

CodeTAP[®] Emulator

for Intel i960[®] RP Microprocessors

Highlights

- Real-time, in-circuit development system for software engineers
- Powerful multi-windowed MWX-ICE C/C++ debugger interface runs on Sun4, HP 9000/700 and PC hosts
 - Convenient access to all the information you need
 - Complete control of CodeTAP features
 - Visibility and control of your target application
- Common debugger interface with Applied's companion CodeICE 960 RP emulator
- Supports Intel, Cygnus, and MRI toolchains
- Debugger operates stand-alone or in the MRI MasterWorks environment
- Macro-extension language uses C-like statements and debugger commands to construct and save debug sequences and target regression test
- Intuitive CPU Browser interface to fully configure, visualize and change internal 960 RP register states (DLMCON, PMCONs, ICON, MPARs, etc.)
- Real-time instruction trace captures 64K frames of execution history at full speed with caches enabled
- Convenient profiling and code coverage support for Intel's optimizing compilers
- Seamless networking support for both workstations and PCs
- Versatile run-control services target interrupts while the emulator is paused, allows user interaction with CodeTAP functions without stopping execution
- 2 hardware access, 2 hardware execution, and 50 software execution breakpoints
- Flash memory programming support lets users download code or data to flash memory devices using standard debugger commands

Companion Products

- CodeICE™ 960 RP emulator complements CodeTAP 960 RP with full-scale development support of RP processors using the same MWX-ICE user interface



Applied
Microsystems
Corporation

The high-performance, low-cost tool for full-productivity 80960 RP development.



How to Do More for Less

Couldn't you get more done if you had your own emulator? Of course you could. Now low-cost CodeTAP emulators put emulation power in the hands of more engineers. Applied invented CodeTAP emulation technology (U.S. patent no. 5,228,039) to give software engineers visibility and control for executing and debugging code at a cost that lets teams use tools wherever they're needed. The latest in the family is CodeTAP 960 RP, built for the speed of the 960 RP processor, and delivering the productivity boost you need to finish on-schedule and beat the time-to-market clock.

CodeTAP 960 RP supports the 80960 RP microprocessor at full-rated processor speed. It runs in-circuit, with no intrusion on your target environment, so you get fully transparent, real-time debug capability.

Unique "Full-Power" Emulation Features

CodeTAP 960 RP speeds development with 64K frames of instruction trace, hardware and software breakpoints, multi-mode run control, high-speed download and the graphical CPU Browser™ register configuration interface. All features are accessed through the powerful MWX-ICE debugger.

You can use the CodeTAP emulator with Applied's full-featured CodeICE 960RP emulator to give your team a full complement of real-time debugging features at your fingertips. This means you can put just the right selection of debug speed and power into the hands of every engineer on the team.

*We also offer tools to support these Intel products:
80960 CA, CF, JA, JF, JD, HA, HD, HT; 80C186/188 XL, EA, EB, EC; 80L186/188 XL, EA, EB, EC; 80286; 80386 SX/DX; 386EX*

A Tool for Today's Software Developers

CodeTAP 960 RP, like Applied's entire line of CodeTAP emulators, was designed with the growing legions of embedded software developers in mind. As software grows in complexity, companies are looking to arm developers with sophisticated debug tools that are easy to learn and use, and also small and affordable so they can be put on every developer's desktop.

Non-Intrusive, No-Compromise Debugging Power

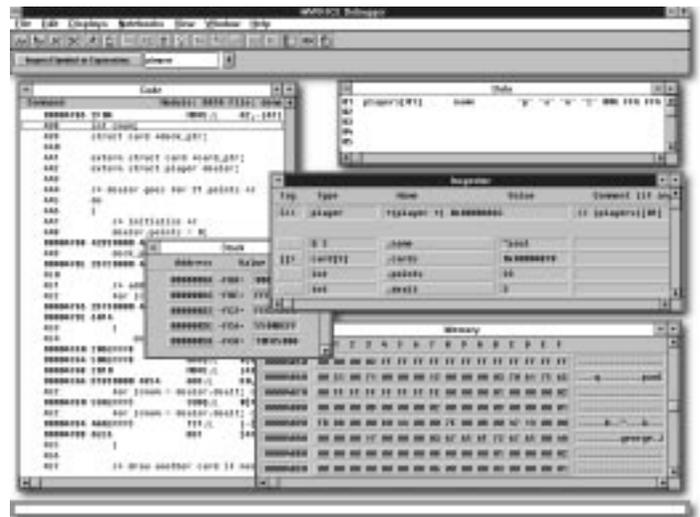
Offering true transparency, CodeTAP 960 RP requires no code modifications and doesn't consume target memory, I/O ports or interrupt vectors. The CodeTAP emulator provides a quick target connection with a compact Target Access Probe. Using customized ASIC technology, CodeTAP 960 RP delivers no-compromise performance—such as 33 MHz bus speed—and a rich debugger feature set.

Versatile Communications Solutions

Ethernet communications are included with CodeTAP 960 RP for Sun and HP workstations. The Ethernet link allows shared use of the CodeTAP on a LAN, including those which are subnetted. This connection lets you directly download large C/C++ applications from your networked file system into your target quickly, whether the target is on your desktop or in the lab across the street. For Windows PC users on a restricted budget, a High-Speed Serial card provides high-throughput point-to-point communication capability. Either communications method combined with a PC and the CodeTAP's small form factor makes it ideal for field debugging anywhere, anytime.

The Ease and Power of Graphical Debugging

Applied's MWX-ICE debugger interface provides complete control and visibility of the target application, letting embedded developers quickly and easily view and control code execution in the target. MWX-ICE combines a point-and-click windowed interface, extensive macro capabilities, and a comprehensive hypertext on-line help system with specially engineered support for all the features of the CodeTAP 960 RP. Users can access information including application code, data structures, processor registers, breakpoint information, trace capture, and issue debugging and emulation commands. MWX-ICE accepts executables from the popular tool chains, such as Intel's i960 CTOOLS and GNU960, Cygnus C/C++, and MRI's C/C++ compilers. The interface provides complete control of CodeTAP functions and code execution for transparent debugging, and is available in native versions for each supported host.



MWX-ICE displays include: C-source statements in the Code window; array contents in the Data window; stack contents in the Stack window; elements of data structures and their values in the Inspector window; and memory contents in the Memory window.

Real-Time, Non-Stop Execution Trace

To see what's really going on in your target system under real-time conditions, an execution trace history is necessary. CodeTAP's instruction trace captures 64K frames of execution history that will verify the correct performance of the software and hardware, and help pinpoint errors that may occur in the program's execution. For targets that can't be stopped to debug a problem, you can examine trace while the CodeTAP runs the target. You can store trace history in a file and add comments to the stored trace for later reference or future run comparison.

To debug code that makes the most of heavily cached processors, such as the RP family, you need a means of seeing the entire execution history — even if the instruction as executed out of cache. Applied's CodeTAP trace system not only does that, but also disassembles cached instructions. Display can be related in source-level, assembly-level or mixed levels.

Breakpoints for Every Situation

The CodeTAP emulator provides a variety of ways to set breakpoints, depending on the particular target situation. Access to the on-chip hardware execution breakpoints provide break capability on the execution of an instruction or in any medium of memory, be it RAM, ROM or Flash. The on-chip hardware access breakpoints are also available through MWX-ICE and can be set for real-time break capability on address-specific data access or write bus cycles. CodeTAP also provides over 50 software execution breakpoints for code located in RAM.

Specialized Tools for Target Visibility and Control

In many cases, tracking down real-time bugs involves continuous target operation. You simply cannot stop your target in order to debug code or else your network may stop, the machine may lose control, or you may simply lose the context of the problem if you stop emulation. CodeTAP's flexible run-control helps support these considerations by providing the ability to interact with or update the debugger while still running the target. It can also continue to service target interrupts even when you have stopped on a breakpoint. These are processor control features that you just can't get with a "general purpose" emulator.

CPU Register Utility

The CPU Browser™ utility provides a guided, error-proof means to configure and visualize the states and meanings of all the 960 RP registers, such as the DLMCON, PMCONs, ICON, and more. Its graphical display shows current or proposed register configuration information, with point-and-click access to all configurable bit fields. The CPU Browser includes clear descriptions of individual bit fields and checks changes for errors before they are applied.

A Family of 960 RP Tools

CodeTAP 960 RP joins the full-featured CodeICE 960 RP to provide engineers and project managers a choice in both lower-cost tools for everyday software debugging and more powerful tools to root out the toughest bugs. A compatible family, both CodeTAP and CodeICE 960 RP share a common MWX-ICE debug front-end to leverage experience and training.

To see how the new CodeTAP emulator can let you to do a lot more on your 960 RP project for a lot less, call 1-800-426-3925 today. And get an emulator you can call your own.



CPU Browser lets you keep the data books on the shelf.

CodeTAP Emulator for Intel i960 RP Microprocessors

Microprocessors Supported

Intel 80960 RP; 33 MHz

Packages Supported

BGA or SBGA

Connection via Intel connector (Intel part 272812-001) or Applied Microsystems connection method (see Applied Application Note 926-07959-00)

Minimum Host Requirements

PC 386 or better

MS Windows 3.1/3.11, 16 MB RAM minimum, 20 MB suggested (1 vacant ISA or EISA slot for High-Speed Serial)

SunSPARC

16 MB RAM minimum, 20 MB swap, Sun OS 4.1.x, Solaris 2.3, Ethernet port

HP 9000/700

16 MB RAM minimum, 20 MB swap, HP/UX 9.0, Ethernet port

Communications

PC Environment

Ethernet (Winsock 1.2, TCP/IP (including Novell)), IEEE 802.3 10base2, 10base 5, 10baseT High Speed Serial

Sun / HP Environment

Ethernet IEEE 802.3 10base2, 10base 5, 10baseT

User Interface

Integrated Source Level Debugger

Multi-windowed interface (X-windows/ Motif/Open Windows on workstations, Windows on PC)

Support for Intel, GNU and MRI C / C++ and assembly language

High-level control of all emulation subsystems

Access to all global, local stack-based and register-based symbols with full data typing features

C-like macro facility extends commands for developing and saving initialization sequences and regression test suites

Data Inspector Window de-references pointers and allows display and modification of structures, structure elements, and unions

Common interface with Applied's EL 3200, and CodeICE emulators

Toolchain Compatibility

Intel, GNU and MRI C / C++ (COFF and IEEE695 objects read directly)

Target and CPU Awareness and Control

Flexible run-control

Service system interrupts while execution is paused; debug code without stopping the target system with Dynamic Run feature

CPU Browser

Graphical interface allows display and modification of all internal memory, breakpoint, interrupt, and bus controller register values

Performance Optimizing Tools

Profile support for Intel's optimizing C compilers and code coverage utilities

Advanced Testing and

Set-Up Capabilities

Construct complex macros containing C-like statements and CodeTAP control commands

Record and play back debugging sessions

Trace System

Trace depth 64K frames of instruction execution history

Display trace data in source, disassembled, or combined levels on-the-fly

Display execution history of cached instructions

Window scrollable forward and backwards

Breakpoint System

Two hardware execution breakpoints

Set on line numbers, source statements, program labels and memory addresses in RAM, ROM, or Flash

Two hardware access breakpoints

Set on read or write bus cycles

50 software execution breakpoints

Set in RAM on line numbers, source statements, program labels and memory addresses

Physical Specifications

Dimensions: 7.25" x 3.18" x 0.918" (18.41 cm x 8.07 cm x 2.33 cm)

[L x W x H]

Weight: 7.2 oz. (201 kg.)

Operating temperature: 32-104° F (0-40° C)

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