

# FY3200S Series Fully Numerical Control Dual-channel DDS Function / Arbitrary Waveform Signal Generator

## **User's Manual**

**Rev1. 4**

**2014-10-22**

Thank you for purchasing our products. Please carefully read the contents of the use's manual before use, to ensure the normal use of the instrument.

## ● **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, FY3224S, “24” means the upper limit frequency of Sine Wave is 24MHz.

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.
- ◆ Each function can be adjusted by host computer.
- ◆ Preinstalled 14 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

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defined by the user.

Product Function and Technology Indexes				
<b>Model</b>	FY3206S	FY3212S	FY3220S	FY3224S
Sine wave frequency range	0Hz~6MHz	0Hz~12MHz	0Hz~20MHz	0Hz~24MHz
Square wave frequency range	0Hz~6MHz	0Hz~6MHz	0Hz~6MHz	0Hz~6MHz
Triangle wave frequency range	0Hz~6MHz	0Hz~6MHz	0Hz~6MHz	0Hz~6MHz
Arbitrary wave frequency wave	0Hz~6MHz	0Hz~6MHz	0Hz~6MHz	0Hz~6MHz
<b>Parameters of signal output</b>				
Output channel	CH1 and CH2 dual channel high speed output separately.			
Output waveform	Sine wave, square wave (duty cycle adjustable), triangle wave, sawtooth wave, arbitrary wave, common pulse, noise, electrocardiogram, AM, FM etc.			
Output amplitude	$\geq 20V_{p-p}$ (No load)			
Output impedance	$50\Omega \pm 10\%$			
DC offset	$\pm 10V$			
Resolution	0.01Hz(10mHz)			
Frequency accuracy	$\pm 5 \times 10^{-6}$			
Frequency Stability	$\pm 2 \times 10^{-6}/3$ 小时			
Sine wave distortion	$\leq 0.8\%$ (reference frequency 1kHz)			
Triangle linearity	$\geq 98\%$ (0.01Hz~10kHz)			
Rise and fall time of square wave	$\leq 100ns$			
Square wave duty cycle range	0.1%~99.9%			
<b>TTL output</b>	Dual-channel TTL electric level synchronize with CH1 and CH2. Phase differences are adjustable.			
Electric level range	$>3.3V_{p-p}$			
Fan-out	>20 TTL (Load)			
Level rise fall time	$\leq 20ns$			
<b>Frequency Counter function</b>				
Counter range	0-4294967295			
Frequency meter range	1Hz~100MHz			
Input Voltage Range	2V <sub>p-p</sub> ~20V <sub>p-p</sub>			
<b>Sweep function</b>	Only CH1 has this function.			
Sweep mode	Linear sweep, Logarithmic sweep			
Frequency setting range	Starting and stop points can be set optionally.			
Sweep range	$fM1$ (pre-set) ~ $fM2$ (pre-set)			
Sweep speed	1s~99s /step-by-step			
<b>Other features</b>				
Display mode	LCD1602 in English			
Save and load	M0-M19(Default: M0)			

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Buzzer warning tone	Can be turned On/Off by setting
Wide working voltage range	AC85V~AC260V
Production technology	Surface mounting technology, large scale integrated circuit, reliable and durable
Operating	Buttons controlled & knob adjusted continuously.
Work condition	Temp.: 0~40°C Humidity: < 80%
Dimension	200mm (Long)×190mm(Wide) ×90mm(High)
Weight	500g (bare machine), Accessory (150g)

## ● structure function introduction

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## ● Button introduction

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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..

**MF=0010. 00000kHz  
AMPL=05. 00V SINE**

**SF=0010. 00000kHz  
AMPL=05. 00V SINE**

### 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.

**MF=0021. 00000kHz  
AMPL=05. 00V SINE**

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

**MF=0021. 00000kHz  
AMPL=05. 00V SINE**

- 【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.

**MF=0021000. 00Hz  
AMPL=05. 00V SINE**

Frequency unit is Hz

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**MF=0.02100000MHz  
AMPL=05.00V SINE**

Frequency unit is MHz

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.

**MF=0021.00000kHz  
AMPL=05.00V SINE**

Main output of waveform is Sine wave.

**MF=0021.00000kHz  
AMPL=05.00V SQR**

Main output of waveform is Square wave.

**MF=0021.00000kHz  
AMPL=05.00V TRGL**

Main output of waveform is Triangle wave.

**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.

**MF=0021.00000kHz  
AMPL=05.00V PRE1**

Main output of waveform is Lorentz Pulses.

**MF=0021.00000kHz  
AMPL=05.00V PRE2**

Main output of waveform is Multitone.

**MF=0021.00000kHz  
AMPL=05.00V PRE3**

Main output of waveform is Random Noise.

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**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. 00V PRE10**

Main output of waveform is frequency-modulated wave.

**SF=0021. 00000kHz  
AMPL=05. 00V SINE**

Subsidiary output of waveform is Sine wave.

**SF=0021. 00000kHz  
AMPL=05. 00V SQR**

Subsidiary output of waveform is Square wave.

**SF=0021. 00000kHz  
AMPL=05. 00V TRGL**

Subsidiary output of waveform is Triangle wave.

**SF=0021. 00000kHz  
AMPL=05. 00V ARB1**

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Subsidiary output of waveform is Arbitrary wave 1.

**SF=0021. 00000kHz  
AMPL=05. 00V ARB2**

Subsidiary output of waveform is Arbitrary wave 2.

**SF=0021. 00000kHz  
AMPL=05. 00V ARB3**

Subsidiary output of waveform is Arbitrary wave 3.

**SF=0021. 00000kHz  
AMPL=05. 00V ARB4**

Subsidiary output of waveform is Arbitrary wave 4.

**SF=0021. 00000kHz  
AMPL=05. 00V PRE1**

Subsidiary output of waveform is Lorentz Pulses.

**SF=0021. 00000kHz  
AMPL=05. 00V PRE2**

Subsidiary output of waveform is Multitone.

**SF=0021. 00000kHz  
AMPL=05. 00V PRE3**

Subsidiary output of waveform is Random Noise.

**SF=0021. 00000kHz  
AMPL=05. 00V PRE4**

Subsidiary output of waveform is electrocardiogram.

**SF=0021. 00000kHz  
AMPL=05. 00V PRE5**

Subsidiary output of waveform is trapezoidal pulse.

**SF=0021. 00000kHz  
AMPL=05. 00V PRE6**

Subsidiary output of waveform is Sinc pulse.

**SF=0021. 00000kHz  
AMPL=05. 00V PRE7**

Subsidiary output of waveform is narrow pulse.

**SF=0021. 00000kHz  
AMPL=05. 00V PRE8**

Subsidiary output of waveform is white Gaussian

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noise.

**SF=0021. 00000kHz  
AMPL=05. 00V PRE9**

Subsidiary output of waveform is amplitude modulated wave.

**SF=0021. 00000kHz  
AMPL=05. 00V PRE10**

Subsidiary output of waveform is frequency-modulated wave.

### 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:

**MF=0021. 00000kHz  
AMPL=05. 00V TRGL**

### 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:

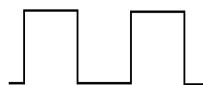
**MF=0021. 00000kHz  
Offset=1. 0V TRGL**

### 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:

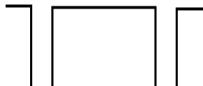
- Duty cycle for Square wave can be adjusted from 0.1% to 99.9%.

**MF=0021. 00000kHz  
DUTY=50. 0% SQR**



(WAVE=SQR)

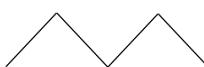
**MF=0021. 00000kHz  
DUTY=80. 0% SQR**



(WAVE=SQR)

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

**MF=0021. 00000kHz  
DUTY=50. 0% TRGL**



(WAVE=TRGL)

**MF=0021. 00000kHz  
DUTY=51. 0% TRGL**



(WAVE=TRGL)

**MF=0021. 00000kHz  
DUTY=49. 0% 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 0° to 359°. As follows:

**SF=0021. 00000kHz  
Phase=000° SQR**

## 8、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:COUNTER**

(Measure=COUNT)

## 9、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.

**CP\_CNT=0000001  
Manual Trigger**

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

**CP\_CNT=0000012**  
**Ext Trigger**

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

**CP\_CNT=0000013**  
**CH2 Trigger**

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

## 10、 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.

**F=0021. 00000kHz**  
**\*LIN-SWEEP:STOP**

**F=0021. 00000kHz**  
**\*LIN-SWEEP:RUN**

**F=0021. 00000kHz**  
**\*LOG-SWEEP:STOP**

**F=0021. 00000kHz**  
**\*LOG-SWEEP:RUN**

- 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.

**F=0021. 00000kHz**  
**\*FUNC:TIME=10S**

## 11、 Save 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.

**Freq CH1=CH2? NO**  
**Following**

The frequency of CH2 will not follow CH1

**Freq CH1=CH2? OK**  
**Following**

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.

**AMPL CH1=CH2?**    **NO**  
**Following**

The amplitude of CH2 will not follow CH1.

**AMPL CH1=CH2?**    **OK**  
**Following**

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.

**Offs CH1=CH2?**    **NO**  
**Following**

The offset of CH2 will not follow CH1.

**Offs CH1=CH2?**    **OK**  
**Following**

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.

**DUTY CH1=CH2?**    **NO**  
**Following**

The duty cycle of CH2 will not follow CH1.

**DUTY CH1=CH2?**    **OK**  
**Following**

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.

**WAVE CH1=CH2?**    **NO**  
**Following**

The waveform of CH2 will not follow CH1.

**WAVE CH1=CH2?**    **OK**  
**Following**

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.

**Save configuration  
Following**

**Save configuration  
Following    OK**

Follow setting information saving complete.

## 12. 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:

**MF=0021. 00000kHz  
\*SAVE P\_ON FREQ**

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

**MF=0021. 00000kHz  
\*SAVE BEGIN FREQ**

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

**MF=0021. 00000kHz  
\*SAVE END FREQ**

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

**MF=0021. 00000kHz  
\*SAVE ADDR=03**

## 13. 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.

**MF=0021. 00000kHz  
\*FUNC:LOAD=00 OK**

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

**MF=0021. 00000kHz  
\*FUNC:LOAD=00 Non**

## ● Other functions

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- 1、Dual 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. The buzzer can be turned off by pressing and holding 【ADJ】 button and then turning on the power switch in shutdown state if you don't like the sound. The buzzer can be turned on by repeating above operations.

## **● Safety Notes**

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- 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.

## **● Warning and personal injury**

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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.

## **● Accessories**

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1、 FY3200S Function Signal Generator	1 Set
2、 Power cord	1 Piece
3、 Square port USB wire	1 Piece
4、 Q9 clip wire	2 Pieces
5、 User's manual	1 (PDF format)

Zhengzhou FeelTech Co. Ltd.

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