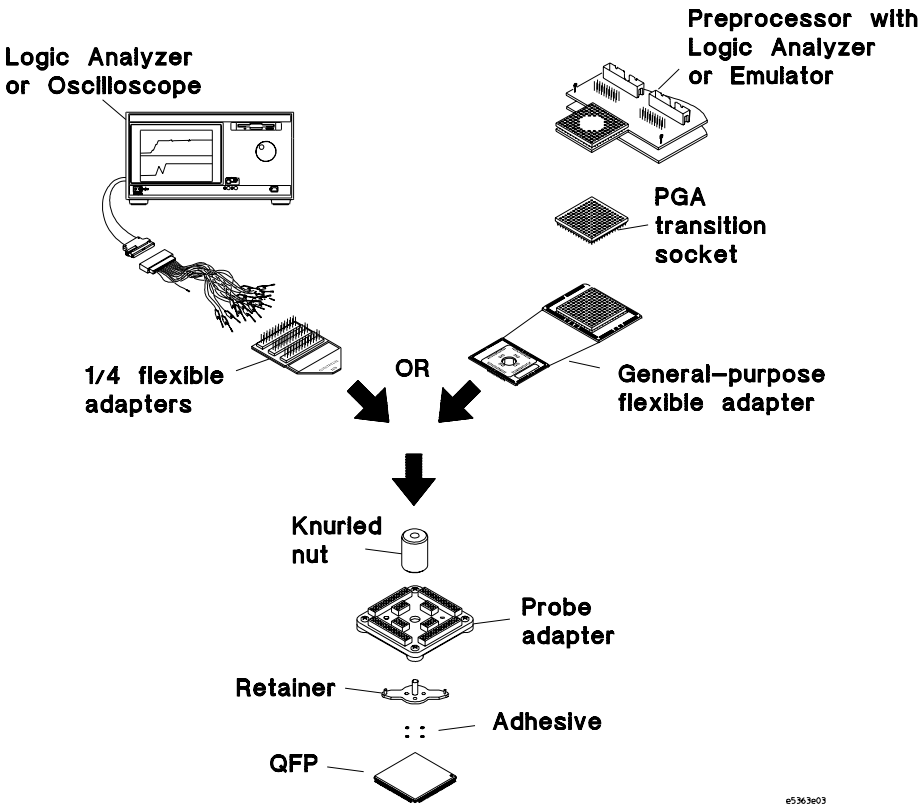
Installation Guide

Publication number E5363-92003
February 2002

Elastomeric Probe Adapter for 240-Pin 0.50 mm QFP

Installation at a Glance



This Installation Guide explains how to use Agilent Technologies' advanced probing system for 0.50 mm pitch 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

This manual is organized in three chapters.

Chapter 1 contains dimensions of the probe adapter for laying out printed circuit boards and the procedure for installing the probe adapter onto your QFP.

Chapter 2 contains the instructions for installing optional flexible adapters.

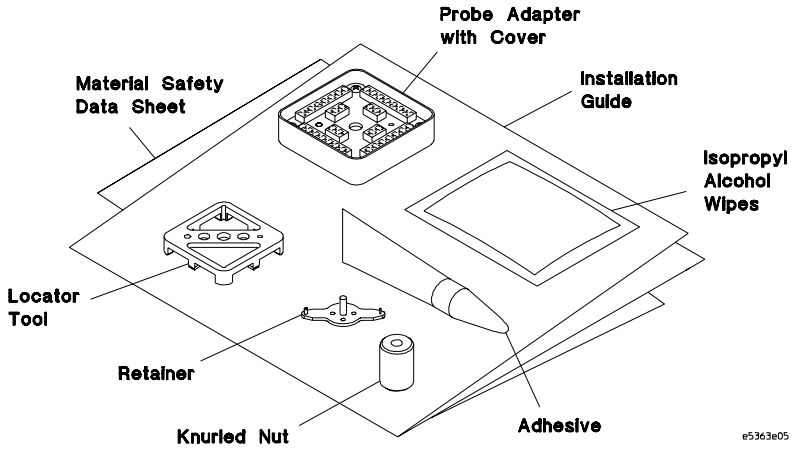
Chapter 3 contains reference information such as pinout and cross-reference maps, replaceable parts list, retainer and adhesive removal.

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:

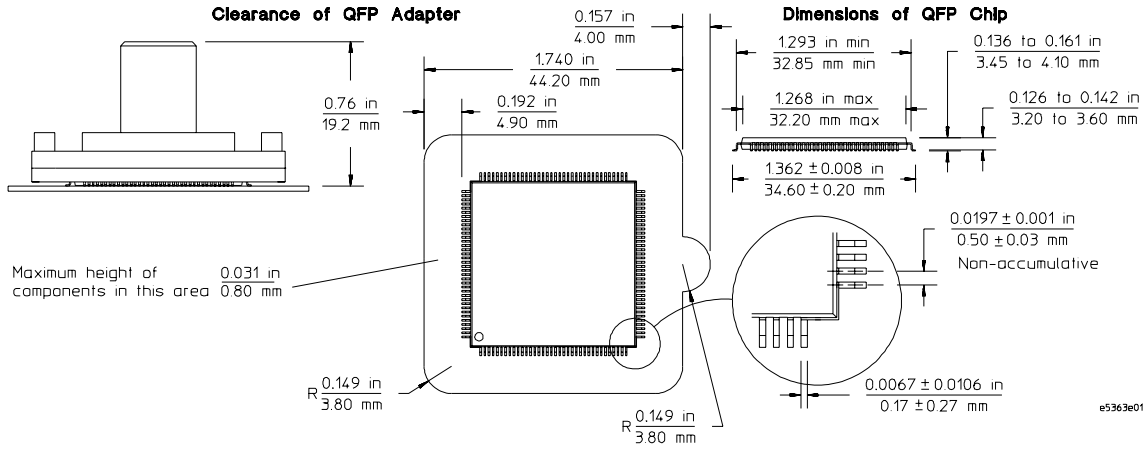
Capacitance between Contacts	0.5 pF (Typical)
Self-Inductance	10 nH (Typical)
Contact Resistance	< 0.25 (Typical)
Operating Bandwidth	dc – 750 MHz (Typical)

Environmental Characteristics

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

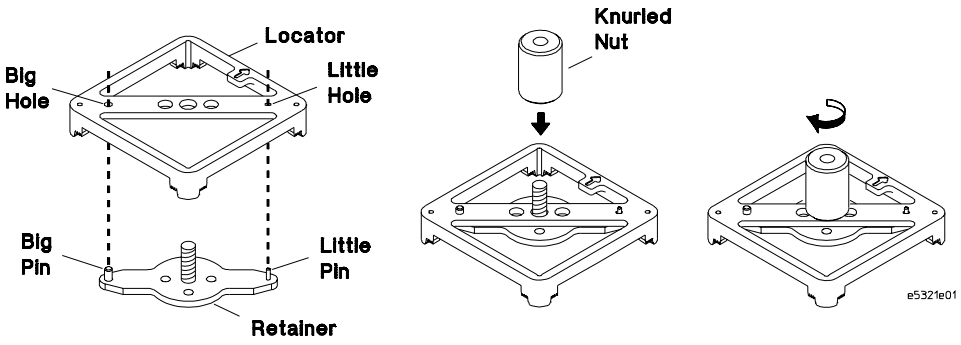
Prepare to attach the retainer to the QFP

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

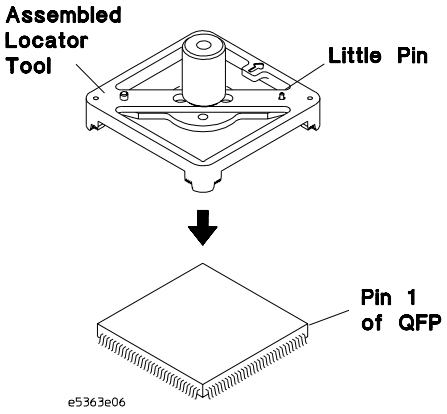
CAUTION

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

CAUTION

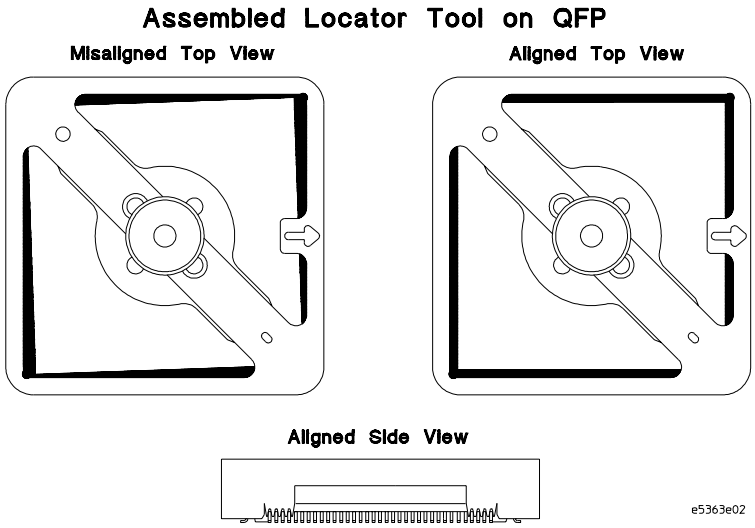
Use grounded wrist straps and mats when installing or performing any service to your probe adapter. Electrostatic discharge can damage electronic components.

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



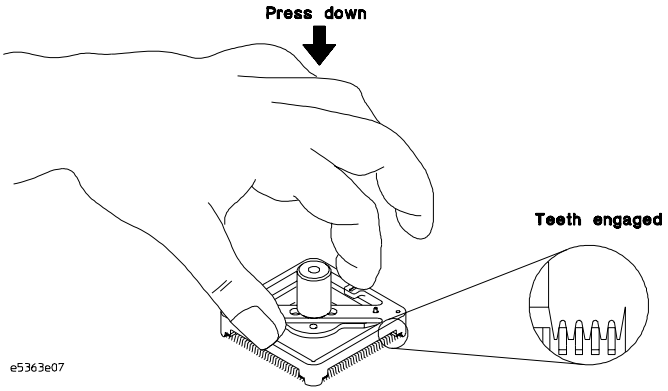
It is possible that the bump on the side of the probe adapter may interfere with components on your target system if the locator is mounted as described in this section. If so, then rotate the locator tool. Keep in mind as you proceed with the following steps that your pin 1 location will be different from the instructions in this manual.

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.

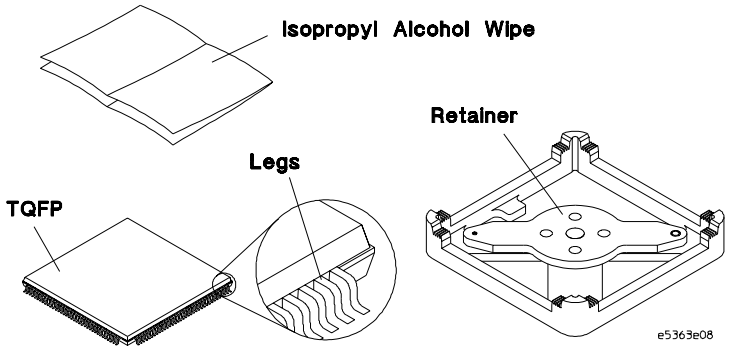


4 Remove the assembled locator tool and prepare surfaces before applying adhesive.

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

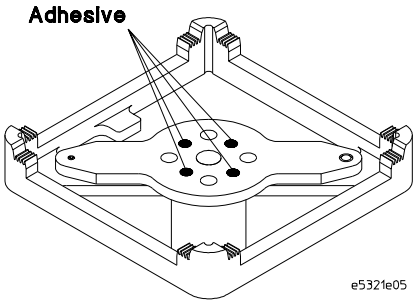
Make sure you can control the amount of adhesive. Excess adhesive can cause problems, so it is better to use too little than too much. Follow the manufacturer's recommended temperature parameters for the adhesive.

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.

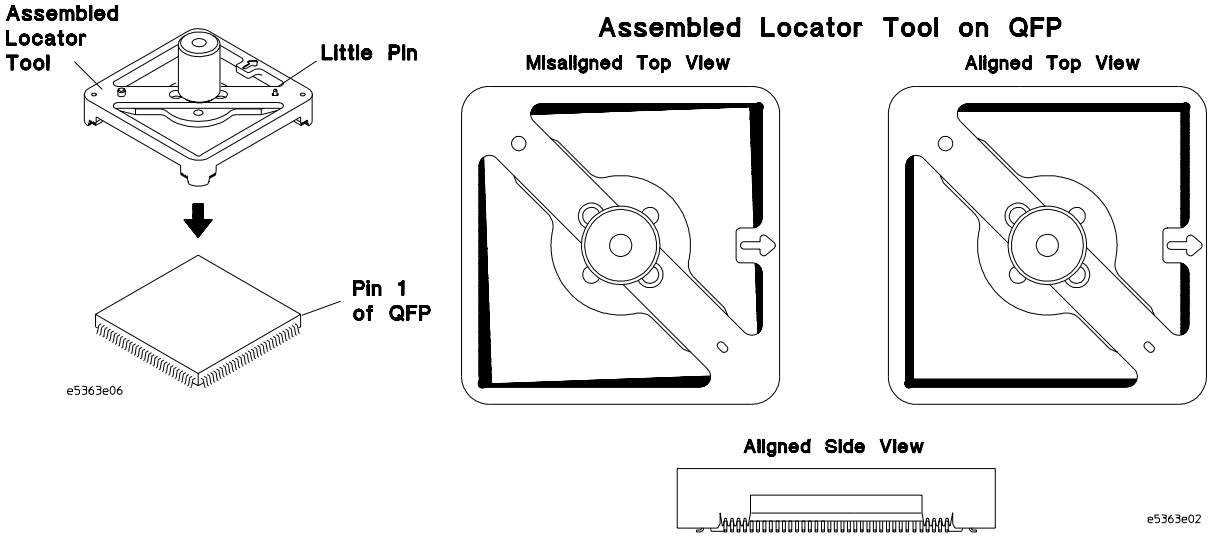


CAUTION

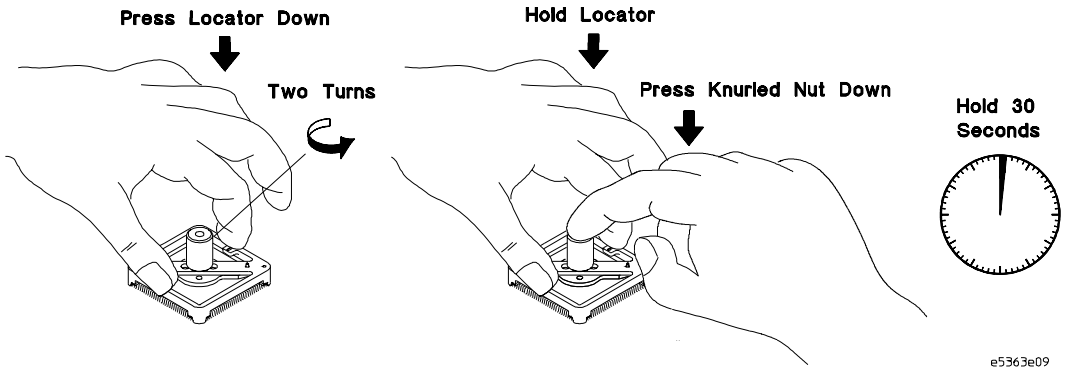
Turn off the power to your QFP when using the metal locator tool. Failure to do so could cause damage to your IC

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

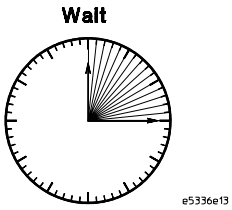
The adhesive on the retainer will not touch the QFP until the next step and the adhesive will not solidify until the retainer and QFP touch, so there is plenty of time to adjust the tool if necessary.



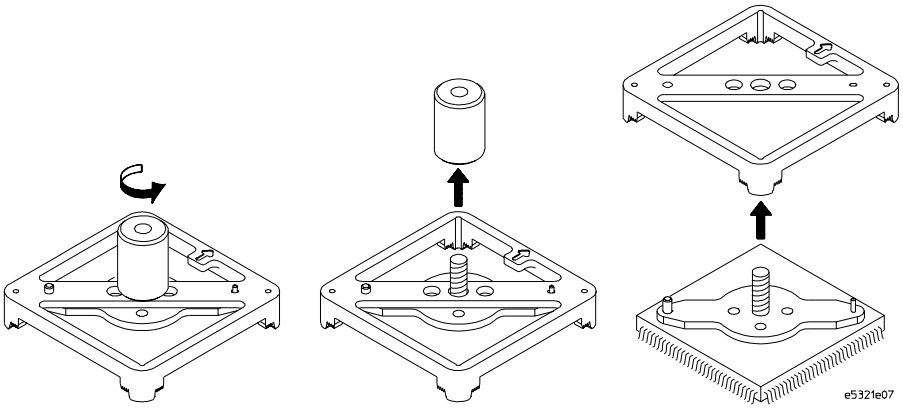
3 Hold down on the sides of the locator tool and loosen the knurled nut two turns. Continue to hold down on the sides of the locator tool and press down on the knurled nut to drop the retainer onto the top of the QFP. Hold for 45 seconds.



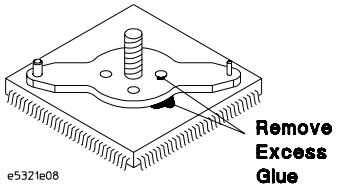
4 Wait 15 minutes for the adhesive to cure.



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.

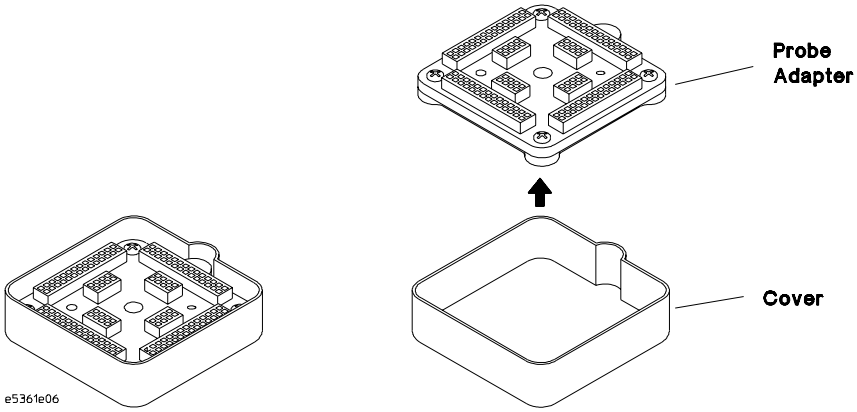


If a retainer ever breaks off of the QFP, a new retainer can be re-attached. There are some contaminates that are not removed with Isopropyl Alcohol in preparing the surfaces before adhering. If a retainer breaks off, the adhesive from the initial installation usually removes any remaining contamination.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

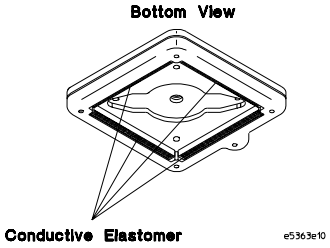
1. If the probe adapter is already attached to the analysis probe (preprocessor) or emulator, go to the analysis probe (preprocessor) or emulator documentation for installation instructions.
2. Remove the cover.

   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.



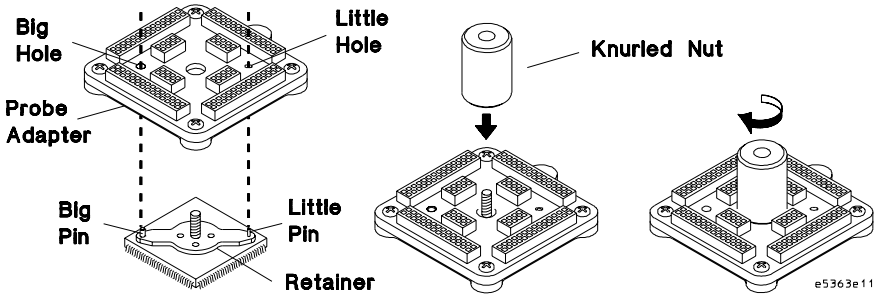
3 Install the elastomeric probe adapter on the retainer.

- **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

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

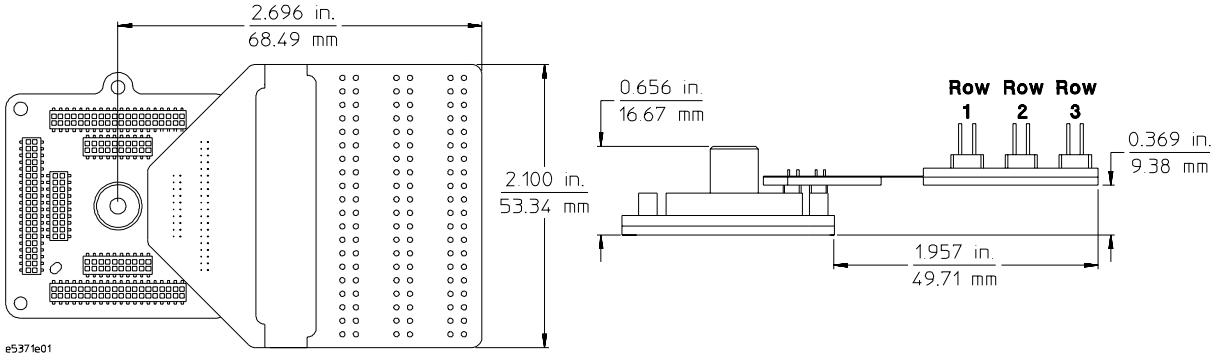
Installation of Optional Flexible Adapters

The E5371A 1/4 flexible adapters

The E5371A 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 E5371A 1/4 flexible adapters

Elastomeric Probe Adapter		E5363A 240-pin 0.50 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	3.5 pF Typical First Row 5.0 pF Typical Second Row 8.0 pF Typical Third Row
	Pin-to-Pin Capacitance	2 pF Typical
	Self-Inductance	30 nH Typical First Row 40 nH Typical Second Row 50 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.

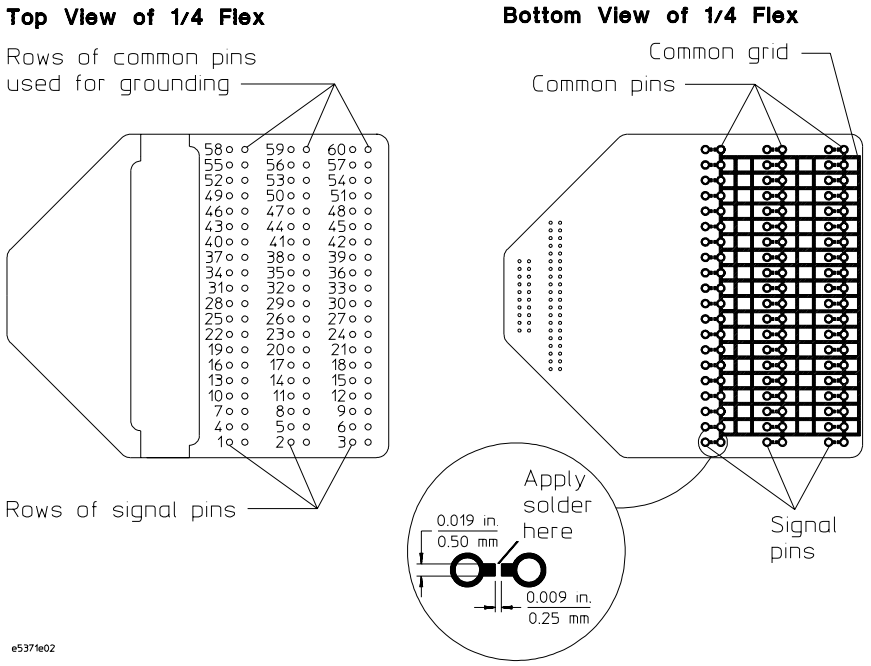
CAUTION

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 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.

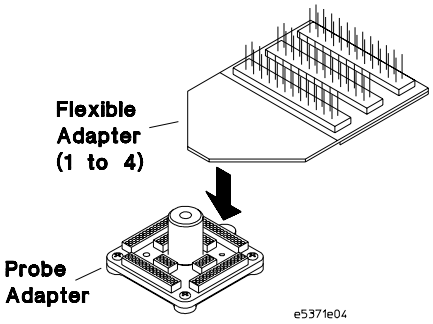
The pin numbers printed on the label correspond to the pins in one quadrant of the probe adapter. Refer to the pinout and cross-reference maps in the Reference chapter of this document when using multiple 1/4 flexible adapters.



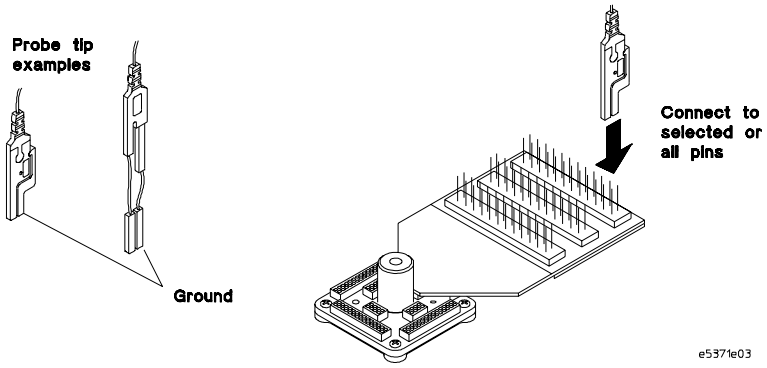
CAUTION

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.

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.

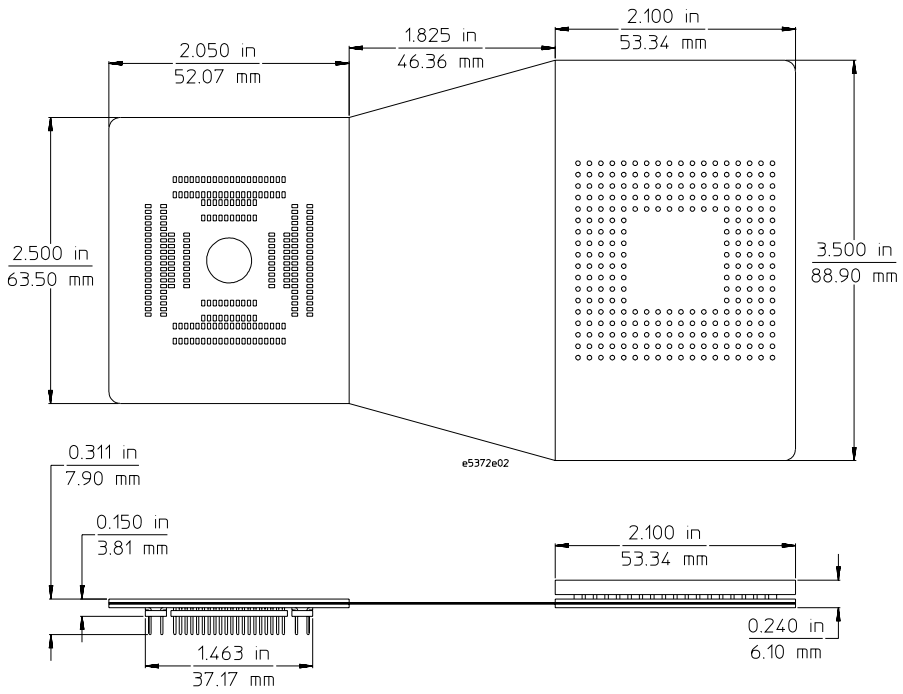


The E5372A general-purpose flexible adapter

The E5372A general-purpose adapter gives you access to predefined processor support for an analysis probe (preprocessor) and logic analyzer or emulator.

Performance characteristics of the E5372A general-purpose flexible adapter

Used with Elastomeric Probe Adapter		E5363A 240-pin 0.50 mm
Electrical Characteristics	Signal loading per line in addition to emulator or analysis probe (preprocessor) load	< 5 pF typical (no target grounds connected) 20 pF typical (with target grounds connected)
	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.

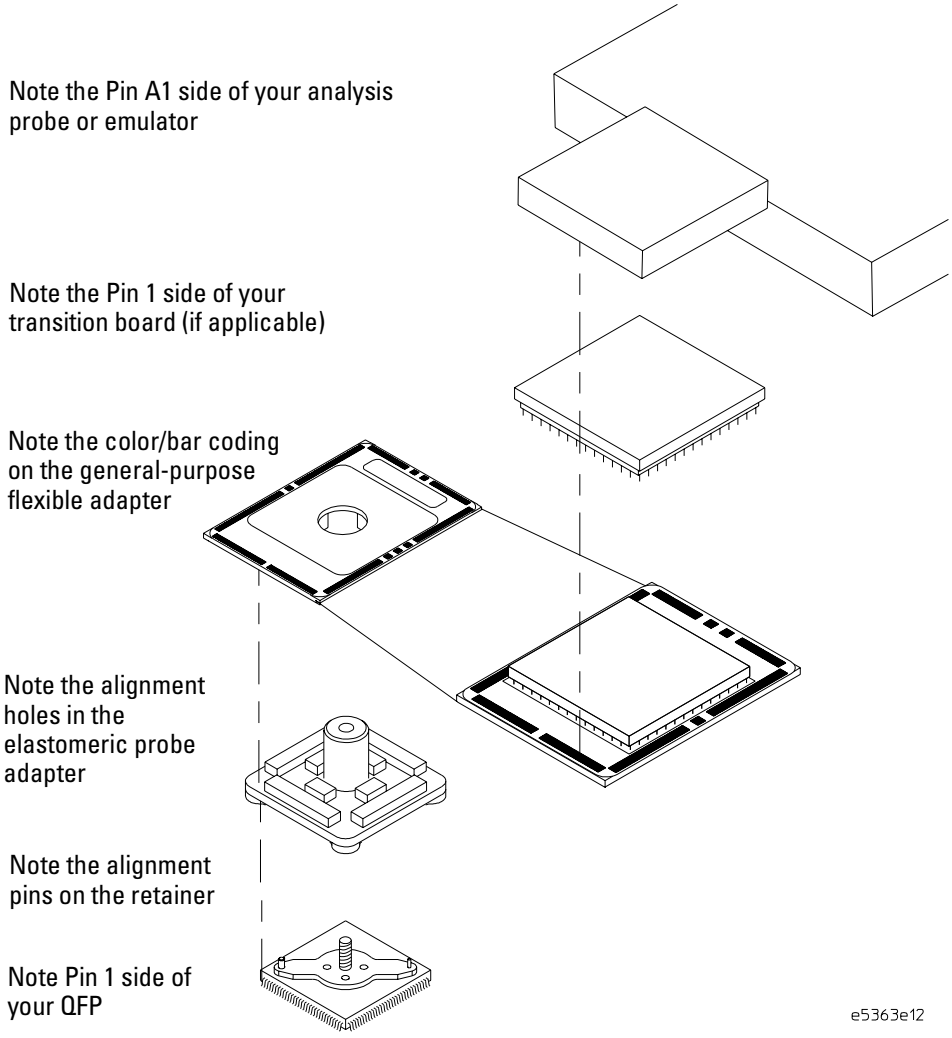
See Also

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

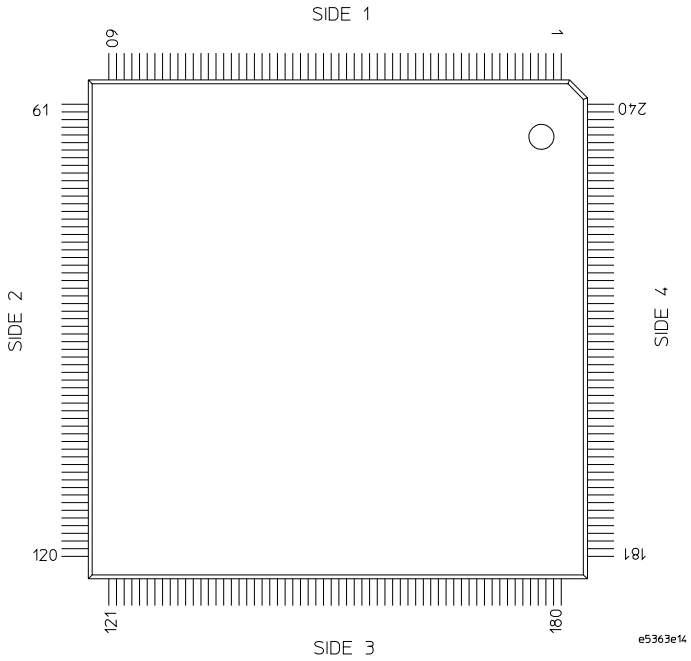
This chapter includes the following reference information:

- Pinout and cross-reference maps and tables
- Grounding
- Replaceable parts
- Removing retainers

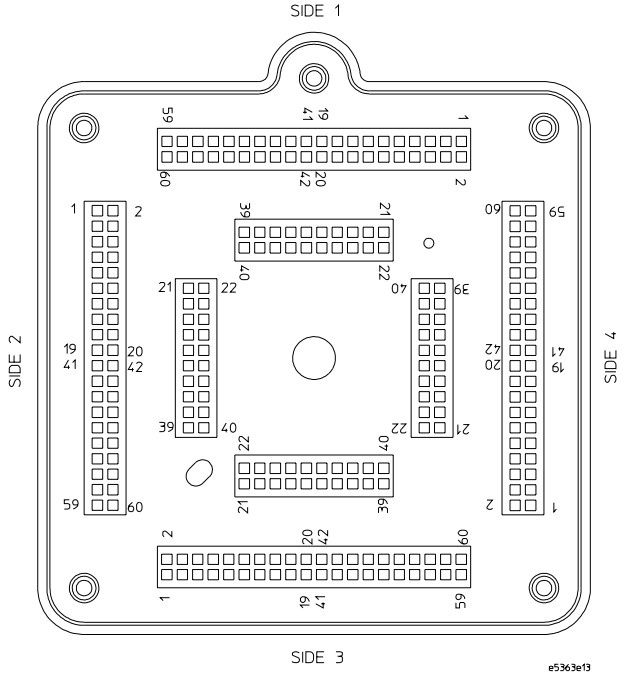
Reference

Pinout and cross-reference maps

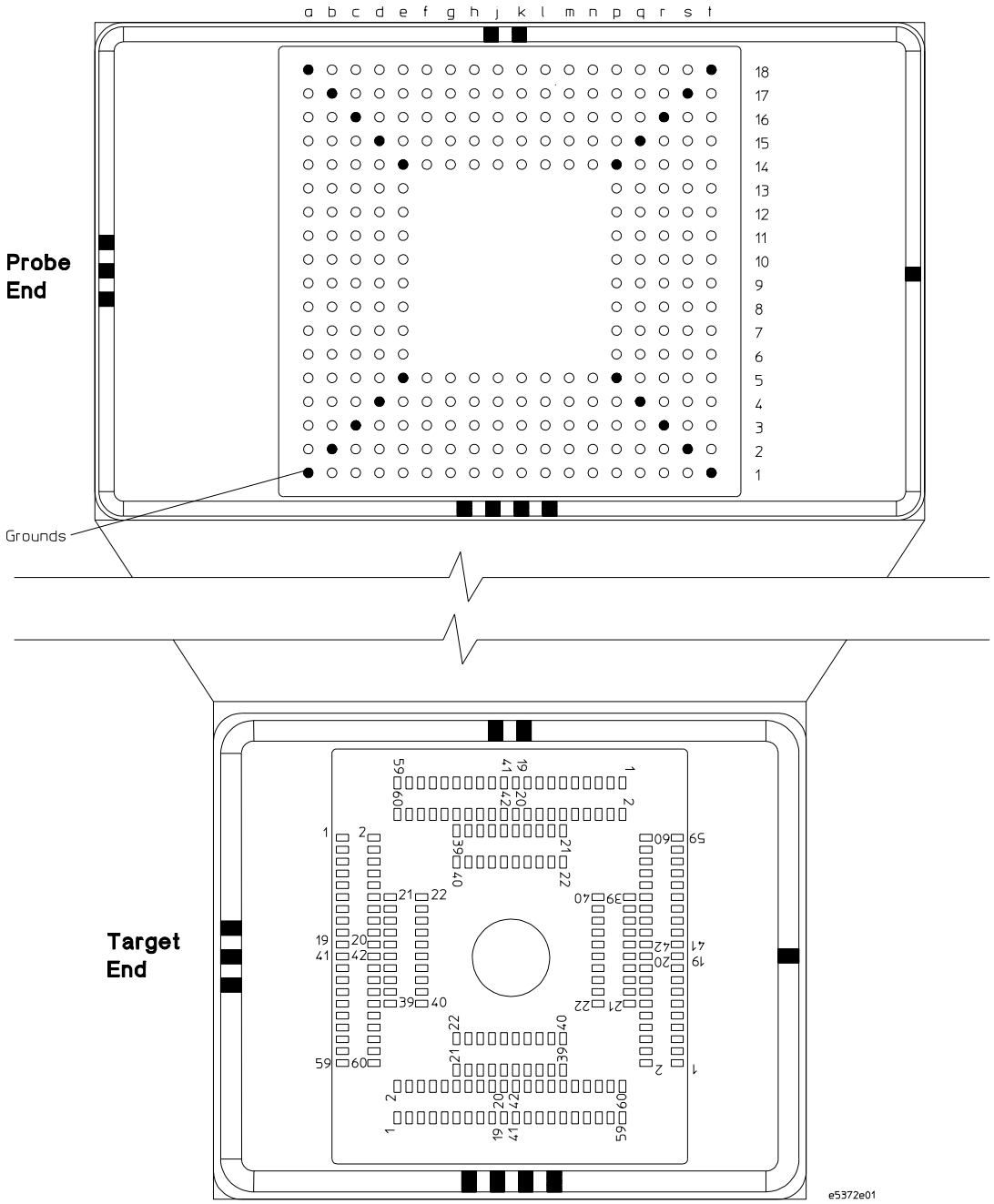
QFP pinout map



Probe adapter pinout map



E5372A General-Purpose Flexible Cable



Cross reference table for the QFP, probe adapter, and flexible cable

Side 1 *			Side 2			Side 3			Side 4		
QFP	Target End **	Probe End	QFP	Target End **	Probe End	QFP	Target End **	Probe End	QFP	Target End **	Probe End
1	1	C1	61	1	T3	121	1	R18	181	1	A16
2	2	B1	62	2	T2	122	2	S18	182	2	A17
3	3	D1	63	3	T4	123	3	Q18	183	3	A15
4	4	C2	64	4	S3	124	4	R17	184	4	B16
5	5	D3	65	5	R4	125	5	Q16	185	5	C15
6	6	D2	66	6	S4	126	6	Q17	186	6	B15
7	7	E2	67	7	S5	127	7	P17	187	7	B14
8	8	E1	68	8	T5	128	8	P18	188	8	A14
9	9	E4	69	9	Q5	129	9	P15	189	9	D14
10	10	E3	70	10	R5	130	10	P16	190	10	C14
11	11	F4	71	11	Q6	131	11	N15	191	11	D13
12	12	F3	72	12	R6	132	12	N16	192	12	C13
13	13	G3	73	13	R7	133	13	M16	193	13	C12
14	14	G2	74	14	S7	134	14	M17	194	14	B12
15	15	H2	75	15	S8	135	15	L17	195	15	B11
16	16	H1	76	16	T8	136	16	L18	196	16	A11
17	17	J1	77	17	T9	137	17	K18	197	17	A10
18	18	H5	78	18	P8	138	18	L14	198	18	E11
19	19	J5	79	19	P9	139	19	K14	199	19	E10
20	20	J4	80	20	Q9	140	20	K15	200	20	D10
21	21	F1	81	21	T6	141	21	N18	201	21	A13
22	22	F2	82	22	S6	142	22	N17	202	22	B13
23	23	F5	83	23	P6	143	23	N14	203	23	E13
24	24	G1	84	24	T7	144	24	M18	204	24	A12
25	25	G4	85	25	Q7	145	25	M15	205	25	D12
26	26	G5	86	26	P7	146	26	M14	206	26	E12
27	27	H3	87	27	R8	147	27	L16	207	27	C11
28	28	H4	88	28	Q8	148	28	L15	208	28	D11
29	29	J2	89	29	S9	149	29	K17	209	29	B10
30	30	J3	90	30	R9	150	30	K16	210	30	C10

* Side 1 is the side that is connected to pin 1 side of QFP
** The target end refers to the pin numbers on the probe adapter, the target end of the general-purpose flexible cable, and the 1/4 flexible cable when using more than one.

Side 1 *			Side 2			Side 3			Side 4		
QFP	Target End **	Probe End	QFP	Target End **	Probe End	QFP	Target End **	Probe End	QFP	Target End **	Probe End
31	31	K1	91	31	T10	151	31	J18	211	31	A9
32	32	K2	92	32	S10	152	32	J17	212	32	B9
33	33	K5	93	33	P10	153	33	J14	213	33	E9
34	34	L1	94	34	T11	154	34	H18	214	34	A8
35	35	L4	95	35	Q11	155	35	H15	215	35	D8
36	36	L5	96	36	P11	156	36	H14	216	36	E8
37	37	M3	97	37	R12	157	37	G16	217	37	C7
38	38	M4	98	38	Q12	158	38	G15	218	38	D7
39	39	N2	99	39	S13	159	39	F17	219	39	B6
40	40	N3	100	40	R13	160	40	F16	220	40	C6
41	41	K4	101	41	Q10	161	41	J15	221	41	D9
42	42	K3	102	42	R10	162	42	J16	222	42	C9
43	43	L3	103	43	R11	163	43	H16	223	43	C8
44	44	L2	104	44	S11	164	44	H17	224	44	B8
45	45	M2	105	45	S12	165	45	G17	225	45	B7
46	46	M1	106	46	T12	166	46	G18	226	46	A7
47	47	N1	107	47	T13	167	47	F18	227	47	A6
48	48	M5	108	48	P12	168	48	G14	228	48	E7
49	49	N5	109	49	P13	169	49	F14	229	49	E6
50	50	N4	110	50	Q13	170	50	F15	230	50	D6
51	51	P2	111	51	S14	171	51	E17	231	51	B5
52	52	P1	112	52	T14	172	52	E18	232	52	A5
53	53	P4	113	53	Q14	173	53	E15	233	53	D5
54	54	P3	114	54	R14	174	54	E16	234	54	C5
55	55	Q2	115	55	S15	175	55	D17	235	55	B4
56	56	Q1	116	56	T15	176	56	D18	236	56	A4
57	57	R1	117	57	T16	177	57	C18	237	57	A3
58	58	Q3	118	58	R15	178	58	D16	238	58	C4
59	59	S1	119	59	T17	179	59	B18	239	59	A2
60	60	R2	120	60	S16	180	60	C17	240	60	B3

* Side 1 is the side that is connected to pin 1 side of QFP
** The target end refers to the pin numbers on the probe adapter, the target end of the general-purpose flexible cable, and the 1/4 flexible cable when using more than one.

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.

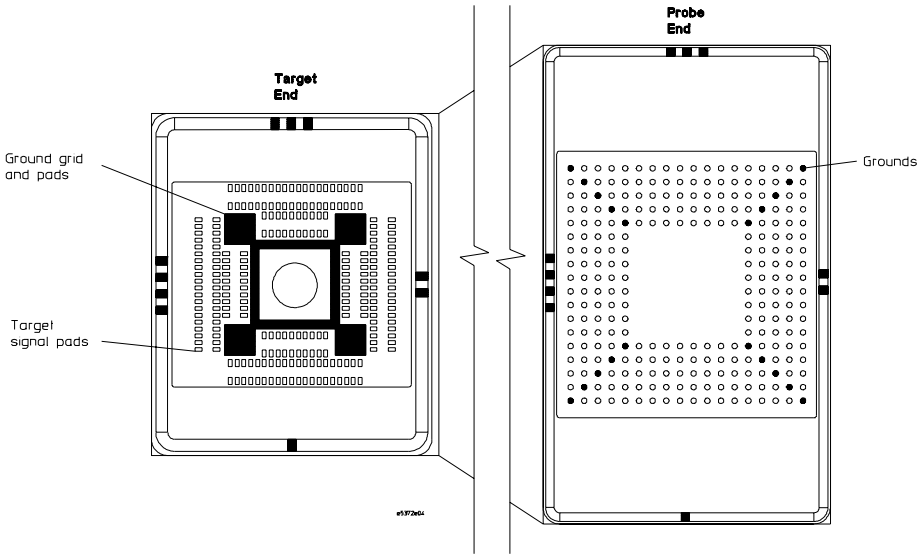
CAUTION

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.

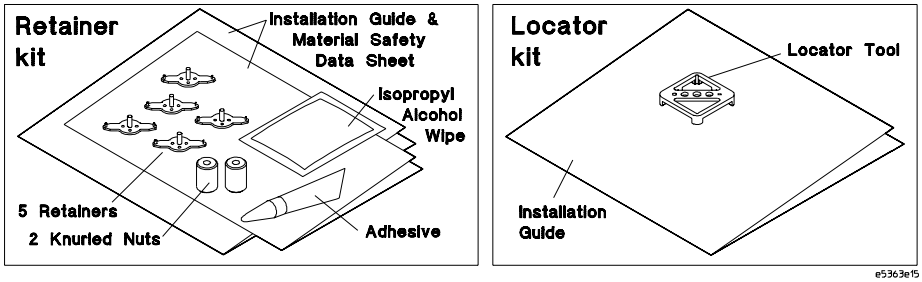
Loading

< 5 pF typcial	No target grounds connected to the flexible adapter cable
20 pF typical	Target ground signals connected to ground grid of flexible adapter cable



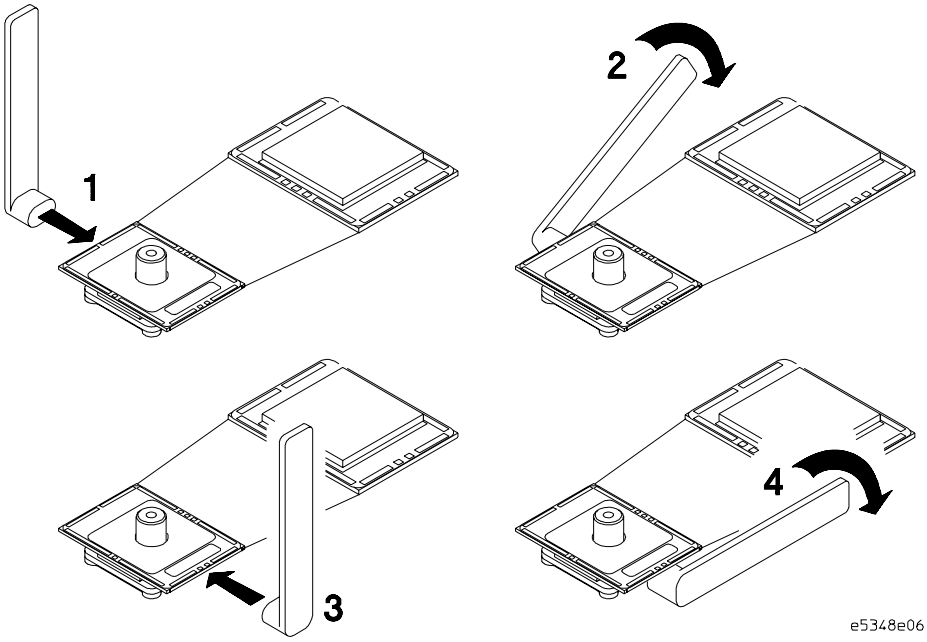
Replaceable Parts

Part Description	Part Number
Elastomeric Probe Adapter (Includes retainers and locators)	E5363A
General-purpose flexible adapter	E5372A
Retainer Kit (shown in the following illustration)	E5363A opt. 201
Locator Kit (shown in the following illustration)	E5363A opt. 202



To remove the general-purpose flexible adapter

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

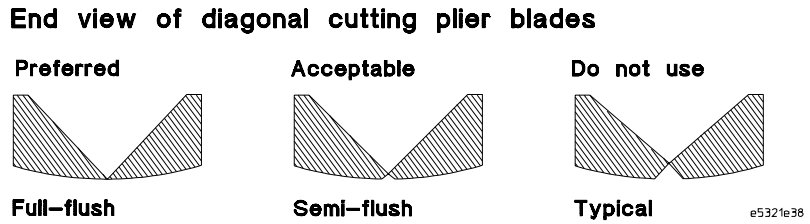


To remove a retainer and adhesive

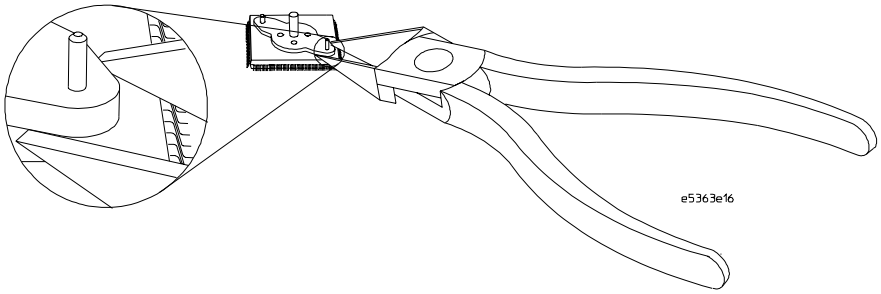
WARNING **Eye injury.** Use protective eye-wear during removal to avoid injury.

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

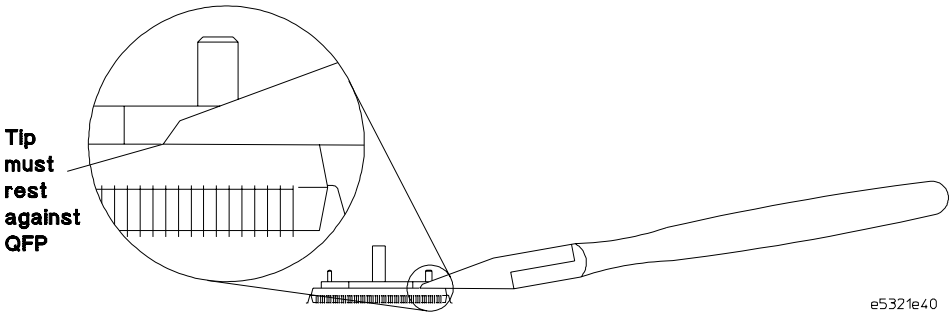
1 Use a semi-flush or full-flush cutting plier with approximately 5-inch handles, such as part number 8170-0006, to remove the retainer.



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



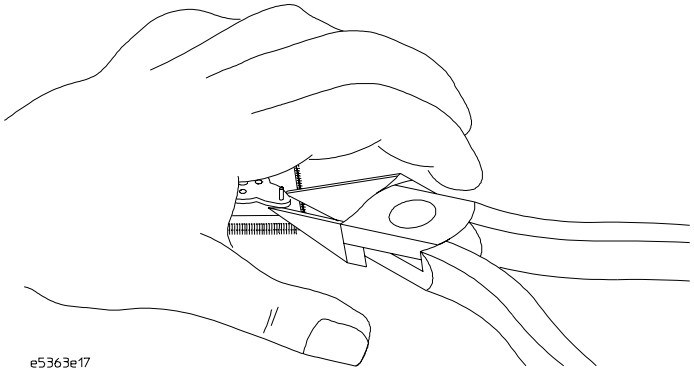
3 Ensure that the tip edge of the plier is as nearly parallel as possible and resting on the surface of the QFP.



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.

Index

Restricted Rights Legend

Use, duplication, or disclosure by the U.S. Government is subject to restrictions set forth in subparagraph (C) (1) (ii) of the Rights in Technical Data and Computer Software Clause in DFARS 252.227-7013. Agilent Technologies Company, 3000 Hanover Street, Palo Alto, CA 94304 U.S.A.
Rights for non-DOD U.S. Government Departments and Agencies are set forth in FAR 52.227-19(c)(1,2).

Document Warranty

The information contained in this document is subject to change without notice.

Agilent Technologies makes no warranty of any kind with regard to this material, including, but not limited to, the implied warranties of merchantability or fitness for a particular purpose.

Agilent Technologies shall not be liable for errors contained herein or for damages in connection with the furnishing, performance, or use of this material.

Safety

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.

Service instructions are for trained service personnel. To avoid dangerous electric shock, do not perform any service unless qualified to do so. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

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

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

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

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

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

Use caution when exposing or handling the CRT. Handling or replacing the CRT shall be done only by qualified maintenance personnel.

Safety Symbols

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

Hazardous voltage symbol.

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

WARNING

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

CAUTION

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

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

Product Warranty

This Agilent Technologies system product is warranted against defects in material and workmanship for a period of 90 days from date of purchase. During the warranty period, Agilent Technologies Company will, at its option, either repair or replace products that prove to be defective.

Products must be returned to a service facility designated by Agilent.

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

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

Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by the Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

No other warranty is expressed or implied. Agilent Technologies specifically disclaims the implied warranties of merchantability or fitness for a particular purpose.

Exclusive Remedies

The remedies provided herein are the buyer's sole and exclusive remedies. Agilent Technologies shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

Assistance

Product maintenance agreements and other customer assistance agreements are available for Agilent Technologies products.

For any assistance, contact your nearest Agilent Technologies Sales Office.

Certification

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

About this edition

This is the first edition of the *Elastomeric Probe Adapter for 240-Pin 0.55 mm QFP User's Guide.*

Publication number
E5363-92003, February 2002

Printed in Malaysia.

Edition dates are as follows:

E5363-92002, April 1998
E5363-92000, July1997
E5363-92001, Sept. 1997

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.

Agilent Technologies
Printed in Malaysia
Part Number E5363-92003