



# Color Addition Spotlight

P2-9700/P2-9703

## CONTENTS:

3 Spotlights with tripods

Circular color filters: red, blue, green, magenta, cyan, and yellow.

## RECOMMENDED ACCESSORIES:

**Control Box** (P2-9703). Allows you to control the intensity of each color.

## SPOTLIGHT USE:

1. Do not look directly into the lighted lamp.
2. To Assemble The Tripod:
  - a) When looking at the projector you should see a body and a leg. Now take the leg of the projector and extend it down.
  - b) You will notice that the leg is split down the middle. Grab the back half of the leg after the split to the rear of the projector and pull it gently until two legs spring open.
  - c) Now you will notice a silver knob on the leg of the projector. This can be used to tighten the positioning of the projector after the legs are open. Turn the knob gently until it will not easily turn. Make sure not to turn the knob to tightly, or you may have trouble loosening it.

3. To Install Slides:

- a) Remove the slide you wish to use from the box.
- b) On the top of the projector body you will find a black cover that you are able to slide back. Slide the cover back away from the projector lens.
- c) Once the cover is slid back, you will see an empty section near the front of the now exposed section and a black box shape near the back. Insert slide with the tab to the rear.
- d) If you are holding the projector with the silver lens down, and the legs away from your body, take the slide and gently push it into the empty slot until it will go no further.
- e) Close the half circle cover to where you can no longer see the slide or the black box shape.



4. To Remove Slides (This will be done at the end of your demonstration):

- a) Take the projector and slide the black cover towards the rear of the projector opposite the lens.
- b) Once the cover is slid back, you will see a thin black cartridge near the front (closest to the silver lens) and a black box shape near the end of the projector. If you cannot easily grab the slide, turn the focusing knob on the side until you can.
- c) Reach into the projector and remove the thin black cartridge.

5. Plugging in the AC adaptor:

- a) Unhook the tie from the cord.
- b) Take the circular end connector and plug it into the back of the projector.
- c) The place to insert the plug is below the back of the projector. The part is a small circular part that sticks out and has a small silver ring on the inside.
- d) Push the plug in gently until the cord will go no further.

## DEMO INSTRUCTIONS:

1. Plug each spotlight into a Control Box.
2. When plugging them into the control box, plug them in upside down and allow the control box to sit on an angle, this will make the knobs easier to turn during a demonstration.
3. Place the three spotlights approximately 6 - 8 feet from a white wall or screen. The spotlights produce a 14.5" circle image at 6'.

## FOCUSING THE COLOR SLIDE:

1. If the color slide looks blurred when you turn the projector on, look for the silver knob that is attached to the body of the projector- not the one attached to the leg.
2. Turn the knob attached to the body of the projector slowly in either direction until the color is focused.

## TROUBLESHOOTING:

1. **The blue spot is too dim, or the green or red spots are too bright.** Variations among bulbs are unavoidable. Place the blue filter in the brightest spotlight for best results. (The human eye is least sensitive to blue, and more sensitive to red and green. That's why fire trucks are red or yellow-green!)
2. **The color is not what you expected.** (i.e. the result of Red + Blue + Green is Pink, not White), try moving the spotlights toward or away from the screen (in the case cited above, move the red spotlight away), or add a layer of waxed paper to the brightest color (red in this example). There is some variation in the spotlight bulbs themselves, so you can also try rearranging the color filters. If you are using the optional Control Box, begin with all three beams as bright as possible. Then make fine adjustments to each color until the three colors are equal in intensity and the addition results are what you expect.

## SAFETY NOTES:

Risk of Electric Shock: The spotlights are rated for outdoor use and carry appropriate safety warnings for outdoor use. Electric shock is much more of a concern when the spotlight is used in a wet location. When the lights are used in a normal classroom setting, they are very safe.

## EXPERIMENTS AND DEMONSTRATIONS:

### Basic Color Addition

Turn on the spotlights two or three at a time, overlapping the beams, to demonstrate the following color combinations:

1. Red + Green → Yellow
2. Red + Blue → Magenta
3. Blue + Green → Cyan
4. Red + Blue + Green → White

### Complimentary Colors

Use two spotlights at a time to show the following color combinations. Each of these pairs is referred to as complimentary colors. A color and its compliment add to produce white.

1. Blue + Yellow → White (Blue + (Red + Green) → White)
2. Red + Cyan → White (Red + (Blue + Green) → White)

3. Green + Magenta → White (Green + (Red + Blue) → White)

### Colored Shadows

First, use a single spotlight to review how shadows are formed. Then arrange the spots, first two at a time and then all three, so that the overlapped area is as large as possible, and the spotlights are at least 6-12" apart. Place your hand or another object into the overlapped beams and explain the various colored shadows that result.

### Advanced Color Addition (using optional Control Box)

Objects appear to be certain colors because of the light wavelengths that reach our eye. It is possible, using only the primary colors of red, blue, and green, to produce any other color. Ask students to predict how each primary color beam should be adjusted to produce the following colors.

1. Orange
2. Purple
3. Pink
4. Brown
5. Other colors that they suggest

Students can record the approximate "recipe" for any color they produce. Orange, for example, might be 100% Red, 70% Green, and 0% Blue.

### RELATED PRODUCTS:

**Light Box and Optical Set** (P2-9561). Complete set allows each student group to experiment with color, reflection, and refraction.

**Spectrum Demonstration Kit** (33-0200). Use this kit to turn your overhead projector into a giant spectroscope that the whole class can see. Demonstrate spectrum and color addition and subtraction.

