Trace Port Analysis for ARM7-ETM and ARM9-ETM Microprocessors

Product Overview

Introduction

Quickly and accurately determine the root cause of your team's most difficult hardware, software, and system integration problems with Agilent Technologies' powerful trace port analysis, JTAG emulation, and logic analysis solutions.

Agilent's emulation and analysis solution for ARM ETM combine the powerful tools of run control, code download, debugger connections, real-time execution trace, and logic analysis for a complete, scalable system debug environment. With a scalable solution from Agilent, your design team members can customize Agilent's product offerings to meet their unique requirements. Solutions range from emulation probes combined with the industry's leading debuggers to emulation with real-time trace to solve today's most complex ARM design problems. Agilent's solutions are designed to meet your needs today and protect your investment as your needs change in the future.

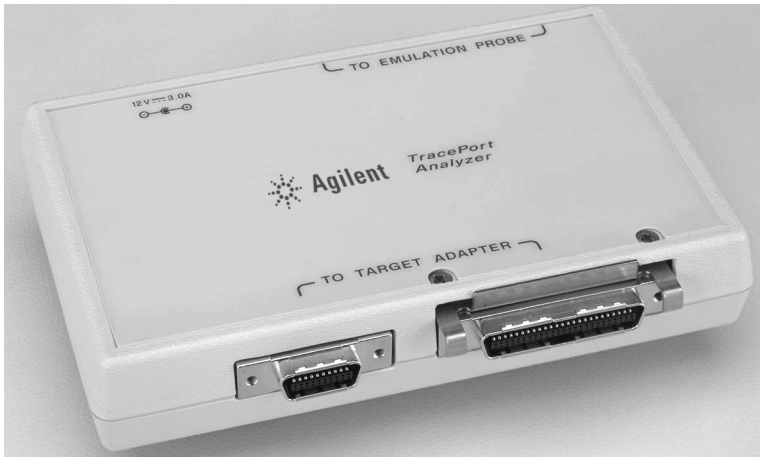


Figure 1. Trace Port Analyzer

Debug and Integrate Real-Time Embedded Systems

Real-time execution trace information is obtained from the trace port on the ARM processor. The real-time trace function does not affect the CPU execution timing in any way, unlike most traditional emulators.

Traditional emulation systems don't allow you to time-correlate events across your entire system using timing, analog, and state analysis for your most difficult integration problems. With Agilent's solution you can add a logic analyzer to provide timing and state analysis to monitor memory bus activity or other important system signals such as a PCI bus, other micro-processors, or I/O devices in relation to execution trace.

Agilent Technologies

Innovating the HP Way

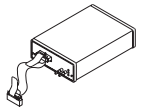
Agilent Scalable Solutions

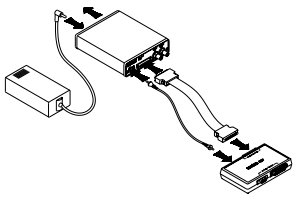
Agilent emulation and logic analysis solutions are scalable for each member of the digital design team. The following are four typical configurations for firmware/software debug, hardware debug, and system integration.

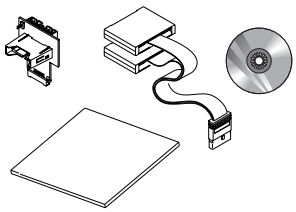
Components of these solutions include an emulation probe, a trace port analyzer and a logic analyzer. Information on each of these components is included in this document.

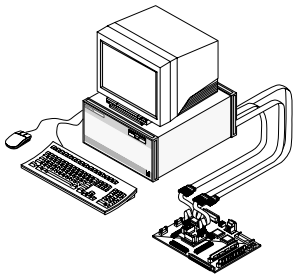
If your application uses a version of the ARM microprocessor which does not have an ETM, please see the Agilent support products listed in *Agilent Emulation and Analysis Solutions for ARM7/ARM9 Microprocessors*, document number 5966-3442E.

System Features	System Components and Functionality

 **Run Control**
• Microprocessor run control on your target system
• Debugger connection
	• Emulation Probe
	  • Download code, view and modify registers on your target system or evaluation board from the debugger interface
	  • Connect to industry-leading debuggers
	  • Control emulation via logic analyzer-hosted interface

 **Run Control with Real-Time Execution Trace of ETM**
• Real-time execution trace
• Debugger connection
• Microprocessor run control on your target system
	• Trace Port Analyzer (TPA)
	  • Trace on address, data, in real-time
	  • Trace 8 and 12 pin trace port widths
	  • Agilent emulation probe required to operate trace port analyzer
	• Emulation Probe
	  • Download code, view and modify registers on your target system or evaluation board from the debugger interface
	  • Connect to industry-leading debuggers

 **High-Performance Execution Trace of ETM**
• Very high-speed and/or very low-voltage swing trace signals
• Optional emulation probe/module for microprocessor run control on your target system
	• Analysis Probe for ETM
	  • Capture ETM trace data using the 16700A series logic analyzer system
	  • Real-time execution trace of ETM with time stamps
	  • Trace 8, 12 and 20 pin trace port widths
	  • Trace to 333 MHz (at time of writing, check with Agilent field engineer for latest speeds)
	• Emulation Probe
	  • Use with Agilent or non-Agilent JTAG emulators for ARM
	  • Connect to industry-leading debuggers

 **Real-Time System Logic Analysis and Execution Trace of ETM**
• Real-time logic analysis for system I/O and buses
• High-performance execution trace
• Optional emulation probe/module for microprocessor run control on your target system
• Debugger connection
	• 16700A Series Logic Analysis System
	  • Capture ETM trace data with ETM, 16700A series, and logic analyzer (LA) module
	  • Capture external memory and/or I/O trace using second LA module
	• Optional Oscilloscope Module
	  • Time correlate analog, timing and state events across your entire system
	  • Connect to industry-leading debuggers

Trace Port Analyzer

The ARM ETM microprocessors contain a dedicated trace port used for real-time execution tracing. During code execution, the CPU sends branch destination addresses, pipe line status, and optional read/write data from inside the processor core to the trace port. The internal information is encoded, serialized, and reduced to a small port width. The information is used by the debugger software, which interprets the trace data and reconstructs the instruction code flow. This execution trace tool provides a cost-effective, nonintrusive, real-time view of code execution. It is not necessary to run any debug code on the target.

Because the information is broadcast from inside the microprocessor, real-time execution trace is available even when the instruction cache is enabled or when the processor is running code in on-chip memory. Real-time execution trace provides a window into the processor's cache that is unavailable by analyzing the controller's external bus.

It is possible to cross trigger the trace port analyzer, emulation probe, and logic analyzer. For example, the logic analyzer can send a trigger to the trace port analyzer when a glitch is detected in some other point in the target system. This provides a system-level view of program activity to help identify the toughest problems. Using the local area network (LAN), the debugger software controls the emulation probe (or module) and the trace port analyzer.

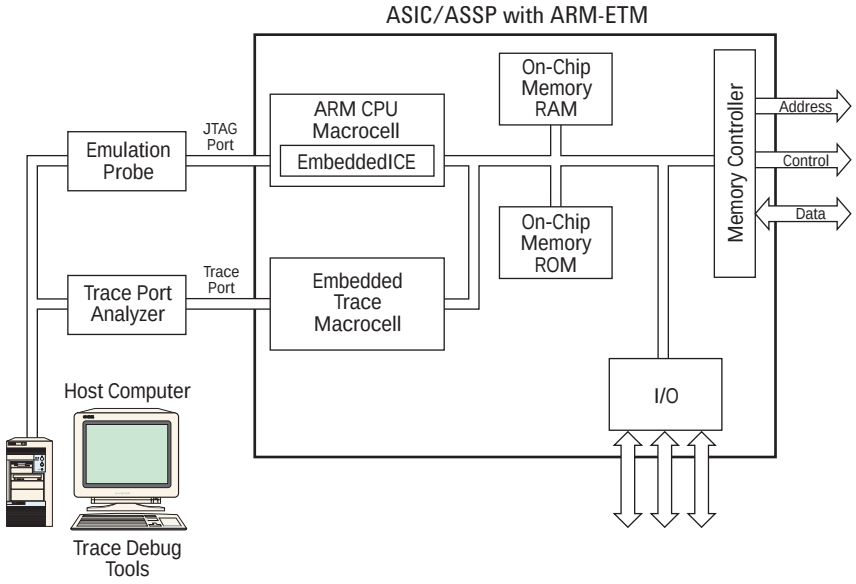


Figure 2. Real-Time Trace of Embedded ARM CPU

Analysis Probe for ARM ETM

For the very high-speed and/or very low-voltage implementations, or where it is desirable to capture time stamp information, the 16700A series logic analyzers may be configured to serve as a trace port analyzer using the E9595A #002 analysis probe and accompanying configuration files.

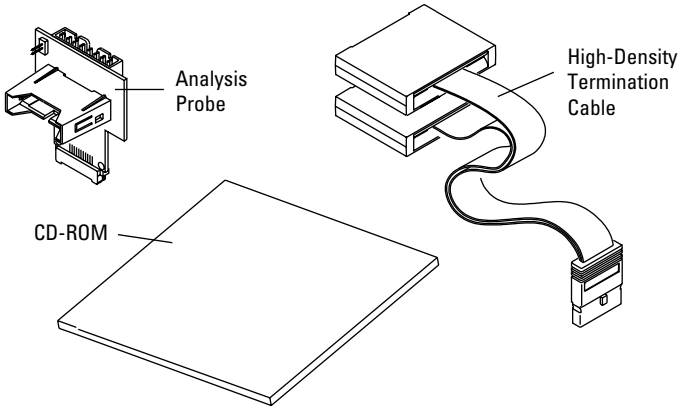


Figure 3. E9595A #002 Analysis Probe for ARM ETM

Agilent E5903A #300 Trace Port Analyzer Characteristics

- 512K trace states (independent of trace packet bus data width)
- 100 MHz at logic levels 2.5V or 3.3V-5V (TTL)
- 125 MHz at 3.3V-5V at room temperature
- Each trace state is 4 or 8 bits of data plus 3 bits of pipe status and one bit of sync

Agilent E9595 #002 Trace Port Analyzer Characteristics

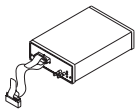
This specification applies to analyzers that are currently available. Please check with your local field engineer for the latest information on new logic analyzer modules.

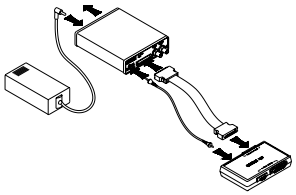
- Trace depth: up to 2 M trace states depending on the logic analyzer module (independent of trace packet bus width)
- Speed: up to 333 MHz depending on logic analyzer module
- Logic voltage: 0.5V to 6V
- Each trace state is 4, 8, or 16 bits of data plus 3 bits of pipe status and one bit of sync

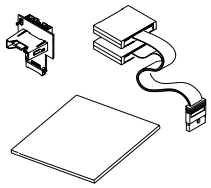
Target requirements and other important information are contained in the User's Guide available via the Internet (see page 6).

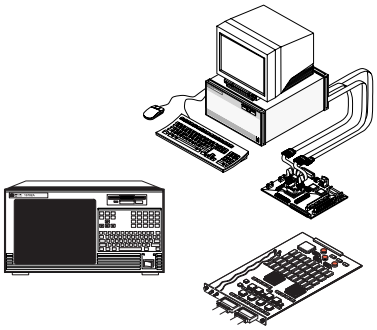
System Configuration and Ordering Information

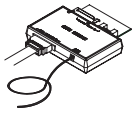
The table below shows the system components you need to order and what is included in each. For real-time trace, two alternatives are available to fit your needs. The solution product numbers do not include logic analysis. The Agilent 16700A Series logic analysis systems must be ordered separately.











Solution	Products to Order
Run Control (JTAG Emulation)	
• Emulation Probe	• E5900B #300
• Debugger	• Order directly from ARM or other supplier
Run Control with Real-Time Execution Trace of ETM	
• Trace Port Analyzer Bundle	• E5903A #301 (includes E5903A #300 trace port analyzer and E5900A #300 emulation probe. Emulation probe required to operate the trace port analyzer.) • May be operated with other suppliers' JTAG emulator
High-Performance Execution Trace of ETM	
• Analysis Probe for ARM ETM	• E9595A #002 (cable, break out board and configuration software)
• Logic Analysis System	• 16700 series frame with appropriate logic analysis module (16550A, 16554/55/56/57, 16710/11/12A, 16715/6/7A)
• Optional Emulation Probe/Module	• E5900B #300 or E5901B #300 E9595A #002 will also work with other suppliers' JTAG emulators
• ETM Debugger Connection	• Order debugger or upgrade directly from ARM or other supplier
Real-Time System Logic Analysis and Execution Trace of ETM	
• Analysis Probe for ARM ETM	• E9595A #002
• Logic Analysis System	• 16700A series frame with appropriate 167XX logic analysis module
• JTAG Emulation	• E5900B #300 or E5901B #300 or other supplier
• ETM Debugger Connection	• Order debugger or upgrade directly from ARM or other supplier
• I/O and/or Memory Trace	• Second 167XX logic analysis module
• Analog Trace	• 167XX oscilloscope module
Upgrade Agilent JTAG Emulation to Run Control with Real-Time Execution Trace of ETM (E5900A only)	
• Trace Port Analyzer	• E5903A #300
• ETM Debugger Connection	• Order debugger or upgrade directly from ARM or other supplier

Related Literature	Pub. Number
Trace Port Analysis for ARM ETM, User's Guide available at www.agilent.com/go/emulator within the ARM section	E5903-9700
16600A and 16700A Logic Analysis System Mainframes	5966-3107E
Processor and Bus Support for Logic Analyzers	5966-4365E
State and Timing Modules for Logic Analysis Systems	5966-3367E
Emulation and Analysis Solutions for ARM7/ARM Microprocessors	5966-3442E
Probing Solutions for Logic Analysis Systems	5968-4632E

Agilent Technologies' Test and Measurement Support, Services, and Assistance

Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Support is available for at least five years beyond the production life of the product. Two concepts underlie Agilent's overall support policy: "Our Promise" and "Your Advantage."

Our Promise

"Our Promise" means your Agilent test and measurement equipment will meet its advertised performance and functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications and practical recommendations from experienced test engineers. When you use Agilent equipment, we can verify that it works properly, help with product operation, and provide basic measurement assistance for the use of specified capabilities, at no extra cost upon request. Many self-help tools are available.

Your Advantage

"Your Advantage" means that Agilent offers a wide range of additional expert test and measurement services, which you can purchase according to your unique technical and business needs. Solve problems efficiently and gain a competitive edge by contracting with us for calibration, extra-cost upgrades, out-of-warranty repairs, and on-site education and training, as well as design, system integration, project management, and other professional services. Experienced Agilent engineers and technicians worldwide can help you maximize your productivity, optimize the return on investment of your Agilent instruments and systems, and obtain dependable measurement accuracy for the life of those products.

Get assistance with all your test and measurement needs at:

www.agilent.com/find/assist

Or check your local phone book for the Agilent office near you.

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