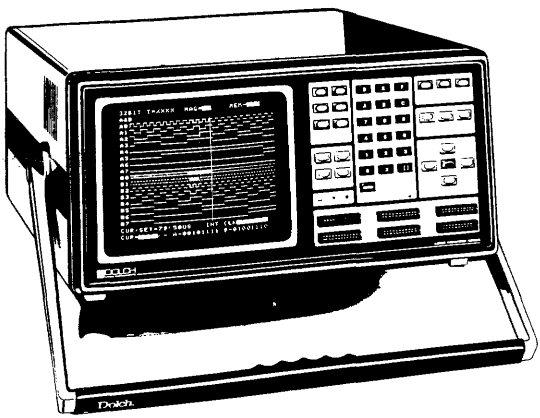
Dolch.



PALAS Manual

Operator's Manual

PALAS 40C50

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Section 1

SECTION 1 - GENERAL DESCRIPTION

You now have in your hands the PALAS 40C50 logic analyzer, a product of proven state-of-the-art technology and Dolch's expertise in logic analysis. This instrument provides features found in many high-end logic analyzers in a cost effective package. We trust you will enjoy many years of service from your instrument.

Section 1 provides an overview of the PALAS 40C50 and a brief description of it's internal architecture and basic operating modes. This material will help you understand basic logic analysis techniques and the application of your PALAS 40C50.

1.1 PALAS 40C50 OVERVIEW

Logic analyzers are a relatively new type of test instrument to the electronics world. Though they date back 10 years or so, the knowledge about them is limited. Basically, logic analyzers are similar to a multichannel oscilloscope that is capable of storing digital information in memory. It can then take the recorded data and rearrange it in a timing diagram display, allow manipulations, comparisons, and extensive searches - all at the operators request. Since it stores information into memory, transient events can now be recorded for an in-depth analysis at a later time.

The PALAS 40C50 is a 32 channel, 25 MHz, benchtop logic analyzer that provides state and timing capabilities in a single instrument. It's combination of technical know-how and state of the art design with an easy to use operating system provides fast solutions to your debugging requirements.

If you include all channels, there are 48 total in the PALAS 40C50 that may be grouped into the following groups.

- 32 data inputs
- 8 additional trigger word extension channels
- 2 external clocks
- 6 clock qualifiers (3 per ext. clock)

The 32 channel inputs are divided among 2 individual memory blocks; pods A&B make up one block, pods C&D make up the other. Each block provides 16 channels with 1K of memory per channel. If needed, the two blocks can be interlaced, to double memory and speed, thereby reconfiguring the PALAS 40C50 into a 16 channel/2K, 50 MHz logic analyzer.

Clocking can be asynchronous (internal) or synchronous (external) to the target system, depending on the application. Typically hardware debug is done asynchronously and software debug done synchronously. The internal clock can be set at sample rates from 20 nanoseconds to 500 milliseconds. The external clock can operate from DC to 25 MHz. Because of the two memory blocks, dual timebase clocking is possible. Clocks can differ between the two blocks or be the same. Each external clock includes 3 clock qualifiers that act as "AND" conditions to the clock.

Other test system parameters that affect the recording, and can be selected as needed, are the logic threshold voltage and glitch capture. More important is the triggering capability. The PALAS 40C50 provides 4 sequential levels of triggering which can perform functions such as 'go to next level', 'go if next is not', "restart" and pass counting. These functions will support 99 % of all triggering requirements. Post-trigger delay is also selectable so as to show data before and after the trigger point.

Once data has been captured, the PALAS 40C50 can display all input channels in a timing diagram or a data list, regardless of whether the recording is synchronous or asynchronous. Full cursor control permits locating a specific point in memory or making time measurements of the recorded data.

What makes the PALAS 40C50 an "analyzer" is its ability to compare data for errors. The compare function allows a known good data pattern to be stored in a reference memory, then repetitively takes new recordings and compares the data against reference. Any errors can be flagged and cause the PALAS 40C50 to either count non-compare conditions or halt the process. If desired, another analysis feature will search the data for these errors or specific word patterns.

All parameter programming in the PALAS 40C50 is menu driven. This means that from displayed menus, you need only scroll through the selections available at a particular field. In addition, the PALAS 40C50 incorporates an entry monitor that displays the steps necessary to program parameters. If an error in programming occurs the analyzer will report back with an "invalid entry" message. Another monitor function used while recording displays the real-time position in the trigger menu, including level pass counting.

To preserve menu contents, a 6-file scratch pad memory is provided. This battery backed CMOS RAM will store complete menu setup files for recall at a later date with up to 3 months of storage without power. These files can be accessed by the user to simplify setup of the logic analyzer.

Finally, the PALAS 40C50 is capable of providing full disassembly support for most popular 8-bit and 16-bit microprocessors. These options can be used to trace uP activity and display the recorded data in mnemonics.

1.2 MEMORY ORGANIZATION

The heart of every logic analyzer is a bank of high speed memory where incoming data is recorded for later display and analysis. During recording, data is continuously written into this memory, with the earliest data overwritten by the latest data. This storage process results in the memory always containing the most recent data.

Incoming data is clocked into memory by the recording clock, which may be generated from within the analyzer or come from an external source. This recording clock causes one data sample of each input channel to be stored during each clock cycle.

The PALAS 40C50 has two identical memories, each 32 channels wide by 1000 words deep. The incoming data is stored in one memory, called the SOURCE memory. Each time a data recording is made, the old data in the source memory is cleared and the new data is stored. The source memory may be viewed as either a data list or a timing diagram.

The second memory is called the REFERENCE memory. It is the same size as the source memory, and is used to save a data recording for comparison with future recordings. In normal analyzer operation, the operator would transfer a known good data recording from the source memory to the reference memory. This data is then used during the compare process to determine if the incoming data matches the known good standard. The reference memory may be displayed only as a data list.

The PALAS 40C50 also includes a mode of operation in which the operator can search for differences between the source and reference memory contents, displaying any differences between the two memories in inverse video. This mode is particularly useful for locating differences between the two memories; a difference of only one bit may be found and displayed with the touch of a few keys.

Both the source memory and the reference memory can be configured by the user into 16-bit wide, 2000 word deep memories. This immediately doubles the memory depth if only 16 input channels are required for an application, and allows recording at 50 MHz on these 16 channels.

1.3 ASYNCHRONOUS VS. SYNCHRONOUS RECORDING

Incoming data may be clocked into the analyzer by an internal clock from within the analyzer or by an external clock generated by the system under test. If an internal clock is used, the recording is called asynchronous; a recording made with an external clock is called synchronous, as it is synchronized to the system under test.

Asynchronous recording is typically used to record hardware signals, where the timing relationship between signals is of interest to the user. The recorded data is usually displayed as a timing diagram, providing a visual picture of the time relationship between signals. Time measurements may be made directly on the timing diagram by using the cursor and the setpoint, reading the time value directly in nanoseconds, microseconds, or milliseconds.

In actual practice, the internal clock should be at least four times the speed of the data to be recorded. The faster the internal clock relative to the incoming data, the closer the displayed data will match the actual data.

Synchronous recording is most often used to record software data, where the data is clocked into the logic analyzer by the system clock. This clock is often qualified by one or more status lines, such as a data strobe or address strobe. This sampling method insures that data is stored only during the time period when it is valid.

Synchronous data is most often displayed as a data list, also known as a "state listing." Individual channels are displayed in groups of eight lines, usually in the hex format. This format corresponds to the address and data listing used by programmers, and aids in interpreting the recorded data. However, other radices, including binary, octal, and ASCII can be displayed as well.

Clock qualifiers may also be used to qualify data which is to be stored in memory. For example, if a recording is made on a microprocessor system where only instruction fetches are of interest, the instruction fetch line could be used as a clock qualifier; this use would conserve analyzer memory for recording only data of interest.

1.4 GLITCH CAPTURE

Glitch capture is a user-selectable feature found on most modern logic analyzers which provides a means of recording brief signals during asynchronous recording. In normal operation, the analyzer records only signals which are present at the recording clock edge. This means that signals shorter than the recording clock time period may be missed. Reducing the clock period to catch these signals is often unsatisfactory, as it also reduces the size of the "recording window."

Glitch capture, also called "latch mode," allows the analyzer to record signals shorter than the recording clock period by latching these signals until the next recording clock edge. The glitch then appears in the display as a single clock transition in the next clock cycle. The example below shows the result of two recordings, one made with glitch capture off and the other with glitch capture on.

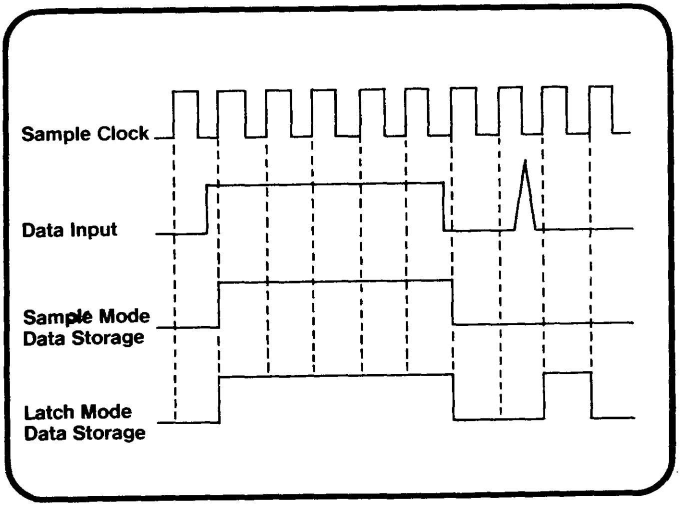

Figure 1-1: Recording Modes

The glitch capture feature also allows recording of glitches shorter than the 20 nSec maximum recording speed of the analyzer. In latch mode, the analyzer will recognize glitches as narrow as 5 nSec, and store them until the next recording clock edge. The use of latch mode on the PALAS 40C50 does not reduce the channel width or decrease the memory depth available for recording.

1.5 DATA DISPLAY

The PALAS 40C50 allows all channels to be displayed as a data list or a timing diagram. The data list may be configured by the user to display the data in the most convenient format for a particular application. The timing diagram, which displays signals from two pods at the same time, also allows the channels to be magnified and arranged in the most convenient order.

The data list display, which is often called a "state listing," allows the user to arrange the four pod groups, A, B, C, and D in any order, select positive or negative polarity for each pod group individually, and display each pod group in binary, hex, octal, and/or ASCII. The display for any pod may be repeated in two or more formats, until the screen is filled.

In addition to recorded data, the data list display also shows the recording format, the trigger address (if a trigger is used during recording), the cursor/set difference, and the memory being displayed. The user may select an ORed display, in which the source memory data is ORed with data in reference memory, showing any memory differences in inverse video. This feature is particularly useful for locating points in the data sets which differ.

The timing diagram displays the data recorded on pods A & B or the data from pods C & D, showing all 1000 memory locations in the 32-bit mode or 2000 locations in the 16-bit mode. The data may be magnified by 5 or by 10 in the 32-bit mode or by 10 or 20 in the 16-bit mode. Channels within the same pod group may be rearranged, duplicated, or deleted to provide the most convenient display format.

The timing diagram also contains a cursor marker, which helps the user locate a particular part of the data display. The cursor may be scrolled across the display in either direction, or moved directly to a specified location. The cursor is correlated with the data list cursor, making it easy to move from one display to the other for comparison. A set point is also provided on the timing display, and is used for making timing measurements between events. An intensified "curtain" is displayed over the area between cursor and set point locations to help identify the data between these markers.

The timing display also shows the recording format, the trigger address, the magnification of the display, and the cursor address. The cursor/set difference is shown in actual time if the internal clock is used, or in clock cycles when an external clock is used. A binary readout at the bottom of the display shows the signals at the cursor location, making it easy to find the exact location of a particular data pattern.

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Section 2

SECTION 2 ACCESSORY LIST

The PALAS 40C50 includes a variety of accessories to aid in its use. Take the time to get familiar with them before continuing on. In addition, there may be options you have ordered with the basic package. Each option has its own accessory list in the user's manual, however space is reserved on the next page for entering options for your PALAS 40C50.

TABLE 2-1: ACCESSORY LIST

ITEM	QTY	DESCRIPTION
Logic Analyzer	1	Model PALAS 40C50. 40 channel; 32 data, 8 trigger extension, 2 external clock each with 3 qualifiers.
ALP 88D	6	Input, Trigger Extension and Clock probes used to connect to the target system. Optional high performance probes are available (ALP 88H)
Leads	6 packs, 10 each	Leads connect the ALP's to the target system either through clips or directly to wire wrap posts.
Clips	6 packs, 10 each	Clips interface the leads to the target system. Provisions on the clip allow double probing a single point with one clip.

TABLE 2-1: ACCESSORY LIST (cont.)

ITEM	QTY	DESCRIPTION
Manual	1	An easy-to-read reference manual describing the analyzer and its operation.
Power Cord	1	6 ft cord to connect the analyzer to a power outlet.

L I S T O P T I O N S H E R E

OPTIONS	SERIAL #	LOCATION
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Section 3

SECTION 3 CONTROLS, INDICATORS AND CONNECTORS

This section of the manual provides you with information concerning front panel and rear panel controls such as the keyboard and switch settings, LED indicators and the CRT display, and all input/output connectors. Refer to this section if you want a brief description of the keys, interface connectors or clock and data inputs.

The information presented here uses the "table and figure" method, with locating coordinates to help you. Just locate the number on the figure relating to the key, connector or input then look it up on the facing table.

3.1 FRONT PANEL DESCRIPTION

This section describes the front panel keyboard and the function of the keys. It is broken into the six groups; Display, Cursor, Entry, Trace, Specify and Edit Groups. The keyboard layout is graphically broken into these groups, making it easier to work the keyboard.

Another section of the front panel contains the Input connectors for data, trigger word extension and external clock and qualifiers.

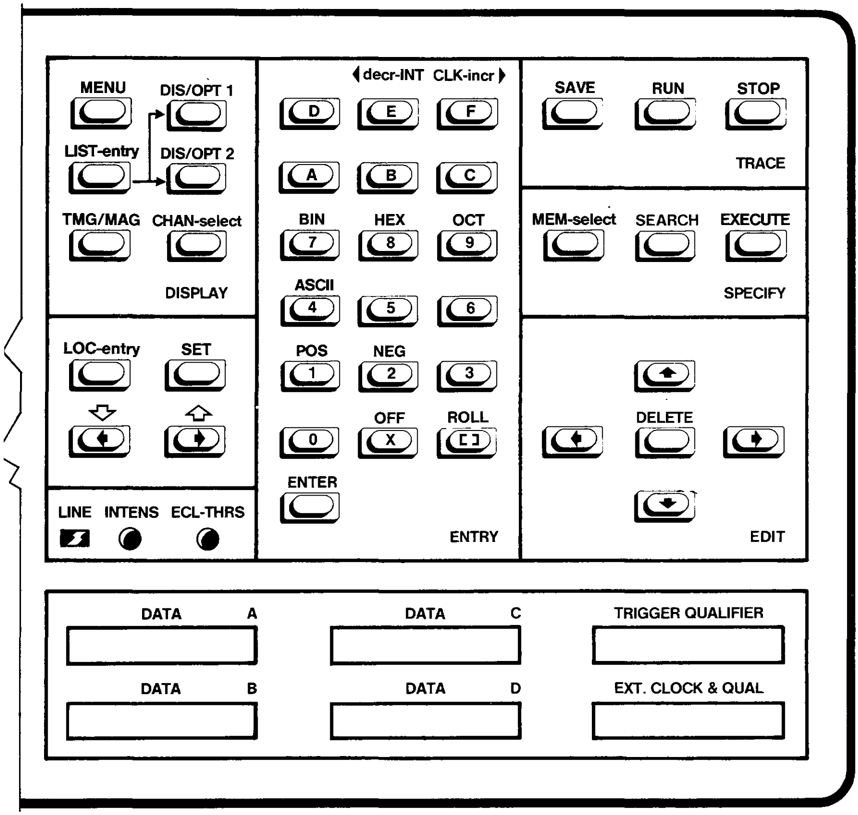

Figure 3-1: Front Panel Keyboard

3.1.1 DISPLAY GROUP

The display group contain the keys that access the menus, timing diagram display/magnification, list display, option access and channel select for editing.

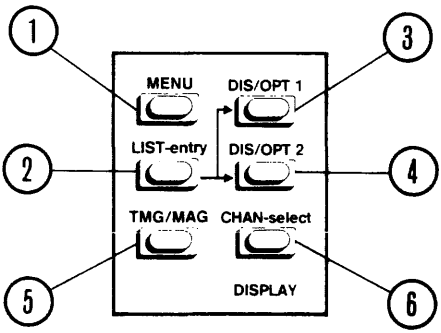

Figure 3-2: The Display Entry Group

TABLE 3-1: DISPLAY GROUP

ITEM NO.	KEY	FUNCTIONAL DESCRIPTION
1	MENU	The MENU key is used to access the FORMAT (TRACE), TRIGGER and COMPARE menus. Repeated pressing will sequentially access the menus in that order.
2	LIST-entry	This key calls up the state (data) list, retaining all previous parameters. It can be selected from any display.
3	DIS/OPT1	This key invokes the software in option bank 1. It can only be activated from the List display.
4	DIS/OPT2	This key invokes the software in option bank 2. It can only be activated from the List display.
5	TMG/MAG	When first pressed, the timing diagram is displayed, retaining all previous parameters. Successive pressing of the TMG/MAG key will magnify the display to X10 & X20 (16 bit mode) or X5 & X10 (32 bit mode).
6	CHAN-select	Used to initiate the List or Timing editing or call up the other timing channels (32 bit).

3.1.2 CURSOR GROUP

This group contains the keys used to scroll through data in the data list or timing diagram, move the cursor directly to a location or set the SET marker.

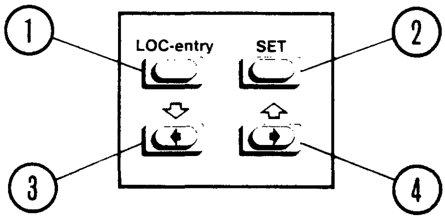

Figure 3-3: The Cursor Entry Group

TABLE 3-2: CURSOR GROUP

ITEM NO.	KEY	FUNCTIONAL DESCRIPTION
1	LOC-entry	Used to move the cursor directly to a defined memory address. After pressing, the value is specified and the ENTER key is pressed to perfrom the move.
2	SET	The SET key positions the SET marker to the current cursor position. This is used to do time measurements.
3	⇦	This key permits scrolling through data in a list or timing diagram in decreasing addresses. In a timing diagram, the cursor will scroll to the left in a X1 mode. In expanded modes, the left edge of the timing will become the cursor, scrolling the data to the right.
4	⇨	This key permits scrolling through data in a list or timing diagram in increasing addresses. In a timing diagram, the cursor will scroll to the right in a X1 mode. In expanded modes, the left edge of the display will become the cursor, scrolling the data to the left instead.

3.1.3 ENTRY GROUP

The keys in this group are used to enter in required values using the hexpad, change a field's parameters, increase or decrease the internal timebase, or edit pod formats on the various menus.

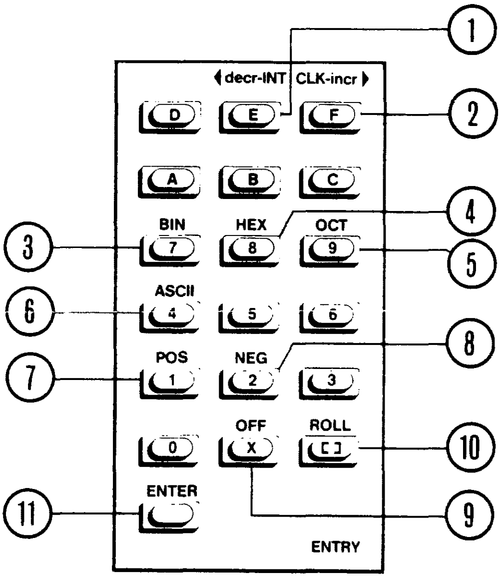

Figure 3-4: The Entry Group

TABLE 3-3: ENTRY GROUP

ITEM NO.	KEY	FUNCTIONAL DESCRIPTION
-	KEYS 0 to 9, A to F, X	These 17 keys are used to specify values in the various fields in the menus and displays.
1	decr (E)	Used to decrement or speed up the internal clock rate of the logic analyzer.
2	incr (F)	Used to increment or slow down the internal clock rate of the logic analyzer.
3	BIN (7)	Used to change a pod format to binary.
4	HEX (8)	Used to change a pod format to hexadecimal.
5	OCT (9)	Used to change a pod format to octal.
6	ASCII (4)	Used to change a pod format to ASCII.
7	POS (1)	Used to change a pod polarity to positive format.
8	NEG (2)	Used to change a pod polarity to negative format.

TABLE 3-3: ENTRY GROUP (CONT.)

ITEM NO.	KEY	FUNCTIONAL DESCRIPTION
9	OFF (X)	Used to enter a don't care condition.
10	ROLL ([])	Used to change the parameter in fields enclosed in brackets [].
11	ENTER	The ENTER key is used to gain access in a direct entry field. Once the value has been programmed, it is used to "lock in" that value.

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3.1.4 TRACE GROUP

The keys in the TRACE group are used to start and stop the recording or compare process and to access the scratch table.

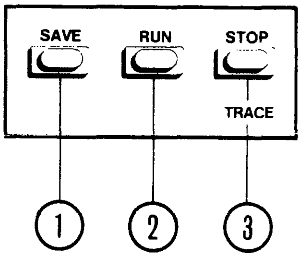

Figure 3-5: Trace and Scratch Control

TABLE 3-4: TRACE GROUP

ITEM NO.	KEY	FUNCTIONAL DESCRIPTION
1	SAVE	This key calls up the scratch table used for storing and recalling setups.
2	RUN	Used to start a recording or compare process. To run a compare, you must start it from the compare menu.
3	STOP	Used to stop a recording or compare process.

3.1.5 SPECIFY GROUP

These keys select the different memories, allow memory overlay and run search and execute functions.

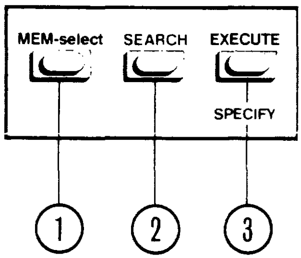

Figure 3-6: The Specify Group

TABLE 3-5: SPECIFY GROUP

ITEM NO.	KEY	FUNCTIONAL DESCRIPTION
1	MEM-select	Used to select Source or Reference memory, S+R or R+S. Must press EXECUTE after selecting.
2	SEARCH	Used to select search functions S<>R, S=R or WORD. Must press EXECUTE after selecting.
3	EXECUTE	Used to execute commands selected in this group or in Scratch Table.

3.1.6 EDIT GROUP

The keys in this group are used to move the edit ccursor to the different fields or positions. There is also a key used to delete list headings, timing channels or turn off trigger levels.

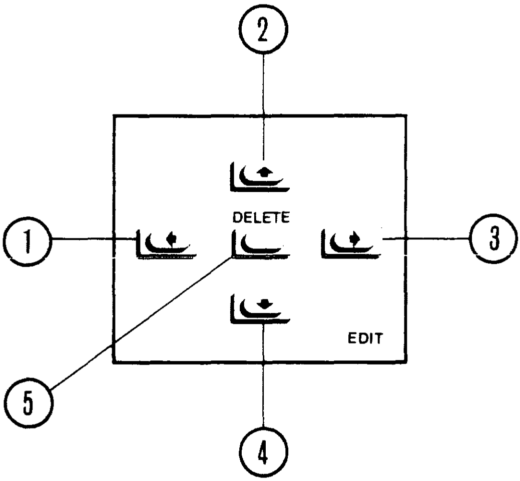

Figure 3-7: The Edit Group

TABLE 3-6: EDIT GROUP		
ITEM NO.	**KEY**	**FUNCTIONAL DESCRIPTION**
1	⇦	Moves the edit cursor to the left and the previous field.
2	⇧	Moves the edit cursor upwards to the field above the current position.
3	⇨	Moves the edit cursor to the right and the next field.
4	⇩	Moves the edit cursor downwards to the field below the current position.
5	DELETE	Used to delete pod headings, timing channels or set a trigger level to off.

3.2 INPUT GROUP

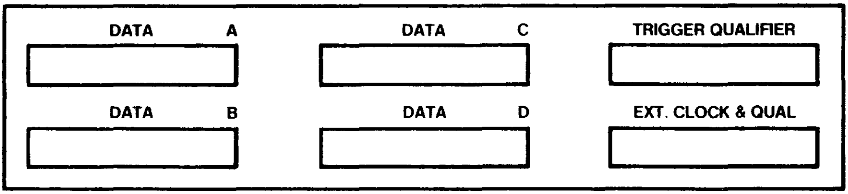

Figure 3-8: The Input Group

Connection to your target system is made through ALP 88 probes that connect to the Input Group located on the front panel of the PALAS 40C50. This is where data and clocks are input to the logic analyzer for recording.

The input group is made up of six ports; data inputs A,B,C and D, Trigger Qualifier, and External Clock and Qualifiers. All six ports are identical in pinout and use the ALP 88 probes.

The following table describes the pinouts for the ALP 88 inputs as defined for the data and trigger qualifier inputs and for the external clock inputs.

TABLE 3-7: DATA AND TRIGGER QUALIFIER INPUTS

ALP PIN NUMBER	PIN DESCRIPTION
0	Data input or trigger qualifier input 0 (LSB)
1	Data input or trigger qualifier input 1
2	Data input or trigger qualifier input 2
3	Data input or trigger qualifier input 3
4	Data input or trigger qualifier input 4
5	Data input or trigger qualifier input 5
6	Data input or trigger qualifier input 6
7	Data input or trigger qualifier input 7 (MSB)
	ALP grounds, 2 per ALP

TABLE 3-8: EXTERNAL CLOCK AND QUALIFIER INPUTS

ALP PIN NUMBER	PIN DESCRIPTION
0	External clock CK 1 input
1	CK 1 first qualifier input
2	CK 1 second qualifier input
3	CK 1 third qualifier input
4	External clock CK 2 input
5	CK 2 first qualifier input
6	CK 2 second qualifier input
7	CK 2 third qualifier input
	ALP grounds, 2 per ALP

* N O T E S *

3.3 FRONT PANEL INDICATORS AND TRIMPOTS

Below the Cursor Group there are two trimpots and a LED located. The LED indicates that power is ON.

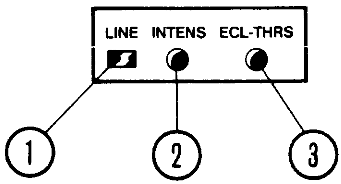

Figure 3-9: Front Panel Indicators

TABLE 3-9: FRONT PANEL INDICATORS AND TRIMPOTS

ITEM NO.	HEADING	FUNCTIONAL DESCRIPTION
1	LINE LED	The LINE LED indicates that the internal +5V power supply is functioning, indicating that power is applied and the machine is on.
2	INTENS	This trimpot is used to adjust the intensity of the CRT.
3	ECL-THRS	This trimpot is used in calibrating the ECL threshold. **IT SHOULD NOT BE ADJUSTED EXCEPT IN CALIBRATION. CONSULT THE FACTORY BEFORE YOU PERFORM A CALIBRATION.**

3.4 REAR PANEL DESCRIPTION

The rear panel of the PALAS 40C50 contains the power switch, fuse, power input connector, the video interface, RS-232 and GPIB interface connectors, the reset, baud rate and GPIB address switches and trigger out BNCs. Included on the rear panel is the instrument legend, indicating the serial number, power rating and fuse rating.

Table 3-10 briefly describes the elements of the rear panel.

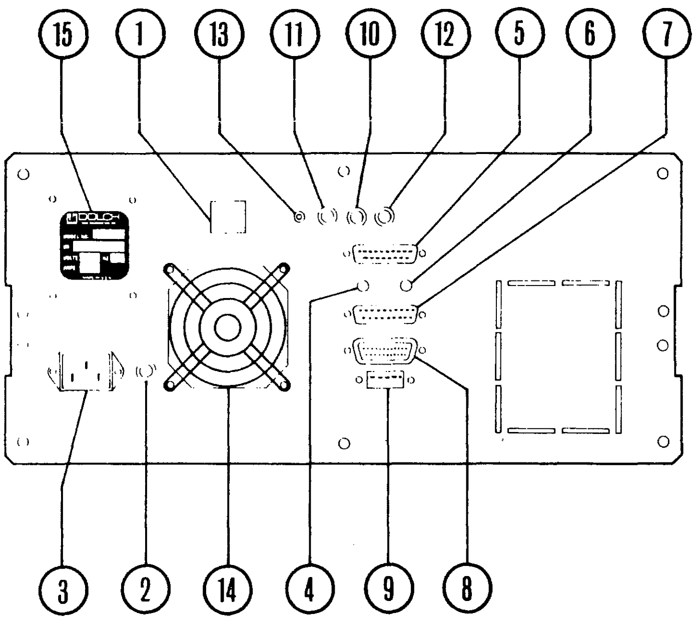

Figure 3-10: Rear Panel

TABLE 3-10: REAR PANEL DESCRIPTION

ITEM NO.	PART	DESCRIPTION
1	POWER SWITCH	Turns on AC power to the PALAS 40C50.
2	FUSE	3.2 AMP slo-blo fuse, AGC series 1/4" by 1 1/4".
3	POWER INPUT CONNECT.	D shape input connector. Accepts 100V TO 240V input, depending on factory configuration.
4	RESET SWITCH	Resets the internal microprocessor and performs power-up diagnostics.
5	VIDEO OUTPUT CONNECT.	Provides raw video, horizontal sync and vertical sync signals. See figure below for pinouts.
6	BD RATE SWITCH	Selects the baud rate of 110 or 300 for the RS-232 interface.
7	RS232 CONNECT.	RS-232/V24 interface connector. See section 5 for details.
8	GPIB CONNECT.	GPIB (IEEE-488) interface connector. See section 6 for details.
9	GPIB SWITCH	Used to set the instrument GPIB address. See section 6 for details.

TABLE 3-10: REAR PANEL DESCRIPTION (CONT.)

ITEM NO.	PART	DESCRIPTION
10	TRIG OUT B BNC	When the final trigger event is found during a recording, TRIG OUT B provides a high to low transition.
11	TRIG OUT A BNC	When any trigger level event is found during a recording, TRIG OUT A provides a high to low transition.
12	VIDEO BNC	Provides a composite (unmodulated) video signal output to drive external monitors or video printers.
13	GND	Jack for chassis ground, internally connected to DC ground.
14	FAN	Used to cool the internal parts of the PALAS 40C50. Fan direction is inward.
15	LEGEND	Lists the serial number, voltage and fuse rating of the PALAS 40C50.

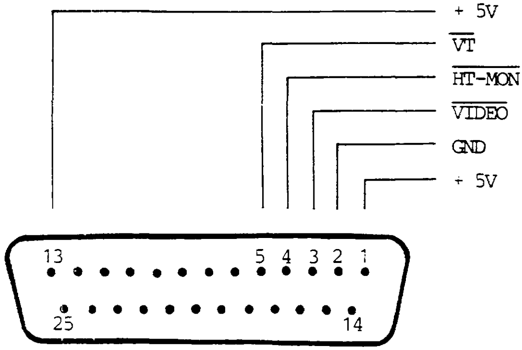

Figure 3-11: Video Interface Pinout

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Section 4

SECTION 4 MENUS AND DISPLAYS

This portion of the User's Manual describes the operation of the instrument and how this operation is controlled by its menus and displays. The PALAS 40C50 is a menu driven product and therefore the reference material in this section is of major importance.

Section 4 has been written to explain the operations to the novice operator and also to perform as a reference guide to the experienced user when he only needs a quick review. Each menu and display is separated into a separate section with its title printed in boldface. Each of these major sections is divided into the various functions of that menu or display. At the end of each major section there is a 2 page quick reference guide with brief descriptions of the various parts of the display.

If there are any questions that can't be answered by the quick reference guide or its associated text, please feel free to call on our qualified applications department for a detailed explanation.

4.1 BASIC PROGRAMMING GUIDELINES

Programmable areas on the various displays are shown in inverse video fields. These "fields" direct the operation of the logic analyzer's recording operation and its data displays.

On the various menus there are fields that can be programmed. A flashing inverse video field will indicate the parameter to be programmed. The EDIT Group located in the lower right corner of the keyboard is used to relocate the flashing cursor over the desired field for programming.

4.1.1 PROGRAMMING RULES

There are 3 basic programming methods used in all PALAS 40C50 menus. By looking at the desired field you can determine what is required to program the field.

1. The first field type is the BRACKET "[ ]" field. Programming of this type of field is done with the "ROLL" key.

2. The second field type is the TIMEBASE SELECT field, enclosed in "< >" . Programming of this type of field is done with the "INCR" and "DECR" keys.

3. The last type of field used in the PALAS 40C50 is the ENTRY field type. The keys in the "ENTRY" Group of the keyboard are used in programming of these field types. Typically, entries involve data patterns, numeric parameters and miscellaneous selections. To enter values into a field,

First press the "ENTER" key. The cursor will appear over the first character position of the field.

Enter in the desired characters using the ENTER and ENTRY group keys. When all positions in the field are programmed, the cursor will automatically advance to the next field. If only a portion of the field is programmed, the "ENTER" key must be pressed to enter the data and advance the cursor to the next field.

In addition to these simplified rules, the PALAS 40C50 will prompt you at the top line of the display while you are setting up menus, indicating the current programing choices.

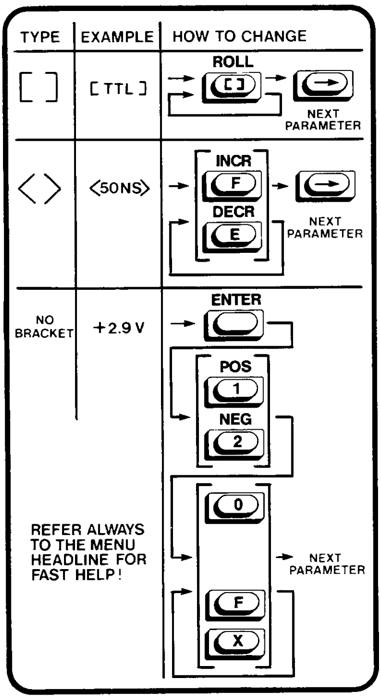


Figure 4-1: Programming Rules

4.2 POWER UP DESCRIPTION

After powering up the logic analyzer, the instrument will go through its own self-diagnostic test. During this time the screen may show a random character display and then go blank. When the diagnostic routine is finished, the power up message will be displayed on the screen. The areas of the power up display includes the revision of the system software, options included (if installed), the result of the self diagnostic tests, and the status of the nonvolatile (scratch) memory.

*** N O T E ***

> The status message "NONVOLATILE MEMORY ERROR" does not necessarily report a failure. It indicates that all of the scratch files are not currently full. This can be caused from never having been stored or their being lost due to low battery voltage, or possible hardware failures. Regardless of the reason for this message, the instrument is still operable.

Failure(s) in the self diagnostic test are reported back in this display, indicating either the PROM that failed or the RAM address and the test pattern responsible for detecting the failure. Contact customer service at the factory at this point. Quite often replacement parts can be sent to you free of charge along with installation instructions. You will need the serial number of the instrument and the revision of the system software.

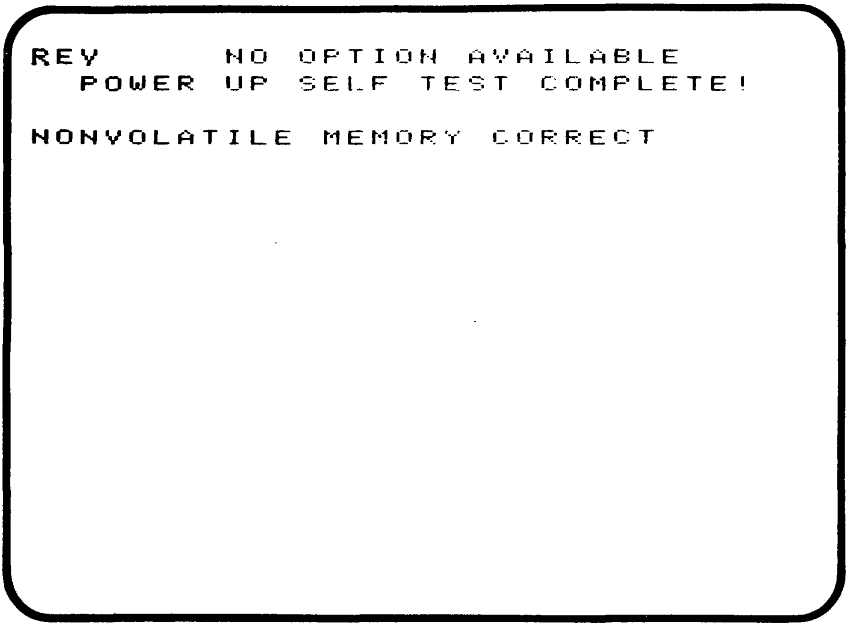


Figure 4-2: Power up display

4.3 TRACE MENU DESCRIPTION

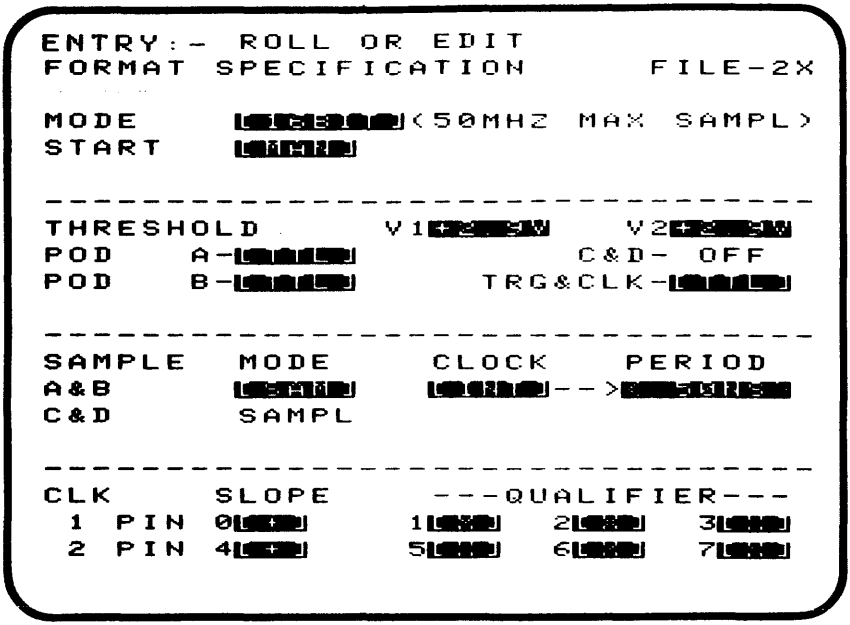


Figure 4-3: Trace Menu

The PALAS 40C50 logic analyzer is comprised of two separate 16 channel logic analyzers, each with 1000 locations of memory. We use the TRACE menu to tell the instrument how to configure these 16 channel groups and how to bring data into them - asynchronously or synchronously, thresholds, manually or repetitive, etc.

The TRACE menu is divided into 4 sections (seperated by horizontal dashed lines) which control the:

- -Recording Mode
- -Logic Threshold Selection
- -Sampling Selection
- -External Clock Control

4.3.1 RECORDING MODE

The two standard memories may be used separately or combined to become a single, 16 channel, 2000 location memory. This is done by either specifying "16 BIT" (1 ea 2K memory), or "32 BIT" (2ea 1K memories). In the 16 channel mode, only channels A & B are available for use and the logic analyzer will turn off all programmable areas for the C & D channels. Changing from one mode to the other is only a setup function. Before data can be displayed in the new mode, a recording must be made.

The second programmable field in this section is the "START" field. The PALAS 40C50 can be started in three different modes including:

"MAN" you push the RUN key for each recording

"REP" Repeat in X seconds. Arms the analyzer automatically until the STOP key is pressed.

"REM" Used when remote control of the instrument via RS-232 is desired. Entering into the REM mode disables IEEE remote control.

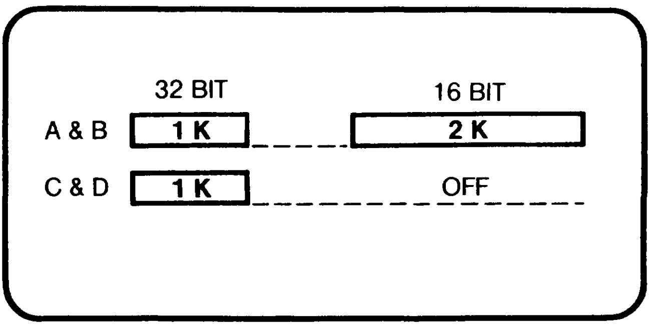


Figure 4-4: Recording Modes

4.3.2 LOGIC THRESHOLD SELECTION

There are 4 selectable threshold levels available in the PALAS 40C50. These include TTL, ECL, and two programmable threshold voltages, V1 and V2. Since most applications involve TTL logic, the default parameter is TTL.

For simultaneous recording of different logic families, the PALAS 40C50 can be programmed such, that its different channel groups can record at different logic levels. The channel groups A, B, and C & D may be set up at different levels.

The external clocks (CLK 1 and CLK 2), and the additional trigger qualification channels are programmed as a group and at a single logic level.

Besides the preset TTL and ECL thresholds, two programmable threshold levels (V1 and V2) have been provided for you to specify the desired logic level. These can be programmed to any level between +9.9 volts and -9.9 volts in 100 millivolt increments.

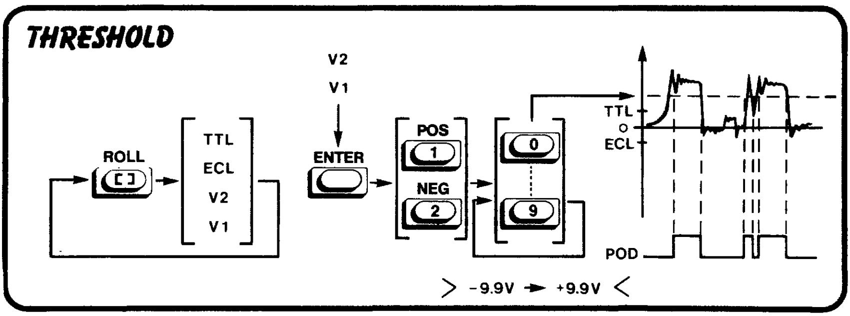


Figure 4-5: Threshold Selection

4.3.3 SAMPLING SELECTION

The sampling selection portion of the trace menu is used to determine how data is to be clocked into the instrument. In the recording mode portion of the trace menu, we formatted our recording memories either into separate recording blocks or a single recording block (32BIT or 16BIT). The instrument can be programmed to clock data into these memories in an asynchronous mode using an internal clock supplied within the instrument, or synchronously with either of the two external clocks (CLK 1 or CLK 2) input through the front of the instrument. The two separate recording blocks can be programmed to run with the same clock or with separate clocks. In the case where internal clock is selected, its rate may also be selected here. The internal clock sampling rates range from 20nS (50nS in 32 bit mode) to 500mS in 1-2-5 type steps and changed by using the INCR and DECR keys.

Channel groups A & B can be selected to operate in either the normal sampling mode (SAM) or in glitch detection mode (LAT). In SAMple mode, the analyzer scans the data present at its inputs and stores it into memory only on its specified clock signal. In LATch mode, transient pulses narrow enough to fall between two successive clock edges are recorded as glitches, and then displayed as a single event of opposite logic level in the next location.

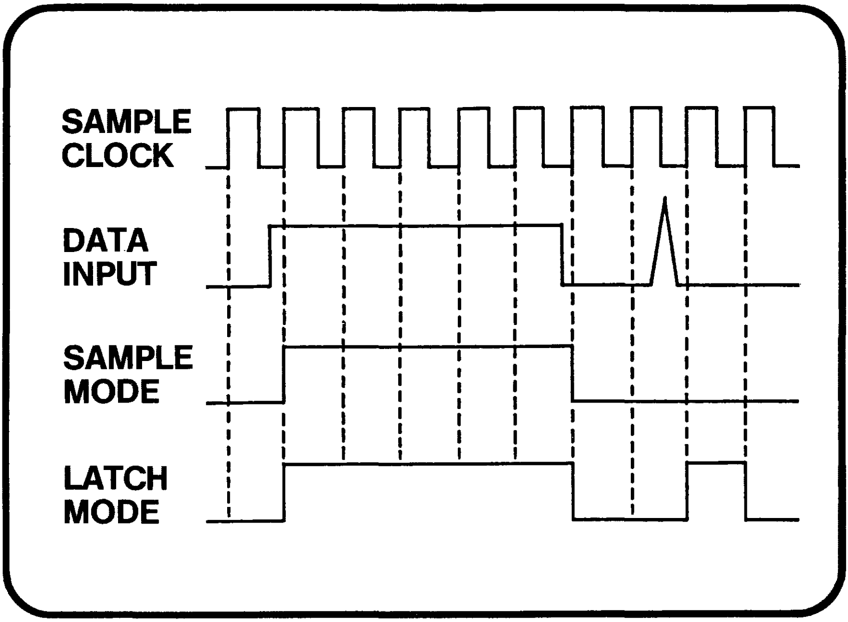


Figure 4-6: Sample Modes

4.3.4 EXTERNAL CLOCK CONTROL

When an external source is selected for clocking data into the instrument, we need to specify the edge of the clock signal and qualification, if any, we wish to use. On each programmed slope (+ or -) of the clock signal the data present at the probe inputs will be clocked into the instrument's memory. Caution should be taken to ensure that enough of these clock signals are provided (1000 in 32 bit mode, 2000 in 16 bit mode) to allow the instrument to make a complete recording of new data.

The qualifiers operate like an AND gate and will only allow clock signals into the instrument when their conditions have been met. There are 3 qualifiers for each external clock and each can be programmed for a high level signal (H), a low level signal (L), or as a don't care state (X). Next to each programmable area in this portion are numbers that indicate the pin numbers of the ALP-88 input probe these signals should be connected to.

		CLOCK INPUT	1st QUAL	2nd QUAL	3rd QUAL
CLOCK 1	ALP	PIN #0	PIN #1	PIN #2	PIN #3
CLOCK 2		PIN #4	PIN #5	PIN #6	PIN #7

NOTE:
A changing qualifier level while clock level is high, will not cause a clock pulse!

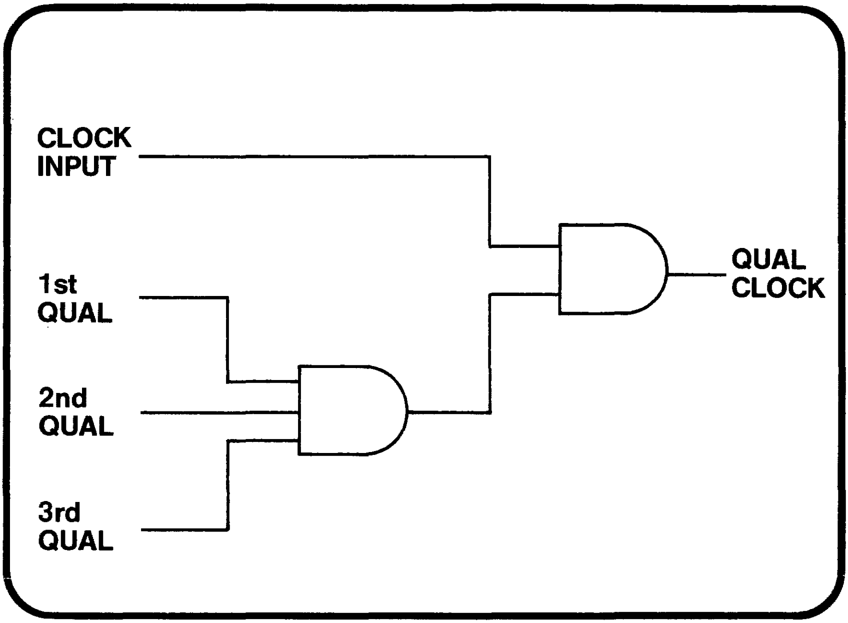


Figure 4-7: Clock and Qualifiers

TABLE 4-1: TRACE MENU OVERVIEW

ITEM NO.	FIELD HEADING	PARAMETERS	DESCRIPTION
1.	MODE	16BIT	16BIT operation 50MHz max. on pods A&B, pods C&D off.
		32BIT	32BIT operation 25MHz max. on pods A&B and C&D.
2.	START	MAN	Manual start with RUN key.
		REP->X	Restarts analyzer every X seconds. Initialized with RUN key.
		REM	Enables control through RS 232 interface. Disables IEEE control ability.
3.	V1/V2	-9.9 +9.9	2 programmable threshold levels in 0.1V steps.
4.	THRESH-HOLD	TTL, ECL, V1, V2	Logic threshold selection by pod group.
5.	SAMPLE MODE	SAM	Records only on clock edge
		LAT	Enables input glitch detector.

TABLE 4-1: TRACE MENU OVERVIEW (CONT.)			
ITEM NO.	**FIELD HEADING**	**PARAMETERS**	**DESCRIPTION**
6.	CLOCK	INT CLK1 CLK2	Recording clock selection by 16BIT pod groups, A&B and C&D.
7.	INTERNAL TIME SELECT	20nS-500mS (50nS IN 32 BIT MODE)	Selects internal clock rate used for recording when "INT" is selected.
8.	SLOPE	+ OR -	Selects slope of external clock used for recording.
9.	QUAL-IFIER	H-HIGH L-LOW X-DON'T CARE	Selectable qualifications "AND"ed together with ext. clock signal.

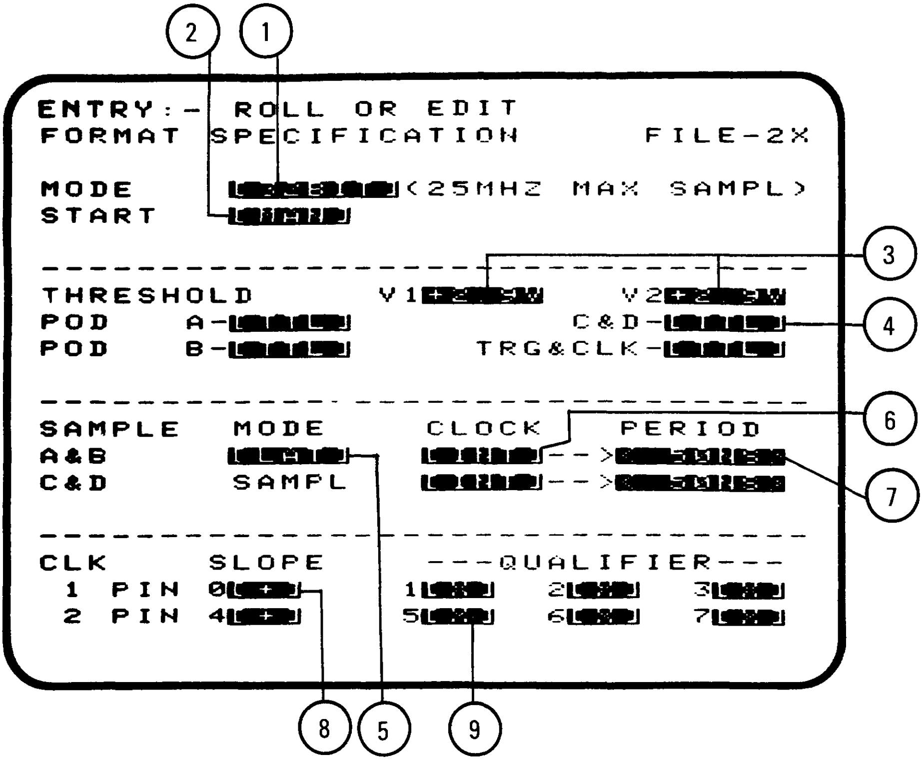


Figure 4-8: Trace Menu Elements

4.4 TRIGGER MENU DESCRIPTION

```
ENTRY:-  ROLL  OR  EDIT
TRIGGER  SEQUENCE                    FILE-3X

*LEVEL  1**                          PASS
A+               C+                  TRG  QUAL
B+               D+              Q+

*LEVEL  2**                      001  PASS
A+               C+                  TRG  QUAL
B+               D+              Q+

*LEVEL  3**                      001  PASS
A+               C+                  TRG  QUAL
B+               D+              Q+

*LEVEL  4**                      001  PASS
A+               C+                  TRG  QUAL
B+               D+              Q+

 DELAY  CLK=          ---->         CNTS
```

Figure 4-9: Trigger Menu

Using the trace menu, we specified how we wanted data clocked into the logic analyzer. We also saw the different ways of starting a recording. The trigger menu is used to tell the logic analyzer when to stop recording so we can have useful data captured in its memories. We tell the analyzer when to stop by programming the trigger menu to search for a specific pattern of data and telling it to stop when it sees that pattern.

There are four sequential levels on the trigger menu that operate in a 1-2-3-4 sequence unless told to do otherwise. When a trigger level is active we describe it as having trigger control.

In each level, the programmable parameters are:

- The function of the level
- The trigger word at this level
- The event counter at this level

There is also a trigger delay function used to define the amount of memory reserved for post trigger data. The difference between memory size and trigger delay is for pre-trigger data. When trigger control has passed through the four trigger levels, the recording process is passed to the trigger delay counter where its value is counted down by clock samples.

4.4.1 TRIGGER FUNCTIONS

There are several trigger functions available for use in the trigger sequence, some being trigger level dependent. These functions are:

FREE RUN (abbreviated to **FREE** in trigger menu) Only available in level 1. Disables all 4 trigger levels allowing the analyzer to fill memory with any available data.

START Used only in level 1. While in level 1, the analyzer will search for the specified number of events (pass counter) of the 40 bit trigger word programmed into level 1 while recording and trigger control is at level 1. When the correct number of events of the trigger word has occurred, trigger control will step to the next level.

THEN Available on levels 2, 3, and 4. It operates the same as START does for level 1.

THEN NOT (abbreviated to **NOT** in the trigger menu) Available on levels 2, 3, and 4. It operates in conjunction with START or a THEN on the previous trigger level. When the START or THEN condition has been met, and the very next 40 bit word clocked into memory **is not** the word specified in the NOT level, then trigger control will advance to the next level. If it is the word specified, trigger control will be sent back to level 1 to restart the trigger process.

OFF Available on levels 2, 3, and 4. It indicates that no function is available and passes trigger control to the next level. Previously entered parameters are temporarily masked but not deleted.

RESTART Available only in level 4 but shares trigger control with levels 2 and 3. If the 40 bit word specified in the RESTART level is seen while trigger control is within levels 2 or 3, the trigger trace process will return to level 1 and start all over again.

4.4.2 TRIGGER WORD DEFINITION

The boolean trigger word to be looked for at each trigger level is the logical AND of the words specified for pods A, B, C, D, and Q. The Q or Qualifier pod is a group of 8 input channels that are not recorded by the analyzer but are available to provide a full 40 channel trigger word. The data for these "Q" channels is input through the TRIG-QUAL connector on the front of the instrument.

The trigger word for each 8-bit channel group may be specified in Hexadecimal, Octal, or Binary, and in positive or negative polarity. To change the format and/or polarity of the trigger word, locate the flashing cursor over the desired word and press the desired key within the ENTRY section of the keyboard (HEX, BIN, OCT, POS, NEG).

4.4.3 EVENT COUNTER

The event counter can be used on each level when a START or THEN function is selected and is programmable from 1 to 255 events. This tells the logic analyzer that the specified trigger word must be seen XXX number of times before trigger control is passed on to the next level.

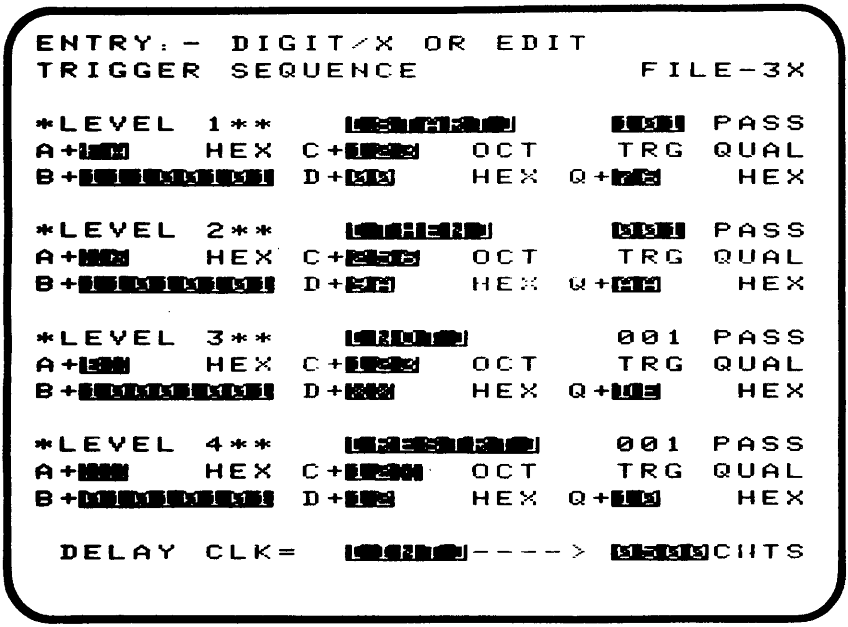


Figure 4-10: Trigger Menu Programming

4.4.4 TRIGGER DELAY

Trigger delay provides the ability to define the location of the trigger point within (or in some cases, outside) the logic analyzer memory. The PALAS 40C50's trigger delay value ranges from 0 to 5000 in 32 bit mode, 0 to 6000 in 16 bit mode.

Figure 4-11 on page 4-23 shows how data is brought into the logic analyzer memory from the right and shifted through until it exits out to the left. If no trigger delay is specified, the trigger word recognizer will be at the right side and will continuously search for the programmed trigger word. When the word is seen, the logic analyzer will stop, showing only pre-trigger data.

Trigger delay allows you to change the point where the trigger will be. If we specify the trigger delay to be 100, the trigger point will be 100 locations from the end of memory. To mathematically compute the trigger address, use the following formula.

TA = TM - TD - 1

where TA = Trigger Address
TM = Total Memory locations
TD = Trigger Delay
1 due to memory start address of 0

4.4.5 TRIGGER DELAY CLOCK

The trigger delay clock is fixed by the logic analyzer to be the same as the clock selected for sampling and can't be changed unless you are operating in the 32 bit mode and have 2 different recording clocks selected. If this is the case, then the user may select either clock to count out the trigger delay.

*** N O T E ***

The recording block memory size is actually 1024 bits per channel, however the first 24 locations are not accessable by the user. This memory is reserved for operating system use in ensuring proper triggering and location. This value is doubled when in 16 bit mode. In either case, this is important to remember, especially when sampling synchronously, with or without a trigger condition.

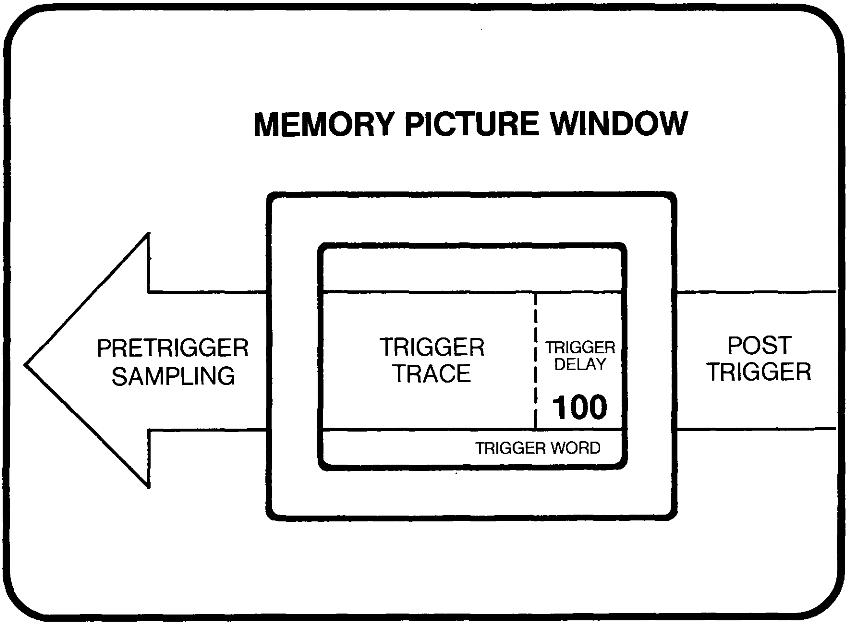


Figure 4-11: Basic Recording Rules

4.4.6 TRIGGER MONITOR

A powerful feature of the PALAS 40C50 is its Trigger Monitor. This function will let you monitor the recording process and identify any triggering problems. However, to understand the Monitor requires that you understand the recording process.

Each time a recording is made, the logic analyzer requires that enough clock pulses be provided to clock in a complete new set of data. When a recording is initiated, it must perform three basic functions called

- Pre-trigger sampling
- Trigger Trace sampling
- Trigger Delay sampling

The Pre-trigger portion of the recording process is the logic analyzer's way of insuring that enough data is brought into memory to obtain a complete new recording. The size of pre-trigger samples is determined by the logic analyzer memory size minus the programmed trigger delay (also include the 24 or 48 system locations described on page 4-23). When the pre-trigger conditions have been met, trigger control is passed on to Trigger Trace Sampling.

Trigger Trace sampling indicates that trigger control is in the hands of the trigger menu. It remains in this mode until the final event has been located, then passes control to the trigger delay counter.

Trigger Delay sampling is used to clock out the trigger delay value. Once this has been completed, the recording process stops.

To access the Trigger Monitor, a recording must be started from the trigger menu display. The Trigger Monitor will flash a message at the top of the display, indicating the current area of the recording process the analyzer happens to be in.

In addition to these flashing messages, the PALAS 40C50 will indicate the current level that has trigger control and when pass counters are used, the number of occurences will be shown as well.

*** N O T E ***

Sometimes the events may occur faster than the display can relocate the counter and thus not be displayed.

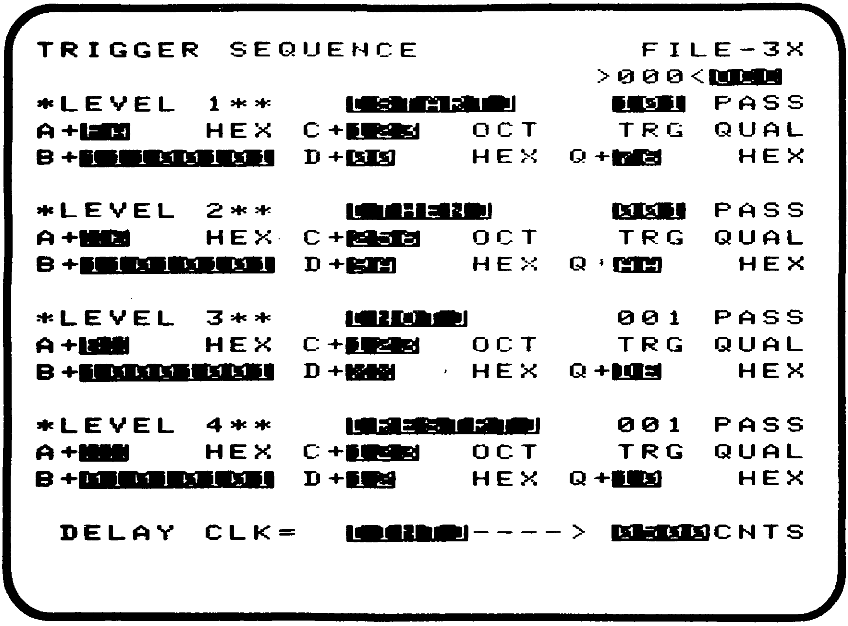


Figure 4-12: Trigger Monitor

TABLE 4-2: TRIGGER MENU OVERVIEW

ITEM NO.	FIELD HEADING	PARAMETERS	DESCRIPTION
1.	TRIGGER FUNCTION	FREE	Disables all trigger levels.
		START	Searches data for a programmed number of occurences of the specified trigger word.
		THEN	Operates same as START for levels 2, 3, and 4.
		NOT	This condition is linked to the previous trigger level. Its function is that the analyzer will only jump to the next level if the programmed Trigger Word does <u>not</u> appear immediately after the previous level. Otherwise the analyzer will jump back to trigger level 1.
		RESTART	If specified word occurs while trigger control is in level 2 or 3 a restart occurs.

TABLE 4-2: TRIGGER MENU OVERVIEW

ITEM NO.	FIELD HEADING	PARAMETERS	DESCRIPTION
2.	EVENT COUNTER	1-255	Specifies how many times trigger word must occur before trigger control is passed to the next level.
3.	TRIGGER WORD	BIN., HEX., OCT., POS. or NEG.LOGIC	40 Bit condition used by trigger function, format programmable by pod group.
4.	DELAY COUNT	0-5000 (6000 in 16 BIT)	Delays the stopping of the recording by the number of programmed clock pulses.
5.	DELAY CLK	CLK 1, CLK 2, INT	Selects the clock to be used to clock the DELAY COUNTer.

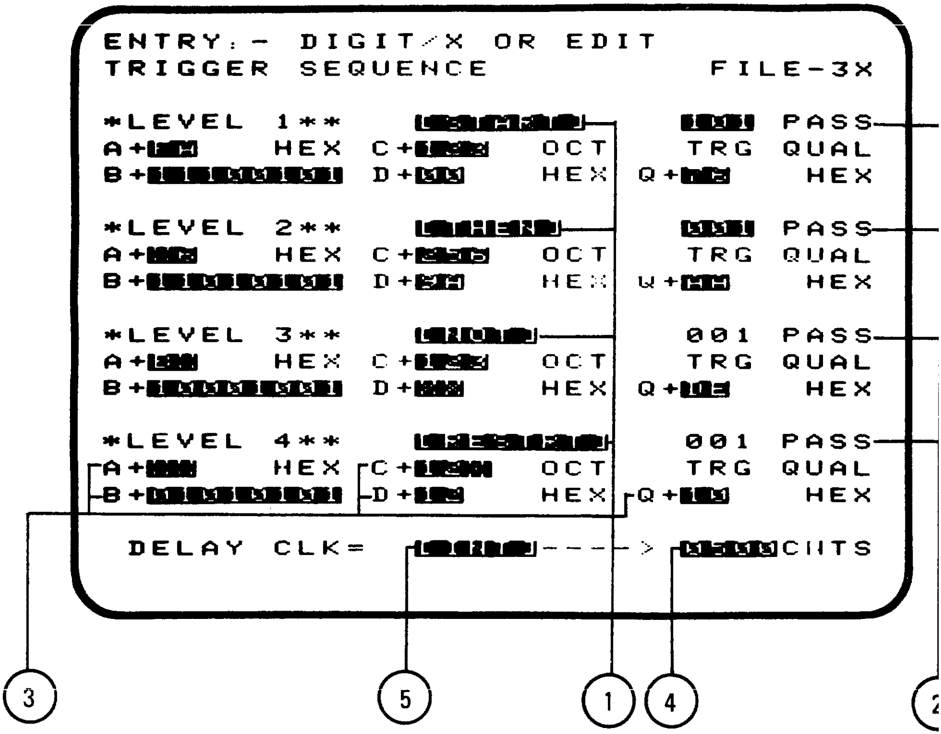


Figure 4-13: Trigger Menu

4.5 COMPARE MENU DISCRIPTION

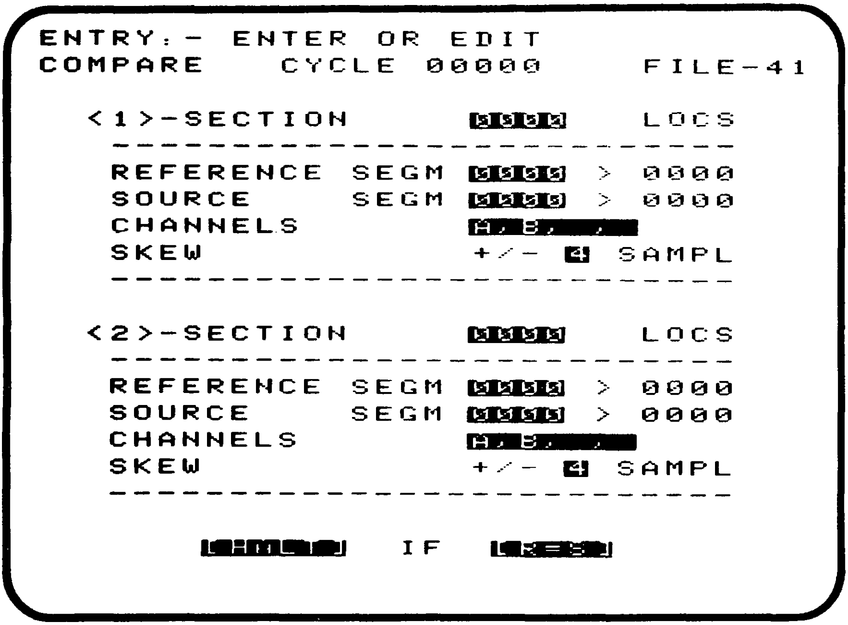


Figure 4-14: Compare Menu

The compare menu provides the means of letting the PALAS 40C50 "baby sit" your system to look for intermittent errors. This is done by taking a recording of known good data, storing it in reference memory, then making repeated new recordings and comparing them to the known good data pattern. Statistical information may be obtained by programming the compare process to count the errors and continue making recordings. The process can also be programmed to stop on the error and save the data for analysis. The compare process can only be activated with the compare menu displayed.

4.5.1 COMPARE SECTIONS

There are two programmable sections within the compare menu that can define different segments of memory for compare consideration. Each of the two sections operate identically and therefore do not require repeating of the programming instructions.

The size of the areas of memory we wish to compare are specified by entering the number of memory locations in the LOCS field for each section.

The areas selected for comparison do not need to reside in the same address ranges in both memories. Enter the first address of where the desired area resides in reference memory in the REFERENCE SEGM field. The Start address for the source memory is entered in the SOURCE SEGM field. The end address will be computed by the analyzer by adding the number of LOCS and the starting address. The sum of the start address plus the LOCS value must not exceed the total memory size. In addition, skew value must be taken into consideration (discussed in 4.5.3).

4.5.2 COMPARE CHANNELS

It is possible to mask out channels in pod groups as needed. This can be advantageous in situations where one pod group data pattern is expected to change and another group might not change. Only the groups that do not change will be included, where a compare process will stop when that fixed pattern changes.

To mask out pod groups from the compare process, move the cursor to the CHANNELS field and press "ENTER". If the pod group is to be deleted, move the flashing cursor over the desired pod charactor (A, B, etc.) and press the "OFF" key.

4.5.3 COMPARE SKEW

In some cases, skew may occur and not be considered an error. For example; a skew of +/- 1 sample may be acceptable in an asynchronous recording (due to the nature of asynchronous sampling) but constitute a failure if skew is more than 1 sample. You can program skew ranging from 0 to +/- 9 samples at each section.

It is important to remember that the skew value must be reflected in the number of locations and the start addresses for each memory. Start and end address must be specified no closer to the ends of memory than the number of skew locations programmed. If this condition does not exist an "E" will appear along the fields that need to be re-programmed.

4.5.4 COMPARE FUNCTIONS

Depending on the application, you may wish to choose between COUNT IF R <> S, COUNT IF R = S, HALT IF R <> S, or HALT IF R = S.

Count functions are useful in reliability tests and failure analysis. Halt functions are suited to intermittent failures or pattern change comparisons. In either case, a previously recorded pattern must have been stored into reference memory prior to running the compare. In the case of count functions, the second top line will indicate the number of cycles which have occurred while the counted errors are displayed next to the compare functions.

4.5.5 STARTING THE COMPARE

To start the compare process, display the compare menu and press the RUN key. If you wish to stop the compare manually, press the STOP key.

TABLE 4-3: COMPARE MENU OVERVIEW

ITEM NO.	FIELD HEADING	PARAMETERS	DESCRIPTION
1.	LOCS	0-999 (32BIT MODE) 0-1999 (16BIT MODE)	Selects window size by number of memory locations to be compared.
2.	REFEREN. SEGM	SAME AS LOCS	Specifies start address of the window in reference memory to be compared.
3.	SOURCE SEGM	SAME AS LOCS	Specifies start address of the window in source memory to be compared.
4.	CHANNELS	A,B,C,D	Specifies which channel groups are to be compared.
5.	SKEW	+/- 0-9 SAMPLES	Specifies number of memory locations data can be skewed in memory and still be compared as good.
6.	COMPARE COND.	R = S, R <>S	Specifies condition for compare process to look for.

TABLE 4-3: COMPARE MENU OVERVIEW (CONT.)

ITEM NO.	FIELD HEADING	PARAMETERS	DESCRIPTION
7.	FUNCTION	COUNT, HALT	Programs the analyzer to either count the compare condition and continue or to halt and save the recording for analysis.
8.	CYCLE	NONE	Shows total number of compare cycles performed.
9.	TRUE COUNTER	NONE	Displays total number of "true" compare conditions encountered.

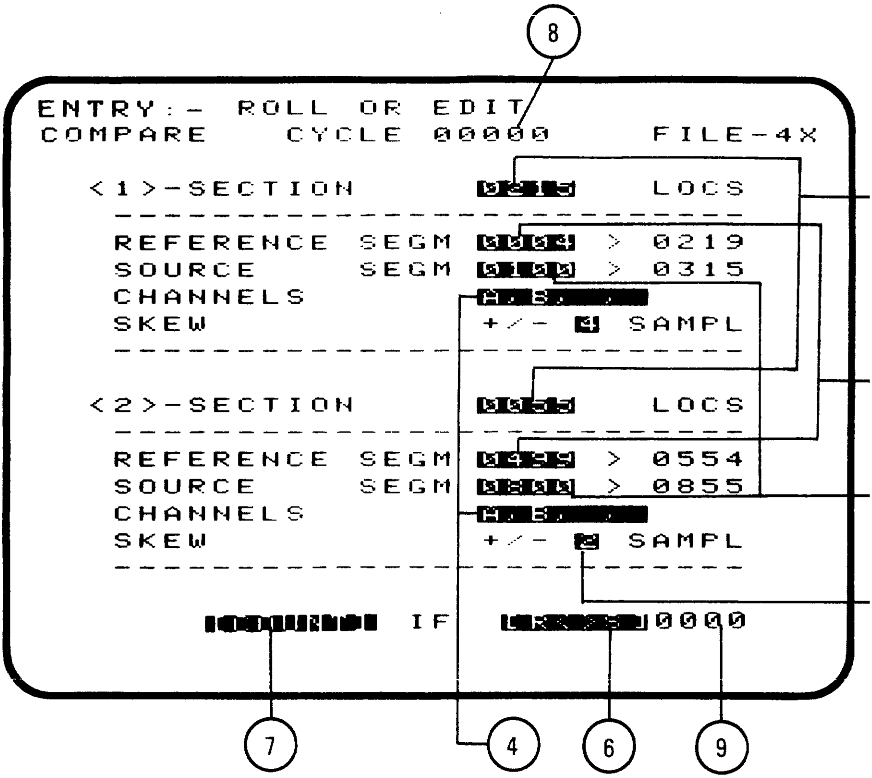


Figure 4-15: Compare Menu Elements

4.6 TIMING DIAGRAM

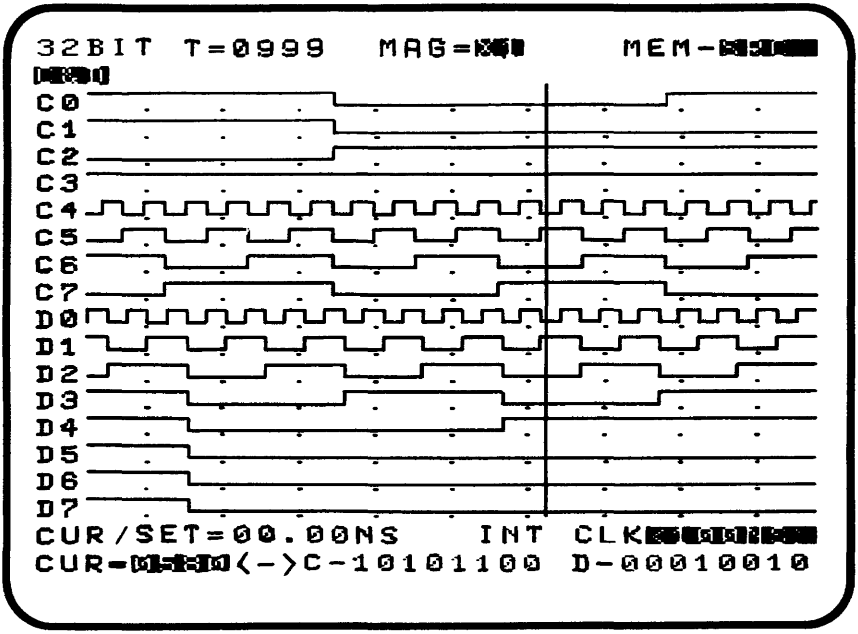


Figure 4-16: Timing Diagram

A timing diagram is an effective way of displaying data where timing and phase relationship analysis is important. Although timing displays are typically used for hardware analysis, they can be a valuable tool in software debugging.

Each timing diagram is composed of 16 data lines, divided by the separate recording memories (A&B and C&D). The timing diagram is accessed for display by pressing the TMG/MAG key in the display section of the keyboard. A binary representation of the data at the current cursor position is located at the bottom of the display. All address information displayed on the screen (cursor, trigger, etc.) is represented in decimal format to indicate memory address.

4.6.1 TIMING DISPLAY SELECTION

To access the timing diagram display, press the TMG/MAG key once (repeated pressing will magnify the timing display). In default conditions, channels A&B are displayed and are in a 16 bit mode. This is indicated by the mode shown in the top left corner of the timing diagram.

NOTE:
Before you can display all 32 channels, the analyzer must have been set to 32 bit mode AND a recording has been made.

4.6.2 TIMING MAGNIFICATION

Pressing the TMG/MAG key again after the timing diagram is displayed will show an expanded view of the same data in a magnified mode. In the 16 bit mode, the timing expansions for are X10 and X20. In the 32 bit mode, the expansions are X5 and X10.

In the X1 magnification, the whole memory is displayed. To magnify a certain area of the timing display, first move the cursor to the first cursor location you wish to magnify. Pressing the TMG/MAG key will show an expanded view of the timing diagram starting with the cursor location.

4.6.3 CHANNEL DISPLAY SELECTION

The available timing displays are in two 16 channel groups; A&B and C&D. To call up the channel changing function, press the CHAN-select key once. This will bring up a flashing cursor over the channel inputs at the top left of the display. To change to the other display, push the CHAN-select key again. To change from one timing diagram to the other, the flashing "field cursor" must be at the top of the display.

The channels may also be rearranged or deleted within their display groups. When the flashing cursor appears over the channel labels at the top left of the display, use the EDIT cursor keys to relocate the flashing cursor over the channel you wish to change or delete, then

> if you wish to change the channel, type in the pod group and the input number, e.g. "D4". You are limited to the channels within the displayed group.
>
> if you wish to delete a channel, press the DELETE key. If you wish to bring back the original channel or enter a new one, type in the pod group and input number, remembering that you are limited to the channels within the displayed group.

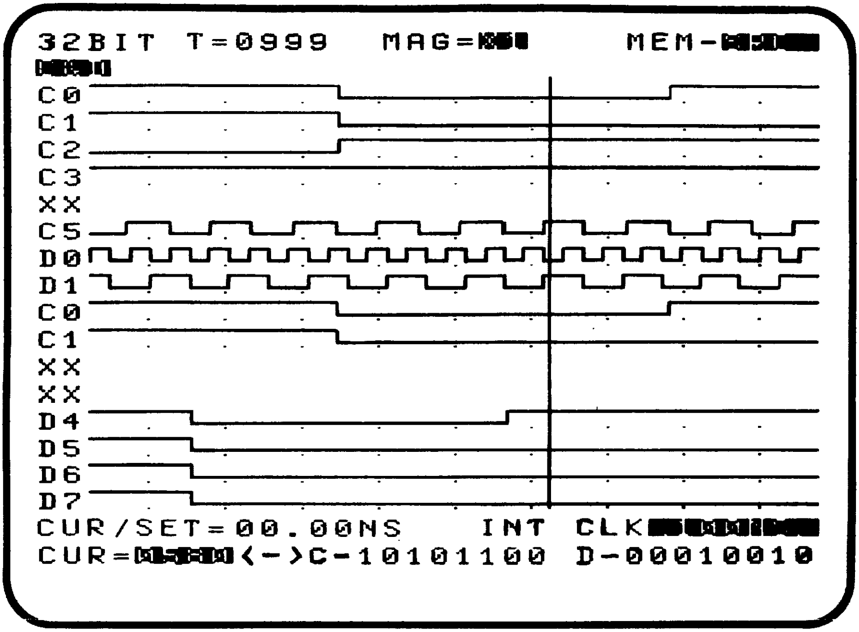


Figure 4-17: Timing Display Configuration

4.6.4 TRIGGER MARKER

When a recording is made with a trigger condition specified, the analyzer will display the trigger address and it's position in memory. On the timing diagram the trigger marker is displayed as a vertical dotted line over all data lines. The memory location where the trigger is located is displayed at the top of the screen as T=XXXX, XXXX being a decimal location.

4.6.5 TIMING CURSOR

A movable "cursor" is provided with the timing diagram to simplify the measurement of timing differences and to call up specific addresses. The timing diagram cursor is shown as a solid vertical line passing through the data lines. The present cursor location is displayed in a field at the lower left corner of the display (CUR = XXXX).

There are two ways of moving the cursor location on the display. The keys for this are located in the CURSOR section of the keyboard.

> Using the two arrow (<-, ->) keys of this section will scroll the cursor to the right and left of its present location.
>
> To move directly to a specific location, press the LOC-entry key, enter the desired address, then press the ENTER key.

In the X1 magnification, the cursor marker will scroll across the fixed display. In any of the expanded modes, the cursor is fixed at the left side of the display and the data display will scroll accordingly.

4.6.6 THE SET MARKER AND TIME MEASUREMENTS

The "SET" marker is a programmable base location from which differences to the cursor position can be measured. To change the SET location, move the cursor to where you wish the set marker to be then press the "SET" key. Now when you move the cursor away from this location, the difference between the SET and cursor positions is shown in the CUR/SET= field in the lower left corner of the display. If the recording was made with the internal time base this difference will be shown in actual time. If the recording was made with an external clock the difference will be shown as memory locations. When the cursor is moved away from the set marker the physical difference will be shown as a shade between the two points.

4.6.7 INTERNAL TIMEBASE CHANGE

If you wish to change the internal timebase sample rate, you may do so here instead of in the format menu. All you need to do is press the INCR and DECR keys to change the sample rate accordingly. This field flashes when the displayed sample rate is different from the rate used in the displayed recording.

TABLE 4-4: TIMING DIAGRAM OVERVIEW

ITEM NO.	FIELD HEADING	PARAMETERS	DESCRIPTION
1.	MAG	X1,X5, X10 (32 BIT MODE) X1,X10, X20 (16 BIT MODE)	Displays specified magnification of timing diagram. Expanded mode begins with the actual cursor location
2.	CHAN SELECT	A& B, C & D	Used for selecting between timing diagrams and for channel re-configuration.
3.	CURSOR ADDRESS	MEMORY ADDRESS	A movable pointer used for making time measurements and relocating expanded displays.
4.	RECORD. CLOCK	CLK 1, CLK 2, INT	Displays recording clock used on current recording. Programmable for displayed channel group to change clock for next recording.
5.	DATA AT CURSOR	NONE	Provides a binary read out of data at cursor location

TABLE 4-4: TIMING DIAGRAM OVERVIEW (CONT.)

ITEM NO.	FIELD HEADING	PARAMETERS	DESCRIPTION
6.	C / S	NONE	Displays difference between SET Cursor and Set point in real time if INT clock was used for recording, or in clock cycles if an external clock was used.
7.	TRIGGER	MEMORY ADDRESS	Displays location of trigger address in memory (if applicable)

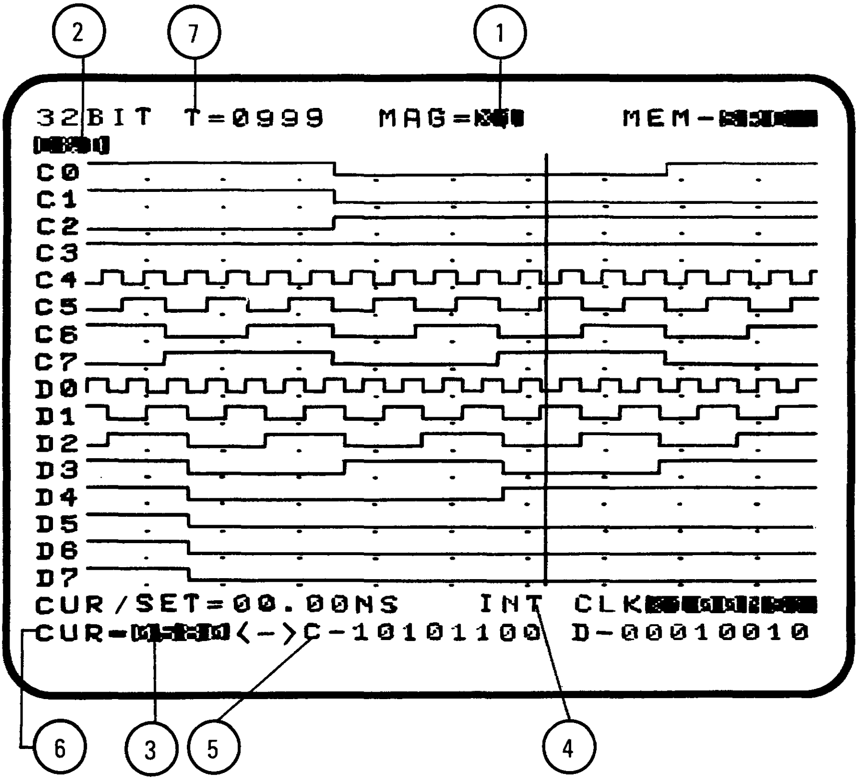


Figure 4-18: Timing Diagram Elements

4.7 DATA LIST DISPLAY

32BIT T=0099 C=S-0011 MEM-[illegible]

	C+	B+	A+	D+
SEQ	OCT	BIN	AS	BIN
0094	337	11110100	&	00000000
0095	337	11110101	'	00000000
0096	337	11110110	(	00000000
0097	337	11110111	(	00000000
0098	337	11111000	)	00000000
[illegible]	340	11111000	*	00000000
0100	340	11111001	+	00000000
0101	340	11111010	+	00000000
0102	340	11111011	,	00000000
0103	340	11111011	-	00000000
0104	340	11111100	.	00000000
0105	340	11111101	.	00000000
0106	340	11111110	/	00000000
0107	341	11111111	0	00000000
0108	341	11111111	1	00000000
0109	341	00000000	2	00000000

Figure 4-19: Data List Display

When recording data from microprocessor designs or synchronous environments, it is often more practical to display it in a state listing, or as it is referred by the PALAS 40C50, a data list. Typically these events can be translated and understood better in numeric form, usually in Hex, ASCII, Octal or Binary.

The PALAS 40C50's Data List can display the pod group data in a variety of bases and polarities. The standard arrangement can be used or the list can be tailored to your analysis requirements. Full cursor control and trigger location are provided in the data list.

4.7.1 DATA LIST CONFIGURATION

The Data List can be configured in a variety of ways, allowing you to define the display as you wish. Besides displaying pods in Binary, Hex, Octal and ASCII, you can arrange the way you wish the pod groups to appear as well as delete pod groups. If the headings take up less than half the screen, the list will double up and show twice the number of locations.

To add a new heading to the list,

Press the Pod Group key, A,B,C or D

Press the Base key, BIN, HEX, OCT or ASCII

Press the Polarity key POS or NEG

Then press the ENTER key

The new heading is appended to the right side of the display. As more are added, those on the left edge will eventually scroll off the display.

NOTE

Channel groups C and D cannot be called to the display unless the unit is in 32 bit mode and a recording has been made.

To delete a pod group, simply type in the Pod group key for the pod you wish to delete and press the DELETE key. All headings under that pod group are removed.

4.7.2 EDITING THE LIST HEADINGS

To edit the current display, press the CHAN-select key. A flashing arrow ">" will appear next to the first heading. You can move the arrow by using the edit cursor keys <- & -> to the heading you wish to edit. Only the defined pod and the polarity can be changed e.g. A+HX to B-HX. Pod base cannot be changed.

To exit from the editing mode, simply press the LIST -entry key.

If you wish to delete a specific heading, move the arrow to that heading then press the DELETE key. The heading is removed and all others to the right shift over.

```
32BIT  T=XXXX  C=S+0000      MEM-[illegible]
      >C+   B+          A+  D+
SEQ    OCT  BIN         AS  BIN

0000   104  10011001    EQ  00000000
0001   105  10011010    AK  00000000
0002   105  10011011    EQ  00000000
0003   105  10011011    BL  00000000
0004   105  10011100    BS  00000000
0005   105  10011101    HT  00000000
0006   105  10011110    LF  00000000
0007   105  10011110    LF  00000000
0008   105  10011111    VT  00000000
0009   105  10100000    FF  00000000
0010   106  10100001    CR  00000000
0011   106  10100010    CR  00000000
0012   106  10100010    SO  00000000
0013   106  10100011    SI  00000000
0014   106  10100100    DL  00000000
0015   106  10100101    DL  00000000
```

Figure 4-20: Editing the Data List

4.7.3 CURSOR CONTROL

The cursor designates the first memory location to be displayed in the list display. The address appears in inverse video at the top of the listing. There are different methods for changing the start of the list display. One method is by using the right and left arrow keys in the cursor section of the keyboard. The left arrow causes the first displayed address to decrement and the right arrow causes it to increment.

To move the cursor directly to a desired memory location,

> press the LOC-entry key, (this will cause the first character of the cursor field to start blinking),
>
> enter the desired address into this field using the numeric keys on the keyboard
>
> and then press the ENTER key.

Now it can be seen that the first address displayed is the one you specified.

4.7.4 TRIGGER MARKER

When a recording is made with a trigger condition specified, the unit will display a trigger marker in the data list. It will appear as the word "TRIG" in inverse video in place of the address. The address where the trigger is located in memory is shown at the top of the display as T=XXXX, XXXX being the address in memory where the trigger is located.

4.7.5 THE CURSOR SET MARKER

The "SET" marker is a programmable base location from which differences to the cursor location can be measured. The set marker location will be displayed as a small inverse video "s" next to the address where it is located.

On power-up the set marker is set to memory address 0000. To change the location of the set marker, move the cursor to the desired location then press the SET key on the keyboard and the set marker is relocated.

When the cursor is moved away from the set marker, the difference between the two will be shown at the top of the display. The format is C=S +/- XXXX, XXXX being the number of memory locations difference.

```
32BIT  T=0099  C=S-0011          MEM-[illegible]
       C+    B+                A+   D+
SEQ    OCT   BIN               AS   BIN

[illegible] 337   11110100          &    00000000
0095   337   11110101          '    00000000
0096   337   11110110          (    00000000
0097   337   11110111          (    00000000
0098   337   11111000          )    00000000
[illegible] 340   11111000          *    00000000
0100   340   11111001          +    00000000
0101   340   11111010          +    00000000
0102   340   11111011          ,    00000000
0103   340   11111011          -    00000000
0104   340   11111100          .    00000000
0105s  340   11111101          .    00000000
0106   340   11111110          /    00000000
0107   341   11111111          0    00000000
0108   341   11111111          1    00000000
0109   341   00000000          2    00000000
```

Figure 4-21: Cursor and Setmarker in the Data List

*** N O T E S ***

TABLE 4-5: DATA LIST DISPLAY OVERVIEW

ITEM NO.	FIELD HEADING	PARAMETERS	DESCRIPTION
1.	CURSOR ADDRESS	MEMORY ADDRESS	A user specified location of the cursor. Selects list window over desired area of memory.
2.	SET MARKER	MEMORY ADDRESS	A user specified location from which clock cycle measurements can be made.
3.	CURS= SET	NONE	Displays difference between Cursor and Set point.
4.	CHANNEL SELECT	A,B,C,D, + / -	A relocatable pointer used in changing the currently configured list display by channel groups, logic polarity and deleting.
5.	CHANNEL ADDING	A,B,C,D, + / -, HEX, BINARY, OCTAL, ASCII	Adds channel groups to the right side of the display by pressing the keys for desired pod, polarity, and logic type.
6.	TRIGGER MARKER	MEMORY ADDRESS	Displays current trigger address in memory.

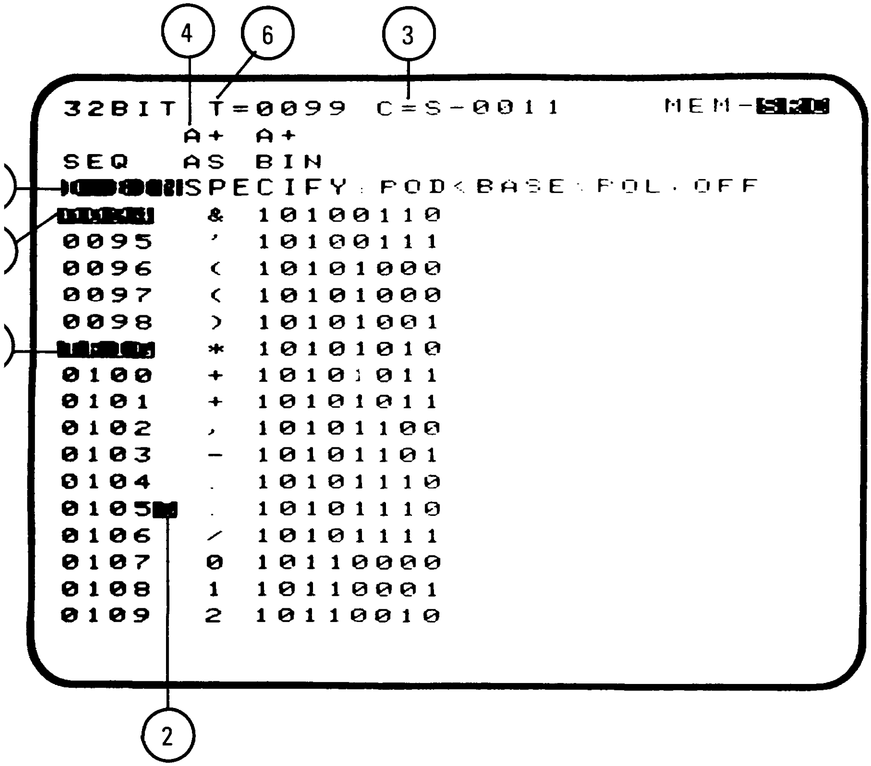


Figure 4-22: Data List Elements

4.8 MEMORY FUNCTIONS

When a recording is made, it is stored in a memory called "SOURCE" memory. Each new recording is written over the previous recording in SOURCE memory. When a recording has been made, and the data has been verified to be "good", we can store this recording into a separate memory in the analyzer called "REFERENCE" memory and use it for analysis later.
Memory functions can only be accessed while a type of data display is on the screen (list, timing diagram, or disassembler display.

The upper right corner of the data display shows the memory function currently in operation, e.g., MEM-SRC. The 5 memory functions available are selected by pressing the MEM-select key until the desired function appears. When the desired memory function is displayed, press the EXECUTE key to put that function into operation. The memory functions with their operations are:

SRC: causes display of source data.

REF: causes display of reference data (not available on timing diagram)

S+R: causes display of source data with any differences from reference shown in inverse video (not available on disassembler display)

R+S: causes display of reference data with differences from source shown in inverse video (not available on timing diagram or disassembler display)

S->R: causes transfer of source data to reference memory.

TABLE 4-6: MEMORY FUNCTION OVERVIEW

ITEM NO.	FIELD HEADING	PARAMETERS	DESCRIPTION
1.	MEM	SRC	Displays source memory.
		REF	Displays reference memory.
		S + R	Displays source memory with any differences from reference shown in inverse video.
		R + S	Displays reference memory with any differences from source shown in inverse video.
		S -> R	Copies data from source memory into reference memory.

```
16BIT  T=XXXX  C=S+0000        MEM-BRD
        A+   B+                  A+   B+
SEQ     HX   HX          SEQ     HX   HX

0000    00   00          0016    00   00
0001    00   00          0017    00   00
0002    00   00          0018    00   00
0003    00   00          0019    00   00
0004    00   00          0020    00   00
0005    00   00          0021    00   00
0006    00   00          0022    00   00
0007    00   00          0023    00   00
0008    00   00          0024    00   00
0009    00   00          0025    00   00
0010    00   00          0026    00   00
0011    00   00          0027    00   00
0012    00   00          0028    00   00
0013    00   00          0029    00   00
0014    00   00          0030    00   00
0015    00   00          0031    00   00
```

Figure 4-23: Memory Functions

4.9 SEARCH FUNCTIONS

After making a recording, it would be a very tedious procedure to scroll the cursor through memory looking for a specific event or condition. To aid the user in this type of endeaver, special search functions have been built into the PALAS 40C50, available for use when the list or timing diagram is displayed.

To select the search functions, press the SEARCH key until the desired search function appears. To execute the search function press the EXECUTE key.

4.9.1 SEARCH FOR S=R, S<>R

Search capabilities will allow you to search for matched or mismatched data between source and reference memory. The headings are defined as

S=R: Source equals Reference
S<>R: Source does not equal Reference

By executing the search function S<>R, the PALAS 40C50 searches for all occurences where data is different in both memories. When the process is complete a total number of true locations will appear in the upper right section of the display.

The cursor will move to the next address where there is a difference. Continued pressing of the EXECUTE key will continue moving the cursor to the next location. If there are blocks of different data, the cursor will be placed at the beginning and the end of each block. It is advisable to program the memory select function for S+R so that differences are easily recognized.

S=R operates identically as S<>R except it searches for matched conditions.

```
32BIT  T=0099  C=S-0011    SRCH-[illegible]
        A+  A+
SEQ     AS  BIN
                              TOTAL=0996
[illegible]  &  10100110
0095    '   10100111
0096    (   10101000
0097    (   10101000
0098    )   10101001
[illegible]  *  10101010
0100    +   10101011
0101    +   10101011
0102    ,   10101100
0103    -   10101101
0104    .   10101110
0105    .   10101110
0106    /   10101111
0107    0   10110000
0108    1   10110001
0109    2   10110010
```

Figure 4-24: Search Functions

4.9.2 WORD SEARCH

The WORD search function searches through memory for a specified word. Upon specifying the WORD function in the list mode, an extra line appears over the data columns with the title "WORD". A flashing cursor indicates which portion of the specified word may be programmed.

Programming of the WORD is done with the front panel keyboard in the format that the data column is displayed in (hex, binary, etc.). When the word is specified, press the EXECUTE key and it will begin the search function.

When the search is finished, a total number of times the word was found in memory is displayed in the upper right portion of the display. The cursor will shift to the first event of the word that was found. Subsequent pressing of the EXECUTE key will continue to shift the cursor to the next address location where the word was found. If there are blocks of the same word , the cursor will be placed at the beginning and the end of each block. The word search function can be executed on either source or reference memory depending on which memory is displayed.

The WORD search function on the timing diagram functions in a slightly different manner than in the list mode. In the timing diagram mode, reference memory can not be searched. The search word can only be specified for the timing diagram displayed (A & B or C & D). When the SEARCH WORD function is called up by pressing the SEARCH key, the physical labels (A0, A1, etc.) are replaced with "WX" 's. A flashing cursor will appear over the first programmable X. Each bit of the search word can be programmed as a 0, 1, or X (don't care).

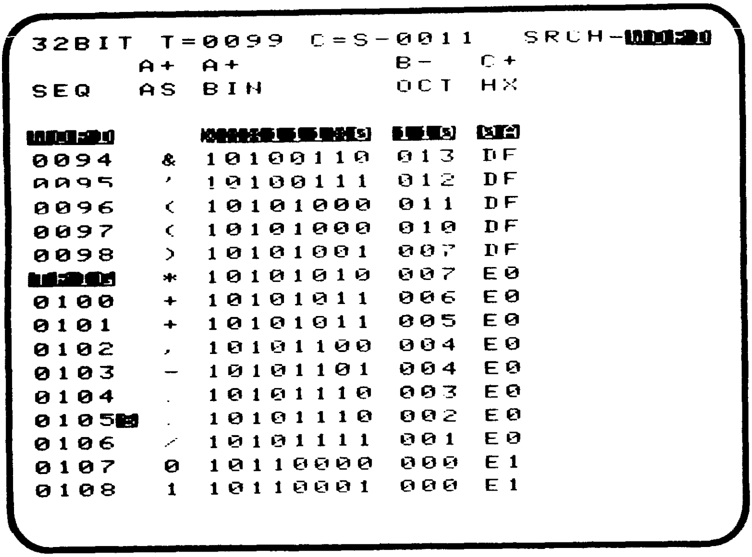


Figure 4-25: Word Search in Data List

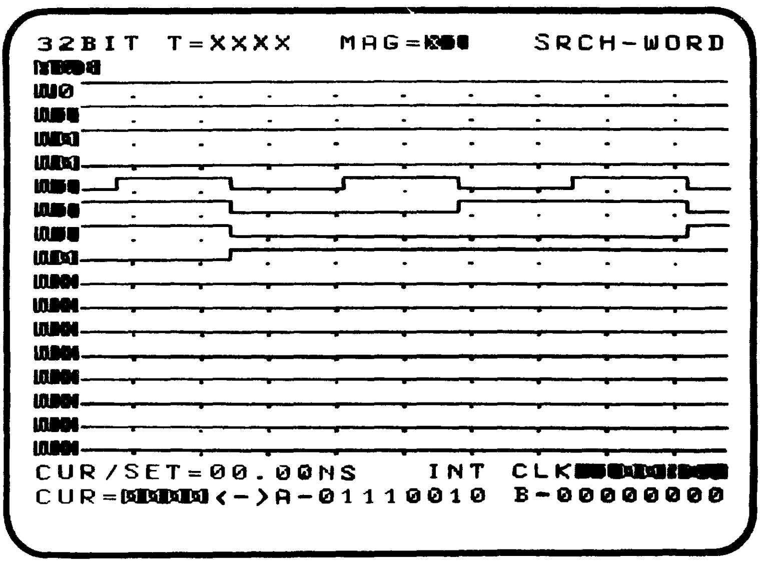


Figure 4-26: Word Search in Timing Diagram

TABLE 4-7: SEARCH FUNCTION OVERVIEW

ITEM NO.	FIELD HEADING	PARAMETERS	DESCRIPTION
1.	SEARCH	S = R	Searches through the displayed memory (SRC or REF) for conditions that are equal in both memories.
		S <> R	Searches through the displayed memory (SRC or REF) for conditions that are not equal in both memories.
		WORD	Searches through the displayed memory for the word specified at the top of the display (List Display, SRC- or REF-Memory) or at the left of the display (Timing Diagram, only SRC-Memory).

4.10 SCRATCH MEMORY

In applications where the same tests are repeated every day, it would not be efficient to have to spend a lot of time setting up the logic analyzer for each test. For this reason the PALAS 40C50 has been supplied with a Nonvolatile RAM memory to store these setups.

The RAM memory is a battery backed CMOS type called SCRATCH memory (like a scratch pad used for writing down setups). It is capable of storing 6 complete machine set-ups including data display formats and search functions. The battery will hold all programmed files for up to 3 months without power being applied to the unit.

SCRATCH TABLE

SPEC. FILE NR(1-6).EDIT.EXECUTE

	STORE	RECALL
ALL STATES	1	1
FORMAT SPEC	2	2
TRIGGER SPEC	3	3
COMPARE SPEC	4	4
TIMING SET UP	5	5
LIST SET UP	6	6
SEARCH WORD	7	7

Figure 4-27: Scratch Menu

4.10.1 SCRATCH STORAGE AND RECALL

To use the SCRATCH memory press the SAVE key on the keyboard. When the Scratch table is displayed you will see categories for each of the menus and displays, including one that says ALL STATES.

To store a setup in Scratch, whether it be an individual menu or a complete setup, simply

> press the SAVE key and the SCRATCH menu is displayed
>
> move the edit cursor to the desired menu category or the ALL STATES for a complete setup store under the STORE column
>
> enter in a file number from 1 to 6 (choose a file not previously used or needed)
>
> then press the EXECUTE key

The setup or setups are now stored in the specified file. The file number will be incremented automatically.

To recall an individual setup or a complete setup, perform the same steps except enter the file number under the RECALL column.

When menus have been recalled from the Scratch table, a file number is assigned at the top of the corresponding setup menus. It looks like

FILE - XY

where X = the corresponding menu number shown in the Scratch Table
Y = the file number from 1 to 6

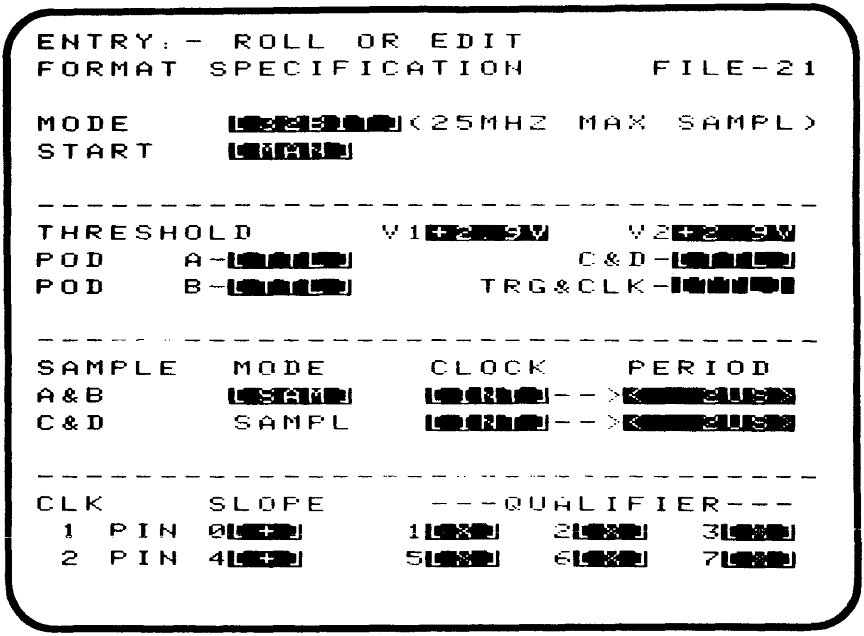


Figure 4-28: This Setup is stored in the Scratch Memory

TABLE 4-8: SCRATCH FUNCTION OVERVIEW

ITEM NO.	FIELD HEADING	PARAMETERS	DESCRIPTION
1.	STORE	FILES 1 - 6	Stores machine set-ups as complete machine set-ups (ALL STATES) or as individual menu set-ups. These files are stored by their file number (1-6).
2.	RECALL	FILES 1 - 6	Recalls machine set-ups as complete machine set-ups (ALL STATES) or as individual menu set-ups. These files are recalled by their file number (1-6).

SCRATCH TABLE

SPEC. FILE NR(1-6),EDIT,EXECUTE

	STORE	RECALL
ALL STATES	1	1
FORMAT SPEC	2	2
TRIGGER SPEC	3	3
COMPARE SPEC	4	4
TIMING SET UP	5	5
LIST SET UP	6	6
SEARCH WORD	7	7

Figure 4-29: Scratch Handling

*** N O T E S ***

4.11 OPTION DISPLAYS

Dolch offers a variety of dedicated Personality Probes, Trace Modules, Bus Analyzer Probes and High Speed Recording Modules for the PALAS 40C50 that are supplied with disassembler firmware. These options greatly simplify microprocessor and bus analysis by providing 100% mnemonic disassembly.

Disassemblers are located in PROMS and are usually installed in the PALAS 40C50 at the factory. Up to two sets of option/disassembler software can be installed in PROM banks and are called Option 1 and Option 2.

To access the option/disassembler firmware, assuming that a proper recording using the corresponding probe or module has been made,

Press the LIST key

Press the DIS/OPT 1 or DIS/OPT 2 key, depending on the disassembler's location

The display will show the recorded data in mnemonics. You have full cursor and set point control.

The users manuals for the Personality Probes, Trace Modules, Bus Analyzers and High Speed Recording Modules provide more detail than found here. Refer to the manual for probe and menu setups, connections and reference material.

Section 5

SECTION 5 - RS-232-C REMOTE CONTROL INSTRUCTION SET

FOREWORD

All functions described in this documentation have been tested carefully and should react at your instrument in the same manner. Proper function can be guaranteed only when using the following software revision (or better ones): !?!

Main Software Revision: 4 A

If your instrument does not operate in the described way and/or you have a software revision level earlier than described above, please contact Dolch Logic Instruments Application Department or your local dealer. Please use also the "Reader's Comment Form" supplied at the end of this manual to report any detected error in this documentation.

Any function not mentioned in this documentation has to be assumed as not implemented and is therefore not covered by our terms of warranty.

REMOTE INTERFACE

This section describes the remote interface commands and programming guides for the RS-232 of the PALAS 40C50 logic analyzer. These commands and the interfaces will allow you to automate your testing by providing full control of the analyzer or producing hardcopy of data lists for reference.

The serial interface provides the simplest and most universal communications between the PALAS 40C50 and a wide range of computer peripherals. The pinouts and voltage levels are as defined in IEC NORM V24/V28 (US RS232C) which provides an interface standard between a wide variety of terminals, peripherals and computers.

5.1 STANDARD RS-232-C INSTALLATION

The standard RS-232-C is a simple 3 wire connection without hardware and software handshake. This interface is designed for use with a terminal to provide printouts and simple programming of the Analyzer from the terminal keyboard. To configure the Analyzer and terminal for standard RS-232-C communications, perform the following steps:

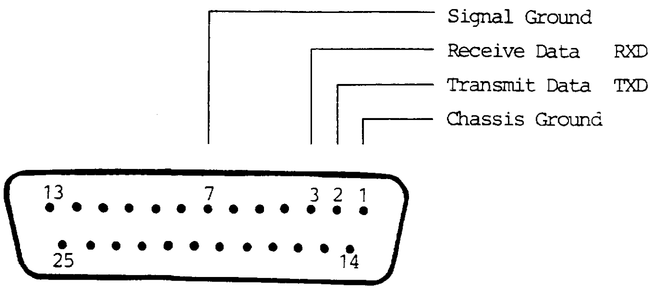


Figure 5-1: Standard RS-232-C Pinout

Connect the Analyzer and the terminal using the RS-232-C ports. Because the Analyzer can act as a DTE (Data Terminal Equipment), pin 2 of the Analyzer must be connected to pin 3 of the terminal. Pin 3 of the Analyzer must be connected to pin 2. See Figure 5-2 below for connections.

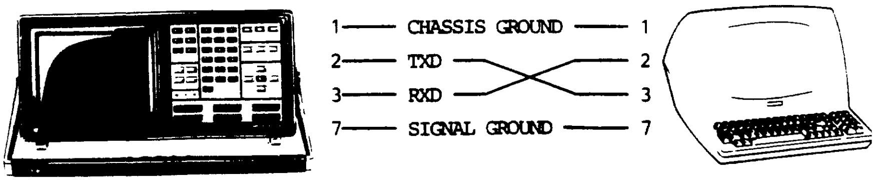


Figure 5-2: Line Connection Example

5.2 TERMINAL SET UP

Baud Rate:	110 or 300
Data Bits:	8 (including Parity Bit)
Start Bits:	1
Stop Bits:	2
Parity:	No (Parity Bit low)
Mode:	Full Duplex

Logic "1"	- 3 V to - 12 V
Logic "0"	+ 3 V to + 12 V

NOTE:
To establish remote control over the PALAS 40C50 it is first of all necessary to program in the TRACE MENU the START condition to REM (Remote).

[REM]

```
MP TR
ENTRY:- ROLL OR EDIT
FORMAT SPECIFICATION        FILE-2x

MODE      [16BIT](50MHZ MAX SAMPL)
START     [REM]

---------------------------------
THRESHOLD       V1+2.9V    V2+2.9V
POD    A-[TTL]            C&D- OFF
POD    B-[TTL]        TRG&CLK-[TTL]

---------------------------------
SAMPLE   MODE      CLOCK    PERIOD
A&B      [SAM]     [INT]--->< 50NS>
C&D      SAMPL

---------------------------------
CLK     SLOPE      ---QUALIFIER---
 1 PIN  0[+]      1[X]   2[X]   3[X]
 2 PIN  4[+]      5[X]   6[X]   7[X]
```

Figure 5-3: Trace Menu Display

5.3 PROGRAMMING RULES

Valid alphanumeric characters are all upper case letters and numbers 0 through 9. Valid symbols are

/ ^ # % , & ! ? .

A programming statement consists of a maximum of 500 alphanumerics and symbols followed by an execution character. All programming specifications must be separated by one character space.

After selection of a programming group by M (X) X is a menue setup specification, the Analyzer will remain in the selected menue until a further menue specification M (X) is executed or if programming errors occur. This does not apply to transmit (MX) or printout (MP) commands.

The symbols are always in effect (menue independent) unless otherwise specified. This is an especially important point to remember. There is no default to a neutral parameter.

Note:

In the programming structures, the six characters "(", ")", "<", ">", "_", and "," are not part of the command. Also, where the format (N1, N2 ...) is used, the comma is not part of the command unless otherwise specified.

The programming format (N1, N2 ... Nn) specifies that there must be n entries for this field.

The programming format (N1-Nn) specifies that there can be up to n entries for this field.

The programming format (N) specifies that there can be only one entry for this field.

TABLE 5-1: IMMEDIATE COMMANDS

Symbol	Command	Description
% CHR$(37)	HALT RECORDING	Stops a recording or compare process in progress, whether initiated manually or through programming.
/ CHR$(47)	DELETE	Delete last character from string buffer.
^ CHR$(94)	BACKUP DISPLAY	Selects and displays the previous location of a data list for the "MP C" command.
<cr> CHR$(13)	EXECUTE	Execute command string from the beginning of the command buffer.
. CHR$(46)	STOP SENDING	Stops data transfer from Logic Analyzer

TABLE 5-2: SUPERVISOR COMMANDS		
Symbol	**Command**	**Description**
&(N)	MEMORY SELECT	This command selects either the source or reference memory for the data transfer or selected display. It can also transfer data from source to reference memory and display high-lighted memory differences.
	(N) = S	Source memory selected.
	= R	Reference memory selected.
	= T	Transfer source to reference memory.
	= X	Displays highlighted differences (S + R or R + S), depending on whether source or reference was last selected. Default value is source data. Once a memory selection has been made it will remain in effect until changed or a power-up reset occurs.

TABLE 5-2: SUPERVISOR COMMANDS (cont.)

Symbol	Command	Description
!(N1)		This command selects how data will be transmitted and the final termination character for that transmission.
	(N1) = 1	: Block transmission mode
	= 2	: Special Commodore PET mode
	= 3	: Standard GPIB mode
	= 4	: HP(Hewlett Packard) transmission mode
?	START RECORDING	This command selects the recording process and starts it.
?	START COMPARE	This command starts also the compare process. But only if the compare menu is on the display.

TABLE 5-3: SPECIAL INTERFACE COMMANDS

Symbol	Command	Description
#(N)	Display Update ON/OFF	Used to enable or disable the PALAS 40C50 display update.
	(N) = 0	Update OFF
	= 1	Update ON

5.4 TRANSMISSION FORMAT

Before the data or setup string transmission command MX is sent, the user can select up to four different types of transmission formats. Once a transmission mode command is sent, the transmission mode and final termination character will remain in effect until changed or a power up reset occurs. For definition of transmission format use the

command: **!(N)<cr>**

(N1) = 1 Block transmission mode

= 2 Commodore Pet mode

= 3 Line transmission mode (with carriage return/line feed)

= 4 Line transmission mode (only carriage return)

NOTE:

Any string received can be sent back to the Logic Analyzer in the same format unless the transmission format has been changed meanwhile. The terminating character has to be the execution character "<cr>" if a string is sent back to the Logic Analyzer.

5.4.1 TRANSMISSION FORMAT DESCRIPTION

Mode 1

(<:> <START BLOCK> <:> <DATA>...<:> <END BLOCK>)

Mode 2

(<S> <START BLOCK> <CR> <S> <DATA> <CR>...<S>
<END BLOCK>)

Mode 3

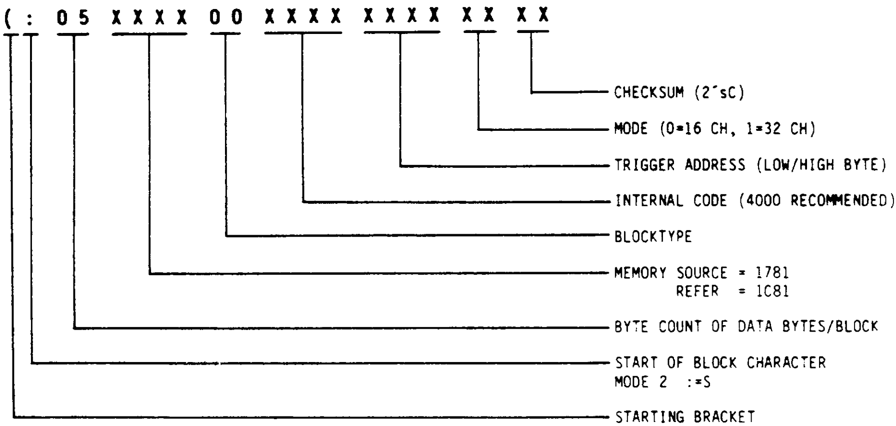
(<:> <START BLOCK> <CR> <LF> <:> <DATA> <CR>
<LF>...<:> <END BLOCK> <CR> <LF>)

Mode 4

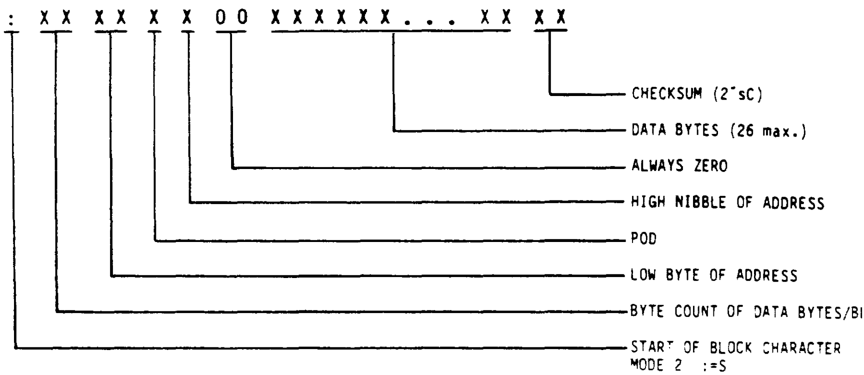
(<:> <START BLOCK> <CR> <:> <DATA> <CR>...<:>
<END BLOCK> <CR>)

5.4.2 DATA BLOCK DEFINITION

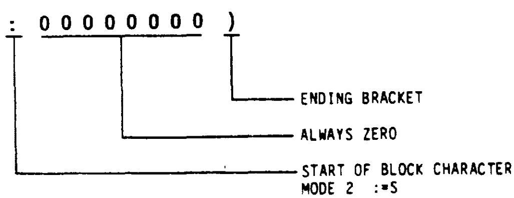
Start Block



Data Block



End Block



5.4.3 DATA TRANSFER COMMAND

For printout of the reloadable Data in string format, use the

command: **MX_P(N1-N4)_S(XXXX)_E(YYYY)<cr>**
MP_BS<cr>

(N1) = Pod A
(N2) = Pod B
(N3) = Pod C
(N4) = Pod D

S(XXXX) = Start address 4 digit
E(YYYY) = End address 4 digit
Range 0000 thru 0999 (32 bit mode)
Range 0000 thru 1999 (16 bit interlace mode)

MP_BS = Print Transmit Buffer

Example:

Command: **MX_PABCD_S0_E10<cr>**
MP_BS<cr>

Result:

```
(:05178100FD7E0500017F
:0B001000FDFEFEFF00010202030405F7
:0B002000000000000000000000000000
:0B003000000000000000000000000000
:0B004000000000000000000000000000
:00000000)
END
```

NOTE:

An initial recording has to be performed, before data can be read out.

5.5 TRACE MENU PROGRAMMING

Trace Menu Display

```
MP TR
ENTRY:- ROLL OR EDIT
FORMAT SPECIFICATION        FILE-2X

MODE      [16BIT](50MHZ MAX SAMPL)
START     [REM]

---------------------------------
THRESHOLD        V1+2.9V   V2+2.9V
POD    A-[TTL]           C&D- OFF
POD    B-[TTL]       TRG&CLK-[TTL]

---------------------------------
SAMPLE   MODE      CLOCK    PERIOD
A&B      [SAM]     [INT]--->< 50NS>
C&D      SAMPL

---------------------------------
CLK     SLOPE     ---QUALIFIER---
 1 PIN 0[+]      1[X]  2[X]  3[X]
 2 PIN 4[+]      5[X]  6[X]  7[X]
```

Figure 5-4: Trace Menu

To call up the menu on the PALAS 40C50-screen, use the command: **MR<cr>**

Trace Menu Printout

To call up the menu on the Terminal-screen, use the

command: **MP_TR<cr>**

Trace Menu Command-String Printout

For printout of the reloadable command-string format, use the

command: **MX_R<cr>**
MP_BS<cr>

result: MR SO G2 RO PA LT CI IS PB LT PC LT CI PQ LT F01 Q1X Q2X Q3X Q5X Q6X Q7X E1+ E2+ T1+29 T2+29 END

5.5.1 TRACE MENU PROGRAMMING SYNTAX

Trace (Format) menu programming command strings are initiated by the

command: **MR**_

and are followed by the commands below. These commands allow full programmability of the trace menu. Any field left unprogrammed will result in a previously stored or default parameter left in that field. The commands must be separated by a <space>. The command string is executed by the execution character <cr>.

Analyzer Sequence Field S (N)

Sets the analyzer in a 16 channel or 32 channel mode.

(N) = 0   16 bit mode (2K format)
    = 1   32 bit mode (1K format)

Start Field G (N)

Sets the analyzer in a manual start or repeat mode.

(N) = 0   Manual
    = 1   Repeat

In addition to the repeat command is the repetition rate R (N):

(N) = 0 thru 9 (time in seconds)

Internal Clock Field F (N)

Programs the internal clock rate.

(N) = 00	20 nanoseconds	(Only in 16 bit mode)
= 01	50 nanoseconds	
= 02	100 nanoseconds	
= 03	200 nanoseconds	
= 04	500 nanoseconds	
= 05	1 microsecond	
= 06	2 microseconds	
= 07	5 microseconds	
= 08	10 microseconds	
= 09	20 microseconds	
= 10	50 microseconds	
= 11	100 microseconds	
= 12	200 microseconds	
= 13	500 microseconds	
= 14	1 millisecond	
= 15	2 milliseconds	
= 16	5 milliseconds	
= 17	10 milliseconds	
= 18	20 milliseconds	
= 19	50 milliseconds	
= 20	100 milliseconds	
= 21	200 milliseconds	
= 22	500 milliseconds	

NOTE:
Programming the clock rate to 20 nanoseconds without being in 16-Bit Mode is an illegal entry.

Pod Selection P (N)

Pod Selection is used to prepare the analyzer for programming of Threshold, Input and Clock Select fields.

(N)	= A	Pod A
	= B	Pod B
	= C	Pod C & D
	= Q	Pods Clock & Qualifiers

The commands L (N), I (N) and C (N) must have a preceding P (N) definition.

Threshold Level Field L (N)

Selects the Threshold level for a previously specified pod group, therefore it must follow a pod selection command. Order is independent from the Input and Clock Select fields.

(N)	= T	TTL at 1.4 V (preset)
	= E	ECL at -1.3 V (preset)
	= 1	V1 See Variable Threshold Field
	= 2	V2 See Variable Threshold Field

Input Field I (N)

Used only on pods A & B. Sets pods in either sample or latch mode. Must follow a Pod Selection command PA or PB. Order independent from the Threshold field and Clock fields.

(N)	= S	Sample Mode (default)
	= L	Latch Mode

Clock Field C (N)

Selects the clock scheme for a previously specified pod group, therefore it must follow a Pod Selection command. Order is independent from the Threshold field and Input field.

```
(N) = I Internal clock
    = 1 External clock 1
    = 2 External clock 2
```

Qualifier Fields Q(N1N2)

Used to program the clock qualifier fields.

```
Q(N1N2)
     N1 = 1   Qualifier at ALP pin 1
     N1 = 2   Qualifier at ALP pin 2
     N1 = 3   Qualifier at ALP pin 3
     N1 = 5   Qualifier at ALP pin 5
     N1 = 6   Qualifier at ALP pin 6
     N1 = 7   Qualifier at ALP pin 7

     N2 = H   Active high "1"
     N2 = L   Active low "0"
     N2 = X   Don't care
```

Clock Edge Field E(N1N2)

Used to program the active external clock edge or slope.

E(N1N2)

N1 = 1	External clock 1
N1 = 2	External clock 2
N2 = +	Rising edge
N2 = -	Falling edge

Variable Threshold Field T(N1N2N3)

Programs the variable thresholds for fields V1 and V2.

T(N1N2N3)

N1 = 1	Selects V1 field
N1 = 2	Selects V2 field
N2 = +	Positive voltage
N2 = -	Negative voltage
N3 =	00 to 99 for 0 to 9.9 volts in 0.1 volt increments. Must always specify 2 digits.

5.5.2 TRACE MENU PROGRAMMING EXAMPLE

1. Program the trace menu to clock at 20 ns in latch mode.

   MR_SO_PA_IL_FOO_<cr>

2. Program the trace menu as shown in Figure 5-5.

```
MR SO PA IL FOO
MP TR
ENTRY:- ROLL OR EDIT
FORMAT SPECIFICATION        FILE-2X

MODE      [16BIT](50MHZ MAX SAMPL)
START     [REM]

----------------------------------
THRESHOLD       V1+2.9V    V2+2.9V
POD    A-[TTL]            C&D- OFF
POD    B-[TTL]        TRG&CLK-[TTL]

----------------------------------
SAMPLE   MODE      CLOCK    PERIOD
A&B      [LAT]     [INT]--><20NS>
C&D      SAMPL

----------------------------------
CLK      SLOPE     ---QUALIFIER---
 1 PIN 0[+]      1[X]   2[X]   3[X]
 2 PIN 4[+]      5[X]   6[X]   7[X]
```

Figure 5-5: Trace Menu Programming Example

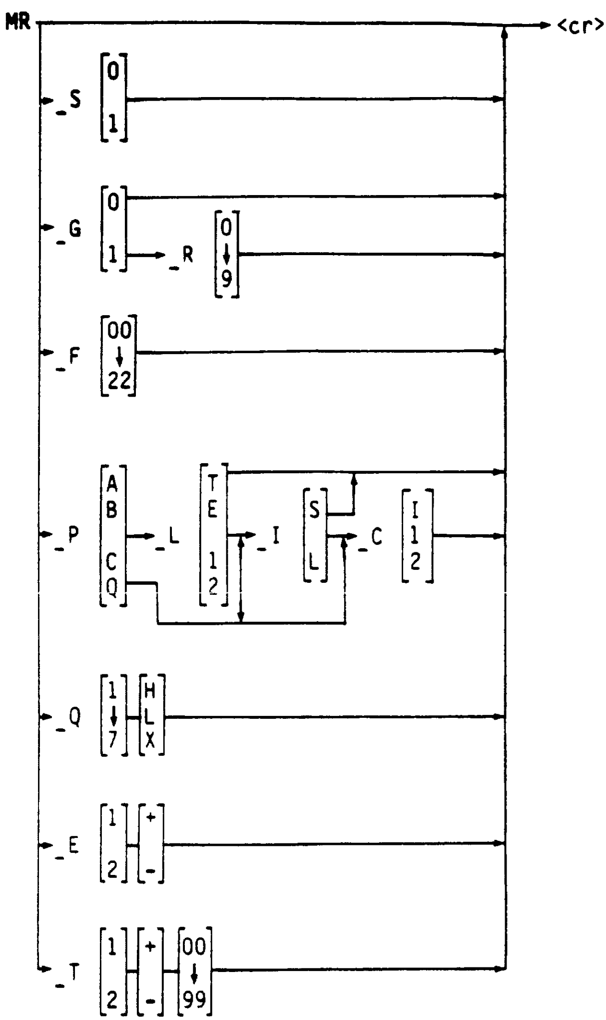


Figure 5-6/1: Trace Menu Programming Summary

(S) SEQUENCE

0=16 BIT
1=32 BIT

(G) START **(R) REPEAT**

0=MANUAL	0-9=0-9sec
1=REPEAT	

(F) INTERNAL CLOCK

0= 20nS	4=500nS	8= 10uS	12=200uS	16= 5mS	20=100mS
1= 50nS	5= 1uS	9= 20uS	13=500uS	17=10mS	21=200mS
2=100nS	6= 2uS	10= 50uS	14= 1mS	18=20mS	22=500mS
3=200nS	7= 5uS	11=100uS	15= 2mS	19=50mS	

(P) POD SELECTION	**(L) THRESHOLD**	**(I) INPUT**	**(C) CLOCKS**
A=POD A	T=TTL	S=SAMPLE	I=INTERNAL
B=POD B	E=ECL	L=LATCH	1=EXT.CLOCK 1
C=PODS C & D	1=V1	(PODS A&B	2=EXT.CLOCK 2
Q=CLOCK & QUALIFIERS	2=V2	ONLY)	

(Q) QUALIFIERS

1=QUAL.ALP PIN1	4=QUAL.ALP PIN4	7=QUAL.ALP PIN7	H=ACTIVE HIGH
2=QUAL.ALP PIN2	5=QUAL.ALP PIN5		L=ACTIVE LOW
3=QUAL.ALP PIN3	6=QUAL.ALP PIN6		X=DON'T CARE

(E) EXTERNAL CLOCK EDGE

1=CLOCK C1	+=RISING EDGE
2=CLOCK C2	-=FALLING EDGE

(T) VARIABLE THRESHOLD

1=V1	+=POS.VOLTAGE	00-99=0.0-9.9V
2=V2	-=NEG.VOLTAGE	

Figure 5-6/2: Trace Menu Programming Summary

5.6 TRIGGER MENU PROGRAMMING

```
MT
MP TT
ENTRY:- ROLL OR EDIT
TRIGGER SEQUENCE              FILE-3X

◆LEVEL 1◆◆     [FREE]       001 PASS
A+XXXXXXXX C    OFF         TRG QUAL
B+XXXXXXXX D    OFF       Q+XXXXXXXX

◆LEVEL 2◆◆     [OFF]        001 PASS
A+XXXXXXXX C    OFF         TRG QUAL
B+XXXXXXXX D    OFF       Q+XXXXXXXX

◆LEVEL 3◆◆     [OFF]        001 PASS
A+XXXXXXXX C    OFF         TRG QUAL
B+XXXXXXXX D    OFF       Q+XXXXXXXX

◆LEVEL 4◆◆     [OFF]        001 PASS
A+XXXXXXXX C    OFF         TRG QUAL
B+XXXXXXXX D    OFF       Q+XXXXXXXX

 DELAY CLK=   [INT]----> 0100CNTS
```

Figure 5-7: Trigger Menu Display

Trigger Sequence Menu Display

To call up the menu on the PALAS 40C50-screen, use the command: **MT<cr>**

Trigger Menu Printout

To call up the menu on the terminal screen, use the

command: **MP_TT<cr>**

Trigger Menu Command-String Printout

For printout of the reloadable command-string format, use the

command: **MX_T<cr>**
MP_BS<cr>

```
result:  MT L1 F1 PAXXXXXXXX PBXXXXXXXX PCXXXXXXXX
         PDXXXXXXXX PQXXXXXXXX E001 L2 F1 PAXXXXXXXX
         PBXXXXXXXX PCXXXXXXXX PDXXXXXXXX PQXXXXXXXX
         E001 L3 F1 PAXXXXXXXX PBXXXXXXXX PCXXXXXXXX
         PDXXXXXXXX PQXXXXXXXX E001 L4 F1 PAXXXXXXXX
         PBXXXXXXXX PCXXXXXXXX PDXXXXXXXX PQXXXXXXXX
         E001 D0100 C1 END
```

5.6.1 TRIGGER MENU PROGRAMMING SYNTAX

Trigger programming command strings are initiated by the

command: **MT_**

and are followed by the commands below. These commands allow full programming with the exception of the trigger word polarity (which is always positive polarity). Any field left unprogrammed will result in a previously stored or default parameter left in that field. The commands must be separated by a <space>. The command string is executed by the execution character <cr>.

Trigger Level Select L(N)

This command selects one of the four trigger levels available and is a precursor to the Function, Event Count and Pod Trigger Word fields. Trigger Level Select remains active until a different level is specified.

L(N)

N = 1	Trigger level 1
N = 2	Trigger level 2
N = 3	Trigger level 3
N = 4	Trigger level 4

Function Select F(N)

Selects the Trigger Function for the predefined Trigger Level. Used in conjunction with and must follow a Level Select command. Order is independent of the Event Count and Pod Trigger Word Fields.

F(N)

N = 0	Start (Level 1 only)
N = 1	Free Run (Level 1) Off (Levels 2 through 4)
N = 2	Then (Levels 2 through 4)
N = 3	Then Not (Levels 2 through 4)
N = 4	Restart (Level 4 only)

Attempts to program a function at the wrong level will result in an error.

Event Count Field E(N)

Programs the event counter for the predefined Trigger Level. Used in conjunction with and must follow a Level Select command. Order is independent of the Function Select and Pod Trigger Word fields.

E(N)

N =	1 to 255 (in decimal; for event counts before moving to the next level or trigger delay countdown)

Pod Trigger Word P(YZZZZZZZZ)

Programs the trigger word in binary for the defined Trigger Level. This command may be repeated to define all pods as needed. Used in conjunction with and must follow a Level Select command. Order is independent of Function Select and Event Count fields.

P(YZZZZZZZZ)

Y = A	Pod A
Y = B	Pod B
Y = C	Pod C
Y = D	Pod D
Y = Q	Trigger qualifier
Z = 0	Binary 0 (low)
Z = 1	Binary 1 (high)
Z = X	Don't care

All eight bit positions are defined in positive binary.

Delay Clock Select Field C(N)

Selects the trigger delay clock used in defining post trigger memory.

C(N)

N = I	Internal clock
N = 1	External clock 1
N = 2	External clock 2

NOTE:
The clock defined here must be previously selected in the trace menu.

Function Select F(N)

Selects the Trigger Function for the predefined Trigger Level. Used in conjunction with and must follow a Level Select command. Order is independent of the Event Count and Pod Trigger Word Fields.

F(N)

N = 0	Start (Level 1 only)
N = 1	Free Run (Level 1)
	Off (Levels 2 through 4)
N = 2	Then (Levels 2 through 4)
N = 3	Then Not (Levels 2 through 4)
N = 4	Restart (Level 4 only)

Attempts to program a function at the wrong level will result in an error.

Event Count Field E(N)

Programs the event counter for the predefined Trigger Level. Used in conjunction with and must follow a Level Select command. Order is independent of the Function Select and Pod Trigger Word fields.

E(N)

N =	1 to 255 (in decimal; for event counts before moving to the next level or trigger delay countdown)

Pod Trigger Word P(YZZZZZZZZ)

Programs the trigger word in binary for the defined Trigger Level. This command may be repeated to define all pods as needed. Used in conjunction with and must follow a Level Select command. Order is independent of Function Select and Event Count fields.

P(YZZZZZZZZ)

Y = A	Pod A
Y = B	Pod B
Y = C	Pod C
Y = D	Pod D
Y = Q	Trigger qualifier
Z = 0	Binary 0 (low)
Z = 1	Binary 1 (high)
Z = X	Don't care

All eight bit positions are defined in positive binary.

Delay Clock Select Field C(N)

Selects the trigger delay clock used in defining post trigger memory.

C(N)

N = I	Internal clock
N = 1	External clock 1
N = 2	External clock 2

NOTE:
The clock defined here must be previously selected in the trace menu.

Trigger Delay Field D(N)

Sets the trigger delay value used in defining post trigger memory size.

```
D(N)
     N =      0 through 6000 (in 16 bit mode)
              0 through 5000 (in 32 bit mode)
```

5.6.2 TRIGGER MENU PROGRAMMING EXAMPLE

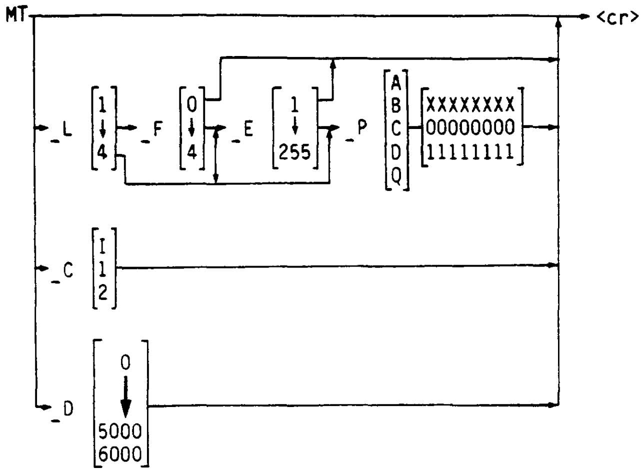
Program the Trigger Menu as shown in figure 5-8

```
ENTRY:- ENTER OR EDIT
TRIGGER SEQUENCE            FILE-3X
                            >000<OCC
◆LEVEL 1◆◆    [START]       101 PASS
A+01001101 C    OFF         TRG QUAL
B+FA   HEX D    OFF        Q+XXXX1111

◆LEVEL 2◆◆    [THEN]        001 PASS
A+XXXXXXXX C    OFF         TRG QUAL
B+08   HEX D    OFF        Q+1111XXXX

◆LEVEL 3◆◆    [NOT]         001 PASS
A+00000001 C    OFF         TRG QUAL
B+XX   HEX D    OFF        Q+XXXXXXXX

◆LEVEL 4◆◆    [RESTRT]      001 PASS
A+XXXXXXXX C    OFF         TRG QUAL
B+01   HEX D    OFF        Q+XXXXXXXX

 DELAY CLK=   [INT]---->  0499CNTS
```

Figure 5-8: Trigger Menu Programming

The command string looks as follows:

```
MT L1 F0 PA01001101 PB11111010 PCXXXXXXXX PDXXXXXXXX
PQXXXX1111 E101 L2 F2 PAXXXXXXXX PB00001000
PCXXXXXXXX PDXXXXXXXX PQ1111XXXX E001 L3 F3
PA00000001 PBXXXXXXXX PCXXXXXXXX PDXXXXXXXX
PQXXXXXXXX E001 L4 F4 PAXXXXXXXX PB00000001
PCXXXXXXXX PDXXXXXXXX PQXXXXXXXX E001 D0499 C1 END
```



(L) TRIGGER LEVEL

1=LEVEL1
2=LEVEL2
3=LEVEL3
4=LEVEL4

(F) FUNCTION

0=START(L1 ONLY)
1=FREE RUN(L1)
  OFF(L2,3,4)
2=THEN(L2,3,4)
3=THEN NOT(L2,3,4)
4=RESTART(L4 ONLY)

(E) EVENT COUNT

1 TO 255

(P) POD TRIGGER WORD

A=POD A
B=POD B
C=POD C
D=POD D
Q=TRIGGER QUAL.

0=BINARY 0 (LOW)
1=BINARY 1 (HIGH)
X=DON'T CARE

(C) DELAY CLOCK SELECT

I=INTERNAL CLOCK
1=EXTERNAL CLOCK 1
2=EXTERNAL CLOCK 2

(D) TRIGGER DELAY

0 TO 5000 32 BIT-MODE
0 TO 6000 16 BIT-MODE

Figure 5-9: Trigger Menu Programming Summary

5.7 COMPARE MENU PROGRAMMING

```
ENTRY:- ENTER OR EDIT
COMPARE   CYCLE 00000    FILE-4X

  <1>-SECTION       0000   LOCS
   --------------------------
   REFERENCE SEGM 0000 > 0000
   SOURCE    SEGM 0000 > 0000
   CHANNELS       A,B, ,
   SKEW           +/- 4 SAMPL
   --------------------------

  <2>-SECTION       0000   LOCS
   --------------------------
   REFERENCE SEGM 0000 > 0000
   SOURCE    SEGM 0000 > 0000
   CHANNELS       A,B, ,
   SKEW           +/- 4 SAMPL
   --------------------------

        [HALT]  IF  [R=S]
```

Figure 5-10: Compare Menu Display

Compare Menu Display

To call up the menu on the PALAS 40C50-screen, use the command: **MC<cr>**

Menu Printout

To call up the menu to the Terminal, use the

command: **MP_TC<cr>**

Compare Menu Command-String Printout

For printout of the reloadable string format, use the

command: **MX_C<cr>**
MP_BS<cr>

result: MC F0 B1 L0000 R0000 S0000 PAB K4 B2 L0000
R0000 S0000 PAB K4 END

5.7.1 COMPARE MENU PROGRAMMING SYNTAX

Compare Menu programming command strings are initiated by the

command: **MC_**

and followed by the commands below. Any field left unprogrammed will result in a previously stored or default parameter left in that field. The commands must be separated by a <space>. The command string is executed by the execution character <cr>.

Section Select B(N)

Selects one of the two sections available in the compare menu and is used as a precursor to Location Count, Source Start Address, Reference Start Address, Pod Select and Skew Select fields.

B(N)
- N = 1 Section 1
- N = 2 Section 2

Location Count Field L(N)

Selects the number of locations used in the predefined section for comparison. Used in conjunction with and must follow a Section Select command.

L(N)
- N = 0 to 1999 (in 16 bit mode)
- 0 to 999 (in 32 bit mode)

The number of locations must take into account the number of skew locations.

Source Start Address S(N)

Selects the source starting address used in the predefined section. Used in conjunction with and must follow a Section Select command.

```
S(N)
    N =     0 to 1999 (in 16 bit mode)
    N =     0 to 999 (in 32 bit mode)
```

The source starting address (and its resulting end address) must take into account the number of skew locations.

Reference Start Address R(N)

Selects the reference starting address used in the predefined section. Used in conjunction with and must follow a Section Select command.

```
R(N)
    N =     0 to 1999 (in 16 bit mode)
            0 to 999 (in 32 bit mode)
```

The reference starting address (and its resulting end address) must take into account the number of skew locations.

Pod Select Field P(NNNN)

Selects the pods which are to be used in the predefined section compare process. Used in conjunction with and must follow a Section Select command.

P(NNNN)
N = A, B, C or D (Enter only those pods to be used; all others will be removed)

Skew Select Field K(N)

Selects the range of skew, plus and minus, over which the selected data of the predefined section will be compared. Used in conjunction with and must follow a Section Select command.

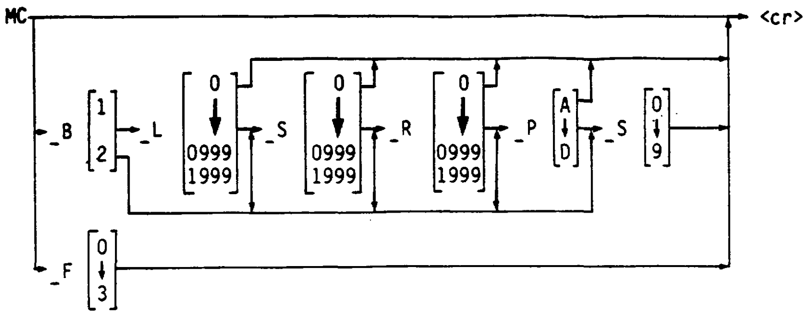
K(N)
N = 0 to 9

Skew value must take into account the start and end address of Source and Reference blocks.

Function Select F(N)

Selects the compare function to be used in the compare process across both sections.

F(N)
N = 0 Halt on R = S
N = 1 Halt on R <> S (not equal)
N = 2 Count on R = S
N = 3 Count on R <> S (not equal)



B SECTION

1=SECTION 1
2=SECTION 2

L LOCATION COUNT

0 TO 0999 32BIT-MODE
0 TO 1999 16BIT-MODE

S SOURCE START ADDRESS

0 TO 0999 32BIT-MODE
0 TO 1999 16BIT-MODE

R REFERENCE START ADDRESS

0 TO 0999 32BIT-MODE
0 TO 1999 16BIT-MODE

P POD SELECT

A=POD A
B=POD B
C=POD C
D=POD D

S SKEW SELECT

0 TO 9

F FUNCTION SELECT

0= HALT ON R = S
1= HALT ON R< >S
2= COUNT ON R = S
3= COUNT ON R< >S

Figure 5-11: Compare Menu Programming Summary

5.8 DATA LIST PROGRAMMING

```
16BIT T=XXXX C=S+0000   MEM-SRC
     A+ B+                A+ B+
SEQ  HX HX           SEQ  HX HX

0000S00 00           0016 00 00
0001 00 00           0017 00 00
0002 00 00           0018 00 00
0003 00 00           0019 00 00
0004 00 00           0020 00 00
0005 00 00           0021 00 00
0006 00 00           0022 00 00
0007 00 00           0023 00 00
0008 00 00           0024 00 00
0009 00 00           0025 00 00
0010 00 00           0026 00 00
0011 00 00           0027 00 00
0012 00 00           0028 00 00
0013 00 00           0029 00 00
0014 00 00           0030 00 00
0015 00 00           0031 00 00
```

Figure 5-12: List Display

Data List Display

To call up the Data List on the Logic Analyzer's screen, use the

command: **ML<cr>**

Data List Printout

To print the Data List on the terminal, use the

command: **MP_L_P(N1,N2,N3)_S(XXXX)_E(YYYY)<cr>**

Pod Specification P (N1, N2, N3)

(N1)	= A thru D	For one Pod from A thru D
(N2)	= +	Positive true data
	= -	Negative true data
(N3)	= H	Hexadecimal base
	= B	Binary base
	= O	Octal base
	= A	ASCII base

Memory Range S (XXXX) E (YYYY)

(XXXX) = Start Address 4 digits
(YYYY) = End Address 4 digits

Range from 0000 thru 0999 (1K mode)
Range from 0000 thru 1999 (2K interlace mode)

NOTE:
For printout of the current Data List display without change of sign or base use the

command: **MP_TL<cr>**

Example:

For printout of pod A negative binary and pod B negative octal from start address 0 to end address 4 type the

command: **MP_L_PA_PB_S0000_E0004<cr>**

Data List Pod Arrangement

To define Pod Arrangement for sign and base, use the

command: **ML_P(N1,N2,N3)<cr>**

Pod Arrangement P (N1, N2, N3)

(N1) = A thru D For one Pod from A thru D

(N2)	= +	Positive true Data
	= -	Negative true Data
	= 0	Turn off previously specified pod when using 0, the next parameter is omitted.

(N3)	= A	ASCII base
	= B	Binary base
	= H	Hexadecimal base
	= 0	Octal base

Example:

Program the pod arrangement pod A negative binary and pod B negative octal.

command: **ML_PA-B_PB-O<cr>**

Data List Pod Arrangement String Printout

For the reloadable pod arrangement string printout use the

command: **MX_L<cr>**
MP_BS<cr>

result:

ML PA+H PB+H PC+H PD+H

Change data in List Mode

The Change Data in List Mode command, when used, changes the value of a pod at its specified address. This change is only reflected in the data list and not the timing diagram.

Command: **MP_C_S(XXXX)<cr>**

S = Start Address 4 digits
Range 0000 thru 0999 (32 bit mode)
Range 0000 thru 1999 (16 bit interlace mode)

Example:

Command: **MP_C_S0000<cr>**

The Analyzer prompts back with

```
     . A  B  C  D      (in 32 bit mode)
  0000 FF FF FF FF_
```

Type in the pod to be changed: **B**

The display now looks like:

```
     . A  B  C  D
  0000 FF FF FF FF B =_
```

now type in the hexadecimal (or the responding base) data byte

AA

With space following:

```
     . A  B  C  D
  0000 FF FF FF FF B = AA_
```

to change another pod assignment on this line, type in the desired pod and go on until all changes are done. With the return key the changes in the defined line are executed.

The " ^ " command can be used to run back through the list to check on results or additional changes.

NOTE:
The "." command finishes the change input mode.

5.9 TIMING DIAGRAM PROGRAMMING

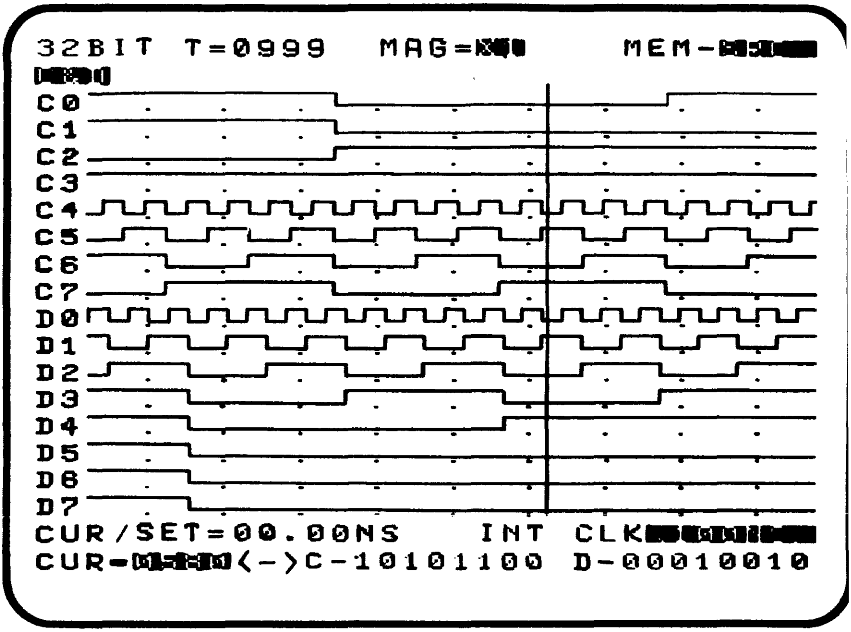


Figure 5-13: Timing Display

Timing Diagram Display

To call up the Timing Diagram on the Logic Analyzer's screen, use the

command: **MD<cr>**

Timing Diagram Printout

This command causes the LAM to send out a representative printout of the timing diagram. The printout covers 58 memory locations per line and continues to print out timing diagrams until the specified end address.

Command: **MP_D(N1,N2,N3,N4)_S(XXXX)_E(YYYY)<cr>**

(N1) = A thru D	For pod select (only one definition)
(N2) = 0 thru 7	For channel select of pod N1 (only one definition)
(N3) = S	Source memory select
= R	Reference memory select
(N4) = X	Marks the differences between memories while displaying the (N2) channel. Omitting the (N4) command disables the marked differences.
(XXXX) =	Start address (4 digits) 0000 thru 0999 (1K mode) 0000 thru 1999 (2K interlace mode)
(YYYY) =	End address (4 digits) 0000 thru 0999 (1K mode) 0000 thru 1999 (2K interlace mode)

Example:

Printout a timing representation of channel A1 between address 0015 and 0030. Print each of the four formats (S, R, S+R, R+S) to show differences of these formats.

Command: **MP_DA1S_DA1R_DA1SX_DA1RX_S0015_E0030<cr>**

```
.MP DA1S DA1R DA1SX DA1RX S0015 E0030
CUR=0015
    ◆    ◆    ◆    ◆    ◆    ◆    ◆    ◆    ◆    ◆    ◆    ◆
                        --------------------
SA1 --------------------                    -------------------
    ◆    ◆    ◆    ◆    ◆    ◆    ◆    ◆    ◆    ◆    ◆    ◆
     - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
RA1 - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
    ◆    ◆    ◆    ◆    ◆    ◆    ◆    ◆    ◆    ◆    ◆    ◆
                        =-=-=-=-=-=-=-=-=-=-
SA1X-=-=-=-=-=-=-=-=-=-=                    -=-=-=-=-=-=-=-=-=-=
    ◆    ◆    ◆    ◆    ◆    ◆    ◆    ◆    ◆    ◆    ◆    ◆
     = = = = = = = = = = - - - - - - - - - - = = = = = = = = =
RA1X- - - - - - - - - - = = = = = = = = = = - - - - - - - - -
```

Timing Diagram Pod Arrangement

This command allows the display arrangement for the 16 channel pod groups A & B, C & D. In each group a channel mixing is allowed. Mixing between pod groups is not possible. Use the

command: **MD_X(N1)_P(N2)_C(N3,N4,N5)<cr>**

Magnification X(N1)

(N1)	= 1	X1	magnification	
	= 2	X5	magnification	(X10 in 16 BIT-Mode)
	= 3	X10	magnification	(X20 in 16 BIT-Mode)

Pod Group P(N2)

(N2)	= A	Group A & B
	= C	Group C & D

Channel Arrangement C(N3,N4,N5)

Arranges displayed channels per programmed sequence. Subsequent commands are possible.

(N3) = 0 thru F (HEX)	For the 16 channel position of the display. 0 is the top most (A0) and F the bottom most (B7).
(N4) = A, B, C, D or 0	Used with N3 to determine which pod will be displayed at the N3 position. 0 used to turn OFF the channel at the N1 position. If OFF is selected N5 must be omitted.
(N5) = 0 thru 7	Used with N4 to determine which channel will be displayed at the N3 position.

Example:

Change the pod arrangement of pod group A & B to the display form :

Expansion Mode x 5
Pod A channel 7 in first line position.
Pod B channel 5 in second line position
Pod A channel 3 off

Command: **MD_X2_PA_COA7_C1B5_C30<cr>**

Timing Diagram Pod Arrangement String Printout

For Printout of the reloadable Pod Arrangement in string format, use the

command: **MX_D<cr>**
MP_BS<cr>

result:

```
MD X3 PA C0A0 C1A1 C2A2 C3A3 C4A4 C5A5 C6A6
C7A7 C8B0 C9B1 CAB2 CBB3 CCB4 CDB5 CEB6
CFB7 END
```

5.10 SEARCH FUNCTION PROGRAMMING

Search function commands are initiated by the

command: **MF_**

and followed by the commands below. The commands must be separated by a <space>. The command string is executed by the execution character <cr>.

Function Select

This command selects the type of search to be executed.

(N) = E Search for equality
= U Search for unequality
= W Word Search

The commands must be separated by a <space>. The command string is executed by the execution character <cr>.

Search Word W (N1,N2)

N1 = PA thru PD for pod select
N2 = 8 pos. binary digits for word definition including don't cares

Printout of Search Result

To read out the result use the

command: **MP_BS<cr>**

NOTE:

Before executing a Search function, perform first of all a dummy Word Search for 16 channels or 32 channels (depends on the recording mode).

Search Result

The search results are prepared and put into the transmit buffer after each execution with the following format:

T = XXXX   C = YYYY

XXXX = Search total counter
YYYY = Actual cursor position

5.11 MNEMONIC PRINTOUT

Mnemonic list of the selected disassembler has to be on the screen. For printout use the

command: **MP_L_S(XXXX)_E(YYYY)<cr>**

(XXXX) = START ADDRESS
(YYYY) = END ADDRESS

Range from 0 to 999 (32 Bit Mode)
0 to 1999 (16 Bit Mode)

NOTE:

See section 4.11, page 4-66 for option display.

Section 6

SECTION 6 - GPIB REMOTE CONTROL INSTRUCTION SET

6.1 GPIB INTERFACE DESCRIPTION

The GPIB Interface allows the user to control most functions of the analyzer remotely from the IEEE 488 instrumention bus. Furthermore, it provides for the transfer of data recordings to other GPIB compatible devices. The electrical Interface use standard IEEE 488 open collector drivers with passiv terminations.

The GPIB Interface provides full remote control, supporting talk/listener addressed mode for the control of the instrument in a test environment with a seperate controller. Figure 6-1 shows the GPIB Interface hardware. Table 6-1 is a listing of the IEEE 488 control messages.

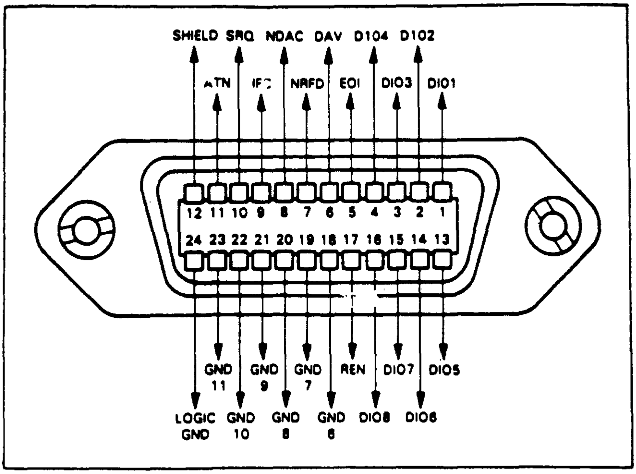


Figure 6-1: GPIB Interface Hardware

b_4	b_3	b_2	b_1	$b_7 b_6 b_5$ →	0 0 0	MSG	0 0 1	MSG	0 1 0	MSG	0 1 1	MSG	1 0 0	MSG	1 0 1	MSG	1 1 0	MSG	1 1 1	MSG
				column →	0		1		2		3		4		5		6		7	
0	0	0	0	0	NUL		DLE		SP		0		@		P				p	
0	0	0	1	1	SOH	GTL	DC1	LLO	!		1		A		Q		a		q	
0	0	1	0	2	STX		DC2		"		2		B		R		b		r	
0	0	1	1	3	ETX		DC3		#		3		C		S		c		s	
0	1	0	0	4	EOT	SDC	DC4	DCL	$		4		D		T		d		t	
0	1	0	1	5	ENQ	PPC	NAK	PPU	%		5		E		U		e		u	
0	1	1	0	6	ACK		SYN		&		6		F		V		f		v	
0	1	1	1	7	BEL		ETB			MLA ASSIGNED TO DEVICE	7	MLA ASSIGNED TO DEVICE	G	MTA ASSIGNED TO DEVICE	W	MTA ASSIGNED TO DEVICE	g	MEANING DEFINED BY PCG CODE	w	MEANING DEFINED BY PCG CODE
1	0	0	0	8	BS	GET	CAN	SPE	(		8		H		X		h		x	
1	0	0	1	9	HT	TCT	EM	SPD	)		9		I		Y		i		y	
1	0	1	0	10	LF		SUB		*				J		Z		j		z	
1	0	1	1	11	VT		ESC		+		;		K		[		k		{	
1	1	0	0	12	FF		FS		,		<		L		\		l				
1	1	0	1	13	CR		GS		-		=		M		]		m		}	
1	1	1	0	14	SO		RS				>		N		^		n		~	
1	1	1	1	15	SI		US		/		?	UNL	O		_	UNT	o		DEL	

ADDRESSED COMMAND GROUP (ACG)
UNIVERSAL COMMAND GROUP (UCG)
LISTEN ADDRESS GROUP (LAG)
TALK ADDRESS GROUP (TAG)
PRIMARY COMMAND GROUP (PCG)
SECONDARY COMMAND GROUP (SCG)

Table 6-1: IEEE Control Messages

6.2 GPIB INTERFACE SETUP

Refer to Figure 6-2 for an illustration of the GPIB Interface and the address select switches located at the rear panel of the Analyzer. The connector is completely defined in the ANSI/IEEE STD 488-1978.

An eight pole address switch, located below the GPIB connector, controls the talk and listen address of the analyzer. It is labeled one through eight. The ON position specifies a "one" in the binary weight position as shown in table 6-2.

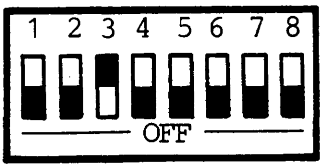


Figure 6-2: Interface Switches

NOTE:

Do not program Start mode to REM, because this mode is reserved for RS 232 programming only, and will disable GPIB-control.

Table 6-2 GPIB SWITCH WEIGHTED POSITIONS

S1 value 2 (1)
S2 value 2 (2)
S3 value 2 (4)
S4 value 2 (8)
S5 reserved for later use
S6 reserved for later use
S7 reserved for later use
S8 reserved for later use

Note that the switch setting shown in the table above actually selects an address pair, one for the talk and one for the listen address. The GPIB controller determines with the address-bits 6 and 7 (ISO-7-Bit Code) if a selected address will be used as a listener or talker address in the following way:

TABLE 6-3 LISTENER-, TALKER-ADDRESS

bit no.	address meaning
7654321	
01XXXXX	listener address
10XXXXX	talker address

Table 6-3 shows that a theoretical maximum of 32 different talkers and listeners are possible, but it has to be considered that 0111111 is reserved for UNLISTEN, and 1011111 for UNTALK. Therefor 31 address pairs are for use.

Factory GPIB Address Switch Setting

The GPIB address is set to 4 (switch 3 in upright position). That means that 0100100 (36 decimal) is listenaddress, and 1000100 (68 decimal) is talkaddress.

6.3 ELECTRICAL SPECIFICATIONS

Supply Voltage	NOM	5.00 V
	MIN	4.75 V
	MAX	5.25 V

Logical 0	> + 2.0 V
Logical 1	< - 0.8 V

6.4 GPIB SIGNAL DESCRIPTION

A GPIB System consists of a 8-Bit data-bus, DI01 to DI08, and a control-bus with 8 signals. The bidirectional data-bus is basically used for datatransfer, while the control-bus handles the transfer of each data byte.

The meaning of the control signals are as following.

DAV(data valid)

A talker device indicates with this signal "true" a listener device, that a data byte on the data-bus is ready to be read.

NRFD(not ready for data)

The not ready for data line shows to the GPIB controller the status of a listener device, either if it can accept new data or not.

NDAC(no data accepted)

This signal is sent by a listener device to indicate to a talker device that it is not allowed to change data on the bus by sending new data.

ATN(attention)

Attention can only be send by the controller. When the controller sets ATN "true", messages on the bus have to be interpreted as controller commands.

IFC(interface clear)

This controller signal sets all devices on the bus to default conditions.

REN(remote enable)

Used to lock the keyboards of all involved devices.

SRQ(service request)

A device sets SRQ "true" if it needs the controllers attention, and wants to interrupt a running process.

EOI(end or identify)

With EOI a talker indicates the end of a multiple data byte transfer. The combination of ATN and EOI also starts a parallel poll routine.

6.5 PROGRAMMING RULES

Valid alphanumeric characters are all upper case letters and numbers 0 through 9. Valid symbols are

* $ / # % , & ! ?

A programming statement consists of a maximum of 500 alphanumerics and symbols followed by an execution character. All programming specifications must be separated by one character space.

After selection of a programming group by M (X) X is a menue setup specification, the Analyzer will remain in the selected menue until a further menue specification M (X) is executed or if programming errors occur. This does not apply to transmit (MX) or printout (MP) commands.

The symbols are always in effect (menue independent) unless otherwise specified. This is an especially important point to remember. There is no default to a neutral parameter.

Note:

In the programming structures, the five characters "(", ")", "<", ">", and "_" are not part of the command. Where the format (N1, N2 ...) is used, the comma is not part of the command unless otherwise specified.

The programming format (N1, N2 ... Nn) specifies that there must be n entries for this field.

The programming format (N1-Nn) specifies that there can be up to n entries for this field.

The programming format (N) specifies that there can be only one entry for this field.

TABLE 6-4: IMMEDIATE COMMANDS

Symbol	Command	Description
% CHR$(37)	HALT RECORDING	Stops a recording or compare process in progress, whether initiated manually or through programming.
/ CHR$(47)	DELETE	Delete last character from string buffer.
, CHR$(44)	EXECUTE	Execute command string from the beginning of the command buffer.
* CHR$(42)	RESET	Resets the Logic Analyzer.
$ CHR$(36)	CLEAR COMMAND BUFFER	Clears the command buffer

TABLE 6-5: SUPERVISOR COMMANDS		
Symbol	**Command**	**Description**
&(N)	MEMORY SELECT	This command selects either the source or reference memory for the data transfer or selected display. It can also transfer data from source to reference memory and display high-lighted memory differences.
	(N) = S	Source memory selected.
	= R	Reference memory selected.
	= T	Transfer source to reference memory.
	= X	Displays highlighted differences (S + R or R + S), depending on whether source or reference was last selected. Default value is source data. Once a memory selection has been made it will remain in effect until changed or a power-up reset occurs.

TABLE 6-5: SUPERVISOR COMMANDS (cont.)

Symbol	**Command**	**Description**
!(N1)		This command selects how data will be transmitted and the final termination character for that transmission.
	(N1) = 1	: Block transmission mode
	= 2	: Special Commodore PET mode
	= 3	: Standard GPIB mode
	= 4	: HP(Hewlett Packard) transmission mode
?	START RECORDING	This command selects the recording process and starts it.
?	START COMPARE	This command starts also the compare process. But only if the compare menu is on the display.

TABLE 6-6: SPECIAL INTERFACE COMMANDS

Symbol	Command	Description
#(N)	Display Update ON/OFF	Used to enable or disable the PALAS 40C50 display update.
	(N) = 0	Update OFF
	= 1	Update ON

6.6 DATA TRANSMISSION

6.6.1 TRANSMISSION FORMAT

Before the data or setup string transmission command MX is sent, the user can select up to four different types of transmission formats. Once a transmission mode command is sent, the transmission mode and final termination character will remain in effect until changed or a power up reset occurs. For definition of transmission format use the

command: **!(N)_,**

(N1) = 1 Block transmission mode

= 2 Commodore Pet mode

= 3 Line transmission mode (with carriage return/line feed)

= 4 Line transmission mode (only carriage return)

NOTE:

Any string received can be sent back to the Logic Analyzer in the same format unless the transmission format has been changed meanwhile. The terminating character has to be the execution character "," if a string is sent back to the Logic Analyzer.

Transmission Format Description

Mode 1

(<:> <START BLOCK> <:> <DATA>...<:> <END BLOCK>)

Mode 2

(<S> <START BLOCK> <CR> <S> <DATA> <CR>...<S>
<END BLOCK>)

Mode 3

(<:> <START BLOCK> <CR> <LF> <:> <DATA> <CR>
<LF>...<:> <END BLOCK> <CR> <LF>)

Mode 4

(<:> <START BLOCK> <CR> <:> <DATA> <CR>...<:>
<END BLOCK> <CR>)

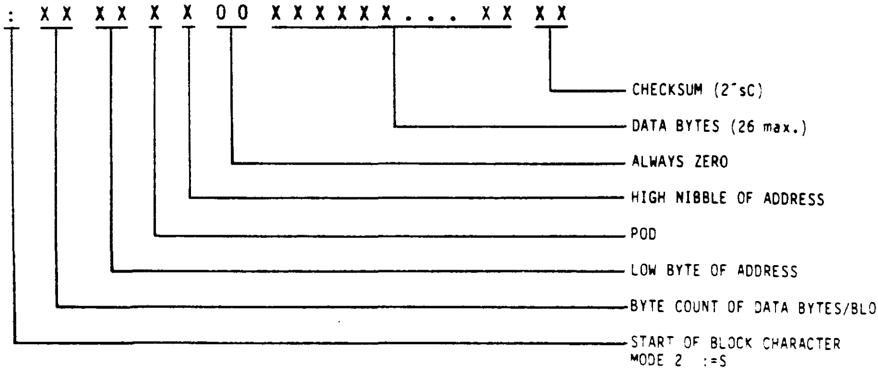
6.6.2 DATA BLOCK DEFINITION

Start Block

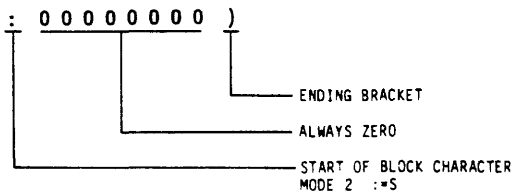
(: 05 XXXX 00 XXXX XXXX XX XX

- (— STARTING BRACKET
- : — START OF BLOCK CHARACTER
MODE 2 :=S
- 05 — BYTE COUNT OF DATA BYTES/BLOCK
- XXXX — MEMORY SOURCE = 1781
REFER = 1C81
- 00 — BLOCKTYPE
- XXXX — INTERNAL CODE (4000 RECOMMENDED)
- XXXX — TRIGGER ADDRESS (LOW/HIGH BYTE)
- XX — MODE (0=16 CH, 1=32 CH)
- XX — CHECKSUM (2'sC)

Data Block



End Block



6.6.3 READ STATUS AND TRANSMIT BUFFER

Every transmit command MX must be followed by a transmit buffer read routine.

The following example shows a routine to read out the PALAS 40C50 transmit buffer. (Using a HP 9835A Desktop computer)

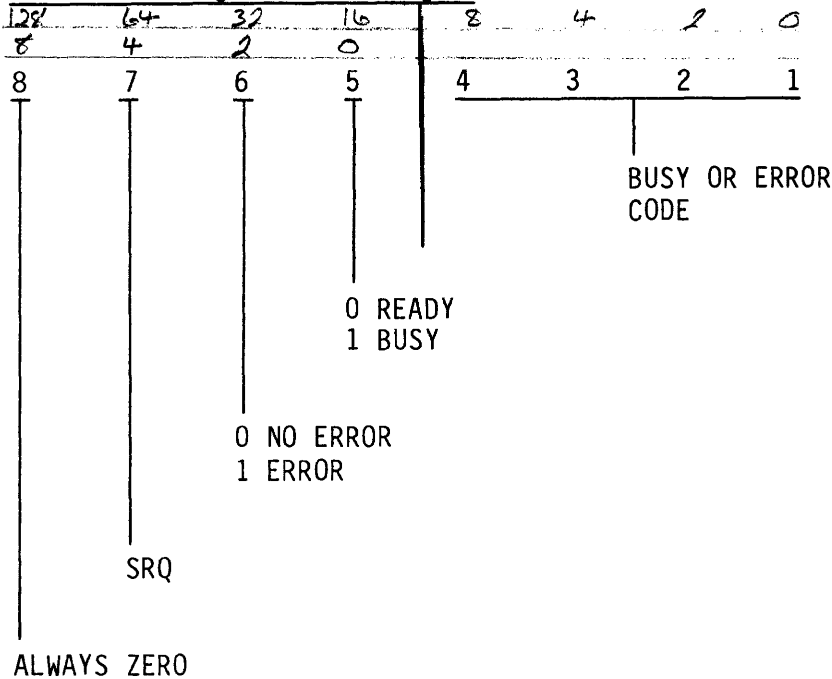
```
DIM A$ (100)
ENTER 7,4; A$ ! 7 is HP INTERNAL DEVICE ADDRESS,
                4 is Analyzer address.
SENDBUS7; 223 ! Unlisten
PRINT A$
END
```

For reading out the analyzer status using the GPIB Interface, the serial poll must be used.

The following programming example shows a serial poll routine.

```
SENDBUS 7;223,191,152,196   ! UNTALK, UNLISTEN,
                              SERIAL POLL ENABLE,
                              MY TALK ADDRESS
S=READBIN(704)   ! GET STATUS IN VARIABLE S
SENDBUS 7;191,25   ! UNLISTEN, SERIAL POLL DISABLE
END
```

Format of Busy and Error Byte



Error Codes

B4	B3	B2	B1	
0	0	0	0	not used
0	0	0	1	parameter out of range
0	0	1	0	invalid function in trig. menu
0	0	1	1	not acceptable clock rate
0	1	0	0	invalid pod - may not be programmed
0	1	0	1	incorrect trig. word
0	1	1	0	invalid parameter
0	1	1	1	invalid function assignment
1	0	0	0	command buffer full
1	0	0	1	incorrect address B1-(A Section)
1	0	1	0	incorrect address B2-(B Section)
1	0	1	1	invalid trigger delay clock
1	1	0	1	null locations B1 & B2
1	1	1	0	not used
1	1	1	1	not used

Busy Codes

B4	B3	B2	B1	
0	0	0	0	interpreter active (note I)
0	0	0	1	data block prep in progress
0	0	1	0	menu info prep in progress
1	0	1	0	slow clock A - any combination of these may occur
1	1	0	0	slow clock B
1	0	0	0	searching for trigger
0	1	1	1	trigger delay active
0	1	1	0	compare menu active

6.6.4 DATA TRANSFER COMMAND

For printout of the reloadable Data List in string format, use the

command: **$MX_P(N1-N4)_S(XXXX)_E(YYYY),**

(N1) = Pod A
(N2) = Pod B
(N3) = Pod C
(N4) = Pod D

S(XXXX) = Start address 4 digit
E(YYYY) = End address 4 digit
Range 0000 thru 0999 (32 bit mode)
Range 0000 thru 1999 (16 bit interlace mode)

Example:

Command: **$MX_PABCD_S0000_E0010_,**

```
result:    (:05178100FD7E0500017F
           :0B001000FDFEFEFF00010202030405F7
           :0B00200000000000000000000000000000
           :0B00300000000000000000000000000000
           :0B00400000000000000000000000000000
           :00000000)
           END
```

NOTE:

An initial recording has to be performed, before data can be read out.

6.7 TRACE MENU PROGRAMMING

Trace Menu Display

```
ENTRY:- ROLL OR EDIT
FORMAT SPECIFICATION      FILE-2X

MODE      [16BIT] (50MHZ MAX SAMPL)
START     [MAN]

----------------------------------
THRESHOLD       V1+2.9V   V2+2.9V
POD    A-[TTL]          C&D- OFF
POD    B-[TTL]      TRG&CLK-[TTL]

----------------------------------
SAMPLE   MODE     CLOCK    PERIOD
A&B      [SAM]    [INT]--->< 50NS>
C&D      SAMPL

----------------------------------
CLK     SLOPE      ---QUALIFIER---
 1 PIN 0[+]      1[X]   2[X]   3[X]
 2 PIN 4[+]      5[X]   6[X]   7[X]
```

Figure 6-3: Trace Menu

To call up the menu on the PALAS 40C50-screen, use the command: **$MR_,**

Trace Menu Command-String Printout

For printout of the reloadable command-string format, use the

command: **$MX_R_,**

result: MR SO G2 RO PA LT CI IS PB LT PC LT CI PQ LT
F01 Q1X Q2X Q3X Q5X Q6X Q7X E1+ E2+ T1+29
T2+29 END

6.7.1 TRACE MENU PROGRAMMING SYNTAX

Trace (Format) menu programming command strings areinitiated by the

command: **$MR_**

and are followed by the commands below. These commands allow full programmability of the trace menu. Any field left unprogrammed will result in a previously stored or default parameter left in that field. The commands must be separated by a <space>. The command string is executed by the execution character <,>.

Analyzer Sequence Field S (N)

Sets the analyzer in a 16 channel or 32 channel mode.

(N) = 0   16 bit mode (2K format)
    = 1   32 bit mode (1K format)

Start Field G (N)

Sets the analyzer in a manual start or repeat mode.

(N) = 0 Manual
  = 1 Repeat

In addition to the repeat command is the repetition rate R (N):

(N) = 0 thru 9 (time in seconds)

Internal Clock Field F (N)

Programs the internal clock rate.

(N) = 00	20 nanoseconds	(Only in 16 bit mode)
= 01	50 nanoseconds	
= 02	100 nanoseconds	
= 03	200 nanoseconds	
= 04	500 nanoseconds	
= 05	1 microsecond	
= 06	2 microseconds	
= 07	5 microseconds	
= 08	10 microseconds	
= 09	20 microseconds	
= 10	50 microseconds	
= 11	100 microseconds	
= 12	200 microseconds	
= 13	500 microseconds	
= 14	1 millisecond	
= 15	2 milliseconds	
= 16	5 milliseconds	
= 17	10 milliseconds	
= 18	20 milliseconds	
= 19	50 milliseconds	
= 20	100 milliseconds	
= 21	200 milliseconds	
= 22	500 milliseconds	

NOTE:
Programming the clock rate to 20 nanoseconds without being in 16-Bit Mode is an illegal entry.

Pod Selection P (N)

Pod Selection is used to prepare the analyzer for programming of Threshold, Input and Clock Select fields.

(N)	= A	Pod A
	= B	Pod B
	= C	Pod C & D
	= Q	Pods Clock & Qualifiers

The commands L (N), I (N) and C (N) must have a preceding P (N) definition.

Threshold Level Field L (N)

Selects the Threshold level for a previously specified pod group, therefore it must follow a pod selection command. Order is independent from the Input and Clock Select fields.

(N)	= T	TTL at 1.4 V (preset)
	= E	ECL at -1.3 V (preset)
	= 1	V1 See Variable Threshold Field
	= 2	V2 See Variable Threshold Field

Input Field I (N)

Used only on pods A & B. Sets pods in either sample or latch mode. Must follow a Pod Selection command PA or PB. Order independent from the Threshold field and Clock fields.

(N)	= S	Sample Mode (default)
	= L	Latch Mode

Clock Field C (N)

Selects the clock scheme for a previously specified pod group, therefore it must follow a Pod Selection command. Order is independent from the Threshold field and Input field.

(N) = I Internal clock
    = 1 External clock 1
    = 2 External clock 2

Qualifier Fields Q(N1N2)

Used to program the clock qualifier fields.

Q(N1N2)

N1 = 1	Qualifier at ALP pin 1
N1 = 2	Qualifier at ALP pin 2
N1 = 3	Qualifier at ALP pin 3
N1 = 5	Qualifier at ALP pin 5
N1 = 6	Qualifier at ALP pin 6
N1 = 7	Qualifier at ALP pin 7
N2 = H	Active high "1"
N2 = L	Active low "0"
N2 = X	Don't care

Clock Edge Field E(N1N2)

Used to program the active external clock edge or slope.

E(N1N2)

N1 = 1	External clock 1
N1 = 2	External clock 2
N2 = +	Rising edge
N2 = -	Falling edge

Variable Threshold Field T(N1N2N3)

Programs the variable thresholds for fields V1 and V2.

T(N1N2N3)

N1 = 1	Selects V1 field
N1 = 2	Selects V2 field
N2 = +	Positive voltage
N2 = -	Negative voltage
N3 =	00 to 99 for 0 to 9.9 volts in 0.1 volt increments. Must always specify 2 digits.

6.7.2 TRACE MENU PROGRAMMING EXAMPLE

1. Program the trace menu to clock at 20 ns in latch mode.

   $MR_SØ_PA_IL_FØØ_,

2. Program the trace menu as shown in Figure 6-4.

```
ENTRY:- ROLL OR EDIT
FORMAT SPECIFICATION       FILE-2X

MODE      [16BIT] (50MHZ MAX SAMPL)
START     [MAN]

--------------------------------
THRESHOLD         V1+2.9V    V2+2.9V
POD     A-[TTL]           C&D- OFF
POD     B-[TTL]       TRG&CLK-[TTL]

--------------------------------
SAMPLE   MODE     CLOCK    PERIOD
A&B      [LAT]    [INT]--><20NS>
C&D      SAMPL

--------------------------------
CLK      SLOPE    ---QUALIFIER---
 1 PIN 0[+]      1[X]   2[X]   3[X]
 2 PIN 4[+]      5[X]   6[X]   7[X]
```

Figure 6-4: Trace Menu Programming Example

* N O T E *

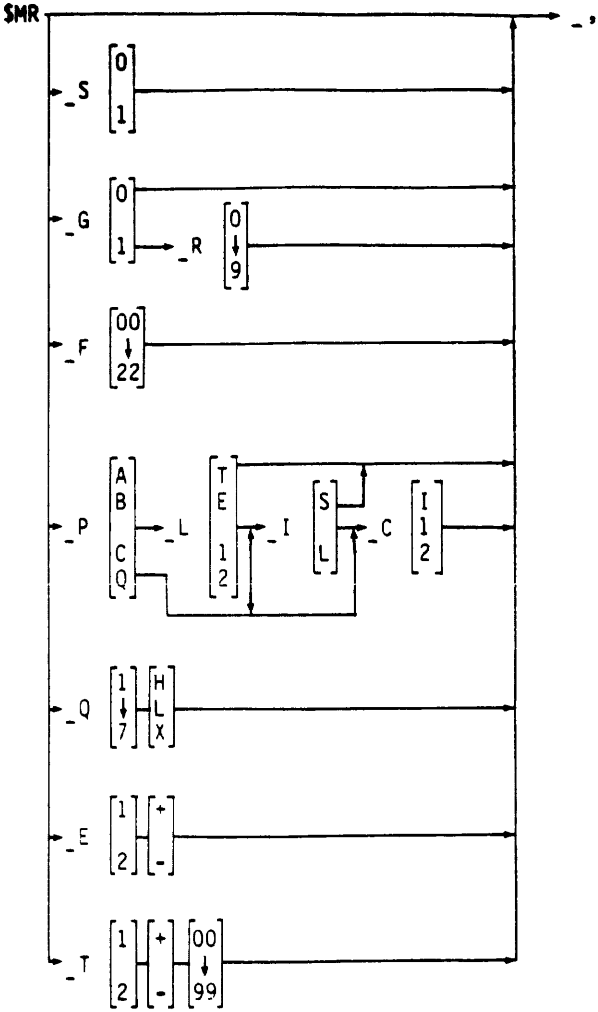


Figure 6-5/1: Trace Menu Programming Summary

(S) SEQUENCE

0=16 BIT
1=32 BIT

(G) START **(R) REPEAT**

START	REPEAT
0=MANUAL	0-9=0-9sec
1=REPEAT	

(F) INTERNAL CLOCK

0= 20nS	4=500nS	8= 10uS	12=200uS	16= 5mS	20=100mS
1= 50nS	5= 1uS	9= 20uS	13=500uS	17=10mS	21=200mS
2=100nS	6= 2uS	10= 50uS	14= 1mS	18=20mS	22=500mS
3=200nS	7= 5uS	11=100uS	15= 2mS	19=50mS	

(P) POD SELECTION	(L) THRESHOLD	(I) INPUT	(C) CLOCKS
A=POD A	T=TTL	S=SAMPLE	I=INTERNAL
B=POD B	E=ECL	L=LATCH	1=EXT.CLOCK 1
C=PODS C & D	1=V1	(PODS A&B	2=EXT.CLOCK 2
Q=CLOCK & QUALIFIERS	2=V2	ONLY)	

(Q) QUALIFIERS

1=QUAL.ALP PIN1	4=QUAL.ALP PIN4	7=QUAL.ALP PIN7	H=ACTIVE HIGH
2=QUAL.ALP PIN2	5=QUAL.ALP PIN5		L=ACTIVE LOW
3=QUAL.ALP PIN3	6=QUAL.ALP PIN6		X=DON'T CARE

(E) EXTERNAL CLOCK EDGE

1=CLOCK C1	+=RISING EDGE
2=CLOCK C2	-=FALLING EDGE

(T) VARIABLE THRESHOLD

1=V1	+=POS.VOLTAGE	00-99=0.0-9.9V
2=V2	-=NEG.VOLTAGE	

Figure 6-5/2: Trace Menu Programming Summary

6.8 TRIGGER MENU PROGRAMMING

```
ENTRY:- ROLL OR EDIT
TRIGGER SEQUENCE                 FILE-3X

♦LEVEL 1♦♦     [FREE]          001 PASS
A+XXXXXXXX  C    OFF           TRG QUAL
B+XXXXXXXX  D    OFF         Q+XXXXXXXX

♦LEVEL 2♦♦     [OFF]           001 PASS
A+XXXXXXXX  C    OFF           TRG QUAL
B+XXXXXXXX  D    OFF         Q+XXXXXXXX

♦LEVEL 3♦♦     [OFF]           001 PASS
A+XXXXXXXX  C    OFF           TRG QUAL
B+XXXXXXXX  D    OFF         Q+XXXXXXXX

♦LEVEL 4♦♦     [OFF]           001 PASS
A+XXXXXXXX  C    OFF           TRG QUAL
B+XXXXXXXX  D    OFF         Q+XXXXXXXX

 DELAY CLK=   [INT]----> 0100CNTS
```

Figure 6-6: Trigger Menu Display

Trigger Sequence Menu Display

To call up the menu on the PALAS 40C50-screen, use the command: **$MT_,**

Trigger Menu Command-String Printout

For printout of the reloadable command-string format, use the

command: **$MX_T_,**

result:
```
MT L1 F1 PAXXXXXXXX PBXXXXXXXX PCXXXXXXXX
PDXXXXXXXX PQXXXXXXXX E001 L2 F1 PAXXXXXXXX
PBXXXXXXXX PCXXXXXXXX PDXXXXXXXX PQXXXXXXXX
E001 L3 F1 PAXXXXXXXX PBXXXXXXXX PCXXXXXXXX
PDXXXXXXXX PQXXXXXXXX E001 L4 F1 PAXXXXXXXX
PBXXXXXXXX PCXXXXXXXX PDXXXXXXXX PQXXXXXXXX
E001 D0100 C1 END
```

6.8.1 MENU PROGRAMMING SYNTAX

All trigger programming command strings are initiated by the

command: **$MT_**

and are followed by the commands below. These commands allow full programming with the exception of the trigger word polarity (which is always positive polarity). Any field left unprogrammed will result in a previously stored or default parameter left in that field. The commands must be separated by a <space>. The command string is executed by the execution character <,>.

Trigger Level Select L(N)

This command selects one of the four trigger levels available and is a precursor to the Function, Event Count and Pod Trigger Word fields. Trigger Level Select remains active until a different level is specified.

L(N)

N = 1	Trigger level 1
N = 2	Trigger level 2
N = 3	Trigger level 3
N = 4	Trigger level 4

Function Select F(N)

Selects the Trigger Function for the predefined Trigger Level. Used in conjunction with and must follow a Level Select command. Order is independent of the Event Count and Pod Trigger Word Fields.

F(N)

N = 0	Start (Level 1 only)
N = 1	Free Run (Level 1) Off (Levels 2 through 4)
N = 2	Then (Levels 2 through 4)
N = 3	Then Not (Levels 2 through 4)
N = 4	Restart (Level 4 only)

Attempts to program a function at the wrong level will result in an error.

Event Count Field E(N)

Programs the event counter for the predefined Trigger Level. Used in conjunction with and must follow a Level Select command. Order is independent of the Function Select and Pod Trigger Word fields.

E(N)

N =	1 to 255 (in decimal; for event counts before moving to the next level or trigger delay countdown)

Pod Trigger Word P(YZZZZZZZZ)

Programs the trigger word in binary for the defined Trigger Level. This command may be repeated to define rll pods as needed. Used in conjunction with and must follow a Level Select command. Order is independent of Function Select and Event Count fields.

P(YZZZZZZZZ)

Y = A	Pod A
Y = B	Pod B
Y = C	Pod C
Y = D	Pod D
Y = Q	Trigger qualifier
Z = 0	Binary 0 (low)
Z = 1	Binary 1 (high)
Z = X	Don't care

All eight bit positions are defined in positive binary.

Delay Clock Select Field C(N)

Selects the trigger delay clock used in defining post trigger memory.

C(N)

N = I	Internal clock
N = 1	External clock 1
N = 2	External clock 2

NOTE:

The clock defined here must be previously selected in the trace menu.

Trigger Delay Field D(N)

Sets the trigger delay value used in defining post trigger memory size.

D(N)

N =	0 through 6000 (in 16 bit mode)
	0 through 5000 (in 32 bit mode)

6.8.2 TRIGGER MENU PROGRAMMING EXAMPLE

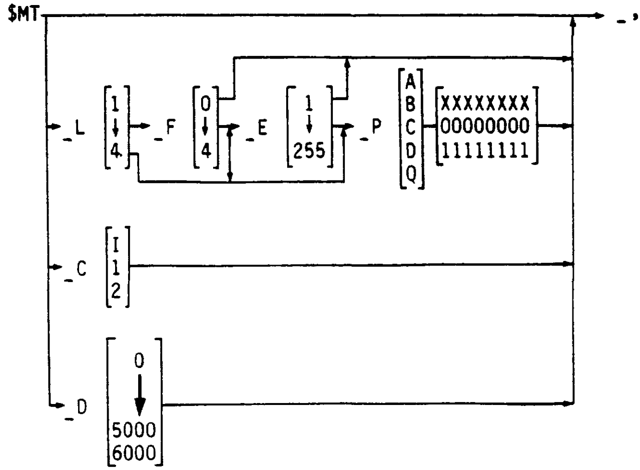
Program the Trigger Menu as shown in figure 6-7

```
ENTRY:- ENTER OR EDIT
TRIGGER SEQUENCE                FILE-3X
                               >000<OCC
◆LEVEL 1◆◆     [START]          101 PASS
A+01001101 C    OFF             TRG QUAL
B+FA    HEX D   OFF            Q+XXXX1111

◆LEVEL 2◆◆     [THEN]           001 PASS
A+XXXXXXXX C    OFF             TRG QUAL
B+08    HEX D   OFF            Q+1111XXXX

◆LEVEL 3◆◆     [NOT]            001 PASS
A+00000001 C    OFF             TRG QUAL
B+XX    HEX D   OFF            Q+XXXXXXXX

◆LEVEL 4◆◆     [RESTRT]         001 PASS
A+XXXXXXXX C    OFF             TRG QUAL
B+01    HEX D   OFF            Q+XXXXXXXX

 DELAY CLK=   [INT]----> 0499CNTS
```

Figure 6-7: Trigger Menu Programming

The command string looks as follows:

```
MT L1 F0 PA01001101 PB11111010 PCXXXXXXXX PDXXXXXXXX
PQXXXX1111 E101 L2 F2 PAXXXXXXXX PB00001000
PCXXXXXXXX PDXXXXXXXX PQ1111XXXX E001 L3 F3
PA00000001 PBXXXXXXXX PCXXXXXXXX PDXXXXXXXX
PQXXXXXXXX E001 L4 F4 PAXXXXXXXX PB00000001
PCXXXXXXXX PDXXXXXXXX PQXXXXXXXX E001 D0499 C1 END
```



(L) TRIGGER LEVEL

1=LEVEL1
2=LEVEL2
3=LEVEL3
4=LEVEL4

(F) FUNCTION

0=START(L1 ONLY)
1=FREE RUN(L1)
  OFF(L2,3,4)
2=THEN(L2,3,4)
3=THEN NOT(L2,3,4)
4=RESTART(L4 ONLY)

(E) EVENT COUNT

1 TO 255

(P) POD TRIGGER WORD

A=POD A
B=POD B
C=POD C
D=POD D
Q=TRIGGER QUAL.

0=BINARY 0 (LOW)
1=BINARY 1 (HIGH)
X=DON'T CARE

(C) DELAY CLOCK SELECT

I=INTERNAL CLOCK
1=EXTERNAL CLOCK 1
2=EXTERNAL CLOCK 2

(D) TRIGGER DELAY

0 TO 5000 32 BIT-MODE
0 TO 6000 16 BIT-MODE

Figure 6-8: Trigger Menu Programming Summary

6.9 COMPARE MENU PROGRAMMING

```
ENTRY:- ENTER OR EDIT
COMPARE   CYCLE 00000    FILE-4X

  <1>-SECTION       0000   LOCS
   ---------------------------
   REFERENCE SEGM 0000 > 0000
   SOURCE    SEGM 0000 > 0000
   CHANNELS       A,B, ,
   SKEW           +/- 4 SAMPL
   ---------------------------

  <2>-SECTION       0000   LOCS
   ---------------------------
   REFERENCE SEGM 0000 > 0000
   SOURCE    SEGM 0000 > 0000
   CHANNELS       A,B, ,
   SKEW           +/- 4 SAMPL
   ---------------------------

        [HALT]  IF  [R=S]
```

Figure 6-9: Menu Display

Compare Menu Display

To call up the menu on the PALAS 40C50-screen, use the command: **$MC_,**

Compare Menu Command-String Printout

For printout of the reloadable string format, use the

command: **$MX_C_,**

result: MC F0 B1 L0000 R0000 S0000 PAB K4 B2 L0000
R0000 S0000 PAB K4 END

6.9.1 COMPARE MENU PROGRAMMING SYNTAX

Compare Menu programming command strings are initiated by the

command: **$MC_**

and followed by the commands below. Any field left unprogrammed will result in a previously stored or default parameter left in that field. The commands must be separated by a <space>. The command string is executed by the execution character <,>.

Section Select B(N)

Selects one of the two sections available in the compare menu and is used as a precursor to Location Count, Source Start Address, Reference Start Address, Pod Select and Skew Select fields.

B(N)

N = 1 Section 1
N = 2 Section 2

Location Count Field L(N)

Selects the number of locations used in the predefined section for comparison. Used in conjunction with and must follow a Section Select command.

L(N)
N = 0 to 1999 (in 16 bit mode)
0 to 999 (in 32 bit mode)

The number of locations must take into account the number of skew locations.

Source Start Address S(N)

Selects the source starting address used in the predefined section. Used in conjunction with and must follow a Section Select command.

S(N)
N = 0 to 1999 (in 16 bit mode)
N = 0 to 999 (in 32 bit mode)

The source starting address (and its resulting end address) must take into account the number of skew locations.

Reference Start Address R(N)

Selects the reference starting address used in the predefined section. Used in conjunction with and must follow a Section Select command.

R(N)
N = 0 to 1999 (in 16 bit mode)
0 to 999 (in 32 bit mode)

The reference starting address (and its resulting end address) must take into account the number of skew locations.

Pod Select Field P(NNNN)

Selects the pods which are to be used in the predefined section compare process. Used in conjunction with and must follow a Section Select command.

P(NNNN)
N = A, B, C or D (Enter only those pods to be used; all others will be removed)

Skew Select Field K(N)

Selects the range of skew, plus and minus, over which the selected data of the predefined section will be compared. Used in conjunction with and must follow a Section Select command.

K(N)
N = 0 to 9

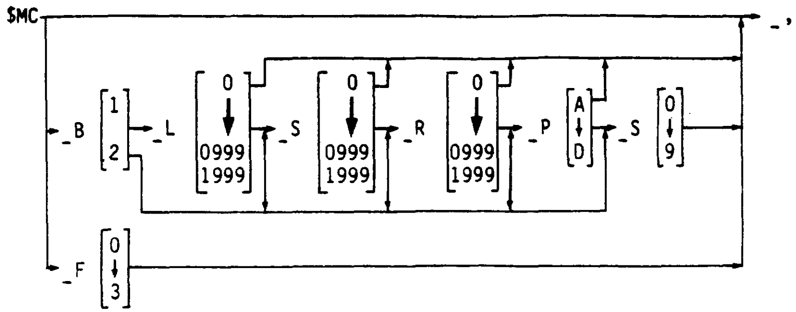
Skew value must take into account the start and end address of Source and Reference blocks.

Function Select F(N)

Selects the compare function to be used in the compare process across both sections.

F(N)

N = 0	Halt on R = S
N = 1	Halt on R <> S (not equal)
N = 2	Count on R = S
N = 3	Count on R <> S (not equal)



Ⓑ SECTION

1=SECTION 1
2=SECTION 2

Ⓛ LOCATION COUNT

0 TO 0999 32BIT-MODE
0 TO 1999 16BIT-MODE

Ⓢ SOURCE START ADDRESS

0 TO 0999 32BIT-MODE
0 TO 1999 16BIT-MODE

Ⓡ REFERENCE START ADDRESS

0 TO 0999 32BIT-MODE
0 TO 1999 16BIT-MODE

Ⓟ POD SELECT

A=POD A
B=POD B
C=POD C
D=POD D

Ⓢ SKEW SELECT

0 TO 9

Ⓕ FUNCTION SELECT

0= HALT ON R = S
1= HALT ON R< >S
2= COUNT ON R = S
3= COUNT ON R< >S

Figure 6-10: Compare Menu Programming Summary

6.10 DATA LIST PROGRAMMING

```
16BIT T=XXXX C=S+0000   MEM-SRC
     A+ B+              A+ B+
SEQ  HX HX         SEQ  HX HX

0000S00 00         0016 00 00
0001 00 00         0017 00 00
0002 00 00         0018 00 00
0003 00 00         0019 00 00
0004 00 00         0020 00 00
0005 00 00         0021 00 00
0006 00 00         0022 00 00
0007 00 00         0023 00 00
0008 00 00         0024 00 00
0009 00 00         0025 00 00
0010 00 00         0026 00 00
0011 00 00         0027 00 00
0012 00 00         0028 00 00
0013 00 00         0029 00 00
0014 00 00         0030 00 00
0015 00 00         0031 00 00
```

Figure 6-11: List Display

Data List Display

To call up the Data List on the Logic Analyzer's screen, use the

command: **$ML_,**

Data List Printout

To print the Data List on the terminal, use the

command: **$MP_L_P(N1,N2,N3)_S(XXXX)_E(YYYY)_,**

Pod Specification P (N1, N2, N3)

(N1)	= A thru D	For one Pod from A thru D
(N2)	= +	Positive true data
	= -	Negative true data
(N3)	= H	Hexadecimal base
	= B	Binary base
	= 0	Octal base
	= A	ASCII base

Memory Range S (XXXX) E (YYYY)

(XXXX) = Start Address 4 digits
(YYYY) = End Address 4 digits

Range from 0000 thru 0999 (1K mode)
Range from 0000 thru 1999 (2K interlace mode)

NOTE:
For printout of the current Data List display without change of sign or base use the

command: **$MP_TL_,**

Example:

For printout of pod A negative binary and pod B negative octal from start address 0 to end address 4 type the

command: **$MP_L_PA_PB_S0000_E0004_,**

Data List Pod Arrangement

To define Pod Arrangement for sign and base, use the

command: $ML_P(N1,N2,N3)_,

Pod Arrangement P (N1, N2, N3)

(N1) = A thru D For one Pod from A thru D

(N2) = + Positive true Data
= - Negative true Data
= 0 Turn off previously specified pod
when using 0, the next parameter is omitted.

(N3) = A ASCII base
= B Binary base
= H Hexadecimal base
= 0 Octal base

Example:

Program the pod arrangement pod A negative binary and pod B negative octal.

command: **$ML_PA-B_PB-0_,**

Data List Pod Arrangement String Printout

For the reloadable pod arrangement string printout use the

command: **$MX_L_,**

6.11 TIMING DIAGRAM PROGRAMMING

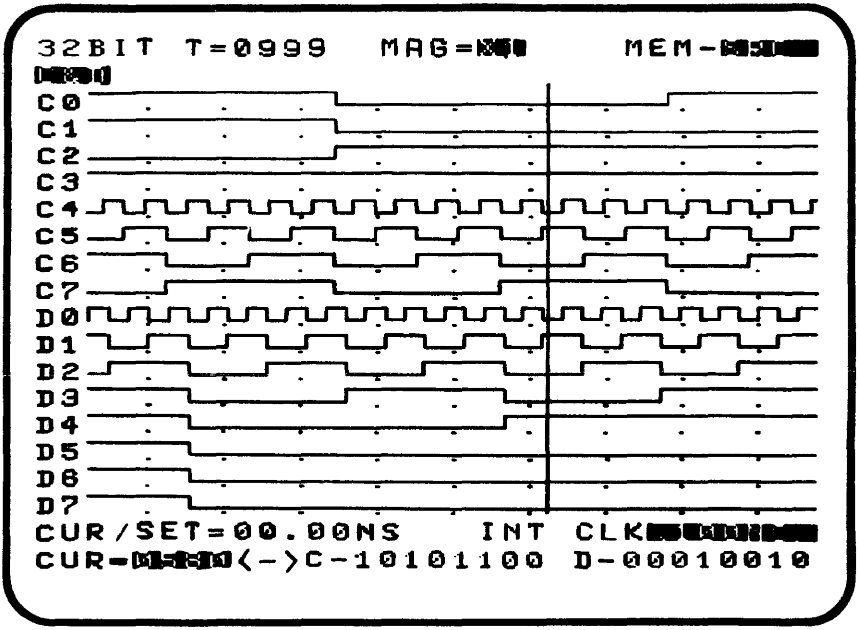


Figure 6-12: Timing Display

Timing Diagram Display

To call up the Timing Diagram on the Logic Analyzer's screen, use the

command: **$MD_,**

Timing Diagram Pod Arrangement

This command allows the display arrangement for the 16 channel pod groups A & B, C & D. In each group a channel mixing is allowed. Mixing between pod groups is not possible. Use the

command: **$MD_X(N1)_P(N2)_C(N3,N4,N5)_,**

Magnification X(N1)

(N1)	= 1	X1	magnification	
	= 2	X5	magnification	(X10 in 16-Bit Mode)
	= 3	X10	magnification	(X20 in 16-Bit Mode)

Pod Group P(N2)

(N2)	= A	Group A & B
	= C	Group C & D

Channel Arrangement C(N3,N4,N5)

Arranges displayed channels per programmed sequence. Subsequent commands are possible.

(N3) = 0 thru F (HEX)	For the 16 channel position of the display. 0 is the top most (A0) and F the bottom most (B7).
(N4) = A, B or 0	Used with N3 to determine which pod will be displayed at the N3 position. 0 used to turn OFF the channel at the N1 position. If OFF is selected N5 must be omitted.
(N5) = 0 thru 7	Used with N4 to determine which channel will be displayed at the N3 position.

See also Figure 6-13.

Example:

Change the pod arrangement of pod group A & B to the display form :

Expansion Mode x 5
Pod A channel 7 in first line position.
Pod B channel 5 in second line position
Pod A channel 3 off

Command: **$MD_X2_PA_C0A7_C1B5_C30_,**

6.12 SEARCH FUNCTION PROGRAMMING

Search function commands are initiated by the

command: **$MF_**

and followed by the commands below. The commands must be separated by a <space>. The command string is executed by the execution character <,>.

Function Select

This command selects the type of search to be executed.

E Search for equality
U Search for unequality
W Word Search

Search Word W (N1,N2)

N1 = PA thru PD for pod select
N2 = 8 pos. binary digits for word definition
including don't cares

Printout of Search Result

To read out the result use the transmit buffer read routine as explained in section 6.6.3.

NOTE:

Before executing a Search function, perform first of all a dummy Word Search for 16 channels or 32 channels (depends on the recording mode).

Search Result

The search results are prepared and put into the transmit buffer after each execution with the following format:

T = XXXX C = YYYY

XXXX = Search total counter
YYYY = Actual cursor position

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