User's Guide

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For Safety information, Warranties, and Regulatory information, see the pages behind the index.

Emulation for the PowerPC 7xx

Agilent Technologies E5900B Option 070 Emulation Probe—At a Glance

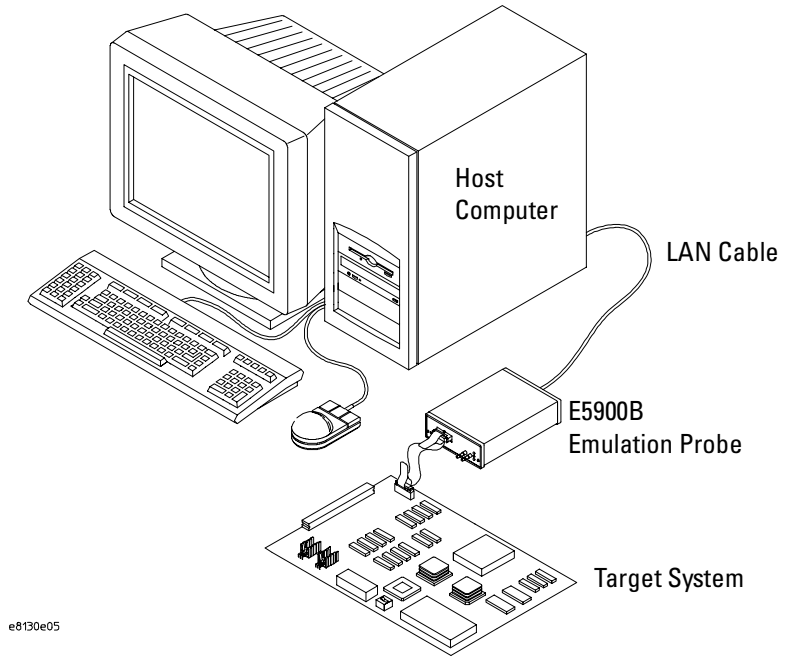
This manual describes how to set up several emulation products: an emulation probe, an emulation module, and an emulation migration.

The emulation probe provides a low-cost way to debug embedded software for PowerPC 700 family microprocessors. The emulation probe lets you use the target processor's built-in JTAG debug port features, including: run control, register access, and memory access. A high-level source debugger can use the emulation probe to debug code running on the target system.

The emulation probe can be controlled by a debugger on a host computer or by the Emulation Control Interface on an Agilent 16700-series logic analysis system.

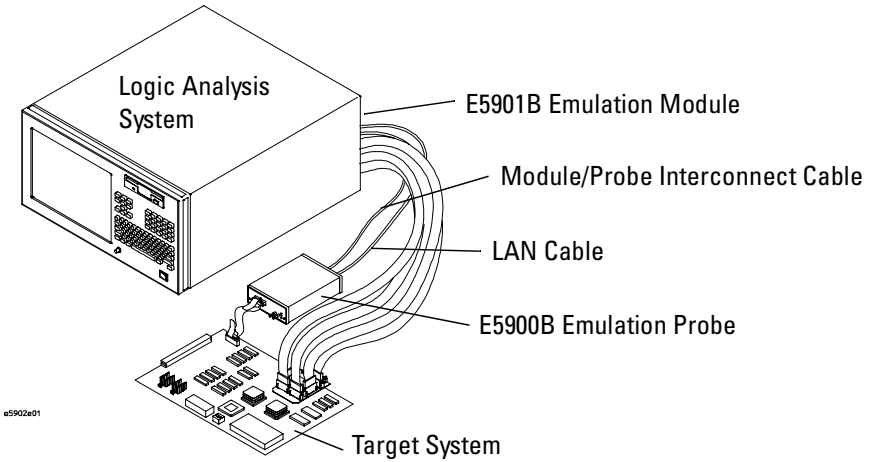
E5900B Emulation Probe

The emulation probe communicates with a host computer or logic analysis system via LAN.



E5901B Emulation Module

The Agilent E5901B emulation module plugs into your Agilent 16700-series logic analysis system frame. It provides power, cross triggering, and limited communication for the E5900B emulation probe through the module/probe interconnect cable. The logic analysis system communicates with the target system through the LAN connection to the E5900B emulation probe.



The E5901B emulation module must be used with an E5900B emulation probe.

This is a major change from the E5901A (16610A) emulation module, which could be connected directly to a target system through a target interface module (TIM).

E5902B Emulation Migration

The emulation migration includes the parts needed to use an emulation probe for a new processor family.

Emulation Solution

If you have an E9xxxB emulation solution, refer to the *Solution User's Guide* for information on how to connect the analysis probe, then return to this book for information on connecting the emulation probe.

In This Book

This book documents the following products:

Emulation Probe		
Processor supported	**Product ordered**	**Includes**
PowerPC 740, 750, 745*, 755*	E5900B Option #070	E5900B #070 emulation probe, cables, software, and manual
Emulation Module		
Processor supported	**Product ordered**	**Includes**
PowerPC 740, 750, 745*, 755*	E5901B Option #070	E5901B emulation module, E5900B #070 emulation probe, cables, software, and manual
Emulation Migration		
Processor supported	**Product ordered**	**Includes**
PowerPC 740, 750, 745*, 755*	E5902B Option #070	Target board adapter, front panel, tool kit, cables, software, and manual
Emulation Solution		
Processor supported	**Product ordered**	**Includes**
PowerPC 740, 750, 745*, 755*	E9486B	E5901B emulation module, E5900B #070 emulation probe, cables, software, and manual, plus analysis software as described in the *Solution User's Guide*

* The emulation probe is programmed with firmware to support the PowerPC 740/750. To use the emulation probe with the MPC745/755, you must load new firmware. See "Updating Firmware" on page 87.

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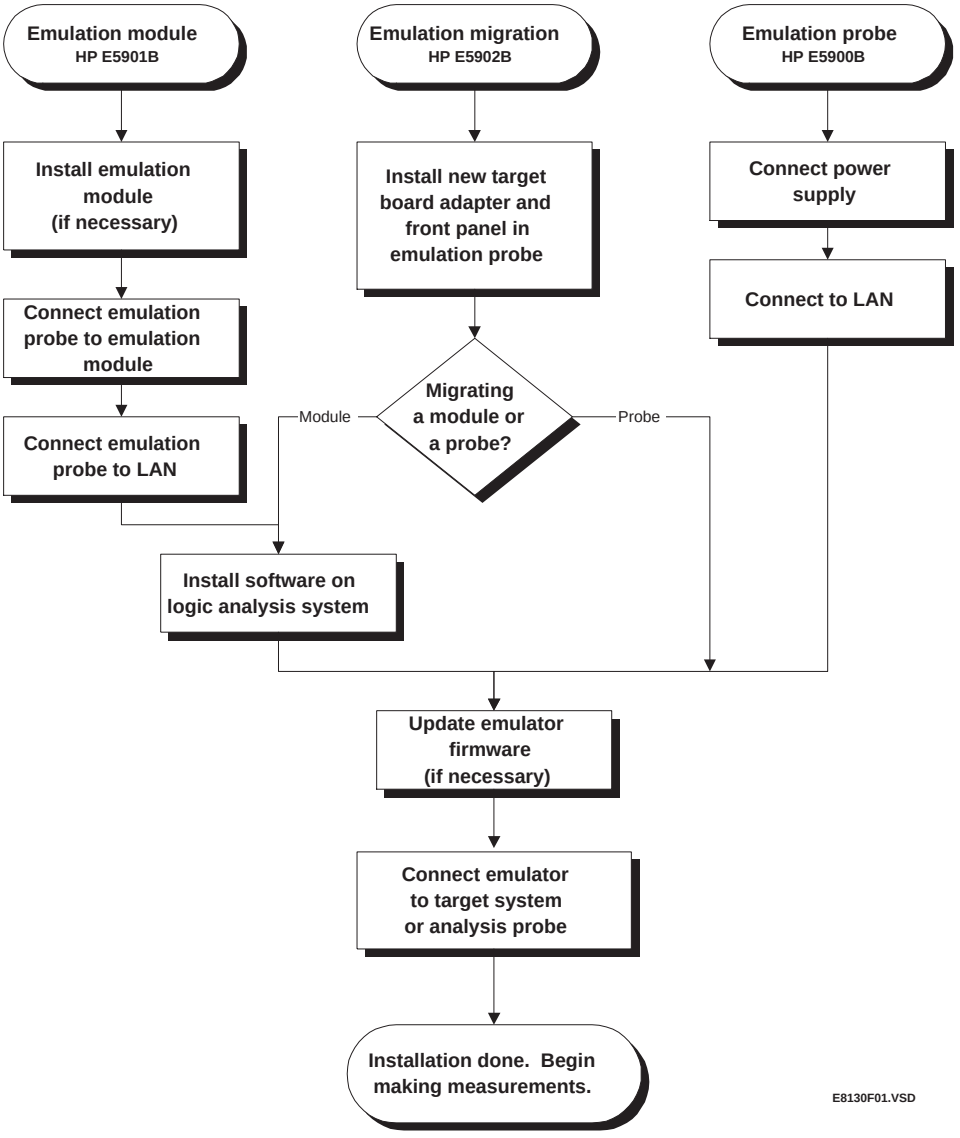
Overview

This chapter describes:

- Setup flowchart
- Equipment used with the emulation probe
- Connection sequences for the emulation probe
- Equipment used with the emulation module
- Additional information sources

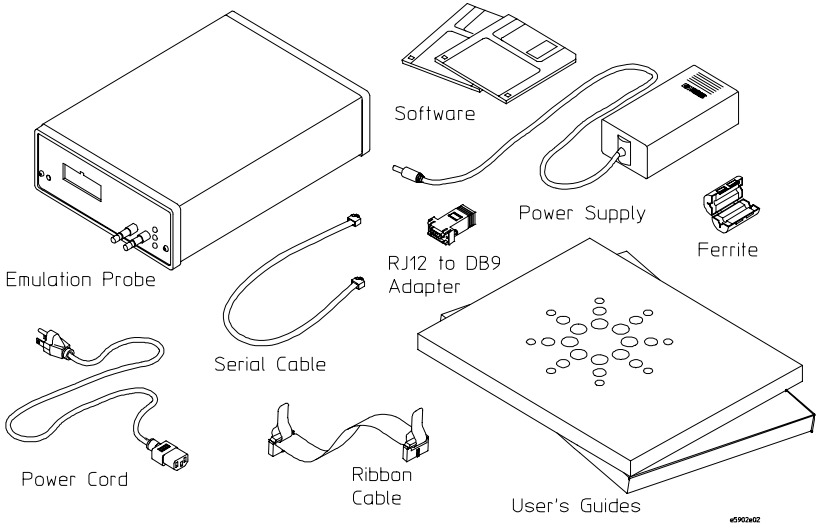
Setup Flowchart



Agilent E5900B Emulation Probe

Equipment supplied

- Emulation probe.
- 12V power supply for the emulation probe.
- Power cord.
- Ferrite (reduces electromagnetic interference on power cord).
- Serial cable.
- RJ12-to-DB9 adapter.
- 16-pin ribbon cable (connects the emulation probe to your target system).
- Firmware for the emulation probe on 3.5-inch disks. (To use the emulation probe with the MPC745/755, you must load new firmware. See "Updating Firmware" on page 87.)
- This *User's Guide Update*.
- An *Emulation User's Guide* for your processor.



Minimum equipment required

The following equipment is required to use the emulation probe:

- A method for connecting the emulation probe to the target system. The target system must have an appropriate JTAG debug port connector. The target system must meet the criteria on page 54.
- A host computer, such as a PC or workstation. You can also connect the emulation probe to an Agilent 16700-series logic analysis system.
- A LAN (local area network) to connect the emulation probe to the host computer or logic analysis system.
- A user interface on the host computer, such as a high-level source debugger or the logic analysis system's Emulation Control Interface.

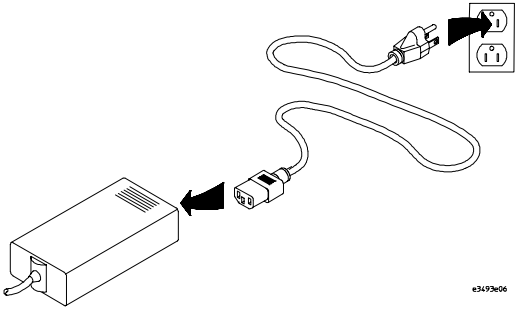
To connect the emulation probe to a power source

The emulation probe is shipped from the factory with a power supply and cord appropriate for your country. If the cord you received is not appropriate for your electrical power outlet type, contact your Agilent Technologies sales and service office.

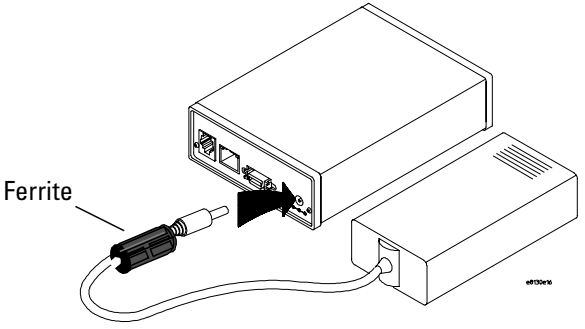
WARNING: ⚠ **Use only the supplied Agilent F1044B power supply and cord. Failure to use the proper power supply could result in electric shock.**

CAUTION: Use only the supplied Agilent power supply and cord. Failure to use the proper power supply could result in equipment damage.

1. Install the ferrite on the 12V power cord, near the end which plugs into the emulation probe.
2. Connect the power cord to the power supply and to a socket outlet.



3. Connect the 12V power cord to the back of the emulation probe.



4. Turn on the emulation probe power switch.

Connection Sequence

Disconnect power from the target system, emulation probe, and logic analyzer before you make or break connections.

1. Connect the emulation probe to a LAN (page 25).
2. Connect the emulation probe to your target system (page 57).
3. Configure the emulation probe (page 61).

To power on the system

With all components connected, power on your system as follows:

1. Logic analyzer, if you are using one.
2. Emulation probe.
3. Your target system.

To power off the system

Power off your system as follows:

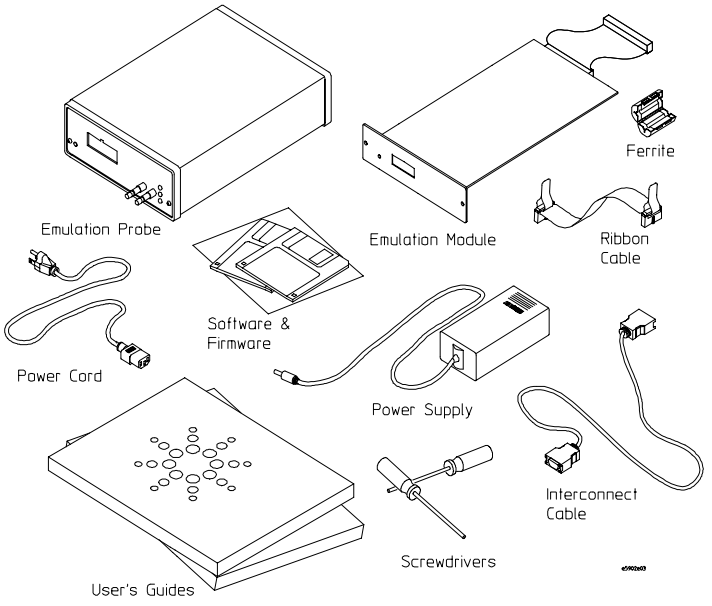
1. Your target system.
2. Emulation probe.
3. Logic analyzer, if you are using one.

Agilent E5901B Emulation Module

Equipment supplied

The equipment supplied with your emulation module includes:

- All of the parts listed for the Agilent E5900B emulation probe (page 16).
- Agilent E5901B emulation module. If you ordered an emulation module as part of your Agilent 16700-series logic analysis system, it is already installed in the frame.
- Module/probe interconnect cable (connected to the emulation module).
- Serial cable.
- RJ12-to-DB9 adapter.
- Firmware for the emulation probe and software for the Emulation Control Interface on a CD-ROM.
- Torx T-10 and T-15 screwdrivers.



Minimum equipment required

The following equipment is required to use the emulation module:

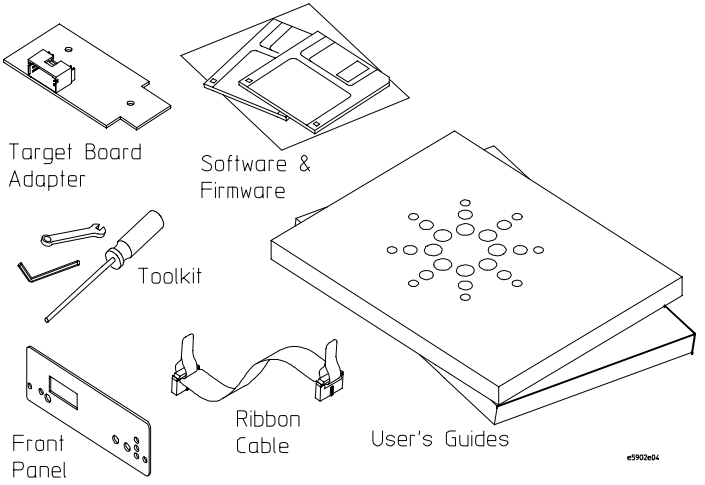
- A method for connecting the emulation probe to the target system. The target system must have an appropriate JTAG debug port connector. The target system must meet the criteria on page 54.
- An Agilent 16700-series logic analysis system.
- A user interface, such as a high-level source debugger or the logic analysis system's Emulation Control Interface.

Agilent E5902B Emulation Migration

Equipment supplied

The equipment supplied with your emulation migration includes:

- A target board adapter for the E5900B emulation probe.
- Firmware for the emulation probe and updated software for the Emulation Control Interface on a CD-ROM (use if you have a 16700-series logic analysis system).
- Firmware for the emulation probe on floppy disks (use if you do not have a logic analysis system).
- 16-pin ribbon cable (connects the emulation probe to your target system).
- Front panel for the emulation probe.
- Tool kit including a 1/4 inch wrench, a #1 Phillips screw driver, and a Torx T-10 screwdriver.
- This *User's Guide Update*.
- An *Emulation User's Guide* for your processor.



Minimum equipment required

The following equipment is required to use the emulation migration:

- An Agilent E5900B emulation probe.
- A method for connecting the emulation probe to the target system. The target system must have an appropriate JTAG debug port connector. The target system must meet the criteria on page 54.
- A host computer such as a PC, a workstation, or an Agilent 16700-series logic analysis system.
- A user interface, such as a high-level source debugger or the logic analysis system's Emulation Control Interface.

E9486B Emulation Solution

See the *Solution User's Guide* for information on the emulation solution.

Additional Information Sources

Additional or updated information can be found in the following places:

Newer editions of this manual may be available. Contact your local Agilent Technologies representative.

If you have an analysis probe, the instructions for connecting the probe to your target microprocessor are in the analysis probe documentation. The ***Solutions User's Guide*** for your microprocessor provides information on using the analysis probe and emulation module together.

Application notes may be available from your local Agilent representative or on the World Wide Web at:

http://www.agilent.com/find/logicanalyzer

If you have an Agilent 16700-series logic analysis system, the **online help** for the Emulation Control Interface has additional information on using the emulation probe.

The **measurement examples** include valuable tips for making emulation and analysis measurements. You can find the measurement examples under the system help in your Agilent 16700-series logic analysis system.

2

Connecting the Emulation Probe to a LAN

You need to set up a LAN connection for the E5900B emulation probe, even if you are using an E5901B emulation module.

The emulation probe has an IEEE 802.3 Type 10/100Base-TX LAN connector.

The emulation probe is compatible with both 10 Mbps (10BASE-T) and 100 Mbps (100BASE-TX) twisted-pair ethernet LANs. The probe automatically negotiates the data rate for the LAN it is connected to.

Before the Emulation Control Interface can connect to the emulation probe, the probe's LAN parameters (that is, its IP address, gateway address, and subnet mask) must be set up. The IP address and other network parameters are stored in nonvolatile memory within the emulation probe.

See Also

For information on connecting a debugger to the emulation probe, see Chapter 8, "Using the Emulation Probe with a Debugger," beginning on page 79.

To choose a point-to-point or site LAN connection

You can connect the emulation probe to your site LAN, or you can create an isolated network between a 16700-series logic analysis system and the emulation probe using a point-to-point connection.

A point-to-point connection is especially useful when you have a 16700-series logic analysis system, and:

- You do not have a site LAN, or
- The measurement setup will be on a cart, or
- You do not want to connect the measurement setup to a LAN because of security reasons.

Advantages of a point-to-point connection:

- If you have an E5901B emulation module, all LAN parameters will be set automatically.
- No need for a system administrator to assign IP addresses. (You can use

any IP address for the emulation probe, and it will not conflict with other devices on the LAN.)

- The logic analysis system cannot be accessed across the network (required in some high-security environments).
- Can be used when a site LAN is not available.

Disadvantages of a point-to-point connection:

- Neither logic analysis system nor the emulation probe are connected to a site LAN.
- A special "crossover" LAN cable must be used.

  If you have an emulation module, use the LAN crossover cable supplied with the emulation module (Agilent part number 5061-7341). If you do not have an emulation module, use a Category 3 (for 10BASE-T) or Category 5 (for 100BASE-TX) crossover cable.
- The emulation probe must be near the logic analysis system. The length of the crossover cable supplied with emulation modules is 1.5m (5 feet).
- Remote file systems cannot be mounted for access to source code files, symbol files, or executable files.
- The emulation probe cannot be controlled by a debugger on a host computer.

Connection Method	Go to Page
Site LAN connection	page 28
Point-to-point	page 36

Connecting the Emulation Probe to a Site LAN

1 Connect the LAN cable to the connector on the emulation probe.

Be sure to use the appropriate Category 3 or Category 5 cable for your LAN. Do not use the LAN cable supplied with the emulation probe—it is a crossover cable used for point-to-point connections only.

2 Find out the IP address and other LAN parameters to use for the emulation probe. See “To obtain an IP address” on page 29.

3 Decide how you want to configure the LAN parameters:

If you have this equipment..	Use this procedure
Emulation probe only	“To configure LAN parameters using a serial connection” on page 30, or “To configure LAN parameters using DHCP” on page 33
Emulation probe and a logic analysis system without an E5901B emulation module	“To configure LAN parameters using a logic analysis system without an emulation module” on page 34
Emulation probe and a logic analysis system with an E5901B emulation module	“To configure LAN parameters using a logic analysis system with an emulation module” on page 35

4 Verify that your emulation probe is now active and on the network. See "To verify LAN communications" on page 38.

To obtain an IP address

1 Obtain the following information from your local network administrator or system administrator:

- An IP address for the emulation probe.

  You can also use a "LAN name" for the emulation probe, but you must configure it using the integer dot notation (such as 127.0.0.1).
- The gateway address.

  The gateway address is an IP address and is entered in integer dot notation. The default gateway address is 0.0.0.0, which allows connections only on the local network or subnet. If connections are to be made to workstations on other networks or subnets, this address must be set to the address of the gateway machine.
- The subnet mask.

  A subnet mask blocks out part of an IP address so that the networking software can determine whether the destination host is on a local or remote network. It is usually represented as decimal numbers separated by periods; for example, 255.255.248.0.

2 Find out whether port numbers 6470 and 6471 are already in use on your network and if that use constitutes a conflict.

The host computer interfaces communicate with the emulation probe through two TCP service ports. The default base port number is 6470. The second port has the next higher number (default 6471).

In almost all cases, the default numbers (6470, 6471) can be used without change. If necessary the base port number can be changed if the port numbers conflict with some other product on your network.

To change the port numbers, see page 32. If you have already set the IP address, you can use a telnet connection instead of a serial connection to connect to the emulation probe.

To configure LAN parameters using a serial connection

The E5900B emulation probe has a 9600 baud RS-232 serial interface with an RJ12 connector.

The emulation probe is shipped with a serial cable (with RJ-12 connectors on both ends, with 6-wire straight-through connections) and an adapter (female RJ-12 to female 9-pin D subminiature). The adapter plugs into the 9-pin serial port found on most PCs.

Serial connections on a workstation

If you are using a UNIX workstation as the host computer, you need to use a serial device file. If a serial device file does not already exist on your host, you need to create one. Once it exists, you need to ensure that it has the appropriate permissions so that you can access it. See the system documentation for your workstation for help with setting up a serial device.

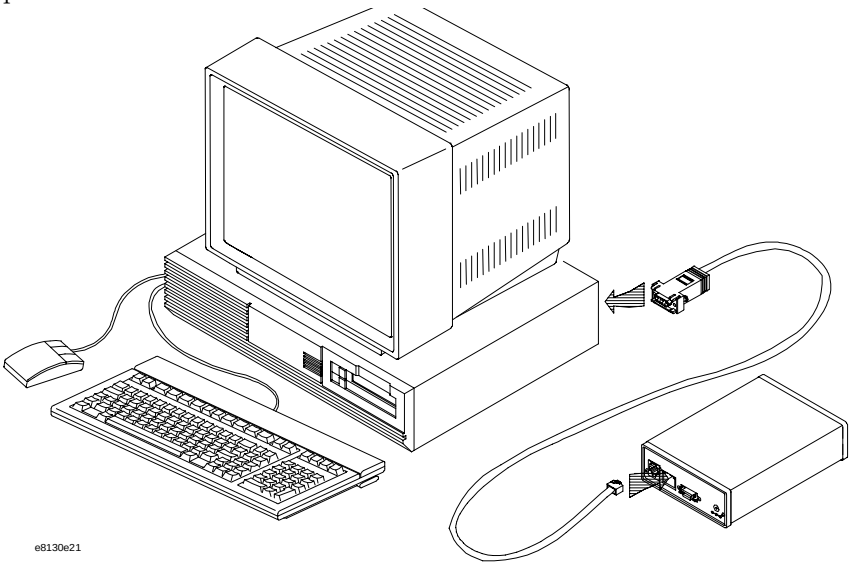
Serial connections on a PC

Serial connections are supported on PCs. You must use hardware handshaking if you will use the serial connection for anything other than setting LAN parameters.

If you are using a PC as the host computer, you do not need to set up any special files.

1 Connect the serial cable from the host computer to the emulation probe.

Use the DB9-to-RJ12 adapter and the serial cable supplied with the emulation probe.



2 Start a terminal emulator program on the host computer.

If you are using a PC, the HyperTerminal application in Microsoft Windows will work fine.

If you are using a UNIX workstation, you can use a terminal emulator such as cu or kermit.

3 Configure the terminal emulator program for:

- Communication rate: 9600 baud
- Bits: 8
- Parity: none
- Stop bits: 1
- Flow control: none

4 Turn on power to the emulation probe.

When the emulation probe powers up, it sends a version message to the serial port, followed by a prompt.

5 Press the Return or Enter key a few times.

You should see a prompt such as "p>" or "R>".

For information about the commands you can use, enter ? or help at the prompt.

6 Display the current LAN configuration values by entering the **`lan`** command:

```
R> lan
lan is enabled
   Link Status is UP
   100BaseTX
  lan -i 15.5.24.116
  lan -g 15.5.23.1
  lan -s 255.255.248.0
  lan -p 6470
  Ethernet Address : 08000909BAC1
R>
```

The Ethernet address, also known as the link level address, is preassigned at the factory, and is printed on a label on the emulation probe.

7 Enter the following command:

```
lan -i <internet> [-g <gateway>] [-p <port>] [-s
<subnet>]
```

The lan command parameters are:

`-i <internet>` The IP address which you obtained from your network administrator.

`-g <gateway>` The gateway address. Setting the gateway address allows access outside your local network or subnet.

`-s <subnet>` This changes the subnet mask.

`-p <port>` This changes the base TCP service port number, normally 6470.

Do not change the default port numbers (6470, 6471) unless they conflict with some other product on your network. The numbers must be greater than 1024. If you change the base port, enter the new value in the configuration of your debugger (and, for UNIX workstations, in the /etc/services file).

8 Cycle power on the emulation probe.

The IP address and any other LAN parameters you change are stored in nonvolatile memory and will take effect when the emulation probe is powered

off and back on again.

Example

To assign an IP address of 192.6.94.2 to the emulation probe, enter the following command:

```
R>lan -i 192.6.94.2
```

Cycle power on the emulation probe so that the new address will take effect.

9 Verify your emulation probe is now active and on the network. See "Verifying LAN Communications" on page 38.

Once you have set a valid IP address, you can use the telnet utility to connect to the emulation probe, and use the lan command to change LAN parameters.

To configure LAN parameters using DHCP

If there is a DHCP server on your network which supports "manual allocation" of IP addresses, the emulation probe can set its network parameters using the DHCP protocol.

1 Ask your system administrator to set up an IP address for the emulation probe on the DHCP server.

You will need to supply the link-level address of the emulation probe.

The link-level address (LLA) is printed on a label above the LAN connector on the emulation probe. This address is configured in each emulation probe shipped from the factory and cannot be changed.

2 Connect the LAN cable to the connector on the emulation probe.

3 Cycle power on the emulation probe by powering it off then on again.

4 Wait at least 20 seconds for the emulation probe to recognize the LAN.

5 Verify that your emulation probe is now active and on the network. See "To verify LAN communications" on page 38.

What is DHCP?

DHCP (Dynamic Host Configuration Protocol) allows clients to obtain LAN parameters automatically from a server.

How does the emulation probe use DHCP?

The emulation probe uses "manual allocation" to obtain a permanent IP address. Every time the emulation probe is turned on, it sends out a DHCPDISCOVER packet. The DHCP server on the network will respond with the IP address and other LAN parameters.

The emulation probe does not support "automatic allocation", which permanently allocates IP addresses from a pool of addresses.

The emulation probe does not support "dynamic allocation" of IP addresses—it does not track lease duration and request a new IP address when the lease is about to expire.

How does DHCP interact with other configuration methods?

The emulation probe sends out a DHCPDISCOVER packet every time it is turned on, even if the LAN parameters have already been configured (using DHCP or any of the other methods in this chapter). Because the emulation probe only supports DHCP's "manual configuration" mechanism, the LAN parameters will be changed *only* if there is a DHCP server on the LAN which has been configured to assign a new set of LAN parameters to the emulation probe's link-level address.

To configure LAN parameters using a logic analysis system without an emulation module

1. Connect the LAN cable to the connector on the emulation probe.
2. In the logic analysis system interface, open the Workspace window.
3. Drag the emulation probe tool from the toolbox to the workspace.
4. From the emulation probe icon, select Init Probe LAN Addresses....

5 Enter the link-level address of the probe you wish to set up.

6 Enter the internet address, gateway IP and subnet mask in the appropriate fields.

7 Select OK.

If "ERROR - no response from emulation probe" is displayed, check that the emulation probe is properly connected to the LAN. Then try selecting OK again.

If no error message is displayed, the internet address and other network parameters will be stored in nonvolatile memory and will take effect when power is cycled.

8 Cycle power on the emulation probe by powering it off then on again.

To configure LAN parameters using a logic analysis system with an emulation module

1 Connect the emulation module to the emulation probe. (See page 45.)

2 Connect the LAN cable to the connector on the emulation probe.

3 Cycle power on the emulation probe by powering it off then on again.

4 Wait at least 20 seconds for the emulation probe to recognize the LAN.

5 From the E5901B emulation module icon, select Modify Interconnected Probe LAN Addresses....

6 Select Read Probe Addresses to read the current settings.

7 Enter the internet address, gateway IP and subnet mask in the appropriate fields.

8 Select OK.

9 Cycle power on the emulation probe. The new addresses will take effect after you do this.

Setting up a Point-to-Point Connection

A point-to-point connection creates an isolated network with only two nodes—the logic analysis system and the emulation probe.

There are two ways to set up the connection:

If you have this equipment..	Use this procedure
Emulation probe and a logic analysis system *with* an E5901B emulation module	"To set up a point-to-point connection with an emulation module" on page 36
Emulation probe and a logic analysis system *without* an E5901B emulation module	"To set up a point-to-point connection without an emulation module" on page 37

To set up a point-to-point connection with an emulation module

1. Connect the emulation module to the emulation probe (page 45).
2. Connect the crossover LAN cable between the logic analysis system and the emulation probe.
3. In the logic analysis system main window, open the System Administration dialog and check that networking is enabled.
4. Select the emulation module icon then select Start Session....

   This will automatically configure the LAN connection and start the Emulation Control Interface. There is no need to set the IP address of the emulation probe.

To set up a point-to-point connection without an emulation module

1. Connect the crossover LAN cable between the logic analysis system and the emulation probe.
2. Turn on power to the emulation probe.
3. In the logic analysis system main window, select the System Admin icon.
4. Select Network Setup....
5. Select Enable to turn on networking.
6. Select Default Network.

   Leave the network parameters with the default values. The IP address should be 192.0.2.231.
7. In the Network Setup dialog, select OK.
8. In the main system window, select the Workspace icon.
9. Drag the emulation probe icon onto the workspace.
10. From the emulation probe icon, select Init Probe LAN Addresses....
11. Enter the link-level address of the emulation probe.

    The link-level address (LLA) is printed on a label above the LAN connector on the emulation probe.
12. Enter the following IP address: 192.0.2.233
13. Select OK then follow the instructions.

Note about the Setup Assistant: If networking is *dis*abled for the 16700-series logic analysis system, the Setup Assistant will guide you through the process of setting up a point-to-point connection. If networking is *en*abled, the Setup Assistant assumes you want to connect the emulation probe to a site LAN.

Verifying LAN Communications

Verify your emulation probe is now active and on the network by issuing a **`ping`** or **`telnet`** command to the IP address.

To verify LAN communications using ping

These instructions assume you are using a PC running Microsoft® Windows® 95 or Windows® 98. The procedure for other operating systems is slightly different.

1 Open an MS-DOS window or select Start→Run....

2 Enter the **`ping`** command followed by the IP address of the emulation probe.

Example

```
C:\WINDOWS>ping 192.35.12.6

Pinging 192.35.12.6 with 32 bytes of data:

Reply from 15.6.253.138: bytes=32 time=1ms TTL=254
Reply from 15.6.253.138: bytes=32 time=1ms TTL=254
Reply from 15.6.253.138: bytes=32 time=1ms TTL=254
Reply from 15.6.253.138: bytes=32 time<10ms TTL=254
```

If You Have Problems If the response is something like "100% packet loss" or "Destination host unreachable", see “Problems with the LAN Interface” on page 126.

To verify LAN communications using telnet

1 Verify your emulation probe is now active and on the network by issuing a telnet to the IP address.

This connection will give you access to the emulation probe’s built-in terminal

interface.

2 To view the LAN parameters, enter the lan command at the terminal interface prompt.

3 To exit from this telnet session, type <CTRL>D at the prompt.

The best way to change the emulation probe's IP address, once it has already been set, is to telnet to the emulation probe and use the terminal interface lan command to make the change. Remember, after making your changes, you must cycle power before the changes take effect. Doing this will break the connection and end the telnet session.

To use telnet on a 16700-series logic analysis system, select the System Admin icon, select the Networking tab, then select telnet....

If You Have Problems "Problems with the LAN Interface" on page 126.

Example

```
$ telnet 192.35.12.6
R>lan
lan is enabled
lan -i 192.35.12.6
lan -g 0.0.0.0
lan -s 255.255.248.0
lan -p 6470
Ethernet Address : 08000F090B30
```

3

Installing the Emulation Module

This chapter shows you how to install an emulation module in your Agilent Technologies 16700-series logic analysis system and how to connect the emulation module to an emulation probe.

You need to set up a LAN connection for the E5900B emulation probe, even if you are using an E5901B emulation module.

If your emulation module is already installed in your logic analysis system frame, you may skip this chapter.

CAUTION: Electrostatic discharge can damage electronic components. Use grounded wrist straps and mats when you handle modules.

To install the emulation module in an Agilent 16700-series logic analysis system or expansion frame

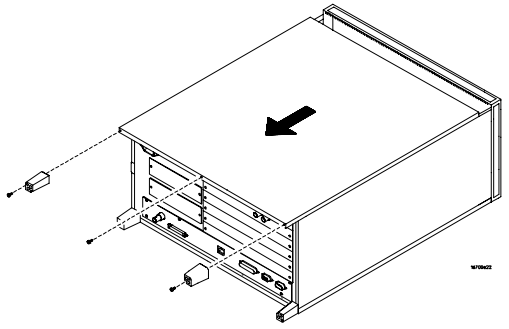
You will need T-10 and T-15 Torx screw drivers (supplied with the emulation module)

1. Turn off the logic analysis system and REMOVE THE POWER CORD.

   Remove any other cables (including mouse or video monitor cables).

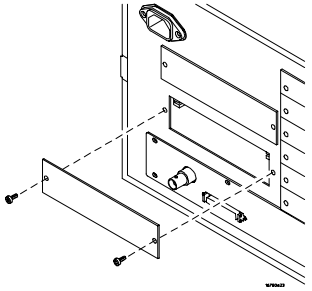
2. Turn the logic analysis system frame upside-down.

3. Remove the bottom cover.

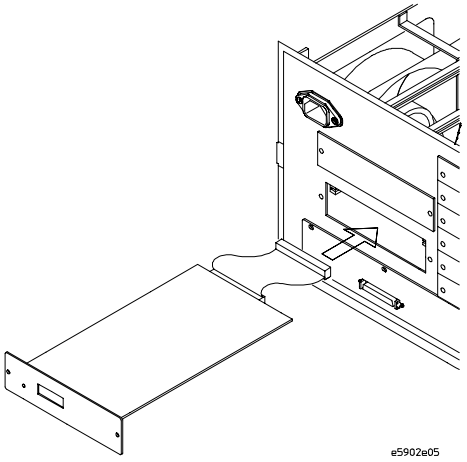


4. Remove the slot cover.

   You may use either slot.

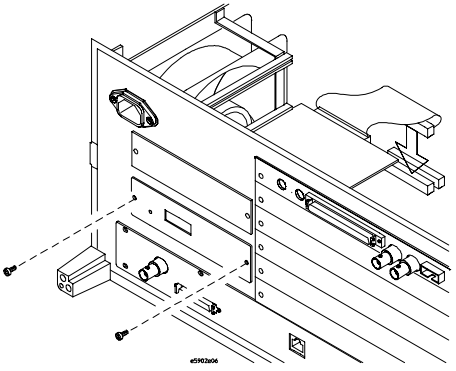


5 Install the emulation module.



6 Connect the cable and re-install the screws.

You may connect the cable to either of the two connectors.



7 Reinstall the bottom cover, then turn the frame right-side-up.

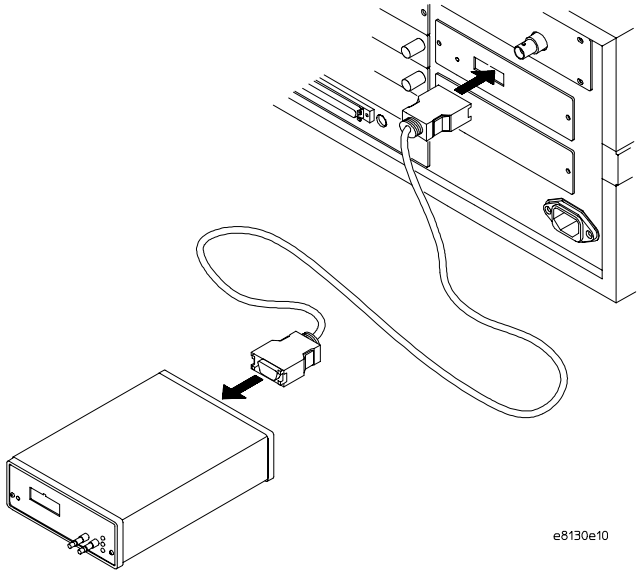
8 Plug in the power cord, reconnect the other cables, and turn on the logic analysis system.

The new emulation module will be shown as an "E5901B Emulation Module" in the system window.

To connect the E5901B emulation module to the E5900B emulation probe

1 Connect one end of the module/probe interconnect cable to the E5901B emulation module in the logic analysis system mainframe.

2 Connect other end of the module/probe interconnect cable to the "Emulation Module" connector on the E5900B emulation probe.



3 Power on the emulation probe.

The LED next to the switch is lit when the switch is turned on and the probe is being supplied with power.

Power is supplied by the 16700-series logic analysis system through the module/probe interconnect cable. The external power supply is not necessary for normal operation.

See Also

Chapter 2, “Connecting the Emulation Probe to a LAN,” beginning on page 25. (You need to connect the emulation probe to the LAN, even when you are using an emulation module.)

Chapter 6, “Connecting the Emulation Probe to Your Target System,” beginning on page 57.

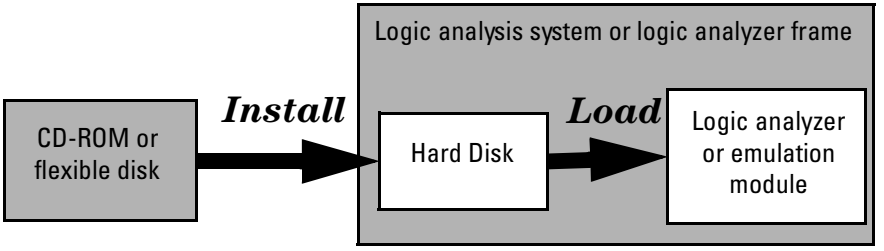
4

Installing Software on a 16700-Series Logic Analysis System

This chapter explains how to install the software you will need for your analysis probe or emulation solution.

Installing and loading

Installing the software will copy the files to the hard disk of your logic analysis system. Later, you will need to **load** some of the files into the appropriate hardware module.



What needs to be installed

HP 16600A/700A-series logic analysis systems

If you ordered an emulation solution with your logic analysis system, the software was installed at the factory.

The following files are installed when you install a processor support package from the CD-ROM:

- Logic analysis system configuration files
- Inverse assembler (automatically loaded with the configuration files)
- Personality files for the Setup Assistant
- Emulation module firmware (for emulation solutions)
- Emulation Control Interface (for emulation solutions)

The HP B4620B Source Correlation Tool Set is installed with the logic analysis system's operating system.

To install the software from CD-ROM (HP 16600A/700A)

Installing a processor support package from a CD-ROM will take just a few minutes. If the processor support package requires an update to the HP 16600A/700A operating system, installation may take approximately 15 minutes.

If the CD-ROM drive is not connected, see the instructions printed on the CD-ROM package.

1. Turn on the CD-ROM drive first and then turn on the logic analysis system.
2. Insert the CD-ROM in the drive.
3. Click the **System Admin** icon.
4. Click **Install...** .

   Change the media type to “CD-ROM” if necessary.
5. Click **Apply**.
6. From the list of types of packages, select “PROC-SUPPORT.”

   A list of the available processor support packages will be displayed.
7. Click on the “POWERPC7XX” package.

   If you are unsure if this is the correct package, click Details for information on what the package contains.
8. Click **Install...** .

   The dialog box will display “Progress: completed successfully” when the installation is complete.

9 Click **Close**.

The configuration files are stored in /logic/configs/hp/ppc7xx. The inverse assemblers are stored in /logic/ia.

See Also

The instructions printed on the CD-ROM package for a summary of the installation instructions.

The online help for more information on installing, licensing, and removing software.

To list software packages which are installed (16700)

In the System Administration Tools window, click **List...** .

5

Designing a Target System for an Emulation Probe

Designing a Target System

This chapter will help you design a target system that will work with the emulation probe.

Target System Requirements for PowerPC 7xx

Unsupported modes

Target systems which use any of the following modes of operation are not currently supported:

- Address parity is not generated on external address bus operations. Accesses to devices that check parity will fail.

$\overline{\text{QACK}}$ signal

If the target development board does not use the $\overline{\text{QACK}}$ signal , the board must have a pull down resistor to pull this signal low. This allows the PowerPC to enter the debug state. Recommended value: 1KΩ or less.

TDO, TDI, TCK, TMS and $\overline{\text{TRST}}$ signals

TDO, TDI, TCK, TMS and $\overline{\text{TRST}}$ signal traces between the JTAG debug port connector and the processor must be less than 3 inches long. If these signals are connected to other nodes, the other nodes must be daisy chained between the JTAG connector at one end and the PowerPC microprocessor at the other end. These signals are sensitive to crosstalk and must not be routed along active signals such as clock lines on the target board.

The TDI, TCK, TMS and $\overline{\text{TRST}}$ signals must not be actively driven by the target system when the JTAG debug port is being used.

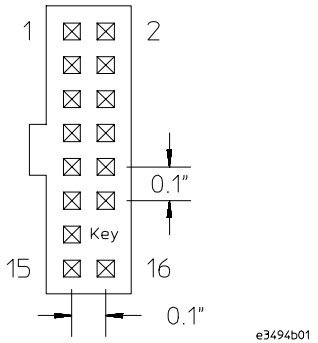
Reset signals

The $\overline{\text{HRESET}}$, $\overline{\text{SRESET}}$ and $\overline{\text{TRST}}$ signals from the JTAG connector must be logically ORed with the $\overline{\text{HRESET}}$, $\overline{\text{SRESET}}$ and $\overline{\text{TRST}}$ signals that connect to the processor on the target system. They cannot be "dotted" or "wire-ORed" on the board. The ORed signals should only reset the processor and no other devices on the target system.

The emulation probe adds capacitance to all target system signals routed to the JTAG debug port connector. This added capacitance may reduce the rise time of the $\overline{\text{SRESET}}$ or the $\overline{\text{HRESET}}$ signal beyond the processor specifications. If so, the target may need to increase the pull-up current on these signal lines.

PowerPC JTAG interface connections and resistors

The target system must have a 16-pin male 2x8 header connector with the following dimensions:



JTAG Header Connector (top view)

Position 14 of the connector on the target system must not contain a pin. The cable supplied with the emulation probe can only be installed if pin 14 has been removed from the header.

Place the connector as close as possible to the processor to ensure signal integrity.

PowerPC 7xx Connections

Header Pin Number	Signal Name	I/O	Board Resistor
1	TDO	Out	
2	Not connected		
3	TDI	In	1KΩ pulldown
4	$\overline{\text{TRST}}$	In	10KΩ pullup
5	Not connected		
6	+POWER[1]		1KΩ series[2]
7	TCK	In	10KΩ pullup
8	Not connected		
9	TMS	In	10KΩ pullup
10	Not connected		

Header Pin Number	Signal Name	I/O	Board Resistor
11	$\overline{\text{SRESET}}$	In	10KΩ pullup
12	Not connected		
13	$\overline{\text{HRESET}}$	In	10KΩ pullup
14	KEY		
15	$\overline{\text{CSTP\_OUT}}$	Out	1KΩ pullup
16	GND		
	$\overline{\text{QACK}}$ [3]	In	1KΩ pulldown
	L2_TEST_CLK	In	10KΩ pullup
	L1_TEST_CLK	In	10KΩ pullup
	$\overline{\text{LSSD\_MODE}}$	In	10KΩ pullup
	ARRAY_WR	In	10KΩ pullup

[1] The +POWER signal is sourced from the target system and is used as a reference signal. It should be the power signal being supplied to the processor (either +3.3V or +5V). It does not supply power to the emulation probe.

[2] This 1KΩ series resistor provides short circuit current limiting protection only. If the resistor is present, it should be 1KΩ or less.

[3] If the target system does not use this signal, the board must have a 1KΩ pulldown resistor connected to this pin. This signal allows the emulation probe to force the processor into soft stop mode. If the target system does use this signal, it should provide logic so that $\overline{\text{QACK}}$ goes low in response to a $\overline{\text{QREQ}}$.

6

Connecting the Emulation Probe to Your Target System

This chapter shows you how to connect the emulation probe to the target system and how to configure the emulation probe and target.

Here is a summary of the steps for connecting and configuring the emulation probe:

1. Make sure the target system is designed to work properly with the emulation probe. (See page 54.)
2. Install the emulation module in your logic analysis system, if necessary. (See page 41.)
3. Connect the emulation probe to your target system using the ribbon cable. (See page 59.)
4. Update the firmware of the emulation probe, if necessary. (See page 87)
5. Configure the emulation probe. (See page 61.)
6. Test the connection between the emulation probe and the target.
7. Connect a debugger to the emulation probe, if applicable. (See page 79.)

See Also

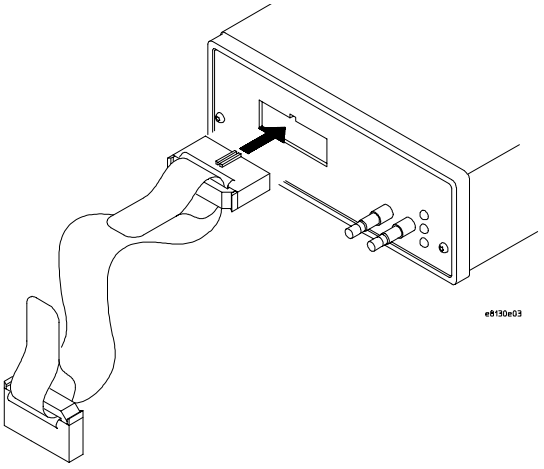
Chapter 8, “Using the Emulation Probe with a Debugger,” beginning on page 79 for information on configuration with a debugger.

To connect the emulation probe to the target system

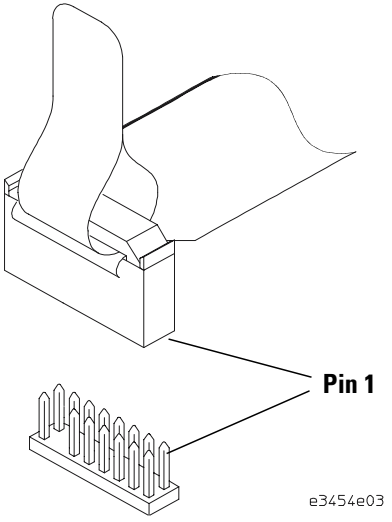
The emulation probe can be connected to a target system through a 16-pin JTAG port connector (a 16-pin male 2x8 header connector on the target system).

The emulation probe should be connected to the target system using the ribbon cable provided.

1. Turn off power to the target system.
2. Turn off power to the emulation probe.
3. Plug the unkeyed end (pin 14 is open) of the ribbon cable into the emulation probe.



4 Plug the keyed end of the cable (pin 14 is blocked) into the JTAG debug port on the target system or on the analysis probe.



CAUTION: **Orient the red stripe** *away* **from pin 1 of the connector and towards the key pin.** If the connector is rotated, your target system or the emulation probe may be damaged.

5 Turn on power to the emulation probe.

6 Turn on power to the target system.

After you have connected the emulation probe to your target system, you may need to update the firmware in the emulation probe.

See Also For information on designing a debug port on your target board, see page 53.

For a list of the parts supplied with the emulation probe, see page 16.

7

Configuring the Emulation Probe

The emulation probe has several user-configurable options. These options may be customized for specific target systems and saved in configuration files for future use.

> The easiest way to configure the emulation probe is through the Emulation Control Interface in an Agilent 16700-series logic analysis system.

If you use the Emulation Control Interface, please refer to the online help in the Configuration window for information on each of the configuration options.

Other ways to configure the emulation probe are by using:

- the emulation probe's built-in terminal interface
- your debugger, if it provides an "emulator configuration" window which can be used with this emulation probe

What can be configured

The following option can be configured using built-in commands:

Configuration items which apply to all PowerPC 7xx processors:

- JTAG clock speed
- Restriction to real-time runs.
- Break in behavior.
- Trigger out behavior.
- Address translation

Configuration items which apply only to the PowerPC 740/750

- Reset operation
- Memory read delays
- Memory write delays
- Parity bit information

The default powerup configuration will generally work with many target systems if the cache is turned off.

If the instruction and data caches are both turned off, the following cache

configuration items are meaningless and can be ignored.

- Memory read operation
- Data memory write operations
- Instruction memory write operations

Configuration items which apply only to the PowerPC 745/755

- Reset operation
- Memory model
- Checkstop status
- 32-bit mode

Configuration items which apply to all PowerPC 7xx processors:

To configure the processor type

Configure the processor type by loading the appropriate firmware, if necessary. See "Updating Firmware" on page 87.

To configure the JTAG clock speed (communication speed)

The emulation probe needs to be configured to communicate at a rate which is compatible with your target processor. The JTAG clock speed is independent of processor clock speed.

With some target systems that have additional loads on the JTAG lines or with target systems that do not quite meet the requirements (described in Chapter 5, "Designing a Target System for an Emulation Probe," beginning on page 53), setting speed to a slower setting may enable the emulation probe to work.

The speed value is a number followed by either K, which indicates the value is in KHz, or M, which indicates the value is in MHz. The clock can be set to speeds in the range 512 KHz to 40 MHz. Not all values in this range are valid; if an invalid speed is intered, the next slower valid speed will be used.

Entering **`cf speed`** without a value will display the current JTAG clock speed.

Processor clock speed configuration

Value	Built-in command
512K - 40M	cf speed = *value*

See Also "Configuring the Emulation Probe for Maximum Performance" on page 77

To configure restriction to real-time runs

Restriction to real-time runs configuration

Value	Emulation probe configured for	Built-in command
no	Does not restrict the emulation probe to real-time runs. Allows any command that requires a break to the monitor to be accepted. (Default)	cf rrt = no
yes	Restricts the emulator to real-time runs. When running, the emulation probe will reject commands that break to the monitor, except "break," "reset," "run," or "step." The processor must be explicitly stopped before commands which break to the monitor can be performed.	cf rrt = yes

If your debugger allows displaying or modifying memory or registers while the processor is running, you must set rrt=no in order to use this feature.

To configure Trigger Out

With an emulation module, this configuration item is always set to the default setting and cannot be changed with a cf command. The Intermodule window of the logic analysis system must be used instead.

Trigger out configuration

Value	Emulation probe Trigger Out will be	Built-in command
monhigh	Logic high when the processor is running in background (Default)	cf trigout = monhigh
monlow	Logic low when the processor is running in background	cf trigout = monlow
fixhigh	Fixed logic high	cf trigout = fixhigh
fixlow	Fixed logic low	cf trigout = fixlow

To configure Break In

With an emulation module, this configuration item is always set to the default setting and cannot be changed with a cf command. The Intermodule window of the logic analysis system must be used instead.

Break in configuration

Value	Emulation probe Break In	Built-in command
rising	The emulation probe will cause a break into monitor on a rising edge. (Default)	cf breakin = rising
falling	The emulation probe will cause a break into monitor on a falling edge.	cf breakin = falling
off	Inputs to Break In will be ignored.	cf breakin = off

There is a delay of about 400 µsec between receiving the edge and stopping the processor.

To configure address translation

You can enable or disable address translation in the emulation probe.

Address translation configuration

Value	Meaning	Built-in command
effective	If the MMU is enabled, addresses are verified for proper translation and the corresponding physical address is used instead. (Default)	cf address = effective
physical	Physical addresses are used, even if the MMU is enabled.	cf address = physical

When the MMU is enabled (MSR[IR] or MSR[DR] is set), and the emulation probe is configured for effective addresses, all memory addresses given to the emulation probe are assumed to be effective addresses (logical addresses). The emulation probe uses the MMU block address translation (BAT) registers, segment registers, hash tables, and other special-purpose MMU registers to

compute each corresponding physical address. The requested memory operation is then performed using the physical address.

Operational notes:

- The emulation probe attempts to perform address translation only if the MSR[IR] and/or the MSR[DR] bits are set (=1) AND the emulation probe is configured to do translation (**`cf address=effective`**). The emulation probe configuration may be changed using the cf command:

```
cf address=effective (default)
cf address=physical
```

- If both the MSR[IR] and MSR[DR] are set, the emulation probe will perform address translations by first searching the IBATs and then the DBATS, if no match is found in the IBATs. Note that the PowerPC silicon allows the IBAT and DBAT registers to specify overlapping effective address ranges. Avoid defining overlapping ranges. These make debugging more difficult because the emulation probe can use the IBATs to translate addresses intended for the DBATs.
- If an effective address is not found in the MMU translation tables, the emulation probe will return an error and will not perform the requested operation.
- Cache coherency is maintained during emulation probe MMU translations.
- Be sure the translation enable/disable condition is the same when you set and clear breakpoints. If a breakpoint is set while translation is enabled and then cleared while translation is disabled, the result will be erroneous and unpredictable. This is also true if a breakpoint is set while translation is disabled and then cleared while translation is enabled.
- The emulation probe ignores read-only restrictions defined in the MMU. (In other words, the emulation probe may attempt to write to memory that has been defined by the MMU as read-only.)
- MMU translation is automatic and transparent to debuggers connected to the emulation probe.

Configuration items which apply only to the PowerPC 740/750

To configure reset operation

The reset configuration item controls what kind of reset is performed and what state the processor will be in after the reset.

Reset configuration (PowerPC 740/750)

Value	Effect of a reset from the emulation probe	Built-in command
runrom	Reset the processor and cause it to start running user code at address FFF00100H.(Default)	cf reset = runrom
rom	Reset the processor and cause it to stop at address 0FFF00100H.	cf reset = rom
runram	Reset the processor and cause it to start running user code at address 00000100H.	cf reset = runram
ram	Reset the processor and cause it to stop at address 00000100H.	cf reset = ram
jtag	Just reset the JTAG interface on the processor. The processor itself will not be reset. This may help in some cases where communications are lost, however all the other reset settings reset the JTAG interface as part of the reset sequence so this setting will only rarely be useful.	cf reset = jtag

To set memory read delays

The memory read delay setting delays the number of microseconds specified during memory reads. It is provided for accessing slow devices like memory mapped IO.

- To set the memory read delay using the built-in terminal interface, use the `cf mrddel=<`*delay in usec*`>` command.

  The <*delay in usec*> must be in the range 0-10000000. This should be set to the smallest number possible for best performance since it delays all reads by the number of microseconds specified.

  Default: **cf mrddel=0**

To set memory write delays

The memory write delay setting delays memory writes by the number of microseconds specified. It is provided for accessing slow devices like memory mapped IO.

- To set the memory write delay using the built-in terminal interface, use the `cf mwrdel=<`*delay in usec*`>` command.

  The <*delay in usec***>** must be in the range 0-10000000. This should be set to the smallest number possible for best performance.

  Default: **cf mwrdel=0**

To generate parity bits on memory operations

The PowerPC processor generates parity bits on both address and data lines when running user code. When used in debug mode these bits must be generated separately slowing down memory operations. Since memory operations on the PowerPC are slow as it is and many target systems do not check parity, parity is only generated if requested.

Parity configuration (PowerPC 740/750)

Value	Emulation probe configured for	Built-in command
off	Do not generate the parity bits for memory operations from the emulation probe. This provides better performance, but will not work correctly when accessing devices that check the parity bits.(Default)	cf parity = off
on	Generate the parity bits for memory operations. Currently, only parity bits for the memory data lines are generated. Parity bits on the address lines are not. This may change in future firmware versions.	cf parity = on

To configure the memory read operation

The memory read operation configuration entry defines how the memory and cache interact during a memory read operation. If both instruction and data caches are turned off (bits ICE and DCE in the register HID0 are zero), this configuration setting has no effect and a memory read will always return the contents of physical memory.

Memory read configuration (PowerPC 740/750)

Value	emulation probe configured for	Built-in command
mm	A memory read from an address that is valid in either the data or instruction cache will return the contents of the cache. Memory reads from addresses not valid in either cache will return the contents of the physical memory.(Default)	cf mrdop = mm
phys	A memory read will always return the contents of physical memory.	cf mrdop = phys

Using the mrdop=phys setting with the cache enabled may show data that is no longer valid. Use this setting only for solving cache problems where you really need to see the contents of physical memory. For general operation, the "mm" setting should always be used.

The instruction cache in PPC740 and PPC750 is encoded. The emulation probe will decode the content of the instruction cache before displaying it. However, the emulation probe will only decode valid instructions. Invalid instructions in the cache will be displayed in coded form, which might not match the content of memory.

To configure data memory write operations

Although the PowerPC processor has one contiguous physical memory address space that can hold both data and instructions, it has separate caches for instructions and data. These separate caches must be considered in order to keep the caches and memory coherent during memory write operations. These settings are only used for memory write operations. Code download always writes to physical memory and disables any cache entries containing addresses written for improved performance. Some host interfaces use the code download mode for all memory write operations so this setting may or may not have any effect on your debugger.

Only the memory write command allows specifying instruction or data memory operations. This may not be provided by your debugger interface. If not specified, memory write operations are always instruction memory.

If the data cache is disabled, a data memory write will always write to physical memory and this configuration setting is ignored.

Memory write configuration (PowerPC 740/750)

Value	emulation probe configured for	Built-in command
mm	Data writes to addresses that are valid in the data cache will write the value only to the cache and mark the cache line modified as "dirty", which will indicate to the cpu that the cache line must be written to memory. A data write that is not valid in the data cache will only be written to physical memory.(Default)	cf dmwrop=mm
thru	A data memory write to an address that is valid in the data cache will write to both cache and physical memory. If the address is not valid in the cache, only physical memory will be modified.	cf dmwrop=thru
bypass	A data memory write will only be written to physical memory, ignoring the cache.	cf dmwrop=bypass

The cf dmwrop=bypass setting should be used with extreme caution because dirty cache entries may be written by the processor over the new data value written to memory by the emulation probe.

To configure instruction memory write operations

Although the PowerPC processor has one contiguous physical memory address space that can hold both data and instructions, it has separate caches for instructions and data. These separate caches must be considered in order to keep the caches and memory coherent during memory write operations. Code download always writes to physical memory and disables any cache entries containing addresses written for improved performance. Some host interfaces use the code download mode for all memory write operations so this setting may or may not have any effect on your debugger.

Only the memory write command allows specifying instruction or data memory operations. Access to this may not be provided by your debugger

interface. If not specified, memory write operations are always instruction memory.

If the instruction and data caches are both disabled, an instruction memory write will always write to physical memory and this configuration setting is ignored. If the instruction cache is disabled, instruction memory writes will always write to physical memory and the data cache will be either updated or bypassed, depending on this configuration setting.

This configuration setting controls the behavior of both caches when doing instruction memory writes so that instruction memory writes can be used for all memory operations, if desired.

Instruction memory write configuration (PowerPC 740/750)

Value	Emulation Probe configured for	Built-in command
upd_dcb	This stands for instruction cache update, data cache bypass. An instruction memory write to an address that is valid in the instruction cache will write the value to both the instruction cache and memory. The data cache will be bypassed even if the address is valid in the data cache.	cf imwrop=upd_dcb
upd_dcu	This stands for update instruction cache and update data cache. An instruction memory write to an address that is valid in both caches will write the value to both caches and physical memory. (Default)	cf imwrop=upd_dcu
inv_dcb	This stands for instruction cache invalidate and data cache bypass. An instruction memory write will invalidate the instruction cache if valid and write only to physical memory. The data cache is not modified even if valid.	imwrop=inv_dcb
inv_dcu	This stands for instruction cache invalidate and data cache update. An instruction memory write will invalidate the instruction cache if valid and write to physical memory. The data cache will also be updated if the address is valid in the data cache	imwrop=inv_dcu

Configuration items which apply only to the PowerPC 745/755

To configure reset operation

The reset configuration items control what kind of reset is performed and what state the processor will be in after the reset.

Reset configuration (PowerPC 745/755)

Value	Effect of a reset from the emulation probe	Built-in command
run	Reset the processor, reset the JTAG interface, and allow the processor to start running user code.(Default)	cf reset = run
stop	Reset the processor, reset the JTAG interface, and cause it to stop at the address defined by the reset vector.	cf reset = stop

Reset vector configuration (PowerPC 745/755)

Value	Built-in command
fff00100	cf vector = fff00100
00000100	cf vector = 00000100

To configure the memory model

You can use a cache coherency or a physical memory model for memory reads and writes. If both instruction and data caches are off (bits HID0[ICE] and HID0[DCE] are zero), this configuration setting has no effect and memory reads return the contents of physical memory.

Memory model configuration (PowerPC 745/755)

Value	Meaning	Built-in command
cache	Use the cache coherency model. This model assumes instructions and data are separate, and will not occur within the same cache block (way).	cf memmodel = cache
physical	Use only the physical model, regardless of the state of the cache. (Default for version 1 of the emulation probe firmware, which does not have cache support.)	cf memmodel = physical

To configure checkstop status

The checkstop signal ($\overline{\text{CSTP\_OUT}}$ on pin 15 of the JTAG connector) can be used to detect a checkstop condition.

Checkstop configuration (PowerPC 745/755)

Value	Meaning	Built-in command
off	The signal is not polled. (Default)	cf checkstop = off
on	The checkstop signal is used to detect a checkstop condition. If a checkstop condition is detected, a prompt of "c > " is returned on the command line.	cf checkstop = on

To configure 32-bit mode

You can enable or disable 32-bit mode.

32-bit mode configuration (PowerPC 745/755)

Value	Meaning	Built-in command
off	Normal, 64-bit mode. (Default)	cf 32bitmode = off
on	The maximum memory access size is forced to 32 bits. Do not enable this option unless it is specifically supported by your target system.	cf 32bitmode = on

Configuring the Emulation Probe for Maximum Performance

The performance of the emulation probe depends on the speed at which it communicates with the target system. Better performance is obtained with faster communication speeds.

Setting TCK speed

On JTAG debug ports the communication speed is controlled by the clock signal TCK. This signal is generated by the emulation probe. You can set the speed of TCK using the Emulation Control Interface in a 16700-series logic analysis system or by using the **`cf speed`** command through a telnet or debugger connection to the emulation probe.

To change TCK speed, send a **`cf speed=`*`x`*** command to the probe. To restore default, send an **`init -c`** command. For more information about cf speed, send a **`help cf speed`** command to the probe. Also note that some debuggers allow the speed to be set from within their GUI or from a command file.

When to decrease TCK speed

Emulation probes are configured at the factory with a default TCK speed. In most cases, this is equal to the maximum allowable speed as specified by the manufacturer (see the table). This speed is suitable for most applications. However, this speed is only valid if 1) the processor is running at it's full rated speed, 2) trace lengths from the processor to the JTAG connector are short (two inches or less), and 3) there are no stubs on the JTAG signals. If the emulation probe cannot communicate reliably with the target system using the factory default speed, TCK speed must be reduced.

When to increase TCK speed

Some target systems will allow TCK speeds greater than the default. The real maximum speed for a given target system can be determined empirically by increasing the speed and observing if the communication to the target is reliable. However, please note that speeds greater than the default are not officially supported by Agilent or the chip manufacturer.

Processor	Manufacturer Spec. Max TCK (MHz)	Emulation Probe Factory Default TCK (MHz)	Emulation Probe Max TCK (MHz)
PowerPC 740/750	25-33	30	50
PowerPC 745/755	25-33	30	40

8

Using the Emulation Probe with a Debugger

Several prominent companies design and sell state-of-the-art source debuggers which work with the Agilent emulation modules and emulation probes.

Benefits of using a debugger

The debugger will enable you to control the execution of your processor from the familiar environment of your debugger. Using a debugger lets you step through your code at the source-code level.

With a debugger connection, you can set breakpoints, single-step through source code, examine variables, and modify source code variables from the debugger interface. The debugger can also be used to download executable code to your target system.

Using a debugger to connect to the emulation probe allows the entire design team to have a consistent interface from software development to hardware/ software integration.

Debugger interfaces must be ordered directly from the debugger vendor.

Compatibility with other logic analysis system tools

You can use your logic analysis system to collect and analyze trace data while you use your debugger. You can use a web browser to display the logic analyzer windows right next to your debugger.

Minimum requirements

To use a debugger with the emulation probe, you will need:

- A debugger which is compatible with the emulation probe
- A LAN connection to the PC or workstation that is running the debugger
- A web browser or X windows or an X terminal emulator, such as Reflection X on a PC. This is required only if you wish to have the logic analysis system user interface displayed on your PC or workstation screen, along with the debugger.

Is your debugger compatible with the emulation probe?

Ask your debugger vendor whether the debugger can be used with an Agilent emulation module or emulation probe.

LAN connection

You will use a LAN connection to allow the debugger to communicate with the emulation probe.

Compatibility with the Emulation Control Interface

Do not use the logic analysis system's Emulation Control Interface and your debugger at the same time.

Connecting to an Emulation Module

If you are using an E5901B emulation module, configure your debugger to use the IP address of the E5900B emulation probe, not the logic analysis system.

You may need to tell the debugger which port number to use. The default port number for a debugger connection is 6470.

Do not use the Emulation Control Interface at the same time as a debugger.

Setting up Debugger Software

The instructions in this manual assume that your PC or workstation is already connected to the LAN, and that you have already installed the debugger software according to the debugger vendor's documentation.

To use your debugger with the emulation probe, follow these general steps:

- Connect the emulation probe to the LAN (see page 28).
- Connect the emulation probe to your target system (see page Appendix , "Connecting to a Target System,").
- If you are using a logic analysis system, export the logic analysis system's display to your PC or workstation (page Appendix , "To export the logic analysis system's display to a workstation,").
- Configure the emulation probe (page Appendix , "Configuring the Emulator,").
- Begin using your debugger.

If you use the Emulation Control Interface to configure the emulation probe, remember to end the Emulation Control Interface session before you start the debugger.

CAUTION: Do not use the Emulation Control Interface at the same time as a debugger. The Emulation Control Interface and debuggers do not keep track of commands issued by other tools. If you use both at the same time, the tools may display incorrect information about the state of the processor, possibly resulting in lost data.

See Also Refer to the documentation for your debugger for more information on connecting the debugger to the emulation probe.

To export the logic analysis system's display to a web browser

You can export the display of an Agilent 16700-series logic analysis system to your PC or workstation using a web browser. See the online help in your logic analysis system for more information.

To export the logic analysis system's display to a workstation

By exporting the logic analyzer's display, you can see and use the logic analysis system's windows on the screen of your workstation. To do this, you must have telnet software and X window installed on your computer.

1. On the workstation, add the host name of the logic analysis system to the list of systems allowed to make connections:

   `xhost +<IP_address>`

2. Use telnet to connect to the logic analysis system.

   `telnet <IP_address>`

3. Log in as "hplogic".

   The logic analysis system will open a Session Manager window on your display.

4. In the Session Manager window, click Start Session on This Display.

Example

On a UNIX workstation, you could use the following commands to export the display of a logic analysis system named "mylogic":

```
$ xhost +mylogic
$ telnet mylogic
Trying...
Connected to mylogic.mycompany.com.
Escape character is '^]'.
Local flow control on
Telnet TERMINAL-SPEED option ON

HP Logic Analysis System

Please Log in as: hplogic [displayname:0]

login: hplogic
Connection closed by foreign host.
```

To export the logic analysis system's display to a PC

By exporting the logic analyzer's display, you can see and use the logic analysis system's windows on the screen of your PC. To do this, you must have telnet software and an X terminal emulator installed on your computer. The following instructions use the Reflection X emulator from WRQ, running on Windows 95, as an example.

1. On the PC, start the X terminal emulator software.

   To start Reflection X, click the Reflection X Client Startup icon.

2. Start a telnet connection to the logic analysis system.

   Log in as "hplogic".

   For Reflection X, enter the following values in the Reflection X Client Startup dialog:

   a. In the Host field, enter the LAN name or IP address of the logic analysis system.

   b. In the User Name field, enter "hplogic".

   c. Leave the Password field blank.

   d. Leave the Command field blank.

   e. Click Run to start the connection.

   The logic analysis system will open a Session Manager window on your display.

3. In the Session Manager window, click Start Session on This Display.

To enable or disable processor caches

The Power PC 7xx processors have instruction and data caches. Debugging using an third party debugger will have the greatest performance if the caches are disabled during debugging. There are three ways to disable the caches prior to a debug session:

- Clear bits HID0[ICE] and HID0[DCE]. This will turn off the instruction and data caches. Also turn off the L2 Cache, by setting L2CR to zero.

  Ensure that your startup code does not reset the HID0 or L2CR registers because this could re-enable the caches.

- (PowerPC 740/750 Only) Issue the following probe commands:
  "cf reset=rom"
  "rst" ("rst" will turn off all caches)

  Ensure that your startup code does not reset the HID0 register after the "rst" command because this could re-enable the caches.

- (PowerPC 740/750 Only) Keep the caches enabled but tell the emulation probe to bypass them. To do this, issue the probe commands:

  "cf mrdop=phys" (so only physical memory is read)
  "cf dmwrop=bypass" (to bypass the updating of the data cache) reference all addresses with the @dmem modifier.

  Example:
  M> cf mrdop=phys
  M> cf dmwrop=bypass
  M> m -d4 -a4 0.. (this will read physical memory only)
  M> m -d4 -a4 0@dmem=12345678 (this will write physical memory only)

  When caches are bypassed, all memory accesses occur out of physical memory and the cache information is ignored. **This means that cache coherency is not maintained.**

If cache handling is not modified using one of the above three methods, execution with the third party debugger may be slower due to the emulation probe making sure the cache information stays coherent with physical memory.

9

Updating Firmware

Firmware gives your emulation probe a “personality” for a particular processor or processor family.

The emulation probe is programmed with firmware to support the PowerPC 740/750. To use the emulation probe with the MPC745/755, you must load new firmware.

After you have connected the emulation probe to your target system, you may need to update the firmware to give it the right personality for your processor.

Update the firmware if:

- You need to change the personality of the emulation probe for a new processor.
- You have an updated version of the firmware from Agilent Technologies.

Updating Firmware When You Do Not Have a Logic Analysis System

To display current firmware version information

- Use `telnet` to access the built-in "terminal interface" and use the `ver` command to view the version information for firmware currently in the emulation probe.

To update firmware from the web

To update the firmware, you must have access to the World Wide Web and a PC or a workstation connected to your emulation probe.

1. Download the new firmware from the following World Wide Web site:

   `http://www.agilent.com/find/emulator`

   The firmware will be in the "Emulator and Emulation Solutions Software" or “Technical Support” section of this web site.

2. Follow the instructions on the web site for installing the firmware.

To update firmware from a floppy disk

- Follow the instructions on the README file on the floppy disk.

  The firmware can be installed using either a PC or a workstation which can read PC disks.

Updating Firmware When You Have a Logic Analysis System

Always update firmware by installing a processor support package. This will ensure that the version of the Emulation Control Interface software is compatible the version of the emulation probe firmware. Logic analysis system operating system CD-ROMS include the processor support packages; versions 1.51 and later will include firmware which is compatible with E5900B emulation probes.

To display current firmware version information

1 In the Update Firmware window, select Display Current Version.

There are usually two firmware version numbers: one for “Generics” and one for the personality of your processor.

To update firmware using the Emulation Control Interface

1 End any run control sessions which may be running.

2 Install the processor support package from the CD-ROM, if necessary.

3 Open the Update Firmware window.

For an emulation module: In the system window, select the emulation module and select Update Firmware....

For an emulation probe: In the Workspace window, drag the emulation probe icon onto the workspace then select Update Firmware....

4 In the Update Firmware window, select the firmware to load into the emulation module.

5 Select Update Firmware.

In about 80 seconds, the firmware will be installed and the screen will update to show the current firmware version.

See also "Installing Software" beginning on page 48 for instructions on how to install the processor support package from the CD-ROM.

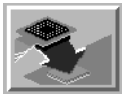
To update firmware for an emulation module using the Setup Assistant

The Setup Assistant is an online tool for connecting and configuring your logic analysis system for microprocessor and bus analysis. The Setup Assistant is available on Agilent 16700-series logic analysis systems.

This menu-driven tool will guide you through the connection procedures for connecting the logic analyzer to an analysis probe, an emulation module, or other supported equipment. It will also guide you through connecting an analysis probe to the target system.

1 Install the processor support package from the CD-ROM.

2 Start the Setup Assistant by selecting its icon in the system window.



3 Follow the instructions displayed by the Setup Assistant.

See also Page page 48 for instructions on how to install a the processor support package from the CD-ROM.

10

Installing an Agilent E5902B Emulation Migration

This chapter will tell you how to install an Agilent E5902B emulation migration so that you can use your emulation probe with a new processor family.

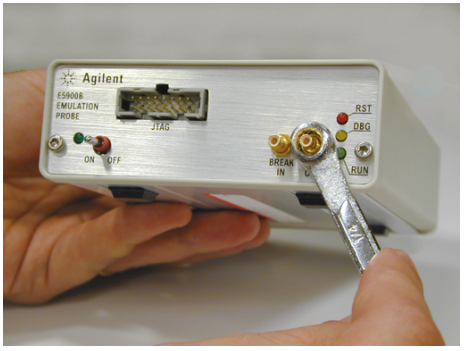
The E5902B emulation migration can be used with any E5900B emulation probe. It cannot be used with E5900A emulation probes.

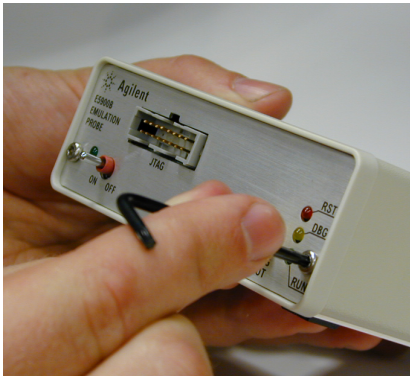
To install the emulation migration

CAUTION: Electrostatic discharge can damage electronic components. Use grounded wrist straps and mats.

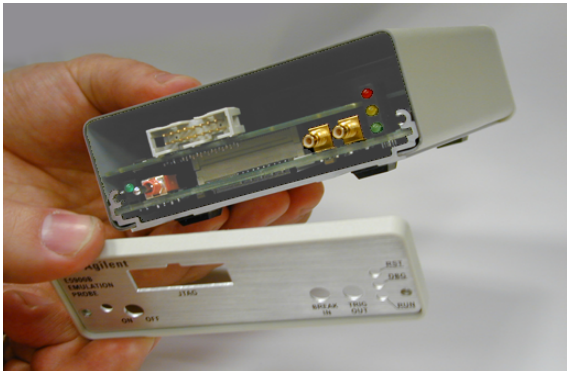
The tools necessary for this procedure are supplied with the emulation migration.

1. Turn off power to the emulation probe.
2. Disconnect all cables from the emulation probe, including the power cord, LAN cable, serial cable, module/probe interconnect cable, and target cable.
3. Remove the cover from the emulation probe:
   a. Remove the 2 nuts and 2 screws from the front of the emulation probe.

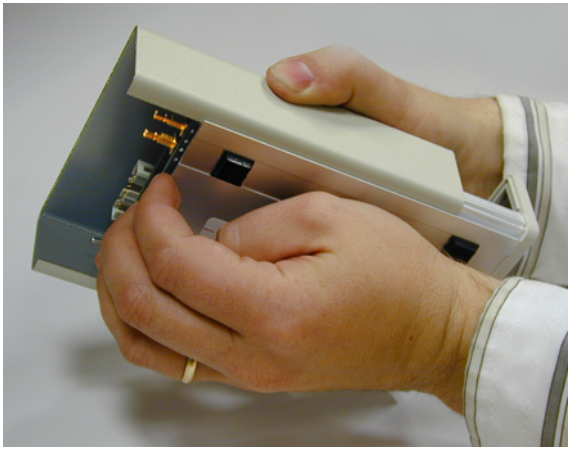




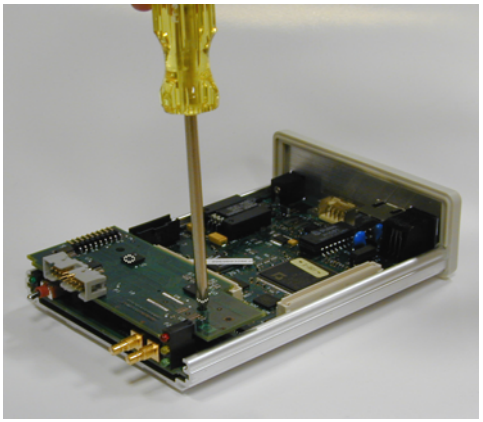
b Remove the front panel.



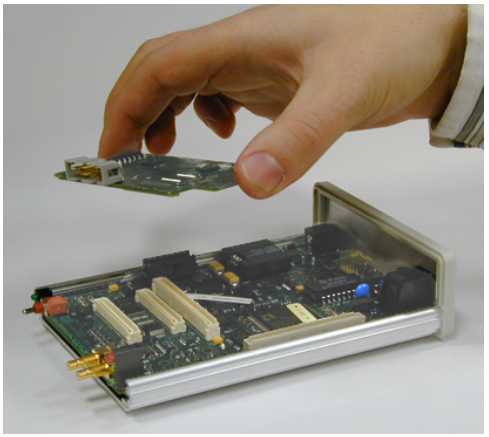
c Grasp the top cover with one hand. With the other hand, pull the plate on the bottom of the emulation probe, so that the top cover slides off.



4 Remove the 3 nylon screws from the target board adapter.



5 Carefully lift the target board adapter from the main circuit board.



Do not turn on power to the emulation probe when no target board adapter is installed.

You cannot run performance verification tests or make any measurements without a target board adapter.

6 Install the new target board adapter on the main circuit board.

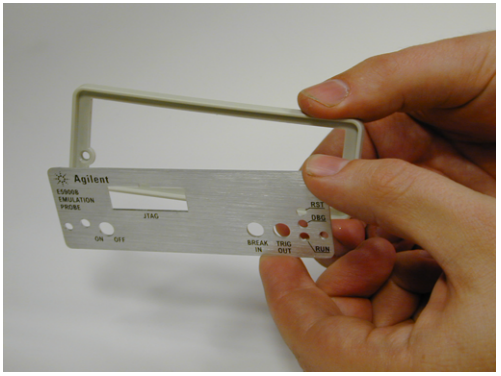
Align both connectors and press down firmly.

7 Replace the 3 nylon screws.

8 Reinstall the cover on the emulation probe:

a Slide the top cover into place.

b Assemble the new front panel.



c Attach the front panel using the 2 screws and 2 nuts.

9 Connect the LAN cable, module/probe interconnect cable (if you will be using the emulation probe with an emulation module), and the LAN cable to the emulation probe. Do not connect a target cable yet.

10 Turn on power to the emulation probe.

11 Update the emulation probe's firmware.

See Chapter 9, "Updating Firmware," beginning on page 87 for instructions on how to update firmware.

12 Run the performance verification test.

See page 132 for instructions on testing the emulation probe.

13 Connect the emulation probe to your target system.

See Chapter 6, "Connecting the Emulation Probe to Your Target System," beginning on page 57, and your emulation or solution *User's Guide* for instructions on how to make this connection.

11

Specifications and Characteristics

The following operating characteristics are not specifications, but are typical operating characteristics for the Agilent Technologies E5900B emulation probe and E5901B emulation module.

Operating characteristics

The following operating characteristics are not specifications, but are typical operating characteristics.

Microprocessor Compatibility	PowerPC 740, PowerPC 750, PowerPC 745, PowerPC 755 The emulation probe is programmed with firmware to support the PowerPC 740/750. To use the emulation probe with the MPC745/755, you must load new firmware. See "Updating Firmware" on page 87.

Emulation probe electrical characteristics

SMB, labeled TRIG OUT

Output Drive. Logic high level with 50-ohm load >= 2.0 V. Logic low level with 50-ohm load <= 0.4 V. Output function is selectable.

SMB, labeled BREAK IN

Input. Edge-triggered TTL level input (active high), 20 pf, with 2K ohms to ground in parallel. Maximum input: 5V above V_{CC}; 5 V below ground. Input function is selectable.

Communications

Serial Port. RJ12 connector. Data rate is 9600 baud.

10/100BASE-T LAN Port. RJ-45 connector. IEEE 802.3 Type 10BASE-T / 100BASE-TX.

Power Input

12 V CAT I, 1.0 A, Center negative.

Installation category I: Mains isolated. Pollution degree 2: Normally only dry non-conductive pollution occurs. Occasionally a temporary conductivity caused by condensation must be expected.

F1044B Power Supply

Input. 100-240 V CAT II, 1.0 A, 50/60 Hz, IEC 320 connector.

Installation category II: Line voltage in appliance and to wall outlet. Pollution degree 2: Normally only dry non-conductive pollution occurs. Occasionally a temporary conductivity caused by condensation must be expected.

Output. 12 V, 3.3 A, Center negative

Characteristics for the PowerPC 7xx emulation module and emulation probe	Symbol	Min	Max
TDO, $\overline{\text{CKSTP\_OUT}}$	V_{ih}	2.0 V	5.5 V
	V_{il}		0.8 V
	I_i		±1 μA
	C_{in}		15 pF
TDI, TCK, TMS, $\overline{\text{TRST}}$ [1]	V_{oh} @ I_{oh} = -32 mA	2.0 V	2.8 V
	V_{ol} @ I_{ol} = 64 mA; V_{CC} = 4.5V		0.55 V
TDI, TMS, $\overline{\text{TRST}}$	C_o		25 pF
TCK	C_o		45 pF
+ 3.3V Power Sense [2]	V_{ih}	2.0 V	5.3 V
	V_{il}	-0.3 V	0.8 V
$\overline{\text{SRESET}}$, $\overline{\text{HRESET}}$ [3]	V_{ol} @ I_{ol} = 12 ma		0.5 V
	C_o		25 pF
TS0 - TS6, SYSCLK	C_{in}		10 pF
	V_{ih}	2.0 V	5.5 V
	V_{il}		0.8 V
	I_i		±1 μA

1 These signals must not be actively driven by the target system when the debug port is being used.

2 Power Sense is used only to determine target powered status. The emulation module and emulation probe do not draw power from this source.

3 Open collector outputs, pulled up to a generated voltage equivalent to the Power Sense voltage with a 2.61 K pullup resistor

Emulation probe environmental characteristics

Temperature Operating, +0 C to +40 C (+32 to +104 F); nonoperating, -40 to +60 C (-40 to +140 F).

Altitude Operating/nonoperating 4600 m (15 000 ft).

Relative Humidity 15% to 95%.

For indoor use only.

Emulation module environmental characteristics

The Agilent E5901B emulation module meets the environmental characteristics of the logic analysis system in which it is installed.

For indoor use only.

12

Troubleshooting the Emulation Probe

If you have problems with the emulation probe, your first task is to determine the source of the problem. Problems may originate in any of the following places:

- The connection between the emulation probe and your debugger
- The emulation module or emulation probe itself
- The connection between the emulation probe and the target system
- The target system

You can use several means to determine the source of the problem:

- The troubleshooting guide beginning on the next page
- The status lights on the emulation probe
- The emulation probe "performance verification" tests
- The emulation probe's built-in commands

Troubleshooting Guide

If you have trouble using the emulation probe, the following steps may help you identify the problem:

Step 1: Telnet to the emulation probe

Use telnet to connect to the emulation probe across the LAN. (For instructions on how to do this, see "Verifying LAN Communications" on page 38.

The emulation probe must be reachable via LAN before you can use it.

If you cannot connect to the emulation probe

If you cannot ping or telnet to the emulation probe ("Verifying LAN Communications" on page 38):

- See "Problems with the LAN Interface" on page 126.
- If you need to change the LAN parameters of the emulation probe, see Chapter 2, "Connecting the Emulation Probe to a LAN," on page 25.

Step 2: Check the prompt

Once you have connected to the emulation probe, press the Enter key a few times and look at the prompt which is displayed.

If a telnet connection to the emulation probe displays the prompt "->"

The "->" prompt indicates that the firmware loaded into the emulation probe is not compatible with the "target board adapter" which is located inside the emulation probe.

Try one of the following until you get a different prompt:

- Cycle power on the emulation probe. (Turn off your target power first.)
- Check that the proper firmware is installed for the target board adapter or the type of emulation probe shown on the front panel of the emulation probe.

  The proper firmware is installed at the factory but it could accidentally be changed. A "ver" command will display the firmware which is currently loaded. Refer to “Updating Firmware” on page 87 if the firmware is incorrect.

- Run the performance verification tests. Refer to “To run the emulation probe performance verification tests” on page 132.

  Connection to the wrong target or connection to the target with the pins connected backward could potentially damage the emulation probe. Use the performance verification tests to validate that the emulation probe itself is working correctly.

If a telnet connection to the emulation probe displays the prompt "?>"

The "?>" prompt indicates that the emulation probe is having trouble talking to the target and it doesn't know what state the target is in.

- Validate that the emulation probe is connect to a powered up target.

  Refer to Chapter 6, “Connecting the Emulation Probe to Your Target System,” beginning on page 57.

- Try initializing the emulation probe with the "init -c" command.

  Some emulation probes need to read the Processor Version Register of the target processor as the emulation probe is initialized.

- Check the emulation probe configuration settings.

  Enter the **`cf`** command to display the configuration settings. Note that some emulation probes must set the processor type with **`cf proc=`*`processor_type`***.

- Decrease the JTAG communication speed. Some targets need slower speeds to properly communicate.

  Use the **`cf speed`** command.

- Check that the proper firmware is installed for this processor.

Some PowerPC chips require different firmware to be installed for different mask revs or other slight differences of the processor. For example, the PowerPC 603ev processor requires that the E3479 firmware be installed and the Motorola PowerPC 603ei requires that the E3477i firmware be installed.

Step 3: Try some simple commands to control the target

Examples of some commands are listed on page 115 and page 118.

If the emulation probe has problems controlling the target

The emulation probe might be having problems controlling the target if you see messages such as:

```
"Cannot break"
"Processor is checkstopped"
"Bad status code (0xff) received from the processor"
```

Or the prompt changes to "?>"

Problems controlling the target can be caused by a variety of conditions. Typically the problem is in the configuration of the emulation probe or the configuration of the target.

Try the following to better control your target:

- Decrease the JTAG communication speed. Some targets need slower speeds to properly communicate.

  If you are using a telnet connection or a debugger command file, use the **`cf speed`** command.

- Check the emulation probe configuration settings.

  If you are using a telnet connection, enter the **`cf`** command to display all of the configuration settings.

  Pay particular attention to the **`cf proc=`*`processor_type`*** line of the output. If you are using an MPC745 or MPC755, the processor type should be MPC755. If you need to change the processor type, you must load the appropriate firmware into the emulation probe (See “Updating Firmware” on

page 87.).

- Check that the emulation probe is not restricted to real-time runs.

  If you are using a telnet connection or a debugger command file, use the **`cf rrt=no`** command.

  Restrict to real time will not allow you to access memory or registers while the target is running. By setting this option to no, you will be able to access the memory and registers while the target is running.

- Check that the target processor is configured.

  Some target require configuration registers on the processor to be initialized before the emulation probe can properly communicate with the target.

  For example, the MPC860 requires memory chip selects to be defined before the target memory can be accessed. Other processors need their memory controllers initialized.

  To initialize the target processor, either run your target from reset (if you have a BOOT ROM) or define a series of emulation probe commands to initialize the target.

  Also refer to "Emulation Probe Built-in Commands" on page 115 for additional information about testing a target.

Step 4: Check the emulation module

If you are using an E5901B emulation module, select the emulation module icon and start the Emulation Control Interface.

If you have problems using the emulation probe as an emulation module in a 16700-series logic analysis system

To use the emulation probe as an emulation module in a 16700-series logic analysis system you must have installed an E5901B emulation module and you must connect the emulation probe to the emulation module using the module/probe interconnect cable. In addition, the emulation probe must be connected to the logic analysis system using a LAN.

- Check that the emulation probe and the logic analysis system are on the LAN.

  If you are using a site LAN you should be able to ping both the logic analysis system and the emulation probe.

  If you are using a point-to-point LAN connection you must use a special crossover LAN cable, such as the one supplied with the emulation module.

  The telnet window of the logic analysis system should be able to communicate with the emulation probe. This window can be found by selecting the "System Admin" icon in the main system window.

- Check that the emulation probe is connected to the emulation module with the module/probe interconnect cable.

  If this cable is connected, you should be able to display the firmware version from the "Update Firmware" window.

- Check that you have the proper processor support package installed.

  You can check this by selecting the System Admin icon in the main system window, then looking at the list of software packages installed.

- Test the emulation module. See page 131.
- Test the emulation probe. See page 132.
- Try using the Setup Assistant to configure your measurement setup.

Step 5: Check your debugger connection

If you are using a debugger, try connecting to the emulation probe.

If you have problems using the emulation probe with a debugger

Most problems are associated with not having the emulation probe and target properly configured or initialized.

Some debuggers have an initialization file that needs to be properly defined before a debugger can connect to the emulation probe.

- Make sure the PC or workstation where the debugger is running can ping the emulation probe. (See "Verifying LAN Communications" on page 38.)
- Initialize the emulation probe and target so that the debugger can connect. Refer to your debugger manual for proper initialization.
- Refer to your debugger manual for proper operation.

If you need to obtain help

If, after following the troubleshooting steps and looking through the other sections in this chapter, the emulation probe still is not working:

1. Write down the target processor version, the emulation probe firmware version, and the type of emulation probe (E5900A or E5900B).
2. Call your nearest Agilent Technologies sales or service office.

   To locate a sales or service office near you, go to **http://www.tm.agilent.com** and select Assistance.

Status Lights

Emulation Probe Target Status Lights

The emulation probe uses status lights to communicate various modes and error conditions.

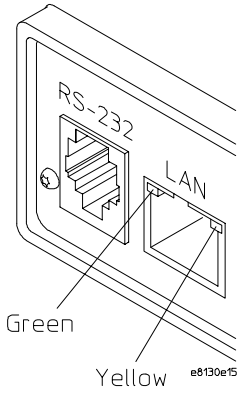
The following table gives more information about the meaning of the power and target status lights.

❍ = LED is off
● = LED is on

Power/Target Status Lights

Pwr/Target LEDs	Meaning
❍ RST ❍ DBG ❍ RUN	No target system power, or emulation probe is not connected to the target system
● RST ❍ DBG ❍ RUN	Target system is in a reset state
❍ RST ● DBG ❍ RUN	The target processor is in Debug Mode
❍ RST ❍ DBG ● RUN	The target processor is executing user code
❍ RST ● DBG ● RUN	Only boot firmware is good (other firmware has been corrupted)
● RST ● DBG ● RUN	The emulation probe can no longer control the target. Reset the target, then initialize the emulation probe.

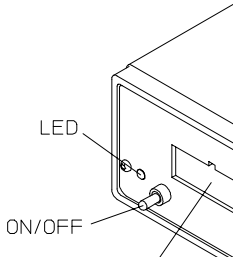
Emulation Probe LAN Status Lights



The yellow LED, on the right side of the connector, indicates LAN activity (receive or transmit).

The green LED, on the left side of the connector, is lit when the LAN interface is operating in 100Base-Tx mode.

Emulation Probe Power On Light



The green LED, to the left of the power switch, is lit when the emulation probe is connected to a power source and the power switch is on.

Emulation Probe Built-in Commands

The emulation probe has some built-in commands (sometimes called the "terminal interface") which you can use for troubleshooting.

You can enter the built-in commands using:

- A telnet (LAN) connection
- The Command Line window in the Emulation Control Interface
- A "debugger command" window in your debugger
- A serial connection (see page 30)

To telnet to the emulation probe

You can establish a telnet connection to the emulation probe if:

- A host computer and the probe are both connected to a local-area network (LAN), and
- The host computer has the telnet program (often part of the operating system or an internet software package).

To establish a telnet connection:

1. Find out the LAN address or LAN name of the emulation probe.
2. Start the telnet program.

   If the LAN name of the emulation probe is "test2", the command might look like this:

   ```
   telnet test2
   ```

3. If you do not see a prompt, press the <Return> key a few times.

   To exit from this telnet session, type <CTRL>D at the prompt.

To use the built-in commands

Here are a few commonly used built-in commands:

Useful built-in commands

b	Break—go into the background monitor state
cf	Configuration—read or write configuration options
help	Help—display online help for built-in commands
init	Initialize—**`init -c`** re-initializes everything in the emulation probe except for the LAN software
lan	configure LAN address
m	Memory—read or write memory
reg	Register—read or write a register
mtest	Memory test—test target memory system
r	Run—start running user code
rep	Repeat—repeat a command or group of commands
rst	Reset—reset the target processor
s	Step—do a low-level single step
ver	Version—display the product number and firmware version of the emulation probe

Use **`help`** ***`command_name`*** to see the command syntax. For example, enter **`help m`** to get help on the memory command.

The prompt indicates the status of the emulation probe:

Emulation probe prompts

U	Running user program
M	Running in background monitor
p	No target power
R	Emulation reset
r	Target reset
c	Checkstop
?	Unknown state

Examples

To set register GPR0, and then view GPR0 to verify that it was set, enter:

```
R>rst -m
 M>reg GPR0=ffff
 M>reg GPR0
   reg GPR0=0000ffff
```

To break execution and then step a single instruction, enter:

```
M>b
 M>s
   PC=xxxxxxxx
 M>
```

To determine what firmware version is installed in the emulation probe, enter:

```
M>ver
```

See Also

Use the **help** command for more information on these and other commands. Note that some of commands listed in the help screens are generic commands for Agilent emulation probes and may not be available for your product.

If you are writing your own debugger, contact Agilent Technologies for more information.

Problems with the Target System

What to check first

Verify that the cf options are correct for your target.

1 Try some basic built-in commands using the Command Line window or a telnet connection:

```
U>rst
 R>
```

This should reset the target and display an "R>" prompt.

```
R>b
 M>
```

This should stop the target and display an "M>" prompt.

```
M>reg GPR1
   reg GPR1=00000000
 M>
```

This should read the value of the r1 register (the value will probably be different on your target system).

```
M>m 0..=abcd1234
M>m 0..
  00000000 abcd1234 abcd1234 abcd1234 abcd1234
  00000010 abcd1234 abcd1234 abcd1234 abcd1234
  00000020 abcd1234 abcd1234 abcd1234 abcd1234
  00000030 abcd1234 abcd1234 abcd1234 abcd1234
  00000040 abcd1234 abcd1234 abcd1234 abcd1234
  00000050 abcd1234 abcd1234 abcd1234 abcd1234
  00000060 abcd1234 abcd1234 abcd1234 abcd1234
  00000070 abcd1234 abcd1234 abcd1234 abcd1234
M>
```

This should display memory values starting at address 0.

```
M>s
```

This should execute one instruction at the current program counter.

If any of these commands don't work, there may be a problem with the design of your target system, a problem with the revision of the processor you are using, or a problem with the configuration of the emulation probe.

2 Check that the emulation probe firmware matches your processor. To do this, enter:

```
M>ver
```

To check the debug port connector signals

- Check for the following logic levels on the target debug port.

Levels with the emulation probe not connected

Header Pin	Signal Name	Level
3	TDI	Low
4	$\overline{\text{TRST}}$	High
6	+POWER	V_{DD}
7	TCK	High
9	TMS	High
11	$\overline{\text{SRESET}}$	High
13	$\overline{\text{HRESET}}$	High
15	$\overline{\text{CHECKSTOP}}$	High
16	GND	Low

Levels with the emulation probe connected

Header Pin	Signal Name	I/O
1	TDO	Toggle with "es" command
3	TDI	Toggle with "es" command
4	$\overline{\text{TRST}}$	High, pulse low with "rst" command
6	+POWER	V_{DD}
7	TCK	10+ MHz clock (default)
9	TMS	Low, pulse with "es" command
11	$\overline{\text{SRESET}}$	High, pulse low with "rst" command
13	$\overline{\text{HRESET}}$	High, pulse low with "rst" command
15	$\overline{\text{CHECKSTOP}}$	High
16	GND	Low

To interpret the initial prompt

The initial prompt can be used to diagnose several common problems. To get the most information from the prompt, follow this procedure:

1 Connect the emulation probe to your target system.

2 Set the default configuration settings. Enter:

```
M>init -c
```

You can enter this command at any prompt. The emulation probe will respond with the same information as printed by the "ver" command.

If the response is "!ERROR 905! Driver firmware is incompatible with ID of attached device"

Make sure the target interface module is connected to the cable of the emulation probe. Then try the "init -c" command again.

If the initial prompt is "p>"

Check pin 6 on header, 3.3V (V_{DD}).

If the initial prompt is "M>"

The processor entered debug mode without the help of the emulation probe. Is another debugger connected?

If the initial prompt is "c>"

Processor is checkstopped. Something caused a machine exception before the emulation probe connected or $\overline{\text{CHECKSTOP}}$ is being pulled or held low.

If the initial prompt is "?>" with "ERROR 171!"

A bad status code (0xXX) was received from the processor. Valid status is 0x01 or 0x05. Any other status indicates a bad scan of the instruction register. Check TCK, TDO, TDI, TMS, and $\overline{\text{TRST}}$ signals. Check the firmware revision.

If the initial prompt is "U>"

The emulation probe is scanning the instruction register correctly. Now you can do some more tests:

3 Enter the reset command:

```
U>rst
 U>
```

The "U>" prompt is a good response that indicates $\overline{\text{SRESET}}$ and $\overline{\text{HRESET}}$ are working. Continue with "If the prompt after rst is U>".

If the prompt after rst is "?>" with "ERROR 171!"

A bad status code (0xXX) was received from the processor. Valid status is 0x01. Any other status indicates bad scan of IR or failure of the reset signals. Verify TCK, TDO, TDI,TMS, and $\overline{\text{TRST}}$ are all changing state on an $\overline{\text{HRESET}}$.

If the rst command fails

Set "cf reset=rom" (no external bus cycles used in this mode). Then enter the "rst" command again:

```
*>cf reset=rom
 *>rst
 M>
```

You can enter these commands at any prompt, shown here as "*>".

- If the prompt is "M>" with no error messages, all scans worked. We have control as long as we don't try to run code. Continue with "If you can get to the "M>" prompt.
- If an error message is displayed, verify that $\overline{\text{HRESET}}$ and $\overline{\text{SRESET}}$ are being driven.
- If the prompt is "c>", there was bad scanning of the data scan chain. Check processor mask revision.
- If the prompt is "U>", the processor failed to stop soft or hard. Check reset lines, mask revision, processor type and firmware version.

If the prompt after rst is "U>"

The $\overline{\text{HRESET}}$ and $\overline{\text{SRESET}}$ lines are working. Continue with more tests:

4 Enter the break command:

```
U>b
 M>
```

If the prompt after b is "M>" with error messages

If you see: "!ERROR 145! Unable to soft stop - freezing the processor clocks" the processor is hard stopped. Check the mask revision, processor type, and firmware version. If all of these look good, the target may not be terminating cycles (pending external bus cycles). Successive run ("r") and step ("s") commands will fail. The processor may have fetched an invalid instruction.

Check the value of the PC (IAR):

```
M>reg PC
   reg PC=xxxxxxxx
 M>
```

If the value is fff00100, the processor had a problem accessing the boot ROM and crashed during boot.

Processor and/or board level reset is required to recover from "freezing processor clocks" -- register and memory commands should still work.

If the prompt after b is "M>" with no error messages

Everything is still working correctly. Continue with more tests:

If you can get to the "M>" prompt

5 At the "M>" prompt , check register and memory access:

```
M>reg GPR0
   reg GPR0=xxxxxxxx
 M>reg GPR0=12345678
 M>reg GPR0
    reg GPR0=12345678
 M>
```

6 If the returned value is equal to the written value, the dd level of the chip is probably correct.

Now enter:

```
M>m -d4 -a4 0=11111111,22222222,33333333,44444444
```

```
M>m -d4 -a4 0..
  00000000   11111111 22222222 33333333 44444444
  00000010   00000000 00000000 00000000 00000000
  00000020   00000000 00000000 00000000 00000000
  00000030   00000000 00000000 00000000 00000000
  00000040   00000000 00000000 00000000 00000000
  00000050   00000000 00000000 00000000 00000000
  00000060   00000000 00000000 00000000 00000000
  00000070   00000000 00000000 00000000 00000000
M>
```

- Returned value is equal to the written value implies that memory is working.
- Returned value is not equal to the written value implies that memory control may not be initialized. Try to initialize by:

```
M>cf reset=runrom;rst;w 5
   #waiting for 5 seconds...
 U>b
 M>
```

a Repeat above memory test.

7 At the "M>" prompt , check the processor's revision level:

The target must support burst cache fill from where PC is pointing.

Set the PC to a location in RAM. For example:

```
M>reg PC=100
 M>
```

Now enter:

```
M>reg PVR
   reg PVR=xxxxxxxx
 M>
```

The returned value is in the form VVVVRRrr where VVVV is the processor's design architecture family, and RRrr is mask revision level.

VVVV:

- `00080` is the PowerPC 740/750
- `00083` is the PowerPC 745/755

For example reg PVR=00080202 means 740/750 Mask Revision 2.2. PVR=00083100 means 745/755 Mask Revision 1.0.

If you see memory-related problems

1 Set caches and translation off:

```
M>reg HID0=0
 M>reg MSR=0
 M>
```

If these commands fail, just try again.

2 Now enter:

```
M>m -d4 -a4 0=11111111,22222222,33333333,44444444
 M>m -d4 -a4 0..
   00000000   11111111 02222222 33333333 44444444
   00000010   00000000 00000000 00000000 00000000
   00000020   00000000 00000000 00000000 00000000
   00000030   00000000 00000000 00000000 00000000
   00000040   00000000 00000000 00000000 00000000
   00000050   00000000 00000000 00000000 00000000
   00000060   00000000 00000000 00000000 00000000
   00000070   00000000 00000000 00000000 00000000
 M>
```

- If you do not see correct values written in memory, try increasing memory delay (page page 45).
- If the read value is not equal to the written value, the memory controller may not be set up correctly.
- If the read value is equal to the written value, but you still suspect memory problems, the emulation probe firmware might not be working with cache.

3 Enter:

```
M>cf reset=rom
 M>rst
 M>m -d4 -a4 0..
```

- Read value not equal to the written value implies that reset is tied to memory controller. Check $\overline{\text{HRESET}}$ and $\overline{\text{SRESET}}$ for correct connections.

4 If you have memory problems running Windows NT, you may have this problem:

- System normally runs in little endian mode
- "rst" returns processor to big endian. Memory controller on target still little endian, so memory access doesn't work.

5 Hand load a little program:

```
M>m -d4 -a4 100=38210001,60000000,60000000,4bfffff4
 M>reg GPR1=0
 M>
```

This means: Add 1, GPR1, NOP, NOP, JMP .-4

Set the PC to this program:

```
M>reg PC=100
 M>
```

Step, and then check the register:

```
M>s
   PC=00000104
 M>reg GPR1
   reg GPR1=00000001
 M>
```

This should return"reg GPR1=00000001" .

Step some more and verify that GPR1 increments after every four steps:

```
M>s 4
   PC=00000104
 M>reg GPR1
   reg GPR1=00000002
 M>
```

Problems with the LAN Interface

If you cannot verify LAN communication

If you cannot verify connection using the procedure in "To verify LAN communication", or if commands are not accepted by the emulation probe:

- ❏ Make sure that you have connected the emulation probe to the proper power source and that the power light is lit.
- ❏ Make sure that you wait for the power-on self test to complete before connecting.
- ❏ Check that the Emulation Control Interface or debugger was configured with the correct LAN address. If the emulation probe is on a different subnet than the host computer, check that the gateway address is correct.
- ❏ Make sure that the emulation probe's IP address is set up correctly. To do this, connect the emulation probe to a terminal or terminal emulator and enter the **`lan`** command. (See "To configure LAN parameters using a serial connection" on page 30.)
- ❏ Make sure that the gateway address is set up correctly. The default gateway address of 0.0.0.0 does not allow the emulation probe to communicate with computers on other subnets.
- ❏ If you have just changed the IP address of the emulation probe, leave the emulation probe powered on and connected to the LAN for a few minutes, then try again. Some hubs, routers, and hosts maintain tables of IP addresses and link-level addresses. It may take a while for these tables to be updated.
- ❏ Make sure that the proper LAN cable is connected.
  - Use a Category 5 cable if your connection is running at 100 Mbps (100BASE-TX).
  - For a point-to-point connection, use a crossover cable.
  - For a LAN connection, use a regular LAN cable, not a crossover cable (the cable supplied with the emulation module, part number 5061-7342, is a crossover cable).

- ❏ Watch the LAN LED's to see whether the emulation probe is seeing LAN activity. The LED's are described on page 114 . Refer to your LAN documentation for information on testing connectivity.
- ❏ It's also possible for there to be a problem with the emulation probe firmware while the LAN interface is still up and running. In this case, you must reboot the emulation probe by turning the emulation probe power switch off then on again.

If you have LAN connection problems

- ❏ Verify the IP address and gateway mask of the emulation probe. To do this, connect the emulation probe to a terminal or terminal emulator and enter the **lan** command (see See "To configure LAN parameters using a serial connection" on page 30.).

If it takes a long time to connect to the network

- ❏ Check the subnet masks on the other LAN devices connected to your network. All of the devices should be configured to use the same subnet mask.

  Subnet mask error messages do not indicate a major problem. You can continue using the emulation probe.

  If there are many subnet masks in use on the local subnet, the logic analysis system may take a very long time to connect to the network after it is turned on.

If you have problems setting the LAN parameters using a logic analysis system

- ❏ If the E5900B emulation probe is not connected to an E5901B emulation module, then make sure the emulation probe is on the same subnet as the logic analysis system during initial setup; otherwise,

probe LAN address setup will fail. After initial setup, you can modify the emulation probe's LAN parameters using the Emulation Control Interface before moving the probe to a different subnet.

- Another thing that will cause emulation probe LAN address setup to fail is a BOOTP daemon, running elsewhere on your network, that is configured to respond to the link-level address of the emulation probe.

Problems with the Serial Interface

If you cannot verify RS-232 communication

If the emulation probe prompt does not appear in the terminal emulator window:

- ❏ Make sure that you have connected the emulation probe to the proper power source and that the power switch is on.
- ❏ Make sure that you have properly configured the data communications parameters on the host computer.
- ❏ Verify that you are using the correct cable. Use the cable and adapter which are supplied with the emulation probe.

If you have RS-232 connection problems with the MS Windows Terminal program

- ❏ Use the "HyperTerminal" program (usually found in the Accessories windows program group) and set up the "Communications..." settings as follows:
  - Baud Rate: 9600
  - Data Bits: 8
  - Parity: None
  - Stop Bits: 1
  - Flow Control: None

  When you are connected, hit the Enter key. You should get a prompt back.
- ❏ If you still don't get a prompt, make sure the serial cable is connected to the correct port on your PC.
- ❏ Make sure you are using the serial cable which was supplied with the emulation probe.

With certain RS-232 cards, connecting to an RS-232 port where the emulation

probe is turned off (or is not connected) will hang the PC. The only way to get control back is to reboot the PC. Therefore, we recommend that you always turn on the emulation probe before attempting to connect via RS-232.

Problems with the Emulation Module

Occasionally you may suspect a hardware problem with the emulation module. The procedure in this section describes how to test the emulation module hardware, and if a problem is found, how to repair or replace the broken component.

This procedure tests the hardware within the logic analysis system—the emulation module and its connection to the logic analysis system. To test the emulation probe, see page 132.

To test the emulation module

1. End any Emulation Control Interface or debugger sessions.
2. Disconnect the emulation probe from the target system.
3. In the system window, select the System Admin icon.
4. Select the Admin tab.
5. Select Self-Test....
6. Read the Question dialog and select Yes if you wish to run the self tests.
7. Select the Master Frame tab.
8. Select the E5901B Emulation Module.
9. Select Test All.
10. When you are finished running self tests, select Quit. Then restart your session from the Session Manager window.

Problems with the Emulation Probe

To run the emulation probe performance verification tests

In addition to the powerup tests, there are several additional performance verification (PV) tests available.

These tests can be performed through a 16700-series logic analysis system or via a serial or telnet connection.

Before running probe performance verification:

- Leave the emulation probe connected to the LAN and to the power supply or module/probe interconnect cable.
- Leave the target board adapter installed inside the emulation probe.
- End any Emulation Control Interface or debugger sessions.
- Disconnect the target cable from the target system. (Power off the emulation probe while you do this.)
- Connect an SMB cable from the "Break In" connector to the "Trigger Out" connector on the emulation probe. (If you aren't concerned about these signals, you may omit this step and ignore any related test failures.)

To run the performance verification tests using the logic analysis system

1. End any Emulation Control Interface or debugger sessions.
2. Turn off the emulation probe and disconnect the emulation probe from your target system, then turn the emulation probe on again.

CAUTION: **Disconnect the emulation probe from your target system before running the tests.** Running the Target Board Adapter Feedback Test with the target system connected can damage components on the target system.

3 In the system window, select the emulation probe icon then select Performance Verification.

4 Select Start PV.

The results will appear on screen.

To run complete performance verification tests using a serial or telnet connection

1 Connect an SMB cable between BREAK IN and TRIGGER OUT.

2 Disconnect the probe/module interconnect cable.

3 Turn off the emulation probe and disconnect the emulation probe from your target system, then turn the emulation probe on again.

CAUTION: **Disconnect the emulation probe from your target system before running the tests.** Running the Target Board Adapter Feedback Test with the target system connected can damage components on the target system.

4 Connect the emulation probe to your PC or workstation using a serial or LAN connection, as described in "Connecting the Emulation Probe to a LAN" on page 25.

5 Use a **`telnet`** or a terminal emulator to connect to the emulation probe.

6 Enter the **`pv 1`** command.

See Also

Options available for the **`pv`** command are explained in the help screen displayed by typing **`help pv`** or **`? pv`** at the prompt.

Examples

Here are some examples of ways to use the pv command.

To execute all of the tests one time:

```
pv 1
```

To execute test 2 with maximum debug output repeatedly until a Ctrl-c is entered:

```
pv -t2 -v9 0
```

The results on a good system, with the trigger out and break in SMBs connected, should similar to the following.

```
U>pv 1

  Testing: HPE8130A Series Emulation System
    Test  1: Powerup PV Results                              Passed!
    Test  2: Emulation Module Port Feedback Test             Passed!
    Test  3: Run Control FPGA Test                           Passed!
    Test  4: Run Control Clock Test                          Passed!
    Test  5: Break In and Trigger Out SMB Feedback Test      Passed!
    Test  6: Target Board Adapter Feedback Test (FACTORY ONLY) Not Executed
  FAILED  Number of tests: 1           Number of failures: 0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prior
written permission is prohibited, except as allowed under copyright laws.

  HPE8130A Series Emulation System
    Version:   A.01.00 Dec 30 1999
    Location:  Generics

  HP E3454A  PowerPC 700 JTAG Emulator
    Version:   A.05.00 Oct 26 1999
R>
```

The product numbers and version information will be different for your emulation probe. The product numbers displayed are for the various pieces of firmware and will be different from the product number you used to order the product.

If a performance verification test fails

There are some things you can do if a failure is found on one of the tests. Details of the failure can be obtained through using a -v value ("verbose level") of 9.

If the particular failure you see is not listed below, contact Agilent Technologies for assistance.

Test 1: Powerup PV Results

Failure of this test indicates a hardware problem with the emulation probe.

Contact Agilent Technologies for assistance.

Test 2: Emulation Module Port Feedback Test

Failure of this test indicates a hardware problem with the emulation probe. Contact Agilent Technologies for assistance.

This test exercises the hardware which drives the connection to the emulation module. It does not test the module/probe interconnect cable.

The test is not executed if the emulation probe is connected to an emulation module.

Test 3: Run Control FPGA Test
Test 4: Run Control Clock Test

Failure of these tests indicates a hardware problem with the emulation probe. Contact Agilent Technologies for assistance.

If the emulation probe fails one of these tests, it may have been damaged by electrostatic discharge through the target cable. To prevent such damage in the future, follow standard ESD preventive practices.

Test 5: Break In and Trigger Out SMB Feedback Test

Before returning to Agilent Technologies, check to ensure that you have connected a good cable between the two SMB connectors.

Test 6: Target Board Adapter Feedback Test

Failure of this test indicates a hardware problem with the emulation probe. Contact Agilent Technologies for assistance.

This test exercises the I/O circuitry. If the test passes, but the emulation probe seems to have trouble communicating with the target system, the problem is probably with the target system.

If this test was not executed, it means that the target board adapter you are using does not support the test.

Returning Parts for Service

The repair strategy for this emulation solution is board replacement.

Exchange assemblies are available when a repairable assembly is returned to Agilent Technologies. These assemblies have been set up on the "Exchange Assembly" program. This lets you exchange a faulty assembly with one that has been repaired, calibrated, and performance verified by the factory. The cost is significantly less than that of a new assembly.

To return a part to Agilent Technologies

1. Follow the procedures in this chapter to make sure that the problem is caused by a hardware failure, not by configuration or cabling problems.
2. In the U.S., call 1-800-403-0801. Outside the U.S., call your nearest Agilent sales office. Ask them for the address of the nearest service center.

   To locate a sales or service office near you, go to **http://www.tm.agilent.com** and select Assistance.
3. Package the part and send it to the Agilent service center.

   Keep any parts which you know are working. For example, if only a cable is broken, keep the emulation probe.
4. When the part has been replaced, it will be sent back to you.

   The unit returned to you will have the same serial number as the unit you sent to Agilent.

   In some parts of the world, on-site repair service is available. Ask an Agilent sales or service representative for details.

To obtain replacement parts

The following table lists some parts that may be replaced if they are damaged or lost. The part numbers are subject to change. Contact your nearest Agilent Technologies sales office for further information.

Exchange assemblies

Part number	Description
E3454-69501	Rebuilt assembly (PowerPC 7xx)

Replacement assemblies

Part number	Description
0950-3043	Power supply for emulation probe (marked F1044B)
E3494-61604	Ribbon cable (PowerPC 60x, PowerPC 7xx, MPC 82xx)
16700-61608	Expansion cable for emulation module
E8130-68702	Serial cable and adapter
5061-7342	LAN cross-over cable
E8130-61601	14-pin module/probe interconnect cable

To clean the instrument

If the instrument requires cleaning:

1. Remove power from the instrument.
2. Clean the instrument using a soft cloth that has been moistened in a mixture of mild detergent and water.
3. Make sure that the instrument is completely dry before reconnecting it to a power source.

Analysis Probe A probing solution connected to the target microprocessor. It provides an interface between the signals of the target microprocessor and the inputs of the logic analyzer. Formerly called a “preprocessor.”

Background Debug Monitor In Also called Debug Mode, In Background, and In Monitor. The normal processor execution is suspended and the processor waits for commands from the debug port. The debug port commands include the ability to read and write memory, read and write registers, set breakpoints and start the processor running (exit the Background Debug Monitor).

Debug Mode See *Background Debug Monitor*.

Debug Port A hardware interface designed into a microprocessor that allows developers to control microprocessor execution, set breakpoints, and access microprocessor registers or target system memory using a tool like the emulation probe.

Elastomeric Probe Adapter A connector that is fastened on top of a target microprocessor using a retainer and knurled nut. The conductive elastomer on the bottom of the probe adapter makes contact with pins of the target microprocessor and delivers their signals to connection points on top of the probe adapter.

Emulation Migration The hardware and software required to use an emulation probe with a new processor family.

Emulation Module An emulation module is installed within the mainframe of a logic analysis system. An E5901A emulation module is used with a *target interface module* (TIM) or an analysis probe. An E5901B emulation module is used with an E5900B *emulation probe* and does not use a TIM.

Emulation Probe An emulation probe is a standalone instrument connected via LAN to the mainframe of a logic analyzer or to a host computer. It provides run control within an emulation and analysis test setup. Formerly called a "processor probe" or "software probe."

Extender A part whose only function is to provide connections from one location to another. One or more extenders might be stacked to raise a probe above a target microprocessor to avoid mechanical

contact with other components installed close to the target microprocessor. Sometimes called a "connector board."

Flexible Adapter Two connection devices coupled with a flexible cable. Used for connecting probing hardware on the target microprocessor to the analysis probe.

Gateway Address An IP address entered in integer dot notation. The default gateway address is 0.0.0.0, which allows all connections on the local network or subnet. If connections are to be made across networks or subnets, this address must be set to the address of the gateway machine.

General-Purpose Flexible Adapter A cable assembly that connects the signals from an elastomeric probe adapter to an analysis probe. Normally, a male-to-male header or transition board makes the connections from the general-purpose flexible adapter to the analysis probe.

High-Density Adapter Cable A cable assembly that delivers signals from an analysis probe hardware interface to the logic analyzer pod cables. A high-density adapter cable has a single Mictor connector that is installed into the analysis probe, and two cables that are connected to corresponding odd and even logic analyzer pod cables.

High-Density Termination Adapter Cable Same as a High-Density Adapter Cable, except it has a termination in the Mictor connector.

In Background, In Monitor See *Background Debug Monitor*.

Inverse Assembler Software that displays captured bus activity as assembly language mnemonics. In addition, inverse assemblers may show execution history or decode control busses.

IP address Also called Internet Protocol address or Internet address. A 32-bit network address. It is usually represented as decimal numbers separated by periods; for example, 192.35.12.6.

Jumper Moveable direct electrical connection between two points.

JTAG (OnCE) port See *debug port*.

Label Labels are used to group and identify logic analyzer channels. A label consists of a name and an

associated bit or group of bits.

Link-Level Address The unique address of the LAN interface. This value is set at the factory and cannot be changed. The link-level address of a particular piece of equipment is often printed on a label above the LAN connector. An example of a link-level address in hexadecimal: 0800090012AB. Also known as an LLA, Ethernet address, hardware address, physical address, or MAC address.

Mainframe Logic Analyzer A logic analyzer that resides on one or more board assemblies installed in a 16500, 1660-series, or 16600/700-series mainframe.

Male-to-male Header A board assembly that makes point-to-point connections between the female pins of a flexible adapter or transition board and the female pins of an analysis probe.

Monitor, In See *Background Debug Monitor*.

Pod A collection of logic analyzer channels associated with a single cable and connector.

Preprocessor See *Analysis Probe*.

Preprocessor Interface See *Analysis Probe*.

Probe Adapter See *Elastomeric Probe Adapter*.

Prototype Analyzer The 16505A prototype analyzer acts as an analysis and display processor for the 16500B/C logic analysis system. It provides a windowed interface and powerful analysis capabilities. Replaced by 16600/700-series logic analysis systems.

Run Control Probe See Emulation Probe and Emulation Module.

Setup Assistant Wizard software which guides a user through the process of connecting and configuring a logic analyzer to make measurements on a specific microprocessor. The Setup Assistant icon is located in the main system window.

Shunt Connector. See *Jumper*.

Solution A set of tools for debugging your target system. A solution includes probing, inverse assembly, the B4620B Source Correlation Tool Set, and an emulation module.

State Analysis When the logic analyzer is configured to capture data

synchronously with a clock signal in the target system.

Subnet Mask A subnet mask blocks out part of an IP address so that the networking software can determine whether the destination host is on a local or remote network. It is usually represented as decimal numbers separated by periods; for example, 255.255.255.0.

Symbol Symbols represent patterns and ranges of values found on labeled sets of bits. Two kinds of symbols are available:
1) Object file symbols — Symbols from your source code, and symbols generated by your compiler. Object file symbols may represent global variables, functions, labels, and source line numbers.
2) User-defined symbols — Symbols you create.

Target Board Adapter A daughter board inside the E5900B emulation probe which provides an interface to the ribbon cable for a particular microprocessor family.

Target Control Port An 8-bit, TTL port on a logic analysis system that you can use to send signals to your target system. It does not function like a pattern generator or emulation module, but more like a remote control for the target's switches.

Target Interface Module A small circuit board which connects the 50-pin cable from an E5901A emulation module or E5900A emulation probe to signals from the debug port on a target system. Not used with the E5900B emulation probe.

TIM See *Target Interface Module*.

Timing Analysis When the logic analyzer is configured to capture data at a rate determined by an internal sample rate clock, asynchronous to signals in the target system.

Transition Board A board assembly that obtains signals connected to one side and rearranges them in a different order for delivery at the other side of the board.

Trigger Specification A set of conditions that must be true before the instrument triggers. See the printed or online documentation of your logic analyzer for details.

1/4-Flexible Adapter An adapter that obtains one-quarter of the signals from an elastomeric probe adapter (one side of a target microprocessor) and makes them available for probing.

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Agilent Technologies

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/EN 45014

Manufacturer's Name:	Agilent Technologies, Inc. / Digital Design PGU
Manufacturer's Address:	1900 Garden of the Gods Road Colorado Springs, Colorado 80907 USA

Declares, that the product

Product Name:	Emulation Probe
Model Number(s):	Agilent Technologies E5900B, E5902B
Product Option(s):	All options based on the above

is in conformity with:

EMC

IEC 61326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998
CISPR 11:1990 / EN 55011:1991—Group 1 Class A[1]
IEC 61000-4-2:1995+A1:1998 / EN 61000-4-2:1995 (ESD 4kV CD, 8kV AD)
IEC 61000-4-3:1995 / EN 61000-4-3:1995 (3 V/m 80% AM)
IEC 61000-4-4:1995 / EN 61000-4-4:1995 (0.5kV line-line, 1kV line-earth)
IEC 61000-4-6:1996 / EN 61000-4-6:1996 (3V 80% AM, power line)
Australia/New Zealand: AS/NZS 2064.1

Safety

IEC 1010-1: 1990+A1:1992+A2:1995 / EN 61010-1: 1994+A2:1995
Canada: CSA-C22.2 No. 1010.1:1992
USA: UL 3111-1:1994

Additional Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC (including 93/68/EEC) and carries the CE marking accordingly (European Union).

[1]This product was tested in a typical configuration with Agilent Technologies test systems.

Date: 12/30/99

Ken Wyatt

Ken Wyatt / Product Regulations Manager

For further information, please contact your local Agilent Technologies sales office, agent or distributor.

Product Regulations

EMC	IEC 61326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998	Performance Criteria[2]
	CISPR 11:1990 / EN 55011:1991—Group 1 Class A[1]	
	IEC 61000-4-2:1995+A1:1998 / EN 61000-4-2:1995 (ESD 4kV CD, 8kV AD)	D
	IEC 61000-4-3:1995 / EN 61000-4-3:1995 (3 V/m 80% AM)	A
	IEC 61000-4-4:1995 / EN 61000-4-4:1995 (EFT 0.5kV line-line, 1kV line-earth)	A
	IEC 61000-4-6:1996 / EN 61000-4-6:1996 (3V 80% AM, power line)	A
	Australia/New Zealand: AS/NZS 2064.1	
Safety	IEC 1010-1: 1990+A1:1992+A2:1995 / EN 61010-1: 1994+A2:1995	
	Canada: CSA-C22.2 No. 1010.1:1992	
	USA: UL 3111-1:1994 {optional}	

Additional Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC (including 93/68/EEC) and carries the CE marking accordingly (European Union).

Performance Criteria:
A Pass - Normal operation, no effect.
B Pass - Temporary degradation, self recoverable.
C Pass - Temporary degradation, operator intervention required.
D Fail - Not recoverable, component damage.

Note:
Use standard ESD preventive practices while handling and connecting the E5900B to its target to avoid component damage.

Sound Pressure Level N/A

N279

CE
ISM 1-A

Agilent Technologies

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/EN 45014

Manufacturer's Name:	Agilent Technologies, Inc. / Digital Design PGU
Manufacturer's Address:	1900 Garden of the Gods Road Colorado Springs, Colorado 80907 USA

Declares, that the product

Product Name:	Emulation Module
Model Number(s):	Agilent Technologies E5901B
Product Option(s):	All options based on the above

is in conformity with:

EMC

IEC 61326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998
CISPR 11:1990 / EN 55011:1991—Group 1 Class A[1]
IEC 61000-4-2:1995+A1:1998 / EN 61000-4-2:1995 (ESD 4kV CD, 8kV AD)
IEC 61000-4-3:1995 / EN 61000-4-3:1995 (3 V/m 80% AM)
IEC 61000-4-4:1995 / EN 61000-4-4:1995 (0.5kV line-line, 1kV line-earth)
IEC 61000-4-6:1996 / EN 61000-4-6:1996 (3V 80% AM, power line)
Australia/New Zealand: AS/NZS 2064.1

Safety

IEC 1010-1: 1990+A1:1992+A2:1995 / EN 61010-1: 1994+A2:1995
Canada: CSA-C22.2 No. 1010.1:1992
USA: UL 3111-1:1994

Additional Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC (including 93/68/EEC) and carries the CE marking accordingly (European Union).

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EMC	IEC 61326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998	Performance Criteria[2]
	CISPR 11:1990 / EN 55011:1991—Group 1 Class A[1]	
	IEC 61000-4-2:1995+A1:1998 / EN 61000-4-2:1995 (ESD 4kV CD, 8kV AD)	A
	IEC 61000-4-3:1995 / EN 61000-4-3:1995 (3 V/m 80% AM)	A
	IEC 61000-4-4:1995 / EN 61000-4-4:1995 (EFT 0.5kV line-line, 1kV line-earth)	A
	IEC 61000-4-6:1996 / EN 61000-4-6:1996 (3V 80% AM, power line)	A
	Australia/New Zealand: AS/NZS 2064.1	
Safety	IEC 1010-1: 1990+A1:1992+A2:1995 / EN 61010-1: 1994+A2:1995	
	Canada: CSA C22.2 No. 1010.1:1992	
	USA: UL 3111-1:1994 {optional}	

Additional Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC (including 93/68/EEC) and carries the CE marking accordingly (European Union).

Performance Criteria:
A Pass - Normal operation, no effect.
B Pass - Temporary degradation, self recoverable.
C Pass - Temporary degradation, operator intervention required.
D Fail - Not recoverable, component damage.

Sound Pressure Level N/A

N10149

CE
ISM 1-A

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- Before turning on the instrument, you must connect the protective earth terminal of the instrument to the protective conductor of the (mains) power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. You must not negate the protective action by using an extension cord (power cable) without a protective conductor (grounding). Grounding one conductor of a two-conductor outlet is not sufficient protection.
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- Service instructions are for trained service personnel. To avoid dangerous electric shock, do not perform any service unless qualified to do so. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.
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- Do not install substitute parts or perform any unauthorized modification to the instrument.
- Capacitors inside the instrument may retain a charge even if the instrument is disconnected from its source of supply.

Safety Symbols

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Hazardous voltage symbol.

Earth terminal symbol: Used to indicate a circuit common connected to grounded chassis.

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The Warning sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a Warning sign until the indicated conditions are fully understood and met.

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Many product updates do not require manual changes, and manual corrections may be done without accompanying product changes. Therefore, do not expect a one-to-one correspondence between product updates and manual updates.