

Keysight N1021B 18 GHz Differential TDR/TDR Probe Kit

User's
Guide

Notices

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Keysight N1021B—At a Glance

The N1021B TDR/TDT probe facilitates differential time domain reflectometry measurements in situations where RF connectors are unavailable. It is ideal for use with the Keysight N1055A and 54754A TDR plug-in modules. Although the N1021B probe was designed for TDR applications, it is also suitable as a high bandwidth, passive probe for non-TDR applications.



Figure 1 N1021B Probe

Supplied Accessories

Table 1 lists the items provided with the probe. The information on the actual shipping list is more accurate and should supersede the information in this list. To order the parts listed in the table, search for “Parts” at www.keysight.com/find/parts. There are no replaceable parts on the probe.

Table 1 Items Supplied With N1021B

Item	Qty	Part Number
Pair of phase-matched cables (1m)	1	N1021-60003
SMA 50 Ω Load (m)	2	1810-0118
SMA Short (m)	2	0960-0055
SMA Adapter (f-f)	2	1250-1666
Positioner Adapter	1	N1021-60008
M2.5 socket-head screws (6 mm long)	2	—
M2.5 Allen wrench	1	—
ESD Wrist Strap	1	9300-1367
ESD Wrist Strap Ground Cord	1	9300-0980

Using the Probe

CAUTION

Electrostatic discharge (ESD) can damage or destroy electronic components and the input circuits on plug-in modules. Coaxial cables with both ends unconnected may store electrostatic charges. Before connecting any coaxial cable to a device or instrument, momentarily short the center and outer conductors of the cable. When making connections, ensure the proper use of a grounded, resistor-isolated wrist strap.

CAUTION

Before connecting the phase-matched cables, always discharge any static buildup. Momentarily short the center and outer conductors of the cable together. Avoid touching the front-panel input connectors without first touching the frame of the instrument.

Proper Handling Techniques

Use the following techniques to avoid damaging the probe. The probe tips are not replaceable.

- Hold the probe perpendicular to the device under test as shown in [Figure 2](#) on page 8. Probing angles greater than 15° from perpendicular will likely damage the tips over time.
- Do not apply side force to the probe tips.
- Avoid *fully* compressing the probe-tip springs.
- Hand tighten the cable connection to the probe. Or, use a 5 in-lb (0.56 Nm) torque wrench.
- Before cleaning the external case parts of the N1021B, disconnect the probe from all cables. Use a dry cloth or one slightly dampened with a mild soap and water solution. Do not attempt to clean internally.

CAUTION

Applying excessive force when handling the probe can result in bent or otherwise damaged probe tips. Apply only enough pressure to ensure a secure connection. The probe tips are spring loaded. Avoid fully compressing the probe-tip springs. The probe tips are not replaceable.

CAUTION

Do not use too much liquid in cleaning the probe. Water can enter the case.

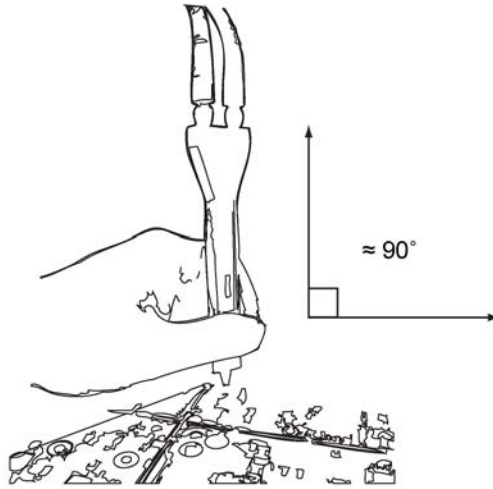


Figure 2 Proper Handling Technique

Adjusting the Probe Tip Separation

Turn the probe spacing adjustment wheel to change the spacing between the probe tips. Avoid using excessive force at the limits of the adjustment range.

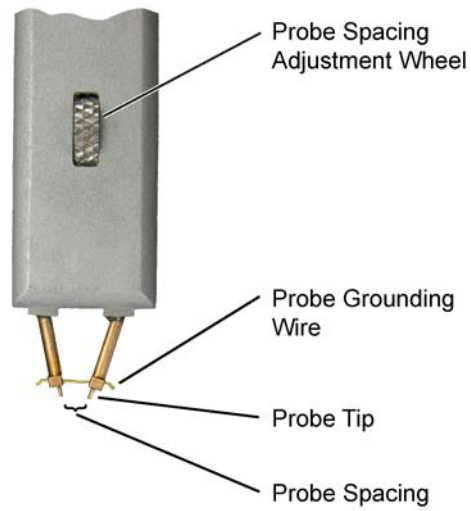


Figure 3 Probe Tip Spacing Adjustment

Calibrating the Probe

The differential probe tips do not have a ground, which is required for a calibration. However, due to the short electrical length of the probe, the frequency-dependent losses of the probe are small compared to those of the cables. Use the following procedure to calibrate the path to the input of the probe.

- 1** Turn on the 86100D with the TDR module in the left slot and allow it to warm up for one hour.
- 2** Perform a module calibration, if needed.
- 3** On the 86100D menu, click Help > Contents to open the online help.
- 4** In the help, click on the search tab and search for the TDR Calibration topic to learn about using the TDR Calibration Setup dialog box. Close the help.
- 5** Place the 86100D in TDR mode, and open the TDR Calibration Setup dialog box. For the TDR setup, connect the N1021B kit's phase-matched cables to the TDR module's TDR ports as the TDR test setup cables. The N1021B probe will be the DUT (Device-Under-Test) for this procedure.
- 6** As you go through the TDR setup steps in the dialog box, be sure to perform Step 5. "Step Deskew".

NOTE

When the TDR calibration instructs you to disconnect everything from the module, leave the cables connected to the module; the cables must be included in the TDR calibration.

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- 7** When you have completed all of the steps in the dialog box, click Start Calibration Measurement Wizard.

Performing an Operation Verification

There are no warranted product specifications to measure product performance against. Use this TDR measurement to confirm if the probe is operational. For additional information on TDR measurements, refer to the 86100D online help.

- 1** Calibrate the probe as described in ["Calibrating the Probe"](#) on page 10.
- 2** Connect the TDR probe to the cables.
- 3** Adjust the probe spacing wheel to move the two probe tips together so that they touch creating a short.
- 4** Move the response of the probe's tip to the screen's left side while reducing the horizontal span. This action ensures that the response remains displayed. Repeat until the span setting is 50 ps/div as shown along the display's bottom edge.
- 5** Center the response.
- 6** Adjust the amplitude position and scale of the response as needed.
- 7** Select the Measure toolbar and click Fall Time. Click Setup > Averaging and enter 16 for the Number of Averages. Close the dialog box.
- 8** Using the following equation, calculate the BW of the probe. This simplified equation estimates one-way bandwidth, based on the measured fall time in seconds. This is a conservative estimate for bandwidth, because it includes neither the fall time of the calibrated module nor the cables.

$$BW_{\text{probe}} = \frac{0.2379\sqrt{2}}{T_{\text{fall time}}}$$

NOTE

If the 86100D has Option 202 Enhanced Impedance and S-Parameter software installed, you can view the SDD11 results for a measurement of the two-way bandwidth.

Probing a Differential Trace's Length Midpoint

What are the effects of probing a differential trace midway along the trace's length? At the probe's tip, the TDR pulse splits into two parts traveling in opposing directions away from the probe. To the probe, it appears that two impedances are connected in parallel. The net effect of probing in the middle of traces are as follows:

- The transmitted signal is greatly attenuated.
- The reflected signal, as viewed and measured by the TDR module, is greatly attenuated.
- A large discontinuity appears in the line that sends a reflection back to the source.

Probe Characteristics

The following are nominal characteristics of the probe and do not describe warranted performance. However, performance which is deemed grossly different than the listed characteristics will be covered by a 1 year warranty.

Table 2 Characteristics of TDR Probe

Description	Characteristic
Bandwidth (pitch dependent)	Up to 18 GHz
Nominal Differential Impedance	100 Ohm
Durability	> 7500 touchdowns with force $\leq 10\text{N}$
Probe Tip Spacing (Variable)	0 mm – 2.54 mm

Returning the Probe for Service

For technical assistance, contact your local Keysight Call Center. Please notify the service office before returning your probe for service. Any special arrangements for the probe can be discussed at this time. This will help the Keysight service office repair and return your instrument as quickly as possible.

- In the Americas, call 1 (800) 829-4444
- Visit <http://www.keysight.com/find/assist>

If the probe is still under warranty or is covered by an Keysight maintenance contract, it will be repaired under the terms of the warranty or contract. If the probe is no longer under warranty or is not covered by an Keysight maintenance plan, Keysight will notify you of the cost of the repair after examining the unit.

When a probe is returned to an Keysight service office for servicing, it must be adequately packaged and have a complete description of the failure symptoms attached. When describing the failure, please be as specific as possible about the nature of the problem. If the phase-matched cables supplied with the probe are suspect, return the cables with the probe. Do not return the entire kit including accessories.