User's Manual

TA320/TA520/TA720 Optical Disk Inter-Symbol Interference Analysis Software

IM 704223-61E

YOKOGAWA
Yokogawa Electric Corporation

IM 704223-61E
1st Edition

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Thank you for purchasing the Optical Disk Inter-Symbol Interference Analysis Software (704223) for the TA320/TA520/TA720 Time Interval Analyzer.
This user's manual contains useful information about the functions, operating procedures, and handling precautions of the software. To ensure correct use, please read this manual thoroughly before beginning operation.
After reading the manual, keep it in a convenient location for quick reference whenever a question arises during operation.
For information about the functions, operating procedures, and handling precautions of the TA320/TA520/TA720 Time Interval Analyzer and the handling and operating procedures of Windows, see the respective manuals.

Contents of the Package

- Software Installation CD-ROM: 1 piece
- TA720 Firmware Upgrade Floppy Disk: 1 piece
- User's Manual (this manual): 1 piece
- Precautions When Using the TA720: 1 sheet

Notes

- **To analyze the measured data of the TA720 using this software, the ROM version of the TA720 must be 1.02 or later. You can check the ROM version of the TA720 in the Version Information dialog box that appears by selecting Utility > Version on the TA720.**
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Revisions

- 1st Edition January 2003

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Contents

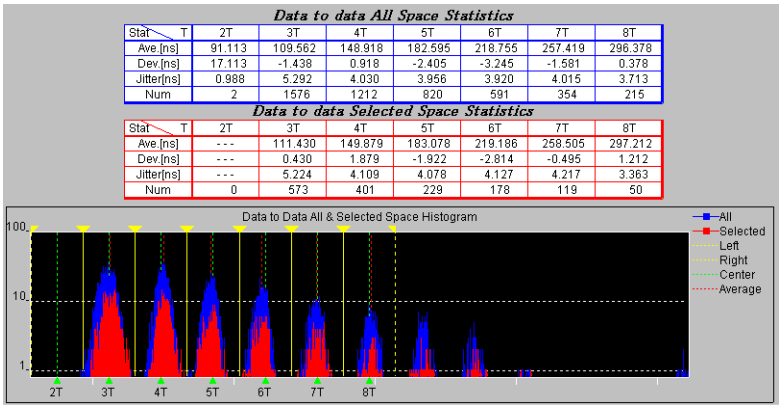
Explanation of Functions

Functional Overview

This software application is capable of analyzing the inter-symbol interference of the data measured by the TA320/TA520/TA720 Time Interval Analyzer using the following two methods. In addition, the result of the analysis can be printed to a printer that is connected to a PC.

- **Histogram Analysis**

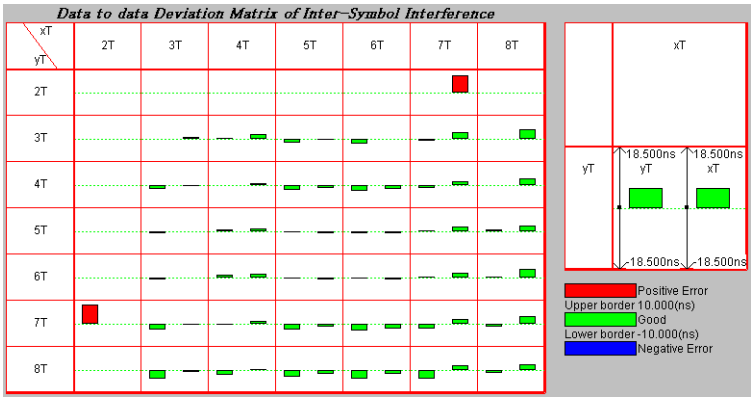
  In this method, data that matches the specified conditions is extracted, and the histogram and a list of statistics are displayed.



- **Matrix Analysis**

  In this method, data that matches the specified conditions is extracted and the level of interference between adjacent data points is displayed using a two-dimensional matrix table (sheet (numeric values) or graph).

  Graph display (bar graph) example



Loading of Measured Data

You can load the measured data to be analyzed using the following methods.

- Open the measured data saved to an external storage medium.
- Connect the Time Interval Analyzer and the PC via the GP-IB interface and load the measured data by starting the measurement from the software.

You can also load the measured data using the following method on the TA720.

- Connect the Time Interval Analyzer and the PC via the Ethernet network and load the measured data by starting the measurement from the software.
- Save the measured data on a PC hard disk operating as a network drive (FTP server) via the Ethernet network and open the saved data.
- Access the measured data stored on an external storage medium connected to the TA720 using an FTP software tool (not included in this software package) on the PC, save the data on the PC, and open the data.

Setting the Number of Times to Load the Data

If the same model is used under the same measurement conditions, multiple sets of measured data (measured data of multiple files) can be loaded and accumulated.
Maximum number of times the data can be loaded: 64 (except the maximum number of data points that can be loaded is 2 Mpoints)

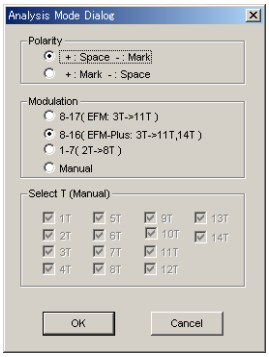
Measurement Conditions of Measured Data That Can Be Loaded

- TA320/TA520
  Sampling mode: Time stamp
  Measurement function: Pulse width (both polarities) measurement
- TA720
  Sampling mode: Inter-symbol interference analysis
  Measurement function: Pulse width, pulse width A→A-to-B time interval, or pulse width A→pulse width B

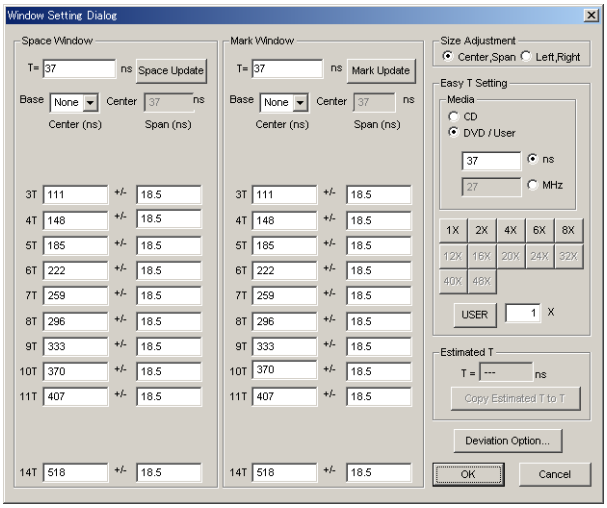
Setting the Analysis Conditions

After loading the measured data, you set the data polarity, modulation type, window, and other parameters.

- **Polarity/Modulation Setup Dialog Box**



- **Window Setup Dialog Box**

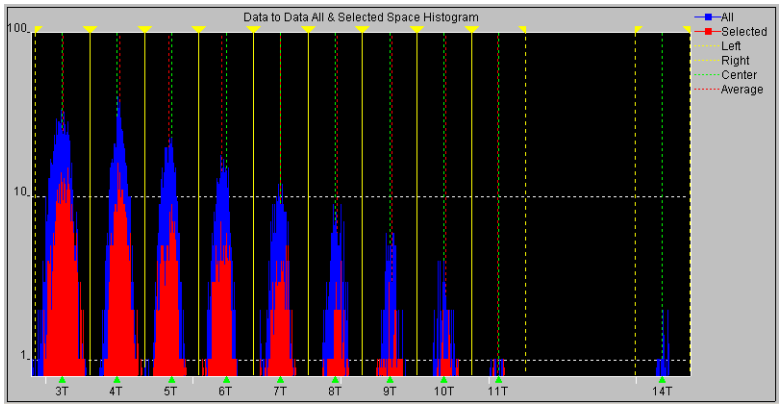


Setting the Display of Analysis Results

Select whether to display the results in a histogram or matrix. You can also select the following display options in each display.

- **Histogram Display**
  Select whether to display only the histogram or both the histogram and a list of statistics. For the statistics, you can select to display the average, the deviation (the deviation of the measured average value with respect to the Center value), the jitter, and/or the number of computed samples.
  You can also switch the histogram color and the histogram vertical scale (Linear or Log).

- Example when only the histogram is displayed



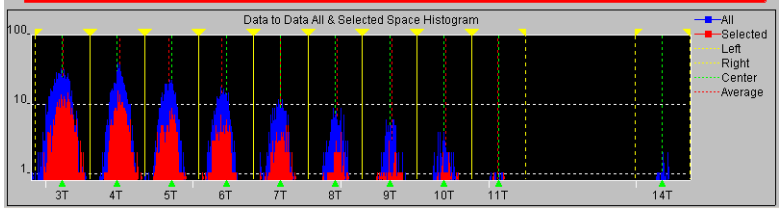
- Example when both the histogram and statistics are displayed

Data to data All Space Statistics

Stat \ T	3T	4T	5T	6T	7T	8T	9T	10T	11T	14T
Ave.[ns]	109.562	148.918	182.595	218.755	257.419	296.378	333.631	370.092	406.347	518.087
Dev.[ns]	-1.438	0.918	-2.405	-3.245	-1.581	0.378	0.631	0.092	-0.653	0.087
Jitter[ns]	5.292	4.030	3.956	3.920	4.015	3.713	3.542	3.883	3.091	2.370
Num	1576	1212	820	591	354	215	137	71	9	12

Data to data Selected Space Statistics

Stat \ T	3T	4T	5T	6T	7T	8T	9T	10T	11T	14T
Ave.[ns]	111.430	149.879	183.078	219.186	258.505	297.212	334.378	371.098	406.587	- - -
Dev.[ns]	0.430	1.879	-1.922	-2.814	-0.495	1.212	1.378	1.098	-0.413	- - -
Jitter[ns]	5.224	4.109	4.078	4.127	4.217	3.363	4.342	3.453	3.588	- - -
Num	573	401	229	178	119	50	34	21	2	0



- **Matrix Display**

  Select whether to display the statistics on a sheet or a graph. You can select to display the statistics of the average, the deviation, or the jitter.

  On the deviation and jitter graph displays, you can switch the display shape (Bar, Rectangle, or Pie), set the threshold levels (2 points), and set the colors for the three sections created by the threshold levels.

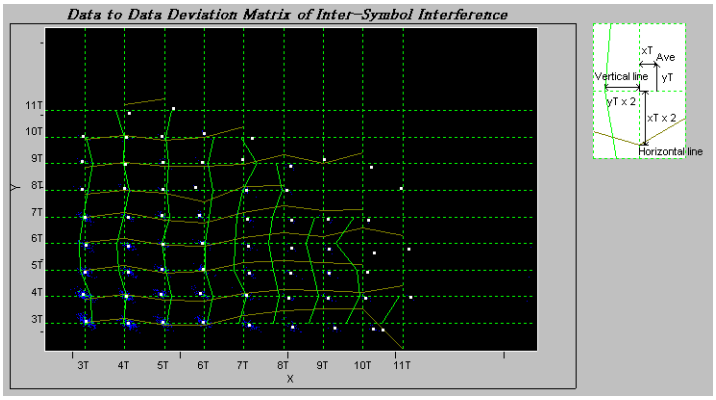
  - Example when statistics are displayed on a sheet

Data to data Average Matrix of Inter-Symbol Interference

xT / yT	3T	4T	5T	6T	7T	8T	9T	10T	11T	14T
	110.680 479	150.692 399	183.207 256	220.138 198	263.317 134	302.699 69	339.205 43	375.985 21	407.165 5	524.767 3
3T 111.430 573	113.994 111.653 175	110.449 151.467 146	112.130 183.814 86	112.573 220.930 68	106.435 264.461 54	106.074 304.344 24	104.290 343.269 12	103.254 379.743 7	101.150 388.850 1	- - - - - - 0
4T 149.879 401	150.622 109.136 127	148.706 149.292 106	151.424 182.228 63	152.136 218.858 42	149.140 261.451 27	145.980 300.912 14	145.925 337.468 11	146.344 372.656 8	146.537 414.600 2	140.925 523.175 1
5T 183.078 229	182.614 110.999 64	182.118 151.331 55	185.851 182.943 36	185.374 220.924 37	180.451 264.357 17	180.414 302.406 9	180.069 338.141 8	182.113 373.825 2	- - - - - - 0	175.400 524.600 1
6T 219.186 178	219.296 111.712 47	218.523 151.726 46	220.680 183.852 30	222.246 220.346 25	217.884 263.143 14	214.929 303.414 7	214.125 338.008 6	209.375 380.525 1	214.050 412.200 1	216.575 526.525 1
7T 258.505 119	258.169 110.731 43	258.392 150.996 19	261.200 182.675 21	261.396 217.977 13	255.633 262.250 12	253.737 303.519 4	255.115 337.565 5	254.950 375.350 2	- - - - - - 0	- - - - - - 0
8T 297.212 50	297.328 108.439 9	298.117 148.206 18	297.118 183.211 7	300.200 213.738 2	295.359 261.819 8	295.400 299.370 5	- - - - - - 0	- - - - - - 0	298.450 405.575 1	- - - - - - 0
9T 334.378 34	336.758 108.481 9	332.400 148.900 1	334.922 183.538 8	334.904 219.929 7	339.050 258.250 1	329.396 302.125 6	338.325 333.450 1	328.175 377.350 1	- - - - - - 0	- - - - - - 0
10T 371.098 21	370.385 109.595 5	370.079 149.511 7	370.762 182.669 4	374.712 222.125 4	368.675 266.550 1	- - - - - - 0	- - - - - - 0	- - - - - - 0	- - - - - - 0	- - - - - - 0
11T 406.587 2	- - - - - - 0	403.000 152.200 1	410.175 193.425 1	- - - - - - 0	- - - - - - 0	- - - - - - 0	- - - - - - 0	- - - - - - 0	- - - - - - 0	- - - - - - 0
14T - - - 0	- - - - - - 0	- - - - - - 0	- - - - - - 0	- - - - - - 0	- - - - - - 0	- - - - - - 0	- - - - - - 0	- - - - - - 0	- - - - - - 0	- - - - - - 0

	xT xT Average(ns) xT Number
yT yT Average(ns) yT Number	yT Average(ns) xT Average(ns) Number(xT,yT)

- Example when the statistics are displayed on a graph



Setting the Data Extraction Conditions

Set the data extraction conditions on the loaded measured data using a setup bar (referred to as the Trigger Bar) as shown in the figure below.

Use Trigger to select Space or Mark (the trigger used to extract the data) and Ch A or Ch B to specify the data to be extracted.

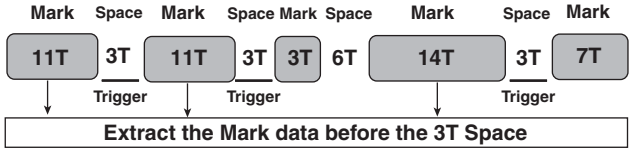
The data extraction conditions vary depending on whether histogram analysis or matrix analysis is being performed as follows.

- **Histogram Analysis**

  If the loaded measured data is pulse width, the following types of data extraction are possible.

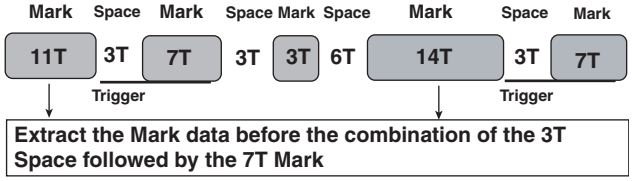
  - Use a Space or Mark as a trigger and extract the Mark or Space around it.

    (The extraction mode setting of the inter-symbol interference analysis on the TA is Single.)



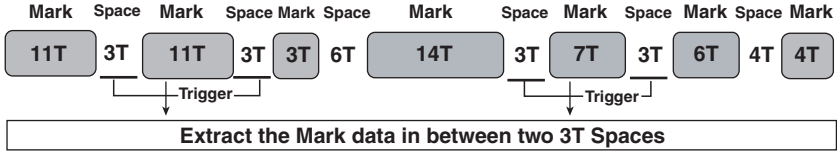
  - Use the combination of a Mark followed by a Space or a Space followed by a Mark as a trigger and extract the Mark or Space around it.

    (The extraction mode setting of the inter-symbol interference analysis on the TA is Combination.)



  - Use a Mark or Space in between two Spaces or two Marks as a trigger and extract the data between two Spaces or the Mark or Space in between two Marks.

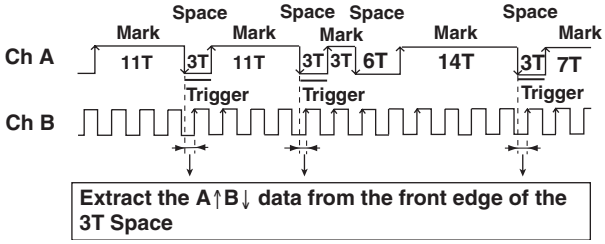
    (The extraction mode setting of the inter-symbol interference analysis on the TA is Between.)



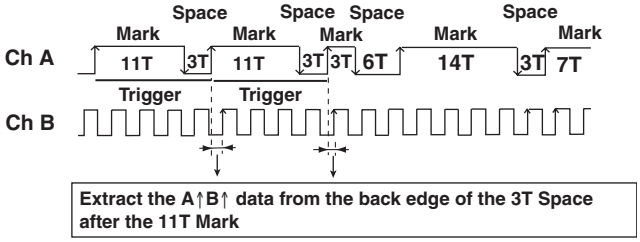
If the loaded measured data is “pulse width→pulse width”, you can use a Mark followed by a Space or a Space followed by a Mark on Ch A as a trigger and extract the Mark or Space around it on Ch B.

If the loaded measured data is pulse width→A-to-B time interval, the following types of data extraction are possible.

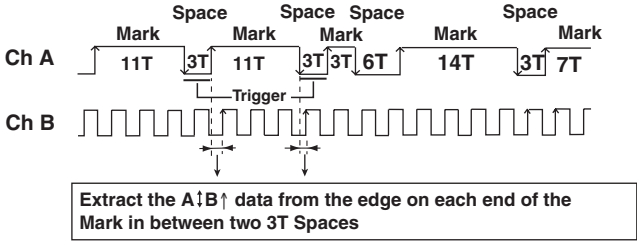
- Use a Space or Mark as a trigger and extract the A-to-B time interval from the front edge, back edge, or both edges.
  (The extraction mode setting of the inter-symbol interference analysis on the TA is Single.)



- Use the combination of a Mark followed by a Space or a Space followed by a Mark as a trigger and extract the A-to-B time interval from the front edge, back edge, or middle edge.
  (The extraction mode setting of the inter-symbol interference analysis on the TA is Combination.)

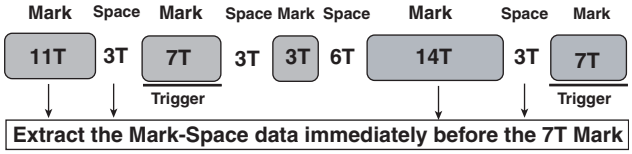


- Use a pair of Spaces that embraces a Mark or a pair of Marks that embraces a Space as a trigger and extract the A-to-B time interval from the front edge, back edge, or middle edge of the Mark or Space embraced by the trigger.



- **Matrix Analysis**

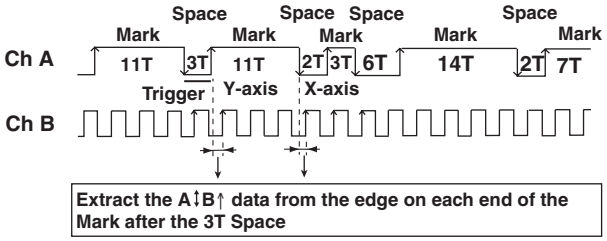
  If the loaded measured data is pulse width, you can select whether to extract the Space-Mark or Mark-Space data immediately before the trigger or after the trigger by using either a Space or Mark as a trigger.



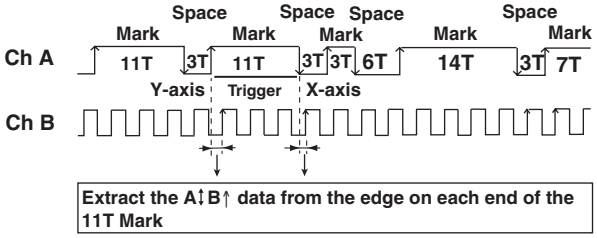
  If the loaded measured data is pulse width→pulse width, you can select whether to extract the Space-Mark or Mark-Space data of Ch B immediately before the trigger or after the trigger by using either a Space or Mark of Ch A as a trigger.

If the loaded measured data is pulse width→A-to-B time interval, the following types of data extraction are possible.

- Use a Space or Mark as a trigger and extract the A-to-B time interval from both edges (one edge if the slope of the measured data is either edge) of a Mark or Space immediately around the trigger.



- Use a Mark or Space in between two Spaces or two Marks as a trigger and extract the A-to-B time interval from both edges.



In addition, you can also extract the A-to-B time interval from an edge embraced between a Space and a Mark or a Mark and a Space.

T symbol of Space/Mark to Be Used as a Trigger

You can select from the following.

All, 1T to 14T, Min.T-1T to Min.T-14T, 1T-Max.T to 14T-Max.T, ODD, and EVEN

If you select Min.T-1T to Min.T-14T, all the symbol from the smallest symbol to 1T to 14T symbol will be used as triggers to perform the analysis. Similarly, if you select 1T-Max.T to 14T-Max.T, all the symbol from 1T to 14T symbol to the maximum symbol will be used as triggers to perform the analysis. ODD denotes all odd Ts and EVEN denotes all even Ts.

Saving/Loading of Data

You can save and load the setup data of the software, the retrieved measured data, and the center value of deviation specified arbitrarily (see page 2-4). In addition, you can save the statistical data (statistics of the extracted data, trigger statistics of all the data, and statistics of matrix analysis) to a file in CSV format.

Printing of Analysis Results

You can print in monochrome or in color the histogram analysis results (histogram and a list of statistics) and the matrix analysis results (sheet and graph).

Other Functions

Phase Adjustment

Phase adjustment in the range of –99.99 ns to 99.99 ns is possible with respect to the measured data of “pulse width A→A-to-B time interval” of the retrieved TA720.

Entering Comments

You can display a comment text on the analysis result screen.

Displaying a List of the Loaded Measured Data

You can display the file path of the loaded measured data (drive letter, directory, and file name) and the communication path (GPIB or Ethernet).

Functions of the Main Window Components and a List of Menus

Functions of the Main Window Components

Load the measured data from files (File > Open)

Load the measured data via the communication interface (File > Open From Communication)

Loading of the measured data and analysis results (File > Load Measured & Setup Data)

Save the measured data and analysis results (File > Save Measured & Setup Data)

Print (File > Print)

Set up printing (File > Print Setup)

Print preview (File > Print Preview)

Corresponding menu item is indicated inside the parentheses.

Clear the measured data and analysis data (Setup > Clear Data)

Histogram display (View > Histogram)

Matrix display (View > Matrix)

Display the graph and a list of statistics of the histogram analysis (View > Histogram & Table)

Display only the graph of the histogram analysis (View > Histogram Graph)

Display all data of the histogram analysis (View > All Graph)

Display the sheet analysis results of the average (View > Statistics Average)

Display the sheet analysis results of the deviation (View > Statistics Deviation)

Display the sheet analysis results of the jitter (View > Statistics Jitter)

Display the graph analysis results of all measured data (View > Graph)

Display the graph analysis results of the deviation (View > Bar Deviation)

Display the graph analysis results of the jitter (View > Bar Jitter)

Display the pulse width data of the matrix analysis (View > Pulse Width)

Display the A-to-B time interval data of the matrix analysis (View > Time Interval)

Set the window (Display > Window)

Display the software version, etc. (Help > About)

Menu
For details on each menu, see the next page.

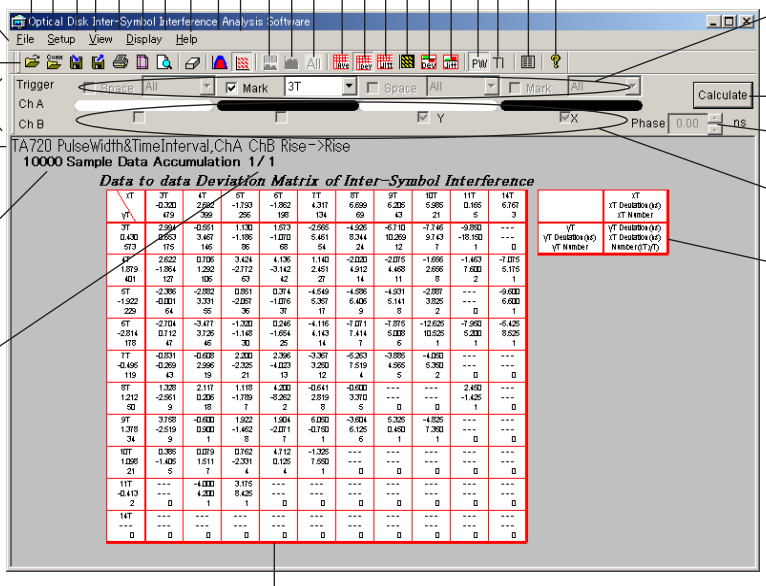
Toolbar

Trigger bar

Model and measurement conditions of the measured data load source

Number of measured data points

Number of measured data accumulations and the specified accumulations (see section 1.1)



Display of the analysis results

Set the Mark/Space to be used as a trigger (See sections 3.2 and 4.2)

Execute the Analysis

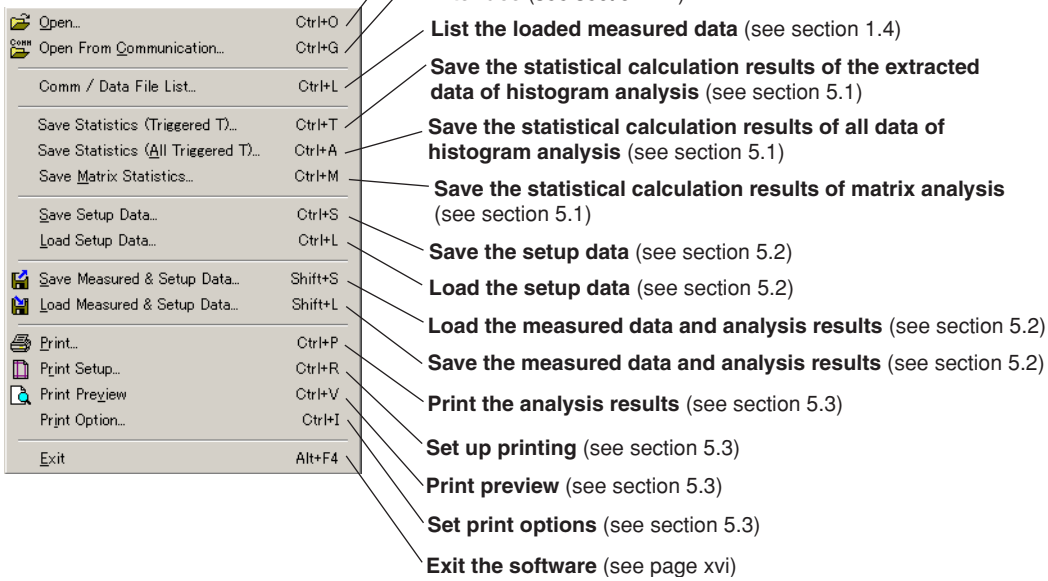
Adjust the phase (See sections 3.2 and 4.2)

Set the extracted data (See sections 3.2 and 4.2)

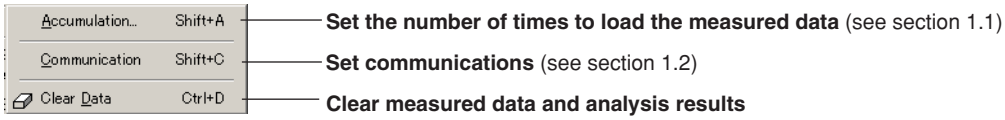
Explanatory notes (See sections 3.1 and 4.1)

A List of Menus

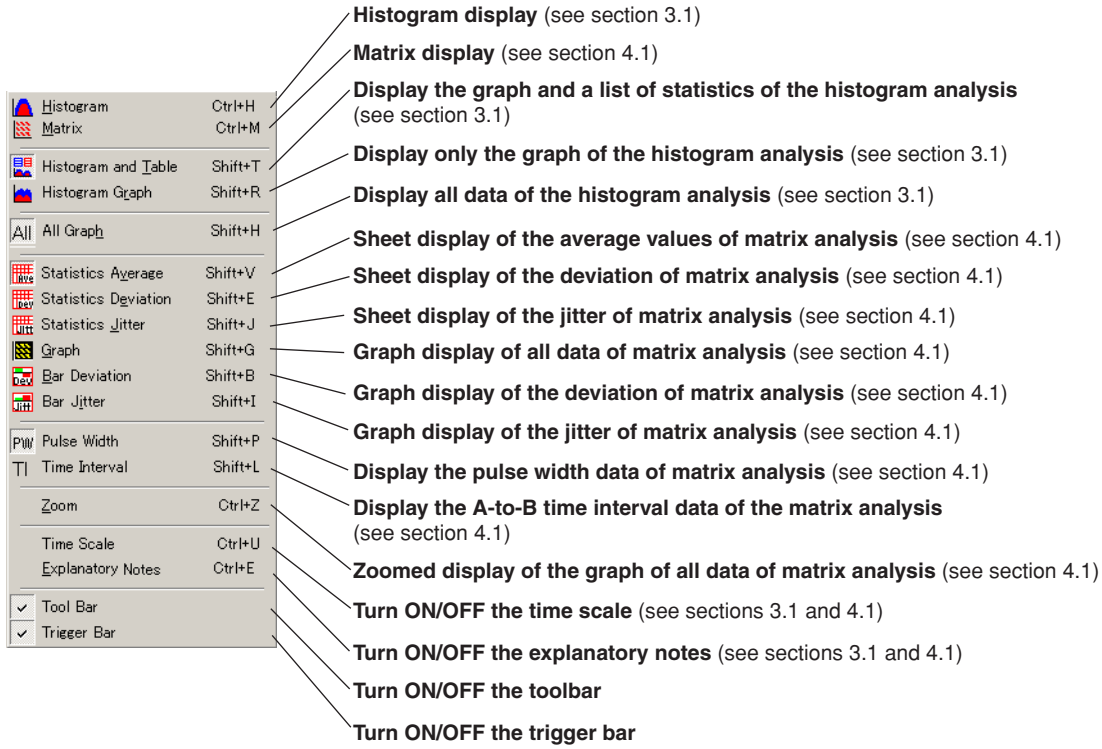
File Menu (File and Print Settings)



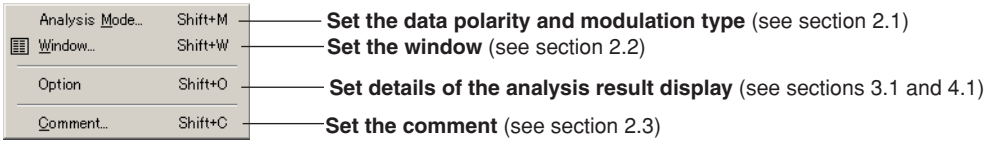
Setup Menu (Settings before Loading Measured data)



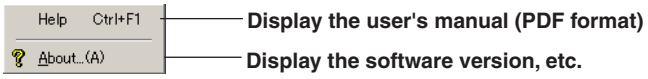
View Menu (Display Settings of Analysis Results)



Display Menu (Analysis Condition Settings, Etc.)



Help Menu



Software Installation

System Requirements

PC

PC running Microsoft Windows 98 SE, Windows NT Workstation 4.0, Windows 2000 Professional, or Windows XP Professional with at least 64 MB (128 MB for Windows 2000 or XP) of memory.

Operating System

Microsoft Windows 98 SE, Windows NT Workstation 4.0, Windows 2000 Professional, or Windows XP Professional.

CD-ROM Drive

The drive is used to install the software.

Free Hard Disk Space

40 MB or more

Display

SVGA (800 × 600 resolution) or better (1024 × 768 or better recommended) and capable of displaying 256 or more colors.

Printer and Mouse

Printer and mouse compatible with the OS that you are using.

GPIB Board/PCMCIA-GPIB Card (only when connecting the TA320/TA520/TA720 and the PC using GP-IB)

GPIB board or PCMCIA-GPIB card by National Instruments along with the driver must be installed in the PC.

Ethernet Port (only when connecting the TA720 and the PC via the Ethernet network)

Port for connecting to the Ethernet network.

FD Drive (only when opening data saved to a floppy disk)

One 31/2" floppy disk drive capable of reading 1.44 MB floppy disks (MS-DOS compatible).

Procedure

The following procedures are for installing the software on Windows 2000 Professional.

1. Start Windows.
   Start windows with the user name set to Administrator. Otherwise, you will not be able to install the software. The same is also true on a PC running Windows NT Workstation 4.0 or Windows XP Professional.

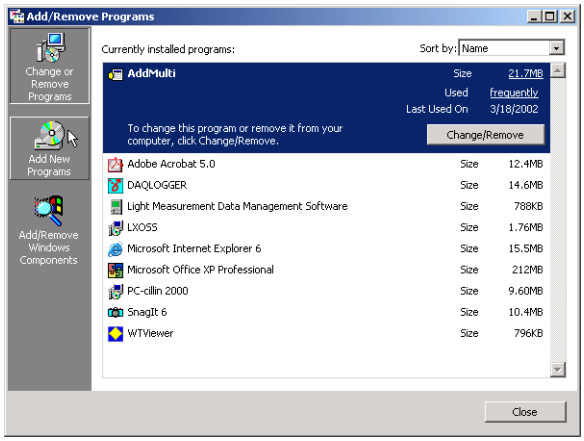
When Auto Run Is Enabled

2. Insert the CD-ROM in the CD-ROM drive.
   The installer automatically starts. Proceed to step 7.

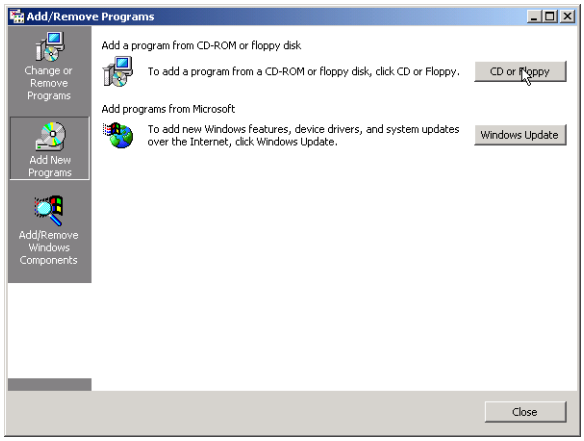
When Auto Run Is Disabled

2. Open the Control Panel folder and double-click the **Add/Remove Programs** icon.

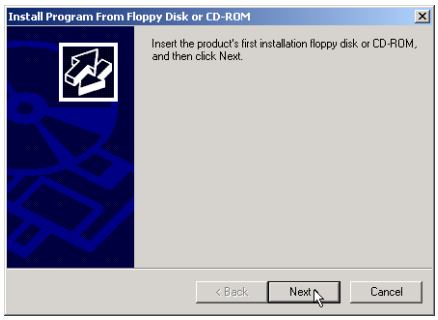
3. Click **Add New Programs**.



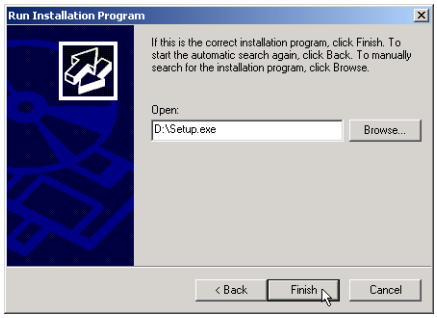
4. Click **CD or Floppy**.



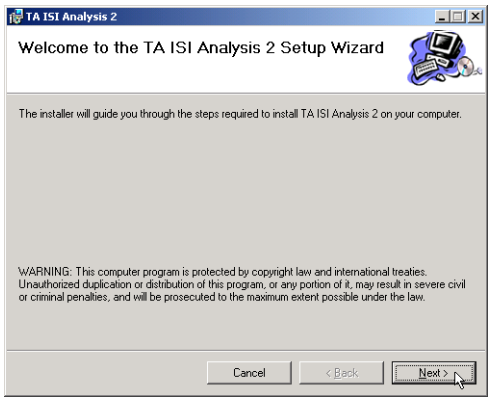
5. Insert the Software Installation CD-ROM in the CD-ROM drive and click **Next**.



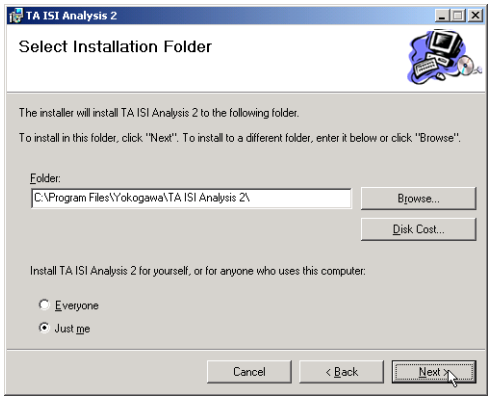
6. In the Open entry box, check that D:\Setup.exe (when drive D is the CD-ROM drive) is displayed and click **Finish**.
   The installer starts.



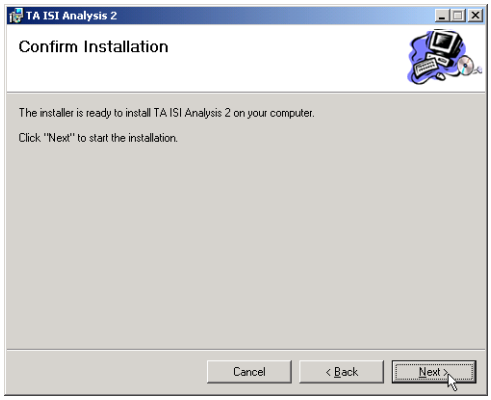
7. Click **Next**.



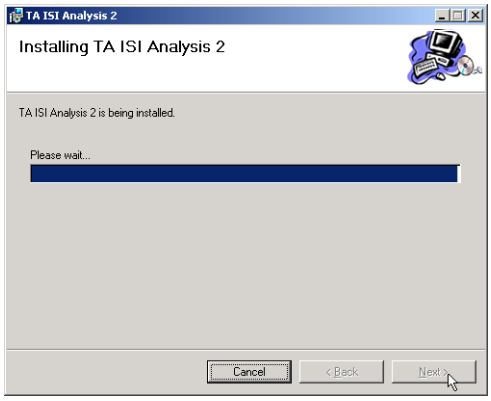
8. After entering the destination, click **Next**.
   The default installation destination is set to “C:\Program Files\Yokogawa\TA ISI Analysis 2\.” Change the destination as necessary.



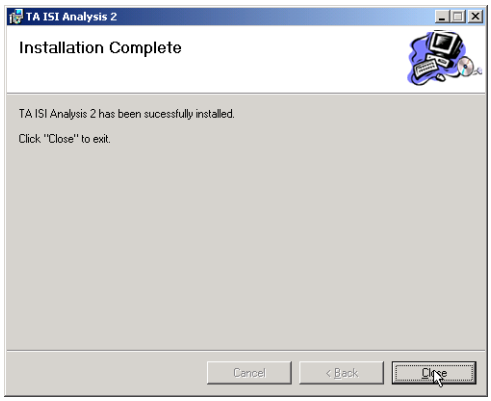
9. Click **Next** to start the installation.



When the installation starts, the following dialog box appears.



10. Click **Close** to finish the installation.



Explanation

Installation Result

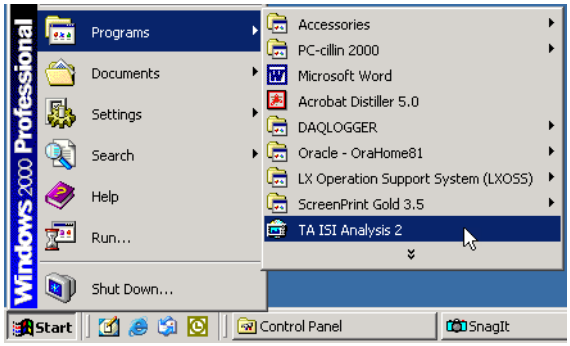
If the software is properly installed, a folder named TA ISI Analysis 2 is automatically created in the specified directory (C:\Program Files\Yokogawa\ by default) and TA ISI Analysis 2 is registered in the program list. In addition, the TA ISI Analysis 2 icon is created on the desktop.

Starting and Exiting the Software

Procedure

Starting the Software

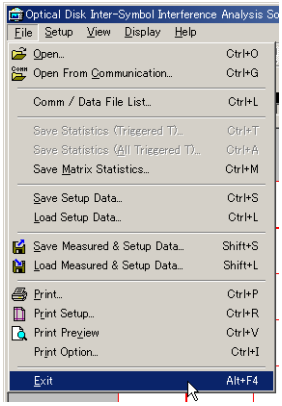
Choose **Start** > **Programs** > **TA ISI Analysis 2** as shown in the figure below or double-click the **TA ISI Analysis 2** icon on the desktop.



Icon on the desktop

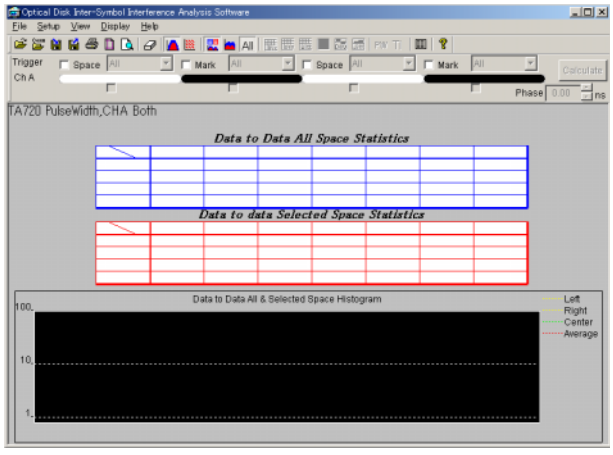
Exiting the Software.

From the **File** menu, choose **Exit**.



Explanation

When you start the software, the main window shown below opens.



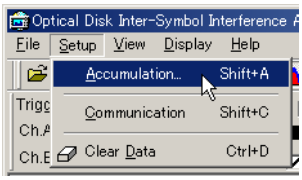
Note

- When you exit the software, the setup data is automatically saved. Therefore, when you start the software again, the main window is displayed using the previous settings not the initial settings.
- You cannot run multiple instances of the software.

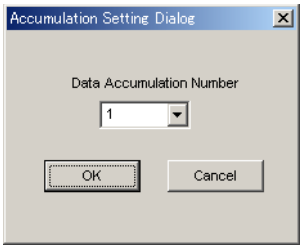
1.1 Selecting the Number of Times to Load the Measured Data

Procedure

1. From the **Setup** menu, choose **Accumulation** to open the Accumulation Setting dialog box.



2. From the **Data Accumulation Number** list box, select the number of times to load the data.
   You can also enter a value directly in the box.



3. Click **OK**.
   To cancel the setting, click **Cancel**.

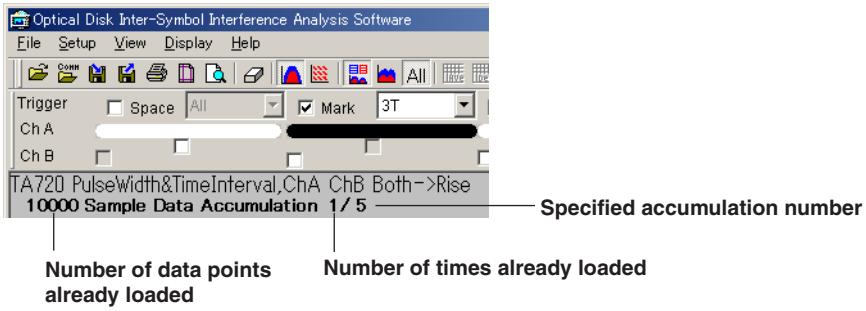
Explanation

Selecting the Number of Times to Load the Measured Data

Set the value in the range of 1 to 64. However, if the number of accumulated points of measured data to be loaded exceeds 2 Mpoints, the exceeded portion of the data is not loaded even if the specified number of times has not been reached.

Display of the Accumulation Number and the Number of Data Points

As shown in the figure below, the values are shown at the top section of the analysis result display area when you start loading the measured data.



Note

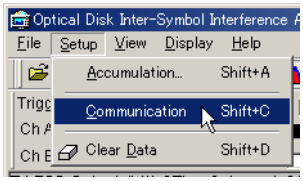
- If the data is loaded more than the specified number of times, the accumulated data is cleared, and the accumulation starts over. For example, if the number of times to load the data is set to 3 and the data is loaded 5 times, only the 4th and 5th data set will remain. If multiple files are loaded simultaneously, however, the loading stops upon reaching the specified number.
- The data can be accumulated even if the method of loading the measured data is different as long as the model and measurement conditions are the same. For example, if the number of accumulations remain after loading the measured data directly from the TA via communications, you can continue to load the measured data by opening a measurement data file.

1.2 Setting Up Communications (Settings When Loading Measured Data via the Communication Interface)

Procedure

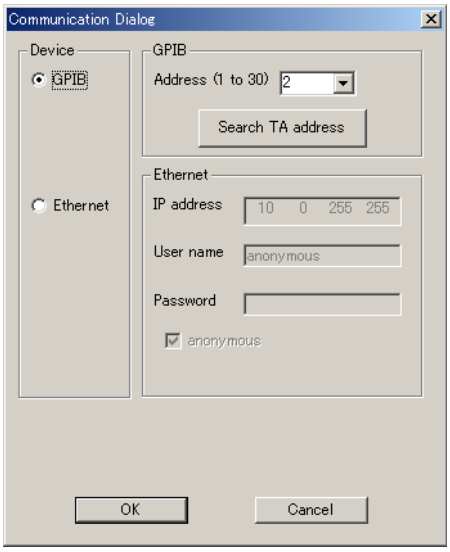
Before using the following procedure, the applicable TA and PC must be connected and communication must be possible.

1. From the **Setup** menu, choose **Communication** to open the Communication dialog box.



When Communicating via the GP-IB Interface

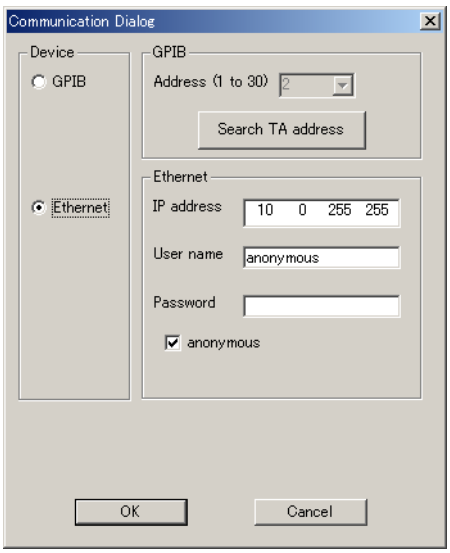
2. Click the **GPIB** option button under Device.
3. In the **Address** entry box, enter the GP-IB address of the applicable TA.
   When you click Search TA Address, the address of the TA320, TA520, or TA720 connected via the GP-IB interface is searched, and the found address appears in the Address entry box.



4. Click **OK**.
   To cancel the setting, click **Cancel**.

When Communicating via the Ethernet Network

2. Click the **Ethernet** option button under Device.
3. In the **IP Address**, **User Name**, and **Password** entry boxes, enter the IP address, user name, and password, respectively.
   The default user name is anonymous. To specify a user name other than anonymous, click the Anonymous check box to unselect it.



4. Click **OK**.
   When you click OK, communication with the TA starts.
   If an error message such as “Device initialize error.” appears, communication with the TA is not possible. In such case, check the connection and communication settings.
   To cancel the setting, click **Cancel**.

Explanation

Setting the GP-IB Address

Set the GP-IB address in the range of 1 to 30 according to the address specified on the applicable TA. The default value is 1.

Note

- If the entered address and the address of the connected TA320, TA520, or TA720 do not match, measured data cannot be loaded.
- Address 0 is reserved for the GPIB board or GPIB card of the PC.

Searching the GP-IB Address

- The address does not change if the TA320, TA520, or TA720 is not connected.
- If there are multiple TA320s, TA520s, or TA720s that are connected, the smallest address is set in the Address box.

Setting the IP Address

Set the IP address that was assigned to the TA720 that you are connecting to. The default value is 10.0.255.255.

Setting the User Name and Password

Set the user name and password that were assigned to the TA720 that you are connecting to. The default user name is anonymous.

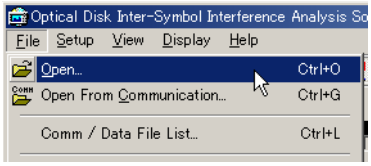
1.3 Loading Measured Data

Procedure

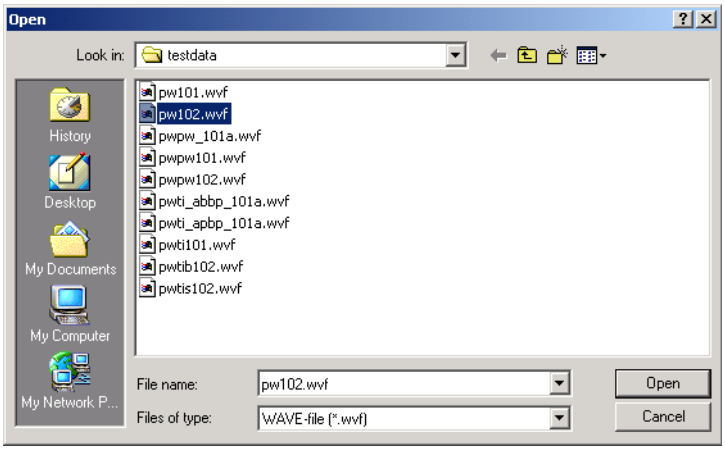
If you wish to load and analyze a new set of measured data when measured data is already loaded, choose Clear Data from the Setup menu to clear the existing measured data and analysis results.

When Loading the Data by Opening Files

1. From the **File** menu, choose **Open** to open the Open dialog box.



2. Specify **Look in** and select the file name from the file list or enter the name of the file you wish to open in the **File name** text box.
   You can select multiple files. In this case, the data is loaded in the order in which the file was selected.

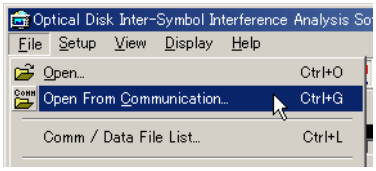


3. Click **Open** to load the measured data.
   To cancel the data load operation, click **Cancel**.

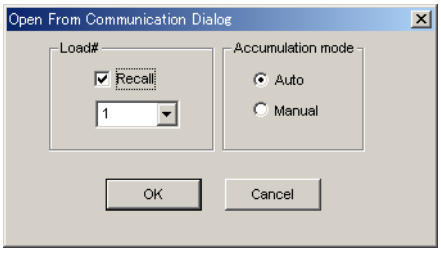
When Loading the Data via the Communication Interface

Before using the following procedure, connection with the applicable TA, communication settings (see page 1-2), and measurement conditions on the TA must be completed.

1. From the **File** menu, choose **Open From Communication** to open the Open From Communication dialog box.



2. Select the **Recall** check box and select from the **Load#** list box the memory number in which the setup data for loading the measured data from the applicable TA is stored.
   If you wish to use the current settings of the applicable TA, clear the Recall check box.



3. Select the mode for loading the measured data using the **Accumulation Mode** option button.
   To load the measured data once, select **Manual**.
4. Click **OK** to load the measured data.
   When you click OK, measurement automatically starts on the TA.
   If communication with the applicable TA is not possible, an error message such as "Device initialize error." appears. In such case, check the connection and communication settings.
   To cancel the data load operation, click **Cancel**.

Explanation

Applicable Files for Loading Measured Data

The applicable measured data that can be loaded is data that has been measured and saved under the following conditions on the TA. The extension of the measured data file is .wvf. To load the measured data, the header file that is created when the measured data is saved (.hdr extension) is also needed.

Model	Sampling Mode	Measurement Function
TA320	Time stamp mode	Pulse width (both polarities) measurement
TA520	Time stamp mode	Pulse width (both polarities) measurement
TA720	Inter-symbol interference analysis mode	Pulse width (both polarities) measurement, pulse width A→pulse width B measurement, or pulse width A→A-to-B time interval measurement

Note

- **To load measured data of the TA720, the TA720 ROM version must be 1.02 or later. You can check the ROM version of the TA720 in the Version Information dialog box that appears by selecting Utility > Version on the TA720.**
- In the case of the TA520, the TA520's built-in hard disk (option) can be accessed from the PC by connecting the PC to the TA520's SCSI (option). For a description of the connection procedure and other information, see chapter 11 in the *TA520 User's Manual (IM704310-01E)*.

Selecting the Setup Data When Loading Measured Data via the Communication Interface

Select the current setting of the applicable TA or select the memory number corresponding to the setup data stored in the internal memory in the range of 0 to 31 (0 to 9 when loading measured data from the TA320 or TA520). The measurement conditions of the setup data to be loaded must match the measurement conditions in "Applicable Files for Loading Measured Data" described above. The settings of the TA change to the stored settings of the selected memory number.

Selecting the Data Load Mode

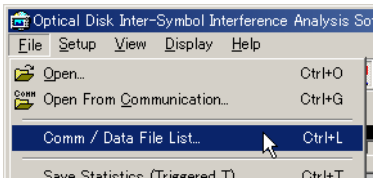
Select the load method of the measured data from the following:

- Auto: The TA automatically repeats the measurement for the number of times specified in section 1.1, and the software loads the measured data.
- Manual: The TA make one measurement, and the software loads the measured data.

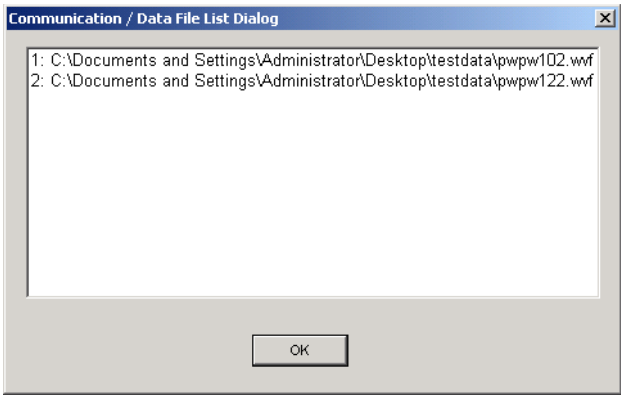
1.4 Displaying a List of Files of the Loaded Measured Data

Procedure

1. From the **File** menu, choose **Comm/Data File List** to open the Communication/Data File List dialog box.



The following dialog box opens.



2. Click **OK** to close the dialog box.

Explanation

Information That Are Listed

The path information or file name of all the loaded measured data is listed in the order of loading.

The data loaded from the file is displayed in the format “Load number: Drive letter\Directory path\File name.” If the data is loaded via the GP-IB interface, the data is displayed as “Load number: GPIB.” If the data is loaded via the Ethernet network, it is displayed as “Load number: ETHERNET.”

Display examples

1:C\TA_Data\Dvd001.wvf

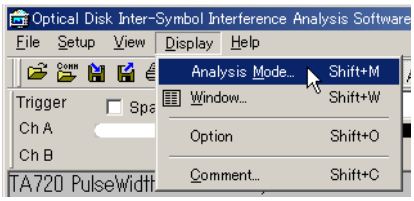
2:C\TA_Data\Dvd002.wvf

3:GPIB

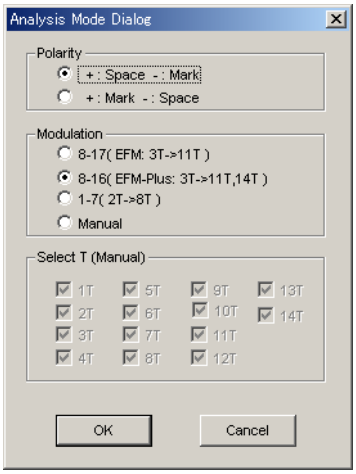
2.1 Setting the Data Polarity and Modulation Type

Procedure

1. From the **Display** menu, choose **Analysis Mode** to open the Analysis Mode dialog box.



2. Select the polarity of the space/mark data using the **Polarity** option button.



3. Select the pulse width modulation type of the data using the **Modulation** option button.
   If you select Manual, select the T symbol to be analyzed using the Select T (Manual) check boxes.
4. Click **OK**.
   To cancel the setting, click **Cancel**.

Explanation

Selecting the Data Polarity

Select the relationship between the pulse polarity and Mark/Space from the following.

- +: Space –: Mark
  Sets the pulse high level (+) to Space and low level (–) to Mark.
- +: Mark –: Space
  Sets the pulse high level (+) to Mark and low level (–) to Space.

Selecting the Pulse Width Modulation Type

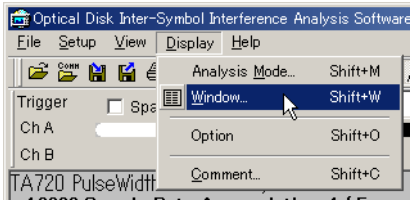
Select how the loaded measured data is to be handled in terms of the modulation signal.

- 8-17(EFM: 3T->11T)
  Analyze the data in the range of 3T to 11T.
- 8-16(EFM-Plus: 3T->14T)
  Analyze the data in the range of 3T to 11T+14T.
- 1-7(2T->8T)
  Analyze the data in the range of 2T to 8T.
- Manual
  Select the data to be analyzed from 1T to 14T.

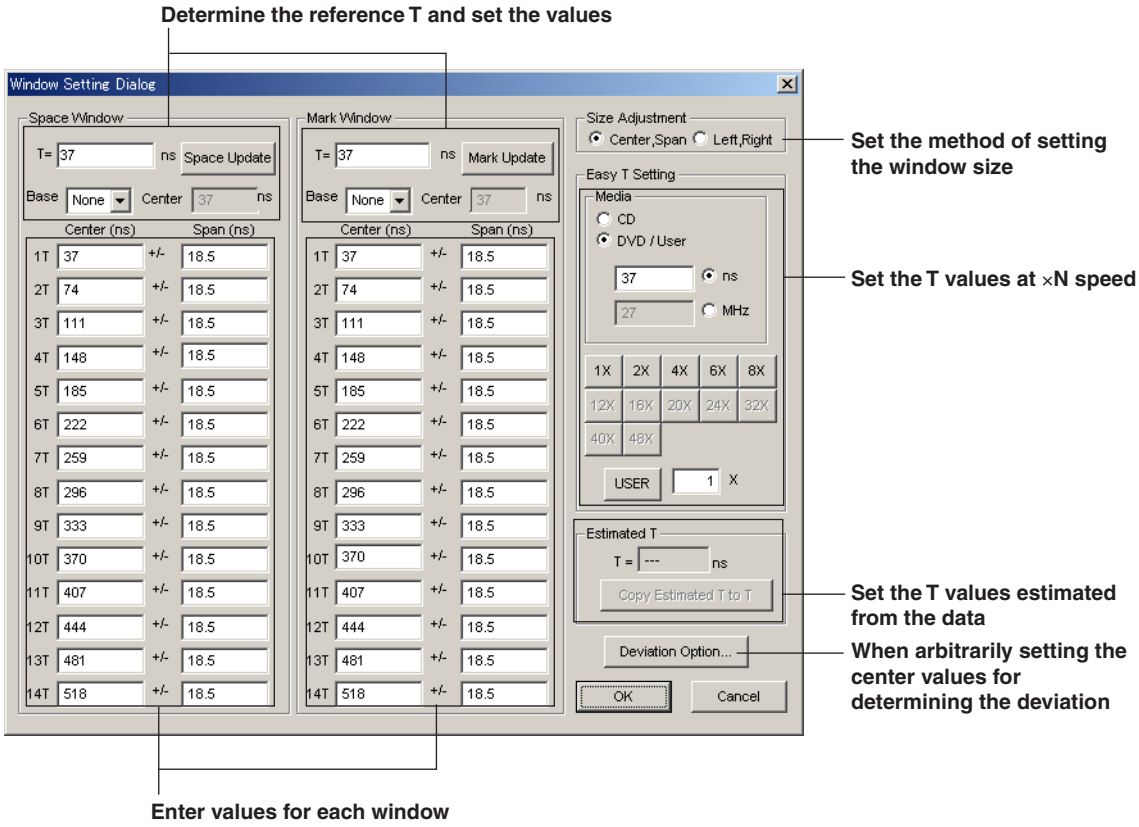
2.2 Setting the Window and Arbitrary Setting the Center Value of Deviation

Procedure

1. From the **Display** menu, choose **Window** to open the Window Setting dialog box.



2. In the Window Setting dialog box, set the window size and the window values.
   The following figure shows a display example when Modulation of the Analysis Mode dialog box is set to Manual and all the data from 1T to 14T are analyzed.



The following four methods are available in setting the window values.

- **Entering Values Directly in Space Window and Mark Window**
  Enter values directly in the **1T** to **14T** entry boxes.

- **Determining the Reference T and Setting the Values**
  1. Enter constant T in the **Space** or **Mark T** text box.
  2. From the **Base** list, select the window T to be the reference.
     If you do not select , enter the center value of the window in the Center text box.
  3. Click **Space Update** or **Mark Update**.

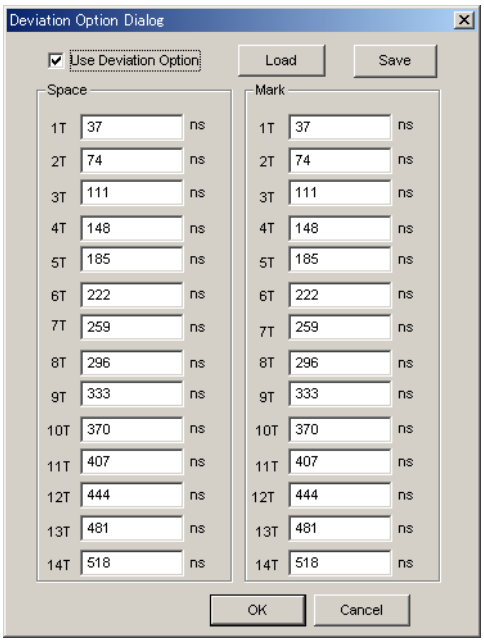
- **Collectively Setting the Values by Specifying the ×N Speed**
  1. Select the **CD** or **DVD/User** option button under Media under Easy T Setting.
     If you select DVD/User, set the clock in units of ns or MHz.
  2. Click the desired ×N speed button or enter an arbitrary ×N speed value in the **USER** text box and click the **USER** button.

- **Using the T Value That Is Estimated from the Data to Set the Values**
  Click **Copy Estimated T to T** under Estimated T.
  The window is set based on the T value estimated from the average of the data. However, if Modulation in the Analysis Mode dialog box was set to Manual, the Copy Estimated T to T button is disabled.

Arbitrarily Setting the Center Value of Deviation

When determining the center value of deviation arbitrarily, set the center value using the following procedure. If you are not setting the center value, proceed to step 8.

4. Click **Deviation Option** to open the Deviation Option dialog box.
5. Select the **Use Deviation Option** check box.
6. Enter the center value of each window.
   If you had saved the center values specified in the past, you can click Load to load the center values that had been saved.
7. Click **OK**.
   To save the specified center values, click **Save** to open the Save As dialog box and save the values.



Confirming the Settings in the Window Setting Dialog Box

8. Click **OK**.
   To cancel the setting, click **Cancel**.

Explanation

Setting the Method of Setting the Window Size

To set each window using center values and span, select Center, Span. To set the windows using left and right values, select Left, Right.

Setting the Window

Set the Center and Span values or Left and Right values of windows 1T to 14T according to the following conditions.

- Set the values so the start point is less than the end point for each window.
- Set the values so that the end point of the previous window is less than or equal to the start point of the next window.
- Selectable range: 1 ns to 5800 ns (0.0001 ns steps)

Constant T

T indicates the sampling clock cycle of the disk or drive under analysis and becomes a reference in determining the start/end points and window widths (size of the window) of each window. The selectable range is 1 ns to 400 ns (0.0001 ns steps).

Base/Center

Select the reference window (Base) from 1T to 14T and set its center value. The selectable range of the center value is 1 ns to 5800 ns (0.0001 ns steps).

Selecting the ×N Speed

The selectable range varies depending on whether CD or DVD is selected as follows:

CD: The clock cycle (T) is fixed to 231.385 ns.
The following ×N speed values can be selected. If you select USER, the value can be set arbitrarily in the range of 1 to 50 (0.1 steps).
1×, 2×, 4×, 6×, 8×, 10×, 12×, 16×, 20×, 24×, 32×, 40×, 48×, and USER

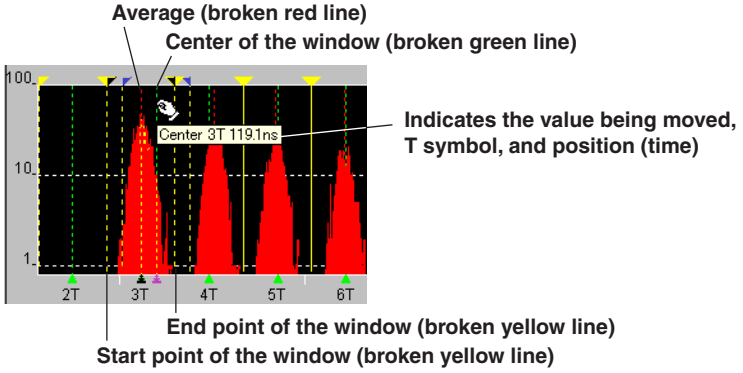
DVD/User: The clock cycle (T) can be set arbitrarily in the range of 1 ns to 400 ns (0.0001 ns steps). The clock cycle can also be set in terms of the frequency (MHz).
The following ×N speed values can be selected. If you select USER, the value can be set arbitrarily in the range of 1 to 50 (0.1 steps).
1×, 2×, 4×, 8×, and USER

Arbitrarily Setting the Center Value of Deviation

Specify this value when setting the center values used to determine the deviation to values other than the center values specified in the Window Setting dialog box. The specified center values are valid when the Use Deviation Option check box is selected. The specified center values can be saved and loaded. The extension of the file containing the center values is .dev.

Setting the Window Outside the Window Setting Dialog Box

During histogram display, the Center/Span or Left/Right values of each window can be changed using the mouse. Placing the mouse over the Left/Right or Center/Span line causes a hand mark to appear. By dragging the mark left and right, the Left/Right or Center/Span values can be changed. The items whose Linkage check box is selected under the Histogram tab that appears when Option is chosen from the Display menu are changed in link. For the setup procedure of Linkage, see page 3-2.



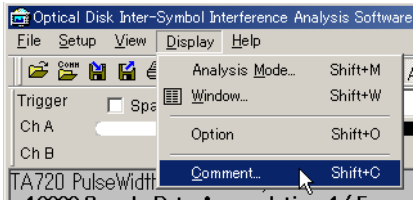
Note

If you wish to restore the previous window settings after changing the settings and pressing the OK button, you must open the window setting dialog box again and reenter the appropriate values. If there is a possibility of setting the values back to the previous values, it is recommended that you save the setup data before changing the values. For the procedure of saving the setup data, see section 5.2, “Saving and Loading Setup Data and Measured Data.”

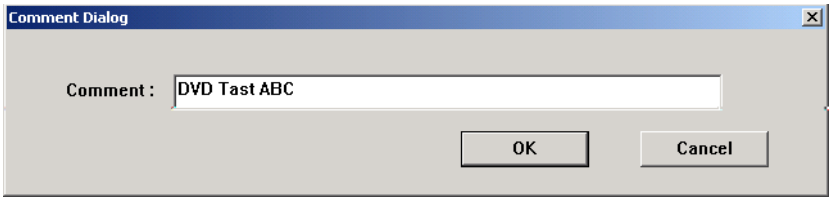
2.3 Setting Comments

Procedure

1. From the **Display** menu, choose **Comment** to open the Comment dialog box.



2. Enter a comment in the Comment text box.



3. Click **OK**.
   To cancel the setting, click **Cancel**.

Clearing Comments

Open the Comment dialog box and clear the text in the Comment text box and click OK.

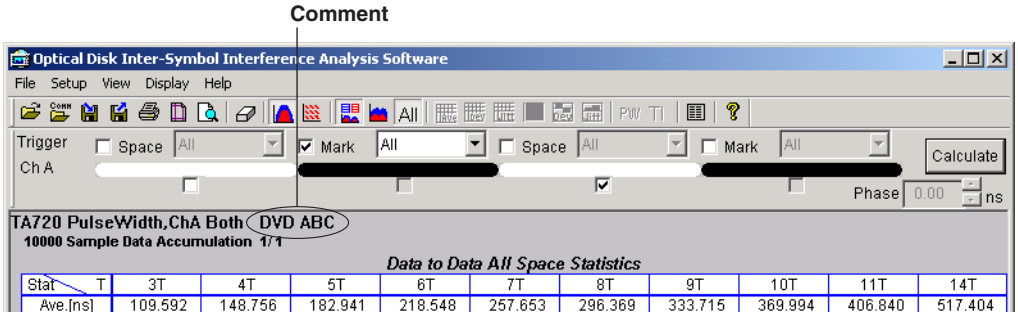
Explanation

Number of Characters That Can Be Entered for the Comment

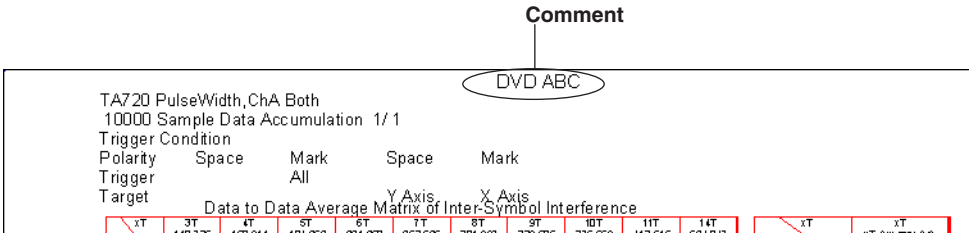
The number of characters that can be entered is up to 50 alphanumeric characters.

Displaying and Printing Comments

The comments are displayed on the screen as follows.



When the analysis results are printed, the comments are printed as follows.

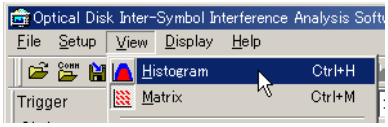


3.1 Setting the Display Format of Analysis Results

Procedure

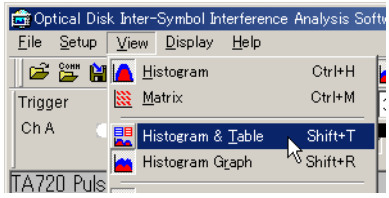
Selecting the Histogram Display

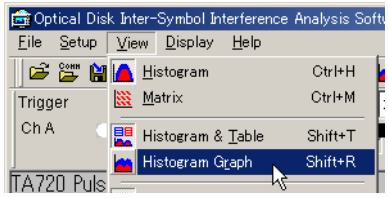
1. From the **View** menu, choose **Histogram**.



Selecting Simultaneous Display of the Histogram and the List of Statistics or Only the Histogram Display

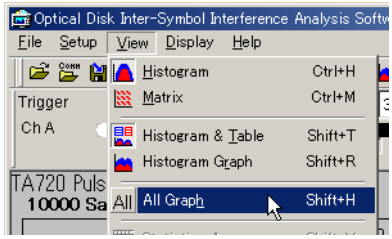
2. To display the histogram and the List of Statistics simultaneously, choose **Histogram & Table** from the **View** menu. To display only the histogram, choose **Histogram Graph**.





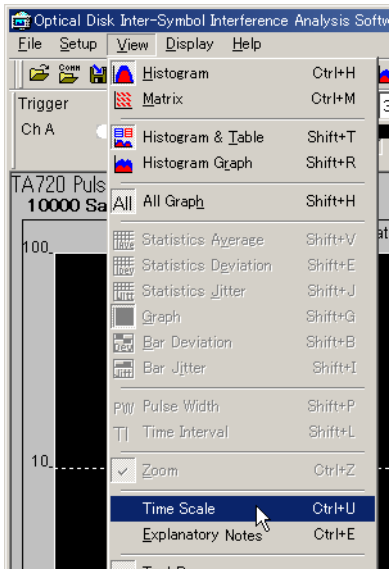
Selecting Only the Extracted Data Display or Extracted Data and All Data Display

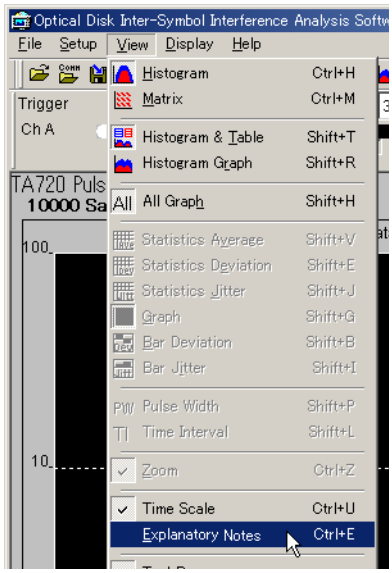
3. From the **View** menu, choose **All Graph**.
   When the All button to the left of All Graph appears depressed, extracted data and all data display is enabled. If you select All Graph in this condition, only the extracted data is displayed.



Showing or Hiding the Time Scale Display of the X-Axis and the Graph Explanatory Notes

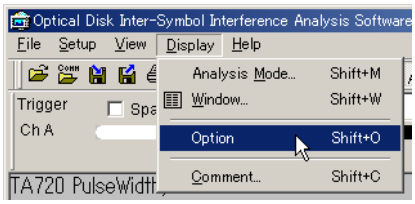
4. To show the time scale on the X-axis, choose **Time Scale** from the **View** menu. To show the graph explanatory notes, choose **Explanatory Notes**.



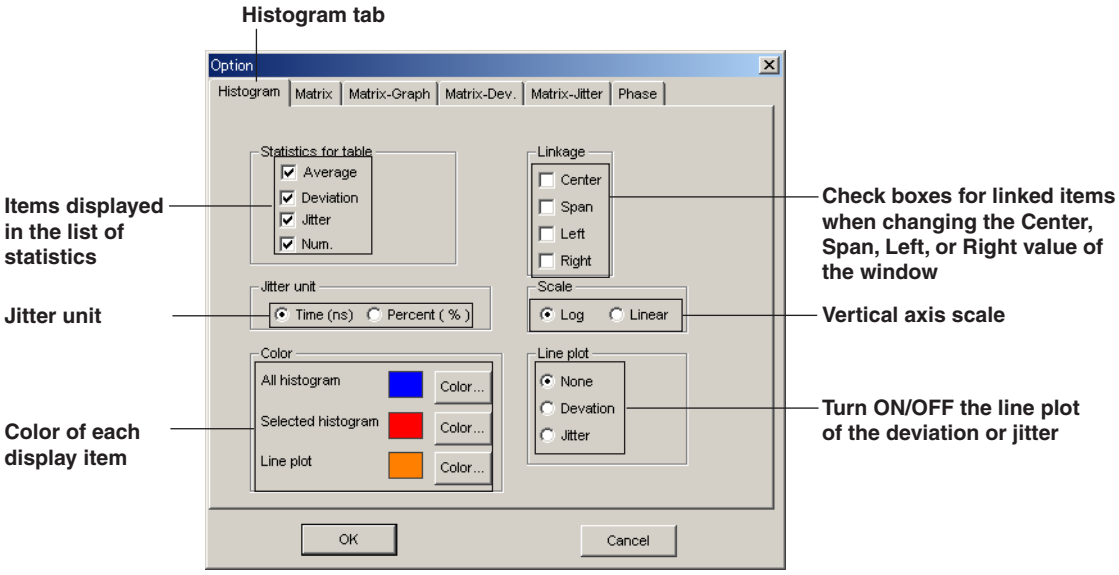


Selecting the Items to Be Displayed in the List of Statistics, Jitter Unit, Linked Items When Window Is Changed, Displayed Item Colors, Y-Axis Scale, and Line Plot of Deviation and Jitter

5. From the **Display** menu, choose **Option**.



6. In the Option dialog box, select the **Histogram** tab.
7. Set the items in the dialog box that appears.



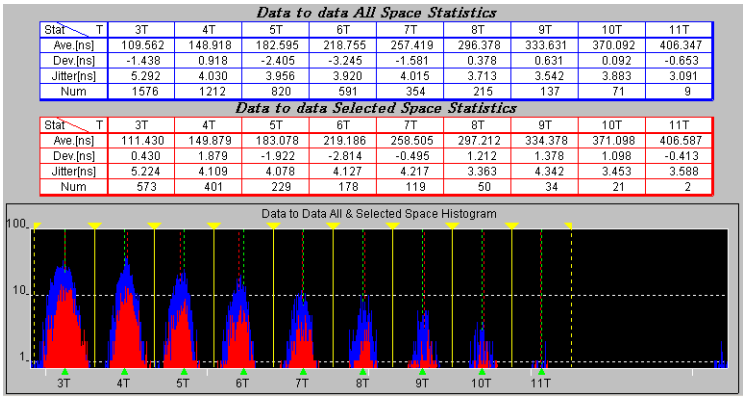
8. Click **OK**.
   To cancel the setting, click **Cancel**.

Explanation

Selecting Simultaneous Display of the Histogram and the List of Statistics (Histogram & Table) or Only the Histogram Display (Histogram Graph)

Select whether to display the histogram and the list of statistics simultaneously or only the histogram.

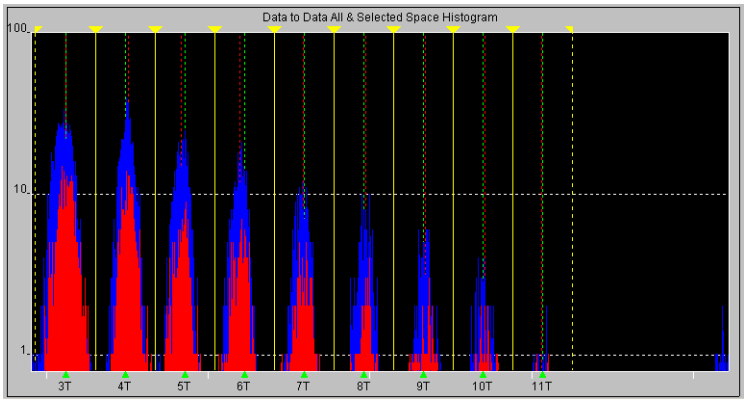
- Display example when the histogram and the list of statistics are displayed simultaneously



Note

When displaying the statistics of both the extracted data and all data, the histogram may not be displayed depending on the setting of the data extraction conditions and the display resolution that you are using.

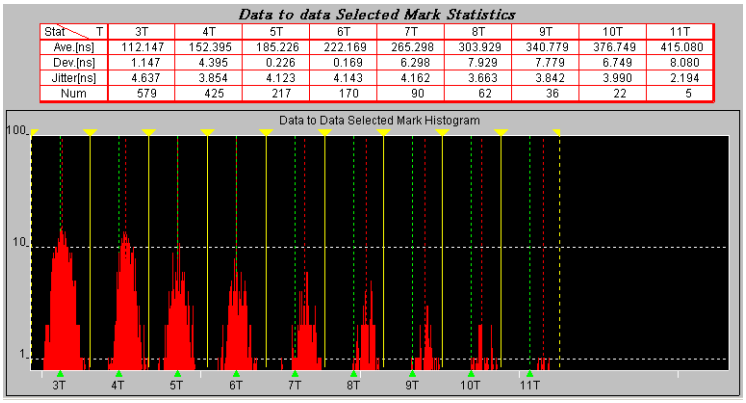
- Display example when only the histogram is displayed



Selecting Only the Extracted Data Display or Extracted Data and All Data Display (All Graph)

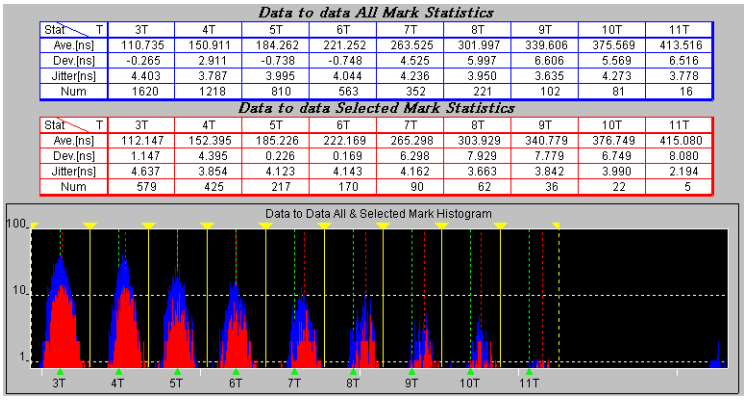
Select whether to display only the data that matched the data extraction conditions or also display all the data.

- Display example when only the extracted data is displayed



Stat \ T	3T	4T	5T	6T	7T	8T	9T	10T	11T
Ave.[ns]	112.147	152.395	185.226	222.169	265.298	303.929	340.779	376.749	415.080
Dev.[ns]	1.147	4.395	0.226	0.169	6.298	7.929	7.779	6.749	8.080
Jitter[ns]	4.637	3.854	4.123	4.143	4.162	3.663	3.842	3.990	2.194
Num	579	425	217	170	90	62	36	22	5

- Display example of extracted data and all data

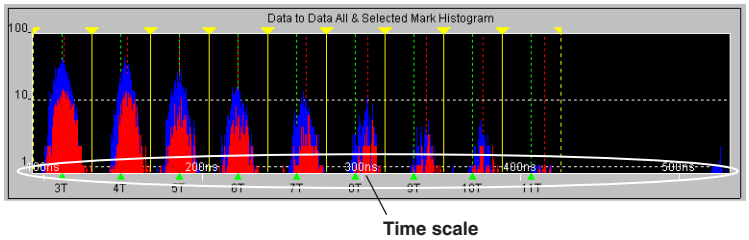


Stat \ T	3T	4T	5T	6T	7T	8T	9T	10T	11T
Ave.[ns]	110.735	150.911	184.262	221.252	263.525	301.997	339.606	375.569	413.516
Dev.[ns]	-0.265	2.911	-0.738	-0.748	4.525	5.997	6.606	5.569	6.516
Jitter[ns]	4.403	3.787	3.995	4.044	4.236	3.950	3.635	4.273	3.778
Num	1620	1218	810	563	352	221	102	81	16

Stat \ T	3T	4T	5T	6T	7T	8T	9T	10T	11T
Ave.[ns]	112.147	152.395	185.226	222.169	265.298	303.929	340.779	376.749	415.080
Dev.[ns]	1.147	4.395	0.226	0.169	6.298	7.929	7.779	6.749	8.080
Jitter[ns]	4.637	3.854	4.123	4.143	4.162	3.663	3.842	3.990	2.194
Num	579	425	217	170	90	62	36	22	5

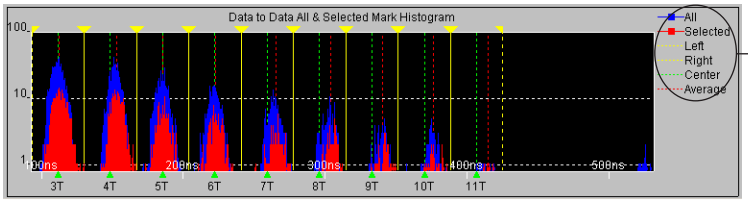
Time Scale Display of the X-Axis

Select whether to display the time scale on the X-axis as shown in the following figure.



Graph Explanatory Notes

Select whether to display the explanatory notes of the graph as shown in the following figure.



Selecting the Items to Be Displayed in the List of Statistics (Statistics for Table)

You can display the average value (Ave.), the deviation (Dev.), jitter, and the number of data points (Num). Clear the check box for statistics you do not wish to display.

Data to data All Mark Statistics

Stat \ T	3T	4T	5T	6T	7T	8T	9T	10T	11T
Ave.[ns]	110.735	150.911	184.262	221.252	263.525	301.997	339.606	375.569	413.516
Dev.[ns]	-0.265	2.911	-0.738	-0.748	4.525	5.997	6.606	5.569	6.516
Jitter[ns]	4.403	3.787	3.995	4.044	4.236	3.950	3.635	4.273	3.778
Num	1620	1218	810	563	352	221	102	81	16

Selecting the Jitter Unit

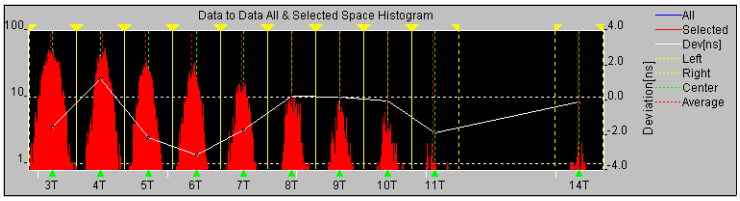
Select time (ns) or percent (%).

- Time(ns): σ (standard deviation)
- Percent(%): Jitter (ns)/T×100

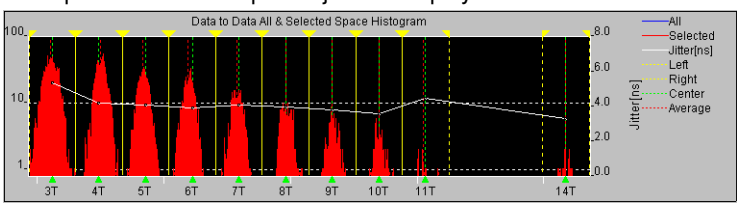
Displaying the Line Plot of Statistics (Line Plot)

A line plot of the statistics (deviation or jitter) can be displayed superimposed on the histogram. To display the graph, choose Deviation or Jitter.

- Example when the line plot of deviation is displayed



- Example when the line plot of jitter is displayed



Linked Items When Windows Is Changed (Linkage)

The Center, Span, Left, and Right values of the window can be changed on the histogram display (see page 2-4). To link the change in each value, select the Linkage check box for the items you wish to link.

Changing the Histogram Display Color

You can change the display color of the histogram.

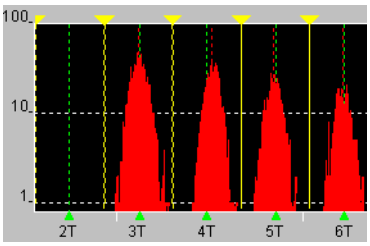
- All histogram: The display color of the histograms of all Mark data or all Space data. The default value is blue.
- Selected histogram: The display color of the histogram of data that match the data extraction condition. The default value is red.
- Line plot: The display color of the line plot of the deviation or jitter. The default setting is orange.

The color is set in the Color dialog box. You can use the 48 basic colors as well as original colors that you create.

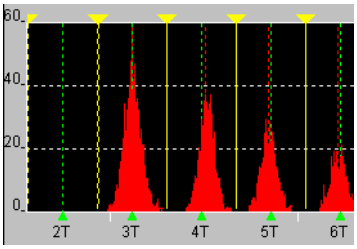
Selecting the Y-Axis Scale

You can select whether to use a log scale or a linear scale for the histogram's Y-axis.

- Display example of a log scale



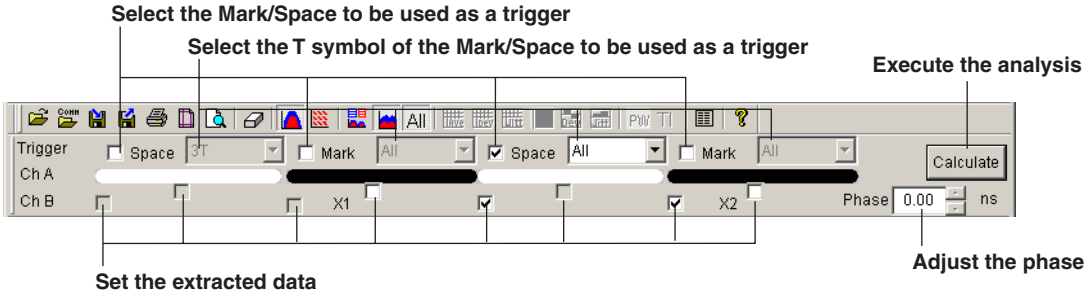
- Display example of a linear scale



3.2 Setting the Data Extraction Conditions and Executing the Analysis

Procedure

1. Set the data extraction conditions using the trigger bar shown below.
   When the measured data of pulse width A→A-to-B time interval measurement of the TA720 is loaded, phase adjustment is possible using the Phase text box.



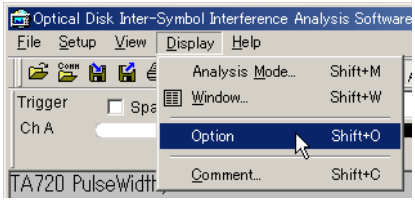
Note

The trigger bar can be displayed on a separate window. Click near the border of the toolbar and the trigger bar and drag to separate the trigger bar from the toolbar. To return to the original condition, drag the trigger bar on top of the toolbar.

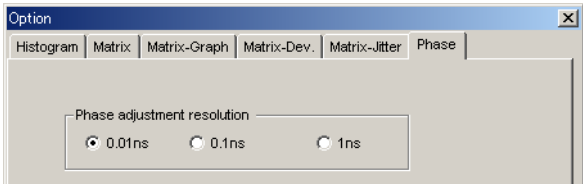
2. Click **Calculate** to perform the analysis.
   The Calculate button becomes available only when a possible data extraction condition is specified.

Changing the Phase Adjustment Resolution

1. From the **Display** menu, choose **Option**.



2. In the **Option** dialog box, select the **Phase** tab. In the dialog box that appears, set Phase adjustment resolution to 0.01ns, 0.1ns, or 1ns.



Explanation

Data Extraction Conditions

The following data extractions are possible.

- Use a Space or Mark as a trigger to extract the data around it
  Example when using the Mark of all Ts as a trigger to extract the pulse width data of the subsequent Space

Example when using the Space of all Ts as a trigger to extract the A-to-B time interval from the edge on each end on the PW→TI measurement data of the TA720

Example when using the Space of 5T as a trigger to extract the A-to-B time interval from the front edge and the preceding edge on the PW→TI measurement data of the TA720

- Use a Mark followed by a Space or a Space followed by a Mark as a trigger to extract data around it

  Example when using the Space of all Ts after the 4T Mark as a trigger to extract the pulse width data of the Space before them

- Use a Space and a Space or a Mark and a Mark as a trigger to extract the data between two Spaces or two Marks

  Example when using the Space of 2T and the Space of 4T as a trigger to extract the pulse width data of the Mark in between the two Spaces

  Example when using the Space of 3T and the Space of 5T as a trigger to extract the A-to-B time interval from the edge on each end of the Mark in between the two Spaces on the PW→TI measurement data of the TA720

T Symbol of the Space or Mark to Be Used as a Trigger

You can select from the following.

All, 1T, 2T, 3T, 4T, 5T, 6T, 7T, 8T, 9T, 10T, 11T, 14T, Min.T-1T, Min.T-2T, Min.T-3T, Min.T-4T, Min.T-5T, Min.T-6T, Min.T-7T, Min.T-8T, Min.T-9T, Min.T-10T, Min.T-11T, Min.T-14T, 1T-Max.T, 2T-Max.T, 3T-Max. T, 4T-Max.T, 5T-Max.T, 6T-Max.T, 7T-Max.T, 8T-Max.T, 9T-Max.T, 10T-Max.T, 11T-Max.T, 14T-Max.T, ODD, and EVEN

* If you select Min.T-1T to Min.T-14T, all the symbol from the smallest symbol to 1T to 14T symbol will be used as triggers to perform the analysis. Similarly, if you select 1T-Max.T to 14T-Max.T, all the symbol from 1T to 14T symbol to the maximum symbol will be used as triggers to perform the analysis. ODD denotes all odd Ts and EVEN denotes all even Ts.

Executing the Analysis (Calculate)

If you click the Calculate button when the measured data is already loaded, the data matching the specified data extraction conditions is extracted, and the histogram or the list of statistics is displayed using the specified display format of analysis results (see section 3.1).

The Calculate button becomes available only when a possible data extraction condition is specified. For the possible data extraction conditions, see “Selectable Triggers and Extracted Data” on pages 6-2 and 6-3.

Note

- Analysis is performed and the histogram or the list of statistics is displayed using the display format of analysis results also when the measured data is loaded after setting the data extraction conditions.
- If you execute data clear (Setup > Clear Data), the loaded measured data is also cleared, not just the histogram and the statistical results.

Phase Adjustment Resolution

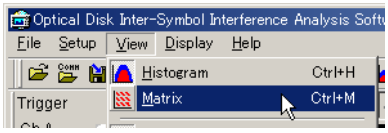
You can set a phase difference between the Ch A pulse edge and the Ch B pulse edge in the range of –99.99 ns to 99.99 ns for the loaded measured data of the A-to-B time interval measurement on the TA720. You can set the resolution to 0.01 ns (default), 0.1 ns, or 1 ns.

4.1 Setting the Display Format of Analysis Results

Procedure

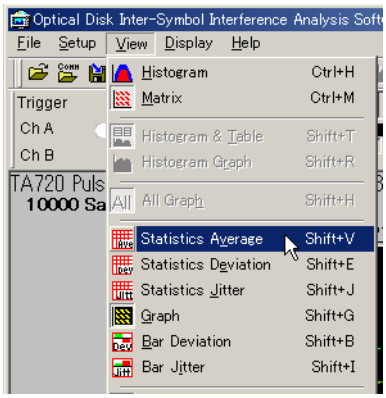
Selecting the Matrix Display

1. From the **View** menu, choose **Matrix**.



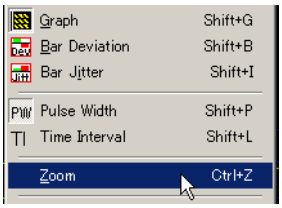
Selecting Sheet Display or Graph Display and Selecting Statistics

2. Select **Statistics Average**, **Statistics Deviation**, **Statistics Jitter**, **Graph, Bar Deviation**, or **Bar Jitter**.
   Sheet display: Statistics Average, Statistics Deviation, or Statistics Jitter
   Graph display: Graph, Bar Deviation, or Bar Jitter



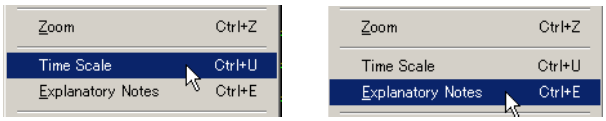
Zooming When Displaying the Graph (only when Graph is selected in the above procedure)

3. To zoom the display, choose **Zoom** from the **View** menu.
   Choose **Zoom** again to return to the original display.



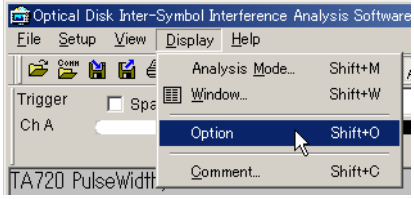
Showing or Hiding the Time Scale Display and the Graph Explanatory Notes

4. To show the time scale on the X-axis, choose **Time Scale** from the **View** menu. To show the graph explanatory notes, choose **Explanatory Notes**.
   Time Scale is valid only when Graph is selected at step 2.



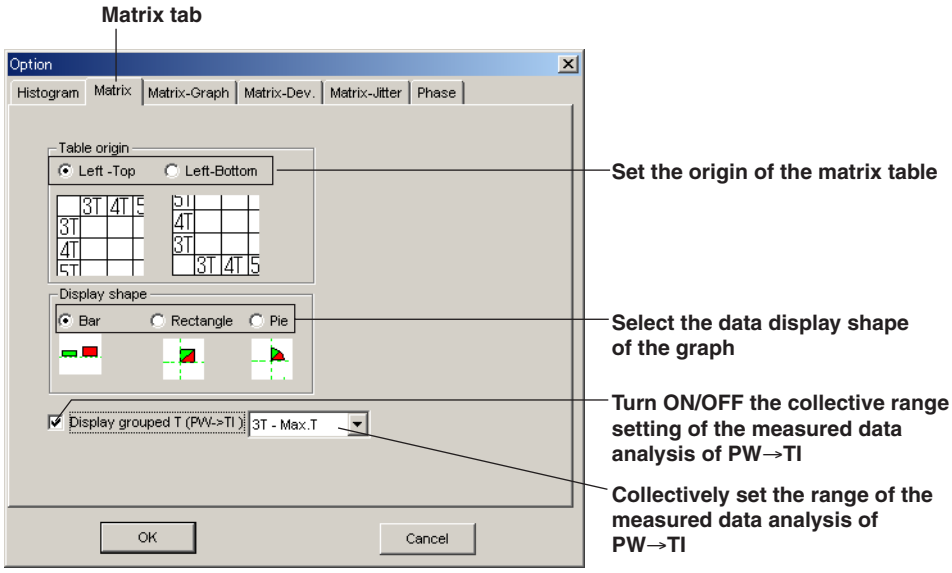
Detailed Settings of the Matrix Display

5. From the **Display** menu, choose **Option**.

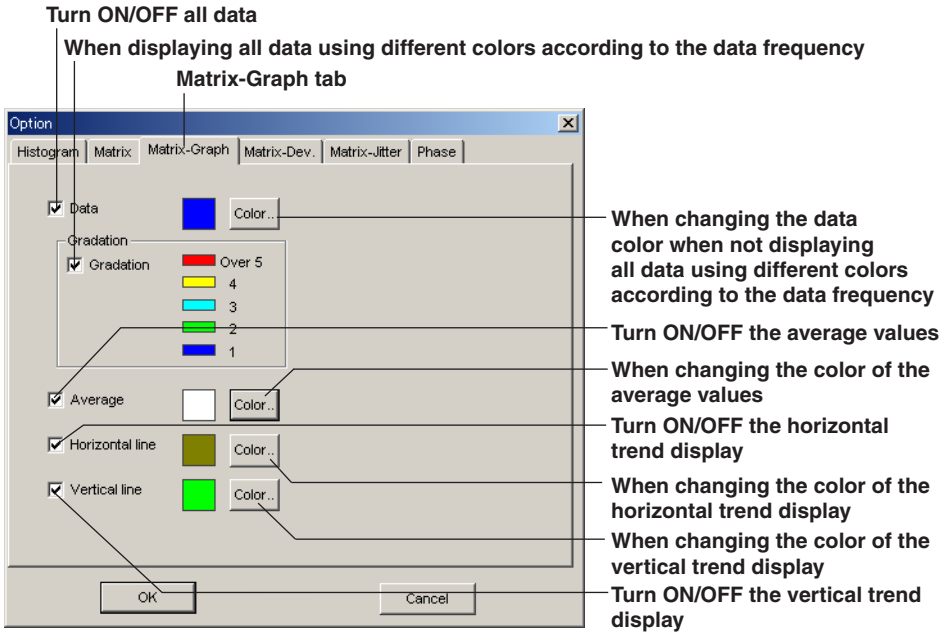


6. In the Option dialog box, select the **Matrix**, **Matrix-Ave.**, **Matrix-Dev.**, or **Matrix-Jitter** tab, and enter various settings in the displayed dialog box.

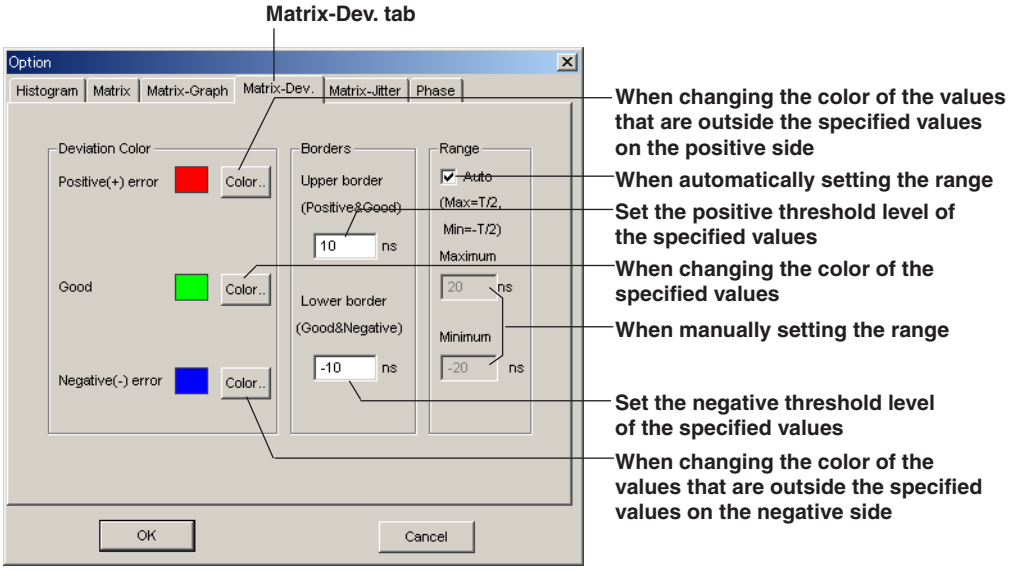
• Matrix tab settings



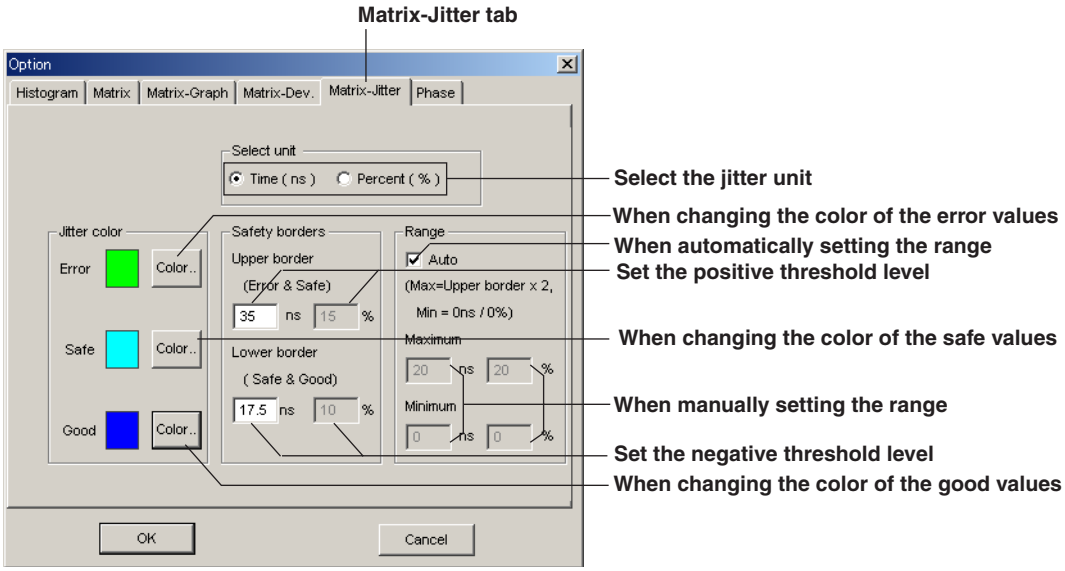
• Matrix-Graph tab settings



• Matrix-Dev. tab settings (Bar Deviation display settings)



• Matrix-Jitter tab settings (Bar Jitter display settings)



7. Click **OK**.
   To cancel the setting, click **Cancel**.

Explanation

Selecting Sheet Display or Graph Display and Selecting Statistics

- **Sheet Display**

  Three different types of sheet displays are available: average of each symbol (Statistics Average), deviation (Statistics Deviation), or jitter (Statistics Jitter).
  In the sheet display, the analysis results are displayed in a matrix where the previous data (Y) is shown on the Y-axis and the subsequent data (X) on the X-axis from the data extracted according to the specified extraction conditions. The top section displays the statistics of the previous data (Y) symbol. The middle section displays the statistics of the subsequent data (X) symbol. The bottom section displays the number of data points of the applicable matrix.

  Example of Deviation Analysis of Space-Mark Data Immediately Before 3T Space

xT / yT	2T	3T	4T	5T
	---	0.371	3.280	-1.024
	0	561	386	253
2T	---	---	---	---
---	---	---	---	---
0	0	0	0	0
3T	---	-1.082	3.044	-1.325
-2.223	---	1.839	4.991	-0.117
535	0	213	124	72
4T	---	-0.019	-0.932	2.258
-0.001	---	-1.051	1.685	-2.026
374	0	129	96	63
5T	---	-3.582	-3.372	-0.116

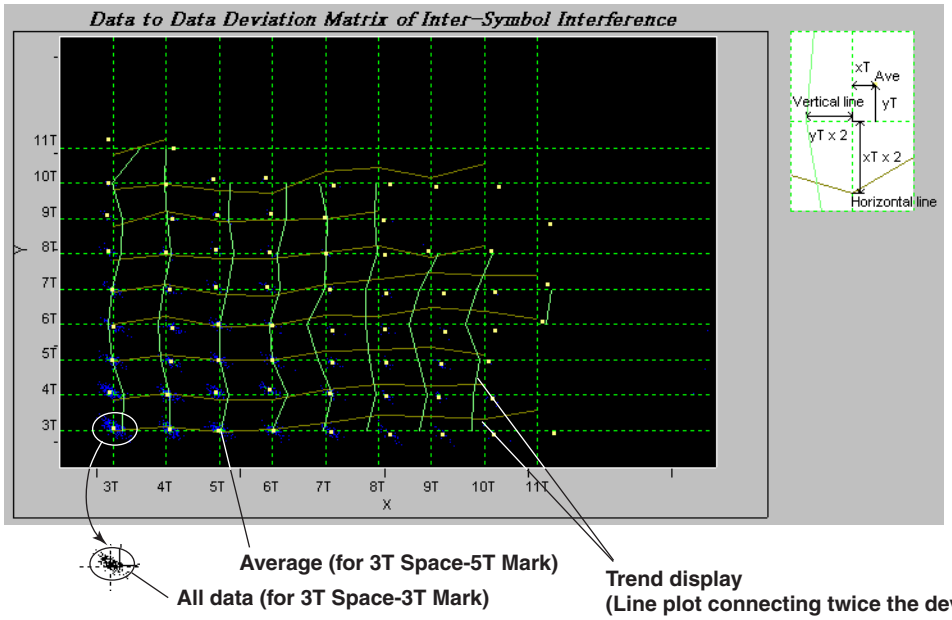
Statistical values of Y
Statistical values of X
Number of data points

- **Graph Display**

  Three different types of graph displays are available: All data (Graph), deviation (Bar Deviation), and jitter (Bar Jitter).

  All data (When Graph is selected)

  Selectable only when the applicable measured data is set to pulse width (see section 4.2 for the setup procedure). All the measured data points are displayed as dots. If the Gradation check box in the Matrix-Graph dialog box is selected, the data is displayed using different colors according to the frequencies of occurrence. In addition, the average values of the combination of symbols and the trend of the average values can be displayed using a line plot connecting twice the deviation values (see page 4-6).

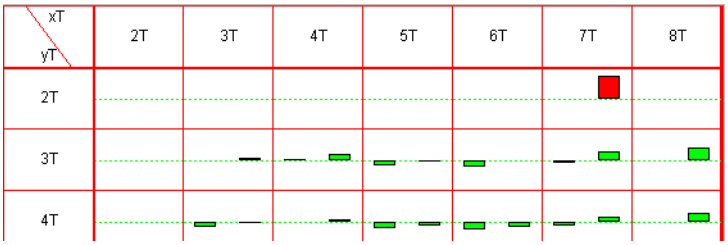


Average (for 3T Space-5T Mark)
All data (for 3T Space-3T Mark)
Trend display
(Line plot connecting twice the deviation values)

Deviation or Jitter

Determines whether the deviation or the jitter of each symbol is high or low with respect to the two specified levels and displays the result using bar, rectangle, or pie graph in color.

Bar display example

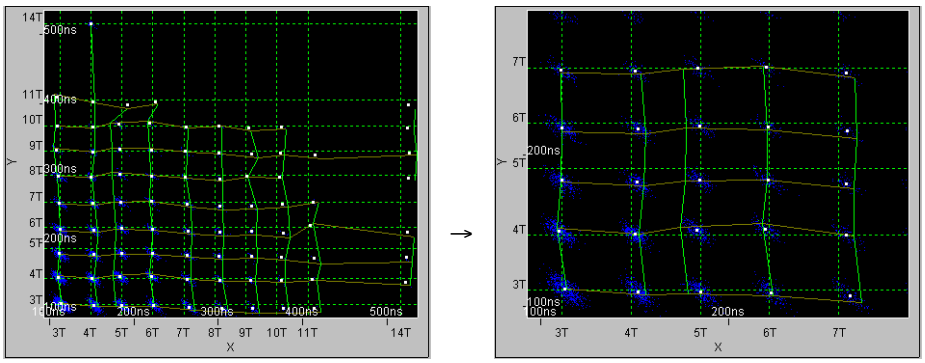


Zooming the Graph (only when the displayed information is Graph)

When zoomed, the display is zoomed and the display range is cut by approximately half. For example, if 3T to 14T data is displayed and the display is zoomed, 3T to 7T data is displayed.

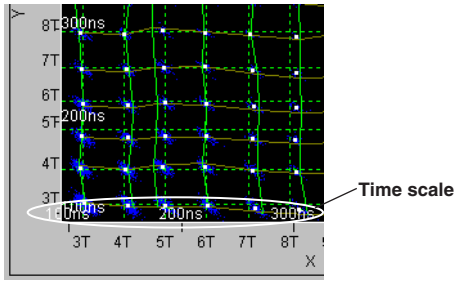
Before zoom

After zoom



Time Scale Display of the X-Axis

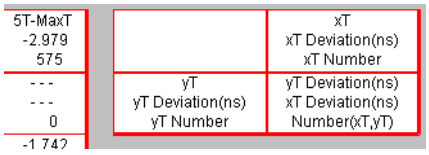
Select whether to display the time scale on the X-axis as shown in the following figure.



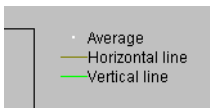
Explanatory Notes

Select whether to display the explanatory notes of the sheet or graph as shown in the following figure.

Sheet explanatory notes example



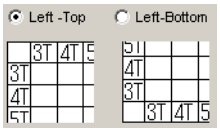
Graph explanatory notes example



Detailed Settings of the Matrix Display

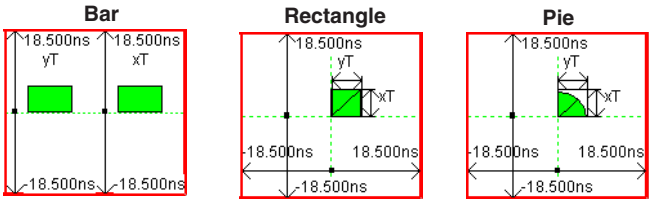
- **Matrix Table Origin**

  You can select Left-Top or Left-Bottom.



- **Selecting the Data Display Shape of the Graph**

  Select Bar, Rectangle, or Pie.



- **Collective Range Setting When Analyzing Measured Data of PW→TI (Display grouped T (PW->TI))**

  When the measured data of pulse width A→A-to-B time interval measurement on the TA720 is being analyzed the data of the specified T range (1T-Max.T to 14T-Max.T) is displayed collectively.

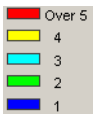
  For example, the following figure shows the case when 5T-Max.T is specified.

xT / yT	2T	3T	4T	5T-MaxT
	---	-1.261	-1.554	-2.979
	0	551	396	575
2T	---	---	---	---
---	---	---	---	---
0	0	0	0	0
3T	---	-0.723	0.016	-1.742

- **Detailed Settings of All Data Display (Graph)**

  Turn ON/OFF all data, average values, and horizontal/vertical trend display on the graph display and set the color of each displayed item. The display color is set to any of the 48 basic colors or an original color you create in the Color dialog box.

  In the case of all data, you can specify Gradation, a setting in which the color changes according to the frequency of occurrence of the data (1 to 4 or Over).



  If the Gradation check box is selected, the data is displayed using different colors according to the frequencies.

  If the Average check box is selected, the average values of the combination of each symbol are displayed using dots.

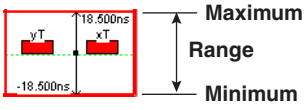
  If the Horizontal/Vertical check box is selected, the trend of the average values are displayed using a line plot connecting twice the average values of the combination of symbols. The trend display of the symbol assigned to the X-axis is Horizontal; the trend display of the symbol assigned to the Y-axis is Vertical.

- **Details Settings of the Bar Deviation Display**

  Under Borders, set the upper and lower threshold levels (Upper border and Lower border) that indicate whether the data is within the prescribed values (Good). Under Deviation Color, set the display colors to distinguish the judgment result above. The display color is set to any of the 48 basic colors or an original color you create in the Color dialog box.

  - Positive(+) Error: Deviation ≥ Upper border level
  - Good: Lower border level ≤ Deviation < Upper border level
  - Negative(-) Error: Deviation < Lower border level

Under Range, set the range of the bar display. When set to auto range, the maximum and minimum ranges are set to T/2 and –T/2, respectively.



- **Detailed Settings of the Jitter Display**

  Under Select unit, set the displayed unit on the sheet display of the jitter analysis to ns or %.

  - Time(ns): σ (standard deviation)
  - Percent(%): Jitter (ns)/T×100

Displayed in ns

4T	- - -	4.095	3.529	3.
4.187	- - -	3.957	3.451	3.
1240	0	407	314	
3T	- - -	5.256	4.762	4.
5.344	- - -	4.601	3.797	4.
1566	0	526	354	
2T	- - -	- - -	- - -	- -
- - -	- - -	- - -	- - -	- -
0	0	0	0	
yT / xT	2T	3T	4T	5
	- - -	4.403	3.634	3.
	0	1589	1196	

Displayed in %

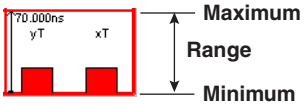
4T	- - -	11.068	9.538	10.
11.316	- - -	10.694	9.328	10.
1240	0	407	314	
3T	- - -	14.205	12.869	12.
14.443	- - -	12.435	10.261	11.
1566	0	526	354	
2T	- - -	- - -	- - -	- -
- - -	- - -	- - -	- - -	- -
0	0	0	0	
yT / xT	2T	3T	4T	5
	- - -	11.901	9.821	10.
	0	1589	1196	

Number of data points
Jitter of X-axis T
Jitter of Y-axis T

On the graph display, the following judgment is made with respect to the two specified levels, and the result is displayed using different colors. Under Safety borders, set the threshold levels (Upper border and Lower border). Under Jitter Color, set the display colors to distinguish the judgment result above.

- Error value: Jitter ≥ Upper border level
- Safe value: Lower border level ≤ Jitter < Upper border level
- Good value: Jitter < Lower border level

Under Range, set the range of the bar display. When set to auto range, the maximum and minimum ranges are set to T/2 and –T/2, respectively.

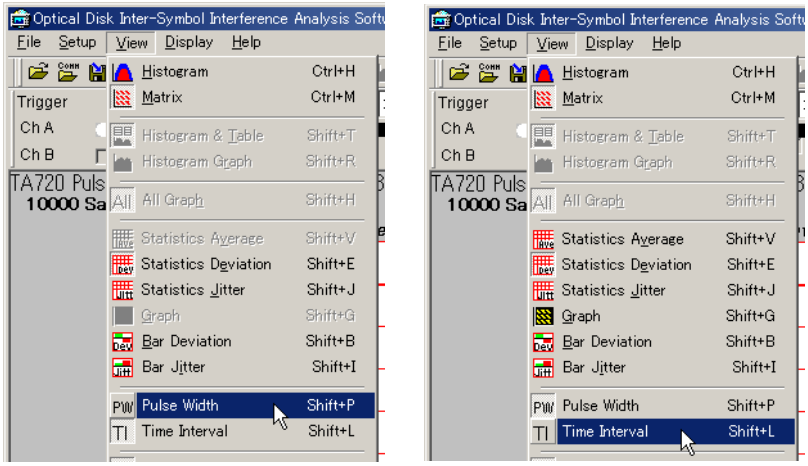


4.2 Setting the Data Extraction Conditions and Executing the Analysis

Procedure

Selecting the Measured Data to Be Analyzed (only on the TA720)

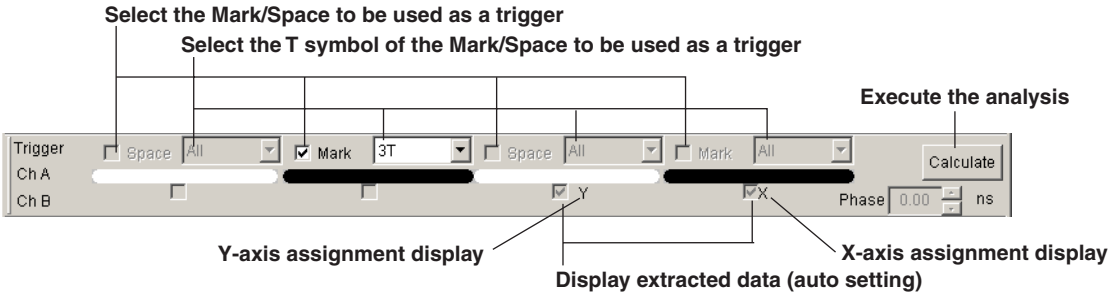
1. If the measured data to be analyzed is pulse width, choose **Pulse Width** from the **View** menu. If the data is A-to-B time interval, choose **Time Interval**.



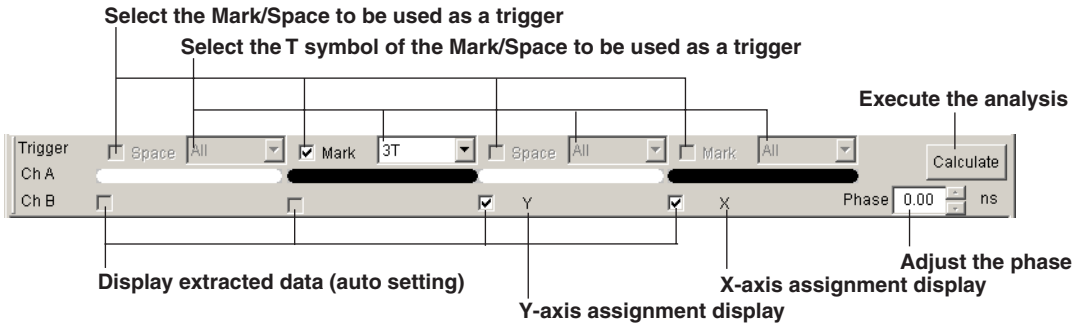
Setting the Data Extraction Conditions

2. Set the data extraction conditions using the trigger bar shown below.
   When the measured data of pulse width A→A-to-B time interval measurement of the TA720 is loaded, phase adjustment is possible using the Phase text box.

   • When the Data to Be Analyzed Is Pulse Width



   • When the Data to Be Analyzed Is A-to-B Time Interval



Executing the Analysis

3. Click **Calculate**.
   The Calculate button becomes available only when a possible data extraction condition is specified.

Changing the Phase Adjustment Resolution

The setup procedure is the same as with the data analysis using histograms. See page 3-6.

Explanation

Selecting the Measured Data to Be Analyzed (only on the TA720)

When performing analysis on the measured data of the pulse width A→A-to-B time interval measurement of the TA720, select whether the analyzed data is pulse width or A-to-B time interval.

Data Extraction Conditions

- **When the Data to Be Analyzed Is Pulse Width**

  Set whether to use a Space or a Mark as a trigger. Whether the Space-Mark or Mark-Space data immediately before the trigger or the Space-Mark or Mark-Space data immediately after the trigger is extracted is automatically specified according to the position of the specified Space or Mark. The Y and X displayed next to the check boxes indicate the axes on the matrix display.

  Example When Mark-Space Data Immediately after All Space Is Extracted

  Example When Mark-Space Data Immediately before 3T Space Is Extracted

- **When the Data to Be Analyzed Is A-to-B Time Interval**

  When extracting all the measured data of A-to-B time interval measurement, select one of the three check boxes located on the same line as Ch B (a single check box when the slope setting of the measured data is not both). The axes assignment of Space/Mark on the matrix display is determined by the selected check boxes. The Y and X displayed next to the check boxes indicate the axes on the matrix display.

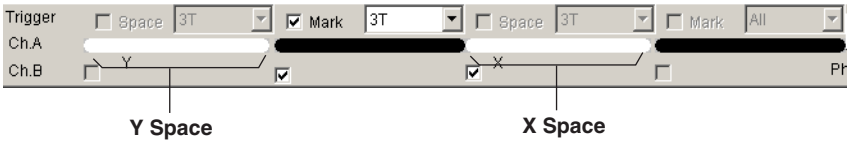
  Example When All the Measured Data of A-to-B Time Interval Measurement Is Extracted

  When using a Space or Mark as a trigger to extract the measured data of A-to-B time interval measurement from the Space-Mark or Mark-Space edge immediately after the trigger, select the Space or Mark check box located on the same line as Trigger. Then, select one of the two check boxes located on the same line as Ch B (a single check box when the slope setting of the measured data is not both). The axes assignment of Space/Mark on the matrix display is determined by the selected check boxes. The Y and X displayed next to the check boxes indicate the axes on the matrix display.

  Example when extracting A-to-B time interval from the Mark-Space edge immediately after 3T Space

  When using a Space or Mark as a trigger to extract the measured data of A-to-B time interval measurement from the edge on each end of the trigger, select the Space or Mark check box located on the same line as Trigger. Then, of the three check boxes located on the same line as Ch B, select the check boxes corresponding to the edge on each end of the Space or Mark set to be the trigger. The axes assignment of Space/Mark on the matrix display is determined by the selected check boxes. The Y and X displayed below Space or Mark indicate the axes on the matrix display.

Example when extracting A-to-B time interval from the edges around 3T Mark



X Space

Y Space

yT \ xT	2T	3T	4T
	---	-1.910	-1.78
0	0	551	416
2T	---	---	---
---	---	---	---
0	0	0	0
3T	---	-0.723	-3.27
-2.181	---	-2.974	-2.83
526	0	176	147
4T	---	-2.179	-4.12

T Symbol of Space/Mark to Be Used As a Trigger

You can select from the following.

All, 1T, 2T, 3T, 4T, 5T, 6T, 7T, 8T, 9T, 10T, 11T, 14T, Min.T-1T, Min.T-2T, Min.T-3T, Min.T-4T, Min.T-5T, Min.T-6T, Min.T-7T, Min.T-8T, Min.T-9T, Min.T-10T, Min.T-11T, Min.T-14T, 1T-Max.T, 2T-Max.T, 3T-Max. T, 4T-Max.T, 5T-Max.T, 6T-Max.T, 7T-Max.T, 8T-Max.T, 9T-Max.T, 10T-Max.T, 11T-Max.T, 14T-Max.T, ODD, and EVEN

* If you select Min.T-1T to Min.T-14T, all the symbol from the smallest symbol to 1T to 14T symbol will be used as triggers to perform the analysis. Similarly, if you select 1T-Max.T to 14T-Max.T, all the symbol from 1T to 14T symbol to the maximum symbol will be used as triggers to perform the analysis. ODD denotes all odd Ts and EVEN denotes all even Ts.

Executing the Analysis (Calculate)

If you click the Calculate button when the measured data is already loaded, the data matching the specified data extraction conditions is extracted, and the matrix sheet or graph is displayed using the specified display format of analysis results (see section 4.1). The Calculate button becomes available only when a possible data extraction condition is specified. For the possible data extraction conditions, see “Selectable Triggers and Extracted Data” on pages 6-3 and 6-4.

Note

- Analysis is performed and the matrix is displayed using the display format of analysis results also when the measured data is loaded after setting the data extraction conditions.
- If you execute data clear (Setup > Clear Data), the loaded measured data is also cleared, not just the analysis results.

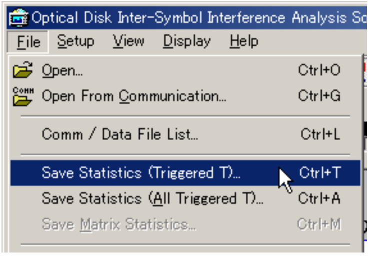
Phase Adjustment Resolution

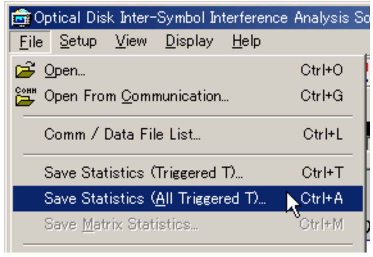
Phase adjustment in the range of –99.99 ns to 99.99 ns is possible with respect to the measured data of pulse width A→A-to-B time interval of the retrieved TA720. The resolution can be set to 0.01 ns (default), 0.1 ns, or 1 ns from Phase tab > Phase adjustment resolution in the Option dialog box that opens when Display > Option is chosen.

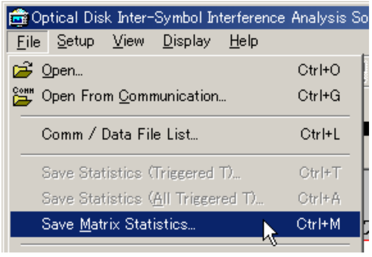
5.1 Saving the Statistical Calculation Results

Procedure

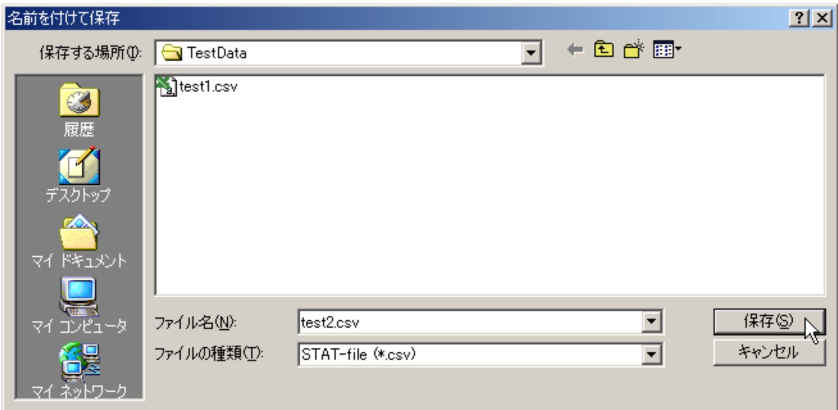
1. To save the statistical calculation results of histogram analysis, choose **Save Statistics (Triggered T)** or **Save Statistics (All Triggered T)** from the **File** menu. To save the statistical calculation results of matrix analysis, choose **Save Matrix Statistics**. The Save As dialog box opens.







2. After setting the Save in box, enter the name of the file you wish to save in the **File name** text box.
3. Click **Save**.
   To cancel, click **Cancel**.



Explanation

Data to Be Saved

During histogram analysis, you can save the data extracted according to the specified extraction conditions (Triggered T) or the data extracted according to all trigger conditions (All Triggered T). However, all the data (All Triggered T) can be saved only when a Space or Mark is used as a trigger to extract the data around the trigger (inter-symbol interference analysis extraction mode on the TA is set Single).

Saved Contents

In addition to the statistics, the comment, the setup data (window width, data analysis conditions, data accumulation number, and data extraction conditions), and the date and time when the data is saved are saved.

Data Format and File Name

The data is saved in CSV format. The file name can be any legal file name as defined by the operating system. The extension is .csv.

- Histogram analysis example

	A	B	C	D	E	F
1	Model	704223				
2						
3	Modulation	1-7modulation				
4	Polarity	Space(+) Mark(-)				
5	Accumulation	5				
6	Date	2002/12/12				
7	Time	15:06:35				
8						
9	Analysis Function	Pulse Width				
10						
11	Trigger Condition					
12	Polarity	Space	Mark	Space	Mark	
13	Trigger		3T			
14	Target			Selected		
15						
16	Window	Left	Right			
17	Unit	nsec	nsec			
18	2T	55.5	92.5			
19	3T	92.5	129.5			
20	4T	129.5	166.5			
21	5T	166.5	203.5			
22	6T	203.5	240.5			
23	7T	240.5	277.5			
24	8T	277.5	314.5			
25						
26	TraceName	Average	Deviation	Jitter	Number	
27	Unit	nsec	nsec	nsec		
28						
29	All Space Data					
30	2T	- - -	- - -	- - -	0	
31	3T	109.424	-1.576	5.344	1566	
32	4T	149.249	1.249	4.187	1240	
33	5T	182.841	-2.159	4.066	809	
34	6T	218.818	-3.182	3.912	610	
35	7T	257.252	-1.748	4.043	361	
36	8T	296.236	0.236	3.949	206	
37						
38	Selected Space Data					
39	2T	- - -	- - -	- - -	0	
40	3T	111.852	0.852	5.148	551	

- Matrix analysis example

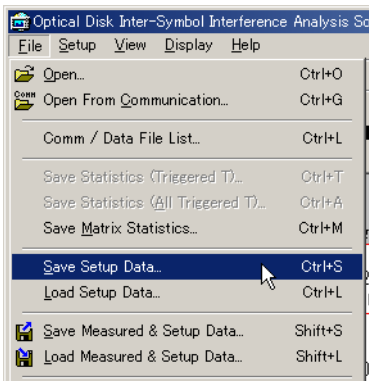
	A	B	C	D	E	F	G	H
1	Model	704223						
2								
3	Modulation	1-7modulation						
4	Polarity	Space(+) Mark(-)						
5	Accumulation	5						
6	Date	2002/12/12						
7	Time	15:07:12						
8								
9	Analysis Function	PW->TI						
10								
11	Trigger Condition	Polarity	Space	Mark	Space	Mark		
12	Trigger		3T					
13	Target	Y		X				
14								
15	Window	X Left	X Right	Y Left	Y Right			
16	Unit	nsec	nsec	nsec	nsec			
17	2T	55.5	92.5	55.5	92.5			
18	3T	92.5	129.5	92.5	129.5			
19	4T	129.5	166.5	129.5	166.5			
20	5T	166.5	203.5	166.5	203.5			
21	6T	203.5	240.5	203.5	240.5			
22	7T	240.5	277.5	240.5	277.5			
23	8T	277.5	314.5	277.5	314.5			
24								
25	TraceName	Average						
26	Axis	Y						
27	Unit	nsec						
28								
29	Window	2T	3T	4T	5T	6T	7T	8T
30	2T	- - -	- - -	- - -	- - -	- - -	- - -	- - -
31	3T	- - -	17.777	15.223	15.538	15.411	14.612	15.528
32	4T	- - -	16.315	14.378	13.823	13.509	14.261	15.163
33	5T	- - -	17.504	15.568	15.018	14.966	15.78	14.4
34	6T	- - -	17.677	15.798	15.028	15.845	16.025	16.75
35	7T	- - -	18.212	14.496	14.944	16.388	15.063	14.12
36	8T	- - -	16.039	15.252	14.436	12.517	13.754	16.663
37								
38	TraceName	Deviation						
39	Axis	Y						
40	Unit	nsec						

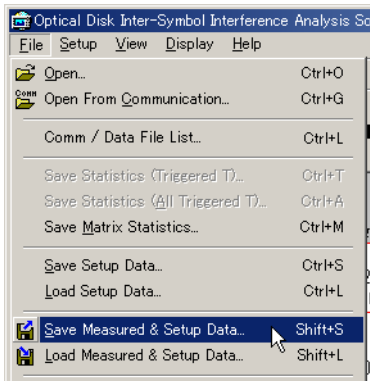
5.2 Saving and Loading Setup Data and Measured Data

Procedure

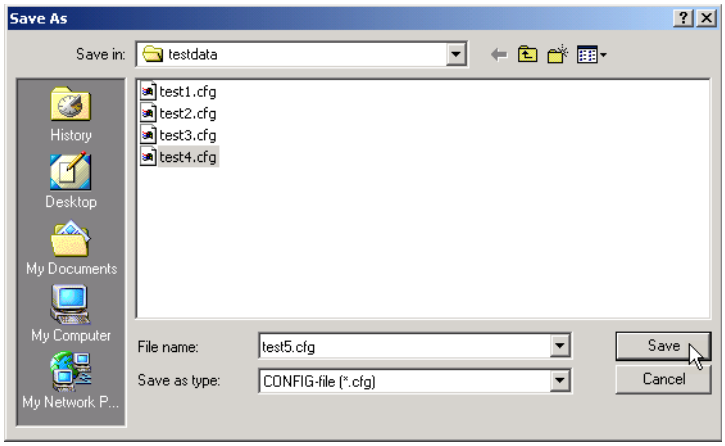
Saving

1. To save only the setup data, choose **Save Setup Data** from the **File** menu. To save both the measured data and setup data, choose **Save Measured Data & Setup**. The Save As dialog box opens.



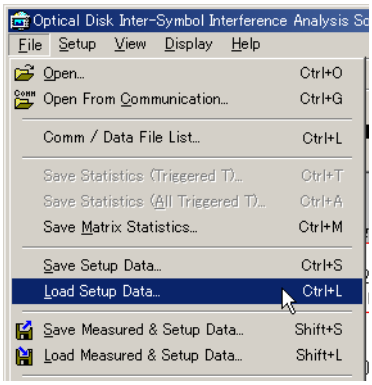


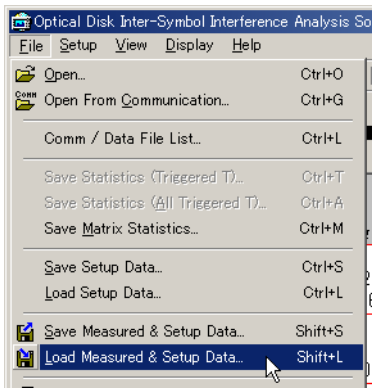
2. After setting the Save in box, enter the name of the file you wish to save in the **File name** text box.
3. Click **Save**.
   To cancel, click **Cancel**.



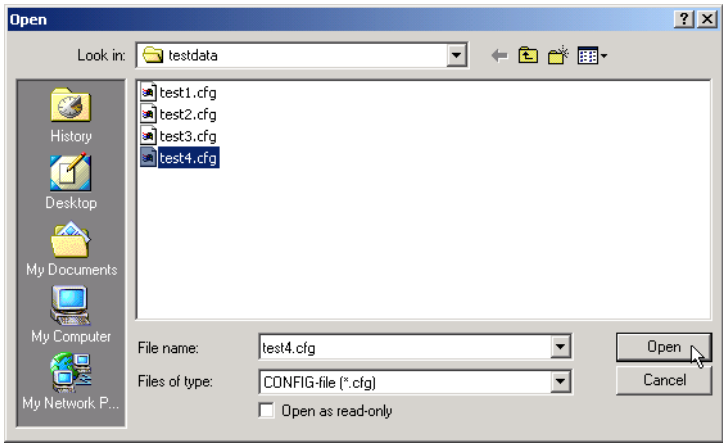
Loading

4. To load only the setup data, choose **Load Setup Data** from the **File** menu. To load all data and setup data simultaneously, choose **Load Measured Data & Setup**. The Open dialog box opens.





5. After setting the **Look in** box, select the file name from the file list.
   You can also enter the name of the file you wish to open in the **File name** text box.
6. Click **Open**.
   To cancel, click **Cancel**.



Explanation

Saved/Loaded Contents

You can save/load only the setup data or both measured data and setup data collectively.

- Measured data: Loaded measured data. If the number of times to load the data is specified, the accumulated data are saved or loaded.
- Setup data: Window width, data analysis conditions, data accumulation number, data extraction conditions, comments, display format of analysis results, etc.

File Name and Extension

The file name can be any legal file name as defined by the operating system.

- Extension of the measured data file name: .mds
- Extension of the setup data file name: .cfg

Precautions to Be Taken When Saving and Loading Data

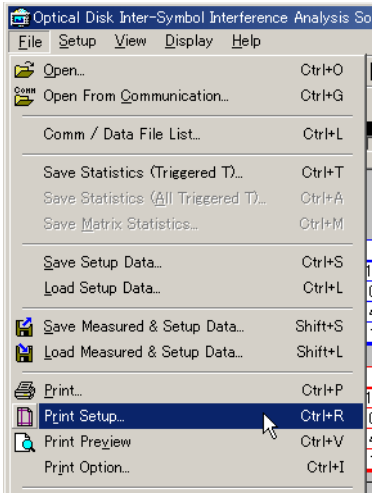
- When the loaded measured data and setup data are saved simultaneously, the header file (.hdr extension) is also created along with the setup data file (.cfg extension). This header file is necessary when loading the measured data and setup data simultaneously. Therefore, make sure not to delete this file.
- When the measured data or setup data is loaded (when Open is clicked), the measured data or setup data existing before the load operation is cleared.

5.3 Printing the Analysis Results

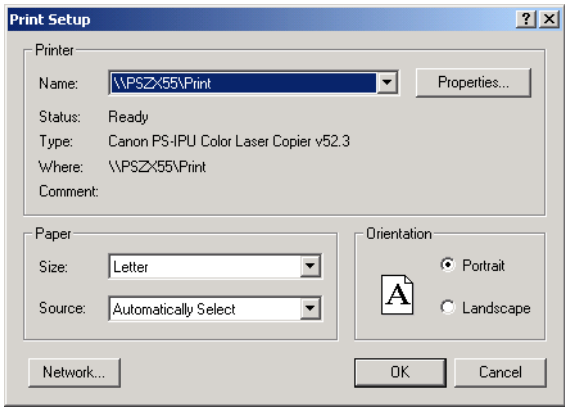
Procedure

Setting Up the Printer

1. From the **File** menu, choose **Print Setup** to open the Print Setup dialog box.



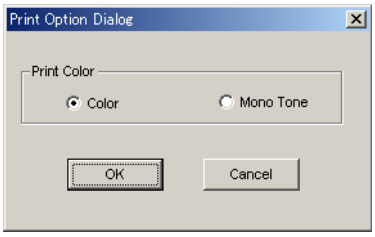
2. Set the printer, orientation, paper size, etc. Then, click **OK**.



Specifying Print Options

1. From the **File** menu, choose **Print Option** to open the Print Option dialog box.

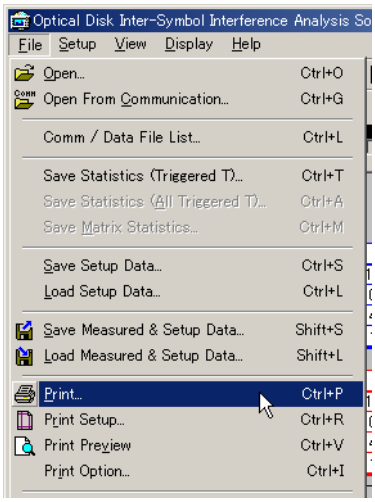
2. Use the **Printer Color** option button to select **Color** or **Mono Tone**.



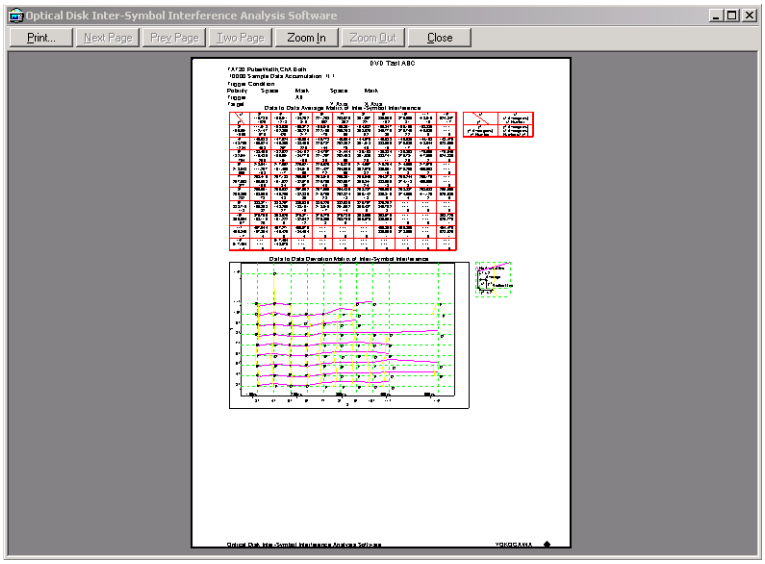
3. Click **OK**.

Print Preview

1. From the **File** menu, choose **Print Preview**.



A window appears for checking the print image as shown below.

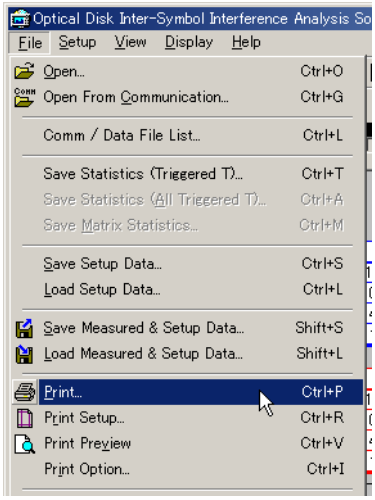


Note

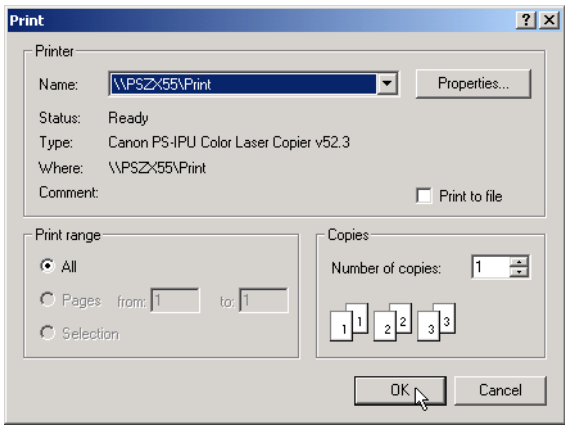
- To check the print image in detail, click Zoom In. Click Zoom Out to return to the original size.
- Click Print to open the Print dialog box.

Executing the Print Operation

1. From the **File** menu, choose **Print** to open the Print dialog box.



2. Confirm the settings in the Print dialog box and click **OK**.



Explanation

Setting Up the Printer

Set the printer according to the system environment that you are using.

Specifying Print Options

You can select whether to print in color or in black and white (Mono Tone).

- Color: Color printing (gray-scale printing on a black and white printer)
- Mono Tone: Black and white printing (On the graph display of jitter matrix analysis, good, safe, and error are displayed in white, stripes, and black, respectively)

Histogram Print Example (The following figure is an image.)

TA720 PulseWidth&TimeInterval,ChA ChB Both->Rise
10000 Sample Data Accumulation 1/1
Trigger Condition

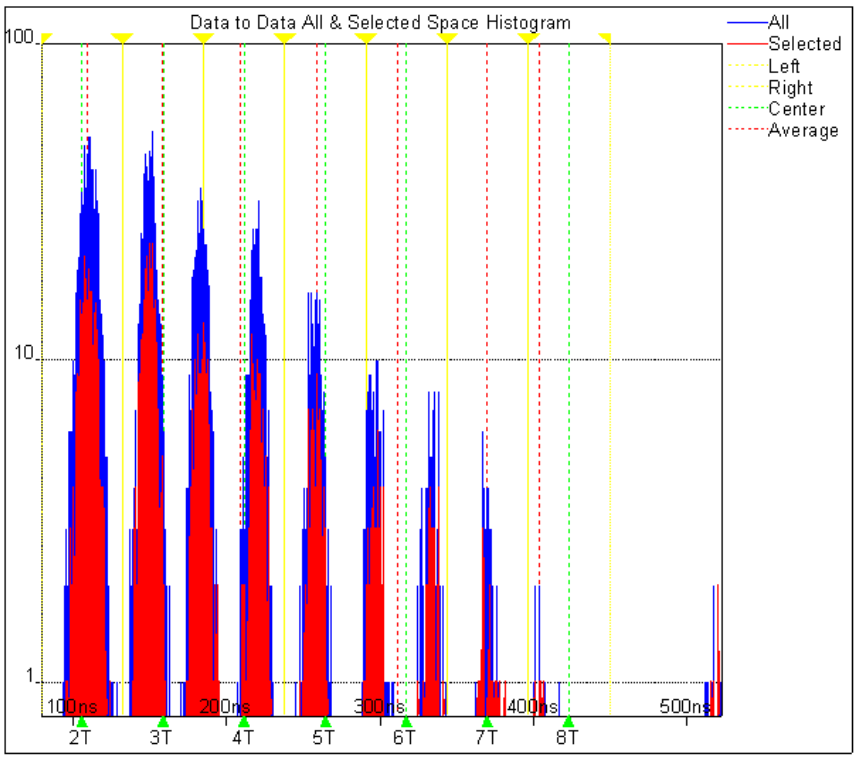
Polarity	Space	Mark	Space	Mark
Trigger		3T		
Target(PW)			Selected	

Data to Data All Space Statistics

Stat \ T	2T	3T	4T	5T	6T	7T	8T
Ave.[ns]	109.424	159.233	210.095	258.558	310.563	369.971	405.095
Dev.[ns]	3.636	0.551	-1.480	-5.912	-6.800	-0.287	-18.056
Jitter[ns]	5.344	15.189	14.450	7.533	18.062	3.577	4.423
Num	1566	1812	848	376	308	64	10

Data to Data Selected Space Statistics

Stat \ T	2T	3T	4T	5T	6T	7T	8T
Ave.[ns]	109.079	157.825	209.404	258.706	312.011	370.144	403.931
Dev.[ns]	3.292	-0.857	-2.172	-5.763	-5.352	-0.113	-19.220
Jitter[ns]	4.852	14.754	15.054	7.041	18.044	4.400	1.987
Num	538	627	265	135	110	21	4



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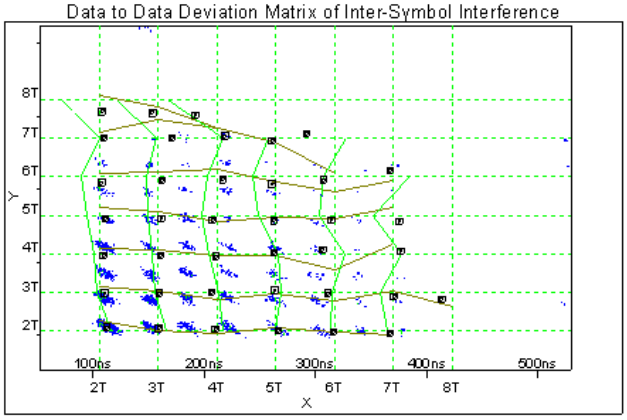
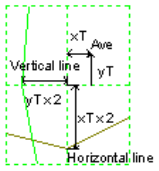
All Data Matrix Print Example (The following figure is an image.)

TA720 PulseWidth&TimeInterval,ChA ChB Both->Rise
10000 Sample Data Accumulation 1/1
Trigger Condition

Polarity	Space	Mark	Space	Mark
Trigger		3T		
Target			Y Axis	X Axis

Data to Data Deviation Matrix of Inter-Symbol Interference





Data to Data Deviation Matrix of Inter-Symbol Interference

xT / yT	2T	3T	4T	5T	6T	7T	8T
2T	4.936 567	1.305 565	-2.126 297	-0.734 125	-4.878 115	-0.448 29	-9.376 1
3T	4.968 3.292 538	3.850 0.223 200	2.651 -1.605 154	-0.096 1.966 106	-1.687 -0.786 29	-2.798 -2.745 39	- - - - - - 10
4T	-0.972 -0.857 627	-1.509 4.382 203	0.313 0.898 219	2.241 -4.982 98	-1.428 -1.196 51	-5.665 -5.959 44	-9.007 0.815 9
5T	-2.869 -2.172 265	-2.828 3.457 97	-3.782 2.438 87	1.339 -0.905 41	4.578 -1.277 24	3.824 -10.803 14	- - - 6.643 2
6T	-5.447 -5.763 135	-4.813 5.027 39	-6.834 2.565 53	-7.983 -4.270 21	-6.976 -1.764 9	-9.207 -2.834 11	- - - 5.405 2
7T	-8.357 -5.352 110	-5.122 1.597 26	-4.471 3.441 37	-10.566 5.504 24	-4.684 -3.422 10	-10.143 -2.828 6	7.707 - - - 6
8T	-0.157 -0.113 21	-0.682 3.662 1	2.814 12.225 8	-3.457 6.887 6	5.368 -3.532 2	- - - -24.888 1	- - - - - - 0
	-16.976 -19.220 4	-18.764 2.012 1	-22.376 -5.044 2	- - - -19.651 1	- - - - - - 0	- - - - - - 0	- - - - - - 0

	xT xT Deviation(ns) xT Number
yT yT Deviation(ns) yT Number	yT Deviation(ns) xT Deviation(ns) Number(xT,yT)

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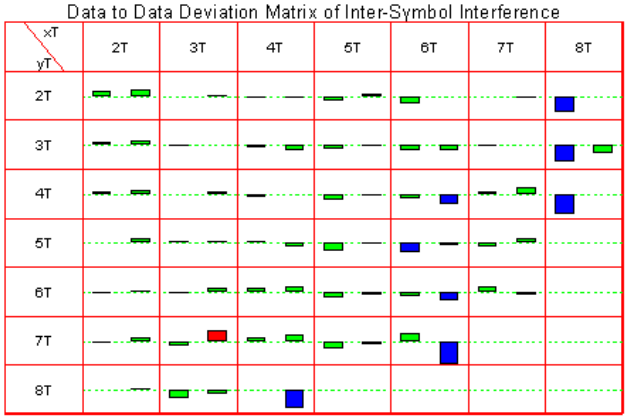
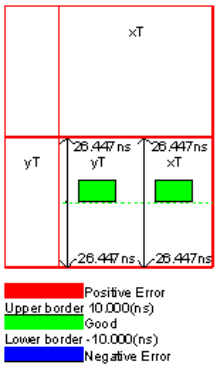
Deviation Matrix Print Example (The following figure is an image.)

TA720 PulseWidth&TimeInterval,ChA ChB Both->Rise
10000 Sample Data Accumulation 1/1
Trigger Condition

Polarity	Space	Mark	Space	Mark
Trigger		3T		
Target			Y Axis	X Axis

Data to Data Deviation Matrix of Inter-Symbol Interference





Data to Data Deviation Matrix of Inter-Symbol Interference

xT / yT	2T	3T	4T	5T	6T	7T	8T
	4.936 567	1.305 565	-2.126 297	-0.734 125	-4.878 115	-0.448 29	-9.376 1
2T 3.292 538	4.968 6.654 200	3.850 0.223 154	2.651 -1.605 106	-0.096 1.966 29	-1.687 -0.786 39	-2.798 -2.745 10	- - - - - - 0
3T -0.857 627	-0.972 4.382 203	-1.509 0.898 219	0.313 -4.982 98	2.241 -1.196 51	-1.428 -5.959 44	-5.665 0.815 9	-9.007 -9.376 1
4T -2.172 265	-2.869 3.457 97	-2.828 2.438 87	-3.782 -0.905 41	1.339 -1.277 24	4.578 -10.803 14	3.824 6.643 2	- - - - - - 0
5T -5.763 135	-5.447 5.027 39	-4.813 2.565 53	-6.834 -4.270 21	-7.983 -1.764 9	-6.976 -2.834 11	-9.207 5.405 2	- - - - - - 0
6T -5.352 110	-8.357 1.597 26	-5.122 3.441 37	-4.471 5.504 24	-10.566 -3.422 10	-4.684 -10.143 6	7.707 -2.828 6	- - - - - - 0
7T -0.113 21	-0.157 3.662 1	-0.882 12.225 8	2.814 6.887 6	-3.457 -3.532 2	5.368 -24.888 1	- - - - - - 0	- - - - - - 0
8T -19.220 4	-16.976 2.012 1	-18.764 -5.044 2	-22.376 -19.651 1	- - - - - - 0	- - - - - - 0	- - - - - - 0	- - - - - - 0

	xT xT Deviation(ns) xT Number
yT yT Deviation(ns) yT Number	yT Deviation(ns) xT Deviation(ns) Number(xT,yT)

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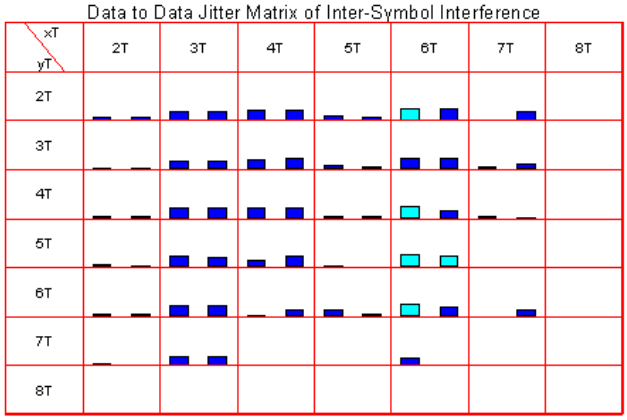
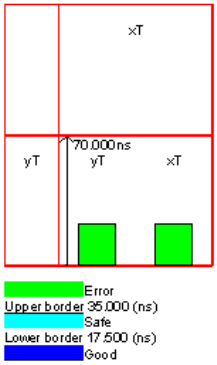
Jitter Matrix Print Example (The following figure is an image.)

TA720 PulseWidth&TimeInterval,ChA ChB Both->Rise
10000 Sample Data Accumulation 1/1
Trigger Condition

Polarity	Space	Mark	Space	Mark
Trigger		3T		
Target			Y Axis	X Axis

Data to Data Jitter Matrix of Inter-Symbol Interference





Data to Data Jitter Matrix of Inter-Symbol Interference

xT / yT	2T	3T	4T	5T	6T	7T	8T
2T	4.630 4.617 200	3.689 13.254 154	4.712 16.512 106	5.448 4.831 29	4.084 16.914 39	3.045 14.741 10	- - - - - - 0
3T	14.166 3.794 203	14.140 14.236 219	15.008 16.617 98	17.239 3.953 51	16.282 17.030 44	13.351 9.598 9	0.000 0.000 1
4T	15.684 4.356 97	15.763 14.978 87	15.540 15.274 41	11.859 3.480 24	2.551 12.949 14	2.250 2.725 2	- - - - - - 0
5T	7.754 3.531 39	6.920 15.160 53	3.367 16.213 21	2.869 1.901 9	10.983 17.563 11	2.412 0.587 2	- - - - - - 0
6T	17.603 3.917 26	17.400 15.841 37	18.601 9.630 24	18.586 3.717 10	18.286 14.052 6	12.281 10.410 6	- - - - - - 0
7T	0.000 0.000 1	4.253 13.409 8	4.222 1.991 6	0.525 0.088 2	0.000 0.000 1	- - - - - - 0	- - - - - - 0
8T	0.000 0.000 1	0.438 0.188 2	0.000 0.000 1	- - - - - - 0	- - - - - - 0	- - - - - - 0	- - - - - - 0

	xT xT Jitter(ns) xT Number
yT yT Jitter(ns) yT Number	yT Jitter(ns) xT Jitter(ns) Number(xT,yT)

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Specifications

Functional Overview

Installing the software into the PC enables measured data of TA320/TA520/TA720 to be loaded and inter-symbol interference analysis to be performed.

Measured Data to Be Analyzed

Data measured under the following conditions

Model	Sampling Mode	Measurement Function
TA320	Time stamp mode	Pulse width (both polarities) measurement
TA520	Time stamp mode	Pulse width (both polarities) measurement
TA720	Inter-symbol interference analysis mode	Pulse width (both polarities) measurement, pulse width A→pulse width B measurement, or pulse width A→A-to-B time interval measurement

Method of Loading the Measured Data

Open measured data saved to an external storage medium or directly load the measured data by connecting the TA320/TA520/TA720 to a PC via the communication interface (GP-IB or Ethernet network*) and starting measurements from the software.

* The Ethernet interface option is available only on the TA720.

Method of Loading the Measured Data

Data accumulation number: Up to 64 times (however, loading of data exceeding 2 Mpoints is not possible)

Communication settings (only when communicating with the TA320/TA520/TA720):

GP-IB: Address setting

Ethernet: IP address, user name, and password settings

Data Extraction Condition Settings

Data Polarity Selection

Select Space(+)-Mark(–) or Mark(+)-Space(–)

Modulation Type Selection

Select from 8-17 modulation (EFM), 8-16 modulation (EFM+), 1-7 modulation, and manual (arbitrarily set from 1T to 14T)

Window Settings

- Window size setup method: Select Center/Span or Left/Right for each window
- Window value setup method: In addition to entering values, the following settings are available:
  - CD/DVD easy setting
  - Auto setting using clock cycle or frequency input
  - Auto setting by estimating the clock cycle from the data

Arbitrary Setting of the Center Value of Deviation

Arbitrary set the Center values of 1T to 14T for determining the deviation

Histogram Analysis

Data Extraction Condition Settings

Set the extraction mode, trigger, and extracted data visually using the trigger bar

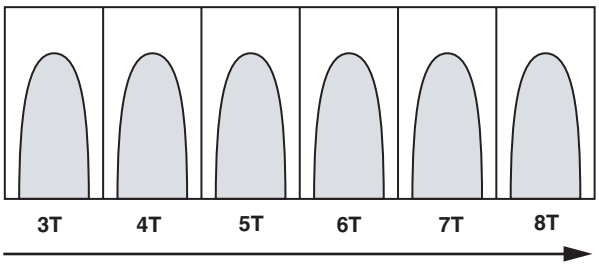
Trigger setting: Select from All, 1T to 14T, greater than or equal to the specified T symbol, less than or equal to the specified T symbol, Odd, and Even

Selectable trigger and extracted data:

- When the extracted data is pulse width

Trigger*	Extracted Data (TARGET)**
SINGLE (Trigger on a single symbol) TRIG	• Symbol before the trigger Ch A X-axis TRIG TARGET • Symbol after the trigger Ch A TRIG X-axis TARGET • Symbol before and after the trigger Ch A X-axis TRIG X-axis TARGET TARGET Analyze both
COMBINATION (Trigger on 2 consecutive symbols) TRIG TRIG	• Symbol before the trigger Ch A X-axis TRIG TRIG TARGET • Symbol after the trigger Ch A TRIG TRIG X-axis TARGET
BETWEEN (Trigger on 2 symbols separated by 1 symbol) TRIG TRIG	• Symbol between the trigger Ch A TRIG X-axis TRIG TARGET

Histogram display image



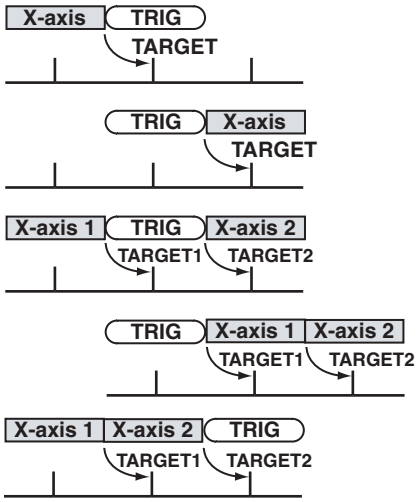
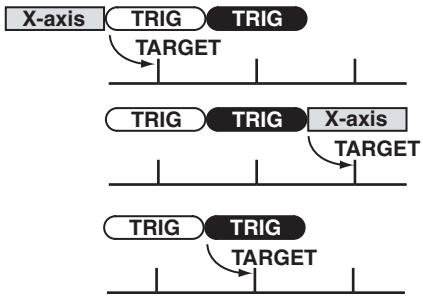
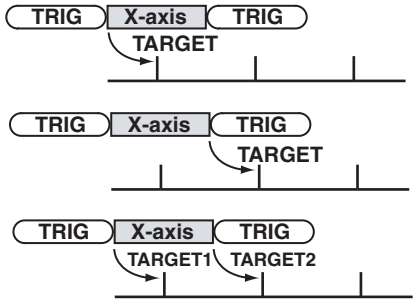
* Reverse setting of Space/Mark to be used as a trigger is possible.

TRIG ⟷ TRIG

Space Mark

** During pulse width→pulse width measurement, Ch A is used as a trigger to extract Ch B data.

• When the extracted data is A-to-B time interval

Trigger	Extracted Data (TARGET)
SINGLE **(Trigger on a single symbol)** TRIG	• Front edge of the trigger symbol • Back edge of the trigger symbol • Front edge and back edge of the trigger symbol • Back edge of the trigger symbol and the next edge • Front edge of the trigger symbol and the previous edge 
COMBINATION **(Trigger on 2 consecutive symbols)** TRIG TRIG	• Front edge of the trigger symbol • Back edge of the trigger symbol • Edge between trigger symbols 
BETWEEN **(Trigger on 2 symbols separated by 1 symbol)** TRIG TRIG	• Front edge of the symbol in between 2 triggers • Back edge of the symbol in between 2 triggers • Front edge and back edge of the symbol in between 2 triggers 

Analysis Result Display

- Histogram display of all the data or extracted data and the list of the statistics (average, jitter, and the number of data samples that are computed)
- Set the histogram color and switch the histogram vertical scale (Linear/Log)

Matrix Analysis

Data Extraction Condition Settings

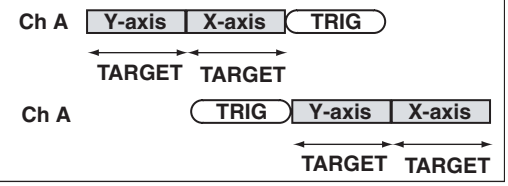
Set the trigger and extracted data visually using the trigger bar

Trigger setting: Select from All, 1T to 14T, greater than or equal to the specified T symbol, less than or equal to the specified T symbol, Odd, and Even

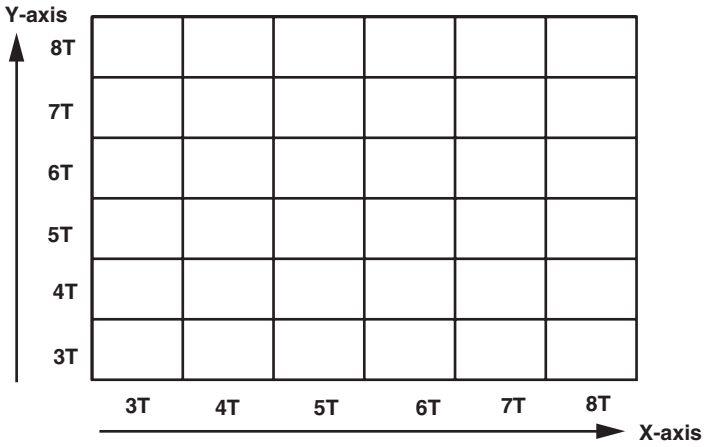
Selectable trigger and extracted data:

- When the extracted data is pulse width

Trigger	Extracted Data (TARGET)
SINGLE (Trigger on a single symbol) TRIG	• 2 symbols before the trigger • 2 symbols after the trigger

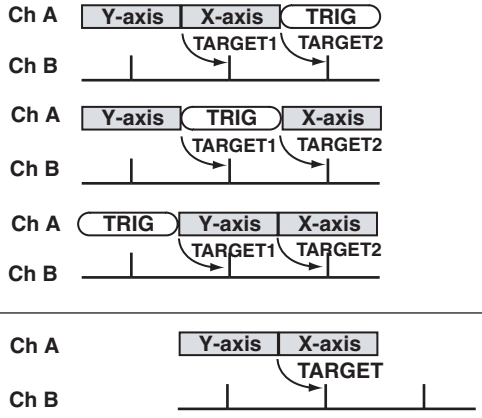


Matrix display image



- When the extracted data is A-to-B time interval

Trigger	Extracted Data (TARGET)
SINGLE (Trigger on a single symbol) TRIG	• 2 front edges of the trigger symbol • Front edge and back edge of the trigger symbol • 2 back edges of the trigger symbol
Not specified	• Edge in between 2 symbols



Analysis Result Display Using Statistics

- Display the statistics of the extracted symbol (before and after the trigger)
- Select the statistics from average, deviation, and jitter
- Set the jitter unit to % or ns

Analysis Result Display Using Graphs

- Select from all point display (graph), deviation display, and jitter display
- All point display
  - Plot the measured average values of the extracted symbol (before and after the trigger) on the X- and Y-axes (frequency can be displayed in color)
  - Turn ON/OFF the average display, turn ON/OFF the trend display (vertical and horizontal line plot)
  - Zoomed display possible
- Deviation display and jitter display
  - Displays the deviation and jitter of the extracted symbol (before and after the trigger)
  - Set the display format to Bar, Pie, Rectangle
  - Set the jitter unit to % or ns
  - Set the threshold (two points) and display the three levels (Good, Safe, and Error) using different colors

Other Display Settings

Comment Entry

Enter up to 50 characters

Auxiliary Display ON/OFF

Turn ON/OFF the graph time scale and explanatory note

Phase Adjustment through the Software (applicable only to data measured on the TA720 with the measurement function set to pulse width A→A-to-B time interval)

–99.99 ns to 99.99 ns (0.01 ns steps)

Zooming When Displaying the Matrix of All Points

Zoom in up to twice the size around the origin

Saving/Loading of Data

- Save and load the setup data of the software (.cfg extension)
- Save and load the loaded measured data (.mds extension)
- Save the statistics data (Triggered T, All Triggered T, matrix statistics) (.csv extension)
- Save and load the deviation center values set arbitrarily (.dev extension)

Setup Data Backup

Save the previous setup data (measured data excluded)

List Display of the Loaded Measured Data

List display of the file path (drive letter, directory, and file name) and communication path (GP-IB and Ethernet)

Printing of Analysis Results

- Print the histogram analysis results and matrix analysis results (graph and sheet)
- Select the print color (black and white or color)

PC System Requirements

PC

PC running Microsoft Windows 98 SE, Windows NT Workstation 4.0, Windows 2000 Professional, or Windows XP Professional with at least 64 MB (128 MB for Windows 2000 or XP) of memory.

Operating System

Microsoft Windows 98 SE, Windows NT Workstation 4.0, Windows 2000 Professional, or Windows XP Professional.

CD-ROM Drive

The drive is used to install the software.

Free Hard Disk Space

40 MB or more

Display

SVGA (800 × 600 resolution) or better (1024 × 768 or better recommended) and capable of displaying 256 or more colors.

Printer and Mouse

Printer and mouse compatible with the OS that you are using.

GPIB Board/PCMCIA-GPIB Card (only when connecting the TA320/TA520/TA720 and the PC using GP-IB)

GPIB board or PCMCIA-GPIB card by National Instruments along with the driver must be installed in the PC.

Ethernet Port (only when connecting the TA720 and the PC via the Ethernet network)

Port for connecting to the Ethernet network.

FD Drive (only when opening data saved to a floppy disk)

One 31/2” floppy disk drive capable of reading 1.44 MB floppy disks (MS-DOS compatible).

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