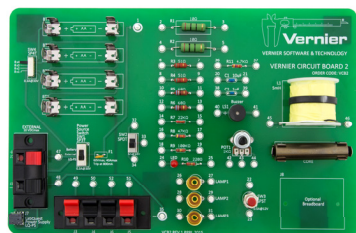


# Vernier Circuit Board 2

(Order Code VCB2)



The Vernier Circuit Board 2 is designed for use in the study of simple electric circuits. The circuit board itself contains resistors, capacitors, an LED, switches, battery clips, connections for external power, a resettable fuse, connections for the addition of other components, and turreted test points for easy connection of alligator-clip test leads.

## What's Included

Check to be sure that each of these items is included with your Vernier Circuit Board 2:

- One 10 in. × 6.5 in. (25.5 cm × 16.5 cm) circuit board
- Ten insulated wires fitted with alligator clips
- Five #48 lamps rated 0.06 A at 2.0 V (cylindrical body)
- Five #50 lamps rated 0.220 A at 7.5 V (round body)

## Board Components and Layout

### Providing Power

The upper left corner of the circuit board contains battery clips for four AA batteries. This combination of batteries provides access to four discrete potential differences from about 1.5 V to about 6 V DC, selectable using SW4. Terminal clips J1 and J2 on the lower left part of the board allow you to connect external power, such as the Power Amplifier (order code PAMP) or Extech Digital DC Power Supply (order code EXPS). The Vernier Circuit Board is designed for low voltages only. Limit the external voltage to 10 volts.

Switch SW1 below the battery clips, and to the right of J1 and J2, is a single-pole, triple-throw (SP3T) switch. The switch is labeled for the battery power or external power, or you can connect a 5VDC LabQuest Power Supply (order code LQ-PS). Set this switch to provide power to connection points 1 and 35.

A resettable fuse is located to the right of switch SW1. This fuse limits the current to 0.8 A. After being tripped, the fuse remains open until power has been removed.

### Installed Components

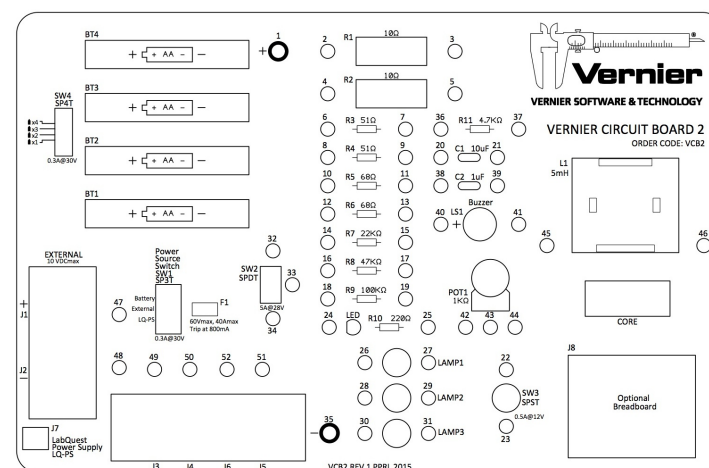
A variety of components have been installed on the circuit board:

- R1 and R2—10  $\Omega$  resistors rated at 5 W
- R3 and R4—51  $\Omega$  resistors rated at 2 W
- R5 and R6—68  $\Omega$  resistors rated at 2 W
- R7—22 k $\Omega$  resistor rated at 1 W
- R8—47 k $\Omega$  resistor rated at 1 W
- R9—100 k $\Omega$  resistor rated at 1 W
- R11—4.7 k $\Omega$  resistor rated at 1 W

- C1—1  $\mu$ F non-polar capacitor
- C2—10  $\mu$ F non-polar capacitor
- L1—5 mH inductor with powdered iron core in adjacent clip
- POT1—1 k $\Omega$  potentiometer
- 85 dB buzzer
- LED and 220  $\Omega$  current limiting resistor
- SW2—Single-pole, double-throw (SPDT) switch
- SW3—Single-pole, single-throw (SPST) momentary switch

## Attaching Other Components

Four wire clips labeled J3, J4, J5, and J6, are located in the lower left of the circuit board. You can use these connections to add your own components, e.g. resistors, capacitors, diodes, etc. You can use lamp sockets Lamp1, Lamp2, and Lamp3 to install lamps such as the ones provided with the circuit board. The sockets are designed for E-10 screw base lamps.



There is a space at the bottom right corner of the Vernier Circuit Board 2 to affix an optional breadboard, which can be used with ICs such as a 555 timer.

## Replacement Parts

A package of 10 #48 bulbs plus 10 #50 bulbs is available from Vernier Software & Technology (order code VCB-BULB). Replacement alligator clip leads are also available (order code VCB-GATOR).

## Sample Uses of the Circuit Board

The Vernier Circuit Board is designed to help simplify the study of simple circuits. The versatility of the circuit board will let your students investigate a wide variety of circuits.

### Circuits with the DC bulbs

Using the DC bulbs that are included, you can perform a variety of qualitative battery and bulb investigations such as

- Investigate the brightness of the #50 bulb and the #48 bulb when separately powered by the same voltage.
- Use the #48 2.0 V bulb with 2 AA batteries to investigate the lamp brightness when lamps are connected in series circuits. Please note that even though the #48 volt is rated at 2.0 V, it will function properly with 3 VDC.
- Use the #48 2.0 V bulb with 2 AA batteries to investigate the lamp brightness when lamps are connected in parallel circuits.
- Quantify the above investigations by measuring current and voltage in these circuits.

### Ohm's Law

You can use the 10  $\Omega$  and 51  $\Omega$  resistors on the circuit board to determine the mathematical relationship between current, potential difference, and resistance. This experiment is described in the Ohm's Law Experiment 22 in *Physics with Vernier*. During the activity, the student is instructed to use a light bulb instead of a resistor. The #50 7.5 V bulb included in this kit will work for that part of the lab.

### Series and Parallel Circuits

Experiment 23–Series and Parallel Circuits in *Physics with Vernier* investigates current flow in series and parallel circuits. It also investigates the voltage throughout series and parallel circuits. You can use the 10  $\Omega$ , 51  $\Omega$  and 68  $\Omega$  resistors found on the Vernier Circuit Board to perform these investigations.

### Charging and Discharging Capacitors

Experiment 24–Capacitors in *Physics with Vernier* investigates charging and discharging of capacitors. It uses the 10  $\mu\text{F}$  non-polarized capacitor found on this circuit board. The capacitor is used in combination with a 22 k $\Omega$  resistor and a 47 k $\Omega$  resistor, and switch SW2, all found on the circuit board, to create two different RC circuits.

### AC Circuits

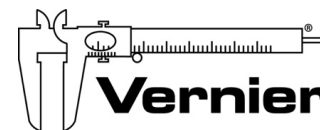
You can use the Vernier Power Amplifier to drive an AC current to the External pins J1 and J2. Use the Power Amplifier app on the LabQuest or LabQuest 2 connected to the Power Amplifier using the audio patch cord. Or, use the Power Amplifier Function Generator software (downloadable for free from our website) on a Windows or Mac computer to control the Power Amplifier output.

If you are using a LabPro interface, you can use a voltage probe (VP-BTA) with the analog output channel CH4. The analog output is limited to 100 mA current, 0.5 to 166 Hz frequency, and maximum 4 V. LabPro can be used with either a computer running *Logger Pro* (version 3.2 or newer) or a TI calculator\* running the Function Generator calculator program (free download at [www.vernier.com/til/2674/](http://www.vernier.com/til/2674/)).

\* TI-Nspire handhelds are not supported.

### 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.™**

**Vernier Software & Technology**

13979 S.W. Millikan Way • Beaverton, OR 97005-2886

Toll Free (888) 837-6437 • (503) 277-2299 • FAX (503) 277-2440

[info@vernier.com](mailto:info@vernier.com) • [www.vernier.com](http://www.vernier.com)

Rev. 7/22/15

*Logger Pro*, Vernier LabPro, Go! Link and other marks shown are our registered trademarks in the United States.

CBL 2 and CBL, TI-GRAPH LINK, and TI Connect are trademarks of Texas Instruments.

All other marks not owned by us that appear herein are the property of their respective owners, who may or may not be affiliated with, connected to, or sponsored by us.



Printed on recycled paper.



When disposing of this electronic product, do not treat it as household waste.