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# Operating Note

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## QFP Probe Adapter Assembly

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# Introduction

A Probe Adapter Assembly provides a connection to 132-pin JEDEC CQFP (Ceramic Quad Flat Pack) or PQFP (Plastic Quad Flat Pack) microprocessors. The Probe Adapter Assembly mounts on top of the microprocessor or mechanical sample (which replaces the microprocessor for some emulators). A clearance of 0.65 inch from the center of the microprocessor is required. The PGA (Pin Grid Array) probe allows preprocessor interfaces or emulators with PGA pins to be easily connected.

This Operating Note provides instructions for installing an HP QFP Probe Adapter Assembly. Separate instructions are provided for preprocessor interfaces and emulators. Illustrations for each application are provided, to show the proper orientations. At the end of this Operating Note is a diagram showing the probe-to-PGA socket mapping and instructions on removing the probe adapter from your target.

## Equipment Supplied

The QFP Probe Adapter Assembly consists of the following items:

- The Probe Adapter Cable.
- A PGA Transition Socket, for those preprocessor interfaces and emulators which do not have a 12 x 12 PGA full-matrix pattern. If a PGA Transition Socket is required, it is automatically included by ordering the microprocessor-specific Probe Adapter Assembly.
- CQFP to PQFP adapters (HP part number 5081-7709, bag of five).
- Extraction tool (HP part number E3435-03801) for removing the probe adapter assembly from your target.
- This Operating Note.

**Tools Needed**

You may need the following tools:

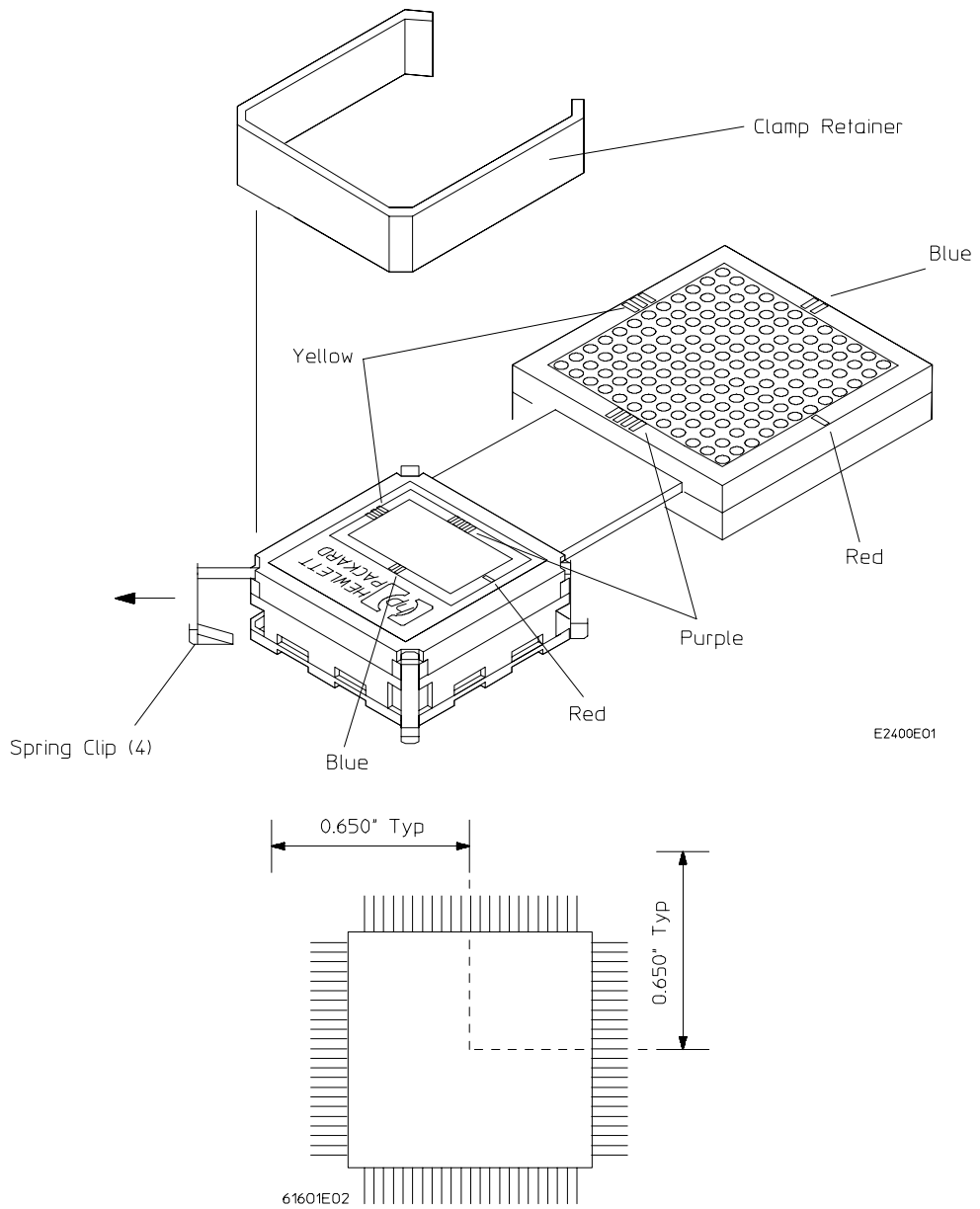
- An Exacto knife, if there is excessive "flash" on the microprocessor.
- Loctite Superbonder glue, or equivalent, if the microprocessor is ceramic (CQFP style).
- Soldering equipment, to solder a mechanical sample microprocessor package onto the target system (for use with some emulators).

**Antistatic Precautions**

Computer cards contain electrical components that are easily damaged by small amounts of static electricity. To avoid damage to the components, follow these guidelines:

- Disconnect all power to the system when installing or removing the probe adapter assembly.
- If possible, work at a static-free work station.
- Handle cards only by the edges; do not touch components or traces.
- Use a grounding wrist strap that is connected to the system's chassis. If you do not have a wrist strap, touch the chassis of the system frequently to equalize any static charge.

Figure 1



Probe Adapter Assembly and Required Clearance

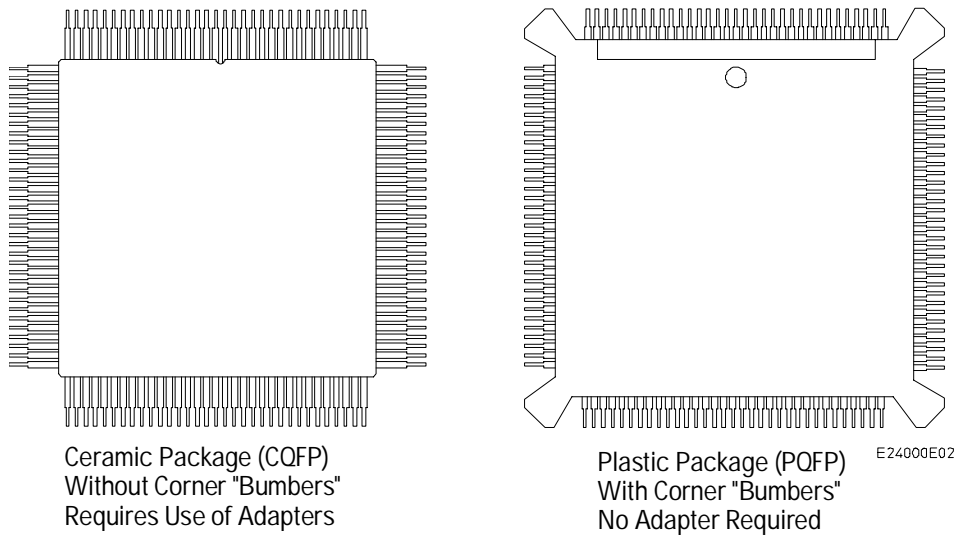
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## Installing the CQFP to PQFP (Ceramic to Plastic) Adapter

If your chip is a ceramic package, you will have to install a CQFP to PQFP adapter. In the figure below, the chip on the left is ceramic and the chip on the right is plastic. The plastic chip has "bumpers" at the four corners. Since the probe adapter aligns with and clamps onto the "bumpers", you will have to install a CQFP to PQFP adapter if you have a ceramic chip. If you have a plastic chip, it already has the "bumpers" so you will not need to install the adapter.

To install the CQFP to PQFP adapter, use Loctite Superbond or equivalent to secure the CQFP to PQFP adapter to the chip. The adapter must be securely fastened to the chip.

Figure 2



Ceramic and Plastic QFP Packages

## Installing the probe adapter assembly for preprocessor interfaces

If your application requires a PGA Transition Socket, ensure that the microprocessor type shown on the probe label matches the microprocessor to be probed. Preprocessor interfaces with a 12 x 12 full-matrix PGA pattern do not require a PGA Transition Socket.

Microprocessor leads must be in factory-formed condition for probe to align properly.

Excessive molding "flash" on plastic chips may need to be trimmed off with an Exacto knife before placing the probe over the chip.

The installation procedure for the probe adapter assembly includes the following steps:

- 1** Place the board with the chip to be probed on a stable, flat, horizontal surface, with all power off.
- 2** Securely install a CQFP to PQFP adapter on your ceramic chip using Loctite Superbondor or equivalent (see figure 2, page 5).

A CQFP to PQFP adapter is not needed for plastic package chips.

- 3** Carefully slide the clamp retainer off of your probe adapter assembly (see figure 1).
- 4** Retract all four spring clips (see figure 1).

The minimum required clearance from the center of the microprocessor is 0.65 inch. If there is not enough additional clearance around the microprocessor, you may have to remove one or more of the spring clips. However, this may affect the integrity of the connection with the chip if the board is placed with the chip in a vertical orientation, or if the board is undergoing shock or vibration.

- 5** Locate pin 1 of the chip. There will be a dot or notch by pin 1. Use the figure designated for your preprocessor interface (figures 3 through 10), and select the orientation with respect to the target-system pin 1 which provides sufficient clearance for all components.

Note that the orientations are microprocessor specific. Use the illustration for your specific preprocessor interface. The illustration for your preprocessor may be in your preprocessor manual if it is not included here.

- 6** Using the orientation selected above, align the Probe Adapter with pin 1.

There is a different color along each edge of each end of the probe; these colors are used for orientation (see figure 1). Note which color is over pin 1 on the target system.

- 7** Carefully place the adapter over the top of the chip, engaging all four "bumpers." Push the adapter down firmly on the chip.

Do not use excessive force. If you encounter resistance, examine the chip for defects such as molding "flash" or deformed leads that could cause resistance.

- 8** Push the spring clips back into the probe and underneath the "bumpers" on the chip or CQFP to PQFP adapter. Replace the retainer clamp around the spring clips.

- 9** Noting the color of the edge of the probe end which was placed over pin 1 (step 6), place the white edge of the PGA Transition Socket or preprocessor interface over that same color on the PGA end of the probe adapter.

For example, if the blue edge of the probe was over pin 1 of the QFP, place the white edge of the PGA Transition Socket/preprocessor interface over the blue edge on the PGA end of the probe. The connection should match the orientation you selected in step 5.



If your preprocessor interface has a 12 x 12 full-matrix PGA pattern, there will be a white mark on one edge of the PGA socket. If it is not a 12 x 12 full-matrix pattern, you will need to use the PGA Transition Socket for your specific preprocessor interface. The PGA Transition Socket also has a white mark along one edge.

- 10** If you used a PGA Transition Socket, connect the preprocessor interface to the PGA Transition Socket. Ensure that pin A1 on the PGA Transition Socket is aligned with pin A1 on the preprocessor interface.

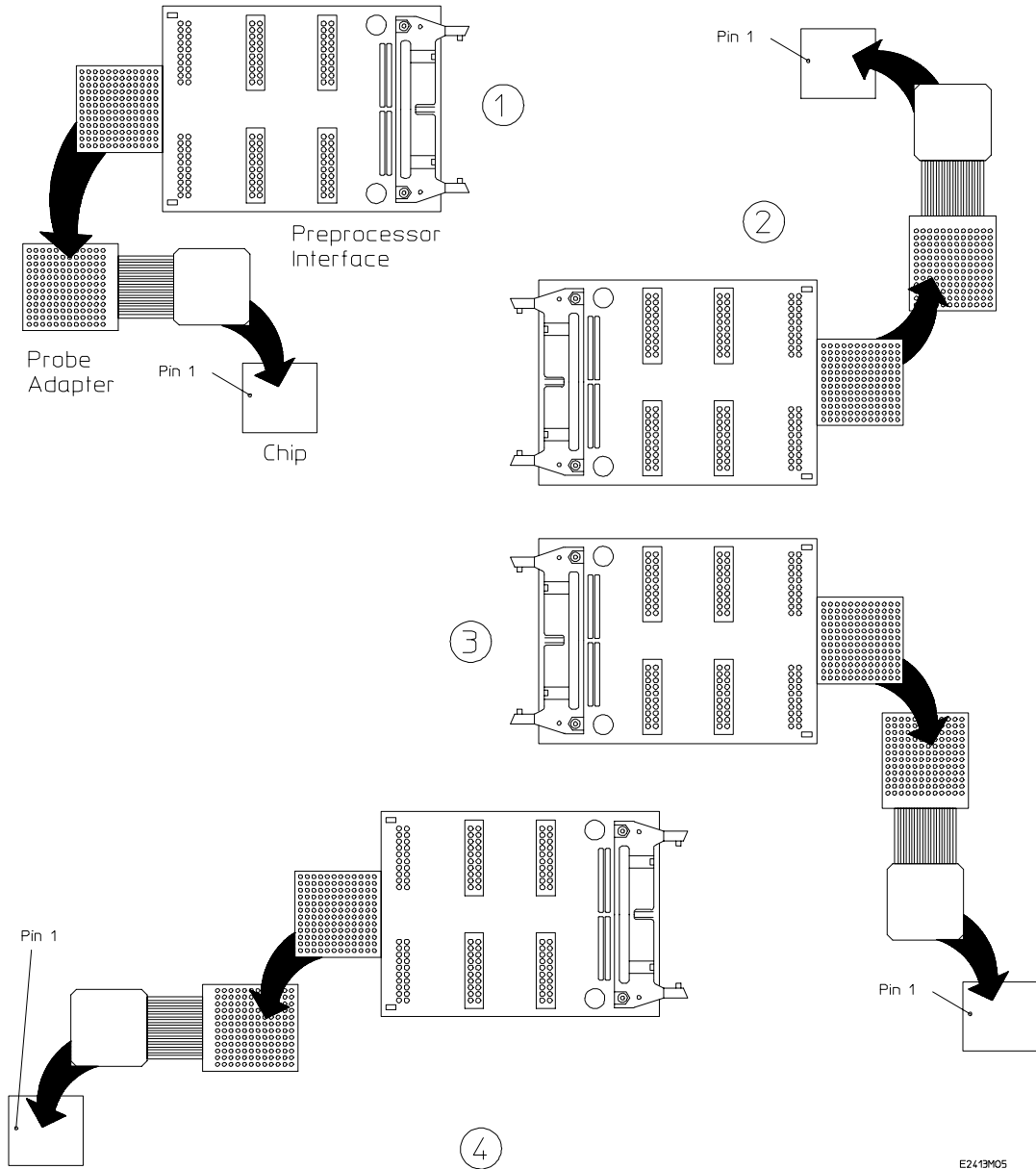
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**CAUTION**

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**Equipment damage.** Ensure that the preprocessor interface probe is aligned with the proper pins when connecting to the PGA socket. Serious equipment damage can result from improper connection. The final connection should match the orientation you selected in step 5.

Figure 3

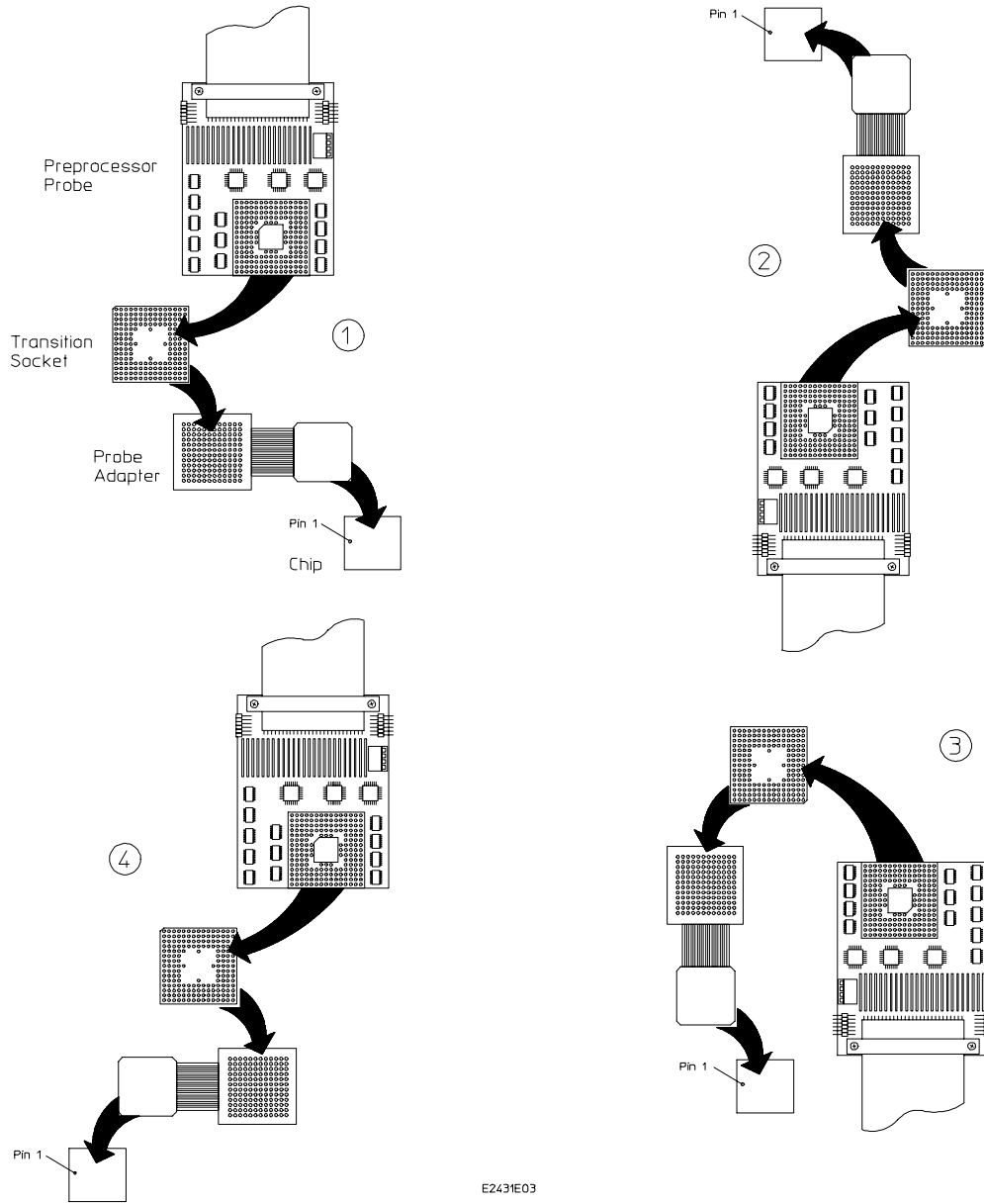


E2413M05

Orientation for MC68331/2 and MC68HC16 Preprocessor Interfaces (HP E2413C, HP E2470A)

QFP Probe Adapter Assembly  
Installing the probe adapter assembly for preprocessor interfaces

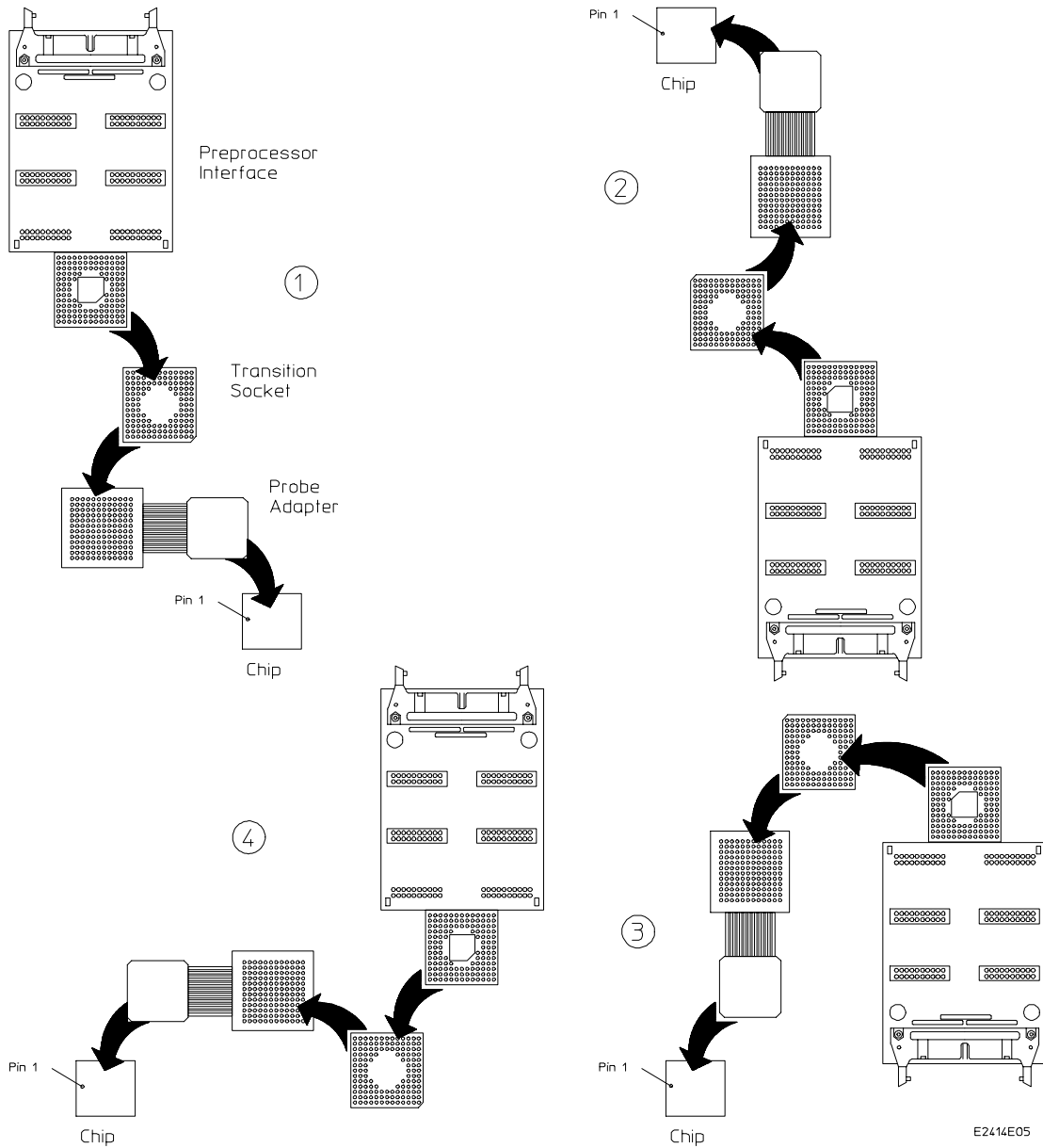
Figure 4



E2431E03

Orientation for TMS320C30/31 Preprocessor Interface (HP E2431A)

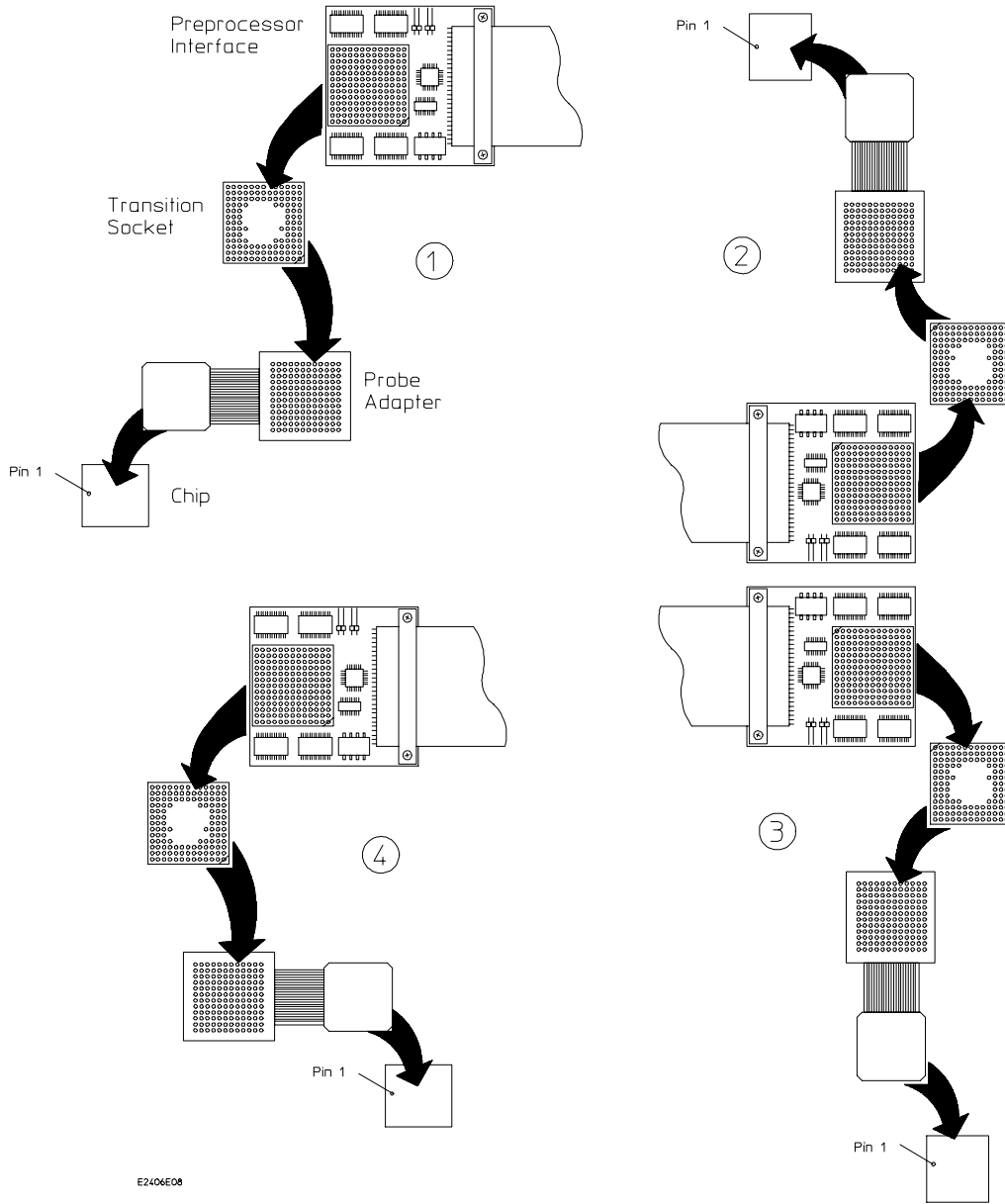
Figure 5



Orientation for MC68302 Preprocessor Interface (HP E2414B)

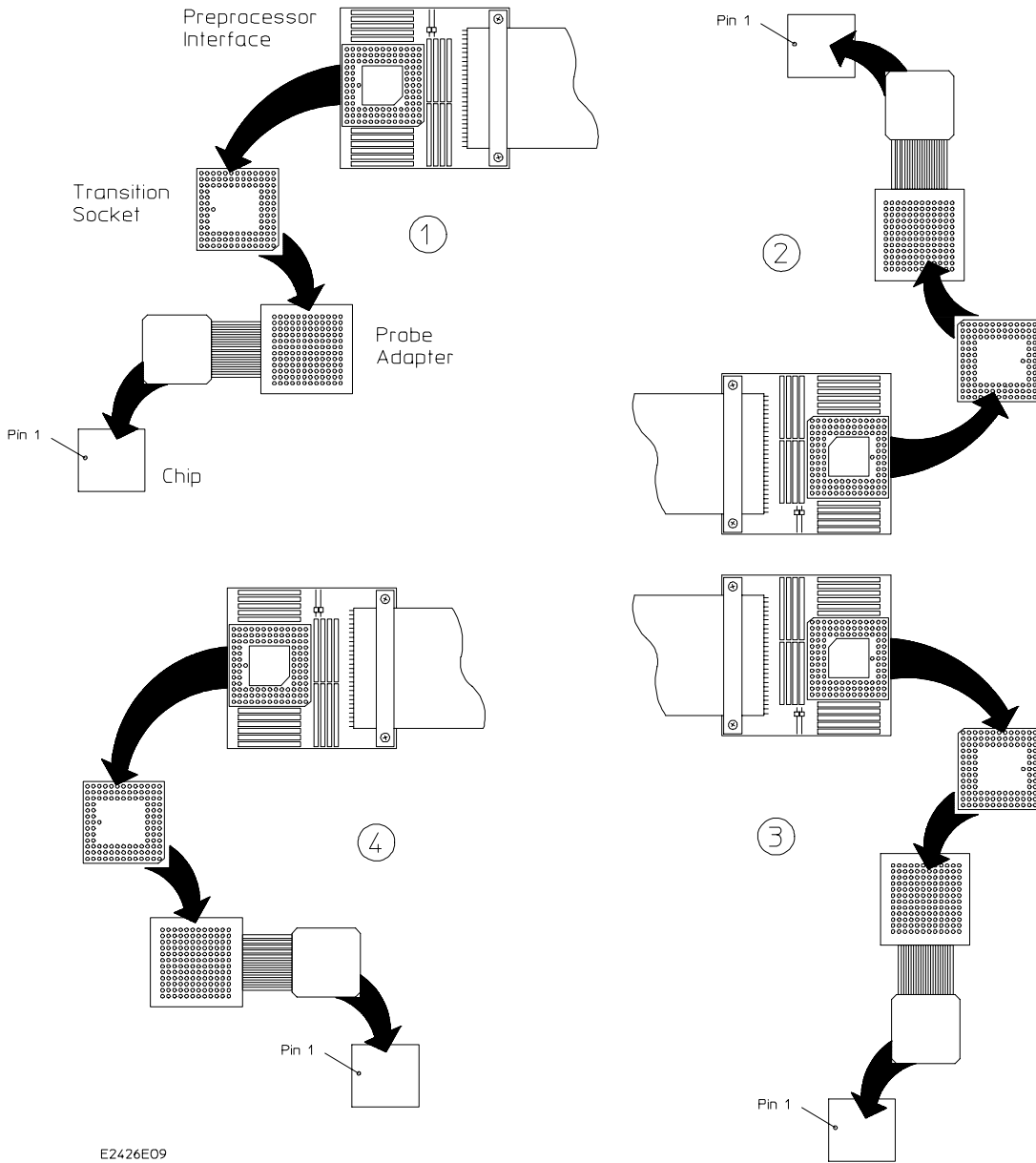
QFP Probe Adapter Assembly  
Installing the probe adapter assembly for preprocessor interfaces

Figure 6



Orientation for MC68030 Preprocessor Interface (HP E2406A)

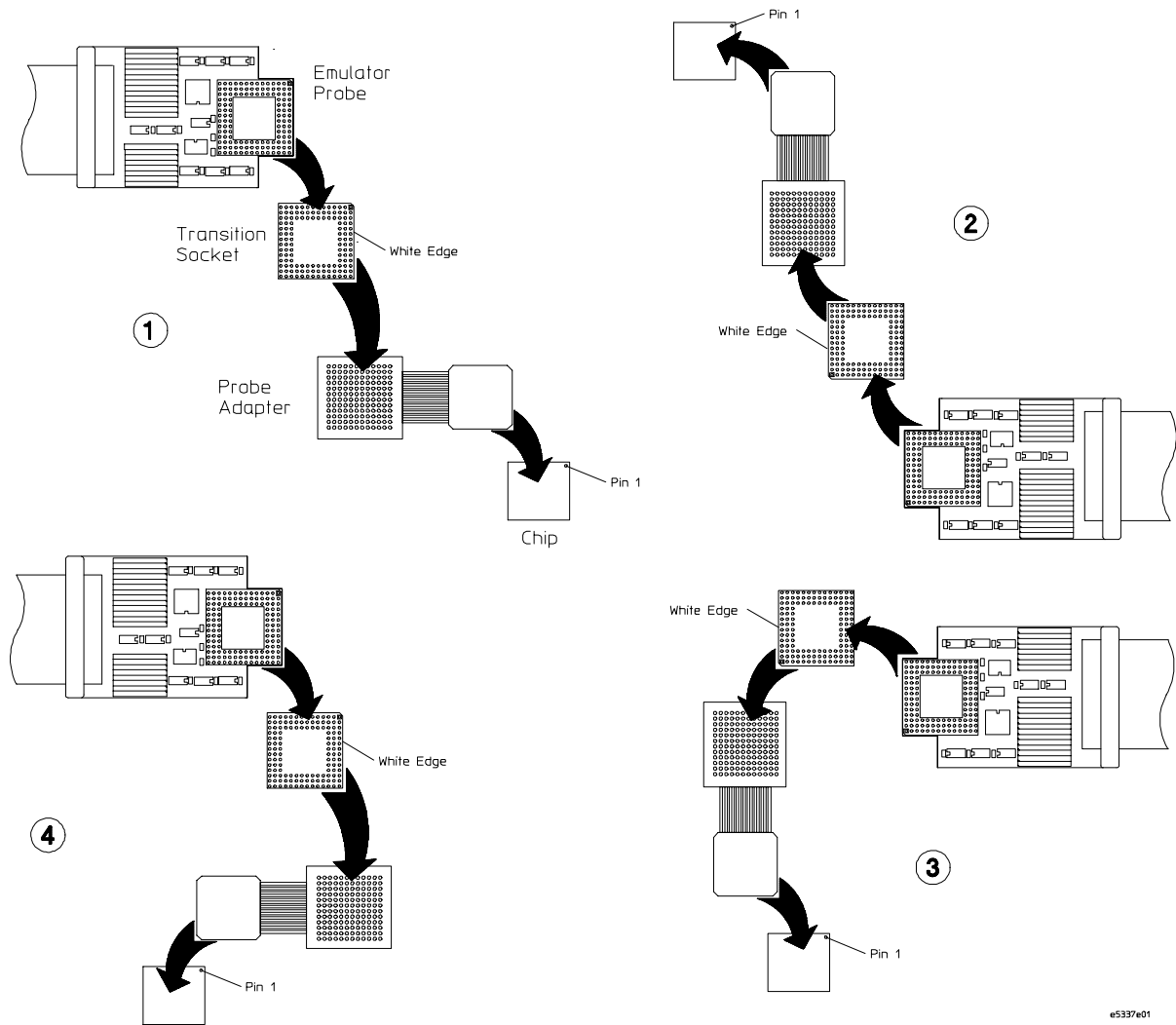
Figure 7



Orientation for MC68020/68EC020 Preprocessor Interface (HP E2426A/B)

QFP Probe Adapter Assembly  
Installing the probe adapter assembly for preprocessor interfaces

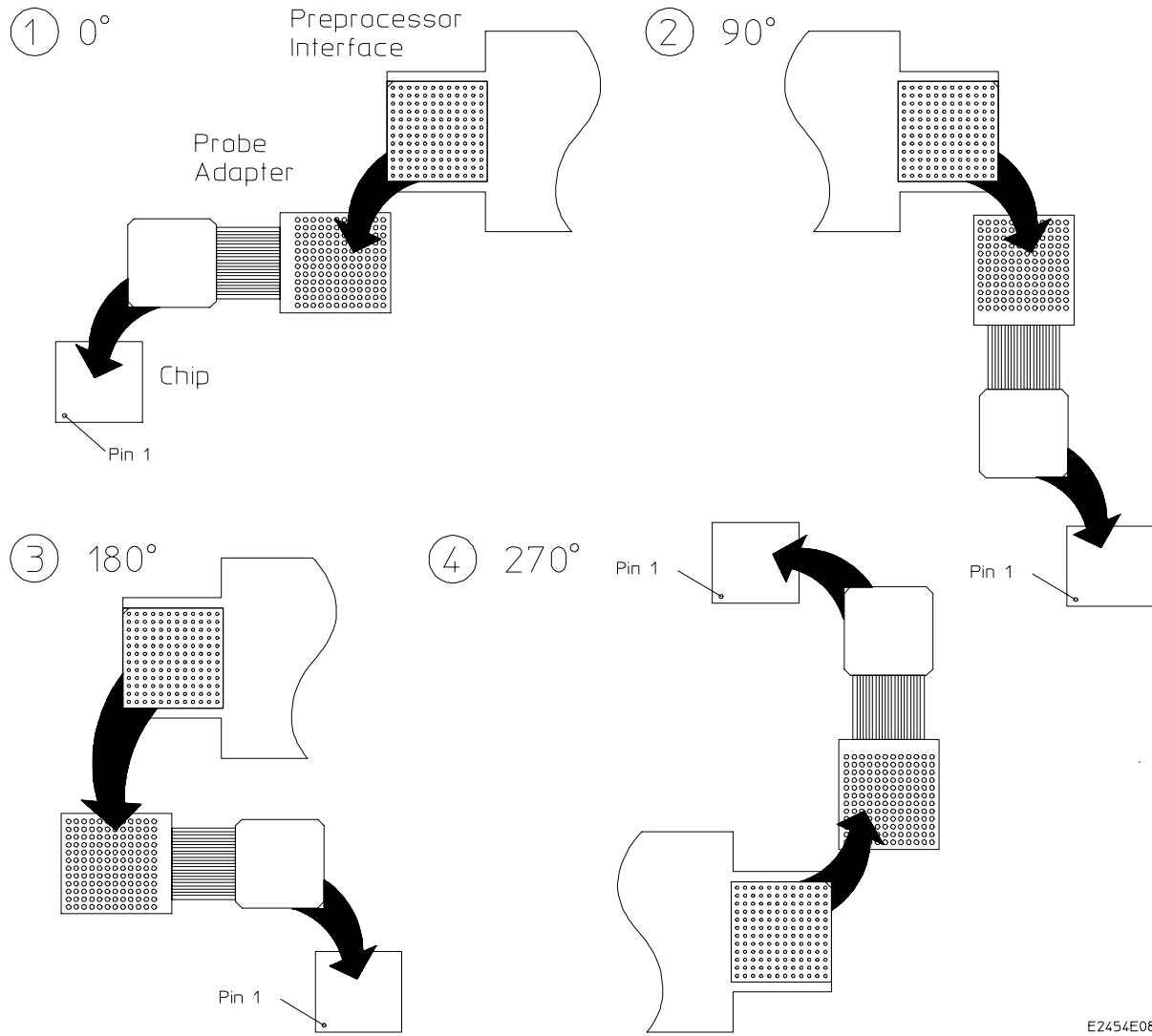
Figure 8



e5337e01

Orientation for 960Jx Preprocessor (HP E5337A)

Figure 9



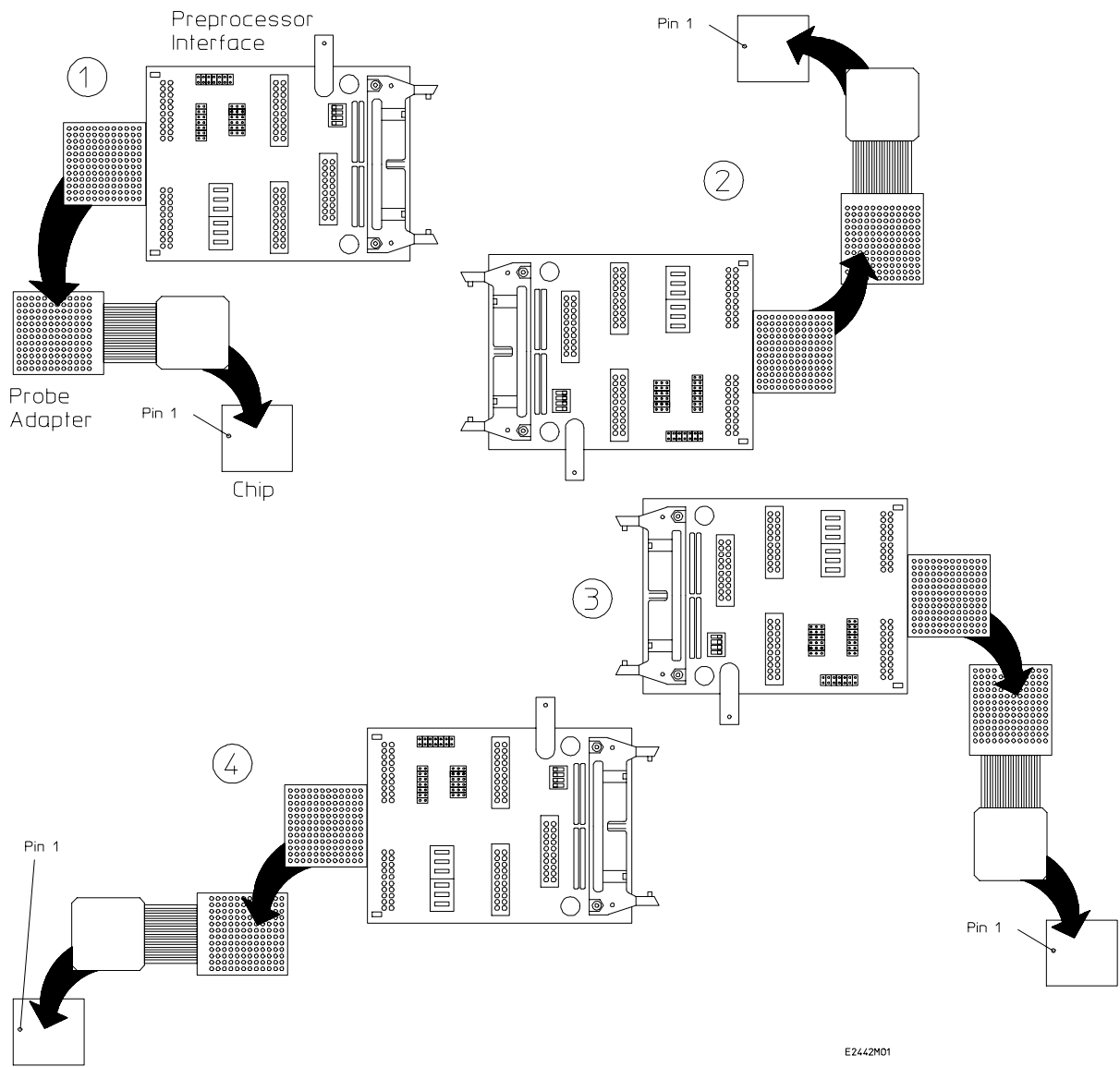
E2454E08

Orientation for 80386EX Preprocessor (HP E2454A)



QFP Probe Adapter Assembly  
Installing the probe adapter assembly for preprocessor interfaces

Figure 10



Orientation for TMS320C50/51 Preprocessor (HP E2442A)

## Installing the probe adapter assembly for emulators

Since emulators have the microprocessor contained in them, the target-system microprocessor must be removed or disabled. The MC68331/32 microprocessor is tristateable; it is disabled by the emulator, so it does not have to be removed. For most microprocessors, the microprocessor must be removed from the target system and a mechanical-sample package installed. The mechanical sample package is a Motorola part number MC22901 PQFP 132 (HP part number 64748-87608, package of 2).

Do not use a daisy-chained mechanical-sample package, as it ties all lines together. Use only the MC22901 PQFP 132 (HP part number 64748-87608) mechanical sample.

If your application requires a PGA Transition Socket, ensure that the microprocessor type shown on the probe label matches the microprocessor to be probed. Emulators with a 12 x 12 full-matrix PGA pattern do not require a PGA Transition Socket.

Microprocessor leads must be in factory-formed condition for probe to align properly.

Excessive molding "flash" on plastic chips may need to be trimmed off with an Exacto knife before placing the probe over the chip.

Use the following steps for installation:

- 1 Start with a new target board that does not have the microprocessor installed, or remove the microprocessor from the target system. Place the board with the chip to be probed on a stable, flat, horizontal surface, with all power off.**

The MC68331/32 microprocessor is tristateable; it is disabled by the emulator, so it does not have to be removed (go to step 3).

- 2 Solder the MC22901 PQFP 132 mechanical sample onto the target board in place of the microprocessor, ensuring that pin 1 is properly aligned. There is a notch or dot next to pin 1. If possible, use production-line techniques for soldering the mechanical sample.**

- 3 Securely install a CQFP to PQFP adapter on your ceramic chip using Loctite Superbondor or equivalent (see figure 2, page 5).**

A CQFP to PQFP adapter is not needed for plastic package chips.

- 4 Carefully slide the clamp retainer off of your probe adapter assembly (see figure 1).**

- 5 Retract all four spring clips (see figure 1).**

The minimum required clearance from the center of the microprocessor is 0.65 inch. If there is not enough additional clearance around the microprocessor, you may have to remove one or more of the spring clips. However, this may affect the integrity of the connection with the chip if the board is placed with the chip in a vertical orientation, or if the board is undergoing shock or vibration.

- 6 Locate pin 1 of the chip. There will be a dot or notch by pin 1. Use the figure designated for your emulator (figures 11 through 16), and select the orientation with respect to the target-system pin 1 which provides sufficient clearance for all components.**

Note that the orientations are microprocessor specific. Use the illustration for your specific preprocessor interface. The illustration for your preprocessor may be in your preprocessor manual if it is not included here.

- 7 Using the orientation selected above, align the Probe Adapter with pin 1.**

There is a different color along each edge of each end of the probe; these colors are used for orientation (see figure 1). Note which color is over pin 1 on the target system.

- 8 Carefully place the adapter over the top of the chip, engaging all four "bumpers." Push the adapter down firmly on the chip.

Do not use excessive force. If you encounter resistance, examine the chip for defects such as molding "flash" or deformed leads that could cause resistance.

- 8 Push the spring clips back into the probe and underneath the "bumpers" on the chip or CQFP to PQFP adapter. Replace the retainer clamp around the spring clips.
- 9 Noting the color of the edge of the probe end which was placed over pin 1 (step 7), place the white edge of the PGA Transition Socket or emulator over that same color on the PGA end of the probe adapter.

For example, if the blue edge of the probe end was over pin 1, place the white edge of the PGA Transition Socket/emulator over the blue edge on the PGA end of the probe. The connection should match the orientation you selected in step 6.

If your emulator has a 12 x 12 full-matrix PGA pattern, there will be a white mark on one edge of the PGA socket. If it is not a 12 x 12 full-matrix pattern, you will need to use the PGA Transition Socket for your specific emulator. The PGA Transition Socket also has a white mark along one edge.

- 10 If you used a PGA Transition Socket, connect the emulator to the PGA Transition Socket. Ensure that Pin A1 on the PGA Transition Socket is aligned with pin A1 on the emulator.

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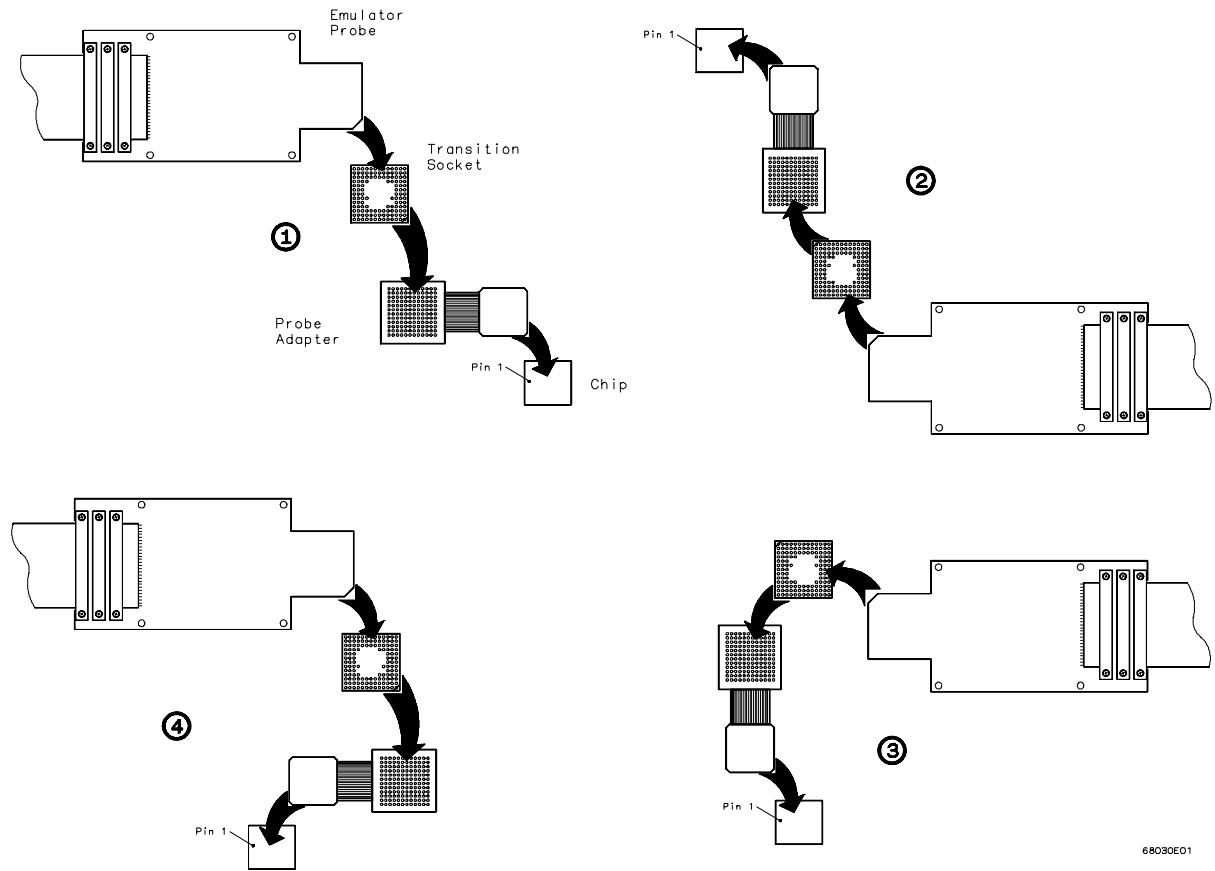
**CAUTION**

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**Equipment damage.** Ensure that the emulator probe is aligned with the proper pins when connecting to the PGA socket. Serious equipment damage can result from improper connection. The final connection should match the orientation you selected in step 6.

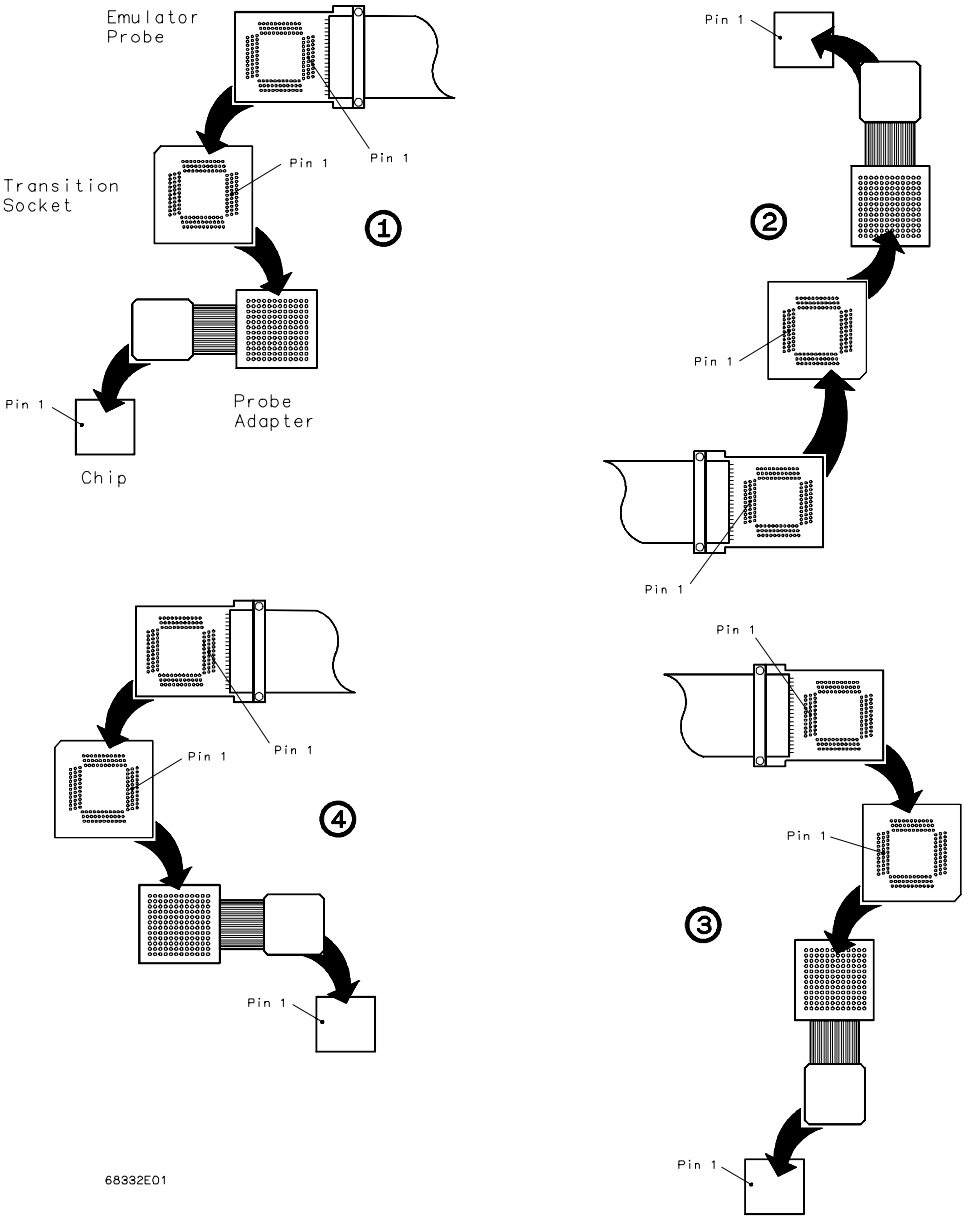
QFP Probe Adapter Assembly  
Installing the probe adapter assembly for emulators

Figure 11



Orientation for MC68030/68EC030 Emulator (HP 64747A/B)

Figure 12

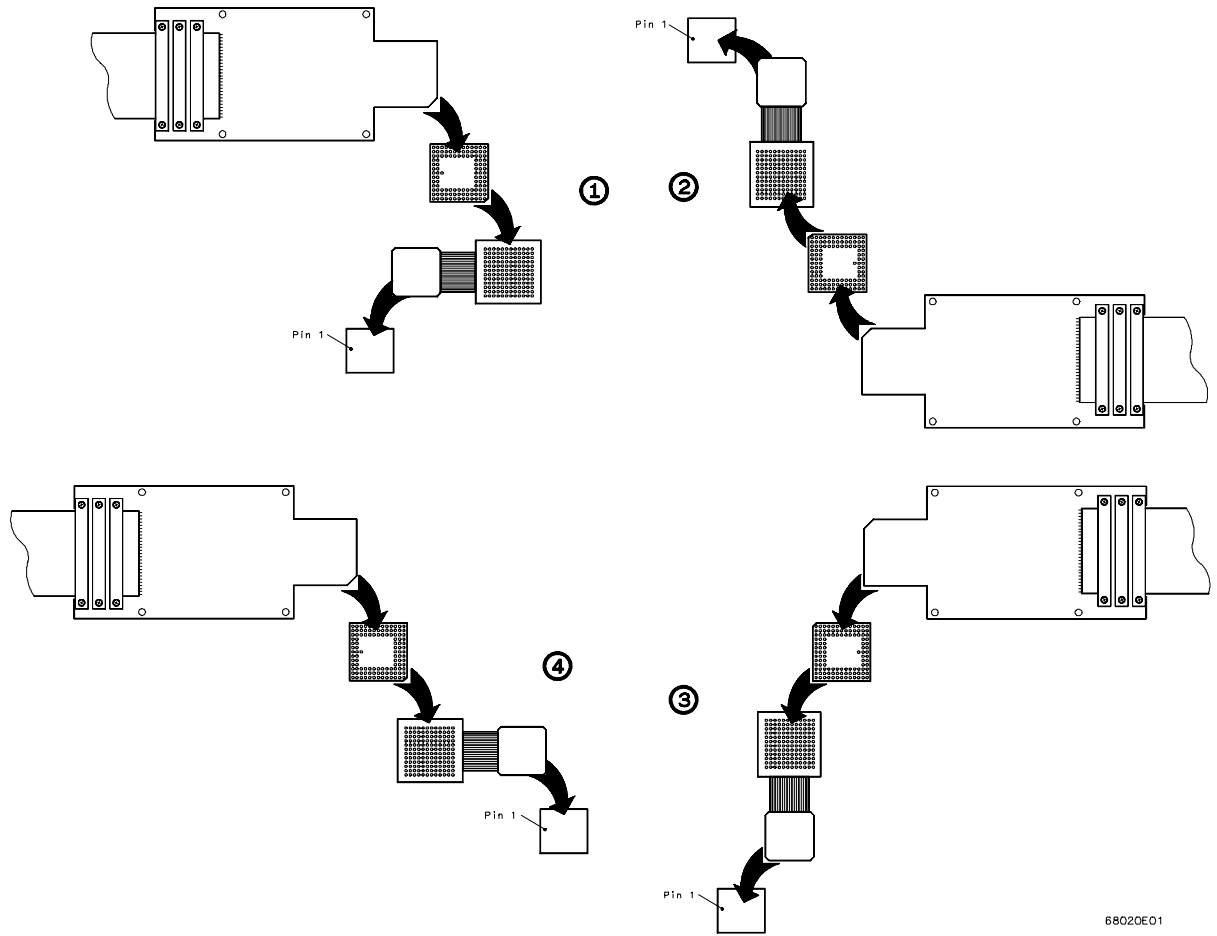


68332E01

Orientation for MC68331/32 Emulator (HP 64749G/H)

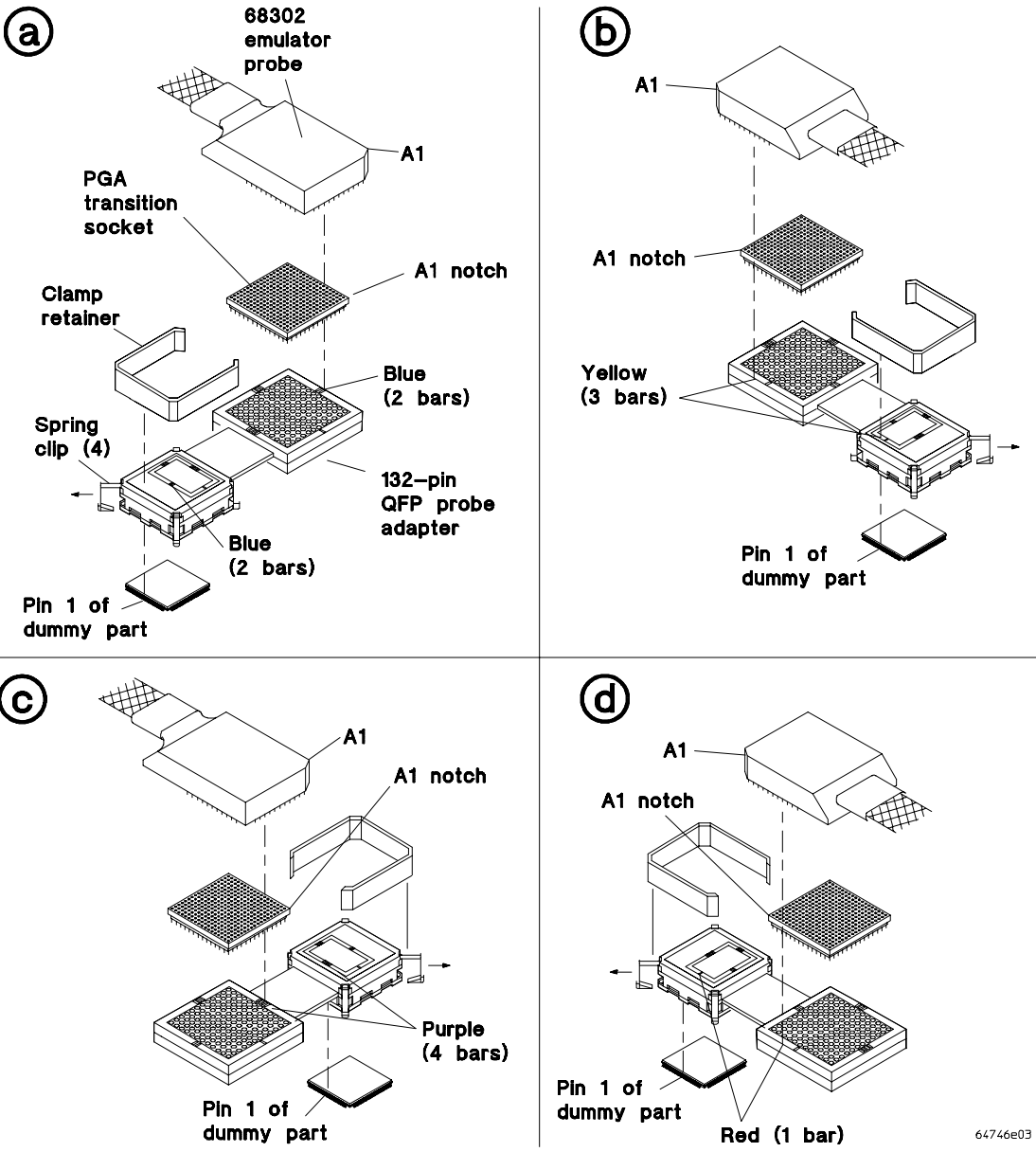
QFP Probe Adapter Assembly  
Installing the probe adapter assembly for emulators

Figure 13



Orientation for MC68020 Emulator (HP 64748A/B)

Figure 14



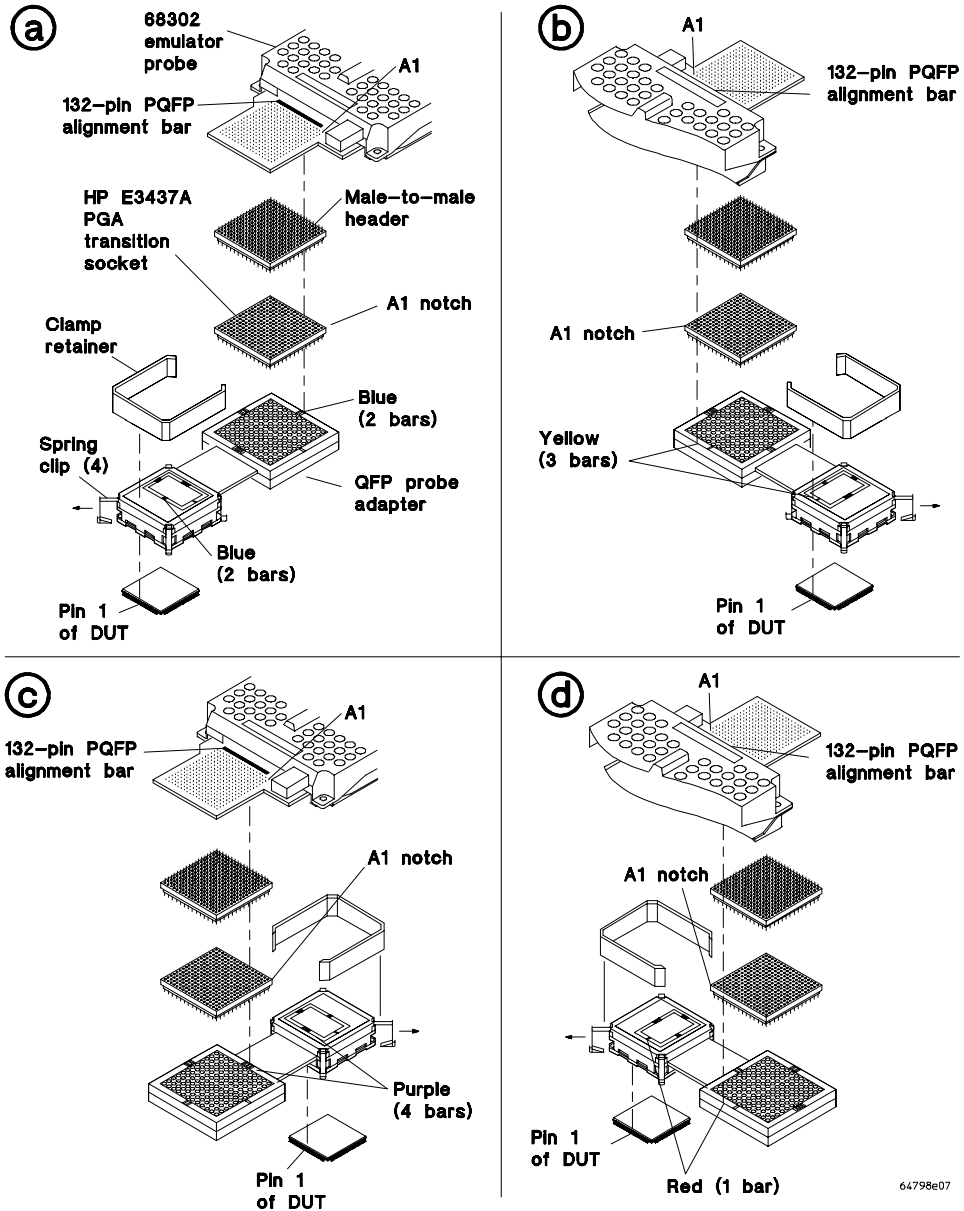
Orientation for MC68302 Emulator (HP 64746A/B)

64746e03



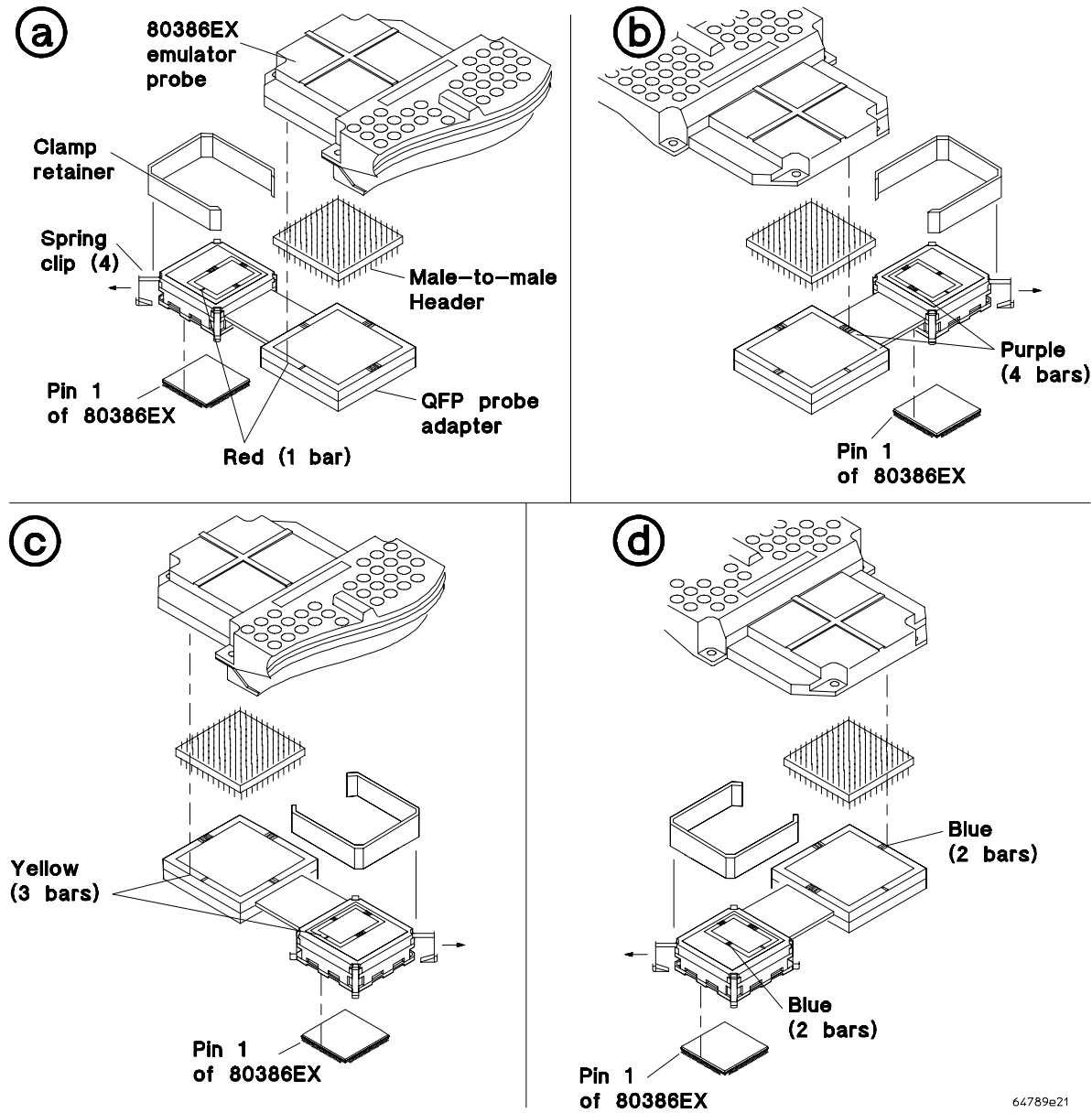
QFP Probe Adapter Assembly  
 Installing the probe adapter assembly for emulators

Figure 15



Orientation for MC68302 Emulator (HP 64798C)

Figure 16



64789e21

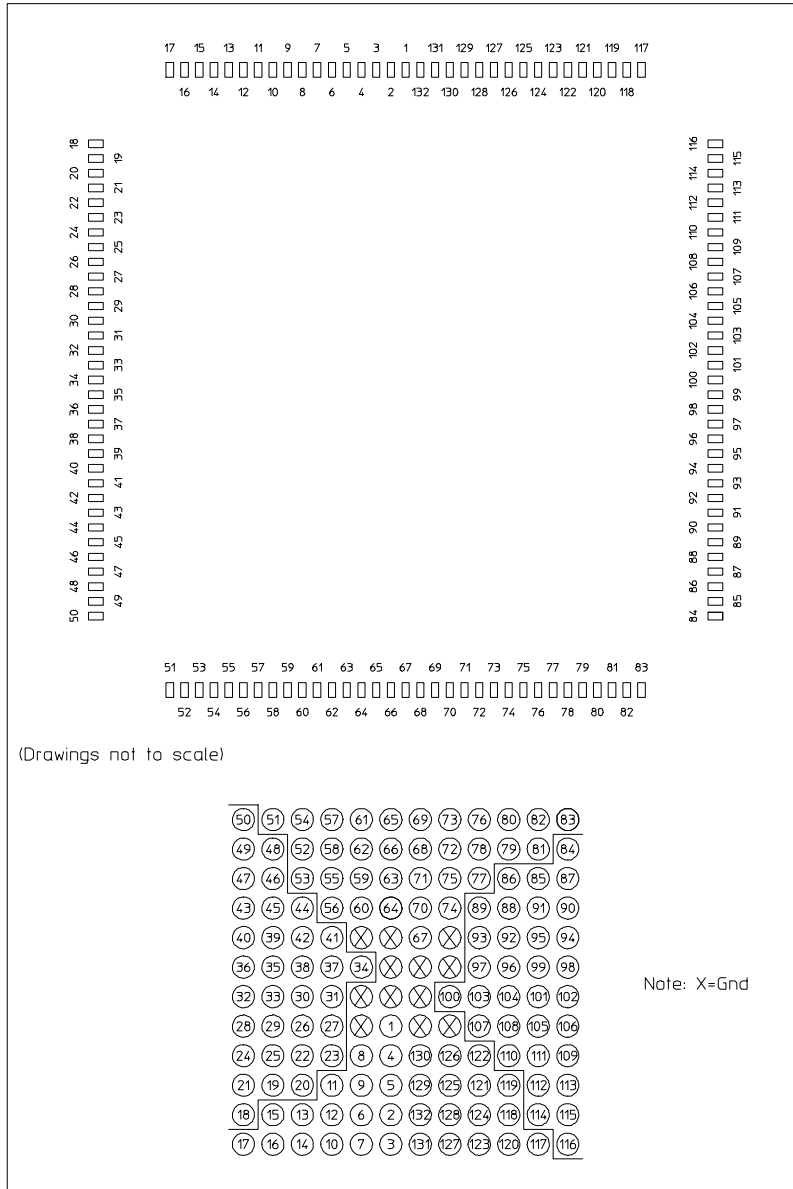
Orientation for 80386EX Emulator (HP 64789B/C)

## QFP to PGA Signal Mapping

Figures 15-16 show the mapping for signals from the QFP probe end to the PGA socket. The PGA pins in the center (marked with an X) are ground pins on the preprocessor interfaces and emulators. They are not ground pins to the microprocessor. If you are probing individual pins on the PGA socket, use a PGA pin which corresponds to a microprocessor ground for your signal ground.

The illustrations show the top (text) side of the Probe Adapter Assembly.

Figure 17

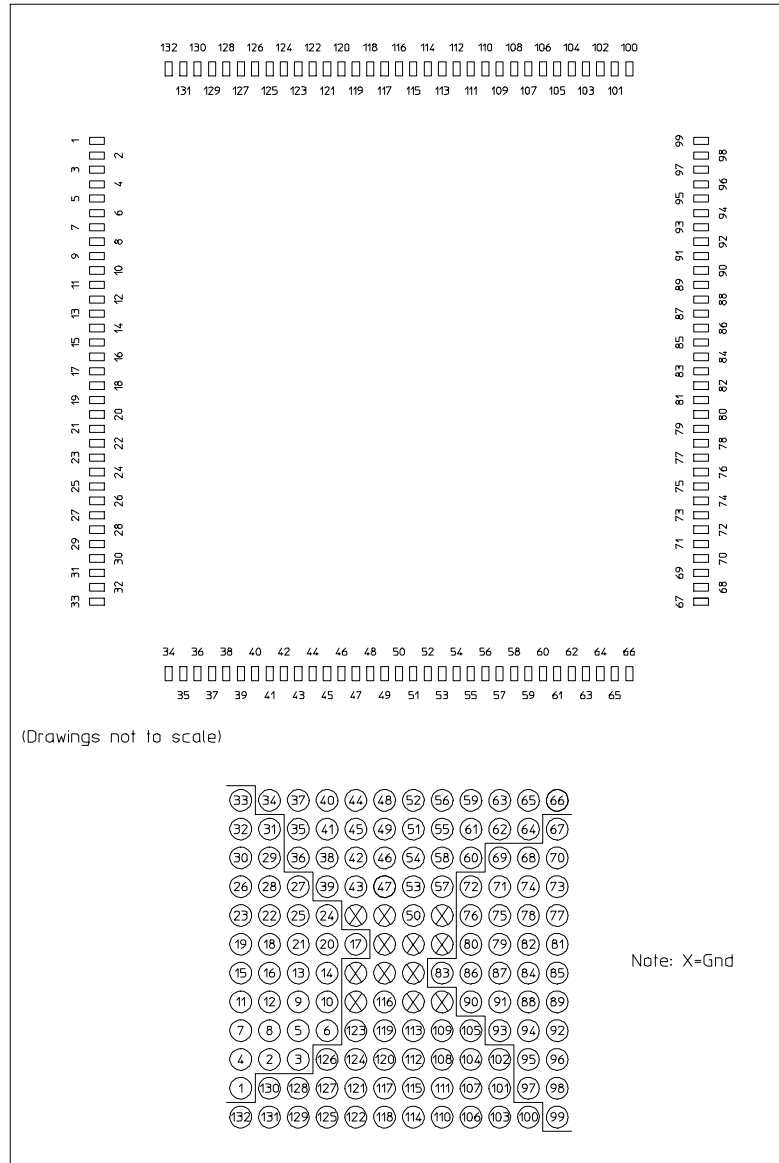


E2426E11

QFP to PGA Signal Mapping (Pin 1 in the middle)

# QFP Probe Adapter Assembly QFP to PGA Signal Mapping

Figure 18



e5337b01

QFP to PGA Signal Mapping (Pin 1 at the corner)

## Removing the probe adapter assembly from your target system

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### CAUTION

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**Damage to the probe adapter.** Use the extractor tool provided (HP part number E3435-03801) and follow the removal instructions below. Improper removal will result in broken combs in your probe adapter.

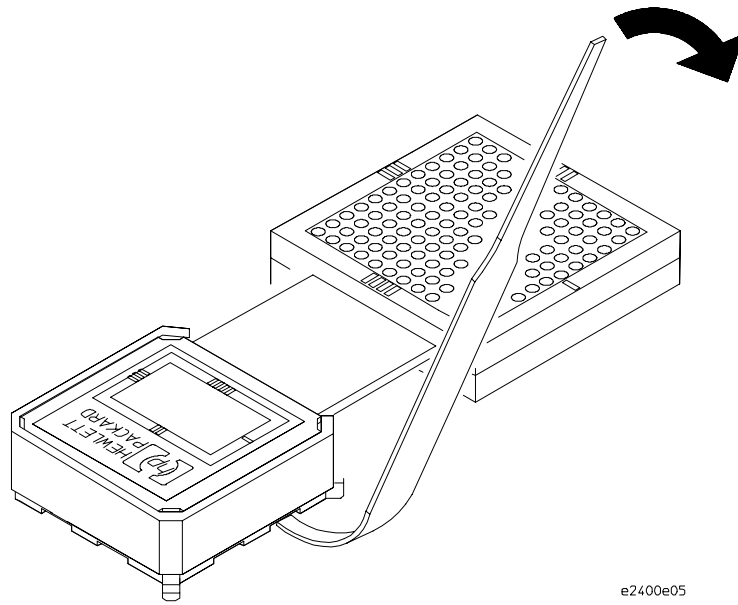
The QFP Probe Adapter Assembly is carefully designed in a robust mechanical package to make reliable electrical contact to each lead of your target IC. Installing and removing the probe requires you to overcome cumulative friction between 132 target leads and corresponding parts of the probe. Removing the probe requires greater force due to the triangular cross-section of the plastic comb teeth that fit between target leads and align the probe contacts. Tests show little risk of probe damage in installing the probe. However, removing the probe by hand from a target with very little space between leads has resulted in broken combs. A simple tool is provided with your QFP Probe Adapter Assembly to reduce the risk of such damage.

Use the following steps for removal:

- 1** Place the extractor tool in one of six indentations on the side of the probe adapter next to the PC board as shown in the following illustration.
- 2** Gently pry the probe approximately 1/16 inch (1.588 mm) by leveraging against the PC board.
- 3** Repeat this on all sides until the probe is completely disconnected.

QFP Probe Adapter Assembly  
Removing the probe adapter assembly from your target system

Figure 19



Removing the probe adapter assembly from your target system

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# Index

---

## A

alignment, 1-6 to 1-7, 1-17  
antistatic precautions, 1-3

## B

bumpers, 1-5, 1-7, 1-18

## C

caution  
  damage to the probe adapter, 1-29  
  equipment damage, 1-8, 1-19  
  power off, 1-6  
ceramic to plastic adapter, 1-5  
clamp retainer, 1-6, 1-18  
clearance, 1-2, 1-4  
color coding, 1-7, 1-19

## D

dummy part, 1-17

## E

emulator  
  HP 64746A/B, 1-23  
  HP 64747A/B, 1-20  
  HP 64748A/B, 1-22  
  HP 64749G/H, 1-21  
  HP 64789B/C, 1-25  
  HP 64798C, 1-24  
equipment supplied, 1-2  
extractor tool, 1-29

## F

flash, 1-6, 1-17

## I

installing  
  CQFP to PQFP adapter, 1-5  
  probe for emulators, 1-17 to 1-25  
  probe for preprocessors, 1-6 to 1-16

## M

mapping, 1-26 to 1-28  
mechanical sample, 1-17  
microprocessor  
  80386EX, 1-15, 1-25  
  960Jx, 1-14  
  MC68020, 1-22  
  MC68020/68EC020, 1-13  
  MC68030, 1-12, 1-20  
  MC68302, 1-11, 1-23 to 1-24  
  MC68331/2, 1-9  
  MC68332, 1-21  
  MC68HC16, 1-9  
  TMS320C30/31, 1-10  
  TMS320C50/51, 1-16

## O

orientation diagrams  
  80386EX emulator, 1-25  
  80386EX preprocessor, 1-15  
  960Jx preprocessor, 1-14  
  MC68020 emulator, 1-22  
  MC68020/68EC020 preprocessor, 1-13  
  MC68030 emulator, 1-20  
  MC68030 preprocessor, 1-12  
  MC68302 emulator, 1-23 to 1-24  
  MC68302 preprocessor, 1-11  
  MC68331/2 preprocessor, 1-9  
  MC68332 emulator, 1-21  
  MC68HC16 preprocessor, 1-9  
  TMS320C30/31 preprocessor, 1-10  
  TMS320C50/51 preprocessor, 1-16

## P

PGA transition socket, 1-6  
preprocessor  
  HP E2406A, 1-12  
  HP E2413A, 1-10  
  HP E2413B, 1-9  
  HP E2414B, 1-11  
  HP E2419A, 1-9  
  HP E2426A/B, 1-13  
  HP E2442A, 1-16  
  HP E2453A, 1-15  
  HP E5337A, 1-14

## R

removing the probe adapter, 1-29 to 1-30  
retainer clamp, 1-7

## S

signal mapping, 1-26 to 1-28  
spring clips, 1-6 to 1-7, 1-18

## T

tools needed, 1-3