AD2201

200 MHz ±60 V active differential probe

User's guide

www.picotech.com

Contents

1. Description

This high-bandwidth, low-voltage active differential probe is designed for low-noise, high-speed applications such as wireless and data communications, digital circuits, timing analysis, disk drive design, power measurement, differential transmitter and receiver design, and troubleshooting ground bounce problems.

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 (*Safety requirements for hand-held probe assemblies for electrical measurement and test*) 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
	Possibility of electric shock
	Caution.
CAT	IEC 61010 overvoltage category
	Do not dispose of this product as unsorted municipal waste

The terminal can be used to make a measurement ground connection. The terminal is NOT a safety or protective earth.

Appearance on the product indicates a need to read these safety and operation instructions.

WARNING
To prevent injury or death use the product only as instructed and use only accessories that have been supplied or recommended. Protection provided by the product may be impaired if used in a manner not specified by the manufacturer.

Maximum input/output ranges

Observe all terminal ratings and warnings marked on the product.

The table below and/or markings on the product indicate the full-scale measurement range, common mode range and overvoltage protection range. The full-scale measurement ranges are the maximum voltages that can be accurately measured by the instrument. The common-mode voltage is the maximum that can be applied to both differential inputs with respect to the power connector ground to achieve a valid measurement and the overvoltage protection ranges are the maximum voltages that will not damage the instrument.

WARNING
To prevent electric shock, do not attempt to measure voltages outside of the specified full scale measurement range or with an applied common-mode voltage that is outside specification and do not attempt to connect voltages outside the overvoltage protection range.

Full-scale measurement range	Common-mode voltage range	Overvoltage protection (DC + AC peak)
±20 V (DC + AC peak)	±60 V (DC + AC peak)	±60 V (DC + AC peak)

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 61010-031:2015		
±60 V DC	30 V AC RMS	±42.4 V pk max.

To prevent electric shock, take all necessary safety precautions when working on equipment where hazardous live voltages may be present.

WARNING
To prevent injury or death, do not directly connect the oscilloscope to the mains (line power).

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

CAUTION
Exceeding the overvoltage protection range on any cable, connector or accessory can cause permanent damage to the probe and other connected equipment.

Grounding

WARNING
The probe's ground connection through the BNC cable is for measurement purposes only. The probe does not have a protective safety ground.

WARNING
To prevent electric shock, do not connect the probe's ground to a voltage source. Connect only to a known ground. If you are unsure about the safety of a ground point, check it with a multimeter before connecting the AD2201 probe's ground to it.

External connections

The AD2201 requires power from a USB port or USB power supply through the TA531 USB to DC power cable supplied.

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.

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

	Storage	Operating
Temperature	–30 to 70 °C	–10 to 40 °C
Humidity	Up to 85 %RH	
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 warranty.

Inspect the probe and all connectors, cables and accessories before use for signs of damage.

WARNING
To prevent electric shock do not tamper with or disassemble the probe, case parts, connectors or accessories.

WARNING
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. Ensure the probe is thoroughly dry after cleaning.

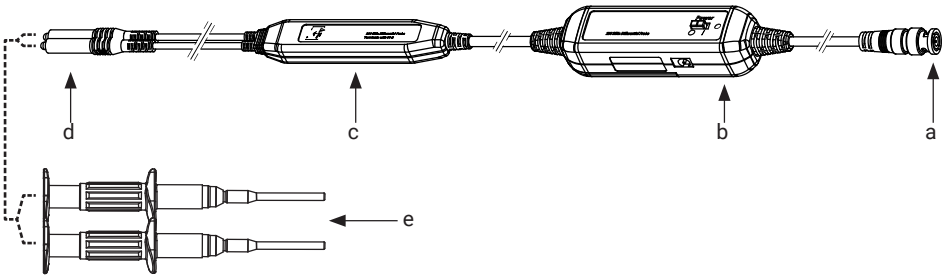
WARNING
To prevent injury or death, do not operate this probe with the covers removed.

CAUTION
To prevent damage to the probe and other connected equipment, do not immerse the probe in any liquid.

3. Pack contents

Description	Quantity
AD2201 probe	1
Test hooks, pair, red and black	1
Crocodile clips, pair, red and black	1
9 V battery	1
TA531 USB to DC jack cable	1

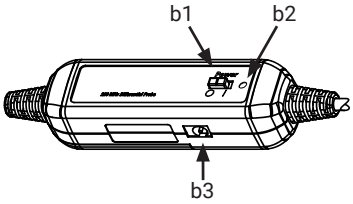
4. Appearance



a. Output cable. The BNC output connector is for connection to the oscilloscope.

b. Power unit. This can be connected to the following sources:

- Internal 9 V battery
- TA531 USB to DC jack cable



b1. On/off switch.

b2. LED indicator (green for normal operation; turns red when the supply voltage is too low).

b3. Power jack.

c. Probe body.

d. Input leads. The input leads of the differential probe.

e. Test hooks or crocodile clips. Allow a safe connection to the circuit under test.

5. Installation

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

1. Simply plug the BNC output connector into the vertical input of a general-purpose oscilloscope or other measurement instrument.
2. Connect the probe to an appropriate power source (see description of *power unit* above).
3. Turn the probe on.
4. Using the appropriate probe accessories, connect the input to the circuit under test.

6. Zero probe offset

The AD2201 probe can be adjusted for zeroing out the probe's offset voltage using a trimmer tool supplied with the probe. Follow this procedure to perform the offset-zero calibration:

1. After turning on the power to the oscilloscope and probe, leave them on for >30 minutes to stabilize. You may use the USB power cord or batteries to power the probe.
2. Connect the probe to channel A of your oscilloscope.
3. Short the + and – probe inputs together with the hook tips.
4. Select Auto range in the oscilloscope software.
5. Then set units to Volt and the probe attenuation to 10:1.
6. Set the ocsilloscope to DC coupled mode.
7. Position the ground of the waveform to the centre of the screen and set the vertical scale to 10 mV/div or 20 mV/div.
8. Set the oscilloscope to Averaging mode (x8 or higher) or High resolution mode to reduce scope noise.
9. Using the trimmer tool supplied with the probe, adjust the probe offset voltage to 0 V.

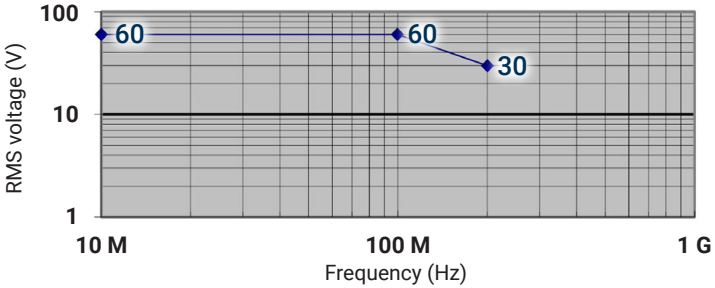
7. Specifications

Bandwidth (–3 dB)	DC to 200 MHz
Attenuation ratio	10:1
DC accuracy (gain error)	±1%
Rise time	1.75 ns
Input impedance	500 kΩ ‖ 7 pF each side to ground
Input voltages	
Differential range	±20 V (DC + peak AC)
Common mode range	±60 V (DC + peak AC)
Absolute maximum voltage (either input to ground)	
Output	
Swing	±2 V into 50 Ω load
Offset (typical)	< ±2 mV
Noise (typical)	0.3 mV RMS
Source impedance (typical)	50 Ω (for use with 50 Ω oscilloscope input)
CMRR (typical)	80 dB at 60 Hz 50 dB at 10 MHz
Temperature	–10 °C to +40 °C (operating) –30 °C to +70 °C (storage)
Humidity	Up to 85% RH (operating and storage)
Power requirements	
Battery *	9 V (PP3, 6LR61)
TA531 USB to DC jack cable *	5 V DC 300 mA
Input cable length	50 cm
BNC cable length	120 cm
Weight	200 g
Dimensions (L x W x H)	111 x 22 x 14 mm
Warranty	1 year

* a. The supplied voltage must be between 3.3 V and 16 V. Voltages outside of this range may damage the probe or affect performance.
b. Polarity is "+" inside and "–" outside. The device is reverse-polarity protected.
c. When the voltage of the battery becomes too low, the power indicator on the panel will change color from green to red and switch off.

8. Derating curve

The derating curve 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 the probe to an appropriate power source.
3. Turn on the probe using the power switch.
4. Set the oscilloscope input to DC coupling and 1 V/div. Center the trace on the display.
5. Connect the inputs of the probe to a sine-wave signal source of 1 kHz and 20 V p-p.
6. A 1 kHz sine wave with 1 V amplitude will be displayed on the screen of the oscilloscope. This demonstrates that the probe is working properly.

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