Logic Analyzer
Software Manual

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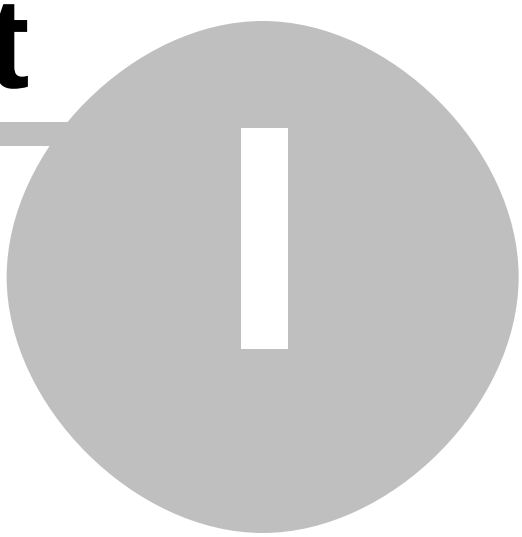


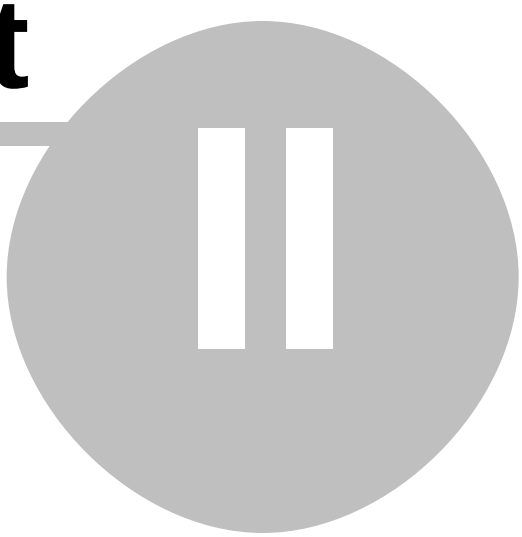
1 Installing software

Installing software

1. Insert the distribution disk into CD drive.
2. Run Windows.
3. Run windows explorer.
4. Double click on Setup.exe file.
5. Follow the on screen instructions.

Note: You must have administrator privileges to install the software in WinXP\NT\2000.

Part



2 Installing Hardware

2.1 Installing Hardware

Installing Hardware

Installing LA-4xxx W/ISA communications card

Installing LA-4xxx W/Parallel port adapter

Installing LA-4xxx W/USB adapter

Installing LA-2124 Parallel port based Logic Analyzer

2.2 Installing LA-2124 Parallel port based Logic Analyzer

Installing LA-2124 Parallel port based Logic Analyzer

Please follow these instructions for installing the LA-2124 Logic Analyzer.

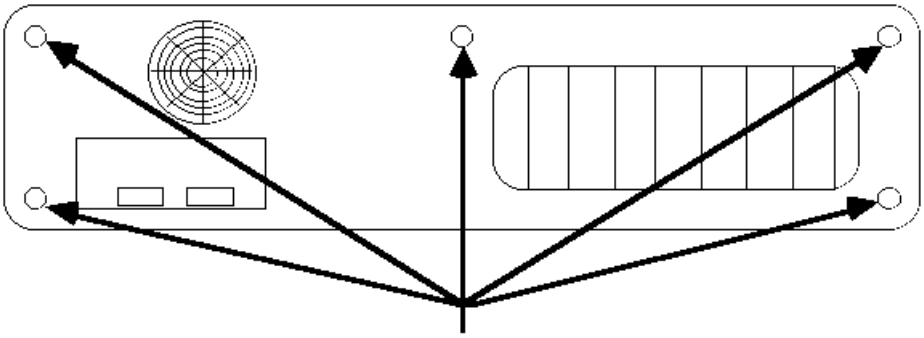
1. Locate an available parallel port.
2. Connect the included DB-25 cable to parallel port.
3. Connect the other end of the DB-25 cable to the LA-2124.
4. Plug the LA2124 power supply into the an AC outlet.
5. Plug the LA2124 power supply into the LA2124.
6. Connect the wires to the Logic Analyzer. See Connecting wires.
7. Make sure the parallel printer port is set to bi-directional mode. This is done in the bios configuration program of your computer.
8. After checking all connections, turn on the computer and peripherals. You are now ready to install the software.

2.3 Installing LA-4xxx W/ISA communications card

Installing LA-4xxx W/ISA communications card

Please follow these instructions for installing the LA-4xxx Logic Analyzer Communications Card (LA Com Card). To install the card you will need a screwdriver.

1. Turn off the computer and all peripherals connected. Remove the computer power cord from the wall outlet.
2. Disconnect any cables from the rear of the system unit as necessary, making note of their original locations.
3. Use a screwdriver to remove the screws on the back of the computer holding the cover on. Refer to your computer manual for more details on cover removal.



Remove These Five Screws

4. Slide the cover of the computer off and put it aside.
5. Locate an empty slot.
6. Remove the slot cover and its screw from the empty slot, retaining the screw to secure the LA Com Card.
7. See the *Technical Information: Hardware Address Information* section at the end of the manual for how to set the hardware address and make sure that you don't have an address conflict.
8 Carefully insert the LA Com Card into the empty slot, making sure the connector is guided smoothly through the slot opening. Verify that the card edge is securely seated in the slot connector.
9. Secure the LA Com Card with the screw removed with the slot cover.
10. Replace the cover of the computer and secure it with the screws as before.
11. Replace all cables as found before.
12. Connect the Logic Analyzer to the LA Com Card. The connector is keyed so that it will connect one way only.
13. Connect the pods and wires to the Logic Analyzer. See Installing Pods and Connecting wires.
14. Re-connect the power cable to the computer.
15. After checking all connections, turn on the computer and peripherals. You are now ready to install the software.

2.4 Installing LA-4xxx W/Parallel port adapter

Installing LA-4xxx W/Parallel port adapter

Please follow these instructions for installing the LA-4xxx Logic Analyzer Parallel port adapter.

1. Locate an available parallel port.
2. Connect the included DB-25 cable to parallel port.
3. Connect the other end of the DB-25 cable to the LA4-LPT-ADAP adapter.
4. Plug the LA4-LPT-ADAP power supply into the an AC outlet.
5. Plug the LA4-LPT-ADAP power supply into the LA4-LPT-ADAP adapter.
6. Connect the Logic Analyzer cable to the LA4-LPT-ADAP adapter. The connector is keyed so that it will connect one way only.
7. Connect the Logic Analyzer cable to the Logic Analyzer.
8. Connect the pods and wires to the Logic Analyzer. See Installing Pods and Connecting wires.
9. Make sure the parallel printer port is set to bi-directional mode. This is done in the bios configuration program of your computer.
10. After checking all connections, turn on the computer and peripherals. You are now ready to install the software.

2.5 Installing LA-4xxx W/USB adapter

Installing LA-4xxx W/USB adapter

Please follow these instructions for installing the LA-4xxx Logic Analyzer USB adapter.

1. Locate an available USB port.
2. Connect the included USB cable to USB port.
3. Connect the other end of the USB cable to the LA4-USB-ADAP adapter.
4. Plug the LA4-USB-ADAP power supply into the an AC outlet.
5. Plug the LA4-USB-ADAP power supply into the LA4-USB-ADAP adapter.
6. Connect the Logic Analyzer cable to the LA4-USB-ADAP adapter. The connector is keyed so that it will connect one way only.
7. Connect the Logic Analyzer cable to the Logic Analyzer.
8. Connect the pods and wires to the Logic Analyzer. See Installing Pods and Connecting wires.
9. After checking all connections, turn on the computer and peripherals. You are now ready to install the software.

Note: When windows asks for the driver disk insert CD with driver or direct windows to the location of Link Instruments USB driver LINKUSB.INF file.

2.6 Connecting pods to LA4xxx series

Connecting pods to the Logic Analyzer

LA-4240-32k
LA-4540-128k

These analyzers have 1 row (Labeled "Board 1") of connectors for 5 pods.
The connectors are labeled 1A, 2A, 3A, 4A and 5A. Connect Pod 1(Ch 0..7), Pod 2(Ch 8..15), Pod 3(Ch 16..23), Pod4(Ch24..31), and pod 5(Ch32..39) to those connectors.

LA-4280-32k
LA-4580-128k

These analyzers have 2 rows (Labeled "Board 1" and "Board 2") of connectors for 10 pods.

"Board 2" is for channels 40..79
he connectors are labeled 1B, 2B, 3B, 4B and 5B. Connect Pod 1(Ch 0..7), Pod 2(Ch 8..15), Pod 3(Ch 16..23), Pod4(Ch24..31), and pod 5(Ch32..39) to those connectors.

"Board 1" is for channels 0..39
he connectors are labeled 1A, 2A, 3A, 4A and 5A. Connect Pod 1(Ch 0..7), Pod 2(Ch 8..15), Pod 3(Ch 16..23), Pod4(Ch24..31), and pod 5(Ch32..39) to those connectors.

LA-45160-128k

This analyzer has 4 rows (Labeled "Board 1", "Board 2", "Board 3" and "Board 4") of connectors for 20 pods.

"Board 4" is for channels 120..159
The connectors are labeled 1D, 2D, 3D, 4D and 5D. Connect Pod 1(Ch 0..7), Pod 2(Ch 8..15), Pod 3(Ch 16..23), Pod4(Ch24..31), and pod 5(Ch32..39) to those connectors.

"Board 3" is for channels 80..119
The connectors are labeled 1C, 2C, 3C, 4C and 5C. Connect Pod 1(Ch 0..7), Pod

2(Ch 8..15), Pod 3(Ch 16..23), Pod4(Ch24..31), and pod 5(Ch32..39) to those connectors.

"Board 2" is for channels 40..79
The connectors are labeled 1B, 2B, 3B, 4B and 5B. Connect Pod 1(Ch 0..7), Pod 2(Ch 8..15), Pod 3(Ch 16..23), Pod4(Ch24..31), and pod 5(Ch32..39) to those connectors.

"Board 1" is for channels 0..39
The connectors are labeled 1A, 2A, 3A, 4A and 5A. Connect Pod 1(Ch 0..7), Pod 2(Ch 8..15), Pod 3(Ch 16..23), Pod4(Ch24..31), and pod 5(Ch32..39) to those connectors.

Note:
Any of the input channels can be used as "Trigger-in"

See also: Connecting wires.

2.7 Connecting wires to Logic Analyzer

Connecting wires to Logic Analyzer

LA-4240-32k
LA-4540-128k
LA-4280-32k
LA-4580-128k
LA-45160-128k

Each pod has 8 channels and 3 ground connections. Each of the grounds is tied together. Push wires onto the posts. Make sure that the wire is actually on the post. It is possible to jam the wire between the post and the plastic case and not make a connection.

The BNC on the back on the Logic Analyzer is a trigger out signal. This pin goes low when you hit Go and then goes to logic High when the instrument triggers.

LA-2124-128K

The LA-2124-128K has 40 pins. They are organized as follows:

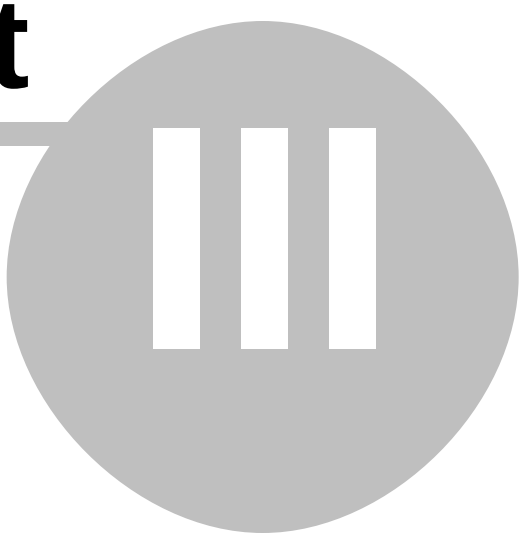
Top row:

0..15	Channels 0..15
CLK	External clock input
Trig	External trigger out. This pin goes low when you hit Go and then goes to logic High when the instrument triggers.
GND	Ground connection

Bottom row:

16..23	Channels 16..23
NC	Not connected
GND	Ground connection

Part



3 How to

3.1 How to: Your first capture

How to: Your first capture

1. Threshold Voltage

The Logic Analyzer determines a Logic "1" from a Logic "0" with the Threshold voltage. Signals below the Threshold Voltage are considered a logical "0" (low) and signals above it are "1" (high).

2. Trigger word

The Logic Analyzer can be configured to acquire data when a certain bit pattern occurs. This bit pattern is called a trigger word.

The trigger word is a group of bits that is made of 0, 1 and X (don't care) values. Each of these values represent one of the LA channels.

Example:

If the trigger word = "XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXX1". The Logic Analyzer will trigger when channel 0 goes to logic high.

If the trigger word = "XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX XXXXXX01". The Logic Analyzer will trigger when channel 0 is high and channel 1 is low at the same time.

The trigger word must be set appropriately for the LA to capture.

3. Clock rate

The clock rate defines when the instrument will sample.

If you are using an internal clock the rate should be set to a value 4 or more times faster than your signal source.

Note:

1. Slow clock rates can lead to long recording times since Acquisition time = Clock rate * buffer length.
2. When using an external clock make sure that the signal has at least as many pulses as the buffer length. If it doesn't the buffer will never be filled, the capture won't finish and the instrument won't transfer the data to the PC.

4. Trigger position

The LA has a continuously variable trigger position (this is sometimes called pre-trigger). This defines how much of the buffer is allocated to data that happens before the trigger event and how much is for data that happens after.

5. Physical connections

Connect the LA to your signal sources

6. Trigger mode
   The trigger mode can be set to Single, Normal or Auto.

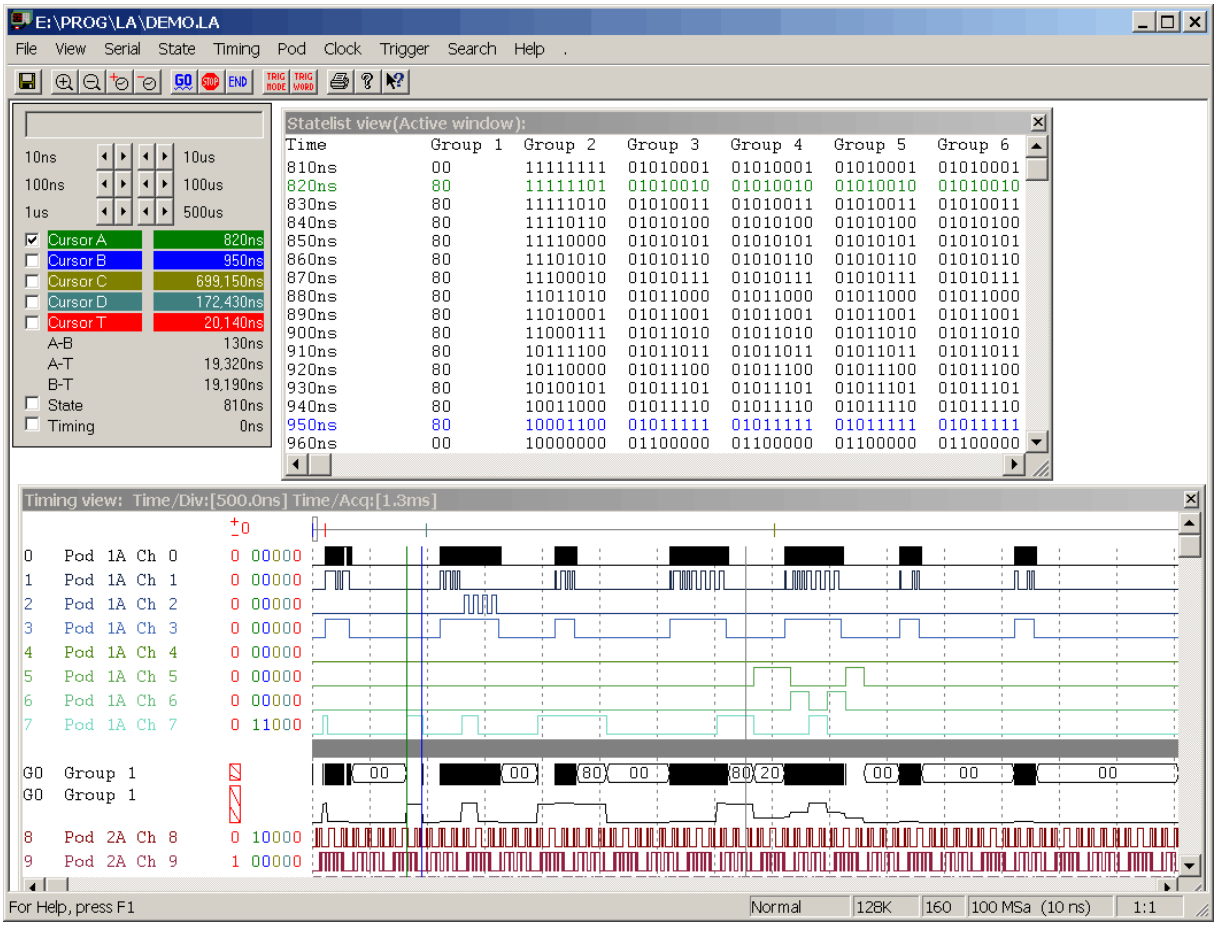
7. Start the process
   Hit the Go button

8. When the LA has triggered and filled the buffer the data will be displayed on the screen.

3.2 How to: Getting familiar with the software

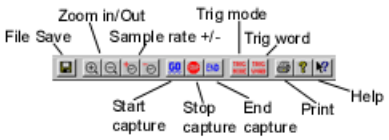
How to: Getting familiar with the software.

Main screen



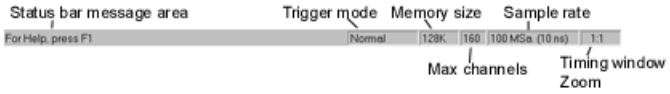
Menu bar

Tool bar



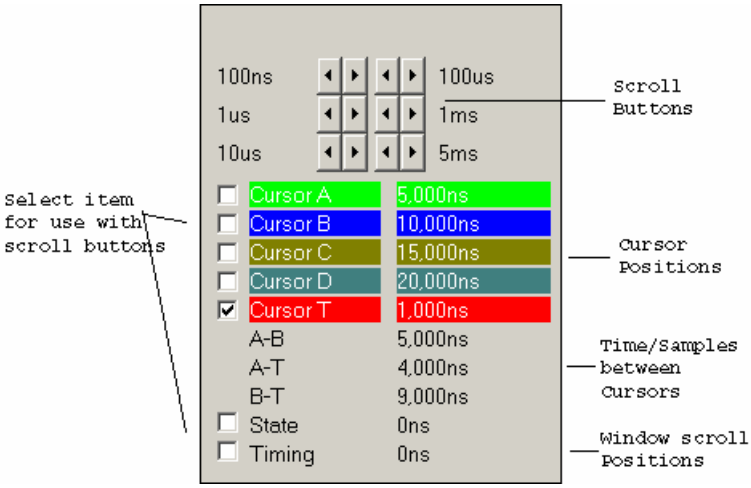
For more info see: Trigger mode, Trigger word, Trigger menu, Memory, Clock menu, zoom and toolbar.

Status bar



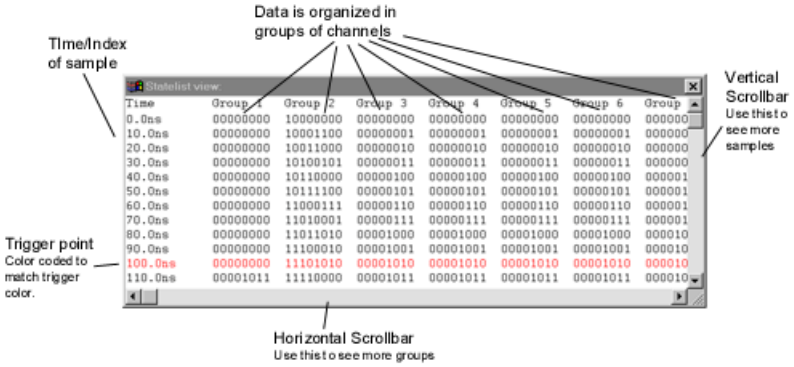
For more info see: Trigger mode, Memory, Clock menu and zoom.

Cursor window



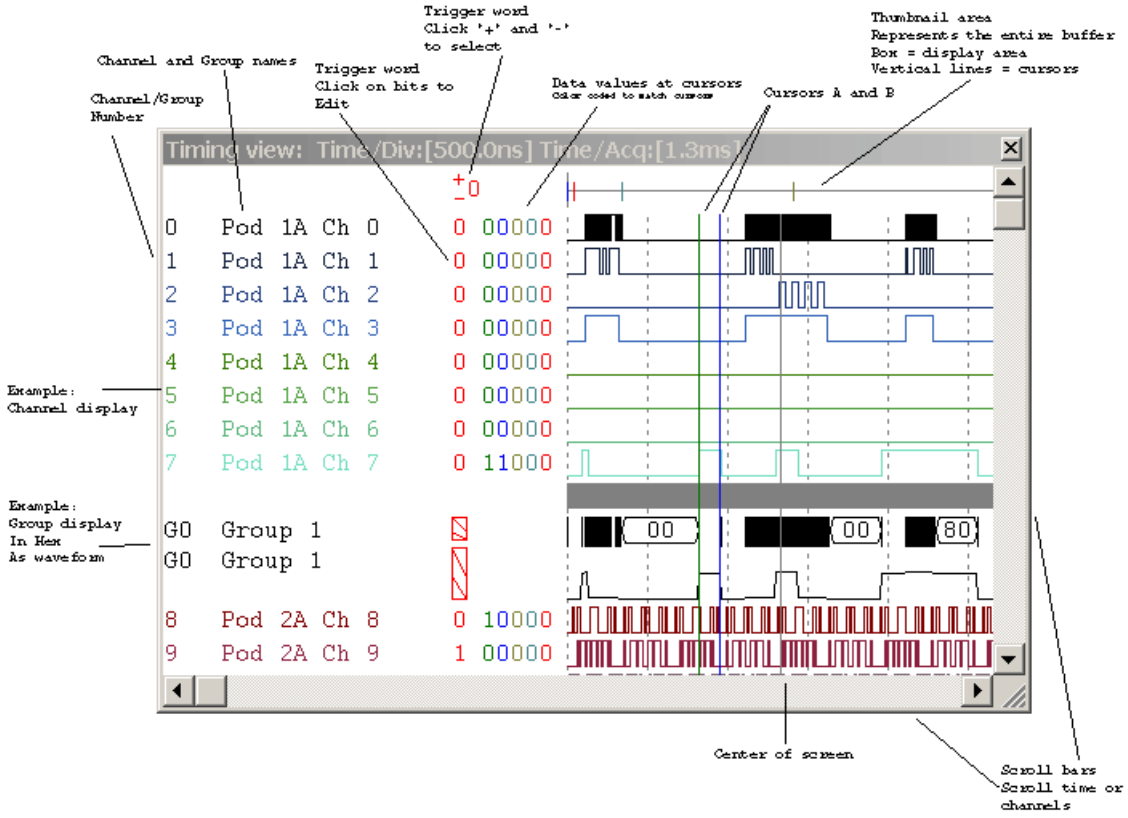
This window displays the positions of the various cursors. It also shows where the timing and statelist windows are scrolled to. Trigger status is displayed at the top of the window.

Statelist window



Data is displayed in statelist format in this window.
For more info see: Statelist, Setting up Statelist window, Setting up channel groups and Statelist verses Timing windows

Timing window



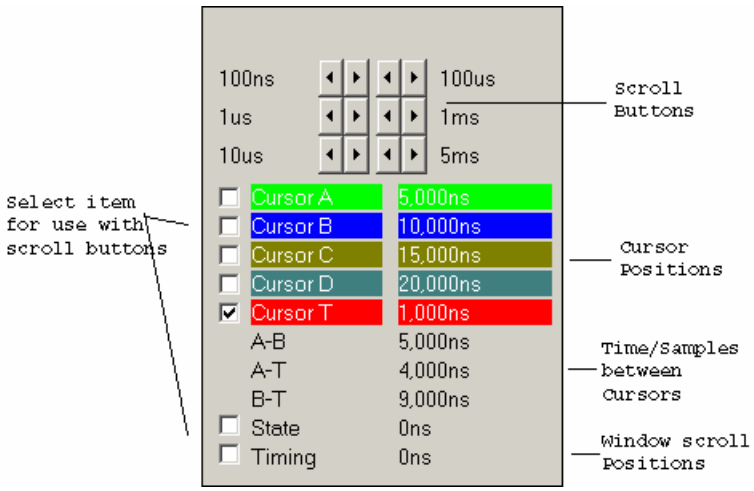
For more info see: Timing window, Setting up Timing window ,
Setting up channel names and colors and Statelist verses Timing windows

3.3 How to: Using cursors

How to: Using cursors

Cursors are used to mark points of interest in the data, to measure time between events and to define pre/post trigger position.

Cursor window



Moving a cursor:

1. In the cursor window you can select a cursor by clicking on the checkbox to the left of the cursors name and then using the arrow buttons in the cursor window to move it. The six sets of arrow buttons will move the selected cursor by the amount listed next to the arrows.
2. You can also "grab" the cursor by left clicking on it in the Timing or Statelist window and then move it by "dragging" it to a new location.
3. The Timing and Statelist menus have selections that allow you to bring the cursors onto their views.
4. You can also right click on the timing window and bring up the zoom dialog box . This dialog box will let you move cursors to the point that you right clicked or to the current view.

Viewing cursor position and time between cursors:

1. The cursor position is graphically depicted in the Timing or Statelist windows.
2. Cursor position is also displayed numerically in the cursor window . To change between Time and Sample number go to the view/Samples or time menu .

Pre-trigger

Trig. Cursor is the Trigger cursor. Its value defines the pre/post trigger position (how much of the buffer represents events that happen before and after the trigger condition is met).
For example: If the buffer was 128ms long and the trigger cursor was set to 40ms and you captured data. The first 40ms of this data would represent the 40ms prior to the trigger condition being met and the last 88ms would be what happened after the trigger event.

3.4 How to: Statelist verses Timing windows

How to: Statelist verses Timing windows

Timing window:

Displays data as horizontal waveforms or as horizontal numeric streams. Typically each line represents a single channel, but a group of channels can also be displayed. Spacer lines can also be inserted to help vertically separate the channels for easier visual differentiation.

The timing window setup is done by right clicking the channel names on the left edge or by going to the " Timing->Timing setup... " menu.

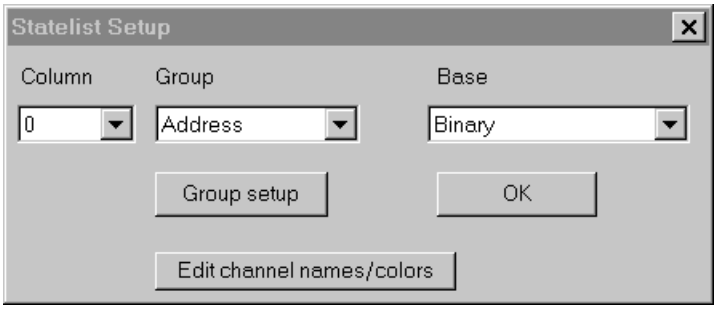
Statelist window:

Displays data as a vertical stream of data. The data is organized as a group of channels and is displayed in a numeric format. The groups are initially defined into groups of 8 channels. You can edit and define groups in the group define dialog box.

Each of the columns can setup to display data in Hex, Ascii, Decimal or as translation table. Setup is done by clicking on "State->Statelist setup... "

3.5 How to: Setting up Statelist window

How to: Setting up the Statelist window



The statelist window is organized in columns. Each column represents a group of channels. Each column can be displayed in a different base (HEX, Ascii, Decimal or Translation table).

Setting up the statelist display.
1. Set column
2. Select which group to display in that column. Groups can repeat in multiple columns and can be in different bases.
3. Set Base.

Note:
Use Group setup to define/edit the actual channel groups

See also: Statelist window , Edit channel names, Group define (how to) and group define.

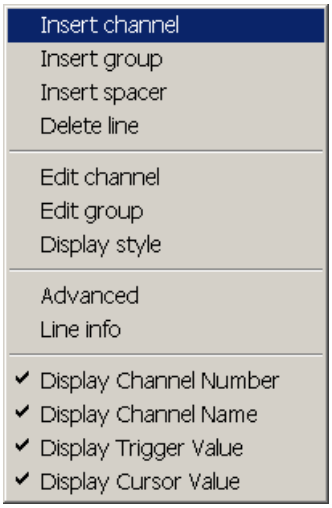
3.6 How to: Setting up the Timing window

How to: Setting up the Timing window

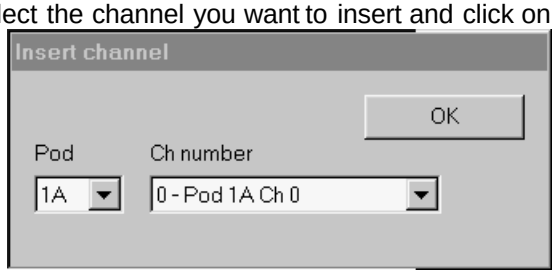
The timing window is organized as a series of lines. Each line represents a single channel or a group of channels. Each line can be drawn in a different size/base.

Adding a channel to the timing window:

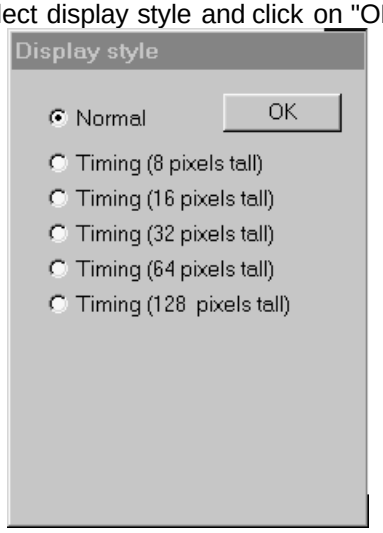
1. Right click on the channel name area of the timing window. The channel will be inserted on the line that you clicked on.



2. Click on the "Insert channel" button.
3. Select the channel you want to insert and click on "OK".

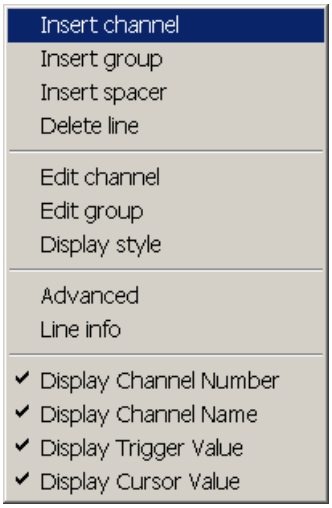


4. Select display style and click on "OK".

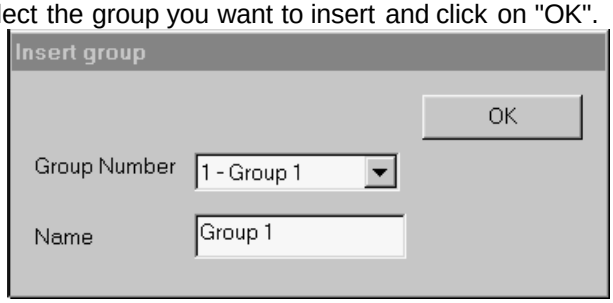


Adding a group to the timing window:

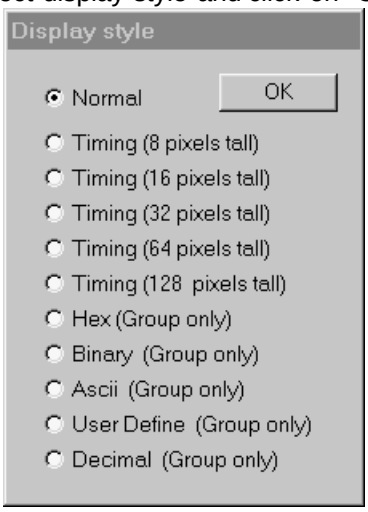
1. Right click on the channel name area of the timing window. The group will be inserted on the line that you clicked on.



2. Click on the "Insert group" button.
3. Select the group you want to insert and click on "OK".

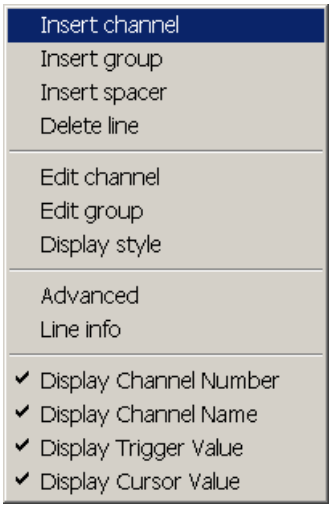


4. Select display style and click on "OK".



Deleting a channel or group from the timing window:

1. Right click on the channel name area of the timing window. The line that will be deleted is the line that you clicked on.

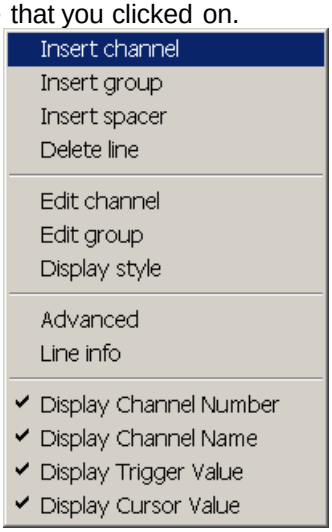


2. Click on the "Delete line" button.

Inserting a spacer in the timing window:

Spacers are used to separate timing display lines to make it easier to organize your data. The spacers are the same color as the grid.

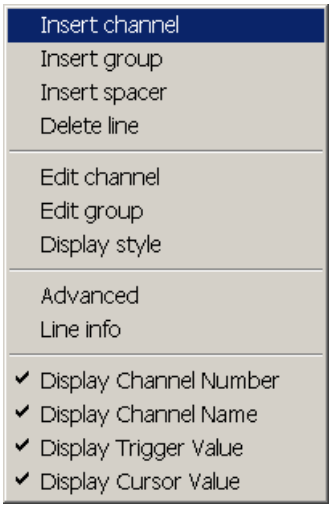
1. Right click on the channel name area of the timing window. The spacer will be inserted on the line that you clicked on.



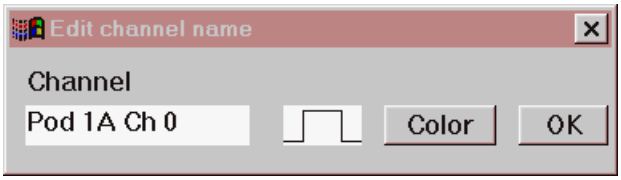
2. Click on the "Insert spacer" button.

Editing a channel name or color:

1. Right click on the channel name area of the timing window. The channel that will be changed is the line that you clicked on.
2. Click on the "Edit channel" button.



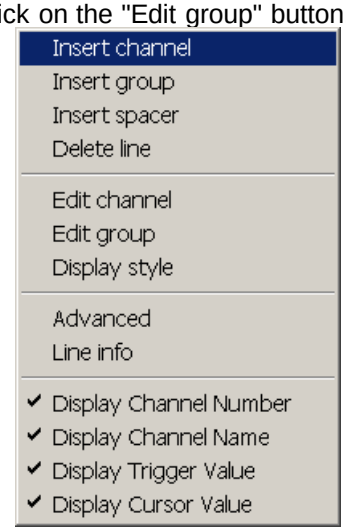
3. Click on "Edit channel".



4. You can edit the channel name or click on the "Color" button to edit the color.

Editing a group:

1. Right click on the channel name area of the timing window. The group that will be changed is the group that you clicked on.
2. Click on the "Edit group" button.



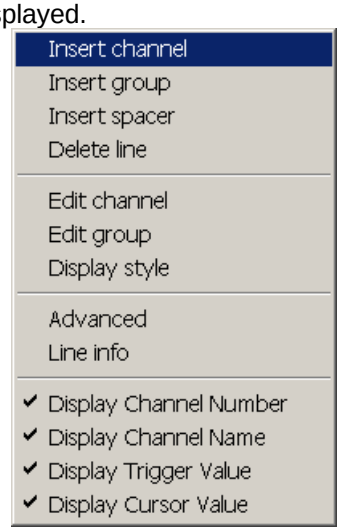
Selecting columns to display in the timing window:

The Timing display is made up of 5 Columns:

Channel/Group number	- Absolute number of channel or group
Channel/Group name	- User defined name
Trigger values	- Trigger value
Cursor values	- Data value at cursor positions

Data - The Timing data

1. Use this menu to turn on/off the display of these columns. The Data column will always be displayed.



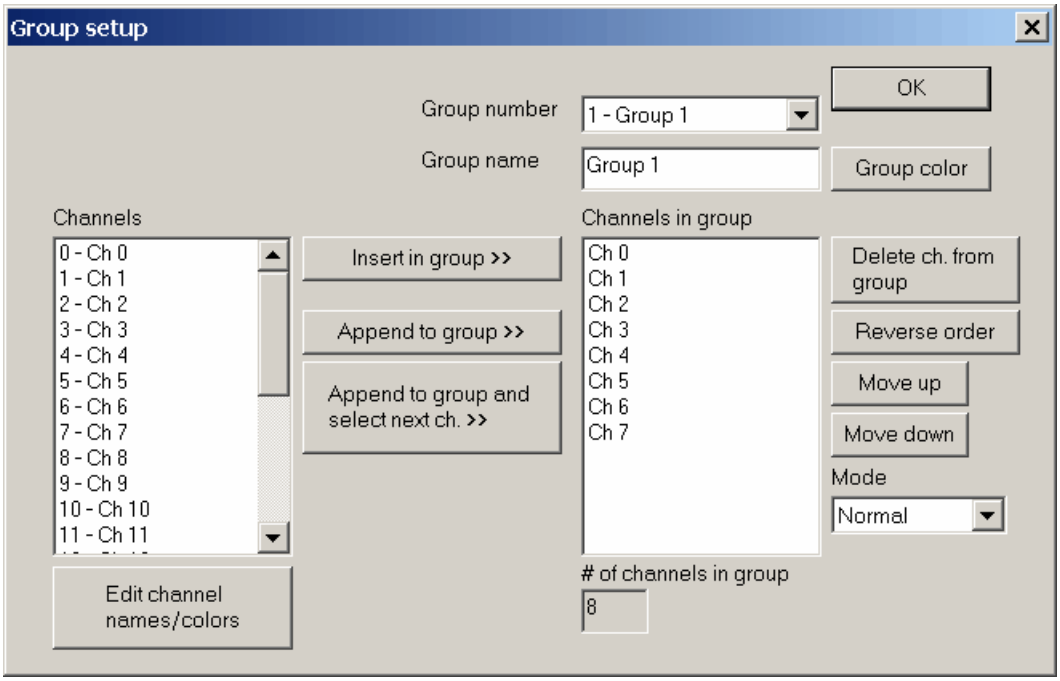
See also: Timing window, How to: Group define

3.7 How to: Setting up channel groups

How to: Defining groups

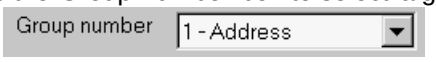
A set of channels can be defined as a "Group". This group is normally displayed in the statelist window, but can also be displayed in the timing window.

The group define window is available in the Statelist pulldown menu.



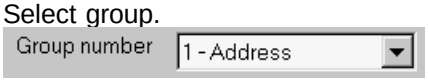
Selecting a group:

1. Use the Group number box to select a group.



Editing a group name:

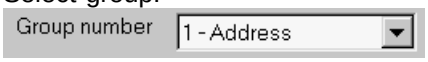
1. Select group.



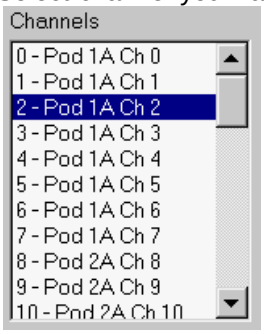
2. Edit name (14 character maximum).

Adding a channel to a group:

1. Select group.



2. Select channel you want to add from the "channels" window.

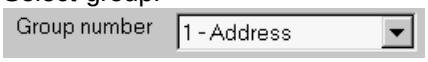


3. Click the "Append to group >>" button.

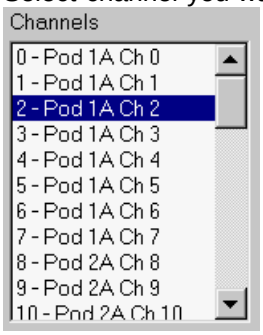
4. "Pod 1A Ch 2" will be added to the end of the group.

Inserting a channel in a group:

1. Select group.



2. Select channel you want to add from the "channels" window. .



3. Select the position, from the "Channels in group" window, you want the channel inserted into.

4. Click the "insert in group >>" button.

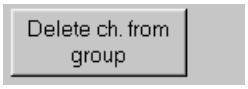
5. "Pod 1A Ch 2" will be added to the group before "Pod1A ch 0"

Deleting a channel from a group:

1. Select group.

2. Select the channel, from the "Channels in group" window, you want to delete.

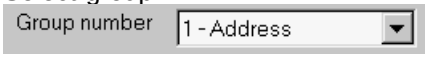
3. Click the "Delete ch. from group" button.



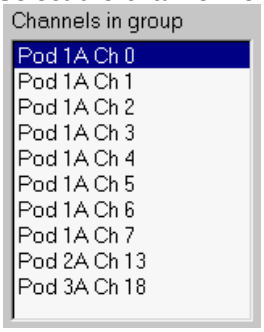
4. "Pod 1A Ch 0" will be deleted from the group.

Changing channel order in a group:

1. Select group.



2. Select the channel from the "Channels in group" window.



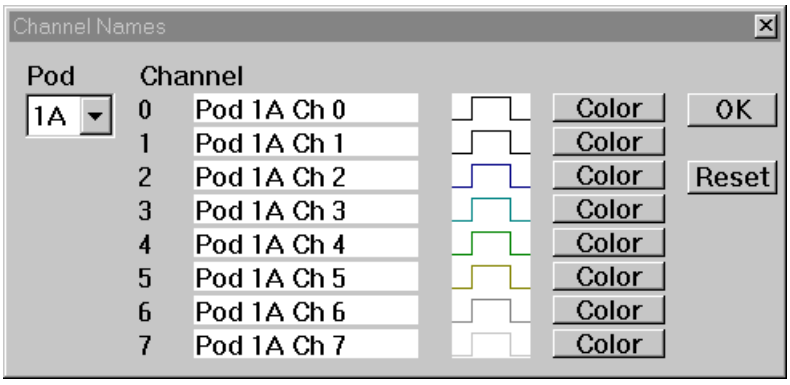
3. Click the "Move down" or "Move up" buttons to change the channels position.

3.8 How to: Setting channel names and colors

How to: Setting channel names and colors.

Channel names and colors be changed with the "Edit channel names and colors dialog box". This option is available in the following places:

1. Timing->edit names and colors menu.
2. Statelist->edit names and colors menu.
3. Right clicking on the channel names in the Timing window.



The channels are organized in groups of 8. Each group is called a pod.

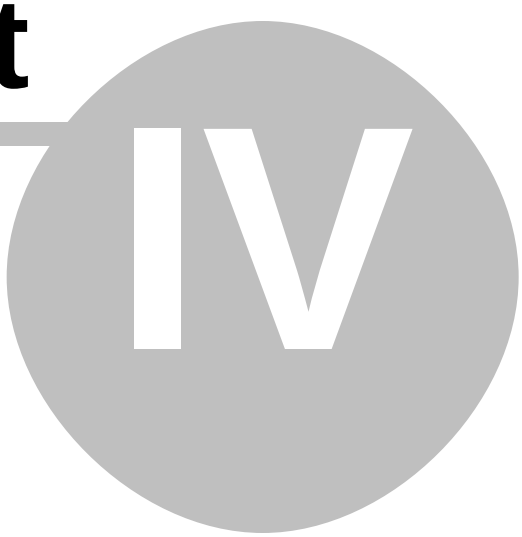
Using the channel names/colors dialog box

1. Select the appropriate pod for the channel that you want to edit.

2. Edit the channel name or hit the "color" button to bring up a color selection screen.

See also: Cursor colors, Grid color, Background color and group color.

Part



4 Commands

4.1 File menu commands

File menu commands

The File menu offers the following commands:

Load	Opens an existing file (data or settings).
Save	Saves a file to a specified file name. Saves settings or data files.
Export	Export data to other programs.
Data Log	Automatically save data to file after each capture.
Data Log Settings	Settings for Data Log.
Auto save settings	If checked settings will be saved when you exit the program.
Quick save settings	Save settings to one of five predefined files.
Quick load settings	Load settings from one of five predefined files.
Delete Settings	Delete one of five predefined settings files.
Print	Prints data in Timing or Statelist format.
Print Preview	Displays the data on the screen as it would appear printed.
Print Setup	Selects a print mode, printer and printer connection.
Memory mode	Select memory/channel/speed mode.
Exit	Exit.

See also: File formats

4.1.1 File Open command

Load command (File menu)

Use this command to open an existing file.

The following types of files are supported:

.LA	Data file
.INI	Settings file
.CSV	Comma Separated Value
.LXT	Translation table

Shortcuts

Toolbar: 

Keys: CTRL+O

4.1.2 File Save command

Save (File menu)

Use this command to save a data or settings file. The Save As dialog box is displayed so you can name your document.

File types are the following:

.LA	Data file Link Instruments file format for data and settings.

.INI Settings file Link Instruments file format for settings only.
.CSV Comma Separated Value Industry standard data file format. Use this to export data to excel, dbase and others
.PRN MathCad file Industry standard data file format. Use this to export data to mathcad and others
.LXT Translation table Link Instruments file format for translation tables.

See also: File/Export

4.1.3 File open dlg

File Open dialog box (File menu)

The following options allow you to specify which file to open:

File Name
Type or select the file name you want to open.
This box lists files with the extension selected in the "List Files of Type" box.

List Files of Type
Select the type of file you want to open:
.LA files Data files.
.CSV files Data files.
.INI files Settings files.

Drives
Select the drive in which the file that you want to open is stored.

Directories
Select the directory in which the file that you want to open is stored.

Network...
Choose this button to connect to a network location, assigning it a new drive letter.

4.1.4 File save dlg

File Save As dialog box (File menu)

The following options allow you to specify the name and location of the file you're about to save:

File Name
Type a new file name to save a document with a different name. A file name can contain up to eight characters and an extension of up to three characters. The extension you specify in the Save File As Type box is added to the file name.

Drives
Select the drive in which you want to store the document.

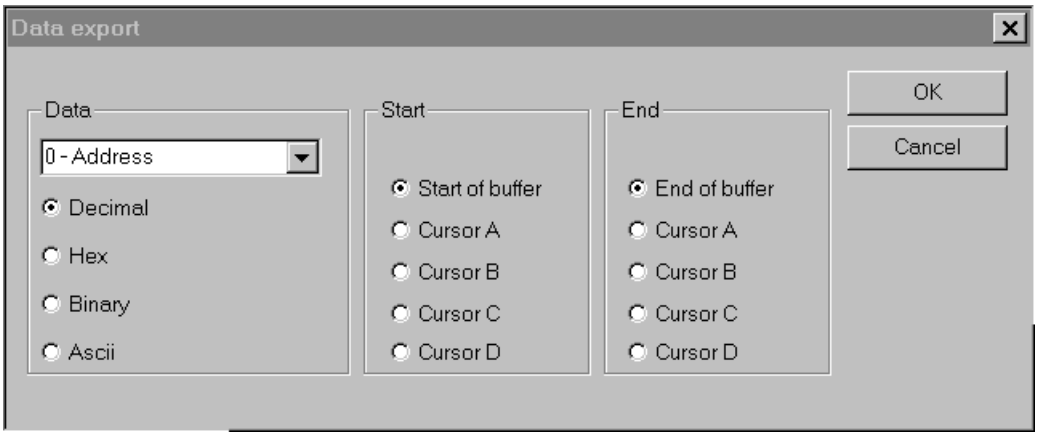
Directories
Select the directory in which you want to store the document.

Network...
Choose this button to connect to a network location, assigning it a new drive letter.

4.1.5 Export data

Export (file menu)

Use this to output data to other programs. You can export a Group of channels or all of the channels. You can output of the data for those channels or just a portion.



How to use:

1) Data:
Select which data to output: Individual group or all channels
Select base to output data in.

2) Start and End:
Select data address range that you want to export.

3) Click OK to save data.

See also: File formats .

4.1.6 Print dialog box

Print dialog box (File menu)

The following options allow you to specify how the document should be printed:

Printer
This is the active printer and printer connection. Choose the Setup option to change the printer and printer connection.

Setup
Displays a Print Setup dialog box , so you can select a printer and printer connection.

Copies
Specify the number of copies you want to print for the above page range.

Collate Copies
Prints copies in page number order, instead of separated multiple copies of each page.

Print Quality
Select the quality of the printing. Generally, lower quality printing takes less time to produce.

4.1.7 File Print command

Print command (File menu)

Use this command to print a document. This command presents a Print dialog box, where you may specify the range of pages to be printed, the number of copies, the destination printer, and other printer setup options.

Use print setup to define printout style and print range.

Shortcuts

Toolbar:
Keys: CTRL+P

4.1.8 File Print Preview command

Print Preview command (File menu)

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

4.1.9 Print Setup dialog box

Print Setup dialog box (File menu)

The following options allow you to select the destination printer and its connection.

Printer

Select the printer you want to use. Choose the Default Printer; or choose the Specific Printer option and select one of the current installed printers shown in the box. You install printers and configure ports using the Windows Control Panel.

Orientation

Choose Portrait or Landscape.

Paper Size

Select the size of paper that the document is to be printed on.

Paper Source

Some printers offer multiple trays for different paper sources. Specify the tray here.

Options

Displays a dialog box where you can make additional choices about printing, specific to the type of printer you have selected.

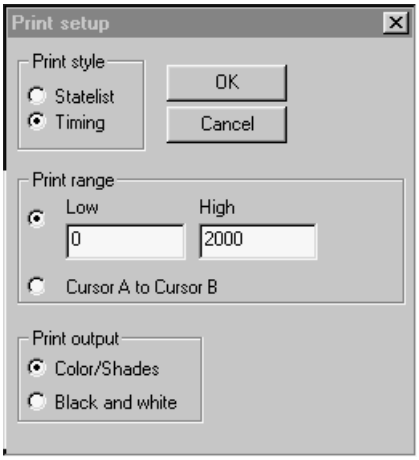
Network...

Choose this button to connect to a network location, assigning it a new drive letter.

4.1.10 File Print Setup command

Print Setup command (File menu)

1. Use this command select output style (statelist or timing), Data range and mode (color or B/W).



Print style:
Select statelist or timing.

Print range:

Low/High:	Specify data range to print. This range is in "Sample" units. See "Samples or Time" in View Menu.
Cursor A to Cursor B:	Print region between cursors A and B

Print output:
Colors are often not printed well on some black and white printers. Choosing Black and white will make the software use a black instead of trying to use color.

2. A second dialog box appears(Print Setup dialog box) when this one closes. This is where you specify the printer and its connection.

4.1.11 File Exit command

Exit command (File menu)

Use this command to end your session. You can also use the Close command on the application Control menu.

Shortcuts
Mouse: Double-click the application's Control menu button.

Keys: ALT+F4

4.2 View menu

View menu commands

The View menu offers the following commands:

Toolbar	Shows or hides the toolbar.
Status Bar	Shows or hides the status bar.
Colors	Set various display colors.
Edit channel names or colors...	Set channel names and colors.
Samples or Time	Set display mode of time. Display in units of time or samples.
Clear data buffer	Set all data points to logic "0".

4.2.1 Color menu

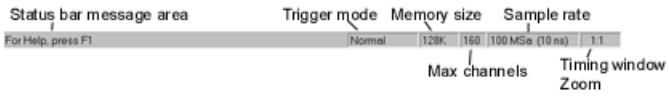
Colors (View menu)

Set the color of various screen items such as cursors, text and background.

It is possible to set the colors of Timing display items and Statelist display items also.

4.2.2 View Status Bar Command

Status Bar command (View menu)



Use this command to display and hide the Status Bar, which describes the action to be executed by the selected menu item or depressed toolbar button, and keyboard latch state. A check mark appears next to the menu item when the Status Bar is displayed.

The status bar shows Trigger mode, Memory setting, number of channels, clock rate and Zoom.

See Status Bar for help on using the status bar.

4.2.3 View Toolbar command

Toolbar command (View menu)

Use this command to display and hide the Toolbar, which includes buttons for some of the most common commands, such as File Open. A check mark appears next to the menu item when the Toolbar is displayed.

See Toolbar for help on using the toolbar.

4.3 Statelist menu

Statelist menu

Statelist window	Display Statelist window.
Statelist setup..	Setup statelist display parameters.
Group Define..	Define channel grouping.
Edit Translation table	Edit Translation table.
Cursor A to Statelist	Move cursor to Statelist window.
Cursor B to Statelist	Move cursor to Statelist window.
Cursor C to Statelist	Move cursor to Statelist window.
Cursor D to Statelist	Move cursor to Statelist window.
Trig cursor to Statelist	Move cursor to Statelist window.
Move all cursors to Statelist.	Move all cursors to Statelist.
Align Statelist with Timing win	Align the start of the Statelist window with the Timing window.
Statelist to cursor A	Move start of Statelist window to cursor.
Statelist to cursor B	Move start of Statelist window to cursor.
Statelist to cursor T	Move start of Statelist window to cursor.

4.3.1 Statelist setup

Statelist setup (Statelist menu)

The statelist window is organized in columns. Each column is a channel group. Each group has one or more channels in it.

This window lets you do the following:

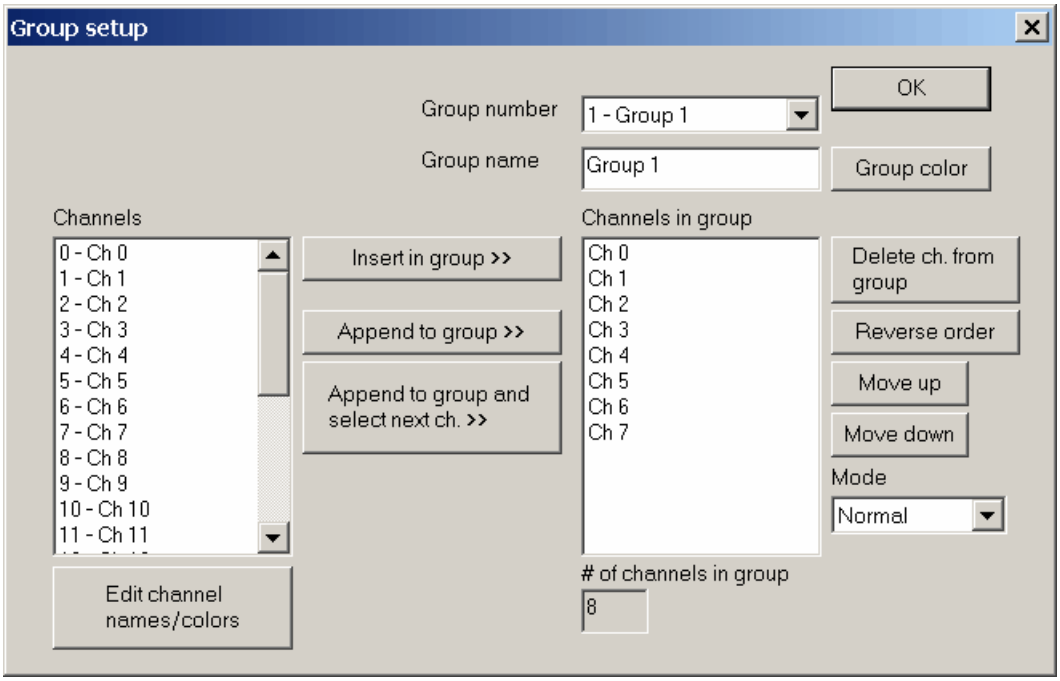
Select which column displays which group.
Choose a base (Hex, Ascii, Decimal or Translation table) for the column.
Note:
You can display a group in more than one column and in different bases.

By default the groups are organized by pod. You can edit and create groups with Group define.

Activate this window via the state menu or by left clicking the group names in the statelist display.

4.3.2 Group define

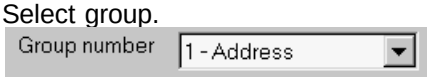
Group define (Statelist menu)



The channels can be organized into groups for display in the Statelist or Timing windows. The default organization is by pods.
In this window you can do the following:

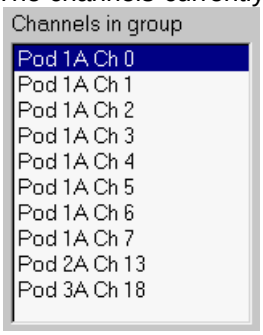
Defining groups:

1. Select group.

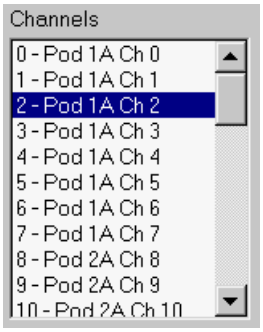


2. Edit name (14 character maximum).

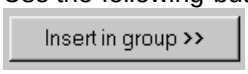
3. The channels currently in the group are listed in the "Channels in group" window:



4. All of the channels in the Logic Analyzer are in the "channels" window:

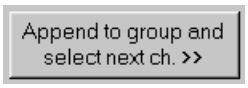


5. Use the following buttons to edit the list of channels in the selected group:

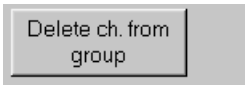


Inserts the channel selected in the "channel" window" in the "channels in group" list.

Appends the channel selected in the "channel" window to the "channels in group" list.

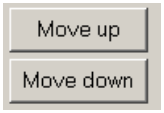


Appends the channel selected in the "channel" window to the "channels in group" list and to select the next channel in the "channel" window.



Deletes the selected channel from the "channels in group" window.

Reverses the order of the channels in the "channels in group" window.



The "Move up" and "Move down" buttons move the selected channel up or down in the "channels in group" window.

4. Select mode with the mode box.

5. Edit a channels name or color by clicking on the 

button.

Activate this window via the state menu ,serial menu or from statelist setup.

4.3.3 Translation tables

Translation tables (Statelist menu)

Translation tables work with the statelist display. They allow you to do simple disassembly type functions. They "Translate" a numeric value into a text string".

You can enter the following in to the table:

Bit pattern	32 bits wide of 1, 0, or X (don't care)
String	The string that will replace the bit pattern.
Number of samples to skip.	Number of clock cycles to skip before starting to look for more patterns.

Example:

If MOV AX,BX had an opcode of 0x9 and it took 3 clock cycles to execute.

Set the following:

Bit pattern to	01001
String to	MOV AX,BX
Skip to	2

4.4 Timing menu

Timing menu

Timing window...	Display the Timing window.
Timing Setup.. .	Setup the Timing window.
Zoom	Adjust horizontal zoom.
Zoom dialog box...	Zoom dialog box .
Edit channel names/Colors	Set channel names and colors.
Grid	Display grid.
Cursor A to Timing	Move cursor to Timing window.
Cursor B to Timing	Move cursor to Timing window.
Trigger cursor to Timing	Move cursor to Timing window.
Move all cursors to Timing	Move all cursors to Timing window.
Align Timing with State win	Align the start of the Timing window with the Statelist window.
Timing to cursor A	Move start of Timing window to cursor.
Timing to cursor B	Move start of Timing window to cursor.
Timing to cursor T	Move start of Timing window to cursor.

4.4.1 Timing setup

Timing Setup

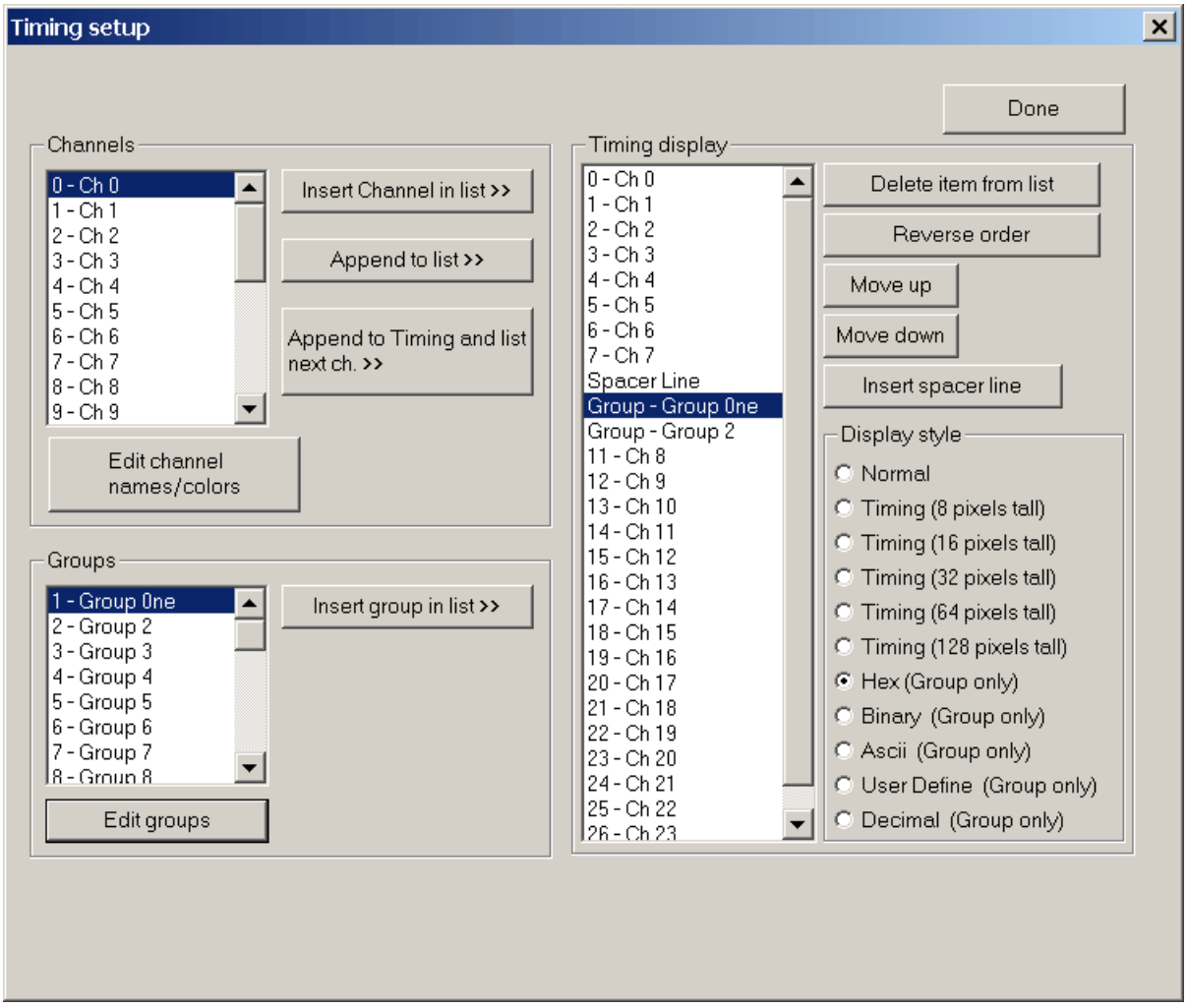
Normal setup
Advanced setup

4.4.2 Timing Setup (Advanced)

Timing Setup (Advanced)

The Timing window is organized in rows. Each row can display a channel or a channel group.

In the "Timing display" section you will see a list of the channels in the display order. You can change the order, delete and insert new display lines.



You can also format each by size or base.

Single channel - display options:

Normal	Display timing waveform.
Timing(8)	Display timing waveform 8 pixels tall.
Timing(16)	Display timing waveform 16 pixels tall.
Timing(32)	Display timing waveform 32 pixels tall.
Timing(64)	Display timing waveform 64 pixels tall.
Timing(128)	Display timing waveform 128 pixels tall.

Group - display options:

Timing(8)	Display group as timing waveform 8 pixels tall.
Timing(16)	Display group as timing waveform 16 pixels tall.
Timing(32)	Display group as timing waveform 32 pixels tall.
Timing(64)	Display group as timing waveform 64 pixels tall.
Timing(128)	Display group as timing waveform 128 pixels tall.
Hex	Display group in Hex format. Data must be Zoomed.
Binary	Display group in Binary format. Data must be Zoomed.
Decimal	Display group in Decimal format. Data must be Zoomed.

Use Edit channel name/color 

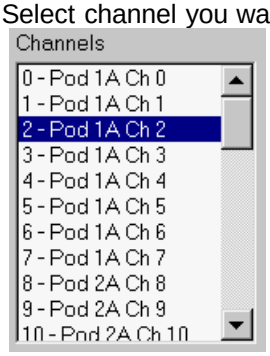
to change channel names or colors.

You can edit and create groups with Group setup. 

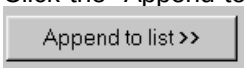
This window will appear when you click on Timing Setup in the Timing menu or when you click on the names in the Timing window.

Adding a channel to the Timing display:

1. Select channel you want to add from the "channels" window:



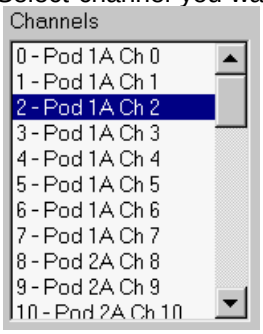
2. Click the "Append to list >>" button



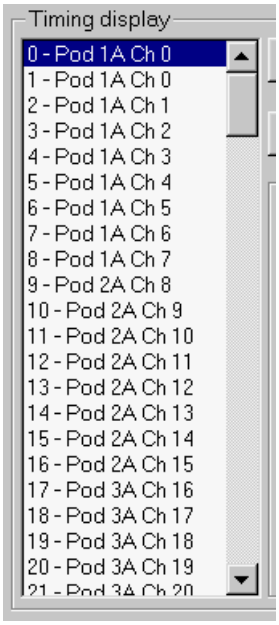
3. "Pod 1A Ch 2" will be added to the end of the list.

Inserting a channel in the Timing display:

1. Select channel you want to add from the "channels" window.



2. Select the position, from the "Timing display" window, where you to insert the channel.

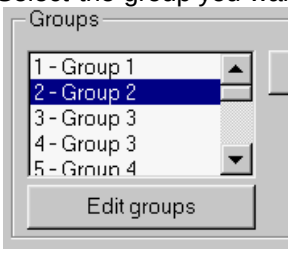


3. Click the "insert in list >>" button

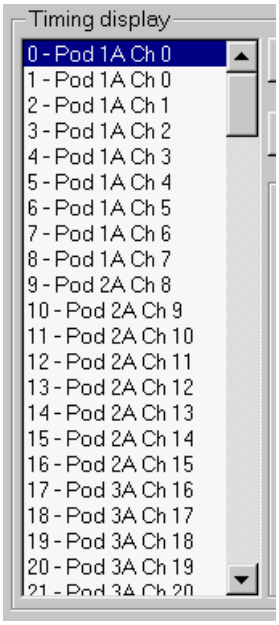
4. "Pod 1A Ch 2" will be added to the list before "Pod1A ch 0"

Inserting a group in the Timing display:

1. Select the group you want to add from the "Group" window.



2. Select the position, from the "Timing display" window, where you to insert the channel.

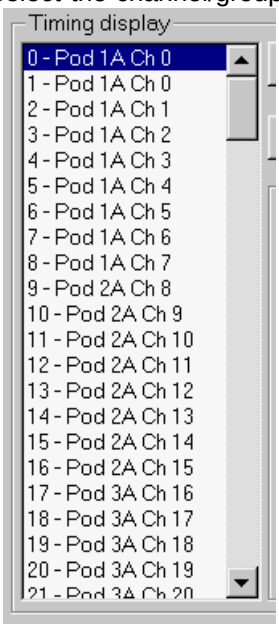


3. Click the "insert in list >>" button

6. "Group 2" will be added to the list before "Pod1A ch 0"

Deleting a channel or group from the Timing display:

1. Select the channel/group, from the "Timing display" window, you want to delete.



2. Click the "Delete ch. from list" button

3. "Pod 1A Ch 0" will be deleted from the list.

Editing a channel name or color:
1. Select Channel
2. Click on the "Edit channel names/colors" button

Editing a group:
1. Select the group
2. Click on the "Edit groups" button

Insert spacer:
Spacers are used to separate timing display lines to make it easier to organize your data. The spacers are the same color as the grid.

To insert a spacer
1. Select an insertion point on the Timing display list.
2. Click on "Insert spacer" button.

The height of the spacer can be set with the "Display style" radio buttons.

Changing the vertical position of an item:
Use the "Move up" and "Move down" buttons.

You can activate this window from the timing menu or by clicking on the channel names in the timing display.

See also: How to (timing setup)

4.4.3 Zoom menu

Zoom(timing)

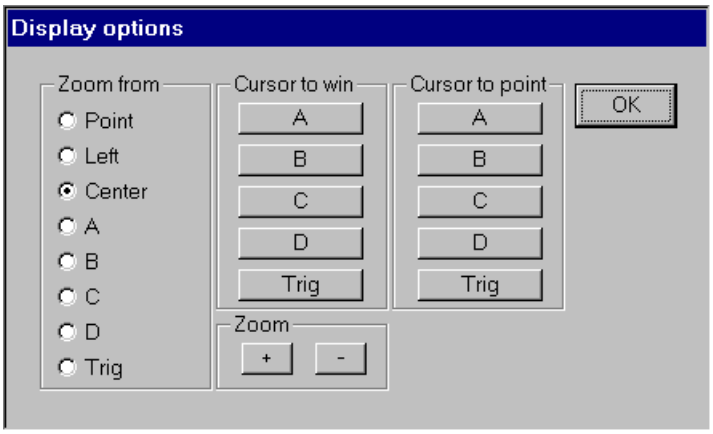
Data in the Timing window can be zoomed in (more detail) or zoomed out (more data). The display is compressed/expanded in the horizontal direction only. The vertical size and format of the data can be changed in the Timing Setup window

Zoom can be changed in the following ways:
1. Timing->zoom menu
2. Zoom toolbar buttons 
3. Control click(Timing window) Zooms in on point clicked.
   Shift click(Timing window) Zooms out on point clicked.
4. Right clicking on the data area of the timing window brings up a zoom dialog box.

See also: timing menu, Toolbar and the Zoom dialog box.

4.4.4 Zoom dialog box

Zoom dialog box



This window appears when you right click in the waveform area of the timing window.

In this window you can do the following:

Zoom:

Zoom in or out with the + or - buttons.

Select a zoom reference point (only active in this window).

Point: Only active if you right clicked on the timing window to bring up this window.
The zoom point is the point you right clicked.

Left: Zoom around the left edge.

Center: Zoom around the center of the screen.

A Zoom around cursor A.

B Zoom around cursor B.

C Zoom around cursor C.

D Zoom around cursor D.

Trigger: Zoom around trigger cursor.

Move cursor to window:

To move a cursor to the timing display window click its button.

Cursor to point:

Move selected cursor to the point you right clicked on (only available by right clicking the timing window).

4.4.5 Analog display of a group

Timing display

The timing window displays data in a "timing waveform" style display.

Single channel

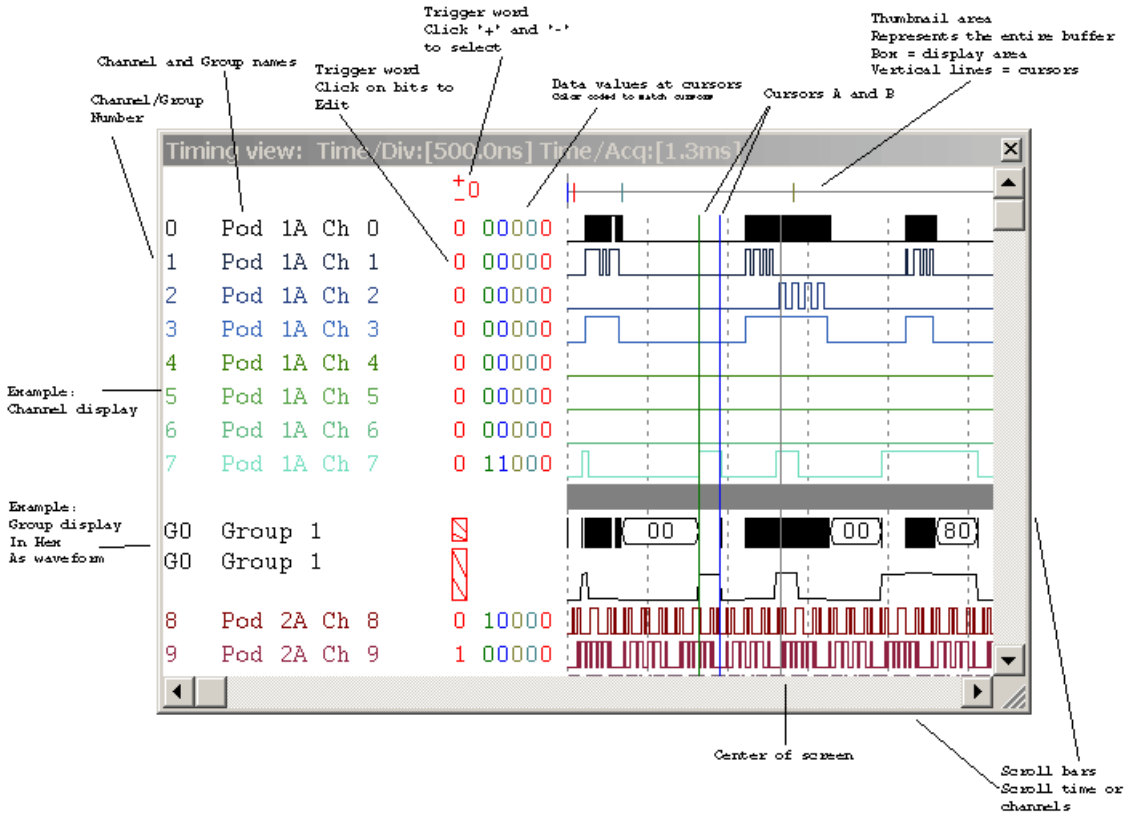
Use the Timing setup to define the height and color of each line of data.

Groups of channels

A group of channels can be displayed in the timing window in an "Analog" style. This is not true analog. This is a group of channels that are each one bit wide. The first channel is the lsb and the last channel is the msb. A value is calculated from this "word" and displayed in an "analog" style.

A group of channels can also be displayed in hex, ascii, binary or decimal.

Use timing setup to select single or groups for each line.



In the above example "Group One" is in Hex and "Group 2" is in Timing(16) format.

See also:

Group define
Timing setup

4.5 Pod Menu

Pod Menu

Pod Mode setup	Select to configure the pods.
Edit pattern (Not available on LA-2124)	Select this to edit pattern generator data.
Threshold voltage	Set threshold voltage. Signals above the threshold voltage are evaluated as a "1" and signals below are "0".

4.5.1 Pod mode

Pattern menu

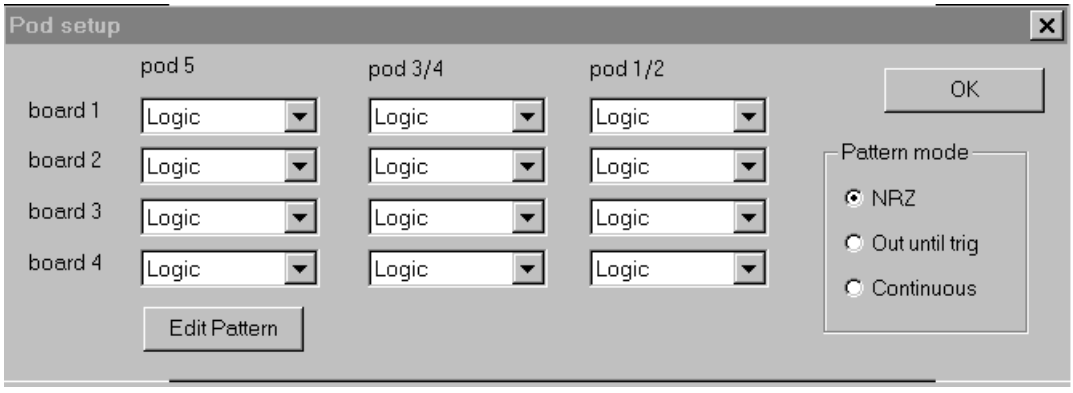
The Logic Analyzer can be converted into a combination Logic Analyzer/Pattern Generator or to a Pattern Generator only. This is done by buying Pattern Generator pods, connecting them instead of the Logic pods and then configuring the software.

Data for the Pattern generator can come from 3 sources:

1) Patterns can be edited and defined in this window.
2) It can be captured from the logic channels and copying to the pattern channels.
3) Data can also come from files. These files could be previously saved by this software or generated by user. Files are loaded in the File menu. They need to be of one of our supported file formats.

Three different modes can be set

Logic	Install Logic pods and acquire data.
Pattern Generator	Install Pattern Generator pods and output data.
Off	Turn off pod connector on instrument and stop inputting/outputting data from that pod.



Pattern mode:

NRZ	Output pattern once. Data is acquired simultaneously on Logic pods.
Out until trig	Output until trigger condition met. Data is acquired simultaneously on Logic pods.
Continuous	Continuously output until stop hit. Data is not acquired simultaneously on Logic pods.

How to:

1) Connect pattern pods and select the matching configuration on the table above.
   Note: Pods 1 and 2 must be both either Pattern Generator or Logic Analyzer. Pods 3 and 4 must also be the same type.

2) Select pattern output mode.
3) Edit the pattern.

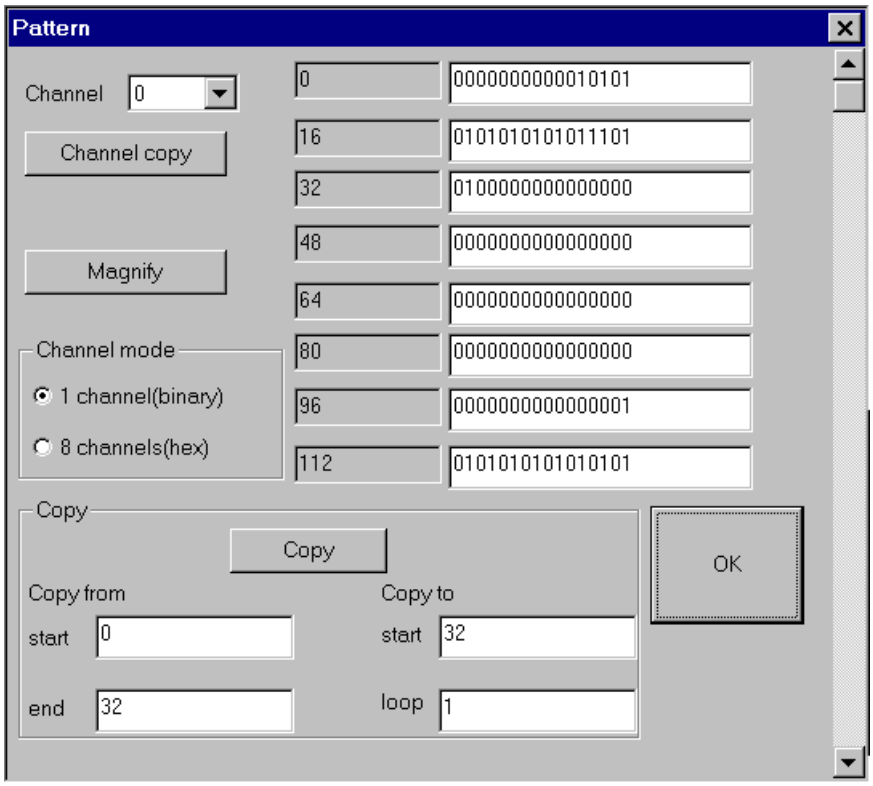
The pattern generator pods output TTL level signals and the voltages can not be changed.

4.5.2 Pattern editor

Pattern editor

Data for the Pattern generator can come from 3 sources:
1) Patterns can be edited and defined in this window.
2) It can be captured from the logic channels and copying to the pattern channels.
3) Data can also come from files. These files could be previously saved by this software or generated by user. Files are loaded in the File menu. They need to be of one of our supported file formats.

Pattern Editor



Channel
Select which channel(s) to edit.

Channel copy
Used to bring up a dialog box to copy entire channels.

Channel mode
Select 1 channel edit or 8 channel edit.

Magnify

Each time the key is hit the data is expanded by a factor of two. For example 0101100 becomes 00110011110000

Copy

Select "copy from" range, "copy to start" and number of times to "loop". Then hit the 'copy' key.

Example 1:

Copy from start = 20
Copy from end = 30
Copy to start = 50
loop = 1

When you click on the copy key the 11 data points from position 20 to and including position 30 in the data buffer will be copied to position 50.

Example 2:

Copy from start = 20
Copy from end = 30
Copy to start = 50
loop = 2

When you click on the copy key the 11 data points from position 20 to and including position 30 in the data buffer will be copied to position 50 to 60 and then from 61 to 71.

Vertical scrollbar

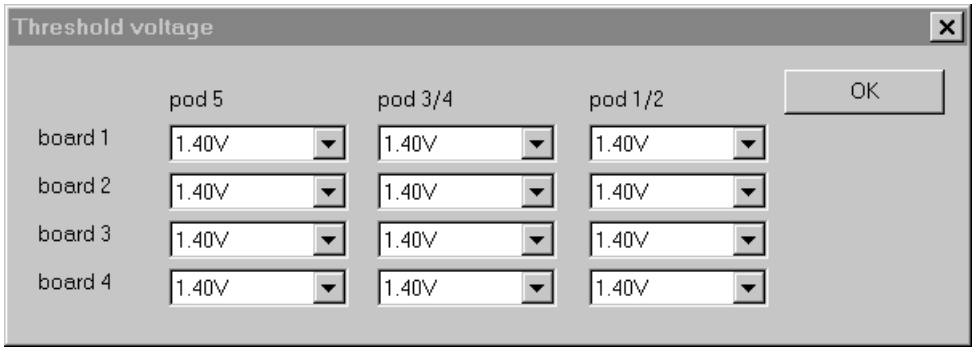
Use to scroll the data.

4.5.3 Threshold voltage setup

Threshold voltage setup (trigger menu)

Signals below the Threshold voltage are considered a logical "0" (low) and signals above it are "1" (high).

Set the threshold voltage for one or more pods. Multiple threshold voltages can be set. Each pod represents 8 channels.



4.6 Clock menu

Clock menu

Select an internal clock rate or an external clock for sampling.

If you are using an internal clock the rate should be set to a value 4 or more times faster than your signal source.

Clock menu for LA-2124
Clock menu for LA-4240-32K and LA-4280-32K
Clock menu for LA-4540-128K, LA-4580-128K and LA-45160-128K

4.6.1 Clock menu for LA-2124

Clock menu for LA-2124

This menu allows you to select memory size and sample rate (Internal clock or external clock).

LA-2124-128K

1K	Set buffer length to 1K sample points
128K	Set buffer length to 128K sample points

External Rising	Sample on rising edge of the external clock input.
External Falling	Sample on falling edge of the external clock input.
100 MHz (10 ns)	Sample on Internal clock.
50 MHz (20 ns)	Sample on Internal clock
20 MHz (50 ns)	Sample on Internal clock.
10 MHz (100 ns)	Sample on Internal clock.
5 MHz (200 ns)	Sample on Internal clock.
2 MHz (500 ns)	Sample on Internal clock.
1 MHz (1 us)	Sample on Internal clock.
500 KHz (2 us)	Sample on Internal clock.
200 KHz (5 us)	Sample on Internal clock.
100 KHz (10 us)	Sample on Internal clock.
50 KHz (20 us)	Sample on Internal clock.
20 KHz (50 us)	Sample on Internal clock.
10 KHz (100 us)	Sample on Internal clock.
5 KHz (200 us)	Sample on Internal clock.

Note: The software only transfers data to the PC when the buffer is full. If you are using a slow clock it might take a long time to fill the buffer.

Recording time/Acquisition time/Capture time/Buffer Length
The Logic analyzer will acquire data for time equal to Buffer length * clock rate.
Example:

If buffer length = 128K and sample rate = 100KHz. The LA will record for 1.32 seconds (128K * 10 us).

Total time is displayed on the titlebar of the Timing window

4.6.2 Clock menu for LA-4540-128K, LA-4580-128K and LA-45160-128K

Clock menu for LA-4540-128K, LA-4580-128K and LA-45160-128K

This menu allows you to select memory size and sample rate (Internal clock or external clock).

8K	Set memory to 8K mode	
128K	Set memory to 128K mode	
---	---	---
		Active Pods
External[0] Rising	Use external (Pod 5A, bit 0) Rising edge.	All Pods active.
External[0] Falling	Use external (Pod 5A, bit 0) Falling edge.	All Pods active.
External ...		All Pods active.
500 MHz (2 ns)		Pod 1* is at 500MHz, Pod 2*, 3* & 5* are off
250 MHz (4 ns)		Pod 5* is at 125MHz, Pods 1* & 2* are at 250MHz, Pod 3* & 5* are off
100 MHz (10 ns)		Pod 5* is at 125MHz, All Pods active.
50 MHz (20 ns)		All Pods active.
20 MHz (50 ns)		All Pods active.
10 MHz (100 us)		All Pods active.
5 MHz (200 us)		All Pods active.
2 MHz (500 us)		All Pods active.
1 MHz (1 us)		All Pods active.
500 KHz (2 us)		All Pods active.
200 KHz (5 us)		All Pods active.
100 KHz (10 us)		All Pods active.
50 KHz (20 us)		All Pods active.
20 KHz (50 us)		All Pods active.
10 KHz (100 us)		All Pods active.
5 KHz (200 us)		All Pods active.
2 KHz (500 us)		All Pods active.
1 KHz (1 ms)		All Pods active.
500 Hz (2 ms)		All Pods active.
200 Hz (5 ms)		All Pods active.
100 Hz (10 ms)		All Pods active.
50 Hz (20 ms)		All Pods active.
20 Hz (50 ms)		All Pods active.
10 Hz (100 ms)		All Pods active.
5 Hz (200 ms)		All Pods active.
2 Hz (500 ms)		All Pods active.
1 Hz (1 s)		All Pods active.

Pattern Generator functions are not available at 250MHz and 500MHz modes.

Note: The software only transfers data to the PC when the buffer is full. If you are using a slow clock it might take a long time to fill the buffer.

Recording time/Acquisition time/Capture time/Buffer Length
The Logic analyzer will acquire data for time equal to Buffer length * clock rate.
Example

If buffer length = 8K and sample rate = 1KHz. The LA will record for 8.096 seconds (8K * 1ms).

Total time is displayed on the titlebar of the Timing window

4.6.3 Clock menu for LA-4240-32K and LA-4280-32K

Clock menu for LA-4240-32K and LA-4280-32K

This menu allows you to select memory size and sample rate (Internal clock or external clock).

LA-4240-32K
LA-4280-32K

	Active Pods	**Note:**
8K		Set memory to 8K mode
32K		Set memory to 32K mode
----------	----------	
External[0] Rising	All Pods active.	Use external clock bit 0(Pod 5A, bit 0) rising edge.
External[0] Falling	All Pods active	Use external clock bit 0(Pod 5A, bit 0) falling edge. .
External ...	All Pods active.	
200 MHz (5ns)	Pods 1* & 2* are at 200MHz, Pod 3* & 5* are off Pod 5* is at 100MHz,	
100 MHz (10 ns)	All Pods active.	
50 MHz (20 ns)	All Pods active.	
20 MHz (50 ns)	All Pods active.	
10 MHz (100 ns)	All Pods active.	
5 MHz (200 ns)	All Pods active.	
2 MHz (500 ns)	All Pods active.	
1 MHz (1 us)	All Pods active.	
500 KHz (2 us)	All Pods active.	
200 KHz (5 us)	All Pods active.	
100 KHz (10 us)	All Pods active.	
50 KHz (20 us)	All Pods active.	
20 KHz (50 us)	All Pods active.	
10 KHz (100 us)	All Pods active.	
5 KHz (200 us)	All Pods active.	
2 KHz (500 us)	All Pods active.	
1 KHz (1 ms)	All Pods active.	
500 Hz (2 ms)	All Pods active.	
200 Hz (5 ms)	All Pods active.	
100 Hz (10 ms)	All Pods active.	
50 Hz (20 ms)	All Pods active.	
20 Hz (50 ms)	All Pods active.	
10 Hz (100 ms)	All Pods active.	
5 Hz (200 ms)	All Pods active.	
2 Hz (500 ms)	All Pods active.	
1 Hz (1 s)	All Pods active.	

Pattern Generator functions are not available at 200MHz mode.

Note: The software only transfers data to the PC when the buffer is full. If you are using a slow clock it might take a long time to fill the buffer.

Recording time/Acquisition time/Capture time/Buffer Length
The Logic analyzer will acquire data for time equal to Buffer length * clock rate.

Example:
If buffer length = 8K and sample rate = 1KHz. The LA will record for 8.096 seconds (8K * 1ms).

Total time is displayed on the titlebar of the Timing window

4.6.4 External clock setup

External clock setup

LA-2124 Logic Analyzer
LA-4xxx Logic Analyzer

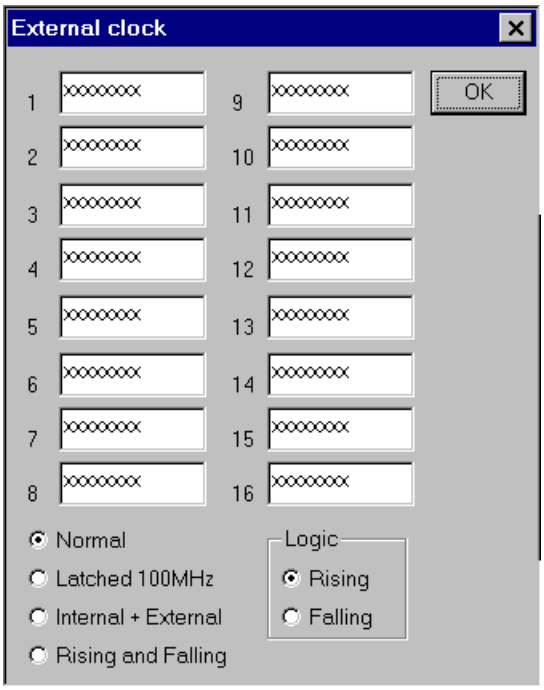
4.6.5 External clock (LA-4xxx)

External clock (LA-4xxx)

External clock setup. The LA has 8 external clock inputs. These inputs can be combined to create very complex clocking.

Pod 5A is used for the external clock.

Note:
The LA only transfers data to the PC after it has received a full buffer worth of data. If your clock is very slow it might take a long time to fill the buffer. Please make sure your clock happens enough times to fill the buffer.



1..16 16 sets of 8 bit patterns that are OR'd together to form a complex clock. Each bit represents one of the inputs on pod 5A. Each bit can be set to 0, 1

or X.

Modes:

Normal	External clock
Latched 100MHz	Clock on external + 100MHz internal (see Internal + external).
Internal+external external clock.	Mix of internal + external clock. This AND's the Internal clock with the Example: If external Pattern 1 = xxxxxxx0 and all other patterns are xxxxxxxx and the internal clock is set to 100MSa(10ns). The LA will sample when bit 0 is low and the internal clock is high. In this example the LA will sample approximately 10 times if bit 0 stays low for 100ns.
Rising and falling	Clock on the rising and the falling edge of the external clock.

Logic:

Logic rising	Clock on the external rising edge.
Logic falling	Clock on the external falling edge.

How to use:

1) Each word represents the 8 external clocks 

. Each bit can be set to 0(low), 1(high) or X(don't care).
2) The 16 words are OR'd together to form a complex clock.
3) Set clock mode:

Normal	Sample on the external clock.
Internal + external	Mix of internal + external clock.
Rising and falling	Clock on the rising or the falling edge of the external clock.

4) Set Logic to rising or falling.

Examples:

Example 1: Pattern 1 = xxx1xxx0 and all other patterns are xxxxxxxx
Result: Sample when line 4 is HIGH and line 0 is LOW.

Example 2: Pattern 1 = xxx1xxx0, Pattern 2 = xxxx xx11 and all other patterns are xxxxxxxx
Result: Sample when line 4 is HIGH and line 0 is LOW
or
when Lines 1 and 0 are HIGH.

See also: GO, STOP and END keys .

4.6.6 External clock (LA-2124)

External clock (LA-2124)

External clock setup. The LA has up to 1 external clock input. This input can be set to rising or falling. The LA will acquire 1 sample every time it sees a clock.

Note 1: The LA only transfers data to the PC after the data buffer is full. Slow external clocks might take a very long time to fill the buffer.
Note 2: Make sure that your external clock has enough pulses to fill the buffer or the instrument will never transfer data.

4.6.7 Memory mode

Memory mode

Select memory mode:

LA-2124-128K

Max speed	channels (memory size)
up to 25MHz external	24 (24 @ 128K each)
up to 100MHz internal	24 (24 @ 128K each)

LA-4240-32K

Max speed	channels (memory size)
up to 50MHz external	40 (40 @ 32K each)
up to 100MHz internal	40 (40 @ 32K each)
200MHz	24 (16@ 200MHz@64K and 8@100MHz@32K) Pods 1a & 2a are at 200MHz, Pod 5a is at 100MHz, Pod 3a & 4a are off

LA-4540-128K

Max speed	Channels (memory size)
up to 80MHz external	40 (40@128K each)
up to 100MHz internal	40 (40@128K each)
250MHz	24 (16@250MHz@256K and 8@125MHz@128K) Pods 1a & 2a are at 250MHz, Pod 5a is at 125MHz, Pods 3a & 4a are off
500MHz	24 (8@500MHz@256K and 8@125MHz@128K) Pod 1a is at 500MHz, Pod 5a is at 125MHz, Pods 2a, 3a & 4a are off

LA-4280-32K

Max speed	Channels (memory size)
up to 50MHz external	80 (80 @ 32K each)
up to 100MHz internal	80 (80 @ 32K each)
200MHz internal	48 (32@200MHz@64K and 16@100MHz@32K) Pods 1a, 2a, 1b & 2b are at 200MHz, Pods 5a & 5b are at 100MHz, Pods 3a, 4a, 3b & 4b are off

LA-4580-128K

Max speed	Channels (memory size)
up to 80MHz external	80 (80 @ 128K each)
up to 100MHz internal	80 (80 @ 128K each)
250MHz	48 (32@250MHz@256K and 16@125MHz@128K) Pods 1a, 2a, 1b & 2b are at 250MHz, Pods 5a & 5b are at 125MHz, Pods 3a, 4a, 3b & 4b are off
500MHz	48 (16@500MHz@256K and 16@125MHz@128K) Pods 1a & 1b are at 500MHz, Pods 5a & 5b are at 125MHz, Pods 3a, 4a, 3b & 4b are off

LA-45160-128K

Max speed	Channels (memory size)
up to 80MHz external	160 (160 @ 128K each)
up to 100MHz internal	160 (160 @ 128K each)
250MHz	96 (64@250MHz@256K and 32@125MHz@128K) Pods 1a, 2a, 1b, 2b, 1c, 2c, 1d & 2d are at 250MHz, Pods 5a, 5b, 5c & 5d are at 125MHz, Pods 3a, 4a, 3b, 4b, 3c, 4c, 3d & 4d are off
500MHz	96 (32@500MHz@256K and 32@125MHz@128K) Pods 1a, 1b, 1c & 1d are at 500MHz, Pods 5a, 5b, 5c & 5d are at 125MHz, Pods 3a, 4a, 3b, 4b, 3c, 4c, 3d & 4d are off

4.7 Search menu

Setup	Setup search pattern
Forward	Forward search
Reverse	Reverse search

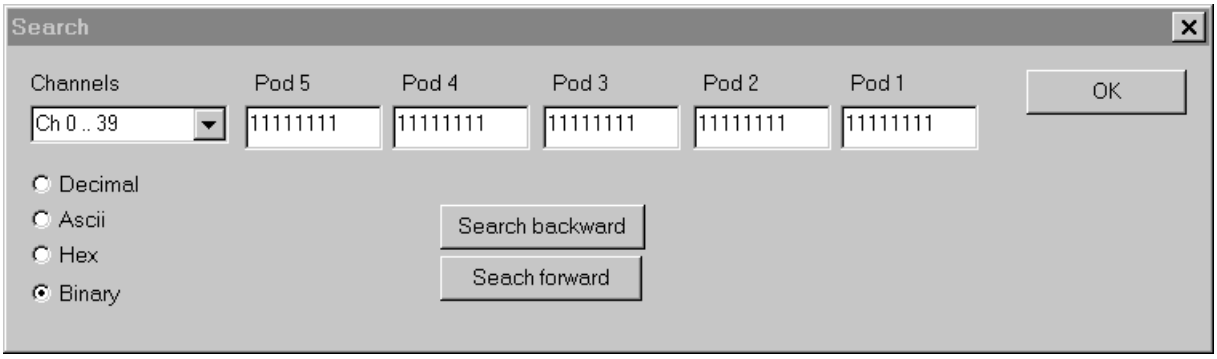
4.7.1 Search Setup

Search

Search patterns are organized in groups of pods (24 or 40 channels). If your logic analyzer has more than 40 channels you can select the remaining channels with the menu on the left edge of the window (titled "channels").

You can specify the search mask in the following bases:

Decimal
Ascii
Hex
Binary (note in binary you can enter 0,1, and X (don't care))



You can search in both forward and reverse directions. If a match is found (all bits much match) the statelist window is position with that data record displayed at the top. If you enter your data in binary you can use wild cards("X").

4.8 Trigger menu

Trigger menu

Go	Start looking for trigger event.
Stop	Stop looking for trigger event.
End	End capture and display data captured up to this point independent of trigger status.

Trigger word	Define trigger event.
Threshold level	Set threshold level.
Mode	Set trigger mode.

See also: Trigger Mode and Trigger position .

4.8.1 Trigger position

Trigger position

The trigger position defines how much data is captured prior to the trigger event and how much data is stored after it. You set the Trigger position by moving the trigger cursor. This feature allows you to see the data that led up to the trigger as well as what happened after the trigger.

4.8.2 Trigger word setup

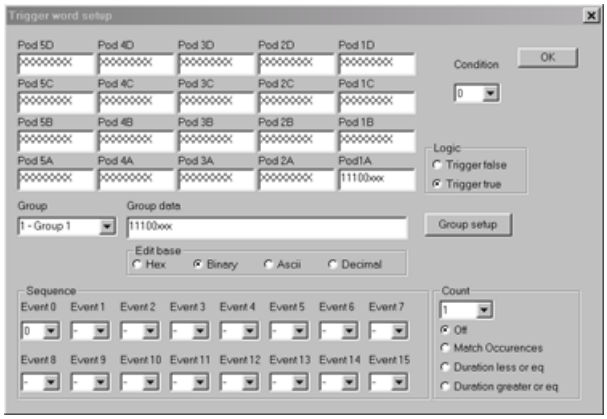
Trigger word setup (trigger menu)

Setting trigger word (LA-2124)
Setting trigger word (LA-4xxx)

Setting trigger word from Timing window

4.8.3 Trigger word setup (LA-4xxx)

Trigger word setup (LA-4xxx)



Each of the trigger words has the same number of bits as the Logic Analyzer has channels. Each bit represents one channel. Each bit can be set to 0, 1 or X (don't care).

Editing by channel/pod.

The upper portion of the display shows all of the channels in binary representation and can be edited.

Example:

If the trigger word = "XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXX1". This means trigger the Logic Analyzer when channel 0 goes to logic high.

If the trigger word = "XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX XXXXXX01". This means trigger the Logic Analyzer when channel 0 is high and channel 1 is low at the same time.

Editing by group.

Below that you can edit the data based on channel groups. This data can be edited in binary, hex, ascii or decimal. If the data has an X(don't care) bit it can only be edited in binary.

Edit base: Select which base you want to edit in.

Trigger sequence.

A sequence of up to 16 trigger words (conditions) can be set. The Logic Analyzer can look for up to 16 trigger words before it triggers.

Condition Select which word you want to edit.

Logic Trigger if condition is true or false.

Count

Count	The number of times you want to see the last word in the sequence before you trigger.
Match occurrences	Look for the last word in sequence exactly "count" times.
Less or equal	Look for the last word in sequence exactly or less than "count" times.
Greater or equal	Look for the last word in sequence exactly or greater than "count" times.

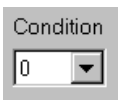
How to set trigger word:

1) The trigger words are edited here:

Edit the pattern: 

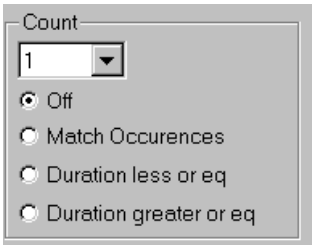
The LSB is to the right. Each bit can be set to "X","1" or "0" (Don't care, true, false)

2) You can build a library of 16 trigger words (called conditions).

You select which one you want to edit with this control. 

3) The LA-4000 series Logic Analyzers have 16 level sequential triggering. That means that can specify up to 16 conditions and the Logic Analyzer won't trigger until all of the conditions have been met in the order specified.
Note: You don't need to use all 16 of the levels and patterns can be repeated.

Use the list boxes to select which condition from the library of trigger patterns you want in each trigger level. Any level set to "-" will be skipped.
Note: A pattern can be repeated in the sequence.



The last word in the sequence has some extra features:

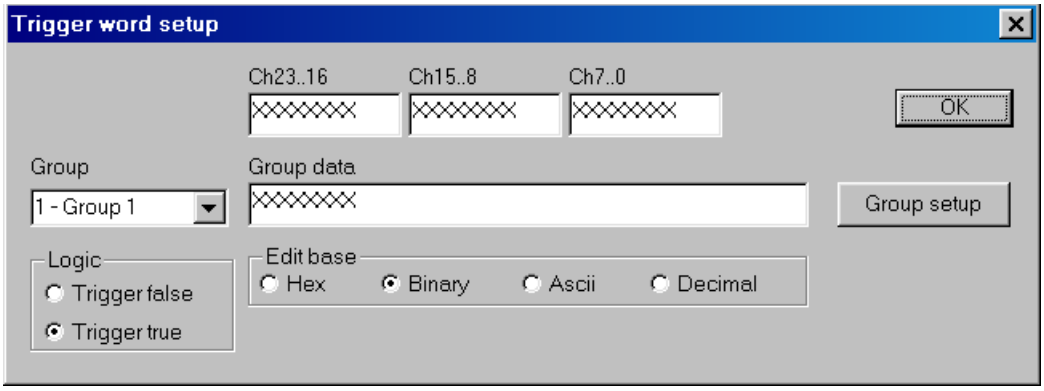
Match Occurrences: The LA won't trigger until the word appears "Count" number of times.
Duration less or eq. The LA won't trigger if the word appears more than "Count" number of times.
Duration greater or eq. The LA won't trigger if the word appears less than "Count" number of times.

4) You can set the trigger logic to "True" (trigger when pattern matches) or "False" (trigger when pattern stops matching).

See also: Trigger position

4.8.4 Trigger word setup (LA-2124)

Trigger word setup (LA-2124)



Each of the trigger words has the same number of bits as the Logic Analyzer has channels. Each bit represents one channel. Each bit can be set to 0, 1 or X (don't care).

Editing by channel/pod.

The upper portion of the display shows all of the channels in binary representation and can be edited.

Example:

If the trigger word = "XXXXXXXX XXXXXXXX XXXXXXX1".
This means trigger the Logic Analyzer when channel 0 goes to logic high.

If the trigger word = "XXXXXXXX XXXXXXXX XXXXXX01".
This means trigger the Logic Analyzer when channel 0 is high and channel 1 is low at the same time.

Editing by group.

Below that you can edit the data based on channel groups. This data can be edited in binary, hex, ascii or decimal. If the data has an X(don't care) bit it can only be edited in binary.
Edit base: Select which base you want to edit in.

Example:

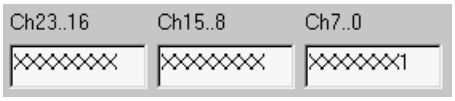
If the trigger word = "XXXXXXXX XXXXXXXX XXXXXXX1".
This means trigger the Logic Analyzer when channel 0 goes to logic high.

This means trigger the Logic Analyzer when channel 0 is high and channel 1 is low at the same time.
If the trigger word = "XXXXXXXX XXXXXXXX XXXXXX01".

Ch23..16
Edit pattern for channels 23 to 16
Ch15..8
Edit pattern for channels 15 to 8
Ch7..0
Edit pattern for channels 7 to 0
Logic
Trigger if condition is true or false.

How to set trigger word:

1) You can edit all 24 channels at a time.

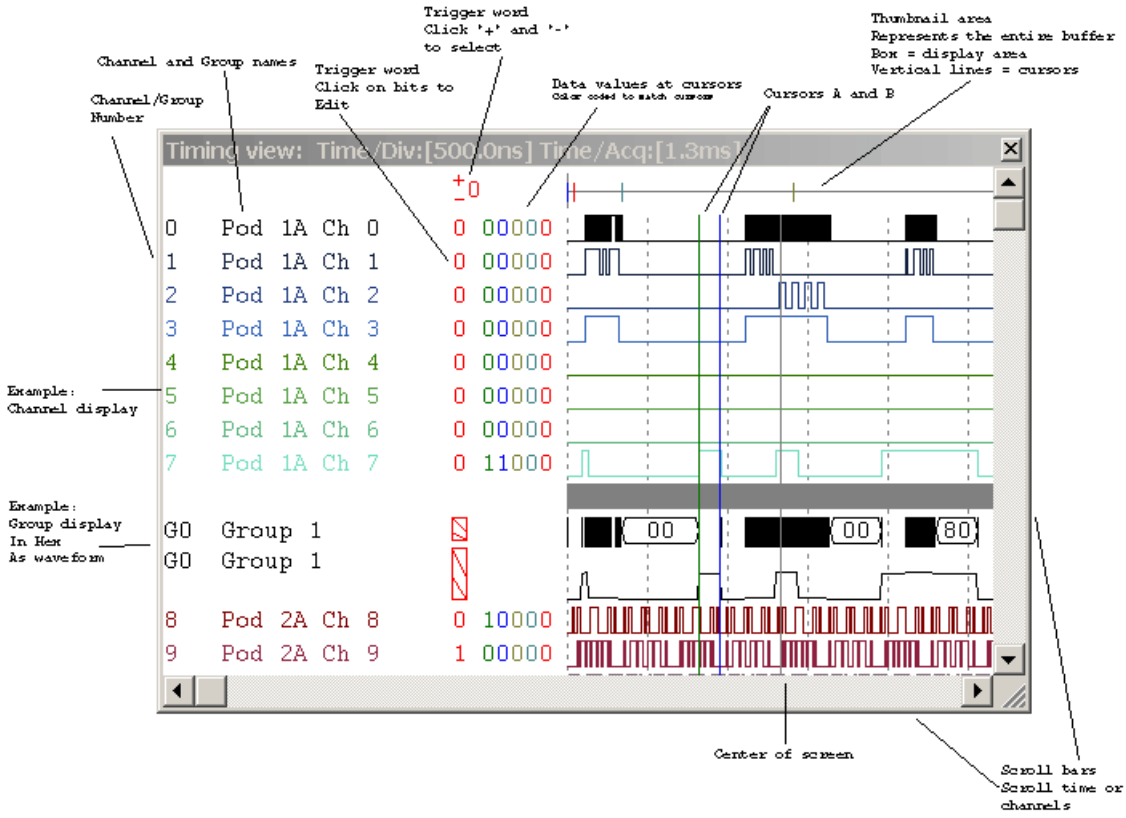
Edit the pattern: 

The LSB is to the right. Each bit can be set to "X","1" or "0" (Don't care, true, false).

2) You can set the trigger logic to "True" (trigger when pattern matches) or "False" (trigger when pattern stops matching).

See also: Trigger position

4.8.5 Setting trigger word from timing window



Clicking on the Trigger word bits will toggle them between '0', '1' and 'X'.
If a group of channels is displayed clicking on the box symbol will cause a window to appear that will allow you to edit the trigger word associated with that group of channels.
Clicking on the '+' and '-' symbols will switch between words in the trigger word sequence. (Not Available in LA-2124).

See also: Advanced trigger word setup (LA-4xxx) and Advanced trigger word setup (LA-2124)

4.8.6 Trigger mode

Trigger mode (trigger menu and toolbar)

Set trigger acquisition mode.

Single	The LA looks for the trigger event. When it is found acquire a single buffer worth of data and stop.
Normal	The LA looks for the trigger event. When it is found acquire a buffer worth of data, re-arm and repeat until stop is hit.
Auto	Similar to Normal except that it will acquire regardless of the trigger event.

4.8.7 Trigger Out/In

Trigger Out and Trigger In

Trigger Out

LA2124 The pin Labeled "Trig" is the trigger out connector. It goes from low to high when the Logic Analyzer is triggered and can be used to trigger another instrument.

LA4xxx The BNC connector on the back of the Logic Analyzer is a trigger output. It goes from low to high when the Logic Analyzer is triggered and can be used to trigger another instrument.

Trigger In

Any/all of the Logic Analyzer inputs can be used as a trigger input. See: setting trigger word.

See also: Trigger

4.9 help menu

Help menu commands

The Help menu offers the following commands, which provide you assistance with this application:

Help Topics	Offers you an index to topics on which you can get help.
About	Display copyright and version number of this application.

4.9.1 help about

About command (Help menu)

Use this command to display the copyright notice and version number of your copy of this program.

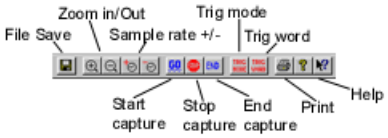
Part V

5 Windows

5.1 Toolbar

Toolbar

The toolbar is displayed across the top of the application window, below the menu bar. The toolbar provides quick mouse access to many tools.



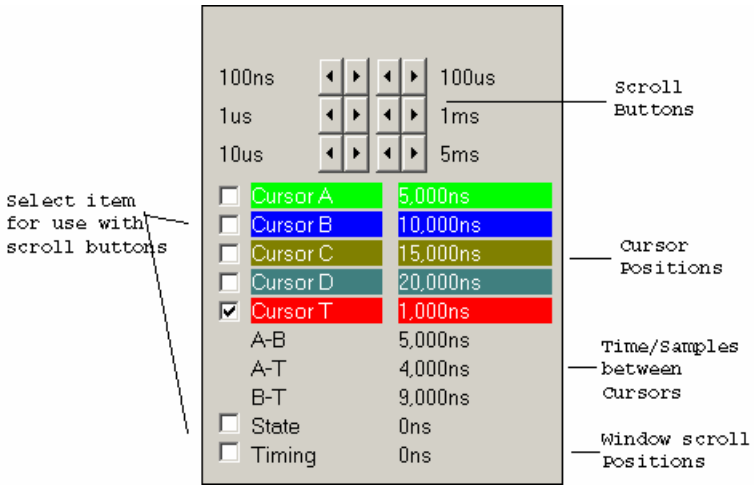
- Zoom in
- Zoom out
- Increase sampling rate
- Decrease sampling rate
- Start capture
- Stop capture
- End capture
- Trigger mode
- Print

5.2 Cursor window

Cursor window

Cursors are used to mark points of interest in the data, to measure time between events and to define pre/post trigger position.

This window is used to move cursors and change what area of the data buffer is being displayed in the Timing and Statelist windows. It also display the Trigger status and the time between the cursors.



Each cursor is displayed in a combination of its color and the background color.

Item selection
Click on the item you want to move.

Movement
Select an item by clicking on its box.

Use the arrow buttons  to move the selected item. Their are 6 sets of arrow buttons. Each set of buttons moves the selected item by the indicated amount.

Right clicking on one of the items brings up a context sensitive menu that allows you to reset, change color or change display units.

Measurements
The position of each cursor, timing and statelist windows are displayed. The differences between some of the cursors are also displayed.

The value is either in Time or Sample units. To select between time and sample number display go to the view/samples or time menu .

Trigger/capture status
Trigger/capture status is also displayed.

See also: How to: using cursors.

5.3 Timing window

Timing window

This window shows the data in a timing waveform style display.

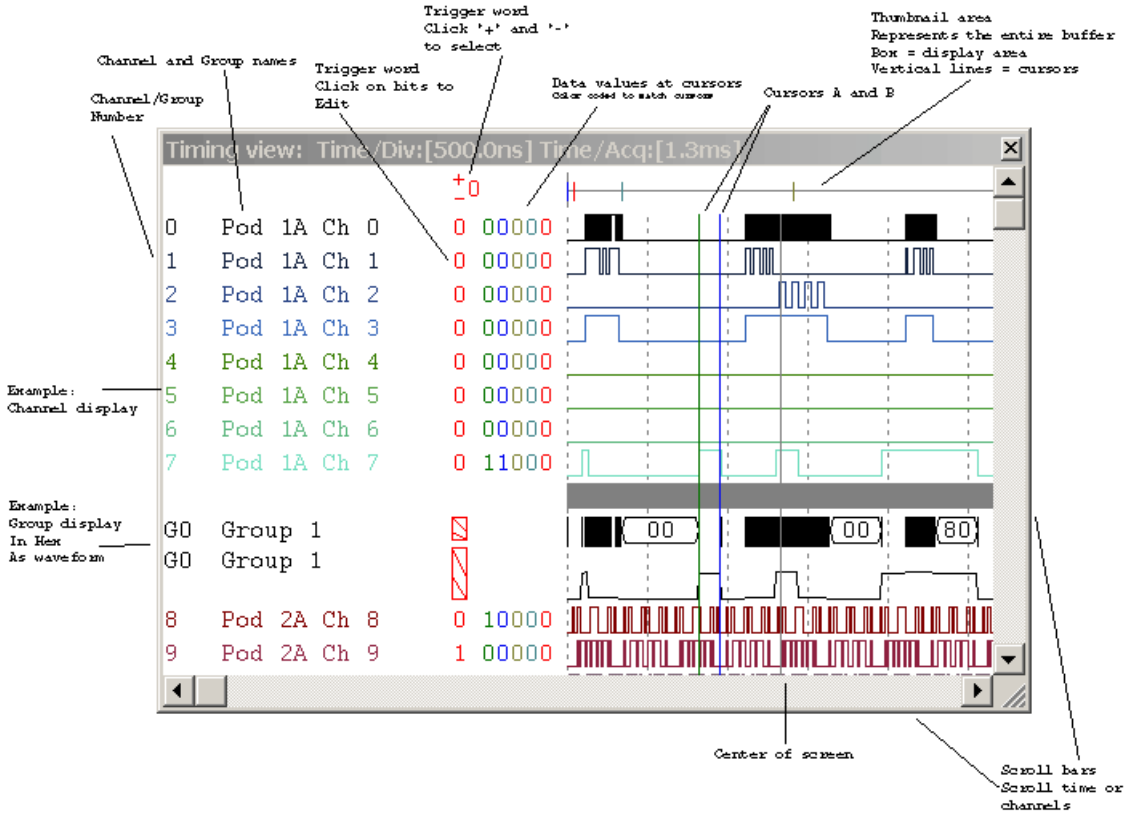
The title bar displays Time/Division (Time between vertical dotted lines) and Time/Acquisition (Total time recordable by Acquisition buffer - based on current Clock rate and buffer size).

Below the title bar is the thumbnail area. The long horizontal line represents the entire data buffer, the box represents the current display area and the small vertical lines represent the cursors. You can click and drag on the box or cursors to reposition them.

Below that is the data area. This area is divided into 5 columns:
1) Channel/group numbers
2) Channel/group names
3) Trigger bits
4) Values of data at each cursor (they are color coded to match the cursors).
5) Timing data display

Display of each of the first 4 columns can be turning on/off from the timing setup window or by right clicking the column.

The vertical scrollbar moves the window up and down to display more channels. The horizontal scrollbar moves the data forward and backward in time. The starting point of the display is shown in the cursor window.



This window can be used with either the internal or external clocks.

The channel order and display characteristics can be changed with the timing setup window.

Activate this window in the timing menu.

The size of the window can be changed by grabbing an edge of the window and dragging it.

Keyboard shortcuts:

When the Timing window is selected (title says "active window")

Left click + "A" key	moves the cursor to the window.
Left click + "B" key	moves the cursor to the window.
Left click + "C" key	moves the cursor to the window.
Left click + "D" key	moves the cursor to the window.
Left click + "T" key	moves the cursor to the window.
Left arrow:	scroll data with respect to time.
Right arrow:	scroll data with respect to time.
Up arrow:	scroll data with respect to channels.
Down arrow:	scroll data with respect to channels.

Holding shift key down while using arrows will scroll by a factor of 10.
Holding control key down while using arrows will scroll by a factor of 100.
Holding shift and control keys down while using arrows will scroll by a factor of 1000.

Control A:	Brings window to cursor.

Control B: Brings window to cursor.
Control D: Brings window to cursor.
Control T: Brings window to cursor.

Shift A: Brings cursor to window.
Shift B: Brings cursor to window.
Shift C: Brings cursor to window.
Shift D: Brings cursor to window.
Shift T: Brings cursor to window.

Note:
This only works on the selected window.
Click on the window to select it.
The selected window will say "active window" in the title bar.

When either window is selected

Right click on timing window
Brings up zoom dialog box .
Allows you to zoom on center or left edge of screen.
Other zoom features.

'Z' zooms in on data
Shift Z zooms out on the data

See also: How to:Setting up the Timing window .

5.4 Statelist window

Statelist window

This window shows the data in a statelist style display. The data will be displayed in columns. Each column represents a group of channels and can be displayed in different bases. Above each column will be its name. The horizontal scrollbar moves the window left and right to display more groups. The vertical scrollbar moves the data forward and backward in time. The starting point of the display is shown in the cursor window.

You can change the groups, column order and bases in the Statelist setup and group define menus.

You can use this with either the internal or external clocks.

Activate this window in the statelist menu.

The size of the window can be changed by grabbing an edge of the window and dragging it.

Keyboard shortcuts:

If the State window is selected (title bar says "active window")
Up arrow: Scroll data with respect to time.
Down arrow: Scroll data with respect to time.
Left arrow Scroll data with respect to channels.
Right arrow Scroll data with respect to channels.

Holding shift key down while using arrows will scroll by a factor of 10.
Holding control key down while using arrows will scroll by a factor of 100.
Holding shift and control keys down while using arrows will scroll by a factor of 1000.

Control A: Brings window to cursor.

Control B:	Brings window to cursor.
Control C:	Brings window to cursor.
Control D:	Brings window to cursor.
Control T:	Brings window to cursor.
Shift A:	Brings cursor to window.
Shift B:	Brings cursor to window.
Shift C:	Brings cursor to window.
Shift D:	Brings cursor to window.
Shift T:	Brings cursor to window.

Note:

This only works on the selected window.
Click on the window to select it.
The selected window will say "active window" in the title bar.

See also: How to: setting up Statelist window .

5.5 Scrollbars

Scrollbars

Displayed at the right and bottom edges of the document window. The scroll boxes inside the scroll bars indicate your vertical and horizontal location in the document. You can use the mouse to scroll to other parts of the document.

5.6 Serial window

Serial window

An optional I2C software package is available that allows you to view a disassembled I2C data capture. The screen looks very similar to the statelist window. The screen is organized in to two columns. The first column displays the address/sample time and the second column displays the I2C commands such as Read, Write, ACK, NACK, ADDR 1, ADDR 0, DATA 1, Data 0, Start, Stop, etc....

The serial window will disassemble a single group. This group be set to a mode "I2C" (See group define). and have two channels (Clock and data).

Contact Link Instruments sales department to order the I2C software.

Part VI

6 File format

File formats

Data files(.LA)

This file contains settings in the traditional windows .INI format and 2 types of records in the following format:

1. Data

A header that starts with a `[` and ends with a `]' character. This header line must be less than 80 characters long.

The line has 4 tokens

Token 1: "Data"

Token 2: Channel ID A1,A2,D1,M1,M2.....
Where A stands for analog channels, D stands for digital channels(8), and M for memory locations.
Example 1: D1 means the first 8 digital channels.
Example 2: A2 means the second analog channel

Token 3: A six digit number for the start address of the data record. The number is coded in decimal.

Token 4: A six digit number for the length of the data record. The number is coded in decimal (maximum length per record is 32768).

Example "[Data D2 000000 004096]"
This line means load digital channels 8..15 with 4096 data points starting at address 0.

Following the data header will be the actual data stored in binary format.

2. Comment

A header that starts with a `[` and ends with a `]' character. this header line must be less than 80 characters long.

The line has 1 or more tokens.
token 1: "Comment"
token 2....: the comment

example "[Comment This file was saved on 1/1/1995 at 8:06]"

Data files(.CSV from file save/load)

Comma Separated Value files will have one or more channels worth of data separated by commas. This file format is used when you want a way to export data to other programs. Each line will represent one sampling of time. Each channel will be separated by a comma. Each line must have the same number of commas.

example A)

1,1,0,0,1,1,1,1,
0,0,0,0,1,1,1,1,

In this example you have 2 samples each with 8 channels.

example B)

1,
0,
0,
0,
0,
1,
1,
1,
1,

In this example you have 9 samples each with 1 channel.

Data files(.CSV from file export)

Export can save a group or all channels. Comma Separated Value files will have one or more channels worth of data separated by commas. This file format is used when you want a way to export data to other programs. Each line will represent one sample.

All channels:

Binary mode: Each channel will be separated by a comma.
Channel order:
Pod0(ch7,ch6,ch6,ch5,ch4,ch3,ch2,ch0),
Pod1(ch7,ch6,ch6,ch5,ch4,ch3,ch2,ch0),
Pod2(ch7,ch6,ch6,ch5,ch4,ch3,ch2,ch0),
Pod3(ch7,ch6,ch6,ch5,ch4,ch3,ch2,ch0), etc....

Decimal mode: Data will be grouped by pod. Data will be in Decimal. Each pod worth of data will be separated by a comma.

Ascii mode: Data will be grouped by pod. Data will be in Ascii. Each pod worth of data will be separated by a comma.

Hex mode: Data will be grouped by pod. Data will be in Hex. Each pod worth of data will be separated by a comma.

Group:

Binary mode: Each channel will be separated by a comma.
Channel order: MSB ... LSB

Decimal mode: Data will be in Decimal. Each group worth of data will be separated by a comma.

Ascii mode: Data will be in Ascii. Each group worth of data will be separated by a comma.

Hex mode: Data will be in Hex. Each group worth of data will be separated by a comma.

Settings file(.INI)

These files store the Logic Analyzer settings. It is in the standard windows .INI format.

Translation table(.LXT)

See Translation tables .

MathCad(.PRN)

This is the same as .CSV except it does not have the commas.

Part VII

7 Hot keys

Hot keys

Alt-F	File menu
Alt-E	Edit menu
Alt-V	View menu
Alt-R	Serial menu
Alt-A	State menu
Alt-I	Timing menu
Alt-P	Pattern menu
Alt-C	Clock menu
Alt-T	Trigger menu
Alt-S	Search menu
Alt-H	Help menu

Timing window selected

Control click	Zooms in on point clicked.
Shift click	Zooms out on point clicked.
Up arrow	Scroll data with respect to channels.
Down arrow	Scroll data with respect to channels.
Left arrow	Scroll data with respect to time (scrolls by 1 sample).
Right arrow	Scroll data with respect to time (scrolls by 1 sample).
Shift-Left arrow	Scroll data with respect to time (scrolls by 10 samples).
Shift-Right arrow	Scroll data with respect to time (scrolls by 10 samples).
Control-Left arrow	Scroll data with respect to time (scrolls by 100 samples).
Control-Right arrow	Scroll data with respect to time (scrolls by 100 samples).
Shift-Control-Left arrow	Scroll data with respect to time (scrolls by 1000 samples).
Shift-Control-Right arrow	Scroll data with respect to time (scrolls by 1000 samples).
Control A:	Brings window to cursor.
Control B:	Brings window to cursor.
Control C:	Brings window to cursor.
Control D:	Brings window to cursor.
Control T:	Brings window to cursor.
Shift A:	Brings cursor to window.
Shift B:	Brings cursor to window.
Shift C:	Brings cursor to window.
Shift D:	Brings cursor to window.
Shift T:	Brings cursor to window.

Note:

These commands only effect the selected window.
Click on the window to select it.
The selected window will say "active window" in the title bar.

State window selected

Up arrow	Scroll data with respect to time.
Down arrow	Scroll data with respect to time.
Left arrow	Scroll data with respect to groups.
Right arrow	Scroll data with respect to groups.

Shift-Up arrow	Scroll data with respect to time (scrolls by 10 samples).
Shift-Down arrow	Scroll data with respect to time (scrolls by 10 samples).
Control-Up arrow	Scroll data with respect to time (scrolls by 100 samples).
Control-Down arrow	Scroll data with respect to time (scrolls by 100 samples).
Shift-Control-Up arrow	Scroll data with respect to time (scrolls by 1000 samples).
Shift-Control-Down arrow	Scroll data with respect to time (scrolls by 1000 samples).

Control A:	Brings window to cursor.
Control B:	Brings window to cursor.
Control C:	Brings window to cursor.
Control D:	Brings window to cursor.
Control T:	Brings window to cursor.
Shift A:	Brings cursor to window.
Shift B:	Brings cursor to window.
Shift C:	Brings cursor to window.
Shift D:	Brings cursor to window.
Shift T:	Brings cursor to window.

Note:

These commands only effect the selected window.
Click on the window to select it.
The selected window will say "active window" in the title bar.

Either window selected

Timing window (Right click)

Brings up zoom dialog box.
Allows you to zoom on center or left edge of screen.
Other zoom features.

Timing window (Left click on channel names)

Brings up Timing setup.

Statelist window (Left click on group names)

Brings up Statelist setup.

Cursor window (Right click)

Right clicking on check boxes will set the item to zero.

Part

8 Technical support

Technical support

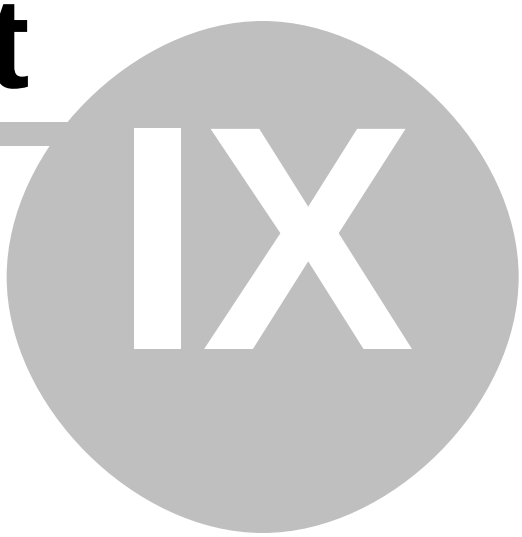
Technical support can be reached at

Link Instruments, Inc.
17a Daniel Road East
Fairfield, NJ 07004, USA
Phone: 973-808-8990 (9:00 - 5:00 eastern standard time)
Fax: 973-808-8786
Email: support@LinkInstruments.com

Software updates

Software can be downloaded from our website
Web: www.LinkInstruments.com

Part



9 Specifications

Hardware specifications

Memory modes and channel specs

See Memory modes .

LA-com-card(ISA) for the LA-4xxx series Logic Analyzers

Address jumper positions for ISA card.

Jumper	Address																							
	210-21F			230-23F			280-28F			2A0-2AF			300-30F			320-32F			380-38F					
	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1			
JP1		X	X	X	X			X	X	X	X			X	X	X	X				X	X		
JP2		X	X		X	X	X	X		X	X			X	X			X	X	X	X			
JP3		X	X		X	X		X	X		X	X	X	X		X	X			X	X			

Software (LA-4xxx series)

Operating systems supported

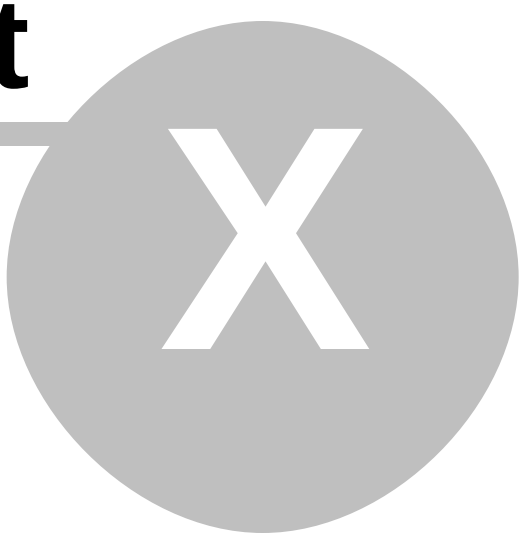
DOS:	Yes.
WIN3.1:	Use DOS version of the software.
WIN95/98/me:	Yes.
WIN NT/2000/XP	Yes.

Software (LA-2124)

Operating systems supported

DOS:	Not supported.
WIN3.1:	Not supported.
WIN95/98/ME:	Yes.
WIN NT/2000/XP	Yes.

Part



10 Accessories

Accessories

Pattern generator pods (Not available for the LA-2124)
: Pattern generator pods can be purchased to convert the LA-4000 into a pattern generator.

Parallel port adapter (Not available for the LA-2124)
: An optional parallel port adapter is available for the LA-4000 series Logic Analyzers. It allows you to run the Analyzer from the parallel port of your computer.

USB adapter (Not available for the LA-2124)
: An optional USB adapter is available for the LA-4000 series Logic Analyzers. It allows you to run the Analyzer from the USB port of your computer.

ISA Communication cards (Not available for the LA-2124)
: Extra communication cards are available for this Logic Analyzer. You can install these cards in multiple computers and easily move the Logic Analyzer from computer to computer.

Clips and wires
: Extra clips and wires are available.

Software library
: Software libraries are available to allow the user to write custom programs to control the instrument.

I2C software
: An optional I2C software package is available that allows you to view a disassembled I2C data capture.

Part

11 FAQs

Frequently asked questions

Q. The Logic Analyzer is working accept one of the channels is dead.
A. Check to see if the wire is actually on the post. It is possible to jam the wire between the post and the plastic case and not make a connection.

Q. Does the Logic Analyzer have an external trigger in?
A. You can use any/all of the inputs as a trigger signal.

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Endnotes 2... (after index)

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