This Luna-Pro F instruction Manual is more than just an instruction book — it is actually a short course in the creative use of an exposure meter.

Section I offers "Basic Operating Instructions". To use your Luna-Pro F properly you need only read and follow the simple instructions in this section.

Section II, however, moves a step forward — to "Getting the Most Out Of Your Luna-Pro F". Here you can really find out how to put the unique versatility of your Luna-Pro F to work for you.

Section III gives you "Helpful Hints" for special shootings — action, snow and sand, sunsets, night and more — the type of information you need for that extra creativity.

And Section IV provides you with full details on the "Accessories" for your Luna-Pro F — to turn it into a true exposure system.

We sincerely hope that this manual will be of help to you and will answer most of your exposure measurement questions. If it does not, feel free to contact your BMC specialist dealer. In addition, our Consumer Service Department is available for help with special requests.

Congratulations!

The Luna-Pro F is the **only** combination flash and daylight meter with null meter readout — the only system that gives you all the critical information you need for perfect pictures faster and more accurately than any other exposure meter.

The Luna-Pro F is a very flexible, versatile and adaptable photographic light metering system, while at the same time being very simple to use. In order to get maximum benefit from the state of the art design of this precision instrument, please take a few minutes to read this instruction manual.

Your new Luna-Pro F utilizes the latest advances in silicon blue sensors and also high performance electronic circuitry including integrated circuits to provide fast, accurate, repeatable readings under the most difficult professional conditions.

The Luna-Pro F is the result of significant research and development by Gossen GmbH, Erlangen, West Germany, Europe's largest manufacturer of precision electrical instruments since 1919, and one of the outstanding pioneers in exposure meter design since 1932.

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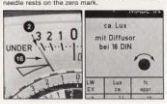
Section I

Basic Operating Instructions

The following instructions are a quick operating guide to the Luna-Pro F. For best results, also read the additional sections describing in detail the different functions and applications of the Luna-Pro F.

I. a. Zeroing the Meter

With the battery removed, check to see that the meter needle (3) rests on the green zero check point (2). If not, turn the zero adjusting screw (23) until the needle rests on the zero mark.



I. b. Inserting & Changing the Battery

Your Luna-Pro F is supplied with a 9-volt battery which fits into the battery compartment at the bottom of the meter. Slide the battery compartment

lid (25) off and attach the battery to the battery clip inside. Note that the battery can only be connected one way. Insert the battery into the battery compartment and slide the lid back on. Check the battery by pushing and releasing the power switch (4) and then pushing in and holding the battery test button (16). The meter needle should be well within, or to the right of, the battery test zone (12).

I. c. Setting the Film Speed

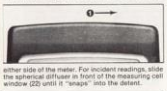
Determine the ASA speed from the data supplied by the film manufacturer. Rotate the clear film speed setting disc (18) by the raised bars until the ASA speed number is opposite the white ASA index triangle (8). A detailed ASA film speed table is on page 40.

I. d. Exposure Factor Scale

Check to make sure that the exposure factor scale index mark (21) is at 1. A more detailed explanation of this useful scale is on page 10.

I. e. Type of Reading

Select the method of measurement desired, either reflected or incident. (For details on incident vs. reflected measurements, see section II. h.). For reflected readings slide the spherical diffuser (1) to



either side of the meter. For incident readings, slide the spherical diffuser in front of the measuring cell window (22) until it "snaps" into the detent.

I. f. Mode of Measurement

Select the mode of measurement desired, either flash or daylight (ambient light). For daylight measurement, the red mode selector (7) should be in the depressed position; for flash measurement, the mode selector should be in the raised position. Depress and release the mode selector to change the mode of measurement, i.e., from flash to ambient. There is a graphic illustration on the side of the meter which shows the positioning of the mode selector necessary to take flash or ambient readings.

Note: The flash mode can be used for taking incident or reflected readings.

I. g. Taking a Measurement

Follow Basic Operating Instructions steps I. a. thru I. f.

For daylight measurement, mode selector (7) should be in the depressed position (see Section I. f.). Aim the meter at the subject for a reflected light reading or at the camera for an incident reading. Depress and release the power switch (4). Rotate the computer dial (11) until the meter needle is over

the "0" null line. Read the desired combination of fstop and shutter speed on the computer scales.

For flash measurement, mode selector (7) should be in the raised position (see Section I. f.). Aim the meter as indicated above. Depress and release the power switch (4). Fire the flash. Rotate the computer dial until the meter nulls. It is important to note that the red zero mark on the exposure correction dial should remain between the two red triangles on the meter face when nulling. If the zero mark is outside either of the red triangles, the flash intensity is beyond the range of the meter. When past the right triangle, the light level is too low. When past the left triangle, the light level is too high.

Read the proper fstop opposite the red flash indicator on the computer dial. This indicator is located between the 1 and 2 second exposure marks.

NOTE: When you release the power switch, the value measured at that moment will be automatically read, and electronically stored by the Luna-Pro F. To conserve battery life, the meter switches itself off automatically after 30 seconds, and your measurement set on the computer dial remains for convenient and repeated reference. For continuous measurements, see Section II. a.

I. h. Reading the Scales

The Luna-Pro F has seven scales to give you information on ASA, aperture, shutter speed, cine speed, exposure value (EV), exposure factor (EF) and Zone System values.

The **time, or shutter speed**, scale is calibrated from 1/4000 of a second to 8 hours and indicates values as follows:

Hours are indicated 8h, 4h, etc.
Minutes are indicated 30m, 15m, etc.
Seconds are indicated 30, 15, etc.
Fractional seconds are indicated, '2, '4, etc.

Note that each section is alternately colored from the adjacent sections for ease of reading. The red ▲ indicates the proper reading point when using the flash measurement mode.

The **ASA scale** is calibrated in standard ASA values from 0.8 to 100,000 (100K). Intermediate values are shown by short lines. A complete table listing these intermediate values in on page 40.

CAUTION: Because of the extreme measuring range of the Luna-Pro F it is possible — under exceptional conditions of very high light levels combined with a very high ASA index — that the computer displays both ends of the exposure time scale (8h and 1/4000 sec.). When this occurs, **the CORRECT reading will be the UPPER part of the scale!**

EXAMPLES:

ASA 25,000 at HIGHEST LIGHT LEVEL:

Scales show above but also (below)	1/4000 sec. at f/128 8 hours at f/5.6 etc.

Obviously, HIGH ASA and HIGH light level add up to SHORT exposure — **1/4000 sec. at f/128.**

The **aperture or fstop scale** is calibrated from f/128 to f/0.7. Numerical values are shown on the scale at full fstop increments. Intermediate values are indicated by short lines at 1/3 stop increments. A table of intermediate values and the mathematical formula for calculating fstops are given in Section III.

The **cine scale** allows direct reading of apertures for various cine speeds (frames per second). These speeds correspond to actual exposure times on the exposure time scale only for cameras having standard shutter angles. For Xl, cameras or those with

adjustable shutter angles, consult the camera's instruction book for the equivalent shutter speeds and read your exposure opposite that speed on the time scale. Also note that some reflex viewing movie cameras use beam splitters to provide a light path to the viewing screen. These beam splitters reduce the light intensity to the film plane, so that a correction factor must be applied to the indicated fstop. Once determined, the correction can be programmed into the exposure correction dial.

An **EV (exposure value) scale** (19) is provided for cameras with shutters calibrated in EV. The Luna-Pro F EV scale is calibrated from -8 to +24. Numerical values are shown for full EV values with intermediate values indicated by short lines at 1/3 EV intervals. Exposure values are used elsewhere on several scales which will be explained later. It is important to remember that a change of 1 EV is equivalent to a change of 1 fstop.

An EF (exposure factor) scale is included for making exposure corrections when using filters, bellows, extension tubes, etc. It is calibrated for exposure factors up to 64. Detailed information on this scale is in Section II. c. The zone system scale provides you with the capacity to read lighting ranges (in zone system values 1 thru 9) directly from the computer dial of the meter. Further information on zone systems can be found in Section II. k.

Section II

Getting the Most Out of Your Luna-Pro F

The preceding condensed instructions gave you information on the basic operating procedures for your Luna-Pro F. However, this meter is extremely versatile, and the following information will acquaint you with the many creative possibilities available to you when using your Luna-Pro F.

II. a. Continuous or Stored Readings

The Luna-Pro F is capable of either continuously reading or storing light values. For simplicity of operation, the read and hold method is used. The continuous method of measurement can be used for the evaluation of different lighting levels (such as when using zone systems) as well as the measurement of cumulative flash.

To operate the meter in the read and hold mode, the power switch ON/OFF button index mark (4) must be aligned with the square switch position indicator (8). Simply depress and release the power switch. The meter will automatically read and electronically hold the value of the light level present at the moment when the button was released. Because advanced electronic circuitry and a silicon blue cell are used in the Luna-Pro F, the measurement is instantaneous with no memory or lag. The reading will be stored and available for a period of thirty seconds after the button is released. After this period, the meter automatically turns itself off, prolonging battery life. Additional readings can be taken at any time by repeating the above sequence.

To operate the meter in the continuous mode, simply depress and hold the ON/OFF button in. The

meter will now respond to all changes in light values. For long term measurements, the ON/OFF switch has a lock position which is indicated by the round switch position indicator (C). To activate and lock the meter on:

1) Depress and hold the power switch in.

2) Rotate the switch button clockwise until the index mark is aligned opposite the round switch position indicator.

The meter will now remain on for constant readings until the switch button is rotated counterclockwise opposite the square position indicator where the read and hold mode will go into operation for one minute, after which the meter will again turn itself off.

NOTE: Be sure to return the switch button to the read and hold position (square mark) after using. Failure to do so will result in short battery life.

II. b. The Null Method of Measurement

Laboratory instruments have long used the null method of measurement for obtaining precise readings. This method has been incorporated into your Luna-Pro F for maximum accuracy and ease of reading.

The basic operating difference between the Luna-Pro F and a conventional meter is that, instead of using various points along a complete scale length, only one position (the null point) is used for all readings and at all light levels. This results in greater accuracy and ease of operation. There is no need to change scale ranges or to read different scales. When the needle is set at the null point, the computer instantly shows a complete read-out of the measurement.

To expand the capabilities of the Luna-Pro F further, its meter face is also calibrated in 1/3 EV increments from the null position to ± 3 EV for use in scene brightness measurements, zone system applications and lighting ratio measurements. Additional information on this extremely useful feature will be found in Section II. i.

If the meter needle is placed in "over" or "under" range, the readings on the calculator dial will result in over or underexposure by the value indicated, compared to a standard exposure.

Each numerically indicated major division on the meter face equals one EV (a change of one EV equals a change by one fstop or one shutter speed setting); the small intermediate dots are equal to 1/3 EV.

II. c. Exposure Correction Dial

Occasionally, the indicated exposure readings obtained with any light meter need be modified for best results. This is especially true when using filters or when taking close-up pictures where the longer lens to film distance results in reduced light at the film plane. To correct for these effects, commonly called filter factor and bellows (extension) factor, additional exposure must be given to the film. In addition, you may, for various creative reasons, wish to depart from the standard exposure values. For these situations, the Luna-Pro F with its exposure correction dial, is ideal.

Normally when making exposure corrections, the correction factor must be calculated and applied each time a reading is taken. However, with the Luna-Pro F the exposure change can be programmed into the exposure correction dial. Any readings will then be automatically corrected.

The exposure correction dial is calibrated to work both in EV (exposure value) and EF (exposure factor). Two index marks are provided at the center or normal positions for each correction method. In addition, the red exposure correction signal (17) gives a visual indication any time the exposure correction dial is in use.

To use the exposure correction feature, determine the correction factor desired, in either EV or EF, and rotate the exposure correction dial while holding the computer ring stationary until the white index mark is opposite the correction value desired. Any readings now taken will reflect this correction.

For example, assume that a filter with a filter factor of 4x is being used. This represents a change of 2 stops. By moving the index mark of the EF ring to a position opposite the number 4, the meter readings will automatically be compensated for the 2 stop difference.

Rotating the exposure correction dial corrects the indicated exposure by changing the shutter speed (and flash symbol), cine speed, and EV scales. Therefore, this feature can be used for still photography using available light and artificial light including flash, motion picture photography, and with cameras calibrated only in EV.

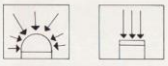
After completing "corrected" measurements, be sure to return the correction dial to its "0" position (red signal will be covered by black tab).

II. d. Footcandle Readings With The Luna-Pro F

The Luna-Pro F is a precision instrument designed to give highly accurate photometric readings specified in readily usable photographic terms. However, footcandle readings can also be obtained with the Luna-Pro F either by converting the photographic reading or by use of an accessory snap-on footcandle scale.

A conversion table of EV to footcandle readings is included on the underside of the meter. To determine the equivalent footcandle reading, set the ASA film speed scale to 50, slide the spherical diffuser over the cell window for incident readings, point the meter toward the light source, and take an EV reading (null the meter). Turn the meter over and read the footcandle value opposite the EV reading just obtained. Similarly, lux values can also be determined. Note that for each change of one EV, the footcandle level changes by a factor of 2. This is because the EV scale is equivalent to a full stop scale in that each change of one EV or one fstop results in either twice or half the amount of light. A formula suitable for calculating intermediate values of footcandles is given in Section III along with pre-calculated values at 1/3 EV.

The most precise footcandle readings are obtained by means of a flat diffuser. When using the spherical diffuser of the Luna-Pro F, all the light falling on the diffuser from an angle of approximately 180° is integrated for a final reading. Since most photographic subjects are three dimensional, this results in more accurate photographic ex-



posures, but can give improper footcandle readings.

When using the spherical diffuser, footcandle readings are most accurate when reading direct light beams such as from spots, arc lights, etc.

II. e. Carrying Case

Your Luna-Pro F is supplied with an exceptionally strong and functional carrying case. It is constructed of the finest heavy-duty materials for long life and extra protection for the meter. Extra thick material and heavy stitching make this case suitable for the abuse encountered in professional usage. The complete top section of the case is removable for ease of handling when taking frequent exposure readings.

To insert the meter, open the case by unsnapping the fastener at the rear of the case and swing the top section forward. Insert the meter strap through the openings at the rear of the case. Place the meter into the bottom section of the case and secure with the retaining strap. To remove the top section of the case completely, unsnap the fastener at the bottom of the case.

II. f. Methods of Measurement

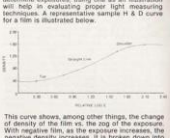
There are two basic methods of obtaining measurements with the Luna-Pro F, incident and reflected light readings. Both methods are popular and when used properly, both are valid and will give good results. However, to evaluate properly the ways in

which these two methods function, it is necessary to discuss briefly how the meter operates and how film responds to light. It is beyond the scope of this manual to get into a detailed discussion of sensitometry, the study of tone reproduction. There are many excellent books available on the subject, some of which are listed in the appendix. This manual will just relate in simple terms, how the Luna-Pro F works and under which conditions you may wish to use either incident or reflected light readings.

All films have characteristic responses to light which, although they may vary from film to film and with changes in storage and processing, are relatively predictable. This consistency of response is what allows the use of light meters and other photographic instruments to predict the final outcome of an exposure.

Film responds to only a limited range of illumination levels before its ability to record that light illumination level properly is lost. Any instrument designed to measure or expose film must take that into consideration. The response of the film to light is generally graphically illustrated by what is called a "characteristic curve" or H & D curve, named for Hurter and Driffield who originated its use.

Although it is not necessary to use such a curve to determine exposures, using one as an illustration will help in evaluating proper light measuring techniques. A representative sample H & D curve for a film is illustrated below.



This curve shows, among other things, the change of density of the film vs. the log of the exposure. With negative film, as the exposure increases, the negative density increases. It is broken down into three distinct regions, the toe, straight line portion, and shoulder. In order to record detail properly on film, the light values (log exposure) should fall within the range where they intersect the straight line portion of the curve. If the exposure falls into the area of the toe or shoulder, the film will lose shadow or highlight detail respectively. This is because, one of those areas are reached, little or no change in film density occurs with a change in exposure, and it is the change of density that produces differentiation and detail. Therefore, your light meter must give you an exposure value that will adjust the measured light so that when it reaches the film, it will fall within the straight line portion of the film's recording ability.

The H & D curve shown above indicates relative log exposure. However, because different films have different light sensitivity ranges, which would affect the density vs. log exposure in actual use, the meter must be programmed for these differences. The ASA film speed setting control on the calculator dial of the meter accomplishes this programming.

In order for this ASA value to be meaningful, all meters and other light measuring devices that relate to photographic applications must take into account not only the film speed, but also the reflectivity of the object being photographed. This is because the film does not know what the reflectivity of a particular object is. It only responds to light levels. Therefore, all other conditions being equal, a light subject with a low level of illumination may record on film the same as a dark object with a high level of illumination. To standardize these varying conditions and to allow you to work with different films and films, a reflectance of 18% value and the understanding that it represents a "typical average" is the basis for readings taken with both reflected and incident methods of measurement. However, under the same lighting conditions, different readings for the same scene can be obtained when using both methods, depending on subject reflectivity. This may seem strange at first, but it is true, and sometimes causes confusion. To eliminate this confusion (something no meter or other device can do), you must consider your subject matter and how you want it to appear on the film. For simplicity, the discussion of this evaluation method will be broken down into a discussion of incident and reflected light measurements.

II. g. Incident Measurement

When reading incident light, the spherical diffuser is placed in front of the measuring cell window and pointed toward the camera, i.e. opposite the subject being photographed, so that the diffuser will receive the same light intensity and distribution as that **falling on** the subject. The reading at this point

indicates the strength of the light, but does not indicate the light value **reflected from** the subject into the camera lens and onto the film. It does not indicate the light value that would be reflected into the lens from an **18%** average reflective subject. Therefore, when working with subjects that are primarily very light or very dark, the incident exposure reading indicated should be adjusted to compensate for the difference in reflectivity from the 18% standard. When the subject is very light, decrease the exposure by 1/2 to 1 f/stop. When the subject is very dark, increase the exposure by 1/2 to 1 f/stop. The amount of change to the exposure will depend on your judgement as to the degree of variation in subject reflectivity from an average scene (18% reflectivity).

Situations may arise where you have extremes of light and dark subjects, all of which are important in the same scene. Under these conditions, the meter should be used in the reflected light method as described under scene brightness range and zone systems.

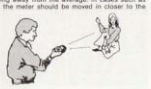
Incident light readings are most valuable when determining exposures where the subject is inaccessible and receives the same illumination as the meter. They also allow you to determine the individual strengths of multiple light sources striking one subject by reading each source independently. In most cases with average subject matter, the incident method is a fast, simple and accurate way to determine exposure.

II. h. Reflected Measurement

When reading reflected light, the meter is pointed toward the subject from the camera position without the spherical diffuser (1) over the measuring cell. Light reflected from the subject passes through a collecting lens onto the measuring cell. This is the same type of path the light takes when exposing film in your camera. The meter cannot "read" any single element in its field, such as a face or highlight; it integrates **all** the light reflected throughout the measuring field, and indicates an exposure which will record **the total picture** on the basis of an overall 18% value.

In most cases, you can simply use this reading to get a perfectly exposed picture. However, there are a few situations where the readings should be modified.

The Luna-Pro F has a measuring angle of 30° when taking a reflected reading. The light from all objects within that 30° measuring range will be averaged to give you the final reading. If you have one or more objects that are significantly lighter or darker than the rest of the scene, the objects will bias the reading away from the average. In cases such as this, the meter should be moved in closer to the



main subjects of interest or one of the accessory spot attachments used to eliminate the effect of the light or dark areas. As an alternative, an incident reading can be taken.

When measuring a subject that departs significantly from an 18% reflective surface, you may wish to modify your readings. This is because the reading indicated will make the subject appear on the film as if it were 18% reflective.

In certain cases, you may not want the subject being measured to fall into that category. For example, if a reflected reading is set in your camera when measuring a brilliant white bridal gown, the resulting image of the gown on the film will appear with the same density as if it were 18% gray instead of white. Here again, you may wish to use an incident reading or compensate the reflected reading by increasing exposure. The same is true for very dark objects, i.e., a black tuxedo, except the exposure would be decreased.

Reflected readings are particularly useful when trying to evaluate the relative range of reflected light from various subjects that may have different reflectivity and may be receiving different amounts of light. Because the reflected reading measures

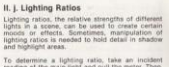
II. i. Scene Brightness Range

In order to assure proper exposures for highlight and shadow detail in scenes with a wide range of

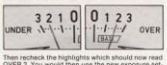
light intensity and subject reflectivity, the extent of the lighting range must be determined. The Luna-Pro F is ideally suited to this type of measurement because of its null meter design.

To utilize this function, you must first determine by testing the limits of exposure change for highlight and shadow areas from average that are acceptable to you with your film. Once this is done, the calibrated reference scales on the meter will automatically indicate if you are within acceptable limits of the film.

For example, if your testing with a particular type of film shows that you could accept an exposure change from average of UNDER (under exposure) 2 to OVER (over exposure) 2½ EV, your total range would be 4½ EV. Using the spot attachment, you could then read the light from the most important area of the scene and then null for that reading. Then, without further adjustment of the calculator dial, you could take light readings from highlight



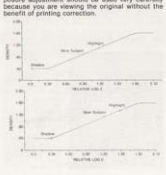
and shadow areas and read the EV variance of these areas. If, in this case, the readings fall within the UNDER 2 to OVER 2½ EV range, your exposures will be good. However, if for example, your readings varied in UNDER 3 and OVER 1, you would lose shadow detail, even though the total range is still only 4 EV. A simple solution would then be to reread the shadow intensity and rotate the computer dial until the meter needle is opposite 2 on the UNDER side which is within the film limits.



Then recheck the highlights which should now read OVER 2. You would then use the new exposure setting indicated on the computer dial. The scene brightness range has not changed, but the meter has adjusted to your exposure so that you are working within the range of the film. To see this graphically in terms of film response see the H & D curves to the right.

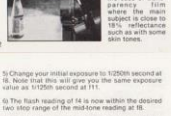
It is important to note that this exposure adjust

ment method works best when using negative films because different density levels can be adjusted for in printing. With transparency films, this type of exposure adjustment should be used very carefully because you are viewing the original without the benefit of printing correction.



With transparencies, about 1 EV is the largest practical shift if your main subject is close to 18% reflectance.

Situations may arise where the meter shows a range of light intensity that is beyond the total range of film acceptance. In these cases, the use of fill light to lighten shadows or a "gobo" (a device to block or modify light such as a dark card) to soften highlights may be indicated. When the proper corrective action is taken, the scene brightness range can again be checked to be sure the limits of the film are not exceeded. Modifying the lighting can also be used in conjunction with shifting the exposure as mentioned above if so desired, as in the case of transparency film where the main subject is close to 18% reflectance such as with some skin tones.



II. j. Lighting Ratios

Lighting ratios, the relative strengths of different lights in a scene, can be used to create certain moods or effects. Sometimes, manipulation of lighting ratios is needed to hold detail in shadow and highlight areas.

To determine a lighting ratio, take an incident reading of the main light and null the meter. Then, without readjusting the computer dial, read the other light or lights in the scene. When reading the secondary lights, deflection of the meter needle will indicate the strengths of those lights in relation to the main light. The method of reading lighting ratios is similar to that described under Scene Brightness Range.

II. k. Fill Flash

When lighting ratios are very high, the difference of the light levels in the areas of direct light and shadow may be so great that the film will not be able to record detail in both areas at the same time. If this occurs, a useful technique for bringing lighting ratios to a more manageable level is fill flash.

By using supplemental flash, generally electronic flash, a sufficient level of light can be introduced into the shadow areas to make proper recording of detail possible. The Luna-Pro F is a useful tool in determining the relative strengths of available light and flash illuminating the scene and can help to adjust to the proper lighting ratios.

Example Method I:

Assume you are shooting a scene where, in order to hold detail in a shadow area, you want the shadow exposure to be 2 stops under the mid-tone reading.

1) Take an incident reading and null the meter.

2) Without moving the computer dial, read in the shadow area. The needle deflection indicates the shadow is 3 stops under your mid-tone (incident) reading. If you wish, electronic flash can be used to bring more light into the shadow area and bring the shadow illumination into the desired range.

3) Select your working aperture and shutter speed from the initial incident reading (i.e., at 1/125th second).

4) Since you want the shadow area to be 2 stops under the mid-tone, set the flash mark (5) at f5.6 (2 stops under f11).

5) Take a reading (with the Luna-Pro F in the flash mode) with the flash unit directed toward the shadow area.

6) Manipulate the flash unit (changing the position or power control) until the meter needle deflects to the null point. Make sure that little, if any, ambient light strikes is measuring cell of the meter.

If you have a leaf shutter camera and are not able to adjust the flash, you can determine fill flash exposure by adjusting the aperture and shutter speed settings.

Example Method II:

Follow steps 1 to 3 as indicated for Method I.

4) Fire the flash into the shadow area and take a reading with the Luna-Pro F in the flash mode. Let us assume that the flash is not powerful enough to bring the exposure into the two stop range and the Luna-Pro F indicates an exposure at f4.

5) Change your initial exposure to 1/250th second at f8. Note that this will give you the same exposure value as 1/125th second at f11.

6) The flash reading of f4 is now within the desired two stop range of the mid-tone reading at f8.

When doing any work with flash, you must work within the camera's "sync" speed (the shutter speed at which the flash will synchronize with the shutter).

II. l. Multiple Flash

Occasionally the light output from a singular flash may not be sufficient to enable you to work at the f/stop desired. When this happens, multiple flashes may resolve the problem. The Luna-Pro F can assist you in measuring the cumulative exposure of multiple flash.

Example:

The indicated f/stop, after your initial flash measurement is f11, you wish to work at f22. Adjust the computer dial until the red flash reference (5) lines up with f22. With your Luna-Pro F in the flash mode, reset the meter and leave the power switch in the continuous read position. Repeatedly fire the flash. Count the number of flash needed to null the meter (bring the meter needle to the zero point).

It is important to note that for each f/stop increase desired you must double the number of flashes. Therefore, if your desired f/stop is more than a few stops away from the indicated f/stop, this method becomes impractical.

II. m. Shutter Speeds and Flash Measurement

Most electronic flash units have a relatively short duration. Therefore, actual film exposure by the flash is not affected by changes in camera shutter speed as long as synchronization is maintained. However, changes in shutter speeds will alter the effect of ambient light on the film exposure. (As the shutter speed changes, the portion of the total exposure caused by the flash remains constant, but the portion caused by the ambient light will vary.) As long as the flash output is considerably higher than the ambient, this effect can be ignored. But when the level of ambient light exposure approaches that of the flash, attention must be given to the effect of shutter speeds. The circuitry of your Luna-Pro F is designed to indicate the f/stop which will produce correct overall exposure with a shutter speed of 1/100th to 1/125th second. If the ambient light is extremely bright, and a different shutter speed is used, the indicated f/stop may have to be modified to compensate for variations in ambient exposure caused by the change in shutter speed. To determine if compensation is required, two parallel measurements must be taken from the same position:

1. Normal measurement (Flash and ambient light) with the Luna-Pro F in the flash mode.

2. Measurement of the ambient light with the Luna-Pro F in the ambient/daylight mode.

3. Compare the different f/stops indicated for a shutter speed of 1/125th second in flash and ambient modes.

Any difference between the two readings calls for an f/stop modification as shown in the table below.

1. Combined measurement (flash and ambient light) with the Luna-Pro F in the flash mode.

2. Measurement of the ambient light only, with the Luna-Pro F in the ambient/daylight mode.

3. Compare the different f/stops indicated for a shutter speed of 1/125th second in flash and ambient modes. Any difference between the two readings calls for an f/stop modification as shown in the following table:

Example:

Luna-Pro F indicates f8 for a flash reading and f5.6 at 1/125th second for an ambient/daylight reading. The difference (f8 and f5.6) is one stop. If the shutter speed to be used is increased to 1/500th second, the table below indicates that the lens must be opened up by 2/3 stop from the reading indicated by the Luna-Pro F. The higher the shutter speed (1/500th second vs. 1/125th second) will decrease the ambient light contribution to the exposure. Opening up the lens 2/3 f/stop will increase the ambient light contribution, bringing the ambient/flash ratio back to the original.

Reading difference between flash and ambient readings	Modification of f/stop setting (fractions of f/stops) with camera shutter speed setting:			
	1/25 — 1/30	1/50 — 1/60	1/200 — 1/250	1/400 — 1/500
	close down	close down	open up	open up
1 stop	1	1/2	1/3	2/3
2 stops	2/3	1/3	1/6	1/3
3 stops	1/3	1/6	1/10	1/6
4 stops	1/4	1/10	0	1/10
5 stops	1/10	0	0	0

II. n. Color Crossover

The preceeding discussion concentrated on the effects that lighting can have on film, either black and white or color. However, with color, three separate emulsions are on the film each of whose individual response may be different. In normal exposure situations all three layers will track reasonably well, resulting in accurate rendition of color as well as density. However, at the extremes of exposure levels, deviations in the characteristic response of individual color layers of the film can result in a condition called color crossover. This condition results in a color shift in an area of under or over exposure that cannot be corrected without affecting the colors of the properly exposed areas of the scene. It is therefore very important to avoid this condition which shows itself as color shifts in the shadows and highlights.

II. o. Zone Systems

There are times when the lighting range cannot be brought within the acceptable limits of the film because of an inability to fill or use "gobos" such as when photographing landscapes. When these situations arise, the exposure levels can be adjusted so that the most important parts of the scene receive proper exposure. This can be done with either black and white or color film. However, some detail, either in the highlight or shadow areas, will be lost.

When using black and white film, another technique is available to extend the capabilities of the film to handle extreme lighting ranges. It is called the zone system. Instead of relying on standard measurement and exposure techniques, the zone system combines special measurement techniques, modified exposures, and altered film processing to expand the range of light values that the film can accept. In doing so, detail can be recorded which would otherwise be lost.

A complete discussion of this technique is far beyond this manual. References are given in the appendix which should help you become familiar with this very useful photographic tool.

The Luna-Pro F is well suited for use with most zone systems because of its null meter principle of operation and the zone system scales (20). Most systems are based on a central zone, representing a certain lighting level, called Zone 5. From this level, the range of light from highlight to shadow is measured and referred to this central zone. The level of variance from the central zone determines the amount of exposure correction and processing modification, if any, that is needed. With most meters, the zone equivalents must be marked on the face or transferred to another sheet to correlate with changes in light level. However, with the Luna-Pro F, the computer dial can be used to adjust the meter needle at any light level. Any subject can be nulled for and light variations from that level read in zone system values I thru IX directly off the meter face in EV. This means that you can always set null for Zone 5. Or, you may wish to bias the reading in one direction.

Simply turning the computer dial of the Luna-Pro F allows you to put the meter needle anywhere from -3 to +3 EV from a normal value.

To use the zone system scales of the Luna-Pro F, take a measurement of a central zone (Zone V), noting the corresponding EV values for each zone

value. Using the EV scale as a reference point, measurements of highlight and shadow areas can then be translated into zone values.

Example:

Take a reading of a central zone or mid-tone (Zone V) and null the meter. Assume the EV indicated for Zone V is '8'. Note the EV values indicated for the other zone values. In this example:

Zone I = EV 4 Zone VI = EV 9
Zone II = EV 5 Zone VII = EV 10
Zone III = EV 6 Zone VIII = EV 11
Zone IV = EV 7 Zone IX = EV 12
Zone V = EV 8

Now you can take a reading of a highlight area, null the meter and note the EV indicated. Assuming the highlight reading corresponds to an EV 12, the zone value would then be Zone IX (see chart above). Now, take a shadow reading, null the meter and note the EV indicated. Assuming the EV value is '5', the corresponding zone value would be a Zone II.

The zone system scale of the Luna-Pro F enables you to easily measure zone system values and establish information regarding tonal range in a scene.

In the example above, Zone V (a mid-tone) is used as a reference point; however, with the Luna-Pro F you can select any zone or light level as a reference. A reading is taken of a particular area, the meter is nulled and the EV value noted (i.e., EV = 7). If you would like that area to be represented as a Zone III, rotate the computer dial until EV 7 is directly above Zone value III. At this point, a reading of the appropriate apertures and shutter speeds will render the particular area measured as a Zone III.

With a little practice, you will be amazed at the ease of obtaining this specialized information.

II. p. Film Reciprocity Failure

All photographic exposure meters rely on a principle of film exposure called reciprocity, to function properly. Basically, the film integrates or adds up light during exposure to produce the latent image. Within certain limits, the same image density is achieved for short exposures of high intensity as with long exposures of low intensity, as long as the product of intensity times time is constant. When the exposure times get very long or very short, however, this reciprocity effect is lost, and an accurate prediction of exposure, and color balance with color films, cannot be determined solely by the meter reading. It is therefore important to check the instructions supplied with the film in use to determine when reciprocity failure can be expected, how severe it will be, and how to correct for it. Here again the Luna-Pro F greatly assists in exposure determination because the corrective filters suggested by film manufacturers to adjust color shifts from reciprocity failure have an effect on exposure. These filter factors can be programmed into the Luna-Pro F and the new, corrected f/stop read directly.

$(\sqrt{2})\cdot 25 = (1.414)\cdot 25 = 1.09$

Next multiply by 4 times 1.09

$(4)\ (1.09) = 4.36$

Your new f/stop is approximately 4.4.

II. q. Intermediate f/stops

The Luna-Pro F is calibrated in 1/3 f/stop increments with numerical indications at full stops. A table is included below with the actual numerical values of the 1/3 stop increments listed for levels from 10.7 to 1138. Values not listed can be calculated from the formula that follows.

New f/stop = (old f/stop) $(\sqrt{2}^{\text{(f/stop change)}})$

For example, if you wish to stop down 1/4 stop from f4, take the $\sqrt{2}^{1/4}$ which equals 1.414 and raise it to the power .25 which is the decimal equivalent of 1/4 stop.

II. r. Intermediate Footcandle Values and Exposure Times

Calculation of intermediate values of footcandles and exposure times is basically the same as calculation of intermediate values of f/stops except that the value $\sqrt{2}^{\text{(f/stop change)}}$ is replaced by 2 in the formula.

For example, you have a footcandle level 1/2 stop above 700 as represented on the chart on the back of the Luna-Pro F.

New footcandle level = (old level) $2^{\text{(f/stop change)}}$
= (700) $(2^{.5})$
= (700) (1.414)
= 990

Section III

Helpful Hints

III. a. Choosing Between Action Stopping Ability and Depth-of-Field

After taking a light reading with your Luna-Pro F you will have a choice of readings to use which may look like this:

Time:	1/1000	1/500	1/250	1/125
f/	2	2.8	4	5.6
Time:	1/60	1/30	1/15	1/8
f/	8	11	16	22

All of them will give good exposures, but, in terms of photographic results, they are all slightly different.

When shooting action, you generally need a faster shutter speed to get a sharp photograph. Speeds from 1/125 to 1/1000 are generally used, with the choice depending upon the relative speed and direction of travel of the object. Objects moving toward or away from you can be stopped with a lower shutter speed than those moving across your field. To create a more realistic feeling of motion with objects moving across you field, use a slower shutter speed and pan across the field. When panning, the relative speed between the subject and the camera is decreased while the relative speed between the background and camera is increased. This results in the characteristic action shot with the main subject sharp and the background blurred.

For shutter speeds of 1/60 second and longer, the use of a good tripod or other camera support is suggested to avoid camera shake and blurred pictures.

When subject speed is not a major factor in your pictures, you may wish to choose a longer exposure time and stop down for maximum depth-of-field. This extra depth may be especially important when using long lenses because of their relatively shallow depth-of-field. However, with long lenses, camera shake is accentuated so be careful to use a sturdy support.

Conversely, even when subject speed is not a major factor, you may still wish to choose a short shutter speed and a larger lens opening to intentionally limit depth-of-field for selective focus. This is especially useful for eliminating the distraction of cluttered backgrounds. Portraits lend themselves ideally to this technique.

II. b. Snow & Sand

When photographing with highly reflective surfaces such as snow and sand, extreme care should be used when using reflected readings. In most cases, an incident reading will produce superior results for normal subject in the scene, although the snow or sand may be overexposed. If reflected readings are desired, the main subject should be metered up close or a spot attachment used to minimize the effect of the reflected light, unless the snow or sand is itself the most important part of the scene. This is an ideal time to use scene brightness range measurements.

III. c. Sunsets

Sunsets can present a problem in light measurement because of brightness range. Sometimes, the sun itself is the most important part of the scene, and at other times, light reflecting from clouds or distant mountains may be more important.

You should first determine what part of the scene is most important. Using an incident reading under these conditions will generally give you poor ex-

posures with washed-out colors. Reflected readings are more accurate, but some compensation is still necessary for the sun or sky. When the sun is present and most important, read the sun directly and use that exposure. If the sky and clouds are most important, read these areas, being careful not to read direct sunlight. In all cases, if practical, bracket exposures on both sides of those indicated. You may get some very striking results that are not apparent to the unaided eye.

III. d. Night Lighting

Measurement of illumination levels at night presents several problems to good exposures. Generally, in outdoor scenes, the lighting is not as uniform as with daylight. Bright artificial lights can create multiple highlights and shadows, with a tremendously large brightness range. In addition, direct use of the meter readings will result in a picture that appears more like a daylight photo than one taken at night.

Generally, night exposures get into the area of film reciprocity failure. It is therefore important to know

the characteristics of your film before shooting under these conditions.

After taking film reciprocity effects into account, decrease your indicated exposures by 1/2 to 1 stop to preserve the night appearance in your scenes.

III. e. Backlighting

When the main subject of interest is backlit, care should be exercised when taking reflected readings. Light from behind the subject entering directly into the measuring cell of the meter will produce reading errors. To avoid this, take your readings up close to the subject or use one of the spot attachments for more accuracy. An incident reading can also be used, with the meter pointed towards the camera.

III. f. Copying

Copying places stringent demands on lighting to make sure that the detail and tonal range of the original is recorded on the copy. Lights are usually placed to the sides of the copyboard to eliminate glare from the surface of the copy. Many people prefer to overlight the corners of the copy to compensate for lens falloff. The exact amount of overlighting varies with the individual situation, but 15-20% is common.

For copy work, the Luna-Pro F can be used with the Copy Attachment for determining exposure and checking evenness of illumination.

III. g. Excessive Skylight

When taking reflected readings of scenes where there are large areas of skylight, care should be exercised that the main subject be given the greatest attention either by tilting the meter down taking up-close measurement or by using one of the spot attachments. As an alternative, an incident reading may be used.

III. h. Bellows [Extension] Factor

When photographs are taken where the focus is at a point other than infinity, an exposure correction must be made. At most working distances, this correction factor is so small that it can be ignored. However, when working at very close distances, it becomes significant and can result in serious exposure errors if not corrected for. This exposure variance is commonly called extension factor or bellows factor.

There are several ways to correct for this effect. Two of the most commonly used take into account

the lens focal length and the lens to film plane distance (bellows extension).

The first method gives you an extension factor which can be programmed into the exposure factor ring of the Luna-Pro F for direct readout of corrected exposure values. The second method gives a corrected aperture only.

I. Extension Factor =

$$\frac{\text{(Lens to film plane distance)}^2}{\text{(Lens focal length)}^2}$$

For example, assume a 210mm lens (approximately 8") is being used with a lens to film plane distance of 14".

$$\text{Extension Factor} = \frac{(14)^2}{(8)^2}$$

$$= \frac{196}{64}$$

$$= 3.06 \text{ or approximately } 3$$

In this case, set the white index mark of the exposure factor ring opposite the number 3. Note that the exposure factor portion of the ring (numbers in black) should be used, not the EV position. All readings will now be corrected for this extension factor.

II. Effective Aperture =

$$\frac{\text{(Lens to film plane distance) (Indicated f/stop)}}{\text{(Lens focal length)}}$$

For example, assume the same conditions as in Example I with an indicated f/stop of f/11

$$\text{Effective Aperture} = \frac{(14)(11)}{8}$$

$$= \frac{154}{8}$$

$$= 19.3 \text{ or approximately } 20$$

In this case, if the lens were set to f/8, the exposure level would be the same as if the lens were set to f/20, although, depth-of-field would remain the same as for f/8. Using this method, each time a different f/stop is chosen, the same amount of correction must be recalculated into the exposure. The first method in conjunction with the exposure factor ring of the Luna-Pro F is much quicker and more flexible because once the exposure factor is programmed, all subsequent readings are corrected for with additional calculations and in terms of all values, not just f/stops.

Another way to determine extension factor is to measure the magnification of the object size at the film plane. This is especially useful when working with large format cameras where measurement of the image on the ground glass is relatively easy.

To calculate the extension factor, measure both the actual object size and the size of the image on the ground glass. These two measurements are used in the formula below.

$$EF = \left(\frac{\text{Image Size}}{\text{Object Size}} + 1\right)^2$$

For example, assume an object size of 2 inches and image size of 4 inches.

$$EF = \left(\frac{2}{2} + 1\right)^2$$

$$= (2 + 1)^2$$

$$= (3)^2$$

$$= 9$$

Setting 9 in the EF correction ring of the Luna-Pro F will give correct exposures for this condition.

Extension and filter factors can be eliminated from exposure reading by using the accessory fiber optics probe and reading on the camera groundglass. Any changes due to these factors will automatically be sensed and compensated for by the meter.

Section IV

Accessories

All of these excellent features are only the beginning of the Luna-Pro F story. The wide range of instantly interchangeable accessories set the Luna-Pro F distinctly apart from other light measuring instruments.

For direct reading with proper exposure values, make the following exposure corrections when using your Luna-Pro attachments with your Luna-Pro F Exposure Meter.

Variable Angle Attachment

The EV + section of the dial is used. When using the 15° position, set the index mark opposite + 1/3 EV. When using the 7.5° position, set the index mark opposite +2EV. Readings are then taken normally.

Repro [Copy] Attachment & Fiber Optics Probe:

Set the index mark opposite +3 EV on your exposure correction dial.

For complete instructions on how to use these and other attachments with your Luna-Pro F, write to Consumer Service Department, Berkey Marketing Companies, 25-20 Brooklyn-Queens Expressway West, Woodside, New York 11377.

Enlarging Attachment

The Enlarging Attachment will help eliminate guesswork in darkroom printing. It determines contrast range and correct exposure time by measuring the projected image on your enlarger easel. After calibrations for paper speed, direct readings of aperture and exposure times are possible, resulting in savings of time and material.

Microscope Attachment

The Microscope Attachment utilizes the Luna-Pro F measuring sensitivity for convenient and reliable exposure measurement when taking photomicrographs. The Microscope attachment fits the ocular tube of most microscopes for exact exposure determinations, and is useful in measuring light intensity for fluorescent microscopy.

Fiber Optics Probe Attachment

With the flexible Fiber Optics Probe Attachment on the Luna-Pro F, measurements can be made in many areas which are usually inaccessible with an exposure meter. It is especially suitable for macrophotography, ground glass measurements, density measurements on negatives or transparencies, and for luminous density measurements.

Variable Angle Attachment

The modestly priced Vari-Angle Attachment locks instantly into the Luna-Pro F and provides convenient selection of either 15° or 7.5° measuring angles. For reflected light readings, the normal measuring area corresponds to a light acceptance angle of 30°. The reflex viewfinder shows the 15° and 7.5° measuring area permits accurate measurements for exposures with telephoto lenses and selective readings of various parts of the scene or subject when normal lenses are used.

Repro [Copying] Attachment

With the Repro Attachment on the Luna-Pro F, it is possible to obtain exposure values of flat copy such as paintings, documents, and photographic prints.

The illumination on the copy board can be measured for evenness of various points on the material to be copied. It can also be reversed for measurements of light transmitted through slides or other translucent material being copied.

Section V

Appendix

Intermediate ASA & DIN Values

ASA	DIN	ASA	DIN	ASA	DIN
0.8	0	50	18	3,200	36
1	1	64	19	4,000	37
1.2	2	80	20	5,000	38
1.6	3	100	21	6,400	39
2	4	125	22	8,000	40
2.5	5	160	23	10,000	41
3	6	200	24	12,500	42
4	7	250	25	16,000	43
5	8	320	26	20,000	44
6	9	400	27	25,000	45
8	10	500	28	32,000	46
10	11	650	29	40,000	47
12	12	800	30	50,000	48
16	13	1,000	31	64,000	49
20	14	1,250	32	80,000	50
25	15	1,600	33	100,000	51
32	16	2,000	34		
40	17	2,500	35		

Intermediate Footcandle Values

.016	.26	4	65	1,000	16,000
.02	.33	5	82	1,250	20,160
.025	.4	6.3	103	1,580	25,400
.032	.5	8	130	2,000	32,000
.04	.63	10	164	2,500	
.05	.79	12.7	206	3,180	
.065	1	16	260	4,000	
.08	1.26	20	328	5,040	
.1	1.6	25	413	6,350	
.13	2	32	500	8,000	
.16	2.5	40	630	10,080	
.21	3.2	51	794	12,700	

Intermediate f/Stop Values

.7	2.8	11	45
.8	3.2	13	51
.9	3.5	14	57
1	4	16	64
1.1	4.5	18	72
1.3	5	20	81
1.4	5.6	22	90
1.6	6.3	25	101
1.8	7	29	113
2	8	32	128
2.2	9	36	
2.5	10	40	

Your Gossen Luna-Pro F

Is your valuable precision instrument, made with great care and accurately calibrated. It deserves your good care!

The battery and zero position tests described on page 5 enable you to check the proper functioning of your Luna-Pro F. If meter is to be stored for extended periods of time, remove the battery from the meter.

Measuring comparisions of your Luna-Pro F with similar or other types of exposure meters cannot be made properly without special laboratory equipment (optical bench).

Do not attempt to open or repair your Luna-Pro F. Service information appears below.

Service

Should your Luna-Pro F require service, send the meter (directly or through an authorized dealer), in the original packing, if possible, prepaid and insured to:

Gossen Service Center
Berkey Marketing Companies
25-20 Brooklyn-Queens Expressway West
Woodside, New York 11377-7885

Gossen Service Center
Berkey Marketing Companies
1011 Chestnut Street
Burbank, California 91508-9964

A brief description of the reason for sending the meter should accompany the package.

Technical Specifications

Photo Cell ..... Silicon Blue Cell
Angle of Coverage ..... 30° Reflected, 180° Incident
Sensitivity ..... .125 to 32,000 footcandles
.016 to 4,000 footlamberts
.3 to 15 EV at ISO (ASA) 25
28.8 lux. to 7360 lux. (Flash)
Power Source ..... 9 volt (Type MN 1604)
Dimensions ..... 4¼"x1¾"x2¾"
Weight ..... 8.4 oz. (with battery)

Scale Ranges:
Cine ..... 4.5 to 144 fps
Exposure Values ..... -8 to 24 EV
Shutter Speeds ..... 1/4000 sec. to 8 hours
Apertures ..... f.07 to f128
Film Speeds ..... ISO (ASA) 0.8 to 100,000/0 to 51 DIN

Additional Reference Material

Eastman Kodak Co.
Kodak Publications
Rochester, New York 14650

KODAK Professional Photo Guide R-28

KODAK Professional Black and White Films, 2nd Ed. F-5

KODAK Color Films, 6th Ed. E-77

Sensitometric and Image Structure Data for KODAK Color Films E-78

Basic Photographic Sensitometry Workbook, J-22-PD

Lens Extension Tables P-300

KODAK Plates and Films for Scientific Photography P-315

KODAK Filters for Scientific and Technical Uses, 1st Ed. B-3

Stroebel, Leslie; **View Camera Technique**; Hastings House Publishers, Inc.; New York, New York 10016

Zakia, Richard and Todd, Hollis; **Photographic Sensitometry**; Morgan and Morgan, Inc.; Dobbs Ferry, New York 10522

Sturge, John; **Handbook of Photography and Reprography Materials, Processes and Systems**; Seventh Edition; Van Nostrand Reinhold Co.; New York, New York 10001

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Davis, Phil; **Beyond the Zone System**; Curtin & London, Inc. and Van Nostrand Reinhold Co.; New York, New York

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Instruction Manual

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