



TA058

50 MHz \pm 70 V differential probe

User's Manual

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1. Description

By enabling conventional oscilloscopes to display and measure in-circuit waveforms that are referenced to high common-mode voltages, this differential probe extends the measurement capability of oscilloscopes to electronic power converters, inverters, motor speed controls, switch-mode power supplies and many other applications.

2. Safety

To prevent possible electrical shock, fire, personal injury, or damage to the product, carefully read this safety information before attempting to install or use the product. In addition, follow all generally accepted safety practices and procedures for working with and around electricity.

The product has been designed and tested in accordance with the European standard publication EN 61010-031:2015, pollution degree 2, and left the factory in a safe condition.






The following safety descriptions are found throughout this guide:

A **WARNING** identifies conditions or practices that could result in injury or death.

A **CAUTION** identifies conditions or practices that could result in damage to the product or equipment to which it is connected.

Symbols

These safety and electrical symbols may appear on the product or in this guide.

Symbol	Description
	Earth (ground) terminal
	Equipment protected through double or reinforced insulation
	Possibility of electric shock
	Caution. Appearance on the product indicates a need to read these safety and operation instructions.
	Do not dispose of this product as unsorted municipal waste



WARNING

To prevent injury or death use the product only as instructed. Protection provided by the product may be impaired if used in a manner not specified by the manufacturer.

Maximum input ranges

Observe all terminal ratings and warnings marked on the product.



WARNING
To avoid any injury, do not use the probe when the voltage between either input lead and earth is above 600 V RMS.

WARNING
Signals exceeding the voltage limits in the table below are defined as “hazardous live” by EN 61010. To prevent electric shock, take all necessary precautions when working on equipment where hazardous live voltages may be present.

Signal voltage limits of EN 61010-1:2010+A1:2019		
±60 V DC	30 V AC RMS	±42.4 V pk max.



WARNING
To prevent injury or death, the probe must not be directly connected to the mains (line power).



CAUTION
Operation outside of the safe voltage range is likely to cause permanent damage to the product and other connected equipment.

Grounding

This probe is grounded with the shell of the BNC connector and an auxiliary grounding terminal.



WARNING
Before making connections to the input leads of this probe, ensure that its output lead is grounded. You may do this either by connecting the BNC shell to a grounded measurement instrument, or by connecting the auxiliary grounding terminal to a reliable ground point. Read the next paragraph for further advice.

You must verify that the probe is securely grounded before connecting the probe input leads. Some types of measuring instrument, such as a USB oscilloscope connected to a laptop, are unlikely to be grounded even if the laptop is powered from the mains. Bench-top oscilloscopes are usually grounded, but in some cases may have been isolated from ground. A USB oscilloscope connected to a desktop computer is usually grounded. In any case, do not assume that the measurement instrument is grounded. Always verify the ground connection for yourself before connecting the probe input leads.

External connections



WARNING
To prevent injury or death, only use the power cord and adaptor supplied with the product. These are approved for the voltage and plug configuration in your country.

**WARNING**

To prevent electric shock, do not touch exposed connections and components when power is present.

**CAUTION**

Take care to avoid mechanical stress or tight bend radii for all connected leads. Mishandling will cause deformation of sidewalls, and will degrade performance and measurement accuracy.

Environment

**WARNING**

To prevent injury or death, do not use in wet or damp conditions, or near explosive gas or vapor.

WARNING

To avoid injury or death, always remove jewellery such as rings, watches and other metallic objects.

**CAUTION**

To prevent damage, always use and store your probe in appropriate environments as shown below:

Temperature	–10 to 40 °C (operating) –30 to 70 °C (storage)
Humidity	25 to 85 %RH (operating and storage)
Altitude	2000 m
Pollution	Degree 2

Care of the product

The product contains no user-serviceable parts. Repair, servicing and calibration require specialized test equipment and must only be performed by Pico Technology or an approved service provider. There may be a charge for these services unless covered by the Pico one-year warranty.

**WARNING**

To prevent injury or death, do not use the product if it appears to be damaged in any way, and stop use immediately if you are concerned by any abnormal operations.

WARNING

To prevent injury or death, do not operate this probe with the covers removed.



CAUTION

Do not tamper with or disassemble the probe or its accessories. Internal damage will affect performance.

CAUTION

When cleaning the product, use a soft cloth and a solution of mild soap or detergent in water. To prevent electric shock, do not allow liquids to enter the casing, as this will compromise the electronics or insulation inside. Always ensure that the probe is dry before connecting it to the oscilloscope, power supply, or device under test.

3. Installation

Follow these instructions to install and start using your differential probe.

1. Simply plug in the BNC output connector to the vertical input of a general-purpose oscilloscope or other measurement instrument.
2. Connect the probe to an appropriate power source: USB or external battery pack.
3. Turn the probe on.
4. If the probe has a selectable attenuation ratio, set it according to the table below.
5. Using the appropriate probe accessories, connect the input to the circuit under test.



WARNING

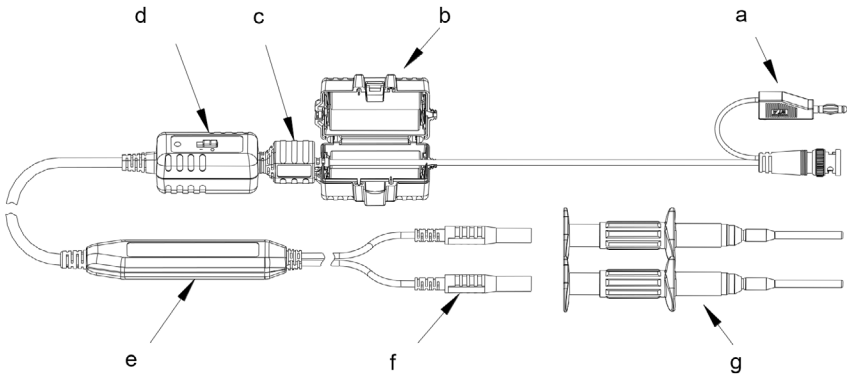
To protect against electric shock, use only the accessories designed for use with this differential probe.

WARNING

To avoid injury or death, you must observe all safety precautions appropriate to the circuit under test.

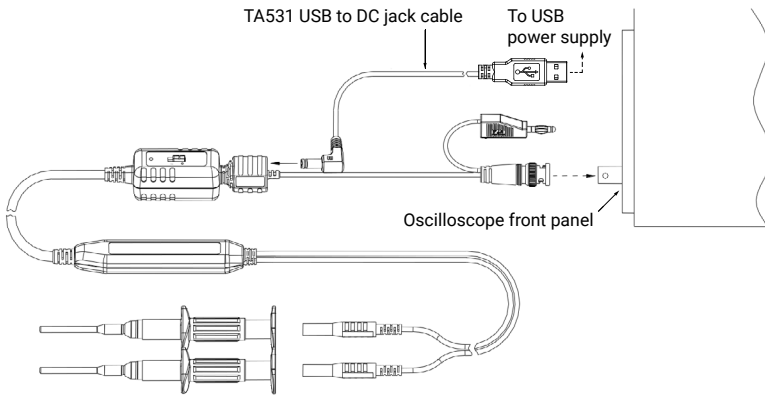
4. Appearance

The TA058 differential probe looks like this:



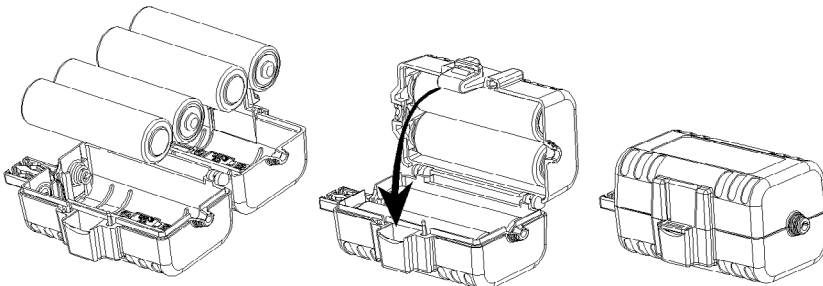
- a. Output cable:
The BNC output connector and an auxiliary grounding terminal are connected to the oscilloscope.
- b. TA047 removable battery pack (optional): 4 x AA cells
- c. Power source connector. This can be connected to the following sources:
 - removable battery pack (4 x AA cells)
 - TA531 power lead (USB to DC jack)
- d. Power-supply switch-box
- e. Probe body
- f. The input leads of the differential probe
- g. Sprung hooks. The sprung hooks allow a safe connection to the circuit under test.

5. Power lead - TA531 USB to DC jack cable



6. TA047 removable battery pack

The TA058 probe can be powered from an optional removable battery pack, which can be connected to the power source connector. The following figures illustrate how to operate the battery pack.



7. Specifications

Bandwidth	DC to 50 MHz (–3 dB)
Attenuation ratio	1:10
Accuracy	±1%
Rise time	< 7 ns
Input impedance	1.6 MΩ 7 pF each side to ground
Input voltage	
Differential range	±70 V (DC + Peak AC)
Common mode range*	±700V (DC + Peak AC) or 600 V RMS
Absolute max. voltage* (either input to ground)	±700 V (DC + Peak AC) or 600 V RMS
Output	
Swing (into 5 kΩ load)	±7 V
Offset (typical)	< ±2 mV
Noise (typical)	0.7 mV RMS
Source impedance (typical)	50 Ω
CMRR (typical)	–95 dB @ 60 Hz; –60 dB @ 1 MHz
Ambient operating temperature	–10 to +40 °C
Ambient storage temperature	–30 to +70 °C
Ambient operating humidity	25 to 85 %RH
Ambient storage humidity	25 to 85 %RH
Power requirements**	
Option 1	Removable battery pack (4 x AA cells)
Option 2	TA531 USB power lead
Length of input leads	50 cm
Length of BNC cable	125 cm
Weight	300 g
Dimensions	111 mm L x 22 mm W x 14 mm H

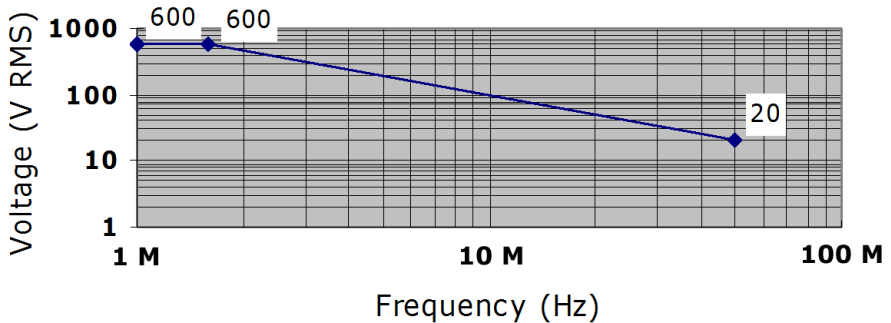
* Voltage limit is the lesser of the DC+Peak AC and RMS values.

** a) Polarity is “+” inside and “–” outside. If the polarity is wrong, a built-in circuit protects the probe so that no danger or damage will occur.

b) When the voltage of the cells becomes too low, the power indicator on the panel will flicker.

8. Derating curve

The derating curves for absolute maximum input voltage is shown below:



9. Test procedure

1. Connect the BNC output connector to the vertical input of an oscilloscope.
2. Connect an appropriate power source to this probe and then turn it on.
3. Set the oscilloscope input coupling to DC and 1 V/div. Center the trace on the display.
4. Connect the inputs of the probe to the power lines.
5. A 50 Hz / 60 Hz sine-wave of proper amplitude will be displayed on the screen of the oscilloscope. This means the probe is working properly.

10. Calibration of the unit

There are three main sources of uncertainty when calibrating a Pico differential probe in addition to any uncertainty in the test setup. These are:

1. The stated DC accuracy of the probe under test ($\pm 1\%$).
2. Any DC offset or noise in the probe output. The values in this manual are typical, so to find the DC offset for a given unit a reading must be taken with the inputs to the probe shorted together.
3. The AC performance of the probe. This is specified as being within 3 dB over the entire frequency range of the probe. Any absolute voltage accuracy testing must be done under DC conditions.

One other possible source of noise is the power source for the probe. It is recommended that where possible the probes are calibrated using a battery supply rather than a mains supply unit.

11. Cleaning

Only use a soft, damp cloth to clean the probe, taking care not to cause damage.



WARNING

To prevent injury or death, always ensure the probe is thoroughly dry after cleaning.

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