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MEASURING FOOT-CANDLES WITH THE WESTON EXPOSURE METER

OWNERS of Weston Universal Exposure Meters are not always aware that they have an extremely versatile instrument in their possession. For instance, if you want to measure the foot-candles of light falling on any surface such as a writing desk, sewing table or work bench, "it's as simple as A and C", if we may take the liberty of amending a familiar expression. In other words, the A and C positions on the exposure control dial give the correct relationship between the meter reading and the desired foot-candle reading.

How It Works

Step by step, it works this way. Place a clean piece of white blotting paper or a few thicknesses of white typewriter paper on the surface you want to measure. Next, read the light reflected from the white surface, using the meter in a normal fashion. To avoid reading unwanted areas outside the white surface, remember to hold the meter at least as close to the paper as its smallest dimension, closer if you wish, but not farther away. For example, if the paper is 12″ by 15″, measure the reflected light with the meter held no more than 12″ from the paper. Be careful not to cast a shadow on the paper as this would not give a true reading.

Let's suppose that the meter reads 13 when we measure the light reflected from the white paper. This means that the white surface has a brightness of 13 candles per square foot. How many foot-candles? Just four times as many. That is, four times 13 or 52 foot-candles. Always multiply the meter reading by 4 to convert the candles per square foot to foot-candles.

Multiplying With The Meter

The versatile Weston control dial will even multiply for you at a glance. As you know, the A and C positions on the exposure meter dial designate a ratio of 4 to 1. Therefore, we merely set the A position opposite 13 on the light scale and we find a reading of 50 opposite the C position. Brightness of 13

candles per square foot equals an illumination of 50 foot-candles. Just as simple as A and C.

The discrepancy between the 52 foot-candles arrived at mathematically and the 50 foot-candles shown on the meter is due to the fact that some of the numbered blocks represent fractional values which are rounded-off to make the dial simpler to use, without losing anything in accuracy.

Unnumbered Block Values

Now, supposing you had taken a meter reading from the white paper and got a brightness reading of one block *below* 13. Then, using the A and C position method, described above, the C rests opposite the block below

50, or minus 50, for the number of foot-candles. How many foot-candles do you have at minus 50? Here again, the dial comes to the rescue. The unnumbered black blocks actually have definite values, but to show them all on the light scale would make it appear very crowded.

In the table below, however, we have listed the values of the unnumbered blocks.

NUMBERED BLOCKS	UNNUMBERED BLOCKS
1600	
	1300
	1000
800	
	650
	500
400	
	320
	250
200	
	160
	130
100	
	80
	65
50	
	40
	32
25	
	20
	16
13	
	10
	8
6.5	
	5
	4
3.2	
	2.5
	2
1.6	
	1.3
	1
.8	
	.65
	.5
.4	
	.32
	.25
.2	
	.16
	.13
.1	

You will see from the table that the block below 50 is actually 40, so your illumination is 40 foot-candles.

Hidden Talent

Here, then, is a hidden talent of the Weston Exposure Meter which will be greatly appreciated by many owners. Of course, for the lighting engineer or electrician we have available, as always, our regular foot-candle meters which are supplied with the normal type of continuous scale graduations for reading exact values. But for the average job, you will get just that much more value from your Weston Exposure Meter when you know how to measure foot-candles with the meter.

WESTON ELECTRICAL INSTRUMENT CORPORATION
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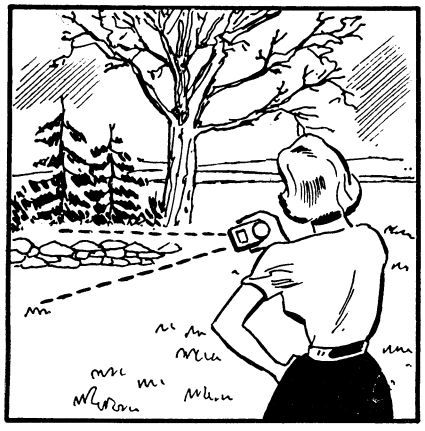
CONTROLLING EXPOSURE WITH THE WESTON METER

Chapter 2: How to Take A Light Reading

PROBABLY the most popular way of taking a light reading with the Weston meter is the reflected light method from the camera position. In this method the photographer simply stands at the camera position, aims the meter toward the scene to be photographed, and notes the reading indicated on the exposure meter scale. This method is a reliable basis for determining correct exposure, provided that a few simple precautions are observed. First, we must remember that the Weston meter is designed to "see" a field of view similar to that seen by the camera. Therefore, if the meter is aimed toward the horizon in outdoor shots, it will pick up light from the sky as well as from



Aim Meter Down, Do Not Read Sky Areas

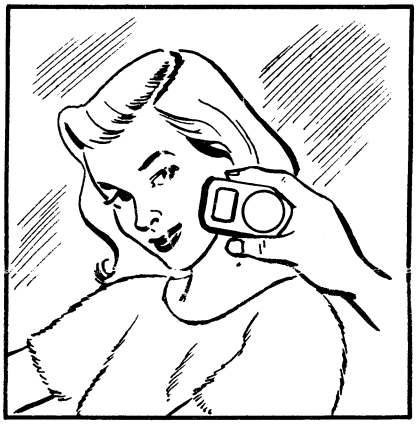
the landscape. The sky normally has a much higher brightness than the landscape, and will cause the meter to read higher than it should. Bearing this in mind, aim the meter at an imaginary point about half-way between your feet and the horizon for best results when using it for outdoor landscapes.

The second fact to remember is the ability of the meter to "average" the various bright and dark areas in the scene. If the scene has about an equal proportion of these areas, this averaging ability works to our advantage. However, when we have an unusual distribution of bright and dark areas we may find it desirable to take the reading by another means such as the Close-Up Method.

The Close-Up Method

In many cases we wish to photograph one object in a scene where the background is of little or no importance. Let's suppose, for example, that our subject is a baby lying on a large, dark colored blanket. A camera position reading, taken at some distance, would not be advisable since the meter would tend to average the large area of the blanket with the relatively small size of the baby. Thus, we should take the reading by holding the meter close to the baby, our object of interest.

How close to the subject should the meter be held? As a general rule the distance should be about the *same as the smallest dimension of the object.* In taking a close-up reading of a door measuring 3 feet by 7 feet, the meter should be held at a distance of no more than 3 feet. This assures us that the meter is seeing only the object of interest



Correct Method of Taking Close-up Reading

and is not taking in any unwanted background. The meter may be held closer than the distance suggested, but it should not be held at a greater distance. If the shadow of the hand or meter falls on the object, do not read this shaded area as it is not a true measurement of the object's brightness. Reading the shadow can usually be avoided by holding the meter at an angle rather than directly in the path of the light falling on the object.

Substitution Readings

Close-up readings are sometimes made impractical or inconvenient when the photographer cannot approach the object for one reason or another. For example, the object of interest may be a rock formation separated from us by a stream of water. If we can find rocks of about the same color and tone on our side of the stream, a light reading taken close-up on them will provide a satisfactory substitute. Naturally, the substituted object must be one that is lighted in the same way as the object of interest. If this object is a tree in full sunlight, then the substitute reading should be made from a similar tree in full sunlight.

Substitute Similar Objects for those Inaccessible

The palm of the hand reflects about the same percentage of light as the face. Thus, if our picture is of a group of people at some distance from the camera, we can save many steps and much confusion by merely taking the meter reading from the palm of our own hand instead of walking up to our subjects. We should always keep in mind that the lighting must be similar on the substituted object. Therefore, if the subjects are in the sun, hold the hand in the sun; if in the shade, hold the hand in the shade.

A special version of the substitution reading involves the use of a photographic gray card. This is simply a piece of heavy cardboard specially coated with a gray tone which has a reflectance value equal to that of

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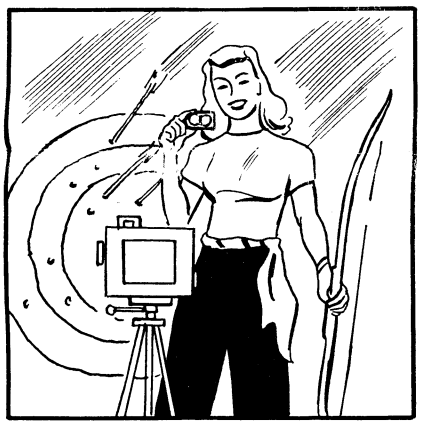
an average scene. In use, the photographer holds the card in one hand and takes a close-up reading with his Weston meter. The card must be held in a position that duplicates the scene both in the angle it makes with the camera and in the way it is illuminated.

The Incident Light Method

With this method we do not aim the meter at the subject, but



Measure Incident Light from the Subject Position

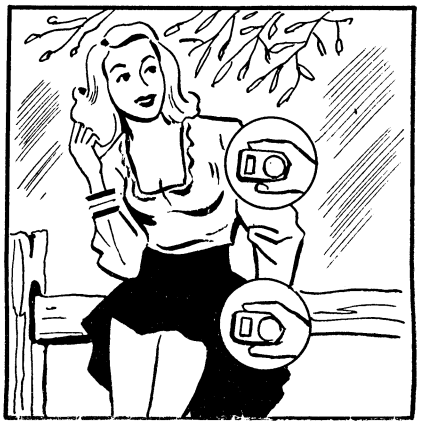
toward the camera instead. A special accessory called the Invercone is supplied by Weston to convert any Weston Master meter into an incident light meter. The Invercone, made of white translucent material, slips in place over the photocell. Its special shape permits the meter to pick up light from all angles in front of the meter, duplicating the condition which exists in the case of the subject itself.

In portrait work the incident light method is quite popular because it enables the photographer to produce negatives with consistent density in the face tones, regardless of the nature of the background area. Since the incident light meter is pointed *at the camera* and not at the subject, the meter reading is influenced only by the light *falling on the subject* and not at all by the light reflected from the subject. The incident light meter does not "see" the subject, in other words. Whether our subject is a man sitting in front of a light gray background, or a man sitting in front of a dark blue background, this method will indicate the same exposure for a given lighting setup. Thus, the incident light method is seen to be simply another means of measuring light. The use of this method is largely a matter of personal choice. It should be pointed out that in some instances this method is not usable. In taking pictures from an airplane window, from covered porches, or from shaded locations of any type where the meter cannot be held in the same light which illuminates the subject, the incident light method must be discarded in favor of the camera position method or its equivalent.

Where the highest degree of accuracy in exposure determination is desired we should actually use the meter to analyze the scene by means of a series of close-up readings. This technique is called the Brightness Range Method which we consider next.

The Brightness Range Method

Most scenes we encounter are composed of many areas which vary in their brightness considerably. The Weston meter, as we saw earlier, takes in all of the light reflected from a selected field of view and averages this light from the various bright and dark areas. We have also seen that any one of these areas can be measured individually by holding the meter close to the object. In the brightness range method we make close-up readings of the brightest and darkest objects in the scene to give us the range of brightness in the scene. This method is particularly valuable in color



Read Brightest and Darkest Areas for Brightness Range

photography because it allows us to fit the range of the scene to the range of the color film. This involves the use of the Exposure Control Dial of the Weston meter which we will consider in the next chapter of this series.

General Precautions

1. Do not cover the photocell with your hand or carrying case when taking a reading.
2. Do not attempt to restrict the angle of view of photocell.
3. Avoid reading the sky—aim the meter at a point midway between your feet and the horizon.
4. Avoid reading the shadow cast by the meter and your hand when using the Close-Up Method.

While Black-and-White and Color film techniques differ considerably, we have endeavored to point out in this portion of the series only how the reading is made, not how it is applied. In subsequent articles of this series we will cover the specific use of the readings in both Black-and-White and Color.

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WESTON ELECTRICAL INSTRUMENT CORPORATION

Manufacturers of Weston and TAG Instruments

Newark 5, New Jersey, U.S.A.

Printed in U. S. A.

CONTROLLING EXPOSURE WITH THE WESTON METER

Chapter 4: Color Work

Even when equipped with all the gadgets recommended by the experts, color transparencies are often unsatisfactory. This is seldom the fault of the equipment. More likely it wasn't handled to the best advantage.

The following points are always important, and must be observed to assure good results.

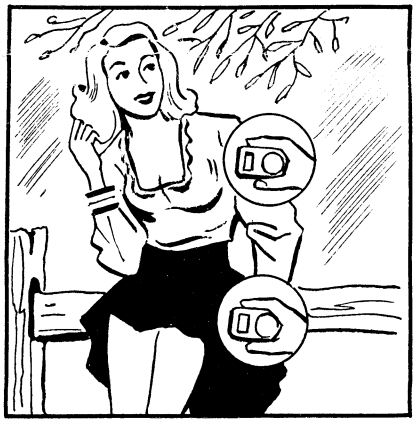
1. Expose color film only in the kind of light it was made for. If a different light source must be employed, be guided by the film manufacturer's instructions for using color-compensating filters.

2. Be sure the exposure meter is set to the proper emulsion rating for the color film being used. If the meter is a Weston Master II, this is simple. The Weston Emulsion Speed values for color film are the result of careful tests in the Weston Photographic studios and outdoors. They are integral factors in the correct operation of Weston Exposure Meters, and for others designed for use with these values.

3. Naturally, the better one understands the operation of the meter, and the more intelligently he interprets the readings, the more certain he is of obtaining correct camera settings. Everything required for perfect results is contained on the exclusive exposure control dial of all Weston Universal Exposure Meters. This includes, for the sake of consistently good color work, the extremely valuable A and C positions.

Selective Exposure Control

The permissible scene contrast for color film is about 1:4, in brightness units of the colored objects in the scene. This contrast range is designated on the Weston dial by the letters "A" and "C", (See dial above.) These positions, coupled with the Brightness Range Method of determining the exposure, afford the most accurate means of getting the best results. The Brightness Range Method is taking close-up readings of the darkest and brightest important colors in the scene, exclusive of blacks and whites, which are not



Read Brightest and Darkest Areas for Brightness Range

colors, and setting the Normal Arrow midway on the calculator dial between the two values.

Weston Exposure Meter Control Dial Showing "A" and "C" Color Film Limits

Now, let's see how we can manipulate these factors to *select* the exposure that will give the best color rendering. In a typical scene with a brightest-color value of 200 and a darkest-color value of 50, the ratio is 4:1. This can be exposed correctly by placing the arrow midway between; in this case, at 100. Now the A and C positions naturally coincide with the brightness-range extremes.

But this is an ideal situation that rarely occurs. Usually the scene's brightness range is greater than 4:1. Above and below these extremes, you lose color quality by overexposure and underexposure. So, without the A and C positions on the Weston dial, and the selective exposure control they permit the photographer would be lost. With other reflected-light meters he might estimate a mid-point exposure, but that is all. He couldn't *control* the exposure according to the merits of the scene, as he can three ways with a Weston.

Let's assume a scene in

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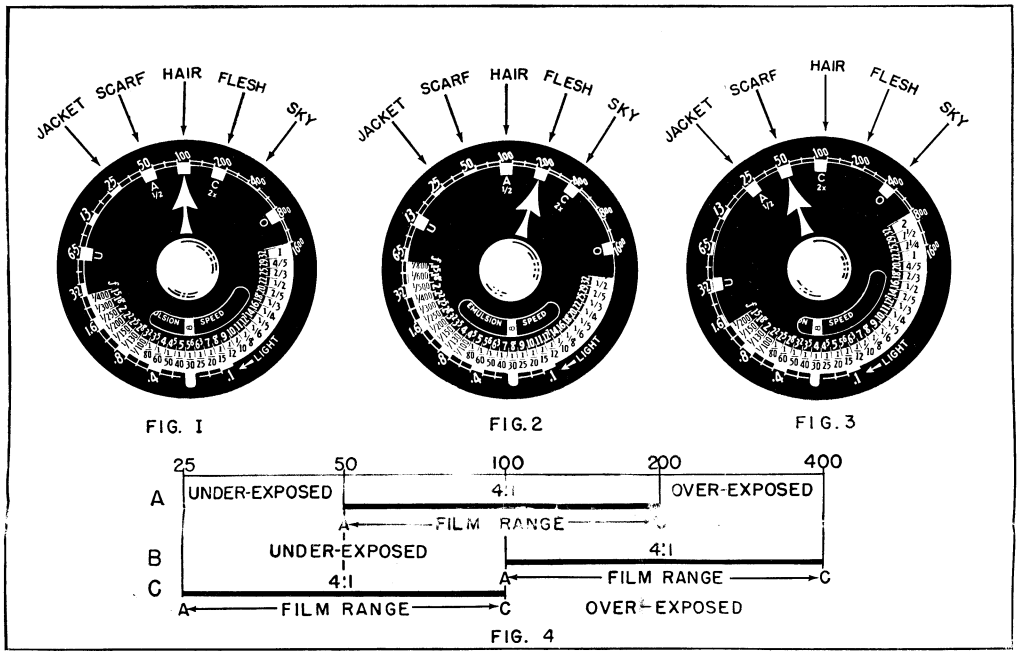

FIG. I FIG. 2 FIG. 3

FIG. 4

which five chief elements have the following readings: girl's jacket 25, scarf 50, hair 100, flesh tones 200, sky 400 . . . an extreme range of 16:1. What can be done? Obviously, the 4:1 acceptance range of the color film cannot cover the entire scene brightness range. All the film can possibly take is 25 to 100, 50 to 200, or 100 to 400.

1. The A and C positions, representing the 4:1 ratio, can be centered on the 50 and 200 readings respectively. Now all objects with readings lower than 50 will be underexposed and dark; those higher than 200 will be overexposed and pale. This is diagramed at A, Fig. 4, and the setting shown on the dial, Fig. 1. But this is the way a general scene would be treated, in which the objects of greatest interest are probably in the middle part of the brightness range.

2. If the most interesting features of the scene are the highlights (as is usually the case), place the C position of the Weston dial at the brightest value; in this illustration, 400. Now everything down to the A position will be reproduced correctly, and only those less important objects with lower brightness values will be sacrificed by underexposure. This is diagramed at B, Fig. 4, and the setting shown on the dial, Fig. 2.

3. However, if the low brightness objects are the most important, place the A position on the Weston dial at the reading of the darkest object; in this illustration, 25. Now everything up to the C position will reproduce correctly, and only the highlights above this, which you now deem less interesting, will become paler by overexposure. This is diagramed at C, Fig. 4, and the setting shown on the dial, Fig. 3.

In taking meter readings from the camera position, tilt the meter toward a point halfway between the horizon and your feet, to avoid inflating the readings by sky light. When objects cannot be reached for close-up readings, substitute a nearer object of similar material and identical lighting.

Errors in Equipment

Sometimes the photographer has been scrupulously observing all of the above points, and yet he is consistently over- or under-exposing. This is probably due to errors in his photographic equipment. There may be slight errors in the shutter, errors in the f/stop calibrations, or abnormal losses by lens absorption. When more than one of these errors is present, they sometimes happily cancel each other out, in which case the photographer may not realize that anything is wrong.

If they do not, an easy method of compensation is by changing the film rating employed. If the transparencies are consistently underexposed, he should lower the film rating accordingly; if they are overexposed, raise the film rating. If they are correct, he is among the majority!

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