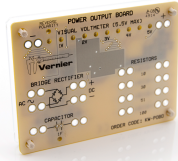


# Power Output Board

## (Order Code KW-POBD)



The Power Output Board is a compact and inexpensive tool for any classroom activity that involves power generation experimentation, such as solar or wind power.

### What is Included

- Power Output Board

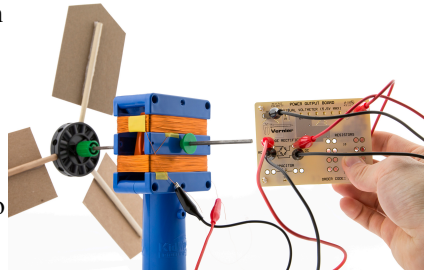
### Power Output Board Components

#### Visual Voltmeter

The Visual Voltmeter gives a general indication of the potential difference produced by a power source. Clip the black wire (ground) to the negative terminal (holes) and the red wire to the positive terminal. The number of lights illuminated indicates the number of volts produced by your power source, approximately one LED for every 0.5 V. If the Reverse Polarity LED lights up, you have connected your power source backwards; switch the red and black wires. No LEDs light up, if you connect less than 0.6 V. **Note:** This board is not meant to give an exact voltage. If you require an exact measurement of the power source voltage, use a multimeter or the Vernier Energy Sensor (order code VES-BTA).

#### Bridge Rectifier

Some power sources, such as the generator in the KidWind simpleGEN kit (order code KW-SGEN), produce an alternating electric current (AC), rather than a simple direct current (DC). Before you can use an AC power source with the Power Output Board, you will need to convert the power output to DC. The Bridge Rectifier is an easy way to do so. Connect the output wires from your



AC power source to the AC side of the Bridge Rectifier; connect wires from the DC side to the Visual Voltmeter to read the voltage output of your power source.

**Note:** Using the Bridge Rectifier introduces about 0.5 V drop in power output. For instance, a 2 V AC input will become a 1.5 V DC output.

#### Capacitor

There is a capacitor on the Power Output Board that can temporarily store electrical energy. A capacitor is similar to a rechargeable battery in that you can add electrical energy to it and then use the energy later. However, typically the energy is added and released much faster from a capacitor. This capacitor operates at a maximum of 9 volts.

#### Resistors

The Power Output Board includes a set of resistors. Test how much load your turbine can handle by connecting across different resistors.

## Specifications

	<b>Intended Operating Range</b>	<b>Absolute Maximum</b>
Visual Voltmeter input	0–5 V	5.5 V
Visual Voltmeter input impedance	25–150 $\Omega$	
Bridge Rectifier	0–5 V	40 V
Capacitor	2–6 V (1 F)	9 V
10 $\Omega$ resistor		1 W
30 $\Omega$ resistor		1 W
51 $\Omega$ resistor		1 W
100 $\Omega$ resistor		1 W

**NOTE:** Vernier products are designed for educational use. Our products are not designed nor recommended for any industrial, medical, or commercial process such as life support, patient diagnosis, control of a manufacturing process, or industrial testing of any kind.

## Suggested Uses

### Testing a Battery

You can use the Power Output Board to test battery voltage. Do not attach more than 5.5 V, about the same as three AA batteries in series, to the Power Output Board. Clip or attach the red wire to the positive terminal of the battery and then clip/attach the black wire to the negative terminal of the battery. Attach the leads to the Visual Voltmeter inputs.

### Measuring the Voltage of a Turbine or Solar Panel

Using alligator clips, attach one end of the red and black wires to the exposed metal part of the red and black wires from the turbine or solar panel; attach the other ends to the Visual Voltmeter terminals. Use a fan to blow air onto the turbine blades or put the solar panel in a sunny place and watch the Visual Voltmeter light up.



### Charging a Capacitor

The Power Output Board can temporarily store electrical energy. To charge the capacitor, you can use a turbine such as the KidWind MINI Wind Turbine (order code KW-MWT) or a solar panel. Connect the red and black wires from the turbine or solar panel to the capacitor positive and negative terminals on the Power Output Board, respectively. As the capacitor charges, the LED will glow brighter and brighter. If the LED does not light up after 30 seconds of charging,

check that the power source wires are connected to the correct capacitor terminals and are providing a minimum of 2.0 V.

### **Load your Turbine or Solar Panel**

Typically, an unloaded turbine or solar panel will produce a relatively large voltage, but very little current. When a load is applied, the voltage will drop, but the current will increase. The resistors on the Power Output Board can be used to apply a load to a turbine or solar panel. Using alligator clips, attach one end of the red and black wires to the exposed metal part of the red and black wires from the turbine or solar panel; attach the other ends to the resistor terminals. Test how much load your turbine can handle by connecting across different resistors.

## **Related Products**

### **KidWind Advanced Wind Experiment Kit (order code: KW-AWX)**

Perform all of the same investigations as the Basic Wind Experiment Kit with the ability to generate more power at higher voltages (0.5 V–20 V). Discover advanced concepts of wind turbine technology, including gearboxes and generator construction (with the GenPack add-on). Students can use the blades they design to generate electricity, lift weights, and pump water. This kit is perfect for grades 7–12 and college. All you need to add is a wind source, basic tools, and imagination!

### **KidWind simpleGEN (order code: KW-SGEN)**

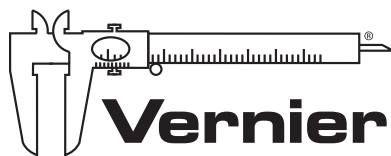
The simpleGEN is an easy-to-build AC generator that allows students to explore the basics of electrical generator design. With the simpleGEN, you can demonstrate Faraday's law, light LEDs, and perform experiments that explore how coils, magnets, and rotation affect electrical generation. With some quick modifications, you will be able to convert your generator to a simple motor and explore additional variables. You can also take your experiments to the next level by converting your simpleGEN into a wind turbine nacelle.

### **Vernier Energy Sensor (order code: VES-BTA)**

The Vernier Energy Sensor provides an easy way to measure the voltage, current, resistance, and power output of a wind turbine or solar panel precisely and accurately. When combined with our Logger *Pro* or Logger Lite software, you can display these measurements in real time and record them for further analysis.

## **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.



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