User's Guide

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

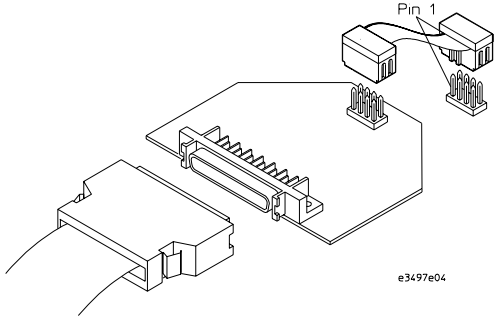
Emulation for the PowerPC MPC500

Motorola's embedded PowerPC MPC500 microprocessors provide a *development port* (also known as a *debug port*) that lets tools like the HP E3456A emulation probe or the HP 16610A emulation module give you capabilities like:

- Stopping or starting program execution.
- Setting breakpoints in the program.
- Displaying and modifying the contents of microprocessor registers.
- Displaying and modifying the contents of target system memory or I/O.
- Downloading program code to target system memory.

The HP E3456A emulation probe and the HP 16610A emulation module require that a debug port connector be designed into your target system (unless you have the HP E2490A analysis probe for MPC505/509 microprocessors which has a built-in connector for the emulation probe or emulation module).

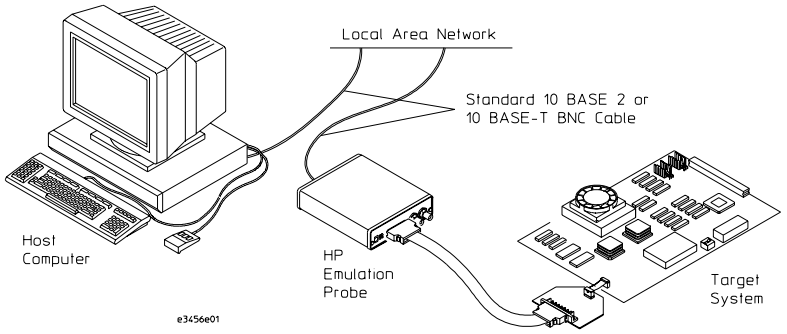
Both the HP E3456A emulation probe and the HP 16610A emulation module come with a target interface module (TIM) that adapts the emulation probe or emulation module to a debug port connector in the target system.



The emulation probe or emulation module can be controlled by a debugger on a host computer or by the Emulation Control Interface on an HP 16600A/16700A-series logic analysis system.

Emulation Probe

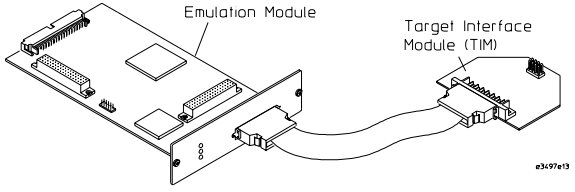
The HP E3456A emulation probe is a stand-alone unit that has its own power supply and local area network (LAN) interface.



The HP E3456A emulation probe is typically used in situations where only its capabilities are needed, for example, by software developers using debuggers to debug program code. But, it can also be used along with the HP 16600A/16700A-series logic analysis system when logic analysis capabilities are needed.

Emulation Module

The HP 16610A emulation module is designed to be installed in HP 16600A/16700A-series logic analysis systems. The logic analysis system supplies the power and LAN interface.



The HP 16610A emulation module is typically used in situations where its capabilities are needed along with the logic analysis system capabilities, for example, by hardware designers, firmware developers, and system integrators who are analyzing the real-time execution of a microprocessor-based target system.

In This Book

This book describes the following products:

Product	Supports	Includes
HP E5900A Option 050 Emulation Probe	MPC505/509/555	HP E3456A emulation probe HP E3497-66503 target interface module (TIM)
HP E5901A Option 050 Emulation Module	MPC505/509/555	HP 16610A emulation module HP E3497-66503 target interface module (TIM)

This book shows how to:

- Install and set up the emulation probe or emulation module.
- Connect the emulation probe/module to a target system.
- Configure the emulation probe/module for proper operation with your target system.
- Use the emulation probe/module with debuggers.

This book also describes the specifications and characteristics of the emulation probe/module, and it contains service information.

See Also

If you're using the Emulation Control Interface in the HP 16600A/16700A-series logic analysis system to control the emulation probe/module, see the logic analysis system's on-line help.

If you're using a high-level source debugger to control the emulation probe/module, see the debugger's documentation.

See also Hewlett-Packard's logic analysis and emulation web site at:

`http://www.hp.com/go/emulator`

Comments on the Documentation?

Send email to `documentation@col.hp.com` (for comments only; please contact your local HP representative if you need technical support).

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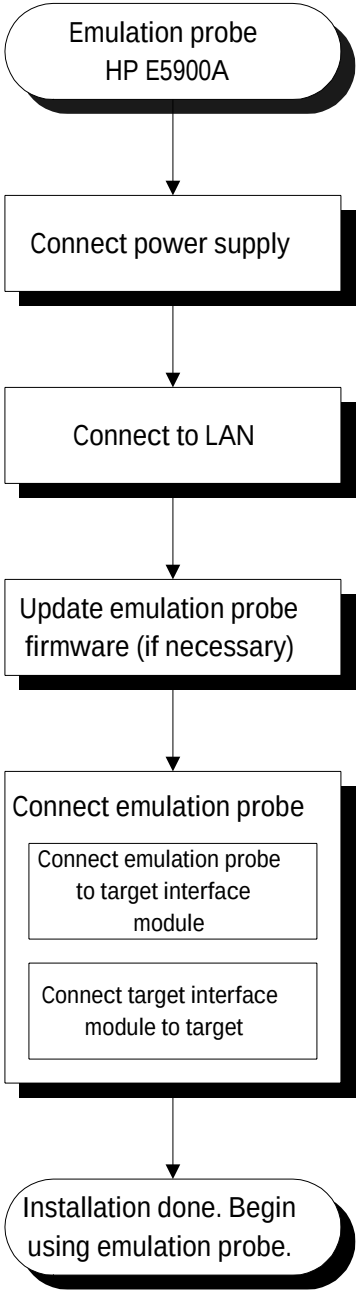
Installing the Emulation Probe

Overview of Installation and Setup

Follow these steps to connect your equipment.

1. Check that you received all of the necessary equipment. See “Equipment and Requirements” on page 16.
2. Disconnect power from the target system, emulation probe, and logic analyzer before you make or break connections. See “Powering-On and Powering-Off the Emulation Probe” on page 19.
3. Connect the emulation probe to a LAN. See “Connecting the Emulation Probe to a LAN” on page 21.
4. Update the emulation probe's firmware to give it the proper “personality” for the microprocessor it will connect to. See “Updating Emulation Probe Firmware” on page 40.
5. Connect the emulation probe to your target system. See the “Connecting to a Target System” chapter on page 63.
6. Configure the emulation probe. See the “Configuring the Emulation Probe/Module” chapter on page 75.


Emulation probe
HP E5900A
Connect power supply
Connect to LAN
Update emulation probe
firmware (if necessary)
Connect emulation probe
Connect emulation probe
to target interface
module
Connect target interface
module to target
Installation done. Begin
using emulation probe.

Equipment and Requirements

Listed below are:

- Equipment and software supplied with the emulation probe.
- Additional equipment and software required by the emulation probe.

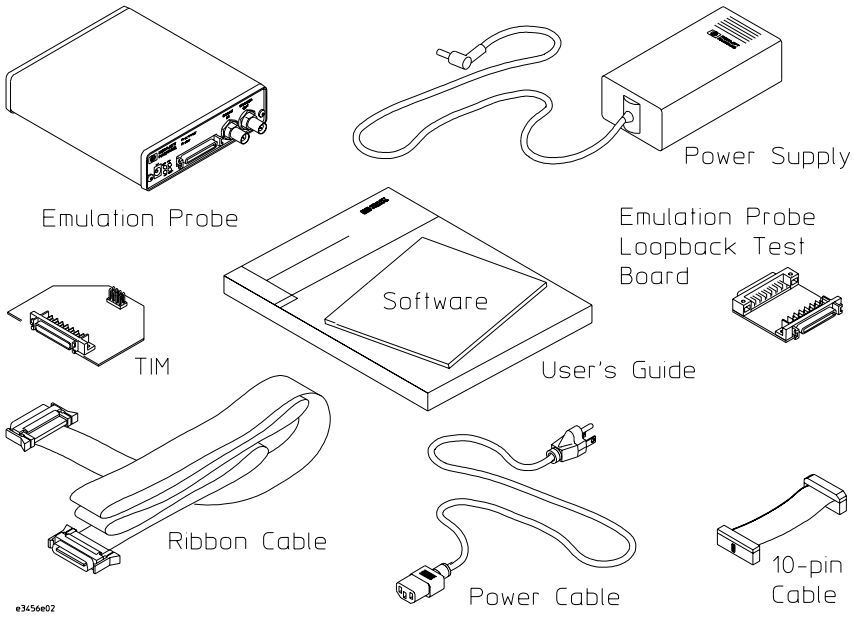
Supplied Equipment and Software

The emulation probe includes:

- An emulation probe.
- A 12V power supply for the emulation probe.
- A power cord.
- A target interface module (TIM) circuit board.

  The target interface module (TIM) is used to connect the emulation probe to a debug port connector in the target system.

  The target interface module (TIM) is not needed when using the HP E2490A analysis probe for MPC505/509 microprocessors because the target interface module's functionality is already built into the analysis probe.
- A 50-pin ribbon cable for connecting the emulation module to the target interface module (TIM) (or to the HP E2490A analysis probe).
- A 10-pin ribbon cable for connecting the target interface module (TIM) to a debug port connector in the target system.
- Emulation Control Interface software.
- An emulation probe loopback test board (HP part number E3496-66502).
- This *User's Guide*.



Additional Equipment and Software Required

The emulation probe requires:

- A target system with the appropriate debug port connector. The target system must meet the criteria described in “Designing the Target System for an Emulation Probe/Module” on page 64.
- A local area network (LAN) for communicating with the emulation probe. The emulation probe needs to be assigned an internet (IP) address, and it needs to know the IP address of the gateway machine.
- Interface software that gives you access to the emulation probe's functionality.

  You can use a third-party high-level source debugger to access and control the emulation module. Debuggers can run on PC or UNIX workstations that are also on the local area network (LAN).

  Or, you can use the HP 16600A/16700A-series logic analysis system' s Emulation Control Interface.

Other Optional Equipment

You can also use the emulation probe with:

- The HP 16600A/16700A-series logic analysis system.
- The HP E2490A analysis probe for Motorola Embedded PowerPC MPC505/509 microprocessors.

  The analysis probe captures microprocessor signals for logic analysis. The HP E2490A analysis probe has a built-in target interface module, which makes it unnecessary to design a debug port connector into the target system.

Powering-On and Powering-Off the Emulation Probe

It's important to follow the proper power-on or power-off sequences so that your target system, the emulation probe, and other equipment are not damaged.

To power on the system

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

1. Power-on the logic analyzer, if you are using one.
2. Power-on the emulation probe.
3. Power-on your target system.

To power off the system

Power off your system as follows:

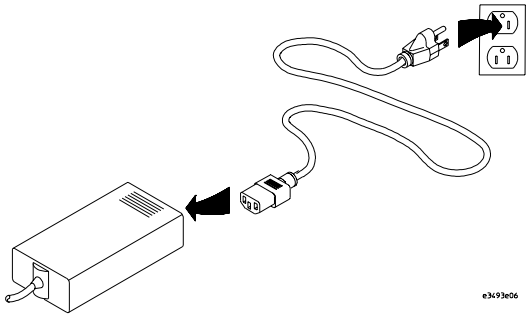
1. Power-off your target system.
2. Power-off the emulation probe.
3. Power-off the logic analyzer, if you are using one.

To connect the emulation probe to a power source

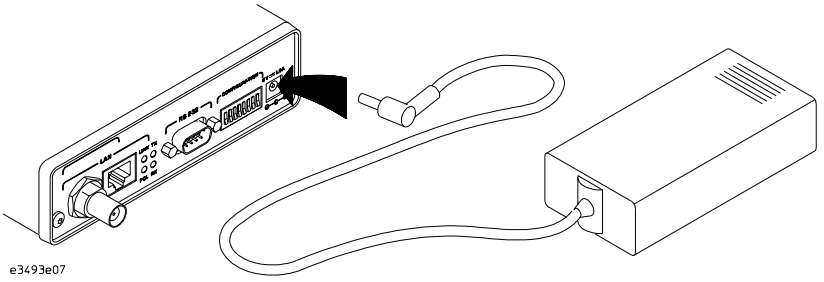
The emulation probe does not have an On/Off switch. To power on the emulation probe:

1. Connect the power cord to the power supply and to a socket

outlet.



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



The power light on the target side of the emulation probe will be illuminated.

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 Hewlett-Packard sales and service office.

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

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

Connecting the Emulation Probe to a LAN

The emulation probe communicates with a debugger (running on a PC or UNIX workstation), or with the HP 16600A/16700A-series logic analysis system, via a local area network (LAN). So, the first thing to do when installing an emulation probe is to set its LAN parameters.

There are two ways to set the emulation probe's LAN parameters:

- By connecting an ASCII terminal (or a PC or UNIX workstation running terminal emulation software) to the emulation probe's serial port and by using the emulation probe's built-in terminal interface. This is the most reliable method.

  (This type of connection is also used when running the complete set of emulation probe performance verification tests. Other use of the serial port and the terminal interface is not supported.)

- By using a BOOTP server running on the LAN. BOOTP is part of the HP-UX, SunOS, and Solaris operating systems.

What type of LAN connection must I use?

The emulation probe has two LAN connectors:

- A BNC connector that can be directly connected to an IEEE 802.3 Type 10BASE2 cable (ThinLAN). When using this connector, the emulation probe provides the functional equivalent of a Medium Attachment Unit (MAU) for ThinLAN.
- An IEEE 802.3 Type 10BASE-T (StarLAN) connector.

NOTE: Use either the 10BASE2 or the 10BASE-T connector. Do not use both. The emulation probe will not work with both connected at the same time.

What are LAN parameters?

You must assign an IP address (Internet address) to the emulation probe before it can operate on the LAN. You also set the gateway address. (The emulation probe automatically sets a subnet mask based on the subnet mask used by other devices on the network.)

The IP address and other network parameters are stored in nonvolatile memory within the emulation probe.

To get the IP and gateway addresses

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 "hostname" 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 all connections 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.

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 default numbers can be changed if they conflict with some other product on your network.

To change the port numbers, see "To configure LAN parameters using the built-in terminal interface" on page 23.

If you have already set the IP address and connected the emulation probe to the LAN, you can use a telnet connection instead of a serial connection to connect to the emulation probe.

3 Write down the link-level address of the emulation probe.

You will need this address if you use BOOTP to set the IP address.

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

IP Address of Emulation Probe _____

Hostname of Emulation Probe _____

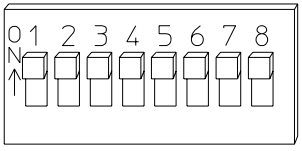
Gateway Address _____

Link-Level Address of Emulation Probe _____

To configure LAN parameters using the built-in terminal interface

1 Set configuration switches S1 through S4 to ON, and set the other switches as appropriate for your serial interface.

Switch setting definitions are printed on the bottom of the emulation probe. If you will use a baud rate of 9600 baud, set the switches like this:



2 Connect an ASCII terminal (or terminal emulator) to the emulation probe's RS-232 port with a 9-pin RS-232 cable.

Complete instructions for setting up a serial connection can be found in "Connecting a Terminal to the Emulation Probe's Serial Port" on page 34.

3 Plug in the emulation probe's power cord. Press the terminal's Enter (that is, carriage return) key a couple times. You should see a prompt such as "p>", "?>", or "R>".

At this point, you are communicating with the emulation probe's built-

in terminal interface.

4 Display the current LAN configuration values by entering the lan command:

```
R>lan
  lan is disabled
  lan -i 0.0.0.0
  lan -g 0.0.0.0
  lan -p 6470
  Ethernet Address : 08000903212f
```

The “lan -i” line shows the current IP address (IP address) of the emulation probe.

The Ethernet address, also known as the link-level address, is preassigned at the factory, and is printed on a label above the LAN connectors.

5 Enter the following command:

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

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.
-p <port>	This changes the base TCP service port number. The default numbers (6470, 6471) can be changed if they conflict with some other product on your network. TCP service port numbers must be greater than 1024. If you change the base port, the new value must also be entered in the /etc/services file on the host computer. For example, you could modify the line: hp64700 6470/tcp

The IP address and any other LAN parameters you change are stored in nonvolatile memory and will take effect the next time the emulation probe is powered off and back on again.

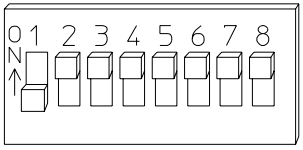
6 Disconnect the power cord from the emulation probe, and connect the emulation probe to your network.

This connection can be made by using either the 10BASE-T connector or the 10BASE2 (BNC) connector on the emulation probe. Do not use both connectors at the same time.

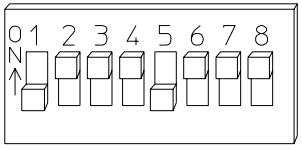
7 Set the configuration switches to indicate the type of connection that is to be made.

Switch S1 must be set to OFF, indicating that a LAN connection is being made.

Switch S5 should be ON if you are connecting to the BNC connector:



Switch S5 should be OFF if you are connecting to the 10BASE-T connector:



If you are using the 10BASE-T connector, see “To set the 10BASE-T configuration switches” on page 28.

Set all other switches to ON.

8 Connect the power cord to the emulation probe.

9 Verify your emulation probe is now active and on the network. See “To verify LAN communications” on page 29.

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.

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
```

Now, cycle power on the emulation probe so that the new address will take effect.

See Also

If you have problems verifying LAN communication, see "Solving LAN Communication Problems" on page 31.

To configure LAN parameters using BOOTP

Use this method only on a workstation which is running bootpd, the BOOTP daemon.

1 Make sure that BOOTP is enabled on your host computer.

If the following commands yield the results shown below, the BOOTP protocol is enabled:

```
$ grep bootp /etc/services
bootps 67/udp
bootpc 68/udp
$ grep bootp /etc/inetd.conf
bootps  dgram  udp  wait    root  /etc/bootpd   bootpd
```

If the commands did not yield the results shown, you must either add BOOTP support to your workstation or use a different method to configure the emulation probe LAN parameters.

2 Add an entry to the host BOOTP database file, /etc/bootptab. For example:

```
# Global template for options common to all HP64700
# emulators and Emulation Probes.
# Use a different gateway addresses if necessary.
hp64700.global:\
    :gw=0.0.0.0:\
    :vm=auto:\
    :hn:\
    :bs=auto:\
    :ht=ether
```

```
# Specific emulator entry specifying hardware address
# (link-level address) and ip address.
hpprobe.div.hp.com:\
    :tc=hp64700.global:\
    :ha=080009090B0E:\
    :ip=192.6.29.31
```

In this example, the “ha=080009090B0E” identifies the link-level address of the emulation probe. The “ip=192.6.29.31” specifies the IP address that is assigned to the emulation probe. The node name is “hpprobe.div.hp.com”.

3 Connect the emulation probe to your network.

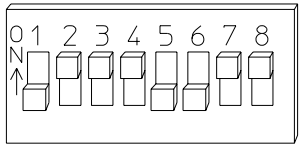
This connection can be made by using either LAN connector on the emulation probe.

4 Set the configuration switches to indicate the type of connection that is to be made.

Switch S1 must be set to OFF, indicating that a LAN connection is being made.

Switch S6 must be set to OFF to enable BOOTP mode.

Switch S5 should be set to OFF if you are connecting to the BNC connector.



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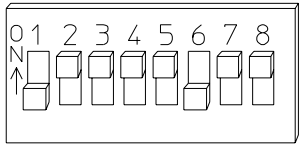
Switch S5 should be set to ON if you are connecting to the 10BASE-T connector.



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If you are using the 10BASE-T connector, see “To set the 10BASE-T

configuration switches" on page 28.

Set all other switches to ON.

5 Connect the power cord to the emulation probe.

6 Verify that the power light stays on after 10 seconds.

The IP address will be stored in EEPROM.

7 Set switch S6 back to ON.

Do this so that the emulation probe does not request its IP address each time power is cycled. The IP address is stored in EEPROM, so BOOTP does not need to be run again. Leaving this switch on will result in slower performance, increased LAN traffic, and even failure to power up (if the BOOTP server becomes inactive).

8 Verify your emulation probe is now active and on the network. See "To verify LAN communications" on page 29.

See Also

For additional information about using bootpd, refer to the bootpd(1M) man page.

To set the 10BASE-T configuration switches

Set switches S7 and S8 to ON unless one of the following conditions is true:

- If the LAN cable exceeds the standard length, set switch S7 to OFF.

  The emulation probe has a switch-selectable, twisted-pair receiver threshold. With switch S7 set to OFF, the twisted-pair receiver threshold is lowered by 4.5 dB. This should allow you to use cable lengths of up to about 200 meters. If you use a long cable, you should consult with your LAN cabling installer to ensure that:

  - The device at the other end of the cable has long cable capability, and
  - The cable is high-grade, low-crosstalk cable with crosstalk attenuation of greater than 27.5 dB.

When switch S7 is set to ON, the LAN port operates at standard 10BASE-T levels. A maximum of 100 meters of UTP cable can be used.

- If your network doesn't support Link Beat integrity checking or if the emulation probe is connected to a non 10BASE-T network (such as StarLAN) set this switch to LINK BEAT OFF (0 or OPEN).

  In normal mode (switch S8 set to ON), a link integrity pulse is transmitted every 15 milliseconds in the absence of transmitted data. It expects to receive a similar pulse from the remote MAU. This is the standard link integrity test for 10BASE-T networks. If your network doesn't support the Link Beat integrity checking or if the emulation probe is used on a non 10BASE-T network (such as StarLAN) set this switch to LINK BEAT OFF (OFF).

NOTE: Setting switch S8 to OFF when Link Beat integrity checking is required by your network will cause the remote MAU to disable communications.

To verify LAN communications

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 or enter a terminal interface init -p command before the changes take effect. Doing this will break the connection and end the telnet session.

Example

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

See Also

If you encounter problems, see “Solving LAN Communication Problems” on page 31.

Solving LAN Communication Problems

If you cannot verify LAN communication

If you cannot verify LAN communication using the procedure in “To verify LAN communications” on page 29, or if the 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.
- ❏ Make sure that the LAN cable is connected. Watch the LAN LED’s to see whether the emulation probe is seeing LAN activity. Refer to your LAN documentation for testing connectivity.
- ❏ Make sure that only one of the LAN ports is connected.
- ❏ Make sure the emulation probe communication configuration switches are set correctly. Unplug the emulation probe power cord, then plug it in again to make sure the switch settings are read correctly by the emulation probe.
- ❏ 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. Use the RS-232 port to verify this that the IP address is set up correctly. When you are connected to the RS-232 port, run performance verification on the emulation probe’s LAN interface with the “pv” command.
- ❏ 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 disconnecting power to the emulation probe and reconnecting it again.

- ❏ Use a serial connection to run the LAN performance verification tests (see "To run complete performance verification tests for an emulation probe" on page 138).

If you have LAN connection problems

- ❏ If the emulation probe does not accept commands from the HP 16600A/16700A-series logic analysis system or a debugger:

  1. Check that switch S1 is "0" (attached to LAN, not RS-232).
  2. Check that switch S5 is in the correct position for your LAN interface (either 10BASE2 or 10BASE-T).

  (Remember: if you change any switch settings, the changes do not take effect until you cycle power.)

- ❏ If the emulation probe still does not respond, you need to verify the IP address and gateway address settings of the emulation probe.

  To do this, connect the emulation probe to a terminal or terminal emulator (see "Connecting a Terminal to the Emulation Probe's Serial Port" on page 34), change the switch settings so it is connected to RS-232, and enter the "lan" command. The output looks something like this:

```
lan -i 15.5.24.116
lan -g 15.5.23.1
lan -p 6470
Ethernet Address : 08000909BAC1
```

  "lan -i" shows the internet address is 15.5.24.116 in this case. If the Internet address (IP) is not what you expect, you can change it with the "lan -i <IP_address>" command.

  "lan -g" shows the gateway address. Make sure it is the address of your

gateway if you are connecting from another subnet, or 0.0.0.0 if you are connecting from the local subnet.

“lan -p” shows the port is 6470.

If the “POL” LED is lit

The “POL” LED indicates that the polarity is reversed on the receive pair if you are using a 10BASE-T connection. The emulator should still work properly in this situation, but other LAN devices may not work.

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.

The emulation probe automatically sets its subnet mask based on the first subnet mask it detects on the network. If it then detects other subnet masks, it will generate error messages.

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.

To “clean up” the network, connect a terminal to the emulation probe. You can then see error messages which will help you identify which devices on the network are using the wrong subnet masks.

Connecting a Terminal to the Emulation Probe's Serial Port

To set up a serial connection, you will need to:

- Set the serial configuration switches.
- Connect a serial cable between the host computer and the emulation probe.
- Verify communications.

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.

To set the serial configuration switches

1. Set switch S1 to ON (RS-232).
2. Set switches S2-S4 to ON.
3. Set switch S5 to ON (HW HANDSHAKE ON) if your serial interface uses the DSR:CTS/RTS lines for flow control. Set S5 to

OFF (HW HANDSHAKE OFF) if your serial interface uses software flow control (XON/XOFF).

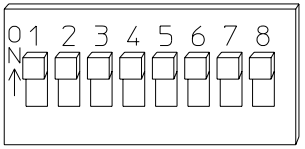
If your serial interface supports hardware handshaking, you should use it (set switch S5 to ON). Hardware handshaking will make the serial connection much more reliable.

4 Set switches S6-S8 for the baud rate you will use. These switch settings are listed on the bottom of the emulation probe.

The higher baud rates may not work reliably with all hosts and user interfaces. Make sure the baud rate you choose is supported by your host and user interface.

Example

To use a baud rate of 9600 baud, set the switches as follows:

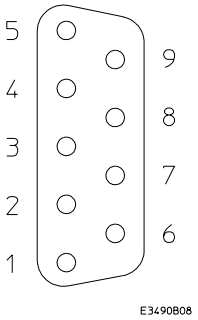


To connect a serial cable

CAUTION: Use a grounded, shielded cable. If the cable is not shielded, or if the cable is not grounded at the serial controller, the emulation probe may be damaged by electrostatic discharge.

Connect an RS-232C modem cable from the host computer to the emulation probe. The recommended cable is HP part number C2932A. This is a 9-pin cable with one-to-one pin connections.

If you want to build your own RS-232 cable, follow the pinout shown in the following figure:



Serial Cable Pinout

Pin Number	Signal	Signal Description
1	DCD	Data Carrier Detect (not used)
2	TD	Transmit Data (data coming from HP emulation probe)
3	RD	Receive Data (data going to HP emulation probe)
4	DTR	Data Terminal Ready (not used)
5	GND	Signal Ground
6	DSR	Data Set Ready (Output from HP emulation probe)
7	RTS	Request to Send (Input to HP emulation probe)
8	CTS	Clear to Send (connected to pin 6)
9	RING	Ring Indicator (not used)

To verify serial communications

1 Start a terminal emulator program on the host computer.

If you are using a PC, the Terminal application in MS Windows 3.1, or the HyperTerminal application in MS Windows 95/NT, will work fine.

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

2 Plug the power cord into the emulation probe.

When the emulation probe powers up, it sends a message (similar to the one that follows) to the serial port and then displays a prompt:

```
                Copyright (c) Hewlett-Packard Co. 1987
All Rights Reserved.  Reproduction, adaptation, or translation without
prior written permission is prohibited, except as allowed under
copyright laws.

  HPE3499A Series Emulation System
    Version:   A.07.53 01Mar98
    Location:  Generics

  HPE3459A ARM7 JTAG Emulator
    Version:   A.01.01 01Mar98
R>
```

The version numbers may be different for your emulation probe.

3 Press the Return or Enter key a few times.

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

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

See Also If you encounter problems, see "Solving Serial Communication Problems" on page 38.

Solving Serial Communication Problems

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 light is lit.
- ❏ Make sure that you have properly configured the data communications switches on the emulation probe and the data communications parameters on the host computer. You should also verify that you are using the correct cable.

  The most common type of data communications configuration problem involves the configuration of the emulator as a DTE device instead of as a DCE device. If you are using the wrong type of cable, no prompt will be displayed.

  A cable with one-to-one connections will work with a PC or an HP 9000 Series 700 workstation.

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

- ❏ Remember that Windows 3.1 only allows two active RS-232 connections at a time. To be warned when you violate this restriction, choose Always Warn in the Device Contention group box under 386 Enhanced in the Control Panel.
- ❏ Use the “Terminal” program (usually found in the Accessories windows program group) and set up the “Communications...”

settings as follows:

Baud Rate:	9600 (or whatever you have chosen for the emulation probe)
Data Bits:	8
Parity:	None
Flow Control:	hardware
Stop Bits:	1

When you are connected, hit the Enter key. You should get a prompt back. If nothing echos back, check the switch settings on the emulation probe.

- ❏ If the switches are in the correct position and you still do not get a prompt when you hit return, try turning OFF the power to the emulation probe and turning it ON again.
- ❏ If you still don't get a prompt, make sure the RS-232 cable is connected to the correct port on your PC, and that the cable is appropriate for connecting the PC to a DCE device.

  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.

Updating Emulation Probe Firmware

Firmware gives your emulator a “personality” for a particular microprocessor or microprocessor family.

After you have connected the emulation probe to a LAN, you may need to update the firmware to give it the right personality for your microprocessor.

You must 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 HP.

To display current firmware version information

- Use telnet or a terminal emulator 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 for an emulation probe

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.hp.com/go/emulator`

   The firmware will be in the “Technical Support Information” section of this web site.

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

firmware.

If HP sends you firmware on a floppy disk, install the firmware from the floppy disk. The README file on the floppy disk contains instructions for installing the firmware using a PC or workstation.

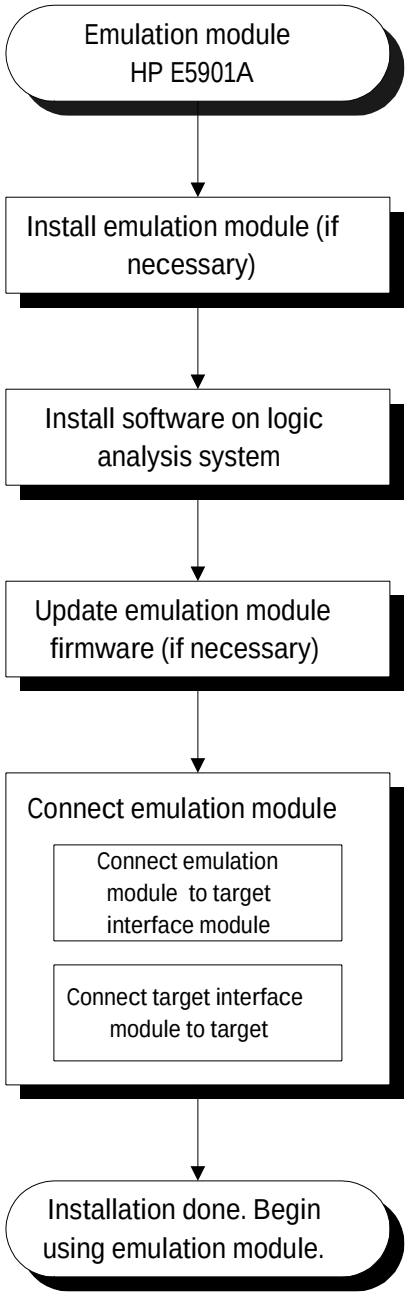
2

Installing the Emulation Module

Overview of Installation and Setup

Follow these steps to connect your equipment.

1. Check that you received all of the necessary equipment. See "Equipment and Requirements" on page 46.
2. Disconnect power from the target system and logic analyzer before you make or break connections.
3. Install the emulation module into the logic analysis system. See "Installing into a Logic Analysis System" on page 48.
4. Install software on the logic analysis system. See "Installing Software" on page 54.
5. Update the emulation module's firmware to give it the proper "personality" for the microprocessor it will connect to. See "Updating Emulation Module Firmware" on page 56.
6. Connect the emulation module to your target system. See the "Connecting to a Target System" chapter on page 63.
7. Configure the emulation module. See the "Configuring the Emulation Probe/Module" chapter on page 75.


Emulation module
HP E5901A
Install emulation module (if necessary)
Install software on logic analysis system
Update emulation module firmware (if necessary)
Connect emulation module
Connect emulation module to target interface module
Connect target interface module to target
Installation done. Begin using emulation module.

Equipment and Requirements

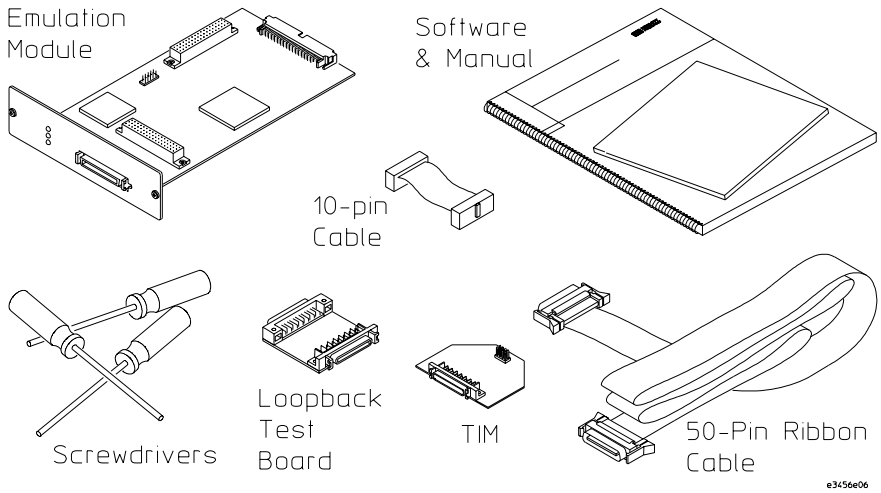
Supplied Equipment and Software

The emulation module includes:

- An HP 16610A emulation module.
- Firmware for the emulation module and/or updated software for the Emulation Control Interface on a CD-ROM.
- A target interface module (TIM) circuit board.

  The target interface module (TIM) is used to connect the emulation module to a debug port in the target system.

  The target interface module (TIM) is not needed when using the HP E2490A analysis probe for MPC505/509 microprocessors because the target interface module's functionality is already built into the analysis probe.
- A 50-pin ribbon cable for connecting the emulation module to the target interface module (TIM) (or to the HP E2490A analysis probe).
- A 10-pin ribbon cable for connecting the target interface module (TIM) to a debug port connector in the target system.
- One Torx T-10 and one Torx T-15 screwdriver.
- An emulation module loopback test board (HP part number E3496-66502)
- This *User's Guide*.



Additional Equipment and Software Required

The emulation module requires:

- An HP 16600A/16700A-series logic analysis system into which it can be installed.
- Interface software that gives you access to the emulation module's functionality.

  You can use the HP 16600A/16700A-series logic analysis system' s Emulation Control Interface.

  Or, you can use a third-party high-level source debugger to access and control the emulation module.

Installing into a Logic Analysis System

Your emulation module may already be installed in your logic analysis system. However, if you need to install an emulation module, follow the instructions on the pages which follow.

CAUTION: These 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.

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

To install in a HP 16700A-series logic analysis system

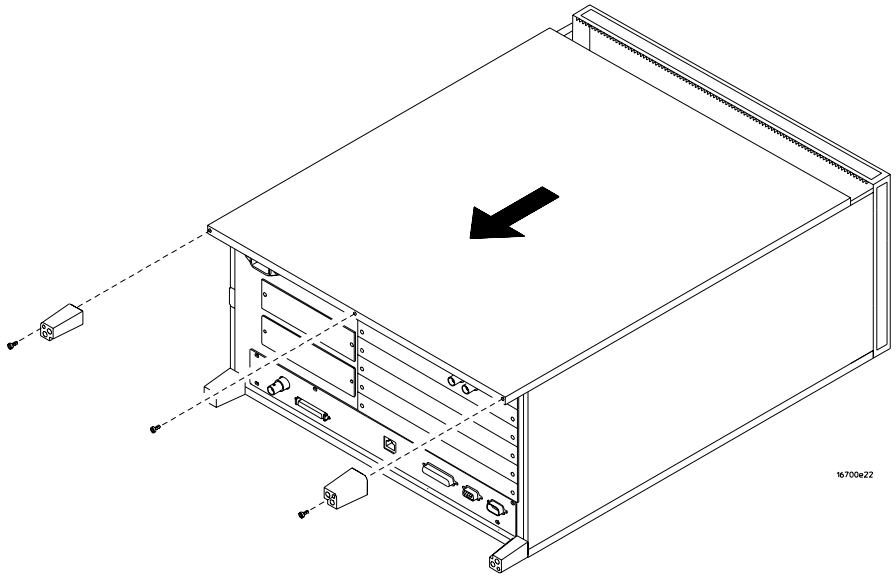
Or, to install in an HP 16701A expansion frame:

You will need a T-10 Torx screw driver.

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

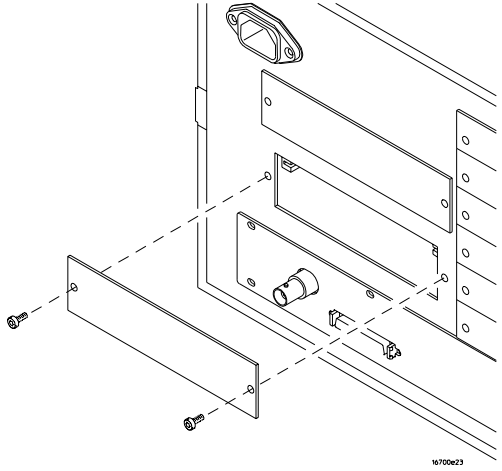
   Remove any other cables (including mouse or video monitor cables).

2. Turn the logic analysis system frame upside-down.
3. Remove the bottom cover.

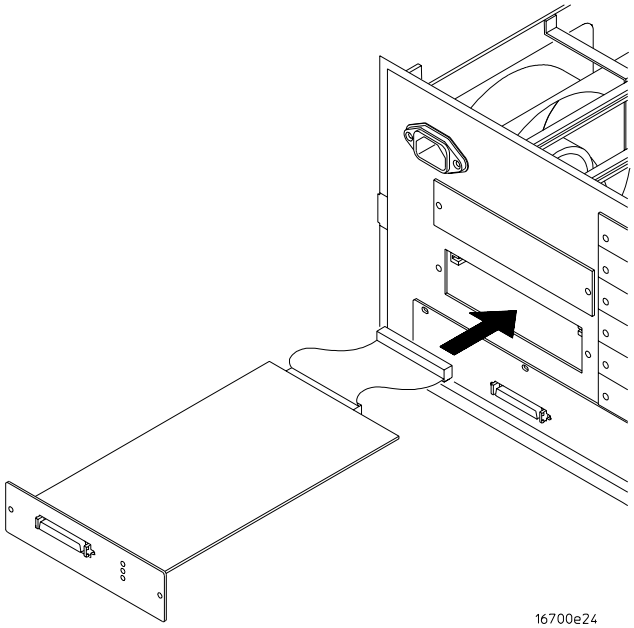


4 Remove the slot cover.

You may use either slot.

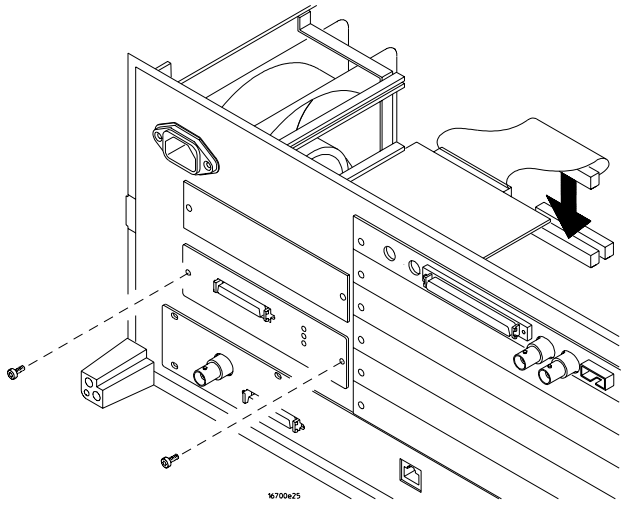


5 Install the emulation module.



6 Connect the cable and re-install the screws.

You may connect the cable to either of the two connectors. If you have two emulation modules, note that many debuggers will work only with the “first” module: the one toward the top of the frame (“Slot 1"), plugged into the connector nearest the back of the frame.



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

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

The new emulation module will be shown in the system window.

See Also See "Updating Emulation Module Firmware" on page 56 for information on giving the emulation module a "personality" for your target processor.

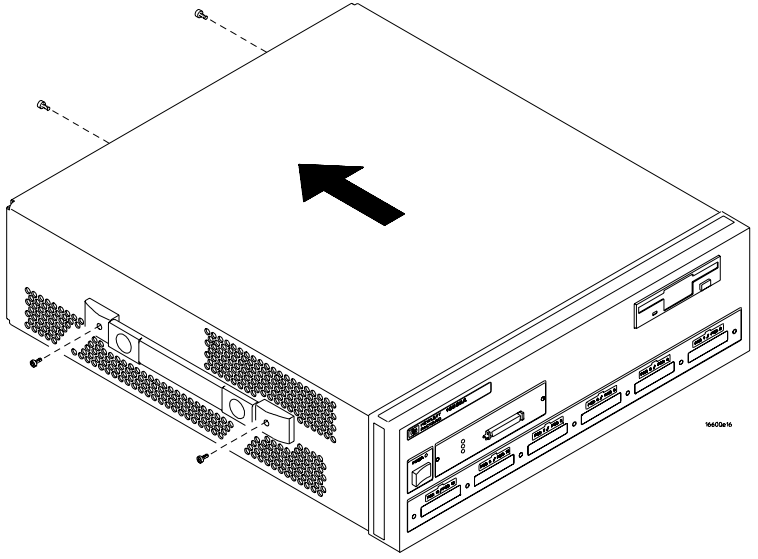
To install in a HP 16600A-series logic analysis system

You will need a T-10 Torx screw driver.

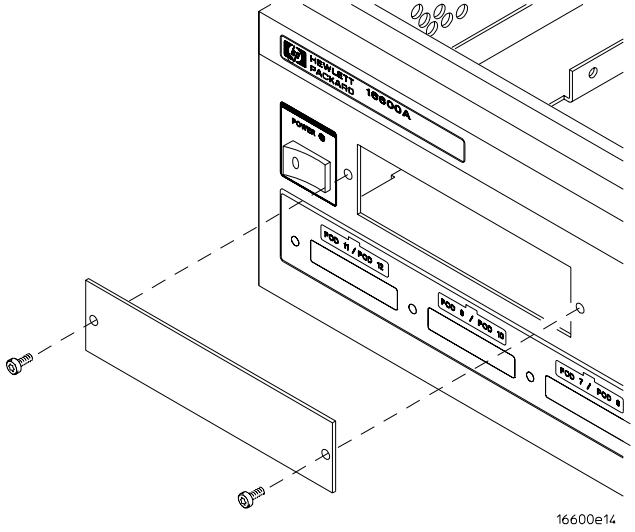
1 Turn off the logic analysis system and REMOVE THE POWER CORD.

Remove any other cables (such as probes, mouse, or video monitor).

2 Slide the cover back.

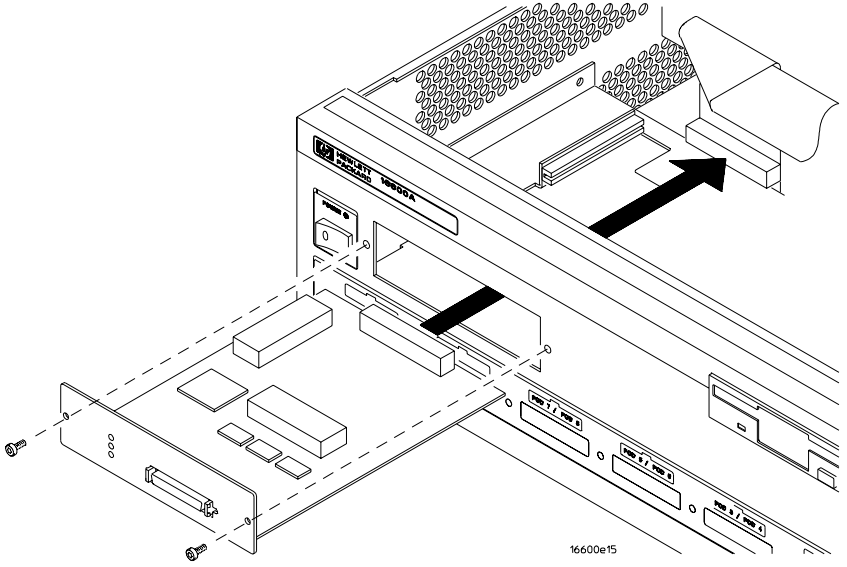


3 Remove the slot cover.



4 Install the emulation module.

5 Connect the cable and re-install the screws.



6 Reinstall the cover.

Tighten the screws snugly (2 N-m or 18 inch-pounds).

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

The new emulation module will be shown in the system window.

See Also See "Updating Emulation Module Firmware" on page 56 for information on giving the emulation module a "personality" for your target processor.

To test the emulation module

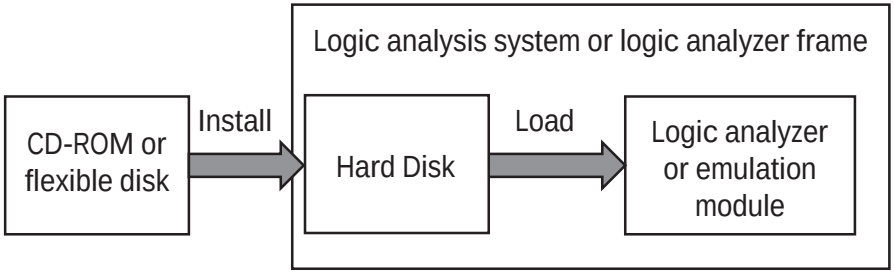
If this is the first time that you have used the emulation module, you should run the built-in performance verification test before you connect to a target system. Refer to "Solving Emulation Module Problems" on page 143 for information on performance verification.

Installing Software

This chapter explains how to install the software you will need for your emulation module.

Installing and loading

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



What needs to be installed

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

The following files are installed from the CD-ROM:

- Emulation module firmware.
- Emulation Control Interface.

To install software from CD-ROM

Installing a processor support package from a CD-ROM will take just a few minutes. If the processor support package requires an update to the HP 16600A/16700A-series logic analysis system's operating system, installation may take approximately 45 minutes.

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

1. Turn on the CD-ROM drive first; then, turn on the logic analysis system.
2. Insert the CD-ROM in the drive.
3. Click the System Admin icon.
4. Click Install... .
5. Select CD-ROM as the media, and click Apply.
6. From the list of types of packages, double-click “PROC-SUPPORT.”

   A list of the processor support packages on the CD-ROM will be displayed.
7. Click on the “MPC5XX” package.

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

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

   The firmware is stored in /hplogic/run_control/firmware.

See Also The on-line help for more information on installing, licensing, and removing software.

Updating Emulation Module Firmware

Firmware gives your emulation module a “personality” for a particular microprocessor or microprocessor family.

After you have installed the emulation module into the logic analysis system, you may need to update the firmware to give it the right “personality” for your processor.

You must update the firmware if:

- You have an emulation module which was not shipped already installed in the logic analysis system.
- You need to change the personality of the emulation module for a new microprocessor.
- You have an updated version of the firmware from HP.

Always update firmware by installing a processor support package. This will ensure that the version of the Emulation Control Interface software is compatible the version of the emulator firmware.

To display current firmware version information

- In the Update Firmware window, click Display Current Version.

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

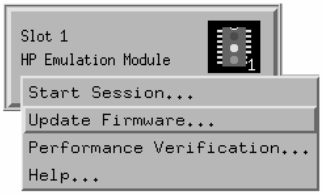
To update firmware using the Emulation Control Interface

1. End any run control sessions which may be running.
2. In the Workspace window, remove any Emulator icons from the

workspace.

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

4 In the system window, click the emulation module and select Update Firmware.



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

6 Click Update Firmware.

In about 20 seconds, the firmware will be installed and the screen will update to show the current firmware version.

See also "Installing Software" on page 54 for instructions on how to install the processor support package from the CD-ROM.

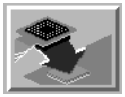
To update firmware using the Setup Assistant

The Setup Assistant is an on-line tool for connecting and configuring your logic analysis system for microprocessor and bus analysis. The Setup Assistant is available on the HP 16600A/16700A-series logic analysis systems.

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

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

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



3 Follow the instructions displayed by the Setup Assistant.

See Also

“Installing Software” on page 54 for instructions on how to install a the processor support package from the CD-ROM.

Preparing for a Debugger

When using a debugger with an emulation module in the HP 16600A/16700A-series logic analysis system, the logic analysis system must be set up on the local area network (LAN).

To connect the logic analysis system to the LAN

See the logic analysis system's installation guide or on-line help for information on setting up a logic analysis system on the LAN.

Debuggers require information about a logic analysis system's LAN connection so they can communicate with an emulation module. They need (write the information here for future reference):

- IP Address of Logic Analysis System _____
- Hostname of Logic Analysis System _____
- Gateway Address _____
- Port Number of Emulation Module _____

Default emulation module port numbers	
Port number	**Use for**
Debugger connections	
6470	Slot 1 (First emulation module in an HP 16600A/700A-series logic analysis system)
6474	Slot 2 (Second emulation module in an HP 16700A-series system)
6478	Slot 3 (Third emulation module in an expansion frame)
6482	Slot 4 (Fourth emulation module in an expansion frame)
Telnet connections*	
6472	Slot 1 (First emulation module in an HP 16600A/700A-series logic analysis system)
6476	Slot 2 (Second emulation module in an HP 16700A-series system)
6480	Slot 3 (Third emulation module in an expansion frame)
6484	Slot 4 (Fourth emulation module in an expansion frame)

*Port numbers for telnet connections are different than for debugger connections because telnet uses a different service than debuggers, and a telnet port is already set up in order to display the logic analysis system interface remotely.

To change the port number of an emulation module

To view or change the port number of an emulation module:

1. Click on the emulation module icon in the system window of the logic analysis system; then, select Update Firmware.
2. Select Modify Lan Port....
3. If necessary, enter the new port number in the Lan Port Address field.

   The new port number must not be 0-1000 and must not already be assigned to another emulation module.

To verify LAN communication with the emulation module

1 Telnet to the IP address.

For example, on a UNIX system, enter “telnet <IP_address> 6472". This connection will give you access to the emulation module's built-in terminal interface. You should see a prompt, such as “M>”.

2 At the prompt, type:

```
ver
```

You should then see information about the emulation module and firmware version.

3 To exit from this telnet session, type Ctrl-d at the prompt.

See Also

For information on physically connecting the logic analysis system to the LAN and configuring its LAN parameters, see the installation guide or on-line help for your logic analysis system.

3

Connecting to a Target System

Designing the Target System for an Emulation Probe/Module

When using the MPC5xx emulation probe/module, you need to be aware of the requirements it makes of target systems, and you need to consider how and when the emulation probe/module connects to the target system.

Target System Requirements

The DSDI and DSCK signals must not be actively driven by the target system when the debug port is being used.

The $\overline{\text{RESET}}$ and $\overline{\text{SRESET}}$ signals from the debug connector must be ORed with the respective $\overline{\text{RESET}}$ and $\overline{\text{SRESET}}$ signals that connect to the processor on the target system. They can be logically ORed or "wire-ORed" on the board. The emulation probe/module drives $\overline{\text{RESET}}$ and $\overline{\text{SRESET}}$ through 100 ohm resistors with an open-collector drivers. There is also 1.79 Kohm pullup to 3.3 volts on the $\overline{\text{RESET}}$ and $\overline{\text{SRESET}}$ lines.

The HP emulation probe/module adds about 40 pF to all target system signals routed to the debug connector. This added capacitance may reduce the rise time of the $\overline{\text{RESET}}$ and $\overline{\text{SRESET}}$ signals beyond the processor specifications. If so, the target may need to increase the pull-up current on these signal lines.

Additional target requirements may be specified in the release notes in the "readme" file on the provided floppy disk.

Debug Port Connection

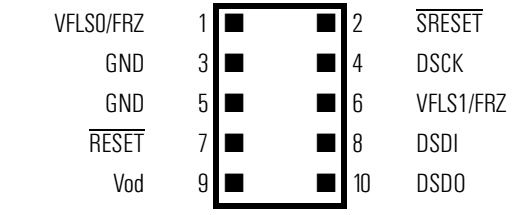
If you are using the HP E2490A analysis probe for MPC505/509 microprocessors, your target system doesn't need a debug port connector and you don't have to use the supplied target interface module to connect to it because the analysis probe has a built-in connector for the emulation probe/module. Otherwise, the emulation

probe/module requires a debug port (BDM) connector in the target system.

The connector should be a dual row header strip (“Berg connector”), 10 pins per inch, with 25 mil pins.

There are three possible pin outs of the BDM connector for the MPC555. While these can be picked based on the application, there are preferred pin outs for specific applications.

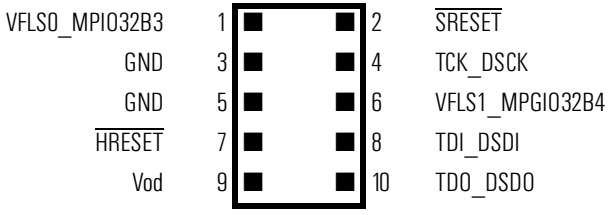
MPC505/509 Debug Port Connector



Pins 1 and 6 may be connected to VFLS0 and VFLS1 respectively, or, if a single freeze line is used, to the FRZ line.

MPC555 Debug Port Connector, Option 1

For maximum debug capability (access to BDM and program trace signals):



The E3497-66502 target interface module (TIM) requires 10k ohm pull-up resistors on pins 1 and 6.

The E3497-66503 target interface module (TIM) has 10k ohm pull-up resistors on pins 1 and 6.

Use the following commands to configure the emulation probe/module for this configuration:

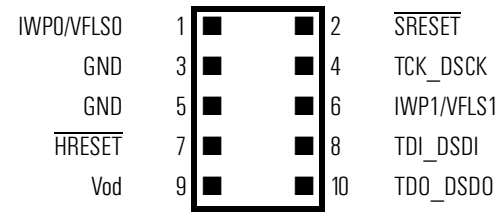
```
cf proc=MPC555
cf dbgconfig=1
rst -m
```

NOTE: The MIOS1TPCR (0x0030 6800) register is modified to configure J18 and K18 as VFLS0/1 pins. Software must not modify this register.

Option 1 is recommended because it leaves Program Trace pins for full analysis support. The other two options sacrifice watchpoint pins or program trace pins, thus forcing you to trade off analysis features.

MPC555 Debug Port Connector, Option 2

For maximum external bus capability:



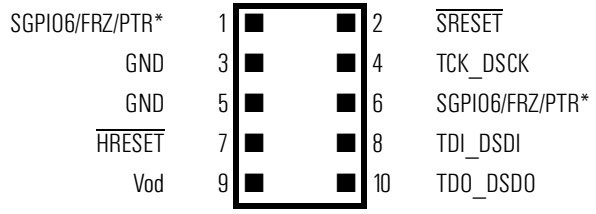
The E3497-66502 (as well as the E3497-66503) target interface module (TIM) is compatible with the MPC555 processor debug port.

Use the following commands to configure the emulation probe/module for this configuration:

```
cf proc=MPC555
cf dbgconfig=2 (default probe setting)
rst -m
```

MPC555 Debug Port Connector, Option 3

For maximum I/O configuration:



The E3497-66502 target interface module (TIM) requires 10k ohm pull-up resistors on pins 1 and 6.

The E3497-66503 target interface module (TIM) has 10k ohm pull-up resistors on pins 1 and 6.

Bit 13 of the SIUMCR (0x002fc000) is set to enable FRZ. Software must not change this bit.

Use the following commands to configure the emulation probe/module for this configuration:

```
cf proc=MPC555
cf dbgconfig=3
rst -m
```

SYPCR Register

SYPCR register is a write once register containing software watchdog timers.

The cf_sypcr register default value of 0xffffff88 is loaded into SYPCR on the reset->break (or rst -m) sequence of commands.

This disables the watchdog timer. If another value of SYPCR needs to be loaded, change the cf_sypcr register before issuing the reset->break sequence of commands.

The reset->run sequence does not copy cf_sypcr into the real SYPCR on the processor which may cause debugging to be unstable.

On-Chip Flash Support

The emulation probe/module will not directly support on-chip flash. Flash support should be provided by 3rd party debug vendors.

Fast Download

The HP probe will automatically use the chip's internally supported fast download mode.

Making the Target System Connection

Choose one of the following methods for connecting the emulation probe/module to a target system.

- Directly through a debug port connector on the target board.
- Through an HP E2490A analysis probe for MPC505/509 microprocessors, which provides a direct connection to the debug port pins.

NOTE: The HP E2490A analysis probe for MPC505/509 microprocessors does not support the MPC555 microprocessor.

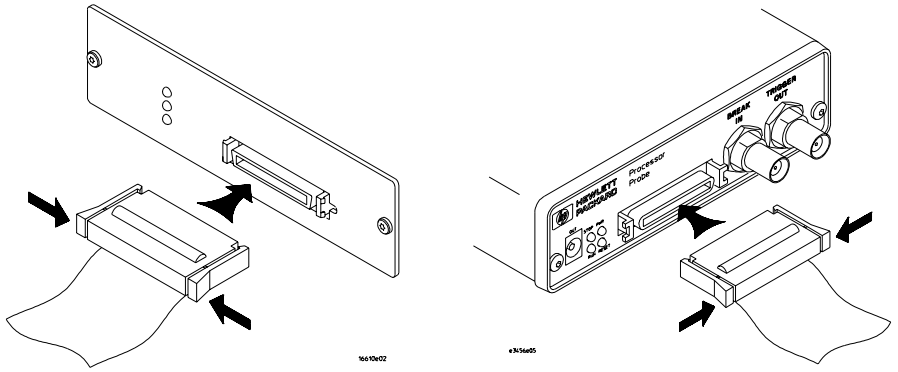
After you have connected the emulation probe/module to your target system, you may need to update the firmware in the emulation module.

See Also For information on designing a debug port on your target board, see "Designing the Target System for an Emulation Probe/Module" on page 64.

To connect to a target system debug port

The emulation probe/module can be connected to a target system through a 10-pin debug port (BDM connector). The emulation module should be connected to a 10-pin male 2x5 header connector on the target system using the 10-conductor cable assembly provided.

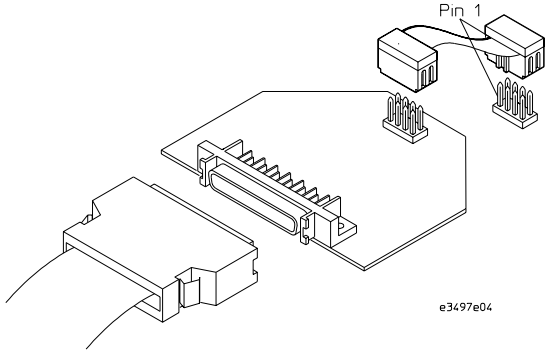
1. Turn off the target system and disconnect it from all power sources.
2. Plug one end of the 50-pin cable into the emulation probe/module.

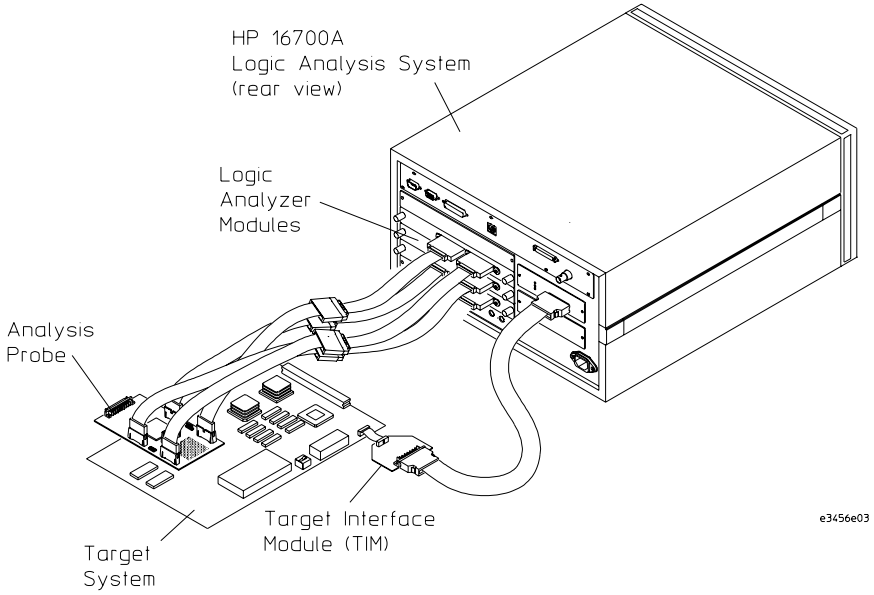


3 Plug the other end of the 50-pin cable into the target interface module.

4 Plug one end of the 10-pin cable into the target interface module.

5 Plug the other end of the 10-pin cable into the debug port connector on the target system.





6 Turn on the power to the logic analysis system and then the target system.

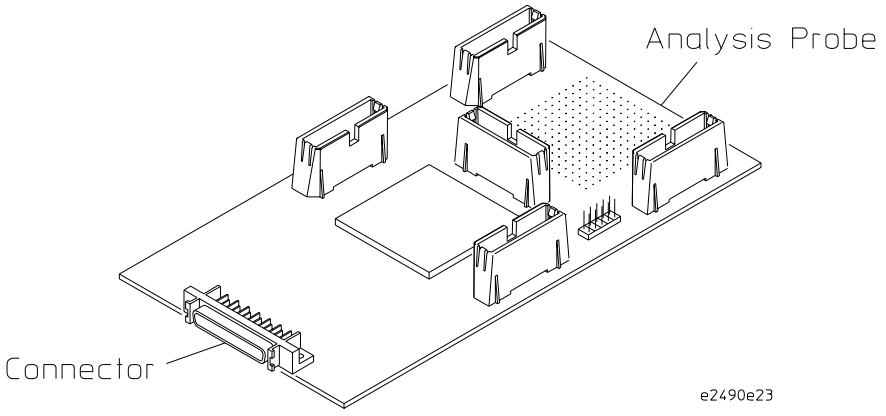
See Also For information on designing a target system for use with the emulation module, see “Designing the Target System for an Emulation Probe/Module” on page 64.

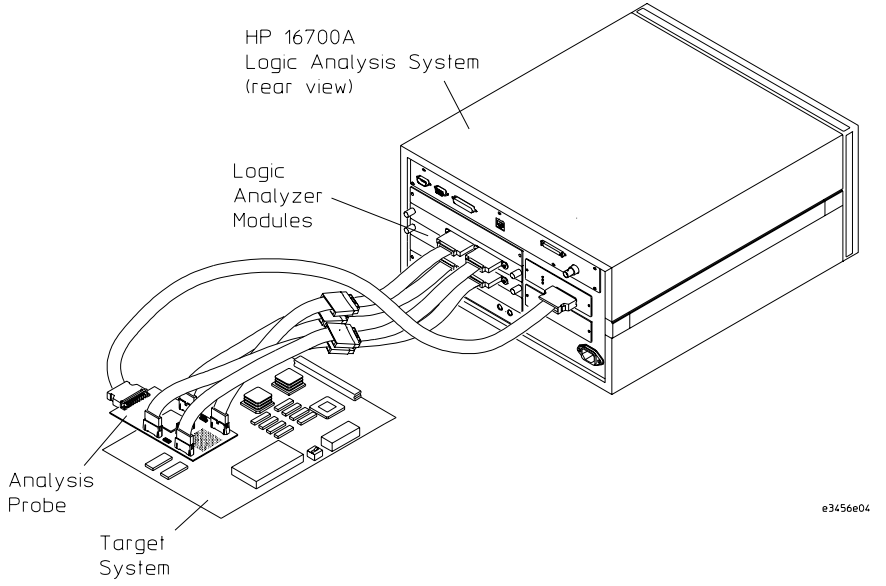
To connect to the analysis probe

1 Remove power from the target system.

2 Plug one end of the 50-pin cable into the emulation probe/ module.

3 Plug the other end of the 50-pin cable into the connector on the analysis probe.

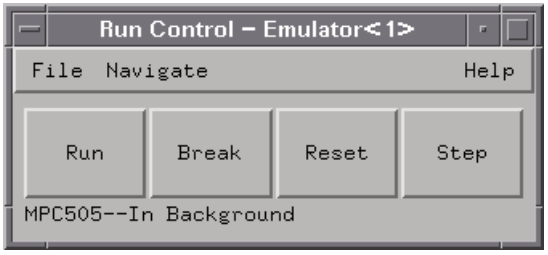

Analysis Probe
Connector
e2490e23


HP 16700A
Logic Analysis System
(rear view)
Logic
Analyzer
Modules
Analysis
Probe
Target
System
e3456e04

To verify communication with the target system

1. Turn on the target system.
2. Start the Emulation Control Interface.

   If the electrical connections are correct, and if the emulator firmware and analysis probe or TIM match your target processor, the Run Control window should be displayed:



4

Configuring the Emulation Probe/ Module

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

Entering Emulation Probe/Module Commands

The easiest way to configure the emulation probe/module is through the Emulation Control Interface in an HP 16600A/16700A-series logic analysis system.

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

Other ways to configure the emulation probe/module are by using:

- The emulation probe/module's built-in terminal interface.
- Your debugger, if it provides an "emulator configuration" window that can be used with this HP emulation module.

To use the Emulation Control Interface

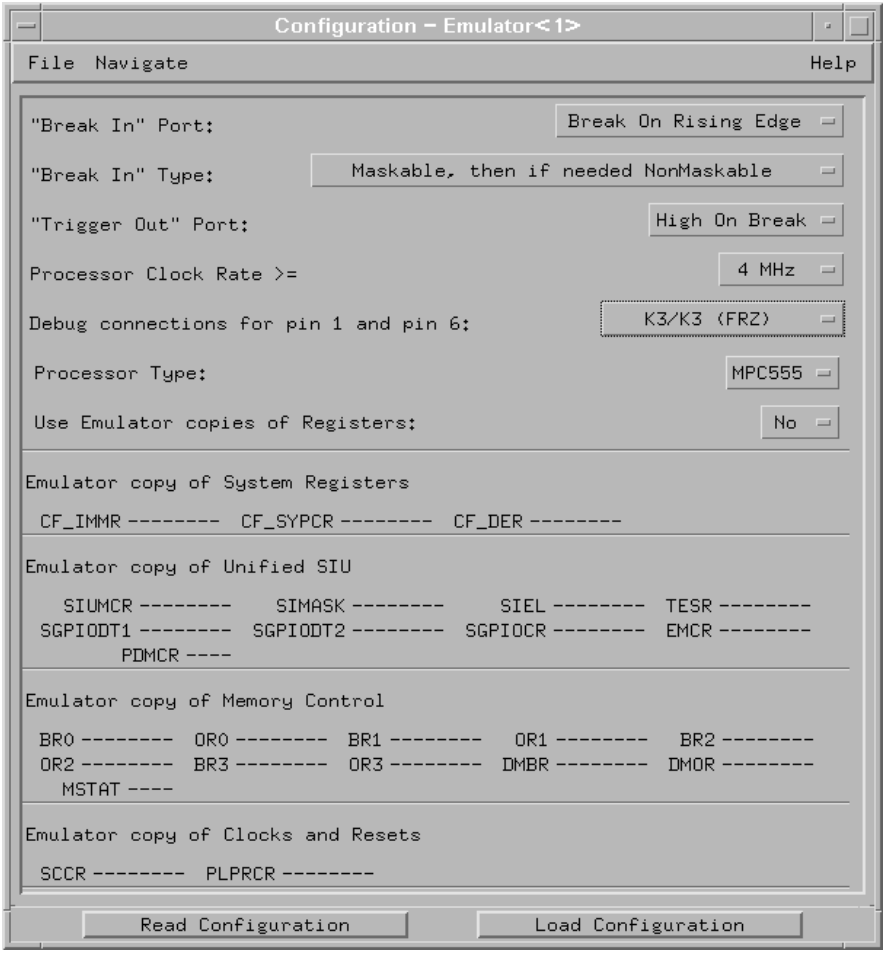
The easiest way to configure the emulation module is to use the Emulation Control Interface.

1 Start an Emulation Control Interface session.

In the system window, click the Emulation Control Interface icon, and then select "Start Session...".

2 Open a Configuration window.

Select "Configuration..." from the Emulation Control Interface icon or from the Navigate menu in any Emulation Control Interface window.



3 Set the configuration options, as needed.

The configuration selections will take effect when you close the configuration window or when you move the mouse pointer outside the window.

4 Save the configuration settings.

To save the configuration settings, open the File Manager window and click Save....

See Also Help->Help on this window in the Configuration window for

information on each of the configuration options.

Help in the Emulation Control Interface menu for help on starting an Emulation Control session.

To use the built-in command interface

If you are unable to configure the emulation probe/module with the Emulation Control Interface or a debugger interface, you can configure the emulation probe/module using the built-in "terminal interface" commands.

1. Connect a telnet session to the emulation probe/module over the LAN.

   For example, to connect to an emulation probe, enter:

   ```
   telnet LAN_address
   ```

   To connect to an emulation module in slot 1, enter:

   ```
   telnet LAN_address 6472
   ```

2. Enter cf to see the current configuration settings.
3. Use the cf command to change the configuration settings.

See Also

Enter help cf for help on the configuration commands.

For information on connecting using telnet, and for information on other built-in commands, see "Built-In Commands" on page 125.

Example

To see a complete list of configuration items, type "help cf". This command displays:

```
cf - display or set emulation configuration

  cf               - display current settings for all config items
  cf <item>        - display current setting for specified <item>
  cf <item>=<value> - set new <value> for specified <item>
  cf <item> <item>=<value> <item> - set and display can be combined

help cf <item> - display long help for specified <item>

--- VALID CONFIGURATION <item> NAMES ---
```

```
  proc     - Set type of target processor
  procck   - Set clock speed of target processor
  dprocck  - Display default clock speed of target processor
  dbgconfig - Define debug pin connection (MPC555 only)
  rstword  - Reset configuration word source (MPC505/509 only)
  bnchardbrk - Set BNC break type
  breakin  - BNC break in control
  rrt      - Set restriction to real time runs
  trigout  - Trigger out control
M>
```

To use a debugger interface

Because the HP emulation probe/module can be used with several third-party debuggers, specific details for sending the configuration commands from the debugger to the emulation module cannot be given here. However, all debuggers should provide a way of directly entering terminal mode commands to the emulation module. Ideally, you would create a file that contains the modified configuration entries to be sent to the emulation module at the beginning of each debugger session.

See Also

Information about specific debuggers in the “Using Debuggers” chapter on page 89.

Your debugger manual.

Setting the MPC5xx Configuration Options

You must configure the processor probe to work with your target system.

The following options can be configured using the Emulation Control Interface or using built-in commands:

- Processor type.
- Processor clock speed.
- Debug port connection type (MPC555 only).
- Reset configuration word source (MPC505/509 only)
- “Break In” type.

The built-in “help cf” command also lists the following options, which are provided only for compatibility with stand-alone emulation probes:

- Trigger Out BNC.
- Trigger In BNC.
- BNC break type.

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

- Restriction to real-time runs.

To configure the processor type

Processor type configuration

Value	Processor probe configured for	Built-in command
MPC505	MPC505	cf proc = MPC505
MPC509	MPC509 (Default)	cf proc = MPC509
MPC555	MPC555	cf proc = MPC555

The cfsave -s command will store this configuration in the processor probe's flash memory. The cfsave -r command will restore this configuration.

To configure the processor clock speed

The BDM communication speed will be 1/3 of the configured processor clock speed. You may set the processor clock speed to a speed lower than the actual clock speed of your target system.

Processor clock speed configuration

Value	Processor clock is at least	Built-in command
25	25 MHz	cf procck = 25
20	20 MHz	cf procck = 20
16	16 MHz	cf procck = 16
8	8 MHz	cf procck = 8
4	4 MHz (default)	cf procck = 4
1	1 MHz	cf procck = 1
512	512 kHz	cf procck = 512
32	32 kHz	cf procck = 32

You can also set the reset clock speed, which controls the BDM communication speed used after a reset, but before the Multiplication Factor in the SCCR is set up:

Reset processor clock speed configuration

Value	Processor clock is at least	Built-in command
25	25 MHz	cf dprocck = 25
4	4 MHz	cf dprocck = 4
32	32 kHz	cf dprocck = 32

To configure the debug port connection type

This configuration option is valid when the processor type has been configured for MPC555.

Debug port connection type configuration

Value	Processor probe configured for	Built-in command
1	Maximum debug capability: Debug port pin 1 = MPIO3/VFLS0 Debug port pin 6 = MPIO4/VFLS1 The emulation probe sets MIOS1TPCR = 0x0003 to enable VFLS[0:1] pins after a reset-> break. Note: reset-> run will not work. See also "MPC555 Debug Port Connector, Option 1" on page 65.	cf dbgconfig = 1
2	Maximum external bus capability (Default): Debug port pin 1 = VFLS0/IWP0 Debug port pin 6 = VFLS1/IWP1 By default, the processor powers up with VFLS[0:1] pin function. See also "MPC555 Debug Port Connector, Option 2" on page 66.	cf dbgconfig = 2
3	Maximum I/O configuration: Debug port pin 1 = SGPIO6/FRZ/PTR Debug port pin 6 = SGPIO6/FRZ/PTR The emulation probe sets bit 13 of SIUMCR to enable the FRZ pin after a reset-> break. Note: reset-> run will not work. See also "MPC555 Debug Port Connector, Option 3" on page 67.	cf dbgconfig = 3

To configure the reset configuration word source

This configuration option is valid when the processor type has been configured for MPC505 or MPC509.

Reset configuration word source		
Value	**Which reset configuration word will be used?**	**Built-in command**
int	Internal.	cf rstword = int
ext	External.	cf rstword = ext

To configure the “Break In” type

This option affects how the emulation module will react to a trigger in an intermodule measurement.

“Break In” type configuration	
Value	**What happens when the emulation module is triggered**
Maskable	A trigger will immediately cause a maskable break. If the maskable break fails, a non-maskable break will be attempted. The delay between an attempted maskable break and the non-maskable break will allow many instructions to be executed. (Default)
NonMaskable	A trigger will immediately cause a non-maskable break. Use this value if you are trying to halt the processor in an interrupt service routine. The processor may not be able to continue running after the break.

To configure the Trigger Out BNC

Trigger out configuration		
Value	**The Trigger Out BNC will**	**Built-in command**
fixhigh	Always be high	cf trigout = fixhigh
fixlow	Always be low	cf trigout = fixlow
monhigh	Go high when the processor is running in background (Default)	cf trigout = monhigh
monlow	Go low when the processor is running in background	cf trigout = monlow

To configure the Trigger In BNC

Trigger in configuration		
Value	**Meaning**	**Built-in command**
off	Inputs to the Break In BNC will be ignored.	cf breakin = off
rising	The processor probe will cause a break on a rising edge. (Default)	cf breakin = rising
falling	The processor probe will cause a break on a falling edge.	cf breakin = falling

To configure the BNC break type

BNC break type configuration		
Value	**Exceptions which halt operation and break to background**	**Built-in command**
no	The appropriate input to the Break In BNC will immediately cause a maskable break. If the maskable break fails, a non-maskable break will be attempted. The delay between an attempted maskable break and the non-maskable break will allow many instructions to be executed. (Default)	cf bnchardbrk = no
yes	The appropriate input to the Break In BNC will immediately cause a non-maskable break. Use this value if you are trying to halt the processor in an interrupt service routine.	cf bnchardbrk = yes

To configure restriction to real-time runs

Real-time runs configuration		
Value	**Processor probe configured for**	**Built-in command**
no	Allows commands which break to the monitor. Examples include commands which display memory or registers. (Default)	cf rrt = no
yes	No commands are allowed which break to the monitor, except “break,” “reset,” “run,” or “step.”	cf rrt = yes

Testing the Emulation Probe/Module and the Target System

After you have connected and configured the emulation probe/module, you should perform some simple tests to verify that everything is working.

See Also

See "Solving Emulation Probe Problems" on page 135 or "Solving Emulation Module Problems" on page 143 for information on testing the emulation probe/module hardware.

To test memory accesses

1. Start the Emulation Control Interface and configure the emulation probe/module, if necessary.
2. Open the Memory window.
3. Write individual locations or fill blocks of memory with patterns of your choosing.

   The access size is the size of memory access that will be used to write or read the memory values.
4. Use the Memory I/O window to stimulate I/O locations by reading and writing individual memory locations.

To test by running a program

To more fully test your target, you can load simple programs and execute them.

1. Compile or assemble a small program and store it in a Motorola S-Record or Intel Hex file.

2. Use the Load Executable window to download the program into RAM or flash memory.
3. Use the Breakpoints window to set breakpoints. Use the Registers window to initialize register values.

   The new register or breakpoint values are sent to the processor when you press the Enter key or when you move the cursor out of the selected register field.
4. In the Run Control window, click Run.
5. Use the Memory Mnemonic window to view the program and use the Memory window to view any output which has been written to memory.

5

Using Debuggers

Several companies sell source debuggers which work with the HP emulation probe/module.

Benefits of Using a Debugger

A debugger lets you:

- control (start and stop) the execution of your microprocessor
- step through your code at the source-code level
- set breakpoints
- single-step through source code
- examine variables
- modify source code variables
- download executable code to your target system

Compatibility with Other Logic Analysis System Tools

You can use your logic analysis system to trace and analyze target system execution while you use your debugger.

If the computer running the debugger is also running X Windows server software, you can display logic analyzer windows next to your debugger windows.

Minimum Requirements

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

- A debugger that is compatible with the emulation probe/module.

  Ask your debugger vendor whether the debugger can be used with an HP emulation probe (which is also known as a “processor probe” or “software probe”) or an HP emulation module.

- A LAN connection between the PC or workstation that is running the debugger and the emulation probe or the HP 16600A/16700A-series logic analysis system (which contains the emulation module).

  Emulation probes or emulation modules communicate with debuggers over the LAN.

- To have the logic analysis system user interface displayed on your PC or workstation screen along with the debugger, your computer needs to be running X Windows server software.

  Most UNIX workstations run X Windows server software, but on a PC you may need to install X Windows server software.

Setting Up Debugger Software

The instructions in this section assume that your PC or workstation is already connected to the LAN and that you have already installed the debugger software according its documentation.

To use your debugger with the emulation probe/module:

1. Install the emulation probe/module (see the "Installing the Emulation Probe" chapter on page 13 or the "Installing the Emulation Module" chapter on page 43).
2. Connect the emulation probe/module to your target system (see the "Connecting to a Target System" chapter on page 63).
3. If you are using the debugger with an emulation module in a logic analysis system, you must connect the logic analysis system to the LAN (see "To connect the logic analysis system to the LAN" on page 59).
4. If you want to display logic analysis system windows next to your debugger windows, export the logic analysis system's display to your PC or workstation (see "To view logic analysis system windows next to the debugger" on page 93).
5. Configure the emulation probe/module (see the "Configuring the Emulation Probe/Module" chapter on page 75).

   If you use the logic analysis system's Emulation Control Interface to configure the emulation probe/module, remember to end the Emulation Control Interface session before you start the debugger.

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

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

6. Begin using your debugger.

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

To change the port number of an emulation probe/module

Some debuggers do not provide a way to specify an emulation probe/module port number. In this case:

- The debugger will always connect to port 6470 (the default port number of an emulation probe, or the port number of the emulation module in slot 1 of an HP 16600A/16700A-series logic analysis system).
- If the port number of the emulation probe/module is not 6470, you must change it.

To change the port number of an emulation probe, see "To configure LAN parameters using the built-in terminal interface" on page 23.

To change the port number of an emulation module, see "To change the port number of an emulation module" on page 60.

To view logic analysis system windows next to the debugger

1. Make sure the computer running the debugger is also running X Windows server software and has telnet software.
2. Give the logic analysis system permission to display on the X Windows server.
3. Connect to the logic analysis system, log in, and start a session, displaying on the X Windows server.

Example, UNIX

On a UNIX workstation:

1. Add the host name of the logic analysis system to the list of systems allowed to make connections:

   ```
   xhost +<IP_address>
   ```

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

   ```
   telnet <IP_address
   ```

3. Log in as “hplogic”.

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

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

Example, PC

On a Windows 95 PC with Reflection X server software from Walker Richer & Quinn, Inc.:

1. On the PC, start the X Windows server software and connect to the logic analysis system.

   To start Reflection X, click the Reflection X Client Startup icon. Enter the following values in the Reflection X Client Startup dialog:

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

   b. In the User Name field, enter “hplogic”.

   c. Leave the Password field blank.

   d. Leave the Command field blank.

   e. Click Run to start the connection.

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

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

Using the Green Hills Debugger

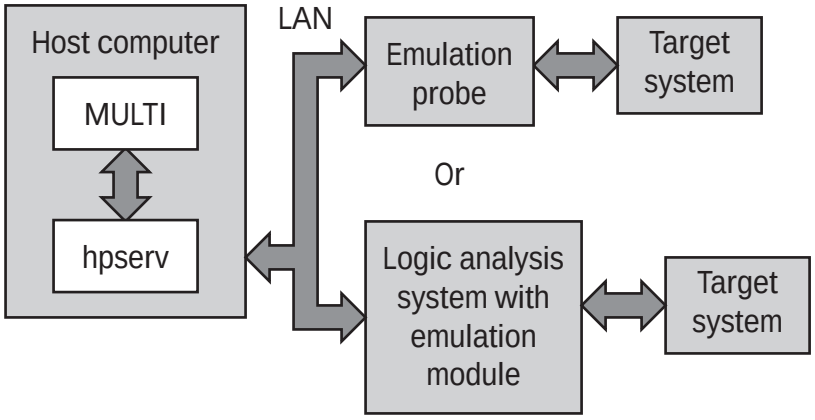
Compatibility

Version 1.8.8.A of the MULTI Development Environment from Green Hills Software, Inc. is one debugger that connects to the HP emulation probe/module.

This information in this section is intended to be used along with the MULTI documentation provided by Green Hills Software.

Overview

MULTI connects to an emulation probe/module through the Green Hills host-resident program (hpserv).



To get started

1 Build the executable.

If you have the demo software shipped with the Green Hills debugger, follow these steps:

a Prepare the executable.

Go to the hpdemo subdirectory where you installed MULTI. Copy the mbx800.lnk file to user.lnk.

You may need to edit the user.lnk file to place the program at a location where target system memory is available.

b Start MULTI.

On Unix, enter “multi”.

On Windows, double-click the Green Hills icon.

c Set up the MULTI software environment:

- Replace the project default.bld (in the Builder dialog box next to the project button) with hpdemo/default.bld and press ENTER.
- Make sure the target button on the MULTI window says “PPC”.
- In the Builder window, double-click ecs.bld.

The box next to the Debug button should display “ecs”. The window should list the names of the source code files.

d In the Builder menu bar, select Options->CPU, then set the processor type.

e In the Builder menu bar, select Options->Advanced, and make sure that “Output DWARF on ELF targets” option is enabled.

f Build the demo program:

- In the Builder window, click the Build icon. (Or, in the menu bar, select Build->Build All.)
- Close the Progress window when the “Build completed” message is displayed.

2 Connect MULTI to the emulation probe/module.

There are two ways to connect to the emulation probe/module:

- In the Remote box in the MULTI Builder window, enter:

```
hpserv IP_address
```

OR

- In the Builder window, click Debug to open the Debugger window; then, in the Debugger window's command pane, enter:

  ```
  remote hpserv IP_address
  ```

Starting hpserv opens two windows: the Target window and the I/O window. Commands entered in the Target window are sent directly to the emulation probe/module.

The I/O window sends input (stdin) to and receives output (stdout) from the target program while it is running.

Note that hpserv connects to the first emulation probe/module (port 6470) in a logic analysis system frame. You may specify another port by using the -p option with hpserv. See "To connect the logic analysis system to the LAN" on page 59 for more information on port numbers.

3 Start the debugger.

If you have not opened the Debugger window yet, click Debug in the Builder window.

4 Configure the emulation probe/module and target system.

Before running the target processor, you must configure the HP emulation probe/module for your target system. For example, you may have to set the BDM clock speed, the reset operation, cache disabling, or other configuration parameters.

If you are unsure of the configuration needed for your emulation probe/module, you can use one of the following methods to explore the configuration options and configure the emulation probe/module and target system:

- Enter "cf" commands in the Target window.
- Use the Configuration window in the logic analysis system's Emulation Control Interface.
- Use an initialization script.

See "To configure using an initialization script" on page 98 for information on saving the configuration commands in a script.

5 Specify an initialization address for the stack pointer.

This is required if the stack pointer is neither initialized when the processor is reset nor set in the start-up code generated by the compiler. If the stack pointer address needs to be initialized:

- In the debugger's command pane, enter:

```
_INIT_SP = <address>
```

OR

- In the Target window, enter:

```
reg r1=<address>
```

OR

- Include the following line in an initialization script:

```
target reg r1= <address>
```

6 Download the code:

In the Debugger window, select Remote->LoadProgram.

The Debugger command pane indicates that the code has been downloaded to the target.

To configure using an initialization script

You can use an initialization script to configure the emulation probe/ module and set up your target system. If you will always be using the same configuration, this way will save time and reduce errors.

1 Save the configuration commands in a text file, one command per line.

Green Hills also provides an example initialization sequence in the file MBX800.rc in the “hpdemo” directory.

2 To run the script, enter the following command in the Debugger

command pane:

```
< filename
```

Example

Create a file with the following lines:

```
remote hpserv hplogic1
target cf proc=MPC505
_INIT_SP=0x10000
```

Save the file in the MULTI startup directory and name it hpserv.rc. To run the script, enter the following command in the Debugger command pane:

```
<hpserv.rc
```

When run, this script will:

- Connect to the target through the emulation probe/module in a logic analysis system frame called “hplogic1”.
- Set the processor type to MPC505.
- Initialize the stack pointer.

To perform common debugger tasks

- To display registers, click the regs button in the Display window.
- To set a breakpoint, right-click on the source code line where the breakpoint is to be located.
- To clear a breakpoint, right-click again on the source line.
- To step through code, click next.
- To run from the current PC, click go.
- To toggle the display between source code and source code interlaced with assembly code, click assem.
- To load program symbols, reset the PC, reset the stack pointer,

and run from the start, click restart.

To send commands to the emulation probe/module

MULTI communicates with the emulation probe/module using the emulation probe/module's "terminal interface" commands. MULTI automatically generates and sends the commands required for normal operation.

If you want to communicate directly with the emulation probe/module during a debug session, you may do so using "terminal interface" commands through the Target window (which comes up when hpserv is brought up).

You can also enter terminal interface commands from the Debugger window's command pane by preceding the command with the "target" command.

To view commands sent by MULTI to the emulation probe/module

The communication between MULTI and the emulation probe/module can be viewed by running hpserv in a logging mode:

```
remote hpserv -dc -a -o <filename> <emulation probe/
module name>
```

The options -dc and -da log both asynchronous and console messages and the -o <filename> directs these messages to a log file called <filename>. When using this option, disconnect from hpserv (to flush out the file) and then you may view <filename> to see what commands MULTI sent to the emulation probe/module.

NOTE: Logging commands in this way may result in a VERY large file. Beware of the disk space it may require.

To reinitialize the system

If you suspect that the emulation probe/module is out of sync with the MULTI debugger, you may want to reinitialize it. Perform the steps below to accomplish reinitialization:

1. In the Target window, type:

   ```
   init -c
   ```

2. Repeat steps 4 through 7 in “To get started” on page 95 to configure the emulation probe/module.

To disconnect from the emulation probe/ module

- In the Debugger window, select Remote->Disconnect.

  The Debugger command pane indicates that the debugger has disconnected from the emulation probe/module.

Error conditions

“!ERROR 800! Invalid command: bcast”

This message usually means that there is no target interface module (TIM) connected to the emulation probe/module or that the emulation probe/module does not have firmware for the MPC500 family.

1. Verify that the emulation probe/module is connected to the target.
2. Next, check that your emulation probe/module is programmed with firmware for the Motorola MPC500:

   For an emulation probe, see “To display current firmware version information” on page 40. If the emulation probe is not programmed with the proper firmware, see “To update firmware for an emulation probe” on page 40.

For an emulation module, see “To display current firmware version information” on page 56. If the emulation module is not programmed with the proper firmware, see “To update firmware using the Emulation Control Interface” on page 56.

“command socket connection failed: WSAECONNREFUSED: connection refused”

This message usually means the emulation probe/module is not at port #6470 on the logic analysis system.

See Also

Green Hills MULTI Software Development Environment User’s Guide.

Using MULTI with the Hewlett-Packard Processor Probe from Green Hills Software, Inc.

The Green Hills web site: http://www.ghs.com

See the “Configuring the Emulation Probe/Module” chapter on page 75 for more information on configuration options and the “cf” command.

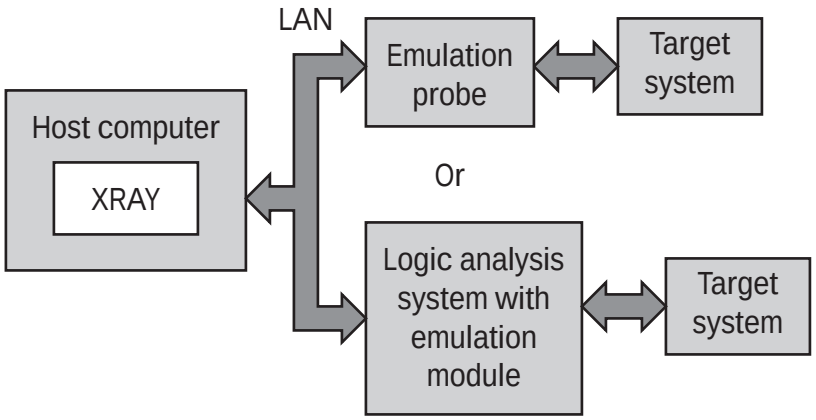
Using the Microtec Research Debugger

Compatibility

Version 4.1 of the XRAY HP Probe debugger from Microtec Research, a Mentor Graphics Company, is another debugger that connects to the HP emulation probe/module.

This information in this section is intended to be used along with the XRAY documentation provided by Microtec Research.

Overview



To get started

1 Edit the gtw.brd file.

The file gtw.brd includes example hostnames, port numbers and initialization information for HP emulation probes/modules that might be on the network for XRAY to connect to. The gtw.brd file is in the “etc” directory under the Microtec tools directory.

a Modify gtw.brd to identify the emulation probe/module.

Modify the file to include the emulation probe/module that you want XRAY to communicate with.

See “To connect the logic analysis system to the LAN” on page 59 for information on which port number to use for your emulation module.

b Add commands to initialize the target system.

The target system must have various memory locations initialized before it can access RAM and before XRAY can download an application. Normally, code in the target's boot ROM performs this initialization. However, when XRAY resets the target, it immediately places the processor in debug mode. Therefore, any initialization code which may exist on the target board will not have been executed.

XRAY provides a way for target initialization to occur through the gtw.brd file. The initialization sequences (contained in “{}” pairs) included in the gtw.brd commands specify the commands that will be sent to the HP emulation probe/module to initialize it and prepare it for code download.

- The gtwinit command sequence defined in the gtw.brd file is sent to the HP emulation probe/module when XRAY is establishing connection with the probe/module.
- The gtwreset command sequence is sent to the emulation probe/module when the XRAY “Reset” command is invoked.

The example gtw.brd file provided by Microtec Research contains initialization sequences which can be referenced. If the configuration for your target board is very involved, you can use the “gtwinit” definition in gtw.brd to merely reset the processor and break and use an include file to do the many configuration steps. Please refer to “To configure the emulation probe/module using an INCLUDE file” on page 106 for more information on using an include file.

If you are unsure of the configuration needed for your emulation probe/module, you can telnet to the emulation module or use the Configuraton window in the logic analysis system's Emulation Control Interface to explore the configuration options. If you use this interface to actually configure your emulation probe/module while connected to XRAY, configuration will be complete and you can proceed to the next step.

NOTE: You must start up XRAY from scratch after gtw.brd is modified for the changes you have made in gtw.brd to be recognized by XRAY.

2 Start XRAY.

After modifying gtw.brd, bring up the XRAY debugger. When XRAY comes up, the Managers dialog will be highlighted. (If the dialog is not present, the Managers dialog can be brought up from the Output Logging Window by selecting Managers->Connection Manager).

Using the Managers dialog, set up the connection to your HP emulation probe/module by selecting the Connect tab, clicking on your emulation probe/module name in the lower Available Connections table and click on the connect button. You should see your emulation probe/module name appear in the Active Connections table in the top half of the dialog. At this point, you are connected to the emulation probe/module and the initialization commands specified in the gtw.brd file have been sent to your emulation probe/module. If you look in the Output Logging Window, you can verify that the connection and initialization did in fact take place.

3 Download the application code.

In the Managers dialog, select the Debug tab, then select Execution->Load File to Target or Control->Load File to Target. This will open the “Load File To Target” dialog. (Alternatively, you may select the Files tab and select Load->Load File to Target.)

Use the Load File To Target dialog to choose the file you would like to download. When the file you want is listed in the center window, you may double click on it to start the load.

When the load is complete, you will see the file you loaded appear in the Active Files window of the File tab and in the Active Processes window of the Debug tab. You are now ready to debug your application code.

To configure the emulation probe/module using an INCLUDE file

You can use an include file to configure the emulation probe/module and set up your target system after bringing up the XRAY debugger. If a complex configuration is needed for your emulation probe/module and target (such as multi-commands sent to the emulation probe/module) this will save time and reduce errors.

1. Save the configuration commands in a text file, one command per line. Microtec Research provides an example include file in its tools directory under the xhippchp directory in the file “mo8xxads.inc”.
2. To run the include file, select “Include Commands from File” under the Debug menu in the Code window and double click on the include filename you want to execute.

To perform common debugger tasks

- To display registers, select Register under the Windows menu in the Code window.
- To set a breakpoint, double-click on the source code line where the breakpoint is to be located.
- To clear a breakpoint, double-click on the line where the breakpoint is set.
- To step through code, select one of the step icons at the top of the Code window.
- To run from current PC, click on the first icon in the Code window.
- To toggle the display between source code and source code interlaced with assembly code, click on the Dsm button at the

bottom of the code display window.

- To load program symbols, reset the PC, reset the stack pointer, and run from start, click restart.

To send commands to the emulation probe/ module

"Terminal interface" commands may be sent directly to the emulation probe/module from XRAY. There are two ways to do this:

- Using an include file (as explained in the "Using an INCLUDE file to configure the emulation probe/module and target" section)

  OR

- Using the XRAY "cf" command.

  This command takes a string as a parameter and sends it to the emulation probe/module. For example, if you want to send the emulation probe/module command cf proc=MPC505, you can type

  ```
  cf "proc=MPC505"
  ```

  in the XRAY Debugger command line.

  Note that the command must be surrounded by double quotes.

To view commands sent by XRAY

XRAY communicates with the emulation probe/module using the emulation probe/module's "terminal interface" commands. XRAY automatically generates and sends the commands required for normal operation. The communication between XRAY and the emulation probe/module can be logged to a file after a connection has been established between XRAY and the emulation probe/module and viewed later. To enable logging, enter the command:

```
PROBEMESSAGE ON,msgfile
```

This will create the “msgfile” and log a summary of the messages that occur between XRAY and the emulation probe/module to it. The logging can be turned off with the following command:

```
PROBEMESSAGE OFF
```

To disconnect from the emulation probe/ module and target

In the Managers window, select the Connect tab. Click on the emulation probe/module name that you want to disconnect. Under the Control menu, select “Disconnect from Board” (or you can “Reconnect to Board” if you have lost connection to the emulation probe/module).

Error conditions

“!ERROR 800! Invalid command: bcast”

This message usually means that there is no target interface probe/ module (TIM) connected to the emulation probe/module or the emulation probe/module does not have firmware for the MPC500 family.

1. Verify that the emulation probe/module is connected to the target.
2. Next, check that your emulation probe/module is programmed with firmware for the Motorola MPC500:

   For an emulation probe, see “To display current firmware version information” on page 40. If the emulation probe is not programmed with the proper firmware, see “To update firmware for an emulation probe” on page 40.

   For an emulation module, see “To display current firmware version information” on page 56. If the emulation module is not programmed with the proper firmware, see “To update firmware using the Emulation Control Interface” on page 56.

"command socket connection failed: WSAECONNREFUSED: connection refused"

This message usually means the emulation probe/module is not at port #6470 on the logic analysis system.

See Also

The Microtec Research web site: http://www.mentorg.com/microtec

The *XRAY Debugger Reference Manual* by Microtec Research.

See the "Configuring the Emulation Probe/Module" chapter on page 75 for more information on configuration options and the "cf" command.

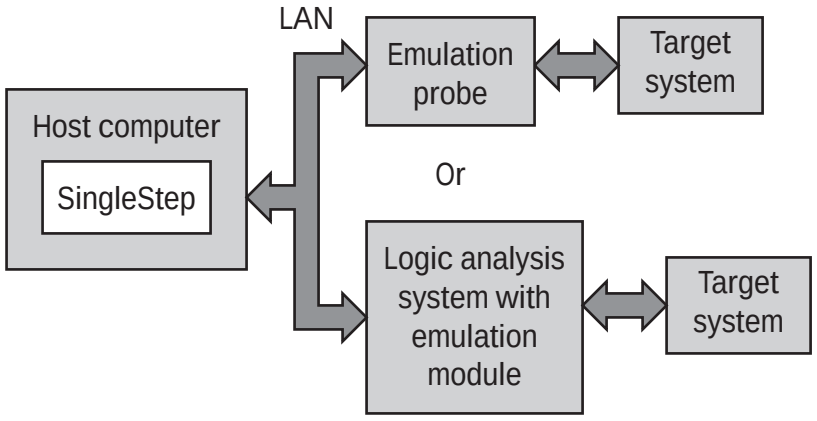
Using the Software Development Systems Debugger

Compatibility

Version 7.3 of the SingleStep debugger from Software Development Systems, Inc. is another debugger that connects to the HP emulation probe/module.

The information in this section is intended to be used along with the SingleStep documentation provided by SDS.

Overview



Startup Behavior

The following actions are performed at the start of a session and when you select File->Debug:

- If the reset target option is selected, the target is reset.
- Hardware breakpoints are disabled.
- Software breakpoints are enabled.
- All breakpoints are cleared.

- main() _exit breakpoints are set, if that option is selected.

To get started

1 Connect to the emulation probe/module:

a Start SingleStep running on your PC or workstation.

b When the small Debug dialog box appears in the middle of the screen, click the Connection tab and then enter the IP address of the HP logic analysis system which contains the emulation probe/module.

If the Debug dialog box is not visible, select File->Debug.

NOTE: SingleStep is hard-coded to connect to the emulation probe/module at port 6470. See "To change the port number of an emulation probe/module" on page 93 for more information on port numbers.

2 Configure the emulation probe/module with the processor clock speed.

In the Debug dialog box, click the Connection tab and then enter a Processor Clock speed which is less than or equal to the speed at which the processor will run out of reset.

The emulation probe/module must know the target clock speed before it can communicate with the target. This value depends on the oscillator or crystal used on your target system and the multipliers applicable at reset. The communications speed can be changed (see "Download performance" on page 114) but will be reset to this value each time SingleStep resets the processor.

3 Initialize the target system.

The target system must have various registers and memory locations initialized before it can access RAM and before SingleStep can download an application. Normally, code in the target's boot ROM performs this initialization. However, when SingleStep resets the target, it immediately places the processor in debug mode. Any

initialization code which may exist on the target board has not been run.

SingleStep provides a way for target initialization to occur without running application code through the use of the Target Configuration tab in the “Debug” dialog box.

An alternate way of performing target initialization is by using the _config alias. _config is used to define a list of commands that will be used to initialize the target after a reset. The _config alias should be defined in the sstep.ini file (in the “cmd” directory).

The “Debug” dialog method and the sstep.ini method are mutually exclusive. Use one or the other, but not both.

Initialization of the target will not actually occur until the “Debug” dialog is successfully exited.

4 Set up the Loading and Execution options in the Options tab of the Debug dialog.

5 Download the application and run:

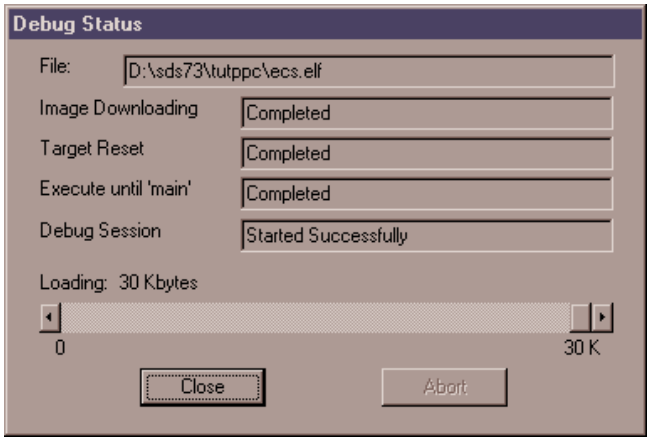
Select the File tab and enter the application file name. Exit the “Debug” dialog box by clicking OK.

Emulation probe/module initialization and target initialization occur every time the “Debug” dialog is terminated via the OK button. A summary of the actions taken by SingleStep is given here:

- Initialize the emulation probe/module with the communication speed specified in the “Debug” dialog.
- If “load image” was selected, download the application and set the PC based on object module file contents.
- If “reset target” was selected, execute the commands specified by the _reset alias. The _reset alias should be used to specify commands that are specific to initializing the processor. It is executed each time the processor is reset. The value of the _reset alias can be viewed by issuing a “alias _reset” from the command window.
- Execute the commands specified by the _config alias. The _config alias should be used to specify commands that are specific to initializing (configuring) the target system. It is executed each time the processor is

reset and each time the debug dialog is exited. The value of the _config alias can be viewed by issuing an “alias _config” from the command window.

- If “execute until main” was selected, set a breakpoint at main() and run.



To send commands to the emulation probe/ module

To view commands sent by SingleStep

SingleStep communicates to the emulation probe/module using the emulation probe/module’s “terminal interface” commands. SingleStep automatically generates and sends the commands required for normal operation. This communication between SingleStep and the emulation probe/module can be observed by entering the following command in the SingleStep command window:

```
control -ms
```

To send commands

“Terminal interface” commands may be sent directly to the emulation probe/ module from the SingleStep command window or included in SingleStep’s .cfg or .dbg command files.

Commands should be enclosed in double quotes and given the prefix: Ctrl-c.

Examples

To see the speed that the emulation probe/module is using to communicate with the target system you would issue the following command in the SingleStep command window:

```
control -c "cf procck"
```

To change the speed to match a 25MHz processor clock you would issue the following command in the command window:

```
control -c "cf procck=25"
```

For more information about “terminal interface” commands see “Built-In Commands” on page 125.

Download performance

Downloads are fastest when the emulation probe/module speed is set to match that of the target processor.

The initial speed that the emulation probe/module uses to communicate with the target processor is set by the Processor clock item in the Connection tab of the “Debug” dialog.

You are responsible for specifying this speed to be less than or equal to the initial, reset speed of the processor. Usually a setting in the Target Configuration tab of the Debug dialog or a command in the _config alias will raise the speed of the processor above its initial, reset value.

For maximum download performance, the command to increase the target processor speed should be followed by a command to increase the speed of the emulation probe/module communication.

Example

The mpc505.cfg file contains the following command which writes to the SCCR register to set the processor speed to 28 MHz (assumes a 4 MHz crystal).

```
write -l 0x8007fc50 = 0x041800000
```

The following command, which increases the emulation probe/module communication speed, should be placed immediately after the write command shown above.

```
control -c "cf procck=25"
```

On-chip breakpoints and debugging ROM code

The MPC500 has a built-in hardware breakpoint capability. When SingleStep steps one source line or sets a user defined breakpoint, it will first try to use a software breakpoint. If the breakpoint does not work because the breakpoint address is located in ROM, SingleStep will automatically attempt to use one of the available hardware breakpoints. For more information, see the SingleStep release notes.

To debug ROM based code, unselect “Load Application Image” in the options tab of the “Debug” dialog.

Error conditions

“!ERROR 800! Invalid command: bcast”

This message usually means that there is not a target interface module (TIM) connected to the emulation probe/module or the emulation probe/module does not have firmware for the MPC500 family.

1. Verify that the emulation probe/module is connected to the target.
2. Next, check that your emulation probe/module is programmed with firmware for the Motorola MPC500:

   For an emulation probe, see “To display current firmware version information” on page 40. If the emulation probe is not programmed with the proper firmware, see “To update firmware for an emulation probe” on page 40.

   For an emulation module, see “To display current firmware version information” on page 56. If the emulation module is not programmed with the proper firmware, see “To update firmware using the Emulation Control

Interface" on page 56.

"command socket connection failed: WSAECONNREFUSED: connection refused"

This message usually means the emulation probe/module is not at port #6470. See "To change the port number of an emulation probe/module" on page 93.

"unrecognized hostname"

This message usually means that the debugger is unable to establish communication with the emulator.

- Verify communication to the emulation probe/module by doing a ping to the emulation probe or to the logic analysis system.

  If you are unable to ping the emulator probe or logic analysis system, refer to "Solving LAN Communication Problems" on page 31 or the logic analysis system on-line help, respectively, for more information.

See Also

The SDS web site: http://www.sdsi.com

The *SDS SingleStep Users Guide*.

See the "Configuring the Emulation Probe/Module" chapter on page 75 for more information on configuration options and the "cf" command.

6

Solving Problems

If you have problems with the emulation probe/module, 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/module and your debugger (PC or UNIX workstation) or the connection between the emulation probe and the logic analyzer.
- The emulation probe/module itself.
- The connection between the emulation probe/module and the target interface module.
- The connection between the target interface module and the target system.
- The target system.

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

- The troubleshooting guide on the next page.
- The status lights on the emulation probe/module.
- The emulation probe/module "performance verification" tests.
- The emulation probe/module's built-in "terminal interface" commands.

Troubleshooting Guide

Common emulation probe problems and what to do about them

Symptom	What to do	See also
Host computer reports LAN connection problems	Follow the checklist in the "If you have LAN problems" section.	page 31
Commands from the Emulation Control Interface or debugger have no effect	1 Verify LAN communication.	page 29
	2 Check that you are using the correct firmware for your chip.	page 40
	3 Use a telnet connection (or serial connection) to try a few built-in commands. If this works, your debugger may not be configured properly. If this does not work, continue with the next procedure...	page 125
Emulation probe built-in commands do not work	1 Check that the emulator has been properly configured for your target system.	page 75
	2 Run the emulator performance verification tests.	page 143
	3 If the performance verification tests pass, then there is an electrical problem with the connection to the target processor OR the target system may not have been designed according to "Designing a Target System."	page 64
"Slow or missing clock" message after a logic analyzer run	Check that the target system is running user code.	
Some commands fail	Check the "restrict to real-time runs" configuration	page 86

Common emulation module problems and what to do about them

Symptom	What to do	See also
Commands from the Emulation Control Interface have no effect	Check that you are using the correct firmware.	
Commands from debugger have no effect	Use the Emulation Control Interface to try a few built-in commands. If this works, your debugger may not be configured properly. If this does not work, continue with the steps for the next symptom....	page 125
Emulation module built-in commands do not work	1 Check that the emulation module has been properly configured for your target system.	page 75
	2 Run the emulation module performance verification tests.	page 143
	3 If the performance verification tests pass, then there is an electrical problem with the connection to the target processor OR the target system may not have been designed according to "Designing a Target System."	page 64, page 128
"Slow or missing clock" message after a logic analyzer run	Check that the target system is running user code or is in reset. (This message can appear if the processor is in background mode.)	
"Slow clock" message in the Emulation Control Interface or "c>" prompt in the built-in terminal interface	Check that the clock rate is properly configured.	page 82
Some commands fail	Check the "restrict to real-time runs" configuration.	page 86

Status Lights

The emulation probe and the emulation module use status lights to communicate various modes and error conditions.

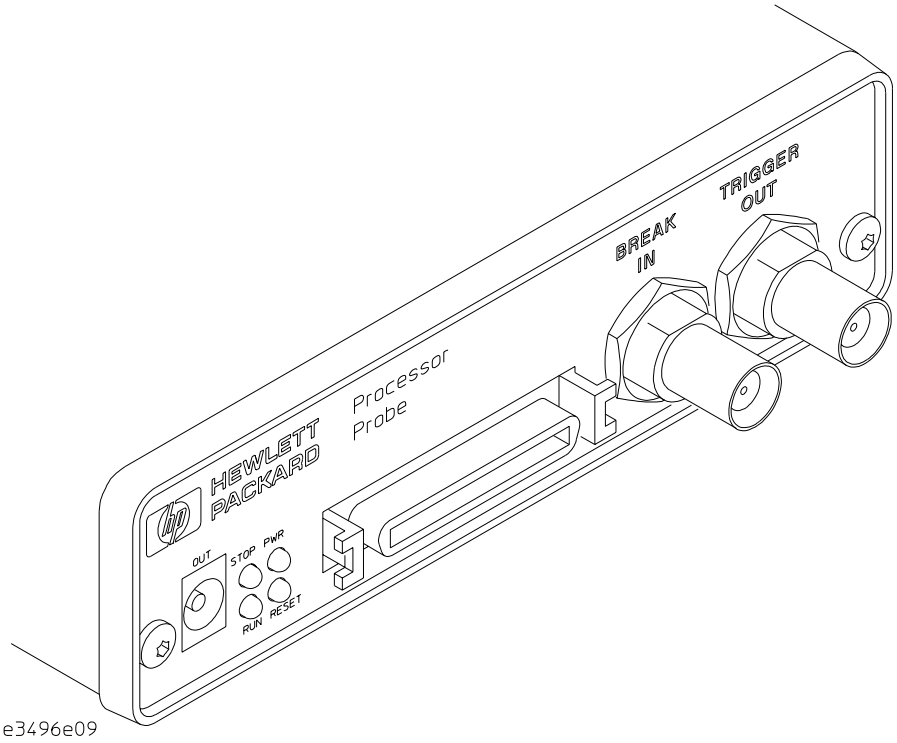
The following table gives more information about the meaning of the power and target status lights.

❍ = LED is off
● = LED is on
✳ = Not applicable (LED is off or on)

Emulation Probe Status Lights

Power/Target Status Lights	
Pwr/Target LEDs	**Meaning**
❍❍ ❍❍	Emulation probe is not connected to power supply
❍● ❍❍	No target system power, or emulator is not connected to the target system
❍● ❍●	Target system is in a reset state
●● ●❍	Only boot firmware is good (other firmware has been corrupted)
●● ❍❍	The target processor is in debug mode
❍● ●❍	The target processor is executing user code
●● ●●	The target processor is in an unknown state

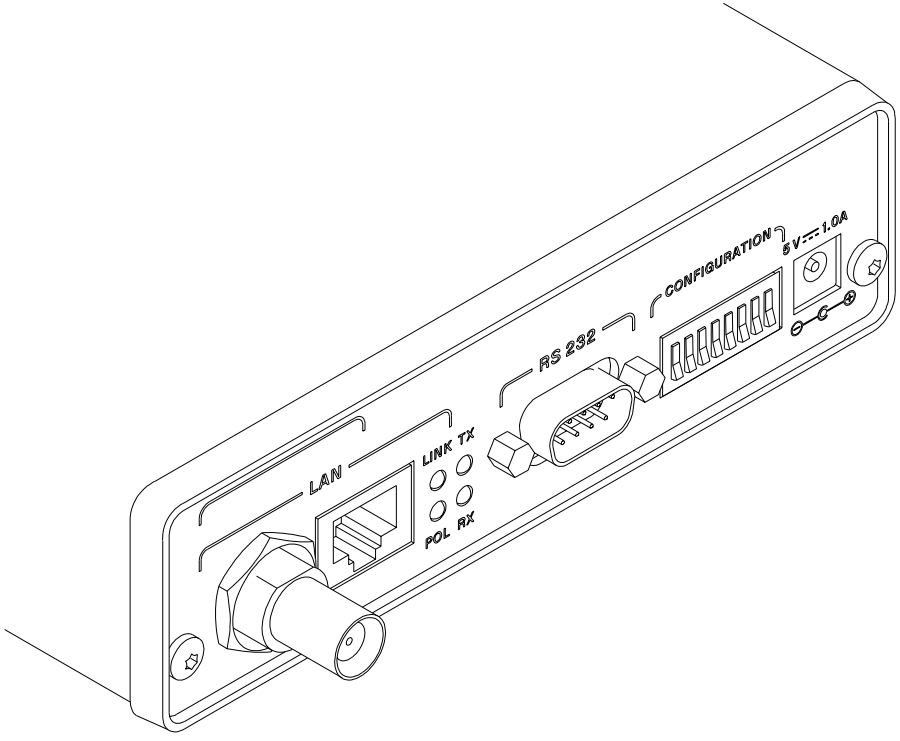
Emulation Probe Target/Power LEDs



e3496e09

Power/Target LED Description	
LED	**Description**
STOP	Lit when the target processor is running in debug mode
PWR	Lit when the power supply is properly connected to the emulation probe
RUN	Lit when the target processor is running in normal (user program) mode
RESET	Lit when the target system is in a reset state

Emulation Probe LAN LEDs



LAN LED Description	
LED	**Description**
LINK	Lit when 10BASE-T connection has a good link; not used for 10BASE2
TX	Lit when LAN data is being transmitted
POL	Lit when the polarity on the receive twisted pair is reversed for a 10BASE-T connection
RX	Lit when LAN data is being received

Emulation Module Status Lights

Power/Target Status Lights	
Pwr/Target LEDs	**Meaning**
❍ Reset ❍ Break ❍ Run	No target system power, or emulation module is not connected to the target system
● Reset ❍ Break ❍ Run	Target system is in a reset state
❍ Reset ● Break ❍ Run	The target processor is executing in Debug Mode
❍ Reset ❍ Break ● Run	The target processor is executing user code
❍ Reset ● Break ● Run	Only boot firmware is good (other firmware has been corrupted)

Built-In Commands

The emulation probe/module has some built-in "terminal interface" commands which you can use for troubleshooting.

You can access the terminal interface using:

- A telnet (LAN) connection.
- The Command Line window in the Emulation Control Interface.
- A "debugger command" window in your debugger.
- A serial port connection (emulation probe only, see "Connecting a Terminal to the Emulation Probe's Serial Port" on page 34.)

To telnet to the emulation probe/module

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

- A host computer and the emulation probe or the logic analysis system containing the emulation module 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 port number of the emulation probe/module.

The default port number of an emulation probe is 6470. Because there is only one port in an emulation probe, you don't have to include the port number in the telnet command.

The default port number of the first emulation module in an HP 16600A/16700A-series logic analysis system is 6472. The default port of a second emulation module is 6476. The default port numbers of a third and fourth module in an expansion frame are 6480 and 6484. These port numbers can be changed, but that is rarely necessary.

2 Find out the IP address or hostname of the emulation probe or the logic analysis system containing the emulation module.

3 Start the telnet program.

For example, if the hostname of the emulator probe is “emprobe”, the command might look like this:

```
telnet emprobe
```

Or, for example, if the hostname of the logic analysis system is “test2” and you have only one emulation module installed, the command might look like this:

```
telnet test2 6472
```

4 If you do not see a prompt, press the Return key a few times.

To exit from this telnet session, type Ctrl-d at the prompt.

To use the built-in commands

Here are a few commonly used built-in commands:

Useful built-in commands	
b	Break—go into the background monitor state
cf	Configuration—read or write configuration options
help	Help—display on-line help for built-in commands
init	Initialize—init -c re-initializes everything in the emulation probe/module except for the LAN software; init -p is the equivalent of cycling power (it will break LAN connections)
lan	configure LAN address (emulation probes only)
m	Memory—read or write memory
reg	Register—read or write a register
r	Run—start running user code
rep	Repeat—repeat a command or group of commands
rst	Reset—reset the target processor (the emulation probe/module will wait for you to press the target’s RESET button)
s	Step—do a low-level single step
ver	Version—display the product number and firmware version of the emulation probe/module

The prompt indicates the status of the emulation probe/module:

Emulation probe/module prompts	
U	Running user program
M	Running in background monitor
p	No target power
R	Emulation reset
r	Target reset
?	Unknown state

Examples

To set register R0, then view R0 to verify that it was set, enter:

```
R>rst -m
M>reg r0=ffff
M>reg r0
  reg R0=0000ffff
```

To break execution then step a single instruction, enter:

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

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

```
M>ver
```

See Also

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

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

Solving Target System Problems

This section describes how to determine whether your target system is causing problems with the operation of the emulation module.

What to check first

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

```
U>rst
R>
```

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

```
R>b
M>
```

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

```
M>reg r1
  reg r1=00000000
M>
```

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

```
M>m 0..
  00000000 7c3043a6 7c2802a6 7c3143a6 4bf04111
  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>
```

This should display memory values starting at address 0.

```
M>s
```

This should execute one instruction at the current program counter.

NOTE: Note that stepping can fail if memory at the current PC does not contain a valid instruction.

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 module.

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

```
M>ver
```

See Also "Built-In Commands" on page 125 for information on entering built-in commands.

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/module to your target system.

2 Set the default configuration settings. Enter:

```
M>init -c
```

You can enter this command at any prompt. The emulation module will

respond with the same information as printed by the “ver” command.

If the response is “!ERROR 905! Driver firmware is incompatible with ID of attached device”	Make sure the target interface module is connected to the cable of the emulation module, then try the “init -c” command again.
If the initial prompt is “p>”	Check pin 9 on header, 3.3V (V_{OD}).
If the initial prompt is “M>”	The processor entered debug mode without the help of the emulation module. Is another debugger connected?
If the initial prompt is “U>”	The emulation module is scanning the instruction register correctly.

Now you can do some more tests:

3 Enter the reset command:

```
U>rst
R>
```

The “R>” prompt is a good response that indicates SRESET and HRESET are working.

If interrupts are non-recoverable

❑ Check that interrupt service routines (ISRs) in the target code meet the requirements listed in the PowerPC documentation.

For proper debugging in ISRs, the PowerPC documentation specifies that the exception handlers must do the following:

- As an epilogue to the ISR:
  - Save the SRR0, SRR1, DAR, DSISR registers.
  - Set the RI bit in the MSR (Machine State Register.Recoverable Interrupt Bit).
- As a prologue to the ISR:

- Restore the SRR0, SRR1, DAR, DSISR registers.
- Issue an RFI (Return from Interrupt) instruction.

Upon entering the ISR, the processor clears the MSR.RI bit, and copies the IP (Instruction Pointer)->SRR0 and the MSR->SRR1. The SRR0 and SRR1 are the save and restore registers. These contain the information needed to return to the state prior to the interrupt.

The RI bit will prevent the processor from breaking into debug mode with a maskable debug port breakpoint. A non-maskable breakpoint is required to break the processor when the RI bit is cleared, resulting in a possible non-recoverable state.

Software breakpoints place a “Trap” instruction into the breakpoint address. If the trap instruction is executed within an ISR, a break to background mode will occur. This causes the SRR0 and SRR1 registers to be written over, causing a non-recoverable state. If the exception handler saves these registers, and sets the MSR.RI bit, the software breakpoint will always be recoverable.

If hardware breakpoints have no effect

Hardware breakpoints by default will not break the processor if they are set within an exception handler which has not saved the SRR's and set the MSR.RI bit. However, these can quite easily be reprogrammed to assert a non-maskable break. Note that the breakpoint will halt the processor, but will cause a non-recoverable state.

To reprogram the hardware breakpoint to assert a non-maskable break:

```
M>bc -e hwbp
M>reg lctrl2
  reg lctrl2=02018000
M>reg lctrl2=02018800 # OR in 0x00000800 with previous value
```

Hardware breakpoints will now cause a non-maskable break, which will halt the processor regardless of the status of the MSR.RI bit. Again, note that in this case the break will be non-recoverable if the exception handler has not saved the SRR's.

If the target resets itself

The most common plug-in issue is the target resetting itself. If the PC is set to some initial location, and then a short time later, the PC=100 or PC=fff00100, the target is resetting itself. In most cases, the chip is causing the reset, not the target hardware.

There are a number of possible causes of the reset. To determine the cause of reset, read the RSR (Reset Status Register):

```
M>m -a2 -d2 288@reg # telnet command which reads the RSR
```

The bits in this register show the cause of the reset:

RSR Bit Encoding

Bit	Cause of reset	Explanation
0 (MSB)	External Hard Reset	The emulation module actually uses an external reset when resetting the target.
1	External Soft Reset	
2	Loss of Lock	Caused when the PLL loses the phase lock on the external clock source.
3	SW Watchdog	Make sure the SYPCR register disables the watchdog timer. R > reg cf_sypcr = ffffff88 or M > m -a4 -d4 4@reg = ffffff88
4	Checkstop	Occurs when the processor enters a checkstop state.
5	Debug Port Hard Reset	
6	Debug Port Soft Reset	
7	JTAG Reset	

To clear the RSR, execute the following:

```
M>m -a2 -d2 288@reg=ffff
```

If running from reset causes problems

Running from reset may cause some problems once background is entered. To ensure proper operation, the DER register must have bits

31,30,29,28 set (0x0000000f), and the SYPCR register must have the "Disable watchdog freeze" bit set (0x00000080).

If you see the "!ASYNC_STAT 173!" error message

If after a break, the following error arises:

```
!ASYNC_STAT 173! MSR.RI bit not set - Break may not be recoverable
```

This indicates that the MSR.RI bit is not set, implying that a non-maskable break was needed, and the interrupt may not be recoverable. If this occurs while breaking out of regular code, then the MSR.RI bit was not set in the boot code. This can be fixed by "ORing" in 0x00000002 into the SRR1 register and resuming the run.

If there are problems with the debug port signals

❑ Check for pull-down resistors on DSDI and DSCK.

Some target systems may have 220 ohm pull-downs on these two signals. These signals are series terminated by the analysis probe or TIM with a 46 ohm resistor. A 220 ohm pull-down would present a 20% drop in signal level when driven high, which could easily cause some malfunctions. There should be a very weak pull-down on the target, if any at all. If you want to pull-down DSCK, use a value of 2.2K or greater.

To test the target system

The following program can be placed into memory.

```
start: addi r1,1 - 0x38210001
nop - 0x60000000
nop - 0x60000000
```

```
bra start - 0x4bffffff4
```

The opcode 0x4bffffff4 is a branch to a relative offset, so this program can be placed at any start address.

```
M>reg r1=0
M>m -a2 -d2 10000=3821,1,6000,0,6000,0,4bff,fff4
M>r 10000
U>reg r1
  reg r1=00034567 # or some number
U>reg r1
  reg r1=00102333 # or some number
U>
```

This program will loop forever, incrementing r1. This is a good test program to load once a memory system is up to make sure the microprocessor can run code out of memory.

Solving Emulation Probe Problems

To run the power up self test

1. Unplug the emulation probe, then plug it in.
2. Watch the status lights. They should show the following pattern:

❍ = LED is off
● = LED is on
✳ = Not applicable (LED is off or on)

Normal sequence during power up self test		
	Pwr/Target LEDs	**Meaning**
1	❍● ❍❍	Initial power up, system reset
2	❍● ❍❍	XILINX array initialized successfully
3	❍● ●❍	XILINX array tested successfully
4	●● ❍❍	BOOT ROM space tested successfully
5	❍● ●❍	GENERIC ROM space tested successfully
6	●● ❍❍	DRIVER ROM space tested successfully
7	❍● ●❍	RESERVED ROM space tested successfully
8	●● ❍❍	RAM tested successfully
9	❍● ●❍	LAN internal feedback tested successfully
10	❍● ❍❍	Boundary scan master (BSM) test begun
11	●● ●❍	BMS test completed, start system, load drivers, initialize LAN

If the power up self test fails, the RESET LED will flash the number of the test, then stay lit.

If any of the LEDs fail to change, or all of them remain on, there is a system failure.

Following power up, the LEDs will enter one of the following states:

Pwr/Target LEDs	Meaning
❍● ❍❍	No target system power, or the emulation probe is not connected to the target system, or remove
❍● ❍●	Target system is in a reset state
❍● ●❍	Target processor is executing user code
●● ●●	Target processor is in an unknown state
●● ❍❍	Target processor is in debug mode
●● ●❍	Only the boot ROM was used; other firmware in the Flash EPROM has been corrupted

Starting a user interface will change the pattern to the one requested by the interface.

If the power up self tests fail, try the following:

- ❏ Check and reset the LAN address. LAN powerup failures will occur if the emulation probe does not have a valid link-level address and IP address.
- ❏ Disconnect all external connections, including the LAN, serial (RS-232), and BNC break and trigger cables, then cycle power.
- ❏ To ensure that the firmware is working as it should, reprogram the firmware, then cycle power.

To run the performance verification tests

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

Some of these tests can be performed through the HP 16700A/16700A-

series logic analysis system. The LAN tests for an emulation probe can only be executed through the RS-232 port.

To fully test the emulation probe, you will need to run the PV test with several hardware configurations:

- For the BREAK IN, TRIGGER OUT BNC FEEDBACK TEST, connect a coaxial cable between BREAK IN and TRIGGER OUT.

To run the performance verification tests using the logic analysis system

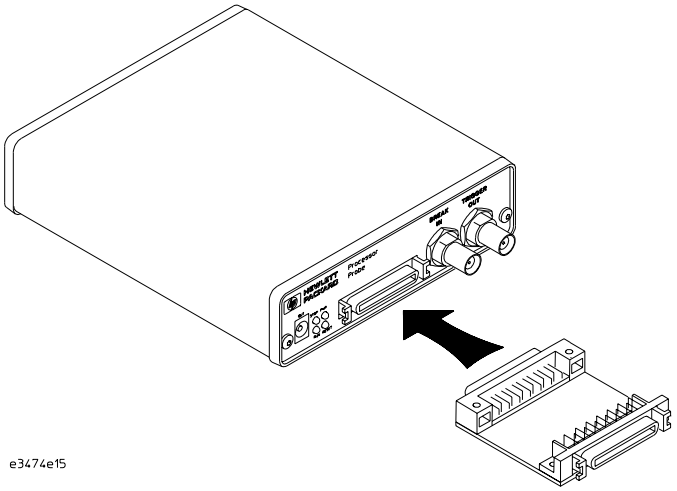
1. End any Emulation Control Interface or debugger sessions.
2. Disconnect the 50-pin cable from the emulation probe, and plug the loopback test board (HP part number E3496-66502) into the emulation probe.
3. In the system window, click the emulation probe and select Performance Verification.
4. Click Start PV.

   The results will appear on screen.

To run complete performance verification tests for an emulation probe

The LAN tests can only be executed through the RS-232 port. The remainder of this section assumes that the tests are being run from a terminal emulator connected to the RS-232 port.

1. Disconnect the 50-pin cable from the emulation probe, and plug the emulator loopback test board (HP part number E3496-66502) directly into the emulator. Do not plug anything into the other end of the emulator loopback test board.



On a good system, the RESET LED will light and the BKG and USER LEDs will be out.

2 Connect a coaxial cable between BREAK IN and TRIGGER OUT.

3 Set all of the switches to CLOSED.

This is standard RS-232 at 9600 baud which can be connected directly to a 9 pin RS-232 interface that conforms to the IBM PC-AT 9 pin standard.

4 Use 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 both tests one time:

```
pv 1
```

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

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

To execute tests 3, 4, and 5 only for 2 cycles:

```
pv -t3-5 2
```

The results on a good system, with the BNCs connected, and with the loopback test board connected, are as follows:

```
c>pv 1
  Testing: HPE3499B Series Emulation System passed!
    Test # 1: Powerup PV Results                              passed!
    Test # 2: LAN 10Base2 Feedback Test                       passed!
    Test # 3: LAN 10BaseT Feedback Test                       passed!
    Test # 4: Break In and Trigger Out BNC Feedback Test      passed!
    Test # 5: Target Probe Feedback Test                      passed!
    Test # 6: Boundary Scan Master Test                       passed!
    Test # 7: 12C Test                                        passed!
    Test # 8: Data Lines Test                                 passed!
  PASSED   Number of tests: 1          Number of failures: 0

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written permission is prohibited, except as allowed under copyright laws.

  HPE3499B Series Emulation System
    Version:   A.07.53 01Mar98
    Location:  Generics

  HPE3459A ARM7 JTAG Emulator
    Version:   A.01.01 01Mar98

R>
```

If a performance verification test fails

There are some things you can do if a failure is found on one of these tests. Details of the failure can be obtained through using a verbose level of 2 or more.

> If the particular failure you see is not listed below, contact HP for assistance.

TEST 2: LAN 10BASE2 Feedback Test failed

For LAN 10BASE2 test, the following is an example of a failure which is not caused by a broken emulator.

```
R>pv -t2 -v2 1

  Testing: HPE3499B Series Emulation System
    Test # 2: LAN 10Base2 Feedback Test                    failed!
      FAILED - no lan connection (LAN probably not terminated
  FAILED  Number of tests: 1          Number of failures: 1
```

Check to see that the port under test has a good cable connected to it and that the cable is properly terminated with a 50 ohm terminator on each end of the overall cable.

```
R>pv -t2 -v2 1

  Testing: HPE3499B Series Emulation System
    Test # 2: LAN 10Base2 Feedback Test                  failed!
      FAILED due to excessive collisions
  FAILED Number of tests: 1          Number of failures: 1
```

The most common cause of this problem is poor termination of the cable or failure to remove the port under test from the LAN before performing the test. Check to see that the terminators are good (50 ohms) and that you are isolated from any traffic on a system LAN.

```
R>pv -t2 -v2 1

  Testing: HPE3499B Series Emulation System
    Test # 2: LAN 10Base2 Feedback Test                  failed!
      FAILED - invalid Ethernet address in EEPROM
  FAILED Number of tests: 1          Number of failures: 1
```

First check to see that a correct link-level address and IP address have been set in the virtual EEPROM through the “lan” command. If the “lan” command shows bad information for the link-level address and IP, then try to set them to correct values. If you are unable to set them to correct values, their is a failure in the FLASH ROM which requires service from HP.

Test 3: 10BaseT Feedback Test failed here

```
R>pv -t3 -v2 1

  Testing: HPE3499B Series Emulation System
    Test # 3: LAN 10BaseT Feedback Test                  failed!
  FAILED Number of tests: 1          Number of failures: 1
```

In addition to the internal checks performed in Test 2, this test also checks for shorts on the cable connected to the network. If this test fails, disconnect the cable and run the test again. If it then passes, the cable is faulty. If it still fails, it requires service from HP.

If the emulator passes this “pv” test, additional testing can be performed through exercising the connection to the network. To run this test, set configuration switch 1 and switch 5 to OPEN, all other configuration switches CLOSED (this enables LAN using 10BaseT). Cycle power and wait for 15 to 30 seconds. Then “ping” the emulator from your host computer or PC. See the LAN documentation for your

host computer for the location and action of the “ping” utility. If the emulator fails to respond to the “ping” request, verify that the LAN parameters (IP address and gateway address) are set correctly and that your host computer recognizes the IP address of the emulator. If all else is good, then failure to respond to ping indicates a faulty emulator.

Test 4: Break In and Trigger Out BNC Feedback Test

```
R>pv -t4 -v2 1

  Testing: HPE3499B Series Emulation System
    Test # 4: Break In and Trigger Out BNC Feedback Test  failed!
      Break In not receiving Break Out HIGH
  FAILED Number of tests: 1          Number of failures: 1
```

Before returning to HP, check to ensure that you have connected a good Coaxial cable between the two BNCs. If the cable is good, the emulator is bad.

TEST 5: Target Probe Feedback Test
TEST 6: Boundary Scan Master Test
TEST 7: I2C Test
TEST 8: Data Line Test

If these tests are not executed, check that you have connected the emulator loopback test board.

If these tests fail, return the emulator to HP for replacement.

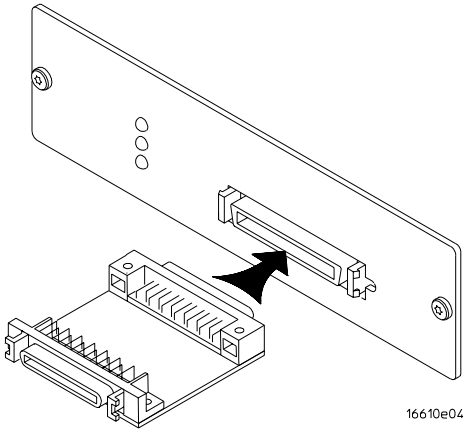
Solving Emulation Module Problems

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

NOTE: The emulation module uses the HP 16600A/16700A-series logic analysis system's LAN interface. If you are having LAN-related problems with the emulation module, refer to the logic analysis system's on-line help.

To run the performance verification tests using the logic analysis system

1. End any Emulation Control Interface or debugger sessions.
2. Disconnect the 50-pin cable from the emulation module, and plug the loopback test board (HP part number E3496-66502) into the emulation module.



3. In the system window, click the emulation module and select Performance Verification.

4 Click Start PV.

The results will appear on screen.

To run complete performance verification tests using a telnet connection

1 Disconnect the 50-pin cable from the emulation module, and plug the loopback test board (HP part number E3496-66502) directly into the emulation module. Do not plug anything into the other end of the loopback test board.

On a good system, the RESET LED will light and the BKG and USER LEDs will be out.

2 telnet to the emulation module.

3 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. Note, however, that some of the options listed may not apply to your emulation module.

Examples

If you are using a UNIX system, to telnet to a logic analysis system named “mylogic”, enter:

```
telnet mylogic 6472
```

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

To execute both tests one time:

```
pv 1
```

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

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

To execute tests 3, 4, and 5 only for 2 cycles:

```
pv -t3-5 2
```

The results on a good system with the loopback test board connected, are as follows:

```
M>pv 1

  Testing: HPE3499C Series Emulation System
    Test  1: Powerup PV Results                          Passed!
    Test  2: Target Probe Feedback Test                  Passed!
    Test  3: Boundary Scan Master Test                   Passed!
    Test  4: I2C Test                                    Passed!
    Test  5: Data Lines Test                             Passed!
  PASSED  Number of tests: 1          Number of failures: 0

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  HPE3499C Series Emulation System
    Version    A.07.51 17Dec97
    Location:  Generics

  HPE3497A Motorola MPC800 Embedded PowerPC Emulator
    Version:   A.01.02 18Dec97
M>
```

You may get an error like “!ERROR 172! Bad status code (0xff) from the hard reset sequence” just before the prompt. This is because the self-test loopback connector is installed instead of being connected to a real PowerPC target system. You may also get a “?>” prompt for the same reason, and this is normal and expected. Any errors after the “PASSED Number of tests: 1 Number of failures: 0” line can be ignored.

If a performance verification test fails

There are some things you can do if a failure is found on one of these tests. Details of the failure can be obtained through using a -v option (“verbose” level) of 2 or more.

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

TEST 5: Target Probe Feedback Test

A verbose output on this test can be extensive. For example, the following is the output of this test if you forget to plug in the loopback test board.

```
p>pv -t5 -v2 1

  Testing: HPE3499A Series Emulation System
    Test # 5: Target Probe Feedback Test                      failed!
      Bad 20 Pin Status Read when unconnected = 0x7fb7
                             Expected Value = 0xffb7
      Bad 20 Pin Status Read when connected = 7fb7
                             Expected Value = 0x7fb7
      Output 19 Low not received on Input 11
      Output 11 Low not received on Input 19
      Output 13 Low not received on Input 1
      Output 12 High not received on Input 6
      Output 12 and Input 6 not pulled high on release
      Output 8 Low not received on Input 10
      Output 7 Low not received on Input 20
      Output 4 Low not received on Input 14
      Output 2 Low not received on Input 18
  FAILED Number of tests: 1            Number of failures: 1
```

If the you get a verbose output like this, check to make sure that the loopback test board was connected properly.

TEST 6: Boundary Scan Master Test
TEST 7: I2C Test

If these tests are not executed, check that you have connected the loopback test board.

If these tests fail, return the emulation module to HP for replacement.

7

Specifications and Characteristics

Emulation Probe Electrical Specifications

BNC, labeled TRIGGER OUT

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

BNC, labeled BREAK IN

Input. Edge-triggered TTL level input (active high), 20 pf, with 2K ohms to ground in parallel. Maximum input: 5 V above VCC; 5 V below ground. Input function is selectable. The BNC introduces approximately 2.5 ms skid after break-in at 25 MHz.

Communications

Serial Port. 9-pin female type “D” subminiature connector. RS-232 DCE to 115.2 kbaud.

10BASE-T LAN Port. RJ-45 connector. IEEE 802.3 10BASE-T (StarLAN).

10BASE 2 LAN Port. 50-ohm BNC connector. IEEE 802.3 10BASE2 (ThinLAN). When using this connector, the processor probe provides the functional equivalent of a Medium Attachment Unit (MAU) for ThinLAN.

Accessory Power Out

12 V, 3.0A, center negative

Power Supply

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

Output. 12 V, 3.3 A

Emulation Probe Operating/Environmental Characteristics

The following operating characteristics are not specifications, but are typical operating characteristics for the HP E3456A emulation probe and MPC505/509/555 target interface module.

Operating Characteristics	
Microprocessor Compatibility	Motorola MPC505, MPC509, and MPC555 Embedded PowerPC microprocessors. For indoor use only.

Environmental Characteristics	
Temperature	Operating, 0 to +40 °C (+32 to +104 °F) Nonoperating, -40 to +60 °C (-40 to +140 °F).
Altitude	Operating/nonoperating 4600 m (15 000 ft).
Relative Humidity	15% to 95%.

Emulation Probe/Module Electrical Characteristics

Maximum Ratings				
Characteristics for the MPC500 Embedded PowerPC emulation module	**Symbol**	**Min**	**Max**	**Unit**
Input voltage range	Vin	-0.5	5.5	V
Input voltage range	Vtt	1.3	1.7	V
Input High Voltage	Vih	2/3Vtt + 0.2		V
Input Low Voltage	Vil		2/3Vtt - 0.2	V
Input High Current	Iih		-15	μA
Input Low Current	Iil		100	μA
Output High Voltage	Voh	2.4	3.3	V
Output Low Voltage	Vol		0.5	V
Output High Current	Ioh	8		mA
Output Low Current	Iol	-16		mA

Emulation Module Operating Characteristics

The following operating characteristics are not specifications, but are typical operating characteristics for the HP 16610A emulation module and MPC505/509/555 target interface module.

Operating Characteristics	
Microprocessor Compatibility	Motorola MPC505, MPC509. and MPC555 Embedded PowerPC microprocessors.
Environmental Characteristics (Temperature, Altitude, Humidity)	The HP 16610A emulation module meets the environmental characteristics of the logic analysis system in which it is installed. For indoor use only.

8

Service Information

To return a part to Hewlett-Packard for service

1. Follow the procedures in the "Solving Problems" chapter on page 117 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 HP sales office. Ask them for the address of the nearest HP service center.
3. Package the part and send it to the HP service center.

   Keep any parts which you know are working. For example, if only the target interface module is broken, keep the emulation module and cables.
4. When the part has been replaced, it will be sent back to you.

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

The HP service center can also troubleshoot the hardware and replace the failed part. To do this, send your entire measurement system to the service center, including the logic analysis system, target interface module, and cables.

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

To get replacement parts

The repair strategy for the emulation probe/module is board replacement. However, the following tables list some mechanical parts that may be replaced if they are damaged or lost. Contact your nearest Hewlett-Packard Sales Office for further information.

Exchange assemblies are available when a repairable assembly is

returned to Hewlett-Packard. These assemblies have been set up on the "Exchange Assembly" program. This allows you to 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.

Emulation Probe Exchange Assemblies	
HP Part Number	**Description**
E3456-69401	Programmed processor probe

Emulation Probe Replaceable Parts	
HP Part Number	**Description**
0950-3043	Power Supply
E3496-61603	10-pin target cable
E3496-61601	50-pin cable
E3497-66503	Target Interface Module

Emulation Module Exchange Assemblies	
HP Part Number	**Description**
E3456-69401	Programmed processor probe

Emulation Module Replaceable Parts	
HP Part Number	**Description**
0950-3043	Power Supply
E3496-61603	10-pin target cable
E3496-61601	50-pin cable
E3497-66503	Target Interface Module

These part numbers are subject to change without notice.

To clean the instrument

If the instrument requires cleaning:

1. Remove power from the instrument.
2. Clean the instrument with a mild detergent and water.
3. Make sure that the instrument is completely dry before reconnecting it to a power source.

A

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."

D

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.

development port See *debug port*.

E

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 module An emulation module is installed within the mainframe of a logic analyzer. It provides run control within an emulation and analysis test setup. See also *emulation probe*.

emulation probe An emulation probe is a stand-alone 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." See also *emulation module*.

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."

F

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

G

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.

H

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.

J

jumper Moveable direct electrical connection between two points.

M

mainframe logic analyzer A logic analyzer that resides on one or more board assemblies installed in an HP 16500, HP 1660-series, or HP 16600A/700A-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.

P

preprocessor See *analysis probe*.

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

preprocessor interface See *analysis probe*.

probe adapter See *elastomeric probe adapter*.

processor probe See *emulation probe*.

prototype analyzer The HP 16505A prototype analyzer acts as an analysis and display processor for the HP 16500B/C logic analysis

system. It provides a windowed interface and powerful analysis capabilities. Replaced by HP 16600A/16700A-series logic analysis systems.

R

run control probe See *emulation probe* and *emulation module*.

S

Setup Assistant A software program that guides a user through the process of connecting and configuring a logic analyzer to make measurements on a specific microprocessor.

shunt connector See *jumper*.

software probe See *emulation probe*.

solution HP's term for a set of tools for debugging your target system. A solution includes probing, inverse assembly, the HP B4620B source correlation tool set, and an emulation module.

stand-alone logic analyzer A stand-alone logic analyzer has a pre-defined set of hardware components which provide a specific set of capabilities. It is designed to perform logic analysis. A stand-alone 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 might be installed within its frame.

T

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 (TIM) A small circuit board which connects the 50-pin cable from an emulation module or emulation probe to signals from the debug port on a target system.

TIM See *target interface module*.

trigger specification A set of conditions that must be true before the instrument triggers. See the printed or on-line documentation for your logic analyzer for details.

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.

1

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

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DECLARATION OF CONFORMITY

according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name:	Hewlett-Packard Company
Manufacturer's Address:	Colorado Springs Division 1900 Garden of the Gods Road Colorado Springs, CO 80907 U.S.A.

declares, that the product

Product Name:	Emulation Probe
Model Number(s):	HP E3456A
Product Option(s):	All

conforms to the following Product Specifications:

Safety:	IEC 1010-1:1990+A1 / EN 61010-1:1993 UL3111 CSA-C22.2 No. 1010.1:1993	
EMC:	CISPR 11:1990 / EN 55011:1991	Group 1 Class A
	IEC 555-2:1982 + A1:1985 / EN 60555-2:1987	
	IEC 555-3:1982 + A1:1990 / EN 60555-3:1987 + A1:1991	
	IEC 801-2:1991 / EN 50082-1:1992	4 kV CD, 8 kV AD
	IEC 801-3:1984 / EN 50082-1:1992	3 V/m, {1kHz 80% AM, 27-1000 MHz}
	IEC 801-4:1998 / EN 50082-1:1992	0.5 kV Sig. Lines, 1 kV Power Lines

Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carries the CE marking accordingly.

This product was tested in a typical configuration with Hewlett-Packard test systems.

Colorado Springs, 03/22/97

John Strathman, Quality Manager

European Contact: Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH, Department ZQ / Standards Europe, Herrenberger Strasse 130, D-71034 Böblingen Germany (FAX: +49-7031-14-3143)

Product Regulations

Safety

IEC 1010-1:1990+A1 / EN 61010-1:1993
UL3111
CSA-C22.2 No. 1010.1:1993

EMC

CE
ISM 1-A

This Product meets the requirement of the European Communities (EC) EMC Directive 89/336/EEC.

Emissions EN55011/CISPR 11 (ISM, Group 1, Class A equipment)

Immunity

EN50082-1	Code[1]	Notes[2]
IEC 801-2 (ESD) 8kV AD	1	1
IEC 801-3 (Rad.) 3 V/m	1	
IEC 801-4 (EFT) 1kV	1	

[1]Performance Codes:
1 PASS - Normal operation, no effect.
2 PASS - Temporary degradation, self recoverable.
3 PASS - Temporary degradation, operator intervention required.
4 FAIL - Not recoverable, component damage.

[2]Notes:
1. The target cable assembly is sensitive to ESD events. Use Standard ESD preventative practices to avoid component damage.

Sound Pressure Level N/A

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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.

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• 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.

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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.

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

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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.

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

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New editions are complete revisions of the manual. 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.