

Exposure Meters and The Cinematographer

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Table of Contents

Introduction	1
Lighting is the First Consideration	2
The Incident Light Meter and the Key Light	2
Measurements of All the Scene Lights	3
Using a Spot Meter, the Final Exposure Check	4
Incident Light Readings Outdoors in Daylight	4
Using a Spot Meter and some Practical Pointers	7
How to Take a Spot Reading for an Accurate Lens Stop	8
Videographers and their Techniques	10
Why Work with Three Meters when One will Do the Job?	11
About “F” Stops and “T” Stops	12
About Gerald Hirschfeld	13

EXPOSURE METERS AND THE CINEMATOGRAPHER

There’s much more of a difference between still photography and cinematography than shooting a single frame at a time and filming at 24 frames per second. However, the goals of each of these art forms is the same: To elicit an emotional response from viewers through the images they see. To that extent both crafts face the same creative challenges.

A cinematographer, particularly a director of photography of feature films, has many decisions to make before telling the film director that he, or she, is ready to film. Starting with setting the first light and ending with telling the assistant cameraperson the T/F stop at which to set the lens, the importance of the exposure meter makes itself known. (See footnote at end of article regarding “T” stops).

Some of the technical considerations that affect the exposure in motion pictures are: Type of film emulsion, type of lab processing, camera speed, shutter angle, filters used, lens stop desired, and above all, the much sought after “look” that determines the audience’s emotional reaction. At this point it’s necessary to be aware of the responsibility the Director of Photography (DP) faces every day of filming. The DP is accountable for the way the picture looks. Is it what the director envisioned? Is the leading lady happy about the way she looks? And, was the exposure set right?

Lighting is the First Consideration

Let's take a look at how a cinematographer uses exposure meters to set the images to fit the story being told. The technique is somewhat different than for still photography. Incident light, the light falling on the subject, is what is read. Every film specification sheet states the necessary light intensity (foot candles) needed for a normal density negative with normal lab processing. Charts are available that show film emulsion speeds from ISO 25 to 2000 and T-stops (F-stops) from 1.4 to 22.6, and foot candles (fc) from 1.25 to 8200, all based on filming at 24 fps and with a 175° to 180° shutter angle. With such a range there is bound to be a usable combination for any situation. For example, the chart will show that if one uses a film rated at ISO 500 and wants to shoot at f/4, only 40 fc are needed for a normal density negative. Depending on the "look" the DP wants, deviations from the norm are often used, determined by a series of definitive lab tests. This paper will only consider normal filming techniques.

The Incident Light Meter and the Key Light

Using an incident light meter with a flat disc receptor, the director of photography positions the "key light" (main light), setting it at 40 fc. at the position of the main action. For this reading the meter is pointed at the light source, not the camera. The DP already knows the lens stop selected for that 40 fc light level is f/4. Since all meters are factory calibrated to offer the correct exposure for average mid-tone brightness, (18% reflectivity from a standard gray card) the incident light reading will be perfect for a normal "look" of average subjects. The stage the DP is working on may be large but he need only to read the one key light with the meter, all other lights are set by eye.

There is another big difference between cine and still photography. The motion picture cameraperson uses a "viewing filter" to judge light balances. When working with color emulsions the viewing filter, sometimes called a contrast viewing glass, is basically a "neutral density filter" which reduces the sensitivity of the eye to more closely match that of the film emulsion. When viewing the scene through the viewing filter the cinematographer can judge the relative brightness of any part of the set, or actors, by visually comparing it to who, or whatever, is in the key light. Looking through the viewing filter the DP can discern dark areas that may need to be brightened or overly bright areas that need reducing. The viewing filter is held to the eye for a relatively short period of time so the eye does not acclimate to the lower light level and thereby cloud the purpose of the viewing filter. Many professional motion picture cameras have viewing filters built into the camera's eye piece for convenience. It does take practice and experience to learn how to properly interpret, or judge, the lighting contrast of the scene.

Measurements of All the Scene Lights

After the key light is set the background is lit with the desired balance to the key. It's not necessary to read every light if you have a point of judgment helped by the viewing filter. It's also a much faster way of working, which every producer appreciates. Fill lights are next added, where necessary, to various parts of the scene. The fill light, as its name implies, fills the shadow areas and lifts them out of the black. The fill light slightly increases the overall luminance level. The DP then takes a second reading by switching from a flat disk incident light meter to an incident meter with a hemisphere which reads all the light that strikes the meter, key, fill, and ambient. This

reading is also taken at the subject - or main action - position, with the meter pointing toward the camera. If the key light is from the side, usually for this reading the meter is pointed mid-way between the key light and the camera. This meter reading directly indicates the lens stop to be used. The added fill light usually brings the lens stop reading up about a quarter to half a stop more, depending on the lighting ratio used. In the above case the final lens stop might be a T/F stop of 4.2 or 4.5, in place of the stop of 4.0 originally set with 40 fc. This, of course, is due to the fill light having added an additional 10, or more, footcandles of light to the scene.

The third light of a basic lighting situation is the “back-light” (hair light) and/or “kicker,” a strong side light that just edges a face. The intensity of these lights is usually judged by eye, with the help of the viewing filter. There are no set rules in using back or kick lights. I know of no DP that sets these lights with a meter. Flesh tone, makeup, hair color, wardrobe, and background brightness visually dictate the intensity of these lights when seen through a viewing filter.

Using a Spot Meter, the Final Exposure Check

Feature films demand a high degree of technical excellence, starting with lighting and exposure. To accomplish this standard, in a large set with action, the DP may check exposures of featured actors in various parts of the set by taking a third reading using a spot meter which can follow the action. A spot meter with an angle of acceptance of only 1° will offer an exact exposure of a face by itself at any distance up to about 35 or 40 feet. Be aware not to read strong highlights if the actor perspires a bit. Spot meter readings can be made during rehearsals or even during filming as they are generally made from the camera position. This is a big advantage in saving time and

obtaining a final check for the correct exposure. Although color negative film has a wide exposure latitude, using the correct exposure to obtain a normal density negative helps to get the best print, particularly when “special” lab processes are requested.

Incident Light Readings Outdoors in Daylight

Up to this point, the main example of using a foot candle incident light meter with its flat disk, an incident meter that reads in lens stops with its hemispherical light integrator, and a 1° angle spot meter, has been on a sound stage, or on a location interior. Things are a bit different when filming exteriors. For one thing, on a sunny day the foot candle reading is no longer valid. The sun being what it is, its intensity can only be changed by use of controlled overhead diffusion materials or a passing cloud. For exteriors in daylight the incident meter with its hemisphere dome often becomes the primary meter. Although the hemisphere dome was designed to gather light from 180°, certain precautions should be taken for an accurate exposure reading. A common situation in which the sun is used as a backlight and faces are filled in with HMI lamps (daylight quality) for normal exposure, care should be taken that the sun does not strike the dome of the light cell. If this happens a false reading could result, because the sun, as a backlight, doesn't hit the actor's face but could touch the top of the dome. Even if direct sunlight doesn't affect the meter reading, the light from the sky can affect the readout, particularly on an overcast day. In fact, an overcast day will easily produce a false reading with an unshielded hemisphere dome. For this reason cinematographers filming actors outdoors and taking readings with an incident light meter with a hemisphere, hold their hand a few inches above the dome. This shields the meter from light that doesn't affect the face, but would affect the reading and give a

false result.

On very wide shots such as landscapes, seascapes, beaches, and snowscapes the incident meter with its hemisphere dome will give an accurate reading of any subject that would fall within the boundaries of its calibrated gray scale. Understandably, a pure white beach or a dead black fire-charred field would be beyond the norm and compensation would have to be made for one or the other depending on which was important to the scene. Stop down one stop for the snow, or open up one stop for the burnt field, when obtaining your exterior reading with an incident type meter. A Caucasian face would be rendered normal as it falls within the parameters of “average” for the meter and film emulsions.

Reflected Light Reading Outdoors in Daylight

A reflected type meter which reads the light reflected back to the lens from the subject, is often used for exterior scenes of wide expanse. It will give an average reading of all the light, medium and darker areas, within its range of about a 40° angle. With the average reflected type light meter used for normal landscape, or similar shots, to get a more accurate exposure reading, tilt the meter down to avoid the bright light from the sky corrupting the readout. Again, on an overcast day, shield the light-sensitive cell from excessive sky light. Using a spot meter, which is also a reflected type meter, you could take a spot reading of a bright area and then a reading of a dark area and average them for a median exposure. Some spot meters have the ability to do the averaging for you if they have memory capability for holding several readings in their computer bank and an averaging button that combines readings and finds a stop mid way between. The Sekonic 508 Cine meter has the capability of averaging two or more readings.

Using a Spot Meter and some Practical Pointers

Using a spot meter for exterior scenes works well when filming actors with makeup, and reading the face brightness with a spot meter for proper exposure. This works if the face is properly light balanced to the surrounding area. Using a spot meter when reading bright areas, or dark areas, outside the normal mid-scale range of the film emulsion, i.e., snow, black shadows, etc., the meter gives a reading that will try to make those subjects fall somewhere within the mid-gray tone of the characteristic curve of film emulsions.

In extreme contrast situations an 18% gray card can be used for a reading when placed at the subject and held parallel to the film plane. Although I’ve never used a gray card it is often used by professionals for their exposure readings. A word of caution: Just a slight tilt of the card the wrong way can render a false reading. The 18° gray card has been in use by still photographers for many years, and it works for them and can for you, with experience. I always liked the meter to tell me the exposure for a normal subject and then I’d adjust that T/F stop up or down by deciding what was most important to the scene being filmed. Remember any exposure meter will put your exposure in the “ball park,” but it’s the decision of the cameraperson to know when to adjust that exposure reading for the specific “look” desired. Light balance within a scene is also most important. Using a viewing filter, if an actor in the foreground looks dark when viewed against a bright background, more light is needed on the actor. Conversely, when against a dark background, if the actor seems too bright, reducing the light level on the actor is necessary to bring the scene brightness into balance.

The spot meter is a reflected type meter that reads a very small area of from 1° to 4°. When using a reflected type exposure meter and getting your reading only from excessively bright or exceeding dark areas remember the meter will try to

have that area record as a shade of gray. Compensation to have white come out as white, would require the meter's T/F stop readout to be opened by about one, to one and a half stops, i.e., meter reads shoot at F/32 for snow; instead set your lens stop at F/22 or F/18 if you want the white mountain to appear white. Conversely, for the very dark areas the meter might read the correct exposure as F/2.8, in this case shoot at F/4.0 or F/4.5 if you want the blacks to be black, not gray! This exposure adjustment with a reflected type meter is the opposite of that used when exposures are obtained with incident light readings.

Professional feature film cinematographers usually work with a well equipped crew. When extreme contrast situations arise and the decision is that both the brightest and darkest areas are important to the scene, the DP does not favor one or the other. In such cases either the darker areas are brightened with supplementary lighting, or the bright areas are shaded or netted down to bring all within the brightness range of the film's emulsion. Here again, the viewing filter is used to help make the judgment regarding what's too bright or what's too dark. It's rare that a still photo depicting a DP at work doesn't show a viewing filter hanging around his or her neck, where it's always handy.

How to Take a Spot Reading for an Accurate Lens Stop

It's often difficult to decide where to take a spot reading for scenic shots. A gray card will work fine, but as I said I've never used one. I've learned, from experience, that a patch of green grass works as a medium gray, or a gray shingled roof, or a large rock of mid-tonal value, or the side of a house that's in the mid-range of brightness. A word of caution, be careful not to let bright reflections give you a false reading. One can learn

how to judge what subject will offer a reading close to that of an 18% gray card by comparing it, during a learning period, to a reading of an 18% gray card. After all, experience is the best teacher you can have on your path to great cinematography.

A spot meter's practical use in motion pictures has an important place in special situations. When a DP checks the lighting, or needs an exposure reading, from a high position, such as when working on a camera crane, or atop several camera parallels, or from any high position not easy to step away from, the spot meter becomes a critical accessory. Other situations, in which the spot meter is often relied upon, arise when doing telephoto work and the subject is far away, or filming on water from one floating vessel to another. A very common usage of the spot meter occurs when filming through a windshield for traveling car shots. The spot meter can zero in on a face from the towing camera car, in addition, if a polarizing filter is used to eliminate some windshield reflections it can be held against the meter's lens and it will automatically compensate for the filter's light loss.

If you accept meter readings as correct for subjects of average brightness and know you have to adjust the exposure for subjects at either end of the brightness range, you'll never be in trouble. Or, as cinematographers often do, reduce the contrast through use of supplemental lighting, overhead diffusion materials, low contrast filters, lab processing, or other available special techniques, such as flashing the negative or print, making low contrast prints for television transmission, or correcting light imbalances during post production film-to-tape transfer sessions. Still photographers can and do bracket exposures when in doubt. Cinematographers almost never request an additional take solely because they're unsure of the exposure.

Videographers and their Techniques

It should be noted that feature film DPs who shoot Movies-of-the-Week or TV mini-series on videotape, light their scenes in the same manner as for film, as described above. They may use slightly different light balances, but their technique is the same as for film. However, videographers, the counterpart to cinematographers, who work exclusively with videotape, most often set their lights and exposure by viewing the scene on a video monitor, or with a waveform monitor. But, what if a monitor is not properly adjusted? Wouldn't it be more prudent to light as for film, obtain the right exposure with an exposure meter, and only then confirm the "look" on a monitor? Every video camera can be assigned an ASA/EI/ISO rating very simply. Here's how; set the light at a predetermined level with the camera zoomed in to a big close up of an actor's face, then let the auto iris set the lens stop. Take that lens stop reading along with the footcandle level you used, and cross reference them on a footcandle chart. Those two readings will point to the ISO rating for that lens stop and that footcandle. From then on, light as for film and set the video camera's iris on "manual." By using a viewing glass the videographer will work more quickly and efficiently than by continually referring to a monitor. It may take a little time to learn this technique, but in the long run it will save time and make the lighting more efficient.

Why Work with Three Meters when One will Do the Job?

My work as director of photography on over fifty feature films usually had me working with the three different meters, as indicated in the above situations. How much simpler life would have been if a meter such as the Sekonic model L-508 Cine

had been available! That one meter can be used as a foot candle meter with its light cell dome recessed to work as a flat disc, or extended to be a hemisphere and read directly in T/F stops, or used as a spot meter with a variable area adjustment of from 1° to 4° coverage. Also, imagine calculating the correct exposure when working with multiple cameras for stunts, which required different camera speeds on each, different light intensities for each, different filters and filter factors for each, perhaps different shutter openings, and possibly different processing for some cameras. The calculations needed for the correct lens stop for each camera, sometimes as many as six, or more, was always a mind boggling job. The Sekonic L-508 Cine can be set for different shutter angles, different camera speeds, filter factors, film speeds, and more. How much easier to let a meter with its onboard computer set all the different exposures correctly and let the DP use the time more creatively. Yes, I would have loved to have had a Sekonic L-508 Cine for all of the films I've made in the last fifty years!

About "F" Stops and "T" Stops

The "F: stop" indicates the diaphragm opening that controls the amount of light passing through the lens. It is a mathematically derived ratio calculated by dividing its focal length by the diameter of its lens opening. Thus a 50mm lens with a maximum 25mm opening would be an F: 2 lens. ($50: 25 = F : 2$). Prior to modern multi-coating techniques, which greatly reduce light loss caused by internal reflection, this method was actually inaccurate. However, the F: stops of modern still camera lenses, which have multi-coated lens elements, are more accurate. The "T stop" expresses the actual light transmission ability of a lens. It was developed many years ago for cinematographers, who desired a more precise method. Therefore cine

lenses are marked in “T” stops. Photographic testing of any lens series may show a slight exposure variance at the same F : or T stop markings. These slight differences can easily be compensated for with the Sekonic 508 Cine Zoom Master, using its 1/10th-stop calibration adjustments.

About Gerald Hirschfeld

Gerald Hirschfeld, A.S.C. has made over fifty feature theatrical films throughout the world. His work on “Young Frankenstein” was recently honored in Hollywood at the 25th Anniversary celebration of the film. In 1990 he was nominated for the ACE Award for cinematography for the mini-series, “The Neon Empire,” made for Showtime. He’s been a member of the International Cinematographers Guild for over 50 years. A member of the American Society of Cinematographers (A.S.C.) for the past 48 years. He’s the recipient of The Billy Bitzer Award bestowed by the New York cameraman’s union for bringing honor to the union. His book, “Image Control - Motion Picture and Video Camera Filters and Lab Techniques” was awarded a prize for excellence by the Krazna-Kraus Foundation which honored him at The Museum of the Moving Image in London, England. For five years he taught Film Techniques and Lighting at the International Film & Video Workshops at Rockport, Maine and became their Filmmaker in Residence. At present he holds special lighting seminars at leading universities and teaches Basic Cinematography at Southern Oregon University in Ashland, Oregon, where he now lives and also writes screenplays.



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