

HP E3470A Emulator for Mitsubishi MELPS M16C/60 Series Microprocessors

Product Overview

Design, debug, and integrate real-time embedded systems

The HP E3470A emulator supports Mitsubishi M16C/60 Series microprocessors up to 10 MHz.* This emulator supports various versions of MELPS M16C Series microprocessors. The HP E3470A offers the real-time measurement capabilities needed to develop M16C/60 Series embedded systems, including interpreted displays of on-chip registers, emulation memory, a deep-trace analyzer, and hardware break events.

For both PC and workstation the C debugger user interface is provided, offering a look and feel similar to Microsoft Windows 95[®] and X/Motif. The debugger combines an easily used full graphical user interface with the HP 64700's transparent, real-time emulation. It provides powerful measurement capabilities ranging from real-time nonintrusive analysis to high-level C source code debugging. This combination allows you to debug embedded C programs at the source level, while your target runs at full speed.



HP E3470A Features

- Support for 5 V and 3 V processor versions in standard
- No-wait-state execution up to 10 MHz* at 5 V and 7 MHz* at 3 V with 1 wait-state
- Support for a variety of M16C/60 processors is provided by specific I/O emulation boards, which are supplied by Mitsubishi
- Disassembly of MELPS M16C/60 series instruction set
- Display and modification of functions for internal I/O registers
- Background monitor
- Eight real-time hardware break events
- Unlimited software execution breakpoints
- Support for fast file download

Emulation Bus Analyzer

- 80 channels available with trace buffer depths of 1 K, 8 K, 64 K, or 256 K
- Real-time instruction dequeuing prevents mis-triggers in trace analysis
- Real-time instruction dequeued trace with symbols and source lines
- Eight events, each consisting of address, status, and data comparators
- 8 level event sequencer
- Time tags with 20-ns resolution (64794x) and state counts
- Prestore capability

*Contact your HP 64000 field engineer for the latest configuration information and supported processor speeds.





Emulation Memory

- Dual-ported emulation memory allows modification and display without processor interruption
- Emulator covers full address space by providing 1 MB of emulation memory standard
- Mapping in 256-byte blocks

Software Support

- C debugger user interface hosted on MS-DOS® compatible PCs and HP 9000 Series 700*
- Support for Mitsubishi assembler and compiler on MS-DOS® compatible PCs and HP 9000 Series 700*
- Support for IAR SYSTEMS AB assembler and compiler on MS-DOS[®] compatible PCs and HP 9000 Series 700*

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^{*}For support on Sun SPARC workstations contact your local HP Sales Representative.

[®] MS-DOS is a US registered trademark of Microsoft Corporation.

HP 64700 Card Cage

The HP 64700 card cage is the basis for modular emulators and analyzers. It can be disassembled easily for cost-saving reconfiguration to support 8-, 16-, and 32-bit processors.

The card cage host control card contains LAN capability, along with RS-232-C/RS-422 serial port and system configuration firmware. System, emulation, and analysis firmware are always resident and may be updated.

Networking

In many embedded design environments, it is not possible for each member of a design team to have a target system and an emulator, which makes remote access from a networked host essential. The HP 64700 Series offer a LAN connection so that vou can share a central emulator and target from either a PC or a workstation. In addition, the rapid file transfers—rates of up to 6 MB per minute—can increase your productivity. The card cage connects to all popular Ethernet/ 803.2 networks through a 10Base2 ThinLAN BNC connector or a 15-pin AUI (attachment unit interface). The system supports TCP/IP protocols, LAN gateways and ARPA/Berkeley standards.

Emulation Bus Analysis

Emulation bus analysis provides real-time, nonintrusive operation along with extensive triggering, tracing, and qualification features. Analysis features include selective tracing, time-tagging, prestore and a selection of 1-K, 8-K, 64-K, or 256-K trace depths. These comprehensive resources combine to help you solve complex problems.

The dual-bus architecture results in real-time, nonintrusive analysis. You can set up and review traces without breaking processor execution. Selective tracing of microprocessor code flow without breaking execution is a major strength of the HP 64700 Series emulators and analyzers.

You can combine up to eight hardware breakpoint resources, each consisting of address, data, and status event comparators, in sequential trace specifications using "find A, followed by B..." constructs up to eight levels deep. Apply a range comparator to address or data events at any one of these levels. The analyzer will trigger on and store all subsequent executions or store only specified execution information.

Precise time-tagging of events helps you identify discrepancies in code execution. The analyzer logs each event with its execution time. Bus cycle, instruction, and module duration can be measured at full processor speeds.

Prestore helps you pinpoint possible problem areas in your coding by determining which of several different functions is accessing a variable and which function is causing the corruption.

Real-Time Emulation

The HP E3470A contains the microprocessor, emulation monitor, run-control circuits, and 1 MB of dual-port emulation memory. The background monitor is also included. It uses no target address space.

HP high-speed emulation memory provides you with no-wait-state real-time execution; dual ports let you display and modify emulation memory locations without interrupting target processor execution. All of these features give you considerable flexibility in a nonintrusive development environment.

Extensive breakpoint capabilities are included, allowing you to define where to stop code execution. Software breakpoints can be set up in the emulator, allowing execution to be halted at an instruction point.

Real-time hardware break events increase the flexibility and power of this feature, extending functionality to include stopping at processor address, data, status points, or a combination of all three.

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Memory Configuration

One MB emulation memory is available on the HP E3470A emulation probe. This covers the entire address space of the M16C/60 series. No additional emulation memory is required.

Symbolic Support

Symbolic debugging clarifies trace -list interpretation by allowing you to see program symbols in the trace list. This feature facilitates quick identification of problems involving the interaction of software and hardware. You can also use symbols in emulation commands and expressions to simplify command entries and user interaction.

C Debugger Solution for PCs and Workstations

The C debugger user interface is a mouse-driven, graphical user interface for HP 64700 emulators. It runs on PCs with Microsoft Windows $95^{\mathbb{R}}$ and on an HP 9000 Series 700 workstation with X/Motif. The interface offers the same look and feel on both PCs and workstations.*

The debugger gives you the ability to perform trace analysis, control program execution, set breakpoints, display variables, and set emulator configuration parameters. It takes full advantage of the emulator's dual-bus architecture and dual-ported memory to perform many C and assembly debug functions while the target runs at full speed. This means that you can handle C debugger functions such as setting breakpoints, displaying and editing C variables. and measuring C program execution. Traditionally such functions

could only be performed when the user program was stopped.

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The debugger supports language tools from Mitsubishi and IAR SYSTEMS, which provide software tools compatible with the HP E3470A emulators. The Mitsubishi toolset includes a C cross-compiler and assembler which runs on MS-DOS® compatible PCs and HP 9000 Series 700.* The IAR SYSTEMS toolset includes a C cross-compiler and assembler which runs on MS-DOS® compatible PCs and HP 9000 Series 700.*

Terminal Mode Operation

A firmware-resident ASCII terminal interface is embedded in the emulator, supplying commands for all emulation and analysis features. Commands are ASCII strings; the system accepts file transfers using industry-standard formats. Because a terminal can access these commands, host independence is realized.

* For support on Sun SPARC workstations contact your local HP sales representative

HP E3470A Specifications

Supported Mitsubishi Processors

The HP E3470A emulator supports most of Mitsubishi M16C/60 series processors by changing the I/O emulation board. HP will continue to add supported processors, so the processor support list is growing. Contact an HP sales representative for the latest detailed information on supported processors.

The HP E3470A emulator does not include an I/O emulation board. To emulate a processor, you need to purchase an I/O emulation board which supports your processor. The I/O emulation board is supplied from Mitsubishi dealers. Please refer to the Mitsubishi catalog for the location of local Mitsubishi sales and support offices to order an I/O emulation board.

Specifications and Characteristics

Processor compatibility

The HP E3470A emulator supports the Mitsubishi M16C/60 family microprocessors operating at clock speeds up to 10 MHz. The emulator supports both 5V and 3V operation.

Electrical

Maximum Clock Speed:

E3470A (5 V): 10 MHz with no-wait states required for emula-tion or target system memory.

E3470A (3 V): 7 MHz with 1-wait state required for emula-tion or target system memory.

with no-wait states required for emulation or target system memory.

Minimum Clock Speed: 32 KHz Operating Voltage: 2.7 to 5.25 V Power: Primary power supplied by card cage

AC Timing Specifications: defined by the I/O emulation board supplied from Mitsubishi. Contact Mitsubishi dealers for detailed specifications.

Environmental

Temperature: operating, 0° to $+40^{\circ}$ C ($+32^{\circ}$ F to $+104^{\circ}$ F); nonoperating, -40° C to $+70^{\circ}$ C (-40° F to $+158^{\circ}$ F).

Altitude: operating /nonoperating, 4600 m (15 000 ft)

Relative humidity: 15% to 95%.

Regulatory Compliance

(When installed in HP 64700 cardcage)

Electromagnetic interference:

CISPR 11:1990/EN 55011 (1991): group 1 class A IEC 801-2:1991/EN50082-1 (1992): 4 kV CD, 8 kV AD IEC 801-3:1984/EN50082-1 (1992): 3 V/m, 80% modulation, 26 MHz-1000 MHz IEC 801-4:1988/EN50082-1 (1992): 0.5 kV signal lines, 1 kV power lines

Safety approvals: self-certified to CSA-C22.2 no. 1010.1-92 and IEC 1010-1 (1990) + Amendment 1 (1992)

Physical

Emulator dimensions: See drawings below.





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Ordering Information



Terminal-Based Emulation System

Model	Description
E3470A	10-MHz Emulation Probe for M16C/60 series with 1MB $$
	emulation memory
64794A	8 K-deep emulation bus analyzer card, 80 channels
64700B	Card cage
64748C	Emulation control card

Note: The I/O emulation board from Mitsubishi is required for processor emulation. The emulation memory is not required for the system, because it is available on the HP E3470A emulation probe in standard.

Emulation System Options

Model	Description
64704A	1 K-deep emulation bus analyzer card, 80-channels
64794C	64 K-deep emulation bus analyzer card, 80 channels
64794D	256 K-deep emulation bus analyzer card, 80 channels

Software Options for Workstations

For each software model number ordered, purchase one media option and at least one license option for each concurrent user.

Media/License Options

B3753A	MELPS M16C/60 C debug user interface
Opt AAY	* HP9000 Series 700 manuals/media (DDS DAT tape)
Opt UBY	HP9000 Series 700 single-user license
Opt AJ4*	* IBM PC manuals/media (3.5" floppy disc)
Opt UDY	IBM PC single-user license
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* HP Unix 9.0 or later

** Windows 95 only and only on HP 64700B

Software Support

HP provides support (support via telephone and software upgrades) through the purchase of the service contract. Contact your HP field engineer for more information. For more information on

Hewlett-Packard Test & Measurement products, applications or services please call your local Hewlett-Packard sales offices. A current listing is available via Web through Access HP at http://www.hp.com. If you do not have access to the internet please contact one of the HP centers listed below and they will direct you to your nearest HP representative.

United States:

Hewlett-Packard Company Test and Measurement Organization 5301 Stevens Creek Blvd. Bldg. 51L-SC Santa Clara, CA 95052-8059 1 800 452 4844

Canada:

Hewlett-Packard Canada Ltd. 5150 Spectrum Way Mississauga, Ontario L4W 5G1 (905) 206 4725

Europe:

Hewlett-Packard European Marketing Centre P.O. Box 999 1180 AZ Amstelveen The Netherlands

Japan:

Hewlett-Packard Japan Ltd. Measurement Assistance Center 9-1, Takakura-Cho, Hachioji-Shi, Tokyo 192, Japan Tel: (81-426) 48-0722 Fax: (81-426) 48-1073

Latin America:

Hewlett-Packard Latin American Region Headquarters 5200 Blue Lagoon Drive 9th Floor Miami, Florida 33126 U.S.A. (305) 267 4245/4220

Australia/New Zealand:

Hewlett-Packard Australia Ltd. 31-41 Joseph Street Blackburn, Victoria 3130 Australia 1 800 629 485

Asia Pacific:

Hewlett-Packard Asia Pacific Ltd 17-21/F Shell Tower, Times Square, 1 Matheson Street, Causeway Bay, Hong Kong Fax: (852) 2506 9285

Data subject to change Printed in the U.S.A. 9/96 5965-5050E

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