Differential Voltage Probe

(Order Code DVP-BTA)

The Differential Voltage Probe is designed for exploring the basic principles of electricity. Use this probe to measure currents in low voltage AC and DC circuits. With a range ±6.0 V, this system is ideal for use in "battery and bulb" circuits. Use it with the Current Probe (order code DCP-BTA) to explore Ohm's law, phase relationships in reactive components and much more. This differs from the Voltage Probe that comes with your interface in that neither clip is connected to ground. Use multiple sensors to explore series and parallel circuits. This sensor has the same characteristics as the Voltage Probe from the Vernier Current and Voltage Probe System.

> **NOTE:** This product is to be used for educational purposes only. It is not appropriate for industrial, medical, research, or commercial applications.

Using the Differential Voltage Probe with a Computer

This sensor can be used with a Vernier LabPro® or Go!®Link. Here is the general procedure to follow when using the Differential Voltage Probe with a computer:

1. Connect the Differential Voltage Probe to any of the analog ports on LabPro (in most cases, Channel 1 is used) or to Go! Link.
2. Start the Logger *Pro*® or Logger Lite™ software on a computer.
3. You are now ready to collect data. Logger *Pro* or Logger Lite will identify the Differential Voltage Probe and load a calibration. Click on Collect and begin collecting data.
4. If you are using Logger *Pro* software, an alternative to Step 3 is to open an experiment file in the Logger *Pro* Probes & Sensors folder. Use the files associated with the Voltage Probe of the Current and Voltage Probe System.

Using the Differential Voltage Probe with Graphing Calculators

This sensor can be used with a TI graphing calculator and any of the following lab interfaces: LabPro, CBL 2™, or CBL™. Here is the general procedure to follow when using the Differential Voltage Probe with a graphing calculator:

1. Load a data-collection program onto your calculator:
   - **LabPro or CBL 2**: Use the DataMate program. This program can be transferred directly from LabPro or CBL to the TI graphing calculator. Use the calculator-to-calculator link cable to connect the two devices. Put the calculator into the Receive mode, and then press the Transfer button on the interface.
   - **Original CBL**: Use the PHYSICS program. This program is available free on our web site at www.vernier.com. Load the program into a calculator using TI-Connect™ or TI-GRAPH LINK™.
2. Use the calculator-to-calculator link cable to connect the interface to the TI graphing calculator using the I/O ports located on each unit. Be sure to push both plugs in firmly.
3. Connect the Differential Voltage Probe to any of the analog ports on the interface. In most cases, CH 1 is used.
4. Start the data-collection program. If you are using the DataMate program, it will automatically recognize the sensor and you are ready to collect data. If you are using the PHYSICS program, you must select a calibration for this sensor. Use the calibration for the Voltage Probe that is part of the Current & Voltage Probe system (C-V VOLTAGE).

Using the Differential Voltage Probe with Palm Powered™ Handhelds

This sensor can be used with a Palm Powered handheld and the LabPro.

1. Connect the Palm Powered handheld, LabPro, and the Differential Voltage Probe.
2. Start Data Pro.
3. Tap New, or choose New from the Data Pro menu. Tap New again. The Differential Voltage Probe will be identified automatically.
4. You are now ready to collect data.

Specifications

Differential Voltage Probe input voltage range: ± 6.0V

Max. voltage on any input: ±10 V

Input Impedance (to ground): 10 MΩ

Linearity: 0.01%

Resolution (using LabPro, ULI II, SBI): 3.1 mV

Resolution (using ULI, CBL, CBL 2): 12.5 mV

Supply voltage: 5 VDC

Supply current (typical): 9 mA

Output voltage range: 0 - 5 V

Transfer function : $V_O = -0.4 (V_+ - V_-) + 2.5$

> This sensor is equipped with circuitry that supports auto-ID. When used with LabPro or CBL 2, the data-collection software identifies the sensor and uses pre-defined parameters to configure an experiment appropriate to the recognized sensor. This greatly simplifies the setup procedures for many experiments. Auto-ID is required for the Quick Setup feature of LabPro and CBL 2.

How the Differential Voltage Probe Works

The Differential Voltage Probe measures the potential difference between the V_+clip (red) and the V_- clip (black). The voltage probes have differential inputs. The voltage measured is with respect to the black clip and not circuit ground. This allows you to measure directly across circuit elements without the constraints of common grounding. The voltage probes can be used to measure negative potentials, as well as positive potentials. This is a nice improvement for people using one of our 0 to 5 volt interfaces.

The voltage probes are designed to be used like voltmeter leads. They should be placed across a circuit element. The differential input range is −6 volts to +6 volts. Over-voltage protection is provided so that slightly higher voltages will not damage the sensor. You should NEVER use high voltages or household AC with these probes.

Do I Need to Calibrate the Differential Voltage Probe? "No"

You should not have to perform a new calibration when using the Differential Voltage Probe in the classroom. We have set the sensor to match our stored calibration before shipping it. You can simply use the appropriate calibration file that is stored in your data-collection program from Vernier in any of these ways:

1. If you are using the Differential Voltage Probe with a LabPro or CBL 2 interface, then a calibration is automatically loaded when the Differential Voltage Probe is detected.

2. If you manually load an experiment or calibration file, choose the Current & Voltage Probe system. The calibration for the Differential Voltage Probe is the same as for the Voltage Probe in this older system.

3. Any version of the DataMate program (with LabPro or CBL 2) will automatically identify this sensor. DataMate also has stored calibrations for this sensor (use the Current & Voltage Probe Voltage Sensor).

4. Any version of the PHYSICS program (for CBL), version 4/1/00 or newer, has stored calibrations for this sensor. Go to our web site, www.vernier.com, to download a current version. Use the calibration for the Voltage Probe that is part of the Current & Voltage Probe system.

The output of this system is linear with respect to the measurement it is making. As mentioned before, the amplifier allows you to measure positive and negative currents on any of our interfaces. Since many lab interfaces can read voltages only in the range of 0 to 5 volts, the amplifier offsets and amplifies the incoming signal so that the output is always in the range of 0 to 5 volts. If an input is zero volts, for example, the amplifier will produce an output of 2.5 volts. The output varies from this 2.5 volt level, depending on the input. To collect data as differential current, use either the calibration supplied with your program, or calibrate the unit using known voltages. A standard, two-point calibration is done, as with any Vernier sensor. Another option to consider instead of calibrating is "zeroing" the sensor. This is done by shorting out the leads of the sensor, then choosing the Zero option in the data-collection software. This option adjusts the calibration offset but does not adjust the calibration gain.

The default calibration slopes and intercepts for these sensors are:
Potential in volts:

> Slope: −2.5 V/V   Intercept: 6.25 V

Warranty

Vernier warrants this product to be free from defects in materials and workmanship for a period of five years from the date of shipment to the customer. This warranty does not cover damage to the product caused by abuse or improper use.

Measure. Analyze. Learn.
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