

Conquering Contrast Killers

The lone spacecraft travels through the inky blackness of space. Pinpoints of starlight guide its way to the distant galaxies. A persistent red glow illuminates the lower right of the screen, following its prey through the dark void. Is it the light reflected from an enemy ship? Is it the thruster of a proton torpedo? Or is it the glow of a hideous alien creature? Worse. . . it is the theatre's unshielded exit sign.

Details are Lurking in the Shadows

The ambush is set. The line of troops crossing the sunlit meadow can't see into the shadows of the dark woods where the enemy quietly waits. Unfortunately, neither can the audience, as the light reflected from the white ceiling of the theatre washes out all the detail in the dark foreground. The effect is certainly not what the cinematographer or director intended.

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Scenes like those above play out in far too many theatres. Stray light, unwanted reflections, lens flare and dirty port glass all conspire to kill contrast. Modern color print film stocks like *Kodak Vision* premier color print film have a density range of more than 4.0, giving filmmakers an unprecedented palette of colors and a contrast range of more than 10,000:1 to tell their stories. Unfortunately, most theatres fall short of even the minimum 400:1 screen contrast ratio specified by SMPTE Standard 196M. Stray light and low screen contrast cause smoky blacks, desaturated colors, and lack of shadow detail. These contrast killers need to be conquered.

Contrast Killer 1: Auditorium Lighting

The first step in conquering contrast killers is to simply look at the "dark" screen. Exit signs, aisle lighting, ceiling lights, wall lighting, and booth lights should be set to normal show levels. The projector lamp should be on, but the douser closed. After taking about five minutes to let your eyes get used to the low light level in the auditorium, look at the screen. Is it truly "black"? If not, get on a stepladder or use a long pole to cast a shadow on the screen to identify the source of stray light.

Exit signs are a necessary source of light that must sometimes be located near the screen. Their brightness and color are strictly regulated by fire code. Their purpose is to guide patrons to the exits in case of emergency. But nothing

says they need to shine ON the screen. Usually, only a simple shield is needed to keep their light from hitting the screen, without compromising their function of clearly identifying the exits. The newer light emitting diode (LED) exit signs offer the possibility of more directionality to the light, with less stray light on the screen.

Aisle and step lights need to be bright enough to safely guide theatre patrons to and from their seats in a darkened theatre. They DO NOT need to be bright enough to guide a jet plane to a landing on a foggy runway. Adjust these guide lights to the minimum brightness that ensures safety, without shining on the screen or being a distraction in the darkened theatre.

Many theatres use a low level of ceiling illumination during the show for the safety and security of their patrons. Care should be taken to shield the screen from direct illumination from these overhead lights. Decorative lighting that doesn't contribute to safety should not be used during the show.

Don't forget other sources of stray light that may shine on the screen, including those that aren't constant. Does light from the lobby shine on the screen every time someone walks into the theatre during a show? If this design flaw was missed when the theatre was built, correct it now. Can work lights in the booth ever shine on the screen? Make sure they don't. Are kids with laser pointers a problem? Enforce a strict policy banning laser pointers, and reward patrons that report perpetrators.

Contrast Killer 2: Reflected Light

The second step in eliminating sources of stray light is to show a film on the screen and look for re-reflection from the ceiling, walls and furnishings of the auditorium. One good film to use for this test is a loop of the SMPTE 35-PA (RP 40) Projector Alignment film, since it has about equal areas of light and dark spread throughout the image. Or a loop made from a bright scene of an old trailer can be shown. To protect the projector lens from heat damage for this test, don't project light without film running through the projector.

With the image being projected on the screen, cast a large shadow on the screen using a lightweight panel of plywood or cardboard about the size of a "one-sheet" (27 X 40 inches, or 70 X 100 centimeters). Cast the shadow from a distance of about 10 feet (3 meters) away from the screen by having an assistant on a ladder hold the panel in the projected light beam. Or mount the shadow-producing panel on a pole than can hold it in the middle of the

projected image.

Using a ladder near the screen, observe whether the shadow of the panel is truly black on the screen. Casting a "shadow within the shadow" will usually point to the light source or reflection that is producing the stray light. In many cases, a light-colored ceiling or wall treatment is the culprit. Or shiny surfaces like mirrors, metal trim, or glass-covered poster cases are reflecting the screen's light. Low-gain, deeply curved or dome screens can also be a source of stray light if they reflect the projected light back onto themselves.

Contrast Killer 3: Lens Flare

The projector lens itself can be a significant contrast killer. Modern projection lenses feature efficient multi-layer anti-reflection coatings on each glass element, and careful design to absorb internal reflections. They also eliminate old-fashioned cemented elements that separated, crazed or yellowed with age and the intense heat of the projector's light. "Hand-me-down" used lenses are false economy, as they severely compromise the quality of the projected image. Lenses over 15 years old are better used as paperweights or museum pieces, as they rarely match the resolution, field flatness, and contrast of modern lenses.

Even modern lenses can be contrast killers. Improper cleaning can scratch or damage the surfaces of the glass, or introduce moisture into the lens. Loose dust should be carefully brushed away with a soft camels-hair lens brush. Cleaning should never be done with a dry cloth or tissue that can scratch the lens surface. Liquid lens cleaner should be used with great care not to get moisture into the lens. Look down the barrel of the lens as it is projecting an image — it should be scratch-free, without any significant haze. The lens should be sent for cleaning and evaluation if there is significant internal haze, scratched elements, loose elements, or any other defect.

Contrast Killer 4: Lamphouse Misalignment

An often-overlooked contrast killer is lamphouse misalignment. If the lamphouse is not perfectly aligned with the projector, or is set to the wrong distance from the film plane, the light may enter the lens at an angle, or overfill the entrance pupil of the lens. This misdirected light can "bounce around" within the lens, greatly reducing contrast. Misalignment of the lamphouse also greatly reduces the efficiency of getting light on the screen, compromising screen luminance. If in doubt, have the alignment checked by your service engineer using an alignment jig or laser beam.

Contrast Killer 5: Poor Ports

The projection port is just as important as the lens in delivering high-quality images. Plain window glass should not be used. Only optical quality glass with anti-reflection coatings should be used. Port glass should never be installed perpendicular to the projection beam, to avoid reflecting light back into the projector lens. Likewise, if two panes of port glass are needed for sound isolation, care should be taken to avoid internal re-reflection. Soundproof, angled port glass frames are available from several vendors. Port glass should be absolutely clean and scratch-free. As with the projection lenses, loose dust should be gently brushed away with a camels-hair lens brush, and liquid lens cleaner and lens tissue used for cleaning any haze. Ideally, the projected image should be almost invisible on the port glass, with no detectable scratches or haze.

Contrast Killer 6: Low Screen Luminance

Low screen luminance is a major contrast killer. Since theatre screen contrast is the ratio between the "whitest white" and "blackest black" that can be shown on the screen, low screen luminance significantly degrades the range of brightness that can be shown. SMPTE Standard 196M specifies an aim of 16 footlamberts screen luminance, with an allowed range of 12 to 22 footlamberts for theatres. In no case should any part of the screen (even at the edges) be less than 10 footlamberts. Unfortunately, many theatres do not meet this important standard. Movies in these sub-standard theatres have dull highlights, desaturated colors, and very poor shadow detail. Theatres with low screen luminance are cheating both filmmakers and audiences by failing to provide proper projection.

Conclusion

Hopefully, this article helped identify factors in your theatre that will improve screen contrast, to deliver the sharp, vibrant images that only film is capable of delivering today. By showing the full contrast range available on today's films, you can assure that the filmmakers' vision and artistry is put on your screen in its entire visual splendor. So, go conquer those contrast killers now.

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