Store the user-defined arbitrary waves edited.
Interpolation	linearity ON/OFF	Enable or disable linear interpolation between defined points of the waveforms

Point edit

Define waveforms by specifying voltage value for each waveform point. Select point edit and enter the interface as shown in Figure 2-18. First, edit the first point. Press Voltage to edit the voltage value of the current point.

When completing the edition of all the points, press OK to exit the current interface and return to the previous ET3310.

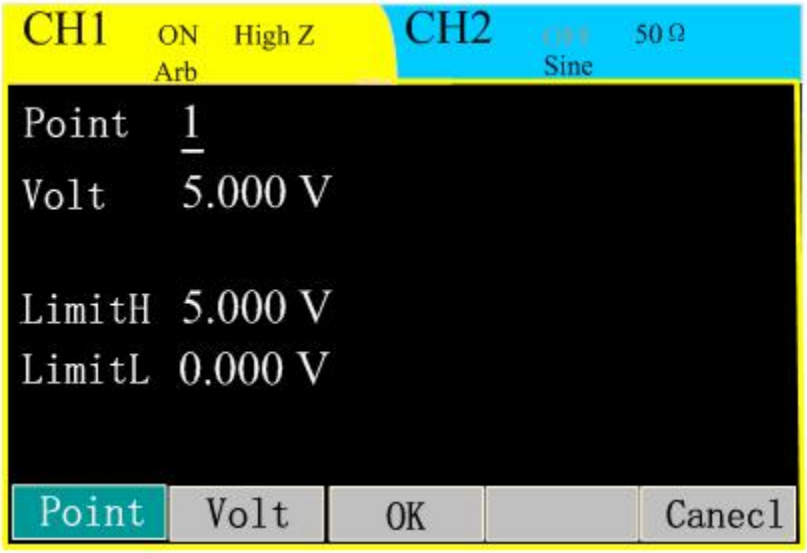


Figure 2-18 Point Edit Interface

Store waveforms

After waveforms created, press Store to enter the storage function interface, as shown in Figure 2-19, and store the waveform in nonvolatile memory or external memory.

Figure 2-19 Store Edited Arbitrary Waveforms

Note:

In the nonvolatile storage, only ET3310 waveform can be stored in each waveform storage location, and the old wave will be overwritten when a new ET3310 stored in.

Edit waveforms

Press Arb → Waveform→ Edit to enter edit interface.

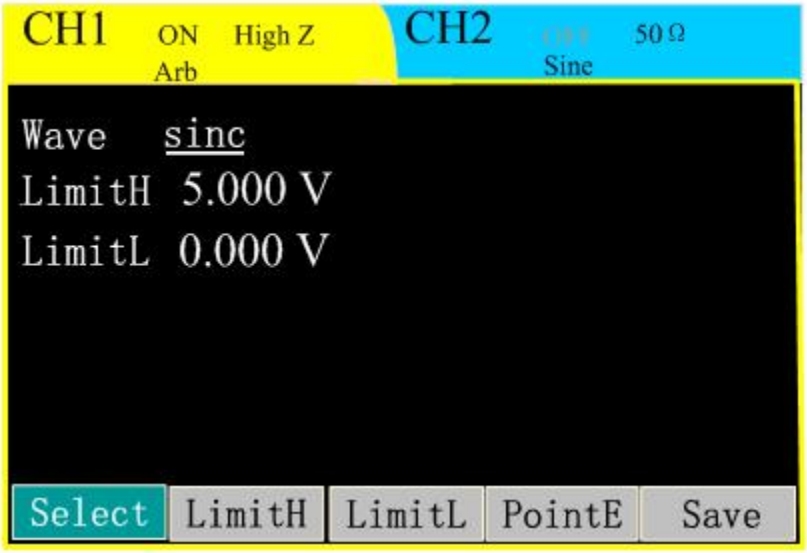


Figure 2-20 Arbitrary Wave Edit Interface

Table 2-11 Arbitrary Wave Edit Menu Description

Functional menu	Setup	Description
Select	——	Select arbitrary waveforms need to be edited, which can be built-in arbitrary waveforms, arbitrary waveforms or volatile waveforms stored in the volatile storage.
Upper limit	——	Set create point voltage upper limit.
Lower limit	——	Set create point voltage lower limit.
Point Edit	——	Start waveform editor
Storage	——	Store the user-defined arbitrary waves edited.

2.2 Modulation Waveform Setup

Press Mod to output modulated waveforms. function signal generators can output modulation waveforms of AM, FM, PM, ASK, FSK and PSK. Set different modulation parameters according to different modulation types.

- In amplitude modulation, internal modulation/external modulation, frequency, depth and modulation waveforms can be set.
- In frequency modulation, internal modulation/external modulation, frequency, frequency deviation and modulation waveforms can be set.
- In phase modulation, internal modulation/external modulation, frequency, phase deviation and modulation waveforms can be set.
- In ASK modulation, internal modulation/external modulation, frequency and modulation amplitude can be set.
- In FSK modulation, internal modulation/external modulation, frequency and frequency-hopping can be set.
- In PSK modulation, internal modulation/external modulation, frequency and modulation phase can be set.

Settings of various modulation parameters will be introduced respectively in the following parts, based on modulation types.

2.2.1 Amplitude Modulation (AM)

Modulated waveforms consist of carrier waves and modulation waveforms. In AM (Amplitude Modulation), the amplitude of the carrier wave changes with the instantaneous voltage of the modulation waveform.

The carrier wave for amplitude modulation can be set through the function keys of Sine Square Ramp Pulse Arb on the front panel.

Press Mod → Type→ AM and enter the interface as shown in Figure 2-21.

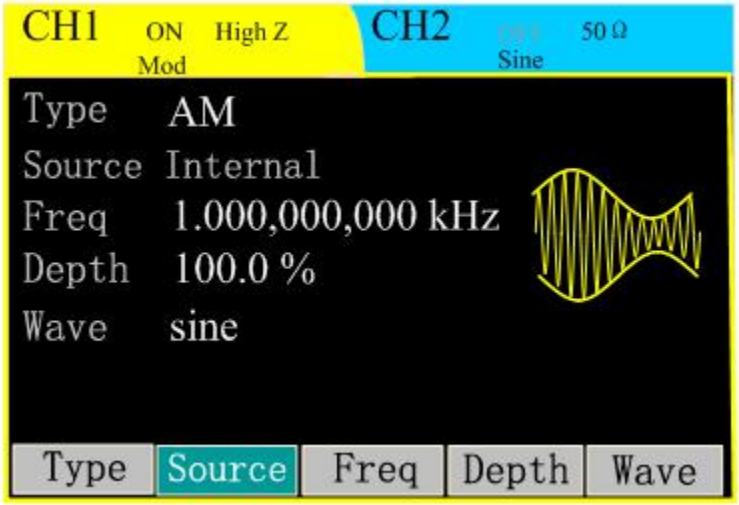


Figure 2-21 AM Waveform Parameter Setup Interface

Table 2-12 AM Parameter Setup Menu Description

Functional menu	Setup	Description
Types	AM	Select AM
Signal source	Internal/external	Select internal modulation/external modulation
Internal modulation	Frequency	Set modulation wave frequency (2mHz~20kHz)
	Depth	Set amplitude variation depth (0%~120%)
	Modulation wave	Select internal modulation signal Sine/Square/Triangle/UpRamp/DnRamp
External modulation	Depth	When selecting external modulation, the modulation signal can be input by the [Modulation In] on the rear panel, and only Depth needs to be set here.

Note:

Modulation depth refers to amplitude variation range (also called Percentage Modulation) settings. Modulation depth can vary from 0% to 120%.

- Modulation at 0%, the output amplitude is half of the specified value.
- Modulation at 100%, the output amplitude equals to the specified value.
- Modulation at 100% above, the output of the instrument will not exceed 20Vpp.

Internal modulation signal description:

Signals	Description
Sine	Sine wave
Square	Square wave of 50% duty cycle
Triangle	Ramp (Triangle) of 50% symmetry
UpRamp	Up Ramp
DownRamp	Down Ramp

2.2.2 Frequency Modulation (FM)

Modulated waveforms consist of carrier waves and modulation waveforms. In FM (Frequency Modulation), the frequency of the carrier wave changes with the instantaneous voltage of the modulation waveform.

The carrier wave for frequency modulation can be set with the function keys of Sine Square Ramp Pulse Arb on the front panel.

Press Mod → Type→ FM and enter the interface as shown in Figure 2-22.

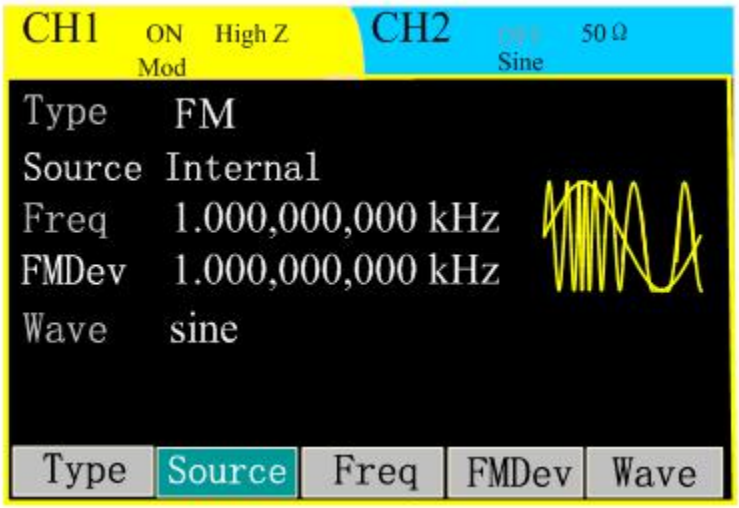


Figure 2-22 FM Waveform Parameter Setup Interface

Table 2-13 FM Parameter Setup Menu Description

Functional menu	Setup	Description
Types	FM	Select FM
Signal source	Internal/external	Select internal/external modulation

Internal modulation	Frequency	Set modulation wave frequency (2mHz~20kHz)
	Frequency offset	Set the offset between the frequency of modulation and the carrier.
	Modulation wave	Select internal modulation signal: Sine/Square/Triangle/UpRamp/DnRamp
External modulation	Frequency offset	When external modulation is selected, the modulation signal is input by the [Modulation In] on the rear panel. And only the parameters of Offset is needed setting here.

Frequency offset note:

- Offset must be less than or equal to carrier frequency;
- Sum of the offset and carrier frequency must be less than or equal to the maximum frequency of the function selected.
- For the external source, offset is controlled by the ±5V level on the [Modulation In] connector. +5 V plus the selected offset, lower external signal levels generate less offset and negative signal levels reduce the frequency below the carrier frequency.

2.2.3 Phase Modulation (PM)

Modulated waveforms consist of carrier waves and modulation waveforms. In PM (Phase Modulation), the phase of the carrier wave changes with the instantaneous voltage of the modulation waveform.

The carrier wave for phase modulation can be set with the function keys of Sine Square Ramp Pulse Arb on the front panel.

Press Mod → Type→ PM and enter the interface as shown in Figure 2-23.

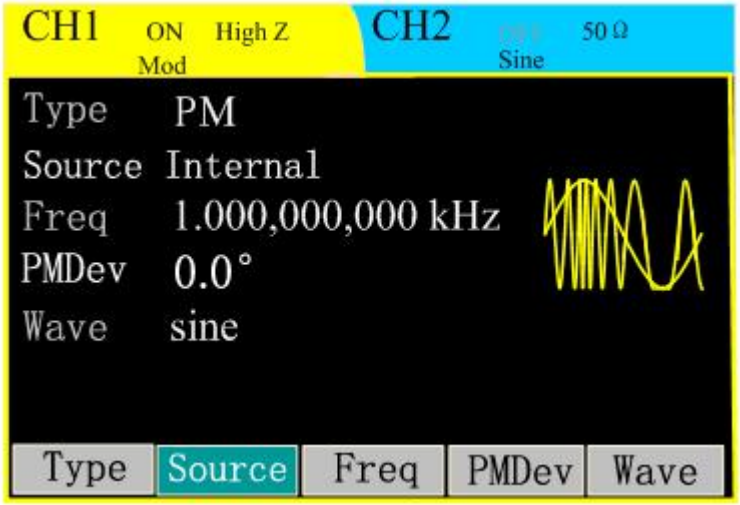


Figure 2-23 PM Waveform Parameter Setup Interface

Table 2-14 PM Parameter Setup Menu Description

Functional menu	Setup	Description
Types	PM	Select PM
Signal source	Internal/external	Select internal/external modulation
Internal modulation	Frequency	Set modulation wave frequency (2mHz~20kHz)
	Phase offset	Set the offset between the phase of modulation and the carrier.
	Modulation wave	Select internal modulation signal: Sine/Square/Triangle/UpRamp/DnRamp
External modulation	Phase offset	When external modulation is selected, the modulation signal is input by the [Modulation In] on the rear panel. And only the parameters of Offset is needed setting here.

Phase offset note:

- Phase offset can vary from 0° to 360°.
- For the external source, offset is controlled by the ±5V level on the [Modulation In] connector. +5 V plus the selected offset, lower external signal levels generate less offset .

2.2.4 Amplitude Shift Keying (ASK)

ASK modulation is to shift its output amplitude between ET3325 preset values (Carrier Amplitude and Modulation Amplitude). The amplitude at which the output shifts between carrier amplitude and modulation amplitude is called ASK amplitude. The frequency at which the output shifts between these ET3325 amplitudes is determined by the internal frequency generator or the signal level on the rear-panel [Ext Trig] connector.

- When the internal modulation is selected, the frequency at which the output shifts between carrier amplitude and modulation amplitude is determined by the specified ASK frequency.
- When the external modulation is selected,ASK frequency cannot be adjusted and is determined by the signal level on the rear-panel [Ext Trig] connector. When a logic high level is present, the larger value between carrier amplitude and modulation amplitude is output. With a logic low level, the smaller value is output.

The carrier wave for ASK modulation can be set with the function keys of Sine Square Ramp Pulse Arb on the front panel.

Press Mod → Type→ ASK and enter the interface as shown in Figure 2-24.

Figure 2-24 ASK Waveform Parameter Value Setup Interface

Table 2-15 ASK Parameter Setup Menu Description

Functional menu	Setup	Description
Types	ASK	Select ASK

Signal source	Internal/external	Select internal modulation/external modulation
Internal modulation	Frequency	Set modulation wave frequency (2mHz~1MHz)
	Modulation amplitude	The modulating signal of internal modulation is a 50% duty cycle square wave. Set modulation amplitude range
External modulation	Modulation amplitude	When the external modulation is selected, the modulation signal is input by the [Ext Trig] on the rear panel. Only Modulation amplitude parameters need to be set.

Note:

Modulation amplitude(High Z) can vary from 0V to 10V, the default value is 2V.

2.2.5 Frequency Shift Keying (FSK)

FSK modulation is to shift its output frequency between ET3325 preset values (Carrier Frequency and the Hop Frequency). The frequency at which the output shifts between carrier frequency and hop frequency is called FSK frequency. The frequency at which the output shifts between these ET3325 frequencies is determined by the internal frequency generator or the signal level on the rear-panel [Ext Trig] connector.

- When the internal modulation is selected, the frequency at which the output shifts between carrier frequency and hop frequency is determined by the specified FSK frequency.
- When the external modulation is selected, FSK frequency cannot be adjusted and is determined by the signal level on the rear-panel [Ext Trig] connector. When a logic high level is present, the carrier frequency is output. With a logic low level, the hop frequency is output.

The carrier wave for FSK modulation can be set with the function keys of Sine Square Ramp Pulse Arb on the front panel.

Press Mod → Type→ FSK and enter the interface as shown in Figure 2-25.

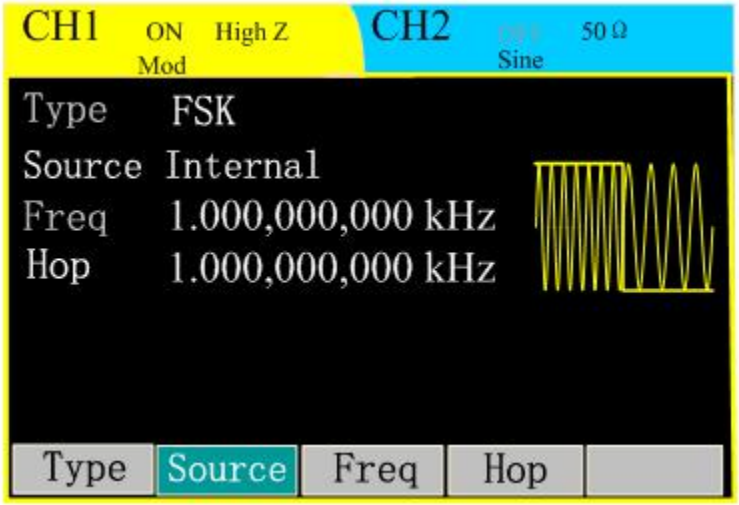


Figure 2-25 FSK Waveform Parameter Value Setup Interface

Table 2-16 FSK Parameter Setup Menu Description

Functional menu	Setup	Description
Types	FSK	Select FSK
Signal source	Internal/external	Select internal modulation/external modulation
Internal modulation	Frequency	Set modulation wave frequency (2mHz~1MHz)
	Hop frequency	The modulating signal of internal modulation is a 50% duty cycle square wave. Set hop range (not exceed carrier frequency)
External modulation	Hop frequency	When the external modulation is selected, the modulation signal is input by the [FSK] on the rear panel. Only Hop Frequency parameters need to be set.

2.2.6 Phase Shift Keying (PSK)

PSK modulation is to shift its output phase between ET3325 preset values (Carrier Phase and the Modulation Phase). The phase at which the output shifts between carrier phase and modulation phase is called PSK phase. The frequency at which the output shifts between these ET3325 phases is determined by the internal frequency generator or the signal level on the rear-panel [Ext Trig] connector.

- When the internal modulation is selected, the frequency at which the output shifts

between carrier phase and modulation phase is determined by the specified PSK frequency.

- When the external modulation is selected, PSK frequency cannot be adjusted and is determined by the signal level on the rear-panel [Ext Trig] connector. When a logic high level is present, the carrier phase is output. With a logic low level, the modulation phase is output.

The carrier wave for PSK modulation can be set with the function keys of Sine Square Ramp Pulse Arb on the front panel.

Press Mod → Type→ PSK and enter the interface as shown in Figure 2-26.

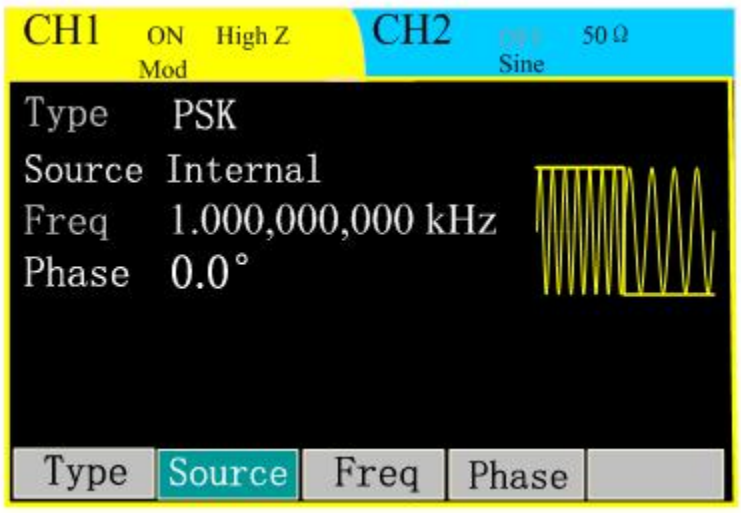


Figure 2-26 PSK Waveform Parameter Value Setup Interface

Table 2-17 PSK Parameter Setup Menu Description

Functional menu	Setup	Description
Types	PSK	Select PSK
Signal source	Internal/external	Select internal modulation/external modulation
Internal modulation	Frequency	Set modulation wave frequency (2mHz~1MHz)

	Modulation phase	The modulating signal of internal modulation is a 50% duty cycle square wave. Set modulation phase range
External modulation	Modulation phase	When the external modulation is selected, the modulation signal is input by the [Ext Trig] on the rear panel. Only Modulation phase parameters need to be set.

2.3 Frequency Sweep Waveform Setup

In frequency sweep mode, the ET3340 outputs variously from the start frequency to the stop frequency in specified time. Sweep waveform can be produced with sine, square, ramp, pulse, or arbitrary waveforms (noise and DC are not allowed to be scanned).

Press Sweep, and the system will display the operation menu as shown in Figure 2-27. Set the output waveform parameters of the sweep wave by operating the sweep menu.

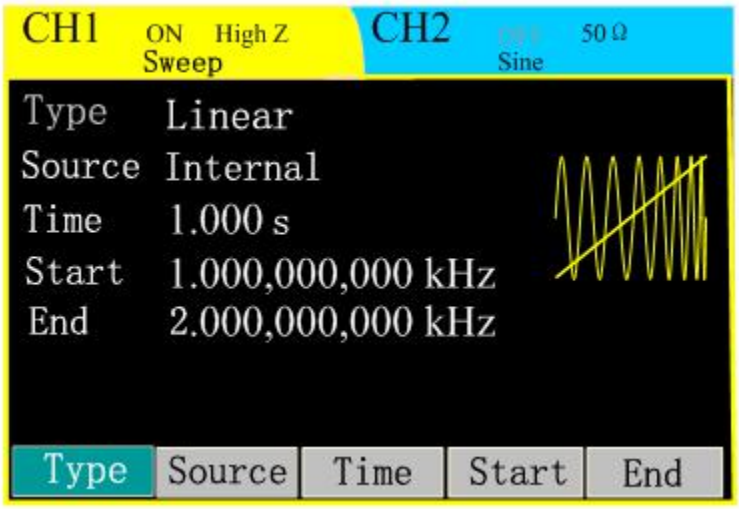


Figure 2-27 Sweep Mode Parameter Value Setup Interface

Table 2-18 Sweep Parameter Setup Menu Description

Functional menu	Setup	Description
Types	Linearity/Logarithm	Select sweep mode of linearity or logarithm sweep

Signal source	Internal/external/manual	Select Trigger Source Internal: select internal trigger source External: select external trigger source with [Ext Trig] connector on rear-panel Manual: select manual trigger, and each time you press Trig, a sweep will start, and a continuous press of the key will trigger the signal generator once again
Time	——	Set the number of seconds needed from the start frequency to the stop frequency
Start	——	Set the start frequency
Stop	——	Set the stop frequency

Note:

- To sweep up in frequency, set the start frequency < the stop frequency
- To sweep down in frequency, set the start frequency > the stop frequency
- In manual trigger mode, switch of Channel 1 should be in the open state.

2.4 Burst Waveform Setup

Burst key can provide users with burst output of various waveform function, and it can output waveforms of specific number (N-cycle burst) continuously; when applying to external gate signal (gated burst), any wave function (except noise and DC) can be used.

Press Burst to set the output waveform parameters in burst mode by operating the burst operation menu.

Set N-cycle burst

Press Burst → Type→ N-cycle and enter the interface as shown in Figure 2-28.

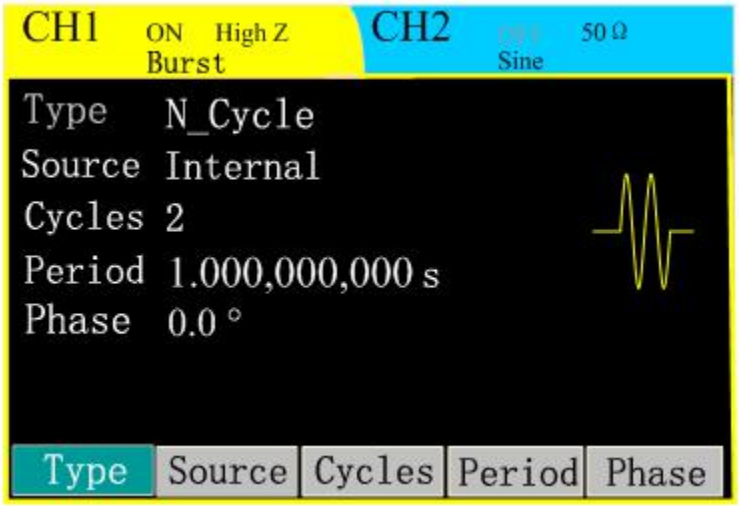


Figure 2-28 N-cycle Burst Setup Interface

Table 2-19 N-cycle Burst Parameter Setup Menu Description

Functional menu	Setup	Description
Types	N-cycle/infinite/gated	Select burst output type: N-cycle
Signal source	Internal/external/manual	Select Trigger Source Internal: select internal trigger source External: select external trigger source, use [Ext Trig] connector on rear-panel Manual: select manual trigger, and each time you press Trig, a burst will be output, and a continuous press of the key will trigger the signal generator once again.
Cycle number	——	Set the cycle number of each N-cycle burst
Period	——	Set the burst period
Phase	——	Set the burst initial phase

Cycle number

Set the output cycle number of each N-cycle burst string (1 - 65535). If necessary, the burst period will increase to adapt the specified number of cycles.

Phase

Define the start and stop points of the burst. The phase can be set from 0 to 360°, with default of 0°. For arbitrary waveforms, 0° is the first waveform point.

Period

Set time from the start of an N-cycle burst to the start of next burst. If necessary, the burst period will increase to allow a specified number of cycles of each burst.

Period > single waveform period × the number of burst

Set infinite burst

Press Burst → Type→ Infinite and enter the interface as shown in Figure 2-29.

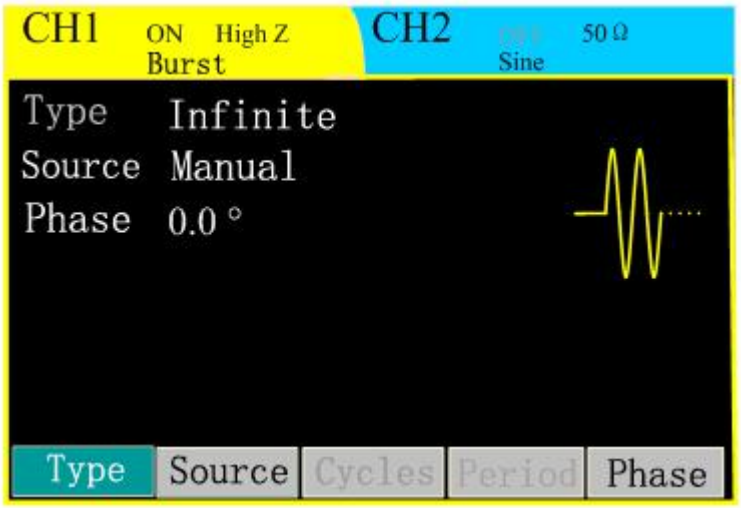


Figure 2-29 Infinite Burst Setup Interface

Table 2-20 Infinite Burst Parameter Setup Menu Description

Functional menu	Setup	Description
Types	N-cycle/infinite/gated	Select burst output type: infinite
Signal source	External/manual operating	Select Trigger Source: External: select external trigger source, use [Ext Trig] connector on rear-panel Manual: select manual trigger, and each time you press Trig, a burst will output, and a continuous press of the key will trigger the signal generator once again
Phase	——	Set the burst initial phase

Set gated burst

Press Burst → Type→ Gated and enter the interface as shown in Figure 2-30.

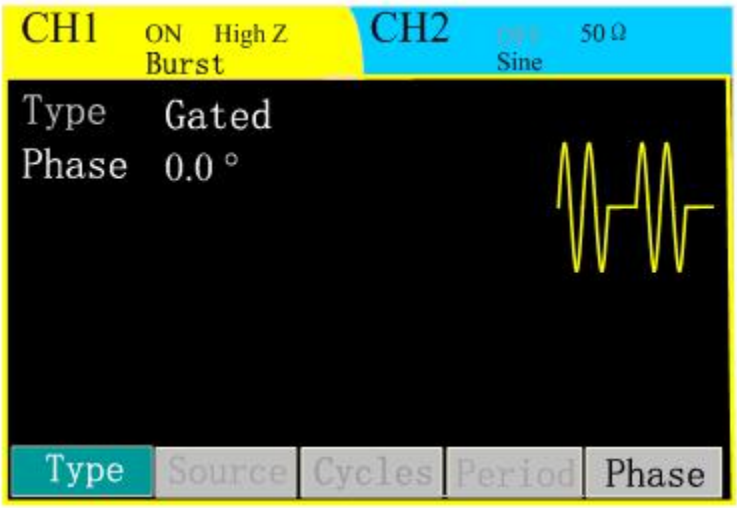


Figure 2-30 Gated Burst Setup Interface

Table 2-21 Infinite Burst Parameter Setup Menu Description

Functional menu	Setup	Description
Types	N-cycle/infinite/gated	Select burst string output type: Gated
Phase	——	Set the burst initial phase

2.5 Sync Output (CH1)

Sync output provides CH1 channel sync output, and all standard functions (except DC and noise) have a related sync signal.

When sine wave and triangle wave are outputted, the sync signal is square wave with 50% duty cycle. When waveform output is positive, relative to 0V voltage (or DC offset), and the sync signal is TTL high-level.

When square wave and pulse wave are outputted, the duty cycle of sync signal is same as that of the waveform. When waveform output is positive, relative to 0V voltage (or DC offset), and the sync signal is TTL high-level.

For internal modulated AM, FM and PM, the sync signal takes modulation waves (not carrier) as references, and the sync signal is square waves of 50% duty cycle. During the first half modulation waveform period, the sync signal is a TTL High-level.

For external modulated AM, FM and PM, the sync signal takes carriers (not modulation wave) as references, and the sync signal is square waves of 50% duty cycle.

For ASK, the sync signal takes the modulation amplitude as a reference, and the sync signal is square waves of 50% duty cycle. For the modulation amplitude, at the time of conversion, the sync signal is a TTL high-level.

For FSK, the sync signal takes the hop frequency as a reference, and the sync signal is square waves of 50% duty cycle. For the hop frequency, at the time of conversion, the sync signal is a TTL high-level.

For PSK, the sync signal takes the modulation phase as a reference, and the sync signal is square waves of 50% duty cycle. For the modulation phase, at the time of conversion, the sync signal is a TTL high-level.

2.6 Frequency Meter

Frequency meter adopts single-channel frequency measurement, with measurable signal range of 1Hz - 160MHz.

Press Counter to enter the interface shown below, and the frequency values measured is shown in the central screen. The external signal is input by the [Counter] interface on the rear panel.

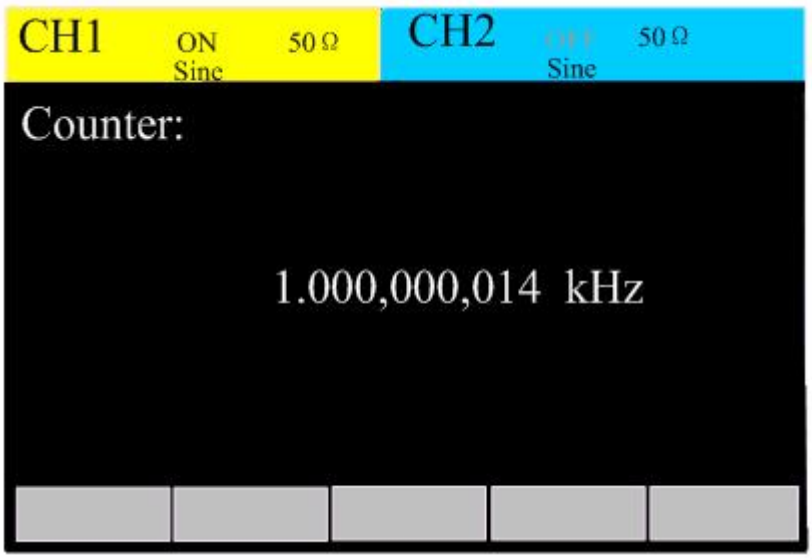


Figure 2-31 Frequency Meter Interface

Note:

When there is an external frequency signal input, the screen value will refresh regularly; if the external frequency signal is disconnected, the refresh stops, and the screen retains the last frequency value.

2.7 Assist System Function Setup

Press Utility to set the channel output parameters, system configuration information, file storage, check interface information, perform machine calibration and system upgrades, and inspect system information.

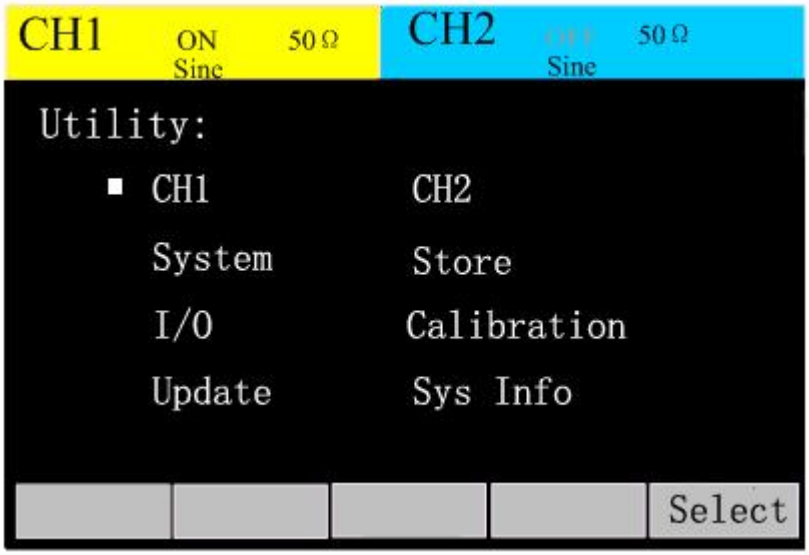


Figure 2-32 Assist System Function Setup Interface

- Channel output parameters include load/impedance setup of Channel 1 and Channel 2
- System setup provides buzzer switch, Chinese-English switch and screen brightness;
- File storage can store and read the state files inside the function signal generator, and also support the creating and deleting operations to the state and data files on the USB storage device;
- Interface information provides USB PID and VID information inquiry, and RS232 interface information inquiries;
- Calibration provides the amplitude and offset calibration of the machine itself;
- System upgrades include front panel upgrade, communication module upgrade and FPGA procedure upgrade;
- System information can inquire some basic information about the machine.

2.7.1 Channel 1/2 output parameter setup

Output impedances of Channel 1 and Channel 2 are set independently, which can be set as load/impedance.

1. Press Utility →CH1→Select to enter Channel 1 output impedance setup interface and set the load value of the Output connector, with specific interface being shown below.

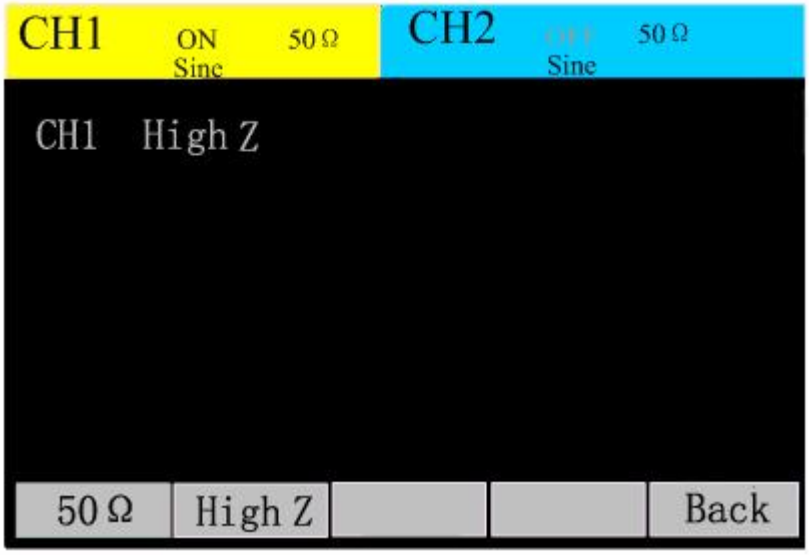


Figure 2-33 Channel 1 Output Parameter Setup

To set the output impedance as 50Ω, press 50Ω; to set high impedance, press High Z.

2. Press Utility →CH1→Select and enter Channel 2 output impedance setup interface.

2.7.2 System setup

Press Utility → System → Select and enter the following interface.

Figure 2-34 System Setup Interface

Table 2-22 System Setup Menu

Functional menu	Setup	Description
Buzzer	——	Set switch of buzzer
Language	——	Set the display language
Light	0-100	Set the screen brightness

Select Language

ET3340 is equipped with a user interface in both Chinese and English for users to choose.

To select the language displayed by the OS, Utility → System → Select → Language and adjust language types in screen operation.

2.7.3 File storage

Press Utility → File Storage → Select, the screen displays file storage interface as shown below, by which you can store and read the state files inside the function signal generator, and also support creating and deleting operations to the state and data files on the USB storage device. The file name support only capital English letters and numeric input.

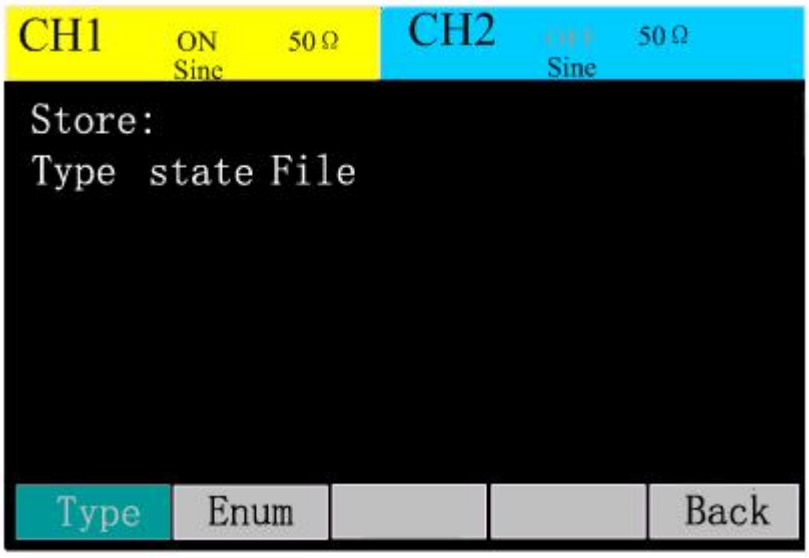


Figure 2-35 File Storage Interface

Table 2-23 File Storage Menu

Functional menu	Setup	Description
Types	State/Arb Files	Set the file types needed to be operated State File: Instrument state files Arb File: Arbitrary wave files
Contents	—	Enter Contents interface
Back	—	Back to the previous interface

Storage Instrument State

Users can store the instrument state at any ONE/10MHZ of the 10 non-volatile storage locations. The state storage feature "remembers" the selected function (including arbitrary waveform), frequency, amplitude, offset voltage, duty cycle, symmetry, phase and any other modulation parameters used.

Specific operations of instrument state storage are as follows:

1. Select the state file type, press type → state → contents and enter the instrument state storage interface.

2. Select the file storage location. There are 10 local storage locations state1: state2: ... state10: and select any storage location in the knobs.

3. Press Store to name and save the file. After input is completed, press Finish, and the file is stored.

Figure 2-36 Instrument State Storage Interface

Arb Data Files Storage

Users can store the Arb data file at any ONE/10MHZ of the 10 non-volatile storage locations. There already exists data file at the currently selected location, and then the new data file will overwrite the old ONE/10MHZs.

Specific operations for Arb data files storage are as follows:

1. Select arb File Type, press Type → arb → Contents, and enter the arb file storage interface.

2 Select the file storage location. There are 10 local storage locations arb1: arb2: ... arb10: and select any storage location in knobs.

3. Press Store to name and save the file. After input completed, press Finish, and the file is stored.

Figure 2-37Arb Data Storage Interface

U-disk storage usage

As shown in the figure, the interface mode is divided into local and U disk. The left side of the front panel is equipped with a USB interface, when the USB storage is inserted, the upper right corner of the interface will show .

1. Install the Removable Storage

Insert the removable storage into the USB interface on the front panel, and the upper right corner of the screen will display to prompt that the system detects a U-disk.

2. Select U-disk Storage

Select the file type as State File or Arb File, and press Contents to enter the contents interface. Press Mode→ U-disk storage → Store, confirm after input the name of the file, and you can store

the file in the U-disk.

3. Eject the U-disk

In the file storage interface, if there is currently insert U-disk, there will be Ejection option and press the Ejection key to eject the U-disk. After the U-disk ejected, the pattern disappears.

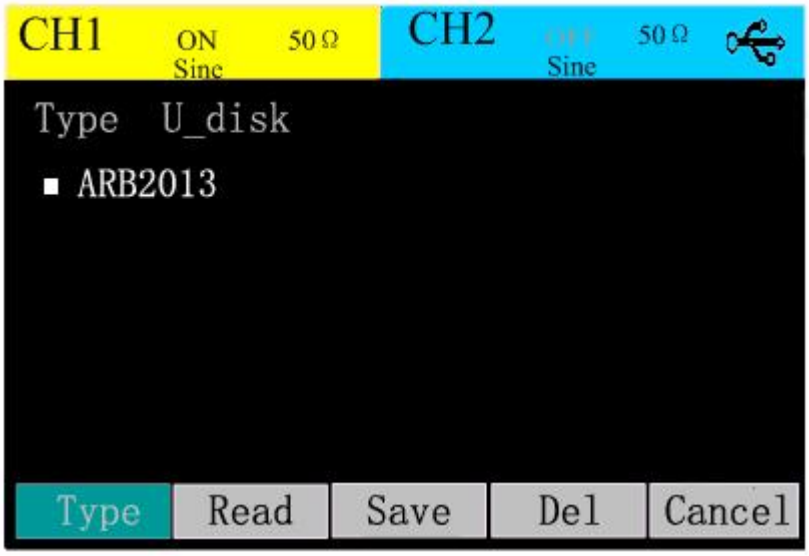


Figure 2-38 USB Storage Usage

File name Input

The file name input supports only English characters, and in U-disk storage, the input characters will be automatically converted to capital letters. Specific interface is shown in Figure 2-39.

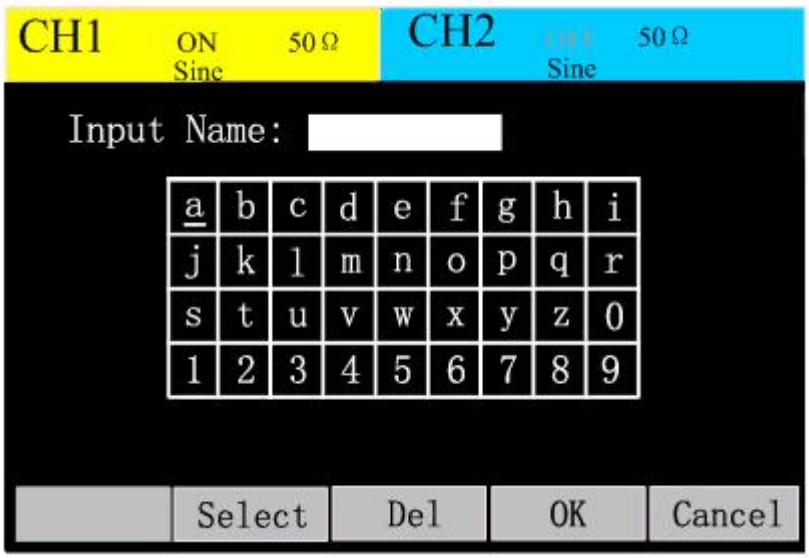


Figure 2-39 File Name Input Interface

1. Use the knob to adjust the left and right positions of the input keyboard cursor, when the letter is selected, press the Select key to input the desired file name;

2. When editing an wrong file name, use the left and right keys to move the cursor to select the wrong letters you want to delete, press the Delete soft key to delete and re-edit the file name to be input;

3. Select Finish ending the file name inputting.

2.7.4 Interface

Press Utility → Interface → Select, enter the interface shown below to check the basic information of USB interface and RS232 interface.

Figure 2-40 Interface Information

2.7.5 Calibration

Signal generator has been calibrated when leaving the factory. We do not recommend users to calibrate individually. Contact the local dealer for calibration services.

2.7.6 System upgrade

System upgrades contains THREE/40MHZ modules: software module, communication module and logic module.

The system supports U-disk upgrade. When the U-disk is inserted, the system will automatically detect the upgrade file package, and if any, the interface will suggest that the module can be upgraded.

After the upgrade is finished, please restart the device to complete the upgrade.

Note:

Be cautious to upgrade the system, please download from the company's official website or

contact local dealer if you need upgrade file package.

2.7.7 System information

System information includes the serial number of the machine and version number of the software and hardware.

2.8 Help

function signal generator has a built-in help system to provide related help for some common operations, and users can use a list of help topics to get operational guidelines about some of the keys on the front panel.

Press the Help key to enter the built-in help menu. Select the help information need to be read; press Select to read the corresponding help information.

1. How to produce basic waveforms

Take Channel 1 output sine as an example:

1) Press the Sine key to enter the Sine editing interface

2) Use the reusable keys to select the parameter to change

3) Data can be modified by the knobs or numeric keys

4) Press the Channel 1 Output key to output waveforms

2. How to generate modulation signal

Take the carrier and sine as an example:

1) Enter the Sine wave editing interface to edit the waveform

2) Press the Mod key to enter the modulation interface to edit parameters

3) Press the Channel 1 Output key to output

4) To change carrier data, press the carrier key to enter the carrier interface for editing

3. How to set the output impedance

Examine how to set up the device output impedance of channel 1 and channel 2.

4. Create arbitrary waveforms

1) Press Arb to enter arbitrary waveform editing interface

2) Select Wave to enter the waveform operating interface

3) Select Create to enter arbitrary waveform creation interface

4) Create basic information of arbitrary waveforms

5) Select Point Edit to enter the point editing interface

6) Edit voltage value point by point, preserve after finishing

7) Output preserved arbitrary waveform

5. How to get help

Check how to get help.

6. Technical support

For technical support, please contact the local dealer.

2.9 Telecommunication

ET3340 supports standard USB or RS232 interface to communication with the computer to realize arbitrary waveform downloading.

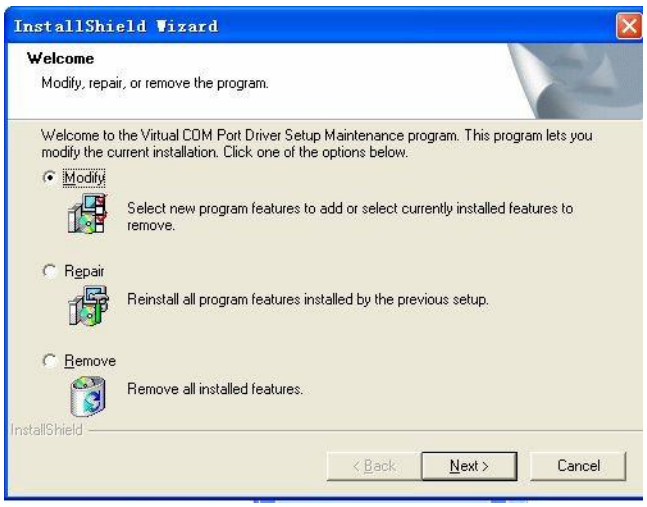
When the instrument is working in remote mode, there is an icon LOCK on the upper right corner of the user interface, and the front panel keys are locked. Here, you can return to the local operating mode by pressing the Help key.

2.9.1 Establishment of communication between instrument and the PC

Connect the PC with a USB

- For USB driver installation, users can install the USB driver software in the CD-ROM to the PC. Specific steps are as follows:

  Step 1, select the installation type:



  Step 2, install according to the installation wizard:

  Step 3, finish:

- Using a standard USB cable to connect the machine, and when "STMicroelectronics Virtual COM Port ..." can be seen on the computer equipment manager ports (COM & LPT), it suggests that the USB driver is installed correctly and the device is connected properly.

Connect the PC with standard RS232 cable

RS232 interface is shown below.

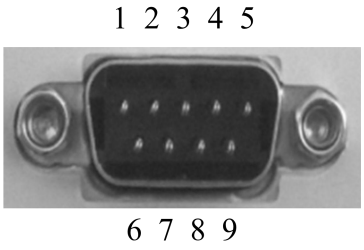


Figure 2-41 RS232 Interface

RS232 interface parameters configuration:

Baud rate: 115200

Data bits: 8

Stop bit: 1

Parity bit: NONE/10MHZ

Note:

Do not use USB and RS232 interfaces simultaneously. The instrument will lock the port after receiving data, and if using them simultaneously, it may lead to the other ET3310 unworking or working abnormally.

3. Technical Specifications

Unless specified otherwise, all technical specifications apply to ET3325 function/arbitrary waveform generators. Signal generator must meet the following requirements at first to meet these specification standards:

- The instrument must work continuously in a specified operating temperature (18 ℃ - 28 ℃) for more than 30 minutes.
- All technical specifications can be met at a temperature change of less than 5 ℃.

3.1 Product Technical Indicators

Frequency Characteristics					
	ET3310	**ET3325**	**ET3340**	**ET3360**	**ET3370**
Waveform types	Sine, square, triangle, pulse, noise and arbitrary waves (including DC)				
Sine	1uHz~10MHz	1uHz~25MHz	1uHz~40MHz	1uHz~60MHz	1uHz~70MHz
Square	1uHz ~ 5MHz	1uHz ~ 5MHz	1uHz~10MHz	1uHz~10MHz	1uHz~10MHz
Triangle	1uHz~500kHz	1uHz~500kHz	1uHz~1MHz	1uHz~2MHz	1uHz~2MHz
Noise (-3dB)	7MHz Bandwidth				
Pulse	100uHz~5MHz	100uHz~ 5MHz	100uHz~10MHz	100uHz~10MHz	100uHz~10MHz
Arbitrary wave	1uHz~5 MHz	1uHz ~ 5MHz	1uHz~10MHz	1uHz~10MHz	1uHz~10MHz
Frequency Resolution	1uHz				
Frequency Accuracy	±5ppm				
Sine Wave Characteristics					
Harmonic distortion(CH1) ＞1Vpp	0~1MHz: ＜-45dBc;1MHz~10MHz: ＜-40dBc; 10MHz~20MHz: ＜-30dBc; 20MHz~40MHz: ＜-25dBc; 40MHz~70MHz: ＜-20dBc;				
Harmonic distortion(CH2) ＞1Vpp	0~1MHz: ＜-45dBc;1MHz~40MHz: ＜-40dBc; 40MHz~70MHz: ＜-35dBc				
Total harmonic distortion	＜0.2% （20Hz-20kHz, 1Vpp）				
Square Wave Signal Characteristics					
Rise/fall	＜20ns				
Overshoot	＜5%				
Duty cycle	≤100kHz: 1%~99%; ≤5MHz: 20%~80%;	≤100kHz: 1%~99%; ≤5MHz: 20%~80%; ≤10MHz: 40%~60%（0.1% resolution）			
Dissymmetry (50% duty cycle)	1% Period + 5ns				
Jitter	6ns+0.1% Period				

Ramp Wave Characteristics	
Linearity degree	≤0.1% Peak output
Symmetry	0.0~100.0%（resolution 0.1%）
Pulse Wave Characteristics	
Pulse width	Min20ns; 1ns resolution
Edge transition time	Min 20ns;
Overshoot	＜5%
Jitter	6ns+0.1% Period
Arbitrary Wave Characteristics	
Sampling speed	160MSa/S
Waveform amplitude resolution CH1	12bits
Waveform amplitude resolution CH2	10bits
Waveform length CH1	16k
Waveform length CH2	4k
Minimum rise/fall time	＜20ns
Jitter	6ns+30ppm
Storage quantity	10 waveforms
Output Characteristics	
Amplitude (50Ω)	
CH1 Range	1mVpp~10Vpp≤20MHz 1mVpp~5Vpp＞20MHz
CH2 Range	1mVpp~3Vpp≤20MHz
Accuracy	±1% set value±1mVpp（1kHz Sine，0 offset，>10mVpp）
Resolution	1mV or 3 bit

CH1 Flatness (relative to 1K Sine, 1 Vpp)	±0.1dB，≤100kHz ±0.3dB，≤5MHz ±0.4dB，≤45MHz ±1dB，≤70MHz
CH2 Flatness (relative to 1K Sine, 1 Vpp)	±0.1dB，≤100kHz ±0.2dB，≤5MHz ±2dB，≤40MHz ±5dB，≤70MHz
Offset (50Ω)	
CH1 Range	±5Vpk , ac + dc
CH2 Range	±1.5Vpk , ac + dc
Accuracy	±（1% set value+5mV+0.5% amplitude）
Output impedance	50Ω
Protection	Short circuit protection, automatically disables the waveform output when overloading
SYNC Output	
Level	TTL compatibility
Impedance	50Ω
Rise/fall time	<25ns;
Maximum frequency	25MHz
AM Modulation (CH1)	
Carrier wave	Sine, square, ramp, pulse and arbitrary waveforms (excluding DC)
Source	Internal/external
Modulation wave	Sine, square, triangle and ramp
Modulation frequency	2mHz~20kHz
Modulation depth	0%~120%
FM Modulation (CH1)	
Carrier wave	Sine, square, ramp, pulse and arbitrary waveforms (excluding DC)
Source	Internal/external

Modulation wave	Sine, square, triangle and ramp
Modulation frequency	2mHz~20kHz
Frequency offset	0~Maximum carrier frequency
FSK Modulation (CH1)	
Carrier wave	Sine, square, ramp, pulse and arbitrary waveforms (excluding DC)
Source	Internal/external
Modulation wave	Square wave of 50% duty ratio
Keying frequency	2mHz~1MHz
ASK Modulation (CH1)	
Carrier wave	Sine, square, ramp, pulse or arbitrary waveforms (excluding DC)
Source	Internal/external
Modulation wave	Square wave of 50% duty ratio
Keying frequency	2mHz~1MHz
PSK Modulation (CH1)	
Carrier wave	Sine, square, ramp, pulse or arbitrary waveforms (excluding DC)
Source	Internal/external
Modulation wave	Square wave of 50% duty ratio
Modulation phase	0°~360°
PM Modulation (CH1)	
Carrier wave	Sine, square, ramp, pulse or arbitrary waveforms (excluding DC)
Source	Internal/external
Modulation wave	Square wave of 50% duty ratio,Triangle wave of 50% symmetry ratio,Up-ramp wave of 100% symmetry ratio,Up-ramp wave of 0% symmetry ratio
Phase offset	0°~360°
Frequency Sweep (CH1)	
Carrier wave	Sine, square, ramp, pulse and arbitrary waveforms (excluding DC)

Types	Linearity/Logarithm
Start/Stop Frequency	1uHz~Maximum carrier frequency
Sweep frequency time	1ms~500s
Trigger source	Manual operating, internal, external
Burst characteristics (CH1)	
Carrier wave	Sine, square, ramp, pulse, noise and arbitrary waveforms (excluding DC)
Pulse count	1~65535 or infinite, gated
Start/stop phase	0~360°
Internal period	1us~500s
Gating source	External
Trigger source	Internal, external, manual operating
Frequency Meter	
Frequency range	1Hz~200MHz
Frequency resolution	6 bit/s
Voltage range and sensitivity	100mVpp~5Vpp
Input adjustment	input impedance: 1MΩ
	coupled modes: AC
Trigger Input	
Level	TTL compatibility
Slope	Rise/Fall
Pulse width	＞100ns
Reaction time	＜500ns（burst）
	＜10us（sweep frequency）
Modulation Input	
Impedance	1MΩ
Signal	±5V ac+dc

range	

3.2 General Technical Specifications

Power Supply	
Supply voltage	200~240V, 45~65Hz
Power consumption	< 40W
Display	
Types	3.5-inch TFT LCD screen
Resolution	480×320
Color	16M color
Environment:	
Temperature range	Operation: 10℃~+40℃ Non-operation: -10℃~+60℃
Cooling methods	Natural cooling
Humidity range	Below +35℃: ≤90％ relative humidity +35℃ ～+40℃: ≤60％ relative humidity
Interface	RS232，USB Host USB Device

4. Appendices

Appendix A: Accessories

Standard accessories:

- 1 piece of 30A51 ET3340-wire power line;
- 1 piece of 33A52 BNC coaxial cable;
- 1 CD-ROM

Optional accessories:

- BNC alligator clip line (33P01);
- Cabinet installation suit (32P02);
- RS232 serial line (32P04);
- USB data line (32P05).

Appendix B: Maintenance and Cleaning

General maintenance

Please do not place the instrument subjected to sunlight exposure for a long time.

Cautions:

Do not make any corrosive liquid stain on the instrument, so as not to damage the instrument.

Cleaning

Clean the instrument regularly based on practice. Specific methods are as follows:

1. Disconnect power

2. Wipe the dust outside of the instrument with a damp but not dripping soft cloth (mild cleaner or water can be used). When cleaning the LCD, be careful not to scratch the transparent LCD protection screen.

Warning:

Before re-power on, make sure the instrument is completely dry to avoid electrical short circuit or even personal injury caused by moisture.