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IMPORTANT NOTICE (Disclaimer/Copyright...)

BEFORE INSTALLING THE LOGIC-3 HARDWARE READ THROUGH THIS MANUAL AND GIVE SPECIAL ATTENTION TO THE HARDWARE INSTALLATION AND SAFETY PRECAUTIONS SECTIONS.

Much effort has been made to ensure that the contents of this manual is complete and without errors, but should this not be the case Jobmatch Systems cannot be held responsible for any damage resulting directly or indirectly from such errors. We will however, appreciate being informed of any errors detected in either the manual or the software or the hardware.

Jobmatch Systems only claims compliance to electromagnetic compatibility/susceptibility, safety, etc. standards specifically stated in this manual or printed on our official packaging. We cannot accept responsibility if any of our products are exported (E.g. by dealers) to any country that might have specific regulations to which any of our products does not comply.

Jobmatch Systems reserves the right to change the contents of this manual without notice and at any time.

CHECK LIST

Please check your Logic-3 package to ensure that it contains the following items:

- This user's manual
- Logic-3 main module unit, with fixed ground lead
- Logic-3 main module to PC printer port connecting cable (25 way)
- +5V power supply or special cable that taps 5V from the keyboard connector.
- 16 x test leads (4 connectors with 4 leads each, or 2 connectors with 8 leads)
- Logic-3 software on stiffy or CD
- Guarantee registration card/form

IMPORTANT SAFETY CONDITIONS

READ ALL THE FOLLOWING PRECAUTIONS:

In this manual, when referring to 'PC', 'Notebook computer' is also implied, except when specifically referring to 'Notebook computer'.

If power to the logic-3p is provided using power directly from the PC, you must ensure that the PC power supply has enough spare capacity to drive the Logic-3. Refer to the user's manual of the PC as well as the manuals of other equipment powered from the PC +5V supply to determine the spare capacity. The PC keyboard power source may also be fused below the Logic-3 current requirement. If in doubt, we recommend that you rather use an external 5V supply to power the Logic-3. The Logic-3 power requirements are specified in the 'Technical specifications' section.

Ensure that the power to the PC as well as to all peripheral devices connected to the PC is turned OFF before the Logic-3 hardware is installed.

Do not use near water and do not spill any liquids onto the unit.

Ensure that the unit is used on stable surfaces only. Dropping the unit may cause serious damage to it.

Slots and openings at the back, sides and bottom of the unit are for ventilation. Ensure that the openings are not blocked by placing the unit on a bed, sofa, carpet or similar surfaces. Do not cover the unit under papers or books etc. while it is powered.

Always remove the power to the unit under test before attaching or removing logic analyzer probes to IC pins. This will prevent short circuit damage to the unit under test.

Do not use the product in direct sunlight. This could result in the overheating of the unit.

Do not push any objects through the ventilation holes, for it may cause short circuits that could damage the product.

Do not attempt to service the product yourself. Opening the product will void the guarantee. A faulty unit should be returned to the dealer with a detailed description of the problem.

Switch off the PC, remove the Logic-3 from the PC and return the whole product to the dealer for service, should any of the following happen:
-If the unit does not operate normally when the instructions in the user's manual are followed.
-If liquid has been spilled into the unit.
-If the unit has been exposed to rain or water.
-If the unit has been dropped.

GUARANTEE CONDITIONS

A one-year guarantee is applicable, unless differently stated on the product registration card.

Should your Logic-3 become defect during the guarantee period, it will be repaired free of charge by Jobmatch Systems under the following conditions:

The guarantee registration form supplied with each product should be completed and returned to the manufacturer or approved agent via the dealer. A copy of the original sales invoice to the end user must be included.

The Logic-3 has no user serviceable parts. Only the manufacturer or authorised repair agents appointed by the manufacturer are allowed to do repairs on the product. Should the unit be opened by any unauthorised person, the guarantee will be void.

The user must ensure that the product is always used within its design specification. Refer to the product specifications in this manual.

The user must ensure that the safety precautions as stated in this manual are adhered to.

The guarantee only applies to failures that occur while the unit is used under "normal" operational conditions. That is: The product is used according to its specifications and the safety conditions are adhered to.

Jobmatch Systems cannot be held responsible for any damage that might occur due to the improper use of this product.

Jobmatch Systems cannot be held responsible for any damage resulting from errors in the manual or software.

The guarantee is not transferable, should the end user sell this product.

This guarantee does not provide for postage costs. It will be paid by the end user.

SYSTEM REQUIREMENTS

Host system requirements

Operating environment	Windows 95 or later compatible versions.
PC	80486 IBM or compatible PC
RAM	8 Mbytes minimum
Mouse	Operating with Windows
Disk space	4 Mbytes
Display screen	VGA,SVGA or equivalent

The Logic-3 uses the PC for command and display purposes only. Its data capturing functions are completely independent of the PC. Therefore the functioning of the Logic-3 is completely independent of the speed of the PC.

Windows performs faster with adequate RAM.

TRADEMARK ACKNOWLEDGMENTS

Windows is a trademark of Microsoft inc.
IBM is a trademark of International Business Machines Corporation.

INSTALLATION

Hardware Installation

1. Turn off all power to your system including peripherals (printer, external drives, modem etc.)

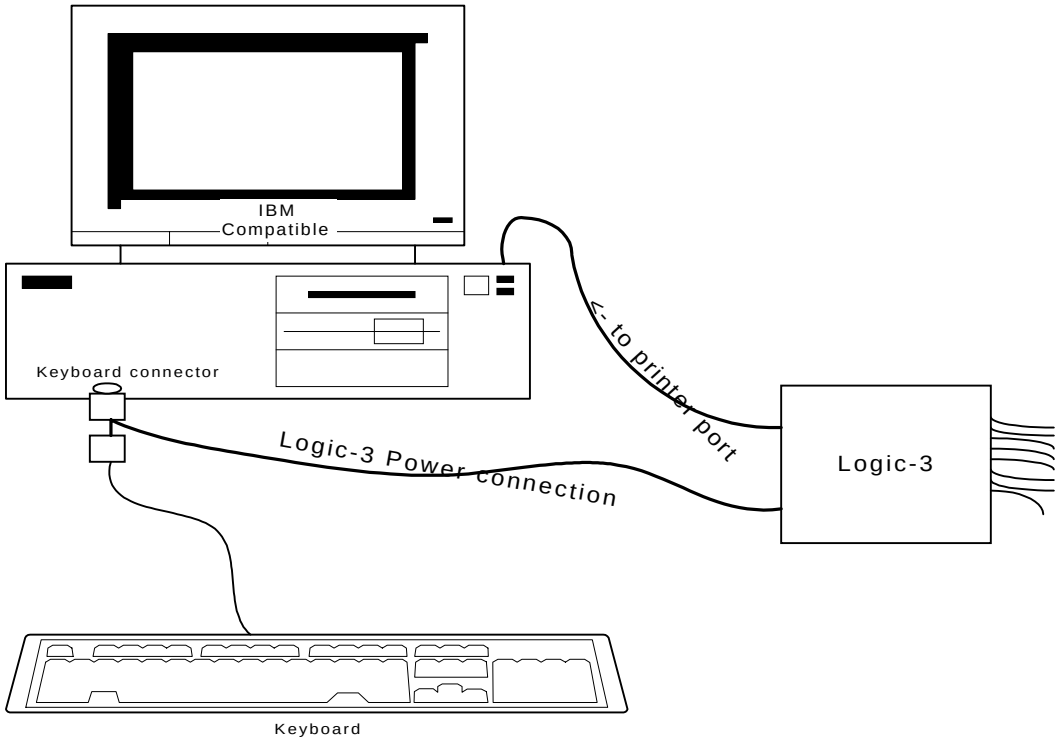
2. Connect the Logic-3 to the PC printer port using the 25-way cable. Secure the connector thumbscrews at both the PC and Logic-3 ends or the cable.

3. Power to the Logic-3 (A): If your Logic-3 is provided with a separate power supply unit. Check that you have been supplied with the correct power supply for your country (E.g. 220-240V in Europe or 110V in the USA). Connect the power supply to the wall and the round 5V power output to the Logic-3.

4. Power to the Logic-3 (B): If the Logic-3 was provided with a power cable for taking power from the PC keyboard connector: After ensuring that the keyboard connector of your system has the capacity to drive the Logic-3: Connect the Logic-3 power connector in series with the PC keyboard connector. For PS2 keyboard connectors, use a PS2 to DIN-5 adapter.

5. Connect the Logic-3 power connector to the Logic-3 power input.

5. The PC may now be switched on.



The above diagram shows the connection to the PC with power taken from the PC Keyboard connector.

Software Installation

The Logic-3 software requires less than 4 Mbytes of hard disk space.

The software can be installed automatically by running the SETUP.EXE. Follow the on-screen instructions until completion of the installation.

After installation an icon called "Logic-3" will be part on your Windows desktop. The program can be run by double clicking your mouse on the icon.

Troubleshooting

If software fails to detect the Logic-3:

- Check that the 25-way cable is connected firmly between the printer port and the PC.
- Check that the Power connector / Power supply is installed correctly.
- Check that the correct printer port is selected in the software (Options/printer port). Once the correct printer port has been selected ensure that the setting is saved in the configuration file (File/Save default), to ensure that the software will look for the Logic-3 at that port during the next program start-up.
- The standard IBM printer port is used. If you have installed the hardware and software correctly and the message that the Logic-3 is not detected is still displayed, select the IBM compatible or SPP printer port standard instead of the EPP, or ECP etc.
- Ensure that your Logic-3 software is compatible with your operating system. E.g.: The Windows 95 software will run under Windows NT, except that it is not capable of accessing the hardware.
- Ensure that you have the latest software version.
- The Logic-3 is protected by a 1.6A (or less) resettable fuse. The fuse will reset if power is remove completely for 3 minutes. If, on reapplying the power, the fuse again cuts the power to the unit, contact your vendor for repairs.
- Some equipment, notably certain scanners, have programs that automatically starts when the PC is switched on. These resident programs continuously checks the printer ports to see whether the specific equipment is attached to the port. These programs may disrupt detection and configuration of the Logic-3. Even should the Logic-3 be detected correctly, these programs may still cause problems by corrupting data transfers, or causing the Logic-3 to go into an undefined state. These programs MUST be disabled before the Logic-3 software is run.

LOCIC ANALYZER USAGE CONSIDERATIONS

Digital ground connection

The digital ground connection is very important.

Do not confuse it with the "Earth" connection, which is usually available from the wall power plug and connects to the PC chassis. The earth is for the protection of the user.

For the Logic-3, the digital ground connection is the thick black lead at the front of the unit.

Always connect it to the Unit Under Test (UUT) digital ground before taking measurements.

Try to connect it to the UUT digital ground, closest to the highest frequency that will be measured. The higher the frequencies measured the more important this becomes and a special effort in this regard should be made especially when measuring frequencies of say more than 10 MHz.

The Logic-3 digital ground is connected to the PC digital ground. If the UUT digital ground is also connected to the PC digital ground, you may well find that not connecting the logic analyzer digital ground will seemingly make no difference to the measurements taken. We strongly recommend that you should not be tempted by this to neglect the digital ground connection, because at higher frequencies or low threshold voltage settings, you may start experiencing "unexplained" marks-space variations, and glitches. This is caused by ground potential variations caused by ground line impedance. The effect of such ground line impedance becomes greater with increase of signal frequency.

Trigger condition

The trigger condition is the criteria the logic analyzer uses to know when the data the user actually wants to see is available. After the capture has occurred it will be displayed. The trigger position will be indicated by the trigger line. Inspecting the position of the trigger line, you will see that the signal states at the trigger line will correspond to the trigger conditions settings as set in the set-up dialog box.

The trigger circuitry of the Logic-3 is completely independent of the sampling clock. Therefore the Logic-3 can be triggered by conditions that occur for very short time durations compared to the selected sampling clock period. It is thus possible that the Logic-3 could trigger on a glitch condition that will not appear in the displayed data. The user could therefore have the peace of mind that the set trigger condition cannot slip by undetected, because the sampling clock might be set too slow to sample the trigger condition while it is actually occurring.

Pre-/post trigger buffer

After data has been captured, it is displayed at the trigger position.
The data before the trigger position is the "pre-trigger data".
The data captured after the trigger is the "post-trigger data".

While the logic analyzer is waiting for the trigger condition to occur it is continuously capturing data into the pre-trigger buffer.
When the trigger occurs, it starts filling the post-trigger buffer.
When the post trigger buffer is full, data capture stops and the data is displayed.

To see more of the data during the time before the trigger position, enlarge the pre-trigger buffer size and vice versa.

Clock sources & Sampling rate

The sampling rate is the rate at which the data signals, at the data channel inputs, are sampled.
Higher sampling rates provides higher sampling resolutions, but results in the quicker filling of the data buffer, and can therefore not be used for capturing slow varying signals.

Internal clock: (200 MHz down to 1.25 KHz)

These frequencies are generated internally in the Logic-3 and are used for general capturing and viewing of the input signals. The internal frequency selected depends on the input signal, e.g. to capture high frequencies like glitches, one would typically use the 200 MHz setting. Should one measure a 250 ms reset pulse a much lower sampling frequency must be chosen like 100 KHz.

Internal clock used for logging:

These frequencies are obtained from the PC and are dependant on the PC clock accuracy and stability as well as the operating system time scheduling.

The digital logger is typically used to measure very slow changing signals like changes in room temperature and humidity.

External clock:
This clock must be applied by the user to the channel 15 input. The user could specify whether the sampling must occur on the rising or falling edge.

Use the external clock for synchronous capturing. This is also called "state" capture. E.g. One could have data being captured on the rising edge of a micro-controller read signal, by using the read signal as the clock input. The logic analyzer will then capture the same data that the micro-controller reads. The text display should be used to analyze this data.

The data buffer configured as a **ring buffer**: In this mode the capturing is done similarly to when an internal frequency is selected, except that the clock input is taken from channel 15.

The data buffer implemented as a **linear buffer**: In this mode data may be captured from the first clock received, into the buffer. Data capture will stop and the displayed when the buffer is full. Should there not be enough clock cycles to fill up the buffer, the user could at any time stop the process and have the limited number of captured samples displayed.

The first sample to be captured may be specified to be the very **first clock received**, or it may **wait for a trigger condition** to occur and then start capturing the data from the first clock that follows the trigger. A very useful trigger setting to use in this case is to set the trigger to occur when a specific pattern is valid on the clocking edge. (Pattern AND Edge setting). This would ensure that a transitional pattern (glitch) state, when the pattern lines change state, does not cause a trigger, but only the clocked pattern can cause the trigger.

Threshold voltage

The threshold voltage level is the level that the logic analyzer uses to establish whether the signal is a logical high or –low at the moment it samples the signal.

The measured signal is compared to the threshold voltage. If the sampled value is higher than the threshold voltage it will be displayed as being "high", if not it will be displayed "low".

Extended Capture time

Refer to the section on the Set-up Dialog box.

Data Capture stages

The progress of the capture is displayed on the status line in the dialog box. Every capture goes through the following stages:
(1) Filling pre-trigger buffer.
(2) Waiting for trigger.
(3) Filling post-trigger buffer.
(4) Extended capture time, time-out (applicable if ECT > zero)
(5) Transferring data to the PC.
(6) Data display.

During stage (1) the pre-trigger buffer is filled. Triggering is disabled during this period.

During stage (2) the Logic-3 actively captures data into the pre-trigger buffer keeping it full with the current samples.

When a trigger is detected the Logic-3 captures the post trigger buffer. Stage (4)

If the extended capture time (ECT) is set to 0 the end of stage (4) will end active data capture. Should the ECT be set to a value not equal to 0, more data will be captured into the data buffer for the set ECT time period. The oldest data in the data buffer will be lost. Should the ECT be long enough, the trigger point will be moved right out of the data buffer. For more detail on the ECT refer to the section describing the set-up dialog box.

During stage (5) the data is transferred from the Logic-3 to the PC.

Stage (6) displays the data after which the user can view it and take measurements.

Off course, data capture is completely unaffected and remains accurate during all the data capturing stages (1…4). No samples or accuracy is lost moving, from one stage to the next.

Some of these stages, especially when the sampling frequency is high, may occur too fast to show on the status line. The dialog box will disappear after the capture has been completed.

While the logic-analyzer is "waiting for trigger", the trigger may be forced to trigger unconditionally by clicking the *'Trigger'* button. Capture may be stopped by clicking the 'stop' button.

Continuous capture

Refer to the section on the Set-up dialog box.

Mark-Space

The mark-space ratio of a square wave refers to the time that the signal is high verses the time the signal is low during one period. A 50% mark-space indicates that the signal is high half of the period and low for the other half.
Say you are measuring a signal of 10 MHz (50% mark-space), using a sampling frequency of 40 MHz, you could expect the signal to be displayed with a 50% mark-space. The sampling frequency is 4 times the rate of the measured signal, therefore one could expect that the measured signal would be sampled twice while it is high and twice while it is low.

In the real world unfortunately thing does not always work according to the ideal:
The measured signal could be smaller than expected, because of bandwidth limitations in its propagation path.
The signal could be distorted.
The logic analyzer threshold may be set too high or too low
The measured signal frequency might be unstable.
A poor digital ground connection might cause ground potential variations.
Etc.
Any of these could result that the measured signal might e.g. be captured say three times on the high and once on the low. This will result in the signal being displayed with a 75% mark-space.

Remedy:
Always try to use the maximum sampling frequency that is practical.
Vary the threshold voltage.
Ensure that the digital ground connection is good. Refer to the section discussing the digital ground connection.

Glitches

Refer to the section on the "Digital ground connection".
Refer to "Trigger condition" for details regarding capturing of glitches and trigger conditions that are relatively short compared to the sampling clock period.

MAIN FEATURES OVERVIEW – Logic-3p

The Logic-3 is a user-friendly, yet sophisticated PC based logic analyzer.

A sampling rate of **200MHz on 16 channels simultaneously** is provided.

Internal sampling rates available: 200MHz, 100MHz, 50MHz, 25MHz, 10MHz, 5MHz, 2.5MHz, 1MHz, 500KHz, 250KHz, 100KHz, 50KHz, 25KHz, 10KHz, 5KHz and 1.25 KHz.

The Logic-3s could be used as a digital data logger. Log rates can be set from 4 seconds to 1 hour (in one-second steps).

A 128**k Samples/channel buffer** is available at all sampling rates for each channel. The large buffer ensures that longer sampling periods can be achieved at any specific sampling frequency. This reduces the need to scale down to a lower sampling frequency, with the resulting reduction in sampling resolution. Therefore, the large buffer ensures more accurate time measurements of longer high frequency signals. The pre-trigger and post-trigger buffer sizes are fully adjustable across the total buffer spectrum.

Flexible trigger options are at the user's disposal. For pattern triggering, the incoming digital signals are compared to a user specified trigger pattern (1,0 and don't care settings allowed). Edge triggering may be performed on any one channel and may be set to occur on a rising, falling or either rising or falling edge (change of state). Pattern and edge triggering may be combined:
Pattern OR Edge: A trigger will occur on a pattern or edge trigger condition, whichever occurs first.
Pattern AND Edge: A trigger will occur when the edge condition occurs while the pattern condition is true.
Pattern THEN edge / Edge THEN pattern: The Logic-3 will initially wait for the first condition to occur. After the first condition was detected it will wait for the second condition to occur which will be

the final trigger, resulting in the data capture completion and display.

A trigger may be forced while the Logic-3 is waiting for a trigger condition to occur, by using the mouse. If a "Condition1-THEN-condition2" is active and the Logic-3 is waiting for the first condition, forcing the trigger will force only the first condition. If the Logic-3 is waiting for the second condition, forcing the trigger will force the second condition.

Input signals may be displayed '**unconditionally continuously'** such that the display screen is continuously updated regardless of what the input signals look like. The input signals may also be displayed '**conditionally continuously'**. In this case the screen is updated only after a trigger condition is detected.

The digital input voltages are compared to a selected **threshold voltage**, determining whether it is high or low. A variety of threshold voltages are available for selection.

External clock functions

Synchronous (state) capturing may be done by using an external clock, applied to channel 15. Capturing may be specified to occur on the rising or falling edge of the clock.

Two basic external clock modes are available:

a. The data buffer configured as a **ring buffer**: In this mode the capturing is done similarly to when an internal frequency is selected, except that the clock input is taken from channel 15.

b. The data buffer implemented as a **linear buffer**: In this mode data may be captured from the first clock received, into the buffer. Data capture will stop and the displayed when the buffer is full. Should there not be enough clock cycles to fill up the buffer, the user could at any time stop the process and have the limited number of captured samples displayed.

The first sample to be captured may be specified to be the very **first clock received**, or it may **wait for a trigger condition** to occur and then start capturing the data from the first clock that follows the trigger. A very useful trigger setting to use in this case is to set the trigger to occur when a specific pattern is valid on the clocking edge. (Pattern AND Edge setting). This would ensure that

a transitional pattern (glitch) state, when the pattern lines change state, does not cause a trigger, but only the clocked pattern can cause the trigger.

Example of external clock capturing:
One could capture data on the rising edge of a micro-controller read signal, by using the read signal as the clock input. The Logic Analyzer will then capture the same data that the micro-controller reads. The text display should be used to analyze this data.

When the Logic-3 is not active, it automatically enters a **sleep mode**, using only a fraction of active power.

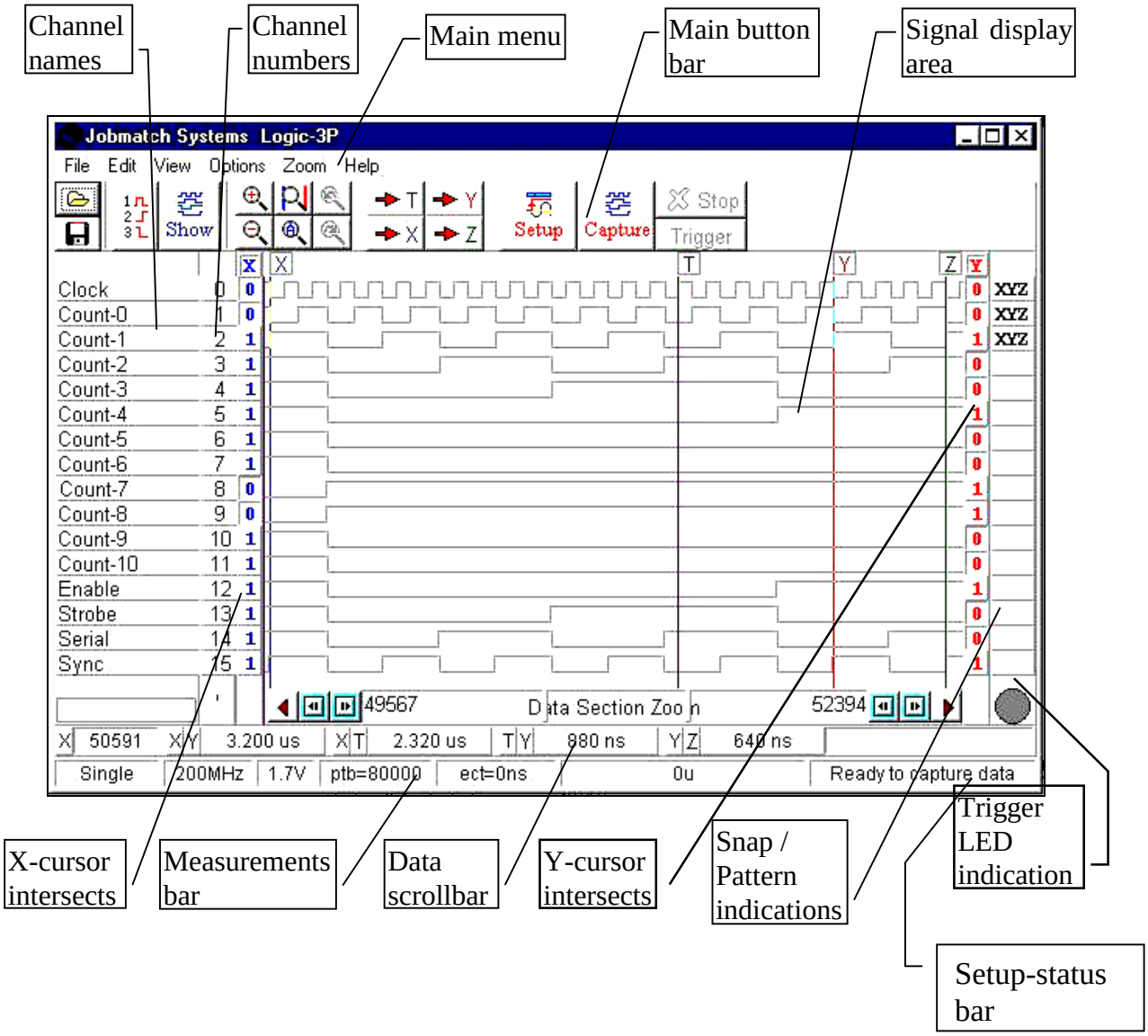
The easy-to-use software takes full advantage of the user-friendly Windows environment. The power of the **multitasking environment** is utilised to run the Logic-3 software and the user's unit under test software simultaneously, if the unit under test is driven from a PC. No separate PC is required! The user software may be launched from within the Logic-3 software or via the normal Windows route. The Logic-3 software may be run in a window in the background, waiting to be triggered, while commands may be executed in a user's program running in the foreground. After a trigger has occurred the user simply switches windows to view the captured data. Remember that although multitasking applications could slow down the PC, the Logic-3 operates completely independent of the PC. The PC merely acts as a command and display interface between the user and the Logic-3.

The **data display** is very flexible. A few of the most significant display features are mentioned:
Any number of channels may be displayed, each with its user specified name. The channel order may be changed to any display order. The whole data buffer may be viewed at one time, or the user may zoom in until only a few samples are displayed. Data combinations may be searched for and jumped to. A trigger line indicates the trigger position, while X, Y and Z cursors are used for time measurements.
Data may also be viewed in hex and binary formats.

Displays may be printed or saved to disk.

The **LED indicators** provide an extra indication giving instantaneous confirmation to the user of the current Logic-3 status. The trigger LED is mirrored in the software main window.

MAIN WINDOW



The main window consists of

1. Main menu
2. Main button bar
3. Signal display area
4. X and Y-cursor intersects
5. Measurements bar
6. Data scrollbar
7. Snap/pattern indications
8. Trigger LED indication
9. Set-up-status bar
10. Channel names
11. Channel numbers

Main window cryptic description

Below follows a short description of each of the main window areas as indicated on the previous page. More details are provided in sections to follow later.

Channel names

The channel names are displayed as entered by the user.

Channel numbers

Next to the channel names are the channel numbers which corresponds to the channel numbers on the Logic-3 face panel.

Main menu

Many, but not all, of the main button bar functions are duplicated in the menu items. Functions not available on the main button bar have to be accessed through the main menu.

Main button bar

The button bar displays the speed buttons. These buttons are used to execute the most commonly used functions with a single click of the left button of the mouse.

Signal display area

The signal display area is where the captured data is displayed in graphical form. The displayed signals correspond to the data between the two zoom posts on the data scrollbar.

Trigger LED indication

The trigger LED on the Logic-3 is duplicated in the software in the main display window.

Snap / pattern indications

Edge snapping makes it easy to put a cursor line exactly on an edge. The snap indication shows when a cursor line is exactly on an edge. The user can accept with confidence that a measurement taken between two cursor lines snapped on edges will give an accurate reading.

When a pattern trigger condition is active, these boxes will indicate the pattern condition for each channel.

When a pattern condition is set and the Logic-3 is waiting for a trigger the set pattern will be indicated here.

When a pattern condition is set and snap indications are displayed here, the set pattern condition will be displayed when the mouse is clicked on any one of the snap indication boxes.

Y-cursor intersects

The channel values where the Y-cursor line intersects the channel signals are indicated in this area.

Data scrollbar

The data scrollbar is used for signal scrolling and zooming.

Measurements bar

The measurements-bar displays cursor to cursor measurements.

X-Cursor intersects

The channel values where the X-cursor line intersects the channel signals are indicated in this area.

Set-up-status bar

The set-up-status bar provides information regarding the Logic-3 set-up- and capture status.

Main menu

'File' menu option

Open file

Use *Open file* to load a previously saved signal file.
The *'Open'* dialog box will appear to help you find the file.
When a file is opened the environment is recreated, as it was when the file was saved.

Save file

Use *Save file* to save the captured data to disk.

The complete set-up, including cursor positions, channel names, channel order, etc. will be saved.

The *'Signal info'* dialog box will appear, allowing you to enter information concerning the signals, to be saved with the data.

The *'Save As'* dialog box assists the user in saving the file in the intended directory.

Save bitmap

Saves a bitmap file of the captured signals. This bitmap file has the appearance much like the "Print signals" printer output.

Save Window

Saves a bitmap file (.BMP) of the main window. This file could be read by most word processors.

Save Text

Saves the data in hexadecimal text.
The saved text file may be viewed, using any text editor.

The text file format is as follows:
Eight samples are saved each separated from the previous by a "space".
The eight samples are followed by a "Carriage return", which is followed by a "line feed"

For the next eight samples the pattern is repeated and so on to end of the display data buffer.
Each data sample consists of sixteen bits and is saved as a four-digit hexadecimal number.
"Space" is "14" in hexadecimal.
"Carriage return" is "0D" in hexadecimal.
"Line feed" is "0A" in hexadecimal.

Save Default

Use this menu option to save the basic software configuration with which the software should start up.

The information saved in the configuration file consists of the *'Options'* dialog box information, as well as the check box settings of the *'Signal info'* dialog box.

Note that information such as the current channel names, channel order, set-up information such as the sampling rate, threshold voltage, etc. is not saved as part of the default configuration. This information is saved though when a signal file is saved. When a signal file is loaded these settings are restored, as they were when the signal file was saved. Refer to the *'Open file'* and *'Save file'* menu options.

Print signals

Use '*Print'* to send the current displayed signals to the printer.

Before the print starts, the *'Signal info'* dialog box will appear, giving you the chance to enter information you would like to be printed with the signals.

Before printing the signals, you may switch off the channels you don't want to appear on the print. Use the 'Show' button or the *'View/Show channels'* menu option.

Print bitmap

Prints the main window bitmap

Print text

Prints the captured data in a compact hexadecimal format or hexadecimal with binary.

The *'Print text'* dialog box appears, allowing you to specify the range of samples to be printed. The default print range is the range from the data scrollbar left zoom post to the - right zoom post.

Each word represents a data sample of all channels.

Each bit of the data word represents the state of that channel input when the sample was taken.

Channel 0 is represented by the least significant bit and channel 15 by the most significant bit.

Printer Set-up

The *Printer Set-up* dialog box is used to change the options for the current printer selected.

Project

If the unit under test (UUT) is PC based, you may run the UUT software by selecting this option.

This option displays the *'Project'* dialog box, which is used to find and run the project file.

Refer to the section on dialog boxes for more information concerning the *'Project'* dialog box.

The user program may also be started through normal Windows methods; just like any other second application would normally be started.

When the UUT software is run and does not appear in a window (e.g. DOS programs), press *'Alt+Enter'* to place it in a window.

To take measurements on a PC-based UUT, one would run both the Logic-3 and UUT software.
Size the two program windows such that when the one is in the foreground, at least part of the other window may be seen in the background.
Let's assume you've hooked up probes to the UUT and the hardware is ready for a capture.
Once the Logic-3 has been prepared for a capture by using the *'Set-up'* dialog box, press *'Capture'* on the main button to start the data capture.
The Logic-3 should now be waiting for a trigger from the UUT, displaying the 'Waiting for trigger' message.
Now click on the UUT program window in the background to bring it to the foreground.
Execute some instruction to the UUT, which should cause the desired trigger.
The 'trigger' LED on the Logic-3 will immediately indicate the detection of a trigger by switching off.
The Logic-3 window running in the background will transfer and display the captured data.
Switch to the Logic-3 software to inspect the captured data.
Easy!

Quit

This option may be used to quit the program.

'Edit' menu option

Channel names

Clicking on the *'Channel names'* option will display *the 'Change channel names'* dialog box, which could be used to edit the channel names.

Refer to the *'Change channel names'* dialog box section for detail on its usage. Channel names may also be changed by clicking the mouse directly onto the name you would like to change.

Signal information

Selecting this option will display the *'Signal info'* dialog box which you may use to log information concerning the captured data.

Refer to the *'Signal info'* dialog box in the 'Dialog boxes' section.

Copy bitmap to clipboard

A copy of the main window is copied to the Windows clipboard.

'View' menu option

Show Channels

This option displays the *'Show Channels'* dialog box, which is used to switch channels off which you don't want to appear in the main window, such as unused channels.
When printing the signals, switch off the channels you don't want to appear on the print.
Refer to the *'Show channels'* dialog box in the dialog boxes section.

Data as text

This option is used to display the data in a hexadecimal format.
Each word represents a data sample of all channels.
Each bit of the data word represents the state of that channel input when the sample was taken.
Channel 0 is represented by the least significant bit and channel 15 by the most significant bit.

Search Pattern

Clicking on '*Search Pattern'* displays the '*Search Pattern'* dialog box which is used to search for any signal bit combinations (patterns) that may occur in the data.

Refer to the *'Search Pattern'* dialog box section for further details on using this dialog box.

'Options' menu option

Selecting this option displays the *'Options'* dialog box

Use this dialog box to set general environment and hardware configuration options.

Refer to the *'Options'* dialog box in the 'Dialog boxes' section for more details on using this dialog box.

'Zoom' menu option

All

Zoom to display all the data in the signal display area.

In

Zooms into the data.

Out

Zooms out, displaying more data in the signal display area.

X-Y

Zooms to display all the data between the X and Y cursor lines, as they are currently placed, in the signal display area.

X-Z

Zooms to display all the data between the X and Z cursor lines, as they are currently placed, in the signal display area.

Y-Z

Zooms to display all the data between the Y and Z cursor lines, as they are currently placed, in the signal display area.

'Help' menu option

A hypertext help is available under the *'Contents'* option.
An *'About'* dialog box may be displayed giving information on the current software and the manufacturer.

Main button bar

The buttons at the top of the main window provides quick access to frequently used menu functions as well as a few functions not represented in the menus.

'Open signal file' button.

Opens a previously saved signal file.

Clicking this button has the same effect as selecting the *'File/Open file'* main menu option.

The *'Open'* dialog box will appear to help you find the file. When a file is opened the environment is recreated, as it was when the file was saved.

'Save signal file' button

Saves a signal file.

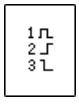
Clicking this button has the same effect as selecting the *'File/Save file'* main menu option.

The complete set-up, including cursor positions, channel names, channel order, etc. will be saved.

The *'Signal info'* dialog box will appear, allowing you to enter information concerning the signals, to be saved with the data.

The *'Save As'* dialog box assists the user in saving the file in the intended directory.

'Normalise channel order' button



If the channel order has been changed, clicking this button will normalise the channel order to its original order of 0 to 15. A channel is moved by clicking on its channel number and then clicking on the channel number of the channel currently in the position where you would like the channel to be moved, to be displayed. (NOTE: Don't try to drag the channel to its new position. Click the channel to move and click at the new position).

'Show channels' button

This option displays the *'Show channels'* dialog box, which is used to switch channels off which you don't want to appear in the main window, such as unused channels.

This button performs the same function as the *'View/Show channels'* main menu option.

When printing the signals, switch off the channels you don't want to appear on the print.

Refer to the *'Show channels'* dialog box in the 'Dialog boxes' section.

Zoom In

See more detail of a specific portion of the data buffer.

Zoom Out

Zoom out to see more data samples.

Zoom X-Y

View the data between the X and Y cursor lines.

Zoom All

View the whole data buffer.

Zoom Previous

View the data at the previous zoom setting. If more than one capture has been taken at the same zoom setting, clicking "zoom previous", will not take you back to the previous capture, since the zoom setting did not change. It will take you back to the previous zoom position within the data buffer.

Zoom Next

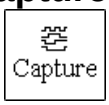
When you have gone backward to a previous zoom setting, using "Zoom Previous", you can go forward again, using "Zoom Next".

'Set-up' button

This button is used to display the *'Set-up'* dialog box, which is used to set trigger options, the sampling rate, threshold voltage, pre- and post-trigger buffer sizes, etc.

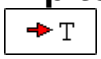
Refer to the *'Set-up'* dialog box in the 'Dialog boxes' section.

'Capture' button



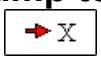
The 'Capture' button is used to execute data captures.

'Jump to trigger' button



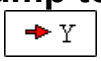
This button will cause the data display to move to the trigger (T) position.

'Jump to X' button



This button will cause the data display to move to the X cursor line (X) position.

'Jump to Y' button

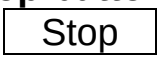


This button will cause the data display to move to the Y cursor line (Y) position.

'Jump to Z' button

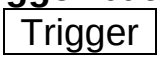
This button will cause the data display to move to the Z cursor line (Z) position.

Stop button



Stops single or continuous data capture.

Trigger button



Forces trigger at any stage during single or conditional continuous capture, when the Logic-3 is waiting for a trigger to occur.

If triggering has been set for "Condition1-THEN-Conditon2" and the Logic-3 is waiting for the first condition, forcing the trigger will force only the first condition. If the Logic-3 is waiting for the second condition, forcing the trigger will force the second condition

Signal display area (& Cursor lines)
The signal display area is where the captured data is displayed in graphical form. The displayed signals correspond to the data between the two zoom posts on the data scrollbar.

Data may be scrolled or zoomed by means of the data scrollbar.
More zooming options are provided by the *'Zoom'* main menu option.

Time differences between signal edges are taken by placing the mouse arrow cursor on (or close to) the edge you would like to measure from and clicking the appropriate mouse button to snap the wanted cursor line to the edge. (Left mouse button for the X, right for the Y and middle (or shift+left) for the Z cursor line).
If the cursor is snapped to an edge, it will be indicated by the snap indications.
Cursor-line to cursor-line time differences may be read from the measurements bar.

Cursors may by switched off, by clicking on the small nametag at the top of the cursor.

All cursors that are off, may be switched on simultaneously by using the "view/cursors on" menu option.

The order in which the signals are being displayed may be changed. Refer to the section on channel numbers.

Snap/Pattern indications
Since a much larger number of data may be displayed on the data display area than the number of screen pixels that are available, one pixel may represent a number of actual data samples. When taking time measurements on such a zoomed out screen, using the X, Y and Z cursor lines, it is important that the cursor lines are placed on the exact samples representing the signal edges before a measurement is taken. If the cursor has not snapped to the data edge, the measurement will not be accurate.

A cursor line is snapped to an edge by placing the arrow cursor on (or close to) the actual data edge in the signal display area from which you would like to measure and clicking the mouse button. (Click left for the X, right for the Y and middle (or shift+left) for the Z cursor). The cursor will snap to the edge pointed to and an indication to this effect will be given in the cursor edge snap-indication area. An 'X', 'Y' or 'Z' is displayed to indicate which cursor line is on the edge. The trigger line (T) is not indicated in the snap indications. It will, of course, always be snapped to at least the trigger position in the data.

When a pattern trigger condition has been selected, the pattern will be indicated in this area, while the logic analyzer is waiting for a trigger.

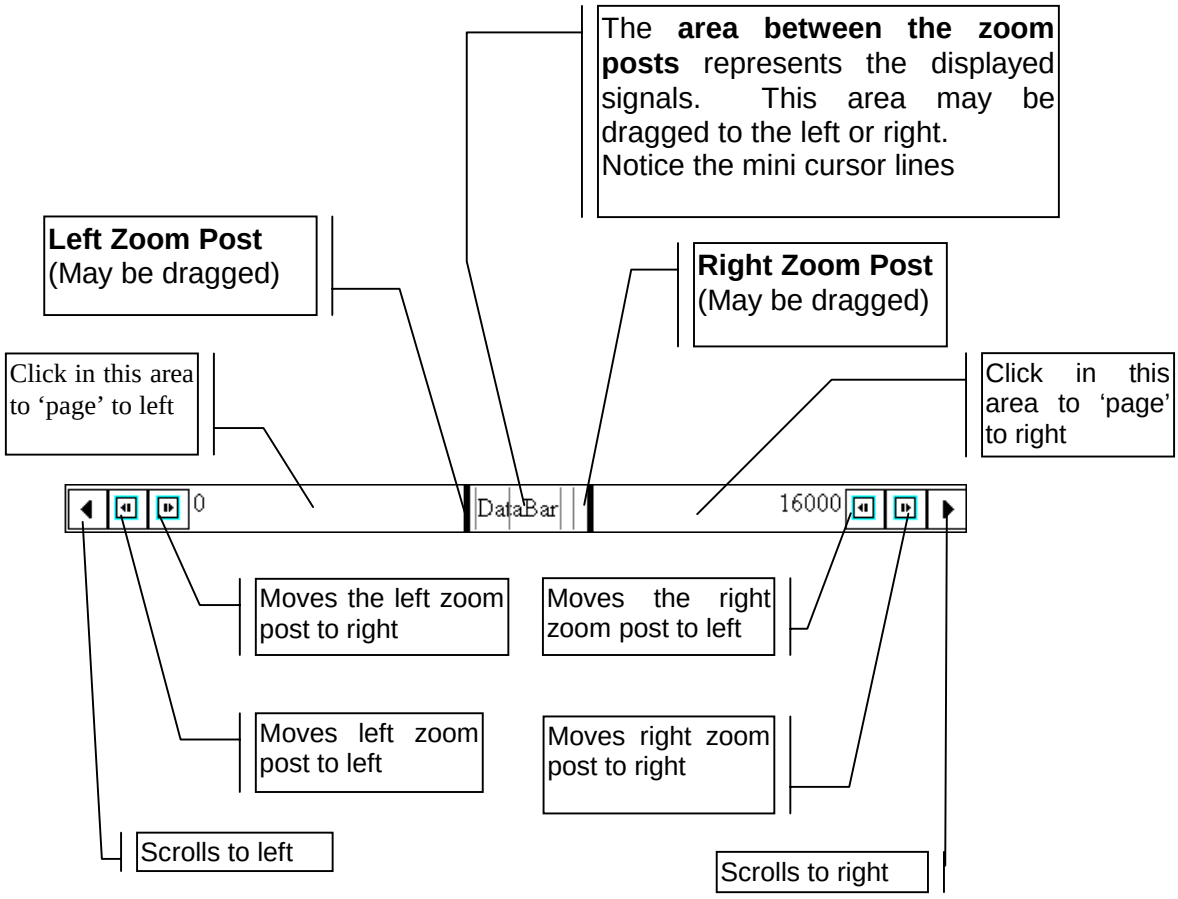
X and Y cursor intersects

The channel values where the X and Y-cursor lines intersect the channel signals are indicated in these areas.

A button display is used to improve readability. The buttons are for display purposes only and cannot be clicked.

When a cursor line is exactly on a signal edge, the signal value to the right of the edge will be indicated. (If it is a high to low edge, a '0' will be indicated. If it is a low to high edge, '1' will be indicated).

Data scrollbar



Zooming and scrolling by dragging

The data scrollbar represents the whole data buffer of 128K samples per channel.

The data displayed in the signal display area is represented on the data scrollbar by the area between the left zoom post and the right zoom post.

A special cursor appears if the mouse cursor is placed on either the left or right zoom post on the data scrollbar. When this cursor appears, the edge may be dragged by pressing the left button of the mouse and dragging the edge to its new desired position.

Another special cursor will appear if the mouse cursor is placed between the two zoom posts on the data scrollbar. If

you now press down the mouse button and drag, both zoom posts will move in the direction you are dragging. In this case you are therefore not zooming, but scrolling to a new position in the data buffer.

Zooming and scrolling using the scrollbar buttons

The two inner buttons (of the three) on the left-hand and right-hand sides of the data scrollbar are used to move the left and right zoom posts respectively. The direction, in which the zoom post is moved, is indicated on the button clicked.

The outer buttons on the data scrollbar are used to move both zoom posts together in the same direction, thus scrolling the data.

The data may also be scrolled in bigger steps: Click in the scrollbar between the left zoom post and the left edge of the scrollbar to 'page' leftwards. Similarly, 'page' rightwards by clicking in the data scrollbar right from the right-hand zoom post.

Databar and data section views

When the program is started up, you will notice the word 'Databar' in the centre of the scrollbar and '0' on the left-hand side and '131000' on the right-hand side. This indicates that the data scrollbar represents the full data buffer of 130000 data samples (per channel).

Should you zoom in until the two zoom posts are right next to each other and then try to move them even closer, you will find that they will suddenly open up again. The words 'Data Section Zoom' written in the middle of the scrollbar. The data limits on the left- and right-hand sides of the scrollbar will not be '0' and '131000' any more, but will be replaced with two new numbers.

What happened is that the data the scrollbar now does not represent the whole data buffer any more but only the small portion of data between the two zoom posts on the 'databar' (before it opened up). You are now zoomed to a section of the

data, with the limits of the section indicated on the left- and right-hand sides of the 'Data Section Zoom'.

Should you zoom out again, by moving the zoom posts further and further apart, the data scrollbar will eventually revert back to the 'databar' view.

Mini cursors

When data has been captured and is displayed in the signal display area, you will notice that a small vertical line is drawn between the two zoom posts on the data scrollbar. This line represents the position of the trigger line (T) in the data buffer.

The lines on the data scrollbar are called 'mini cursors'. They also appear to indicate the positions of the three cursor lines (X, Y and Z).

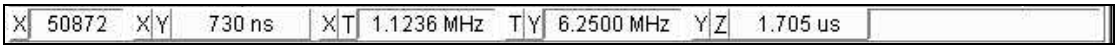
The special cursor lines P (Trigger precondition) and S (Search Cursor) are also indicated.

The mini cursors have the colours of the trigger or cursor lines they represent.
If the pre- and post trigger buffers were selected to be equally sized the trigger (T) mini cursor will be in the middle of the data scrollbar.

The position of the trigger line on the data scrollbar is determined by the pre-/post trigger buffer size setting in the *'set-up'* dialog box.

The data to the left of the trigger mini cursor on the data scrollbar comprises the pre-trigger buffer and the data to the right comprises the post-trigger buffer.

Measurements bar



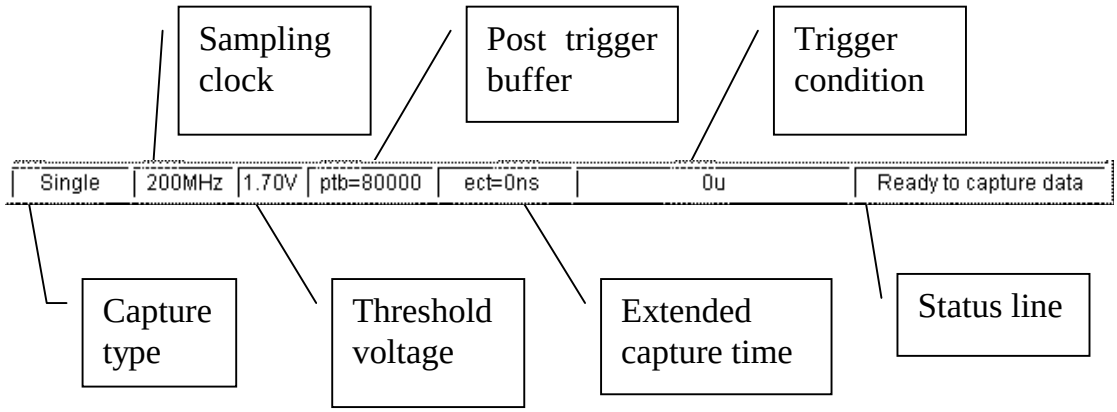
Measurements displayed

The status bar displays the following:
The absolute cursor line sample position.
Click to view another cursor line
Four cursor-line to cursor-line time differences.

Which time differences are displayed, are set in the *'Options'* dialog box, or by clicking on the small button to select another cursor line.

Clicking on the cursor-line to cursor-line time reading will switch the reading to a frequency reading and vice versa.

Set-up-status bar



Capture type

Indicates what kind of capturing the Logic-3 is set up for:
Single capture, unconditional continuous, conditional continuous or logger.

Sampling clock

Indicates which clock will be used to do the sampling:
Any of the internal sampling clock frequencies, logger or external clock.

Threshold voltage

Shows the current threshold voltage set-up.

Post trigger buffer

Shows the current post trigger buffer setting.

Extended capture time

Shows the current extended capture time setting.

Trigger condition

Shows the current trigger condition:

Examples:
0u: (Channel 0, up).
A Trigger will occur on a rising edge on channel 0
5d: (Channel 5, down)
Trigger will occur on a falling edge on channel 5.

14c: (Channel 14, Change of state)
A Trigger will occur on a rising edge or falling edge on channel 14. In other words, if channel 14 would change of state.

Pattern OR 0u
A Trigger will occur should the current pattern condition be met, or should a rising edge on channel 0 occur. (Whichever happens first). The pattern condition will be shown in the snap/pattern boxes on the right-hand side of the main window, while the Logic-3 is waiting for the trigger to occur.

Pattern AND 0d
A Trigger will occur should a falling edge occur on channel 0, while the pattern condition is valid.

0c THEN pattern.
The first condition will be detected should channel 0 change of state. The Logic-3 will indicate that it is waiting for the first condition, until the first condition is detected. During this time the LED indication will be purple. When the first condition is detected the LED indication will become green indicating that the second (final) trigger condition is awaited.

Internal.
This trigger condition will be displayed during unconditional continuous capture, indicating that the triggering does not depend on a set trigger condition, but is internally forced.

Status line

This panel is used for general messages to the user, mostly regarding the Logic-3 capture status.

Channel names

The channel names are entered/changed by clicking the mouse on the name to be changed. A dialog box will appear, prompting for a new channel name. You may also change the channel names by using the Main menu *'Edit/Channel names'* option that activates the *'Change channel names'* dialog box.

Channel numbers

Next to the channel names are the channel numbers which correspond to the channel numbers on the Logic-3 faceplate.

The order in which channels are displayed may be changed by clicking on the channel numbers:
If the main window hints are enabled (*'Options'* dialog box) a hint stating 'channel to move' will appear when the cursor is moved onto a channel number. (The hint appears after about 2 seconds).
Click on the channel you want to move. (One click, don't keep the button down. This is not a drag action).
The cursor has now changed shape and the hint has become 'Move destination' and the number of the channel to be moved will appear indented.
Move the cursor to another channel number and click. The channel to move will be inserted above this channel.

The channel order may be normalised to its original 0 to 15 order by clicking the *'Normalise channel order'* button on the main button bar.

TUTORIAL OVERVIEW: - LOGIC-3 USAGE

This is a short description of how the Logic-3 may typically be used.

When referring to mouse 'clicks' without specifying which mouse button should be pressed, the left button is assumed.

Assume that the hardware and software have been installed and are up and running.

Connect the **ground connection** from the Logic-3 to the digital ground of the Unit Under Test (UUT). It is important to connect the Logic-3 ground hook to the digital ground of UUT. A good ground connection is very important, don't just connect it to the chassis of the UUT. The ground hook should be used regardless whether the UUT and the PC have a common ground or not.

Connect probes to the UUT outputs you would like to take measurements of.

The **channels not used may be switched off**.

Enter channel names (by clicking on the channel names or by using the *'Edit'* menu option).

Prepare the Logic-3 for data capture. (Click the *'Set-up'* button): The set-up dialog box will appear.
On the 'trigger' page do the following selections:

- Select the **edge to trigger** on for edge triggering or **pattern to trigger** on for pattern triggering. You may simply click on the preferred option in the 'trigger method' box if the correct edge/pattern is already indicated. Edge- and pattern trigger may be combined.

On the 'General' page do the following selections:

- Set the desired **pre-trigger/post-trigger setting** (scroll bar)
- Set the desired internal **sampling frequency**. (Pull-down list)
- Set the desired **threshold voltage**. (Pull-down list)
- Return to the main screen. (Click 'OK' to accept the settings and leave the dialog box.)

The selected set-up will be displayed in the Set-up-status bar.

The Logic-3 is **now ready to capture data**.

Click on the *'Capture'* button to **start the data capture**. Note that the 'Trigger' LED on the Logic-3 unit will light. The Trigger LED software indicator will also light.

If a 'slow' sampling rate is selected and the pre-trigger buffer is set large enough, the message 'Filling pre-trigger buffer' will be displayed while it is capturing enough data to fill the pre-trigger buffer. For high sampling rates this phase is too quick to see.

While the Logic-3 is waiting for the trigger condition to occur, the 'Waiting for trigger' status will be displayed.

The **post-trigger data** will now be captured according to the post-trigger buffer size as set by the user, displaying the 'capturing post-trigger data' status. For high sampling rates this phase is too quick to see.

After the post-trigger data has been captured, the Logic-3 will **transfer the whole data buffer to the PC**, displaying the 'Transferring data to PC' status. Note: the data capture process is continuous and is uninterrupted throughout all the different stages.

After the captured data has been transferred from the Logic-3 to the PC the data will be displayed.

The **trigger line** will be on the screen when the data is displayed after a single capture.

You may now **zoom and scroll** the data, using the data scrollbar.

The **display order of the channels** may be changed according to your liking. (Click on channel number of the channel you want to move, then click on the new position) The display order can be normalised instantaneously, by clicking on the *'Reset display order'* button on the button bar.

Take **time measurements** as follows:

- Move the cursor arrow to the **first edge** you would like to measure from. Click the mouse left button on the edge. The X cursor line will be placed on that edge. The cursor actually snaps to the exact sample representing that edge. Looking at the snap indication area at the right-hand side of the main window, you will see that an 'X' in the relevant channel's snap box indicates that the cursor has snapped onto the exact edge. This is important for accurate time measurements, especially when the display represents a large number of data samples such that each screen pixel actually represents a lot of samples.
- Move the arrow cursor to the **second edge;** the one you would like to measure to. This may of course be on another channel signal. Press the right button of the mouse to place the Y cursor line onto this edge. Note in the relevant snap box that the Y cursor line has snapped to the desired edge.
- **Read the time difference** between the X and Y cursor lines from the status bar at the bottom of the main window.
- Measurements between the X, Y, Z cursors and the trigger line (T) may be read from the measurements bar. The Z-Cursor is placed by clicking the middle button on a three-button mouse or by holding down the 'shift' key and clicking the left button.

To search for the occurrence of any data combination, do a **pattern search** (*'View'* menu). Assume you would like to know whether the channel 2 data has ever been high while the data in both channels 5 and 6 has been low: Select channel 2 a '1' (high) and channels 5 and 6 each a '0' (low) and the rest of the channels 'X' (don't care). Start the search. If the combination occurs in the data, the display will automatically jump to it. You can repeat the search for another occurrence.

You may **print the current display area** (*'File'* menu). The printer should of course be set up correctly before printing (also from *'File'* menu). You may also print a bitmap of the main window.

The captured **data may be saved to disk**. The current configuration, hardware set-up, channel names, zoom position, etc. is saved with the captured data. Before the data is saved, a

dialog box will appear allowing you to add information concerning the captured data, which will be saved with the data. When the data is reloaded this information may be viewed in the 'Signal information' dialog box.

The **current set-up may be saved as the new default** configuration. (*'File'* menu option). The information contained within the *'Set-up'* dialog box, channel names etc. are not saved as part of the configuration. When a signal file is saved, this information is saved as part of it. By loading a signal file, you can therefore recover the exact set-up, as it was when you saved the signal file.

Using the multitasking environment to run PC based UUT software:

- If the Unit Under Test (UUT) is PC based, it and its software may be driven from the same PC as the Logic-3 and its software.
- Size the Logic-3 window so that it is not full screen. (Standard Windows functions)
- Select the 'Project' option in the 'File' menu option. This displays the *'Project'* dialog box. Select and run your project UUT program.
- If the UUT program does not start in a window, press 'Alt+Enter' to run it in a window. (Standard Windows key press. Windows may also be set to open DOS applications in a window)
- Size the window so that the Logic-3 software window can be seen in the background. (Standard Windows usage)
- Click on the Logic-3 window to bring it to the foreground. The UUT program window should now be seen in the background. (Standard Windows usage)
- Set-up the Logic-3 for capture and start a capture (as described before). The Logic-3 should be displaying the 'Waiting for trigger' status.
- Click on the UUT program window, visible in the background, to bring it to the foreground.
- The Logic-3 software is now running in the background and the Logic-3 is waiting as actively as ever, for a trigger to occur.
- Execute a command to the UUT. One that should cause a trigger.

- If the Logic-3 has been triggered you will see it on the hardware, as well as in the software running in the background.
- Click on the Logic-3 program window in the background to bring it forward and to view the captured data.

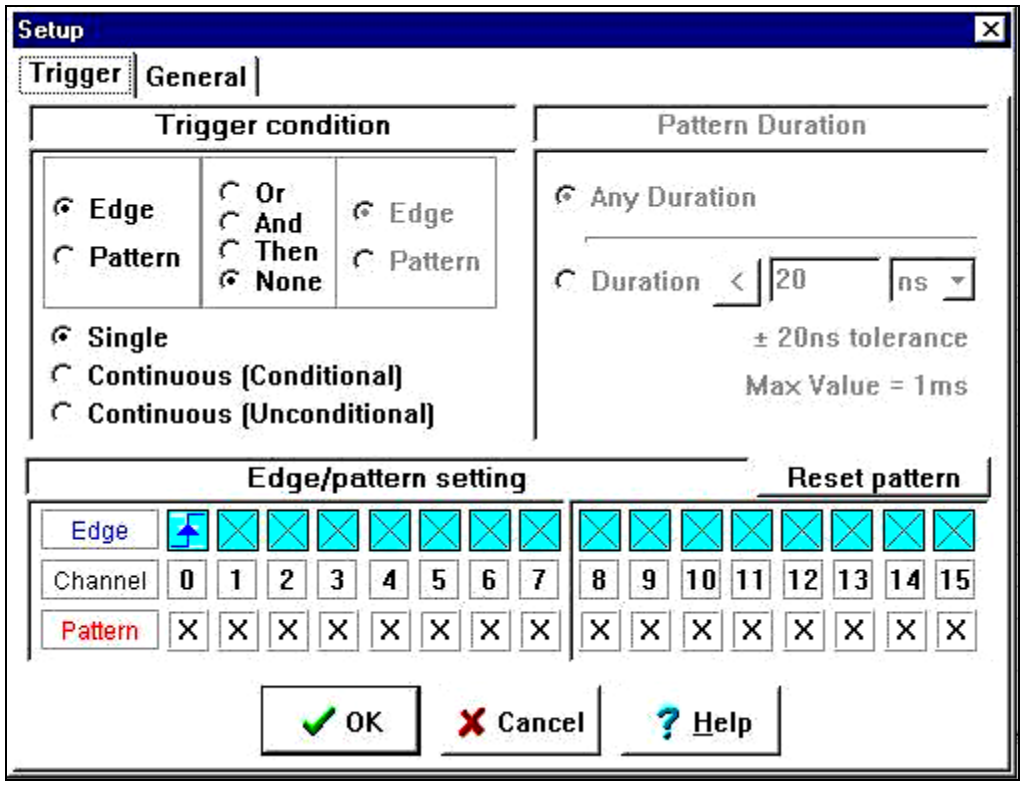
We hope that through this tutorial overview you have established a sufficient good 'feel' for the Logic-3 and its software to allow you to easily pick up the rest of the features it offers.

DIALOG BOXES

In this section we will look at some of the more important dialog boxes.

Set-up dialog box

Trigger page



This page contains all the options needed to specify the conditions to which the Logic-3 will trigger.

Trigger condition

Edge and pattern condition may be linked to another edge or pattern condition via one of the following: None, Or, And, Then:

NONE:
Triggering is allowed on only an Edge of Pattern condition.

OR: (Condition-1 OR Condition-2)
The trigger will occur on either condition-1 or condition-2, whichever occurs first.

AND: (Condition-1 AND Conditon-2)
The trigger will occur when the edge occurs while the pattern condition is valid. The pattern setting, for the channel for which the edge is set, must be set to "don't care".

THEN: (Condition-1 THEN Condition-2)
The logic analyzer will first wait for condition-1 to occur. After condition-1 has occurred the logic analyzer will wait for condition-2 to occur. After condition-2 has occurred the capture will complete and the captured data displayed.

If 'unconditional continuous' trigger is clicked, the trigger condition will be de-activated automatically. Should the *'Capture'* button on the main menu be clicked, 'unconditional continuous' capture will start. Data will be captured and displayed at regular intervals, regardless of what the input signals look like (unconditionally).

If 'conditionally continuous' is selected the trigger conditions will remain active. In this case clicking 'capture' on the main menu will start 'conditional continuous' capture. The screen will now be updated only after a legal trigger condition occurred. A 'waiting for trigger' message will be displayed, should no triggers be detected. This feature is extremely handy for looking at continuous data transmissions, e.g. data on serial lines etc. It is also handy in the case where the logic analyzer will receive only single triggers, which are under user control; for it will update the screen with each trigger. There would be no need to press 'capture' before each data capture.

The triggering of the Logic-3 operates completely independent of the sampling clock. Refer to "Logic analyzer usage considerations/Trigger condition
.

Summary of trigger conditions

The following table summarises the Edge/pattern trigger conditions available:

Trigger condition – Logic-3p
Edge up
Edge down
Change of state*
Pattern (Any duration)
Pattern < Duration (glitch capture)
Pattern > Duration
Pattern OR Edge up
Pattern OR Edge down
Pattern OR Change of state
Pattern AND Edge up
Pattern AND Edge down
Pattern AND Change of state
Pattern THEN Edge up
Pattern THEN Edge down
Pattern THEN Change of state
Edge up THEN Pattern
Edge down THEN Pattern
Change of state THEN Pattern

*Change of state = Edge up OR Edge down

Any of the above conditions may be combined with 'Conditional Continuous' capturing.

Edge/Pattern setting

The edge and pattern trigger set-up is organised in such a way that each channel is represented by a rectangle. The option for each channel is changed by clicking the mouse left button on the picture in the rectangle associated with that channel.

The pictures in the Edge Trigger area rotates between  "disabled",  "rising edge",  "falling edge" and  "Change of state".

(Change of state: Trigger on the low-to-high transition (rising edge), or high-to-low transition (falling edge), whichever occurs first).

The pattern trigger bits rotate between ☒ "don't care'", 0 "low" and 1 "high" when clicked. The trigger will occur when all channel inputs marked '0' are low and all those marked '1' are high. The channels marked 'X' are not taken into consideration.

Pattern duration

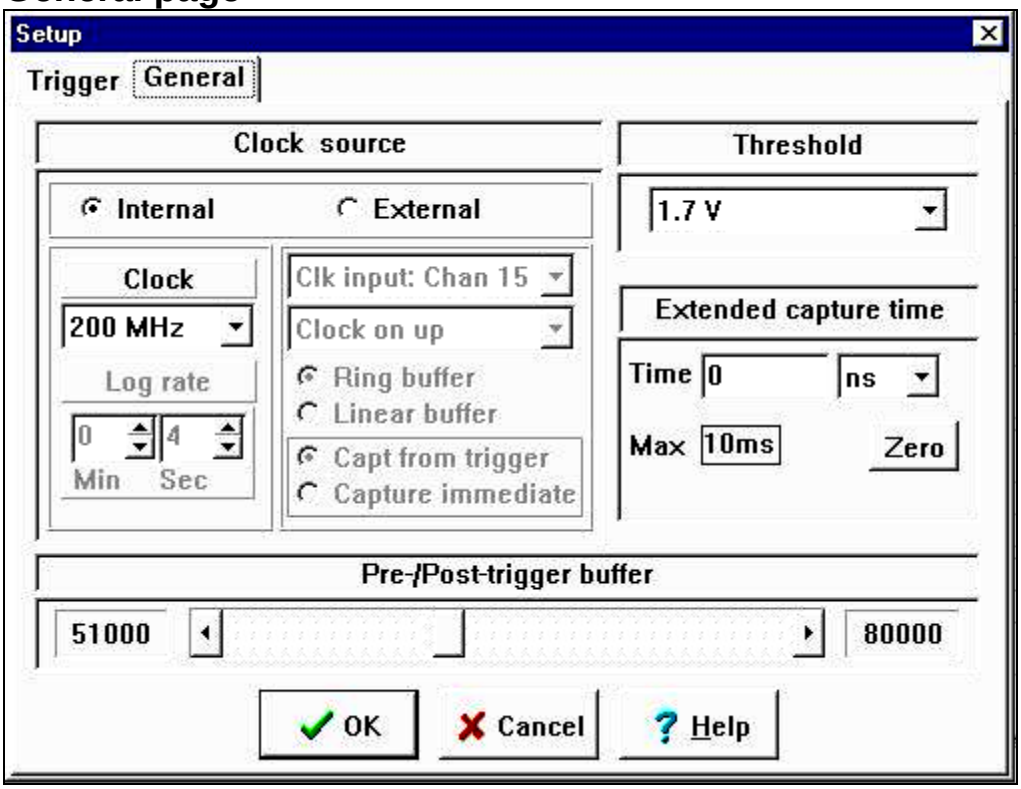
A trigger condition may be set to occur only if a pattern is valid for more than, or less than a specified time period.

For Example, say you are measuring a 1Mhz signal. You know that the minimum time that this signal should be high is 500ns, since the signal period is 1uSek. You can allow for some mark-space variation, but certainly, if a pulse of less than say 200ns occur it must be a glitch. You can therefore set the Logic-3 to trigger on any pulse less than 200ns. This is called "glitch capturing".

Reset pattern button

The *'Reset pattern'* button is used to change all the pattern bit conditions to "don't care".

General page



Sampling clock

See also "Logic analyzer usage considerations / Clock sources"

Internal

The sampling clock is selected in the 'Clock' box.

This is the frequency at which the Logic-3 will sample all 15 channel inputs. The sampling rate is totally independent of how many channels are used.

The digital logger is the last item in the pull-down list.

When the "Logger" option is selected the "Log rate" pull-down box becomes enabled for selection of the required log period.

External

This clock must be applied by the user to the channel 15 input. The user could specify whether the sampling must occur on the rising or falling edge.

Use the external clock for synchronous capturing. This is also called "state" capture. E.g. One could have data being captured on the rising edge of a micro-controller read signal, by using the read signal as the clock input. The logic analyzer will then capture the same data that the micro-controller reads. The text display should be used to analyze this data.

The data buffer configured as a **ring buffer**: In this mode the capturing is done similarly to when an internal frequency is selected, except that the clock input is taken from channel 15.

The data buffer implemented as a **linear buffer**: In this mode data may be captured from the first clock received, into the buffer. Data capture will stop and the displayed when the buffer is full. Should there not be enough clock cycles to fill up the buffer, the user could at any time stop the process and have the limited number of captured samples displayed.

The first sample to be captured may be specified to be the very **first clock received**, or it may **wait for a trigger condition** to occur and then start capturing the data from the first clock that follows the trigger. A very useful trigger setting to use in this case is to set the trigger to occur when a specific pattern is valid on the clocking edge. (Pattern AND Edge setting). This would ensure that a transitional pattern (glitch) state, when the pattern lines change state, does not cause a trigger, but only the clocked pattern can cause the trigger.

Pre-/post trigger buffer

The 'Pre-/post trigger buffer' group shows the pre-trigger and post-trigger buffer sizes. The pre-/post trigger buffer sizes can be set, by using the scroll bar. The total buffer size is 131000(Decimal) and therefore not the full 128K(Hex), which is 131072(decimal). The 72-byte difference (128K Hex - 131000 Decimal) is not displayed.

Threshold level

Incoming signals are compared to a fixed threshold voltage. If the signal voltage is lower than the threshold voltage when it is sampled, it will be taken as a '0' and if it is higher than the threshold voltage, it will be taken as a '1'.

The available levels allows optimal usage with the most common technology type (TTL, 5V-CMOS, 3.3V-CMOS, 2.5V-CMOS etc.) At lower frequencies it may not be very important which level is selected, but at high frequencies you might want to ensure that the threshold is set to the applicable technology type.

Extended Capture Time (ECT)

The Extended Capture Time (ECT) group is used to set a time period that will be timed out after the post trigger buffer has been filled.

During this time the logic analyzer will keep capturing data. Capture will stop and the data displayed when the ECT has been timed out.

The process of capturing the post trigger buffer and then the ECT is completely smooth and uninterrupted.

If a short ECT is set the effect will be the same as if the post trigger buffer size has been increased. If the ECT is long enough the trigger point will not be in the eventually displayed data any more.

The effect of the ECT is therefore to move the window of captured data forward in time. You can capture data "long" after the trigger has occurred, without reducing the sampling rate.

The Trigger-to-Cursor measurements (E.g.. T-X) are slightly less accurate when the trigger point is not within the data buffer (Refer to technical specifications).

The "Zero" button offers a quick way to set the ECT to zero. The maximum allowed ECT is displayed. It varies depending on the sampling frequency chosen.

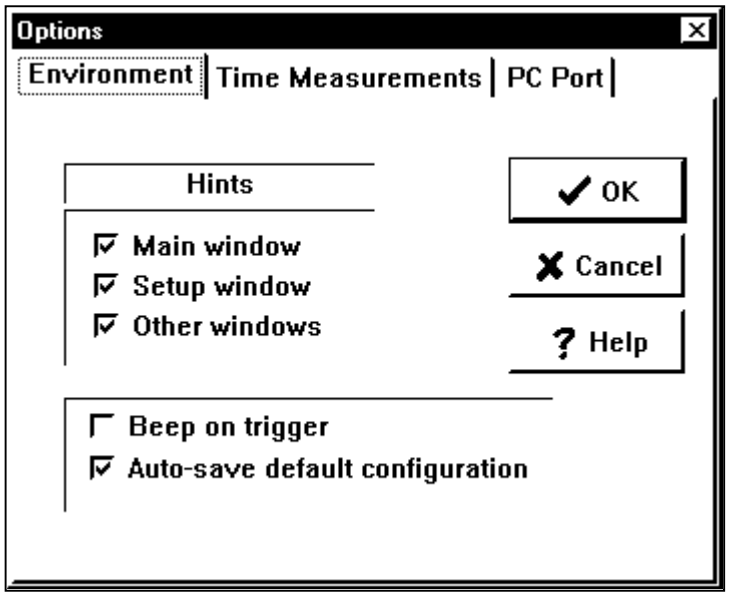
Example-1:
Problem: Say for instance that you know that a certain event in your data should happen 1 ms after say a strobe-S has gone low. Now let us further assume that it is difficult to trigger on the desired event, because there is a lot of unpredictable data in-between. You would also like to sample at 200MHz, because if you lower the sampling rate to get the desired data into the data buffer you would not be able to see the desired data properly, because of reduction in sampling resolution.
Solution: Set an ECT of 1 ms and capture. The desired data should now be in the data buffer. Scan through the data visually or use the "view/search" dialog box to find the desired data.

Examle-2:
Problem: Assume you have a very long serial string of configuration data, for configuring a FPGA. For some reason the FPGA is not configuring correctly and you would like to inspect the whole string of data. The string of data is much too long to fit into the logic analyzer buffer when you are capturing at the sampling rate that you prefer for the inspection.
Solution:
Set the post trigger buffer to maximum. Set a trigger condition to cause a trigger at the start of the data string. Do a capture (ECT=0) to capture the first portion of the string.

To capture the next portion of the string, set the ECT to the time it took to fill the post trigger buffer.
This time = (Post trigger buffer size) x (Sampling period).
Ensure that you get the last of the previous data string portion so that you could add this portion to the previous. In the same way you would add to the ECT to get the third portion to the data string, and so on.

Options dialog box

Environment page

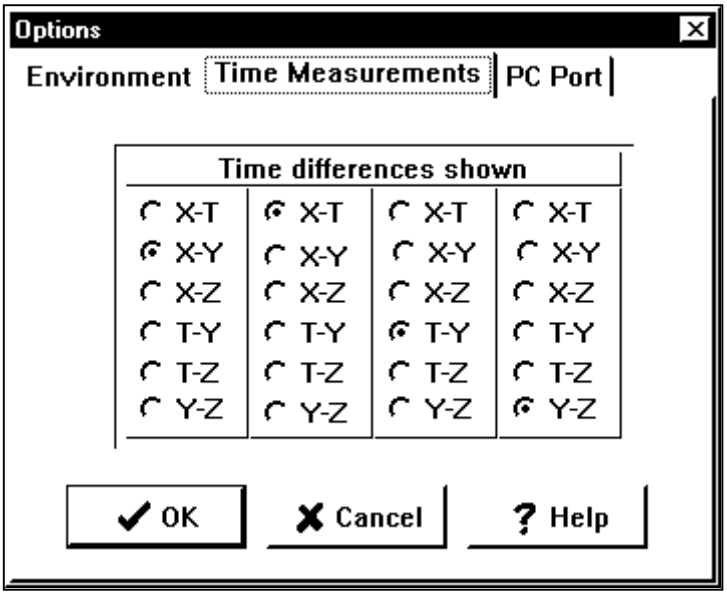


Hints: These options are used to switch hints in different parts of the software on or off.

If the '*Beep on trigger'* checkbox is set, a beep will sound when a trigger is detected, when a single capture is done. During continuous capture (unconditional or conditional), this checkbox is ignored.

If the *'Auto-Save default configuration'* checkbox is checked, the current configuration will be saved as the default configuration. This is done when the program is quitted. If this checkbox is not checked, you may save the default configuration by selecting the *'File/Save default'* menu option.

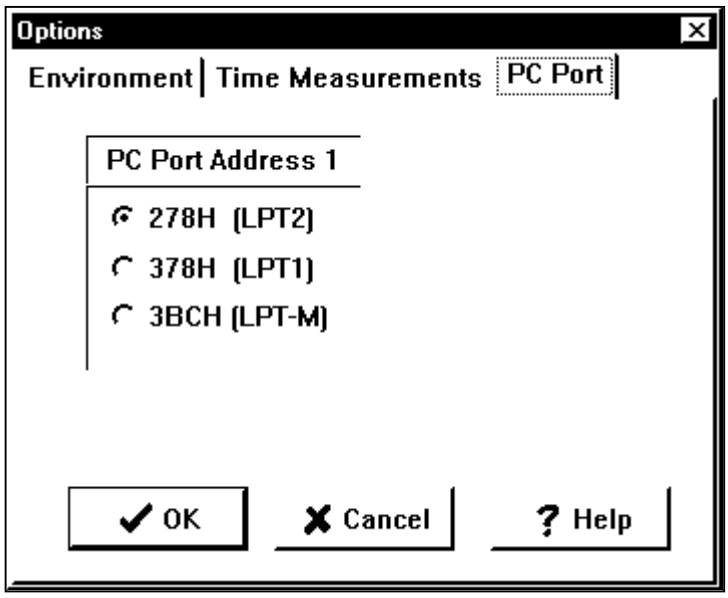
Time measurements page



On this page you may specify which cursor-line to cursor-line or cursor-line to trigger-line measurements are to be displayed on the main window measurements bar.

Which cursor-line to cursor-line measurements are displayed may also be set by clicking on the small cursor name buttons on the measurements bar (main window).

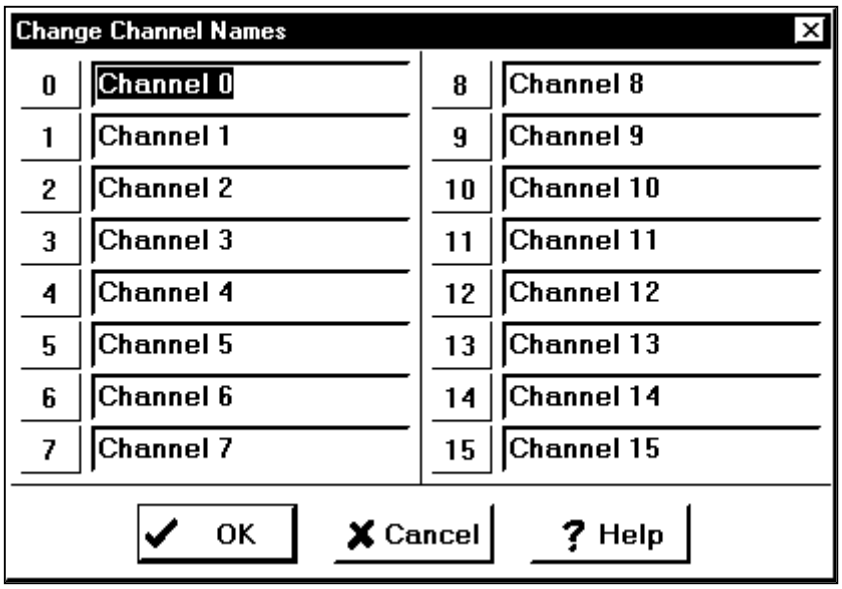
PC port page



This page allows you to select an alternative parallel printer port address through which the PC will communicate with the Logic-3.

Should the printer port address be changed, you could ensure that the new address will be loaded each time you run the program by saving the current configuration to the default file by using the *'File/Save default'* menu option. It will be saved automatically if *the 'AutoSave default configuration'* checkbox in the options dialog box is checked.

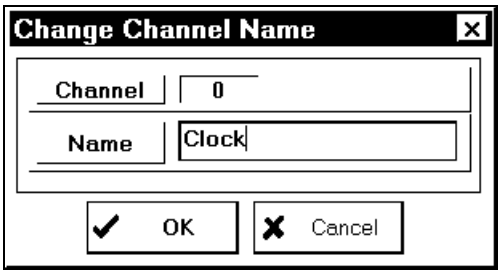
Change channel names dialog box



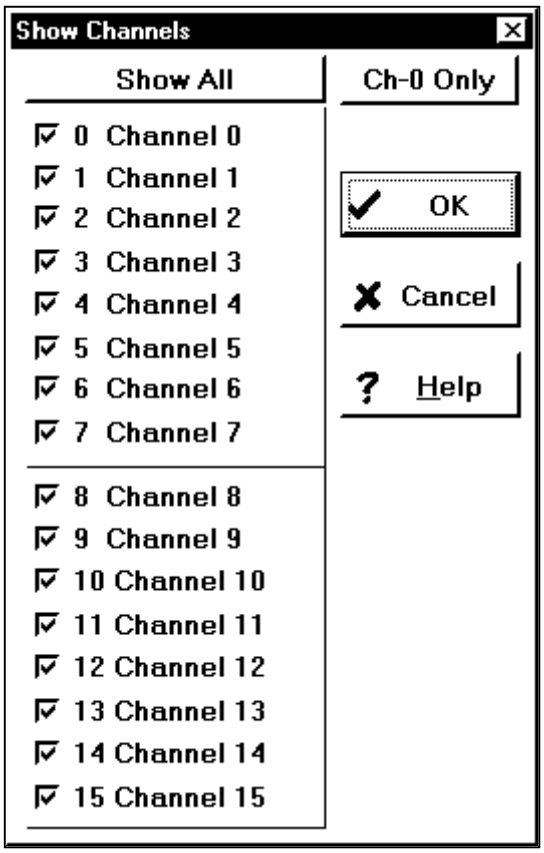
This box is handy for changing a number of channel names in succession.

By tabbing from one name to the next, the names will be automatically hi-lighted. You don't need to delete the previous name; it will disappear when you start typing the new name.

You may also click the mouse in the main window on any channel name to change. The following dialog box will appear:



Show channels dialog box



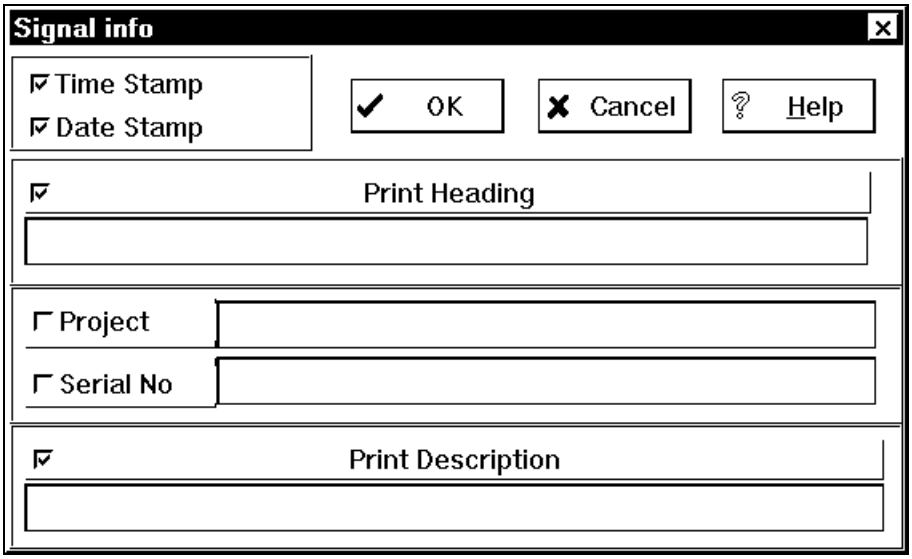
This check box is used to remove channels from the signal display, which you don't want to see, such as unused channels.

The channels that are switched off are also not printed.

Although a channel might be switched off, it is handled in the software like any other, the only difference being that it is not displayed. For example if data is captured while a certain channel, connected to the unit under test, is switched off, you may simply switch the channel back on to see the captured data. You don't need to do another capture.

A button is provided to overrule the selection as set in the check boxes and display all the channels. This same button is used to enable the check box selection.

Signal info dialog box



The signal information dialog box is used to hold information concerning a set of captured data.

Before signal printing or saving, this dialog box will appear and it provides for the following information to be entered:
(1) Heading
(2) Description: General information
(3) Project information: The project under which the work is done or the name of the product that is being tested.
(4) Serial Number: The serial number of the unit tested.

Date- and time stamps are taken with each capture.

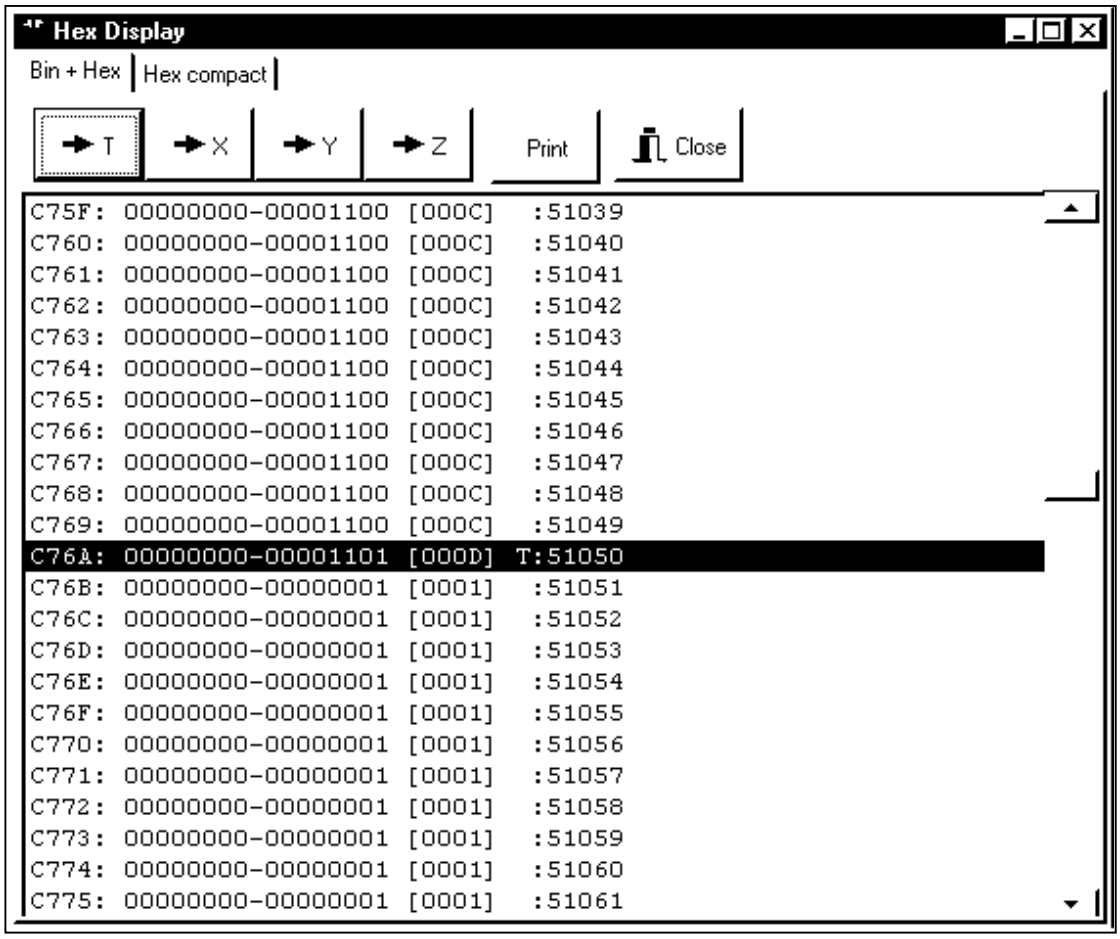
The check boxes specify which of the information will appear on printouts.
When a signal file is saved, all the information is saved, regardless of whether the check boxes are checked or not.

When the signal info dialog box appears before saving or printing, the '*Cancel'* button will abort the process if clicked.

Clicking the '*OK'* button will allow the *'Save As'* dialog box to appear, in the case of file saving or will start the signal print in the case of printing.

Data as text dialog box

Bin + Hex Page



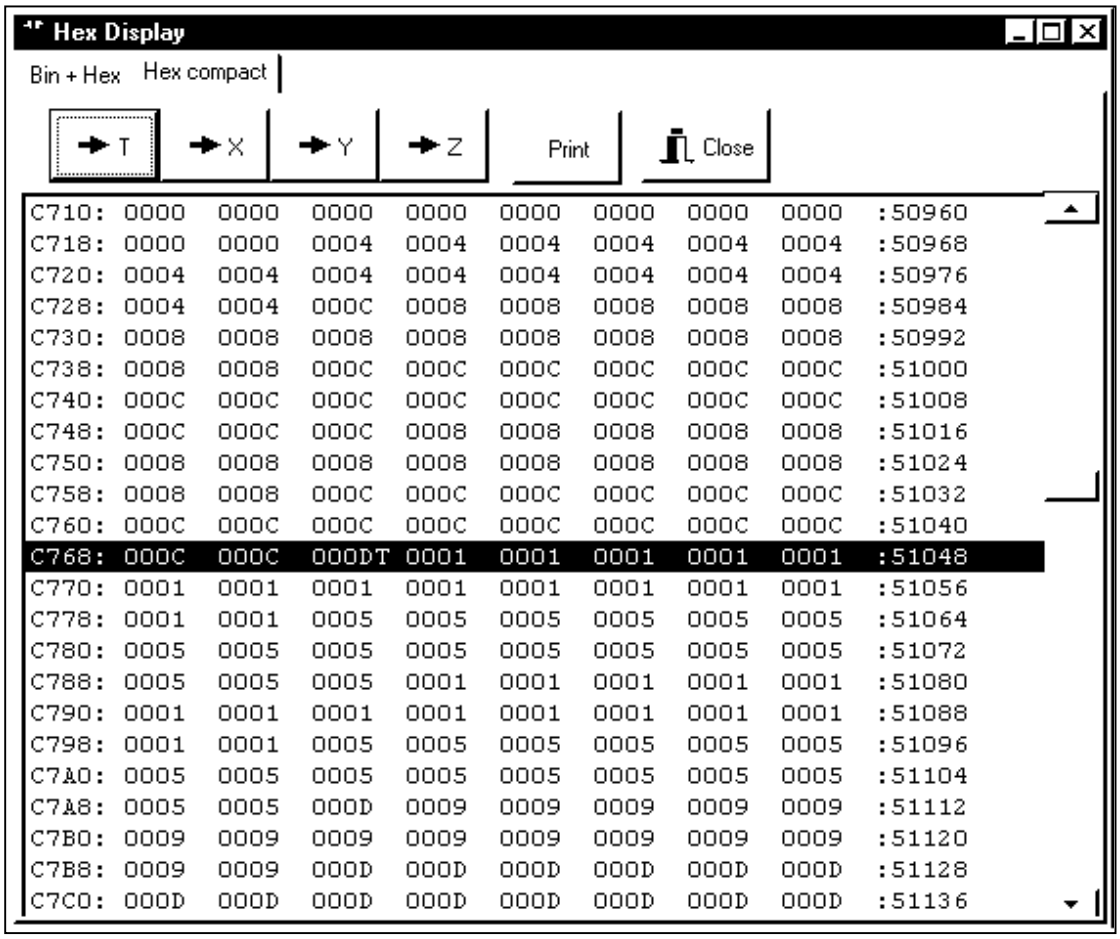
This page displays the captured data in text format as follows:

1. Sample number in hexadecimal.
2. Sample value as 16-bit binary word. Channel-15 is represented by the most significant bit and channel 0 by the least significant bit.
3. The sample value as a hexadecimal word.
4. The sample number in decimal.

Each byte represents a data sample of all channels.

Each bit of the data byte represents the state of that channel input when the sample was taken.

Hex Compact page



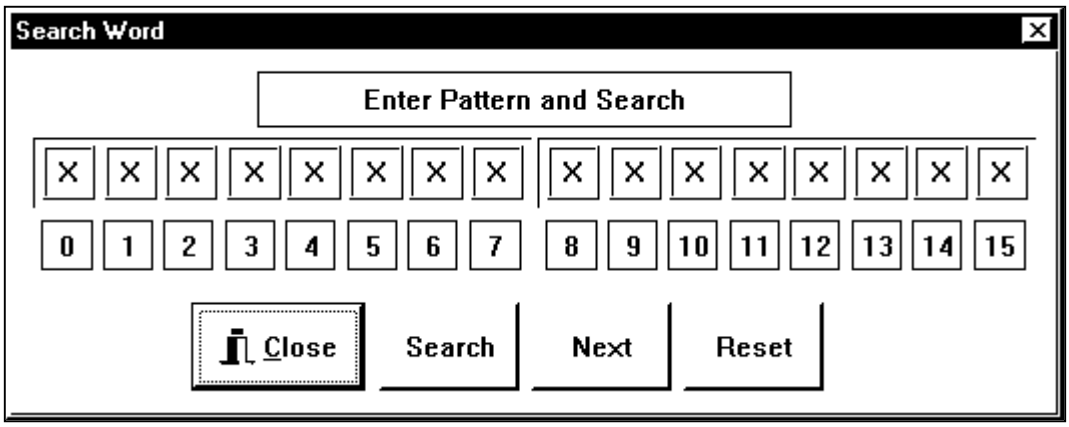
This page displays the captured data in text format as follows:

1. Sample number in hexadecimal.
2. Eight samples in hexadecimal format.
3. The sample number in decimal (Same number as at beginning of line in hexadecimal)

Use the jump-to buttons to jump to the X, Y, Z, and T positions in the data.

Clicking the "print" button will print the data in the current format.

Search pattern dialog box



This feature is used to search any pattern combination in the sampled data.

After setting up the pattern to be searched, click the *'Search'* button to find the first occurrence of that pattern.

If the pattern is found a special cursor line will indicate the position in the signal display area.

Any further occurrence of the pattern may be found by pressing the *'Next'* button. These subsequent searches are done at edges only.

Project dialog box

If the unit under test (UUT) is PC based you may launch the software driving the UUT, using this dialog box.

Refer to the *'File/Project'* main menu item description for information on how to take measurements on a PC based UUT.

LED Hardware and software indicators

The power LED will be on when the Logic-3 is powered.

The trigger LED is on while the Logic-3 is waiting for a trigger. The trigger LED is duplicated in the software on the main display window.

Software trigger indicator colours:

Grey - NOT waiting for trigger / Trigger done.
Purple - Waiting for first trigger condition
(Condition-1 THEN Condition-2 setting)
Green - Waiting for (final) trigger
Light blue - Unconditional trigger.
(The trigger is performed internally at a fixed period)

TECHNICAL SPECIFICATIONS

Internal sampling rates:	MHz: 200, 100, 50, 25, 10, 5, 2.5, 1 KHz: 500, 250, 100, 50, 25, 10, 5, 2.5 1.25
No. of channels:	16
Data buffer:	131000 (decimal) samples/channel
Trigger methods: Pattern: (Pattern valid for any duration) Pattern valid < Duration Pattern valid > Duration Edge: Mouse/Keyboard Edge/Pattern combinations: Continuous:	 1,0, and "don't care" ("X") conditions selectable on all channels. The pattern must be valid for at least 20ns. Glitch Capture. Pattern duration may be specified in steps of 20 ns to 1 ms. Duration tolerance of ±20ns Pattern duration may be specified in steps of 20ns to 1 ms. Duration tolerance of ±20ns Triggers on: Rising edge, falling edge, either rising or falling edge (change of state), of any one channel Trigger may be forced. Edge: Rising edge, falling edge, Change of state Pattern: Edge OR pattern: Edge or pattern condition that occurs first will cause a trigger. Edge AND Pattern: For a trigger the edge condition must occur while the pattern condition is valid. The pattern must be valid for at least 20ns before the edge and 20ns after the edge. Edge THEN Pattern / Pattern THEN Edge: The first condition is required before the second condition. At least 30ns is required from detection of the first condition to the second. Unconditionally Continuous: Trigger forced internally and display updated with regular intervals. Conditionally Continuous: Display updated when a trigger condition is detected. Any of the above trigger conditions may be set as described above.
Digital logger:	4 Seconds to 1-hour sampling rates.
Threshold voltage:	1.0V, 1.3V, 1.5V, 1.7V, 2.0V, 2.4V
Pre-trigger and post-trigger buffer setting:	The data buffer is divided in pre- and post trigger sections. The pre-/post-trigger buffer relation may be changed in 1000 samples steps.

Multitasking environment	
Windows:	Windows 95 or later compatible versions. The power of the Windows multitasking environment is utilised to run the analyzer software and user's unit under test (UUT) software simultaneously (if the UUT is PC based). Hardware that interfaces with the PC may be driven from the PC while real-time measurements are performed on the hardware. (The logic analyzer and UUT software are simultaneously run on the same PC). The analyzer and the user program may be viewed simultaneously in the Windows environment.
Ease of use:	The software is very easy to use. Most functions are directly selectable by means of function buttons on the main screen.
User UUT application program launching:	The user application program may be run from the analyzer program menu or from Windows.
Display:	
No. of channels:	Any number of channels may be displayed.
Channel names	User specified signal names
Display order:	Channel display order user specified
Zooming:	Data zoom: All captured data may be viewed on one screen. Zooming in to only a few samples displayed on the screen Easy data display window sizing using the mouse.
Single capture	Captures a single set of data
Continuous capture display:	Unconditionally: Continuously captures and displays data at a fixed update period. Conditionally: Updates the display each time a specified edge or pattern trigger condition is met.
Cursors:	T-trigger line: Indicates trigger position. P-trigger line: Indicates trigger condition-1 position in case of condition-1 THEN condition-2 setting. S-Cursor line indicates data search positions. X, Y and Z-cursor for time measurements. The values of the X and Y cursor lines, where they intersect the signal lines are shown.
Time measurements:	The time differences between any two cursor lines or trigger line may be displayed.

Edge snapping: Pattern search:	Cursors (X, Y & Z) snap to signal edges for accurate time measurements. (Especially useful when the display is zoomed out so that one screen pixel represents more than one data sample). The signal edges to which the cursors lines have been snapped are indicated Any channel conditions may be searched for. 1, 0 and don't care conditions specified. Also repeated search
Printed output:	The timing diagrams, bitmaps, binary and hex data, may be. Landscape and portrait.
Power requirements:	Capturing data: 4.5W Max Logic-3 not capturing: 800mW Max The Logic-3 will be fused with a 1.6A (or less) resettable fuse. Remove power for 3 minutes to reset.
Power supply	+5V, 3% ripple max. 2.5mm power jack input
Internal sampling clock stability	100 ppm
External clock	Input to channel 15. 25Mhz Max Ring buffer configuration: Operates with pre and post trigger buffer. Linear buffer configuration: Start capture immediate or from trigger. No initial clock pulses are missed with either immediate or from trigger capture.
Logger sampling clock	Timing obtained from PC
Cursor to T-line accuracy	T-Line onscreen: ± 1 sampling clock period (1.25 KHz to 200 MHz) T-Line not onscreen (due to "large" ECT): 200 MHz: 140ns. 100 MHz: 180ns. 50 MHz down to 1.25 MHz: 10 x sampling clock period.
Digital inputs	
Input voltage:	0 - 7V
Input bandwidth:	40MHz min
Input impedance:	100kΩ ± 5 % , 8pF
Logic-3 unit weight Logic-3 unit dimensions	210 g 150mm x 86mm x 26mm
Logic-3 packaged Weight: Dimensions:	
Operating Temperature:	10°C - 40°C. (50°F-105°F)

Logic-3 Manufacturer:

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