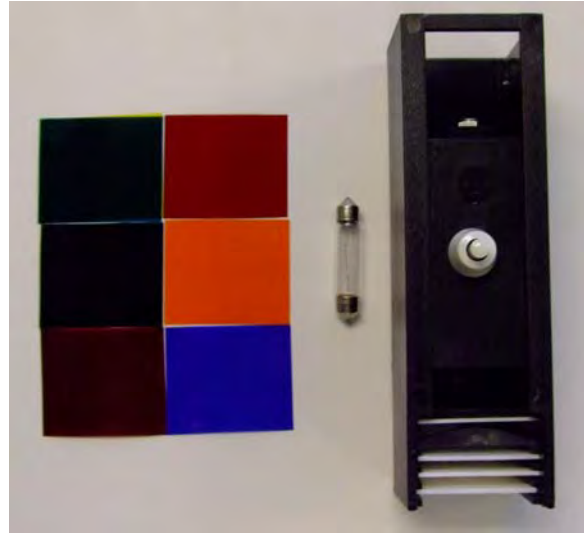


## **614-0660 (50-055) Ray Box**

**Introduction:** White light, while seemingly simple, is actually a very complex phenomenon. It is relatively uncommon in nature; our own sun is yellow, for example. Sunlight appears white to our eyes due to a fascinating twist: although the sun itself is yellow, it is able to produce a full spectrum. This means that instead of radiating just yellow light, as one might expect, it instead is able to produce all the colors of visible light, plus infrared and ultraviolet wavelengths. What we call visible light is only a narrow portion of the electromagnetic spectrum. In general, humans are able to see wavelengths between 400 and 700 nanometers. Some people have a slightly larger range, but this should be treated as the exception, rather than the rule.



Light is never an easy subject to teach, and some of your students may actively dread the prospect. Topics such as color mixing, reflection, refraction, and light transmission can seem daunting, even for more advanced classes. However, these subjects are not insurmountable, and with the right equipment can be overcome.

Your ray box is designed to be simple and economical. Although it lacks some of the functionality of larger units, its low cost and ease of use make it perfect for introductory classes.

**Operation:** To maximize the teaching value of your ray box, some accessories are recommended. These include prisms, acrylic refracting blocks, color mixing screens, and others. These items are available at low cost from Science First, and are probably already present in your science classroom.

Your ray box comes with an included power supply. This takes power from an outlet and steps it down to 12 volts at 0.8A. This level of electricity is inherently safe; even in the unlikely case of shock, there is not enough voltage to cause lasting harm. The bulb will produce good illumination and long life.

For the study of parallel rays, install the collimation lens. This will transmit light rays parallel to one another. It fits into a special slot closest to the bulb. After that, install one of the three white cards to produce 1, 2, or 3 rays.

Using a special card, it is possible to produce three parallel rays, one each in green, blue, and red. This can be used for refraction and color mixing studies.

For more advanced color mixing, turn to the filters. There are seven in all: green, orange, yellow, red, magenta, blue, and cyan. These correspond to the primary colors of light and pigments. Colors of light are transmitted, while colors of pigments must be reflected. In order for a pigment to be one color under white light, it must absorb all wavelengths except a narrow band, which is reflected.

It is best to use the ray box on a large sheet of white paper, and to point it at a card or white wall. This will show the different effects most clearly.

Your bulb has a long life span, but it will eventually burn out. To mitigate that, we have included a spare with your set. To change bulbs, please follow the instructions below:

- Unscrew the cap around the on/off button
- Gently push the switch down into the hole
- Remove the bulb holder
- Lift out the bulb
- Slot the new bulb in place
- Slide the bulb holder back into the outer casing
- Carefully push the switch back up through the hole
- Screw the cap back down around the on/off switch.

**Warranty and Parts:**

We replace all defective or missing parts free of charge. Additional replacement parts may be ordered toll-free. We accept MasterCard, Visa, checks and School P.O.s. All products warranted to be free from defect for 90 days. Does not apply to accident, misuse or normal wear and tear. Intended for children 13 years of age and up. This item is not a toy. It may contain small parts that can be choking hazards. Adult supervision is required.