Installation Guide

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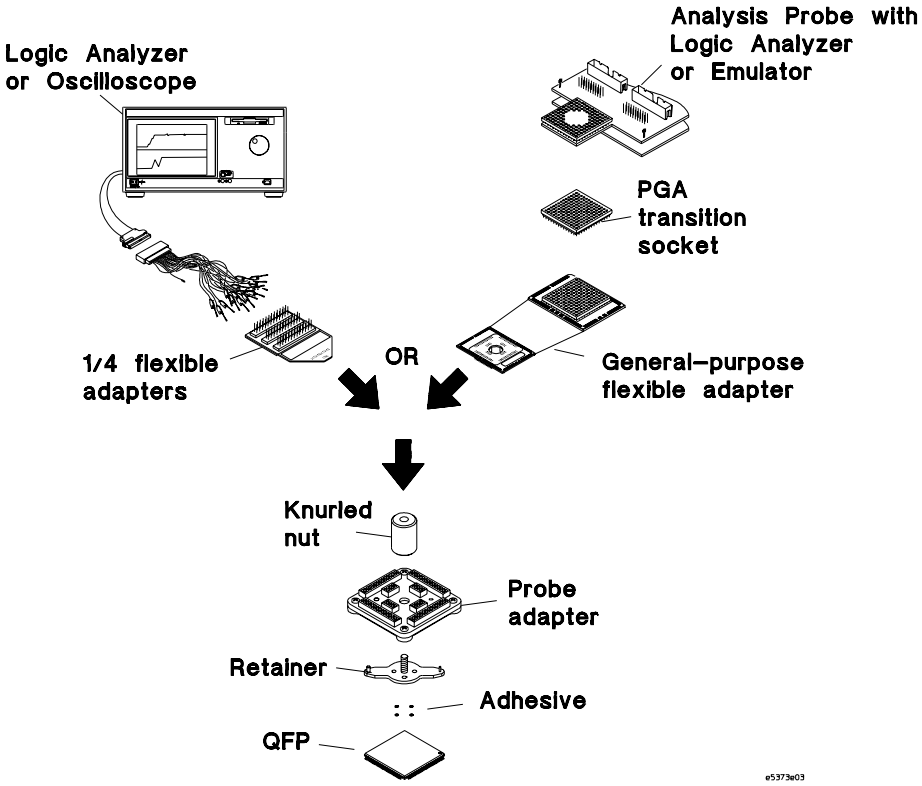
Elastomeric Probe Adapter for 160-Pin 0.65 mm QFP

Installation at a Glance



This Installation Guide explains how to use Agilent Technologies' advanced probing system for 0.65 mm pitch Quad Flat Pack (QFP) surface-mounted integrated circuits. This probing system provides a quick and reliable connection from these devices to Agilent 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

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.

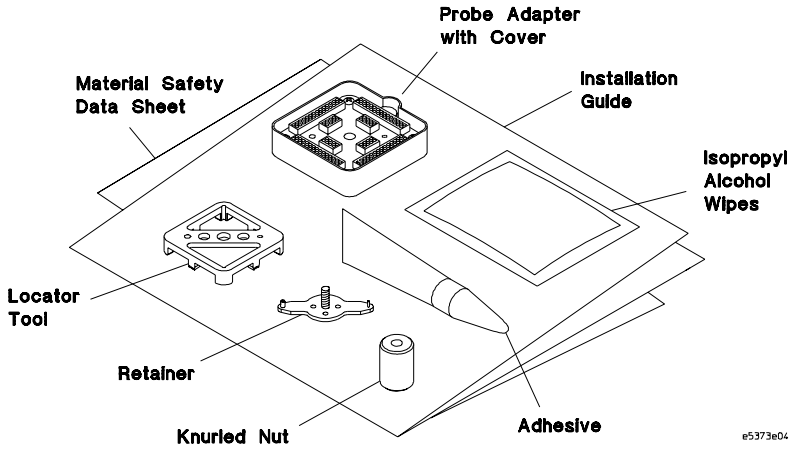
Chapter 3 contains reference information such as pinout and cross-reference maps, additional or replaceable parts lists, retainer and adhesive removal.

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

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:

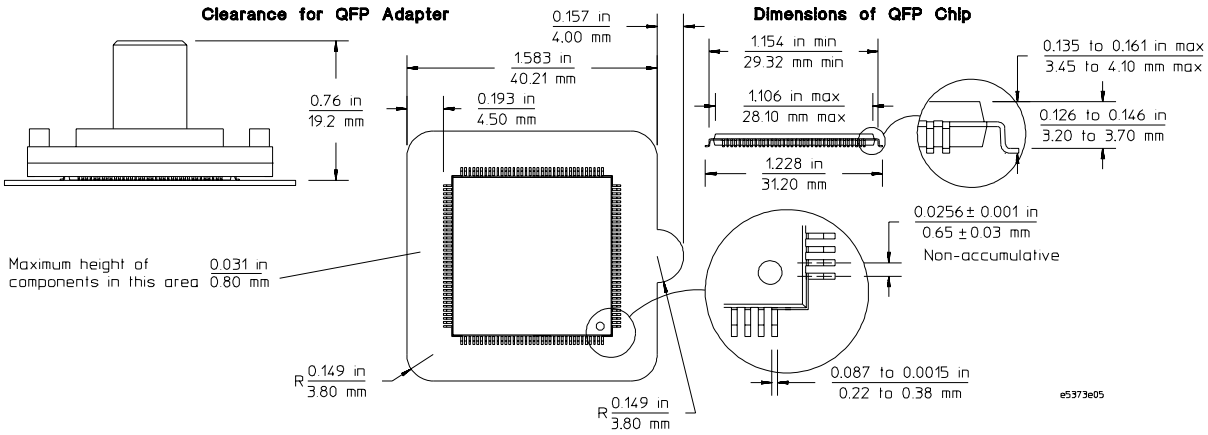
Capacitance between Contacts	0.5 pF (Typical)
Self-Inductance	10 nH (Typical)
Contact Resistance	< 0.25 (Typical)
Operating Bandwidth	dc – 750 MHz (Typical)

Environmental Characteristics

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

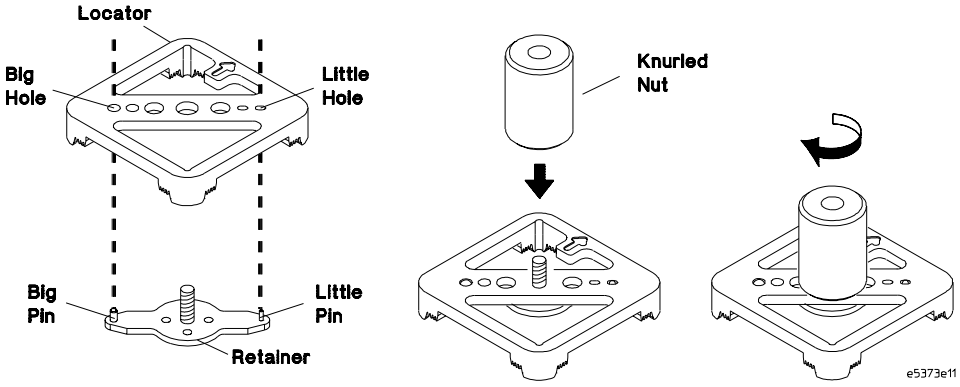
Prepare to attach the retainer to the QFP

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

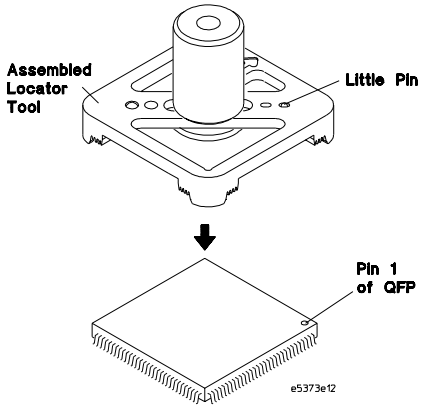
CAUTION

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

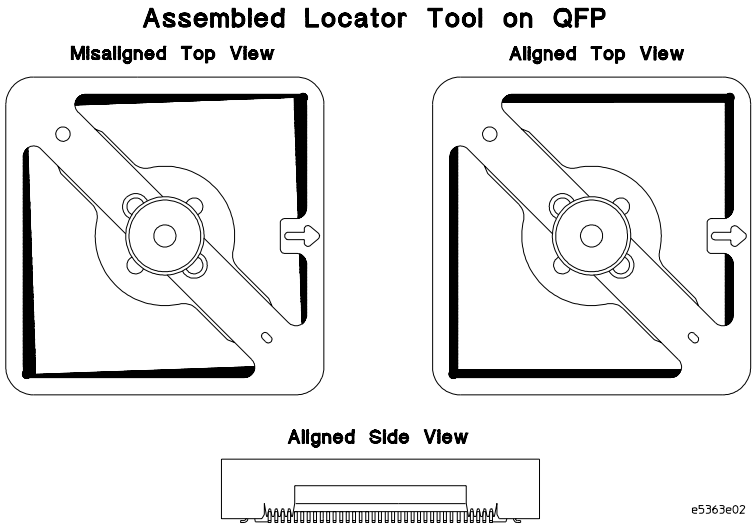
CAUTION

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.

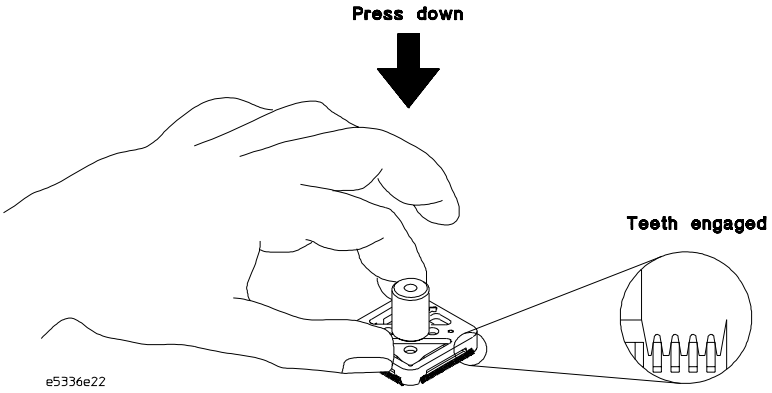


2 Place the assembled locator tool on the QFP, making sure that it aligns squarely. You will feel the teeth drop between the QFP legs when it is aligned.



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.

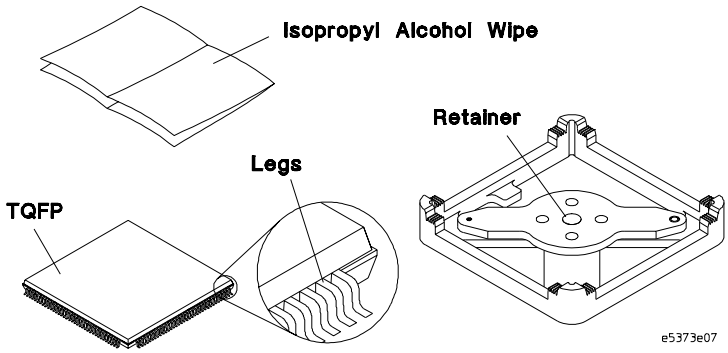


4 Remove the assembled locator tool and prepare surfaces before applying adhesive.

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

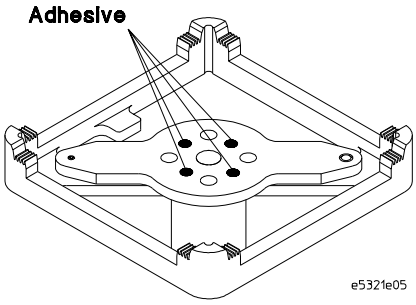
Make sure you can control the amount of adhesive. Excess adhesive can cause problems, so it is better to use too little than too much. Follow the manufacturer's recommended temperature parameters for the adhesive.

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.

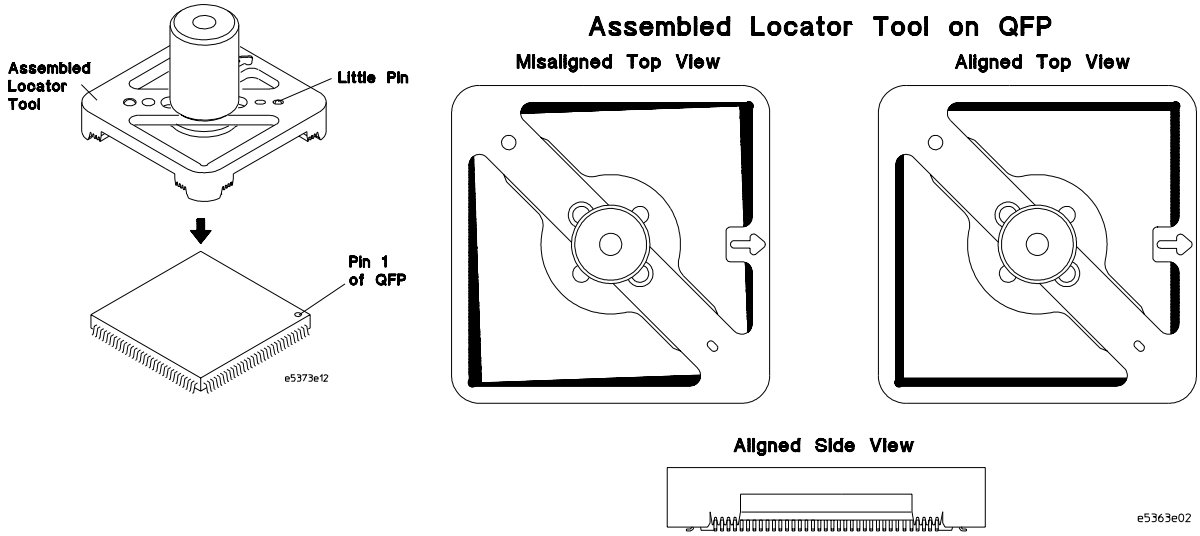
1 Apply four small drops of adhesive to the underneath side of the retainer as shown.



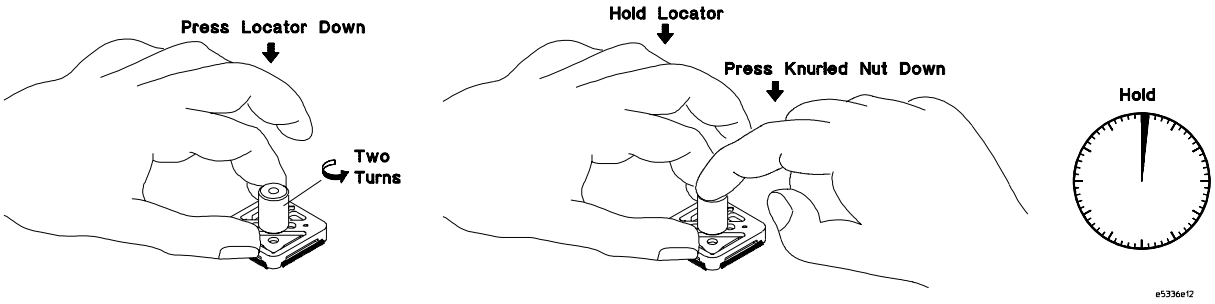
CAUTION Turn off the power to your QFP when using the metal locator tool. Failure to do so could cause damage to your IC

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

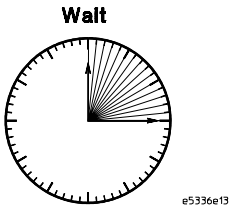
The adhesive on the retainer will not touch the QFP until the next step and the adhesive will not solidify until the retainer and QFP touch, so there is plenty of time to adjust the tool if necessary.



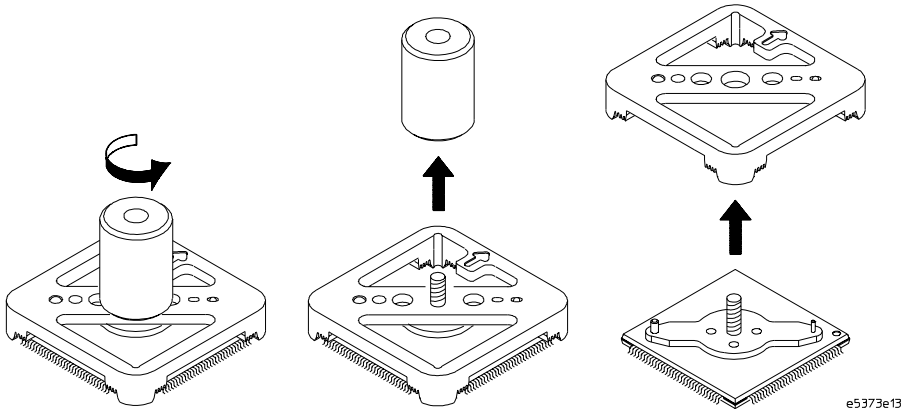
3 Hold down on the sides of the locator tool and loosen the knurled nut two turns. Continue to hold down on the sides of the locator tool and press down on the knurled nut to drop the retainer onto the top of the QFP. Hold for 45 seconds.



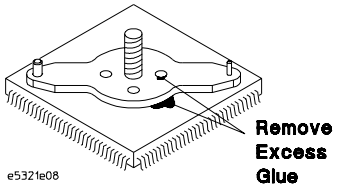
4 Wait 15 minutes for the adhesive to cure.



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.

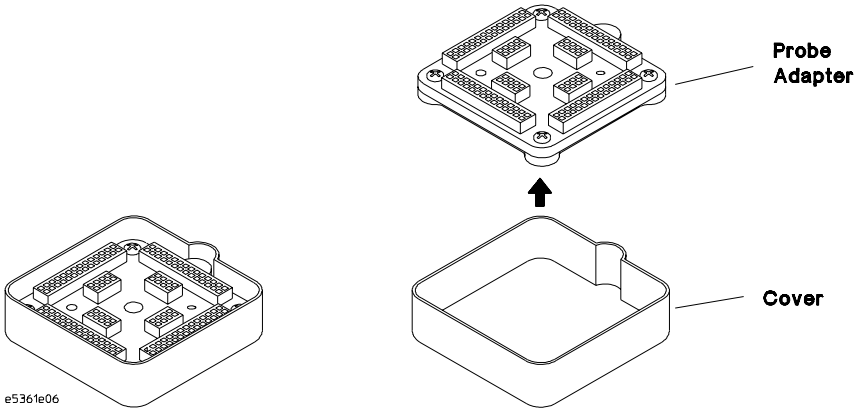


If a retainer ever breaks off of the QFP, a new retainer can be re-attached. There are some contaminates that are not removed with Isopropyl Alcohol in preparing the surfaces before adhering. If a retainer breaks off, the adhesive from the initial installation usually removes any remaining contamination. 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

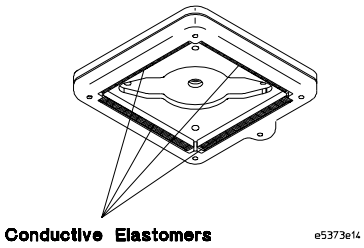
1. If the probe adapter is already attached to the analysis probe (preprocessor) or emulator, go to the analysis probe (preprocessor) or emulator documentation for installation instructions.
2. Remove the cover.

   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.



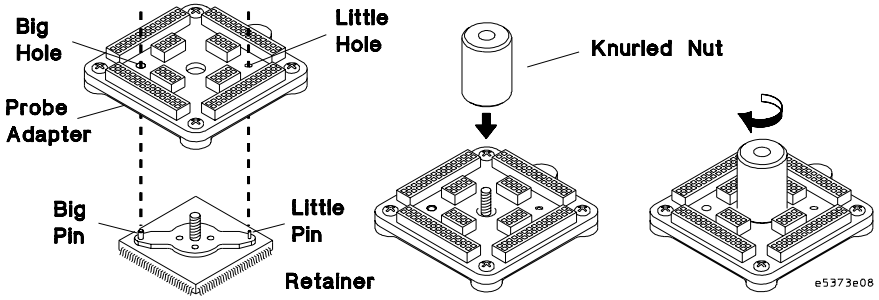
3 Install the elastomeric probe adapter on the retainer.

- **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

Installation of Optional Flexible Adapters

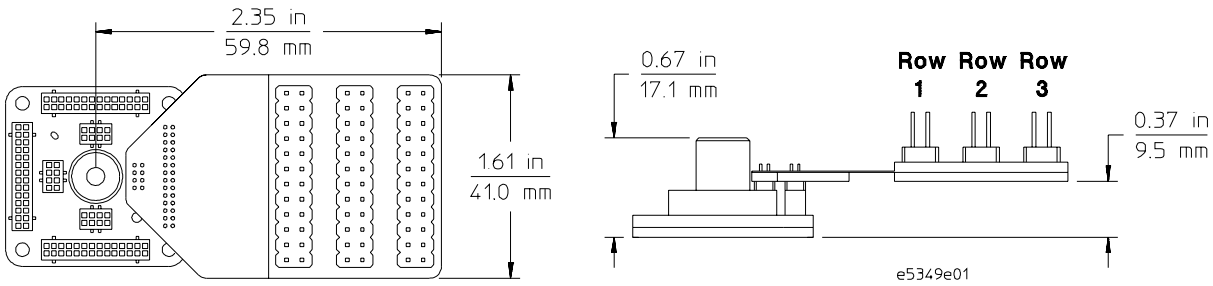
This chapter includes procedures to install optional flexible adapters for use with logic analyzers, oscilloscopes, and emulators.

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	E5373A 160-pin 0.65 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 3.5 pF Typical Second Row 5.0 pF Typical Third Row
Pin-to-Pin Capacitance	2 pF Typical
Self-Inductance	20 nH Typical First Row 30 nH Typical Second Row 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 a logic analyzer or oscilloscope using a 1/4 flexible adapter

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

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

CAUTION

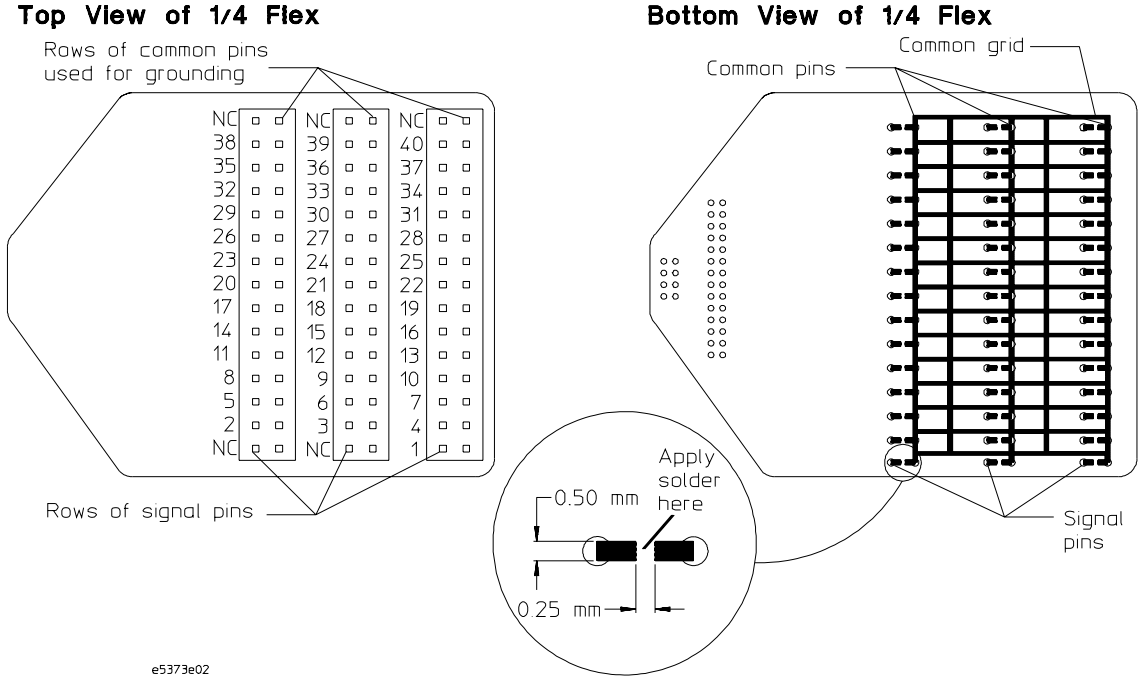
Damage to the QFP. Once the 1/4 flexible adapter has had its common pins connected to ground it should not be used in any other quadrant of the elastomeric probe adapter or in any other device. Remove the solder connecting the common pins to ground before reuse.

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.

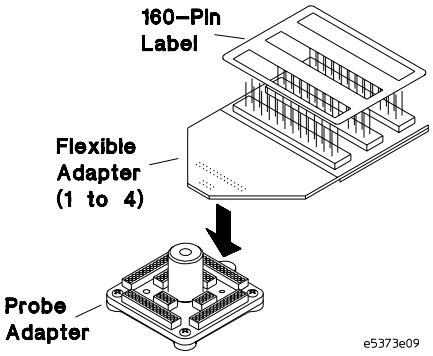
The pin numbers printed on the label correspond to the pins in one quadrant of the probe adapter. Refer to the pinout and cross-reference maps in the Reference chapter of this document when using multiple 1/4 flexible adapters.



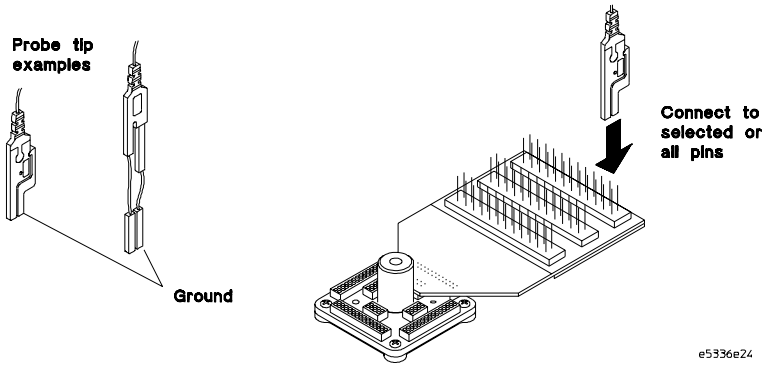
CAUTION

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.

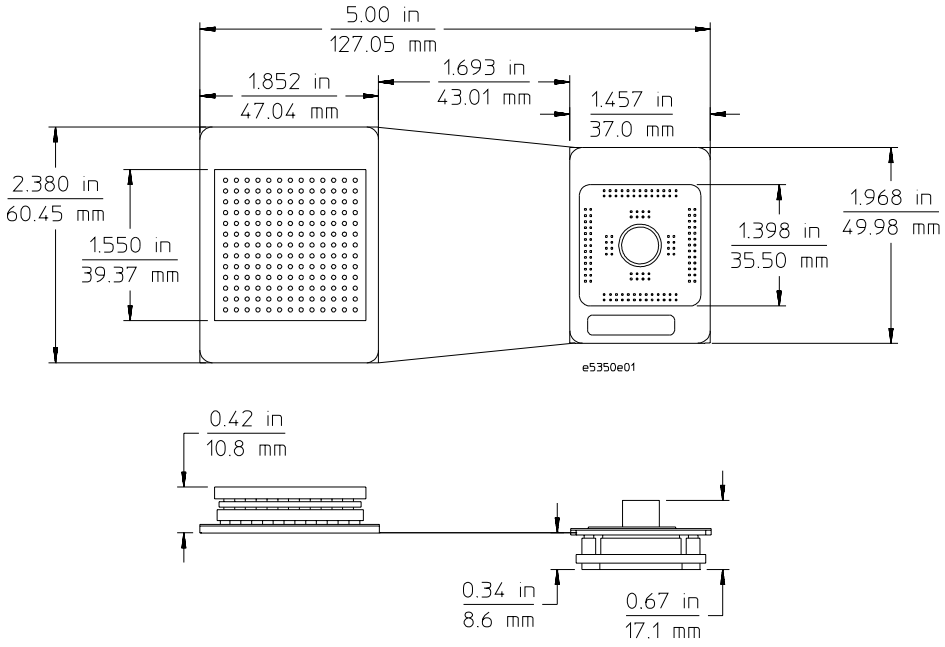


The E5350A general-purpose flexible adapter

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

Performance characteristics of the E5350A general-purpose flexible adapter

Elastomeric Probe Adapter		E5373A 160-pin 0.65 mm
Electrical Characteristics	Signal loading per line in addition to emulator or analysis probe (preprocessor) 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 a logic analyzer or oscilloscope using a general-purpose flexible adapter

1 Power-off the target system, analysis probe (preprocessor) 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 (preprocessor) 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 (preprocessor) or emulator manual.

3 Refer to the orientation illustration in your analysis probe (preprocessor) 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 (preprocessor) probe, transition board, general-purpose flexible adapter, and elastomeric probe adapter are aligned and seated correctly in the sockets.

4 Connect the analysis probe (preprocessor), 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.

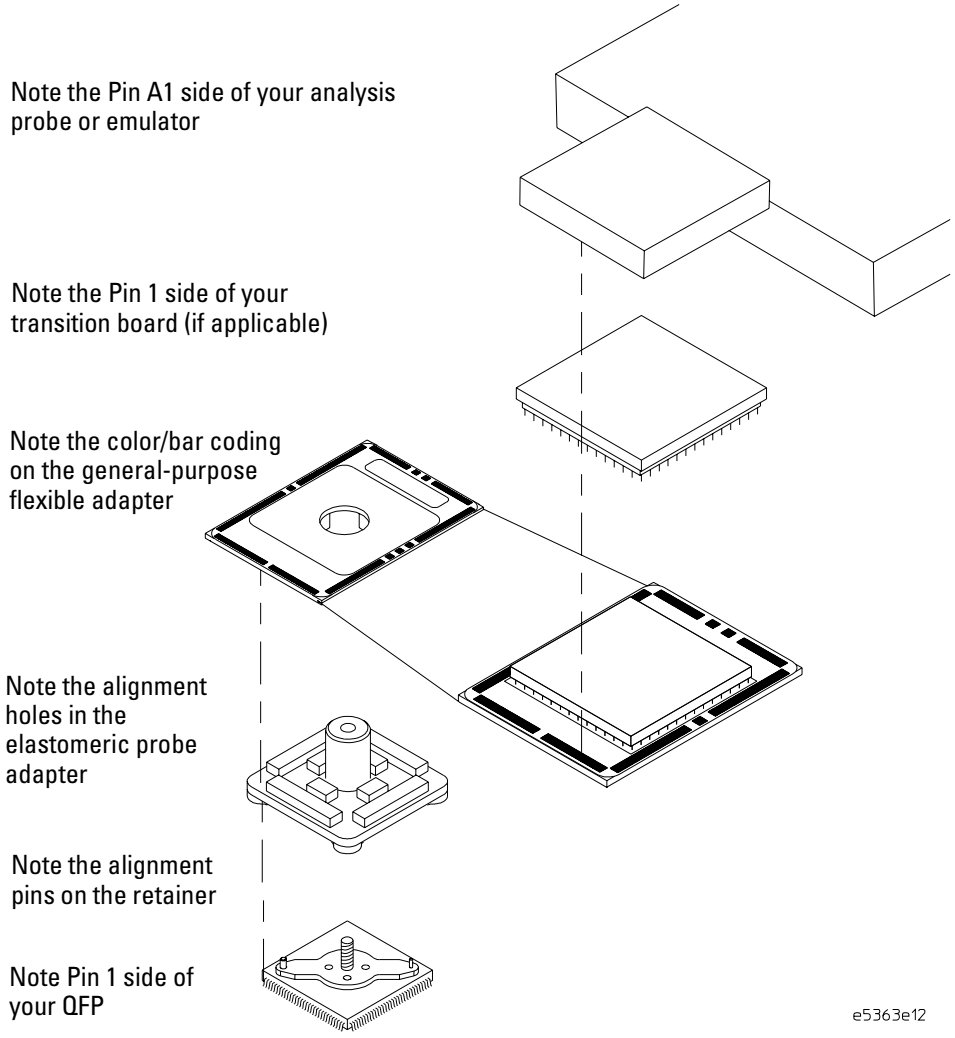
See Also

Refer to your analysis probe (preprocessor) or emulator manual for information on connecting to and using the analysis probe (preprocessor) 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 (preprocessor) or emulator manual to select the orientation which allows the best access to your target system.



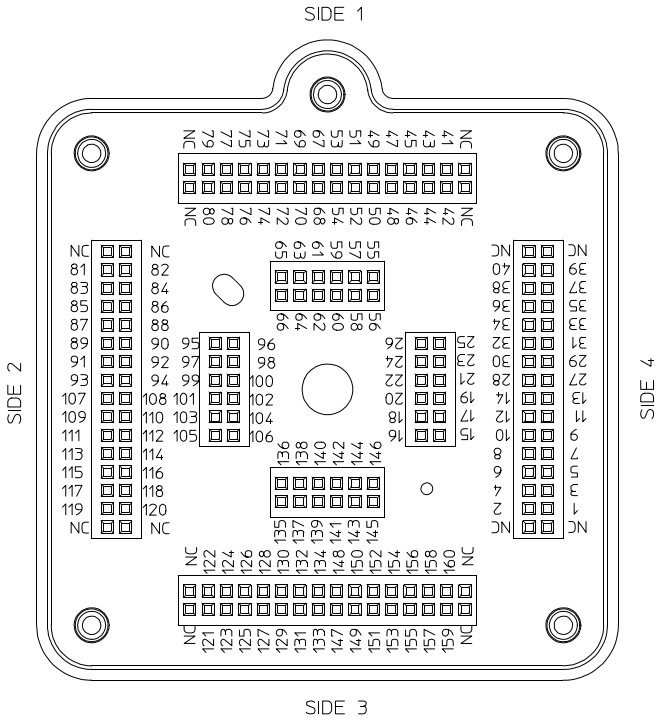
3

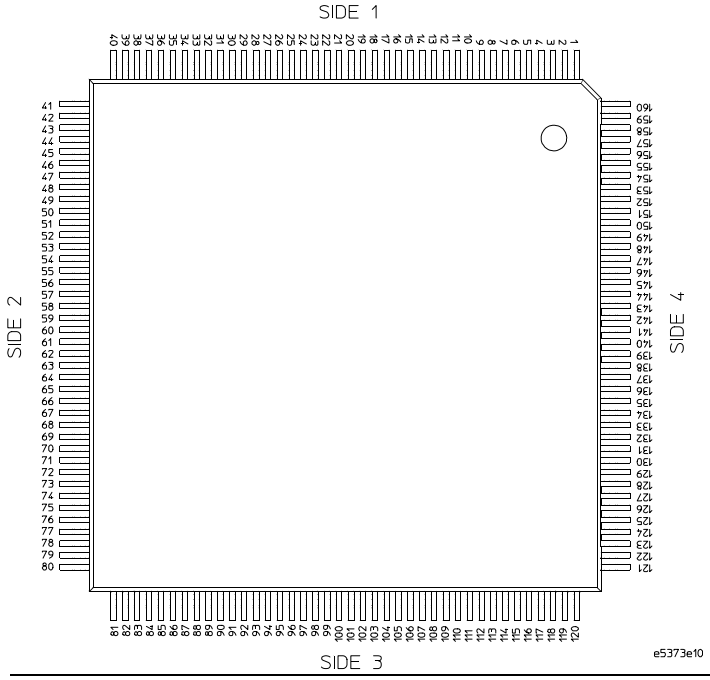
This chapter includes the following reference information:

- 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

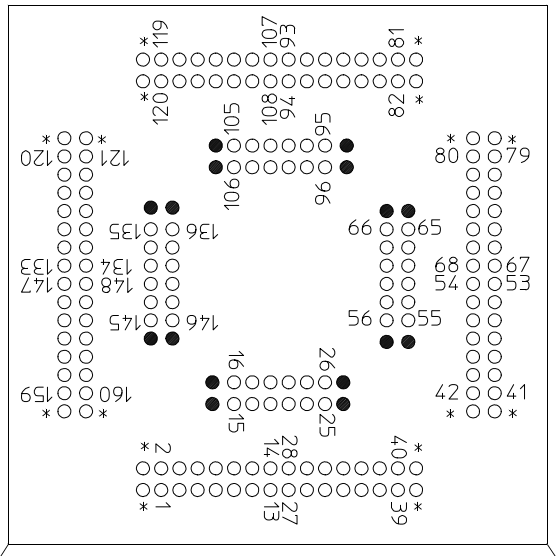
SIDE 3

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



TARGET END

	q	b	c	d	e	f	g	h	j	k	l	m	p	r	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	●

PROBE END

● = Ground

* = No Connect

e5373b02

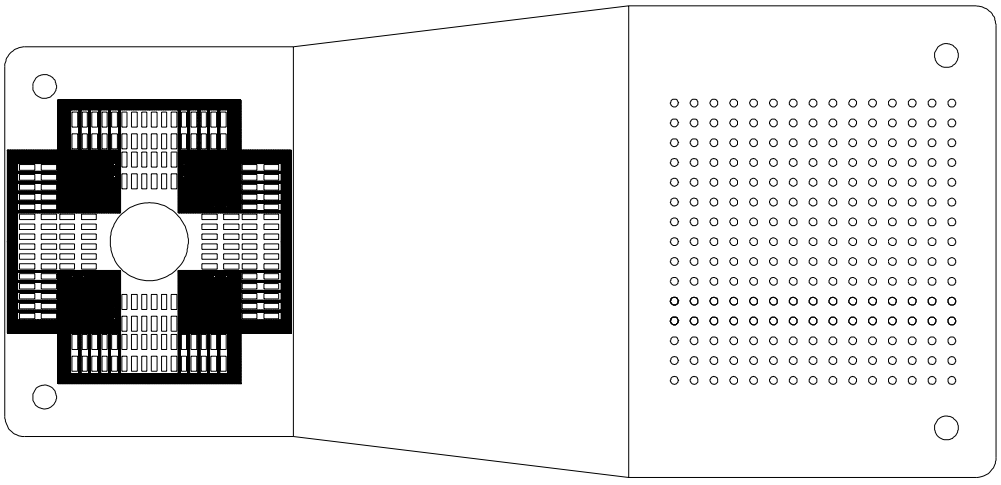
Grounding

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.

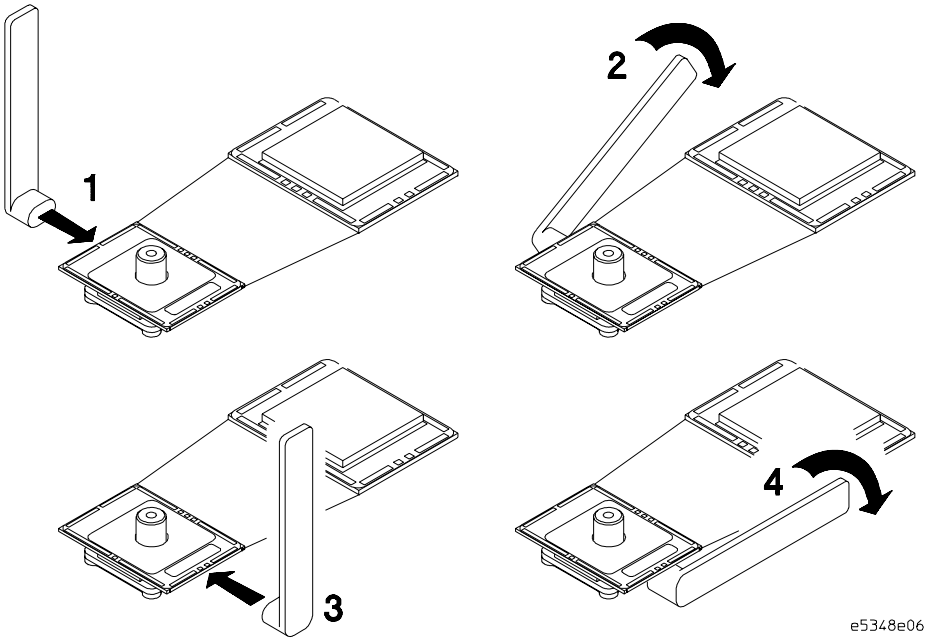
Connecting target grounds to the flexible cable ground will provide a low impedance path for return currents resulting in more accurate measurements by your instrument. This increases the load capacitance seen by your target system. In some cases you may not need to connect ground signals in order to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



e5350e03

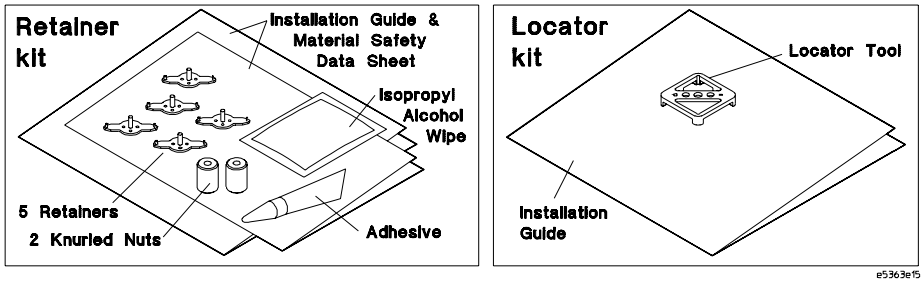
To remove the general-purpose flexible adapter

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 (Includes retainers and locators)	E5373A
1/4 flexible adapter	E5349A
General-purpose flexible adapter	E5350A
Retainer Kit (shown in the following illustration)	E5373A opt. 201
Locator Kit (shown in the following illustration)	E5373A opt. 202

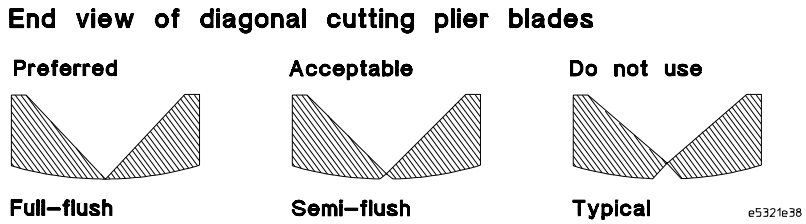


To remove a retainer and adhesive

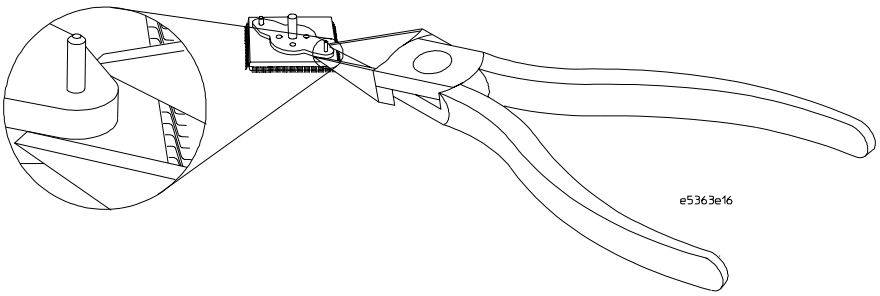
WARNING **Eye injury.** Use protective eye-wear during removal to avoid injury.

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.

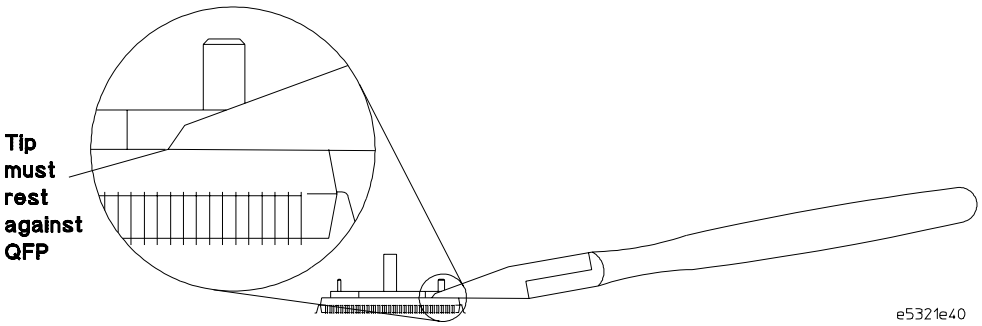
1 Use a semi-flush or full-flush cutting plier with approximately 5-inch handles, such as part number 8170-0006, to remove the retainer.



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

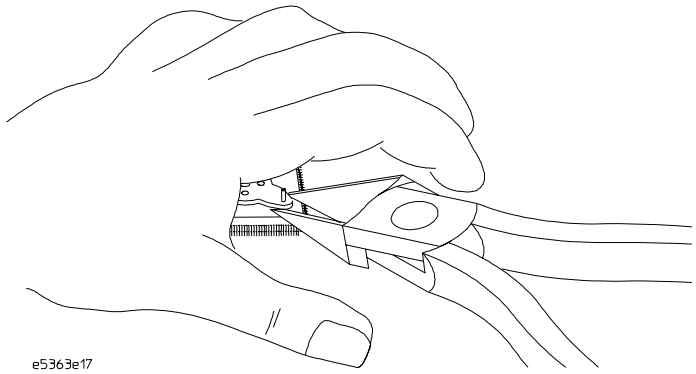


3 Ensure that the tip edge of the plier is as nearly parallel as possible and resting on the surface of the QFP.



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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This apparatus has been designed and tested in accordance with IEC Publication 348, 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.

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If you energize this instrument by an auto transformer (for voltage reduction), make sure the common terminal is connected to the earth terminal of the power source.

Whenever it is likely that the ground protection is impaired, you must make the instrument inoperative and secure it against any unintended operation.

Do not operate the instrument in the presence of flammable gasses or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Do not install substitute parts or perform any unauthorized modification to the instrument.

Capacitors inside the instrument may retain a charge even if the instrument is disconnected from its source of supply.

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.

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About this edition

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

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