

UNI-T®



UTG9000BS/DS Series

OPERATING MANUAL

**DDS FUNCTION/ARBITRARY
WAVEFORM GENERATOR**

UTG9000BS/DS

DDS Function/Arbitrary Waveform Generator
Operating Manual

Introduction

Thanks for purchasing our product. In order to ensure to use this instrument correctly for best performance, please read this manual in details and keep it properly. This instrument is under strictly quality control for production. All the parts go through screening and a series of performance testing, environmental testing and safety testing which guarantee safety in proper using. It has the best working performance under the guidelines of working environment.

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1. General Description

Thank you for purchasing DDS Function/Arbitrary Waveform Generator.

DDS function generator is the updated product of traditional analog function generator with more function advantages and better cost performance. It is now widely used in manufacturing, teaching and researching.

This series have the following features:

- DDS technique is applied with the same high frequency stability and resolution as crystal oscillator and extreme low frequency is realizable.
- VLSI and SMT are used. Auto-calibrating program without mechanical potentiometer can insure the high reliability.
- Double channels output, frequency of both A/B channels reach max limit of the instrument. (max output of channel B of UTG9040BS/DS is 20MHz)
- Ten basic waveforms includes Sine, Square, Triangle, Pulse, Up Ramp, Down Ramp, P-Exp, N-Exp, Sine (x) /x and Noise wave.
- Modulation waveforms include AM, FM, PWM, Sweep,

Burst, ASK, FSK, PSK

- 4.3" color TFT LCD (480 × 272) display, Chinese or English menu.
- Favorable human-machine interface with convenient operation. Each one button to each waveform and modulation waveform. The parameters can be keyed in by number buttons or by combined operation of buttons and pulse knob.
- All settings and conditions for waveforms are saved automatically and can be recovered automatically.
- Convenient and practical software for arbitrary waveform programming can download and save 16 arbitrary waveforms, edit and output 4 arbitrary waveforms at the same time. The arbitrary waveforms could be output independently or in groups. (optional)
- USB interface (applied for DS series)

Please read this manual carefully before using and keep it for reference. The instrument is of high quality and stable reliability since it is manufactured strictly according to the quality controlling standards.

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2. Safety summary

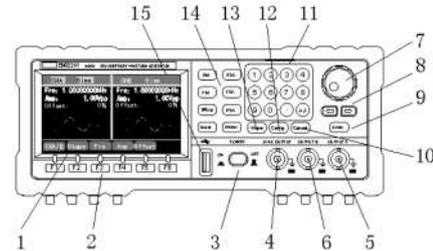
- The protection from the instrument may be ruined if it is not used as guided by the manual
- The power plug should be grounding protected.
- The instrument should be used in the specified conditions as followed (temperature 0°C ~ 40°C, humidity≤80%) , The best operation condition is at the indoor temperature (around 25°C)
- As for the instrument with its sine wave frequency is ≤ 20M, the signals of more than 20 Vpp(open-circuited) or 10Vpp (50Ω) cannot be connected to the signal output. If the frequency is >20M the signals of more than 6 Vpp (open-circuited) or 3Vpp (50Ω) cannot be connected to the signal output.
- Replace the new fuse only after the power is switched off and the specified fuse of rated current (220V/0.5A) should be used.
- The protection of the product may be ruined when it can not work properly. Please contact our sales department or service station to get quick and effective after-sale service

if there is anything wrong with our product.

- The cover of the case cannot be opened except by professional technicians.

3. Panel Functions

3.1 Front Panel as followed



- 1—4.3' color TFT LCD (480×272) display; display of all operations and data settings with high resolution
- 2—Function key zone: There are 6 function keys. They are of different functions according to different menus and the corresponding functions are displayed down on LCD.

3—Power switch: key in to turn on and out to turn off.

4—Synchronization output: “SYNC OUTPUT” terminal outputs TTL level pulse wave which is used to indicate the time of the output signal A issued. At this time the synchronized signal can be input through external trigger port of oscilloscope so the complex waveform of the product can be stable to be observed conveniently.

5—CHA main output: It outputs all basic waveforms and modulated signals. The output impedance is 50Ω .

6—CHB output: At the condition of basic waveform output it has similar function as the main output CHA to output all basic waveforms. At the condition of modulated waveform output it outputs modulated wave while CHA outputs modulated carrier wave.

7—Digital Knob: Roller for short. It is a novel digital part which is used to choose, add or subtract the value when there is any function to be modified or parameter in the menu highlighted. The corresponding output changes correspondingly when the roller works.

8—Direction keys of Left and Right: to choose bits when changing the data with pulse switch. The right direction key can delete the last number just input when setting numbers.

9—Enter: key to confirm and save the setting of signal frequency, amplitude and other parameters directly by Number key. In model with function of arbitrary wave it should be pressed to confirm the choosing of arbitrary waveform in memory.

10—Cannel: Press it to exit from direct number setting of parameters such as signal frequency and amplitude.

11—Number: set parameters

12—Config: has functions of external frequency measurement, measuring arbitrary wave output and downloading. (some functions are optional)

13—Wave: press it once and the key will be lightened with one “beep” sound to enter the basic wave interface including Sine, Square, Triangle, Pulse, Up Ramp, Down Ramp, P-Exp, N-Exp, Sine (x) /x and Noise.

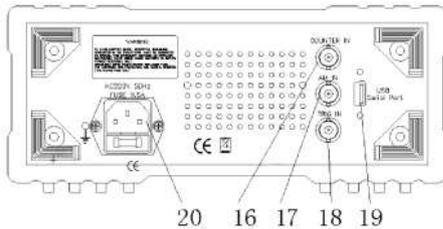
14—Modulation waveform key zone: each of 8 button to ac-

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cess corresponding modulation waveforms of AM, FM, Sweep, Burst, ASK, FSK, PSK and PWM.

15—USB interface (applied for DS series)

3.2 Back panel



16—COUNTER IN: external frequency input

17—AM IN: external AM signal input

18—TRIG IN: external trigger input of modulation

19—USB serial port (optional)

20—power input socket

4. Use Method

4.1 Start up

Connect the power cord to the power supply socket and press the power switch to enter the start up interface as Fig. 1 below which is basic waveform interface with “WAVE” button lightened.

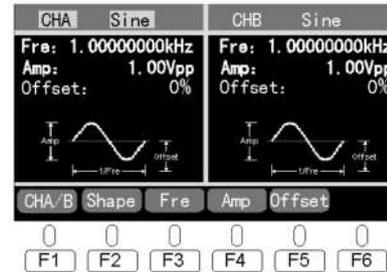


Fig. 1

4.2 Waveform choose

4.2.1 Basic waveform choose

Confirm the current interface. If it is not as Fig. 1 then press the “Wave” button to access the basic waveform in-

terface.

Default setting is CHA output setting, wave choose and Sine wave with the top line CHA and wave name highlighted. If it is not highlighted press F2-Shape to enter the interface of wave choose (similarly hereinafter) to make it. Then use the roller to choose waves of Sine, Square, Triangle, Pulse, Up Ramp, Down Ramp, P-Exp, N-Exp, Sine (x) /x and Noise.

In CHA interface waves output through the high frequency socket OUTPUT A. In CHB interface waves output through the high frequency socket OUTPUT B Default settings is routine of this product.

Press F1-CHA/B to switch between CHA and CHB setting interface. When it is switched to CHB including the highlighted zone as Fig. 2, the way to choose waveform is similar to CHA as above to choose waves of Sine, Square, Triangle, Pulse, Up Ramp, Down Ramp, P-Exp, N-Exp, Sine (x) /x and Noise.

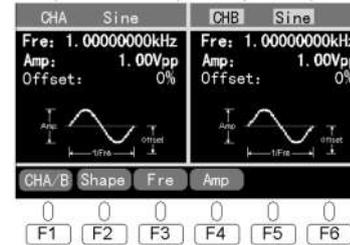


Fig. 2

Note: Default frequency is 1.0000000KHz. Default amplitude is 1.00Vpp. Default DC offset is 0%. All the three are the routine default settings of this product.

4.2.2 modulated waveform choose

In the modulated waveform choose zone of the panel all of 8 buttons including AM, FM, Sweep, Burst, ASK, FSK, PSK, PWM can be pressed once to access the corresponding modulated wave interface. Modulated wave outputs through OUTPUT A terminal on front panel .Wave to modulate outputs through OUTPUT B terminal.

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For example the AM wave interface is as Fig. 3 below.

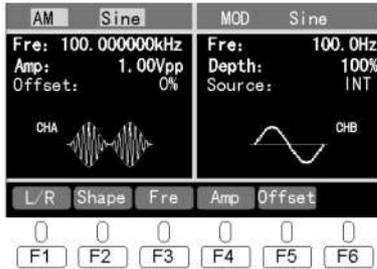


Fig. 3

Press F1-L/R to switch between the left and right interface. The left interface is for carrier wave setting. Default setting is wave choose and Sine wave. In start interface as Fig. 3 or press “F2-wave” that the carrier wave choose zone is highlighted. Use roller to choose among 5 waves of Sine, Square, Triangle, Up Ramp and Down Ramp.

Press F1 to switch to right interface as modulated wave setting including highlighted zone as Fig. 4. The way to choose wave is similar to carrier wave choose as above. Use roller to choose among 5 waves of Sine, Square, Trian-

gle, Up Ramp and Down Ramp.

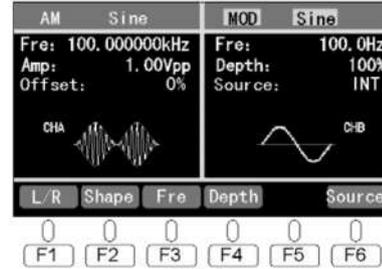


Fig. 4

The ways to choose modulated waves of FM, Sweep, Burst, ASK, FSK, PSK, PWM are similar as above.

4.2.3 Arbitrary wave choose (applied for DS series)

Press the button “Config” to access the setting interface to operate arbitrary wave output and download in Model with the arbitrary wave software and function. Refer to 4.16 arbitrary wave output.

4.3 Frequency setting

In wave setting interface press the Frequency correspond-

ing function key .The Frequency numbers will be highlighted while the frequency parameters can be set. For example in Sine interface as Fig. 5 press F3-Fre to set the frequency and the interface is as below.

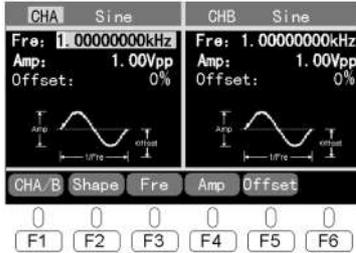


Fig. 5

4.3.1 Set by roller and direction keys

Use the roller to change frequency setting and real-time output.

Use the left and right direction keys to choose numbers and unit of frequency and they will be highlighted and then can be modified by the roller.

Note: When the direction key moves the highlighted zone

at “KHz”, use the roller control it will be switched among “μHz”, “mHz”, “Hz”, “KHz”, “MHz” with the value multiplied or divided by 10^3 .

4.3.2 Set directly by number keys

The frequency can also be set by number keys directly which is a quick way to set parameters. Press the number keys the interface will change to the specific one of number setting. For example, press number 1 and the interface is as Fig. 6 below.

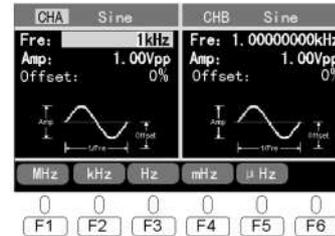


Fig. 6

Keep pressing the number key the number will move forward from right to left. During the number setting the new-

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est number input can be deleted from right to left by the left direction key. After the number setting is done, press the frequency corresponding function key to finish and confirm the setting of frequency and the signal of such settings will output immediately.

Press the “Enter” key to confirm the value and the output changes to new settings(frequency unit remains). During the number setting process press the “cancel” key to exit and return to the parameters before.

There’s upper and lower limit of frequency setting as per kinds of waves and model of the product.

Sine 1 μ Hz~upper limit

Square 1 μ Hz~5MHz

Others 1 μ Hz~1MHz

★ Except other frequency range indicated separately in technical parameters

4.4 Amplitude setting

In wave setting interface press the Amp corresponding function key that the amplitude parameter will be highlighted to be set.

For example in Sine interface the default amplitude is 1.00Vpp. Press F4-Amp to set the amplitude and the interface is as Fig. 7 below.

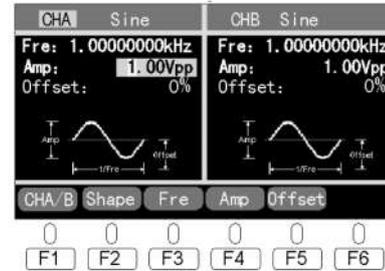


Fig. 7

4.4.1 Set by roller and direction keys

Use the roller to change amplitude setting and real-time output.

Use the left and right direction keys to choose numbers and unit of amplitude as highlighted then use roller to modify them.

Note: When the direction key moves the highlighted zone

at “V”, use the roller control it will be switched between “mV” and “V” with the value multiplied or divided by 10^3 .

4.4.2 Set directly by number keys

The amplitude can also be set by number keys directly which is a quick way to set parameters. Press the number keys the interface will change to the specific one of number setting. For example, press number 1 and the interface is as Fig. 8 below.

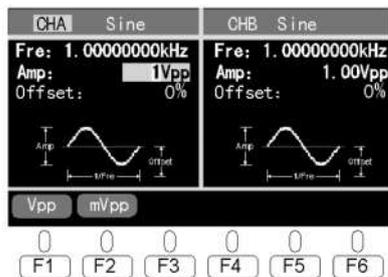


Fig. 8

The way to set amplitude number is similar to the setting of frequency.

There is upper and lower limit of amplitude as per kinds of waves and model specifications.

4.5 DC offset setting

In this series DC offset is shown in the unit of %. In wave setting interface press the Offset corresponding function key and the DC offset number will be highlighted while the DC offset parameters can be set. The default setting is 0%. For example in Sine interface press F5-Offset and the interface is as Fig. 9 below.

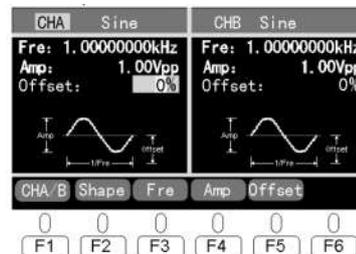


Fig. 9

4.5.1 Set by roller and direction keys

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Use the roller to change DC offset +/- and setting and signal real-time output.

Use the left and right direction keys to choose numbers and unit of DC offset.

4.5.2 Set directly by number keys

The DC offset can also be set by number keys directly which is a quick way to set parameters. Press the number keys the number input will be highlighted and flicker. For example, press number 1 and the interface is as Fig. 10 below.

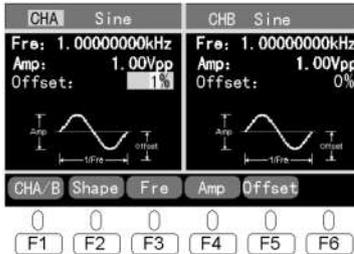


Fig. 10

The way to set DC offset number is similar to the setting of

frequency.

The range of DC offset is $\pm 100\%$.

4.6 Duty cycle setting

Duty cycle setting is only effective in Pulse and PWM.

In Duty cycle setting interface press Duty corresponding function key and the Duty number will be highlighted while the duty cycle parameters can be set. The Default setting is 20%.

For example in Pulse interface Press F6-Duty and the interface is as Fig. 11 below.

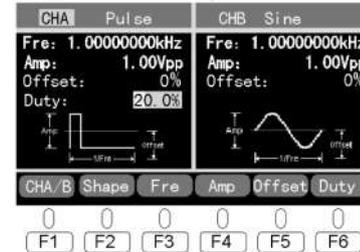


Fig. 11

4.6.1 Set by roller and direction keys

Use the roller to change Duty cycle setting and real-time output.

Use the left and right direction keys to choose numbers and unit of Duty cycle.

4.6.2 Set directly by number keys

The Duty cycle can also be set by number keys directly which is a quick way to set parameters. Press the number keys the number input will be highlighted and flicker. For example, press number 1 and the interface is as Fig. 12 below.

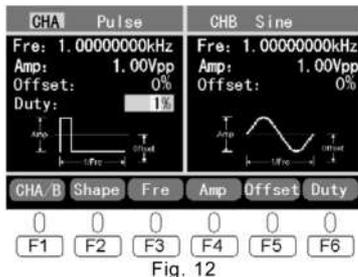


Fig. 12

The way to set Duty cycle number is similar to the setting of frequency.

The range of Duty cycle is 0.1% ~ 99.9%.

4.7 AM setting

Press the button AM to access the AM wave interface as Fig. 13 below.

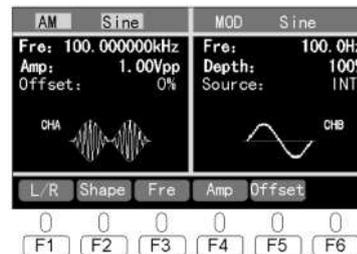


Fig. 13

4.7.1 Carrier wave setting

In this interface:

F1-L/R is switch of left and right interface of AM carrier wave and Modulated wave setting.

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F2 ~ F5 are function keys to set the frequency, amplitude and DC offset of carrier wave. Refer to introductions above. AM carrier waveform includes 5 waves of Sine, Square, Triangle, Up Ramp and Down Ramp.

Default frequency setting of carrier wave is 100.000000kHz
Carrier wave frequency range:

Sine 1μHz ~ upper limit of frequency (20MHz max)
Square 1μHz ~ 5MHz
Others 1μHz ~ 1MHz

4.7.2 Modulated wave parameter setting

Press F1-L/R to switch to the right interface - modulated wave setting as Fig. 14.

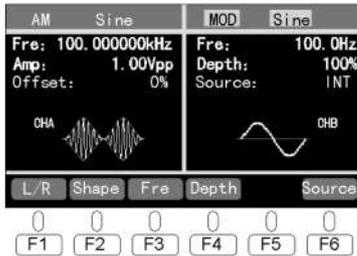


Fig. 14

In this interface:

F1-L/R is switch of left and right interface.

F2~F3 are function keys to set modulated waveform and frequency. The setting way is similar to carrier wave.

F4-Depth is modulation depth function key to set modulation depth. When it's chosen the roller or the number keys can be used to set parameters which is similar to the way of DC offset setting.

F6-Source is to choose internal or external signal modulation.

The modulation waveform includes 5 waves of Sine, Square, Triangle, Up Ramp and Down Ramp.(the same below)

Modulation frequency: 1mHz~20KHz. Default setting is 100.0Hz

The range of modulation depth is 0%~100%. Default setting is 100%.

When the source is external the modulation is up to the waveform, frequency and amplitude of external modulation signal.

4.8 FM setting

Press the button FM to access the FM wave interface as Fig. 15

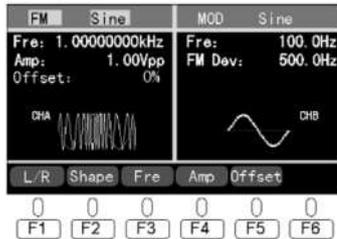


Fig. 15

4.8.1 Carrier wave setting

In this interface:

F1-L/R is switch of left and right interface of carrier wave and FM parameter setting.

F2~F5 are function keys to set the waveform, frequency, amplitude and DC offset of carrier wave. Refer to introductions above.

The waveform and frequency range is similar to those of AM wave.

4.8.2 Modulated wave parameters setting

Press F1 to switch to the right interface - modulated wave

setting as Fig. 16.

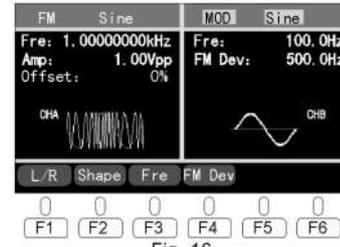


Fig. 16

In this interface:

F1-L/R is switch of left and right interface.

F2~F3 are function keys to set modulated waveform and frequency. The setting way is similar to carrier wave.

F4-Dev is Frequency offset function key. When it's chosen the roller or the number keys can be used to set parameters which is similar to the way of frequency setting as above.

Note: the FM signal is fixed to internal modulation.

Modulation frequency: 1mHz~20KHz .

The range of modulation offset must be less than the differ-

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ence between the upper limit of carrier wave frequency & waveform frequency and the carrier wave frequency. Default setting is 500.0Hz.

4.9 Sweep setting

Press the button Sweep to access the Sweep interface as Fig. 17

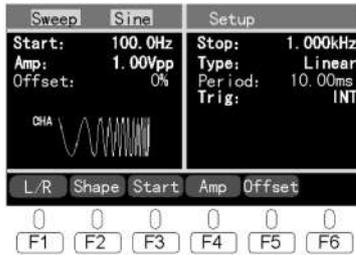


Fig. 17

4.9.1 Carrier wave setting

In this interface:

F1-L/R is switch of left and right interface of carrier wave and SWEEP parameter setting.

F2, F4 and F5 are function keys to set the parameters of carrier wave. Refer to introductions of AM setting above.

F3-Start is to set the sweep start frequency. The setting way is similar to carrier wave setting.

The waveform and frequency range of Sweep carrier wave is similar to those of AM carrier wave.

4.9.2 Sweep parameters setting

Press F1 to switch to the right interface - Sweep setting as Fig. 18

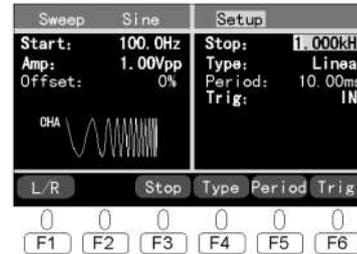


Fig. 18

In this interface:

F1-L/R is switch of left and right interface.

F3-Stop is for setting sweep termination frequency. The way to set is similar to the start frequency setting.

F4-Type is for sweep method choosing from Linear or Log

with roller.

F5-Period is for sweep period setting. When it's chosen the roller or the number keys can be used to set parameters which is similar to the way of DC offset setting.

F6-Trig is to choose external or internal trigger signal

Note: the range of sweep termination frequency is the same to the sweep start frequency.

Sweep period: 1ms ~100.0s, default as 10.00ms

When external trigger is chosen the function generator outputs start frequency and waits to be triggered. It outputs one sweep when receiving one TTL pulse from Trig IN at back panel with all parameters as set and displayed by original interface. After When the scanning output is done, the function generator outputs start frequency and wait for the next trigger.

The trigger period should be larger than or equal to the scanning rate +1ms. The trigger signal in the period will be neglected.

4.10 Burst setting

Press the button Burst to access the FM wave interface as

Fig.19

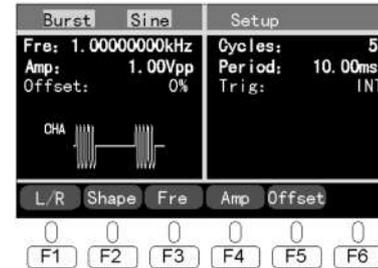


Fig. 19

4.10.1 Carrier wave setting

In this interface:

F1-L/R is switch of left and right interface of carrier wave and Burst parameter setting.

F2~F5 are function keys to set the parameters of carrier wave. Refer to AM carrier wave setting above.

The waveform and frequency range of Burst carrier wave is similar to those of AM carrier wave.

4.10.2 Burst parameters setting

Press F1-L/R to switch to the right interface - Burst setting

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as Fig. 20

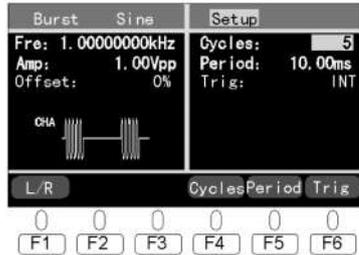


Fig. 20

In this interface:

F1-L/R is switch of left and right interface.

F4-Cycles is for waveform cycle times(burst count) setting.

When it's chosen the roller or the number keys can be used to set parameters.

F5-Period is for burst period setting. When it's chosen the roller or the number keys can be used to set parameters.

F6-Trig is for external or internal trigger choosing.

Waveform cycle times are 1~60000 with default as 5.

Burst period is 1ms ~100.0s with default as 10.00ms.

Both internal and external trigger works for Burst with de-

fault as internal trigger.

When internal trigger is chosen, it constantly outputs cycle numbers.

Burst period will decide the time span between burst frequency and burst.

The burst cycle should be long enough and meet the conditions below:

Burst cycle > burst numbers / wave frequency + 1ms

When external trigger is chosen, each time the function generator will output one waveform with specified cycle number (burst) when it receives the trigger. After the operation is done the function generator will stop and wait for the next trigger.

4.11 ASK setting

Press the button ASK to access the ASK interface as Fig. 21

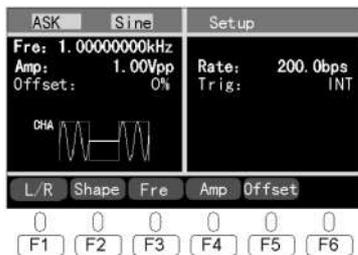


Fig. 21

4.11.1 Carrier wave setting

In this interface:

F1-L/R is switch of left and right interface of carrier wave and ASK parameter setting.

F2~F5 are function keys to set the parameters of carrier wave. Refer to AM carrier wave setting above.

The waveform and frequency range of ASK carrier wave is similar to those of AM carrier wave.

4.11.2 ASK parameters setting

Press F1 to switch to the right interface - ASK setting as Fig. 22

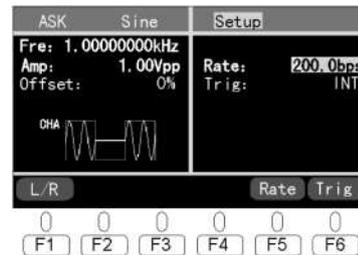


Fig. 22

In this interface:

F1-L/R is switch of left and right interface.

F5-Rate is for ASK rate setting with similar setting way to the way of amplitude setting.

F6-Trig is for external or internal trigger choosing with roller. Both internal and external trigger work for ASK and default is internal.

ASK internal modulated waveform is fixed as symmetrical square with duty cycle of 50%(i.e. 0101...).

The rate range is 0.1bps~1Mbps with default as 200.0bps.

If external trigger is chosen, the function generator will receive the TTL signal from trigger input on the back panel.

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When the signal is low level (rate 0) there's no output of carrier wave and when the signal is high level (rate 1) the carrier wave will output.

4.12 FSK setting

Press the button FSK to access the FSK interface as Fig. 23

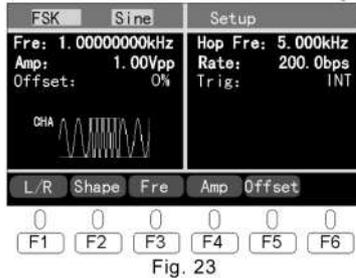


Fig. 23

4.12.1 Carrier wave setting

In this interface the way to set parameters is the same to ASK.

The FSK waveform and frequency range is the same to AM.

4.12.2 FSK parameters setting

Press F1 to switch to the right FSK setting interface as Fig. 24

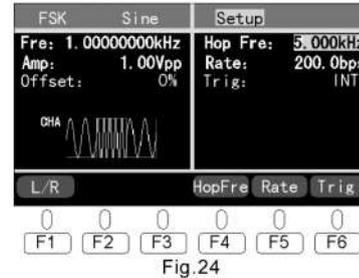


Fig.24

In this interface:

F1-L/R is switch of left and right interface.

F4-Hop Fre is for FSK hopping frequency setting.

F5-Rate is for FSK rate setting with the same way to ASK

F6-Trig is for external or internal trigger choosing with roller.

The hopping frequency range is the same to the carrier wave with default as 5.000KHz.

Both internal and external trigger work for FSK and default is internal.

FSK internal modulated waveform is fixed as symmetrical square with duty cycle of 50%(i.e. 0101...).

The rate range is 0.1bps~1Mbps with default as 200.0bps.

If external trigger is chosen, the function generator will receive the TTL signal from trigger input on the back panel.

When the signal is low level (rate 0) the carrier wave will output and when the signal is high level (rate 1) the hopping frequency will output.

4.13 PSK setting

Press the button PSK to access the PSK interface as Fig. 25

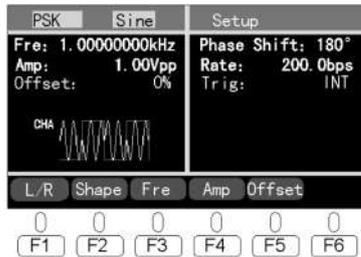


Fig. 25

4.13.1 Carrier wave setting

In this interface the way to set parameters is the same to ASK.

The FSK waveform and frequency range is the same to AM.

4.13.2 PSK parameters setting

Press F1 to switch to the right interface - PSK setting as Fig. 26

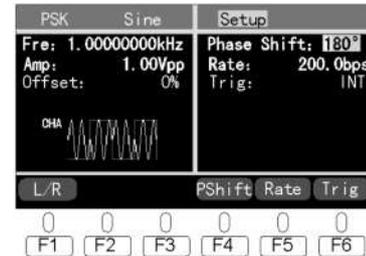


Fig. 26

In this interface:

F1-L/R is switch of left and right interface.

F4-P Shift is for PSK phase shift setting.

F5-Rate is for PSK rate setting with the same setting way

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to ASK

F6-Trig is for external or internal trigger choosing with roller.

PSK phase shift range is $-180^{\circ}\sim 180^{\circ}$ with default as 180° .

Both internal and external trigger work for PSK and default is internal.

PSK internal modulated waveform is fixed as symmetrical square with duty cycle of 50%(i.e. 0101...).

The rate range is 0.1bps~1Mbps with default as 200.0bps.

If external trigger is chosen, the function generator will receive the TTL signal from trigger input on the back panel. When the signal is low level (rate 0) the carrier wave will output and when the signal is high level (rate 1) the hopping phase will output.

4.14 PWM setting

Press the button PWM to access the PSK interface as Fig. 27

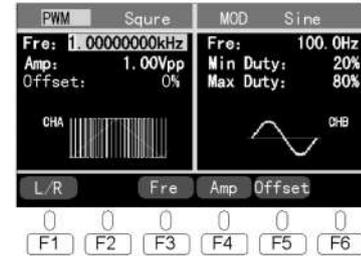


Fig. 27

4.14.1 Carrier wave setting

F1-L/R is switch of left and right interface for carrier wave and modulated wave setting.

F3~F5 are for carrier wave parameters setting with same setting way of AM carrier wave.

PSK carrier waveform is fixed as symmetrical square with duty cycle of 50%.

Frequency range is $1\mu\text{Hz}\sim 5\text{MHz}$ with default 1.0000000KHz.

4.14.2 PWM parameters setting

Press F1 to switch to the right interface - PWM setting as

Fig. 28

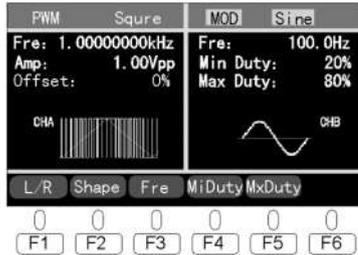


Fig. 28

In this interface:

F1-L/R is switch of left and right interface.

F2~F3 are for modulated waveform and frequency setting.

See antecedent.

F4-Mi Duty is for minimum duty ratio setting. When it's chosen both roller and number keys could set it in the same setting way to duty ratio.

F5-Mx Duty is for maximum duty ratio setting in the same setting way to Min Duty.

Modulated wave frequency is 100mHz~20KHz with default as 100.0Hz

The range for duty ratio is 0.1%~99.9%.

PWM signal is fixed as internal modulated.

4.15 External frequency measurement

This product has function of external frequency measurement. Press the button "Config" to access the start interface with default function of measuring external frequency as Fig. 29 below.

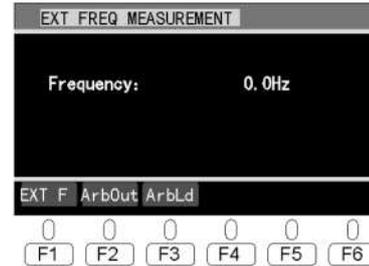


Fig. 29

In this interface external signal inputs through "OUNTER IN" on back panel and the product will measure automatically and show the result.

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4.16 Arbitrary wave output (applied for DS series)

Arbitrary wave outputs through the terminal CHA.

Press the button “Config” to access the original interface as Fig. 29 and then press F2-ArbOut to enter the arbitrary wave operating interface as Fig. 30 below.

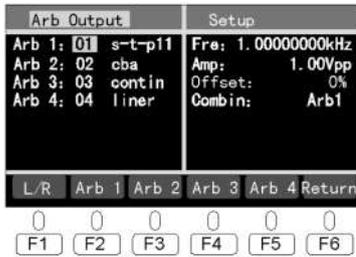


Fig. 30

The left interface displays the saved pages and name(if there is name when the arbitrary wave is downloaded and saved) of current 4 arbitrary waves.

F1-L/R is switch of left and right interface for carrier wave on left and arbitrary wave output setting on right.

Press F6-return to return the interface of Fig. 29.

4.16.1 Choose arbitrary wave

In the interface of Fig. 30 press F2~F5 to choose among “Arb1” ~” Arb 4” and then use the roller to choose the saved waveform and press “Enter” to confirm the output.

The default setting is “Arb 1” so to change the setting to output waveforms of “Arb2”, “Arb 3”, “Arb 4” or combined the right interface should be accessed.

4.16.2 Arbitrary wave output parameters setting

Press F1-L/R to switch to the setup interface as Fig. 31

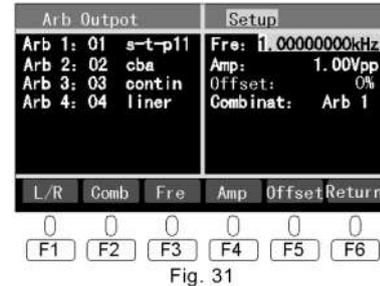


Fig. 31

F2-Combin is for combined ways of output choosing with roller to choose single output of Arb1, Arb2, Arb3, Arb4 or combined output of Arb1-2, Arb2-3, Arb 3-4, Arb 1-4.

F3~5 is for frequency, amplitude and DC offset arbitrary wave output setting. Refer to the setting way of AM carrier wave.

F6-Return is for returning to Config setup original interface.

The frequency range of arbitrary wave is 100mHz~1MHz.

★ The frequency and amplitude of arbitrary wave output are determined by the wave created by the arbitrary wave software on PC.

4.17 Arbitrary wave download and save (applied for DS series)

Install the drive on PC and open the arbitrary wave software. Connect the product with PC through USB to download and save arbitrary waves.

First create or load waveform in the software, name it(or skip), choose proper parameters such as port numbers. See 5. Software for Arbitrary Waveform Programming.

In Config setting interface as Fig. 29 press F3-ArbLd to ac-

cess the start interface of arbitrary wave downloading and saving as Fig. 32

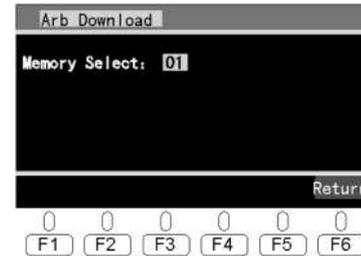


Fig. 32

Use the roller to choose the page 01~16 to save and press download button on PC afterwards. On the interface there will be display of “loading...” and after downloading is completed display of “OK” together with the waveform name (blank if no name). Then choose another page to continue downloading another wave and 16 different waves can be saved in this product. The page can be reedited with the newest wave saved. F6-Return for returning to the Config setting interface as Fig. 29.

5. Software for Arbitrary Waveform Programming (applied

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for DS series)

It's a green software on PC that no need to be installed. It's run in Windows and with the mouse you can conveniently draw, revise, save or download any arbitrary waveform.

5.1 Software interface

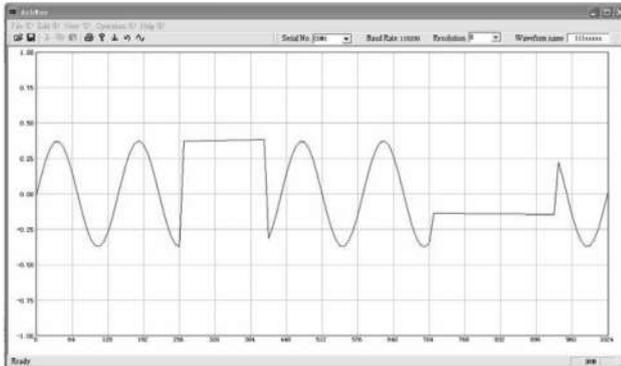


Fig. 33

The software interface is as Fig. 33. On top is the pull-down menu. Also there's another operation way of icon buttons under the menu line which is visual and simple.

Press one with the left mouse button to access corresponding mode of operation. When the arrow is on one button there will be description of the function under.

5.2 Arbitrary waveform programming

Left mouse button	draw curve
Right mouse button	draw straight line
Click by left mouse button	place the remark

It's very convenient to draw arbitrary waveform with the functions above by the mouse. For those waveforms which require the sine law or symmetry there're basic wave of sine or square wave in system to be modified on.

★ The frequency and amplitude of arbitrary wave output are relevant to the wave parameters created by the arbitrary wave software on PC.

5.3 Data format and editing

Data support by the software has two formats of own format and text format. Arbitrary waveform drawn can be saved and read in.

The own format is used to save waveform data created by

arbitrary waveform programming software.

The text format is used for the arbitrary waveform programming software to read in waveform files created by user in other methods with the file as .txt.

Txt file can be opened and edited in “notepad” interface only if keyed in in hexadecimal. Every 8 numbers are regarded as one dot of the wave. There should be space between dots and the size of the number is related to the height of the wave dot. If less than 8 numbers it is regarded as default height. The highest corresponds to 1big, the second highest corresponds to 1/16 big and ... The data range is 0~7FFFFFFF and the corresponding waveform value is 1 at max and -1 at min.-1 ~ 1 stands for the peak value range of signal change.

Text file which is edited can be opened in arbitrary wave software interface to be modified, reviewed, downloaded and saved.

5.4 arbitrary waveform download

1. Before downloading the drive should be installed on PC

side and the serial port number to which of PC the generator is connected should be confirmed so it can be chosen in the pull-down menu of the software when waveform downloading or there may be error.

2. choose resolution ratio. The software has 4 resolution ratios of 1,2,4 and 8. Smaller number means higher resolution for editing waveform with lower frequency while larger number means lower resolution for editing waveform with higher frequency.

3. Download. Click the menu of download and click start. There’s display of “loading...” in the interface and “OK” when downloading is finished.

6. Accessories

●Fuse	1 pcs (installed on machine)
●Power cord	1pcs
●Double Q9 connection cord	1pcs
●Instruction manual	1pcs

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7. Main specifications

WAVE	Sine, Square, Triangle, Pulse, Up Ramp, Down Ramp, P-Exp, N-Exp, Sine (x) /x, Noise
Arbitrary wave	<p>Saved waveform: 16</p> <p>Output waveform: 1 ~ 4 single or combined</p> <p>Length of wave saved: 32x1k (1024) bit</p> <p>Resolution: 12 bit</p> <p>Sample rate: 131Msa/s</p>
frequency specifications	<p>Sine: 1μHz ~ upper limit (max output of CHB is 20MHz)</p> <p>Square: 1μHz ~ 5MHz</p> <p>Other waves: 1μHz ~ 1MHz</p> <p>Highest resolution: 1μHz</p> <p>Long-term stability: 50ppm (0°C ~ 40°C)</p> <p>Short-term stability: 1ppm (after turning on and heat stable)</p> <p>Accuracy: 0.4Hz (>100Hz) 0.1μHz (<100mHz)</p>

Signal features	<p>sine: (50Ω impedance, 1Vpp output) Harmonic distortion: <20kHz -60dBc 20kHz ~ 1MHz -50dBc 1MHz ~ 10MHz -40dBc 10MHz ~ 20MHz -30dBc</p> <p>square: (50Ω impedance 1Vpp output) Rise/fall time: <25ns Overshoot: <5% Asymmetry: 0.1%</p> <p>Pulse: Duty cycle: 0.1% ~ 99.9% (<10kHz) 1% ~ 99% (<100kHz) 3% ~ 97% (<1MHz)</p> <p>Triangle, ramp: linear (1kHz) <0.1%</p>
CHA Output features	<p>waveform: function waveform, modulation waveform, arbitrary waveform</p> <p>amplitude: (to open circuit) 1mVpp ~ 20Vpp Sine wave >20MHz is 1mV ~ 5Vpp (to 50Ω) 0.5mVpp ~ 10Vpp Sine wave >20MHz is 0.5mV ~ 2.5Vpp</p> <p>Output impedance: 50Ω Sine flatness: 5% DC offset: -100% ~ 100% peak value</p>

CHB Output features	<p>waveform: function waveform amplitude: (to open circuit) 100mVpp ~ 20Vpp (to 50Ω) 50mVpp ~ 10Vpp Output impedance: 50Ω Sine flatness: 5% DC offset: -100% ~ 100% peak value</p>
Sweep	<p>Carrier waveform: sine, square, triangle, up ramp, down ramp Sweep range: 1Hz ~ waveform upper limit (max 20MHz) Min step: 1Hz Sweep cycle: 1ms ~ 100s Trigger method: internal, external</p>
Burst	<p>Burst pulse number: 1 ~ 60000 Trigger method: internal, external Carrier wave frequency: 1μHz ~ upper limit of waveform frequency (max 20MHz) Carrier waveform: sine, square, triangle, up ramp, down ramp Cycle: 1ms ~ 100s</p>

ASK FSK PSK	<p>Rate: 0.1bps ~ 1Mbps trigger method: internal, external Carrier wave frequency: 1μHz ~ upper limit of waveform frequency (max 20MHz) Carrier waveform: sine, square, triangle, up ramp, down ramp FSK jumping frequency range: 1μHz ~ upper limit of waveform frequency (max 20MHz) PSK phase shift range: -360° ~ 360°</p>
INTERNAL AM	<p>Carrier waveform: sine, square, triangle, up ramp, down ramp Carrier wave frequency: 1μHz ~ upper limit of waveform frequency Modulation waveform: sine, square, triangle, up ramp, down ramp Modulation frequency: 100mHz ~ 20kHz AM depth: 0% ~ 100%</p>
EXTERNAL AM	<p>Input impedance: 1kΩ AM depth: controlled by output amplitude and external modulation signal amplitude</p>

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INTERNAL FM	Carrier waveform: sine, square, triangle, up ramp, down ramp Carrier wave frequency: 1μHz ~ upper limit of waveform frequency (max 20MHz) Modulation waveform: sine, square, triangle, up ramp, down ramp Modulation frequency: 100mHz ~ 20KHz The range of modulation offset: less than the difference between the upper limit of carrier wave frequency & waveform frequency and the carrier wave frequency
PWM	Carrier waveform: square Carrier wave frequency: 1Hz ~ 5MHz Modulation waveform: sine, square, triangle, up ramp, down ramp Modulation frequency: 100mHz ~ 20KHz Modulation duty cycle: 0.1 ~ 99.9%
SYNC OUTPUT	Output impedance: 200Ω Output level: TTL

AM IN	Input impedance: 100kΩ Input level: TTL
TRIG IN	Input impedance: 1kΩ Input level: TTL
FREQUEN CY METER	Frequency range: 1Hz ~ 100MHz Input level: TTL

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