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# User's Guide

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## Wedge Probe Adapter

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# Before you begin

## **IMPORTANT — Read this guide before you begin**

Before you begin installing and using your Wedge Probe Adapter you should have an understanding of how it works. Learn the theory behind the Wedge Probe Adapter and the different applications for using it.

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## In this manual

**Chapter 1** - Provides theory behind the Wedge Probe Adapter and other background information you need to understand before you use the probe.

**Chapter 2** - Provides cleaning, installing, connecting, and repairing information on the Wedge Probe Adapter.

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## Equipment supplied

The Wedge Probe Adapter is available in several configurations of pin spacing and signal probing. Each model includes a User's Guide and a magnifying lens, in addition to the following adapters:

<b>E2613A</b>	One 0.5 mm x 3-signal Wedge Probe Adapter
<b>E2613B</b>	Two 0.5 mm x 3-signal Wedge Probe Adapters
<b>E2614A</b>	One 0.5 mm x 8-signal Wedge Probe Adapter
<b>E2615A</b>	One 0.65 mm x 3-signal Wedge Probe Adapter
<b>E2615B</b>	Two 0.65 mm x 3-signal Wedge Probe Adapters
<b>E2616A</b>	One 0.65 mm x 8-signal Wedge Probe Adapter
<b>E2643A*</b>	One 0.50 mm x 16-signal Wedge Probe Adapter
<b>E2644A*</b>	One 0.65 mm x 16-signal Wedge Probe Adapter

\* 16-signal Wedge Probe Adapters include 3 removable jumpers

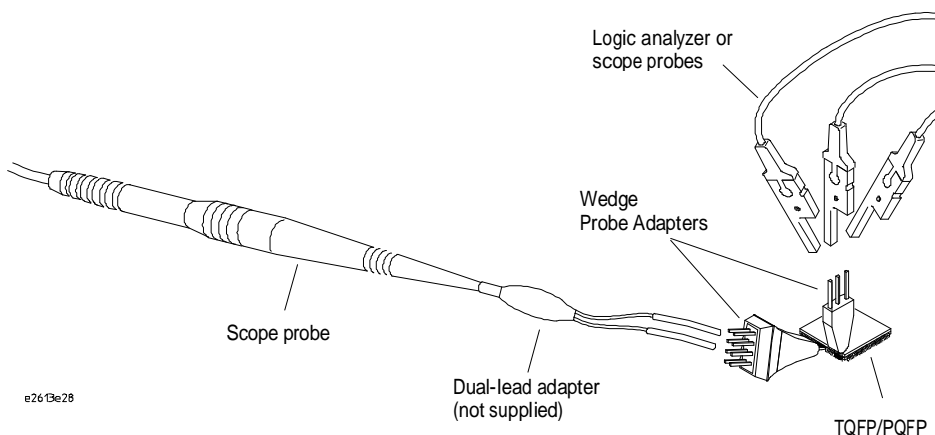
## **Color coding**

For ease of identification, 0.5 mm Wedge Probe Adapters are color-coded orange and 0.65 mm Wedge Probe Adapters are color-coded green.

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# Overview

This guide explains how to install the Wedge Probe Adapter on thin quad flat pack (TQFP) or plastic quad flat pack (PQFP) surface-mounted integrated circuits. This probing solution provides accurate, mechanically non-invasive contact to the TQFP/PQFP package legs. Accessories such as flexible leads enable you to connect to various oscilloscope probes and logic analyzers. When these guidelines are followed, the Wedge Probe Adapter will provide you with many cycles of problem-free probing.



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## Electrical characteristics

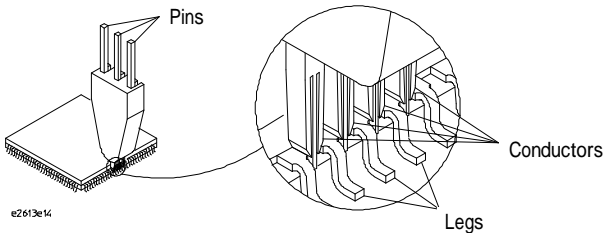
<b>Operating voltage</b>	< 40 V (dc + peak ac)
<b>Operating current</b>	0.5 A maximum
<b>Capacitance between contacts</b>	2 pF typical (all except E2643A/44A) 4.33pF typical at 1 MHz (E2643A/44A)
<b>Self-inductance</b>	15 nH typical (all except E2643A/44A) 37 nH typical at 1 MHz (E2643A/44A)
<b>Cross coupling</b>	-31 dB typical at 100 MHz (E2643A/44A)
<b>Contact resistance</b>	< 0.1 Ohm



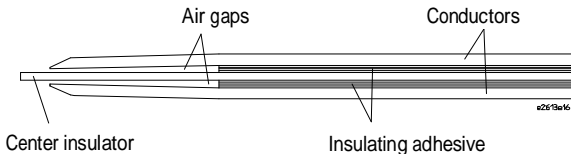
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## How the Wedge Probe Adapter works

The Wedge Probe Adapter makes contact with legs of the IC under test when the Wedge Probe Adapter conductors are inserted into the space between the legs of the IC. The Wedge Probe Adapter conductors are connected to pins on the opposite end of the Wedge Probe Adapter.

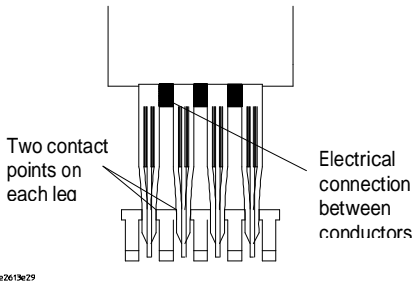


Each Wedge Probe Adapter consists of two separate conductors insulated from each other by a center insulator. A shortened insulating adhesive between the center insulator and the outer conductors creates an air gap at the tip of the Wedge Probe Adapter.



**Cross-section view of typical wedge segment**

The air gap allows the conductors to conform to the package as the Wedge Probe Adapter is inserted between the package legs.



The Wedge Probe Adapter has two contact points on each leg of the IC under test. The redundant physical connection between the wedge segments and the legs on the IC package increases reliability of the electrical connection.

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**CAUTION**

Although to the naked eye it's difficult to see the difference between a 0.5 mm and 0.65 mm IC, the Wedge Probe Adapter is a precision tool designed for probing at a specific spacing. While it has been tested for 30,000 insertions, damage to the Wedge Probe Adapter can easily occur if not used with care.

- 1 Always use the magnifying glass provided to ensure the conductors of the Wedge Probe Adapter are accurately aligned with the dam bar gaps before applying pressure to insert.
- 2 Ensure that you use the correct size Wedge Probe Adapter for the part you are probing.

If damage occurs to the Wedge Probe Adapter, please see "Repairing you Wedge Probe Adapter" in chapter 2 of this guide

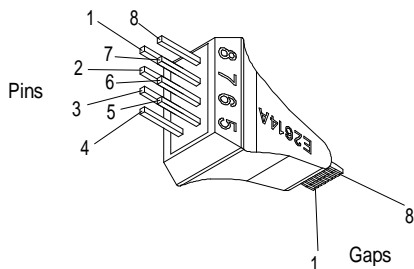
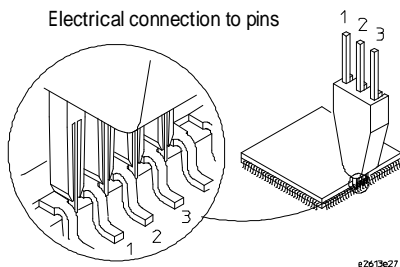
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**Pin-spacing variation on 0.65 mm ICs**

There can be a significant variation in the pin spacing of 0.65 mm ICs. While the 0.65 mm Wedge Probe Adapter will work with the vast majority of 0.65 mm ICs, we can not guarantee it's performance for all ICs.

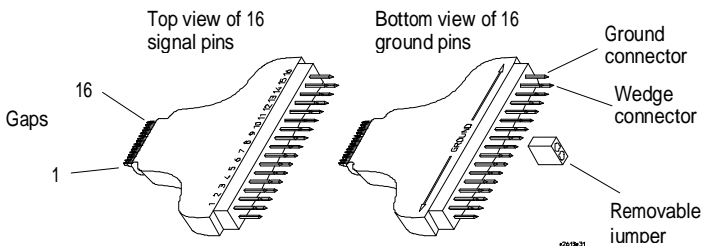
## Electrical connection to IC pins

If you look closely at the IC-connection end of the 3-signal adapter, you will see there are 4 groups of wedge segments that form 3 gaps. The pins of the IC fit into these gaps of the adapter. Likewise, the 8-signal adapter has 9 groups of wedge segments and 8 gaps, and the 16-signal adapter has 17 groups of wedge segments and 16 gaps that fit into the IC pins.



**3-signal Wedge Probe Adapter**

**8-signal Wedge Probe Adapter**



**16-signal Wedge Probe Adapter**

### Common ground plane on 16-pin Wedge Probe Adapter

The top side of the 16-pin Wedge Probe Adapter has pins numbered 1 through 16 and provides access to IC signals. The 16 pins (marked GROUND) on the bottom side of the Wedge Probe Adapter are connected together to provide a common ground plane. If any of the signals acquired in the 16-signal segment from the IC are connected to ground, a removable jumper (3 provided) can be used to tie this IC ground signal to the ground plane connected to the bottom 16 pins on the wedge connector. After this connection is made, all 16 bottom pins are connected to ground.

**Using the Wedge Probe Adapter**



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## Installing your Wedge Probe Adapter

### CAUTION

Although to the naked eye it's difficult to see the difference between a 0.5 mm and 0.65 mm IC, the Wedge Probe Adapter is a precision tool designed for probing at a specific spacing. While it has been tested for 30,000 insertions, damage to the Wedge Probe Adapter can easily occur if not used with care.

- 1 Always use the magnifying glass provided to ensure the conductors of the Wedge Probe Adapter are accurately aligned with the dam bar gaps before applying pressure to insert.
- 2 Ensure that you use the correct size Wedge Probe Adapter for the part you are probing.

If damage occurs to the Wedge Probe Adapter, please see "Repairing your Wedge Probe Adapter" later in this chapter.

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### Pin-spacing variation on 0.65 mm ICs

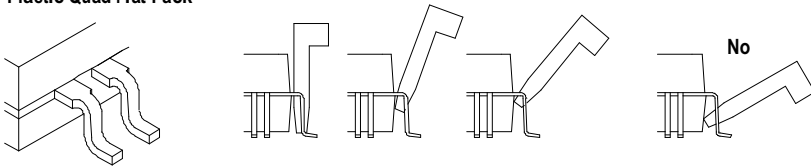
There can be a significant variation in the pin spacing of 0.65 mm ICs. While the 0.65 mm Wedge Probe Adapter will work with the vast majority of 0.65 mm ICs, we can not guarantee it's performance for all ICs.

The diagram on the following page shows various techniques for inserting the Wedge Probe Adapter, depending on the thickness of the IC and the location of the dam bar gap.

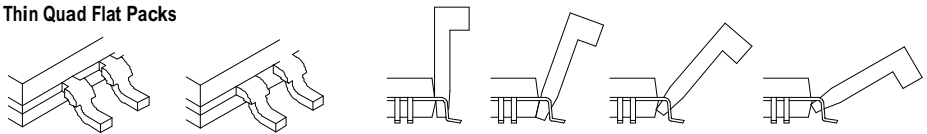
For most PQFP packages, the dam bar gap portion of the IC leg is horizontal to and adjacent to the plastic body of the package, requiring insertion of the AWedge Probe Adapter at a 90° angle, as shown in the upper figure. For thinner packages, such as the TQFP type, the dam bar gap portion of the IC leg is often located on the bend of the leg, requiring insertion of the Wedge Probe Adapter at a lesser angle than 90°, as shown in the lower figure.

## Chapter 2: Using the Wedge Probe Adapter Installing your Wedge Probe Adapter

### Plastic Quad Flat Pack



### Thin Quad Flat Packs



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Once the Wedge Probe Adapter is properly located between the legs of the IC and in the dam bar gap, apply pressure so the Wedge Probe Adapter becomes fully seated. Use caution to insure that the Wedge Probe Adapter is inserted at the proper angle to make contact in the dam bar gap area.

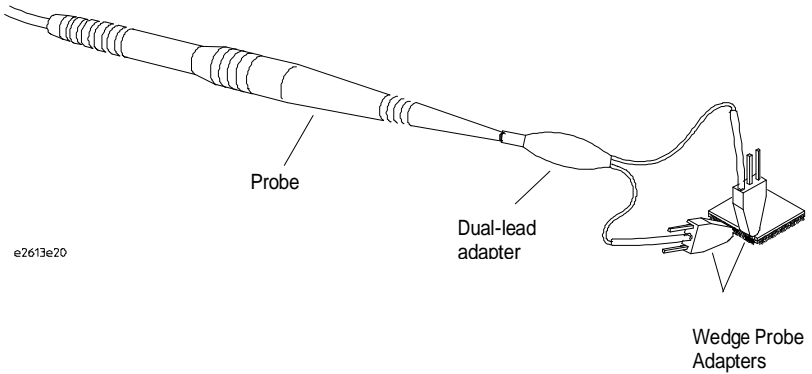
After the Wedge Probe Adapter is attached, it should have a very solid connection to the IC; you should be able to attach a lead to the Wedge Probe Adapter while maintaining a good connection to the IC. If the Wedge Probe Adapter becomes loose after you attach it, you likely have one of the following problems:

- the Wedge Probe Adapter has not been inserted far enough onto the legs of the IC as shown in the figure above. For this case, you might need to try inserting the Wedge Probe Adapter at a different angle, perhaps an angle of less than 30° to the board.
- the Wedge Probe Adapter has not been inserted in the dam bar gap portion of the IC leg; as mentioned earlier, the dam bar gap is a thicker part of the IC leg. This thicker part of the IC leg is generally closer to the body of the IC. Try inserting the Wedge Probe Adapter on the portion of the IC legs closer to the body of the IC.
- the IC may be a ceramic package which has no dam bar gap. Note that the Wedge Probe Adapter is not designed for this type of IC package.

## Connecting the Wedge Probe Adapter to your instrument

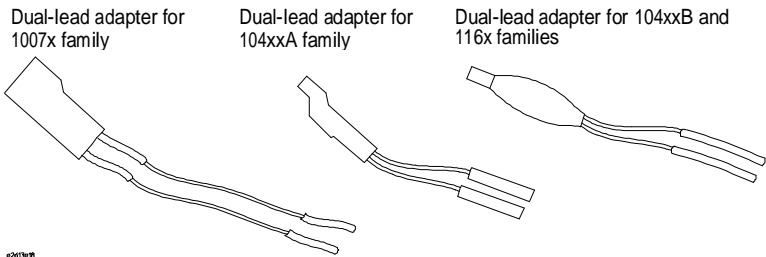
### Oscilloscopes and logic analyzers

The Wedge Probe Adapter can be easily attached to oscilloscopes or logic analyzers. For oscilloscope probes, use a dual lead adapter as shown below.



Part numbers for the dual-lead adapter for oscilloscope probe families:

Probe family	Dual lead Adapter Part Number
1007x	8710-2063
104xxA	5081-7742
104xxB	5063-2147 (included with probe)
116x	5063-2147 (included with probe)

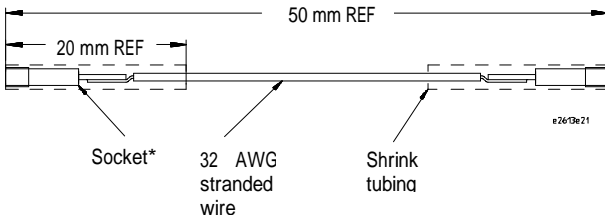


**Other instruments**

To maintain a solid connection to the Wedge Probe Adapter, you will need to use a flexible lead between the probe and the Wedge Probe Adapter pins. Without the flexible lead, the weight of the probe on the Wedge Probe Adapter will most likely cause the Wedge Probe Adapter to disconnect from the IC.

The Wedge Probe Adapter pins are 0.635 mm square. If you build your own flexible lead, you will need a socket designed to fit a 0.380- to 0.635-mm square pin at the end of the wire that will be connected to the Wedge Probe Adapter. You will need to define the size of the socket at the probe end of the wire.

The probe for your instrument may include flexible leads similar to the dual lead adapters shown earlier in this manual; also, one of the dual-lead adapters listed previously may fit your instrument's probe.



\*Mill Max part number 1305-0-15-01-47-14-040 socket

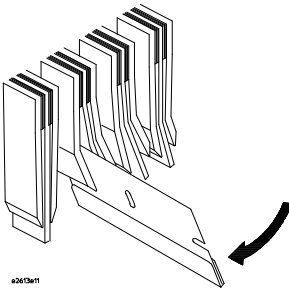
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## Repairing your Wedge Probe Adapter

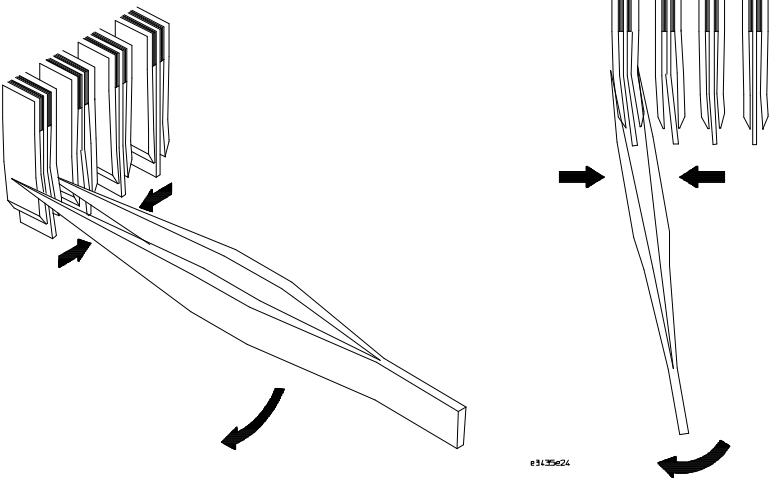
### Typical bent wedge segments

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

- 1 Use a razor blade between the Wedge Probe Adapter conductors to straighten them as much as possible.
- 2 Repeat this on each bent wedge segment conductor.

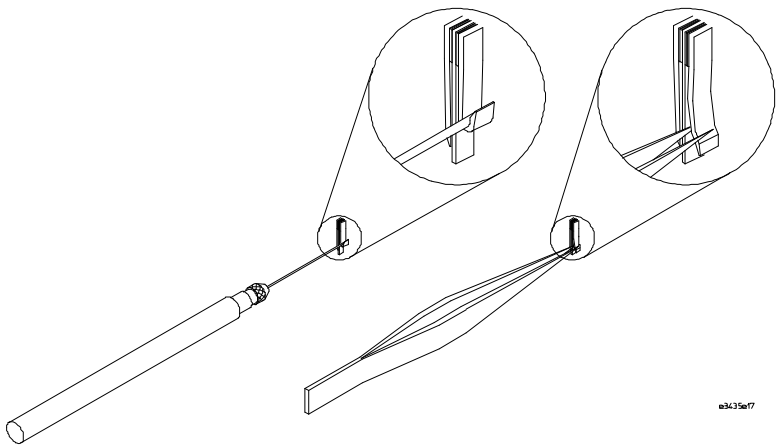


- 3 Hold the Wedge Probes Adapter conductors tightly together with tweezers and flex to straighten each individual wedge segment.



**Severely bent wedge segments**

- 1 Use a x20 or x40 microscope so you can see the bent wedge segment conductor.
- 2 Use a needle probe to bend the wedge segment conductor enough that you can get tweezers on it.
- 3 Gently straighten out wedge segment conductors using tweezers as shown below.



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**Electrical connection is still often made**

Even though the bent section often breaks due to metal fatigue, an electrical connection is often made because there are two electrical contact points on each leg of the TQFP/PQFP package. For more information on how electrical connection is made, see "How the Wedge Probe Adapter works" in Chapter 1 of this guide.

### Pinched air gap

The air gap is described in chapter 1 of this guide. Wedge segments may fail to make contact if this air gap is closed. The following instructions tell you how to correct this problem.

- 1 Turn the probe so that the wedge segments are facing up.
- 2 Use a x20 or x40 microscope so you can see the pinched wedge segment.

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

- 3 Insert the edge of a razor blade between the center insulator and the conductor.
- 4 Gently pry the conductor away from the center insulator to open the gap.

