

# Ana

# User Manual

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Software Version: V3.12.0

Professional Data Collection and Analysis Software

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# 1. Software Overview

## 1.1. Features

Welcome to use the Ana Offline Analysis Software, which is used to open offline waveforms recorded by the data collection software PLC-Recorder and perform data analysis.

### **Main Features:**

- ✓ Rich note and annotation features, allowing for quick analysis and annotation of Bool tags.
- ✓ Powerful numerical and logical search, with fast edge positioning.
- ✓ Powerful multi-file processing capabilities: includes fast browsing, one-click connection, multi-file merging, and matching browsing functions etc.
- ✓ Expression tags: You can use existing recorded data for mathematical and logical operations to generate virtual series and initially explore the value of the data (supports over 30 functions).
- ✓ Drag-and-drop operations: You can select series, set various parameters, adjust series order, adjust series height, and co-axially display multiple series (numerical values, Bool tags, strings, etc. can be mixed freely) directly from the main interface.
- ✓ Powerful zooming features: Y-axis zooming for series, area zooming through drag-and-drop, step-by-step or full rollback, and movement in the XY direction etc.
- ✓ Data export: Data can be partially or fully exported to a spreadsheet file.
- ✓ Image output: Automatic screenshot with comments and annotations can be taken, and parts that extend beyond the screen can also be copied using the long image feature.
- ✓ One-click series color setting for a comfortable color scheme.
- ✓ Quick tag filtering, marking, and statistical functions.
- ✓ Users can open a separate software for each file, without interference.
- ✓ For 64-bit operating systems, large memory can be utilized for handling huge files.
- ✓ Channel time offset function: aligning waveforms between different channels.
- ✓ Powerful navigation function: You can navigate using any series and quickly locate the target area.

## 1.2. Notice

- ! The contents of this manual may differ from the actual interface and functions; your understanding is appreciated.
- ! This software will not perform any communication actions. If you notice abnormal behaviors such as advertisements or other links that may threaten network security, please obtain this software from official channels.
- ! The company is not responsible for any losses incurred during the use of the software.
- ! If you encounter issues within the functionality of this software: please refer to this manual. If the issue remains unresolved, check the official website to see if the software has been upgraded and try the latest version. If the issue still cannot be resolved, please join the community to report it, or send an email to the support address below (service@HiddenMap.cn, including a description of the problem, fault information files, and waveform files when the issue occurred).

### 1.3. Support

Official Website provides complete services such as downloads, upgrades, purchases, and technical support.

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Shanghai HiddenMap Intelligent Technology Co., Ltd  
2019

Email: [service@HiddenMap.cn](mailto:service@HiddenMap.cn)

Web: [www.HiddenMap.cn](http://www.HiddenMap.cn)



## 2. Terms and Basic Concepts

### 2.1. Terms

Terms	Meaning
Channel	Channels are divided into two types: external channels and expression channels. External channels correspond one-to-one with data sources, the most typical being each device in PLC-Recorder. Expression channels are built-in channels in the Ana software that store all tags that need to be displayed.
Tags	Tags include two types: external tags and expression tags; the data for external tags comes from external channels. Expression tags may come from external tags or may be tags used for secondary calculations.
Model	Includes all expression tags and their display and combination methods. The file extension for model files is ".apj".
Cycle	Polling cycle of the tag.
Absolute Time	Acquisition time recorded in hours, minutes, and seconds.
Relative Time	The recorded trigger time is 0:00, with the time difference measured in seconds.

### 2.2. Data Type and Length Correspondence (Partial)

Supported Types by This Software	Length	Controller Data Type (IEC61131-3)
bool (Bool tags)	1 bit	BOOL
Byte	1 byte	BYTE
SByte		SINT
Char (ASCII characters)		CHAR
WChar (Extended characters)		WCHAR
short (Int16)	2 bytes, single word	INT
ushort (UInt16)		WORD, UINT
int (Int32)		DINT
uint (UInt32)	4 bytes, double words	DWORD, UDINT
Float (real)		REAL
long (Int64)		LINT
ulong (UInt64)	8 bytes	LWORD, ULINT
Double		LREAL
String	tag length	STRING
Wstring (Extended string)	tag length	WSTRING

### 2.3. Supported file types

This software supports. ihm data files generated by PLC-Recorder, which are in compressed format. The software also supports. atd (a text format file) and power system waveform files (COMTRADE format).

## **3. Installation and Operation**

### **3.1. Required Environment**

This software is based on the .NET 4.0 framework.

Supported Operating Systems: Windows XP SP3 and above, automatically adapting to both 32-bit and 64-bit (with a larger operable data volume in 64-bit).

Required Software

- ✓ XP System: .NET 4.0 needs to be installed (sometimes WIC software needs to be installed first to install .NET 4.0; the software can be found in the supporting software directory).
- ✓ For other systems, please install or enable .NET features.

### **3.2. Installation Process**

This software is deployed with PLC-Recorder; please use the Setup.exe in the software directory to configure file associations.

### **3.3. Authorization**

This software has no authorization restrictions and can be used freely.



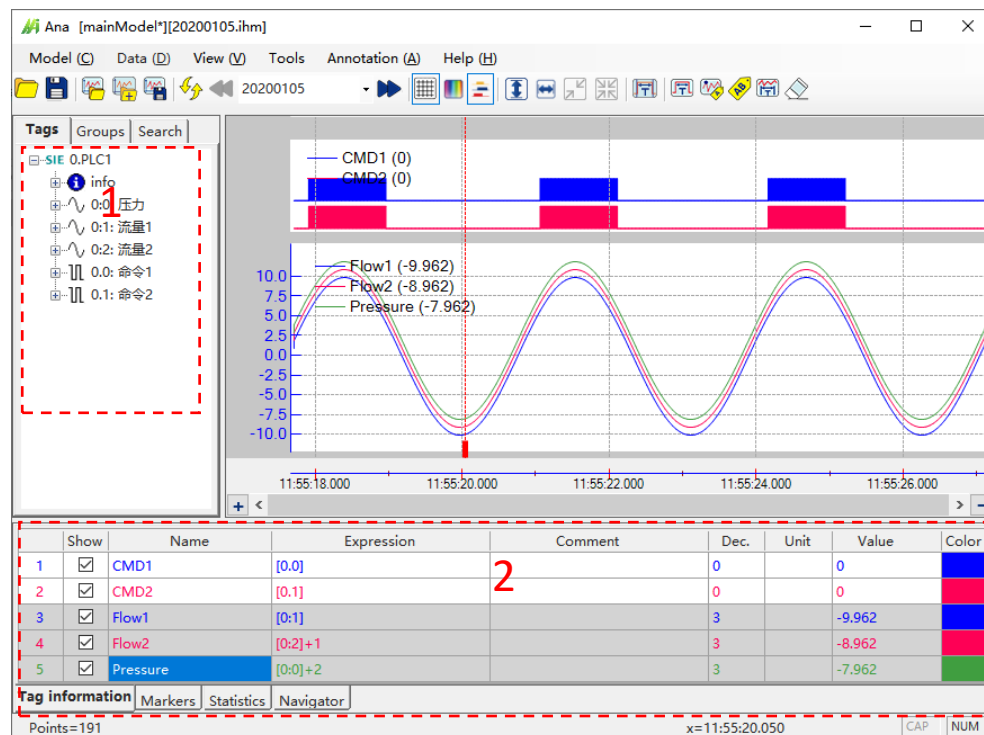
## 4. Expression Tags

### 4.1. Brief description

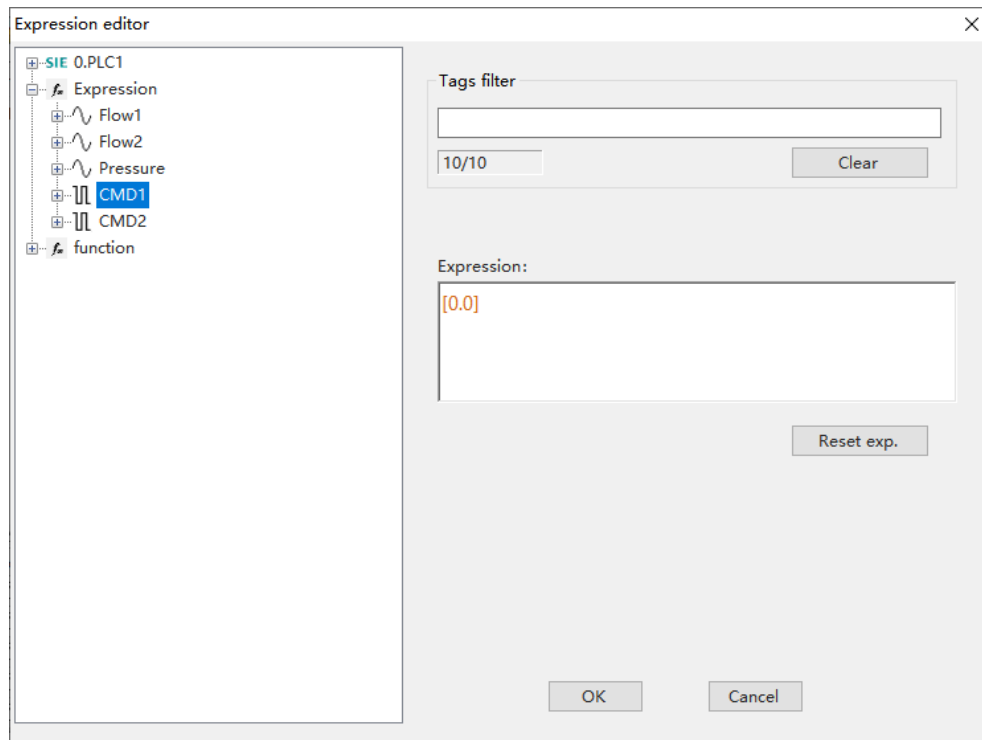
To enhance computational and analytical capabilities and to initially explore the value of the data, this software has added the expression tags feature. All expression tags are placed in a single expression channel and appear in the table at the bottom.

The red dashed box 1 in the figure below displays the external channels and all available external tags.

The expression tags in the red dashed box 2 can be edited by clicking on the expression cells.



## 4.2. Editor

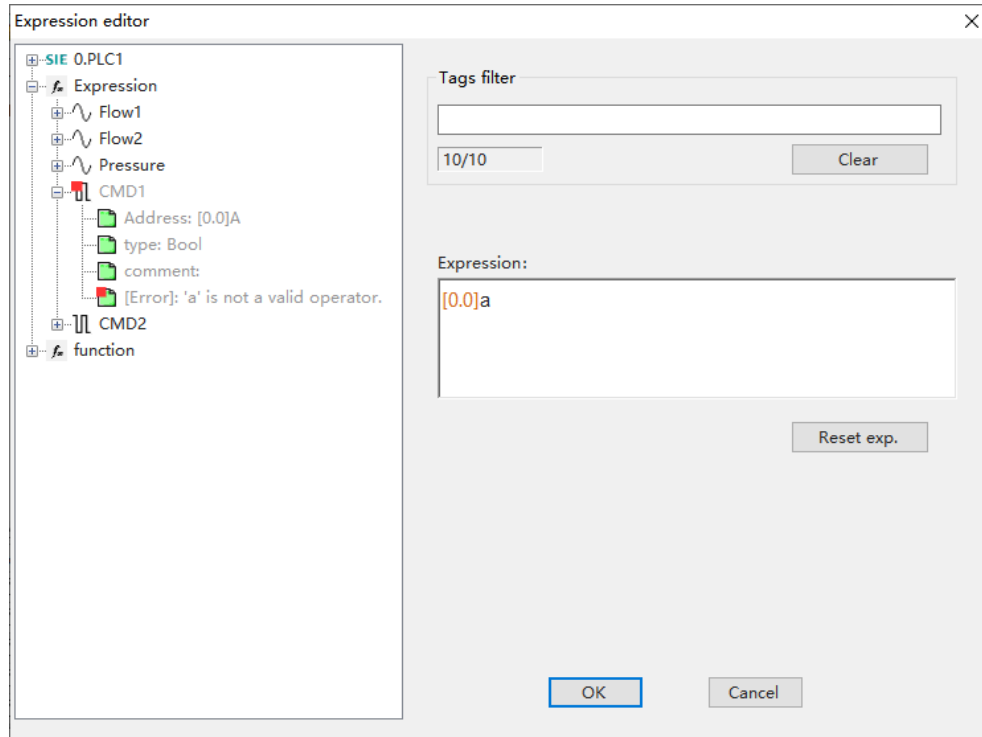


The left side of the editor window shows the tag tree and the list of available functions, while the expression area on the right is where you input formulas. The tags and functions to be referenced can be dragged directly from the left side or input manually in the specified format.

Keywords in the expression are automatically distinguished by color: **functions**, **referenced variables**, **operators** and constants.

Formulas must follow certain syntax; please refer to [Appendix 1](#) for details.

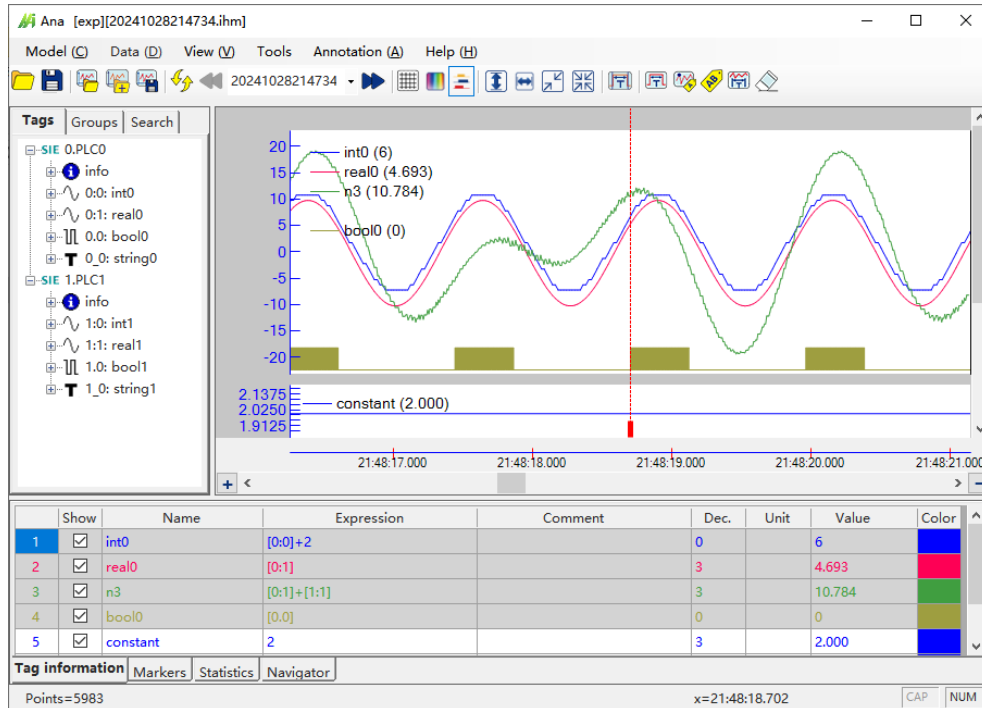
After confirmation, a grammar check will be performed. If any errors occur, they need to be corrected, as shown in the following example.



### 4.3. Classification of expression tags

Based on processing characteristics, expression tags can be classified into four types: constants, single-reference tags, direct tags, and multiple-reference tags.

- A constant is an unchanging value, represented at the far left and far right points in the graph generation.
- Single-reference tags: expression tags that are related to only one external tag. The X coordinates of the data points for these tags correspond one-to-one with the X coordinates of the data points for the referenced external tag. The expression tags `int0`, `real0`, `bool0` in the figure below are all single-reference tags.
- Direct tags: a special form of single-reference tags that are directly equivalent to external tags. The expression tags `sint0`, `real0`, `bool0` in the figure below are all direct tags. **Note: String tags can only be displayed through direct tags and cannot undergo other calculations or combinations.**
- Multiple-reference tags: tags that are related to multiple external tags. To minimize combination distortion, if the referenced external tags belong to different external channels, their data points will be denser than those of any single external tag and will be evenly spaced in time. The expression tag `n3` in the figure below is a multiple-reference tag.



#### 4.4. Creation of expression tags

Method 1: Drag the external tags from the left side directly into the chart on the right to create.

Method 2: In the tag information form at the bottom, right-click and select "Add Tag" to create.

#### 4.5. Deletion of expression tags

In the tag information form at the bottom, right-click on a tag and select "Delete Tag" to remove it.

#### 4.6. Save

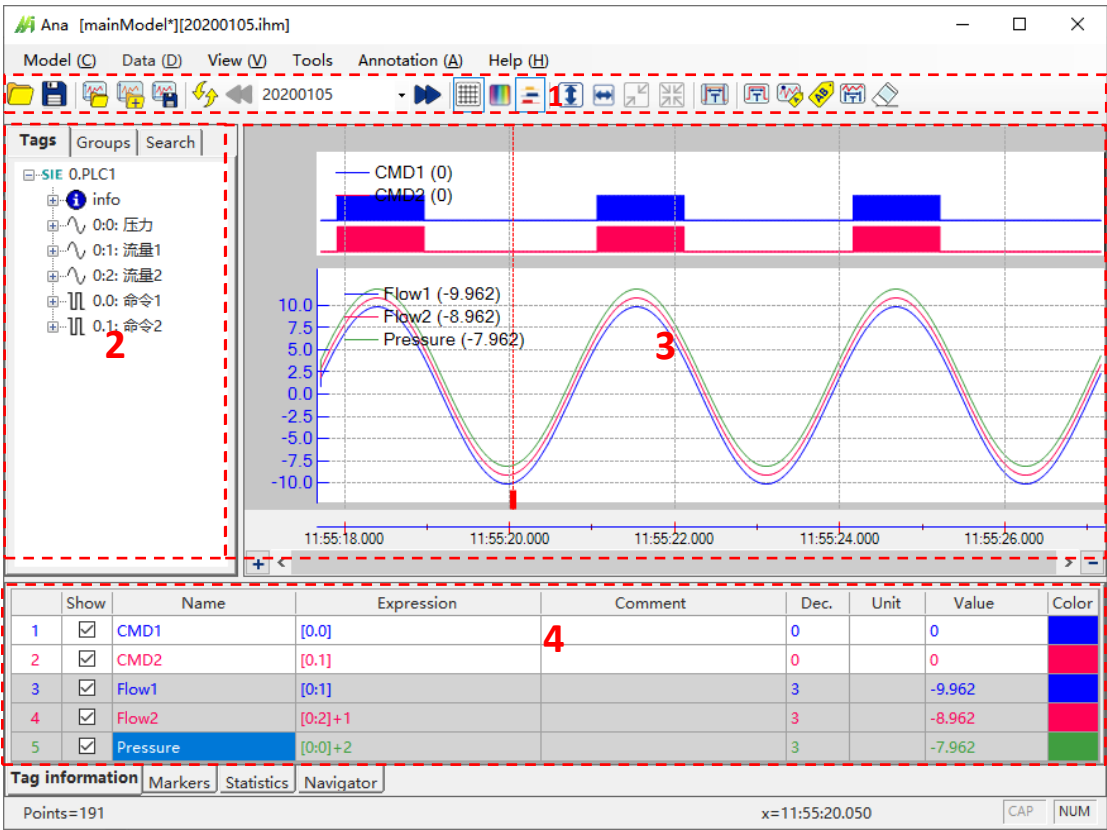
Expression tags are only saved in the analysis model and are not stored in the data files; they can be applied to all data files that match the format.

Reference:

[Demonstration of Expression Operation](#)

# 5. Display Area

## 5.1. Division of the Display Area




## 5.2. Software Title Area


The software title includes the software name, model file name, data file name, and model file.


The model file includes the configuration content for tags.

### 5.3. Function Options Area (Area 1)


This area includes menus, shortcut function buttons, file list boxes, and more. The shortcut function buttons have tooltip hints that provide a brief description of their functions. Some function buttons can be toggled on or off via the menu "View" -> "Show tools". The following will introduce the functions of some buttons, while topics like search and annotation will be covered in later chapters.


Clicking  opens the expression tag configuration interface.


Clicking  opens existing analysis model.


Clicking  saves the changes to the model.


Clicking  shows or close grid lines.


Clicking  open or close bool fill color.

Clicking  will automatically assign the color of the series once (Series Color Automatic Setting: Enable the automatic color setting function through the menu "View" -> "Auto color for new series". When adding a new series, the color is automatically assigned according to the series number in the area. The color of the existing variables in the area is not modified. When dragging the series between areas, the color remains unchanged. The "Auto color once" button is still valid, and the color can be reassigned automatically.).

Clicking  will adapt the Y-axis of all series.

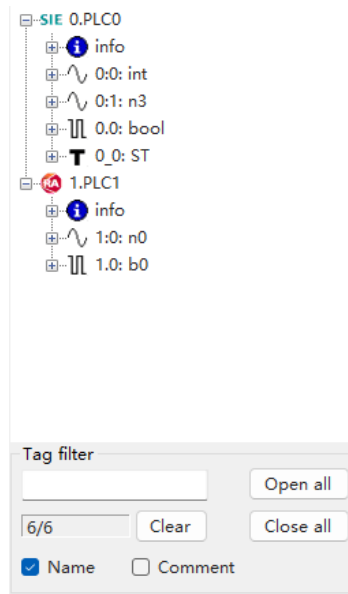
Clicking  will maximize the display range of the X-axis.

Clicking  will undo the last zoom operation. The software will remember each local zoom operation and allows for step-by-step undoing.

Clicking  will reset the zoom to the original state (no zoom). The zoom will reset to the original state during operations such as adding or deleting series and opening new files.

## 5.4. Tag Tree (Area 2)

This area lists all valid tags according to channel numbers (devices). The icon determines whether it is a Bool tag; opening a tag allows you to view the address, specific type, and comment.



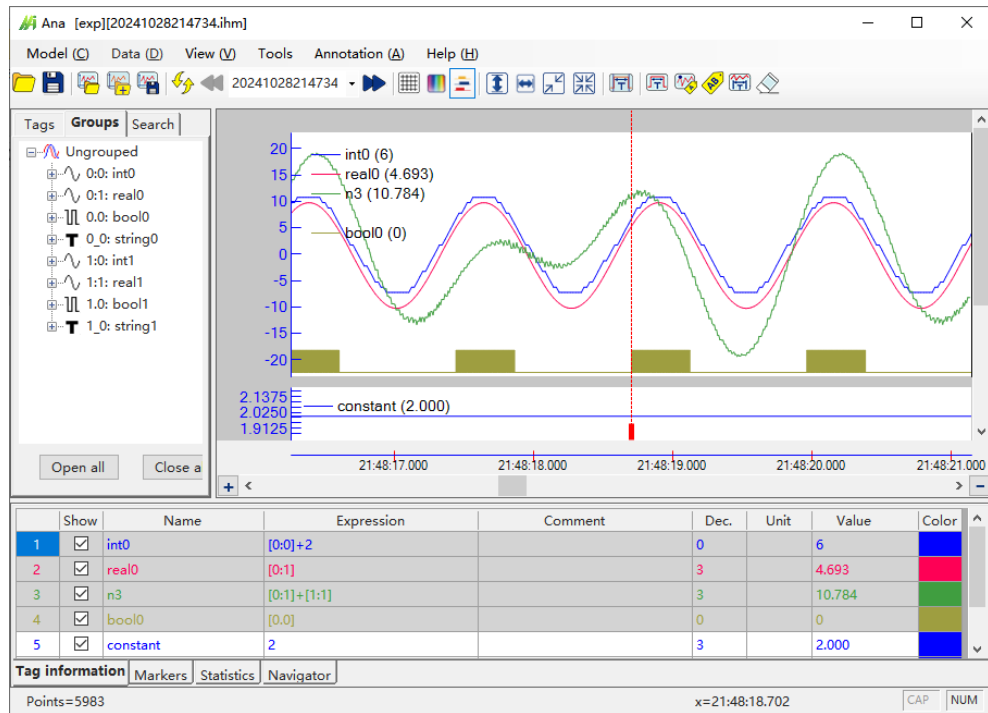
Entering characters or text in the filter box will quickly filter all tags whose names or comment contain the specified text. The numbers indicate the discovered tags and the total number of tags.

Dragging the right border of this area with the mouse can change the size of the area.

The left area can be displayed or hidden through the menu "View" -> "Show Left Area".

## 5.5. Group (Area 2)

Tag information is displayed by group, with ungrouped tags categorized as "Ungrouped".



Tags within a group can be dragged to the right series area just like in the tag tree.

You can also drag the entire group into the right area.



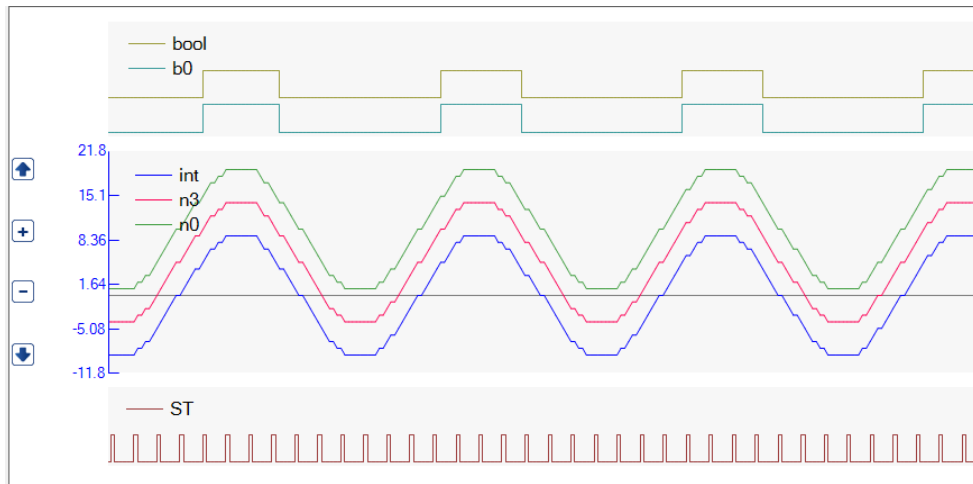
## 5.6. Series Area (Area 3)

Recorded data is presented in the form of series within this area. It includes multiple independent charts (white background).

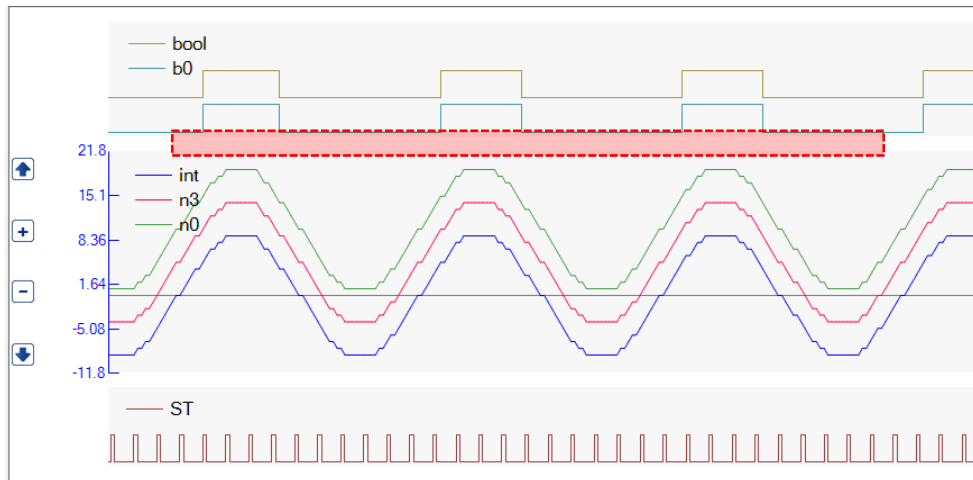
To the left of each chart is the region adjustment function area, which includes options for adjusting the region's position (↑, ↓), stretching the Y-axis (+, which can be clicked or held for continuous adjustment), shrinking the Y-axis (-, which can also be clicked or held for continuous adjustment), and vertical panning (dragging the Y-axis), among other functions.

The bottom of the series area has a common X-axis, and after local zooming, you can pan left or right by dragging the X-axis.

There are two types of series: numerical and Bool. Numerical series have functions for stretching, compressing, and panning, while Bool series can only be scaled in the X direction.



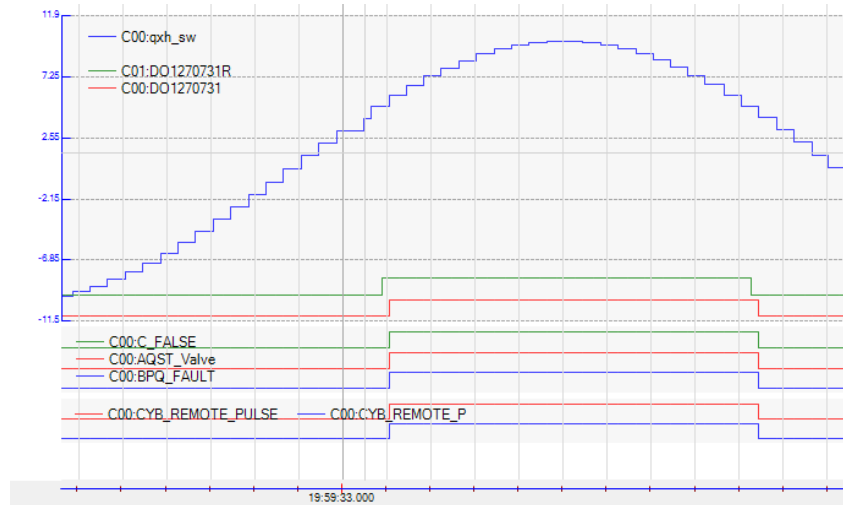
### 5.6.1. Adjustment of Series Height





When the mouse moves to the red box area at the bottom of the chart, if that area contains numerical series, the cursor will change to a horizontal line. By holding down the left mouse button, you can drag up or down to adjust the height of the series, and the adjustment will take effect upon releasing the mouse button.

### 5.6.2. Local Zoom

In the non-annotation state (with no annotation functions selected), left-clicking and dragging to select a gray area of the series (avoiding the legend) will perform a local zoom.

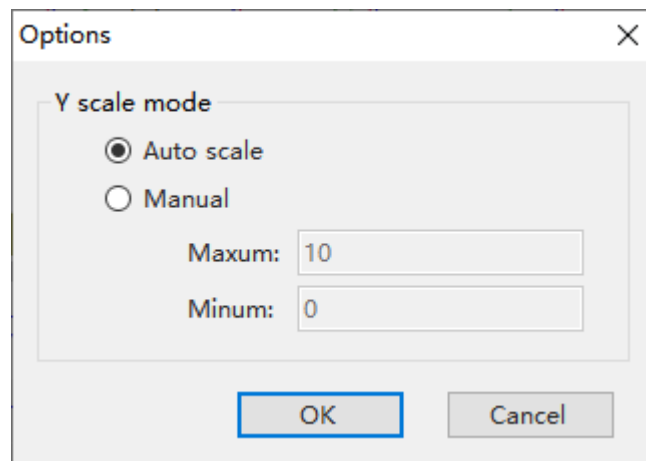




After local zooming, all series will also have their X-axis enlarged. Clicking  will apply adaptive scaling to the Y-axis of all areas. Clicking  will restore the X direction to its original value.

Right-clicking within the area and selecting "Axis Y auto scale" from the menu will apply adaptive scaling to the Y-axis of the individual area.

Right-clicking within the area and selecting "Axis Y options..." from the menu allows you to set different Y-axis ranges or functions for the area (adaptive or fixed range).

If the Y-axis range is set to manual, after dragging or other operations, right-click in the area and use the menu "Axis Y restore manual scale" to restore to the manually set range.



You can continue to select areas for local zooming or perform zoom-out operations afterward (, ).

### 5.6.3. Moving Series Between Charts

Dragging the legend of the corresponding series within the chart allows users to move the series between charts. If released in an existing chart, the series will be added to that area, enabling the function of multiple series sharing the same Y-axis. If released outside the chart or in the X-axis area, a new chart will be created.

### 5.6.4. Change the Order of the Series in the Area

Series are divided into two types: Bool tag and numerical. The tag types represented as Bool tag include: BOOL, Discrete, String, etc. The others are represented in numerical form.

If a chart has multiple series of different types, the display order can be changed. In the "Tag information" table, right-clicking on a tag row will bring up a menu that allows for operations such as adjusting area order, changing tag positions, and closing series.

	Show	Name	Expression
1	<input checked="" type="checkbox"/>	int	
2	<input checked="" type="checkbox"/>	n3	
3	<input checked="" type="checkbox"/>	n0	
4	<input checked="" type="checkbox"/>	bool	
5	<input checked="" type="checkbox"/>	ST	
6	<input checked="" type="checkbox"/>	b0	

Add an expression tag  
 Delete the expression tag  
 Move area up  
 Move area down  
 Move series up in area  
 Move series down in area

**Tag information** Markers Statistics Navigator

Points=12001

#### 5.6.5. Delete Series

Method 1: Hide the series

In the list at the bottom, deselect the display option for that tag, and the series will be closed. This method does not affect the data annotation and statistical functions.

Method 2: Completely close the series

Right-click on the series legend and select "Close the series" to remove the tag from the display list, achieving a complete closure.

Method 3: Close area

Right-click in the chart and select "Close area" to completely close all tags within that area.

#### 5.6.6. Shortcut Operations for the X-axis

Method 1: Dragging the mouse on the X-axis will move the window accordingly.

Method 2: Quickly select a new area from the navigation table (See subsequent contents).

Method 3: Use the X scrollbar for zooming in and out, dragging, and paging etc.

Activate the X scrollbar through the menu "View -> Show X scroll bar" to perform various operations; the navigation and series windows will move and scale accordingly.

Use the menu "View -> Options" to switch the functions of the + and - buttons to suit your preferences.

## 5.7. Tag Information Table (Area 4)

This area includes three sub-tables: the Tag Information Table, Markers, and Statistics. The height of the area can be adjusted using the top border.

### 5.7.1. Tag Information Table

The Tag Information Table presents information such as display control, name, expression, comment, decimal places, units, and color for each tag.

The display options allow users to control whether to show series, with the ability to select individually or in batch.

	Show	Name	Expression	Comment	Dec.	Unit	Value	Color
1	<input checked="" type="checkbox"/>	int	[0:0: int]		0		-1	Blue
2	<input checked="" type="checkbox"/>	n3	[0:1: n3]		0		-1	Red
3	<input checked="" type="checkbox"/>	n0	[1:0: n0]		0		-1	Green
4	<input checked="" type="checkbox"/>	bool	[0:0: bool]		0		0	Olive
5	<input checked="" type="checkbox"/>	ST	[0_0: ST]		0		Result=-1.14	Brown
6	<input checked="" type="checkbox"/>	b0	[1.0: b0]		0		0	Teal
<div> <div>Tag information</div> <div>Markers</div> <div>Statistics</div> <div>Navigators</div> </div>								

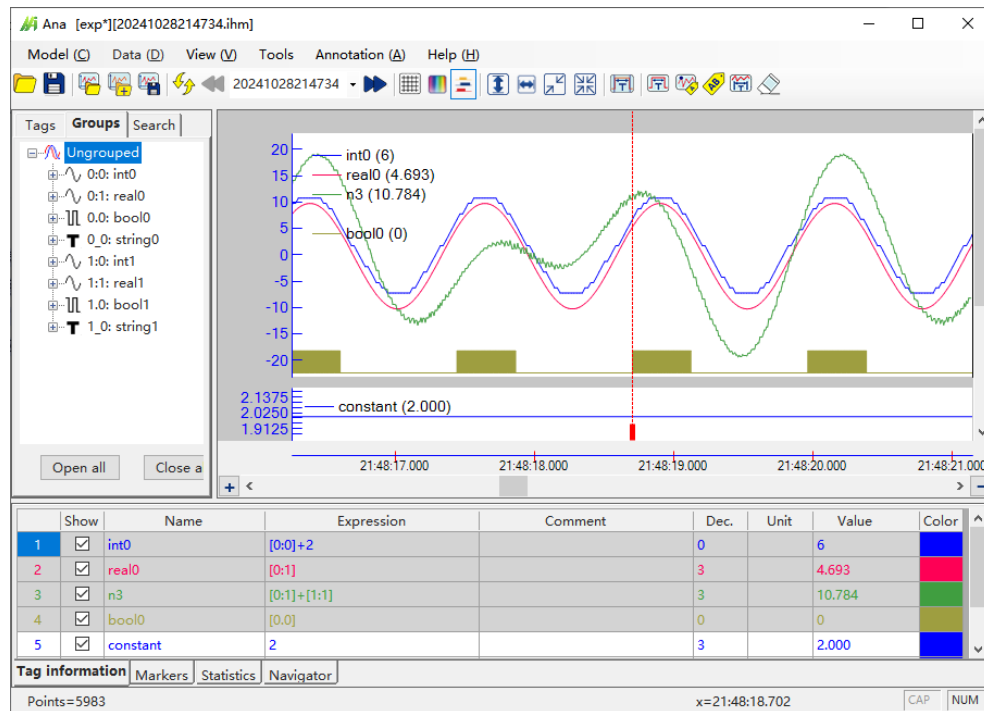
Correspondence between tags and charts:

When a row in the table is selected, all tags in the corresponding chart will be indicated in gray. After selecting a chart with the mouse, the related tags in the table will also be indicated in gray.

If there are too many series and a scrollbar appears, some series may not be displayed automatically. In this case, clicking on the series legend will automatically scroll the corresponding entries in the bottom table into view.

Automatic decimal adjustment function: When the expression tag type changes from integer to floating-point, the decimal places will be automatically set to 2. When converting from floating-point to integer, the decimal places will be automatically set to 0.

A red ruler appears that can be dragged to a certain position to display the current values of all curves. The current value first appears in the table at the bottom. It can also appear on the legend. Please turn on this feature by selecting "View" -> "Show values in legends" from the menu. You can also quickly move the ruler to the target position by double clicking in the drawing area.



### 5.7.2. Marker Information Table

Opening the table displays two movable X marker (red dashed lines) in the series area: X1 on the left and X2 on the right. The table shows the corresponding time values, time differences, series values, and series differences. Moving the marker will change the values accordingly.

When dragging the marker, the values will change in real time.

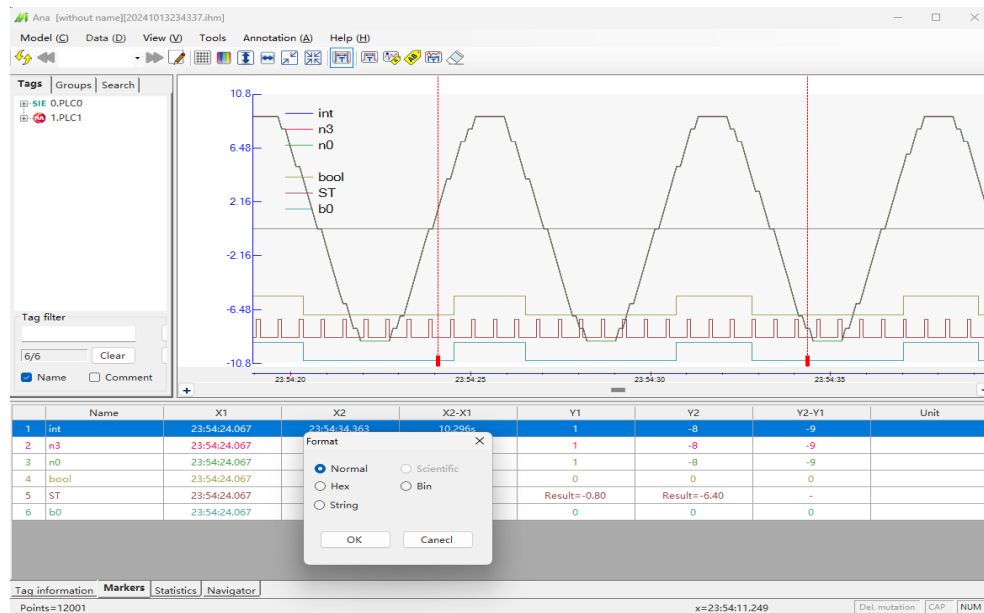
Precise marker control: Select the marker and use the left and right keys to move it pixel by pixel.

Use the menu "View -> Options" to adjust the block size to suit your preferences.

According to the settings in the Tag Information Table, the first tag is displayed in binary format.

Tags listed in the Tag Information Table will still be included in statistics, even if the series are not displayed, but their background will be gray to indicate this distinction.

Right-clicking on a tag allows users to change its display format. The available options for display formats depend on the tag type. Bool type has no other format; floating-point and double types can also select scientific notation, while other types can choose hexadecimal or binary formats for easier viewing of bit or byte values.



If relative time is selected, the values at X1 and X2 will display the time differences relative to the trigger moment.

Correspondence between tags and charts:

When a row in the table is selected, all tags in the corresponding chart will be indicated in gray. After selecting a chart with the mouse, the related tags in the table will also be indicated in gray.

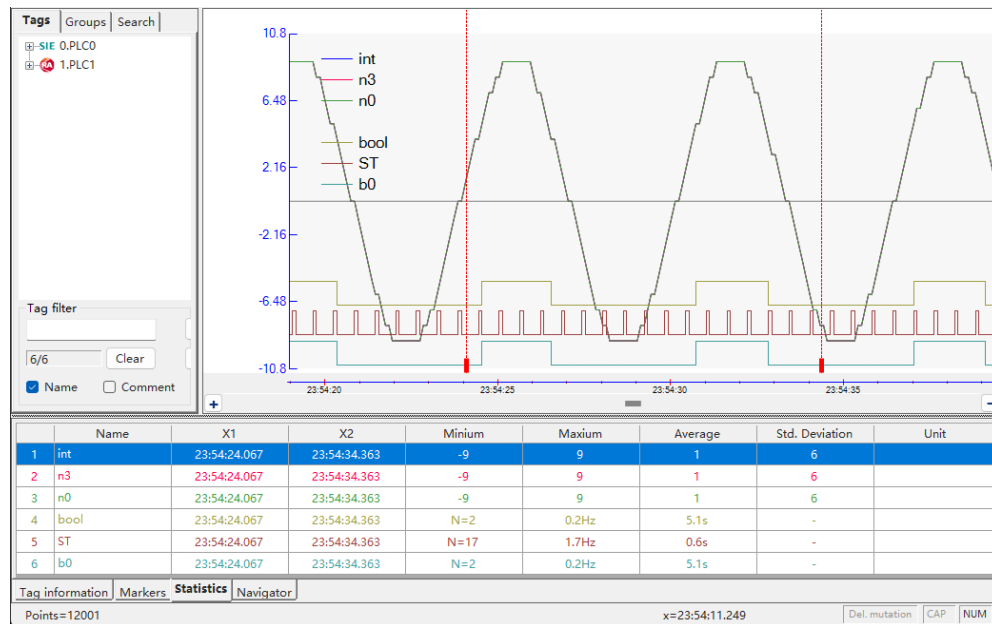
### 5.7.3. Statistics Information Table

Opening the table will display two movable X markers in the series area (X1 on the left and X2 on the right), with statistical information between the markers shown in the table. For numerical series, the displayed statistics include Maximum, Minimum, Average, and Std. Deviation. For Bool series, the displayed statistics include pulse count, interval frequency, and average cycle information. Moving the marker will change the values accordingly.

When dragging the marker, the values will change in real time.

Precise marker control: Select the marker and use the left and right keys to move it pixel by pixel.

Tags listed in the Tag Information Table will still be included in statistics, even if the series are not displayed, but their background will be gray to indicate this distinction.



If relative time is selected, the values at X1 and X2 will display the time differences relative to the trigger moment.

Correspondence between tags and charts:

When a row in the table is selected, all tags in the corresponding chart will be indicated in gray. After selecting a chart with the mouse, the related tags in the table will also be indicated in gray.

#### 5.7.4. Adjust Column Width

Some columns allow width adjustments, which can be done by dragging the header row. After adjusting the width, if the window size is changed, each column will be proportionally adjusted to fill the available width.

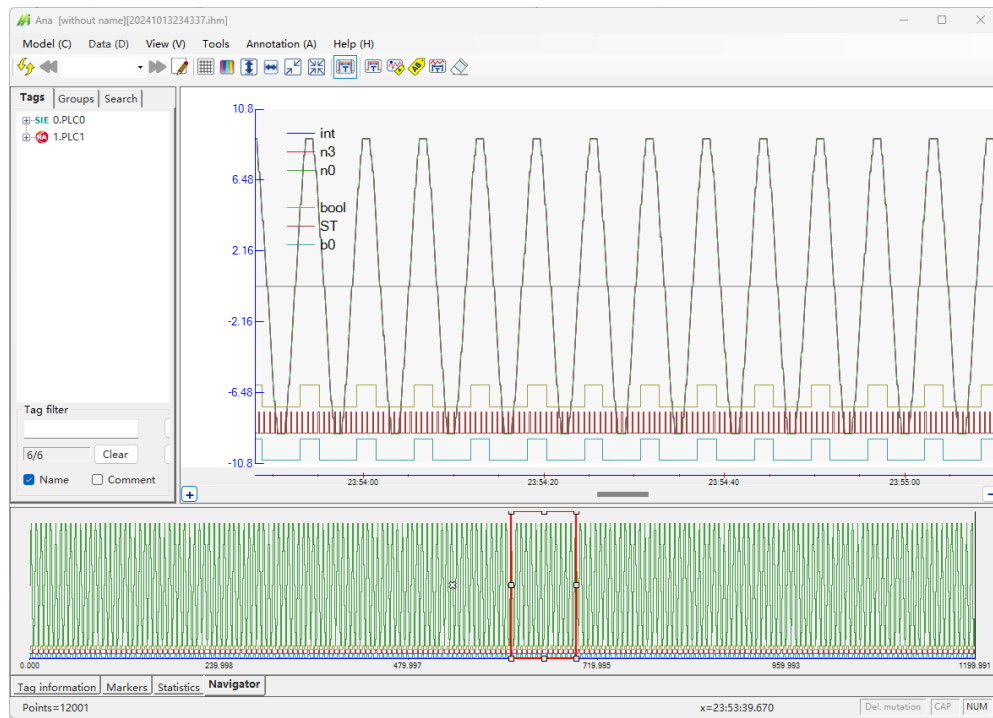
#### 5.7.5. Navigation Table

Select the navigation table, then choose any chart to navigate to that area.

Select the red box to adjust its size and position; the content in the corresponding area will change, and the time axes of other areas will also adjust accordingly.

Zooming in and out of each graphical area will have the red box indicate the current window of the navigation area.

In the absence of dragging, quick rulers, annotations, or other active states, clicking on different charts will switch the navigation window to the corresponding chart.



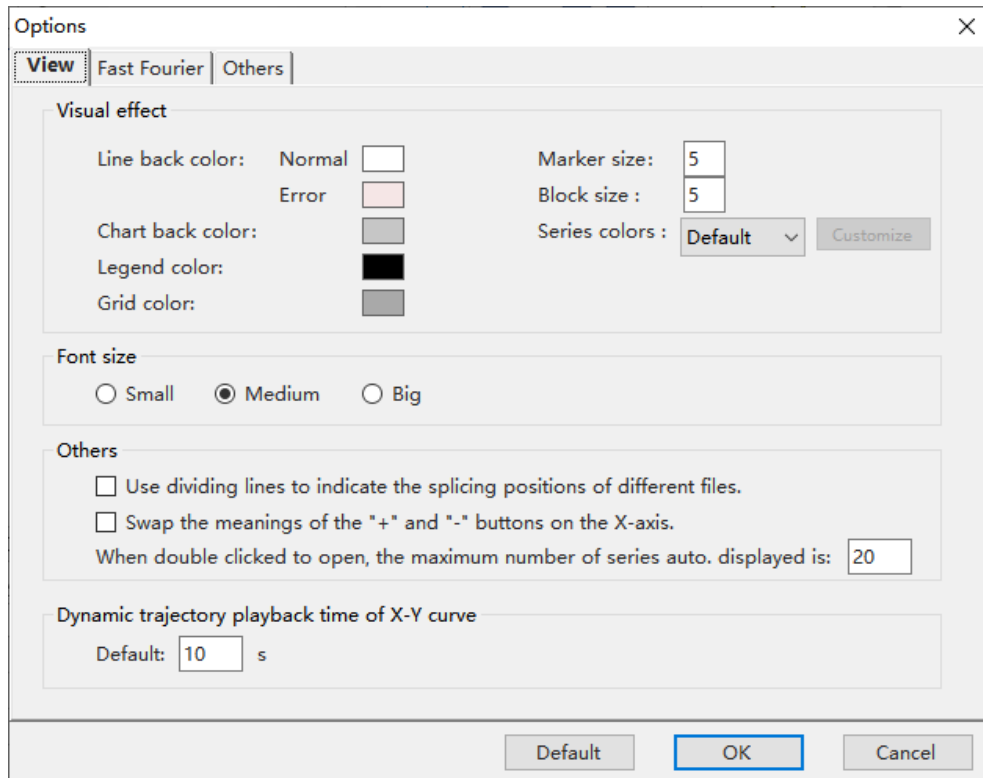


## 5.8. The Information at the Bottom

The left side at the bottom displays the maximum number of points for each channel (maximum points). The right side shows the x value at the mouse click.


## 5.9. Display Format Modification (Options)

You can open the options page for personalized display settings through the menu "View" -> "Options".

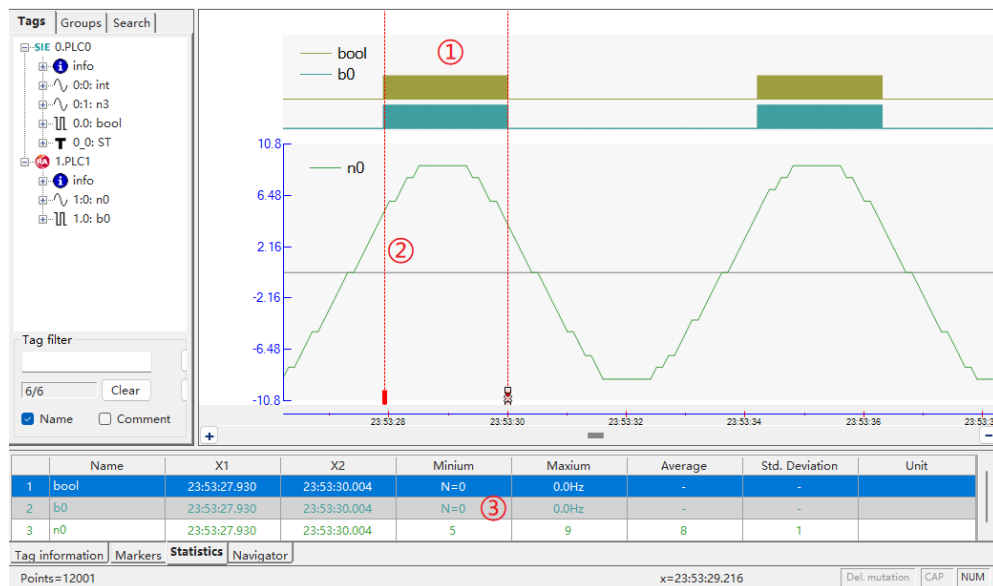


## 6. Shortcut Operations for Bool Tags

### 6.1. Quick Ruler Function for Bool Tags

Click  button or use the menu "View -> Quick ruler" to enable this function. Then select the bottom ruler or statistics function; two red rulers will appear. Click any Bool tags area, and the ruler will automatically position itself at the left and right edges of that tag's state, while the statistical or annotation data for all tags in the table will change accordingly.

This feature can greatly facilitate segment analysis of a range of data.



### 6.2. Quick Annotation Function for Bool Tags

It can quickly measure and annotate the pulse length of Bool tags (excluding waveform-like String tags of Bool tags), as detailed in "[Annotation for Bool Tags](#)".

### 6.3. Bool Tags are displayed as bar shapes.

Enable this feature through the menu "View -> Bool fill color"; high levels of Bool tags will be displayed as solid shapes, making it easier to view and distinguish the status of Bool tags.

### 6.4. Bool Height Adjustment

Select the height of Bool tags through the menu "View -> Bool height"; in conjunction with font size adjustment, this allows for nine levels of height adjustment.

[Download Operation Tips Video.](#)

## 7. Search Function

Click the search form on the left to access the search interface, where you can set conditions and perform searches.



### 7.1. Search Condition

The image displays two side-by-side screenshots of a search interface. Both screenshots show a 'Tags' dropdown menu, a 'Search target' section with 'Value' selected, and a 'Value' section with a 'Rule' dropdown and a 'Value' input field. The left screenshot shows the 'sysword' tag selected, with the rule set to 'GT >' and the value set to '0'. The right screenshot shows the 'bool' tag selected, with the rule set to 'EQ =' and the value set to 'True'. Both screenshots also show a 'Time span' section with a 'value' input field and a 'Time span' dropdown menu, and a 'Judge' section with radio buttons for '>=' and '<'. The interface is divided into three tabs: 'Tags', 'Groups', and 'Search'.

The tag name list displays all available tags, with expression channel tags listed first, followed by external tags sorted by channel and tag numbers.

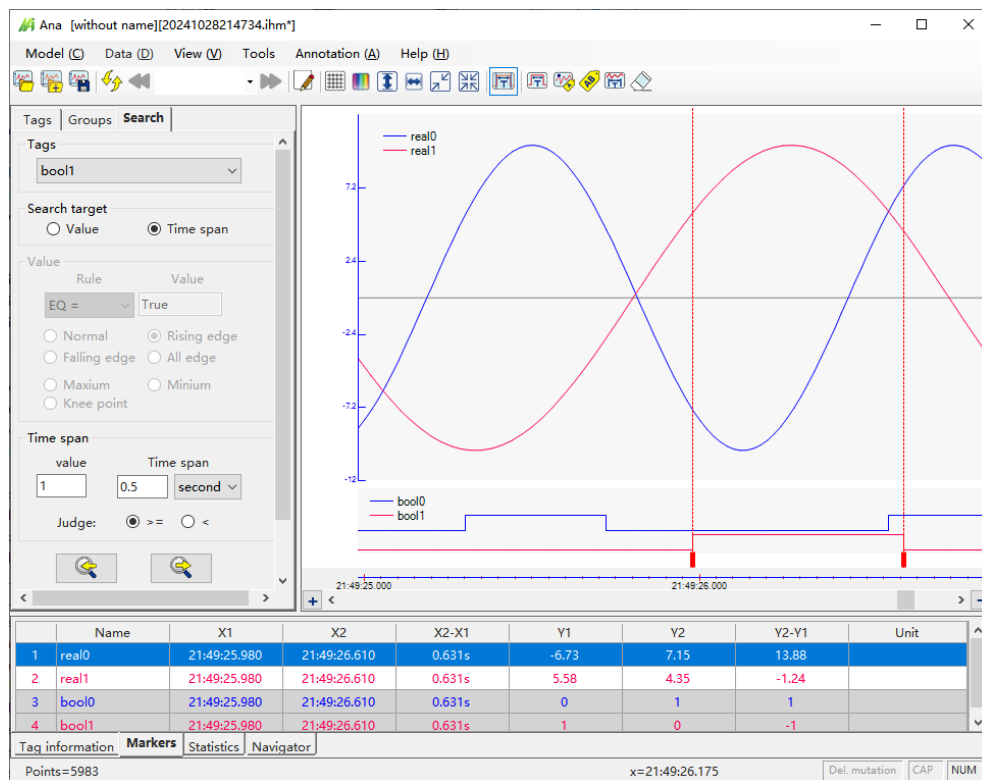
For numerical tags, only value searches are allowed. For Bool tags, searches can also be conducted based on the duration of the state. Value 1 represents True, while value 0 represents False.

## 7.2. Search Mode

Then click on  to search backward from the cursor, or click on  to search forward.

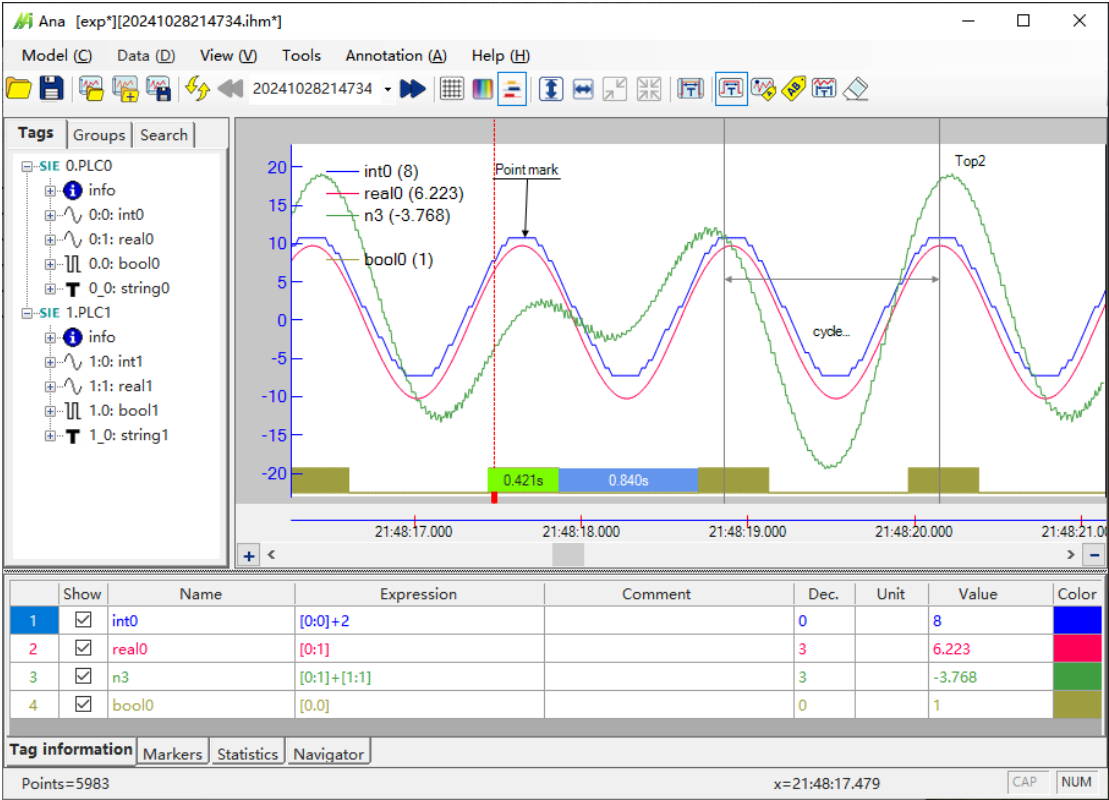
If the bottom table is on the "Tag Information" or "Navigation" page, the cursor will stop at the first found point, change to a red cursor, and update the current value in "Tag Information".

If the bottom table is on the "Markers" or "Statistics" page. Before performing a value search, you need to select a marker for positioning. When performing a time span, there is no need to select a marker; the dual cursor will automatically position itself at the pulse that meets the conditions.



Edge Detection Function: "Normal" indicates non-edge detection. Other options can search for specified edge types. For numerical tags, there are three types: "Entry edge", "Left edge", and "All edge". For Bool tags, there are three types: "Rising edge", "Falling edge", and "All edge".

# 8. Annotation Function




Features quick annotation for Bool tags, point annotation, text annotation, and range annotation. At any time, only one annotation method can be selected, or none can be chosen (by clicking on an already selected button), allowing for other graphical operations.


Since the annotation are associated with the data, some annotations can be saved within the data file, allowing for recovery when reopened. If an annotation is associated with multiple reference tag data points, it cannot be saved.

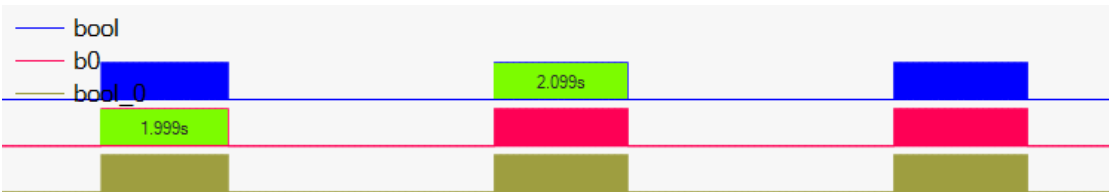
## Description

The local zoom feature conflicts with the annotation function; therefore, local zoom can only be performed when the annotation function is not selected.


## 8.1. Annotation for Bool Tags

Used to quickly determine the width of Bool tags  pulse (unit: ms).

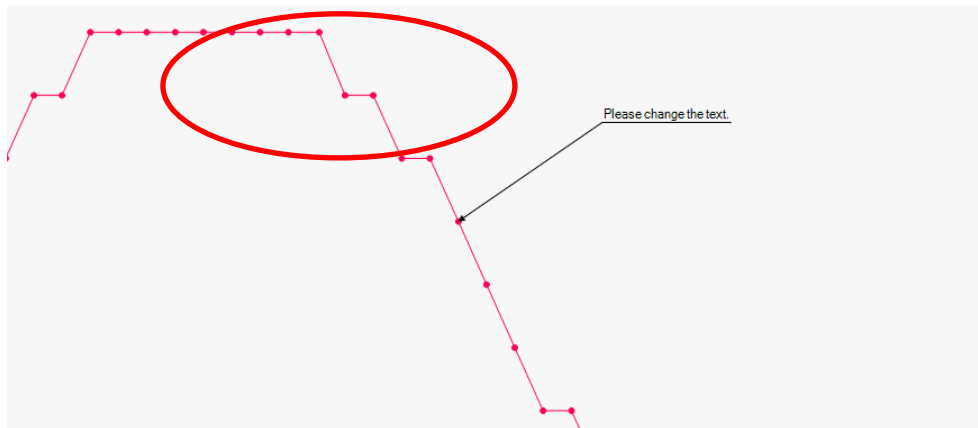
Click  button, then click on the Bool tag series to label the duration of this state. The effect is as follows:




## 8.2. Point Annotation

Click  button, then click the mouse near the target point to display a note pointing to the selected point. Double-click to edit the note's content, and drag to change its position.

The effect is as follows:




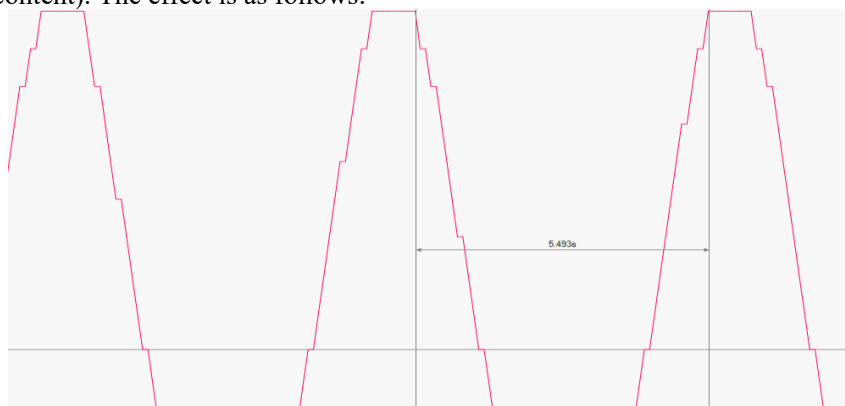
### 8.3. Text Annotation

Click  button, then click on the series with the mouse to display a text annotation. Double-click to edit the annotation content, and drag to change the position of the annotation. The effect is as follows:




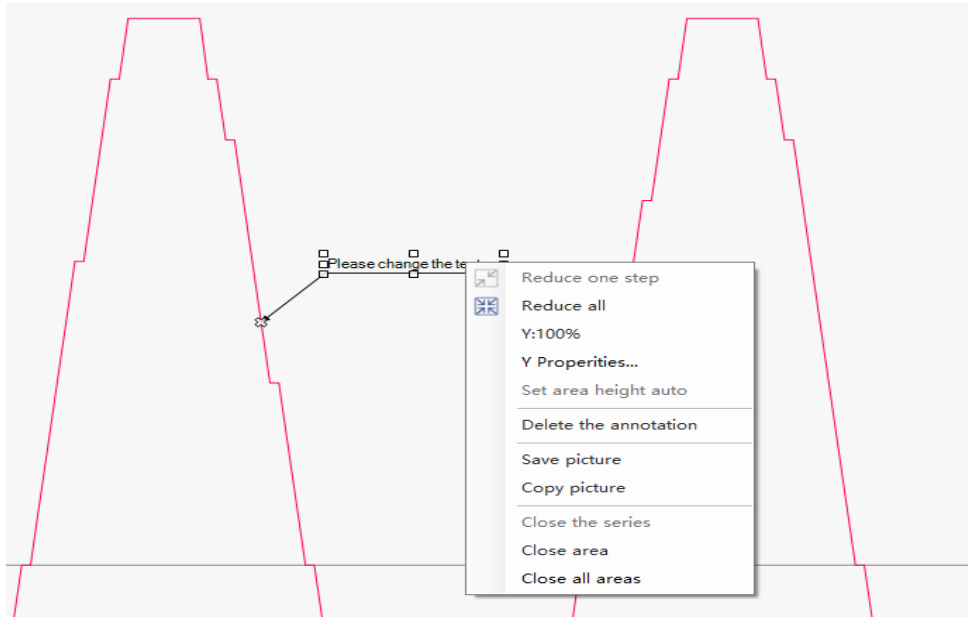
### 8.4. Range Annotation

Click  button, then drag from the starting point to the endpoint on the graphic to create a range annotation. Moving the vertical line left or right can change the annotation area. Moving the horizontal line up or down can change the position of the text. When annotating, the text displayed shows the duration, which can also be double-clicked to change its content (Note: If the vertical line is moved again, it will revert to the time content). The effect is as follows:



## 8.5. Delete Annotation

Each type of annotation can be selected, and right-clicking the mouse will show the "Delete the annotation" option, allowing you to remove the selected annotation. You can also click  button to delete all annotations.



## 9. Data Files Operations

### 9.1. Open

Method 1: Double-click to open

Use File Explorer to locate the data file you need to open, and you can open it directly. And display the curve in its original display state (not affected by the option Show original status') The prerequisite is that the data file is already associated with the software, valid only for: ihm and. atd.

When there are too many displayed curves (which can be set in the option parameters), the original display will be disabled. If you need to display the original state, please open the file from Ana software.

Method 2: Open via menu

Menu: "Data -> Open". After locating the file, you can open it directly.

Do you need to "Show original status"?

When double clicking to open a file, due to uncertainty about how to display the curve, the curve is displayed in its original display state.

If no model operation has been performed in an already opened Ana window, the original display state will be loaded when opening the data file.

When browsing data files quickly, the original display state is not loaded.

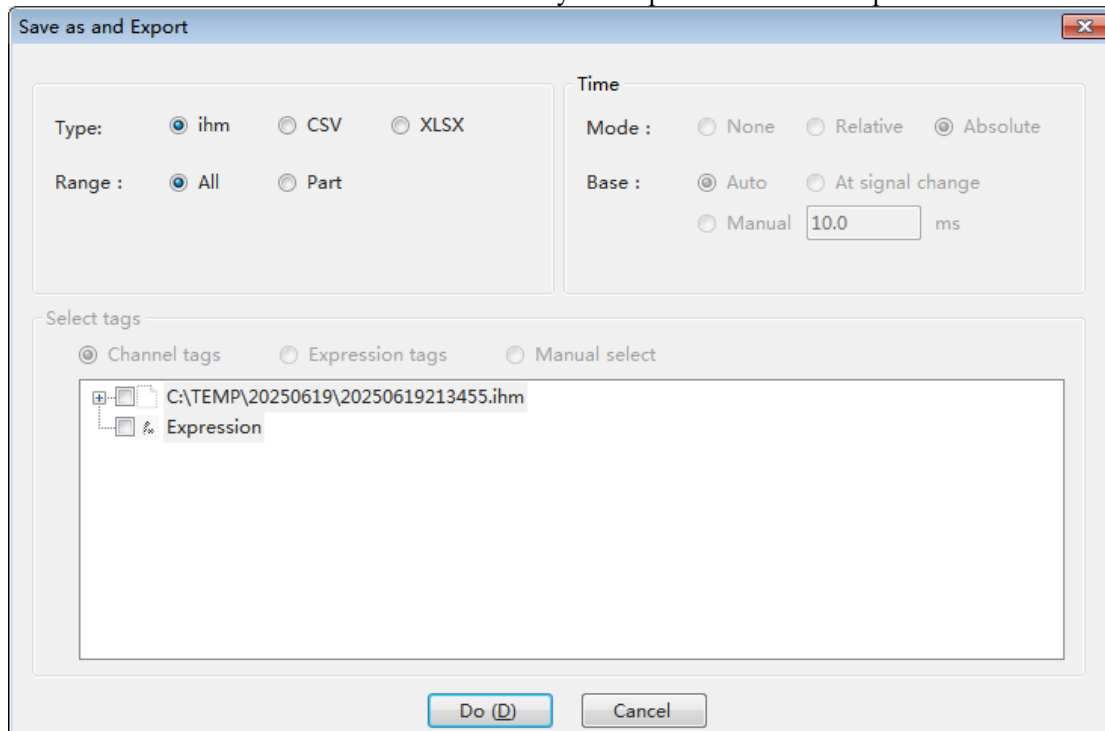
### 9.2. Save

If the displayed content or format changes, you are allowed to save it back to the original file. Note: Some annotations cannot be saved.



### 9.3. Save As and Export

The menu: "Data -> Save as..." allows you to open Save As and Export.



When selecting the save path, the file extension helps distinguish the saved file formats. This software supports three formats: .ihm, .csv and .xlsx.

.ihm is the data file save format for this software, which includes channel, tag configuration, annotation information, and data sections.

The .csv format is a universal data table format that includes only tag names, time, and data content. The time axis can have multiple options, and the tag range can also be freely selected.

The .xlsx format can be directly opened by spreadsheet software and can distinguish between time, numerical, and text formats.

The time base is the time interval between output points, including three modes: Auto, At signal change, and Manual.

✓ Auto:

It will automatically determine the optimal value based on the tag type and the number of external channels involved.

✓ At signal change:

With no fixed time base, an output record will be generated whenever there is a change in the selected tag values. If the selected tag changes slowly, it can significantly reduce the number of output records. If the selected tags include data that may change with each sampling, it could significantly increase the number of output records.

✓ Manual:

The user determines the calculation interval. If the output interval is greater than the sampling interval, some details may be overlooked.

"Partial Save" can be used to export a portion of the data content. The operation method is as follows: use the Marker function to select the area to be saved, then go to this page,


choose the save path, channels, and other details, and check "Partial Save" to achieve partial saving. After exporting, do not immediately open the newly created file.

"Relative" will export the time difference relative to the trigger record, measured in seconds and accurate to milliseconds.

## 9.4. Quick View Function

The Quick View function allows for fast viewing of the current file directory. The interface is as follows:



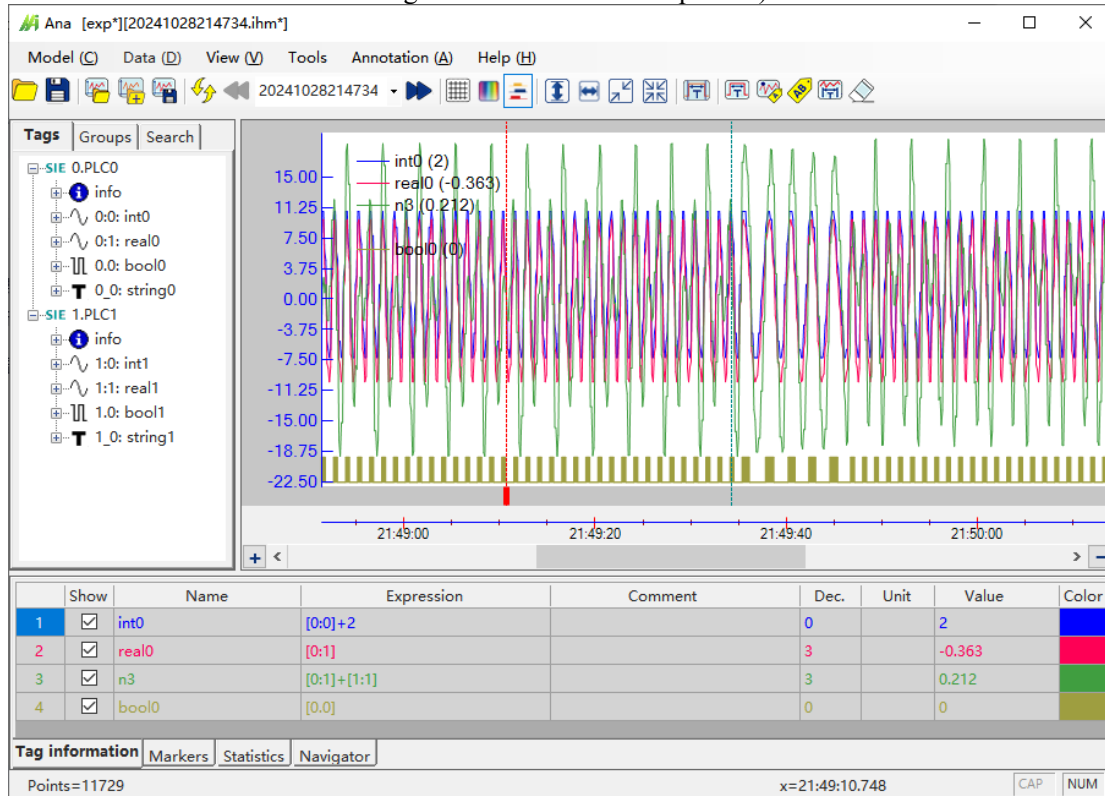
Clicking  will read the waveform files in the current file directory. After the update, the first file in the list will open and be displayed.

The left and right arrows are used to switch between files in the list. The dropdown box can also be used for quick file opening.


## 9.5. Data Files Connection

### Method 1: Connect next

Directly search for the next connected file in the current file's directory and connect the waveforms. A vertical dashed line will indicate the connection (you can show or hide the file connection line through the menu "View -> Options").



You can perform this operation through the menu: "Data -> Multi files -> Connect next".

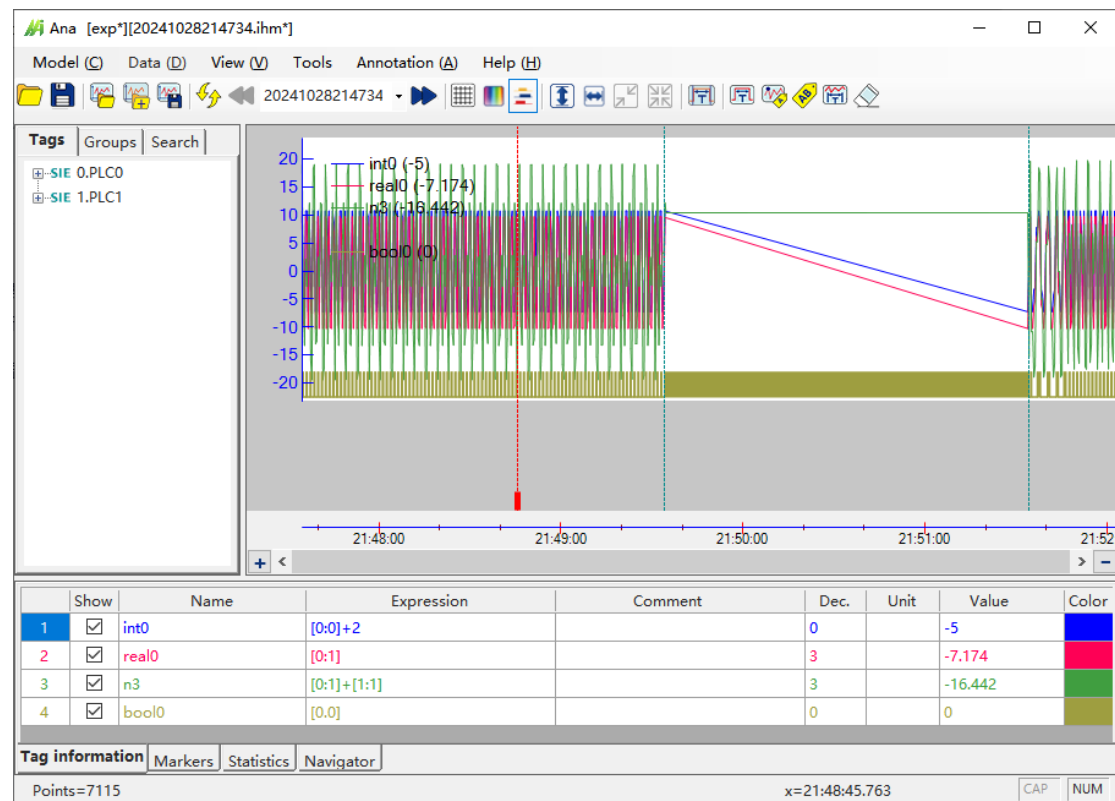
You can also use the shortcut button  or the keyboard shortcut Ctrl+N to perform this operation.

### Method 2: Connect previous

You can perform this operation through the menu: "Data -> Multi files -> Connect previous". You can also use the keyboard shortcut Ctrl+P to perform this operation.

### Method 3: Open multi

Multiple matching data files can be connected in chronological order, even if they are not adjacent, and presented on a single graph.



You can perform this operation through the menu: "Data -> Multi files -> Open multi".  
You can also use the keyboard shortcut Ctrl+H to perform this operation.

No matter which way you connect them, the merged file will be named after the first file.  
When you click save, you will be prompted to save it as a new merged file. The merged file behaves like a single file and no longer has a vertical dashed line.

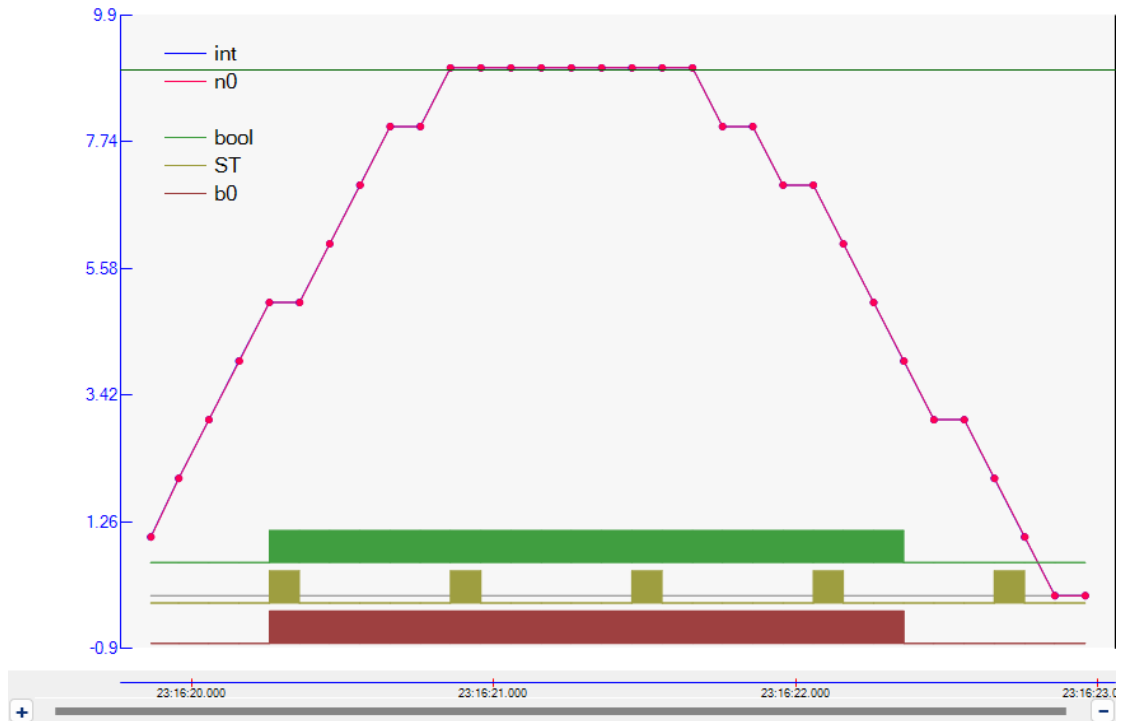
## 9.6. Merge

Please [Open multi-file](#) and then save them.

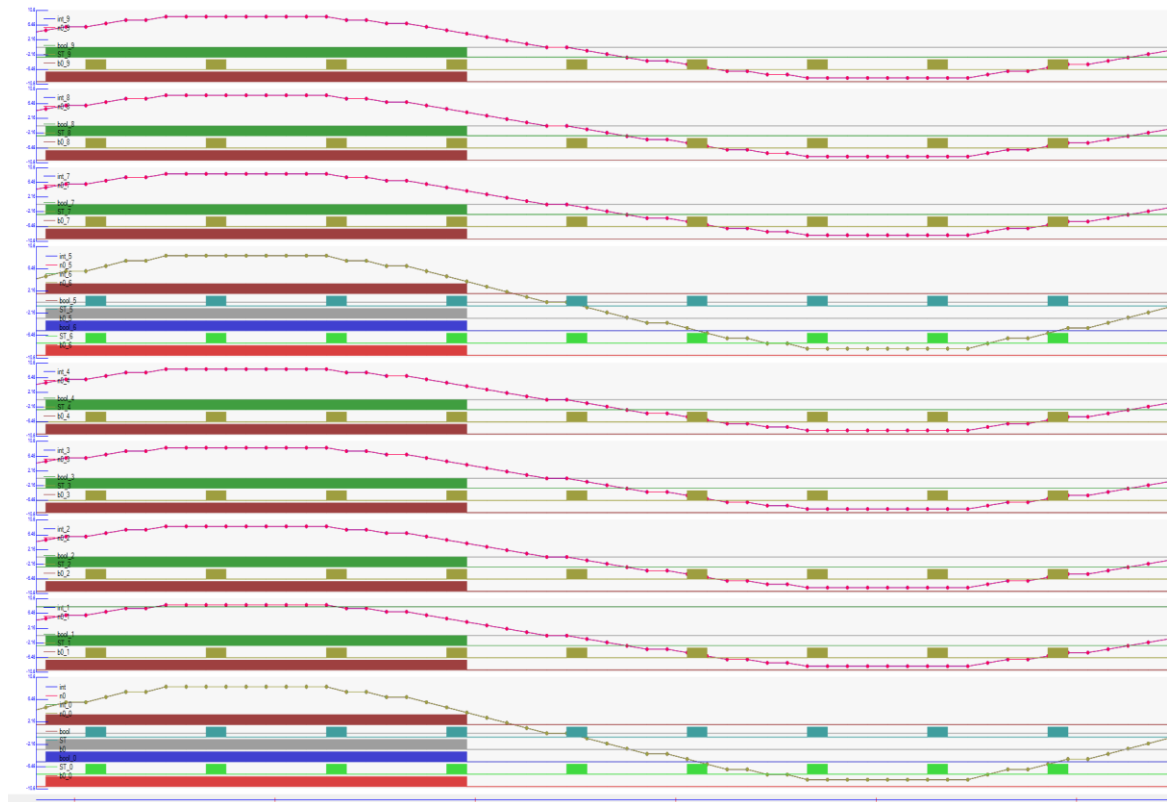
## 9.7. Save the Picture

The picture can be copied and saved.

Right-click on the picture to access the "Save Picture" and "Copy Picture" buttons, allowing you to save or copy the currently displayed content, as shown below:



In the top edit menu, in addition to the save and copy functions mentioned above, there is a "Copy full" feature that allows you to copy the entire picture, even beyond the window's range. The effect is as follows:

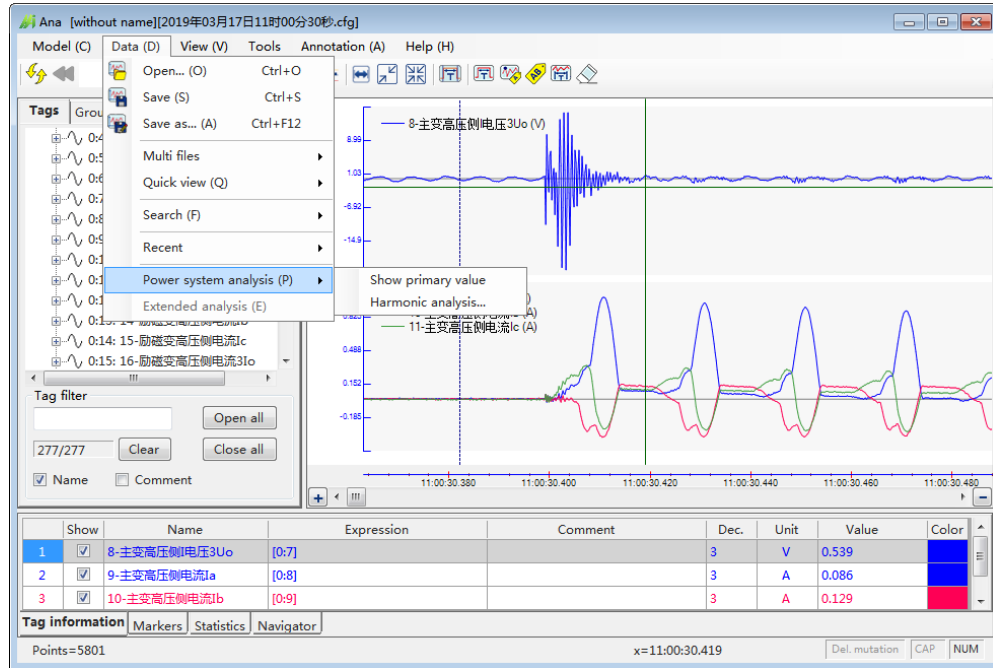


## 9.8. Power waveform file

The power system waveform file (COMTRADE format) is a commonly used fault recording file in the power system.

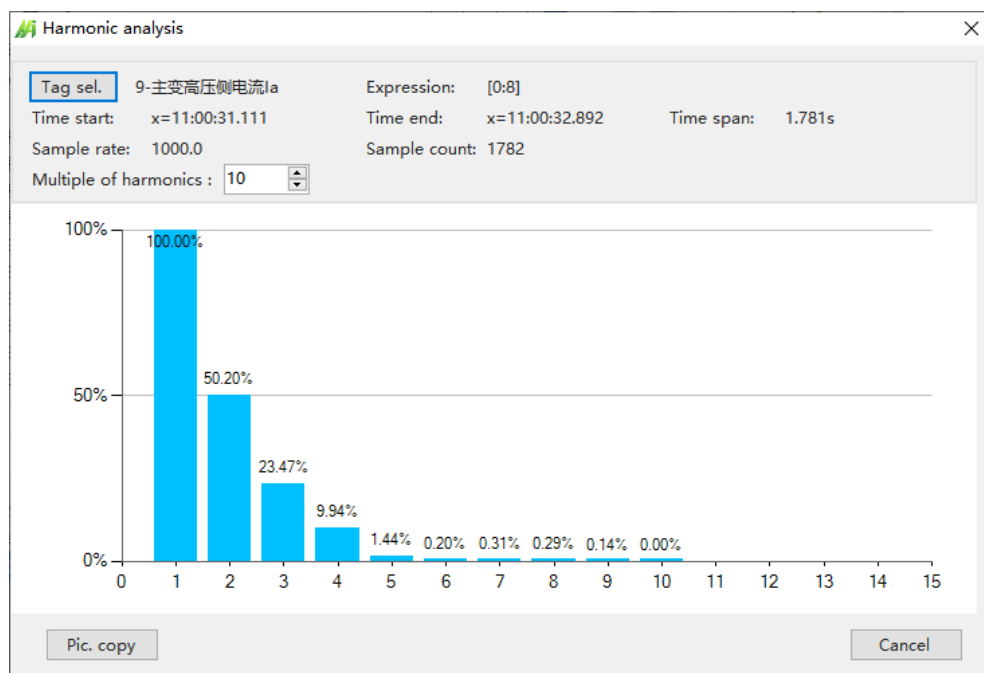
This software supports waveform files that comply with the IEEE Std C37.111-1999, 2013 standard and supports: CFG and. DAT (binary format only) files are not supported .HDR,. INF, .CFF files. Time zone information in the 2013 standard is not supported.

By After opening the CFG file, the menu "Data" will display the content of "Power System Analysis":



By displaying the primary value, it is possible to switch between primary and secondary values and automatically change the units of voltage and current.

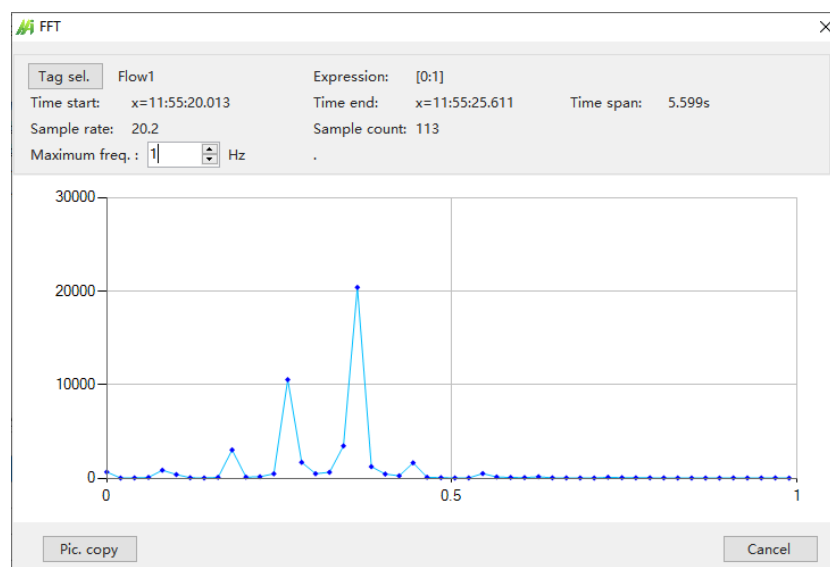
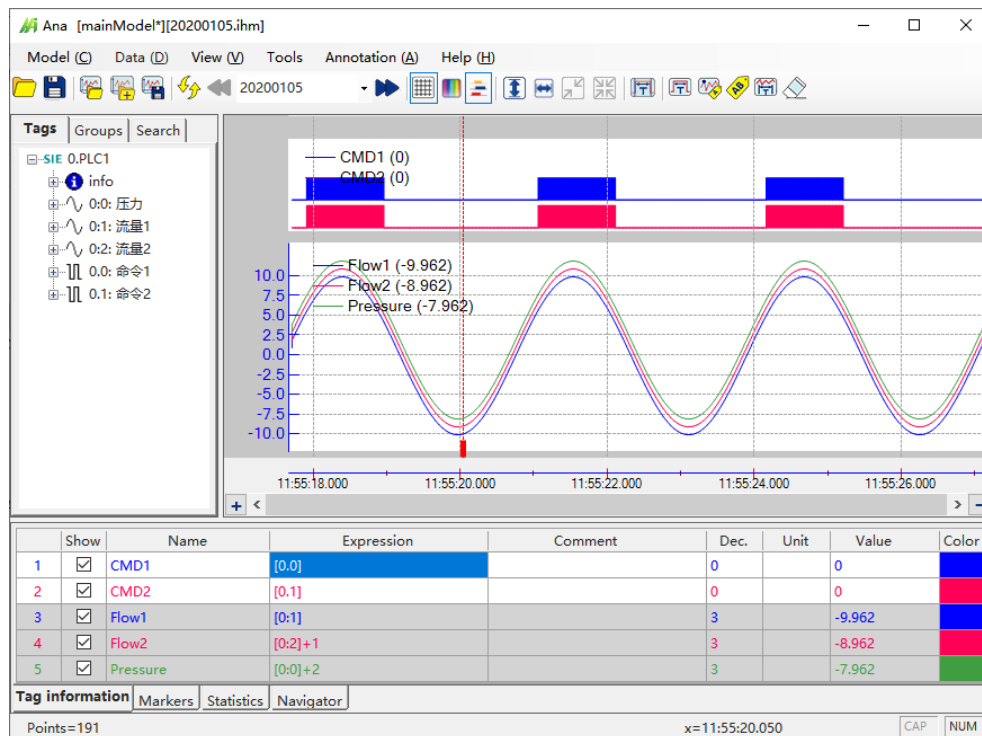
Through "Power Harmonic Analysis", the harmonic analysis window can be opened to perform real-time harmonic analysis on the selected variables and time periods.



## 10.Data Analysis

### 10.1. Fast Fourier analysis

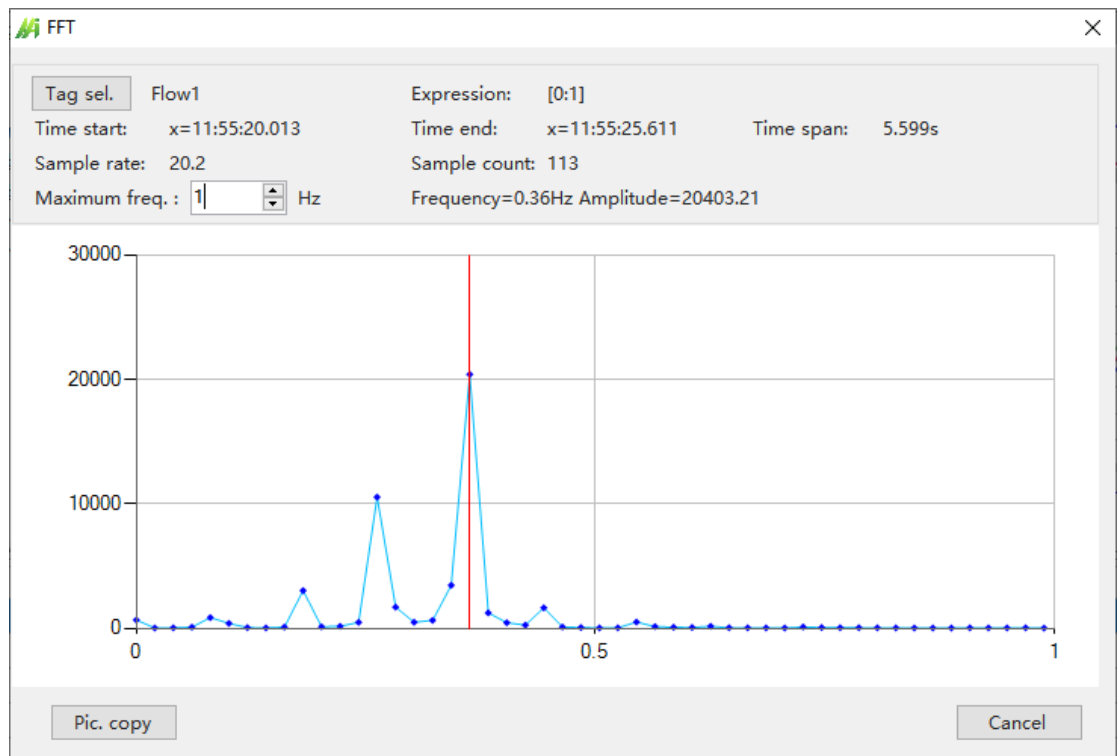
By using fast Fourier analysis, various frequency components in the waveform can be viewed. Open the data file and create the expression variables that need to be viewed or analyzed (drag and drop or create in the bottom table). Then, enter the window through the menu: "Tools" - "Fast Fourier Analysis" (automatically opens the first selected variable). Select the curve to be analyzed on the main interface, use a ruler to select the time window for analysis, and you can see the spectral distribution in real-time in the Fourier analysis window.



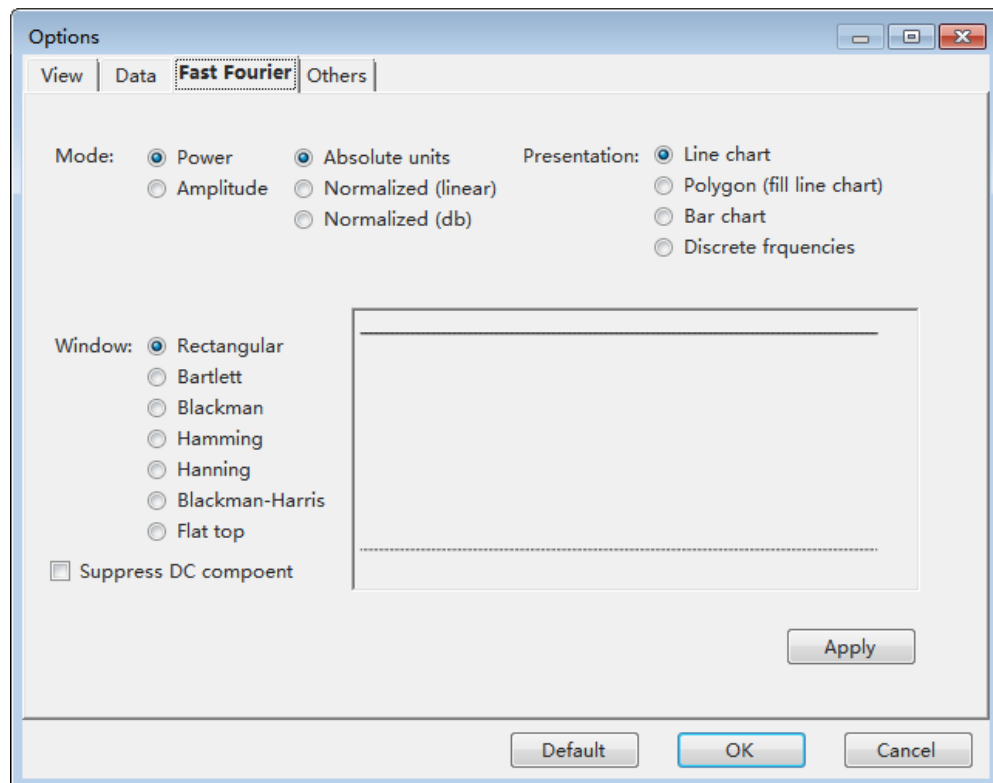
The frequency range to be viewed can be modified through the "maximum frequency" input box. Click on the frequency curve with the mouse to view the corresponding frequency and amplitude.



Select the box with the mouse in the X direction to view details:



By using the Fast Fourier option, you can adapt to their desired preprocessing window and specify the content and format of the output.



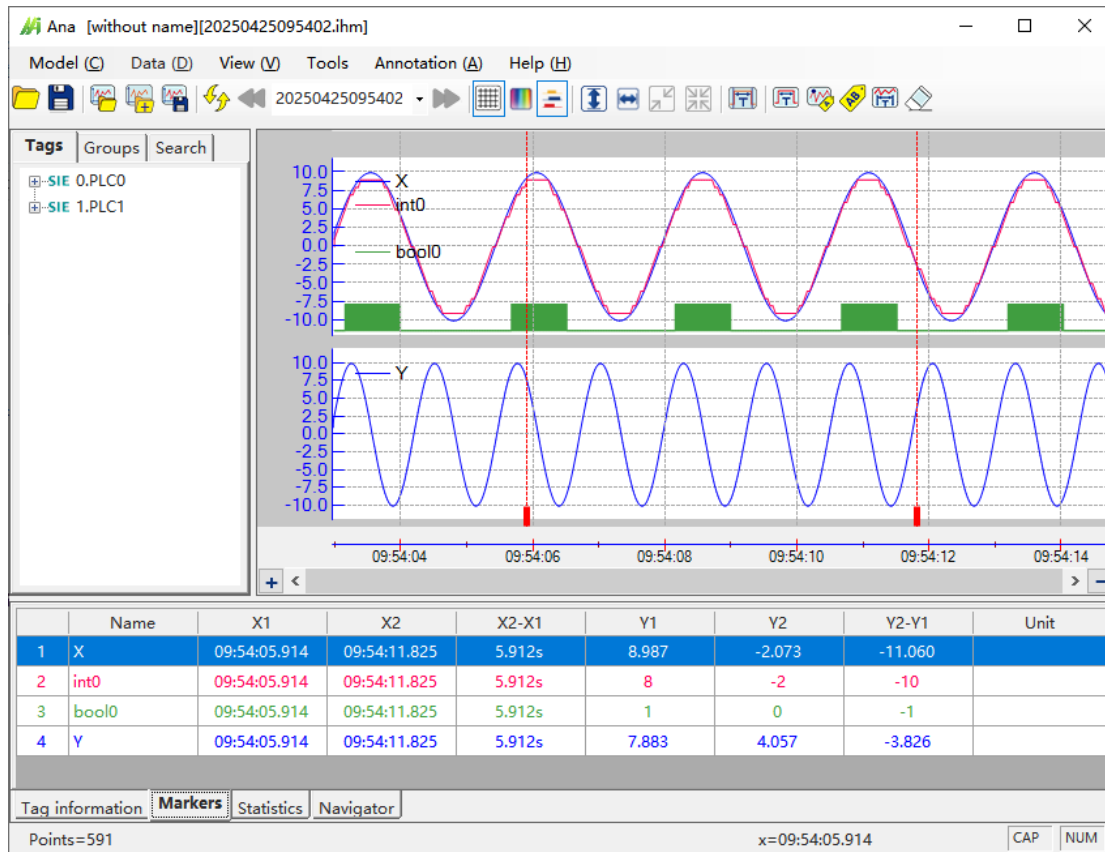
## 10.2.X-Y Curve

When opening the curve with Ana, all you see are curves with time as the X-axis, making it difficult to see the relationship between variables. The X-Y curve is a method of demonstrating the relationship between two variables.

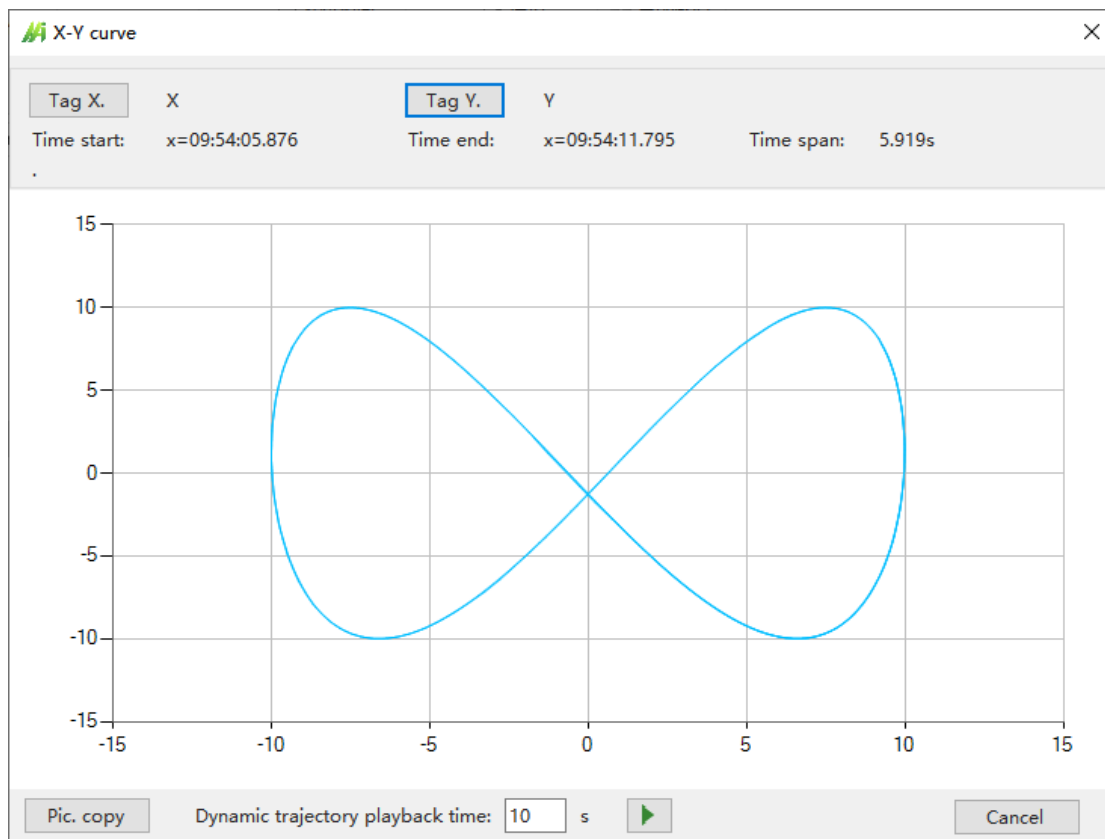
From the menu "Tools" - "X-Y Curve", you can open the interface, allowing multiple interfaces to be opened for simultaneous analysis of multiple sets of variables.

Select the X-axis and Y-axis variables in the interface. In the main interface, the display range can be adjusted using a double ruler. The play button can generate curves in chronological order, displaying dynamic X-Y relationships.

The temporal relationship of X and Y:



The interrelationship relationship of X and Y:



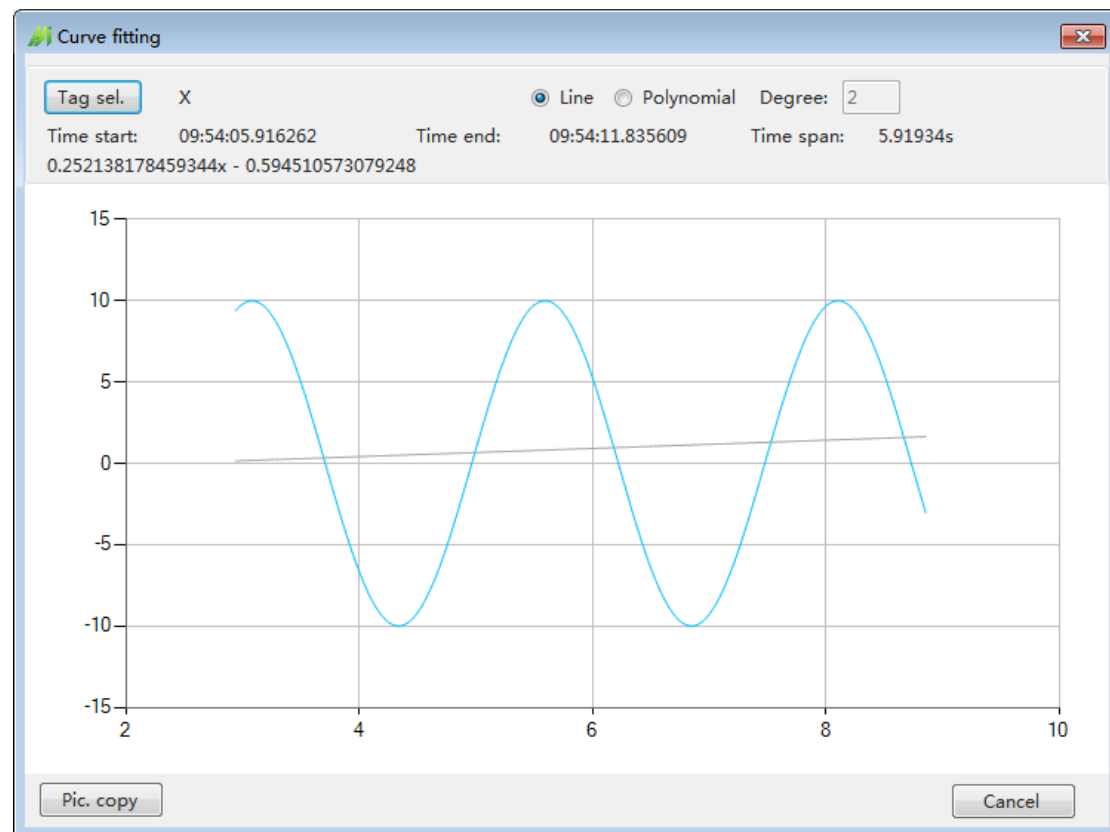
### 10.3. Curve Fitting

Fit a curve to a single variable. Linear fitting and polynomial fitting can be performed.

From the menu "Tools" - "Curve Fitting", you can open the interface, allowing multiple interfaces to be opened for simultaneous analysis of multiple sets of variables.

Select variables in the interface and then choose the fitting method. The fitting curve (grey curve) and fitting formula can be obtained.

Linear fitting:



Second-order polynomial fitting:

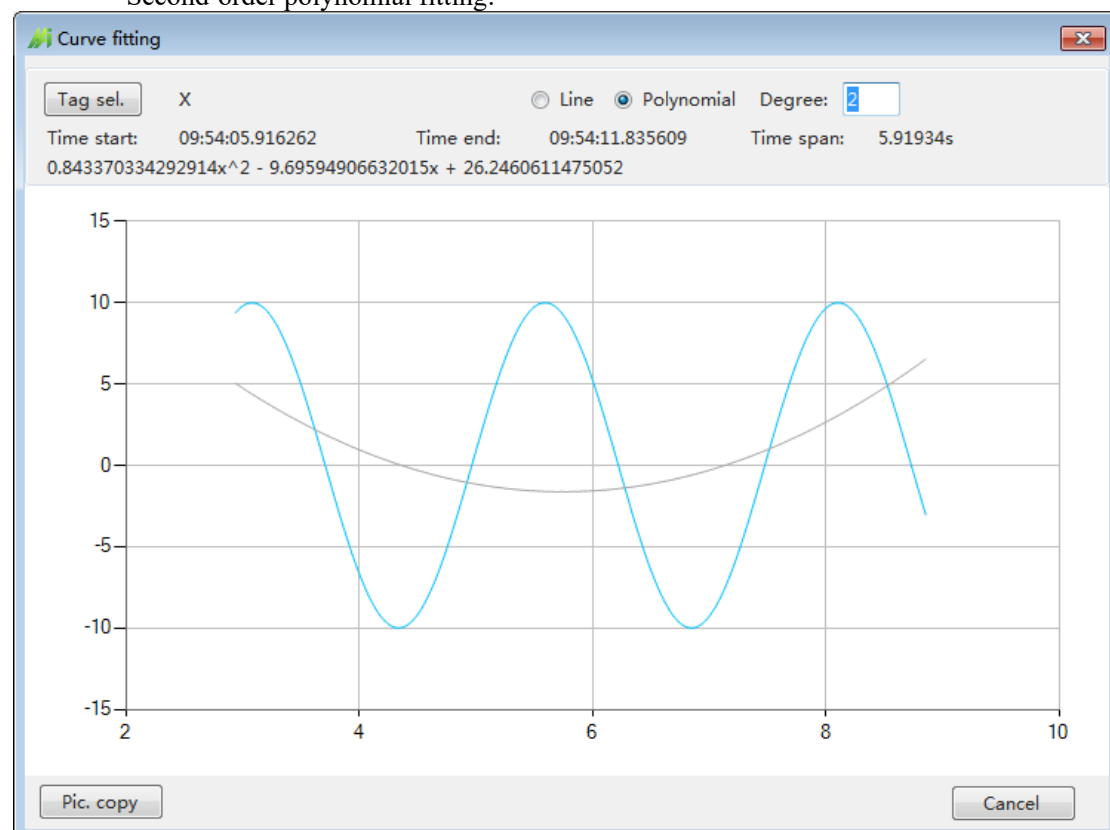


Figure 11.8: Second-order polynomial fitting

## 10.4. Correlation Analysis

In fault analysis and quality analysis, correlation analysis tools are commonly used to visually confirm the degree of mutual influence between variables in order to find the cause.

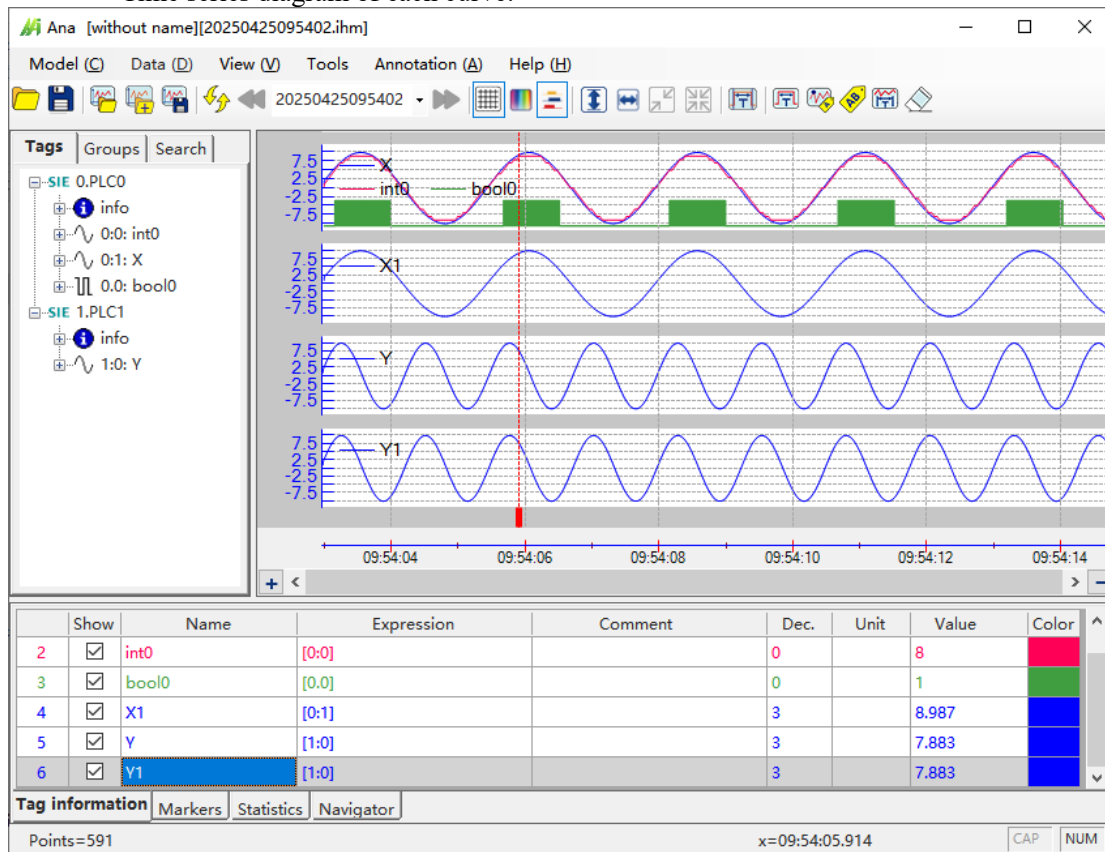
The correlation analysis of this software can quickly analyze the correlation between multiple variables during a certain period of time.

From the menu "Tools" - "Correlation Analysis", you can open the interface, allowing multiple interfaces to be opened for simultaneous analysis of multiple sets of variables.


Select the coefficient calculation method in the interface, and then select multiple variables to immediately calculate their correlation.

Pearson correlation coefficient is a statistical measure of the strength of a linear relationship between two variables, assuming that the data follows a normal distribution, continuity, and size consistency. The Spearman correlation coefficient is applicable when any of these prerequisites cannot be met, and it evaluates the degree of monotonic correlation between two sets of data based on rank rather than the original value.

Time series diagram of each curve:



Correlation between curves:

 Correlation analysis
 ✕

Tag sel.

☒ Pearson correlation
 ☐ Spearman correlation

Recalculate

Time start: x=09:54:05.901

Time end: x=09:54:11.795

Time span: 5.894s

	0:Y1	1:X1	2:Y	3:bool0	4:int0	5:X
0:Y1	1	-0.0482	1	0.019	-0.0404	-0.0482
1:X1	-0.0482	1	-0.0482	0.8446	0.999	1
2:Y	1	-0.0482	1	0.019	-0.0404	-0.0482
3:bool0	0.019	0.8446	0.019	1	0.8461	0.8446
4:int0	-0.0404	0.999	-0.0404	0.8461	1	0.999
5:X	-0.0482	1	-0.0482	0.8446	0.999	1

Cancel

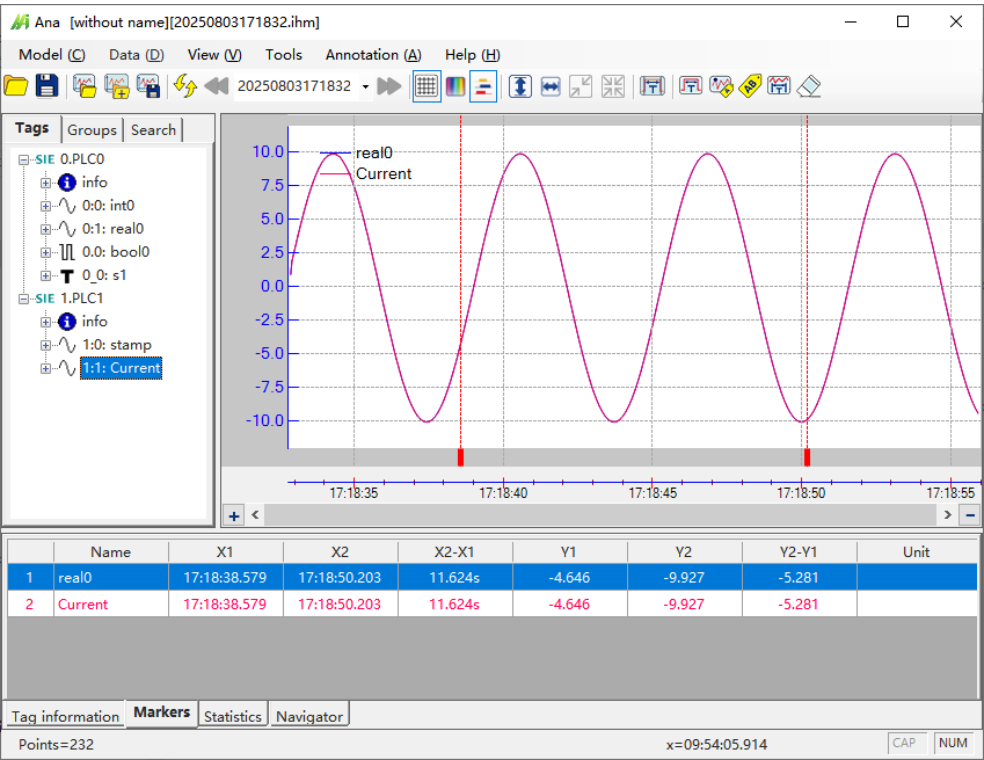
# 11.Channel Offset

## 11.1.Function Description

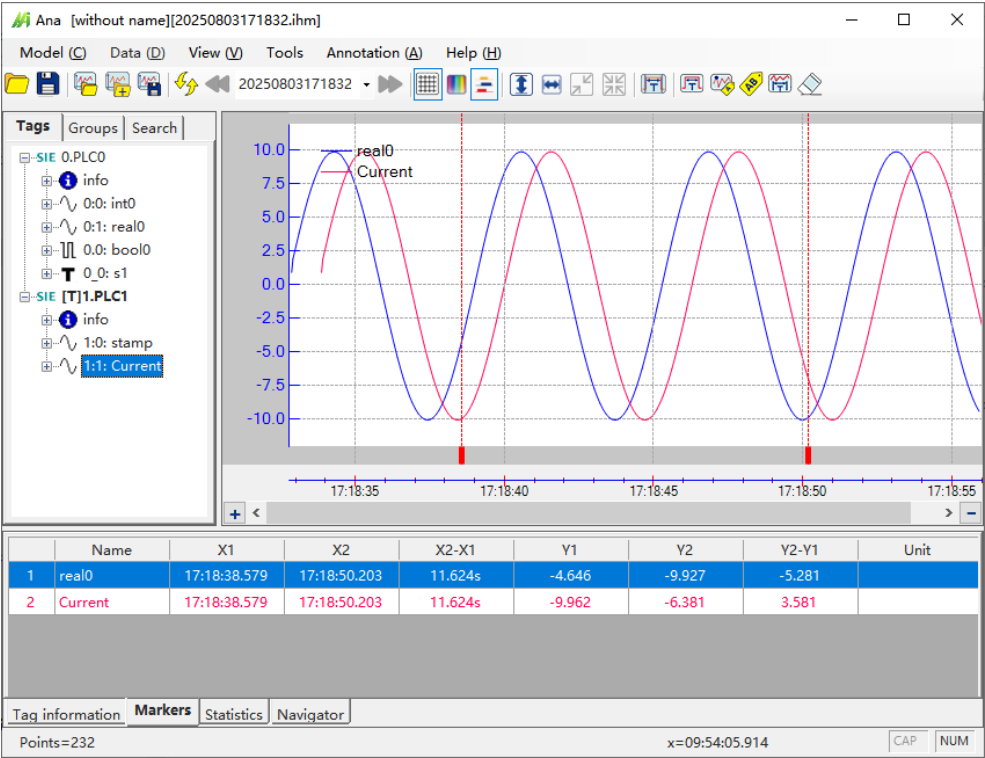
If users need to align the series of different channels at a specific time point, for example: there are two PLCs driving two moving carts, and they need to compare their acceleration and positioning for consistency, one channel's time can be offset to align the starting points of acceleration for both PLCs, allowing for comparison of whether the series coincide.

The two series below show the changes in effects before and after adjusting the channel offset.

Data Timestamps of Two Channels Being Exactly Aligned:



The Effect After a 1-second Offset Applied to PLC2:





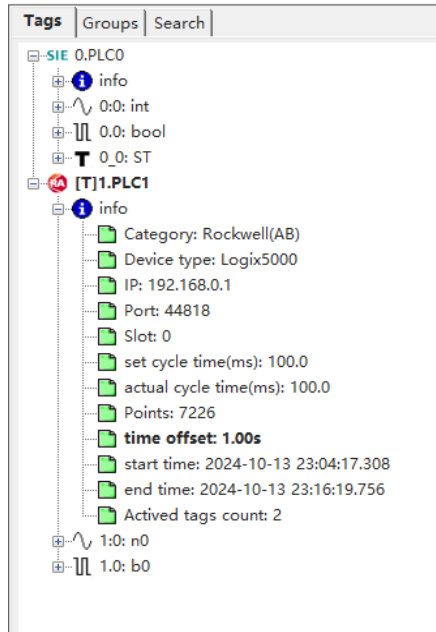
## 11.2.Channel Offset Setting Method

Select a channel on the left tree diagram, right-click on the channel name, and you can access the channel offset menu.

You can modify the channel's offset time, which can be positive or negative, in units of ms or s. You can also clear the offset.

The offset time is stored in the layout file.

Channels with a time offset set will have their names bolded and prefixed with [T]. In the channel information, you can also see the bolded "Time Offset":



## 12.Extended Analysis

### 12.1.Function Description

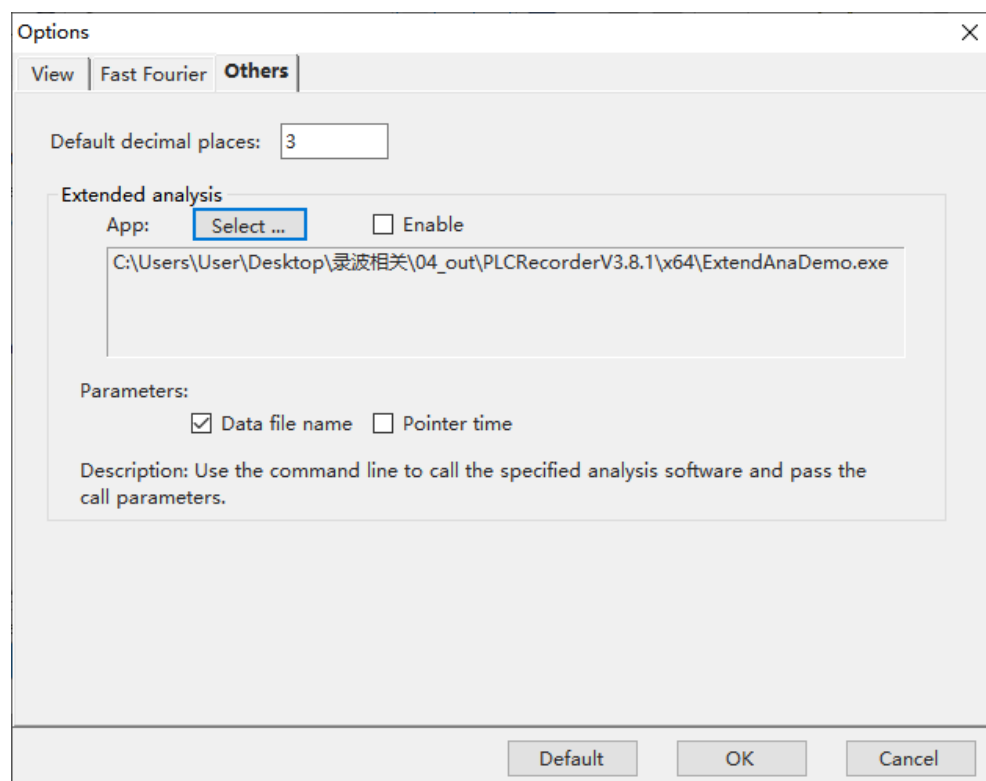
Through the extended analysis function, users can launch an external program for further analysis of the current data file.

### 12.2.Setting Method

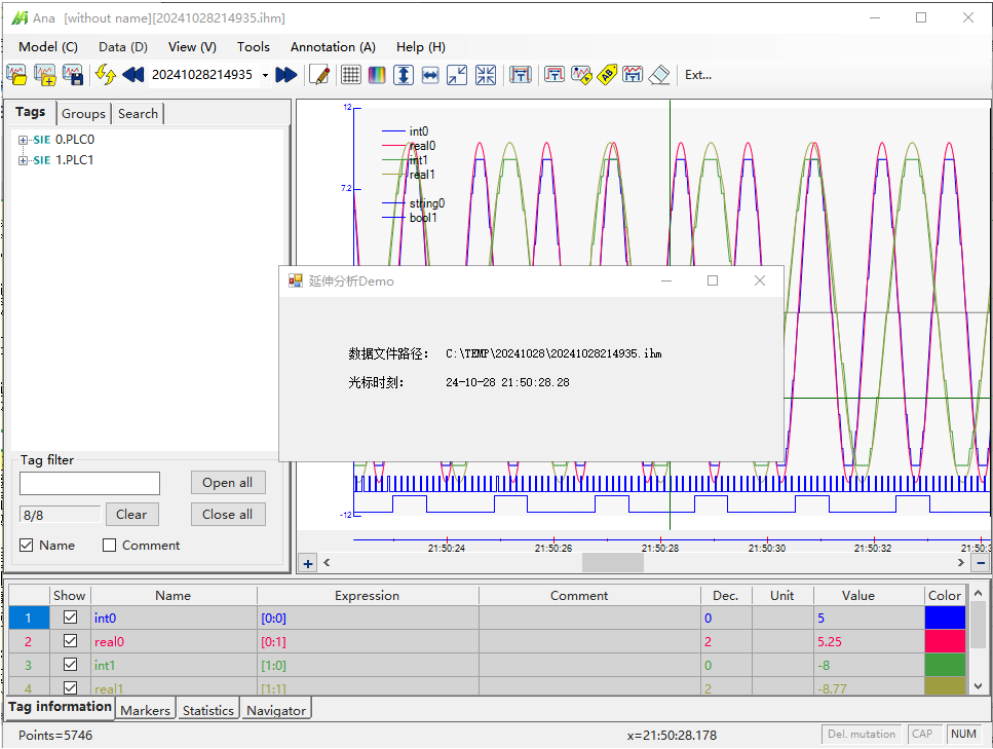
Set it up via the menu: "View -> Options". If this feature is enabled, a button labeled "Ext..." will appear on the main interface for quick operations.

Use the "Select..." button to choose the external analysis software.

When launching the analysis software, you can pass two parameters: the current data file name and the pointer time of the mouse click (refer to the demo software for parameter parsing methods).



### 12.3.Extended Analysis Effect Demonstration



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## 13.Shortcut

Category	Function	Shortcut
Data Operations	Single file: Open	Ctrl+O
	Single file: Save	Ctrl+S
	Single file: Save as	Ctrl+F12
	Multi-file: Connect next	Ctrl+N
	Multi-file: Connect previous	Ctrl+P
	Multi-file: Open multi-file	Ctrl+H
	Quick view: List update	Ctrl+Shift+2
	Quick view: Previous file	Ctrl+Shift+3
	Quick view: Next file	Ctrl+Shift+4
	Search: Backward search	Ctrl+Shift+B
	Search: Forward search	Ctrl+Shift+F
Model Operations	Check channels	Ctrl+Q
	New	Ctrl+Shift+N
	Open	Ctrl+Shift+O
	Save	Ctrl+Shift+S
Series Operations	Save As	Ctrl+Shift+F12
	Reset X	Ctrl+X
	Reset Y	Ctrl+Y
	Zoom out	Ctrl+I
	Fit screen	Ctrl+A
	Expression tags settings	Ctrl+T
	Copy picture	Ctrl+K
	Copy full	Ctrl+L
Others	Save the picture	Ctrl+R
	Open Help file	F1
	Exit the program	Alt+F4

## 14. Frequently Asked Questions (FAQ)

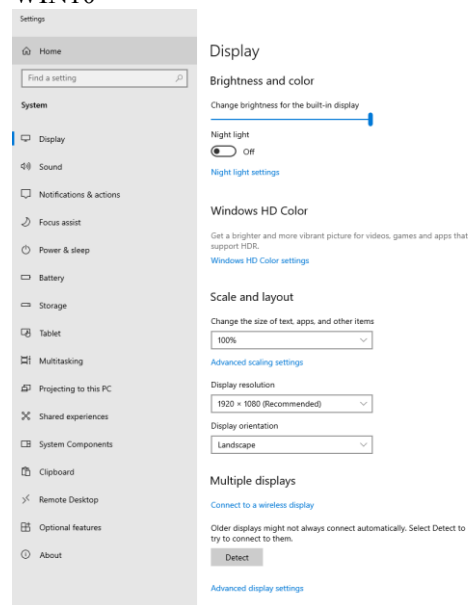
### 14.1. How to merge multiple waveform files?

Perform the [multi-file connection operation](#), and then save.

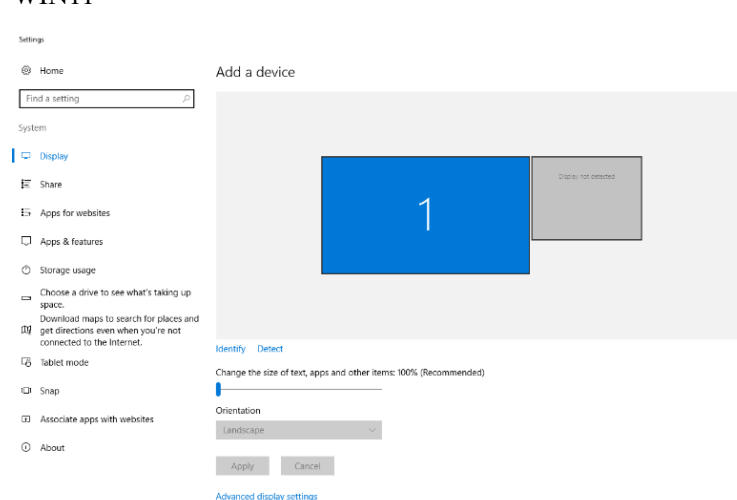
### 14.2. Software interface display issues, including incomplete font rendering.

Please adjust the scaling and layout options in the Windows system to the recommended values:

#### WIN10



#### WIN11

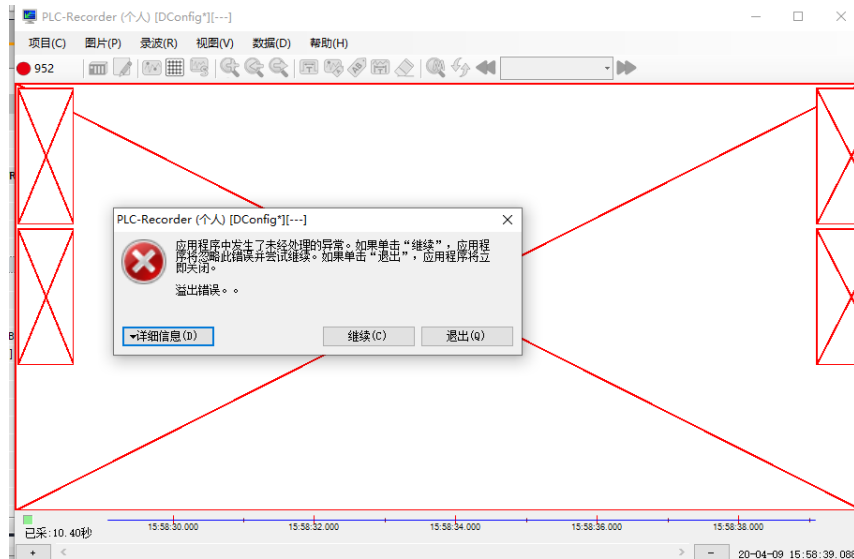


### 14.3. The window shows a big red "X"; what should I do?

The display crash shown in the picture below has been largely avoided by the software, but it cannot be completely eliminated. The common cause is data type errors that can't be detected during recording, leading to extreme values being collected, which causes the display controls to crash.

For example: when we collect tags using DB1.0 and the PLC has a DINT, which is a 32-bit tag, if the recording software uses DOUBLE for collection, it may collect the following 32 bits as well, potentially causing an error (though this does not necessarily cause an error).

So, if you encounter this situation, **please first carefully verify the data types**.



# Appendix 1 Rules of Expression Tags and Descriptions of Functions

## 1. Rule Description

- Conversion relationships when performing mixed operations with logic and numeric values:
  - Numeric 0 <-> Boolean False
  - Non-zero numeric values -> Boolean True
  - Boolean True -> Numeric 1
- The software will first attempt to convert the constant to a long integer; if the conversion fails, it will be converted to double precision. If the constant has a decimal point, it will be converted to double precision; if it does not have a decimal point, it will be converted to a long integer.
- When performing mixed operations between integer and non-integer values, they will be converted to double precision before calculation. Be aware of potential precision loss.
- Some operations require non-floating-point or double precision parameters (please follow the instructions).
- Tag reference format: [0:2]
  - ':' is a type connector symbol, '!' represents a numerical value, '!' represents a bool, and '\_' represents a string.
  - the part before ":" is the channel number
  - the part after ":" is the number of the variable of this type.
- Names and functions are case-insensitive.
- When a dynamic calculation encounters an error, it will return a value of 0 without interrupting the calculation.
- String type is not currently supported.
- Other Rules:

Serial Number	Rule	Correct	Wrong
1	Fuzzy continuous operators are not supported.	1+(-3)	1+-3
2	When "-" is preceded by "(" or ",", it will be recognized as a negative sign.	-(1+2), Max(1,-2)	1>-2
3	"*" should not be ignored	3*max(1,2)	3max(1,2)

## 2. Supported Operators and Their Precedence

Precedence	Operators	Name or Meaning	Usage Format	Associative Direction	Description
1	()	Parentheses	(Expression) / Function Name(Parameter list)	Left to Right	
2	-	Negative sign operator	-Expression	Right to Left	Unary operator
	!	Logical NOT operator	!Expression		Unary operator
3	/	Division	Expression/Expression		Binary operator

Precedence	Operators	Name or Meaning	Usage Format	Associative Direction	Description
	*	Multiplication	Expression*Expression	Left to Right	Binary operator
	%	Remainder (Modulus)	Int Expression*Int Expression (Convert to Long for calculation; the result is of Long type.)		Binary operator
4	+	Addition	Expression+Expression	Left to Right	Binary operator
	-	Subtraction	Expression-Expression		Binary operator
6	>	Greater than	Expression>Expression	Left to Right	Binary operator
	>=	Greater than or equal to	Expression>=Expression		Binary operator
	<	Less than	Expression<Expression		Binary operator
	<=	Less than or equal to	Expression<=Expression		Binary operator
7	==	Equal to	Expression==Expression	Left to Right	Binary operator
	!=	Not equal to	Expression!=Expression		Binary operator
8	&	Bitwise AND	Expression&Expression	Left to Right	Binary operator
9	^	Bitwise XOR	Expression^Expression	Left to Right	Binary operator
10		Bitwise OR	Expression Expression	Left to Right	Binary operator
15	,	Comma	Used for separating multiple parameters within a expression		

### 3. Function Description

Name	Function	Parameter Description	Return Value/Type
abs	Take the absolute value	Count: 1 Type: Any Range: Any	Double-precision value
acos	acos(a): Returns the angle corresponding to a.	Count: 1 Type: Any Range: [-1, 1]. Values outside this range will be clamped, for example, 1.5 will be clamped to 1.	Angle: [0,180]
asin	asin(a): Returns an angle whose sine is a.	Count: 1 Type: Any Range: [-1, 1]. Values outside this range will be clamped, for example, 1.5 will be clamped to 1.	Angle: [-90,90]
atan	atan(a): Returns the angle whose tangent is a.	Count: 1 Type: Any Range: Any	Angle: [-90,90]
ceil	ceil(a): Returns the smallest integer value greater than or equal to the specified double-precision floating-point number.	Count: 1 Type: Any Range: Any	Double-precision value
changing	changing(a): If the status (or value) of a changed, return true; if not, return false.	Count: 1 Type: Any Range: Any	bool
cos	cos(a): Returns the cosine value of a.	Count: 1 Type: Any (angle) Range: Any	Double-precision value



## Appendix 1: Rules of Expression Tags and Descriptions of Functions

Name	Function	Parameter Description	Return Value/Type
Diff	Diff(a): Returns the differential of a. If the reference tag "a" belongs to the same external channel, the differentiation will be calculated according to the sampling frequency of that channel to ensure the stability of the differentiation. If the reference tag of a belongs to different external channels, the differentiation will be calculated according to the optimization frequency set by the expression channel.	Count: 1 Type: Any Range: Any	Double precision
exp	Returns the specified power of e.	Count: 1 Type: Any Range: Any	Double-precision value
floor	floor(a): Returns the maximum integer value less than or equal to the specified double-precision floating-point number.	Count: 1 Type: Any Range: Any	Double-precision value
getBit	getBit(a,b): Get bit b from a.	Count: 2 Type: a can be any type (will be forcibly converted to long integer; if out of range, the result will be 0), b is an integer. Range: The value of b must be within the length range of a.	bool
IF	IF(a,b,c): If a is true, return b. If not, return c.	Count: 3 Type: Any Range: Any	If b or c is a bool, return a bool; if b or c is a float or double, return a double; for other types, return a long integer.
Int	Int(a,b): Returns the integral of a. If b is true, return 0.	Count: 2 Type: a can be any type, b is a bool. Range: Any	Double precision
limit	limit(a,b,c): Limit a between b and c.	Count: 3 Type: Any Range: Any	Double-precision value
lg	ln(a): Returns the base 10 logarithm of the specified number.	Count: 1 Type: Any Range: Any	Double-precision value
ln	Return the natural logarithm to the base of the constant e.	Count: 1 Type: Any Range: Any	Double-precision value
log	log(a,b): Returns the logarithm of b when using the base a.	Count: 2 Type: Any Range: a,b>0	Double-precision value
max	max(a,b,c,...): Returns the largest of a,b,c...	Count: $\geq 1$ Type: Any Range: Any	Double-precision value
min	min(a,b,c,...) : Returns the minimum value of a,b,c...	Count: $\geq 1$ Type: Any Range: Any	Double-precision value
PI	Returns 3.1415926...	None	Double-precision value
pow	pow(a,b): Returns the b-th power of a.	Count: 2 Type: Any Range: Any	Double-precision value
round	round(a): Rounds a to the nearest integer value and the midpoint value to the nearest even number.	Count: 1 Type: Any Range: Any	Double-precision value

*Appendix 1: Rules of Expression Tags and Descriptions of Functions*

Name	Function	Parameter Description	Return Value/Type
RS	Return the state value of the RS(a, b, c) trigger, where a is used for setting and b for resetting. When c=1, a takes priority; when c=0, b takes priority.	Count: 3 Type: bool Range: Any	bool
sAnd	sAnd(a,b): Bitwise AND operation of a and b.	Count: 2 Type: non-floating point number or double precision number. Range: Any	Long integer
setBit	Return the setting result of setBit(a, b, c). a is the number being modified, b is the bit index, and c is the target value of the bit.	Count: 3 Type: a is a non-floating point number or double precision number, b is an integer, and c is a bool. Range: The value of b must be within the length range of a.	Long integer
sin	sin(a): Returns the sine of a.	Count: 1 Type: Any (angle) Range: Any	Double-precision value
sNot	sNot(a): A is inversed bit by bit.	Count: 1 Type: non-floating point number or double precision number. Range: Any	Long integer
sOr	sOr(a,b): Bitwise OR operation of a and b.	Count: 2 Type: non-floating point number or double precision number. Range: Any	Long integer
sqrt	sqrt(a): Returns the square root of a.	Count: 1 Type: Any Range: Any	Double-precision value
sXor	sXor(a,b): Bitwise XOR operation of a and b.	Count: 2 Type: non-floating point number or double precision number. Range: Any	Long integer
tan	tan(a): Returns the tangent of a.	Count: 1 Type: Any (angle) Range: Any	Double-precision value
trunc	trunc(a): Computes the integer portion of double precision floating-point number a.	Count: 1 Type: Any Range: Any	Double-precision value