THURLBY LA3200 & LA4800

LOGIC ANALYSERS

OPERATING MANUAL

Preface

This manual covers both the LA3200 and the LA4800 logic analysers. The two models are similar apart from the number of data channels (which is thirty two for the LA3200 and forty eight for the LA4800), although the LA4800 incorporates some features which are not present on an LA3200.

The manual has been written assuming some knowledge of logic analysers on behalf of the user. Users who know very little about logic analysers should start by reading Appendix A. Experienced users should be able to operate the analyser using only the on-screen instructions and "help" windows. Where the on-screen instructions and help messages do not provide adequate information on any particular topic, this manual provides more complete information.

Thurlby Thandar Instruments Ltd.

Glebe Road, Huntingdon. Cambs. PE18 7DX England Book Part No. 48583-0570

Telephone: (01480) 412451 Fax: (01480) 450409 Issue 4

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Technical Specifications - LA3200 *(LA4800 in italics)*

SIGNAL INPUTS

Number of data channels:	32 *(48),* 16 per connector
Number of clock inputs:	3 independent clocks, active edge can be independently selected for each. Data is stored on the OR of the three active clock edges.
Number of clock qualifiers:	3; 1 for each clock. Selectable as high, low or don't care.
Input characteristics:	Dependant upon the type of pods fitted. (see pod specifications).
Data Skew:	Typically within ± 4ns.

MEMORY ORGANISATION

Data memory size:

32 *(48)* bits x 1K deep (normal mode) or

32 *(48)* bits x 8K deep (deep mode) or

8 *(12)* bits x 1K or 8K deep (high speed mode).

Reference memory size:

2 *(4)* non-volatile memories each of 32 *(48)* bits x 1K deep. Data retention time 3 months typical.

Set-up memory:

Non-volatile storage for up to 10 set-ups. Data retention time 3 months typical.

EXTERNAL CLOCK

Frequency range:	DC to 25MHz.
Organisation:	3 independent clocks, individually qualified. Data is recorded on the logical OR of each active clock edge.
Data set-up and hold times:	15ns set-up; 0ns hold.

INTERNAL CLOCK

Clock rate:	Selectable 40ns to 100ms (25MHz to 10Hz) in 1:2:5 sequence (normal asynchronous modes). 10ns (100MHz) in high speed timing mode (requires high speed data pods). 200ms and 1s (5Hz and 1Hz) in Roll mode.

GLITCH CAPTURE (Only available when high speed data pods are fitted)

Number of channels:	16 *(24)* (8 per pod) when in glitch mode.
Minimum detectable pulse:	5nsec.

TRIGGERING

Trigger sequencer words:	4 words of up to 32 *(48)* bits
Trigger sequencer terms:	Each term can be the logical combination (including NOTs) of any number of the sequencer words.
Trigger sequencer steps:	Up to 4 steps with two comparisons and redirections per step, e.g. for step N; IF event X occurs THEN GO TO step N+1, IF event Y occurs THEN GOTO step M. Event or clock counting on each step.
Trigger filter:	1 to 15 clock events (1 to 14 extra clocks).
Trigger position:	Selectable between 100% pre-trigger, 50% pre-trigger/50% post-trigger and 100% post trigger plus up to 23,999 of post-trigger delay.
Trace control:	Any trigger word can be used as a trace start word or a trace stop word allowing comprehensive qualification of the data stored.
Glitch Triggering:	Glitch words can be ANDed with normal trigger words.

TIMING DISPLAY

Number of channels:	Any 16 channels plus a timing scale (channels may be repeated).
Channel labelling:	Each channel can be uniquely labelled with up to 8 characters.
Number of samples:	For normal mode the full 1K memory depth can be displayed with an expansion of x1, x4, x16 or x64. For deep mode the full 8K memory depth can be displayed with an expansion of x1, x8, x32, x128 or x256.
	The expansion window can be moved anywhere in the store. The position of the window is shown graphically on the display.
Cursor system:	There are two moveable cursors and a fixed trigger marker. The display shows the absolute and relative position of each within the store with the data value at the reference cursor (selectable base format). A window into the state display showing the state of all the channels at the reference cursor position is also shown.
Glitch display:	Glitches are displayed as narrow vertical lines.
State information:	The state of all 32 *(48)* channels at the reference cursor position is displayed in the format as set within the State Display system.
Roll mode operation:	Timing diagram is updated continuously as acquisition takes place when using very slow clock rates (5Hz and 1Hz).

Analog Display Mode (LA4800 only)

8 channels can be displayed as the analog equivalent of an 8-bit binary word.
8 further channels can be displayed in conventional mode simultaneously.

STATE DISPLAY

Channel groups:

Up to eight groups can be defined. Each group can be given a user defined name. Each group can contain up to 16 channels. Channels can be randomly positioned and repeated in different groups.

Display format:

Each individual group can be displayed in its own radix selected from binary, octal, decimal, hex, or ASCII. Each group is displayed under its own user-defined label.

16 consecutive store locations from the selected memory (main or reference) can be selected and scrolled up and down. The start line can also be selected directly from the keyboard.

SEARCH AND COMPARE

Word Search:

An individual word can be searched for in any memory. A mask can be specified.

Block Search:

A block of any length and any position can be searched for in any memory.

A mask can be specified and a filter can be set.

Page Compare:

The current page can be compared with the same page in another memory.

Differences are displayed in reverse video.

Block Compare:

A block of any length and any position can be compared with a block of similar length and any position within any memory. A mask can be specified and a filter can be set.

Conditional Repeat

During data acquisition, the block compare function can be operated automatically. The acquisition can be stopped on an equality or an inequality.

Mask and Filter:

A mask specifies which parts of the data are to be defaulted to don't care for the purposes of a search or a comparison. A filter specifies an allowable number of non-matching words that can exist between matching words. It is particularly useful in compensating for data position skew in asynchronous data capture.

SIGNATURE ANALYSIS (LA4800 ONLY)

Compression of data into unique 4 digit Hex signatures using a multiple feedback path shift register algorithm. The data can be from a single channel or a group of channels. Data can be from any section of any memory. Signatures can be used for rapid go, no-go testing against prepared documentation.

PERFORMANCE ANALYSIS (LA4800 ONLY)

Performance analysis provides statistical information for a group of 16 channels (normally a microprocessor address bus). A histogram is generated showing the percentage of the time for which the address was within a number of user defined address ranges.

DISPLAY

9" super-twist blue mode LCD with cold cathode fluorescent backlighting. 80 columns by 25 lines in text mode, 640 by 200 pixels in graphics mode.

INTERFACES OUTPUTS

Data input/output

RS-423 serial interface standard (RS-232 compatible), IEEE-488 interface optional. Output to a printer via the serial interface, optional serial to Centronics parallel interface cable available.

Trigger interface

Outputs for the following signals: Triggered, Word A True, Word B True, Memory Clock. Inputs for the following: Disable sequencer goto, disable event counting.

Power

110V, 120V, 220V, 230V, 240V 48-63Hz, adjustable internally; operating range ± 10% of nominal, 75VA max. Installation Category II.

Operating Range

5°C to 40°C, 20% to 80% RH.

Storage Range

-20°C to +60°C

Environmental

Indoor use at altitudes up to 2000m. Pollution Degree 1.

Mechanical

Size: 315mm x 190mm x 268mm (12.4" x 7.5" x 10.5")

Weight: 5kg (11 lb).

Electrical Safety

Complies with EN61010-1.

EMC

Conforms with the protection requirements of the U.K. EMC Regulations SI 1992/2372.

OPTIONAL DATA PODS

Combination data pod AP01

Single pod with 32 data inputs (DC to 25MHz), 3 clock inputs, 3 clock qualifier inputs. Single 40-way connector with colour coded plug-on connection leads.

Input Impedance:	100k/10pF
Threshold:	TTL (+1.4V)
Max input volts:	+10V/-5V

Combination data pod AP02

Single pod with 48 data inputs (DC to 25MHz), 3 clock inputs, 3 clock qualifier inputs. 40-way and 24-way connectors with colour coded plug-on connection leads.

Input impedance:	100k/10pF
Threshold:	TTL (+1.4V)
Max. input volts:	+10V/-5V

High Speed data pods AP03

16 channels at DC to 25MHz, 8 channels at DC to 25MHz with glitch capture, 4 channels at 100MHz (asynchronous only). Colour coded plug-on connection leads.

Input impedance:	100k/6pF
Threshold:	TTL (+1.4V)
Max. input volts:	+10V/-5V
Min. Pulse width (Glitch mode):	5ns.

Clock pod AP04

3 clock inputs, 3 clock qualifier inputs. Colour coded plug-on connection leads.

Input impedance:	100k/6pF
Threshold:	TTL (+1.4V)
Max. input volts:	+10V/-5V

High Speed variable threshold data pods AP03V

16 channels at DC to 25MHz, 8 channels at DC to 25MHz with glitch capture, 4 channels at 100MHz (asynchronous only). Colour coded plug-on connection leads.

Input impedance:	100k/6pF
Threshold: variable	-5V to +10V in 0.1V steps
Hysteresis: typically	± 200mV
Min. input overdrive:	±50mV above hysteresis level
Max. input volts:	±50V
Max. pulse width (Glitch mode):	5ns

Variable threshold clock pod AP04V

3 clock inputs, 3 clock qualifier inputs. Colour coded plug-on connection leads.

Input impedance:	100k/6pF
Threshold:	variable -5V to +10V in 0.1V steps.
Hysteresis:	typically ± 200mV
Min. input overdrive:	± 50mV above hysteresis level.
Max. input volts:	± 50V

OTHER OPTIONS

Microprocessor disassembler pods

Disassembler pods are available for many popular 8-bit and 16 bit microprocessors. Each pod has the disassembler firmware incorporated within it and is supplied complete with a test clip connector for connection to the target microprocessor.

Serial to parallel printer cable PC01A

This cable enables the logic analyser to be used with printers which have a Centronics parallel input.

IEEE-488 interface GP500a

This option enables data to be sent to and from the logic analyser using the IEEE-488 bus (GPIB) instead of RS-232.

Software interface for IBM_PC compatible computers LATALK

Disk based software which will operate on most IBM compatible personal computers. The computer is linked to the serial interface of the logic analyser by a cable which is supplied. The software allows remote control of the analyser, disk storage of acquisition data, disk storage of set-up data etc.

SAFETY

This instrument is Safety Class I according to IEC classification and has been designed to meet the requirements of EN61010-1 (Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use). It is an Installation Category II instrument intended for operation from a normal single phase supply.

This instrument has been tested in accordance with EN61010-1 and has been supplied in a safe condition. This instruction manual contains some information and warnings which have to be followed by the user to ensure safe operation and to retain the instrument in a safe condition.

This instrument has been designed for indoor use in a Pollution Degree 1 environment (no pollution, or only dry non-conductive pollution) in the temperature range 5°C to 40°C, 20% - 80% RH (non-condensing). It may occasionally be subjected to temperatures between +5° and -10°C without degradation of its safety.

Use of this instrument in a manner not specified by these instructions may impair the safety protection provided. Do not operate the instrument outside its rated supply voltages or environmental range. In particular excessive moisture may impair safety.

WARNING! THIS INSTRUMENT MUST BE EARTHED

Any interruption of the mains earth conductor inside or outside the instrument will make the instrument dangerous. Intentional interruption is prohibited. The protective action must not be negated by the use of an extension cord without a protective conductor.

When the instrument is connected to its supply, terminals may be live and opening the covers or removal of parts (except those to which access can be gained by hand) is likely to expose live parts. The apparatus shall be disconnected from all voltage sources before it is opened for any adjustment, replacement, maintenance or repair.

Any adjustment, maintenance and repair of the opened instrument under voltage shall be avoided as far as possible and, if inevitable, shall be carried out only by a skilled person who is aware of the hazard involved.

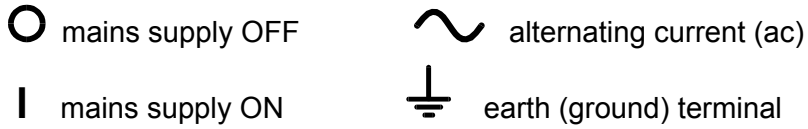
If the instrument is clearly defective, has been subject to mechanical amage, excessive moisture or chemical corrosion, the safety protection may be impaired and the apparatus should be withdrawn from use and returned for checking and repair.

Make sure that only fuses with the required rated current and of the specified type are used for replacement. The use of makeshift fuses and the short-circuiting of fuse holders is prohibited.

This instrument uses a rechargeable NiCd or NiMH cell for non-voltatile memory battery back-up; typical data retention is 3 months. In the event of replacement becoming necessary, replace only with a cell of the correct type, i.e. 2.4V, 2V110 size. Exhausted cells must be disposed of carefully in accordance with local regulations; do not cut open, incinerate, expose to temperatures above 60°C or attempt to recharge.

Do not wet the instrument when cleaning it.

The following symbols are used on the instrument and in this manual:



The LA3200/LA4800 logic analysers meet the intent of the EMC Directive 89/336/EEC by conforming with the protection requirements of the U.K. EMC Regulations SI 1992/2372 under the provisions made for Education and Training Equipment (Regulation 8).

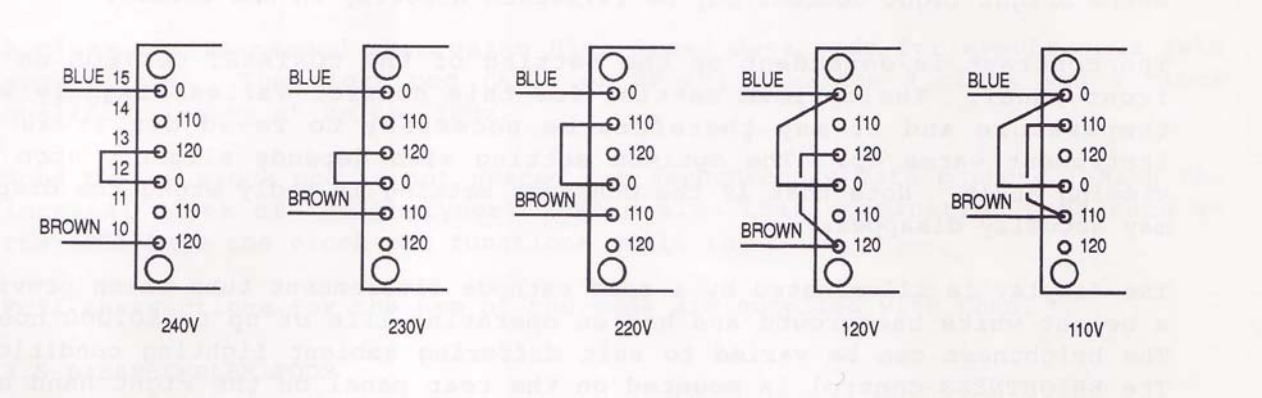
Use of the apparatus outside the classroom, laboratory, study area or similar such place invalidates conformity with the protection requirements of the Electromagnetic Compatibilty Directive (89/336/EEC) and could lead to prosecution.

The apparatus when operated will not cause electromagnetic disturbance to apparatus situated outside its immediate electromagnetic environment.

MAINS OPERATING VOLTAGE

Before switching ON, check that the operating voltage of the instrument shown on the rear panel is suitable for the local supply. Should it be necessary to change the operating voltage range proceed as follows:

1. Ensure that the instrument is disconnected from the AC supply.
2. Remove the screws holding the case upper and lift off upper.
3. Change the transformer connections following the diagram.
4. Reassemble in the reverse order.
5. Change the fuse type if necessary.
6. Change the operating voltage setting shown on the rear panel.



FUSE

The correct fuse type is:

500mA 250V HRC time-lag, 20mm for 220, 230 & 240V

1A 250V HRC time lag, 20mm for 110 & 120V

Make sure that only fuses with the required rated current and of the specified type are used for replacement. The use of makeshift fuses and the short-circuiting of fuse holders are prohibited.

MAINS LEAD

When a three core mains lead with bare ends is connected as follows:

BROWN	-	MAINS LIVE
BLUE	-	MAINS NEUTRAL
GREEN/YELLOW	-	EARTH

WARNING! THIS INSTRUMENT MUST BE EARTHED

Any interruption of the mains earth conductor inside or outside the instrument will make the instrument dangerousl. Intentional interruption is prohibited. The protective acrtion must not be negated by the use of an extension cord without a protective conductor.

POWER SWITCH

The power switch is mounted on the rear panel on the left hand side when viewed from the front.

DISPLAY CONTRAST AND BRIGHTNESS

The liquid crystal display is a second generation blue-mode supertwist unit which gives very good contrast and angle of view. For maximum contrast the angle of the display should be at roughly 90 degrees to the line of sight of the user. To achieve this, the combined handle/tilt-stand can be set at several different angles. Note that although the display window has an anti-reflective coating, care should be taken to avoid positioning the unit where bright light sources may be reflected directly in the screen.

The contrast is dependent on the setting of the CONTRAST CONTROL on the front panel. The optimum setting for this control varies slightly with temperature and it may therefore be necessary to re-adjust it as the instrument warms up. The optimum setting also depends slightly upon the viewing angle. Note that if the contrast setting is badly wrong the display may actually disappear.

The display is illuminated by a cold cathode fluorescent tube which provides a bright white background and has an operating life of up to 50,000 hours. The brightness can be varied to suit differing ambient lighting conditions. The BRIGHTNESS control is mounted on the rear panel on the right hand side as viewed from the front.

Signal Inputs and Pods

The signal inputs to the analyser are provided via a set of latched dual-row headers mounted along the bottom of the front panel. The data inputs are divided into groups of 16. Each group of 16 has a 34-way header and is indi-vidually labelled as DATA A and DATA B for an LA3200, or DATA A, DATA B and DATA C for an LA4800. The clock inputs and clock qualifier inputs are provided via a 20-way header labelled CLOCKS.

CONNECTING TO THE SIGNAL INPUTS

The signal inputs on the analyser front panel are high impedance and have a threshold voltage of +2.5V. If the inputs are left unconnected they will sit at an indeterminate level. The inputs are unprotected and must not be taken outside of the range -0.5V to +5.5V, doing so could permanently damage the analyser. It is not recommended that connections should be made directly to these inputs unless the analyser is being used in a permanently wired configu-ration where there is no possibility of an over-voltage being applied accidentally.

The analyser is intended to be connected via the various types of Thurlby data pods. See Appendix G. for full details. These provide protection against accidental over-voltage and provide buffering of the signals to allow long cables to be driven. Note that the signal grounds for the analyser and for the pods are all connected to the chassis ground of the analyser.

STANDARD (COMBINATION) DATA PODS

Standard data pods (such as the AP01 32-channel combination data pod or the AP02 48-channel version) provide high impedance buffering of the signal inputs, over-voltage protection, and line drivers to enable them to drive the cables which connect them to the analyser.

Standard data pods have a maximum speed capability of 25MHz. They do not provide a 100MHz or a Glitch Capture capability.

Full instructions for the use of the pods are supplied with them.

HIGH SPEED DATA PODS

High Speed data pods (such as the AP03) provide 16 data inputs at up to 25MHz or 8 data inputs with Glitch Capture at up to 25MHz or 4 data inputs at 100MHz (asynchronous only). Two high speed data pods would be needed for an LA3200 and three would be needed for an LA4800.

Full instructions for the use of the pods are supplied with them.

CLOCK PODS

A clock pod is needed when using High Speed data pods for synchronous data acquisition. The clock pod (AP04 or AP04V) provides 3 clock and 3 clock qualifier inputs at up to 25MHz.

Note that a clock pod is not needed for asynchronous data capture (using the internal clock of the analyser). Note also that combination pods such as the AP01 have the clock pod functions built in.

Full instructions for the use of the pods are supplied with them.

DISASSEMBLER PODS

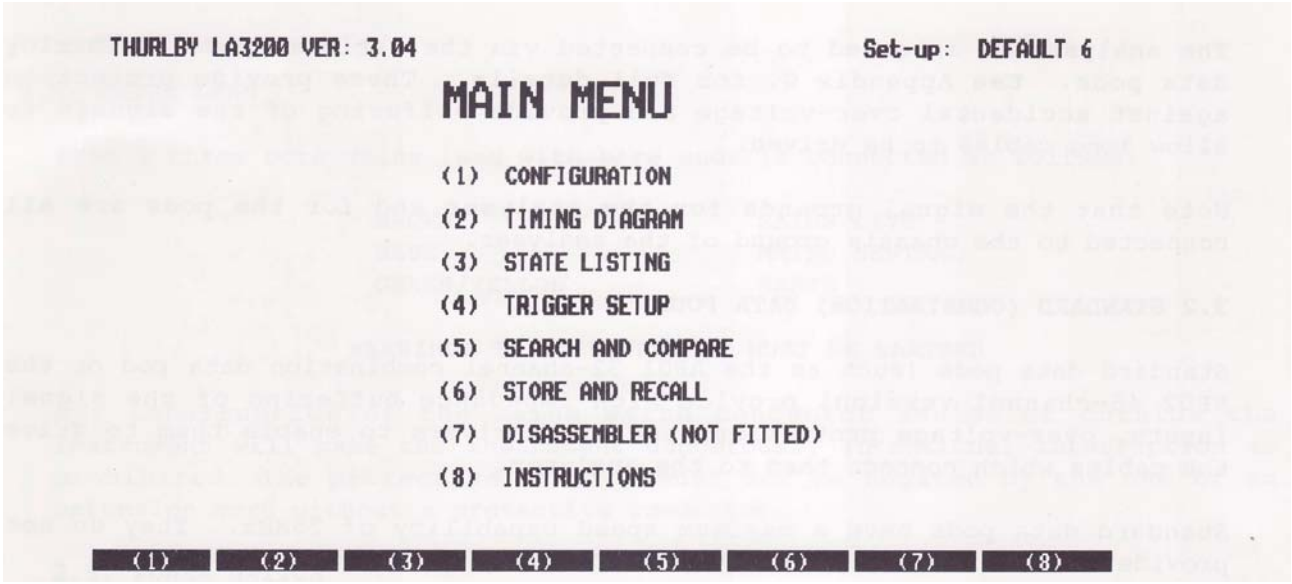
Each disassembler pod is specific to a particular microprocessor or group of microprocessors. It is arranged so that it can connect directly to the target microprocessor using either the sprung test clip connector supplied or a micro-processor replacement connector (Thurlby LC91).

Full instructions for the use of the pods are supplied with them.

Main Menu

The analyser powers-up to the Main Menu screen. This screen provides access to all of the other screens of the instrument. Pressing MENU at any time will return to the Main Menu screen.

The top of the Main Menu screen provides some basic information. The left hand side shows the firmware version number (e.g. ver 2.5A). The right hand side shows the name of the set-up currently in use.



There are several options which are selected by the soft keys below the screen:

CONFIGURATION

This enables the basic configuration of the analyser to be modified. It includes such items as clock setup, acquisition control, and input pod setup.

TIMING DIAGRAM

This enables the contents of the acquisition memory, or either of the reference memories, to be displayed as a diagram of logic levels against time.

STATE LISTING

This enables the contents of the acquisition memory, or either of the reference memories, to be displayed as a list of logic state data against memory position.

TRIGGER SETUP

This enables the trigger sequence and trace words to be setup.

SEARCH AND COMPARE

This enables a word or a block of data to be searched for in any memory. It also enables two blocks to be compared.

STORE AND RECALL

This enables the contents of the data acquisition memory to be stored in either of two non-volatile reference memories. It also enables the complete "setup" of the analyser to be stored in non-volatile memory, or any previously stored setups to be recalled.

DISASSEMBLER FOR ....

This option will only be available if a disassembler pod is plugged into the analyser in which case it will enable a disassembly listing for that particular microprocessor to be displayed. If not the option will be labelled "Disassembler (not fitted)".

INSTRUCTIONS (LA3200)

This provides a simplified on-screen operating manual.

MORE MENU OPTIONS (LA4800)

This provides access to a sub-menu as follows:

SIGNATURE (LA4800 only)

This enables the contents of any portion of any of the memories to be compressed into a 4 digit hex signature. This facility is very useful for go, no-go testing of digital circuits.

PERFORMANCE ANALYSIS (LA4800 only)

This provides graphical and numeric analysis of software performance by indicating the percentage of time that is spent within user specified address ranges.

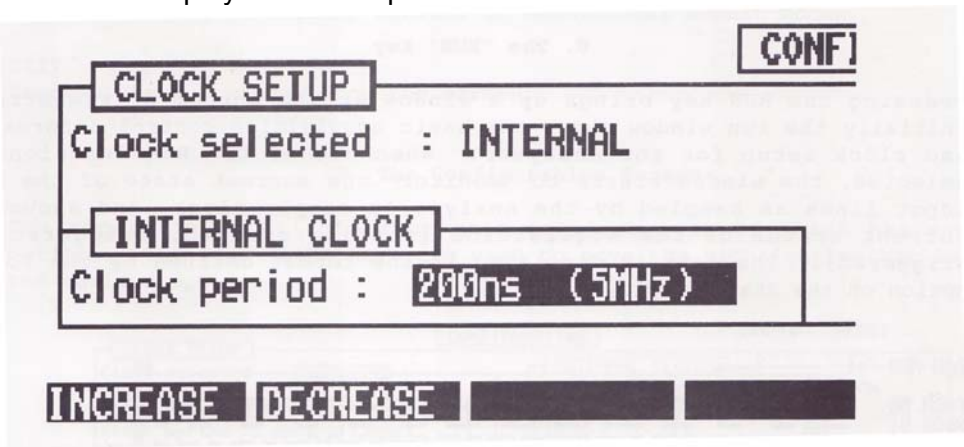
INSTRUCTIONS

This provides a simplified on-screen operating manual.

Pressing the MENU key at any time will return the display to the main menu.

Selecting and Modifying Options

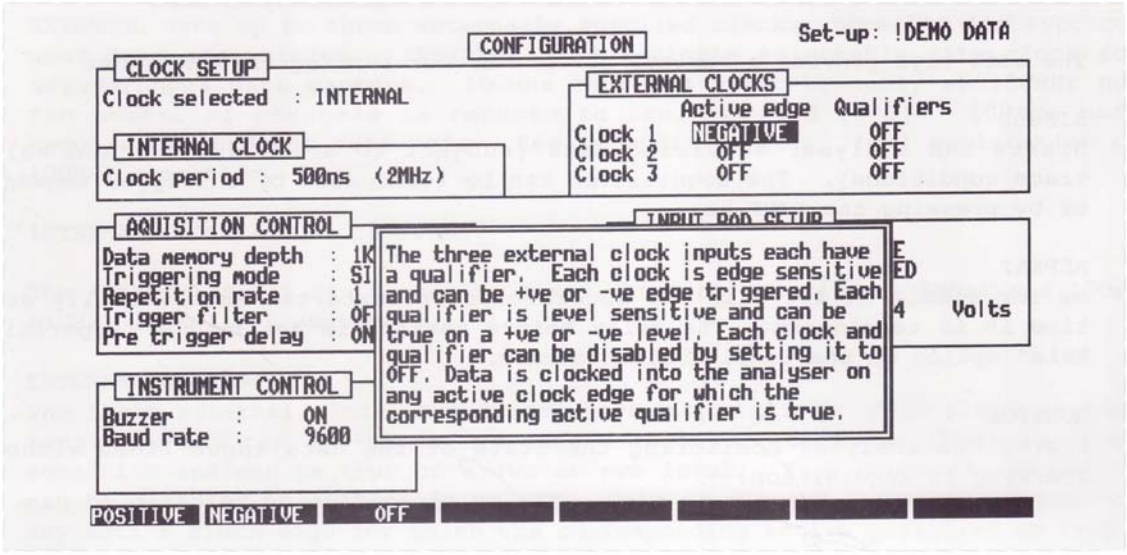
The instrument is controlled by "soft" keys. On each screen the items that can be changed can be highlighted by a reverse video bar. The bar is moved using the four blue directional "tab" keys. The eight keys below the display show the options available for each item.



Where alpha-numeric entry is needed this is done from the numeric keypad. New characters enter from the right with old characters rolling off to the left. The normal function of a key is the one printed above it. The secondary func-tion is printed to the right of the key and is accessed by preceding it with the Shift key. Pressing the Shift key causes a flashing block to appear in the top right-hand corner of the screen. Note that the "X" symbol is used to denote Don't Care.

Help

Help is context sensitive. Pressing HELP at any time will bring up a window providing information relevant to the options currently selected. Press any key to cancel help.



The Current Set-Up Name

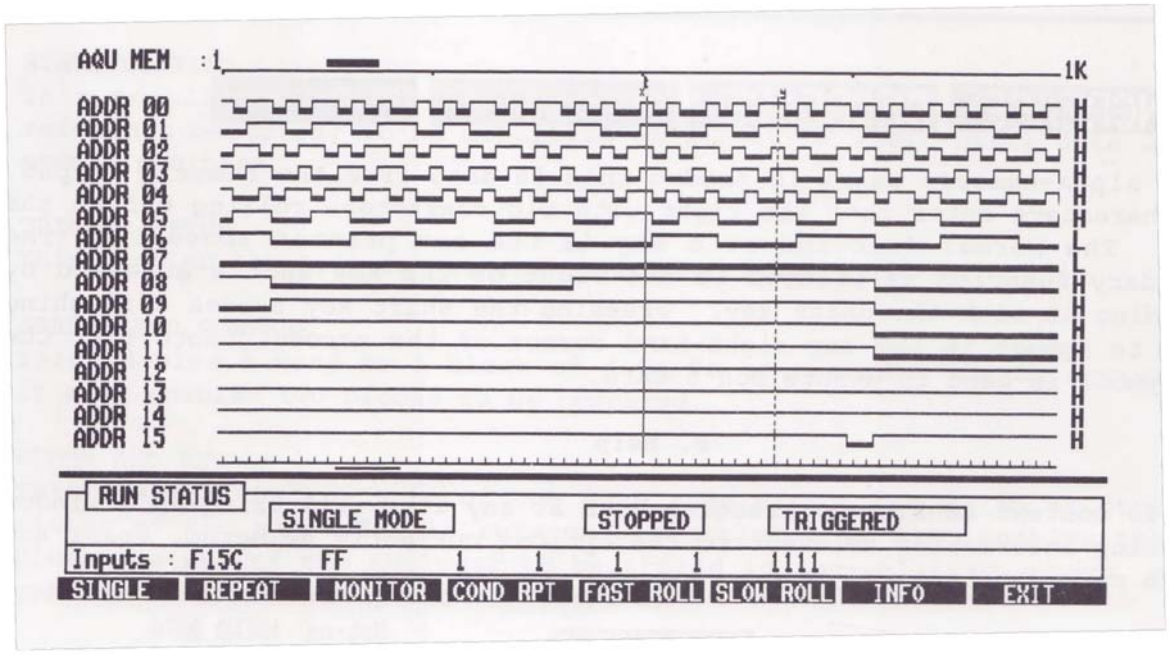
Because of the large number of different options that can be set, it would be very time consuming to have to set up the analyser every time that it is used. To avoid this, a number of complete set-ups of the analyser can be stored in non-volatile memory and recalled whenever required using the Store and Recall option from the Main Menu section.

Each set-up has a fixed name of up to 8 characters. The name of the set-up currently in use is displayed at the top right of every screen (except for the Timing Diagram screen).

When any of the analyser's option settings are subsequently altered by the user, an ! symbol is placed in front of the set-up name to warn the user that the analyser is no longer set up exactly as per the stored set-up.

The "RUN" Key

Pressing the RUN key brings up a window at the bottom of the screen. Initially the run window shows the basic acquisition control information and clock setup for the analyser. When one of the Run functions is selected, the window starts to "monitor" the current state of the data input lines as sampled by the analy-ser's sample clock, and shows the current status of the acquisition (running/stopped, triggered/not triggered). The data is displayed in the format defined by the Format option on the State display.



The soft keys provide a variety of options for running the analyser:

SINGLE

Starts the analyser acquiring data (subject to a valid clock and valid trace conditions). The acquisition can be terminated by a trigger sequence or by pressing the STOP key.

REPEAT

As for SINGLE except that the acquisition is restarted automatically each time it is terminated. The delay before restart is set by the "Repetition Rate" option on the Configuration screen.

MONITOR

Starts the analyser monitoring the state of the data input lines without starting an acquisition.

COND RPT

Starts acquisitions which will be repeated or stopped depending on the result of a comparison as set from the Conditional Repeat section of the Search and Compare screen.

FAST ROLL/SLOW ROLL

The "roll" mode functions enable the analyser to function usefully as a very slow speed timing analyser. This can be very useful for observing the output of low speed logic circuits such as PLCs (programmable logic controllers). See Appendix D. for an explanation of roll mode.

INFO

Returns the window to displaying the acquisition control information.

STOP

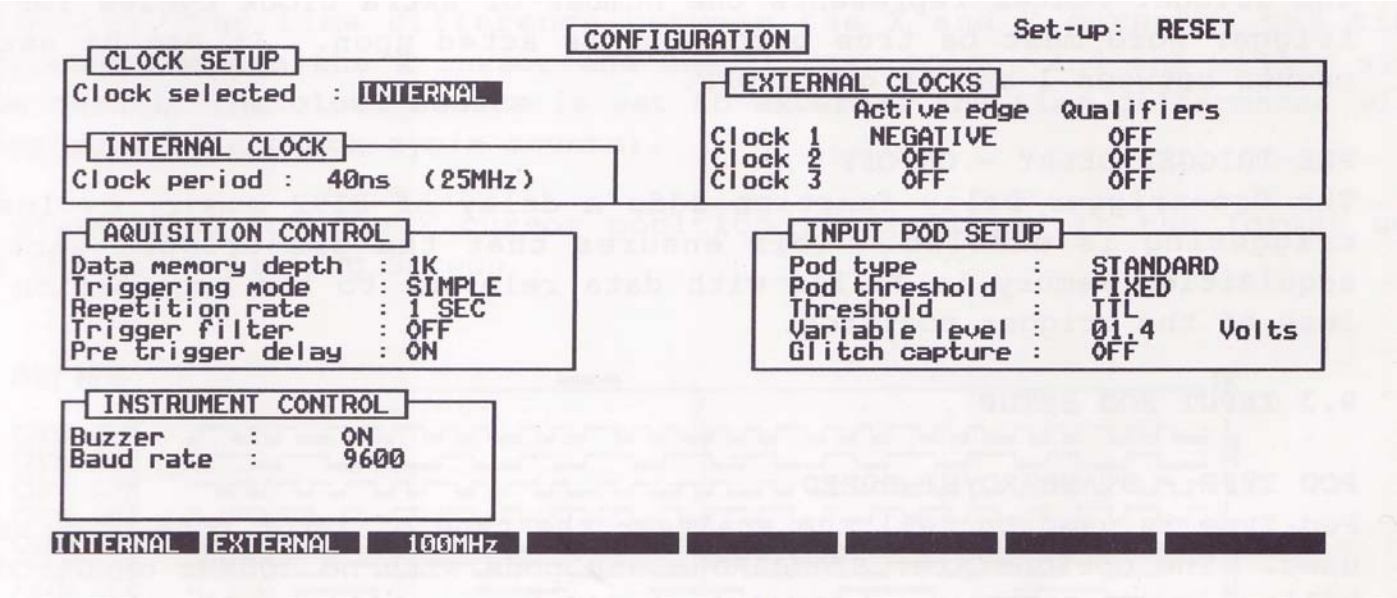
Terminates Single, Repeat, Monitor or Conditional Repeat modes.

EXIT

Removes the Run window from the screen.

The Configuration Screen

The screen is split into four main sections each of which has several options. The blue "tab" keys are used to move the highlighting bar between the various options.



CLOCK SETUP

CLOCK - EXTERNAL/INTERNAL/100MHz

EXTERNAL uses up to three externally supplied clocks, normally for synchronous data acquisition. INTERNAL uses a single selectable rate clock for asynchronous data capture. 100MHz captures asynchronously at 100MHz but the number of channels is reduced to four per pod (0-3). 100MHz mode requires High Speed data pods. See Appendix F. for a full explanation of 100MHz operation.

INTERNAL CLOCK - 40ns to 100ms

The internal clock can be set to fixed rates between 40ns (25MHz) and 100ms (10Hz) in a 1:2:5 sequence.

EXTERNAL CLOCKS

The three external clock inputs each have a qualifier. Each clock is edge sensitive and can be +ve or -ve edge triggered. Each qualifier is level sensitive and can be true on a +ve or -ve level. Each clock and qualifier can be disabled by setting it to OFF. Data is clocked into the analyser on any active clock edge for which the corresponding active qualifier is true.

The setup and hold times for the data inputs (and the clock qualifier inputs) relative to the active clock edge is as follows:

15ns setup, 0ns hold.

ACQUISITION CONTROL

DATA MEMORY DEPTH - 1K/8K

Memory depth can be 1K or 8K bits per channel. 1K is for normal operation. 8K is for extended data capture.

Note that the reference memories are only 1K depth, and that only 1K of an 8K data acquisition can be used for automatic comparison.

TRIGGERING MODE - SIMPLE/COMPLEX

The triggering mode sets the Trigger Setup screen to be either SIMPLE or COMPLEX.

SIMPLE provides only a single trigger word and a single trace word. COMPLEX provides a full multi-level triggering menu. COMPLEX is not available in 100MHz mode.

REPETITION RATE - 1s/3s/10s

Repetition rate sets the delay between acquisitions when in Repeat mode.

TRIGGER FILTER - OFF/1 to 14

The Trigger Filter represents the number of extra clock cycles for which a trigger word must be true before it is acted upon. It can be set to any number between 1 and 14 or to OFF.

PRE-TRIGGER DELAY - ON/OFF

The Pre-trigger Delay function adds a delay of 8192 memory cycles before triggering is enabled. This ensures that the pre-trigger part of the acquisition memory is filled with data relevant to the acquisition regardless of the trigger position.

INPUT POD SETUP

POD TYPE - STANDARD/HI-SPEED

Pod Type is used to tell the analyser the type of input pods that are being used. The options are: STANDARD - any pods with no 100MHz or Glitch capability, or HI-SPEED - pods with both 100MHz capability and Glitch Capture.

POD THRESHOLD - FIXED/VARIABLE

Pod Threshold is used to tell the analyser whether the input pods presently in use are fixed threshold (TTL) or variable threshold.

THRESHOLD - TTL/AC-HC/ECL/VARIABLE

If the Pod Threshold is set to variable, the Threshold function enables it to be varied. The Threshold can be set as TTL (+1.4V), AC/HC (+2.5V), ECL (-1.3V) or VARIABLE. Variable allows thresholds between -5V and +10V to be set. Fixed threshold pods are unaffected by these settings.

VARIABLE LEVEL - -2.5V to +10V

The variable level can be set in steps of 1V and 0.1V from -2.5V to +10V.

GLITCH CAPTURE - ON/OFF

Glitch Capture ON enables transitions occurring between clock sampling edges to be captured. The number of channels is reduced to 8 per data input connector (0-7). Glitches are shown as narrow lines on a timing diagram and by a 1 on the corresponding unused channel when viewing state listings. Glitch capture requires High-Speed data pods to be fitted. See Appendix D. for a full explanation of Glitch capture.

INSTRUMENT CONTROL

BUZZER - ON/OFF

The buzzer is used to alert the user to the status of the analyser at certain times. It can be enabled or disabled by the user.

BAUD RATE - 1200/9600/HI-SPEED

The analyser is fitted with an RS-423 interface which is RS-232 compatible. The baud rate can be set to 1200 or 9600 baud or to HI-SPEED. HI-SPEED is only for use when the optional IEEE-488 interface is fitted. Note that when using the Thurlby RS-423 to Centronics converter cable type PC01, the baud rate must be set to 9600.

Timing Diagram

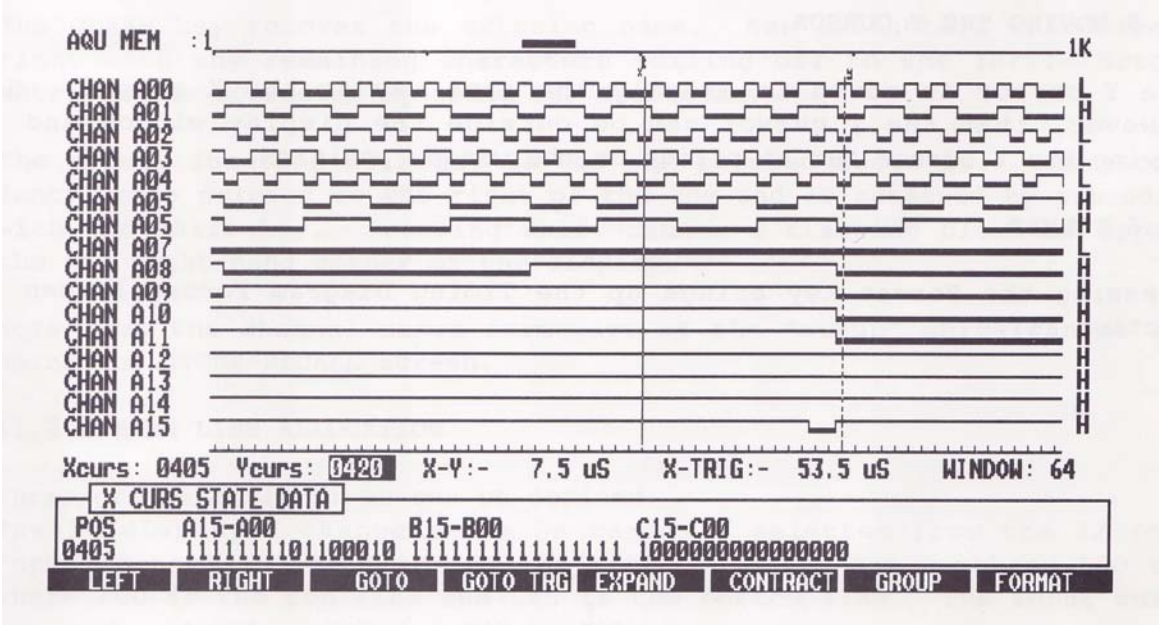
The timing diagram display can show any 16 channels plus a clock marker with a window size of 8K, 1K, 256, 64 or 16 words. It also includes two movable cursors and a display of the data state for all 32 (or 48) channels at the X cursor position. Three separate groups of 16 channels can be displayed.

On an LA4800 only, the option is provided for displaying eight data lines from Group 3 as an analogue display.

The line above the timing display shows the position of the display window and the trigger point in the memory.

The line below the timing display shows the X and Y cursor positions within the memory, the time difference between the X and Y cursors, the time difference between the X cursor and the trigger point, and the window size (note that if the clock source is set to external the time differences will be replaced by a clock cycle counts).

The state data for the X cursor position is displayed in the format set from the State Listing Screen.



The memory presently being displayed is shown in the top left-hand corner of the display. To change the memory, move the highlight bar to that position and choose from the memory options: AQU MEM, REF MEM 1, or REF MEM 2 (and REF MEM 3 REF MEM 4 on an LA4800 only).

The Mem Info key brings up a window which shows the basic acquisition parameters that apply to the currently selected memory.

SELECTING THE GROUP OF CHANNELS

Up to three groups of 16 channels can be defined within the Timing Diagram Format screen. The group currently displayed is shown in the top left-hand corner of the screen following the memory name. The GROUP key toggles between the three groups.

MOVING THE X CURSOR

The X cursor is always visible in the display window. To move the cursor position the highlight bar over the Xcurs position. The soft keys marked LEFT and RIGHT move the cursor in one word steps with auto-repeat and auto-speedup. Alternatively the cursor can be moved by overwriting the position value (using the numeric keypad) and pressing GOTO. Note that the display window is always moved so as to maintain the X cursor within the window.

To position the X cursor at the trigger position, press GOTO TRG. Note that the levels shown against each line on the right-hand side of the screen repre-sent the levels at the X cursor position.

SCROLLING, EXPANDING AND CONTRACTING THE WINDOW

The window size is marked below the timing diagram on the right-hand side. It can be 8K words (if the data memory depth is set to 8K) or 1K, 256, 64 or 16 words. EXPAND decreases the size of the window, CONTRACT increases the size of the window. The window is redrawn around the position of the X cursor. The window can be scrolled by moving the X cursor to the edge of the window and continuing to move it.

The total size of the memory is marked in the top right-hand corner of the screen (1K or 8K). The line at the very top of the screen represents the whole of the memory and the bar above it represents the current size and position of the display window. The position of the trigger point within the memory is marked with a small "t".

MOVING THE Y CURSOR

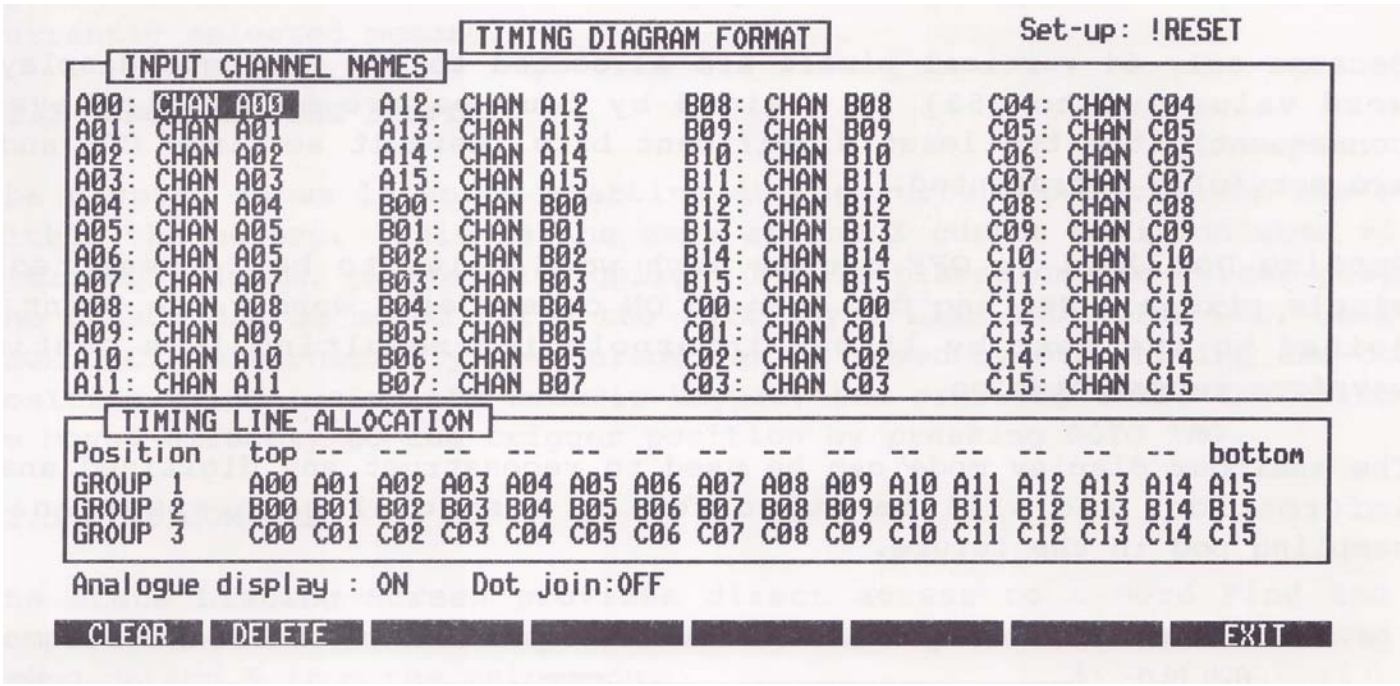
The Y cursor is moved in exactly the same way as the X cursor. Note, however, that the Y cursor can be outside the display window and that moving the Y cursor has no effect on the window position.

FORMAT

Pressing the Format key brings up the Timing Diagram Format Screen.

Timing Diagram Format

Pressing the soft key marked FORMAT when in the Timing Diagram screen brings up the Timing Diagram Format Screen which enables the displayed channels to be selected and channel names allocated. The screen is split into two sections:



Note that the bottom section of the screen (Analogue display) is only present on an LA4800.

INPUT CHANNEL NAMES

Each of the data input channels can be allocated an individual name of up to 8 characters. The channels are numbered from A00 to B15 (or A00 to C15) and each can be given a user-defined name. To change the name, move the highlight bar onto the name and use the numeric keypad to overwrite it.

The CLEAR key re-moves the existing name. New characters enter from the right with any remaining characters rolling off to the left. Errors on entry can be corrected by using the Delete key.

The normal function of a key is the one printed above it. The secondary function is printed to the right of the key and is accessed by preceding it with the Shift key. Pressing Shift causes a flashing block to appear in the top right-hand corner of the display.

Note that the channel names form part of the "setup" which can be stored using the STORE-RECALL screen.

TIMING LINE ALLOCATION

Three groups of 16 lines can be defined. The 16 displayed channels can be randomly selected from the 32 (or 48) input channels. The lines of the timing diagram are numbered L00 to L15 where L00 is the top line and L15 is the bottom line. The input channels are numbered A00 to B15 (or A00 to C15).

The default allocation is A00 to the top line, A01 to next line etc. To change the allocation move the highlight bar to the appropriate place and use the numeric keypad to enter a new channel reference. Where successive channel references are to be allocated to successive line numbers it is only necessary to enter the first reference, thereafter pressing NEXT will set the next line to the next channel reference.

Note that the line allocations form part of the "setup" which can be stored using the STORE-RECALL screen.

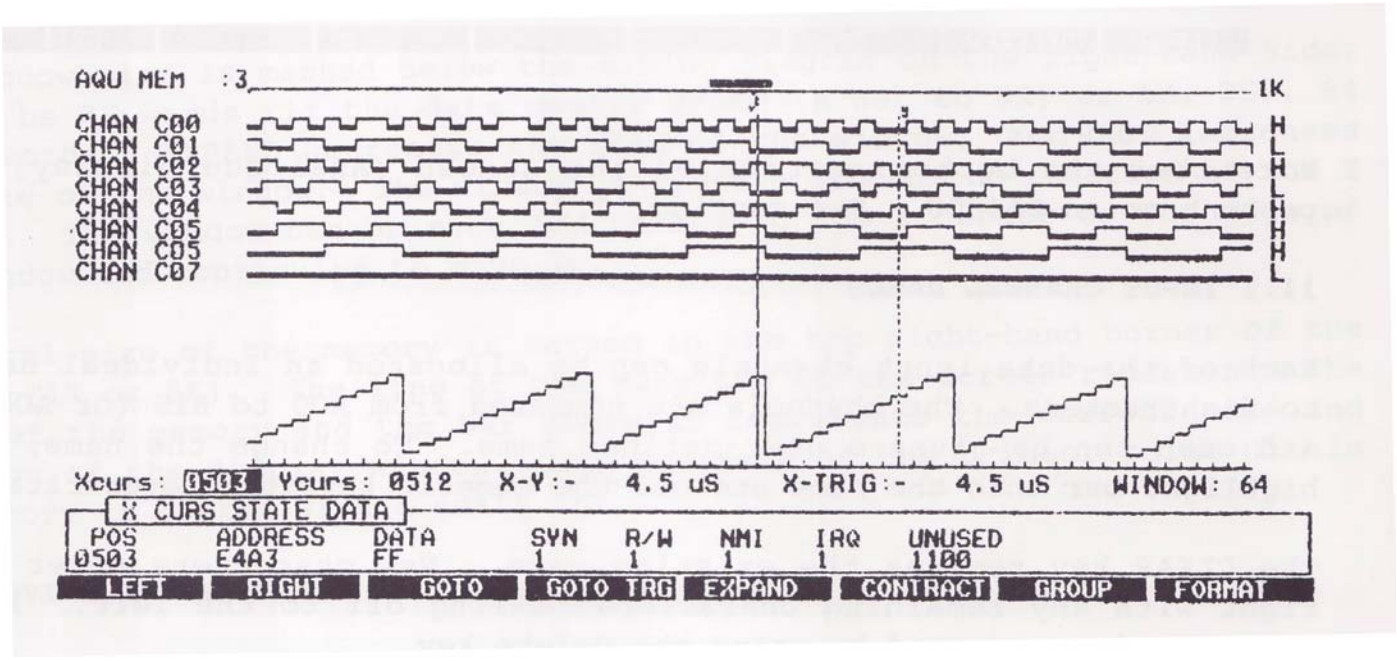
ANALOGUE DISPLAY MODE (LA4800 only)

Setting Analogue display to ON will cause the display of Group 3 to be modified such that the bottom eight lines are replaced with an analogue representation of the 8 bit digital word from the input channels selected for the those bottom eight lines (defaulted to be C08 to C15).

Because only 64 vertical pixels are allocated to the analogue display, the word value (up to 255) is divided by four before being displayed and consequently the two least significant bits (default settings C08 and C09) are not fully represented.

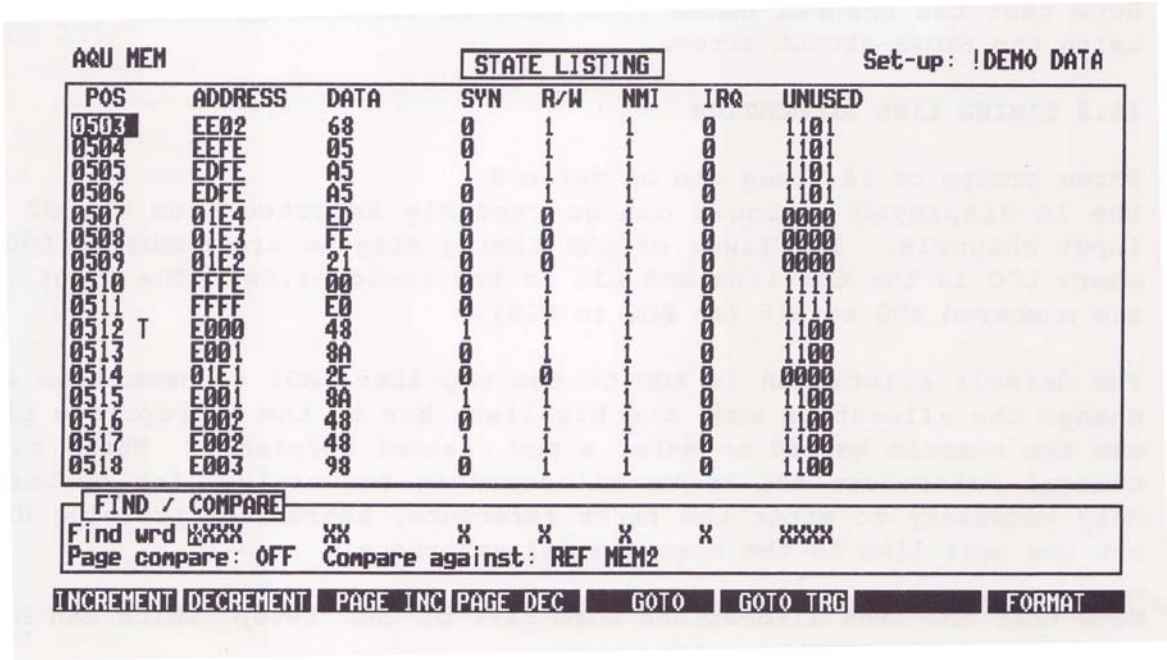
Setting Dot Join to OFF causes each word value to be represented by a single pixels. Setting Dot Join to ON causes each word value point to be joined to the next by linear interpolation resulting in a continuous waveform representa-tion.

The analogue display mode can be used to reconstruct any digitised analogue information, and will be supported by a special high speed analogue sampling pod in the future.



State Listing

The state listing display shows 16 successive words from anywhere within the acquisition memory or either of the reference memories. Each line shows the state of the data input channels in any required format as set using the Format option.



MEMORY SELECTION

The memory presently being displayed is shown in the top left-hand corner of the display. To change the memory, move the highlight bar to that position and choose from the memory options: AQU MEM, REF MEM 1, or REF MEM 2 (plus REF MEM 3, REF MEM 4 on the LA4800 only). The Mem Info key brings up a window which shows the basic acquisition parameters that apply to the currently selected memory.

SCROLLING THE DISPLAY

The display shows 16 words starting at the current position of the cursor within the memory. This is the same as the X cursor position when viewing a timing diagram. When the highlight bar is placed on the cursor position, the cursor can be moved using the soft keys, LINE INC, LINE DEC, PAGE INC, PAGE DEC. Alternatively the cursor can be moved by overwriting the current position value (using the numeric keypad) and pressing GOTO. The cursor can be moved directly to the trigger position by pressing GOTO TRG.

FIND/COMPARE

The State Listing Screen provides direct access to a Word Find and Page Compare function. More complex search and compare functions are available using option 5 from the main menu.

WORD FIND

Moving the highlight bar to FIND WRD provides soft key options of LEFT, RIGHT and CLEAR. CLEAR sets any existing Find Word to all don't cares. LEFT and RIGHT move a highlight block along the word. The character at the current block position can be overwritten using the numeric keypad.

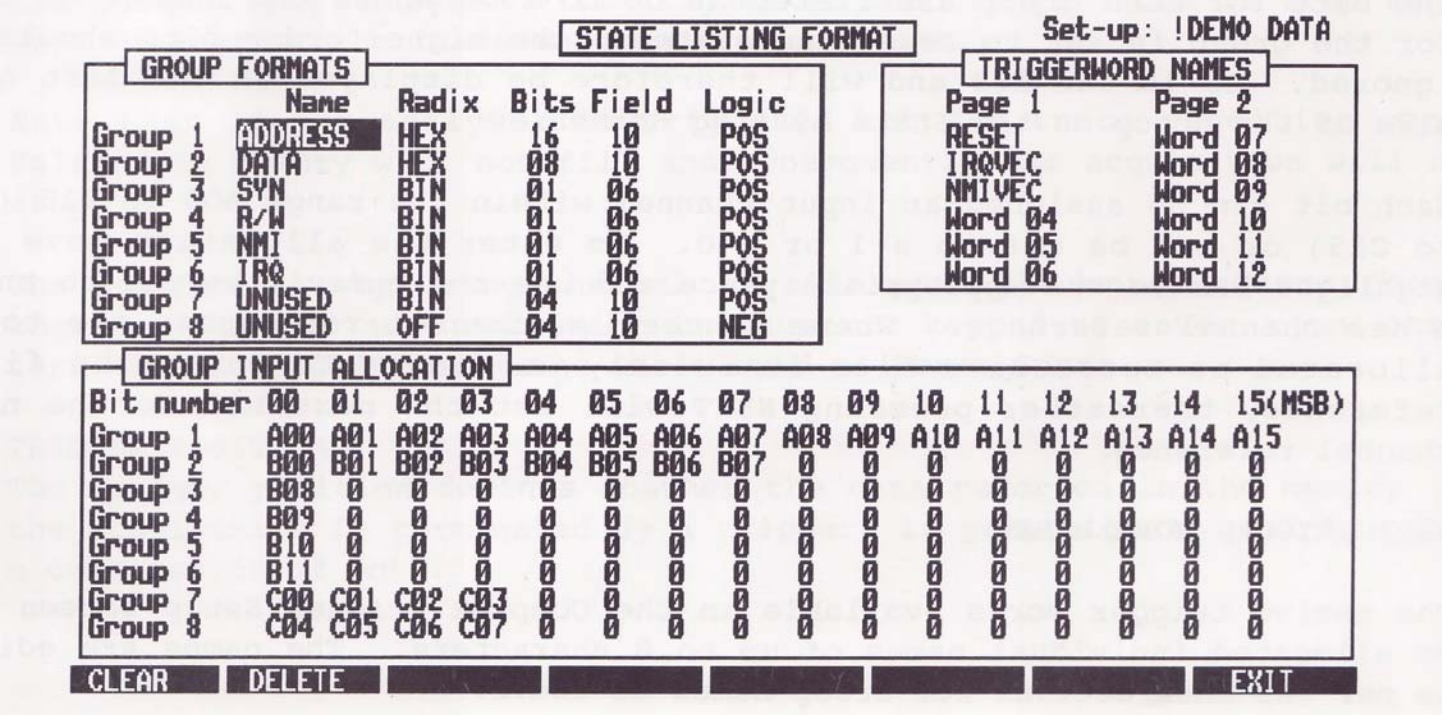
Pressing FIND starts the analyser searching for the word starting at the current cursor position. To move the cursor to the start of the memory before using FIND press GOTO STRT. When the analyser finds a word which matches the Find Word it redraws the screen with the cursor at that point. If no matching word is found the cursor will not be moved.

PAGE COMPARE

Page Compare compares the current displayed page with the same page in another memory. Turning Page Compare ON causes any differences to be displayed in reverse video. To change the memory with which a comparison is being made move the highlight bar to COMPARE AGAINST and select using the soft keys.

FORMAT

Pressing Format brings up the State Listing Format screen.



State Listing Format

Pressing FORMAT when in the State Listing screen brings up the State Listing Format Screen which enables the format of the data on each line to be set. The data can be split into up to 8 groups each of which can be given an individual name. Each group can include up to 16 input channels displayed in any radix and positioned anywhere on the screen. The input channels can be randomly assigned to the groups and a channel can be repeated in more than one group. The logic polarity of each group can be individually set. This screen also enables individual names to be allocated to the twelve trigger words available in the Complex Trigger Setup screen. The State Listing Format screen is directly accessible from the Complex Trigger Setup screen.

GROUP FORMATS

NAME

The name can be up to 8 characters in length. Press CLEAR to delete the existing name. Use the numeric keypad to enter new characters. DELETE removes the right hand character.

RADIX

The data can be displayed in any radix, HEX, DECIMAL, OCTAL, BINARY, or ASCII. Alternatively if the radix is set to OFF the group is eliminated from the display.

BITS

The number of bits in the group can be set in the range 1 to 16. If an inappropriate number of bits for the Type is entered (e.g. 15 bits for Hex) the analyser will allocate the missing bits as zeros.

FIELD

The Field defines the distance between the start of the current group and the start of the next group. Defaults are set automatically when the Type is selected. If the field is set too low, the two groups will overlap causing part of the more left-hand group to be lost.

LOGIC

Selecting positive logic causes a positive level on an input data line to be interpreted as a logic 1. Selecting negative logic causes a positive level on an input data line to be interpreted as a logic 0.

GROUP INPUT ALLOCATION

The bits for each group are listed as 00 to 15. Where the number of bits for the group is set to less than sixteen, the higher order bits should be ignored. 15 is the MSB and will therefore be displayed on the left hand side of the group on the State Listing Screen.

Each bit can be assigned an input channel within the range A00 to B15 (A00 to C15) or can be set to a 1 or a 0. To enter the allocation move the highlight bar to the appropriate place and use the numeric keypad to enter a new channel reference. Where successive channel references are to be allocated to succes-sive bits it is only necessary to enter the first reference, thereafter press-ing NEXT will set the next bit to the next channel reference.

TRIGGER WORD NAMES

The twelve trigger words available in the Complex Trigger Setup screen can be allocated individual names of up to 8 characters. The names are edited as per the instructions for Group Names as above.

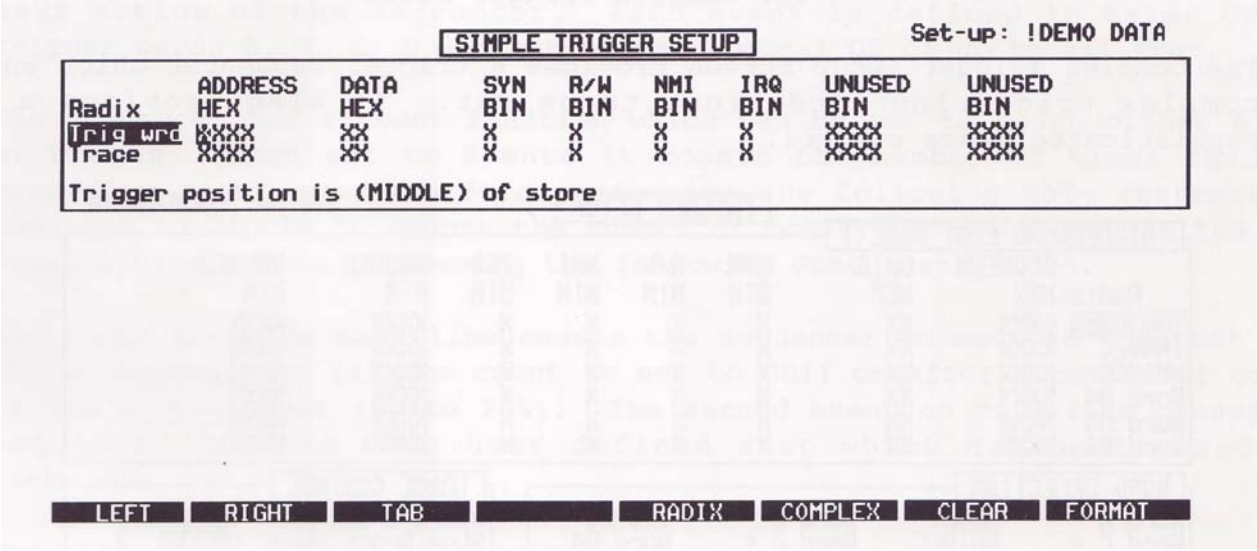
Trigger Setup

The Trigger Setup can be either Simple or Complex. Simple provides only a single trigger word plus a single trace word. Complex provides a full list of trigger words with complex trigger sequencing. Complex is not available in 100MHz mode.

The type of trigger setup can be changed either by changing the Triggering Mode option on the Configuration screen or by using the appropriate soft key on the Trigger Setup screen.

Simple Trigger Setup

The Simple Trigger Setup screen provides for a single trigger word and a single trace word. Words are set using the same data format as for the State Listing.



TRIG WRD

The trigger word defines the point at which the recording of data will stop. When the input data word matches the trigger word the acquisition will cease, either immediately or after a delay, depending on the setting of the Trigger Position.

The word is set by using the tab keys to move the entry cursor from one character to the next and using the numeric keypad to enter a new character. Pressing CLEAR sets the whole word to Don't Cares.

TRACE

The trace word controls the recording of data. Data is only recorded into the memory when the trace word is True. The trace word does not control triggering, the analyser will trigger if the trigger word is True regardless of whether the trace word is True or False.

Note that if the analyser is triggered but the trace condition remains False, the memory will not fill and consequently the acquisition will never stop.

The word is set by using the tab keys to move the entry cursor from one character to the next and using the numeric keypad to enter a new character. Pressing CLEAR sets the whole word to Don't Cares.

TRIGGER POSITION

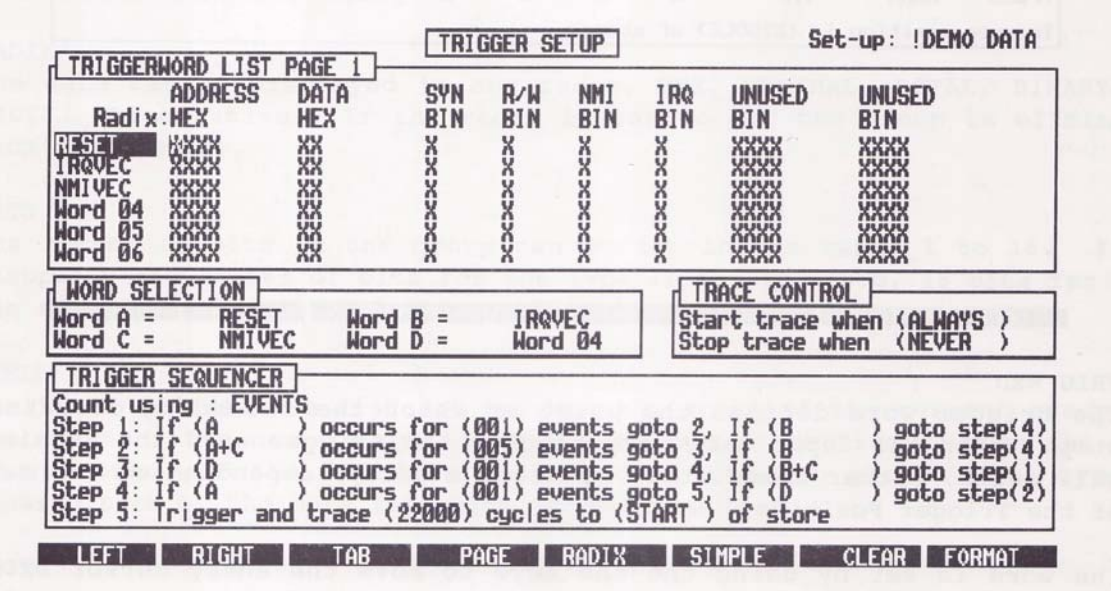
The trigger position defines whether the data recorded in the memory (when the acquisition is terminated by a trigger) is pre-trigger, post-trigger or a combination of both.

If the position is set to END then the recording ceases as soon as the trigger becomes True, thus all of the data recorded is pre-trigger. If the position is set to START then the recording continues for the full depth of the memory after the trigger becomes True, thus all of the data recorded is post-trigger. If the position is set to MIDDLE then the recording contin-ues for half of the depth of the memory after the trigger becomes True, thus the data recorded is half pre-trigger and half post-trigger.

Note that if the Pre-trigger Delay option from the Configuration screen is set to ON, then the trigger word does not become active until after 8192 memory cycles have occurred. This ensures that on each acquisition the memory is always filled with new data even when the trigger position is set to END. When Pre-trigger Delay is set off, part of the pre-trigger section of the memory may be invalid if the trigger event occurs shortly after the acquisition is started.

Complex Trigger Setup

The Complex Trigger Setup screen provides a trigger sequencer which enables complex triggering conditions to be set. It also provides a more sophisticated trace control.



TRIGGERWORD LIST

A list of up to 12 trigger words can be defined for use within the trigger sequencer. There are two pages of six words which can be alternated by pressing the Page key. The words are set in the same format as is used for state listings. To set a trigger word, enter digits from the numeric keypad. The small block cursor shows the position of the next digit to be entered, the Left and Right keys move the block cursor thus allowing full editing. Pressing Clear sets the whole of the word to don't cares. The names of the trigger words can be edited by entering the State Listing Format screen. Access to this screen is avail-able by pressing Format.

WORD SELECTION

The trigger sequencer can use up to four trigger words, A, B, C, and D. These can be selected to be any of the twelve words in the triggerword list, the NOT of any of the twelve words, or always True. The soft keys only provide the option of the six triggerwords in the current page of the list.
To select from the other six, tab up to Triggerword List and change the page.

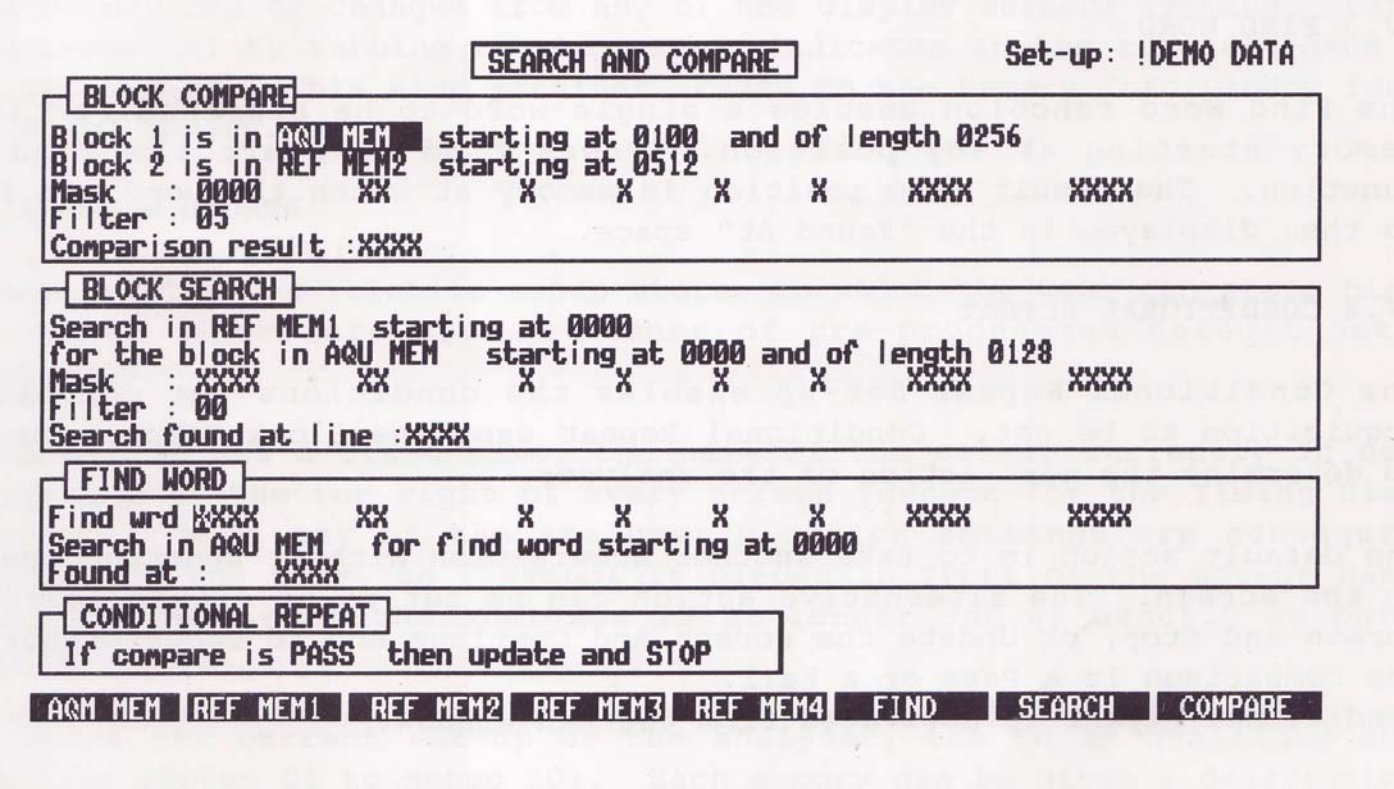
TRACE CONTROL

The Trace Control function enables data to be recorded selectively depending upon the occurrence of data words. Two trace events can be defined, a start event which starts the recording of data, and a stop event which stops the recording of data. Each event is defined in terms of the trigger words A, B, C, D and can be the logical OR of up to all four. Pressing the Always key sets the start event to always and the stop event to never. Note that by setting a stop word which is the NOT of the start word, simple data qualification is achieved as in the simple trigger setup.

TRIGGER SEQUENCER

The Trigger Sequencer has five steps of which the fifth step is the actual trigger. Each of the steps 1 to 4 defines two events which determine the next action of the sequencer. Each event is defined in terms of the trigger words A, B, C, D and can be the logical OR of up to all four. The sequencer has a count function which can be set to count either events or clocks. When set to Events it counts the number of times that the preceding event occurs before performing the following GoTo instruction. When set to Clocks it counts the number of memory cycles for which the word remains true before performing the following Goto instruction. The first event on each line causes the sequencer to move to the next step either immediately (if the count is set to 001) or after a number of occurrences of the event (up to 255). The second event on each line causes the sequencer to move to a user defined step which can be forwards or backwards. The fifth step defines the position of the trigger within the memory store. The trigger can be placed at the start, middle or end of the store following a delay of up to 23999 cycles.

Search and Compare



The Search and Compare screen provides facilities for comparing two blocks, searching for a block, or finding a word. It also enables the conditions for Conditional Repeat to be set-up.

BLOCK COMPARE

The Block Compare function enables a block of any size starting at any position in any memory (Block 1) to be compared with a block of the same size starting at any position in any memory (Block 2). Press Compare to start a comparison, the result (Pass or Fail) is displayed in the "Comparison Result" space.

MASK

The Mask defines which parts of the words are active within the comparison. Digits which are to be used in the comparison are marked 0 to signify valid. Digits which are not to be used in the comparison are marked X for Don't Care. The small block cursor shows the position of the next digit to be entered, the Left and Right keys move the block cursor thus allowing full editing. Pressing Clear sets the whole of the word to don't cares.

FILTER

The Filter function enables two similar but slightly different blocks (as might occur when acquiring data asynchronously) to pass a comparison. The filter value can be set between 0 and 15.

If the blocks are similar but different the comparison will find alternating sub-blocks of matching and non-matching words. If the filter number is set to N, then for the comparison to yield a Pass the size of any matching sub-block must be greater than N words and the size of any non-matching sub-block must be less than N words.

BLOCK SEARCH

Block Search performs the block compare function successively, starting at a user defined position in the chosen memory, until a match is found. Press Search to start the block search function. The result (the memory position for the start of the block) is then displayed in the "Search Found at Line" space. Setting up the block search is similar to setting up the block compare as above.

FIND WORD

The Find Word function enables a single word to be searched for in any memory starting at any position. Press Find to start the Find Word function. The result (the position in memory at which the word was found) is then displayed in the "Found At" space.

CONDITIONAL REPEAT

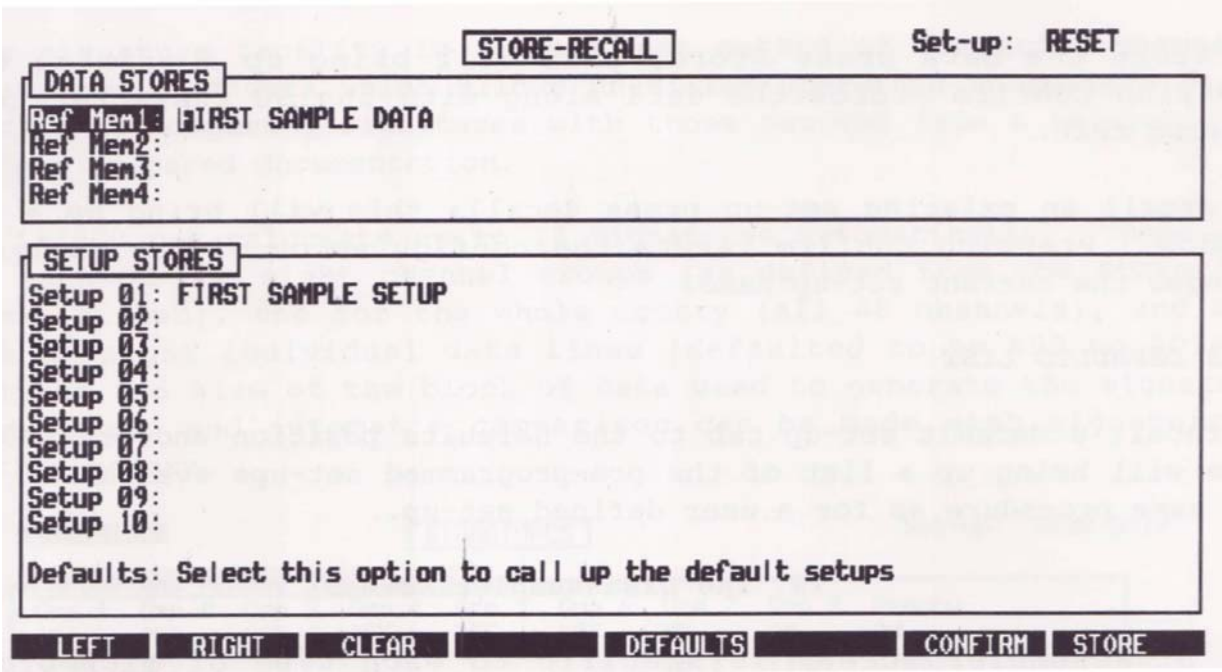
The Conditional Repeat Set-up enables the conditions for conditional acquisition to be set. Conditional Repeat uses the Block Compare function to deter-mine the next action of the analyser.

The default action is to take another acquisition without updating the data on the screen. The alternative action can be set to be either Update the screen and Stop, or Update the screen and Continue and to occur either when the com-parison is a Pass or a Fail.

Conditional Repeat is activated from the Run window.

Store and Recall

The Store and Recall screen provides access to the two data reference memories (or four data memories on an LA4800), the ten user defined set-up stores, and the default set-up stores.



DATA STORES

Tabbing to any REF MEM position allows the current contents of the acquisition memory to be stored into the appropriate non-volatile reference memory. Each memory can be given a description of up to 50 characters of text.

To edit the description, press Clear to remove the existing text and then enter characters from the keypad. The Left and Right keys allow full editing.

To store the data press Store; this will bring up a window showing some basic information on the current setup of the analyser. Pressing Confirm stores the data along with the set-up information as shown in the window plus the 50 characters of user entered text. Note that if the acquisition memory depth is 8K, only 1K of the data, starting at the current X cursor position, will be stored.

There is no recall function for data stores from the Store-Recall screen. The memory can be changed from any of the display screens (Timing, State or Disas-sembler) by tabbing to the memory indicator at the top left-hand side of the screen. This also provides access to the Memory Info window for the selected memory.

SETUP STORES

There are ten non-volatile setup stores in which the user can store his own set-ups. There are also a number of pre-programmed default set-ups available. Each set-up has a fixed name, the name of the set-up currently in use is displayed at the top right of every screen (except for the Timing Diagram screen). When any of the analyser's option settings are subsequently altered by the user, an ! symbol is placed in front of the set-up name to warn the user that the analyser is no longer set up exactly as per the stored set-up.

To store the current set-up of the analyser, tab to an available set-up posi-tion (Setup 01 to Setup 10). Each memory can be given a description of up to 50 characters of text.

To edit the description, press Clear to remove the existing text and then enter characters from the keypad. The Left and Right keys allow full editing.

To store the data press Store; this will bring up a warning window.

Pressing Confirm stores the data along with the 50 characters of user entered text.

To recall an existing set-up press Recall; this will bring up a warning window. Pressing Confirm resets the configuration of the analyser and changes the current set-up name.

DEFAULTS LIST

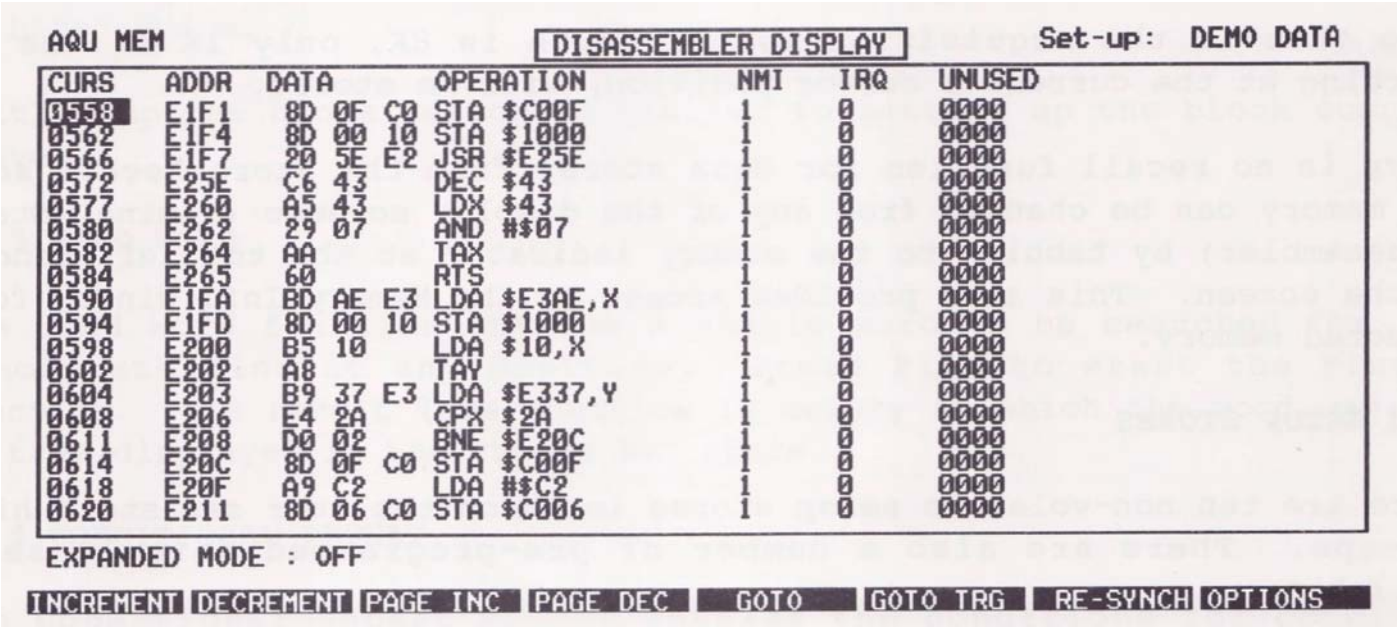
To recall a default set-up tab to the Defaults position and press Default. This will bring up a list of the pre-programmed set-ups available. Follow the same procedure as for a user defined set-up.

The Disassembler Screen

The Disassembler screen is specific to each type of microprocessor disassembler option. The firmware for each disassembler is contained within the pod and is sent to the analyser automatically each time that the analyser is switched on.

If no disassembler pod is fitted Option 7 from the main menu will read "Disassembler (Not Fitted)" and selecting it will have no effect. If a disassembler pod is fitted while the analyser is turned on, it will be necessary to turn the analyser off before the disassembler can be read.

When the disassembler is loaded, the analyser will provide the option of loading a default set-up for that particular microprocessor. It is not necessary to load the default set-up at this time since it can be recalled at any time from the Defaults section of the Store-Recall Screen (the default for the particular microprocessor is automatically added to the default set-up list at switch-on). The options for any specific disassembler are explained in the manual that accompanies the disassembler pod.



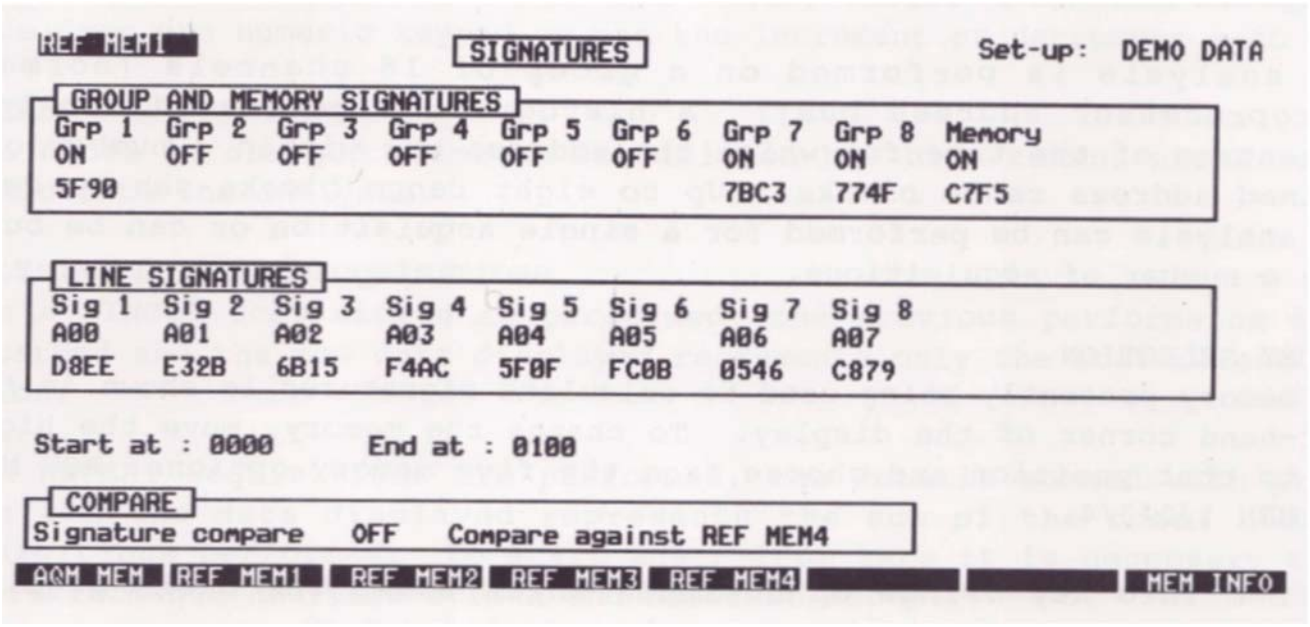
The Signatures Screen (LA4800 only)

The Signatures screen provides a facility for rapidly analysing the validity of blocks of data captured from digital circuits. Data from a channel or a block of channels over a defined section of one of the memories is compressed into a 4 digit Hex signature. This enables the user to immediately identify a block of data as correct or incorrect by means of its unique signature.

The Signatures function uses a multiple feedback-path shift register algorithm. This ensures that small changes in the data cause large quasi-random changes in the signature thus preventing errors from cancelling themselves out and providing a 99.99% certainty of identifying incorrect data.

This signature facility is a very fast method of comparing suspect data with known good data which allows unskilled operators to perform go, no-go testing by comparing signatures with those derived from a reference memory or from prepared documentation.

The LA4800 can calculate up to 17 signatures automatically. These are one for each of the eight channel groups (as defined from the State Listing Format screen), one for the whole memory (all 48 channels), and one for each of eight individual data lines (defaulted to be A00 to A07). The position and size of the block of data used to generate the signature can be defined, and automatic comparison can be made with signatures from another memory.



MEMORY SELECTION

The memory presently being used to calculate signatures is shown in the top left-hand corner of the display. To change the memory, move the highlight bar to that position and choose from the five memory options: AQU MEM, or REF MEM 1/2/3/4. The Mem Info key brings up a window which shows the basic acquisition parameters that apply to the currently selected memory.

GROUP AND MEMORY SIGNATURES

Signatures are available for each of the eight groups of data channels as defined from the State Listing Format screen. Each group signature can be turned on or off by tabbing to that position (turning groups off speeds up the screen update after each acquisition). The Memory signature represents all 48 channels.

LINE SIGNATURES

Signatures are available for each of eight individual lines. The default lines are A00 to A07 but these can be changed by tabbing to the line number and overwriting it from the numeric keypad. Each line signature can also be turned on or off (turning any signature off speeds up screen update following an acquisition).

START AT/END AT

The position and size of the block of data used to generate the signatures can be set as required. The larger the block used, the longer the calculation of signatures will take. The default settings are start at memory position 0000 and end at memory position 0100. To change either position, tab to the appropriate point and overwrite the value using the numeric keypad.

COMPARE

The signature compare facility enables all of the signatures to be compared with signatures calculated for the same block of data in another memory. Non matching signatures are displayed in reverse video. To turn Compare on or off, tab to the appropriate point and use the soft keys. Tabbing to the Compare Against point allows any of the memories to be selected as the reference for comparison.

CALC

When the highlight bar is anywhere other than on a Memory Select position, the CALC option is provided on one of the soft keys. This enables the signatures to be recalculated whenever a change is made (such as changing the Start At or End At positions) without acquiring new data.

The Performance Analysis Screen (LA4800 only)

Performance analysis provides statistical information which can be very valu-able for analysing the performance of a digital system. It is primarily in-tended for analysing the address activity of a microprocessor, though it can be equally useful in other areas.

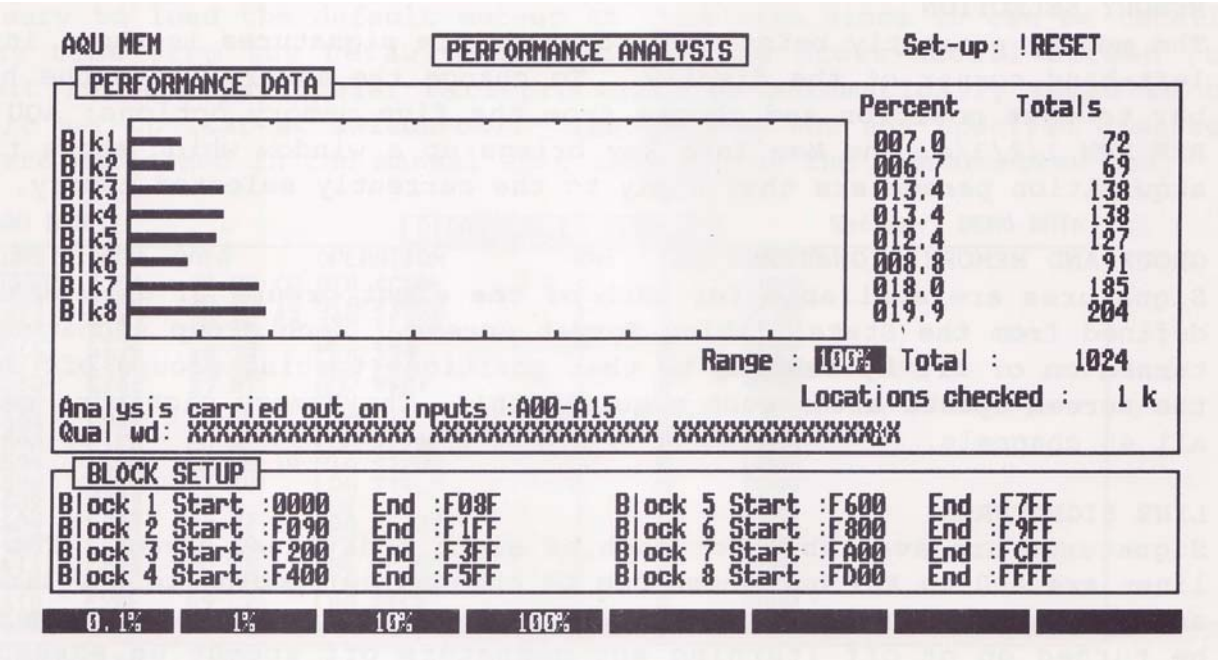
The analysis is performed on a group of 16 channels (normally a microprocessor address bus). A histogram is generated showing the percentage of the time for which the address was within a number of user defined address range blocks. Up to eight range blocks can be defined.

The analysis can be performed for a single acquisition or can be built up over a number of acquisitions.

MEMORY SELECTION

The memory presently being used to calculate signatures is shown in the top left-hand corner of the display. To change the memory, move the highlight bar to that position and choose from the five memory options: AQU MEM, or REF MEM 1/2/3/4.

The Mem Info key brings up a window which shows the basic acquisition parameters that apply to the currently selected memory.



STATISTICAL DATA

The data is displayed in both graphical and tabular form. The data is calculated immediately after an acquisition and, in the case of an 8K acquisition, takes several seconds to perform.

RANGE

The range of the histogram can be set to be 100%, 10%, 1% or 0.1%

DATA INPUT SELECTION

The data channels used for the analysis can be selected to be A00-A15, B00-B15 or C00-C15.

QUALIFIER WORD

The analysis can be carried out on data qualified by a qualifier word. The format of the qualifier word is as set from the State Listing Format screen. When a qualifier word has been set, the Total figure (representing 100%) will be the total number of locations which passed the qualifier, whereas the Locations Checked figure will be the total number of locations which were qualified.

BLOCK SETUP

Eight blocks can be defined. Each block can be of any length and is defined by giving it a Start value and an End value. These values are always in Hex since they normally represent an address.

The blocks are given default start and end values representing contiguous 8K blocks. To change a Start or End value, either overwrite the existing value from the numeric keypad or use the increment or decrement soft keys.

RE-CALC

If a block is changed after an acquisition has been taken, use Re-calc to recalculate the analysis.

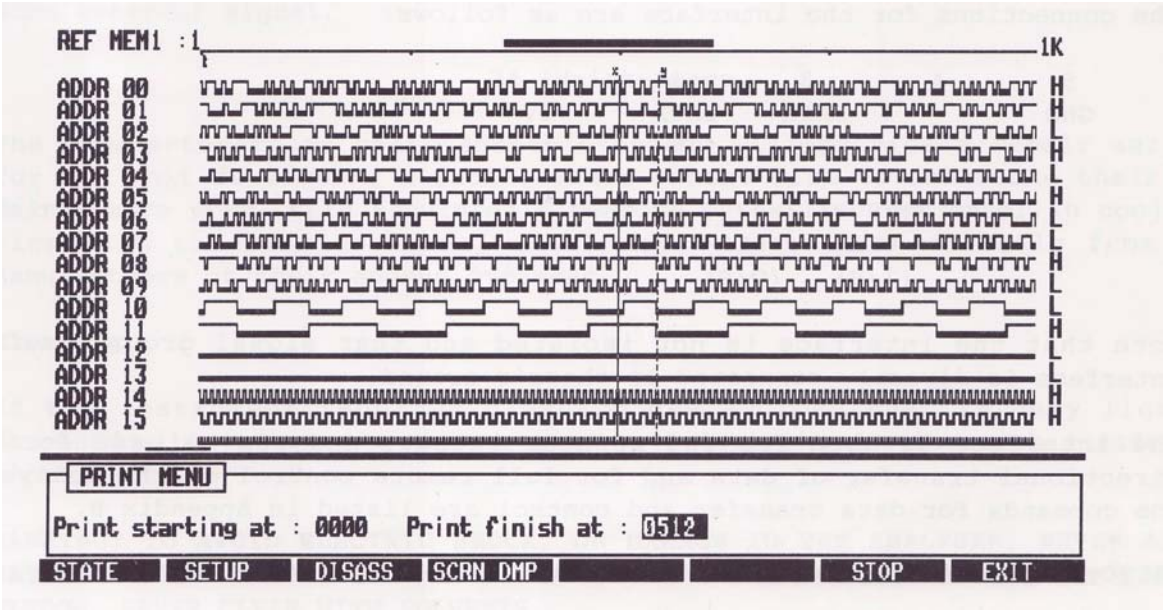
ANALYSING MULTIPLE ACQUISITIONS

When a SINGLE acquisition is performed, the previous performance data is discarded and the new data displayed represents only the most recent acquisition. When REPEAT acquisitions are performed, the data is summed with previous data and the data displayed represents the sum of the total number of acquisitions performed. To start again from zero it is necessary to exit the Performance Analysis screen and reselect it.

The "PRINT" Key

Pressing the Print key brings up a window which contains the print menu. This provides a number of options for printing out listings and screen dumps.

The printer output is via the serial interface. The list-ings can be printed using any type of printer which can handle 80 columns, but the screen-dump function requires a graphics mode printer compatible with IBM or Epson graphics codes.



If a serial interface printer is not available, the serial output can be converted to standard Centronics parallel by using the Thurlby printer cable type PC01. Note that this requires the baud rate setting (on the Configuration screen) to be set to 9600.

STARTING AT/FINISH AT

The starting and finishing positions in memory for print listings can be set by the user. Tab to the start number or finish number and use the numeric keypad to over-write the existing position.

STATE

This prints out a listing of the currently selected memory in the format as set for the State Listing screen.

SETUP

This prints out a complete listing of the set-up of the analyser.

DISASS

This prints out a disassembler listing for the currently selected memory using the format and mnemonics defined by the current disassembler pod. This key will be inoperative if no disassembler pod is connected.

SCRN DMP

This prints out the total contents of the current screen (screen dump). Note that a printer with graphics capability is required.

STOP AND EXIT

The Stop key interrupts printing before it is completed. Exit removes the print menu from the screen.

Input-Output Connectors

There are two other connectors mounted on the rear panel of the analyser. These are the trigger interface connector and the serial interface connector.

SERIAL INTERFACE

The analyser is fitted with a bi-directional RS-423 serial interface which is fully compatible with equipment fitted with an RS-232 interface. The interface can be operated at either 1200 baud or 9600 baud (selectable from the Configu-ration screen).

The connections for the interface are as follows:

5	4	3	2	1
GND		DATA OUT	DATA IN	+5V

9	8	7	6
-5V	CTS (I/P)	RTS (O/P)	

Note that the interface is not isolated and that signal ground for the interface is directly connected to chassis ground.

The interface is used for the printer output, and can be used for bi-directional transfer of data and for full remote control of the analyser. The commands for data transfer and control are listed in Appendix B.

THE TRIGGER INTERFACE

The trigger interface connector enables external hardware to be connected to the trigger circuitry of the analyser.

The connections for the interface are as follows:

8	7	6	5	4	3	2	1
GND	NOT TRIG'D	NOT WORD A TRUE			CLOCK OUT	NOT GOTO OVERRIDE	+5V

15	14	13	12	11	10	9
	NOT WORD B TRUE				NOT EVENT OVERRIDE	+5V

NOT TRIGGERED

This output goes low whenever the analyser is actually triggered.

NOT WORD A TRUE

This output goes low each time Word A in the trigger word selection becomes true. This can be used to trigger external instruments and to make timing measurements.

CLOCK OUT (Memory clock output)

This is a buffered TTL output in synchronism with the cycle clock for the acquisition memory. It can be used to clock a second analyser using the trace control conditions defined from the first analyser.

NOT GOTO OVERRIDE

Holding this input low prevents the trigger sequencer from performing any Goto function. This can be used to qualify the triggering dependent upon some external signal.

NOT WORD B TRUE

This output goes low each time Word B in the trigger word selection becomes true. This can be used to trigger external instruments and to make timing measurements.

NOT EVENT OVERRIDE

Holding this input low prevents the trigger sequencer from recognising any event counting. This can be used to qualify the triggering dependent upon some external signal.

Maintenance

The Manufacturers or their agents overseas will provide a repair service for any unit developing a fault. Where owners wish to undertake their own maintenance work, this should only be done by skilled personnel in conjunction with the service manual which may be purchased directly from the Manufactuers or their agents overseas.

Cleaning

If the instrument requires cleaning use a cloth that is only lightly dampened with water or a mild detergent. Polish the display with a soft dry cloth.

WARNING! TO AVOID ELECTRIC SHOCK, OR DAMAGE TO THE ANALYSER, NEVER ALLOW WATER TO GET INSIDE THE CASE. TO AVOID DAMAGE TO THE CASE OR DISPLAY WINDOW, NEVER CLEAN WITH SOLVENTS.

Appendix A. A Brief Introduction to Logic Analysers

THE BASIC NEED

An engineer with the task of designing, testing or fault finding digital electronic circuits faces a fundamental problem. How can he observe the operation of his circuit in detail? A conventional oscilloscope is of limited use since digital information tends to be continuously changing and therefore cannot be synchronised with the oscilloscope sweep. A storage oscilloscope allows the signal to be frozen, but its trigger function is inadequate to precisely define the point at which the data must be captured. In addition, with a two channel 'scope, only two signals can be looked at simultaneously which is inadequate for most digital circuit analysis. Logic probes and logic monitors are useful in checking whether signals are high, low or pulsing, but provide little infor-mation about how the signals are changing with respect to time.

The answer, of course, is a logic analyser. The logic analyser enables the activity of many digital signal points to be recorded simultaneously, and then examined in detail. The information is recorded with respect to a "clock" signal, and the analyser samples all the signal inputs on each active edge of the clock signal to determine whether they are high or low with respect to a defined threshold voltage. This information is stored in memory and is then available for detailed analysis via the logic analyser's display.

TYPES OF DATA DISPLAY

There are three basic forms of display. A "timing diagram" is where a series of successive logic levels for each channel are displayed from left to right on a screen. This is similar to the way that an oscilloscope displays informa-tion since the trace represents the signals plotted against a time reference.

A "state display" is used to show the digital relationship between the various signals at each point in time. The analyser reads the logic levels for all the signals at each active clock edge and displays them as a "word". This word may be in binary, decimal, hex or ASCII or in a mixture of formats. The display then becomes a list of successive words. This method is particularly relevant to bus organised digital systems such as microprocessor based equipment, paral-lel data transmission systems, etc.

Many analysers provide the option of disassemblers for various types of micro-processor. By recording and analysing the buses and control signals of the uP, the logic analyser can decode the information into the appropriate mnemonics to describe the logical operations of the uP. Thus a "disassembly display" pro-vides a list of mnemonics and operands specific to a particular uP.

TRIGGERING THE ANALYSER

In order to define the section of data that is recorded, the logic analyser must be triggered. Triggering may be a simple change of level on a single line (as with triggering an oscilloscope) or it may be the simultaneous occurrence of a set of levels on a set of lines (e.g. triggering on a 16 bit word from a microprocessor address bus).

Most logic analysers provide the ability to define trigger words which include all of the input channels. More sophisticated analysers provide the ability to define a sequence of trigger words connected via logical statements (if-then-goto) to generate the trigger event.

Unlike an oscilloscope where the trigger event starts the sweep, in a logic analyser the trigger event stops the recording process, either immediately or after a defined number of clock cycles. This enables the analyser to capture data occurring before the trigger event as well as after it. Varying the delay changes the amount of pre-trigger and post-trigger data that is recorded.

SYNCHRONOUS AND ASYNCHRONOUS RECORDING

There are two basic ways of recording data (often called acquiring data). These are synchronous acquisition and asynchronous acquisition. In the synchronous mode, the clock signal for the analyser is supplied from the unit under test, and each piece of data is stored at a defined point; normally when the data is known to be stable.

In the asynchronous mode the clock signal is supplied from the analyser and is independent of the unit under test. Consequently the data may be stored at any point on the data waveform. If the analyser clock is set to be much faster than that of the data being stored, a timing diagram display will show a plot of data against time enabling the exact timing of level changes to be observed.

TRACE CONTROL AND DATA QUALIFICATION

The recording of data into the memory can be controlled to prevent unwanted data from being recorded. For synchronous acquisition one way of achieving this is by "qualifying " the clock signal. Most analysers provide one or more clock qualifier and data is only recorded on a clock edge for which the quali-fier input is "true".

Another way of controlling the recording is by means of a "trace" word. A trace word defines the condition for the data inputs which must be true for data to be recorded. Clearly if the trace word defined the condition for all of the data inputs then only the trace word would ever be recorded, so the trace word will normally define a condition for only a few of the data inputs. More sophisticated analysers often provide trace start and trace stop words. When a trace start word is encountered recording starts and when a trace stop word is encountered recording stops.

GLITCH CAPTURE

Sometimes the sampling rate of the clock chosen to record data is too low to ensure that very short pulses are captured. Glitch capture allows pulses occurring between the sample points to be captured. A glitch is defined as two or more transitions of the signal between successive sample points.

Glitch capture provides no information on the width, position or number of pulses which occurred. Glitches are normally displayed on a timing diagram as narrow lines.

REFERENCE MEMORIES

The memory into which the data is recorded is referred to as the acquisition memory. Most logic analysers also have one or more reference memories into which data can be transferred. The reference memory can be used for comparing new data with old or suspect data with known good data.

Logic analysers range from simple units with only eight data channels and 64 words of memory, a maximum clock speed of a few Mhz, and limited trigger and display capability; up to highly complex units with 100 or more channels, acquisition speeds of several hundred MHz, very sophisticated trigger and display facilities, and a very large price tag.

Appendix B. Understanding the Aquisition Memory of the LA3200/4800

The Acquisition Memory has a total capacity of 8192 words which can be restricted to 1024 words. This is controlled by the Data Memory Depth option on the Configuration screen. In the following explanations a memory depth of 1K has been used, the figures that would apply to an 8K depth are given within brackets.

When an acquisition is started, the acquisition memory is first cleared so that all of the bits are low. The analyser then starts to write data into the memory in synchronism with the memory cycle clock (providing that the trace control conditions are True). Unless the acquisition is terminated beforehand (either by a trigger event or by the Stop key) the memory will fill with data after 1024 (8192) cycles. Once full, the first-in data is over-written by new data and this process continues until the acquisition is stopped. Because an acquisition can last for any number of memory cycles, there is no fixed relationship between the position of a word in the memory and the hard-ware address of the high speed RAM which forms the memory. The relationship is defined after the acquisition is stopped. The RAM address at which the acqui-sition is stopped is normally defined as memory position 1024 (8192). The acquisition can be stopped in one of two ways, by a trigger event or by pressing the stop key:

1. Acquisition stopped by a trigger event

When the trigger event occurs, the acquisition is stopped after a delay which depends upon the setting of the Trigger Position on the Trigger Setup screen. If the position is set to "Start of store" the delay is 1024 (8192) memory cycles. If the position is set to "Middle of store" the delay is 512 (4096) memory cycles. If the position is set to "End of store" the delay is zero.

Thus when the position is set to Start the acquisition will stop with the memory filled entirely with post-trigger data, when it is set to End it will be filled entirely with pre-trigger data, and when it is set to Middle it will be filled 50% with pre-trigger and 50% with post-trigger data.

The above statement assumes that either the Simple Trigger Setup screen is being used or that Step 5 in the trigger sequencer for the Complex Trigger Setup screen has the cycle counter set to 00000. This cycle counter provides a more complex control of the trigger position by adding an additional delay set by the user. For instance, if the position is set to End and the cycle counter is set to 00768 (06144), then the memory would contain 75% pre-trigger and 25% post-trigger data. The cycle counter can be set anywhere between 00000 and 24000 which enables the analyser to capture data that occurred a considerable time after the trigger event. Note that if a trigger event occurs within a number of cycles from the start of the acquisition which is smaller than 1024 (8192) minus the total trigger delay setting, then the pre-trigger section of the memory will not be full when the acquisition is stopped and the early part of the memory will contain all low bits. To overcome this problem a Pre-Trigger Delay function is incorporated.

Pre-trigger delay is set On or Off from the Acquisition Control section of the Configuration screen. When set to On it prevents a trigger event from being recognised until 8192 memory cycles have occurred since the start of the acquisition. This ensures that the pre-trigger section of the memory is always filled with valid data.

2. Acquisition stopped by the Stop key

When an acquisition is terminated by the Stop key rather than by a trigger event there are two possible conditions. Either the analyser had not yet triggered or the analyser was triggered but the post trigger memory had not yet filled.

If the analyser had not yet triggered when the Stop key is pressed, then the analyser stops the acquisition immediately and defines that RAM address as position 1024 (8192). Thus the last data recorded is always placed at the end of memory.

If the analyser had triggered but the memory had not filled when the Stop key was pressed, then the analyser stops recording the input data immediately but continues the acquisition filling the remainder of the memory with 0s (low levels). Thus the data is positioned correctly relative to the trigger marker but the last data recorded will not be placed at the end of memory.

Appendix C. Interface Commands for Data Transfer and Control

The analyser can be remotely commanded via either its serial interface or via its IEEE-488 interface (if fitted).

For communication via the IEEE interface the Baud Rate on the Configuration Menu must be set to HI-SPEED. Using the RESET command via IEEE will reset the Baud Rate to 9600 and IEEE communications will cease. If the analyser needs to be reset it is better to reload the analyser using 'MLOAD' with a dump which was first saved using 'MDUMP' after a Total Analyser Reset. This will set the analyser to the default condition and clear all memories.

The commands are the same for either interface. All commands are in ASCII and all data transfers are also in ASCII format. Data sent is separated by the delimiter (,) and each command terminated by a Carriage Return (\r or 0DH). Two commands can be sent in a string as long as they are separated by a Carriage Return.

Each command received (which must be in upper case, i.e. "CLM\r" not "clm\r") will generate an answer message which will be an OK message or an error mes-sage, as necessary. These messages will be held in the output buffer ready to be received. The OK message consists of the two characters 'OK' followed by a Carriage Return (0DH); the error message returns an error number which relates to the number of characters received. If two commands are sent then two OK messages will be present in the buffer. If data is then requested then any messages stored in the buffer will be sent out first. The buffer can be cleared by sending a device clear followed by a single byte read to clear the remaining character in the buffer. A list of commands follows:

RESET Does a complete System Reset which clears all setups to default and memories to zeros. Resets the Baud Rate to 9600 so stopping IEEE communication.

e.g. "RESET\r"

IDENT After sending this command the identification string can be read back which will identify the model and version number ie "LA4800 V2.40".

e.g. "IDENT\r"

MENU Displays the Main Menu.

e.g. "MENU\r"

CLM Clears the cursor positions on all displays to their defaults so the user has a reference point to start from when moving the cursor. This must be done with the Main Menu being displayed as the cursor will not move on a menu which is being displayed when the command is given.

e.g. "CLM\r"

RUN Displays the Run Window and starts a single acquisition.

e.g. "RUN\r"

RPT Displays the Run Window and starts a repeat acquisition.

e.g. "RPT\r"

COND Displays the Run Window and starts a conditional repeat acquisition.

e.g. "COND\r"

MON Displays the Run Window and starts the monitor mode.

e.g. "MON\r"

LINES Dumps twelve bytes of data, with MSB first, from the input lines (as seen in monitor mode) as three blocks of four bytes, each block ending with a delimiter and the whole ending with the OK message.

e.g. "LINES\r"

D, N Dumps twelve bytes of the AQU MEM data from one location with a single delimiter and OK message, N representing the location.

e.g. "D,100\r"

SDUMP Dumps the complete current analyser setup out.

e.g. "SDUMP\r"

SLOAD Causes the analyser to await the reception of a setup previously loaded using the 'SDUMP' command. This is useful for setting up all the analy-ser parameters for an acquisition.

e.g. "SLOAD\r"

MDUMP Dumps all the data memories (except REF2 and REF3), the current setup and all the stored and named setups in the analyser.

e.g. "MDUMP\r"

MLOAD Causes the analyser to await the reception of a dump previously loaded using the 'MDUMP' command. This is useful for installing a new set of data memories (except AQU, REF3 and REF4) and setups saved from a previous session.

e.g. "MLOAD\r"

RLOAD,N Causes the analyser to await the reception of a 1K data memory dump previously loaded using the 'AQU?', 'REF1?' or 'REF2?' command where N is the Reference memory number to load to. It is not possible to reload the Acquisi-tion memory using this command. An 8K dump from the command 'AQU8?' cannot be down loaded using 'RLOAD,N'

e.g. "RLOAD,2\r"

CONFG, This command is used to setup the configuration of the analyser by sending the various set up parameters individually in a known order as follows:

1	Clock Selection	0 = Internal, 1 = External, 2 = 100MHz.
2	Clock Period	0 = 40nS, 1 = 50nS, 2 = 100nS etc to 14 = 100mS.
3	Glitch Status	0 = On, 1 = Off.
4	Clock 1	0 = Pos, 1 = Neg, 2 = Off.
5	Clock Qual 1	0 = Pos, 1 = Neg, 2 = Off.
6	Clock 2	0 = Pos, 1 = Neg, 2 = Off.
7	Clock Qual 2	0 = Pos, 1 = Neg, 2 = Off.
8	Clock 3	0 = Pos, 1 = Neg, 2 = Off.
9	Clock Qual 3	0 = Pos, 1 = Neg, 2 = Off.
10	Memory Depth	0 = 1K, 1 = 8K.
11	Trigger Mode	0 = Simple, 1 = Complex.
12	Repetition Rate	0 = 1S, 1 = 3S, 2 = 10S.
13	Buzzer	0 = On, 1 = Off.
14	Baud Rate	0 = 9600, 1 = 1200, 2 = High Speed.
15	Variable Level	19H = -2.5V to 96H = +10V, increments of 0.1V.
16	Trigger Filter	0 = Off, 1 = 1, 2 = 2, through to D = 13.
17	Not Used	Send 0.
18	Threshold	0 = TTL, 1 = HC/AC, 2 = ECL, 3 = Var.
19	Pre-Trigger Delay	0 = On, 1 = Off.
20	Pod type	0 = None, 1 = Standard, 2 = High Speed.

The parameter list must contain 20 items each separated by the delimiter and the whole string terminated by a Carriage Return.
NOTE: If the Baud Rate is changed from High Speed the IEEE interface will not work.

e.g. "CONFG,0,2,1,0,2,1,2,2,2,0,1,1,0,2,14,0,0,3,1,0\r"

TRG,N, This allows the setting of a Trigger Word where N is the trigger word number from 1 to 12 followed by a delimiter and 48 ASCII characters (0, 1 or X) which represent the 48 binary bits of the complete trigger word starting with the MSB. The LA3200 expects 48 bits but the first 16 bits are ignored.

e.g. "TRG,3,111100001111111101010101010101010000111100001111\r"

CNTRG, This command automatically sets the Trigger Screen to Complex by sending the various parameters individually in a known order as follows:

1 Word Selected for Triggerword A: 0 = Always True, 1 = Word 1, 2 = Word 2 through to C = Word 12. For a NOT word put a 1 in front, i.e. 17 = NOT word 7.

2 Word Selected for Triggerword B: As for Triggerword A.

3 Word Selected for Triggerword C: As for Triggerword A.

4 Word Selected for Triggerword D: As for Triggerword A.

5 Start Trace: 0 = Always, 1 through to F represents the OR of Words A, B, C and D where bit 0=A, bit 1=B, bit2=C, bit 3=D
Thus 2 = B, A = B+D and 7 = A+B+C etc.

6 Stop Trace: As for Start Trace except 0 = Never.

7 Step 1 'If' Word: As for Stop Trace.

8 Step 1 or 'If' Word: As for Stop Trace.

9 Step 2 'If' Word: As for Stop Trace.

10 Step 2 or 'If' Word: As for Stop Trace.

11 Step 3 'If' Word: As for Stop Trace.

12 Step 3 or 'If' Word: As for Stop Trace.

13 Step 4 'If' Word: As for Stop Trace.

14 Step 4 or 'If' Word: As for Stop Trace.

15 Step 1 Count Number: 1 = 1, through to FF = 255.

16 Step 2 Count Number: 1 = 1, through to FF = 255.

17 Step 3 Count Number: 1 = 1, through to FF = 255.

18 Step 4 Count Number: 1 = 1, through to FF = 255.

19 Step 1 'goto step': 0 = 1, 1 = 2, through to 4 = 5.

20 Step 2 'goto step': 0 = 1, 1 = 2, through to 4 = 5.

21 Step 3 'goto step': 0 = 1, 1 = 2, through to 4 = 5.

22 Step 4 'goto step': 0 = 1, 1 = 2, through to 4 = 5.

23 Step 5 Cycles Count Number: 0 = 0, 1 = 1, through to 4E20 = 20000.

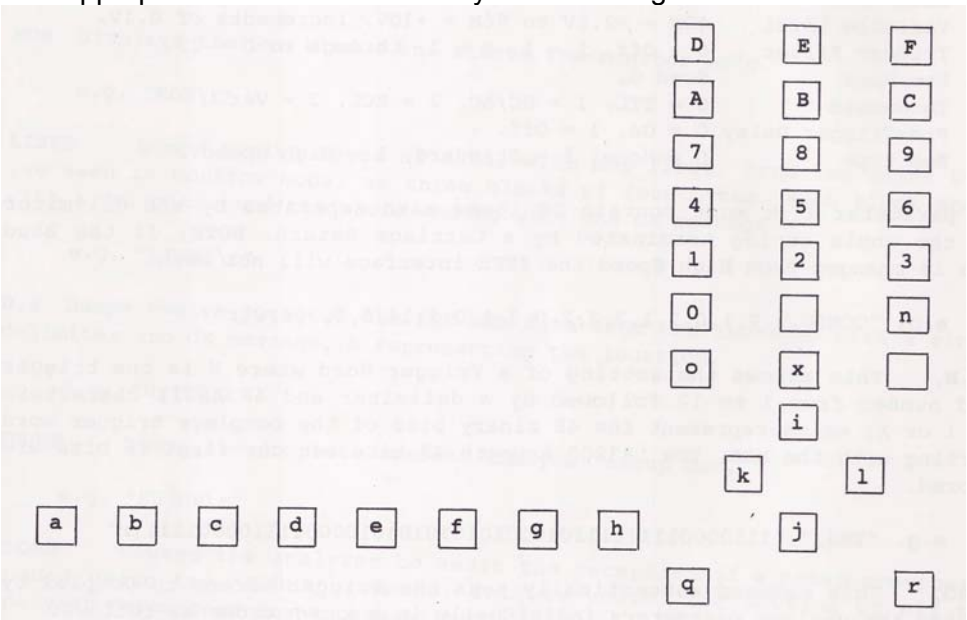
24 Step 5 Position: 0 = Start, 1 = Middle, 2 = End.

25 Sequencer 'count using': 0 = Clocks, 1 = Events.

The parameter list must contain 25 items each separated by the delimiter and the whole string terminated by a Carriage Return.

e.g. "CNTRG,1,2,3,0,0,0,1,2,3,0,4,0,0,0,1,1,8,1,0,2,3,4,0400,2,0\r"

KEY,N This simulates the pressing of any of the front panel keys where N represents the appropriate character for the key from the diagram below.



To enter Text characters the upper case can only be used (e.g. 'A' to 'Z') as the lower case characters ('a' to 'z') are used for key codes.

e.g. "KEY,c\r,KEY,h\r"
"KEY,j\r,KEY,j\r"
"KEY,j\r,KEY,l\r"
"KEY,N\r,KEY,T\r"
"KEY,A\r,KEY, \r"
"KEY, \r,KEY, \r"

This sequence selects State Listing, State Listing Format Menu, moves the cursor down three times and enters a label 'INTA', and three spaces.

CONF? Returns a string of 20 delimited characters in the same order and format as those for the 'CONFG' command.

e.g. "CONF?\r"

STAT? Returns a run status character, 0 if the analyser is busy, 1 if it is not.

e.g. "STAT?\r"

AQU? Returns the 1K AQU MEM data in delimited blocks of twelve characters, the Most Significant Byte is sent first.

e.g. "AQU?\r"

AQU8? Returns the 8K AQU MEM data in delimited blocks of twelve characters, the Most Significant Byte is sent first.

e.g. "AQU8?\r"

REF1? Returns the 1K REF 1 MEM data in delimited blocks of twelve characters, the Most Significant Byte is sent first.

e.g. "REF1?\r"

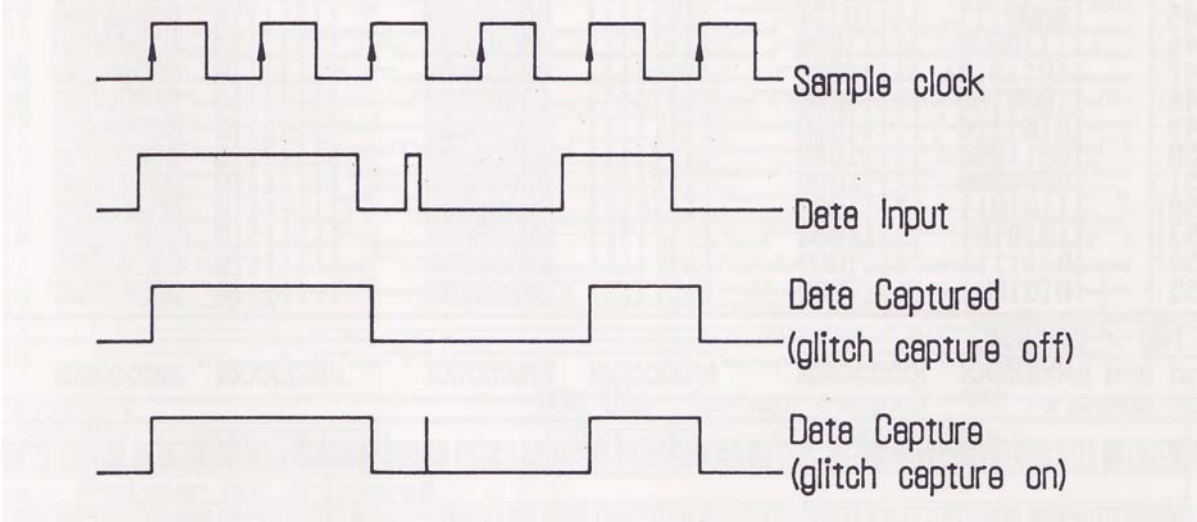
REF2? Returns the 1K REF 2 MEM data in delimited blocks of twelve characters, the Most Significant Byte is sent first.

e.g. "REF2?\r"

Appendix D. Glitch Capture Operation

Glitch capture is a special mode of operation which enables transitions occurring between clocks to be captured. This can be very important as it avoids the possibility of events being "missed" by the analyser when the clock period is set wider than the shortest event that could occur.

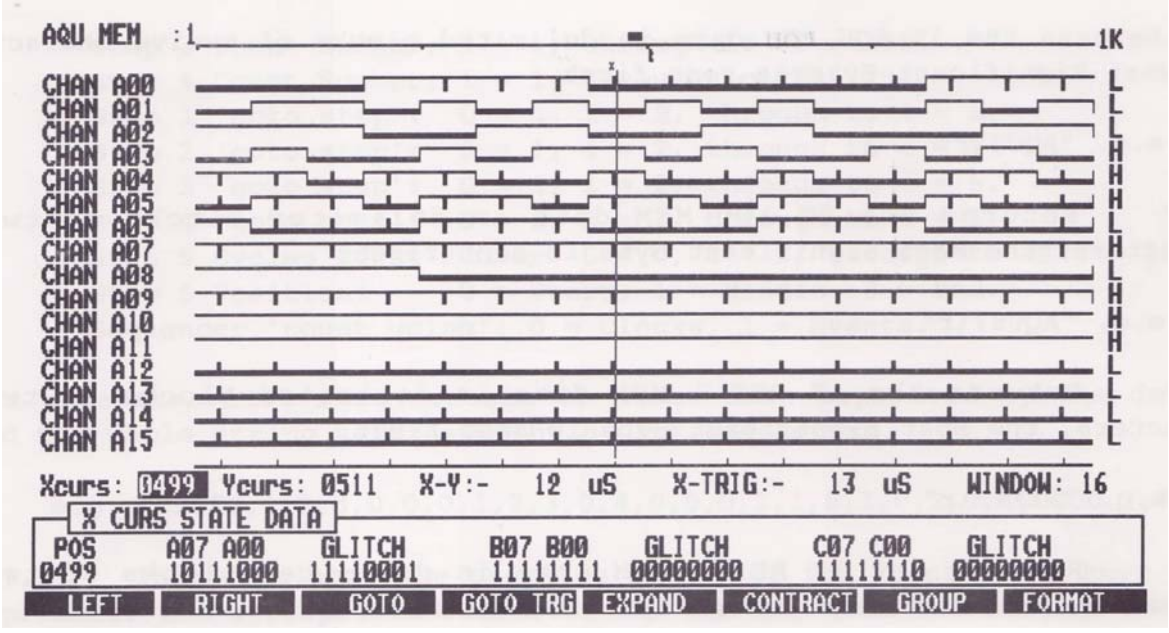
A Glitch is defined as two or more changes of level between successive edges of the sample clock. Glitches as narrow as 5ns can be captured.



Glitch capture is only available when High Speed data pods are fitted. Glitch capture is turned on from the Pod Setup section of the Configuration screen. With Glitch capture On the number of channels is reduced to 8 per pod (inputs 0 to 7), the remaining inputs (8 to 15) become inactive.

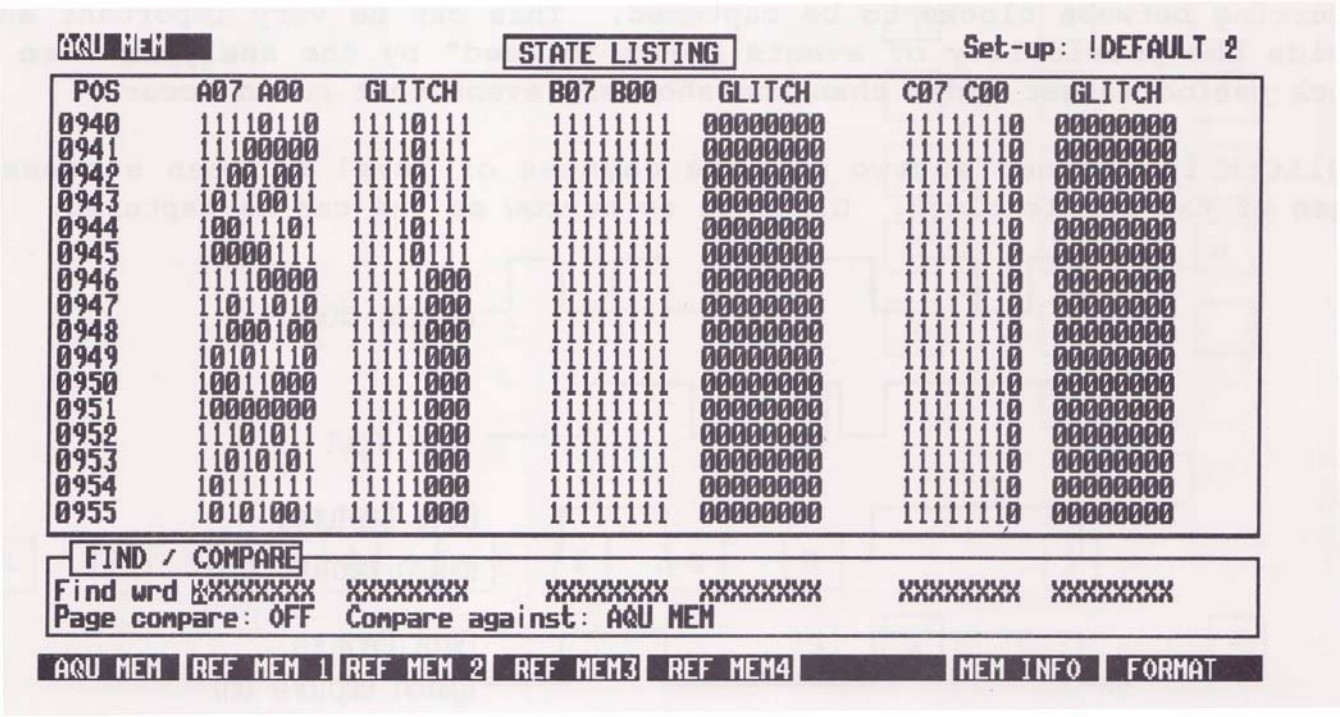
Glitch capture can be used in both asynchronous mode (internal clock) and synchronous mode (external clock). However, when using an external clock there will be a dead-band of up to 40ns following each active clock edge during which time glitches will not be captured. Glitch capture is not available in 100MHz mode.

Glitches are displayed as narrow vertical lines on a timing diagram. The Timing Diagram screen should be formatted so that only the active channels are displayed. Glitches can only be uniquely identified on an expanded timing display (256 words are less in the window).



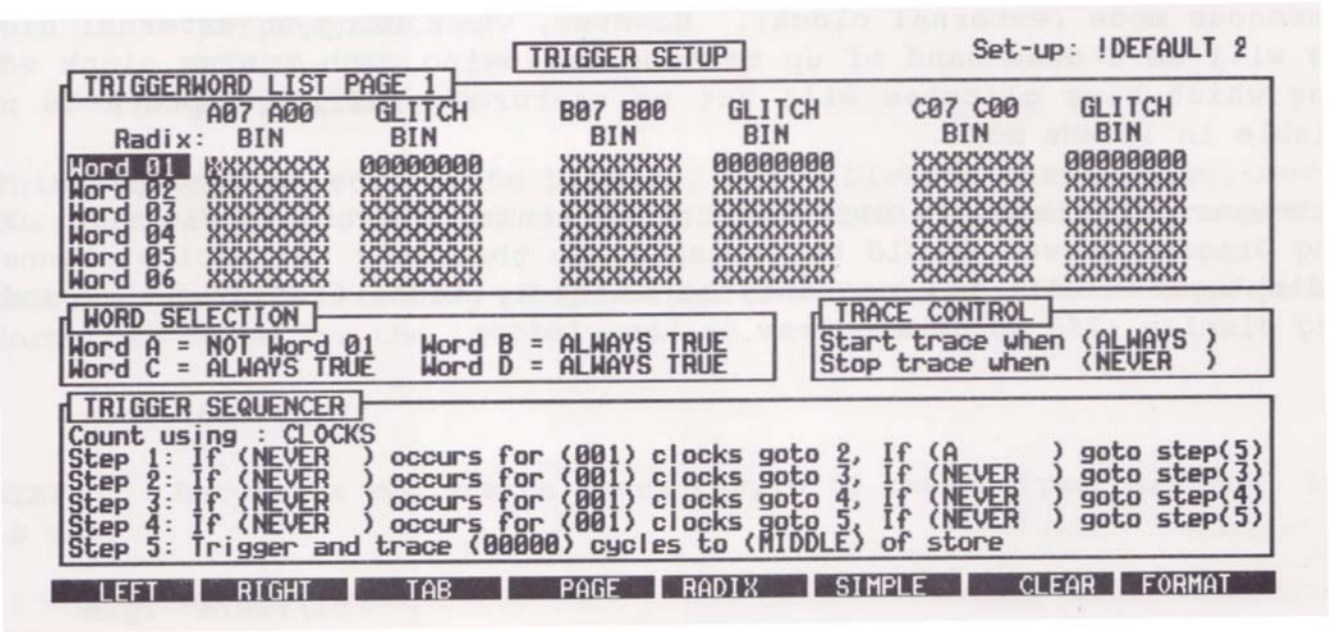
Note‼ that Glitch capture is not available in 100MHz mode.

If it is required to display glitches in a state listing, this can done by displaying the inactive channels alongside the active channels. A glitch on input A0 is represented by a 1 on A8, a glitch on A1 is represented by a 1 on A9 etc.



GLITCH TRIGGER

The analyser can be triggered on glitches. By using trigger words that contain the inactive channels, the trigger can be made to take account of the glitch conditions as would appear in a state listing as described above.



A common requirement is to trigger on a glitch occurring on any line. This can be achieved by setting all of the glitch bits to 0s and defining the trigger word as the NOT of that word.

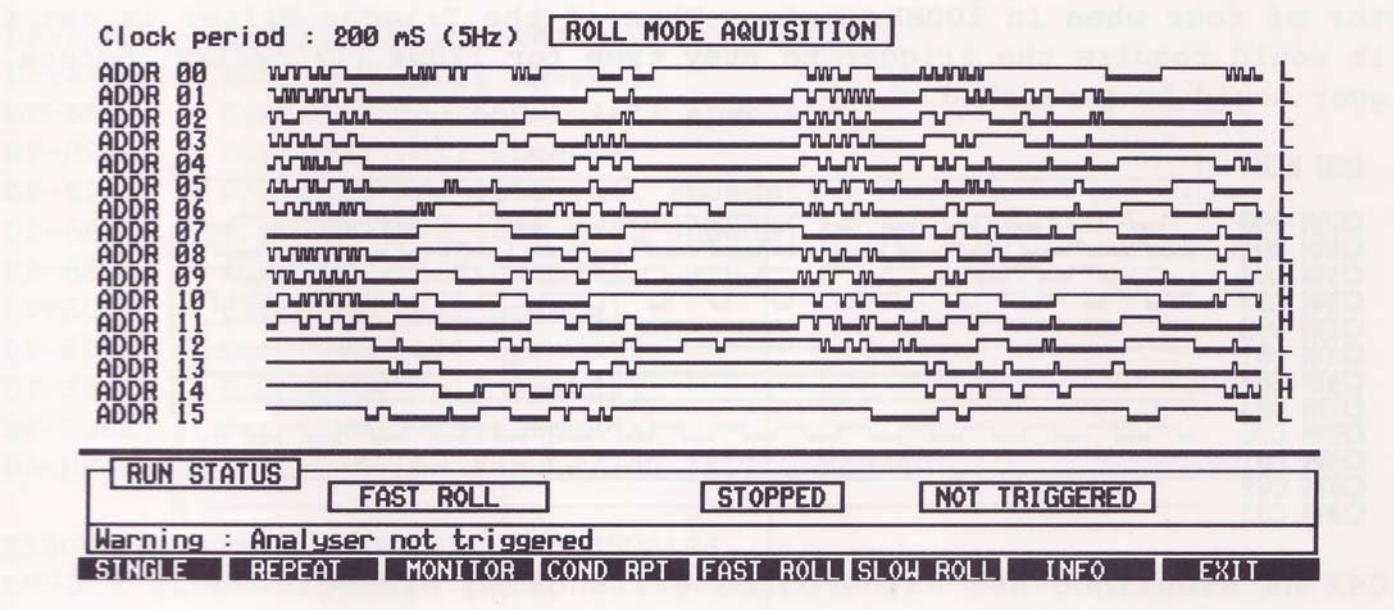
Appendix E. Roll Mode Operation

The "roll" mode functions enable the analyser to function usefully as a very slow speed timing analyser. This can be very useful for observing the output of low speed logic circuits such as PLCs (programmable logic controllers).

Roll mode is a special form of the Timing Diagram display in which data is "rolled" across the screen from right to left providing a continuous updating of the screen as the acquisition progresses. This differs from a normal acqui-sition where the screen is only updated when the acquisition is completed.

In the case of a 10Hz clock rate a normal 1K acquisition would take nearly two minutes to complete. This would be of very little use if the user wishes to "see" what the logic circuit is doing. Roll mode display solves this problem.

Roll mode is asynchronous only. There are two clock rates, Fast Roll uses an internal clock period of 200ms (5Hz), Slow Roll uses an internal clock period of 1s (1Hz). This enables acquisitions extending to over two hours to be made.



Pressing Fast Roll or Slow Roll from the Run Window options brings up the Roll Mode Acquisition display. This is always 256 words wide and is cleared and redrawn at the start of each new acquisition. Roll mode is unaffected by the Trace Control, data starts to be drawn onto the screen as soon as the screen has been cleared, and continues until it is stopped by a trigger event or until the Stop key or the Exit key is pressed.

The lines displayed are those selected from the Timing Diagram Format screen. The levels (H or L) displayed on the right hand side of the screen represent the levels of the incoming data. There are no cursors.

Pressing Stop freezes the display. It is not possible to observe any of the data which has rolled off the left of the screen while in this mode. Exit returns to the Main menu. To observe the whole of the acquisition either as a timing diagram or as a state listing, exit from roll mode and select the appro-priate screen.

Note that the contents of the acquisition memory will be affected by the Trace Control and may not therefore represent what was displayed on the Roll Mode screen.

Appendix F. 100MHz Operation

The analyser can operate at 100MHz on a reduced number of channels provided that High Speed data pods are fitted.

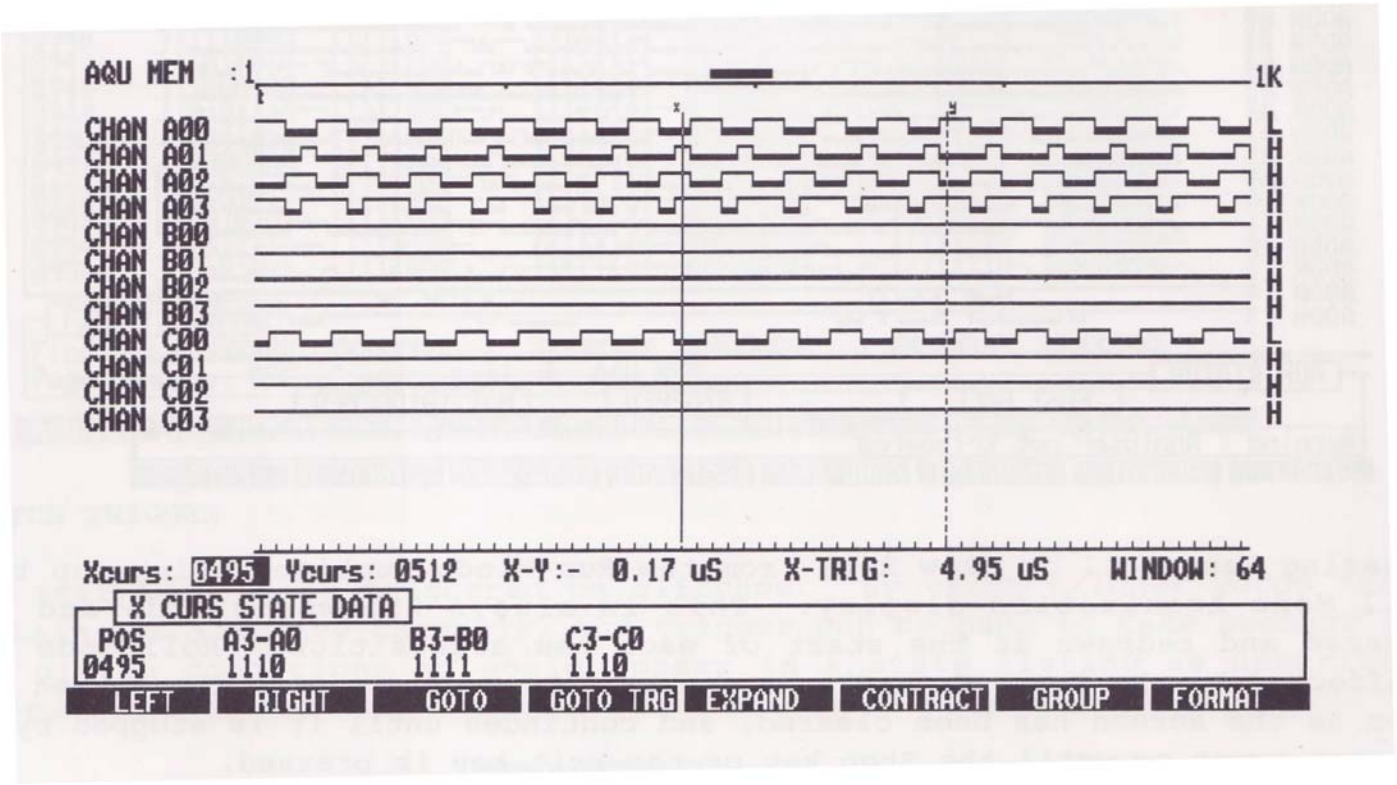
Operation is asynchronous only (i.e. the 100MHz clock signal is generated internally). The number of channels is reduced to 4 per pod (data inputs 00 to 03). Glitch Capture can not be used in 100MHz mode.

100MHz operation is achieved by setting the Clock Selected option on the Configuration screen to 100MHz. The Pod Type must be set to HI-SPEED.

The format screens for the timing diagram or state listing screens must be set to show only channels A00 to A03, B00 to B03 and C00 to C03 (LA4800 only). Including any of the other channels will show meaningless data. A suitable setup can be accessed by selecting the default setup "100MHz Timing Analysis" from the defaults list of the Store and Recall screen.

The Triggering Mode is automatically forced to SIMPLE by selection 100MHz clock type.
No Complex trigger screen is available. The format used for setting the trigger and trace words should incorporate only channels 00 to 03. If any other channels are incorporated they must be set to Don't Cares.

Note that the Trigger Filter setting (set from the Configuration screen) is interpreted differently in 100MHz mode. The minimum trigger filter delay is limited to 40ns. The effect is to increase the filter setting by a factor of four when in 100MHz mode. Thus if the Trigger Filter is set to 3, it would require the trigger to stay true for 120ns (12 cycles) before a trigger would be generated.



Appendix G. Options and Accessories

A wide range of options and accessories are available for the LA3200 and LA4800 as follows:

COMBINATION DATA PODS

These provide data and clocks together on a single pod. They have high impedance inputs (100K/8pF) at fixed TTL threshold (+1.4V). They operate from DC up to 25MHz. They do not provide either 100MHz operation or Glitch Capture operation.

AP01 - 32 channels plus clocks/qualifiers

AP02 - 48 channels plus clocks/qualifiers

HIGH SPEED DATA PODS

These each provide 16 data channels at DC to 25MHz, or 8 channels at DC to 25MHz plus 5ns glitch capture, or 4 channels at 100MHz asynchronous. Inputs are high impedance (100k/5pF) and are available with either fixed TTL threshold (+1.4V) or variable threshold (-2.5V to +10V). Note that fixed and variable threshold pods must not be mixed on the same analyser.

AP03 - fixed TTL threshold pod

AP03V - variable threshold pod

CLOCK PODS

When using an analyser in synchronous (external clock) mode with high speed data pods, the external clocks and qualifiers must be supplied via a clock pod. The clock pod provides 3 clock inputs and three qualifier inputs at high impedance (100k/5pF) and is available with either fixed TTL threshold (+1.4V) or variable threshold (-2.5V to +10V). Note that fixed and variable threshold pods must not be mixed on the same analyser.

AP04 - fixed TTL threshold pod

AP04V - variable threshold pod

DISASSEMBLER PODS

A wide range of disassembler pods are available. Each pod connects directly to the microprocessor via a sprung test clip. The disassembly software is contained within the pod and is automatically loaded into the logic analyser at switch-on.

DP-Z80 - for Z80 (all speeds)

DP-64180 - for 64180 (all speeds)

DP-6502 - for 6502 and 65C02 (all speeds)

DP-8085 - for 8085 (all speeds)

DP-8051 - for 8031 and 8051 (all speeds)

DP-6800 - for 6800 and 6802 (all speeds)

DP-6809 - for 6809 (all speeds)

DP-8088 - for 8088 (all speeds)

DP-8086 - for 8086 (all speeds)

DP-68000 - for 68000 (all speeds)

DP-68HC11 - for 68HC11 (all speeds)

DP-H8/300 - Disassembler for H8/300 (all speeds)

TARGET SYSTEM INTERFACING ACCESSORIES

LC90 - wire-wrappable personality board which can configure an AP01 for direct connection to a target system via a 40-way IDC cable.

LC-91 - Alternative connection system for 40-pin I.C.s (for use with disassembler pods etc). I.C. is removed from the target system and fitted into the LC-91 which is then connected to the target via a DIP plug.

PERIPHERAL INTERFACING ACCESSORIES

PC-01A - Printer cable for use with parallel (Centronics) input printers. Incorporates a serial to centronics converter within it.

LATALK - Software interface for linking to IBM-PC compatible computers.

Provides facilities for disk storage of data and set-ups etc.

GP500a - GPIB (IEEE-488) interface enabling data transfer and control of the analyser to be achieved over the General Purpose Interface Bus.