UNITED SCIENTIFIC SUPPLIES, INC.

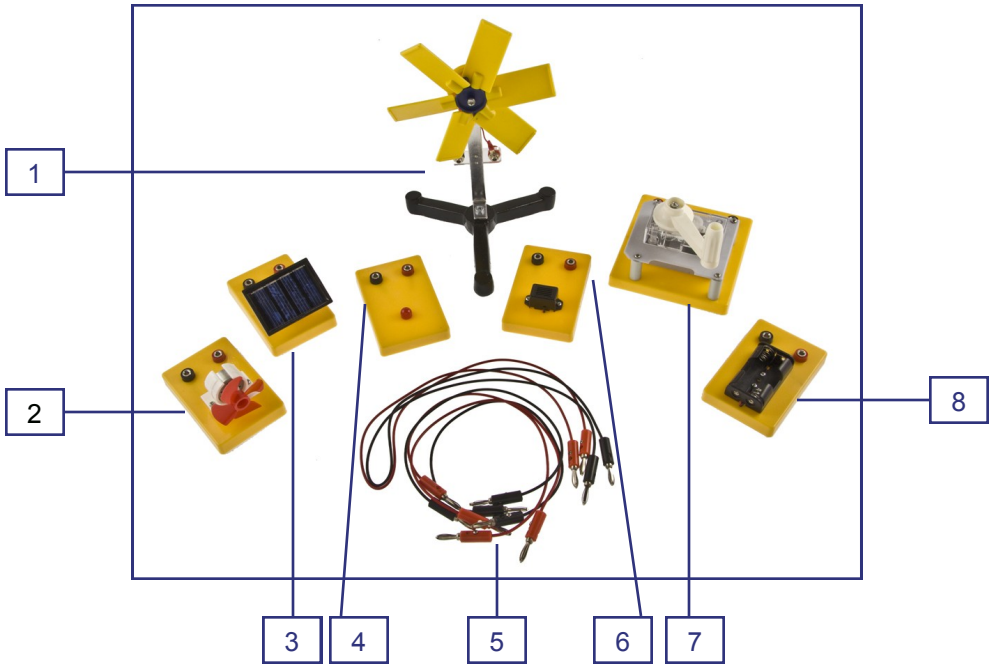
OPERATING INSTRUCTIONS AND ACTIVITY GUIDE

ENERGY CONVERSION KIT

ECK001

INTRODUCTION

The ECK001 Energy Conversion Kit contains a series of items that illustrate the conversion of energy between different forms:



1. Windmill
2. Electric Motor
3. Solar Panel
4. LED Lamp
5. Set of 6 Connecting Cords
6. Buzzer
7. Hand Generator
8. Battery Holder (2 AA's)

Each unit in the kit accepts energy in one form and releases it in a different form. For the units in this kit, one of the forms is always electrical energy in the form of an electrical current flowing in a wire against a resistance, and the energy converting units involved may release the electrical energy or accept it. Two of the units may do either.

Apart from the electrical energy, the other energy forms involved are mechanical motion (kinetic energy), wind (also kinetic energy), light, sound (another form of kinetic energy), and internal chemical energy. The various units and their operations are

shown in the following table:

IN → ENERGY CONVERSION → OUT			
ENERGY FORM **ACCEPTED**	ENERGY CONVERTER		ENERGY FORM **RELEASED**
CHEMICAL	BATTERY PACK (2 AA cells)		ELECTRICAL
ELECTRICAL	BUZZER		SOUND (kinetic energy of waves)
MOTION (kinetic energy of rotation)	HAND GENERATOR		ELECTRICAL
ELECTRICAL	HAND GENERATOR (acting as MOTOR)		MOTION (rotation)
ELECTRICAL	LAMP (red LED)		LIGHT
ELECTRICAL	MOTOR		MOTION (kinetic energy of rotation)
LIGHT	SOLAR PANEL		ELECTRICAL
WIND (kinetic energy of air motion)	WINDMILL		ELECTRICAL
ELECTRICAL	WINDMILL (acting as FAN)		WIND (kinetic energy of air motion)

SOME NOTES ON THE INDIVIDUAL UNITS

Sources and Consumers

Units that release electrical energy for use by others are called *sources* and units that accept electrical energy are called *consumers*.

In this kit, the following units are **sources**:

Battery Pack
Hand Generator
Solar Panel
Windmill

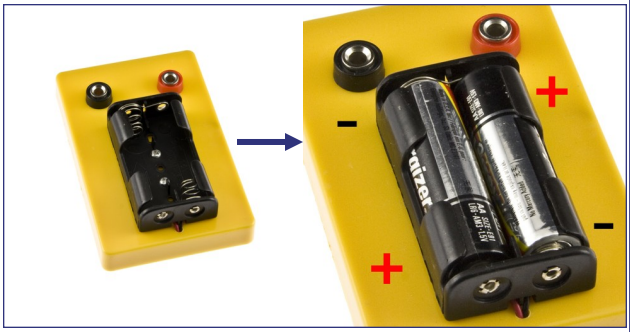
The following units are **consumers**:

Buzzer
Hand Generator
Lamp
Motor
Windmill

Notice that the Hand Generator and the Windmill can be used as either a source or a consumer.

Electrical energy is passed from one unit to another through the connecting cords. Electrical currents flow from a positive pole to a negative one. For some units, the direction that the current flows though them is important for them to work at all. Others will work with the current flowing in either direction, but they will behave differently. *To avoid confusion, always connect red sockets together using a red cord and black ones using a black cord*.

The Battery Pack



The battery pack holds two AA size batteries. You can use regular alkaline batteries or rechargeable ones (these are usually NiCd or NiMH batteries). The springs inside the holders are where the negative (flat) end of the battery goes. The positive end of each battery is marked with a small + sign. Be sure to insert the batteries into the holders in the correct orientation as shown in the picture. The red socket is then the positive pole and the black one is the negative pole of the output.

Batteries convert chemical energy into electrical energy. The chemicals in a fresh battery contain internal energy because of their composition. When they are in contact with each other, they produce an electrical tension (a "*voltage*") and if the poles of the battery are connected to an electrical consumer, a current flows, taking energy from the battery. Inside the battery, this causes chemical reactions to take place to produce new chemicals that contain less internal energy than the original ones. When all the original chemicals have been used up, the battery is exhausted. In an alkaline battery,