

APPENDIX A: ML4400 SPECIFICATIONS

PHYSICAL

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| Dimensions | Width, 15.75"; Depth, 18.75"; Height, 7.5" |
| Weight | 26 lbs |
| Input Power | 100-240 VAC, 8 A, 1000 w, 50/60 Hz (switch-selectable) |
| Environment | 0-40 degrees C operating 5-95% RH, noncondensing |
| Display | 7" flat green-screen CRT, standard |

CONFIGURATION OPTIONS

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|-----------------------------|--|
| MAINFRAME (ML4400) | Holds up to four Capture Modules plus several options. Standard unit includes: ROM Emulator interface for 2716, 2732, 2764, 27128, 27256, 27512, 271024 (Requires optional ROM Em. Pod.) Serial Printer interface (RS232C/V24) for speeds of 1200, 2400, 4800, 9600, and 19200 baud. Parallel printer interface Multisync color video output (50/60 Hz) Trigger out (TTL level) Trigger in (TTL level) Nonvolatile storage for 8 setups and 1 data memory Search and Compare functions in standard software |
| STARTER SYSTEM (ML4400S) | 40-channel state and timing analysis system (ML4400 + SC-4400 + LP-4050) |

CAPTURE MODULES/CARDS

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| Groups | Capture Modules can be grouped together to get more channels clocked at the same time, or can be used as separate logic analyzers. |
| Standard Capture Module (SC-4400) | 80-channel state and timing analysis |
| Channel Modes | 20 channels at 100 MHz (requires LP-4050) 40 channels at 50 MHz (requires LP-4050) 80 channels at 25 MHz (requires LP-4050 + LP-8025) (Capture Modules cannot be grouped if any is connected to an LP-8025.) |
| High-Speed Capture Module (HS-4400) | 16-channel state and timing analysis |
| Channel Modes | 4 channels at 400 MHz Timing (requires LP-4400) 8 channels at 200 MHz Timing (requires LP-8200) 16 channels at 100 MHz State and Timing 8 channels at 100 MHz plus 8 channels at 100 MHz with glitch detection (only with LP-8200) |

LOGIC PODS

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|--|--|
| 100-MHz Logic Pod, (LP-4050) | 40 channels at 50 MHz or 20 channels at 100 MHz State and Timing Can be used only with SC-4400. |
| Expansion Logic Pod (LP-8025) | 40 more channels at 25 MHz when used with LP-4050 State and Timing Can be used only with SC-4400 and LP-4050. Cannot be grouped. |
| 200-MHz Logic Pod (LP-8200) | 8 channels at 200 MHz (Timing), 16 channels at 100 MHz (State or Timing), or 8 channels at 100 MHz and 8 chan- nels at 100 MHz with glitch detection (State or Timing) Glitch aperture is 5 ns minimum. Can be used only with HS-4400. |
| 400-MHz Logic Pod (LP-4400) | 4 channels at 400 MHz (Timing) or 16 channels at 100 MHz (State or Timing) Can be used only with HS-4400. Expands to 16 channels at 400 MHz (async) by HS-4400s (4 channels per HS-4400). |
| Serial Data Anal- ysis Pod (RS-232) | Supports monitoring and analysis of all serial interface activities. State and Timing |
| MICROPROCESSOR PODS | Support most popular 8-, 16-, and 32-bit microprocessors, as well as most popular single-chip microprocessors. ML4100 Pods can be used (requires AD4100 Adaptor). All Pods support NMOS as well as CMOS devices. |

ARIUM OPTIONS

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|-------------------------------|--|
| Adaptor (AD-4100) | For adapting the ML4100 Microprocessor Pods to the ML4400 |
| Floppy Disk Drive (FD-003) | Stores setups or Reference Memory data for Compare functions or automatic test sequences. |
| Size | 3 1/2 inches, 720 Kbytes, DOS format |

NON-ARIUM OPTIONS

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|---------------|--|
| PC Keyboard | Any IBM-compatible keyboard can be used to enter alpha- numeric characters. |
| Color Monitor | Any multisync-compatible monitor can be connected. 50 or 60 Hz |

DATA INPUTS

| | <u>LP-4050</u> | <u>LP-8025</u> | <u>LP-8200</u> | <u>LP-4400</u> |
|--|---------------------|---------------------|---------------------|---------------------|
| Input Voltage | | | | |
| Minimum (from Threshold) | 250 mV | 250 mV | 150 mV | 150 mV |
| Maximum Operating | +18 VDC | 18 VDC | 18 VDC | +16 VDC |
| Maximum Absolute | +40 VDC | 40 VDC | 40 VDC | 40 VDC |
| Threshold Voltage | | | | |
| ECL | -1.30 VDC | -1.30 VDC | -1.30 VDC | -1.30 VDC |
| TTL | 1.40 VDC | 1.40 VDC | 1.40 VDC | 1.40 VDC |
| Variable (50-mV steps) | -2.5 to +9.9 VDC | -2.5 to +9.9 VDC | -2.5 to +9.9 VDC | -2.5 to +9.9 VDC |
| Input Impedance | 6 pF 140 Kohms | 6 pF 140 Kohms | 5 pF 100 Kohms | 5 pf 100 Kohms |
| Internal Clock (Async.) | 100 MHz | 25 MHz | 200 MHz | 400 MHz |
| Transitional Timing | no | no | yes | yes |
| Max. count between samples | N.A. | N.A. | 65535 | 65535 |
| Max. virtual (transi- tional) samples | N.A. | N.A. | 10 ⁹ | 10 ⁹ |
| Skew, all channels | 4.5 ns | 5.0 ns | 1.8 ns | 1.8 ns |
| External Clock (Sync.) | 100 MHz | 25 MHz | 100 MHz | 100 MHz |
| Clocks | 4 | 0* | 1 | 1 |
| Qualifiers | 2 | 0 | 1 | 1 |
| Set-up time | 8 ns | 8 ns | 4 ns | 4 ns |
| Hold time | 0 ns | 0 ns | 0 ns | 0 ns |
| Period (minimum) | 20 ns | 40 ns | 10 ns | 10 ns |
| Pulse width | 10 ns | 10 ns | 5 ns | 5 ns |

* (derived
from LP-4050)

MEMORY

8,000 samples/channel maximum per SC-4400 Capture Module
32,000 samples/channel maximum with HC-4400 Capture Module

| | <u>LP-4050</u> | <u>LP-8025</u> | <u>LP-8200</u> | <u>LP-4400</u> |
|--------------------|----------------|----------------|----------------|----------------|
| | LP-4050 | LP-8025 | LP-8200 | LP-4400 |
| 4 ch., 400 MHz | ---- | ---- | ---- | 32000 |
| 8 ch., 200 MHz | ---- | ---- | 16000 | ---- |
| 8 ch + 8 G/100 MHz | ---- | ---- | 8000 + 8000 G | ---- |
| 16 ch., 100 MHz | ---- | ---- | 8000 | 8000 |
| 20 ch., 100 MHz | 8000 | ---- | ---- | ---- |
| 40 ch., 50 MHz | 4000 | ---- | ---- | ---- |
| 80 ch., 25 MHz | 2000 | 2000 | ---- | ---- |

TRIGGERING

| | |
|------------------|---|
| Words | 8 maximum with SC-4400, Standard Capture Module 4 maximum with HS_4400, High-Speed Capture Module |
| Width | 80 bits per group maximum with SC-4400 64 bits per group maximum with HS-4400 |
| Levels | 14 |
| Delay | 0-65,535 clocks |
| Cross-trigger | Any group may be triggered from a Boolean combination of the external trigger in and/or the outputs of the trigger machines for any group |
| Special Features | GoTos at all levels Trigger on glitch (only with LP-8200, 200-MHz Logic Pod) Trigger on range, count, time Predefined sequences: 28 User-defined sequence |

DATA QUALIFICATION

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|---------------|--|
| Record Select | Switch on/off at any level in trigger sequence |
| Types | |
| State | Toggle trace on/off on combination of words |
| Combinational | Capture predefined words only |

TIMING DISPLAY

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|------------------|--|
| Channel Display | 16 channels maximum; if 8 or fewer channels, timing lines are displayed in double-height. |
| Glitch Display | Special character (stored in separate memory) |
| Channel Groups | Up to 32 channels can be grouped to display a hex value (or other bases) representing the value of the total group of channels |
| Cursor | Current position in trace buffer |
| Markers | 3 |
| Expansion | X1, X4, X16, X64 centered around cursor |
| Time Measurement | In clocks (with external clock) or time (internal clock) Marker to cursor |
| Summary | Graphical representation of position of data on current screen data relative to the total Trace Buffer |

STATE DISPLAY

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|--------------------------|---|
| TimeStamp | On all channels 50-ns maximum resolution (user-selectable) |
| Fields | Maximum of 12 per group |
| Samples/screen | Maximum of 17 |
| Format for Each Field | Hexadecimal, decimal, octal, binary or ASCII Inverted or noninverted |

SPLIT SCREEN

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|--------------------|--|
| Timing/State | Number of timing channels is selectable. Time-aligned between State and Timing halves |
| State/State | For multiprocessor support Time-aligned between groups (processors) |
| Timing/Disassembly | Number of timing channels is selectable. Time-aligned between Timing and Disassembly halves |

PRINT Uses Epson-graphics-compatible printer.
Prints hard copies of any current screen or, for State and
Disassembly displays, partial or complete trace buffer.

DISASSEMBLY DISPLAY

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|-------------------|---|
| Formatted Display | Microprocessor cycles displayed with address, mnemonic for opcode, operand(s) and I/O and memory locations |
| Search | Search for ASCII string |
| Scrolling | Up/Down, page, fast positioning in Timing and State |

ROM EMULATOR Supports 2716, 2732, 2764, and 27128 at publication time.
Will also support 27256, 27512, and 271024.

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|-------------------|--|
| ROM Socket Plugs | 4 per Pod |
| Address Bus | 17 lines, all common |
| Data Buses (2) | 8 bits each, independent for 8-, 16-, or 32-bit targets |
| Timing | Tacc: 200 nsec Tce : 200 nsec Toe : 70 nsec Iol : 2.1 mA Vol : 0.5 V |
| Interface to Host | RS232C/V24 |
| Data Editing | Via ML4400 front-panel keyboard or attached PC keyboard |

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