HP E3492B Embedded MIPS Processor Probe

Technical Data

Technical trends in high-end embedded microprocessors, such as higher frequencies, customization, smaller packages, and internal cache, make traditional in-circuit emulation difficult. Working with Toshiba, HP co-developed an on-chip debug monitor. The HP processor probe utilizes this technology to provide support for software debug. The processor probe provides a real-time development environment for the high-speed Toshiba-R3900 embedded MIPS processor series.

What Is the Processor Probe?

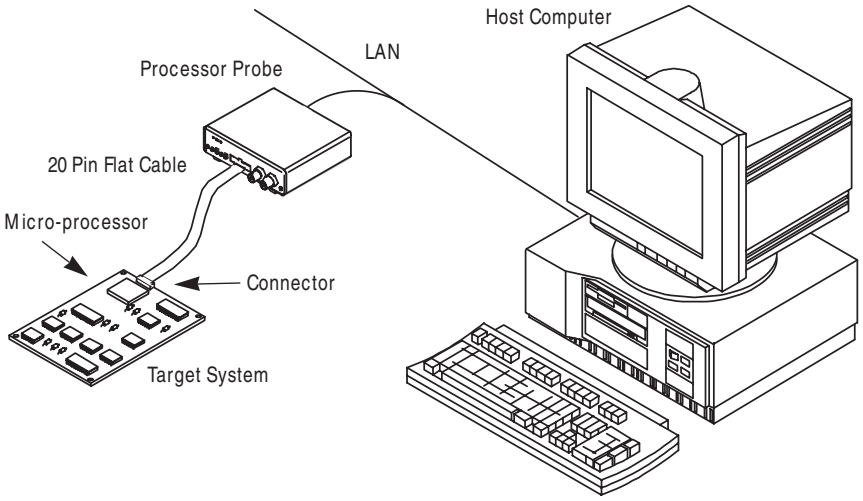
The processor probe provides much of the capability software engineers need to perform in-target debugging at a much lower cost than a traditional emulator. A benefit to using the on-chip monitor is that the microprocessor does not need to be replaced. Access to the target system is gained using the eight pins dedicated to debugging.

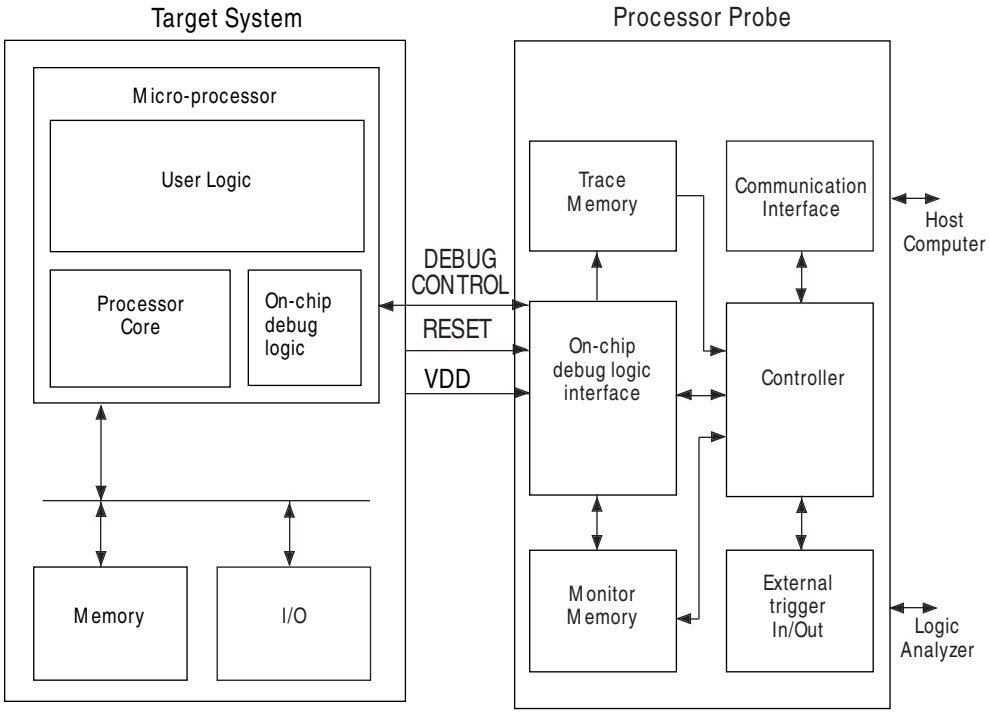
The processor probe offers several advantages over traditional in-circuit emulators.

- Real time Program Counter (PC) trace makes program execution visible even when the internal cache is on
- No probing effects on target signals
- Stable operation at high processor speeds
- Mechanically stable probe provides easy connect regardless of microprocessor package
- Applicable to customized ASIC microprocessors incorporating the same core
- Compact
- Low cost

The processor probe has significant advantages over ROM monitors:

- No need to customize the monitor
- No serial port is required on your target system
- The monitor does not occupy user memory
- High-speed code download





Processor Probe Block Diagram

On-chip Debug Logic

HP developed the on-chip debug logic with Toshiba Corporation. The system includes logic for a debug interrupt, hardware breakpoints, memory/register display and modification, and real-time PC trace. The processor probe contacts only eight debug pins, user reset, VDD and VSS.

Stable Operation

Unlike in-circuit emulators, the processor probe only accesses the debug pins, affecting no other user signals and ensuring stable operation. Probing through a connector reduces physical connection problems.

Applicable to Customized ASIC Microprocessors

The interface and the protocol between on-chip debug logic and the processor probe is common among ASIC microprocessors using the same core. The processor probe will support them when the debug port is brought to external pins.

Real Time PC Trace

Now you can trace execution of code in real-time even with the cache enabled. When internal cache is active, in-circuit emulators cannot use external bus cycles to analyze program execution. The debug circuitry detects and reports any changes in program flow.

Comparison

Item	ROM Monitor	HP Processor Probe	In-Circuit Emulator
Display/Modify Registers/Memory	•	•	•
Software Breakpoint	•	•	•
Hardware Breakpoint		•	•
Data Breakpoint		•	•
Program Counter (PC) Trace		•	
External Bus Trace		(1)	•
Emulation Memory			•
Flash Programming		•	
Applicability to ASIC-Chip	•	•	
Fast Code Download		•	•
No Target Customization Required		•	•

(1) Supported if used with logic analyzer

These code branches are captured in trace memory at full speed. The interface software reconstructs the addresses of all the executed instructions by post processing the raw trace data. The trace list can be displayed as C source for most operating conditions. Exceptions are when two consecutive register indirect branches (jumps) occur within 30 system clock cycles; then the target address of the first branch is lost.

Integrated with Hewlett-Packard Analysis Tools

To trace external bus activities such as memory or I/O accesses, and to measure timing waveforms, the HP 16500C logic analysis system provides an effective development environment for the processor probe. The processor probe can trigger and be triggered by the logic analyzer. When the logic analyer finds a problem, it simultaneously triggers the processor probe to generate a break in program execution or to start PC trace.

Flash Programming

The processor probe supports the following flash programming algorithms:

- AMD 12V Embedded (e.g. Am28F020A)
- AMD 5V Embedded (e.g. Am29F016)
- Intel Auto (e.g. 28F032SA)
- Intel Quick-Pulse (e.g. 28F020)

Connection to C-debugger:

MULTI provides a high-level language debug. Contact Green Hills Software for more information on their MULTI Environment Debugger.

Supported language:

HP B3745B supports Green Hills Software's C CROSS MIPS complier/assembler Version 1.8.7 or higher.

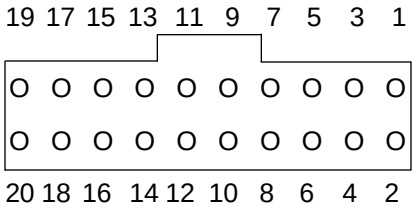
Supported Hosts

The processor probe requires HP B3745B interface software on the host computer. The supported hosts and operating system are listed in the order information table.

Connection to Your Target System

The processor probe requires a double row 20 pin AMPMODU system 50 connector to connect to the target system. The part numbers are listed below.

Header Pin Assignment



Connection to Processor Probe

Probe Pin Number	Signal	TMPR3901F Pin Number
1	RESET	80
3	VDD	79
5	DRESET	78
7	SDI/DINT	77
9	DBGE	76
11	SDAO/TPC	75
13	PCST [0]	74
15	PCST [1]	73
17	PCST [2]	72
19	DCLK	71
even-number pins	VSS	70, and others

AMP Header Part Number

AMP Part Numbers	Description
104069-1	Shrouded, Double Row, Right-Angle
104068-1	Shrouded, Double Row, Vertical
104549-2	Shrouded, Double Row, Vertical (SMT)

Specifications

Supported Processor	Toshiba TMPR3901AF-70 Please contact your local HP sales office for a list of supported derivatives in R3900 family
Highest Clock Frequency	75 MHz
Target Power Voltage	3.3±0.3V
Trace Memory	65536 State
RS232C	1200~115200 baud
LAN	10BASE-T or 10BASE2 Ethernet Connections TCP/IP Protocol
Physical	142mm (W) x200mm (D) x42mm (H)
Physical (AC adapter)	126mm (W) x73mm (D) x33mm (H)
Environmental	
Temperature	Operating 0°C to +40°C (+32°F to +104°F) Nonoperating -40°C to +70°C (-40°F to +158°F)
Altitude	Operating, 4,600m (15,000 ft); Nonoperating 15,300, (50,000 ft)
Humidity	15% to 95% relative

Specifications (Continued)

Regulatory Compliance	
EMC	CISPR 11:1990/EN 55011:1991 Group 1, Class A IEC 801-2:1991/EN 50082-1:1992 4KV CD, 8KV AD IEC 801-3: 1984/ EN 50082-1: 1992 3V/m, (1KHz 80% AM, 27-1000 MHz) IEC 801-4: 1988/EN 50082-1:1992 0.5KV Signal Lines, 1KV Power Lines
Safety Compliance	IEC 1010-1 (1990) + Amendment +1 (1992) CSA-C22.2 No. 1010.1-92

Ordering Information

Hardware: HP E3492B
Software: (Requires Green Hills Software Multi Environment Debugger)

Host	OS	Order Number	CD-ROM
HP9000 700	HP-UX9.0 or later	HP B3745B AAY, #UBY	B3761A
Sun SparcStation [1]	SunOS4.1.4 + Open Windows 3.0 Solaris2.3 or later + Open Windows 3.0 or later	HP B3745B AAV, #UBK	B3762A
IBM-PC Compatibles [2]	MS-Windows 3.1	HP B3745B AJ4, #UDY	B3763A

[1] Motif 1.2.2 or later must be pre-installed for Solaris

[2] Requires Sun Select PC-NFS 5.1 or later

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