User's Guide

Publication number E3464-97001
February 2002

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

Agilent Technologies

Emulation for the MIPS32 and MIPS64

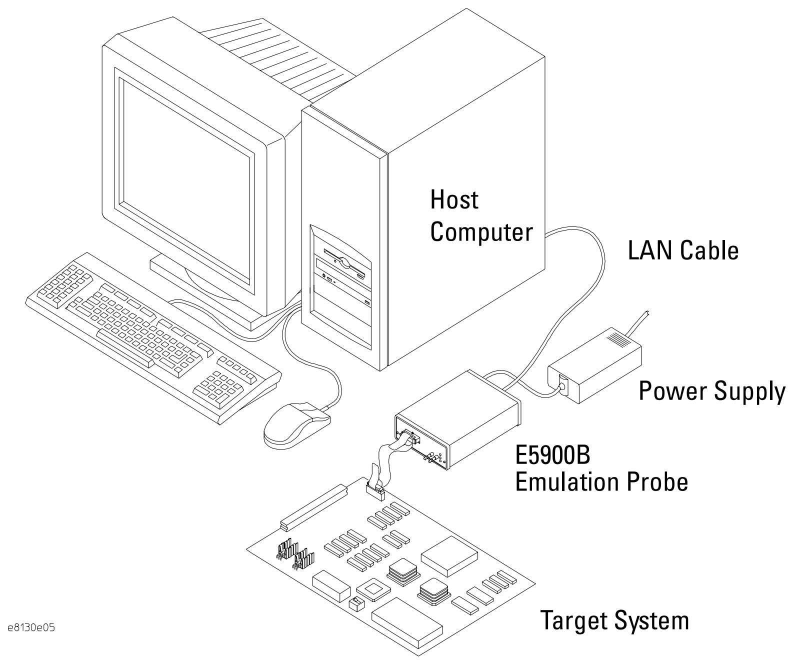
Agilent Technologies E5900B Option 200 Emulation Probe—At a Glance

This manual describes how to set up an emulation probe or an emulation migration.

The emulation probe provides a low-cost way to debug embedded software for MIPS32 and MIPS64 family microprocessors. The emulation probe lets you use the target processor's built-in debugging 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. The emulation probe communicates with a host computer via LAN.

E5900B Emulation Probe



E5902B Emulation Migration Kit

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

In This Book

This book documents the following products:

Emulation Probe			
Processors supported		**Product ordered**	**Includes**
MIPS32 4Kc MIPS32 4Km	MIPS32 4Kp MIPS64 5Kc	Agilent Technologies E5900B Option #200	E5900B emulation probe, power supply, cables, firmware, and manual
Emulation Migration			
Processors supported		**Product ordered**	**Includes**
MIPS32 4Kc MIPS32 4Km	MIPS32 4Kp MIPS64 5Kc	E5902B Option #200	Target board adapter, front panel, tool kit, cable, firmware, and manual

Contents

Contents

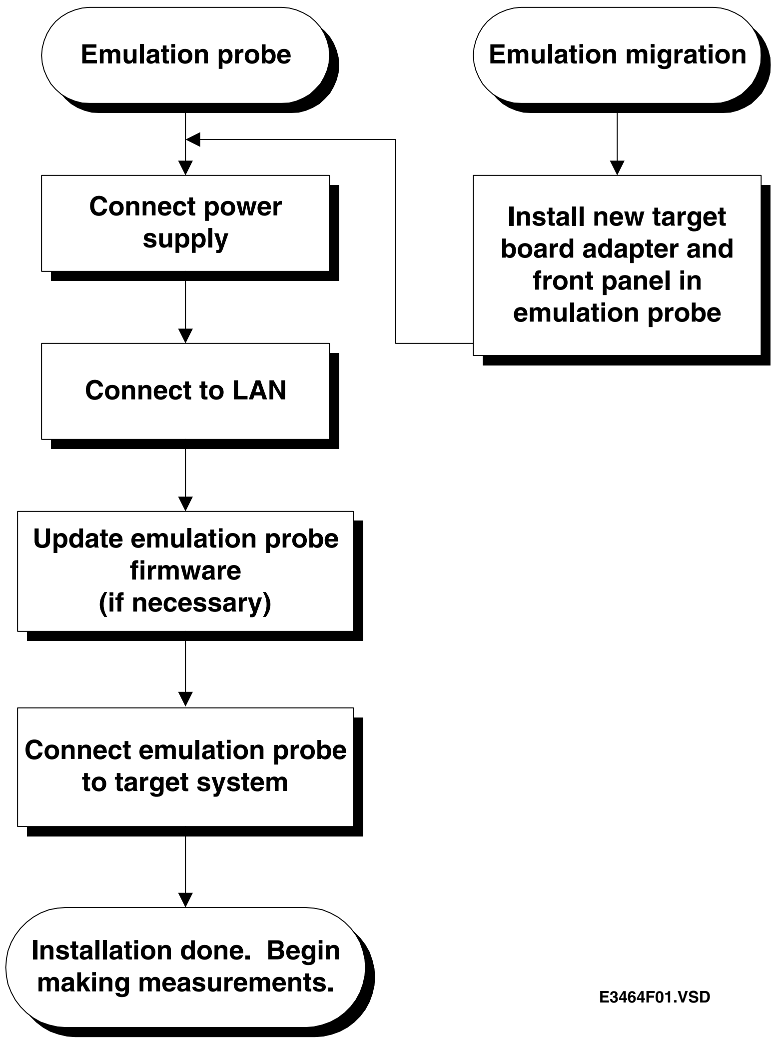
1

Overview

This chapter describes:

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

Setup Flowchart



Agilent E5900B Emulation Probe

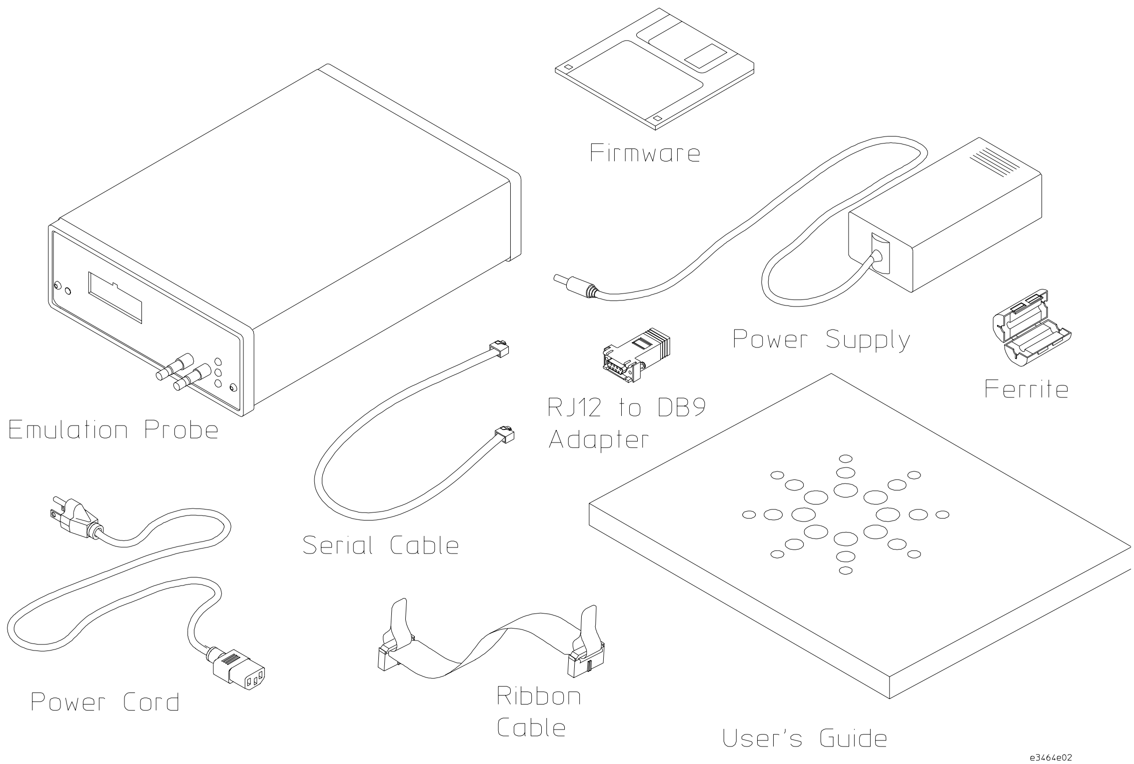
Equipment supplied

Part Number	Description
E3464B	Emulation probe
0950-3043	12V, 40W power supply for the emulation probe
xxxx-xxxx	Power cord (part number depends on country of use)
E8130-68703	Ferrite kit (reduces electromagnetic interference on power cord)
E8130-68702	Cable kit consisting of a serial cable and RJ12-to-DB9 adapter (for setting the emulation probe's IP address from a PC)
E3464-61600	14-pin MIPS EJTAG ribbon cable (connects the emulation probe to the target debug port)
E3464-xxxxx	Emulation probe firmware on 3.5 inch disk (part number depends on firmware revision)
E3464-97000	This *User's Guide*

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 EJTAG debug port connector. The target system must meet the criteria described in Chapter 3, "Designing a Target System for an Emulation Probe," beginning on page 33.
- A host computer, such as a PC or workstation.
- A LAN (local area network) to connect the emulation probe to a host computer.
- A user interface on the host computer, such as a high-level source debugger.


Firmware
Power Supply
Ferrite
Emulation Probe
RJ12 to DB9
Adapter
Serial Cable
Power Cord
Ribbon
Cable
User's Guide
e3464e02

Agilent E5902B Emulation Migration Kit

Equipment supplied

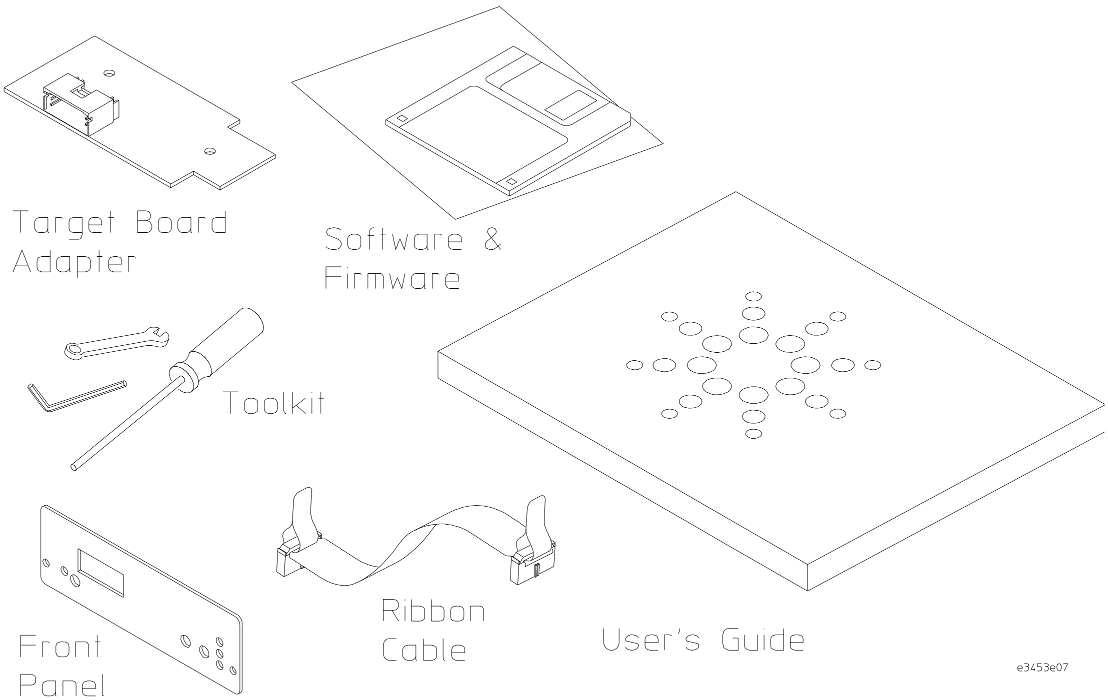
The equipment supplied with your emulation migration kit includes:

Part Number	Description
E8130-66503	Target board adapter (formerly called cable board)
E3464-61600	14-pin MIPS EJTAG ribbon cable (connects the emulation probe to the target debug port)
E3464-xxxxx	Emulation probe firmware on 3.5 inch disk (part number depends on firmware revision)
E3464-97000	This *User's Guide*
E8130-00208	Front panel for emulation probe
E8130-68701	Tool kit (#1 Phillips screwdriver, Torx T-10 wrench, and 1/4 inch combination end wrench)
B3760A	Logic analysis system software CD-ROM (included as a courtesy to owners of Agilent logic analysis systems)

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 EJTAG debug port connector. The target system must meet the criteria described in Chapter 3, "Designing a Target System for an Emulation Probe," beginning on page 33.
- A host computer such as a PC, a workstation.
- A user interface, such as a high-level source debugger.


Target Board
Adapter
Software &
Firmware
Toolkit
Front
Panel
Ribbon
Cable
User's Guide
e3453e07

To connect the emulation probe to a power source

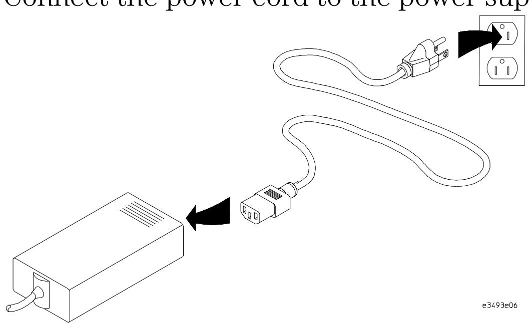
The emulation probe is shipped from the factory with a power supply and cord appropriate for your country. If the cord you received is not appropriate for your electrical power outlet type, contact your Agilent Technologies sales and service office.

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

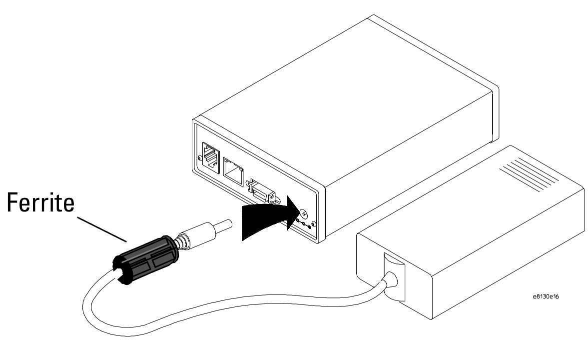
CAUTION: Use only the supplied Agilent power supply and cord. Failure to use the proper power supply could result in equipment damage.

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 and emulation probe before you make or break connections.

1. Connect the emulation probe to a LAN (page 21).
2. Connect the emulation probe to your target system (page 37).
3. Configure the emulation probe (page 41).

To power on the system

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

1. Emulation probe.
2. Your target system.

To power off the system

Power off your system as follows:

1. Your target system.
2. Emulation probe.

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.

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

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

The latest firmware versions and additional utilities can be found on the World Wide Web at **http://www.cos.agilent.com/probe**.

2

Connecting the Emulation Probe to a LAN

You need to set up a LAN connection for the E5900B emulation probe.

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.

To establish communication with 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 6, "Using the Emulation Probe," beginning on page 51.

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.

2 Find out the IP address and other LAN parameters to use for the emulation probe. See “To obtain an IP address” on page 24.

3 Decide how you want to configure the LAN parameters. See “To configure LAN parameters using a serial connection” on page 25, or “To configure LAN parameters using DHCP” on page 28

4 Verify that your emulation probe is now active and on the network. See "To verify LAN communications" on page 30.

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 27. 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.

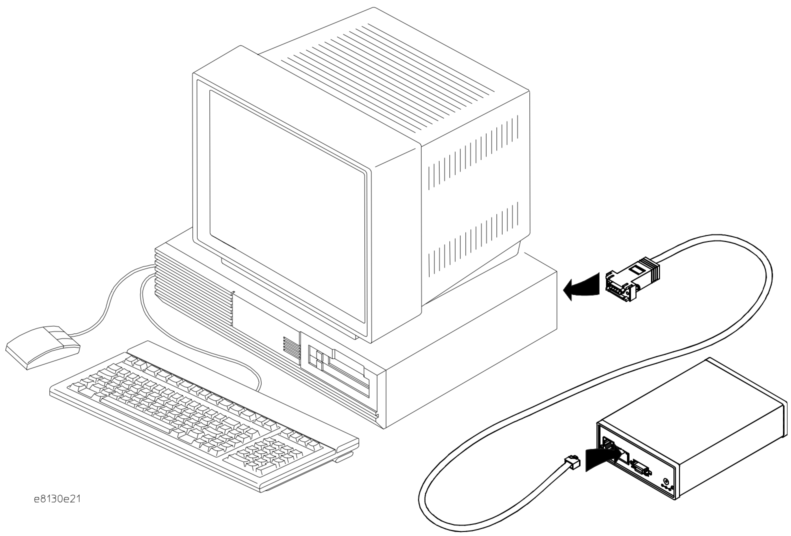
Serial connections on a PC

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 30.

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 responds to BOOTP requests and supports “static allocation” of IP addresses, it can be used to set the emulation probe’s LAN parameters.

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 30.

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 “static allocation” (sometimes called “manual allocation”) to obtain a permanent IP address. Every time the emulation probe is turned on, it sends out a BOOTP request packet. If the DHCP server on the network responds to BOOTP requests and has been configured to reply to the emulation probe’s link-level address, it 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.

Nor does the emulation probe 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 methods of setting LAN parameters?

Every time the emulation probe is turned ON, it sends out a BOOTP request packet (even if the LAN parameters have already been configured). As long as the DHCP server is configured to reply to BOOTP requests from the emulation probe’s link-level address, it will respond with the IP address and other LAN parameters.

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 104.

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.

If You Have Problems See "Problems with the LAN Interface" on page 104.

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

Designing a Target System for an Emulation Probe

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

Target System Requirements for MIPS

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

TDO, TDI, TCK, TMS and $\overline{\text{TRST}}$ signal traces between the EJTAG 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 EJTAG connector at one end and the 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.

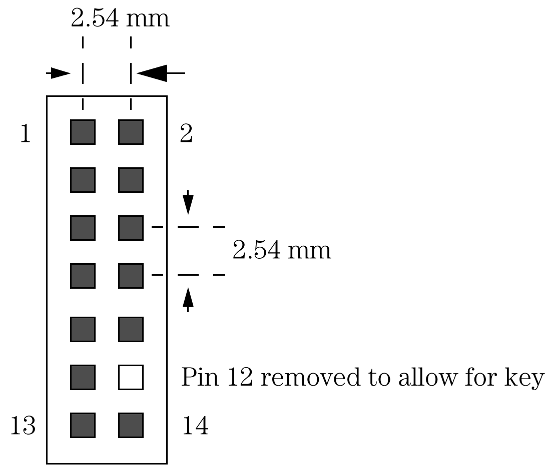
The TDI, TCK, TMS and $\overline{\text{TRST}}$ signals must not be actively driven by the target system when the EJTAG debug port is being used.

DINT

EJTAG Debug Interrupt. Can be used to create an interrupt of processor execution for the purpose of entering debug mode. The emulation probe does not use this pin nor this method of entering debug mode.

EJTAG interface connections and resistors

The target system must have a 14-pin male 2x7 header connector with dimensions as shown below.



EJTAG Header Connector (top view on PC board)

Position 12 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 12 has been removed from the header.

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

MIPS Connections and Resistors

Header Pin Number	Signal Name	I/O	Board Resistor
1	TRST*	Input	1 kΩ pulldown
2	GND		
3	TDI	Input	1 kΩ pullup
4	GND		
5	TDO	Output	33 Ω series at EJTAG connector and 1 kΩ pullup at processor [1]
6	GND		
7	TMS	Input	1 kΩ pullup
8	GND		
9	TCK	Input	1 kΩ pullup
10	GND		
11	RST*	Input	1 kΩ pullup
12	Key - pin removed		
13	DINT	Input	1 kΩ pullup
14	VIO - Voltage sense [2]	Output	1 kΩ series [3]

[1] For information regarding EJTAG electrical connections and recommended resistor values, see MIPS Technologies *EJTAG Specifications*, document number MD00047. Resistor values are target system dependent.

[2] The VIO 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 +3.3 V or +5 V). It does not supply power to the emulation probe.

[3] The 33 Ω series resistor on VIO provides short-circuit current limiting protection only. If the resistor is present, it should be 1 kΩ or less.

4

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 37.)

2 Connect the emulation probe to a LAN. (See page 21.)

3 Connect the emulation probe to your target system using the ribbon cable. (See page 39.)

4 Update the firmware of the emulation probe, if necessary. (See page 71.)

5 Configure the emulation probe. (See page 41.)

6 Connect a debugger to the emulation probe. (See page 53.)

To connect the emulation probe to the target system

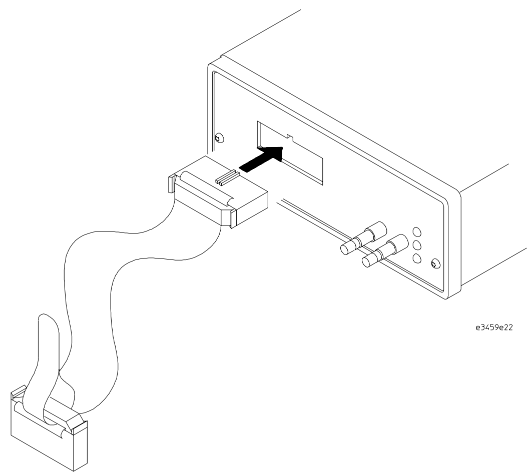
The emulation probe can be connected to a target system through a 14-pin EJTAG port connector (a 14-pin male 2x7 header connector on the target system).

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

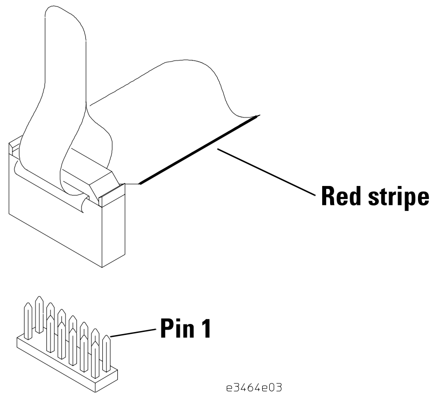
1 Turn off power to the target system.

2 Turn off power to the emulation probe.

3 Plug the unkeyed end (pin 12 is open) of the ribbon cable into the emulation probe.



4 Plug the keyed end of the cable (pin 12 is blocked) into the EJTAG debug port on the target system.



CAUTION: Orient the red stripe toward pin 1 of the connector. 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 33.

For a list of the parts supplied with the emulation probe, see page 14.

5

Configuring the Emulation Probe

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

The emulation probe can be configured 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 options can be configured using built-in commands:

- EJTAG clock speed
- Endian mode
- Restriction to real-time runs
- Voltage reference
- Voltage threshold
- Break in behavior
- Trigger out behavior
- Address size (MIPS64 only)

Configuration items

Configuration items can be changed using the various cf <item> commands listed in this chapter. Configuration information is stored in non-volatile memory, so the changes you make to the emulation probe configuration will remain in effect even if you cycle power to the emulation probe.

To restore the emulation probe configuration to its factory default settings, issue the **`cf default`** command.

To configure the EJTAG clock speed (communication speed)

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

With some target systems that have additional loads on the EJTAG lines or with target systems that do not quite meet the requirements (described in Chapter 3, “Designing a Target System for an Emulation Probe,” beginning on page 33), 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 entered, the next slower valid speed will be used.

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

EJTAG Clock Speed Configuration

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

The default speed value is 30 MHz.

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 EJTAG 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 **`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 a **`cf default`** 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 EJTAG connector are short (two inches or less), and 3) there are no stubs on the EJTAG 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)
MIPS32 4Kc/4Km/4Kp	40	30	40
MIPS64 5Kc	40	30	40

To configure the endian mode of the target system

The MIPS processor is capable of being configured as either big-endian or little-endian. The emulation probe must know whether the target system is configured for big-endian or little-endian mode.

Processor Endian Configuration

Value	Emulator configured for	Built-in command
little	Little endian **(Default)**	cf endian=little
big	Big endian	cf endian=big

To configure restriction to real-time runs

This option enables or disables restriction to real-time runs implemented for all commands other than "rst", "b", "s" and "r".

Real-time Runs Configuration

Value	Emulation probe configured for	Built-in command
no	If the processor is running user code, a request for a register or memory display will put the processor in monitor mode, read the requested register(s), then restore the processor to running user code. **(Default)**	cf rrt=no
yes	If the processor is running user code, a request for a memory or register display will return: !ERROR 647! Restricted to Real Time	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 that feature.

To configure the voltage reference

The emulation probe uses the V_{ref} signal on the EJTAG connector to determine logic high and logic low levels when driving the TDI and TCK signals.

Voltage Reference Configuration

Value	Meaning	Built-in command
external	The voltage reference is generated by the target system. (**Default**)	cf vref=external
value	The voltage reference of *value* is generated internally by the emulation probe. The value is a number followed by either mV, which indicates the value is in millivolts, or V, which indicates the value is in volts.	cf vref=*value*

CAUTION: This option should only be used if the core voltage is different than that of the Vref signal on the EJTAG connector. Use this option with extreme care, because it is possible to damage the target system if the voltage level is chosen incorrectly.

To configure the voltage threshold

Threshold for voltage reference. Voltages above (vref*thresh) will be considered logic high and voltages below this level will be considered logic low.

Voltage Threshold Configuration

Value	Built-in command
1/2 (**Default**)	cf thresh=1/2
2/3	cf thresh=2/3
1/3	cf thresh=1/3

To configure the Break In SMB port

Use the following table to configure the behavior of the Break In SMB connector on the front of the emulation probe.

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 the Trigger Out SMB port

Use the following table to configure the behavior of the Trigger Out SMB connector on the front of the emulation probe.

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 the address size (MIPS64 only)

This configuration item tells the emulation probe whether the processor uses 32-bit or 64-bits addresses.

Address Size Configuration

Value	Meaning	Built-in command
32	The address size is 32 bits. The emulation probe will sign extend addresses up to 64 bits.	cf memaddr=32
64	The address size is 64 bits. (**Default**)	cf memaddr=64

6

Using the Emulation Probe

Using the Emulation Probe

The emulation probe, when used in conjunction with a third-party debugger, can be used to run, stop, break, and reset the target system.

The emulation probe can be operated via a command line interface for the purpose of verifying emulation probe functionality. This is described in "Using the Emulation Probe Command Line Interface" on page 89.

Using the Emulation Probe with a Debugger

Several prominent companies design and sell state-of-the-art source debuggers that work with Agilent 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.

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

Is your debugger compatible with the emulation probe?

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

LAN connection

You will use a LAN connection to allow the debugger to communicate with the emulation probe. This is described in Chapter 2, “Connecting the Emulation Probe to a LAN,” beginning on page 21.

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 21).
- Connect the emulation probe to your target system (see Chapter 4, "Connecting the Emulation Probe to Your Target System," beginning on page 37).
- Configure the emulation probe (see "Configuring the Emulation Probe" on page 41).
- Begin using your debugger.

See Also

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

7

Testing Target System Memory

Many times when a system under test fails to operate as expected, you will need to determine whether the failure is in the hardware or the software. These tests verify operation of the memory hardware in the system under test.

Using memory tests from the command line interface

The memory tests can be run from a command line interface via a telnet session or via the emulator command window of your debugger. You can initiate a telnet connection by issuing a telnet to the emulation probe's IP address from a terminal window.

See Chapter 2, "Connecting the Emulation Probe to a LAN," beginning on page 21 for instructions on making a connection to the emulation probe which will allow you to access the emulation probe via a command line interface.

For general memory test syntax information, enter the following command at the emulation probe command line interface:

`help mtest`

This will display the following help dialog:

```
mtest - memory test     General Help:

 mtest bp [-a1/2/4/8] [-v1-4] [-r1] <start>[..<end>]=<pattern> - basic pattern
 mtest ap [-a1/2/4/8] [-v1-4] [-r1] <start>[..<end>] - address pattern
 mtest rp [-a1/2/4/8] [-v1-4] [-r1] <start>[..<end>]=<pattern> - rotate pattern
 mtest w1 [-a1/2/4/8] [-v1-4] [-r1] <start>[..<end>] - walking ones
 mtest w0 [-a1/2/4/8] [-v1-4] [-r1] <start>[..<end>] - walking zeros
 mtest or [-a1/2/4/8] [-v1-4] [-r0] <start>[..<end>] - oscilloscope read
 mtest ow [-a1/2/4/8] [-v1-4] [-r0] <start>[..<end>]=<pattern> - osc. write
 mtest sm - summary command

  Syntax Parameters:
    -a    memory access size (1,2,4,8 bytes)
    -v    verbosity level (level of detail of output)
            -v1 prints end summary only
            -v2 prints status at the end of each repetition
            -v3 prints status at the end of each rep. and up to 10 errors
            -v4 prints status at the end of each rep. and all errors.
    -r    number of repetitions to be executed
    <start>      memory test start address
    <end>        memory test end address
    <pattern>    pattern to be written to memory

  The following applies to the oscilloscope tests:
      Default repetitions is -r0 (repeat forever).
      Default verbosity is -v1.
      Default access size is provided by mo.

  The following applies to all other tests:
      Maximum value for repetitions is 10,000.
      Default verbosity is -v3.
      Default access size is provided by mo.

  For more details type '? mtest <test>'
```

Memory Test Patterns

You can use the memory test feature of the emulation probe to perform seven different types of tests. Use these tests to find problems in address lines, data lines, and data storage. Use these tests in combination because no single test can perform a complete evaluation of the target system memory.

The emulation probe provides the following memory tests:

- Basic Pattern - to validate data read-write lines.
- Address Pattern - to validate address read-write lines.
- Rotate Pattern - to validate data read-write lines, and test voltage and ground bounce.
- Walking Ones - to validate individual storage bits in memory.
- Walking Zeros - to validate individual storage bits in memory.
- Oscilloscope Read - to generate the signals associated with reading from memory so they can be viewed on an oscilloscope.
- Oscilloscope Write - to generate the signals associated with writing to memory so they can be viewed on an oscilloscope.

Recommended Test Procedure

Two types of tests are offered for testing target memory: oscilloscope tests, and memory functionality tests.

Oscilloscope Tests

1. Connect the oscilloscope to view activity on the bits of interest.
2. Start an Oscilloscope Read (see page 68) or Oscilloscope Write (see page 69) test, as desired.

The test activity will be written onto the bits you specified continuously until you cancel the test.

Use both the Oscilloscope Read test and the Oscilloscope Write test to thoroughly check the connections of interest.

Memory Functionality Tests

1. Run the Basic Pattern (see page 59) test on the entire Memory Range.

   Result:

   - No Problems. Perform the Address Pattern (see page 62) test next.
   - Problems found. Refer to "If problems were found by the Basic Pattern test" on page 60.

2. Run the Address Pattern (see page 62) test on the entire Memory Range.

   Result:

   - No Problems.
   - Problems found. Refer to "If problems were found by the Address Pattern test" on page 63.

If no problems were found by the Basic Pattern test and the Address Pattern test above, you can ignore the rest of the tests. The memory in your system has been tested thoroughly and it is good.

Basic Pattern test

The Basic Pattern test finds data bits in the specified memory range that are stuck high or low. It also detects data lines that may be tied to power, ground, or not connected at all.

How the Basic Pattern test works

This test writes the *Pattern* and the complement of the *Pattern* to the *Memory Range*, and then compares the values in memory with what was written. The complement of the *Pattern* and then the *Pattern* are then written, read, and compared.

Example:

Entering the command
`mtest bp -a4 -v1 -r2 20000000..2000000f=55555555`
will produce the following memory writes and reads:

```
                First              Second
              Write/Read         Write/Read

20000000      55555555            AAAAAAAA
20000008      AAAAAAAA            55555555
```

If no errors were found, the following output would appear on your screen:

```
M>mtest bp -a4 -v1 -r2 20000000..2000000f=55555555
Starting: Basic Pattern Test
Completed: Basic Pattern Test
Summary: 2 - PASSED
```

Instructions for using the Basic Pattern test

To use the Basic Pattern test from the command line interface, enter **`mtest bp <parameters>`**. To see a list of the required parameters, enter **`? mtest bp`**.

For general instructions on using the command line interface see page 89.

Interpreting Basic Pattern test results

Consistent errors such as a particular bit incorrect every four bytes typically indicate a problem with the data lines. Random or sparse errors may indicate hardware data memory errors—check individual locations with the Walking Ones and Walking Zeros tests.

This test will halt and generate an error message if your Memory Range specification causes this test to be performed outside the range of valid memory in your target system.

This test will not halt but it will generate an error message if it is run on ROM or on locations with data line or location errors.

You can use the **`m <start address>..<end address>`** command to view the memory content. Expect to see the pattern and the complement of the pattern that was specified.

> This test will not always detect errors in the address lines. For example, if a bit in the address lines is stuck high or low, the Pattern Test will write to a different location in memory. Then the read from memory for comparison will also be made from that different location so the data will be correct. Use the Address Pattern test with this test to completely evaluate the memory range.

If problems were found by the Basic Pattern test

Below are two examples of problems found by the Basic Pattern test.

Example 1: Consistent error

```
Starting: Basic Pattern Test
Error: 1 at address 00000200:
  Read      5557  (0101 0101 0101 0111)
  Expected  5555  (0101 0101 0101 0101)
Error: 2 at address 00000204:
  Read      5557  (0101 0101 0101 0111)
  Expected  5555  (0101 0101 0101 0101)
Error: 3 at address 00000208:
  Read      5557  (0101 0101 0101 0111)
  Expected  5555  (0101 0101 0101 0101)
Error: ...
  Read      ...
  Expected  ...
```

Assume the data line bit associated with the error is stuck high. This could happen if the suspected data line bit were soldered to power.

For an additional test of suspected memory, perform the Walking Ones (see page 66) and Walking Zeros (see page 67) tests on the problem memory range.

Example 2: Random errors

```
Starting: Basic Pattern Test
Error: 1 at address 00000200:
  Read      8000  (1000 0000 0000 0000)
  Expected  0000  (0000 0000 0000 0000)
Error: 2 at address 000004a2:
  Read      efff  (1110 1111 1111 1111)
  Expected  ffff  (1111 1111 1111 1111)
Repetition: 1 - FAILED found 2 errors
Completed: Basic Pattern Test
Summary: 1 of 1 - FAILED (2 errors total)
```

From the above listing, we assume there are two location errors in memory. At location 200, there is a bit stuck high. At location 4a0, there is bit stuck low. Use the Walking Ones and Walking Zeros tests to verify the errors.

There is one bit stuck high at location 200 so the Walking Zeros test will print one error message when it tests this location. Use the Walking Ones test to isolate the bit that is stuck low at location 4a0. Again, this will print only one error message.

Address Pattern test

This test verifies that the address lines of the selected memory range are without error.

How the Address Pattern test works

This test writes the address of each memory location as data to each location. The data is then read back to see if it matches the address.

The pattern written to the memory is generated at the start of the test and is dependent upon the start address, access size, and the number of bytes in the memory range.

Depending on the last *Access Size* selected, subsets of the addresses may be written to memory.

Example:

If the last access size was 1 byte, address 00000001 will have 01 written to it, and address 00000002 will have 02 written to it.

The data written in address 00001000 will look like this, depending on the last *Access Size*.

```
1 Byte = 00001000  00 01 02 03 04 05 06 07 08 09 0a 0b 0c 0d 0e 0f

2 Byte = 00001000  1000 1002 1004 1006 1008 100a 100c 100e

4 Byte = 00001000  00001000 00001004 00001008 0000100c

8 Byte = 00001000  0000000000001000 0000000000001008
```

The upper four bytes of an 8 Byte access size are not tested for a 4 Byte address. The upper four bytes will always be zeros. Use a smaller access size to test these locations with the Address Pattern test.

Unless the access size is 1 Byte, the odd bits of the memory locations will not be tested. Use the Basic Pattern test to check the odd bits.

Instructions for using the Address Pattern test

To use the Address Pattern test from the command line interface, enter **`mtest ap <parameters>`**. To see a list of the required parameters, enter **`? mtest ap`**.

For general instructions on using the command line interface see page 89.

Interpreting Address Pattern test results

This test does not ensure that the data lines or individual data locations are without error. If a bit is stuck in a memory location, but is stuck in the written value, the stuck bit will not be detected.

You can use the **`m <start address>..<end address>`** command to view the memory content. You should see direct correlation between each address and the data stored at that address.

Consistent errors typically indicate problems in the address lines. This is especially likely if the results of the Basic Pattern test were without errors.

Errors in specific memory locations may indicate errors in the memory hardware instead of the address lines.

If problems were found by the Address Pattern test

You may see no errors in the Basic Pattern test, but errors in the Address Pattern test. For example, you might see the following result in the Address Pattern test:

Example:

```
Error: 1 at address 00000000:
  Read      0020  (0000 0000 0010 0000)
  Expected  0000  (0000 0000 0000 0000)
Error: 2 at address 00000002:
  Read      0022  (0000 0000 0010 0010)
  Expected  0002  (0000 0000 0000 0010)
```

You would see that the data stored at locations 00 through 0f is the data that should be at locations 20 through 2f. This indicates an address line problem. Address bit 5 must be stuck low because the addresses that should have been written to the range 20 through 2f were written instead to 00 through 0f.

Random errors typically do not indicate address line errors. Use the Walking Ones (see page 66) and Walking Zeros (see page 67) tests to check the locations of random errors.

Rotate Pattern test

The Rotate Pattern test finds data bits in memory that are stuck high or low. It also detects data lines that may be tied to power ground, or not connected at all. This test can be used to test voltage and ground bounce problems associated with the selected memory range.

How the Rotate Pattern test works

This test writes the *Pattern* and the complement of the *Pattern* to the *Memory Range*, and then compares the values in memory with what was written. Next, the rotated *Pattern* and the rotated complement of the *Pattern* are written, read, and compared. Now the *Pattern* is rotated again, and again it is written, read, and compared. This continues until the rotations of the pattern return it to its original arrangement. That constitutes one *Repetition* of the Rotate Pattern test.

Example:

Address	First Write/Read	Second Write/Read	Third Write/Read
00000000	01	FE	02
00000001	FE	02	FD
00000002	02	FD	04
00000003	FD	04	FB
00000004	04	FB	08
00000005	FB	08	F7
00000006	08	F7	10
00000007	F7	10	EF
00000008	10	EF	20

Larger *Access Size* selections take more time because they require more patterns to be written to all locations (2-byte *Access Size* requires writing 32 patterns, and 4-byte *Access Size* requires writing 64 patterns).

The *Access Size* you select will affect the appearance of memory when you view memory after a test. When a test is complete, memory contains the last set of patterns that was written to it.

Example:

The following listing is from a Rotate Pattern test which was performed one time with an *Access Size* of 2 bytes, and an initial pattern of 0001.

What you see below is the 32nd set of patterns written to memory during the test.

```
00000000  7fff 0001 fffe 0002 fffd 0004 fffb 0008
00000010  fff7 0010 ffef 0020 ffdf 0040 ffbf 0080
00000020  ff7f 0100 feff 0200 fdff 0400 fbff 0800
00000030  f7ff 1000 efff 2000 dfff 4000 bfff 8000
00000040  7fff 0001 fffe 0002 fffd 0004 fffb 0008
00000050  fff7 0010 ffef 0020 ffdf 0040 ffbf 0080
00000060  ff7f 0100 feff 0200 fdff 0400 fbff 0800
00000070  f7ff 1000 efff 2000 dfff 4000 bfff 8000
```

Instructions for using the Rotate Pattern test

Since the Rotate Pattern test is designed to rotate a single bit through memory, it is generally best to use a pattern such as 01, 0001, or 00000001.

To use the Rotate Pattern test from the command line interface, enter **`mtest rp <parameters>`**. To see a list of the required parameters, enter **`? mtest rp`**.

For general instructions on using the command line interface see page 89.

Interpreting Rotate Pattern test results

You can use the **`m <start address>..<end address>`** command to view the memory content. Expect to see the pattern and the complement of the pattern that was specified.

Consistent errors such as a particular bit incorrect every four bytes typically indicate a problem with the data lines. Random or sparse errors may indicate hardware data memory errors—check individual locations with the Walking Ones and Walking Zeros tests.

This test will halt and generate an error message if your Memory Range specification causes this test to be performed outside the range of valid memory in your target system.

This test will not halt but it will generate an error message if it is run on ROM or on locations with data line or location errors.

Walking Ones test

How the Walking Ones test works

The Walking Ones test finds data bits stuck in logical "0". This test cycles "1" through each bit position in memory, and checks results. It does this by writing and then reading a pattern sequence of ones and zeros from all memory locations in the range.

Example:

The hexadecimal values 01, 02, 04, ... are written to each location in the *Memory Range*.

Address	1st	2nd	3rd	4th	5th	6th	7th	8th
00000000	01	02	04	08	10	20	40	80
00000001	02	04	08	10	20	40	80	01
00000002	04	08	10	20	40	80	01	02
00000003	08	10	20	40	80	01	02	04
00000004	10	20	40	80	01	02	04	08

1st, 2nd, 3rd, etc. are the first, second, third, etc. complete passes through the memory.

Larger *Access Size* selections take more time because they require more patterns to be written to all locations (2-byte *Access Size* requires writing 16 patterns, and 4-byte *Access Size* requires writing 32 patterns).

Example:

2-byte Access Size writing 16 patterns:

Address	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	...	16th
00000000	0001	0002	0004	0008	0010	0020	0040	0080	0100	...	8000
00000001	0002	0004	0008	0010	0020	0040	0080	0100	0200	...	0001
00000002	0004	0008	0010	0020	0040	0080	0100	0200	0400	...	0002
00000003	0008	0010	0020	0040	0080	0100	0200	0400	0800	...	0004
00000004	0010	0020	0040	0080	0100	0200	0400	0800	1000	...	0008

Instructions for using the Walking Ones test

To use the Walking Ones test from the command line interface, enter **`mtest w1 <parameters>`**. To see a list of the required parameters, enter **`? mtest w1`**.

For general instructions on using the command line interface see page 89.

Walking Zeros test

The Walking Zeros test finds data bits stuck in logical "1".

How the Walking Zeros test works

This test cycles "0" through each bit position in memory, and checks results.

Example:

The hex values FE, FD, FB, ... are written to each location in the *Memory Range*.

Address	1st	2nd	3rd	4th	5th	6th	7th	8th
00000000	FE	FD	FB	F7	EF	DF	BF	7F
00000001	FD	FB	F7	EF	DF	BF	7F	FE
00000002	FB	F7	EF	DF	BF	7F	FE	FD
00000003	F7	EF	DF	BF	7F	FE	FD	FB
00000004	EF	DF	BF	7F	FE	FD	FB	F7

1st, 2nd, 3rd, etc. are the first, second, third complete pass through the memory.

Larger *Access Size* selections take more time because they require more patterns to be written to all locations (2-byte *Access Size* requires writing 16 patterns, and 4-byte *Access Size* requires writing 32 patterns).

Example:

2-byte Access Size writing 16 patterns:

Address	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	...	16th
00000000	FFFE	FFFD	FFFB	FFF7	FFEF	FFDF	FFBF	FF7F	FEFF	...	7FFF
00000001	FFFD	FFFB	FFF7	FFEF	FFDF	FFBF	FF7F	FEFF	FDFF	...	FFFE
00000002	FFFB	FFF7	FFEF	FFDF	FFBF	FF7F	FEFF	FDFF	FBFF	...	FFFD
00000003	FFF7	FFEF	FFDF	FFBF	FF7F	FEFF	FDFF	FBFF	F7FF	...	FFFB
00000004	FFEF	FFDF	FFBF	FF7F	FEFF	FDFF	FBFF	F7FF	EFFF	...	FFF7

Instructions for using the Walking Zeroes test

To use the Walking Zeroes test from the command line interface, enter **`mtest w0 <parameters>`**. To see a list of the required parameters, enter **`? mtest w0`**.

For general instructions on using the command line interface see page 89.

Oscilloscope Read test

How the Oscilloscope Read test works

This test repetitively reads the present content from the *Memory Range* for the number of *Repetitions* specified, typically reads continuously until cancelled.

NOTE: The Oscilloscope Read test does not print or store the data it has read. It is usually used to perform timing analysis on target system memory.

Instructions for using the Oscilloscope Read test

Connect your oscilloscope to view signals on the lines to be tested. These will be the signals generated to perform read transactions from the memory in your target system.

When you have finished using your oscilloscope to view the read-from-memory signals, press Ctrl+C.

You will see an error message if your test attempts to read memory addresses outside the range of available memory.

To use the Oscilloscope Read test from the command line interface, enter **`mtest or <parameters>`**. To see a list of the required parameters, enter **`? mtest`** or **`help mtest`**. For general instructions on using the command line interface see page 89.

Oscilloscope Write test

How the Oscilloscope Write test works

This test repetitively writes your selected *Pattern* to the *Memory Range* for the number of *Repetitions* specified, typically continuously until cancelled.

If your pattern is larger than the access size, it will be truncated to fit. If your pattern is smaller than the access size, it will be zero-padded to fit.

This test does not generate error messages for unsuccessful write transactions, such as writes to ROM. This test is usually used to perform timing analysis on target system memory.

You can use the **`m <start address>..<end address>`** command to view the memory content. If the memory is ROM or if it contains errors, it may not contain the pattern that was written.

Instructions for using the Oscilloscope Write test

Connect your oscilloscope to view signals on the lines to be tested. These will be the signals generated to perform write transactions to the memory in your target system.

When you have finished using your oscilloscope to view the write-to-memory signals, press Ctrl+C.

You will see an error message if your test attempts to write to memory addresses outside the range of available memory.

To use the Oscilloscope Write test from the command line interface, enter **`mtest ow <parameters>`**. To see a list of the required parameters, enter **`? mtest ow`**.

For general instructions on using the command line interface see page 89.

8

Updating Firmware

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

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.
- An error message was displayed indicating that the firmware must be updated

The E5900B Option 200 emulation probe is factory-programmed with the E3464 firmware driver, which is compatible with the MIPS 4Kc, 4Km, and 4Kp. To use the emulation probe with the MIPS 5Kc, you must load the E3464B firmware driver.

MIPS Firmware Driver Compatibility

Processor Compatibility	Driver
MIPS 4Kc, 4Km, 4Kp	E3464A
MIPS 5Kc	E3464B

For a complete list of processors supported by Agilent Technologies emulation probes, direct your web browser to:

http://www.cos.agilent.com/probe/processor_support.html

Updating Firmware

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.cos.agilent.com/probe`

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

To update firmware from a floppy disk

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

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

9

Installing an Agilent E5902B Emulation Migration Kit

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.

Will I need to change the target board adapter?

A target board adapter is supplied with the emulation migration. Some target board adapters are compatible with more than one type of processor.

Use the table below to determine the part number of the target board adapter that you already have. Then use the table to determine the part number of the target board adapter for the processor type that you are migrating to. If the part numbers are the same, you don't need to change the target board adapter.

Processor Type	Use target board adapter	Emulation Migration P/N
MPC6XX	E8130-66503	Agilent E5902B Option 060
MPC7XX	E8130-66503	Agilent E5902B Option 070
MPC8XX	E8130-66508	Agilent E5902B Option 080
Motorola M•CORE	E8130-66515	Agilent E5902B Option 090
MPC82XX	E8130-66503	Agilent E5902B Option 100
MPC74XX	E8130-66503	Agilent E5902B Option 110
MIPS32/MIPS64	E8130-66516	Agilent E5902B Option 200
ARM7/ARM9	E8130-66504	Agilent E5902B Option 300

Steps 4 through 7 of the procedure that follows show how to replace the target board adapter.

If you don't need to replace the target board adapter, proceed to Chapter 8, "Updating Firmware," beginning on page 71.

To install the emulation migration

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

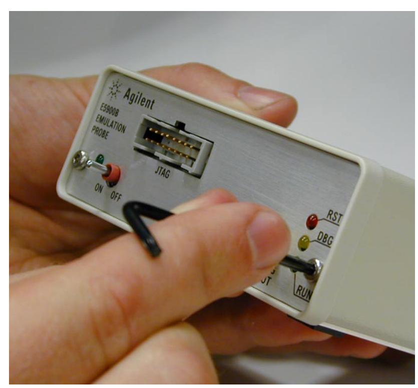
The tools necessary for this procedure are supplied with the emulation migration kit.

1 Turn off power to the emulation probe.

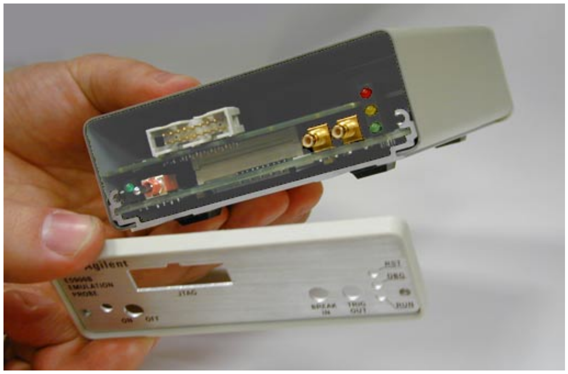
2 Disconnect all cables from the emulation probe, including the power cord, LAN cable, serial cable, and target cable.

3 Remove the cover from the emulation probe:

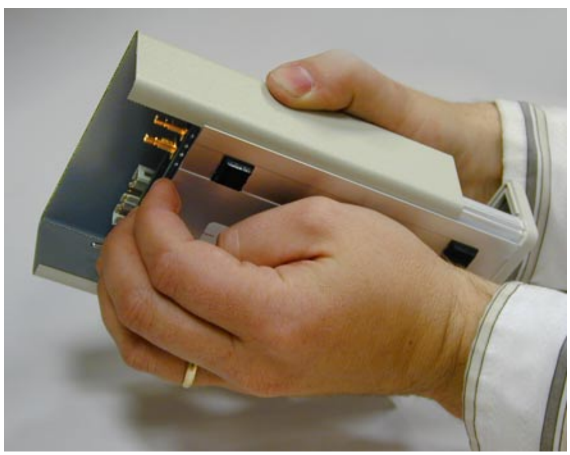
   a Remove the 2 nuts and 2 screws from the front of the emulation probe.



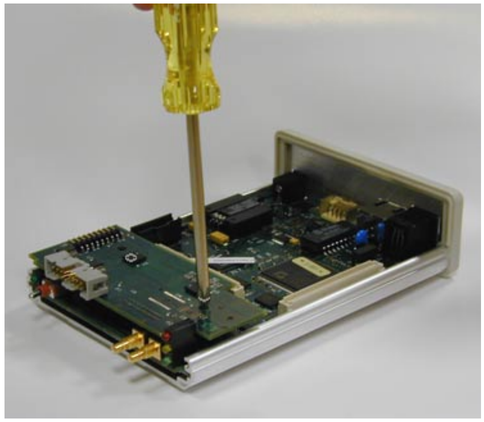
b Remove the front panel.



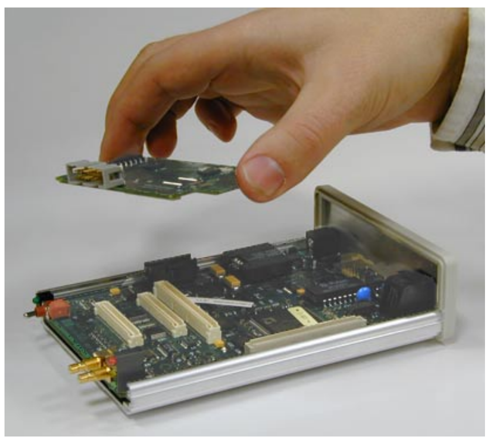
c Grasp the top cover with one hand. With the other hand, pull the plate on the bottom of the emulation probe, so that the top cover slides off.



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.

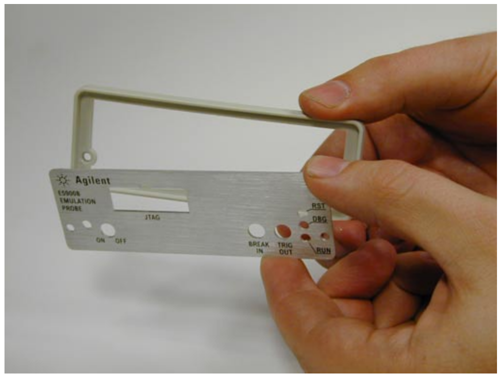
Align both connectors and press down firmly.

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, 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 8, "Updating Firmware," beginning on page 71 for instructions on how to update firmware.

12 Run the performance verification test.

See page 108 for instructions on testing the emulation probe.

13 Connect the emulation probe to your target system.

See Chapter 4, "Connecting the Emulation Probe to Your Target System," beginning on page 37 for instructions on how to make this connection.

10

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 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 (PV) tests
- The emulation probe's built-in commands

The information in this chapter is presented in the following sections:

- General Troubleshooting
- Status Lights
- Emulation Probe Built-in Commands
- Problems with the Target System
- Problems with the LAN Interface
- Problems with the Serial Interface
- Problems with the Emulation Probe
- Using the Emulation Probe Terminal Interface
- Returning Parts for Service

General Troubleshooting

If you have trouble using the emulation probe, the following steps may help you identify the problem. This troubleshooting procedure uses the built-in command line interface. For more information on the command line interface, see page 89.

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 30.)

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:

- See “Problems with the LAN Interface” on page 104.
- If you need to change the LAN parameters of the emulation probe, see Chapter 2, “Connecting the Emulation Probe to a LAN,” on page 21.

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 71 if the firmware is incorrect.
- Run the performance verification tests. Refer to “To run the emulation probe performance verification tests” on page 108.

  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 4, “Connecting the Emulation Probe to Your Target System,” beginning on page 37.
- 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 EJTAG 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.

  See Chapter 8, “Updating Firmware,” beginning on page 71.

Step 3: Try some simple commands to control the target

Examples of some commands are listed on page 89.

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"
```

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:

- Check that the EJTAG signals are being driven properly.
- Decrease the EJTAG communication speed. Some targets need slower speeds to properly communicate.

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

  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.

Step 4: 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 “To verify LAN communications using ping” on page 30.)
- 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 (E5900B). See page 73 for instructions on how to display the emulation probe firmware version.

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 Contact Us.

Status Lights

Emulation Probe Target Status Lights

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

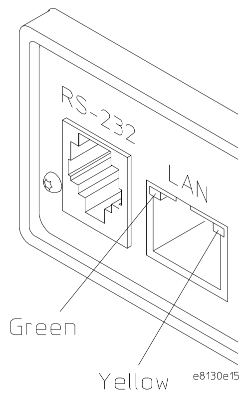
The following table gives more information about the meaning of the power and target status lights.

❍ = 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.

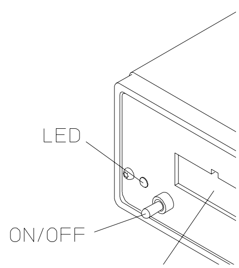
Emulation Probe LAN Status Lights



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.

Using the Emulation Probe Command Line Interface

The emulation probe has some built-in commands (also called the “terminal interface”) that you can use for troubleshooting.

You can enter the built-in commands using:

- A telnet (LAN) connection (see page 89).
- A "debugger command window" in your debugger (see your debugger software instructions).
- A serial connection (see page 25).

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 list the emulation probe commands

To list the emulation probe command line mode commands enter:

`? *`

To get help on an individual command enter

`? <command name>`

Examples

`? cf`	Help on configuration questions
`? cf speed`	Help on configuration speed question

To use the built-in commands

Here are a few commonly used built-in commands:

Overview of Useful built-in commands

b	Break—go into the background monitor state
bc	Enable or disable breaking
bp	Set, enable, disable, remove or display breakpoints
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 and configuration settings
lan	configure LAN address
m	Memory—read or write memory
mtest	Memory test—test target memory system
r	Run—start running user code
reg	Register—read or write a register
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.

Examples of built-in commands

Reset, break and run commands

```
rst     To reset the target
b       To break(stop) the target into debug mode
        (Background)
r       To run the target
r 100   To run the target from an address
r rst   To run the target from reset
```

Register commands

```
reg           Read all of the registers
reg pc        Read the program counter
reg pc r0 r1  Read multiple registers
reg pc=200    To Set the pc to 0x200

All register and memory values are entered as
hexadecimal values and should not be entered with the
leading "0x". Use values like "200", NOT "0x200".
```

Memory commands

```
m 0..ff               Display memory from 0 through ff
m -d1 0..ff=0,1,2,3   Write 0,1,2,3 repetitively
                      through the memory 0 to ff
```

Memory test commands

```
mtest bp -a1 0..ff=55              Basic pattern test
                                   byte access
mtest bp -a4 -r10 0.ff=55555555    Basic pattern test
                                   4-byte access
? mtest                            Additional test
                                   information
```

To write a NOP loop into memory

NOTE: This example is specific to ARM little endian mode. Please adapt this example for the processor type you are using. Note: the program shown on Chapter 10, “Troubleshooting the Emulation Probe,” beginning on page 103 is specific to MIPS processors.

```
b                                  To stop target if
                                   not already stopped
m -d4 200=0,0,0,0,0,0,1000fff9,0   To write NOP loop
                                   into memory
reg pc=200                         To Set the pc
```

To step the program

```
s                Step one instruction
PC = 00000204    Shows the new location of the PC
s 10             Step ten instructions
? s              Additional information on stepping
? ss             Additional information on source
                 stepping
```

To run the simple NOP program

```
r 200        Run from address 200
b            To stop the program
reg pc       To see the location of the PC register
r            To continue running the program
```

To set a software breakpoint (Memory trap replacement breakpoints)

```
bc -e swbp   Enable Software Breakpoints
bp -p 204    To set a Software Breakpoint at address
             204
bp           To review the breakpoints that are set
r            To run the program and hit the software
             breakpoint !ASYNC_STAT  603! Software
             breakpoint: 00000204
bp -r *      To remove all software breakpoints
```

To set a hardware breakpoint (On processor breakpoint registers)

(Use this type of breakpoint when debugging ROM)

```
bc -e hwbp      Enable Hardware Breakpoints
bc -h -p 204    To set a hardware breakpoint at address
                204
r               To run the program and hit the hardware
                breakpoint !ASYNC_STAT  601! Hardware
                breakpoint: 00000204
bp -h -r *      To remove all hardware breakpoints
? bp            To see additional bp capabilities
                (Hardware Breakpoints can be set on
                memory transactions also)
```

To use command line editing

```
<cntrl>-r       To recall last command(s) backward
<cntrl>-b       To recall last command(s) forward
? cl            To show you how to do it
cl -e           To enable command line editing
<ESC>           To enter command line editing mode
```

To build scripts

To build scripts, get the emulload utility from our web site
http://www.cos.agilent.com/probe
The script utility is a unsupported utility but it will work for most scripts that you may want to build. It is unsupported in that if you find a defect with it we may choose not to fix the defect. The source code of the utility is also available. The emulload utility also has the ability to download ELF, COFF, IEEE695 and S-record files.

To flash memory

This is best left to a debugger interface.

In addition we provide some information at our Web site on how to build scripts to flash parts. Go to **http://www.cos.agilent.com/probe** and choose Flashing Target ROM.

To display the emulation probe firmware version

```
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.

Emulation probe command line prompts

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
->	Firmware is not properly communicating with the target (Try running "`init -p`" immediately to correct this condition)
$	$ with any prompt indicates to a telnet user that the emulator is in use by a debugger or a logic analysis system's Emulation Control Interface

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

Configuration commands

The following commands are useful to determine whether your emulation probe is working properly.

`cf speed`	Read the speed setting
`cf speed=4M`	Set the EJTAG communication speed to 4 MHz
`cf speed=16M`	Set the EJTAG communication speed to 16 MHz
`? mtest`	Show available memory tests
`mtest w1 -a1 0..100`	Do a walking ones memory test from memory location 0 to 100

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
U>
```

This should reset the target and display a "U>" prompt if ’cf reset=run’.

```
U>rst
M>
```

This should reset the target and display an "M>" prompt if ’cf reset=stop’.

```
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
1	TRST	High/Low (depends on pullup or pulldown.)
3	TDI	Low
7	TMS	High
9	TCK	High
11	RST	High
14	VIO	I/O voltage high level
2, 4, 6, 8, 10	GND	Low

Levels with the emulation probe connected:

Header Pin	Signal Name	I/O
1	TRST	Low pulse with "rst" command
3	TDI	Toggle with "es" command
5	TDO	Toggle with "es" command
7	TMS	Low, pulse with "es" command
9	TCK	Clock (10 MHz default)
11	RST	High, pulse low with "rst" command
14	VIO	I/O voltage high level
2, 4, 6, 8, 10	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>cf default
```

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 emulation probe is powered-on, then try the “init -c” command again.
If the initial prompt is “p>”	Check pin 14 on header (VIO).
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 "?>"	Indicates the emulation probe is not able to communicate with the target processor. Check TCK, TDO, TDI, TMS, and TRST signals. Check the emulation probe firmware revision.
If the initial prompt is “U>”	Processor is running and the emulation probe is scanning the instruction register correctly.

Now you can do some more tests:

3 Enter the reset command:

```
U>rst
U>
```

If the prompt after rst is "?>"

Indicates the emulation probe is not able to communicate with the target processor. Check TCK, TDO, TDI, TMS, and TRST signals. Check the emulation probe firmware revision.

If the rst command fails

Set "cf reset=stop" (no external bus cycles used in this mode), then enter the "rst" command again:

```
*>cf reset=stop
*>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. The probe was able to put the target processor in debug mode.
- 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 TRST line is working.

Continue with more tests:

4 Enter the break command:

```
U>b
M>
```

If the prompt after b is "U>" with error messages	If you see: "!ERROR Unable to break" Check the electrical connections from the emulation probe to the target processor.
	
	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.

If you can get to the "M>" prompt, continue with more tests:

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

```
M>reg r0=12345678
M>reg r0
  reg r0=12345678
M>
```

If the returned value is equal to the written value, then the VDD 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
```

```
If the target memory system is configured, this should
write abcd1234 to memory starting at 0 and then read back
the same values.

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=run;rst;w 5
  #waiting for 5 seconds...
U>b
M>
```

- Repeat above memory test.

If you see memory-related problems

1 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>
```

- Read value not equal to the written value implies that the memory controller is not setup correctly.

2 Hand load a small program:

```
start 80096280=26b50001    addiu $s5, $s5, 0x1
#Increment r21 by 1
      80096284=00000000    nop
      80096288=00000000    nop
      8009628c=1000fffc    b start  #Loop back to start
      80096290=00000000    nop      #Branch delay slot
```

The instruction 0x1000fffc is a branch to a relative offset so this program can be placed at any start address.

```
M>reg R21=0
M>reg R21
  reg R21=00000000
M>m -d4 -a4 80094150=26b50001,00000000,00000000,1000fffc,00000000
```

Verify that stepping the program will increment the register.

```
M>r 80094150
U>b
M>s; reg R21
  PC = 80094150
  reg R21=031b3c6c
M>s; reg R21
  PC = 80094154
  reg R21=031b3c6d
```

Run the program and check the value of reg R21.

```
M>r
U>reg R21
  reg R21=08f90175 # or some number
U>reg R21
  reg R21=0af1ed2f # or some number
```

This program will loop forever, incrementing R21. This is a good test program to load once a memory system is up to make sure the microprocessor can run code from memory.

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 25.)
- ❑ 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 probe, part number 5061-7342, is a crossover cable).

- ❑ Watch the LAN LEDs to see whether the emulation probe is seeing LAN activity. The LEDs are described on page 88. 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 "To configure LAN parameters using a serial connection" on page 25.)

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 emulation probe may take a very long time to connect to the network after it is turned on.

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 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.
- 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 (such as Agilent 16532-61601) from the "Break In" connector to the "Trigger Out" connector on the front panel of the emulation probe. (If you aren't concerned about these signals, you may omit this step and ignore any related test failures.)

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

1. Connect an SMB cable (such as Agilent 16532-61601) between BREAK IN and TRIGGER OUT on the front panel of the emulation probe.
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 Performance Verification tests. Running the Target Board Adapter Feedback Test (which is part of the **`pv`** test) with the target system connected can damage components on the target system.

3. 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 21.
4. Use a **`telnet`** or a terminal emulator to connect to the emulation probe.
5. 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
```

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


         Copyright (c) Agilent Technologies, Inc. 1999
All Rights Reserved.  Reproduction, adaptation, or translation without
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.

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

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

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 there are random problems

Occasionally target development systems using the Agilent emulation probe can experience erratic behavior, or random target connection and operation errors or failures. Two major causes for there problems are:

- Crosstalk between the EJTAG signals on the cable between the emulation probe and the target.
- Noise from the external fields being coupled into the target connection cable. Major external fields that can affect this connection include the startup and shutdown of nearby fluorescent lamps and CRTs. Universal motors in appliances such as vacuum cleaners and floor buffers can generate significant field impulses.

The following is two potential solutions to the problems mentioned above.

1. Reduce the TCK clock rate. A reduction from 32 MHz to 10 MHz (cf speed = 10 M) can cause up to a 50% reduction in the crosstalk. The most significant side effect is a reduction in download rate. If the increase in download times cannot be tolerated the TCK clock rate can be increased for the duration of the download time, then reduced to gain the increased reliability while debugging.

2. Provide an additional ground path between the emulation probe and the target system. The SMB connections on the front of the emulation probe provide a solid ground connection.

> 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 that drives the connection to the emulation module (for emulation probes that can be connected to an Agilent Technologies logic analysis system). 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 Contact Us.

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 Agilent will repair or replace the part and send it 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. Not all parts are shipped with every product. The part numbers are subject to change. Contact your nearest Agilent Technologies sales office for further information.

Exchange assemblies

Part number	Description
E3464-69501	Rebuilt PC board assembly (for MIPS32/MIPS64)

Replacement assemblies

Part number	Description
0950-3043	Power supply for emulation probe (marked F1044B)
E3464-61600	EJTAG Ribbon cable for MIPS (Connects the emulation probe to the target system.)
E8130-68702	Serial cable and adapter (Connects the emulation probe to a PC for configuration.)

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.

11

Specifications and Characteristics

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

Operating characteristics

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

Input/Output Electrical Characteristics

Trigger Out SMB Port

With a 50 Ω load, a logic high is >= 2.0 V, and a low is <= 0.4 V. The output function is selectable (see “To configure the Trigger Out SMB port” on page 48).

Break In SMB Port

Edge-triggered TTL level input, 20 pF, with 4.6 kΩ to ground in parallel. Maximum input: +5 V to -5 V when the emulation probe is powered OFF; +10 V to -5 V when the emulation probe is powered ON. Input function is selectable (see “To configure the Break In SMB port” on page 48).

Communication Ports

Serial Port

RJ12 connector (DB9-to-RJ12 adapter and serial cable included). RS-232 DCE to 9600 baud, 8-bit, no parity, one stop bit.

IEEE 802.3 Type 10/100Base-TX LAN Port

RJ-45 connector, is compatible with both 10 Mbps (10Base-T) and 100 Mbps (100Base-TX) twisted-pair ethernet LANs.

Power Supply

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

Output. 12 V, 3.3 A

CAT I (Mains isolated).

Emulation Probe Characteristics

Microprocessor Compatibility	MIPS32 4Kc MIPS32 4Km	MIPS32 4Kp MIPS64 5Kc

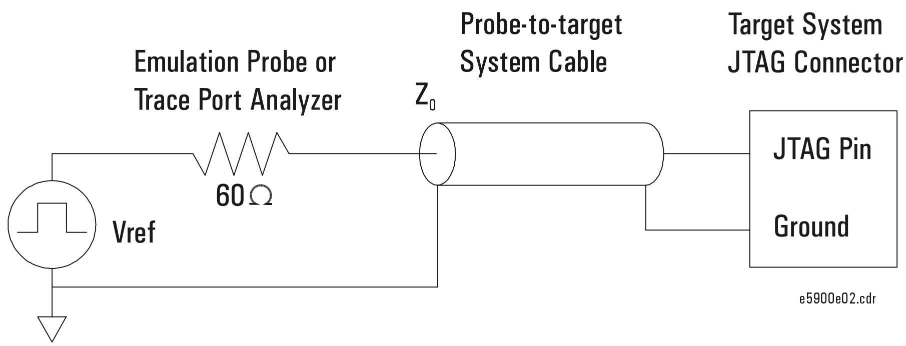
Input Characteristics							
Signal	**Symbol**	**1/3 Vref**		**1/2 Vref**		**2/3 Vref**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**
TDO	Vih	0.5 Vref	5.1 V	0.65 Vref	5.1 V	0.8 Vref	5.1 V
	Vil	-0.1V	0.2 Vref	-0.1 V	0.35 V	-0.1 V	0.5 Vref
	Ib (Bias)	± 15 uA					
	Rin	4.7 kΩ pullup to Vref					
	Cin	75 pF					

Input Characteristics			
Signal	**Symbol**	**Min**	**Max**
Vref	Vin	1.65 V	5.5 V
	Rin	25 kΩ pulldown to ground	
RST*	Rin (inactive)	4.7 kΩ pullup to Vref	
	Rin (active)	12 Ω pulldown to ground	
	Cout		200 pF
	Vin		5.5 V

Output Characteristics		
Signal	**Symbol**	**Condition**
TDI,TCK,TMS,TRST*, DINT[1]	Voh/Ioh	66 Ω ± 15 Ω to Vref
	Vol/Iol	66 Ω ± 15 Ω to 0.2 V
1 These signals must not be actively driven by the target system when the debug port is being used. * Indicates an active-low signal.		

Output Model

Model of output drive to TDI, TCK, TMS, TRST*, and DINT.



Note: Z_o = 66 Ω in the diagram above.

* Indicates an active-low signal.

Environmental Characteristics

Temperature	Operating: +5°C to +40°C (+41°F to +104°F)	Nonoperating: -40°C to +70°C (-40°F to +158 °F)
Altitude	Operating or nonoperating: 4600 m (15 000 ft)	
Relative Humidity	15% to 95% @ 40°C for 24 hrs.	
Pollution Degree	Pollution Degree 2: Normally only dry non-conductive pollution occurs. Occasionally a temporary conductivity caused by condensation may occur.	

For indoor use only.

See Also

See the Declarations of Conformity at the end of this book for EMC, safety, and supplemental information.

Glossary

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 Also called Debug Mode, In Background, or 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 Kit 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."

Emulator An emulation module or an emulation 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.

MICTOR Connector A high-density matched impedence connector manufactured by AMP Corporation. *High-density adapter cables* can be used to connect the logic analyzer to MICTOR connectors on the target system.

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*.

Processor Probe See *Emulation Probe*.

Run Control Probe See *Emulation Probe* and *Emulation Module*.

Setup Assistant Wizard software program 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.

Stand-Alone Logic Analyzer A standalone logic analyzer has a predefined set of hardware components which provide a specific set of capabilities. A standalone logic analyzer differs from a mainframe logic analyzer in that it does not offer card slots for installation of additional capabilities, and its specifications are not modified based upon selection from a set of optional hardware boards that may be installed within its frame.

State Analysis A mode of logic analysis in which 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 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 customizes the emulation probe for a particular microprocessor family. The target board adapter provides an interface to the ribbon cable which connects to the debug port on the target system.

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 A mode of logic analysis in which 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.

Index

W

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

		Performance Criteria
EMC	IEC 61326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998	
	CISPR 11:1990 / EN 55011:1991—Group 1 Class A	
	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

N10149

ISM 1-A

Restricted Rights Legend

Use, duplication, or disclosure by the U.S. Government is subject to restrictions set forth in subparagraph (C) (1) (ii) of the Rights in Technical Data and Computer Software Clause in DFARS 252.227-7013.
Agilent Technologies
395 Page Mill Road
Palo Alto, CA 94303-0870 U.S.A.
Rights for non-DOD U.S. Government Departments and Agencies are set forth in FAR 52.227-19 (c) (1,2).

Document Warranty

The information contained in this document is subject to change without notice.

Agilent Technologies makes no warranty of any kind with regard to this material, including, but not limited to, the implied warranties of merchantability or fitness for a particular purpose.

Agilent Technologies shall not be liable for errors contained herein or for damages in connection with the furnishing, performance, or use of this material.

Safety

This apparatus has been designed and tested in accordance with IEC Publication 1010, Safety Requirements for Measuring Apparatus, and has been supplied in a safe condition. This is a Safety Class I instrument (provided with terminal for protective earthing). Before applying power, verify that the correct safety precautions are taken (see the following warnings). In addition, note the external markings on the instrument that are described under "Safety Symbols."

Warning

- 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.
- Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short-circuited fuseholders. To do so could cause a shock of fire hazard.
- 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.
- If you energize this instrument by an auto transformer (for voltage reduction), make sure the common terminal is connected to the earth terminal of the power source.
- Whenever it is likely that the ground protection is impaired, you must make the instrument inoperative and secure it against any unintended operation.
- Do not operate the instrument in the presence of flammable gasses or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.
- 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

Instruction manual symbol: the product is marked with this symbol when it is necessary for you to refer to the instruction manual in order to protect against damage to the product.

Hazardous voltage symbol.

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

WARNING

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.

CAUTION

The Caution sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a Caution symbol until the indicated conditions are fully understood or met.

Agilent Technologies Inc.
P.O. Box 2197
1900 Garden of the Gods Road
Colorado Springs, CO 80901-2197, U.S.A.

Product Warranty

This Agilent Technologies product has a warranty against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Agilent Technologies will, at its option, either repair or replace products that prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by Agilent Technologies.

For products returned toAgilent Technologies for warranty service, the Buyer shall prepay shipping charges to Agilent Technologies and Agilent Technologies shall pay shipping charges to return the product to the Buyer. However, the Buyer shall pay all shipping charges, duties, and taxes for products returned to Agilent Technologies from another country.

Agilent Technologies warrants that its software and firmware designated by Agilent Technologies for use with an instrument will execute its programming instructions when properly installed on that instrument. Agilent Technologies does not warrant that the operation of the instrument software, or firmware will be uninterrupted or error free.

Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by the Buyer, Buyer- supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

No other warranty is expressed or implied. Agilent Technologies specifically disclaims the implied warranties of merchantability or fitness for a particular purpose.

Exclusive Remedies

The remedies provided herein are the buyer's sole and exclusive remedies. Agilent Technologies shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

Assistance

Product maintenance agreements and other customer assistance agreements are available for Agilent Technologies products. For any assistance, contact your nearest Agilent Technologies Sales Office.

Certification

Agilent Technologies Inc. certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

About this edition

This is the *Agilent Technologies Emulation for MIPS 32 and MIPS 64 User's Guide*.

Publication number
E3464-97001, February 2002
Printed in USA.

Print History
E3464-97000, November 2001

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.