EXPOSURE TOOLS

Measuring the amount of light in a scene helps the cinematographer select the camera settings that will best satisfy the creative intent. Accurate exposure is affected by the intensity of light striking the film and the length of time the shutter is open. Light intensity is affected by the lens opening (T-stop), the amount of light falling on the scene (incident light), and the strength of light reflected off the subjects (scene reflectance).

THE EXPOSURE METER

Light meters, or exposure meters, are offered in a variety of shapes, sizes, and styles.

Incident light meters are easy to use, because they tell us how much light is falling on them. Holding the incident light meter in the subject lighting, enter the exposure time and film sensitivity, and the light meter indicates normal exposure.

Exposure meters have two parts; a photometric sensor and a simple calculator. When we aim the meter at some light source and push the button, the measurement is taken (in foot candles) and incorporated into the calculation.

Most meters allow you to change one or more of the exposure variables, and it will reflect your changes in its suggested f/stop.

Incident light meters are designed to measure light falling onto the subject. **Spot meters** measure light reflected from the subject. If you understand the function of each meter, either one will give you very reliable, consistent results.

An incident light meter

A spot meter

- Incident meters conveniently give the correct T-stop when held in the subject lighting. Cinematographers differ in how to point the incident meter. Manufacturers often recommend pointing the white dome of their meters toward the camera. Contrary to this advice, some notable cinematographers always measure by pointing toward the main light source instead of the camera position. Their feeling is that more shot-to-shot consistency will be achieved by this method.

- All reflected light meters are calibrated to reproduce any reflected tone, whether it is black or white, as 18% gray density.

- The response of a photocell to light is not the same as color film's response. The meter may mislead you into accidentally under- or over-exposing the film, depending upon the predominant color of the scene.

- Cautions and reminders:

1. Have your meters checked for accuracy over the entire scale. A small error can be tolerated if it is uniform over the entire range. An inconsistent response in a high light level vs. a low light level would mislead you in exposure.

2. Spot meters use an optical system, so be sure to check for the accuracy of the spot indicator by reading a small bright area (such as a light bulb in the distance). The indicator should not move until the spot contacts the bright surface.

3. Check spot meters for flare. Read a small dark surface surrounded by light surfaces. First, read it from a distance, then, from close up to fill the entire viewing area. If the reading is significantly lower at the close distance, flare should be suspected. Try a cardboard tube to shield the lens and reduce the chance of optical flare.

An 18% reflectance represents an average of all the reflectance values in a given scene. It can be thought of as a reflected value that falls halfway between a white object and a black object. Cinematographers sometimes meter an 18% gray card to determine the proper exposure for a subject. The gray card serves as a reference for the cinematographer when viewing the dailies. Using a gray card minimizes guesswork and helps to ensure more accurate color reproduction.

> When setting up exposure meters, entering the correct variables is critical for optimal exposure. First, enter your film's EI. Next, enter the frame rate, which determines exposure time per frame. Most cine meters are set up for a 180-degree shutter, and calculations are based on this assumption. It's also important to compensate for any deviation from the 180-degree shutter angle and for any lens filters used. A shutter angle of 90 degrees, for example, requires one stop exposure compensation. Therefore, a film with an exposure index of 250 is entered as 125.

Using a Spot Meter

Spot meters allow the cinematographer to pick certain parts of the scene and measure the reflectance of that part of the frame. You should take your measurement from the camera axis to measure light entering the lens and onto the film plane.

Whatever you measure on a spot meter will read as middle gray whether it is or not in reality. For example.

- If you use your spot meter to measure something that is a middle tone (approximately 18% reflectance), you will get a normal exposure.

- If you measure something that is 5 stops over middle gray, like snow, your spot meter will interpret the snow at 18% reflectance and will calculate an exposure that is 5 stops under normal. The snow would come out looking like a middle gray instead of white.

- The same would happen if you measured the light reflecting off of something 3 stops under middle gray, like a black shirt. Your exposure would then be 3 stops over normal and the black shirt would be gray in your picture.

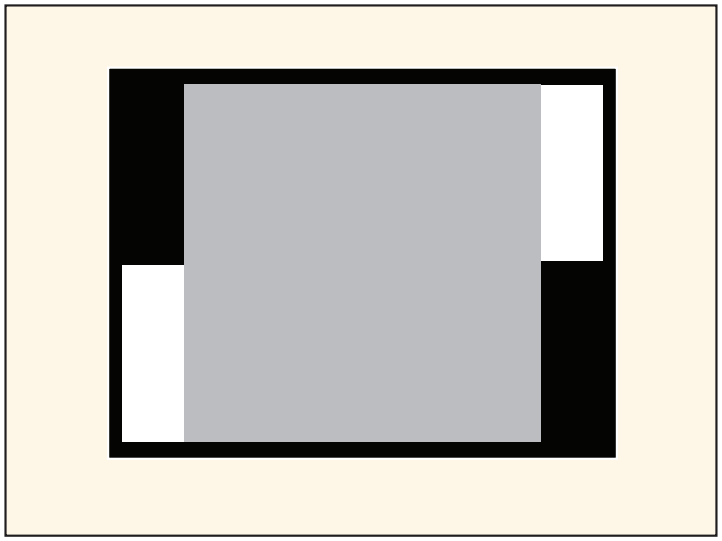
The point of all of this is to be aware of what you are measuring, and adjust your exposure accordingly.

THE GRAY CARD

To achieve normal exposure for an incident or reflection reading, an assumption about the reflectance of an average scene is made—that an "average scene" reflects 16% of the light. (This value was empirically derived by analyzing the reflectance of numerous scenes and computing the average.) A standard definition of "average scene reflectance" allows camera and meter manufacturers to build equipment that provides consistent results. ANSI standard PH2.12 explicitly specifies 16% average scene reflectance as the metering constant for incident and reflection meters.

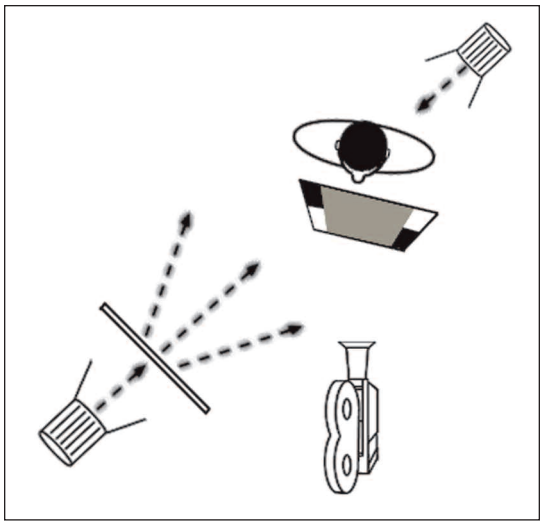
> Kodak studio photographers preferred 18% reflectance, one-sixth of a stop more than 16%, because it provided better results. Given the superior latitude of today's films, an exposure difference of one-sixth of a stop is insignificant.

In the still photographic world, the gray card reading provides simple exposure information. In the motion picture world, the gray card performs an equally, if not more important task—providing a reference point to the lab or post house. An actual exposure of the KODAK Gray Card Plus helps the Colorist and Film Color Timer preserve the look the cinematographer captured on film and provides a neutral reference for exposure and color balance in telecine transfer set-up.



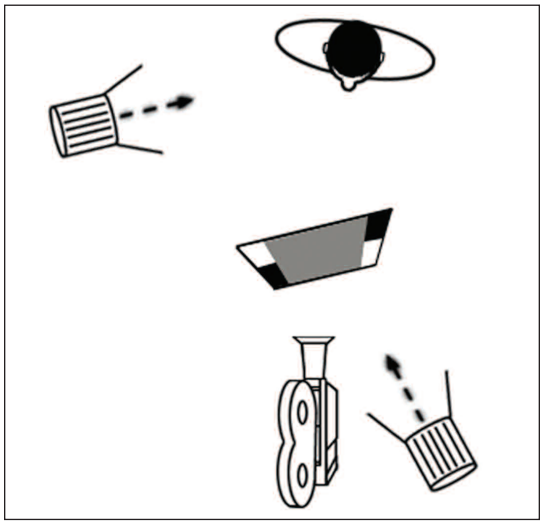
KODAK Gray Card Plus

The Gray Card Plus should be used in subject lighting, at the head of each roll, and every time there is a major lighting change.



- Position the card so it receives the same light intensity and color balance as the main subject and occupies at least 15% of the frame.
- Turn or tilt the card so it is evenly illuminated without shadows or flare. The color temperature of the light reflected from the card should match the scene.
- Determine the normal exposure for the scene using an incident light meter or the method that you prefer.
- Take a reflected spot meter reading on the gray portion of the card from the camera position. If necessary, reposition the card or add supplemental light for a reading that agrees with the aperture you have chosen for a normal exposure.
- Shoot the card including some of the scene, if possible, as a reference.
- Repeat this procedure at the head of each roll and every time there is a major lighting change.

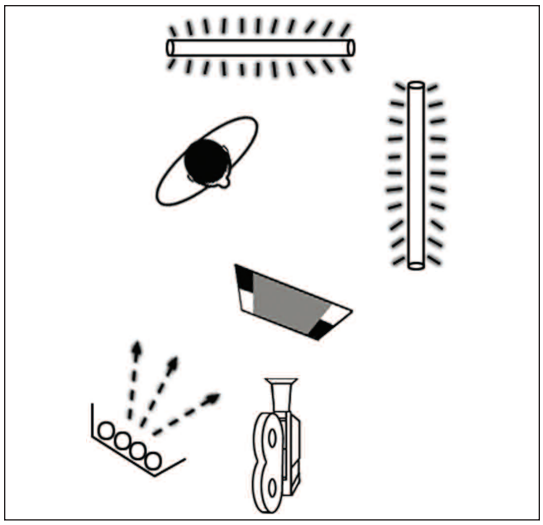
Gray Card Plus shot with separate light



If placing the Gray Card Plus in the scene doesn't provide an accurate exposure reference, set up lighting for the card that's separate from scene lighting (scenes that are cross-lit or lit mainly from a backlight). The card is placed in a C-stand or is held steady near the camera and lit with the same color temperature as the scene lighting. The Gray Card Plus is also used when the lighting doesn't match the color balance of the film (when shooting under fluorescent lighting or warm, household incandescent lights without correction filters).

- This may be necessary when an accurate exposure reference can't be achieved by placing the card in the scene (scenes that are cross lit or mainly from a backlight).
- Place the card in a C-Stand or have a steady handed grip carefully hand-hold it near the camera. Light the card with a unit of the same color temperature as the scene lighting.
- Tilt the card, if necessary, for even reflectance.
- As stated in the above example, take a spot meter reading from the camera position. Adjust the card and/or light to match the incident meter reading.

Gray Card Plus used for color correction

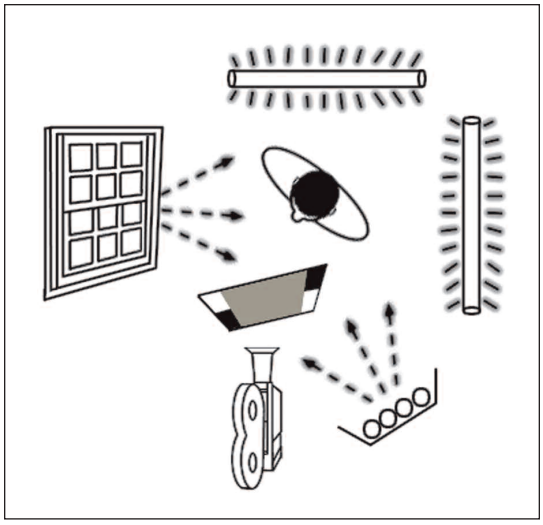


When using the Gray Card Plus in scenes where lighting consists of different color temperatures, such as a combination of daylight, fluorescent, or tungsten, you have two options. The first option is to read the color temperature of the various areas of the scene, and determine the color temperature of the area that is visually dominant. The card is then shot in this area to provide a reference for the color correction needed in transfer or print.

There are instances when the lighting doesn't match the film's color balance, such as when shooting under fluorescent lighting or warm, household incandescent lights without correction filters. In those instances:

- Verify that the card receives the same light (color and intensity) as the scene to be shot. If necessary, light the card separately, maintaining the same dominant color balance of the main scene.
- When the shot with the card is graded to a neutral gray, the scene(s) following will be corrected to a more natural looking color balance.

Gray Card Plus used in mixed lighting



The second option is to determine the average color temperature for the scene. Next, light the card for this color temperature using a separate light. When the shot of the card is graded to a neutral gray, the scenes following will be corrected for a warmer or cooler color balance as determined by the light on the card.

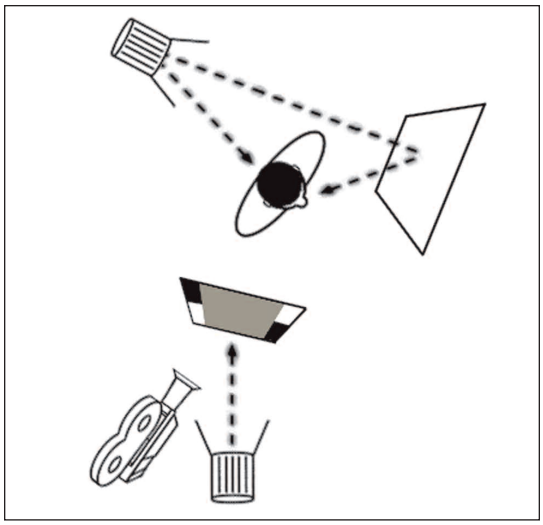
When your lighting consists of different color temperatures, such as a combination of daylight, fluorescent, or tungsten:

- Read the color temperature of the various areas of the scene.
- Determine the color temperature of the area which is visually the most dominant or most important. Shoot the card in this area as a reference for the color correction needed in the transfer or print.
- OR, determine the average color temperature in the scene. Light the card for this color temperature using separate lights. A voltage dimmer or color correction gels can be used to achieve the desired color balance on the card.

When the shot of the card is graded to a neutral gray, the scene(s) following will be corrected for a warmer or cooler color balance as determined by the light on the card.

Gray Card Plus used to produce lighter or darker grading

The Gray Card Plus is also used when a scene is to be graded or printed lighter or darker for effect, such as when shooting day-for-night scenes at normal exposure, then printing or grading to look like dusk or night. The scene is shot at normal exposure to provide a full-range negative. To darken the scene, the card is overexposed. To lighten the scene, the card is underexposed. The amount the card is over or underexposed provides a grading reference for transferring or printing.



To maintain colored lighting, make sure that you shoot the card under white light (light balanced for the film). This will preserve your creative lighting when the card is timed/graded to a neutral gray.

"Cinematography is not something that should be up for grabs. It has to be considered as part of the sensation of experiencing a movie. Comparing film and video now is comparing apples and oranges. It's chemistry and science. It's all about how you want people to perceive your movie, and what the audience is going to feel."

—Lemore Syvan, Independent Producer