

# TA058

## 50 MHz $\pm$ 70 V Differential Probe

### User's Manual

This probe complies with IEC-1010.1, IEC-1010.2-031 CAT I, Pollution Degree 2.

Absolute max. voltage  $\pm$ 700 V (DC + Peak AC) or 600 V RMS CAT I

#### 1. Safety terms and symbols

Terms appearing in this manual:



**WARNING** Warning statements identify conditions or practices that could result in injury or death.



**CAUTION** Caution statements identify conditions or practices that could result in damage to this product or other property.

Symbols appearing on the product:



Danger  
High Voltage



Protective  
(Earth) Terminal



Attention  
Refer to Manual

## 2. General safety summary

Please review the following safety precautions to avoid injury and prevent damage to this probe or any products that are connected to it.

### Observe maximum working voltage

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

### Must be grounded

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



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**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.

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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.**

### Use fused test prods if necessary

If this probe is intended to use for measurements in circuits of INSTALLATION CATEGORY III, it must be used with fused test prods.

### Do not operate without covers

To avoid electric shock or fire hazard, do not operate this probe with the covers removed.

### Do not operate in wet or damp conditions

To avoid electric shock, do not operate this probe in wet or damp conditions.

### Do not operate in explosive atmosphere

To avoid injury or fire hazard, do not operate this probe in an explosive atmosphere.

### Avoid exposed circuitry

To avoid injury, remove jewelry such as rings, watches and other metallic objects. Do not touch exposed connections and components when power is present.

## Use proper power source

To ensure proper functioning of this probe, use four AA cells or a 6 V DC 90 mA mains adaptor or 9 V DC 70 mA mains adaptor or power leads.

## Do not operate the probe if it is damaged

If you suspect there is damage to this probe, have it inspected by qualified service personnel.

## 3. 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.

## 4. Installation

- a. Simply plug in the BNC output connector to the vertical input of an oscilloscope or other measurement instrument, and connect the auxiliary grounding terminal to a proper ground. The measurement instrument must have a ground reference.
- b. Connect an appropriate power source (mains adaptor, battery pack or power lead) to this probe and then turn it on.



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

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- c. Using the appropriate probe accessories, connect the input to the circuits under measurement.



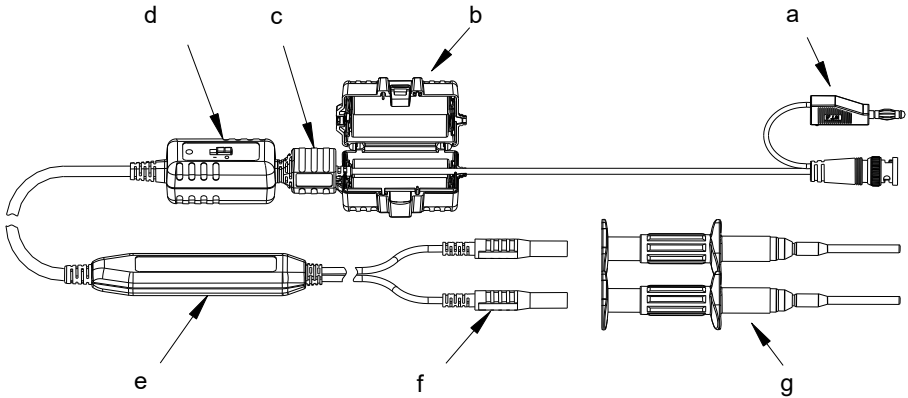
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**CAUTION** This probe is designed for carrying out differential measurements between two points on the circuit under test. It is not intended for electrically insulating the circuit under test and the measuring instrument.

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## 5. Appearance

The differential probe looks like this:

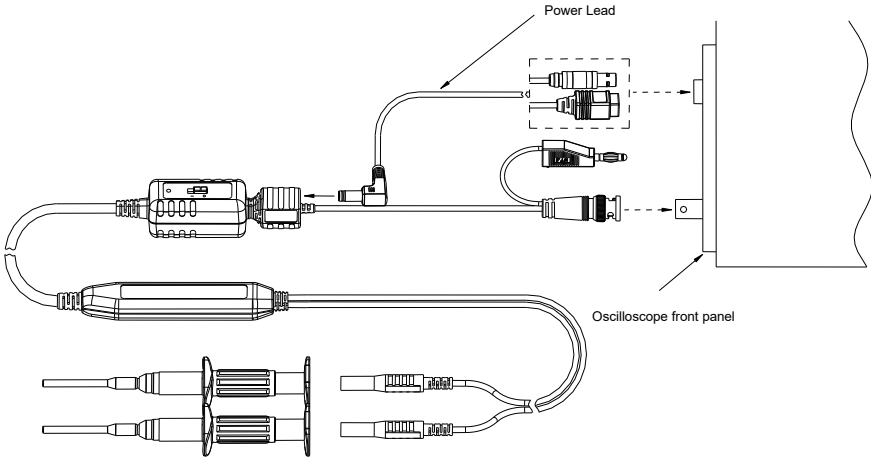


- a. Output Cable: The BNC output connector and an auxiliary grounding terminal are connected to the oscilloscope.
- b. Removable Battery Pack (optional): 4 x AA cells
- c. Power Source Connector. This can be connected to the following sources:
  - Mains adaptor (6 V DC 90 mA or 9 V DC 70 mA)
  - Removable battery pack (4 x AA cells)
  - Power leads
- d. Power Supply
- e. Probe Body
- f. The input leads of the differential probe
- g. Sprung Hooks. The sprung hooks are connected safely to test points in circuits.

## 6. Power leads

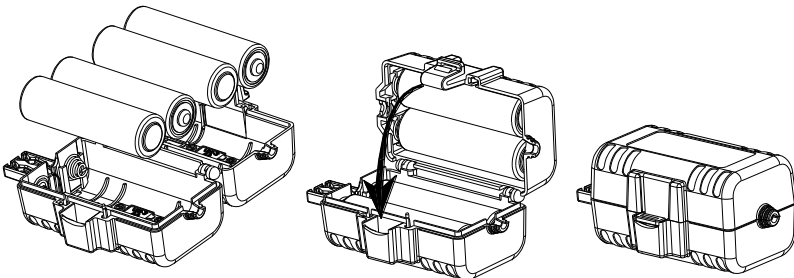
Two types of power leads are available for use with this instrument:

- a. Lemo® Lead: For oscilloscopes with Lemo® power connectors.
- b. Probus® Lead: For oscilloscopes with Probus® power connectors.



## 7. Removable Battery Pack

The following figure illustrates the operation of the removable battery pack:



## 8. Specifications

Bandwidth	DC to 50 MHz (-3 dB)
Attenuation ratio	1:10
Accuracy	±1%
Rise time	< 7 ns
Input impedance	1.6 M $\Omega$    7 pF each side to ground
Input voltage	
Differential range*	±70 V (DC + Peak AC) or 70 V RMS
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 k $\Omega$ load)	±7 V
Offset (typical)	< ±2 mV
Noise (typical)	0.7 mV RMS
Source impedance (typical)	50 $\Omega$
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	Mains adaptor (6 V DC 90 mA or 9 V DC 70 mA)
Option 2	Removable battery pack (4xAA cells)
Option 3	Power leads
Optional extension plugs for mains adaptor	
- Input	One jack with 1 A current rating
- Output	Three plugs with 1 A current rating
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

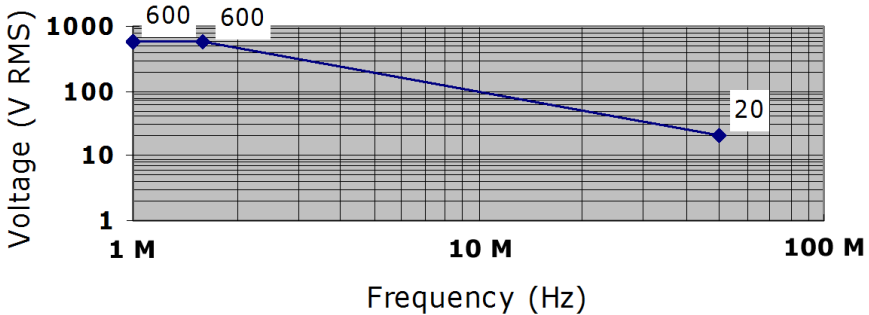
\* Voltage limit is the lesser of the DC+Peak AC and RMS values.

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- The supplied voltage must be less than 16 V and greater than 3.3 V, otherwise the probe could be damaged or might not operate properly.
- 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.
- When the voltage of the cells becomes too low, the power indicator on the panel will flicker.

## 9. Derating curve

The derating curve for absolute maximum input voltage is as follows:



## 10. 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 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.

## 11. Calibrating 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.

The adjustment procedure is available from Pico Technology on request.

## 12. Cleaning

Use a soft cloth to clean the probe, taking care not to cause damage.

- a. Do not immerse the probe.
- b. Do not use abrasive cleaners.
- c. Do not use chemicals contains benzene or similar solvents.



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