# Dynatronic Software User Guide

Dynatronic Corporation (China) Ltd.

# Contents

# Chapter 1. Software Installation

## 1.1 Before Installation

The software must be run with Microsoft.NET Framework 4.0. Please make sure Microsoft.NET Framework 4.0 is installed before installing the software.

## 1.2 Install the Software

Double-click on the icon “Setup” in the software package, install the software by following prompting messages. After installation, double-click on the icon “DHDAS” on the desktop to start the software, as illustrated below.

Figure 1.1 Icon “Setup”

When starting the software, the starting display is as follows:


Figure 1.2 Starting Display After opening the software, the main interface is as follows:

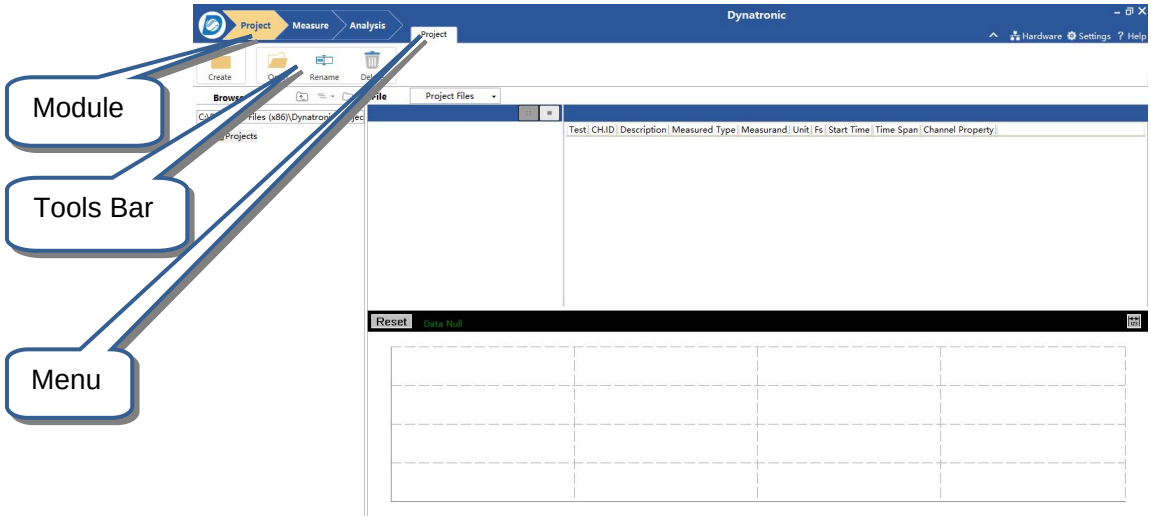



Figure 1.3 Main Interface

Module Options: There are three modules, “Project”, “Measure” and “Analysis”.

Use “Project” module to create a new project or to open a project.

“Measure” module is for real-time data acquisition and basic signal analysis.

“Analysis” module is for data post-processing and report export.

Menu Bar: For each module, there are different menu items; each menu item will produce a related sub-interface or toolbar.

Toolbar: under different menu items, there will be various function buttons.

## 1.3 Hardware Requirements

| Hardware | Requirements |
|---|---|
| CPU | Intel or AMD processor with basic frequency above 1GHz |
| Memory | 1 G (Minimum) |
| Hard Drive | 50 G (Minimum) |

## 1.4 System Requirements

Operating system: Microsoft Windows XP/7/8, 64 bits or under.

Genuine Windows Operating System is recommended. Some Windows Lite Operating System may cause problems.

***Caution:***

***This manual is a general introduction and description of functions of the complete version of the software. Specific function availabilities are subject to change upon purchase.***

# Chapter 2. Hardware

Open software and the instrument. If the device name in the software is not DE-924U, the software prompts that “Equipment is not found”. Click on the button “Hardware” on top right, “Hardware” window will pop up; select “Interface” (1Gbps) and “Instrument” (DE-924U). Click on the button “OK”; a tooltip pops up, select “Yes”; the software will restart and search for the device automatically.

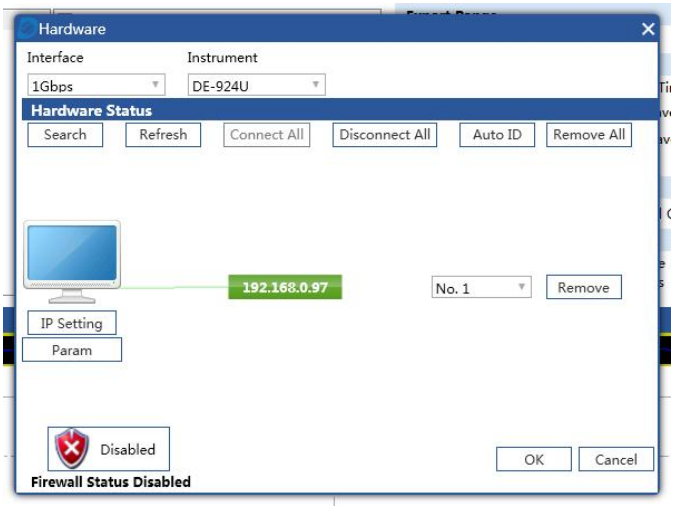



Figure 2.1 Hardware Settings

After the software is restarted, click to enter the “Hardware” interface, than single-click on the button “Search”. If the instrument is correctly connected, an IP address with red background will be shown, press it and hold the left button of the mouse and drag towards right, move it towards the left. You can also click on the button “Connect All” to connect all instruments.

When it is successfully connected, the background color of the IP address is green. When it turns yellow, it means connection fails. You should check computer IP address, firewall settings. When disconnecting, move the cursor to the IP address you want to disconnect; press and hold the left button of the mouse and drag towards right, the background color of corresponding IP address will turn red. Or, single-click on the button “Disconnect All” to disconnect all connected instruments.

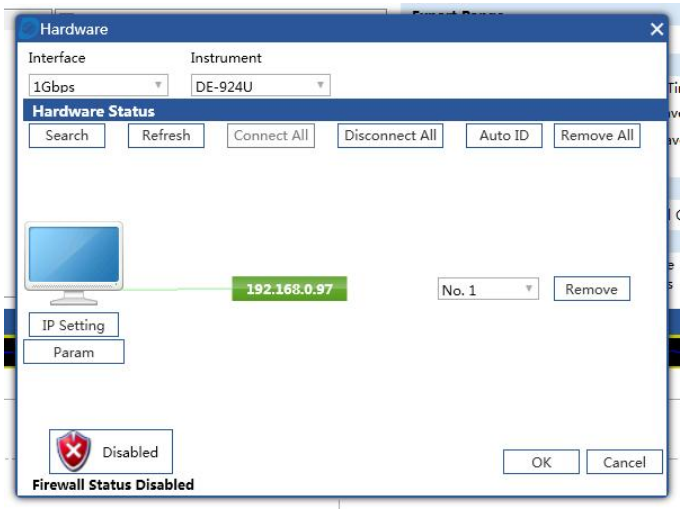



Figure 2.2 Normal Connection

# Chapter 3. Project

## 3.1 New Project File

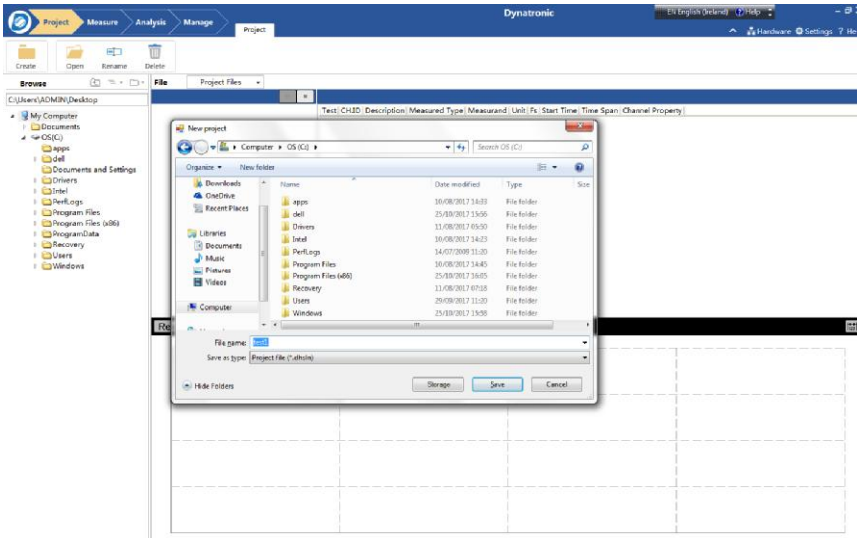



Figure 3.1 New Project

For the very first experiment, you need to create a new project. Select the saving path on the left side; single-click on the button “Create”; input a project name in the popup naming menu; single-click on the button “OK” to complete creating a new project.

## 3.2 Open Project File

If you want to open saved project file, first you must select the saving path on the left side; Project files in the corresponding folder will be displayed in the middle window; select a project file, the right side will display channel information of the corresponding project file, including measurement types, sampling frequency and so on. Single-click on a channel, the time curve of that channel can be viewed in the preview window below.

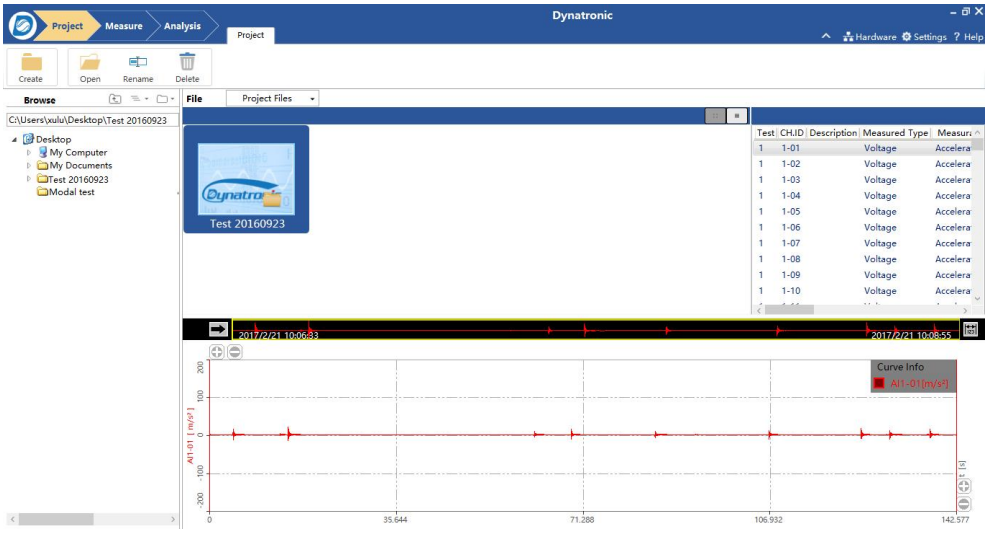



Figure 3.2 Open project file

Single-click on the button “Open” to open that project; or simply double-click on the icon of the corresponding project to open it, then you will turn to “Analysis”.

# Chapter 4. Measure

## 4.1 Parameters

Open the software, after the instrument is successfully connected, entering “Measure” interface. Click “Param”, entering the interface, the parameter files will be shown, you can rename, copy, delete or import it. Double click on the parameter file to import it to the instrument. If the type or numbers of the channels are different from the instrument, the operation will be failed. If you import the file successfully, you will turn to the “Param set ” interface , there you can check the parameter and set the sampling frequency.

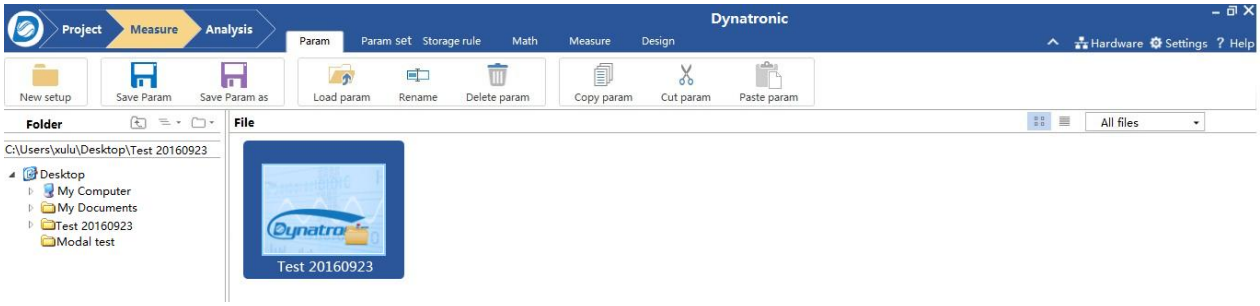



Figure 4.1 Parameters

## 4.2 Storage Rule

Click on the button “Storage rule”, entering the “Storage rule” interface. Storing type and test names can be set in this interface. Multiple batch of test files can be recorded under one project.

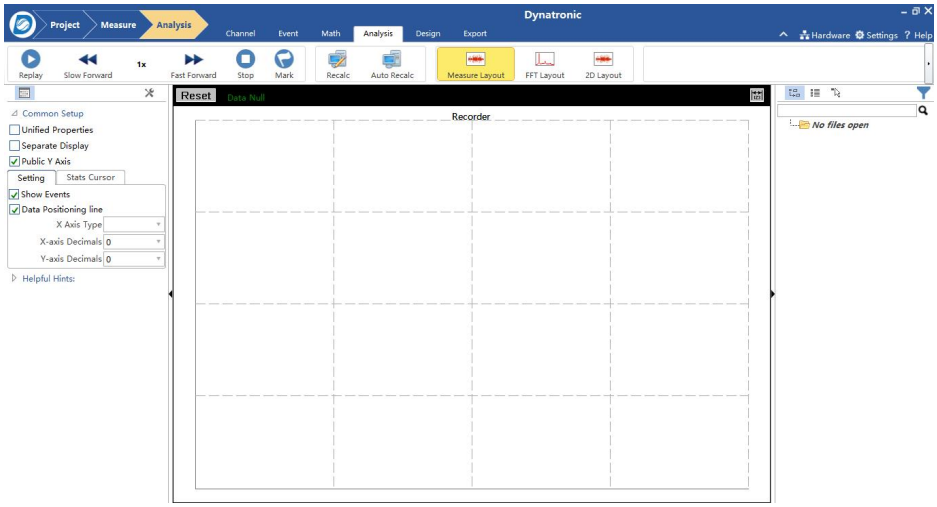



Figure 4.2 Storage rule Interface

### 4.2.1 Name the Test

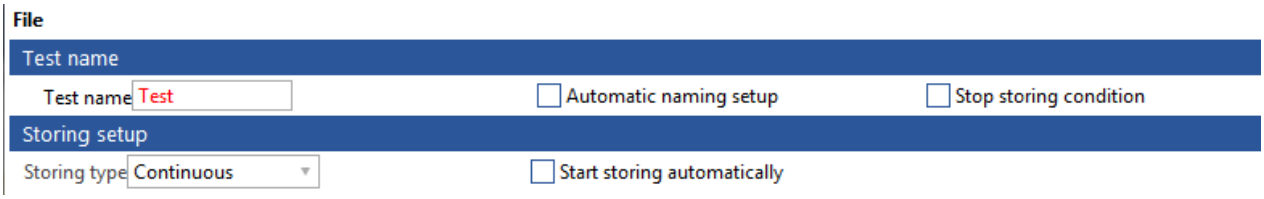



Figure 4.3 Storage

Input a test name in the first box. If the input name is red, this means there already exists a test file with the same name. You should choose another name. Otherwise, the software will prompt to ask whether you want to overwrite the existing one.


Figure 4.4 Conflicting Names

The software is capable of recording test batch under one single project file. When storing data, a new folder with the project name will be created in the selected saving directory; multiple tests in this project will be saved in the same folder.

The software supports automatic naming. Check before “Auto Naming” then click on the button “Setup” to set up naming rules. After setting, single-click on “OK” to complete the naming setup. Every time a test file is being saved, it will be automatically named according to the rules. When checking “Create File”, the software will periodically create a data file according to the rendering conditions and automatically name it according to the naming rules.


Figure 4.5 Auto-naming

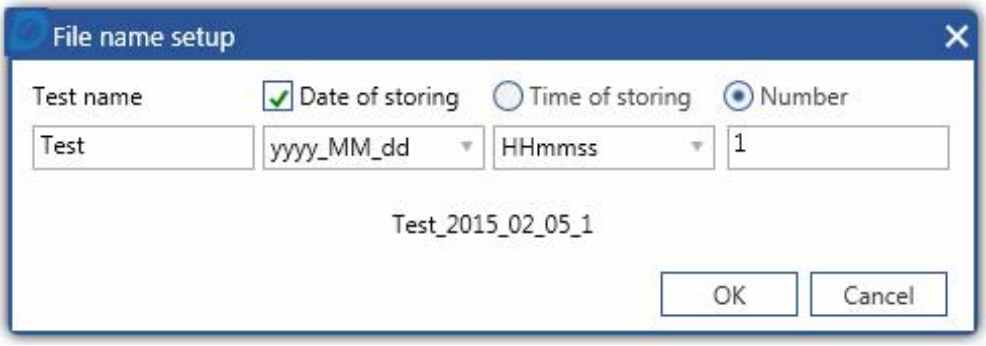


Figure 4.6 Naming Rules

When “Auto Naming” is not checked, you can still set up stop-saving conditions for the test files. When the conditions are satisfied, the software will automatically stop saving (or the software will stop sampling when the trigger rules are satisfied).

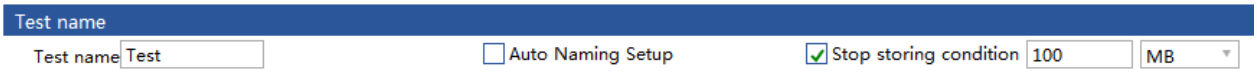



Figure 4.7 Auto-stopping

## 4.2.2 Storing Modes

There are two storing modes: “Continuous” and “Trigger”. When continuous storing is selected, the instrument will continuously record the data. If checking “Start storing automatically”, upon switching to the “Measure” interface, the software will automatically start saving without clicking the button “Store”.


Figure 4.8 Storage Modes

When trigger recording is selected, you can set the storing conditions for data sampling. When “Start storing condition” is satisfied, the software will start storing; when “Stop storing condition” is satisfied, the software will stop storing.

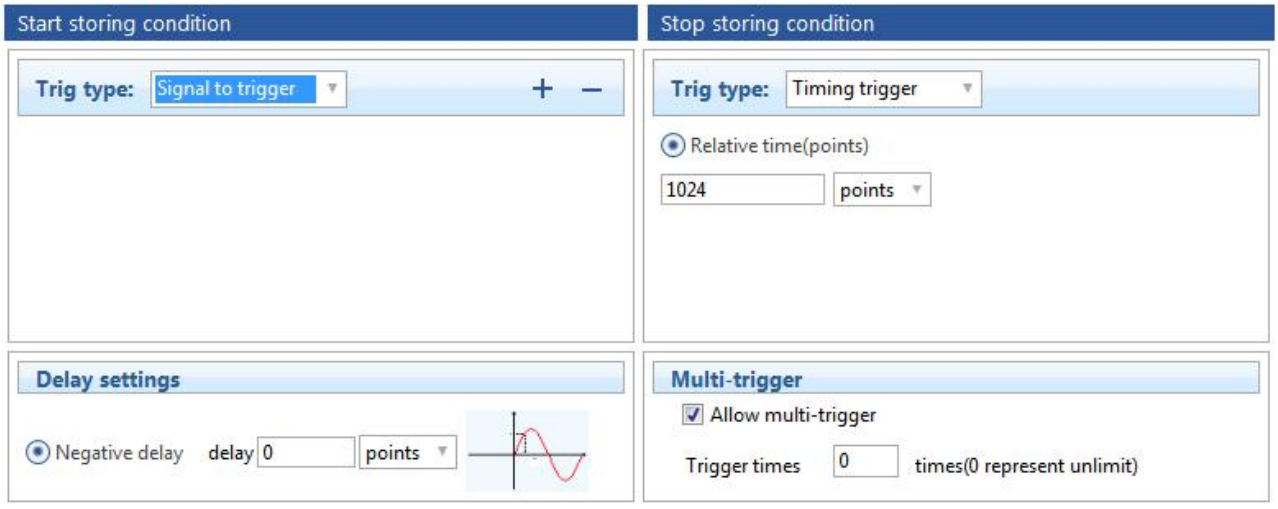



Figure 4.9 Trigger Storing Conditions

There are three “Start storing conditions”: manual trigger, signal to trigger and timing trigger;

1. Manual trigger

In this mode, you need to manually press down the “Trigger” button in the “Measure” interface to start storing.

2. Signal to trigger

In “Signal to trigger” mode, by setting some conditions, the software will start storing when the signal voltage of any selected channel reaches the trigger level. Single-click on the “+” on the right, a “start storing condition” block will be added in the table area below.

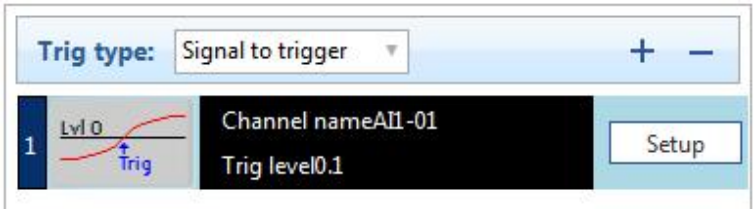



Figure 4.10 Signal to trigger condition list

Click “Setup” on the right, the “Trigger Setup” window will pop up. In this window, you can select channels to be triggered and the trigger levels. When there are multiple trigger conditions, the software will start saving if any of these conditions is met.

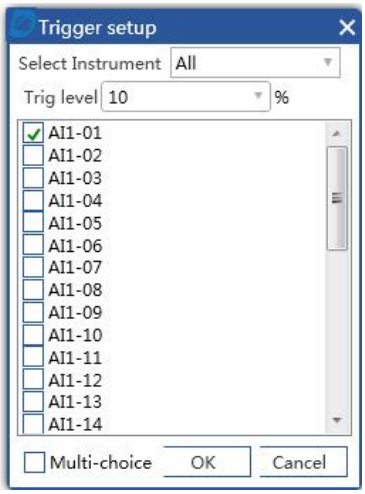



Figure 4.11 Signal to trigger parameters settings

3. Timing Trigger (some translation to be updated)

In “Timing Trigger” mode, by setting triggering time you can start storing.

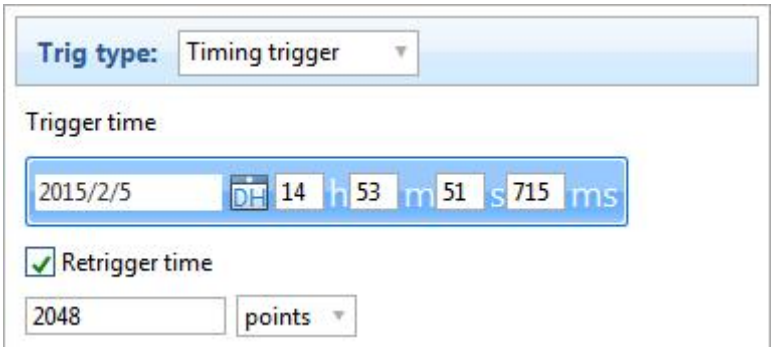



Figure 4.12 Timing Trigger

After checking “Retrigger time”, the software will initiate cycled trigger to store. Now “Stop storing condition” will automatically change into “Timing Trigger”, and only “Relative Time” can be selected. The checkbox before “Allow multi-trigger” will be automatically checked, as shown below: the software starts storing from 16:53:51 715, February 5, 2015, and stops storing after collecting 1024 points. After waiting for 2048 points from the previous trigger timing, the software will start storing again. The triggering cycles will continue until it is manually stopped. In addition, more triggers can be added in the “Custom” section by clicking “+” symbol.

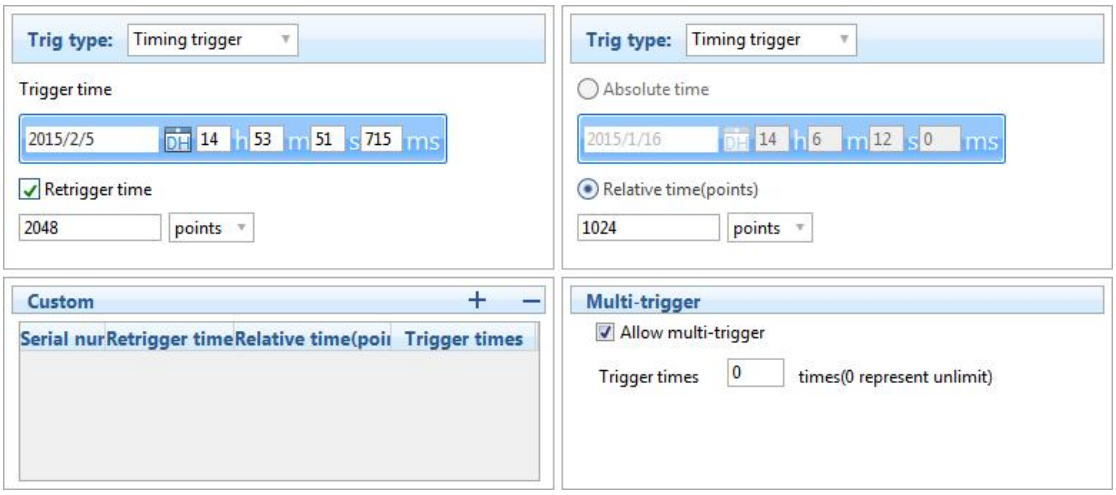



Figure 4.13 Timing Retrigger

4. External Trigger

If the instrument is equipped with “Ext Trigger” terminal, “External trigger” function will show in the dropdown list. You can trigger sampling through the external trigger port of the instrument.

There are two stop storing conditions available: manual trigger and timing trigger.

1) Manual trigger

Similar to manually starting storing, you can manually press down the trigger button in the “Measure” interface to start/stop storing.

2) Timing trigger

In timing trigger mode, stop storing conditions include absolute timing and relative timing. Absolute timing: when the system time satisfies the timing conditions, the software will automatically stop storing. When multiple triggering is allowed, absolute timing is not available. Absolute timing can only be used for single triggering. Relative timing: when configured points are collected or when configured time span is reached, the software will automatically stop storing. Relative timing allows multiple triggering.

## 4.3 Analog Channel Settings

### 4.3.1 Settings

Select “Measure” → “Param set” → “Analog” to enter analog channel settings interface. In this interface, you can set analog channel parameters.


Figure 4.14 Analog Channels

Select appropriate sampling frequency according to the target signals.

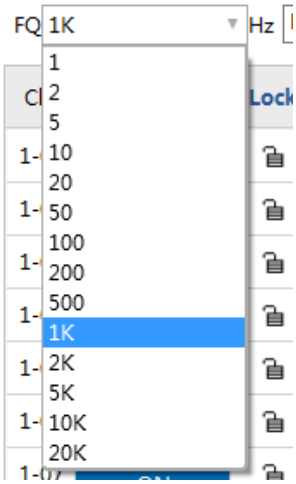



Figure 4.15 Set Sampling Frequency

Double click on “ON/OFF” of any channel row to turn on or turn off that channel. If you turn a channel off, the channel will become non-working channel and disappear from the channel list in other interfaces. Move the mouse to the column “ON/OFF”, a menu will pop up where you can choose to turn on/off all channels. The number of working channels will affect the selectable range of maximal sampling frequency.

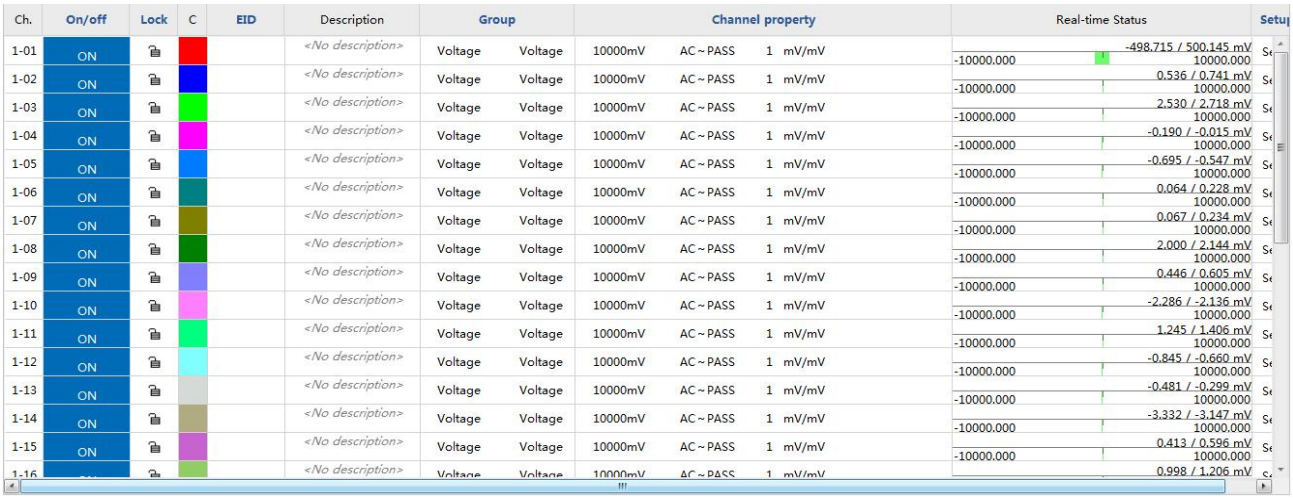



Figure 4.16 Analog Channels List

The “1-01” in the channel number column means channel No. 1 of No. 1 DAQ instrument. Single-click on the color of a channel, a palette will pop up where you can modify the graph color for that channel.

The channel property column displays some parameter information of corresponding channels. When clicking on corresponding parameters, a dropdown menu will pop up and you can quickly set up the parameters.

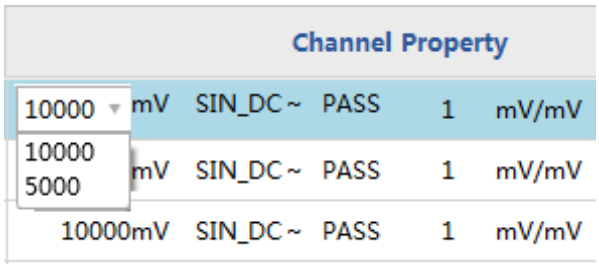



Figure 4.17 Set up channel parameters

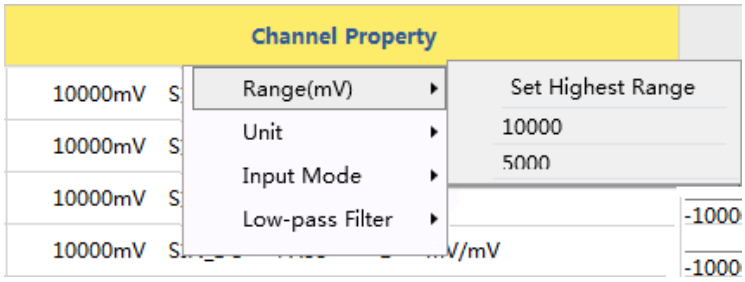



Figure 4.18 Unified parameters set up

Move the mouse to the column title, a menu will pop up, where you may choose measurement range, input modes, upper frequency limit and other common parameters (only parameters shared by all the selected channels are listed here). Multiple channels can be selected by “Shift + left

mouse button” or “Ctrl + left mouse button”, whose parameters can be configured together. The real-time status column displays the signal of each channel, according to which you may adjust the range manually.

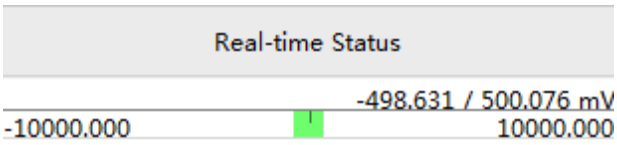



Figure 4.19 Real-time Status

Move the mouse to the label “Balance and Zero” to balance and zero all channels or selected channels in the group.

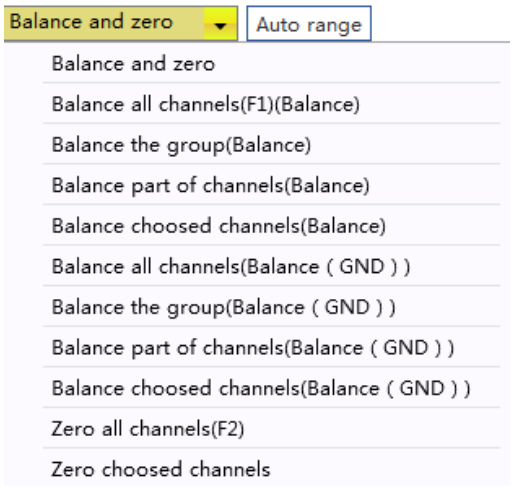



Figure 4.20 Balance and zero

Move the mouse to a channel and right-click, a menu will pop up where you may copy or paste parameters of this channel or clear this channel only.

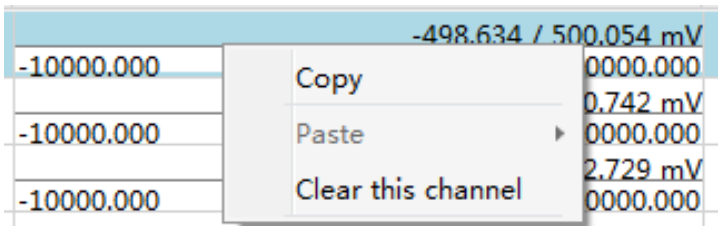



Figure 4.21 Right-click on the channel

You can copy parameters of selected channel to another channel, or to all channels of the same type, or to selected channels. Select an analog channel, right-click and choose “Copy” to copy parameters. Move the mouse to a channel of the same type, right-click to select “Paste” and pick an option. Click on “Paste into current channel” to copy parameters to the selected channel; click on “Paste into all channels of same type” to copy parameters to the channels of the same type;

click on “Choose channels to paste”, a dialogue box will pop up where you can choose channels and even parameters to be pasted.

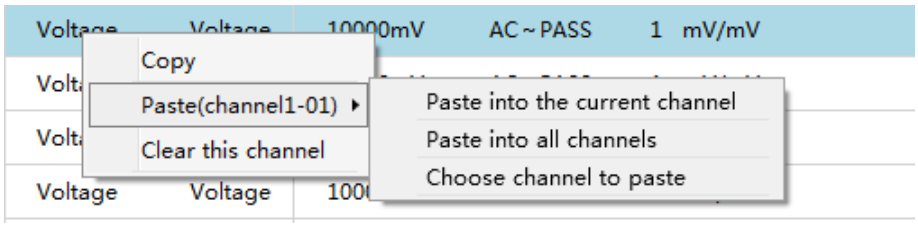



Figure 4.22 Copy parameters

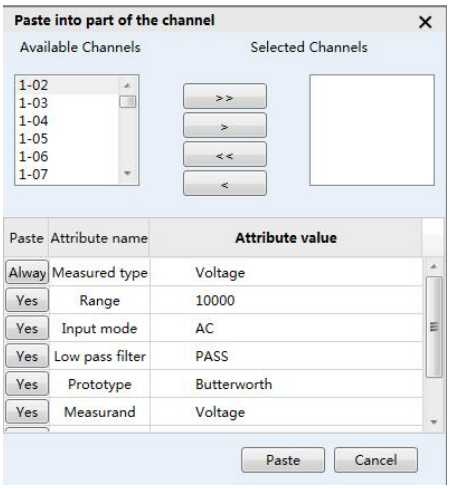



Figure 4.23 Paste options

Single-click on the button “Setup” of each channel row to configure detailed parameters for that channel. Channels of different types have different parameter settings interface.

## 4.3.2 Voltage Measurement

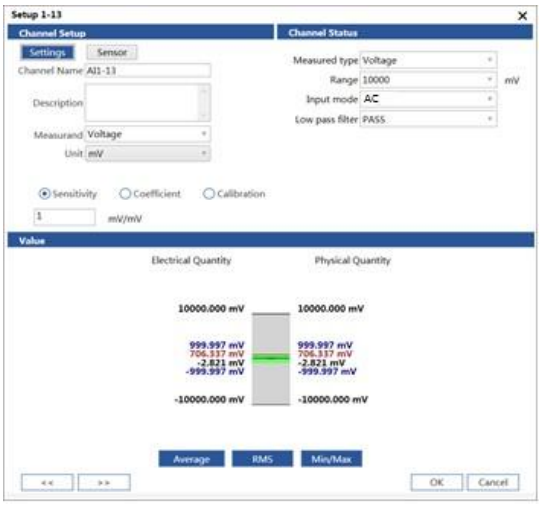



Figure 4.24 Voltage channel settings

Channel name is the name of corresponding channel, which displayed in the signal channel list in the “Measure” interface. Select correct “Input Mode” and “Sensitivity” according to the connected sensors.

Set up “Measurand”, “Unit”, and filtering according to the signals to be measured. Engineering unit will automatically change according to the selected “Measurand”. Choose appropriate measuring range as stated before.

Select the sensor from transducer database or manually add a sensor as mentioned in previous sections.

***Caution:***

***You can only set the input mode as “IEPE” when the connected sensors are IEPE type. Otherwise, the sensor may be damaged.***

## 4.4 Math

Select “Measure”-“Math”, enter real-time algorithm settings interface, which is used to real-time data processing, analysis and display, including many analysis methods.

There are two ways to create new algorithms:

1. The first one is to single-click on the algorithm module on the left side; and an algorithm module will be automatically added on the right side;
2. The second one is to point the mouse to the corresponding module on the left side, press down and hold the left mouse button, drag the cursor to any place on the right side to add the algorithm; release the mouse button to complete the adding.
3. Delete Algorithm Module: Point the cursor to the corresponding algorithm module in the editing section on the right; single-click on the left mouse button to select the corresponding algorithm module; press the button “Delete” on the keyboard to complete deleting the algorithm module.

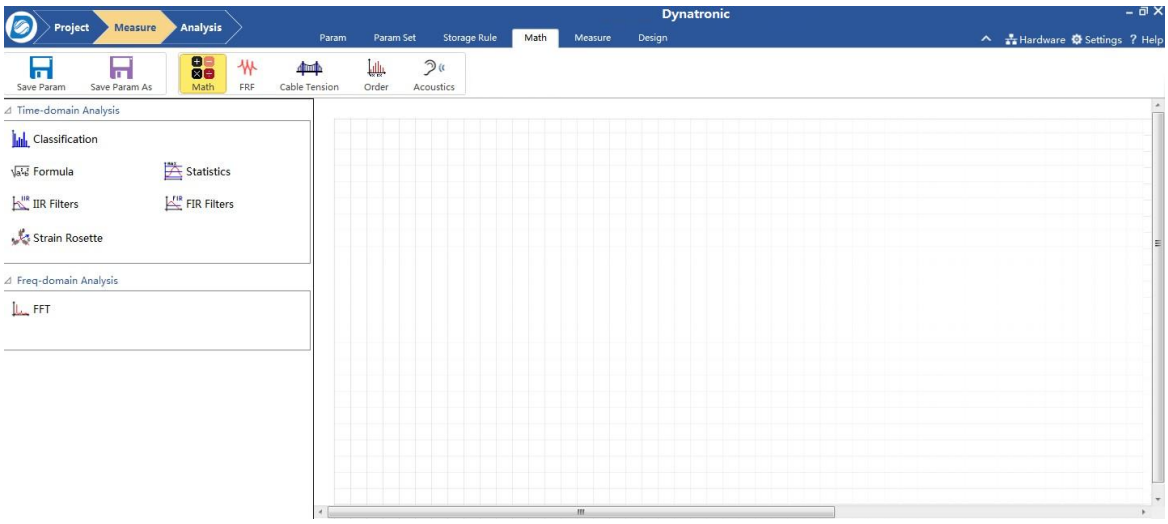



Figure 4.25 Math

1) FFT

Add the FFT module and enter the setting interface. Select channels to be analyzed from the list in the “Import” window. Multiple channels can be selected. Channel name, curve color and more can be configured in the export window on the lower left. The export channel name will be the name that displayed in the signal selection list in “Measure” interface.

Click appropriate algorithm on the left, corresponding algorithm icon will appear in the right area. Double-click the icon, a detailed algorithm settings interface will pop up to create virtual channels. The diagram below is a detailed algorithm settings interface for FFT algorithm.

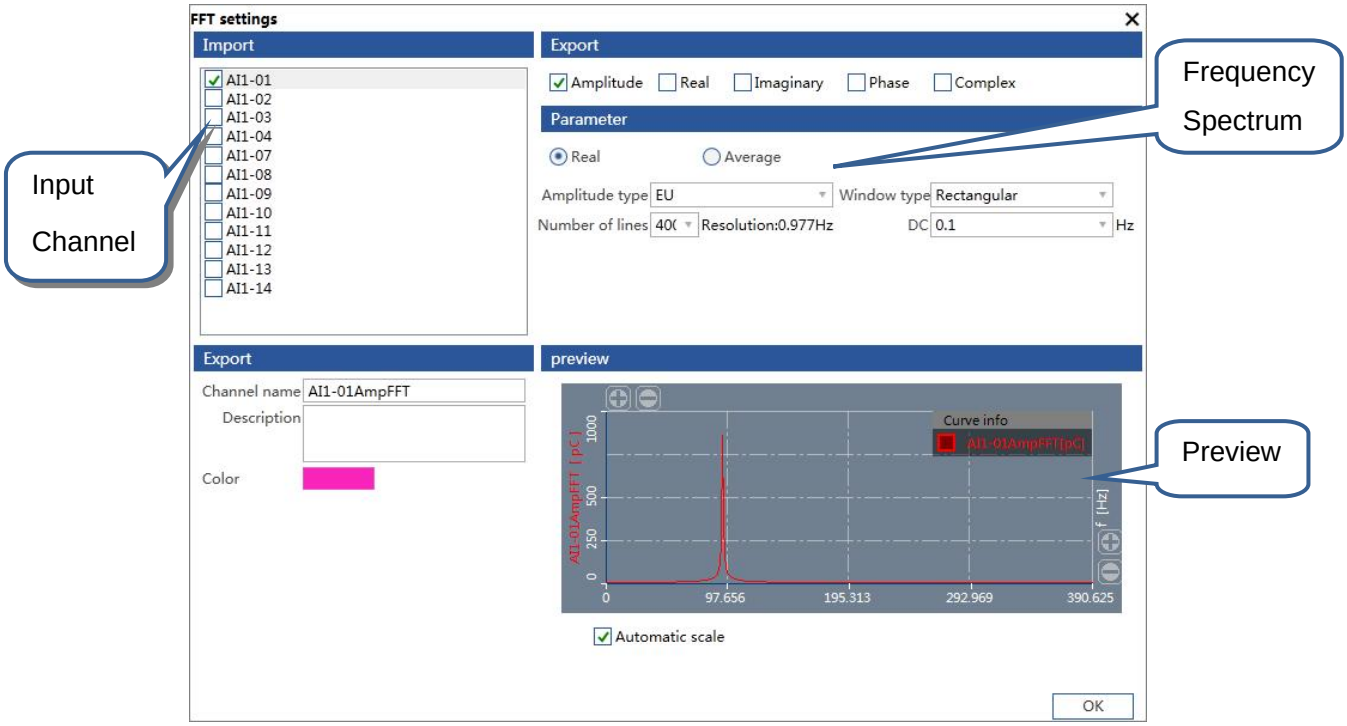



Figure 4.26 FFT parameter settings interface

Spectrum analysis parameters can be configured based on the actual testing. There are real-time spectrum and average spectrum available. Real-time spectrum is the amplitude spectrum of Fourier spectrum of every data block. Average spectrum is an amplitude spectrum, which is the result of averaging the real-time spectra of all data blocks. When selecting average spectrum, you can set averaging methods and overlap rate.

Averaging includes non-averaging, linear averaging, exponential averaging and peak averaging. Averaging is extensively applied in spectrum measurement of random or compound random periodic signals. The purpose of averaging is to improve statistical precision or suppress the noise. Averaging is introduced with respect to the raw data. Non-averaging means no averaging. Linear averaging is a basic type of averaging. When adopting this averaging, you have to first perform FFT and other calculation for all given data blocks one by one. Then make uniformly weighted

linear averaging of all spectrum values of each frequency point, respectively. For analyzing stationary random process, increasing average times can reduce relative standard deviation. Exponential averaging is non-uniformly weighted averaging. The last result of FFT spectrum analysis counts as half the weight of the final averaging, while all previous FFT spectra count as the other half of the weight. The exponential averaging emphasizes the importance of the last measurement. Exponential averaging is often used for analysis of non-stationary processes. By using this type of averaging, not only you can examine the basic characteristics of the “latest” measured signals, but also can you reduce the measurement error or improve signal-noise ratio by averaging with “Old” measured values. Peak-holding is peak averaging, which just retains the maximal value of every measurement for each frequency point.

Overlap rate is used to set the percentage to cover averaging, that is, the reuse factor of time domain data. For example: if the overlap rate is set as 50%, when making FFT analysis for the first time, you must collect enough data points to fulfil FFT setting. For the subsequent FFT analyses, you only need to collect half of data points, and the previously collected data can be used as the other half. This is very useful for measurement of low-frequency FFT analysis and also requiring higher frequency resolution.

The lower right is the preview window. Click on different input channels to preview the corresponding analysis results. Click on the button “OK” to complete settings.

In “Measure” or “Analysis” interface, 2D View is adopted to observe FFT analysis results.

2) Formula

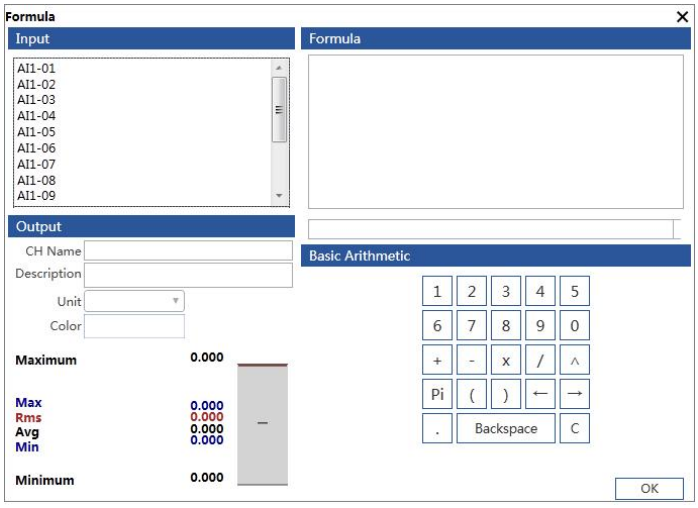



Figure 4.27 Virtual channel parameter settings interface

It’s used to make some arithmetic calculation and combination of measurement channels to create new virtual channels. For example, if you want to add signals of Channel 1-01 and 1-02 together, you can perform the operation of “AI 1-01 + AI 1-02” as shown below:

1. Add the module and enter the setting interface, channel name, curve color and more can be configured in the export window on the lower left. The export channel name will be the

name displayed in the signal selection list in “Analysis” interface,

2. Double-click on “AI1-01” in the “Import” window on the top left;
3. single-click on “+” on the lower right;
4. Double-click on “AI1-02” in the “Import” window;
5. In the window area on the right, the arithmetic formula will be displayed.

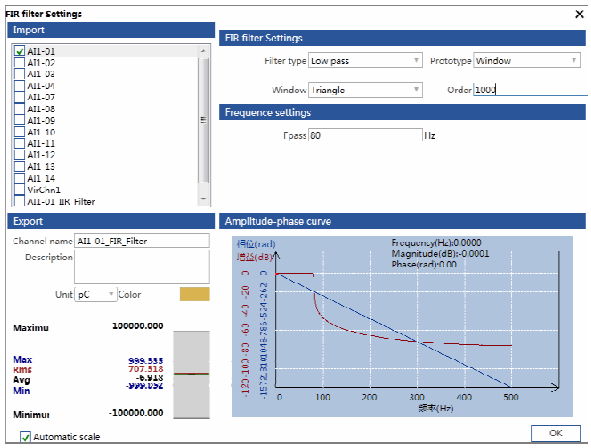
If the compiled formula is erroneous, the software will prompt “Error” message after the formula editing area. Click on the formula editing row to modify.

In “Measure” or “Analysis” interface, recorders, digital meters and bar charts are adopted to observe the virtual channels.

3) Filter

You can select two different types of filter: FIR filter and IIR filter whose setting interfaces are different. Select the import channels and configure parameters as needed. The export channel name is the name of corresponding channel displayed in the signal selection list in “Measure” interface.


1)IIR filter




2)FIR filter

Figure 4.28 Filter settings

1. IIR filter

High precision of amplitude-frequency characteristic; non-linear phased. According to the requirements, select appropriate filtering modes and filter types, as well as setting up proper cutoff frequencies, passband flatness and stopband attenuation. The smaller the passband flatness, the smaller the fluctuation within the passband range, which means the smaller amplitude change. The bigger the stopband attenuation, the bigger the suppression of amplitude within the stopband frequency range. However, if the passband flatness is too small and the stopband attenuation is too big, the filter will not be stable. By observing the filter’s amplitude-frequency characteristic curve, select a proper combination of passband flatness and stopband attenuation to achieve the best results.

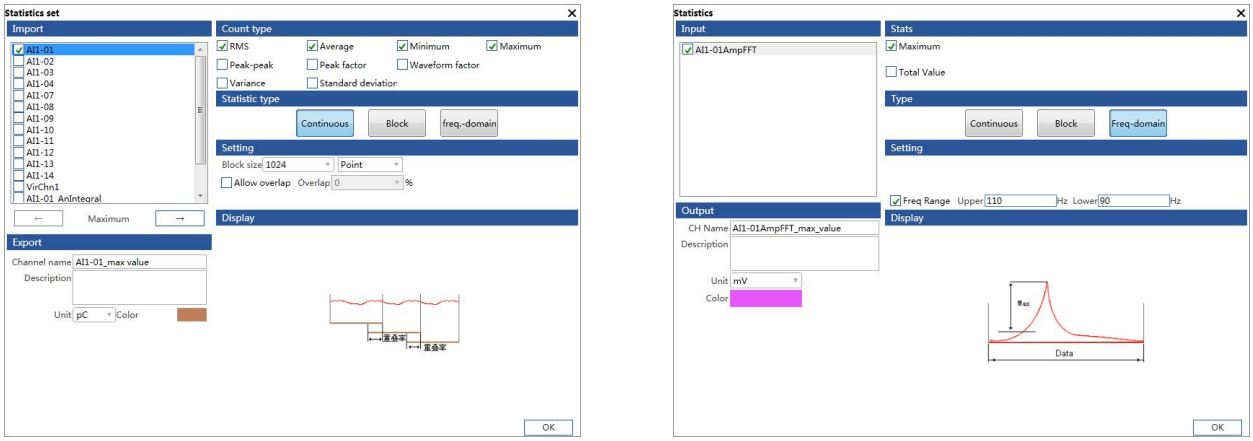
2. FIR filter

Relatively low precision of amplitude-frequency characteristic comparing to IIR; linear phases. According to the actual requirements, select proper filtering modes and window function. Set up proper cutoff frequencies and orders through previewing amplitude-frequency characteristic curve.

The filtered signals can also be used for other analysis, such as FFT.

In “Measure” or “Analysis” interface, recorders, digital meters and bar charts are adopted to observe filtered signals.

### 4.4.4 Statistics




1)Continuous 2)Freq-domain

Figure 4.29 Statistical information

Add the module and enter the setting interface. Select the import channels and configure parameters as needed. The export channel name is the name of corresponding channel , which displayed in the signal selection list in “Measure” interface. For time domain statistics, you can select RMS value, average, min and max value, etc. For frequency domain, you can select gross value and max value. Statistical analysis includes: “Continuous” statistics, “Block” statistics, and “Freq-domain” statistics.

In “Continuous” statistics mode, after setting up the analysis points and overlap rate, the software will continuously calculate related statistical information. In “Block” mode, the software will calculate at certain intervals and display the values.

Both “Continuous” and “Block” modes are statistical algorithms in the time domain. Only channels of time history data can be selected for statistical calculation.

“Freq-domain” statistics is statistical algorithm in the frequency domain and can only calculate two values: the maximal value and the gross value. In channel selection area, you can only select frequency spectrum signals.

In “Measure” or “Analysis” interface, recorders, digital meters and bar charts are adopted to observe the results of statistical analysis.

### 4.4.5 Continuous spectrum

First establish the FFT, select the analyzed channel, set FFT lines and other parameters to observe the real-time spectrum.

Then establish the statistics, select “Freq-domain”, select the FFT output as the input, the statistical type is set to “maximum”, selecte the freq range, set the frequency upper and lower.

In the “Measure” or “Analysis” interface, use the recorder to observe the calculation results.

## 4.5 Measurement

Select “Measure” → “Measure” to enter the “Measure” interface. This interface is used to control data storage and display real-time data, which consists of sampling toolbars, display properties window on the left, display window in the middle and signal selection list on the right.

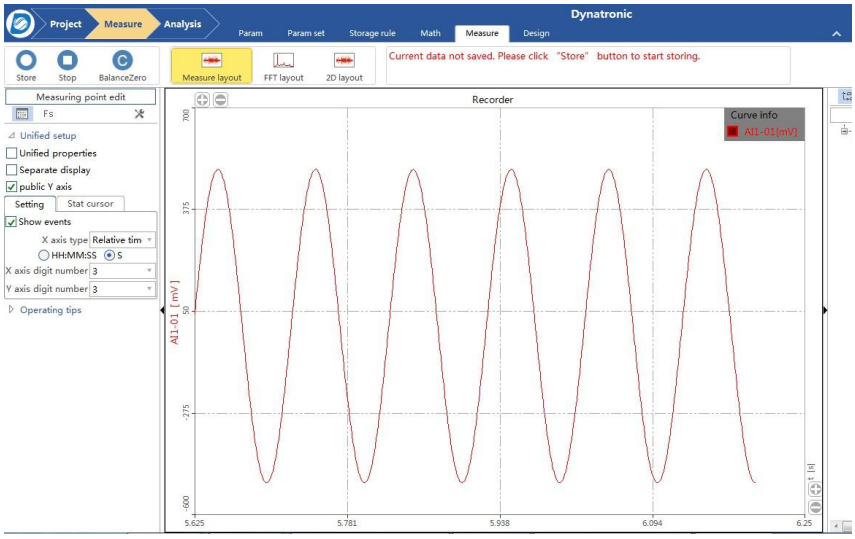



Figure 4.30 Measurement interface

### 4.5.1 Start/Stop Storing

After setting up storing rules, channel parameters and analysis module, click “Store” in the toolbar (if checked “auto saving” in “Storing Rules”, the software will start storing instantly when switching to the “Measure” interface.); the software will start storing according to the preconfigured rules. If the saved test name conflicts with existing files, the software will prompt whether to overwrite. Click on “Yes” to delete existing files with the same name and start storing. Click on “No”, a dialog box will pop up to create a new project or test.


Figure 4.31 Control buttons

After the system starts storing, if stop storing conditions are set, the software will automatically stop storing upon fulfilling those conditions. You can also click “Stop” to manually stop storing.

### 4.5.2 Layout design

In “Measure” interface, the view layout is non-editable. The size and position of the view window is fixed and not adjustable.


Figure 4.32 Layout

Click on the tag “Design” on the left panel of the interface to enter the layout “Design” interface. In this interface, you can freely add a view window, delete a view window, and/or modify the size and position of a view window.


Figure 4.33 Design

Add view window: the software has many view window options. Click any view window on the toolbar to add corresponding view windows in the interface below.

Delete view window: select a view window; click “Delete” from the toolbar to delete selected view window or right-click to select delete. You can also delete the view window using the “Delete” key from the keyboard.

In “Design” interface, you can select a view window and drag to any location. You can also drag the corner/edge to change the window size. When selecting a view window and right-clicking to select “Bring to Front” in the popup menu to display that window in front of other windows. When there are multiple view windows in the layout interface, click “Horizontal” or “Vertical” to automatically arrange the windows.

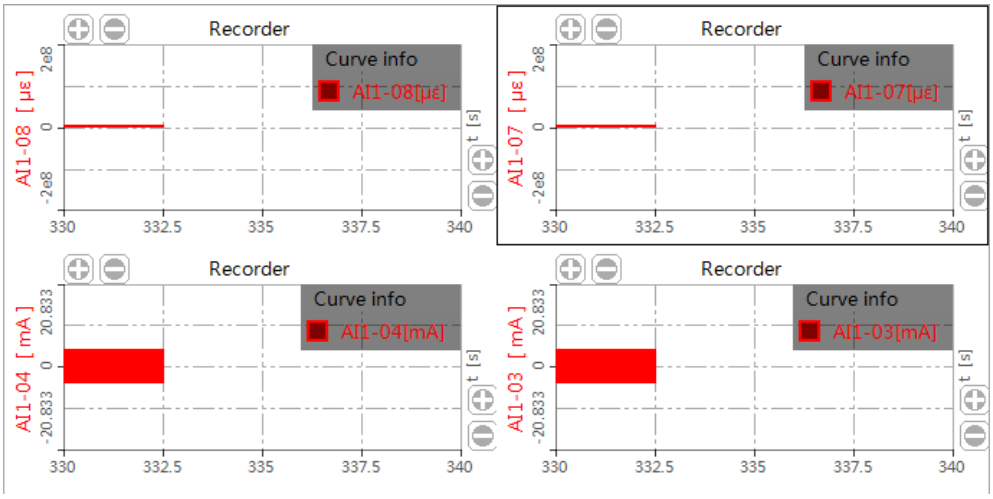



Figure 4.34 Horizontal tile

After completing designing, click “Measure” on the left side to quit “Design” interface and automatically save the layout.

## 4.6 Layouts

1) Recorder

Display the selected data in curved lines. This view is mainly used to observe time history curves.

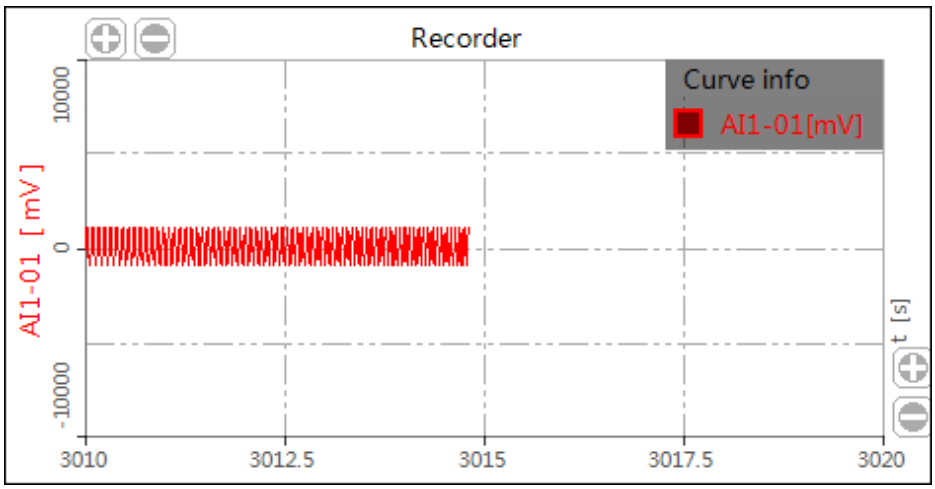




Figure 4.35 Recorder

2) 2D Graph

2D Graph is used to observe FFT frequency spectrum and other frequency response functions, etc. Coordinate types (linear, log scale or dB), graphic display modes and other parameters can be set.

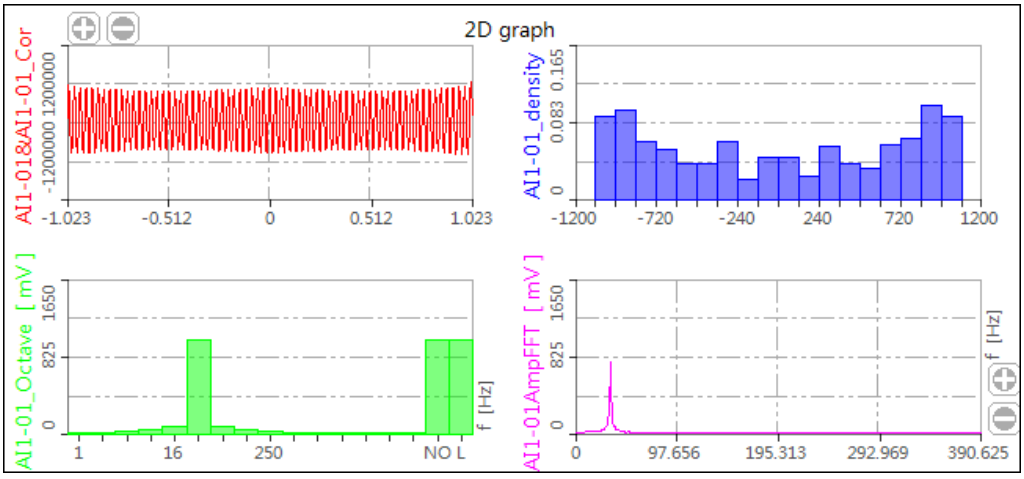



Figure 4.36 2D Graph

3) FFT

Real-time display of FFT spectrum. Both average spectrum and real-time spectrum are available. It is different from the FFT in “Analysis” module, in that the FFT data here can only be displayed rather than for further processing and analysis.

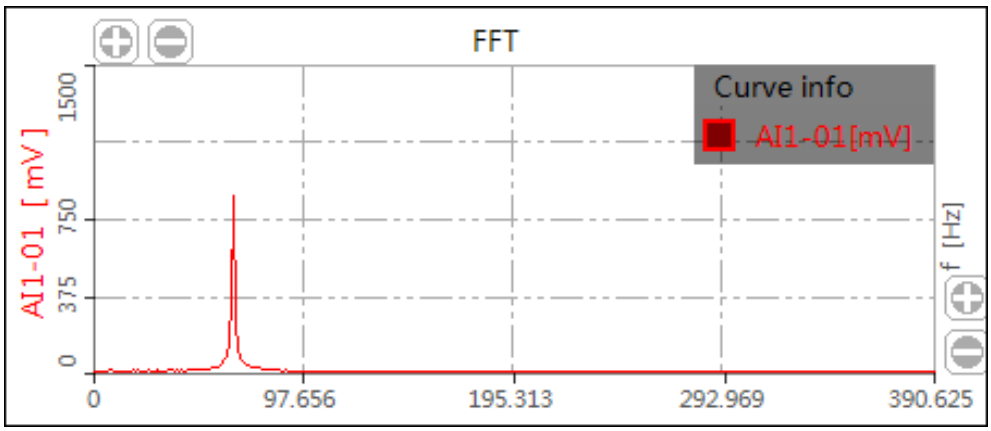




Figure 4.37 FFT

4) Digital Meter

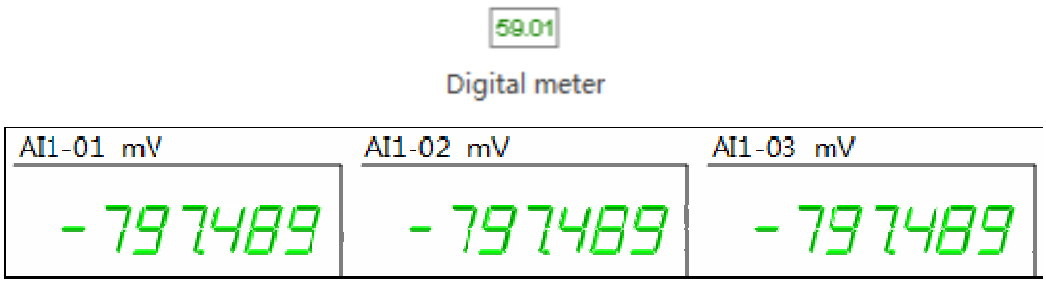



Figure 4.38 Digital meter

Display measured value, statistical value or time in the form of digital meters. It also has alarm function. When the value exceeds the threshold, it will be highlighted.

5) Vertical Bar

Display measured value and statistical value in the form of bar charts. It also has alarm function. When the value exceeds the threshold limit, it will be highlighted.

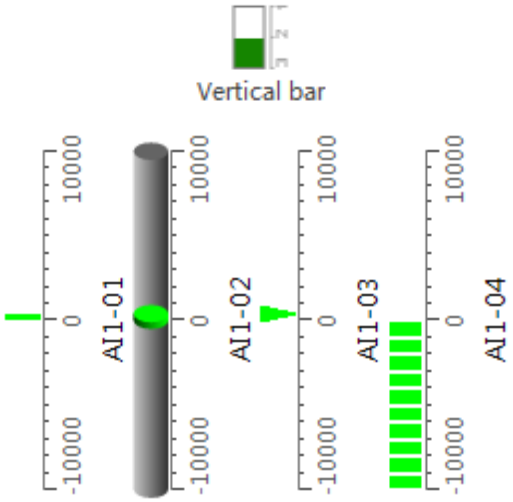



Figure 4.39 Vertical bar

6) 3D Graph

Displaying spectrum graph in 3D means which is typically used for displaying waterfall plot and other 3D spectrum graphs.

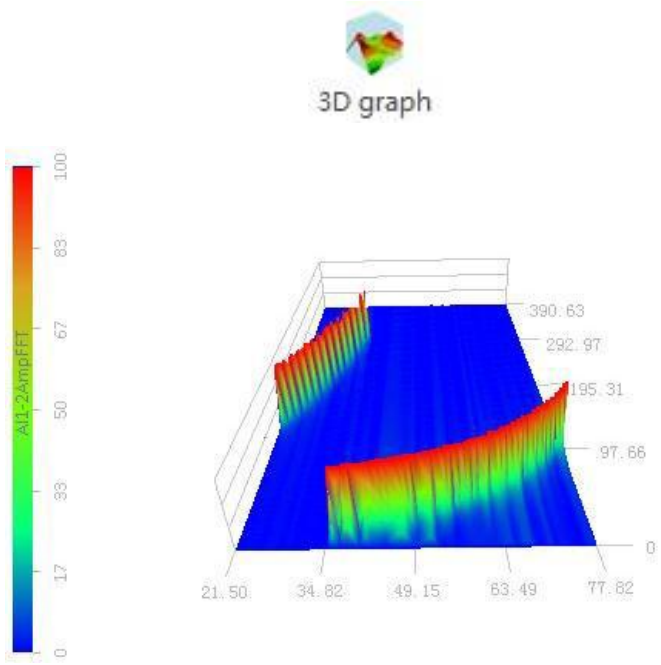



Figure 4.40 3D Graph

7) Table


Display data of selected channels in the form of table. It is applicable for displaying slowly varying signals, statistical values and four-cursor calculation results.

| Time | AI1-01<br>mV | AI1-02<br>mV | AI1-03<br>mV | AI1-04<br>mV |
|---|---|---|---|---|
| 2015/02/05 13:24:32... | -480.238 | -553.109 | -480.238 | -480.238 |
| 2015/02/05 13:24:3... | -248.301 | 163.175 | -248.301 | -248.301 |
| 2015/02/05 13:24:32... | 123.756 | 616.2 | 123.756 | 123.756 |
| 2015/02/05 13:24:32... | 478.613 | 987.718 | 478.613 | 478.613 |
| 2015/02/05 13:24:32... | 680.961 | 995.668 | 680.961 | 680.961 |
| 2015/02/05 13:24:32... | 901.868 | 459.724 | 901.868 | 901.868 |
| 2015/02/05 13:24:32... | 997.429 | 225.722 | 997.429 | 997.429 |
| 2015/02/05 13:24:32... | 998.581 | -498.888 | 998.581 | 998.581 |
| 2015/02/05 13:24:32... | 850.807 | -853.318 | 850.807 | 850.807 |
| 2015/02/05 13:24:32... | 599.214 | -979.764 | 599.214 | 599.214 |
| 2015/02/05 13:24:32.5 | 494.726 | -580.447 | 494.726 | 494.726 |

Figure 4.41 Table

8) XY Recorder

Show the measured data in the pattern of X-Y Recorder. There are two patterns here: public X axis display (multiple Y Axis signals share one X Axis), and grouped display (one X axis signal corresponds to one Y axis signal).

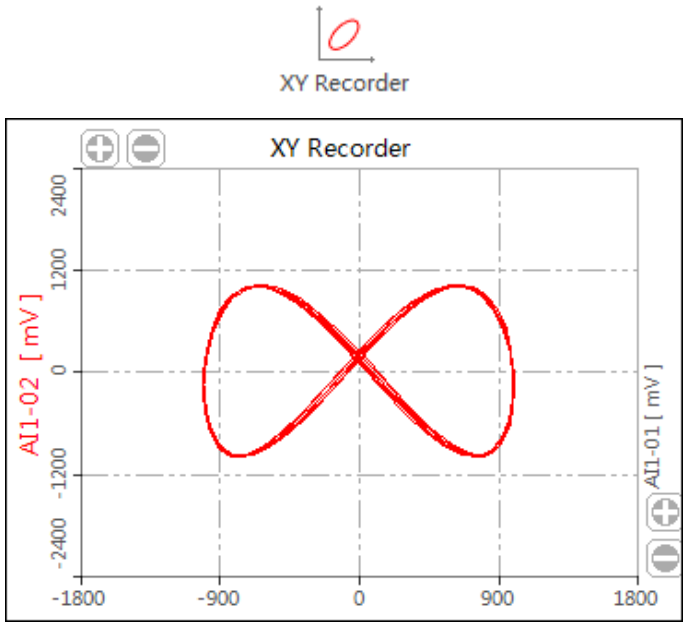



Figure 4.42 XY Recorder

## 4.7 Select Signals

Select a view window and the corresponding channel list of the view window will be displayed on the right panel. View windows of different function also have different channel list. For example, recorder view can select analog channel signals, virtual channel signals, integration/differentiation signals, etc. 2D view can select frequency spectrum signals, amplitude analysis signals, and frequency response analysis signals, etc.


1)Selection list of recorder signals 2)Selection list of 2D Graph spectrum

Figure 4.43 Selection list

In the signal list, you can click/check the signal channel to observe corresponding signal. When the icon before the channel changes from to , the signal curve of that channel will be

displayed in the corresponding view window. When you uncheck a channel (the icon changes from to), the signal of that channel will be removed from the corresponding view window. Click on the button on the top of the right panel to view all selected signals in the corresponding view window.

When there are many signal curves in the view window, check ( ) the function “Separate Display” to display each signal curve separately in one view window. You can set up the number of columns to be displayed (one column means sharing the same X-axis). When unchecked, all curves will be superposed in one view window.

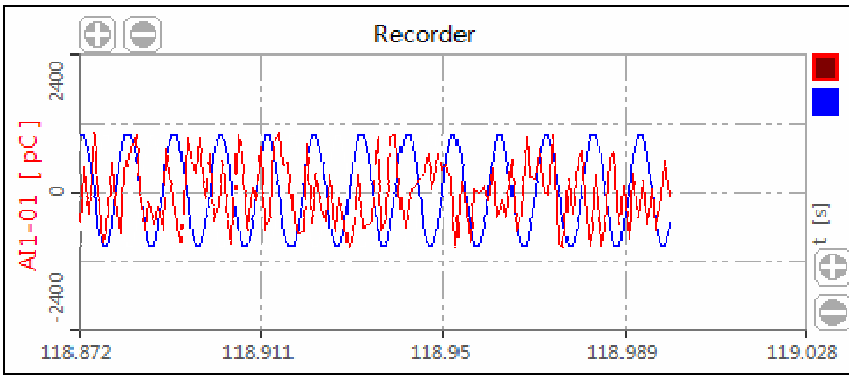



Figure 4.44 Superposing Display

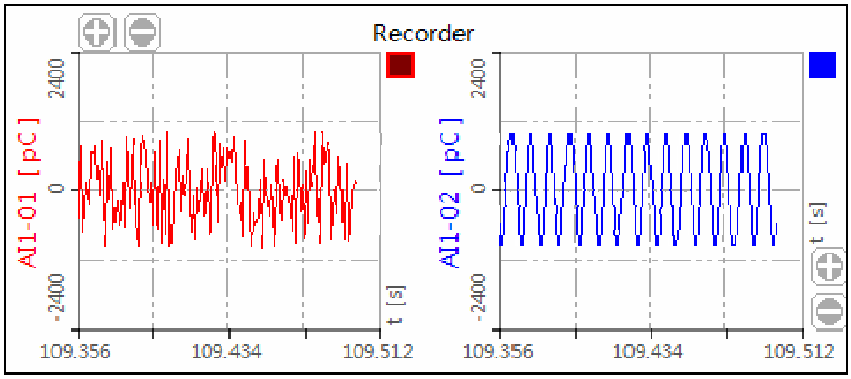



Figure 4.45 Separate Display (2 columns)

## 4.8 View Window Operations

### 4.8.1 Zoom

#### 4.8.1.1 Auto Scale

In the view window, move the cursor to the scale on Y axis, the cursor will turn into shape.

Left-click the mouse, the software will automatically adjust the display range according to the signals magnitude. If there are more than one signal curve superposing, the software will adjust the display range according to the maximum value and the minimum value of all signals in the window. If separate display is chosen, each sub-window will adjust the display range according to the signal,

respectively.

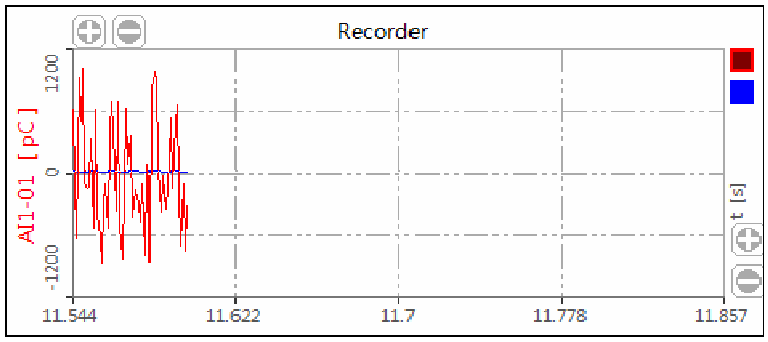



Figure 4.46 Auto scale - superposing display

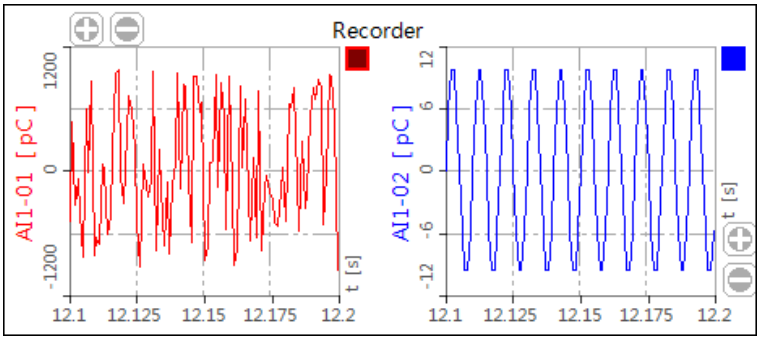



Figure 4.47 Auto scale - Separate display

Right-click to exit auto scale and return to the measurement range. When there are multiple curves in the view window, the software will use the maximum signal range as the display range in the window. Under separate display option, each sub-window returns to its measurement range correspondingly.

4.8.1.2 Vertical Zoom

In the view window, move the cursor to the top left and click the button  to vertically zoom in the signal; click  to vertically zoom out the signal.

4.8.1.3 Horizontal Zoom

In the view window, move the cursor to the bottom right and click on the button  to horizontally zoom in the signal; click on the button  to horizontally zoom out the signal.

1) Local Zoom

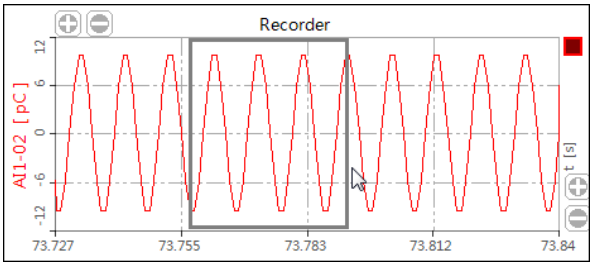


Figure 4.48 Local zooming

If you want to change the time span for display, you can perform local zooming using the mouse. Hold down the “Ctrl” key and left click at the start point of the data block to be amplified (a rectangle starts forming), then drag the mouse to the stop point of the curve and release both buttons. Now you can zoom in the section of curve framed within the rectangle. For accurate zoom in, you can click the start time and end time on the time axis and input desired time to display that a specific data block.

#### 4.8.1.5 Panning

In the display window, move the cursor to the vertical axis area and a stroll bar thumb appears.
Move the cursor to the thumb and drag the mouse upward or downward to translate the signal curve.

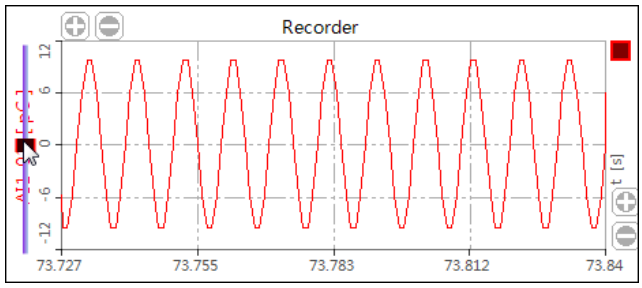



Figure 4.49 Translating signals

#### 4.8.1.6 Change Line Types

In the display window, move the cursor to the curve legends on the top right. Right-click to pop up a window where you can change color, line type and other parameters of corresponding signal curves. Click “OK” to save and close the setting window.

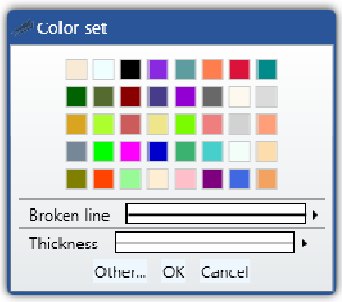
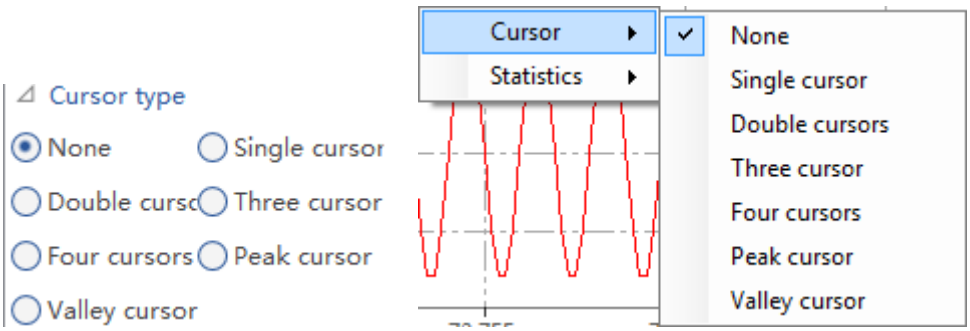



Figure 4.50 Change line types

### 4.8.2 Use the Cursor

Cursor reading is a very useful function through which the user can observe and compare collected data from different channels. Select a display window; click on the tab “Stats Cursor” in the left properties panel where you can select different cursor type. Or, in the display window, right-click the mouse and select “Cursor”, the user can also switch between different cursor types.




1)Properties panel 2)Right-click menu

Figure 4.51 Cursor

1. Single Cursor

Use the single cursor reading to observe the time (frequency) or amplitude value of any point on the curve.

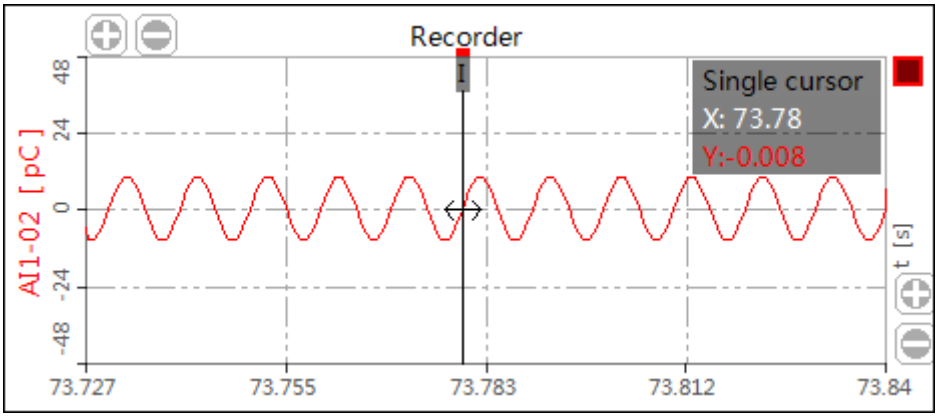



Figure 4.52 Single cursor

The cursor reading is displayed in the floating “information window”. You can drag the information window to any location inside the display window. A small red block will appear on the top end of the cursor. Below there is another small box with a Roman number “I” inside the box representing Cursor 1. “X” value represents the value of Cursor 1 on the X-axis, which is the time here. “Y” value represents the value of Curve 1 on Y-axis in the display window. If there are several curves in one display window, each curve will render a “Y” value on Y-axis as a separate row. The font color of the “Y” values is the same as the color of corresponding curve. When multiple curves are displayed in one window, through single cursor reading, the user can observe

signals of multiple channels at the same time, which is helpful when comparing different signals. When using single cursor, the user can move the cursor around in three ways:

Click at any point on the curve, the cursor will move to that spot;

Use the direction key "←" or "→" on the keyboard to move the cursor by one sampling period to the left or right. If the user keeps hold the direction key, the cursor will continuously move to the left or right until it reaches the left or right boundary of the curve displayed in the window.

Hold the left mouse button down near the cursor line, or at the top end of the cursor line (the small square at the end of the cursor line) and drag the mouse to move the cursor along.

2. Double Cursors

Use double cursors reading to compare any two points on the curve. For periodic signals, the user can estimate the period of the signal through double cursors reading. The two cursors are named as Cursor 1 and Cursor 2, respectively. A symbol "IL" or "IIR" will show inside the top end box, respectively. The two cursors can be distinguished by different colors, which can be configured in "Style Settings - Cursor". Similarly, the values displayed are named as X1, X2, and Y1, Y2.

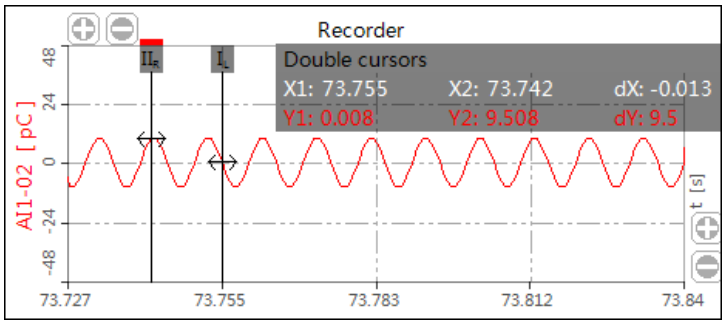



Figure 4.53 Double Cursors

There are six values in the "information window". The first two columns represent the corresponding values of Cursor 1 and Cursor 2 on X-axis and Y-axis, respectively. The last column, which is dX and dY, represent the difference between the two cursors on X-axis (time difference) and on Y-axis (amplitude difference) of the curve.

Click on either cursor to set that cursor as active cursor. A small red block will appear on the top end of the active cursor.

3. Four Cursors

The use of four cursors is similar to double cursors. The four cursors are named as Cursor IL, Cursor IR, Cursor IIL and Cursor IIR, which are shown inside the top end box, respectively. Cursor IL and IR function as group I while the rest as group II.

In the "information window", X1 is the readings of group I on X-axis; X2 is the readings of group II on X-axis. Ave (Y1) and Ave (Y2) are respectively the average of all Y values within the range. Ave (Y2) – Ave (Y1) is the difference between the two averages. Four cursors reading is often used in average calculation. Related applications are wind tunnel testing and others.

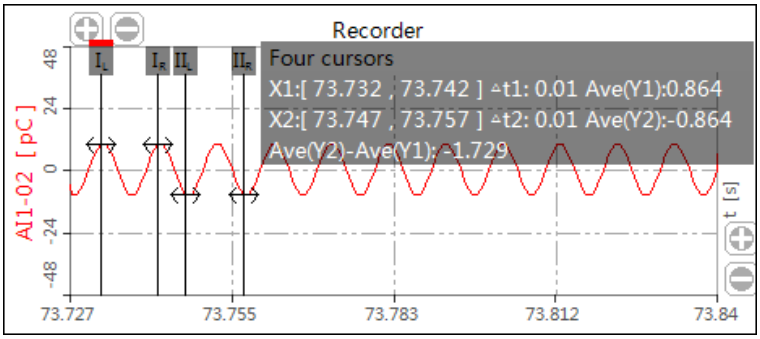



Figure 4.54 Four Cursors

4. Harmonic Cursor

In spectrum signals, harmonic cursor can be used to determine harmonics. Harmonics is sine wave, the frequency of which is multiples of fundamental frequency.

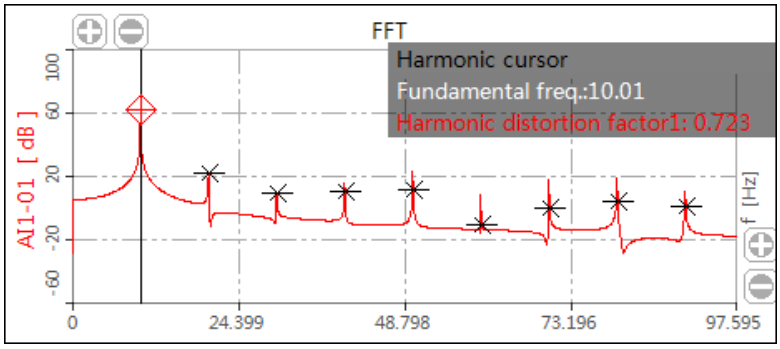



Figure 4.55 Harmonic cursor

Fundamental frequency and harmonic distortion factor are displayed in the “information window”.

5. Peak Cursor

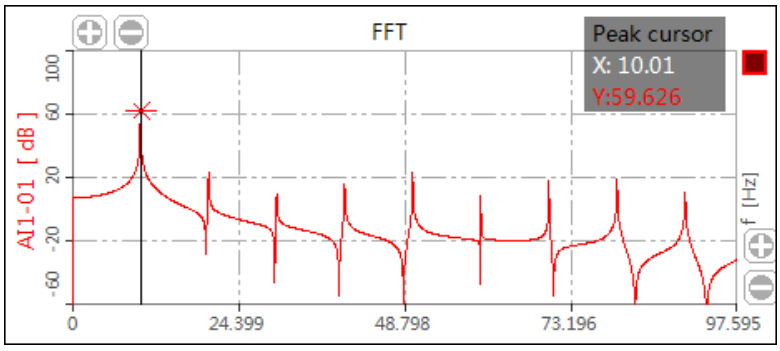



Figure 4.56 Peak cursor

Peak cursor is also a single cursor. However, this cursor cannot move freely. The cursor is always automatically positioned on the peak point of the active curve. This is called peak search. If the user is interested in the maximal value of the data, peak search cursor can be helpful which allows the software automatically search the maximal value.

6. Side Frequency Cursor

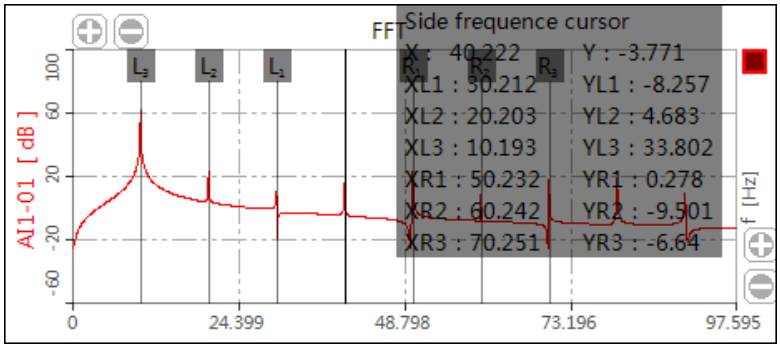
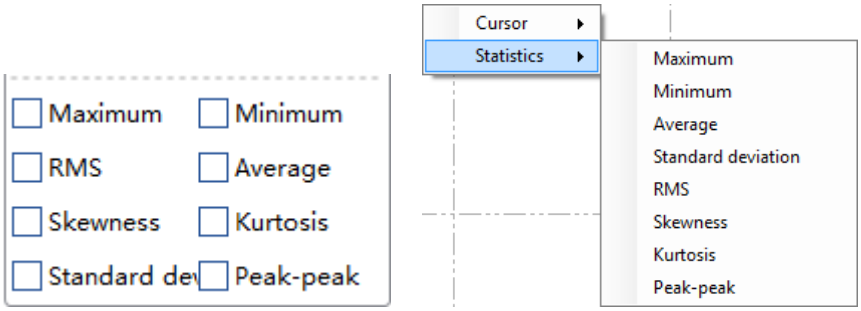



Figure 4.57 Side frequency cursor

In the “information window”, values of main cursor, left side frequency and right side frequency on X axis and Y axis are displayed successively.

## 4.9 Statistical Information

Statistical information is very helpful both in measurement mode and analysis mode. By viewing statistics of the data block, the user can have better understanding of the signal. Currently the software can provide maximum, minimum, average, standard deviation, RMS, skewness, kurtosis, and peak-peak.




1)Parameter column 2) Right-button menu bar

Figure 4.58 Statistical information

Click on the label “Statistics” in the left panel or in the view window right-click and select “Statistics” then choose an option.

If there are double cursors in the current display window, the statistical information is for the data between the two cursors. Otherwise, the statistics is for the whole window. When there are more than one curves in the display area, the statistical information is for the active curves.

## 4.10 Acoustics (Sound Pressure Analysis)

Can be used in both Measure and post-Analysis Mode.

### 4.10.1 Parameters Settings

First click on the "Acoustics" button, then select the "Sound Pressure Analysis " label, and click on

the “New” button to enter the setting interface as Figure 4.59 .

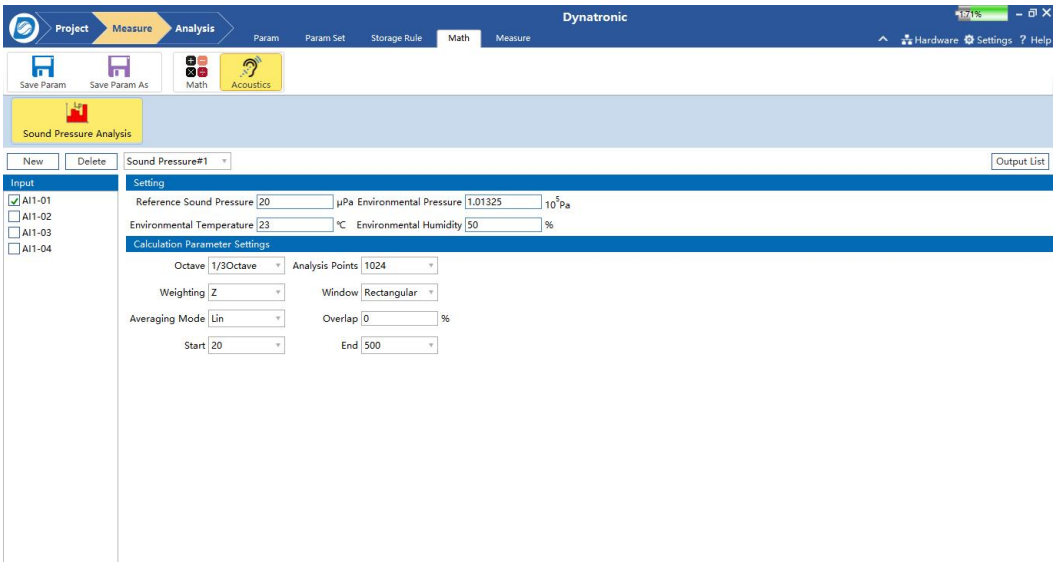



Figure 4.59 Sound Pressure Setting Interface

In the left "input" window, select the channel to be analyzed, and can select multiple channels.

Setting environmental parameters and reference sound pressure in the "Settings" window above the middle. The reference sound pressure in the air is generally set to 20 μPa. The environmental pressure, environmental temperature and environmental humidity are set according to the actual situation.

Setting Analytical Parameters in the Middle "Calculation Parameter Settings" Window.

**Octave**: the spectrum form can be chosen as 1/1 octave and 1/3 octave.

**Weighting**: A, B, C, D and Z types can be selected.

**Averaging Mode**： No Average, Lin, Peak, Time Weighting can be selected. After selecting the time weighting, you can set the Tap position (F, S, I), or you can customize the time constant.

**Analysis Points**: the number of points contained in the data block for each analysis. When the sampling frequency is high, the number of analysis points should be properly increased to avoid frequency resolution exceeding one octave bandwidth.

**Overlap**: the reuse rate of the domain data, which can increase the number of computations.

**Start /End**: use to set the frequency range of signal analysis. The maximum range can be selected from 20Hz to 20000Hz.

After setting up, click on the "Output List" button on the right, and you can see the output. Each selected channel has two outputs.”AI1-01_Lp” represents the sound pressure octave of the first channel; AI1-01_Overall represents the time-dependent curve of the total sound pressure level of the first channel as in Figure 4.60. Click "Setup" to return to the settings interface.

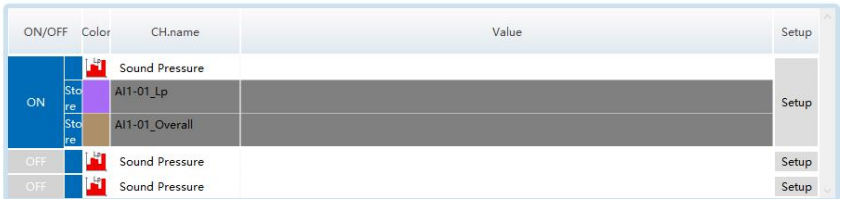



Figure 4.60 Output List

## 4.10.2 Sound Pressure Measure and Display

Enter “Measure” interface, the sound pressure octave display is observed by using a 2D view, the curve of total sound pressure level varying with time and the original signal of the microphone are observed by a recorder, as shown in Figure 4.61.

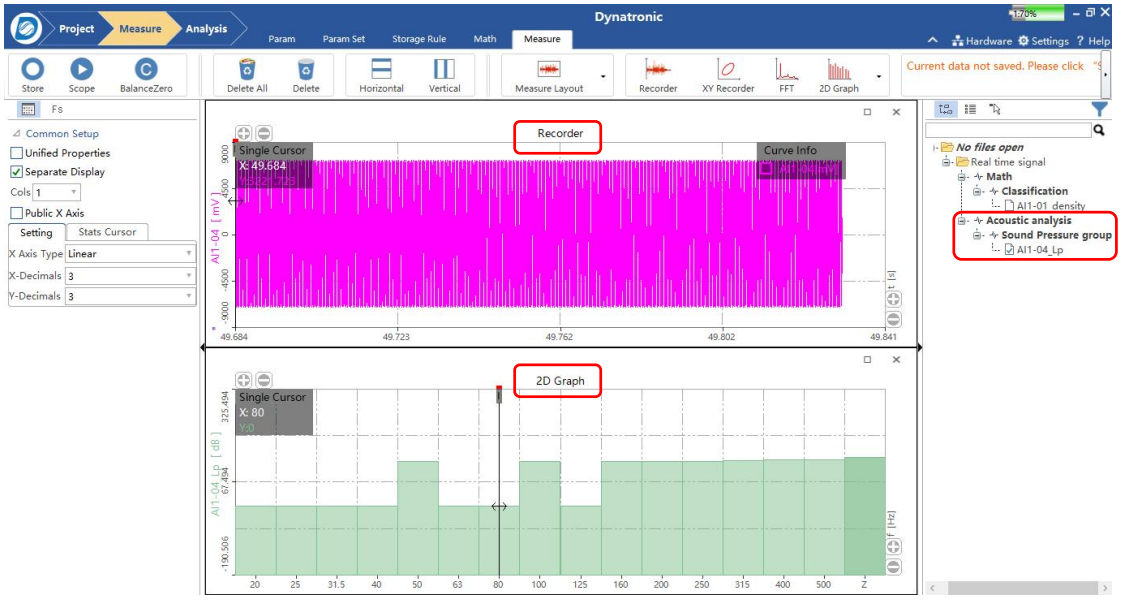



Figure 4.61 Sound Pressure Display

# Chapter5. Analysis

## 5.1 Open Project File

If you want to open an existing project file, first select the storage path on the left panel, project files in the corresponding directory will be displayed on the right. Select the corresponding project and click on the button “Open” to open that project. Or, simply double-click on the icon of the corresponding project to open.

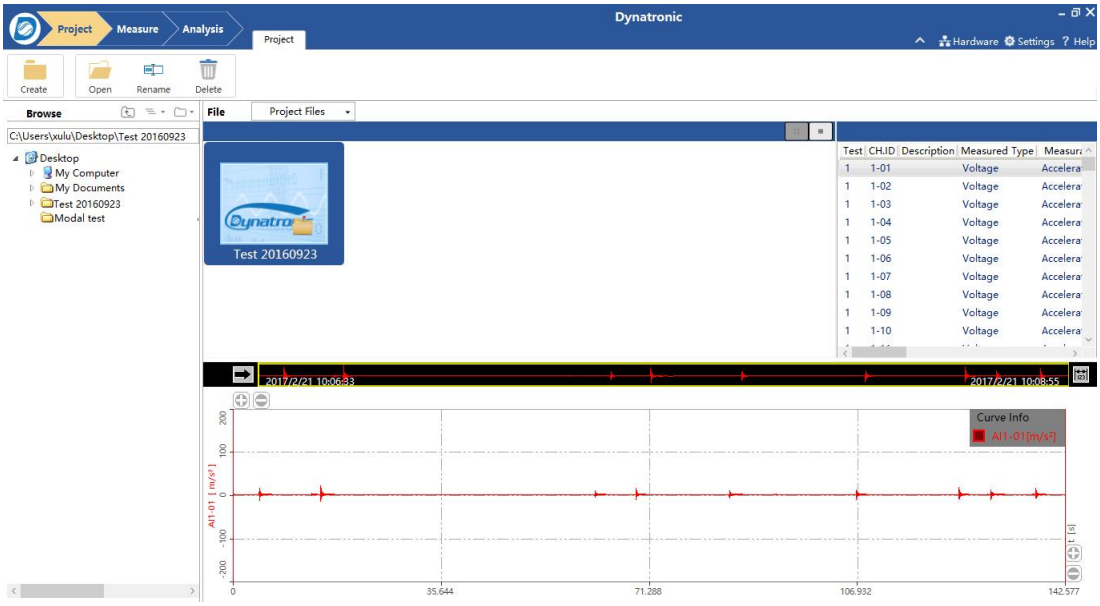



Figure 5.1 Open project file

In the file management panel on the left, when selecting the project folder, the project files in that folder will be displayed in the middle window. If you select a project file, the right window will display channel information of the corresponding project file, including measurement types, sampling frequency, etc. Single-click on a specific channel, the time history graph of that channel can be viewed in the preview window below.

Move the mouse to the yellow cursor on the left side of the navigation bar, the cursor will change into “↔”. By pressing and holding the left mouse button, you can drag to change the time range to be displayed. Similarly, move the mouse to the yellow cursor on the right side can also change the display range. After changing the display range, the selected range of data will be displayed below.

When opening the project file, you will enter “Analysis” interface. This interface is similar to “Measure” interface in the Measure module, where you can switch between different view layouts and observe different signal curves.

## 5.2 Channel

Select “Analysis” → “Channel” to enter the channel list interface. In this interface, you can view the channel list of current project and their detailed parameter information.

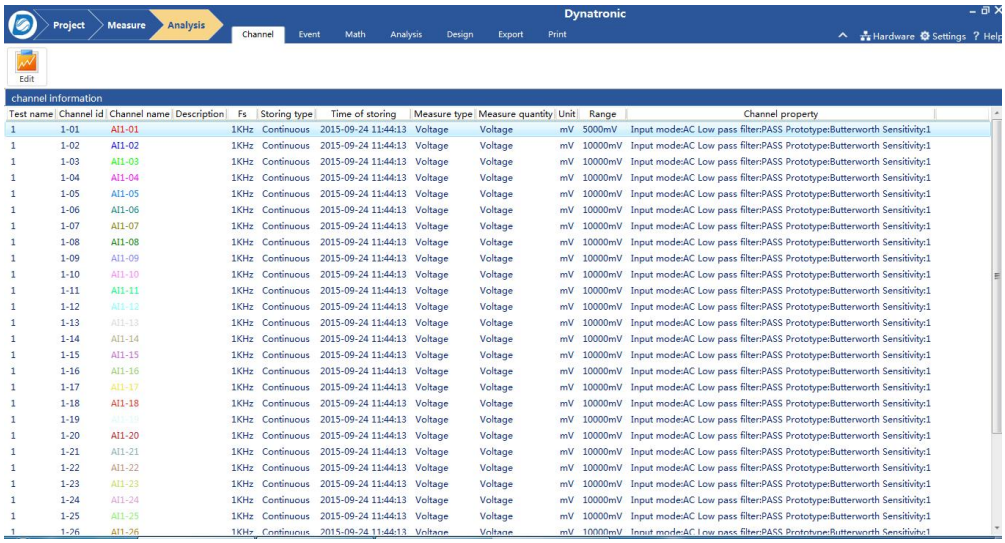



Figure 5.2 Channel list

Double-click on one channel and the user can modify partial parameter information of that channel. These parameters include channel name, color, description, measurand, unit and sensitivity. After completing the change, click “OK” to exit the setup. The software will automatically calculate or refresh according to the parameters which were modified.

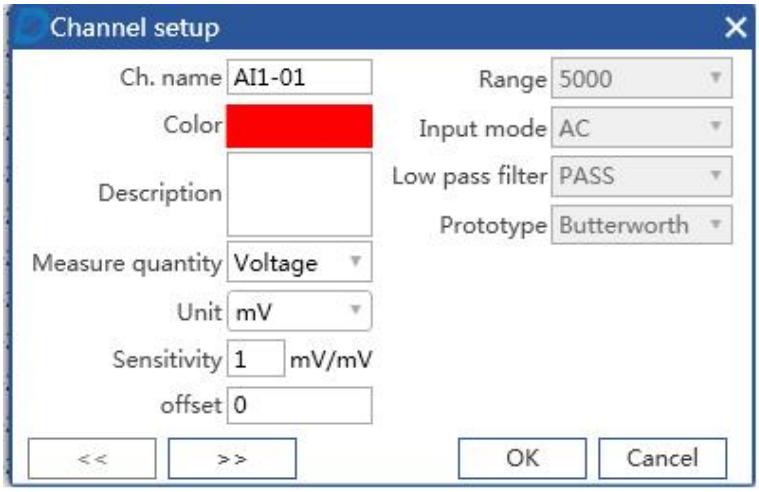



Figure 5.3 Modify parameters

## 5.3 Event

Select “Analysis” → “Event” to enter event list interface. In this interface, you can view the time log of start storing, stop storing, triggering and other events in the current project.


Figure 5.4 Event

## 5.4 Math

Select “Analysis” → “Math” to enter post processing algorithm interface. You can view the analysis channel list of currently active test files.

Activate test files: in “Analysis” interface, move the cursor to the list on the right. Click the right mouse button on the test files to be activated; in the popup menu, single-click on the item “Activate” to activate this test. Activated test files are displayed in green fonts.

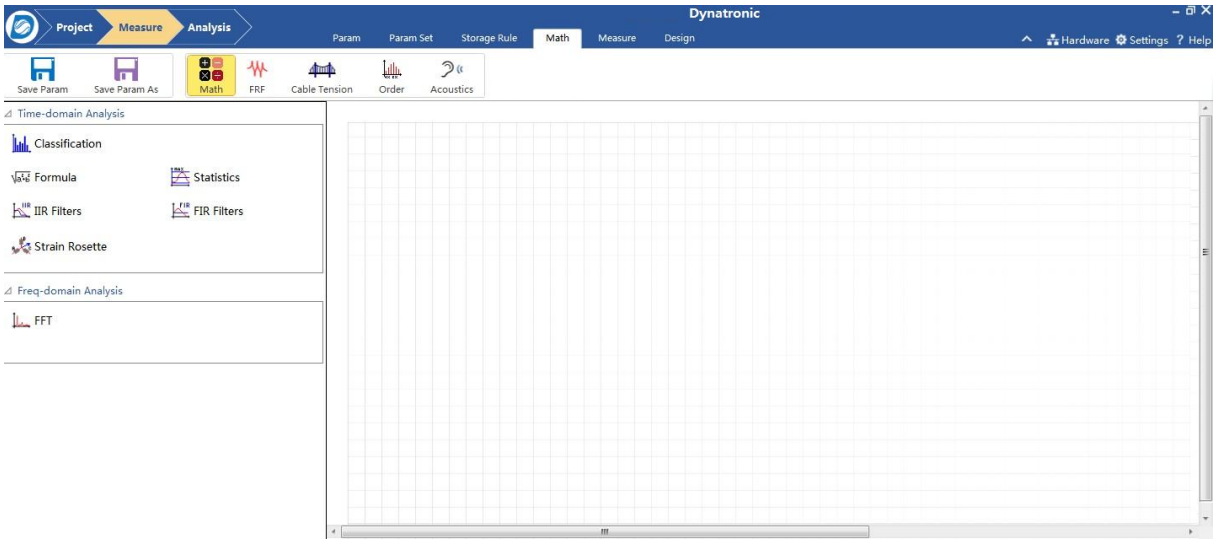



Figure 5.5 Channel list

### 5.4.1 Modify Algorithm Parameters

Double-click on the icon of corresponding algorithm so the user can modify the parameter settings. After modifying, the corresponding channel will need recalculation.

### 5.4.2 Add/delete an Algorithm

Similar to “Measure” interface, you can click or drag the algorithm to the operation area on the right to add the module.

The parameter settings interface of each analysis algorithm is the same as in “Measure” interface. After completing adding, the user need to recalculate corresponding channels.

Use the “Delete” key from the keyboard or right-click the icon to delete an algorithm module.

Delete one algorithm will delete all related links where the output of that algorithm is used as input signals. Please refer to previous section for detailed explanation.

### 5.4.3 FFT

Add the FFT module and enter the setting interface. Select channels to be analyzed from the list in the “Import” window. Multiple channels can be selected. Channel name, curve color and more can be configured in the export window on the lower left. The export channel name will be the name that displayed in the signal selection list in “Analysis” interface.

Click appropriate algorithm on the left, corresponding algorithm icon will appear in the right area. Double-click the icon, a detailed algorithm settings interface will pop up to create virtual channels. The diagram below is a detailed algorithm settings interface for FFT algorithm.

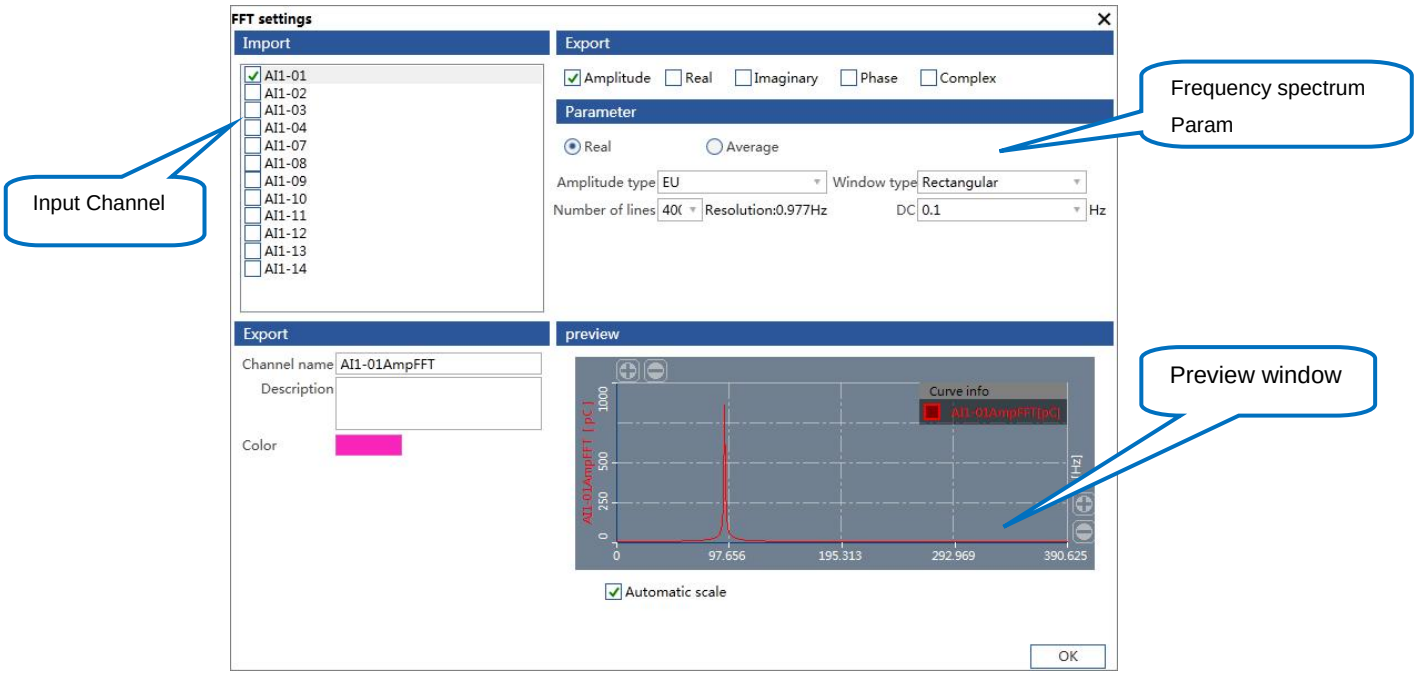



Figure 5.6 FFT parameter settings interface

Spectrum analysis parameters can be configured based on the actual testing. There are real-time

spectrum and average spectrum available. Real-time spectrum is the amplitude spectrum of Fourier spectrum of every data block. Average spectrum is an amplitude spectrum, which is the result of averaging the real-time spectra of all data blocks. When selecting average spectrum, you can set averaging methods and overlap rate.

Averaging includes non-averaging, linear averaging, exponential averaging and peak averaging. Averaging is extensively applied in spectrum measurement of random or compound random periodic signals. The purpose of averaging is to improve statistical precision or suppress the noise. Averaging is introduced with respect to the raw data. Non-averaging means no averaging. Linear averaging is a basic type of averaging. When adopting this averaging, you have to first perform FFT and other calculation for all given data blocks one by one. Then make uniformly weighted linear averaging of all spectrum values of each frequency point, respectively. For analyzing stationary random process, increasing average times can reduce relative standard deviation. Exponential averaging is non-uniformly weighted averaging. The last result of FFT spectrum analysis counts as half the weight of the final averaging, while all previous FFT spectra count as the other half of the weight. The exponential averaging emphasizes the importance of the last measurement. Exponential averaging is often used for analysis of non-stationary processes. By using this type of averaging, not only you can examine the basic characteristics of the “latest” measured signals, but also can you reduce the measurement error or improve signal-noise ratio by averaging with “Old” measured values. Peak-holding is peak averaging, which just retains the maximal value of every measurement for each frequency point.

Overlap rate is used to set the percentage to cover averaging, that is, the reuse factor of time domain data. For example: if the overlap rate is set as 50%, when making FFT analysis for the first time, you must collect enough data points to fulfil FFT setting. For the subsequent FFT analyses, you only need to collect half of data points, and the previously collected data can be used as the other half. This is very useful for measurement of low-frequency FFT analysis and also requiring higher frequency resolution.

The lower right is the preview window. Click on different input channels to preview the corresponding analysis results. Click on the button “OK” to complete settings.

In “Measure” or “Analysis” interface, 2D View is adopted to observe FFT analysis results.

## 5.4.4 Formula

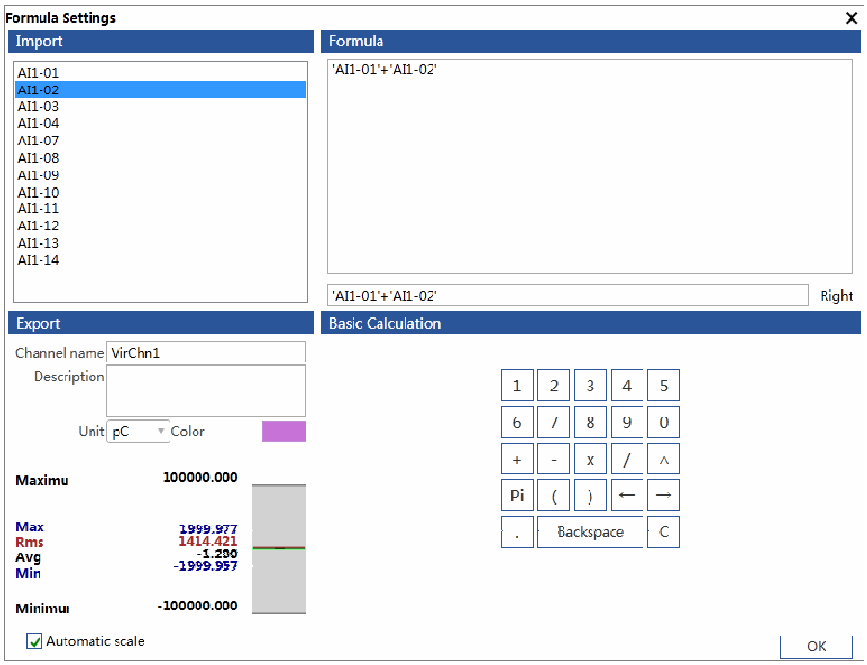



Figure 5.7 Virtual channel parameter settings interface

It's used to make some arithmetic calculation and combination of measurement channels to create new virtual channels. For example, if you want to add signals of Channel 1-01 and 1-02 together, you can perform the operation of "AI 1-01 + AI 1-02" as shown below:

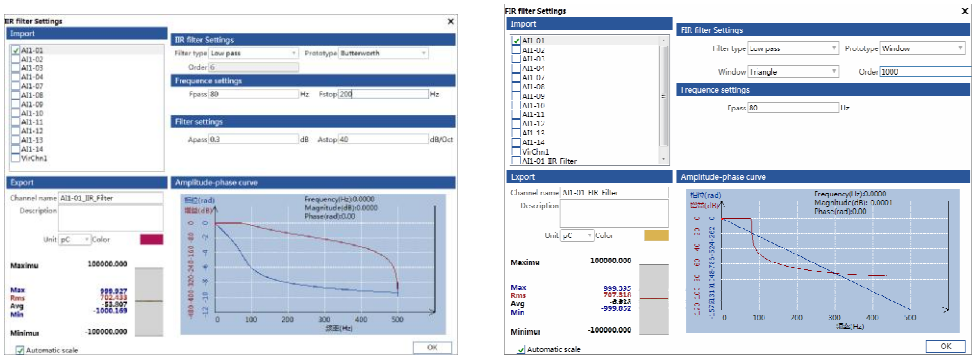
Add the module and enter the setting interface, channel name, curve color and more can be configured in the export window on the lower left. The export channel name will be the name displayed in the signal selection list in "Analysis" interface.

1) Double-click on "AI1-01" in the "Import" window on the top left;
2) single-click on "+" on the lower right;
3) Double-click on "AI1-02" in the "Import" window;
4) In the window area on the right, the arithmetic formula will be displayed.
5) If the compiled formula is erroneous, the software will prompt "Error" message after the formula editing area. Click on the formula editing row to modify.

In "Measure" or "Analysis" interface, recorders, digital meters and bar charts are adopted to observe the virtual channels.

### 5.4.5 Filter

You can select two different types of filter: FIR filter and IIR filter whose setting interfaces are different. Select the import channels and configure parameters as needed. The export channel name is the name of corresponding channel displayed in the signal selection list in “Analysis” interface.



1)IIR filter 2)FIR filter

Figure5.8 Filter settings

1) IIR filter

High precision of amplitude-frequency characteristic; non-linear phased. According to the requirements, select appropriate filtering modes and filter types, as well as setting up proper cutoff frequencies, passband flatness and stopband attenuation. The smaller the passband flatness, the smaller the fluctuation within the passband range, which means the smaller amplitude change. The bigger the stopband attenuation, the bigger the suppression of amplitude within the stopband frequency range. However, if the passband flatness is too small and the stopband attenuation is too big, the filter will not be stable. By observing the filter’s amplitude-frequency characteristic curve, select a proper combination of passband flatness and stopband attenuation to achieve the best results.

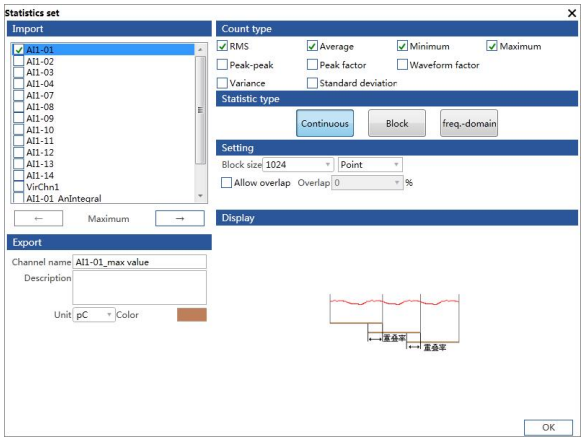
2) FIR filter

Relatively low precision of amplitude-frequency characteristic comparing to IIR; linear phases. According to the actual requirements, select proper filtering modes and window function. Set up proper cutoff frequencies and orders through previewing amplitude-frequency characteristic curve.

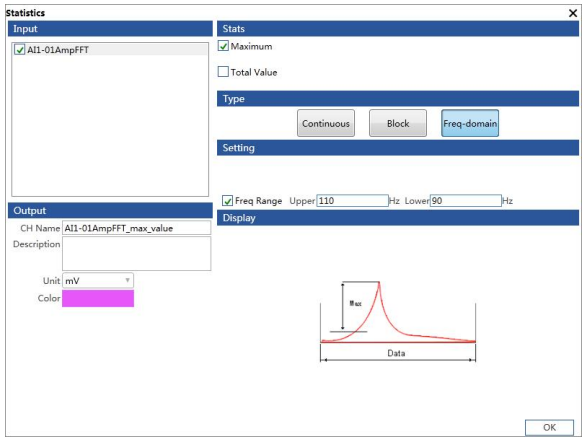
The filtered signals can also be used for other analysis, such as FFT.

In “Measure” or “Analysis” interface, recorders, digital meters and bar charts are adopted to observe filtered signals.

## 5.4.6 Statistics




1)Continuous




2)Freq-domain

Figure 5.9 Statistical information

Add the module and enter the setting interface. Select the import channels and configure parameters as needed. The export channel name is the name of corresponding channel ,that displayed in the signal selection list in “Analysis” interface. For time domain statistics, you can select RMS value, average, min and max value, etc. For frequency domain, you can select gross value and max value. Statistical analysis includes: “Continuous” statistics, “Block” statistics, and “Freq-domain” statistics.

In “Continuous” statistics mode, after setting up the analysis points and overlap rate, the software will continuously calculate related statistical information. In “Block” mode, the software will calculate at certain intervals and display the values.

Both “Continuous” and “Block” modes are statistical algorithms in the time domain. Only channels of time history data can be selected for statistical calculation.

“Freq-domain” statistics is statistical algorithm in the frequency domain and can only calculate two values: the maximal value and the gross value. In channel selection area, you can only select frequency spectrum signals.

In “Measure” or “Analysis” interface, recorders, digital meters and bar charts are adopted to observe the results of statistical analysis.

## 5.4.7 Continuous spectrum

First establish the FFT, select the analyzed channel, set FFT lines and other parameters to observe the real-time spectrum.

Then establish the statistics , select “freq-domain”, select the FFT output as the input, the statistical type is set to “maximum”, selecte the freq range, set the frequency upper and lower.

In “Measure” or “Analysis” interface, use the recorder to observe the calculation results.

## 5.5 Analysis

Data replay

Select “Analysis”→ “Analysis” to enter post processing interface. It is mainly used to view the data of opened projects graphically.

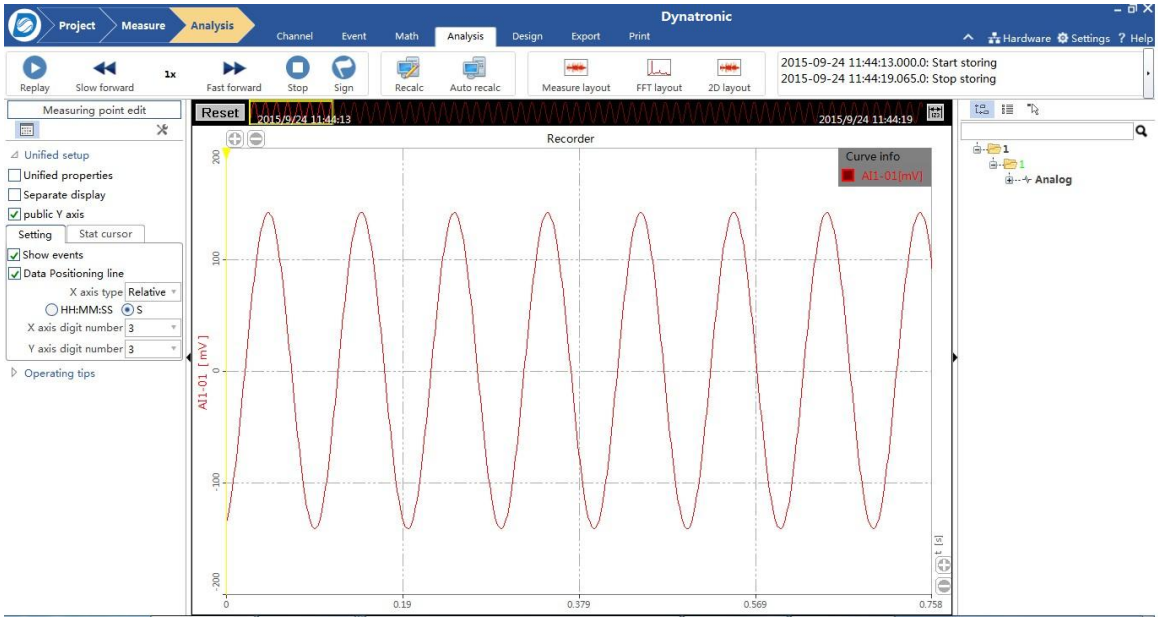



Figure 5.10 Analysis

### 5.5.2 Change Data Range

To change the data range for review, move the cursor to the yellow cursors on the left side of the navigation bar first. Drag the mouse when the cursor changes into “↔” to change the data range to be displayed. Similarly, the user can change the data range from the right side.

Click “Reset” to restore the range to default. For continuous signals, the default range is all the data recorded. For trigger signals, the default range is a segment of data. Click “→” on the left of the navigation bar to move to the next segment.

The user can also precisely select the range for data review. Click “123” from the right of the navigation bar, a dialogue box will pop up. Enter the start time and length of data to review the defined range.

After adjusting the analysis range, you need to click recalculation to update the analysis results.

### 5.5.3 Manual Calculating

For all analysis channels in the “Offline” state and after changing data range to be displayed, you must single-click on the button “Recalc” to recalculate and analyze. After calculating, the button will turn into “Calculated”.


Figure 5.11 Calculating

### 5.5.4 Auto Calculating

Click “Auto Recalc” (when the background color turns into yellow) to activate automatic calculating. The software will automatically recalculate the analysis channels whenever the data range is changed. If the user only need to observe the data, “Auto Recalc” shall not be activated. Otherwise, the analysis results will be overwritten automatically.


Figure 5.12 Automatic Calculating

## 5.6 Export

### 5.6.1 Quick Export

Right-click inside a display window area and select “Export”, where you can choose from one of the options.

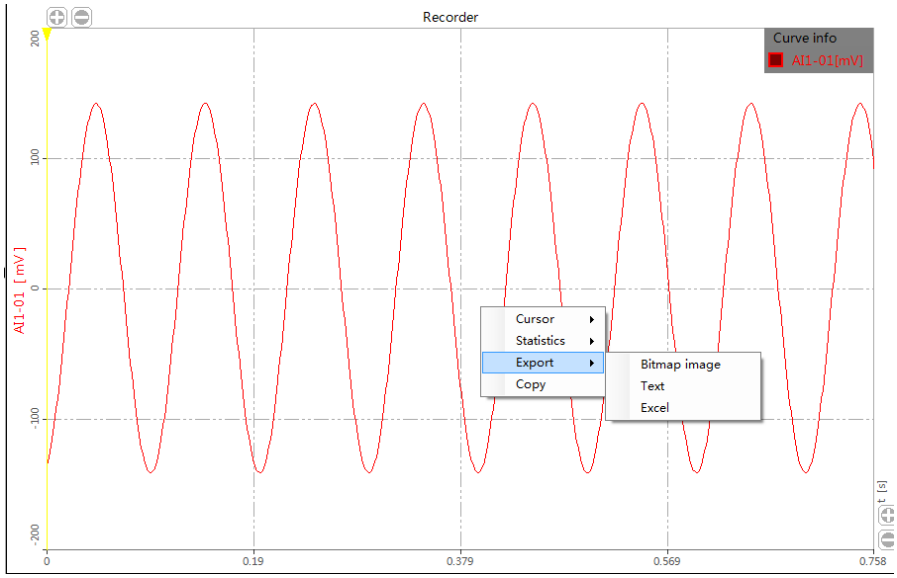



Figure 5.13 Export in the display window

When “Bitmap Image” is selected, the display window interface will be saved as BMP files. When “Text” is selected, data displayed in the current window will be saved as TXT files. When “Excel” is selected, data displayed in the current window will be saved as Excel files.

## 5.6.2 Export Management

Select “Analysis” → “Export” to enter export settings interface. Various export formats can be selected, including: Excel, Matlab, Word, Image, etc.

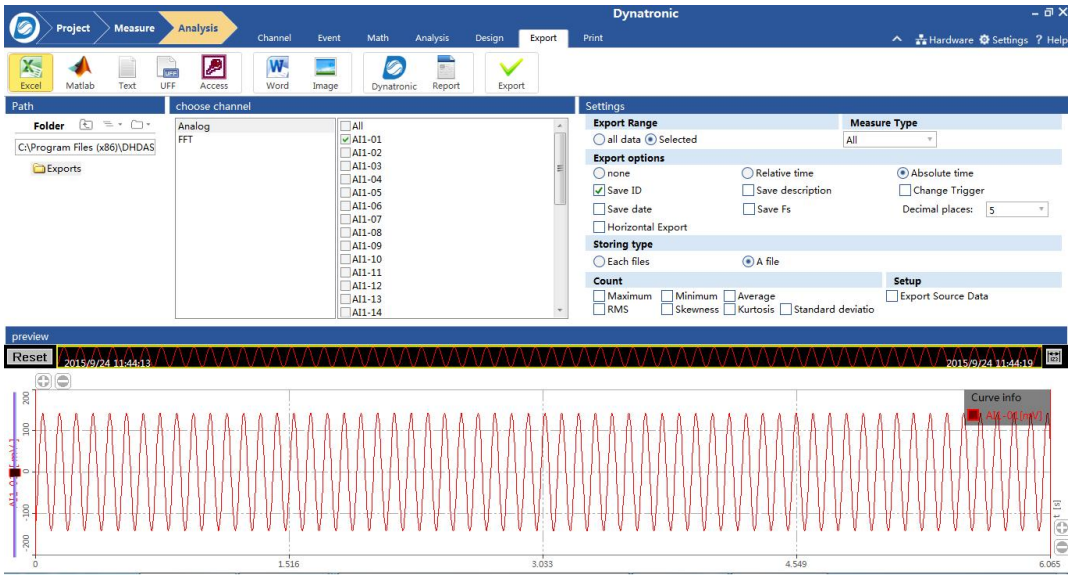



Figure 5.14 Export Interface

1) Export Excel, TXT, Matlab and UFF

The export parameter settings interface is similar for these four formats. The left side is for setting storing path of the exported files. The center is for selecting channels to be exported. The right side is for setting export parameters. The lower area is the preview window. Click on each channel to display the data of that channel below.

Data range can be all recorded data or selected range when exporting.

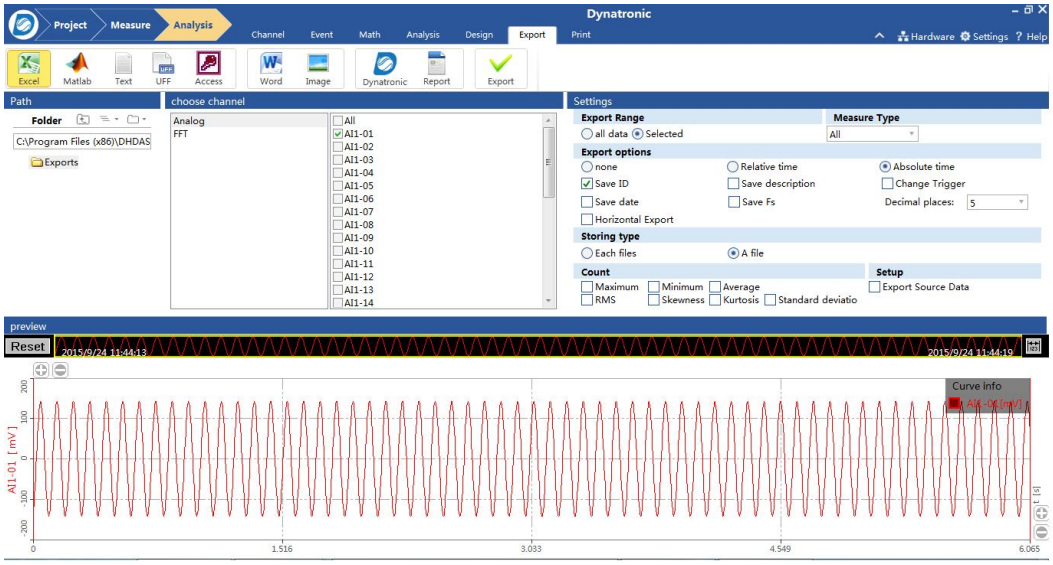



Figure 5.15 Excel

When exporting signals in time domain, “Relative Time” or “Absolute Time” can be selected. “Save

ID" refers to saving the channel number to the export file. Storing types refer to saving data of all channels in one file or individual files.

After setting, click "Export" on top to export data into files.

2) Export Word

When exporting as Word file; you can view the saved view window and perform operations like zoom in/out, cursor readings in Word.

Word has activity report and still images. The activity report requires Microsoft Office 2007 or above.

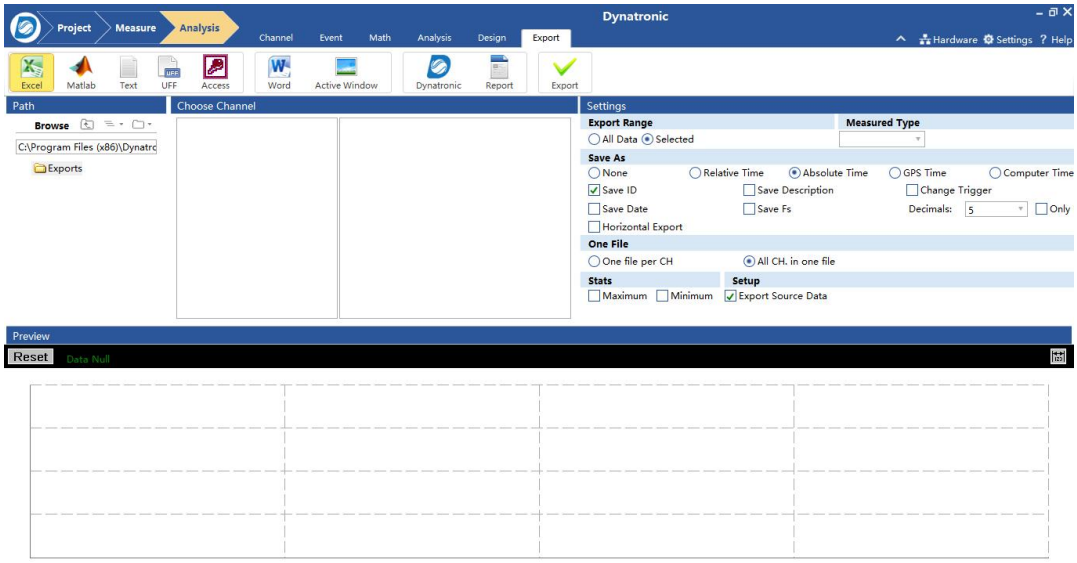



Figure 5.16 Export Word