

Keysight U1818A/B Active Differential Probe



Operating and
Service Manual

Notices

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	The CE mark shows that the product complies with all the relevant European Legal Directives.	ISM GRP.1 CLASS A	This symbol indicates that this is an Industrial Scientific and Medical Group 1 Class A product.
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This instrument complies with the WEEE Directive marking requirement. This affixed product label indicates that you must not discard this electrical or electronic product in domestic household waste.

Product category:

With reference to the equipment types in the WEEE directive Annex 1, this instrument is classified as a “Monitoring and Control Instrument” product.

The affixed product label is as shown below.



Do not dispose in domestic household waste.

To return this unwanted instrument, contact your nearest Keysight Service Center, or visit <http://about.keysight.com/en/companyinfo/environment/takeback.shtml> for more information.

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To contact Keysight for sales and technical support, refer to the support links on the following Keysight websites:

- www.keysight.com/find/mta
(product-specific information and support, software and documentation updates)
- www.keysight.com/find/assist
(worldwide contact information for repair and service)

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Keysight U1818A/B Active Differential Probe
Operating and Service Manual

1 Introduction

Product Overview 10

This chapter provides you the overview of Keysight U1818A/B active differential probe.

Product Overview

The Keysight U1818A/B active differential probes provides high differential input impedance from 100kHz to 7 or 12GHz. The new probes are designed to be directly compatible with Keysight's network, spectrum and signal source analyzers. The U1818A/B probes provide high-frequency probing solution for R&D and quality assurance engineers performing RF/Microwave and high-speed digital design and validation in the wireline, wireless communications and aerospace/defence industries.



Figure 1-1 Keysight U1818A/B active differential probe

Key features of Keysight U1818A/B active differential probes

- Broad bandwidth with flat frequency response, $\pm 1.5\text{dB}$, which ensures excellent measurement accuracy and helps users achieve the best product specifications
- Low noise floor, less than -130dBm/Hz at 10MHz to 12GHz, which allows measurements to be made at a low signal amplitude
- Convenient biasing from Keysight's RF and microwave instruments probe power port or bench top power supply for user flexibility

Options

There are two DC power supply cable options available for Keysight U1818A/B.

- Option 001 - Power probe bias cable
- Option 002 - Banana plug cable

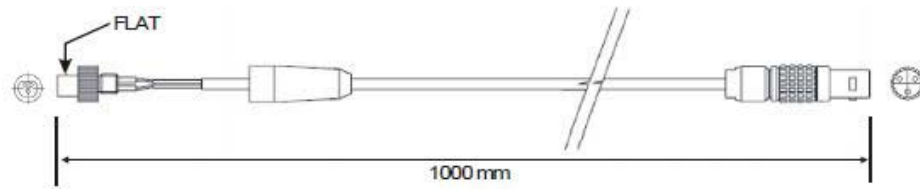


Figure 1-2 Power probe bias cable

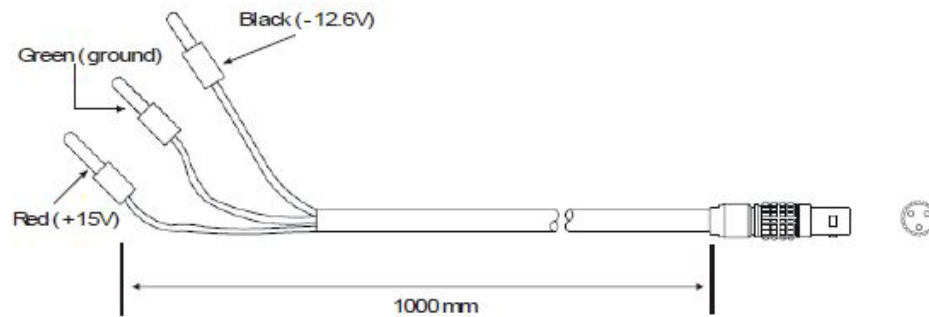


Figure 1-3 Banana plug cable

There are five probe head options available for Keysight U1818A/B. Probe head will not be included unless probe head option is chosen.

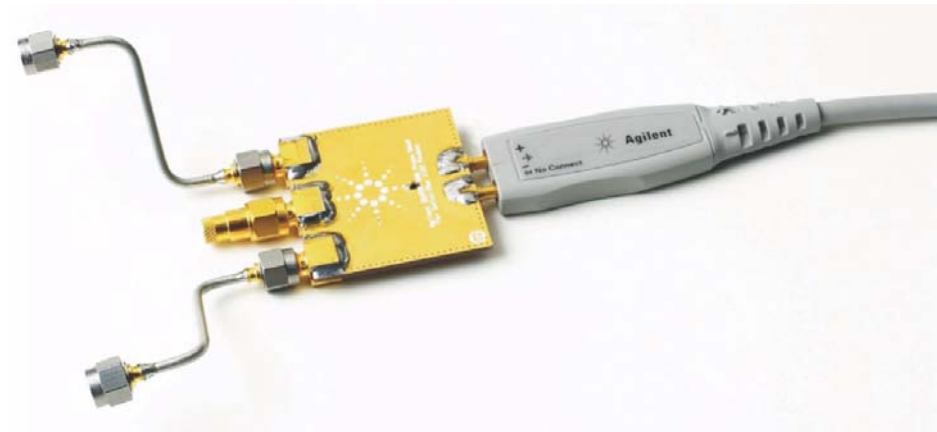


Figure 1-4 E2695A differential SMA probe head for InfiniiMax probe

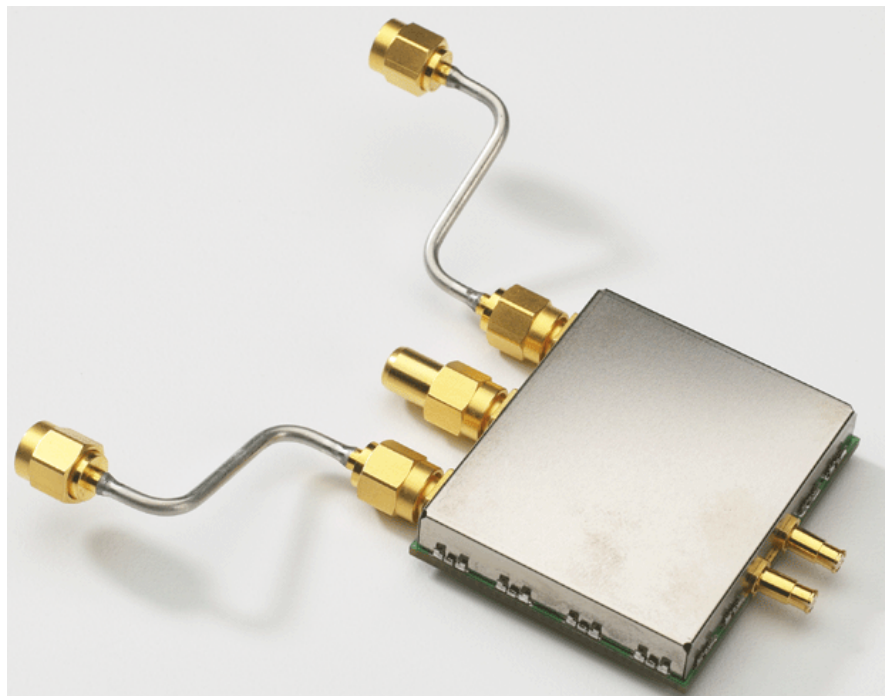


Figure 1-5 N5380A InfiniiMax II 12GHz differential SMA adapter



Figure 1-6 N5381A 12GHz InfiniiMax differential solder-in probe head and accessories



Figure 1-7 N5382A InfiniiMax II 12GHz differential browser

1 Introduction

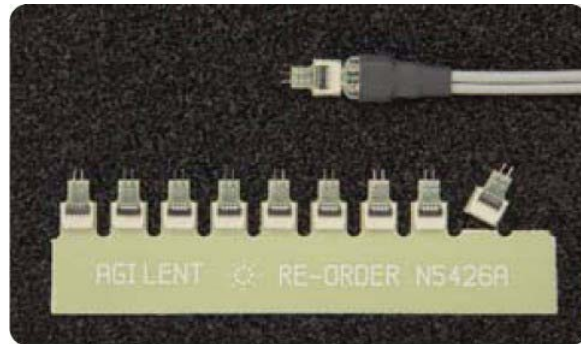


Figure 1-8 N5425B 12GHz InfiniiMax ZIF solder-in probe head

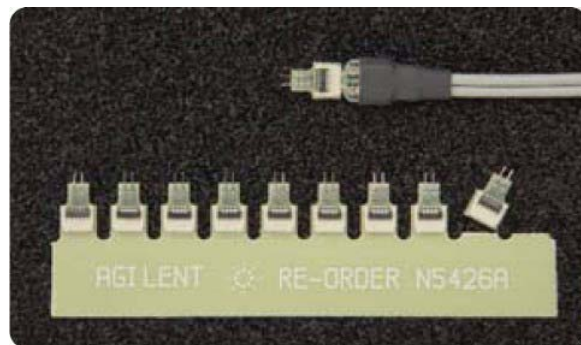


Figure 1-9 N5426A 12GHz InfiniiMax ZIF Tip - kit of 10

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This chapter provides you the operating instructions, service information and handling guide.

Operating Instructions

To power up the probe, user can either use power probe cable or banana plug cable. When the probe is ON, you will see the green LED will lights up to indicate the probe is ready to be used.

Power probe cable

Connect the power probe bias cable to the probe power port of spectrum analyzer, signal source analyzer or network analyzer.

Banana plug cable

Connect the banana plug cable to power supply with below configuration:

- Red - > +15V
- Black - > - 12.6V
- Green - > Ground

Other Probe Heads

Besides standard probe head options, below are some other probe heads that can be used with U1818A/B (with limitations).

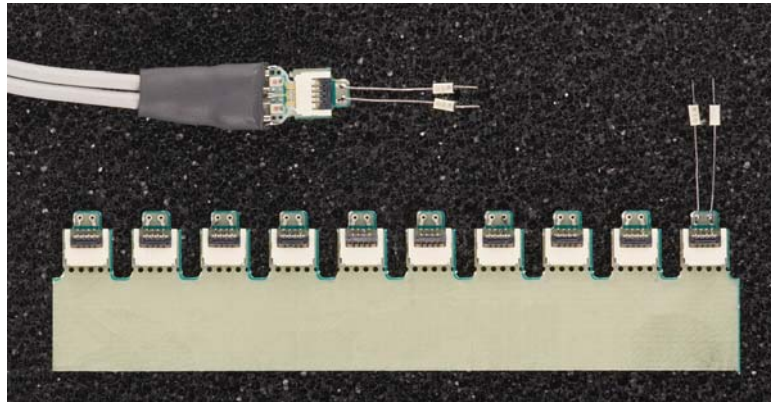


Figure 2-1 N5451A differential long wire ZIF tip

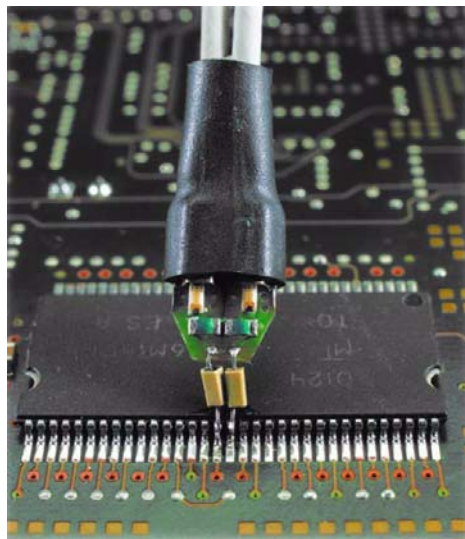


Figure 2-2 E2677A 12 GHz differential solder-in probe head

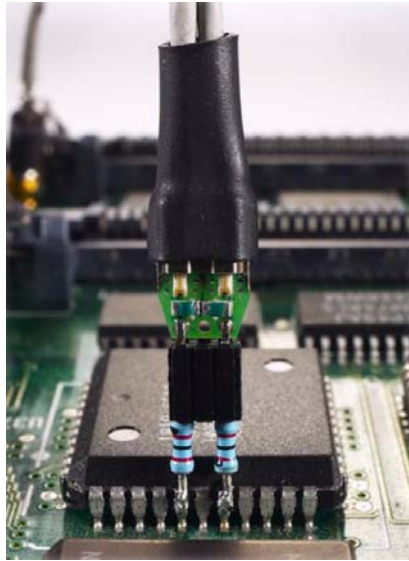


Figure 2-3 E2678A single-ended/differential socketed probe head



Figure 2-4 E2675A differential browser kit

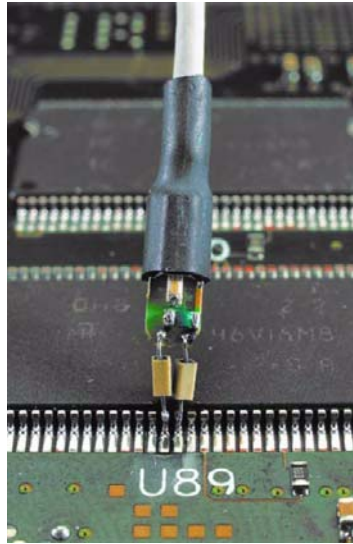


Figure 2-5 E2679A single-ended solder probe head



Figure 2-6 E2676A single-ended browser probe head

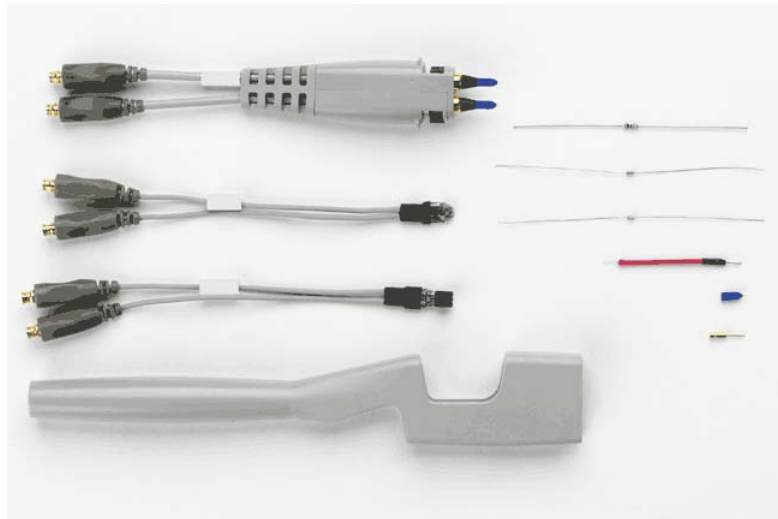


Figure 2-7 E2669A differential connectivity kit

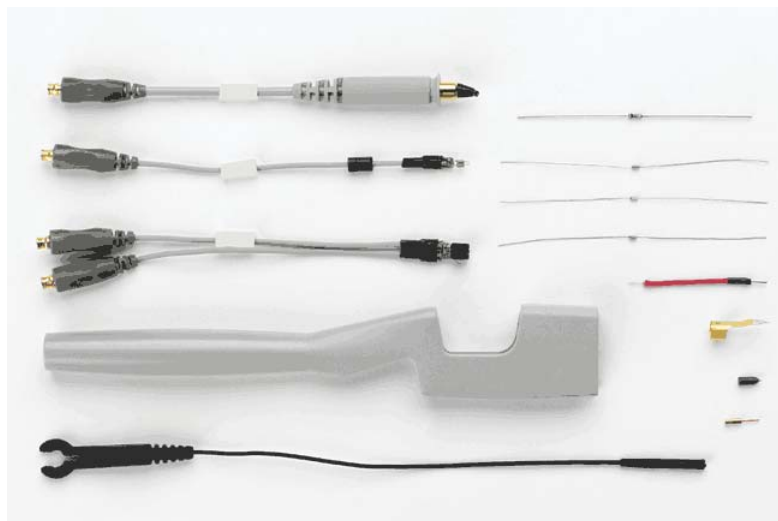


Figure 2-8 E2668A single-ended connectivity kit

Other Available Accessories

There are more accessories that you can get from Keysight to work with U1818A/B.



Figure 2-9 N2880A in-line attenuator kit



Figure 2-10 N2881A DC blocking capacitor



Figure 2-11 11852B minimum loss attenuator pad



Figure 2-12 N2784A 1-arm probe positioner



Figure 2-13 N2785A 2-arm probe positioner



Figure 2-14 N2787A 3D probe positioner



Figure 2-15 N5450A InfiniiMax extreme temperature cable extension



Figure 2-16 E3620A 50W dual output power supply, two 25V, 1A

Handling Guide

This probe has been designed to withstand a moderate amount of physical and electrical stress. However, with an active probe, the technologies necessary to achieve high performance, do not allow the probe to be unbreakable. You should treat the probe with care. It can be damaged if excessive force is applied to the probe tip. This damage is considered to be abuse and will void the warranty when verified by Keysight Technologies service professionals.

This section will assist you in properly handling your Active Differential probes to maximize their lifetime of operation and maintain their high performance.

Connecting/Disconnecting probe heads

When disconnecting a probe head from an amplifier, pull the probe head connectors straight out of the socket as shown in [Figure 2-17](#). When removing or disconnecting a probe head, hold the amplifier by grasping the indentations located on the sides of the amplifier (as shown in [Figure 2-17](#)). There are also indentations on many of the probe head sockets so you have a convenient place to grasp there as well. When connecting a probe head to an amplifier, push straight in also.



Figure 2-17 Pull the probe head straight out to disconnect it from the amplifier

Never bend the probe head in order to “pop” it loose from the amplifier. Also, do not wiggle the probe head up and down or twist it to remove the connectors from the sockets. This can damage the pins in the amplifier or the probe head itself.

[Figure 2-18](#) is an example of an improper way to disconnect the probe head.

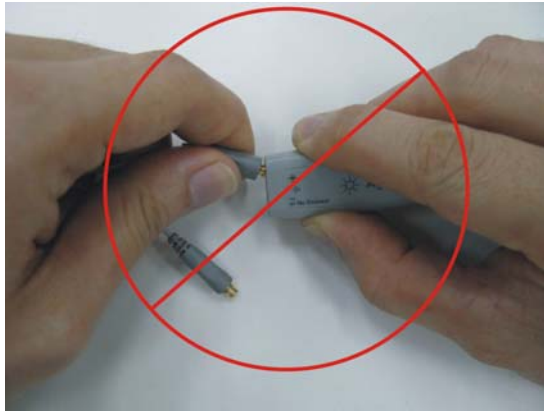


Figure 2-18 An improper way to disconnect a probe head from an amplifier

To see if the pins in the probe amplifier are bent, visually inspect them by looking in the sockets on the amplifier. Notice in [Figure 2-19](#) that the pins are straight (as they should be).

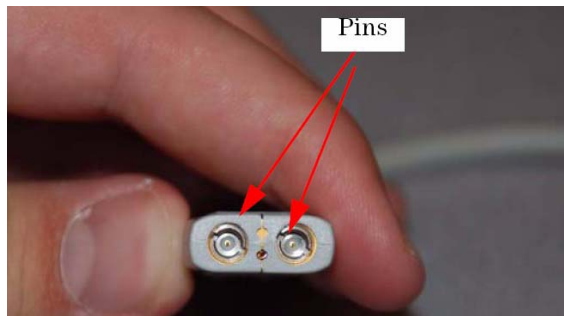


Figure 2-19 Straight pins in an amplifier

If you connect and disconnect probe heads using the appropriate method, these pins should not bend. Always remember to apply enough force to pull the probe head straight out or push it straight in. Do not wiggle, twist, or bend it in any way.

Handling the probe cable

In general, you need to be careful not to kink the cable, twist it, or bend it too much.

For example, slamming a drawer or dropping a heavy item on a cable can kink it and significantly degrade the probe's performance.

Also, when a probe is attached to instrument, you need to be careful not to let a chair or other object crash into the face of the instrument because it will hit the probe cable where it exists the probe amplifier and bend it well beyond its limit.

When storing the probe, it is best to coil the cable in a large radius and avoid a net twist in the cable during the process. This can be done in a similar manner to how garden hoses or extension cords are typically coiled.

You can start by wrapping the cable around your thumb (Figure 2-20 - first picture). Then continue to circle your thumb, but provide a slight twist with each rotation. This will allow the cable rotations to lie flat against each other and will eliminate the net twisting of the cable in the end.

Note that the radius of the coil must be fairly large so it does not induce kinking or bending.

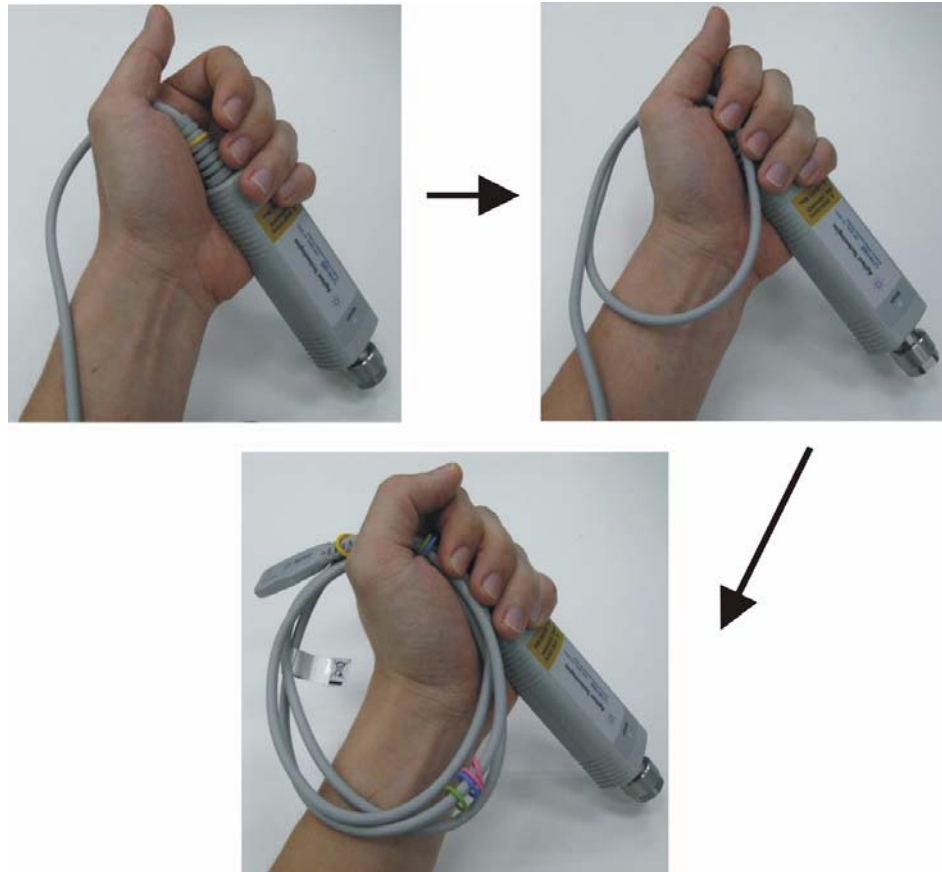


Figure 2-20 The recommended way to coil and store your probe

Handling the probe amplifier

The probe amplifier contains a delicate circuit board. You, therefore, need to treat it carefully and take standard precautions (for example, not dropping it repeatedly or from large heights, not getting it wet, not smashing it with heavy objects, etc.).

CAUTION

These probes are sensitive ESD devices so standard precautions need to be used to not ruin the probe from the build-up of static charges.

Handling the differential browsers with ergonomic handle

Because of their small size, it can be difficult to hold the differential browsers for extended periods of time. The ergonomic handle can be used to more comfortably hold the browser. [Figure 2-21](#) shows how to mount the browser in the ergonomic handle and [Figure 2-22](#) shows how to remove the browser from the ergonomic handle.

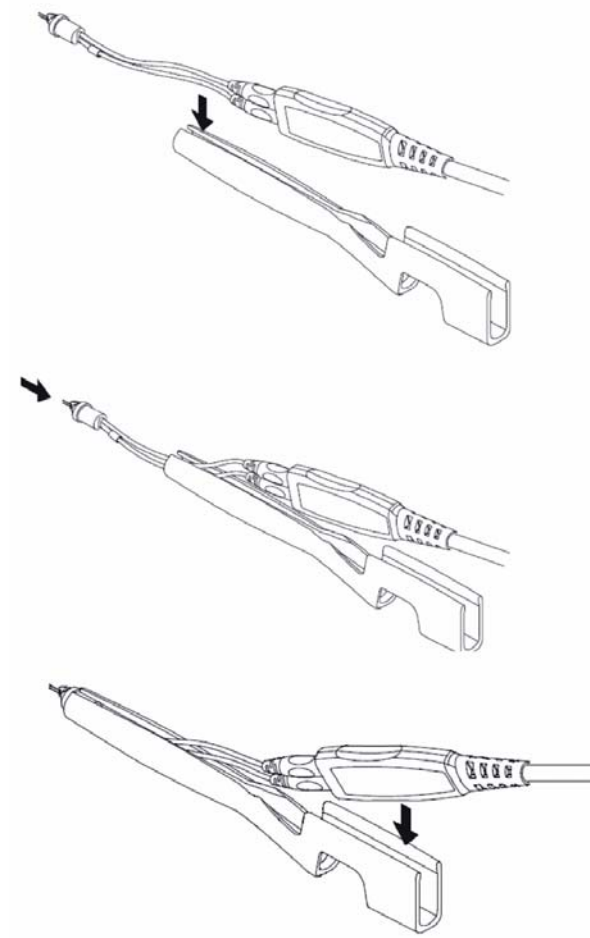


Figure 2-21 Steps to mount the browser in the ergonomic handle

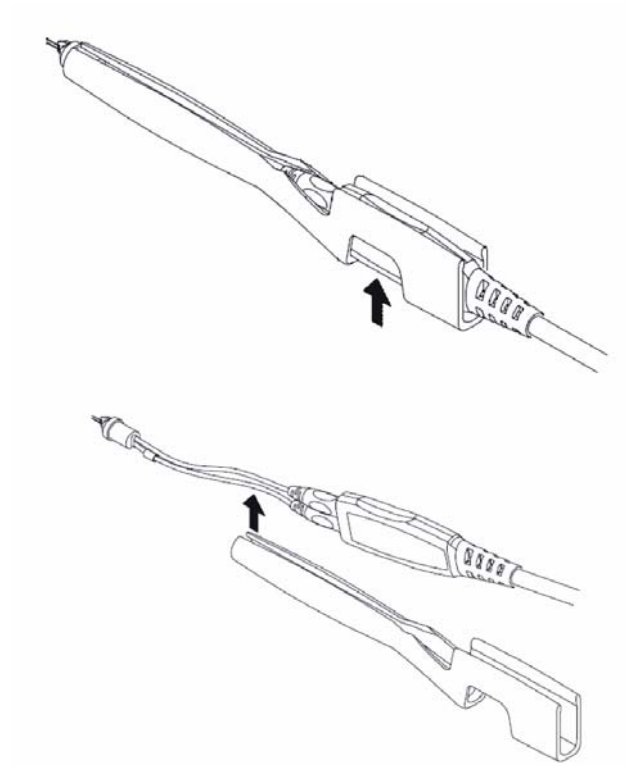


Figure 2-22 Steps to remove the browser from the ergonomic handle

Handling SMA probe heads

The U1818A/B probe amplifier can become damaged when used with the N5380A or E2695A SMA probe heads. Use the Keysight N5380-64701 SMA Head Support to prevent damage. Make sure to plug the probe amplifier into the SMA head before installing the SMA Head Support and do not attempt to plug or unplug the SMA head from the probe amplifier while it is in the SMA head support housing. [Figure 2-23](#) shows how to attach the SMA head support using two provided screws.

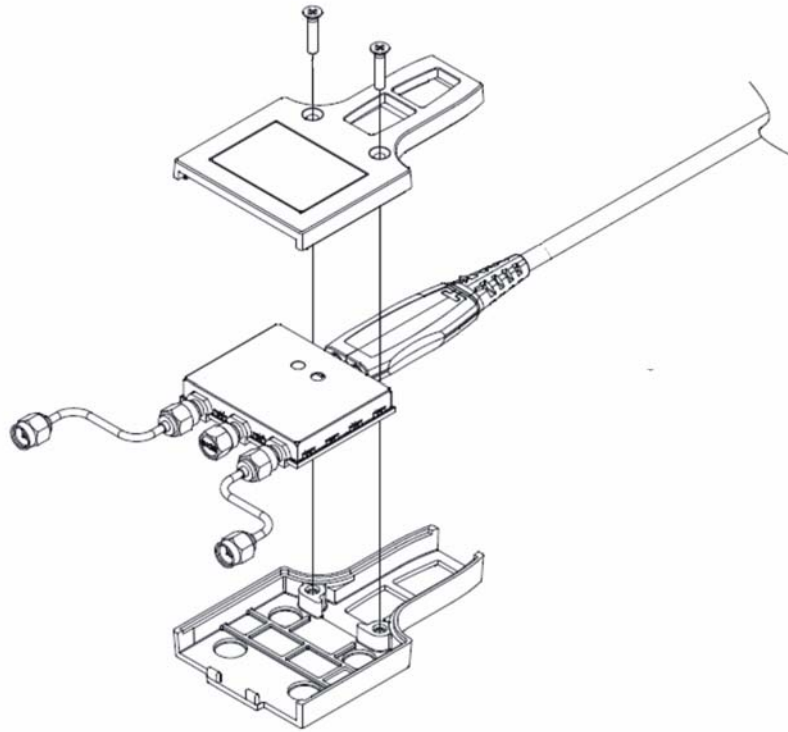


Figure 2-23 Attaching the SMA head support

Temperature rating

U1818A/B probe amplifier have a specified operating temperature range of 0°C to +50°C. However, the probe heads can be operated over a much larger range of temperatures. If you need to make measurements at temperatures outside the range of the amplifier, the N5450A Extreme Temperatures Cable Extension Kit is your solution.

These cables can be used to physically separate the amplifier from the probe head to allow you to operate the probe head inside a temperature chamber while the probe amplifier remains outside the chamber.

Securing probe heads and amplifiers to your DUTs

When soldering a probe to a circuit, you should first provide some strain relief by using low temperature hot glue (use as little as possible) or non-conductive double-sided tape. Do not use super glue and do not get the low temperature hot glue on the actual probe head tip as this can damage the precision components of your probing system (only use the low temperature hot glue on the probe head cables). The provided velcro pads can be used to secure your probe amplifier casing to the board.

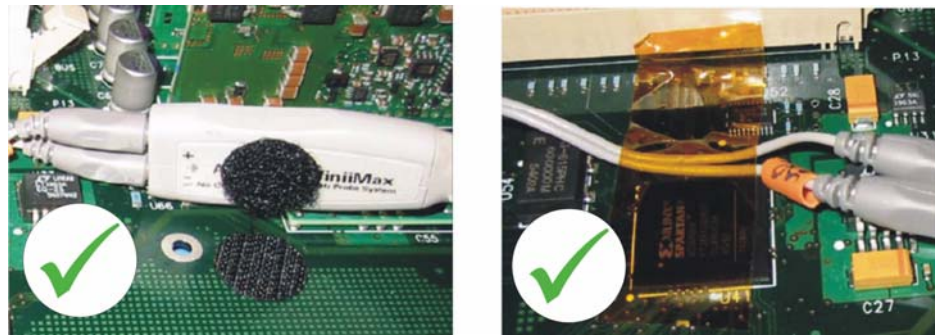


Figure 2-24 Correct securing methods

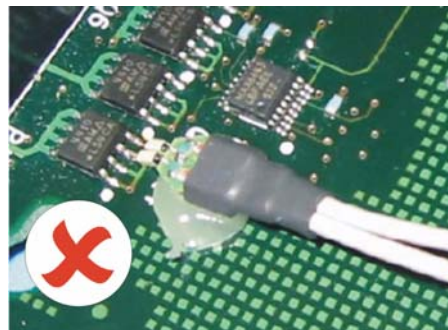


Figure 2-25 Incorrect securing method because glue is placed on the probe head tip

Maintenance

If the probe requires cleaning, disconnect it from the instrument and clean it with a soft cloth dampened with a mild soap and water solution. Make sure the probe is completely dry before reconnecting it to the instrument.

Service Instructions

Adjustment

The probe amplifiers do not have internal adjustments and should not be opened.

Repair

The U1818A/B contain no user serviceable parts (with the exception of the probe head). If service or repair is required, contact your nearest Keysight Technologies Service Center. Refer to [“Sales and Technical Support”](#) on page 4.

Replacing the wires on N5381A and N5382A probe heads

When the wire leads of the N5381A and N5382A probe heads become damaged or break off due to use, the wires can be replaced. Use the appropriate wire for each probe head as follows:

- The N5381A uses the 0.005 inch tin-plated nickel wire. (01169-21306) or 0.007 inch tin-plated nickel wire. (01169-81301)
- The N5382A uses the 0.005 inch tin-plated steel wire. (01169-21304)

Recommended equipment

Below lists the equipment required to replace the wires. Equipment other than the recommended can be used, provided minimum specifications are satisfied.

- Vise or clamp for holding tip
- Metcal STTC-022 (600°C) or STTC-122 (700°C) tip soldering iron or equivalent. The 600°C tip will help limit burning of the FR4 tip PC board.
- 0.381mm (0.015in) diameter RMA flux standard tin/lead solder wire
- Fine stainless steel tweezers
- Rosin flux pencil, RMA type (Kester #186 or equivalent)
- Flush cutting wire cutters
- Magnifier or low power microscope
- Keysight supplied trim gauge (01169-23801)

- Ruler

Recommended procedure

- 1 Use the vise or clamp to position the tip an inch or so off the work surface for easy access. If using a vise, grip the tip on the sides with light force. If using a tweezers clamp, grip the tip either on the sides or at the top and bottom. See [Figure 2-26](#).

CAUTION

When tightening the vise, use light force to avoid damaging the solder-in probe head.

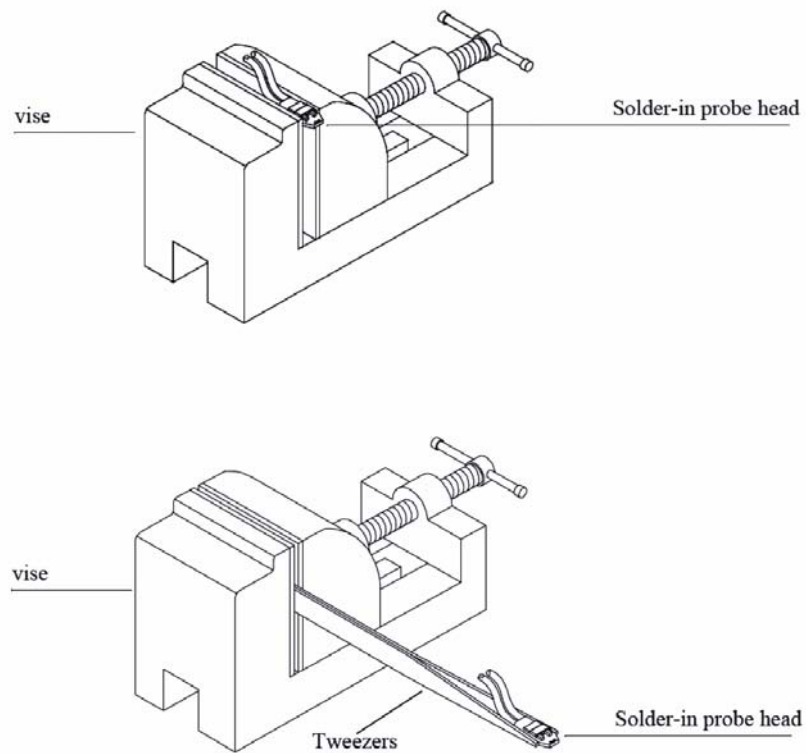


Figure 2-26 Holding tip with vise

- 2** Make sure soldering iron tip is free of excess solder. Grab each wire lead with tweezers and pull very gently up. Touch the soldering iron to solder joint just long enough for the wire to come free of the probe head tip. Do not keep the soldering iron in contact with the tip any longer than necessary in order to limit burning and damage to the PC board. This solder joint has very low thermal mass so it should not take very long for the joint to melt and release.
- 3** Prepare the mounting hole(s) for new wire(s) by insuring that the holes are filled with solder. If they are not, use the soldering iron and solder to fill the holes. Again, do not leave the iron in contact with the tip any longer than necessary. When the hole(s) are filled with solder use the flux pencil to coat the solder joint area with flux.
- 4** Cut two wires to a length of about 12.7mm (0.5inches).
- 5** Using tweezers, put 90 degree bend at the end of the wire. Leave enough wire at the bend such that it will protrude through the board when the wire is installed.
- 6** Holding the wire in one hand and the soldering iron in the other hand, position the end of the wire lead over the solder filled hole. Touch the soldering iron to the side of the hole. When the solder in the hole melts, the wire lead will fall into the hole. Remove soldering iron as soon as lead falls into the hole. Again, the thermal mass of the joint is very small, so extra dwell time is not needed with the soldering iron to insure a good joint.
- 7** Cut the wires that protrude on the bottom side of the probe head board even with the solder pad.
- 8** Place the wires through the hole in the trim gauge with the probe head perpendicular to the trim gauge. Refer to [Figure 2-27](#).

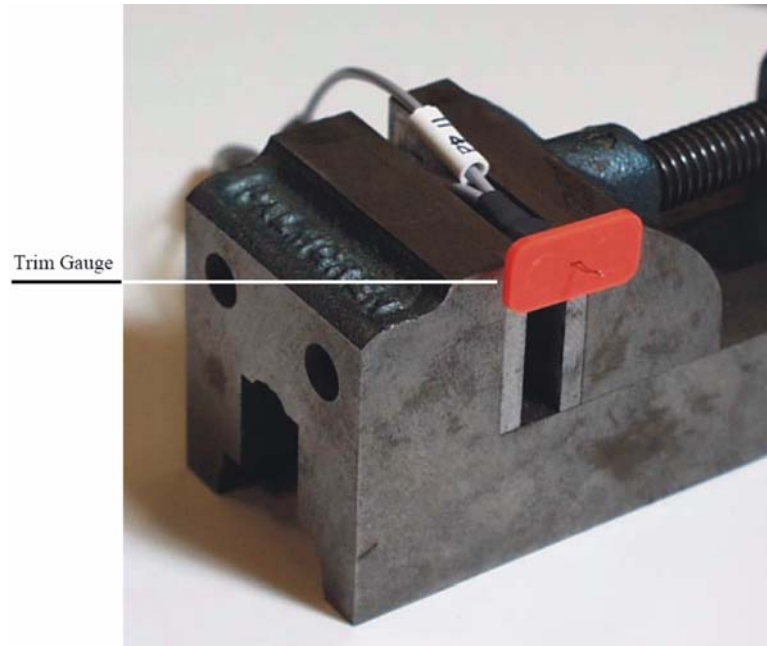


Figure 2-27 Use trim gauge to gauge the wire

9 Cut the wires even with the trim gauge on the side opposite of the probe head.

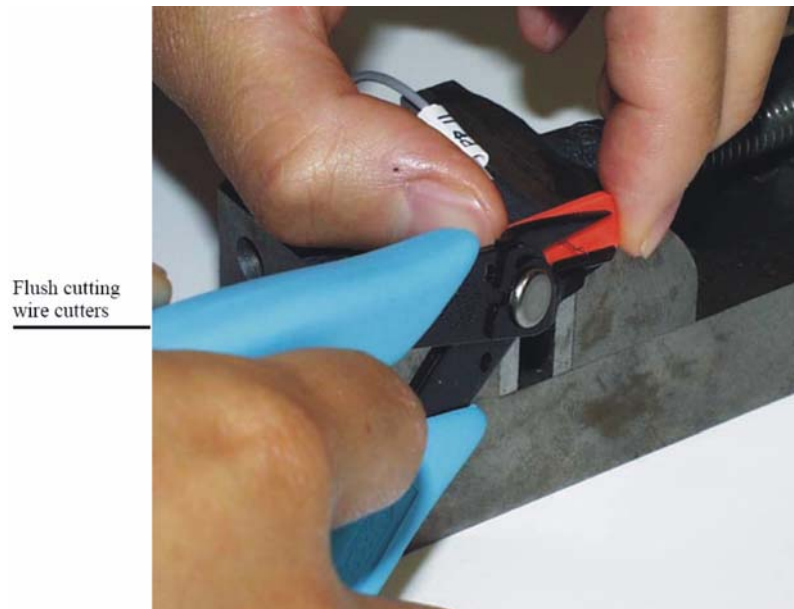


Figure 2-28 Cut the wires even with the trim gauge

- 10** When replacing wires on the N5382A Browser, bend the wires down at about 30 degree angle.

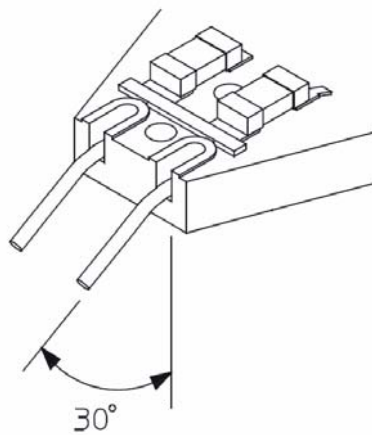


Figure 2-29 N5382A wire bend down at about 30 degree

Tips for using browser probe heads

- Spring steel wires will last longer if the span is set by grabbing the lead near the PC board edge and twisting instead of just pulling or pushing the wires apart or together.

Tips for using solder-in probe heads

- When soldering in leads to DUT always use plenty of flux. The flux will insure a good, strong solder joint without having to use an excessive amount of solder.
- Strain relieves the micro coax leading away from the solder-in tips using hook-and-loop fasteners or adhesive tape to protect delicate connections.
- Note that for the differential solder-in probe head, the + and - connection can be determined when the probe head is plugged into the probe amplifier, therefore, it does not matter which way the tip is soldered.

Procedures and soldering tips for using N5425A InfiniiMax ZIF probe heads

The InfiniiMax ZIF (Zero Insertion Force) Probe Heads system is a way to use a less expensive connection accessory (ZIF tip) that can be installed at many locations on a device under test, to connect to a probe head (N5426A) that transports the signal to the probe amplifier. The advantages of this system are that the ZIF tip is very small and connects to the probe head using a zero insertion force feature allows connection without compressing the delicate wires which cannot support this compression.

A close-up of the ZIF tip and the ZIF probe head before the probe head is inserted into the ZIF tip is shown in [Figure 2-30](#). Note that lever on the ZIF tip is shown in the open position (pointed up) which allows the insertion of the probe head contacts into the ZIF tip with zero insertion force.

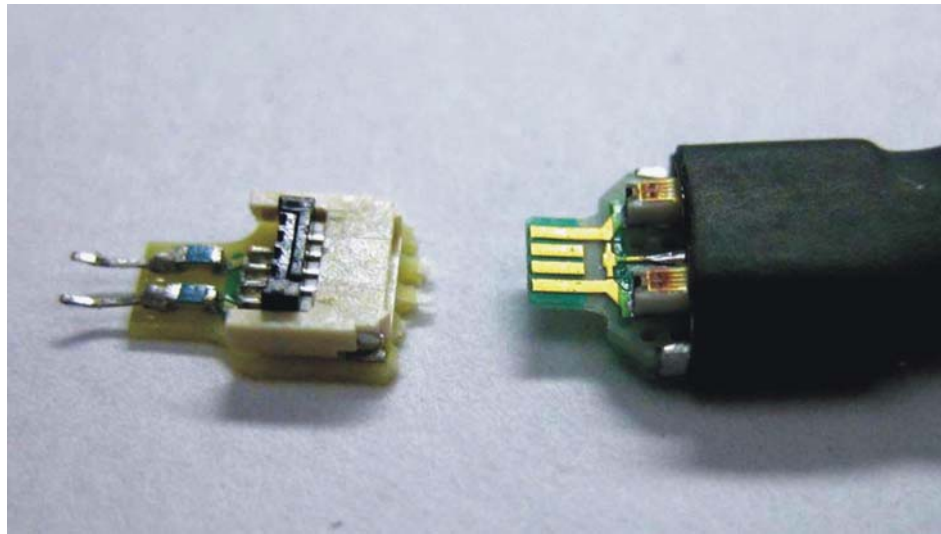


Figure 2-30 ZIF tip (open position) and ZIF probe head

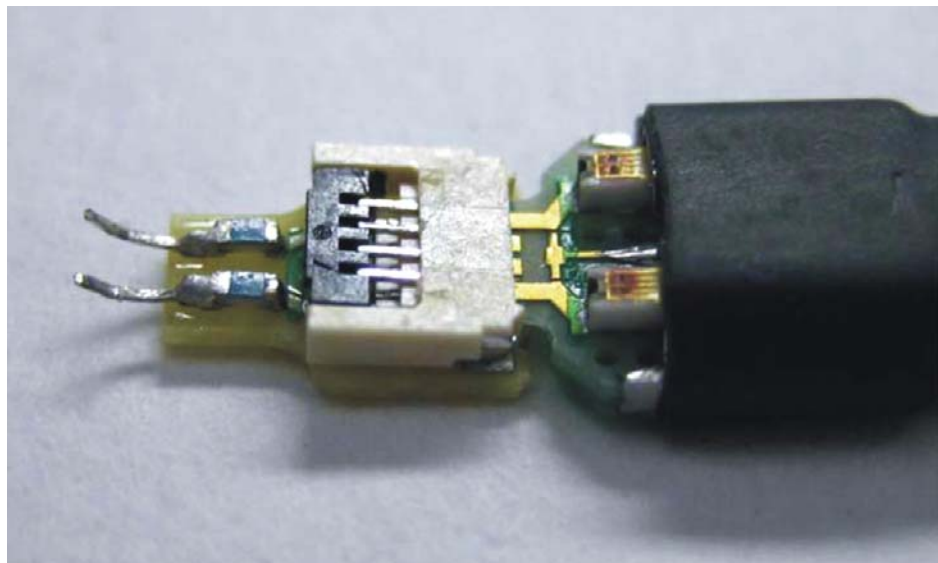


Figure 2-31 ZIF tip (closed position) with ZIF probe head inserted

A close-up of the ZIF probe head inserted into the ZIF tip is shown in [Figure 2-31](#). Note that now the lever on the tip is in the closed position (down, rotated 90 degree to the left) which closes the contacts of the ZIF connector.

Soldering the tip into a DUT is straightforward, but some of the traditional soldering techniques that are typically used on larger components will not work well here. Holding the leads on the ZIF tip in place while applying the soldering iron and adding solder requires the use of three hands.

The following is an overview of the recommended soldering techniques:

- 1** Add some solder to the DUT connection points. There should be enough solder to provide a good fillet around the ZIF tip leads, but not so much as to create a big solder ball. A fine MetCal (or equivalent) soldering tip should be used along with some 11 or 15mil solder.
- 2** Using a rosin flux pen, coat the solder points with flux. The flux core solder does not provide enough flux for this small scale soldering. Also, put flux on the tips of the leads of the ZIF tip.
- 3** Clean the soldering tip well, then add a little bit of solder to the tip. It may take several tries to get just a little bit of solder right at or near the tip of the soldering iron. The solder on the tip keeps the soldering iron tip from pulling solder on the DUT connection points.
- 4** Position a lead of the ZIF tip on top of one of the target points, then briefly touch the soldering iron tip to the joint. The thermal mass of this joint is very small, so you don't need to dwell on the joint for very long. The flux that was added to the joint should produce a good, clean solder joint. If you do not get a good, shinny, strong solder joint, then there was either not enough flux or the joint was heated too long and the flux boiled off.
- 5** Repeat step 4 for the other lead of the ZIF tip.
- 6** There is a possibility that if a lead of the ZIF tip is inserted into a large ball of solder that is heated excessively with a soldering iron, the solder joint holding the lead onto the ZIF tip PC board could flow and the lead would come off destroying the ZIF tip. Only the first third of the lead or so needs to be soldered to the target point.

Illustrated procedure of recommended soldering techniques

An illustrated example of the installation of a ZIF tip and connection to a ZIF probe head is shown below. **Figure 2-32** shows a IC package which we will attach a ZIF tip to the first two package leads. The target could also be via pads or signal traces.

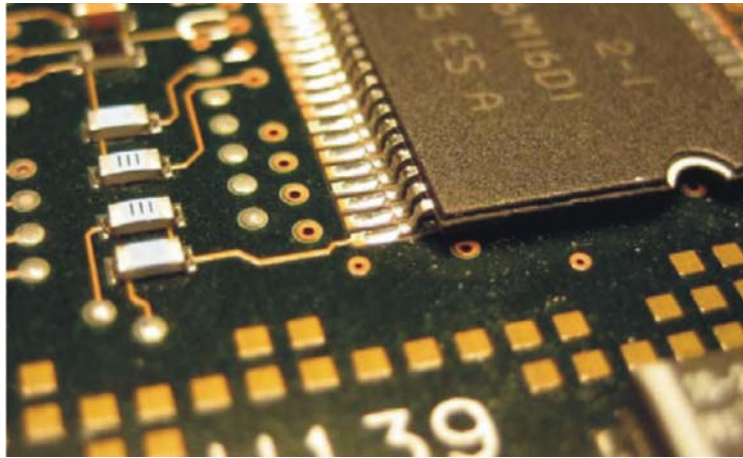


Figure 2-32 IC package for example ZIF tip installation

- 1 Add some solder to the target points in the DUT. **Figure 2-33** shows extra solder added to the pads for the first two pins on an IC package.

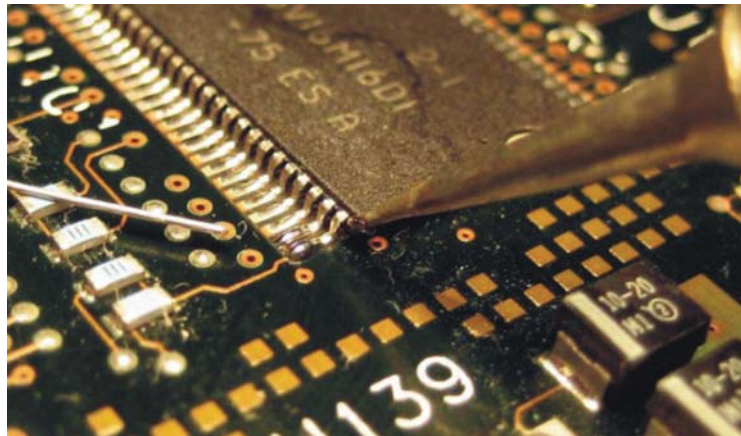


Figure 2-33 Solder added to target points

- 2** Use flux pen to add flux to the target points. Also, flux the tip of the lead on the ZIF tip at this time.

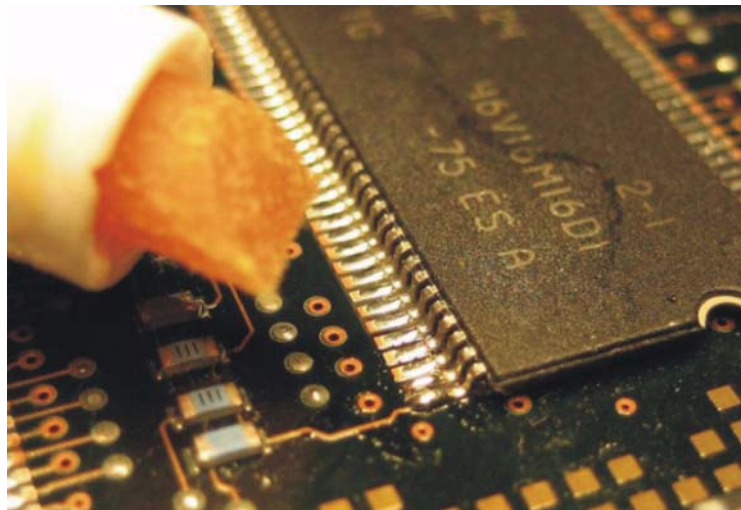


Figure 2-34 Fluxing of the target points

- 3 Clean the soldering iron tip and add a small amount of solder to the very tip. This may take a few tries because the solder may tend to ball up and move away from the tip. [Figure 2-35](#) shows a small amount of solder on the tip of the soldering iron.

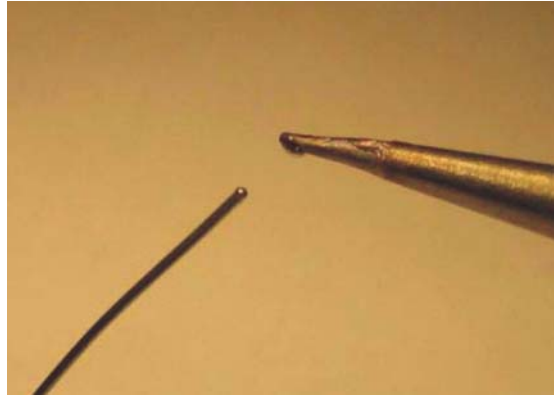


Figure 2-35 Small amount of solder added to ZIF Tip of soldering iron

- 4 Installation of ZIF tip. Connect the ZIF tip to the ZIF probe head as shown in [Figure 2-30](#) and [Figure 2-31](#). This allows the probe to be used as a handle for the ZIF tip to allow positioning in the DUT. Position the lead wires on the target points and then briefly heat the solder joints. There should be enough solder to form a good fillet and enough flux to make the joint shiny. There should not be so much solder that the big solder ball is formed that could cause a solder bridge or overheat the leads on the ZIF tip. This is shown in [Figure 2-36](#).

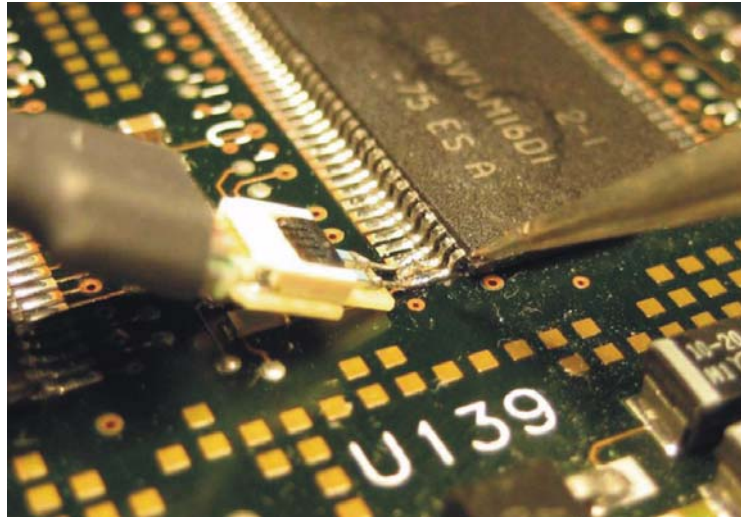


Figure 2-36 ZIF tip positioned and soldered in place

- 5 Remove ZIF probe head and leave ZIF tip behind for future connection. It is best to use a non-conductive, pointed object such as a tooth pick or plastic tool. Hold on the heat-shrink part of the probe head to support the ZIF tip while releasing the latch. [Figure 2-37](#) shows a toothpick releasing the latch on the ZIF connector and [Figure 2-38](#) shows the ZIF tip left behind in the DUT with the latch open, ready for future connections.

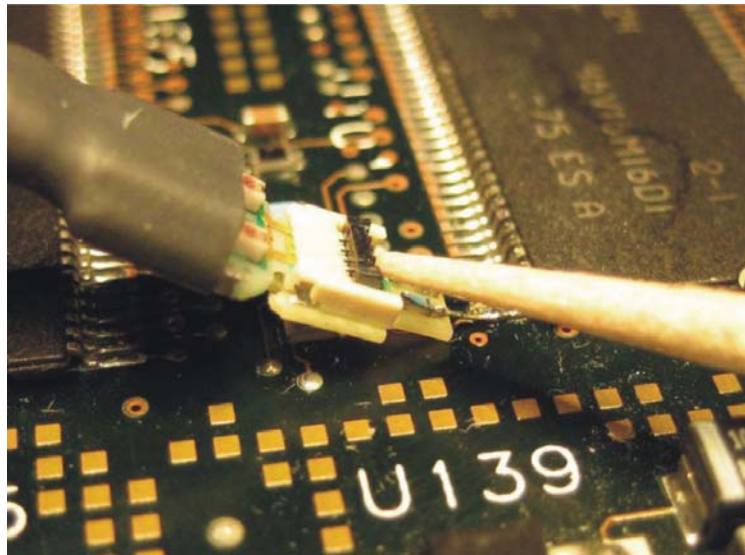


Figure 2-37 Using non-conductive tool to open the ZIF connector

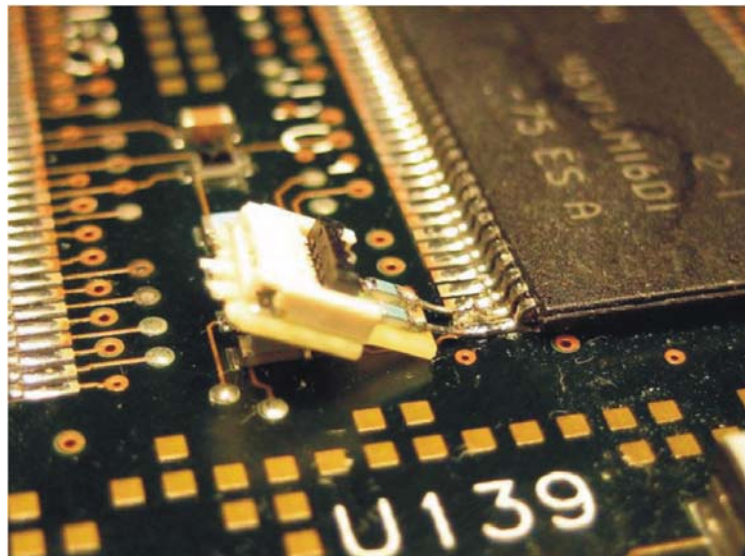


Figure 2-38 ZIF Tip left behind in DUT with ZIF latch open

- 6 Connect ZIF probe head to ZIF tip desired for measurement. When you need to make a measurement at a point where you've previously installed a ZIF tip, insure the latch on the ZIF tip is open, insert the contacts on the probe head into the ZIF socket, and then close the ZIF latch with a non-conductive tool. Depending on the positioning of the ZIF tip, you may need to support the body of the ZIF tip while closing the latch. This can be done by tweezers or other suitable tool by grabbing the PC board at the tip while the latch is being closed. If the circuit is live and there is concern about shorting anything out, use plastic or non-conductive tweezers. See [Figure 2-39](#).

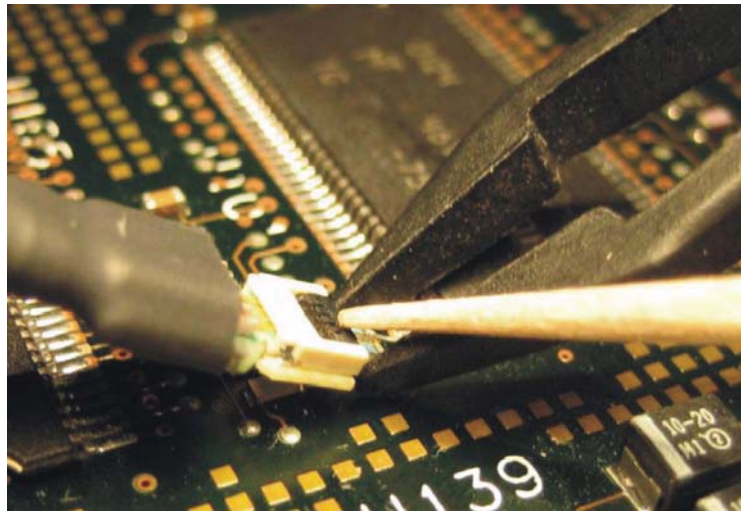


Figure 2-39 Use non-conductive tool to close the latch



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