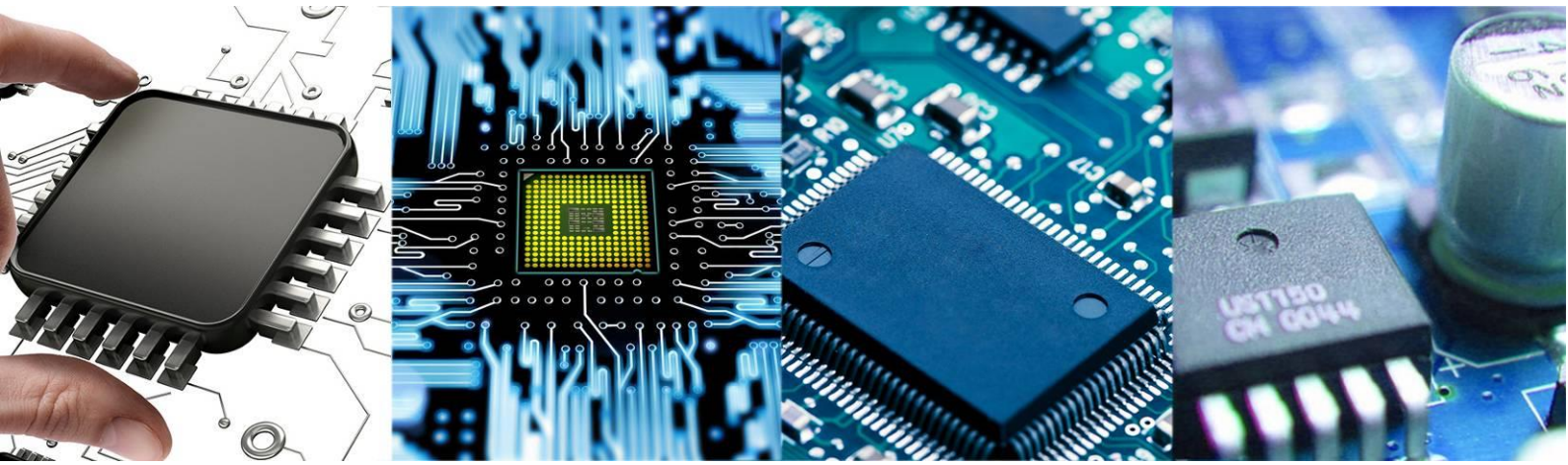
FeelElec

User's Manual

FY6200 Series Fully Numerical Control

Dual Channel Function/Arbitrary

Waveform Generator



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Contact Us

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Product Introduction

This manual is applicable to various models of FY6200 series Function / Arbitrary Waveform Generator. The last three digits in the model of FY6200 instrument indicate the upper limit value of sine wave frequency (MHz) of the instrument. For example: the "60M" of the Model Number "FY6200-60M" indicates the Sine wave maximum output frequency is up to 60MHz.

FY6200 series dual channel function / arbitrary waveform generator is a high-performance, cost-effective and multi-functional signal generator which integrates the functions of function signal generator, arbitrary waveform generator, pulse signal generator, noise generator, counter and frequency meter. The instrument adopts large-scale FPGA integrated circuit and high-speed MCU microprocessor, the internal circuit uses high-precision active crystal oscillator as the reference, and the signal has high stability. Surface mount technology greatly improves the anti-interference and service life of the instrument. The instrument has completely independent two-way DDS signal and four-way TTL level output, which can generate 31 preset waveform signals such as sine wave, square wave, triangle wave, sawtooth wave, pulse wave, white noise and 64 groups of user-defined waveforms. The instrument is easy to use, excellent technical index and perfect combination of many functional characteristics in signal generation, waveform scanning, parameter measurement and use, which can help users complete work tasks faster. It is an ideal testing and measuring equipment for electronic engineers, electronic laboratories, production lines, teaching and scientific research.

FY6200 series dual channel function / arbitrary waveform generator has humanized keyboard layout and indication, providing users with intuitive operation interface. The display interface adopts 3.2-inch TFT color LCD with high resolution of 320 * 240, which can display all parameters of two channels at the same time and prompt the current key function. The fast key greatly simplifies the complex operation process and greatly enhances the operability of the instrument. Users do not have to spend a lot of time to learn and familiar with the operation of the instrument, you can use it proficiently.

The instrument has the following excellent technical indicators and Functional Characteristics：

◆ DDS direct digital synthesis technology is used to produce accurate, stable and low distortion output signals.

◆ It adopts the embedded panel design of ABS plastic shell, which is convenient to integrate with user's equipment and easy to install.

◆ Use the 3.2-inch (320 * 240) color display screen is used to display the waveform parameters of two channels at the same time.

◆ Maximum output frequency 60MHz (sine wave), 250msa / s sampling rate, 14bits vertical resolution.

◆ Long press the "OK" key during use to quickly save the current output parameter information of the instrument, and the saved parameters can be loaded automatically after the next power on.

◆ Fully independent dual channel output (equivalent to two independent signal sources), which can work synchronously and the phase difference can be precisely adjusted.

◆ Standard channel tracking function. When tracking is turned on, all parameters of the two channels can be updated according to the user's configuration at the same time.

◆ It can output up to 98 groups of functions / arbitrary waveforms, including 34 groups of preset waveforms and 64 groups of user-defined waveforms. Preset waveforms include sine wave, square wave (duty cycle adjustable), triangle wave, pulse wave (pulse width and frequency can be accurately set), rising sawtooth wave, falling sawtooth wave, step wave, trapezoid pulse wave, cinke pulse, narrow pulse wave, noise wave, exponential rise, exponential fall, ECG, Lorentz pulse wave, multi audio wave, CMOS (0-10V) and DC voltage, etc.

◆ There are 64 groups of arbitrary wave storage bits, each group of storage depth is 8192 * 14bits.

◆ High frequency accuracy: Frequency accuracy can reach 10-6 orders of magnitude；

◆ The frequency resolution is relatively high: the full-range frequency resolution is 1uHz（0.000001Hz）；

◆ Amplitude resolution is higher: Amplitude resolution can be as low as 1mV

(0.001V).

◆ It has a DC bias function of - 10V ~ + 10V (< 20MHz), with a resolution of 1mV.

◆ With -10V~+10V DC bias function (<20MHz), resolution up to 1mV

◆ The pulse width and frequency of the pulse wave are continuously adjustable, and the adjustment range is 20ns-1s. The pulse amplitude can be continuously adjusted between 0-10V, and the adjustment accuracy is 0.001V.

◆ The phase adjustment range of the two channels is 0~359.99°, and the adjustment accuracy is 0.01°

◆ No range limit: The full range of frequency is not divided into gear switches, program-controlled settings.

◆ With digital signal output function, it can realize any CMOS level with 0~10V amplitude.

◆ Scanning function: It can scan the four properties of the signal: frequency, amplitude, offset, and duty cycle. It has two scanning modes: linear scan and logarithmic scan. The scan time can reach 999.99S. The start and end of the scan can be set arbitrarily.

◆ Burst Output Function: There has Manual Trigger, internal CH2 Trigger, and External Trigger for your options. It can output 1~1048575 pulse trains.

◆ Various modulation types: AM, FM, PM, ASK, FSK and PSK modulations.

◆ Storage feature: it can be store 20 groups of instrument state parameters set by users, and call up and reappear at any time.；

◆ 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 procedures；

◆ Equipped with powerful arbitrary waveform editing function, it can edit arbitrary waveform on PC and download to instrument output waveform.

◆ Powerful communication features that can be controlled using a PC. Open communication protocol makes secondary development very simple

◆ High reliability: Large-scale integrated circuit, surface mount technology, high reliability, long service life

◆ Output short-circuit protection: All signal outputs can work under load short-

circuit conditions 60S or more.

◆ Optional FYV2000 series or fpa2000 series power amplifier of our company can stably output the undistorted power signal of more than 20W in DC-10mhz bandwidth. The maximum output power of FPA2000-50w can reach 60W, and the maximum output power of FPA101a can reach 100W.

General Description

General Inspection

Please follow the items below when you receive a new FY6200 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

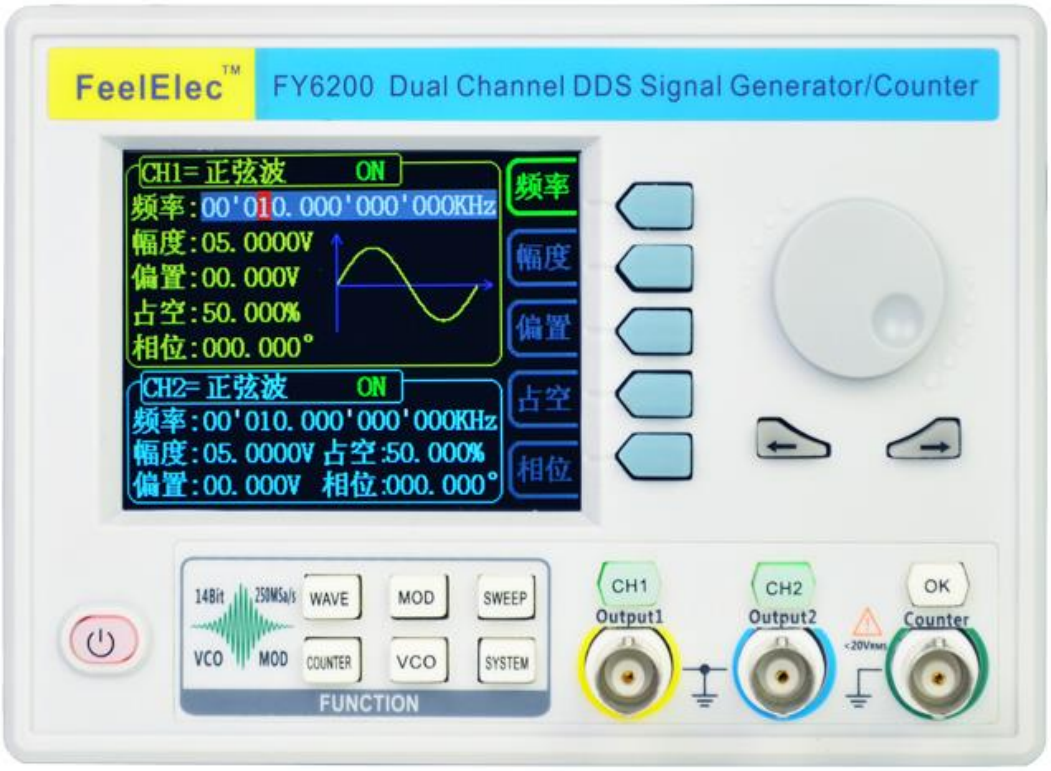
If there is mechanical damage or missing, or the instrument fails electrical and mechanical tests, please contact your FeelElec dealer.

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 FeelElec sales representative.

Front Panel Overview

The front panel is divided into easy to operate functional areas. This section briefly introduces the front panel control components and screen interface.



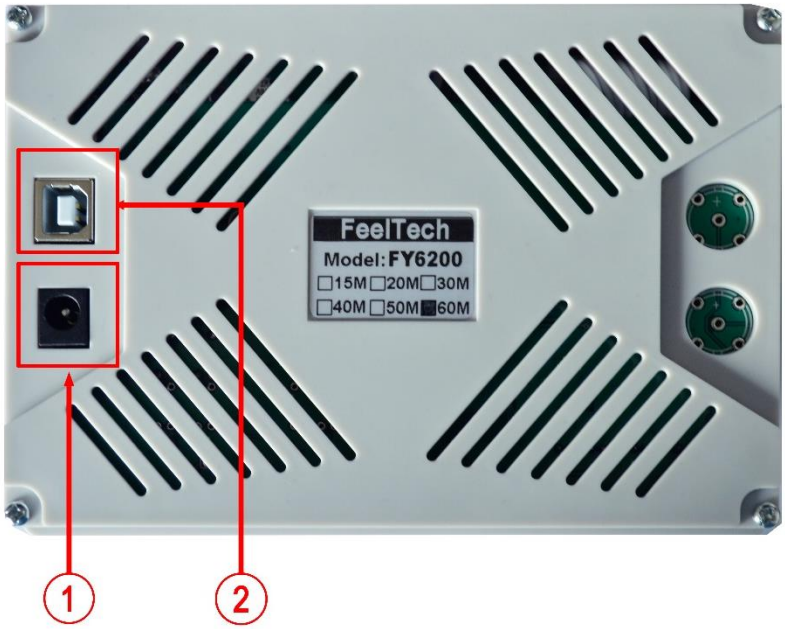
1-1 Front Panel

Item	Description	Explain
1	LCD	The 3.2 inch TFT (320 x 240) color LCD displays the menu and parameter settings, system status and prompt message of the current function. Please refer to the "User Interface" section for details.
2	Manu Buttons	Corresponding to the menu displayed on the left, press this soft key to activate the corresponding menu.
3	Function shortcut, Function for switching signal generator	WAVE Waveform selection button: — You can switch between sine, square wave, triangle wave, and any type of arbitrary wave — Change the selected channel signal type
		MOD Trigger and modulation function buttons — Can set a specific number of pulse train output function（BURS） — Modulation mode can be set :ASK、FSK、PSK、AM、

		FM、PM
		SWEEP — Sine, square, sawtooth and arbitrary waveforms can be scanned. — Supports scanning of four parameters of frequency, amplitude, offset, and duty cycle. — Supports two linear and logarithmic scanning methods.
		COUNTER — Can switch to frequency meter and counter function, measure frequency, period, duty cycle, positive pulse width of external input signal. — Supports DC and AC signal input — Supports 1 s, 10 s and 100 s gate time switching. — Dual channel output can work with frequency meter measurement.
		VCO — VCO function can be set — Support VCO voltage control signal generator's frequency, amplitude, offset, duty cycle and other parameter output functions (such as voltage-controlled oscillator).
		SYSTEM — Used to set auxiliary function parameters and system parameters. — Supports storage of 20 sets of parameters such as frequency, amplitude, offset, and phase — Support Chinese and English switching — Support prompt tone off/on — Supports multi-machine cascading — Supports master/slave switchover in cascaded state — Supports dual-channel power-on default output state setting
4	Direction key	When the knob is used to set parameters, it is used to move the cursor to select the bit to be edited.
5	Adjusting knob	When using the knob to set parameters, you can increase (clockwise) or decrease (counterclockwise) the value at the current cursor.
6	Power button	The power indicator will remain on when it is turned on. When the signal generator is turned off, the indicator light will enter the breathing lamp state and CH1 and CH2 will stop outputting (the output will remain at 0 volts).
7	CH1 channel output Connector	BNC connector, nominal output impedance 50Ω. When channel CH1 is on (the CH1 button indicator lights up), the connector outputs the waveform in the current configuration of CH1.
8	Channel control, Confirm button	CH1 — It is used to control the output of the CH1 channel and can be switched to the CH1 parameter setting interface in any interface.

		— Press this button, the CH1 light will turn on, and the CH1 output will turn on. At this point, the [CH1] connector outputs the signal in the current configuration. — Press this button again, the indicator light goes off, and at this point, the CH1 output is turned off
		OK Confirm button — When editing frequency parameters, press this key to change the frequency unit. — When scanning the interface, press this button to start/stop scanning.
		CH2 It is used to control the output of the CH1 channel and can be switched to the CH1 parameter setting interface in any interface. — Press this button, the CH2 light will turn on, and the CH2 output will turn on. At this point, the [CH2] connector outputs the signal in the current configuration. — Press this button again, the indicator light goes off, and at this point, the CH2 output is turned off.
9	CH2 channel output connector	BNC connector, nominal output impedance 50Ω. When channel CH2 is on (the CH2 button indicator lights up), the connector outputs the waveform in the current configuration of CH2.
10	AC coupling measuring terminal	BNC connector, input impedance 100Ω. For inputting signal of meter or counter.

Back Panel Overview



1-2 Back Panel

1. Power input interface, input voltage DC5V 1.5A.
2. USB Device Interface

Used to communicate with the computer. (this is a USB to TTL serial port. You need to install a serial driver). Through the upper computer software or user-defined programming.

Warning

In order to avoid damaging the instrument, the voltage range of the input signal of the ext.in terminal shall not exceed ± 20Vac + dc. The input signal voltage range of Trig / FSK / ASK / PSK in terminal shall not exceed DC5V.

Note

In order to ensure the normal operation of the instrument, please use 5V 1.5A DC power supply.

Power On and Inspection

Connect to Power

Please use the power supply provided by the accessory to connect to the DC power connector on the back of the signal generator. The signal generator supports DC power of DC5V specification, and the power consumption of the whole machine is less than 3W.

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 "Fault Handing" for solution.

Set the System Language

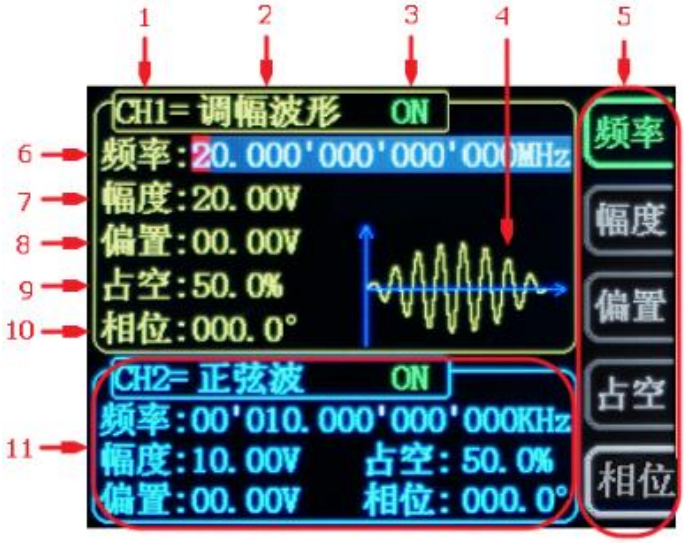
FY6200 series Function/Arbitrary Waveform Generator supports Chinese and English system languages. You can press **SYSTEM**→**CONF** to switch the system language.

User Interface

The user interface of fy6200 includes four display modes: dual channel parameter display mode, single channel extended display mode, additional function display mode and system configuration display mode.

Dual Channels Parameters

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.

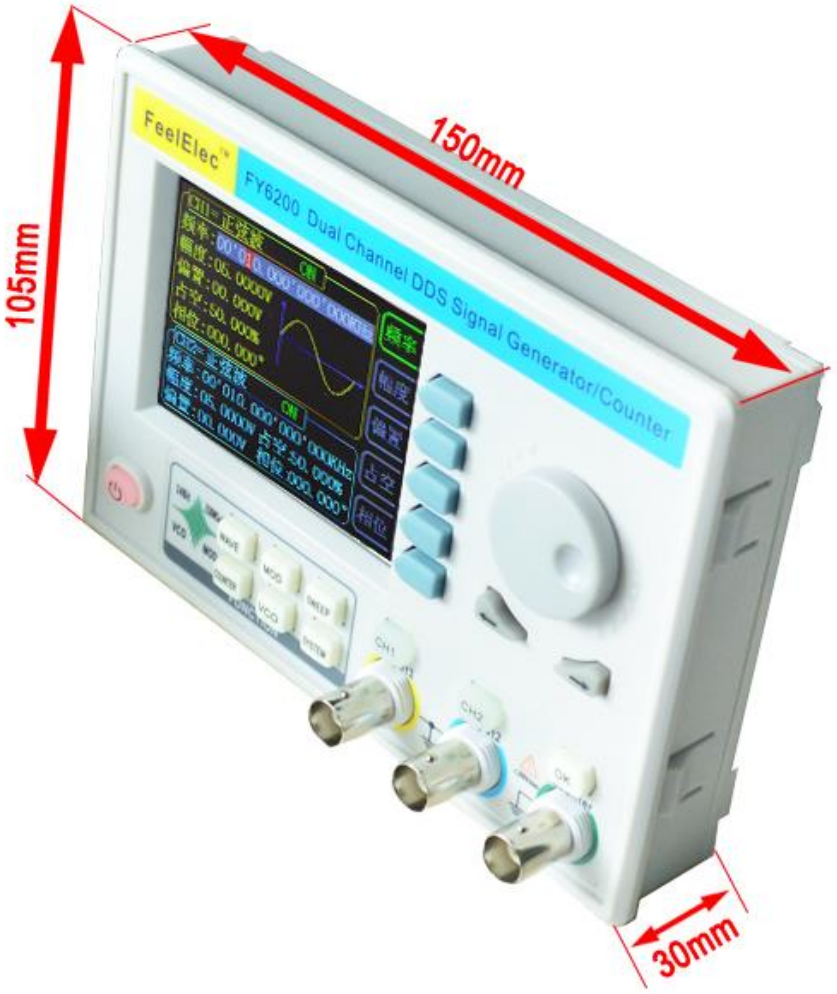


1-4 User Interface（CH1 channel is selected）

Item	Description
1	Current channel selected. Display current channel selected for operation.
2	Current waveform type selected Displays the name of the currently selected feature. For example: "ch1 = amplitude modulation waveform" means that the currently selected channel CH1 outputs amplitude modulation waveform, and the waveform type can be changed through the **WAVE** button on the front panel. In addition, when the change waveform type function is activated, you can use the parameter adjustment knob to perform fast switching on the waveform type or click the knob to quickly locate the waveform. In the waveform adjustment state, the preset waveform and customization can be realized by pressing the OK button. Fast switching between waveforms.

3	Currently selected channel output status bar The current channel output on / off status is displayed, and the output status can be changed by adjusting the front panel channel control buttons **CH1** and **CH2**.
4	Waveform Display diagram of current waveform（Including Arbitrary）. Yellow indicates CH1 and blue indicates CH2.（The instrument can also display any user-defined waveform.）
5	Manu Bar Displays the action menu for the currently selected function.
6	Frequency Displays the frequency of the currently selected channel waveform. Press the corresponding **FREQ** button to highlight the "frequency" display value, and change the parameter through the direction key and adjustment knob.
7	Amplitude Displays the amplitude of the currently selected channel waveform. Press the corresponding **FREQ** **button to highlight the "amplitude" display value, and change the parameter through the direction key and knob.**
8	Offset Displays the DC offset of the currently selected channel waveform. Press the corresponding **OFFS** button to highlight the "offset" display value, and change the parameter through the direction key and knob.
9	Duty Cycle Display Duty Cycle value of current channel. Press **DUTY** button to highlight it and use adjusting Knob and Arrows to change the value.
10	Phase Displays the phase of the current waveform for each channel. After pressing the corresponding **PHAS** button menu, change the parameter with the arrow keys and knob.
11	Channel parameter status is not selected Displays information such as the frequency, amplitude, offset, phase, duty cycle, and output status of the current waveform of the unselected channel. The parameters in this column cannot be directly changed under the current interface. If you need to change, please switch the channel to the selected channel.

Dimensions


150mm
105mm
30mm
FeelElec
FY6200 Dual Channel DDS Signal Generator/Counter

Front Panel Operations

Waveform Output

FY6200 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 5Vpp amplitude by default. Two channels use default setting saved at Position 1 when power on. Users can configure the instrument to output various waveforms.

Select Output Channel

CH1、**CH2** keys are used to switch ch1 or CH2 to the currently selected channel. When power on, ch1 is selected by default and displayed in yellow on the top half of the screen. Press the CH2 key on the front panel to select CH2, which is displayed in blue on the top half of the screen. After selecting the required output channel, you can configure the waveform and parameters of the selected channel.

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 "Synchronizing".

Select Waveform

FY6200 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. Pressing the knob can change to arbitrary waveform directly when choosing waveform. At start-up Sine is selected by default. (Users can also configure start-up waveform. Please check Chapter "Save and Load".)

Waveform		Sine	Square	Triangle	Sawtooth	Arbitrary
Function Name		SINE	SQUR	TRGL	RAMP	ARB
Parameter	Frequency	√	√	√	√	√
	Amplitude	√	√	√	√	√
	Offset	√	√	√	√	√
	Phase	√	√	√	√	√
	Duty Cycle		√			

Note: the user-defined waveform can be edited and downloaded through the fy6200 upper computer control software provided by feelelec. Relevant software and drivers can be downloaded from our website: http://www.feelelec.com

Set Frequency

Frequency is one of the most important parameters of the basic waveform. The frequency can be set differently based on different signals and different waveforms. Please refer to the description of "Frequency Characteristics" in "Performance Specifications". The factory default setting is 10KHz.

Press the **FREQ** soft key to highlight the frequency parameter. At this time, use the direction key and knob to set the parameter value: use the direction key to move the cursor to select the position to be edited, and then rotate the knob to modify the value.

The frequency unit can be switched according to the user's requirements. Press the OK key to change the frequency unit. The optional frequency units are: MHz, kHz, Hz, MHz and μ Hz.

Set Amplitude

The settable range of amplitude is limited by the "frequency" setting. Please refer to the description of "output characteristic" in "performance index". The default is 5vpp.

Press the **FREQ** soft key to highlight the amplitude parameter. At this time, use the direction key and the adjustment knob to set the value of the amplitude: use the direction key to move the cursor to select the position to be edited, and then rotate the knob to modify the value.

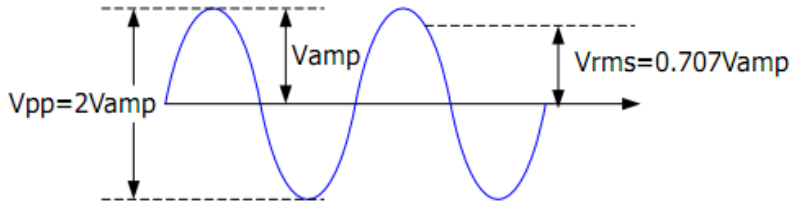
Key Points:

1. What is the difference between the amplitude in Vpp and the value in Vrms?

Answer:
Vpp is the unit of signal peak value, Vrms is the unit of signal effective value. Vpp is used by default.

Explain:
For different waveforms, the relationship between Vpp and Vrms is different. Take the sine wave as an example.

The relationship is shown in the figure below.



According to the above figure, it can be deduced that the conversion relationship between Vpp and Vrms meets the following relationship:

$$Vpp = 2\sqrt{2}\ Vrms$$

For example, for a sine wave with a current amplitude of 5Vpp, the converted value is 1.768Vrms.

Set Offset

Press the **OFFS** key to highlight the offset parameter. At this time, use the direction key and adjustment knob to set the offset value: use the direction key to move the cursor to select the position to be edited, and then rotate the knob to modify the value.

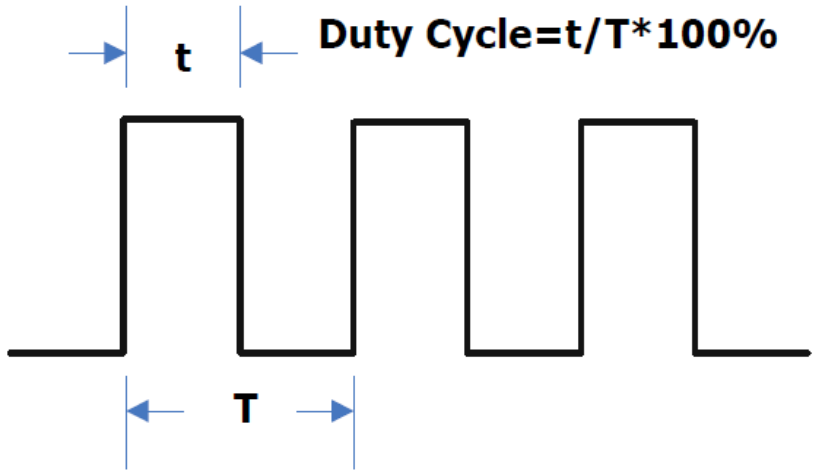
The minimum adjustment accuracy of offset is 1mV (0.001V).

When the output frequency is lower than 20MHz, the bias voltage can be adjusted arbitrarily between - 10V and + 10V.

When the output frequency exceeds 20MHz, the bias voltage can be adjusted arbitrarily between - 2.5V and + 2.5V.

Set duty cycle (square wave)

Duty cycle is defined as the percentage of the duration of the high level of the square wave in the cycle, as shown in the figure below. This parameter is only valid when square wave 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%.

1. Press the **DUTY** soft key to highlight the duty cycle parameter. At this time, use the direction key and knob to set the parameter value: use the direction key to move the cursor to select the position to be edited, and then rotate the knob to modify the value.
   a. The adjusting range of duty cycle of this instrument is 0.01% - 99.99%.
   b. Press the OK key in the duty cycle adjustment state, and the duty cycle will be initialized to 50.0%.
2. Press duty cycle repeatedly to switch between rising edge time and falling edge time.

Set pulse width (pulse wave)

The adjustable pulse wave refers to a square wave that can maintain a fixed pulse width at any frequency, that is, the pulse width set by the user does not change with the frequency change.

Pulse width setting method: when the tunable pulse wave is selected, press the time key to adjust the duration of the pulse width t (NS). Pulse width can be set by direction key and parameter adjusting knob. Use the direction key to move the cursor to select the position to be edited, and then turn the knob to modify the value.（(Note: Please don't make the set length of the

positive pulse width t greater than or equal to the period T length of the output waveform).

Set Phase

The initial phase can be set from 0 ° to 359.99 ° and the phase resolution is 0.01 °. The default value is 0 °.

1. The starting phase of the screen display is the default value or the previously set phase.
2. Press the **PHAS** soft key to highlight the phase parameters. At this time, use the direction key to move the cursor to select the position to be edited, and then turn the knob to modify the value.

Enable channel output

After completing the parameter settings for the selected waveform, you need to turn on the channel to output the waveform. When the output is off, the LED below the corresponding channel button is off; when the output is on, the LED is lit.

The default CH1 and CH2 are enabled for output, and the LEDs under the CH1 and CH2 buttons are lit.

The power-on can also be set to the default off output state. Setting method: Press the【SYS】button, and then press the【MORE】soft key to set the default output status of the two channels.

- To turn off/on the output on the CH1 channel, there are two states：
  1. The signal generator works in the waveform parameter setting menu, and the currently selected channel is **CH1**, Pressing the **CH1** button will switch the output between off/on.
  2. The signal generator works in other function menus, or the selected channel is not **CH1**， Press **CH1** button once to make CH1 as the currently selected channel. Press **CH1** again to switch the output between off/on.
- To turn off/on the output on the CH2 channel, there are two states:
  1. The signal generator works in the waveform parameter setting menu, and the currently selected channel is CH2. Pressing the **CH2** button will switch the output between off/on.
  2. The current signal generator works in other function menus, or the selected channel is not CH2. Press **CH2** once to take CH2 as the currently selected channel, and press **CH2** again to switch the output between off / on.

Example: output sine wave

This section mainly introduces how to output a sine wave from the [ch1] connector (frequency 20KHz, amplitude 2.5vpp, offset 1.6vdc, initial phase 90.9 °)

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 the direction key to adjust the cursor to the "2" position as shown in the figure below, and rotate the adjustment knob to obtain the following data.

FREQ： 00’020.000’000’000kHz

4. Set the Amplitude: Press **AMPL** to highlight the amplitude value, Press the direction key and rotate the adjustment knob to obtain the following data.

AMPL： 02.500V

5. Set the offset voltage: Press **OFFS** to highlight the offset value. Press the direction key and rotate the adjustment knob to obtain the following data.

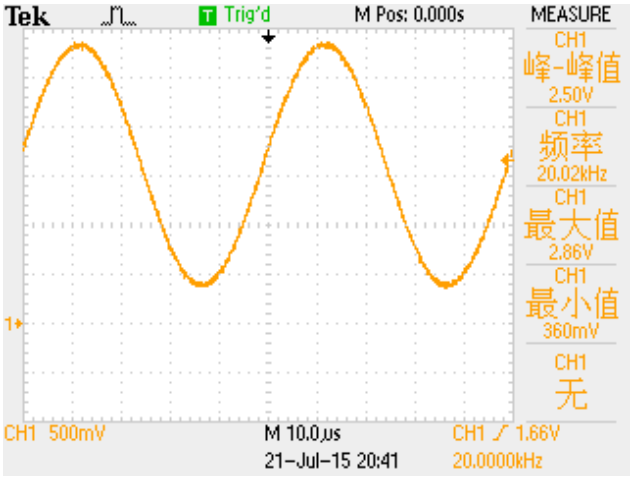
OFFS： 01.600V

6. Set Phase: Press the **PHAS** soft key to highlight the "phase" parameter. Press the direction key and rotate the adjustment knob to obtain the following data.

PHAS： 090.90°

7. Enable channel output: Press the **CH1** key to turn on the ch1 output light, and the [CH1] connector outputs the sine wave signal in the current configuration.

8. Observe the output waveform: Connect the [CH1] of fy6200 to the oscilloscope with BNC connecting wire. The following figure shows the waveform observed by the oscilloscope.


Tek
Trig'd
M Pos: 0.000s
MEASURE
CH1
峰-峰值
2.50V
CH1
频率
20.02kHz
CH1
最大值
2.86V
CH1
最小值
360mV
CH1
无
CH1 500mV
M 10.0µs
21-Jul-15 20:41
CH1 ⁄ 1.66V
20.0000kHz

Modulation function

Press the **MOD** key on the front panel to enable the modulation function, and fy6200 can output the modulation waveform from ch1 channel. This function uses ch1 waveform signal as carrier, CH2 waveform signal, external signal or manual pulse signal as modulation wave to modulate signal. It can realize FSK, ASK, PSK digital modulation, trigger pulse series output, and AM, FM, PM analog signal modulation functions. The modulation signal is input by Trig / FSK / ASK / PSK IN at the tail of the signal generator.

2-3 Modulation parameter setting interface

（Note: after entering the modulation interface, the signal generator will immediately perform the current modulation function.）

Modulation mode

Click the < F1 > mode key under the modulation function to switch the modulation modes, including

① FSK (frequency keying)
② ASK (amplitude keying)
③ PSK (phase keying).
④ Trigger (controllable burst output).
⑤ AM (Amplitude Modulation).）
⑥ FM（Frequency modulation）
⑦ PM（Phase modulation）

Every time the "mode" button is pressed, the function will switch down once.

Modulation source

Under the modulation function, click the <F2> source button to switch the modulation source, that is to say, select the modulation signal.

In FSK, ASK, PSK and Trigger modes, there are four sources：

① CH2: Channel 2 signal as modulation signal
② External (AC): access external signals in the form of AC coupling through the EXT.IN port
③ Manual: click "OK" key manually as modulation signal
④ External (DC): access external signals in the form of DC coupling through TTL_IO port.

There are two sources in AM, FM and PM modes:

① CH2: Channel 2 signal as modulation signal
② External (Ext.IN): access external signals in the form of DC coupling through the EXT.IN port

Every time the "source" button is pressed, the function will switch down once

Modulation parameter

Click the < F3 > parameter key under the modulation function to adjust the modulation parameters.

For Example:

① In the "FSK" mode, the frequency of frequency hopping can be adjusted.
② In the "trigger" mode, the number of output pulse trains can be adjusted.
③ In the "AM" mode, you can adjust the modulation rate of the amplitude modulation (0 to 200%).
④ In FM mode, frequency offset parameters can be adjusted.
⑤ In the "PM" mode, the degree of phase deviation can be adjusted.

Other button functions

You can adjust the frequency of CH1 by clicking the <F4>"Frequency" button under the modulation function.

You can adjust the amplitude of CH1 by clicking the <F5> "Amplitude" button under the modulation function.

Pulse string

The FY6200 can output a waveform with the specified number of cycles from the CH1 channel (called burst, Burst). Fy6200 supports the output of pulse strings controlled by CH2 internal, manual or external trigger sources; the signal generator can use sine wave, square wave, sawtooth wave, pulse, noise wave or any wave (except DC) to generate pulse strings.

Enable burst function

Press the **MOD** key and press the **BURS** soft key to enter the burst burst burst output function. The instrument supports [CH2], [external] and [manual] three trigger output modes, which can be selected by corresponding soft keys. Press **COUNTER** soft key to set the number of pulse strings. When the number of pulses is selected, use the direction key and parameter adjustment knob to change the number of single burst output pulses. The default value is 1, and the setting range is 1 to 1048575. After the parameter setting, the signal generator will output the pulse train waveform from ch1 channel (if it is currently on) according to the current trigger configuration.

- Normal mode, i.e. burst off mode.
- CH2 triggering mode, that is, CH2 has a pulse generation, then CH1 outputs a burst pulse waveform.
- External trigger mode, that is, if Trig.IN terminal has a pulse input, CH1 will output a burst pulse waveform.
- Manual trigger mode, the user can press the [OK] key to trigger CH1 to output a burst pulse waveform.

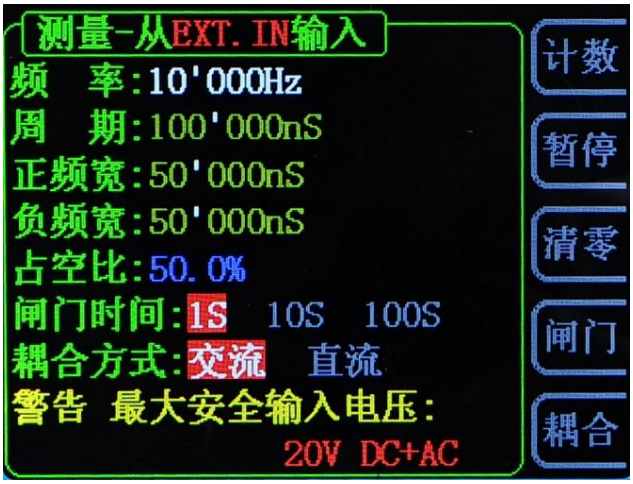
Frequency meter/counter

FY6200 provides the function of frequency meter/counter, which can measure the frequency, period, duty cycle, positive pulse width, negative pulse width and other parameters of external input signal. Dual channel output can work simultaneously with the frequency meter measurement.

Enable frequency meter

Press **COUNTER** on the front panel to open the function of frequency meter and display the setting interface of frequency meter. The measurement signal is introduced from the input (AC coupling) or Trig.IN (DC coupling) terminal and displayed on the screen in real time. The minimum frequency of measurement is 0.01Hz (gate time 100s).

- Press **COUNTER** soft key to enter the external pulse counting function. At this time, **COUNTER** soft key will be changed to **FREQ**.
- Press this key repeatedly to switch between **FREQ** and **COUN** functions.



2-1 Frequency meter / counter parameter setting interface

If the current frequency meter is turned on, you can use the stop soft key to **STOP** he screen content, and the **ZERO** soft key to set the frequency / count value to zero.

Key Points:

The amplitude of the input signal of the frequency meter of the fy6200 series generator is greater than 1.5V, and the maximum safe input voltage of the [counter] terminal is 20vpp. When using the function of frequency meter / counter, please turn off the cascade function of the instrument.

Set frequency meter

Gate Time

Press the **GATE** soft key to select the gate time of the measurement system. The default is 1s. When measuring low frequency signal, 10s or 100s gate time can be selected.

Strobe time	Frequency resolution
1S	1Hz
10S	0.1Hz
100S	0.01Hz

Sweep

Press the **SWEEP** key on the front panel to enable the scanning function, and fy6200 can output the scanning waveform from ch1 channel. The process of gradient scanning for a specific parameter object at a specified time from the initial value to the termination value. For sine wave, square wave, sawtooth wave and arbitrary wave, scanning output can be generated.

2-2 Sweep parameter setting interface

Sweep Object

The FY6200 can output sweep waveforms from the CH1 channel. The parameters that can be scanned are: frequency, amplitude, offset, duty cycle. Switching object types can be switched via the **OBJE** soft key.

- In the frequency scanning mode, the signal generator changes the output from the starting frequency to the ending frequency within the specified sweep time.
- In the amplitude scanning mode, the signal generator changes the output from the starting amplitude to the ending amplitude within the specified scanning time.
- In the offset scanning mode, the signal generator changes the output from the start offset to the end offset within the specified scanning time.
- In duty cycle scanning mode, the signal generator changes the output from the start duty cycle to the end duty cycle within the specified scanning time.

Scanning start position

After the "Sweep" function key is enabled, the scan start value needs to be set according to the scan object.

- Frequency scanning: press the **STAR** soft key to highlight the "start" parameter, press the direction key and rotate the adjustment knob to adjust to the start value specified by the user, as shown in the following example.

  START：00’010.000’000’000kHz

- Amplitude scanning: press the **STAR** soft key to highlight the "start" parameter, press the direction key and rotate the adjustment knob to adjust to the start value specified by the user, as shown in the following example.

  START： 10.000V

- Offset scanning: press the **STAR** soft key to highlight the "start" parameter, press the direction key and rotate the adjustment knob to adjust to the start value specified by the user, as shown in the following example.

  START： 00.000V

- Duty cycle scanning: press the **STAR** soft key to highlight the "start" parameter, press the direction key and rotate the adjustment knob to adjust to the start value specified by the user, as shown in the following example.

  START： 50.0%

Sweep end position

When the sweep function key is enabled, you need to set the scan cut-off value according to the scan object.

- Frequency scanning: press the **END** soft key to highlight the "cut-off" parameter, press the direction key and rotate the adjustment knob to adjust to the cut-off value specified by the user, as shown in the following example.

- Amplitude scanning: press the **END** soft key to highlight the "cut-off" parameter, press the direction key and rotate the adjustment knob to adjust to the cut-off value specified by the user, as shown in the following example.

- Offset scanning: press the **END** soft key to highlight the "END" parameter, press the direction key and rotate the adjustment knob to adjust to the cut-off value specified by the user, as shown in the following example.

- Duty cycle scanning: press the **END** soft key to highlight the "END" parameter, press the direction key and rotate the adjustment knob to adjust to the cut-off value specified by the user, as shown in the following example.

Sweep Time

When the scan function is enabled, press the [Time] soft key to highlight the [time] parameter. Press the direction key and the parameter adjustment knob to set the required scanning time value. The default is 2S, and the setting range is 10ms to 999.99s. The setting interface is as follows

Sweep Type

FY6200 provides two types of scanning: linear scanning and logarithmic scanning. The default is linear scanning. In the scan interface, press the mode soft key to switch.

Linear sweep

Under the linear scanning mode, the parameters of the output signal of the instrument change linearly.

Take frequency scanning as an example, i.e. changing the output frequency by several Hertz per second, which is controlled by "start frequency", "end frequency" and "scanning time".

The step value of the object parameter of linear scanning is calculated by the signal generator, and the calculation formula is as follows:

Step value = (cut-off value - start value) / (scanning time * 100)

Logarithmic scanning

In the logarithmic scanning mode, the parameters of the output signal of the instrument change in logarithmic mode.

Take the frequency sweep as an example, that is, change the output frequency in octaves per second or ten times per second. The change is controlled by the "starting frequency", "terminating frequency" and "scanning time".

When logarithmic sweep is enabled, the user can set the following parameters: start frequency Fstart, stop frequency Fend and scan time Tsweep. The function prototype of logarithmic sweep is：

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

$F_{current}$ is the instantaneous frequency of the current output. The parameters p and t can be expressed as follows with the above parameters.

$$P=10\ lg^{(Fend/Fstart)/Tsweep}$$

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

Among them, t is the time from the beginning of scavenging, ranging from 0 to T_{sweep}.

Enable frequency sweep function:

Press the **SWEEP** key on the front panel to enable the frequency sweep function, press the OK key to start the scanning process, and press the OK key again to stop the scanning.

Initial value and cut-off value

Initial and cut-off values are the upper and lower bounds of parametric scanning. The signal generator always scans from the start value to the end value of the parameter, then returns to the start value, and circulates.

Here is an example of frequency scanning:

When the starting frequency is < the ending frequency, the signal generator scans from low frequency to high frequency.

When the starting frequency > the ending frequency, the signal generator scans from high frequency to low frequency。

When the starting frequency = the ending frequency, the signal generator outputs at a fixed frequency.

When the sweep mode is enabled, press the **STAR** soft key to highlight the start parameter. Use the direction key and the knob to enter the desired frequency value. The start and end frequency ranges of different sweep waveforms are different.

Sine wave: 100MHz to the highest output frequency of this type of sine wave

Square wave: 100MHz to 25MHz

Sawtooth wave: 100MHz to 10MHz

Arbitrary wave: 100MHz to 10MHz

After modifying the "starting frequency" or "terminating frequency", the signal generator will restart the sweep output from the specified "starting frequency".

VCO Sweep Function

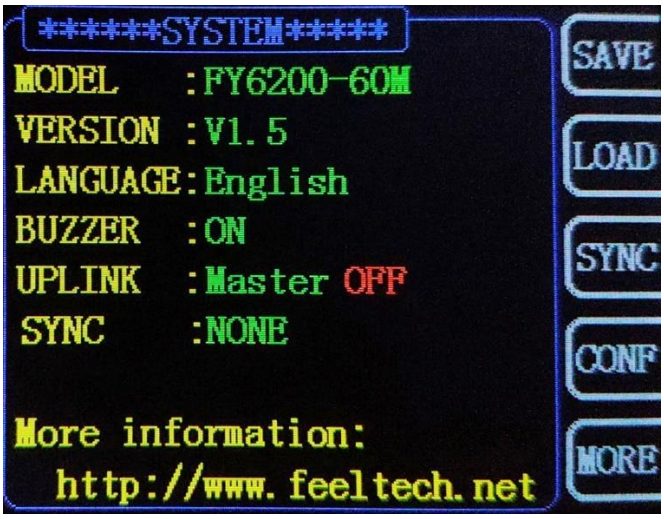
Function introduction: The signal output of the external voltage control signal generator can be realized by external scanning (VCO function). This function can be realized: voltage control frequency (VCF), voltage control amplitude (VCA), voltage control bias, voltage control duty cycle function. Note：VCO (Voltage Control Output)

Operation method: Press the [VCO] button to enter the function interface. After the scan object, start, cutoff, and scan mode settings are completed, connect the external scan signal to the [Counter] port on the instrument panel. At this point, press the OK button to start the VCO scan function. Press OK again, the scan stops.

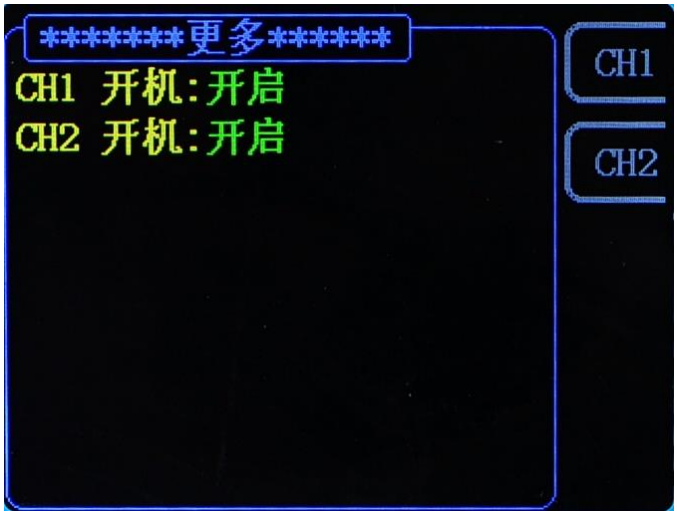
Note: The input signal of the external scan (VCO function) needs to be input from the [Counter] port on the front panel of the signal generator. The input signal frequency should be within 1000Hz, and the voltage amplitude must be between 0~5V.

System settings and auxiliary functions

Press the **SYSTEM** key on the front panel to open the operation interface shown in the figure below. This interface displays the function information of instrument parameter storage, parameter loading, synchronization, configuration, etc.



- SAVE：The current waveform parameters can be stored in 20 groups of storage areas of the system.
- LOAD：The preset parameter information in the system can be loaded into the current working state.
- CONF：The system language can be set, the on / off of prompt tone, the on / off of multi machine cascade function, and the mode setting in the cascade state.
- MORE：The default output state of CH1 and CH2 channel power on can be set.



SAVE and LOAD

In the system interface, press the **SAVE** soft key to store the information of the current system waveform in the specified storage location; press the **LOAD** soft key to load the previously stored system waveform parameter information into the current system status.

Select the **SAVE** soft key on the right to store the current system parameters in the corresponding storage location.

Select the right **LOAD** soft key to load system parameters from the corresponding position.

- FY6200 provides 20 groups of available storage areas。
- The signal generator is powered on by default and automatically stores the storage 1 position data parameter.

Configuration

Press the【SYSTEM】key to enter the system interface, press the **SYSTEM** soft key to enter the system configuration interface, press the right parameter soft key to set the system's working mode.

- Press the 中文 soft key and select the system prompt language as Chinese.
- Press the **Eng** soft key and select the system prompt language as English.
- Press the **BUZZ** soft key to switch the system button tone between on/off status, and the system default tone is turned on.

Synchronization function

After pressing the【SYSTEM】button, press the【Sync】soft key to enter the synchronization function setting interface. Press the right parameter soft key to switch it in the selected (highlighted) / canceled state.

When the synchronization of the corresponding parameters is turned on, the corresponding parameter of CH2 changes according to the change of CH1, and no human intervention is required. The synchronization parameters provided by the FY6200 include: waveform, frequency, amplitude, offset, duty cycle, and can be set separately.

- **WAVE** The soft key is highlighted, and the waveform type of CH2 changes synchronously with the waveform type of CH1.
- **FREQ** The soft key is highlighted, and the waveform frequency of CH2 and the waveform frequency of CH1 change synchronously.
- **AMPL** The soft key is highlighted, and the waveform amplitude of CH2 and the waveform amplitude of CH1 change synchronously.
- **OFFS** The soft key is highlighted, the waveform offset of CH2 and the waveform offset of CH1 are changed synchronously.
- **DUTY** The soft key is highlighted, and the duty cycle of CH2 and the duty cycle of CH1 change synchronously.

Fault Handling

The following is a list of faults and troubleshooting methods that may occur during the use of the FY6200. When you encounter these faults, please follow the corresponding steps, if not, please contact **FeelElec** and provide the equipment information of your machine (obtaining method: press the **SYSTEM** key to obtain the system information.)

Fault phenomenon	Methods of Resolution
After the instrument is connected to the power supply, there is no display and the channel indicator is not on	1) Check whether the power socket has power. 2) Check whether the power connector is connected properly. 3) After the above inspection, restart the instrument. 4) If you are still unable to use the product properly, please contact **FeelElec**.
Signal generator CH2 locked	1) Check whether the signal generator works in synchronous state. Press the **SYSTEM** button -> SYNC to enter the synchronization setting interface to cancel all synchronization parameters. 2) Restart the signal generator and unlock it.
Correct setting but no waveform output	1) Check that the BNC cable is securely connected to the corresponding [CH1] or [CH2] channel output port. 2) Check BNC wire for internal damage. 3) Check whether the BNC wire is firmly connected with the test instrument. 4) Check whether the side indicator light on the [CH1] or [CH2] key is lit on. If it is not lit, press the corresponding button to make its indicator light. 5) If you still cannot use the product properly, please contact **FeelElec**.

Technical Index

Unless otherwise stated, all technical specifications are guaranteed when the following two conditions are met.

- The signal generator is in the pass-through state.
- The signal generator runs continuously for more than 30 minutes at the specified operating temperature (18 ° C to 28 ° C).

Technical specifications

Frequency characteristics				
Product number	**FY6200-20M**	**FY6200-30M**	**FY6200-50M**	**FY6200-60M**
Sine wave	0~20MHz	0~30MHz	0~50MHz	0~60MHz
Square wave	0~15MHz	0~20MHz	0~25MHz	0~25MHz
Triangular wave	0~10MHz	0~10MHz	0~10MHz	0~10MHz
Pulse wave	0~10MHz	0~10MHz	0~10MHz	0~10MHz
Arbitrary wave	0~10MHz	0~10MHz	0~10MHz	0~10MHz
TTL/CMOS Digital wave	0~10MHz	0~20MHz	0~20MHz	0~20MHz
Minimum pulse width	20ns(The minimum adjustable width of all types of pulse wave can reach 20ns)			
Min. Resolution on all frequency range	1μHz (The minimum resolution of the whole frequency band can reach 1uhz, so as to ensure the adjustment accuracy of the instrument at high frequency. For example, the instrument can output 10.000000000001MHz high-precision signal.)			
Frequency Accuracy	±20ppm			
Frequency stability	±1ppm/ 3 hours			

Waveform Characteristic		
Waveform Catalog	Sine wave, square wave (duty cycle adjustable), pulse wave (pulse width and cycle time can be accurately set), triangle wave, rising sawtooth wave, falling sawtooth wave, CMOS wave, DC level, half wave, full wave, positive ladder wave, anti ladder wave, exponential rise, exponential fall, Lorentz pulse wave, multi sound wave, irregular noise wave, ECG wave, trapezoid pulse wave, cinke pulse wave, narrow Pulse wave, Gaussian white noise wave, amplitude modulation wave, frequency modulation wave, and 64 user-defined waves.	
Nonvolatile storage (64)	64 user-defined arbitrary waveforms can be stored	
Waveform Length	8192 points (8K points) * 14bits	
Sampling rate	250MSa/s	
Vertical Resolution	14 bits	
Sine Wave	Harmonic suppression system	≥50dBc(<1MHz);≥45dBc(1MHz~20MHz);
	Total harmonic distortion	<0.5% (20Hz~20kHz,0dBm)
	Rising and falling time	≤7ns(VPP<5V)

Square and Pulse wave	overshoot	≤5%	
	Duty cycle adjustment range	0.01%~99.99% (Resolution 0.01%)	
Sawtooth wave	linearity	≥98% (0.01Hz~10kHz)	
Output characteristics			
Amplitude（VPP）	Frequency≤10MHz	10MHz<Frequency ≤20MHz	Frequency>20MHz
	1mVpp~20Vpp	1mVpp~10Vpp,	1mVpp~5Vpp
Amplitude Resolution	1mV		
Amplitude Stability	±0.5%/ 5 hours		
Amplitude flatness	±5%(<10MHz)；±10%(>10MHz);		
Waveform Output			
Output Impedance	50Ω±10%（Typical）		
Protection	All signal output terminals can work for more than 60s under load short circuit condition		
DC Offset			
Offset Range	Frequency≤20MHz:±10V； Frequency>20MHz: ±2.5V		
Offset Resolution	1mV (Minimum)		
Phase Feature			
Adjustable Range	0~359.99°		
Minimum resolution	0.01°		
TTL Output			
TTL Level Amplitude	>3Vpp		
Fan-out coefficient	>8 TTL Load		
Rise/Fall Time	≤10ns		
CMOS Output			
Low Electric Level	<0.3V		
High Electric Level	1V~10V		
Rise/Fall Time	≤18ns		
External measuring function			
Function	It can measure frequency, period, positive pulse width, negative pulse width and duty cycle of external signal.		
Input signal voltage range	2Vpp~20Vpp		
Function of frequency meter	Frequency measurement range	0.01Hz~100MHz	
	measurement accuracy	Gate time 1s, 10s, 100s three speed regulation	

Counter function	Counting range	0-4294967295
	counting mode	Manual
Pulse width measurement	10ns Resolution，Maximum measurable 20S	
Cycle measurement	10ns Resolution，Maximum measurable 20S	
Sweep Function		
Carrier waveform	Sine wave, square wave, sawtooth wave, arbitrary wave (excluding DC voltage)	
Sweep Type	Linear sweep, logarithmic sweep	
Sweep Direction	Forward, reverse, round trip	
Sweep Object	Frequency, amplitude, offset, duty cycle	
Sweep Time	0.01S~999.99S/ stepping	
Setting Range	Arbitrary setting of start point and end point	
Sweep Range	Determined by sweep parameter setting value	
VCO Function	Note：VCO (Voltage Control Output)	
Modulation signal range to input	0~5V	
VCO signal frequency range	0-1000Hz	
VCO control object	Voltage-controlled frequency（VCF）Voltage control range（VCA）Voltage-controlled bias voltage controlled duty ratio	
VCO Feature	Amplitude modulation（AM）or frequency modulation（FM）can be performed by an external analog signal	
Modulation function		
Modulation Type	AM, FM, PM, ASK, FSK, PSK	
Carrier waveform	Sine wave, square wave, triangle wave, sawtooth wave, arbitrary wave (except DC voltage)	
AM		
Source	Internal（CH2）/ External（Counter）	
Modulation Waveform	Sine wave, square wave, triangle wave, sawtooth wave, arbitrary wave	
Modulation Depth	0% to 100%	
Modulation Frequency	Internal: 1μHz~1MHz; External: 1μHz~2KHz;	
FM		
Source	Internal（CH2）/External（Counter）	
Modulation Waveform	Sine wave, square wave, triangle wave, sawtooth wave, arbitrary wave	
Modulation Frequency	Internal: 1μHz~1MHz; External: 1μHz~2KHz;	
PM		
Source	Internal（CH2）/ External（Counter）	
Modulation Waveform	Sine wave, square wave, triangle wave, sawtooth wave, arbitrary wave	
Phase shift range	0°~360°	
Modulation Frequency	Internal: 1μHz~1MHz; External: 1μHz~2KHz;	

ASK	
Source	Internal（CH2） Manual
Modulation Waveform	50% Duty Cycle square wave
Keying frequency	1μHz~10MHz
FSK	
Source	Internal（CH2） Manual
Modulation Waveform	50% Duty Cycle square wave
Keying Frequency	1μHz~10MHz
PSK	
Source	Internal（CH2） Manual
Modulation Waveform	50% Duty Cycle square wave
Keying Frequency	1μHz~10MHz

Burst Function

Carrier waveform	Sine wave, square wave, triangle wave, sawtooth wave, arbitrary wave (except DC voltage)
Pulse Count	1-1048575
Burst Mode	Manual Burst, Internal Burst (CH2), External Burst (Counter)

General specifications

Display	Display Type	3.2-inch TFT color LCD display
Storage and Load	Quantity	20 sets
	Location	01 to 20 (Power on by default to enter 01 storage location parameters)
Connector	Interface mode	USB to serial interface
	Communication Rate	115200 bps
	Communication protocol	Using the command line, the agreement is open
Power supply	Voltage Range	AC100V~240V
Manufacturing technique	Surface mount technology, large scale integrated circuit, high reliability and long service life	
Warning Tone	Users can turn on or off through program settings	
Operational characteristics	All buttons are operated, and the knob is adjusted continuously.	
Environment condition	Temperature：0~40℃ Humidity：﹤80%	
Size	150mm (Length)×105mm(Width) ×30mm(Height)	
Weight	Mainframe（350g） Accessory（200g）	

Appendix

Appendix A：Safety precautions

1. Before using the instrument, please check whether the power supply is normal to ensure the normal use and personal safety of the instrument.

2. It must be used within the range of technical indexes of the instrument.

3. Please don't change the circuit of the instrument at will to avoid damaging the instrument and endangering the safety.

Appendix B：Warning and personal injury

Please don't apply the product to the safety protection device or emergency stop device, and any other application that may cause personal injury due to the failure of the product, unless there is a special purpose or authorized use. Before installation and use, all technical indexes in the instructions shall be referred to. Failure to comply with this recommendation may result in death and serious personal injury. The company will not be liable for all compensation for personal injury or death arising therefrom, and will be exempt from any claims that may arise from this to the company's managers and employees, affiliated agents, distributors, etc., including various costs, compensation fees, attorney fees, etc.

Appendix C: accessories and options

	Description	数量
Main Frame	FY6200 series signal generator	1
Standard Accessories	DC5V DC power supply	1
	USB cable	1
	BNC Transfer clip cable (Q9 clip cable)	2
	BNC-BNC Connecting cable	1
	Warranty Card	1
Optional Accessories	FYA2000 serial power amplifier	
	FPA2000 serial power amplifier	

Note: Accessories need to be ordered from the dealer

Appendix D：Summary of the warranty

FeelElec 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, **FeelElec** 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.