



Hand-Crank Generator

Model No. EM-8090



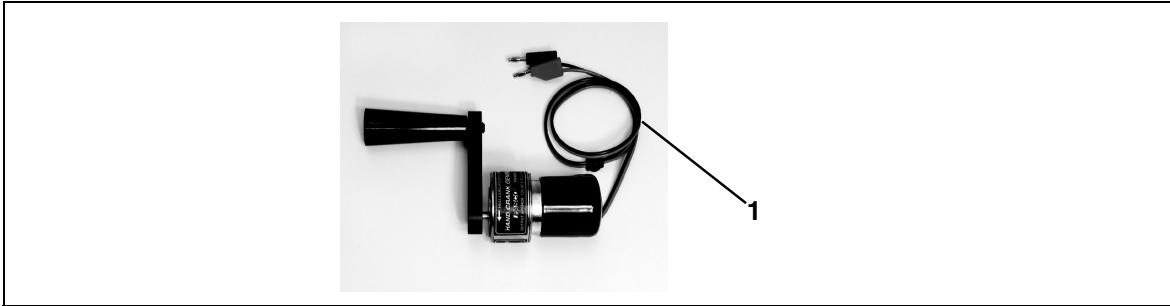
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Hand-Crank Generator

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Equipment List



Included Equipment	Replacement Model Number*
1. Generator with cables (1), maximum output: 25 Watts, 12 volts	EM-8090
2. Bag, 5" x 9" (1) (not shown above)	NSS

*Use Replacement Model Numbers to expedite replacement orders.

NSS= not sold separately from PASCO scientific

Additional Equipment Recommended (for experiments)	
Series/Parallel Circuit Board (with five 12-volt light bulbs)	EM-8677

Introduction

The Hand Crank Generator (EM-8090) consists of a permanent magnet DC motor and is used for demonstrating how manual work can be applied to energy conversion. The generator plugs into the EM-8677 Series/Parallel Circuit Board, allowing the demonstration of both series and parallel circuit pathways.

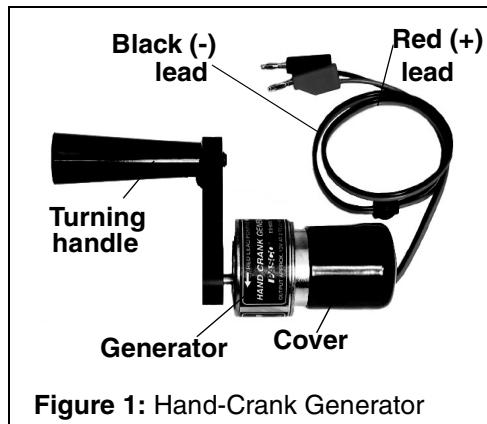


Figure 1: Hand-Crank Generator

As a person cranks the handle on the generator, mechanical energy is transferred to electrical energy in the circuit and lights the bulb filament(s).

Suggested Activities

Equipment required: You will need the Hand-Crank Generator (EM-8090) and a Series/Parallel Circuit Board (EM-8677) to perform the following suggested activities.

Demonstrating the Electrical Path through a Series Circuit:

1. Connect the black lead to the COMMON port (ground) and the red lead to the SERIES port of the Series/Parallel Circuit Board (EM-8677).
2. Close Switch 1 (Move the switch handle down into the metal slot.)

Note: Keep Switch 2 open. Switch 2 is used for demonstrating parallel circuits.

3. Rotate the Hand Crank Generator in the positive direction (shown by the arrow on label of the generator) at approximately 1 to 2 revolutions per second. Both bulb filaments on the circuit board will light. (Figure 2 on page 6 shows the electrical pathway.)



WARNING: To avoid the risk of shock or damaging the generator, never connect the Hand-Crank Generator to another power source, disassemble the generator, use the generator in or around water, or try to repair the generator yourself. Always keep the plastic covering over the generator to protect the leads from corrosion, damage, etc. For assistance with a faulty generator, see Technical Support in Appendix A and the Warranty in Appendix B.



Note: Rotating the handle backwards generates a negative voltage on the red wire.

Demonstrating the Electrical Path through a Parallel Circuit:

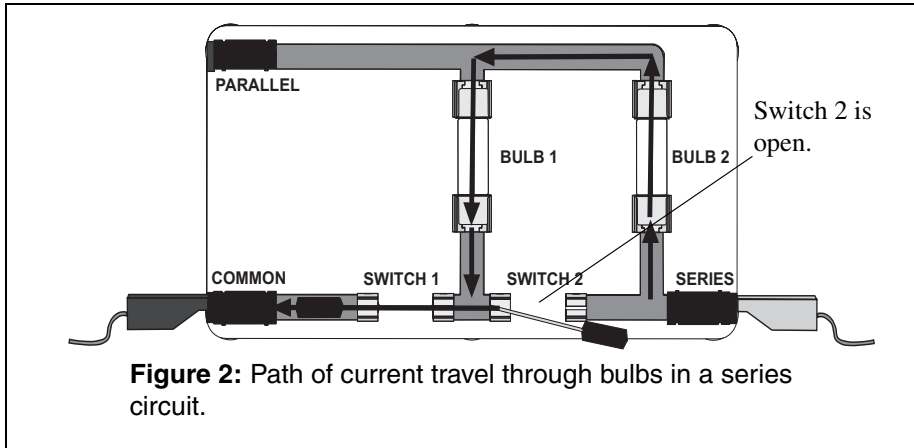
1. Insert the black lead into the COMMON port and the red lead into the PARALLEL port of the Series/Parallel Circuit Board (EM-8677).
2. With Switches 1 and 2 open, rotate the Hand Crank Generator in the positive direction (shown by the arrow on the label of the generator) at approximately 1 to 2 revolutions per second. Note what happens.
3. With the leads still connected, close Switch 1 by moving the switch handle down into the metal slot. Crank the handle. Note what happens.
4. Close both Switch 1 and 2 and crank the handle again. Note what happens. (Figure 3 on page 6 shows the electrical pathway.)

Other Suggested Activities

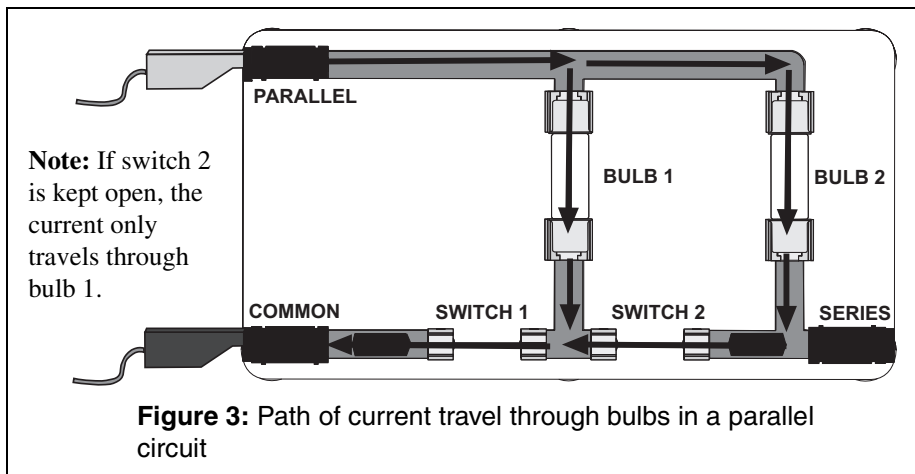
- a) Plug in two Hand-Crank Generators (using stacked banana plugs) into the EM-8677 Series/Parallel Circuit Board. Have one student rotate the handle of the first generator forwards (according to the direction arrow on the generator label) and a second student rotate the handle of the second generator forwards and note what happens. Then have the first student rotate the handle forwards and the second student rotate the handle backwards and note what happens.
- b) Obtain two Hand-Crank Generators and lay them on the table. Connect the Generators to each other (through the openings in the back of the banana plugs). Ask a student to crank the handle of the second generator and note what happens.

Schematics/Electrical Paths

Series Circuit Path



Parallel Circuit Path



Appendix A: Technical Support

For assistance with the EM-8090 Hand Crank Generator or any other PASCO products, contact PASCO as follows:

Address: PASCO scientific
10101 Foothills Blvd.
Roseville, CA 95747-7100

Phone: (916) 786-3800

FAX: (916) 786-3292

Web: www.pasco.com

Email: techsupp@pasco.com

Appendix B: Copyright and Warranty

Copyright Information

The PASCO scientific 012-08330A *Hand Crank Generator Manual* is copyrighted and all rights reserved. However, permission is granted to non-profit educational institutions for reproduction of any part of the 012-08330A *Hand Crank Generator Manual*, providing the reproductions are used only for their laboratories and are not sold for profit. Reproduction under any other circumstances, without the written consent of PASCO scientific, is prohibited.

Limited Warranty

PASCO scientific warrants the product to be free from defects in materials and workmanship for a period of one year from the date of shipment to the customer. PASCO will repair or replace, at its option, any part of the product which is deemed to be defective in material or workmanship. The warranty does not cover damage to the product caused by abuse or improper use. Determination of whether a product failure is the result of a manufacturing defect or improper use by the customer shall be made solely by PASCO scientific. Responsibility for the return of equipment for warranty repair belongs to the customer. Equipment must be properly packed to prevent damage and shipped postage or freight prepaid. (Damage caused by improper packing of the equipment for return shipment will not be covered by the warranty.) Shipping costs for returning the equipment after repair will be paid by PASCO scientific.

