CHRISTIE
SCREEN GAIN AND PORT GLASS EFFICIENCY

Two factors that influence image quality and perceived brightness in a cinema are screen gain and port glass efficiency. In cinemas, the projected image passes through a port glass and reflects off a screen before reaching the viewer's eyes. Dirty port glass and screens can reduce image quality, but the extent to which brightness is affected by screen gain and port window efficiency may be less apparent. Accurate values for both screen gain and port window efficiency improve the precision of CineMaster.

Screen Gain

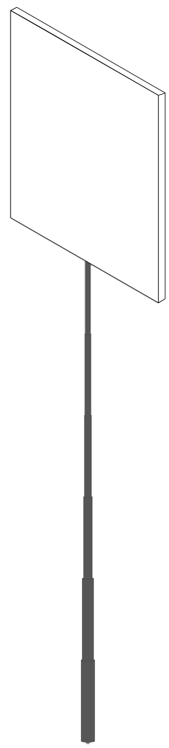
Screen reflectivity, or gain, significantly impacts the amount of projected light that reaches the viewer's eyes. There are various types of cinema screens available, each with distinct characteristics. A new screen will have a specific reflectivity or gain rating that can be utilized as input in CineMaster. As screens age, their gain may change considerably, leading to a potential loss in screen brightness. If the screen is not new or the gain is unknown, measurements should be taken to determine the actual screen gain. It is crucial to input the most accurate value possible for screen gain in CineMaster.

- Measuring screen gain accurately requires a matte white reference surface and a light meter mounted on a tripod. The optimal positions for the meter and target spot will vary depending on the layout of the screen and auditorium.

  - **Matte white reference surface material (test reference):**
    The test reference surface can be any matte white material that has a known reflectivity gain of 1.0. The most accurate material to use would be a calibrated ceramic matte white reference plate. If this is not available, a new section of matte white cinema screen material in good condition with a gain of 1.0 will provide sufficient accuracy.

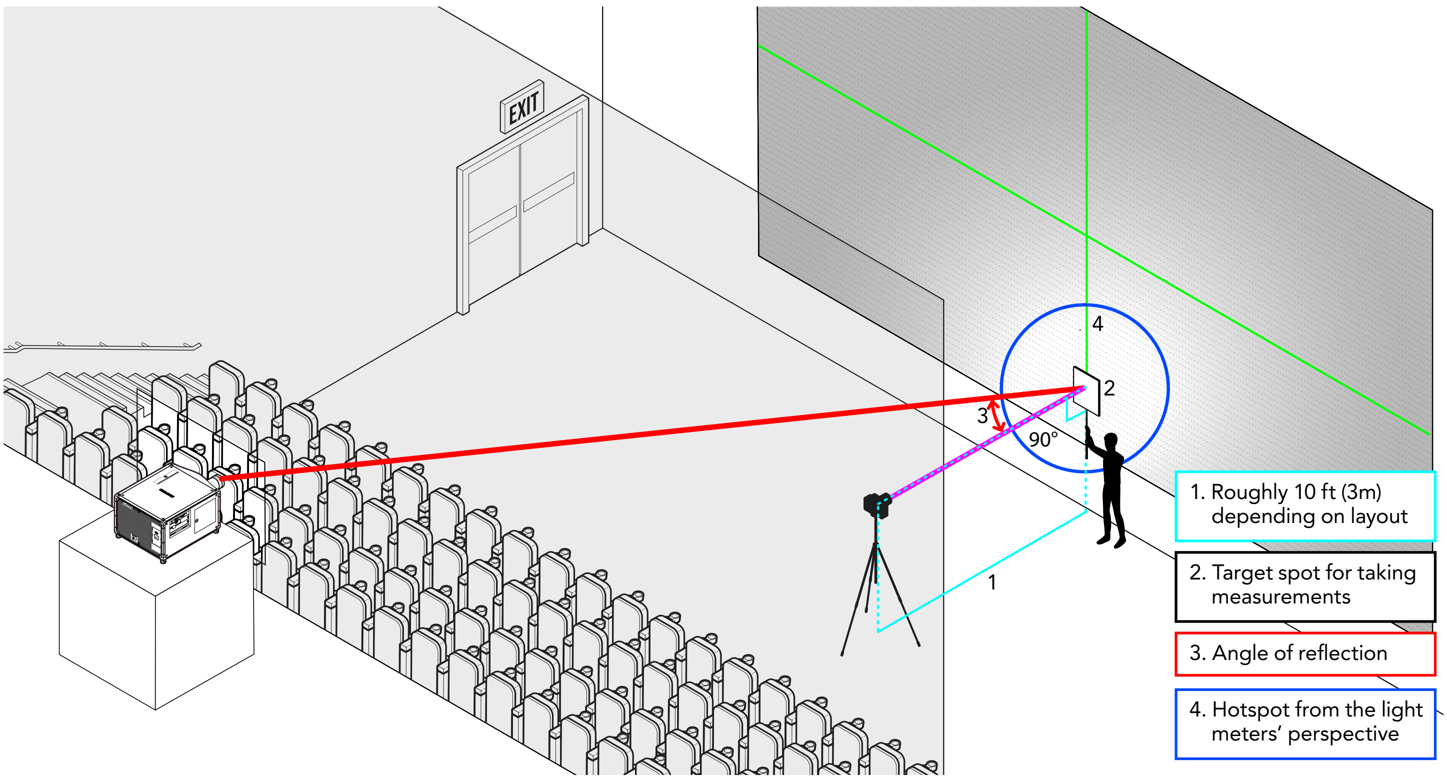
  - **Test reference size:**
    The test reference must be large enough for a standard spot meter to capture readings from the material at about 10' (3m) away from the screen without including any area outside of the test reference. A size of 12" X 12", approximately the dimensions of a piece of notebook paper, is sufficient and suitable for most cinemas.

  - **Practical method for holding the test reference in place for measurements:**
    The test reference can be attached to a frame so that it is flat and mounted on a telescoping extension pole. This setup allows measurements for screens that are higher. Measurements should be taken from a position in the lower center area of the screen, slightly away from the edge. The test reference should be held parallel to and close to the screen surface.



- **Finding the hot spot**
  The position of the brightest spot on the screen changes based on the viewing angle. When the projection is angled downwards and viewed from a lower position in the auditorium, the bright spot will appear lower on the screen. Low gain or matte white screens may not have an easily identifiable bright spot, but a light meter can detect it. High gain screens make it easier to see the bright spot. To find the center of the bright spot, aim the light meter around the target spot until you locate the highest measurement. This identified spot is where the light meter should be locked for further measurements

- **Angle of reflection and light meter position**
  Minimize the angle of light reflection to avoid reduced off-angle gain readings. Keep the path from the light meter to the target spot horizontal and place the light meter as high as possible on the tripod. Position the light meter about 10’ (3m) from the center of the screen.



1. Darken the auditorium and project a 100% white test pattern. Position a light meter on a tripod, centered horizontally and about 10 feet (3m) from the screen. Find the hot spot with the meter and lock its position, then measure and record the light value.

2. Without adjusting the projector settings or repositioning the light meter, place the test reference at the target location against the screen where the spot meter is directed. Take a light measurement on the test reference surface and document the value.

3. Screen gain is calculated by dividing the screen surface brightness by the test reference brightness. For instance, if the test reference measures 10.0fL and the screen surface measures 14.0fL, the screen gain is 14.0 divided by 10.0, resulting in a gain of 1.4.

4. Repeat steps 1 and 2 multiple times to ensure accuracy. Remove any erroneous values by referencing the most consistent data points. Apply this screen-gain estimation in CineMaster.

Port Window Efficiency

Good quality projection port window glass will block very little light to the screen. Typical high quality port glass is of a specific type with anti-reflective treatment which increases transmissivity by reducing back reflection. If the glass is not new or the transmissive efficiency of the glass is not known, light measurements can be taken to verify the efficiency.

- Accurately measuring port glass efficiency requires moving the port glass out of the projection path.

1. With the port glass in place, project a 100% white test pattern on the screen and measure the brightness from a place roughly in the center of the auditorium to the center of the screen and record the value.
2. Without changing the projector settings or the position of the light meter, remove the port glass from the projection path. Measure the screen brightness in the same spot on the screen and record the value.
3. The port glass efficiency is the brightness value with the port glass in place divided by the brightness value without port glass multiplied by 100 for the percentage. For example, If the brightness with the port glass in place is 14.0fL and without the port glass is 14.2fL then the port glass efficiency is: 14.0 divided by 14.2 multiplied by 100 which is 98% efficiency.

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