HP 64744 and HP 64746 Emulators for Motorola 68000/68EC000/68HC000/ 68HC001 and 68302

Product Overview

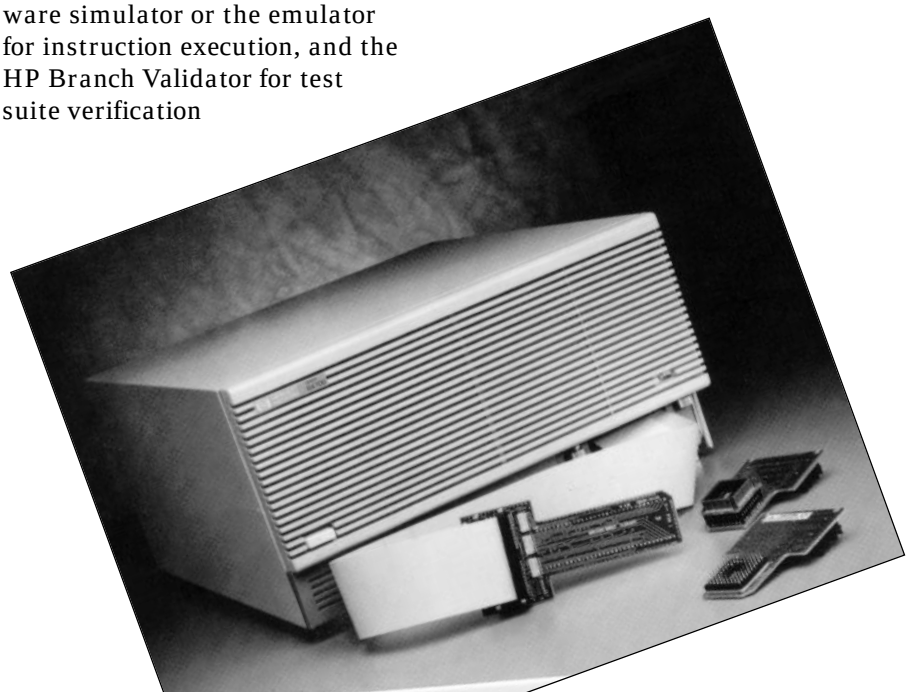
Design, debug, and integrate real-time embedded systems

Description

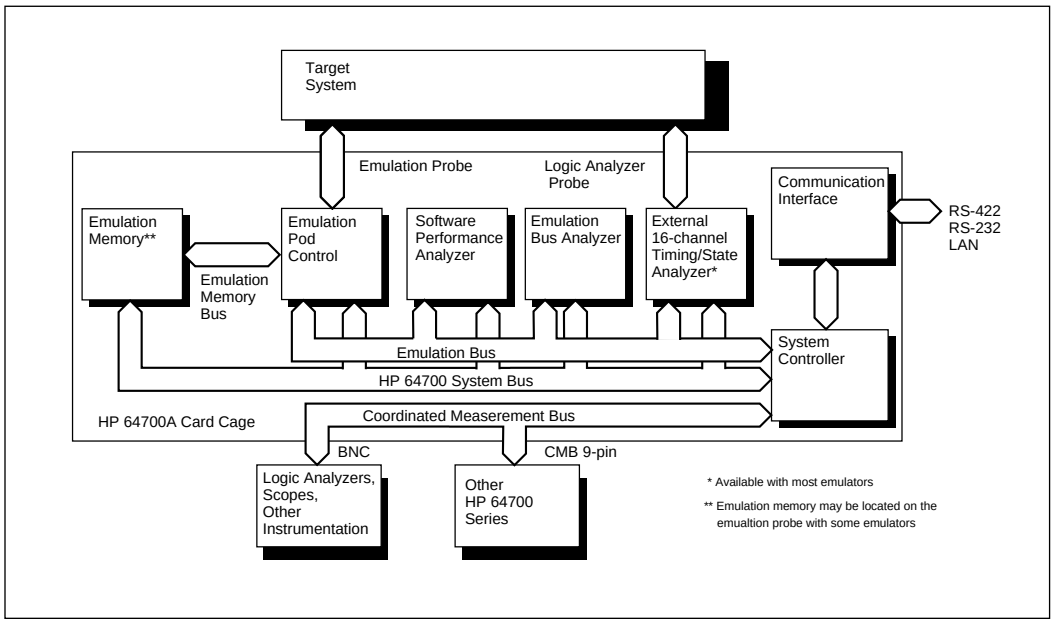
Hewlett-Packard has the microprocessor development solutions that you need to meet time to market and quality goals for Motorola 68000, 68EC000, 68HC000, 68HC001, and 68302 microprocessor based designs. A full range of development tools are available from HP and leading third-party vendors. These tools combine to ensure your design has support throughout the development life cycle. Compilers assemblers/linkers, debuggers, emulators and analyzers combine to solve the tough problems of efficient code generation, software debug, and software/hardware integration.

The emulators plug into the modular HP 64700A card cage, which connects to your host via RS-232, RS-422, or LAN. Easy-to-use interfaces are offered on IBM-compatible PCs, Sun SPARCstations, and HP 9000 Series 300/400/700 workstations. Additionally, the card cage firmware-resident interface can talk to any ASCII terminal

For software development, the HP AxCASE environment is available on Sun SPARCstations and HP workstations. This environment includes an ANSI standard C compiler assembler/linker, a debugger that uses either a software simulator or the emulator for instruction execution, and the HP Branch Validator for test suite verification



Modular HP 64700 Series System



HP 64700 Series development tools include emulators, emulation bus analyzers, software performance analyzer (SPA), and an external 16-channel timing/state analyzer.

64700A card cage

The HP 64700A card cage is the basis for modular HP 64700 Series emulators and analyzers. It can be disassembled and re-assembled for easy, cost-saving re-configuration to support other 8, 16, or 32-bit processors.

The card cage has six and a half card slots. Two and a half slots are dedicated to a card cage host control card, an emulation bus analyzer card, and an optional LAN card. The remaining four slots are available for emulator card sets, a Flash EPROM card, an optional software performance analyzer card and any future products. The Flash EPROM card provides easy software and firmware updates.

Your host computer can communicate with the card cage via LAN, RS-232-C or RS-422, allowing the HP development tools to operate in a wide variety of design environments. The card cage contains two independent RS-232-C serial ports, each with standard 25-pin female connectors. RS-422 capability embedded in one of the ports can be programmed to operate at rates up to 230 kbaud and is available for IBM PC compatibles. A LAN card allows connection to Ethernet networks via ThinLAN, ThickLAN, or StarLAN. TCP/IP protocols, LAN gateways, subnets, and ARPA/ Berkeley stardards are supported on HP 9000 workstations.

Real-tune emulation
State-of-the-art probing technology insures nonintrusive, electrical transparency of targeted 68000 family processors. Passive probes are used for the HP 64744 emulators There are four adapters available for changing between processors and package types.

The HP 64746 emulator has an emulator probe with a 132-pin PGA probe for accessing 68302 based target systems.

Extensive breakpoint capabilities let you define where to start and stop the execution of code. Up to 32 software breakpoints can be set up in the emulators,allowing execution to be halted at an instruction point. Eight real-time hardware breakpoints increase the flexibility and power of this feature, extending functionality to include stopping at processor address, data, and status points.

Flexible memory configuration

68000 Processors

The HP 64744 emulator has 60 Kbytes of emulation memory plus the ability to expand up to 2 Mbytes. Two slots are available on the emulator card, allowing you to plug in the amount of memory needed. If you initially order less than the maximum amount, you can easily expand your system by adding the appropriate module[s]. Modules for 256 Kbyte (HP 64171A) and 1 Mbyte (HP 64171B) are available and can be used in any combination with a maximum configuration of 2 Mbytes.

68302 Processors

For the HP 64746 emulator, there are two configurations. The HP 64746G emulator card includes 128 Kbytes of emulation memory. The HP 64746J emulator card has no built-in memory but allows you to configure the amount of memory needed for the application through a separate memory board. Two slots are available on the memory board (HP 64170A), which allows you to plug-in up to 2 Mbytes of memory. Memory modules are available in 256 Kbyte (HP 64171A) and 1 Mbyte (HP 64171B) and can be used in any configuration.

The assignable memory attributes include target or emulation, and RAM, ROM, or guarded memory. Emulation memory accesses can also be synchronized to target system DTACK. Dual-port emulation memory lets 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.

Emulation bus analysis

Dual-bus architecture provides real-time, nonintrusive analysis. This allows traces to be set up and reviewed without breaking processor execution.

Tracing microprocessor code flow is a major strength of the HP 64700 Series emulators and analyzers. Up to eight hardware resources, each consisting of addresses, data, and status event comparators, can be combined in sequential trace specifications, using “find A, followed by B...” constructs up to eight levels deep. A range comparator can be applied to address or data events at any one of these levels. The analyzer will trigger on and store all subsequent execution or store only certain execution information.

Precise time tagging of events helps you identify discrepancies in code execution times. Each event is logged into the analyzer with an execution time. Bus cycle, instruction and module duration times can be measured at full processor speeds with 40 ns resolution.

Prestore assists you in pinpointing possible problem areas in your code. For example, prestore determines which of several different functions is accessing a variable and is responsible for corrupting it.

These comprehensive resources in the emulation bus analyzer combine to solve both simple and complex problems.

Robust symbolic support

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

Software performance analysis
If your development team is workstation based, a software performance analyzer enables you to tune and verify the time-critical aspects of your design. These capabilities are provided at both the C source and assembly language level. Through automated one-key set up this system quickly identifies code bottlenecks and gathers statistics and timing information that aid in solving time critical problems.

External state/timing analysis

A 64-channel emulation bus analyzer with sixteen channels of state and timing analysis is available for these emulators. The external analyzer can serve as a stand-alone logic analyzer or can be coupled with the emulation bus analyzer for correlation of microprocessor activity with other target system activity. The two analyzers can cross trigger or arm each other, based on hardware or software events that one analyzer detects.

Coordinated measurement bus

Multiprocessor designs can be analyzed by using the Coordinated Measurement Bus (CMB) to synchronize (start/stop) multiple emulators. To help understand and isolate relationships between processors, up to 32 emulators and analyzers can be set up to cross trigger one another. A BNC connector included on the card cage can drive or receive a trigger signal to allow cross triggering of logic analyzers, oscilloscopes, and other instruments

Easy-to-use interfaces

Easy-to-use interfaces are available on HP 9000 workstations Sun SPARCstations and PCs. The workstations interface can run in the X-Windows or open windows environments, allowing you to open several emulation and analysis windows during a session. For example, you can have a window open displaying global symbols and another windows displaying trace results. Command selection is done with the click of a mouse button and the interface guides you through command completion.

On the PC, the emulation interface is windowed. Commands are selected by pressing the first letter, of a command and you are guided through completion of the command syntax. Function keys can be defined as a macro to represent a sequence of commonly used commands. For trace specification there is a window dedicated to defining events and another window dedicated to defining the search sequence. This logical partitioning aids a user in defining complex measurements

High-level debug

The same high level debugger interface that controls the software simulations can also be used to control the emulator on supported workstations. This allows you to debug code in real time while maintaining the benefits of a source level debugger.

Full source debugging is provided for these emulators by the AxCASE debuggers on HP 9000 workstations and Sun SPARCstations. These debuggers support data types, stack backtrace, and stack-resident local variables. User code runs in realtime on the emulators and breakpoints are set via the debugger interface. Source debugging is also provided by various third-party software vendors

HP 64744 Emulator

The HP 64744 emulator support 68EC000,68000,68HC000 and 68HC0001 processors by changing adapters at the end of the emulator cable. Adapters available include DIP for 68000,PGA for 68000/ 68HCOO1,PLCC for 68000/68HC001 and PLCC for 68EC000 processors.

HP 64744 Features

- Real-time, no-wait-state execution up to 6.7MHz
- 60 Kbytes of basic emulation memory mappable in 4-Kbyte blocks may be expanded to 2-Mbytes with 256 Kbyte and 1-Mbyte memory modules
- Dual-ported emulation memory for modification and display without processor interruption
- Flash EPROMs for easy firmware update
- Disassembly of microprocessor instruction set
- Support for DIP, PGA, and PLCC versions
- User-selectable background or foreground emulation monitors
- Configurable target interface while in the background monitor
- 32 software breakpoints
- 48-channel bus emulation analyzer
- Modular architecture that allows for various microprocessor personalities, memory sizes, and cable modifications
- Optional softkey interface or PC user interface for symbolic debug and a friendly windowed user environment
- Simulated I/O (on workstations)
- Support for IEEE-695, HP-OMF, Motorola S-Records and Extended Tek HEX file formats (symbols supported with IEEE-695 and HP-OMF)
- Multiprocessor emulation
  - synchronous start of up to 32 emulators
  - cross triggering from another emulator, logic analyzer, or oscilloscope
- Integrated C language system available

Specifications

Processor compatibility: compatible with Motorola 68000, 68EC000. 68HC000, or 68HC001 and any other microprocessors that comply with the specifications of these processors.

Electrical
Maximum external clock speed: 16.7 MHz with no wait states required for emulation or target system memory
Minimum clock speed: 4 MHz

Power: 20 mA drawn from target system; all other power supplied by emulator.

Operating Environment

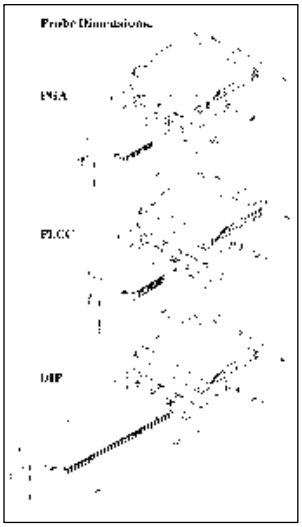
Temperature: Operating. 0° to +40°C (+32°F to + 104°F); non-operating, -40°C to +70°C (-40°F to +158°F).
Altitude: operating. 4600 m (15 000 ft.); non-operating, 15300 m (50 000 ft.).
Relative humidity: 15% to 95%.

Regulatory Compliance: (when installed in HP 64700 card cage)

Electromagnetic Interference: VDE 0871/6.78
Level A;C.I.S.P.R. 11

Safety approvals: self certified to UL 1244, IEC 348, CSA 22.2

Physical
Cable length: emulator to target system approximately. 610 mm (2 ft.)
Probe Dimension:



Ordering Information HP 64744

Terminal Based Emulation System

Model	Description
64744A	**Emulator card with 60 Kbytes of emulation memory** Expandable by 2 Mbytes
64706A	**48-channel emulation bus analyzer card**
64700A	**Card cage** Note: order one adapter for the desired processor support
64744B	**68000 DIP adapter**
64744C	**68000/68HC001 PGA adapter**
64744D	**68000/68HC001 PLCC adapter**
64744E	**68EC000 PLCC adapter**

Emulation System Components

64171A	**266 Kbyte 35 ns SRAM memory module**
64171B	**1 Mbyte 35 ns SRAM memory module**
64703A	**64-channel emulation bus analyzer card** with 16-bits of external state/timing analysis
64701A	**LAN card** (supported on HP 9000 Series workstations and Sun SPARCstations)
64037A	**RS-422 card for PC compatibles** (Software supplied)
64708A	**Software Performance analyzer card** (B1487A software required) (supported on HP 9000 series workstations and Sun SPARCstations)
64032A	**CMB cable** (4 m long, includes three 9-pin connectors)

Software for PCs

64744S	**Hosted user interface**

Opt 006

Software for Workstations

	Note: for each software model number ordered, purchase one media option and at least one license option for each concurrent user.
B1471B	**64000-UX Operating environment** (Required for all workstation based systems)
B1468B	**Graphical User Interface**
B1464A	**Cross Assembler Linker**
B1460A	**Cross C Compiler**
B1466B	**Cross Debugger Simulator**
B1472B	**Cross Debugger Emulator**
B1487A	**Software Performance Analysis User Interface**

Option Numbers

Opt AAH	**HP 9000 Series 300/400 manuals/media** (DDS DAT tape)
Opt AAX	**HP 9000 Series 300/400 manuals/media** (1/4 in. cartridge tape)
Opt UBX	**HP 9000 Series 300/400 single user license**
Opt AAY	**HP 9000 Series 700 manuals/media** (DDS DAT tape)
Opt UBY	**HP 9000 Series 700 single user license**
Opt AAV	**Sun SPARCstation manuals/media** (1/4 in. cartridge tape)
Opt UBK	**Sun SPARCstation single user license**

Software Support
HP provides software upgrades through the purchase of the Software Materials Subscription (SMS) service. Contact your HP sales representative for more information.

Note: Contact your HP Field Engineer for configuration information, supported, processor speeds, and latest software options.

HP Emulator for Motorola 68302 Integrated Multiprotocol Processor

Hewlett-Packard has the development solution that you need to meet time-to-market and quality goals for communication products based on the Motorola 64302 Integrated Multiprotocol Processor. A full range of development tools is available from HP and leading software vendors.

HP 64746 Features

- Real-time, zero wait state operation at 20 MHz
- Extensive DMA support
  - Tracing of DMA cycles
  - External devices can arbitrate processor bus
  - Bidirectional DMA between target memory and internal processor memory
- 80-channel emulation bus analyzer
- Optional 64-channel emulation bus analyzer with 16-bits of external state/timing analysis
- Up to 2 Mbytes of emulation memory
- Full symbolic debug, including source-line referencing
- Dual-ported emulation memory for modification and display without processor interruption
- Flash EPROMs for easy firmware update
- Two independent RS-232-C ports, one with RS-422 support for high speed upload and download
- 32 software breakpoints
- Support of IEEE-695, Motorola S-record, and HP 64000 file formats

Probing

State-of-the-art probing technology insures nonintrusive, electrical transparency of targeted processors. The 68302 emulator card has a 24-inch long, flexible cable that terminates in a 132-pin PGA probe. If you are using a PQFP or CQFP version of the processor, a PGA to QFP adapter is available for connection to your target system.

A PQFP dummy part is used to replace the processor on the target board which allows the adapter to be connected to your system. The emulator PGA probe then connects to the adapter transition board.

HP 64746 Specifications

Processor compatibility: Motorola 623302 Integrated multiprotocol processor in either 8- or 16-bit modes; does not support disable CPU mode.

Electrical

Maximum external clock speed: 20 MHz with no wait states required for emulation or target memory

Internal clock speed: 16.0 MHz

Inputs at PGA probe pins: **/RESET, /HALT, PBl-PBl1, PAO-PA15, RXD1, TXD1, RCLK1, TCLK1, /CD1, / CTS1,/RTS1, BRG1,/BCLR,/RMC, LAC:** unbuffered to the target system

Data inputs, address, and function codes: one 7AFCT245A load plus approx 50 pF capacitance

Clocks: one 74ACT load plus approximately 20 pF capacitance

/DTACK, /BR, /BG, /BGACK: 5ns pal

/UDS, /LDS, /AS, R/W: .5 ns pal path plus approximately 3.3 kohm pull-up and approx. 50 pF capacitance

Chip Selects: one 74FCT244A load plus approximately 50 pF capacitance

Interrupts: 1F load per bit plus approx. 3.3 kohm pull-up and approx. 50 pF capacitance

Power: approx. 40 mA from the target system, all other power is supplied by the card cage

Operating Environment

Temperature: operating, 0° to +40°C (+32°F to +104°F);
non operating, -40°F to +70°C (40°F to +158°F).

Altitude: operating, 4600 m (15 000 ft);
nonoperating 15 300 m (50 000 ft).

Regulatory Compliance
(When installed in HP 64700A card cage)

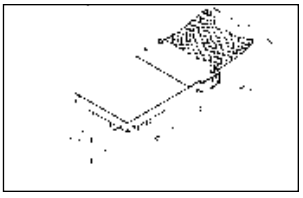
Electromagnetic interference: VDE 0871//6.78 Level SA; C.I.S.P.R.11

Safety approvals: self-certified to UL. 1244, IEC .348, CSA 22.2

Physical

Cable length: emulator to target system approximately 610 mm (24 in.), terminating at 132 PGA probe

Probe dimensions:



Ordering Information HP 64746

Terminal Based Emulation System

Model	Description
64746G	**Emulator card with 128 Kbytes of emulation memory and 132 pin PGA probe**
64746J	**Emulator card with no emulation memory and 132 pin PGA probe** (Memory is ordered separately with this emulator card)
64704A	**80-channel emulation bus analyzer card**
64700A	**Card cage**

Emulation System Components

64170A	**Emulation memory board (used with HP 64746J emulator card)**
64171A	**256 Kbyte 35 ns SRAM memory module** (maximum of two can be used on the HP 64170A memory board)
64171B	**1 Mbyte 35 ns SRAM memory module** (maximum of two can be used on the HP 64170A memory board)
64703A	**64-channel emulation bus analyzer card** with 16-bits of external state/timing analysis
64701A	**LAN card (supported on HP 9000 Series workstations and Sun SPARCstations)**
64037A	**RS-422 card for PC compatibles (software supplied)**
64708A	**Software Performance analyzer card (B1487A software required)** (supported on HP 9000 series workstations and Sun SPARCstations)
64023A	**CMB cable (4m long, includes three 9-pin connectors)**

Software for PCs

64746S opt 006	**Hosted user interface**

Software for Workstations

Note: for each software model number ordered, purchased one media option and at least one licensed option for each concurrent user.

B1471B	**64000-UX Operating environment (required for all workstation based systems)**
B1469B	**Graphical User Interface**
B1464A	**Cross Assembler Linker**
B1462A	**Cross C Compiler**
B1466B	**Cross Debugger Simulator**
B1473B	**Cross Debugger Emulator**
B1487A	**Software Performance Analysis User Interface**

Option Numbers

Opt AAH	**HP 9000 Series 300/400 manuals/media (DDS Dat tape)**
Opt AAX	**HP 9000 Series 300/400 manuals/media (14 in. cartridge tape)**
Opt UBX	**HP 9000 Series 300/400 single user license**
Opt AAY	**HP 9000 Series 700 manuals/media (DDS DAT tape)**
Opt UBY	**HP 9000 Series 700 single user license**
Opt AAV	**Sun SPARCstation manuals/media (1/4 in. cartridge tape)**
Opt UBK	**Sun SPARCstation single user license**

PGA to QFP Adapter

Model	Description
E3448A	**68302 PGA to QFP Adapter (includes HP P/N 64748-87608 dummy part)**

HP P/N	Description
64748-87608	**Interactive Mechanical Sample** (this is an inactive 132 pin PQFP processor package that replaces the target system processor, two per package Note: the inactive mechanical sample is supplied with the HP E3408A PGA to PQFP adapter. The sample should be assembled on the target board during the surface mount process for the PQFP adapter to be connected properly

Software Support

HP provides software upgrades through the purchase of the Software Materials Subscription (SMS) service.

Note: Contact your HP sales representative for configuration information supported processor speeds, and latest software options.

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For more information, call your local HP sales office listed in your telephone directory, or an HP regional office listed below:

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1-800-447-3282

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