User's Guide

DDS-3X25 USB
ARBITRARY FUNCTION GENERATOR

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General Safety Summary

Please understand the following safety precautions to avoid injuries and damages to the product or any equipment connected. To be away from possible dangers, please be sure to follow the regulations.

- **Only qualified persons are allowed to do the maintenance**.
- **Prevent from fire and any personal damage.**
- **Use Proper Power Cord.** Use the power cord authorized in your country only.
- **Correctly Plug in and Pull out.** When the probes or the test leads are connecting to the voltage source, please do not plug in or pull out.
- **Ground the product.** This product is grounded through the grounding conductor of the power cord. To avoid electric shocks, the grounding conductors must be grounded properly before making connections to the input or output terminals of the instrument.
- **Correctly connect probe.** The probes' ground terminals are at the same voltage level of the product ground. Do not connect the ground terminals to a high voltage.
- **Check the ratings of all terminals.** To avoid fire or shock hazard, check all ratings and marks on the product. Follow the user's guide for detailed rating information before making connections to the product.
- **Do not operate the product when the case or panel is removed.**
- **Avoid Circuit Exposure.** Do not touch exposed connections and components when power is on.
- **If you think the product is broken, do not operate.** If you think that this product has something wrong, please let qualified service persons to check it.
- **Keep proper ventilation.**
- **Do not operate in wet/damp environment.**
- **Do not operate in flammable and explosive air.**
- **Please keep the product surface clean and dry.**

Introduction

DDS-3X25 Arbitrary Waveform Generator has one channel of arbitrary waveform output, 12 Bits outputs, synchronized signal output, 1 channel of Counter/Frequency Measurement input, 6 Bits inputs and external trigger input. User can edit the waveform arbitrarily by the mouse or choose the regular waveforms such as Sine, Square, Tri-angle, Saw-tooth, TTL, White Noise, Gauss Noise, Trapezia, Exponent, AM and FM. The parameters, such as amplitude, frequency and offset, are also settable. The data format of DDS-3X25 is completely compatible with that of Tektronix; it can directly read the waveform data files produced by the Tektronix oscilloscope or Tektronix waveform editor software and redisplay the waveform. DDS-3X25 adopts the DDS technology so that it has the advantages of high frequency accuracy, high waveform resolution, high reliability, and wide software support. It can be widely used in various kinds of electronics labs and it offers complete interface for second time development to be pointlessly inserted into other auto-measuring systems.

Chapter 1 Getting Started

This chapter focuses on the following topics:

- System Requirements
- Install hardware
- Install software
- Understanding of the user interface

System Requirements

- **Minimum System Requirements**
  Operating System
  Windows NT/2000/XP/Vista/ 7

  Memory
  128MB

  Graphic Card
  Microsoft DirectX supported
  Screen resolution: 1024x768
  Color depth: 16bit

- **Recommended System Requirements**
  Operating System
  Windows NT/2000/XP/Vista/ 7

  Memory
  256MB

  Graphic Card
  Microsoft DirectX supported
  Screen resolution: 1024x768
  Color depth: 16bit

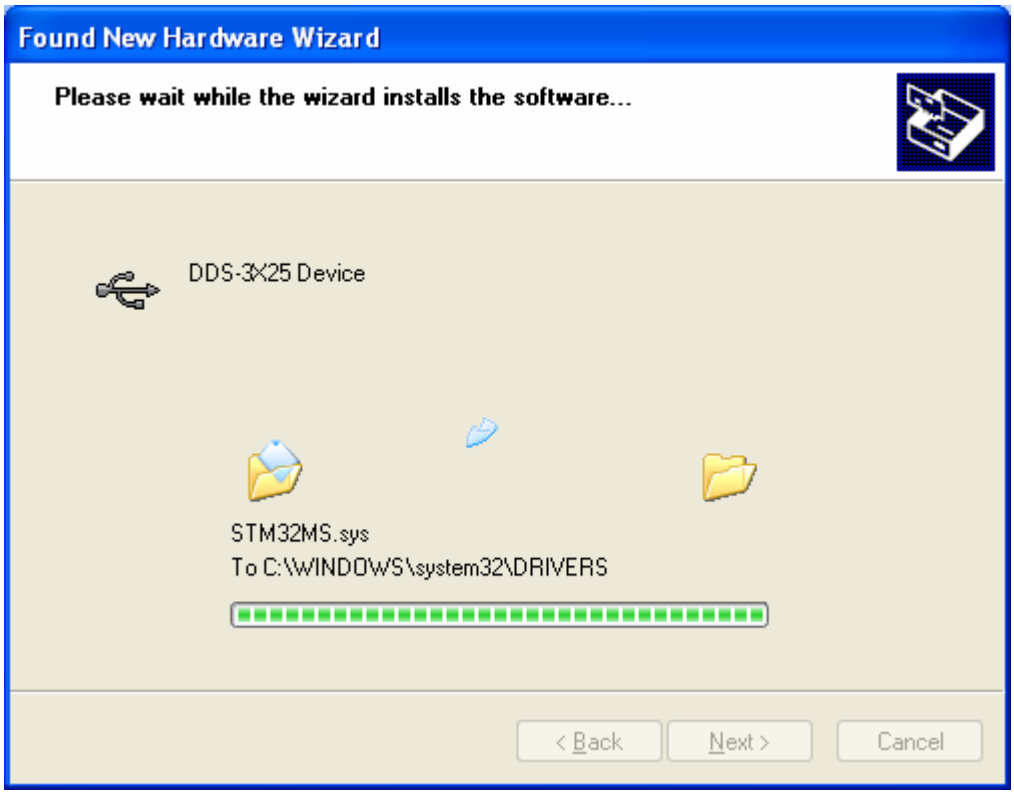
Installing Hardware

1. Connect the A-Type Plug of the USB cable to your PC's USB port.
2. Connect the B-Type Plug of the USB cable to DDS-3X25's USB port.
3. New hardware is found.

4. New hardware search wizard starts.

Choose the correct directory of the driver through the browser or search in the CD driver.

5. New hardware wizard installs the software



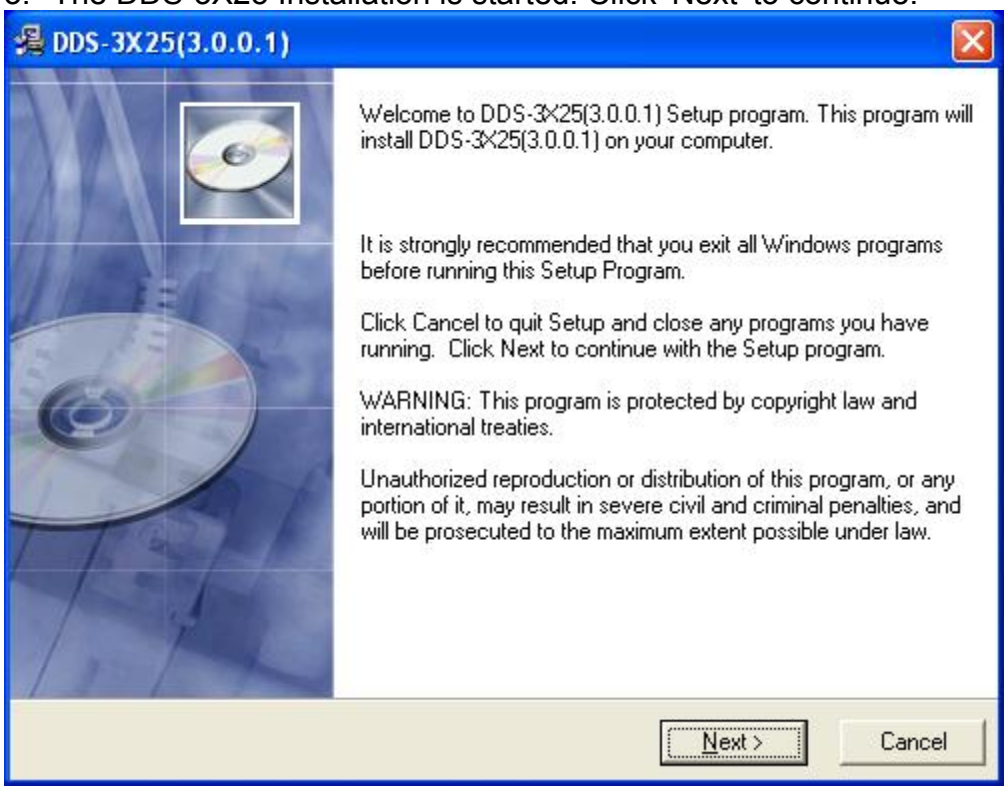
6. Finish new hardware search wizard.

Found New Hardware Wizard
Completing the Found New Hardware Wizard
The wizard has finished installing the software for:
DDS-3X25 Device
Click Finish to close the wizard.
< Back
Finish
Cancel

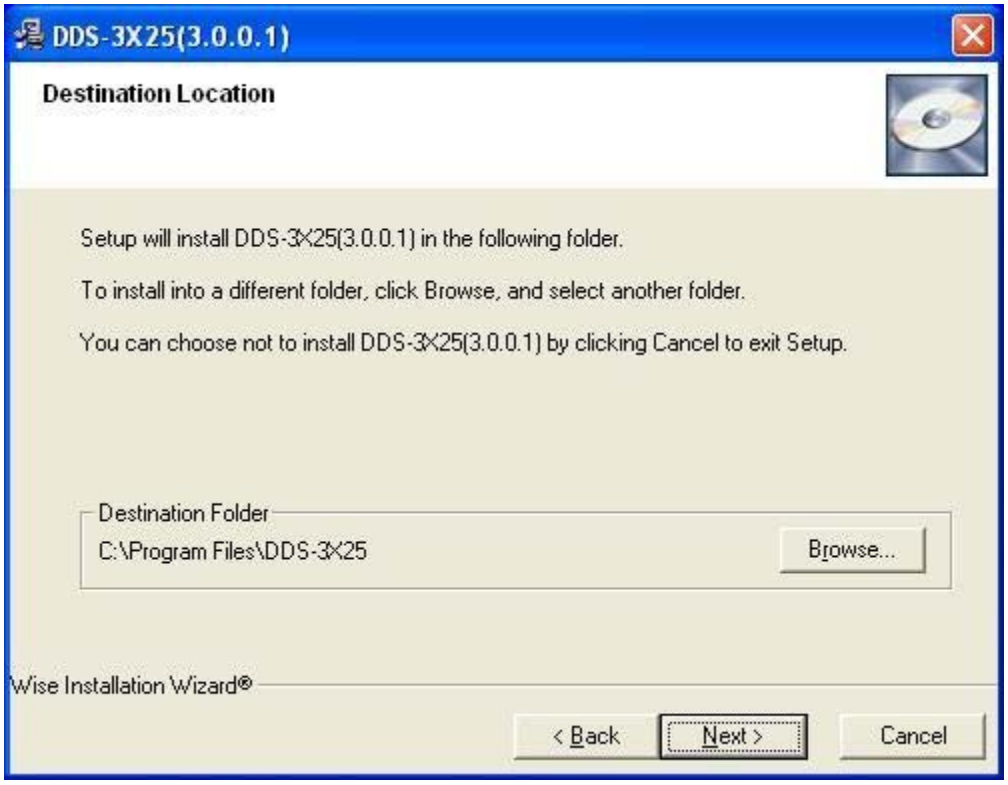
Installing Software

1. While in Windows, insert the installation CD into the CD-ROM drive.
2. The installation should start up automatically. Otherwise in Windows Explorer, switch to the CD-ROM drive and run "Setup.exe".

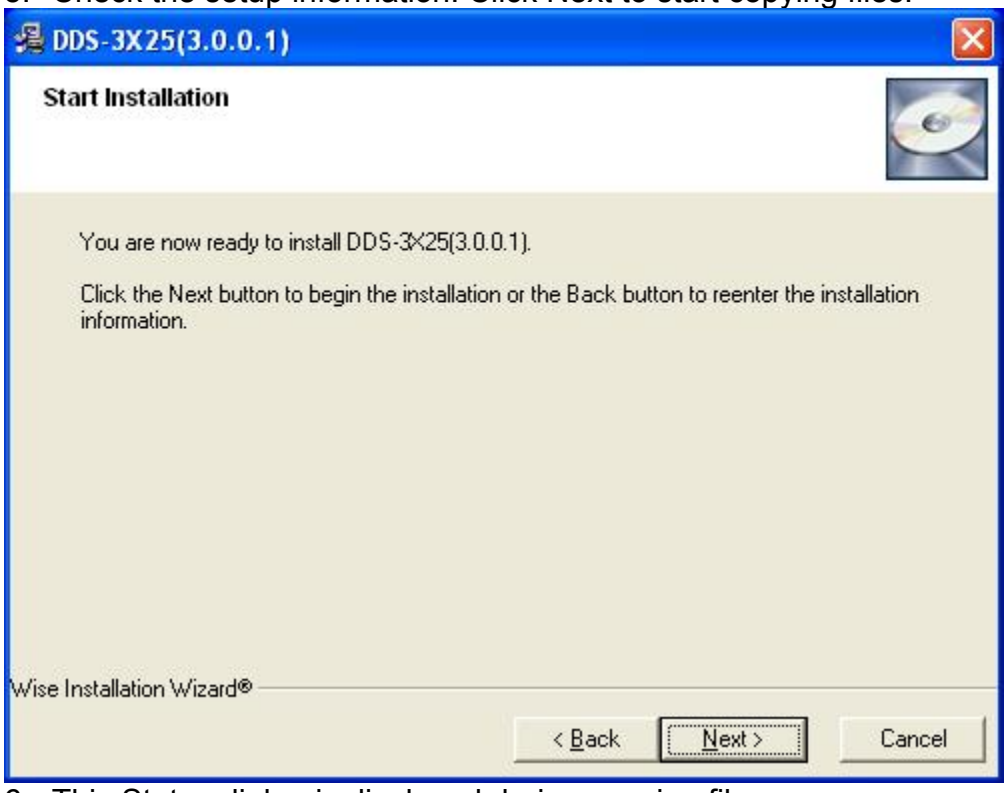
3. The DDS-3X25 Installation is started. Click 'Next' to continue.



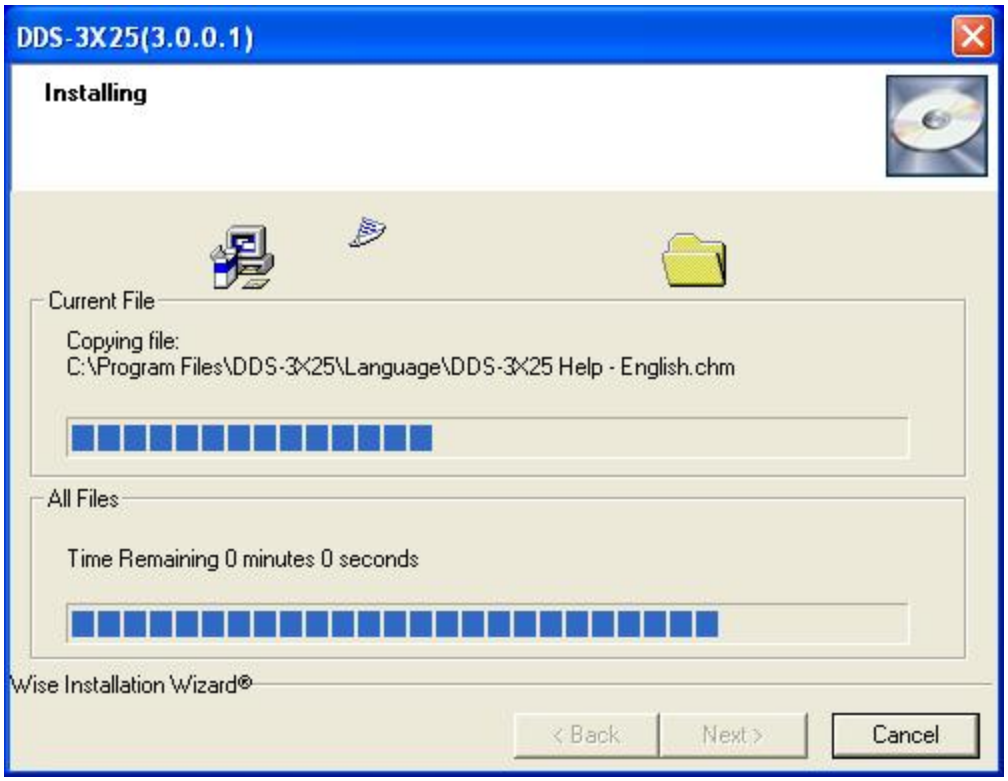
4. Choose a destination directory. Click 'Next' to continue.



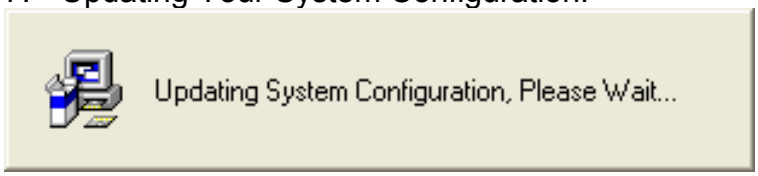
5. Check the setup information. Click Next to start copying files.



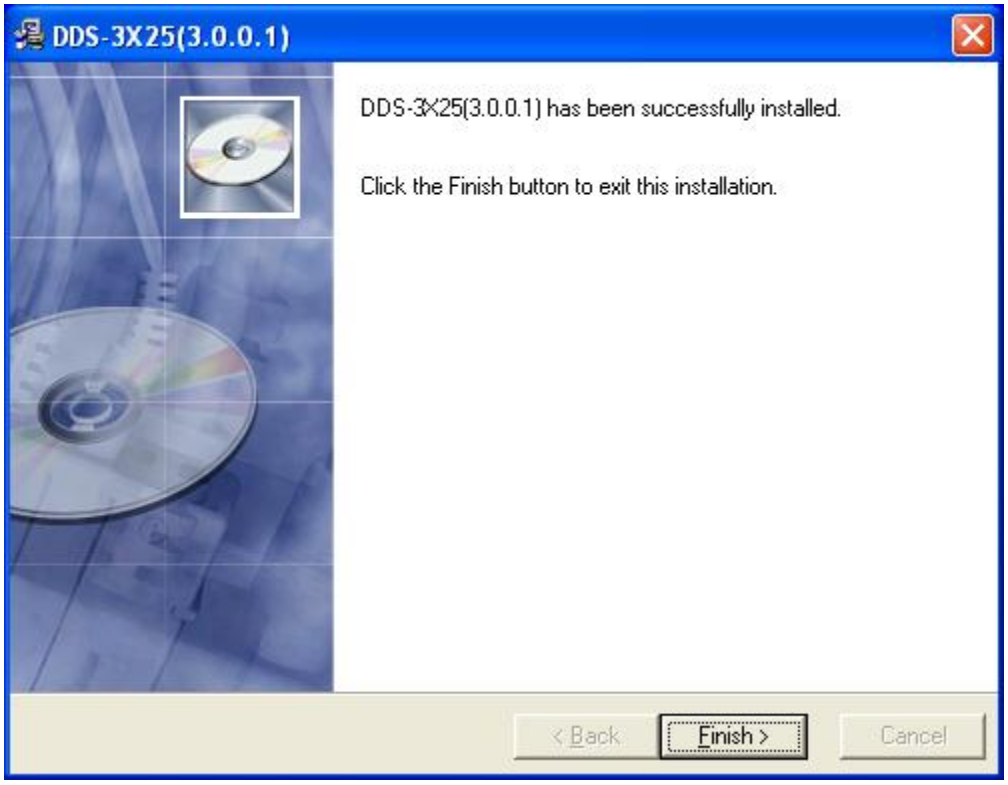
6. This Status dialog is displayed during copying files.



7. Updating Your System Configuration.



8. The installation is completed.


DDS-3X25(3.0.0.1)
DDS-3X25(3.0.0.1) has been successfully installed.
Click the Finish button to exit this installation.
< Back
Finish >
Cancel

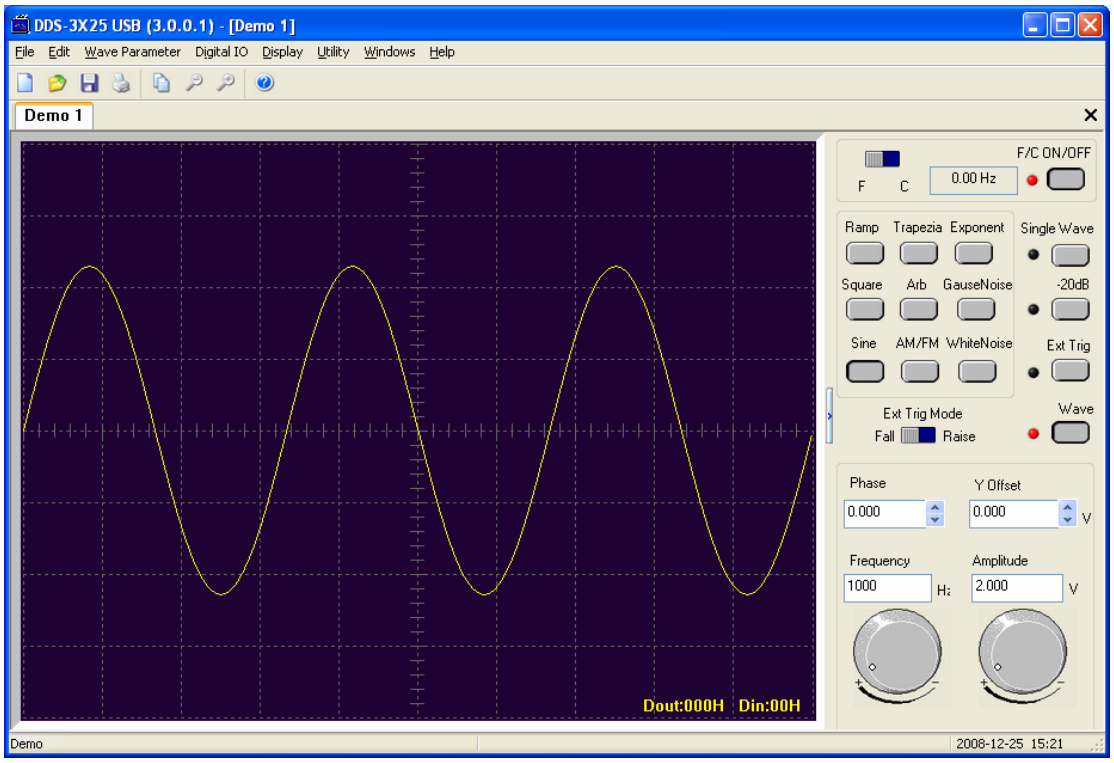
Chapter 2 Operating Basics

This chapter focuses on the following topics:

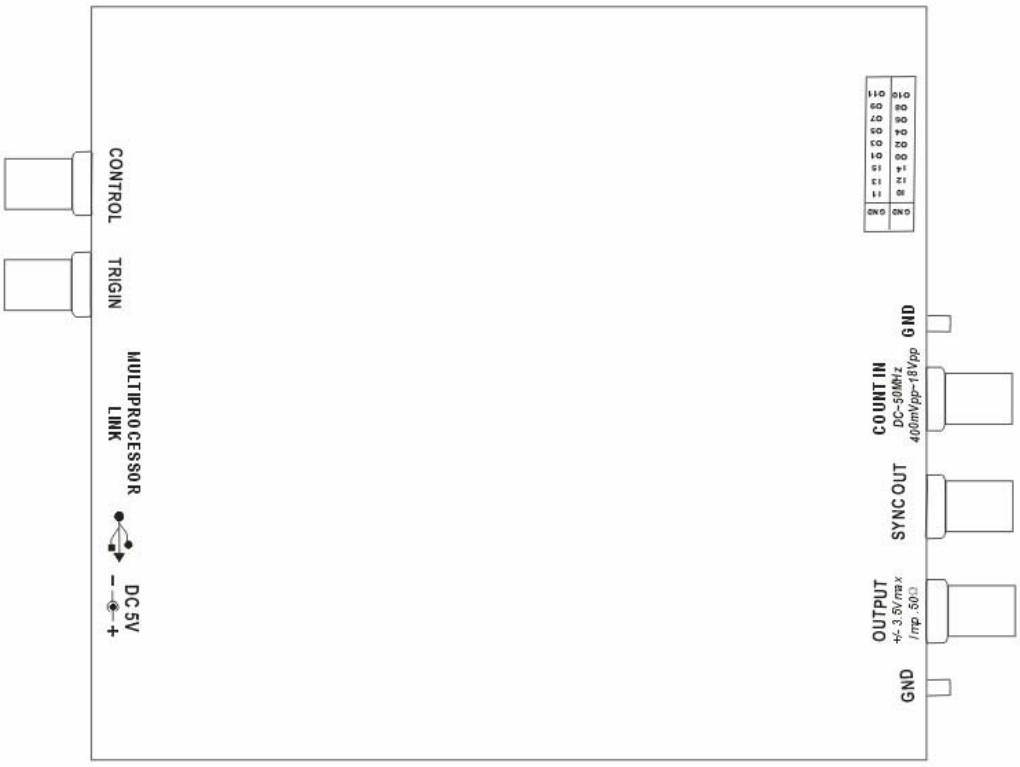
- The User's Interface
- The Menu System
- The Waveform Control System

The User's Interface

DDS-3X25 provides users a simple and full-featured interface so that users do not have to spend a lot of time to learn.

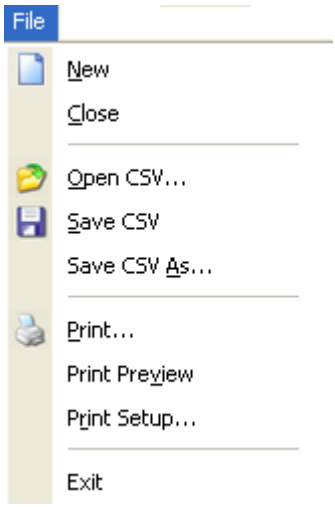


The Instrument's Interface



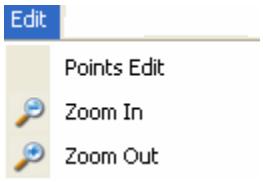
The Menu System

1. File



- **New:** Create a new device
- **Close:** Close current device
- **Open CSV…:** Open a “CSV” file
- **Save CSV…:** Save as a “CSV” file
- **Save CSV As…:** Save a “CSV” file as other name
- **Print…:** Print the current waveform
- **Print Preview:** Preview the current waveform
- **Print Setup:** Configure the printing setup
- **Exit:** Exit DDS-3X25 USB

2. Edit

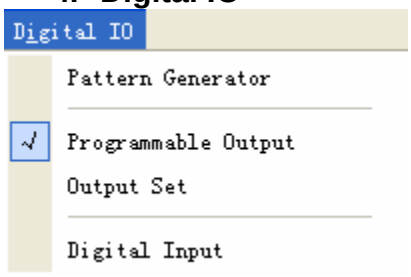


- **Points Edit:** Draw the waveform after click the command of Arb.
- **Zoom In:** Zoom in the waveform.
- **Zoom Out:** Zoom out the waveform.

3. Wave Parameter

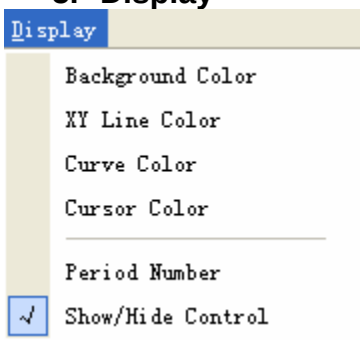
- **Square:** Show square waveform.
- **Ramp:** Show ramp waveform.
- **Trapezia:** Show trapezia waveform.
- **Exponent:** Show exponent waveform.
- **AM/FM:** Show AM/FM waveform.

4. Digital IO



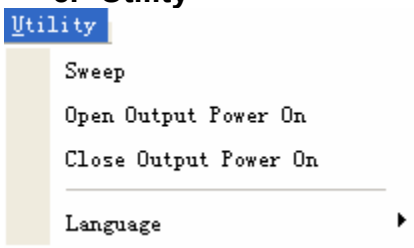
- **Pattern Generator:** Set the Digital out pins as pattern generator.
- **Programmable Output:** Set the Digital out pins as programmable output.
- **Output Set:** Show Digital out setup dialog.
- **Digital Input:** Show Digital Input status dialog.

5. Display



- **Background Color:** Set background color.
- **XY Line Color:** Set XY color.
- **Curve Color:** Set curve color.
- **Cursor Color:** Set cursor color.
- **Period Number:** Set the number of periods displayed.
- **Show/Hide Control:** Show or hide the control panel.

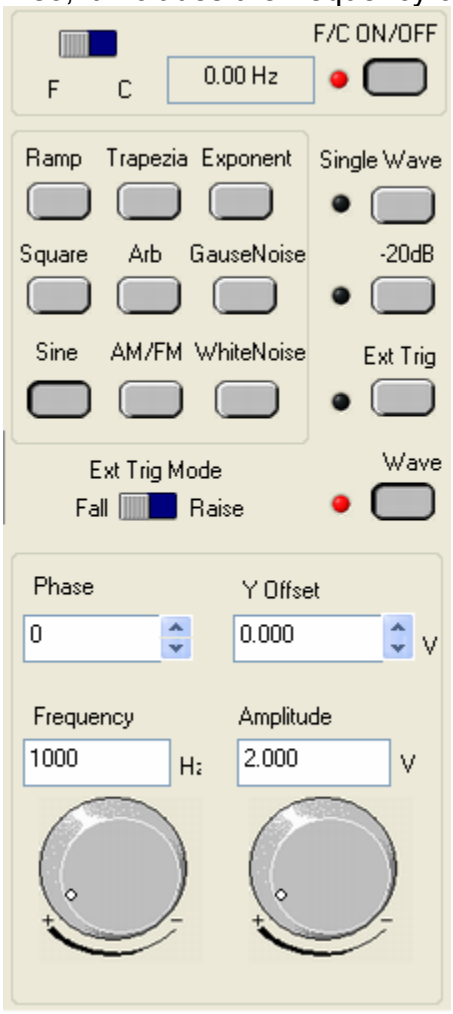
6. Utility



- **Sweep:** Show the sweep dialog.
- **Open Output Power On:** Save the current waveform to DDS-3X25, and generate the waveform when the DDS-3X25 has power on.
- **Close Output Power On:** Stop generating the waveform when the DDS-3X25 has power on.

The Waveform Control System

Click Menu “Display”->”Show/Hide control”, you can show or hide the waveform control panel.
You can change the waveform parameter such as frequency, amplitude, Y Offset, or phase.
Also, it includes the frequency/counter measurement system.



Chapter 3 Understanding Functions

This chapter focuses on the following topics:

- Waveform parameter
- Waveform output control
- Edition of Arbitrary Waveform
- Counter/Frequency Measurement
- Waveform data files
- Digital Input/Output
- Output without PC
- Multiprocessor link
- Synchronized Output
- External Trigger Input

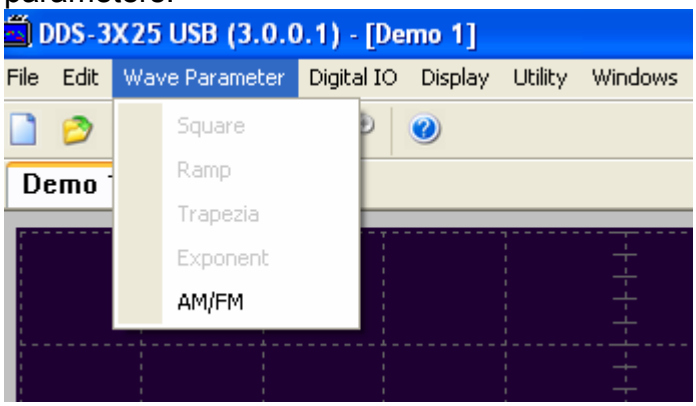
Waveform parameter

1. **Choose waveform**

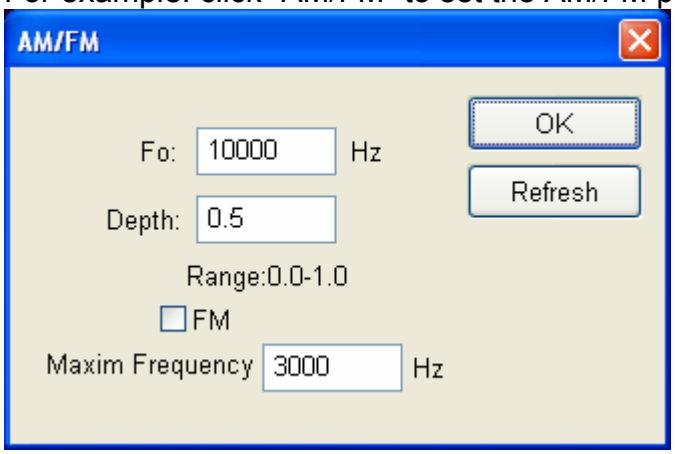
Press down any button of certain waveform to switch to the output of such kind of waveform. When switching to arbitrary waveform from other kinds of waveform, the edition work can be done on the original wave form.

2. **Set waveform parameters**

Click Menu “Wave Parameter”, there are the options for setting various waveform parameters.

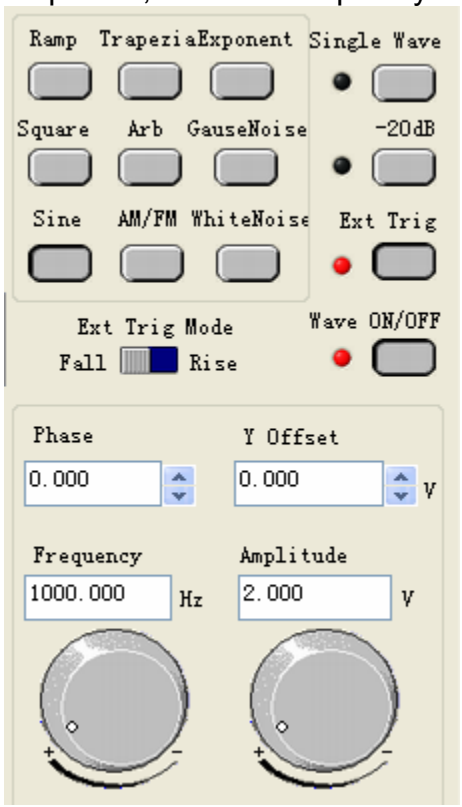


For example: click “AM/FM” to set the AM/FM parameters in the dialog.



Waveform Output Control

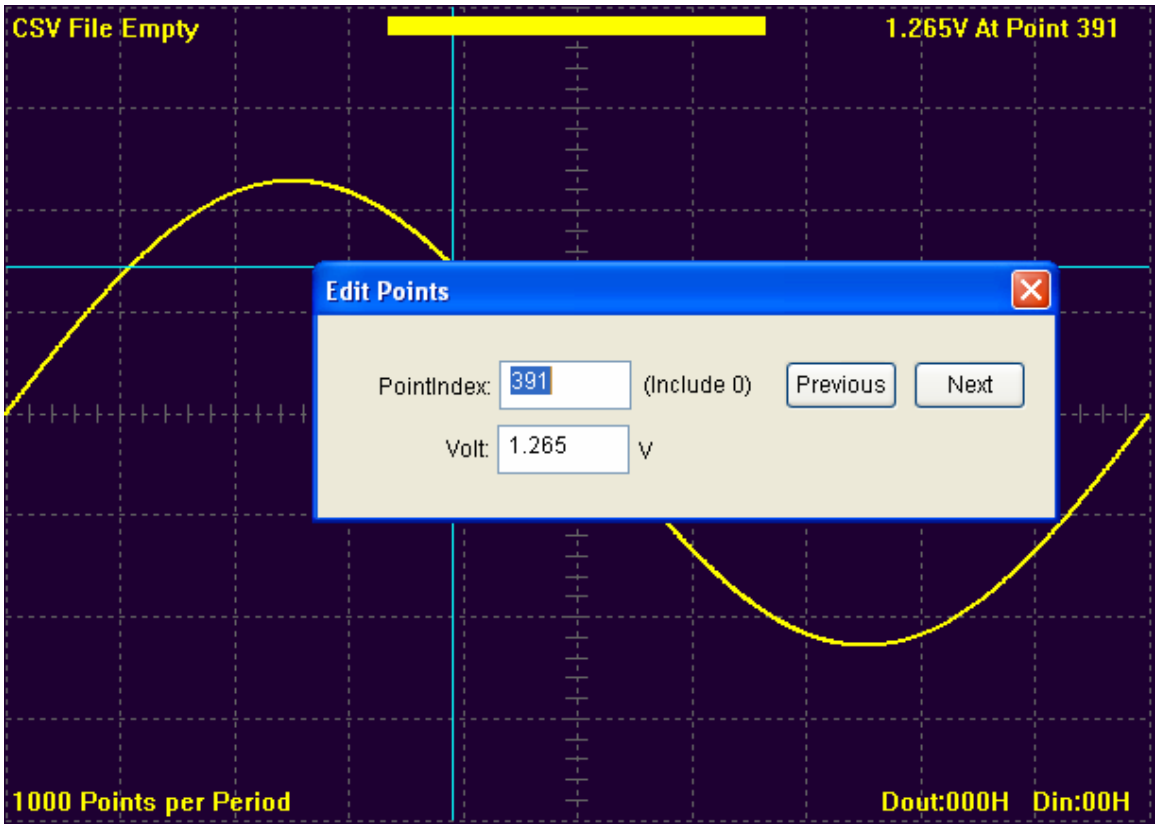
By the following buttons to control the output dot numbers, trigger mode, output amplitude, and limit frequency of the wave filter.



Single Wave: Output waveform only once.
-20dB: Attenuation the waveform
Ext Trig: Use the external or internal trigger system.
Wave ON/OFF: Turn the waveform on/off.
Ext Trig Mode: External Trigger Mode (see “External Trigger Input”).
Phase: The phase of the waveform to generate.
Y Offset: The offset of the waveform to generate.
Frequency: The frequency of the waveform to generate (The Frequency Range is DC~75MHz when generating sine waveform, or DC~25MHz when generating other waveforms).
Amplitude: The maximum voltage of the waveform to generate.

Edition of Arbitrary Waveform

Choose “Arb” waveform, and click the menu” Edit”->”Edit Points” to open “edit points” dialog.

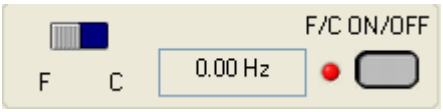


Waveform Data Files

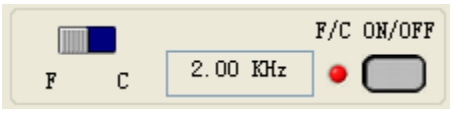
The data format of DDS-3X25 is ".CSV". Its format is compatible with the CSV file produced by the Tektronix ARB Express software. User can edit or set up the required CSV waveform and also use Excel to open and edit the CSV wave files.

Frequency/Counter Measurement

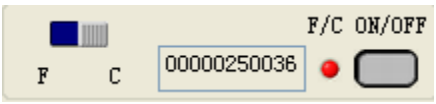
Click the “F/C ON/OFF” to turn on or off the frequency/counter measurement.

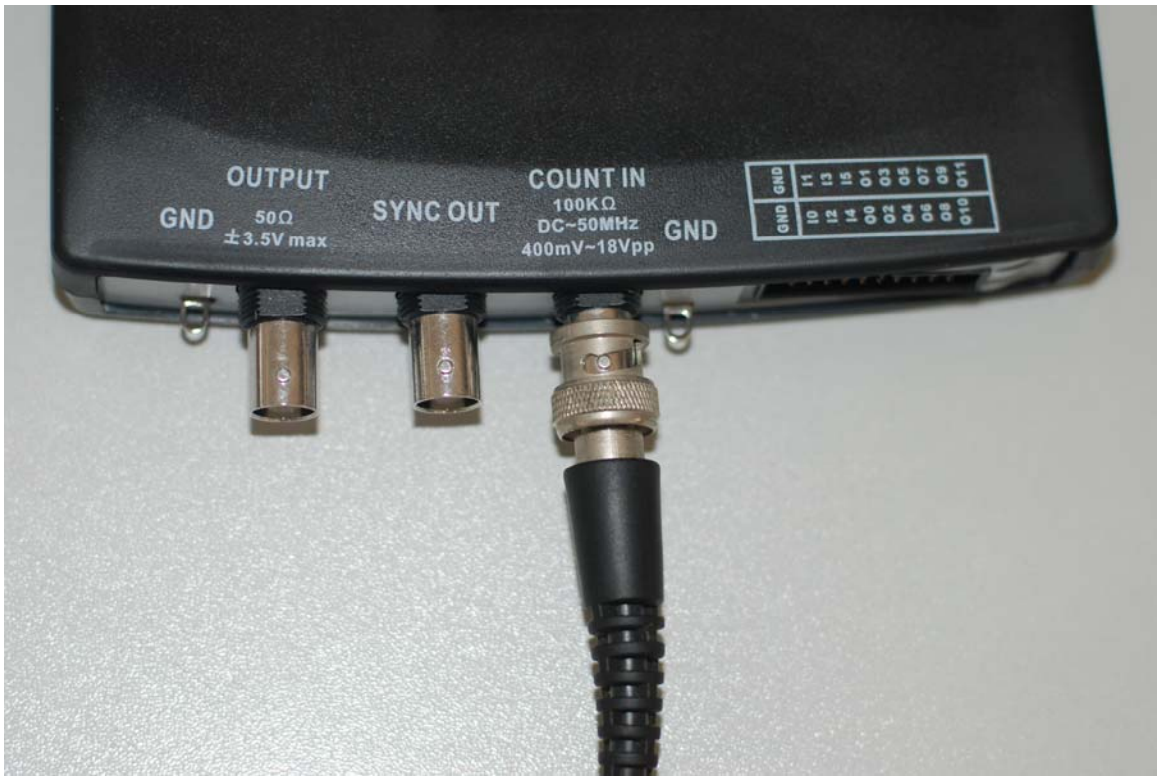


Input the signal through the “COUNT IN” terminal, and turn on the “F/C ON/OFF”, you can see the measured frequency value in the edit box.



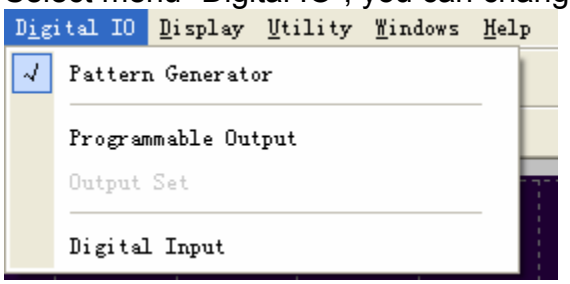
Turn the left-right button to “C” end; you can see the counter value in the edit box.





Digital Input/Output

Select menu “Digital IO”, you can change the current digital IO mode.



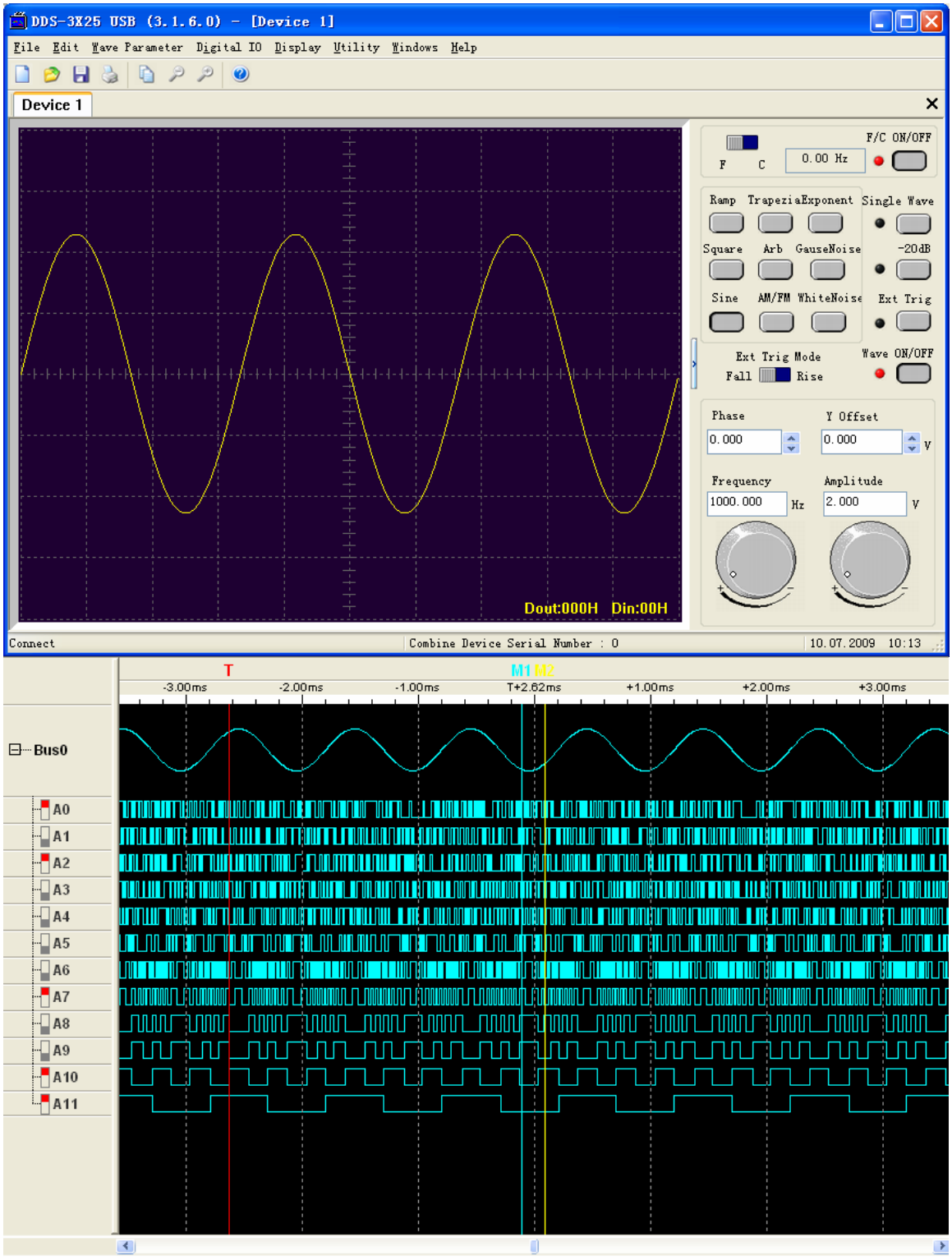
At the digital IO terminals on the DDS-3X25 USB, there are 20 IO pins, including 2 pins for GND, 6 pins for Digital In and 12 pins for Digital Out.

There are two Digital Out modes in DDS-3X25 USB: Pattern Generator and Programmable Output.

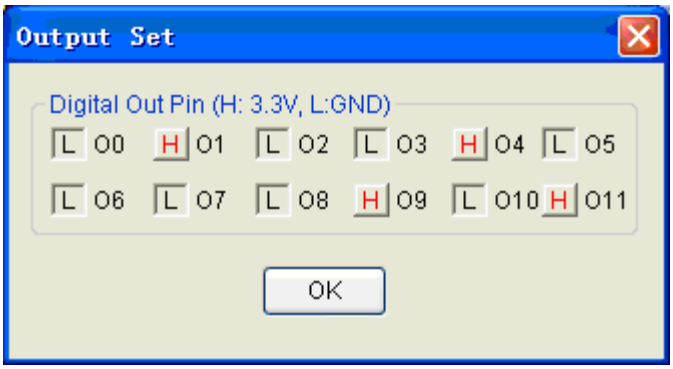
1. Pattern Generator:

The vertical resolution of DDS-3X25 is 12bits, and in this mode, you can get the value of each bit through the digital out pins. The LSB is O0, and O11 is MSB. With a logic analyzer, you will get a good view.

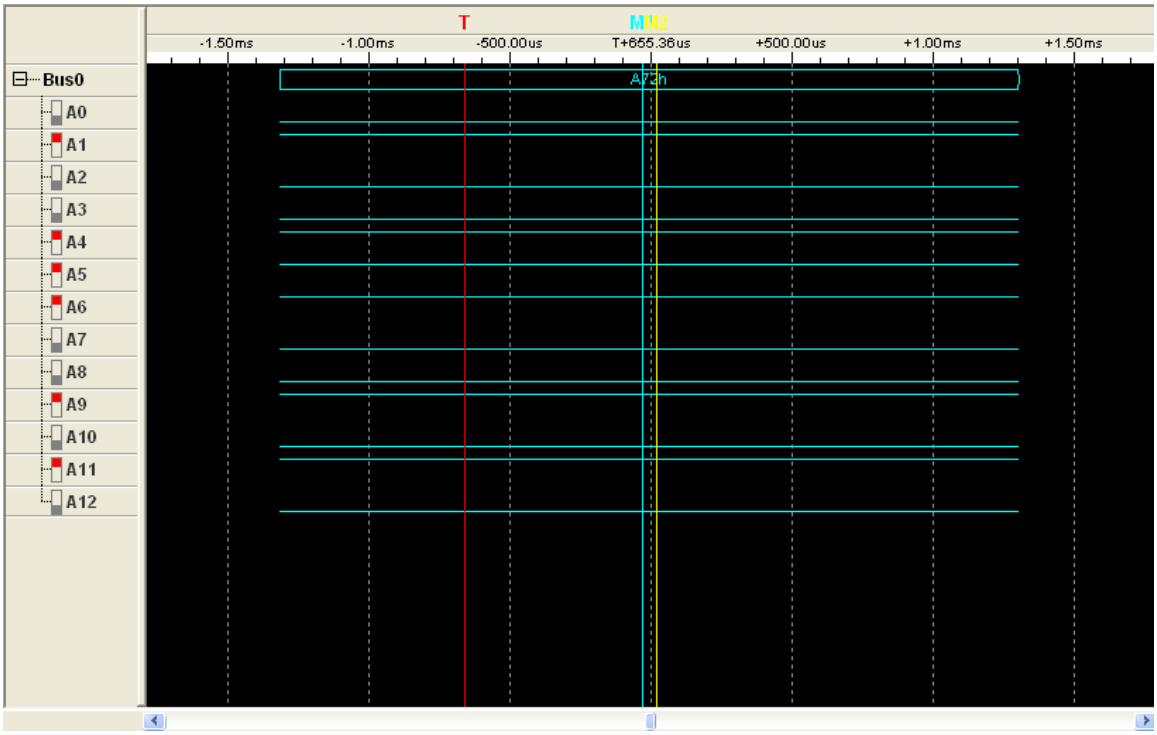
Example: Let the DDS-3X25 USB generate a 1 KHz, 2.00V, Sine waveform and connect the O0, O1-O11 pins to the A0, A1-A11 channels of a logic analyzer. Then you will see the sine waveform on the logic analyzer.



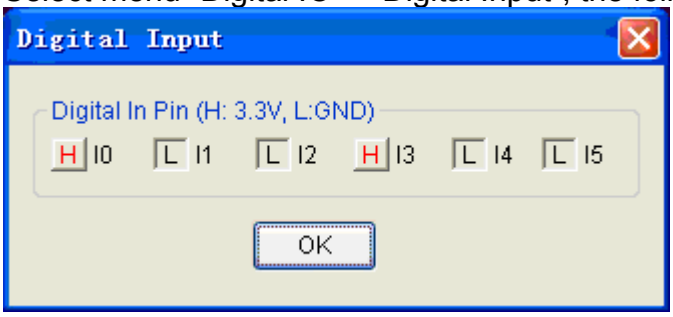
2. Programmable Output:
   Select menu “Programmable output”, then the Programmable output mode works. Select menu “Digital IO”->”Output set”, the “output set” dialog show.



Select one pin, that pin will output high level. Otherwise, the pin will output low level.



3. Digital Input
Select menu “Digital IO”->”Digital Input”, the following dialog shows.



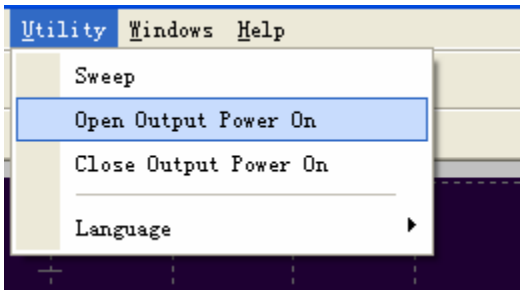
If you input a high level to a digital input pin, the pin on the dialog would show H; otherwise, the pin on the dialog would show L.

Output without PC

DDS-3X25 can save a waveform to its own memory and work without PC.

Open:

Select menu “Utility”->”Open output power on”. Then the current waveform will be saved to hardware. And the waveform will be generated every time when you connect the DDS-3X25 to power.



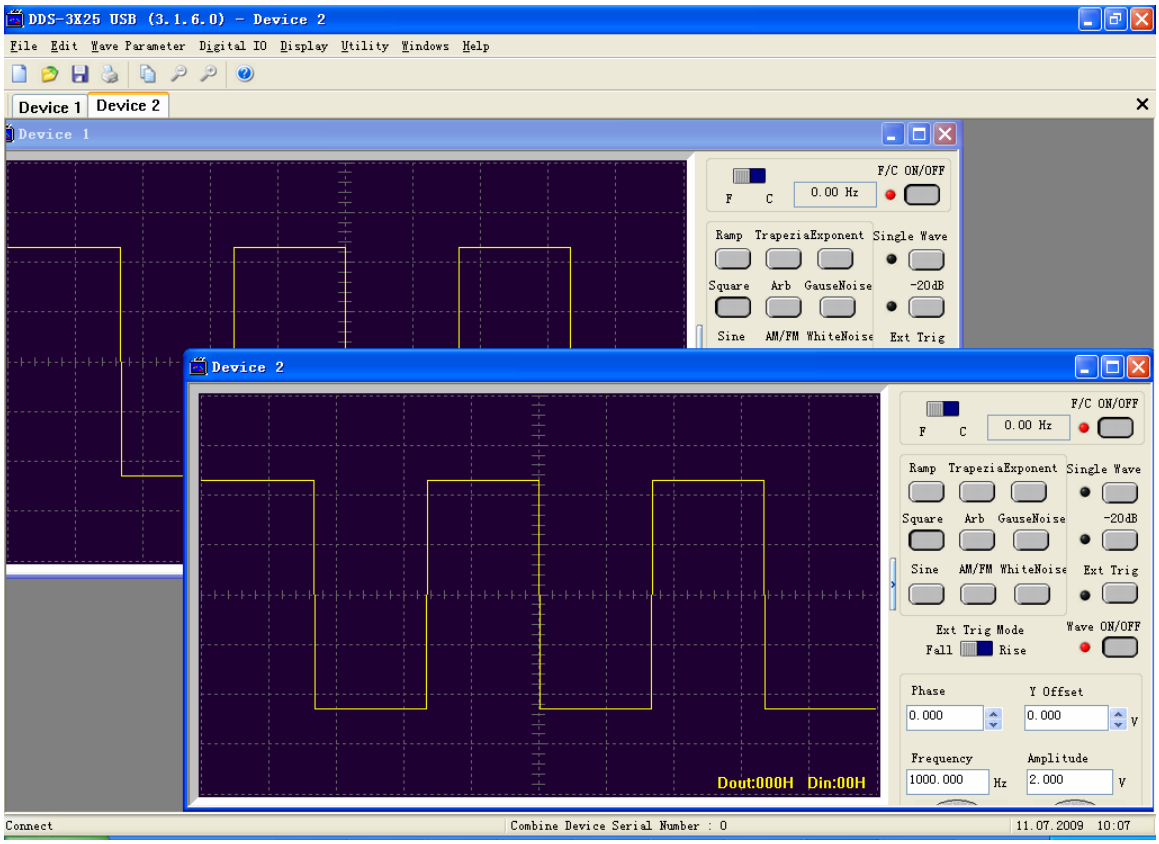
If the DDS-3X25 USB is without PC, it should be powered by an external power of DC 5V through the “DC 5V” input socket, like below picture.

Close:

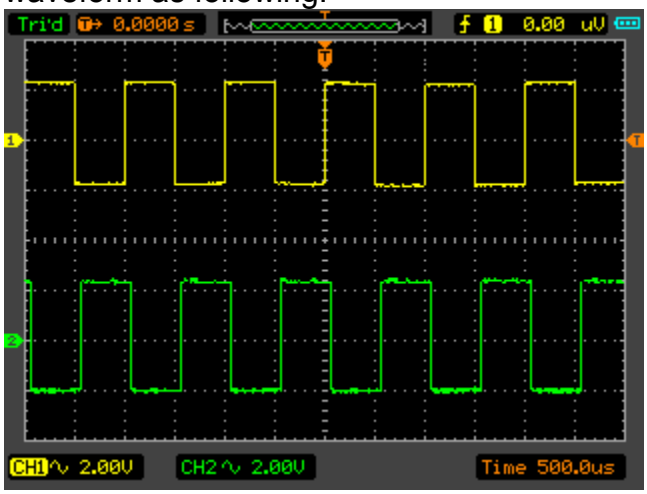
If you want to clear the waveform from the hardware memory, select “Close Output Power On”.
If you don’t want to generate the waveform which is saved in the hardware memory, connect the “CONTROL” BNC end to ground before inputting power to this instrument. You can use a Short-Circuit Cap as shown in below.

Multiprocessor Link

To generate two or more channels of signals, you must work with two or more instruments. Open them in the same application window as the following picture:



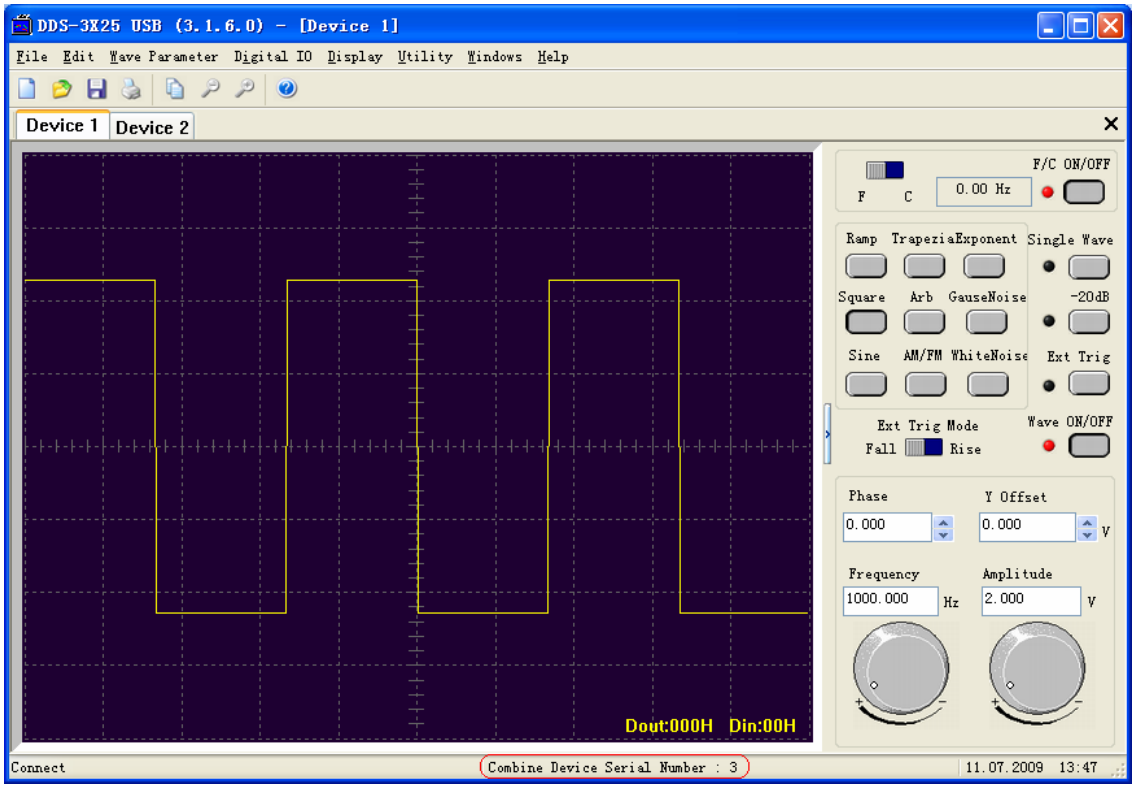
If connecting the instruments to oscillograph, you will see the two channels waveform as following:

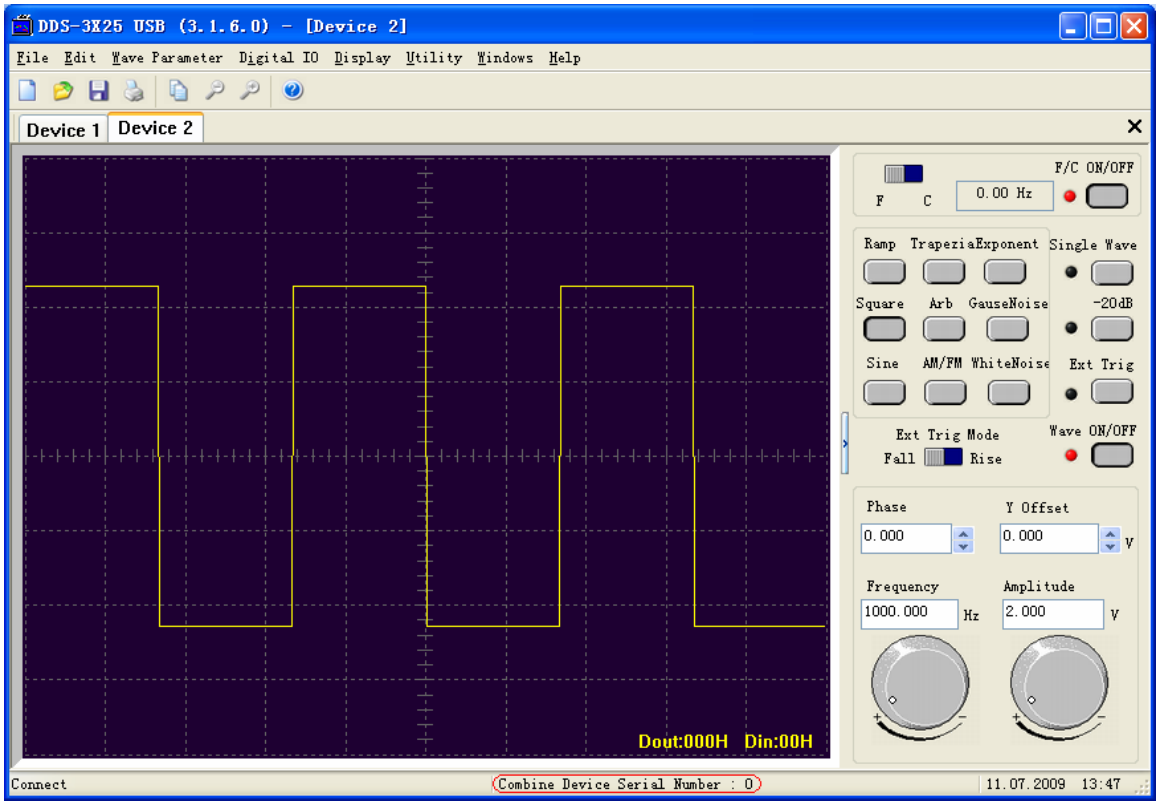


In above picture, you can see that the waveforms of CH1 and CH2 are not synchronized.

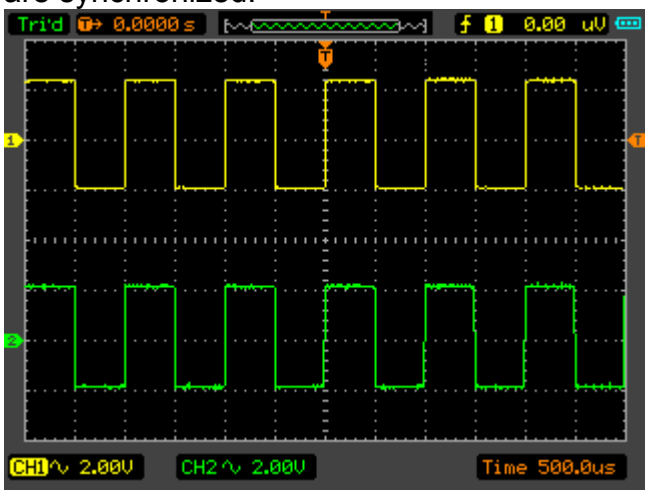
To get synchronized waveforms, you must use the optional MULTIPROCESSOR LINK cable.
First, disconnect the instruments from PC, and connect them with this special cable. At least, you must connect one instrument to the main interface of the cable.（In the default setting, the device serial no. of the main interface is No.3 and the others are No. 0, 1 and 2.）

Then, connect them to PC through USB ports and open them in the same application window.

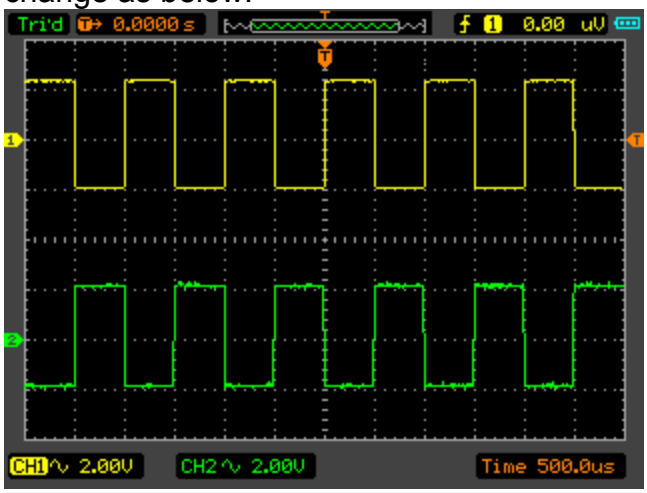

DDS-3X25 USB (3.1.6.0) - [Device 1]
File Edit Wave Parameter Digital IO Display Utility Windows Help
Device 1
Device 2
F/C ON/OFF
F C
0.00 Hz
Ramp TrapeziaExponent Single Wave
Square Arb GauseNoise -20dB
Sine AM/FM WhiteNoise Ext Trig
Ext Trig Mode
Fall Rise
Wave ON/OFF
Phase
Y Offset
0.000
0.000
V
Frequency
Amplitude
1000.000
Hz
2.000
V
Dout:000H Din:00H
Connect
Combine Device Serial Number : 3
11.07.2009 13:47


DDS-3X25 USB (3.1.6.0) - [Device 2]
File Edit Wave Parameter Digital IO Display Utility Windows Help
Device 1
Device 2
F/C ON/OFF
F C
0.00 Hz
Ramp TrapeziaExponent Single Wave
Square Arb GauseNoise -20dB
Sine AM/FM WhiteNoise Ext Trig
Ext Trig Mode
Fall Rise
Wave ON/OFF
Phase
Y Offset
0.000
0.000
V
Frequency
Amplitude
1000.000
Hz
2.000
V
Dout:000H Din:00H
Connect
Combine Device Serial Number : 0
11.07.2009 13:47

Now, the combine device serial number of “Device1” is 3, and the number of “Device2” is 0. On the oscillograph, you will see the waveform of CH1 and CH2 are synchronized.

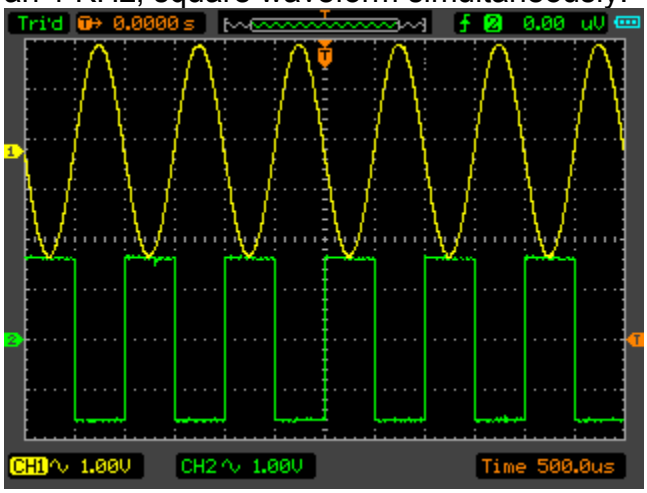


If you set the phase of Device 2 to 0.5, the waveforms on the oscillograph will change as below.

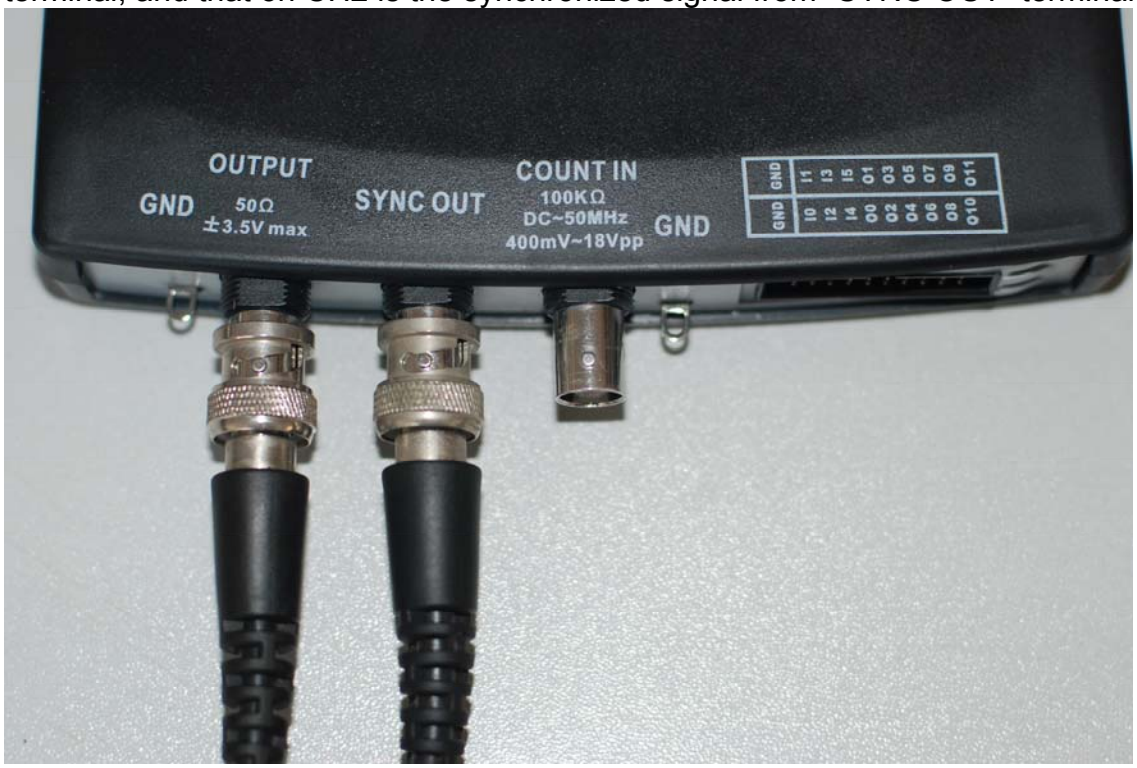


Synchronized output

If you generate a waveform by software, there is a synchronized signal output from “SYNC” terminal. The signal is square waveform, the frequency of which is equal to the waveform you generated.
For example, if you generated an 1 KHz, sine waveform, you will also generate an 1 KHz, square waveform simultaneously.

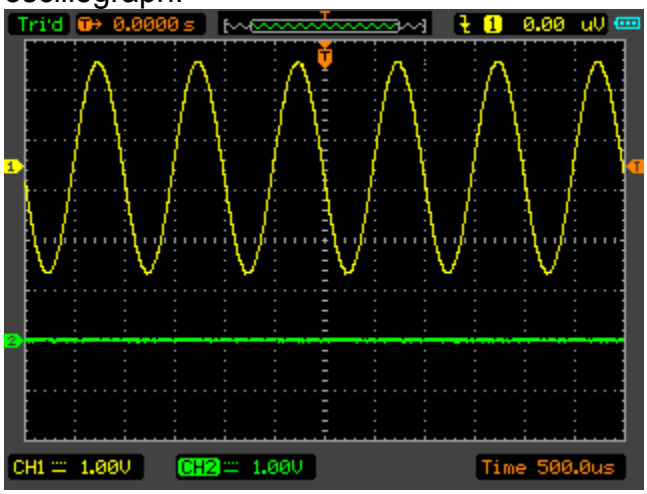


The waveform on CH1 is the sine waveform you generated from the “OUTPUT” terminal, and that on CH2 is the synchronized signal from “SYNC OUT” terminal.

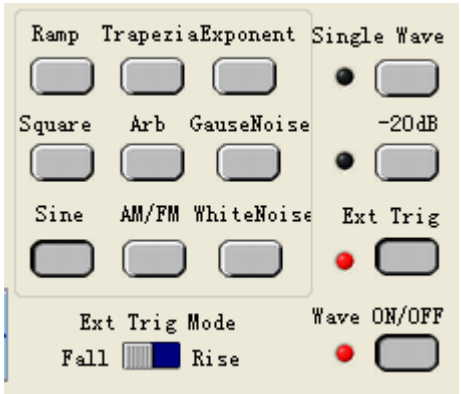


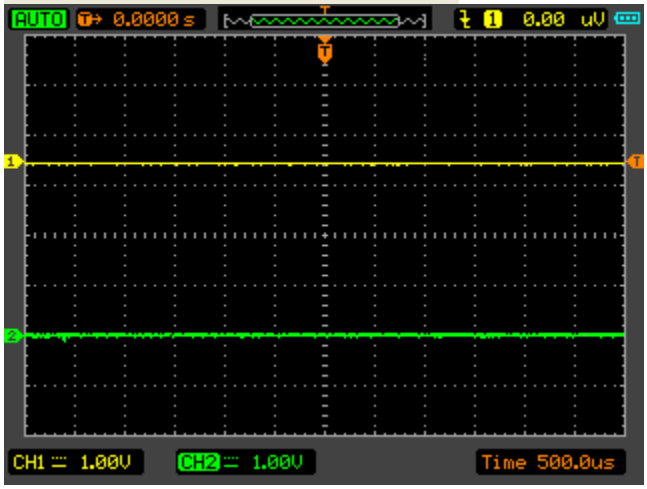
External Trigger Input

Also, you can use the external trigger input to control the DDS-3X25 USB.
For example, the instrument generated a waveform, and you got a waveform on oscillograph.

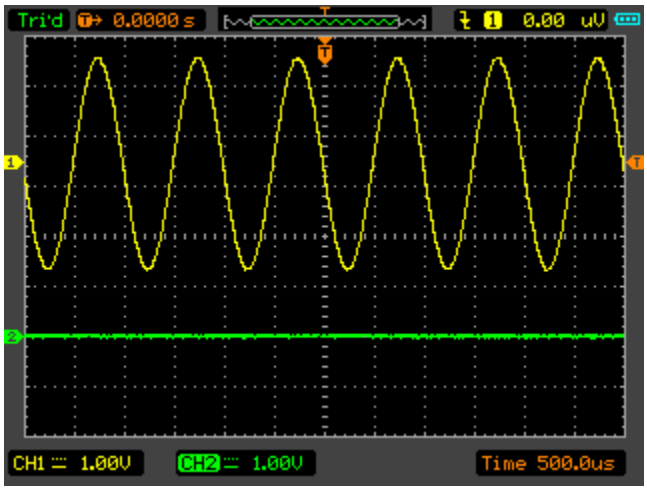


Then, click the “Ext Trig” button on the interface of the software. The waveform on the oscillograph disappeared. Now the instrument use the external trigger system, but there is no external signal input, so the instrument stops to output waveform.





Click the “Ext Trig Mode “to switch the external trigger mode between “Fall” and “Rise”. Select the Fall mode as example.
Input a signal which has fall edges to the “TRIGIN” BNC terminal. When the DDS-3X25 USB gets to the fall edge of the external signal, it begins to generate waveform.



Chapter 4 Application Examples

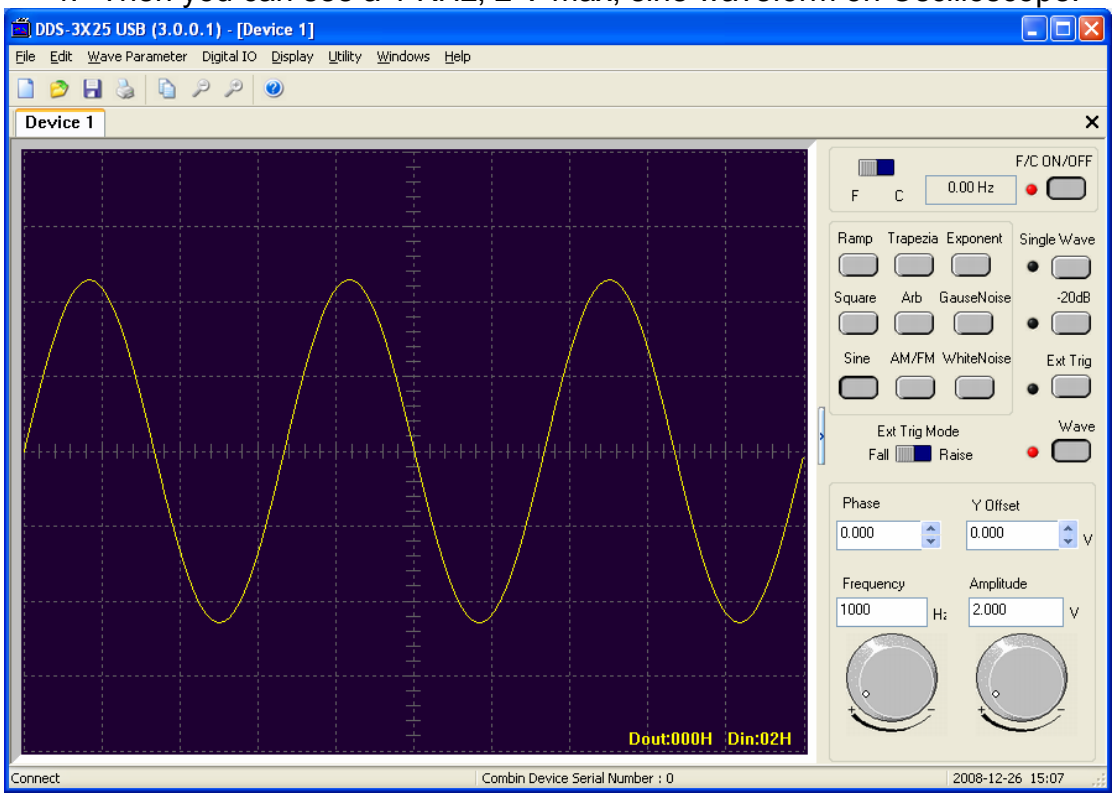
This chapter focuses on the following topics:

- Generate simple waveform
- Generate Arbitrary Waveform
- Combine Devices

Generate Simple Waveform

To generate a simple waveform, please do these steps as follows:

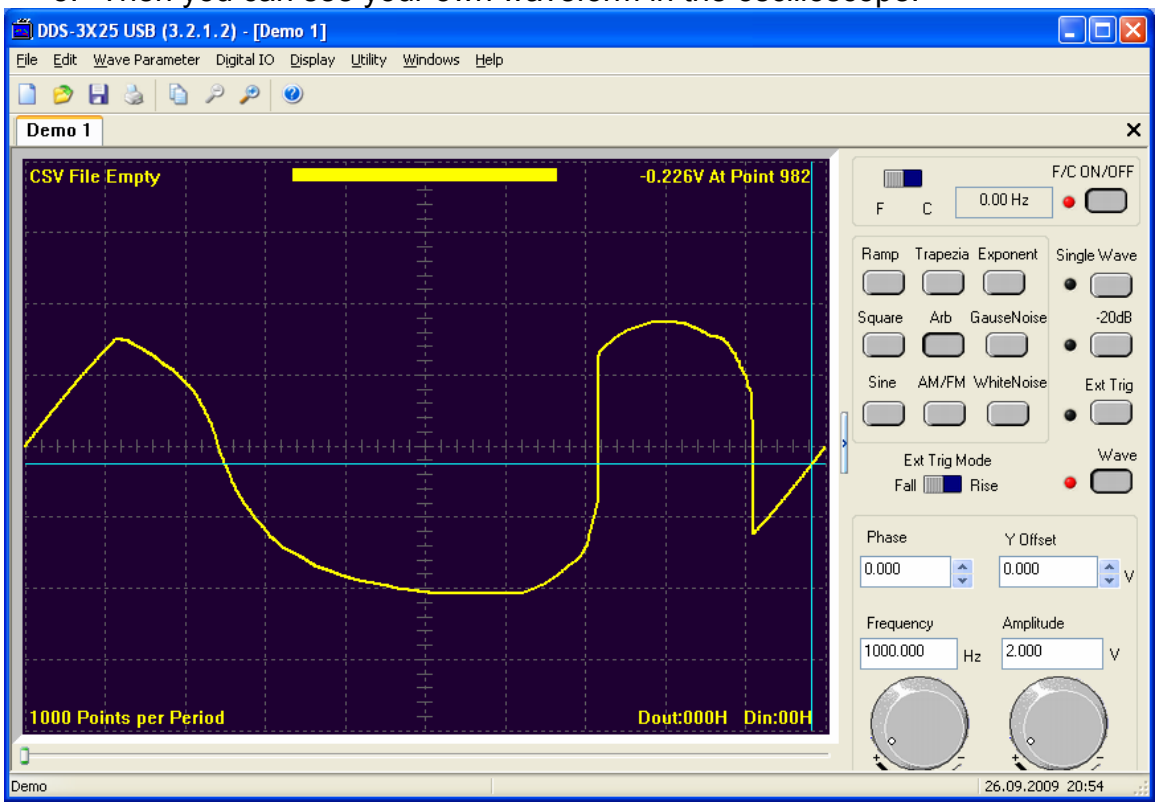
1. Connect wave output pin to Oscilloscope.
2. Connect the USB probe to PC.
3. Select “Start”->”All programs”->”DDS-3X25 USB”->”DDS-3X25 USB” to go into the software interface.
4. Then you can see a 1 KHz, 2 V max, sine waveform on Oscilloscope.



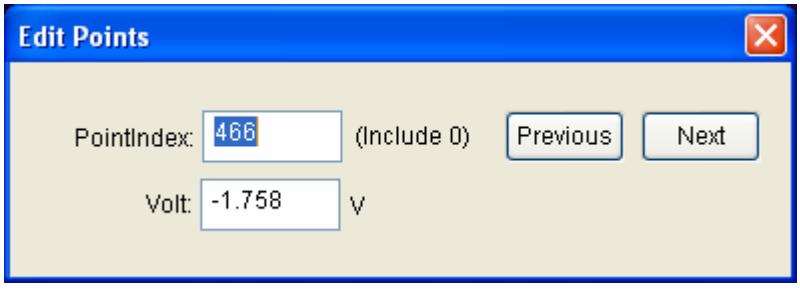
Generate Arbitrary Waveform

To generate an arbitrary waveform, please do the steps as follows:

1. Open the software.
2. Choose the “Arb” waveform in the control panel.
3. Move your mouse to the waveform screen.
4. Press down the mouse left button, drag and draw your own waveform.
5. Then you can see your own waveform in the oscilloscope.



6. Click “Edit”->”Edit Points”, you can change the voltage of each point.
7. Click “Edit”->”Zoom In” or “Zoom Out”, you can zoom in or out the waveform screen.

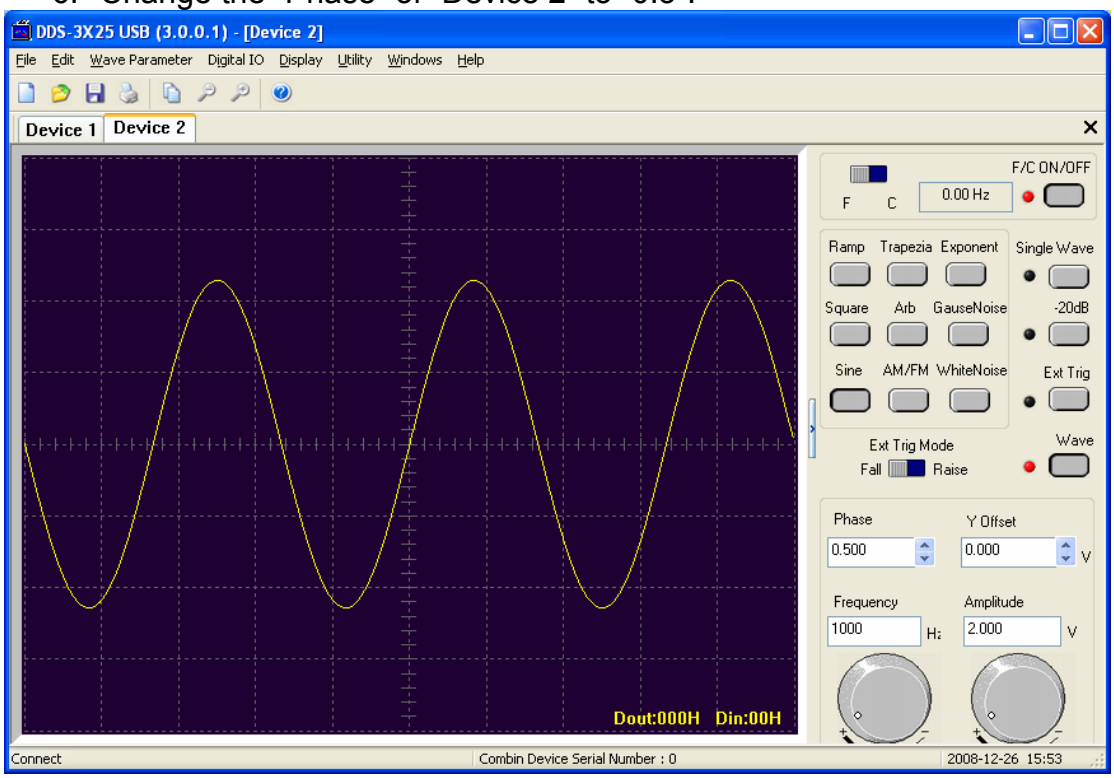


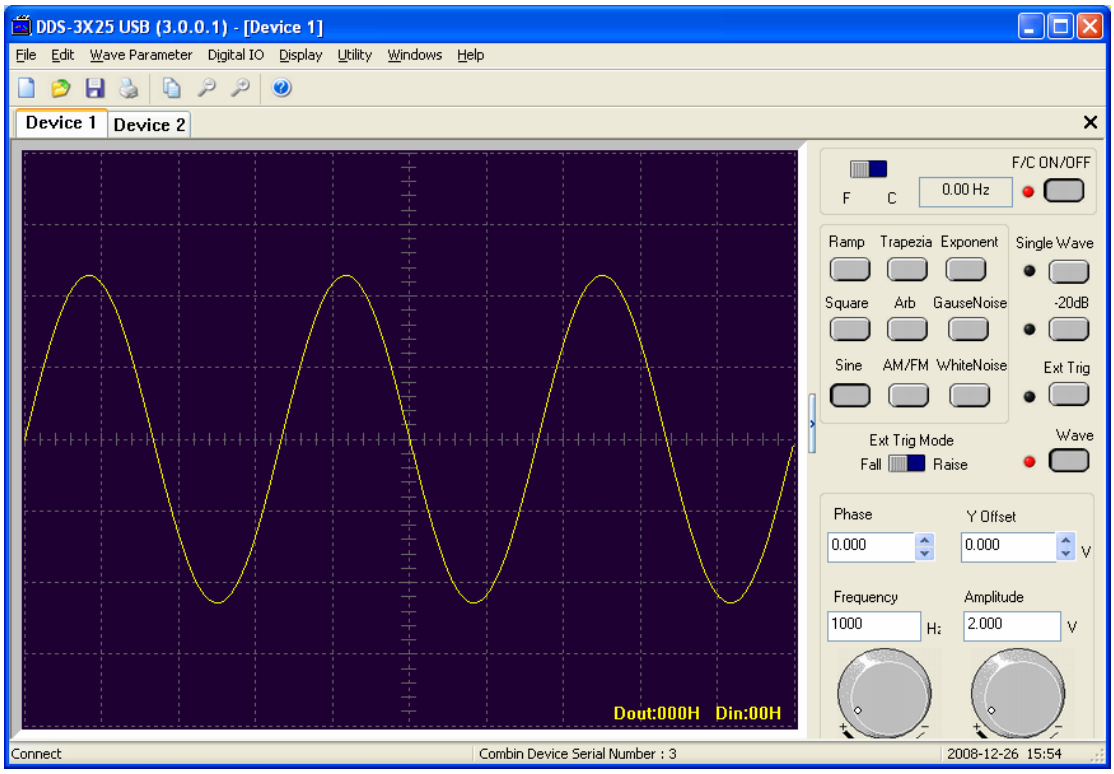
Combine Devices

To generate the combine-device waveforms, please do the steps as follows:

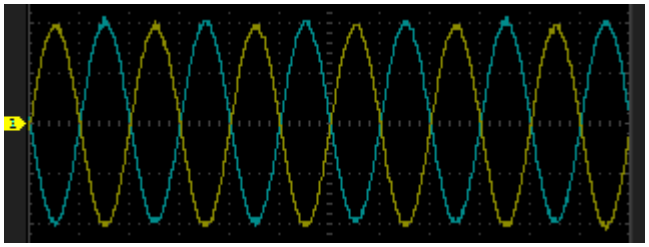
For example, we have two devices.

1. Connect them by the MULTIPROCESSOR LINK cable. (Caution: You must connect one device to the main interface of the cable!).
2. Connect them to the same oscilloscope.
3. Connect them to the same PC.
4. Open the two devices by software.
5. You can see the device serial number in the status window.
6. Change the “Phase” of “Device 2” to “0.5”.





7. Then you can see the waveform like below on the oscilloscope.



Appendix

- Hardware specification
- Cleaning and Maintenance

Hardware Specification

Waveform Output Channel	
Frequency Range	1Hz(DC)~25MHz
Frequency Resolution	0.1%
DAC Clock	2K~200MHz adjustable
Channels	1CH waveform output
Memory Depth	4KSa
Vertical Resolution	12 Bits
Stability	<30ppm
Amplitude	±3.5V Max.
Output Impedance	50 Ω
Output Current	50mA Ipeak=100mA
System BW	25M
Harmonic Wave distortion	-50dBc(1KHz), -40dBc(10KHz)
Frequency Counter Channel	
Range	DC~50MHz
Input Amplitude	400mVpp~18Vpp
Coupling Mode	DC
Accuracy	±Time Base Error ±1 Count
Input Impedance	> 100KΩ
Digital Input and Output	
12 Bits Output 6 Bit Input	12 Bits Digital Generator and GO 6Bit GI
Level	LVCMOS
Working Environment	
Working Temperature	0~70 Centigrade
Working Humidity	0~95%
Weight	300 g

Cleaning and maintenance

Cleaning

In order to keep the instrument clean, you need to check often whether the channels are dusty or not. Please clean the instrument surface and the channel connecting points as per the following cautions:

1. Use soft and uncottony cloth, such as velvet, to wipe the dust off the instrument surface and channel connection points.

2. Use wet but not water-dropping cloth to clean the instrument. Do not use any corrosive or chemical detergent.

Caution: Please make sure that the instrument is dry enough before power is on. Avoid short-circuit or even body damage caused by water!

Maintenance

Don’t put the instrument in sunshine for a long time. Put it in good ventilation environment.

Caution: In order not to not destroy the instrument, do not put it in fog, liquid or solvent.