Agilent N1020 TDR Probe User's Guide





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### Agilent N1020A TDR Probe User's Guide

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## Agilent N1020A—At a Glance

The Agilent N1020A TDR Probe facilitates accurate, repeatable time domain reflectometry measurements in situations where RF connectors are unavailable. It is ideal for use with the Agilent 54753A and Agilent 54754A TDR plug-in modules.



### Figure 1. Agilent N1020A TDR Probe

The Agilent N1020A TDR Probe includes the following items:

- RF cable (SMA, 36-inch)
- Calibration substrate (quantity 2)
- Grounding pin
- Tweezer



### Figure 2. Probe tip and grounding pin

#### Accessories available

The following accessories are available from Cascade Microtech®.

Internet address: http://www.cascademicrotech.com

- Fixed-pitch compliant 50Ω probe for testing SMTs, hybrids, and MCMs. Bandwidth from dc to 20 GHz. Order FPC-GSG-xxxx probe.
- Fine-pitch active 100kΩ probe for testing SMTs, hybrids, and MCMs. Bandwidth from dc to 2.5 GHz. Order FPA-10X probe.
- DC coaxial microprobes
- Fine-pitch microprobes
- Fine-pitch DC needle holder

## Installing the Probe

1 Locate the grounding pin supplied with the probe. probe tip grounding pin



**2** As explained in the following caution statement, insert the long end of the grounding pin into one of the holes that are located in the tip of the probe. Select any hole that is located in the spiral pattern.

**CAUTION** The grounding pin consists of two solid end pieces connected by a spring. To avoid damaging the grounding pin, always insert the longest solid end into the probe tip.

- **3** Using tweezers, gently push the pin until it is fully seated into the hole.
- 4 Connect the supplied SMA cable to the TDR probe.

**CAUTION** The input circuits on the Agilent 83480A plug-in modules can be damaged by electrostatic discharge.

5 Discharge any static buildup on the SMA cable. 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. 6 Connect the other end of the SMA cable to the TDR plug-in module's Channel input connector.

### Moving the grounding pin

The probe comes with a movable grounding pin to make connections to the ground plane easier. Use the following steps to move of grounding pin:

- 1 Using the supplied tweezers, gently pull the pin out of the probe tip.
- **2** Insert the pin into one of the adjacent, conveniently-located holes. Notice that these holes are in a spiral pattern.
- **3** Using the tweezers, gently push the pin until it is fully seated into the hole.

### Normalizing the Probe

Normalizing the probe ensures accurate measurements with Agilent 54753A and Agilent 54754A TDR plug-in modules. To learn more about normalization, refer to the *Agilent 83480A User's Guide* and the *Agilent 54753A and Agilent 54754A User's Guide*. For the most recent version of these books, visit the following Internet web site http://www.agilent.com/go/light-wave, and "click" on *Support*.

The TDR probe comes with two identical calibration substrates. During the normalization procedure, the calibration substrate is used to move the measurement plane from the module's input connector to the end of the probe tip. Each calibration substrate provides one short pad, three 28 $\Omega$  pads, three 50 $\Omega$  pads, and three 75 $\Omega$  pads for probing. Three pads of each type are provided in the event that pads becomes damaged or worn out with use.

When probing, always connect the probe's ground to the larger side of the resistant pad.



### Figure 3. Calibration substrate

The  $28\Omega$  and  $75\Omega$  pads are provided so that you can verify measurement normalization on devices that have a characteristic impedance other than  $50\Omega$ . For example, Rambus®\* technology has a  $28\Omega$  characteristic impedance. Regardless of the characteristic impedance of the device being measured, *always* use the  $50\Omega$  termination pad during the normalization procedure.

### To normalize the probe

- 1 Press the Setup key and then *Default setup* on the Agilent 83480A mainframe.
- **2** Remove any connections from the Agilent 54753A or Agilent 54754A front-panel channel input connectors.
- 3 Press Utility, Calibrate, and then Calibrate plug-in.
- \*. Rambus® is a trademark of Rambus Inc.

- 4 Select the plug-in module to be calibrated, press 1 and 2 or 3 and 4.
- **5** Press *Start cal* to start the calibration, and follow the on-screen instructions. This step completes a plug-in module vertical calibration.

**CAUTION** The input circuits on the Agilent 83480A plug-in modules can be damaged by electrostatic discharge.

- 6 Discharge any static buildup on the TDR probe's SMA cable. 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.
- **7** Connect the SMA cable on the probe to the TDR plug-in module's Channel input connector.
- 8 Press Setup on the TDR plug-in module. Press *Stimulus* and select *1 only*. Press *Enter* and then *Preset TDR/TDT*.
- **9** Connect the TDR probe to the device that you are testing.
- **10** Use the Agilent 83480A's Time base key to adjust the time scale and position so that the desired response is displayed. Changing the time base setting after the calibration voids the calibration.

The following two steps perform a normalization routine. These steps move the measurement plane from the module's input connector to the end of the probe tip.

11 Press Setup on the plug-in module. Press Normalize response and then Establish normalization & ref plane.

12 Follow the onscreen instructions (upper left-hand corner). Use the short and  $50\Omega$  pads on the calibration substrate for short and  $50\Omega$  terminations.

**NOTE** During the normalization procedure, use *only* the short and  $50\Omega$  termination pads on the calibration substrate. After the procedure, you can use the  $28\Omega$  pad or  $75\Omega$  pad to verify measurement accuracy for devices having a characteristic impedance of  $28\Omega$  or  $75\Omega$ .

The following two steps activate the normalized response.

- 13 Press Setup on the TDR plug-in module.
- 14 Press Normalize Response and then set TDR normalize to on.
- 15 Press Channel 1/3 and then set *Display* to *off*. This step is optional.
- 16 On the Agilent 83480A mainframe, press Marker. Set Mode to TDR/TDT.
- 17 Set + Source to response 1 and then press Enter.
- 18 Set *Reference* so that *ref plane* is selected.
- **19** Press + *Position*, the 0 key, and then the Enter key that is located next to the numeric keypad.
- 20 Press × *Position*, the 0 key, and then the Enter key that is located next to the numeric keypad.
- $21~{\rm Set}\times \textit{Source}$  to response 1 and then press Enter.

The + and  $\times$  markers should now be visible on the displayed normalized response.

Use the following optional steps to simulate the impedance profile of the device that you are testing as a function of the incident TDR step rise time.

- 22 Press Setup on the TDR plug-in module.
- 23 Press Normalize response and then Risetime.
- 24 Enter the desired rise time, and then press Enter.

Setting the rise time value too fast results in a noisy normalized waveform. This is because the bandwidth of the system has been exceeded. Increase the rise time until the noise on the normalized waveform disappears.

## **Probe Characteristics**

There are no specifications for the Agilent N1020A TDR Probe. (Product specifications describe warranted performance.) However, the following characteristics provide useful information by giving functional, but nonwarranted, performance parameters.

Description	Characteristic
Bandwidth	DC to 6 GHz
.Insertion loss	< 1.5 dB
Return loss	> 16 dB
Connector	3.5 mm SMA
Weight	1.3 kg
Joystick travel	17 x 17 x 13 mm
Arm reach	100 to 220 mm
Arm sweep angle	<i>+90</i> °
Probe pitch	1.5 to 5.0 mm

### **Table 1. Characteristics of TDR Probe**

### **Replaceable Parts**

The following table lists the replaceable parts for the probe. Notice that the grounding pin must be ordered from Inter-Continental Microwave Company:

Phone:	(408) 727-1596
Fax number:	(408) 727-0105
Internet address: http://	//www.icmicrowave.com
Email address:	ICMfixture@aol.com

### **Table 2. Replaceable Parts and Accessories**

Description	Part Number
Grounding pin*	41112542
SMA cable (m) 36" (91.4 cm)	8120-4977
Calibration substrate	1NB7-8474
Tweezer	8710-1308

\*. Order from Inter-Continental Microwave Co.

## **Contacting Agilent Technologies**

To learn about other signal integrity test solutions, visit our Internet web site at the following address:

#### http://www.agilent.com/go/tdr

Before returning the probe for service, call the Agilent Technologies Instrument Support Center at (800) 403-0801. Always call the Agilent Technologies Instrument Support Center first to initiate service before returning your probe to a service office. This ensures that the repair can be properly tracked and that your probe will be returned to you as quickly as possible. Call this number regardless of where you are located.

If the instrument is still under warranty or is covered by an Agilent Technologies maintenance contract, it will be repaired under the terms of the warranty or contract. If the instrument is no longer under warranty or is not covered by an Agilent Technologies maintenance plan, Agilent Technologies will notify you of the cost of the repair after examining the unit. When an instrument is returned to a Agilent Technologies service office for servicing, it must be adequately packaged and have a complete description of the failure.

### Warranty

This Agilent Technologies instrument product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Agilent Technologies will, at its option, either repair or replace products which prove to be defective. For warranty service or repair, this product must be returned to a service facility designated by Agilent Technologies. Buyer shall prepay shipping charges to Agilent Technologies and Agilent Technologies shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to Agilent Technologies from another country.

### Limitation of Warranty.

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

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#### **Exclusive Remedies.**

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

# Safety Symbols

**CAUTION** The *caution* sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in damage to or destruction of the product. Do not proceed beyond a caution sign until the indicated conditions are fully understood and met.

WARNING The *warning* sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning sign until the indicated conditions are fully understood and met.

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