N2841/2/3A and N2853A High-Impedance Passive Probes

KEYSIGHT

USER GUIDE

Notices

Manual Part Number

N2840-97003

Edition

Second Edition, December 2025

Published by:
Keysight Technologies, Inc.
1900 Garden of the Gods Road
Colorado Springs, CO 80907 USA

Warranty

The material contained in this document is provided "as is," and is subject to being changed, without notice, in future editions. Further, to the maximum extent permitted by applicable law, Keysight disclaims all warranties, either express or implied, with regard to this manual and any information contained herein, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Keysight shall not be liable for errors or for incidental or consequential damages in connection with the furnishing, use, or performance of this document or of any information contained herein. Should Keysight and the user have a separate written agreement with warranty terms covering the material in this document that conflict with these terms, the warranty terms in the separate agreement shall control.

Technology Licenses

The hardware and/or software described in this document are furnished under a license and may be used or copied only in accordance with the terms of such license.

U.S. Government Rights

The Software is "commercial computer software," as defined by Federal Acquisition Regulation ("FAR") 2.101. Pursuant to FAR 12.212 and 27.405-3 and Department of Defense FAR Supplement ("DFARS") 227.7202, the U.S. government acquires commercial computer software under the same terms by which the software is customarily provided to the public. Accordingly, Keysight provides the Software to U.S. government customers under its standard commercial license, which is embodied in its End User License Agreement (EULA), a copy of which can be found at http://www.keysight.com/find/sweula. The license set forth in the EULA represents the exclusive authority by which the U.S. government may use, modify, distribute, or disclose the Software. The EULA and the license set forth therein, does not require or permit, among other things, that Keysight: (1) Furnish technical information related to commercial computer software or commercial computer software documentation that is not customarily provided to the public; or (2) Relinquish to, or otherwise provide, the government rights in excess of these rights customarily provided to the public to use, modify, reproduce, release, perform, display, or disclose commercial computer software or commercial computer software documentation. No additional government requirements beyond those set forth in the EULA shall apply, except to the extent that those terms, rights, or licenses are explicitly required from all providers of commercial computer software pursuant to the FAR and the DFARS and are set forth specifically in writing elsewhere in the EULA. Keysight shall be under no obligation to update, revise or otherwise modify the Software. With respect to any technical data as defined by FAR 2.101, pursuant to FAR 12.211 and 27.404.2 and DFARS 227.7102, the U.S. government acquires no greater than Limited Rights as defined in FAR 27.401 or DFAR 227.7103-5 (c), as applicable in any technical data. 52.227-14 (June 1987) or DFAR 252.227-7015 (b)(2) (November 1995), as applicable in any technical data.

Safety Notices

CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Contents

Introduction

NOTE The model N2840A is now discontinued, others remain active.

The N2841/2/3A and N2853A high-impedance passive probes and accessories are a great choice for high quality at a very reasonable price. The probes include probe ID capability that allows most oscilloscopes, such as Keysight's InfiniiVision and Infiniium series, to detect the probe's impedance and attenuation ratio.

Table 1 Quick Probe Comparison

	N2841A	N2842A	N2843A	N2853A
Bandwidth (–3 dB)	150 MHz	300 MHz	500 MHz	350 MHz
Attenuation Ratio	10:1			
Probe ID	Yes			

CAUTION Before using the probe, refer to "Safety Information" on page 20.

Oscilloscope Compatibility

To be compatible with the probes, the oscilloscope must have a 1 MΩ input resistance shunted by 5 to 30 pF of input capacitance.

Handling the Probe

Handle the probe with care and refer to the safety notices in this manual. The probe cable is a sensitive part of the probe, so use care not to damage the probe through excessive bending or pulling. Avoid any mechanical shocks to the probe to guarantee accurate performance and protection.

CAUTION Always wear an ESD wrist strap when working with the probe. Not doing so can result in the probe becoming permanently damaged.

Accessories

The probes come with the accessories shown in Figure 1. A probe tip is pre-installed on the probe.

Two additional accessories *not* supplied with the probes are available: the PCB socket adapter and the dual-lead adapter. Refer to "Printed-Circuit Board Adapter" on page 12 and to "Dual-Lead Adapter" on page 15.

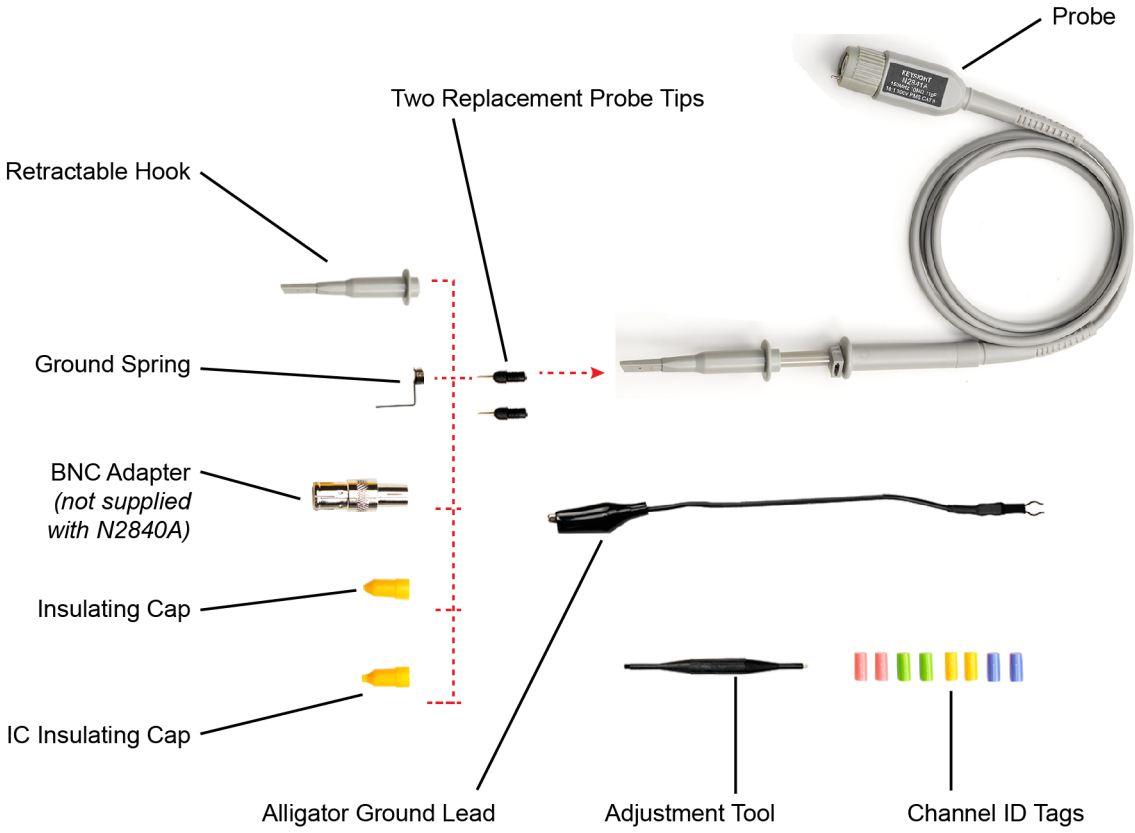

Figure 1 Probe With Supplied Accessories

WARNING **Handle Probe Tips and Ground Spring Carefully. The probe tip and ground spring are sharp. Handle these items with care to avoid personal injury.**

NOTE To order a replacement kit that provides all of the supplied accessories listed in Table 2, order accessory kit N2856A. The quantities of the accessories included in the kit are the same quantities originally supplied with the probe.

Table 2 Supplied Accessories

Accessory	Qty	Replacement Order Number
Retractable Hook Tip	1	N2858A
Replacement Probe Tips	2	N2859A
Ground Spring	1	–
Alligator Ground Lead (12 cm long)	1	N2857A
Insulating Cap	1	–
IC Insulating Cap	1	–
BNC Adapter	1	1250-3978
Low-Frequency Compensation Adjustment Tool	1	–
Channel Identification Tags (2 of each color: green, yellow, purple, and pink)	8	–

Table 3 Available Accessories

Accessory Kit	Order
Dual-Lead Adapter	0960-2923
Printed Circuit Board (PCB) Adapter	0960-2922

NOTE When using any accessory, the probe assembly-accessory combination is only rated for measurements on mains isolated circuits, not CAT II, III, or IV circuits.

Cleaning the Probe

Disconnect the probe from the oscilloscope and clean the probe with a soft cloth dampened with a mild soap and water solution. Do not allow any solution to enter the probe. Make sure that the probe is completely dry before reconnecting it to an oscilloscope.

Inspecting the Probe

- Inspect the shipping container for damage.

  Keep the damaged shipping container or cushioning material until the contents of the shipment have been checked for completeness and the probe has been checked mechanically and electrically.
- Check the accessories.
- If the contents are incomplete or damaged, notify your Keysight Technologies Sales Office.
- Inspect the probe. If there is mechanical damage or defect, or if the probe does not operate properly, notify your Keysight Technologies Sales Office.

If the shipping container is damaged, or the cushioning materials show signs of stress, notify the carrier as well as your Keysight Technologies Sales Office. Keep the shipping materials for the carrier's inspection. The Keysight Technologies office will arrange for repair or replacement at Keysight Technologies' option without waiting for claim settlement.

Using the Probe

This section describes how to attach the various accessories as well as the channel ID tags. Before making measurements, compensate the probe as explained in "Low-Frequency Compensation" on page 18.

WARNING **Must be Grounded. Before making connections to the input leads of this probe, ensure that the probe's output connector is attached to the channel input of the oscilloscope and that the oscilloscope is properly grounded.**

WARNING **The maximum input voltage rating of the probe decreases as the frequency of the applied signal increases. Refer to Figure 14 on page 23.**

CAUTION To protect against electrical shock, use only the accessories supplied with or available for this probe.

Channel Identification Tags

When multiple probes are connected to the oscilloscope, it can be difficult to determine which probe is connected to each oscilloscope channel. To quickly identify a probe tip with the associated channel input, use the colored channel ID tags. Snap one color-matched tag to each end of the probe's cable as shown in Figure 2. Select the tag color that matches the oscilloscope's channel color.

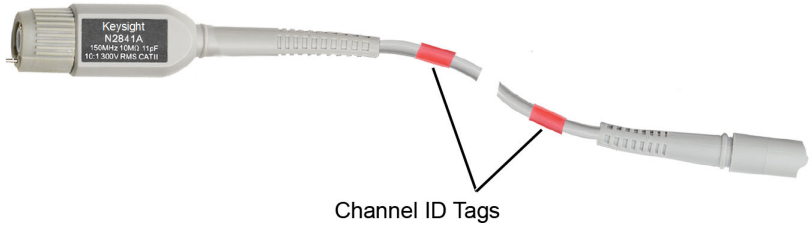

Figure 2 Channel ID Tags Attached to the Probe Cable

Retractable Hook

Use the retractable hook tip to make quick connections for hands-free probing. To attach the retractable hook tip to the probe, gently slip the hook tip onto the end of the probe barrel. Once the tip is attached to the probe, push the tip's collar towards the probe body to expose the hook.

NOTE To securely engage the retractable hook tip with the probe, ensure that you push the hook tip onto the probe completely until it stops and then release it.

CAUTION Avoid damaging the probe tip. Always align the axis of the retractable hook tip with the probe tip when inserting the tip.

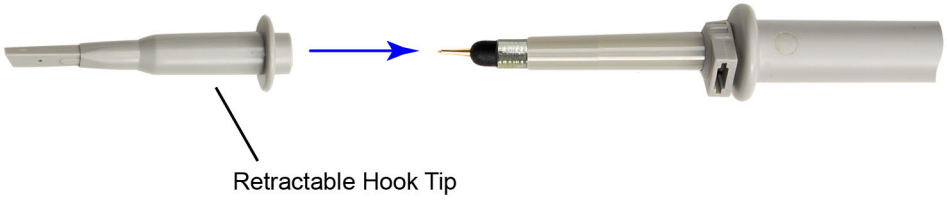

Figure 3 Push the Tip onto the Probe's Barrel

Ground Spring

The ground spring improves measurement performance by providing a short ground connection. The shorter lead reduces the inductance in the ground return path which corresponds to higher performance than using the alligator ground lead. To attach the ground spring, insert it over the end of the probe barrel as shown in Figure 4. The spring must make contact with the metallic band on the probe's barrel.

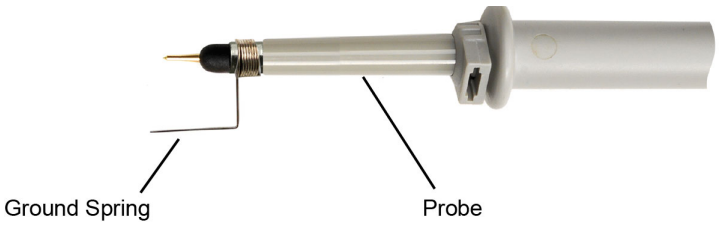

Figure 4 Ground Spring Placed on Probe Tip

Alligator Ground Lead

Use the alligator ground lead to reach circuit grounding points that are farther away from the probing location than can be reached by the ground spring. Because the longer lead increases the inductance in the ground return path, this solution results in slightly lower performance than using the ground spring.

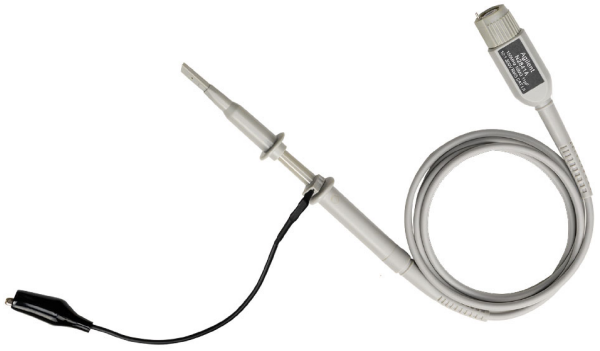

Figure 5 Probe with Alligator Ground Lead Attached

BNC Adapter

The BNC adapter connects the probe tip to a BNC (female) connector. Insert the probe's tip into the adapter as shown in Figure 6.

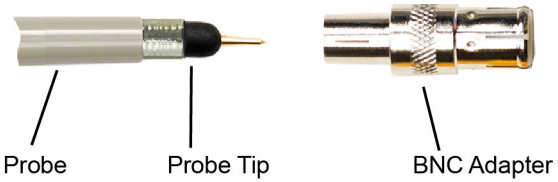

Figure 6 BNC Adapter

Printed-Circuit Board Adapter

The Printed-Circuit Board (PCB) socket adapter provides a stable, permanent probing location, which minimizes the effects of a longer ground connection. Figure 7 shows the PCB adapter soldered on a PC board. Mounting hole dimensions are included in the figure. Figure 8 on page 14 shows the PCB adapter plugged onto a solder-less breadboard. In both situations, the probe tip is inserted into the adapter.

NOTE This adapter is *not* provided with the probe but is available. Order part number 0960-2922.

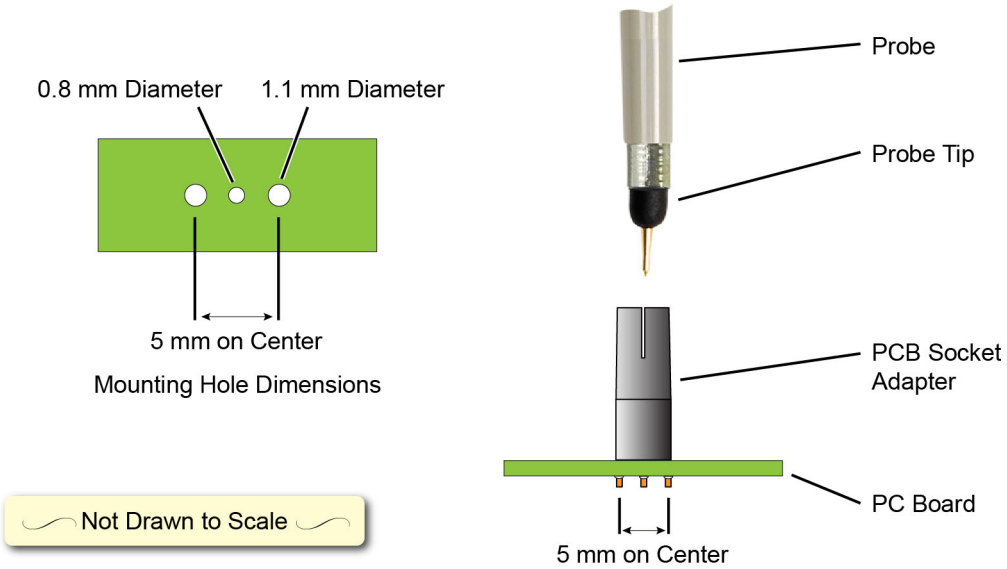

Figure 7 PCB Socket Adapter Soldered on PC Board

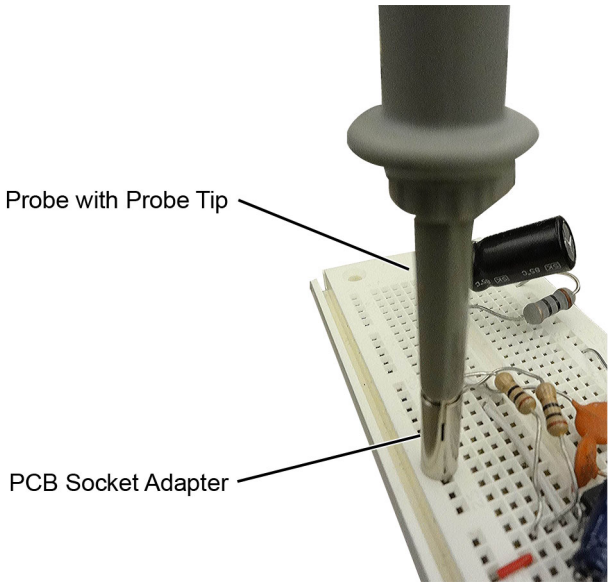

Figure 8 PCB Socket Adapter Plugged onto Breadboard

Dual-Lead Adapter

The dual-lead adapter allows you to connect the probe to common probing test clips and hooks that have 0.025-inch (0.635 mm) pins. Insert the probe's tip into the adapter as shown in Figure 9. The adapter's leads are approximately 60 mm long.

NOTE This adapter is *not* provided with the probe but is available. Order part number 0960-2923.

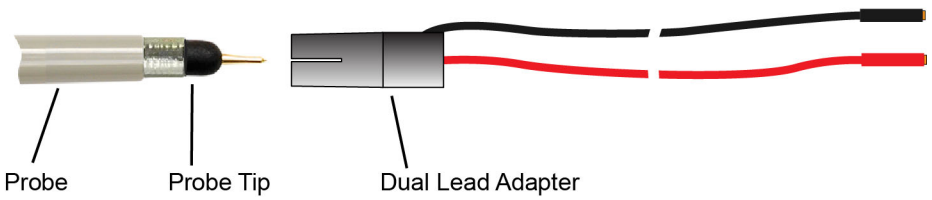

Figure 9 Dual-Lead Adapter

Insulating Cap

The insulating cap fits over the probe tip and covers the grounding band of the probe barrel. This enables you to probe in high-density environments without having to worry about shorting the circuit. Use the alligator ground lead when probing with the insulating cap.

IC Insulating Cap

The IC insulating cap fits over the probe tip and provides a convenient self-aligning connection to an IC's pins. This helps to maintain contact on small fine-pitch pins and prevents shorting adjacent pins by preventing the probe tip from sliding between the legs of the component.

Figure 10 shows how the cap fits around the IC pins. Notice where the probe tip comes through the cap. Use the alligator ground lead when probing with the IC insulating cap.

NOTE The cap is designed to fit on ICs that have 2.54 mm pitch spacing as shown in Figure 10.

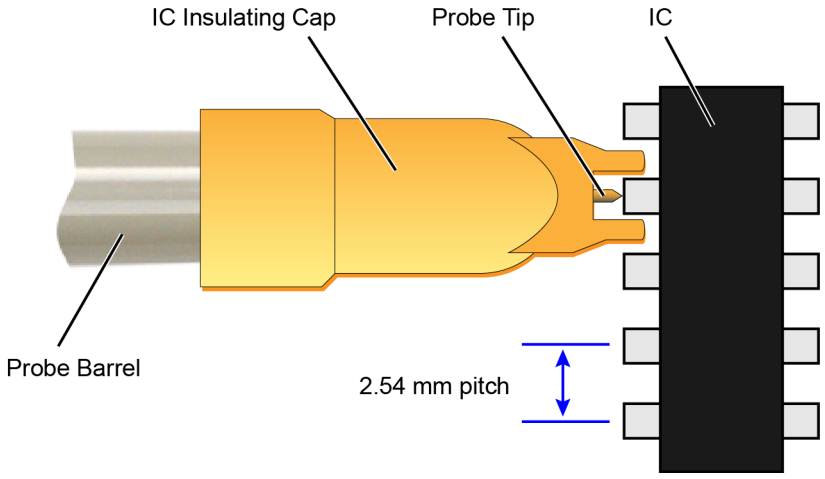

Figure 10 Top View of IC Insulating Cap Positioned Over IC Pin *(not drawn to scale)*

To Replace the Probe Tip

A dull probe tip can make it more difficult to obtain a reliable connection. If this happens, replace the tip with one of the replacement probe tips that are provided with the probe. The probe tip screws onto the end of the probe barrel.

CAUTION Do not over tighten the replacement probe tip.

NOTE If you need additional replacement tips, order the N2859A replacement kit.

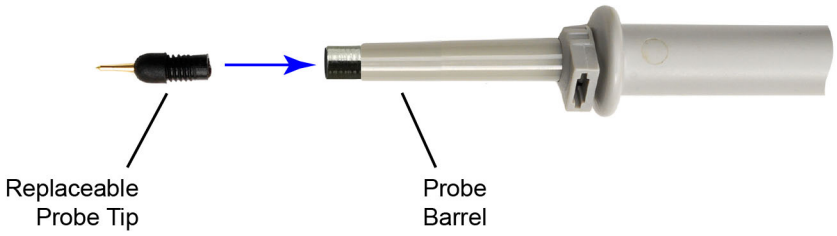

Figure 11 Screw on the Replaceable Probe Tip

Low-Frequency Compensation

The probes can be adjusted for low-frequency (LF) compensation. LF compensation matches the probe cable capacitance to the oscilloscope input capacitance. This matching assures good amplitude accuracy from DC to the upper bandwidth limit frequencies. A poorly compensated probe influences the overall system performance (probe and oscilloscope) and introduces measurement errors resulting in inaccurate readings and distorted waveforms.

Perform LF compensation whenever the probe is connected to the oscilloscope's input for the first time.

1 Connect the probe to one of the oscilloscope's channel inputs.

2 Connect the probe tip to the oscilloscope's front-panel calibration output. For example, on 2000X, 3000X, and 4000X series InfiniiVision oscilloscopes, use the front-panel **Demo 2 / Probe Comp** terminal as shown in Figure 12.

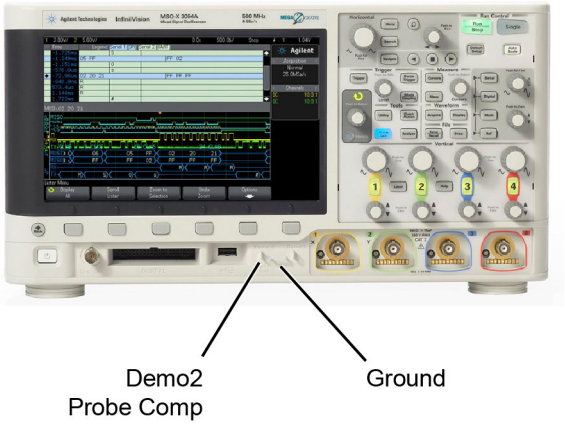

Figure 12 Probe Comp Terminals on 3000 X Series Oscilloscope

3 Press the front-panel channel key to turn on the channel.

4 If you are using a 2000X, 3000X, or 4000X InfiniiVision oscilloscopes, use the guided probe compensation:

   a Press the **Probe** softkey.

   b Press the **Probe Comp** softkey to run the compensation.

NOTE If the probe is already properly adjusted, the guided compensation will not prompt you to make the adjustment.

5 If you are using a different oscilloscope, display two or three waveform cycles over two to six vertical divisions.

6 Use the supplied trimmer tool to adjust the **LF Comp** to an optimum square wave response as shown in Figure 13.

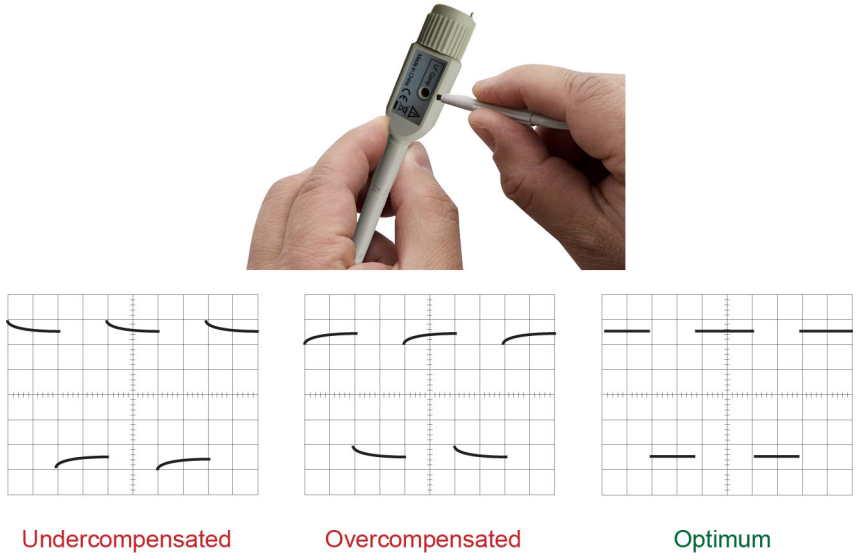

Figure 13 Proper Low-Frequency Compensation Adjustment

Safety Information

WARNING **To avoid personal injury and to prevent fire or damage to this product or products connected to it, review and comply with the following safety precautions. Be aware that if you use this probe assembly in a manner not specified, the protection this product provides may be impaired.**

WARNING **Handle Probe Tips / Accessories Carefully. Some of the probe tips / accessories are very sharp (the ground spring, for example). You should handle these with care to avoid personal injury.**

WARNING **Use Only Grounded Instruments. Do not connect the probe's ground lead to a potential other than earth ground. Always make sure the probe and the oscilloscope are grounded properly.**

WARNING **Connect and Disconnect Properly.**

The probe assembly does not provide protection at the BNC when not mated to a grounded oscilloscope. If proper connecting and disconnecting procedures (as described below) are not observed, hazardous voltages may be present at the probe assembly BNC.

-> Connect the probe to the oscilloscope and connect the ground lead to earth ground before connecting the probe to the circuit under test.

-> Disconnect the probe input and the probe ground lead from the circuit under test before disconnecting the probe from the oscilloscope.

WARNING

Observe Probe Ratings. Do not apply any electrical potential to the probe input which exceeds the maximum rating of the probe. Make sure to comply with the voltage versus frequency derating curve (Figure 14).

WARNING

This probe has a cable with a built-in wear indicator. When the insulation of the cable deteriorates, the wear indicator becomes visible. Do not use the probe when the wear indicator is visible. Using a product with a worn cable may result in electric shock, fire, or equipment failure.

WARNING

Indoor Use Only. Do not operate in wet/damp environments. Keep product surfaces dry and clean.

WARNING

Do Not Operate With Suspected Failures Refer to qualified service personnel.

WARNING

Do Not Operate in an Explosive Environment.

Characteristics

This section lists the characteristics for the probes. The probe and oscilloscope should be warmed up for at least 20 minutes before any testing and the environmental conditions should not exceed the probe's specified limits.

Table 4 Electrical Characteristics

Description	Probe			
	N2841A	N2842A	N2843A	N2853A
Bandwidth (–3 dB)	150 MHz	300 MHz	500 MHz	350 MHz
Attenuation Ratio	10:1			
Rise Time (10% – 90%)	2.3 ns	1.2 ns	0.7 ns	1 ns
Input Resistance	10 MΩ			
Input Capacitance	11 pF			
Compensation Range	5 – 30 pF			
Maximum Rated Input Voltage	150 V_{rms} CAT II (300 V_{rms} mains isolated)			
Probe ID	Yes			
Cable Length	1.2 m	1.2 m	1.3 m	2 m
Safety	Conformance to CAN/CSA-C22.2 No. 61010-031:17/A1:20 , ANSI/UL 61010-031, Edition 2 + AMD 1:2020, IEC 61010-031: 2015/AMD1:2018			

Table 5 Environmental Specifications

Description	Specification
Operating Temperature	0 °C to +50 °C
Storage Temperature	0 °C to +50 °C
Humidity	80% RH Non-condensing
Altitude	Operating: 2,000 m (6,561 ft) Non-Operating: 15,000 m (49,212 ft)
Pollution Degree	Pollution Degree 2

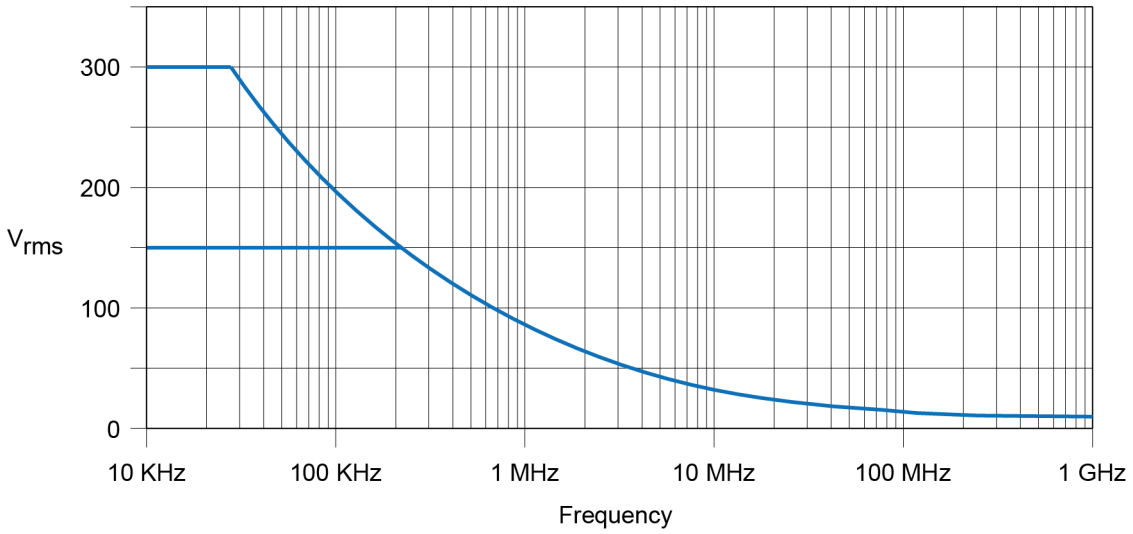

Figure 14 Typical Voltage Derating Curve

WARNING **The maximum input voltage rating of the probe decreases as the frequency of the applied signal increases.**

CAUTION Refer to the oscilloscope documentation for the oscilloscope's acceptable input range and do not exceed this limit when using the probes.

Returning the Probe for Service

If the probe is found to be defective we recommend sending it to an authorized service center for all repair and calibration needs. Perform the following steps before shipping the probe back to Keysight Technologies for service.

1. Contact your nearest Keysight sales office for information on obtaining an RMA number and return address.
2. Write the following information on a tag and attach it to the malfunctioning equipment.

- Name and address of owner
- Product model number (for example, N2841A)
- Product Serial Number (for example, MYXXXXXXXX)
- Description of failure or service required

NOTE Include probing and browsing heads if you feel the probe is not meeting performance specifications or a yearly calibration is requested.

3. Protect the probe by wrapping in plastic or heavy paper.
4. Pack the probe in the original carrying case or if not available use bubble wrap or packing peanuts.
5. Place securely in sealed shipping container and mark container as "FRAGILE".

NOTE If any correspondence is required, refer to the product by serial number and model number.

Contacting Keysight Technologies

For technical assistance, contact your local Keysight Call Center.

- In the Americas, call 1 (800) 829-4444
- In other regions, visit http://www.keysight.com/find/assist

Before returning an instrument for service, you must first call the Call Center at 1 (800) 829-4444.

Index