# FeelTech

FY2300 Series Fully Numerical Control
Dual Channel Function/Arbitrary
Waveform Generator

User's Manual

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Brief Introduction

This manual applies to each model of FY2300 series Function/Arbitrary Waveform Signal Generator. The "**25M**" of the Model Number "**FY2300-25M**" indicates the Sine wave maximum output frequency is up to 25MHz.

FY2300 series Dual Channel Function/Arbitrary Waveform Generator is a multifunctional signal generator product integrating Function Signal Generator, Arbitrary Waveform Generator, Pulse Signal Generator, Noise Signal Generator, Counter and Frequency Meter with excellent cost performance. This instrument adopts large scale CMOS integrated circuit and high speed MCU microprocessor. The internal circuit uses SPXO as the basic standard to guarantee the stability of signals. Surface mounting technology improves interference immunity and operational life span.

This instrument has double channels can output 31 preseted DDS signals including Sine, Square, Triangle(Ramp), Rise Sawtooth, Fall Sawtooth, Lorenz Pulse, Multitone, Noise, Cardiogram, Trapezoidal Pulse, Sinc Pulse, Narrow Pulse, Gauss White Noise, AM, FM, Step and user-defined waveform. It can also output TTL electric level. Both channels are completely independent

It has friendly human-machine mutual interface. 2.4 inch TFT Color LCD with 320×240 resolution can display all the parameters of both channels and current functions of all buttons . Shortcut keys simplify all complicated operations and save time. Users can be proficient after several minutes practice.

The advantages of this instrument in signal generating, waveform sweeping, parameter measurement and other fields, make it to be the ideal equipment for electronic engineers, laboratories, industry producing line, university, R&D institutes and so on.

Main Features:

◆ Adopt DDS technology to generate accurate, stable signal with low distortion.

◆ Portable design with top grade aluminum alloy shell. Use DC5V power

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adopter or 5V portable power for power supply.

◆ 2.4 inch TFT Color LCD with 320 × 240 resolution can display all the parameters of both channels and current functions of all buttons .

◆ Frequency output of Sine wave can be up to 25MHz. 200MSa/s sampling rate. 12 bits vertical resolution.

◆ Complete independent dual channels can work at same time and phase difference is adjustable.

◆ Following function allows users to synchronize all or partial parameters of CH2 to CH1.

◆ Two instruments or more can be synchronized by TTL_IO interface.

◆ Various Waveform:

- Sine
- Square
- Triangle/Ramp
- Rise Sawtooth
- Fall Sawtooth
- Lorenz Pulse
- Multitone
- Noise
- Electrocardiogram (ECG)
- Trapezoidal Pulse
- Sinc Pulse
- Narrow Pulse
- Gauss White Noise
- Step Triangle
- Positive Step
- Inverse Step
- Positive Exponent

- Inverse Exponent
- Positive Falling Exponent
- Inverse Falling Exponent
- Positive Logarithm
- Inverse Logarithm
- Positive Falling Logarithm
- Inverse Falling Logarithm
- Linear FM
- AM
- FM
- Positive Half Wave
- Negative Half Wave
- Positive Half Wave Rectification
- Negative Half Wave Rectification
- User-defined waveform

◆ It has 16 positions for saving user-defined waveform. Waveform Length of each one is 2048 and vertical resolution is 12 bits.

◆ High frequency precision up to 10^{-6} orders of magnitude.

◆ Full range of 1μHz frequency resolution.

◆ Minimum amplitude resolution can be up to 1 mV.

◆ Duty cycle of each channel can be adjusted separately. Precision can be 0.1%.

◆ Direct digital Setting covering full range of frequency without grading.

◆ Sweep Function: It can sweep 4 properties of signals including frequency, amplitude, offset and duty cycle. It has Linear and Logarithm two sweep types. Sweep time can be up to 999.99S. Sweep starting point and end point can be set arbitrarily.

◆ It has pulse train burst output function. There has Manual Trigger, internal CH2 Trigger, and External Trigger for your options. It can output 1~1048575 pulse trains.

◆ -10V~+10V DC Offset function. Resolution 0.01V.

◆ Digital signal output function can output any 0~10V CMOS electric level.

◆ Save function: It can save 20 sets user-set parameters and can be loaded at anytime.

◆ 100M Frequency meter function: It can measure frequency, period, pulse width and duty cycle. Max. frequency workable is 100MHz and Min. frequency workable is 0.01 Hz.

◆ Counter Function: It has 2 coupling measure modes including DC coupling and AC coupling. This design can solve inaccuracy problem of AC coupling.

◆ All parameters can be calibrated by internal program.

◆ Powerful arbitrary waveform edit function: Users can download arbitrary waveform to this instrument after edit through PC program which is included in user CD.

◆ Powerful communicating function. All functions can be controlled by PC program and the communication protocol is open for secondary development.

◆ Output short-circuit protection: All channels can work more than 60 seconds when the load is short-circuited.

◆ Can choose our FYV2000 series or FPA1000 series power amplifier to output 20W~60W signal in DC-3MHz width without any distortion.

Quick Start

General Inspection

Please follow the items below when you receive a new FY2300 series Function/Arbitrary Waveform Generator.

1. Inspect the shipping container for damage

Keep the damaged shipping container or cushioning material until the contents of the shipment have been checked for completeness and the instrument has passed both electrical and mechanical tests. The consigner or carrier shall be liable for the damage to instrument resulting from shipment.

2. Inspect the instrument
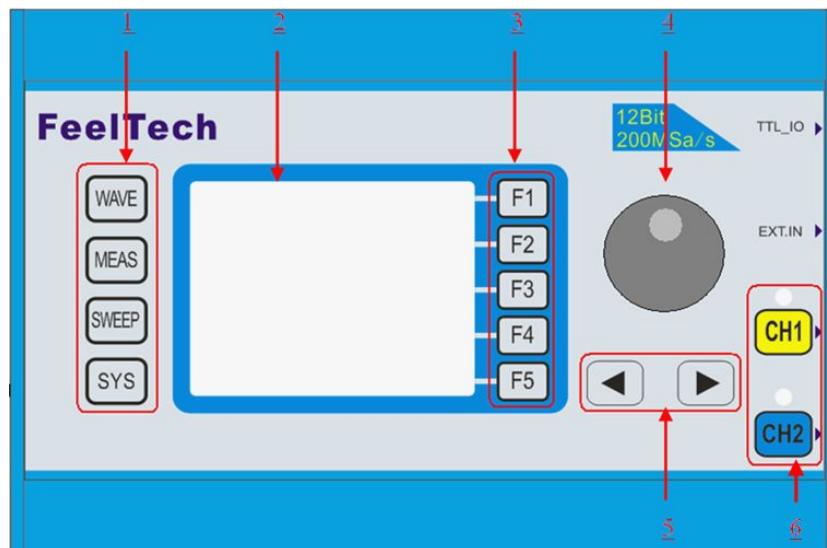
In case of any damage, or defect, or failure, notify your **FeelTech** sales representative.

3. Check the accessories

Please check the accessories according to the Appendix C (packing lists). If the accessories are incomplete or damaged, please contact your **FeelTech** sales representative.

Front Panel Overview

The front panel is divided into several function areas for easy operation.
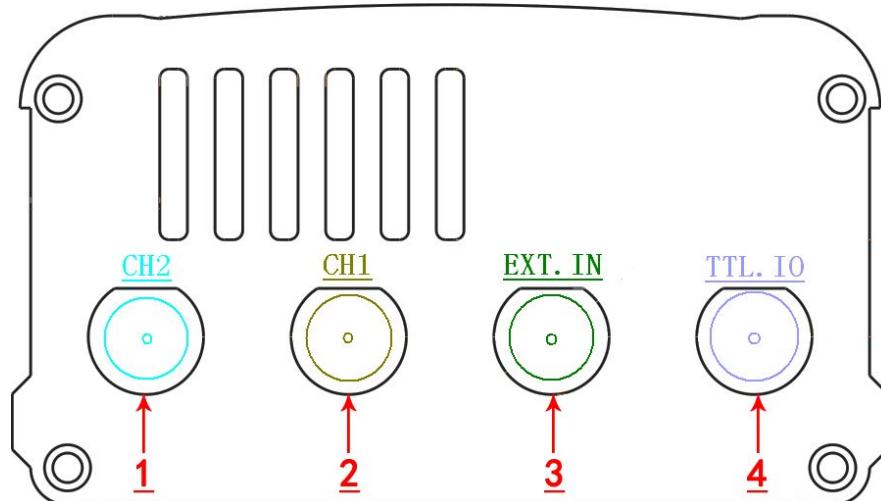
Front Panel

Item	Function	Description
1	Function Buttons Area	**WAVE** Press this buttons to switch waveforms among Sine, Square, Triangle and so on.
		MEAS Press this button to switch between frequency meter and counter to measure frequency, period, duty cycle and pulse width of external signal output. — Both DC and AC are workable. — Gate Time can be 1S, 10S or 100S. — Dual channels output and measurement function can work together at same time.
		SWEEP Can sweep Sine, Square, Arbitrary and so on. — Can sweep frequency, amplitude, offset and phase. — 2 sweep types: Linear, Logarithm.
		SYS Auxiliary functions and system configuration setting. — Can save 20 sets waveform parameters including frequency, amplitude, offset, phase and so on. — System Language has English and Chinese for user's option. — Buzzer can be turned on/off in this manu. — Set multimachine uplink. — Switch Master-Slave status

2	LCD	2.4 inch TFT（320×240）color LCD. Operation instruction please check chapter "**User Interface**".
3	Manu Buttons	F1~F5 buttons are matched with Manu displayed on the LCD. Press corresponding button to activate submenu represented.
4	ADJ Knob	— Rotate the ADJ Knob to increase or reduce the current value indicated by the cursor. — Frequency unit can be changed by Press ADJ Knob under Frequency value setting status. — Press ADJ Knob to Start/Stop sweep under Sweep interface.
5	Arrows	Press Arrow buttons to select figure which you want to edit when setting values of each parameter.
6	Output Channels	**CH1** Control CH1 output. Press it to switch to CH1 parameter setting interface. — Press it to turn on CH1 output with current configuration. The indicator will illuminate. — Press it again to turn off CH1 output and the indicator will extinguish. **CH2** Control CH2 output. Press it to switch to CH2 parameter setting interface. — Press it to turn on CH2 output with current configuration. The indicator will illuminate. — Press it again to turn off CH2 output and the indicator will extinguish.

Right Panel Overview

Right Panel

1. CH2 BNC

    It is a BNC (female) connector which nominal impedance is 50Ω. The function of this connector is determined by the work mode of CH2.
2. CH1 BNC

    It is a BNC (female) connector which nominal impedance is 50Ω. The function of this connector is determined by the work mode of CH1.
3. EXT.IN Connector

    It is a BNC (female) connector for inputting signals for measurement. Impedance is 100KΩ.

> ⚠️ Note:
> Voltage of signal input CANNOT exceed ±20Vac+dc
> in case any damage to this instrument.
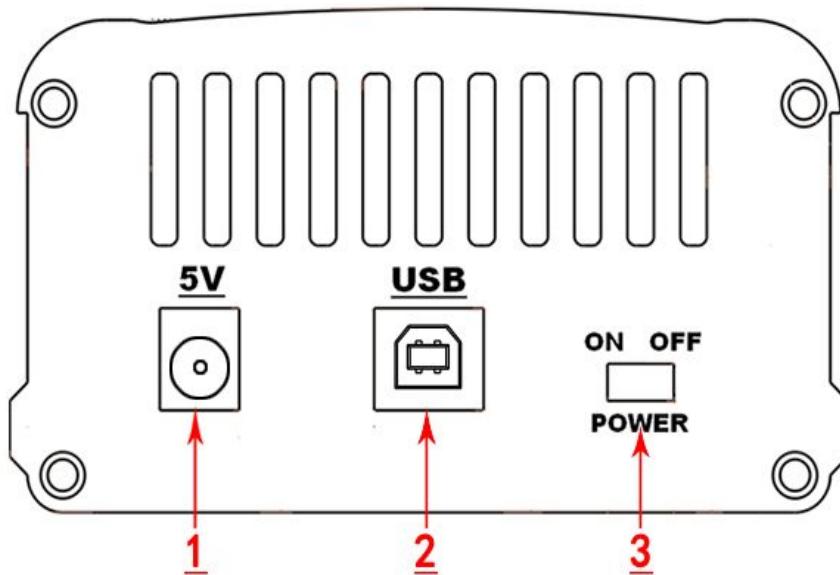
4. TTL_IO Connector

    It is a BNC (female) connector for outputting TTL signal synchronized with CH1 and inputting uplink signal.

    1) Under non-uplink status it can output 3.3 Vpp LVTTL signal synchronized with CH1 and output impedance is no higher than 50Ω.
    2) When uplink is enabled and work as slave, the connector works as external signal input interface and input impedance is more than 100 KΩ. Please refer to chapter **"Synchronization"**.

Left Panel Overview

1. DC power input connector (External diameter 5.5mm, Inner diameter 2.1mm)
   The DC voltage is 5V±0.5V, and electric current is 500 mA. The maximum power input cannot exceed 5W. Instrument also supports DC5V mobile power supply.

⚠️

Note:
Please use original power adapter and data cable to guarantee normal use.

2. USB Device Interface
   This is for communicating with PC.
   — Use PC Host software to program.
3. Power Switch
   Set to "ON" to turn on this instrument or "OFF" to turn it off.

Power On and Inspection

Connect to Power

Please connect the generator to AC power supply using the Power Adaptor supplied in the accessories . The specifications of the adaptor: DC voltage is 5V±0.5V, and electric current is 500 mA. The maximum power input cannot exceed 5W.

Power On

Turn on the power switch after the power cord is connected. The generator will execute self-inspection. The LCD will show welcome interface after the inspection is over. If the generator cannot work normally, please check the Chapter "Troubleshooting" for solution.

Set the System Language

FY2300 series Function/Arbitrary Waveform Generator supports Chinese and English system languages. You can press **SYS**→**CONF** to switch the system language.
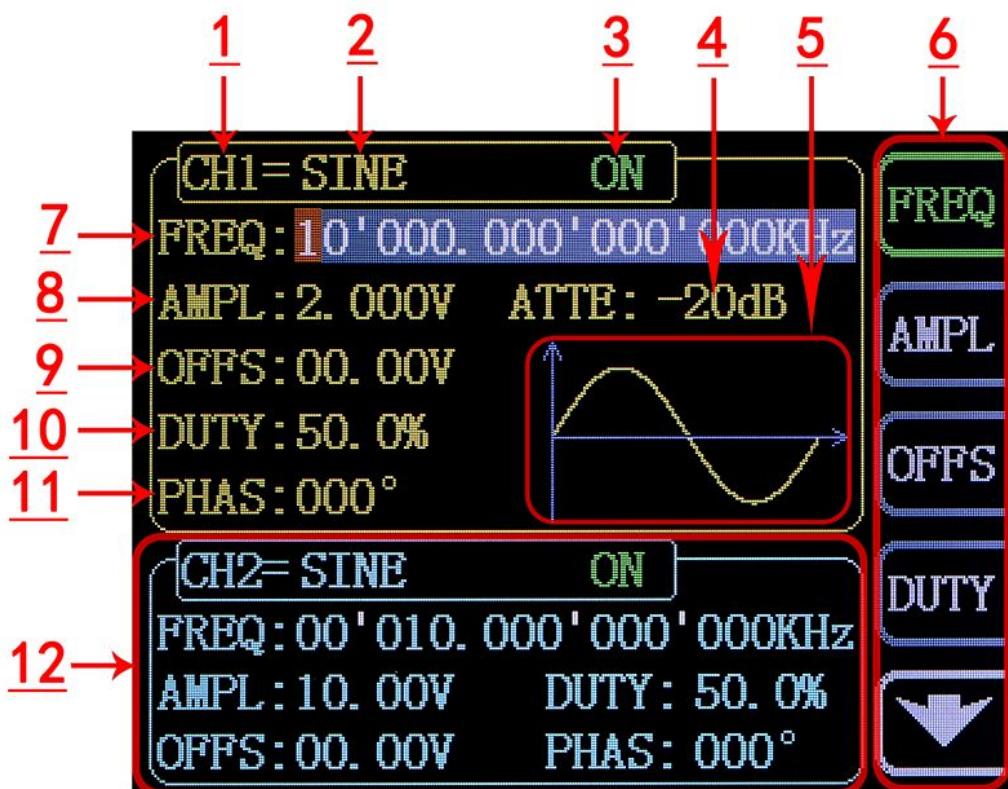
User Interface

The user interface of FY2300 provides four types of display modes: Dual Channels Parameters (default), Single Channel Extension, Auxiliary Functions and System Interface.

Dual Channels Parameters (default)

The upper half of LCD displays the channel selected currently and the parameters can be set. Press CH1 or CH2 to change current channel selected.

Item	Description
1	Current channel selected. Display current channel selected for operation.
2	Current waveform selected. Display the name of current waveform selected. For example, "CH1=Sine" means current waveform selected of CH1 is Sine Wave. It can be changed by press WAVE button. Meanwhile, waveform can be changed quickly by rotating ADJ Knob when waveform switch function is activated.
3	Output status of current channel.

Display On/Off status of current channel. It can be switched by Press `CH1` or `CH2`.

4	Attenuation

Display attenuation status of current channel. There have 0dB and 20dB attenuation for user's option. Press `▼` to enter Single Channel Extension and press `ATTE` to change the value.

5	Waveform

Display diagram of current waveform（Including Arbitrary）。

6	Manu Bar

Display current operable options 。

7	Frequency

Display frequency value of current channel. Press `FREQ` button to highlight it and use ADJ Knob and Arrows to change the value.

8	Amplitude

Display amplitude value of current channel. Press `AMPL` button to highlight it and use ADJ Knob and Arrows to change the value.

9	Offset

Display DC Offset value of current channel. Press `OFFS` button to highlight it and use ADJ Knob and Arrows to change the value.

10	Duty Cycle

Display Duty Cycle value of current channel. Press `DUTY` button to highlight it and use ADJ Knob and Arrows to change the value.
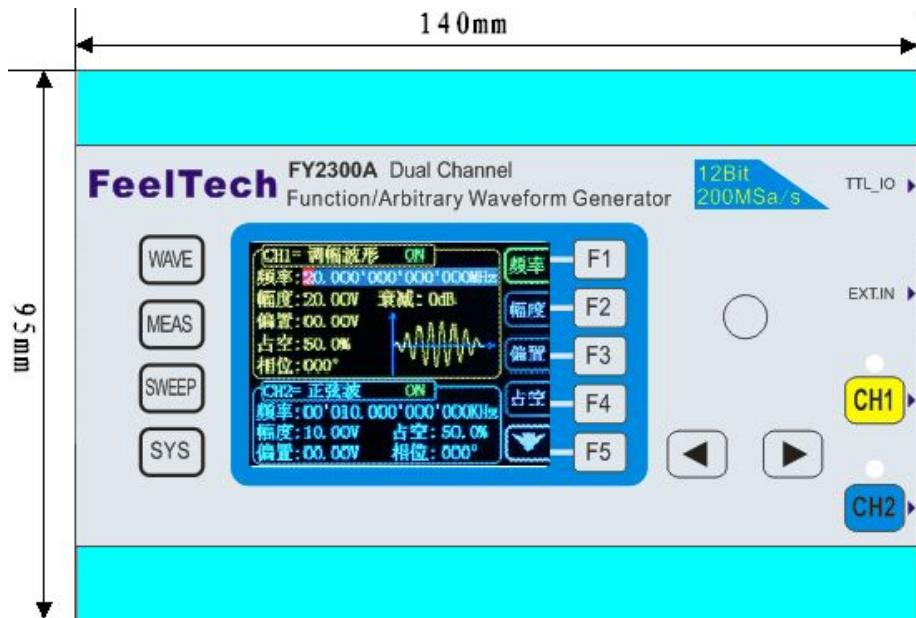
11	Phase

Display Phase value of current channel. Press `▼` button to enter Single Channel Extension and press `PHAS` to highlight it and use ADJ Knob and Arrows to change the value.
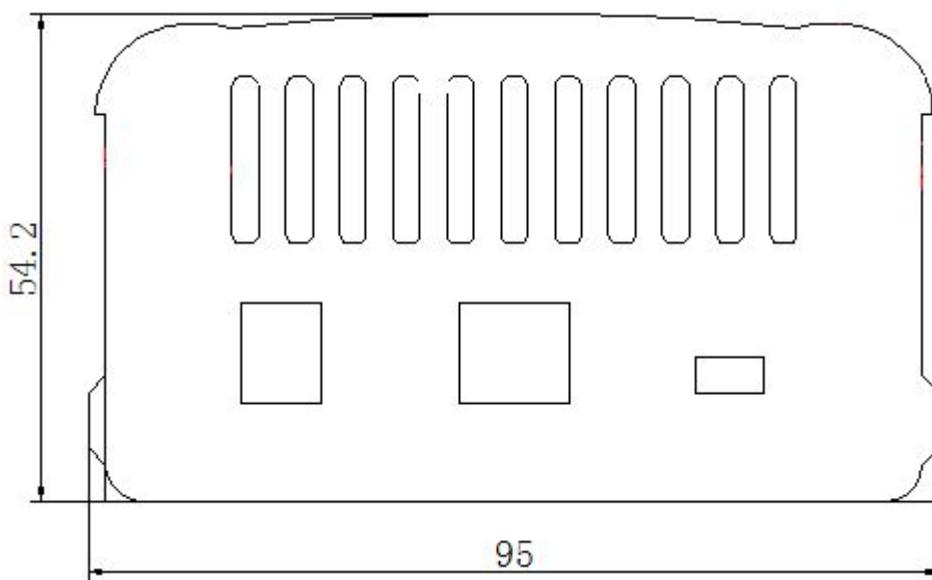
12	Parameters of the channel unselected.

Display parameters of the channel unselected including frequency, amplitude, offset, phase, duty cycle and output status. These Parameters cannot be changed directly in this interface. If you need to change them, Please switch the channel to be selected.
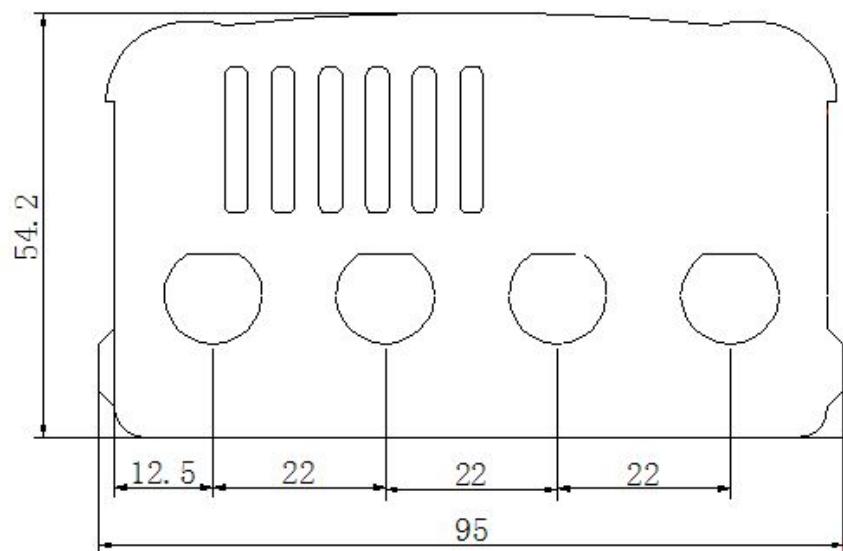
Appearance and Dimensions

Front View

Left View

Right View

Front Panel Operations

Waveform Output

FY2300 series can output waveforms (Sine, Square, Triangle/Ramp, Pulse and Noise etc.) from one of the channels separately or from the two channels at the same time. At start-up, the dual channels are configured to output a sine waveform with 10kHz frequency and 10Vpp amplitude by default. Users can configure the instrument to output various waveforms.

Select Output Channel

CH1 and **CH2** buttons are used to change current channel selected. At start-up, CH1 is displayed on the top with yellow color and CH2 is displayed on the bottom with blue color. Press **CH1** or **CH2** to select channel needed. When selecting CH2 as output channel, CH2 parameters displays on the top for configuration.

KEY POINT:

CH1 and CH2 can not be selected at the same time. Users can first select CH1 and then select CH2 after configuring the waveform and parameters of CH1. If you need to change the parameters of two channel at same time, please refer to Chapter "**Synchronization**".

Select Waveform

FY2300 can output Function/Arbitrary Waveform including:

- Sine
- Square
- Triangle/Ramp
- Rise Sawtooth
- Fall Sawtooth
- Lorenz Pulse
- Multitone
- Noise
- Electrocardiogram (ECG)
- Trapezoidal Pulse
- Sinc Pulse
- Narrow Pulse
- Gauss White Noise
- Step Triangle
- Positive Step
- Inverse Step
- Positive Exponent

- Inverse Exponent
- Positive Falling Exponent
- Inverse Falling Exponent
- Positive Logarithm
- Inverse Logarithm
- Positive Falling Logarithm
- Inverse Falling Logarithm
- Linear FM
- AM
- FM
- Positive Half Wave
- Negative Half Wave
- Positive Half Wave
  Rectification
- Negative Half Wave
  Rectification
- User-defined waveform

Press **WAVE** to change waveform selected. Or rotate ADJ Knob under waveform switching status to change waveform. The waveform diagram displays on the screen. At start-up Sine is selected by default. (Users can also configure start-up waveform. Please check Chapter "Save and Load".

Waveforms		Sine	Square	Triangle	Sawtooth	Arbitrary
Function Name		SINE	SQUR	TRGL	Ramp	Arb
Parameters	Frequency	√	√	√	√	√
	Amplitude	√	√	√	√	√
	Offset	√	√	√	√	√
	Phase	√	√	√	√	√
	Duty Cycle		√			
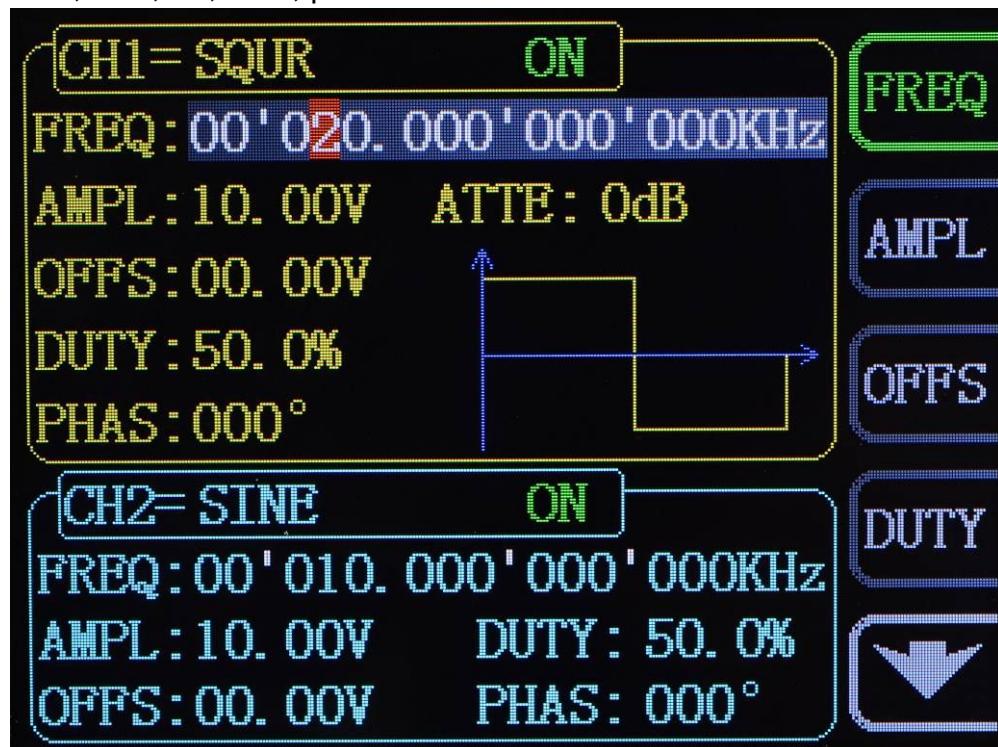
Note: Arbitrary waveforms can be edited and downloaded from PC software provided by **FeelTech**.

Set Frequency

Frequency is one of the most important parameters of waveforms. For different instrument models and waveforms, the setting ranges of frequency are different. For detailed information, please refer to "**Frequency**" in "**Specifications**". The default frequency is 10kHz.

Press ⬛ **FREQ** button to highlight value of Frequency. Then use Arrow buttons and ADJ Knob to set the value. Press Arrows button to move the cursor and rotate ADJ Knob to set the value.

Under setting frequency status, press ADJ Knob to change frequency units among MHz, KHz, Hz, mHz, µHz.
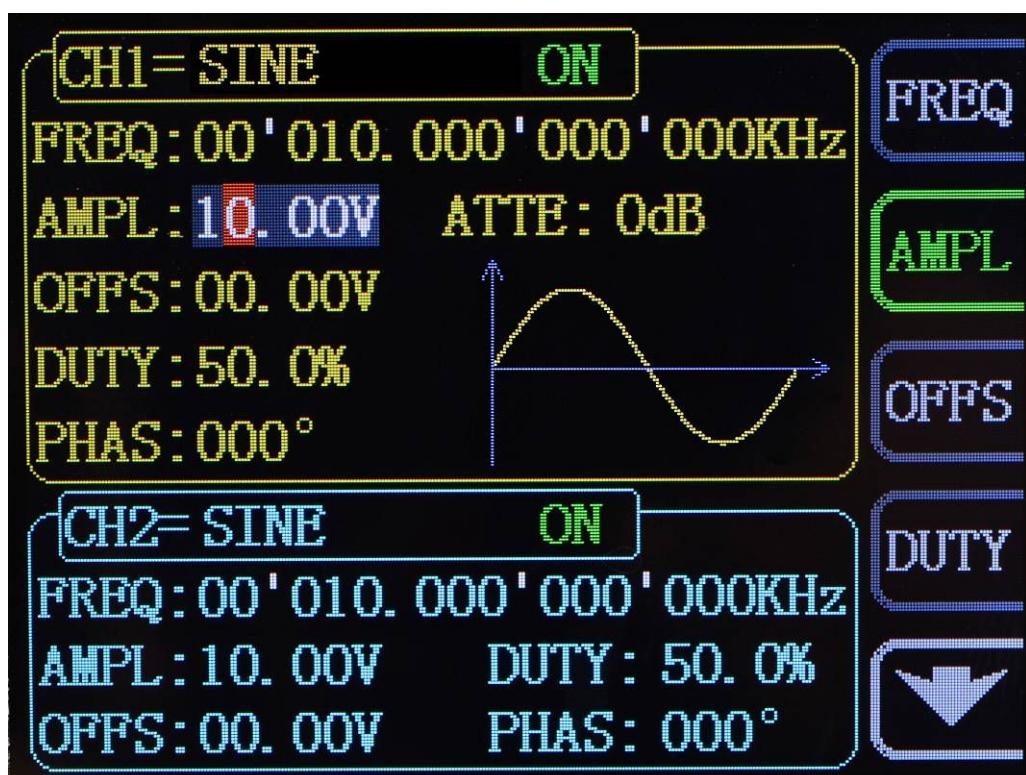
Set Amplitude

The amplitude setting range is limited by the "Attenuation" and "Frequency" settings. Please refer to "**Output Characteristics**" in **"Specifications"**. The default value is 10Vpp.

Press AMPL button to highlight amplitude value. Then use Arrows button and ADJ Knob to set the value. Press Arrows button to move the cursor and rotate ADJ Knob to set the value.

When Attenuation is 20dB, Amplitude output will be reduced by 10 times.

Key Points：
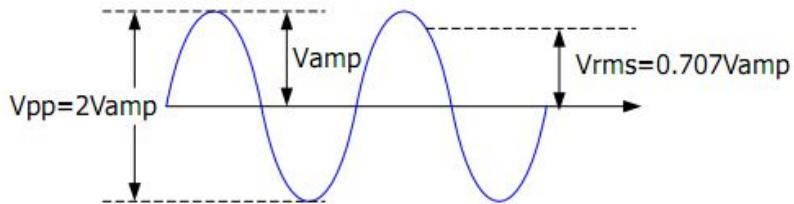
1．What's the difference of amplitude in Vpp and the corresponding value in Vrms?

Answer:
Vpp is the unit for signal peak-peak value and Vrms is the unit for signal effective value. The default unit is Vpp.

Note：
For different waveforms, the relation between Vpp and Vrms is different. The relation of the two units is as shown in the figure below (take sine waveform as an example).

According to the figure above, the conversion relation between Vpp and Vrms fulfills the following equation:

$$Vpp = 2\sqrt{2}\ Vrms$$
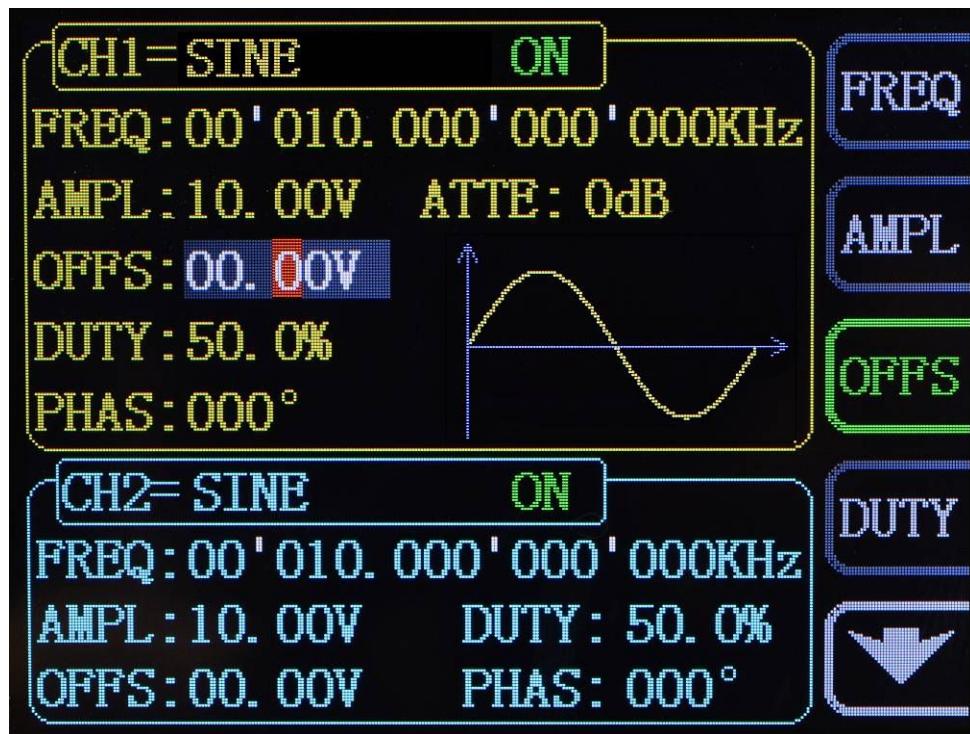
For example, if the current amplitude is 5Vpp, For sine waveform, the converted value is 1.768Vrms.

Set Offset

The DC offset setting range is limited by the "Attenuation". Please refer to the "Output Characteristics" in "Specifications". The default value is 0VDC.
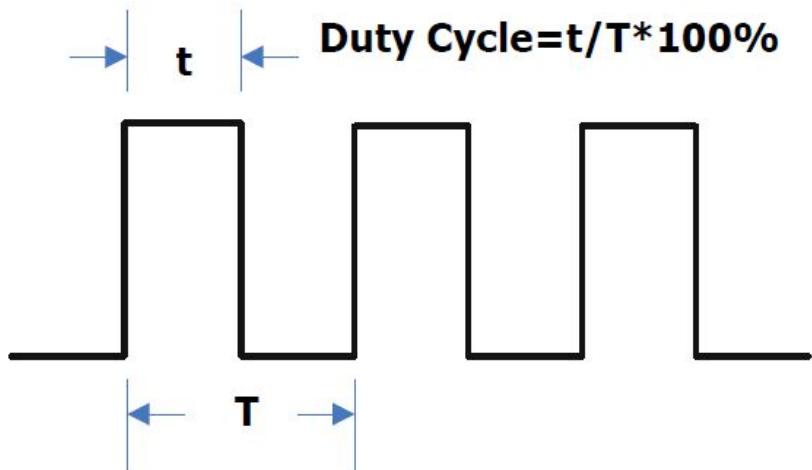
The DC offset voltage displayed on the screen is the default value or the offset previously set. When the attenuation value is changed, the instrument will set the value according to the attenuation value automatically.

Press **OFFS** button to highlight offset value. Then use Arrows button and ADJ Knob to set the value. Press Arrows button to move the cursor and rotate ADJ Knob to set the value.

Set Duty Cycle (Square)

Duty cycle is defined as the percentage that the high level takes up in the whole period (as shown in the figure below). This parameter is only available when square is selected.

The setting range of duty cycle is limited by the "FREQ" setting. Please refer to "**Waveform Characteristics**" in "**Specifications**". The default value is 50%.

Press **DUTY** button to highlight duty cycle value. Then use Arrows button and ADJ Knob to set the value. Press Arrows button to move the cursor and rotate ADJ Knob to set the value.

- The setting range of duty cycle is 0.1%-99.9%；
- Press ADJ Knob under duty cycle setting status will initial the value to 50%.
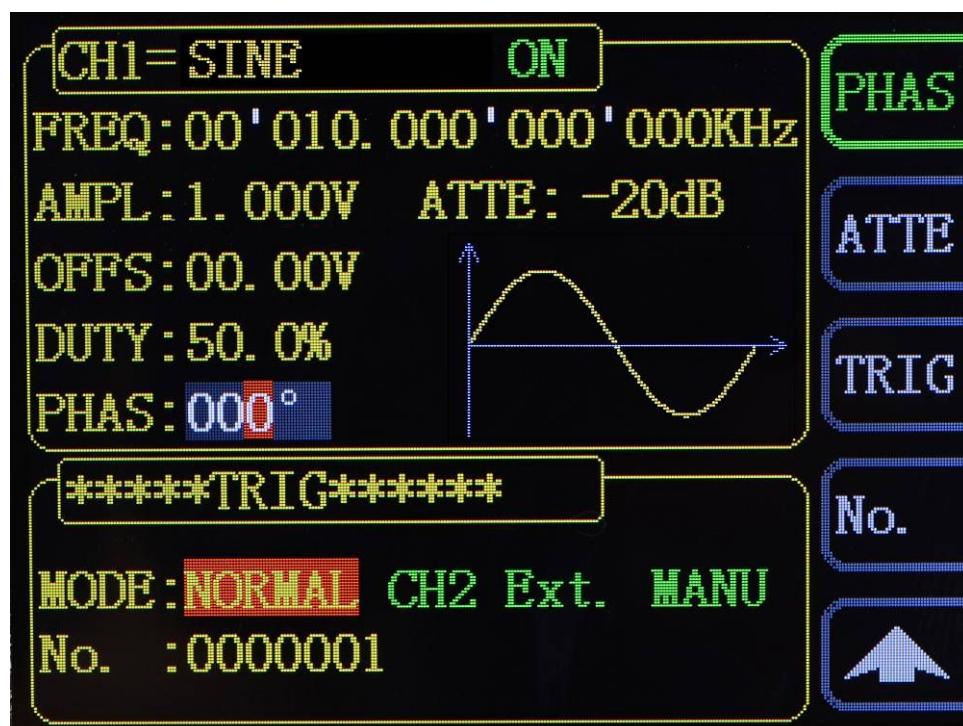
Set Phase

The setting range of phase is from 0° to 359° and the default is 0°

The start phase displayed on the screen is the default value or the phase previously set.

Press ▼ button to enter Single Channel Extension. Then press **PHAS** button to highlight phase value. Then use Arrows button and ADJ Knob to set the value. Press Arrows button to move the cursor and rotate ADJ Knob to set the value.

```
CH1=SINE              ON          PHAS
FREQ:00'010.000'000'000KHz
AMPL:1.000V    ATTE:-20dB         ATTE
OFFS:00.00V
DUTY:50.0%                        TRIG
PHAS:000°

*****TRIG******                   No.

MODE:NORMAL CH2 Ext.  MANU
No.  :0000001
```

Enable Output

After configuring the parameters of the waveform selected, waveform output could be enabled.

At start-up output of CH1 and CH2 are both turned as default. At this time indicator lights of dual channels illuminate.

For CH1 there are two status:

1) Generator is in parameter setting status and current channel selected is CH1, then press **CH1** to switch between output ON/OFF.
2) Generator is in other working status or current channel selected is not CH1, then press **CH1** to make CH1 as channel selected and press **CH1** again to switch between output ON/OFF.

For CH2 there are two status:

3) Generator is in parameter setting status and current channel selected is CH2, then press **CH2** to switch between output ON/OFF.
4) Generator is in other working status or current channel selected is not CH2, then press **CH2** to make CH2 as channel selected and press **CH2** again to switch between output ON/OFF.

Example： Output Sine Waveform

This section mainly introduces how to output a sine waveform (Frequency: 20kHz, Amplitude:2.5Vpp, DC Offset: 1.6VDC, Start Phase: 90°) from the [CH1] channel.

1. Select output channel

Press CH1 to select CH1. Now all characters and border of the channel is displayed in yellow.

2. Select the Sine

Press WAVE button to select Sine. Then the diagram of Sine displays on the screen.

3. Set the frequency

Press FREQ button to highlight the frequency value. Press Arrow buttons to move the cursor to the position "2" below. Then rotate the ADJ Knob to get "2".

FREQ：00'020. 000'000'000kHz

4. Set the Amplitude

Press AMPL to highlight the amplitude value. Press Arrow buttons to move the cursor and rotate the ADJ Knob to get the figures below.

AMPL：02. 50V

5. Set Offset

Press OFFS to highlight the offset value. Press Arrow buttons to move the cursor and rotate the ADJ Knob to get the figures below.

OFFS：01. 60V

6. Set Phase

Press ▼ button to page down and press PHAS button to highlight phase value. Then Press Arrow buttons to move the cursor and rotate the ADJ Knob to get the figures below.
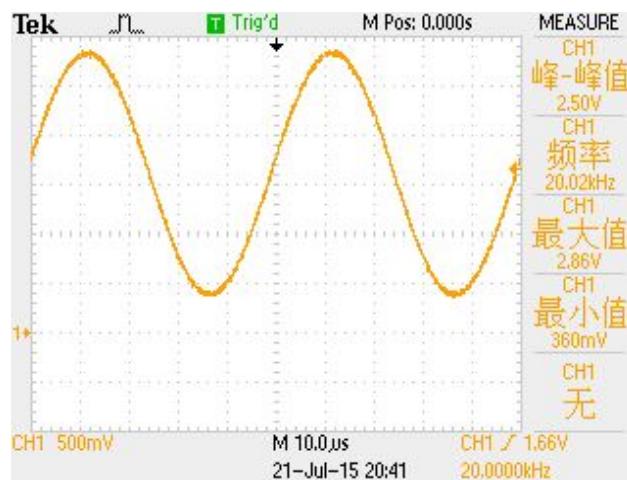
PHAS：090°

7. Enable the output

Press CH1 button to turn CH1 output on. The [CH1] connector outputs the configured waveform.

8. Observe the output waveform

Connect the [CH1] connector to the oscilloscope with BNC cable. The waveform is as shown below.

Generate a Burst Waveform
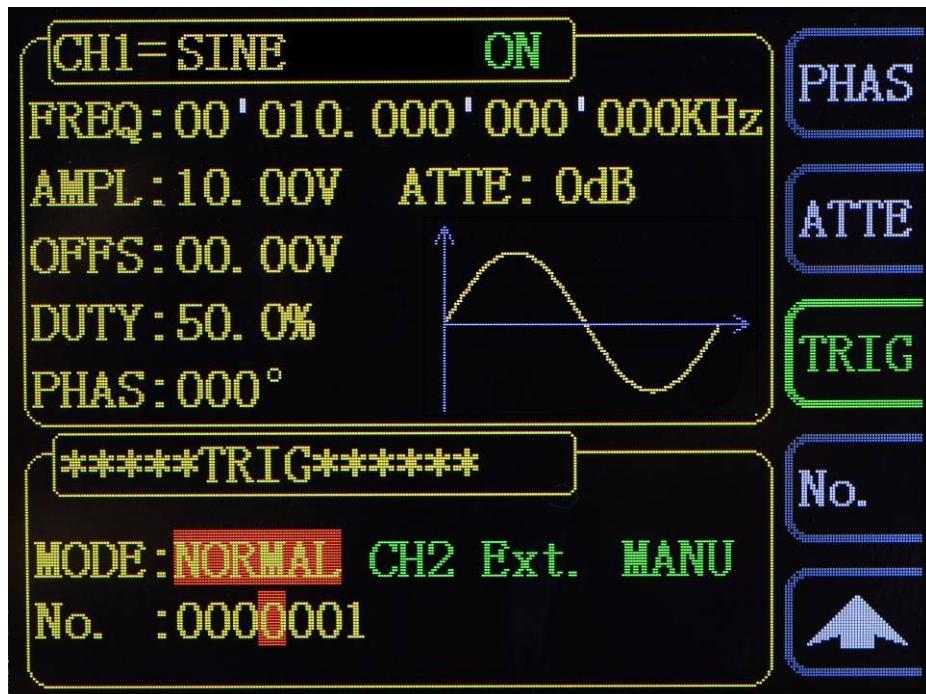
This instrument can output a burst (waveform with specified number of cycles) using standard waveforms such as sine, square, Triangle/ramp, and noise, or arbitrary waveforms. The instrument supports control of burst output by internal CH2, manual and external trigger source.

Enable Burst Function

Press ▼ button in CH1 parameter setting status. Then press "TRIG" button to enter burst function. Then press TRIG button to select trigger sources from " CH2", "Ext." and "MANU". Then the generator will output burst waveform according to current configuration.

When the burst function is enabled, press No. button to set the cycles of burst. Use arrow buttons and ADJ Knob to set the numbers from 1 to 1048575.

- NORMAL: The Burst function is disabled。
- CH2 Trigger: CH1 will generate a burst when CH2 generates a pulse.
- Ext. Trigger: CH1 will generate a burst when EXT.IN connector was inputted a pulse.
- MANU Trigger: User can trigger a burst by pressing ADJ Knob (OK button).

Frequency Meter/Counter

FY2300 provides a counter which can measure various parameters of external input signal such as frequency, period, duty cycle, positive pulse width and negative pulse width. Dual channels output can work together with counter.

Enable the Counter

Press **MEAS** button of the front panel to enable the counter and measurement Manu. External signal for measurement can be inputted by EXT.IN connector and the result will be displayed on the screen in real time. The lowest frequency workable is 0.01 Hz. （GATE TIME:100S）。

Press **COUN** button to enter external pulse counter function. At this time **COUN** button is turned into **FREQ** button. Repeat pressing this button to switch between **FREQ** and **COUN**.

Frequency Meter/Counter Interface

When the Frequency Meter/Counter is turned on, press **STOP** button to pause and press **ZERO** button to reset.

> Key Point：
>
> Amplitude of signal input should be bigger than 1.5V. Maximum safe voltage input is 20V.

Set the Counter

Gate Time

Press **GATE** button to select gate time. The default is "1S". It's better to use "10S" as gate time for low frequency signal.
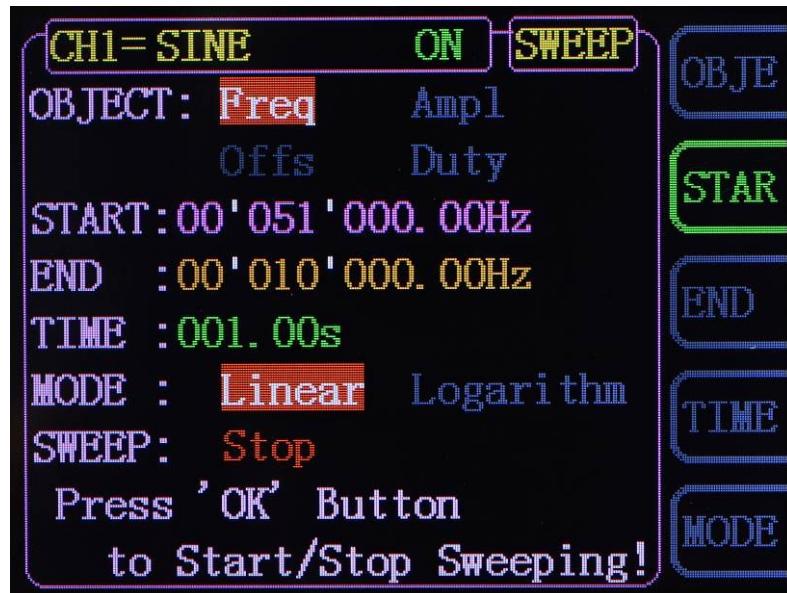
Gate Time	Frequency Resolution
1S	1Hz
10S	0.1Hz
100S	0.01Hz

Coupling

Set the coupling mode of the input signal to "AC" or "DC" and the default is "AC".

Sweep

Press SWEEP button of front panel to enable sweep function. FY2300 can output sweep from CH1. In sweep mode, the generator outputs signal variably from the start frequency to stop frequency within the specified sweep time. It can generate sweep output for Sine, Square, Triangle/Ramp and arbitrary waveform.

Sweep Object

FY2300 Can output sweep from CH1. The sweep objects include frequency, amplitude, offset, duty cycle. It can be selected by pressing OBJE button.

- In Frequency Sweep Mode, the generator will output signal variably from start frequency to end frequency within the specified sweep time.
- In Amplitude Sweep Mode, the generator will output signal variably from start amplitude to end amplitude within the specified sweep time.
- In Offset Sweep Mode, the generator will output signal variably from start offset to end offset within the specified sweep time.
- In Duty Cycle Sweep Mode, the generator will output signal variably from start duty cycle to end duty cycle within the specified sweep time.

Sweep Start Position

When Sweep function is enabled. Sweep start position need to be set according to sweep objects.

- Frequency Sweep: Press STAR button to highlight start frequency parameter. Press the Arrow buttons and rotate the ADJ Knob to set the specified value. For example:

START：00'010.000'000'000kHz

- Amplitude Sweep: Press STAR button to highlight start amplitude parameter. Press the Arrow buttons and rotate the ADJ Knob to set the specified value. For example:

START：10.00V

- Offset Sweep: Press STAR button to highlight start offset parameter. Press the Arrow buttons and rotate the ADJ Knob to set the specified value. For example:

START：00.00V

- Duty Cycle Sweep: Press STAR button to highlight start duty cycle parameter. Press the Arrow buttons and rotate the ADJ Knob to set the specified value. For example:

START：50.0%

Sweep End Position

When Sweep function is enabled. Sweep end position need to be set according to sweep objects.

- Frequency Sweep: Press **END** button to highlight end frequency parameter. Press the Arrow buttons and rotate the ADJ Knob to set the specified value. For example:

END：00'020. 000'000'000kHz

- Amplitude Sweep: Press **END** button to highlight end amplitude parameter. Press the Arrow buttons and rotate the ADJ Knob to set the specified value. For example:

END：20. 00V

- Offset Sweep: Press **END** button to highlight end offset parameter. Press the Arrow buttons and rotate the ADJ Knob to set the specified value. For example:

END：10. 00V

- Duty Cycle Sweep: Press **END** button to highlight end duty cycle parameter. Press the Arrow buttons and rotate the ADJ Knob to set the specified value. For example:

END：80. 0%

Sweep Time

When Sweep function is enabled, press TIME button to highlight time parameter. Press the Arrow buttons and rotate the ADJ Knob to set the specified value. The default is "1S". The work range is 10mS~999.99S. For Example:

TIME：999.99S

Sweep Type

FY2300 provides Linear, Logarithm sweep types. The default is Linear sweep. The sweep type can be switched by pressing "MODE" button.

Linear Sweep

In linear sweep type, the signal parameter varies linearly. For example, in the frequency sweep the output frequency of the instrument varies linearly in the way of "Changing several Hertz per second". The variation is controlled by "Start Frequency", "End Frequency" and "Sweep Time".

The step value of linear sweep object is computed by the generator, the formula is as follows:

Step value=（End value － Start value）/（Sweep time*100）

Logarithm Sweep

In linear sweep type, the signal parameter varies logarithmically.

For example, in the frequency sweep the output frequency changes in the way of "octave per second" or "decade per second". The variation is controlled by "Start Frequency", "End Frequency" and "Sweep Time".

When Logarithm Sweep is enabled, users can set the following parameters: Start Frequency (F_{start}), Stop Frequency (F_{end}) and Sweep Time (T_{sweep}).

The function prototype of Logarithm Sweep:

$$F_{current}=P^T$$

$F_{current}$ is the instantaneous frequency of the current output. P and T could be expressed as shown below by the above-mentioned parameters:

$$P=10^{\ lg(F_{stop}/F_{end})/T_{sweep}}$$

$$T=t+lg(F_{start})/lg(P)$$

Wherein, t is the time from the start of the sweep and its range is from 0 to T_{sweep}.

Enable Sweep Function

Press **SWEEP** button of front panel to enable sweep function. Then press ADJ Knob to start sweep process. Press ADJ Knob again to stop sweep.

Start value and End value

Start value and stop value are the upper and lower limits of sweep for specified parameter. sweep. The generator always sweeps from the start value to the end value and then returns back to the start value and continues indefinitely.

For example, in Frequency Sweep function:
- Start Frequency < End Frequency: the generator sweeps from low frequency to high frequency.
- Start Frequency > End Frequency: the generator sweeps from high frequency to low frequency.
- Start Frequency = Stop Frequency: the generator outputs with a fixed frequency.

When Sweep function is enabled, press **STAR** button to highlight start value. Use arrow buttons and ADJ Knob to set the specified value. Different frequency sweep corresponds to different start frequency and end frequency range.

Sine：　　10mHz to 25MHz
Square：　10mHz to 6MHz
Ramp：　　10mHz to 5MHz
Arbitrary：10mHz to 6MHz
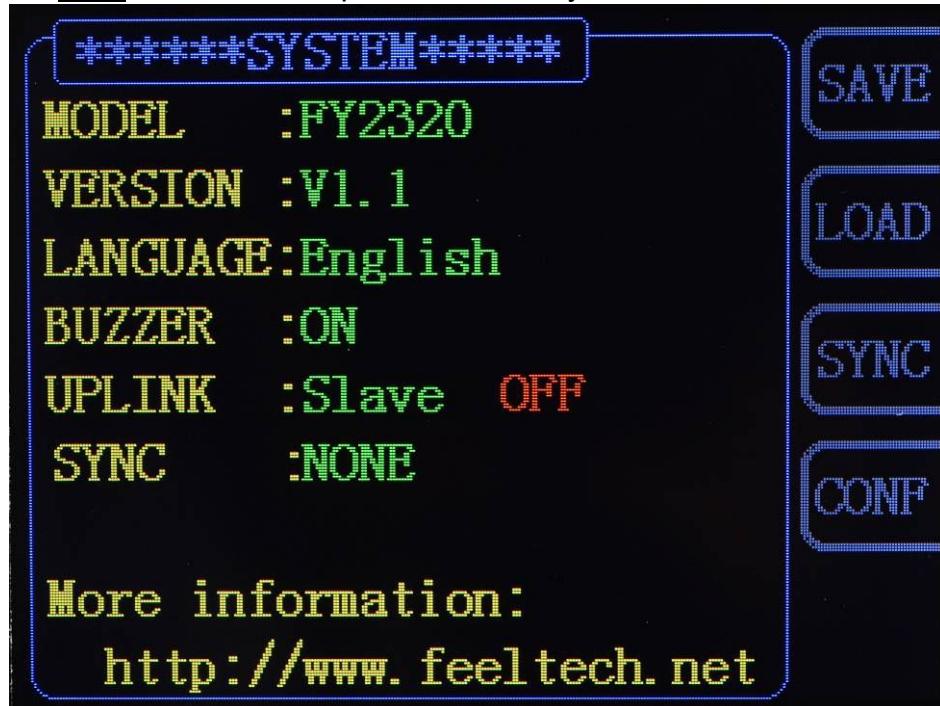
The generator will restart sweep (according to the current new configuration) from the specified "start frequency" after start or end frequency is changed.

System Configuration and Auxiliary Functions

Press **SYS** button of front panel to enter System interface.

SAVE: To save current parameters of waveform to save positions (20 sets).

LOAD: To load parameters to current working status from save positions.

SYNC: To synchronize CH2 parameter with CH1. Each parameter can be selected separately for synchronization including waveform, frequency, amplitude, offset and duty cycle.

CONF: To set system language, turn on/off Buzzer and Uplink mode.

Save and Load

Press **SAVE** button in System interface to save parameters of current waveform to specified position. Press "Load" button to load parameters of waveforms previously set to current system status.

Select **S xx** on the right to save current parameters to corresponding position.

Select **L xx** on the right to load parameters from corresponding position to current system status.

- FY2300 provides 20 positions for saving.
- The generator will load default parameters from Position 1 automatically after start-up.

Synchronization

Press SYNC button in system interface to enter synchronization setting interface. Press corresponding buttons on the right to highlight or cancel selecting status to set synchronization status of CH2.

When the synchronization of corresponding parameters are activated, the corresponding parameters of CH2 will vary according to variation of CH1 automatically. The parameters workable for synchronization include waveform, frequency, amplitude, offset, and duty cycle, which can be set separately.

When WAVE is highlighted, the waveform of CH2 will vary according to variation of CH1.

When FREQ is highlighted, the frequency of CH2 will vary according to variation of CH1.

When AMPL is highlighted, the amplitude of CH2 will vary according to variation of CH1.

When OFFS is highlighted, the offset of CH2 will vary according to variation of CH1.

When DUTY is highlighted, the duty cycle of CH2 will vary according to variation of CH1.

●

Configuration

Press SYS button to enter system interface. Then press "CONF" button to enter system configuration interface. Press corresponding buttons to select system work mode.

- Press 中文 button to select Chinese as system language.
- Press Eng button to select English as system language.
- Press BUZZ button to turn on/off buzzer. On is the default.
- Press M/S button to set uplink mode: Master/Slave. Master is the default.
  - Press UPLI button to turn on/off uplink function. Off is the default.

Uplink

FY2300 supports multi-machine uplink, which can provide users more channels for output. In uplink network, only one master machine can exist. Others must be set as slave machine. The setting method is as follows:

- Select on FY2300 as master machine. Press **SYS** -> **CONF** ->**M/S**, to set the UPLINK MODE to be "Master". Press **UPLI**, to set the UPLINK to be "ON".
- Set all other machines to be slave machines. Press **SYS** -> **CONF** ->**M/S**, to set the UPLINK MODE to be "Slave". Press **UPLI**, to set the UPLINK to be "ON". Repeat this step to set all slave machines.
- Connect all FY2300 in parallel by TTL_IO connecter.
- The uplink machines cannot exceed 8 because the driving ability.

When the setting above has been finished, all machines in network will work synchronously according to the start phase of master machine. When outputting signal with same frequency, multi channels output can be executed with phase adjustable.

Troubleshooting

This chapter lists the commonly encountered failures of FY2300 and their solutions. When you encounter these problems, please solve them following the corresponding steps below. If the problem remains still, please contact **FeelTech** and provide the device information (Press `SYS` to get it).

Failure Phenomena	Solutions
The screen of the generator is still dark (no display) after switch on.	1) Check whether the power is correctly connected. 2) Check whether the power switch has been pulled in place. 3) Restart the instrument after finishing the above inspections. 4) Use USB-B cable to input power. 5) If it still does not work correctly, please contact **FeelTech**.
. The screen of the generator is still dark (no display) after switch on, but the channel indicator lights illuminate.	This is because the power supply is not enough. 1). Please use original power adapter. If you need to connect to PC, please select USB port with enough current. 2). Please use original data cable because the original one has communicating function when supplying power, which others may don't have. 3). Please do not repeat switching the power switch too soon. The instrument has power protection. Please wait for 2S at least to switch on after it is switched off.
CH2 is locked.	1) Check whether the generator is worked in synchronization mode. Press `SYS` button to enter system interface, then press `SYNC` button to enter synchronization setting interface and cancel all parameters selected. 2) If the problem is still, please restart the generator.
The settings are correct but there's no waveform being generated:	1) Check whether the BNC cable is connected tightly with CH1 or CH2 connector. 2) Check whether the BNC cable has internal damage. 3) Check whether the BNC cable is connected tightly with the test instrument. 4) Check whether the indicators of CH1 or CH2 is turned on. If not press corresponding button to turn it on. 5) If the problem is still, please contact **FeelTech**.

Technical Specification

Unless specified, all specifications can be guaranteed if the following two conditions are met.

- The generator has passed self-inspection.
- The generator has been working continuously for at least 30 minutes under the specified temperature (18℃~28℃).

All the specifications are guaranteed unless those marked with "typical"

Frequency

	FY2300 -6MHz	FY2300 -12MHz	FY2300 -15MHz	FY2300 -20MHz	FY2300 -25MHz
Sine	0~6MHz	0~12MHz	0~15MHz	0~20MHz	0~25MHz
Square	0~6MHz	0~6MHz	0~6MHz	0~6MHz	0~6MHz
Ramp/Triangle	0~6MHz	0~6MHz	0~6MHz	0~6MHz	0~6MHz
Pulse	0~6MHz	0~6MHz	0~6MHz	0~6MHz	0~6MHz
TTL	0~6MHz	0~6MHz	0~6MHz	0~6MHz	0~6MHz
Others	0~6MHz	0~6MHz	0~6MHz	0~6MHz	0~6MHz
Resolution	1µHz (0.000001Hz)				
Accuracy	$\pm 5 \times 10^{-6}$				
Stability	$\pm 1 \times 10^{-6}$/ 3 Hours				
Impedance	50Ω±10%（Typical）				
Phase Range	0~359°				
Phase Resolution	1°				

Waveform Characteristics

Waveforms	Sine, Square, Triangle(Ramp), Arbitrary, Rise Sawtooth, Fall Sawtooth, Lorenz Pulse, Multitone, Noise, Cardiogram, Rapezoidal Pulse, Sinc Pulse, Narrow Pulse, Gauss White Noise, AM, FM, Step.	
Waveform Length	2048Points	
Sampling Rate	200MSa/s	
Vertical Resolution	12 Bits	
Sine	Harmonic Suppression	≥45dBc(<1MHz);≥40dBc(1MHz~20MHz);
	Total Harmonic Distortion	<0.8% (20Hz~20kHz,0dBm)
Square	Rise/Fall Time	≤20ns
	Overshoot	≤7.5%
	Duty Cycle	0.1%~99.9%

Sawtooth	Linearity	≥98% (0.01Hz~10kHz)

Output characteristics

Amplitude (50Ω)	10mVpp~20Vpp
Amplitude Resolution	1mV (Attenuate 20dB)
Amplitude Stability	±0.5%/ 5 Hours
Amplitude flatness	±5%(<10MHz)；±10%(>10MHz);

Waveform Output

Impedance	50Ω±10%（Typical）
Protection	All channels can work more than 60 seconds when the load is short-circuited.

Dc Offset

Offset Range	±10V
Offset Resolution	0.01V (0.001V With Attenuation)

TTL Output

Electrical Level Amplitude	>3Vpp
Fan-out	>20 TTL Load
Rise/Fall Time	≤20ns

CMOS Output

Low Electric Level	<0.3V
High Electric Level	1V~10V
Rise/Fall Time	≤20ns

External Measurement

Frequency Meter	Range	0.01Hz~100MHz
	Sensitivity	Gate Time 3 grades adjustable
Counter	Range	0-4294967295
	Coupling	DC，AC
	Working Mode	Manual
Pulse Width measurement	Resolution 5 nS.　Max. 10S	
Voltage Input Range	0.7Vpp~20Vpp	
Period Measurement	Resolution 5ns，Max. Limit 10s	

Sweep　　Only CH1 available

Sweep Type	Linear or :Logarithm

Sweep Objects	Frequency, Amplitude, Offset, Duty Cycle
Sweep Time	0.01S~999.99S/Step
Sweep Range	Starting position and Finishing position can be set arbitrarily.

General Specifications

Display	Mode	2.4 inch TFT Color Lcd.
Save & Load	Amount	20
	Position	01 to20 (01 for default value)
Interface	Type	USB to Serial interface.
	Communicating Speed	9600bps
	Protocol	Command line mode, protocol complete open.
Power	Voltage Range	DC5V±0.5V
Buzzer	Can be turned on/off by setting.	
Environment	Temp.：0~40℃　Humidity：＜80%	
Dimension	140mm（Length）X95mm（Width）X54.2mm（Height）	
Weight	Net Weight: 450g，　Gross Weight: 750g	

Appendix

Appendix A：Safety Notes

1. Before using this instrument, please check if the power supply is normal, to ensure the normal use and personal safety.
2. This instrument must be used in the technical index range.
3. Please do not change the instrument circuit arbitrarily, so as to avoid damaging equipment or endangering the safety.

Appendix B：Warning and personal injury

Do not apply the product in the safety protection device or emergency stop device, or any other applications that the product failure could result in personal injury, unless there is special purpose or use authorization. Before the installation and use, each parameter of the technical indexes in this manual should be referred to. If this suggestion is not obeyed, death or serious personal injury could be caused. In this condition the company will not be responsible for any compensation of personal injury or death, and all the company managers and employees and auxiliary agents, distributors, other personnel concerned will be released from any claim (including all the costs, expenses, attorney fees etc.) that may result in.

Appendix C：Accessories and Options

	Description	Quantity
Model	FY2300-6M （6MHz, Dual-channel）	1
	FY2300-12M（12MHz, Dual-channel）	
	FY2300-15M（15MHz, Dual-channel）	
	FY2300-20M（20MHz, Dual-channel）	
	FY2300-25M（25MHz, Dual-channel）	
Standard Accessories	5V 1A Power Adapter	1
	USB-B Data/Power Cable	1
	BNC-Clip Cable	2
	Resource CD (including the User's Manual)	1
	Warranty Card	1
Options	BNC-BNC cable	
	FYA2000/FPA1000 Series Amplifier	

Note: Options can be ordered from local **FeelTech** distributors.

Appendix D：Warranty

FeelTech warrants that its products mainframe and accessories will be free from defects in materials and workmanship within the warranty period. If a product is proven to be defective within the respective period, **FeelTech** guarantees the free replacement or repair of products which are approved defective. This product enjoy 1 year warranty since its delivery. Damages caused by misuse, vandalism, improper maintenance or force majeure are not covered by the warranty. Any disassembly or amendment without permission will be deemed giving up warranty rights consciously.