WAVECREST CORPORATION

GigaView SA™ Software

For Agilent and Tektronix Sampling Oscilloscopes

User's Guide and Reference Manual

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WAVECREST Corporation continually engages in research related to product improvement. New material, production methods, and design refinements are introduced into existing products without notice as a routine expression of that philosophy. For this reason, any current *WAVECREST* product may differ in some respect from its published description but will always equal or exceed the original design specifications unless otherwise stated.

The purpose of this manual is to provide the user with a quick overview of *GigiView SA* software.

Parts of this manual have been compiled from the online Help system included with the *GigiView SA* software. Some areas will appear different due to the presentation and layout format of the Help system versus the hard copy manual format. **It is recommended that this manual be used as a supplement to the online Help system.** Parts of the manual may differ from the software appearance due to changes and modifications of the software.

In general, this manual is an overview of the functions and operation of *GigiView SA* software. It is assumed that the user has some familiarity with test equipment such as signal generators and oscilloscopes as well as the terminology involved with their usage.

The manual has been organized as follows:

Section 1 — *GigiView SA* System Requirements and Installation

This section lists the hardware and software requirements needed for *GigaView SA* and helps the user to quickly install the software on your oscilloscope, PC or UNIX workstation.

Section 2 — *GigiView SA* Software

This section describes the basic controls and features of *GigiView SA*.

Section 3 — *GigiView SA* Tools

This section gives a general overview of *GigiView SA* including the setup of all measurement tools and provides examples of plot measurements.

Appendix A contains an overview of *GigiView SA* Macro features.

Appendix B contains a detailed explanation of **TailFit** theory.

Glossary contains detailed definitions of menu selections, functions, dialog bar selections and jitter related terminology.

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SECTION 1 – System Requirements and Installation

SYSTEM REQUIREMENTS

This version of the *GigaView SA* software operates on a personal computer running Microsoft® Windows™ 95, 98, 2000, NT 4.0 **or XP** as well as SUN/Solaris® and Hewlett-Packard® Workstations.

HARDWARE REQUIREMENTS

Windows 95/98/2000/NT 4.0/XP

- Minimum extended memory: 32 megabytes for Windows 95/98
  48 megabytes for Windows 2000/NT 4.0/XP
- VGA Monitor
- Video Graphics card with minimum of 256 colors and minimum display area of 1024x768 pixels
- National Instruments GPIB card: PCI-GPIB recommended, PCMCIA or AT-GPIB
- Hard drive with 8 megabytes of unused space
- Printer is configured through Windows printer Setup feature

SUN/Solaris

- SPARC Workstation
- National Instruments GPIB Interface Card (GPIB-SPRC B), or external (GPIB/SCSI-A) interface box

Hewlett-Packard

- Hewlett–Packard 9000, Model 715 and later
- National Instruments GPIB Interface: a) EISA-GPIB for HP-UX or
  b) GPIB-SCSI-A Controller
- HP E2070 Card (ISA HP-IB Interface Card)
  or,
  HP E2071I Card (ISA/EISA High Speed HP-IB Interface Card).

SOFTWARE REQUIREMENTS

Windows 95/98/2000/NT 4.0/XP

- MS Windows 95, 98, 2000, NT 4.0 **or XP** Operating Systems
- National Instruments GPIB driver to match GPIB card used

SUN/Solaris

- Solaris version 1.x (SunOS 4.1.x), or
- Solaris version 2.x (SunOS 5.x), and
- National Instruments GPIB driver: NI-488.2M

Hewlett Packard

- HP 9000 O/S 10.x and above
- National Instruments GPIB driver: a) NI-488.2M for HP-UX
  b) No driver software is required for the SCSI-A Controller
- HP E2091 HP I/O Libraries for HP 9000 series 700.

GigaView SA INSTALLATION

Installation instructions for use with the Agilent 86100 Oscilloscope

GigaView SA is installed on a separate computer and communicates to 86100 oscilloscopes via the GPIB. See Hardware Requirements in previous section for specific GPIB interface board recommendations.

- Insert the GigaView SA CD into your CD drive.
- Double click on GigaView SA.exe and follow the step-by-step instructions. A popup box will appear that asks for a GigaView SA License String (see figure below).
- To obtain the license string, copy the CPU ID (highlight the string and use Control C) and email it to gigaviewSA@wavecrest.com or call WAVECREST at 1-800-733-7128 and a license string will be provided that can be typed into the GigaView SA License String box in order to complete the installation. A license string will be provided within one business day.
- When running the software, ensure the GPIB address is set correctly in GigaView SA to match the address of the oscilloscope. Go to Edit|Configuration and select the appropriate GPIB device number(7 is default).

GigaView SA can be installed on other PC's as a reader version that enables users to view files. Follow the same instructions as above, but do not enter a License String.

Installation instructions for use with the Tektronix CSA/TDS 8000 and 8200 Oscilloscopes

- Insert the GigaView SA CD into the back of the oscilloscope.
- Double click on GigaView SA.exe and follow the step-by-step instructions. A pop-up box will appear that asks for a GigaView SA License String (see figure below).
- To obtain the license string, copy the CPU ID (highlight the string and use Control C) and email it to gigaviewSA@wavecrest.com or call WAVECREST at 1-800-733-7128 and a license string will be provided that can be typed into the GigaView SA License String box in order to complete the installation. A license string will be provided within 24 hrs.

GigaView SA can be installed on other PC's as a reader version that enables users to view files. Follow the same instructions as above, but do not enter a License String.
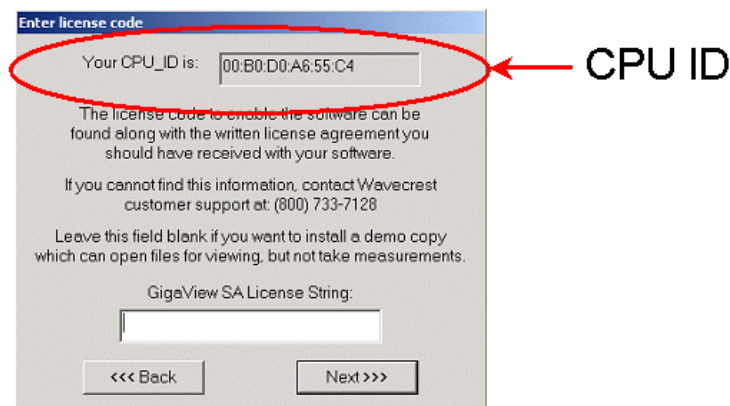
License Code pop-up box

It is recommended to use a separate monitor when running GigaView SA on your Tektronix oscilloscope. To setup a second monitor on your Tektronix oscilloscope follow these steps;

- Connect a monitor to the SVGA Out on the back of the oscilloscope.

- Right mouse click on the oscilloscope desktop (minimize the oscilloscope software).

- Select the **Settings** tab.

- Set the appropriate screen area for the second monitor (for example 1024 x 768)

- Check the "**Extend my Windows desktop onto this monitor"** box.

- Apply changes and close window.

To run GigaView SA on the second monitor, drag the GigaView icon to the second monitor desktop and double click on the icon. Go to Edit|Configuration and select Tektronix oscilloscope for the target device.

Installation instructions for UNIX systems

Although it is not mandatory, it is recommended that root user perform the *GigaView SA* installation. If root user is unavailable, write permissions to the installation directory are needed. A symbolic link is created by the root user in the **/bin** directory in order to provide universal access to the program.

To install *GigaView SA*:

1. Mount the CDROM using the applicable method for your workstation.

2. Issue the following command:

   ```
   /<cdrom_loadpoint>/setup.sun
   or
   /<cdrom_loadpoint>/setup.hp
   ```

   replacing <cdrom_loadpoint> with the applicable path for your workstation.

3. Follow the prompts to install the required files.

   If you did not install the files as root user, a symbolic link to the /bin directory by someone with root access should be entered as directed by the installation program.

4. CShell users should now issue the rehash command in order to refresh the path.

5. To install the license codes, issue the command:

   ```
   gigascope -license
   ```

   and enter supplied license codes.

6. To configure the macro language interface, issue the command:

   ```
   gigascope -macrocfg
   ```

7. The installation is now complete. Launch the program by issuing the command:

   ```
   gigascope
   ```

If your *WAVECREST* instrument is not configured as GPIB device 5, you will need to replace the default by selecting Edit; Configuration; and replacing the name with the applicable device.

For more information regarding *GigaView SA* installation and remote automation, contact *WAVECREST Corporation* at (952)646-0111 or email TechSupport@wavecrest.com.

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Introducing *GigaView SA* Software

For data rates beyond 1 Gb/s, signal integrity becomes the most critical issue for determining overall device performance, which means more comprehensive analysis tools are required. Using *WAVECREST's* GigaView SA software with a sampling oscilloscope, it is now possible to significantly expand your analysis capabilities. You can quantify Random and Deterministic Jitter and Amplitude components, measure Total Jitter and Total Amplitude Noise to 10^{-16} BER and quantify Data Dependent Jitter. You can determine the horizontal and vertical eye opening to 10^{-16} BER in seconds. *WAVECREST's* signal integrity solutions have offered comprehensive analysis capabilities to design engineers for over 10 years. This experience enables us to provide you with all the compliance and diagnostic tools on your sampling oscilloscope.

Expands the capabilities of your sampling oscilloscope

- **Quantifies Random and Deterministic Jitter**

- **Determines Total Jitter to 10^{-16} BER**

- **Quantifies Random and Deterministic Noise**

- **Determines Total Amplitude Noise to 10^{-16} BER**

- **Quantifies Data Dependent Jitter**

Using *GigaView SA*

Introduction

This section introduces a user to the basic controls and features of *GigaView SA* software. Refer to the Help files provided in the *GigaView SA* software for more detailed information on the functions and features.

Opening *GigaView SA*

Once *GigaView SA* is running on your oscilloscope or PC, the following screen will be displayed. Access to *GigaView SA* tools is through the Dialog bar at the right. Each tool is described in their respective Tool Overview sections in the online help system or in this User's Guide.

Title Bar - Contains the name of the application and tool.

Menu Bar - Provides pull-down menus for the many features in *GigaView*.

Toolbar - provides one-button activation of common application features

Work Area - Where active and/or open tools are displayed.

Dialog Bar – Provides access to tools and Contains tool-specific parameter options of active window.

Status Bar - Displays status messages, cursor position and tool status.

- "Run" will appear if "Run" was pressed in the active window.

- A black bar appears when the unit is performing/computing a measurement.

- A timer displays the elapsed time of the test.

- Cursor coordinates for the active window are displayed when using a pointing device.

MENU BAR

The Menu Bar is displayed across the top of the application window below the Title Bar. The Menu Bar provides pull-down menus for accessing the many features in *GigaView SA*.

| Tool | Edit | Action | Macro | Display | View | Accessories | Help |

Tool Pull-down Menu

The **Tool** pull-down menu lists options for opening new or previously saved tool configurations, printing the displayed window, recalling the most recent tools used and closing *GigaView SA*. See the **Glossary** section for a detailed explanation of each selection.

Tool	Edit	Action	Macro	Display	Vie
New					Ctrl+N
Open...					Ctrl+O
Close					
Save					Ctrl+S
Save As...					
Print...					Ctrl+P
Print Preview					
Configure Printer...					
1 VoltageEyeDiagram1.gtd					
2 TimingEyeDiagram1.gtd					
3 CompositePlot5.gtd					
Exit					

New, Open, Close, Save and Save As - Presents options for opening, closing or saving new or previously saved *GigaView SA* tools.

Print, Print Preview and Configure Printer - Presents options for printing, choosing and setting up a printer as well as previewing the active tool view as it would appear when printed.

1, 2, 3, 4 List - This area displays the last four tools used. Click on the number/name that corresponds with the tool to re-open.

Exit - Click on this command to end your *GigaView SA* session and shut down the instrument.

Edit Pull-down Menu

The **Edit** pull-down menu lists options for editing displayed data as well as customizing display/window characteristics.

Edit Action Macro Display
>   Copy   Ctrl+C
>   Clear
>   Annotation…
>   Configuration…
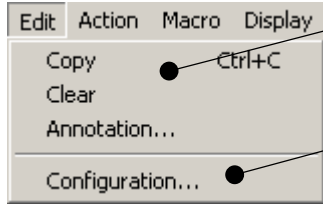
Copy, Clear and Annotation – Copy or clear the currently displayed data. Annotate the Summary view.

Configuration – User can customize display settings as well as GPIB board and device addresses.

GigaView SA

Display
- ☑ Auto-scale Windows ☑ Print Summary w/Pages
- ☐ No Margins   ☐ Print Color Background

	Color	Width
Plot Line 1	Magenta	1
Plot Line 2	Green	1
Plot Line 3	Red	1
Plot Line 4	Blue	1
Grid Lines	Grey	1
Markers	Red	4
Background	White	Font

Device Configuration

Target Device: Agilent Technologies,86100
GPIB Board: 0

Device Name (UNIX only): dev7
GPIB Device: 7

Apply | Close | Data Path | Reset
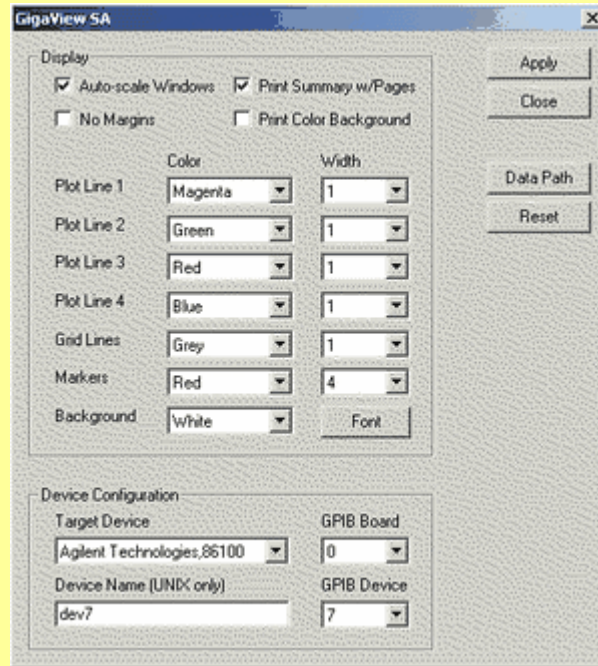
Action Pull-down Menu

The **Action** pull-down menu lists commands for taking measurements and determining threshold voltages in *GigaView SA*. See the **Glossary** for a more detailed explanation of each selection.
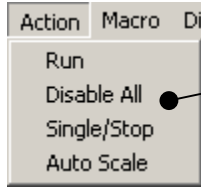
Run, **Disable All**, **Single/Stop** and **Auto Scale** - These options are for taking multiple/single measurements, as well as stopping all measurements, finding peak voltages and determining threshold voltages based on current settings.

Macro Pull-down Menu

The **Macro** pull-down menu lists commands for scripting and automating activities performed on a repetitive basis. The Macro interface is based on Microsoft's VBScript language that includes the ability to control program execution using conditional and looping statements. See Appendix B or online Help Topics.
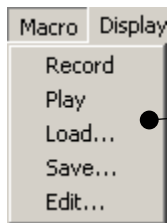
Macros can be recorded, modified or written from scratch. The Macro interface can also be used to access *GigaView* functionality from an external application. See Macro Overview in the *GigaView* Help Topics index.

Display Pull-down Menu

The **Display** pull-down menu lists commands for configuring the Main Window features, Work Area and *GigaView SA* tool display area. See the **Glossary** for a more detailed explanation of each selection.
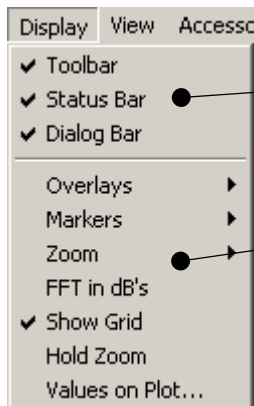
Toolbar, Status Bar and Dialog Bar - A check mark appears next to the menu item when it is displayed in the Main Window.

This area lists selections for customizing a tool's display area to aid in the presentation and interpretation of data. See the **Glossary** for a more detailed explanation of each selection.

View Pull-down Menu

The **View** pull-down menu lists options for adding a new window with the same contents as the active window, determining the order and placement of *GigaView SA* tools in the Work Area as well as scrolling between tools. Active tools are displayed at the bottom of the menu and are activated when checked. See the **Glossary** for a more detailed explanation of each selection.

Add - Adds a new window with the same contents as the active window. User can then change the view; a tool typically has different views associated with it.

Cascade and Tile - Determines the order and placement of *GigaView* tools in the Work Area.

Next and Previous - Used for scrolling between active tools.

Composite Plot - Used to overlay various plots which relate to each other. The plots must be of the same plot type

This area lists all open/active tools.

Accessories Pull-down Menu

The **Accessories** pull-down menu lists additional system features.

This area lists resident features of the operating system.
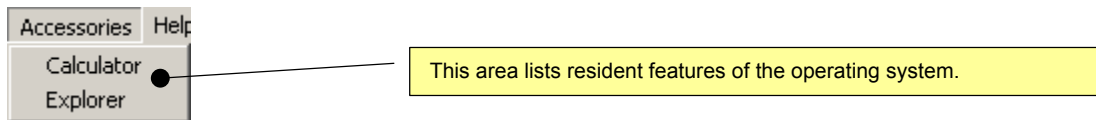
Help Pull-down Menu

The **Help** pull-down menu provides access to the online help system, version number and technical support phone number.

Clicking on **Help Topics...** opens the *GigaView* online help system.

Online Documentation - Clicking on this selections accesses additional *WAVECREST Corporation* documentation.

Clicking on this selection displays the software version number and *WAVECREST Corporation's* technical support number.
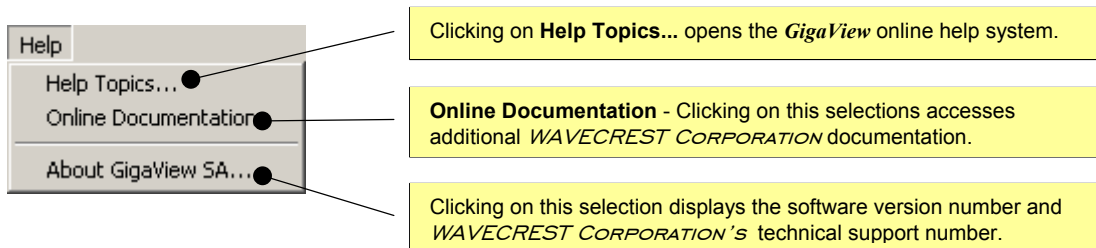
TOOLBAR

The toolbar is displayed across the top of the application window below the menu bar. The toolbar provides one-button activation for many of the selections listed in the **Menu Bar** pull-down menus such as **New, Open, Save, Run** and **Single/Stop**. See the **Glossary** section for a more detailed explanation of individual buttons.

To hide or display the Toolbar, un-check/check **Toolbar** in the **Display** menu.
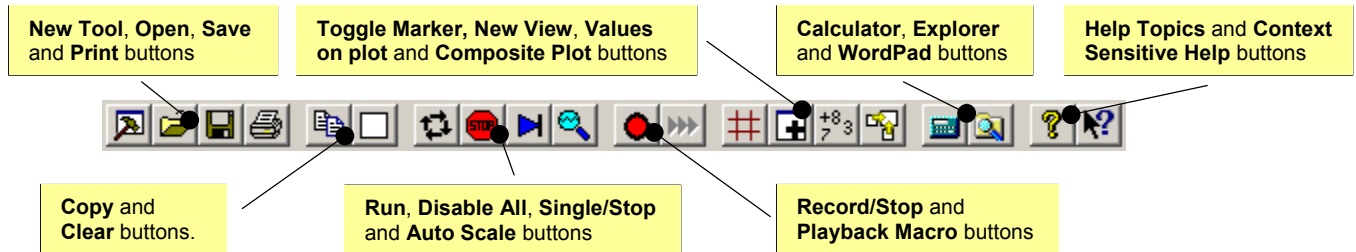
New Tool - Open a new tool in *GigaView SA*. Tool buttons will be displayed in place of the Dialog Bar.

Open Tool - Open an existing tool in a new window. Multiple tools can be open at the same time.

Save - Saves the active tool to its current name and directory. When saving a tool for the first time, *GigaView SA* displays the Save As dialog box. To change the name and directory of an existing tool, choose the Save As command.

Print - Print a tool view. This command presents a Print dialog box, where the range of pages to be printed and the number of copies may be specified as well as the destination printer and other printer setup options.

Copy - Copy selected data onto the clipboard.

Clear - Clears active window of data.

Run - Repetitively acquire new measurements in active tool. Measurements will be acquired until either the Single/Stop command is issued or an error occurs.

Disable All - Stops all running windows simultaneously.

Single/Stop - Acquire a single measurement in active tool. Also used to stop current series of measurements when the Run command is issued.

Auto Scale - Analyzes the waveform and automatically configures parameters for display.

Record/Stop Macro - Record a series of steps that can then be replayed. See Macro Overview for an in-depth description of the Macro feature.

Playback Macro - Play back a series of steps that were previously recorded. See Macro Overview for an in-depth description of the Macro feature.

Toggle Marker Mode - Scrolls through marker selections by displaying current selection on window.

New View - Open a new window with the same contents as the active window. You can open multiple tool windows to display different parts or views of a tool at the same time. If you change the contents in one window, all other windows containing the same tool reflect those changes. When you open a new window, it becomes the active window and is displayed on top of all other open windows.

Values on Plot - Provides option of displaying all or select measurement data in text format in the active tool window.

Composite Plot - Used to overlay various plots which relate to each other. The plots must be of the same plot type.

Calculator - Activates calculator.

Windows Explorer - Activates Windows Explorer feature of operating system.

Wordpad - Activates Wordpad for text editing.

Help Topics - Opens the online Help system.

Context Sensitive Help - Activates context sensitive help. Once activated, the cursor changes to the Context Sensitive Help icon and will remain so until another click of the pointing device occurs. Upon clicking the second time, Help text will be displayed.

INITIAL DIALOG BAR

The initial Dialog Bar (see figure below) displays each tool selection. Once a tool is chosen, the Dialog Bar will remain showing various pages of menus to control each tool. These configuration menus change to reflect the selected tool window if more that one tool at a time is open.

Clicking on a button opens the tool.
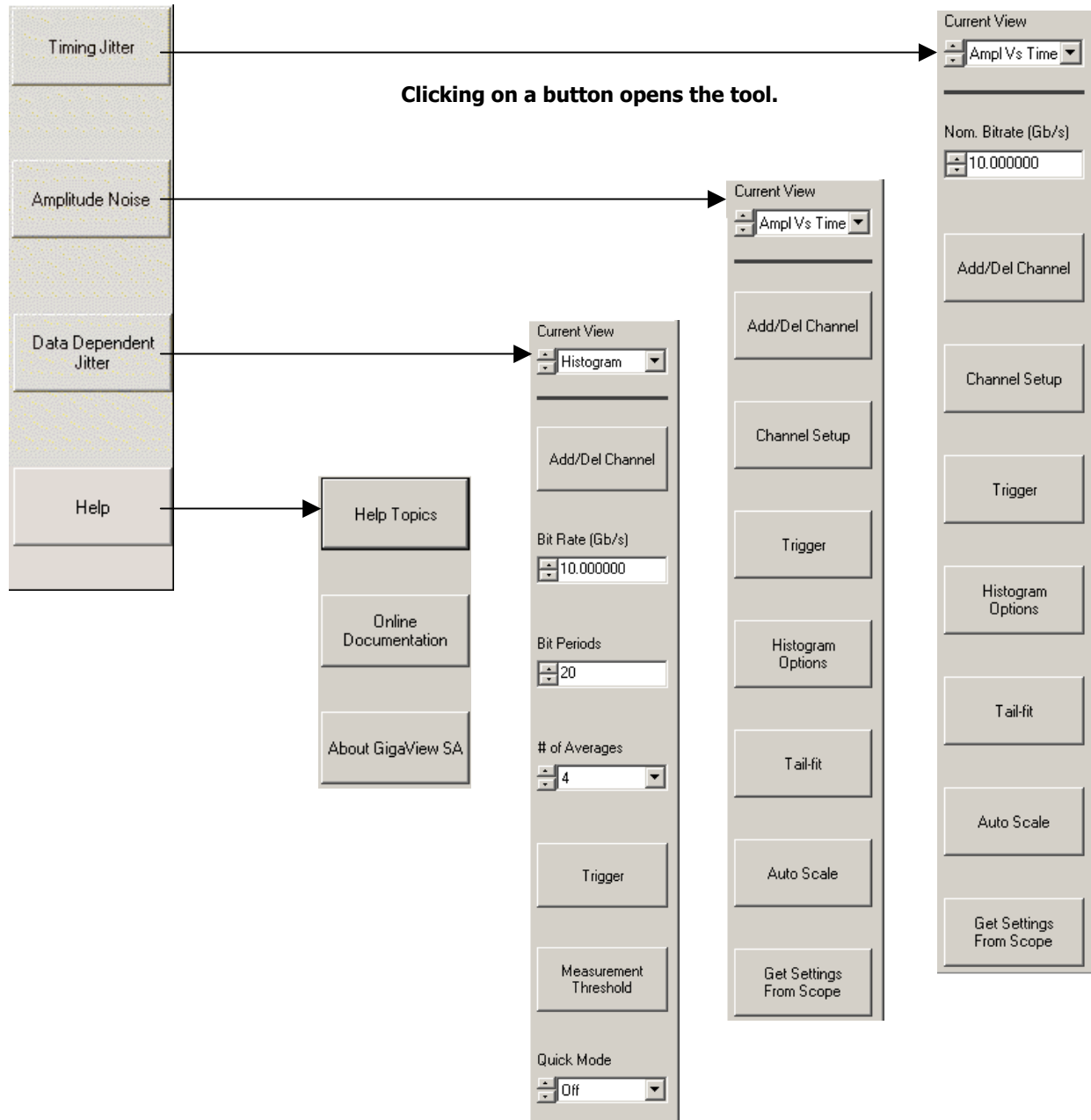
DIALOG BARS

Once a measurement tool has been chosen, the **Dialog Bar** displays parameter selections. The tools have parameters common between them, such as Offset or Delay , while each of the *GigaView SA* tools has parameters unique to their function. For a detailed explanation of a specific tool's Dialog Bar parameters, see the **Glossary** section at the end of this manual or use the context sensitive online Help system in *GigaView SA*.

The **Current View** menu lists data display options and remains unchanged throughout tool dialog pages.

Scrolling menus list parameter and function options

User-selectable/configurable parameters in active fields

Command buttons for automatic parameter setting
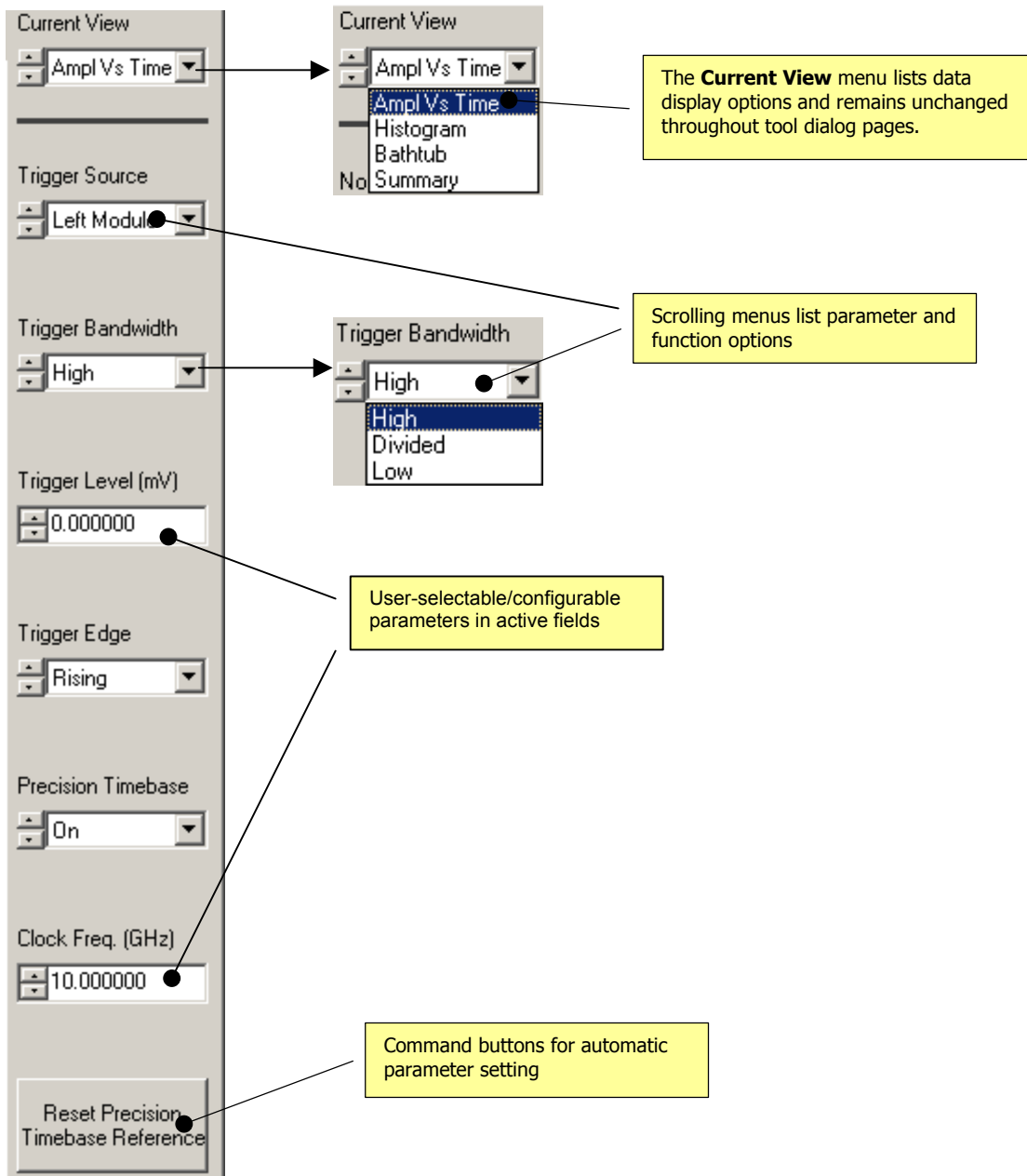
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GigaView SA **Measurement Tools**

Timing Jitter - Analyzes the timing histograms from an equivalent-time sampling oscilloscope. Requires a data pattern and bit clock.

Amplitude Noise - Analyzes the timing histograms from an equivalent-time sampling oscilloscope. Requires a data pattern and bit clock.

Data Dependent Jitter - Analyzes data dependent jitter, or mean displacement of edges, from the ideal position using an equivalent-time sampling oscilloscope. Requires a data pattern and a pattern trigger.
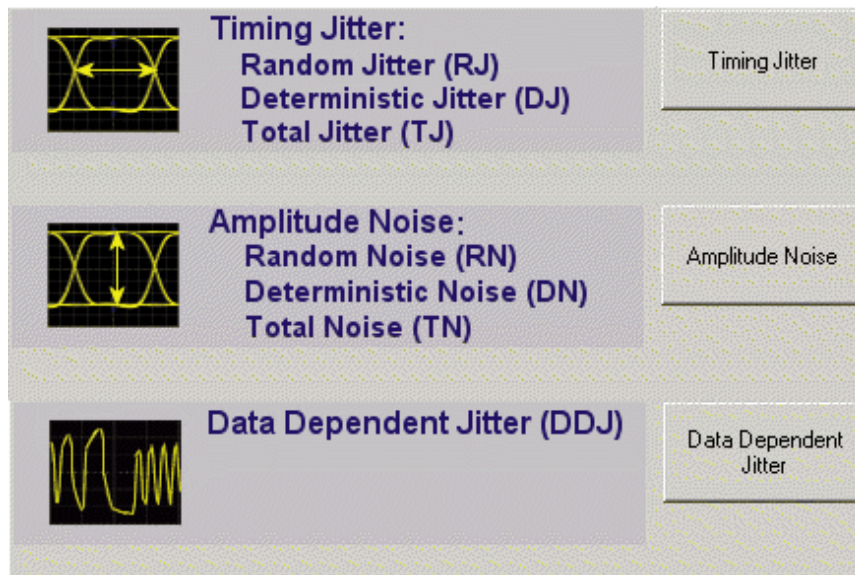
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Timing Jitter Tool

Applications

- Accurately determine device performance using TailFit™ to separate Random and Deterministic Jitter for data signals from 50 Mb/s to 40 Gb/s.

- Quantify Random (RJ) and Deterministic (DJ) Jitter

- Quantify Total Jitter (TJ) to 10^{-16} BER

- Obtain a Bathtub curve that shows eye opening as a function of probability level

Timing Jitter:
Random Jitter (RJ)
Deterministic Jitter (DJ)
Total Jitter (TJ)

Overview

This tool analyzes the timing histograms from an equivalent-time sampling oscilloscope, obtained from an eye diagram, to quantify device performance and provide diagnostic information. The diagnostic results displayed include RJ, DJ, and TJ to 10^{-16} and a graphical view of the histograms and bathtub curve. The Timing Jitter tool requires a data pattern and bit clock.

> **GigaView SA** minimum requirements of Oscilloscope software:
>
> *Tektronix CSA/TDS 8000 & 8200*   **ver. 1.5.2.2 or higher**
>
> *Agilent 86100*   **ver A.03.05 or higher**
>
> **See "Help About" on the Oscilloscope to verify these versions.**

Timing Jitter Tool Dialog Bars (See the Glossary or Online Help for definitions of each field.)

Current View

Ampl Vs Time

Nom. Bitrate (Gb/s)

10.000000

Add/Del Channel

Channel Setup

Trigger

Histogram Options

Tail-fit

Auto Scale

Get Settings From Scope

Current View

Ampl Vs Time

Ampl Vs Time
Histogram
Bathtub
Summary

No

GigaView SA

Primary Channel:

○ 1   ○ 2   ○ 3
○ 4   ○ 5   ○ 6
○ 7   ○ 8

☑ Differential Pair:

○ 1   ○ 2   ○ 3
○ 4   ○ 5   ○ 6
○ 7   ○ 8

Enter

Mode

Infinite Pers

Watts/Div (uW)

31.300000

Offset (uW)

5.400000

Time/Div (ps)

33.300000

Delay (ns)

25.248600

Trigger Source

Left Module

Trigger Bandwidth

High

Trigger Level (mV)

0.000000

Trigger Edge

Rising

Precision Timebase

On

Clock Freq. (GHz)

10.000000

Reset Precision Timebase Reference

Display Scale

2 Divisions

Height (uW)

50.000000

Show Hist. Box

On

Stop on Success

On

Min Hits

5,000

Bit Error Rate

1e-12

Bathtub X-axis

Unit Interval

Keep Out Region

Keep Out Enable

On

Left Limit (ns)

0.000000

Right Limit (ns)

0.000000

From Markers

Making a Timing Jitter Measurement

Measurements can be performed in either single-ended or differential mode. No configurations need to be changed on the Agilent or Tektronix oscilloscopes for differential mode measurements.

Step 1

Open the Timing Jitter Tool and set nominal bit rate
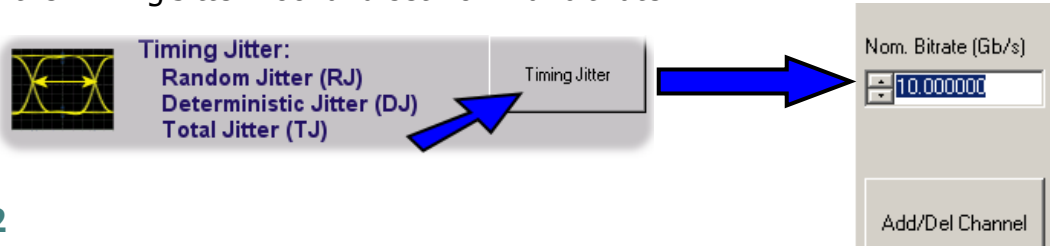
Step 2

Configure the channel inputs from the Add/Del Channel dialog box

Measurements can be performed in either single-ended or differential mode. For single-ended mode, select only one channel from the Primary Channel selection. For a differential measurement, select one Primary Channel, check the Differential Pair box and then select the other differential pair channel. No configurations need to be changed on the Agilent or Tektronix oscilloscopes for differential mode measurements.
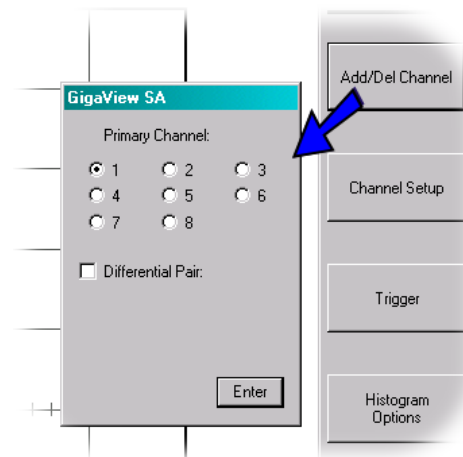
Select a channel

Step 3

Select the appropriate trigger option from the Trigger dialog bar

The trigger supplied to the Oscilloscope must be a *bit clock* trigger.

This dialog bar provides controls for the Trigger source, Trigger Level and Trigger Edge. The Trigger Source options are dependent on the Agilent or Tektronix oscilloscope. For example, The Agilent oscilloscopes can be triggered from the Front Panel, Left Module and Right Module. The Trigger Level sets the voltage for the trigger and the Trigger Edge selects either a rising or falling edge (see Figure to the right).

When choosing the Trigger source, you should use the same configuration/trigger as you would use to create any eye diagram or eye mask test.
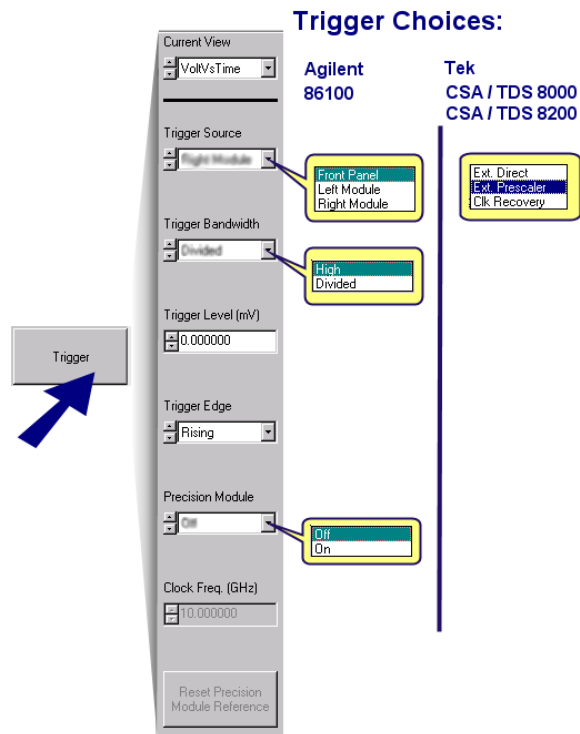
Step 4

Set up the Eye Diagram

The goal is for the eye diagram crossing to be centered on the screen (see Figure below). This can be accomplished in a number of ways.

First, settings can be adjusted manually on the oscilloscope front panel and then copied to GigaView SA by pressing **Get Settings From Scope.**

Second, you may set up the eye diagram by manually entering values for delay, volts/div, time/div and offset from the **Channel Setup** menu selection.

Or lastly, you may use Auto Scale by pressing [icon] on the toolbar, or by pressing the **AutoScale** button on the main toolbar menu selection.

It may be necessary to also adjust the height of the Histogram box. Use the mouse to left-click and drag the highlighted middle portion of the box. Specific size values and positions can be entered in the **Histogram Options** menu.

Trigger choices
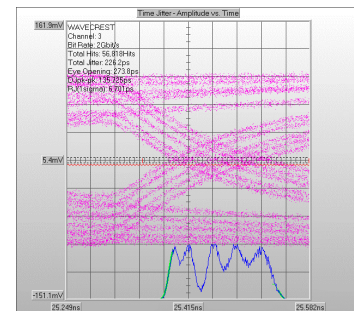
Eye Diagram Setup

Step 5

You are now ready to take a measurement

Press the ▶️ button for a single acquisition on the toolbar. The software will take a quick initial acquisition of the eye diagram crossing. The results of the histogram of this crossing will be displayed in the Oscilloscope and Histogram views.

Verify that the eye diagram placement is good.

If so, you can continue the data acquisition process by pressing 🔄 or run on the toolbar. The software will continue to acquire data for the eye diagram and zoomed in portion of the eye diagram. While the measurement is acquiring, the hourglass cursor will appear, and the status bar in the lower right will move, and RUN will be displayed.

> RUN ▌ 5.4s

Acquisition typically takes a few minutes but may be more if the histograms have a complex shape. When a successful TailFit is obtained, results for the Total Jitter and eye opening will be displayed and RUN will disappear. Highlighted lines will be displayed to show the TailFits.

Step 6

View the results

To toggle results on or off the plot, press ⁺⁸³ .

Other views, or plots, are available without reacquiring the measurement. To see these views, choose from the Current View menu (see Figure to the right). The default view is the "AmplVsTime" plot which is the common oscilloscope view. To view only the histogram, choose "Histogram". "Bathtub" view shows the Bathtub curve and total jitter. "Summary" shows a table of text results.

Current View	
Ampl Vs Time ▼	
Ampl Vs Time	
Histogram	
Bathtub	
Summary	
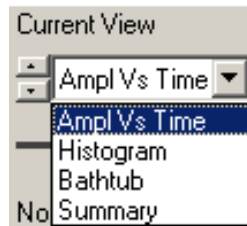
WAVECREST	Time Jitter Summary
Channel	3
Bit Rate	2Gbit/s
Total Hits	56,818Hits
Total Jitter	226.2ps
Eye Opening	273.8ps
DJpk-pk	135.725ps
RJ(1sigma)	6.701ps

Current View Summary

When TailFit is successful for the histogram, you will see the following results (see Figure to the right) on the summary screen:

- The channel number is the channel for the data.
- Total Jitter is displayed for the selected BER.
- Eye Opening is determined from the Bit Rate calculation (in ps) minus the Total Jitter.

Other values are shown in the Figure to the right. 'DJ' is the Deterministic Jitter of the histogram. 'RJrt' is the Random Jitter for the right side of the histogram. 'RJlt' is the Random Jitter for the left side of the histogram. The RJ values used for Total Jitter calculation and the Bathtub curve are the 'RJrt' and 'RJlt' values.
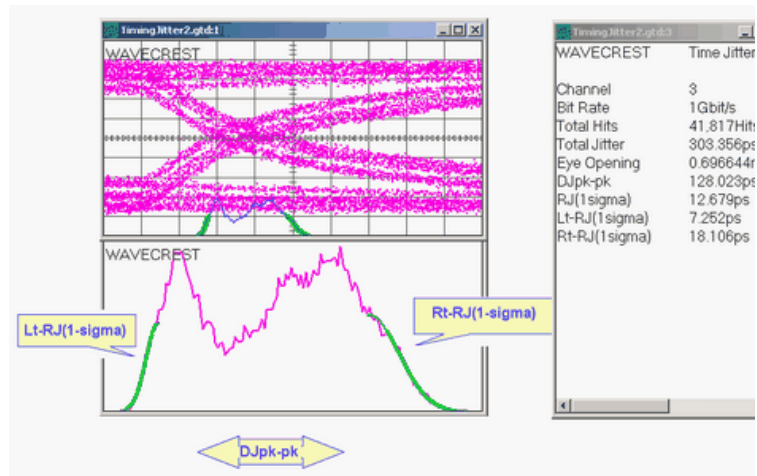
Definitions of summary values

The eye opening at the specified BER is also displayed as a vertical line in each histogram box. The line indicates the maximum extent of the jitter at the specified BER (See Figure to the right).
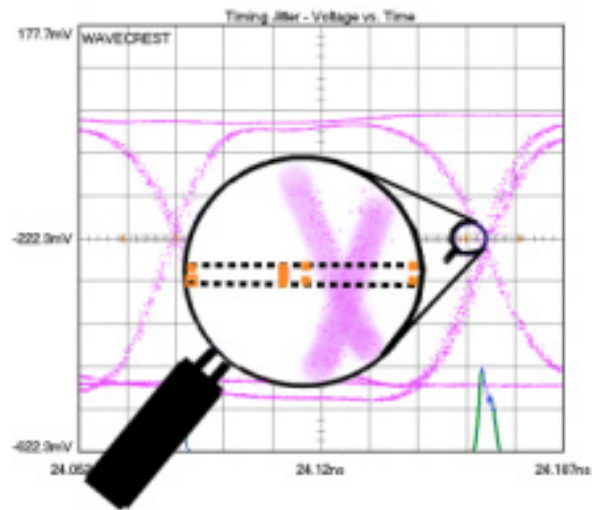
Vertical line in histogram box indicates eye opening at selected BER

Helpful Hints, Troubleshooting and Theory of Operation

This section briefly describes some helpful hints and a brief description about how the measurements are made.

Settings used by the TailFit are poor

In some cases, the TailFit algorithm may not detect low probability deterministic jitter. The symptoms of this would be the TailFit lines obviously do not fit to the random tail regions of the histogram. The example to the right shows this case. You should use the **Keep Out Region** to force the fit to occur outside of the markers. To do this
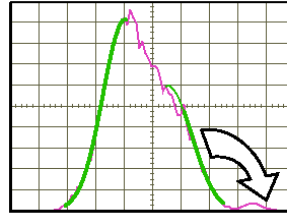
Tail Fit should be on the Right-most tail.

Select **TailFit** from the selection menu. Then select **Keep Out Region**. If a keep out region is defined, the TailFit or Gaussian distributions will only be fit to left and right of the keep out region. To define a keep out region the Current View must be on Histogram view. The **Keep Out Enable** must be **On**. The Left and Right limit can be selected by inputting values into the boxes or by using the markers.
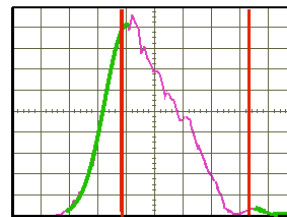
Use the 'Keep out' region to force Tailfit outside of the markers.

To select the vertical markers press two timesand a pair of vertical markers will be displayed on the screen. Move the markers by clicking the vertical line with the right mouse button and dragging the marker to the desired location. Press **From Markers** to set the Keep Out Region. Now reacquire the measurement.

Typical Test Patterns

Choosing the appropriate data test pattern is critical in order to accurately determine the system or device performance. Many telecom applications recommend using PRBS 2^{23}-1 or 2^{31}-1 test patterns. In order to achieve a sufficient statistical basis for long patterns using an equivalent time oscilloscope, the analysis time would be many years. For this reason, test patterns should be 25,000 bits or shorter. Typical test patterns that meet this requirement include K28.5, CJTPAT, 2^7-1, 2^{10}-1.

Triggering Hints

To obtain statistically valid samples for jitter and noise calculations from an eye diagram it is important to have the correct trigger condition. Histograms from the Timing Jitter analysis tool should be identical in shape as crossing points are analyzed as a function of the trigger delay. One condition can produce different histograms: using a divided bit clock that is an integer multiple of the pattern length. This causes the triggering and sampling become predictable and the triggering does not occur on an every bit basis. The common example is an 'incomplete' eye.

Interpreting Timing Jitter Views (plots)

The Timing Jitter tool has 4 views available. The Current View selection allows you to choose which plot to view.

Interpreting views (plots)

Ampl vs. Time - Shows the standard oscilloscope "eye diagram"

Histogram - Shows the Histogram of the crossing from the Volts vs. Time view, or Eye Diagram

Bathtub - Shows the timing eye closure

Summary - Shows a text display of measurement results

Ampl vs. Time View

This view shows the standard oscilloscope "eye diagram" crossing. The amplitude is displayed on the vertical y-axis and Time is displayed on the horizontal x-axis. A histogram of the crossing point of the 1 and 0 transitions is displayed. To examine the histogram, change the "Current View" to Histogram.
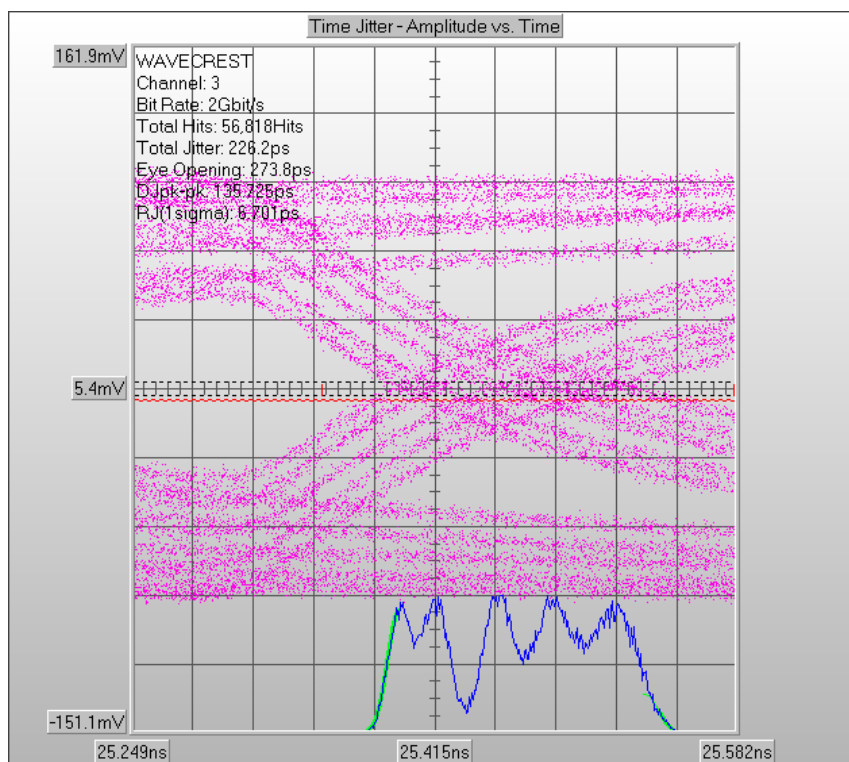
Histogram View

This view shows the Histogram of the 1/0 crossing from the Ampl vs. Time view – or Eye Diagram. On this plot, the number of accumulated samples for this histogram is displayed on the vertical y-axis. The trigger delay, or time, is displayed on the horizontal x-axis. TailFit lines are overlaid on the histogram to show the model used for RJ/DJ separation.
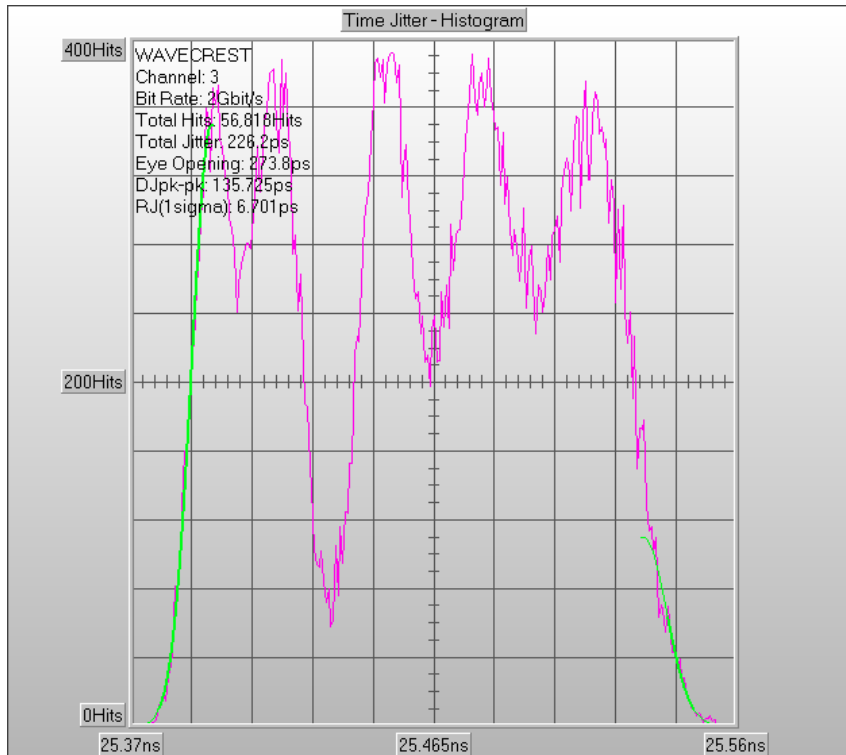
Bathtub View

This view shows the timing eye closure. The RJ/DJ values from the Histogram are used to show what the Total Jitter will be at a particular Bit Error Rate. Bit Error Rate is displayed on the vertical y-axis. Time (from the Eye Diagram) is displayed on the horizontal x-axis.
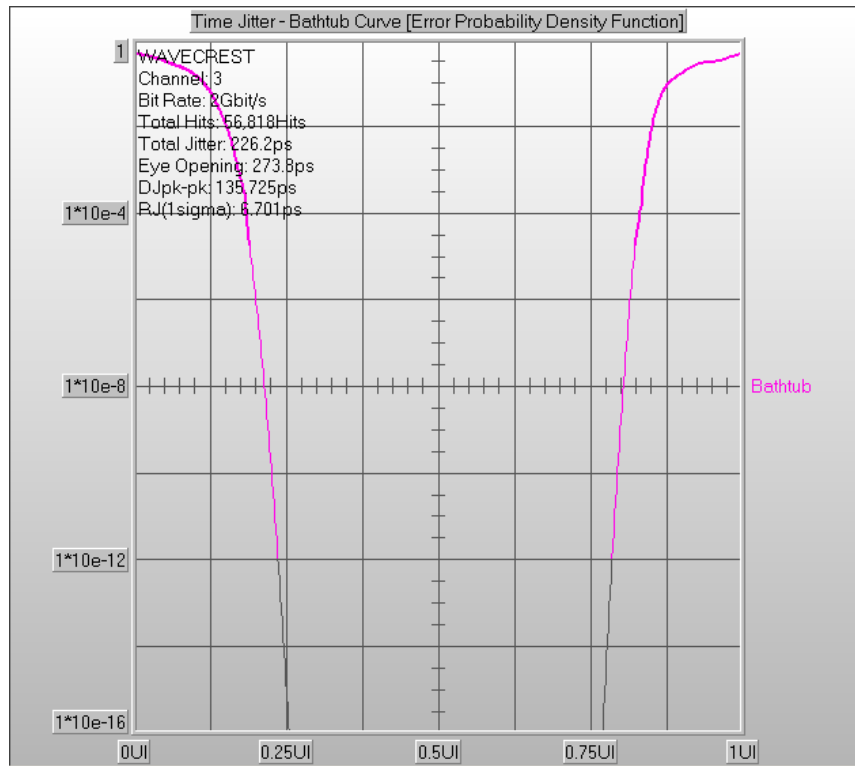
Summary View

The summary page shows a text display of measurement results.

```
WAVECREST          Time Jitter Summary

Channel            3
Bit Rate           2Gbit/s
Total Hits         56,818Hits
Total Jitter       226.2ps
Eye Opening        273.8ps
DJpk-pk            135.725ps
RJ(1sigma)         6.701ps
```

- The **Channel** number is the channel for the data.
- **Bit Rate** is determined from the mean position of the right and left crossing point of the eye diagram..
- **Total Jitter** is displayed for the selected BER.
- **Eye Opening** is determined from the Bit Rate calculation (in ps) minus the Total Jitter.
- **DJ** is the Deterministic Jitter of the histogram
- **RJrt** is the Random Jitter for the right side of the histogram.
- **RJlt** is the Random Jitter for the left side of the histogram.

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Amplitude Noise Tool

Applications

- Accurately determine device performance using TailFit™ to separate Random and Deterministic Noise
- Quantify device performance to 10^{-16} BER

Amplitude Noise:
Random Noise (RN)
Deterministic Noise (DN)
Total Noise (TN)
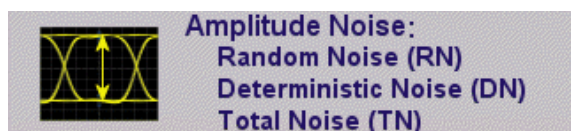
Overview

The tool analyzes the timing histograms from an equivalent-time sampling oscilloscope obtained from an eye diagram to quantify device performance and provide diagnostic information. The Amplitude Noise tool requires a data pattern and bit clock.

With this tool, the user can:

- Quantify Random and Deterministic Noise
- Quantify Total Noise to 10^{-16} BER
- Obtain a Bathtub curve that shows vertical eye opening as a function of probability level

⚠️	*GigaView SA* **minimum requirements of Oscilloscope software:**
	Tektronix CSA/TDS 8000 & *8200* **ver. 1.5.2.2 or higher**
	Agilent 86100 **ver A.03.05 or higher**
	See "Help About" on the Oscilloscope to verify these versions.

Amplitude Tool Dialog Bars (See the Glossary or Online Help for definitions of each field.)

Current View

[VoltVsTime ▼]

Add/Del Channel

Channel Setup

Trigger

Histogram Options

Tail-fit

Auto Scale

Get Settings From Scope

Current View

[VoltVsTime ▼]

- VoltVsTime
- Top Hist
- Bottom Hist
- Bathtub
- Summary

GigaView SA

Primary Channel:

- ⦿ 1 ○ 2 ○ 3
- ○ 4 ○ 5 ○ 6
- ○ 7 ○ 8

☑ Differential Pair:

- ○ 1 ⦿ 2 ○ 3
- ○ 4 ○ 5 ○ 6
- ○ 7 ○ 8

[Enter]

Stop on Success

[On ▼]

Min Hits

[5,000]

Bit Error Rate

[1e-12 ▼]

User Amplitude Limits

[On ▼]

High Limit (uW)

[0.000000]

Low Limit (uW)

[0.000000]

Keep Out Region

Display Scale

[2 Divisions ▼]

Height (uW)

[50.000000]

Width (ps)

[50.000000]

Show Hist. Box

[On ▼]

Default

Trigger Source

[Left Module ▼]

Trigger Bandwidth

[High ▼]

Trigger Level (mV)

[0.000000]

Trigger Edge

[Rising ▼]

Precision Timebase

[On ▼]

Clock Freq. (GHz)

[10.000000]

Reset Precision Timebase Reference

Mode

[Infinite Pers ▼]

Watts/Div (uW)

[50.000000]

Offset (uW)

[250.000000]

Time/Div (ps)

[100.000000]

Delay (ns)

[24.000000]

Keep Out Enable

[On ▼]

Left Limit (mV)

[-520.480000]

Right Limit (mV)

[-467.280000]

From Markers

Making an Amplitude Noise Measurement

Step 1

Open the Amplitude Noise Tool
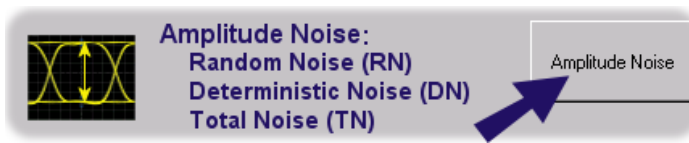
Step 2

Configure the channel inputs from the Add/Del Channel menu

Measurements can be performed in either single-ended or differential mode. For single-ended mode select only one channel from the Primary Channel selection. For a differential measurement select one Primary Channel, check the Differential Pair box and then select the other differential pair channel. No configurations need to be changed on the Agilent or Tektronix oscilloscopes for differential mode measurements.

Select a channel

Step 3

Select the appropriate trigger option from the Trigger menu

The trigger supplied to the Oscilloscope must be a *bit clock* trigger.

This menu provides controls for the Trigger source, Trigger Level and Trigger Edge. The Trigger Source options are dependent on the Agilent or Tektronix oscilloscope. For example, the Agilent oscilloscopes can be triggered from the Front Panel, Left Module and Right Module. The Trigger Level sets the voltage for the trigger and the Trigger Edge selects either a rising or falling edge.

When choosing the Trigger source, you should use the same configuration/trigger as you would use to create any eye diagram or eye mask test. See the Figure to the right for trigger setup.
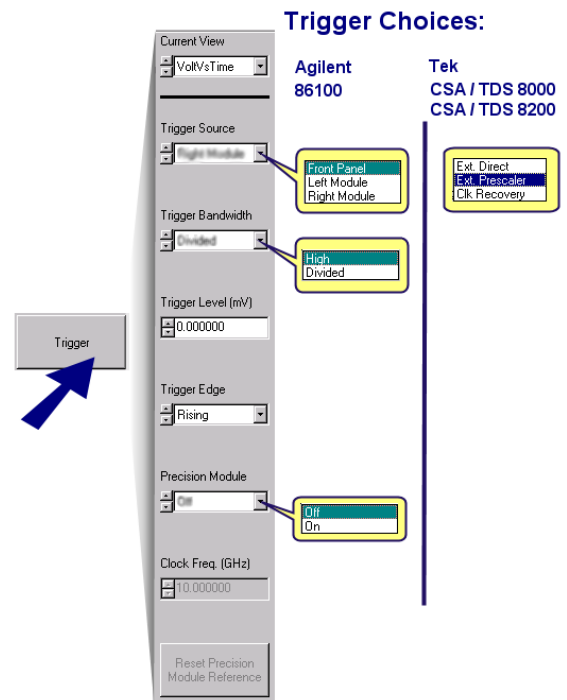
Trigger choices

Step 4

Setup the eye diagram

The goal is for the eye diagram to be centered on the screen as see in the Figure to the right. The top of the eye should be centered roughly ¼ the distance from the top of the screen and the bottom of the eye is centered roughly ¼ from the bottom of the screen. This can be accomplished in a number of ways.

First, settings can be adjusted manually on the oscilloscope front panel and then copied to GigaView SA by pressing **Get Settings From Scope**.

Second, set up the eye diagram by manually entering values for delay, volts/div, time/div and offset from the **Channel Setup** menu selection.

Eye Diagram Setup

Or lastly, you may use Auto Scale by pressing on the toolbar, or by pressing the **Auto Scale** button on the main toolbar menu selection.

It may be necessary to also adjust the size of the Histogram boxes so that the waveform passes through both. Use the mouse to left-click and drag the highlighted corner or edge of a box. Both boxes will be sized at the same time. Specific size values and positions can be entered in the **Histogram Options** menu.
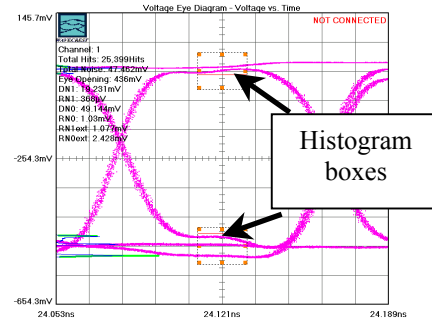
Step 5

You are now ready to take a measurement

Press the ▶️ button for a single acquisition on the toolbar. The software will take a quick initial acquisition of the eye diagram and then zoom into the **top** and the **bottom** part of the eye diagram defined by the histogram windows. Verify that the eye diagram placement is good. If so, you can continue the data acquisition process by pressing 🔄 or run on the toolbar. The software will continue to acquire data for the eye diagram and zoomed in portion of the eye diagram. While the measurement is acquiring, the hourglass cursor will appear, and the status bar in the lower right will move, and RUN will be displayed.

Acquisition typically takes a few minutes but may be more if the histograms have a complex shape. When a successful TailFit is obtained, results for the Total Jitter and eye opening will be displayed and RUN will disappear. Highlighted lines will be displayed to show the TailFits.

Step 6

View the Results

To toggle results on or off the plot, press ⊞. Other views, or plots, are available without reacquiring the measurement. To see these views, choose from the Current View menu. The default view is the "VoltVsTime" plot which is the common oscilloscope view. To view the individual histograms, choose "Top Hist" or "Bottom Hist". "Bathtub" view shows the Bathtub curve and total jitter. "Summary" shows a table of text results.

WAVECREST	Amplitude Noise Summary
Channel	1
Total Hits	25,399Hits
Total Noise	47.462mV
Eye Opening	436mV
DN1	19.231mV
RN1	368µV
DN0	49.144mV
RN0	1.03mV
RN1ext	1.077mV
RN0ext	2.428mV

Current view summary

When TailFit is successful for both histograms you will see the following results on the summary screen: The channel number is the channel for the data. The 'Total Noise' is displayed for the selected BER. 'Eye opening' is determined from the mean of the top and bottom histogram minus the 'Total Noise' (in mV). 'DN1' is the Deterministic Noise for the top histogram or level 1 and 'DN0' is the Deterministic Noise for the bottom histogram or level 0. 'RN1' is the Random Noise for the top histogram or the Random Noise of the inside portion of the eye diagram for the 1 level. 'RN0' is the Random Noise for the bottom histogram or the Random Noise of the inside portion of the eye diagram for the 0 level. 'RN1ext' is the Random Noise of the external side of the top histogram. 'RN0ext' is the Random Noise of the outside bottom histogram. The only RN values used for Total Noise calculation and the Bathtub curve are the 'RN1' and 'RN0' values. These labels are shown in the Figure to the right.
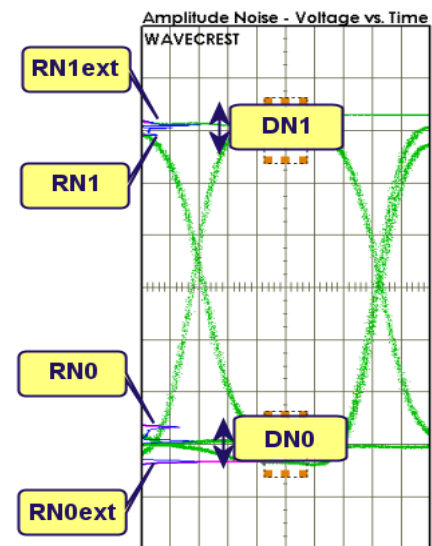
Definitions of summary values

The eye opening at the specified BER is also displayed as a horizontal line in each histogram box. The line indicates the maximum extent of the amplitude noise at the specified BER. See Figure to the right.

Helpful Hints, Troubleshooting and Theory of Operation

This section briefly describes some helpful hints and a brief description about how the measurements are made.
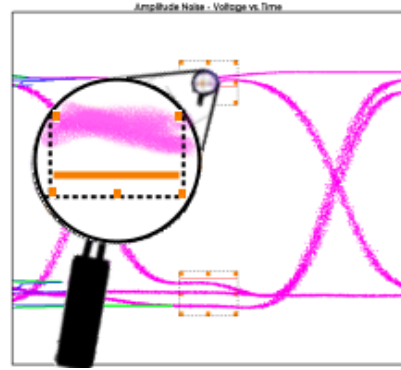
Horizontal line in histogram box
indicates eye opening at selected BER

Improving Test Time

When "Single Acquire/Stop Run" ▶| is pressed, the oscilloscope acquires samples in the histograms for a

fixed amount of time. Pressing Run 🔁 has the same effect as pressing Single Acquire many times. When Run is pressed, the test will repeatedly acquire samples until a TailFit can be performed and then the test stops. The fixed amount of time during which samples are acquired can be changed. By increasing the value, overall test time may be shortened because the TailFit algorithm has more time and samples to attempt a fit before the next acquisition in the Run cycle. The setting is located in the **Histogram Options** menu and is called **Acquire Time (s).**

So, for instance, with Acquire Time set to 1s the test may run for many minutes acquiring samples and checking TailFit for each histogram in one second bursts. By setting Acquire Time to 10s each individual acquire will take longer, but the percentage of time used for the TailFit process will be greater and therefore overall test time may be shortened.

Settings used of the TailFit is poor

In some cases, the TailFit algorithm may not detect low probability deterministic jitter. The symptoms of this would be the TailFit lines obviously do not fit to the random tail regions of the histogram. The example to the right shows this case. You should use the **Keep Out Region** to force the fit to occur outside of the markers. To do this

Select **TailFit** from the selection menu. Then select **Keep Out Region**. If a keep out region is defined, the TailFit or Gaussian distributions will only be fit to left and right of the keep out region. To define a keep out region the Current View must be either on Left or Right Histogram. The **Keep Out Enable** must be **On**. The Left and Right limit can be selected by inputting values into the boxes or by using the markers. To

select the vertical markers press ⌗ two times and a

Tail Fit should be on the Right-most tail.

Use the 'Keep out' region to force Tailfit outside of the markers.

pair of vertical markers will be displayed on the screen. Move the markers by clicking the vertical line with the right mouse button and dragging the marker to the desired location. Press **From Markers** to set the keep out region. Now reacquire the measurement.

Typical Test Patterns

Choosing the appropriate data test pattern is critical in order to accurately determine the system or device performance. Many telecom applications recommend using PRBS 2^{23}-1 or 2^{31}-1 test patterns. In order to achieve a sufficient statistical basis for long patterns using an equivalent time oscilloscope, the analysis time would be many years. For this reason, test patterns should be 25,000 bits or shorter. Typical test patterns that meet this requirement include K28.5, CJTPAT, 2^7-1, 2^{10}-1.

Triggering Hints

To obtain statistically valid samples for jitter and noise calculations from an eye diagram it is important to have the correct trigger condition. The **top** and **bottom** histograms from the **Amplitude Noise** analysis should **be** identical in shape. One condition can produce different right and left timing histograms: using a divided **bit** clock that is an integer multiple of the pattern length. This causes the triggering and sampling become predictable and the triggering does not occur on an every bit basis. The common example is an 'incomplete' eye.

Interpreting Amplitude Noise Views (plots)

The Amplitude Noise tool has 5 views available. The Current View selection allows you to choose which plot to view.

Interpreting views (plots)

Ampl vs. Time - Shows the standard oscilloscope "eye diagram"

Top Histogram - Shows the Histogram of the top, or '1' level, crossing from the Volts vs. Time view, or Eye Diagram

Bottom Histogram - Shows the Histogram of the bottom, or '0' level, crossing from the Volts vs. Time view, or Eye Diagram

Bathtub - Shows the amplitude noise eye closure

Summary - Shows a text display of measurement results

Ampl vs. Time View

This view shows the standard oscilloscope "eye diagram". Volts are displayed on the vertical y-axis and Time is displayed on the horizontal x-axis. Amplitude histograms of the '1' level and '0' level at the center of the eye are displayed. To examine each individual histogram, change the "Current View" to either Top Histogram or Bottom Histogram.
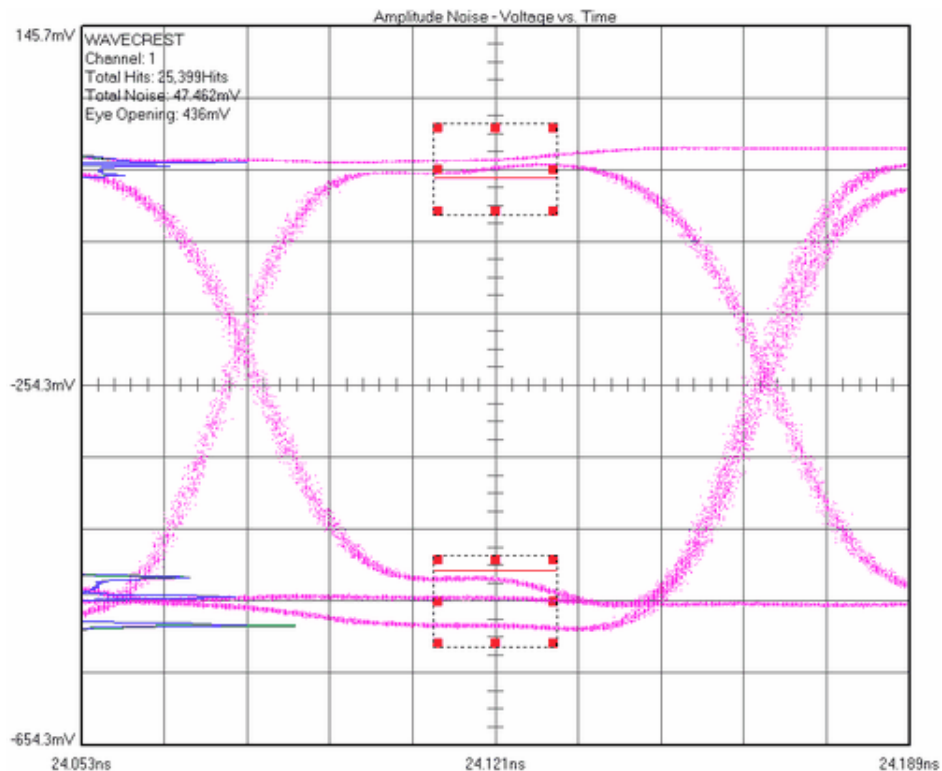
Top Histogram View

This view shows the Histogram of the top or '1' level crossing from the Volts vs. Time view, or Eye Diagram. On this plot, the number of accumulated samples for this histogram is displayed on the vertical y-axis. The amplitude or voltage is displayed on the horizontal x-axis. TailFit lines are overlaid on the histogram to show the model used for RN/DN separation.
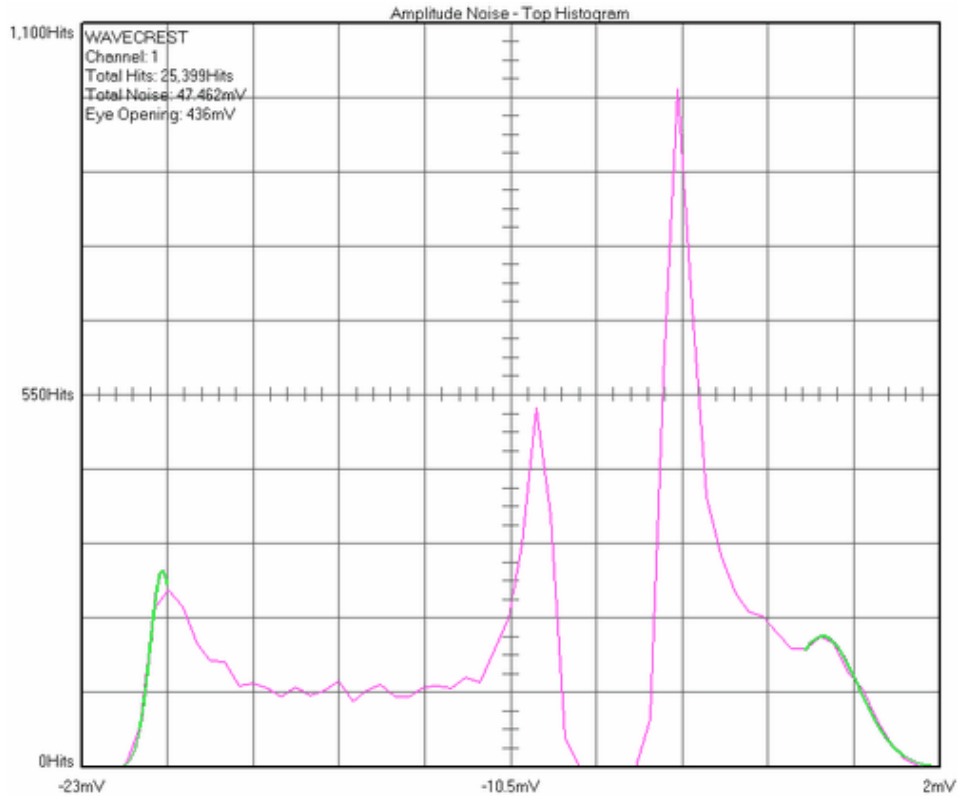
Bottom Histogram View

This view shows the Histogram of the top or '0' level crossing from the Volts vs. Time view, or Eye Diagram. On this plot, the number of accumulated samples for this histogram is displayed on the vertical y-axis. The amplitude or voltage is displayed on the horizontal x-axis. TailFit lines are overlaid on the histogram to show the model used for RN/DN separation.
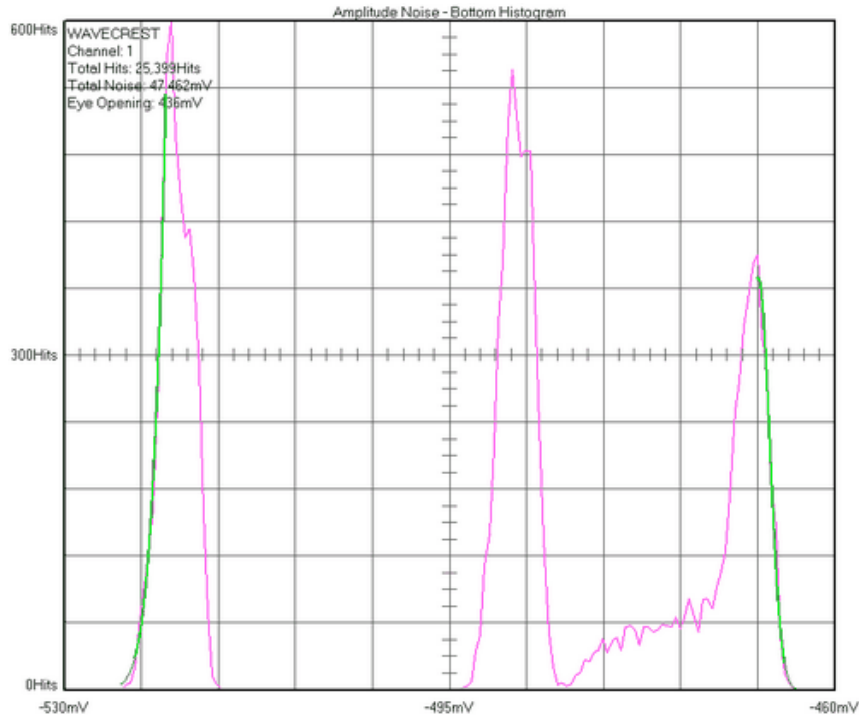
Bathtub View

This view shows the amplitude noise eye closure. The inside RN/DN values from the Top and Bottom Histograms are used to show what the Total Noise will be at a particular Bit Error Rate. Bit Error Rate is displayed on the vertical y-axis. Voltage (from the Eye Diagram) is displayed on the horizontal x-axis.
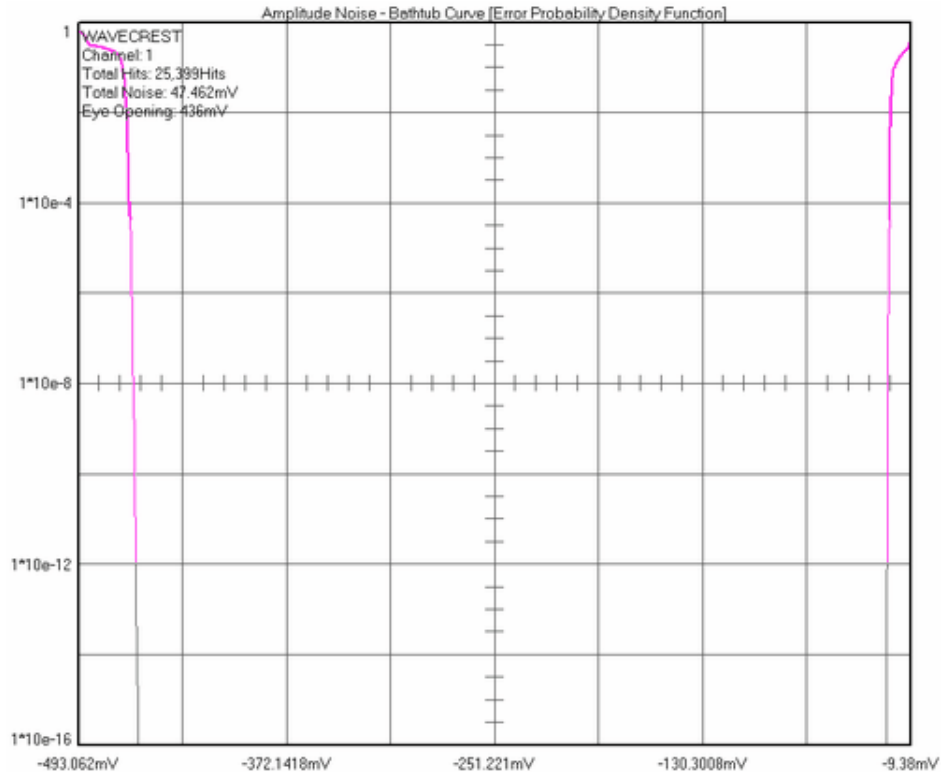
Summary View

The summary page shows a text display of measurement results.

```
WAVECREST        Amplitude Noise Summary

Channel          1
Total Hits       25,399Hits
Total Noise      47.462mV
Eye Opening      436mV
DN1              19.231mV
RN1              368µV
DN0              49.144mV
RN0              1.03mV
RN1ext           1.077mV
RN0ext           2.428mV
```

- Channel number is the channel for the data.
- Total Noise' is displayed for the selected BER.
- Eye opening' is determined from the mean of the top and bottom histogram minus the
- Total Noise (in mV).
- DN1 is the Deterministic Noise for the top histogram or level 1
- DN0 is the Deterministic Noise for the bottom histogram or level 0.
- RN1 is the Random Noise for the top histogram or the Random Noise of the inside portion of the eye diagram for the 1 level.
- RN0 is the Random Noise for the bottom histogram or the Random Noise of the inside portion of the eye diagram for the 0 level.
- RN1ext is the Random Noise of the external side of the top histogram.
- RN0ext is the Random Noise of the outside bottom histogram.

Data Dependent Jitter Tool

Applications

- Determine the Data Dependent Jitter (DDJ) for a system or device

- Determine DDJ for rising and falling edges

- Quantify DDJ for Jitter Tolerance measurements

- Quantify DDJ on bandwidth limiting devices such as backplanes

Overview

The tool analyzes data dependent jitter or mean displacement of edges from the ideal position using an equivalent time sampling oscilloscope. Data Dependent Jitter is also referred to as Duty Cycle Distortion and Inter-symbol Interference (DCD&ISI). The DDJ measurement must be performed on a repeating data pattern using a pattern trigger.

⚠	*GigaView SA* **minimum requirements of Oscilloscope software:**	
	Tektronix CSA/TDS 8000 & 8200	**ver. 1.5.2.2 or higher**
	Agilent 86100	**ver A.03.05 or higher**
	See "Help About" on the Oscilloscope to verify these versions.	

Data Dependent Jitter Tool Dialog Bars (See the Glossary or Online Help for definitions of each field.)

Current View
Histogram

Add/Del Channel

Bit Rate (Gb/s)
10.000000

Bit Periods
20

# of Averages
4

Trigger

Measurement Threshold

Quick Mode
Off

GigaView SA

Primary Channel:

◉ 1   ○ 2   ○ 3
○ 4   ○ 5   ○ 6
○ 7   ○ 8

☑ Differential Pair:

○ 1   ◉ 2   ○ 3
○ 4   ○ 5   ○ 6
○ 7   ○ 8

Enter

Meas. Threshold
User Ampl

User Threshold (uW)
0.000000

Trigger Source
Front Panel

Trigger Bandwidth
High

Trigger Level (mV)
0.000000

Trigger Edge
Rising
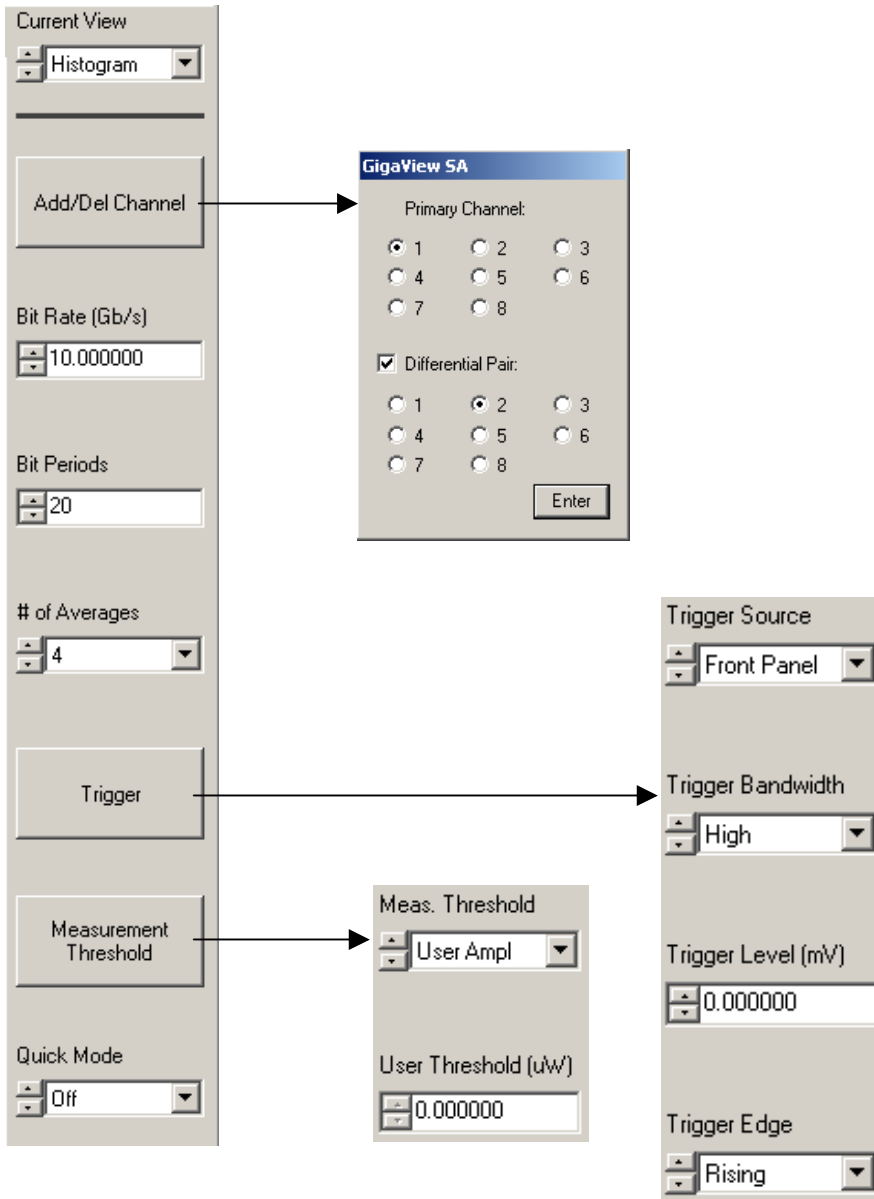
Making a Data Dependent Jitter Measurement

Step 1

Open the Data Dependent Jitter Tool

Step 2

Configure the channel inputs from the Add/Del Channel menu

Measurements can be performed in either single-ended or differential mode. For single-ended mode select only one channel from the Primary Channel selection. For a differential measurement select one Primary Channel, check the Differential Pair box and then select the other differential pair channel. No configurations need to be changed on the Agilent or Tektronix oscilloscopes for differential mode measurements. See Figure to the right.
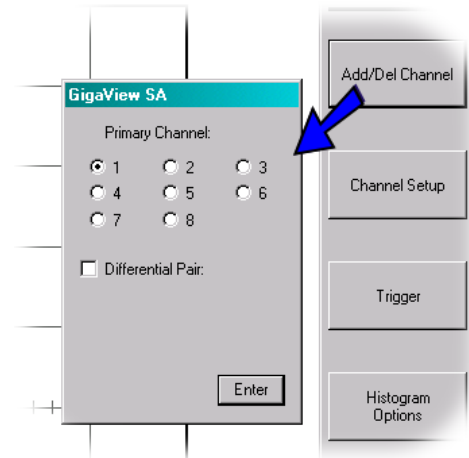
Select a channel

Step 3

Select the appropriate trigger option from the Trigger menu

The trigger supplied to the Oscilloscope must be a *pattern* trigger. This means that the trigger must be at a rate equal to or a multiple of the pattern repeat. This will allow the tool to increment the trigger delay and measure the time of each edge in the pattern.

This menu provides controls for the Trigger source, Trigger Level and Trigger Edge. The Trigger Source options are dependent on the Agilent or Tektronix oscilloscope. For example, The Agilent oscilloscopes can be triggered from the Front Panel, Left Module and Right Module. The Trigger Level sets the voltage for the trigger and the Trigger Edge selects either a rising or falling edge. See Figure to the right.
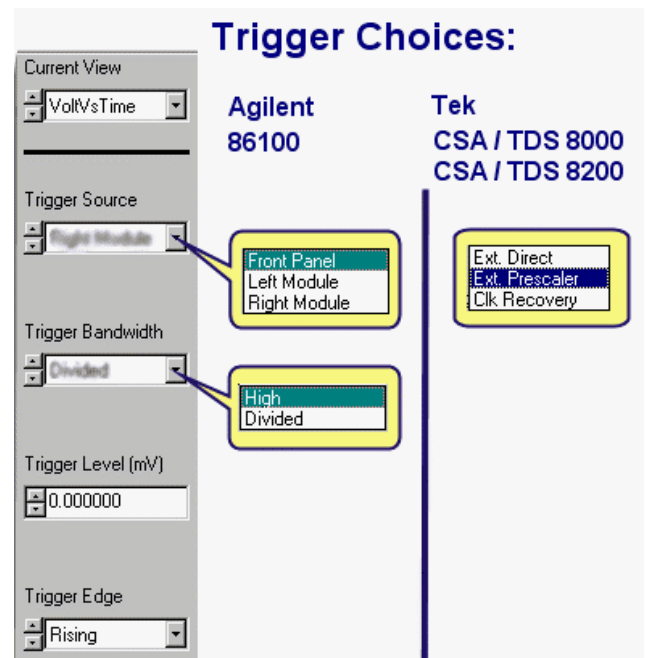
Step 4

Set the Bit Rate

This is important to set as closely as possible to the bit rate being measured

Step 5

Set the Bit Periods

Typically, this value should be equal to the pattern length to be measured. For example, a PRBS 2^7-1 would be 127. It is possible to set this to a different value, but then only a portion of the pattern is analyzed. If a PRBS 2^{23}-1 pattern is used, the test would not finish in a reasonable amount of time due to the sample rate of the oscilloscope. But, a portion of the pattern could be measured as determined by this setting. So, by setting Bit Periods to 200, then the DDJ will only be measured across 200 bits.

Step 6

You are now ready to make a measurement

The Auto Scale button should be depressed in order to determine the threshold voltage. Alternatively, you can enter the threshold voltage by pressing the Measurement Voltage Threshold button.

Press the button for a single acquisition on the toolbar. The software will begin measuring edge times of the pattern. The length of the pattern and the # of Averages will affect the test time. Longer patterns or more averages will increase the test time.
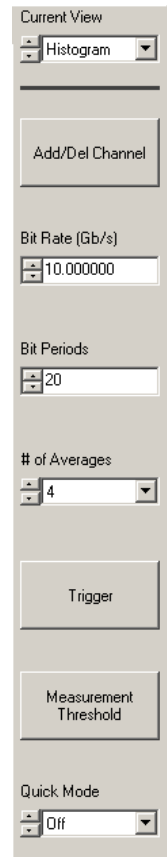
Measurement Setup

Step 7

View the Results
After the tool completes the DDJ measurements there will be two views/plots available. The DDJ versus Edge view shows the DDJ on the y-axis versus edge position (as shown in the Figure to the right). The pk-pk spread of the DDJ values is the DDJ value that is reported.
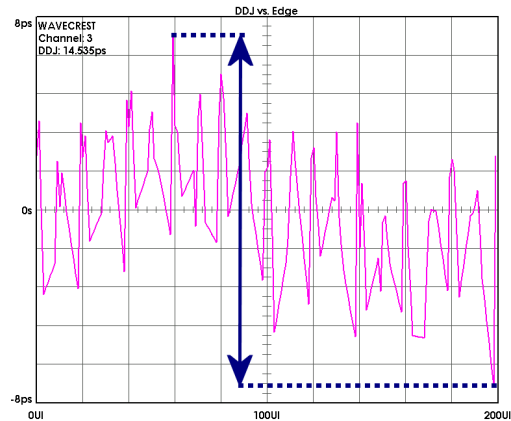
DDJ vs. Edge plot

The other view/plot shows the DDJ results in the form of a histogram for rising and falling edges. Each sample in the histogram is the time measured for each individual edge in the pattern. The pk-pk spread of the histogram is the DDJ as shown to the right.
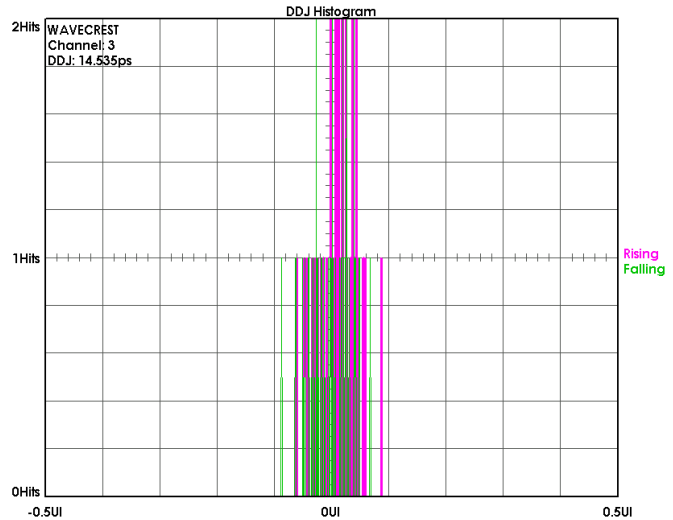
DDJ histogram shows each of the measured times of all edges in the pattern

Helpful Hints, Troubleshooting and Theory of Operation

This section briefly describes some helpful hints and a brief description about how the measurements are made. Refer to Section 3 for specific settings and controls for each menu.

⚠ Voltage Threshold Value has dramatic effect on DDJ magnitude

The voltage threshold value has a dramatic impact on the DDJ magnitude so it is important that the value is accurately determined. Pressing the Auto Scale button automatically determines the value if Mid Level is selected, but the voltage level is only as accurate as the portion of the waveform in which the value was determined. Many 'runt' pulses over the span of the waveform which the voltage measurements is made could create an offset in the measured midpoint as compared to the actual known midpoint of the signal. If you know the data pattern is centered around 0V then manually enter that value.

Understanding the Measurement Theory

This tool measures the time of each edge in the pattern at a set voltage threshold. The software automatically increments the trigger delay (from the applied pattern trigger) over a time equal to the number of **Bit Periods** set so that each edge is measured. Entering the **Bit Rate** and the **Bit Periods** allows the software to scale and position the waveform on the oscilloscope and measure the appropriate edges. The DDJ vs. UI plot displays the difference of each of these measured edge times relative to their ideal time. The ideal time is made by performing a measurement across the number of bit periods and dividing that time by the number of bit periods which provides an average ideal UI time.

Improving Test Time

The default mode for the DDJ tool is to zoom in on each edge. Another option to increase throughtput is to turn quick mode on. Quick mode improves the throughput by analyzing many edges per screen view and interpolating the crossing point. Using quick mode does sacrifice accuracy and is generally not recommended for signals with large DDJ.

Interpreting Data Dependent Jitter Views (plots)

The DDJ analysis tool has 3 views available. The Current View selection allows you to choose and view:

Interpreting views (plots)

DDJ Histogram - shows histograms of the rising and falling edge times across the total number of 'Bit Periods".

DDJ vs. Edge - Shows the deviation from Ideal UI of each measured edge time relative to the "Bit Periods" or pattern location of an edge

DDJ Summary - Shows a text display of measurement results

DDJ Histogram View

This view shows histograms of the rising and falling edge times across the total number of 'Bit Periods". Each sample in the histogram is a time measured for one edge in the pattern or number of "Bit Periods". The number of samples is displayed on the vertical y-axis. The time of that sample is shown on the horizontal x-axis. The Ideal UI time is zero on the x-axis.
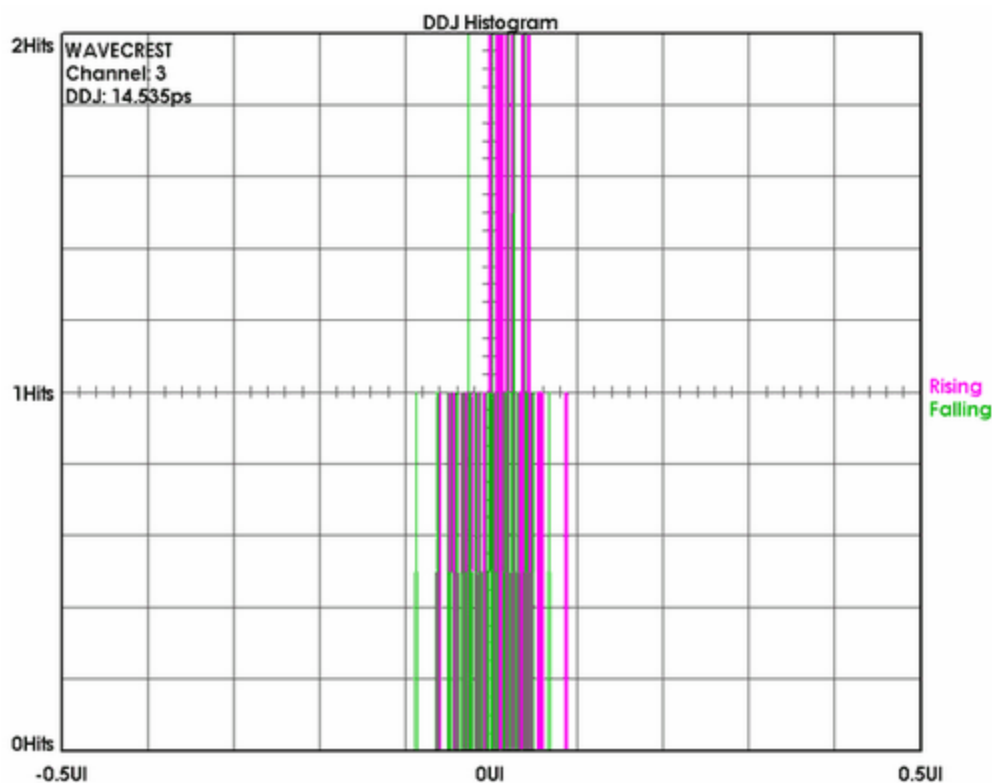
DDJ vs. Edge View

This plot shows the deviation from Ideal UI of each measured edge time relative to the "Bit Periods" or pattern location of an edge. The vertical y-axis shows the difference of the measured edge from the Ideal UI. The horizontal x-axis shows the "Bit Periods" or position of the edge in the pattern. This is essentially the trigger delay from the pattern marker.
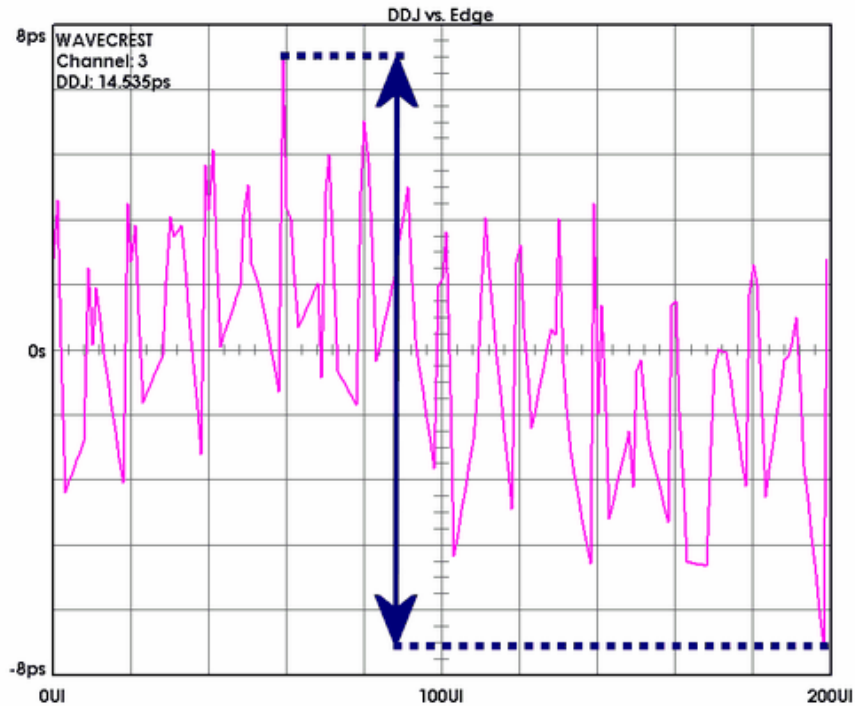
DDJ Summary View

The summary page shows a text display of measurement results.

```
WAVECREST       Data Dependent Jitter Summary

Channel         3
DDJ             14.535ps
```

Composite Plot Tool

Access to this tool is through the Toolbar by clicking on the [image] button.

The Composite Tool is used to overlay various plots that relate to each other. The plots must be of the same plot type, for instance, overlaying multiple Timing Jitter plots. Different plot types cannot be overlaid, such as a TJ plot and a DDJ plot.

To overlay plots, select the View in the tool that has the plot that you want to overlay. Open Composite Tool and select the plot from the View pull-down menu and press Add this Plot. Repeat this process to add other plots.
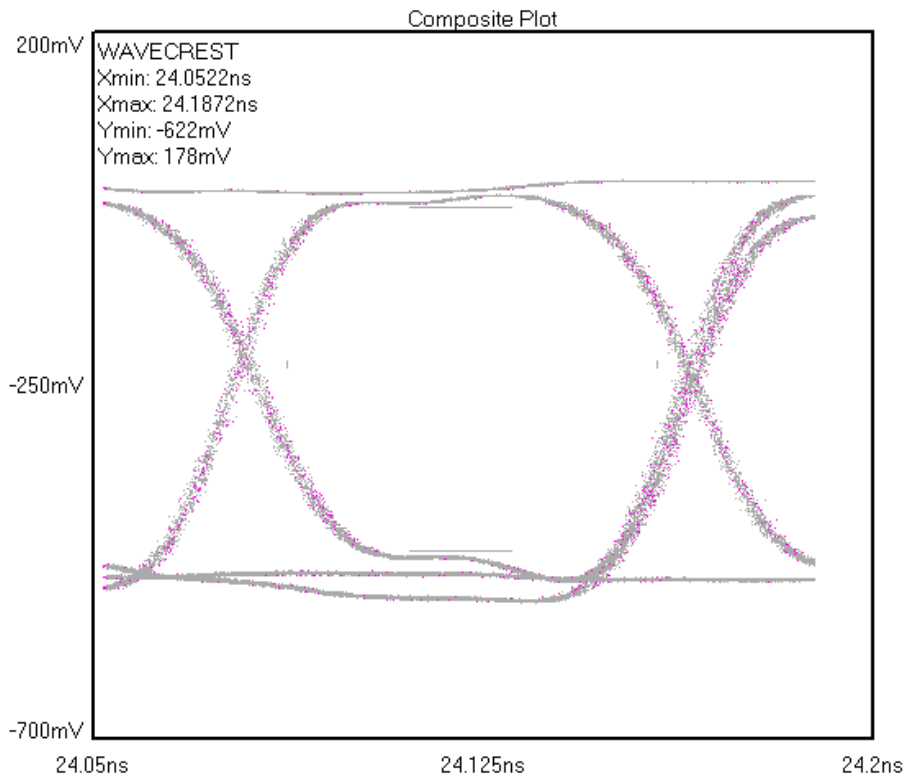
Help Tools

Help Tools Overview

Help Topics
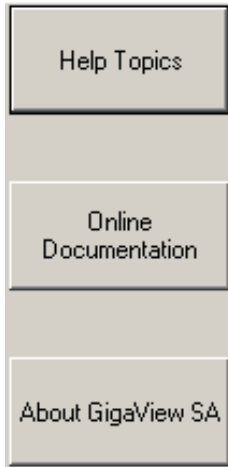
Use this button to access the opening screen of Help (see figure below). From the opening screen, you can jump to step-by-step instructions for using GigaView SA as well as various types of reference information. Once you open Help, you can click the Contents button whenever you want to return to the opening screen.

Online Documentation

The Online Documentation selection provides access to *WAVECREST* Manuals, Application Notes and Technical Bulletins. When selected, an active index for all *WAVECREST* Corporation documentation is displayed in Adobe Acrobat Reader (version 3.0 or later). Click on the Document Summary number for a brief overview of the document or click on the Document Number to bring up the document in Adobe Acrobat. Acrobat is available during the installation of *GigaView* or from Adobe.com.

About GigaView SA

Click on this command button to display the copyright notice and version number of your copy of GigaView software (see figure below).
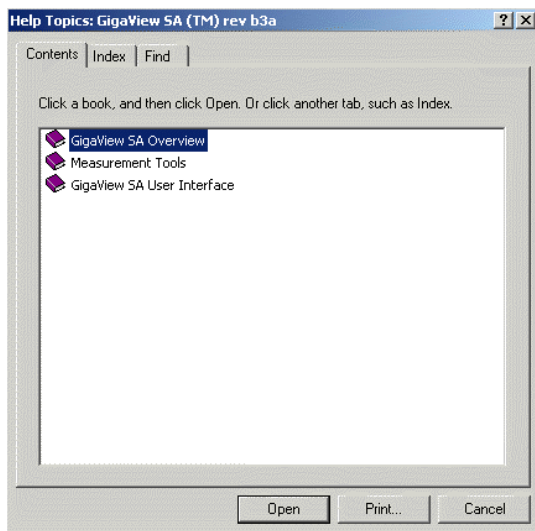
Help Topics
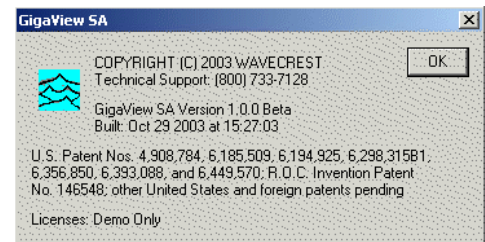
About GigaView SA

GigaView SA provides Macro Record and Playback features for scripting and automating activities performed on a repetitive basis. The Macro interface is based on Microsoft's VBScript language, which includes the ability to control program execution using conditional and looping statements.

Macros can be recorded and then modified, or written from scratch. The Macro interface can also be used to access *GigaView SA* functions from an external application. In particular, Microsoft® Visual Basic™ may be used, but other programs which support the VBScript language such as Microsoft Word and Excel™ may also be used.

In order for the VBScript engine to access *GigaView SA*'s functionality, a variable that acts as a placeholder to the application must be dimensioned and initialized as follows:

```
Dim Gigascope
Set Gigascope = CreateObject ("Gigascope.Application")
```

This is automatically done for you if the macro is recorded. If you are writing your macro from scratch, you will need to include this initialization as well. This variable is then used on all subsequent calls to access the *GigaView SA* application, for example:

```
Dim Gigascope
Set Gigascope = CreateObject ("Gigascope.Application")
Gigascope.New ("Histogram")
Gigascope.New ("Oscilloscope")
Gigascope.Tile
```

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The tail-part of an histogram distribution reflects the random process. Physically, Random Jitter (RJ) or Noise (RN) is due to the random motion of particles within a device or transmission medium. In an equilibrium state, the random velocity of these particles is best described as a Gaussian distribution. Therefore, random processes are naturally modeled by a Gaussian function. Since multi-temperature particle distribution is possible, a multi-Gaussian distribution function may be needed to model certain random processes.

Based on their definitions, deterministic components are bounded and random components are un-bounded. The measured total jitter or noise histogram represents the scaled-up, total jitter or noise probability distribution function (PDF). On the other hand, the convolution of the random PDF with deterministic PDF gives the total PDF, if the deterministic and random processes are independent. In most cases, such an assumption is valid. Therefore, the tail-part of the distribution is determined mostly by the random processes, which, in general, has a Gaussian-type distribution. The random jitter or noise can be quantified by the standard deviation (or 1 σ) of the Gaussian distribution. Depending on the error coverage range, the total random component can be a multiple of the σ, determined from the Gaussian distribution.

In the absence of deterministic sources, a histogram of the jitter or noise should roughly be a Gaussian distribution. Under this condition, there is only one peak in the distribution that corresponds to zero DJ. The rms RJ is the σ value. When both deterministic and random components are present, the measured distribution will be broadened and non-Gaussian as a whole. On the other hand, both ends of the distribution should retain Gaussian-type components. These tail component distributions can be used to determine the random component. Because of the deterministic sources, the mean of each tail is no longer the same and multi-peaks can be present in the histogram.

If there is no bias or statistical sampling noise in the measurement, the two tails, which represent the random process, should be symmetrical. Since it is not possible to completely randomize measurements and reduce the sampling noise to zero, the σ values for the far left and right Gaussian tails may not be the same.

A fitting algorithm that weights the data record based on the quality of each datum should be used. The bigger the error, the smaller role it should play in minimizing the difference between the model's expected and measured values. Thus, goodness-of-fit is used as a gauge to determine how "good" the fit is. The fitting function is Gaussian and the fitting algorithm is nonlinear so it can handle both linear and non-linear fitting functions.

The modified least-square fitting is an iterating process, in contrast to linear equation solving in the case of linear least-squared fitting. The final answer is obtained when the iteration converges. For this reason, initial values of the fitting parameters are needed.

When a tail-fit is successfully completed, the calculated tail-fits are plotted on top of the raw histogram and values for the Deterministic Jitter (or Noise), Random Jitter (or Noise), and Total Jitter (or Noise) are displayed. You can also view the resulting Bathtub Plot that is based on the PDF of the raw histogram with extrapolated tails calculated from the tail-fit. The Total Jitter or Noise is extracted directly from the Bathtub Plot. See the following TailFit Enabled section. GigaView SA quantifies Timing Jitter (RJ, DJ and TJ) using the Timing Jitter tool and Amplitude Noise (RN, DN and TN) using the Amplitude Noise tool.

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# of Averages - Selects the number of averages for each sampled point displayed on the screen.

1, 2, 3, 4 command (Tool menu) - Use the numbers and filenames listed at the bottom of the Tool menu to open the last four tools used. Choose the number/name that corresponds with the tool to re-open.

1-sigma - The standard deviation of jitter. For a pure Gaussian distribution, the standard deviation value is 1/14 of the peak-to-peak value for BER 10^{-12}.

About command (Help menu) - Click on this command to display the copyright notice and version number of your copy of *GigiView* software.

Add/Delete Channel - Clicking on [Add/Del Channel] button will display a selection box for adding or deleting channels.

Use the keypad to select one or more channels to measure. Buttons will toggle channel on or off. Click on Enter when done.
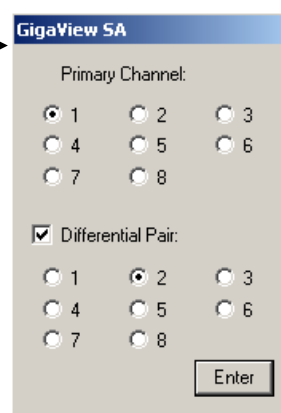
Add command (View menu) - Adding a view opens a new (default) tool window associated with the active tool. There may be many opened window views of one tool, but all views reflect any measurements or settings for that tool.

To see both a measurement plot and summary page, open a tool, select Add from the View pull-down menu or click on the New View button (see below), select Summary from the View menu on the Dialog Bar.

⊞ - New View button performs the same function as the Add command.

Add this Plot Button - Clicking on button will add the selected plot.

Annotation command (Edit menu) - Allows user to add or modify a text annotation on the summary page of the current tool. This text will be displayed, saved and printed with the summary page. Also, right clicking on the summary view will open the annotation editor.

Auto Scale - Analyzes the waveform and automatically configures the Delay, Range, and Resolution to display the waveform.

Back - Return to previous Dialog bar page or Getting Started Wizard page.

Background Color - Selects the color of the work area.

Bathtub X-axis - Select the unit of measure for the horizontal plot axis.

Bit Error Rate - Determines the Bit Error Rate to be used when extracting total jitter from the Bathtub Curve. The default value is 1e-12. This setting has a direct effect on the TJ value that is calculated. For example, TJ at 1e-6 will be lower (smaller) than TJ at 1e-12.

BER = 1e-12

BER = 1e-6
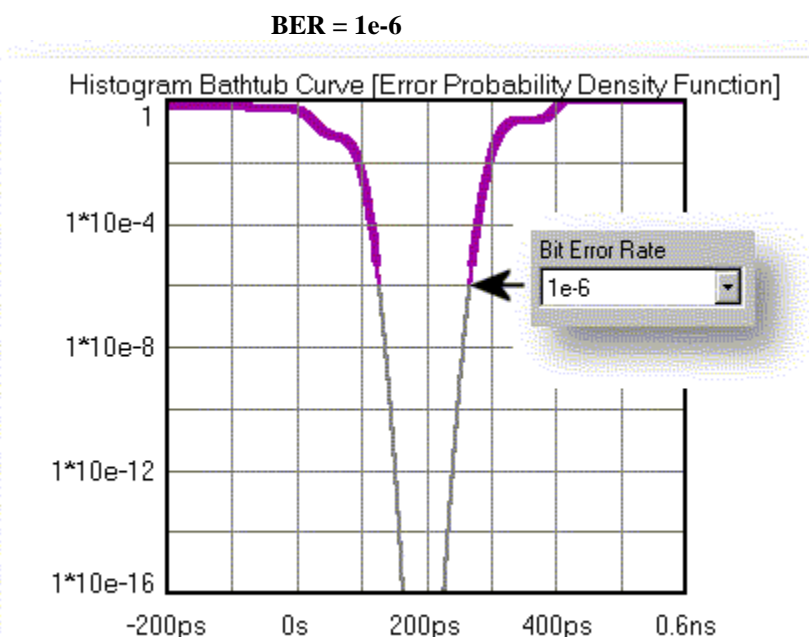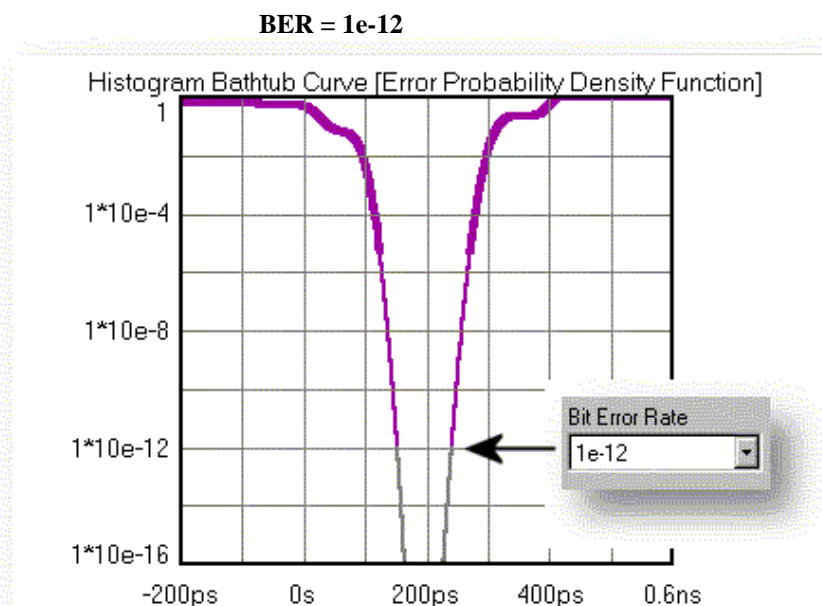
Bit Periods - This value should be equal to the pattern length to be measured. For example, a PRBS 2^7-1 would be 127.

It is possible to set this to a different value, but then only a portion of the pattern is analyzed. If a PRBS 2^{23}-1 pattern is used, the test would not finish in a reasonable amount of time due to the sample rate of the oscilloscope. But, a portion of the pattern could be measured as determined by this setting. So, by setting Bit Periods to 200, then the DDJ will only be measured across 200 bits.

Bit Rate - Enter the bit rate of the signal to be measured. This setting is used to scale and position the waveform on the oscilloscope for the edge times to be measured.

The average data rate of the signal, entered in Gigabits per second. An accurate Bit Rate is crucial as it is used in the calculation of the various jitter components. The default is 1.0625 Gbit/s, which is the standard 1x Fibre Channel speed. Because the pattern and total number of UI is known, the Bit Rate that is reported is an average value derived from the total time across a number of patterns (defined by Bit Rate Patterns) divided by the total number of UI contained in that many patterns.

Bounded Uncorrelated Jitter (BUJ) - Jitter that is uncorrelated to the data signal, yet bounded in amplitude. A typical source might be cross talk from another data signal. See also Deterministic jitter.

Calculator - Clicking on this button accesses the operating system calculator.

Cancel - Closes main dialog bar for choosing *GigiView* tools and returns to previous dialog bar view.

Cascade command (View menu) - Arranges windows so they overlap starting in the upper left-hand corner with the active tool screen being displayed. The title bar of each window tool remains visible allowing easy selection of any window.

Channel Setup Options button - Clicking on the Channel Setup button will provide access to fields for changing input channel settings.

Clear Button - Clears active window of data.

Clear Command (Edit menu) - Clears active tool of any measurements or plots. Toolbar symbol:

Clock Frequency (GHz) - Sets the input frequency of the clock.

Close (Tool menu) - Use this command to close all views containing the active tool. If you close a tool without saving, you lose all changes made since the last time you saved it.

Configuration command (Edit menu) - Permits instrument and display settings to be modified (See figure to the right). The user can customize signal trace display colors, the window background color, font type, Rise/Fall %, Pattern and Data paths as well as GPIB board and device addresses. For options to be activated after being changed, the Apply button must be clicked on before closing dialog box. Clicking on reset will set all parameters to default settings.

Context Sensitive Help - Clicking on the button ( ) activates context sensitive help. Once activated, the cursor changes to the Help Topics icon and will remain so until another click of the pointing device occurs. Upon clicking the second time, help text will be displayed.
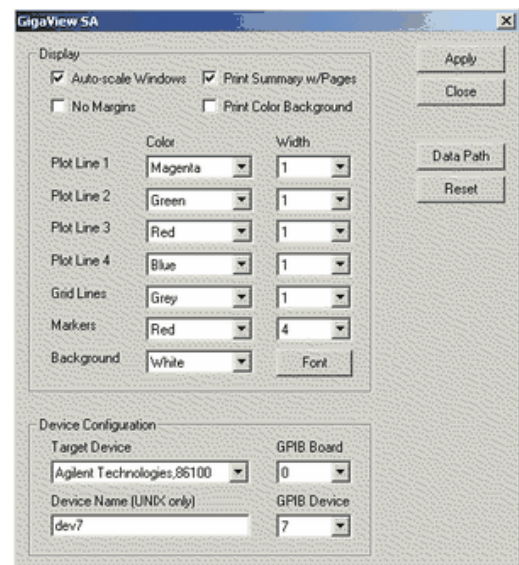
Copy command (Edit menu) - Use this command to copy the current active view onto the clipboard. This command is unavailable if there is no data currently selected. Copying data to the clipboard replaces the contents previously stored there.

Current View - The Current View pull-down menu provides the user several different ways to see the acquired measurement data, depending on the active tool.

Data Dependent Jitter (DDJ) - The jitter that is added when the transmission pattern is changed from a clock-like to non-clock-like pattern. Includes Intersymbol Interference (ISI).

DDJ is generally due to bandwidth effects of the transmission media. The top view in the figure below shows a traditional oscilloscope view of DDJ effects. **Note:** Low transition density areas reach a different voltage than high transition density areas; this affects the Edge timing.

The bottom plot is from the dataCOM with Marker tool and shows a representation of the pattern where each edge is actually a histogram of edge measurements. The jagged line represents the mean deviation of each edge relative to its ideal time.
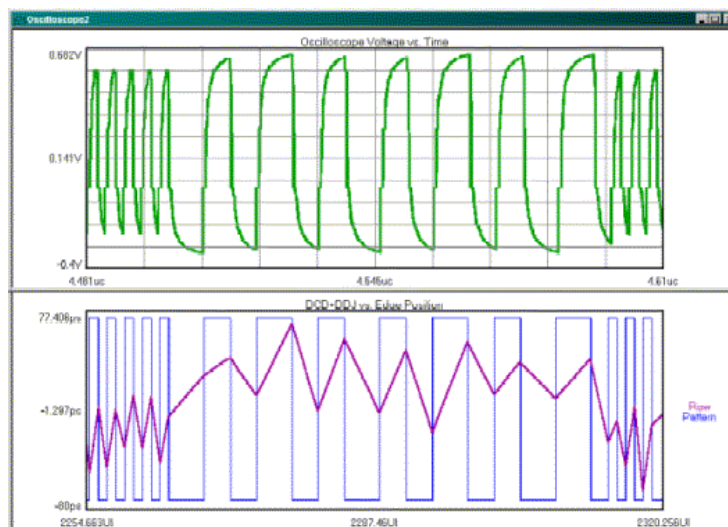
Default - Sets the histogram box to a center default position and size.

Delay (ns) - Sets the time delay of the waveforms, or use the "Horizontal Position" knob on the front panel. The limits are from 25ns to 3μs.

Delete this Plot Button - Clicking on button will delete the selected plot.

Deterministic Jitter (DJ) - Jitter with non-Gaussian probability density function. Deterministic jitter is always bounded in amplitude and has specific causes. Four kinds of deterministic jitter are identified: duty cycle distortion (DCD), data dependent (DDJ), sinusoidal (PJ) and bounded uncorrelated (BUJ) (to the data) jitter. DJ is characterized by its bounded, peak-to-peak value. Some typical causes of DJ are: crosstalk, switching power supplies and EMI.

Dialog Bar - Contains tool-specific parameter options.

Dialog Bar command (Display menu) - The dialog bar is displayed to the right of the *GigaView SA* window if this selection is checked. To hide the dialog bar, uncheck this selection.

Disable All command (Action menu) - Use this command to stop all running windows simultaneously. Shortcut Key:F8

Display Scale - Sets the height of the two histograms that will be acquired from the eye diagram. The default is 2 Divisions, therefore the two histograms will have a maximum height of 2 screen divisions. Choose the number of divisions for the histogram display.

Display Markers Horizontal - Only horizontal marker is shown. **Markers can be positioned by using the right button of a pointing device (mouse).** Click and drag near the marker to be repositioned using the right mouse button. Release the mouse button when the marker is positioned in the desired location. Note that you do not need to click directly on top of a marker in order to select it. The marker nearest your pick point will be selected.

Display Markers None - Neither horizontal nor vertical markers are shown.

Display Markers Vertical - Only vertical marker is shown. **Markers can be positioned by using the right button of a pointing device (mouse).** Click and drag near the marker to be repositioned using the right mouse button. Release the mouse button when the marker is positioned in the desired location. Note that you do not need to click directly on top of a marker in order to select it. The marker nearest your pick point will be selected.

Display Options - Clicking on this button enables the dialog bar for choosing persistence time, show IN or /IN channel--both or either, enable averaging, change zoom reference.

Display Scale - Choose the number of divisions for the histogram display.

Duty Cycle Distortion (DCD) - DCD is caused when a data signal has a static duty-cycle error and/or this error varies with time. DCD is the difference in the mean pulse width of a "1" pulse compared to the mean pulse width of a "0" pulse in a clock-like (repeating 0,1,0,1,...) bit sequence. DCD is part of the D distribution and is measured at the ideal receiver threshold point.

Duty Cycle Enable - Choosing 'On' or 'Off' will enable or disable a duty cycle measurement. The results from the duty cycle measurement will be displayed on the Summary view

Edit Macro - Allows a user to modify or create a macro that can then be replayed. Standard VBScript syntax is supported. "For" and "While" loops may be added to a recorded macro.

Exit command (Tool menu) - Use this command to end your *GigaView SA* session. You can also use the Close command on the application Control menu. Any changes not saved will be lost.

From Markers Button - Selects the font for the text displayed in the work area.

Gaussian - A statistical distribution (also termed "normal") characterized by populations that are not bounded in value and have well defined "tails". Analog amplifiers are the most important source of Gaussian noise in serial data transmissions. The term "random" in this document always refers to jitter that has a Gaussian distribution.

Get Settings from Scope - Settings can be adjusted manually on the oscilloscope front panel and then copied to *GigaView SA* by pressing this button.

GPIB Board - Controls the host GPIB address.

GPIB Device - The GPIB Device selection sets the address of the remote OE-2 connected to the GPIB bus.

Grid Lines – Selects the color for the grid lines displayed in the work area.

Height (mV) - Defines the height of the histogram box for analog input channel.

Height (μW) - Defines the height of the histogram box for optical input channel.

Help Button - Clicking on the button activates context sensitive help. Once activated, the cursor changes to the Help Topics icon and will remain so until another click of the pointing device occurs. Upon clicking the second time, help text will be displayed.

Help Topics Button – Clicking on this button will start the online help system. A directory will be displayed from which the user can access information about *GigiView*. From the opening screen, you can jump to step-by-step instructions for using *GigiView* as well as various types of reference information. Once you open Help, you can click the Contents button whenever you want to return to the opening screen.

High Limit (mV) - The upper voltage level used in the calculation of Total Noise for analog input channel.

High Limit (μW) - The upper power level used in the calculation of Total Noise for optical input channel.

Histogram Options Button - This button will open a menu for configuring a histogram window. The histogram shows statistics from the samples that fall inside this window.

Hold Zoom command (Display menu) - Maintain current zoom setting when in Run/Cycle mode.

Intersymbol Interference (ISI) - Data dependent deterministic jitter caused by the time differences required for the signal to arrive at the receiver threshold when starting from different places in bit sequences (symbols). For example when using media that attenuates the peak amplitude of the bit sequence consisting of alternating 0,1,0,1... more than peak amplitude of the bit sequence consisting of 0,0,0,0,1,1,1,1... the time required to reach the receiver threshold with the 0,1,0,1... is less than required from the 0,0,0,0,1,1,1,1.... The run length of 4 produces higher amplitude that takes more time to overcome when changing bit values and therefore produces a time difference compared to the run length of 1 bit sequence. When different run lengths are mixed in the same transmission the different bit sequences (symbols) therefore interfere with each other. ISI is expected whenever any bit sequence has frequency components that are propagated at different rates by the transmission media.

ISI is caused by a data path propagation delay that is a function of the past history of the data. It occurs in all finite bandwidth data paths. It is also known as Data Dependent Jitter (DDJ).

Jitter - Jitter is a period / frequency displacement of a signal from its ideal location. These displacements can occur in amplitude, phase or pulse width and are generally categorized as either deterministic or random in nature. The reference event is the differential zero crossing for electrical signals and the nominal receiver threshold power level for optical systems. Jitter is composed of both deterministic and Gaussian (random) content.

Total jitter is the convolution of Deterministic Jitter (DJ) and Random Jitter (RJ). (See Fibre Channel Methodologies for Jitter Specification REV 10 page 30, at ftp://ftp.t11.org/t11/member/fc/jitter_meth/99-151v2.pdf). Deterministic Jitter is composed of Duty Cycle Distortion (DCD), Inter-Symbol Interference (ISI), Periodic Jitter (PJ) and Bounded Uncorrelated Jitter (BUJ).

At very high frequencies, unchecked jitter causes:
- Flicker in video devices
- Clicks and glitches in audio devices
- Disparity between input and output serial data in network applications
- Devices such as computers to operate slowly and potentially crash.

Currently, some semiconductor devices require jitter tolerances as low as 50 picoseconds and allow one bit error per 10 thousand billion clock cycles. Therefore, jitter measurements are critical during the prototyping and developmental stages of the semiconductor devices. The more accurately device performance is measured and errors corrected prior to production, the faster the device can ultimately operate.
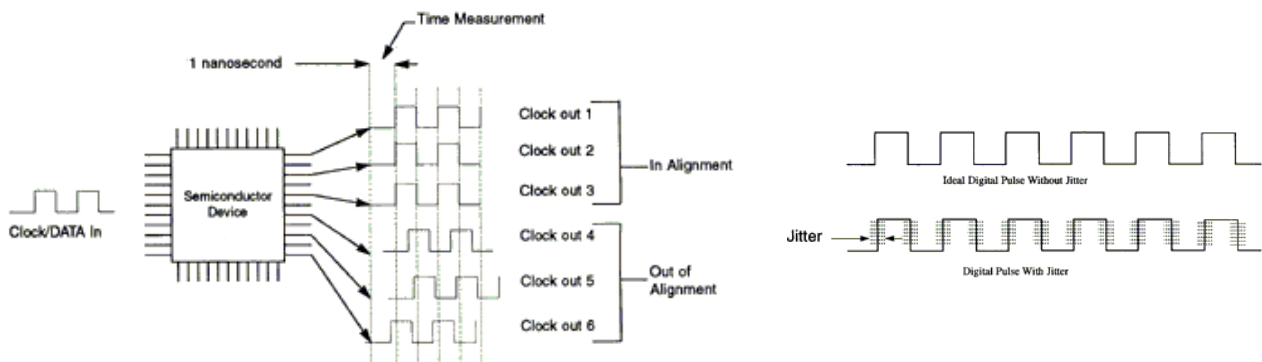
Time Measurement Relationship of Clock Out from Output Pin to Output Pin.

Keep Out Enable - By turning this feature on, the user is able to define an exclusion region for Tail Fit. When a keep out region is defined, the TailFit or Gaussian distributions will only be fit to the left and right of the keep out region. To define a keep out region the Current View must be either on Left or Right Histogram. This feature can be useful for capturing low probability events.

Keep Out Left Limit (mV) - A user definable voltage limit for the left side of the distribution for exclusion. TailFit will be forced to fit to the left of this limit.

Keep Out Left Limit (ns) - A user definable time limit for the left side of the distribution for exclusion. TailFit will be forced to fit to the left of this limit.

Keep Out Left Limit (µW) - A user definable power limit for the left side of the distribution for exclusion. TailFit will be forced to fit to the left of this limit.

Keep Out Region - For defining a "keep out" region of the Right and Left histograms.

When a keep out region is defined, the TailFit or Gaussian distributions will only be fit to the left and right of the keep out region. To define a keep out region the Current View must be either on Left or Right Histogram. The keep out region is useful because the mean position of the Gaussian tails is a loosely constrained variable and defining a keep out region can reduce the time required to converge to a stable location.

Keep Out Right Limit (mV) - A user definable voltage limit for the right side of the distribution for exclusion. TailFit will be forced to fit to the right of this limit.

Keep Out Right Limit (ns) - A user definable time limit for the right side of the distribution for exclusion. TailFit will be forced to fit to the right of this limit.

Keep Out Right Limit (µW) - A user definable power limit for the right side of the distribution for exclusion. TailFit will be forced to fit to the right of this limit.

Load (Macro menu) - Opens a dialog box for choosing a previously saved mask.

Low Limit (mV) – Lower voltage limit of Bit Error Range over which the Effective Jitter is derived.

Low Limit (µW)- Lower power limit of Bit Error Range over which the Effective Jitter is derived.

Macro Edit command (Action menu) - Allows a user to modify or create a macro that can then be replayed.

Macro Interface Overview - *GigiView* provides Macro Record and Playback features for scripting and automating activities performed on a repetitive basis. The Macro interface is based on Microsoft's VBScript language that includes the ability to control program execution using conditional and looping statements. See **Appendix A** for detailed explanations of all macro commands.

Macros can be recorded and then modified or written from scratch. The Macro interface can also be used to access *GigiView* functionality from an external application. In particular Microsoft Visual Basic may be used, but other programs which support the VBScript language such as Microsoft Word and Excel may also be used.

Macro Play (Action menu) - Allows a user to playback a series of steps that were previously recorded.

Macro Record (Action menu) - Allows a user to record a series of steps that can then be replayed.

Markers - Provides movable grid lines. The four movable markers can be displayed all at once, horizontal markers only, vertical markers only or no markers at all. Text near the top right of the panel displays the position of each marker and the difference between them. **Markers can be positioned by using the right button of a pointing device (mouse).** Click and drag near the marker to be repositioned using the right mouse button. Release the mouse button when the marker is positioned in the desired location. Note that you do not need to click directly on top of a marker in order to select it. The marker nearest your pick point will be selected.

Markers Both (Display menu) - Displays both horizontal and vertical markers. **Markers can be positioned by using the right button of a pointing device (mouse).** Click and drag near the marker to be repositioned using the right mouse button. Release the mouse button when the marker is positioned in the desired location. Note that you do not need to click directly on top of a marker in order to select it. The marker nearest your pick point will be selected.

Measurement Threshold - The voltage threshold value has a dramatic impact on the DDJ magnitude so it is important that the value is accurately determined. Pressing the Auto Scale button automatically determines the value if Mid Level is selected, however, the voltage level is only as accurate as the portion of the waveform in which the value was determined. Therefore, if you know the data pattern is centered around 0v, manually enter that value.

Minimum Hits - A TailFit is not attempted until the number of hits specified is acquired.

Mode - This mode selects the amount of persistence. **Infinite persistence** holds all measured samples on the screen until "clear" is pressed or the configuration is changed. The other persistence values hold the measured samples on the screen for the amount of persistence time selected. **Dot Connect** connects samples with a line.

New command (Tool menu) - Use this command to create a new tool in *GigiView SA*. When selected the dialog bar on the right hand side is filled with choices that you can select to create a new tool. You can open a previously saved tool with the Open command. Shortcut Key: CTRL+N.

New View - Clicking on the New View button will open a new window of the active tool.

Next Window Command (View menu) - Switch to the next tool view/window pane.

No Margins - Check box for toggling margins in work area on/off.

Nominal Bitrate - If Nom. Bitrate is selected, the Unit Interval can be selected.

Offset (mV) - Sets a DC level offset for the waveform in millivolts.

Offset (mW) - Sets a DC level offset for the waveform in microwatts.

Online Documentation - This selection provides access to *WAVECREST* Manuals, Application Notes and Technical Bulletins. When selected, an active index for all *WAVECREST* Corporation documentation is displayed in Adobe Acrobat Reader (version 3.0 or later). Click on the Document Summary number for a brief overview of the document or click on the Document Number to bring up the document in Adobe Acrobat. Acrobat is available during the installation of *GigiView SA* or from Adobe.com.

Open command (Tool menu) - Use this command to open an existing/saved tool in a new window. You can open multiple tools at once. Use the Tool pull down menu to switch among the multiple open tools. See also 1, 2, 3, 4... command. Shortcut Keys: CTRL+O Toolbar.

Overlays command (Display menu) - Gives the user the option of displaying up to 10 measurements, or sets of measurements, on top of each other for comparison on the same plot. The most recent measurement is a dark line while previous measurements are light lines of the same color.

Play Macro (Macro menu) - Allows a user to play back a series of steps that were previously recorded.

Periodic Jitter (PJ) - Periodic Jitter (PJ) is caused by one or more sine waves and its harmonics. It is typically the result of signal crosstalk. Jitter that is sinusoidal and is bounded.

Plot Interpreter - This module helps the user interpret plots of actual measurements and to understand how to continue analysis and provide the most comprehensive "picture" of signal integrity. Jitter has many components that can influence each other in many combinations. Therefore, this interpreter only offers general ideas and descriptions of acquired measurements. It will not always describe the exact cause of jitter on measured signals or the exact procedure to continue analysis. The interpreter is intended to serve only as a guide to offer possible directions of troubleshooting, analysis or study.

Precision Timebase - Select 'On' when using the Agilent 86107 precision timebase. The Clock Freq. can now be set.

Previous Command (View menu) - Switch back to the previous window pane.

Print Color Background check box - When box is checked, the selected color in the Background field will be printed.

Print command (Tool menu) - Use this selection to print a tool view. This command presents a Print dialog box, where you may specify the range of pages to be printed, the number of copies, the destination printer and other printer setup options. Shortcut Keys: CTRL+P

Print Preview command (Tool menu) - Use this selection to display the active tool view as it would appear when printed. When you choose this command, the main window will be replaced with a print preview window in which one or two pages will be displayed in their printed format. The print preview toolbar offers you options to view either one or two pages at a time; move back and forth through the tool view; zoom in and out of pages; and initiate a print job.

Print Setup command (Tool menu) - This selection presents a Print Setup dialog box where you specify the printer and its connection. This selection also presents options for adding or removing printers.

Print Setup dialog box - The following options allow you to select the destination printer and its connection.
>   **Printer** - Select the printer you want to use. Choose the Default Printer; or choose the Specific Printer option and select one of the current installed printers shown in the box. You install printers and configure ports using the Windows Control Panel.
>   **Orientation** - Choose Portrait or Landscape.
>   **Paper Size** - Select the size of paper that the tool view is to be printed on.
>   **Paper Source** - Some printers offer multiple trays for different paper sources. Specify the tray here.
>   **Options** - Displays a dialog box where you can make additional choices about printing, specific to the type of printer you have selected.
>   **Network...** - Choose this button to connect to a network location, assigning it a new drive letter.

Probability Density Function (PDF) - A mathematical model showing a representation of the probabilities for all possible values of a given variable.

Quick Mode - When 'quick mode' is off, the edge measurement is made by zooming in on each edge individually. This provides good time resolution by setting the time/div to a low value which can provide a more accurate measurement of the mean time of the edge. When 'quick mode' is on, ten bit times are scaled to fit on the oscilloscope display and the edges are measured while at that time/div setting. The time/div setting is not reset to show only one edge at a time. All edges are measured at once which makes the measurement faster but will have lower time resolution. This setting is useful when analyzing the DDJ on longer patterns.

Reset - Resets all user selections to default.

Reset Precision Timebase Reference - Resets the Precision Timebase. Precision timebase needs to be reset when the Clock Frequency is changed.

Reset Hardware - Clicking on this button will restart the SIA-3000. All settings will be lost unless previously saved.

Right Limit (mV) - A user definable voltage limit for the right side of the distribution for exclusion. TailFit will be forced to fit to the right of this limit.

Right Limit (µW) - A user definable power limit for the right side of the distribution for exclusion. TailFit will be forced to fit to the right of this limit.

Run button/command (Action menu) - Use this command to repetitively acquire new measurements in *GigiView SA*. Measurements will be acquired until either the Single/Stop command is issued or an error occurs. This command affects the current tool only. Shortcut Key: F5

Save (Tool menu) - Use this command to save the active tool to its current name and directory. When you save a tool for the first time, *GigaView SA* displays the Save As dialog box so you can name your tool. If you want to change the name and directory of an existing tool before you save it, choose the Save As command.

Save As command (Tool menu) - Use this command to save and name the active tool. *GigiView SA* displays the Save As dialog box so you can name your tool. To save a tool with its existing name and directory, use the Save command.

Show Grid command (Display menu) - If checked/selected, vertical and horizontal grid lines will be displayed on the activated plot.

Show Hist. Box – Selecting On will display histogram box.

Single/Stop command (Action menu) - Use this command to acquire a single measurement in *GigiView*. It is also used to stop a series of measurements from being taken after the Run command is issued. This command affects the current tool only. Shortcut Keys: F6

Status Bar - The status bar is displayed at the bottom of the *GigiView* window. To display or hide the status bar, use the Status Bar command in the View menu. A check mark appears next to the menu item when the Status Bar is displayed. The left area of the status bar describes actions of menu items as you use the arrow keys to navigate through menus. This area similarly shows messages that describe the actions of toolbar buttons as you depress them, before releasing them. If after viewing the description of the toolbar button command you wish not to execute the command, then release the mouse button while the pointer is off the toolbar button.

The right areas of the status bar indicate the following information:

Indicator	Description
CURSOR	Displays the position of the cursor with respect to the current window.
REC/PLAY	Indicates the status of the macro recorder.
RUN	The current tool is repetitively acquiring measurements.
BUSY	The instrument is currently busy performing an operation.

Stop on Success - The Tailfit option has certain quality requirements that must be met in order to successfully separate RJ and DJ. If there is a large DJ component, this may require several passes. Enable this option and then use Cycle in order to accumulate until the requirements are met.

TailFit - See TailFit theory, **Appendix B**, for more information.

Tile command (View menu) - Arranges tool views side by side so each is visible and that no windows overlap.

Time Per Division (ps) - Sets the horizontal time scale.

Title Bar - The title bar is located along the top of a window. It contains the name of the application and tool. To move the window, drag the title bar. Note: You can also move dialog boxes by dragging their title bars.

Toggle Marker Next Button - Clicking on the Toggle Marker Next Button scrolls through Marker selections by displaying current selection on window.

Toolbar command (Display menu) - Use this command to display and hide the Toolbar, which includes buttons for some of the most common commands in *GigiView SA*, such as Tool Open. A check mark appears next to the menu item when the Toolbar is displayed.

Trigger Bandwidth - For Agilent oscilloscopes, the selection for trigger bandwidth for Option 001 is 'High'.

Trigger Edge - Selects the rising or falling edge to trigger the instrument.

Trigger Level (mV) - Displays the threshold voltage used to trigger the instrument. Limits are +/- 1.1 volts.

Trigger Source - Selects the trigger input. The Trigger Source options are dependent on the Agilent or Tektronix oscilloscope. For example, The Agilent oscilloscopes can be triggered from the Front Panel, Left Module and Right Module. When choosing the Trigger source, use the same configuration/trigger used to create any eye diagram or eye mask test.

User Threshold (mV, μW) – See Measurement Threshold.

User Voltage Limits - Selection for user defined voltage limits. If Off is selected, then the Total Noise calculation is determined from the mean of the top and bottom histograms. If On is selected, the Total Noise calculation uses the 'High Limit' and 'Low Limit' which are manually set.

Values on Plot button (⊞) - Clicking on button will toggle select measurement data in text format in the active tool window. These displayed values can be selected using the **Values on Plot...command** in the display pull-down menu.

Values on Plot...command (Display Menu) - When selected, the a dialog box pops up providing the option of displaying all or select measurement data in text format in the active tool window. The example to the right is from the High Frequency Modulation Tool.
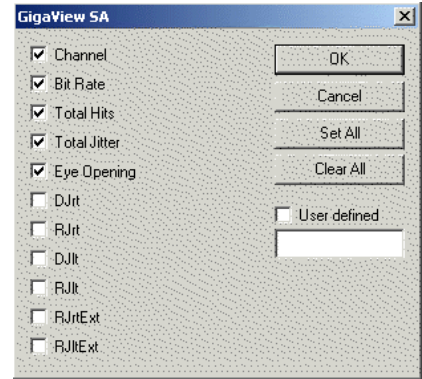
View List - Displays open tools. User can activate open tool by selecting.

Volts Per Division (mV) - Sets the Vertical Scale or use the "Vertical Scale" knob on front panel.

Watts Per Division (μW) - Sets the Vertical Scale Scale or use the "Vertical Scale" knob on front panel.

Width (ps) - Defines the width of the histogram.

Windows Explorer - Activates Windows Explorer feature of operating system.

Work Area - Where active and/or open tools are displayed.

Zoom command (Display Menu) - Allows the option of zooming only the x-axis, y-axis or both the x- and y-axes when utilizing the Zoom In/Out feature.

Zoom Both command (Display menu) - Zooms both the x and y axes when using the Zoom In/Out feature.

Zoom In/Out - The **Zoom In/Zoom Out** feature is activated using the left button of a pointing device (mouse). To **Zoom In**, click and drag using the left mouse button until the area to be enlarged is highlighted. This can be done repeatedly until the desired magnification is achieved. To **Zoom Out**, double click the left mouse button.

Zoom X-axis only - Will only zoom the x-axis plot.

Zoom Y-axis only - Will only zoom the y-axis plot.

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