# Installation Guide

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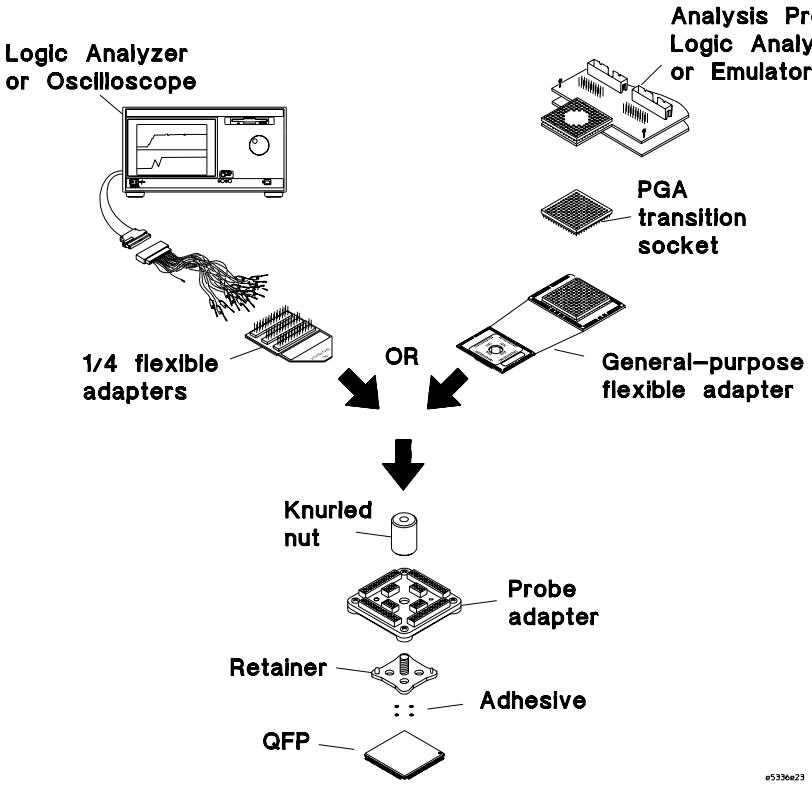
# Elastomeric Probe Adapter for 160-Pin 0.5 mm QFP

# Installation at a Glance




This Installation Guide explains how to use Agilent's advanced probing system for 0.5 mm pitch Thin Quad Flat Pack (QFP) surface-mounted integrated circuits. This probing system provides a quick and reliable connection from these devices to oscilloscopes, logic analyzers, and emulators.

This information also explains how to use optional accessories that will enhance the adapter's use in particular probing situations. Drawings are included that instruct you in laying out printed circuit boards with the proper component spacing to allow correct use of the adapter.

# In This Book


1 Installing the probe adapter

2 Installing optional flexible adapters

3 Reference


This manual is organized in three chapters.

Chapter 1 contains the procedure for installing the probe adapter onto your QFP.

Chapter 2 contains the instructions for installing optional flexible adapters.

Chapter 3 contains reference information such as pinout and cross-reference maps, additional or replaceable parts lists, retainer and adhesive removal.

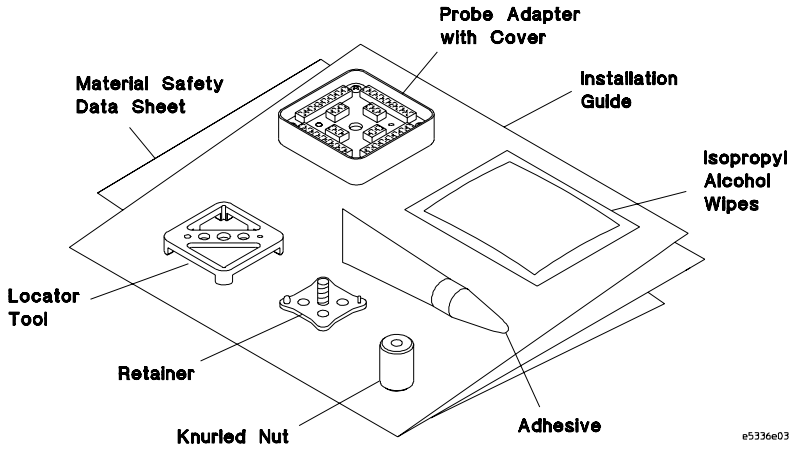
This chapter includes the procedure for installing the probe adapter onto your QFP. The major steps are:

**1** Prepare to attach the retainer to the QFP 1-3
**2** Test the alignment before adhering the retainer 1-4
**3** Adhere the retainer to your QFP 1-7
**4** Install the probe adapter 1-10

# Installation of the Elastomeric Probe Adapter

# To install the QFP elastomeric probe adapter

You should have the items shown in the following illustration to install the probe adapter. Installation will take about 20 minutes.




**Electrical Characteristics**

| | |
|---|---|
| Operating Voltage | < 40 V (dc + Peak ac) |
| Operating Current | 0.5 Amps Maximum |
| Insulation Resistance | > 100 M |

**Model Parameters:**

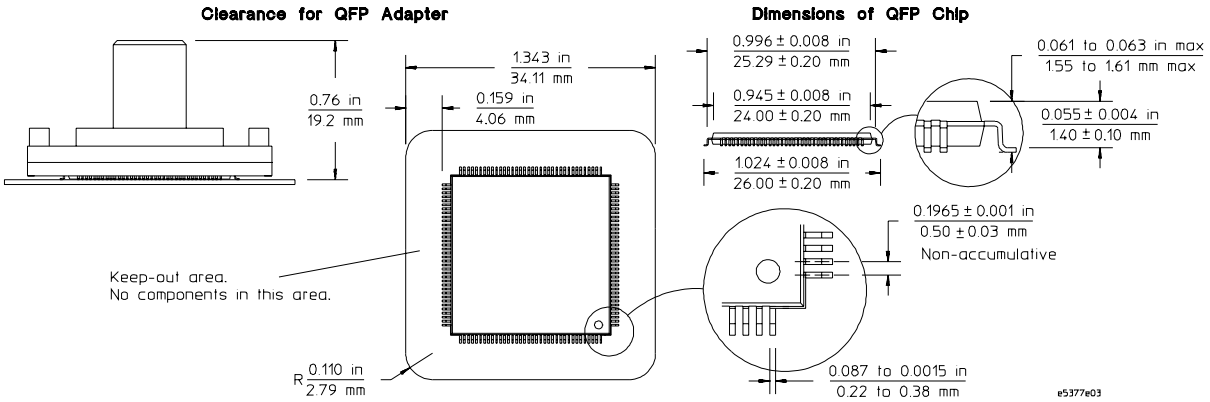
| | |
|---|---|
| Capacitance between Contacts | 0.5 pF (Typical) |
| Self-Inductance | 10 nH (Typical) |
| Contact Resistance | < 0.25 (Typical) |
| Operating Bandwidth | dc – 750 MHz (Typical) |

**Environmental Characteristics**

| | |
|---|---|
| Operating Temperature | 0 C to 55 C |
| Maximum Operating Humidity | 75% Relative Humidity |

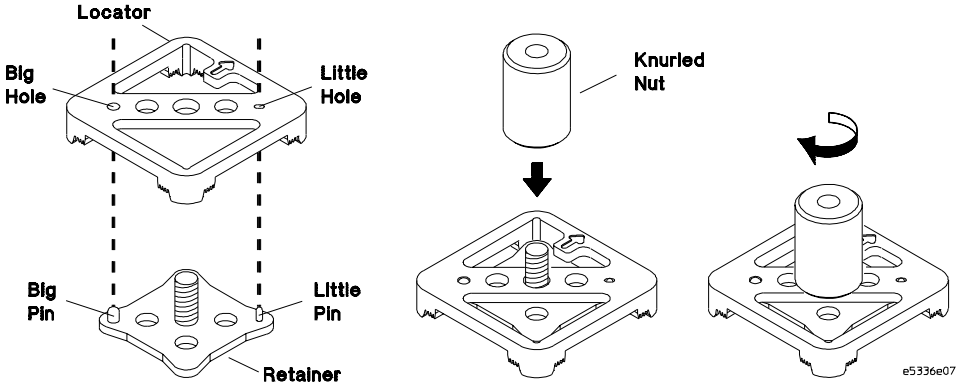
# Prepare to attach the retainer to the QFP

**1** Check the area around the package to be probed. The minimum required clearance from the package and any components is shown in the illustration below. The probe will work within the parameters shown.




**2** Assemble the locator and the retainer, using the knurled nut to hold them together.

Align the big and little pins of the retainer with the big and little holes of the locator tool.

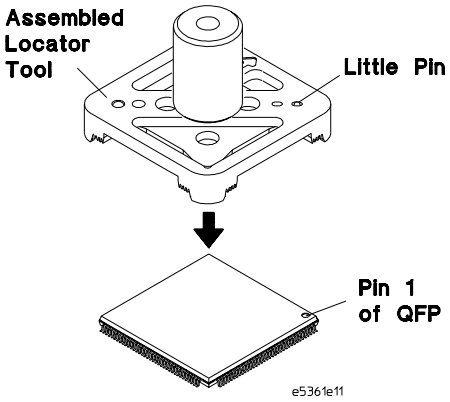


## Test the alignment before adhering the retainer

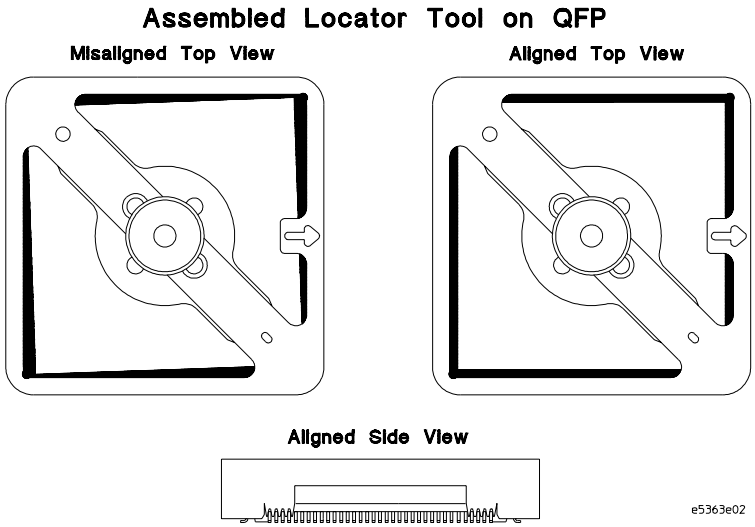
**CAUTION** Turn off the power to your QFP when using the metal locator tool. Failure to do so could cause damage to your IC.

**CAUTION** Use grounded wrist straps and mats when installing or performing any service to your probe adapter. Electrostatic discharge can damage electronic components.

**1** Align the little pin corner of the assembled locator tool with the pin 1 corner on the QFP.

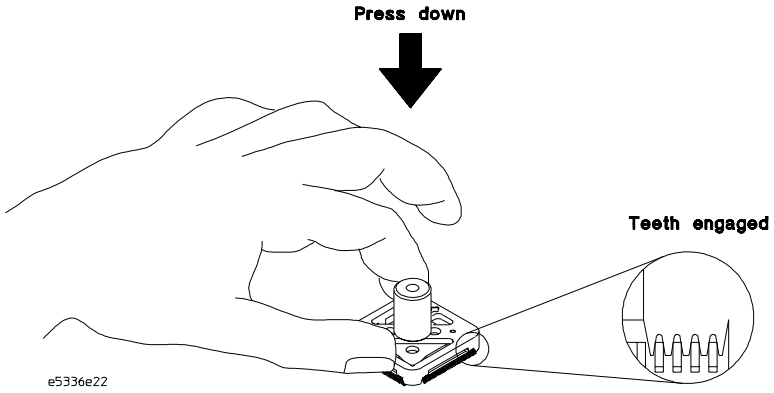


**2** Place the assembled locator tool on the QFP, making sure that it aligns squarely. You will feel the teeth drop between the QFP legs when it is aligned.




**3** Press down on the middle of both sides of the locator tool.

If the tool is down far enough, it will not rock when pressed on the sides.

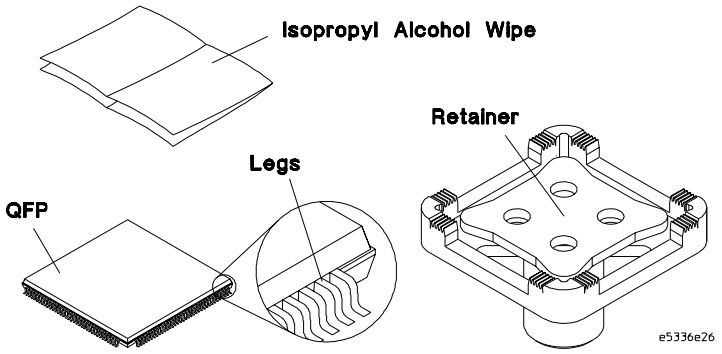


**4** Remove the assembled locator tool and prepare surfaces before applying adhesive.

**a** Use a single edged razor (or equivalent) to remove foreign material, such as stickers or adhesive, from the top surface of the QFP.

**b** Remove any remaining debris from the top surface and legs of the QFP with precision dusting cleaner (also known as inert dusting gas or compressed air in a can).

**c** Clean the the bottom of the retainer, and the top surface and legs of the QFP by wiping with an Isopropyl Alcohol wipe provided in the Retainer Kit. Do not use other cleaners or solvents.



## Adhere the retainer to your QFP

**CAUTION**

You will use adhesive to attach a retainer to the top of the QFP. The retainer ensures precise alignment between the probe adapter and the device. Read the following steps to understand the process of applying adhesive before doing them.

**CAUTION**

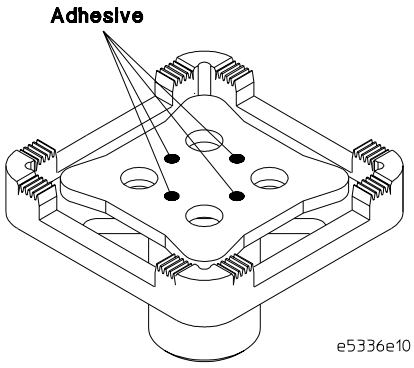
Make sure you can control the amount of adhesive. Excess adhesive can cause problems, so it is better to use too little than too much. Follow the manufacturer's recommended temperature parameters for the adhesive.

**WARNING**

Read the Material Safety Data Sheet enclosed for handling precautions on the Loctite 4204 Prism Instant Adhesive or call Loctite Corporation at (860) 571-5100.

Cyanoacrylate adhesive is a very fast setting and strong adhesive. It bonds human tissue including skin in seconds. Experience has shown that accidents due to cyanoacrylates are handled best by passive, nonsurgical first aid. Treatment of specific types of accidents are given in the data sheet.

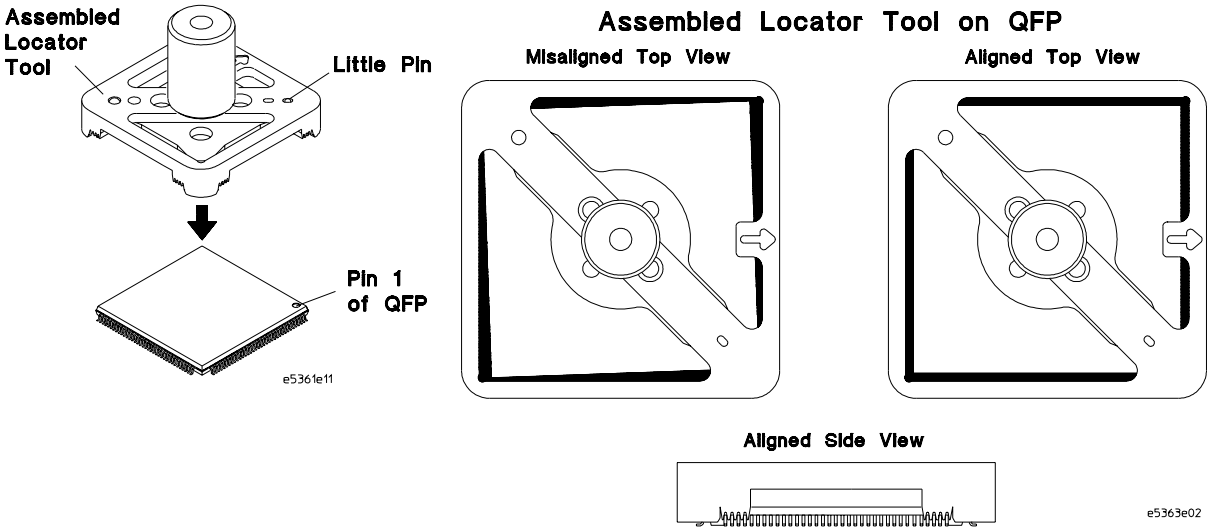
**1** Apply four small drops of adhesive to the underneath side of the retainer as shown.



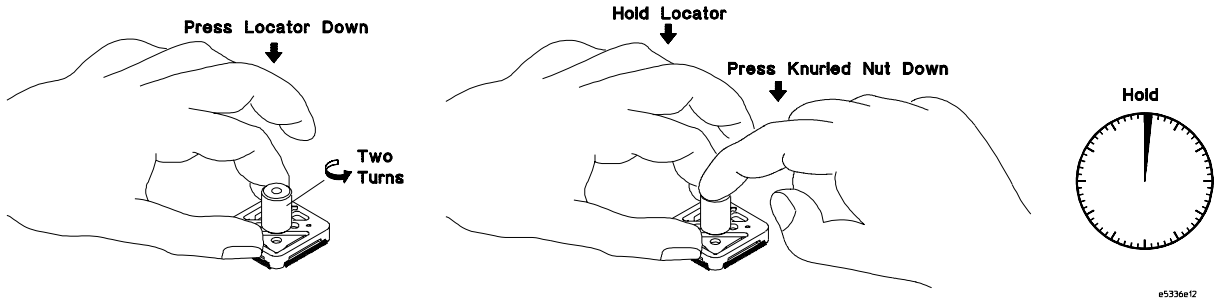
**CAUTION** Turn off the power to your QFP when using the metal locator tool. Failure to do so could cause damage to your IC

**2** Place the locator tool on top of the QFP as you did to test the alignment.

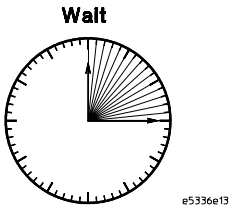
The adhesive on the retainer will not touch the QFP until the next step and the adhesive will not solidify until the retainer and QFP touch, so there is plenty of time to adjust the tool if necessary.



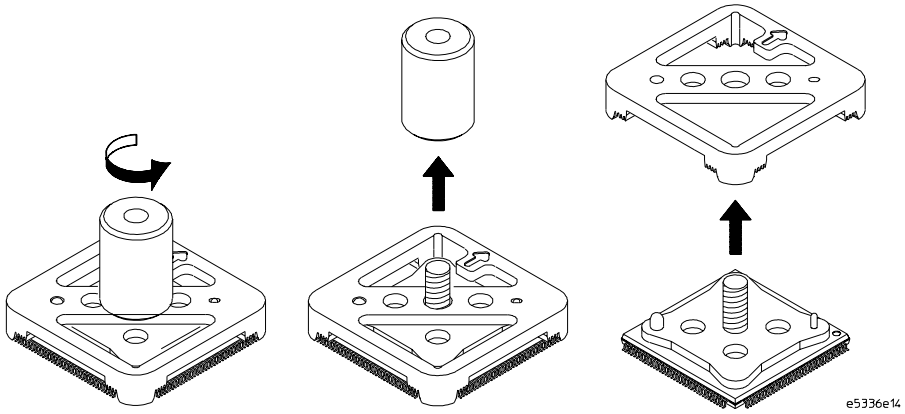

**3** Hold down on the sides of the locator tool and loosen the knurled nut two turns. Continue to hold down on the sides of the locator tool and press down on the knurled nut to drop the retainer onto the top of the QFP. Hold for 45 seconds.



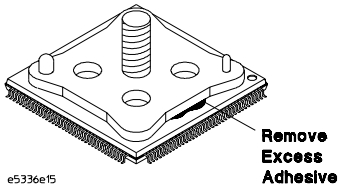
**4** Wait 15 minutes for the adhesive to cure.




**5** Remove the locator tool, by completely unscrewing the knurled nut and lifting the locator off the QFP.




**6** Remove any adhesive that leaked out the edges of the retainer, using a knife, so that the probe adapter will seat properly.

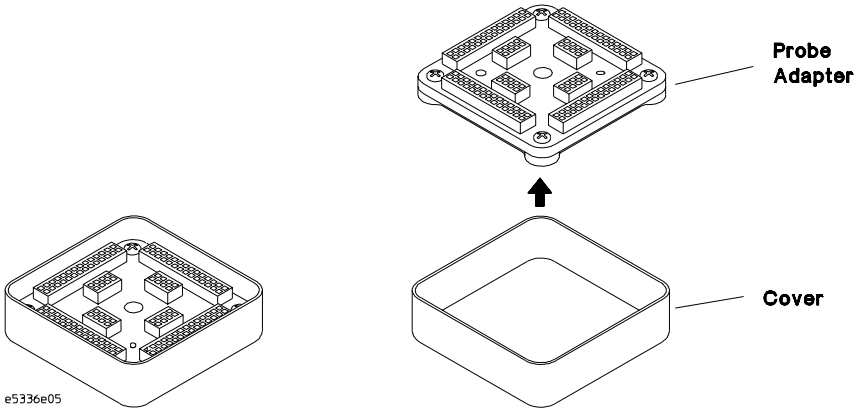



If a retainer ever breaks off of the QFP, a new retainer can be re-attached. There are some contaminates that are not removed with Isopropyl Alcohol in preparing the surfaces before adhering. If a retainer breaks off, the adhesive from the initial installation usually removes any remaining contamination. The bond strength of a second retainer is usually higher than the bond strength of the first. Repeat all steps in this section to re-attach a new retainer.

## Install the probe adapter

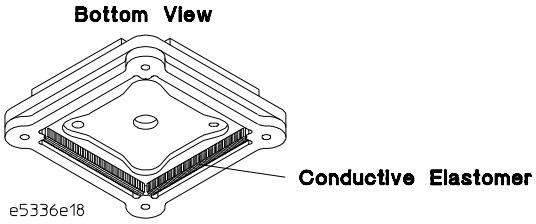
1. If the probe adapter is already attached to the analysis probe (analysis probe) or emulator, go to the analysis probe (analysis probe) or emulator documentation for installation instructions.
2. Remove the cover.

   When you store the probe adapter, put the cover back on to protect the conductive elastomer from dust or damage.




**CAUTION**

Do not touch the contact area on the conductive elastomer, which is on the bottom of the probe adapter. Contamination or damage to the conductive elastomer will cause shorts or poor contact.



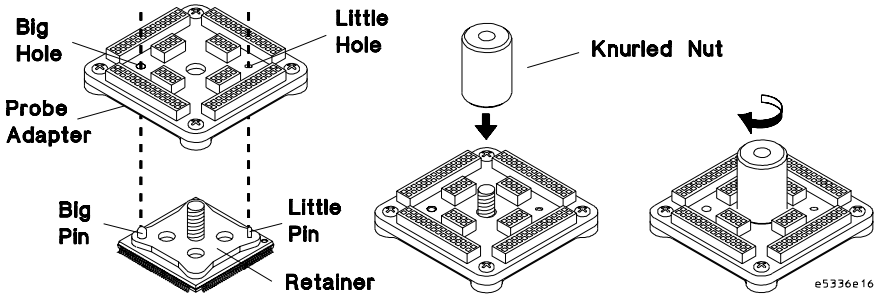
3 Install the elastomeric probe adapter on the retainer.

- **a** Place the probe adapter over the retainer so that the threaded stud passes through the center hole of the adapter, and the dowel pins of the retainer enter the holes in the adapter.
- **b** Avoid touching the elastomers to the threaded stud or dowel pins of the retainer as the probe is inserted.
- **c** Make sure the dowels on the retainer are inserted in the holes on the probe adapter and that it is laying flat against the QFP before tightening the nut.

4 Turn the knurled nut until it stops.

**CAUTION**

Do not over-tighten the knurled nut. Over-tightening the nut will make it difficult to remove.




A pinout map showing the pin numbers of the probe adapter and your QFP is in the Reference chapter of this document.

2

This chapter includes procedures to install optional flexible adapters for use with Agilent logic analyzers, oscilloscopes, and emulators.

The E5349A 1/4 flexible adapters, 2-2

The E5350A general-purpose flexible adapter, 2-5

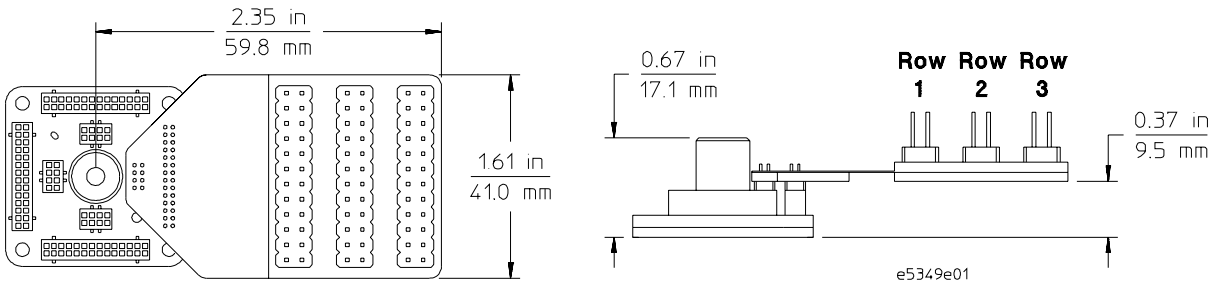
# Installation of Optional Flexible Adapters

# The E5349A 1/4 flexible adapters

The E5349A 1/4 flexible adapters can be used with any Agilent oscilloscope or logic analyzer. They provide a flexible mechanical interface while maintaining the electrical performance to the probe tip. They allow you to probe selected pins or every pin on your QFP. Use one to four flexible adapters depending on your needs.

**Performance characteristics of the E5349A 1/4 flexible adapters**

| | |
|---|---|
| **Elastomeric Probe Adapter** | E5377A 160-pin 0.5 mm |
| **Electrical Characteristics** | |
| Operating Voltage | < 40 V (dc + Peak ac) |
| Operating Current | 0.5 Amps Maximum |
| Insulation Resistance | > 100 M |
| **Model Parameters** | |
| Pin-to-Ground Capacitance | 2.5 pF Typical First Row<br>3.5 pF Typical Second Row<br>5.0 pF Typical Third Row |
| Pin-to-Pin Capacitance | 2 pF Typical |
| Self-Inductance | 20 nH Typical First Row<br>30 nH Typical Second Row<br>40 nH Typical Third Row |
| Operating Band width | 350 Mhz Typical |
| **Environmental Characteristics** | |
| Operating Temperature | 0 C to 55 C |
| Maximum Operating Humidity | 75% Relative Humidity |



**To connect an logic analyzer or oscilloscope using a 1/4 flexible adapter**

1 Power-off the analysis probe (analysis probe), logic analyzer, and target system.

2 Follow the steps in chapter 1 to install the elastomeric probe adapter.

**CAUTION**

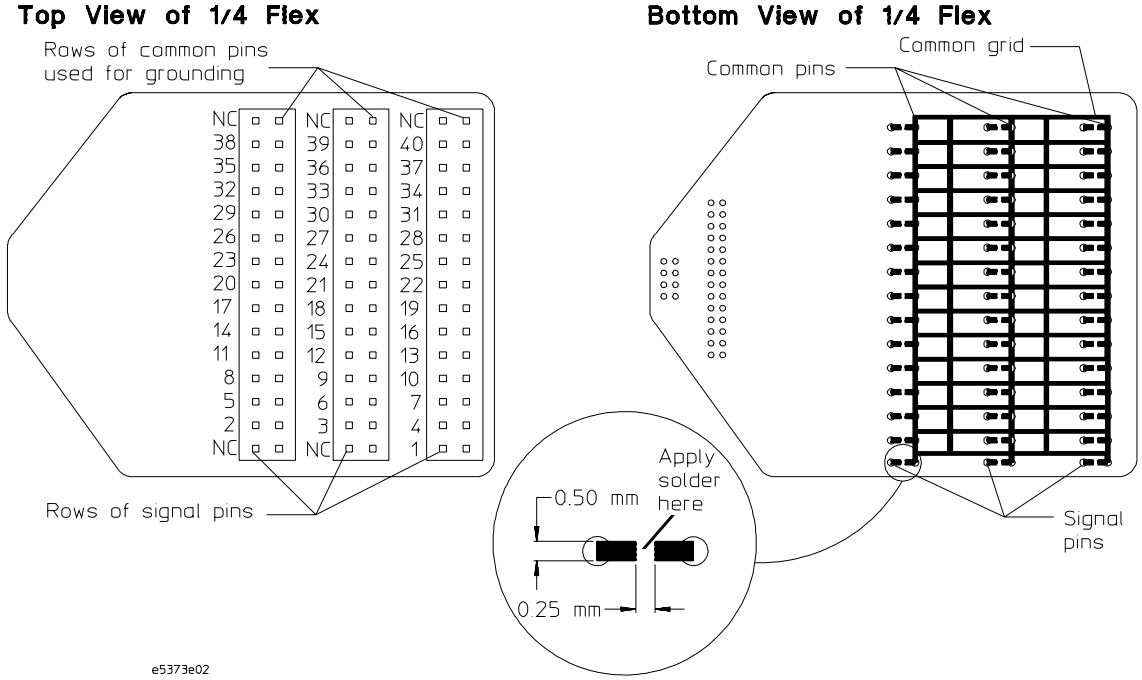
**Damage to the QFP.** Once the 1/4 flexible adapter has had its common pins connected to ground it should not be used in any other quadrant of the elastomeric probe adapter or in any other device. Remove the solder connecting the common pins to ground before reuse.

3 Put the supplied label(s) on your 1/4 flexible adapter(s) as shown in step 5.

4 Apply a small amount of solder across the gap between the signal pins that are ground on your device under test and the common pins of the 1/4 flexible adapter. This will facilitate the connection of the logic analyzer or oscilloscope probe ground.

All of the common pins are connected together through a grid on the bottom of the flexible adapter as shown below.

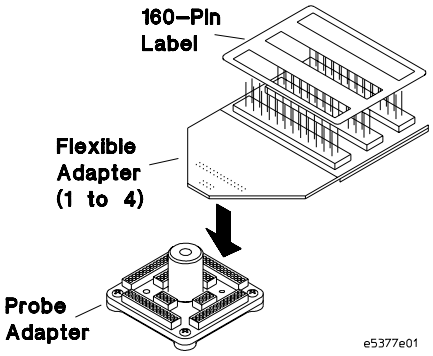
The pin numbers printed on the label correspond to the pins in one quadrant of the probe adapter. Refer to the pinout and cross-reference maps in the Reference chapter of this document when using multiple 1/4 flexible adapters.



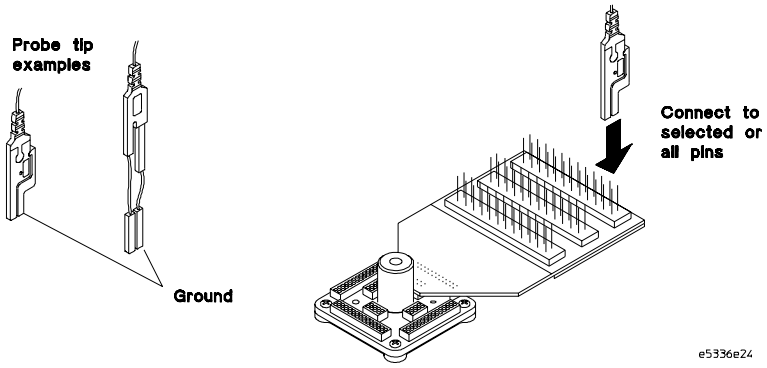
**CAUTION**

To prevent pin damage and ensure a proper connection, make sure the pins of the flexible adapter are aligned and seated correctly in the sockets on the probe adapter.

**5** Plug 1 to 4 flexible adapters into the sockets on the top of the probe adapter assembly as shown in the following illustration.




**6** Connect the appropriate logic analyzer or oscilloscope probe to the correct circuit as indicated by the adapter pin numbers.

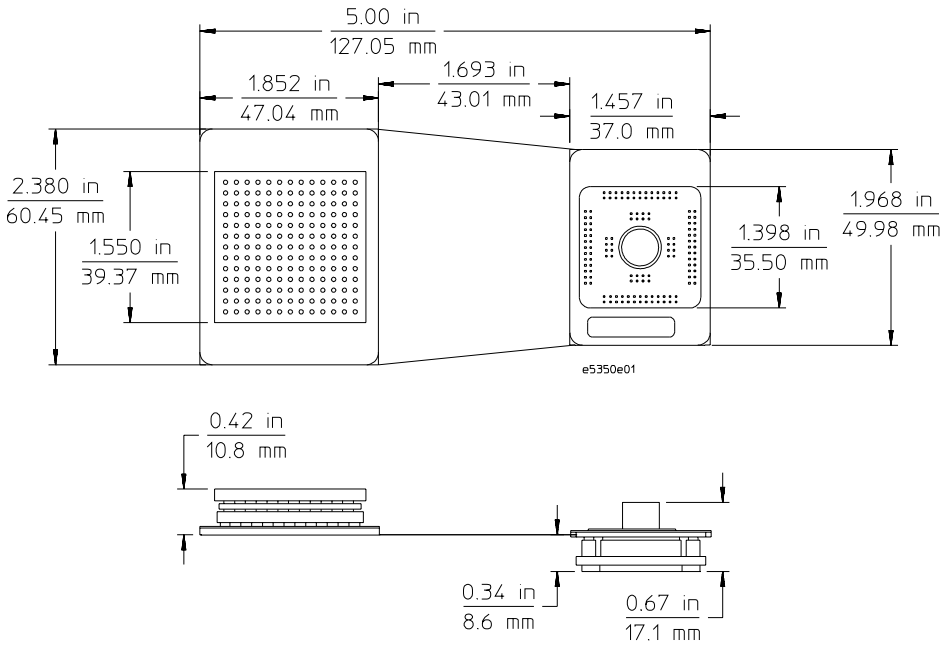


# The E5350A general-purpose flexible adapter

The E5350A general-purpose adapter gives you access to predefined processor support for an analysis probe and logic analyzer or emulator.

### Performance characteristics of the E5350A general-purpose flexible adapter

| | | |
|---|---|---|
| **Elastomeric Probe Adapter** | | E5377A 160-pin 0.5 mm |
| **Electrical Characteristics** | Signal loading per line in addition to emulator or analysis probe (analysis probe) load | 25 pF maximum |
| | Maximum operating frequency | 33 MHz |
| **Environmental Characteristics** | Operating Temperature | 0 C to 5 C |
| | Maximum Operating Humidity | 75% Relative Humidity |



**To connect an logic analyzer or oscilloscope using a general-purpose flexible adapter**

1 Power-off the target system, analysis probe (analysis probe) and logic analyzer, or emulator.

2 Follow the steps in chapter 1 to install the elastomeric probe adapter.

**CAUTION**

**Serious equipment damage.** Ensure that the analysis probe (analysis probe) or emulator probe is aligned with the proper pins when connecting to the general-purpose flexible adapter. Serious equipment damage can result from improper connection. The final connection should match the orientation you select from your analysis probe or emulator manual.

3 Refer to the orientation illustration in your analysis probe or emulator manual to select one of four possible orientations.

The general-purpose flexible adapter can be attached to the probe adapter in one of four orientations to avoid interfering with tall components on the target system.

**CAUTION**

To prevent pin damage and ensure a proper connection, make sure the pins of the analysis probe, transition board, general-purpose flexible adapter, and elastomeric probe adapter are aligned and seated correctly in the sockets.

4 Connect the analysis probe, transition board, general-purpose flexible adapter, and elastomeric probe adapter using the orientation selected in the previous step.

Refer to the pinout and cross-reference maps in the Reference chapter of this document for pin numbers on the general-purpose flexible adapter.

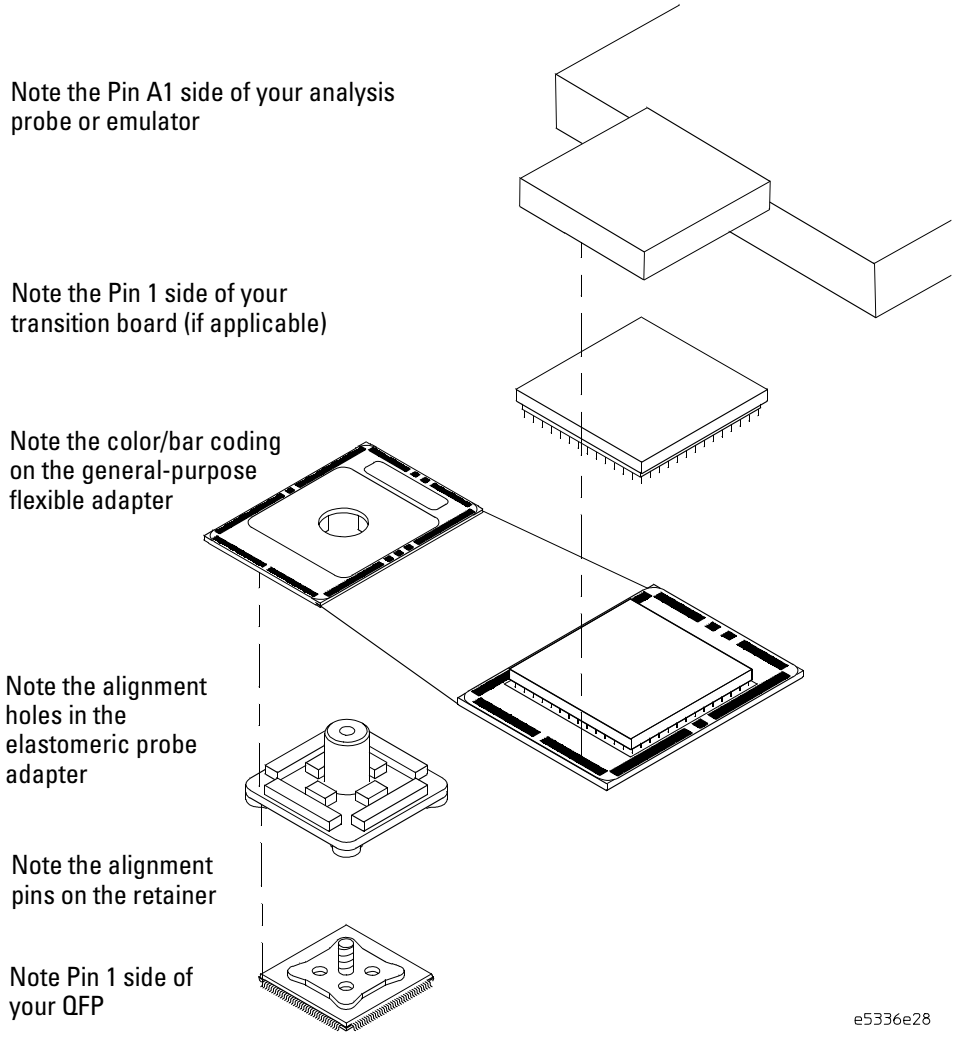
**See Also**

Refer to your analysis probe or emulator manual for information on connecting to and using the analysis probe or emulator.

**Example**

The following illustration shows one of four possible orientations for connecting the QFP elastomeric probing system using the general-purpose flexible adapter.

Refer to your analysis probe or emulator manual to select the orientation which allows the best access to your target system.

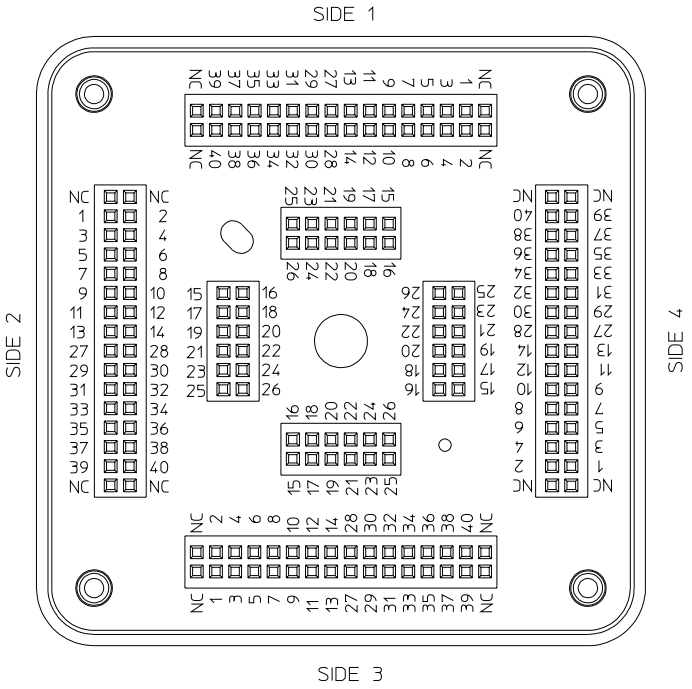


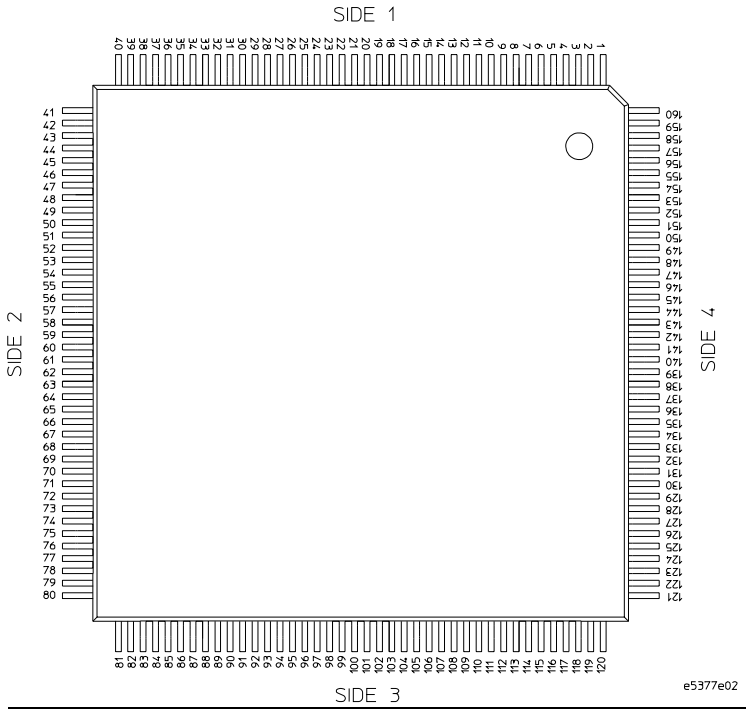
This chapter includes the following reference information:

- Pinout and cross-reference maps
- Parts for probing additional QFPs
- Replaceable parts
- Removing retainers

# Reference

### Probe adapter and QFP pinout maps



## Cross reference for multiple 1/4 flexible adapters and QFP

**SIDE 1**

| QFP | FLEX | QFP | FLEX | QFP | FLEX |
|---|---|---|---|---|---|
| -- | NC | -- | NC | -- | NC |
| 38 | 38 | 39 | 39 | 40 | 40 |
| 35 | 35 | 36 | 36 | 37 | 37 |
| 32 | 32 | 33 | 33 | 34 | 34 |
| 29 | 29 | 30 | 310 | 31 | 31 |
| 26 | 26 | 27 | 27 | 28 | 28 |
| 23 | 23 | 24 | 24 | 25 | 25 |
| 20 | 20 | 21 | 21 | 22 | 22 |
| 17 | 17 | 18 | 18 | 19 | 19 |
| 14 | 14 | 15 | 15 | 16 | 16 |
| 11 | 11 | 12 | 12 | 13 | 13 |
| 8 | 8 | 9 | 9 | 10 | 10 |
| 5 | 5 | 6 | 6 | 7 | 7 |
| 2 | 2 | 3 | 3 | 4 | 4 |
| -- | NC | -- | NC | 1 | 1 |

**SIDE 2**

| QFP | FLEX | QFP | FLEX | QFP | FLEX |
|---|---|---|---|---|---|
| -- | NC | -- | NC | -- | NC |
| 78 | 38 | 79 | 39 | 80 | 40 |
| 75 | 35 | 76 | 36 | 77 | 37 |
| 72 | 32 | 73 | 33 | 74 | 34 |
| 69 | 29 | 70 | 30 | 71 | 31 |
| 66 | 26 | 67 | 27 | 68 | 28 |
| 63 | 23 | 64 | 24 | 65 | 25 |
| 60 | 20 | 61 | 21 | 62 | 22 |
| 57 | 17 | 58 | 18 | 59 | 19 |
| 54 | 14 | 55 | 15 | 56 | 16 |
| 51 | 11 | 52 | 12 | 53 | 13 |
| 48 | 8 | 49 | 9 | 50 | 10 |
| 45 | 5 | 46 | 6 | 47 | 7 |
| 42 | 2 | 43 | 3 | 44 | 4 |
| -- | NC | -- | NC | 41 | 1 |

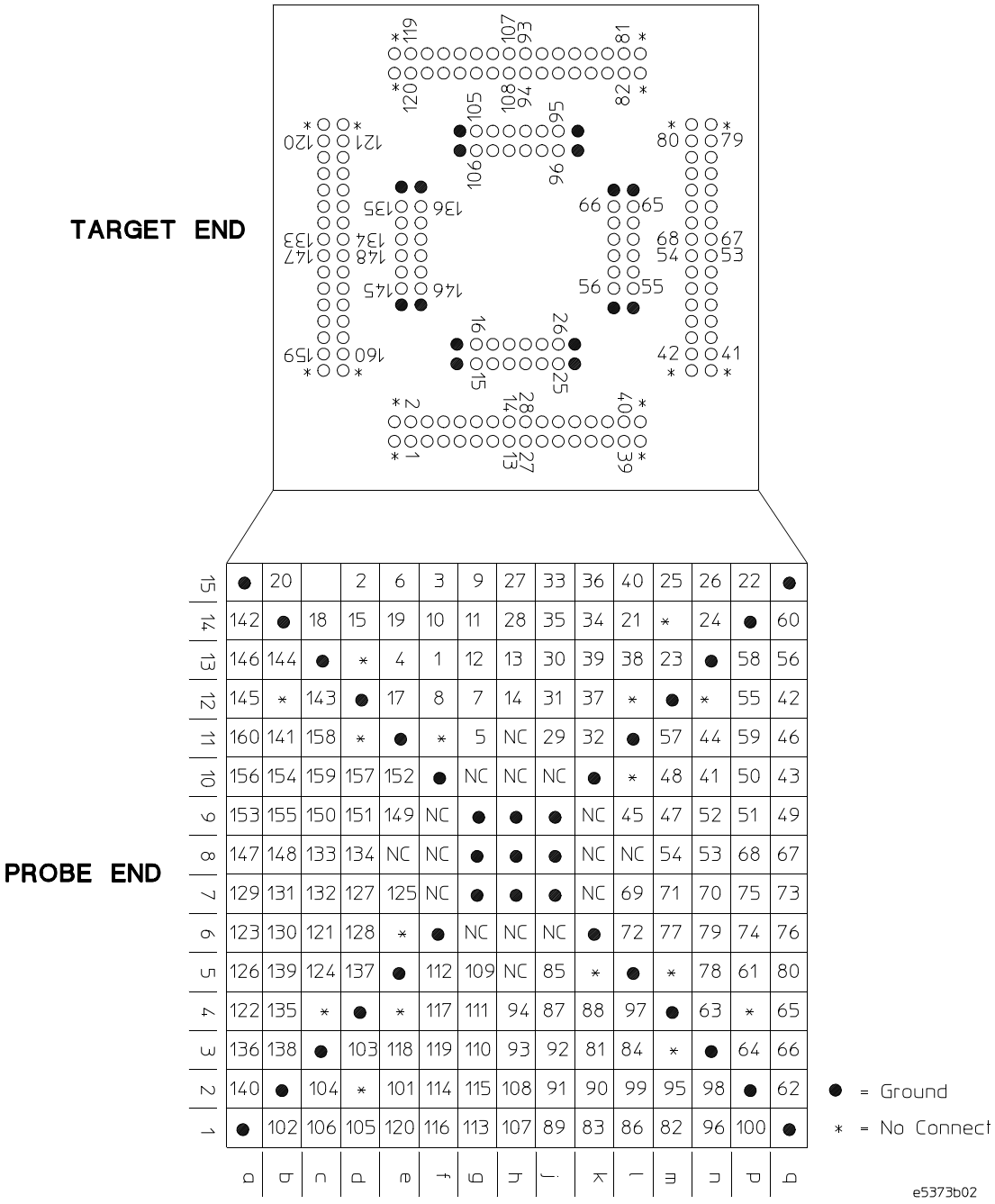
**SIDE 3**

| QFP | FLEX | QFP | FLEX | QFP | FLEX |
|---|---|---|---|---|---|
| -- | NC | -- | NC | -- | NC |
| 118 | 38 | 119 | 39 | 120 | 40 |
| 115 | 35 | 116 | 36 | 117 | 37 |
| 112 | 32 | 113 | 33 | 114 | 34 |
| 109 | 29 | 110 | 30 | 111 | 31 |
| 106 | 26 | 107 | 27 | 108 | 28 |
| 103 | 23 | 104 | 24 | 105 | 25 |
| 100 | 20 | 101 | 21 | 102 | 22 |
| 97 | 17 | 98 | 18 | 99 | 19 |
| 94 | 14 | 95 | 15 | 96 | 16 |
| 91 | 11 | 92 | 12 | 93 | 13 |
| 88 | 8 | 89 | 9 | 90 | 10 |
| 85 | 5 | 86 | 6 | 87 | 7 |
| 82 | 2 | 83 | 3 | 84 | 4 |
| -- | NC | -- | NC | 81 | 1 |

**SIDE 4**

| QFP | FLEX | QFP | FLEX | QFP | FLEX |
|---|---|---|---|---|---|
| -- | NC | -- | NC | -- | NC |
| 158 | 38 | 159 | 39 | 160 | 40 |
| 155 | 35 | 156 | 36 | 157 | 37 |
| 152 | 32 | 153 | 33 | 154 | 34 |
| 149 | 29 | 150 | 30 | 151 | 31 |
| 146 | 26 | 147 | 27 | 148 | 28 |
| 143 | 23 | 144 | 24 | 145 | 25 |
| 140 | 20 | 141 | 21 | 142 | 22 |
| 137 | 17 | 138 | 18 | 139 | 19 |
| 134 | 14 | 135 | 15 | 136 | 16 |
| 131 | 11 | 132 | 12 | 133 | 13 |
| 128 | 8 | 129 | 9 | 130 | 10 |
| 125 | 5 | 126 | 6 | 127 | 7 |
| 122 | 2 | 123 | 3 | 124 | 4 |
| -- | NC | -- | NC | 121 | 1 |

### Cross reference for general-purpose flexible adapter and QFP




| | a | b | c | d | e | f | g | h | j | k | l | m | n | p | q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | ● | 20 | | 2 | 6 | 3 | 9 | 27 | 33 | 36 | 40 | 25 | 26 | 22 | ● |
| 14 | 142 | ● | 18 | 15 | 19 | 10 | 11 | 28 | 35 | 34 | 21 | * | 24 | ● | 60 |
| 13 | 146 | 144 | ● | * | 4 | 1 | 12 | 13 | 30 | 39 | 38 | 23 | ● | 58 | 56 |
| 12 | 145 | * | 143 | ● | 17 | 8 | 7 | 14 | 31 | 37 | * | ● | * | 55 | 42 |
| 11 | 160 | 141 | 158 | * | ● | * | 5 | NC | 29 | 32 | ● | 57 | 44 | 59 | 46 |
| 10 | 156 | 154 | 159 | 157 | 152 | ● | NC | NC | NC | ● | * | 48 | 41 | 50 | 43 |
| 9 | 153 | 155 | 150 | 151 | 149 | NC | ● | ● | ● | NC | 45 | 47 | 52 | 51 | 49 |
| 8 | 147 | 148 | 133 | 134 | NC | NC | ● | ● | ● | NC | NC | 54 | 53 | 68 | 67 |
| 7 | 129 | 131 | 132 | 127 | 125 | NC | ● | ● | ● | NC | 69 | 71 | 70 | 75 | 73 |
| 6 | 123 | 130 | 121 | 128 | * | ● | NC | NC | NC | ● | 72 | 77 | 79 | 74 | 76 |
| 5 | 126 | 139 | 124 | 137 | ● | 112 | 109 | NC | 85 | * | ● | * | 78 | 61 | 80 |
| 4 | 122 | 135 | * | ● | * | 117 | 111 | 94 | 87 | 88 | 97 | ● | 63 | * | 65 |
| 3 | 136 | 138 | ● | 103 | 118 | 119 | 110 | 93 | 92 | 81 | 84 | * | ● | 64 | 66 |
| 2 | 140 | ● | 104 | * | 101 | 114 | 115 | 108 | 91 | 90 | 99 | 95 | 98 | ● | 62 |
| 1 | ● | 102 | 106 | 105 | 120 | 116 | 113 | 107 | 89 | 83 | 86 | 82 | 96 | 100 | ● |

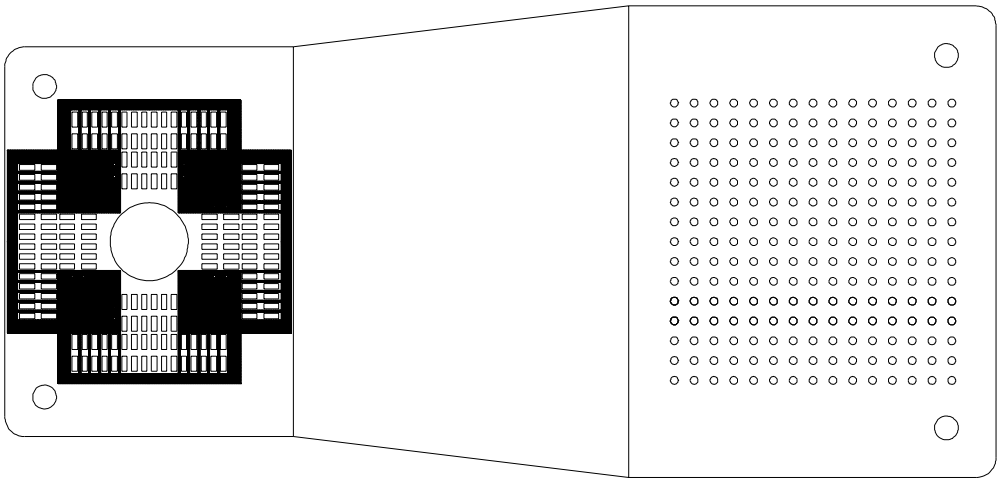
# Grounding

The general-purpose flexible adapter cable has a ground grid that can be used to provide a low impedance path for ground signals. Because the flexible cable is a generic solution, no probed signals are connected to this low impedance ground. The exposed pads and metal areas on the top of the target end of the cable allow you to individually ground signals. Connect ground signals from the target (small rectangular pads) to the large square pads which are connected to the ground grid.

**CAUTION**

**Damage to the target. Be careful not to connect any target signals to the ground grid. See the previous pin-out maps and cross-reference tables to determine which pads correspond to ground signals.**

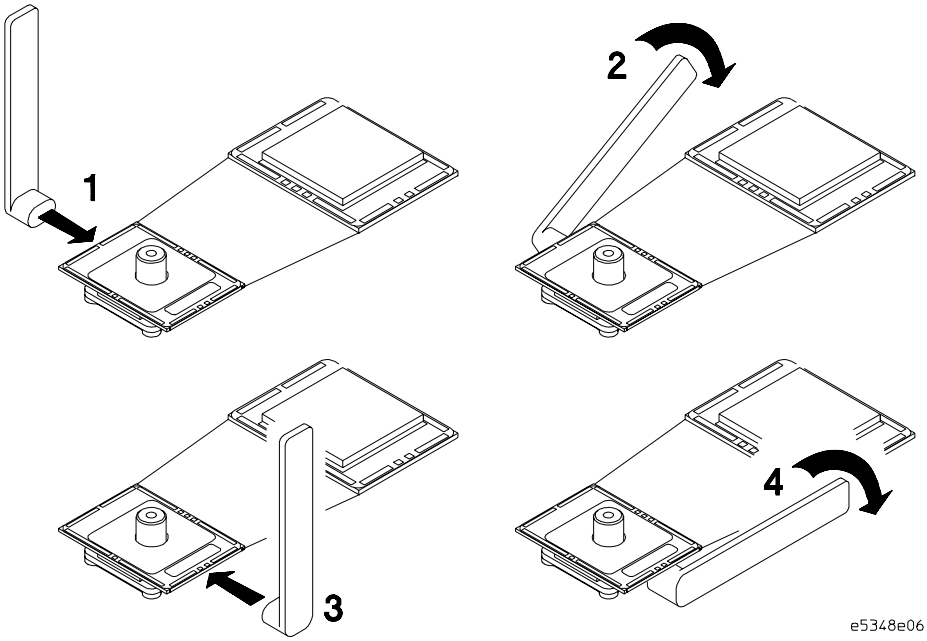
Connecting target grounds to the flexible cable ground will provide a low impedance path for return currents resulting in more accurate measurements by your instrument. This increases the load capacitance seen by your target system. In some cases you may not need to connect ground signals in order to get accurate measurements, but it is recommended that you do so to ensure optimal signal fidelity at your measurement tool.



e5350e03

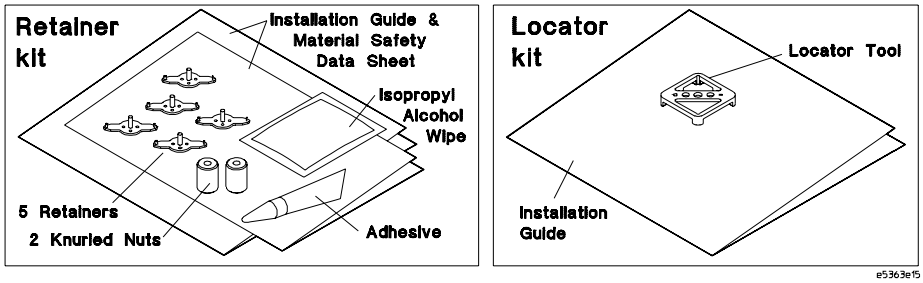
# To remove the general-purpose flexible adapter

Gently pry the flexible adapter from the probe adapter using the pry tool as shown.



# Replaceable Parts

| 160-Pin Part Description | Part Number |
|---|---|
| Elastomeric Probe Adapter<br>(Includes retainers and locators) | E5377A |
| 1/4 flexible adapter | E5349A |
| General-purpose flexible adapter | E5350A |
| Retainer Kit<br>(shown in the following illustration) | E5377A opt. 201 |
| Locator Kit<br>(shown in the following illustration) | E5377A opt. 202 |

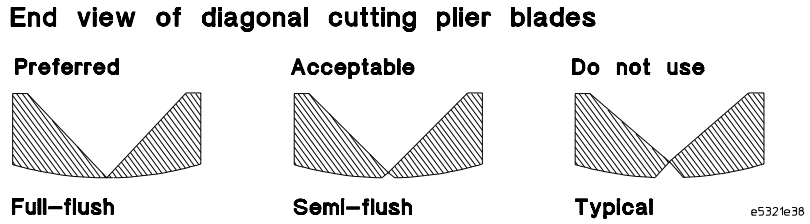


# To remove a retainer and adhesive

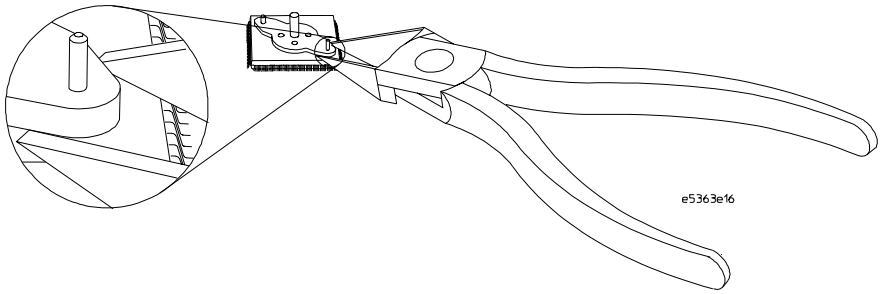
**WARNING** **Eye injury.** Use protective eye-wear during removal to avoid injury.

**CAUTION** The following procedure could cause damage to some QFPs, depending upon the construction of the part and surface condition.
Power off the devide under test before attempting to remove a retainer.

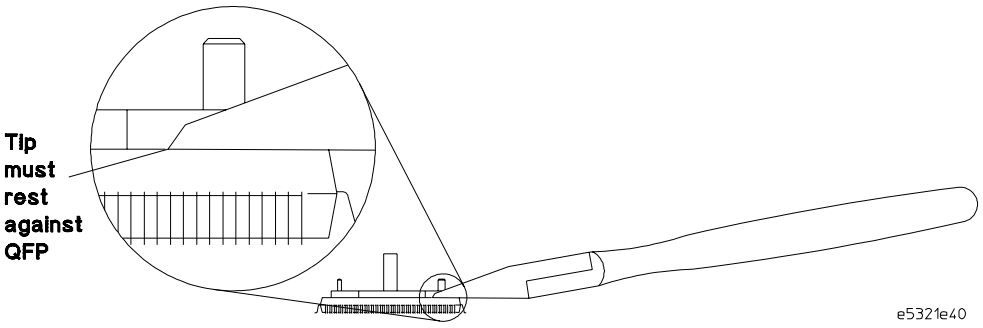
1 Use a semi-flush or full-flush cutting plier with approximately 5-inch handles, such as part number 8170-0006, to remove the retainer.




2 Place the tip of the plier against the slanted edge of the retainer.

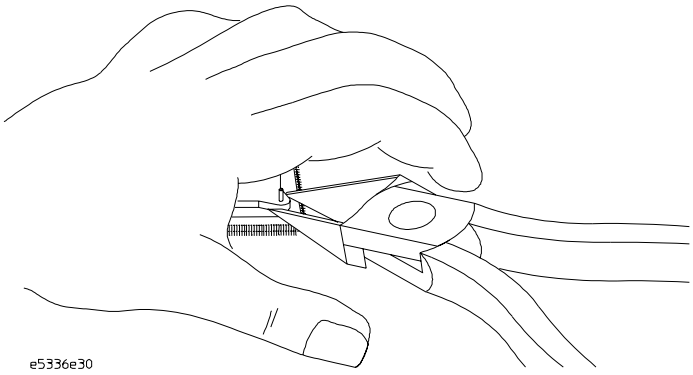



3 Ensure that the tip edge of the plier is as nearly parallel as possible and resting on the surface of the QFP.



**WARNING** **Possible injury.** Exercise care when using any sharp cutting tool.

4 Hold your hand over the QFP during removal to prevent the part from flying when it pops off.




**CAUTION** Prevent the retainer from landing on any electrical circuits which might cause shorting.

5 Squeeze the pliers to pop the retainer off.

6 Discard the retainer.

**WARNING** **Possible injury.** Exercise care when using any sharp cutting tool.

7 Scrape the adhesive off the top of your QFP using a single-edge razor blade or similar tool.

Do not use solvent because the solvent might dissolve the adhesive onto the leads of your QFP causing unreliable probing.

8 Make sure all adhesive has been removed and that there are no rough spots on the top of the QFP.

9 If you want to attach another retainer to your QFP, follow the installation procedure in chapter 1.

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**Warning**

Before turning on the instrument, you must connect the protective earth terminal of the instrument to the protective conductor of the (mains) power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. You must not negate the protective action by using an extension cord (power cable) without a protective conductor (grounding). Grounding one conductor of a two-conductor outlet is not sufficient protection.

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Hazardous voltage symbol.

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

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