FeelTech

FY3200S Series Fully Numerical Control Dual Channel Function/Arbitrary Waveform Generator

User's Manual

●Introduction of the instrument

This manual applies to each mode of FY3200S series DDS Function Signal Generator. In the series, the last two digits “xx” represent the upper limit frequency value (MHz) of Sine Wave for each mode. For example, FY3225S，“25” means the upper limit frequency of Sine Wave is 25MHz.

The instrument adopts large scale CMOS integrated circuit and high speed microprocessor. The internal circuit adopts active crystal oscillator as benchmark. So the signal stability is greatly strengthened. Surface mounting technology improves interference immunity and operational life span. It has Dual-channel DDS signal output, includes Sine wave, Square wave, Triangle wave, Sawtooth wave and user-defined waveform. The amplitude, offset and phase can be controlled. Meanwhile, it has TTL electric level output, External frequency measurement, counter and sweep functions including Linear sweep and Logarithmic sweep. Both the sweep frequency and time can be set arbitrarily. It’s the ideal instrument for electronic engineering, laboratories, production lines, teaching and scientific research.

Excellent technical indexes and function features:

◆Sampling rate up to 250 MSa/s.

◆Built-in arbitrary waveform with 250 MSa/s sampling rate.

◆4 downloadable 2048 dots arbitrary waveform memories

◆With 12 bit wide waveform generator, the output waveform can be more delicate with low distortion.

◆Fully numerical control. It can display and numerical control amplitude, offset, frequency, duty cycle of current signal output and phase difference of two channels. And dual-channel arbitrary integer multiples of the frequency output when no phase error signal phase drift;

◆Each function can be adjusted by host computer.

◆Preinstalled 17 common waveforms.

◆High frequency accuracy: magnitude 10^{-6}

◆High resolution: Full range frequency resolution can be 10 mHz.

◆Both main and subsidiary wave duty cycle are adjustable separately (0.1%~99.9%）.

◆All range continuously adjustable, digital directly setting.

◆High waveform accuracy: The output waveform synthesized by function calculation is of high accuracy and low distortion.

◆Arbitrary waveform: User can load arbitrary waveform according to the need.

◆Sweep Function：Linear sweep and Logarithmic sweep. Starting and stop points can be set optionally.

◆Save function: 20 sets of parameters defined by the users can be saved and loaded anytime.

◆Operation mode: Button and knob controlled with LCD1602 display, digital set directly or knob adjusted continuously.

◆Highly reliable：Large scale integrated circuit, Surface mounting technology, reliable and durable.

◆Frequency measurement：Frequency of internal / external signal can be measured through built-in 100MHz frequency meter.

◆Follow function: Built-in parameter follow function covering frequency, amplitude, offset, duty cycle, waveform etc. for user's convenience.

◆Trigger output function: User can choose manual trigger, external trigger or CH2 trigger to control the main output to output waveforms of specified periodicity. This periodicity can also be defined by the user.

◆FSK frequency shift keying and ASK amplitude shift keying signal output.

●Button introduction

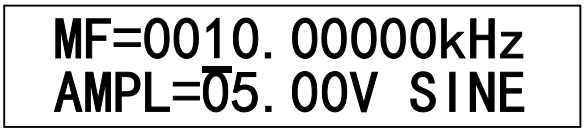
1. 【PARM】 **button can be used to toggle the interfaces among Waveform, Amplitude, Offset, Duty cycle and Phase.**
2. 【WAVE】 **button can be used to enter waveform selecting interface and toggle the type of current output waveform.**
3. 【COUNT】**button is shortcut key for measurement and can be used to switch between frequency measurement interface and counter interface.**
4. 【SWEEP】**button is shortcut key for sweep function and can be used to enter sweep and sweep time interfaces.**
5. 【SYS】**button can be used to enter the interfaces of follow setting, save or load.**
6. 【CH1】**Main waveform confirmation, Output/Stop.**
7. 【CH2】**Subsidiary waveform confirmation, Output/Stop.**
8. 【◄】**Cursor move to left.**
9. 【►】**Cursor move to right.**
10. 【OK】ADJ **confirmation（move downward）**

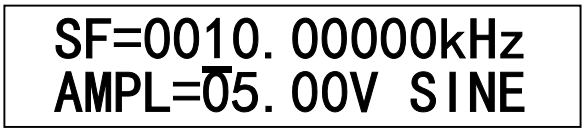
●Operating introduction

1、Channel selection

After starting up, “MF” or “SF” will be displayed in the top left corner to indicate current channel selection state.

- “MF” means choosing main channel for operation. “SF” means choosing subsidiary channel for operation. It can be chosen by pressing【CH1】or 【CH2】accordingly.。
- When the main channel has been chosen, press button【CH1】again and the main channel output will be shut down and the corresponding LED goes out.
- Press the button【CH1】again and the main channel output will be activated again and the corresponding LED illuminates
- “SF” of 【CH2】operating the same way as above.。



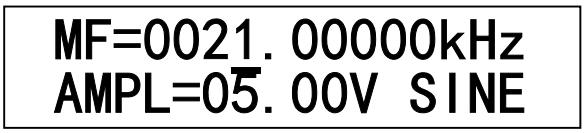


2、Frequency adjustment

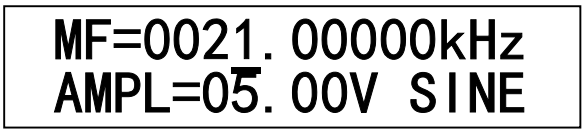
If you want to adjust frequency of chosen main and subsidiary waveform, you need to make the cursor point to frequency value. If the cursor is in other functions, you can use 【PARM】button to change position.

(Note: The frequency value displayed for arbitrary waveform is referenced. The actual output frequency = Display value × periodicity of waveform defined by user).

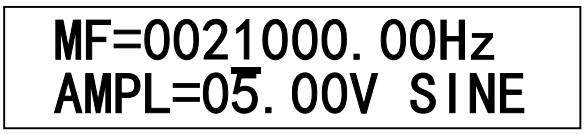
- Use 【ADJ】knob to change the frequency value of the cursor position. Rotate clockwise to increase the frequency. Rotate anticlockwise to reduce the frequency.



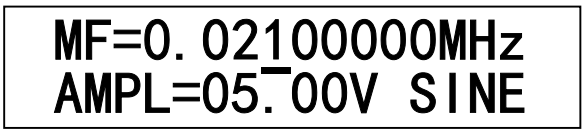
- If you want to change frequency value significantly, you can use 【 】and 【 】to move the position of cursor.



- 【OK】button can change the unit of frequency displayed (Hz, kHz and MHz). Rotate the 【ADJ】knob to change the number displayed to change the frequency.



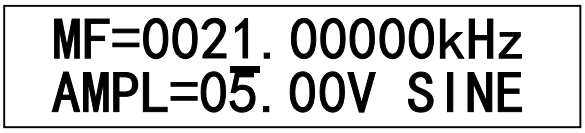
Frequency unit is Hz



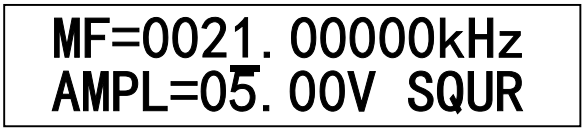
Frequency unit is MHz

3、Waveform selection

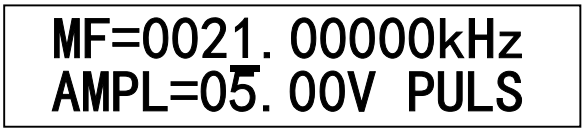
In the interface of chosen main and subsidiary waveform, press 【WAVE】button can toggle among Sine wave, Square wave, Triangle wave, Arbitrary wave and so on. You can also toggle the waveform quickly by rotating the【ADJ】knob. Press 【PARM】 button to quit waveform selection interface.



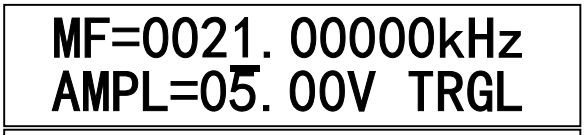
Main output of waveform is Sine wave.



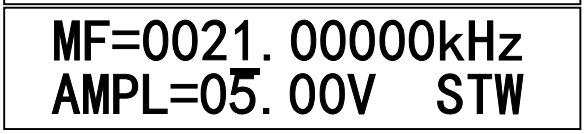
Main output of waveform is Square wave.



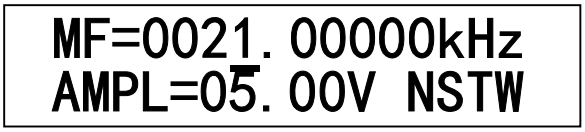
Main output of waveform is Pulse wave.



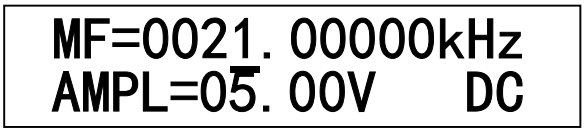
Main output of waveform is Triangle wave.



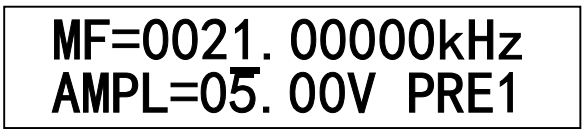
Main output of waveform is Rise Sawtooth wave.



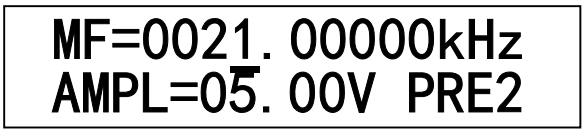
Main output of waveform is Fall Sawtooth wave.



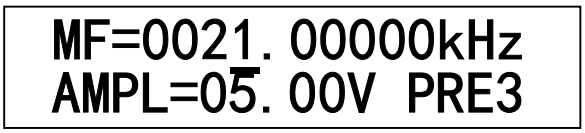
Main output of waveform is DC wave.



Main output of waveform is Lorentz Pulses.

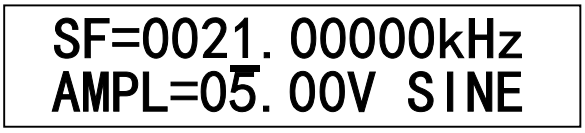


Main output of waveform is Multitone.

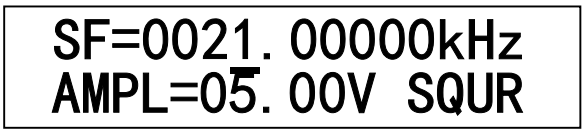


Main output of waveform is Random Noise.

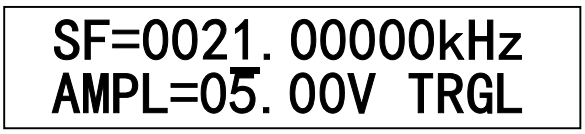
MF=0021.00000kHz AMPL=05.00V PRE4	Main output of waveform is electrocardiogram.
MF=0021.00000kHz AMPL=05.00V PRE5	Main output of waveform is trapezoidal pulse.
MF=0021.00000kHz AMPL=05.00V PRE6	Main output of waveform is Sinc pulse.
MF=0021.00000kHz AMPL=05.00V PRE7	Main output of waveform is narrow pulse.
MF=0021.00000kHz AMPL=05.00V PRE8	Main output of waveform is white Gaussian noise.
MF=0021.00000kHz AMPL=05.00V PRE9	Main output of waveform is amplitude modulated wave.
MF=0021.00000kHz AMPL=05.00VPRE10	Main output of waveform is frequency-modulated.
MF=0021.00000kHz AMPL=05.00V ARB1	Main output of waveform is Arbitrary wave 1.
MF=0021.00000kHz AMPL=05.00V ARB2	Main output of waveform is Arbitrary wave 2.
MF=0021.00000kHz AMPL=05.00V ARB3	Main output of waveform is Arbitrary wave 3.
MF=0021.00000kHz AMPL=05.00V ARB4	Main output of waveform is Arbitrary wave 4.



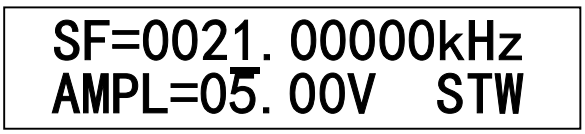
Subsidiary output of waveform is Sine wave.



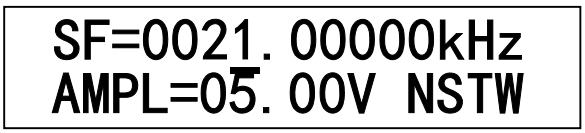
Subsidiary output of waveform is Square wave.



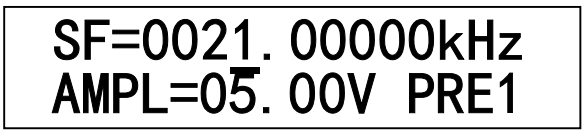
Subsidiary output of waveform is Triangle wave.



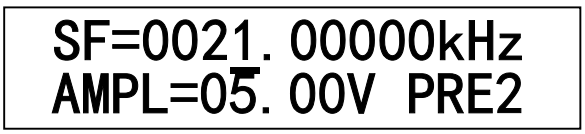
Subsidiary output of waveform is Rise Sawtooth wave.



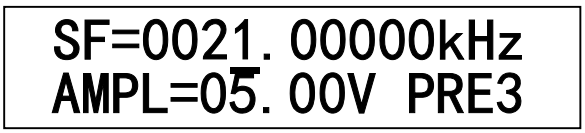
Subsidiary output of waveform is Fall Sawtooth wave.



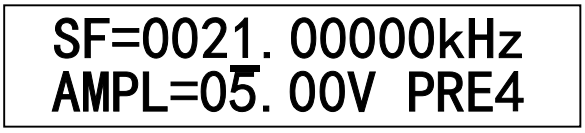
Subsidiary output of waveform is Lorentz Pulses.



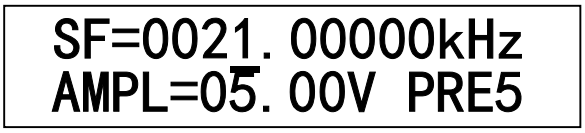
Subsidiary output of waveform is Multitone.



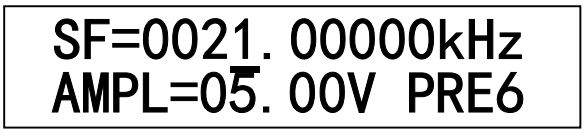
Subsidiary output of waveform is Random Noise.



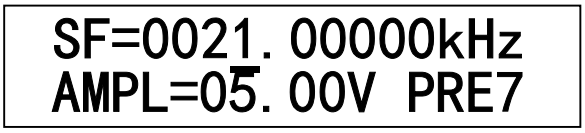
Subsidiary output of waveform is electrocardiogram.



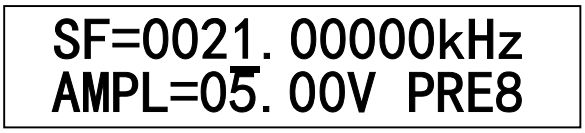
Subsidiary output of waveform is trapezoidal pulse.



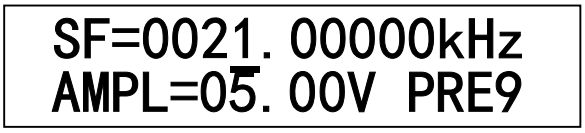
Subsidiary output of waveform is Sinc pulse.



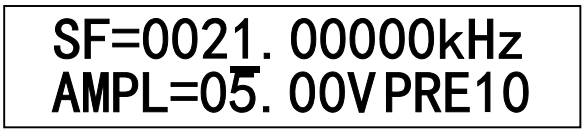
Subsidiary output of waveform is narrow pulse.



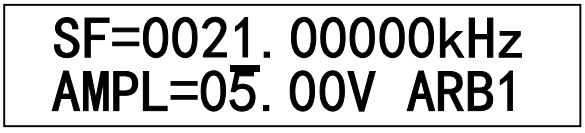
Subsidiary output of waveform is white Gaussian noise.



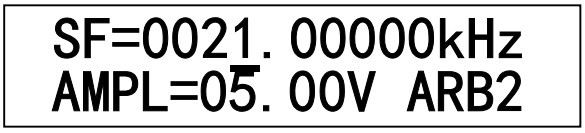
Subsidiary output of waveform is amplitude modulated wave.



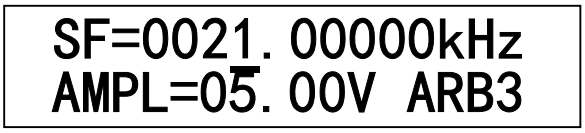
Subsidiary output of waveform is frequency-modulated wave.



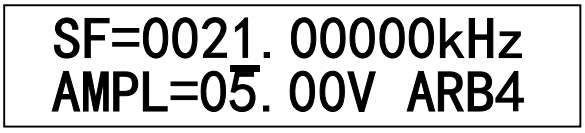
Subsidiary output of waveform is Arbitrary wave 1.



Subsidiary output of waveform is Arbitrary wave 2.



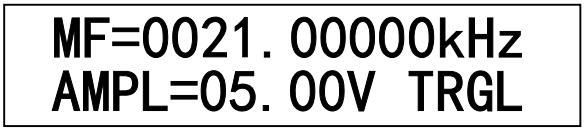
Subsidiary output of waveform is Arbitrary wave 3.



Subsidiary output of waveform is Arbitrary wave 4.

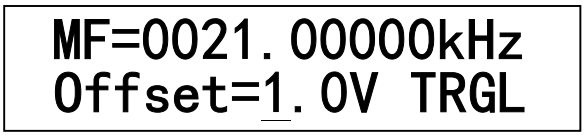
4、Amplitude adjustment

In chosen main and subsidiary waveform interface, press 【PARM】button to make the cursor point to the value of amplitude （AMPL=）. The value (Vpp) is peak value of the signal. Use【 】and【 】buttons and 【ADJ】knob to change the value. As follows:



5、Offset adjustment

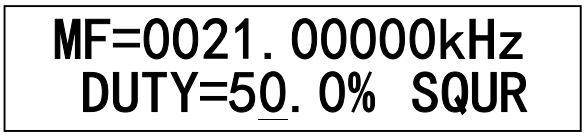
In chosen main and subsidiary waveform interface, press 【PARM】button to make the cursor point to the value of offset （Offset=）. Use【◄】and【►】buttons and 【ADJ】knob to change the value. As follows:

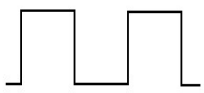


6、Duty cycle adjustment

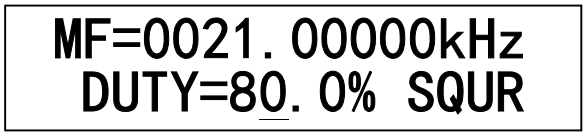
In chosen main and subsidiary waveform interface, press 【PARM】button to make the cursor point to the value of duty cycle （DUTY=）. Use【 】and【 】buttons and 【ADJ】knob to change the value. (Duty cycle adjustment is invalid for Sine wave).As follows:

- Duty cycle for Square wave can be adjusted from 0.1% to 99.9%.



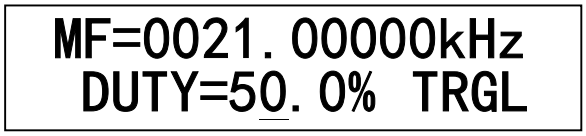


(WAVE=SQUR)

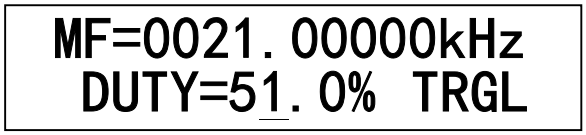


(WAVE=SQUR)

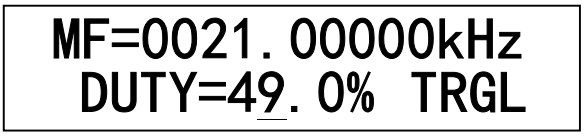
- Triangle wave adjustable among 50% (standard TRGL), above 50% and below 50% (both are different sawtooth waves).



(WAVE=TRGL)



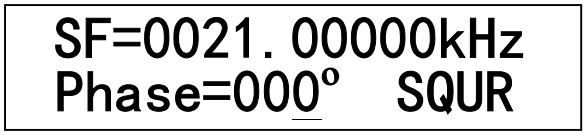
(WAVE=TRGL)



(WAVE=TRGL)

7、Phase adjustment

In chosen Subsidiary waveform interface, press 【PARM】button to make the cursor point to the value of phase（Phase=）. Use【 】and【 】buttons and 【ADJ】knob to change the value of DC offset. The phase difference of main wave and subsidiary wave can be adjusted from 0º to 359º. As follows:



8、Pulse width adjustment (pulse)

Pulse positive pulse width can be set in the range of 10nS to 1S. The default value is 50nS.

In CH1 channel waveform interface function is selected, press【WAVE】key to switch to the main waveform pulse wave "PLUS" mode, press 【PARM】 key to make the cursor position corresponding positive pulse parameters (Pu =) , use【 】and【 】buttons and 【ADJ】knob to change the output positive pulse width can range 10nS ~ 1S adjustment, As below:

```
SF=0021.00000kHz
Pu=0000000.010uS
```

9、Setting DC wave parameters (DC)

DC wave can be set in the range of -10V to + 10V, the default value is 0V.

In CH1 channel waveform interface function is selected, press【WAVE】key to switch to the main waveform pulse wave "PLUS" mode, press 【PARM】 key to make the cursor position corresponding positive pulse parameters (Pu =) , use【 】and【 】buttons and 【ADJ】knob to change the output positive pulse width can range 10nS ~ 1S adjustment, As below:

In CH1 or CH2 channel waveforms interface function is selected, press 【WAVE】 key to switch to the main wave "DC" mode, press【PARM】key to move the cursor to stay in offset level parameters corresponding to the position (Offs =), use【 】and【 】buttons and【ADJ】knob to change the value of the output voltage direct current wave can be adjusted in the range between -10V to + 10V, as shown below:

```
SF=0021.00000kHz
Offs=-5.00V    DC
```

10、Measurement function

Press 【COUNT】button in any interface to enter measurement function. This instrument offers frequency and counter two measurement functions. Input the signal from “Input” port on the front panel. Press 【COUNT】button again to switch between frequency measurement and counting pulse.

```
 ExtF=21.000kHz
*FUNC:EXT.TREQ
```

(Measure=FREQ)

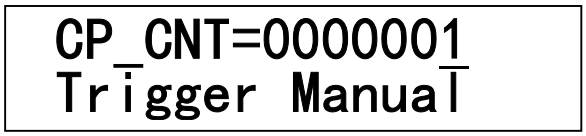
- Press 【ADJ】button to reset the counter.
- Rotate the 【ADJ】knob anticlockwise to pause (Doesn’t disturb counter).
- Rotate the 【ADJ】knob clockwise to cancel the pause.

```
 CNTR=0
*FUNC:COUNGTER
```

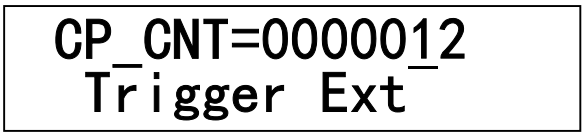
(Measure=COUNT)

11、Trigger output function

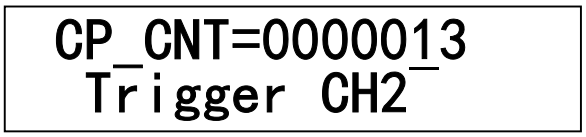
In counter function interface, press 【**COUNT**】button to enter waveform trigger output function. This instrument offer manual trigger, external trigger and CH2 trigger for options. Rotate the 【ADJ】knob to adjust the waveform amount for single trigger. Press【**COUNT**】button to toggle among manual trigger, external trigger , CH2 trigger and measurement function.



(Manual trigger. Single trigger output 1 period of waveform. Press 【ADJ】button to trigger.)



(External trigger. Single trigger output 12 periods of waveform. Reverse the electric lever of input port to trigger.)



(CH2 trigger. Single trigger output 13 periods of waveform.Reverse the CH2 signal output to trigger.)

12、FSK Frequency Shift Keying

FY3200S can FSK waveform from CH1 channel output. FY3200 provides two FSK trigger source: manual, external. Trigger Mode Select 【**COUNT**】 button can be selected.

The first frequency shift keying component is determined by the CH1 fundamental frequency, frequency shift keying a second frequency component is determined by the FSK interface frequency F2, use【 】key and【 】key with parameter adjustment knob to change the“F2” output signal frequency value, As below:

F2 = 0020.00000KHz (manual trigger mode, one-shot output corresponding to the frequency of the waveform F2

F2=0020.00000KHz (press the 【OK】 button Trigger)
FSK- Manual_Mod

F2=0020.00000KHz (external trigger mode, the trigger source INPUT terminal introduced)
FSK- Ext_Mod

- Terminal trigger source is INPUT , when a rising edge of the trigger signal “INPUT”, FSK output signal at a frequency of CH1, when the falling edge of the trigger signal “INPUT”, FSK output frequency signal corresponding to F2

13、ASK Amplitude Shift Keying

FY3200S from CH1 channel output amplitude shift keying waveform. FY3200 provides two FSK trigger source: manual, external. Trigger Mode Select [COUNT] button can be selected.

The first frequency shift keying component is determined by the CH1 fundamental frequency, frequency shift keying a second frequency component is determined by the frequency of the FSK interface F2,

ASK (ASK- Manual_MOD release OK button rotary encoder output signal is 0)

ASK ()

ASK- Ext_Mod

ASK (manual trigger mode, press 【OK】 output waveform to CH1

ASK- Manual_MOD release【OK】output signal is ZERO)

ASK (external trigger mode, the trigger source INPUT terminal ntroduced)

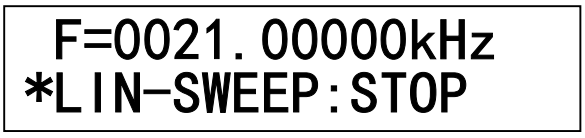
ASK- Ext_Mod

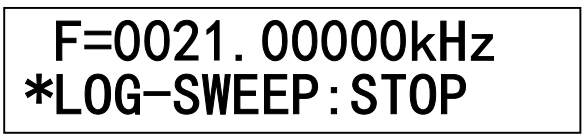
trigger source INPUT terminal is introduced, when a rising edge of the trigger signal INPUT, amplitude shift keying output signal at a frequency of CH1, when INPUT falling edge of the trigger signal, the output amplitude shift keying output to zero.

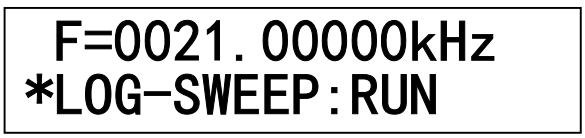
14、Sweep function

Press the 【SWEEP】 button in any interface to enter sweep function. This instrument has LIN-SWEEP and LOG-SWEEP. The sweep signal outputs from CH1.

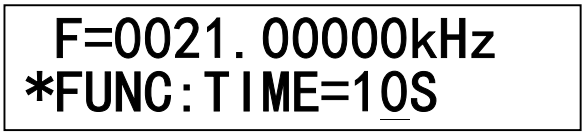
- The default sweep mode is LIN-SWEEP. You can change the mode by rotating the 【ADJ】 knob before sweep.
- Press the【ADJ】knob to start or stop sweep function. The frequency of sweep signal changes from fM1 to fM2 (Refer to function10). The value of M1 and M2 need to be set by SAVE function. The sweep time need to be set by TIME function.







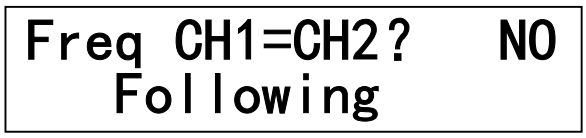
- In sweep interface, Press 【SWEEP】button again to switch between the interfaces of sweep begin and sweep time adjustment. The sweep time refers to the time length from fM1 (starting frequency) to fM2 (stopping frequency). The time can be adjusted from 1s to 99s.



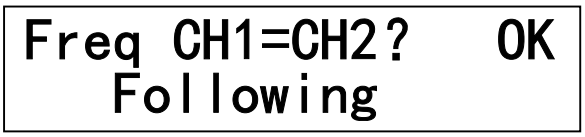
15、SYNC function

In chosen main and subsidiary waveform interface, press 【SYS】button to enter follow function and set if the parameters of subsidiary waveform follow the parameters of main waveform. In this way, the corresponding parameters of CH2 will follow the change if the parameters of CH1 have been changed.

- Frequency follow setting: Press【ADJ】button to change the frequency follow status.

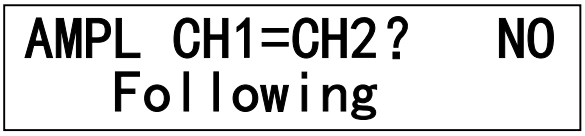


The frequency of CH2 will not follow CH1

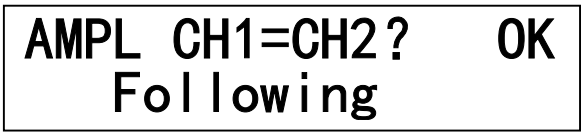


The frequency of CH2 will follow CH1

- Amplitude follow setting: Rotate the 【ADJ】knob in follow mode setting interface to enter amplitude follow interface. Press【ADJ】button to change the amplitude follow status.

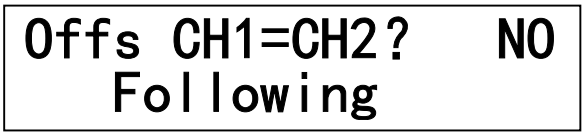


The amplitude of CH2 will not follow CH1.

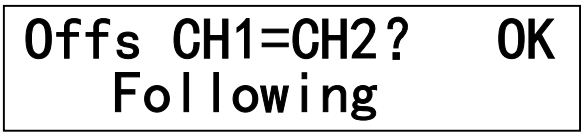


The amplitude of CH2 will follow CH1.

- Offset follow setting: Rotate the 【ADJ】 knob in follow mode setting interface to enter offset follow interface. Press【ADJ】button to change the offset follow status.

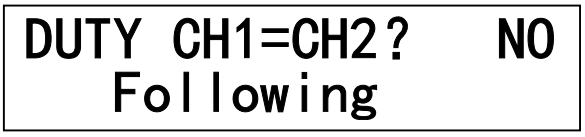


The offset of CH2 will not follow CH1.

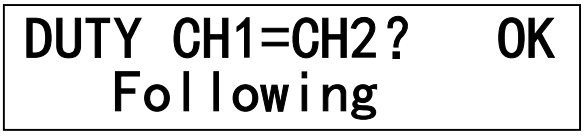


The offset of CH2 will follow CH1.

- Duty cycle follow setting: Rotate the 【ADJ】 knob in follow mode setting interface to enter duty cycle follow interface. Press【ADJ】button to change the duty cycle follow status.



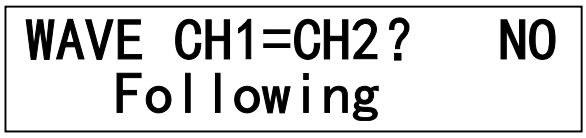
The duty cycle of CH2 will not follow CH1.



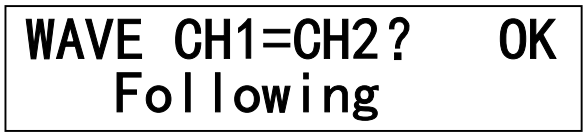
The duty cycle of CH2 will follow CH1.

- Waveform follow setting: Rotate the【ADJ】 knob in follow mode setting interface to enter

waveform follow interface. Press【ADJ】button to change the waveform follow status.



The waveform of CH2 will not follow CH1.



The waveform of CH2 will follow CH1.

- Follow setting information saving: Rotate the【ADJ】 knob in follow mode setting interface to enter follow setting information saving interface. Press 【ADJ】button to set follow status. (Next starting machine will affect follow status.

Follow setting information saving complete.

16、Save function

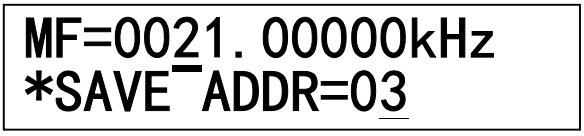
Press【SYS】button in follow function interface to enter save function. Current frequency value, amplitude value, offset value, duty cycle, waveform and phase of main and subsidiary waveform can be saved. This instrument provides 20 memory positions（M0~M19）for saving and can be loaded easily next time.

- Rotate the 【ADJ】 knob to choose saving position（M0~M19）. Then press the 【ADJ】button and “M” will display in the top right corner for a short while which means all the current parameters have been saved to this position.
- Position 0 (M0) is used to save the boot default parameters. The instrument will load all the parameters from this position next boot. As follows:

- Position 1 (M1) is used to save starting frequency for sweep function which will be loaded by sweep function automatically. As follows:

- Position 2 (M2) is used to save stop frequency for sweep function which will be loaded by sweep function automatically. As follows:

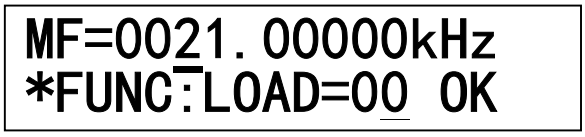
- Positions 03~19 (M3~M19) are for user defined waveform. As follows:



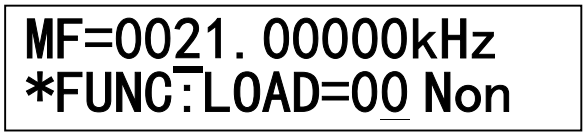
17、Load function

Press 【PARM】button in save function interface to enter load function. It will enable the user to load the frequency value, amplitude value, offset value, duty cycle, waveform and phase of main and subsidiary waveform from memory (M0~M19).

- Rotate the【ADJ】knob to select the position（M0~M19）for loading. Press 【ADJ】button to confirm. “OK” will display in the top right for a short while which means loading complete.



- If“Non”displays，it means no information in this position. Loading can’t be done.



●Other functions

1、Duel TTL output are CH1 and CH2 waveform synchronized TTL waveform.

2、Buzzer function.

Each time when you press a button or rotate a knob, an impulse will be generated and the buzzer will beep once. It will beep longer if invalid operation is conducted.

Buzzer opening and closing： Press the [SYS] button repeatedly until the “SET BEEP BEEP=ON” interface appears. The "BEEP=ON" buzzer sounds open, and the "BEEP=OFF" buzzer closes. The state can be changed by rotating the parameter adjusting knob, and the setting state can be saved by pressing the parameter adjusting knob downward.

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

Model	FY3200S -6MHz	FY3200S -12MHz	FY3200S -20MHz	FY3200S -24MHz	FY3200S -25MHz
Sine	0~6MHz	0~12MHz	0~20MHz	0~24MHz	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/CMOS	0~6MHz	0~6MHz	0~6MHz	0~6MHz	0~6MHz
Arbitrary wave	0~6MHz	0~6MHz	0~6MHz	0~6MHz	0~6MHz
Resolution	0.01Hz(10mHz)				
Accuracy	± 5×10^{-6}				
Stability	±1×10^{-6}/ 3 Hours				
Phase Range	0~359°				
Phase Resolution	1°				

Waveform Characteristics

Waveforms	Sine, Square, Triangle (Ramp), Arbitrary, Sawtooth, Pulse, Noise, etc.	
Waveform Length	2048Points	
Sampling Rate	250MSa/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 (No load)	
Amplitude Resolution	10mV	
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	
TTL Output	Dual-channel TTL electric level synchronize with CH1 and CH2. Phase differences are adjustable.	
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	1Hz~100MHz (Gate Time 1S)
Counter	Range	0-4294967295
Voltage Input Range	2Vpp~20Vpp	
Sweep	Only CH1 available	
Sweep Type	Linear or Logarithm	
Sweep Objects	Frequency	
Sweep Time	1S~999S/Step	
Sweep Range	Starting position and Finishing position can be set arbitrarily.	
General Specifications		
Display	Mode	LCD1602 in English
Save & Load	Amount	20

	Position	01 to20 (SAVE P_ON FREQ for default value)
Interface	Type	USB to Serial interface.
	Communicating Speed	9600bps
Power	Voltage Range	AC85V~AC260V
Buzzer	Can be turned on/off by setting.	
Environment	Temp.：0~40℃ Humidity：＜80%	
Dimension	200mm（Length）X190mm（Width）X90mm（Height）	
Weight	Net Weight: 750g， Gross Weight: 900g	

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	FY3200S-6M （ 6MHz, Dual-channel）	1
	FY3200S-12M（12MHz, Dual-channel）	
	FY3200S-20M（20MHz, Dual-channel）	
	FY3200S-24M（24MHz, Dual-channel）	
	FY3200S-25M（25MHz, Dual-channel）	
Standard Accessories	Power Cable	1
	USB-B Data Cable	1
	BNC-Clip Cable	2
	Resource CD (including the User's Manual)	1
Options	BNC-BNC cable	
	FYA2000/FPA1000 Series Amplifier	

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