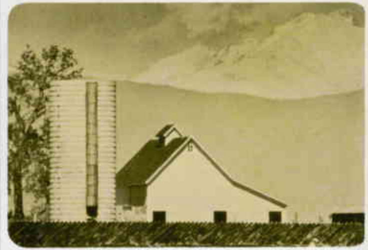
GUIDE TO GOOD exposure



Pentax Spot Meter
1°/21° Instruction Book
Maver J. Campbell

The 1°/21° Meter is extremely simple to use. Nevertheless, you should read the instructions beforehand. For those in a hurry, a good start can be made by examining the illustrations identifying the external parts, and by following the ABC's of operation. A more thorough reading of this booklet should follow later.

A short ABC of Exposure Readings with your Honeywell Pentax 1°/21° Meter

A. Set the ASA scale to the correct film speed rating of the film you're using.

B. Hold the meter in your right hand (with viewing ocular close to your eye) and direct meter toward photographic subject.

C. Center the small circle on area of prime picture interest. Observe on the H scale of the viewing screen the light level (L.L.) number at which the needle comes to rest. If the level is less than 10 on the H scale and/or the needle is not deflected, then press the "L" button down and observe the L.L. on the low range* indicated by L scale.

D. Set this observed number below the silver index mark on the meter calculator by turning the knurled outer ring.

E. Select the shutter speed and f/stop combination desired (from the two top scales of the meter calculator) and transfer this data to your camera.

**Important—Refer to Low Light phenomena—section 5b*

section 1

basic concept of light measurement for photographic exposure

a. Historical outline of light measurement—Since the discovery of photography, photographers have searched for efficient ways in which to measure the reflected light they are recording on film. In the beginning, films were slow, latitude was great, and exposures were long. Volumes of printed exposure tables were carried which listed many types of camera subjects, sky conditions, variations of exposure due to change of light during the day at different latitudes for different months. These were reduced in size as a step toward progress and can still be found in circular slide rule form. The next development, which is now primarily of historical interest, was actinometers, which are rarely, if ever, used today. They determined the "actinic value" of the light by determining the time required for a piece of photographic printing-out paper to darken to a standard tone. These actinometers were the forerunners of today's incident type light meters. Unfortunately, the printing-out papers were insensitive to the yellow, orange and red portions of the spectrum and were very slow in operation, particularly under low light conditions.

The actinometer was followed by the development of the visual-type exposure meter. These are of three types: 1) wedge-extinction type, in which the exposure is determined by varying a graduated neutral-density wedge until shadow detail disappears; 2) stepped-wedge devices, whose steps are lettered or numbered, the dimmest symbol which can be read being taken as an indication of the integrated light intensity of the scene; and 3) the photometer, which contains its own comparison lamp which is set to illuminate an internal comparison surface at a predetermined brightness level. These meters measure reflected rather than incident light. Some of the problems inherent in these instruments are that they are subjective in operation, which introduces human errors; they are fairly slow in reading, particularly at low light levels, because the eye must

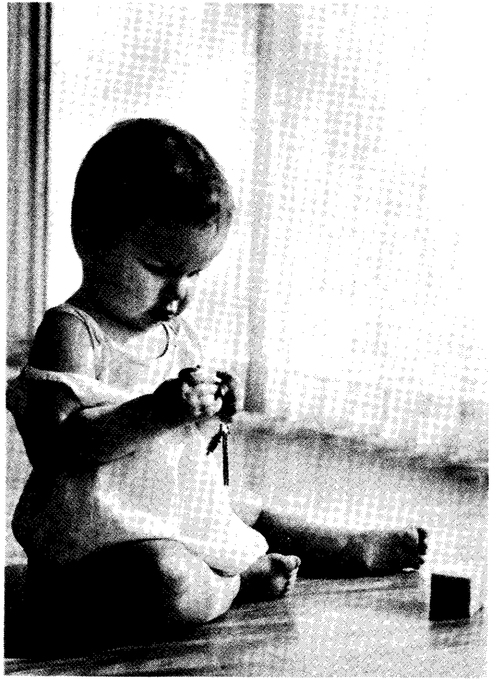


Plate 1 ■ *Problem: to produce good skin tone in the shadow area of a back and side lighted subject.* ■ *Solution: selective reading with the 1°/21° meter of the dark side of the face. (Sec. 5c)*

become accommodated to the light; and, in some types, they are improperly calibrated.

Photoelectric type exposure meters were for many years the most precise type available in their price range. They vary in size proportionately to their sensitivity and may have a simple direct reading scale or a dual range scale and complex computer. The operation of these meters is based on the use of a photoelectric cell, generally selenium, which generates an electric current in minute amounts, proportionate to the amount of light falling on the cell surface, using a grid to control the light acceptance angle of the cell. The current is measured by a sensitive galvanometer, coupled to an indicating needle. Sensitivity is dependent upon the size of the cell and the efficiency of the meter. Unfortunately, the most efficient meters tend to be fragile and sensitive to shock, so a design compromise usually results. This severely limits the use of the photoelectric type meters for measuring low light intensity. The large angle of acceptance required, which is necessary for any degree of sensitivity, can also be a source of misleading readings in many situations, such as the effects of bright sky or back light.

The most recent development in light measurement is a by-product of the current technological boom in electronics and semi conductors. This revolutionary concept resulted in the photo-conductive or photoresistor meter. The highly sensitive cadmium sulfide cell, several hundred times more sensitive than that of the selenium photo-cell, is battery powered, producing no current of its own. Cadmium sulfide is a semi-conductive material, which changes its resistance level with the intensity of the light it receives. It has excellent qualities of moisture and heat resistance and has a near permanent life. A relatively high voltage battery generates the current, the flow of which is in turn regulated by the cell. The meter's light reading sensitivity, therefore, can be quite high and a fairly large and more rugged galvanometer can be incorporated within the meter case. Because no light is needed to generate current, small amounts of light may be measured precisely.

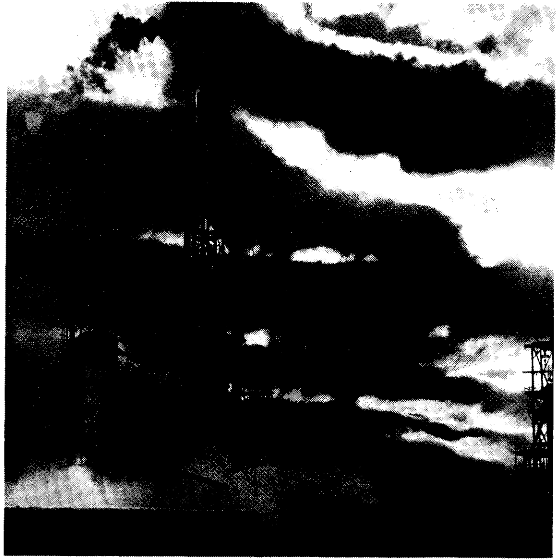


Plate 2. ■ *Problem: to determine the proper exposure for a back lighted subject with the light source in the area of exposure and some detail required in the subject.* ■ *Solution: selective reading of the brightest area other than the source of light. This method will produce the semi-silhouette effect with some detail in the structure. (Sec. 5f)*

Today's photographers have available to them, in films (color and black and white) and developers, the largest choice ever known. Faced with this wide range of material and the extreme variety of conditions under which photographs must be made, the photographer will find that a sensitive and selective light meter is an indispensable tool rather than a luxury.

b. Methods of Light Measurement —Pros—Cons—Precautions

1. Incident light measurement— refers to measuring the intensity of the total of all the light falling **on** the subject from every source, i.e., measurement of illumination rather than brightness.

Pros—The advantage of meters making this type of measurement is that consistent readings can be made for objects of average brightness and contrast. Actually, calibration is based on average subject reflectance of approximately 18%. (The reflectance of subject matter varies from approximately 4% for dark materials to 81% for snow. Exposures are calculated on a doubling scale, i.e., 1, 2, 4, 8, etc.; therefore, the center of average reflectance between 4 and 81 is 18, since 4 x 81 = 324, of which the square root is 18. This also explains why we use a gray card of 18% reflectance to represent the average subject.)

Cons—Meters which measure incident light do not take into account differences of color, surface texture, or reflectance of the subject, or the angle of the light hitting the surface.

Plate 3 ■ *Problem: to read from a distance the brightness of a spotlighted performer surrounded by dark areas (clothing and stage curtain) for telephoto.* ■ *Solution: selective reading with the 1°/21° of the performer's head. (Sec. 5b and q)*

The reading of the light reaching the subject will be the same whether the subject to be photographed is black or white, rough or smooth, shiny or dull. If the subject is not accessible, you cannot always correctly measure the exposure. The light falling on a distant mountain top may not be the same as that falling on the photographer and his meter. Indoors, the reading must also be taken close to the subject, particularly if spot lights are being used, or if the room illumination is uneven.

Since all the light falling **on** the subject affects the exposure for that subject, it is obviously desirable to measure incident light from the widest possible angle. A narrow acceptance angle is the pitfall of many meters which are designed for measuring **incident** light by both methods, i.e., those with a flat disc or ribbed plate will give a reading only comparable to the light falling on a flat surface in the same relative position. A hemisphere or dome shaped diffuser approximates the camera side of a three dimensional subject, collecting light from all angles. This design is logical for portrait photography but not for photography of a flat surface or copy work.

Incident light measurement for photography on the water is generally a poor method because of the extreme contrast of light.

This method cannot be used with the zone system of exposure because you cannot measure the tone values of specific areas in the subject.

2. Reflected light measurement refers to measuring the light reflected **from** the subject, i.e., measurement of brightness rather than illumination.

Pros—The advantage of using this method of measurement is that it determines the brightness of the light which will be focused by the camera lens to form an image on the film. Because of the variations in reflectance of various specific areas of a subject and the fact that brightness depends on both reflectance of the subject and the intensity of the light falling on the subject, measuring this intensity alone obviously will not give us all the necessary information for creative aesthetic photographic decisions.

Cons—The disadvantage of most reflected light meters has been the

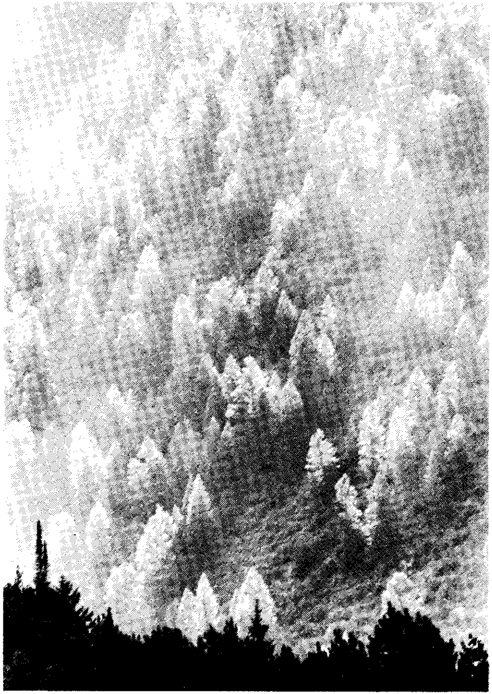


Plate 4. ■ *Problem: to eliminate sky by using a long lens and expose correctly in spite of very bright background and very dark foreground.* ■ *Solution: selective exposure of back lighted area, eliminating influence of surroundings. (Sec. 5a)*

large acceptance angle required because of the low sensitivity of the selenium type photo cell. This meant that an integrated reading resulted, which, like the incident meters, gave an average value of the total amount of light. Obviously, the narrower the acceptance angle, the more suitable a meter would be for measuring reflected light. The Honeywell Pentax 1°/21° Meter solves the problem by using a cadmium sulfide cell with the great sensitivity necessary to allow a **very narrow acceptance angle.** The narrow acceptance angle provides the selectivity necessary for intelligent analysis of subject brightness. This permits the statistical analysis to be made by the photographer rather than the meter.

c. Film Speeds—Film speeds are numerical ratings given to each specific film by the manufacturer and are established following the standard procedures of the American Standards Association. The number serves as a basis for computing exposure. The film speed number appears in the data sheet packed with the film and is generally based on an average emulsion used under average conditions. With some professional color films supplementary data is included which gives a corrected speed applying specifically to the film bearing the emulsion number given.

Film speeds may be designated under one or both of the following numerical series: an arithmetic series—3, 6, 12, 25, 50, 100, 200, 400, 800 and 1600; or the newer logarithmic series, base 2—0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. The log series is called Film Speed Values to distinguish it from the arithmetic Film Speeds. The degree notation (°) is also used with the log series. The two series should **not** be confused, however, since their numbers do not coincide for any commonly used films. It may be noted that these systems can never correspond exactly; however, the conversion is sufficiently accurate for the intended use of the film products in question.

Black and White Film Speeds —For panchromatic films generally, only one speed is given for all light sources because the film is sensitive to light of all colors. With blue-sensitive and orthochromatic material a second film speed number is usually indicated, because a lower speed number is required for tungsten illumination.

For any film, these numbers are primarily guides to ascertaining the proper exposure, or indications of expected performance. They include a safety factor to insure a photograph when a standard exposure is made and the film receives standard processing as provided by drug stores or commercial concerns. Most photographers determine a film speed based on their own equipment and system of custom development for each film. This number may be more than twice the manufacturer's recommendation in some instances. Once a normal system of development is established for a given film, if negatives are consistently thin, exposures should be increased by lowering the film speed number; if negatives are too dense, reduce exposure by using a higher number.

Color Film Speed Numbers—Color films are, for the most part, processed by the manufacturer under close control and therefore will generally give most satisfactory results when the speed is used exactly as indicated. Some color films which can be processed by the photographer do offer a variable film speed through modification of the developing process, at the sacrifice of changes in color balance, contrast, and grain structure.

For positive color transparencies (reversal color films), optimum film speed should be established by the photographer based on producing film which is extremely transparent in the lightest areas of importance in the subject, while still retaining essential detail or color in such areas. If the transparencies are consistently too light (overexposed) decrease the exposure by using a higher number; if too dark (underexposed), increase the exposure by using a lower film speed number.

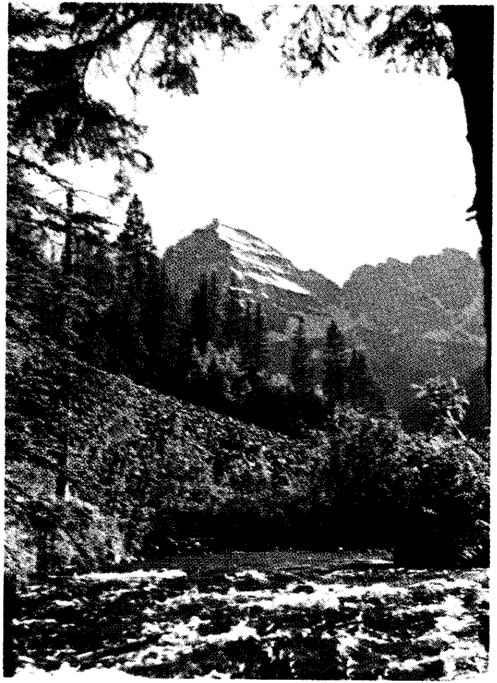
For negative color film, the exposure latitude is much larger and following the manufacturer's recommendations, as well as giving adequate exposure to the shadow areas, will generally assure successful results.

Polaroid black and white positive, positive/negative, and color films have their own technical characteristics with regard to film speed and the data sheet enclosed with the specific product should be carefully read.

Obviously, it is possible to obtain a picture from any one of a wide range of exposures. To obtain the very best picture, the exposure must be adjusted to fit the nature of the subject and the quality of the light.

Whether this is done by varying the film speed or by interpreting the meter reading, the result will be the same. Which method is used should be based on the consistency of your results. Consistent over or under-exposure can be most easily corrected by changing the basic film speed number used. Random results indicate a problem in ability to make and/or interpret the readings which may be improved by practice, and by reviewing the section on how to use the meter.

d. Reciprocity Effects—The reciprocity law is a basic corollary of photography which states that the exposure is the product of the length of time of exposure and the intensity of the light falling on the film. This assumption is not exactly true, however, and while the failure of the law is usually insignificant for most applications of photography, it cannot be neglected when extremely long exposures are given. The practical effects with black and white film occur principally at low light levels or under other conditions when the time of exposure indicated by the light meter exceeds one second. Variations occur between brands and sizes of films and exact corrections can only be determined experimentally or by writing to the manufacturer. The degree of compensation for a typical sheet film might be to increase the exposure time by a factor of 1⅓ for an indicated exposure of 1 second, a factor of 1¾ for 2 seconds (3½ seconds), a factor of 2⅓ for 4 seconds (9⅓ seconds) and 3½ for 8 seconds (28 seconds). If you do not take this factor into consideration in making a long ex-



posure, not enough light will get to the film and your picture will be underexposed.* Other effects of reciprocity failure which may occur are not pertinent to the use of the 1°/21° meter and may be further explored in the references cited.

Reciprocity failure of most color film is more severe, and compensation more complex, because changes in color balance occur with variations in the time of exposure. Each film is manufactured with the color balanced for a specific exposure time, which is usually stated in the data sheet accompanying the film. Extreme deviation from this speed will cause a change in color balance.

*In a general sense with panchromatic films, exposures longer than 8 seconds times the compensating factor are not recommended because of the nature of film, which tends to degradation of the image beyond this point.

Plate 5 ■ *Problem: to obtain an accurate reading in the presence of brilliant reflections.* ■ *Solution: selective reading with the 1°/21° of a middle value (foliage) to render the scene accurately, avoiding undue influence of strong highlights. (Sec. 5c and f)*

Because of this shift, adjustments must be made in filtration as well as exposure time. Information for compensation in exacting work may be obtained by writing to the film manufacturer; however, for very critical work, careful testing, with film of the same emulsion number, is necessary.

e. Equipment Variations—Since the origination of photoelectric exposure meters about 1928, reputable exposure meters intentionally differed by as much as one f-stop. From 1938 to date, the American Standards Association has established, revised and periodically improved standardization. International standardization is also progressing. Minor variations exist and even more misleading variations can be demonstrated when one meter reading is compared with the

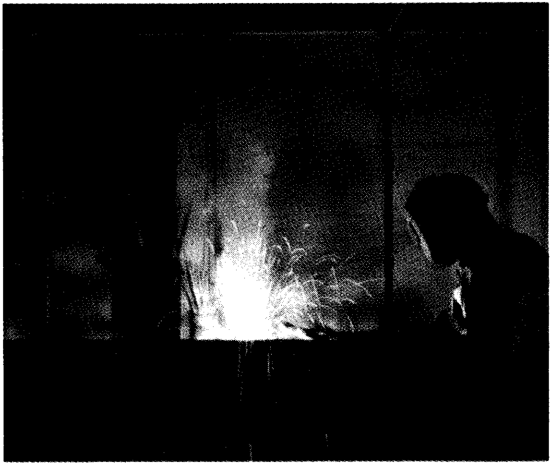


Plate 6 ■ *Problem: to obtain certain detail in shadow areas of a subject with extreme contrast.* ■ *Solution: 1°/21° reading of the most important area in which detail is desired. (Sec. 5c and h)*

reading from another meter, unless these comparison tests are made by rigorous objective tests under laboratory conditions. Making comparative readings with various meters pointed up at the sky, etc., particularly if one tries to compare meters having different acceptance angles, obviously does not constitute an objective test.

Even comparing meters manufactured by the same company can produce variations. To compensate for variations among cadmium sulfide cells and the electronic circuit of each Honeywell 1°/21° meter, a careful calibration test is made after the meter is assembled to insure complete accuracy of the readings obtained with your meter.

f. Other Variations—Not only is the number of variables in photography great, but frequently variations occur within the variables. In spite of quality control in the manufacture of photographic products, many technical characteristics accepted as constants vary unavoidably, or change with normal wear, and when subjected to abnormal environmental conditions. Shutter speeds are one of the most variable "constants" and true shutter speed is often elusive. Periodic inspection of your camera shutter is vital for critical work. The true film speed and sensitivity or color balance will vary slightly among different emulsion numbers of the same type of film. Age of the film, storage conditions, and the length of time between exposure and processing are also important variables. Lighting quality can change during a shooting session, e.g., the movement of clouds can quickly modify the light. Non-standard processing conditions can cause variations in all types of photography.

Analysis of the finished slide or print is subject to variations in viewing conditions, such as non-standard illumination and light quality. Last, but not least in importance, are the differences in personal judgment in evaluating a slide or print.

Some variations may cancel out and be insignificant in end result. Some may be additive and cause severe changes in the final picture. Variations can be minimized by carefully following the manufacturer's recommendations for specific products, and by testing equipment frequently.

When a system is devised that gives consistent results, which, however, are still unsatisfactory, the 1°/21° meter can be used to solve the problem by selecting an artificial ASA rating which will yield consistently good results.

section 2

Honeywell pentax 1°/21° cds exposure meter

a. Design—The 1°/21° meter is a rugged, portable, practical exposure meter for on-location or in-studio use. The meter is light in weight and is designed for rapid, one-hand operation. The changeover from reading high to low levels of light intensity is instantaneous and requires no change of position when holding the meter. The meter is essentially a single-lens reflex optical system, consisting of an objective lens and a reflex viewing system with a 1.5 x eyepiece or ocular. The viewing screen covers a viewing angle of 21° and in the center of the screen is a circle defining the 1° angle of acceptance of the cadmium sulfide light sensitive element.

An L.L. (Light Level) scale is located beneath the viewing screen below the circle in large black numbers which can be easily read, even under low levels of brightness of the object being viewed or photographed. The scale is essentially self-illuminated and will prove advantageous to photographers with a vision problem as well as to the average photographer working in dark locations.

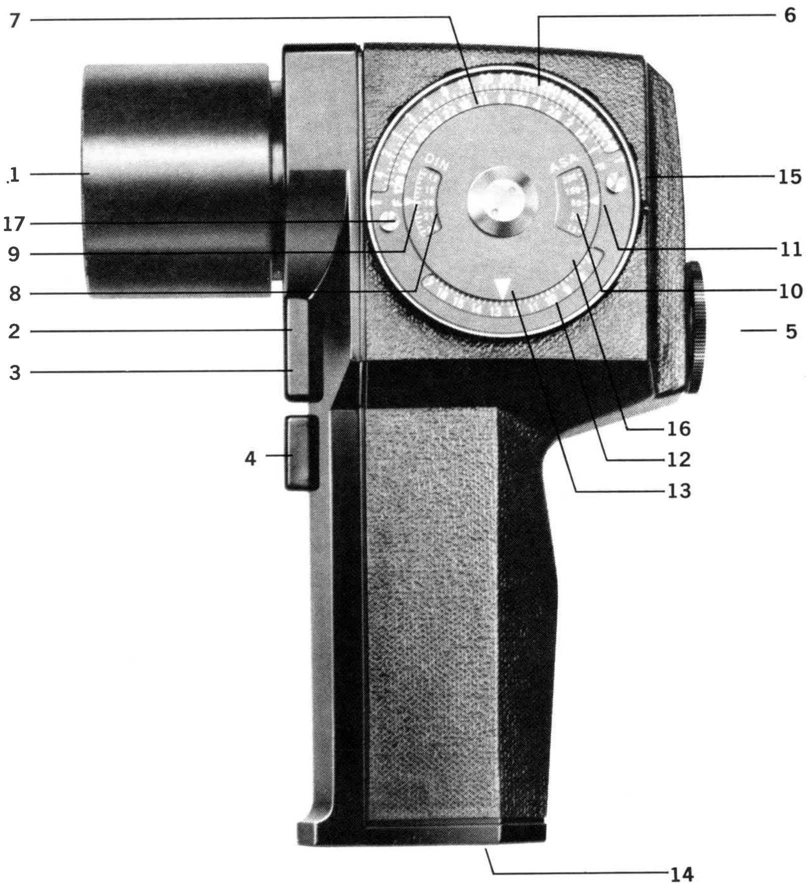
The scales located on the meter calculator are engraved in three colors for good visibility and ease of reading.

The external design of the 1°/21° meter is clean, contemporary, and functional. The hand grips its pistol shape in a manner that affords comfortable ease of use. Eye-level viewing makes subject location and metering of a fast-moving subject a simple task. The high range of the meter will function with removal of the lens cap. The index finger is automatically led to the "L" button where low range readings can be made quickly and without fumbling. Raising the index finger approximately ½ inch will bring it to the "B" button which is used to check the battery. All this can be accomplished without moving the eye from the viewing screen.

At the base of the meter is a tripod socket which is also used for a neck or wrist strap providing a secure and easy method of carrying the meter.

The internal design characteristics assure long life through rugged construction. The basic chassis is made from cast aluminum covered with a molded impact-resistant material. The brackets supporting the electronic components are thick brass or steel fixed in position with brass screws. Both battery cases are spring loaded and of extra heavy construction which will prevent contact failure. Positive and negative terminals of both compartments are clearly marked to prevent improper replacement of the batteries.

All electronic components, i.e., galvanometer, cadmium-sulphide cell, and resistors, are of selected quality elements.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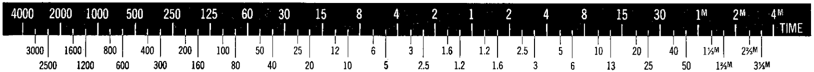
identification of external parts

1) Objective lens
2) Zero adjustment screw
3) Battery checker button
4) 'L' switch button for low light
5) Adjustable eyepiece
6) Shutter speed scale
7) Diaphragm scale
8) DIN scale
9) Index for DIN scale
10) ASA scale
11) Index for ASA scale
12) Light-level scale
13) Index for light level
14) Battery housing cover
15) Outer ring for matching light level
16) Film-speed setting plate
17) Nipple for turning inner disk

b. The Scales—The 1°/21° scales are designed with ranges of shutter speeds, f/stops and ASA film speeds above and below the limits of today's cameras, which is built-in insurance that your meter will remain ahead of our ever-growing technology.

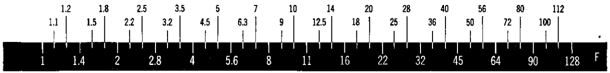
The exposure calculator of the meter includes two movable rings. The first scale located on the outer ring at the bottom of the calculator (12) is the L.L. (Light Level), scale and is marked in numbers from 3 to 18. These correspond to the L.L. scale on the viewing screen. The low level range (L), below the line, carries values from 3 to 10, and the high level range (H), above the line, carries values from 10 to 18. In subdued light the (L) **Low** range of the scale is used. **(Important: This scale should not be confused with the EV or Exposure value system used on some cameras and shutters.)** The numbers on the L. L. scale are a convenient series of numbers expressing light intensity or "light level" for the 1°/21° meter only and cannot be transposed directly to cameras or shutters with the EVS or LVS systems. There may be instances when the values, because of a certain combination of the variables of light and film speed of the film you are using, would result in the L. L. number being the same as the EVS number; however this would be purely coincidental.

The second scale "T" located on the outer ring at the top of the calculator (6) shows shutter speeds from 4 minutes to 1/4000 second. The silver numbers are fractions of a second ½, ¼, ⅛ . . . 1/4000. Orange numbers 2, 4 . . . 30 are full seconds. Orange numbers with a small m beside represent full minutes. 1/50 second is marked by a small orange triangle as an aid to motion picture photographers, who may wish to use this as a point of departure in obtaining readings for movie use. 1/30 second is the shutter speed for most 16mm movie cameras operating at 16 frames per second. (See Section 8 for motion picture data). Intermediate shutter speeds other than ASA standard speeds are shown:



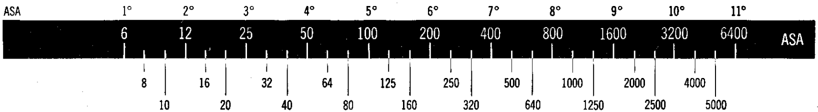
Shutter speed Scale "T"—Time

The Diaphragm Scale "F" located on the inner rotating disk (17), contains lens diaphragm f/numbers from f/1 to f/128. Numbers marked are ASA Standard f/stops and each interval represents a full stop, i.e. adjacent numbers represent double or half the amount of light admitted. Since f/numbers are fractions, the higher the number, (actually a denominator), the smaller the aperture. Other intermediate stops are shown on the following scale.



Diaphragm Scale "F"—f/numbers of lens diaphragm.

The inner rotating disk also has two film speed scales. The orange scale calibrated in ASA, the green in DIN. The Indices for the film speed scales as well as the L.L. scale are respectively colored triangles (9, 13 and 11) on the innermost non-rotating disk. The ASA film speeds are calibrated in the familiar arithmetic series. These numbers again relate to full f/stop values which are an indication of the film sensitivity. The calibrations on the ASA Film Speed Scale and the intermediate numbers indicated by marks between the engraved numbers are shown below. The new ASA film speed values are also shown. This series of ASA degrees from 1° to 11° is a logarithmic series, base 2, and designates the same film sensitivities as the alternate arithmetic series 6 to 6400. The log series in degrees is called "film-speed values" to distinguish them from the arithmetic "film speeds." The two series do not exactly coincide; however, the conversion shown is sufficiently accurate for general use. Note: Doubling the ASA film speed permits closing down 1 f/stop; halving the ASA film speed requires opening up 1 f/stop. Addition or subtraction of 1 to an ASA degree value is equivalent respectively to a decrease or an increase of one f/stop.



ASA Film Speed Scale

c. Reading the Meter

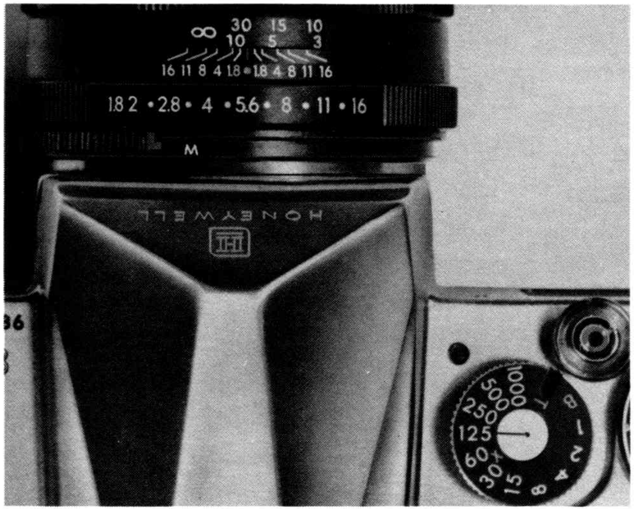
1) Turn the inner rotating disk (16) by means of the nipple (17), and set the film speed, ASA or DIN, to its respective index (9 or 11).

2) Remove the lens cap and turn the eyepiece to adjust it to your eyesight.

3) The subject is selected and located within the 21° viewing angle on the screen. Note that the image is erect and unreversed. The center circle of the viewing screen covers an angle of 1° in which the meter's light sensitive elements function. The specific area to be metered should be centered within the 1° circle.

4) With the removal of the lens cap the 1°/21° meter reads high light intensity. If the area of subject within the circle is sufficiently bright the needle will then move to the right of the 10 on the H (high) scale, which covers light levels 10 to 18. If the light level of the subject is less than 10 and the needle does not move far enough to the right to reach 10 on the H scale, press the "L" switch button. This places the meter in the second or low range indicated by the "L" scale. Numbers from 3 to 10 fall in this range. **IMPORTANT,** *do not push the "L" button putting the meter on the low range, until you have determined that the light level is below 10. If the "L" switch button is depressed in bright light the needle will read off the scale and this may damage the meter movement.*

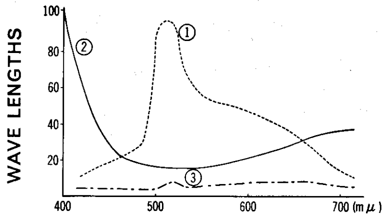
5) Observe the L.L. or light level number from the position of the needle on the scale. Move the outer ring (15), and match with the light level index (13), the same number obtained from the light level scale on



the viewing screen. For your convenience, the light level numbers on the scale (12) are two colors; white from 3 to 10, which corresponds to the low light scale, and red from 11 to 18, which corresponds to the high light scale.

6) Select the shutter speed and f/stop combination desired and transfer the data to your camera.

1. Curve for a typical CdS cell
2. Curve compensating coating
3. Color corrected curve



RELATIVE LIGHT SENSITIVITY

d. Color Balance of the Meter— The sensitivity of a cadmium sulfide photo conductor light-sensitive element varies with the wave length of the light. A typical spectral response curve is shown at right. If such an uncorrected element were used in a meter, colors in perhaps the blue-green section of the spectrum would give a very high (false) reading influenced by color rather than brightness. This characteristic of the cadmium sulfide element is corrected by incorporation of compensating interference coating in the optical system of each individual meter. The optical system of the 1°/21° consists of an objective lens, reflex viewing system including a pentaprism (the same pentaprism as used in the Honeywell Pentax camera), and an eyepiece. The reflex viewing system and the CdS cell have the special interference coating which properly corrects the color sensitivity of the light-sensitive element. Thus, you can be assured that your meter has been color-corrected, insuring excellent exposure readings for black and white and color photography.

e. Low Light Level Phenomena—

1) Photoconductor conditioning—When the meter is to be used to read very low-level subject brightness, and the cap has been in place on the meter, it is advantageous to "condition" the meter by viewing an object of slightly greater brightness than the subject of interest. As long as the object is within the 1° circle, the dual-range button does not need to be depressed. Obviously, in a studio situation, leaving the cap off between readings will keep the meter conditioned. The advantage of this "conditioning" of the cadmium sulfide crystal is simply a time-saver, because if the dual-range button is held down, a low level reading will be reached without "conditioning" in about 2 to 3 minutes for a meter which has been capped for several hours. The time constant is reduced to some degree, depending on the frequency of use. Exposure to a brighter object for a second or two will permit instantaneous readings. One precaution is advised—exposure of the photoconductor to an extremely bright light will result in over compensation, i.e., when the meter is redirected to the low level subject, the needle will stop at approximately one L.L. unit higher, and then slowly move to the left and come to rest on the correct value. This may take as long as a minute. The importance of good judgment being used in choice of an object only slightly brighter than the subject is therefore obvious.

Example: 1) Photoconductor conditioning—Meter cap on for 1 hour; time required to reach reading of L.L. 3.5—3 minutes.

Conditioning by exposure to L.L. 6 value object—approximately 1 second; time required to reach reading of L.L. 3.5—approximately 1 second.

2) Dampening—The time constant for those phenomena and speed of the needle movement in general, as well as fluctuations of the needle in scanning subjects of varied brightness levels, are functions of the dampening effect of the individual meter. These variations are inherent in any electronic instrument.

3) Drift—If the needle is observed to drift, i.e., the needle does not come to rest within a reasonable period of time, provided the light source is constant and the meter is held in a rigid, fixed position, battery weakness is indicated.

f. Mechanics—replacing batteries, etc.

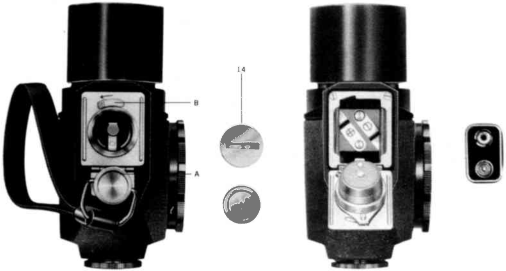
1) Zero correction—The 1°/21° meter will retain its accuracy with an absolute minimum of attention. Should the needle ever not lie exactly on the zero mark when at rest, zeroing is easily accomplished by turning the adjustment screw above the battery test button.

2) Battery life and method of replacement—The 1°/21° meter is powered by two batteries—one 1.3 volt mercury battery and one 9 volt dry cell. The mercury battery operates the high range, "H," and the dry cell operates the low range, "L." The life of the mercury battery is very long at a uniform level of output until failure. Length of life is dependent on frequency of use, but it should be replaced after one year's use.

It is a characteristic of dry cell batteries to fail eventually even with no use, and the output slowly decreases as the battery ages. The life depends upon the quality of the dry cell and how much it is used. The life expectancy is six months to one year for the 9V dry cell.

3) How to test batteries—The battery checker button (3) checks the life of the 9V dry battery. Look through the viewfinder, and depress the battery checker button. If the needle moves to the black mark between the figures 7 and 8, the dry battery is still active. If it does not move to this mark, replace the battery.

The mercury battery usually lasts for about a year. When it is depleted, the needle will not move rapidly against bright light. It should usually be replaced after one year's use. When replacing batteries, use the correct replacement batteries.



To replace the mercury battery, unscrew the battery housing cover (14) with a coin. When inserting a new battery, be sure that the (+) side is UP.

For replacing the dry battery, remove the retainer (A) of the strap by unscrewing it, and turn the lever (B) to the direction of the arrow, and the whole housing of the mercury battery will spring up. Open it as illustrated, and drop the dry battery from inside the meter's grip. When inserting a new dry battery, make sure that it makes correct contact with the (+) and (−) terminals.

section **3**

general use with black and white films

a. Exposure latitude—Most modern films have a margin of safety known as exposure latitude which may produce useable negatives even when over- or under-exposure occurs. The relationship of the useful exposure range to the subject brightness range determines the amount of latitude. Useful exposure range is dependent on the film and length of development time in a specific developer and should be determined by the photographer. The subject brightness range can be easily determined with the 1°/21° meter. If the subject brightness range is less than the useful exposure range, the latitude will be great and more than one exposure could give good results. If the ranges are about equal, there is said to be no latitude and only one correct exposure will give a good result. If the subject brightness range is more than the useful exposure range, there can be no exposure which will give a perfect result, i.e., either shadow detail or highlight detail will be lost. Such a subject is said to be beyond the latitude of the film. It is therefore important for the photographer to know the brightness range of the subject, which can be determined quickly with the 1°/21° meter, as well as the useful exposure range, instead of relying on latitude to produce good results.

b. Methods of Determining Exposure

1. Selective Exposure or Spot Reading—The photographer selects the area of the subject of principal importance, centers this area within the 1° circle on the viewing screen, and makes the reading. This is applicable when the subject is important and the background is not. The degree of validity of this method is also a function of the focal length of the lens. As we increase the length of the lens, the significance of the reading within the 1° circle becomes greater, until, with a very long lens, we find we are reading exactly the area to be photographed.

Example: Textural abstraction (see Plate 7)—let background fall where it may.

Plate 7 ■ *Problem: to obtain texture in a dark subject with a dark background.* ■ *Solution: selective reading from the textured area. The 1°/21° reading will not be affected by the black background. (Sec. 3b1)*

2. Weighted Average—This method is applicable for the normal, flat lighted scene. Readings are taken from the brightest important parts of the subject and at the same time the photographer must determine the proportion of the brightest parts to the total area of the scene which will be covered by the camera lens. The same system is then carried out with the darkest important areas. These weighted averages are then noted on the diaphragm and shutter speed scales and the proportion visually determined from the distance between the high and low values. This figure is used to select the setting.

Example: Industrial photograph, (see Plate 8) with ¾ of the picture area light, reading 14, and ¼ darker, reading 10. The weighted average would be 13, rather than the true average, 12.

If the camera angle is changed and moved over to take in more dark area and less light area, the weighted average would now be 12½, giving more consideration to the dark areas because of their increased importance in terms of the proportion of space they will occupy on the film.

Plate 8 ■ *Problem: to expose correctly for a scene with a great brightness range when the subject is inaccessible.* ■ *Solution: a weighted average of the readings for the brightness and darkest important areas in proportion to their size. It is not necessary to get close to the subject with the 1°/21° meter because of its narrow acceptance angle. (Sec. 3b2)*

3. Arithmetic Average—This method is also applicable for normal, flat lighted subjects. It is particularly suitable for landscapes and other subjects in which both bright and shadow areas are important.

Readings are made of the brightest and darkest areas in which detail is important. The arithmetical average or midway point, which will be used to determine the setting for exposure is found by adding the bright and dark readings together, and dividing by 2.

Example: Boats at 14 + water at 10 $= 24 \div 2 = 12$. (See Plate 9). The arithmetical average of 14 and 10 is 12. The values may be visually averaged quickly and easily by using the diaphragm and shutter speed scales on the 1°/21° meter.

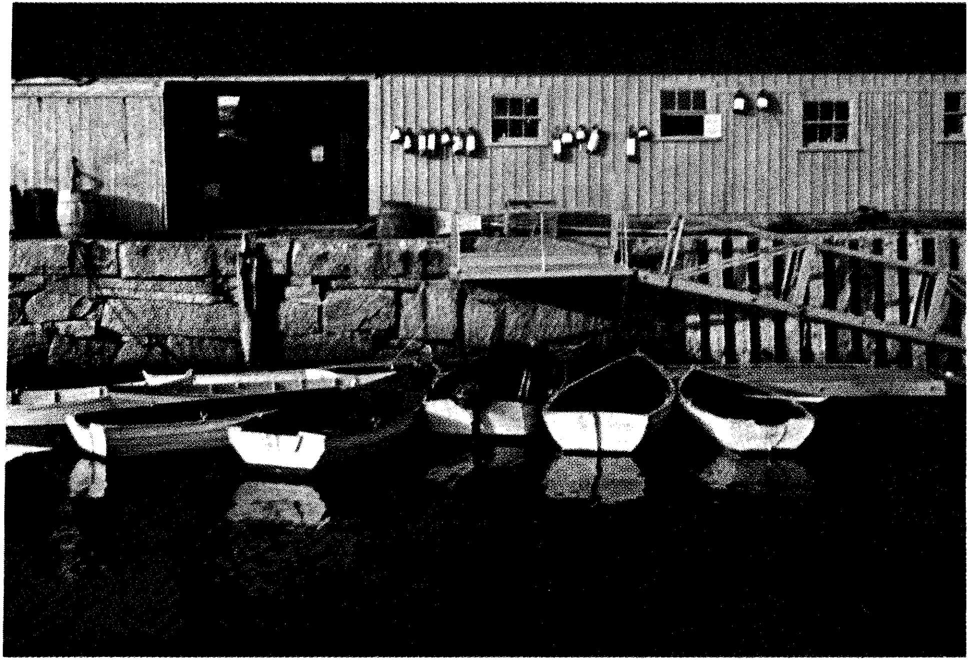


Plate 9 ■ *Problem: to record detail in an average scene with a full range of values.* ■ *Solution: arithmetic average of readings from important dark area and important bright area. (Sec. 3b3)*

4. Zone System—This technique concerns previsualization (i.e., visualizing in the mind what the final print will look like before making the exposure), exposure, development and printing under the complete control of the photographer, so that the resulting print will be as it was previsualized. The system is based on a prescribed method of use of the reflected light meter. Use of the print zone scale, below, attached to the 1°/21° meter, makes visible the relationship of print values to the "gray scale" of the meter. Note that Zone 5 is placed above the silver index triangle on the calculator so that the lower zones extend to the right and the higher zones to the left. This system is extremely precise, though complicated, and is explained in the writings of Ansel Adams and Minor White (see References).

The 1°/21° meter is ideally suited for use with the Zone System because the narrow acceptance angle facilitates the determination of luminance of very small areas from the camera position. Location of the gray scale on the meter calculator is simple and quite visible from the position in which the meter is normally read. Division of the scales in whole f stops is advantageous in interpreting the readings obtained with the meter in terms of a gray scale.

Example: Child on tub. (See Plate 10), 8 zones present. Darkest important area zone 3. Normal plus 2 development.

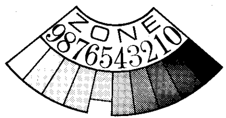


Plate 10 ■ *Problem: to avoid the flatness normal to flat lighting.* ■ *Solution: using the 1°/21° meter, determine the number of zones present in the area to be photographed (e.g., 8). The reading from the darkest part of the scene in which detail is desired is placed opposite Zone 3. Expansion of the range is desired to achieve a full complement of 10 zones in the print. Negative development must be "normal plus 2" to add 2 zones to the range. (Sec. 3b4)*

c. Polaroid—When using the 1°/21° meter with cameras using Polaroid film, contrary to the procedure used in determing the exposure for regular black and white film you should take the reading from the brightest area of the subject in which detail is desired. Contrast control is slight; however, developing the film longer than the prescribed time will tend to increase contrast in the print.

Because the development time is temperature-dependent, when the temperature varies greatly from the normal 70°F., adjustments should be made in development time.

This method of using the 1°/21° meter applies to the Polaroid Positive/Negative Type 55 P/N film as well as to the simple Positive types; however, with 55 P/N, an ASA rating should be determined by the photographer (approx. ASA 50) to produce a print which is lighter than "normal." This will insure a negative of good density and contrast.

section 4

general use with color film

a. Exposure latitude and subject brightness range—The exposure latitude of color film is more limited than that of typical black and white films. Reversal or color positive film has the least potential latitude; however, color negative film can be overexposed 2 stops under similar conditions and still yield good prints. Effects of subject brightness range variations are similar to those of black and white film; however, the hue of the subject should also be considered when using color film. In terms of good reproduction, yellows can be underexposed. Because of the effects of both subject brightness range and hue on the latitude of color films, it is very important to use a meter which has good spectral response, i.e., an even response to all colors in the spectrum. This was a consideration in the design of the 1°/21° and is an important feature of the meter.

In color photography of multicolored subjects, read single color areas of the subject. The narrow acceptance angle of the 1°/21° is particularly useful in determining the subject brightness range, because it permits an accurate reading for a small area which is unaffected by its surroundings. Determine the brightness range by taking readings from the brightest colored portion of the subject, such as yellow, and use this as the high reading, and a dark color, such as blue, for the low value.

Control of the range can be accomplished by changing lights indoors, or moving reflectors outdoors. This control is more necessary in color work than in black and white because a limited ratio of 3:1 or even 2:1 is frequently required for many applications of color photography to stay within the latitude of the film.

In terms of the readings on the L.L. scale, each number of the L.L. scale represents a full f/stop difference in exposure at the same shutter speed. Put another way, each number represents twice the light of the number before, or ½ the light of the number after; e.g., a reading of 12 is half the light of 13 and twice the light of 11 and a subject which has a brightness range of from 11 to 13 would have a ratio of 4:1 (11 to 12 is a 2:1 ratio, 11 to 13 is a 4:1 ratio, 11 to 14 is an 8:1 ratio.). A brightness range of 1½ f/stops, or 3:1 ratio, is preferred, particularly for color which is to be printed or in some way reproduced to be viewed by reflected light. For transparencies, which will only be seen by transmitted light, a higher ratio can be satisfactory. There may, of course, be times when a very high ratio can be turned to a creative purpose, but this should only be done with anticipation of the effect.

Before the advent of the 1°/21° meter, with its narrow acceptance angle, it was customary to measure artificial and studio lighting with an incident light meter, i.e., to measure the light falling on the subject, rather than the light reflected by the subject. Earlier reflected light meters had such a wide acceptance angle that they were likely to take in spotlights and floodlights directly and give a false reading, unless these lights were turned off and back on, etc. The system was not satisfactory, nor did the incident meter take the color, brightness, or texture, etc. of the subject into account. With the 1°/21° meter it is now possible to make accurate readings in this situation.

b. Methods of Determining Exposure

1. Reversal Color Film—This film may be considered correctly exposed when it is extremely transparent in the lightest areas of importance in the subject, yet still retains the necessary detail or color in those areas. Highlights, such as specular reflection of the sun on water or bright metal, are not usually considered important areas, and are to be avoided in the reading. The difficulty of making a reading depends chiefly on the subject brightness range. As discussed previously, when the subject brightness range is low, latitude is great and the arithmetic average of readings is a good approach. The values to be averaged should be read from yellow for the bright color and from blue for the dark area. When the subject bright-

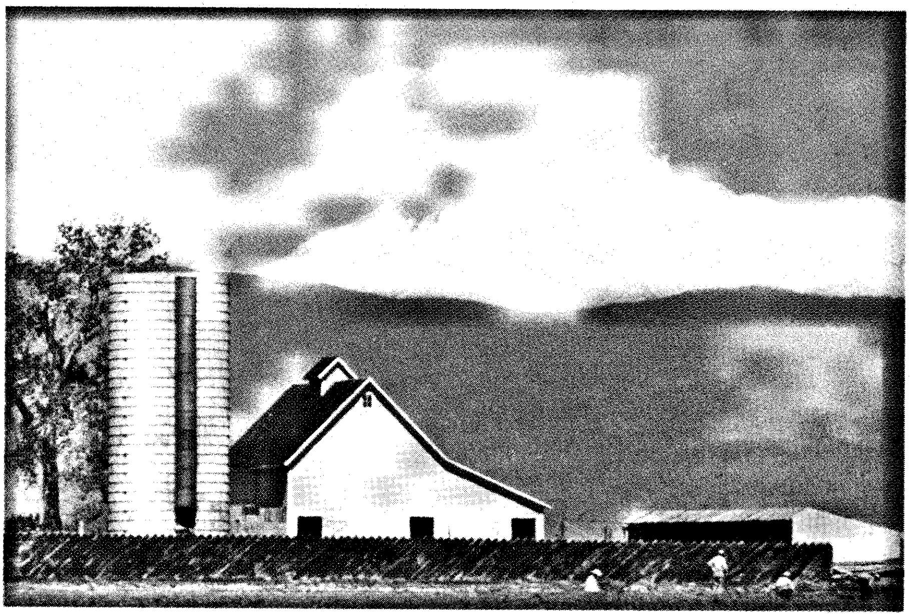


Plate 11 ■ *Problem: to read the light from a distant subject to be photographed with a long lens (300mm lens on 35mm camera) without interference from intervening areas.* ■ *Solution: selective reading of the subject with the 1°/21. The narrow acceptance angle of this meter eliminates the effect on light readings of adjacent reflectance—light or dark. (Sec. 6a)*

ness range is great and the scene is of a general nature, a weighted average may be made, favoring the brighter reading. If the subject has one area of prime importance, then a selective reading of that area should be made. When this is done, you should realize that detail in areas at the opposite extreme of brightness may be lost.

2. Negative Color Film—The method for determining the brightness range of the subject, using the 1°/21° meter, is the same as for reversal film; however, interpretation of the readings differs. Because the exposure latitude is greater and it is underexposure which is more detrimental, the selective reading should be directed toward the shadow areas and the weighted average method should favor the dark end of the brightness range.

3. Polacolor—Now, for the first time, the photographer can produce a color print in seconds and compare the color of the print with the color of the subject photographed. This will allow slight corrections to be made and another photograph can be produced to correct for errors. Film speed is 75 ASA equivalent at temperatures above 60° F. and development time approximately 50 seconds. At lower temperatures the film speed is somewhat lower and at higher temperatures, the film speed is higher. Because of these temperature-dependent ASA values, rather careful temperature measurement of the film-camera combination is suggested for critical work. Development time is also variable with temperature, i.e., development time should be increased at low temperatures. Care should be taken in determining the development time to prevent shifts in color balance. Time of development refers to the time between pulling the tab on the camera (which breaks the pod containing the processing reagent and starts the reaction between the positive and negative sheets) and the actual separation of the finished print from the camera. Overdevelopment results in a slight shift of color balance toward the blue and cool tones. Underdevelopment results in a pink or warm tone. Variations in exposure result in variations in color saturation and overall density. If the prints are consistently too dark, use a lower ASA film speed setting on the 1°/21°. If the prints are consistently too light, use a higher ASA film speed. For example, in hot weather, when the film-camera combination may be above 80° F., an adjusted ASA value of 100 might be necessary, and the development time shortened to 40 seconds.

Polacolor film is balanced for light at a color temperature of 6250° K. (bright daylight). Use of this film under other lighting conditions requires color balancing filters and a corresponding change in ASA film speed.

section 5

light measurement of specific subjects

a. Landscapes—For general scenes with even distribution of bright and dark areas and with no sky visible in the scene, use the arithmetic average of the brightest important area and the darkest important area, Plate 4.

When the sky is included, a weighted average of high readings and low readings is used with the proportion of bright sky in the scene determining the weight given to the high reading. For example, with a high of 15 and a low of 12 in a scene which is ⅓ sky, Plate 12, use ⅓ of the range, or 13 for the reading.

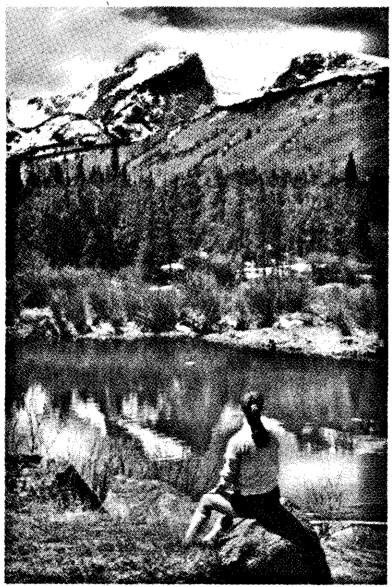
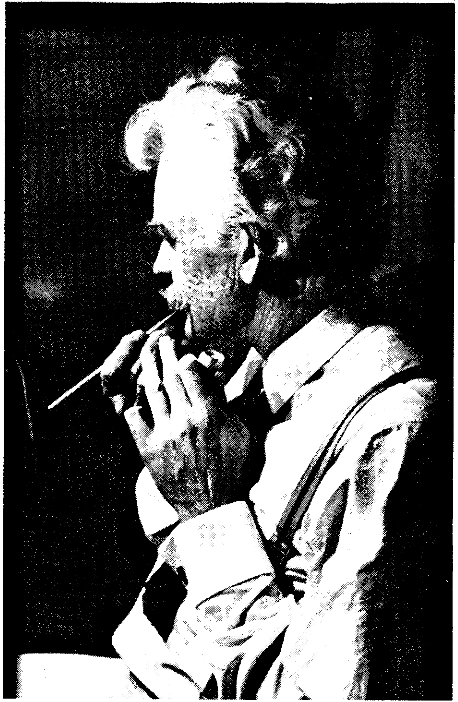


Plate 12

b. Low Light/Available Light—Direct, accurate exposures of low light level can be easily determined with the 1°/21° meter, Plates 13 and 14. Photography indoors or after dark can be very rewarding, Plate 3. Possibilities include: the city at night, a farm by moonlight, neon signs reflected on wet pavement, store windows, semi-silhouettes of bridges or buildings at dusk, industry at night, etc. To capture the effect of a low light scene, it is best to read the light from the brightest highlight areas, such as street lights and automobile headlights.

For color photography under low light conditions, choice of the film depends upon the individual taste of the photographer and the quality of light predominating. If shooting indoors under tungsten light, Type A or B film will give the most satisfactory results. For most low light out of doors, where the light is of mixed quality, daylight film is generally most acceptable. An exception would be when a particularly cool mood is desired. Then a tungsten balanced film should be used.

For critical work, knowledge of the color temperature of the light is necessary and the correct film and light-balancing filters can then be selected.



Plates 13 and 14 ■ *Problem: to obtain a low light level reading of the subject in the presence of the light source.* ■ *Solution: selective reading of the face with the 1°/21° meter, disregarding the light source in determining the exposure. (Sec. 5b)*

Since low light photography generally involves long exposures, reciprocity failure corrections must be made as discussed in Section 1, d.

c. High Contrast Scenes—The selective reading method is ideal for this problem. Because of the narrow acceptance angle of the 1°/21° meter, accurate readings can be made of the small important areas of the subject without fear of false readings produced by peripheral light, or nearby bright areas, Plate 5.

For example, in Plate 15, brightly lighted leaves are photographed against a dark natural background.

The reading can be made easily by centering one of the leaves in the 1° circle on the meter's viewing screen. The reading will be for the leaf only, and will not be influenced by the background.

For the other extreme, Plate 1, read the dark area of the child's face. The bright light coming through the window would not detrimentally affect the reading and detail in the shadow area would be accurately rendered.

Plate 6 is typical of a high contrast scene including a dark area of importance, the welder, with a brilliant light source in the scene.

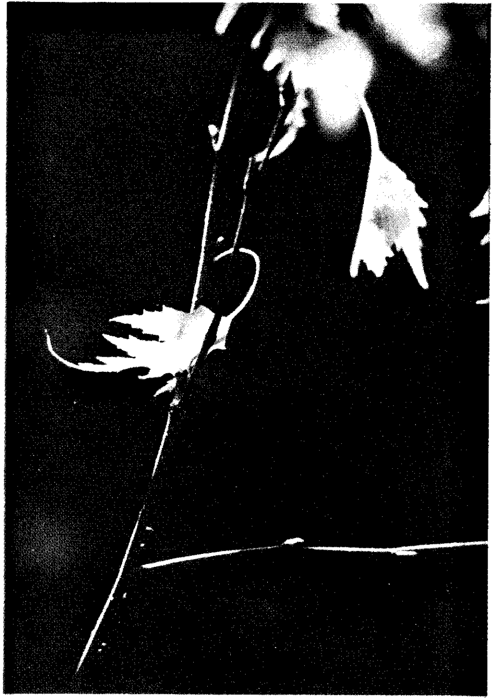


Plate 15 ■ *Problem: to measure for telephoto the light reflected from a distant, brightly lighted subject, with a dark background.* ■ *Solution: selective reading with the 1°/21° of the subject, eliminating the influence of the dark surroundings. A substitute reading from the camera position is not accurate in this type of situation. (Sec. 5c)*

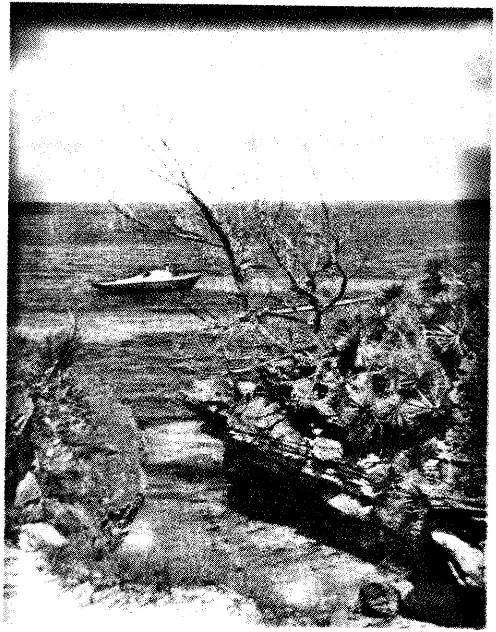
d. Copying—Photographic reproduction of continuous tone or line material has become an important field of photography. Dozens of films are available which are designed especially for copy work, and the manufacturer's data sheets include specific information for proper exposure. The 1°/21° is particularly well suited for establishing proper illumination for copy work. An Eastman Kodak 18% gray card is useful as a standard when applying tungsten ASA film speeds; however, a matte white card, such as the back of a double weight print, can be substituted, in which case exposure is increased by five times the calculated exposure time. An allowance must be made for the increase in effective f/number if the lens is extended abnormally. When copying with color film, a high contrast film is recommended for line material. For critical color copying, care should be taken to use the proper light source and filter combination for which each film is designed. For very critical work, where it is necessary to match strictly the spectral characteristics of the 1°/21° meter with those of an orthochromatic film, the red sensitivity of the meter can be reduced by using a cyan filter.

If the copying index numbers listed for some films are less than the ASA 6 value of the 1°/21° meter, multiply the number by 100, and give 100 times the calculated exposure time.

e. Seascapes and photography on the water—The chief problem encountered in these situations is one of extreme range of brightness. Exposure of the water scene is complicated by the nature of water to relfect and/or absorb light. In coastal regions the large expanse of sky and brilliant white sand beaches on sunny days can improperly affect readings from the small area you may wish to photograph, Plate 16. With the 1°/21° meter you can easily get selective exposure data, with the assurance that the area you wish to emphasize will be recorded without the interference of peripheral light which would give false readings to meters with a wide acceptance angle. This type of selective reading is especially valuable for emphasizing a light sail against dark sky or water, a buoy against the sea, or the skin tones of a face against the beach. This selectivity is particularly helpful when photographing during a race, when a long lens must be used for reasons of safety, or in pinpointing a fast-moving water skier.

If the bright sun is included in a picture, avoid getting it in the 1° field, unless you wish the special effect of moonlight or silhouette. Select the part of the subject you wish to accentuate and read it directly. Avoid specular highlights of sun reflected on the water. These brilliant highlights will affect your reading falsely.

When the sun is obscured by clouds or is photographed at sunrise or sunset, it can be read directly as the highlight and averaged with a reading from a dark area to achieve an integrated value.



In this type of photography, you may wish to use filters. (See Section 6c on filters to determine and apply filter factors.) In good weather, with black and white film, better separation between the sky, sea and sails can be achieved with a yellow filter. This will also improve the contrast of shadow areas. An orange filter which darkens blue, adds further contrast and separation in distant views. A polarizing filter will darken the sky and emphasize cloud formations if you are using color film. On an overcast day, you can penetrate fog or haze with the yellow filter and black and white film, or an ultraviolet-absorbing or haze-cutting filter (UV or skylight) for color reversal films. However don't hesitate to shoot the scene without filters to capture the mood, Plate 17. Using the 1°/21° meter, you won't overex-

Plate 16 ■ *Problem: to avoid underexposure of subject area in the presence of bright sky and foreground.* ■ *Solution: weighted average of foreground and sky readings, balanced in proportion to readings from important middle distance and subject (sail boat). (Sec. 5e)*

Plate 17 ■ *Problem: to achieve a correct exposure of bright and dark areas which are important to the mood.* ■ *Solution: 1°/21° readings of bright and dark areas, using the arithmetic average of brightness. (Sec. 5e)*

pose as most photographers do under these conditions.

f. Back Lighting—Two different effects can be achieved under conditions of back lighting. Take a reading from the shadow area of a back-lighted subject and the fringe areas will be light, while the subject retains detail. For example, in the photograph of a child, Plate 18, the reading was made from the face, and the rim lighting of the hair and jacket allowed to go quite light.

For another extreme, with a back-lighted subject, read from the sky or light area, and let the subject go dark with a silhouette effect, as shown in Plate 19. Decreasing the exposure by one or two stops will increase the effect.

Plate 18 ■ *Problem: to make a portrait of a back lighted subject whose face is in shadow.* ■ *Solution: selective 1°/21° reading from the face, avoid peripheral light and emphasizing the halo effect. (Sec. 5f)*

Plate 19 ■ *Problem: to enhance the silhouette effect of a back lighted structure against a cloudless pale blue sky.* ■ *Solution: 1°/21° reading from the sky with underexposure by one stop (e.g., read f/8, expose at f/11) to increase contrast and improve the silhouette effect. (Sec. 5f). High-contrast film was used.*

A second effect occurs when reading is made from a bright area and the surroundings are allowed to go dark, Plate 20.

Occasionally it is desirable to reproduce detail in both the subject and the background, Plate 2. The weighted average method will give the best results, but the extreme brightness range of back-lighted subjects is often beyond the latitude of the film for fine detail in all areas, Plate 5.

Plate 20 ■ *Problem: to emphasize small, brightly back lighted areas in dark surroundings.* ■ *Solution: selective reading with the 1°/21° to expose for accurate rendition of bright areas, letting the surroundings go dark. Because of the extreme brightness range, an overall reading (typical of most other meters) would give too much consideration to the dark areas and overexpose the highlights which are so important. (Sec. 5f)*

g. Medical—In medical photography the conditions and methods of exposure must always be suited to the requirements of the case. The 1°/21° meter has the unique ability to make quick exposure determinations with a minimum disturbance to the patient. For the medical technician, it allows a minimum of interference with the work of doctors or surgeons. Using the 1°/21° meter and a camera with telephoto lenses permits close-up photography to be done accurately and rapidly. This is particularly suited to photography of body cavities or operations.

In all areas of medical photography heavy shadows should be avoided. Subject brightness range should be controlled, using the 1°/21° for evaluating results of added illumination or reflectors.

When using negative color film in medical photography, including an 18% gray card in the picture area, or photographing it separately, using identical lighting conditions, will contribute to true color rendition in printing, which is vital in this field.

The broad spectral response of the 1°/21° meter makes possible accurate exposure of color film to reflected ultra violet light, used by the optometrist to photograph fluorescent dyes in experiments or problems with contact lenses.

Some of the specific areas of medical photography where the 1°/21° meter is particularly useful in determining exposure include:

Photography of gross specimens, particularly when using a light-box background to define the forms.

Photography as an aid in somatology or psychology, when informality of approach is important.

Color photography in dermatology, where good exposure with resulting natural color is vitally important in order to render correctly pathogenic symptoms and adjacent healthy tissue.

h. Luminous subjects—In this category are many subjects which prove rewarding to the photographer, but which are very difficult to expose correctly with conventional light meters and practically impossible with incident light meters.

Self luminous subjects. Sunsets are typical examples. If the sun is visible above the horizon and the light is so brilliant that the needle goes off scale, the 1° circle should be moved from the sun slowly until a constant reading is obtained from the bright areas of sky or clouds just out of the sun's direct light. See

Plate 30. If the sun has dropped below the horizon, reading the brightest areas of the sky will give dramatic results. Flame and welding scenes can be treated in the same manner. When photographing a welder, as in Plate 6, placing a piece of metal or other opaque object between the arc or brightest part of the flame and the camera will prevent extreme lens flare, if this is the effect desired.

Neon and other self luminous signs can be read directly with the 1°/21° meter as shown in Plate 21.

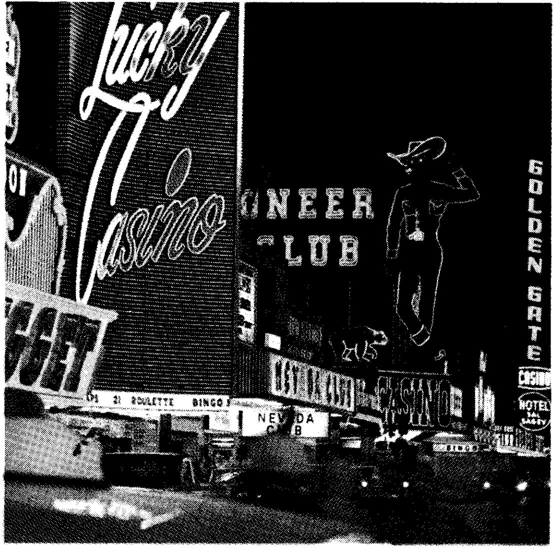


Plate 21 ■ *Problem: to record neon signs at night.* ■ *Solution: selective reading from the signs. Use daylight color film for best rendition. (2¼x2¼ with 250mm lens to compress signs.) (Sec. 5h)*

Frosted windows can be read directly with the 1°/21°, using a selective reading, assuming the window is of uniform brightness.

Bright clouds. The selective exposure method is best for bright clouds. The brightness range will probably exceed the latitude of the film, but if the brilliant color of the clouds is to be captured, no attempt should be made to record detail in the shadow areas.

Transilluminated subjects.

Stained glass windows. Depending upon size and accessibility, stained glass windows can usually be read with ease using the 1°/21° meter. If the window is large and fills the picture, individual sections can be read, using yellow or clear areas as the brightest area and dark blue for the darkest area. Then use the weighted average method to determine the correct setting. If the window is small and surrounded with dark areas as in a church, the narrow acceptance angle eliminates the usual misleading influence of the dark areas.

Television screen. Before determining the proper exposure, the television should be tuned as carefully as possible with the contrast control set as high as possible while maintaining a fairly full range of grays. With the room lights dimmed and the camera mounted on a tripod, focus carefully on the screen. The shutter setting should be 1/25 second to photograph a single image. The exposure can best be made using the arithmetic average method, to find an average brightness.

i. Animals—When photographing domestic or caged animals, determining exposure with the 1°/21° meter is no great problem, and if the animal is the most important part of the scene, selective measurement will yield the proper exposure.

For photography of animals in their natural habitat, the narrow acceptance angle of the 1°/21° is advantageous because readings can be obtained without startling the animal. Lenses of long focal length and the 1°/21° meter make an excellent combination for the naturalist photographer.

Plate 22 ■ *Problem: to expose for good skin tone in an indoor portrait with top and front lighting. Solution: selective reading with the 1°/21° meter of the subject's face is unaffected by highly reflective white table cloth and dark background. The overall reading typical of most other meters would be unduly influenced by the dark background. Taking the reading from the camera position also facilitates getting a natural pose.*

j. Portraits—Outdoors. For best results, use a high-contrast color film and shoot on a slightly overcast day. When taking a portrait, the principal problem is control of the subject brightness range. Using the weighted average method, readings of the bright areas, such as nose or forehead, and darkest important areas, such as hair or nose shadow, can be quickly determined with the 1°/21° meter. With color film, a 2-to-1 or 3-to-1 ratio is usually desired. If this ratio is exceeded, corrections can be made easily and accurately with the help of the 1°/21° meter. With color reversal film, best results will be obtained on an overcast day. If the sun is bright, however, locate the subject just within an available shadow area, Plate 22, such as cast by a house or building. Another possibility is to use a reflector to bounce light into the shadow areas of the face, thus decreasing the subject brightness range. A satisfactory reflector could be a sheet of crinkled aluminum foil, a newspaper, or a white sweater. See also Section 5f., Flash Fill.

Indoors—When taking a portrait indoors with controlled lighting, the 1°/21° offers an unexcelled method for controlling the lighting contrast by guiding the placement of the key and fill lights, Plate 23. Kicker lights and background lights can be left on and their position controlled without affecting the 1°/21° reading adversely. High key effects can be accurately produced by matching the light reflected from the subject against the light reflected from the background. When photographs are made of a group, e.g., a family portrait, exposure can be easily determined from each person's face and the lighting balanced, if necessary, to insure the desired uniformity.

Plate 23 ■ *Problem: to determine the proper exposure for an "available light" portrait with mixed light—daylight and artificial room light.* ■ *Solution: 1°/21° readings from the subject are made to determine the lighting ratio which is manipulated to the desired proportion by moving the draperies in front of the windows. The precision of this instrument allows the photographer to achieve the exact degree of contrast desired. (Sec. 5j)* eg. w/Met II FP std > w/KII @ guide #63 @ 8'–f8. * stop down to f11. Since 1/50" f11 is an ave. exp. in bright sunlight the fill-in w/be about 1/2 light of direct sunlighted area. About 1/2 stop overexp. could result here. If highlights only needed 1/50 f11 the exp. could be ok. so measure highlights carefully.

k. Flash Fill—The 1°/21° can be used as an aid to controlling subject brightness range with flash fill. an accurate exposure determination is necessary so that you may properly establish the correct balance of light, avoiding an artificial look. For the most natural effect, let the sun do most of the lighting and add just the right amount of electronic flash light to fill in the shadows cast by the sun. Using normal methods, determine the flash exposure f/stop for your lamp-to-subject distance. * Then stop down 1 additional f/stop if using color film, or 2 f/stops with black and white film. This keeps the flash fill secondary to the sunlight. With the 1°/21° meter take a reading from the brightest area in which you wish to include detail. Then determine the proper shutter speed for the f/stop already determined. If your camera has a focal plane shutter, the approach must be modified should the shutter speed required exceed the recommended maximum speed at which your camera will operate with electronic flash. Determine the shutter speed and f/stop first, with the 1°/21° meter, then adjust the lamp-to-subject distance for the flash. When working in close to the subject with electronic flash, a neutral density filter (such as is contained in Honeywell's Strobonar Series 65 Lens Kit and Lens Kit for Strobonar 400) on the unit can be used to advantage. When using flash bulbs outdoors for flash fill with daylight color film, use blue bulbs or a blue filter over the flash reflector.

** 1/50" w/C 1/60" w/P

Don't use EH or EHB for fill-in w/Met II FP bulb needed for high shutter speeds w/EH or other fast film.

I. Still life photography and commercial product photography— The problem of getting a conventional type exposure meter between the light source and the subject, and erroneously reading the shadow cast on the subject by the meter, especially in small subject arrangements, is eliminated with use of the 1°/21° meter. With the 1°/21° meter, critical highlight areas or the dark shadow areas can be measured, whether the background is dark, as a still life being made in the old masters' style, or high-key. This ability to make selective readings from a distance can be particularly valuable when a light tent is used, since the meter readings can be made through the same hole in the tent from which the picture will be taken. Control of tone is particularly important in black and white still-life photography and this is greatly dependent upon lighting. Changes can be made by adjusting the intensity and balance of the lighting. In this case, balance is the degree of contrast between the brightest and darkest parts of the subject. The problem is less critical here, however, with color film. The light-to-dark balance is generally considered to be much less than with black and white films, i.e. in the neighborhood of a 3 to 1 ratio or less, particularly for accurate color reproduction. This can now be more easily determined and corrections made by changing positions, number or intensity of the lights or reflectors. Measuring the relfected light from small objects in front of very light or very dark backgrounds which would incorrectly influence an integrated light measurement from meters of wide acceptance angle, is no longer difficult. The 1°/21° meter permits selective measurement of specific areas of the photographic scene. This is done at a distance with no meter shadow cast which would incorrectly influence readings and adjustment of lighting to conform to materials and process limitations.

Plate 24 shows an advertising photograph which required critical close-up readings to aid light adjustment for high contrast effect.

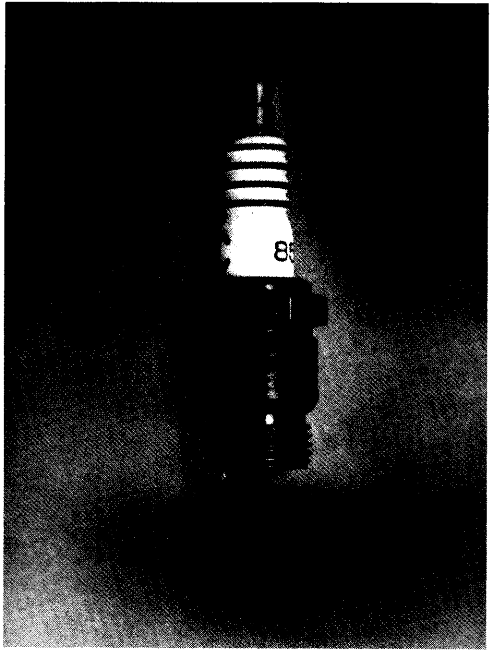


Plate 24 ■ *Problem: to obtain high contrast lighting of small objects on light background.* ■ *Solution: 1°/21° reading of very small subjects or highlights and shadows of small objects permits critical adjustment of lights for desired effect. (Sec. 5l)*

m. Photojournalism—One of the chief applications of the 1°/21° meter in determining exposures for the photojournalist is the selective nature of the reading. With care to avoid detection, accurate readings can be made of such subjects as a face in a crowd, a person across the room or in a courtroom. Even if the factor of detection is not a problem, the photographer who wishes to remain unobtrusive and still get accurate readings under unusual lighting conditions can use the 1°/21° to great advantage. The 1°/21° meter takes the guess work out of available light photography.

Predetermination of exposure in anticipation of capturing a subject at the "decisive moment" is suggested. The 1°/21° is designed to be operated quickly in one hand; however, in many situations the predetermination approach will pay off when the action is fast.

Photographic quality has been considered by many as secondary to photographic content in photojournalism. However, with improvements in printing techniques, in newspapers as well as magazines, the importance of good print quality cannot be disregarded.

Other specific applications of the 1°/21° which concern the photojournalist are discussed in the sections on theatre stage photography, sports and moving subjects, etc.

n. Architecture—Architectural photography involves all of the problems exposure determination has to offer.

Exteriors. The photographer can dramatize a building or record the architectural detail purely in a descriptive manner, depending upon his use of exposure. Generally, detail must be preserved, if possible, in both the highlight and shadow areas. For exterior coverage of an entire building, select a camera position which will record the form of the building to the best advantage and make use of cross lighting to dramatize and bring out surface texture. A weighted average method was used to determine exposure in the photograph in Plate 25. The exposure favored the bright areas to

Plate 25 ■ *Problem: to record faithfully the facade of a building in a dramatic manner.* ■ *Solution: after the proper time of day is selected to create contrast between the sides of the building, readings are made of the bright and dark sides of the facade and a weighted average determined favoring the light area because of its predominance. (Sec. 5n)*

show the texture of the facade. If the landscaping is an important feature, more space should be included in the photograph than usual and a filter might be used to increase the contrast of the scene, as shown in Plate 34. In this instance an orange filter was used with Polaroid 55 P/N film and the exposure was determined by placing the filter over the lens of the 1°/21° meter when reading the light.

Architectural detail or decoration, such as tops of columns, sculpture, frescoes, etc., have always posed a problem because of inaccessibility. Small areas could be recorded using telephoto lenses, but exposure was generally arrived at by guess work or substitution. Sighting the area of interest within the meter's 1° circle will assure proper exposure.

Interiors. High subject brightness range frequently complicates interior photography. Using the 1°/21° meter selectivity will permit proper exposure of shadow areas without the false influence of peripheral light from windows, doorways, or bright lights. The meter can also be used to place reflectors or auxiliary lighting, in order to achieve the proper lighting ratios, Plate 26. Visual judgment in this area is very poor and the 1°/21° is unexcelled in seeing with the vision of the film and/or camera.

With color film, particularly, care should be taken in matching film color balance and the color temperature of the light source. Reciprocity failure must also be considered where applicable. See Section 1d.

Plate 26 ■ *Problem: to render interior in which quality of desk and chair is paramount.* ■ *Solution: 1°/21° reading of chair and foreground showed too great a lighting ratio for good detail in the furniture. Flood light was added to the foreground as indicated by 1°/21° readings. Balance of lighting is easily controlled using the 1°/21°. (Sec. 5n)*

o. Snow—The best kind of day for taking snow pictures is a bright, clear, sunny day. Care must be taken when photographing the snow scene because the subject brightness range is generally beyond the latitude of most films. Readings of a single area of brightness will give a good exposure of that area only and the darker portions of the scene will probably be too dark. If the area of principal importance is in the shade, it can be correctly exposed, but at the sacrifice of detail in the bright snow. Therefore, using the arithmetic average is generally the best compromise. Avoid taking snow scenes when your shadow falls in front of you because this indicates flat lighting. Backlighting or strong side lighting will enhance the snow texture and give the most dramatic effect possible, Plate 27.

Care must be exercised in extremely cold situations because most shutter mechanisms will slow down unless serviced for very cold weather use.

Use of filters is recommended both to increase dramatic effect and to protect the lens. With color film: to reduce bluishness of shadow, use skylight filter; UV filter will improve distant scenics and not affect shadows. With black and white film: yellow, light green, orange and red filters will darken sky and shadows in progressive degrees. See Section 6c. for correction of exposure with the 1°/21° meter.

Plate 27 ■ *Problem: to record snow texture and shadow detail in back lighted scene.* ■ *Solution: 1°/21° readings from bright areas and shadow areas are used to determine a weighted average based on the proportion of these areas (3 to 1 in this scene). (Sec. 5o)*

p. Sports and Moving Subjects—The method of determining exposure of these subjects depends chiefly on the time required to measure the light, determine the setting, set the camera and take the picture. For most sports, such as baseball or tennis, the action takes place intermittently within a rather limited area which is lighted fairly uniformly. In these situations, the selective exposure method can be used to measure light reflected from the players before the action occurs and the readings will be accurate as long as the light remains unchanged, Plate 28. In cases where the subject is moving through the picture area, such as when photographing a horse race, you must generally rely on substituting the subject with another of similar reflectance, color, etc. Preliminary exposure calcula-

Plate 28 ■ *Problem: to predetermine exposure for a moving figure.* ■ *Solution: use the 1°/21° meter to take a reading from the figure in the area where the figure will appear and set the camera before the action takes place.* (Sec. 5p) tion is nearly always necessary when fast action is to be photographed.

With the advent of very fast black and white and color films, depth of field is no longer sacrificed, because a small aperture can be used as well as the fast shutter speed usually required. Requirements for correct choice of shutter speed to stop action can be obtained from published texts. Factors involved include: distance from camera, direction of movement in relation to the camera, speed of subject, focal length of lens, etc. Stopping the action is not always desired. Two variations of controlled blur to enhance the feeling of motion may be had by 1) using a slower shutter speed than required to stop the action, which results in subject blur, or 2) panning the camera along with the subject, which will stop the subject, but blur the background. Both techniques demand accurate exposure determination as achieved with the 1°/21° meter.

q. Theatre stage photography from the audience—This is another area in which use of the 1°/21° meter is unexcelled. Because of the dark surroundings and uneven illumination of most stage settings with spot lights on the principals, Plate 3, light measurement with a conventional meter from the audience is impossible. With the narrow acceptance angle and high sensitivity of the 1°/21°

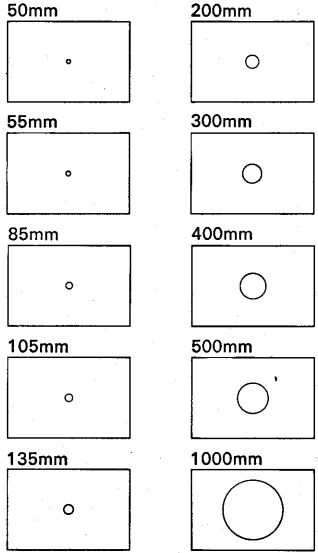
meter it is possible to take an accurate "pinpoint" reading of an actor on the stage, Plate 29. Depending upon your location in the theatre, a 55mm lens or wide angle lens on your 35mm camera will record the entire stage set. A telephoto, 135mm for instance, will fill the frame with one person or allow close-ups. Generally, the fastest film available should be used when shooting in color or black and white. The use of artificial light type color film is best unless you plan to photograph only the actor or performer spotlighted with carbon arc light, which requires daylight film. Out of consideration for the actors as well as the audience, you should wait to click the shutter during moments of laughter or applause.

Plate 29 ■ *Problem: to determine low light level reading from the audience for a long lens shot of an actor on stage against a dark background.* ■ *Solution: an unobtrusive selective reading with the 1°/21° meter may be taken of the actor only, unaffected by the large dark expanse surrounding him. (Sec. 5q)*

section 6

light measurement with accessories

a. Use with interchangeable lenses—The 1°/21° light meter is an ideal companion to interchangeable lenses. In fact, with lenses of longer than normal focal length, the 1°/21° meter becomes a necessity for rapid, accurate determination of exposure information, Plate 11. By referring to the chart, page 81, **angle of view of typical lenses and formats,** and the examples at the right illustrating the relationship of the 1° measuring area with the various film formats, you can mentally evaluate how much scanning will be required to establish the luminance of the picture areas recorded by the lenses you regularly use. When time is taken to learn to apply and interpret the 1°/21°



Comparison of fields of view of typical 35mm interchangeable lenses with the 1° circular field of the 1°/21° meter.

methods of determining exposure, the problem of when to use a selective reading or make a weighted average of the brightest and darkest important areas, or to use an arithmetic average, ceases to be a problem and the choice becomes automatic and instantaneous. Note that, as the focal length of the lens increases, the area of reflected light measured becomes more and more representative of the total picture area, until, with very long lenses, the angles of view become equal and the reading is completely integrated, Plate 31. Use of the 1°/21° meter permits almost all readings to be made from the camera position. There is no more need to make inaccurate substitute readings, or to walk up to the important part of a scene to read the bright and dark areas, Plate 30. Determine the boundaries of the picture area the lens covers, and read the reflected light within those limits.

angle of view of typical lenses and formats

FOCAL LENGTH	mm	28	35	38	50	55	60	65	75	76	80	85	102	105	127	135	150	152	178	180	200	203	250	254	300	308	360	400	500	600	700	800	1000
	in.							2½		3			4		5			6	7			8		10		12	14½	16	20	24	28	32	40
ANGLE OF VIEW (degrees)	35 mm	75	63		46	43						29		23		18	16				12		10		8			6	5				2.5
	2¼			90	75	71	67	63	56		53			41		33	29			24			18						9				
	4x5							100		93			77		65			56	49			44		35									
	5x7												94		81			71	63			56		47									
	8x10														103			93	85			77		65									

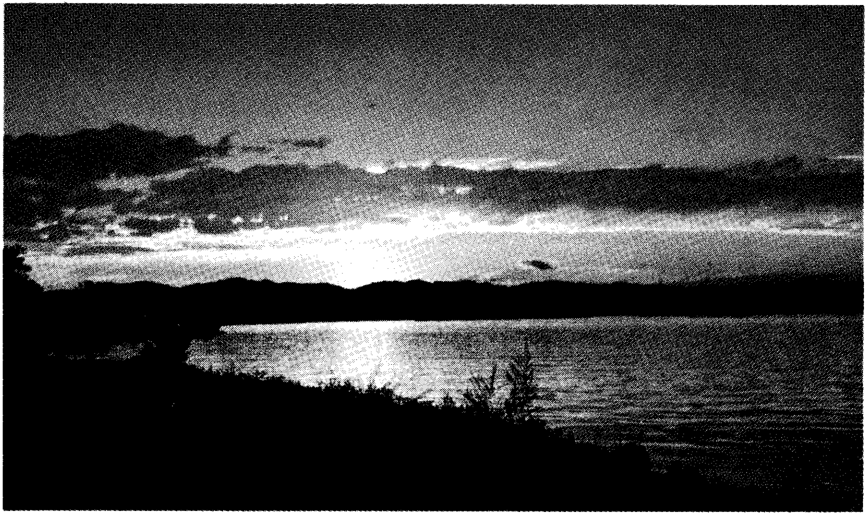
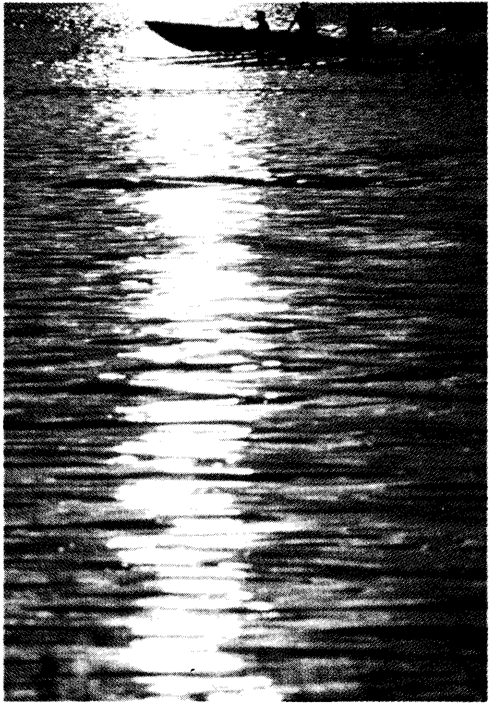


Plate 30 ■ *Problem: to avoid the influence of dark foreground in exposing for sunset.* ■ *Solution: selective reading with the 1°/21° of the bright clouds. (Sec. 5h, 6a)*



b. Use with Kodak Neutral Test Card—

- 18% reflectance value
- Middle value of the gray scale
- Zone 5 in zone system of exposure

The use of the Kodak neutral test card with the 1°/21° meter will give what amounts to an incident light reading. Substitute the gray side of the card for the subject matter and make the light measurement from the card. The 18% gray side of the card matches the average reflectance of indoor subject matter. Since outdoor scenes have a lower average reflectance (12%), ½ stop more exposure should be given.

Plate 31 ■ *Problem: to emphasize sunset reflections with extra long lens (500mm on 35mm Pentax)—same location as Plate 30.* ■ *Solution: 1°/21° selective reading of the bright area, eliminating influence of dark areas. (Sec. 6a)*

The use of a test card has, of course, the same limitations as an incident meter measurement in that it makes no allowance for unusually light or dark colored subject matter.

When photographing a 3-dimensional subject and taking your reading from a gray card, you must take into consideration the flat surface of the card. The card must be held at an angle halfway between the angle of the light to the subject and the angle of the camera to the subject.

With the sun behind the camera and shining fully on the card, hold the card perpendicular to the camera lens and 1°/21° lens for reading. When the light is directly overhead or crosses the subject from either side, angle the card halfway between the camera and the light source. The 1°/21° should be held at an angle perpendicular to the plane of the card. Obviously the card should be held in the same light as the subject.

The gray card is useful in copy work because it gives an average reflectance value immediately, eliminating calculations.

The Eastman Kodak gray card is very useful in color photography as well as in black and white because the gray card is centered at the useful density range of color film, thus producing optimum exposures.

The gray card can be used very effectively with color negative film by holding the card at the very edge of the scene or by making a separate exposure of the entire card. An exposure of the standard gray card under the same lighting as the exposure to be printed is extremely helpful as a color standard for both visual and electronic determination of color balance in making color prints.

c. Use with Filters—There are two methods of employing the 1°/21° meter when using filters. One is to place the filter over the meter lens and make the reading as you would normally, Plate 34. This will give the corrected value without the necessity of making conversions by calculation. This method would be advantageous for special effects photography in color, such as shooting through theatrical gels or when using unusual filters whose filter factor is lost or unknown. For filters smaller in diameter than the 1°/21° lens, i.e., 46mm., a cardboard mask can be made to eliminate peripheral light. When using this technique, filters as small as ¼ inch in diameter may be used. Threaded 46mm diameter filters screw directly

Plate 32 ■ *Problem: to record detail in light close-up subject with very light out-of-focus background.* ■ *Solution: 1°/21° selective close-up reading from the subject, allowing the background to go light by over-exposure. (Sec. 7)*

Plate 33 ■ *Problem: to record detail in light subject with very dark out-of-focus background.* ■ *Solution: selective reading from the subject, letting the background go dark by underexposure. (Sec. 7)*

into the front flange of the 1°/21° meter barrel. The Honeywell Pentax Step-up Ring, 46mm to 49mm (Cat. No. 820), adapts 49mm Pentax filters for direct attachment to the 1°/21°.

The second method of using the meter with filters does not require placing the filter over the meter lens. Instead, the filter factor is used to change the ASA film speed setting on the ASA scale.

Polarizing Filters. When using the polarizing filter, be careful to place the filter on the meter at the same angle of rotation as it will be placed on the camera. Since pola filters are basically neutral density filters, the filter factor will actually be constant; however, the contrast will vary as the angle of viewing and amount of polarized light change.

Filter Factors. To compensate for the increased exposure required when using filters with a known filter factor, divide the ASA film speed by the filter factor. For example, if you are using a film with ASA rating of 160 and the filter factor is 2, then the meter can be set at ASA 80.

Example: $\frac{\text{Film speed } 160}{\text{Filter factor } 2} = 80$

Film speed setting to use on meter.

Plate 34 ■ *Problem: to emphasize white home and show extent and beauty of surroundings.* ■ *Solution: selective reading of the house with the 1°/21° meter with an orange filter placed over the meter lens to obtain a corrected reading directly, eliminating caclulations with the filter factor. Photograph with the filter on the camera lens. (Sec. 5n, 6c)*

d. Use with Bellows or Extension Tubes—When bellows or extension tubes are used on 35mm or 2¼ x 2¼ format cameras (or extended bellows with larger cameras), the light is traveling a longer distance than the lens was designed for, and a correction must be made, since the indicated aperture (f/stop) is no longer effective. Likewise, with larger format cameras with bellows focusing, when the subject-to-lens distance is less than 8 times the focal length of the lens, the exposure must be modified. The scales on the 1°/21° meter can be used to establish this correction, as follows.

Assume you are using a normal 55mm (2 inch) focal length lens on a 35mm camera. The L.L. reading 12 at film speed ASA 100 indicates a 1/60 second shutter speed for an aperture of f/8 (Fig. 1). Substituting the f/stop numbers as focal length numbers, use f/2 to represent a focal length of 2 inches, and place the 2 on the f/stop scale (Scale 3, Ring B) below the 1/60 second shutter speed (Fig. 2). Measure the lens-to-film distance. (Using the lens at 1.5 feet and 3 extension tubes, the distance from the lens to the film would be 5.6 inches.) Now look on the f/stop scale and find the number 5.6. Directly above on the shutter speed scale will be found ⅛ second. This new shutter speed (⅛ second) should be used with the f/stop determined originally (f/8). Align these two values on the shutter speed and f/stop scales and any of the exposure combinations aligned may be used, i.e. ½ @ f/16, ¼ @ f/11, 1/30 @ f/4, 1/60 @ f/2.8 (Fig. 3). For maximum depth of field in this situation, use the f/16 aperture and a shutter speed of ½ second, or an even smaller aperture and a longer shutter speed combination.

If the meter is used frequently for closeup readings (less than 12″) the photographer may wish to sharpen the image by attaching a portra or close-up lens (+1, +2, +3 diopter, Series 7) to the lens barrel of the 1°/21° meter with a screw-in adapter (46mm diameter).

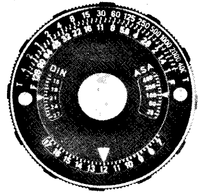


Fig. 1

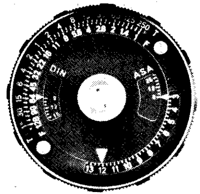


Fig. 2

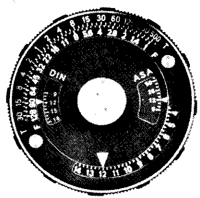


Fig. 3

section 7

creative use of the meter

The correct exposure for a given subject may be used as a standard from which variations may be intelligently made, based on aesthetic considerations. Without an accurate exposure reading for a "straight" photograph, variations can only be guess work, instead of precise, calculated deviations from the norm. Controlled exposure, when used creatively, is an important photographic tool which enables a photograph to communicate more effectively. How light is rendered in a photograph is dependent upon exposure. The role of light in communication is chiefly an emotional one as indicated by descriptive terms, such as gloomy, dim, dusky, shady, or sparkling, radiant, luminous and dazzling.

For example, using color reversal film for high key, illuminate the subject with flat, diffused light and deliberately overexpose ½ stop to create a delicate pastel effect. In some situations where increased color saturation is desired, slight underexposure can be employed.

Using black and white film, creative exposure control is much less limited than the controls normally available to the photographer through varying the contrast grades of the print paper with a "straight" negative.

One of the most effective tools of the creative photographer is the selective focus technique. Because depth of field is a function of lens aperture, rely on the 1°/21° scales to determine what speed is required for a given f/stop after taking a selective reading from the subject to be emphasized within the picture area. Knowledge of depth of field for each f/stop for each lens is important, and fortunately, most lenses incorporate this information on the lens barrel. Note that depth of field is a function of the focal length of the lens as well as the aperture, i.e., with a 300mm lens at f/8, the depth of field is much less than that of a 35mm lens at f/8 on the same 35mm camera. Generally, when choosing to use selective focus creatively, it is advisable to select a film with a low ASA film speed, because if maximum aperture is desired, a slow film will reduce the need for an extremely fast shutter speed (perhaps beyond the capability of the shutter). The effect of controlled depth of field can best be observed on the ground glass of a large reflex camera or view camera. Thus, controlling depth of field can selectively emphasize or play down any part of a picture. For example, the leaves in the photographs, Plates 32 and 33 show the selectivity of the 1°/21° for either a very dark or very light background.

All of the above choices may appear to be purely technical, rather than creative. Actually the choice will be a creative one only if the photographer understands the technical processes involved.

a. Motion Pictures—In order to use the 1°/21° meter with motion picture cameras, the exposure time must be established for the camera being used. When exposure time, ASA film speed, and the intensity of reflected light are determined, the appropriate f/stop can be established to use on the camera lens. The exposure time is a result of the frames-per-second rate at which the camera operates and the angle of the shutter opening. Professional cameramen usually think in terms of 24 frames-per-second and a 175 degree shutter, which give a basic exposure time of 1/50 second. Amateur motion picture photographers usually think in terms of 16-18 frames-per-second with a basic exposure time of 1/30-1/35 second. (This would indicate a shutter angle of about 190 degrees). Almost all cameras have an individual shutter angle which differs from all others; therefore it would be impossible to indicate basic exposure settings on the 1°/21° meter which would be meaningful for professional or even serious amateur use. For the amateur, the corresponding exposure time in seconds for conventional motion picture camera frames-per-second is as follows:

Frames/sec.	**8**	**16**	**32**	**64**	**128**
Exp. times	**1/15**	**1/30**	**1/60**	**1/125**	**1/250**

The normal speed should be listed in the instruction manual for the camera. If it differs from the 16 frames-per-second-1/30 second relationship, use the correct value given and establish equivalent exposure times for the various frames-per-second settings on the camera. The ratio will be proportional and the 1°/21° meter can be used with any camera once this equivalent exposure time is known.

The professional can refer to the tables in the American Cinematographer Manual which list exposure times for various speeds and shutter openings, as well as the shutter angles for professional 16, 35 and 65mm cameras.

Methods for determining exposures for motion picture photography are comparable to those for other types of photography; however, since many shots cannot be retaken, the assurance of exposure accuracy more than justifies the purchase of a Honeywell Pentax 1°/21° Exposure Meter, as well as the time spent learning to read and interpret its indications.

b. Television—One of the major applications of the 1°/21° meter in the television industry is its use for accurate determination of exposure for television motion pictures. This means that motion picture materials produced especially for television use should be adjusted to fit the range and transfer characteristics of the TV system and not the eye. One of the problems is that the subject brightness range should not exceed a ratio of 1:30, i.e., 5 stops. The extreme simplicity of the 1°/21° meter lends itself to these applications. Because of system flare and various other contrast reducing actions, accurate exposure determination can be made, in most cases, by a single measurement of the brightest highlight in the scene. If exposure is set to place this major high-