ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Tektronix TLA7M4* at our website: ***Click HERE***

User Manual

Tektronix

TLA 700 Series
Logic Analyzer

070-9775-04

This document supports application software
version 2.0 and above.

CE

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Copyright © Tektronix, Inc. All rights reserved. Licensed software products are owned by Tektronix or its suppliers and are protected by United States copyright laws and international treaty provisions.

Use, duplication, or disclosure by the Government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.227-7013, or subparagraphs (c)(1) and (2) of the Commercial Computer Software – Restricted Rights clause at FAR 52.227-19, as applicable.

Tektronix products are covered by U.S. and foreign patents, issued and pending. Information in this publication supercedes that in all previously published material. Specifications and price change privileges reserved.

Printed in the U.S.A.

Tektronix, Inc., P.O. Box 1000, Wilsonville, OR 97070–1000

TEKTRONIX and TEK are registered trademarks of Tektronix, Inc.

MagniVu is a trademark of Tektronix, Inc.

Windows and Windows 95 are trademarks of Microsoft Corporation.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

WARRANTY

Tektronix warrants that the products that it manufactures and sells will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If a product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by Tektronix, with shipping charges prepaid. Tektronix shall pay for the return of the product to Customer if the shipment is to a location within the country in which the Tektronix service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Tektronix shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of non-Tektronix supplies; or d) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

THIS WARRANTY IS GIVEN BY TEKTRONIX IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED. TEKTRONIX AND ITS VENDORS DISCLAIM ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. TEKTRONIX' RESPONSIBILITY TO REPAIR OR REPLACE DEFECTIVE PRODUCTS IS THE SOLE AND EXCLUSIVE REMEDY PROVIDED TO THE CUSTOMER FOR BREACH OF THIS WARRANTY. TEKTRONIX AND ITS VENDORS WILL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IRRESPECTIVE OF WHETHER TEKTRONIX OR THE VENDOR HAS ADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

WARRANTY

Tektronix warrants that the media on which this software product is furnished and the encoding of the programs on the media will be free from defects in materials and workmanship for a period of three (3) months from the date of shipment. If a medium or encoding proves defective during the warranty period, Tektronix will provide a replacement in exchange for the defective medium. Except as to the media on which this software product is furnished, this software product is provided “as is” without warranty of any kind, either express or implied. Tektronix does not warrant that the functions contained in this software product will meet Customer’s requirements or that the operation of the programs will be uninterrupted or error-free.

In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period. If Tektronix is unable to provide a replacement that is free from defects in materials and workmanship within a reasonable time thereafter, Customer may terminate the license for this software product and return this software product and any associated materials for credit or refund.

THIS WARRANTY IS GIVEN BY TEKTRONIX IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED. TEKTRONIX AND ITS VENDORS DISCLAIM ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. TEKTRONIX’ RESPONSIBILITY TO REPLACE DEFECTIVE MEDIA OR REFUND CUSTOMER’S PAYMENT IS THE SOLE AND EXCLUSIVE REMEDY PROVIDED TO THE CUSTOMER FOR BREACH OF THIS WARRANTY. TEKTRONIX AND ITS VENDORS WILL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IRRESPECTIVE OF WHETHER TEKTRONIX OR THE VENDOR HAS ADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table of Contents

General Safety Summary . . . . . **xi**

Preface . . . . . **xiii**
Related Documentation xiii
Contacting Tektronix xv

Getting Started

Getting Started **1–1**
Product Description 1–1
Installation 1–2
Powering On the Logic Analyzer 1–2
Powering Off the Logic Analyzer 1–3
Connecting Probes to the Target System 1–3
Approaching the Windows 1–6
Programmatic Control 1–17
Backing Up User Files 1–17
Portable Mainframe Front Panel Controls 1–18
For Further Information 1–20

Operating Basics

Sampling and Digitizing a Signal 2–1
LA Module Block Diagram 2–2
DSO Module Block Diagram 2–4
Logic Analyzer Physical Model 2–5
Logic Analyzer Conceptual Model 2–6
Intermodule Interactions and Time Correlation 2–7
Listing-Data Concepts 2–8
Microprocessor Support 2–9
High-Level Language (HLL) Support 2–10
Waveform Data Concepts 2–11
Performance Analysis Concepts 2–17
Comparing Acquired Data Against Saved Data 2–18
Repetitive Acquisitions 2–19
TLA 700 Programmatic Interface (TPI) 2–20
Symbol Support 2–21

Reference

Setup **3–1**
Starting From the System Window 3–1
Setting Up the LA Module 3–3
Setting Up the Trigger Program 3–12
Setting Up the DSO Module 3–24
System Trigger 3–30
Arming Modules 3–31
Intermodule and External Signaling 3–32
Merging Modules 3–34

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Saving and Loading Setups, Triggers, and Data 3–35
System Options 3–39
Menu Shortcut Keys 3–40

Acquisition 3–41
Starting and Stopping Acquisition 3–41
Viewing Acquisition Activity 3–43
If the Logic Analyzer Does Not Trigger 3–44

Display 3–47
Opening an Existing Data Window 3–48
Opening a Saved Data Window 3–49
Aligning Saved Data with Current Data 3–49
Creating a New Data Window 3–50
General Purpose Data Window Shortcut Keys 3–51

Waveform Window 3–53
Types of Waveforms 3–54
Reading the Waveform Indicators 3–56
Cursor Measurements 3–58
Jumping to Specific Data Locations 3–59
Searching Data 3–60
Locking Windows 3–61
MagniVu Data 3–62
Comparing Waveform Data 3–63
Adjusting the Waveform Data View 3–65
Customizing the Waveform Window Data 3–68
Exporting Waveform Data 3–68
Printing Waveform Data 3–69
Waveform Window Shortcut Keys 3–70

Listing Window 3–71
Reading the Listing Window Indicators 3–71
Jumping to Specific Data Locations 3–73
Measuring Listing Data 3–75
Comparing Listing Data 3–75
Searching Data 3–77
Locking Windows 3–78
MagniVu Data 3–79
Adjusting the Listing Data View 3–79
Customizing the Listing Window Data Area 3–81
Exporting Listing Data 3–82
Printing Listing Data 3–85
Listing Window Shortcut Keys 3–86

Source Window 3–87
Creating a Source Window 3–88
Reading the Source Window Indicators 3–89
Jumping to Specific Data Locations 3–90
Moving Through Source Files 3–92
Searching for Source Data 3–95
Adjusting the Source Data View 3–96
Customizing the Source Window Data Area 3–97
Locating Source Files 3–97
Printing Source Data 3–99
Source Window Shortcut Keys 3–100

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Histogram Window 3–101
Measuring Histogram Data 3–102
Creating a Histogram Window 3–103
Adjusting the Histogram Data View 3–104
Customizing the Histogram Window Data Area 3–105
Exporting Histogram Data 3–106
Printing Histogram Data 3–107
Histogram Window Shortcut Keys 3–108

Appendices

Appendix A: Specifications A–1
Characteristic Tables A–1
TLA 704 Color Portable Mainframe Characteristics A–8
TLA 711 Color Benchtop Chassis Characteristics A–12
TLA 711 Color Benchtop Controller Characteristics A–15
TLA 700 Series Logic Analyzer Module Characteristics A–17
TLA 700 Series Digitizing Oscilloscope Module Characteristics A–24

Appendix B: TLA 700 Symbol File Format B–1
TSF Headers B–2
TSF Pattern Symbols B–3
TSF Range Symbols B–4

Appendix C: User Service C–1
General Care C–1
Module Self Calibration C–1
Preventive Maintenance C–2
In Case of Problems C–4
Repacking for Shipment C–4

Appendix D: Probe and Connector Information D–1
P6417 Probe Information D–1
P6434 Probe Information D–2
Benchtop Mainframe Remote On/Standby Switch D–3

Glossary

Index

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

List of Figures

Figure 1–1: Portable and benchtop mainframes 1–1
Figure 1–2: On/Standby switch locations 1–2
Figure 1–3: P6417 17-channel probe 1–4
Figure 1–4: P6434 high-density probe connections 1–5
Figure 1–5: Window usage control flow 1–6
Figure 1–6: System window 1–7
Figure 1–7: DSO Setup window 1–8
Figure 1–8: LA Setup window 1–8
Figure 1–9: LA Trigger window 1–9
Figure 1–10: Trigger library 1–10
Figure 1–11: DSO Trigger window 1–10
Figure 1–12: Listing window 1–11
Figure 1–13: Waveform window 1–12
Figure 1–14: Histogram window 1–13
Figure 1–15: Source window 1–14
Figure 1–16: Comparing regular and MagniVu data 1–15
Figure 1–17: Save and Load operations in the File menu 1–16
Figure 1–18: Using a property sheet to customize the display 1–17
Figure 1–19: Portable mainframe front panel 1–18
Figure 1–20: GlidePoint pad 1–18
Figure 1–21: Locations of external connectors 1–19

Figure 2–1: Acquiring a digital signal (LA module) 2–1
Figure 2–2: Acquiring an analog signal (DSO module) 2–2
Figure 2–3: Block diagram of the LA module acquisition and storage 2–2
Figure 2–4: Block diagram of the DSO module acquisition and storage 2–5
Figure 2–5: Logic analyzer physical model 2–6
Figure 2–6: Logic analyzer conceptual model 2–7
Figure 2–7: Listing data 2–8
Figure 2–8: Listing window with analog data 2–9
Figure 2–9: Listing data using a microprocessor support package . . 2–9
Figure 2–10: High-level source code 2–10
Figure 2–11: Source code viewed as acquired data 2–11
Figure 2–12: Waveform data 2–11
Figure 2–13: Using the DSO module to capture a runt pulse 2–13

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Figure 2–14: LA module sampling resolution 2–14
Figure 2–15: Aliasing 2–15
Figure 2–16: LA module triggering on a glitch 2–16
Figure 2–17: DSO module triggering on a glitch 2–17
Figure 2–18: Viewing the performance of code with a Histogram window 2–18
Figure 2–19: Using color to show memory differences in a Listing window 2–19
Figure 2–20: Defining repetitive setups 2–20
Figure 2–21: Using symbols in a trigger program 2–21
Figure 2–22: Waveforms using pattern symbols 2–23
Figure 2–23: Listing data using range symbols 2–23
Figure 2–24: Symbols dialog box 2–24
Figure 2–25: Load Symbol Options dialog box 2–25

Figure 3–1: System window 3–1
Figure 3–2: Opening a Waveform window from the System window 3–2
Figure 3–3: The LA module Setup window 3–3
Figure 3–4: Setup window with the QSTART support package 3–4
Figure 3–5: Selecting channels for memory compare 3–5
Figure 3–6: Enabling data compare 3–6
Figure 3–7: Channel grouping table in the Setup window 3–10
Figure 3–8: The Activity Indicators dialog box 3–11
Figure 3–9: Probe Thresholds dialog box 3–12
Figure 3–10: LA module Trigger window 3–13
Figure 3–11: Trigger window structure 3–14
Figure 3–12: Overview portion of LA Trigger window 3–15
Figure 3–13: Trigger detail portion of LA Trigger window 3–15
Figure 3–14: Using trigger storage 3–23
Figure 3–15: DSO Setup window 3–25
Figure 3–16: DSO Setup window vertical input settings 3–27
Figure 3–17: DSO Setup window Horizontal settings 3–28
Figure 3–18: Signals property page 3–32
Figure 3–19: Merging modules 3–34
Figure 3–20: Logic analyzer conceptual model 3–35
Figure 3–21: Saving a system with data 3–36
Figure 3–22: Load System Options dialog box 3–37
Figure 3–23: Saving a file in a personalized trigger library 3–38
Figure 3–24: Defining setups for Repetitive mode 3–43

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Figure 3–25: The Status Monitor 3–43
Figure 3–26: The Listing and Waveform windows 3–47
Figure 3–27: Opening a data window 3–48
Figure 3–28: New Data Window wizard 3–50
Figure 3–29: Waveform window 3–53
Figure 3–30: Waveform types 3–54
Figure 3–31: Magnitude waveform 3–55
Figure 3–32: Range readouts 3–55
Figure 3–33: Waveform window cursors and marks 3–56
Figure 3–34: Using the Go To dialog box to jump to the system trigger 3–59
Figure 3–35: Using the Overview Mark bar to jump to a data location 3–59
Figure 3–36: Defining search criteria 3–61
Figure 3–37: Lock Windows dialog box 3–61
Figure 3–38: MagniVu data 3–62
Figure 3–39: Adding a MagniVu data source to a data window 3–63
Figure 3–40: Selecting compare data colors in the Waveform Window property page 3–64
Figure 3–41: Viewing LA compare data in a Waveform window 3–65
Figure 3–42: Add Waveform dialog box 3–66
Figure 3–43: Waveform with a glitch 3–67
Figure 3–44: Property page 3–68
Figure 3–45: Listing window 3–71
Figure 3–46: Listing window cursors and marks 3–72
Figure 3–47: Using the Go To dialog box to jump to the system trigger 3–74
Figure 3–48: Using the Overview Mark bar to jump to a data location 3–74
Figure 3–49: Selecting compare data colors in the Listing Window property page 3–76
Figure 3–50: Viewing LA compare data in a Listing window 3–77
Figure 3–51: Defining search criteria 3–78
Figure 3–52: Lock Windows dialog box 3–79
Figure 3–53: Add Column dialog box 3–80
Figure 3–54: Export Data dialog box 3–82
Figure 3–55: Export Data Options dialog box 3–83
Figure 3–56: Source window 3–87
Figure 3–57: Source window cursors and marks 3–89

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Figure 3–58: Using the Go To dialog box to jump to the cursor location 3–91
Figure 3–59: Using the Overview Mark bar to jump to a data location 3–91
Figure 3–60: Source window controls 3–92
Figure 3–61: Defining source search criteria 3–96
Figure 3–62: Source Files property page 3–98
Figure 3–63: Histogram window 3–101
Figure 3–64: Selecting the data source for the Histogram window . . 3–102
Figure 3–65: Measuring events with the Histogram window 3–103
Figure 3–66: Export Histogram dialog box 3–106
Figure 3–67: ASCII histogram data file 3–107

Figure A–1: Front and side views of TLA 704 Color Portable Mainframe A–11
Figure A–2: Front view and side view of standard Benchtop chassis A–14
Figure A–3: Front view and side view of Benchtop chassis with Rackmount Option A–14

Figure D–1: P6417 probe footprints D–1
Figure D–2: P6417 probe podlet clearance D–1
Figure D–3: Connector used for remote On/Standby switch D–3

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

List of Tables

Table 2–1: Using symbols in logic analyzer windows 2–22

Table 3–1: LA Trigger library 3–16
Table 3–2: Trigger events 3–20
Table 3–3: Trigger resources 3–21
Table 3–4: Trigger actions 3–22
Table 3–5: Menu shortcut keys 3–40
Table 3–6: General purpose data window shortcut keys 3–51
Table 3–7: Waveform window cursor and mark summary 3–57
Table 3–8: Waveform window shortcut keys 3–70
Table 3–9: Listing window cursor and mark summary 3–72
Table 3–10: Listing window shortcut keys 3–86
Table 3–11: Source window cursor and mark summary 3–89
Table 3–12: Source window shortcut keys 3–100
Table 3–13: Histogram window shortcut keys 3–108

Table A–1: Atmospheric characteristics (mainframes and modules) A–2
Table A–2: Backplane interface (portable and benchtop mainframes) A–3
Table A–3: External signal interface (portable and benchtop mainframes) A–5
Table A–4: Certifications and compliances: TLA 704 Color Portable Mainframe1 and TLA 711 Color Benchtop Mainframe1 . . . . . A–7
Table A–5: Portable mainframe internal controller A–8
Table A–6: Portable mainframe display system A–8
Table A–7: Portable mainframe front-panel interface A–9
Table A–8: Portable mainframe rear-panel interface A–9
Table A–9: Portable mainframe AC power source A–10
Table A–10: Portable mainframe secondary power A–10
Table A–11: Portable mainframe cooling A–11
Table A–12: Portable mainframe mechanical A–11
Table A–13: Benchtop chassis AC power source A–12
Table A–14: Benchtop chassis secondary power A–12
Table A–15: Benchtop chassis cooling A–13
Table A–16: Benchtop chassis mechanical A–13
Table A–17: Benchtop controller characteristics A–15
Table A–18: Benchtop controller mechanical characteristics A–16
Table A–19: LA module channel width and depth A–17

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–20: LA module clocking A–17
Table A–21: LA module trigger system A–19
Table A–22: LA module input parameters (with P6417 Probe) A–21
Table A–23: LA module MagniVu feature A–21
Table A–24: Merged LA modules A–22
Table A–25: LA module data handling A–22
Table A–26: LA module mechanical A–23
Table A–27: DSO module signal acquisition system A–24
Table A–28: DSO module timebase system A–27
Table A–29: DSO module trigger system A–27
Table A–30: DSO module front-panel connectors A–29
Table A–31: DSO module certifications and compliances A–29
Table A–32: DSO module mechanical A–30

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

To Avoid Fire or Personal Injury

Use Proper Power Cord. Use only the power cord specified for this product and certified for the country of use.

Connect and Disconnect Properly. Do not connect or disconnect probes or test leads while they are connected to a voltage source.

Ground the Product. This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and marking on the product. Consult the product manual for further ratings information before making connections to the product.

The common terminal is at ground potential. Do not connect the common terminal to elevated voltages.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

Use Proper AC Adapter. Use only the AC adapter specified for this product.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

Use Proper Fuse. Use only the fuse type and rating specified for this product.

Avoid Exposed Circuitry. Do not touch exposed connections and components when power is present.

Do Not Operate With Suspected Failures. If you suspect there is damage to this product, have it inspected by qualified service personnel.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

Provide Proper Ventilation. Refer to the manual's installation instructions for details on installing the product so it has proper ventilation.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Symbols and Terms

Terms in this Manual. These terms may appear in this manual:



WARNING. *Warning statements identify conditions or practices that could result in injury or loss of life.*



CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Terms on the Product. These terms may appear on the product:

DANGER indicates an injury hazard immediately accessible as you read the marking.

WARNING indicates an injury hazard not immediately accessible as you read the marking.

CAUTION indicates a hazard to property including the product.

Symbols on the Product. The following symbols may appear on the product:



WARNING
High Voltage



Protective Ground
(Earth) Terminal



CAUTION
Refer to Manual



Double
Insulated

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Preface

This manual contains operating information for the TLA 700 Series Logic Analyzer. The manual consists of the following sections:

- *Chapter 1: Getting Started.* Provides basic information about using the logic analyzer.
- *Chapter 2: Operating Basics.* Describes some logic analyzer concepts.
- *Chapter 3: Reference.* Describes how to configure and operate the logic analyzer.
- *Appendix A: Specifications.* Lists the environmental, physical, and electrical properties of the logic analyzer and LA module probes.
- *Appendix B: TLA 700 Symbol File Format.* Provides information on the contents of symbol files using the TLA 700 Symbol File format.
- *Appendix C: User Service.* Provides user service information.
- *Appendix D: Probe and Connector Information.* Provides logic analyzer probe and connector information.

Related Documentation

In addition to this user manual, the following documentation is available for your TLA 700 Series Logic Analyzer:

- The *TLA 700 Series Logic Analyzer Installation Manual* provides installation information for the TLA 700 Series Logic Analyzer.
- The online help provides information about the TLA 700 Series user interface and the TLA 700 Programmatic Interface (TPI). To view the online help, select Help Topics from the Help menu.
- The online release notes provide last-minute product and software information not included in this manual. Refer to *Release Notes* on page 1–21 for information on viewing the release notes.
- A series of microprocessor support instruction manuals provide operating and service instructions for the individual microprocessor support packages.
- The *TLA 700 Series TLA 7QS QuickStart Training Manual* provides training exercises to help you learn key features of the TLA 700 Series Logic Analyzer. The training manual is designed to be used with the TLA 7QS QuickStart training board.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- The *TLA 700 Series TLA 7QS QuickStart Technical Reference Manual* provides technical and service information for the TLA 7QS QuickStart training board.
- The *TLA 700 Series Performance Verification and Adjustment Technical Reference Manual* provides performance verification and adjustment procedures for the major components of the TLA 700 Series Logic Analyzer. The manual includes the performance verification and adjustment software.
- The *TLA 711 Color Benchtop Chassis Service Manual* provides board-level service information for the benchtop chassis.
- The *TLA 711 Color Benchtop Controller Service Manual* provides board-level service information for the benchtop mainframe controller module.
- The *TLA 704 Color Portable Mainframe Service Manual* provides board-level service information for the portable mainframe.
- The *TLA 700 Series Logic Analyzer Modules TLA 7Lx and TLA 7Mx Service Manual* provides board-level service information for the LA modules.
- The *TLA 700 Series DSO Modules TLA 7Dx and TLA 7Ex Service Manual* provides board-level service information for the DSO modules.
- The *P6434 Mass Termination Probe Instructions* provides instructions for using the P6434 probes.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Contacting Tektronix

Product Support	For application-oriented questions about a Tektronix measurement product, call toll free in North America: 1-800-TEK-WIDE (1-800-835-9433 ext. 2400) 6:00 a.m. – 5:00 p.m. Pacific time Or, contact us by e-mail: tm_app_supp@tek.com For product support outside of North America, contact your local Tektronix distributor or sales office.
Service Support	Contact your local Tektronix distributor or sales office. Or, visit our web site for a listing of worldwide service locations. http://www.tek.com
For other information	In North America: 1-800-TEK-WIDE (1-800-835-9433) An operator will direct your call.
To write us	Tektronix, Inc. P.O. Box 1000 Wilsonville, OR 97070-1000 U.S.A.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Getting Started

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Getting Started

This chapter provides basic information about using the logic analyzer. There is information about the physical instrument and introductory information about how to operate it. Once you have a basic grasp of this information, proceed to the next chapter, *Operating Basics*, for a conceptual model of how the logic analyzer works.

Product Description

The TLA 700 Series Logic Analyzer is a configurable instrument that combines a high-performance logic analyzer with a digitizing storage oscilloscope. There are two mainframe styles, portable and benchtop, as shown in Figure 1–1.

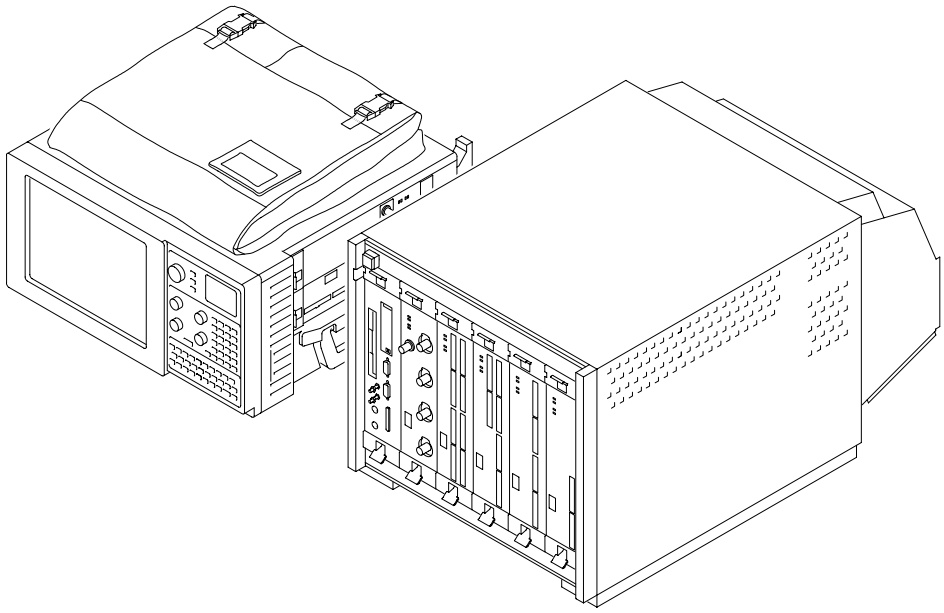


Figure 1–1: Portable and benchtop mainframes

Several logic analyzer (LA) modules are available, in various combinations of channel width and memory depth. All provide simultaneous state and timing measurements through a single probe.

The LA module implements a feature called MagniVu, an acquisition technology that enables each of the LA modules to offer 500 picosecond timing resolution on all channels. MagniVu data is always available for all channels and requires no additional probing.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The digitizing storage oscilloscope (DSO) module incorporates digital real-time signal acquisition. DSO module data is tightly correlated with data from other modules, for displays and for intermodule triggering and signalling.

The user interface is built on the familiar Windows 95 operating system. In addition to using an interface you probably already know, this means that you can install any PC-compatible, third-party hardware and software on the instrument.

Installation

Installation information for the TLA 700 Series mainframe, modules, and software is located in the *TLA 700 Series Logic Analyzer Installation Manual*.

Powering On the Logic Analyzer

Power on the logic analyzer as follows:

1. Press the On/Standby switch to power on the logic analyzer (see Figure 1–2 for the switch location).
2. Wait for the logic analyzer to complete power-on self-tests, start Windows, and start the TLA 700 application.

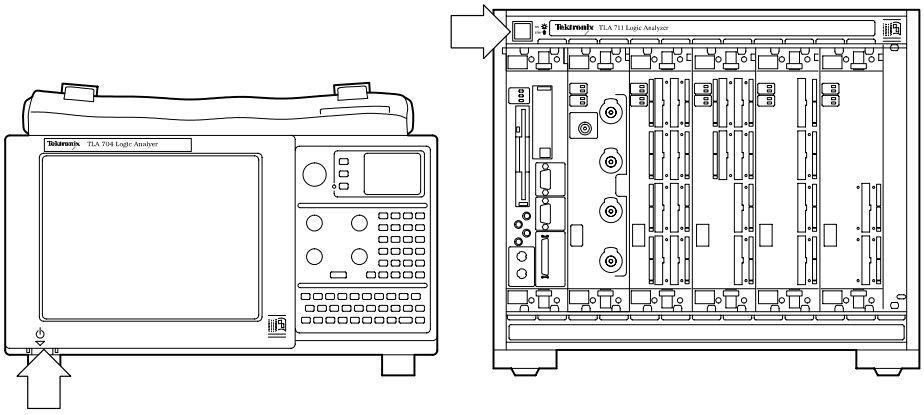


Figure 1–2: On/Standby switch locations

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Powering Off the Logic Analyzer

The portable mainframe has a built-in soft power-off function that safely powers off the mainframe when you press the On/Standby switch. If you have the benchtop mainframe, you must power off the mainframe using the Windows 95 shutdown process before depressing the On/Standby switch.

You can set the shutdown mode in the Mainframe Utilities tool in the Windows 95 control panel.



CAUTION. *When powering off the benchtop mainframe, use the Windows 95 shut down procedure. Powering down the benchtop mainframe prematurely can corrupt the software on the hard disk.*

Connecting Probes to the Target System

The logic analyzer connects to the target system through probes. The LA probes allow you to connect to the target system in several different ways as shown in the following illustrations. You can use the color-coded probe channels to map the hardware connections to the channel settings in the LA Setup window. Each LA probe group consists of eight channels that can be individually named in the LA Setup menu.

Connect the probes to the logic analyzer by matching the color-coded label to the label on the LA module. To provide a secure connection to the LA module, you can optionally use the probe retainer bracket with the probe connector.

General Purpose Connections

The P6417 probes provide a means to connect to the target system for most applications. Figure 1–3 shows different ways to connect the probe to the target system.

Note the location of the ground connections for the probe:

- The individual podlets have the ground (GND) engraved on the podlet.
- When you use the 8-channel leadsets, the ground lead is a single black connector. Make sure you connect the ground side of the 8-channel lead set to the ground side of the 8-channel podlet holder.

Refer to *Appendix D: Probe and Connector Information* for information on dimensions for the P6417 probes.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

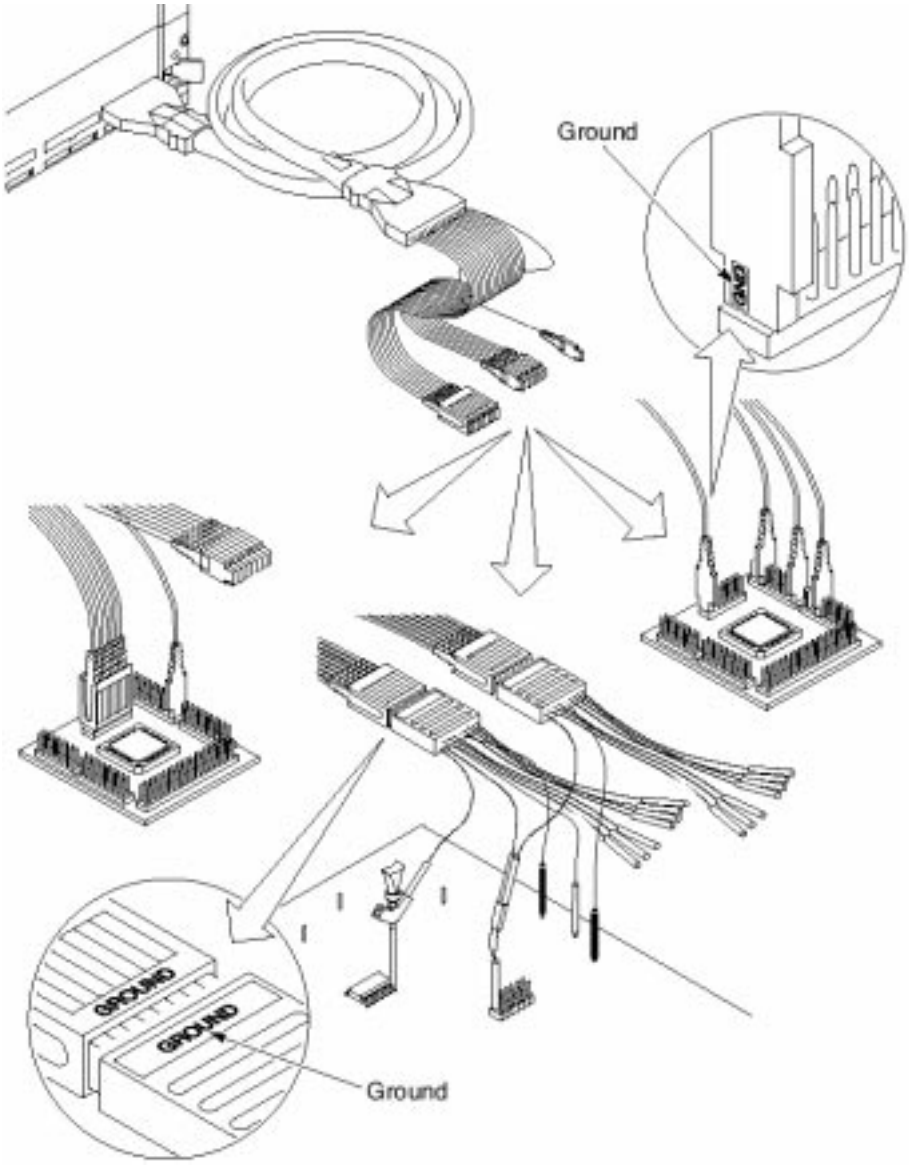


Figure 1–3: P6417 17-channel probe

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

High-Density Probe Connections

The P6434 Mass Termination Probe allows you to connect 34 LA channels to a microprocessor probe adapter or directly to the target system. To connect to the target system directly, you must include compatible Mictor connectors in your circuit board design.

Figure 1–4 shows two ways of connecting the LA module to a target system. For more information on the P6434 Mass Termination Probe and how to connect it to your target system, refer to the *P6434 Mass Termination Probe Instructions*.

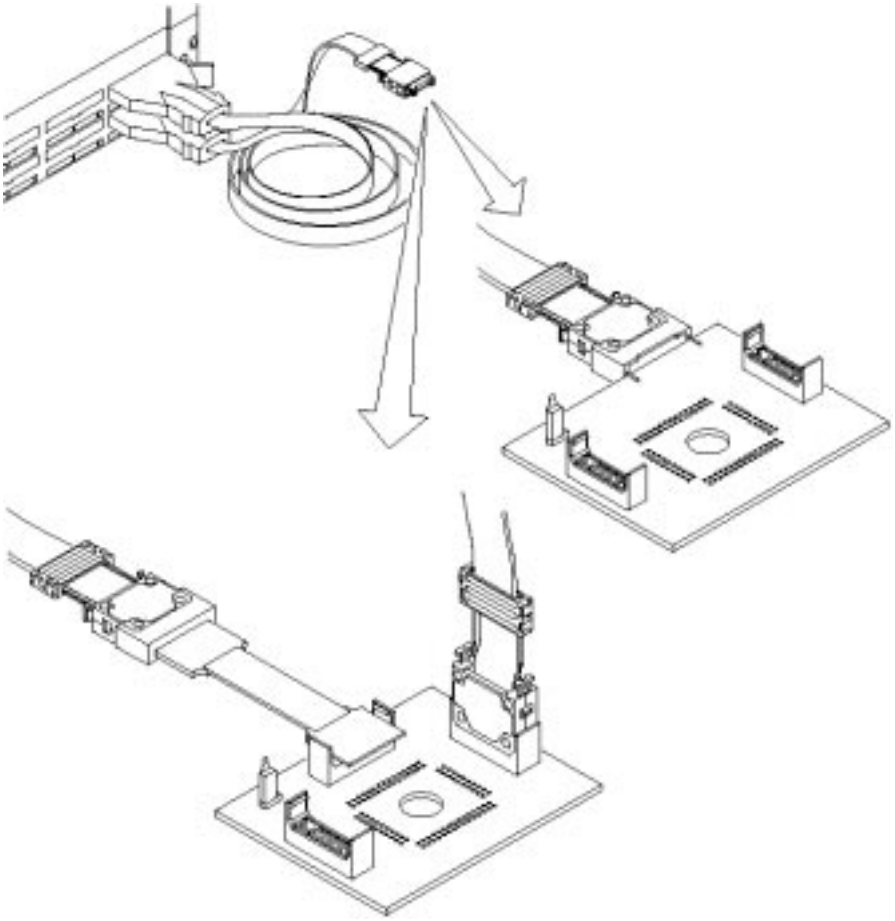


Figure 1–4: P6434 high-density probe connections

Microprocessor Connections

Both the P6417 and the P6434 probes can be connected to microprocessor adapters. Refer to the documentation that comes with your microprocessor disassembler package for details about connecting the probes to the microprocessor adapters and to the target system.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Approaching the Windows

Typically, you use the windows in this application as shown in Figure 1–5.

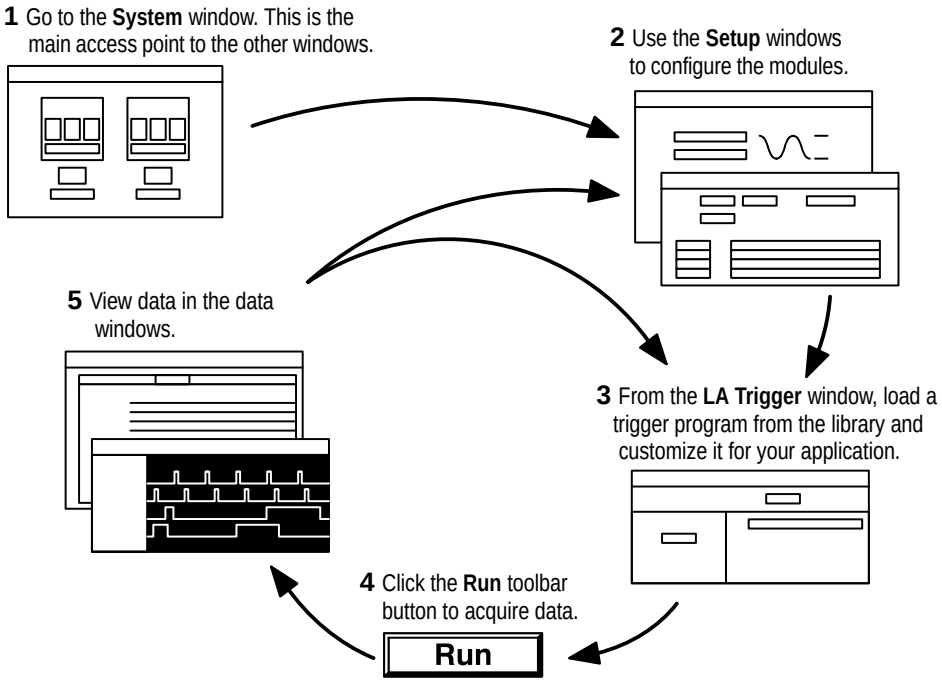


Figure 1–5: Window usage control flow

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

System Window

The System window is your point-of-entry into the logic analyzer, and functions as the overall control center.

You can perform the following functions from the System window:

- Open module and data windows by clicking their buttons. To select a module without opening its windows, click inside the icon (but not on its buttons).
- Create new data windows through the New Data Window wizard. You can create Histogram windows for performance analysis operations and Source windows to track the execution of source code. You can also create additional Listing and Waveform windows.
- Use the System window for an overview of how the modules and data windows relate to one another. Relationships between modules (if any) are always shown; to view which modules are associated with a data window, you must select the module icon.
- View which modules provide data to each window by clicking the window name.
- Enable and disable modules by clicking their On/Off buttons.
- Save and load files containing setup, trigger, and data information, by means of selections from the File menu.

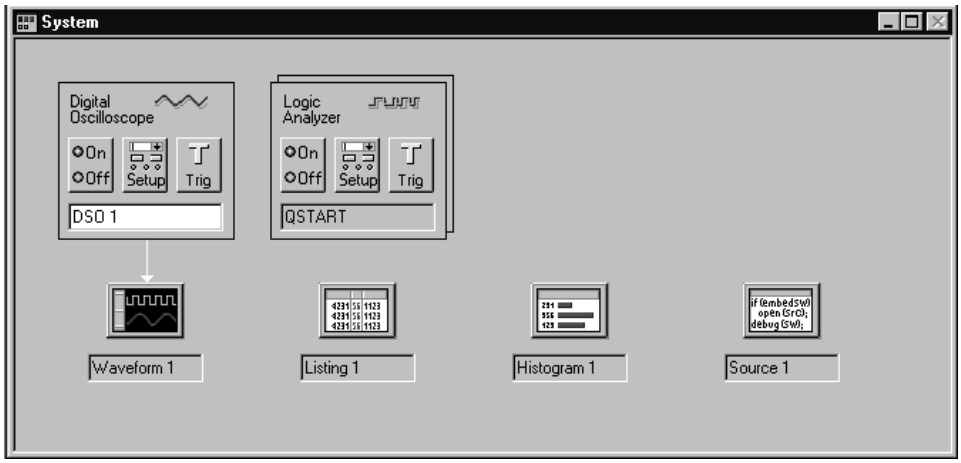


Figure 1–6: System window

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Setup Windows

Before you acquire and display data, you must first configure the modules using the module Setup windows. Each module has its own Setup and Trigger window; each is set up individually. Generally, you should configure the Setup windows before the Trigger windows, because some of the Setup window settings affect Trigger window selections.

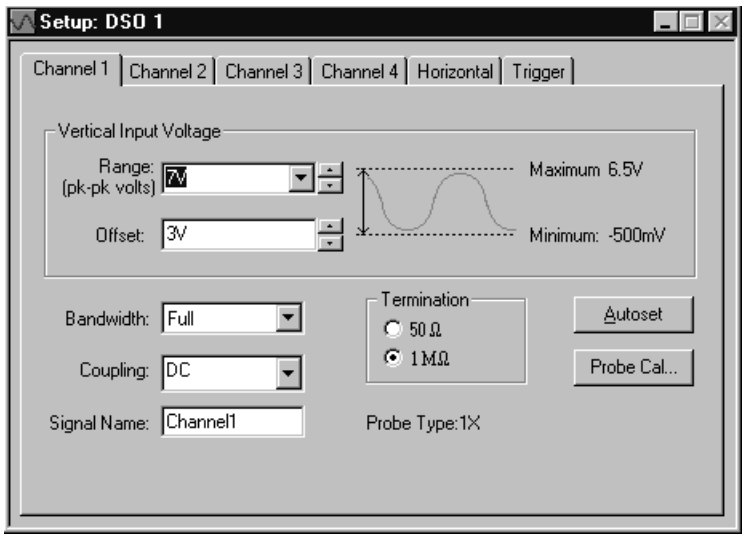


Figure 1–7: DSO Setup window

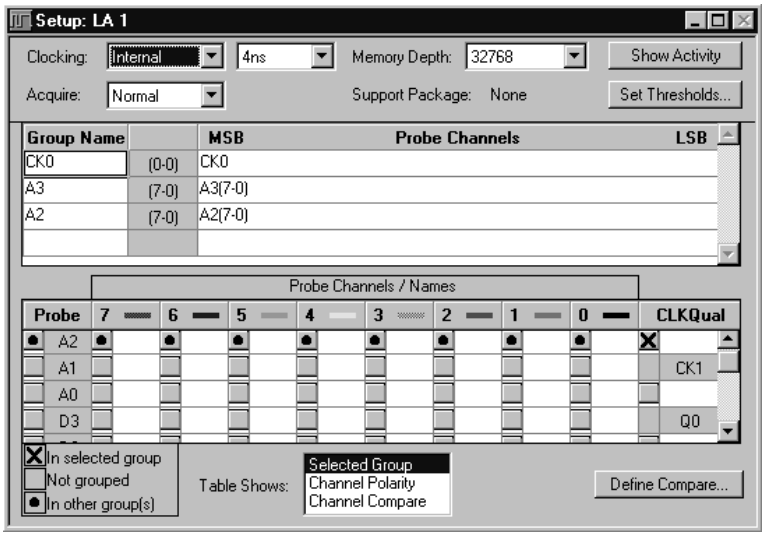


Figure 1–8: LA Setup window

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Trigger Windows

Both modules have their own Trigger windows. The primary purposes of the Trigger windows are to specify the trigger conditions.

LA Trigger Window. The LA Trigger window is the heart of the logic analyzer. You can use the Trigger window to define the conditions when the logic analyzer acquires and stores data. See Figure 1–9.

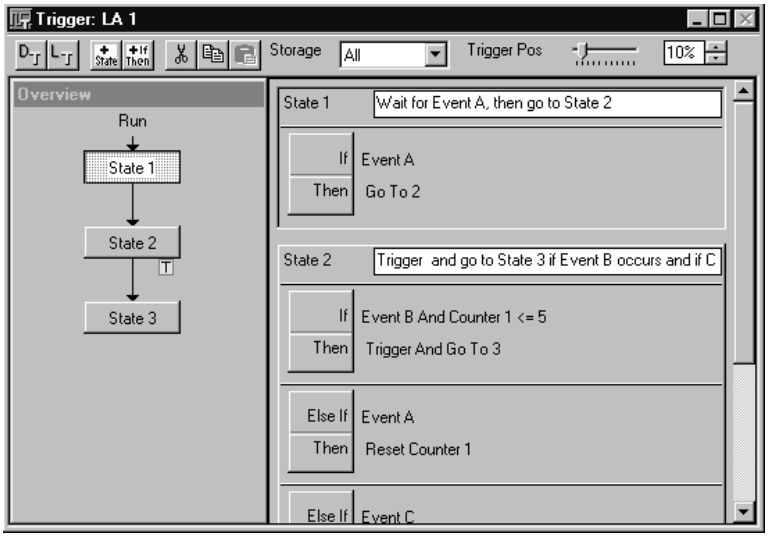


Figure 1–9: LA Trigger window

You can define simple or complex trigger programs one step at a time to determine how the logic analyzer finds the data you are interested in.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Another common method for setting up a trigger program is to load a trigger program from the trigger library (see Figure 1–10). You can then alter the trigger program details as necessary.

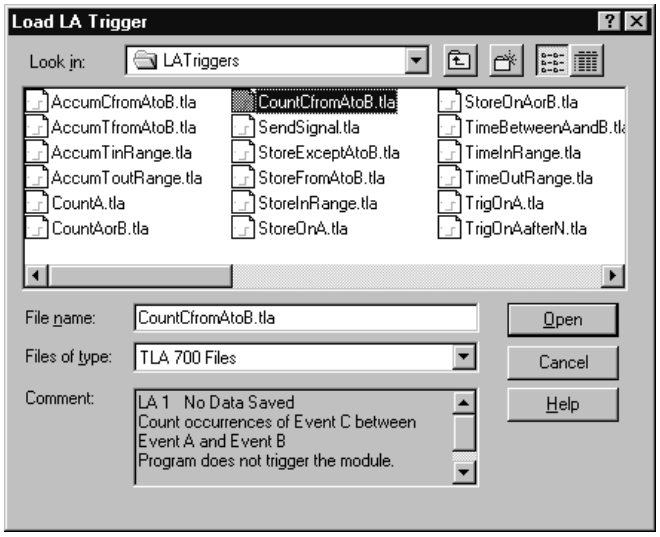


Figure 1–10: Trigger library

DSO Trigger Window. The DSO Trigger window lets you define how to trigger the DSO on analog and digital signals.

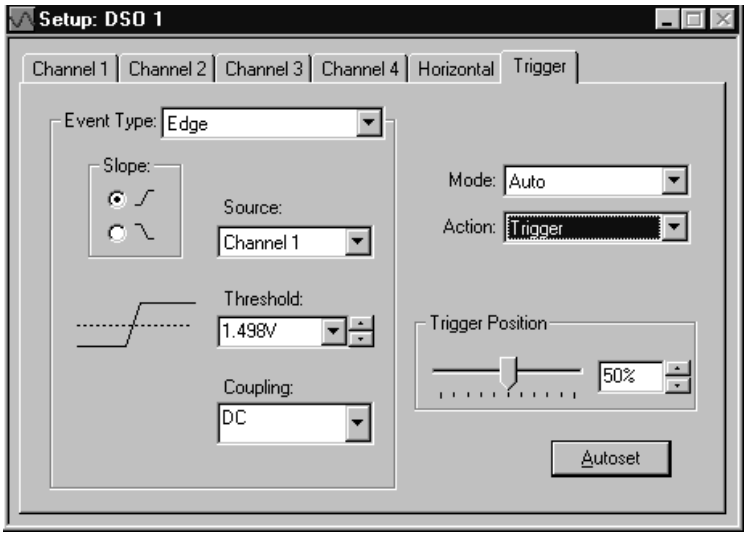


Figure 1–11: DSO Trigger window

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Data Windows

You can use data windows to display and analyze acquired data from the LA or DSO modules. The most common data windows are the Listing windows and Waveform windows. These are the two default windows for a logic analyzer with a DSO module and a LA module installed.

To display and evaluate complex logic analyzer data, you can create other types of data windows using the New Data Window wizard (such as the Histogram window and the Source window). Refer to *Creating a New data Window* beginning on page 3–50 for information on creating data windows.

You can have as many data windows as you want to display different data or different views of the same data.

Listing Windows. Listing windows (see Figure 1–12) display LA data in lists or columns.

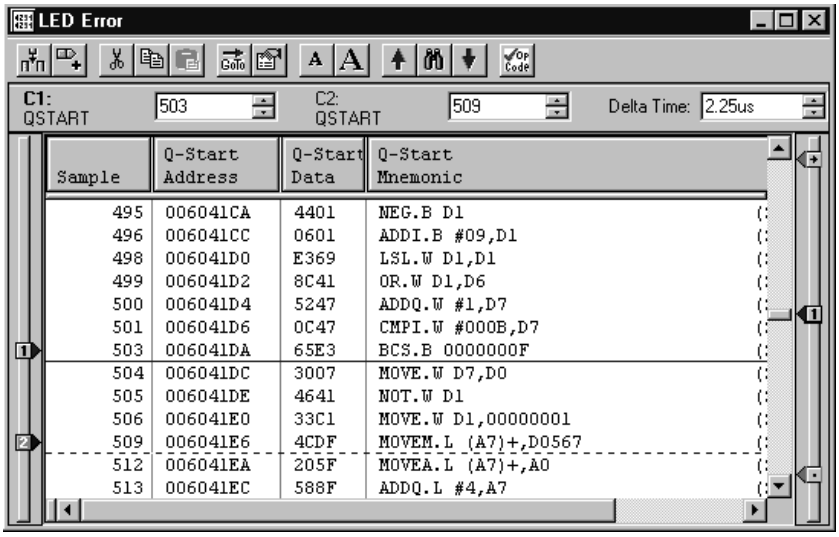


Figure 1–12: Listing window

You can perform the following functions in Listing windows:

- Place user marks to flag specific data samples for evaluation.
- Use the scroll bars to move through the data or jump to a specific point in the data by clicking the Go To toolbar button and selecting a mark.
- Search for a data event by clicking the Define Search button in the toolbar.
- Move columns by clicking on their labels to select them, and then dragging them to a new location.
- Add columns by clicking the Add Column toolbar button.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- Split the window into two panes for viewing data that is offscreen.

Waveform WIndows. Waveform windows (see Figure 1–13) display DSO or LA waveform data.

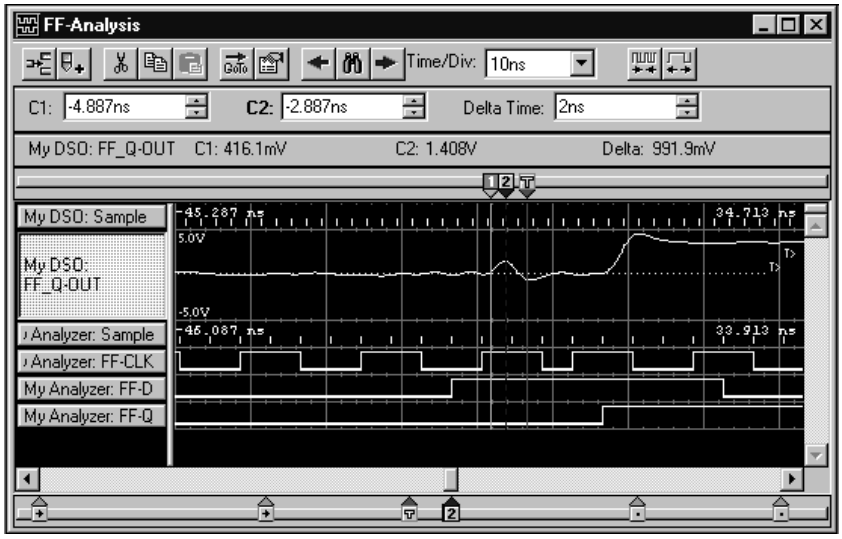


Figure 1–13: Waveform window

You can perform the following functions in Waveform windows:

- Use the cursors to take time or voltage measurements.
- Place user marks to flag specific data samples for evaluation.
- Use the scroll bars to move through the data, or jump to a specific point in the data by clicking the Go To toolbar button and selecting a mark.
- Search for a data event by clicking the Define Search button in the toolbar.
- Move waveforms by clicking on their labels to select them, and then dragging them to a new location.
- Add waveforms by clicking the Add Waveform toolbar button.
- Split the window into two panes for viewing data that is offscreen.
- View collections of LA module waveforms as busforms.
- View the value of a LA module waveform group versus time using magnitude mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Histogram Window. Histogram windows (see Figure 1–14) display LA data as histograms. You use Histogram windows to evaluate the performance of software; this is also known as performance analysis.

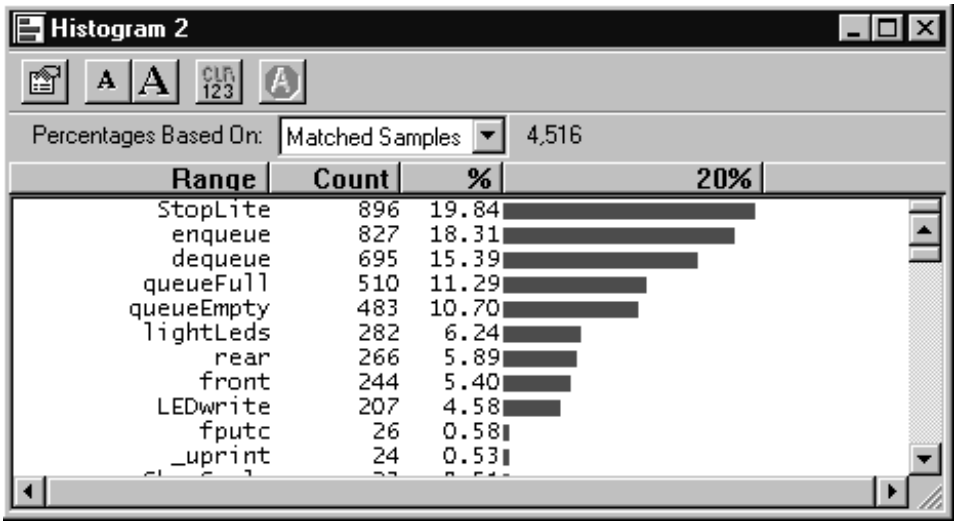


Figure 1–14: Histogram window

You can perform the following functions in Histogram windows:

- Use the scroll bars to move through the data.
- Sort histogram data by ranges, counts, or percentages.
- Change the magnification of histogram bars to view the data in greater detail.
- Split the window into two panes for viewing data that is off screen.
- View various statistics on the acquired data.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Source Windows. Source windows (see Figure 1–15) display source data. You can track the execution of source code based on the data displayed in a Listing window.

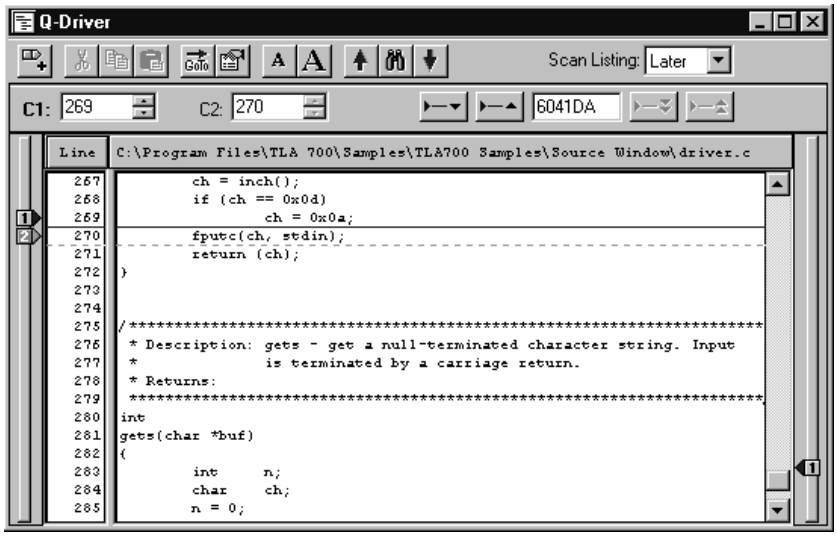


Figure 1–15: Source window

You can perform the following functions in Source windows:

- Step through source code statements.
- Turn source code line numbers on or off.
- Place user marks to flag specific data samples for evaluation.
- Use the scroll bars to move through the data, or jump to a specific point in the data by clicking the Go To toolbar button and selecting a mark.
- Search for source code statements by clicking the Define Search button in the toolbar.
- Determine whether there is any acquired data for the corresponding source file displayed in the Source window.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

MagniVu Data

The LA modules have MagniVu data acquisition as a standard feature. MagniVu acquisition offers 500 picosecond high-resolution timing simultaneous with 200 MHz state on all channels through the same probes; no double-probing is required. The example shown in Figure 1–16 shows regular data and MagniVu data for the same channels. You can easily add MagniVu data with the Add Waveform toolbar button.

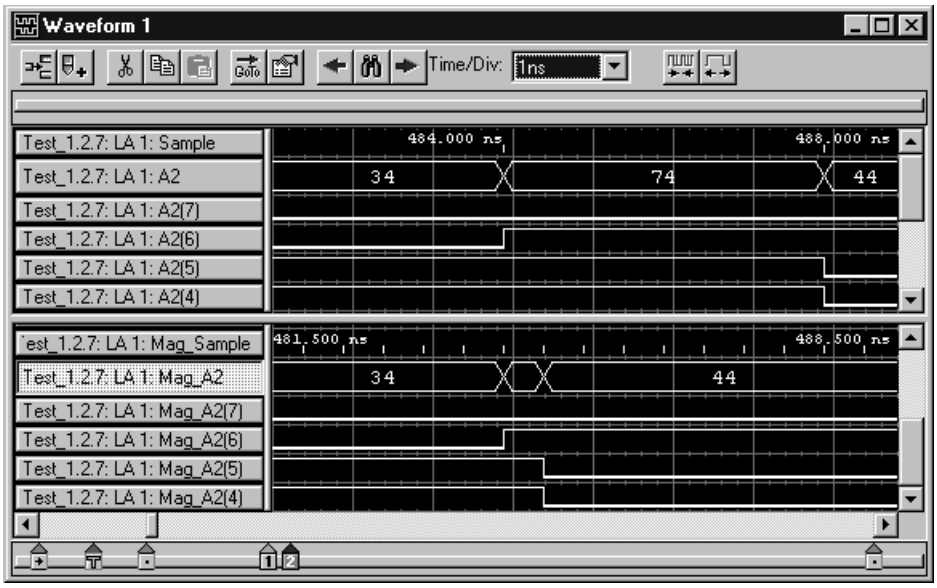


Figure 1–16: Comparing regular and MagniVu data

Saving and Loading Setups and Data

Once you set up the logic analyzer to your satisfaction you will probably want to save the setup for future use. You can save setup information in two ways, as a saved system file or as a saved module file.

Saved system files contain setup and trigger information for each module as well as system level information (such as repetitive properties) and data windows for the logic analyzer. Saved module files contain setup and trigger information for only the module specified. In both cases you have the option of saving acquired data with the files.

Execute Save and Load operations from the File menu. For module Save or Load operations, you must first go to the module Setup or Trigger window.

Save the setups and data in a folder where you can easily retrieve them. For example, you may want to save the data in the My Documents folder or within a folder of your own choosing. You should not save the data in a location that may be difficult to find or in a location (such as the Windows System folder) that may cause problems with your operating system.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Avoid using file name extensions other than the default ones supplied by the system. The logic analyzer may not recognize saved setups with nonstandard file name extensions.

Saved system and module files both contain trigger program information. When you load a trigger from the LA Trigger window, you can select a saved system or module file as the source. When you do so, the logic analyzer extracts only the trigger information from the file and loads it to the module.

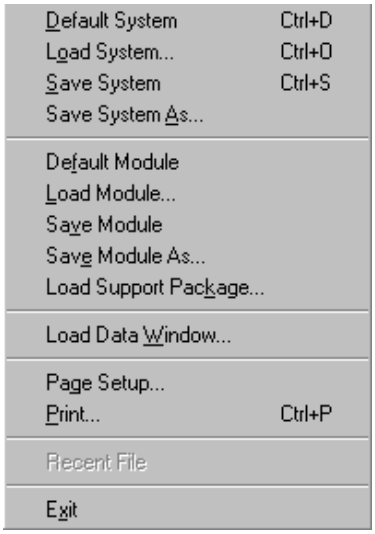


Figure 1–17: Save and Load operations in the File menu

Customizing the Display

You can customize your data windows. Using property sheets, you can control data window display parameters. Also, many screen elements, such as waveforms, columns, and marks, have their own property sheets.

Open data window property sheets by clicking the Properties toolbar button in the data window. Open screen element property sheets by double-clicking on the element or its label.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

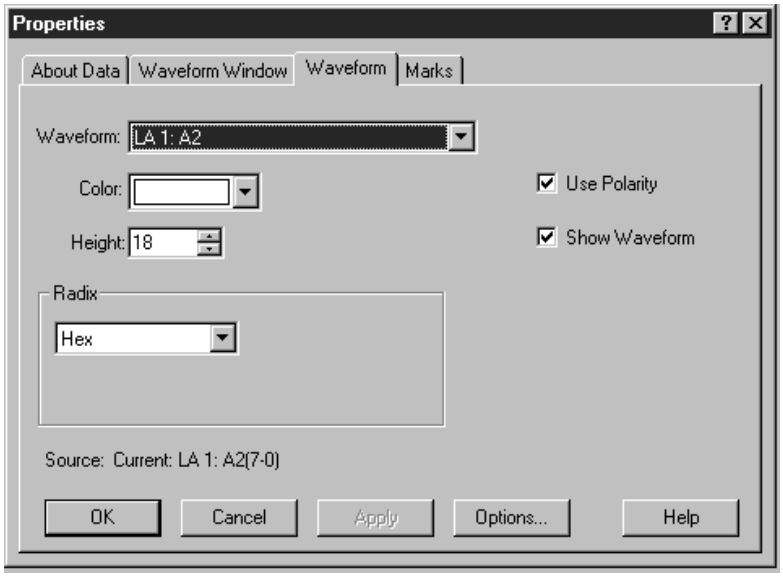


Figure 1–18: Using a property sheet to customize the display

Programmatic Control

In addition to controlling the logic analyzer from the user interface, you can use the TLA 700 Programmatic Interface (TPI) to control the logic analyzer from a separate program running on the logic analyzer or on a remote host. Information for using TPI is included as part of the TLA 700 online help. An online TPI user manual (available in PDF format) can be printed from the logic analyzer.

Backing Up User Files

You should back up your user files on a regular basis. Use the Windows Back Up tool to back up files stored on the hard disk. The Back Up tool is located in the System Tools folder in the Accessories folder. Start the tool and determine which files and folders you want to back up. Use the Windows online help for information on using the Back Up tool.

In particular, you should frequently back up your user-generated files. For the logic analyzer, the user-generated files consist of saved system and module files, which have a .tla file name extension.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Portable Mainframe Front Panel Controls

The portable version of the mainframe has front panel controls which you can operate the logic analyzer without the mouse or keyboard.

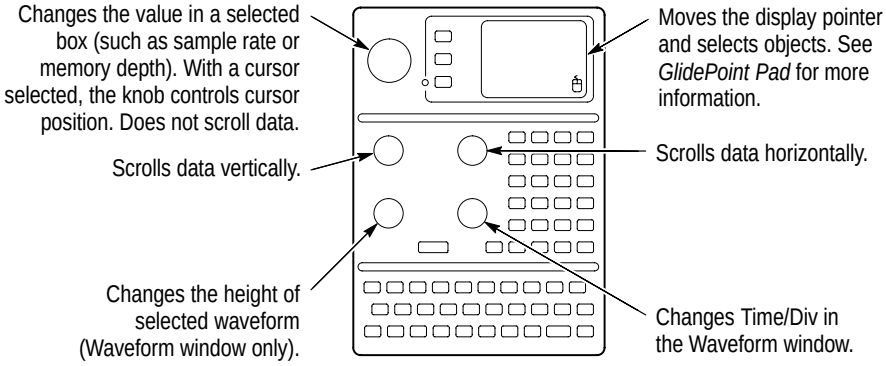


Figure 1–19: Portable mainframe front panel

Keys

For the portable mainframe, you can use the front panel keys as an alternative to the detachable keyboard. Most keys and key combinations are available via the front panel.

For key combinations, it is not necessary to hold down more than one key at a time. For example, you can press SHIFT in the hexadecimal keypad, and then press a QWERTY key to accomplish a Shift+key combination. The same is true for other key combinations, such as CTRL and ALT keys.

GlidePoint Pad

For the portable mainframe, you can use the GlidePoint pad as an alternative to the mouse. To move the pointer, slide your finger lightly over the surface of the pad. Tap the surface to simulate a click of the left mouse button, or use the control buttons to select the type of operation.

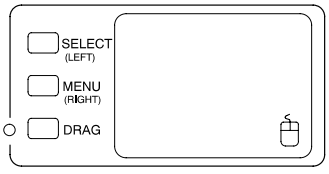


Figure 1–20: GlidePoint pad

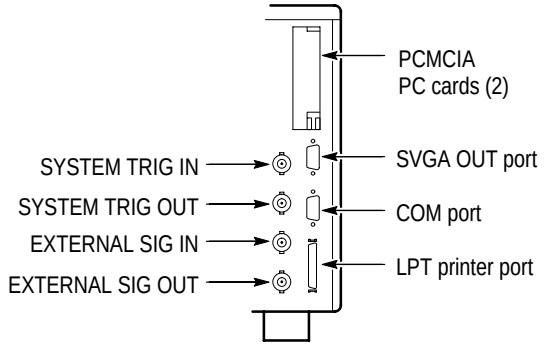
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

External Connectors

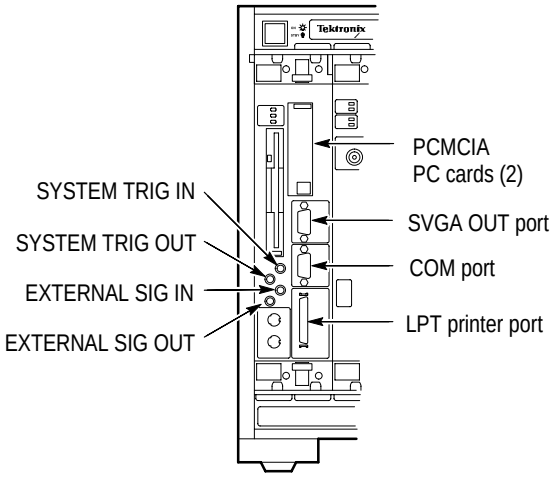
The mainframe external connectors are shown in Figure 1–21. The following connections are available:

- System Trigger In and System Trigger Out, used to receive or send a trigger from/to an external source.
- External Signal In and External Signal Out, used to receive or send a signal from/to an external source.
- Accessory connections.

For information about the accessory connections, refer to the *TLA 700 Series Logic Analyzer Installation Manual*.



Portable mainframe (rear view)



Benchtop mainframe (front view)

Figure 1–21: Locations of external connectors

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

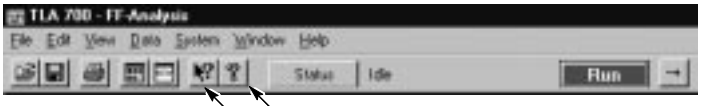
For Further Information

In addition to the information in this manual, you may want to refer to other documentation for this TLA 700 Series Logic Analyzer.

Online Help

The online help gives detailed information about the logic analyzer and its modules. Look in the online help for details about user interface selections that are not described in this manual. The online help also has basic operating information for microprocessor support products.

To access online help, go to the Help menu, or click the toolbar buttons shown:



Click for Topic help.

Click for What's This? help on selected object.

Help Topics. Help topics tell you how to perform tasks and describe software features and selections shown on the screen. There are two types of help topics, overview topics and task topics.

Overview topics describe application features, such as windows. Overview topics may also describe concepts. Overview topics are available through the Help menu and through Help buttons in dialog boxes. From the Help menu, click Help Topics, and locate the topic using the Contents or Index tab. The Help on Window selection in the Help menu provides overview help for the currently-selected window.

Task topics provide procedure information about how to perform specific tasks. Task topics are available through the Help menu. From the Help menu, click Help Topics, and locate the topic using the Contents or Index tab.

What's This? Help. What's This? help provides a short description of the control or screen feature selected. First click the What's This? button on the toolbar, and then click the item of interest. For further information about the item, go to the Topic help.

TPI Online Help. Select Help on TPI from the drop-down help menu for information on using the TLA 700 Programmatic Interface. You can also print hard copies of the TPI help from a PDF file.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Windows 95 Online Help. Information about Windows features is available through the Windows help system. Access Windows help as you would with any Windows application:

1. Go to the Windows 95 toolbar and click Start.
2. Select Help.

Release Notes

The online Release Notes contain information about this release of the logic analyzer application. Check the Release Notes for information such as software compatibility and software version differences from last release.

To access the Release Notes, follow these steps:

1. Go to the Windows 95 toolbar and click Start.
2. Select Programs → Tektronix TLA 700 → TLA 700 Release Notes.

Additional Related Documentation

Refer to *Related Documentation* on page xiii for a list of documentation for your TLA 700 Series Logic Analyzer.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Operating Basics

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Operating Basics

This chapter provides an overview of the TLA 700 logic analyzer and basic logic analyzer concepts.

To acquire and display signals from the target system, the logic analyzer must perform a complex series of actions. For the most part, these actions are transparent. However, it can be helpful to understand how the logic analyzer operates. This knowledge can influence how you approach a logic analysis problem.

Sampling and Digitizing a Signal

Acquisition is the process of sampling the input signal, digitizing it to convert it into digital data, and assembling it into a waveform record. The order and method of accomplishing these functions is different between the LA and DSO modules.

The LA module converts incoming data into ones and zeros using a comparator with a user-selectable threshold voltage. If the incoming signal is above the threshold voltage, it is converted to a one; if it is below the threshold voltage, it is converted to a zero. After digitizing the data, the LA module samples it at regular time intervals. The sampled and digitized points are stored in memory along with corresponding timing information. (See Figure 2–1.)

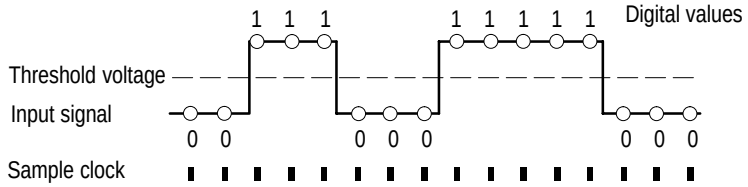


Figure 2–1: Acquiring a digital signal (LA module)

The DSO module samples the voltage level of the signal at regular intervals, and then converts the sampled analog data into 8-bit digital values. (See Figure 2–2.) The sampled and digitized points are stored in memory along with corresponding timing information.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

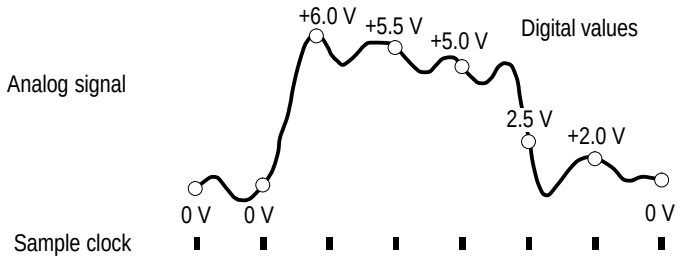


Figure 2–2: Acquiring an analog signal (DSO module)

LA Module Block Diagram

The LA module is the key element of the instrument. Functionally, the LA module can be divided into several blocks, as shown in Figure 2–3. Refer to the figure as you read about the functional blocks.

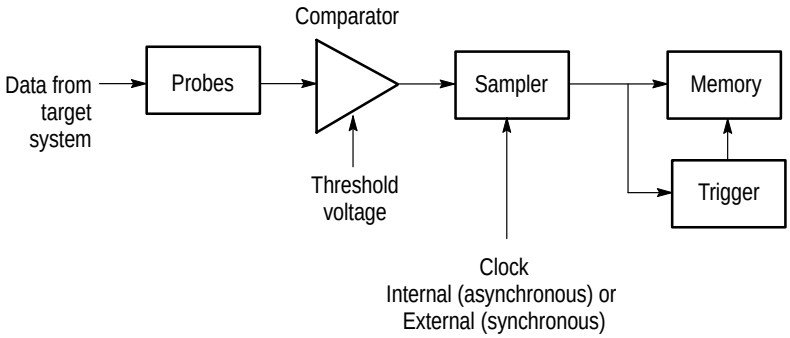


Figure 2–3: Block diagram of the LA module acquisition and storage

Clocking

Clocks control when data is sampled. Naturally, the point at which you sample data has a great deal to do with the type and quality of data you acquire. For the LA module, there are two primary approaches to clocking, external (synchronous) clocking and internal (asynchronous) clocking.

External (Synchronous) Clocking. This clocking mode is called an external or synchronous clock because the clock is external to the logic analyzer, and is synchronized to the target system.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The signal you chose as the external clock to the logic analyzer should be the same signal that controls the activity of the other signals you want to observe. For example, to observe the output states of a counter chip, you might use the clock input to the counter chip to act as the external clock source to the logic analyzer. With this setup, each clock pulse to the counter chip could also be used to clock data from the counter's output lines into the logic analyzer. As another example, to record the data being written to a latch, you could use the load signal to the latch as the external clock source to the logic analyzer.

Internal (Asynchronous) Clocking. Much activity can occur in the target system between system clock signals. Using the LA module's internal (asynchronous) clock, you can view all activity in the target system, not just the data available at the target system clock signal.

Internal clocking is the best choice when you are primarily interested in the timing aspects of the data. Internal clocking is a natural choice for waveform timing analysis. It is important to note, however, that the value of internal clocking is not limited to just displaying waveforms. For a detailed picture of data activity both during and between state changes, use internal clocking. For example, when you use internal clocking you are able to acquire and display glitch information in either the Waveform or Listing windows.

Acquiring Data

When you start an acquisition, the logic analyzer begins sampling data from the probes. Then, each time a sample clock occurs, data is sampled. Sampled data is then sent to the trigger functional block and to the main memory.

Triggering and Storage Qualification

The trigger program looks at sampled data for specific events and then takes a specified action. The trigger program can look for events, such as data values, data ranges, or signals from another module. You can also use internal counters to trigger when the counter reaches a specified value.

When the trigger condition is satisfied, the LA module enables its posttrigger delay counter to allow the posttrigger portion of the acquisition memory to fill before stopping acquisition.

The trigger function block includes storage qualification that looks at sampled data. If the storage conditions are met, a storage qualifier signal enables sampled data to pass into the acquisition memory as qualified data. Any unqualified data samples are excluded.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Storing Data in Memory

The acquisition memory works like a circular buffer, storing every qualified data sample until the entire memory is full. After that, each new data sample overwrites the oldest existing sample. This process continues until the trigger event is found and the posttrigger delay counter reaches the specified value (based on the trigger position selection), which stops acquisition. During acquisition, you can monitor the progress of the data storage process using the Status Monitor.

After storing the data you can display the acquired data in the Listing or Waveform data windows.

DSO Module Block Diagram

The DSO module adds analog analysis capability to the instrument. Functionally, the DSO module can be divided into several blocks, as shown in Figure 2–4. Refer to the figure as you read about the functional blocks.

Probes

A probe interface detects the attenuation factor of each probe. This information is used to set the vertical scale.

Acquiring Data

When you start an acquisition, the DSO module begins sampling data from the probes. Each time a sample clock occurs, data is sampled. Signals from the probes go to the attenuators/preamp functional block, which is responsible for input coupling, termination, bandwidth, offset, and full scale range. The DSO module always uses internal clocking.

From the attenuators/preamp, signals are sent to the acquisition unit and trigger functional blocks.

Acquisition Unit

The acquisition unit functional block samples the input signals and converts them to digital data.

Triggering

The DSO trigger looks at sampled data for a specific event. The trigger can look for various types of events, such as glitches, setup and hold violations, runt pulses, or signals from another module.

When the trigger event is found, the DSO module enables its posttrigger delay counter to allow the posttrigger portion of the acquisition memory to fill before stopping acquisition. When triggered, the DSO module performs its specified trigger action (for example, triggering all modules).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

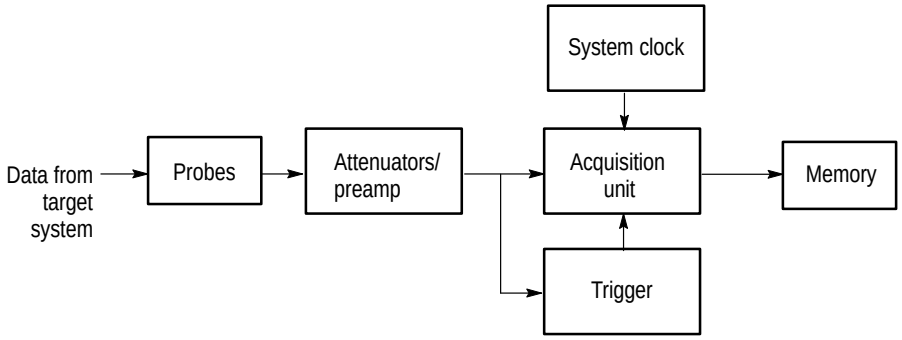


Figure 2–4: Block diagram of the DSO module acquisition and storage

Storing Data in Memory

The acquisition memory works like a circular buffer, storing data samples until the entire memory is full. After that, each new data sample overwrites the oldest existing sample. This process continues until the trigger occurs and the posttrigger delay counter reaches the specified value (based on the trigger position selection), which stops acquisition. During acquisition, you can monitor the progress of the data storage process using the Status Monitor.

After storing the data you can display the acquired data in the data windows. In the Waveform window, the data is shown as analog waveforms. In the Listing window, the data is shown as a series of voltage values.

Logic Analyzer Physical Model

Physically, the logic analyzer is made up of two main parts: the modules and the mainframe. Figure 2–5 illustrates the relationship between the logic analyzer and its subparts.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

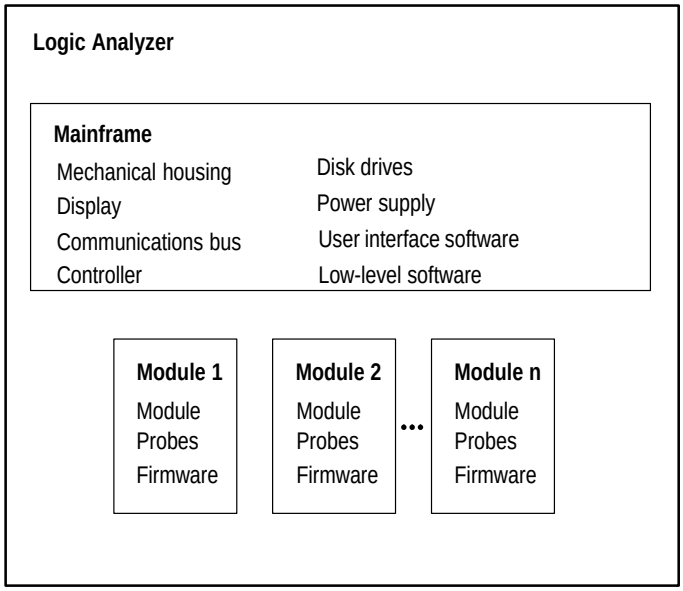


Figure 2–5: Logic analyzer physical model

Logic Analyzer Conceptual Model

Conceptually, the logic analyzer is made up of two main parts: the modules and the system. From the operational perspective, a module encompasses the setup, trigger, and data associated with the physical LA or DSO module installed in the logic analyzer. See Figure 2–6. The system refers to the setup and data for the whole logic analyzer, including all the modules.

Some actions occur at the module level, some at the system level. For example, you can save either module or system files. When you save a module, you save all the setup and trigger information for that module. (You also have the option of saving the data for that module.) When you save a system, you save all the setup information for the system, including data window display settings, and all the module information, as well.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

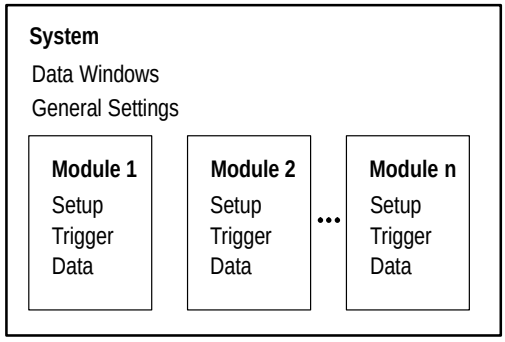


Figure 2–6: Logic analyzer conceptual model

Intermodule Interactions and Time Correlation

Each module has its own setup, trigger, and clocking functions. (LA modules may include microprocessor support as part of their setup.) Each module also acquires and stores its own data.

When you start an acquisition, all modules start acquiring data together. (Exceptions are when one module has been programmed to arm another or when a module has been turned off.) Modules stop acquiring data individually, according to their trigger programming. You also have the option of setting the logic analyzer to operate in repetitive mode, in which the modules acquire data and update the data windows continually until you manually stop the acquisition.

Modules readily communicate with one another by means of their trigger programs. You can specify functions such as the following:

- Trigger all modules (system trigger)
- One module arms another
- Modules respond to events declared by another module (internal signals)

After the modules have captured and stored data, you can view the data in a Listing or Waveform window. All data is time-correlated in the display, regardless of its source. Due to the precise time stamp information stored with the data, and the tightly-integrated communications between modules, the logic analyzer interleaves data acquired from various sources. Because time stamp information is always stored with the data, you can also compare saved data and current data with no loss of accuracy.

MagniVu data is also time-correlated with regular data. Because MagniVu data is always present, you can easily compare a normal acquisition with its MagniVu counterpart.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Listing-Data Concepts

In many cases, you will use the logic analyzer to observe the data flow in the target system. The data recorded by the logic analyzer can be displayed in a listing format, as shown in Figure 2–7.

Listing data is a table of sequential operations performed by the target system. In the Listing window, each data sample is displayed sequentially. Because each data sample includes time stamp information, it is a straightforward process to display acquisitions from multiple data sources. Samples from all specified data sources are interleaved in chronological order. For clarity, each line in the table represents a single data sample from a single data source.

You control the presentation of the data by selecting the display radix of the columns. You can also make other format selections such as font size, color, and column width.

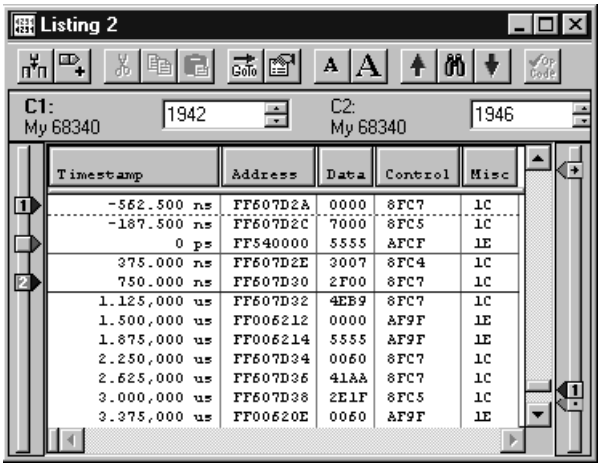


Figure 2–7: Listing data

You can include data acquired by the DSO module in the Listing window. The Listing window in Figure 2–8 shows DSO module Channel 1 data as discrete voltage levels. As with any module, the data samples from the DSO module are time-correlated with the other data and appear on separate lines.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

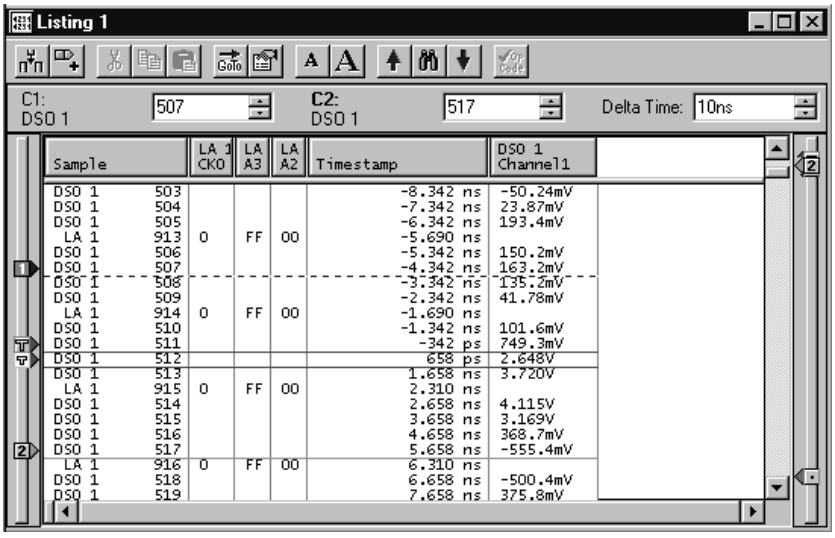


Figure 2–8: Listing window with analog data

Microprocessor Support

For microprocessor applications, the acquired data can be disassembled back into the assembly language mnemonics used by a particular microprocessor. Figure 2–9 shows an example of the disassembled mnemonic display format. Microprocessor support usually requires a special input probe dedicated to a specific microprocessor.

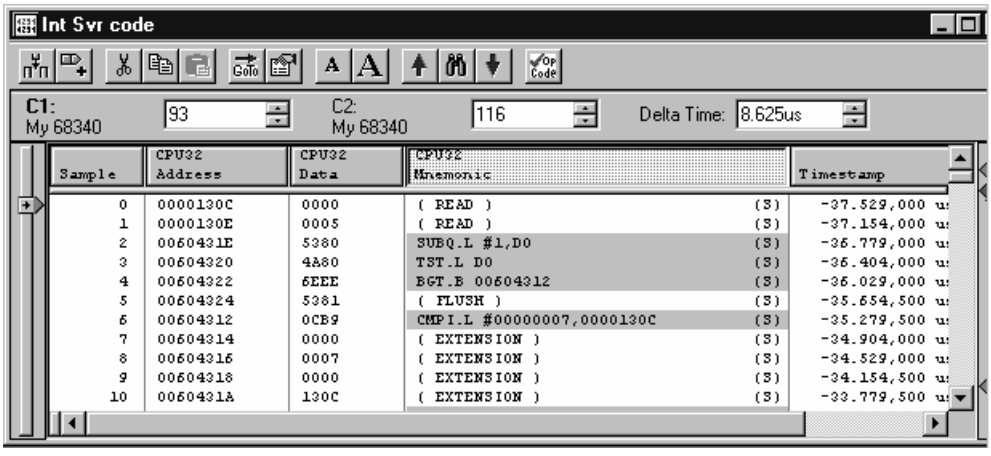


Figure 2–9: Listing data using a microprocessor support package

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The logic analyzer provides support for a wide variety of different microprocessors. Microprocessor support packages include the software, probe adapters, and documentation.

High-Level Language (HLL) Support

You can correlate the high-level language (HLL) source code that you wrote with your code as it was executed on your target system and acquired by the logic analyzer. The correlation is based on symbolic information which is extracted from your object file or load module. You configure the logic analyzer to access your source files.

You can step through each executed source statement in the Source window and view the results in a correlated Listing window. You can also set user-defined marks as break points within the code and then trace the execution of the code between the marks. Figure 2–10 shows an example of viewing source code in a Source window, while Figure 2–11 on page 2–11 shows the actual acquired data in an associated Listing window.

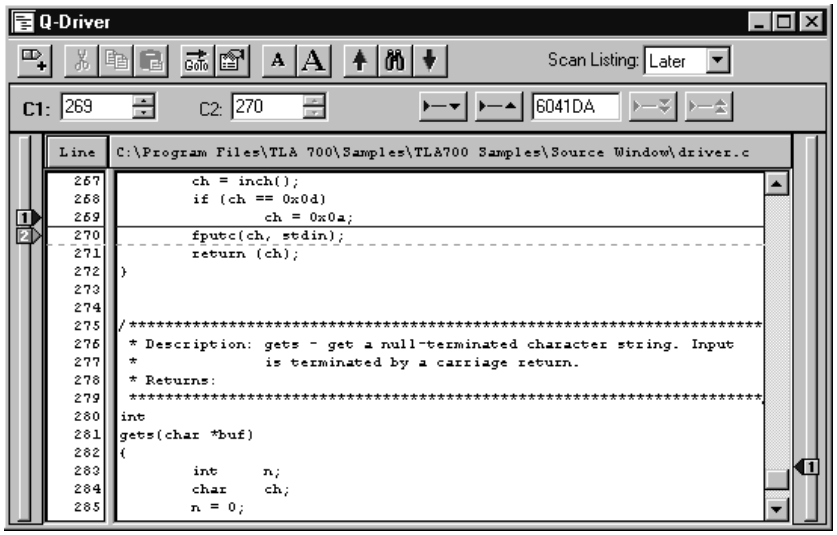


Figure 2–10: High-level source code

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

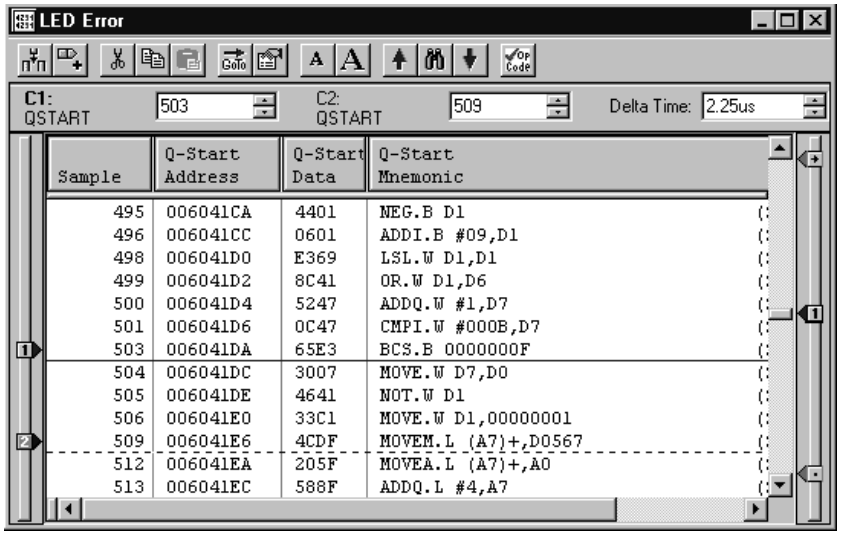


Figure 2–11: Source code viewed as acquired data

The LA module supports a wide variety of object files including IEEE695, OMF86, OMF286, OMF386, COFF, Elf/Dwarf, Elf/Stabs, and the TLA 700 Symbol File format (TSF).

Waveform Data Concepts

You can use the logic analyzer to observe the timing relationships between signals by displaying the recorded signal activity as a series of waveforms in the Waveform window. Figure 2–12 shows waveform data from an LA module.

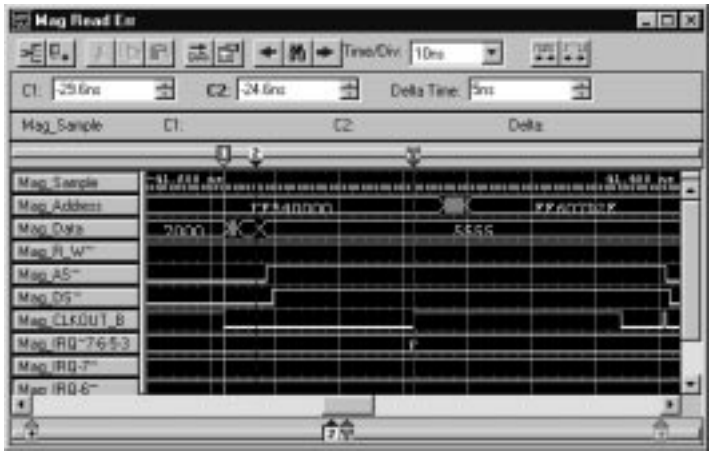


Figure 2–12: Waveform data

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Each waveform is displayed in a separate track, but all waveforms are time-aligned horizontally and displayed in the same time per division. Again, the inclusion of time stamp information with the stored data samples makes it a straightforward process to display time-correlated acquisitions from multiple data sources.

You control the horizontal scale of the acquired data in the display. (You do not, however, change setup parameters by changing settings in the waveform display.) You can also make other format selections such as channel group radix, waveform color, and track height. To show when the logic analyzer sampled the data, you can add Sample using the Add Waveform toolbar button.

When viewing LA data, you can view the data as individual channels. You can also display the LA data in groups of channels known as busforms. Use the busforms to display when data changes with respect to clock or control signals.

When you are interested in displaying the value of a group of channels over a period of time, you can use magnitude mode. For example, using magnitude mode, you can view the channels connected to a 16-bit digital counter. The magnitude waveform appears as a sawtooth waveform as the counter values increment from the minimum value (00) to the maximum value (FF).

LA Module Versus DSO Module Waveforms

A logic analyzer waveform appears to have zero-length rise and fall times. This is because the logic analyzer is recreating the waveform from the samples stored in its memory, which are either ones or zeros.

No electronic signal is perfectly digital in nature; there is always some analog component. Consider a fast-rising pulse with ringing on the front edge, or glitches that can occur in a noisy circuit. If you suspect problems caused by analog signal characteristics (such as signal voltages higher or lower than specified voltage levels, or slow transition times), you should use a DSO module to observe the voltage characteristics of the signal. Figure 2–13 shows where the DSO module captured a runt pulse that was below the logic analyzer's threshold.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



Figure 2–13: Using the DSO module to capture a runt pulse

Sampling Resolution

The accuracy of the waveform recreated from the sampled data depends on the sample clock rate used to record the incoming signals. This is due to the fact that the waveform re-created by the logic analyzer is based on the sampled signals stored in its memory. If the sample clock rate is too low, the recorded data will produce an inaccurate display. Figure 2–14 shows how the sample clock rate can affect an LA module waveform.

Insufficient DSO module sampling resolution can result in aliasing. For information about aliasing, see page 2–14.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

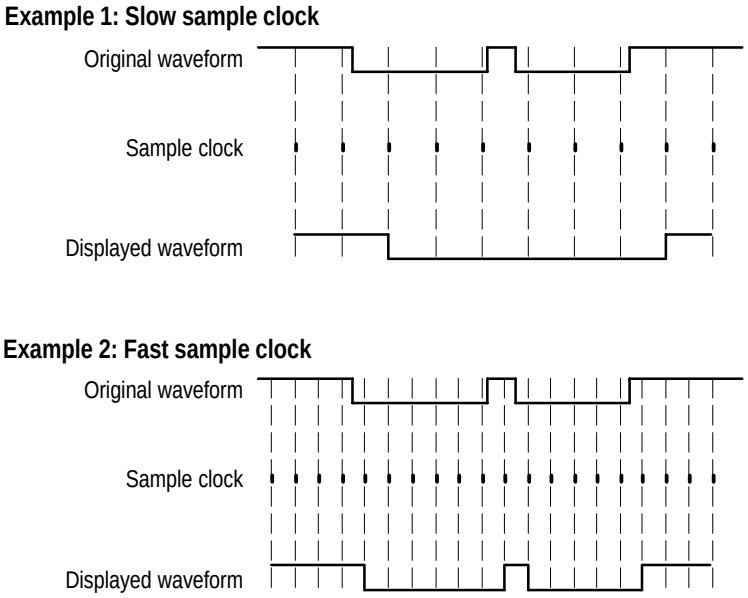


Figure 2–14: LA module sampling resolution

Signal Resolution and Signal Duration

There is an important trade-off between the resolution of the recorded signal and its duration in terms of elapsed time. Because the total number of samples that can be recorded by the logic analyzer is fixed by the depth of the logic analyzer's acquisition memory, increasing the sample clock rate provides better signal resolution at the expense of reducing the duration of the captured signal. That is, a faster sample clock rate will record a smaller portion of the signal, but with better resolution.

For the LA module it is important to remember that you have an additional tool to offset the signal resolution/signal duration relationship. By using the MagniVu data feature, you can view high-resolution data centered about the LA module trigger. This allows you to zoom in on the data of particular interest while still maintaining visibility of a more extended signal duration.

Preventing Aliasing

Under certain conditions, an analog waveform can be aliased on screen. When a waveform aliases, it appears on screen with a frequency lower than the actual waveform being input or it appears unstable. Aliasing occurs because the instrument cannot sample the signal fast enough to construct an accurate waveform record. (See Figure 2–15.)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

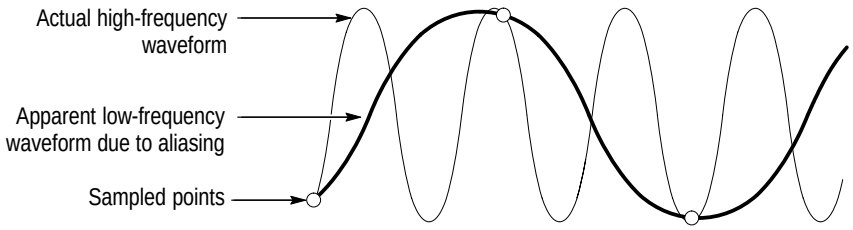


Figure 2–15: Aliasing

To check for aliasing, increase the sampling rate (decrease the clock sample period) in the module Setup window. If the shape of the displayed waveform changes drastically or becomes stable at a faster clock sample period setting, your waveform was probably aliased.

Although the principles of sampling theory define a minimum sample rate of 2X, a good rule of thumb is to choose a sample clock rate five times faster than the speed of the fastest signal being measured. A faster sample clock rate results in a more accurate reconstructed waveform.

Displaying Waveforms

Waveforms are rarely displayed at an exact one sample point per pixel. Waveforms are usually displayed in a compressed or expanded format. As a general rule, waveforms are compressed when the time per pixel is greater than the time per sample clock. Waveforms are expanded when the time per pixel is less than the time per sample clock.

For compressed DSO module waveforms, the display shows the lowest and highest point that occupy a given pixel column joined by a vertical line. For expanded waveforms, the display points between the actual sample points are calculated.

For expanded DSO module waveforms, *Sin(x)/x interpolation* computes the display points between the actual values acquired.

High-Speed Timing

The LA module provides high-speed timing support through MagniVu data. The MagniVu data is stored in a separate memory that is parallel to the main memory. All data from the sampler goes directly to the MagniVu memory. The MagniVu memory also works like a circular buffer. Unlike the acquisition memory, the MagniVu memory does not qualify data storage through the trigger function block.

MagniVu data is continuously acquired on all channels at the fastest sample rate of 500 ps. Like normal acquisition data, MagniVu data can be displayed in the Listing or Waveform data windows. The MagniVu data is centered on the LA module trigger in the data window. For additional information, see *MagniVu Data* on page 3–62.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Detecting Glitches

One of the logic analyzer's most useful features is its ability to detect and trigger on signal glitches. A glitch is a signal that makes a transition through the threshold voltage two or more times *between* successive sample clocks. Because glitches are often signal transitions that occur intermittently, they can cause circuit malfunctions that are extremely difficult to diagnose.

Although you could try using a very fast sample clock rate to ensure that you never miss any glitches, a better solution is to use the glitch-detection feature. The logic analyzer can trigger on a glitch, either alone or in combination with other signal events. This capability is useful for catching intermittent glitches that might not occur very often, or only when a particular operation is taking place.

You can capture noise spikes and pulse ringing using the glitch capture feature. Figures 2–16 and 2–17 show data captured by triggering on a glitch. In the Waveform window, a glitch captured by an LA module is indicated by a band of color. (See Figure 2–16. For clarity, an arrow identifies the glitch in the figure.)

You must select internal clocking to use the glitch detection feature.

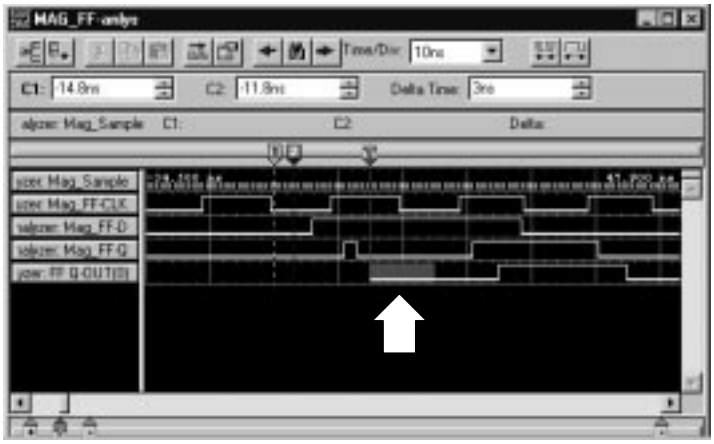


Figure 2–16: LA module triggering on a glitch

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



Figure 2–17: DSO module triggering on a glitch

Performance Analysis Concepts

For performance analysis applications, you can use the Histogram window to view the performance of your software. The actual data is displayed as horizontal bars in a histogram.

You may want to use the Histogram window to see which one of your software routines is taking up most of the CPU time. Or, you can use the Histogram window to measure the amount of time used by a particular subroutine. You can use a symbol file to view each of the routines by name.

Figure 2–18 shows an example of the Histogram window where the StopLite routine is taking up most of the computer resources.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

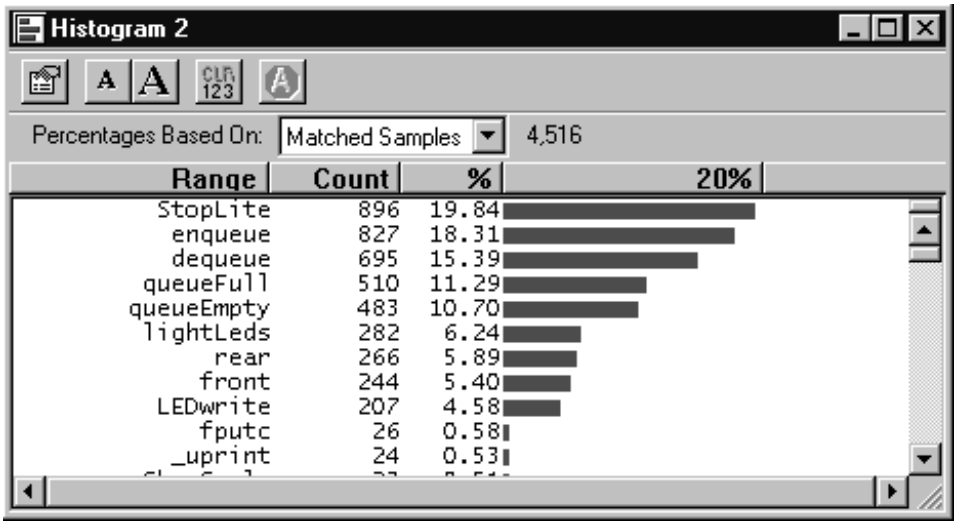


Figure 2–18: Viewing the performance of code with a Histogram window

Comparing Acquired Data Against Saved Data

You can use the LA module to compare acquired data against saved reference data. Use the LA Setup menu to define the data channels that you want to use during the compare operations. You can further define the number of samples that you want to compare as well as data alignment offset.

In the Listing and Waveform windows, you can use color to quickly identify the compared data. You can set up one color to show where the acquired data does not equal the reference data. You can use another color to show where the acquired data equals the reference data.

Figure 2–19 shows a Listing window during a memory compare operation; notice that some of the data under the LA 2 A2 column appears in a different color, indicating that there were differences between the acquired data and the reference data.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

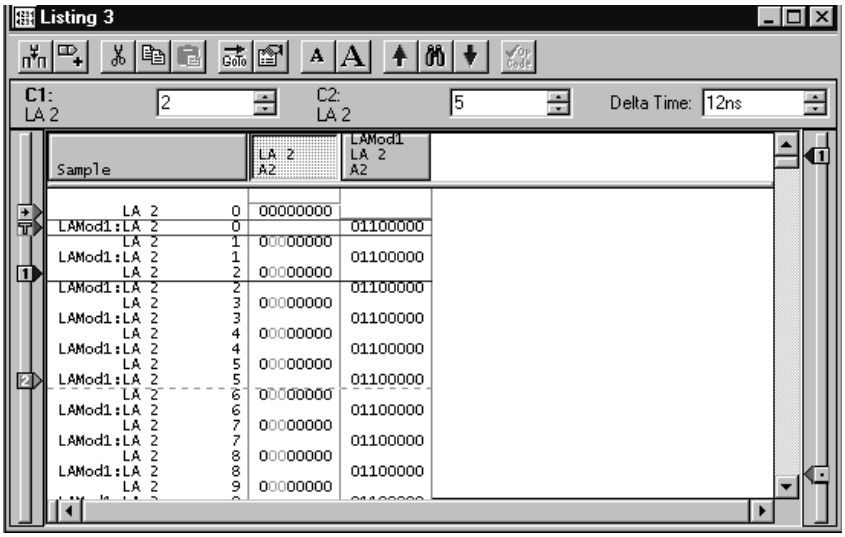


Figure 2–19: Using color to show memory differences in a Listing window

Repetitive Acquisitions

Use the Repetitive acquisition features of the logic analyzer to automate repetitive and time-consuming tasks. For example, you can specify the number of times that you want the logic analyzer to acquire data. With each acquisition, you can save the data to a file for analysis. You can also set up the logic analyzer to open a file or execute a program when all of the acquisitions have been completed.

You can set up the LA module to acquire and compare the acquisition data against known reference data. The LA module can continue acquiring data until there is a mismatch between the acquisition data and the reference data.

Figure 2–20 shows an example of such a setup where the acquired data is exported to a file for each acquisition. When a data-mismatch occurs the logic analyzer stops acquiring data and exports the data to a file. The faulty data can now be analyzed by another application.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

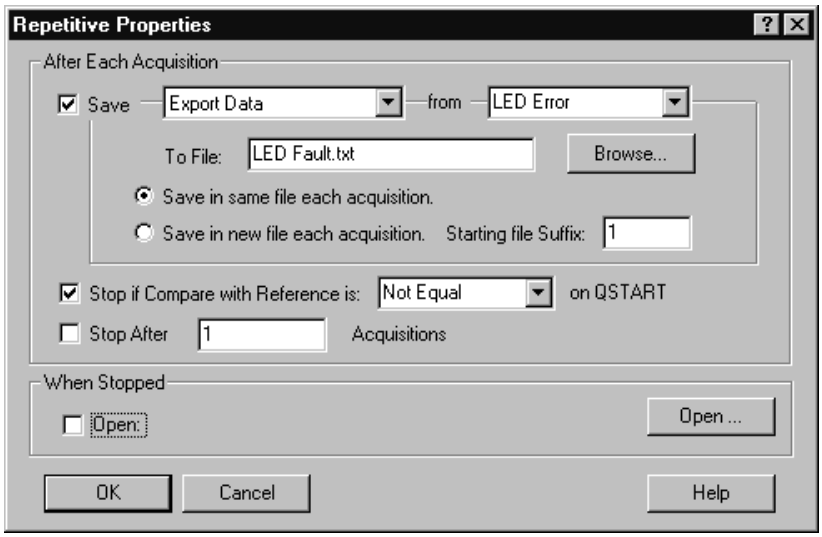


Figure 2–20: Defining repetitive setups

TLA 700 Programmatic Interface (TPI)

Using the TLA 700 Programmatic Interface (TPI) you can control a TLA 700 series logic analyzer from a separate user program from the logic analyzer itself or from a remote computer. The interface is based on the Component Object Model (COM). You can use any programming language or programming environment that supports the Component Object Model, such as Microsoft Visual C++ and Microsoft Visual Basic.

Using TPI, you can control various aspects of the logic analyzer. You can load and save system and module setups. You can extract information from the logic analyzer, such as LA module counter and timer values, configuration information, LA module data, and DSO module data for analysis by other applications.

The TLA 700 Programmatic Interface comes with its own online help (select Help on TPI from the Help menu in the TLA application). For your convenience, the information contained in the TPI help file is also available in Portable Document Format (PDF) in the C:\Program Files\TLA 700\System directory. The file name is tpi.pdf. You will need the Adobe Acrobat Reader application to view or print tpi.pdf. If you do not have Adobe Acrobat Reader on your machine, you can download a free copy from the Adobe site at http://www.adobe.com/acrobat/.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Symbol Support

Symbols simplify tasks, such as setting up triggers or identifying specific values within the data. When you program a trigger or view data, it is cumbersome to remember which numeric channel group values correspond to particular machine instructions or code modules. The logic analyzer makes this task more manageable by allowing you to assign symbolic names or mnemonics to group values.

For example, you might assign the symbol WRITE to the control bus event that causes the target system to write to a memory location. Then, if you wanted to trigger when a write cycle occurs, you could enter WRITE in the trigger program in place of the actual data value. You could also choose to have WRITE appear in the Listing window for quick identification of the instruction.

In Figure 2–21, the example shows a trigger program which uses the symbol SYSTEM_RESET as part of the trigger clause.

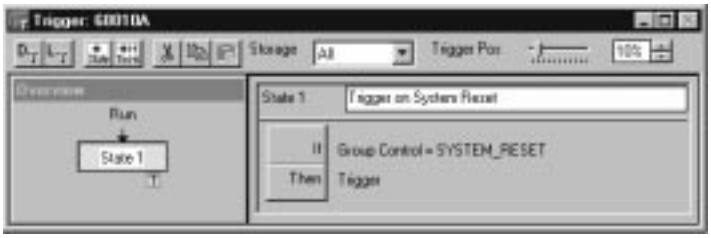


Figure 2–21: Using symbols in a trigger program

You can use symbol files with a Source window and an associated Listing window to track the execution of source code. The symbol file provides the information to associate a line of source code to an address in a Listing window. When you move a cursor in one window, the symbol file provides the necessary information to move the cursor to the correct location in the other window.

Often, the application software will define symbols for you. For example, when you load a microprocessor support package, symbols are also loaded (typically, to the control group). These symbols represent data values that correspond to bus cycle types. Other software applications produce range symbol files which you can load (typically, these files are loaded to the address group).

Symbol Files

To use symbols, you must first load or create one or more symbol files that define the symbols. Symbol files contain symbol names and their associated data values. You can use symbol files created by another application, edit symbol files from other applications, or you can create your own symbol files using a text editor.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Each entry in a symbol file consists of an alphanumeric symbol name with its associated numeric value or range of values. After you create a symbol file, you can specify the symbol file for the appropriate channel group in the Waveform or Listing window, use symbolic names as a substitute for numeric values in the Trigger and data windows, and use symbols for tracing source code in a Source window.

Symbol files perform like look-up tables. For example, if the address of a printer I/O port is at address F734BC, you can define a symbol, printer-port, that corresponds to that value. Then, in the Trigger window, you can specify the symbol name as an event in the trigger program and cause the module to trigger when printer-port (F734BC) appears on the address bus. You can also specify the symbolic display radix for the address channel group and the symbol name printer-port will show in the Listing window every time F734BC appears on the address bus.

Symbol Types. Two main types of symbol files are possible: pattern symbol files and range symbol files. Range symbols can be further divided into three different categories: functions, variables, and source code (source). Table 2–1 shows the different types of symbols and the windows where they are commonly used.

Table 2–1: Using symbols in logic analyzer windows

Window	Pattern symbols	Range symbols		
		Functions	Variables	Source code
Listing	Yes	Yes	Yes	Yes
Waveform	Yes	Yes	Yes	Yes
Histogram	No	Yes	Yes	No
Source	No	No	No	Yes
LA Trigger	Yes	Yes	Yes	Yes

Pattern Symbols. Pattern symbols consist of data patterns up to 32 bits. Each bit in a pattern symbol can be 0, 1, or X (don't care). Pattern symbols are used when a group of signals define a logical state. For example, a microprocessor has a set of pins that indicate the type of bus cycle in progress. A memory read cycle is indicated when the RD~ and MREQ~ pins are 0 (logic low) and the BUSAK~ and M1~ pins are 1 (logic high). You can define a pattern symbol name called mem-read that corresponds to bit pattern 1100 and thereby mark all memory read bus cycles in the Listing window. For other bus cycles the logic state of these pins is also important and you can define different bit patterns for each cycle type.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Figure 2–22 shows pattern symbols used in a Waveform window.



Figure 2–22: Waveforms using pattern symbols

Range Symbols. Range symbols define a range of 32-bit addresses represented by a contiguous set of integers, marked by specific lower and upper bounds. The different types of range symbols are discussed in detail under *TLA 700 Symbol File Format* beginning on page 0–1.

When defining a range symbol file, do not overlap ranges of values. If ranges overlap, they may not be recognized. For example, if SYM1 covers the range 1000–3FFF, and SYM2 covers 2000–2FFF, then the values in range 2000–2FFF may be recognized as either SYM1 or SYM2, and the values in the range 3000–3FFF may not be recognized as SYM1 at all.

The range symbols shown in Figure 2–23 define subroutine boundaries.

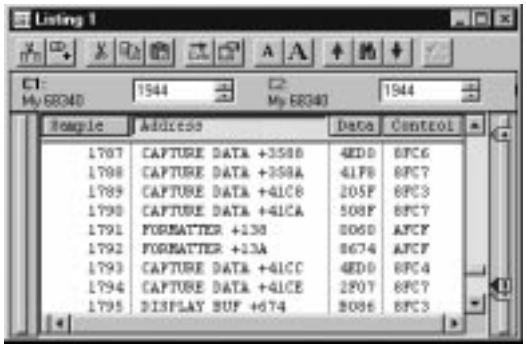


Figure 2–23: Listing data using range symbols

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Symbols Dialog Box

Use the Symbols dialog box to provide an overview of all currently loaded symbol files (see Figure 2–24). You can display information on all symbol files currently used by the logic analyzer.

The following status information is available for each currently-loaded symbol file:

- The last time the file was loaded into the TLA 700 application software. It also includes error and warning messages associated with the last load.
- When the file was last modified. The logic analyzer also displays a message if the file may need to be reloaded (such as when the file is modified after it was first loaded).
- The format of the loaded file.
- If the file can be unloaded or if the file is currently in use. Symbol files can only be unloaded if no data windows or setups are using them.

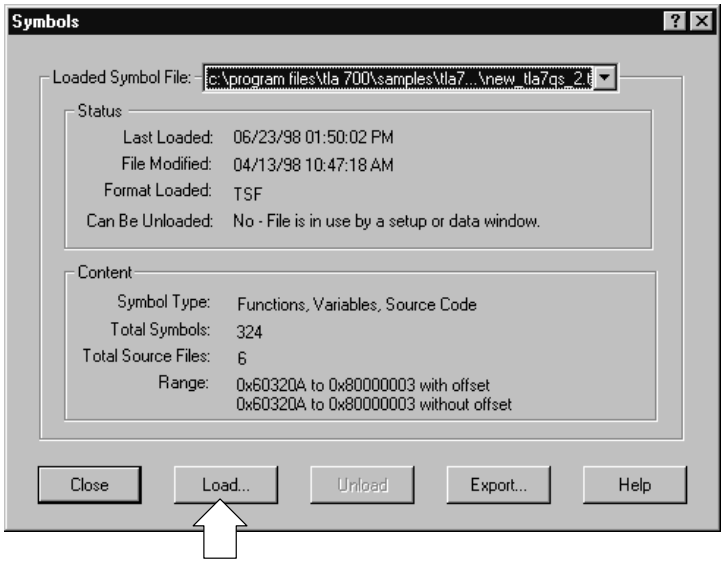


Figure 2–24: Symbols dialog box

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The following content information is displayed in the Symbols dialog box:

- Whether the file is a pattern symbol file or a range symbol file. If the file is a range file, this field also lists the types of symbols loaded.
- The number of symbols loaded from the file. Symbol files can have an unlimited number of symbols. The number of symbols is limited by the amount of memory. When you load a symbol file, the symbols are placed in memory. Because symbol files consume memory, you should unload unused symbol files to keep memory available for your main application.
- The number of source files referenced by source code symbols loaded from the file.
- The minimum and maximum address values and offset information.

Click the Load button (see Figure 2–24) to open the Select Symbol File dialog box and load a new symbol file. You can browse the file system for the symbol file. If the symbol file is a range file, you can click the Options button in the Select Symbol File dialog box to open the Load Symbols Options dialog box.

Click the Export button to save the current file as a TSF-format symbol file. You can view the exported symbol file with applications such as Wordpad. Edit the symbol file by saving it under a new name and using a text editor. Save the edited file in text format. You can then load the edited symbol file.

Load Symbol Options Dialog Box

Use the Load Symbols Options dialog box (see Figure 2–25) to specify options for range symbol files before loading them into the system.

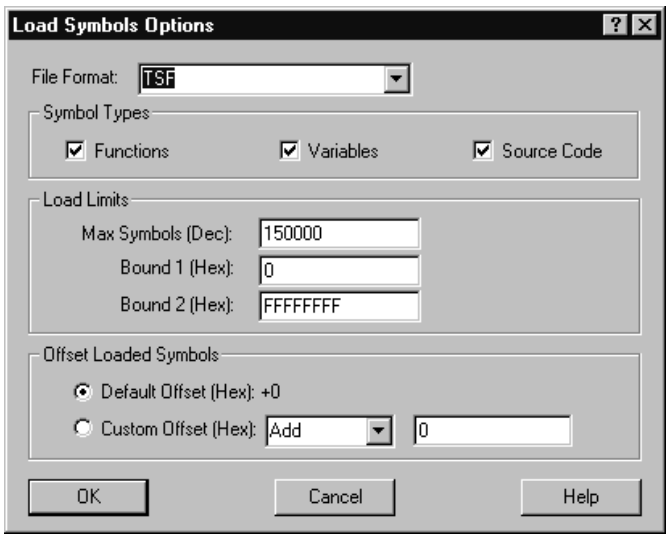


Figure 2–25: Load Symbol Options dialog box

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Select one or more of the symbols types to load. If you want to use the symbol file with the Source window, you should be sure to select Source Code symbols.

You can enter a decimal number for the maximum number of symbols to load. The maximum number of symbols that you can load is limited only by the amount of memory available. The file loads symbols until the specified maximum number of symbols is reached. Additional symbols are ignored, even if they fall within the Bound 1 and Bound 2 range limits.

The Bound 1 and Bound 2 fields define the range of symbol addresses that will be loaded. You can enter any hexadecimal values from 0 through FFFFFFFF. Symbols with values outside of these limits are ignored and will not be loaded.

NOTE. *If the lower bound of the range symbol is within the Bound 1 and Bound 2 limits and the higher bound is not, the entire symbol will be valid. However, if the higher bound is within the Bound 1 and Bound 2 limits and the lower bound is not, the entire symbol will be ignored.*

Select either Default Offset or Custom Offset to apply an offset to the symbol values. If you select Default Offset, the default offset is read from the source file and applied to each symbol in the file as it is loaded. If you select Custom Offset, you can add or subtract the specified offset value to each symbol in the file as it is loaded. You can choose any 32-bit hexadecimal value from 0 to FFFFFFFF.

When you enter bound values, enter the values without an offset value. If your application adds an offset, you must subtract the offset value before you enter the bound values.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Reference

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Setup

This section describes how to set up the logic analyzer (LA) and DSO modules, and how to load an LA module trigger program.

For further details, particularly about selections available to you in windows and dialog boxes, please refer to the online help.

Starting From the System Window

The System window gives an overview of the logic analyzer configuration, arming, and triggering relationships. The System window also indicates whether LA modules are merged to increase the number of channels. See Figure 3–1.

A black arrow from one module to another indicates that one module is set up to arm another. Figure 3–1 shows the merged LA module arming the DSO module.

A module that is programmed to cause a system trigger has an indicator symbol on the right edge of the module graphic.

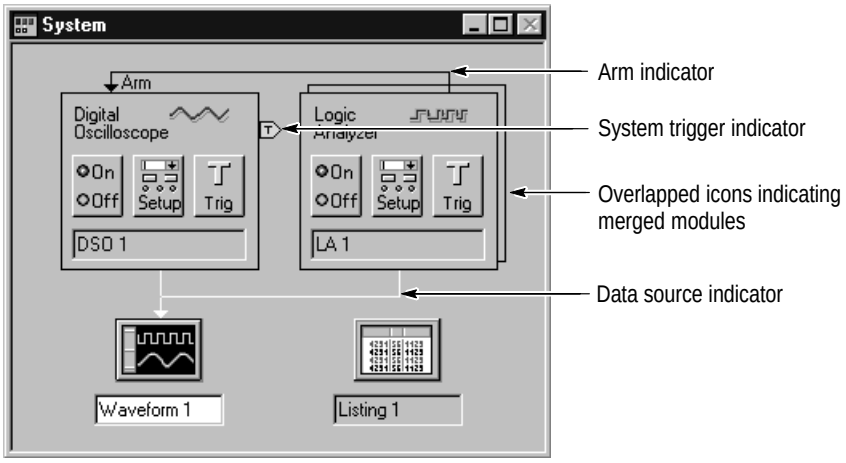


Figure 3–1: System window

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Opening Other Windows from the System Window

You can use the System window as a quick navigation tool.

- To open a module Setup or Trigger window from the System window, click the Setup or Trigger button in the module icon.
- To open a data window from the System window, click the data window button. See Figure 3–2.

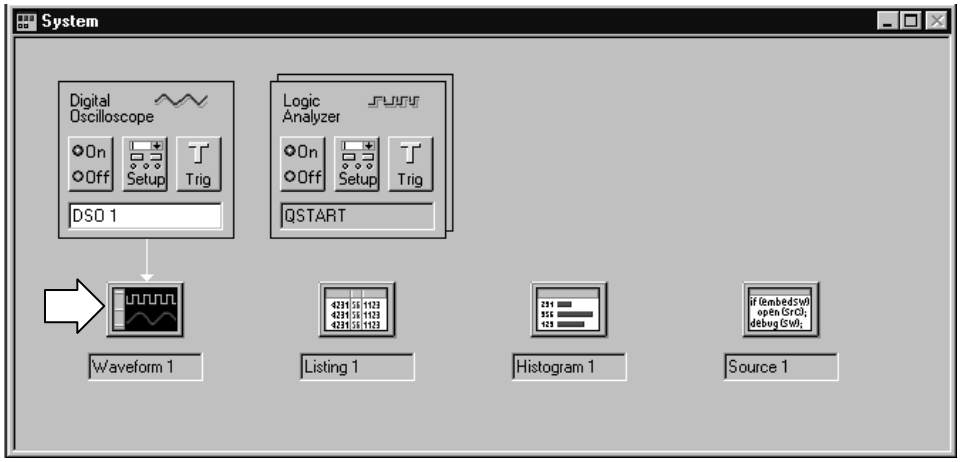


Figure 3–2: Opening a Waveform window from the System window

Disabling Modules

If you are not using a module, you can disable it by clicking the module's On/Off button. When you disable a module, make sure that no other trigger programs depend on that module's output.

Renaming Windows

You can rename the windows by selecting the current window labels and overtyping. Names must be unique and are limited to the space available.

Identifying Modules

If you are unsure which physical module is represented by an icon, double-click on the icon to open its System Properties page. This property page lists information about the module, including the mainframe slot numbers in which it is installed. (Slot numbers are indicated on the mainframe.)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Setting Up the LA Module

The primary function of the Setup window is to configure the LA module for compatibility with the target system. This is where you specify channel groups, set thresholds, and select the sample clock rate. Additional selections configure the LA module for best compatibility with the type of data you want to acquire.

Before you acquire and display data, you must first set up the LA module using the LA Setup and Trigger windows. Together, these windows determine the data to be acquired.

Each module has its own Setup window and Trigger window, each is set up individually. Generally, you should configure the Setup window before the Trigger window, because some of the Setup window settings affect Trigger window selections.

- To open the LA module Setup window, go to the System window and click the LA module Setup button.

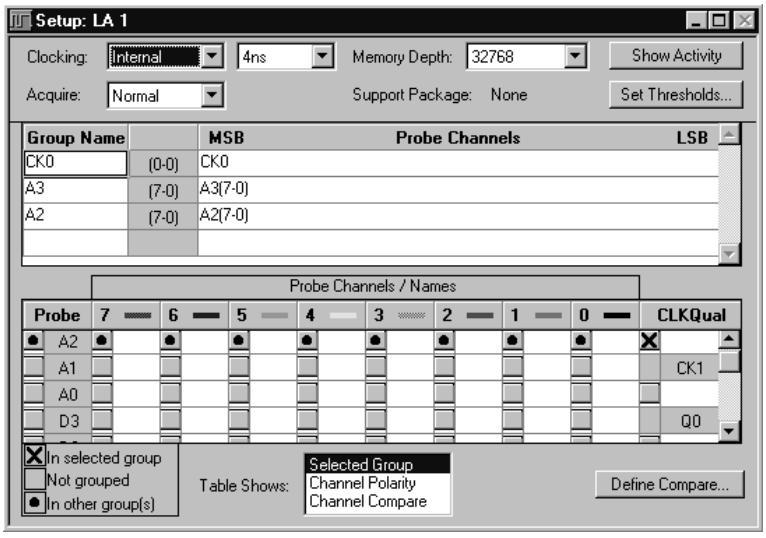


Figure 3–3: The LA module Setup window

NOTE. *If you intend to use merged modules, turn to page 3–34 for information before you proceed with the setup procedure.*

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Microprocessor Support Setup

If you intend to use a microprocessor support package, load it before completing the entries in the Setup window. The microprocessor support package configures the Setup window for you.

- To load a microprocessor support package, go to the File menu, click Load Support Package, select the support package you want to load, and then click Load.

After loading the microprocessor support package, the LA Setup window shows the channel definitions, channel groups, and clocking requirements for the microprocessor support package. Figure 3–4 shows an example of the LA Setup window after loading the QSTART support package.

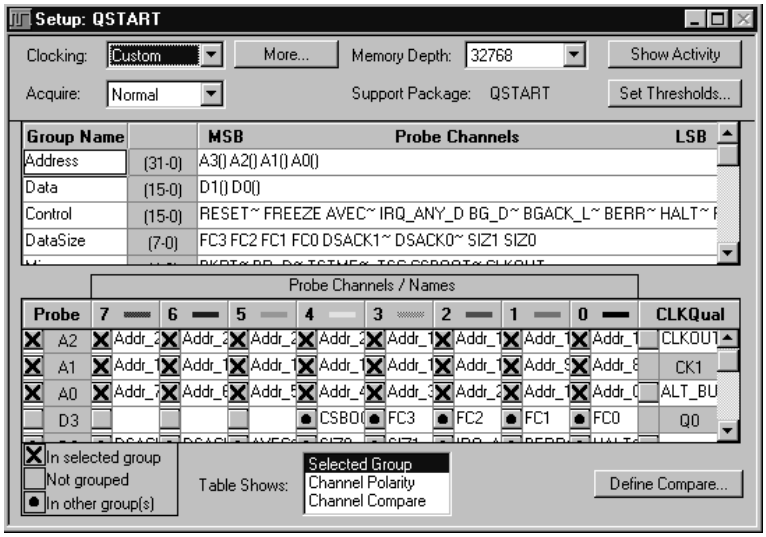


Figure 3–4: Setup window with the QSTART support package

For information about microprocessor support packages, refer to the online help and to the instruction manual that came with your microprocessor support package.

Performance Analysis Setups

If you intend to do performance analysis with your LA module, you need to define the channel and clocking setups in the Setup window. You may also want to load a microprocessor support package which contains the predefined channel setups and clocking setups.

Memory Compare

Memory Compare allows you to compare the current acquisition data of an LA module against a known reference data. You can quickly view data differences and similarities in a Listing or Waveform window using user-defined colors.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Selecting Channels for the Memory Compare. Choose the channels that you want to compare in the LA Setup window by selecting Channel Compare in the Table Shows box (see Figure 3–5). You can then compare all data channels, specific channel groups, or individual channels by selecting the appropriate channels in the Probe Channels/Names table.

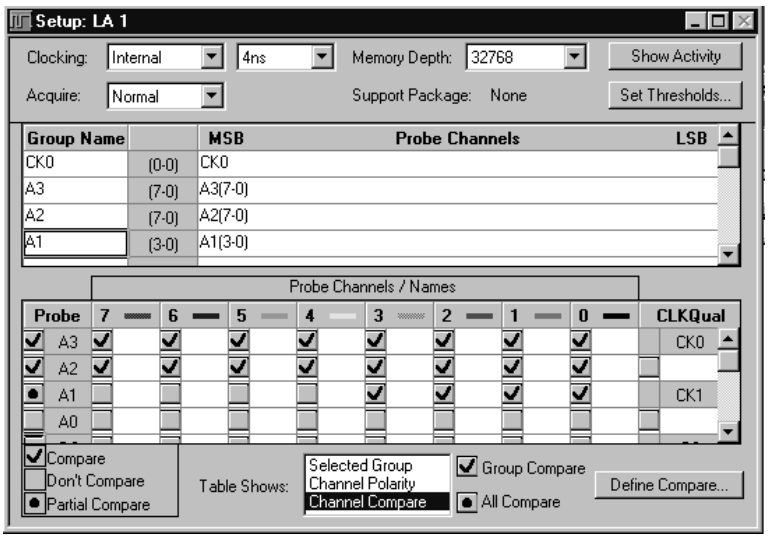


Figure 3–5: Selecting channels for memory compare

After selecting the channels that you want to compare, click the Define Compare button in the lower-right corner of the Setup window to define the compare actions.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Defining Memory Compare Parameters. Select Enable Data Compare in the Compare Definition dialog box as shown in Figure 3–6. Select the reference data source in the box; if the data source that you are interested in does not appear in the list, click Add Data Source to browse for the data source in the file system.



Figure 3–6: Enabling data compare

After you select the data source, define the amount of data that you want to compare against. You can compare all data or a portion of the data by filling in the appropriate information. You can also define the alignment of the data by filling in the appropriate information. A summary of your setup displays at the bottom of the dialog.

NOTE. *After defining the compare setup, remember to select Show Compare in the Listing Window or Waveform Window property page*

Guidelines for Memory Compare. There are a few guidelines that you should be aware of when using memory compare:

- You must enable the memory compare in the Compare Definition dialog box (see Figure 3–6).
- Acquisition modules and reference modules must be the same width.
- Specify the color of compare data in the Listing Window or Waveform Window property sheet, or use the default colors.
- You can search for data differences or data equalities.

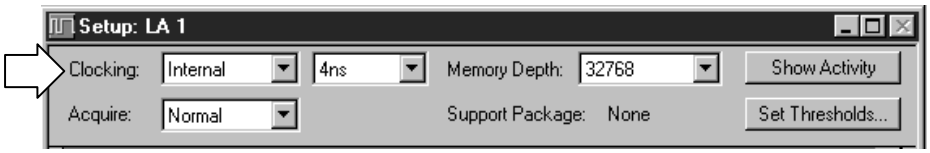
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- You can use memory compare with repetitive acquisitions.
- You can compare only the main LA data, you cannot compare glitch data, disassembler group data, or MagniVu data.

NOTE. *Although you cannot compare disassembler group data directly, you can compare the raw nondisassembled data by using the channel groups as defined in the Setup window. To view these channel groups in a Listing window, use the Add Column toolbar button to add the channel group to the window.*

Clocking

Use Clocking to specify the clock(s) used to sample data. Select one of two basic clocking modes, Internal (asynchronous) or External (synchronous). A third choice, Custom, is available if a microprocessor support package has been loaded. Your clocking choice determines further clocking selections.



Internal Clocking. Internal (asynchronous) clocking uses the LA module's internal clock to determine when to sample data. Typically, internal clocking is used for timing analysis (waveform data).

When you select Internal clocking, the only additional selection to make is the clock rate in the next field.

Because the internal clock signal is asynchronous to the target system, be careful to select a sample period that is considerably faster than the data rate of your target system.

External Clocking. External (synchronous) clocking synchronizes data sampling with the clock of the target system so you can be more selective about the data you sample. This type of clocking is best for software analysis (listing data).

When you select External clocking, you have the option of further selections to define the sample clock. You can create clocking equations in the Clocking dialog box. Clocking equations qualify when data is sampled. The equations consist of a Boolean combination of events, linking clock and qualifier lines. Data is sampled and stored in memory only when this clock equation is true.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

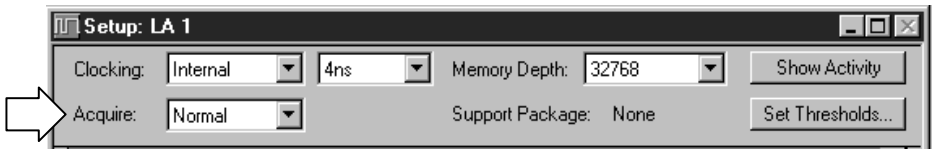
Advanced Clocking. Advanced clocking is available only if you select External clocking. Use advanced clocking to set up multiple-phase clocking, probe demultiplexing, and other clocking controls. Multiple-phase clocking specifies two different sample clock equations and assigns an equation to separate probe groups to clock in sample data. You can also sample data from different channel groups at different points in time relative to the sample clock through a variable setup and hold window.

Custom Clocking. Custom clocking is used only with microprocessor support packages. Custom clocking enables and disables a variety of microprocessor-specific clock cycle types (such as DMA cycles).

For more information, see the instructions that came with your microprocessor support package.

Selecting the Acquisition Mode

Use Acquire to select the acquisition mode. The acquisition mode determines the data to store. You can store channel data only, glitch data, or blocks of data around requested samples.



Normal Mode. Normal mode stores only the requested channel data.

Blocks Mode. Blocks mode stores a block of approximately 60 samples around each qualified sample. In Blocks mode, only channel data is stored. If you store blocks they will override other forms of data qualification. All samples in the block are always stored.

Glitch Mode (Internal Clocking Mode Only). Glitch mode captures glitch data and regular data for each data channel. You must select internal clocking for Glitch mode to be available.

Glitch mode limits memory depth to half of the maximum depth and limits the sample period to 10 ns or greater.

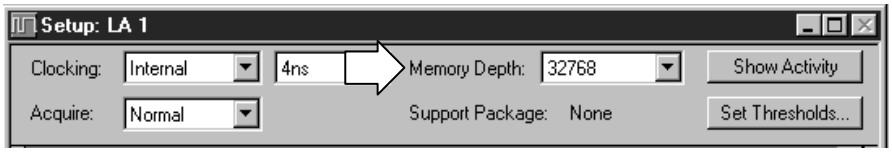
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Setting Memory Depth

Use Memory Depth to specify the total number of samples acquired by the LA module. If you do not require full memory depth, select a lesser value because you will have less data to search to find the data of interest.

For a given memory depth there is a tradeoff between the clock sample rate and data record length. (A faster sample rate provides a shorter time window, but with higher resolution.)

***NOTE**. If you select Glitch mode, the maximum memory depth is limited to one half the normal value.*



Channel Grouping

Use channel grouping to organize the LA probe channels to match the configuration of the target system. Depending on your application, match the channel groups to the address and data buses, or other channels of interest. Then name the channel groups for easy identification.

Any number of groups can be created. Each group can contain any combination of module channels; the application does not restrict you from repeating channels from various groups.

When using group range events (range recognizers), the probe groups and probe channels must be used in hardware order. That is, probes must be used from the most-significant probe group to the least-significant probe group based on the following order:

C3 C2 C1 C0 E3 E2 E1 E0 A3 A2 D3 D2 A1 A0 D1 D0 Q3 Q2 Q1 Q0 CK3 CK2 CK1 CK0

The probe channels must be used from the most-significant channel to the least-significant probe channel based on the following order:

7 6 5 4 3 2 1 0

If a microprocessor support package is loaded, the channel groups are defined for you.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

NOTE. *If a microprocessor support package is loaded, you should not change or delete the default channel groups. Doing so can cause an inaccurate analysis. You can still add and delete new channel groups.*

Channel groups defined in the channel grouping table are used in other displays and setup controls. The order of the groups in this table determines the order of presentation in other parts of the application.

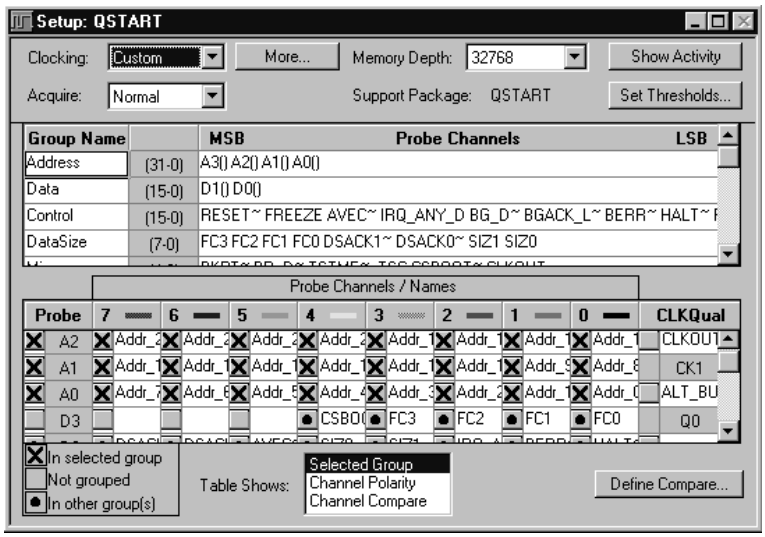


Figure 3–7: Channel grouping table in the Setup window

Channel Group Name. Each channel group must have a name. You can use the default name, or you can enter another name, as long as it is unique within the module. There is no limit to the number of groups you can create.

For each group name, you must list all the probe channels that make up the group. The group names are listed in the left column of the table. The individual probe channels that make up each group are listed in the right column of the table. The center column of the table lists the number of channels in a group (where a zero refers to bit 0). For example in Figure 3–7, the Address group is made up of 32 channels, with channel 31 as the most-significant bit (A3-7) and channel 0 as the least-significant bit (A0-0).

Probe Channels/Names Table. Use the Probe Channels/Names Table to enter names for individual channels, add and remove channels from a group, or change polarity of individual channels.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Activity Indicators

Use the Activity Indicators dialog box to show the real-time signal activity at the LA module probe tip without having to acquire data. The activity symbols indicate whether the signals at the probe tip are high, low, or changing. See Figure 3–8.

- In the LA Setup window, click Show Activity.

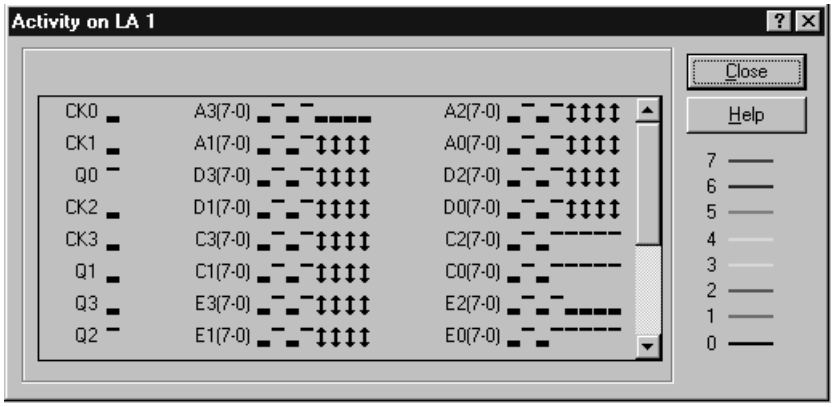


Figure 3–8: The Activity Indicators dialog box

If the activity indicators show no activity, the problem could be that there is no signal voltage, an incorrect threshold voltage level, or the channel lead is not connected. If all the channels associated with a probe are inactive, check the probe connections to the LA module.

You can leave the Activity Indicators dialog box open while you set up other windows, such as setting up the Trigger window or adding channels to the Waveform or Listing window. This dialog box is useful for verifying that clocks are active in external clocking and for troubleshooting complex clock setups.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Setting Probe Thresholds

Use Set Thresholds to set the input threshold voltage settings for probe channels, clocks, and qualifiers of the LA module. Changes are immediately executed even during acquisition. Figure 3–9 shows the Set Thresholds dialog box.

Initially, the Probe Thresholds box contains values that are set in the Preset page of the Options Property sheet.

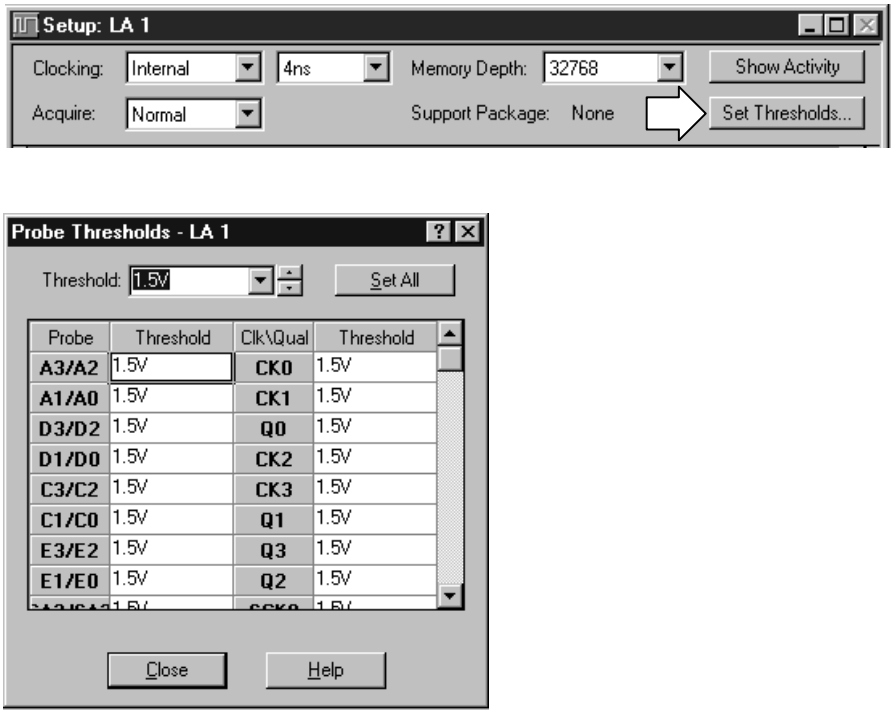


Figure 3–9: Probe Thresholds dialog box

Setting Up the Trigger Program

The primary function of the LA Trigger window (see Figure 3–10) is to construct a trigger program. You also use the Trigger window to select how and when to store data.

A trigger program is a series of events and actions that define when to trigger and store data. The trigger program filters acquired data to find a specific data event, or series of data events. The trigger program can accept information from other modules or send signals external to the logic analyzer.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Trigger programs range from the simple to the extremely complex. They are the key to logic analyzer operation, which is to acquire the desired data in acquisition memory and to display the data for viewing. One method for setting up a trigger program is to load a trigger program from the trigger library. You can then alter the trigger program details as necessary. Once you become familiar with trigger programming, you can also create trigger programs without the help of the trigger library. For more information, see *Trigger Library* on page 3–16.

Before you work in the Trigger window, you should already have configured the LA module Setup window because some of the Setup window settings affect Trigger window selections.

Figure 3–10 shows a Trigger window with a trigger program loaded from the trigger library.

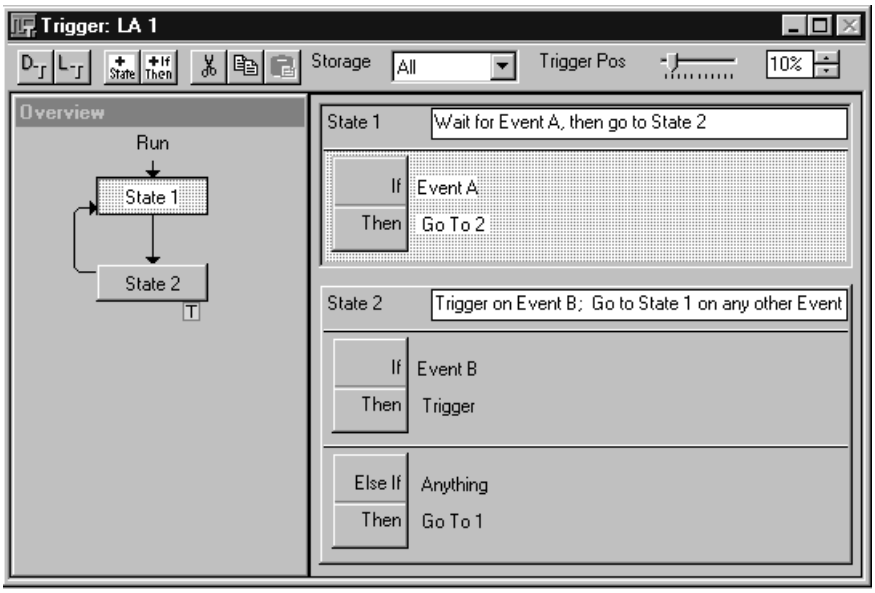


Figure 3–10: LA module Trigger window

Trigger Program Structure

A trigger program is made up of one or more states (up to 16). Only one state is active at a time.

Each state is made up of one or more clauses. If you use more than four trigger event resources in a state, you can have up to four clauses per state. If you have four or fewer trigger event resources in a state, you can define up to 16 clauses per state. Clauses are made up of two parts: an If statement, that defines the data event of interest, and the Then statement, which specifies the action taken when the If statement is true. You can define up to eight events per If statement and up to eight trigger actions per Then statement.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

During each sample clock cycle, all clauses within the active state simultaneously evaluate each data sample. Clauses are evaluated from top (State #1, IF-Then Clause #1) to bottom. When one of the clauses goes true (the event defined in the If statement occurs), then the logic analyzer performs the action(s) specified in the Then statement. There are several actions to choose from, including triggering the system and transferring control of the trigger program to another state.

NOTE. *If multiple clauses are true in the same clock cycle, only the earliest clause in the sequence to go true will have its action(s) executed.*

Trigger Window Structure

The Trigger window summarizes the trigger program. The Overview shows the general structure of the trigger program. The Trigger Detail, at the right of the window, summarizes activity within individual program states. You can click the If/Then button in the Trigger Detail to open the Clause Definition dialog box, which is where the actual trigger programming takes place.

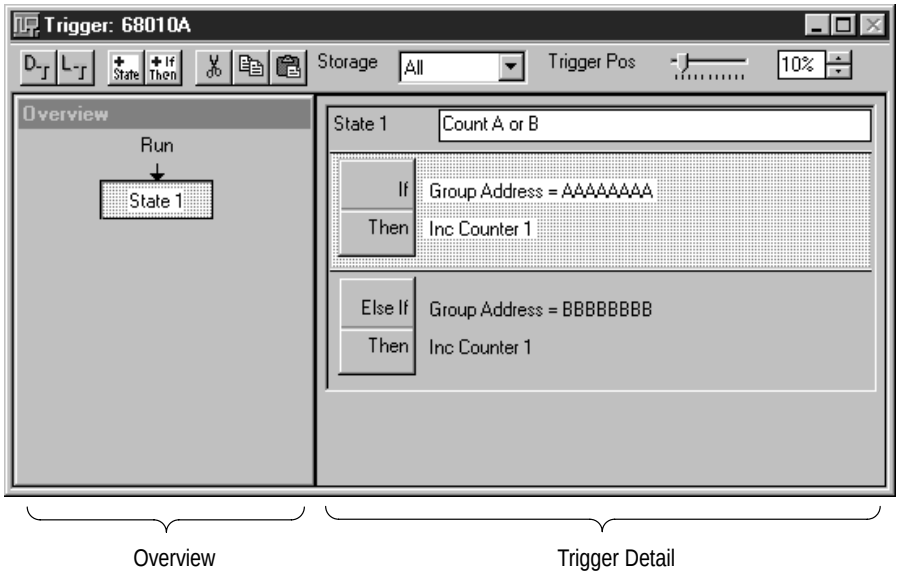


Figure 3–11: Trigger window structure

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Overview. The Overview portion of the Trigger window shows the relationship of the states. See Figure 3–12. This example shows a branch occurring in State 2. This example also shows that a trigger (note the trigger indicator) occurs in State 2 and an Arm occurs.

To view the details in a particular state, double-click on the State button in the Overview.

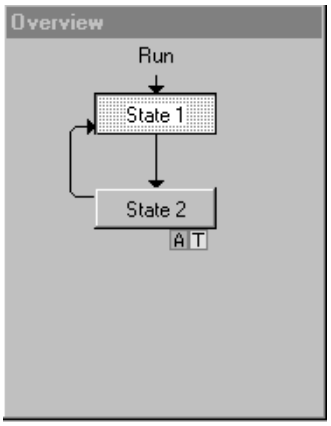


Figure 3–12: Overview portion of LA Trigger window

You can view the progress of the trigger states during acquisition using the Status Monitor. (See *Status Monitor* on page 3–43.)

Trigger Detail. The Trigger Detail portion, at the right of the Trigger window, shows summary information about the clauses within the states. See Figure 3–13. For lengthy trigger programs, click on the State buttons in the Overview to jump to the corresponding Trigger Details.

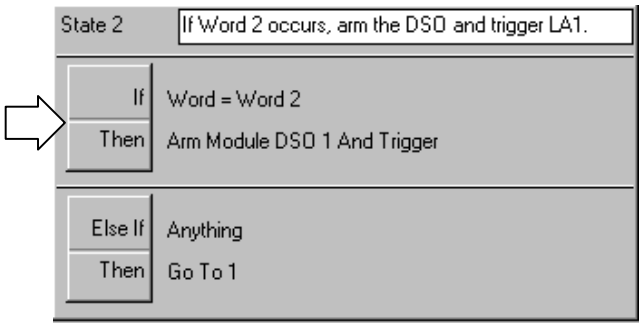


Figure 3–13: Trigger detail portion of LA Trigger window

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Click on the If/Then button to open the Clause Definition dialog box for complete information about the clause.

Trigger Library

One advantage of a logic analyzer is that you can create sophisticated trigger programs so that you can carefully qualify and store only the relevant data. However, configuring such trigger programs can be time-consuming.

The TLA 700 Series Logic Analyzer simplifies this process with its trigger library. It provides a list of trigger programs to fit most needs. The trigger programming is partially done for you.

To use the trigger library, select a trigger program that is close to what you require, and then alter the program as necessary. Once you have customized the trigger, you can save it along with the rest of your setup using the Save Module or Save System function. You can later retrieve the saved trigger program alone or with the related saved module or system information.

Table 3–1 lists the programs in the trigger library and a brief description of each library item.

Table 3–1: LA Trigger library

File name	Description
TrigOnA	Trigger on the first occurrence of Event A.
TrigOnAafterN	Wait for Event A. Trigger after the specified number of events.
TrigOnNthA	Trigger after Event A has occurred a specified number of times.
TrigOnNthAorB	Trigger after Event A or Event B has occurred a specified number of times.
TrigOnAthenB	Trigger if Event B eventually follows Event A
TrigOnAimedB	Trigger if Event B immediately follows Event A.
TrigOnAthenBresetC	Wait for Event A. If Event C occurs before Event B, then reset and wait for Event A again. Otherwise, trigger when Event B occurs.
TrigOnAtoBltNCs	Trigger on Event C if Event C occurs less than or equal to the specified number of times between Event A and Event B.
TrigOnAtoBgtNCs	Trigger on Event C if Event C occurs more than the specified number of times between Event A and Event B.
TrigOnAthenBinN	Trigger when Event B occurs within a specified number of events of Event A.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 3–1: LA Trigger library (Cont.)

File name	Description
TrigOnAinRange	Trigger when the group event occurs within specified upper and lower ranges.
TrigOnGlitch	Trigger on glitches; valid only with Internal clocking.
TrigOnSetHold	Trigger on setup and hold violations; valid only with External or Custom clocking.
TrigOnAtoBinT	Trigger when Event B follows Event A within the specified time.
TrigOnAtoBafterT	Trigger when Event B follows Event A after the specified time.
CountA	Count the occurrences of Event A. This program does not trigger the LA module.
CountAorB	Count the occurrences of Event A or Event B. This program does not trigger the LA module.
CountCfromAtoB	Count the occurrences of Event C between Event A and Event B. This program does not trigger the LA module.
AccumCfromAtoB	Accumulate the total counts of Event C between Event A and Event B. This program does not trigger the LA module.
AccumTfromAtoB	Accumulate the total time between Event A and Event B. This program does not trigger the LA module.
AccumTinRange	Accumulate the total time spent within the specified range in Event A. This program does not trigger the LA.
AccumToutRange	Accumulate the total time spent outside the specified range in Event A. This program does not trigger the LA.
TimeBetweenAandB	Measure the delay between Event A and Event B. This program does not trigger the LA module.
TimeInRange	Measure the time spent within a specific range of events. This program does not trigger the LA module.
TimeOutRange	Measure the time spent outside a specific range of events. This program does not trigger the LA module.
StoreOnA	Store nothing except occurrences of Event A. This program does not trigger the LA module.
StoreOnAorB	Store nothing except occurrences of Event A or Event B. This program does not trigger the LA module.
StoreFromAtoB	Store nothing except the samples between Event A and Event B. This program does not trigger the LA module.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 3–1: LA Trigger library (Cont.)

File name	Description
StoreExceptAtoB	Store everything except those samples between Event A and Event B. This program does not trigger the LA module.
StoreInRange	Store nothing except samples within specified ranges of Event A. This program does not trigger the LA module.
TrigOnSignal	Trigger the LA module on a signal from another module.
SendSignal	Send a signal to another module when Event A occurs.
TrigSysOnA	Trigger the system when Event A occurs.

Loading a Trigger from the Trigger Library

To load a trigger program from the trigger library, follow these steps:

1. From the Trigger window, click the Load Trigger toolbar button.

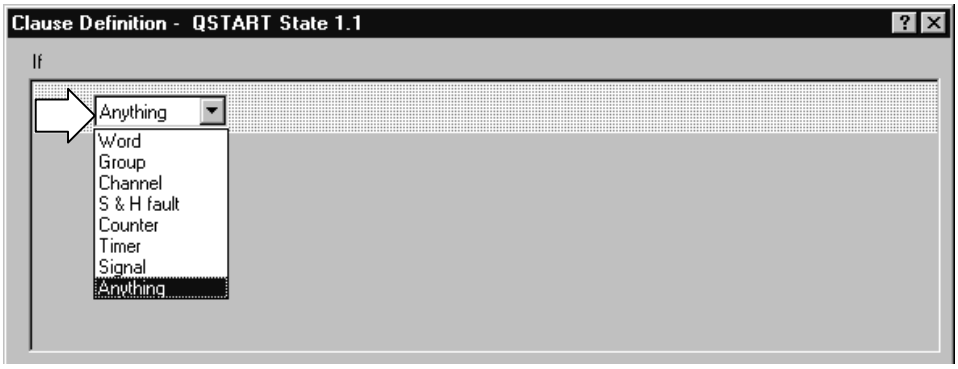


2. From the Load LA Trigger dialog box, click Browse Library.
3. Select a trigger program from the list.
4. Click Open to apply the selection.
5. Click Load to load the trigger program into the module.

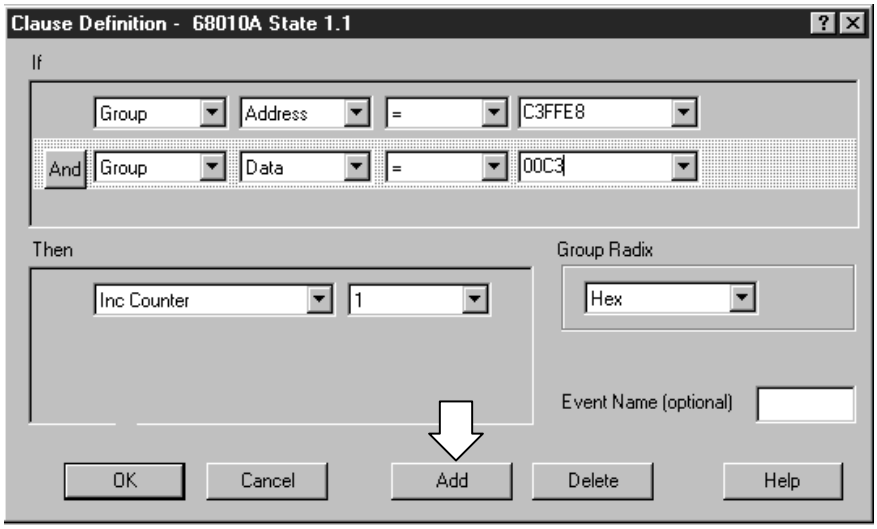
Once you load the trigger program, customize it for your application.

6. Click the If/Then button to open the Clause Definition dialog box. This is where you specify trigger program details.
7. Change the Clause Definition selections to fit your application. Start with the first box in the If statement; the selection you make affects other selections. Enter appropriate values in the address and data boxes.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



8. If you want additional clauses, you can add to the If or Then statements using the Add button, as shown in the following figure.



9. Click OK to complete the clause definition.

10. Check the trigger program summary in the Trigger window.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Trigger Events

Use trigger events to define the If portion of the event clause in the trigger program. Table 3–2 lists the trigger events available.

Table 3–2: Trigger events

Event	Description
Word	Tests the channel groups for the word values defined in the Word definition dialog box.
Group	Tests a specified channel group for a specific value, a range of values, or a value change.
Channel	Tests the specified channel for a value or a value change.
Glitch	Detects glitches in channel groups as defined in the Glitch Detect dialog box. Only available with internal (asynchronous) clocking.
Setup & Hold fault	Tests setup and hold parameters as defined in the Setup and Hold Event dialog box. Not available as an event with internal (asynchronous) clocking.
Counter and timer events	Tests the specified counter or timer value. Timer events are only supported by LA Modules with serial numbers B020000 or higher.
Signal	Looks for one of the four internal system signals. Only one signal event is available in a trigger program.
Anything	All sampled data makes this event true.
Nothing	All sampled data makes this event false.

Trigger Resources

You can use up to 16 unique trigger resources (not including counters and timers) in a trigger program to define the events and actions. A trigger resource can be used more than once in a trigger program. However, some events use more than one trigger resource. Table 3–3 lists the trigger resources and any interactions that may occur when you use them.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 3–3: Trigger resources

Resource	Operator	Interactions and restrictions
Word	=, Is Not	One trigger resource across all defined channel groups.
Group		
Word recognizer	=, Is Not	One trigger resource per channel group.
Range recognizer	<, <=, >=, >, Is In, Is Not In	Three trigger resources per channel group.
Change detector	Changes	One trigger resource per group event, one change detector allowed in a trigger program, not available when transitional storage is used.
Channel		
Word recognizer	=	One trigger resource per channel group.
Change detector	Goes, Doesn't go	One trigger resource, one change detector allowed in a trigger program, not available when transitional storage is used.
Glitch		One trigger resource, only available with internal (asynchronous) clocking.
Setup & Hold Fault		One trigger resource, only available with external (synchronous) or custom clocking.
Counter	>, <=	0 trigger resources, 2 counters or 2 timers. Maximum width 51 bits Maximum clocking 250 MHz Maximum count 2^{51} Counter 1 and 2 events conflict with Timer 1 and 2 events respectively.
Timer	>, <=	0 trigger resources, 2 counters or 2 timers Maximum width 51 bits Maximum clocking 250 MHz Maximum time 2,000,000 S (23 days) Counter 1 and 2 events conflict with Timer 1 and 2 events respectively.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 3–3: Trigger resources (Cont.)

Resource	Operator	Interactions and restrictions
Signal (Signal in)	Is True, Is False	One trigger resource, uses one of four system signals. Only one signal event is available in a trigger program.
Anything		0 trigger resources. Used as a place-holder. Not available with the OR conjunction.
Nothing		0 trigger resources. Used as a place-holder with the OR conjunction.

Trigger Actions

After defining the events in the If (event) portion of the clause, you can select one or more trigger actions to complete the clause. Table 3–4 lists the trigger actions available for your trigger program.

Table 3–4: Trigger actions

Action	Description
Trigger	Triggers the current module. When you use Trigger in the trigger program, you cannot use Trigger All Modules.
Trigger All Modules	Also known as a System trigger. This signal is also available at the System Trigger Out connector. When you use Trigger All Modules in the trigger program, you cannot use Trigger.
Go To	Passes the program flow to a different trigger state. You can only use one Go To action in the clause definition.
Counter and Timer actions	Starts, stops, resets, or clears counters or timers. Counter 1 and 2 actions conflict with Timer 1 and 2 actions respectively. Counter/timer actions may conflict with counter/timer event usage.
Set and Clear Signal	Sets or clears one of the four internal system signals. You can use only one Set or Clear in a trigger program. The Set or Clear Signal is mutually exclusive with the Arm Module action.
Arm Module	Sends an Arm signal to another module. The other module begins running its trigger program. You can arm only one module in a trigger program. However, you can use actions throughout the trigger program. Arm Module is mutually exclusive with Set and Clear Signal actions.
Store Sample	Stores exactly one sample. Not available in Start/Stop storage mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 3–4: Trigger actions (Cont.)

Action	Description
Start & Stop Storing	Begins or ends storing of samples. Start and Stop Storing actions only appear when you select Start/Stop storage mode. Use Start and Stop Storing in conjunction with Start/Stop storage mode in the Trigger window. Available only in Start/Stop storage mode.
Do Nothing	Use as a placeholder when defining a complicated trigger program. Does not override other actions specified in a clause.

Other Trigger Options

From the Trigger window, you can also make data storage and trigger position selections.

Storage. Use the storage selections to avoid filling up the acquisition memory with data samples that do not interest you. You can use the storage selections to disqualify the unwanted data samples and fill memory only with the desired data.

Use the Storage box to select the default data storage rules for the module. Use one of the storage actions in the Then statement of the clause definition to override the default storage setting.

The example shown in Figure 3–14 is using conditional storage. Data is stored only when the specified event is true.

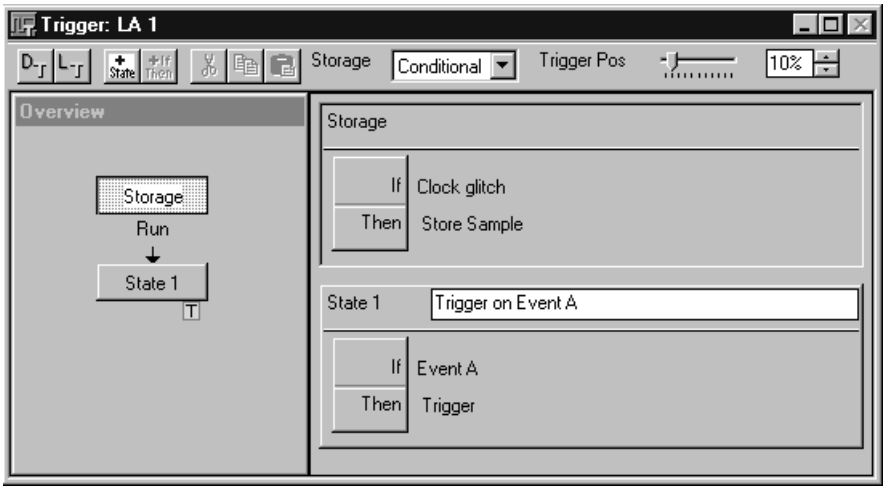


Figure 3–14: Using trigger storage

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Trigger Position. The Trigger Position selects the amount of posttrigger data that is stored and determines the position of the trigger in the data record.

After a module has triggered, it continues to acquire data until it fills a specified amount of memory. The total memory depth that the module fills is set in the Memory Depth box in the Setup window. The proportion of data that is stored before and after the trigger is determined by the Trigger Position field. For example, if the Trigger Position is set to 10%, and the module triggers, then the module continues to acquire posttrigger data until the remaining 90% of memory is filled.

If the trigger event occurs on any data sample before the specified amount of pretrigger data has occurred, then the logic analyzer triggers and begins filling memory with posttrigger data regardless of the amount of pretrigger data specified. For example, if you set the trigger position to 50% and set the logic anlayzer to trigger on a processor reset, start the logic analyzer, then power on your target system, the logic analyzer will trigger. However, the logic analyzer memory will be filled only with posttrigger data, not any pretrigger data. This is due to the trigger event, which has higher precedence, occurring before the pretrigger condition is satisfied.

Saving Trigger Programs

You can save your trigger programs for future use by means of the Save Module or Save System functions. Although these functions save more than just the trigger program, you can load just the trigger program from one of the saved files. For more information, see *Saving and Loading Setups, Triggers, and Data* on page 3–35.

Setting Up the DSO Module

Before acquiring and displaying an analog waveform, you must first set up the DSO using the DSO Setup window. You can set the vertical, horizontal, and trigger parameters manually, or you can use Autoset for a quick automatic setup based on the input signal.

NOTE. *The setup and data windows operate independently; you cannot change setup parameters by changing the data display. Once you acquire data, you can manipulate the display, but that will not change the input settings used to acquire the data. You must return to the DSO Setup window to change input settings which take effect with the next acquisition.*

- To open the DSO Setup window, go to the System window and click the DSO Setup button.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

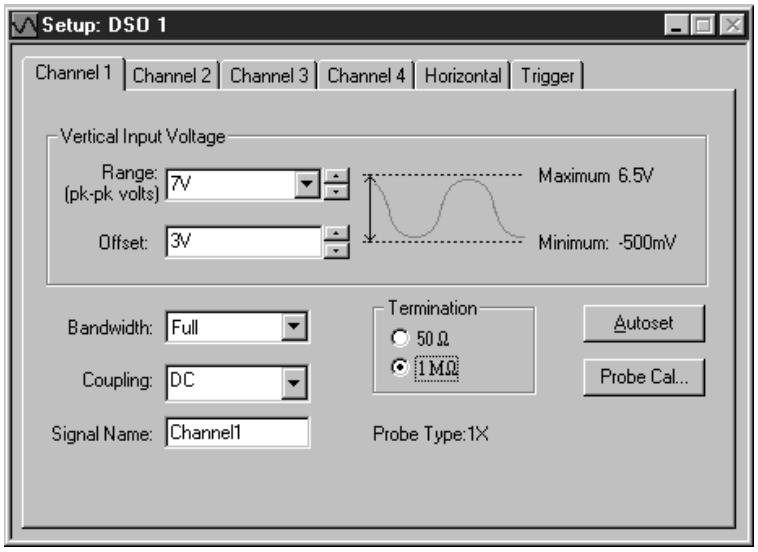


Figure 3–15: DSO Setup window

DSO Probe Calibration

Probe calibration optimizes the signal path for this probe/channel/module combination. For maximum accuracy, execute Probe Cal if any of these conditions have occurred:

- The ambient temperature has changed more than 5°C
- You reconnect the probes to different DSO module input channels

The Probe Calibration dialog controls all DSO probe calibration cycles and directs you to perform any necessary steps. You can calibrate all attached probes or only the probe on the selected channel.

NOTE. *Passive or unknown probes are not calibrated.*

You can start a calibration cycle, view the progress of calibration, and see the results of calibration. Once calibration starts, the calibration cycle of a single probe cannot be stopped. After a calibration cycle completes, you can see the status of probe calibration.

- To open the Probe Calibration dialog, go to the System window and click the DSO Setup button, select a vertical tab (Channel x), and click Probe Cal.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

NOTE. *You should execute the DSO module self calibration if the ambient operating temperature has changed more than 5°C since last calibration. Also, you should execute the self calibration once a week if vertical settings of 50 mV full scale or less are used. Perform self calibration after a 30 minute warm up.*

To open the Self Calibration property page, go to the System menu and select Calibration and Diagnostics. Click Self Calibration.

Autoset

Use Autoset when you need to see a signal in a circuit, but do not know the signal amplitude or frequency. Autoset automatically chooses the DSO setup values based on the input signal at the time you clicked the Autoset button.

Autoset works best on repetitive signals that do not have a DC offset component. If the Autoset setup does not display the waveform as you want it, you can easily change the setup manually.

To set the DSO input values based on the input signal:

1. Go to the System window and click the DSO Setup button.
2. Click Autoset from any page of the DSO Setup window.

   The Autoset selections apply to all input channels, the horizontal setup, and the trigger setup, regardless of which Autoset button was clicked.
3. If the signal changes, or you move the probe to another signal, click Autoset again to reset the setup values.

Autoset affects only the DSO setup; it does not affect data window settings. You may need to adjust data window settings for optimum display of the data.

Vertical Controls

Use the vertical controls to adjust vertical input voltage parameters. See Figure 3–16.

- To open the page containing the vertical controls, go to the System window and click the DSO Setup button and then select one of the Channel tabs.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

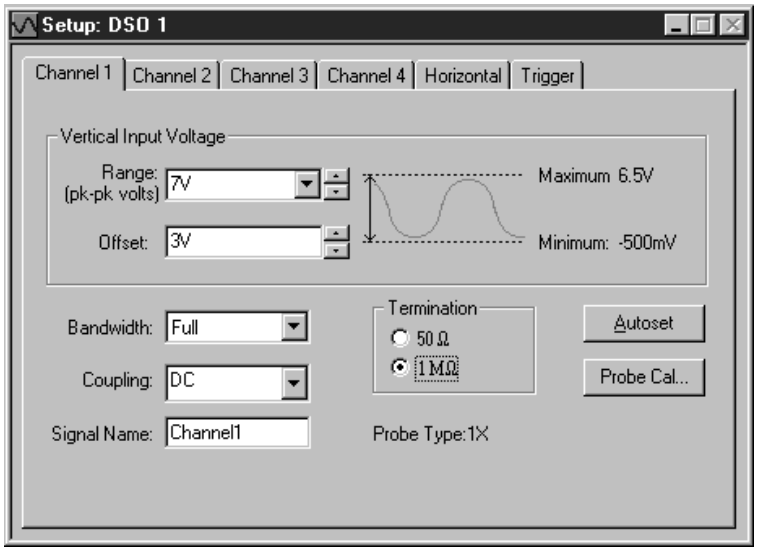


Figure 3–16: DSO Setup window vertical input settings

For best vertical resolution, set the range just slightly larger than the expected input signal. Autoset automatically sets the vertical range for the signal, assuming a 0 VDC offset.

Offset. Offset is the offset voltage applied to the probe. If Range is changed using the preset values, then Range also sets the Offset. The Offset default is 3 V for TTL signals.

Bandwidth. Bandwidth is the range of frequencies that can be acquired and displayed accurately. Your bandwidth selection sets the upper limit of frequencies that will be acquired and displayed. Bandwidth filters reduce unwanted noise and aliasing.

Coupling. Coupling selects how the input signal is coupled to the vertical input channel.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Horizontal Controls

Horizontal settings control the rate at which the data is sampled and the amount of data acquired. See Figure 3–17.

- To open the horizontal page, go to the System window, click the DSO Setup button, and then select the Horizontal tab.

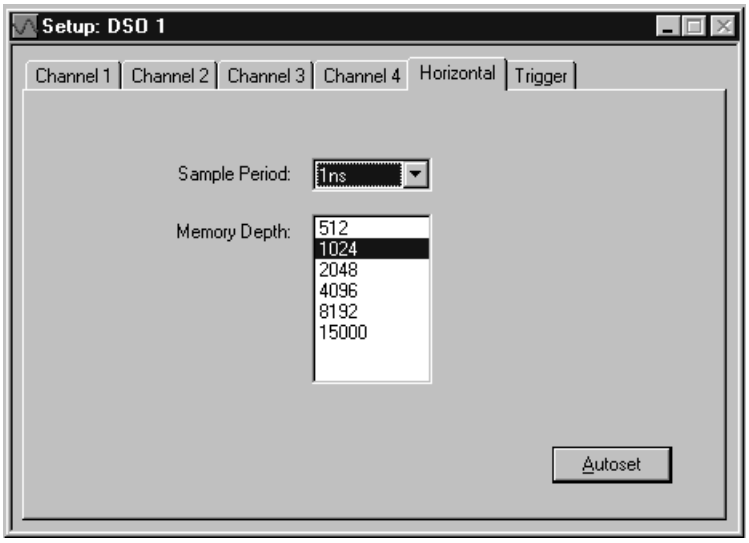


Figure 3–17: DSO Setup window Horizontal settings

Sample Period. The Sample Period sets the interval between successive samples in a waveform record. Choose a sample period that is fast enough that the waveform will not be aliased, and slow enough to provide the waveform record length that you need. For repetitive waveforms, you should set the sample period to at least 5× faster than that of the waveform. (Sample period ≤ ⅕ waveform period.)

Memory Depth. The Memory Depth sets the total number of data samples to be acquired. If you do not need to use the full memory depth to acquire the data of interest, select a smaller memory depth to get faster acquisitions.

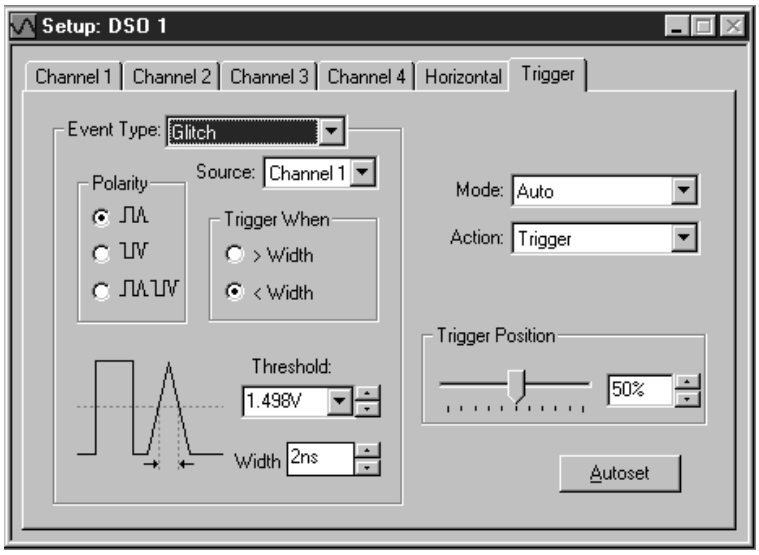
Trigger

The DSO Trigger page contains all controls for setting DSO trigger events and actions. Threshold changes are recognized and executed immediately during acquisitions. Execution of all other controls are delayed until the next acquisition.

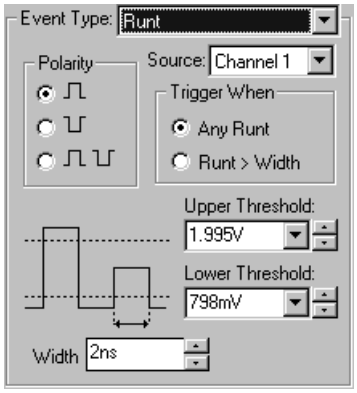
- To open the Trigger setup page, go to the System window and click the DSO Trigger button.

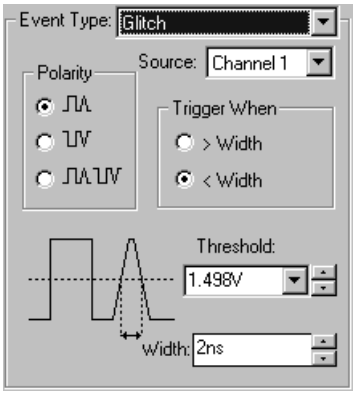
Select a trigger event from the list of event types, and then modify it for your application.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



Event Type. Event Type selects the type of event the DSO will recognize as a trigger. Choose from the list of trigger event types. The following figure shows two of the available trigger event selections.





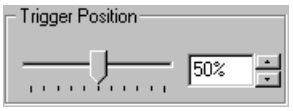
Mode. Mode selects whether the DSO waits for a trigger (Normal) or forces a trigger after a set length of time has passed without a trigger (Auto).

Action. Action selects what happens when a trigger is recognized. Choose from a list of actions. Actions include triggering the DSO, triggering all modules, or triggering and arming another module.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Trigger Position. Trigger position sets the amount of data in the data record that occurs before the trigger.

- To set the Trigger Position, use the slider or enter a numeric value, as shown below.



Event-Based Selections. Depending on the trigger event you choose, other selections may become available. Refer to the online help for further information.

System Trigger

The system trigger is a global trigger event that forces all untriggered modules to arm immediately and trigger. Only one system trigger occurs per acquisition. When displaying data, the logic analyzer uses the system trigger as the primary reference point for the acquisition. The data windows show the system trigger and all module triggers. Module triggers can be forced by the system trigger or specified by module trigger programs.

The system trigger can be generated from any of several sources. Often, the system trigger is specified in a module's trigger program. Any module can specify the system trigger as a trigger action (Trigger All Modules). However, modules can specify trigger actions other than system triggers, and the system trigger does not have to originate from a module. The logic analyzer can also accept a system trigger generated by an external source. External system triggers are input through the SYSTEM TRIG IN connector. Regardless of the source of the system trigger, all modules must respond.

It is not uncommon to have a condition where the acquisition completed, but where an explicit system trigger did not occur. (This means that there was neither an external system trigger, nor a system trigger generated internally by a module trigger program.) To ensure that a time reference exists for the acquisition, the logic analyzer must designate a system trigger. If no system trigger is generated during an acquisition (the modules are internally triggered), the logic analyzer designates the latest-occurring module trigger as the system trigger.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

***NOTE**. If an acquisition does not complete, due to one or more modules not receiving a trigger or not completing posttrigger acquisition, then you can manually stop the acquisition by clicking the Stop button. Clicking the Stop button effectively generates a system trigger and completes the acquisition.*

The system trigger is a latched event and it resets to a false state between acquisitions. The external system trigger input uses real-time gating and is only active (capable of latching system triggers) during the actual acquisition period.

The logic analyzer can also send an internally-generated system trigger out to the target system or to other test equipment through the SYSTEM TRIG OUT connector. All the external signal inputs and outputs operate at TTL levels. The connectors are located at the rear of the portable mainframe and at the front of the benchtop mainframe. For more information about external signaling capabilities, see *Intermodule and External Signaling* on page 3–32.

Arming Modules

Using the arm feature, you can use one module to control when another module accepts triggers. When module A arms module B, this means that module B does not begin looking for a trigger until it receives an arm signal.

Arming is accomplished through trigger actions. For the LA module, arming is specified in the Clause Definition dialog box; for the DSO module, arming is specified in the Trigger page. A module can arm any one of the other modules. The designated module can be armed by only one module. The same arming action can, however, appear multiple times within the same trigger program.

Arms are latched events which, once set, cannot be cleared until the acquisition is completed.

***NOTE**. For a single module, arming and internal signaling are mutually exclusive. You cannot simultaneously arm modules and set signals. You can test for a set signal (for example, If Signal X Is True), but you must designate an external signal for this purpose; otherwise you will be unable to set the signal when using the arming feature.*

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Intermodule and External Signaling

The logic analyzer has four internal signals that you can use to set up trigger conditions between modules, or to send or receive signals external to the logic analyzer. Use the Signals property page, shown in Figure 3–18, in conjunction with the module trigger programs to configure these signals for your application. The trigger programs determine when the signals occur. The Signals property page specifies characteristics of the signals.

NOTE. *Be careful to observe the bandwidth and latency specifications when using internal and external signals. Refer to Tables 3–15 and 3–16 on pages A–3 and A–5 for information.*

- To open the Signals property page, go to the System menu and click System Configuration. Then select the Signals tab.

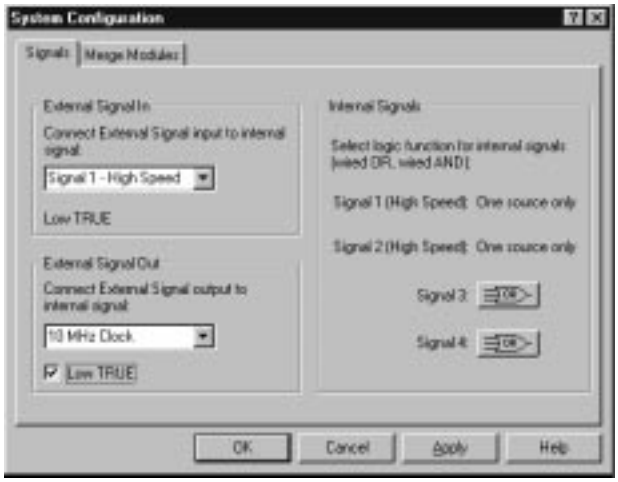


Figure 3–18: Signals property page

Internal Signals

All LA modules can set and clear any of the four internal signals. The DSO can set but not clear any signal. The logical output of these signals can be used as an event in other modules' trigger programs. You can also connect the internal signals to the External Signal In and External Signal Out connectors on the mainframe, so that you can use an external signal as a trigger event or send a signal out when a trigger condition is met.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Internal signaling is for users with special trigger programming requirements. Internal signaling adds flexibility to trigger programming, but also adds complexity. When using internal signaling you must take care that the signals are correctly set and cleared, and that the trigger programs for all modules are compatible with regard to signal usage. Also, you must have correctly set the internal signal attributes in the Signals property page.

Internal signaling is accomplished through trigger actions specified in the Clause Definition dialog box and the DSO Trigger page.

NOTE. *Arming and internal signaling are mutually exclusive. You cannot simultaneously arm modules and set signals. You can test for a set signal (for example, If Signal X Is True), but unless you have designated an external signal for this purpose, you will be unable to set the signal when using the arming feature.*

Signal Logic Function. To use internal signals, you must select which internal signal logic function is appropriate for your trigger program. Signals 1 and 2 (high speed) can be asserted by only one module each. For signals 3 and 4, the modules can be wired-OR or wired-AND. Selecting the OR function means that any module can assert the signal. Selecting AND means that all modules must set the signal for it to be asserted. The same logic applies to clearing signals.

The logic function applies only at a module level, not to multiple set/clear statements within a single module.

NOTE. *Be careful when using wired-AND internal signals. If your trigger depends on an internal signal, all modules must set the signal for it to be asserted, or the trigger will not occur. If you change your trigger program, remember to update the logic function settings accordingly.*

External Signals

The logic analyzer can send and receive signals to/from the target system using the External Signal In and External Signal Out connectors on the mainframe. Use the External Signal In function to include a signal from your target system as part of the trigger setup. Use the External Signal Out function to send a signal to the target system or other test equipment when a trigger condition is met.

The connection from the module to the external connector is made by one of the four internal signals. You must designate which internal signal is to be used for this purpose.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The external signal connectors are located at the rear of the portable mainframe and at the front of the benchtop mainframe. The external signals all operate at TTL logic levels.

Merging Modules

You can merge two LA modules to increase channel width. Such a merged module functions as a single unit and the data it acquires is automatically time-correlated. This is useful when analyzing buses or devices with a high pin count. In addition, some microprocessor support packages require merged modules.

Modules must have the same maximum state speed and must be physically connected in the mainframe before they can be merged by software. Modules must be adjacent and connected as described in the *TLA 700 Series Logic Analyzer Installation Manual*.

When LA modules are merged, only one set of clock channels needs to be connected to the target system to acquire data. This makes it easier to connect and reduces capacitive loading.

Modules that have been physically connected in the mainframe, and are therefore capable of being merged, are shown in the Merge Modules property page with a merge button. See Figure 3–19.

- To open the Merge Modules property page, go to the System menu and click System Configuration. Then select the Merge Modules tab. To merge or unmerge modules, click the merge button between the module icons.

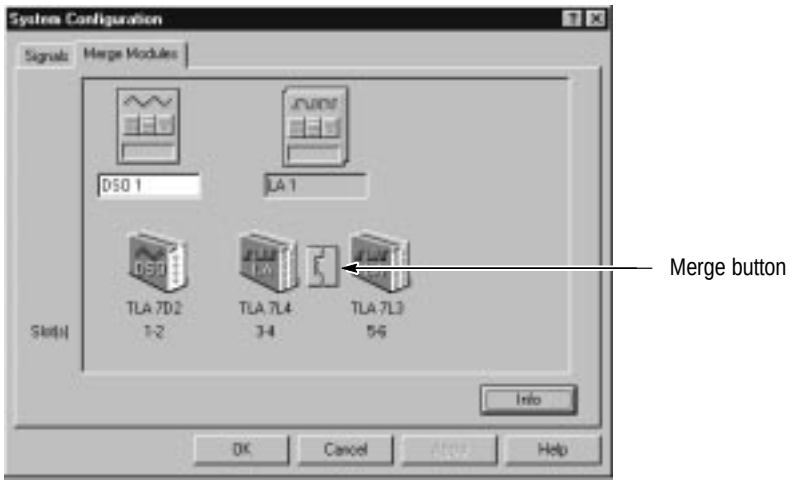


Figure 3–19: Merging modules

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

NOTE. *After the modules have been physically merged, you should run the self-calibration procedure on the modules as a merged pair. To run the self-calibration procedure, go to the System menu and select Calibration and Diagnostics. Click Self Calibration.*

You can unmerge the modules at any time for independent operation. You do not have to remove the hardware connection between the modules.

In setup and data windows, merged module probe names use the following convention: master module probe names are displayed normally, and slave module probe names are prepended with an S.

Saving and Loading Setups, Triggers, and Data

Once you set up the logic analyzer to your satisfaction, you will probably want to save the setup for future use. You can save setup information in two ways, a saved system file or a saved module file.

Refer to the *Logic Analyzer Conceptual Model* described on page 2–6. The modules consist of the setup, trigger, and data associated with the physical LA or DSO module installed in the logic analyzer. The system consists of the setup and data for the whole logic analyzer, including all the modules and all data windows. See Figure 3–20.

When you save a module, you save all the setup and trigger information for that module. When you save a system, you save all the setup information for the system, including data window display settings, and all the module information, as well. In either case, you have the option of saving acquired data.

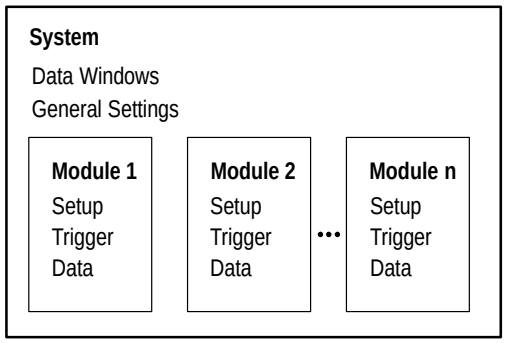


Figure 3–20: Logic analyzer conceptual model

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Saving System and Module Files

Determine whether you want to save the information from just the module or for all modules. Select Save System or Save Module accordingly. If you want to save the data in addition to the setup and trigger information, select Save Acquired Data.

You execute Save operations from the File menu.

NOTE. *When saving systems or modules, be aware that the data is by far the largest component of the save file. If the data is not important, you can save significant disk space by saving the file without saving the data.*

Saved system and module file names have a .tla file name extension (*file-name.tla*). The initial default location for saved files is C:\My Documents.

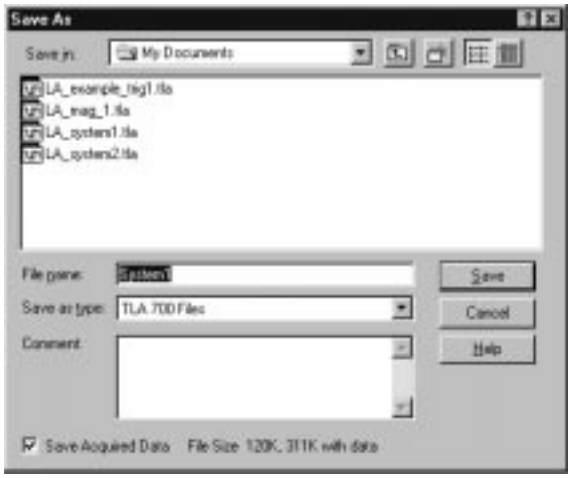


Figure 3–21: Saving a system with data

Loading Saved System and Module Files

The logic analyzer stores all the setup, trigger, and data information in just two types of files: saved module and saved system. However, the logic analyzer can extract different types of information individually from these files. From a saved module file, you have the option of loading any of the following:

- An LA module trigger program
- A module setup and trigger program
- Saved data from the module (accomplished by opening a saved data window; see *Opening a Saved Data Window* on page 3–49)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

From a saved system file, you can load any of the following:

- Any of the previous module-related choices
- Full system setup, including data windows
- Saved data from one or more modules

You execute Load operations from the File menu. For module Load operations, you must first go to the module Setup or Trigger window before accessing the File menu.

Loading a System. When you load a system you load the full system setup, which includes setup, data, and trigger information for the logic analyzer and all installed modules. If the saved system file included data, the data windows and saved data are also loaded.

There may be situations where you attempt to load a saved system with a different module configuration than your current system. The Load System Options dialog box displays informing you of the differences. To load a module from the saved system, drag the module icon from the top of the dialog box to a module icon in the bottom of the dialog box. Figure 3–22 shows an example of the Load System Options dialog box.



Figure 3–22: Load System Options dialog box

Loading a Setup and a Trigger Program. When you execute a Load System or Load Module operation, you load a saved setup and its related trigger program(s) to the logic analyzer (system) or specified module.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Loading Saved Data. You can load saved data using the Load Data Window selection in the Window menu. See *Opening a Saved Data Window* on page 3–49 for more information.

Loading a Saved Trigger. You can load an LA module trigger without loading a full setup. Saved system and module files both contain trigger program information. When you load a trigger from the LA Trigger window, you can select a saved system or module file as the source. When you do so, the logic analyzer extracts only the trigger information from the file and loads it to the module.

Creating a Personalized Trigger Library. To create your own trigger library, follow these steps:

1. Create a folder in a convenient location. For example, create a folder named Project Trigger Library in the folder My Documents. The path name would be as follows:

   `C:\My Documents\Project Trigger Library`

2. Go to the Trigger window containing the trigger program you want to save.
3. Go to the File menu and select Save Module As.
4. In the Save As dialog box, navigate to your trigger library folder.
5. Name the new file, and use the Comment box to enter descriptive comments. See Figure 3–23.
6. Make sure that Save Acquired Data is not selected.
7. Click Save.

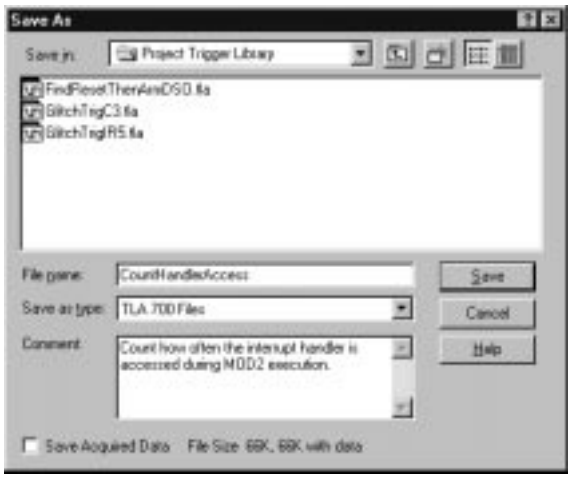


Figure 3–23: Saving a file in a personalized trigger library

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Loading Default Settings

To return the logic analyzer to its default condition, go to the File menu and click Default System.

System Options

The logic analyzer provides several property pages where you can set or change system options. To access the system options, select Options from the System menu and choose the property page you are interested in.

- Use the Color property page to create, remove, and modify color schemes.
- Use the Defaults property page to specify the defaults throughout the TLA 700 application. The settings you enter will be the default settings when you create new data windows.
- Use the Preference property page to specify user preferences, such as changing the color of the Run or Stop buttons or hiding the Status bar.
- Use the Presets property page to view and modify preset names and values such as probe threshold voltages and DSO vertical range or vertical offset values.
- Use the Start-Up property page to select which system setup (such as a previous system or a saved system setup) to open after you power on the logic analyzer.
- Use the System Source Files property page to define the location of source files and suffixes used to create new Source windows.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Menu Shortcut Keys

You can use the shortcut keys listed in Table 3–5 to manipulate menus and edit windows. You should also refer to the discussions of short cut keys in the online help or under the section for the individual data windows.

Table 3–5: Menu shortcut keys

Desired action	Key combination
File menu	
Return system to the default setups	CTRL + D
Load a saved system	CTRL + O
Save a system setup	CTRL + S
Print the active window	CTRL + P
Edit menu	
Cut a selected item to the clipboard	CTRL + X
Copy a selected item to the clipboard	CTRL + C
Paste items from the clipboard	CTRL + V
Undo edit	CTRL + Z
Data menu	
Search backward	CTRL + B
Search forward	CTRL + F
System menu	
Display the Status Monitor	CTRL + M
Run or Stop	CTRL + R
Window menu	
Create a new data window	CTRL + N

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

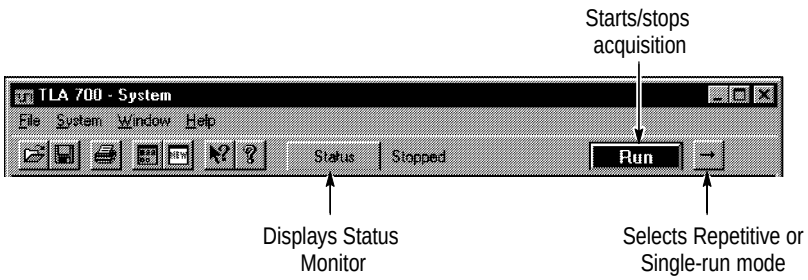
Acquisition

After you set up the logic analyzer you are ready to acquire the data.

When you start an acquisition, all modules start acquiring data together. (Exceptions are when one module has been programmed to arm another or when a module has been turned off.) Modules stop acquiring data individually, according to their trigger programming.

Starting and Stopping Acquisition

You control acquisition from the Control bar, shown below:



1. In the Control bar, click Run to start acquisition.
2. Wait for the logic analyzer to trigger and display data, or click Stop to manually stop acquisition.

There are two ways to acquire data: Single-run or Repetitive mode. Within Repetitive mode, you can specify the following three conditions:

- Save Module and Data
- Stop if Compare with Reference is Equal or Not Equal
- Stop After N Acquisitions

When comparing acquisition data against reference data, you can view the results in either a Listing window or in a Waveform window.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Single Run Mode

In Single-run mode, the logic analyzer automatically stops acquiring and displays data when it fulfills the setup conditions. Use Single-run mode when you want to find and display a specific event.

During acquisition, the logic analyzer monitors the data, looking for the events you specified in the Trigger windows. When the specified events occur, the logic analyzer responds according to the selections you made in the Setup and Trigger windows.

Repetitive Mode

In Repetitive mode, the logic analyzer keeps acquiring data until you click Stop or until it fulfills the stop conditions.

You can use Repetitive mode as follows:

- To observe the same waveform or listing for a period of time
- To stop after a set number of acquisitions for a period of time and look for differences

After each acquisition you can have the logic analyzer do the following tasks:

- Save the system or module setups and data
- Export the data to separate files or overwrite the same file
- Compare the LA acquisition data against data in another LA module or a saved LA module file
- To open a file or execute a set of defined tasks after the acquisition is complete. For example, you can run a WIndows 95 command such as sending email or paging you that the logic analyzer has stopped.

Select Repetitive Properties from the System menu to select the different options for the Repetitive mode. Figure 3–24 shows an example of the Repetitive Properties dialog box.

NOTE. *You can minimize the time between acquisitions by specifying compare conditions under the LA Setup window, deleting (not just minimizing) all data windows, and then starting the logic analyzer. When the logic analyzer fulfills the compare conditions, you can create a new data window with the New Data Window wizard to view the data.*

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

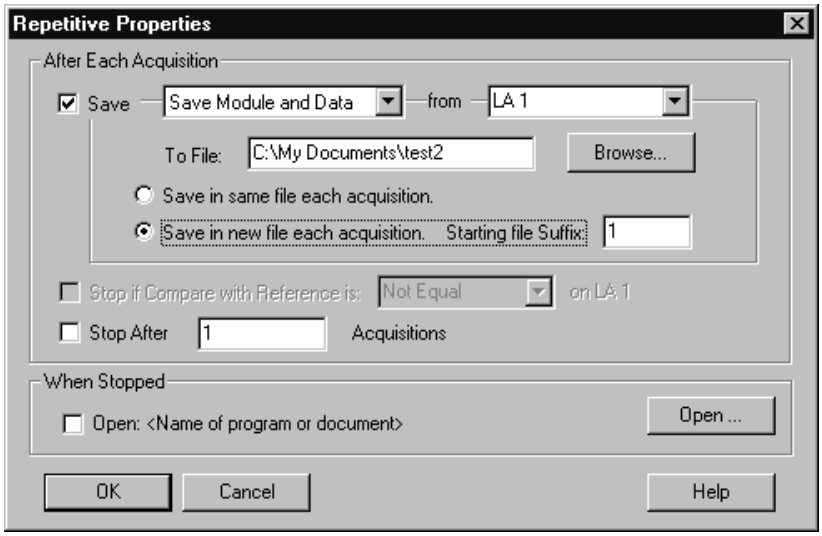


Figure 3–24: Defining setups for Repetitive mode

Viewing Acquisition Activity

While the logic analyzer is acquiring data, you can check its progress to see how much data it has acquired or to view channel activity.

Use the Status Monitor for a brief summary of acquisition, trigger, and data storage progress. See Figure 3–25.

- In the Control bar, click Status.

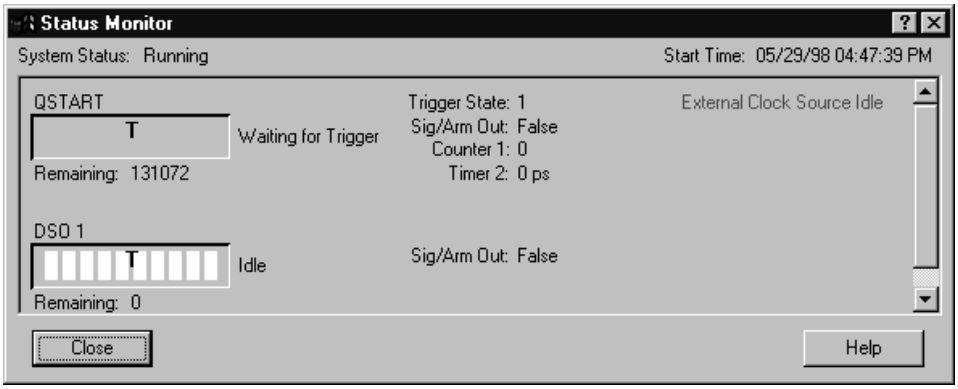


Figure 3–25: The Status Monitor

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The Status Monitor is also useful to debug a trigger program. From the Status Monitor you can view the current status of various resources of the logic analyzer during acquisition. However, be aware that rapid changes in trigger state, counter values, timer values, and the internal signals cannot be accurately displayed in real time in the Status Monitor.

If the Logic Analyzer Does Not Trigger

If the logic analyzer does not trigger, then you should check the following:

- Check that your target system is powered on.
- Check the System window to verify that required modules are turned on.
- If the module has correctly clocked data, acquired the specified events, triggered, but has not stopped, the module probably has not acquired enough additional data to fill acquisition memory. Click Stop to manually stop the acquisition, and then change the module Memory Depth (reduce) or Trigger Position (increase).

LA Module

The following conditions apply to the LA module only:

- Check the Status Monitor for an external clock warning. If the LA is not receiving an external clock, the Status Monitor displays the following message: External Clock Source Idle.
- Check for signal activity at the probe tip. If there is no activity, then check the probe connections.

  Check the clock signal to make sure that the LA module is actually clocking data. Problems with the clock signal can impact setups using external clocking, custom clocking (microprocessor support packages only), or storage qualification.
- Similar to the previous item, check clock qualifier signals and clocking equations.
- Check the threshold voltages for probes and clocks.
- If the module is correctly clocking data and the data events have occurred, but the trigger program did not generate a trigger, then you should check the trigger program itself. The trigger program might not be reaching the state that generates the trigger. Use the Status Monitor to track trigger program progress and identify the state in which trigger progress stops.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- Check the complexity of your trigger program. If your trigger program is too narrowly defined, or over-specified, the trigger program might not acquire the desired data or might not trigger. A less-specific trigger program might acquire the desired data and will also verify that you have set up the proper clocking and threshold levels.

DSO Module

The following condition applies to the DSO module only:

- Check the trigger Mode setting. If Mode is set to Normal, and the data does not meet the trigger conditions, the module will not trigger. (Conversely, if Mode is set to Auto, the module will trigger after a set length of time, even if the specified data does not occur.)

Arming or Intermodule Triggering

The following conditions apply only if you are using arming or intermodule triggering:

- Internal signal logic function. If your trigger depends on setting an internal signal, and that signal has been set to Wired-And, all modules in the system must set the signal or it cannot assert.
- If any modules are turned off, check that the trigger program is not waiting for input from an inactive module.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Display

To view acquired data, open one of the data windows. The Listing window and the Waveform window are the data windows that you will use for most applications; see Figure 3–26. You can also create Source windows to use with high-level language support applications or Histogram windows to use with performance analysis applications. You can have multiple data windows to display different data or different views of the same data.

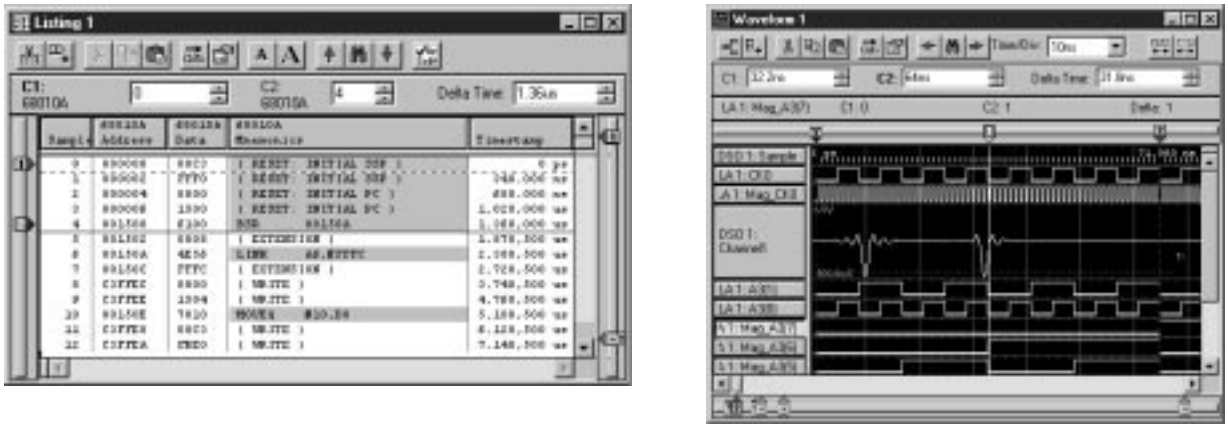


Figure 3–26: The Listing and Waveform windows

Setup window and data window controls act independently of one another. Controls in the Setup windows affect how the modules acquire data. Controls in the data windows affect how the acquired data is displayed.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Opening an Existing Data Window

The System window shows the relationship between the modules and the data windows.

- To open a data window, go to the System window and click a data window button. See Figure 3–27.
- To see which modules supply data to a data window, go to the System window and click the data window label.

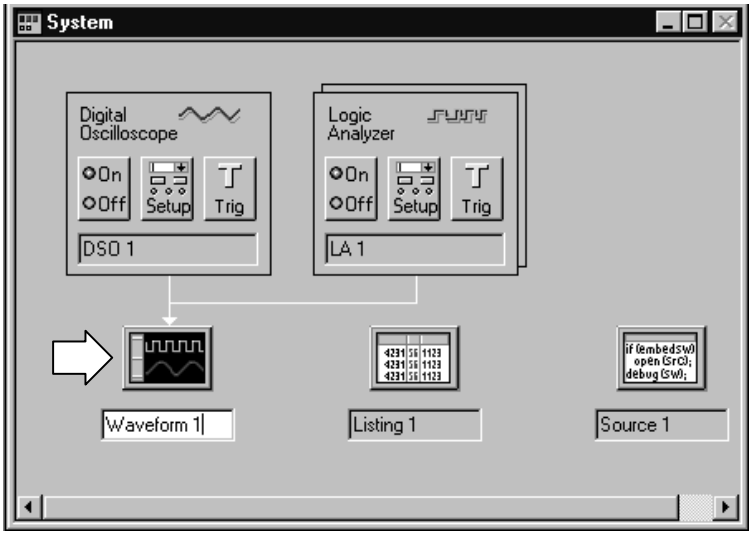


Figure 3–27: Opening a data window

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Opening a Saved Data Window

To open a window displaying data from a saved system file, do the following:

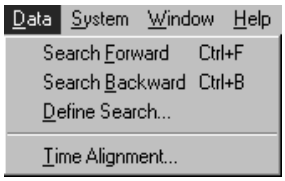
1. Go the Window menu and select Load Data Window.
2. Click Browse to search for the file or enter a path to the file in the text box.

***NOTE**. The saved file must be a saved system file.*

3. Once the file is found, click Open.
4. Select the data window to load.
5. Click OK.
6. If the data window name is not unique, you will be prompted for a new name. Enter a name and click OK.

Aligning Saved Data with Current Data

Saved data and current data are time-correlated by aligning their system triggers. You can manually adjust this alignment using the Time Alignment dialog box. To access the Time Alignment dialog box, go to the Data menu and select Time Alignment, as shown below.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Creating a New Data Window

Use the New Data Window wizard to create a new data window for the data you want to display. You can select data from any module, a saved system file, or saved module file. See Figure 3–28.

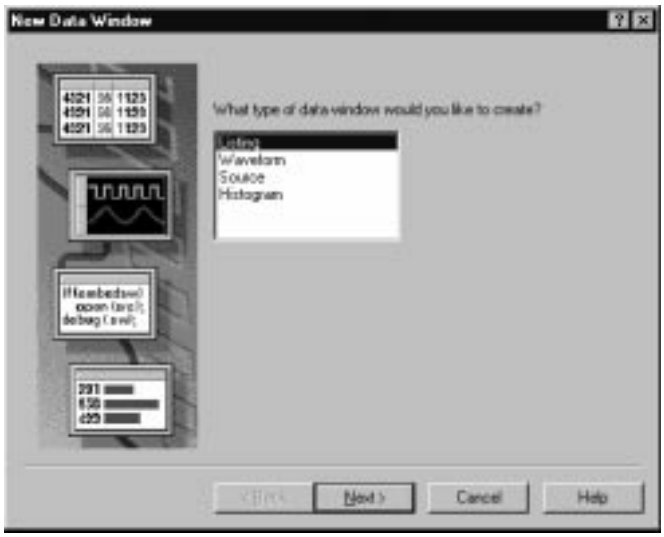


Figure 3–28: New Data Window wizard

Create a new data window as follows:

1. Click the New Data Window icon in the toolbar.
2. Select the appropriate Window Type and click Next.

***NOTE**. The contents of the New Data Window wizard will vary depending on the type of data window that you are creating.*

3. For each page in the wizard, enter the required information and click Next.
4. On the last page, enter the name for the data window or use the default name and then click Finish.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

General Purpose Data Window Shortcut Keys

You can use the general-purpose shortcut keys listed in Table 3–6 to move data and cursors in data windows. You should also refer to the discussions of short cut keys in the online help or under the section for the individual data windows.

The shortcut keys (also known as accelerator keys or hot keys) abide by the following rules:

- Arrow keys with no modifier keys scroll data.
- Arrow keys with the Control (CTRL) key move the active cursor.
- The Shift key increases movement by a factor of 10.

Table 3–6: General purpose data window shortcut keys

Desired action	Key combination
Scroll data up 10 pages	Shift + Page Up
Scroll data down 10 pages	Shift + Page Down
Scroll data to the top of the window	Shift + Home
Scroll data to the end of the window	Shift + End
Move active cursor up one page	CTRL + Page Up
Move active cursor down one page	CTRL + Page Down
Move active cursor to the top of the data	CTRL + Home
Move active cursor to the end of the data	CTRL + End
Move active cursor up 10 pages	CTRL + Shift + Page Up
Move active cursor down 10 pages	CTRL + Shift + Page Down
Move active cursor to the top of the data	CTRL + Shift + Home
Move active cursor to the end of the data	CTRL + Shift + End

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Waveform Window

Use the Waveform window to display and evaluate acquisition data. You can display both DSO waveforms and logic analyzer waveforms. Each window contains a data area, waveform labels, marks and several toolbars that allow you to measure and manipulate your waveforms. See Figure 3–29 for an example.

Each waveform is displayed independently within its own track. Waveforms cannot be overlapped.

For the LA module, data values for each channel are shown as a digital (two-state) waveform. Logic level low is drawn as a thick line; logic high as a thin line. For the DSO module, data values for each channel are displayed as an analog waveform.

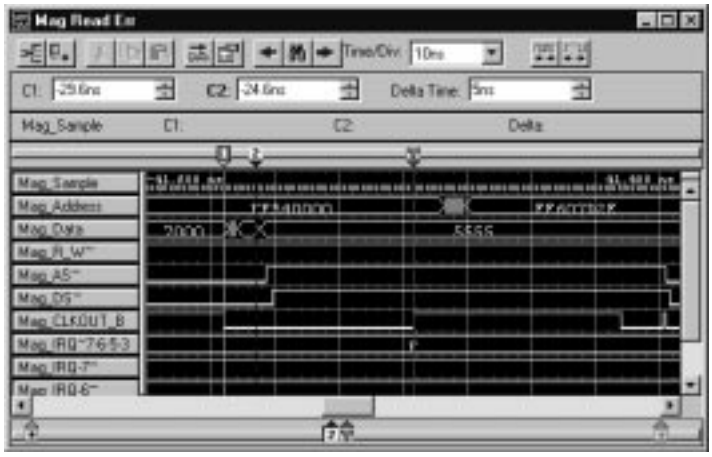


Figure 3–29: Waveform window

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Types of Waveforms

There are several types of waveforms that can be shown in the Waveform window, as shown in Figure 3–30.

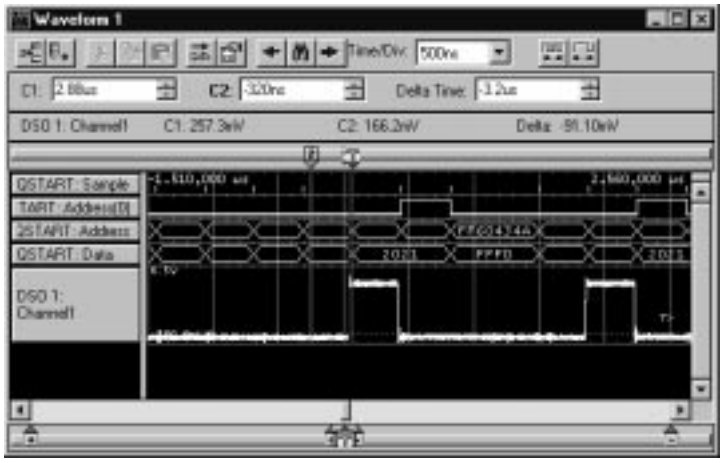


Figure 3–30: Waveform types

Busforms Busforms display the value of an LA module channel group.

Single-Channel LA Waveforms Digital timing diagrams that represent a single LA channel.

Magnitude Waveforms Magnitude waveforms plot the numeric value of a channel group on a vertical axis over a period of time. For example, you can use magnitude waveforms with A/D and D/A applications for viewing the RGB components of a digitized video signal. Figure 3–31 shows such a component.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

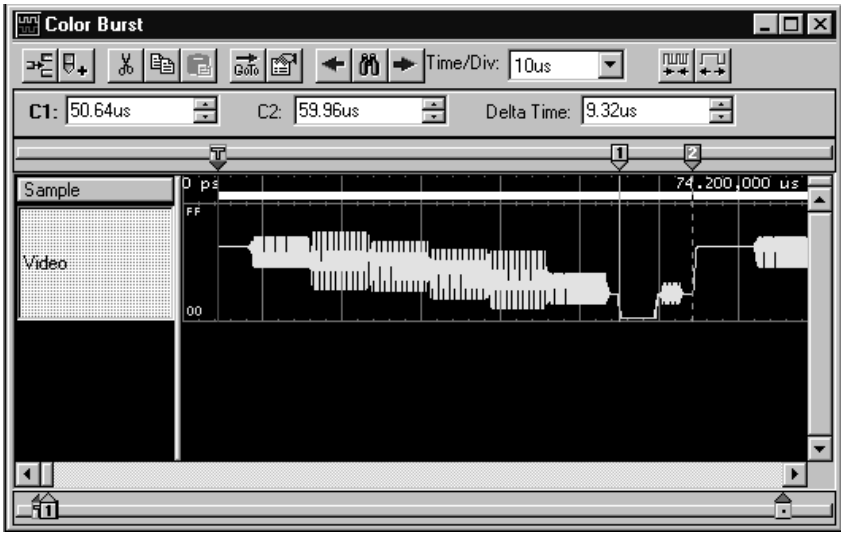


Figure 3–31: Magnitude waveform

DSO Waveforms

Analog timing diagrams that represent a single DSO channel.

The size of the DSO waveform within its track depends on signal size and the input voltage range selected in the DSO Setup Window.

Range readouts for DSO waveforms are located at top and bottom left of the waveform. The range readouts show the maximum and minimum vertical input voltage settings for the waveform. See Figure 3–32.

The ground line is shown as a horizontal dotted line through each DSO waveform track. If ground is outside the bounds of the track, the ground line is not shown.

The trigger threshold is indicated by a “T>” at the right edge of the track. The trigger threshold is set in the DSO Trigger page of the DSO Setup window.

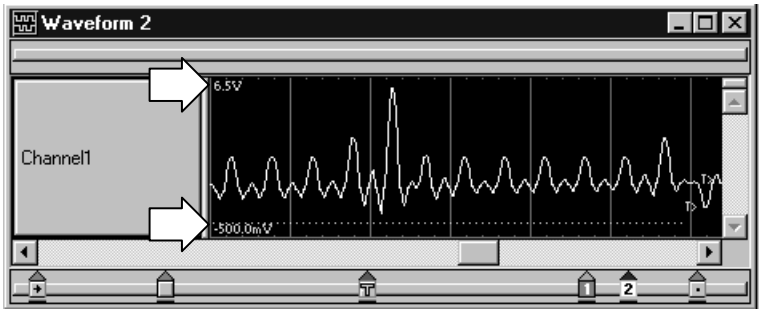


Figure 3–32: Range readouts

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Sample Clock Waveforms

Each module that contributes current data to the window has its own Sample Clock waveform. The sample clock waveform consists of a row of short vertical tick marks placed along the time axis at each display point that represents an actual acquired sample for the module.

Reading the Waveform Indicators

Data marks, cursors, and other indicators help you navigate and identify the data. Figure 3–33 and Table 3–7 identify and describe data window marks.

- To move cursors or marks, drag the cursor and mark handles. Trigger marks and Begin/End data marks cannot be moved.

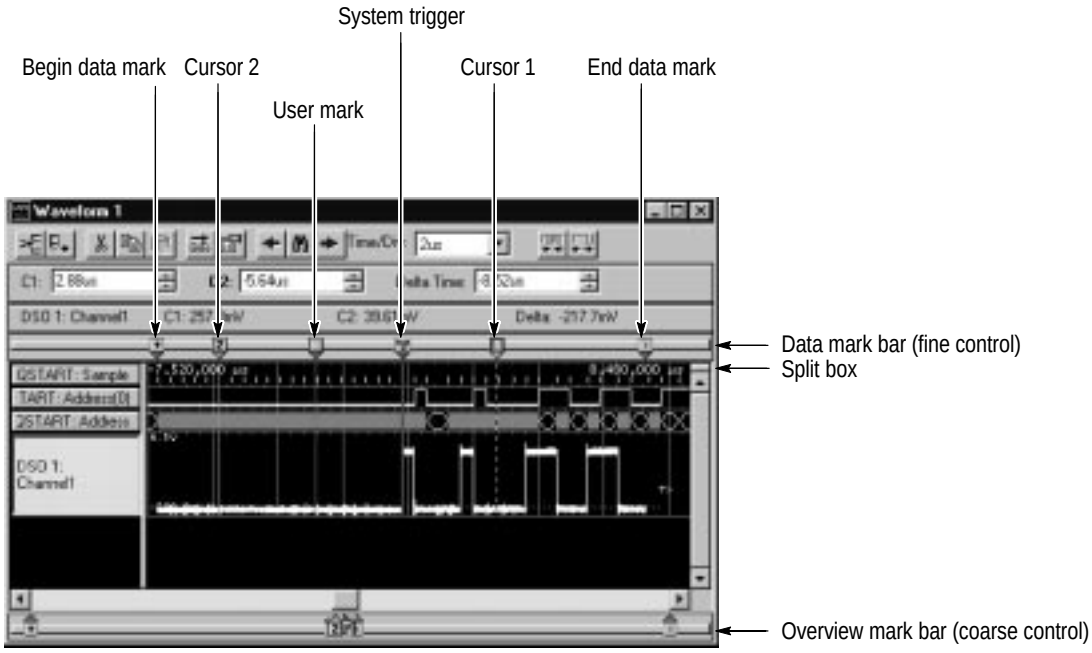


Figure 3–33: Waveform window cursors and marks

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 3–7: Waveform window cursor and mark summary

Mark	Name	Description
	System trigger	The system trigger is the reference point for the acquisition. Timing and location information is relative to the system trigger. Trigger marks cannot be moved. Under some conditions the system trigger associated with a module's data might not be displayed in the data window. If the system trigger was caused by another module, whose data is not included in the current display, then the system trigger is not shown. Nevertheless, all time measurements still relate to that system trigger, even if it is not shown. The system trigger associated with the current data is called the active system trigger. The system trigger associated with saved data is called the reference system trigger. The active system trigger is indicated by a yellow T; the reference system trigger is indicated by a gray T.
	Module trigger	The point at which the module triggered. Trigger marks cannot be moved.
	Begin data / end data	The start and end of a module's data record. These data marks cannot be moved.
1 2	Cursors 1 and 2	Moveable marks used for visual reference and for data measurements.
	User mark	User-created marks. Use marks to make specific data more easy to identify and find.

Adding a Mark to a Waveform Window

You can mark interesting data that you may want to refer back to at a later time. To add a user mark, follow these steps:

1. In the System window, click the Waveform window icon.
2. From the Edit menu select Add Mark. The mark appears at the center of the display, has default properties, and is selected.
3. Move the mark to the desired location by dragging its handle.

***NOTE**. You cannot add a mark if you have not acquired data.*

Sending Stacked Marks to the Back

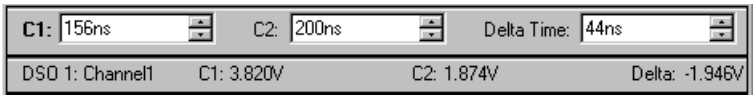
Sometimes, marks can be stacked on top of one another. To send a mark to the back, follow these steps:

1. Select a mark you know is on top of another one.
2. Click the right mouse button and select Send To Back.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Cursor Measurements

Use the cursors to take time and voltage measurements. You take time and voltage measurements in the Waveform window, as shown below.



The following steps describe how to take a time measurement. Use the same method to take a voltage measurement for the DSO module. (Magnitude on an LA module waveform is expressed as a 1 or a 0.)

1. In the Waveform window, select a waveform.
2. Move Cursor 1 to the location on the waveform that you want to measure.
3. Read the time from the C1 readout on the measurement bar.
4. Move Cursor 2 to another location on the waveform that you want to measure.
5. Read the time from the C2 readout on the measurement bar.
6. Read the time difference between the two waveform locations from the Delta readout on the measurement bar.

Cursor time is relative to the active system trigger.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Jumping to Specific Data Locations

You can use the Go To dialog box to jump to a new position by selecting any current mark or waveform. See Figure 3–34.

- To open the Go To dialog box, open a Waveform window and click the Go To toolbar button, as shown in Figure 3–34.

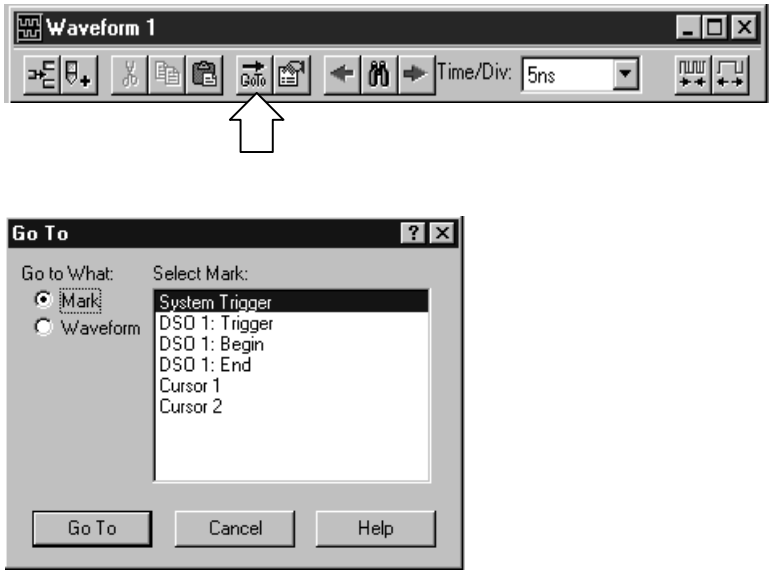


Figure 3–34: Using the Go To dialog box to jump to the system trigger

You can also use the Overview Mark bar to quickly jump to another location. If you do not click on a mark, clicking in the Overview Mark bar scrolls to that location.



Figure 3–35: Using the Overview Mark bar to jump to a data location

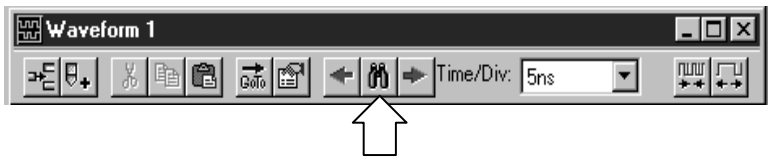
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Searching Data

Use the Define Search dialog box to search for specific data within the current Waveform window. Searches are specific to the selected data source and begin from the active cursor.

To search for a specific event in a Waveform window, follow these steps:

1. Open a Waveform window and click the Define Search toolbar button, as shown.



2. Select the Data Source. See Figure 3–36.
3. Select the appropriate name.
4. Select the Condition.
5. Enter the Value, if appropriate.
6. Click Search Fwd or Search Back. The first occurrence is marked by cursor 1.

You can search any data source available to the current data window, but Search can only search one data source at a time. For additional searches of the same event, click the Search Forward and Search Back arrow buttons in the toolbar.

NOTE. *Data that is hidden cannot be found by the search function. For example, if you turn off a waveform in the Waveform property page by unchecking Show Waveform, the search function cannot search for data for that waveform.*

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



Figure 3–36: Defining search criteria

Locking Windows

Locking windows provides an easy method to compare data from two different windows. Use the Lock Windows dialog box, shown in Figure 3–37, to select how windows are locked together.

- To open the Lock Windows dialog box, go the System window and click the button for the data window you want to open. Go to the View menu and select Lock Windows.

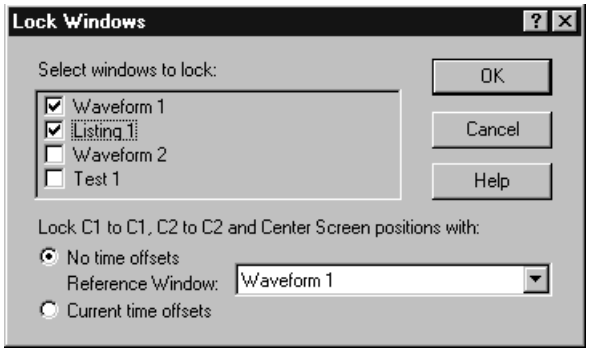


Figure 3–37: Lock Windows dialog box

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

MagniVu Data

The LA modules have MagniVu data acquisition as a standard feature. MagniVu data acquisition offers 500 picosecond high-speed timing simultaneous with 200 MHz state on all channels through the same probe; no double probing is required. The record length for MagniVu data is 2000 samples. MagniVu data is centered on the LA module trigger. Figure 3–38 shows an example of MagniVu data.

You can view MagniVu data in both Listing and Waveform windows.

In Figure 3–38, the top waveforms were acquired at the fastest normal sample rate. The MagniVu waveforms, in the lower part of the display, were acquired through the same probe channels at the same time as the top waveforms.

Take a close look at the difference in the acquired data. First view the regular data acquisition, which was sampled at 4 ns. The regular acquisition captured the address bus as it made the transition from 34 to 44. The data shows an invalid address of 74, and indicates that the invalid address lasts for the entire 4 ns sample period. At the next sample, the address is shown correctly as 44.

Now view the MagniVu data acquisition, which was sampled at 500 ps. The MagniVu data shows the same address bus transition from 34 to the invalid address of 74, before settling to the correct address of 44. Note, however, that the indicated settling time is different. The MagniVu data shows that the address bus took approximately 500 ps to complete the transition, and shows the address bus as 44 approximately 3.5 ns earlier than did the regular acquisition data.

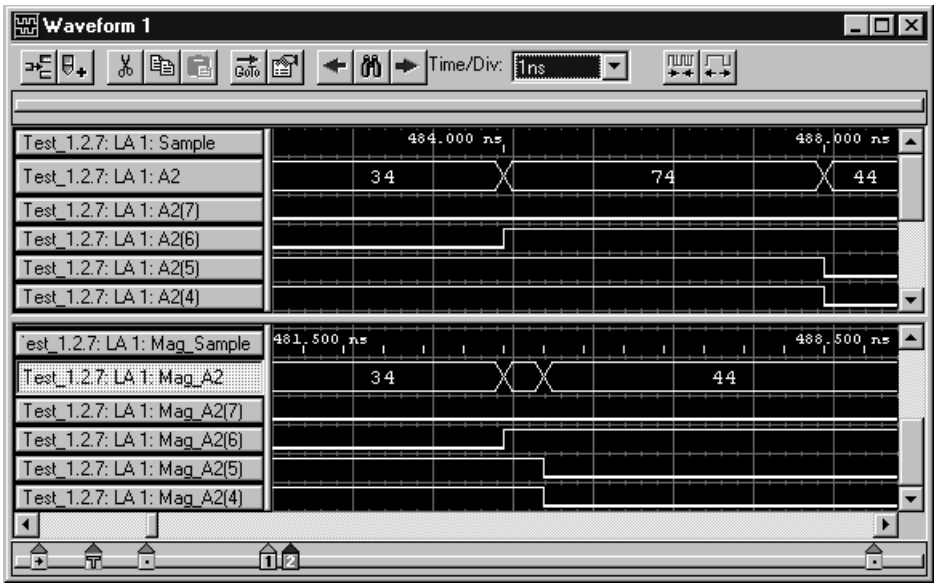


Figure 3–38: MagniVu data

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

To display MagniVu data, load the MagniVu data source as follows:

1. Open a data window that contains acquired data.
2. Click Add Column or Add Waveform.
3. Select the MagniVu data source. If the source you want is not listed, click Add Data Source and add the one you want to the list. See Figure 3–39.
4. Click Add. The column or waveform appears in the data window.

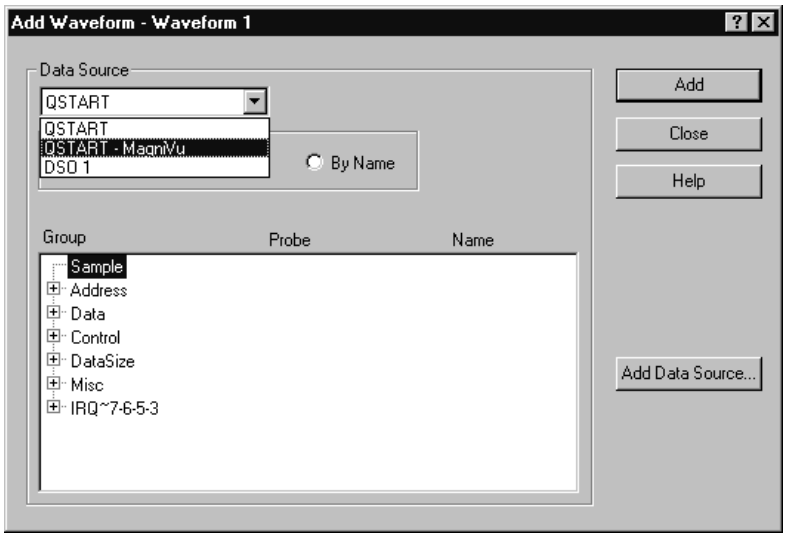


Figure 3–39: Adding a MagniVu data source to a data window

Comparing Waveform Data

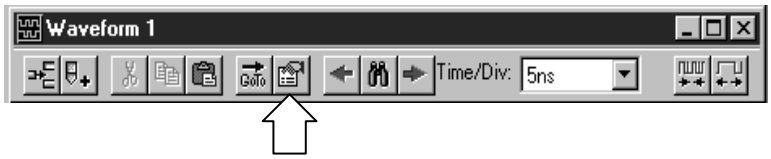
When comparing data against reference data, you can highlight data that is equal to or not equal to the reference data.

NOTE. *Before you can display compare data, you must define the compare parameters in the Define Compare Dialog box in the LA Setup window. Refer to* Memory Compare *beginning on page 3–4 for information on setting up the compare parameters.*

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The following steps describe how to display compare data in the Waveform window.

1. Open a Waveform window and click the Properties toolbar button, as shown.



2. Select the Waveform Window property page.

3. Select Show Compare and select one of the colors for when data does not equal the reference data (Acq!=Ref).

   If you want to highlight data that does equal the reference data, select Acq=Ref and the appropriate color (see Figure 3–40).

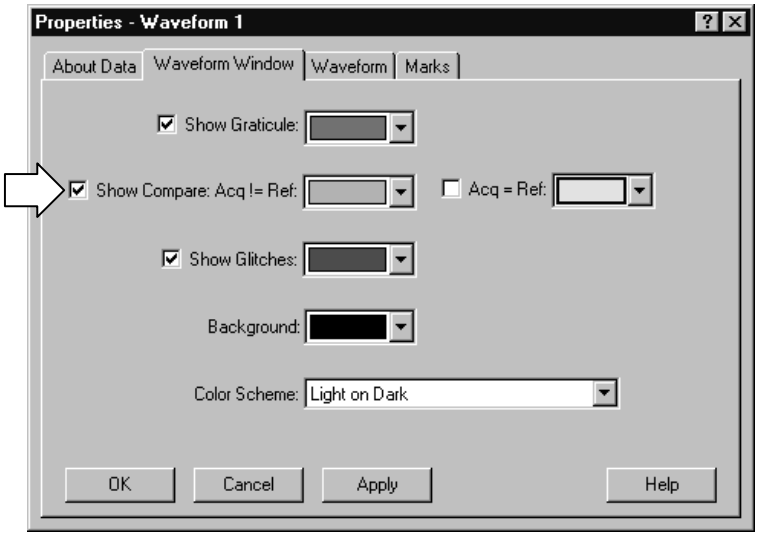


Figure 3–40: Selecting compare data colors in the Waveform Window property page

4. Click OK.

The data differences or equalities will be highlighted in colors you specified, similar to Figure 3–41.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

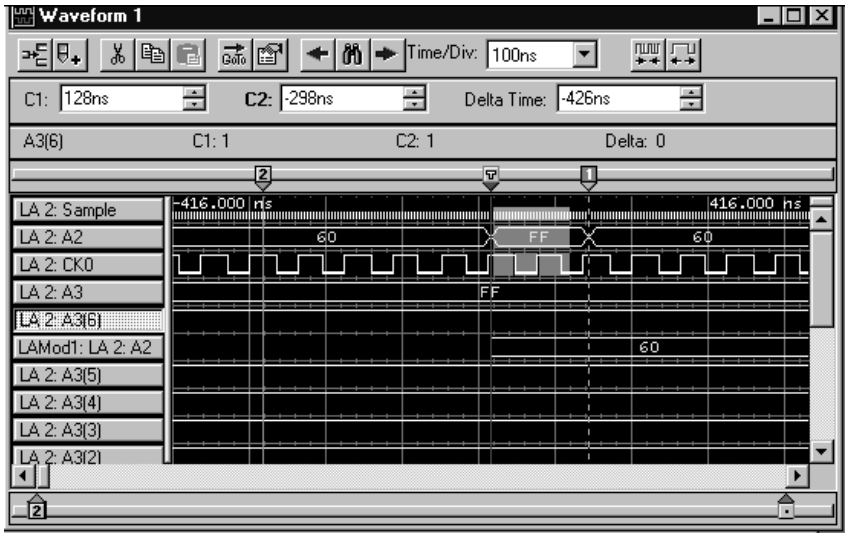


Figure 3–41: Viewing LA compare data in a Waveform window

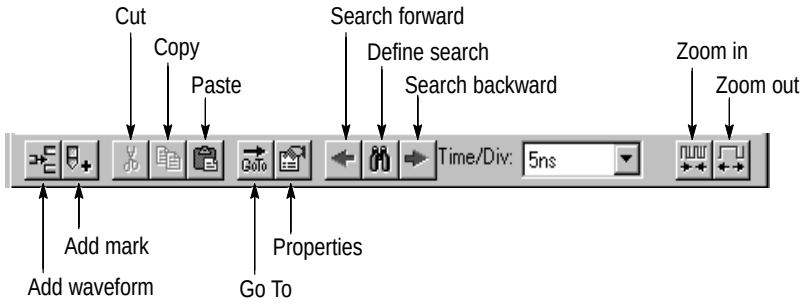
NOTE. *For more information on comparing data, refer to* Guidelines for Memory Compare *on page 3–6.*

Adjusting the Waveform Data View

There are a number of actions you can perform in the Waveform window to get the exact view of the data that you want.

Waveform Window Toolbar

The toolbar has shortcut buttons for common operations, as shown below:



Moving Waveforms

Select the waveform labels and then drag them to their new location.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Adding a New Waveform or a Data Source

Click the toolbar Add Waveform button to open the Add Waveform dialog box. Then select the data source and its associated group or channel to add it to the display.

To select a group, first select By Group. (See Figure 3–42.) Then, from the list, select a group name indicated by a the + symbol. Default groups are displayed as busforms. (You can also choose to display a group as a magnitude waveform. Double-click the waveform label. From the waveform properties page, click Options and select Magnitude.)

To select individual channels, first select By Probe. Then, from the list, select the channel(s). If you have named individual channels in the LA Setup window, you can select By Name to list just those channels.

If the data source you want is not listed, click Add Data Source and find and select the source. (The data source can be an installed module or a saved module file.) See Figure 3–42.

New waveforms are added after the selected waveforms or after all waveforms if none are selected.

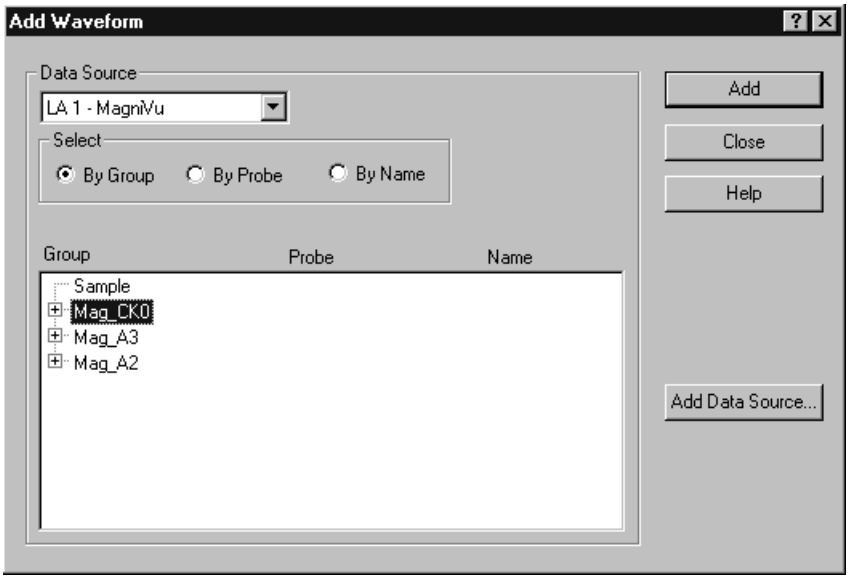


Figure 3–42: Add Waveform dialog box

Deleting Waveforms

Select the waveform labels, then click the Cut toolbar button.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Changing Waveform Label Width

Drag the waveform label border as shown.



Changing Waveform Height

To change the height of a waveform, double-click on the waveform label to open the Waveform property page. Enter a new value or use the spinbox controls to change the value in the Height box.

In addition to adjusting the height using the Waveform property page, you can select the waveform, and adjust the waveform from the front-panel Size control on the portable mainframe.

Changing the Displayed Time/Div

Change the displayed time per division using the Time/Div toolbar control. For a quick change, use the Zoom In and Zoom Out toolbar buttons. You can continue to click the toolbar buttons until you reach the desired horizontal scale.

Cut, Copy, and Paste

You can cut, copy, and paste waveforms and marks.

Viewing Glitches

Glitches are indicated on a waveform by a block of color behind the waveform. See Figure 3–43. Turn the glitch display on or off from the Waveform window property page.

***NOTE**. To view glitches in a data window, you must enable Glitch storage in the Setup window before acquiring data.*

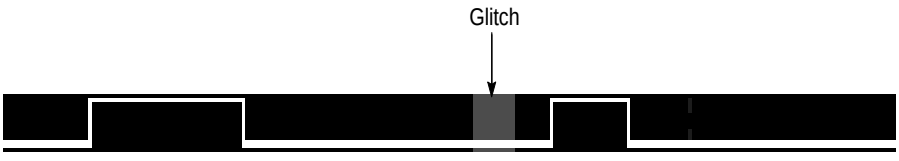


Figure 3–43: Waveform with a glitch

Naming Waveforms

Rename a waveform by returning to the Setup window and changing the channel or channel group name.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Splitting the Data Area

You can split the data area to compare waveforms that are far away from each other within the display. Drag the split box from the top end of the vertical scroll bar.

Customizing the Waveform Window Data

Use property sheets to customize data windows. Property sheets control aspects of the display such as size, color, and in some cases, enabling or disabling whether an element is shown. Click the Properties toolbar button to open the data window property sheet. Figure 3–44 shows a property page.



Figure 3–44: Property page

Exporting Waveform Data

You cannot export waveform data directly. However, you can add DSO waveform information as a column in a Listing window and then export the data as a listing file. Refer to *Exporting Listing Data* on page 3–82 or more information on exporting data.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

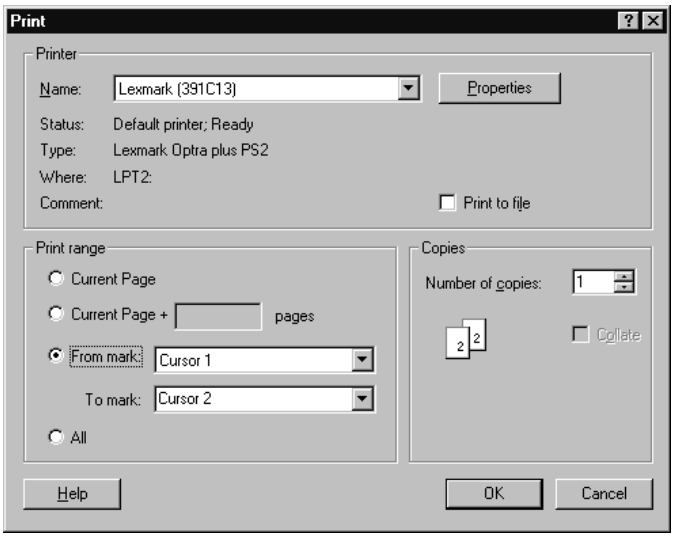
Printing Waveform Data

You can print a hardcopy of the Waveform window or you can print the image to a file. You can print a single page, a range of pages, or you can print a range of data between two marks or cursors.

1. Go to the File menu and select Print.
2. Select Print to File, or select your printer in the window.
3. Select the print range and click OK.

   When you click OK a confirmation message displays, informing you of the number of approximate pages that will be printed.
4. Click OK again to confirm your actions.
5. To interrupt printing at any time, press ESC.

The contents of the window will be sent to the printer or to the specified file.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Waveform Window Shortcut Keys

You can use the general-purpose shortcut keys listed in Table 3–8 to move data and cursors in the Waveform window. You should also refer to the discussions of short cut keys in the online help or under the section for the individual data windows.

The shortcut keys (also known as accelerator keys or hot keys) abide by the following rules:

- Arrow keys with no modifier keys scroll data.
- Arrow keys with the Control (CTRL) key move the active cursor.
- The Shift key increases movement by a factor of 10.

Table 3–8: Waveform window shortcut keys

Desired action	Key combination
Go to next trigger	CTRL + T
Display Go To dialog box	CTRL + G
Move Cursor 1 to the center of the window	CTRL + 1
Move Cursor 2 to the center of the window	CTRL + 2
Zoom in	CTRL + I
Zoom out	CTRL + U
Add a mark	CTRL + K
Add a waveform	CTRL + W
Scroll data left 50 pixels	Shift + Left arrow
Scroll data right 50 pixels	Shift + Right arrow
Move active cursor left five pixels	CTRL + Left arrow
Move active cursor right five pixels	CTRL + Right arrow
Move active cursor left 50 pixels	CTRL + Shift + Left arrow
Move active cursor right 50 pixels	CTRL + Shift + Right arrow

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Listing Window

Use the Listing window to view and evaluate acquisition data. Data is presented as tabular text in columns that represent channel groups. Other columns are sample numbers and time stamp values. See Figure 3–45 for an example.

This window displays the amount of data you specified in Setup and Trigger windows. Each row in the table consists of data sampled on one acquisition cycle, and is assigned a sample number. Sample numbers are relative to the beginning of memory.

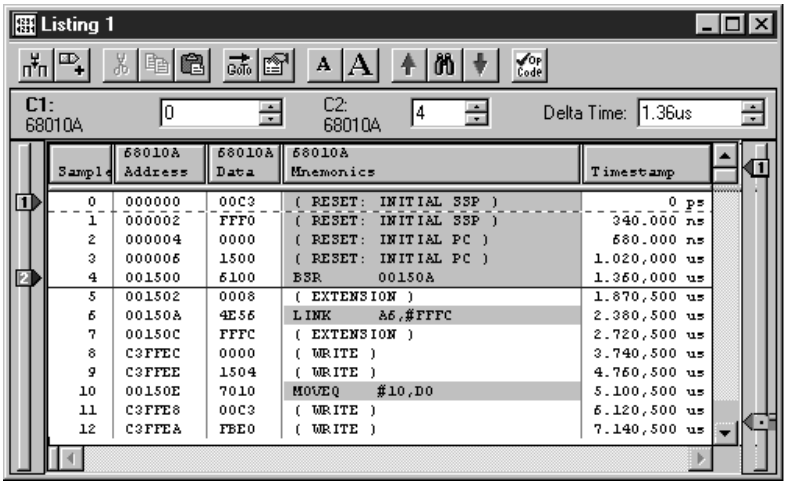


Figure 3–45: Listing window

Reading the Listing Window Indicators

Data marks, cursors, and other indicators help you navigate and identify the data. Figure 3–46 and Table 3–9 identify and describe data window marks.

- To move cursors or marks, drag the cursor and mark handles. Trigger marks and Begin/End data marks cannot be moved.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

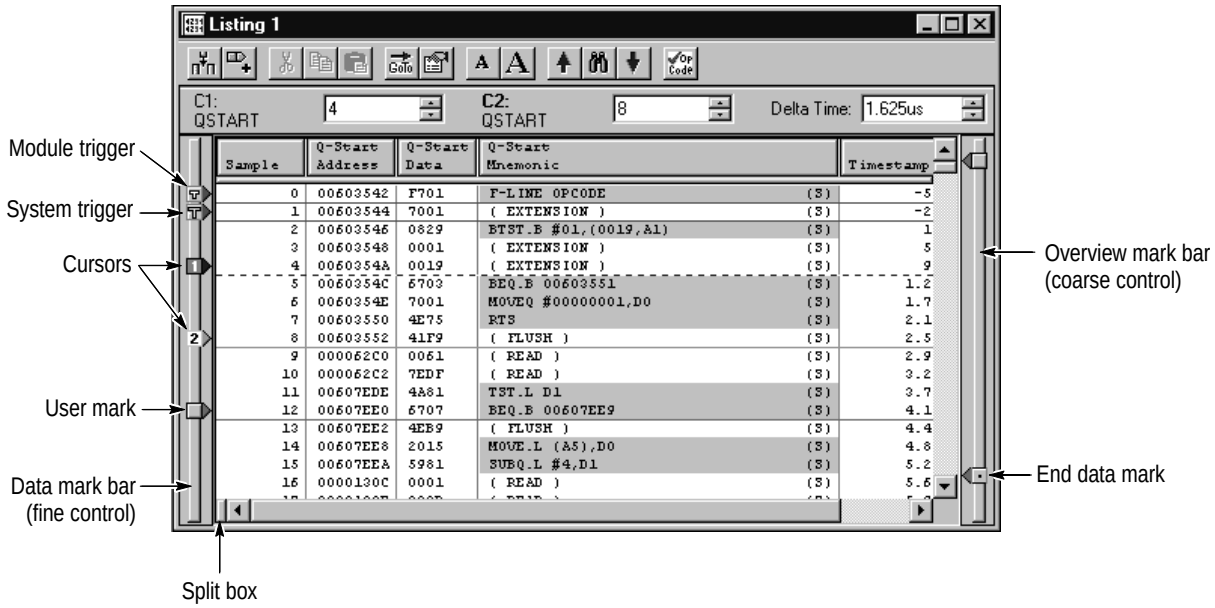


Figure 3–46: Listing window cursors and marks

Table 3–9: Listing window cursor and mark summary

Mark	Name	Description
	System trigger	The system trigger is the reference point for the acquisition. Timing and location information is relative to the system trigger. Trigger marks cannot be moved. Under some conditions the system trigger associated with a module's data might not be displayed in the data window. If the system trigger was caused by another module, whose data is not included in the current display, then the system trigger is not shown. Nevertheless, all time measurements still relate to that system trigger, even if it is not shown. The system trigger associated with the current data is called the active system trigger. The system trigger associated with saved data is called the reference system trigger. The active system trigger is indicated by a yellow T; the reference system trigger is indicated by a gray T.
	Module trigger	The point at which the module triggered. Trigger marks cannot be moved.
	Begin data / end data	The start and end of a module's data record. These data marks cannot be moved.
1 2	Cursors 1 and 2	Moveable marks used for visual reference and for data measurements.
	User mark	User-created marks. Use marks to make specific data more easy to identify and find.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Adding a Mark to a Listing Window

You can mark interesting data that you may want to refer back to at a later time. To add a user mark, follow these steps:

1. In the System window, click the Listing window icon.
2. From the Edit menu select Add Mark. The mark appears at the center of the display, has default properties, and is selected.
3. Move the mark to the desired location by dragging its handle.

***NOTE**. You cannot add a mark if you have not acquired data.*

Sending Stacked Marks to the Back

Sometimes, marks can be stacked on top of one another. To send a mark to the back, follow these steps:

1. Select a mark you know is on top of another one.
2. Click the right mouse button and select Send To Back.

Jumping to Specific Data Locations

You can use the Go To dialog box to jump to a new position by selecting any current mark or waveform. See Figure 3–47 on page 3–74.

- To open the Go To dialog box, open a data window and click the Go To toolbar button, as shown in Figure 3–47.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

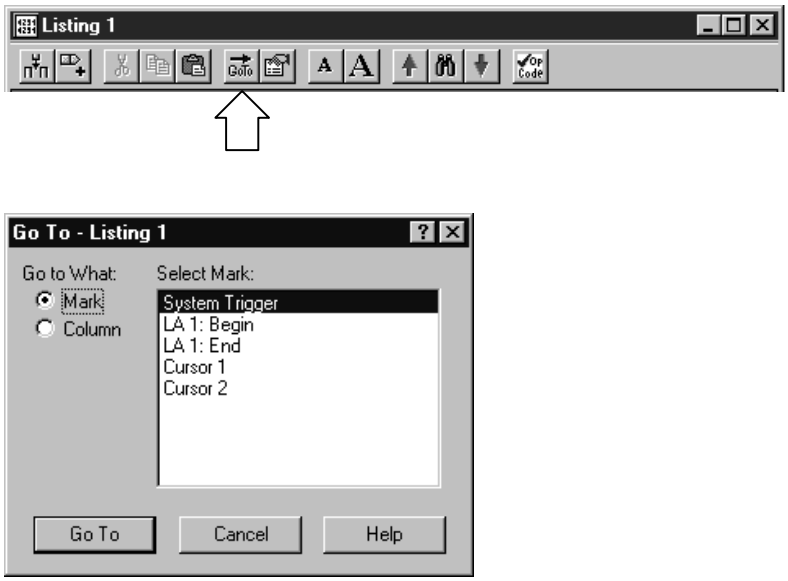


Figure 3–47: Using the Go To dialog box to jump to the system trigger

You can also use the Overview Mark bar (see Figure 3–48) to quickly jump to another location. If you do not click on a mark, clicking in the Overview Mark bar scrolls to that location.

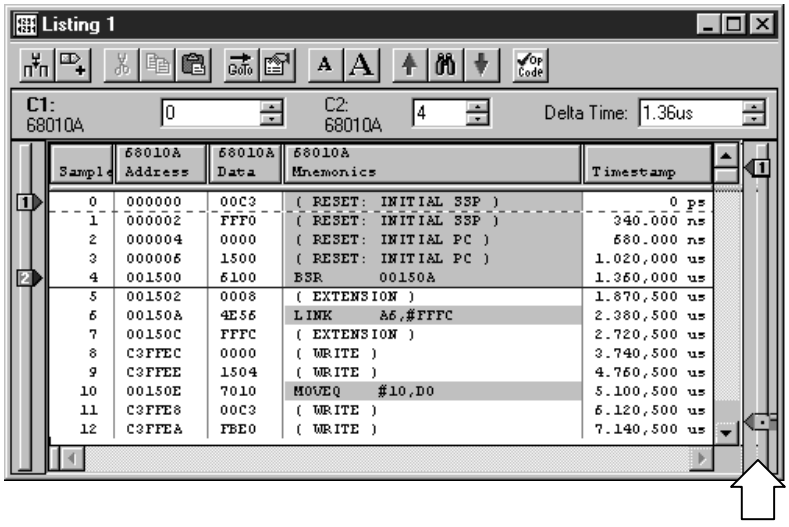


Figure 3–48: Using the Overview Mark bar to jump to a data location

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Measuring Listing Data

Use the cursors to take time measurements. You take time measurements in the Listing window, as shown below.



The following steps describe how to take a time measurement.

1. In the Listing window, move Cursor 1 to the location that you want to measure.
2. Read the time from the C1 readout on the measurement bar. Cursor time is relative to the active system trigger.
3. Move Cursor 2 to another location that you want to measure.
4. Read the time from the C2 readout on the measurement bar.
5. Read the time difference between the two locations from the Delta readout on the measurement bar.

Comparing Listing Data

When comparing data against reference data, you can highlight data that is equal to or not equal to the reference data.

NOTE. *Before you can display compare data, you must define the compare parameters in the Define Compare dialog box in the Setup window. Refer to* Memory Compare *beginning on page 3–4 for information on setting up the compare parameters.*

The following steps describe how to display compare data in the Listing window.

1. Open a Listing window and click the Properties toolbar button, as shown.



2. Select the Listing Window property page.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3. Select Show Compare, and select one of the colors for when data does not equal the reference data (Acq!=Ref). See Figure 3–49.

4. If you want to highlight data that does equal the reference data, select Acq=Ref and the appropriate color.

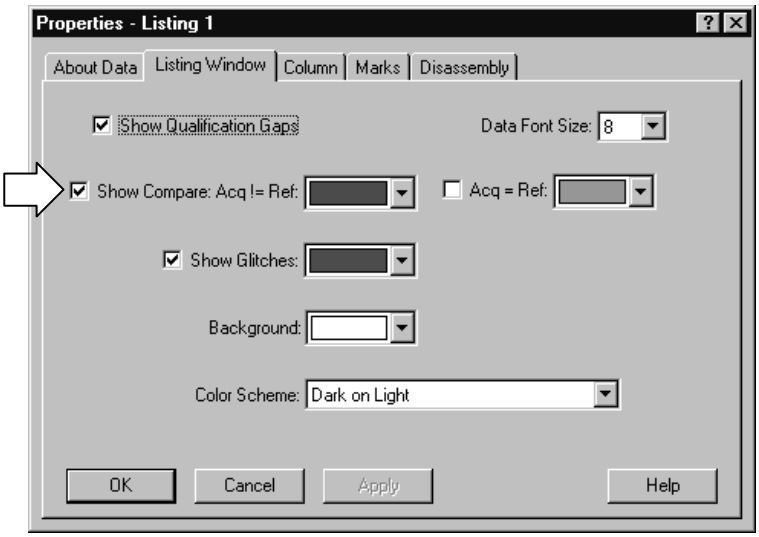


Figure 3–49: Selecting compare data colors in the Listing Window property page

5. Click OK.

The data differences or equalities will be highlighted in colors you specified, similar to Figure 3–50.

NOTE. *For more information on comparing data, refer to* Guidelines for Memory Compare *on page 3–6.*

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

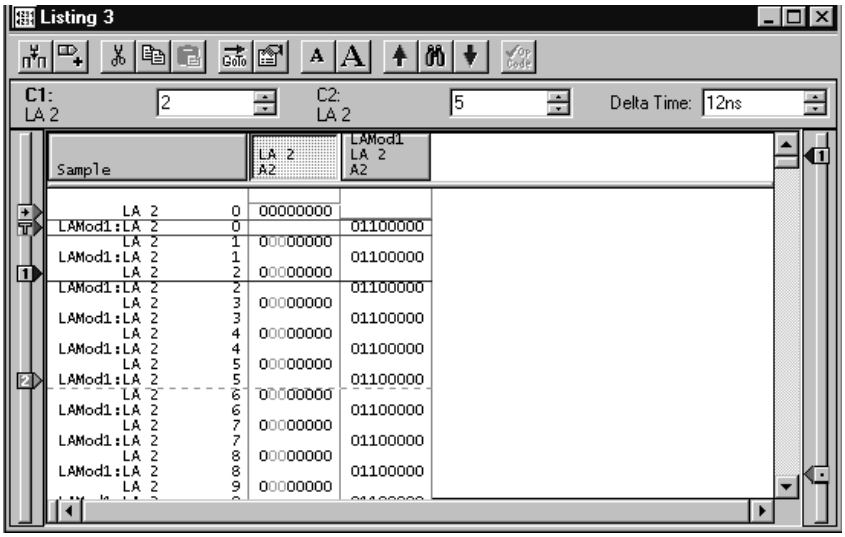


Figure 3–50: Viewing LA compare data in a Listing window

Searching Data

Use the Define Search dialog box to search for specific data within the current Listing window. Searches are specific to the selected data source and begin from the active cursor.

To search for a specific event in a Listing window, follow these steps:

1. Open a Listing window and click the Define Search toolbar button, as shown.



2. Select the Data Source. See Figure 3–51.
3. Select the appropriate name.
4. Select the Condition.
5. Enter the Value, if appropriate.
6. Click Search Fwd or Search Back. The first occurrence is marked by cursor 1.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

You can search any data source available to the current data window, but Search can only search one data source at a time. For additional searches of the same event, click the Search Forward and Search Back arrow buttons in the toolbar.

NOTE. *Data that is hidden cannot be found by the search function. For example, if you turn off a column display in the Column properties page by unchecking Show Column, you cannot search for data in that column.*



Figure 3–51: Defining search criteria

Locking Windows

Locking windows provides an easy method to compare data from two different windows. Use the Lock Windows dialog box, shown in Figure 3–52, to select how windows are locked together.

- To open the Lock Windows dialog box go the System window and click the button for the data window you want to open. Go to the View menu and select Lock Windows.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

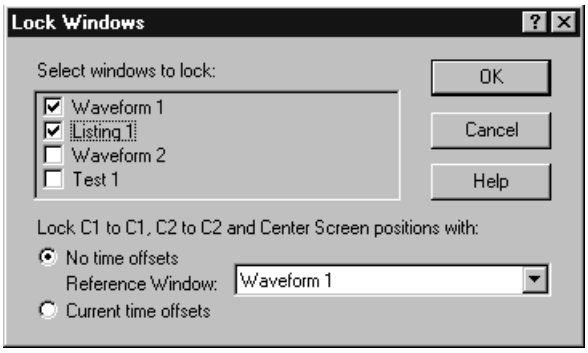


Figure 3–52: Lock Windows dialog box

MagniVu Data

The LA modules have MagniVu data acquisition as a standard feature. MagniVu data acquisition offers 500 picosecond high-speed timing simultaneous with 200 MHz state on all channels through the same probe; no double probing is required. The record length for MagniVu data is 2000 samples.

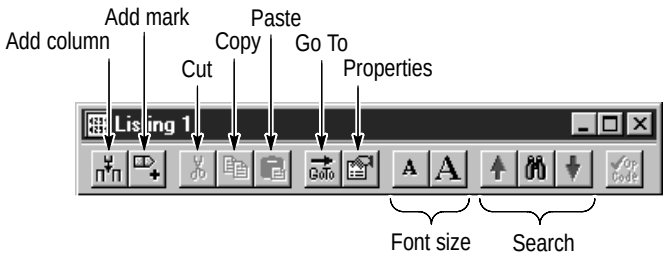
You can view MagniVu data in both Listing and Waveform windows. For more information on MagniVu data, refer to *MagniVu Data* beginning on page 3–62.

Adjusting the Listing Data View

There are a number of actions you can perform in the Listing window to get the exact view of the data that you want.

Listing Window Toolbar

The toolbar has shortcut buttons for common operations, as shown below.



Changing the Display Font Size

Click the Font Size toolbar buttons, shown in the previous figure. You can continue to click the toolbar buttons until the text reaches the desired size. You can also set the font to a specific size in the Listing Window property sheet.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Moving Columns

Select the column labels and then drag them to their new location.

Adding a New Column or Data Source

Click the toolbar Add Column button to open the Add Column dialog box. Then select the data source and its associated group or channel to add it to the display. If the data source you want is not listed, click Add Source and find and select the source. The data source can be an installed module or a saved module file. See Figure 3–53.

New columns are added after (to the right of) the selected columns or after all columns if none are selected.

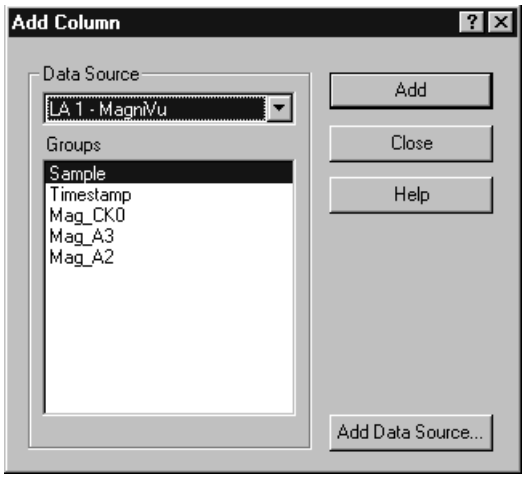


Figure 3–53: Add Column dialog box

Deleting Columns

Select the column labels, then click the Cut toolbar button.

Changing Column Width

Double-click the column label to open the Column Properties page. Enter a new value for the column width. If you have a portable mainframe, you can also change the column width by selecting the column label and use the front panel Scale control to set the width.

Cut, Copy, Paste

You can cut, copy, and paste columns and marks. You can also copy textual data from the listing to the clipboard. From there you can paste it to other areas, such as the Define Search dialog box or the Clause Definition dialog box in the Trigger window.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Changing Radixes

To change a column radix in the Listing window, double-click the column label to open the Column Properties page. Select a new radix. To select the Symbolic radix, you must have loaded a symbol table. See *Symbol Support* beginning on page 2–21 for information about using symbols and symbol table files.

Viewing Qualification Gaps

Qualification gaps indicate that data samples were not stored due to storage qualification or Don't Store trigger actions.

Qualification gaps are indicated with a horizontal gray line above the first data after the gap. Turn qualification gaps on or off from the Listing Window property page.

Viewing Glitches

Glitches are indicated by highlighted text of the complete sample for all radixes except binary, octal, and hexadecimal. In those radixes, only the glitch bits are highlighted. Turn glitches on or off from the Listing Window property page.

NOTE. *To view glitches in a data window, you must enable Glitch storage in the LA Setup window before acquiring data.*

Naming Columns

Rename a column by returning to the LA Setup window and changing the channel group name.

Changing the Disassembly Format

For microprocessor support packages, you can change the disassembly format used in the Listing window. Use the Disassembly property page to select the display format of disassembly groups. You must have a support package loaded for this page to be active.

Splitting the Data Area

You can split the data area to compare columns that are far away from each other within the display. Drag the split box from the left end of the horizontal scroll bar.

Customizing the Listing Window Data Area

Use property sheets to customize data in the Listing window. The property sheets control aspects of the listing display such as size, color, and in some cases, enabling or disabling whether an element is shown. Click the Properties toolbar button to open the Listing Window property sheet. Then select one of the property sheets to change the data you are interested in.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Exporting Listing Data

Use the Export Data dialog box to export data from the current listing window to a text file or to a binary file. This is a way to print a copy of a complete or partial listing. Figure 3–54 shows the Export Data dialog box.



Figure 3–54: Export Data dialog box

You can export the following listing data:

- All listing data from the acquisition
- Listing and DSO voltage measurement from a Listing window
- A range of listing data between two selected marks
- A range of listing data between two samples

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Exporting Data to an ASCII File

If you want to export data to a text file, click Options to define the format of the data in the Export Data Options dialog box (see Figure 3–55). The data is saved in a text file with the .txt file name extension.

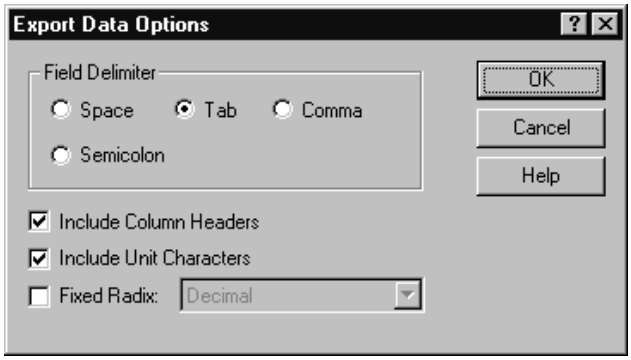


Figure 3–55: Export Data Options dialog box

Use the Export Data Options dialog box to customize the listing data for a text file. You can specify the field delimiter to separate the listing columns. You can also specify that measurement units should be included with the data. If you export the data without unit characters, the time stamp values are in picoseconds and the DSO values are listed in volts.

To export listing data, follow these steps:

1. In the System window, select a Listing window.
2. Go to the File menu and select Export Data.
3. In the Export Data dialog box, select the folder to which you want to export data. Otherwise, leave the default of My Documents.
4. Click Options to specify any export options for the text data and then click OK.
5. Enter a name for the exported file.
6. Specify the export range.
7. Click Save.

Exporting Data as a Binary File

You can also export the listing data as a binary file with a .tbf (TLA 700 Binary Format) file name extension. This option is only available if the data window is from a single data source. You can export any data that appears in a Listing window, including DSO and MagniVu data. This option is useful when you write applications that need to use binary data. It is also faster than exporting an ASCII file and the file size is often smaller.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

LA Module Binary Export File Format. The LA module binary data is exported as a stream of bytes with the following characteristics:

- The binary data uses big-endian fields (the most-significant bit is the left-most bit).
- Each group column field is zero-padded on the most-significant end to the nearest byte.
- Sample numbers and mnemonics groups are not exported.
- Time stamp data is seven bytes wide and represents the number of picoseconds since the start of the acquisition.
- The left-most column in the Listing window display corresponds to the first exported field of a sample.
- The first sample in the Listing window appears at the beginning of the exported file.
- MagniVu data follows the same guidelines as regular listing data.

DSO Module Binary Export File Format. The DSO module binary data (when used in a Listing window) is exported as a stream of bytes with the following characteristics:

- The binary data uses little-endian fields (the most-significant bit is the right-most bit).
- Each channel field is a 16-bit value.
- Sample numbers, mnemonics groups, and time stamp values are not exported.
- The left-most column in the Listing window display corresponds to the first exported field of a sample.
- The first sample in the Listing window appears at the beginning of the exported file.
- DSO data values are in twos-compliment format.
- The formula used for converting a DSO channel field into a voltage is:

```
((Vertical range in volts / 64512) X channel field) +
vertical offset in volts
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

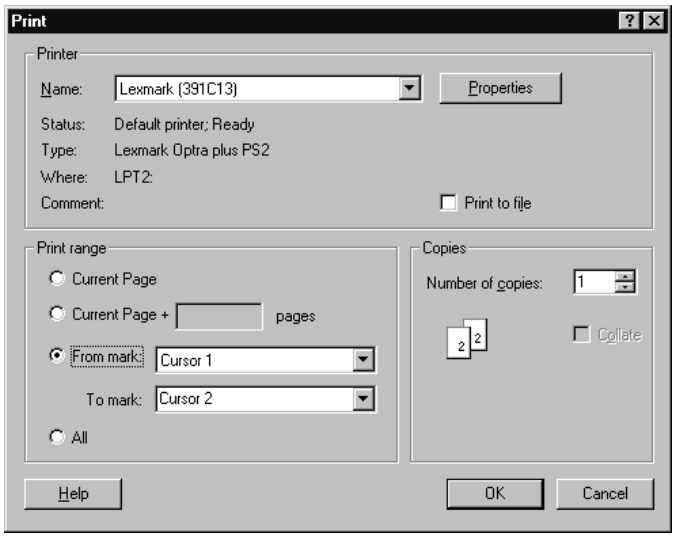
Printing Listing Data

You can print a hardcopy of the Listing window or you can print the image to a file. You can print a single page, a range of pages, or you can print a range of data between two marks or cursors.

1. Go to the File menu and select Print.
2. Select Print to File, or select your printer in the window.
3. Select the print range and click OK.

   When you click OK a confirmation message displays, informing you of the approximate number of pages that will be printed.
4. Click OK again to confirm your actions.
5. To interrupt printing at any time, press ESC.

The contents of the window will be sent to the printer or to the specified file.



NOTE. *The print selection prints a copy of the current Listing window. If you want to print a text file, use the Export Data option to save the Listing window contents to a file and then send that file to a printer.*

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Listing Window Shortcut Keys

You can use the general-purpose shortcut keys listed in Table 3–10 to move data and cursors in the Listing window. You should also refer to the discussions of short cut keys in the online help or under the section for the individual data windows.

The shortcut keys (also known as accelerator keys or hot keys) abide by the following rules:

- Arrow keys with no modifier keys scroll data.
- Arrow keys with the Control (CTRL) key move the active cursor.
- The Shift key increases movement by a factor of 10.

Table 3–10: Listing window shortcut keys

Desired action	Key combination
Go to next trigger	CTRL + T
Display Go To dialog box	CTRL + G
Move Cursor 1 to the center of the window	CTRL + 1
Move Cursor 2 to the center of the window	CTRL + 2
Add a mark	CTRL + K
Add a column	CTRL + L
Scroll data up 10 samples	Shift + Up arrow
Scroll data down 10 samples	Shift + Down arrow
Move active cursor up one sample	CTRL + Up arrow
Move active cursor down one sample	CTRL + Down arrow
Move active cursor up 10 samples	CTRL + Shift + Up arrow
Move active cursor down 10 samples	CTRL + Shift + Down arrow

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Source Window

Use the Source window to display the high-level language (HLL) source code that you wrote correlated to your code as it was executed by your target system and acquired by the logic analyzer. The logic analyzer links the Source and Listing windows, and provides additional tools to help you view the tools and data. See Figure 3–56 for an example of a Source window.

The data area of the Source window lists the content of the source file including line numbers for each source code statement. The path name of the file displays immediately above the source data.

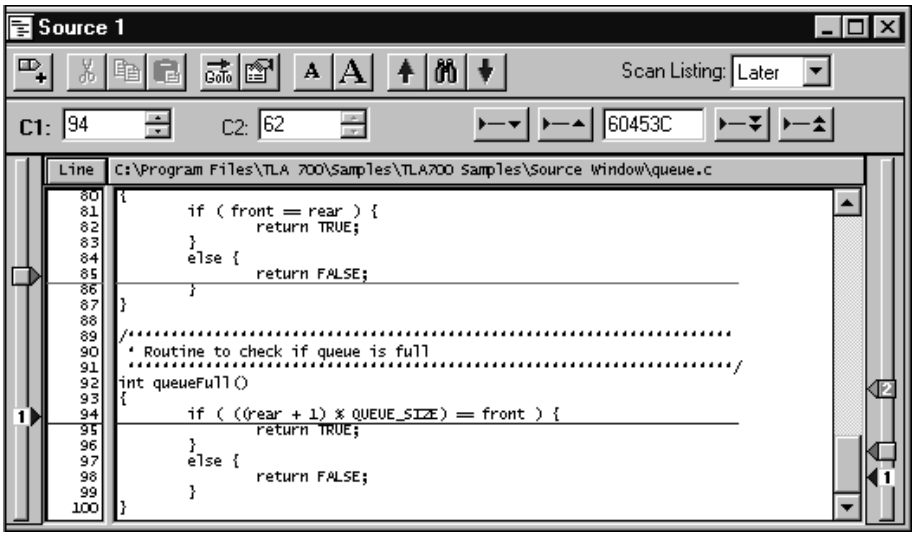


Figure 3–56: Source window

You can use controls to step through data, move between user-defined marks, and scroll through data. These controls directly affect the active cursor in the associated Listing window and indirectly affect the active cursor in the Source window.

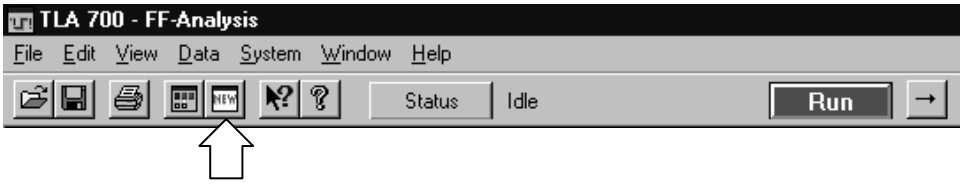
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Creating a Source Window

Before creating a Source window you should load a microprocessor support package. You should also set up the Listing window you will use with the Source window.

Create a new Source window with the New Data Window wizard as follows:

1. Click the New Data Window icon in the toolbar.



2. Select Source and click Next.
3. Select an existing Listing window.
4. Click Next.
5. Select the name of the Listing window, the data source, and the listing column (normally an address column).
6. Enter the name of the symbol file or click Symbol File to browse the file system for the symbol file.

   The symbol file contains all of the information for the source window, such as function, variable, and source code symbols.
7. Click Next.
8. Enter a name for the Source window or use the default name.
9. Click Finish.
10. If the Source File Locator dialog box appears, enter the path name for the source file or click Browse to look for the file listed in the dialog box.
11. The new Source window will display the contents of the source file.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Reading the Source Window Indicators

Data marks, cursors, and other indicators help you navigate and identify the data. Figure 3–57 and Table 3–11 identify and describe data window marks.

- To move cursors or marks, drag the cursor and mark handles.

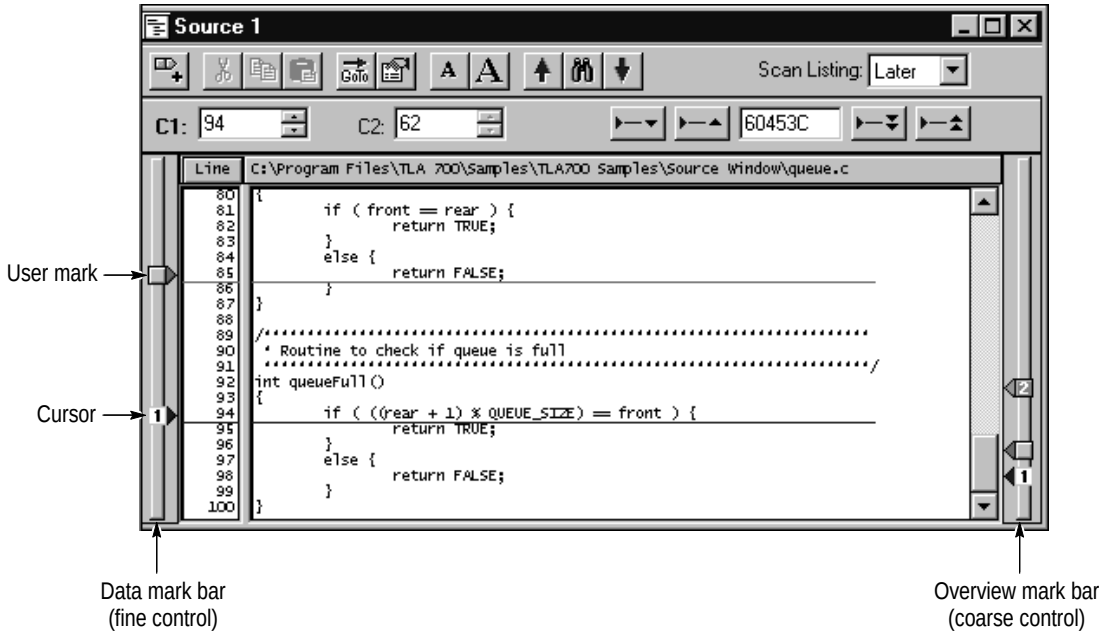


Figure 3–57: Source window cursors and marks

Table 3–11: Source window cursor and mark summary

Mark	Name	Description
1 2	Cursors 1 and 2	Moveable marks used for visual reference and for data measurements.
	User mark	User-created marks. Use marks to make specific data more easy to identify and find.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Adding a Mark to a Source Window

To add a user mark to a Source window, follow these steps:

1. In the System window, click the Source window icon.
2. Point the mouse at the source statement where you want to add the mark.
3. Right-click the mouse and select Add Mark. The mark appears in the display, has default properties, and is selected.
4. If necessary, move the mark to the desired location by dragging its handle.

***NOTE**. You cannot add a mark if there is no data.*

Sending Stacked Marks to the Back

Sometimes, marks can be stacked on top of one another. To send a mark to the back, follow these steps:

1. Select a mark you know is on top of another one.
2. Click the right mouse button and select Send To Back.

Jumping to Specific Data Locations

You can use the Go To dialog box to jump to a new position by selecting any current mark or waveform. See Figure 3–58.

- To open the Go To dialog box, open a data window, and click the Go To toolbar button, as shown in Figure 3–58.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

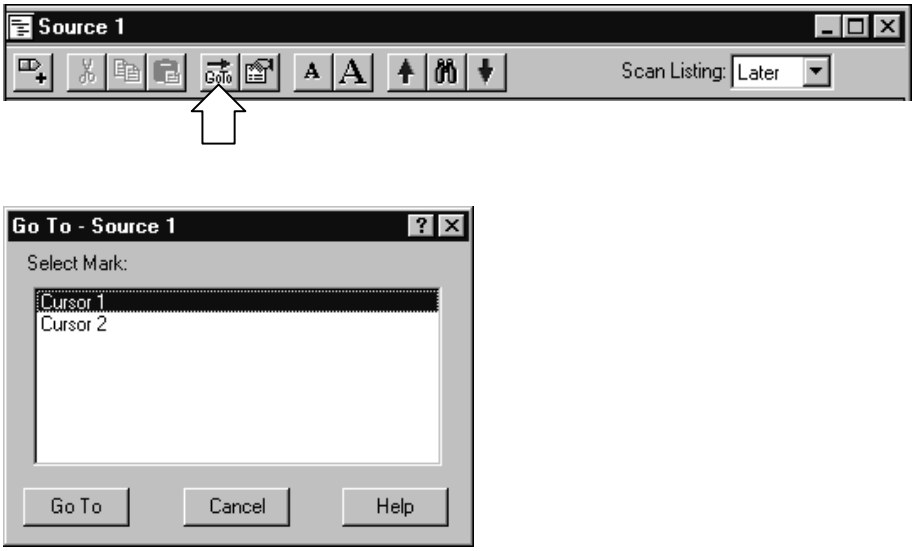


Figure 3–58: Using the Go To dialog box to jump to the cursor location

You can also use the Overview Mark bar to quickly jump to another location. If you do not click on a mark, clicking in the Overview Mark bar scrolls to that location.

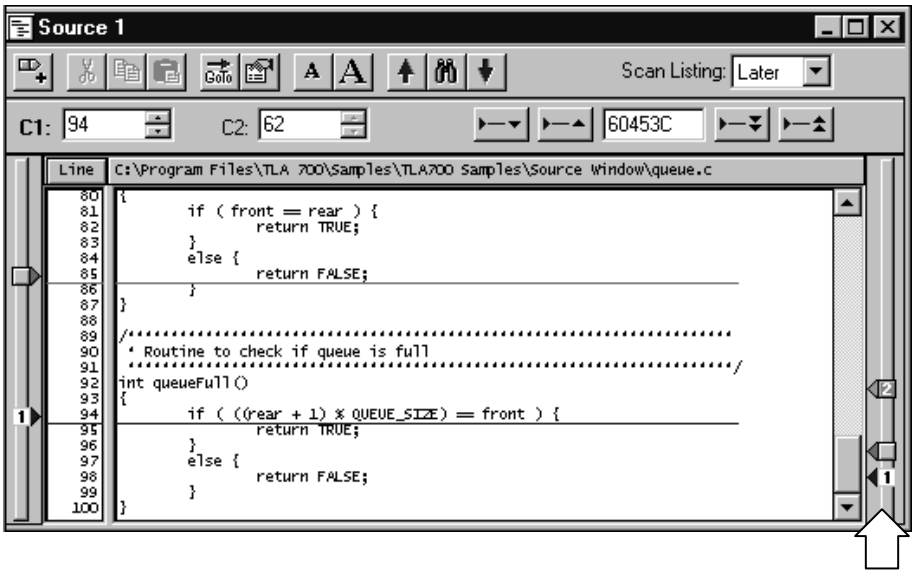


Figure 3–59: Using the Overview Mark bar to jump to a data location

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Moving the cursor between statements in the Source window does not necessarily move the cursor in the same direction in the Listing window. This can happen, for example, if the statement in the new location was executed both before and after the statement in the old location, such as when the statement is in a loop. The Scan Listing box sets the scan direction in a Listing window when you move the cursor in the Source window.

Moving Through Source Files

There are several ways of moving through the data in source files. You can move through source files from the Source window or from the Listing window. When you move a cursor in one window, the corresponding cursor in the other window also moves.

Use the Step Forward or the Step Backward buttons (see Figure 3–60) to step through source statements in execution order in the Source window. You can also use the Next Mark or the Previous Mark buttons to jump to the next or previous executed source statement that has a user-defined mark.

Use the cursor controls in either window to move the cursors. You can also move the cursors in either window by clicking and dragging the cursor handles or by adjusting the cursor spin box controls.

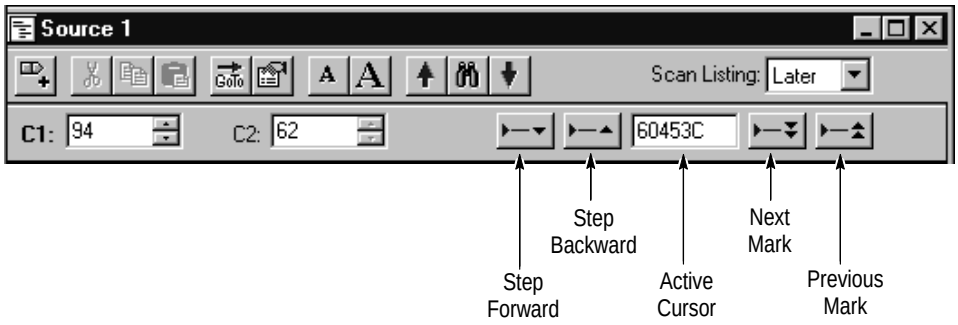


Figure 3–60: Source window controls

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Source-Relative Cursor Positioning

Source-relative cursor positioning refers to updating the Listing window cursor positioning as a result of changing the position of the active cursor in the Source window.

When you move the Source window cursor to a new statement, the Source window determines the address range of the source statement based on information from the loaded symbol file. The Source window uses the setting of the Scan Listing mode to determine the search direction in the Listing window. The Listing window searches the acquisition data for a matching address. When the matching address is found, the active cursor in the Listing window is moved to the matching sample.

If the Source window cursor is moved to a non-executable statement, such as a comment, the address of the next executable statement is used.

Listing-Relative Cursor Positioning

Listing-relative cursor positioning refers to updating the Source window cursor position of the active cursor in the Listing window.

When you move the Listing window cursor to a new sample, the active Source window cursor attempts to move to a corresponding source statement in the Source window. The Source window uses information from the loaded symbol file to convert the address of the Listing cursor position to a source file name and statement (line number) location. The Source window then updates the active Source window cursor position and displays the corresponding source statement.

Step Forward and Step Backward Buttons

Use the Step Forward and Step Backward buttons to trace the execution order of source statements. Click the Step Forward button to move to the next executed source statement. Click the Step Backward button to move to the previous executed source statement.

When you click the Step Forward or Step Backward buttons, the Source window tells the Listing window to search forward or backward beginning at the active Listing cursor for the next or previous executed source statement. When a match is found, the Listing window positions the active Listing cursor to the matching sample. The Source window converts the address to a file name and line number, and then updates the active Source cursor position to the corresponding source statement. The statement may be located in a source file that is different than the original displayed file. In this case, the new file is displayed and the cursor is placed on the proper statement.

A single line in the Source window may consist of more than one statement, for example:

```
for ( i=0; i < NUM_STATES; i++)
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The next executed statement in the Listing window may appear on the same line in the Source window as the current statement. However, the next executed statement may also appear on a different line (before or after the current statement), or in a different file. Click the Step Forward and Step Backward buttons to move the cursor between statements in execution order.

The ability of the Source window to discriminate between multiple statements on the same line depends on the amount of information provided by the code-generation tools. If there is enough information to identify multiple statements per line, the Source window cursors will include character highlighting to identify individual statements on a line.

Next Mark and Previous Mark Buttons

Use the Next Mark and Previous Mark buttons to move the active cursor in the Source window to the next or previous executed user-defined mark position (if any marks have been defined). Next and previous refer to the execution sequence and not to the position of the mark in the window.

The Next Mark and Previous Mark buttons operate similar to the Step Forward and Step Backward buttons. However, rather than stepping through every executed statement, you can define marks in the Source window as breakpoints and then step between marks in execution order to move though the source code.

When you click the Next Mark or Previous Mark buttons, the Source window tells the Listing window to search for addresses corresponding to the marked source statements. When a corresponding sample is found, the Listing window positions its active cursor to the matching sample. The Source window converts the address to a file name and line number. It then updates the active Source cursor position and displays the corresponding source statement.

If the code-generation tools provide column information for symbol files, you can mark individual statements of multiple-statement lines in the source code. You can then use the Next Mark and Previous Mark buttons to step between the marks and highlight the individual statements.

The Next Mark and Previous Mark buttons are not active if there are no marks defined in the Source window.

Active Cursor Readout

The active cursor readout displays the address of the source statement at the active cursor. The address shown is the low address bound. The radix of the address is always hexadecimal. If you position the cursor on a non-executable statement, such as a comment or white space, the address of the next executable statement is displayed.

Use the active cursor readout to jump to a new location in the source file. Enter an address in this field and the active cursor moves to the corresponding statement. If you enter an address that does not correspond directly to the address of a source statement, the next statement will be used and the address is adjusted.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

You can copy and paste the readout value into other locations such as in the event portion of the Clause Definition dialog in the LA Trigger window.

Uncorrelated State

There are situations when you move the cursor in the Listing window to a location where there is no corresponding source statement. The cursor in the Source window remains at the current location and changes the color of the Source window to signify an uncorrelated state exists between the Source and Listing windows. When this happens, you can click the Step Forward or the Step Backward buttons to search for an executable source line in the Listing window; this correlates the active cursors in both windows.

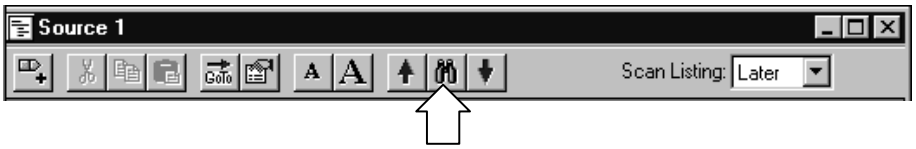
Clicking the buttons forces the Listing window to search for a data sample that corresponds to the next or previous line of executed source code. The line of executed code may be in a different source file. If this happens, the Source window displays the required file or prompts you for a path name. The ability to locate source files depends on the Search Path List and Suffix List defined in the Source Files property page.

Searching for Source Data

Use the Define Search dialog box to search for specific text patterns. You can search the current source file or search all of the source files identified by the loaded symbol file.

To search for a specific data pattern in a Source window, follow these steps:

1. Open a Source window and click the Define Search toolbar button, as shown.



2. Select All Files or This File. See Figure 3–61.
3. Enter the text pattern.
4. Click Search Fwd or Search Back. The first occurrence is marked by the active cursor.

You can search for any text pattern including leading and embedded white space; trailing white space is ignored.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

When searching for data in multiple files, the search operation follows the order of files listed in the Source Window property page in the Displayed Source File list. When you search for data in all files and one or more of the files cannot be found, the Source File Locator dialog box displays, asking you to specify the location of the file.

If the search is not completed in a set amount of time, the Search Progress dialog box shows the status of the search. You can let the search continue, or you can click Abort to stop the search.

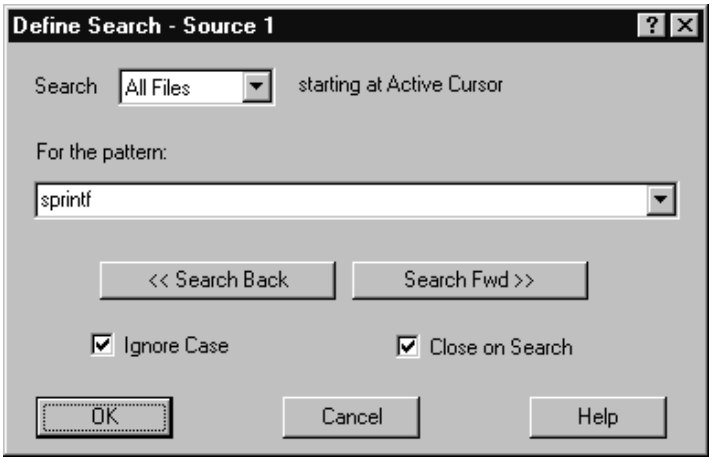


Figure 3–61: Defining source search criteria

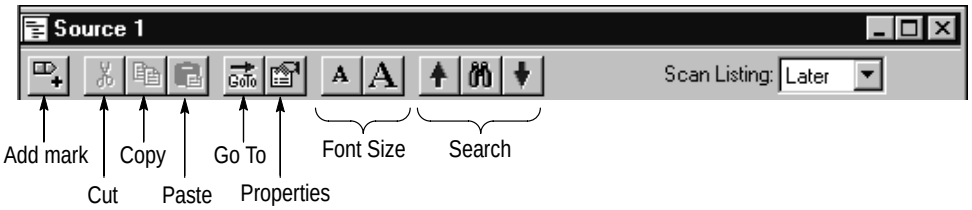
Adjusting the Source Data View

There are a number of actions you can perform in the Source window to get the exact view of the data that you want.

Source window Toolbar

The toolbar has shortcut buttons for common operations.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



Changing the Display Font Size

Click the Font Size toolbar buttons, shown in the previous figure. You can continue to click the toolbar buttons until the text reaches the desired size. You can also set the font to a specific size in the Source window property sheet.

Cut, Copy, Paste

You can cut, copy, and paste columns and marks. You can also copy text data to the clipboard. From there you can paste it to other areas, such as the Define Search dialog box or the Clause Definition dialog box in the Trigger window.

Turning Line Numbers On or Off

Turn source line numbers on or off by clicking Line Number Column in the View menu.

Customizing the Source Window Data Area

Use property sheets to customize data in the Source window. The property sheets control aspects of the source display such as source files, text size, colors, tab spacing, and source file locations. Click the Properties toolbar button to open the Source window property sheet. You can also click the label above the data area to open the property sheet. Then select one of the property sheets to change the data you are interested in.

Locating Source Files

You can define the location of source files with the Source Files property page (see Figure 3–62 on page 3–98). Use the property page to list the locations of source files as well as possible file suffixes that can be attached to the file names (used for compilers that do not include the file suffixes). A similar property page (System Source Files property page) is used as a default list of locations of source files and suffixes. The logic analyzer uses this list every time you create a new source window.

The Source window uses the file path and file suffix in combination to locate the correct source file. It searches for the file name in each directory indicated by the file path list in the order specified. If a file name does not have a suffix, then suffixes from the suffix list are tried until a match is found or all file path and suffix combinations are exhausted.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



Figure 3–62: Source Files property page

When specifying the search path, you can use an asterisk (*) as the final component of a search path directory. For example, if you specify the following path, C:\MySources*, the MySources directory and all directories (one level deep) within MySources will be searched. However, you cannot use the asterisk as a general-purpose wild card character. For example, the use of an asterisk in C:\MySources** or C:\MySources\abc* is invalid.

You must specify the complete absolute (not relative) path name for the file in the Search Path List. Otherwise, the Source window will not locate the source file. Make sure that the source file you are looking for has a unique file name. When searching for source files it is possible to load the wrong file if there is another file with the same name in the directories specified by the search path. The Source window always loads the first file that matches the search criteria.

Because some compilers do not include a source file suffix, you may also need to specify the correct file suffixes in the file suffix list (examples of correct file suffixes are: .c .cpp, and .s). The Source window will always load the first file that matches the criteria in the file suffix list.

The logic analyzer searches for files using both lists from top to bottom. Therefore, you should place the most likely search path or file suffix at the beginning of the lists.

The search path lists and the suffix lists in the Source Files property page are valid only for the current Source window. If you want to save the settings as defaults, click Save settings as application defaults. The settings will be saved to System Source Files property page and will be used each time you create a new Source window.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

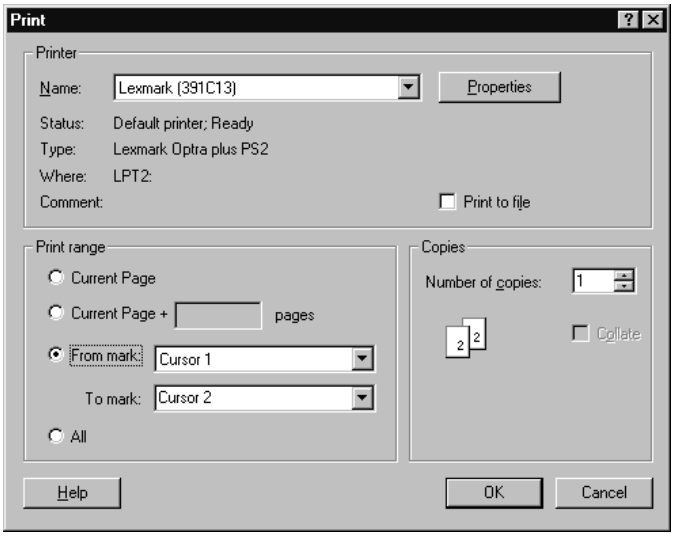
Printing Source Data

You can print a hardcopy of the Source window or you can print the image to a file. You can print a single page, a range of pages, or you can print a range of data between two marks or cursors.

1. Go to the File menu and select Print.
2. Select Print to File, or select your printer in the window.
3. Select the print range and click OK.

   When you click OK a confirmation message displays, informing you of the approximate number of pages that will be printed.
4. Click OK again to confirm your actions.
5. To interrupt printing at any time, press ESC.

The contents of the window will be sent to the printer or to the specified file.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Source Window Shortcut Keys

You can use the general-purpose shortcut keys listed in Table 3–12 to move data and cursors in the Source window. You should also refer to the discussions of short cut keys in the online help or under the section for the individual data windows.

The shortcut keys (also known as accelerator keys or hot keys) abide by the following rules:

- Arrow keys with no modifier keys scroll data.
- Arrow keys with the Control (CTRL) key move the active cursor.
- The Shift key increases movement by a factor of 10.

Table 3–12: Source window shortcut keys

Desired action	Key combination
Display Go To dialog box	CTRL + G
Move Cursor 1 to the center of the window	CTRL + 1
Move Cursor 2 to the center of the window	CTRL + 2
Add a mark	CTRL + K
Scroll data up 10 lines	Shift + Up arrow
Scroll data down 10 lines	Shift + Down arrow
Move active cursor up one line	CTRL + Up arrow
Move active cursor down one line	CTRL + Down arrow
Move active cursor up 10 lines	CTRL + Shift + Up arrow
Move active cursor down 10 lines	CTRL + Shift + Down arrow

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Histogram Window

Use the Histogram window to set up, capture, and display performance analysis data from an LA module channel group, counter, or timer. You can use the Histogram window to determine the level of activity within various functions or subroutines, analyze how memory is used, or determine the relative execution time of subroutines or program modules.

Histogram data is presented as a list of ranges and corresponding histogram bars showing the distribution of the ranges. See Figure 3–63 for an example.

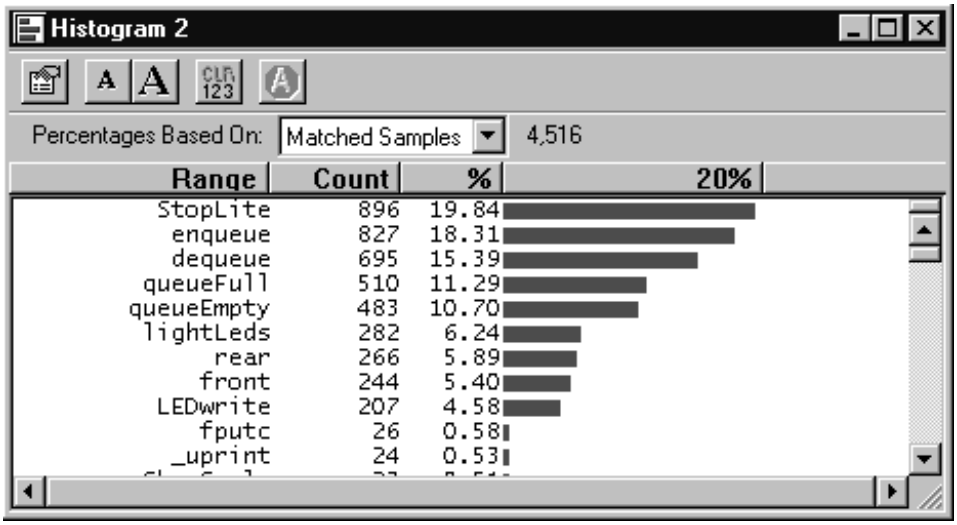


Figure 3–63: Histogram window

The histogram data is based on all acquisition data (All Samples) or on the data within a defined set of ranges (Matched Samples).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Measuring Histogram Data

There are two basic ways of using the Histogram window to analyze data. One is to provide a graphic overview of the address activity of software execution. The other is to use counters or timers to measure specific events.

If you want to use counters or timers to measure events, you set up the counters or timers in the Trigger window. You can then select the data source in the New Data Window wizard when you create a Histogram window. You can also select the data source for an existing Histogram window from the Data Source property page as shown in Figure 3–64.

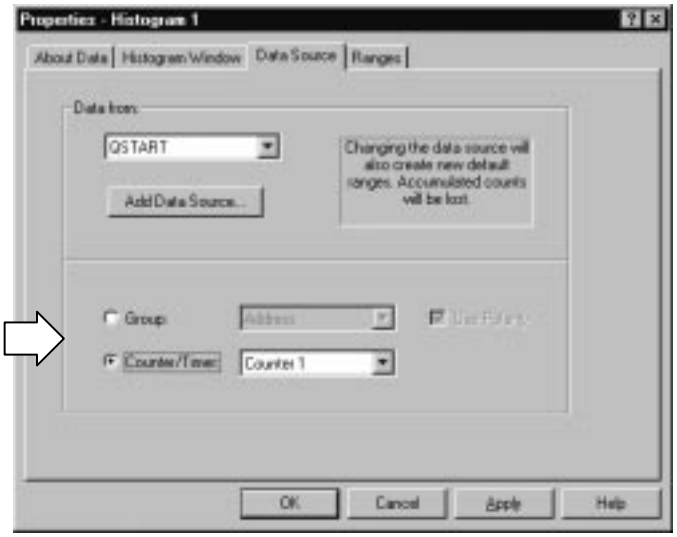


Figure 3–64: Selecting the data source for the Histogram window

Viewing Address Activity for Channel Groups (Range Overview)

To provide an overview of the address activity of a software routine, you define a set of ranges (either numeric, logarithmic, or symbolic). You can set up the Trigger window to look for data within the defined ranges. The data is processed and displayed in the Histogram window for the current acquisition. If you set up the logic analyzer to repetitively acquire data, the sampling errors will decrease over time as you acquire more data. The resultant data provides a stable display in the Histogram window where you can view the overall activity of the software.

You can use this method of analyzing data to determine which sections of code are being accessed or not accessed. You can also determine the overall time spent in a routine with respect to other areas of code. Figure 3–63 is an example of viewing address activity in a software application using symbolic ranges.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Measuring Counter or Timer Events (Single Event)

To measure an event, you define a starting point, a target event, a counter or a timer, and a stopping point in the LA Trigger window. Use the Data Source property page to select the counter or timer as the data source for your analysis. When you acquire data, the Histogram window displays the minimum, maximum, and average value of the counter or timer data as shown in Figure 3–65.

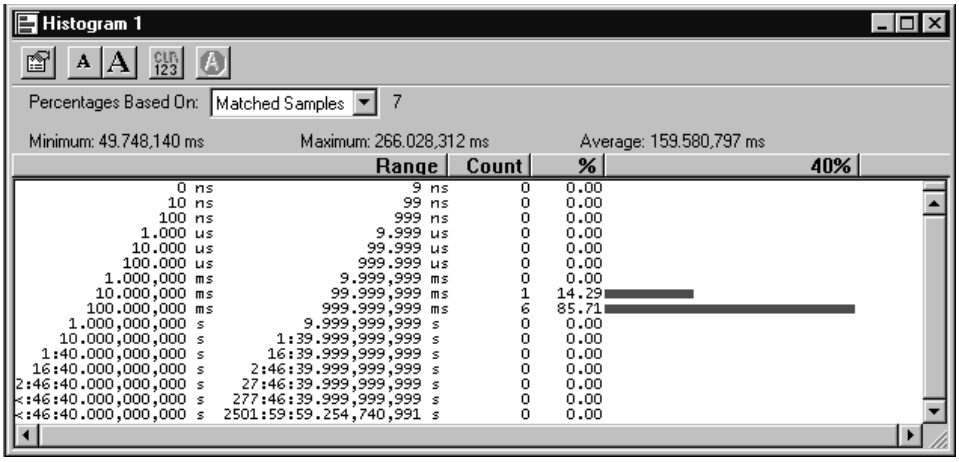


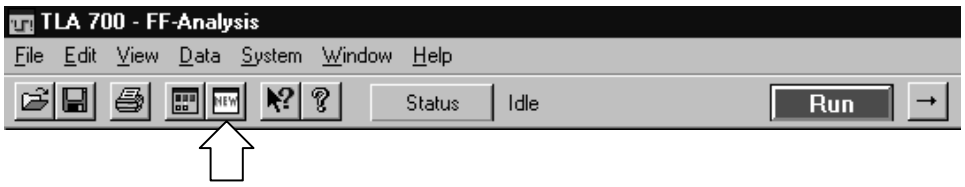
Figure 3–65: Measuring events with the Histogram window

Creating a Histogram Window

Before creating the Histogram window you should define the channel setups and clocking in the Setup window. You should also define your trigger program in the Trigger window. If you want to measure an event, you should define the trigger events and set up the appropriate counter and timer actions. If you want to use symbols, you should make sure that you load the symbol file.

You can create a new Histogram window with the New Data Window wizard as follows:

1. Click the New Data Window icon in the toolbar.



2. Select Histogram and click Next.
3. Select Data from an LA in the System.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

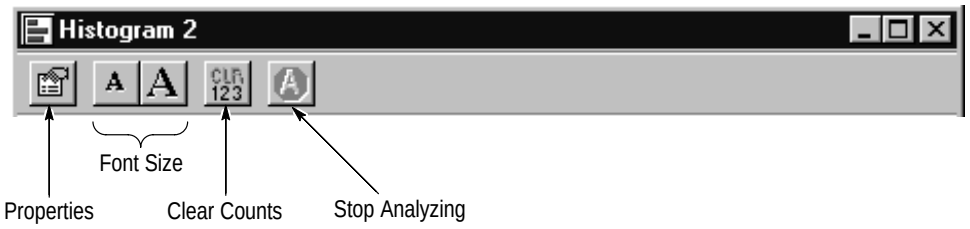
4. Click Next.
5. If you want to do an overview of address groups, select Group and the address group that you want to monitor.
6. If you want to measure an event, select Counter/Timer and the counter or timer that you defined in the Trigger window.
7. Click Next.
8. Enter a name for the Histogram window or use the default name.
9. Click Finish.

Adjusting the Histogram Data View

There are a number of actions you can perform in the Histogram window to get the exact view of the data that you want.

Histogram Window Toolbar

The toolbar has shortcut buttons for common operations as shown below.



Changing the Display Font Size

Click the Font Size toolbar buttons, shown in the previous figure. You can continue to click the toolbar buttons until the text reaches the desired size. You can also set the font to a specific size in the Histogram Window property sheet.

Clearing Histogram Counts

Click the Clear Counts toolbar button to reset all ranges and percentages to zero.

Stopping Analysis

Click the Stop Analyzing toolbar button to stop analyzing the current acquisition. This button is inactive when there is no current acquisition in process.

Sizing Columns

Select the column label separator and drag it to change the width of a column.

Sorting Data within Columns

Sort ranges, counts, and percentages by clicking on the column labels. Click the column label to toggle the sort between increasing and decreasing values.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Changing Histogram Magnification

Select Scale from the View menu. Select a new magnification value from the list and click OK. You can also click on the percentage column label and select a magnification value.

Defining Histogram Ranges

Ranges displayed in the Histogram window are based on the values you select in the Ranges property page. You can define ranges as follows:

- Linear generation. The ranges are divided linearly between two bounds.
- Log generation. The ranges are divided logarithmically between two bounds.
- Symbols. The ranges are defined by the values in a loaded symbol file. You can use the same loaded symbol table as in other windows.

Splitting the Data Area

You can split the data area to compare ranges that are far away from each other within the display. Drag the split box from the top of the horizontal scroll bar.

Customizing the Histogram Window Data Area

Use property sheets to customize data in the Histogram window. The property sheets control aspects of the Histogram display such as ranges, bounds, font size, color, and data source information. Click the Properties toolbar button to open the property sheets. Then select one of the specific property sheets you are interested in.

Here are some guidelines for using and customizing the Histogram window.

- You can analyze live LA data or saved LA data (reference data).
- Data is accumulated until you explicitly clear the data.
- There is no limit to the number of symbolic ranges for histogram data.
- You can use up to 32 bits of data in a address group.
- You can enable or disable channel group polarity.
- You can change colors for the foreground, background, and histogram bars as needed.
- You can change the data font size as necessary to view the data.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Exporting Histogram Data

Use the Export Histogram dialog box to export data from the current Histogram window to a text file. This is a way to print a copy of the histogram data. Figure 3–66 shows the Export Histogram dialog box.

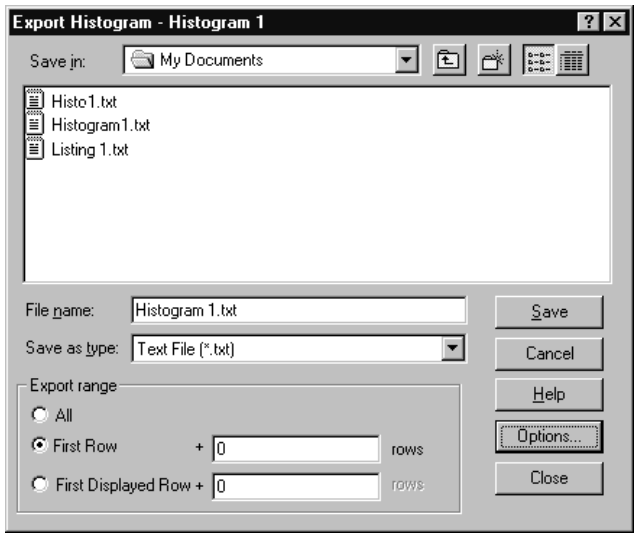


Figure 3–66: Export Histogram dialog box

Click Options to define the format of the data in the Export Histogram Options dialog. The data is saved in a text file with the .txt file name extension.

Use the Export Data Options dialog to customize the data for a text file. You can specify the field delimiter to separate the columns. To export the bounds as a text string, select Label “00–FF.” To export the bounds as two delimited numbers, select Numbers.

To export Histogram data, follow these steps:

1. In the System window, select a Histogram window.
2. Go to the File menu and select Export Histogram.
3. In the Export Histogram dialog box, select the folder to which you want to export data. Otherwise, leave the default of My Documents.
4. Click Options to specify any export options for the text data and then click OK.
5. Enter a name for the exported file.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6. Specify the export range.
7. Click Save.

Figure 3–67 shows an example of an exported histogram file. The file was viewed with WordPad.

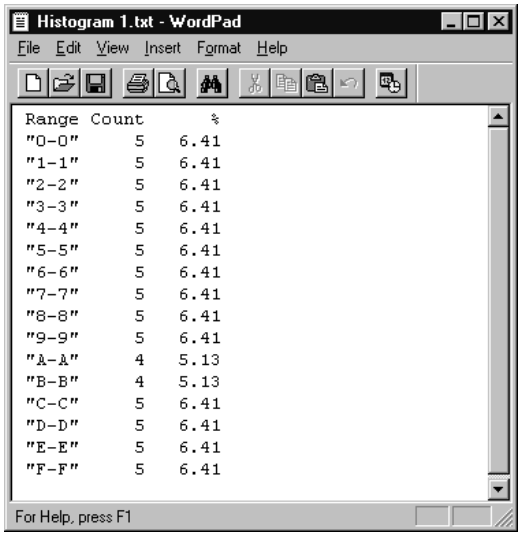


Figure 3–67: ASCII histogram data file

Printing Histogram Data

You can print a hardcopy of the Histogram window or you can print the image to a file. You can print a single page, a range of pages, or all pages.

1. Go to the File menu and select Print.
2. Select Print to File, or select your printer in the window.
3. Select the print range and click OK.

   When you click OK, a confirmation message displays, informing you of the approximate number of pages that will be printed.
4. Click OK again to confirm your actions.
5. To interrupt printing at any time, press ESC.

The contents of the window will be sent to the printer or to the specified file.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Histogram Window Shortcut Keys

You can use the general-purpose shortcut keys listed in Table 3–13 to move data and cursors in the Histogram window. You should also refer to the discussions of short cut keys in the online help or under the section for the individual data windows.

The shortcut keys (also known as accelerator keys or hot keys) abide by the following rules:

- Arrow keys with no modifier keys scroll data.
- The Shift key increases movement by a factor of 10.

Table 3–13: Histogram window shortcut keys

Desired action	Key combination
Scroll data up 10 ranges	Shift + Up arrow
Scroll data down 10 ranges	Shift + Down arrow

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Appendices

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Appendix A: Specifications

This chapter lists the specifications for the logic analyzer and its modules. The first section lists specifications that are common to the mainframes or modules. The following sections list specifications that are specific to individual logic analyzer components.

Characteristic Tables

All specifications are guaranteed unless noted *Typical*. Typical characteristics describe typical or average performance and provide useful reference information. Specifications that are marked with the ✓ symbol are checked directly (or indirectly) in the *TLA 700 Series Performance Verification and Adjustment Technical Reference Manual*. The specifications apply to all versions of the logic analyzer mainframe or module unless otherwise noted.

For mainframes and modules, the performance limits in this specification are valid with these conditions:

- The logic analyzer must be in an environment with temperature, altitude, humidity, and vibration within the operating limits described in these specifications.
- The logic analyzer must have had a warm-up period of at least 30 minutes.

For modules, the performance limits in this specification are valid with these conditions:

- The modules must be installed in a TLA 700 Series Logic Analyzer Mainframe.
- The module must have been calibrated/adjusted at an ambient temperature between +20°C and +30°C.
- The module must have had its signal-path-compensation routine (self calibration) last executed after at least a 30 minute warm-up period.
- After the warm-up period, the DSO module must have had its signal-path-compensation routine (self cal) last executed at an ambient temperature within ±5°C of the current ambient temperature.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–1: Atmospheric characteristics (mainframes and modules)

Characteristic	Description
Temperature: Operating and Non-Operating	Operating (no media in floppy disk drive) +5°C to +50°C, 15°C/hour maximum gradient, non-condensing (derated 1°C per 1000 feet above 5000 foot altitude) Non-operating (no media in floppy disk drive) –20°C to +60°C, 15°C/hour maximum gradient, non-condensing.
Relative Humidity: Operating and Non-Operating	Operating (no media in floppy disk drive) 20% to 80% relative humidity, non-condensing. Maximum wet bulb temperature: +29°C (derates relative humidity to approximately 22% at +50°C). Non-operating (no media in floppy disk drive) 8% to 80% relative humidity, non-condensing. Maximum wet bulb temperature: +29°C (derates relative humidity to approximately 22% at +50°C).
Altitude: Operating and Non-Operating	Operating: To 10,000 feet (3040 meters), (derated 1°C per 1000 feet (305 meters) above 5000 feet (1524 meters) altitude) Non-operating: 40,000 feet (12190 meters).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–2: Backplane interface (portable and benchtop mainframes)

Characteristic	Description
Slots	
Portable mainframe	4
Benchtop mainframe	13
CLK10 Frequency	10 MHz ±100 PPM
Relative Time Correlation Error[1,2] *(Typical)*	
LA to LA "MagniVu" data	2 ns
LA to LA "normal" data utilizing an internal clock[3]	1 LA sample – 0.5 ns
LA to LA "normal" data utilizing an external clock	2 ns
LA "MagniVu" to DSO data	3 ns
LA to DSO "normal" data utilizing an internal clock[3,4]	1 LA sample + 1 ns
LA to DSO "normal" data utilizing an external clock[4]	3 ns
DSO to DSO[4]	3 ns
System Trigger and External Signal Input Latencies[5,6] *(Typical)*	
External System Trigger Input to LA Probe Tip[7]	–271 ns
External Signal Input to LA Probe Tip via Signal 3, 4[8]	–212 ns + Clk
External Signal Input to LA Probe Tip via Signal 1, 2[8, 9]	–208 ns + Clk
External System Trigger Input to DSO Probe Tip[7]	–27 ns
System Trigger and External Signal Output Latencies[6] *(Typical)*	
LA Probe Tip to External System Trigger Out[3]	380 ns + SMPL
LA Probe Tip to External Signal Out via Signal 3, 4[3]	
OR function	371 ns + SMPL
AND function	383 ns + SMPL
LA Probe Tip to External Signal Out via Signal 1, 2[3,9]	
normal function	381 ns + SMPL
inverted logic on backplane	384 ns + SMPL
DSO Probe Tip to External System Trigger Out	70 ns
DSO Probe Tip to External Signal Out via Signal 3, 4	
OR function	68 ns
AND function	78 ns
DSO Probe Tip to External Signal Out via Signal 1, 2[9]	
normal function	71 ns
inverted logic on backplane	71 ns

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–2: Backplane interface (portable and benchtop mainframes) (Cont.)

Characteristic	Description
Inter-Module Latencies[6] *(Typical)*	
LA to DSO Inter-module System Trigger[3,7]	358 ns + SMPL
LA to LA Inter-module System Trigger[3,7]	68 ns + SMPL
LA to DSO Inter-Module ARM[3]	360 ns + SMPL
LA to LA Inter-Module ARM[3,8]	108 ns + SMPL + Clk
LA to LA Inter-Module via Signal 1, 2[3,8, 9]	120 ns + SMPL + Clk
LA to LA Inter-Module via Signal 3, 4[3,8]	116 ns + SMPL + Clk
DSO to DSO Inter-module System Trigger[7]	50 ns
DSO to LA Inter-module System Trigger[7]	–236 ns
DSO to LA Inter-Module ARM[8]	–192 ns + Clk
DSO to DSO Inter-Module ARM	59 ns
DSO to LA Inter-Module via Signal 1, 2[8, 9]	–179 ns + Clk
DSO to LA Inter-Module via Signal 3, 4[8]	–184 ns + Clk

1 **Includes typical jitter, slot-to-slot skew, and probe-to-probe variations to provide a "typical" number for the measurement. Assumes standard accessory probes are utilized.**

2 **For time intervals longer than 1 μs between modules, add 0.01% of the difference between the absolute time measurements to the relative time correlation error to account for the inaccuracy of the CLK10 source.**

3 **SMPL represents the time from the event at the probe tip inputs to the next valid data sample of the LA module. In the Normal Internal clock mode, this represents the delta time to the next sample clock. In the MagniVu Internal clock mode, this represents 500 ps or less. In the External clock mode, this represents the time to the next master clock generated by the setup of the clocking state machine, the system-under-test supplied clocks, and the qualification data.**

4 **The DSO module time correlation is measured at the maximum sample rate on one channel only.**

5 **All system trigger and external signal input latencies are measured from a falling-edge transition (active true low) with signals measured in the wired-OR configuration.**

6 **Latencies are based on typical portable mainframe configurations consisting of two LA modules or an LA module plus a DSO module. Latencies are system-configuration-dependent and may vary slightly with module loading.**

7 **In the Waveform window, triggers are always marked immediately except when delayed to the first sample. In the Listing window, triggers are always marked on the next sample period following their occurrence.**

8 **"Clk" represents the time to the next master clock at the destination logic analyzer. In the asynchronous (or internal) clock mode, this represents the delta time to the next sample clock beyond the minimum async rate of 4 ns. In the synchronous (or external) clock mode, this represents the time to the next master clock generated by the setup of the clocking state machine and the supplied system under test clocks and qualification data.**

9 **Signals 1 and 2 (ECLTRG0, 1) are limited to a "broadcast" mode of operation, where only one source is allowed to drive the signal node at any one time. That single source may be utilized to drive any combination of destinations.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–3: External signal interface (portable and benchtop mainframes)

Characteristic	Description
System Trigger Input	TTL compatible input via rear panel mounted BNC connectors (portable mainframe) or front panel mounted SMB connectors (benchtop mainframe)
Input Levels V_{IH} V_{IL}	TTL compatible input. ≥ 2.0 V ≤ 0.8 V
Input Mode	Falling edge sensitive, latched (active low)
Minimum Pulse Width	12 ns
Active Period	Accepts system triggers during valid acquisition periods via real-time gating, resets system trigger input latch between valid acquisition periods
Maximum Input Voltage	0 to +5 Volt peak
External Signal Input	TTL compatible input via rear panel mounted BNC connectors (portable mainframe) or front panel mounted SMB connectors (benchtop mainframe)
Input Destination	Signal 1, 2, 3, 4
Input Levels V_{IH} V_{IL}	TTL compatible input. ≥ 2.0 V ≤ 0.8 V
Input Mode	Active (true) low, level sensitive
Input Bandwidth[1] Signal 1, 2 Signal 3, 4	 50 MHz square wave minimum 10 MHz square wave minimum
Active Period	Accepts signals during valid acquisition periods via real-time gating
Maximum Input Voltage	0 to +5 Volt peak
System Trigger Output	TTL compatible output via rear panel mounted BNC connectors (portable mainframe) or front panel mounted SMB connectors (benchtop mainframe)
Source Mode	Active (true) low, falling edge latched
Active Period	Outputs system trigger state during valid acquisition period, resets system trigger output to false state between valid acquisitions
Output Levels V_{OH} V_{OL}	50 Ohm back terminated TTL-compatible output ≥4 V into open circuit ≥ 2 V into 50 Ohm to ground ≥ 0.7 V sinking 10 ma
Output Protection	Short-circuit protected (to ground)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–3: External signal interface (portable and benchtop mainframes) (Cont.)

Characteristic	Description
External Signal Output	TTL compatible outputs via rear panel mounted BNC connectors (portable mainframe) or front panel mounted SMB connectors (benchtop mainframe)
Source Selection	Signal 1, 2, 3, 4, or 10 MHz clock
Output Modes Level Sensitive	User definable Active (true) low or active (true) high
Output Levels V_{OH} V_{OL}	50 Ohm back terminated TTL output ≥ 4 V into open circuit ≥ 2 V into 50 Ohm to ground ≤ 0.7 V sinking 10 ma
Output Bandwidth[2] Signal 1, 2 Signal 3, 4	 50 MHz square wave minimum 10 MHz square wave minimum
Active Period	Outputs signals during valid acquisition periods, resets signals to false state between valid acquisitions Outputs 10 MHz clock continuously
Output Protection	Short-circuit protected (to ground).
Intermodule Signal Line Bandwidth Signal 1, 2 (ECLTRG 0,1) Signal 3, 4 (ECLTRG 0,1)	Minimum bandwidth up to which the intermodule signals are specified to operate correctly 50 MHz square wave minimum 10 MHz square wave minimum

1 **The Input Bandwidth specification only applies to signals to the modules; it does not apply to signals applied to the External Signal Input and sent back to the External Signal Output.**

2 **The Output Bandwidth specification only applies to signals from the modules; it does not apply to signals applied to the External Signal Input and sent back to the External Signal Output.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–4: Certifications and compliances: TLA 704 Color Portable Mainframe[1] and TLA 711 Color Benchtop Mainframe[1]

EC Declaration of Conformity – EMC	Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities: EN 55011 Class A Radiated and Conducted Emissions EN 50081-1 Emissions: EN 60555-2 AC Power Line Harmonic Emissions EN 50082-1 Immunity: IEC 801-2 Electrostatic Discharge Immunity IEC 801-3 RF Electromagnetic Field Immunity IEC 801-4 Electrical Fast Transient/Burst Immunity IEC 801-5 Power Line Surge Immunity 1 The following modules meet the intent of EMC Directive 89/336/EEC when they are used with the above named mainframes: TLA 700 Series Logic Analyzer Modules (TLA 7L1, TLA 7L2, TLA 7L3, TLA 7L4, TLA 7M1, TLA 7M2, TLA 7M3, TLA 7M4) TLA 700 Series Digitizing Oscilloscope Modules (TLA 7D1, TLA 7D2, TLA 7E1, TLA 7E2)
EC Declaration of Conformity – Low Voltage	Compliance was demonstrated to the following specification as listed in the Official Journal of the European Communities: Low Voltage Directive 73/23/EEC EN 61010-1:/A2 1995 Safety requirements for electrical equipment for measurement, control, and laboratory use
Approvals	UL3111-1 – Standard for electrical measuring and test equipment CAN/CSA C22.2 No. 1010.1 – Safety requirements for electrical equipment for measurement, control and laboratory use
Installation Category Descriptions	Terminals on this product may have different installation category designations. The installation categories are: CAT III Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location CAT II Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected CAT I Secondary (signal level) or battery operated circuits of electronic equipment
Conditions of Approval	Safety Certifications/Compliances are made for the following conditions: Temperature (operation): +5°C to +40°C Altitude (maximum operation): 2000 meters
IEC Characteristics	Equipment type: Test and Measuring Installation Category II Pollution Degree 2 Safety Class I

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TLA 704 Color Portable Mainframe Characteristics

Table A–5: Portable mainframe internal controller

Characteristic	Description
Processor	Intel 133 MHz Pentium PC-AT configuration, with an Intel 82430HX (Triton II) chip set
Main Memory	EDO DRAM
Style	Two 72-pin SIMMs, gold-plated
Loading	Symmetric, 2-SIMM minimum (64 bits)
Speed	60 ns
Installed Configurations	16-MByte minimum, 32-MByte maximum
Cache Memory	256 Kbyte, level 2 (L2) write-back cache
Flash BIOS	512 Kbyte
Real-Time Clock and CMOS Setups NVRAM *(Typical)*	Real-Time clock/calendar, with typical 10-year life. Standard and advanced PC CMOS setups: see BIOS specification. Year 2000 compliant.
Floppy Disk Drive	Standard 3.5 inch, 1.44 Mbyte, double-sided PC-compatible high-density floppy disk drive
Hard Disk Drive	Standard PC-compatible with ATA/Enhanced Integrated Device Electronics (EIDE) interface
Capacity	MIN configuration: 1.4 GByte MAX configuration: 2.1 GByte Subject to change; these are the storage capacities valid at product introduction

Table A–6: Portable mainframe display system

Characteristic	Description
Classification	Standard PC graphics accelerator technology (bitBLT-based); capable of supporting both internal color LCD display and external color SVGA/XGA monitor
Display Memory	DRAM-based frame-buffer memory
Size	1 MByte
Width	32-bit
Display Selection	Hardware sense of external SVGA monitor during BIOS boot sequence; defaults to internal color LCD display; automatically switches to external SVGA monitor, if attached Dual (simultaneous) display of external SVGA monitor and internal color LCD is possible via special “simulscan” CMOS setup, as long as internal and external displays operate at same resolution (limited to 640x480 on current TFT LCD) and display rates Dynamic Display Configuration 1 (DDC1) support for external SVGA monitor is provided
External Display Drive	1 SVGA/XGA-compatible analog output port

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–6: Portable mainframe display system (Cont.)

Characteristic	Description
Display Size	User selected via Windows 95 Resolution (Pixels) / Colors / DDC1 640x480 / 256 / yes 640x480 / 64K / yes 640x480 / 16.8M / no 800x600 / 256 / yes 800x600 / 64K / yes 1024x768 / 256 / yes
Internal Display	
Classification	Thin Film Transistor (TFT) 10.4 inch active-matrix color LCD display; CCFL backlight; intensity controllable via software
Resolution	640 pixels horizontal by 480 pixels
Color Scale	262,144 colors (6-bit RGB)

Table A–7: Portable mainframe front-panel interface

Characteristic	Description
QWERTY Keypad	ASCII keypad to support naming of files, traces, and keyboard equivalents of pointing device inputs for menus
HEX Keypad	HEX keypad supporting standard DSO and LA entry functions
Special Function Knobs	Various functions
Integrated Pointing Device	GlidePoint touchpad
Mouse Port	PS/2 compatible mouse port utilizing a mini-DIN connector
Keyboard Port	PS/2 compatible keyboard port utilizing a mini-DIN connector

Table A–8: Portable mainframe rear-panel interface

Characteristic	Description
Parallel Interface Port (LPT)	36-pin high-density connector supports standard Centronics mode, Enhanced Parallel Port (EPP), or Microsoft high-speed mode (ECP)
Serial Interface Port (COM A)	9-pin male sub-D connector to support RS-232 serial port.
SVGA Output Port (SVGA OUT)	15-pin sub-D SVGA connector
Type I and II PC Card Port	Standard Type I and II PC-compatible PC card slot
Type I, II, and III PC Card Port	Standard Type I, II, and III PC-compatible PC card slot

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–9: Portable mainframe AC power source

Characteristic	Description
Source Voltage and Frequency	90–250 V_{RMS}, 45–66 Hertz, continuous range CAT II 100–132 V_{RMS}, 360–440 Hertz, continuous range CAT II
Fuse Rating	
90 V - 250 V Operation (159-0046-00)	UL198/CSA C22.2 0.25 in × 1.25 in, Fast Blow, 8 A, 250 V
90 V - 250 V Operation (159-0381-00)	IEC 127/Sheet 1 5 mm × 20 mm, Fast Blow, 6.3 A, 250 V
Maximum Power Consumption	600 W line power maximum
Steady-State Input Current	6 A_{RMS} maximum
Inrush Surge Current	70 A maximum
Power Factor Correction	Yes
On/Standby Switch and Indicator	Front Panel On/Standby switch, with LED indicator located next to switch The power cord provides main power disconnect.

Table A–10: Portable mainframe secondary power

Characteristic	Description		
⩘ DC Voltage Regulation (Combined System, voltage available at each slot)	Voltage	Vmin,	Vnom, Vmax
	+24 V	23.28 V,	24.24 V, 25.20 V
	+12 V	11.64 V,	12.12 V, 12.60 V
	+5 V	4.875 V,	5.063 V, 5.250 V
	–2 V	–2.10 V,	–2.00 V, –1.90 V
	–5.2 V	–5.460 V,	–5.252 V, –5.044 V
	–12 V	–12.60 V,	–12.12 V, –11.64 V
	–24 V	–25.20 V,	–24.24 V, –23.28 V

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–11: Portable mainframe cooling

Characteristic	Description
Cooling System	Forced air circulation (negative pressurization) utilizing six fans operating in parallel
Cooling Clearance	2 inches (51 mm), sides and rear; unit should be operated on a flat, unobstructed surface

Table A–12: Portable mainframe mechanical

Characteristic	Description
Overall Dimensions	(See Figure A–1 for overall chassis dimensions)
Height (with feet)	9.25 in (235 mm)
Width	17.0 in (432 mm)
Depth	17.5 in (445 mm)
Weight	30 lbs 12 oz (13.9 kg) with no modules installed, 2 dual-wide slot covers, and empty pouch
Shipping configuration	60 lbs 13 oz (27.58 kg) minimum configuration (no modules), with all standard accessories 86 lbs 9 oz (39.26 kg) full configuration, with 2 TLA 7M4 modules and standard accessories (including probes)

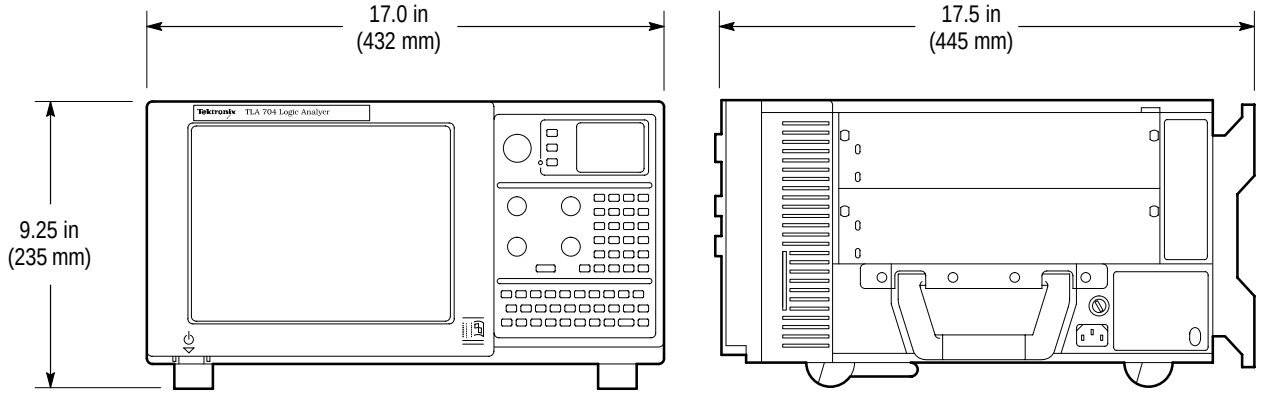


Figure A–1: Front and side views of TLA 704 Color Portable Mainframe

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TLA 711 Color Benchtop Chassis Characteristics

Table A–13: Benchtop chassis AC power source

Characteristic	Description
Source Voltage	90–250 V_{RMS}, 45–66 Hertz, continuous range CAT II 100–132 V_{RMS}, 360–440 Hertz, continuous range CAT II
Maximum Power Consumption	1350 W line power (the maximum power consumed by a fully loaded 13-slot instrument)
Fuse Rating (Current and voltage ratings and type of fuse used to fuse the source line voltage)	
90 V – 132 VAC_{RMS} Operation High-power/Low Line (159-0379-00)	Safety: UL198G/CSA C22.2, Size: 0.25 in × 1.25 in, Style: Slow acting, Rating: 20 A/250 V
103 V – 250 VAC_{RMS} Operation (159-0256-00)	Safety: UL198G/CSA C22.2, Size: 0.25 in × 1.25 in, Style: No. 59/Fast acting, Rating: 15 A/250 V
207 V – 250 VAC_{RMS} Operation (159-0381-00)	Safety: IEC 127/Sheet 1, Size: 5 mm × 20 mm, Style: Fast acting “F”, high-breaking capacity, Rating: 6.3 A/250 V
Inrush Surge Current	70 A maximum
Steady State Input Current	15 A_{RMS} maximum at 90 VAC_{RMS} 6.3 A_{RMS} maximum at 207 VAC_{RMS}
Power Factor Correction	Yes
ON/Standby Switch and Indicator	Front Panel On/Standby switch with integral power indicator

Table A–14: Benchtop chassis secondary power

Characteristic	Description		
⩘ DC Voltage Regulation (Combined System, voltage available at each slot)	Voltage	Vmin,	Vnom, Vmax
	+24 V	23.28 V,	24.24 V, 25.20 V
	+12 V	11.64 V,	12.12 V, 12.60 V
	+5 V	4.875 V,	5.063 V, 5.250 V

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–14: Benchtop chassis secondary power (Cont.)

Characteristic	Description	
	–2 V	–2.10 V, –2.00 V, –1.90 V
	–5.2 V	–5.460 V, –5.252 V, –5.044 V
	–12 V	–12.60 V, –12.12 V, –11.64 V
	–24 V	–25.20 V, –24.24 V, –23.28 V

Table A–15: Benchtop chassis cooling

Characteristic	Description
Cooling System	Forced air circulation system (positive pressurization) utilizing a single low-noise centripetal (squirrel cage) blower configuration with no removable filters
Blower Speed Control	Rear panel switch selects between full speed and variable speed. Slot exhaust temperature and ambient air temperature are monitored such that a constant delta temperature is maintained across the module with the highest exit air temperature at the minimum operational blower speed
Slot Activation	Installing a module activates the cooling for the corresponding occupied slots by opening the air flow shutter mechanism. Optimizes cooling efficiency by only applying airflow to modules that are installed
Delta Temperature Readout Sensitivity	100 mV/°C with 0°C corresponding to 0 V output
Temperature Sense Range	–10°C to +90°C, Delta temperature ≤ 50°C
Clearance	2 in (51 mm), rear, top, and sides of chassis

Table A–16: Benchtop chassis mechanical

Characteristic	Description
Overall Dimensions	(See Figure A–2 for overall chassis dimensions)
Standard Chassis	
Height (with feet)	14.25 in (362.0 mm)
Width	16.75 in (425.5 mm)
Depth	26.5 in (673.1 mm)
Chassis with Rackmount	
Height	14.0 in (355.6 mm)
Width	18.9 in (480.1 mm)
Depth	29.4 in to 34.4 in (746.8 mm to 873.8 mm)
Weight	
Minimum configuration with benchtop controller and slot covers	62 lbs 2 oz (28.18 kg)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–16: Benchtop chassis mechanical (Cont.)

Characteristic	Description
Typical configuration with 2 LA, 1 DSO, and controller	77 lbs 14 oz (35.32 kg)
Shipping configuration	118 lbs (53.52 kg) minimum configuration (no modules) with benchtop controller and all standard accessories 175 lbs (79.38 kg) fully configured with benchtop controller, 3 LA modules, 2 DSO modules, and all standard accessories
Rackmount kit adder	20 lbs (9.1 kg)
Module Size	13 plug-in slots

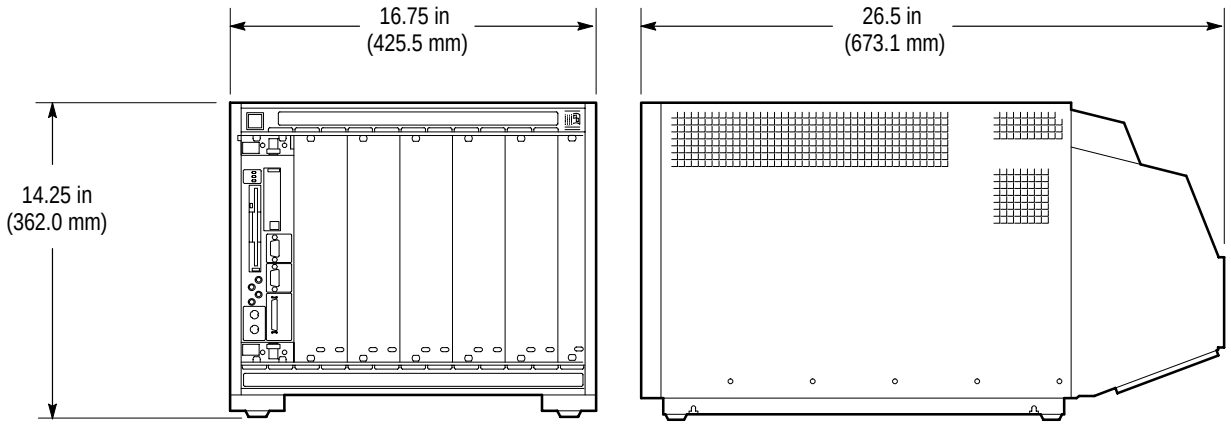


Figure A–2: Front view and side view of standard Benchtop chassis

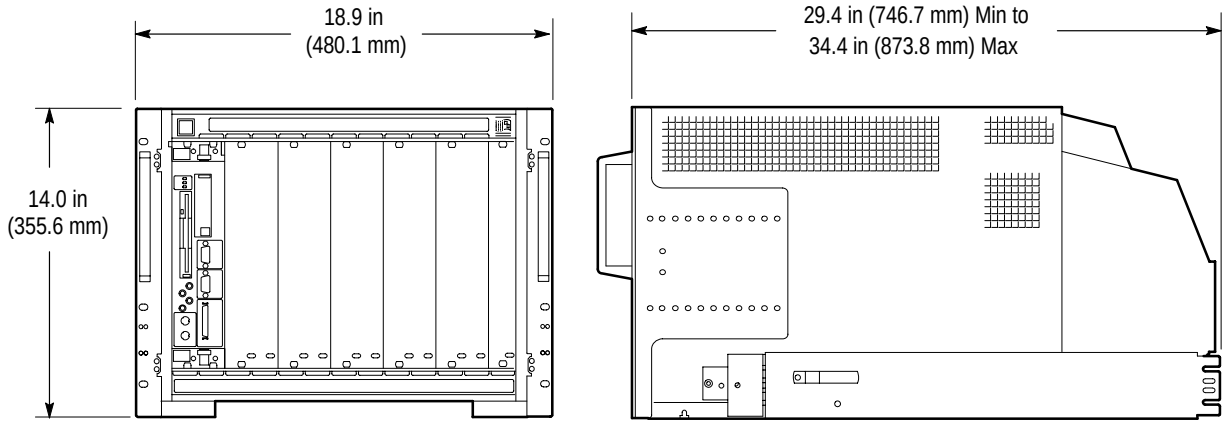


Figure A–3: Front view and side view of Benchtop chassis with Rackmount Option

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TLA 711 Color Benchtop Controller Characteristics

Table A–17: Benchtop controller characteristics

Characteristic	Description
Processor	Intel Pentium 133 MHz PC-AT configuration with an Intel 82430HX (Triton II) chip-set
Main Memory	EDO DRAM
Style	2-72 pin SIMMs, gold plated
Loading	Symmetrical, 2-SIMM minimum (64-Bits)
Speed	60 ns
Installed Configuration	16 MByte minimum configuration 32 MByte maximum configuration
Cache Memory	256 Kbyte, level 2 (L2) write-back cache
Flash BIOS	512 Kbyte
Real-Time Clock and CMOS Setups NVRAM *(Typical)*	Real-Time clock/calendar, with typical 10-year life. Standard and advanced PC CMOS setups: see BIOS specification. Year 2000 compliant.
Floppy Disk Drive	Standard 3.5 inch, 1.44 Mbyte, double-sided, PC-compatible high-density floppy disk drive
Hard Disk Drive	Standard PC-compatible with ATA/Enhanced Integrated Device Electronics (EIDE) interface
Capacity	MIN configuration: 1.4 GByte MAX configuration: 2.1 GByte Subject to change; these are the storage capacities valid at product introduction
Display Classification	Standard PC graphics accelerator technology (bitBLT based) capable of driving external color VGA, SVGA, or XGA monitors
Display Memory	DRAM based frame-buffer memory.
Width	32 Bit
Size	1 MByte
Display Drive	One VGA, SVGA, or XGA compatible analog output port
Display Size	User selected via Windows 95. Resolution (Pixels) — Colors — DDC1 640x480 — 256 — yes 640x480 — 64 K — yes 640x480 — 16.8 M — no 800x600 — 256 — yes 800x600 — 64 K — yes 1024x768 — 256 — yes
Mouse Port	Front panel mounted PS2 compatible mouse port utilizing a mini-DIN connector
Keyboard Port	Front panel mounted PS2 compatible keyboard port utilizing a mini-DIN connector

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–17: Benchtop controller characteristics (Cont.)

Characteristic	Description
Parallel Interface Port (LPT)	36-pin high-density connector supports standard Centronics mode, Enhanced Parallel Port (EPP), or Microsoft high-speed mode (ECP)
Serial Interface Port (COM)	The serial port utilizing a 9-pin male sub-D connector to support an RS232 serial port
SVGA Output Port (SVGA)	The SVGA port utilizing a 15-pin sub-D SVGA connector
Type I and II PC Card Port	Standard Type I and II PC compatible PC card slot
Type I, II, and III PC Card Port	Standard Type I, II, and III PC compatible PC card slot

Table A–18: Benchtop controller mechanical characteristics

Characteristic	Description
Weight	5 lb. 3 oz. (2.34 kg)
Size	Standard dual-wide, VXI C-size enclosure
Overall dimensions	
Height	10.32 in (262 mm)
Width	2.39 in (61 mm)
Depth	14.7 in (373 mm)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TLA 700 Series Logic Analyzer Module Characteristics

Table A–19: LA module channel width and depth

Characteristic	Description	
Number of channels	Product	Channels
	TLA 7L1 and TLA 7M1	32 data and 2 clock
	TLA 7L2 and TLA 7M2	64 data and 4 clock
	TLA 7L3 and TLA 7M3	96 data, 4 clock, and 2 qualifier
	TLA 7L4 and TLA 7M4	128 data, 4 clock, and 4 qualifier
Acquisition memory depth	Product	Memory depth
	TLA 7L1, TLA 7L2, TLA 7L3, TLA 7L4	32 K[1]
	TLA 7M1, TLA 7M2 ,TLA 7M3, TLA 7M4	512 K

1 **PowerFlex configurable to 128 K**

Table A–20: LA module clocking

Characteristic	Description	
Asynchronous clocking		
✓ Internal sampling period[1]	4 ns to 50 ms in a 1–2–5 sequence	
✓ Minimum recognizable word[2] (across all channels)	Channel-to-channel skew + sample uncertainty Example: for a P6417 Probe and a 4 ns sample period = 1.6 ns + 4 ns = 5.6 ns	
Synchronous clocking		
Number of clock channels[3]	Product	Clock channels
	TLA 7L1 and TLA 7M1	2
	TLA 7L2 and TLA 7M2	4
	TLA 7L3 and TLA 7M3	4
	TLA 7L4 and TLA 7M4	4
Number of qualifier channels	Product	Qualifier channels
	TLA 7L1 and TLA 7M1	0
	TLA 7L2 and TLA 7M2	0
	TLA 7L3 and TLA 7M3	2
	TLA 7L4 and TLA 7M4	4

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–20: LA module clocking (Cont.)

Characteristic	Description
✓ Setup and hold window size (data and qualifiers)	Maximum window size = Maximum channel-to-channel skew + (2 x sample uncertainty) + 0.4 ns Maximum setup time = User interface setup time + 0.6 ns Maximum hold time = User interface hold time + 0.4 ns Max. setup time for slave module of merged pair = User Interface setup time + 0.8 ns Max. hold time for slave module of merged pair = User Interface hold time + 0.7 ns Example: for P6417 Probe and user interface setup & hold of 2.0/0.0 typical Maximum setup time = 2.0 ns + 0.6 ns = 2.6 ns Maximum hold time = 0.0 ns + 0.4 ns = 0.4 ns
Setup and hold window size (data and qualifiers) (*Typical*)	Channel-to-channel skew (*typical*) + (2 x sample uncertainty) Example: for P6417 Probe = 1 ns + (2 x 500 ps) = 2 ns
Setup and hold window range	The setup and hold window can be moved for each channel group from +8.5 ns (Ts) to –7.0 ns (Ts) in 0.5 ns steps (setup time). Hold time follows the setup time by the setup and hold window size.
✓ Maximum synchronous clock rate[4]	200 MHz in full speed mode (5 ns minimum between active clock edges) 100 MHz in half speed mode (10 ns minimum between active clock edges)
Demux clocking	
Demux Channels (TLA 7L3 ,TLA 7L4, TLA 7M3, TLA 7M4)	Channels multiplex as follows: A3(7:0) to D3(7:0) A2(7:0) to D2(7:0) A1(7:0) to D1(7:0) A0(7:0) to D0(7:0)
(TLA 7L1, TLA 7L2, TLA 7M1, TLA 7M2)	Channels multiplex as follows: A3(7:0) to C3(7:0) A2(7:0) to C2(7:0) A1(7:0) to D1(7:0) TLA 7L2 and TLA 7M2 only A0(7:0) to D0(7:0) TLA 7L2 and TLA 7M2 only
Time between DeMux clock edges[4] (*Typical)*	5 ns minimum between DeMux clock edges in full-speed mode 10 ns minimum between DeMux clock edges in half-speed mode
Time between DeMux store clock edges[4] (*Typical)*	10 ns minimum between DeMux master clock edges in full-speed mode 20 ns minimum between DeMux master clock edges in half-speed mode
Clocking state machine	
Pipeline delays	Each channel group can be programmed with a pipeline delay of 0 through 3 active clock edges.

1 It is possible to use storage control and only store data when it has changed (transitional storage).

2 Applies to asynchronous clocking only. Setup and hold window specification applies to synchronous clocking only.

3 Any or all of the clock channels may be enabled. For an enabled clock channel, either the rising, falling, or both edges can be selected as the active clock edges. The clock channels are stored.

4 Full and half speed modes are controlled by PowerFlex options and upgrade kits.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–21: LA module trigger system

Characteristic	Description
Triggering Resources	
Word/Range recognizers	16 word recognizers. The word recognizers can be combined to form full width, double bounded, range recognizers. The following selections are available: 16 word recognizers — 0 range recognizers 13 word recognizers — 1 range recognizer 10 word recognizers — 2 range recognizers 7 word recognizers — 3 range recognizers 4 word recognizers — 4 range recognizers
Range recognizer channel order	From most-significant probe group to least-significant probe group: C3 C2 C1 C0 E3 E2 E1 E0 A3 A2 D3 D2 A1 A0 D1 D0 Q3 Q2 Q1 Q0 CK3 CK2 CK1 CK0 Missing channels for modules with fewer than 136 channels are omitted. When merged, the range recognition extends across the two modules; the master[1] module contains the most-significant groups.
Glitch detector[2,3]	Each channel group can be enabled to detect a glitch
Minimum detectable glitch pulse width (*Typical)*	2.0 ns (single channel with P6417 probe)
Setup and hold violation detector[2,4]	Each channel group can be enabled to detect a setup and hold violation. The range is from 8 ns before the clock edge to 8 ns after the clock edge. The range can be selected in 0.5 ns increments. The setup and hold violation of each window can be individually programmed.
Transition detector[2, 5]	Each channel group can be enabled or disabled to detect a transition between the current valid data sample and the previous valid data sample.
Counter/Timers[6, 7]	2 counter/timers, 51 bits wide, can be clocked up to 250 MHz. Maximum count is 2^{51} Maximum time is 9.007^{6} seconds or 104 days
Signal In 1	A backplane input signal
Signal In 2	A backplane input signal
Trigger In	A backplane input signal that causes the main acquisition and the MagniVu acquisition to trigger if they are not already triggered
Active trigger resources[8]	16 maximum (excluding counter/timers)
Trigger States	16
✓ Trigger State sequence rate	Same rate as valid data samples received, 250 MHz maximum
Trigger Machine Actions	
Main acquisition trigger	Triggers the main acquisition memory
Main trigger position	Trigger position is programmable to any data sample (4 ns boundaries)
Increment counter	Either of the two counter/timers used as counters can be incremented.
Start/Stop timer	Either of the two counter/timers used as timers can be started or stopped.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–21: LA module trigger system (Cont.)

Characteristic	Description
Reset counter/timer	Either of the two counter/timers can be reset. When a counter/timer used as a timer and is reset, the timer continues in the started or stopped state that it was in prior to the reset.
Signal out	A signal sent to the backplane to be used by other modules
Trigger out	A trigger out signal sent to the backplane to trigger other modules
Storage Control	
Global storage	Storage is allowed only when a specific condition is met. This condition can use any of the trigger machine resources except for the counter/timers. Storage commands defined in the current trigger state will override the global storage control. Global storage can be used to start the acquisition with storage initially turned on (default) or turned off.
By event	Storage can be turned on or off; only the current sample can be stored. The event storage control overrides any global storage commands.
Block storage[9]	When enabled, 31 samples are stored before and after the valid sample.
Glitch violation storage	The acquisition memory can be enabled to store glitch violation information with each data sample when asynchronous clocking is used. The probe data storage size is reduced by one half (the other half holds the violation information). The fastest asynchronous clocking rate is reduced to 10 ns.

1 **For merged modules, the master module is the module installed in the lower-numbered slot.**

2 **Each use of a glitch detector, setup and hold violation detector, or transition detector requires a trade-off of one word recognizer resource.**

3 **Any glitch is subject to pulse width variation of up to the channel-to-channel skew specification + 0.5 ns.**

4 **Any setup value is subject to variation of up to 1.6 ns; any hold value is subject to variation of up to 1.4 ns.**

5 **This mode can be used to create transitional storage selections where all channels are enabled.**

6 **Counters and timers can be set, reset, or tested and have zero reset latency.**

7 **Timers can be tested with TLA 7Lx and TLA 7Mx Modules with serial numbers B020000 and higher and TLA 700 Series Software Version 1.10 and higher.**

8 **Word recognizers are traded off one-by-one as Signal In 1, Signal In 2, glitch detection, setup and hold detection, or transition detection resources are added.**

9 **Block storage is disallowed when glitch storage or setup and hold violation is enabled.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–22: LA module input parameters (with P6417 Probe)

Characteristic	Description
✓ Threshold Accuracy	±100 mV
Threshold range and step size	Setable from +5 V to –2 V in 50 mV steps
Threshold channel selection	16 threshold groups assigned to channels. Each probe has two threshold settings, one for the clock/qualifier channel and one for the data channels.
✓ Channel-to-channel skew	≤ 1.6 ns maximum (When merged, add 0.5 ns for the slave module.)
Channel-to-channel skew (*Typical)*	≤ 1.0 ns typical (When merged, add 0.3 ns for the slave module.)
Sample uncertainty	
Asynchronous:	Sample period
Synchronous:	500 ps
Probe input resistance (*Typical*)	20 kΩ
Probe input capacitance (*Typical*)	2 pF maximum
Minimum slew rate (*Typical*)	0.2 V/ns
Maximum operating signal	6.5 V_{p-p} –3.5 V absolute input voltage minimum 6.5 V absolute input voltage maximum
Probe overdrive	±250 mV or ±25% of signal swing minimum required beyond threshold, whichever is greater ±4 V maximum beyond threshold
Maximum nondestructive input signal to probe	±15 V
Minimum input pulse width signal (single channel) (*Typical*)	2 ns
Delay time from probe tip to input probe connector (*Typical*)	7.33 ns

Table A–23: LA module MagniVu feature

Characteristic	Description
MagniVu memory depth	2016 samples per channel
MagniVu sampling period	Data is asynchronously sampled and stored every 500 ps in a separate high resolution memory.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–24: Merged LA modules

Characteristic	Description
Number of modules that can be merged together	Two adjacent modules regardless of channel widths and memory depths (TLA 7L3, TLA 7L4, TLA 7M3, TLA 7M4 only)
Number channels after merge	The sum of the data channels of both modules plus the CLK/QUAL channels (active clocks for the merge system) of the master module plus the CLK/QUAL channels (nonactive stored clock channels to the merge system)
Merge system acquisition depth	Channel depth is equal to the smaller depth of the two modules.
Number of clock and qualifier channels after merge	Same number of clock and qualifier channels on the master module. The clock and qualifier channels on the slave module have no effect on clocking and are only stored.
Merge system triggering resources	Triggering resources are the same as a single module except that the widths of the word/range recognizers, setup and hold violation detector, glitch detector, and transition detector are increased to the merged channel width.

Table A–25: LA module data handling

Characteristic	Description
Nonvolatile memory retention time (*Typical*)	Battery is integral to the NVRAM. Battery life is > 10 years.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–26: LA module mechanical

Characteristic	Description
Slot width	Requires 2 mainframe slots
Weight	5 lbs 10 oz. (2.55 kg) for TLA 7L4 or TLA 7M4 8 lbs (3.63 kg) for TLA 7L4 or TLA 7M4 packaged for domestic shipping
Overall dimensions	
Height	10.32 in (262 mm)
Width	2.39 in (61 mm)
Depth	14.7 in (373 mm)
Probe cables	
P6417 length	6 ft (1.8 m)
Mainframe interlock	1.4 ECL keying is implemented

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TLA 700 Series Digitizing Oscilloscope Module Characteristics

Table A–27: DSO module signal acquisition system

Characteristic	Description		
✓ Accuracy, DC Gain	±1.5% for full scale ranges from 20 mV to 100 V ±2.0% for full scale ranges <19.9 mV		
✓ Accuracy, Internal Offset[1]	*Full Scale Range Setting*	*Offset Accuracy*	
	10 mV – 1 V	±[(0.2% × | offset |) + 1.5 mV + (6% × full scale range)]	
	1.01 V – 10 V	±[(0.25% × | offset |) + 15 mV + (6% × full scale range)]	
	10.1 V – 100 V	±[(0.25% × | offset |) + 150 mV + (6% × full scale range)]	
✓ Analog Bandwidth, DC–50 Ω Coupled	*Full Scale Range Setting*	*Bandwidth*[2]	
	10.1 V – 100 V	DC – 500 MHz (TLA7E1 and TLA7E2) DC – 500 MHz (TLA7D1 and TLA7D2)	
	100 mV – 10 V	DC – 1 GHz (TLA7E1 and TLA7E2) DC – 500 MHz (TLA7D1 and TLA7D2)	
	50 mV – 99.5 mV	DC – 750 MHz (TLA7E1 and TLA7E2) DC – 500 MHz (TLA7D1 and TLA7D2)	
	20 mV – 49.8 mV	DC – 600 MHz (TLA7E1 and TLA7E2) DC – 500 MHz (TLA7D1 and TLA7D2)	
	10 mV – 19.9 mV	DC – 500 MHz (TLA7E1 and TLA7E2) DC – 500 MHz (TLA7D1 and TLA7D2)	
Bandwidth, Analog, Selections	20 MHz, 250 MHz, and FULL on each channel		
Calculated Rise Time *(Typical)*[3] Typical full-bandwidth rise times are shown in the chart to the right	*Full Scale Range Setting*	*TLA7E1 and TLA7E2*	*TLA7D1 and TLA7D2*
	10.1 V – 100 V	900 ps	900 ps
	100 mV – 10 V	450 ps	900 ps
	50 mV – 99.5 mV	600 ps	900 ps
	20 mV – 49.8 mV	750 ps	900 ps
	10 mV – 19.9 mV	900 ps	900 ps
Crosstalk (Channel Isolation)	≥300:1 at 100 MHz and ≥100:1 at the rated bandwidth for the channel's sensitivity (Full Scale Range) setting, for any two channels having equal sensitivity settings		
Digitized Bits, Number of	8 bits		

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–27: DSO module signal acquisition system (Cont.)

Characteristic	Description		
Effective Bits, Realtime Sampling *(Typical)*	*Input Frequency*	*TLA7E1 and TLA7E2 5 GS/s (each Channel)*	*TLA7D1 and TLA7D2 2.5 GS/s (each Channel)*
	10.2 MHz	6.2 bits	6.2 bits
	98 MHz	6.1 bits	6.1 bits
	245 MHz	6.0 bits	6.0 bits
	490 MHz	5.7 bits	5.7 bits
	990 MHz	5.2 bits	N/A
Frequency Limit, Upper, 20 MHz Bandwidth Limited *(Typical)*	20 MHz		
Frequency Limit, Upper, 250 MHz Bandwidth Limited *(Typical)*	250 MHz		
Input Channels, Number of	*Product*	*Channels*	
	TLA7E2	Four	
	TLA7D2	Four	
	TLA7E1	Two	
	TLA7D1	Two	
Input Coupling	DC, AC, or GND[4]		
Input Impedance, DC–1 MΩ Coupled	1 MΩ ±0.5% in parallel with 10 pF ±3 pF		
Input Impedance Selections	1 MΩ or 50 Ω		
Input Resistance, DC–50 Ω Coupled	50 Ω ±1%		
Input VSWR, DC–50 Ω Coupled	≤1.3:1 from DC – 500 MHz, ≤1.5:1 from 500 MHz – 1 GHz		
Input Voltage, Maximum, DC–1 MΩ, AC–1 MΩ, or GND Coupled	300 V_{RMS} but no greater than ±420 V peak, Installation category II, derated at 20 dB/decade above 1 MHz		
Input Voltage, Maximum, DC–50 Ω or AC–50 Ω Coupled	5 V_{RMS}, with peaks ≤ ±25 V		
Lower Frequency Limit, AC Coupled *(Typical)*	≤10 Hz when AC–1 MΩ Coupled; ≤200 kHz when AC–50 Ω Coupled[5]		
✓ Random Noise	*Bandwidth Selection*	*RMS Noise*	
	Full	≤(350 µV + 0.5% of the full scale Setting)	
	250 MHz	≤(165 µV + 0.5% of the full scale Setting)	
	20 MHz	≤(75 µV + 0.5% of the full scale Setting)	

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–27: DSO module signal acquisition system (Cont.)

Characteristic	Description				
Range, Internal Offset	*Full Scale Range Setting*	*Offset Range*			
	10 mV – 1 V	±1 V			
	1.01 V – 10 V	±10 V			
	10.1 V – 100 V	±100 V			
Range, Sensitivity (Full Scale Range), All Channels	10 mV to 100 V[6]				
Step Response Settling Errors *(Typical)*[7] The maximum absolute difference between the value at the end of a specified time interval after the mid-level crossing of the step, and the value one second after the mid-level crossing of the step, expressed as a percentage of the step amplitude. See IEEE std. 1057, Section 4.8.1, *Settling Time Parameters*.	*Full Scale Range Setting*	*± Step Response*	*Maximum Settling Error (%) at*		
			20 ns	*100 ns*	*20 ms*
	10 mV – 1 V	≤2 V	0.5%	0.2%	0.1%
	1.01 V – 10 V	≤20 V	1.0%	0.5%	0.2%
	10.1 V – 100 V	≤200 V	1.0%	0.5%	0.2%

1 **Net offset is the nominal voltage level at the digitizing oscilloscope input that corresponds to the center of the A/D Converter dynamic range. Offset accuracy is the accuracy of this voltage level.**

2 **The limits given are for the ambient temperature range of 0°C to +30°C. Reduce the upper bandwidth frequencies by 5 MHz for each °C above +30°C. The bandwidth must be set to FULL.**

3 **Rise time (rounded to the nearest 50 ps) is calculated from the bandwidth when Full Bandwidth is selected. It is defined by the following formula:**

$$Rise\ Time\ (ns) = 450 \div BW\ (MHz)$$

4 **GND input coupling disconnects the input connector from the attenuator and connects a ground reference to the input of the attenuator.**

5 **The AC Coupled Lower Frequency Limits are reduced by a factor of 10 when 10X passive probes are used.**

6 **The sensitivity ranges from 10 mV to 100 V full scale in a 1–2–5 sequence of coarse settings. Between coarse settings, you can adjust the sensitivity with a resolution equal to 1% of the more sensitive coarse setting. For example, between the 500 mV and 1 V ranges, the sensitivity can be set with 5 mV resolution.**

7 **The Full Bandwidth settling errors are typically less than the percentages from the table.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–28: DSO module timebase system

Characteristic	Description	
Range, Extended Realtime Sampling Rate	5 S/s to 10 MS/s in a 1–2.5–5 sequence	
Range, Realtime Sampling Rate	*Products*	*Limits*
	TLA7E1 and TLA7E2	25 MS/s to 5 GS/s on all channels simultaneously in a 1–2.5–5 sequence
	TLA7D1 and TLA7D2	25 MS/s to 2.5 GS/s on all channels simultaneously in a 1–2.5–5 sequence
Record Length	512, 1024, 2048, 4096, 8192, and 15000	
✓ Long Term Sample Rate	±100 ppm over any ≥ 1 ms interval	

Table A–29: DSO module trigger system

Characteristic	Description	
✓ Accuracy (Time) for Pulse Glitch or Pulse Width Triggering	*Time Range*	*Accuracy*
	2 ns to 500 ns	±(20% of Setting + 0.5 ns)
	520 ns to 1 s	±(104.5 ns + 0.01% of Setting)
✓ Accuracy (DC) for Edge Trigger Level, DC Coupled	±((2% × | Setting) |) + 0.03 of Full Scale Range + Offset Accuracy) for signals having rise and fall times ≥20 ns	
Range (Time) for Pulse Glitch and Pulse Width Triggering	2 ns to 1 s	
Range, Trigger Level	*Source*	*Range*
	Any Channel	±100% of full scale range
Range, Trigger Point Position	Minimum: 0% Maximum: 100%	
Resolution, Trigger Level	0.2% of full scale for any Channel source	
Resolution, Trigger Position	One Sample Interval at any Sample Rate	
Sensitivities, Pulse-Type Runt Trigger *(Typical)*	10% of full scale, from DC to 500 MHz, for vertical settings >100 mV full scale and ≤10 V full scale at the BNC input	
Sensitivities, Pulse-Type Trigger Width and Glitch *(Typical)*	10% of full scale for vertical settings >100 mV full scale and ≤10 V full scale at the BNC input	

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–29: DSO module trigger system (Cont.)

Characteristic	Description		
✓ Sensitivity, Edge-Type Trigger, DC Coupled	The minimum signal levels required for stable edge triggering of an acquisition when the trigger source is DC-coupled		
	Products	*Trigger Source*	*Sensitivity*
	TLA7E1 and TLA7E2	Any Channel	3.5% of Full Scale Range from DC to 50 MHz, increasing to 10% of Full Scale Range at 1 GHz
	TLA7D1 and TLA7D2	Any Channel	3.5% of Full Scale Range from DC to 50 MHz, increasing to 10% of Full Scale Range at 500 MHz
Sensitivity, Edge-Type Trigger, Not DC Coupled *(Typical)*	*Trigger Coupling*	*Typical Signal Level for Stable Triggering*	
	AC	Same as the DC-coupled limits for frequencies above 60 Hz; attenuates signals below 60 Hz	
	High Frequency Reject	One and one-half times the DC-coupled limits from DC to 30 kHz; attenuates signals above 30 kHz	
	Low Frequency Reject	One and one-half times the DC-coupled limits for frequencies above 80 kHz; attenuates signals below 80 kHz	
	Noise Reject	Three times the DC-coupled limits	
Time, Minimum Pulse or Rearm, and Minimum Transition Time, for Pulse-Type Triggering *(Typical)*	For vertical settings >100 mV and ≤10 V at the BNC input		
	Pulse Class	*Minimum Pulse Width*	*Minimum Rearm Width*
	Glitch	1 ns	2 ns + 5% of Glitch Width Setting
	Width	1 ns	2 ns + 5% of Width Upper Limit Setting
Trigger Position Error, Edge Triggering *(Typical)*	*Acquisition Mode*	*Trigger Position Error*[1]	
	Sample	±(1 Sample Interval + 1 ns)	

[1] **The trigger position errors are typically less than the values given here. These values are for triggering signals having a slew rate at the trigger point of ≥5% of full scale/ns.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–30: DSO module front-panel connectors

Characteristic	Description
⌐ Probe Compensator, Output Voltage The Probe Compensator output voltage in peak-to-peak Volts	0.5 V (base–top) ± 1% into a ≥ 50 Ω load

Table A–31: DSO module certifications and compliances

EC Declaration of Conformity – Low Voltage	Compliance was demonstrated to the following specification as listed in the Official Journal of the European Communities: Low Voltage Directive 73/23/EEC EN 61010-1:/A2 1995 Safety requirements for electrical equipment for measurement, control, and laboratory use
Approvals	UL3111-1 – Standard for electrical measuring and test equipment CAN/CSA C22.2 No. 1010.1 – Safety requirements for electrical equipment for measurement, control and laboratory use
Safety Certification of Plug-in or VXI Modules	For modules (plug-in or VXI) that are safety certified by Underwriters Laboratories, UL Listing applies only when the module is installed in a UL Listed product. For modules (plug-in or VXI) that have cUL or CSA approval, the approval applies only when the module is installed in a cUL or CSA approved product.
Installation Category Descriptions	Terminals on this product may have different installation category designations. The installation categories are: CAT III Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location CAT II Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected CAT I Secondary (signal level) or battery operated circuits of electronic equipment
Conditions of Approval	Safety Certifications/Compliances are made for the following conditions: Temperature (operation): +5°C to +40°C Altitude (maximum operation): 2000 meters
IEC Characteristics	Equipment type: Test and Measuring Installation Category II Pollution Degree 2 Safety Class I

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table A–32: DSO module mechanical

Characteristic	Description	
Slot width	Requires 2 mainframe slots	
Weight	*Products*	*Weight*
	TLA7D1 and TLA7E1	2.44 kg (5.38 lbs)
	TLA7D2 and TLA7E2	2.55 kg (5.63 lbs)
Weight, shipping	*Products*	*Weight*
	TLA7D1 and TLA7E1	6.35 kg (14 lbs)
	TLA7D2 and TLA7E2	7.71 kg (17 lbs)
Overall Dimensions	Height: 262.05 mm (10.32 in) Width: 60.66 mm (2.39 in) Depth: 373.38 mm (14.70 in)	

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Appendix B: TLA 700 Symbol File Format

The logic analyzer can extract range symbol information directly from object files in the following formats:

- OMF86
- OMF286
- OMF386
- IEEE695
- COFF
- ELF/DWARF
- ELF/STABS

For users whose code-generation tools do not generate these file formats, the TLA 700 Symbol File (TSF) format (a text format) can be used. The TSF format is used by the logic analyzer when it exports symbol files. The logic analyzer can also read files in this format.

TLA 700 symbol files consist of alphanumeric symbol names and associated data values. The files contain a header line and lines defining the symbol names and values. Fields on a line are separated with white space (blank spaces or tabs). The formats for the pattern symbol files and the various range symbol files differ; if you need to use pattern symbols and range symbols, you use separate files.

Both TLA 700 range and pattern symbol files have a .tsf file name extension (*filename.tsf*).

The first few lines of a TSF symbol file are typically comment lines describing when and how the file was generated.

```
#  TLA700 Symbol File
#  Created on Friday, May 29, 1998 at 09:52:03
#  From file: "c:\quickstart\tla7qs.x"
```

All lines in a TSF file that begin with a pound sign (#) character are treated as comments, unless the very next character is a plus sign (+). The plus sign signifies a file reader directive. (An example of a file reader directive “#+” can be seen in the header definition below.) The pound sign character can also initiate a comment on the end of a symbol definition or other uncommented lines. All text between the pound sign and the end of the line is treated as a comment and ignored.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TSF Headers

A TSF header identifies the file format version to potential file readers. It specifies whether the file contains pattern or range symbols, the radix used to specify symbol values, and an optional offset amount to be added to each symbol value (for range symbol files).

The TSF Header is a file directive which means that the following information begins with the special character combination of a pound sign character followed immediately by a plus sign (#+). This is not a comment line. The special character sequence is used to mark instructions to the file reader; these instructions are called “file directives.”

The following examples show sample file headers for a pattern symbol file and a range symbol file. The first two lines are comments included for readability; they are not required as part of the file header.

```
#     TSF Format     Type    Display Radix  File Radix
#  ===============  =======  =============  ==========
#+ Version 2.0.131  PATTERN       HEX           HEX

#     TSF Format    Type   Display Radix  File Radix   Offset
#  ===============  =====  =============  ==========  ========
#+ Version 2.0.131  RANGE       HEX           HEX     00000000
```

The File Format Version number contains three fields. The first two fields are the format major and minor version numbers. The logic analyzer will only read TSF files where the major and minor version number of the file is less than or equal to that of the TLA 700 application itself. The third field is the build number of the application which generated the TSF file. The value of the third field is ignored when the file is read.

The File Format Version number is followed by a key word, PATTERN or RANGE, which signifies the type of symbols to be found in the file. TSF files can contain either type of symbols, but no single file can contain both. The header specifies the type for all symbols in the file.

The Display Radix field sets the default radix that will be used to display the numeric symbol value. For range symbol files this field must be one of the key words: HEX, DEC, OCT, or BIN. For pattern symbol files, only the key words: HEX, OCT, or BIN are allowed.

The File Radix field specifies the radix used by the symbol values in this file. Like the Display Radix field, the File Radix field must be one of the key words: HEX, DEC, OCT, or BIN for range symbol files, or HEX, OCT, or BIN for pattern symbol files.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The Offset field specifies an offset value and is applicable only to range symbol files. The offset value is specified in the radix indicated by the File Radix field. This offset value will be added to the lower and upper bounds of each range symbol that is read from the file. The offset is a 32-bit value, so it can have any value between 0x00000000 and 0xFFFFFFFF. If the sum of the offset and a range symbol bound value exceeds the 32-bit limit of 0xFFFFFFFF, the overflow bit is discarded. Negative offsets are specified by using a twos complement value for the offset.

TSF Pattern Symbols

Each pattern symbol in a TSF pattern file consists of two fields. The first field is the symbol name, and the second is the symbol pattern. The symbol name is a sequence of ASCII characters of up to 220 characters in length, although it is impractical to display symbol values much longer than 32 characters. Symbol names longer than 220 characters will be truncated during loading. The characters in a symbol name can be any character with an ASCII value between 0x21 (the exclamation point character (!)) and 0x7E (the tilde character (~)). You can use symbol names with embedded spaces by enclosing the Symbol Name in double quotes.

```
# Symbol      Symbol
# Name        Pattern
# ======      ========
  NUL         X0000000
  SOH         X0000001
  STX         X0000010
 "ETX 0x03"   X0000011
```

The symbol pattern consists of numerals in the radix specified by the File Radix field in the header, and Xs signifying “don’t-care” values. The number of bits represented by each character position in the pattern depends on the selected radix. For a radix of HEX, each character represents 4 bits. For an OCT radix, each character represents 3 bits; and for a BIN radix, each character represents one bit.

Symbol order in a TSF pattern file is important. When selecting the symbol to display for a particular value, the logic analyzer scans the list of pattern symbols from top to bottom. It selects the first symbol for which all non-don’t-care bits of the symbol match the corresponding bits of the target symbol.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TSF Range Symbols

There are three different types of range symbols: function, variable and source. Each of these three types define a range of 32 bit addresses associated with some entity. Variable range symbols define the beginning and ending addresses where the value of a variable is located in memory. Function range symbols define the beginning and ending addresses where instructions that implement a function are located in memory. Source range symbols are similar to function range symbols, except that the address range for a source symbol describes the location of the instructions that implement just one source statement. (Source symbols also contain file name, line number, and an optional column range that define the location of the source code associated with the symbol.)

Each of the three types of range symbols appear in a separate section of the file. Each section begins with a file directive indicating the type of symbols that follow. The sections may appear in any order, and can be broken up and separated by other sections if necessary. The first section might be variables, followed by functions, then followed by another variable section. Each section is also optional, however some TLA 700 applications are unable to use the symbol file if the appropriate type of symbols are not present. For example, the Source window is only able to correlate with a Listing window if the symbol file contains source symbols.

Range symbol names follow the same rules as pattern symbol names. The symbol name is a sequence of ASCII characters of up to 220 characters in length, although it is impractical to display symbol values much longer than 32 characters. Symbol names longer than 220 characters will be truncated during loading. The characters in a symbol name can be any character with an ASCII value between 0x21 (the exclamation point character (!)) and 0x7E (the tilde character (~)). You can use symbol names with embedded spaces by enclosing the Symbol Name in double quotes.

Range symbol address ranges can overlap, however, this sometimes produces unexpected results. When overlaps occur, and the logic analyzer needs to convert a numeric value to a symbol, it must to choose between the overlapping symbols. When choosing between overlapping symbols, the logic analyzer assigns a precedence order to the symbol types. Function symbols have the highest precedence, followed by variable symbols, and then source symbols.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TSF Function Symbols

The file directive "#+ Function" introduces the function symbol section of a TSF Range file. The file directive tells the file reader that the following symbols represent functions, as opposed to variables or source statements. If no symbol type file directive is given, the function symbol type is assumed.

```
#+ Function
#          Symbol Name              Low      High
# ============================== ======== ========
displayBanner                    006035ba 00603675
buildMenus                       00603676 006036e5
displayLCDmenu                   006036e6 0060372f
```

Function symbols consist of three fields: the symbol name, the lower bound, and the upper bound.

The lower and upper bound values are each 32-bit values, defined by numerals in the radix specified by the File Radix field in the file header. These values define the lower and upper limits of the range of addresses occupied by the instructions which implement a function. Both values are inclusive, which means that the specified range includes both of the bound values, as well as all of the addresses between them.

TSF Variable Symbols

The file directive "#+ Variable" introduces the variable symbol section of a TSF Range file. The file directive tells the file reader that the following symbols represent variables, as opposed to functions or source statements. If no symbol type file directive is given, the function symbol type is assumed.

```
#+ Variable
#          Symbol Name              Low      High
# ============================== ======== ========
menu                             00000100 00000102
userMenu1                        000004c0 000004c2
binBits                          000004d4 000004d6
```

Variable symbols consist of three fields: the symbol name, the lower bound, and the upper bound. Variable symbols are just like function symbols except that they define the address range occupied by a variable, instead of function. The lower and upper bound values of a variable symbol are inclusive, meaning that they are themselves a part of the range. For variables occupying only a single byte in memory, the lower and upper bound values are equal.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TSF Source Symbols

The file directive "#+ Source" introduces the source symbol section of a TSF range file. The file directive tells the file reader that the following symbols represent source statements, as opposed to functions or variables. The source file directive must be followed by a file name which specifies the name of the source file containing the following source statements. Each new set of symbols for a unique source file must be introduced with an additional source file directive to specify the file name for those symbols. If no symbol type file directive is given, the function symbol type is assumed.

```
#+ Source stoplite
# Line   Low      High    Beg End  Symbol Name
# ==== ======== ======== === ===  ===========
    27 006043ec 006043ef   0  25  # stoplite_27_25
    35 006043f0 006043f5   0  23  # stoplite_35_23
    47 006043f6 006043ff   0  30  # stoplite_47_30
    48 00604400 00604409   0  30  # stoplite_48_30
    49 0060440a 00604413   0  30  # stoplite_49_30
    50 00604414 0060441d   0  30  # stoplite_50_30
    51 0060441e 00604427   0  30  # stoplite_51_30
    52 00604428 00604431   0  30  # stoplite_52_30
    56 00604432 00604437   0  17  # stoplite_56_17
    59 00604438 00604439   0  18  # stoplite_59_18
    60 0060443a 00604445   0  37  # stoplite_60_37
    61 00604446 0060444d   0  33  # stoplite_61_33
    59 0060444e 0060444f  35  39  # stoplite_59_35
    59 00604450 00604455  19  34  # stoplite_59_19
    71 00604456 00604457   0  37  # stoplite_71_37
    74 00604458 0060445f   0  35  # stoplite_74_35
    77 00604460 00604467   0  36  # stoplite_77_36
    80 00604468 0060446f   0  36  # stoplite_80_36
    83 00604470 0060447b   0  43  # stoplite_83_43
    87 0060447c 00604483   0  34  # stoplite_87_34
    71 00604484 0060448d   0  37  # stoplite_71_37
    84 0060448e 00604490   0  29  # stoplite_84_29
```

The source symbols section consists of five fields for each source statement: line number, lower address bound, upper address bound, beginning column value, and ending column value.

Source symbols do not have a name in the same sense as function or variable symbols, because there is no name associated with each of the executable statements in a source file. Instead, a source symbol has a file name, specified in the source directive, and a line number. The line number specifies the line of the source file that contains the source statement. Line numbers are always in decimal regardless of the file radix in the header.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The lower and upper bound values for a source symbol are similar to those of function and variable symbols. For source symbols, these bounds represent the range of addresses occupied by the instructions that implement a single source statement. The bound values are defined in the file radix specified in the header and can range in value from 0x00000000 to 0xFFFFFFFF. The lower and upper bound addresses are inclusive, just like other symbols. A source symbol for an instruction occupying a single memory location has matching lower and upper bound values.

The beginning and ending column fields of a source statement are optional. When present, and non-zero, they define the beginning and ending column position for the source statement. In other words, the beginning and ending column values define the location of the statement in the line. This is especially useful when there are multiple statements on a single line, because it makes it possible to define a separate symbol for each statement. When the column information is not present, or is set to zero, the symbol is assumed to correspond to the entire line.

Only a few compilers generate column information, but when the information is present, in the symbol file, the logic analyzer uses the column information to provide highly accurate source code correlation. The example source symbols on the previous page show typical column values. In most cases, only one of the column values is non-zero. This is because those lines contain only one statement, and the compiler specified only the column at which the statement ended. Some compilers specify only the beginning column position for such lines, in which case the beginning value would be non-zero and the ending value zero.

Note that there are three symbols corresponding to line 59 of the file. Line 59 of the original source file contains the following statement:

```
for (i = 0; i < NUM_STATES; i++)
```

This one line contains three separate statements. The first statement is the initialization `(i = 0)`, the second statement is the test `(i < NUM_STATES)`, and the third statement is the increment `(i++)`. Although all three statements appear on the same line, each generates a separate set of instructions, and the symbols in the example define unique address ranges for each. This enables the Source window to accurately indicate which of the three statements on the line is associated with any given address.

Each of the source symbols in the example includes a comment at the end of the line showing a symbol name. Since this is a comment, it is ignored by the symbol file reader, and is optional. When symbol files are exported by the logic analyzer, they contain comments that show the derived symbol name created by the logic analyzer itself. The name is a concatenation of the symbol file name, line number, and column number (if present). This is the symbol value that the logic analyzer will display for addresses that fall within the lower and upper bounds of a source symbol.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Appendix C: User Service

This appendix describes general care and service procedures for the logic analyzer. Additional information, such as user troubleshooting procedures and replacing LA module probe podlets, is located in the *TLA 700 Series Logic Analyzer Installation Manual*.

Mainframe and module service troubleshooting procedures are located in the service manuals (see the *Preface* for a list of manuals).

General Care

Protect the instrument from adverse weather conditions. The instrument is not waterproof.

Do not store or leave the portable mainframe where the LCD display will be exposed to direct sunlight for long periods of time.



CAUTION. *To avoid damage to the instrument, do not expose it to sprays, liquids, or solvents.*

Module Self Calibration

Use the Self Calibration property page to run self calibration procedures for installed modules and merged modules. For all modules, you should run these procedures after repair. At a minimum, you should run these procedures once a year. For the DSO module you should also run these procedures if the ambient operating temperature has changed more than 5°C since last calibration or once a week if vertical settings of 50 mV full scale or less are used.

Perform self calibration after a 30 minute warm up.

- To run the self-calibration procedure, go to the System menu and select Calibration and Diagnostics. Click Self Calibration.

NOTE. *For merged modules, you should run the self-calibration procedure on the modules as a merged pair.*

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Preventive Maintenance

Once a year the electrical performance should be checked and the instrument accuracy certified (calibrated). This service should be performed by a qualified service technician using the procedures outlined in the *TLA 700 Series Performance Verification and Adjustment Technical Reference Manual*.

Preventive maintenance mainly consists of periodic cleaning. Periodic cleaning reduces instrument breakdown and increases reliability. You should clean the instrument as needed, based on the operating environment. Dirty conditions may require more frequent cleaning than computer room conditions.

Flat Panel Display Cleaning

The TLA 704 Portable Mainframe display is a soft plastic display and must be treated with care during cleaning.



CAUTION. *Improper cleaning agents or methods can damage the flat panel display.*

Do not use abrasive cleaners or commercial glass cleaners to clean the display surface.

Do not spray liquids directly on the display surface.

Do not scrub the display with excessive force.

Clean the flat panel display surface by gently rubbing the display with a clean-room wipe (such as Wypall Medium Duty Wipes, #05701, available from Kimberly-Clark Corporation).

If the display is very dirty, moisten the wipe with distilled water or a 75% isopropyl alcohol solution and gently rub the display surface. Avoid using excess force or you may damage the plastic display surface.

Exterior Mainframe

Clean the exterior surfaces of the mainframe with a dry, lint-free cloth or a soft-bristle brush. If dirt remains, use a cloth or swab dampened with a 75% isopropyl alcohol solution. A swab is useful for cleaning in narrow spaces around the controls and connectors. Do not use abrasive compounds on any part of the mainframe.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



CAUTION. *Avoid getting moisture inside the mainframe during external cleaning; and use only enough solution to dampen the cloth or swab.*

Do not wash the front-panel On/Standby switch. Cover the switch while washing the mainframe.

Use only deionized water when cleaning. Use a 75% isopropyl alcohol solution as a cleanser and rinse with deionized water.

Do not use chemical cleaning agents; they may damage the instrument. Avoid chemicals that contain benzene, toluene, xylene, acetone, or similar solvents.

Floppy Disk Drive

The floppy disk drive requires routine maintenance to operate at maximum efficiency. The disks can be damaged if dirt and dust accumulate on the recording surfaces. To prevent damage, the disks should be properly stored in their protective containers where they will not be exposed to dust or dirt. In addition, the head should be cleaned periodically.

You will need a 3.5-inch floppy disk head-cleaning kit for routine maintenance. Perform the routine maintenance as follows:

- Clean the face of the floppy disk drive monthly with a dampened cloth.



CAUTION. *Do not allow moisture to enter the disk drive. When power is applied, the internal components may be damaged.*

- Clean the head monthly. Follow the instructions provided with the head-cleaning kit.

External Monitor, Keyboard, and Mouse

Clean the exterior surfaces of the monitor, keyboard, and mouse with a dry, lint-free cloth or a soft-bristle brush. A swab is useful for cleaning in narrow spaces around the controls and connectors. Do not use abrasive compounds on any part of the instrument.



CAUTION. *Avoid getting moisture inside the terminal during external cleaning; and use only enough solution to dampen the cloth or swab.*

Use only deionized water when cleaning. Use a 75% isopropyl alcohol solution as a cleanser and rinse with deionized water.

Do not use chemical cleaning agents; they may damage the instrument. Avoid chemicals that contain benzene, toluene, xylene, acetone, or similar solvents.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

In Case of Problems

The logic analyzer runs power-on diagnostics every time you power on the instrument. You can view the results of the diagnostics by selecting Calibration and Diagnostics from the System menu. You can run more detailed diagnostics by selecting Extended diagnostics. Here you can run all tests, loop on one or more tests, or loop on a test until a failure occurs.

Refer to the chapter *In Case of Problems* in the *TLA 700 Series Logic Analyzer Installation Manual* for information about software and hardware problems that you might encounter.

Repacking for Shipment

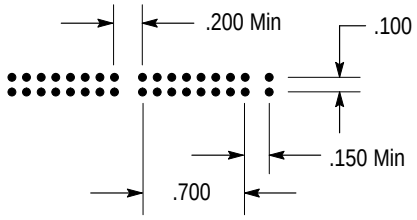
If a mainframe or module is to be shipped to a Tektronix field office for repair, attach a tag to the mainframe or module showing the owner's name and address, the serial number, and a description of the problem(s) encountered and/or service required. If you are returning a module, always return both the module and the probes so that the entire unit can be tested.

When packing an instrument for shipment, use the original packaging. If it is unavailable or not fit for use, contact your Tektronix representative to obtain new packaging.

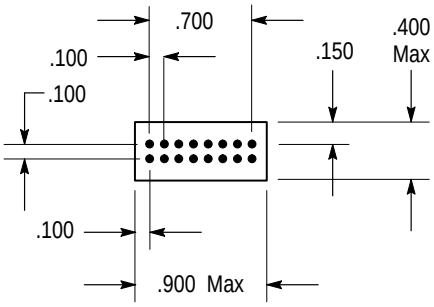
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Appendix D: Probe and Connector Information

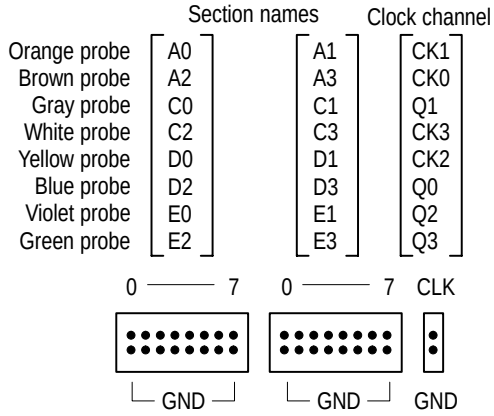
P6417 Probe Information



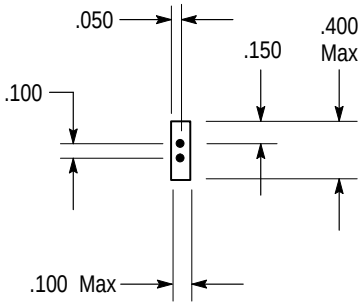
16 Channels plus one clock – pin spacing



8 Channel probe footprint



16 Channels plus one clock – grouping footprint



Single podlet footprint

Figure D–1: P6417 probe footprints

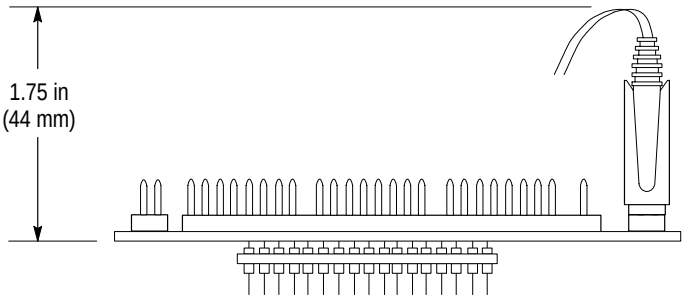


Figure D–2: P6417 probe podlet clearance

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

P6434 Probe Information

The P6434 Mass Termination probes are available as an option to the TLA 700 Series Logic Analyzer. For information on using this probe refer to the *P6434 Mass Termination Probe Instructions* (Tektronix part number 070-9793-01 or higher).

You can also access a PDF file for design guideline instructions at the following web site:

`http://www.tek.com/Measurement/Support`

Use the following instructions to access the PDF files at the above web site:

1. Click Application Support Files.
2. Scroll to the TLA7xx Files Area.
3. Click p6434.pdf to download the design-in guideline titled *Mass Termination Probe Document*.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Benchtop Mainframe Remote On/Standby Switch

The 25-pin Sub-D connector at the rear of the benchtop mainframe provides remote on and off capability. Figure D–3 shows the connector.

Connect only a momentary switch or an open collector device to pin 5 of the connector. By momentarily grounding this line, the mainframe will toggle from on to standby (or vice versa). The state changes on the falling edge of the signal. Hold the signal low for at least 500 ms before releasing.

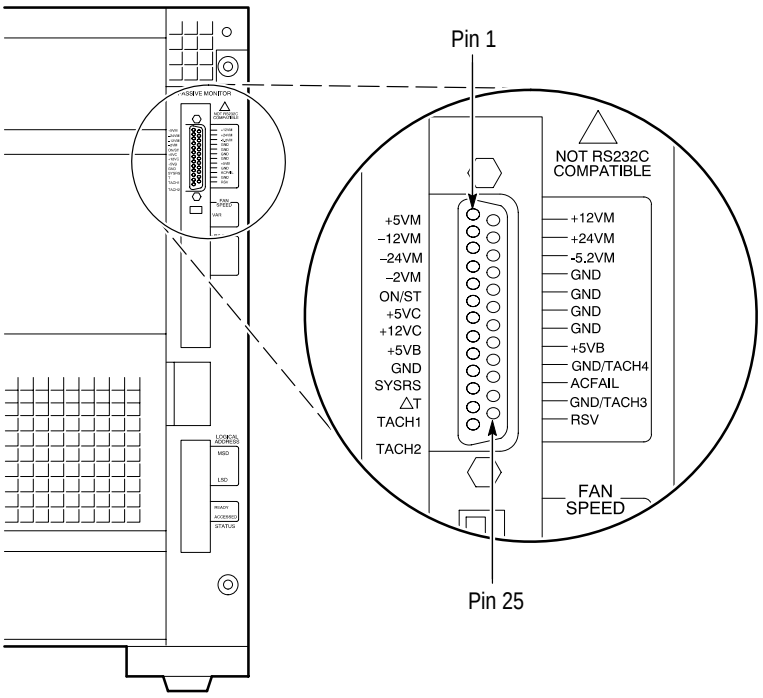


Figure D–3: Connector used for remote On/Standby switch

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Glossary

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Glossary

AC coupling
A DSO mode that blocks the DC component of a signal but passes the dynamic (AC) component of the signal. Useful for observing an AC signal that is normally riding on a DC signal.

Acquisition
The process of sampling signals from input channels, processing the results, and displaying the data.

Active module
The module highlighted by the pointer in the System window.

Aliasing
The condition that occurs when data is sampled at a rate slower than the rate at which data changes. When this happens, misleading data is displayed because the instrument misses the changes in data that occurred between sample points. Data pulses that fall between samples meet the technical definition of a glitch and are stored and displayed as glitches. See also *asynchronous acquisition* and *glitch*.

For DSO data, the displayed waveform may appear to be untriggered and much lower in frequency. For complex waveforms, distortion occurs due to the impact of aliasing on the high-order harmonics.

All samples
A Histogram window term. The total number of data samples analyzed.

Arm
To specify when the module should begin looking for a trigger.

Assert
To cause a signal or line to change from its logic false state to its logic true state.

Asynchronous acquisition
An acquisition that is made using a clock signal generated internally by the logic analyzer. This clock is unrelated to the clock in the system under test, and you can set it to a different rate. You should use an asynchronous clock rate that is five to ten times faster than your data rate to avoid aliasing. See also *Aliasing*.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Attenuation
The degree the amplitude of a signal is reduced when it passes through an attenuating device such as a DSO probe or attenuator (the ratio of the input measure to the output measure). For example, a 10X probe attenuates, or reduces, the input voltage of a signal by a factor of 10.

Clause
A trigger program term. The combination of one or more events (If statements) or actions (Then statements). When the Event is satisfied, the action is performed. See also *State*.

Clock cycle
A clock sequence that includes both high- and low-going transitions.

Clock equation
The Boolean combination of events needed to generate a storage clock. You can define a variety of clock inputs and link them using Boolean operators. Data will be sampled and stored in memory only when this clock equation is true.

Clock qualification
The process of filtering out irrelevant data by combining an acquisition clock with one or more bus signals.

Clock qualifier
An external signal that acts as a gate for the acquisition clock. When the external signal is false, the acquisition clock is not allowed to load acquired data into the acquisition memory.

COFF file formats
The COFF (Common Object File Format) format contains a number of variations and extensions, such as ECOFF and XCOFF. This flexibility enables it to be used with a wide variety of different microprocessors. Some code-generation tool vendors also extend this format in non–standard ways that may make their files unreadable by the TLA 700 logic analyzers.

Counter
A trigger program device that records occurrences of an event.

Cursors
Paired markers that you can use to make measurements between two data locations.

Custom clocking
Custom clocking is used only with microprocessor support packages. Custom clocking can enable and disable a variety of microprocessor-specific clock cycle types (such as DMA cycles).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Data differences
Highlighted data in a Listing or Waveform window that indicate that there are differences between the acquired data and saved data during a compare operation.

Data equalities
Highlighted data in a Listing or Waveform window that indicate that there are no differences between the acquired data and saved data during a compare operation.

Data sample
The data logged in during one occurrence (or one cycle) of the acquisition clock. A data sample contains one bit for every channel.

Data window
A window used to display acquired data. There are two types of data windows, Listing windows and Waveform windows.

DC coupling
A DSO mode that passes both AC and DC signal components to the DSO circuit. Available for both the trigger system and the vertical system.

Delta measurement
The difference between two points in memory. For example, the voltage difference between the two cursors in a selected waveform.

Demultiplex
To identify and separate multiplexed signals (for instance, some signals from a microprocessor). To separate different signals sharing the same line and organize those signals into useful information.

Digital real-time signal acquisition
A digitizing technique that samples the input signal with a sample frequency of four to five times the DSO bandwidth. Combined with sin(x)/x interpolation, all frequency components of the input up to the bandwidth are accurately displayed.

Digitizing
The process of converting a continuous analog signal such as a waveform to a set of discrete numbers representing the amplitude of the signal at specific points in time.

Don’t care
A symbol (X) used in place of a numeric character to indicate that the value of a channel or character is to be ignored.

Edge
A signal transition from low to high, or high to low.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Edge trigger
Triggering that occurs when the module detects the source passing through a specified voltage level in a specified direction (the trigger slope).

Event condition
Event conditions are a logical combination of trigger events within a single clause. If you set up a logical AND statement, all event conditions in the clause must be fulilled before the clause can execute the action. If you set up a logical OR statement, any one of the event conditions can be fulfilled before the clause can execute the action.

External clock
A clock external to the logic analyzer and usually synchronous with the system under test.

Internal signal
An internal communication line that can be set as a marker. An internal signal can be used as either an event or an action in a trigger program. When used as an event, the internal signal is tested for true/false value like any other event; when used as an action, the signal can simply be set or cleared as the result of a condition being satisfied.

Glitch
An unintentional signal that makes a transition through the threshold voltage two or more times between successive sample clock cycles. Noise spikes and pulse ringing are examples of glitches.

Ground (GND) coupling
A DSO coupling option that disconnects the input signal from the vertical system.

Histogram window
A data window used to observe the performance of software routines.

IEEE695 file format
This object file format refers to the IEEE695 specification. This format is used primarily by compilers for a wide variety of Motorola microprocessors and compatible microprocessors from other vendors. This format provides for the inclusion of column information in source symbols, but not all compilers use this capability.

Internal clock
A clock mode in which the sampling of input logic signals occurs asynchronously to the activity of the system under test.

Interpolation
Display method used to connect the sample points acquired and display them as a continuous waveform. The logic analyzer uses sin(x)/x interpolation to display DSO signals.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Linear generation
A Histogram window term. The histogram ranges are evenly distributed from the highest range boundary to the lowest range boundary.

Listing window
A data window used to observe the data flow in the system under test. The acquired data is displayed in a listing (tabular text) format.

Log generation
A Histogram window term. The histogram ranges are distributed over a logarithmic scale.

MagniVu data
High-speed data stored in a special memory.

Matched samples
A Histogram window term. The total number of data samples analyzed that matched a defined range. These samples exclude any samples outside of the defined ranges.

Merge modules
To physically or logically join two LA modules together to form a single module with greater channel width.

Microprocessor support
Optional microprocessor support software that allows the logic analyzer to disassemble data acquired from microprocessors.

Mnemonic disassembly
A display format for data acquired from a microprocessor or a data bus. A logic analyzer decodes bus activity and displays it in formats such as: cycle types, instruction names, and interrupt levels. Advanced forms of mnemonic disassembly can detect queue flushes, and provide a display that resembles the original assembly language source code listing.

Module
The unit that plugs into a mainframe, providing instrument capabilities such as logic analysis.

Module trigger (trigger)
A trigger specific to a single module. When a module trigger occurs, the module continues to acquire data until the specified amount of posttrigger data is acquired, and then stops.

OMF86 file format
A file format that holds symbolic information and executable images for an 8086 or equivalent microprocessor. It is also used for code intended to run on 80286, 80386, or higher-level microprocessors in real or 8086-compatible mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

OMF286/386 file formats
These file formats hold symbolic informaton and executable images for 80286 80386, or equivalent microprocessors. They are also used for executable images intended to run on the 8086 or other microprocessors in the 80x86 families.

Podlet
A circuit contained in a flex lead and attached to a probe that provides square-pin connections to the circuit under test for one data acquisition channel and a ground pin.

Pretrigger
The specified portion of the data record that contains data acquired before the trigger event.

Probe adapter
A microprocessor-specific lead set that connects the LA module probe to a system under test.

Qualification gap
Qualification gaps indicate that data samples were not stored due to storage qualification or Don't Store trigger actions. In a Listing window, qualification gaps are indicated by a horizontal gray line. In a Waveform window, qualification gaps are indicated by a blank vertical gap.

Range recognizer
A trigger term. Use range recognizers to trigger the logic analyzer on ranges of data.

Record length
The specified number of samples in an acquisition.

Sample clock
The clock signal that determines the points in time when the module samples data. A sample clock can be set up to occur at regular intervals specified by an internal clock (asynchronous acquisition), or to occur when a Boolean expression combining an external clock and qualifier signals is "true" (synchronous acquisition).

Sample rate
The frequency at which data is logged into the logic analyzer.

Sampling
The process of capturing an input signal, such as a voltage, at a discrete point in time and holding it constant so that it can be quantized.

Skew
The relative time difference between input channels, specified in terms of one edge relative to another. Also, the misrepresentation of data caused by parallel channels with different propagation delays.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Source Window
A data window where you can view the execution of source code.

Standby (STBY)
The off-like state when the instrument in not in use. Some circuits are active even while the instrument is in the standby state.

State
A trigger program term. A step in a trigger program, made up of one or more clauses. See also *clause*.

Storage qualification
The process of filtering out data that has been acquired but which you do not want to store in acquisition memory. This allows you to avoid filling up your module's acquisition memory with irrelevant data samples.

Symbolic range generation
A Histogram window term. The histogram ranges are defined in a range symbol file. The highest and lowest ranges depend on the maximum and minimum boundaries for the ranges defined in the symbol file.

Symbolic radix
A format that allows you to substitute mnemonics (names) for radix numbers in the Trigger and data windows.

Synchronous acquisition
An acquisition that is made using a clock signal generated external to the logic analyzer. This clock is usually the clock in the system under test. The external clock is usually synchronous with the system under test and may or may not be periodic.

System trigger (trigger all)
An overriding command to all modules that causes them to stop looking for a trigger, and to acquire their posttrigger data, regardless of whether they have been armed or have fulfilled their own trigger conditions. The system trigger also functions as the primary reference point for the entire data acquisition. In data windows, timing and location information is relative to the system trigger.

Time correlation
The tracking of independent events captured by different modules and indicating how they relate to each other in time. Specifically, the chronological interleaving of data from different modules into a single display. Shows real-time interactions between independently clocked circuits.

Time stamp
A separate clock value stored with each acquisition cycle.

Timer
A trigger program device that records elapsed time.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Threshold voltage
The voltage to which the input signals are compared.

Trigger
An event or condition that leads to the end of an acquisition cycle. When started, the instrument continuously acquires data from a system under test until the trigger occurs. After triggering, the instrument continues to acquire data until the post-fill requirement is met.

Trigger library
A collection of predefined trigger programs for the LA module. You can load an individual program into the Trigger window and modify it for your requirements.

Trigger position
Where the trigger resides in acquisition memory. Electing to place the trigger in the center of memory means that half of the acquisition consists of data that occurred after the trigger.

Trigger program
A series of conditions, similar to software code, that defines the data you want to capture and view. The trigger program also specifies actions for data events. The trigger program filters acquired data to find a specific data event, or series of data events. The trigger program can accept information from other modules, or send signals external to the logic analyzer.

Unassert
To cause a signal or line to change from its logic true state to its logic false state.

Waveform window
A data window used to observe timing relationships in the system under test. The acquired data is displayed as a series of waveforms.

Word recognizer
A trigger term. Word recognizers are specific patterns of data or words. Use word recognizers to trigger the logic analyzer on specific data combinations.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Index

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Index

Symbols

.tbf format
  DSO module data, 3–84
  LA module data, 3–84

A

AC coupling, Glossary–1
Accelerator keys
  general purpose data window, 3–51
  Histogram window, 3–108
  Listing window, 3–86
  menu keys, 3–40
  Source window, 3–100
  Waveform window, 3–70
Acquisition, 2–1, 3–41, Glossary–1
  asynchronous, 2–3, Glossary–1
  DSO module, 2–1
  LA module, 2–1
  MagniVu data, 3–62, 3–79
  mode, 3–8
  module relationship, 2–7
  synchronous, 2–2, Glossary–7
Active Cursor readout, 3–94
Active module, Glossary–1
Activity Indicators dialog box, 3–11
Add Column dialog box, 3–80
Add Waveform dialog box, 3–66
Advanced clocking, 3–8
Aliasing, 2–14, Glossary–1
  bandwidth filters, 3–27
Aligning data, 3–49
All samples, Glossary–1
Arm, Glossary–1
  arming modules, 3–31
  indicator, 3–1
Assert, Glossary–1
Asynchronous acquisition, 2–3, Glossary–1
  See also Internal clock
Attenuation, 2–4, Glossary–2
Autoset, 3–26

B

Bandwidth, DSO module setup, 3–27
Basic concepts, 2–1
Binary data, exporting, 3–83
Block diagram
  DSO module, 2–4, *2–5*
  LA module, 2–2
Blocks mode, 3–8
Busforms, 2–12, 3–54

C

Calibration
  See also Self calibration
  DSO probe, 3–25
Change detectors, 3–21
Channel activity, 3–11
Channel group, 3–9
  adding/removing channels, 3–10
  hardware order, 3–9
  name, 3–10, 3–67, 3–81
  polarity of channels, 3–10
  probe thresholds, 3–12
Clause, 3–13, Glossary–2
Clause Definition dialog box, 3–18, 3–23, 3–31
Cleaning, C–2
  LCD display, C–2
Clock, 2–2
  advanced, 3–8
  custom, 3–8
  cycle, Glossary–2
  DSO module, 3–28
  equation, 3–7, Glossary–2
  external, 2–2, 3–7, Glossary–4
  internal, 2–3, 3–7, Glossary–4
  multiple-phase, 3–8
  problems, 3–44
  qualification, Glossary–2
  qualifier, Glossary–2
  sample clock, 3–7, 3–28, Glossary–6
  sample clock waveform, 3–56
  sample rate vs. memory depth, 3–9
COFF file formats, Glossary–2
Color in data windows, 3–39, 3–68, 3–81, 3–97, 3–105
Column
  adding, 3–80
  changing width, 3–80
  cut, copy, and paste, 3–80
  cutting, 3–80
  moving, 3–80
  naming, 3–81
  order, 3–10
Columns, sizing histograms, 3–104
Compare data, displaying, 3–63, 3–75

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Comparing
listing data, 3–75
waveform data, 3–63
Comparing data, 2–18
Connectors
See also External signals
external, 1–19
Remote On/Standby switch, D–3
Contacting Tektronix, xv
Copying text, 3–80, 3–97
Correlation. *See* Time correlation
Counter, Glossary–2
Coupling, 3–27
Creating a Histogram window, 3–103
Creating a Source window, 3–88
Cursors, 3–56, 3–58, 3–71, 3–75, 3–89, 3–92, Glossary–2
Custom clock, 3–8
Custom clocking, Glossary–2
Cutting
columns, 3–66, 3–80
columns, marks, 3–80
marks, 3–97
waveforms, marks, 3–67

D

Data, exporting, 3–82, 3–106
Data differences, Glossary–3
Data equalities, Glossary–3
Data marks, 3–56, 3–57, 3–71, 3–73, 3–89, 3–90
Data sample, Glossary–3
Data source, adding, 3–66, 3–80
Data window, 1–11, 3–47, Glossary–3
marks, cursors, and indicators, 3–71
splitting the data area, 3–81
Data, saving and loading. *See* Saved files
DC coupling, Glossary–3
Default settings, 3–39
Deleting. *See* Cutting
Delta measurement, 3–58, 3–75, Glossary–3
Demultiplex, Glossary–3
clock setting, 3–8
Diagnostics, C–4
Differences. *See* Data differences
Digital real-time signal acquisition, Glossary–3
Digitizing, 2–1, Glossary–3
Digitizing storage oscilloscope module. *See* DSO module
Disabling modules, 3–2
Disassembly format, changing, 3–81
Documentation list, xiii
Don't care, Glossary–3
DSO, data, viewing in a Listing window, 2–8
DSO module
acquisition, 2–1
block diagram, 2–4
description, 1–2
export binary data, 3–84
horizontal controls, 3–28
self calibration, C–1
setup, 3–24
trigger controls, 3–28
vertical controls, 3–26
DSO probe calibration, 3–25
DSO setup, Autoset, 3–26
DSO Setup window, 3–24
DSO Trigger window, 1–10, 3–28

E

ECOFF. *See* COFF file formats
Edge, Glossary–3
Edge trigger, Glossary–4
Equalities. *See* Data equalities
Equation. *See* Clock, equation
Event condition, Glossary–4
Exporting
binary data, 3–83
histogram data, 3–106
listing data, 3–82
text data, 3–83
Exporting data, 3–82
Extended diagnostics, C–4
External
clock, 2–2, 3–7, Glossary–4
signal connectors, 1–19, 3–30
signals, 3–30, 3–32, 3–33

F

File name extension
saved files, 3–36
symbol files, B–1
Font in Histogram window, 3–104
Font in Listing window, 3–79
Font in Source window, 3–97
Front panel controls, 1–18
Function symbols, B–5

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

G

Gap, qualification, 3–81, Glossary–6
General maintenance, C–1
GlidePoint pad, 1–18
Glitch, 2–16, 3–8, Glossary–4
  glitch mode, 3–8
  Listing window, 3–81
  Waveform window, 3–67
Go To dialog box, 3–59, 3–73, 3–90
Ground (GND) coupling, Glossary–4
Ground line indicator in DSO waveforms, 3–55

H

Help, online, 1–20
High-level language, 2–10, 3–87
High-speed timing. *See* MagniVu data
Histogram ranges
  defining, 3–105
  linear generation, 3–105
  log generation, 3–105
  symbols, 3–105
Histogram window, 1–13, 2–17, 3–101, Glossary–4
  accelerator keys, 3–108
  changing font size, 3–104
  clearing counts, 3–104
  columns, 3–104
  creating, 3–103
  customizing the display, 3–105
  exporting data, 3–106
  hot keys, 3–108
  magnification, 3–105
  measuring events, 3–103
  printing, 3–107
  shortcut keys, 3–108
  sorting data, 3–104
  splitting the data area, 3–105
  stopping analysis, 3–104
  viewing address activity, 3–102
Horizontal controls
  DSO setup, 3–28
  Waveform window, 3–67
Hot keys
  general purpose data window, 3–51
  Histogram window, 3–108
  Listing window, 3–86
  menu keys, 3–40
  Source window, 3–100
  Waveform window, 3–70

I

IEEE695 file format, Glossary–4
Installation, 1–2
Intermodule signals, 3–32
Internal clock, 2–3, 3–7, Glossary–4
Internal signal, 3–32, 3–45, Glossary–4
Interpolation, 2–15, Glossary–4

J

Jumping to specific data locations, 3–59, 3–73, 3–90

K

Keypad, 1–18

L

LA module
  acquisition, 2–1
  block diagram, 2–2
  description, 1–1
  export binary data, 3–84
  self calibration, C–1
  setup, 3–3
  trigger setup, 3–12
LA Setup window, 3–3
LA Trigger window, 1–9, 3–12
  window structure, 3–14
Label. *See* Naming
Library, trigger, 3–16
  creating your own trigger library, 3–38
Linear generation, 3–105, Glossary–5
Listing window, 1–11, 3–71, Glossary–5
  See also Data window
  accelerator keys, 3–86
  changing font size, 3–79
  columns, 3–80
  cursors, 3–75
  customizing the display, 3–81
  disassembly format, 3–81
  exporting binary data, 3–83
  exporting data, 3–82
  exporting text data, 3–83
  hot keys, 3–86
  jumping to specific data locations, 3–73
  locking data windows together, 3–78
  printing, 3–85

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

qualification gaps, 3–81
searching data, 3–77
shortcut keys, 3–86
viewing DSO data, 2–8
Listing-data concepts, 2–8
Load Symbol Options dialog box, 2–25
Load System Options dialog box, 3–37
Loading a trigger program, 3–18
Loading symbol files, 2–25
Locking windows, 3–61, 3–78
Log generation, 3–105, Glossary–5
Logic analyzer
basic concepts, 2–1
conceptual model, 2–6
description, 1–1
physical model, 2–5
specifications, A–1
Logic analyzer module. *See* LA module

M

Magnifying data in Histogram windows, 3–105
Magnitude mode, 2–12
Magnitude waveforms, 3–54
MagniVu data, 1–15, 2–7, 2–14, 2–15, 3–62, 3–79, Glossary–5
Mainframe utilities, 1–3
Manuals list, xiii
Marks, 3–56, 3–57, 3–71, 3–73, 3–89, 3–90
cut, copy, and paste, 3–67, 3–80, 3–97
using the mark bar to jump to a new location, 3–59, 3–74, 3–91
Matched samples, Glossary–5
Measuring counter or timer events in Histogram windows, 3–103
Measuring using cursors, 3–58, 3–75
Memory compare, 3–4
channel setups, 3–5
guidelines, 3–6
Memory depth, 2–14, 3–9, 3–28
See also Storage qualification
Merge modules, 3–34, Glossary–5
self calibration, 3–35, C–1
Microprocessor support, 3–4, 3–81, Glossary–5
channel grouping, 3–9
custom clock, 3–8
Mnemonic disassembly, Glossary–5
Module, 2–5, 2–6, Glossary–5
arming another module, 3–31
disabling, 3–2
identifying slot number, 3–2
intermodule interactions, 2–7
joining two LA modules. *See* Merge modules
self calibration, 3–34, C–1
time correlation, 2–7
turning on/off, 3–2
Module trigger, Glossary–5
Multiple-phase clocking, 3–8

N

Naming
channel groups, 3–10
columns, 3–81
merged module probe names, 3–35
waveforms, 3–67
windows, 3–2
New Data Window wizard, 3–50
Next Mark and Previous Mark buttons, 3–94
Normal acquisition mode, 3–8

O

Offset
DSO module, 3–27
range symbols, 2–26, B–2
OMF286/386 file formats, Glossary–6
OMF86 file format, Glossary–5
On/Standby switch, 1–2
Online help, 1–20
Options, system, 3–39

P

Pattern symbols, 2–22, B–3
PC card connector, 1–19
Performance analysis, 2–17
Podlet, Glossary–6
Pointing device, 1–18
Polarity, LA channels, 3–10
Power-off procedure, 1–3
Power-on diagnostics, C–4
Power-on procedure, 1–2
Pretrigger, Glossary–6
Preventive maintenance, C–2
cleaning, C–2
disks, floppy disk drive, C–3
LCD display, C–2
Printing
Histogram window, 3–107
Listing window, 3–85
Source window, 3–99
Waveform window, 3–69

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Probe adapter, Glossary–6
Probe calibration, DSO module, 3–25
Probe channel activity, 3–11
Probe Channels/Names table, 3–10
Probe podlet, Glossary–6
Probe thresholds
  DSO vertical input, 3–26
  LA channels, 3–12
Programmatic control, 1–17
Property sheets, 3–68, 3–81, 3–97, 3–105

Q

Qualification
  clock, Glossary–2
  gaps, 3–81, Glossary–6
  storage, 2–3, 3–23, Glossary–7
Qualifier, clock, Glossary–2

R

Radix, 3–81
  binary, glitch display, 3–81
  changing, 3–81
  symbolic, 2–21, 3–81, Glossary–7
Range readouts in DSO waveforms, 3–55
Range recognizer, Glossary–6
Range recognizers, 3–9, 3–21
Range symbols, 2–22, B–4
Record length, 3–9, 3–23, 3–28, Glossary–6
Remote On/Standby switch, D–3
Renaming. *See* Naming
Repacking for shipment, C–4
Repetitive acquisition, 3–42
Run/Stop button, 3–41

S

Sample
  clock, 2–2, 2–14, 3–7, 3–56, Glossary–6
  data, Glossary–3
  period, DSO, 3–28
  rate, 2–13, 2–14, Glossary–6
Sampling, Glossary–6
Sampling and digitizing a signal, 2–1
Sampling resolution, 2–13
Saved files, 1–15, 3–35, 3–36
  backing up, 1–17
  file name extension, 3–36
  loading, 3–36
    saved data, 3–38
    saved trigger, 3–38
    setups and trigger programs, 3–37
    system file, 3–37
  module and system, 2–6
  saving, 3–36
  trigger programs, 3–24
Saving setups, triggers, or data. *See* Saved files
Scan Listing box, 3–92
Searching data, 3–60, 3–77, 3–95
Self calibration, 3–35, C–1
Service, user, preventive maintenance, C–2
Setup window, 1–8, 3–1
  See also DSO Setup window; LA Setup window
Setups, saving and loading. *See* Saved files
Shipping, C–4
Shortcut keys
  general purpose data window, 3–51
  Histogram window, 3–108
  Listing window, 3–86
  menu keys, 3–40
  Source window, 3–100
  Waveform window, 3–70
Signals property page, 3–32
Sin(x)/x interpolation, 2–15
Single-run acquisition, 3–42
Skew, Glossary–6
Slot numbers, 3–2
Sorting data in Histogram windows, 3–104
Source Files property page, 3–97
Source symbols, B–6
Source window, 1–14, 3–87, Glossary–7
  accelerator keys, 3–100
  buttons, 3–93, 3–94
  changing font size, 3–97
  creating, 3–88
  cursors, 3–92
  customizing the display, 3–97
  hot keys, 3–100
  jumping to specific data locations, 3–90
  marks, cursors, and indicators, 3–89
  printing, 3–99
  scan listing, 3–92
  searching data, 3–95
  shortcut keys, 3–100
  Source Files property page, 3–97
Specifications, A–1
Splitting the data area, 3–68, 3–81, 3–105
Standby (STBY), Glossary–7
Starting and stopping acquisition, 3–41
State, 3–13, Glossary–7
State display. *See* Listing window
Status bar, hiding, 3–39

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Status Monitor, 3–43
Step Forward and Step Backward buttons, 3–93
Storage qualification, 2–3, 3–23, Glossary–7
Storing data, 2–4, 2–5
Support package. *See* Microprocessor support
Symbol files
  function symbols, B–5
  loading, 2–25
  pattern symbols, B–3
  range, B–4
  source symbols, B–6
  variable symbols, B–5
  viewing the status, 2–24
Symbolic radix, 2–21, Glossary–7
Symbolic range generation, Glossary–7
Symbols
  function symbols, B–5
  histogram ranges, 3–105
  pattern symbols, B–3
  range, B–4
  source symbols, B–6
  variable symbols, B–5
Symbols and symbol files, 2–21
  file name extension, B–1
  TLA 700 symbol file format (TSF), B–1
Symbols dialog box, 2–24
Synchronous acquisition, 2–2, Glossary–7
  See also External clock
System defaults, 3–39
System options, 3–39
System trigger, 3–30, 3–49, Glossary–7
System window, 1–7, 3–1, 3–48

T

Technical support, xv
Tektronix binary format, 3–84
Tektronix, contacting, xv
Text data, exporting, 3–83
Threshold voltage, Glossary–8
Thresholds
  DSO vertical input, 3–26
  indicator in DSO waveform, 3–55
  LA channels, 3–12
Time Alignment dialog box, 3–49
Time correlation, 2–7, 2–12, 3–49, Glossary–7
Time per div in Waveform window, 3–67
Time stamp, 2–8, Glossary–7
Timer, Glossary–7
Timing display. *See* Waveform window
TLA 700 symbol file format, B–1
Toolbar
  LA Trigger window, 3–18
  Listing window, 3–79, 3–104
  Source window, 3–96
  Waveform window, 3–65
Touch pad, 1–18
TPI, 1–17, 2–20
Trigger, 2–3, Glossary–8
  clause, 3–13, Glossary–2
  DSO module, 2–4
  DSO module setup, 3–28
  indicator, 3–1, 3–15
  LA trigger actions, 3–22
  LA trigger events, 3–20
  LA trigger resources, 3–20
  LA Trigger window configuration, 3–12
  library, 3–16
    creating your own trigger library, 3–38
  position, 3–24, 3–30, Glossary–8
  problems, 3–44
  program, 3–12, Glossary–8
    debugging, 3–44
    loading, 3–18
    saving, 3–24
    setting/clearing signals, 3–32
    structure, 3–13
  state, 3–13
  storage qualification, 3–23
  system, 3–30, 3–49, Glossary–7
    external signal, 1–19, 3–30
Trigger library, Glossary–8
Trigger program, saving and loading. *See* Saved files
Trigger window. *See* DSO Trigger window; LA Trigger window
Troubleshooting, C–4
  logic analyzer does not trigger, 3–44
TSF pattern file header, B–2
TSF range file header, B–2

U

Unassert, Glossary–8
User service
  general maintenance, C–1
  preventive maintenance, C–2

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

V

Variable symbols, B–5
Vertical controls, DSO setup, 3–26

W

Waveform data concepts, 2–11
Waveform window, 1–12, 3–53, Glossary–8
  See also Data window
  accelerator keys, 3–70
  cursors, 3–58
  customizing the display, 3–68
  hot keys, 3–70
  jumping to specific data locations, 3–59
  locking data windows together, 3–61
  marks, cursors, and indicators, 3–56
  printing, 3–69
  searching data, 3–60
  shortcut keys, 3–70
  splitting the data area, 3–68
  zoom, 3–67
Waveforms
  adding, 3–66
  busforms, 3–54
  changing height, 3–67
  changing horizontal scale, 3–67
  changing width, 3–67
  compression/expansion in display, 2–15
  cut, copy, paste, 3–67
  cutting, 3–66
  DSO ground line indicator, 3–55
  DSO range readouts, 3–55
  DSO trigger threshold indicator, 3–55
  DSO waveforms, 2–12, 3–55
  LA waveforms, 2–12
  magnitude, 3–54
  magnitude waveforms, 2–12
  moving, 3–65
  naming, 3–67
  sample clock waveforms, 3–56
  sin(x)/x interpolation, 2–15
  single-channel LA waveforms, 3–54
  types, 3–54
Weld modules. *See* Merge modules
Window
  data window, 1–11, 3–47, Glossary–3
    creating a new data window, 3–50
    opening a saved data window, 3–49
  DSO Setup window, 3–24
  DSO Trigger window, 1–10, 3–28
  Histogram window, 1–13, 3–101
  LA Setup window, 3–3
  LA Trigger window, 1–9, 3–12
  Listing window, 1–11, 3–71, Glossary–5
  locking data windows together, 3–61, 3–78
  opening, 3–2, 3–48
  overview, 1–6
  renaming, 3–2
  Setup window, 1–8
  Source window, 1–14, 3–87
  System window, 1–7, 3–1, 3–48
  Waveform window, 1–12, 3–53, Glossary–8
Word recognizer, Glossary–8
Word recognizers, 3–21

X

XCOFF. *See* COFF file formats

Z

Zoom, 3–67

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP