

# Ring Launcher (EM-8661)

## Introduction

The Ring Launcher is an electrically powered projectile launcher that is used to demonstrate the principles of electromagnetic induction and magnetic force. Alternating current in the electromagnetic coil induces an alternating current in an aluminum ring. This produces a magnetic field in the ring that is opposed to the field of the electromagnetic coil. As a result, the aluminum ring is pushed upward.

The optional Ring Launcher Accessory (EM-8662) includes a heavy copper ring, a lightweight aluminum ring, an aluminum ring with a gap, and a small light bulb connected to a copper coil. These accessories can be used to create additional demonstrations of electromagnetic induction and magnetic force.

## Included equipment



- Ring Launcher
- Iron rod
- 2x aluminum rings (2.5 cm diameter)
- Transformer (220 V version only)

## Safety

- Do not attempt to remove any portion of the back casing or immerse the Ring Launcher in water. Doing either could cause shock or injury.
- **Plug the ring launcher power cord ONLY into a grounded 110 V output port!** Do not plug the Ring Launcher into a non-grounded electrical outlet. If you are using the 220 V version of the product, plug the power cord into the included transformer and then plug the transformer directly into a 220 V wall outlet. Other than this, do NOT plug the Ring Launcher power plug into an adapter.
- Do not use any rings that are different than the ones included with the Ring Launcher or Ring Launcher Accessory. For example, do not use any paper, plastic, or rubber items with the Ring Launcher.

- If the green **POWER ON** indicator goes out at any time, replace the Ring Launcher's fuse. Always unplug the launcher *before* replacing the fuse, and use only the same type of fuse as a replacement (8A, 250V, Type F).
- Do not hold the launch switch down continuously for more than 20 seconds, as doing so will cause the copper coil to overheat.



**NOTE:** If the copper coil overheats, the red **OVER TEMPERATURE** indicator will light up and the launcher will not work. Wait until the light turns off before trying more launches.

## Background

The alternating current (AC) power source generates an alternating current in the copper coil of the launcher. The changing current induces an alternating electromagnetic field. When a conducting ring is on the Ring Launcher, the alternating field induces a current in the ring. This current generates another electromagnetic field, this one opposed to the one generated by the launcher. The magnetic repulsion between the two fields pushes the ring upward.

Closed metal rings are conductors of electricity and therefore respond to the changing electromagnetic field. In the split aluminum ring included as part of the Ring Launcher Accessory (EM-8662), the ring cannot conduct an electric current because the circuit is "open". Without current, no electromagnetic repulsion occurs and the split aluminum ring is not pushed upward.

## Setup

1. Insert the iron rod into the copper coil on the Ring Launcher.
2. Plug the Ring Launcher power cord into a grounded 110 V electrical outlet. When connected, the green **POWER ON** indicator will light up.
3. In a spacious room, place the Ring Launcher on a stable support, such as the floor or a low table.



**CAUTION:** To prevent the rings from hitting other objects or people, clear a one meter radius of space around the Ring Launcher and a two meter distance above the Ring Launcher.

4. Before launching, position yourself to the side of the Ring Launcher and be prepared to catch the ring as it falls.
5. Slip one of the aluminum rings over the iron rod and copper coil of the launcher.



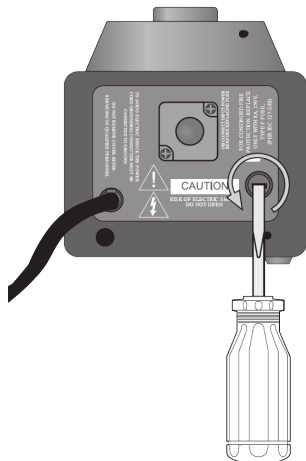
**CAUTION:** Do **NOT** place your face or any other body part directly over the top of the iron rod or anywhere in the launch path.

6. To launch the ring, push down on the Launch Switch momentarily, then release the switch. The ring will "jump" about two meters.

## Replacing the fuse

Follow these steps to replace the Ring Launcher's fuse.

1. Unplug the Ring Launcher's power cord.
2. Insert a flat bladed screwdriver into the slotted fuse cap on the back of the launcher and turn counterclockwise to remove the fuse holder, as shown below.



3. Replace the fuse in the fuse holder with another fuse of the same type (8A, 250V, Type F).
4. Place the fuse holder back into the launcher. Turn the fuse cap clockwise to tighten.

## Experimental variations

### Change the launch angle

Place the Ring Launcher in a horizontal or angular launching position. Use the rod clamp on the back of the Ring Launcher to mount the launcher on a support rod. Observe how the different orientation affects the launch.

### Remove the iron rod

To show how the properties of the iron rod enhance the electromagnetic repulsion, attempt to launch a ring with the rod removed. You will observe that the height of the launched ring is about one half of the height reached when the rod is inserted into the coil.

### Launch multiple rings

Try launching multiple rings simultaneously. The inductive effects occur within the closed rings, and all other rings are pushed up by the induced rings. This will change the experimental model, challenging students to think more deeply about the concepts involved.

## Credits

The Ring Launcher is modeled after the classroom "jumping ring" designed by Carl S. Schneider and John P. Ertel, Physics Department, United States Naval Academy, Annapolis, Maryland, USA. An article describing their design is available in the American Journal of Physics, 66 (8), August 1998, pages 686 to 692.

## Specifications and accessories

Visit the product page at [pasco.com/product/EM-8661](https://www.pasco.com/product/EM-8661) to view the specifications and explore accessories. You can also download support documents from the product page.

## Technical support

Need more help? Our knowledgeable and friendly Technical Support staff is ready to answer your questions or walk you through any issues.

-  Chat [pasco.com](https://www.pasco.com)
-  Phone 1-800-772-8700 x1004 (USA)  
+1 916 462 8384 (outside USA)
-  Email [support@pasco.com](mailto:support@pasco.com)

## Regulatory information

### Limited warranty

For a description of the product warranty, see the Warranty and Returns page at [www.pasco.com/legal](https://www.pasco.com/legal).

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