

EL 1600 Development System

For Motorola 68000/EC/HC000 and Toshiba 68003/301/303/305

Highlights

- Full 16 MHz support for all 68000/EC000/HC000 variants
- Powerful, multi-windowed C/C++ debugger runs on Sun SPARC, HP 9000, and PC hosts
- Debugger operates stand-alone or in the MRI MasterWorks environment
- Compatible with MRI, GNU, DIAB Data and Intermetrics compilers (IEEE695 and a.out OMF)
- Installs no monitor in target memory; all 68000 features available
- Auto-configured Performance Analysis System runs at full bus-cycle frequency, monitors unlimited modules
- RTOS-Link™/KA option provides high-level view of RTOS data structures and allows task qualification for breakpoints from within MWX-ICE
- Trace memory with timestamp or LSA captures 72 bits of information about each bus cycle with depth of 8 K frames
- Monitor up to 8 parallel events at once or use 4 event system groups to find deeply nested bugs
- Overlay memory (1 MB and 2 MB) to effectively replace target ROM
- Single-window correlated assembly-to-source trace display clearly describes effect of compiler optimizations
- Fully isolated probe-tip, diagnostic scope loops, and trace memory help verify hardware design and diagnose problems
- Probe-tip has exceptional AC timing performance for accurate emulation
- Compact probe-tip simplifies target connection

Fully integrated, high-performance development solution for 68000/EC/HC.



Do it Better

The EL 1600 Emulator from Applied Microsystems is customized to the unique needs of 68000 developers. And it offers utility that spans the entire product development process. Whether you're working on software or debugging production hardware, the EL 1600 makes developing MC68000 products easier, faster, and better.

During specification, EL 1600 overlay memory helps your team analyze algorithms in real-time. A powerful trace and event system tracks data through the various software layers, while the fully-buffered probe tip and diagnostic scope loops accelerate hardware verification and diagnosis. Get through the critical integration phase with non-intrusive emulation and the help of Applied's experienced Application Support Group. And with its ability to accept regression scripts and isolate production problems, the EL 1600 keeps giving value as the product is released to manufacturing.



Applied
Microsystems
Corporation

*We also offer tools to support these Motorola products:
68000, 68020, 68030, 68040/040V, 68060/EC/LC060 ColdFire
MCF5102, 68330/340, 68331/332, 68360/EN/MH, CPU32*

Helping You Build It

Easier. That's the difference between a tool you use, and one that sits on the bench. The EL 1600 makes the capabilities of a full-scale emulator so accessible that you'll actually use all that power.

The EL 1600 makes it simple right from the start. Just plug in the probe tip; no need for special adaptors or complicated wiring. And because no target hardware resources are used, you don't have to worry about compensating for the emulator or modifying your hardware design.

Best of all, working with the EL 1600 is easy. The graphical windowed interface puts you in control, with shortcuts for experienced users and intuitive operation and help for new or occasional users. And full network support lets you work where you want.

Faster. That's what your tools are all about. And while any development team gets value from logic analyzers and monitors, a well-designed emulator gives you the breadth and depth that can make all the difference in meeting your schedule.

The EL 1600 is designed to help the whole team get done sooner. From software or hardware engineers to manufacturing technicians, the EL 1600 delivers information about your product that you can't get as easily—or at all—with any other tool. And because it's designed just for the 68000, the emulator offers complete visibility of even the most esoteric processor activity, but doesn't intrude on the operation of your application.

Better. The EL 1600 for 68000 makes it easy to do a better job, and that makes a better product. And when you're ready to move to other 68000 family designs, Applied offers tools for them that use the same interface, so you already know how to get the job done.

Debugging Made Better

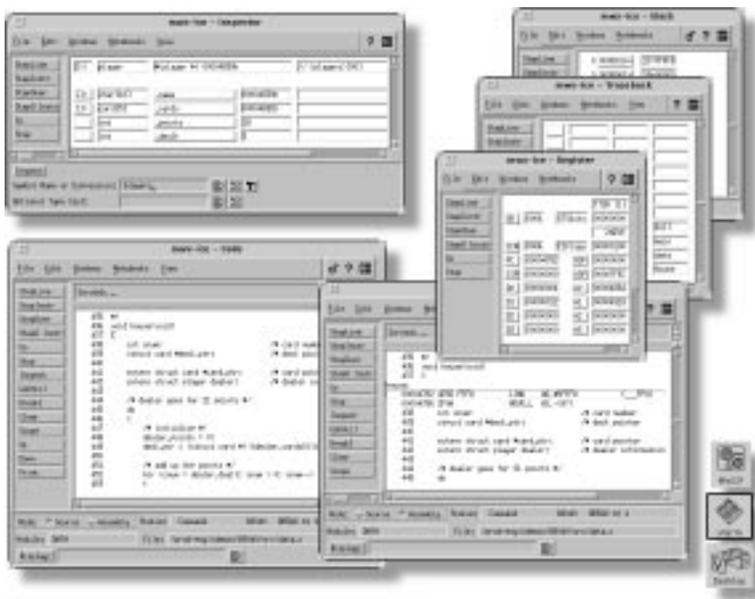
Whether you use a debugger every day or just every so often, you can easily be comfortable and productive with this intuitive, function-rich Sun SPARC-, HP 9000-, or PC-hosted C/C++ source- and assembly-level debugger.

The notebook feature eliminates the need to remember debugger command language—you can just point and click. And the context-sensitive hypertext help system saves time spent hunting through manuals.

The windowed graphical interface lets you visually organize your approach to solving a problem. You don't have to grapple with complex modes and functions to fully exploit the power of the emulator. And whether you prefer to work with a mouse or from the command line, you get simple, straightforward control of your target and the emulator.

Even when you have a target that can't be stopped for troubleshooting, you can still debug using dynamic run mode. You can also display source code together with the corresponding assembly language to clarify the relationship between them and verify compiler performance.

Optional language tools include an ANSI C/C++ optimizing compiler, assembler, and an instruction set simulator. And because the debugger fits seamlessly into the MasterWorks environment from Microtec Research, you can easily enjoy the advantages of integrated graphical development.



The multi-windowed debugger speeds development with simultaneous display including (clockwise from upper left): symbolic representation of structure elements; stack values; call tracing; register values; interleaved source and assembly; and pure source code.

Trace System Simplifies Problem Analysis

The last thing you want to do is spend your time figuring out the relationship between execution history and your source code. The EL 1600 handles all of that for you with its highly approachable trace system.

Four trace display modes let you see information in the format most useful to you. High-Level Mode supports application developers using C or C++. Low-Level Mode supports team members writing device drivers. Combined High/Low-Level mode supports anyone interested in the relationship between source and compiler-generated assembly language. Raw Trace Mode permits analysis of hardware activity on a bus cycle or clock cycle basis.

For complete capture of execution history, the system provides 72 bits of width and 8K frames of depth. The Event System can qualify trace to help focus your search for a problem. For targets that can't be stopped to debug a problem, you can examine trace while the emulator runs the target. To quickly find the information you want, you can scroll trace frames and search for any combination of address, data, and status information.

Trace Disassembler Reveals Critical Information

The custom 68000 trace memory disassembler helps you understand how your code operates and manipulates data. It also provides valuable information about interrupt and stacking activity and function calls.

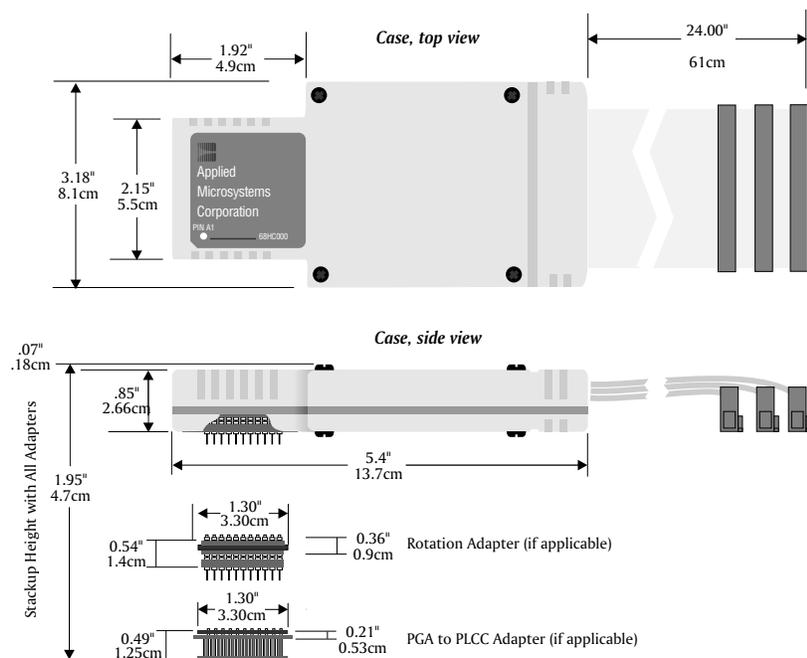
Breakpoint System Easily Tracks Code Execution

The EL 1600 Breakpoint System lets you readily determine the execution trail of code without having to modify your code with printf statements or semaphores. You can quickly and easily place up to 64 transparent breakpoints anywhere in code.

Intuitive Event System Pinpoints Problems

The advanced Event System helps you rapidly track down deeply nested, real-time problems. The system can be easily configured using familiar names and symbol references. It supports address, data or status qualification, or any combination of the three.

The event system language is both simple to understand and powerful. With a full complement of event system actions, you have a complete tool kit for isolating a problem. Available actions include: stop emulation; turn-on trace; turn-off trace; trace one bus cycle; increment, reset, or toggle a counter; reset timestamp; change event group; jump to a user-specified routine; and generate an external trigger for operations such as synching an oscilloscope.



EL 1600 emulator probe tip dimensions.

Versatile Overlay Memory

EL 1600 overlay memory helps extend the utility of the emulator to early stages of the development cycle. Before target hardware is available, the emulator probe tip overlay memory and simulated I/O capability provide an execution vehicle without the need for an evaluation board.

Mapping overlay in place of target memory also eliminates time wasted burning ROMs to verify a code fix. And overlay simplifies and accelerates hardware-software integration by letting you gradually implement target memory. Simply use overlay until the target hardware is debugged.

Overlay can be mapped on 2 KB boundaries anywhere in memory. Two memory sizes of 1 MB or 2 MB let you match overlay to the requirements of your target.

Non-Intrusive Performance Analysis

The Performance Analysis system puts no demands on target operation or resources, so you get an accurate view of where your code spends its time. The system monitors an unlimited number of modules, address ranges or data variables at the full bus cycle frequency of the processor.

The Performance Analysis System is easy to use: it is automatically configured and can quickly be re-configured from the command line. The system gathers performance data to describe execution activity, code timing, interrupt timing and fault detection. Data is presented in an easily understood histogram format, and the system helps you generate reports to document software and product performance.

Real Time Kernel Support

The RTOS-Link/KA package allows you to debug your application running with a commercial RTOS without changing tools. RTOS-Link/KA provides a high-level view of OS structures and task status. Using RTOS-Link/KA, you can qualify breakpoints to specific tasks.

Network Support and Fast Code Downloads

With Ethernet network support for workstations and PCs, the EL 1600 lets you get out of the lab and work where you are most comfortable. Exceptional download speeds help accelerate code modification cycles. And for PC hosts without networks, a high-speed parallel interface speeds code delivery to your target.

Keeping You Satisfied

Because our success depends on your success, we take product support very seriously. In fact, at Applied Microsystems we call our program Total Customer Satisfaction.

Keeping you satisfied means more than just answering your questions. Our on-site training and engineering assistance, technical guidance on emulation issues, and expedited product service can help you get your product to market on time and on budget.

Our Applications Engineering Group is backed by a network of experienced Field Application Engineers, our own design teams, and the commitment of the entire company. And with over 15,000 installed solutions and more than fourteen years of leadership in embedded hardware and software development tools, our team is an important asset to have on your team.

Do It Now

To see how the EL 1600 emulator can help build your products, call 1-800-426-3925 today for information or a product demonstration.

EL 1600 Emulator for Motorola 68000/EC/HC000

Microprocessors Supported

Motorola 68000/EC/HC at 8 MHz to 16 MHz
Toshiba 68003/301/303/305 at 8 MHz to 20 MHz

Packages Supported

PGA, PLCC

Minimum Host Requirements

PC386, Microsoft Windows 3.0 or higher, 16 MB RAM, ISA or EISA slot
Sun SPARC, Sun OS 4.1, 20 MB swap
HP 9000, HP-UX 9.0 or above, 20 MB swap

Communications

Windows PC Environment

IEEE 802.3 10base2, 10base5, 10baseT (effective download speed 4 MB/min)

Sun Sparc and HP 9000 Environment

IEEE 802.3 10base2, 10base5, 10baseT (effective download speed 4 MB/min)

Optional Code Generation Tools

ANSI C / C++ cross-compiler
Cross-assembler
Embedded linking loader
Object module librarian
Instruction set simulator

Source-Level Debugger

Integrated source level debugger

Window-oriented interface (X-Window support on SUN)
Support for C, C++ and assembler
Access to source code variables
Disassembled source view for machine-level debug and patch
Access to all global, local, stack-based and register-based symbols
Full C-typing features

Execution control and full access to the emulator

Soft switches provide interactive instrument control
Execution breakpoints can be set on line numbers, C statements, program labels and memory addresses
Display trace in raw, assembly, and high-level formats or disassembled
Monitor real and simulated I/O
High-level control of event system set-up and operation
Perform emulator operations while the target is running

In-line assembler/memory functions

Assemble code in target memory using Motorola mnemonics
Display and modify memory

Performance analysis

Display relative time spent in functions or groups of functions

Advanced testing and set-up capabilities

Construct complex macros containing C-like statements and debugger commands

Record and play back debugging sessions

File format compatibility

IEEE 695, A.OUT, COFF, S-record

RTOS Support

ISI pSOS+ via Applied's RTOS-Link™

Extended Trace History

8K deep x 72 bit wide trace buffer records information in real-time

Display CPU bus cycle information, including address, data and control lines with symbols

Search for trace frames containing any combination of address, data, and status information

Display executed code, both assembly level and C source level, with symbols

Save trace to file

Record timestamp information using the optional Timestamp Module (selectable resolutions from 100 ns to 1 ms)

Perform emulator operations while the target is running

Record external 16-bit logic state inputs (available with the optional Logic State Analysis probe)

Performance Analysis

Gathered on every bus-cycle at full processor speed
Unlimited number of modules

Target Diagnostics

Fully buffered probe tip allows attachment to defective target hardware

Built-in diagnostic routines to debug target hardware before running target code

Run RAM tests over target or overlay memory in byte or word mode

Run scope loops to debug target hardware problems, such as inoperative address, data, or control lines

High-speed scope loops allow measurement of signals in target without a storage oscilloscope

Breakpoints

64 software execution breakpoints

Event System

4 independent groups

Up to 8 parallel comparisons per group

1 event counter per group

Up to 8 conditional statements per group

for a total of 32 event statements

1 trigger-output via BNC connector

Event Actions (may be combined)

Break emulation

Change event group

Trace on/off/trace-one

Jump to user-specified routine

Count one, toggle on/off, reset counter

Trigger output

Overlay Memory

Overlay size: 1 MB or 2 MB

High-speed, zero wait state static RAM

Write and Read/Write protection

Mappable anywhere, with minimum resolution of 2K bytes

User-selectable wait states on overlay access

In-Line

Assembler/Memory Functions

Assemble code in target memory using Motorola mnemonics

View target & trace memory in assembly language

with symbols; view C source or C source with assembly in trace

Display and modify memory

Block move, fill, search, copy between target and overlay, up/download

data and verify read after write

Formatted binary upload/download in S record and hex formats

Environmental Specifications

Input power: 115 VAC, 47 Hz–63 Hz or 230 VAC, 47 Hz–63 Hz

Power consumption: < 200 watts
Emulator pod dimensions: 3.2 cm x 21.6 cm x 29.2 cm (1.25" x 8.5" x 11.5")

Weight: Chassis with pod assembly 11.4 kg (25 lbs)

Shipping weight 15.5 kg (34 lbs)

Chassis dimensions: 16.5 cm x 44.4 cm x 37.5 cm (6.5" x 17.5" x 14.75")

Ambient humidity: 0–90% non-condensing

Operating temperature: 0–40° C

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**Applied
Microsystems
Corporation**

U.S. and Canada

Applied Microsystems Corporation
5020 148th Avenue N.E.
P.O. Box 97002
Redmond, WA 98073-9702
Tel: 206-882-2000
Toll-Free: 1-800-426-3925
TRT Telex 185196
Fax: 206-883-3049

Europe

Applied Microsystems Corporation Ltd.
AMC House, South Street
Wendover, Buckinghamshire, HP22 6EF
United Kingdom
Tel: +44 (0)1296-625462
Fax: +44 (0)1296-623460

Germany

Applied Microsystems GmbH
Stahlgruberring 11a, 81829 Muenchen
Germany
Tel: +49 (0)89-427-4030
Fax: +49 (0)89-427-40333

Japan

Applied Microsystems Japan, Ltd.
Arco Tower 13 F
1-8-1 Shimomeguro, Meguro-ku
Tokyo 153
Japan
Tel: +81-3-3493-0770
Fax: +81-3-3493-7270

*For more information, call 1-800-426-3925
or browse <http://www.amc.com>*

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