About this Manual

We've added this manual to the Agilent website in an effort to help you support your product. This manual is the best copy we could find; it may be incomplete or contain dated information. If we find a more recent copy in the future, we will add it to the Agilent website.

Support for Your Product

Agilent no longer sells or supports this product. Our service centers may be able to perform calibration if no repair parts are needed, but no other support from Agilent is available. You will find any other available product information on the Agilent Test & Measurement website, www.tm.agilent.com.

HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. We have made no changes to this manual copy. In other documentation, to reduce potential confusion, the only change to product numbers and names has been in the company name prefix: where a product number/name was HP XXXX the current name/number is now Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

User's Guide

Publication number E3474-97000
June 1997

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

HP E3474A
Siemens C167 Distributed Emulation Solution

HP E3474A Siemens Distributed Emulation Solution— At a Glance

The HP E3474A distributed emulation solution for Siemens C167 series microcontrollers provides a low-cost way to debug embedded software.

Features

The distributed emulation solution allows you to:

- Directly connect to 144 pin .65 mm MQFP packages
- Step, run, and break execution
- Set software breakpoints
- View and edit memory and registers
- Collect and view real-time trace data
- Substitute up to 128K of IROM memory.
- Read and write messages to the XBUS CAN module

The distributed emulation system does not support:

- RAM memory mapping

Supported processors

The distributed emulation solution supports Siemens C167 family microcontrollers, currently including: C167CR-LM, C167-LM, C167CR-16FM, C167CR-16RM, C167CR-4RM, C167SR-LM, and C167S-4RM.

The logic analyzer

An HP logic analyzer can be connected to provide real-time trace acquisition and state analysis.

The processor probe

The processor probe allows your Run Control tool or debugger to connect to the emulator probe head via a LAN or serial connection.

The emulator probe head

The emulator probe head acts as an emulator probe and as a preprocessor for your logic analyzer.

The elastomeric QFP adapter

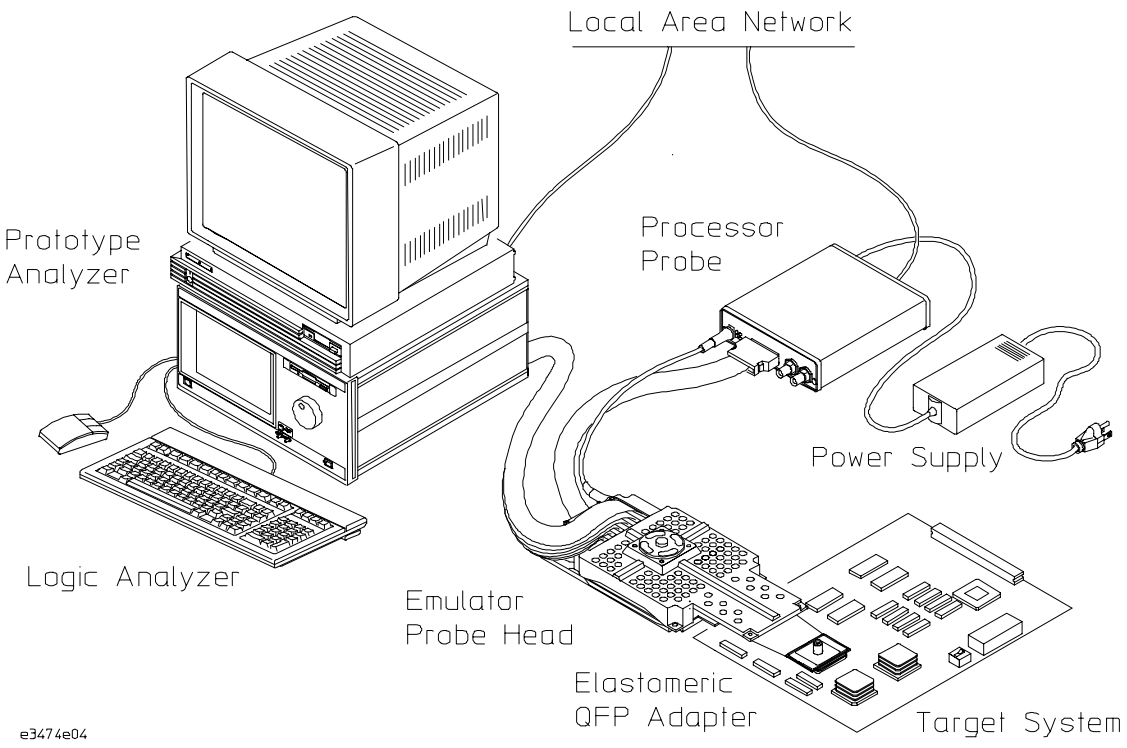
The elastomeric QFP adapter reliably connects the emulator probe head to a surface-mounted processor. It is separately packaged as HP E5361A.

The prototype analyzer interface

The prototype analyzer interface gives you a windowed interface to the full power of your HP 16500B/C logic analyzer. The Run Control tool (Processor Control Tool Set) gives you access to many distributed emulation features and provides an easy way to configure your measurement setup.

The debugger interface

Some debuggers work alongside the distributed emulation solution. See page 25.


Local Area Network
Prototype
Analyzer
Processor
Probe
Power Supply
Logic Analyzer
Emulator
Probe Head
Elastomeric
QFP Adapter
Target System
e3474e04

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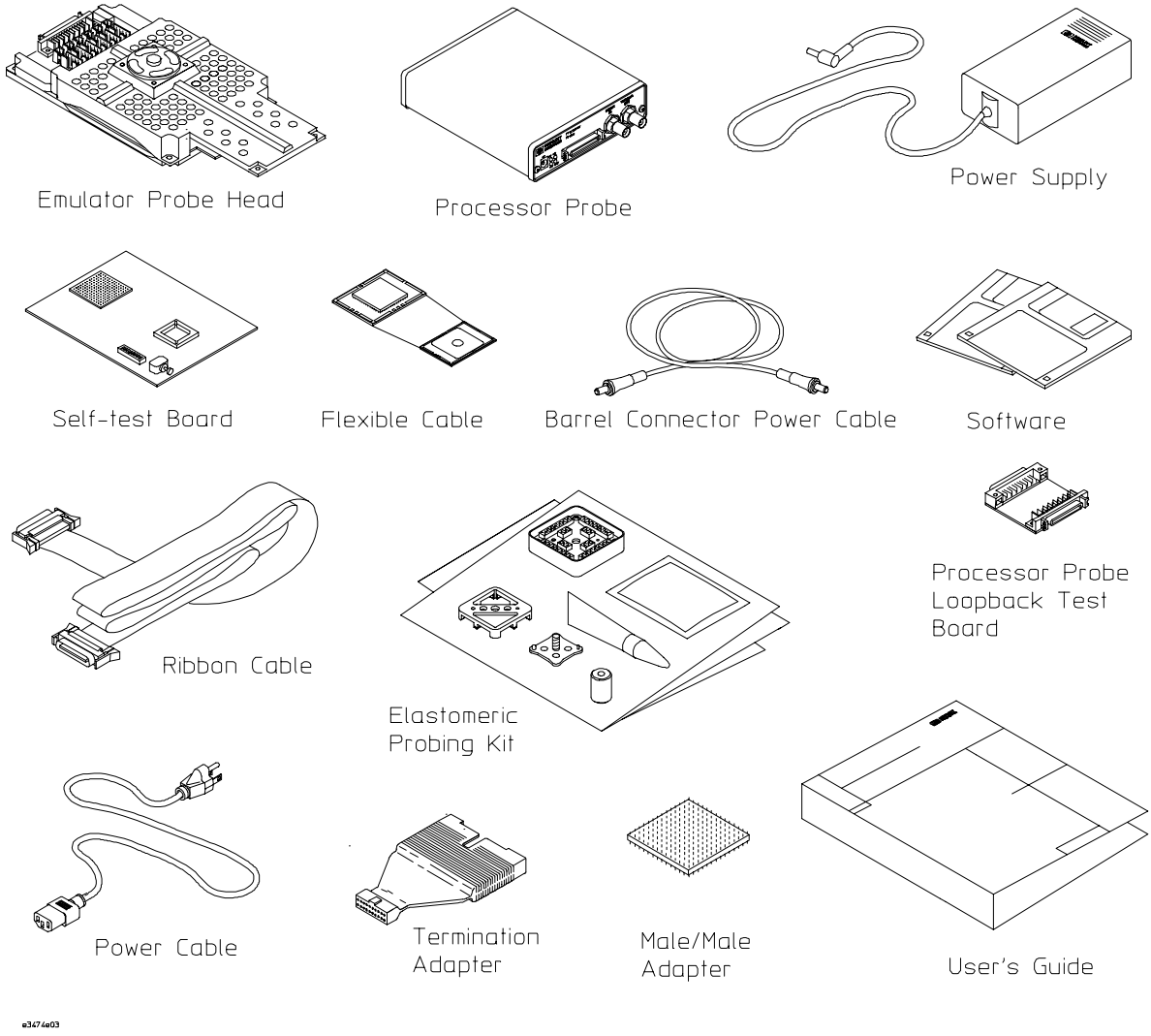
Overview

Equipment Used with the Distributed Emulation Solution



Equipment Supplied

- The emulator probe head (consists of three circuit boards).
- A processor probe.
- A 12V power supply for the processor probe.
- A processor probe loopback test board (HP part number E3496-66502).
- A self-test board for testing the emulator probe head.
- The logic analyzer configuration and inverse assembler software on a 3.5-inch disk.
- Configuration software for the HP 16505A Prototype Analyzer on a 3.5-inch disk.
- A 50-pin ribbon cable.
- A male-to-male adapter to connect the emulator probe head to the flexible adapter cable or to the self-test board.
- An HP E5361A elastomeric probing kit. This kit is in a separate package, shipped in the box with the distributed emulation solution.
- A flexible adapter cable to connect to the elastomeric QFP probe.
- A barrel connector power cable.
- 6 HP 01650-63203 logic analyzer termination adapters.
- This *User's Guide*.
- A power cord.

Minimum Equipment Required

For state analysis of an Siemens C167 target system, you need all of the following items in addition to the items listed on the previous page:

- A target system with a surface-mounted QFP chip. The target system must meet the criteria on page 106.
- One of the logic analyzers listed in the table in this chapter.

  For the mainframe logic analyzers, one of the following mainframes is required:

  - An HP 16500B mainframe with software revision 3.4 or higher.
  - An HP 16500C mainframe with software revision 1.0 or higher.

Logic Analyzers Supported

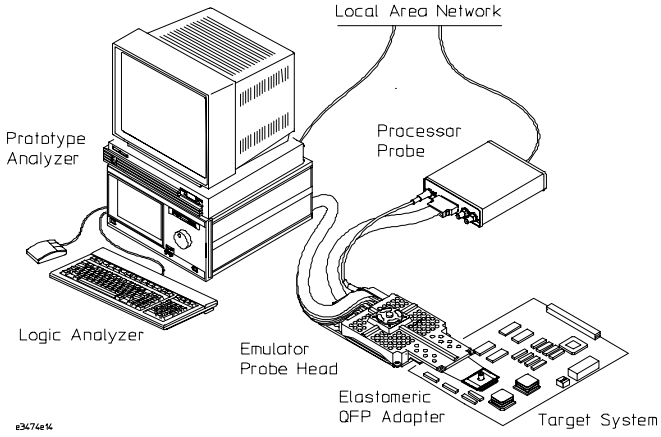
Logic Analyzer	Channel Count	State Speed	Timing Speed	Memory Depth
1660C/CS	136	100 MHz	250 MHz	4 k states
1661C/CS	102	100 MHz	250 MHz	4 k states
1670A	136	70 MHz	125 MHz	64 k or .5 M states
1670D	136	70 MHz	125 MHz	64 k or 1 M states
1671A	102	70 MHz	125 MHz	64 k or .5 M
1671D	102	70 MHz	125 MHz	64 k or 1 M
16550A (one card)	102	70 MHz	125 MHz	4 k states
16554A (two or three cards)	68/card	70 MHz	125 MHz	512 k states
16555A (two or three cards)	68/card	110 MHz	250 MHz	1 M states
16555D (two or three cards)	68/card	110 MHz	250 MHz	2 M states
16556A (two or three cards)	68/card	100 MHz	200 MHz	1 M states
16556D (two or three cards)	68/card	100 MHz	200 MHz	2 M states
Optional		**Features**		
HP 16505A Prototype Analyzer		Software Version Required: A.01.30 or higher		

The distributed emulation solution works only with the logic analyzers listed above, using an HP inverse assembler. This is because many signals used by the distributed emulation solution are internal processor signals.

System Configurations

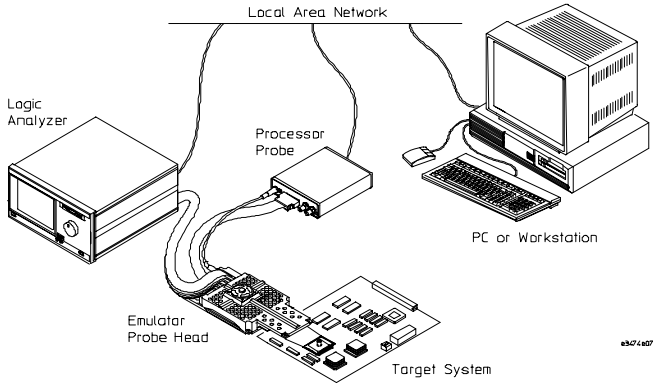
HP Prototype Analyzer

You can use an HP 16505A prototype analyzer connected to an HP 16500B or HP 16500C logic analysis system to analyze internal bus activity and to control processor execution. This configuration is the easiest way to configure the processor probe. You can use the Run Control tool or a debugger to control processor execution.



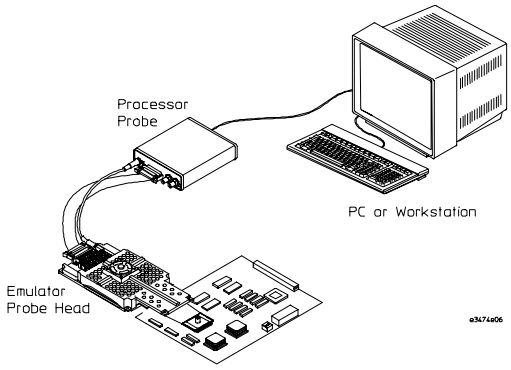
HP Logic Analyzer

You can connect an HP logic analyzer to the emulator probe head to analyze internal bus activity. To control processor execution, you will need to use a debugger. To configure the processor probe, use a debugger or the built-in configuration commands.



No Logic Analyzer

With no logic analyzer connected, you will not be able to analyze bus activity, but you can still use a debugger to control processor execution. To configure the processor probe, use a debugger or the built-in configuration commands.



Target Connection Sequence

This is a summary of the steps to connect the components of the distributed emulation solution for the first time. Each of the steps is explained in greater detail later in this manual.

To prevent equipment damage, remember to:

- Disconnect power from the target system, processor probe, and logic analyzer before you make or break connections.
- Carefully follow the instructions in "Designing a Target System" (page 105).
- Carefully read the Cautions in the detailed procedures later in this manual.

1. Connect the processor probe to the host computer (page 11) or to the prototype analyzer (page 27).
2. Verify the connections you have made so far by connecting to the self-test board and running some tests (page 47).
3. Connect the elastomeric 144-pin QFP adapter to the target processor (refer to the *HP E5361A Installation Guide* included in the elastomeric probing kit).
4. Connect the emulator probe head to your target system (page 55).
5. Configure the processor probe for the target CPU (page 55).

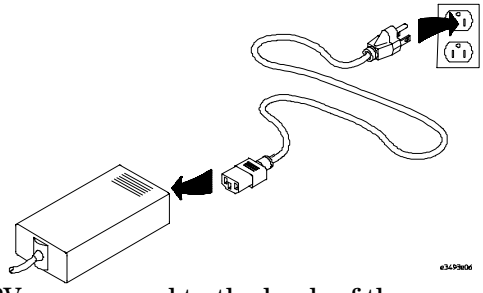
If you are using a logic analyzer...

6. Connect the logic analyzer to the emulator probe head (page 37).
7. Load configuration and inverse assembler files into the logic analyzer (page 75).

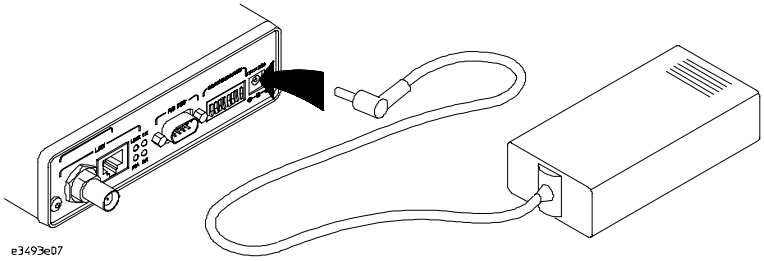
Connecting the processor probe to a power source

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



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

The processor 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.

2

Connecting the Processor Probe to a PC or Workstation

Connecting the Processor Probe to a PC or Workstation

You can connect your PC or workstation to the processor probe via a serial or LAN connection.

Serial connection

A serial connection allows you to complete all of the performance verification tests. Performance over a serial connection may be unacceptably slow.

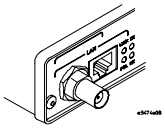
LAN connection

A LAN connection will allow you to make your measurements quickly and easily. A few of the performance verification tests cannot be run over a LAN.

Recommended connection

Use a LAN connection for routine use, and a serial connection for LAN configuration and for troubleshooting.

Setting Up a LAN Connection to a PC or Workstation



The processor probe has two LAN connectors:

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

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

You must assign an IP address (Internet address) to the processor probe before it can operate on the LAN. You can also set other network parameters such as a gateway address. The IP address and other network parameters are stored in nonvolatile memory within the processor probe.

The processor probe automatically sets a subnet mask based on the subnet mask used by other devices on the network.

You can configure LAN parameters in any of the following ways:

- Using the built-in terminal interface over a serial connection. This is the most reliable method.
- Using BOOTP. BOOTP is part of the HP-UX, SunOS, and Solaris operating systems.

To obtain an IP address

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

   - An IP address for the processor probe.

   You can also use a "LAN name" for the processor 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.**

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

   The default numbers (6470, 6471) can be changed if they conflict with some other product on your network.

   To change the port numbers, see page 15. If you have already set the IP address, you can use a telnet connection instead of a serial connection to connect to the processor probe.

3. **Write down the link-level address of the processor probe.**

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

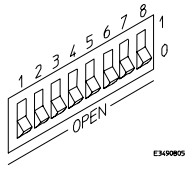
   The link-level address (LLA) is printed on a label above the LAN connectors on the processor probe. This address is configured in each processor probe shipped from the factory and cannot be changed.

IP Address of Processor probe
LAN Name of Processor Probe
Gateway Address
Link-Level Address of Processor Probe

To configure LAN parameters using the built-in terminal interface

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

   Switch settings are printed on the bottom of the processor 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 processor probe's RS-232 port with a 9-pin RS-232 cable.**

   Complete instructions for setting up a serial connection begin on page 22.

3. **Plug in the processor probe's power cord. Press the terminal's <RETURN> key a couple times. You should see a prompt such as "p>", "R>", "?>", or "c>".**

   At this point, you are communicating with the HP E3474A Processor 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 processor 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
```

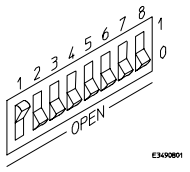
6 Disconnect the power cord from the HP E3474A Processor Probe, and connect the processor probe to your network.

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

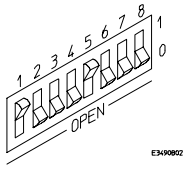
7 Set the configuration switches to indicate the type of connection that is to be made.

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

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



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



Set all other switches to CLOSED.

8 Connect the power cord to the HP E3474A Processor Probe.

9 Verify your processor probe is now active and on the network. See "To verify LAN communications" on page 21.

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

Example

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

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

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

See Also

"Solving Problems," page 113, if you have problems verifying LAN communication.

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 processor probe LAN parameters.

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

```
# Global template for options common to all HP 64700
# emulators and Processor 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 processor probe. The "ip=192.6.29.31" specifies the IP address that is assigned to the processor probe. The node name is "hpprobe.div.hp.com".

3 Connect the processor probe to your network.

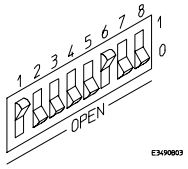
This connection can be made by using either LAN connector on the processor probe.

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

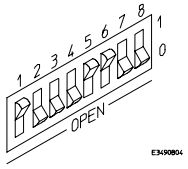
Switch S1 must be set to OPEN, indicating that a LAN connection is being made.

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

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



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



Set all other switches to CLOSED.

5 Connect the power cord to the processor probe.

Verify that the power light stays on after 10 seconds.

The IP address will be stored in EEPROM.

6 Set switch S6 back to CLOSED.

Do this so that the processor 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).

7 Verify your processor probe is now active and on the network. See "To verify LAN communications" on page 21.

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 CLOSED unless one of the following conditions is true:

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

  The processor probe has a switch-selectable, twisted-pair receiver threshold. With switch S7 set to OPEN, 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 CLOSED, 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 processor 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 CLOSED), 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 Software Probe is used on a non 10BASE-T network (such as StarLAN) set this switch to LINK BEAT OFF (OPEN).

Note

Setting switch S8 to OPEN 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 processor probe is now active and on the network by issuing a **telnet** to the IP address.

   This connection will give you access to the processor 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 processor probe's IP address, once it has already been set, is to telnet to the processor 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.

If You Have Problems

If you encounter problems, refer to the "Problems" chapter (page 113).

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
```

Setting Up a Serial Connection

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 processor 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

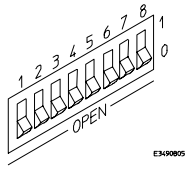
1. Set switch S1 to CLOSED (RS-232).
2. Set switches S2-S4 to CLOSED.
3. **Set switch S5 to CLOSED (HW HANDSHAKE ON) if your serial interface uses the DSR:CTS/RTS lines for flow control. Set S5 to OPEN (HW HANDSHAKE OFF) if your serial interface uses software flow control (XON/XOFF).**

   If your serial interface supports hardware handshaking, you should use it (set switch S5 to CLOSED). 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 processor 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 processor probe may be damaged by electrostatic discharge.

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

To verify serial communications

1. **Start a terminal emulator program on the host computer.**

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

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

2. **Plug the power cord into the processor probe.**

   When the processor 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.

  HPE3474A Series Emulation System
    Version:   A.07.06 06May97
    Location:  Generics

 HPE3474A SIEMENS C167/5 Emulator
    Version:   A.01.01 May97
    Speed:     25.0 MHz
    Memory:    128 KBytes

R>
```

   The version numbers may be different for your processor probe.

3. **Press the Return or Enter key a few times.**

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

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

See Also "Problems with the Serial Interface," page 125.

Setting up Debugger Software

Supported debuggers

Contact HP to find out which debuggers have been validated for use with the distributed emulation solution. At the time of publication, the PLS debugger has been validated.

Configuration

Before you can use a debugger with the processor probe, you may need to configure some communication parameters, including the LAN address which you assigned to the processor probe.

Use your debugger to configure the processor probe for your processor.

> Do not use the Run Control tool at the same time as a debugger.

See Also

Refer to the documentation for your debugger for more information on connection the debugger to the processor probe.

3

Connecting the Processor Probe to an HP 16505A Prototype Analyzer

Connecting to an HP 16505A Prototype Analyzer

To use the HP E3474A C167 processor probe you need to:

- Install the HP E3474A software (Run Control Tool) in the HP 16505A Prototype Analyzer, if a disk was included
- Install the HP 16505A inverse assembler
- Connect the processor probe to a power source
- Connect the processor probe to the HP 16505A via a LAN or direct connection

For a list of the parts supplied with the HP E3474A C167 processor probe, see page 3.

Installing HP 16505A Files

To install the Run Control tool software and inverse assembler in the HP 16505A prototype analyzer:

1. Check that you have version 1.30 of the prototype analyzer software.

   To do this, click **Help→On Version...** in the main workspace window or click **License Management** in the Session Manager window.
2. Insert Disk 1 of the Run Control tool update disks into the prototype analyzer disk drive.
3. Open the Session Manager window.
4. Click **Update**.
5. Click **Update/Install**. Follow any instructions which are displayed.
6. Repeat steps 2-5 for the HP 16505 inverse assembler disk.
7. Click **Close**.

Connecting the Probe to the Prototype Analyzer

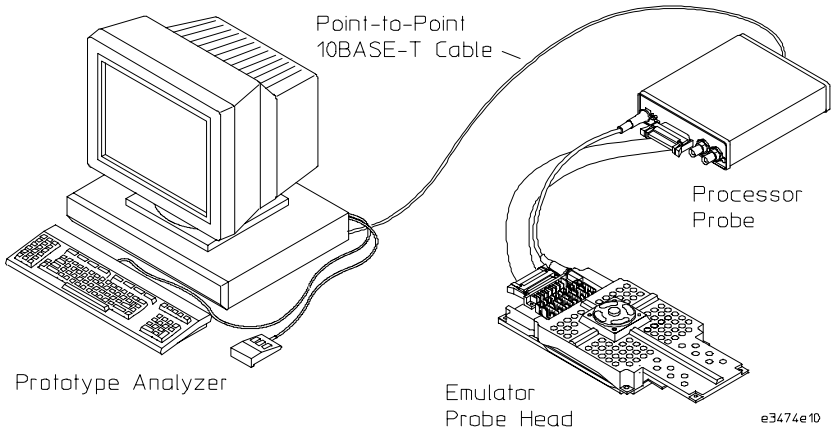
The processor probe can be connected directly to the prototype analyzer for a point-to-point connection, or it can be connected via a LAN. The LAN connection allows remote operation; it also allows a probe to be shared by more than one prototype analyzer.

The following sections describe the connections for point-to-point and LAN configurations.

Connecting for a point-to-point configuration

The point-to-point connection is technically a LAN connection, with only two nodes.

- Use a point-to-point 10Base-T LAN cable (such as HP part number 5061-7342) to connect the processor probe directly to the prototype analyzer.
- The configuration switches must be set for a LAN configuration. Switch 1 must be set to OPEN, indicating that a LAN connection is being made. Since this is a 10BASE-T connection, switch 5 must also be set to OPEN.
- Use the procedure in "Setting Up LAN Communication" to set the Ethernet address, IP address, and gateway address.



Point-to-point Connection

Connecting to a LAN

The processor probe has two LAN connectors:

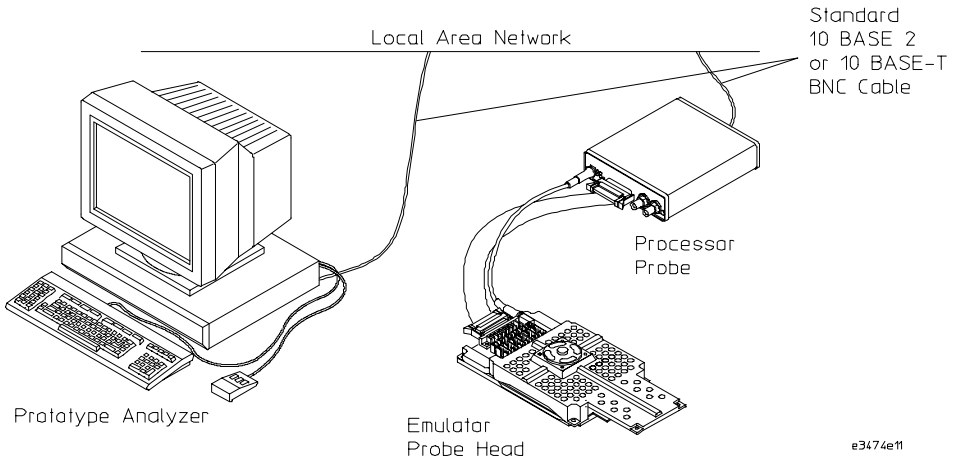
- A BNC connector that can be directly connected to an IEEE 802.3 Type 10BASE2 cable (ThinLAN). When using this connector, the processor probe provides the functional equivalent of a Medium Attachment Unit (MAU) for ThinLAN.
- An IEEE 802.3 Type 10BASE-T (StarLAN) connector.

Caution

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

The configuration switches must be set for a LAN configuration. Switch 1 must be set to OPEN, indicating that a LAN connection is being made. For 10BASE-T connections, switch 5 must also be set to OPEN. Refer to "To set the 10BASE-T configuration switches" for additional information on configuring 10BASE-T switches.

Use the procedure in "Setting Up LAN Communication" to set the Ethernet address, IP address, and gateway address.



LAN Connection

To set the 10BASE-T configuration switches

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

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

  The processor probe has a switch-selectable, twisted-pair receiver threshold. With switch S7 set to OPEN, 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 CLOSED, 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 processor 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 CLOSED), 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 processor probe is used on a non 10BASE-T network (such as StarLAN) set this switch to LINK BEAT OFF (OPEN).

Note

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

Switch Positions for LAN (left) and 10BASE-T LAN (right) Configurations, S6 Open for Initialization

Setting Up LAN Communication

To use the processor probe on a LAN, you must assign an IP address (Internet address) an Ethernet address, and a gateway address. The IP address and other network parameters are stored in nonvolatile memory within the processor probe. These addresses must be initialized for either point-to-point or LAN connections.

The processor probe automatically sets the subnet mask based on the subnet mask used by other devices on the network.

To set the LAN address of the processor probe using the Run Control tool

1. Set the configuration switch S6 on the processor probe to OPEN. Cycle power to reconfigure the probe. Switch 6 causes the probe to continuously broadcast a search message over the network.
2. Drag the "uP Run Control" tool from the toolbox onto the HP 16505A prototype analyzer workspace.
3. Move the mouse cursor over the icon, press the right mouse button, and select "Init Probe LAN Addresses...".
4. Enter the Ethernet address, IP address, and the gateway address in the appropriate fields, then select Set Addresses.

   Use the processor probe Ethernet address. This address is on a sticker labeled "LLA" (for "link-level address") on the processor probe.

   For point-to-point connections, use an IP address that is one greater than or one less than the HP 16505A IP address (for example, the prototype analyzer default address is 192.0.2.231, so use 192.0.2.230 or 192.0.2.232).

For LAN connections, obtain an IP address from your local network administrator or system administrator.

The gateway address is an IP address and is entered in integer dot notation. For point-to-point connections, just leave this field blank. 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. Obtain that address from your local network administrator or system administrator.

5 **Set the configuration switch S6 back to CLOSED, then power down the probe. When the probe is powered down and then powered up, it will be configured for the new LAN parameters.**

See also "Setting Up the Processor Probe on Your LAN" in the on-line help for the uP Run Control tool.

To verify LAN communications

Start a user session to verify your processor probe is now active and on the network.

1 Drag the uP Control Tool from the toolbox to the workspace.

2 Move the mouse cursor over the uP Control Tool in the workspace, press and hold the right mouse button, move the cursor over Start Session..., and release the mouse button.

See also "Starting Sessions" in the on-line help for the uP Run Control tool.

If You Have Problems
If you encounter problems, refer to the "Problems" chapter (page 113).

If you are having difficulty establishing LAN connections and need to perform the LAN performance verification tests, you will need a serial connection to a PC or a workstation.

4

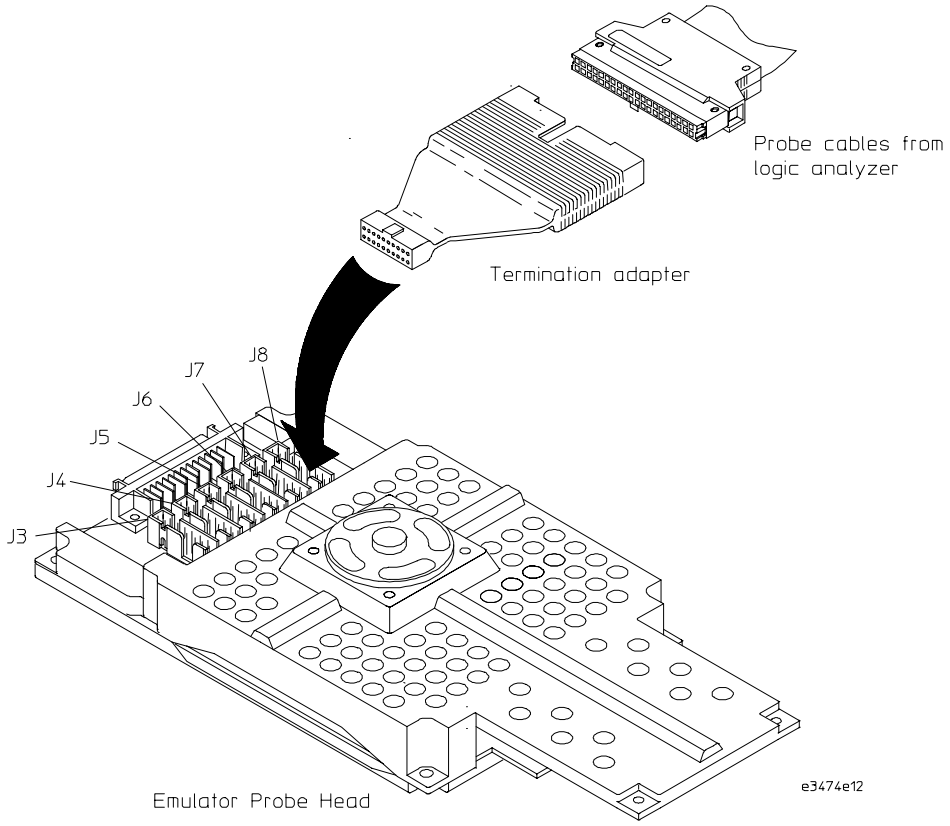
Connecting the Emulator Probe Head to a Logic Analyzer

Connecting to the Logic Analyzer

This chapter explains how to connect the HP E3474A emulator probe head to the supported logic analyzers. Connecting consists of the following steps:

1. Connecting the termination adapters to the logic analyzer cables
2. Connecting the logic analyzer cables to the emulator probe head

Connecting the termination adapters to the emulator probe head



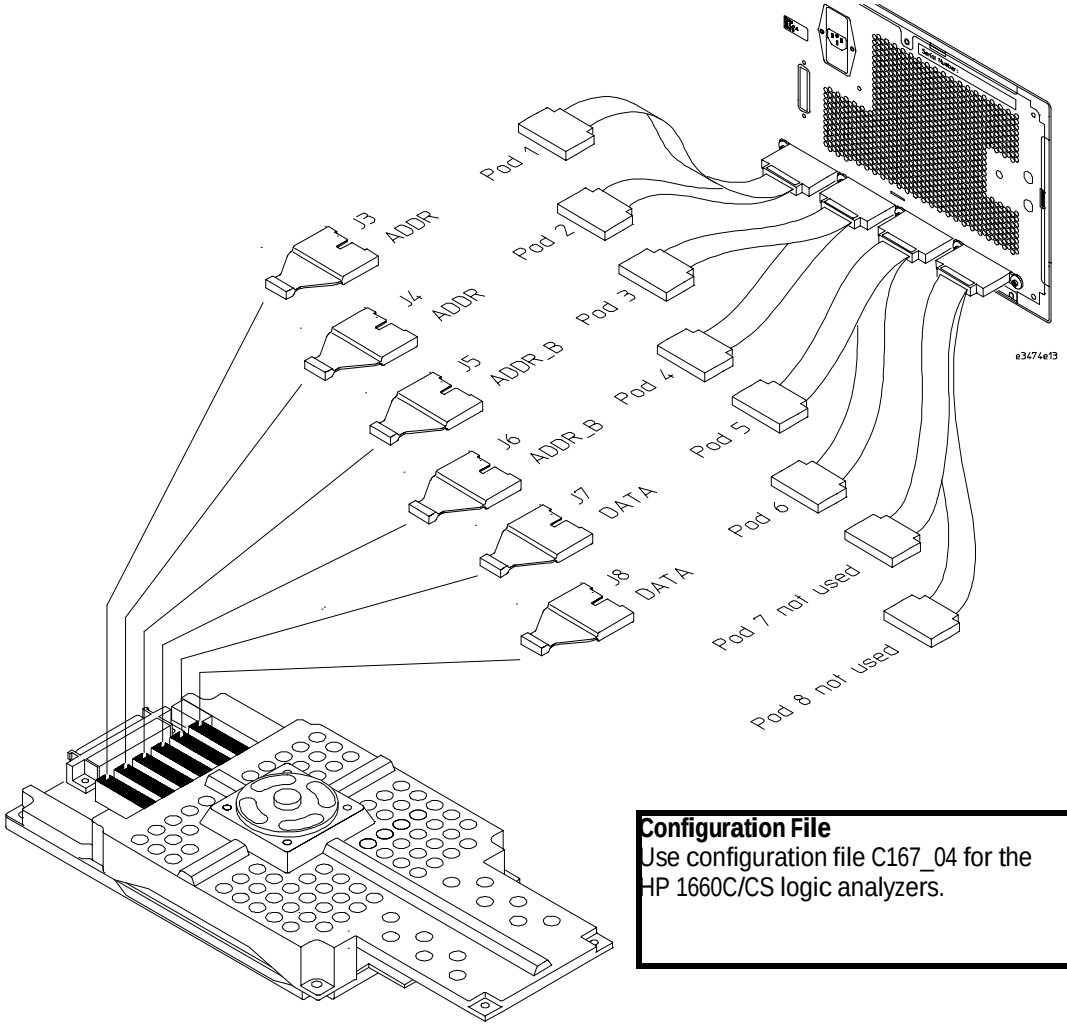
Connecting the termination adapters to the logic analyzer pods

The following sections show the connections between the logic analyzer pod cables and the connectors on the emulator probe head interface. Use the appropriate section for your logic analyzer. The configuration file names for each logic analyzer are included with the connection diagrams.

The figure on the previous page shows the connectors on the emulator probe head.

To connect to the HP 1660C/CS logic analyzers

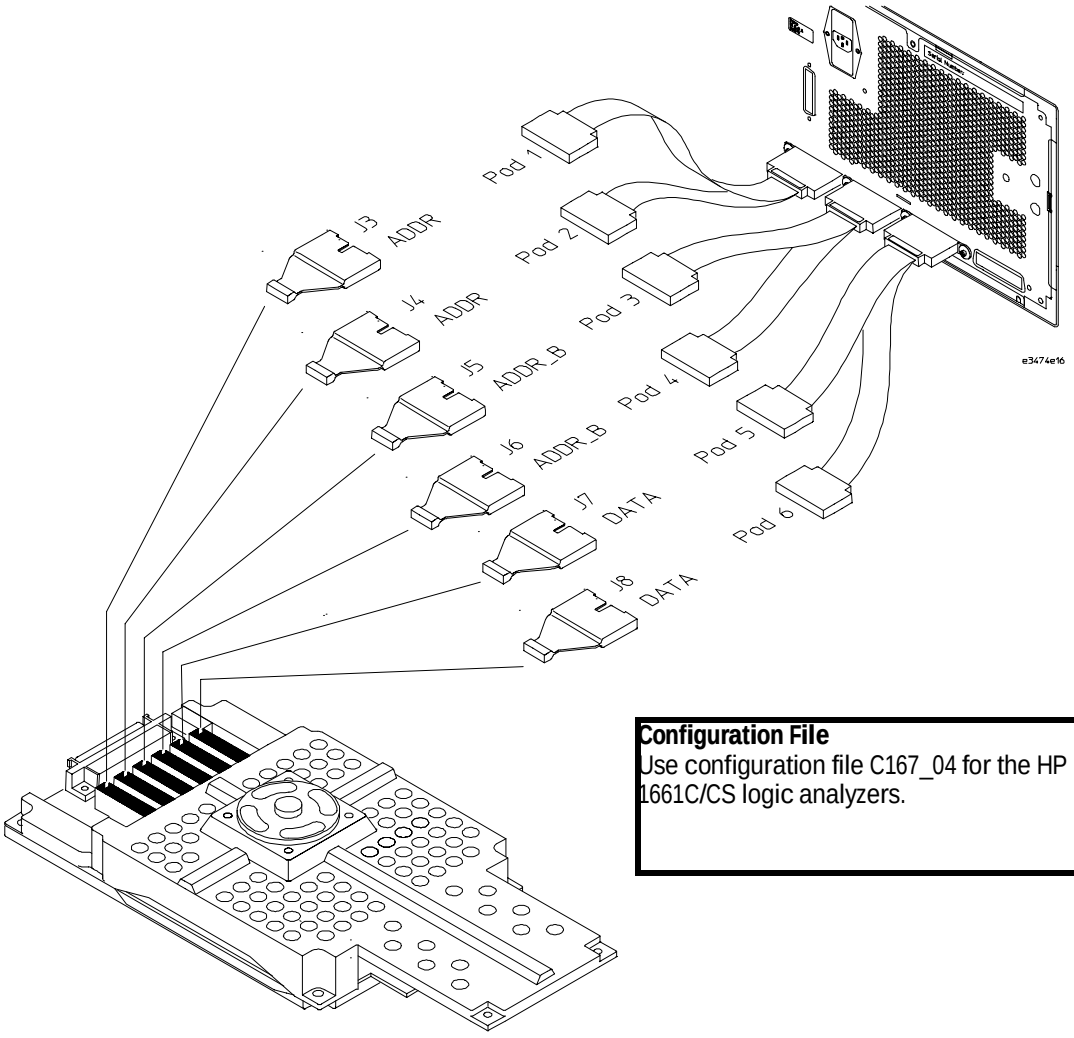
Use the figure below to connect the emulator probe head to the HP 1660A/C logic analyzers.



Configuration File
Use configuration file C167_04 for the HP 1660C/CS logic analyzers.

To connect to the HP 1661C/CS logic analyzers

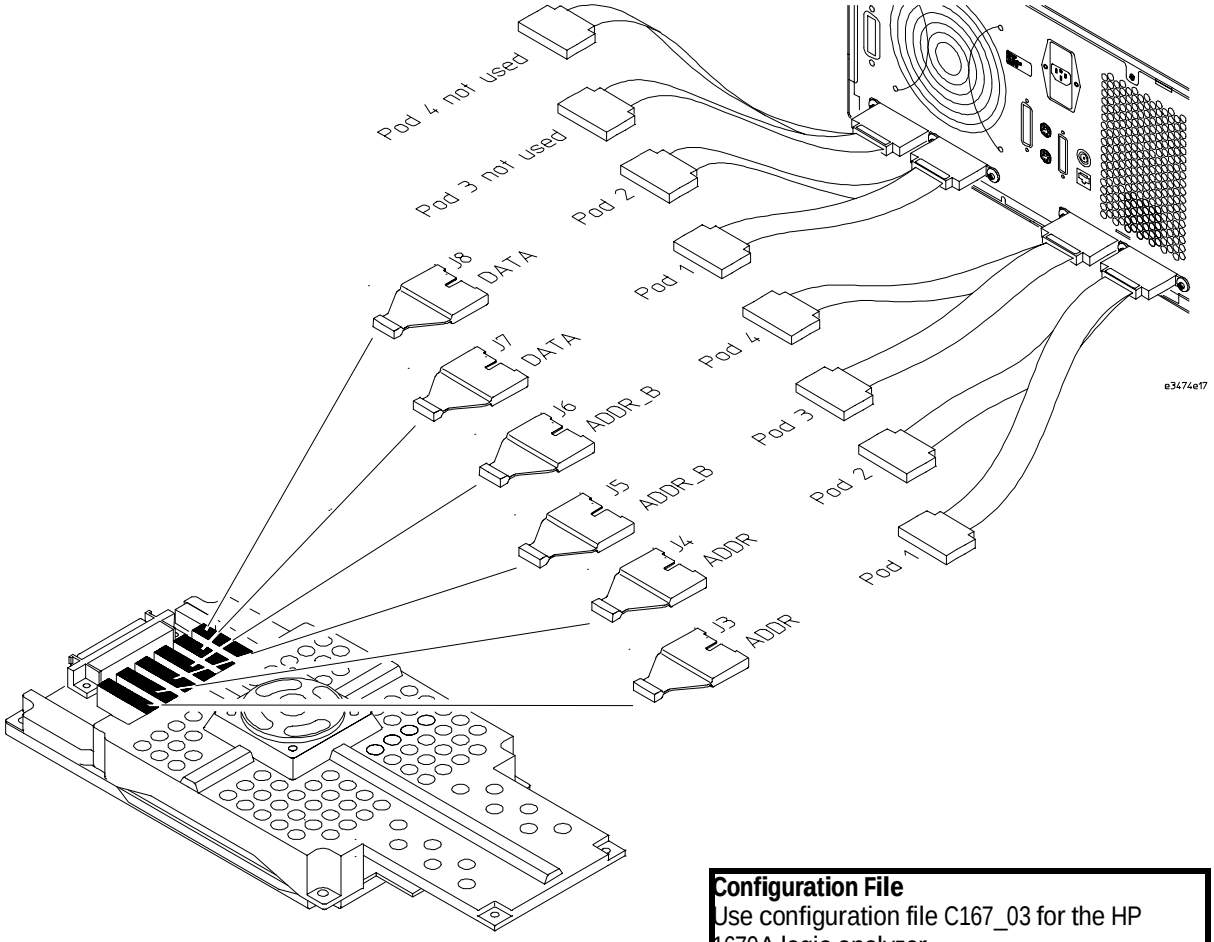
Use the figure below to connect the emulator probe head to the HP 1661A/C logic analyzers.



Configuration File
Use configuration file C167_04 for the HP 1661C/CS logic analyzers.

To connect to the HP 1670A logic analyzer

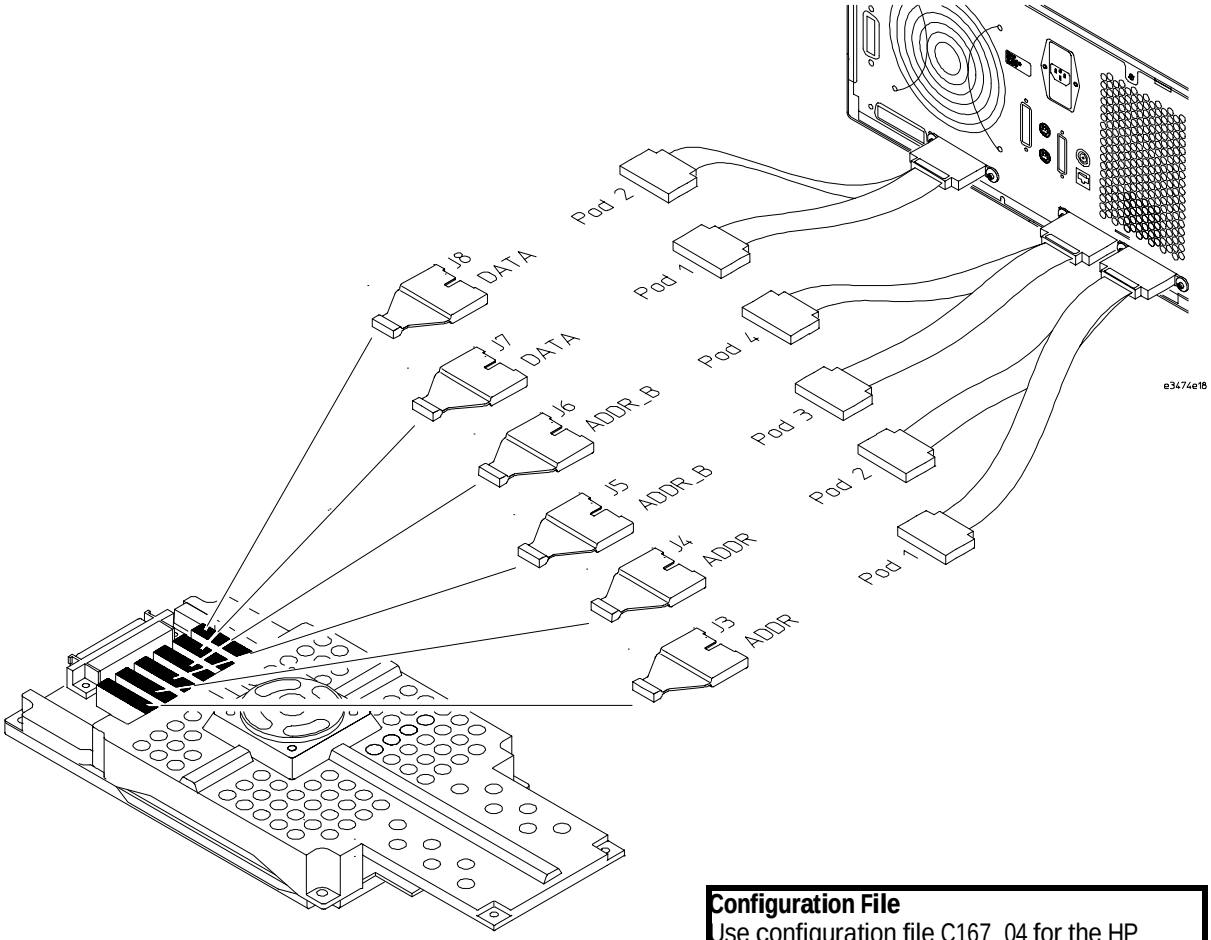
Use the figure below to connect the emulator probe head to the HP 1670A logic analyzer.



Configuration File
Use configuration file C167_03 for the HP 1670A logic analyzer.

To connect to the HP 1671A logic analyzer

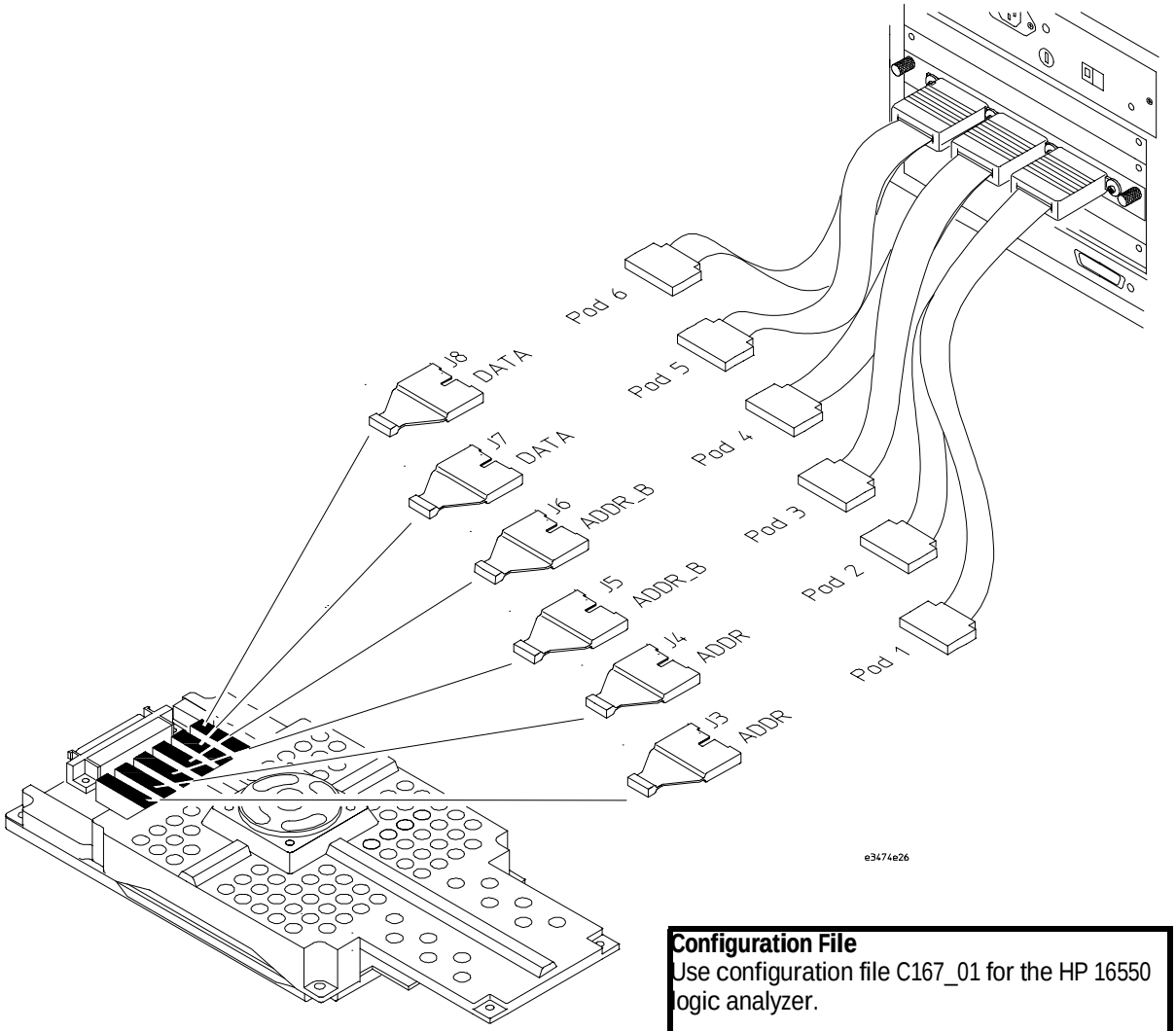
Use the figure below to connect the emulator probe head to the HP 1671A logic analyzer.



Configuration File
Use configuration file C167_04 for the HP 1671A logic analyzer.

To connect to the HP 16550A

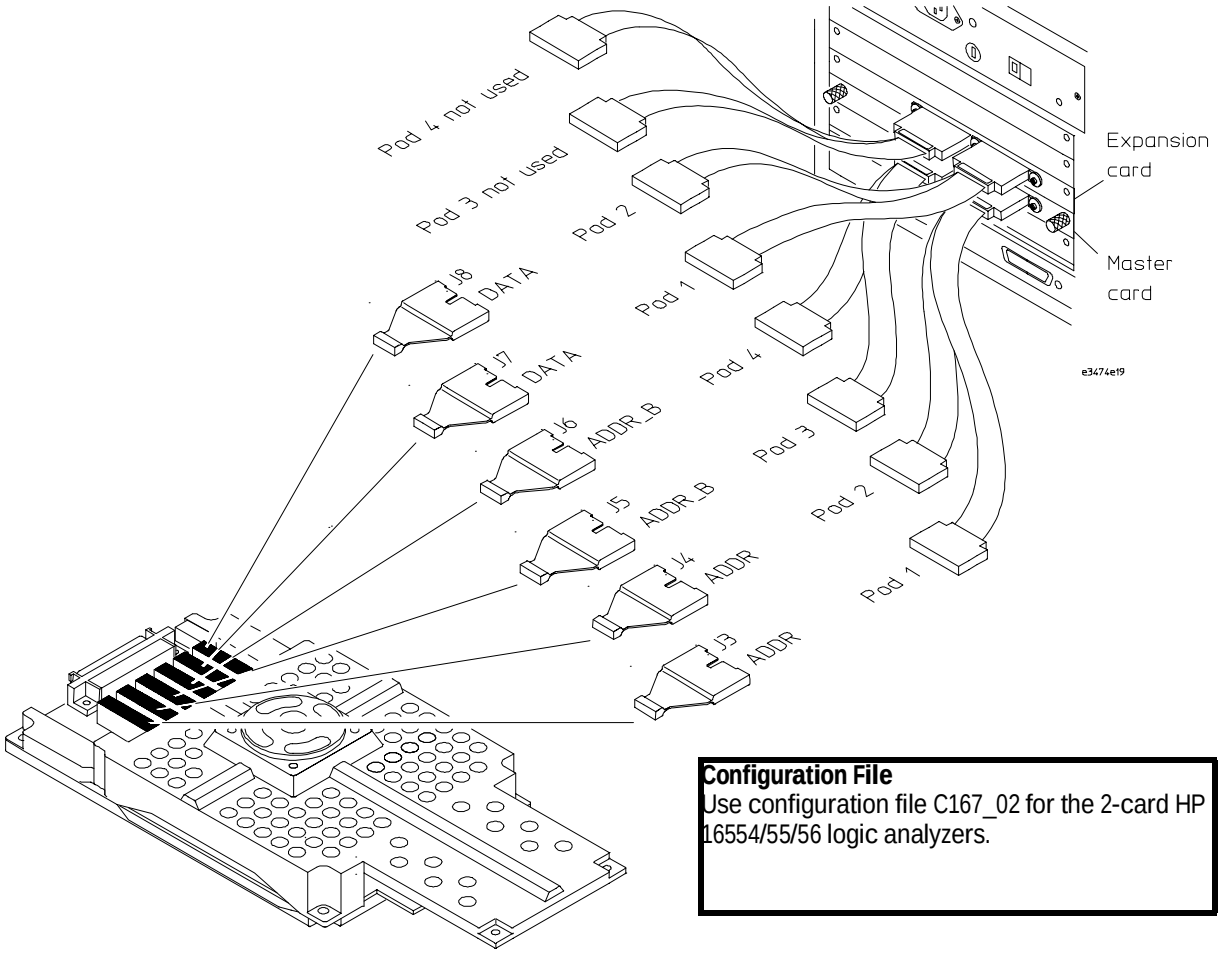
Use the figure below to connect the emulator probe head to the HP 16550A logic analyzer card.



Configuration File
Use configuration file C167_01 for the HP 16550 logic analyzer.

To connect to the HP 16554A/55A/56A (two-card)

Use the figure below to connect the emulator probe head to the two-card HP 16554A/55A/56A logic analyzers.



Configuration File
Use configuration file C167_02 for the 2-card HP 16554/55/56 logic analyzers.

5

Connecting to the Self-Test Board

Installation

This chapter shows you how to connect the emulator to the self-test board which is shipped with the emulator. It also shows you how to verify installation by starting the prototype analyzer Run Control tool interface for the first time.

About the self-test board

The self-test board contains logic which is used by the performance verification tests. It can also be used to run the distributed emulation solution in the absence of a target system.

Power

Power is supplied to the self-test board through a ground pin on the PGA connector. On other target systems, this pin would be connected to ground (see page 107); the emulator probe head sends power to the pin *only* if it is *not* tied to ground.

The LED indicates that the board is receiving power.

Memory

The self-test board does not have any RAM or ROM memory.

Reset button

The reset button asserts the $\overline{\text{RSTIN}}$ signal.

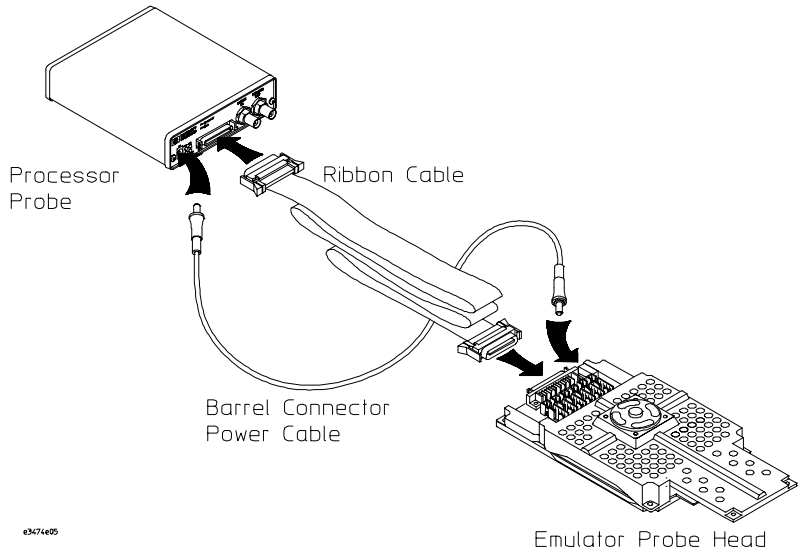
DIP switches

To run performance verification tests, set switch 8 in the block of switches labeled SW2 on the self-test board to OFF (the other switch settings have no effect.

To make the self-test board appear like a target system, set switch 8 to ON and set the other switches to the values used by your target system. Remember to configure the processor probe for the same values.

Step 1. Connect the processor probe to the emulator probe head

1. Remove power from the processor probe.
2. Plug one end of the 50-pin cable into the processor probe.
3. Plug the other end of the 50-pin cable into the emulator control head.
4. Plug one end of the barrel connector cable into the" Power Out" connector on processor probe.
5. Plug the other end of the barrel connector cable into the emulator probe head.



Step 2. Set the self-test board switches

1. Set switch 8 to ON.

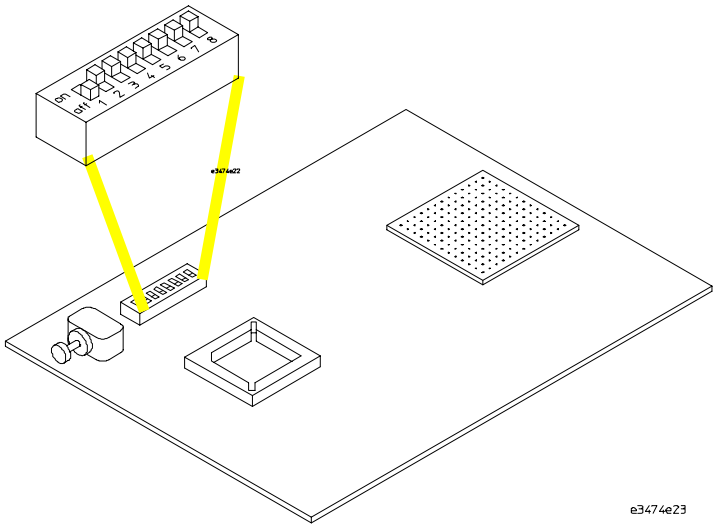
   This allows you to use the emulator probe head as if it was connected to a target system.

2. Set switch 1 to OFF.

   This enables the internal ROM at reset.

3. Set switches 2 through 7 to any value you like.

   If you are unsure how to set a switch, set it to ON.



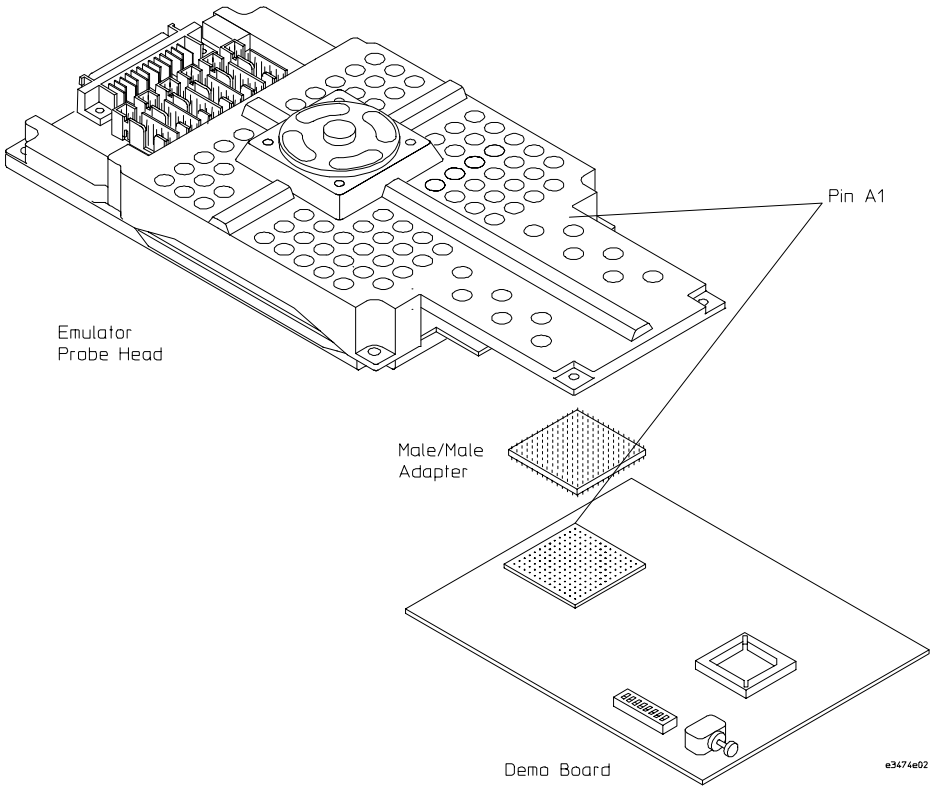
See Also

Refer to the "System Reset" chapter in the Siemens *C167 Derivatives User's Manual* for information on the meaning of the POH.x and POL.x settings.

Step 3. Connect the emulator probe head to the self-test board

1. With processor probe power OFF, connect the emulator probe to the male-to-male adapter.
2. Connect the adapter to the self-test board. When you install the probe into the self-test board, be careful not to bend any of the pins.
3. Power on the processor probe.
4. Check that all of the LEDs on the emulator probe head and on the self-test board are ON.

   If one or more LEDs do not come on, then refer to page 119.



Step 4. Start the Run Control tool

If you are using the processor probe with an HP 16505A prototype analyzer, start the Run Control tool. If you don't have a prototype analyzer, you might try a few of the built-in commands (see page 120).

1. Drag the "uP Run Control" tool from the toolbox onto the HP 16505A prototype analyzer workspace.

2. Move the mouse cursor over the icon, press the right mouse button, and select "Start Session...".
3. Enter the LAN address (or LAN name) of the processor probe and click **Start Session**.

See Also

Help →Help on this window in the Configuration window for information on each of the configuration options.

Help in the Run Control tool menu for help on starting a uP Run Control session.

Step 5. Try a few run control commands

1 In the Run Control window, click the Window menu and select the Registers window.

The Registers window shows the values in the processor's registers.

2 In the Run Control window, click Step several times.

The IP register in the Registers window should advance, demonstrating that the processor on the emulator control head is executing instructions..

Remember that the self-test board does not have any memory, so you will not be able to read or write external memory.

If You Have Problems
If you encounter problems, first check that you have configured the processor probe to match the switch settings on the self-test board. If the Run Control tool still does not work, refer to the "Problems" chapter (page 113).

6

Connecting the Emulator Probe Head to the Target System

Connecting to a Target System

The processor probe must be connected to a target system via the HP E3474A emulator probe head. This chapter describes how to connect the processor probe to the emulator probe head, and how to connect the emulator probe head to your target system.

See Also

For information on designing a your target board for compatibility with the HP E3474A distributed emulation solution, see page 106.

For a list of the parts supplied with the HP E3474A C167 processor probe, see page 3.

For information on connecting the emulator probe head to a logic analyzer, see page 37.

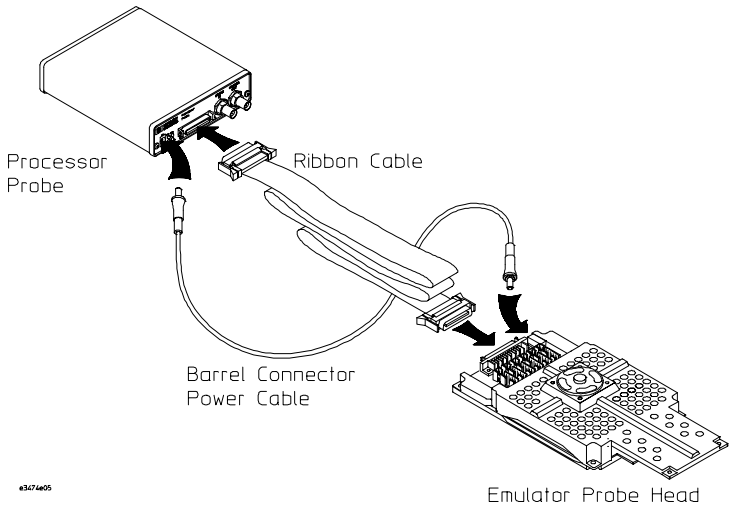
Step 1. Test the processor probe

If this is the first time that you have used the E3474A C167 processor probe, you should run the built-in performance verification test before you connect to a target system. Connect the self-test board (see page 47) then run the performance verification tests described in the "Problems" chapter.

Step 2. Connect the processor probe to the emulator probe head

If you have not already connected the processor probe to the emulator probe head:

1. Remove power from the processor probe.
2. Plug one end of the 50-pin cable into the processor probe.
3. Plug the other end of the 50-pin cable into the emulator control head.
4. Plug one end of the barrel connector cable into the "Power Out" connector on processor probe.
5. Plug the other end of the barrel connector cable into the emulator probe head.



Step 3. Connect the elastomeric QFP probe adapter to the target processor

- For instructions, refer to the *HP E5361A Installation Guide* included in the elastomeric probing kit.

Step 4. Connect the flexible adapter cable to the QFP adapter and to the emulator probe head

1. Connect the male-to-male adapter to the emulator probe head, if it is not already attached.

   The adapter is symmetrical—you do not need to align pin 1 for this step.

2. Choose an orientation of the flexible adapter cable and the emulator probe head.

   The flexible adapter cable can be connected to the elastomeric QFP adapter in any of four different orientations. You must connect the emulator probe head with the corresponding orientation, as illustrated on the next page.

   Notice that the flexible adapter is color coded. Match the color along the front edge of the emulator probe head with the color along the pin 1 side of the processor.

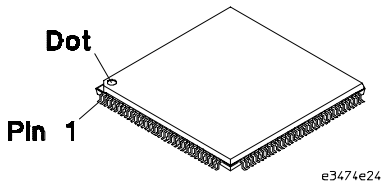
3. Connect the flexible adapter cable to the male-to-male adapter on the emulator probe head.

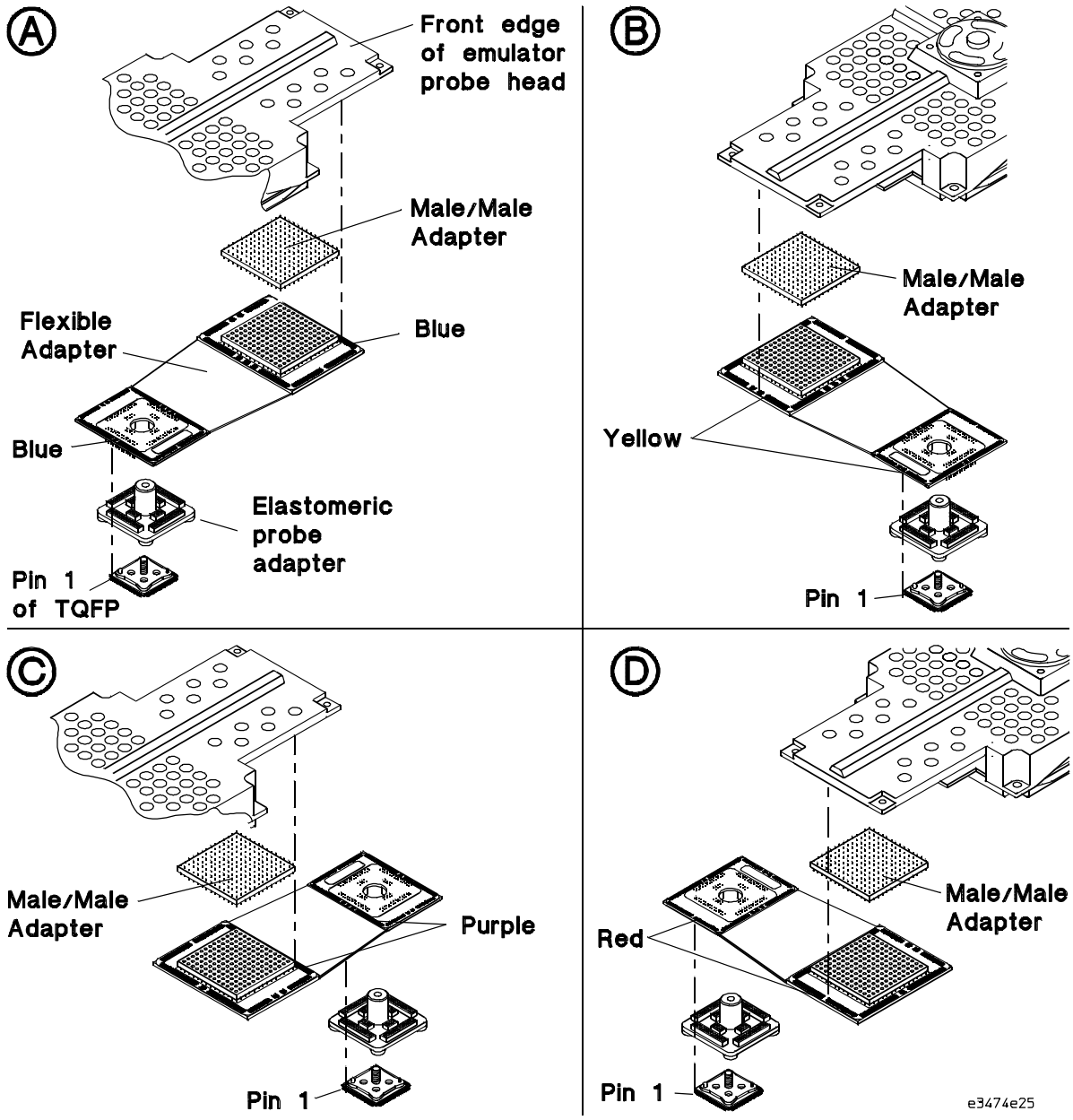
   Be careful to follow the orientation you chose. Note the colored marks along each edge of each end of the flexible adapter cable.

4. Connect the flexible adapter cable to the QFP probe adapter. Be careful to follow the orientation you chose.

Caution

Ensure that the emulator probe head is aligned with the proper pins when connecting to the flexible adapter. Serious equipment damage can result from improper connection.




A
Front edge of emulator probe head
Male/Male Adapter
Flexible Adapter
Blue
Blue
Elastomeric probe adapter
Pin 1 of TQFP
B
Male/Male Adapter
Yellow
Pin 1
C
Male/Male Adapter
Purple
Pin 1
D
Male/Male Adapter
Red
Pin 1
e3474e25

Power-On/Power-Off Sequence

To power on the system

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

1. Logic analyzer (and HP prototype analyzer, if applicable).
2. Processor probe (see page 9).
3. Configure the processor probe for the type of CPU and for your target system (see page 61).
4. Your target system.
5. Press the reset button (if any) on the target system.

To power off the system

Power off your system as follows:

1. Your target system.
2. Processor probe.
3. Logic analyzer.

7

Configuring the Processor Probe

Configuring the Processor Probe

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

The easiest way to configure the processor probe is through the Run Control tool in the HP 16505A prototype analyzer.

The Run Control tool will automatically configure many parameters in accordance with the processor you are using.

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

Other ways to configure the processor probe are:

- the processor probe's built-in terminal interface
- your debugger

To configure using the Run Control tool

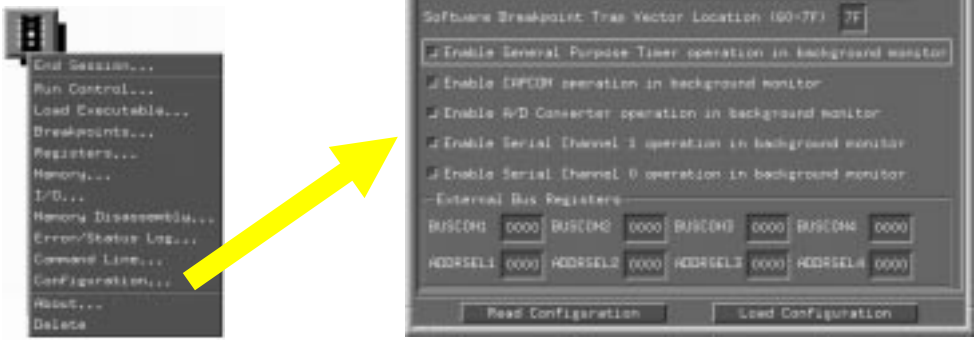
If you are using the processor probe with an HP 16505A prototype analyzer, you can use the Run Control tool to configure the processor probe.

1 Start a Run Control tool session.

Drag the "uP Run Control" tool from the toolbox onto the HP 16505A prototype analyzer workspace. Next, move the mouse cursor over the icon, press the right mouse button, and select "Start Session...".

2 Open a Configuration window.

Select "Configuration..." from the tool menu or from the Window menu in any uP Run Control tool 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.

If you like, you can save the configuration settings as part of a workspace.To save the configuration settings, save the workspace by selecting **File→Save Workspace As...** from the prototype analyzer's main menu.

See Also

Help →Help on this window in the Configuration window for information on each of the configuration options.

Help in the Run Control tool menu for help on starting a uP Run Control session.

To configure using the built-in commands

If you are unable to configure the processor probe with the Run Control tool or a debugger interface, you can configure the processor probe using the built-in "terminal interface" commands.

1. Connect a terminal or terminal emulator to the processor probe's serial port, or use a telnet session over the LAN.
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 a serial terminal or terminal emulator, see page 22.

For information on other built-in commands, see page 120.

Example

A typical configuration for a C167CR-16RM looks like this:

```
R>cf
  cf emuc=0000c
  cf trap=07f
  cf rrt=no
  cf xbc1=004bd
  cf xbc2=004bf
  cf xbc3=00000
  cf xad1=00ef0
  cf xad2=00e03
  cf xad3=00000
  cf pll=0
  cf tlr=0
  cf bsl=167cr
  cf xp1=yes
  cf xp2=yes
  cf xp3=no
  cf breakin=rising
  cf trigout=monhigh
```

To configure the breakpoint trap vector

Breakpoints are set by inserting a TRAP instruction. This configuration option allows you specify which trap vector will be used to handle the breakpoints. To avoid conflicts with interrupt service routines in your target system, choose an unused trap vector location.

You can enter any location from 60 to 7F. The default value is 7F.

The built-in command is `cf trap=`*`value`*.

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. These commands break to the monitor to access the target processor, then resume the user program. (Default)	`cf rrt=no`
yes	No commands are allowed which break to the monitor, except "break," "reset," "run," or "step."	`cf rrt=yes`

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 clock rate

If you configure the distributed emulation solution using the Run Control tool, the clock rate will be set automatically based on the processor you choose.

The clock rate used for communication with the target processor is determined by the Phase Lock Loop (PLL) setting, the Prescaler (TLR) setting, the P0H.7 signal level during reset, and the target's clock oscillator rate (fosc).

If your target system has additional loads on the lines used for the debug port, or if it does not meet the requirements described in the "Designing a Target System" chapter, a slower clock speed may enable the probe to work.

Clock rates of up to 25 MHz are supported.

Caution

Configure clock rates only up to 25 MHz.
If the clock rate is configured to be greater than 25 MHz, the emulator probe head may be damaged.

Clock rate configuration

cf tlr	cf pll	P0H.7	Clock
0	0	0	fosc
		1	fosc * 4
	1	0	fosc
		1	fosc
1	0	0	fosc / 2
		1	fosc * 2
	1	0	fosc / 2
		1	fosc / 2

P0H.7 = 0 means that the P0H.7 line is pulled down.

To configure the EMUCON register

To set the EMUCON register using the built-in terminal interface, use the `cf emuc=`*value* command. Use a 16-bit hexadecimal value (0x0000-0xffff). The default value is 0x000c. Modifying this value causes processor to reset.

EMUCON Register

Bit		Meaning
15	DGPT	General Purpose Timer Unit (1=enabled)
14	DCC1	CAPCOM1 (Capture Compare Unit 1) (1=enabled)
13	DADC	A/D Converter Unit (1=enabled)
12	DSSC	High Speed Sync Serial Channel (1=enabled)
11	DASC	Async/Sync Serial Channel (1=enabled)
10	DPWM	Pulse Width Modulation Unit (1=enabled)
09	DCC2	CAPCOM2 (Capture Compare Unit 2) (1=enabled)
08		not defined
07	TMOD1	read-only
06	TMOD2	read-only
05-04		not defined
03		reserved for HP use
02-00	ROMSIZE	Size of processor's internal ROM: 111 - 32 Kbyte 110 - 64 Kbyte 101 - 96 Kbyte 100 - 128 Kbyte 011 - reserved for HP use 010 - reserved for HP use 001 - reserved for HP use 000 - reserved for HP use

To configure the internal ROM substitution memory

The emulator probe head's substitution memory works like the processor's internal ROM, except that you can read, write (from the background monitor), and set breakpoints in this memory.

To configure the substitution memory:

1. **Set the ROMSIZE field in the EMUCON register.**

   Note that the emulator probe head has 128K of substitution memory.

2. **Enable the internal ROM by setting the ROMEN bit in the processor's SYSCON register or by pulling down the EA line on the target processor.**
3. **Set the ROMS1 bit in the processor's SYSCON register to map the internal ROM to segment 0 or 1.**
4. **Load the appropriate memory image into the mapped memory segment.**

   The substitution memory is not automatically programmed with the contents of the target processor's internal ROM. Create a file which contains the memory image, then use your debugger or the Run Control tool's "Download Executable" window to write it to the substitution memory.

Note that the distributed emulation solution does not have the ability to program the internal ROM on your target CPU.

Do not map any RAM to the segment used for IROM (defined by the ROMS1 bit in the processor's SYSCON register). The distributed emulation solution cannot read memory mapped to this segment.

To configure X-Peripherals

The XBUSCON and XADRS registers should be programmed for any X-Peripherals which are part of your C167-family processor. The value for the XBCON and XADRS registers can be in the range 0-0xffff. The default value is 0.

To configure a register, enter one of the following commands:

XBUS peripheral register configuration

Register configured	Built-in command
XBCON1	`cf xbc1=value`
XBCON2	`cf xbc2=value`
XBCON3	`cf xbc3=value`
XADRS1	`cf xad1=value`
XADRS2	`cf xad2=value`
XADRS3	`cf xad3=value`

To enable or disable an X-Peripheral, use one of the following commands:

X-Peripheral Output

X-Peripheral	Output	Built-in command
1	enabled	`cf xpl=yes`
	disabled (default)	`cf xp1=no`
2	enabled	`cf xp2=yes`
	disabled (default)	`cf xp2=no`
3	enabled	`cf xp3=yes`
	disabled (default)	`cf xp3=no`

Modifying any of these values causes the processor to reset.

You can substitute the output of an X-Peripheral for the standard peripheral Port output. For example, you can use the xp1 configuration option to enable or disable CAN bus I/O.

Example

For the CAN X-peripheral, set XBCON = 04bd and XADRS = 0ef0, then enable the peripheral.

For the XRAM X-peripheral, set XBCON = 04bf and XADRS = 0e03, then enable the peripheral.

To configure the bootstrap loader program

Enter the bootstrap loader used by the processor. This determines which code will be loaded into the bootstrap memory of the processor probe.

This will be the bootstrap program executed when the target starts up in bootstrap mode.

Bootstrap Loader Configuration

Value	Processor probe configured for	Built-in command
167	C167SR-LM C167S-4RM C167-LM (Default)	`cf bsl=167`
167cr	C167CR-16FM C167CR-16RM C167CR-8RM C167CR-LM	`cf bsl=167cr`
165	C165-RM C165-LM C165-RF C165-LF C165-L25M C165-xM/F	`cf bsl=165`

To configure the processor probe's copies of the external bus registers

The external bus registers are typically initialized at reset by the target system's initialization code. During development this code might not exist on the target system. To aid in development, these registers can be set directly by the processor probe, before executing any user code.

The processor probe's values will be copied from the processor probe to the processor's registers upon a transition from Reset to Background (break).

- To set the processor probe's copy of an ADDRSEL register using the built-in terminal interface, use the `reg cf_addrsel`*n*`=`*value* command, where *n* is 1, 2, 3, or 4. Use a 16-bit hexadecimal value.
- To set the processor probe's copy of a BUSCON register using the built-in terminal interface, use the `reg cf_buscon`*n*`=`*value* command, where *n* is 1, 2, 3, or 4. Use a 16-bit hexadecimal value.
- To display the value of a register using the built-in terminal interface, use the `reg cf_`*registername* command.

See also

The documentation for your target system for information on setting external bus registers.

To configure processor registers using the processor probe's copies

Copying from the processor probe to the processor

- The processor probe's values will be copied from the processor probe to the processor's registers upon a transition from Reset to Background (break).
- If you are using the Run Control tool, click the **Load Configuration** button in the Configuration window.
- You can also copy the registers using the built-in `sync config` command.

Copying from the processor to the processor probe

- If you are using the Run Control tool, click the **Read Configuration** button in the Configuration window.
- You can also copy the registers using the built-in `sync proc` command.

Comparing registers

- To display differences between the target's registers and the processor probe's copies, use the built-in `sync diff` command.

Initializing registers

- To set the processor probe's copies to their power-up values, use the built-in `sync init` command.

8

Configuring the Logic Analyzer

Configuring the Logic Analyzer

This chapter explains how to configure a logic analyzer for your microprocessor.

You can configure the logic analyzer by loading a configuration file. The information in the configuration file includes:

- Signal names
- Inverse assembler for the logic analyzer

Configuring the logic analyzer consists of loading the software by inserting the floppy disk into the logic analyzer disk drive and loading the proper configuration file. The configuration file you use is determined by the logic analyzer you are using.

If you are using an HP prototype analyzer, use the procedure on page 79.

To load the configuration and inverse assembler

Make a duplicate copy of the master disk. For information on duplicating disks, refer to the reference manual for your logic analyzer.

For logic analyzers with a hard disk, you might want to create a directory such as \siemens on the hard drive and copy the contents of the floppy onto the hard drive. You can then use the hard drive for loading files.

1. Insert the floppy disk in the front disk drive of the logic analyzer.
2. Go to the Flexible Disk menu.
3. Configure the menu to load.
4. Use the knob to select the appropriate configuration file.

   Choosing the correct configuration file depends on which analyzer you are using. The configuration files are shown with the logic analyzer connection tables, and are also in the table on the next page.
5. Select the appropriate analyzer on the menu. The HP 16500 logic analyzers are shown in the table.
6. Execute the load operation on the menu to load the file into the logic analyzer.

   The logic analyzer is configured for C167 analysis by loading the appropriate configuration file. Loading this file also automatically loads the IAC167E inverse assembler.

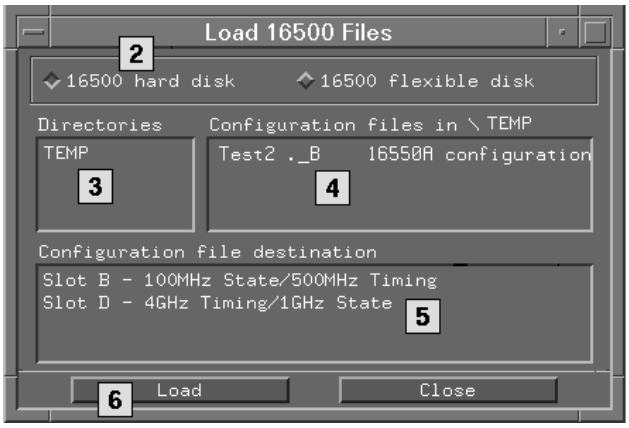
Logic Analyzer Configuration Files

Analyzer Model	16500 Analyzer Description	Configuration File Name
16550A (one card)	4 k SAMPLE 100 MHz LA	C167_01
16554A (two card)	0.5M SAMPLE 70/125 MHz LA	C167_02
16555A/D (two card)	1.0/2.0M SAMPLE 110/250 MHz LA	C167_02
16556A/D (two card)	1.0/2.0M SAMPLE 100/200 MHz LA	C167_02
1660C/CS		C167_04
1661C/CS		C167_04
1670A/D		C167_03
1671A/D		C167_03

To load the configuration and inverse assembler using an HP prototype analyzer

The inverse assembler files are part of HP 16500B/C configuration files. You DO NOT have to perform the Transfer Invasm Files operation. These instructions assume you have installed the inverse assembler as described on page 29.

1. In the main menu bar, click **File**, then select **Load HP 16500B Files**.
2. From the Load HP 16500B Files dialog, select the source disk drive.
3. If necessary, select the appropriate subdirectory.
4. Click on the desired configuration file.
5. Select the configuration file destination.
6. Click **Load**.



7. Open the Listing window.
   1. Drag the state analyzer instrument tool icon onto the workspace.
   2. Drag the Listing tool on top of the instrument tool. The two tool icons will be connected by a line, showing that the output of the logic analyzer module is being sent to the listing tool.
   3. Double-click the Listing tool icon to display the Listing window.

7 In the Listing window, select **Invasm→Load...** and load the IAC167E inverse assembler.

See Also

Note that the Run Control tool is not configured when you load a configuration file. To configure the Run Control tool, see page 61.

For more information on transferring and managing files, click **Help** in the main workspace window, then go to the "Working with the File Manager" topic.

If you received other disks (such as Run Control tool patch disks), refer to the installation instructions provided with the disks. If you cannot find any instructions, look for a README file on the disks.

9

Analyzing the C167

Analyzing the C167

This chapter describes status information label and symbol encodings and gives some specific examples of triggers using the HP 16505A prototype analyzer.

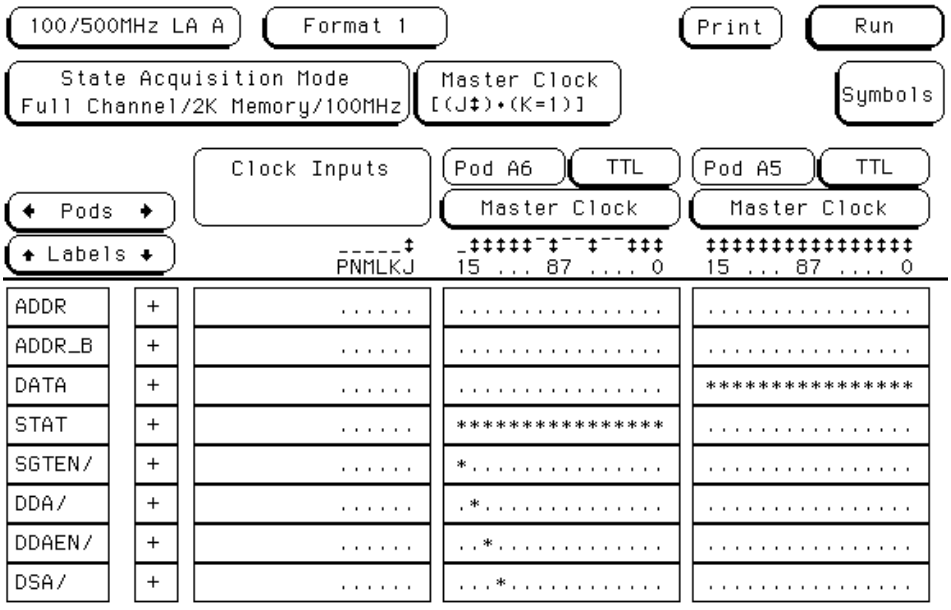
Modes of operation

Unlike many HP preprocessors which have both a state mode and a timing mode, the HP E3474 distributed emulation solution always operates in state mode.

Format Menu

Bit 0 is the least significant signal on a bus.

The configuration software sets up the analyzer format menu to display either six pods of data. The following figure shows the Format Menu for the C167 as configured on the HP 16550. The clocks and the first two of the six pods are displayed.



Status signals

Pod 6 and the upper 8 bits of pod 4 consist of status signals. The status signals can be viewed as individual labels, or as the 24-bit STAT label.

The following table describes the signals that comprise the analyzer's STAT label.

Except where otherwise noted, signals are active low.

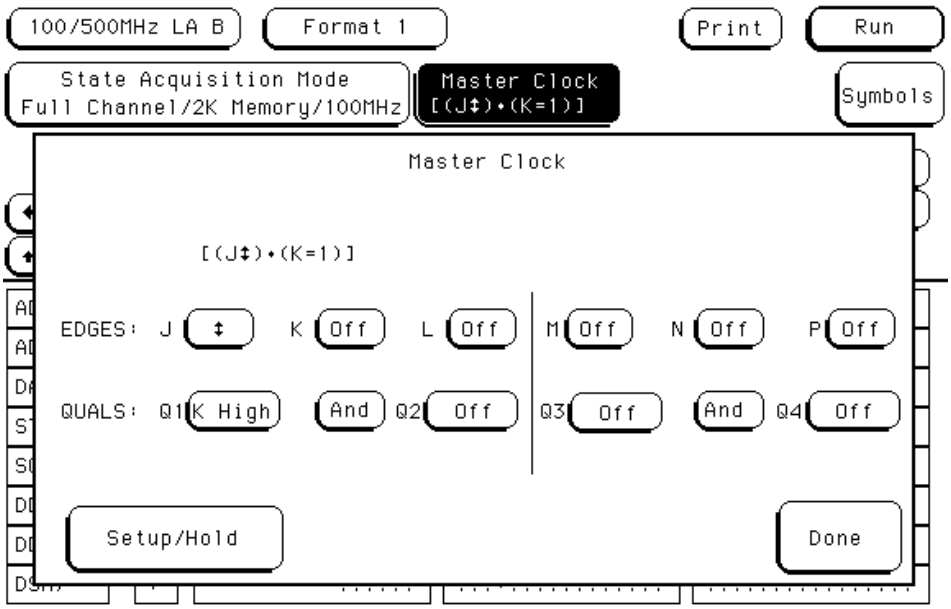
Status Bit s

Label	STAT bit	Description
SGTEN	23	Segmentation is enabled
DDA	22	Destination data address (1): Low=destination address is available on the DDA bus bus High=data is available on the DDA
DDAEN	21	DDA bus is available (1)
DSA	20	Destination source address (2): Low=address is available on the DSA bus High=data is available on the DSA bus
DSAEN	19	DSA bus is available (2)
DEN	18	DAT bus is available (3)
BOPEN	17	Bit data operation
DOPEN	16	Data output enable: Low=data operation High=program flow control, other
CAN	15	Current instruction is cancelled
JCLOAD	14	Jump cache load
INSFD	13	Instruction moved from fetch to decode stage
INJ	12	Injected instruction
REINJ	11	Re-injected instruction
ROMDAT	10	Data access on IROM
JMPTKN	9	Jump taken
JCHIT	8	Jump cache hit
BG	3	Background
OPR	2	Low=operand state High=opcode state
RQRACC	1	ROM access requested

(1) DDA bus is the ADDR_B bus during the operand state
(2) DSA bus is the ADDR bus during the operand state
(3) DAT bus is the DATA bus during the operand state

To configure the master clock

The distributed emulation solution uses the processor's internal clock signal, which is visible as the K clock. To properly latch data, your logic analyzer's clock screen should look like this:



Using the Inverse Assembler

This section discusses the general output format of the inverse assembler and processor-specific information.

Data

r0...r15, register:bit

General purpose registers are displayed as r0, r1, ..., r15. Special function registers (SFR and ESFR) are displayed using their mnemonic. Bit addressable registers are represented as *register:bit*.

The DSTP0-7 and SRCP0-7 registers are not displayed.

h

Most numerical data is displayed in hexadecimal. Hexadecimal values are identified with an 'h'.

#data16

In many cases, operand values cannot be determined from the processor's internal signals which are available to the logic analyzer. The unknown operand values are displayed as #data16.

The captured or inferred values for these operands are often displayed later in the trace listing, below the disassembled instruction. Note, however, that the "data" notation in the listing refers to the ALU result, not an operand value.

Opcodes

The disassembler decodes the full C167 instruction set architecture, including 32-bit mode instructions.

Branch Instructions

If the address of a branch relative instruction is known, its target is presented as an absolute hex address.

Extended Mnemonics

C167 assemblers support a number of extended mnemonics for some popular assembly language instructions as described in the C167 User's Manual. The E3474A disassembler supports the following extensions:

- Instructions ending with "2" are injected or reinjected instructions. For example, the MOV2 instruction is a reinjected MOV instruction.
- Conditional branches decode the condition mnemonically. A few of the condition codes are decoded in the following way:

Condition Codes

Mnemonic	Meaning	Decoded As
CC_EQ	Equal	CC_Z
CC_NE	Not equal	CC_NZ
CC_ULT	Unsigned less-than	CC_C
CC_UGE	Unsigned greater-than-or-equal	CC_NC

Display Filtering

The inverse assembler allows you to Show or Suppress several types of states. This function is called display filtering. States can be filtered according to what type of cycle the state is.

The show/suppress settings do not affect the data that is stored by the logic analyzer; they only affect whether that data is displayed or not. The same data can be examined with different settings, for different analysis requirements.

Inverse Assembler Notations

In addition to standard Siemens C167 assembly language notation, the following notations are used in the trace listing:

bit	bit position (inferred value of b??)
b??	bit number unavailable (value will be displayed later in the operand state)
can	cancelled instruction
cpsw	current program status word (PSW)
#data8	data value not available (value will be displayed later in the operand state)
data8	data (inferred value of #data8)
data	ALU result
#data16	operand value not available
ddat	destination data value (shown before operation is complete)
illegal	undefined opcode
inj	injected instruction
jc	jump on cache (jump target instruction was taken from the jump cache)
mask8	mask (inferred value of #mask8)
#mask8	mask value unavailable (value will be displayed later in the operand state)
n-ip	next IP address
n-ip:nojmp	the jump was not taken
ncsp	next CSP
npsw	next PSW
#pag	page value unavailable
radr	read address
rd-d	read data
reinj	reinjected instruction
r-ip	return IP address
sdat	source data value
#seg	segment value unavailable
stkd	stack data (top of stack)
wadr	write address

Examples of Common Measurements

This section gives a few examples of common measurements using HP benchtop logic analyzers (such as the HP 16500C) or using the HP 16505 prototype analyzer. For more information, refer to the manuals or online help for your logic analyzer.

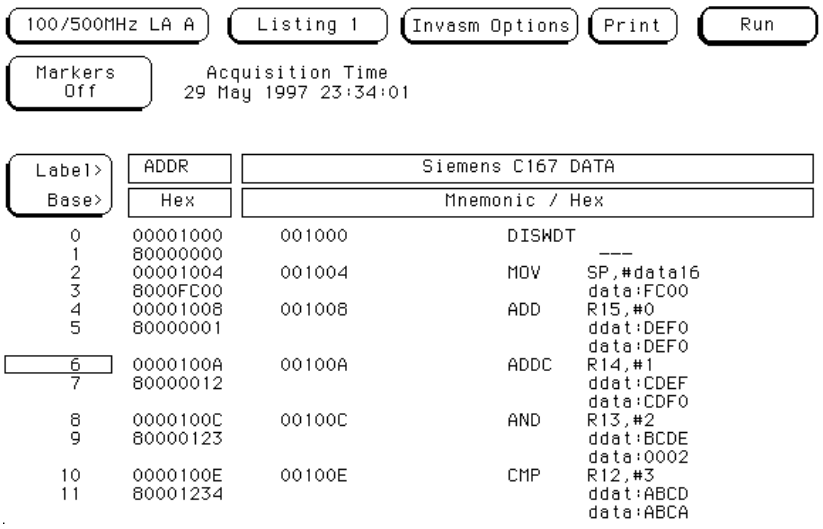
To view a disassembled trace listing

With an HP 16500 logic analyzer

1. Check that you have loaded the appropriate configuration file and inverse assembler.
2. Select the Listing screen.
3. Check that your target system is running user code.
4. Click the **Run** button.

   If you have not set a trigger, wait a few seconds and click the **Stop** button to stop collecting trace data.

   The logic analyzer displays captured state data in the Listing Menu. The inverse assembler display is obtained by setting the base for the DATA label to Invasm. The following figure shows a typical disassembled listing.



With an HP prototype analyzer

1. Check that you have loaded the appropriate configuration file (using **File→Load 16500 Files...** in the main workspace window).
2. Drag the state analyzer instrument tool icon onto the workspace.
3. Drag the Listing tool on top of the instrument tool.

   The two tool icons will be connected by a line, showing that the output of the logic analyzer module is being sent to the listing tool.
4. Check that your target system is running user code.
5. Click the **Run** button in any window.

   If you have not set a trigger, wait a few seconds and click the **Stop** button to stop collecting trace data.
6. Double-click the Listing tool icon to display the Listing window.

   If you need help, click **Help** in the Listing window menu bar (for help on the Listing tool), in one of the instrument tool window menus (for help setting up the logic analyzer module), or in the main workspace menu bar (for general help).

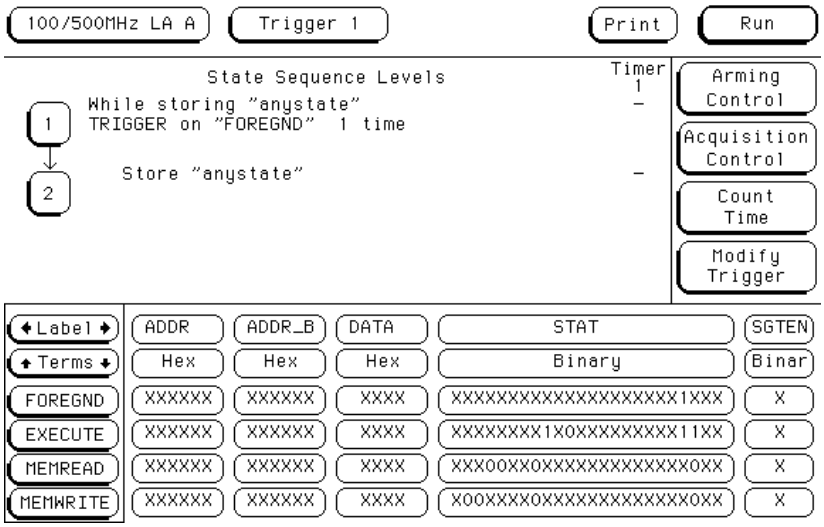
To trigger on execution of an instruction

Define a resource term which excludes cancelled, background, and injected cycles, and includes cycles in which an instruction moves from the fetch stage to the decode stage:

ADDR = *address*
CAN/ = 1
INSFD/ = 0
BG/ = 1
INJ/ = 1
REINJ/ = 1

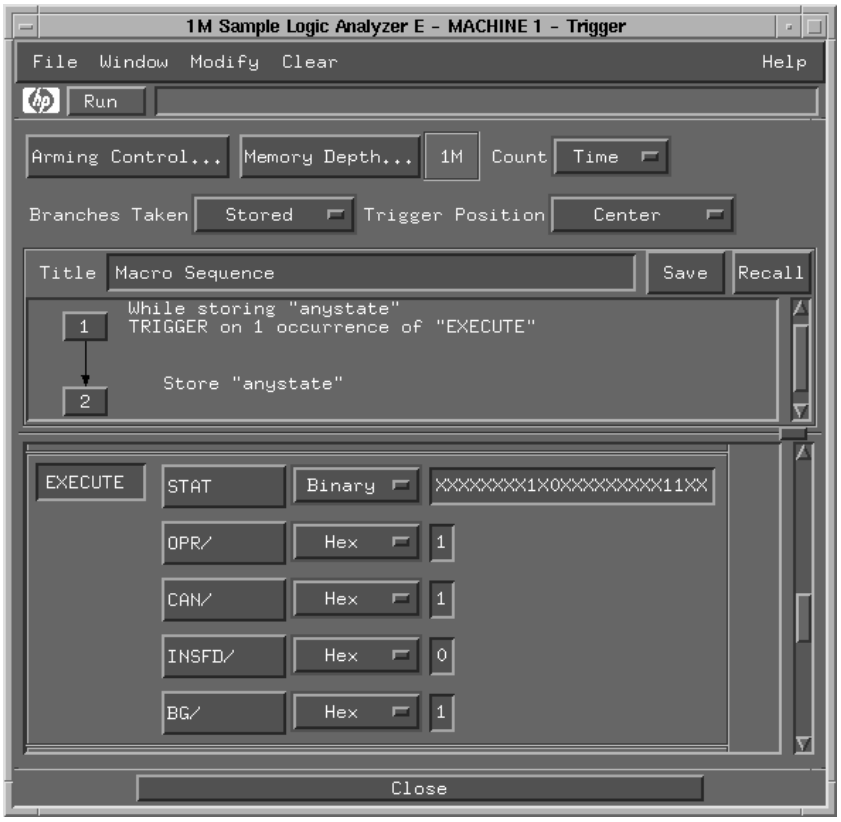
With an HP 16500 logic analyzer

1. Make sure the processor is executing user code.
2. In the Trigger screen, trigger on one occurrence of the predefined "EXECUTE" resource term.
3. Click the **Run** button.



With an HP prototype analyzer

1 In the Trigger window, define a trigger pattern called "EXECUTE" and trigger on the first occurrence of this pattern:



2 Open the Listing window. If necessary, load the C167 inverse assembler (using **Invasm→Load...).**

3 Make sure the target processor is running user code.

4 Click the **Run** button in the Listing window.

To trigger on a read of a memory location

There is no read/write status signal, but you can use bus status to trigger on a read.

With an HP 16500 logic analyzer

Use the predefined MEMREAD resource term.

With an HP prototype analyzer

Define a resource term which excludes program flow control cycles and which includes operand (not opcode) cycles which have a read address (DSA):

ADDR = *address*
DSA/ = 0
DSAEN/ = 0
DOPEN/ = 0
OPR/ = 1

To trigger on a write of a memory location

With an HP 16500 logic analyzer

Use the predefined MEMWRITE resource term.

With an HP prototype analyzer

Define a resource term which excludes program flow control cycles and which includes opcode cycles which have a write address (DDA):

ADDR = *address*
DDA/ = 0
DDAEN/ = 0
DOPEN/ = 0
OPR/ = 1

To trigger on an interrupt

Define a resource term which looks for injected TRAP instructions:

DATA = XX9B
INJ/ = 0
OPR/ = 1

To determine the pipeline stage of a state

Trace listings show activity in all four pipeline stages: fetch, decode, execute and writeback.

You may be able to determine which pipeline stage a state corresponds to by looking at the status bits.

The DSA and DSAEN bits are valid only in the ***fetch*** stage.

The INSFD, INJ, and REINJ status bits are valid only in the ***decode*** stage.

The JCLOAD, ROMDAT, JMPTKN, and JCHIT bits are valid only in the ***execute*** stage. Furthermore, the OPR bit will be high only in the execute stage.

The CAN bit is valid in both the ***decode*** and ***execute*** stages.

The DDA and DDAEN bits are valid only in the ***writeback*** stage.

10

Updating Firmware

Updating Firmware

Hewlett-Packard formally supports only configurations that include the latest revisions of all software and firmware. Software updates can be ordered to get the latest firmware revisions.

You can update the firmware in the HP processor probe by using the prototype analyzer Run Control tool or by running the prgflash.xxx utility program.

Four different versions of the prgflash program are available. The program prgflash.hp7 runs on HP-UX Series 700 machines, prgflash.sun runs on Sun SPARC machines running SunOS 4.1, prgflash.sol runs on Sun SPARC machines running Solaris and prgflash.exe runs on Windows® machines. The prgflash.xxx utility will only update the firmware over lan.

The floppy disk is in MS-DOS format and can be read directly on MS-DOS machines, HP-UX Series 700 and Solaris machines equipped with a 3.5 inch floppy drive.

See the "readme" file on the floppy disk for any special instructions regarding the firmware.

To update firmware using the HP prototype analyzer

The easiest way to update the firmware in your HP processor probe is to use the Run Control tool.

1. End any run control sessions which may be running.
2. Install the firmware onto the prototype analyzer hard disk.
3. Move the mouse cursor over the Run Control tool in the workspace, press and hold the right mouse button, move the mouse cursor over *Update Probe Firmware...*, and release the right mouse button.
4. Select the firmware to be updated.
5. In the Update Probe Firmware dialog, enter the LAN name or address of the processor probe, then click *Update Firmware*.
6. When the firmware has been updated, cycle power on the processor probe.

See Also

The Run Control tool online help for instructions on how to copy the firmware files to the prototype analyzer hard disk.

To update firmware using prgflash.xxx

1. **Make a directory on your computer, change to that directory and copy the files from the floppy to that directory.**

   On HP-UX Series 700 machines, if your machine is equipped with a floppy drive, copy the file install.hp7 to this directory with the doscp command and execute it as follows:

```
mkdir myprobe
cd myprobe
doscp <floppy device>:install.hp7 .
./install.hp7 <floppy device>
```

   Where <floppy device> is the name of the floppy raw device file, typically "/dev/rdsk/0s1".

   On SUN Solaris machines, insert the floppy in the drive, run volcheck to "mount" the volume and copy the files to the current directory.

```
volcheck
mkdir myprobe
cd myprobe
cp /floppy/floppy0/* .
eject
```

   On SUN SunOS 4.1 machines, there are no standard utilities for reading MS-DOS format floppies. To find out if there are any non-standard means of reading PC format floppies on your machine, check with your system administrator.

   For MS-DOS machines, you can run prgflash.exe copy the files from the floppy drive to a directory on your hard drive.

```
md c:\hpprobe
a:
copy *.* c:\hpprobe
```

   For all UNIX machines that do not have floppy drives, you can copy the files from a LAN based PC using a LAN based file transfer utility like ftp or rcp, see your network administrator or LAN software documentation. Use binary mode when transferring the files from MS-DOS machines.

2. Run the **prgflash.xxx** command.

To run prgflash.xxx on Unix workstations

Use the command:

`prgflash.xxx [-v] [probe IP addr] [product to update]`

where xxx is hp7, sun or sol as described above.

The -v option means "verbose". It causes progress status messages to be displayed during operation.

The probe IP addr option is the ip address of the HP processor probe in either dotted decimal form or alias form (from /etc/hosts).

The product to update option names the products whose firmware is to be updated. Check the "readme" file on the disk for more details.

If you enter the prgflash.xxx command without all options, it becomes interactive. You must always supply the "probe IP addr" option. If you don't include the "product to update" option, it displays the products which have firmware update files on the system and asks you to choose one. It will first look in the current directory for product files, if it does not find any there, it will check the directory $HP64000/inst/update if the $HP64000 environment variable is set or /usr/hp64000/inst/update if $HP64000 is not set. You can abort the interactive prgflash.xxx command by pressing <CTRL>c.

Example

To use update the firmware in "myprobe" from a series 700 HP-UX machine, you could enter the following command:

```
prgflash.hp7 -v myprobe E3474
```

To run prgflash.exe on Windows 95 or Windows NT

In an MS-DOS window, use the command:

`prgflash [-v] [probe IP addr] [product to update]`

The -v and [product to update] options are the same as described above.

The [probe IP addr] option is the ip address of the HP processor probe in dotted decimal form or alias form (if a hosts file has been set up on the PC).

You can enter prgflash without any options and you will be prompted for the IP address and "product to update" option. It will first look in the current directory for product files, if it does not find any there, it will check the directory $HP64700\update if the $HP64700 environment variable is set or

\hp64700\update if $HP64700 is not set. You can abort the interactive prgflash.exe command by pressing <CTRL>c.

This version of prgflash will only run under Windows 95 or Windows NT. If you only have access to MS-DOS or Windows 3.1, contact HP.

Example

To use update the firmware for a C167, you could enter the following command:

```
prgflash -v 192.5.21.2 E3474
```

Prgflash.xxx will print "Flash programming SUCCEEDED" and return 0 if it is successful; otherwise, it will print "Flash programming FAILED" and return a nonzero (error).

You can verify the update by displaying the firmware version information.

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 HP processor probe.

If the firmware doesn't appear to be updated

Though Flash EPROM is very reliable, it can fail. If the HP processor probe determines the Flash EPROM is not working, it will try to use the boot code in its Flash EPROMs. The only useful operation the boot code allows is running prgflash.

- ☐ Make sure the current version information is correct by comparing it with the version numbers of the update software.
- ☐ Try updating the firmware again.

  If none of these steps solves the problem, contact your local HP Representative.

If there is a power failure during a firmware update

If there is a power glitch during a firmware update, some bits may be lost during the download process, possibly resulting in an HP processor probe that will not boot up.

- ☐ Set switch S4 to OPEN, then cycle power. This tells the HP processor probe to ignore everything in the Flash EPROM except the boot code.
- ☐ Repeat the firmware update process.
- ☐ Set switch S4 to CLOSED, then cycle power. This restores the HP processor probe to its normal mode.

11

Designing a Target System

Designing a Target System

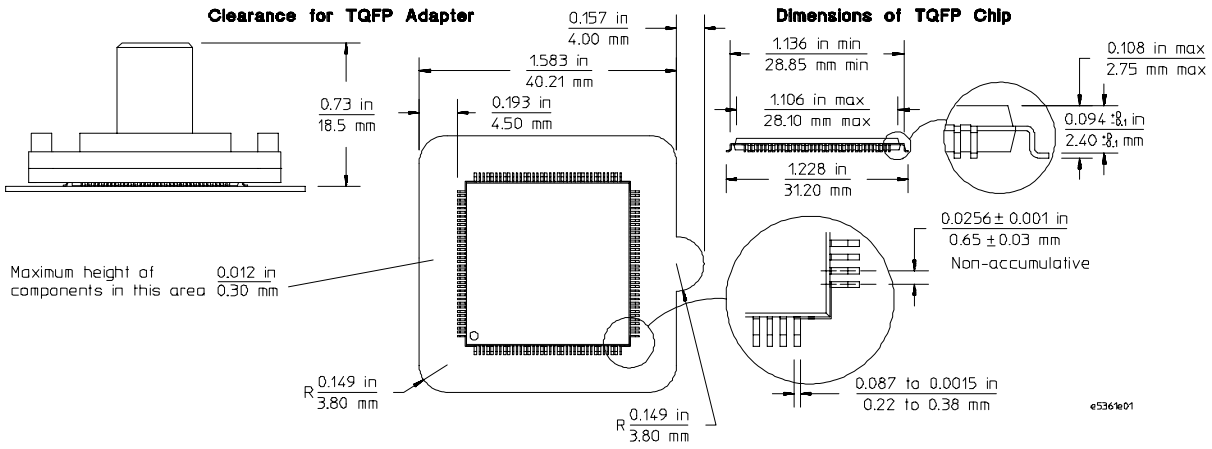
This chapter will help you design a target system that will work with the HP E3474A C167 processor probe.

Target System Physical Requirements

Minimum keepout area:

1.58 inches x 1.58 inches (40.2 mm x 40.2 mm) square centered over CPU.

Maximum height of components in the keepout area is 0.30 mm.



Target System Signal Requirements

Port0 pulldown resistor

For best reliability, use an 8 KΩ resistor. Do not use a resistor greater than 10 KΩ. Contact Siemens if you require additional information on calculating the value of this resistor.

Ground pins

Caution

Possible target damage
Pins 45 and 110 of the target processor must be tied to the other ground pins of the processor.

Pins 45 and 110 must be tied to the other ground pins of the processor. If these pins are not connected to ground, the emulator probe head will believe it is connected to the self-test board, and will supply power to the target system.

Reset Button

You need to have a way to assert a hardware reset signal on your target system. Reset commands (from the Run Control tool or a debugger) will not force the $\overline{\text{RSTIN}}$ line low. Instead, a reset command tells the processor probe to wait until the target processor has been reset (that is, it will wait until $\overline{\text{RSTOUT}}$ is asserted).

After turning on the power system, you should press the reset button to allow the distributed emulation solution to gain control of the target processor.

If you cannot incorporate a reset button, some target systems can be reset by cycling power.

Bootstrap Loader

In most cases, pin P0L.4 (BSL) should not be pulled low during reset. Because the distributed emulation solution can download code (with a debugger or the Run Control tool), the bootstrap loader is usually unnecessary.

If this pin is low during reset, the bootstrap loader will attempt to start moving code into internal RAM through the serial interface ASC0. The code you see running will be the bootstrap loader code, not the reset vector code.

Target System Initialization Requirements

Memory

If your target system has extra memory control logic, you will need to set up the BUSCON registers.

Some target systems may require other operations, such as writes to a memory location, to configure the memory. An example of such a target system is the one supplied with the I+ME C166 Promotion Package.

To simplify this initialization, consider using a startup file in your debugger. If you are using the Run Control tool with an HP prototype analyzer, you can use the Command Line window to create and store a script to run the initialization commands.

12

Specifications and Characteristics

Processor Compatibility

The HP E3474A C167 Distributed Emulation Solution supports Siemens C167 family microcontrollers, including: C167CR-LM, C167-LM, C167CR-16FM, C167CR-16RM, C167CR-4RM, C167SR-LM, and C167S-4RM.

Processor 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 by the HP 16505A Prototype Analyzer. Refer to Online Help for more information.

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 $V_{CC;}$ 5 V below ground. Input function is selectable by the HP 16505A Prototype Analyzer. Refer to Online Help for more information. When a break is received, there is a 100 ns delay, then the currently executing instruction will complete before execution stops.

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

Emulator Probe Head Operating Characteristics

The following operating characteristics are not specifications, but are typical operating characteristics for the HP E3474A distributed emulation solution.

Maximum Ratings

Characteristics for HP E3474A C167 processor probe	Notes	Symbol	Min	Max	Unit
Input voltage range		V_{in}	-0.5	5.5	V
Input voltage range (Vtt)			1.3	1. 7	V
Input High Voltage		V_{ih}	$^2/_3V_{tt}$ + 0.2		V
Input Low Voltage		V_{il}		$^2/_3V_{tt}$ - 0.2	V
Input High Current		I_{ih}		-15	µA
Input Low Current		I_{il}		100	µA
Output High Voltage		V_{oh}	2.4	Vdd	V
Output Low Voltage		V_{ol}		0.5	V
Output High Current		I_{oh}	8		mA
Output Low Current		I_{ol}	-16		mA

Signal loading is 17 pf to ground.

Environmental Specifications

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%.

13

Solving Problems

Solving Problems

If you have problems with the HP E3474A C167 processor probe, your first task is to determine the source of the problem. Problems may originate in any of the following places:

- The processor probe itself
- The emulator probe head itself
- The connection between the emulator probe head 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 processor probe, emulator probe head, and self-test board
- The processor probe "performance verification" tests
- The processor probe's built-in "terminal interface" commands

Troubleshooting Guide

Common 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 122
LEDs are off when the emulator probe head is connected to the self-test board	Check all power connections.	page 119
Unable to break into the monitor	**1** Check the orientation of the flexible adapter cable.	page 55
	2 Check that QFP probe adapter is fully seated. In particular, make sure that the target system has adequate clearance around the processor, and that no target system components are preventing a good connection.	page 105
Commands from the Run Control tool or debugger have no effect	**1** Verify LAN communication.	page 21
	2 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 120
Processor probe built-in commands do not work	**1** Check that the processor probe has been properly configured for your target system.	page 61
	2 Run the processor probe head performance verification tests.	page 129
	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 105

Symptom	What to do	See also
"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 Run Control tool or "c>" prompt in the built-in terminal interface	Check that the clock rate is properly configured.	page 67
Some commands fail	Check the "restrict to real-time runs" configuration	page 65
After reset, the wrong code appears to be running	Check that the P0H.4 (BSL) pin is not held low	page 107
Accesses to external memory fail	**1** Press the reset button on your target system	
	2 Check that the RAM is not mapped to IROM	page 69
Memory access fails	Check that the BUSCON registers are correctly configured.	

Status Lights

The processor probe communicates various modes and error conditions via the status lights. The meanings of the status lights are shown on the previous page.

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)

Power/Target Status Lights

Pwr/Target LEDs	Meaning
❍❍ ❍❍	Processor probe is not connected to power supply
❍● ❍❍	No target system power, or processor probe 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 executing in the background monitor
❍● ●❍	The target processor is executing user code

Processor probe status lights

The following illustration shows the status lights on both sides of the processor probe and what they mean:

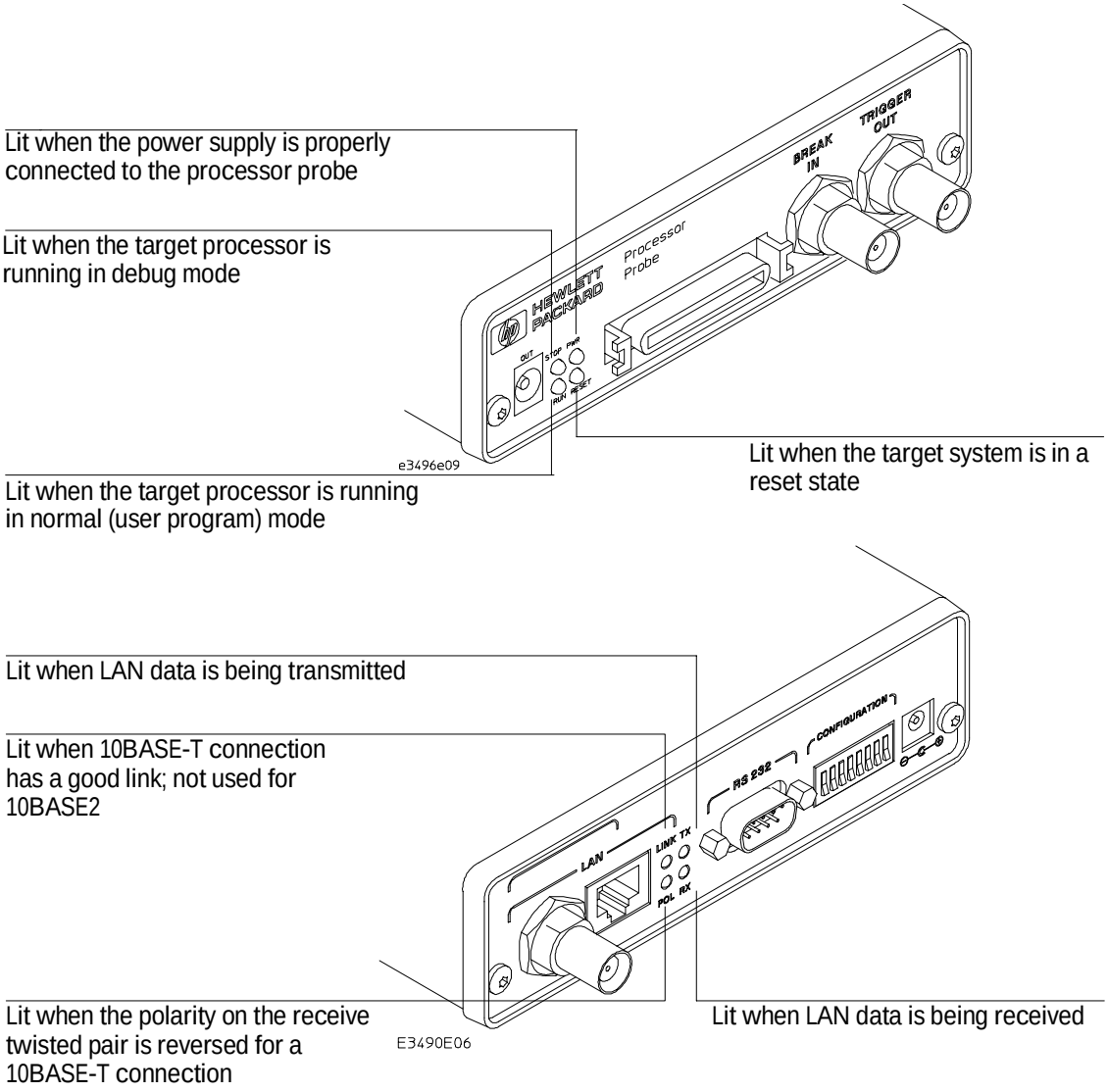
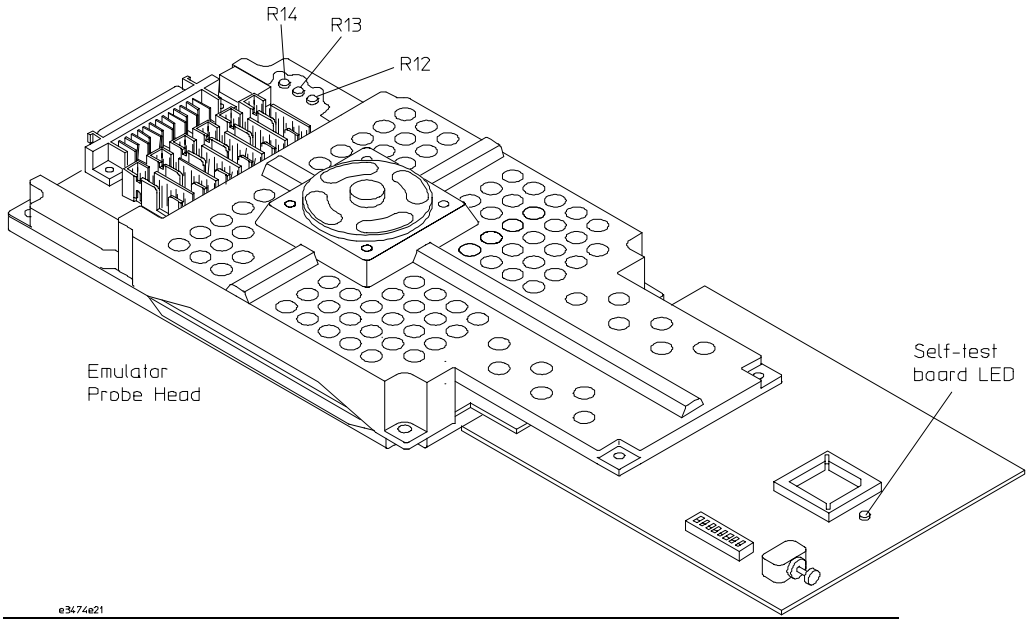


Figure 7. Status Lights

Emulator probe head and self-test board status lights

Normally, the LEDs on the emulator probe head and on the self-test board should be lighted (on).



Emulator probe head and self-test board status lights

LED	Meaning	What to do if the LED is off
R12 (DS1)	Power from processor probe ribbon cable	Check that the processor probe is connected and powered on.
R13 (DS2)	On-board 5V power	If both R13 and R14 are off, check that the barrel connector power cable is connected.
R14 (DS3)	Power from barrel connector power cable	
self-test board	Self-test board power	Check that all LEDs on the emulator probe head are lighted. Check that the self-test board is connected with the correct orientation. Check that the pins on the male-to-male adapter are not damaged.

If the measures above do not solve the problem, you may need to return the emulator probe head to HP for service.

Built-in Commands

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

You can access the terminal interface via:

- A serial connection (see page 22)
- A telnet (LAN) connection
- The Command Line window in the Run Control tool
- A "debugger command" window in your debugger

Here are a few useful commands:

Useful built-in commands

b	Break—go into the background monitor state
cf	Configuration—read or write configuration options
help	Help—display online help for built-in commands
init	Initialize—init -c reinitializes everything in the processor probe except for the LAN software; init -p is the equivalent of cycling power (it will break LAN connections)
lan	configure LAN address
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 processor probe 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 processor probe

The prompt indicates the status of the processor probe:

Processor probe prompts	
R	Reset
U	Running user program
M	Running in background monitor
T	Awaiting target reset
c	Slow clock
p	No target power
r	Target reset
w	Awaiting target ready
b	No bus cycles (Idle/hold)
?	Unknown state

Examples

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

```
reg r0=ffff
reg r0
```

To break execution then step a single instruction, enter:

```
b
s
```

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

```
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 may not be available.

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

Problems with the LAN Interface

If you cannot verify LAN communication

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

- ☐ Make sure that you have connected the processor 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 processor 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 processor probe communication configuration switches are set correctly. Unplug the processor probe power cord, then plug it in again to make sure the switch settings are read correctly by the processor probe.
- ☐ Check that the Run Control Tool or debugger was configured with the correct LAN address. If the processor probe is on a different subnet than the host computer, check that the gateway address is correct.
- ☐ Make sure that the processor 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 HP E3474A processor probe's LAN interface with the "pv" command.

- It's also possible for there to be a problem with the HP E3474A processor probe firmware while the LAN interface is still up and running. In this case, you must reboot the processor probe by disconnecting power to the processor probe and reconnecting it again.

- Use a serial connection to run the LAN performance verification tests (see page 129).

If you have LAN connection problems

- If the processor probe does not accept commands from the prototype analyzer:

  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 processor probe still does not respond, you need to verify the IP address and gateway mask of the HP E3474A processor probe. To do this, connect the processor probe to a terminal or terminal emulator (see page 22), 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 <new IP>' 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 port is not 6470, you must change it with the "lan -p 6470" command (unless you have deliberately set the port number to a different value because of a conflict).

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 processor probe 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 processor probe.

  The processor 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 processor 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 processor probe. You can then see error messages which will help you identify which devices on the network are using the wrong subnet masks.

Problems with the Serial Interface

If you cannot verify RS-232 communication

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

- ☐ Make sure that you have connected the processor 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 processor 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 processor probe 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 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
emulator)
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 processor 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 HP E3474A processor 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 processor 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 processor probe before attempting to connect via RS-232.

Problems with the HP E3474A C167 Processor Probe Itself

To run the power up self test

1 Unplug the HP E3474A processor 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

	Pwr/Target LEDs	Meaning
9	❍● ●❍	LAN internal feedback tested successfully
10	❍● ❍❍	Boundary scan master (BSM) test begun
11	●● ●❍	BSM 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:

❍● ❍❍	No target system power, or HP E3474A processor probe is not connected to the target system, or
❍● ❍●	Target system is in a reset state
●● ●❍	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 as shown in the "Connecting to the HP 16505A Prototype Analyzer" chapter. LAN powerup failures will occur if the processor 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 execute the built-in performance verification test

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

Some of these tests can be performed through the prototype analyzer. The LAN tests can only be executed through the RS-232 port.

To fully test the processor probe and emulator probe head, 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.
- For the TARGET PROBE FEEDBACK TEST, connect the processor probe loopback test board (HP part number E3474-66502).
- For the emulator probe head tests, connect the emulator probe head to the self-test board and set switch 8 to OFF.

To perform PV tests through the HP 16505A prototype analyzer

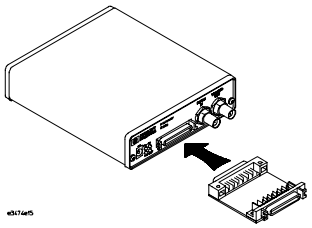
1. End any Run Control tool sessions.
2. Disconnect the 50-pin cable from the processor probe, and plug the processor probe loopback test board (HP part number E3496-66502) into the processor probe.
3. From the Run Control tool menu, open the Performance Verification window.
4. Enter the LAN address of the processor probe.
5. Select the number of iterations to perform.
6. Click **Start PV**.

   The results will appear on screen.

To perform complete PV tests

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 processor probe, and plug the processor probe loopback test board (HP part number E3496-66502) directly into the processor probe. Do not plug anything into the other end of the processor probe loopback test board.



On a good system, when the feedback connector is plugged into the target connector, 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 HP E3474A processor probe.

5 Enter the **pv 1** command.

6 Disconnect the processor probe loopback test board, and connect the emulator probe head to the processor probe.

7 Plug the emulator probe head into the self-test board, and set switch 8 on the self-test board to OFF.

8 Enter the **pv -d** command.

Note that all of the tests cannot be executed at once. Tests 4, 5, and 6 require the loopback test board, which cannot be connected at the same time as the emulator probe head.

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 ^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 BNC's connected, and with the loopback test board connected, are as follows:

```
R>pv 1

Testing: HPE3499A Series Emulation System
  Test  1: Powerup PV Results                              Passed!
  Test  2: LAN 10Base2 Feedback Test                       Not Executed!
  Test  3: LAN 10BaseT Feedback Test                       Not Executed!
  Test  4: Break In and Trigger Out BNC Feedback Test      Passed!
  Test  5: Target Probe Feedback Test                      Not Executed!
  Test  6: Boundary Scan Master Test                       Not Executed!
  Test  7: I2C Test                                        Not Executed!
Testing: HPE3474A SIEMENS C167/5 Emulator
  Test  1: emulation status registers                      Passed!
  Test  2: monitor running                                 Passed!
  Test  3: monitor memory data bus by controller           Passed!
  Test  4: monitor memory address bus by controller        Passed!
  Test  5: irom memory data bus by controller              Passed!
  Test  6: irom memory address bus by controller           Passed!
  Test  7: controller break                                Passed!
  Test  8: software break point                            Passed!
  Test  9: single step break                               Passed!
  Test 10: mon write memory data bus by CPU                Passed!
  Test 11: mon write memory address bus by CPU             Passed!
  Test 12: irom memory data bus by CPU                     Passed!
  Test 13: irom memory address bus by CPU
PASSED  Number of tests: 1          Number of failures: 0
```

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 HP E3474A processor probe.

```
R>pv -t2 -v2 1

  Testing: HPE3499A 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: HPE3499A 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: HPE3499A 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 LLA and IP address have been set in the virtual EEPROM through the "lan" command. If the "lan" command shows bad information for the LLA 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

```
R>pv -t3 -v2 1

  Testing: HPE3499A 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 HP E3474A processor probe 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 processor probe 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 HP E3474A processor probe 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 processor probe. If all else is good, then failure to respond to ping indicates a faulty processor probe.

HPE3474A TEST 4: Break In and Trigger Out BNC Feedback Test

```
R>pv -t4 -v2 1

  Testing: HPE3499A 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 E3474A is bad.

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 processor probe 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 processor probe loopback test board.

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

HPE3474A SIEMENS C167/5 Emulator (pv -d) tests

Check that switch 8 on the self-test board is set to OFF. If the tests still fail, contact HP.

Returning the Parts to Hewlett-Packard for Service

To return a part to Hewlett-Packard

1. Follow the procedures in this chapter to make sure that the problem is caused by a failure in the HP E3474A processor probe, emulator probe head, or power supply, not by configuration or communication problems.
2. Call your nearest HP sales office. Ask them for the address of the nearest HP service center.

   A list of HP sales offices is included at the back of this binder.
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 power supply is broken, keep the HP E3474A emulator probe head, processor probe 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.

To obtain replacement parts

The repair strategy for this emulation solution is board replacement. The following table lists some parts that may be replaced if they are damaged or lost. Contact your nearest Hewlett-Packard Sales Office for further information on servicing the board.

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.

Part numbers

Exchange Assemblies

Part Number	Description
E3474-6940*x*	Program Assembly (comes with self-test board)
E3496-69401	Programmed processor probe

Replacement Assemblies

Part number	Description
0950-3043	Power Supply
E3496-61602	Barrel connector power cable
E3496-61601	50-pin cable
E3496-66502	Processor probe loopback test board
5042-1724	Male-to-male adapter (13x13)
01650-63203	Logic analyzer termination adapter
E5338-60001	144-pin QFP flexible adapter cable

For the elastomeric probing kit, see the *HP E5361A Installation Guide* for part numbers.

To clean the processor probe

If the processor probe requires cleaning:

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

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DECLARATION OF CONFORMITY

according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: Hewlett-Packard Co.

Manufacturer's Address: Colorado Springs Division
1900 Garden of the Gods Rd.
Colorado Springs, CO 80907 U.S.A.

declares, that the product

Product Name: Emulator

Model Number(s): HP E3474A

Product Option(s): All

conforms to the following Product Specifications:

Safety:	IEC 1010-1:1990+A1 / EN 61010-1:1993	
	UL 3111	
	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 801-4:1988 / 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 teh CE-marking accordingly. This product was tested in a typical configuration with Hewlett-Packard test systems.

Colorado Springs, 4/29/97

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
UL 3111
CSA-C22.2 No.1010.1:1993

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

CE
ISM 1-A

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

N279

Immunity

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

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.

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

Sound Pressure Level NA

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Hewlett-packard Company
3000 Hanover Street
Palo Alto, California 94304
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Safety

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

Warning

- Before turning on the instrument, you must connect the protective earth terminal of the instrument to the protective conductor of the (mains) power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. You must not negate the protective action by using an extension cord (power cable) without a protective conductor (grounding). Grounding one conductor of a two-conductor outlet is not sufficient protection.
- Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short-circuited fuseholders. To do so could cause a shock or fire hazard.
- Service instructions are for trained service personnel. To avoid dangerous electric shock, do not perform any service unless qualified to do so. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.
- If you energize this instrument by an auto transformer (for voltage reduction), make sure the common terminal is connected to the earth terminal of the power source.
- Whenever it is likely that the ground protection is impaired, you must make the instrument inoperative and secure it against any unintended operation.
- Do not operate the instrument in the presence of flammable gasses or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.
- Do not install substitute parts or perform any unauthorized modification to the instrument.
- Capacitors inside the instrument may retain a charge even if the instrument is disconnected from its source of supply.
- Use caution when exposing or handling the CRT. Handling or replacing the CRT shall be done only by qualified maintenance personnel.

Safety Symbols

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

Hazardous voltage symbol.

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

WARNING

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

CAUTION

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

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

Product Warranty

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

For warranty service or repair, this product must be returned to a service facility designated by Hewlett-Packard.

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

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

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Assistance

Product maintenance agreements and other customer assistance agreements are available for Hewlett-Packard products.

For any assistance, contact your nearest Hewlett-Packard Sales Office.

Certification

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

About this edition

This is the *HP E3474 Siemens C167 Distributed Emulation Solution User's Guide.*

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New editions are complete revisions of the manual. Many product updates do not require manual changes; and, conversely, manual corrections may be done without accompanying product changes. Therefore, do not expect a one-to-one correspondence between product updates and manual updates.

Siemens C167 family microcontrollers are part of the Siemens SAB80C166 architectural family.