Installation Guide

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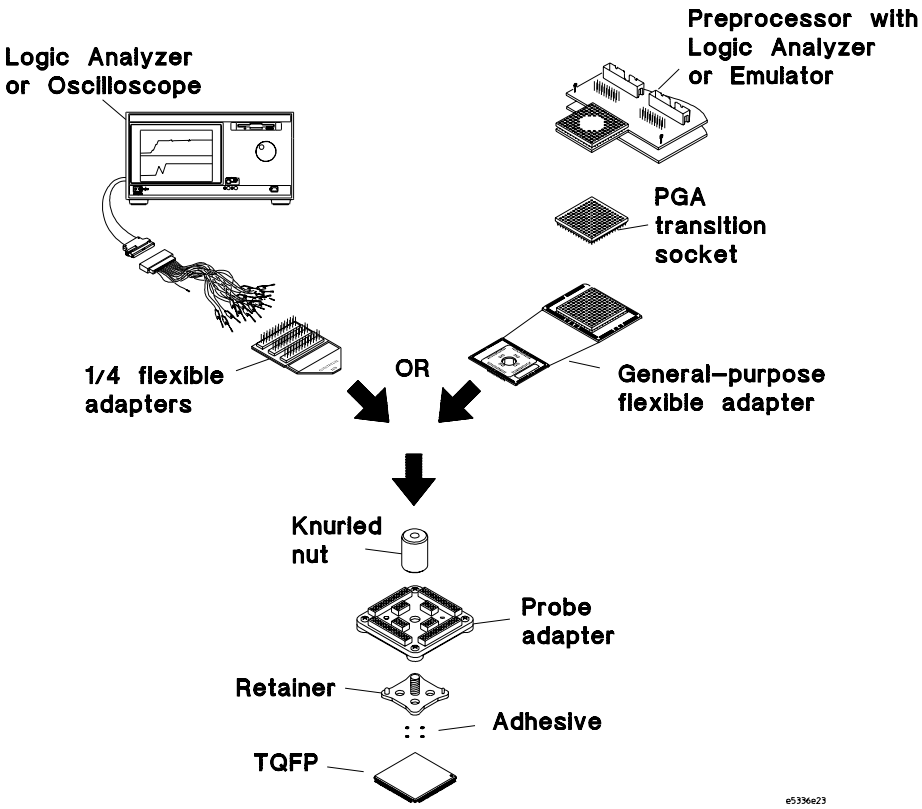
Elastomeric Probe Adapter for the 176-pin 0.5mm TQFP

Installation at a Glance



This Installation Guide explains how to use advanced probing system for 0.5 mm pitch Thin Quad Flat Pack (TQFP) 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 to help 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 TQFP.

Chapter 2 contains the instructions for installing optional flexible adapters.

Chapter 3 contains reference information such as retainer and adhesive removal, and replaceable or additional parts list.

Contents

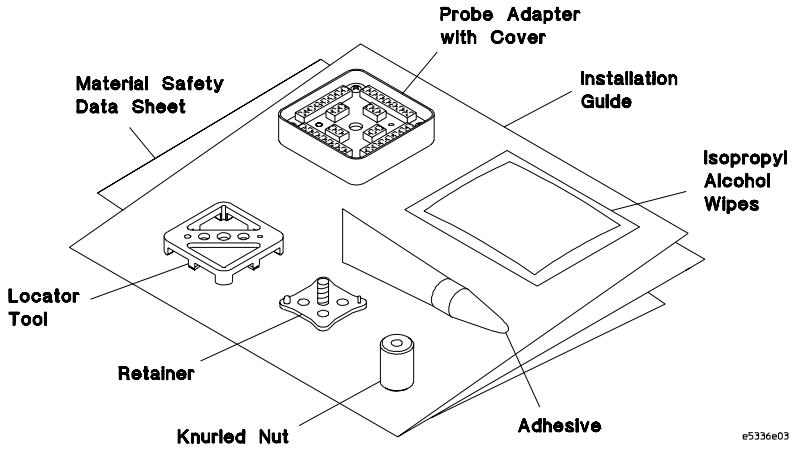
Contents

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

Installation of the Elastomeric Probe Adapter

To install the TQFP elastomeric probe adapter

You should have the items shown in the following illustration to install the probe adapter.



Electrical Characteristics

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

Model Parameters:

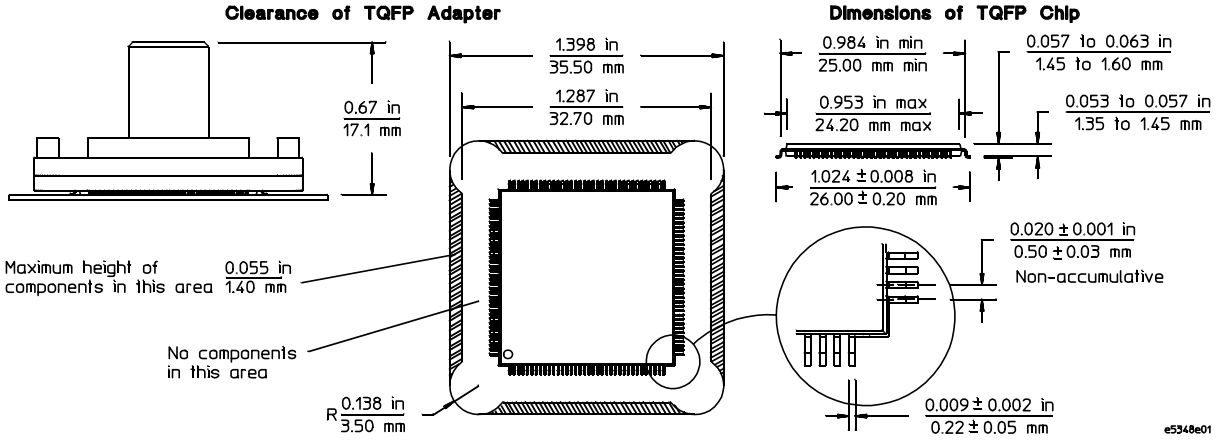
Capacitance between Contacts	0.5 pF (Typical)
Self-Inductance	10 nH (Typical)
Contact Resistance	< 0.25 Ω (Typical)
Operating Bandwidth	dc – 750 MHz (Typical)

Environmental Characteristics

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

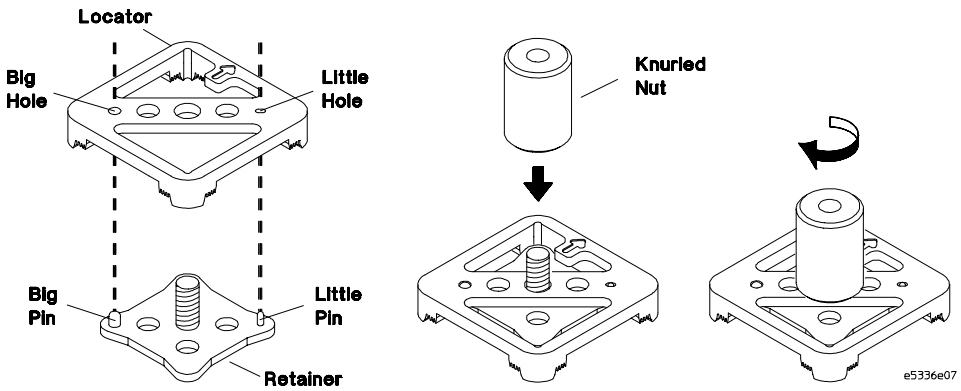
Prepare to attach the retainer to the TQFP

1 Check the area around the package to be probed. The minimum required clearance from the package and any components is shown in the illustrations 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.

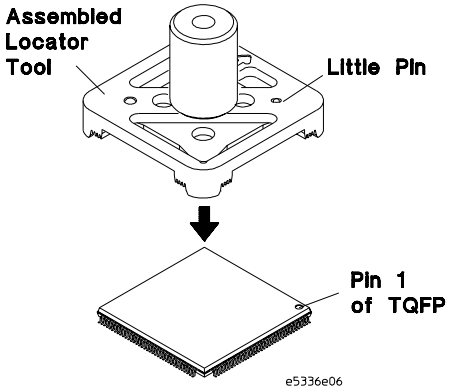


Test the alignment before adhering the retainer

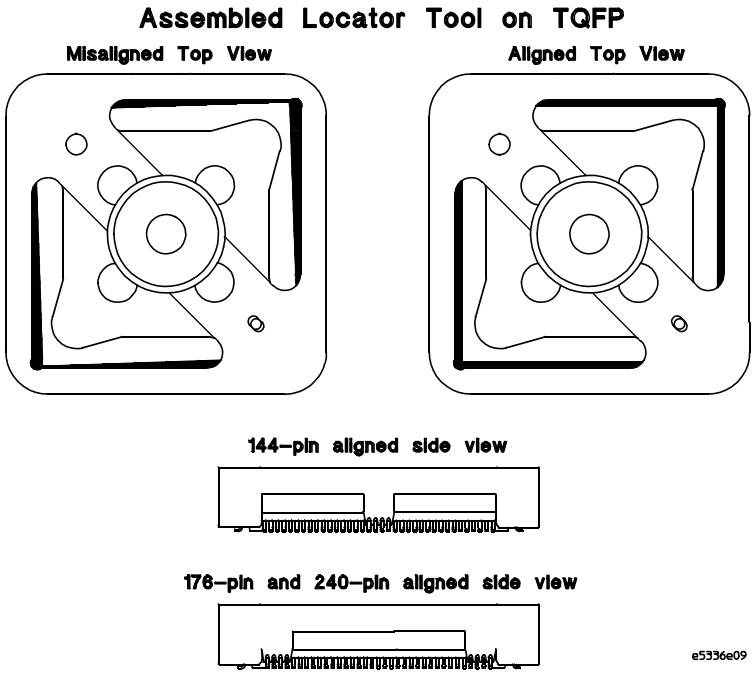
CAUTION Turn off the power to your TQFP when using the metal locator tool. Failure to do so could cause damage to your IC.

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

1 Make sure the little pin corner of the assembled locator tool is in the same corner as pin 1 on the TQFP.

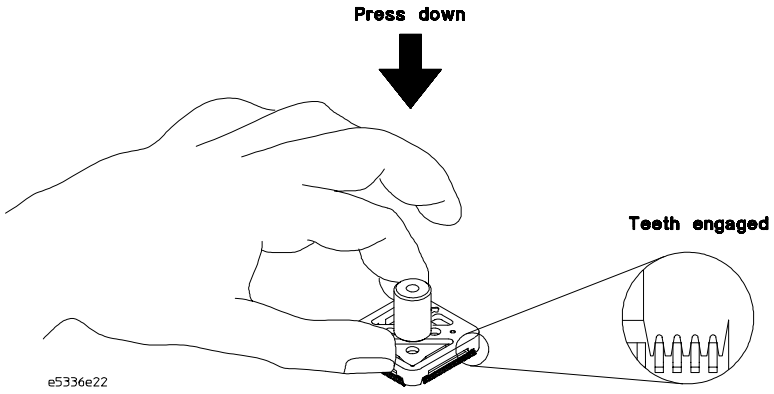


2 Place the assembled locator tool on the TQFP, making sure that it aligns squarely. You will feel the teeth drop between the TQFP legs when it is aligned.



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.

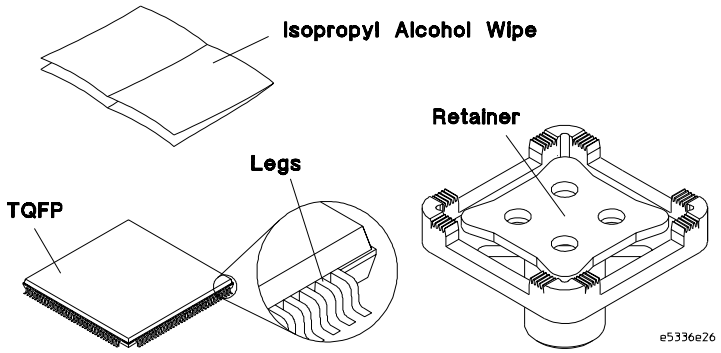


4 Remove the assembled locator tool and prepare surfaces before applying adhesive.

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

b Remove any remaining debris from the top surface and legs of the TQFP 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 TQFP by wiping with an Isopropyl Alcohol wipe provided in the Retainer Kit. Do not use other cleaners or solvents.



Adhere the retainer to your TQFP

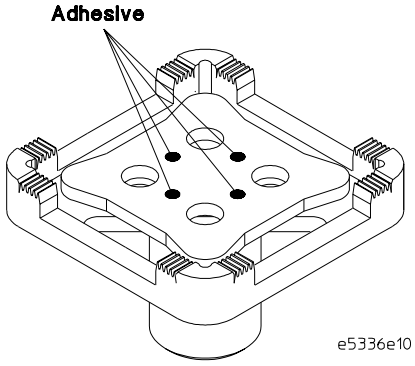
CAUTION You will use adhesive to attach a retainer to the top of the TQFP. The retainer ensures precise alignment between the probe adapter and the device. Read the following steps to understand the process of applying adhesive before doing them.

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.

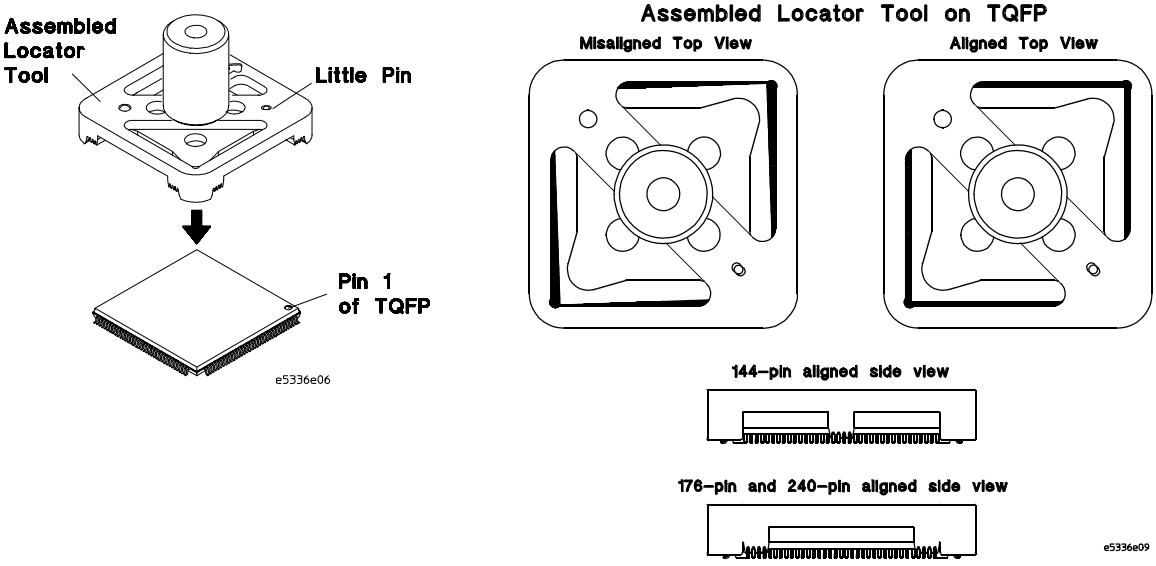


CAUTION

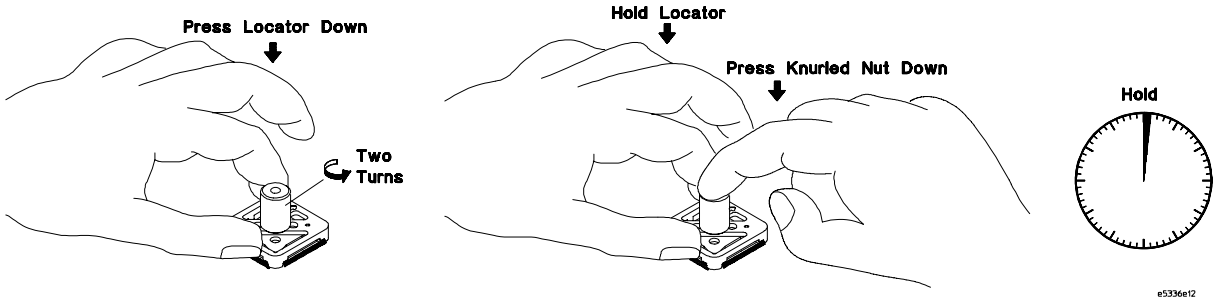
Turn off the power to your TQFP when using the metal locator tool. Failure to do so could cause damage to your IC

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

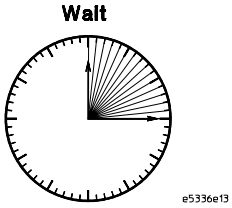
The adhesive on the retainer will not touch the TQFP until the next step and the adhesive will not solidify until the retainer and TQFP touch, so there is plenty of time to adjust the tool if necessary.



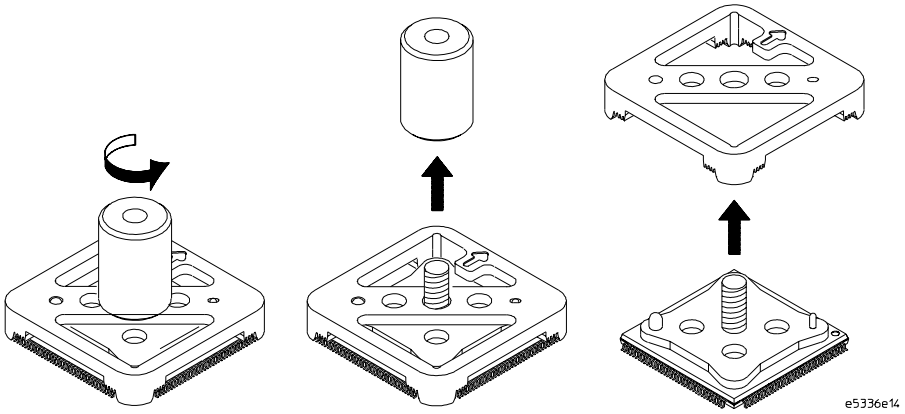
3 Hold down on the sides of the locator tool and loosen the knurled nut two turns. Continue to hold down on the sides of the locator tool and press down on the knurled nut to drop the retainer onto the top of the TQFP. Hold for 45 seconds.



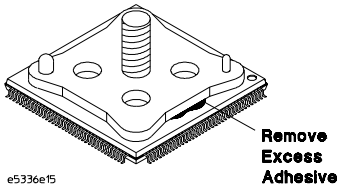
4 Wait 15 minutes for the adhesive to cure.



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



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

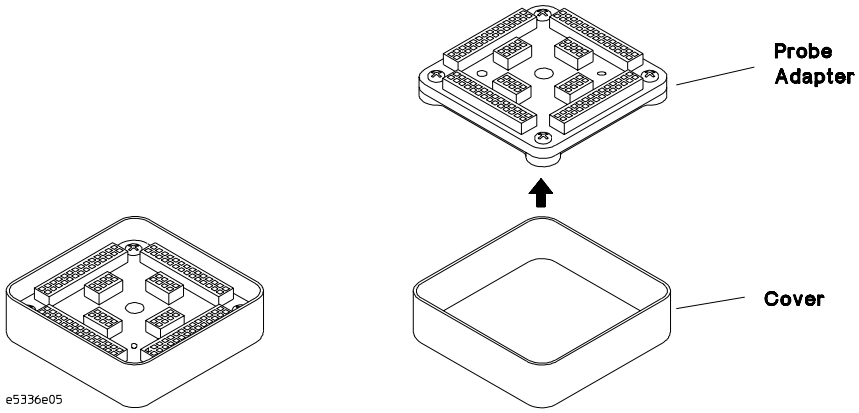


If a retainer ever breaks off of the TQFP, a new retainer can be re-attached. There are some contaminates that are not removed with Isopropyl Alcohol in preparing the surfaces before adhering. If a retainer breaks off, the adhesive from the initial installation usually removes any remaining contamination.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

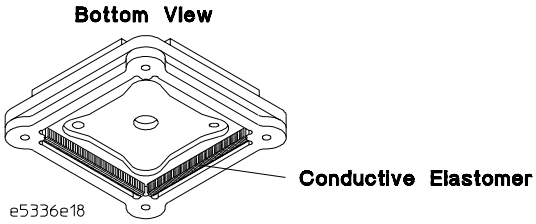
1 Remove the cover.

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.



2 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.

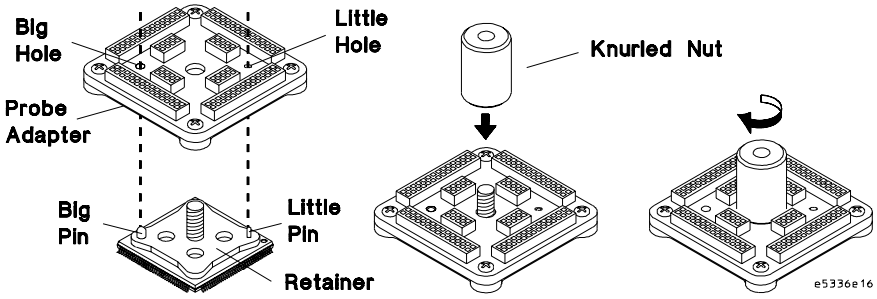
   b Avoid touching the elastomers to the threaded stud or dowel pins of the retainer as the probe is inserted.

   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 TQFP before tightening the nut.

3 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 TQFP is in the Reference chapter of this document.

2

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

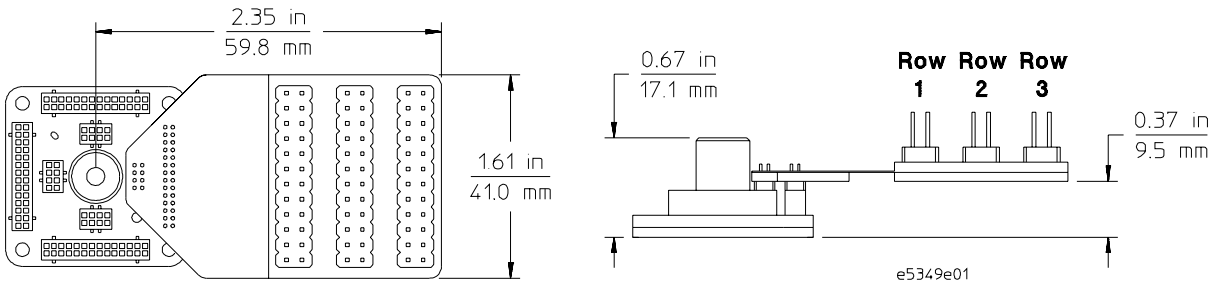
Installation of Optional Flexible Adapters

The E5349A 1/4 flexible adapters

The E5349A 1/4 flexible adapters can be used with any 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 TQFP. Use one to four flexible adapters depending on your needs.

Performance characteristics of the E5349A 1/4 flexible adapters

Electrical Characteristics		
	Operating Voltage	< 40 V (dc + Peak ac)
	Operating Current	0.5 Amps Maximum
	Insulation Resistance	> 100 M Ω
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 an 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.

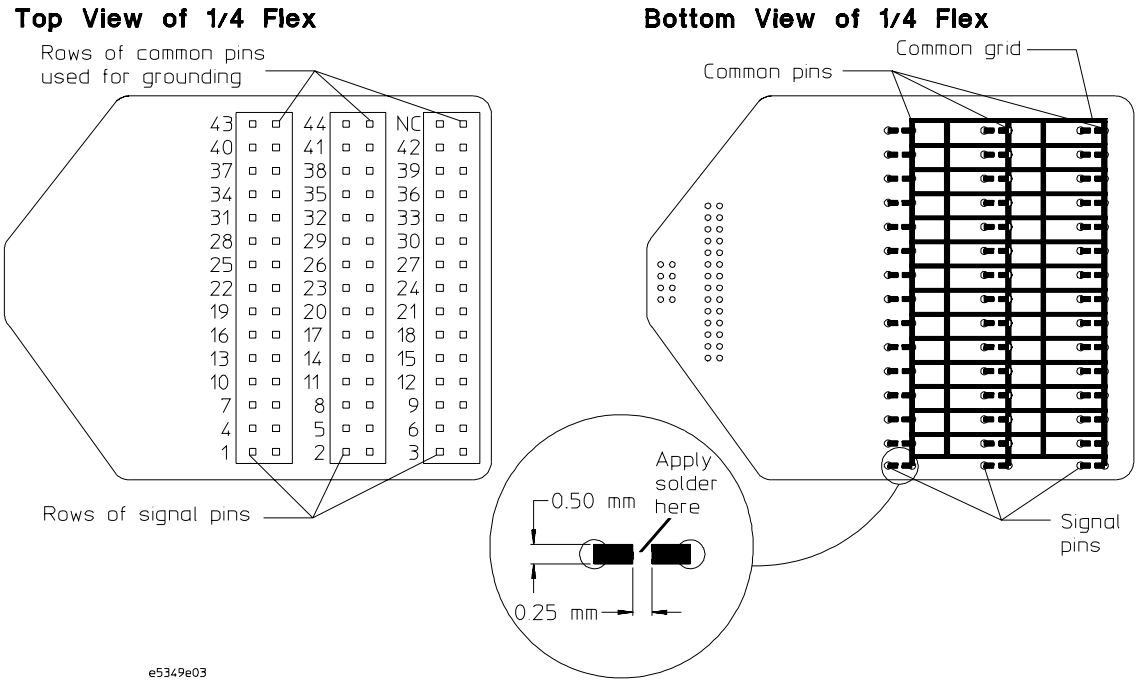
CAUTION

Damage to the TQFP. 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 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 ogic 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.

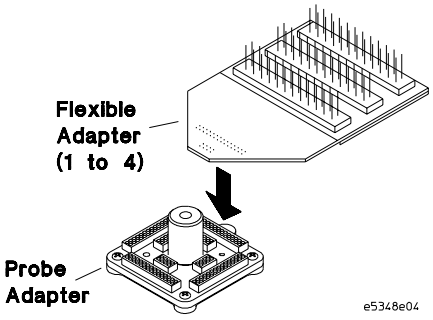
The pin numbers printed on the label correspond to the pins in one quadrant of the probe adapter. You do not need the overlay label that came with your 1/4 flexible adapter. Refer to the pinout and cross-reference maps in the Reference chapter of this document when using multiple 1/4 flexible adapters.



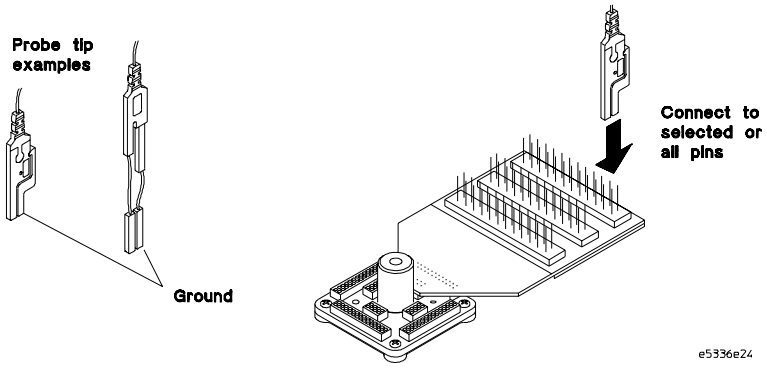
CAUTION

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.

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



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

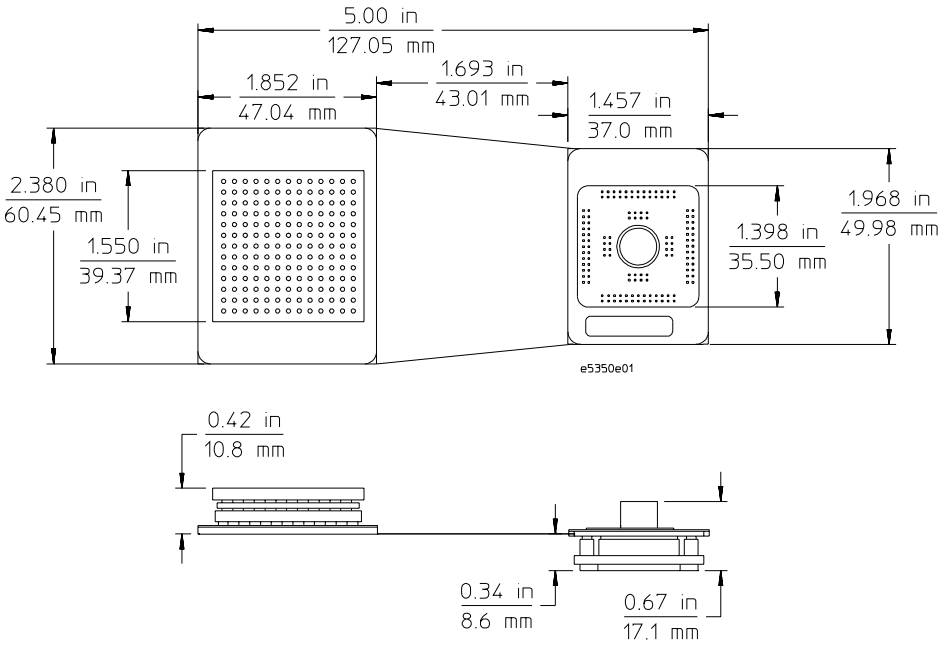


The E5350A general-purpose flexible adapter

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

Processor Specific Connecction	80486SX/SF analysis probe (preprocessor)	E5352A PGA trans. socket
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 55°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), 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.

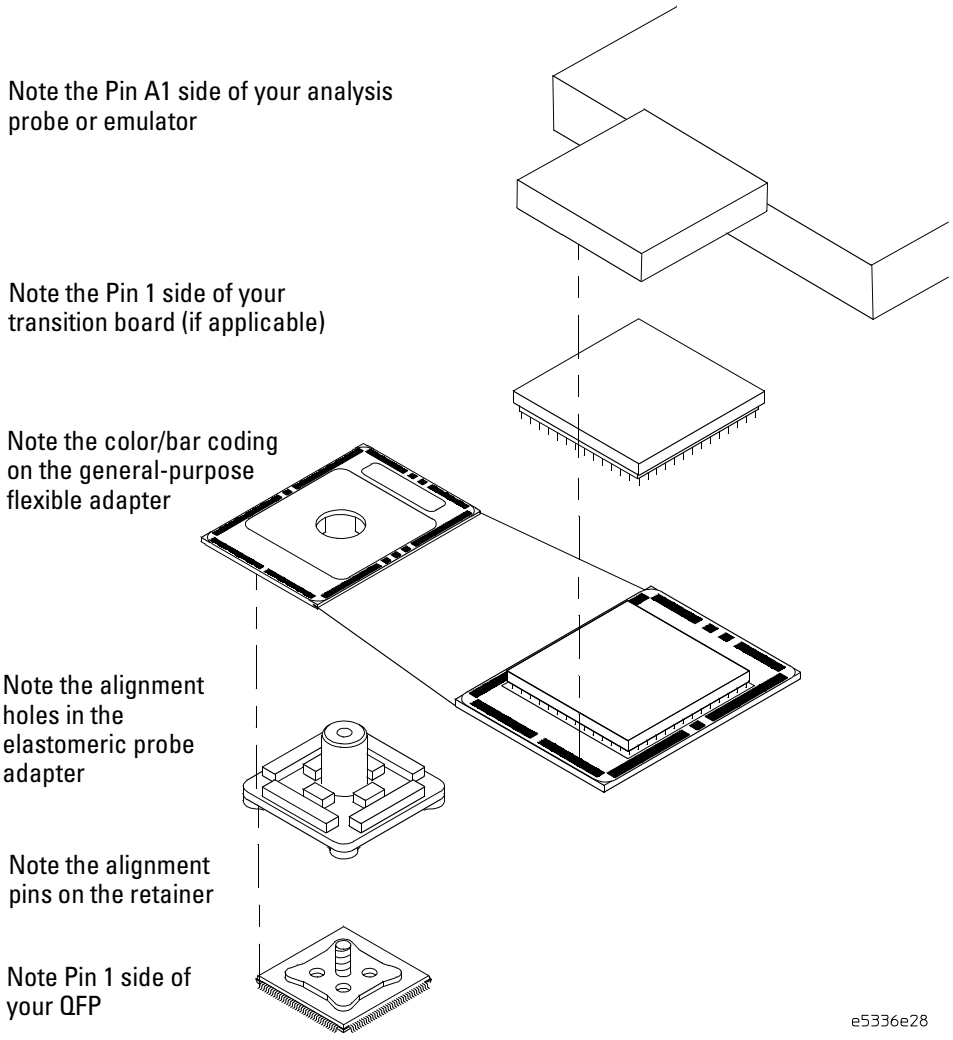
See Also

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 TQFP 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.



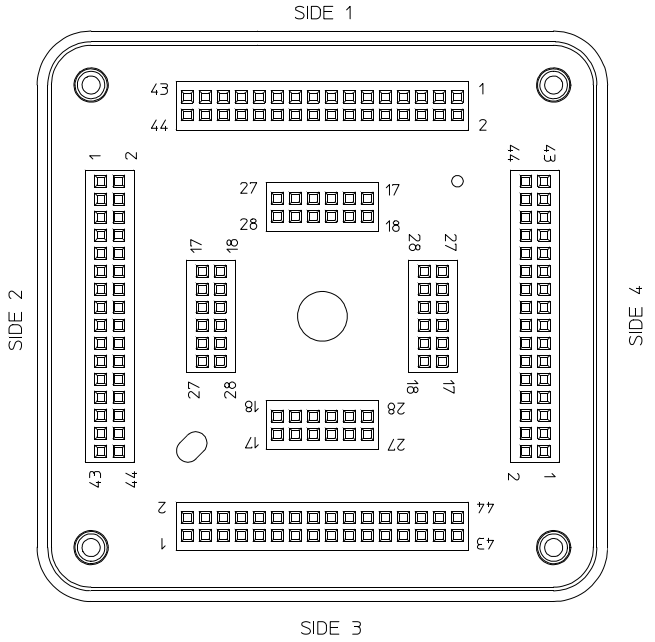
3

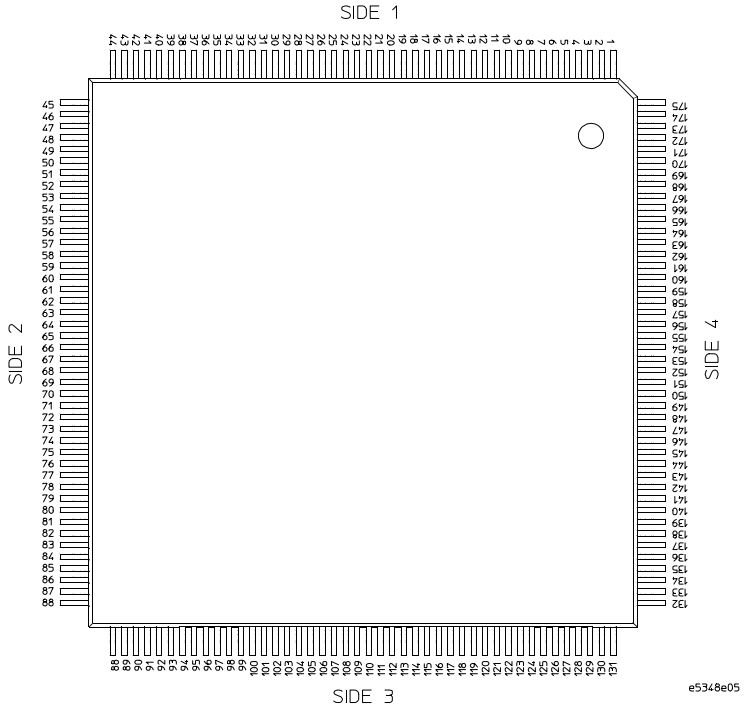
This chapter includes the following reference information:

- Pinout and cross-reference maps
- Grounding
- Replaceable parts
- Removing the general-purpose flexible adapter
- Removing a retainer and adhesive

Reference

Probe adapter and TQFP pinout maps





Cross-reference for multiple 1/4 flexible adapters and TQFP

SIDE 1

QFP	FLEX	QFP	FLEX	QFP	FLEX
43	43	44	44	--	NC
40	40	41	41	42	42
37	37	38	38	39	39
34	34	35	35	36	36
31	31	32	32	33	33
28	28	29	29	30	30
25	25	26	26	27	27
22	22	23	23	24	24
19	19	20	20	21	21
16	16	17	17	18	18
13	13	14	14	15	15
10	10	11	11	12	12
7	7	8	8	9	9
4	4	5	5	6	6
1	1	2	2	3	3

SIDE 2

QFP	FLEX	QFP	FLEX	QFP	FLEX
87	43	88	44	--	NC
84	40	85	41	86	42
81	37	82	38	83	39
78	34	79	35	80	36
75	31	76	32	77	33
72	28	73	29	74	30
69	25	70	26	71	27
66	22	67	23	68	24
63	19	64	20	65	21
60	16	61	17	62	18
57	13	58	14	59	15
54	10	55	11	56	12
51	7	52	8	53	9
48	4	49	5	50	6
45	1	46	2	47	3

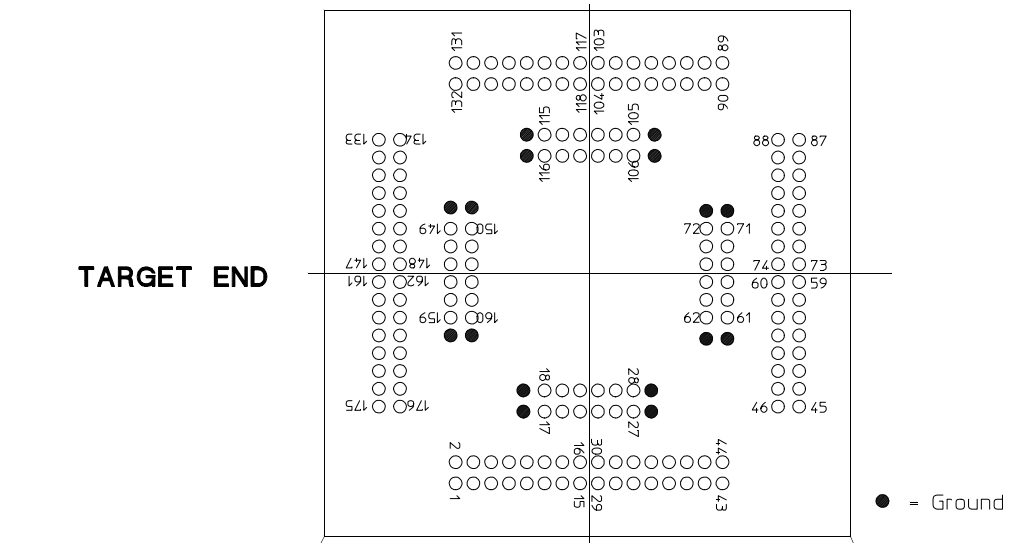
SIDE 3

QFP	FLEX	QFP	FLEX	QFP	FLEX
131	43	132	44	--	NC
128	40	129	41	130	42
125	37	126	38	127	39
122	34	123	35	124	36
119	31	120	32	121	33
116	28	117	29	118	30
113	25	114	26	115	27
110	22	111	23	112	24
107	19	108	20	109	21
104	16	105	17	106	18
101	13	102	14	103	15
98	10	99	11	100	12
95	7	96	8	97	9
92	4	93	5	94	6
89	1	90	2	91	3

SIDE 4

QFP	FLEX	QFP	FLEX	QFP	FLEX
175	43	176	44	--	NC
172	40	173	41	174	42
169	37	170	38	171	39
166	34	167	35	168	36
163	31	164	32	165	33
160	28	161	29	162	30
157	25	158	26	159	27
154	22	155	23	156	24
151	19	152	20	153	21
148	16	149	17	150	18
145	13	146	14	147	15
142	10	143	11	144	12
139	7	140	8	141	9
136	4	137	5	138	6
133	1	134	2	135	3

Cross reference for general-purpose flexible adapter and TQFP



PROBE END

	a	b	c	d	e	f	g	h	j	k	l	m	n	p	q
15	GND	22	18	4	8	5	11	29	35	38	42	27	28	24	GND
14	156	GND	20	17	21	12	13	30	37	36	23	44	26	GND	66
13	160	158	GND	2	6	3	14	15	32	41	40	25	GND	64	62
12	159	176	157	GND	19	10	9	16	33	39	43	GND	46	61	48
11	174	155	172	175	GND	1	7	NC	31	34	GND	63	50	65	52
10	170	168	173	171	166	GND	NC	NC	NC	GND	45	54	47	56	49
9	167	169	164	165	163	NC	GND	GND	GND	NC	51	53	58	57	55
8	161	162	147	148	NC	NC	GND	GND	GND	NC	NC	60	59	74	73
7	143	145	146	141	139	NC	GND	GND	GND	NC	75	77	76	81	79
6	137	144	135	142	133	GND	NC	NC	NC	GND	78	83	85	80	82
5	140	153	138	151	GND	122	119	NC	95	89	GND	87	84	67	86
4	136	149	134	GND	131	127	121	104	97	98	107	GND	69	88	71
3	150	152	GND	113	128	129	120	103	102	91	94	90	GND	70	72
2	154	GND	114	132	111	124	125	118	101	100	109	105	108	GND	68
1	GND	112	116	115	130	126	123	117	99	93	96	92	106	110	GND

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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.

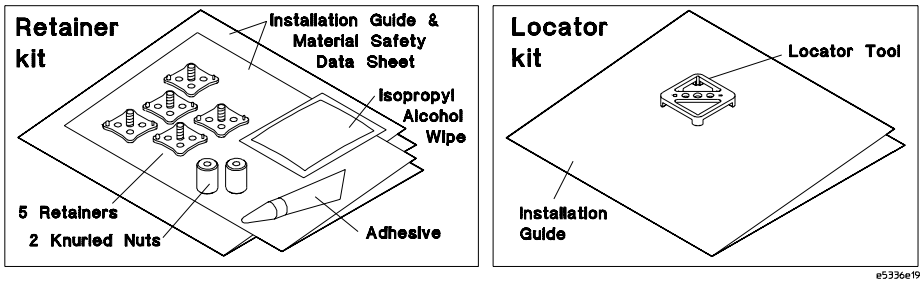
CAUTION

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.

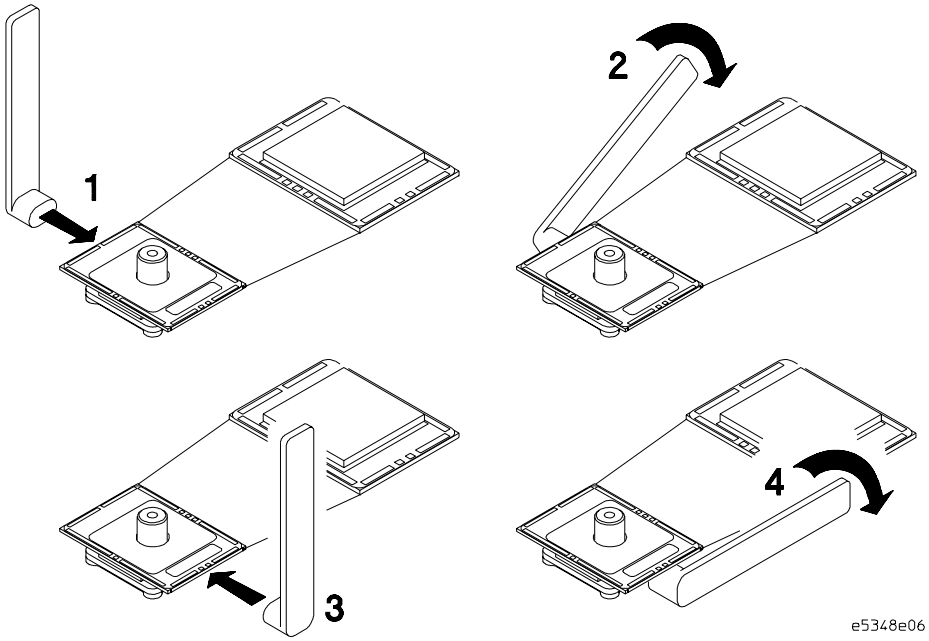
Replaceable parts

176-Pin Part Description	Part Number
Elastomeric Probe Adapter	E5348A
1/4 flexible adapter	E5349A
General-purpose flexible adapter	E5350A
80486SX/SF probing kit for analysis probe (preprocessor) includes probe adapter, flexible adapter, and transition board	E5353A
80486 transition board	E5352A
Retainer Kit (shown in the following illustration)	E5348A opt. 201
Locator Kit (shown in the following illustration)	E5348A opt. 202



To remove the general-purpose flexible adapter

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

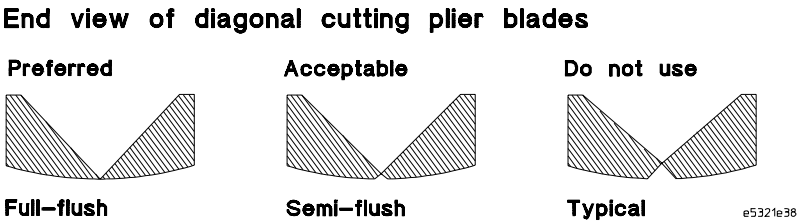


To remove a retainer and adhesive

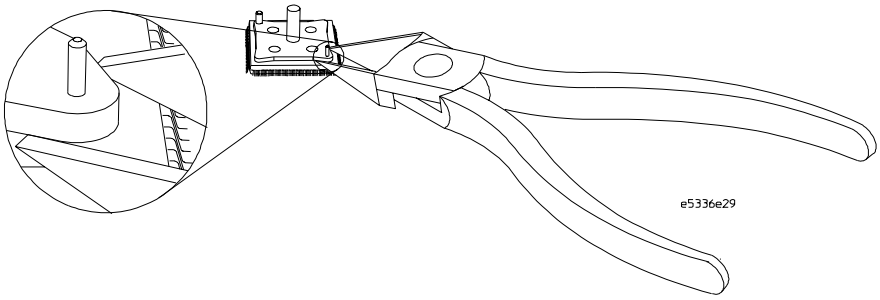
WARNING **Eye injury.** Use protective eye-wear during removal to avoid injury.

CAUTION The following procedure could cause damage to some TQFPs, depending upon the construction of the part and surface condition.
Power off the DUT before attempting to remove a retainer.

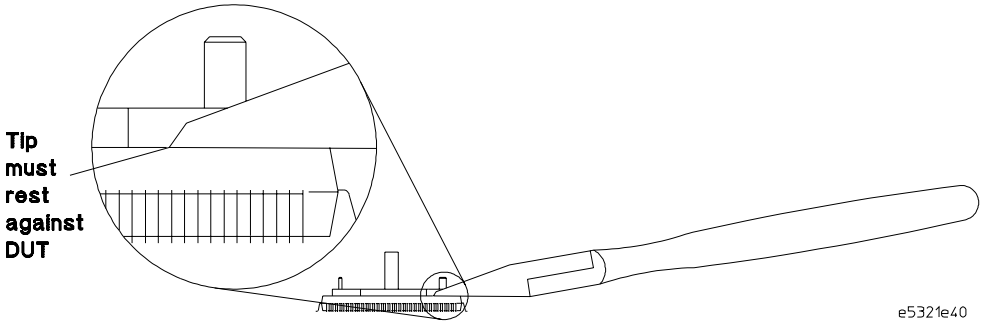
1 Use a semi-flush or full-flush cutting plier with approximately 5-inch handles, such as part number 8170-0006, to remove the retainer.



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

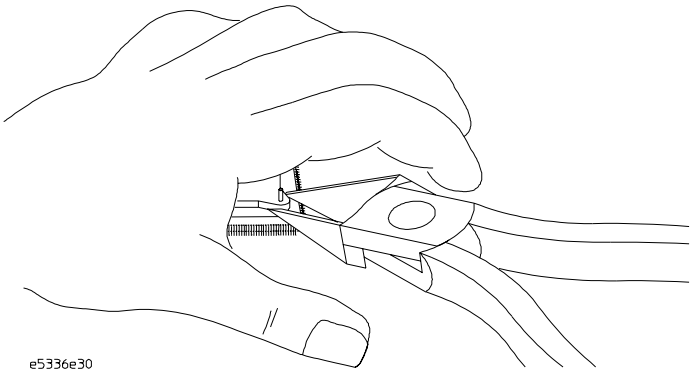


3 Ensure that the tip edge of the plier is as nearly parallel as possible and resting on the surface of the TQFP.



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

4 Hold your hand over the TQFP 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 TQFP 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 TQFP causing unreliable probing.

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

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

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Warning

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Hazardous voltage symbol.

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

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About this edition

This is the first edition of the *Elastomeric Probe Adapter for the 176-pin 0.5mm TQFP User's Guide.*

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