

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

IM 704222-61E  
1st Edition

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## Foreword

Thank you for purchasing the Optical Disk Inter-Symbol Interference Analysis Software (704222) for the Time Interval Analyzer TA320/TA520.

This User's Manual contains useful information about the precautions, functions, and operating procedures of the instrument. To ensure correct use, please read this manual thoroughly before operation.

Keep this manual in a safe place for quick reference in the event a question arises.

For information about the handling precautions, functions, and operating procedures of the Time Interval Analyzer TA320/TA520 and the handling and operating procedures of Windows, see the respective manuals.

## Notes

- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functions. The figures given in this manual may differ from the actual screen.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer as listed on the back cover of this manual.
- Copying or reproducing all or any part of the contents of this manual without YOKOGAWA's permission is strictly prohibited.

## Trademarks

- Windows and MS-DOS are a registered trademark of Microsoft Corporation.
- Other company and product names are trademarks or registered trademarks of their respective holders.

## Revisions

1st Edition: December, 1999

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# Precautions on Use

## **Storing the system floppy disk**

Please store the original system floppy disk (software) in a safe place. During the actual operation, use the software that is installed on the hard disk.

## **Backing up the system floppy disk**

Please make a back up disk (2HD 1.44 MB) of the software on the original system floppy disk that you have purchased. Use the backup copy for all future operations including installation.

## **Agreement**

- **Restriction on Use**

Use of this product (this utility software and manual) by more than one computer at the same time is prohibited. Use by more than one user is also prohibited.

- **Transfer and Lending**

Transfer or lending of this product to any third party is prohibited.

- **Guarantee**

Should a physical deficiency be found on the original floppy disk or this manual upon opening the product package, please promptly inform Yokogawa. The claim must be made within seven days from the date you received the product in order to receive a replacement free of charge.

- **Exemption from Liability**

Yokogawa Electric Corporation provides no guarantees other than for physical deficiencies found on the original floppy disk or this manual upon opening the product package. Yokogawa Electric Corporation shall not be held responsible by any party for any losses or damage, direct or indirect, caused by the use or any unpredictable defect of the product.

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# Product Overview

## Main functions

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

### Histogram analysis

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

### Matrix analysis

In this method, data that match the specified conditions are extracted and the level of interference between adjacent data points is displayed using a two-dimensional matrix.

## Measurement data that are handled

The data that are handled by this software are binary format data obtained when the sampling mode of the Time Interval Analyzer TA320/TA520 is set to time stamp and the measurement function (item) is set to pulse width measurement (measuring both polarities). On the TA320, the maximum number of samples that can be loaded is 32,000 data points per file and the maximum number of files that can be analyzed is 64. On the TA520, a maximum number of 512,000 data points can be loaded and up to four files can be analyzed.

- Data that have been saved to a binary file (.wvf extension) along with the header file (.hdr extension).
- Data that have been measured by the TA320/TA520 and loaded into this software application via the communication interface (GP-IB).  
(You cannot use this software application to load data from the TA320/TA520's floppy disk drive via GP-IB.)

## System Requirements

### PC

PC capable of running Windows 95/98 or Windows NT 4.0 with at least 32 MB of RAM

### Operating System

Windows 95/98 or Windows NT.

### GP-IB board and PCMCIA card

A GP-IB board or a PCMCIA card made by National Instruments must be installed in the PC.

### Disk drive

One 3 1/2" floppy disk drive capable of reading 1.44 MB floppy disks (MS-DOS compatible) The disk drive is also used to install the software.

### CRT

SVGA (800 x 600) or better (1024 x 768 or better recommended), displays 16 or more colors

### Printer and mouse

Those supported by Windows 95/98 or Windows NT.

# Installing the software

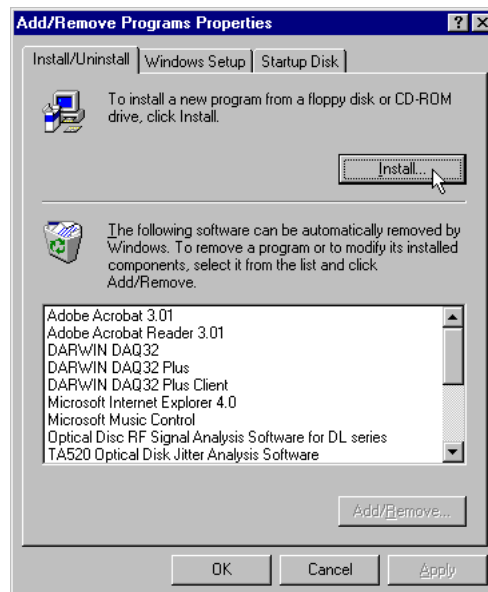
## Procedure

The following procedures are for installing the software on Windows 95.

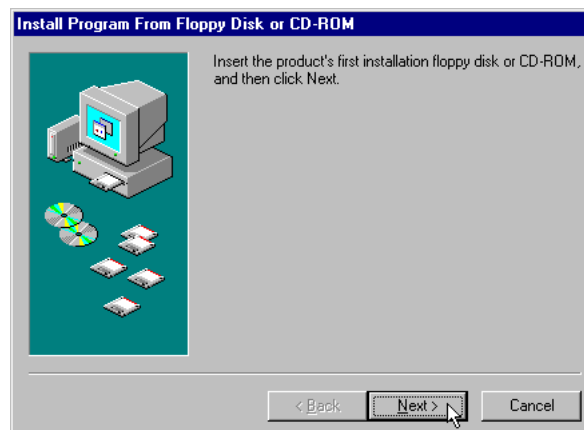
1. Start Windows.
2. Open the Control Panel folder and double-click [Add/Remove Programs] icon.



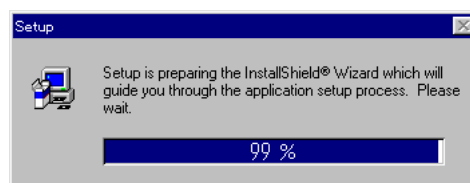
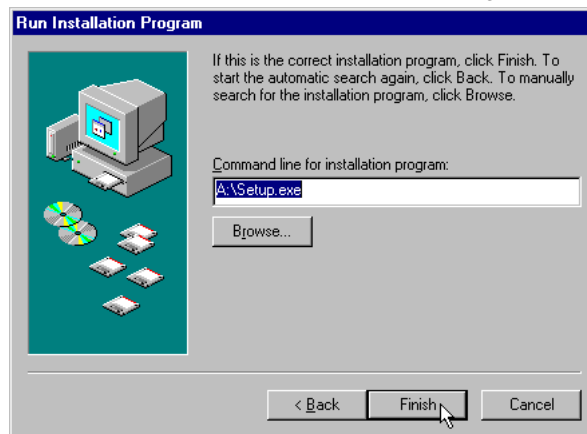
3. Click the [Install] button under the [Install/Uninstall] tab. The installation program starts.



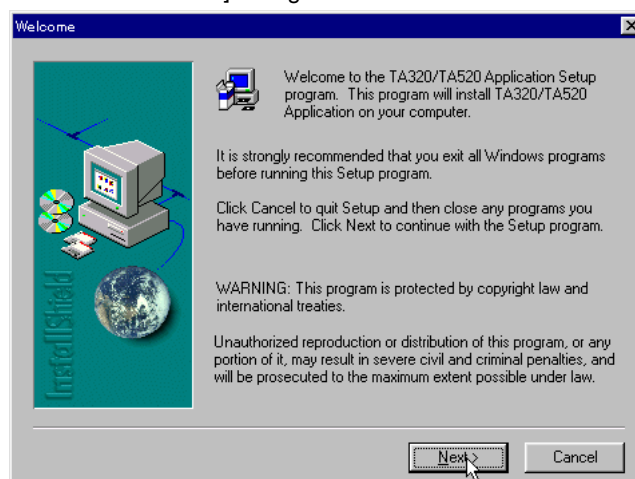
4. Insert the first system floppy disk (backup copy) into the floppy disk drive and click the [Next] button.



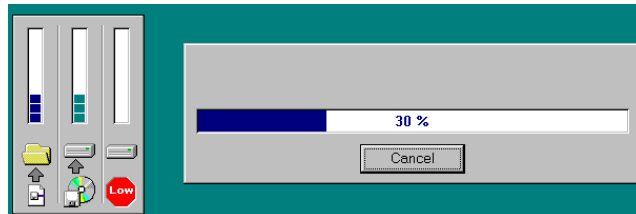
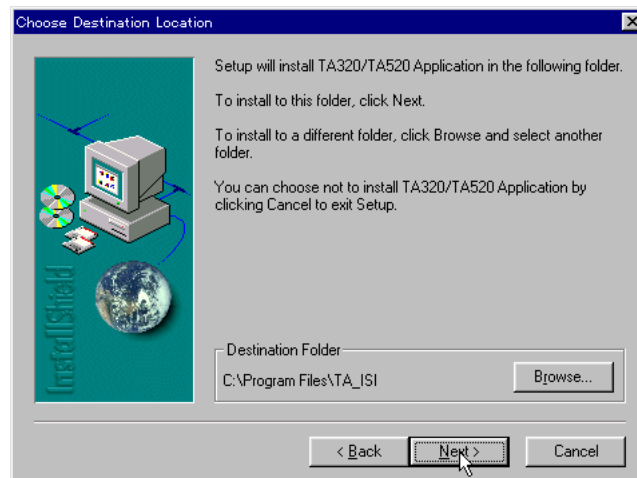
5. Enter "A:\SETUP.EXE" in the command line text box and click the "Finish" button. The [InstallShield Wizard] preparation message is displayed.



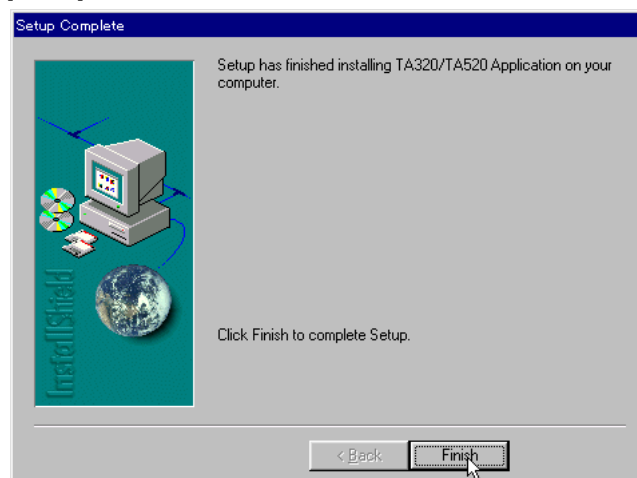
6. The following screen appears. Clicking the [Next] button displays the [Choose Destination Location] dialog box.



7. The default installation destination is set to "C:\Program Files\TA\_ISI." Change the destination as necessary. After entering the destination, click the [Next] button. The software installation is executed.



8. When the installation completes properly, the following window appears. Click the [Finish] button.



## Explanation

### Creating the [TA\_ISI] folder

When the software is installed properly, the [TA\_ISI] folder is automatically created. This folder is placed inside the [Program Files] folder. The executable file is placed inside the [TA\_ISI] folder.

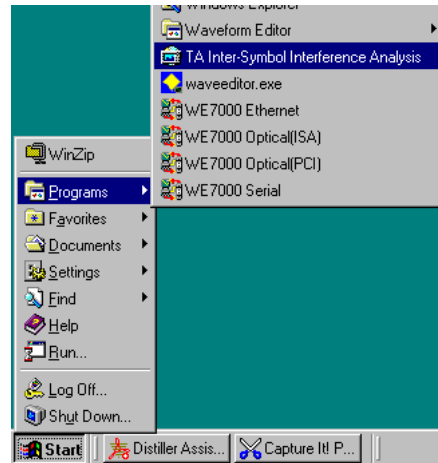


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# Starting the software

## Procedure

As shown below, select [TA Inter-Symbol Interference Analysis] from the start menu to start the software application.



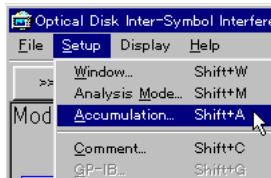
## Explanation

For Windows 95, the [TA\_ISI] folder containing this software application is located inside the [Program Files] folder.

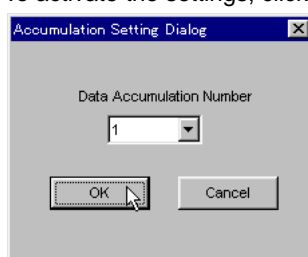
# 1.1 Selecting the Number of Times to Load the Data

## Procedure

1. Select [Accumulation] from the [Setup] menu (Setup - Accumulation) to display the dialog box used to set the number of times to load the data.



2. Select the number of times to load the data from the [Data Accumulation Number] list box.
3. To activate the settings, click the "OK" button. To cancel, click the [Cancel] button.



## Explanation

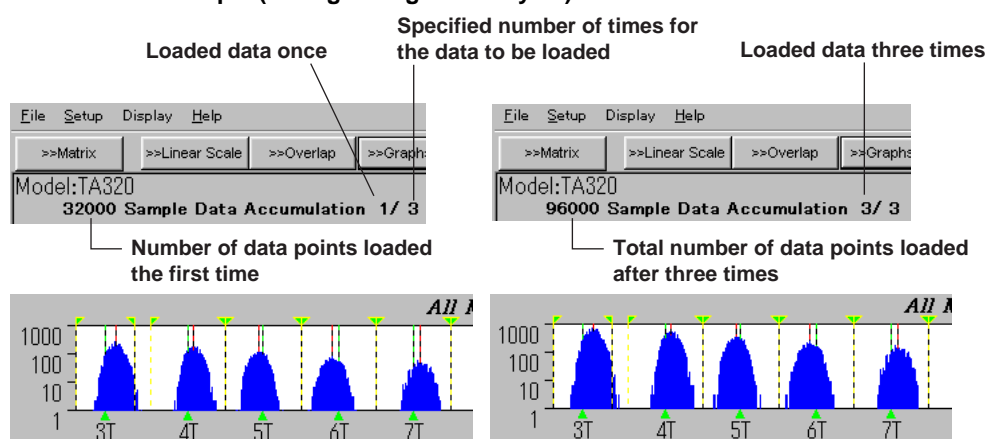
### Selecting the number of times to load the data

Select the number of times to load the data for analysis. The loaded data are accumulated according to the number of specified times.

Selectable range: 1 to 64 (for the TA320)

1 to 4 (for the TA520)

### Data load example (during histogram analysis)



### Note

If the data are loaded more than the specified number of times, the accumulated data are cleared and the accumulation starts over. For example, if the number of times to load the data is set to "3" and the data are loaded four times, only the fourth data set will remain. In this case, the fourth to the sixth data sets are accumulated as the three sets of loaded data. If multiple files are loaded simultaneously, however, the loading stops upon reaching the specified number.

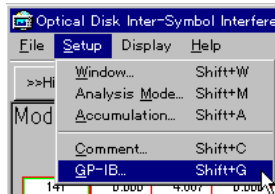
## 1.2 Setting the GP-IB Address and Testing GP-IB Communication Functions

### Procedure

These procedures are not applicable, if the GP-IB board is not installed.

1. Select [GP-IB] from the [Setup] menu (Setup - GP-IB) to display the GP-IB setup dialog box.

(The button cannot be selected if the GP-IB board is not installed.)



### Entering the GP-IB address

2. Enter the TA320/TA520's GP-IB address in the "GP-IB Address" entry box.

### Searching the address

3. When the [Search Address] button is clicked, the GP-IB is scanned for the address of the TA320 or the TA520 and the address is placed in the [GP-IB Address] entry box.

### Setting the GP-IB communication function to the test mode

4. Click the [Enable GP-IB Test Func] check box to select whether or not to test the communication function. The communication test is executed from the file menu.

See section 2.2.



### Activating the new settings

5. To activate the settings, click the "OK" button. To cancel, click the [Cancel] button.

## Explanation

### Entering the GP-IB address

- Enter the address of the TA320 or the TA520 that is connected via GP-IB interface.
- For the range of addresses for the TA320/TA520, see section 1.4 in the TA320 GP-IB Interface User's Manual IM704210-12 or the TA520 GP-IB Interface User's Manual IM704310-12.
- If the specified address does not match the actual address, data cannot be loaded.

### Searching the address

- Searches the address of the TA320 or the TA520 that is connected via GP-IB interface.
- The address does not change if the TA320/TA520 is not connected.
- If there are multiple TA320/TA520s that are connected, the smallest address is set in the [GP-IB Address] entry box.

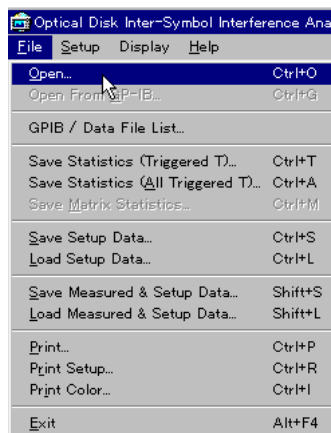
### Setting the GP-IB communication function to the test mode

The communication test is executed from the file menu. See section 1.4. However, if the [Enable GP-IB Test Func.] box is not checked, the menu does not appear.

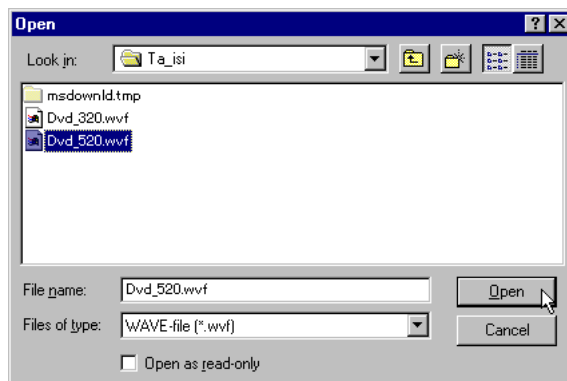
## 1.3 Loading the Data

### Procedure

1. Select [Open] from the [File] menu (File - Open) to display the open file dialog box.



2. After setting the [Look in] box, enter the name of the file you wish to open in the [File name] entry box. The file name can also be selected from the file list.
3. To load the specified file, click the [Open] button. To cancel, click the [Cancel] button.



## Explanation

### Files that can be opened

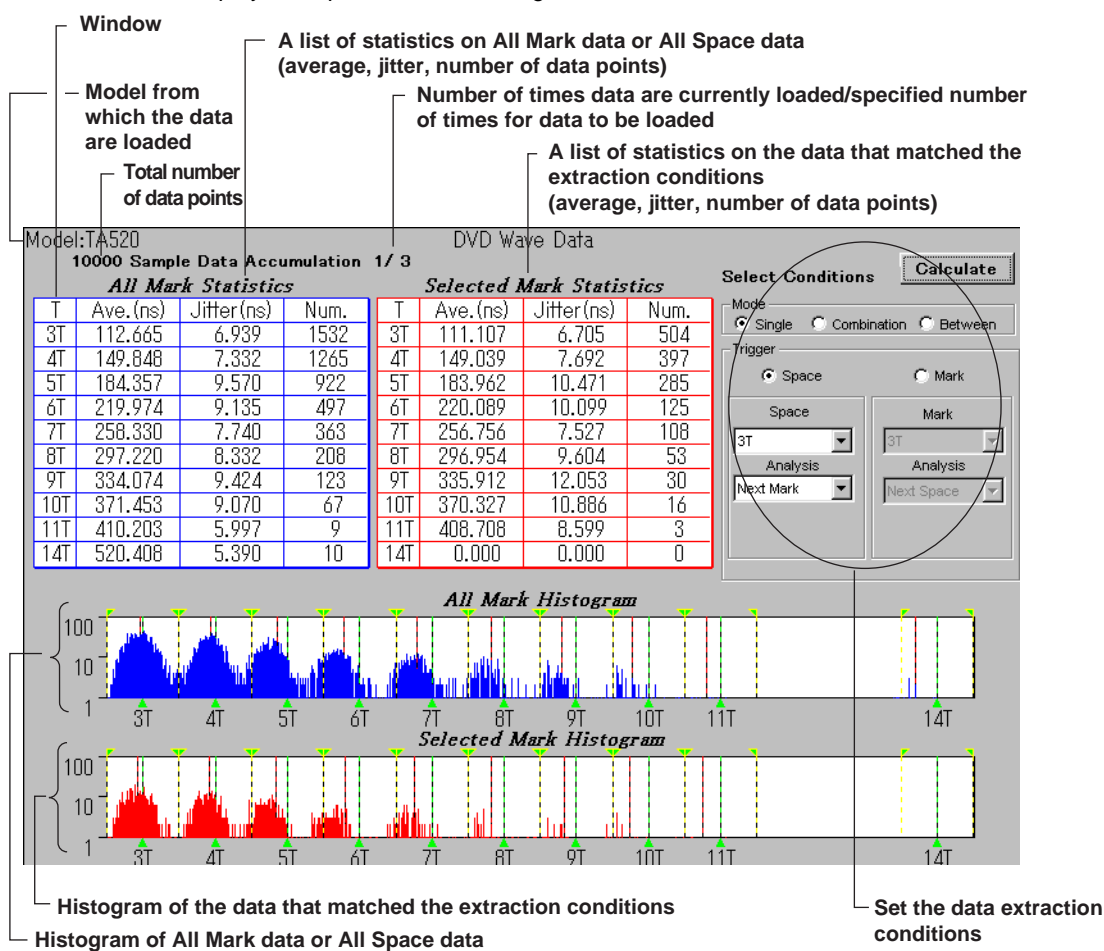
The type of files that can be opened are those containing measured data of YOKOGAWA's Time Interval Analyzer TA320/TA520 (Waveform File: .wvf extension). For details, see page 4.

### Note

By connecting the TA520's SCSI (option) to a PC, the TA520's built-in hard disk (option) can be accessed from the PC. For the connection procedures, see chapter 11 in the User's Manual IM704310-12.

### Display example

A display example and the meanings of each item are indicated below.

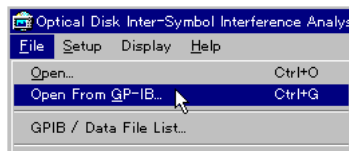


## 1.4 Loading Measured Data from the TA320/TA520 via GP-IB Interface

### Procedure

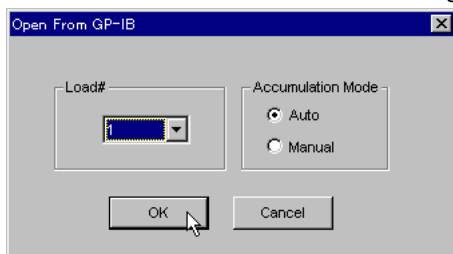
These procedures are not applicable if the GP-IB board is not installed.

1. Select [Open From GP-IB] from the [File] menu (File - Open From GP-IB) to display the GP-IB load dialog box.



### Selecting the setup information for the data to be loaded and selecting the data load mode

2. From the [Load#] list box, select the setup information that will be used when loading measured data from the TA320/TA520. The setup information are the setup information that are stored in the TA320/TA520.
3. Select the measured data load mode using the [Accumulation Mode] option button.

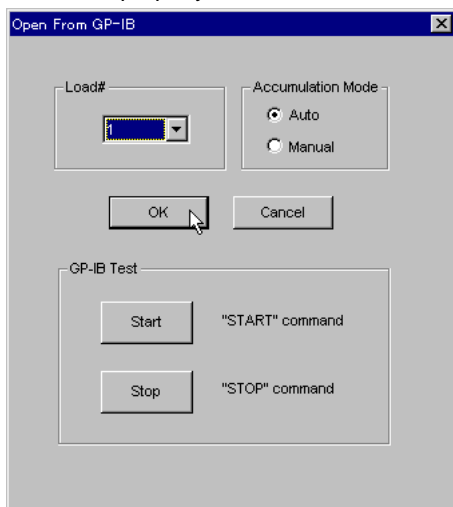


### Testing communications

If the GP-IB communication test mode was specified in section 1.5 and [Open From GP-IB] is selected in step 1, the following menu is displayed.

4. Click the [Start] button under [GP-IB Test]. Check that the TA320/TA520 starts the measurement.
5. Click the [Stop] button under [GP-IB Test]. Check that the TA320/TA520 stops the measurement.

If the TA320/TA520 operates properly in steps 4 and 5, the GP-IB interface is connected properly.



**Loading the Data**

6. After step 3 or 5, click the [OK] button to start the TA320/TA520 measurement and to load the measured data. To cancel, click the [Cancel] button.

**Explanation****Selecting the data to be loaded**

Select the setup information that are stored in the internal memory of the TA320/TA520. The setup information must be as follows: The TA320/TA520's sampling mode set to time stamp mode and the measurement function (item) set to pulse width continuous measurement (both polarities).

Range: 0 to 9

**Selecting the data load mode**

Select the load method of the measured data from the following list of choices.

- Auto: The TA320/TA520 automatically repeats the measurement for the number of times specified in section 1.1 and the software loads the measured data.
- Manual: The TA320/TA520 makes one measurement and the software loads the measured data.

**Communication test**

This operation is possible if the GP-IB communication test mode was specified in section 1.2.

This test is executed in order to check whether or not communications are operating properly.

**Display example**

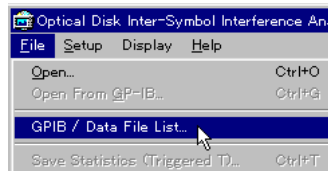
See "Display example" in section 1.3, also.



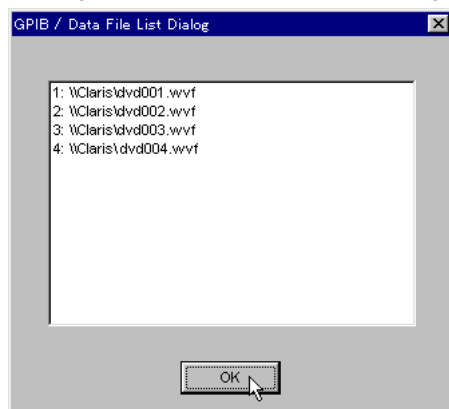
## 1.5 Checking the File List of the Loaded Data

### Procedure

1. Select [GPIB/Data File List] from the [File] menu to display the [GPIB/Data File List] dialog box.



2. Clicking the [OK] button closes the dialog box.



### Explanation

#### Information that are listed

The file information is displayed in the order that the data are loaded (the number of times specified in section 1.1.)

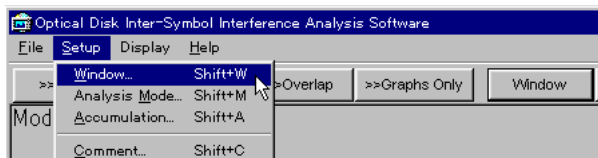
Data that are loaded via the GP-IB interface are indicated by a character string [GPIB].

Data that are loaded from a file are displayed with the drive letter, directory path, and file name (example: C:\\704220\_Data\\Dvd001.wvf).

## 2.1 Setting the Window

### Procedure

1. Click the [Window] button or select [Window] from the [Setup] menu (Setup - Window) to display the window setting dialog box.



#### Selecting the method to set the window size

2. Using the [Size Adjustment] option button, select [Center, Span] or [Left, Right].

#### Setting the window values

The following four methods are available:

- **Using the T values that are entered**

3. In the [T] entry box for Space or Mark, enter a value for constant T that will be used as a reference for the start and end points and the window width of each window.
4. Click the [Space Update] or [Mark Update] button. The [Left] and [Right] values or the [Center] and [Span] values are set in the 2T to 14T entry boxes in reference to the constant T value specified in step 3. Go to step 5.

- **Setting the windows at once by specifying the speed**

3. Select [CD] or [DVD] using the [Media] option buttons in the [Easy Setting] box. If the [DVD] button is checked, enter the reference T value.
4. Click the button corresponding to the desired speed or enter a value in the [User] entry box and click the [USER] button. The 2T to 14T entry boxes are set to the [Left] and [Right] values or the [Center] and [Span] values corresponding to the specified speed. Go to step 5.

- **Using the T value that is estimated from the data**

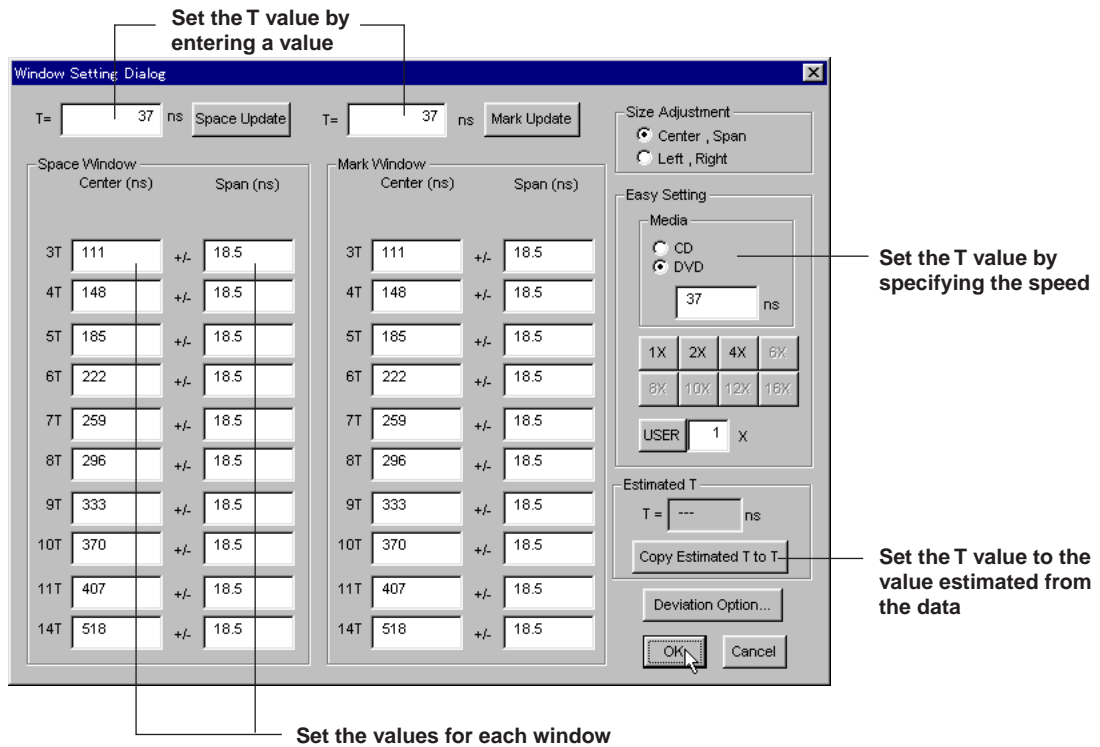
3. By clicking the [Copy Estimated T to T] in the [Estimated T] box, the 2T to 14T entry boxes are set based on the T value that is estimated from the data. Go to step 5.

- **Setting the values for each window**

3. Enter values in the 2T to 14T entry boxes. Go to step 5.

### Activating the new settings

5. To activate the settings, click the “OK” button. To cancel, click the [Cancel] button.



### Explanation

#### Constant T

Normally, 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. Set the value in the range that satisfies the “Range” that is specified in “Window setting” below.

#### Selecting the speed

The range that can be selected varies depending on whether [CD] or [DVD] is selected as follows:

CD: The clock cycle (T) is fixed to 231.385 ns, and the following speeds can be selected.

1x, 2x, 4x, 6x, 8x, 10x, 12x, 16x, and USER (range: 1.0 to 50.0)

DVD: The clock cycle (T) can be set to any arbitrary value. The following speeds can be selected.

1x, 2x, 4x, and USER (range: 1.0 to 50.0)

#### Setting the window

Set the [Center, Span] or [Left, Right] values of windows 2T to 14T.

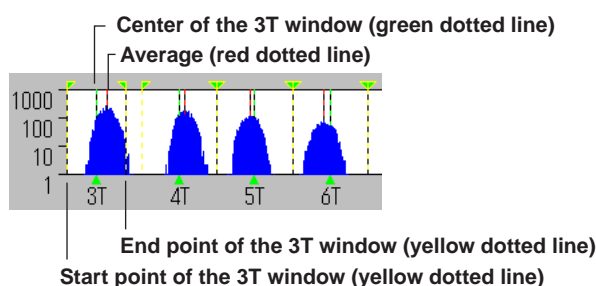
- Set the values so the start point < the end point for each window.
- Set the values so that the end point of the previous window ≤ the start point of the next window.
- Range: 1 ns to 10 μs

**Window setting example (during histogram display)**

During a 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.

By using the [Linkage] option button of the parameter setting dialog box that appears when [Graph Parameter] from the [Display] menu is selected, the selected item can be changed simultaneously for each window.

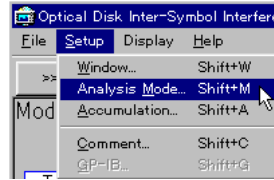
**Note**

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 information before changing the values. For the procedures related to saving the setup information, see section 3.5, “Saving or Loading All the Data and Setup Information” and section 4.6, “Saving or Loading All the Data and Setup Information.”

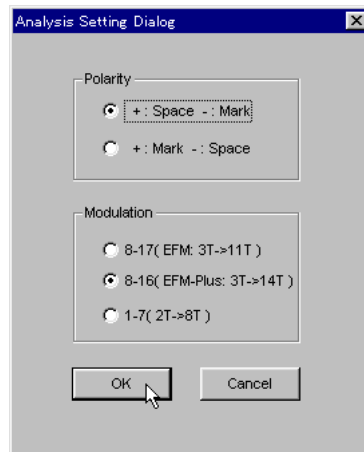
## 2.2 Selecting the Analysis Mode

### Procedure

1. Select [Analysis Mode] from the [Setup] menu (Setup - Analysis Mode) to display the analysis setting dialog box.



2. Select the polarity of the space/mark data with the [Polarity] option button.
3. Select the pulse width modulation method of the data with the [Modulation] option button.
4. To activate the settings, click the "OK" button. To cancel, click the [Cancel] button.



### Explanation

#### Selecting the polarity

Space data represent the data at the land section which is the base of the disk, and mark data represent the data at the pit section. Select the data polarity from the following list of choices.

- + : Space – : Mark  
Handles space data as positive polarity and mark data as negative polarity.
- + : Mark – : Space  
Handles mark data as positive polarity and space data as negative polarity.

#### Selecting the pulse width modulation method

Spaces and marks are both pulse width data. Select what type of modulation signal is to be used to handle the data. The choices are shown below.

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

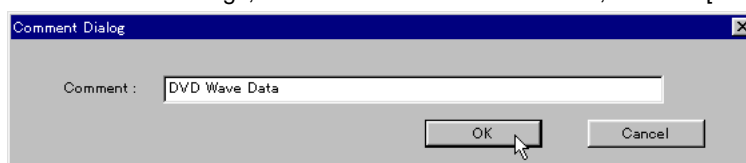
## 2.3 Entering comments

### Procedure

1. Select [Comment] from the [Setup] menu (Setup - Comment) to display the comment entry dialog box.



2. Enter comments in the [Comment] entry box.
3. To activate the settings, click the "OK" button. To cancel, click the [Cancel] button.



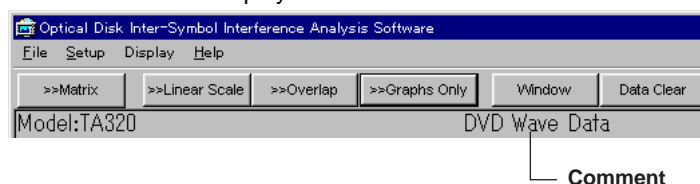
### Explanation

#### Number of characters that can be entered

The maximum number of characters that can be entered is 50.

#### Displaying comments

The comments are displayed as shown below.



#### Deleting comments

Delete all the characters in the comment entry dialog box and click the [OK] button.

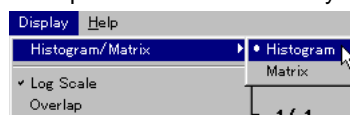
## 3.1 Setting the Data Extraction Conditions and Performing the Analysis

### Procedure

#### Displaying the histogram

1. Click the [>>Histogram] button or select [Histogram] under [Histogram/Matrix] of the [Display] menu to display the histogram.

This operation is not necessary if the [>>Matrix] button is being displayed.



#### Selecting the extraction mode

2. Select the extraction mode with the [Mode] option buttons. If you select [Single], go to step 3. If you select [Combination], go to step 5. If you select [Between], go to step 7.

#### Selecting the trigger (when the extraction mode is [Single])

3. Select whether to activate the trigger on a space or mark using the [Trigger] option buttons.
4. If you select [Space], set the width of the [Space] with the list box. If you select [Mark], set the width of the [Mark] with the list box. Go to step 9.

#### Selecting the trigger (when the extraction mode is [Combination])

5. Select whether to activate the trigger on a Space->Mark or Mark->Space using the [Trigger] option buttons.
6. Select the width of the [Space] and [Mark] with each list box. Go to step 9.

#### Selecting the trigger (when the extraction mode is [Between])

7. Select whether to activate the trigger on a Space-Space or Mark-Mark using the [Trigger] option buttons.
8. Select the width of the [Space] and [Mark] with each list box. Go to step 10.

#### Selecting the data to be analyzed

9. Select the data to be analyzed with the [Analysis] list box.

#### Performing the analysis

10. Click the [Calculate] button to perform the analysis.

##### When set to Single

 A screenshot of the 'Select Conditions' dialog box. The 'Mode' section has 'Single' selected. The 'Trigger' section has 'Space' selected. There are two columns of list boxes: 'Space' and 'Mark'. Each column has a '3T' list box and an 'Analysis' list box. The 'Analysis' list boxes have 'Next Mark' and 'Next Space' selected respectively. A 'Calculate' button is at the top right.

##### When set to Combination

 A screenshot of the 'Select Conditions' dialog box. The 'Mode' section has 'Combination' selected. The 'Trigger' section has 'Space->Mark' selected. There are two columns of list boxes: 'Space' and 'Mark'. Each column has a '3T' list box and an 'Analysis' list box. The 'Analysis' list boxes have 'Prev. Mark' and 'Prev. Space' selected respectively. A 'Calculate' button is at the top right.

##### When set to Between

 A screenshot of the 'Select Conditions' dialog box. The 'Mode' section has 'Between' selected. The 'Trigger' section has 'Mark - Mark' selected. There are two columns of list boxes: 'Prev. Space' and 'Prev. Mark'. Each column has a '3T' list box and an 'Analysis' list box. The 'Analysis' list boxes have 'Next Space' and 'Next Mark' selected respectively. A 'Calculate' button is at the top right.

#### Clearing the Data

11. To clear the loaded data, the histogram currently displayed, and the list of statistics, click the [Clear Data] button or select [Clear Display Data] from the [Display] menu (Display - Clear Display Data). The data are also cleared, if you exit the software (by clicking the [X] mark on the upper right corner of the window or by selecting [Exit] from the [File] menu).

#### Explanation

##### Selecting the extraction mode

Select from the following list of choices.

- Single: Activate the trigger on a Space or Mark and analyze the data around the trigger.
- Combination: Activate the trigger on a Space followed by a Mark or a Mark followed by a Space and analyze the data around the trigger.
- Between: Activate the trigger when a Mark exists between two Spaces or a Space exists between two Marks and analyze the data around the trigger.

##### Selecting the trigger and selecting the data to be analyzed

The type of trigger you can select and the data to be analyzed vary depending on the extraction mode. The Space/Mark that is used as a trigger can be selected from the following:

2T, 3T, 4T, 5T, 6T, 7T, 8T, 9T, 10T, 11T, 14T, 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, 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

\* If you select Min T-\*T, all the data from the smallest data to \*T data will be used as triggers to perform the analysis

Similarly, if you select \*T-Max T, all the data from \*T data to the maximum data will be used as triggers to perform the analysis.

Extraction Mode (Mode)	Trigger (Trigger)	Data to be analyzed (Analysis)	Description
Single	Space Mark	Prev.Mark/Next.Mark/Both.Mark Prev.Space/Next.Space/Both.Space	Select data immediately before or after the trigger or data around the trigger
Combination	Space/EMark Mark→Space	Prev.Mark/Next.Space Prev.Space/Next.Mark	Extract the data immediately before or after the trigger
Between	Space-Space  Mark-Mark		Extract the data between two spaces Extract the data between two marks

##### Performing the analysis

If data are already loaded, data meeting the specified extraction condition are analyzed (display the histogram, display the statistical computation and its result, a list of statistics) when you press the [Calculate] button. Data meeting the specified extraction condition are also analyzed when the data are initially loaded.

\* If Mark data are being analyzed, a histogram of all Mark data and a list of statistics are also displayed simultaneously. If Space data are being analyzed, a histogram of all Space data and a list of statistics are also displayed simultaneously.

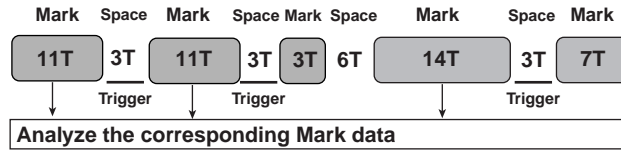


**Clearing the data**

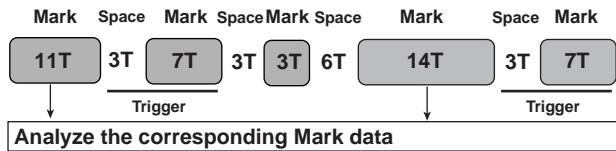
When you clear the data, the histogram and the result of the statistical computation are cleared, as well as all the data that are loaded.

**Example of setting the extraction condition**

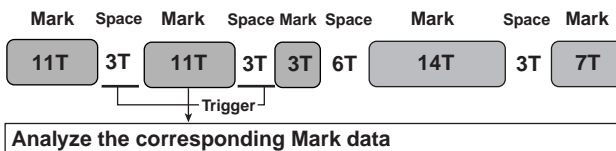
- **Trigger is Single (Space):** Extract the data immediately before 3T Space.



- **Trigger is Combination (Space-Mark):** Extract the data immediately before [3T Space]-[7T Mark].



- **Trigger is Between (Space-Space):** Extract the data between [3T Space]-[3T Space].

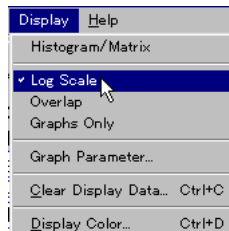


## 3.2 Setting the Display Format of the Analysis Results

### Procedure

#### Selecting the vertical scale

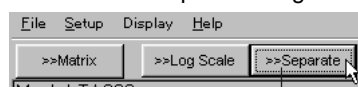
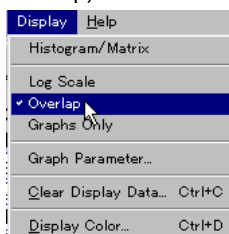
1. Click the [Scale] button or select [Log Scale] from the [Display] menu (Display - Log Scale) to select log or linear scale.



[Scale] button

#### Select whether or not to overlap the histograms

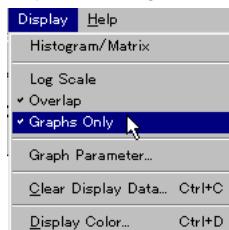
2. Click the [Overlap] button or select [Overlap] from the [Display] menu (Display - Overlap) to select whether or not to overlap the histograms.



[Overlap] button

#### Select whether to display the histogram and table simultaneously or only the histogram

3. Click the [Graph] button or select [Graph Only] from the [Display] menu (Display - Graphs Only) to select whether to display the histogram and table simultaneously or only the histogram.



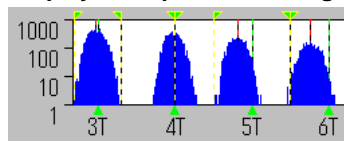
[Graph] button

## Explanation

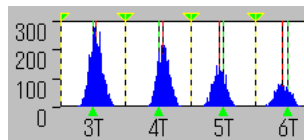
### Selecting the horizontal scale

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

- Display example when using log scale



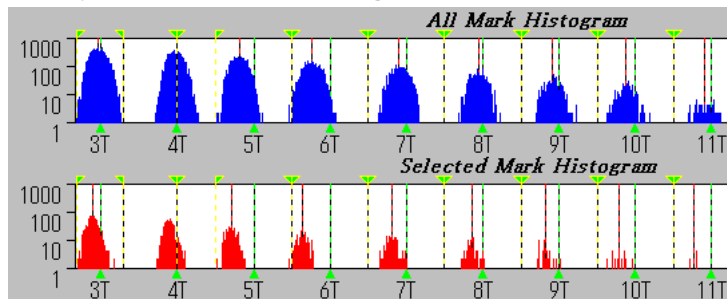
- Display example when using linear scale



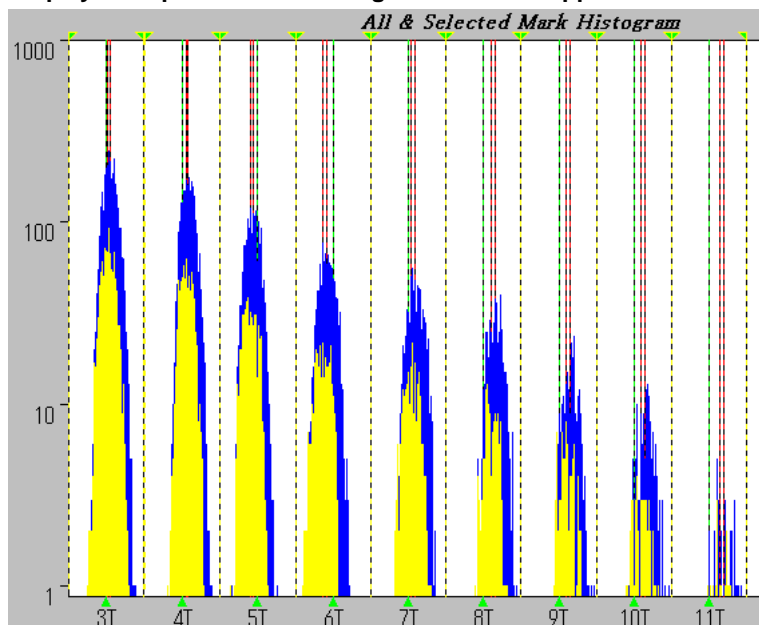
### Select whether or not to overlap the histograms (Overlap/Separate)

You can select whether or not to overlap the histogram displays.

- Display example when the histograms are not overlapped



- Display example when the histograms are overlapped



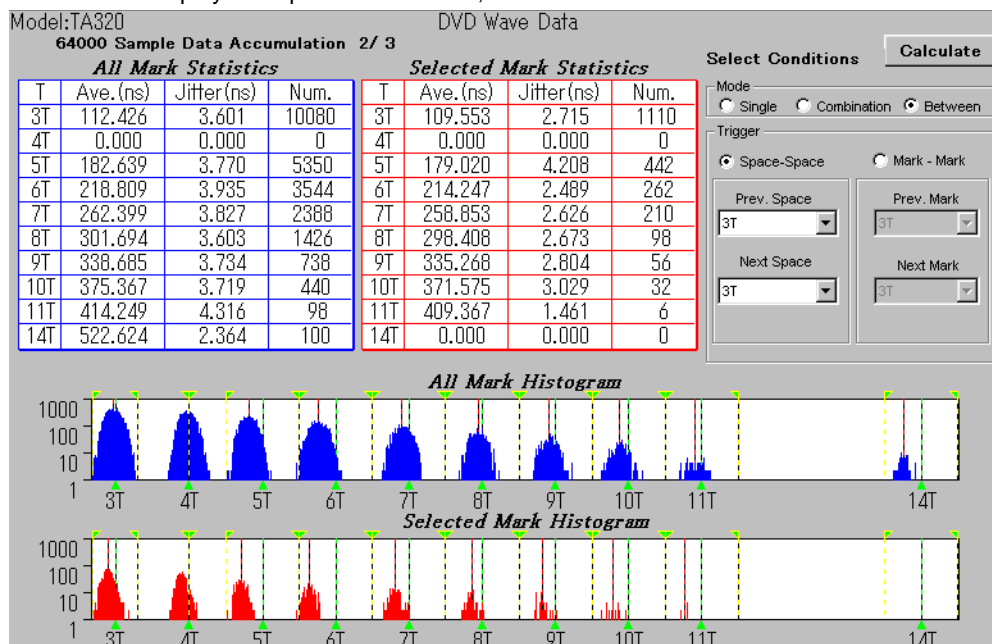
### 3.2 Setting the Display Format of the Analysis Results

Select whether to display the histogram and table simultaneously (Graph&Sheet) or only the histogram (Graphs Only)

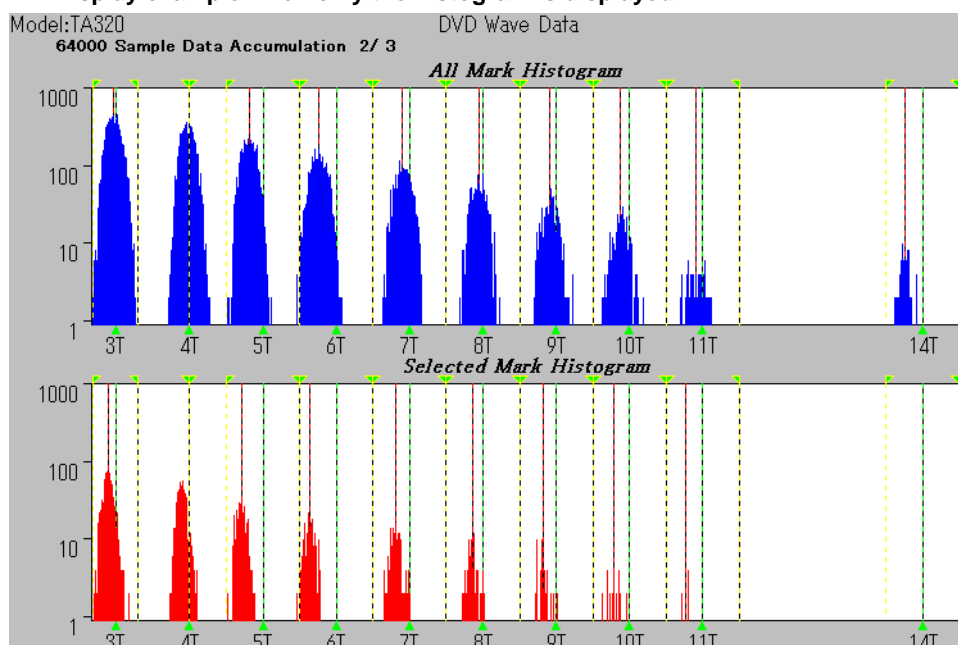
You can select whether or not to display the histogram and table simultaneously.

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

See “Display example” in section 2.1, also.



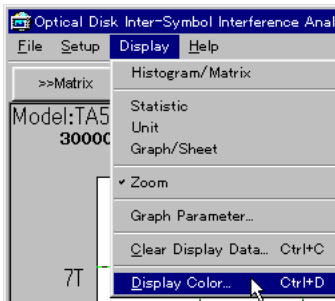
- Display example when only the histogram is displayed



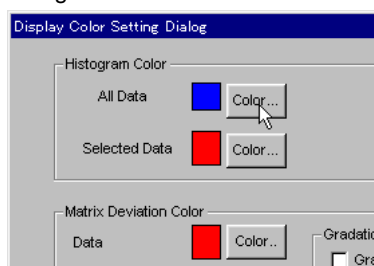
## 3.3 Setting the Display Color of the Analysis Results

### Procedure

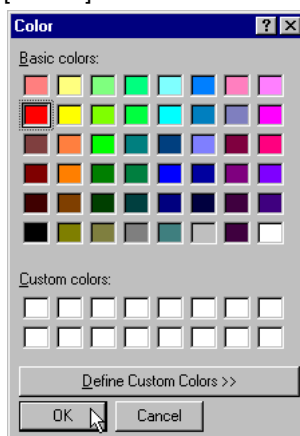
1. Select [Display Color] from the [Display] menu (Display - Display Color) to display the display color dialog box.



2. Click the [Color] button to the right of [All Data] or [Selected Data] to display the color dialog box.



3. Set the color. To activate the settings, click the "OK" button. To cancel, click the [Cancel] button.



### Explanation

You can set the display color of the histogram.

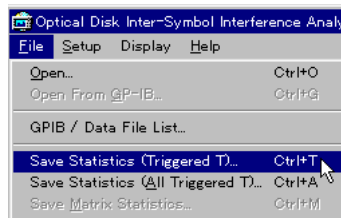
- All Data: You can set the display color of the histograms of all Mark data or all Space data.
- Selected Data: You can set the display color of the histogram of data that match the data extraction condition.

You can select any of the 48 basic colors or a color that you created. For details, see the instruction manual that came with your operating system. The colors that can be displayed vary depending on the graphic accelerator that is installed in your PC.

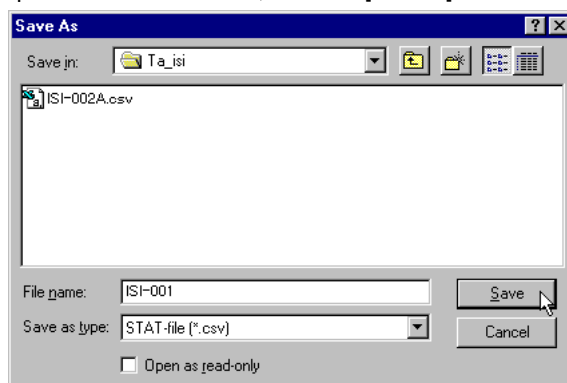
## 3.4 Saving the Results of the Statistical Computation

### Procedure

1. Select [Save Statistics(Triggered T)] or [Save Statistics(All Triggered T)] from the [File] menu (File - Save Statistics(Triggered T) or File - Save Statistics(All Triggered T)) to display the save file dialog box.



2. After setting the [Save in] box, enter the name of the file you wish to save in the [File name] entry box.
3. Click the [Save] button to save the results of the statistical computation to the specified file. To cancel, click the [Cancel] button.



### Explanation

#### Data that can be saved

You can save the data (Triggered T) that were extracted according to the specified trigger conditions or all the data (All Triggered T).

However, you can save all the data (All Triggered T) only when the trigger mode is set to Single.

#### Contents that are saved

The following contents are saved: comments, setup information (window width, analysis mode, number of times to load the data, and extraction condition), date and time when the data were saved, statistics, etc.

**Data format**

The data are saved in ASCII format. The file can be opened using software applications such as EXCEL.

• **Triggered T example**

"Model", "704222"  
"DVD Wave Data"  
"Modulation", "8-16modulation"  
.  
.  
.  
"All Mark Data"  
"3T", 112.423, 3.604, 5041  
"4T", 0.000, 0.000, 0  
"5T", 182.639, 3.770, 2675  
.  
.  
.  
"Selected Mark Data"  
"3T", 111.295, 3.391, 1717  
"4T", 0.000, 0.000, 0  
"5T", 181.408, 4.004, 807  
"6T", 216.844, 3.667, 506  
.  
.

• **All Triggered T example**

"Model", "704222"  
"DVD Wave Data"  
"Modulation", "8-16modulation"  
.  
.  
.  
"All Mark Data"  
"3T", 112.423, 3.604, 5041  
"4T", 0.000, 0.000, 0  
"5T", 182.639, 3.770, 2675  
.  
.  
.  
"Selected Mark Data"  
"TriggerSpace", "3T"  
"3T", 111.295, 3.391, 1717  
"4T", 0.000, 0.000, 0  
"5T", 181.408, 4.004, 807  
.  
.  
.  
"TriggerSpace", "4T"  
"3T", 0.000, 0.000, 0  
"4T", 0.000, 0.000, 0  
"5T", 0.000, 0.000, 0  
.  
.  
.  
"TriggerSpace", "5T"  
"3T", 113.968, 3.356, 894  
"4T", 0.000, 0.000, 0  
"5T", 183.966, 3.261, 438  
.  
.  
.  
"TriggerSpace", "14T"  
"3T", 0.000, 0.000, 0  
"4T", 0.000, 0.000, 0  
"5T", 0.000, 0.000, 0  
.  
.  
.

**File name and extension**

The file name can be any legal file name as defined by the operating system. The file extension is [.csv].

**Notes when saving the data**

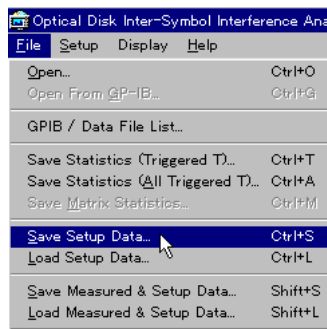
When saving the data, no warning messages will be displayed even if a file with the same name already exists. The file will be overwritten when the [Save] button is clicked.

## 3.5 Saving/Loading All the Data and Setup Information

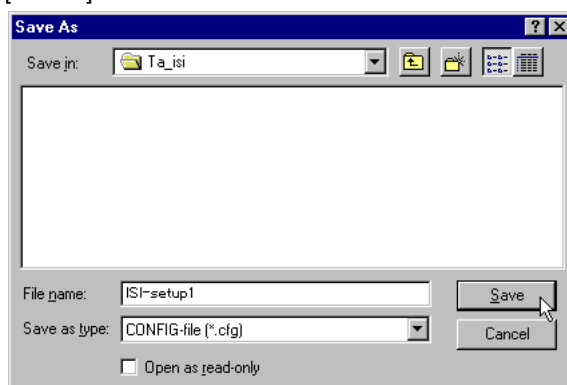
### Procedure

#### Saving only the setup information/saving all the data and setup information

1. To save only the setup information, select [Save Setup Data] from the [File] menu (File - Save Setup Data). To save all the data and setup information simultaneously, select [Save Measured Data & Setup] from the [File] menu (File - Save Measured Data & Setup). This will display the save file dialog box.

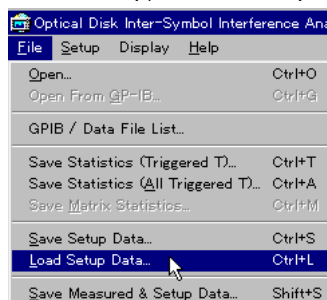


2. After setting the [Save in] box, enter the name of the file you wish to save in the [File name] entry box.
3. Click the [Save] button to save the data to the specified file. To cancel, click the [Cancel] button.



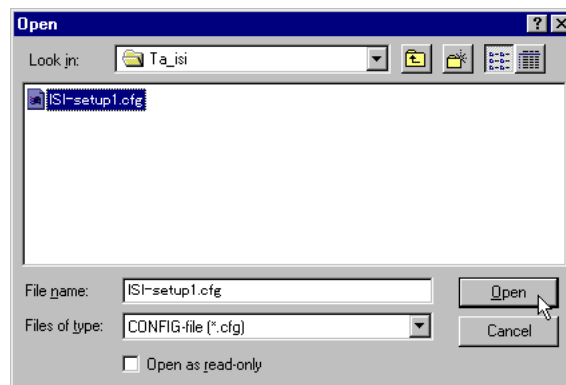
#### Loading only the setup information/Loading all the data and setup information simultaneously

4. To load only the setup information, select [Load Setup Data] from the [File] menu (File - Load Setup Data). To load all the data and setup information simultaneously, select [Load Measured Data & Setup] from the [File] menu (File - Load Measured Data & Setup). This will display the load file dialog box.





5. After setting the [Look in] box, enter the name of the file you wish to open in the [File name] entry box. The file name can also be selected from the file list.
6. To load the specified file, click the [Open] button. To cancel, click the [Cancel] button.



## Explanation

### Information that is saved or loaded

You can save or load the setup information only or all the data and setup information simultaneously.

- All the data: The measurement data that were loaded according to the procedures described in section 1.3 or 1.4. If the number of times to load the data is specified in section 1.1, the accumulated data are saved or loaded.
- Setup information: Window width, analysis mode, number of times to load the data, extraction condition, comments, display format (see section 3.2), display color (see section 3.3), etc.

### File name and extension

The file name can be specified in the range that is defined by the operating system.

- The file extension attached to the file containing all the data: .mds
- The file extension attached to the file containing setup information: .cfg

### Notes when saving or loading

- When saving the data, no warning messages will be displayed even if the file with the same name already exists. The file will be overwritten when the [Save] button is clicked.
- When all the data and setup information are saved simultaneously, the header file (.hdr extension) is also created along with the setup information file (.cfg extension). This header file is necessary when loading all the data and setup information simultaneously. Therefore, make sure not to delete this file.
- When all the data or setup information are loaded ("Open" is clicked), the data that existed before are cleared.

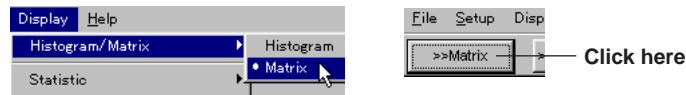
## 4.1 Displaying the Matrix and Setting the Data Extraction Condition

### Procedure

#### Displaying the matrix

1. Click the [>>Matrix] button or select [Matrix] under [Histogram/Matrix] of the [Display] menu to display the matrix.

This operation is not necessary if the [>>>Histogram] button is being displayed.



#### Selecting the trigger

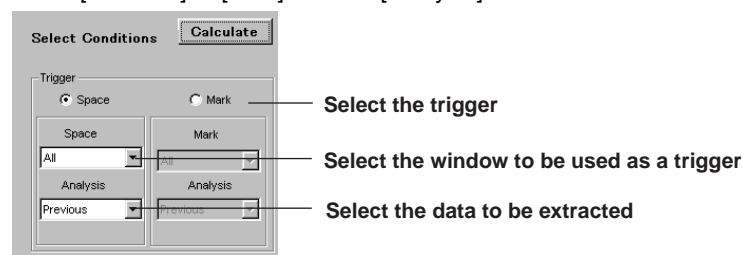
2. Select whether to activate the trigger on a space or mark using the [Trigger] option buttons.

#### Selecting the window to be used as a trigger

3. Select the data that will be used as a trigger with the [Space] or [Mark] list box. If you select [Space], set the data for the [Space] with the list box. If you select [Mark], set the data for the [Mark] with the list box.

#### Selecting the data to be extracted

4. Select [Previous] or [Next] with the [Analysis] list box.



### Explanation

#### Selecting the trigger

- Space: Set the Space as a trigger. Select from the following list of choices.  
All, 2T, 3T, 4T, 5T, 6T, 7T, 8T, 9T, 10T, 11T, 14T, 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, 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  
\* If you select Min T-\*T, all the data from the smallest data to \*T data will be used as triggers to perform the analysis  
Similarly, if you select \*T-Max T, all the data from \*T data to the maximum data will be used as triggers to perform the analysis.  
\* If you select All, all the data are used as triggers. Therefore, [Total number of data points - 2] of data will be extracted.
- Mark: Set the Mark as a trigger. The selectable data are the same as those for the Space.

#### Selecting the data to be extracted

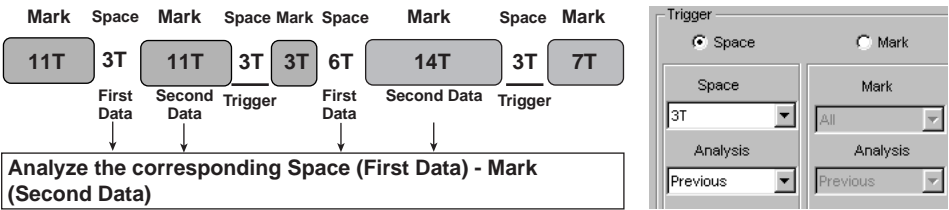
You can select whether to extract two data points immediately before or after the trigger.

Previous: Extracts the [Space-Mark] or [Mark-Space] data immediately before the trigger.

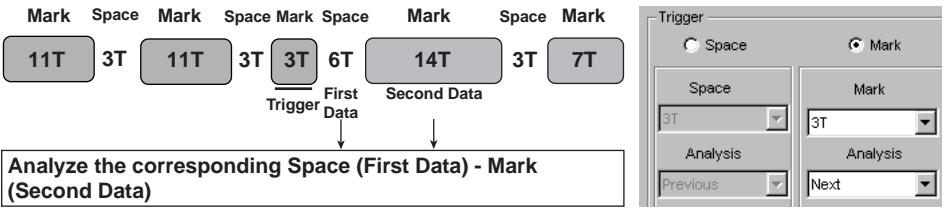
Next: Extracts the [Space-Mark] or [Mark-Space] data immediately after the trigger.

Example of setting the extraction condition

- Extract the Space-Mark data immediately before the 3T Space



- Extract the Space-Mark data immediately after the 3T Mark

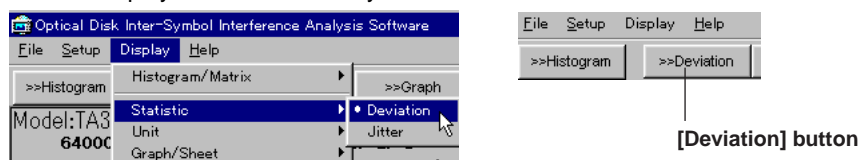


## 4.2 Analyzing the Deviation with the Matrix

### Procedure

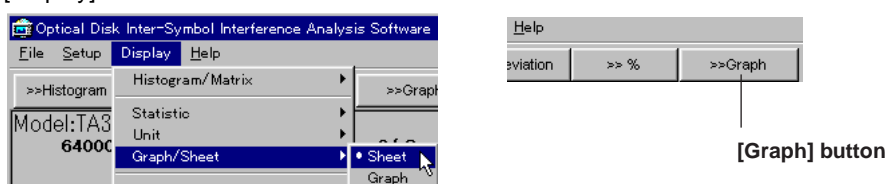
#### Selecting deviation analysis

1. Click the [Deviation] button or select [Deviation] under [Statistic] of the [Display] menu to display the deviation analysis screen.



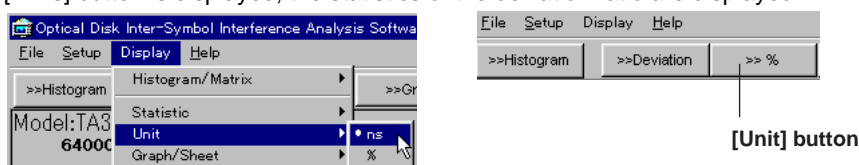
#### Selecting sheet display or graph display

2. Click the [Graph] button or select [Graph] or [Sheet] under [Graph/Sheet] of the [Display] menu.



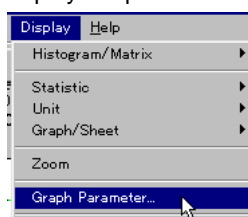
#### Selecting the analysis type (for sheet display)

3. Click the [Unit] button or select [ns] or [%] under [Unit] of the [Display] menu.  
When the [>>%] button is displayed, the deviation statistics is displayed. If the [>>ns] button is displayed, the statistics of the deviation ratio are displayed.



#### Marking the average values (for graph display)

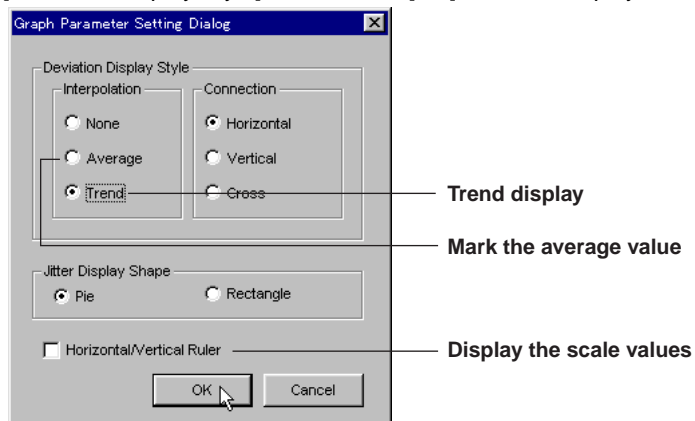
4. Select [Graph Parameter] from the [Display] menu (Display - Graph Parameter) to display the parameter dialog box.



5. Select [Average] with the [Interpolation] option button under [Deviation Display Style] and click the [OK] button to display the average values of various data as points.

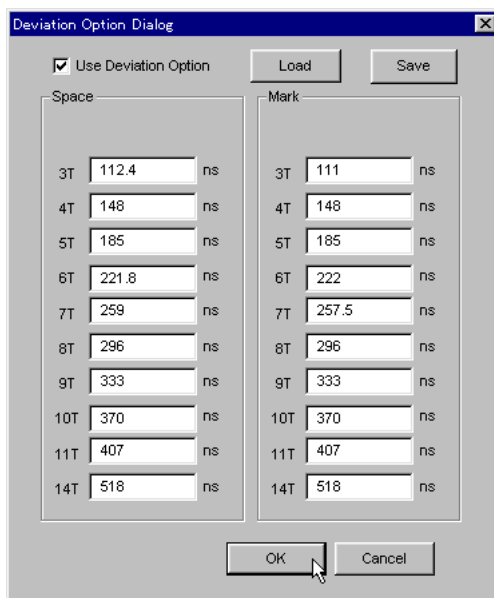
### Displaying the deviation trend of various data (for graph display)

6. Select [Trend] with the [Interpolation] option button under [Deviation Display Style].
7. Select [Horizontal], [Vertical], or [Cross] with the [Connection] option buttons under [Deviation Display Style] and click the [OK] button to display the trend.



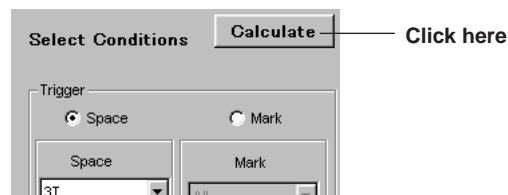
### Setting the Center value (when determining the deviation with respect to an arbitrary reference)

8. Click the [Window] button or select [Window] from the [Setup] menu to display the window setup dialog box.
9. Click the [Deviation Option] button to display the center value dialog box.
10. Check the [Use Deviation Option] box.
11. Enter the center values of each window or click the [Load] button to load the file containing the center values.
12. When the [OK] button is clicked, the deviation or deviation ratio is calculated using the specified center values.



**Performing the analysis**

13. Click the [Calculate] button to analyze the data that were extracted according to the conditions specified in section 4.1, "Displaying the Matrix and Setting the Data Extraction Condition."

**Zooming the graph**

14. Click the [Zoom In] button or select [Zoom] from the [Display] menu to zoom in on the graph. Click the [Zoom Out] button to display the entire graph.

**Clearing the Data**

15. To clear the loaded data and the list of statistics, click the [Clear Data] button or select [Clear Display Data] from the [Display] menu (Display - Clear Display Data). The data are also cleared if you exit the software (by clicking the [X] mark on the upper right corner of the window or by selecting [Exit] from the [File] menu).

## Explanation

### Selecting deviation analysis

The following two matrix analyses can be performed on this software application.

- Deviation: Display the matrix of the data and deviation of the data
- Jitter: Display the matrix of the data's jitter

### Selecting sheet display or graph display

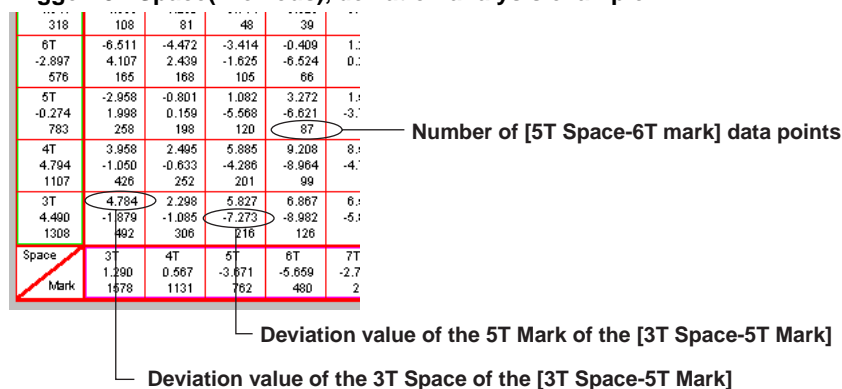
You can select whether to display a table (sheet) or a graph of the results of the deviation analysis.

### Sheet display screen

The result of the analysis of the data that were extracted according to the specified conditions is displayed on a matrix with the first data set on the vertical axis and the second data set on the horizontal axis.

The deviation values of the First Data, the deviation values of the Second Data, and the number of data points of the matrix are displayed in the top, middle, and bottom sections, respectively.

- **Trigger: 3T Space(Previous), deviation analysis example**



### Graph display screen

All the data are displayed as points. If the [Gradation] box in the color dialog box is checked, the data are displayed using different colors according to the frequencies of occurrence.

In addition, the average value of the combination of the data can be displayed as points and the deviation trend of the data can be displayed.

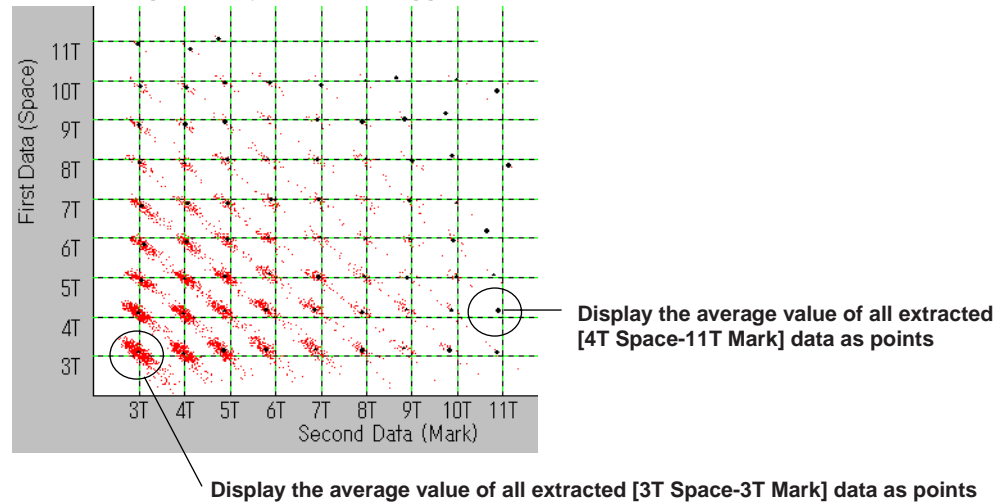
There are three types of trend displays.

- Horizontal: Displays the deviation trend of the Second Data.
- Vertical: Displays the deviation trend of the First Data.
- Cross: Displays the deviation trend of the First Data and the Second Data, simultaneously.

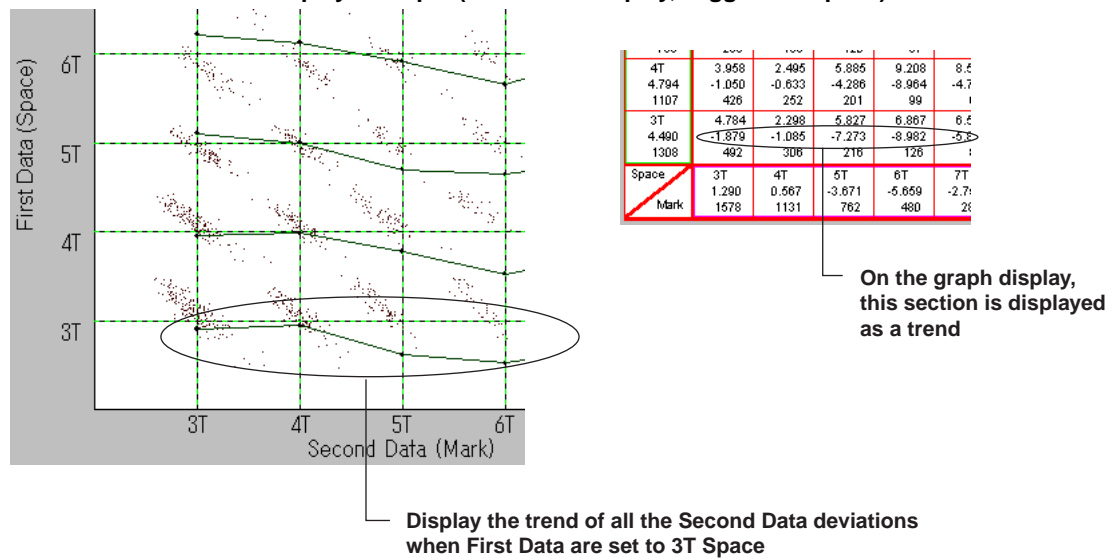
### Note

If the [Horizontal/Vertical Ruler] box in the parameter dialog box is checked, horizontal and vertical scales are displayed when the graph is displayed.

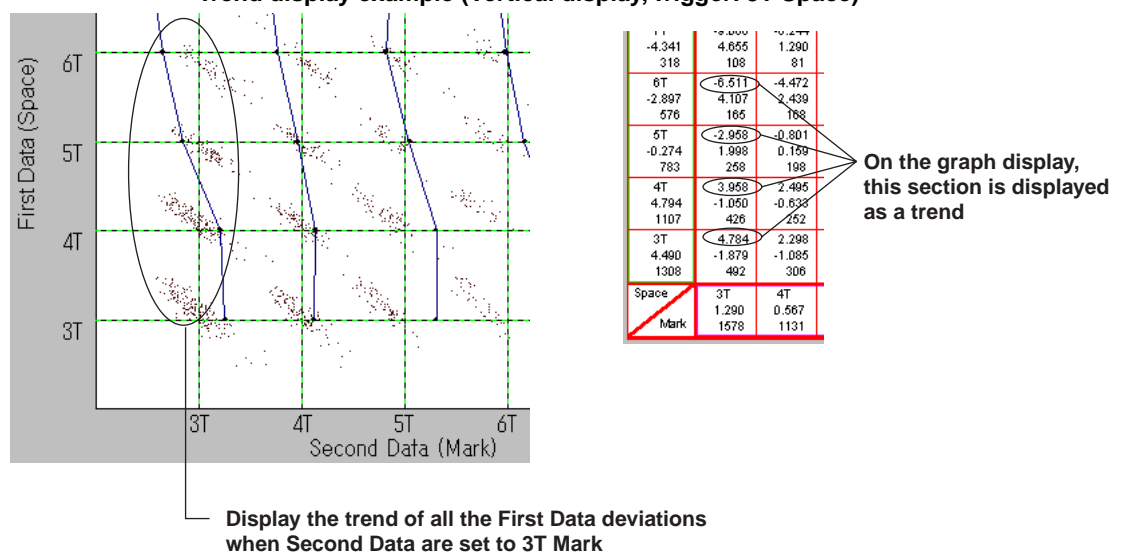
- Average display example (Trigger: 3T Space)



- Trend display example (Horizontal display, Trigger: 3T Space)



- Trend display example (Vertical display, Trigger: 3T Space)





**Analysis type**

Of the statistics show below, one parameter can be analyzed on the sheet display for the deviation analysis.

- Deviation (ns): Average (data average) - Center value of the window
- Deviation ratio (%):  $(\text{Deviation}_{\text{All}} - \text{Deviation}_{\text{Mrx}}) / \text{Deviation}_{\text{All}} \times 100$   
 $\text{Deviation}_{\text{All}}$  = Deviation of all the data  
 $\text{Deviation}_{\text{Mrx}}$  = Deviation of the extracted data

**Example:**

5T	-2.958	-0.801	1.082
-0.274	1.998	0.159	-5.568
783	258	198	120
4T	3.958	2.495	5.885
4.794	-1.050	-0.633	-4.288
1107	426	252	201
3T	4.784	2.298	5.827
4.490	-1.879	-1.085	-7.273
1308	482	306	216
Space	3T	4T	5T
Mark	1.290	0.567	-3.671
	1678	1131	762

Deviation<sub>All</sub>
Deviation<sub>Mrx</sub>

Deviation ratio of the 3T Space of the 3T Space-3T Mark  
 $= (4.490 - 2.298) / 4.490 \times 100 = 48.819$

**Setting the Center value**

Set this value to determine the deviation or deviation ratio when using a center value other than the one specified in the window setting dialog box. When the [Use Deviation Option] box is checked, the deviation or deviation ratio is determined using the specified center value.

In addition, the specified value can be saved and loaded later. The file extension is [.dev].

**Performing the analysis**

Click the [Calculate] button to compute the statistics (deviation) of the data that matched the specified extraction condition and to display the result for each data combination on a table (sheet) or graph.

**Clearing the data**

When you clear the data, not only are the histogram and the result of the statistical computation cleared, but also all the data that are loaded.

**Note**

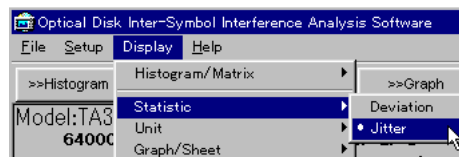
When displaying the deviation trend, the deviation values are doubled (expanded by a factor of two).

## 4.3 Analyzing the Jitter with the Matrix

### Procedure

#### Selecting jitter analysis

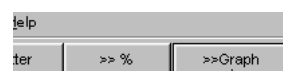
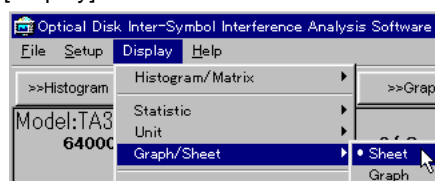
1. Click the [Jitter] button or select [Jitter] under [Statistic] of the [Display] menu to display the jitter analysis screen.



[Jitter] button

#### Selecting sheet display or graph display

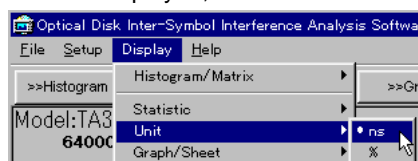
2. Click the [Graph] button or select [Graph] or [Sheet] under [Graph/Sheet] of the [Display] menu.



[Graph] button

#### Selecting the analysis type (for sheet display)

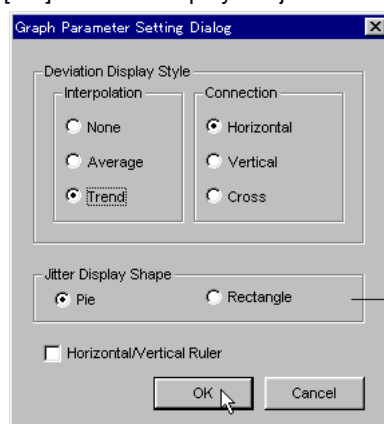
3. Click the [Unit] button or select [ns] or [%] under [Unit] of the [Display] menu. When the [>>%] button is displayed, the Jitter statistics are displayed. If the [>>ns] button is displayed, the statistics of the Jitter ratio are displayed.



[Unit] button

#### Selecting the display format of the jitter values

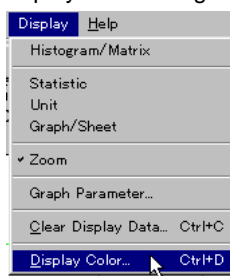
4. Select [Graph Parameter] from the [Display] menu (Display - Graph Parameter) to display the parameter dialog box.
5. Select [Pie] or [Rectangle] with the [Jitter Display Shape] option buttons and click the [OK] button to display the jitter in the selected form.



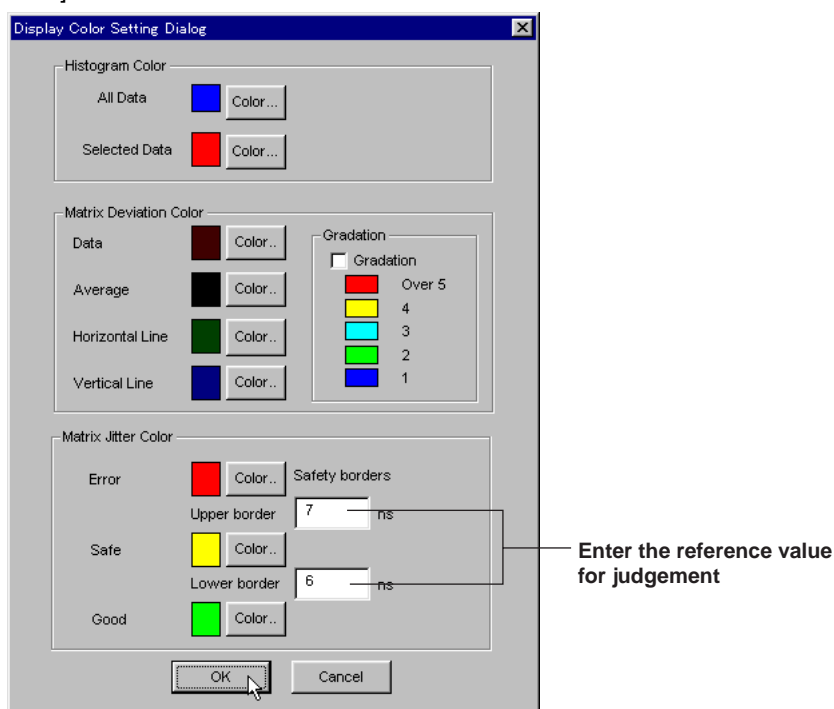
Select the display format

### Setting the threshold

6. Select [Display Color] from the [Display] menu (Display - Display Color) to show the display color dialog box.

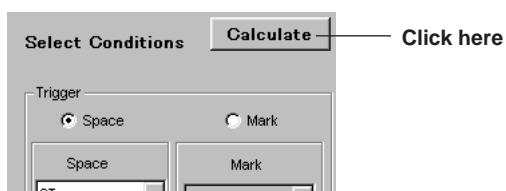


7. Enter values in the [Upper border]/[Lower border] entry boxes in the [Matrix Jitter Color] box.



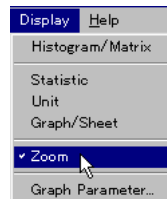
### Performing the analysis

8. Click the [Calculate] button to analyze the data that were extracted according to the conditions specified in section 4.1, "Displaying the Matrix and Setting the Data Extraction Condition."



**Zooming the graph**

9. Click the [>>>Zoom In] button or select [Zoom] from the [Display] menu to zoom in on the graph. Click the [>>>Zoom Out] button to display the entire graph.



Click here

**Explanation****Selecting jitter analysis**

The following two matrix analyses can be performed on this software application.

- Deviation: Display the matrix of the data and deviation of the data
- Jitter: Display the matrix of the data's jitter

**Analysis type**

Of the statistics show below, one parameter can be analyzed on the sheet display for the jitter analysis.

- Jitter (ns):  $\sigma$  (Standard deviation)
- Jitter ratio (%):  $(\text{Jitter}_{\text{All}} - \text{Jitter}_{\text{Mrx}}) / \text{Jitter}_{\text{All}} \times 100$   
 $\text{Jitter}_{\text{All}}$  = Jitter of all the data  
 $\text{Jitter}_{\text{Mrx}}$  = Jitter of the extracted data

**Example:**

5T	5.148	5.704	5.580
6.234	6.016	6.063	6.733
783	258	198	105
4T	5.525	5.832	5.888
6.500	6.332	6.365	5.264
1107	426	252	120
3T	6.052	6.363	6.420
6.713	6.227	6.214	8.805
1308	492	306	201
Space	3T	4T	5T
Mark	6.473	6.727	7.203
	1578	1131	762

Deviation<sub>All</sub>Deviation<sub>Mrx</sub>

$$\text{Jitter ratio of the 3T Space of the 3T Space-3T Mark} \\ = (6.713 - 6.363) / 6.713 \times 100 = 5.214$$

**Selecting sheet display or graph display**

You can select whether to display a table (sheet) or a graph of the results of the jitter analysis.

**Sheet display screen**

Of the data that were extracted according to the specified conditions, the result of the analysis is displayed on a matrix with the first data set on the vertical axis and the second data set on the horizontal axis.

The jitter values of the First Data, the jitter values of the Second Data, and the number of data points of the matrix are displayed in the top, middle, and bottom sections, respectively.

- **Trigger: 3T Space(Previous), jitter analysis example**

	3T	4T	5T	6T	
6T	5.892	7.382	5.580	5.031	7
6.947	5.997	7.320	6.733	3.999	8
576	165	168	105	66	
5T	5.148	5.704	5.888	4.826	4
6.234	6.016	6.063	5.264	5.534	6
783	258	198	120	87	
4T	5.525	5.832	6.420	5.739	5
6.500	6.332	6.365	8.805	7.265	8
1107	426	252	201	99	
3T	6.052	6.363	5.758	7.043	7
6.713	6.227	6.214	6.056	6.525	7
1308	492	306	216	126	
Space	3T	4T	5T	6T	7
Mark	6.473	6.727	7.203	6.924	7
	1578	1131	762	480	

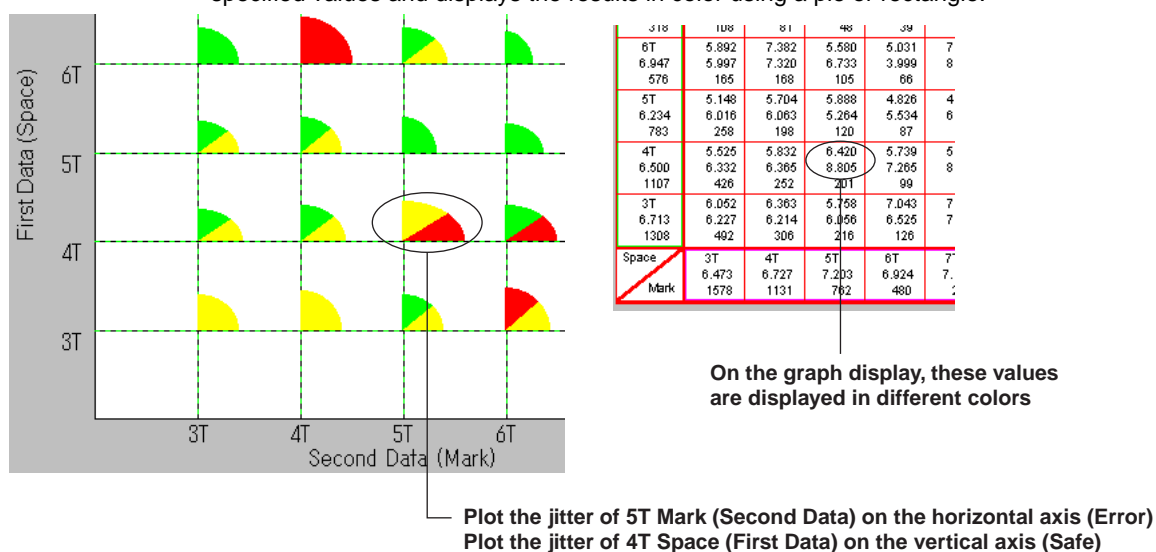
Number of [5T Space-6T Mark] data

Jitter value of the 5T Mark of [3T Space-5T Mark]

Jitter value of the 3T Space of [3T Space-3T Mark]

**Graph display screen**

Determines whether the jitter values of the data are higher or lower than the two specified values and displays the results in color using a pie or rectangle.

**Setting the threshold**

Makes the following judgement with respect to the specified values (Upper border and Lower border) and assigns different colors.

- Error : Jitter  $\geq$  [Upper border] level
- Safe : [Lower border] level  $\leq$  jitter < [Upper border] level
- Good : Jitter < [Lower border] level

**Note**

An error results if the upper border is less than the lower border.

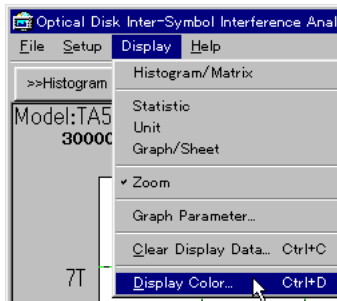
**Performing the analysis**

Click the [Calculate] button to compute the statistics (jitter) of the data that matched the specified extraction condition and to display the result for each data combination on a table (sheet) or graph.

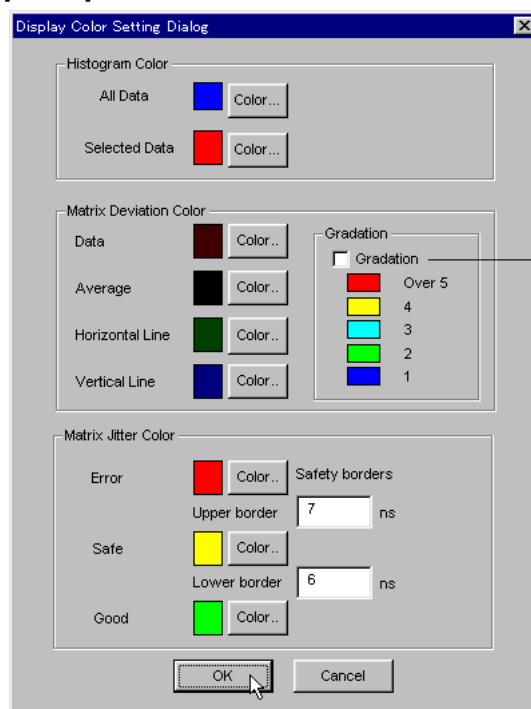
## 4.4 Setting the Display Color of the Analysis Results

### Procedure

1. Select [Display Color] from the [Display] menu (Display - Display Color) to show the display color dialog box.



2. Click the [Color] button for the [Matrix Deviation Color] or [Matrix Jitter Color] box to display the color dialog box.
3. Set the color. To activate the settings, click the "OK" button. To cancel, click the [Cancel] button.



Use different colors by data frequency

### Explanation

You can set the displayed color of the matrix analysis screen (deviation or jitter). The selectable items are different for the deviation analysis screen and the jitter analysis screen.

- **Deviation analysis screen**

You can assign colors to the line and the data frequency when displaying the data, average, or trend.

If the [Gradation] box is checked, the data are displayed using different colors according to the frequencies.

If the check is removed, the data are displayed using the color specified for [Data].

- **Jitter analysis screen**

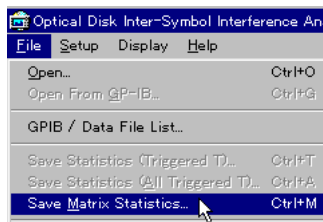
The following judgement is made with respect to the two specified levels, and the result is displayed using different colors.

- Error:  $\text{Jitter} \geq [\text{Upper border}] \text{ level}$
- Safe:  $[\text{Lower border}] \text{ level} \leq \text{jitter} < [\text{Upper border}] \text{ level}$
- Good:  $\text{Jitter} < [\text{Lower border}] \text{ level}$

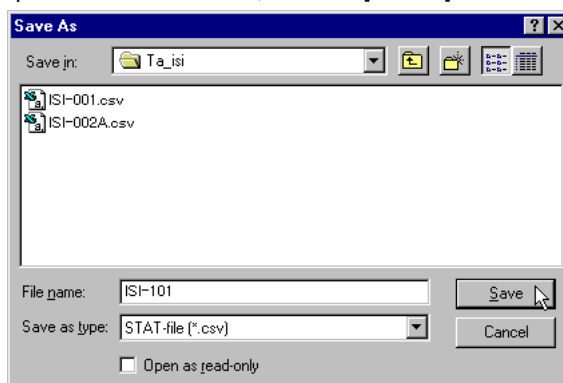
## 4.5 Saving the Results of the Matrix Analysis

### Procedure

1. Select [Save Matrix Statistics] from the [File] menu (File - Save Matrix Statistics) to display the save file dialog box.



2. After setting the [Save in] box, enter the name of the file you wish to save in the [File name] entry box.
3. Click the [Save] button to save the results of the statistical computation to the specified file. To cancel, click the [Cancel] button.



### Explanation

#### Contents that are saved

The following contents are saved: comments, setup information (window width, analysis mode, number of times to load the data, and extraction condition), date and time when the data were saved, statistics, etc.

#### Data format

The data are saved in ASCII format. The file can be opened using software applications such as EXCEL.

#### Example:

```
"Model", "704222"
""
"Modulation", "8-16modulation"
"Polarity", "Space(+) Mark(-)"
"Accumulation", "4"
"Trigger", "Space", "4T", "Previous"
"Mark Window", "Left", "Right"
"Unit", "nsec", "nsec"
"3T", 92.500, 129.500
.
.
.
"Space Window", "Left", "Right"
"Unit", "nsec", "nsec"
"3T", 92.500, 129.500
.
.
.
```



## 4.5 Saving the Results of the Matrix Analysis

---

```
"TraceName","Deviation","Jitter","Number"
"Unit","nsec","nsec",""

"First All Space Data"
"3T", 2.802, 3.780, 20243
"4T", 0.555, 3.611, 15634
.
.
.
"11T", 3.214, 4.735, 184
"14T", 2.839, 2.862, 189

"Second All Mark Data"
"3T", 4.864, 3.172, 20221
.
.
.
"14T", -4.068, 3.002, 219

"TraceName","1st Deviation","1st Deviation","1st Jitter","1st Jitter","2nd Deviation","2nd
Deviation","2nd Jitter","2nd Jitter","Number"
"Unit","nsec","%","nsec","%","nsec","%","nsec","%",""

"Selected Mark - Space Data"
3T(M) - 3T(S), -1.275, 145.519, 2.558, 32.327, 3.908, 19.644, 2.810, 11.396, 2255
3T(M) - 4T(S), -0.414, 114.785, 2.581, 31.710, 0.396, 82.699, 2.760, 4.392, 1723
.
.
.
3T(M) - 11T(S), 1.950, 30.408, 2.260, 40.216, -7.672, -85.891, 2.660, 20.223, 18
3T(M) - 14T(S), 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0

4T(M) - 3T(S), -3.387, 710.216, 2.875, 20.386, 3.875, 20.331, 2.954, 6.873, 1541
4T(M) - 4T(S), -2.889, 620.624, 2.579, 28.591, 1.533, 33.090, 2.343, 18.838, 1218
.
.
.
4T(M) - 11T(S), -1.709, 407.950, 2.227, 38.318, -4.127, 0.000, 1.949, 41.534, 11
4T(M) - 14T(S), -1.524, 374.632, 2.855, 20.935, -3.901, 4.114, 3.183, -6.025, 91

.
.
.

14T(M) - 3T(S), 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0
14T(M) - 4T(S), 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0
.
.
.
14T(M) - 11T(S), 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0
14T(M) - 14T(S), 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0.000, 0
```

### File name and extension

The file name can be any legal file name as defined by the operating system. The file extension is [.csv].

### Notes when saving the data

When saving the data, no warning messages will be displayed even if a file with the same name already exists. The file will be overwritten when the [Save] button is clicked.

---

## 4.6 Saving/Loading All the Data and Setup Information

### Procedure

The procedures used to save and load the data are the same as the procedures described in chapter 3, “Analyzing the Data with the Histogram.”

See the procedures described in section 3.5, “Saving/Loading All the Data and Setup Information.”

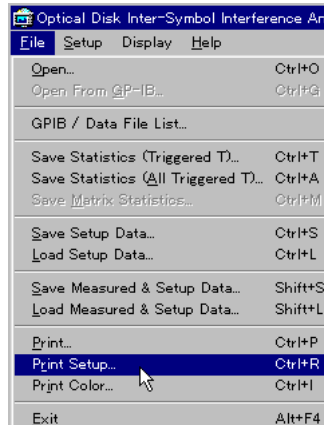
### Explanation

See the explanation described in section 3.5, “Saving/Loading All the Data and Setup Information.”

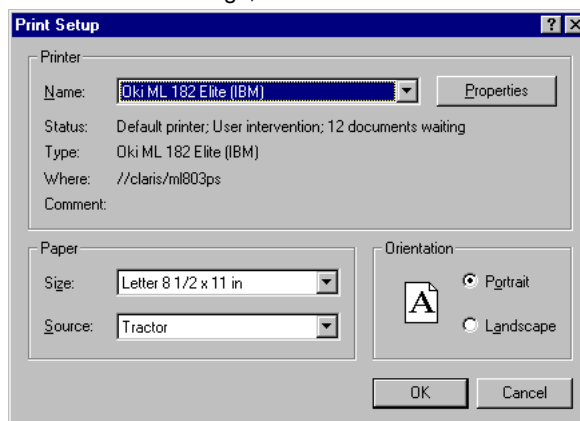
## 5.1 Setting the Printer

### Procedure

1. Select [Print Setup] from the [File] menu (File - Print Setup) to display the printer setup dialog box.



2. Select the printer, orientation, paper size, etc.
3. To activate the settings, click the "OK" button. To cancel, click the [Cancel] button.



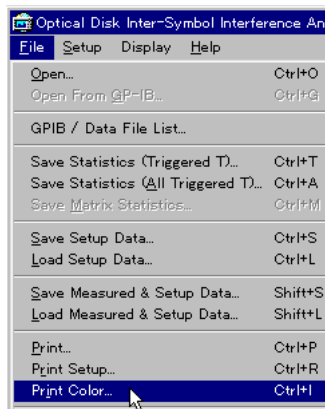
### Explanation

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

## 5.2 Selecting the Print Color

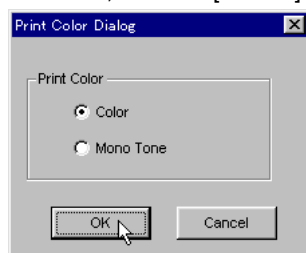
### Procedure

1. Select [Print Color] from the [Display] menu (Display - Print Color) to display the print color dialog box.



2. Select [Color] or [Mono Tone] with the [Printer Color] option button.
3. To activate the settings, click the "OK" button.

To cancel, click the [Cancel] button.



### Explanation

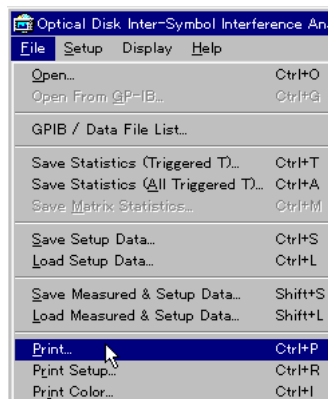
You can select whether to print in color or in black and white.

- 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)

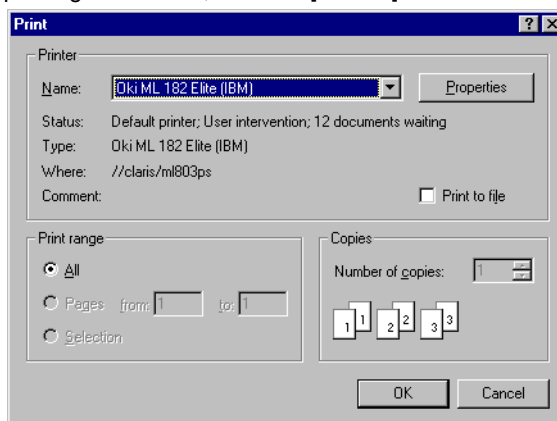
## 5.3 Printing

### Procedure

1. Select [Print] from the [File] menu (File - Print) to display the print dialog box.



2. Confirm the settings in the print dialog box and click the [OK] button to execute printing. To cancel, click the [Cancel] button.



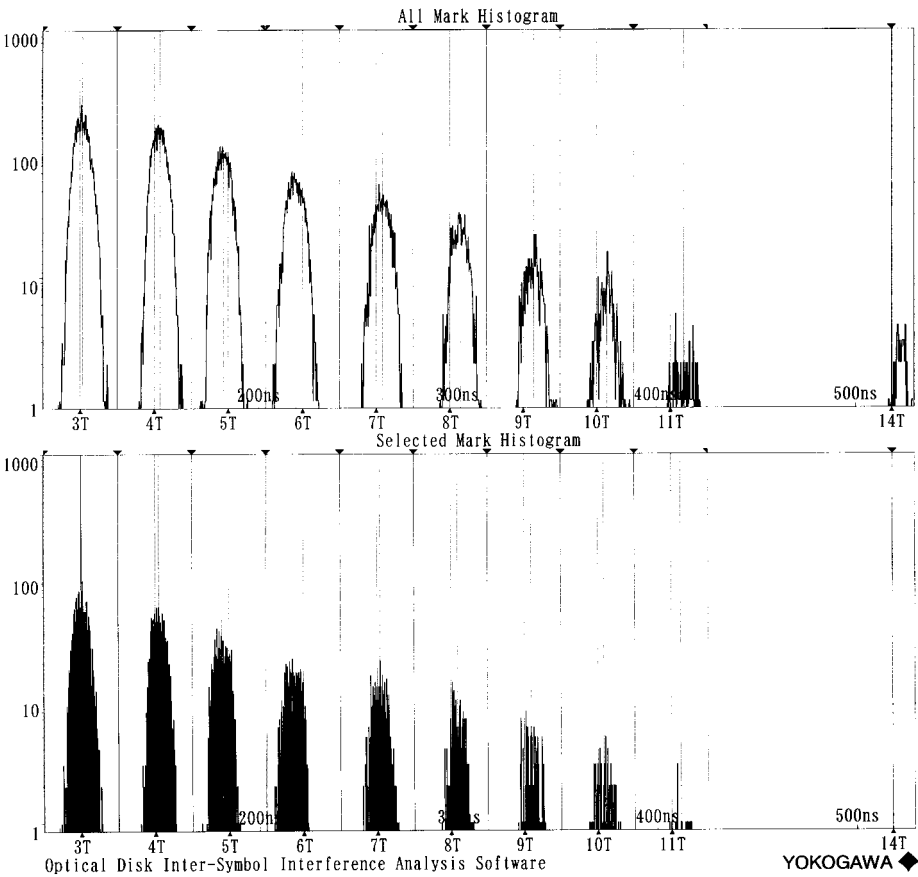
Explanation

Print example of a histogram

32000 Sample Data Accumulation 1/ 4  
Single Trigger Trigger:3TSpace Analysis:Next Mark  
Model:TA320

All Mark Statistics			
T	Ave.(ns)	Jitter(ns)	Num.
3T	112.423	3.604	5041
4T	150.842	3.366	3917
5T	182.582	3.576	2669
6T	218.773	3.978	1778
7T	262.399	3.827	1194
8T	301.694	3.603	713
9T	338.685	3.734	369
10T	375.367	3.719	220
11T	414.249	4.316	49
14T	0.000	0.000	0

Selected Mark Statistics			
T	Ave.(ns)	Jitter(ns)	Num.
3T	111.295	3.391	1717
4T	149.891	3.185	1235
5T	181.243	3.425	802
6T	216.756	3.754	511
7T	260.598	3.587	362
8T	299.668	3.179	197
9T	336.780	3.270	109
10T	373.321	3.691	63
11T	412.140	3.322	15
14T	0.000	0.000	0



## Print example of a deviation matrix

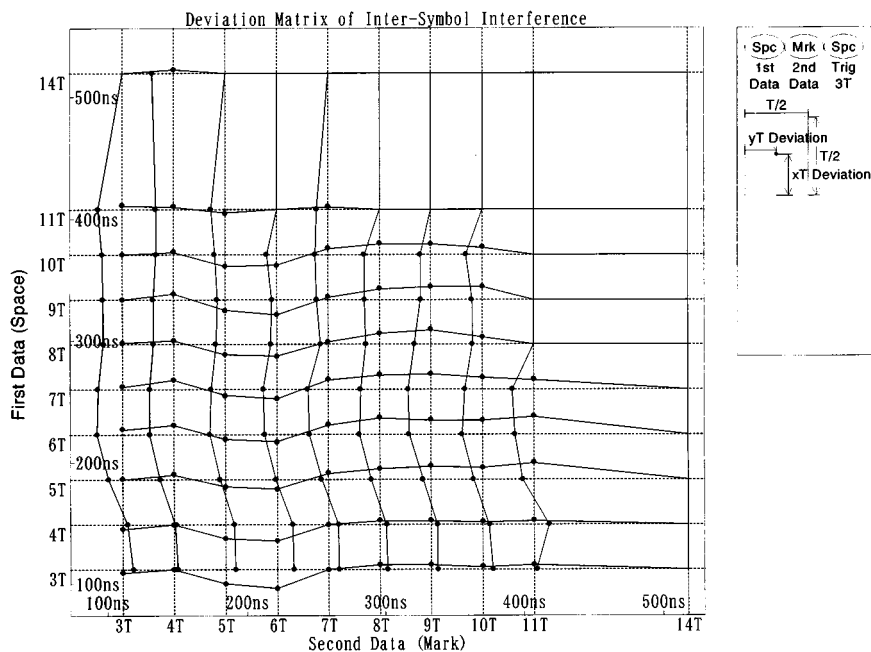
32000 Sample Data Accumulation 1/ 4  
 Trigger: Space 3T Analysis: Previous Mark(-1), Space(-2)  
 Model: TA320

yT Deviation Space[ns]  
 xT Deviation Mark[ns]  
 Number(xT,yT)

Deviation Matrix of Inter-Symbol Interference

14T	0.000	-7.774	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-7.767	0.000	1.644	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24	0	24	0	0	0	0	0	0	0	0	0
11T	-8.697	-6.735	-5.385	0.000	-4.252	0.000	0.000	0.000	0.000	0.000	0.000
-5.785	1.820	1.303	-1.721	0.000	1.355	0.000	0.000	0.000	0.000	0.000	0.000
15	8	2	2	0	3	0	0	0	0	0	0
10T	-7.398	-6.513	-4.025	-3.984	-4.990	-5.826	-4.050	-6.101	0.000	0.000	0.000
-5.627	0.204	1.271	-5.013	-4.755	2.705	4.796	4.385	3.250	0.000	0.000	0.000
75	21	16	12	9	10	4	1	2	0	0	0
9T	-7.226	-7.654	-3.121	-1.974	-4.170	-5.565	-3.840	-3.915	0.000	0.000	0.000
-5.148	-0.074	2.647	-4.619	-6.422	1.210	4.787	5.335	5.383	0.000	0.000	0.000
114	38	18	17	17	11	6	4	3	0	0	0
8T	-6.996	-7.358	-3.572	-2.396	-2.885	-5.041	-6.110	-3.646	0.000	0.000	0.000
-5.203	0.529	1.572	-4.448	-5.186	1.022	4.474	6.055	2.950	0.000	0.000	0.000
237	61	51	42	36	18	13	10	6	0	0	0
7T	-8.945	-8.861	-5.283	-5.064	-7.552	-7.112	-8.378	-6.535	-7.945	0.000	0.000
-7.421	1.313	4.027	-2.679	-3.920	4.158	6.207	6.327	5.029	4.282	0.000	0.000
376	110	88	66	43	29	15	12	10	3	0	0
6T	-9.304	-8.836	-5.745	-4.768	-6.840	-7.729	-8.030	-7.655	-6.860	0.000	0.000
-7.485	2.241	3.929	-2.099	-3.253	4.285	7.164	6.085	5.794	7.515	0.000	0.000
628	205	147	128	69	37	16	15	9	2	0	0
5T	-5.175	-5.078	-2.064	-0.671	-2.588	-3.290	-3.138	-3.550	-4.275	0.000	0.000
-3.480	0.447	2.215	-3.219	-4.219	2.691	4.479	5.629	4.950	7.015	0.000	0.000
868	271	241	138	104	55	34	16	8	1	0	0
4T	1.973	0.883	3.368	5.478	3.813	2.525	2.456	2.689	5.660	0.000	0.000
2.618	-2.112	-0.403	-5.914	-6.836	-0.310	1.905	1.735	1.350	1.915	0.000	0.000
1195	417	318	194	131	57	46	24	7	1	0	0
3T	4.045	1.541	3.831	5.935	4.037	2.935	2.574	3.707	1.361	0.000	0.000
3.514	-1.568	0.012	-6.253	-8.098	-0.392	2.129	2.119	1.225	1.982	0.000	0.000
1479	556	369	218	134	105	49	29	16	3	0	0
Space	3T	4T	5T	6T	7T	8T	9T	10T	11T	14T	
Mark	1.318	2.795	-2.290	-3.438	3.154	5.414	5.370	5.017	6.864	-518.036	
	1687	1274	817	543	325	183	111	61	10	0	

xT  
 xT Deviation Mark[ns]  
 xT Number

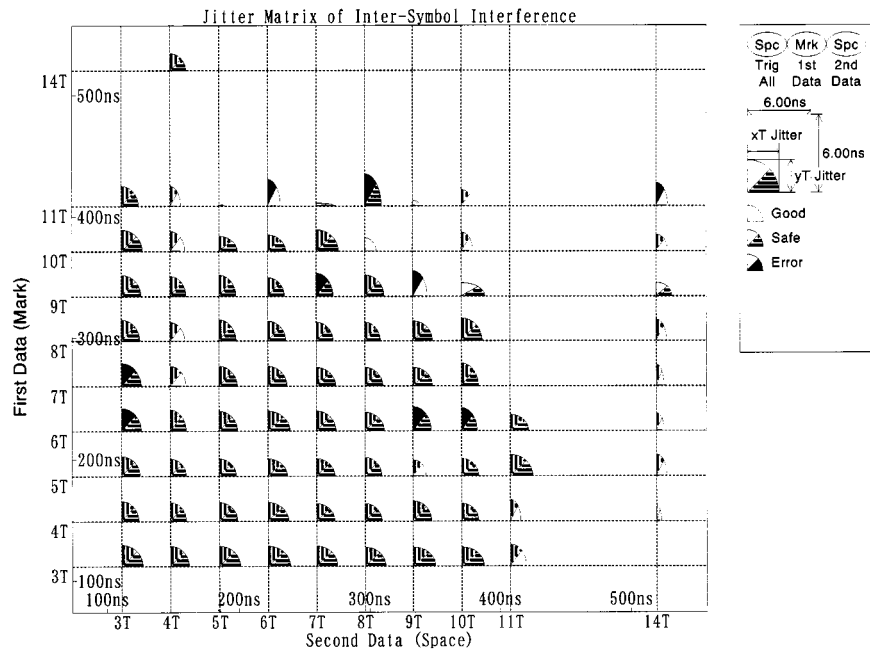


Print example of a jitter matrix

DVD Data  
32000 Sample Data Accumulation 1/ 4  
Trigger: Space All Analysis:Next Mark(+1), Space(+2)  
Model:TA320

yT Jitter Mark[ns]  
xT Jitter Space[ns]  
Number(xT,yT)

Jitter Matrix of Inter-Symbol Interference											
14T	0.000	2.364	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.364	0.000	2.037	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
50	0	50	0	0	0	0	0	0	0	0	0
11T	2.797	2.721	0.350	3.533	0.454	4.288	0.850	2.260	0.000	3.018	
4.316	2.141	1.326	0.850	1.638	2.336	2.254	1.050	1.603	0.000	1.558	
49	10	12	2	6	5	4	2	3	0	5	
10T	2.823	2.743	2.001	2.232	2.955	1.821	0.000	2.530	0.000	2.188	
3.719	2.644	1.901	2.346	2.329	2.781	1.488	0.000	1.497	0.000	1.474	
220	61	57	35	26	24	7	1	3	1	5	
9T	2.909	2.806	2.836	2.586	3.112	2.966	3.430	1.800	0.000	1.880	
3.734	2.516	2.040	2.186	2.268	2.261	2.587	1.848	2.934	0.000	2.007	
369	111	66	59	41	36	33	14	6	0	3	
8T	2.853	2.574	2.944	2.651	2.530	2.582	2.719	2.986	0.000	2.861	
3.603	2.393	1.789	2.217	2.418	2.213	2.105	2.584	2.710	0.000	1.431	
712	183	155	114	119	54	36	28	13	1	9	
7T	3.039	2.766	2.694	2.668	2.560	2.492	2.622	2.989	0.300	2.900	
3.827	2.567	1.981	2.283	2.594	2.526	2.343	2.460	2.201	0.050	1.050	
1194	325	272	189	183	97	76	31	17	2	2	
6T	3.026	2.873	2.736	2.711	2.692	2.525	3.163	3.026	2.204	2.414	
3.978	2.466	2.077	2.341	2.849	2.470	2.516	2.372	2.091	2.394	1.043	
1778	543	397	290	245	143	89	37	24	6	4	
5T	2.797	2.392	2.354	2.413	2.399	2.551	2.270	2.446	2.847	2.892	
3.576	2.291	2.036	2.258	2.572	2.307	2.235	1.744	2.234	2.841	1.321	
2669	817	605	474	346	196	131	50	33	7	10	
4T	2.795	2.487	2.456	2.498	2.331	2.428	2.667	2.441	2.966	2.000	
3.366	2.260	2.035	2.289	2.622	2.348	2.263	2.289	2.240	1.336	0.794	
3917	1274	1002	648	437	252	146	84	52	8	14	
3T	2.845	2.722	2.670	2.654	2.750	2.492	2.531	2.584	2.936	0.000	
3.604	2.738	2.383	2.710	2.764	2.718	2.619	2.811	2.780	1.983	0.000	
5041	1687	1238	857	566	348	170	94	70	11	0	
Mark	3T	4T	5T	6T	7T	8T	9T	10T	11T	14T	
Space	3.274	2.705	2.976	3.288	3.202	3.137	3.104	3.232	2.872	2.758	
	5011	3854	2668	1969	1155	692	341	221	36	52	





# Specifications

## Software

The Optical Disk Inter-Symbol Interference Analysis software (704222) is the executable file named ta\_isi.exe.

### Measurement data that are handled

The data that are handled by this software are binary format data obtained when the sampling mode of the Time Interval Analyzer TA320/TA520 is set to time stamp and the measurement function (item) is set to pulse width measurement (measuring both polarities). The maximum number of data samples that can be loaded is 32,000 data points per file for the TA320 and 512,000 points per file for the TA520. Up to 64 files of data on the TA320 or four files on the TA520 (2 M of data points) can be analyzed.

- Data that have been saved to a binary file (.wvf extension) along with the header file (.hdr extension).
- Data that have been measured by the TA320/TA520 and loaded into this software application via communication interface (GP-IB).  
(You cannot use this software application to load data from the TA320/TA520's floppy disk drive via GP-IB.)

## Setting the analysis conditions

### Setting the window

- Switch the setting method (Center/Span or Left/Right)
- Manual setting
- CD/DVD easy setting
- Auto setting using clock cycle input
- Auto setting by estimating the clock cycle from the data

### Selecting the data polarity

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

### Selecting the modulation method

Select 8-17 modulation (EFM), 8-16 modulation (EFM+), or 1-7 modulation

### Selecting the number of times to load the data

Select a value up to 64 (on the TA320) or 4 (on the TA520)

### Entering comments

Enter up to 50 characters

## Displaying the analysis result

- Histogram analysis screen
- Matrix analysis screen (deviation/jitter)
- Sheet display screen (deviation/jitter)

## Histogram analysis

### Setting the extraction condition

- Select the mode (Single/Combination/Between)
- Select the trigger (2T to 11T and 14T, above the specified code, or below the specified code)
- Select the extracted items (Previous, Next, or Both)

### Analysis display

- Histogram of all the data or extracted data and sheet (table) display of the statistics (average, jitter, and the number of data samples that are computed)
- Set the histogram color
- Switch the histogram vertical scale (Linear/Log)
- Switch between histogram overlap/separate
- Switch between histogram and histogram + statistic sheet display

## Matrix analysis (deviation)

### Setting the extraction condition

- Select the trigger (All, 2T to 11T and 14T, above the specified code, or below the specified code)
- Select the extracted items (Previous or Next)

### Analysis display (matrix display)

- Plot the measured values of the extracted data on the X-axis (data before the trigger) and Y-axis (data after the trigger) (frequency can be displayed in color)
- Display the deviation trend of the extracted data (before and after the trigger) (Horizontal, Vertical, or Cross).
- Plot the average values of the extracted data on the X-axis (data before the trigger) and Y-axis (data after the trigger)
- Arbitrarily set the center values of the data and compute the deviation based on the center values (Deviation Option)
- Zoomed display of the XY graph (all/up to 7T)
- Display the measurement time ruler on the XY graph
- Set the data, average, and trend line gradation on the XY graph

### Analysis display (sheet display)

Display the deviation (ns) or deviation ratio (%) of the extracted data (before and after the trigger) in text form.

## Matrix analysis (jitter)

### Setting the extraction condition

Same as those for the deviation

### Analysis display (matrix display)

- Display the graph of the jitter of the extracted data (before and after the trigger)
- Switch the jitter display form (Pie or Rectangle)
- Zoom setting of the XY graph (all/up to 7T)
- Display the measurement time ruler on the XY graph
- Set the threshold (two points) and display the three levels (Good, Safe, and Error) using different colors

### Analysis display (sheet display)

Display the jitter (ns) or jitter ratio (%) of the extracted data (before and after the trigger) in text form.

**Save/Load function**

- Save/Load the setup information (.cfg extension)
- Load TA320/TA520 measurement data (.wvf extension)
- Save/Load accumulated measurement data (.mds extension)
- Save the statistic data (Triggered T, All Triggered T, matrix statistics) (.csv extension)
- Save/Load the Deviation Option Center values (.dev extension)

**Print function**

- Print the histogram, graph, and sheet
- Select the print color (black and white or color)

**Entering comments**

Enter up to 50 characters

**Displaying a list of the loaded data**

Display a list of the data load source (GP/IB or file) and file path (drive letter, directory, and file name)

**Backing up the setup information**

Save the previous setup information (measured data excluded)

**System Requirements****PC**

PC capable of running Windows 95/98 or Windows NT 4.0 with at least 32 MB of RAM

**Operating System**

Windows 95/98 or Windows NT.

**GP-IB board and PCMCIA card**

A GP-IB board or a PCMCIA card made by National Instruments must be installed in the PC.

**Disk drive**

One 3 1/2" floppy disk drive capable of reading 1.44 MB floppy disks (MS-DOS compatible) The disk drive is also used to install the software.

**CRT**

SVGA (800 x 600) or better (1024 x 768 or better recommended), displays 16 or more colors

**Printer and mouse**

Those supported by Windows 95/98 or Windows NT.

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