

# **Delta Probe**

## **User's Manual**

---

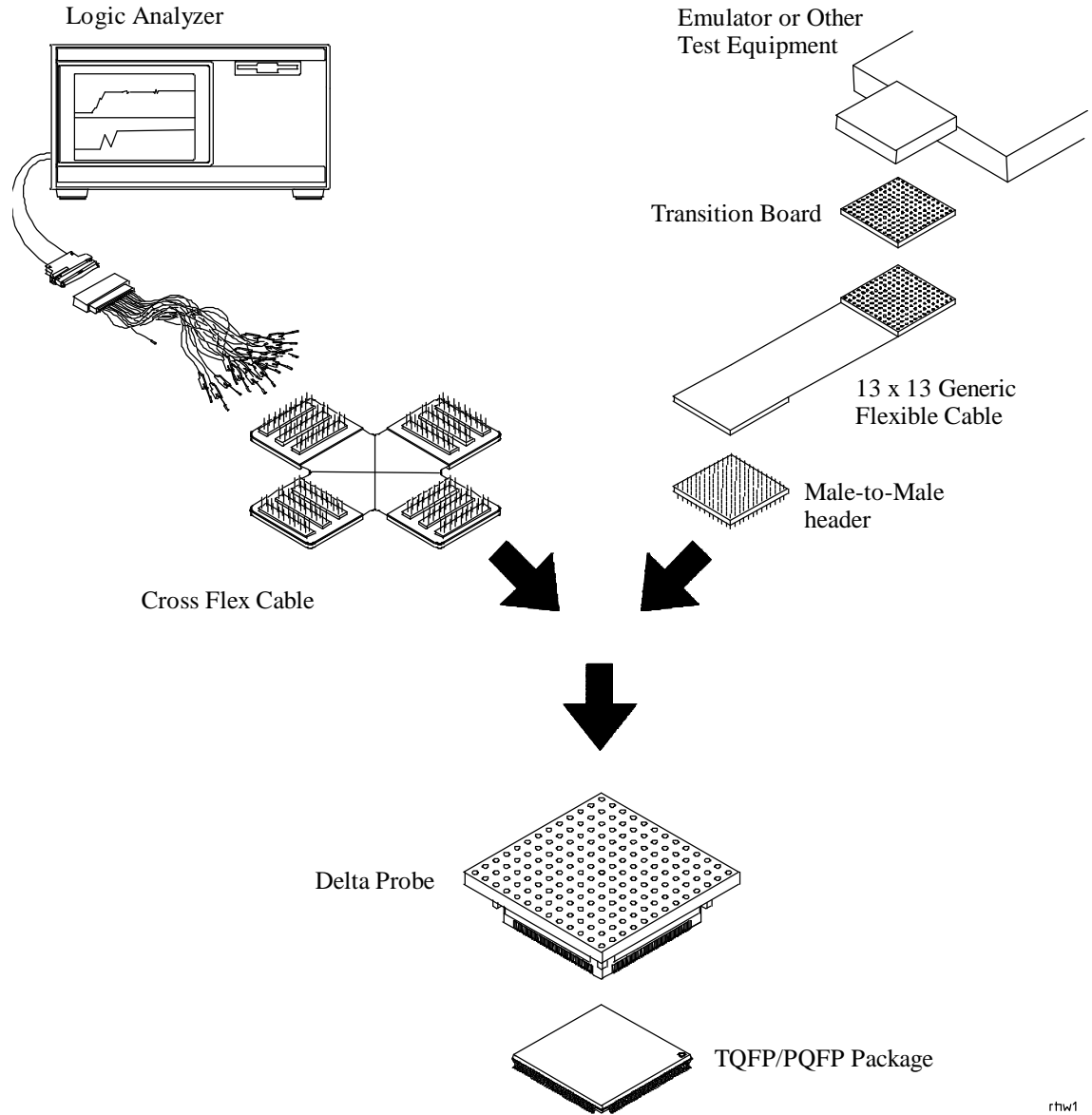
---

### **Emulation Technology, Inc.**

2344 Walsh Avenue, Building F, Santa Clara, CA 95051  
408-092-0660, 800-232-7837, FAX 408-982-0660

# Overview

This document explains how to install the Delta probe for 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 leads. Accessories such as flexible cables and transition boards enable you to connect to logic analyzers, emulators, and various test equipment. When these guidelines are followed, the Delta Probe will provide you with many cycles of problem free probing.



rhw1

# TABLE OF CONTENTS

---

## Chapter 1 Getting Started

- Before you begin 1–2
  - In this manual 1–2
  - Equipment required 1–2
  - Additional accessories available 1–2
- Description of the Delta Probe 1–3
- Differences in Surface-mounted Devices 1–5
  - Dam bars, gaps, and leg spacing 1–5
- Supported IC Packages and their Parameters 1–6
  - Supported devices 1–6
  - Parameters for gap and pin spacing 1–6

## Chapter 2 The Delta Probe

- Cleaning the Delta Probe 2–2
- Repairing the Delta Probe 2–4
  - Typical bent wedges 2–4
  - Severely bent wedges 2–4
  - Pinched air gap 2–5

## Chapter 3 Applications

- Using the Delta Probe with Your Test Equipment 3–2
  - Generic Flex Cable 3–3
    - Installing the generic flex cable 3–3
  - Direct Use Transition Boards 3–4
    - Installing a transition board 3–4
  - Mounted Sockets 3–5
    - Installing the mounted socket 3–5
  - Substitution Clips 3–6
    - Installing the substitution clip 3–6
  - Cross Flex Cables 3–7
    - Installing the cross flex cables 3–7
-

**Chapter 4 Reference Information**

Delta Probe Reference Information 4-2

- Performance Characteristics of Delta Probes 4-2
- Dimensions of Delta Probes 4-3
- Pin-out maps of Delta Probes 4-4
  - 240-pin 0.5 mm PQFP package and Delta Probe PGA pattern 4-4
  - 208-pin 0.5 mm PQFP package and Delta Probe PGA pattern 4-4
  - 184-pin 0.65 mm PQFP package and Delta Probe PGA pattern. 4-5
  - 160-pin 0.65 mm PQFP package and Delta Probe PGA pattern 4-5
  - 144-pin 0.5 mm PQFP package and Delta Probe PGA pattern 4-6
  - 132-pin 0.635 mm Intel BQFP package and Delta Probe PGA pattern 4-6
  - 132-pin 0.635 mm Motorola BQFP package and Delta Probe PGA pattern 4-7
  - 128-pin 0.5 mm TQFP rectangular package and Delta Probe PGA pattern 4-7
  - 120-pin 0.5 mm TQFP rectangular package and Delta Probe PGA pattern 4-8
  - 100-pin 0.5 mm PQFP package and Delta Probe PGA pattern 4-8
  - 100-pin 0.65 mm PQFP rectangular package and Delta Probe PGA pattern 4-9
  - 80-pin 0.5 mm TQFP package and Delta Probe PGA pattern 4-9
- Generic Flex Cable Reference Information 4-10
  - Electrical characteristics of the generic flex cable 4-10
  - Dimensions of the generic flex cable 4-10
- Cross Flex Cable Reference Information 4-11
  - Dimensions of the Cross flex cable 4-11
- Double Header Reference Information 4-12
  - Dimensions of the Double Headers 4-12
- Glossary of Terms 4-13
- Parts List 4-14

---

# Getting Started

---

## Chapter 1

# Before you begin

---

***IMPORTANT*** *Read this manual before you begin.*

Before you begin installing and using your Delta Probe you should have an understanding of how it works. Learn the theory behind the Delta Probe and the different applications for using it. You should also make sure that you have the right Delta Probe for the type of package you are probing and that the application you are using allows clearance of other parts on the target system.

## In this manual

Chapter 1 - This chapter, gives you the theory behind the Delta Probe and other background information you need to understand before you use the probe.

Chapter 2 - Provides cleaning, installation, removing, and repairing information on the Delta Probe.

Chapter 3 - Shows the various ways the Delta Probe can be used to probe a TQFP/PQFP package. It also includes installation instructions for each application.

Chapter 4 - Separates out detailed information such as characteristics, dimensions, pin-out maps, and cross reference charts for the different pieces of the probing solutions. It also includes a parts list with descriptions and part numbers for required and additional equipment.

## Equipment required

- Delta Probe (see parts list for part numbers)
- Extractor tool (included with Delta Probe)
- Logic analyzer, emulator, or other test equipment

## Additional accessories available

Part numbers and detailed information for the following accessories can be found in chapter 4.

- Cross flex cables
- Generic flex cables
- Double sided headers

Detailed information on the following custom accessories is available by contacting JM Engineering directly.

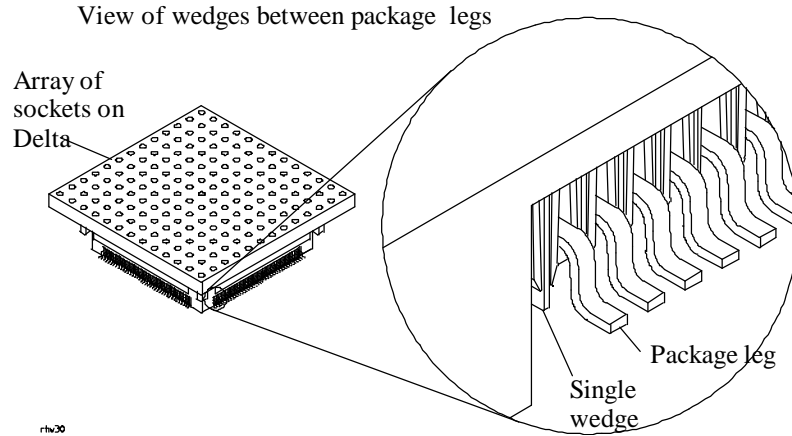
- Custom transition boards for specialized signal mapping between target and measurement equipment
- Transition boards with a mounted socket of choice
- Transition boards for creating a substitution clip

# Description of the Delta Probe

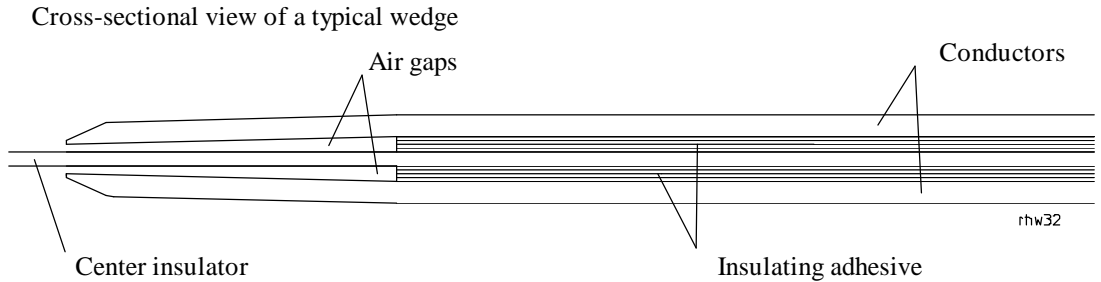
The Delta Probe is made up of an array of wedge shaped conductors that are fastened to a printed-circuit board containing a female socket with insertion points spaced at .100" intervals. The Delta Probe is designed to provide a *snap-on* connection to ICs contained in specific PQFP and TQFP packages while providing a simple, PGA interface to test tools such as logic analyzer analysis probes and microprocessor emulators.

The Delta Probe makes contact to the legs of the package when the conductors penetrate the space between the legs. The conductors are connected to an array of sockets. The user may probe the sockets directly, use a cross flex cable, use a generic flex cable, or other accessories (such as a double header with .030" diameter pins).

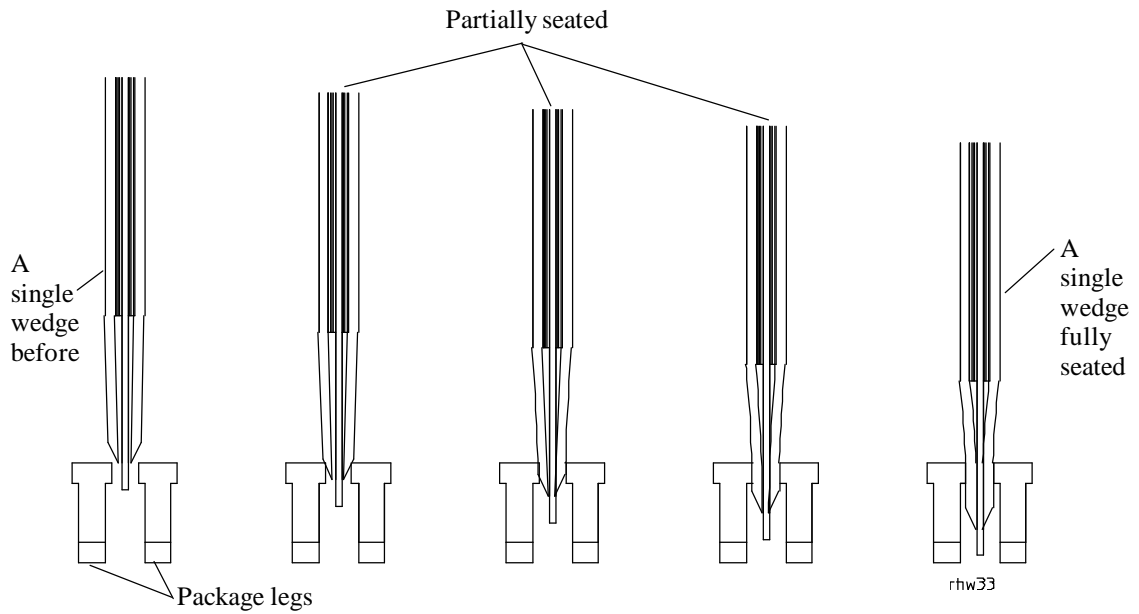
Each wedge consists of two separate conductors insulated from each other by a center



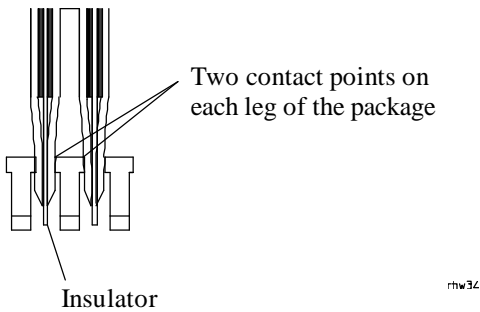
insulator. A shortened insulating adhesive between the center insulator and the outer conductors creates an air gap at the tip of the wedge.



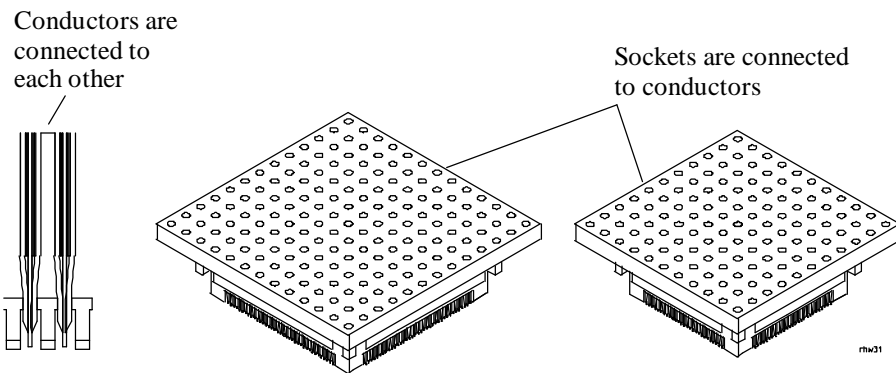
The air gap allows the conductors to conform to the package as the wedge is inserted between the package legs. The insertion force required to ensure positive contact can be as much as 20 pounds.



Each leg of the package has two contact points, one on each side of the leg. The redundant physical connection between the wedges and the legs on the package increases reliability of the electrical connection.



The conductors common to each leg of the package are electrically connected to each other and to a socket on the top surface of the Delta Probe.



# Differences in Surface-mounted Devices

## NOTE

The Delta Probe supports Plastic Quad Flat Pack and Thin Quad Flat Pack IC packages. Contact JM Engineering for the latest information regarding the support of Ceramic ICs. The following information is provided as a comparison.

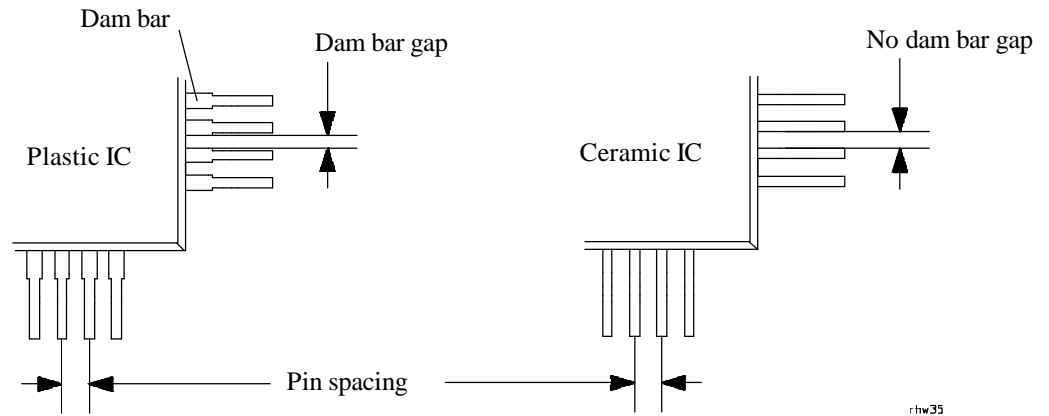
## Dam bars, gaps, and leg spacing

The manufacturing process for making TQFP/PQFPs necessitates the use of a “dam bar.” Dam bars prevent the plastic from spewing out between the legs of the part during the molding process.

After the plastic injection process is completed, the residual metal dam bar is removed to allow electrical isolation of each leg, accomplished by a precision blanking die. The remaining gap between the legs of the part is commonly referred to as the “dam bar gap.” The dam bar gap is critical for this type of probing because the wedges actually make electrical contact with the legs of the TQFP/PQFP package in this area.

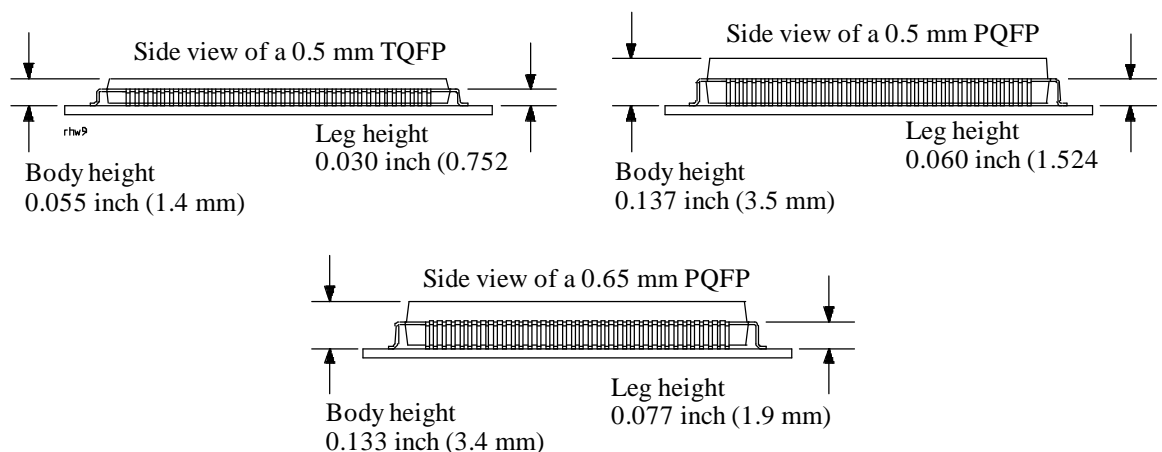
When examining a TQFP/PQFP package for probing, check the width of the dam bar gap, and make sure it is free of excess solder. Wicking of solder up the leg and into the dam bar region reduces the dam bar gap width, which can prevent insertion of the wedges.

Verification of leg spacing is necessary to ensure that the proper wedge is used in each case. Refer to the next section, “Supported ICs and their parameters,” for the dimensions of specific



ICs. The Delta Probe is not designed to be used with CQFPs (ceramic quad flat packs).  
Leg and body height

The leg and body height of TQFPs (thin quad flat packs) and PQFPs (plastic quad flat packs) are typically:



# Supported IC Packages and their Parameters

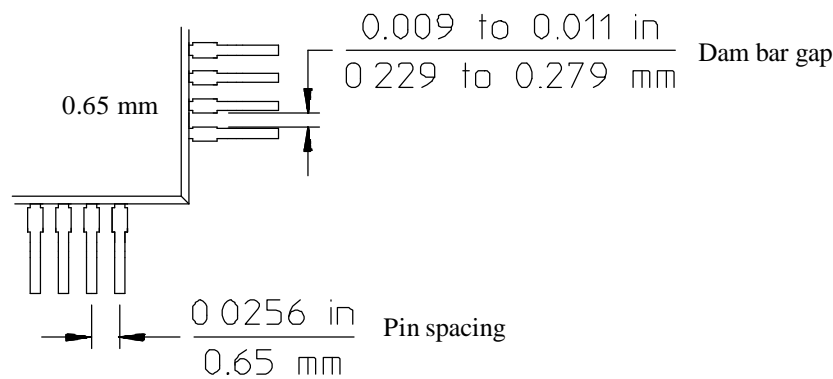
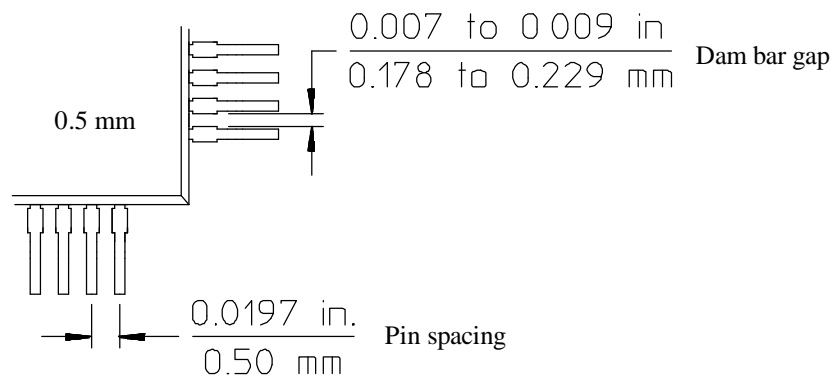
## Supported devices

The following table shows which surface-mounted integrated circuits are supported.

	# Pins	Pin Spacing
<b>Plastic TQFP</b>	240 square	0.5 mm
	208 square	0.5 mm
	144 square	0.5 mm
	128 rectangular	0.5 mm
	120 rectangular	0.5 mm
	100 square	0.5 mm
	80 square	0.5 mm
<b>Plastic PQFP</b>	184	0.65 mm
	160	0.65 mm
	132	0.635 mm
	100 rectangular	0.65 mm

## Parameters for gap and pin spacing

The Delta Probe will work within the parameters shown in the following figures. JM Engineering does not guarantee support for any dimensions outside of this window.



rhw10

# **The Delta Probe**

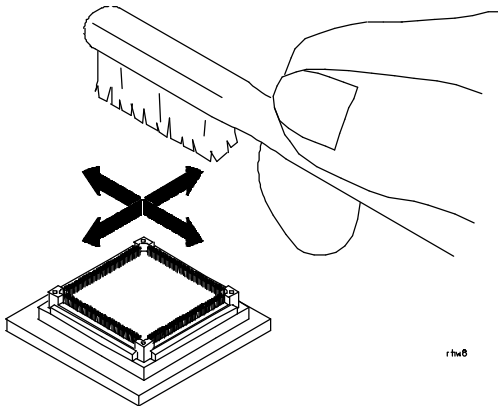
---

## Chapter 2

# Cleaning the Delta Probe

Clean the Delta Probe contacts before each installation. Debris on the contacts can interfere with its function.

- 1 Use a common toothbrush to remove any dust between the wedges. The individual wedges are engineered to be durable; nevertheless take appropriate care when brushing them to avoid damage.



- 2 Use precision dusting cleaner (also known as inert dusting gas or compressed air in a can) to remove debris loosened by the brushing.

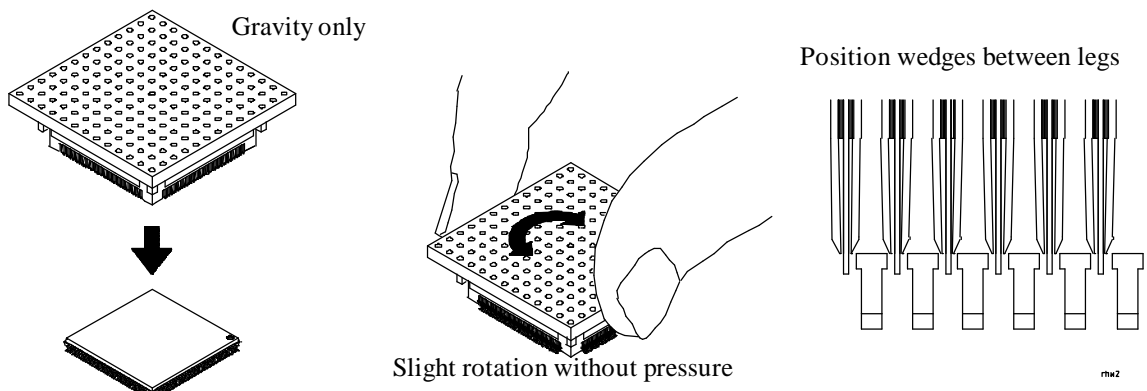
# Installing the Delta Probe

Extra care is required the first time you install the Delta Probe. Since the TQFP/PQFP package has not had previous intrusion between the legs, more force than usual is required during installation. This is due to the fact that there is excess solder from the plating process on the sides of the legs. Once the Delta Probe has been inserted on a TQFP/PQFP package far less force will be required.

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

- 1 Clean the Delta Probe as described above.
- 2 Allow the Delta Probe to seek its own alignment by resting it on the TQFP/PQFP package with no downward pressure applied.
- 3 Rotate the Delta Probe back and forth, to allow a tactile indication when the sharp tips of the wedges are correctly positioned between the legs of the TQFP/PQFP package.

**CAUTION** Installation of the Delta Probe with any improper alignment can result in damage to the TQFP/PQFP package legs and the Delta Probe itself. Avoid damage by ensuring proper positioning as shown below. If a transition board or flexible cable are attached to the Delta Probe during installation, the tactile response is diminished and greater care must be taken with initial positioning.

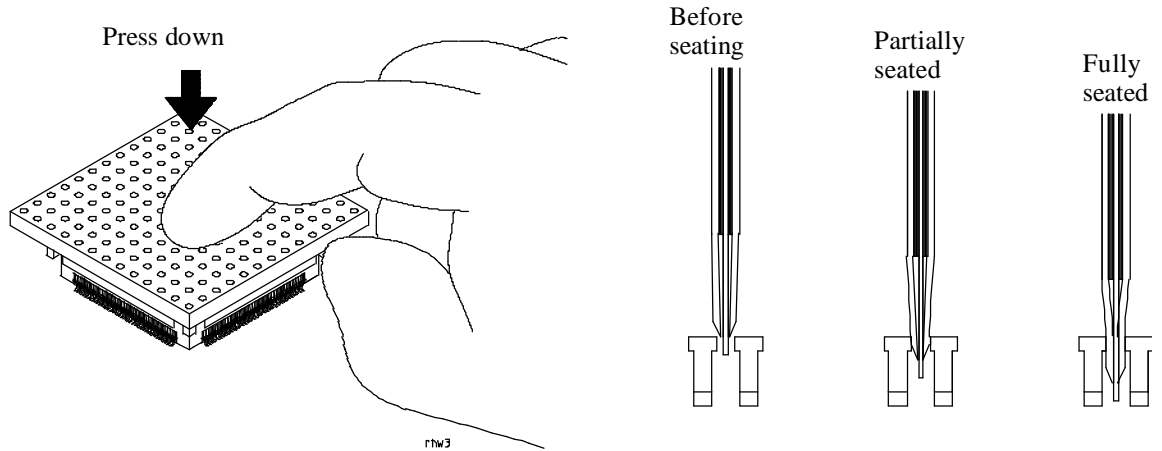


- 4 Apply a constant downward force after the wedges are centered between the legs.

Proper seating of the wedges is proportional to the width of the dam bar gap which is described in chapter 2 of this manual. The smaller the dam bar gap, the more downward force required. The forces required range from 10 to 20 pounds.

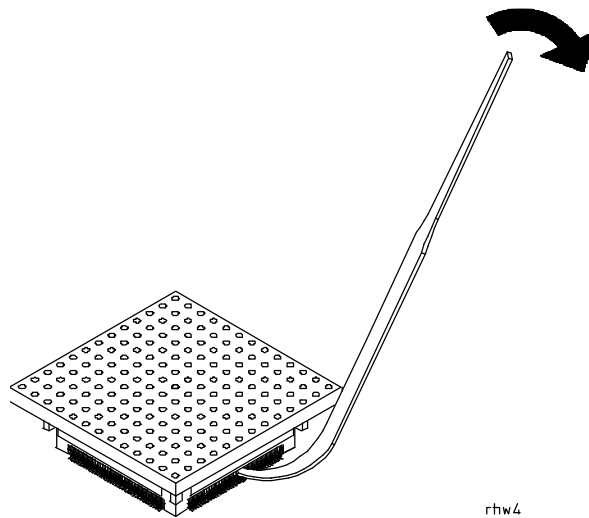
- 5 Apply additional downward pressure to ensure contact between each wedge and the adjacent legs of the TQFP/PQFP package.

Support under the board where the TQFP/PQFP package is located may be helpful when applying this downward force. See reference information for individual wedge contact area parameters.



## Removing the Delta Probe

### CAUTION



*Improper removal of the Delta Probe from the TQFP/PQFP package will result in damage to the legs of the TQFP/PQFP package.*

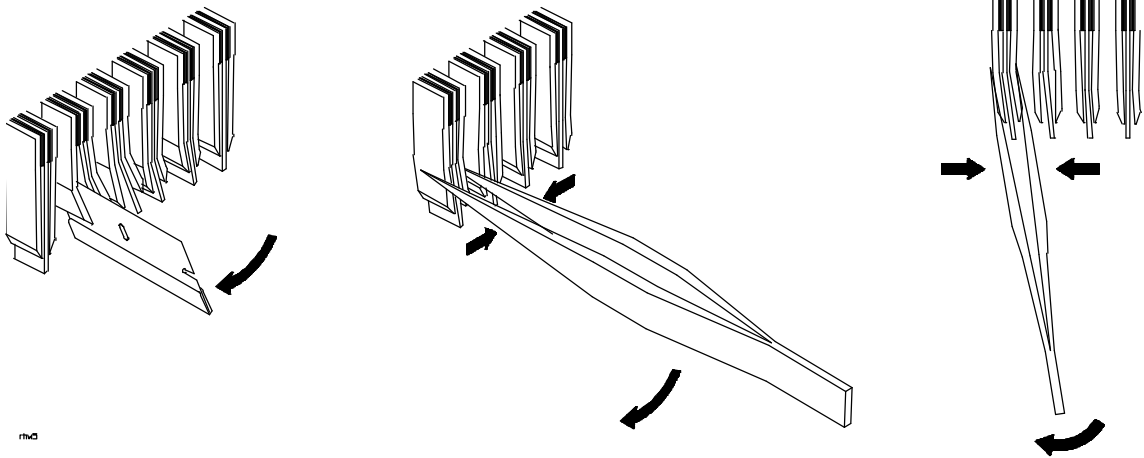
- 1 Place the extractor tool between the PC board and the bottom rail of the Delta Probe.
- 2 Pry up slightly on opposite sides of the Delta Probe to loosen it from your TQFP/PQFP package.
- 3 Repeat until you can lift the Delta Probe off of the part without damage to the legs of the TQFP/PQFP package.

# Repairing the Delta Probe

## Typical bent wedges

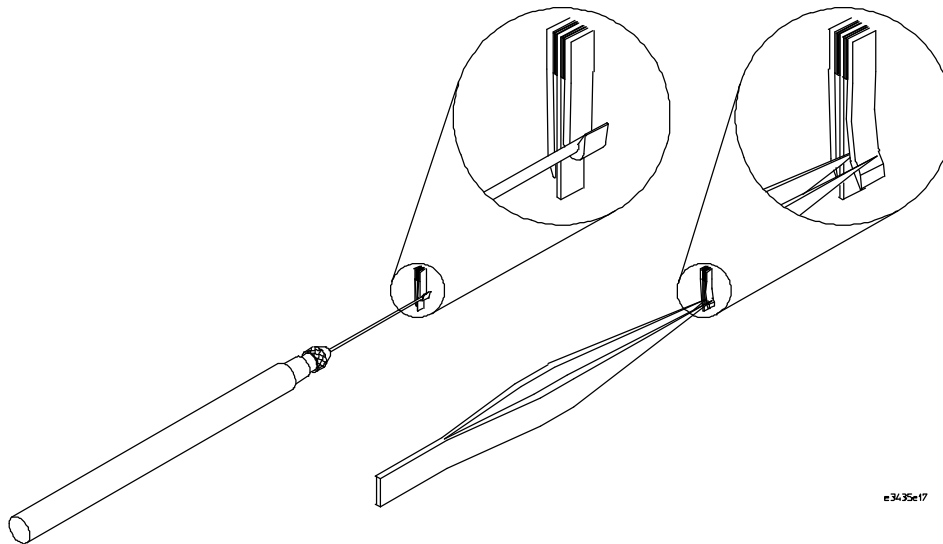
**WARNING** Possible injury. Exercise care when using any sharp tool.

- 1 Use a razor blade between the wedge conductors to straighten them as much as possible.
- 2 Repeat this on each bent wedge conductor.
- 3 Hold the wedge conductors tightly together with tweezers and flex to straighten each individual wedge.



## Severely bent wedges

- 1 Use a x20 or x40 microscope so you can see the bent wedge conductor. A magnifying glass is provided with each Delta Probe which may also be helpful.



- 2 Use a needle probe to bend the wedge conductor enough that you can get tweezers on it.
- 3 Gently straighten out wedge conductors using tweezers as illustrated above.

**NOTE** *Electrical connection 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 the Theory of Operation section in the Reference chapter of this document.

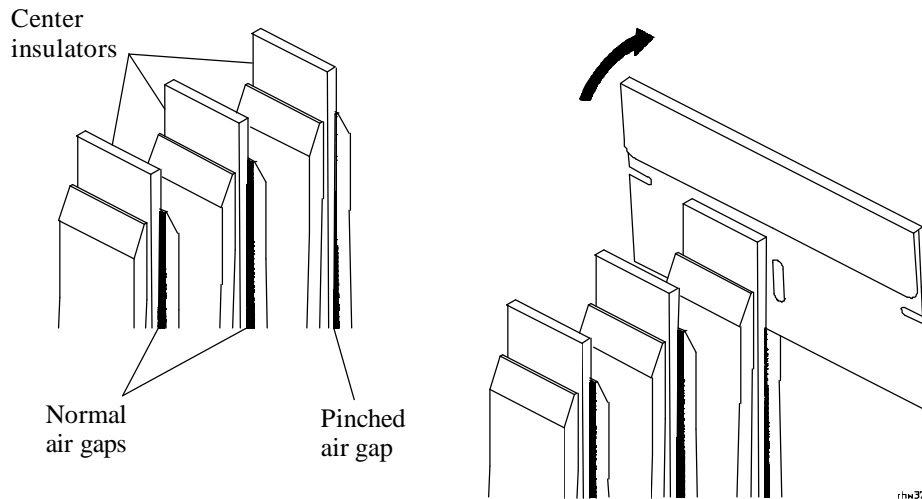
## Pinched air gap

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

- 1 Turn the Delta Probe so that the wedges are facing up.
- 2 Use a x20 or x40 microscope so you can see the pinched wedge.

**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.





# Applications

---

## Chapter 3

# Using the Delta Probe with Your Test Equipment

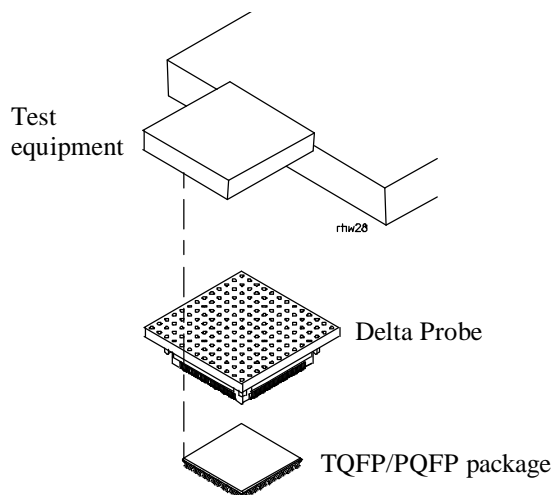
---

The Delta Probe is designed to allow you to connect your target device to instrumentation such as an analysis probe (or pre-processor), microprocessor emulator, or logic analyzer. This chapter shows you how to use accessories such as the cross flex cable, transition boards, flex cable extenders, and substitution clips to accomplish this.

## Direct Connection

---

You can design your test equipment with pin-outs that match the pin-outs of the Delta Probe and connect directly to it as shown. If you already have a pre-defined PGA pattern present on your test instrumentation then a transition board may be needed. For detailed information on how a custom transition board can be used to connect the Delta Probe to your existing test instruments contact JM Engineering.



# Generic Flex Cable

The 13x13 PGA sockets on both ends of the generic flex cable allow flexibility when target system components interfere with connecting to a Delta Probe. Both ends are identical. Pin 1 on one end is in the same position as pin 1 on the other end. This allows you to rotate the flex cable in any direction to avoid components on the target.

The generic flex cables work with Delta Probes for up to 144 pins. For example, you can connect to the 144-pin Delta Probe using a 13x13 male-to-male header or connect to the 100-pin, and 100-pin rectangular Delta Probes using an 11x11 male-to-male header. A pin-out map and other details on the generic flex cable can be found in chapter 4.

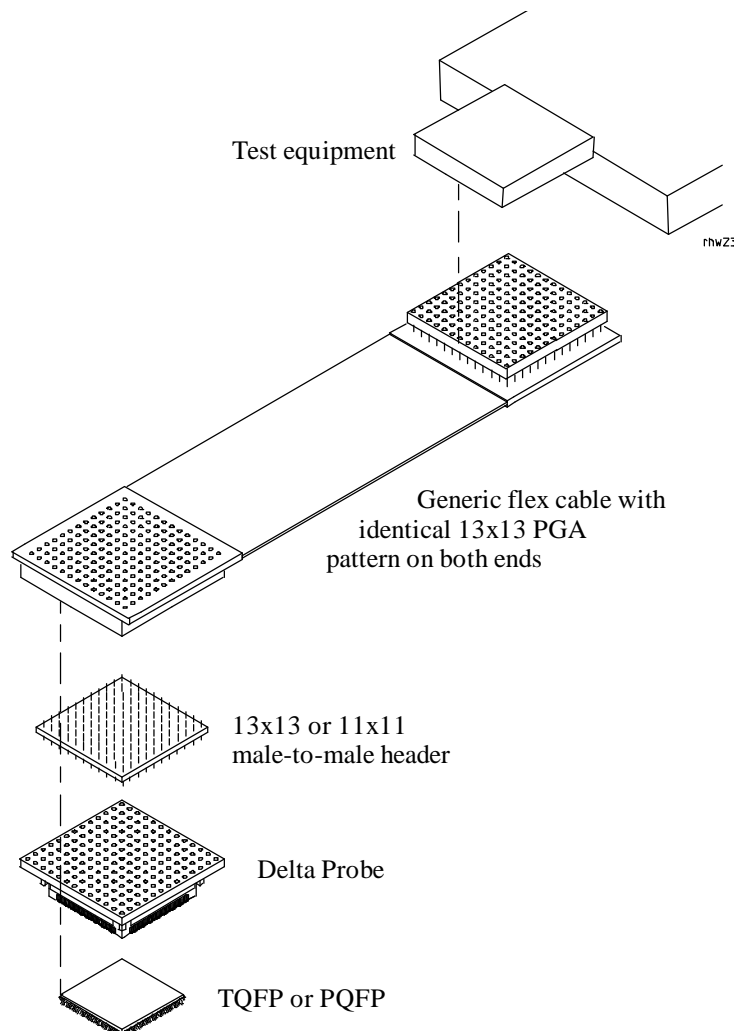
## Installing the generic flex cable

- 1 Power-off the emulator, logic analyzer, or other test equipment as well as the target system.
- 2 Follow the steps in chapter 2 to install the Delta Probe to the package.

### **CAUTION**

*To prevent pin damage and ensure proper connection, make sure the pins are aligned and seated correctly.*

- 4 Plug the male-to-male header into the top of the Delta Probe.  
If your male-to-male header is 11x11, center it in the 13x13 PGA pattern on the probe.
- 5 Plug the generic flex cable into the male-to-male header.  
If your male-to-male header is 11x11, center it in the 13x13 PGA pattern on the flex cable.
- 6 Connect your test equipment to the generic flex cable.



# Direct Use Transition Boards

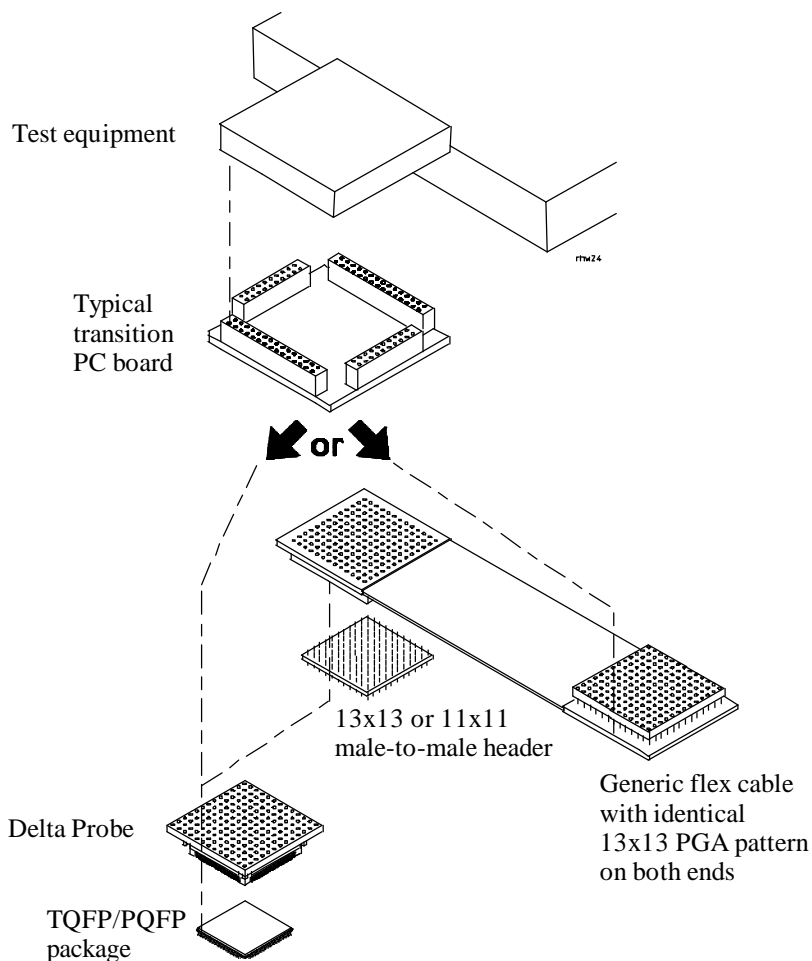
Direct use transition boards are designed to convert the pin-out of your test equipment to the pin-out of the Delta Probe. For detailed information on your transition board contact JM Engineering.

## Installing a transition board

- 1 Power-off the emulator, logic analyzer, or other test equipment as well as the target system.
- 2 Follow the steps in chapter 2 to install the Delta Probe to the package.

**CAUTION** To prevent pin damage and ensure proper connection, make sure the pins are aligned and seated correctly.

- 3 Plug the transition board directly into the Delta Probe or if components interfere with connection, use a generic flex cable and male-to-male header. See the previous page for installing the generic flex cable and male-to-male header.
- 4 Connect your test equipment to the transition board.

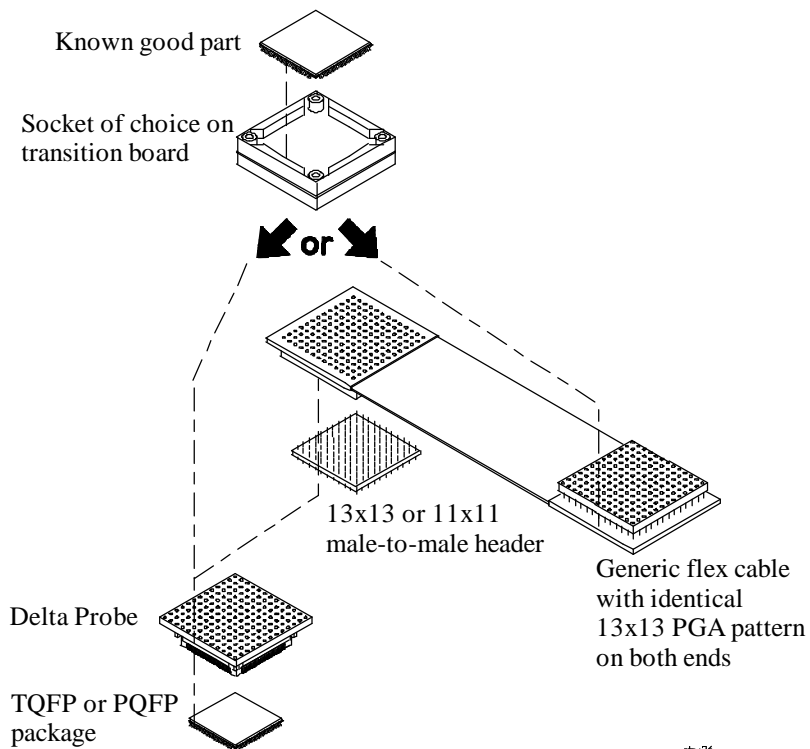


# Mounted Sockets

In this application a known good part is inserted in a socket of choice that has been mounted on a transition board. For detail information on your transition board contact JM Engineering.

## Installing the mounted socket

- 1 Power-off the emulator, logic analyzer, or other test equipment as well as the target system.
- 2 Follow the steps in chapter 2 to install the Delta Probe on the package.
- 3 Insert a known good part into the mounted socket.
- 4 Plug the mounted socket into the Delta Probe or if components interfere with connection, use a generic flex cable and male-to-male header. See the previous section on “Using the generic flex cable” to install the generic flex cable and male-to-male header.
- 5 Proceed with electrical analysis as required.



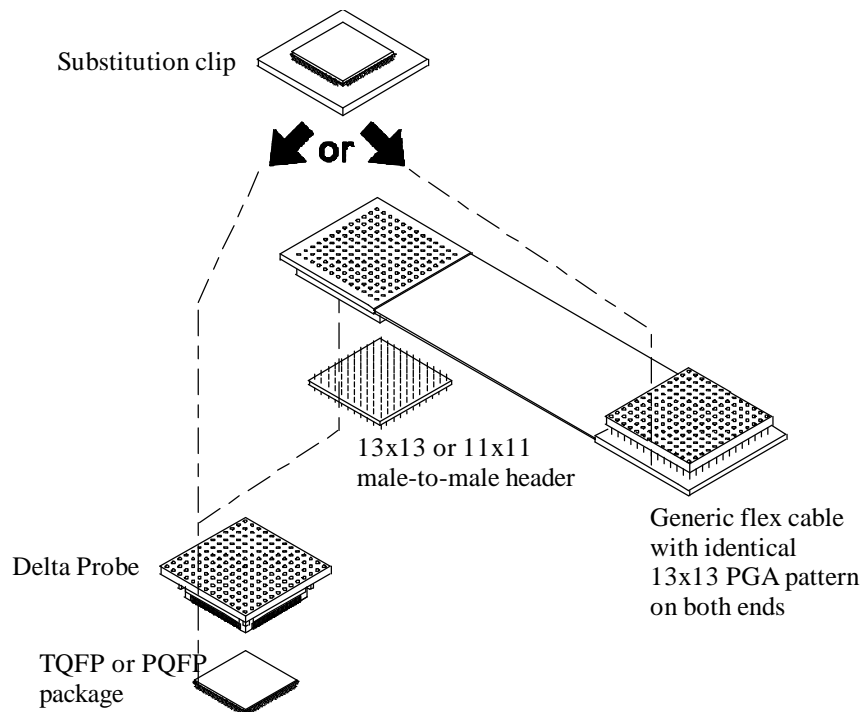
rhw26

# Substitution Clips

Substitution clips are transition boards which are ready for you to solder a known good part onto. For detail information on your transition board contact JM Engineering.

## Installing the substitution clip

- 1 Power-off the emulator, logic analyzer, or other test equipment as well as the target system.
- 2 Follow the steps in chapter 2 to install the Delta Probe to the package.
- 3 Solder a known good part onto the transition board to make the substitution clip.
- 4 Plug the substitution clip directly into the Delta Probe or if components interfere with connection, use a generic flex cable and male-to-male header. See the previous section on “Using the generic flex cable” to install the generic flex cable and male-to-male header.
- 4 Tristate the part in question.
- 5 Proceed with electrical analysis as required.



rhw27

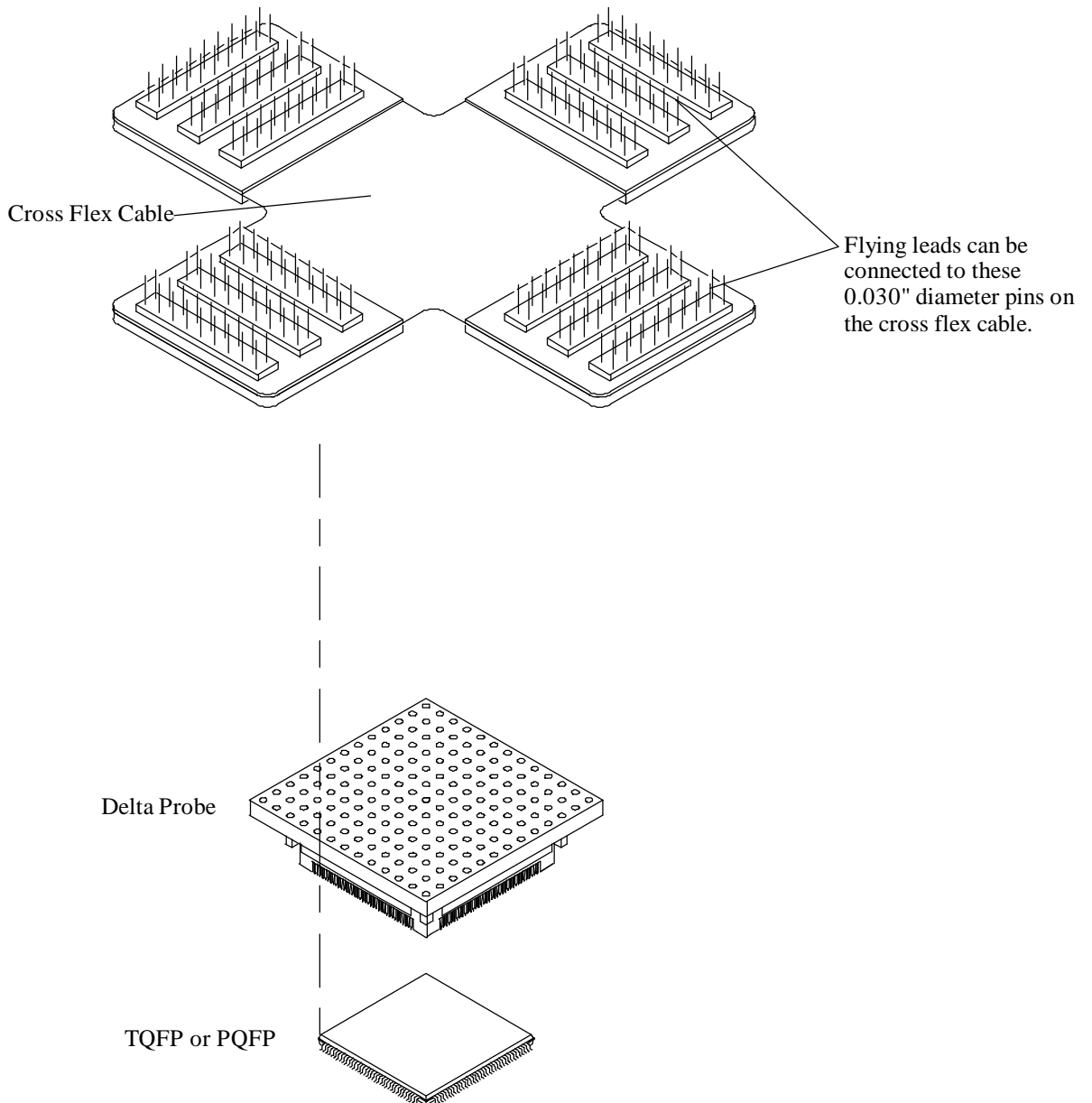
# Cross Flex Cables

The cross flex cable mates with the PGA sockets of the Delta Probe to provide access to all of the signals brought out by the Delta Probe. The cross flex cable provides a flexible mechanical interface while maintaining the electrical performance of the Delta Probe.

Refer to the pin-out maps and cross-reference tables in chapter 4 to identify pin numbers when using a cross flex cable.

## Installing the cross flex cables

- 1 Power-off the test equipment and the target system.
- 2 Follow the steps in chapter 2 to install the Delta Probe on the package.
- 3 Plug the cross flex cable into the sockets on top of the Delta Probe, similar to figure shown in the section on the generic flex cable.





# Reference Information

---

## Chapter 4

# Delta Probe Reference Information

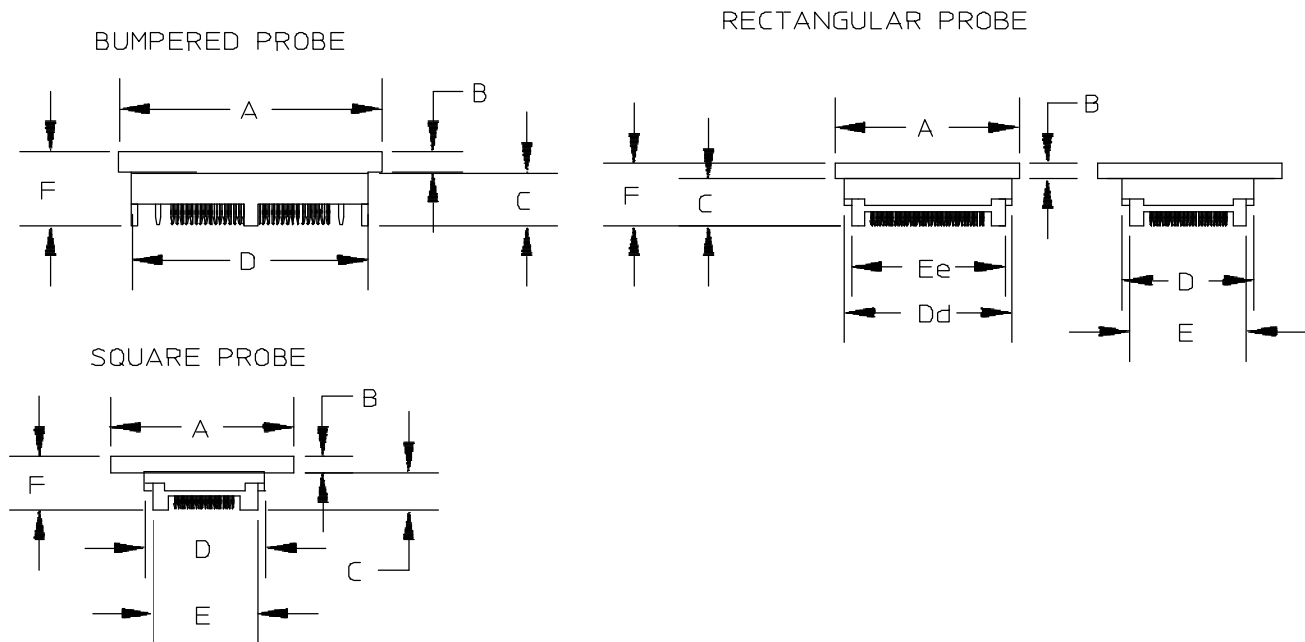
---

## Performance Characteristics of Delta Probes

Operating voltage	<40 V (dc + peak ac)
Operating current	0.5 amp maximum
Insulation resistance	> 100 M $\Omega$
Capacitance between contacts	2 pF (typical)
Self-inductance	15 nH (typical)
Operating bandwidth	dc - 600 MHz
Operating temperature	0 °C to 50 °C
Relative humidity	75% maximum

## Dimensions of Delta Probes

The Delta Probe does not require a keep-out area around the TQFP/PQFP package. Use the dimensions shown below to avoid mechanical interference on your PC board.

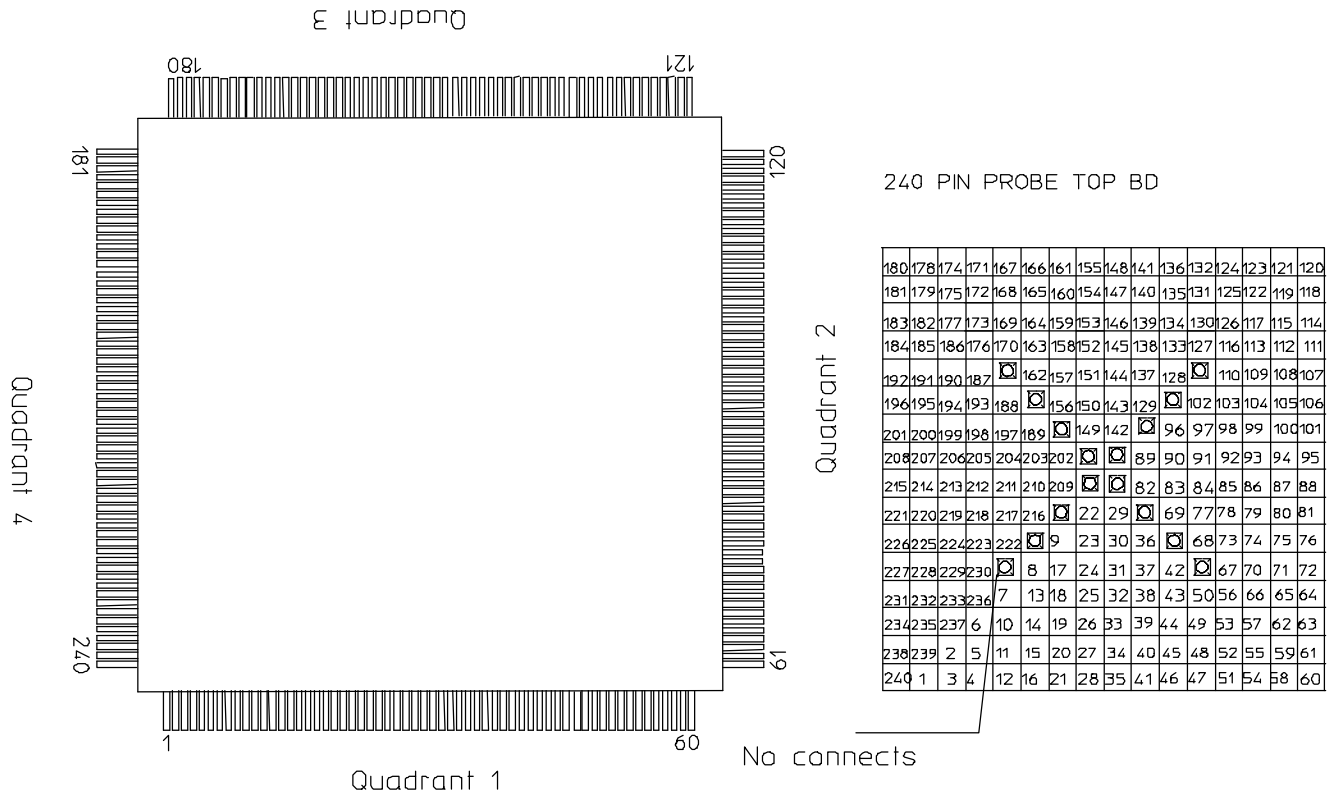


PART NUMBER	PROBE DESCRIPTION	A	B	C	D	Dd	E	Ee	F
8800-0001	100 PIN, .5mm, SQUARE	1.1	0.093	0.280	0.785	N/A	0.7	N/A	0.380
8800-0003	144 PIN, .5mm, SQUARE	1.3	0.093	0.280	1.035	N/A	0.935	N/A	0.380
8800-0032	208 PIN, .5mm, SQUARE	1.6	0.093	0.280	1.34	N/A	1.25	N/A	0.380
8800-0057	80 PIN, .5mm, SQUARE	1.1	0.093	0.280	0.72	N/A	0.62	N/A	0.380
8800-0067	240 PIN, .5mm, SQUARE	1.7	0.093	0.280	1.5	N/A	1.404	N/A	0.380
8800-0034	160 PIN, .65mm, SQUARE	1.6	0.093	0.280	1.34	N/A	1.25	N/A	0.380
8800-0055	120 PIN, .5mm, RECT.	1.3	0.093	0.280	0.788	1	0.695	0.93	0.380
8800-0033	128 PIN, .5mm, RECT.	1.3	0.093	0.280	0.788	1	0.695	0.93	0.380
8800-0011	100 PIN, .65mm, RECT.	1.1	0.093	0.280	0.788	1	0.695	0.93	0.380
8800-0029	132 PIN, .635mm, BUMPERED	1.4	0.093	N/A	1.3	N/A	N/A	N/A	0.390

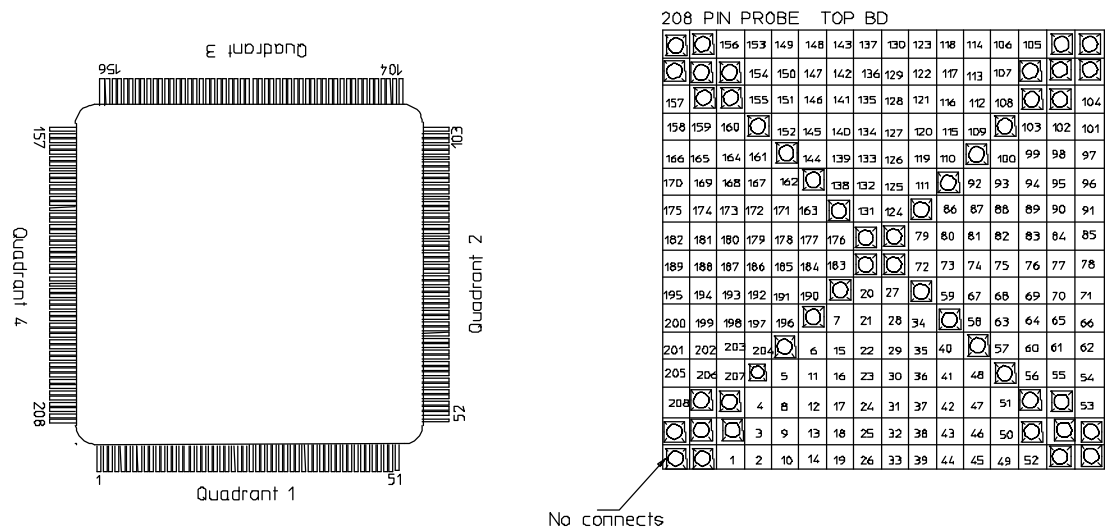
# Pin-out maps of Delta Probes

All quadrants of the Delta Probe are identical, allowing you to install it in any direction.

## 240-pin 0.5 mm PQFP package and Delta Probe PGA pattern

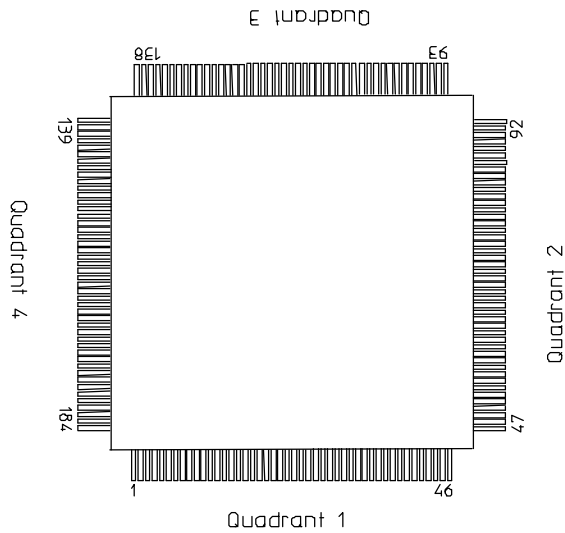


## 208-pin 0.5 mm PQFP package and Delta Probe PGA pattern



### 184-pin 0.65 mm PQFP package and Delta Probe PGA pattern.

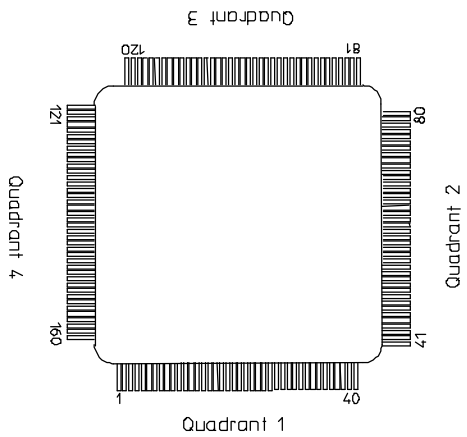
This probe is designed specifically to interface to a Tektronics PGA pinout.



184 PIN 65mm TEKTRONICS PROBE

50	47	44	39	38	36	34	30	29	26	15	14	13	11	5	6	2
53	43	40	41	37	35	31	27	22	21	12	10	7	4	3	184	183
57	49	48	45	42	33	32	28	24	23	19	18	17	9	8	1	181
61	52	51													180	179
63	60	54													177	176
64	59	58													172	171
66	62	55													175	169
70	65	56													174	165
71	67	68													162	164
74	73	69													161	159
76	72	81													149	158
77	75	79													153	155
80	78	83													150	152
82	87	89													145	148
86	84	92													142	146
90	88	96	99	94	95	100	108	109	121	122	130	135	136	134	138	143
93	85	101	98	102	105	107	111	112	115	118	124	125	128	129	137	140
97	103	104	106	110	113	114	116	117	119	120	123	126	127	129	131	133

### 160-pin 0.65 mm PQFP package and Delta Probe PGA pattern

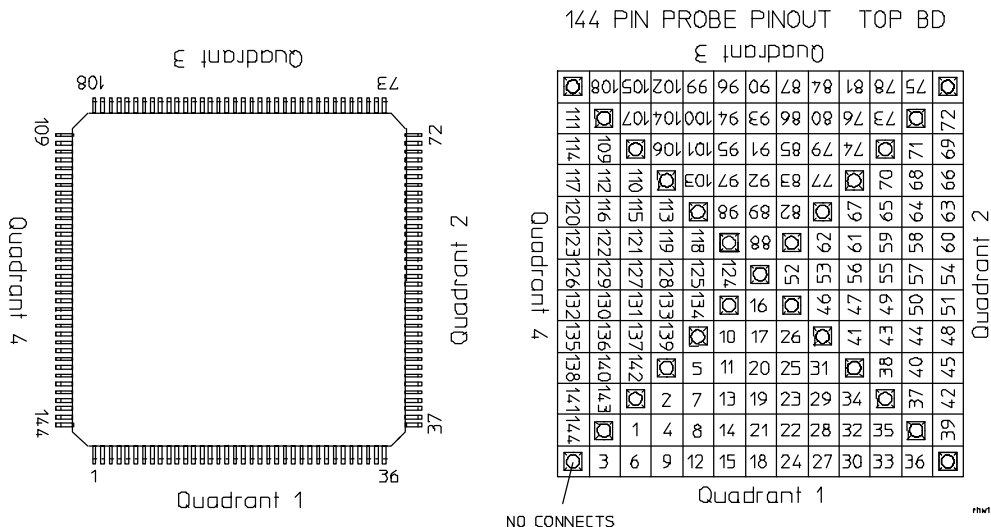


160 PIN PROBE TOP BOARD

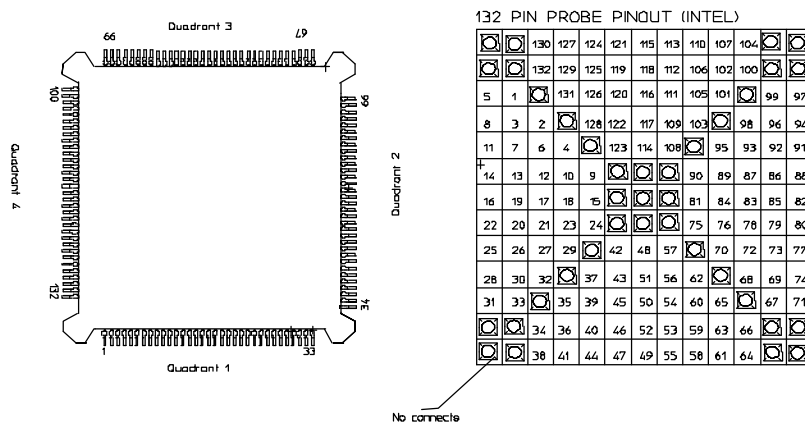
120	118	115	111	107	100	94	90	86	83	81						
119	116	112	108	101	95	89	85	82								
121		117	113	109	102	96	88	84								80
123	122		114	106	103	97	87								79	78
126	125	124		110	105	99	93	91						77	76	75
130	129	128	127	131		104	98	92		70	74	73	72	71		
134	135	136	137	133	132				64	65	66	69	68	67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

No connect

**144-pin 0.5 mm PQFP package and Delta Probe PGA pattern**

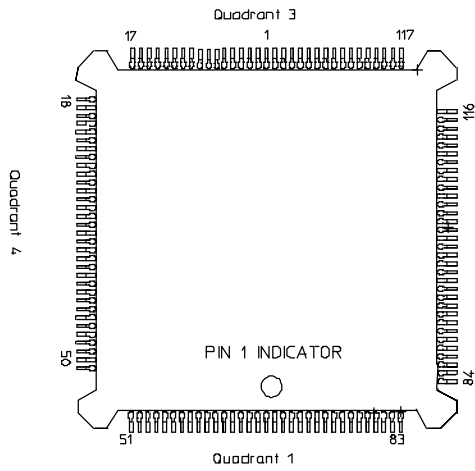


**132-pin 0.635 mm Intel BQFP package and Delta Probe PGA pattern**



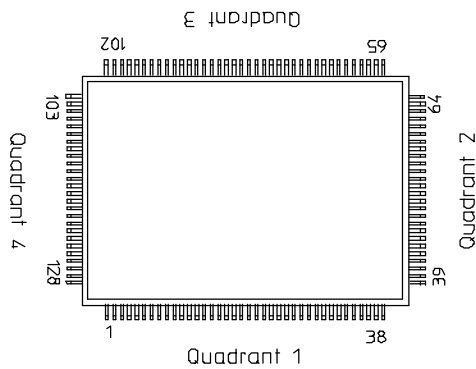
### 132-pin 0.635 mm Motorola BQFP package and Delta Probe PGA pattern

132 PIN PROBE PINOUT (MOTOROLA)



N/C	N/C	15	12	9	6	132	130	127	124	121	N/C	N/C
N/C		17	14	10	4	3	129	123	119	117		N/C
22	18		16	11	5	1	128	122	118		116	114
25	20	19		13	7	2	126	120		115	113	111
28	24	23	21		8	131	125		112	110	109	108
31	30	29	27	26		N/C		107	106	104	103	105
33	36	34	35	32	N/C		N/C	98	101	100	102	99
39	37	38	40	41		N/C		92	93	95	96	97
42	43	44	46		59	65	74		87	89	90	94
45	47	49		54	60	68	73	79		85	86	91
48	50		52	56	62	67	71	77	82		84	88
N/C		51	53	57	63	69	70	76	80	83		N/C
N/C	N/C	55	58	61	64	66	72	75	78	81	N/C	N/C

### 128-pin 0.5 mm TQFP rectangular package and Delta Probe PGA pattern

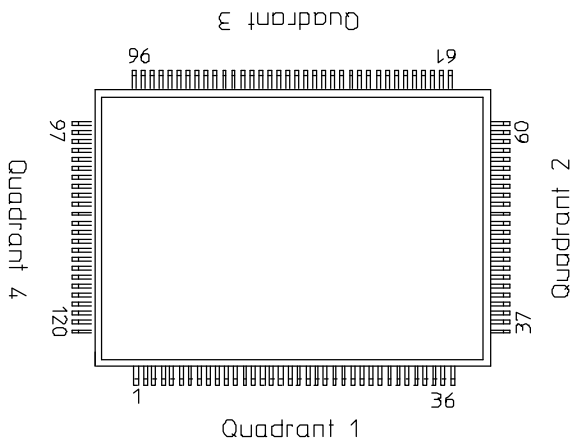


128 PIN PROBE PINOUT TOP BD

95	92	89	86	80	77	74	71	68				
94	90	84	83	76	70	66						
100	96	91	85	81	75	69	65			63		
103	98	97	93	87	82	73	67		64	62	60	
106	102	101	99	88	79	72		61	59	58	57	
109	108	107	105	104	78		56	55	53	52	54	
112	115	113	114	111	110	46	47	50	49	51	48	
118	116	117	119	120	14		40	41	43	44	45	
121	122	123	125	8	15	24		35	37	38	42	
124	126	128		3	9	18	23	29		33	34	39
127			1	5	11	17	21	27	32			36
			2	6	12	19	20	26	30			
			4	7	10	13	16	22	25	28	31	

No connects

**120-pin 0.5 mm TQFP rectangular package and Delta Probe PGA pattern**

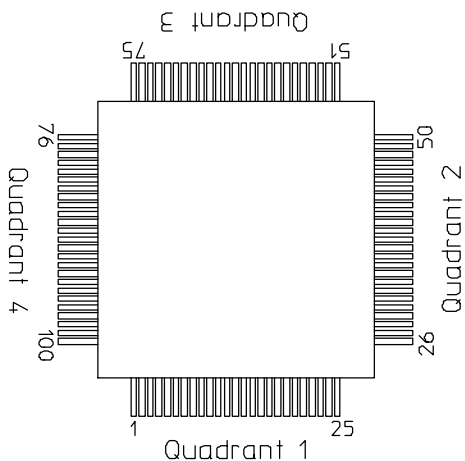


120 PIN PROBE PINOUT TOP BD

95	92	89	86	80	77	74	71	68		
94	90	84	83	76	70	66				
100	96	91	85	81	75	69				63
98	97	93	87	82	73	67				62
106	101	99	88	79	72	61	59	58	57	
109	108	107	105	104	78	56	55	53	52	54
112	115	113	114	111	110	46	47	50	49	48
118	116	117	119	120	14	40	41	43	44	45
121	122	123	125	8	15	24	35	37		42
124	126	3	9	18	23	29	33	34		
127	5	11	17	21	27	32				36
	2	6	12	19	20	26	30			
	4	7	10	13	16	22	25	28	31	

No connects

**100-pin 0.5 mm PQFP package and Delta Probe PGA pattern**



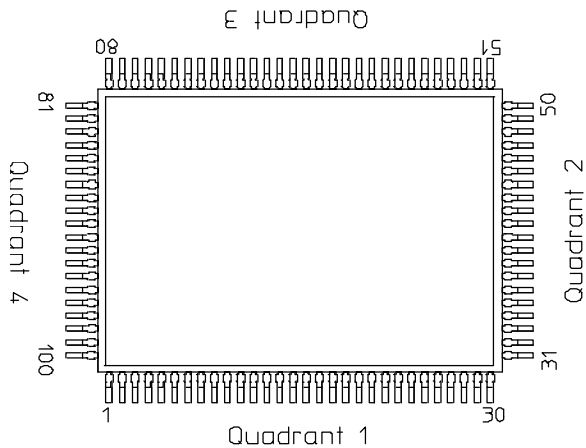
100 PIN PROBE PINOUT TOP BD

75	74	72	69	65	60	56	54	51		
76	73	71	68	64	59	55	52			50
79	77	70	67	63	58	53	48	47		49
81	80	78	66	62	57	54	47	47		47
85	84	83	82	61	57	47	37	36	35	40
90	89	88	87	86	96	38	38	36	35	40
94	96	92	91	11	11	32	33	30	31	35
97	96	95	7	12	16	28	27	27	29	29
99	86	98	3	8	13	17	20			26
100	2	5	9	14	18	21	23			26
	1	4	6	10	15	19	22	24	25	

NO CONNECTS

THW12

### 100-pin 0.65 mm PQFP rectangular package and Delta Probe PGA pattern



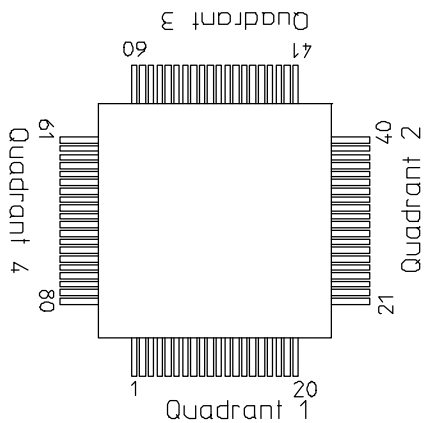
100 PIN PROBE PINOUT TOP BD

75	74	73	72	69	65	60	56	54	51	50
76	77	78	70	68	67	63	58	53	48	47
81	80	83	82	83	82	87	86	85	84	81
85	84	89	88	92	91	11	16	33	38	43
90	91	93	92	91	91	11	16	33	38	43
96	97	96	95	95	95	7	12	28	30	31
99	98	3	8	13	17	20	23	27	29	29
100	2	5	9	14	18	21	23	26	26	26
1	4	6	10	15	19	22	24	25	25	25

NO CONNECTS

rw13

### 80-pin 0.5 mm TQFP package and Delta Probe PGA pattern



80 PIN PROBE PINOUT TOP BD

60	59	56	52	48	47	47	42	40	40
62	63	61	61	57	54	50	46	41	40
67	67	66	65	69	70	74	73	69	68
72	71	71	75	74	74	77	73	70	70
76	75	74	73	73	73	73	73	73	73
79	77	77	77	77	77	77	77	77	77
80	1	6	10	14	17	17	22	22	22
81	3	7	11	15	18	18	23	23	23
82	2	4	8	12	16	19	20	22	22

NO CONNECTS

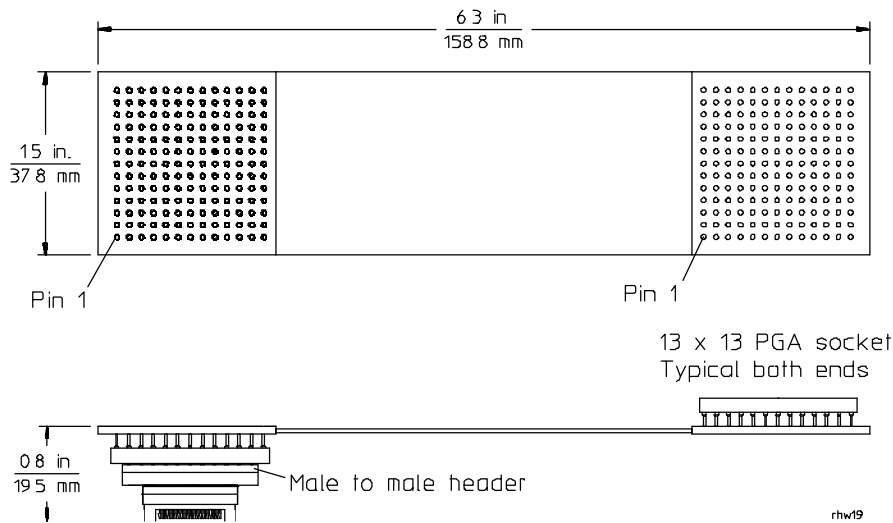
# Generic Flex Cable Reference Information

## Electrical characteristics of the generic flex cable

Signal loading in addition to emulator or preprocessor load	12 pF
Typical operating frequency	20 MHz

## Dimensions of the generic flex cable

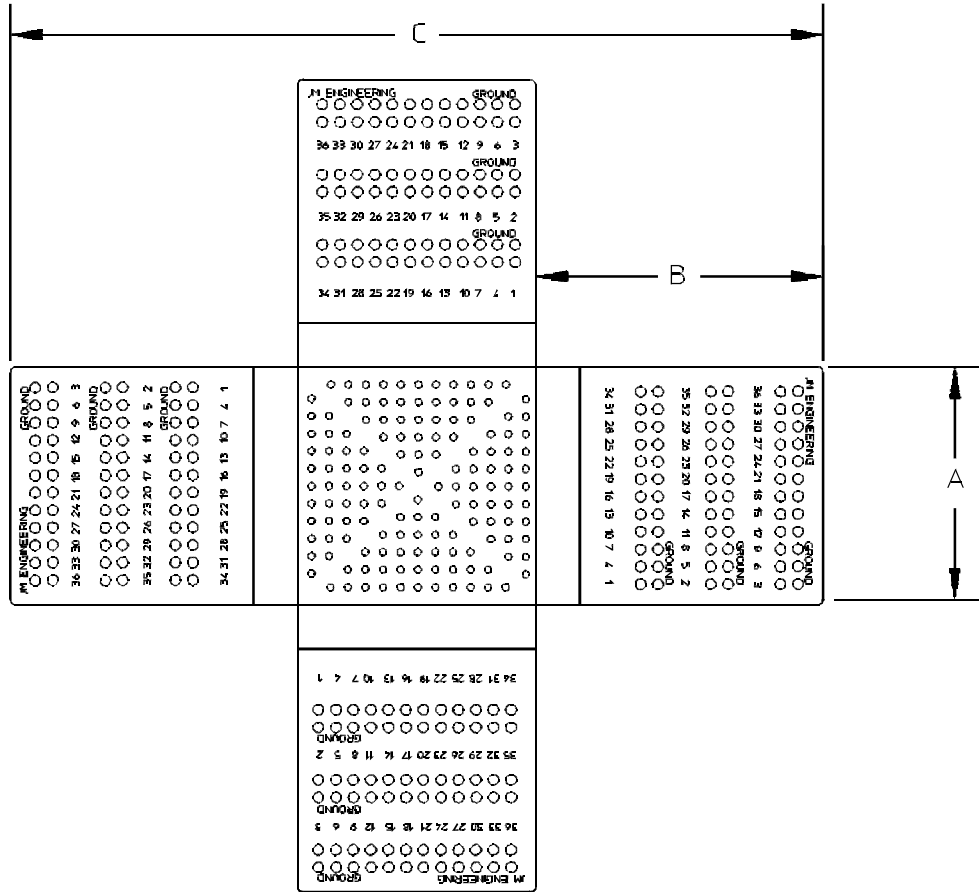
The following dimensions show the generic flex cable installed on the Delta Probe. The generic flex cable works with Delta Probes designed for 144 pin or smaller packages. Both ends are identical so pin 1 on one end is in the same position as pin 1 on the other end.



# Cross Flex Cable Reference Information

## Dimensions of the Cross flex cable

The following dimensions show the cross flex cable. There are four different sizes of cross flex cable that cover all of the available Delta Probes. At the bottom of the page is a table which provides the dimensions for the different models of the cross flex cable.

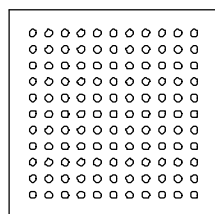
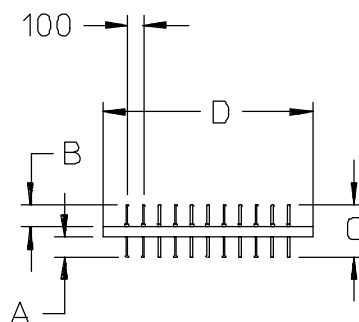


PART NUMBER	CROSSFLEX DESCRIPTION	A	B	C
8800-0056	11X11 CROSS FLEX, 80 PIN	1.1	1.6	4.3
8800-0040	11X11 CROSS FLEX, 100 PIN	1.1	1.6	4.3
8800-0048	13X13 CROSS FLEX, 128 PIN	1.3	1.575	4.35
8800-0030	13X13 CROSS FLEX, 132 PIN	1.3	1.575	4.35
8800-0047	13X13 CROSS FLEX, 144 PIN	1.3	1.575	4.35
8800-0052	15X15 CROSS FLEX, 160 PIN	1.7	1.45	4.6
8800-0050	15X15 CROSS FLEX, 184 PIN	1.7	1.45	4.6
8800-0053	16X16 CROSS FLEX, 208 PIN	2.1	1.45	5
8800-0068	16X16 CROSS FLEX, 240 PIN	2.1	1.45	5

# Double Header Reference Information

## Dimensions of the Double Headers

The following diagram and table provide dimensions for the double headers. The dimensions shown are specific to the height parameters defined by the pin length and circuit board width. Double headers are available with either 0.018" diameter pins on each side or 0.018" diameter pins on one side and 0.030" diameter pins on the other side (for flying lead applications).



MALE TO MALE HEADERS ARE AVAILABLE IN 11 X 11, 13 X 13, 15 X 15 AND 16 X 16 VERSIONS.

PART NUMBER	HEADER DESCRIPTION	A	B	C	D
8800-0044	HEADER, DOUBLE, 11X11, .018" - .030" PIN DIA	0.125	0.217	0.524	1.2
8800-0015	HEADER, DOUBLE, 11X11, .018" PIN DIA	0.125	0.14	0.325	1.2
8800-0013	HEADER, DOUBLE, 13X13, .018" PIN DIA	0.125	0.14	0.325	1.4
8800-0036	HEADER, DOUBLE, 13X13, .018" - .030" PIN DIA	0.125	0.217	0.524	1.4
8800-0043	HEADER, DOUBLE, 15X15, .018" - .030" PIN DIA	0.125	0.217	0.524	1.6
8800-0042	HEADER, DOUBLE, 15X15, .018" PIN DIA	0.125	0.14	0.325	1.6
8800-0046	HEADER, DOUBLE, 16X16, .018" - .030" PIN DIA	0.125	0.217	0.524	1.7
8800-0045	HEADER, DOUBLE, 16X16, .018" PIN DIA	0.125	0.14	0.325	1.7

# Glossary of Terms

---

PGA = pin grid array

IC = integrated circuit

TQFP = thin quad flat pack

PQFP = plastic quad flat pack

CQFP = ceramic quad flat pack

BQFP = bumpered quad flat pack

# Parts List

---

## **Delta Probes**

240-pin PQFP 0.5 mm	8800-0067
208-pin PQFP 0.5mm	8800-0032
184-pin PQFP 0.65 mm	8800-0066
160-pin PQFP 0.65 mm	8800-0034
144-pin PQFP 0.5 mm	8800-0003
132-pin PQFP 0.635 mm	8800-0029
128-pin TQFP 0.5 mm rectangular	8800-0033
120-pin TQFP 0.5 mm rectangular	8800-0055
100-pin TQFP 0.5 mm	8800-0001
100-pin PQFP 0.65 mm rectangular	8800-0011
80-pin TQFP 0.5 mm	8800-0057

## **JM Engineering Part Number**

## **Quarter Flex Cables**

144-pin quarter flex cable	8800-0004
100-pin quarter flex cable	8800-0002

## **JM Engineering Part Number**

## **Generic Flex Cables**

13 x 13 PGA	8800-0005
-------------	-----------

## **JM Engineering Part Number**

## **Cross Flex Cables**

80-pin	8800-0056
100-pin	8800-0040
128-pin	8800-0048
132-pin	8800-0030
144-pin	8800-0047
160-pin	8800-0052
184-pin	8800-0050
208-pin	8800-0053
240-pin	8800-0068

## **JM Engineering Part Number**

## **Double Headers for Connectivity**

11 x 11 0.018" diameter pins	8800-0015
13 x 13 0.018 diameter pins	8800-0013
15 x 15 0.018 diameter pins	8800-0042
16 x 16 0.018" diameter pins	8800-0045

## **JM Engineering Part Number**

## **Double Headers for Flying Leads**

11 x 11 0.018" - 0.030" diameter pins	8800-0044
13 x 13 0.018" to 0.030" diameter pins	8800-0036
15 x 15 0.018" to 0.030" diameter pins	8800-0043
16 x 16 0.018" to 0.030" diameter pins	8800-0046

## **JM Engineering part Number**

---

## INDEX

---

- 100-pin TQFP
  - pin-out map 4-4 4-8
- 120-pin rectangular TQFP
  - pin-out map 4-8
- 128-pin TQFP
  - pin-out map 4-6
- 132-pin PQFP
  - pin-out map 4-6
- 144-pin PQFP
  - pin-out map 4-6
- 160-pin PQFP
  - pin-out map 4-5
- 184-pin PQFP
  - pin-out map 4-5
- 208-pin PQFP
  - pin-out map 4-4
- 240-pin PQFP
  - pin-out map 4-4
- 80-pin TQFP
  - pin-out map 4-9
  
- A**
  - air gap 1-3
  
- B**
  - bandwidth
    - Delta Probe 4-2
  - bent wedge repair 2-4
  
- C**
  - capacitance
    - Delta Probe 4-2
  - Cautions
    - damage to electronic components 2-2
    - damage to the TQFP 2-2 - 2-3
    - prevent pin damage 3-3 - 3-4
  - ceramic IC 4-2
  - characteristics
    - generic flex cable 4-10
    - of the probe 4-2
  - cleaning the probe 2-2
  - concepts of the Delta probe 1-3
  - conductors 1-3
  - connecting
    - preprocessor to the DUT 3-4
  - contact points 1-4
  - Cross Flex
    - Dimensions 4-11
    - Reference 4-11
  - Cross Flex Cables
    - installing 3-7
    - use of the 3-7
  - current
    - Delta Probe 4-2
  
- D**
  - dam bar gap 1-5
  - dam bars 1-5
  - damaged probe 2-4
  - dimensions
    - Delta Probe 4-3
    - generic flex cable 4-10
  - Double Header
    - Dimensions 4-12
  
- E**
  - electrical characteristics
    - Delta Probe 4-2
  - extractor tool 2-3
  
- G**
  - generic flex adapter
    - description and use 3-3
  - generic flex cable
    - characteristics 4-10
    - dimensions 4-10
    - installation 3-3
  - glossary of terms 4-13
  
- H**
  - How the Delta Probe works 1-3
  - humidity
    - Delta probe 4-2
  
- I**
  - IC packages supported 1-6
  - IC parameters 1-5 - 1-6
  - installation
    - Delta Probe 2-2
    - Delta Probe 2-2 ii-ii
    - generic flex cable 3-3
    - substitution clips 3-6
    - transition boards 3-4
  - installing
    - mounted sockets 3-5
  - insulation resistance
    - Delta Probe 4-2
  - insulator 1-3
  
- K**
  - keep-out area 4-3
  
- L**
  - leg height 1-5
  - leg spacing 1-5
  
- M**
  - making contact 1-3, 2-3
  - mounted sockets
    - installing 3-5
  
- O**
  - operating bandwidth
    - Delta Probe 4-2
  - operating current
    - Delta Probe 4-2
  - operating frequency
    - generic flex cable 4-10
  - operating temperature
    - Delta Probe 4-2
  - operating voltage
    - Delta Probe 4-2
  
- P**
  - parameters 1-5
    - of an individual wedge 4-2
  - parts list 4-14
  - performance characteristics
    - Delta Probe 4-2
    - generic flex cable 4-10
  - PGA, defined 4-13
  - pin-out maps
    - 100-pin TQFP 4-4 4-8
    - 128-pin rectangular TQFP 4-8
    - 128-pin TQFP 4-6
    - 132-pin PQFP 4-7 4-6
    - 144-pin PQFP 4-6
    - 160-pin PQFP 4-5
    - 184-pin PQFP 4-5

# Index

---

208-pin PQFP 4-4  
240-pin PQFP 4-4  
80-pin TQFP 4-9

Delta Probe 4-4  
plastic IC 4-2  
preprocessor  
connecting to the DUT 3-4

## R

relative humidity  
Delta Probe 4-2  
removing debris from the probe 2-2  
removing the probe 2-3  
repairing the probe 2-4  
resistance  
Delta Probe 4-2

## S

seating of probe wedges 2-3  
seating sequence 2-3  
self-inductance  
Delta Probe 4-2  
signal loading  
generic flex cable 4-10  
substitution clips  
installing 3-6  
supported devices 1-6  
supported IC packages 1-6  
supported ICs 1-5  
surface-mounted devices 4-2

## T

temperature  
Delta Probe 4-2  
theory of operation 1-3  
TQFP, dam bars 1-5  
transition PC boards  
description and use 3-4  
installation 3-4

## V

voltage  
Delta Probe 4-2

## W

Warnings  
possible injury 2-4 - 2-5  
wedge parameters  
Delta Probe 4-2

Second Edition  
September 1998

---