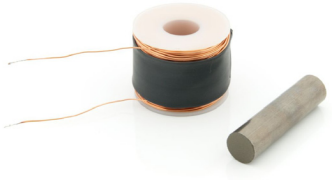
Inductor

(Order Code IND)



This air-core inductor is made from 24 gauge copper wire. It has an inductance of 5 mH and low resistance (less than 5 ohms).

This inductor is used in many physics experiments, including some in our *Advanced Physics with Vernier – Beyond Mechanics* book. It is an air-core inductor that is made from 24 gauge copper wire. It has an inductance of 5 mH and a resistance of 2.4 ohms. It is rated at 200 Watts. The powdered- metal core, which is included, can be added to increase inductance.

For RL or RLC circuit experiments, we recommend using this inductor in combination with the Vernier Circuit Board. The ends of the coil wire are exposed so that you can easily make connections to the Vernier Circuit Board or to other components or sensors.

Experiments using this Inductor

Experiments 13 and 14 in the *Advanced Physics with Vernier – Beyond Mechanics* lab book were written with this inductor in mind. Even if you do not own these books you can see a PDF of the experiments at http://www.vernier.com/products/books/phys-abm/. Experiment 13 uses a simple DC voltage source and has the students study how the potential across the inductor changes with time when you connect an RL circuit. A sample graph is shown below:

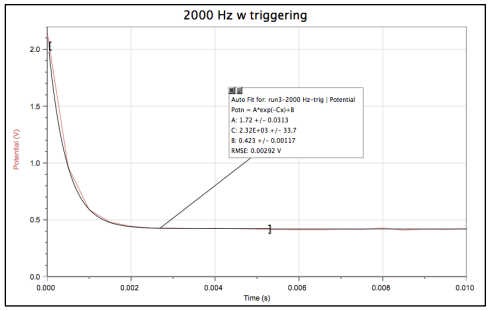


Figure 1: Potential change when the inductor is connected

Experiment 14 in *Advanced Physics with Vernier - Beyond Mechanics* studies RC, RL, and RLC circuits driven by a low-voltage AC signal. In Part 2 of this experiment the response of an inductor like this one at various frequencies is studied. The impedance of the inductor (inductor in series with resistor) *vs.* frequency is plotted.

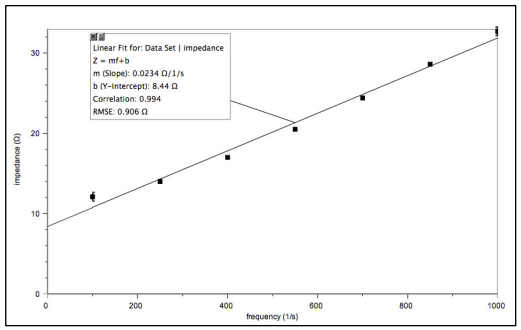


Figure 2: Impedance vs. frequency for an RL Circuit

In Part 3 of the same experiment, an RLC circuit using this inductor, a 10 mF capacitor and a small lamp acting as a resistor is used. Students drive this circuit at different frequencies and discover that the lamp lights up brightest at the resonant frequency.

The Powdered-Iron Core for the Inductor

The powdered-iron core that is included with the inductor can be inserted inside into the 0.520 inch hole in the inductor. It will increase the inductance considerably. The core is made of bits of metal in a non-conducting base to reduce eddy current losses. You may want to have students experiment inserting a solid iron or steel object inside the inductor and noting the change in both the inductance and the energy lost on eddy currents. For example, in the experiment with the light bulb and resonance described above, inserting a solid magnetic core inside the inductor will change the resonant frequency, but the energy losses will be large enough that the bulb will not light at the new resonant frequency.

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