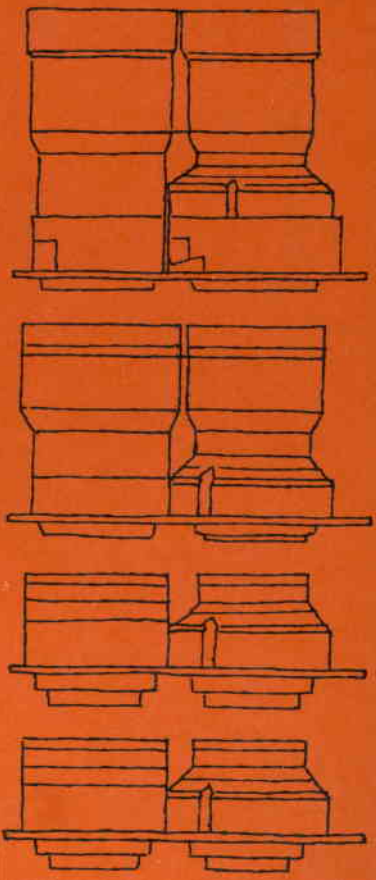
MAMIYA C CAMERA GUIDE

SECOND EDITION
FULLY REVISED



1

How to Operate the Mamiya C

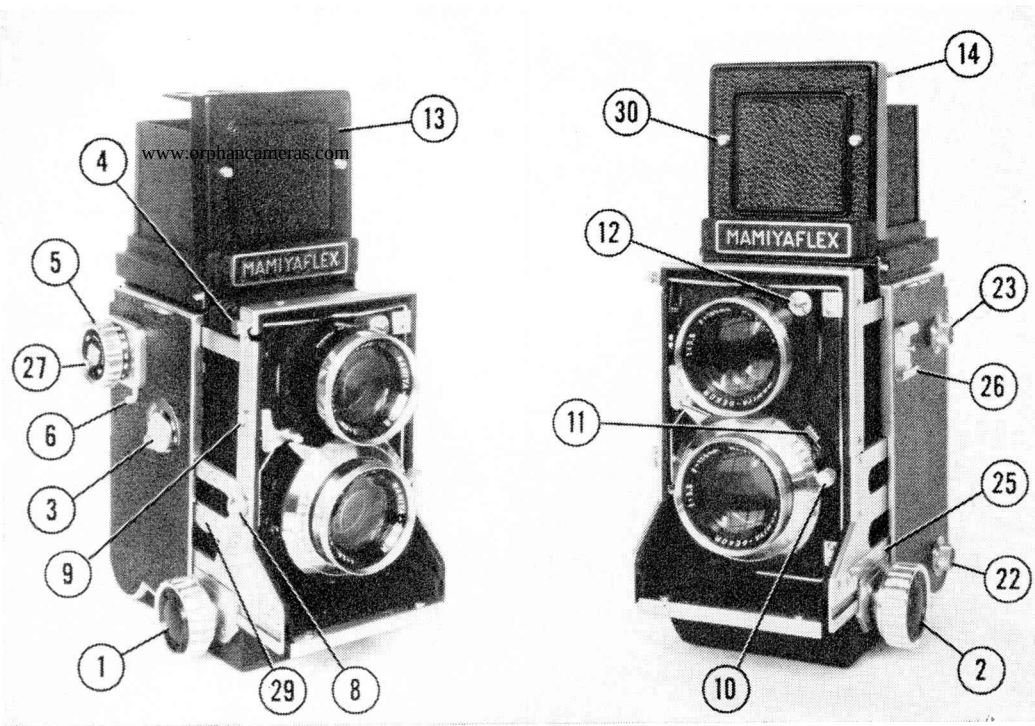
The Mamiya C Professional is the only twin-lens reflex camera, using standard 120 roll film, which has a full range of interchangeable lenses, ranging from wide angle through telephoto. An interchangeable lens set consists of both the taking lens and the viewing lens, both of identical focal length. Each interchangeable lens set has its own Seikosha shutter with speeds ranging from 1 sec. to 1/500 and bulb; each is separately synchronized for combustible and electronic flash.

The exceptional sturdiness of the camera, together with its lens flexibility, has made it a popular choice of portrait photographers, fashion photographers, news photographers and others.

A full range of accessories makes it convenient to take close-up pictures with full parallax correction as well as to take sports, action and outdoor pictures generally with the convenience of eye-level viewing.

In this chapter we will cover:

1. Loading and unloading film.
2. Focusing the camera.
3. Adjusting the shutter and diaphragm.



Figs. 1-1, 1-2. Nomenclature of Mamiya C2, Front and Side Views.

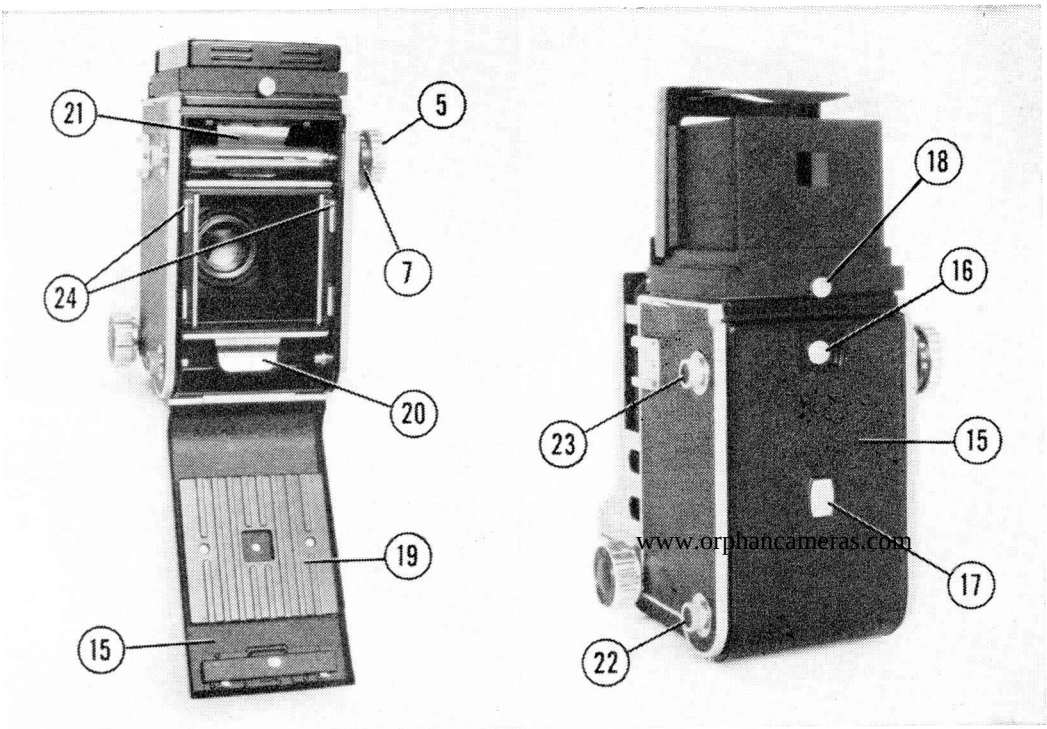
1. *Focusing Knob*
2. *Focusing Knob (left)*
3. *Lens Change Lever*
4. *Lens Locking Spring*
5. *Filmwind Knob*
6. *Filmstop Release*
7. *Exposure Counter Dial*
8. *Shutter Button*
9. *Cable Release Socket*
10. *Shutter Cocking Lever*
11. *M-X Adjustment*
12. *Synchroflash Tip*

4. Taking the picture.
5. Advancing the film after each exposure.
6. Interchanging lenses.
7. Interchanging viewfinders.
8. Interchanging film backs.

More detailed instructions for making the best use of the camera are contained in other chapters. Numbers in parentheses throughout the book refer to identifying numbers of camera parts in Figs. 1-1 to 1-6 for the C2 and 1-7 to 1-11 for the C3.

Loading and Unloading Film

Loading the Mamiya C is a little easier than with other twin-



Figs. 1-3, 1-4. Nomenclature of Mamiya C2, Back Views.

13. *Front Cover, Focusing Hood*
14. *Magnifying Glass*
15. *Backlid*
16. *Backlid Catch Button*
17. *Red Window Cover*
18. *Focusing Hood Lock Screw*
19. *Pressure Plate*
20. *Film Spool Chamber*
21. *Take-Up Spool Chamber*
22. *Film-Spool Catch*

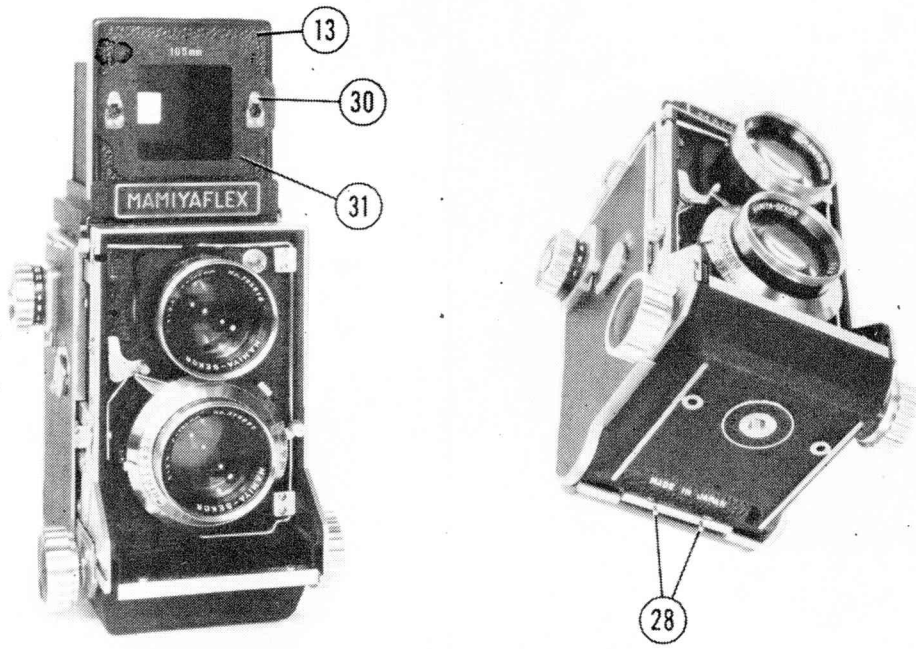
lens reflex cameras because the film does not have to be wound around a 90° bend. This gives you greater control over the film as it is being loaded into the camera, because both the new spool of film and the take-up spool lie in the same plane, as shown in Fig. 1-12.

Loading and Unloading the C2

Opening the Camera

1. Push the film stop release (6). Turn the film wind knob (5) until it turns freely and then stop.

2. Push the backlid catch button (16) to the right. This will release the camera back (16).

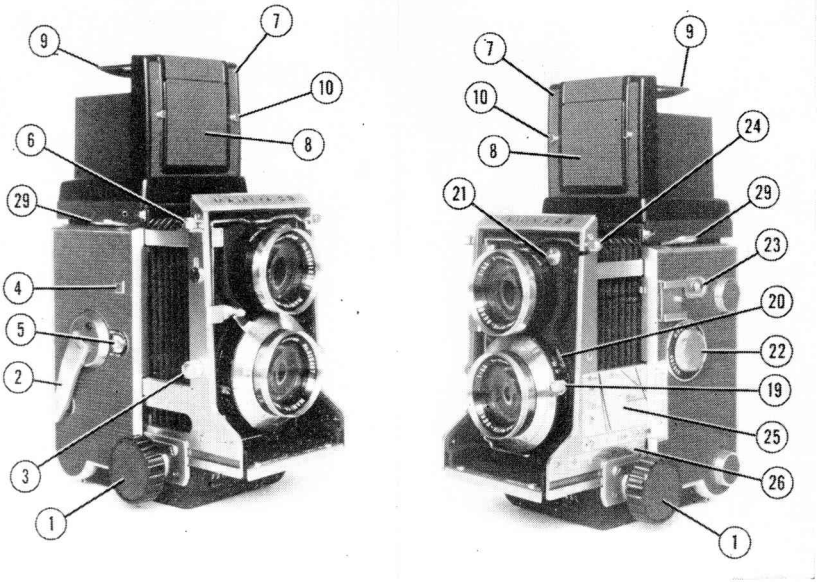


Figs. 1-5, 1-6. Nomenclature of Mamiya C2, Hood and Base Views.

23. *Take-Up Spool Catch*
24. *Start Mark*
25. *Exposure Correction Scale*
26. *Accessory Clip*
27. *Film Rating Indicator*
28. *Backlid Release*
29. *Distance Scale*
30. *Frame Finder Auxiliary Mask Studs*
31. *Auxiliary Mask*

Loading the Film

1. If you are using the camera for the first time, a take-up spool will be in the take-up spool chamber (21). If you have already used the camera, it will be necessary first to remove the empty spool from the lower film spool chamber (20). To insert the empty spool in the take-up chamber, first pull out the take-up spool catch (23), giving it about ¼ turn in either direction so that it remains out until you have fully inserted the empty spool. The slot on the right-hand end of the spool should be aligned properly with the turning knob. The spool will then fall into place easily, after which the take-up spool catch can then be turned back to its original position.



Figs. 1-7, 1-8. Nomenclature of Mamiya C3, Front and Side Views.

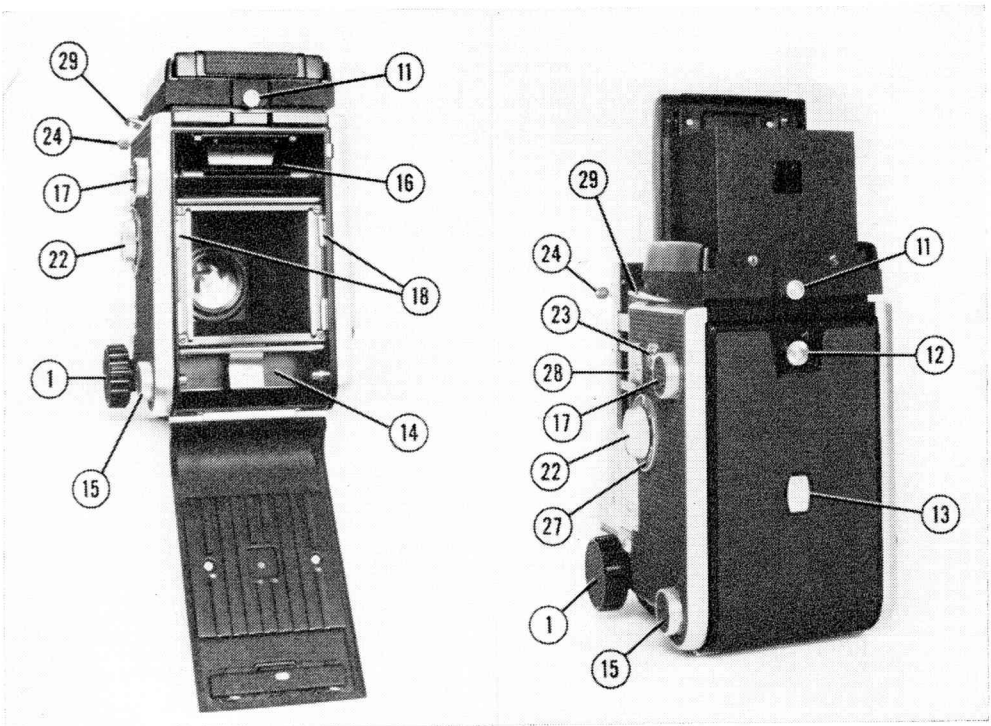
1. *Focusing Knobs*
2. *Filmwind Crank*
3. *Shutter Button*
4. *Film Counter Window*
5. *Multiple Exposure/Filmstop Selector*
6. *Cable Release Socket*
7. *Focusing Hood Front*
8. *Frame Viewfinder Lid*
9. *Magnifying Glass*
10. *Frame Viewfinder Mask Studs*
11. *Focusing Hood Lock Screw*

2. Place the new roll of film in the lower chamber (20). To do this you will need to pull out the film spool catch (22) in the same manner as described in the preceding paragraph.

3. Pull out the paper leader of the roll of film far enough to permit you to insert it into the longer of the two grooves of the empty spool (21). Be careful not to let the roll of film unloosen too much or it may become light-fogged.

4. With the camera back open, turn the film wind knob (5) until the starting marks on the edges of the paper are lined up with the red dots on both sides of the film rail of the camera (24). This alignment is shown in Fig. 1-12.

5. Close the camera back by snapping it shut.



Figs. 1-9, 1-10. Nomenclature of Mamiya C3, Back Views.

12. *Backlid Catch Button*
13. *Red Window Cover*
14. *Film Chamber*
15. *Film Spool Catch Stud*
16. *Take-up Spool Chamber*
17. *Take-up Spool Catch Stud*
18. *Start Marks*
19. *Shutter Cocking Lever*
20. *Synchroflash M-X Selector*
21. *Synchroflash Tip*
22. *Lens-Shutter Assembly Change Knob*
23. *Lens-Shutter Catch Lock Button*

Advancing to the First Picture

Push the film stop release (6) to the left, then turn the film wind knob until it stops mechanically. The exposure counter (7) should show the figure 1 opposite the indicator mark. The first film frame is then in position, ready for the first picture to be taken.

Loading and Unloading the C3

Opening the C3

1. Turn back lid catch button (12) so that red dot is on top (at 12 o'clock position).

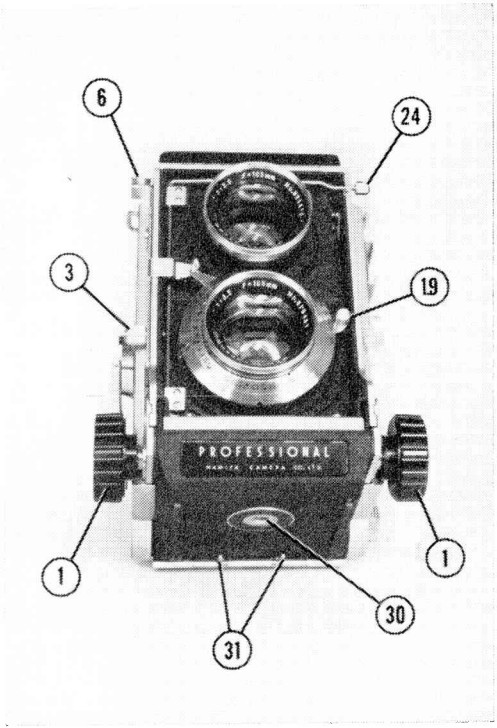


Fig. 1-11. Nomenclature of Mamiya C3, Base View.

24. *Lens-Shutter Assembly Catch*
25. *Distance Scale*
26. *Exposure Corrections Scale*
27. *Filmspeed Dial*
28. *Accessory Clip*
29. *Strap Eyelets*
30. *Tripod Socket*
31. *Backlid Hinge Release*

2. Push back lid catch button to right. Back lid will spring open slightly.

Loading the Film

Note: Before loading roll film, make sure that the multiple exposure/film stop selector (5) is turned to "Roll Film."

The insertion of a roll of film in the C3 is carried out in very much the same way as with the C2. Follow the instructions for the C2 under this heading, paragraphs 1 through 5, with these differences: The procedure for paragraphs 1 to 3 is identical. The one difference in paragraph 4 is that instead of turning the film wind knob, you turn the film wind crank for the C3. After snapping the camera back shut, with the C3 you turn the back lid catch button so that the red dot now points to the 9 o'clock position.

Advancing to First Frame

Turn film wind crank (2) in clockwise direction until it stops. The first frame of film will be in correct position for exposure. This will

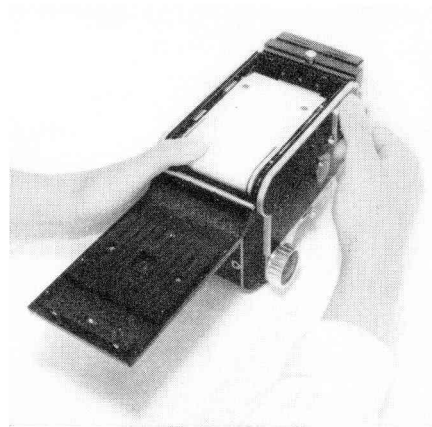


Fig. 1-12. Film is in position when the two arrows are lined up with the red dots on both sides of the film rail.

be indicated by the number 1 appearing in the film counter window (4). Then, turn the crank counter-clockwise until it stops. When it does, fold it out of the way.

Focusing the Camera

The Mamiya C is sold with a standard focusing hood as regular equipment. This section explains how to focus the camera with this hood in place. Interchanging this hood with others which are available is explained later in this chapter. Suggestions for using the various focusing and viewing hoods are contained in Chapter 12.

Opening the Hood

1. To open the hood, lift the cover (13) at the back of the camera. When fully erected, the back and sides will spring up to form an enclosure around the focusing glass.

2. To bring the magnifying glass into position, press in the front cover insert until the magnifying glass flips up. The front cover insert will spring back to its original position if it is not pushed all the way in.

Focusing Procedure

1. The focusing glass is a fresnel-type field lens which gives extraordinary brightness over the entire field for faster focusing and

for easier composing even under dim lighting conditions. The focusing glass has engraved parallax compensation indicators whose use will be described in a subsequent section.

2. You may focus with or without the magnifying lens in position, as you prefer, but the magnifying lens will give you more critical focusing, especially for close-up work or when you are using telephoto lenses.

3. Actual focusing is done by rotating either of the focusing knobs (1 and 2) located on both the right and left sides of the camera. This permits you to use either hand, whichever is most convenient.

4. You can focus on the focusing glass itself or you can set the correct distance by reference to the appropriate distance scale (29) on the side of the camera. Distance scales are provided for all lenses. The 65mm lens must be focused through the glass focusing screen only.

Adjusting the Shutter and Diaphragm

Shutter Settings

1. Shutter speeds are engraved on a rotating ring at the edge of the taking lens. To set the desired shutter speed, you turn this outer ring until the desired speed appears opposite the triangular indicator mark.

2. The shutter is independent of the film advance mechanism of the camera and it must be cocked before taking each picture. To cock the shutter, push downward on the shutter cocking lever (C2-10; C3-19).

3. To release the shutter, push downward on the shutter button (C2-8; C3-3).

4. A cable release may be used; it is inserted into the cable release socket (C2-9; C-3-6) just above the shutter button.

Setting the Diaphragm

1. The lens apertures or diaphragm openings, technically called *f*/stops, are engraved on the lens mount on the left side of the lens. The standard 80mm lens has a range of *f*/2.8 through *f*/32. Other

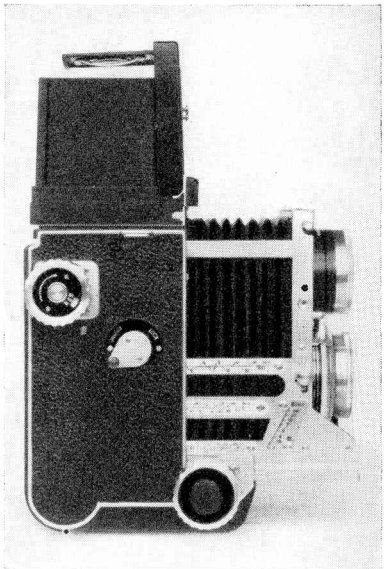


Fig. 1-13. For close focusing, the Mamiya C bellows can be extended. Focusing distance for each of the lenses is shown on the scales which extend with the bellows. There are slight differences in the scales of the two models of the Mamiya C.

of the interchangeable lenses have different *f*/stop scales; for example, the 105mm lens has an aperture range of *f*/3.5 through *f*/32.

2. Move the pointed indicator on the left side of the lens until it appears opposite the number representing the desired *f*/stop (lens aperture).

Advancing the Film

Mamiya C2

1. After each exposure, operate the film stop release to permit advancing to the next frame. Advance the film by turning the film wind knob until it stops. The next frame number will then appear on the frame counter.

2. To prevent double exposures on the same film frame, always advance the film immediately after taking a picture.

3. To make sure the film is turning (or that there is film in the camera) you can open the red window (17). This is done merely by sliding the little button downward.

Fig. 1-14. The new lightweight Porroflex Eyelevel Finder provides an erect, correct right-to-left image, giving all the advantages of a prism.

4. After exposure 12 is made, release the film stop and then continue winding until you feel the paper trailer pull loose from the original spool of film. Continue turning the film wind knob several times more to make sure that the film is fully wound up.

5. Open the back of the camera; pull out the take-up spool catch (23); remove the film. Seal the roll of film.

Mamiya C3

1. Before each new exposure, advance the film by winding the film crank until it stops. The next frame number will automatically apear in the film counter window.

2. Double exposures are automatically prevented when the multiple exposure/film stop selector (5) is set at "Roll Film." With this setting, the shutter button (3) is operable only once with each forward cranking of the film.

3. Never forget to operate the shutter cocking lever (19) before each shot. Failure to do so results in the shutter button being locked

without any action of the shutter. If you should inadvertently forget to cock the shutter before pressing the shutter button, you can still save the unexposed frame of film by operating the shutter, after cocking, by means of the shutter trip lever on the shutter itself, or by temporarily shifting the multiple exposure/film stop selector (5) back to SHEET or "Multi-Exp." This will enable you to release the shutter button. After you do so, set the selector back to ROLL FILM.

4. To make sure the film is turning (or that there is film in the camera), you can open the red window (13). This is done merely by sliding the little button downward.

5. After exposure 12 is made, continue cranking the film until you feel the paper trailer pull loose from the original spool of film. Turn the crank several times more to make sure that the film is completely wound up. Then, open the back of the camera, pull out the take-up spool catch (17), and remove the film.

Interchanging Viewfinders

The following procedure applies to each of the several focusing hoods and viewfinders which are available.

1. Loosen the focusing hood lock screw (C2-18; C3-11). Lift up the rear end of the folded focusing hood. It will readily disengage itself from the camera body.

2. Slip on the interchangeable mirror finder or Porroflex finder and tighten the lock screw. This completes the hood-changing operation.

Interchanging Film Backs

Single Exposure Photography

A special back attachment is available for making single exposures on individual pieces of film. See Fig. 1-16. For this purpose, standard 6 x 9cm (2¼ x 3¼ inch) film must be used.

Fig. 1-15. The folding hood of the Mamiya C2 (right) may be removed and replaced by the mirror finder (left).

1. Remove the standard backlid by first opening the camera in the normal way. Then squeeze inward the two protruding ends of the backlid hinge pivots (C2-28; C3-31). The pivots should be locked into their open position by turning them upward into the two slots of the hinge. The backlid will then slide off easily.

2. Remove the empty film spool.

3. Attach the special single exposure back by slipping it into position in place of the standard backlid. Push the hinge pivots downward, out of the slots, and they will automatically lock the single exposure back in position.

4. Individual plate or cut-film holders are inserted into the single exposure back by sliding them into the parallel grooves (see Fig. 1-18). When the film holder is pushed all the way in, it will be secured by a spring catch.

5. To take individual pictures, remove the dark slide, lift up tab on rear of film holder, twist 90° so that it slips into the holder permitting the film carrier inside to make contact with the camera film plane guides. After exposing, reverse the procedure and reinsert the dark slide. Remove the individual film holder and insert another if you wish to take additional pictures. Fig. 1-19 shows the camera with an individual film holder fully inserted.

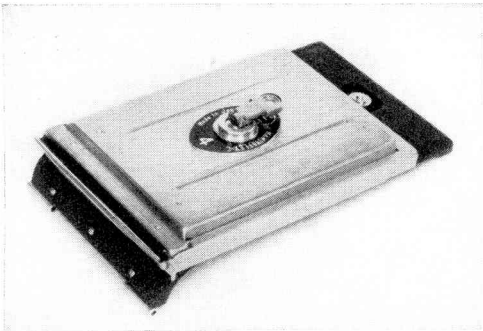


Fig. 1-16. The special back attachment for making single exposures on cut film.

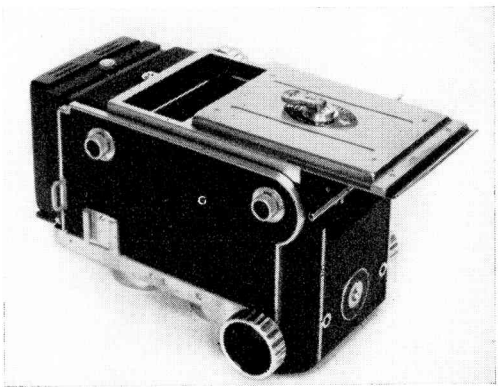


Fig. 1-17. The single exposure film holder being slipped into place.

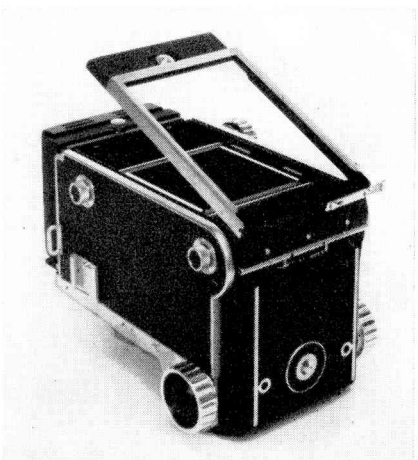


Fig. 1-18. After the standard backlid has been removed, the single exposure back is put into position.

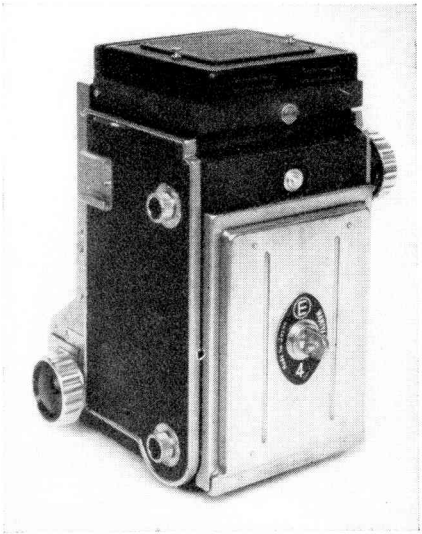


Fig. 1-19. The Mamiya C2 ready for use with the single exposure back in place.

6. The letter E on the back of the individual film holder should be covered when the film has not been exposed, so that the number of the film holder will be plainly visible. After the film has been exposed the number should be covered so that the E may be seen.

2

Tips on Handling the Mamiya C

This chapter contains additional suggestions for making the most flexible use of the Mamiya C under a variety of conditions.

Holding and Viewing

While the material which follows contains suggestions for using the Mamiya C with the standard focusing hood, it also includes material on use of the mirror focusing hoods. Additionally, this section includes information on making parallax adjustments, either through use of the Paramender or the parallax adjustment marks on the focusing glass itself.

Waist-Level Viewing and Focusing

In the normal holding position, the camera is held cradled in both hands at waist level, as follows.

1. Hold the camera at a comfortable height, with both arms snug against the sides of your body.
2. Let the camera rest comfortably in your two hands, using them as a cradle. The thumb and forefinger of one hand

should be on the knob in order to rotate it forward or backward. You may find it convenient to hold both knobs simultaneously.

3. To focus without the magnifying lens, bend the head forward at a comfortable viewing distance from the glass focusing screen.

4. To focus *with* the magnifying lens, it is necessary for you to hold your eye right over the magnifying lens.

5. To make an exposure, lift the right thumb and rest it on top of the shutter button (8). To release the shutter, squeeze down gently but firmly on the shutter button until there is an audible "click," which will tell you that the exposure has been made. Do not do this abruptly or you will tend to shake the camera and thereby obtain a blurred picture. Train yourself to hold the camera steadily with the finger still on the shutter button for a moment after its release. This will tend to assure that you do not jar the camera.

6. You may also use the grip handle for taking pictures at waist level, if you prefer, although this accessory is best suited for eye-level viewing. If you should use it at waist level, attach it to the camera so that either the right or left hand is free, as best suits your personal convenience. Focusing can then be done only with one hand while the other hand holds the grip handle.

Eye-Level Focusing and Viewing

1. The camera may be used at eye level with the standard focusing hood but if you want to focus critically you must first hold it at waist level for focusing in the normal manner as described above. Assuming that you want to take pictures of sports or action events, it should be unnecessary to focus on the ground glass because at the distances involved you should have a sufficient margin of safety by focusing with the use of the appropriate lens distance scale (29).

2. To use the standard focusing hood at eye level, you must first press the front cover insert (31) all the way down until it catches and remains in place. You will now be able to sight through the rear peep-hole, looking through the opening of the eye-level "sports" finder.

3. To close the frame finder, press the right flap of the focusing hood, just above the film-wind knob, so that it comes into contact with the depressed inserts. When you release this flap, the front cover insert will spring back to its original position. See Fig. 2-1.

4. In order to focus, compose and view simultaneously at eye level, you should obtain one of the two mirror finders. The standard mirror finder gives you an inverted reverse image so that objects are seen upside down from left to right as though they were actually facing from right to left (and vice versa). To overcome this slight disadvantage, you can obtain a Porroflex image-erecting mirror finder. Both of these finders interchange with the standard focusing hood as described in Chapter 1.

The Grip Handle

1. The Mamiya grip handle is particularly useful for active users of the Mamiya C, especially for photography "on the move." The sturdy handle is designed for comfortable holding while a leather strap provides additional support and security against having the camera accidentally dislodged from one's hand. The grip handle has

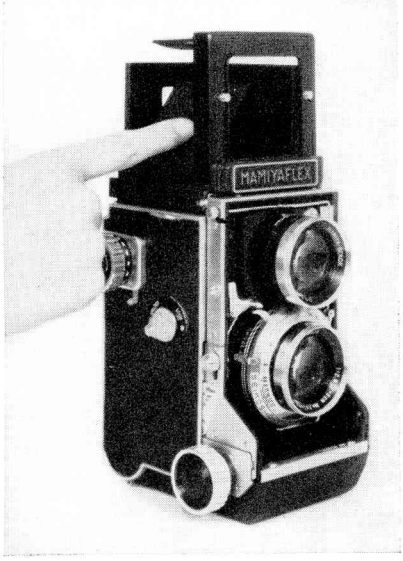


Fig. 2-1. Closing the sports frame finder. First step is to depress the right side of the hood.

a built-on additional accessory shoe to which a flash unit or exposure meter can be attached.

2. You can attach the grip handle so that it may be held on either side of the camera, although it is best suited for use in the left hand. This permits the right hand to be used freely for making adjustments and taking the picture. See Fig. 2-2.

Parallax Correction

1. The term "parallax" refers to the difference between what you see through the viewing lens and what is transmitted to the film by the taking lens. Since there is a physical separation between these two, tops of heads or other objects may be cut off when taking pictures at close distances. The clear lines drawn across the upper part of the ground glass are used for correcting the parallax error.

2. When the exposure correction scale (25) indicates a factor of 1.5, then the upper line defines the upper limit of the subject matter as it will appear on the film surface. Use the appropriate exposure correction scale for the particular lens you are using. When the exposure must be doubled, the parallax error is such that the lower line defines the upper limit.

3. When using the 80mm lens at ranges closer than 2.7 feet, as shown on the distance scale on the other side of the camera, the upper limit of the subject matter lies at about half-way down the ground glass.

Fig. 2-2. The Mamiya C grip holder, ideal for steadying the camera, especially when the longer lenses are in use.

Fig. 2-3. The Mamiya C Paramender is used to make adjustments in parallax when you are working at close distances.

4. A more certain method for assuring precise correction for parallax is to use the Paramender with the camera on a tripod. The Paramender is shown in Fig. 2-3. The image is focused and composed with the Paramender in its lowered position. When you are ready to take the picture, the camera is raised the full length of the Paramender extension. It is then locked in place by tightening the knob on the side of the Paramender. The picture you obtain will then be that which you originally composed, even though some of it now seems cut off.

Special Picture-Taking Techniques

Slow Shutter Speeds

1. Under some conditions, such as in dim light or when you want to use the smallest lens apertures with relatively slow films, you will need to use shutter speeds that are too slow to permit hand-held exposures. For any exposure less than 1/30 sec., the camera should be held on a solid support or mounted on a tripod. Even an exposure at 1/30 sec. is risky, unless you are absolutely sure you are holding the camera steady. Still, it would be helpful to lean against

a solid support, if available. With the camera supported by a sturdy tripod or resting on a solid support, you can release the shutter in the normal way, through the shutter button, or you can use a cable release. A cable release is a little safer on slow shutter speeds, because there is less likelihood of jarring the camera at the moment of exposure. When making time exposures of a duration longer than 1 sec., the shutter must be set at B. The shutter will then remain open as long as the shutter button is held down or as long as the cable release plunger is held in without being released. A cable release, preferably, should be used which has a locking knob. With such a cable release the shutter can be held open as long as desired without your having to exert pressure on the plunger. When you are ready to close the shutter, you simply release the knob or catch and the shutter will close.

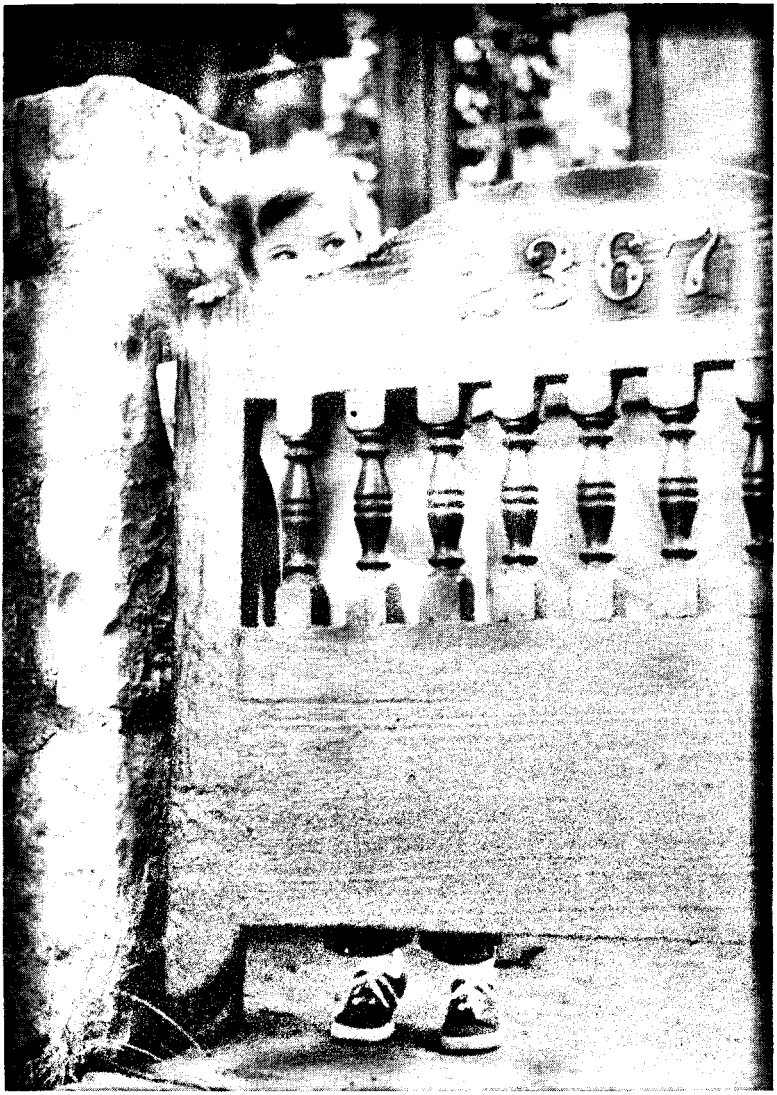
2. If you are taking pictures from atop an automobile or other non-flat surface, a handy expedient is to use a small sack of sand or salt. The camera is pressed down into the sack so that it makes its own sturdy base.

Delayed Exposures

If you want to get into the picture yourself or if you want the camera shutter to be activated mechanically, without hand or cable release pressure, you can use a "self-timer." This accessory, available from most photo dealers, screws into the cable release socket. When you are ready to take the picture, you cock the activating mechanism of the self-timer and then you release it. This will permit you to walk into the picture area or to step aside long enough for the geared mechanism to click the shutter when its working time has expired.

Ever-Ready Settings

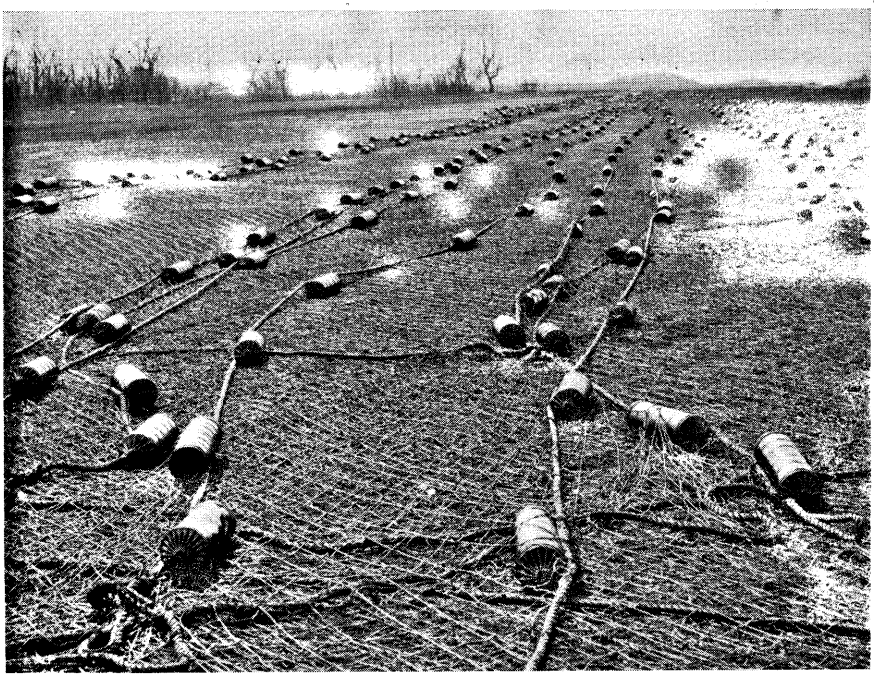
1. An ever-ready setting is one at which the shutter speed, lens diaphragm and distance settings are all predetermined so that you can take pictures on the spur of the moment without having to make these adjustments. If the camera is carried in an ever-ready leather case, it will not be possible to have the distance scale pre-set because the camera will be carried in its closed position, focused at infinity. The "ever-ready" technique is useful, however, when the



If you keep your camera handy and ready for use, you'll find many photos as appealing as this one. Taken with 105mm lens by Cort Best.

camera has already been opened for use and you don't know just which pictures you'll be taking in an active situation. The main idea is that you must have sufficient depth of field to allow you a safety margin in case your subjects are a little before or behind the distance at which the camera has been pre-set.

2. The first thing you should do then is to determine how much depth of field you will require. This can be ascertained by reference to the appropriate depth of field table shown in Chapter 4. Having determined the distance and *f*/stop settings from the table, you can then find the correct shutter speed which will be governed mainly by the film you are using and the lighting conditions, as explained in Chapter 4 and Chapter 7, depending on whether you are using available light or flash light.



The normal 80mm lens of your Mamiya C gives you considerable depth of field. Here, the lines of the drying fish nets, diminishing in the distance, increase the feeling of depth. Photo by Dudley Brumbach.

3

Exposure Procedures

Although this chapter is concerned mainly with setting forth rules for taking the guesswork out of exposure, it begins with a discussion of the interrelationship between shutter and diaphragm. These are the control "valves" which govern the amount of light which will enter the lens to expose the film. Hence, it is important that the effects of adjusting them be fully set forth.

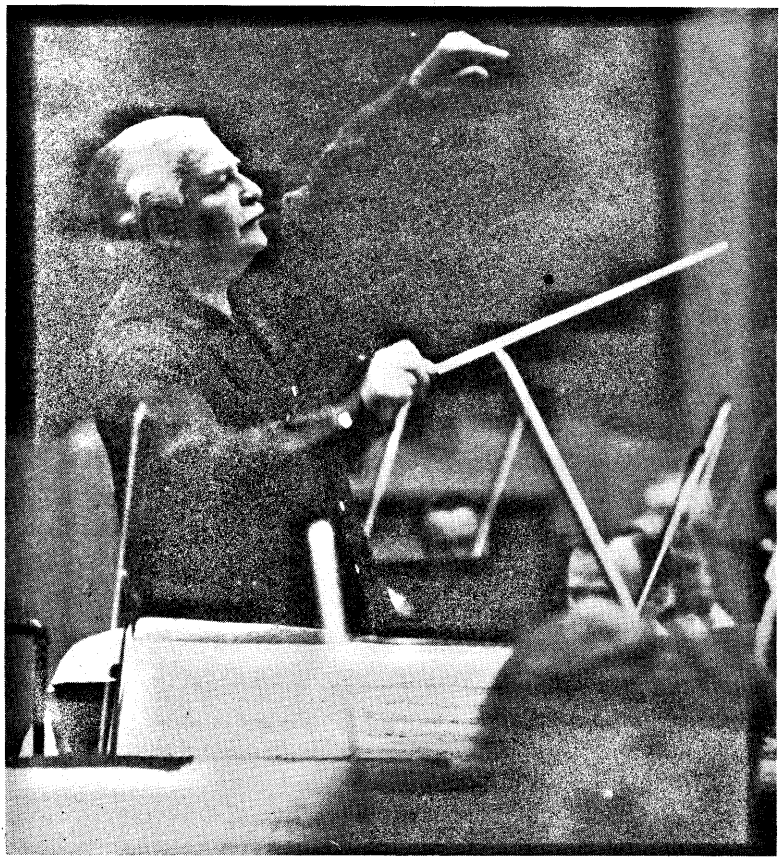
The Shutter and Diaphragm

The shutter speeds and the *f*/stops (diaphragm openings) control the amount of light entering the camera. The shutter acts to slice off an interval of time; the *f*/stop regulates the volume of light going through the lens for the interval of time controlled by the shutter. An analogy may be seen in a faucet: the hand serves as a shutter; it determines how long the faucet will remain open. The amount of turn on the faucet handle determines how wide the opening of the faucet valve will be, just as the diaphragm on the lens determines how wide the light opening will be.

The f/Stop System

The *f*/stops represent the relative amounts of light which the diaphragm will admit at its various openings. Taking the Mamiya-Sekor 80mm lens as an example, you will note that it has *f*/stops which are identified successively as *f*/2.8, 4, 5.6, 8, 11, 16, 22 and 32.

The *f*/stop ratings are established in a progressive series which



In the dim light of an orchestral rehearsal, the 180mm lens of the Mamiya C is still fast enough to deliver a powerful picture. Photo by Robert Steinau.

bear a doubling relation to each other. Thus, *f*/2.8 admits twice as much light as *f*/4, while *f*/4 admits twice as much light as *f*/5.6 and so on down the scale until *f*/32, which admits only one-half the amount of light of *f*/22. The formula to use, in case you want to compute this yourself, such as when you are jumping two or more *f*/stops, is as follows: *the difference in light-transmitting value of one* f*/stop as compared to another is found by dividing the square of the one into the square of the other.* For example, suppose you want to compute the difference between *f*/8 and *f*/11. The square of 8 is 64 and the square of 11 is 121. Hence, one is twice the value of the other or one-half the value of the other, depending upon whether you're going to a smaller or a larger opening. Suppose, now, that you are going from 8 to 16. The square of 16 is 256, which is exactly four times the square of 8.

The Shutter Speed System

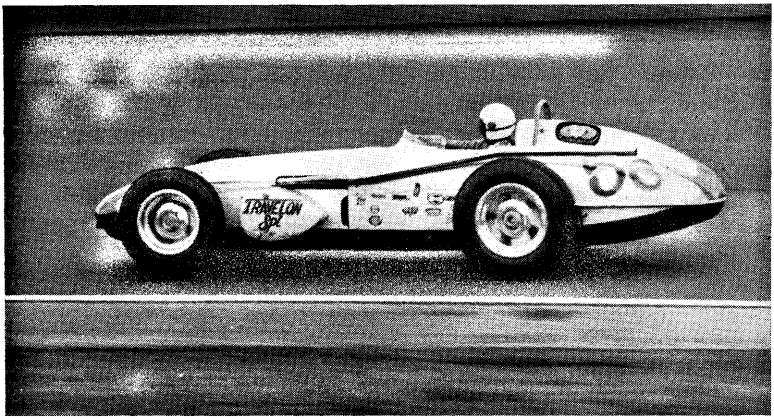
The same type of progression is built into the shutter speed system. Thus, the progression starts with one full second and moves by halves to 1/500 as follows: 1, 2, 4, 8, 15, 30, 60, 125, 250 and 500. In each case but the first, the numbers given here denote fractions, such as ½, ¼, etc. (In the interest of smoothing out the progression and obtaining round numbers, some minor liberties have been taken. For example, 8 is doubled into 15 and 60 is doubled to 125 instead of 120.) Thus, depending on whether you are going in one direction or the other, a shift from one shutter speed to the next means either a halving or a doubling of the amount of light admitted into the camera.

If you shift more than one shutter setting, you must divide one into the other. For example, if you change from 1/500 to 1/125, the latter divides into 500 exactly four times, which means that it allows four times as much light to enter the lens.

Interrelating the Diaphragm and Shutter

This linear relationship of the two sets of lens controls permits you to achieve specific effects without altering the total amount of light admitted to the lens for a given exposure.

For example, suppose a given light situation calls for an exposure of 1/125 at *f*/8. Now the action in the situation changes so that



This racing car was traveling at 150 mph, but by panning the camera in line with the car, the photographer was able to stop it cold. Taken with 180mm lens by Bud Kamenish.

you must arrest movement. You decide to set the camera at 1/250. If you change the shutter to this speed, you must compensate reciprocally by opening the diaphragm to the next larger *f*/stop in order to let the light enter at a rate of twice the volume (for half the time).

The principle is a simple one: once having determined the proper exposure setting, if you thereafter make a change in either the shutter speed or the *f*/stop, you must make a compensating change in the other so that an equivalent amount of light continues to enter the camera.

The Main Ingredients of Exposure

Three things will determine how much exposure you give a subject through the setting of the shutter and lens diaphragm. These are the sensitivity of the film, quality of the light falling on the subject and reflectance qualities of the subject itself. These will be explained briefly below.

Sensitivity of the Film

The sensitivity of the film is indicated by the letters ASA or DIN. ASA is an abbreviation of American Standards Association

while DIN stands for Deutsche Industrie Norm. Most European films are stated in both DIN and ASA ratings. The ASA number gives you a basis of comparing the sensitivity of one film with another. Thus, a film with a rating of ASA 50 is twice as fast as one with a rating of ASA 25. In practical use, if you have been accustomed to exposing at 1/250 for certain subjects in bright sunlight with a film rated at ASA 25, the exposure with a film rated at ASA 50 would be 1/500. If you wanted to have a deeper zone of sharpness (or a greater depth of field, if you prefer) you could decide to keep the shutter speed the same but use a smaller lens aperture.

The ratings of black-and-white films are in a state of transition. Until recently, the official ASA ratings had a built-in safety factor which was so great that you could double the official ratings and still get a proper exposure. The ratings on all Ansco and Kodak films have been readjusted to eliminate most of the safety factor. If you should buy other brands of film, ascertain whether they still incorporate safety factors. If so, as a general rule of thumb, you can double the indicated exposure rating.

In spite of the reduction of the safety factor in black-and-white film, it still has more latitude than color film. The term "latitude" refers to the extent to which you can deviate from an ideal exposure, plus or minus, and still get a good, reproducible negative. Ordinarily, the latitude of the film is exploited on the side of underexposure because a slightly thin negative is more suited to enlarging. Overexposure is to be avoided because denser images produce graininess.

Color films have much less latitude for either overexposure or underexposure. If you overexpose substantially, the result will be disappointingly flat, watery and toneless. Marked underexposure will give you transparencies in which the colors will be dark and somber.

The Quality of the Light

As already discussed, the more light you have entering the camera, the shorter can be the exposure or the smaller can be the lens aperture. Conversely, if the light diminishes, you must either allow more exposure time or you must use a wider lens aperture. As an example, assume that a subject in hazy sunlight requires an exposure of 1/125. In bright sunlight, the exposure for the same subject would be cut in half because of the additional brilliance. Your shut-

ter setting then could be 1/250, or you could keep the shutter setting constant and cut the lens aperture to the next smaller one.

The sun is more brilliant at midday than in the morning or afternoon. It is more brilliant when the sky is clear than when it has to penetrate the dust and soot that blanket certain industrial areas and cities with a haze. On a gray, foggy day you will need the most exposure of all, because then the least sun comes through.

Bright sunlight produces sharp contrasts and deep shadows which are not at all good for outdoor portraits, whether in black-and-white or color, but particularly in the case of color. If your subjects face the sun, they will not be relaxed, because of a tendency to blink or squint. While a hazy sunlight produces only half the brilliance of bright sunlight, it is preferred for outdoor portraiture because the haze diffuses the light and produces softer shadows. You do not want to eliminate shadows completely, however, for then your pictures would appear flat and dull, without any feeling of brilliance and depth.

The shortest exposures, for any given quality of sunlight, can be made with the sun beaming directly toward the subject from behind you. This kind of lighting is ideal for color films, although it is perfectly satisfactory for the sun to be slightly off at an angle to the line of sighting running from the subject to your camera. When the sun is at an angle, so that some of the subject has shadows upon it, you must increase the exposure from one-half to one full stop (or the equivalent in shutter speeds), depending upon the angle of the sun and the amount of shadow area it creates.

Exposure Qualities of the Subject

The light entering the camera is a reflection of the light which strikes the subject. A bright subject will reflect twice the amount of light as one of average tones and hence the bright subject will require only one-half the exposure. A dark subject will reflect about one-half the amount of light as an average subject and hence you would need to double the amount of exposure.

Light subjects include distant scenery, light-colored or white clothing, people with fair skins, people on the beach or on the snow, etc. An average subject is dominated by middle tones or is made up of evenly distributed dark, light and middle tones. A dark sub-

Backlighting makes for a rich print and increases the three-dimensional appearance of the subject matter. Taken with 180mm lens by Robert Steinau.

ject includes people wearing dark clothing, heavily tanned or dark-skinned people, dark-haired animals, deep blue-green foliage, buildings of deep red brick, etc.

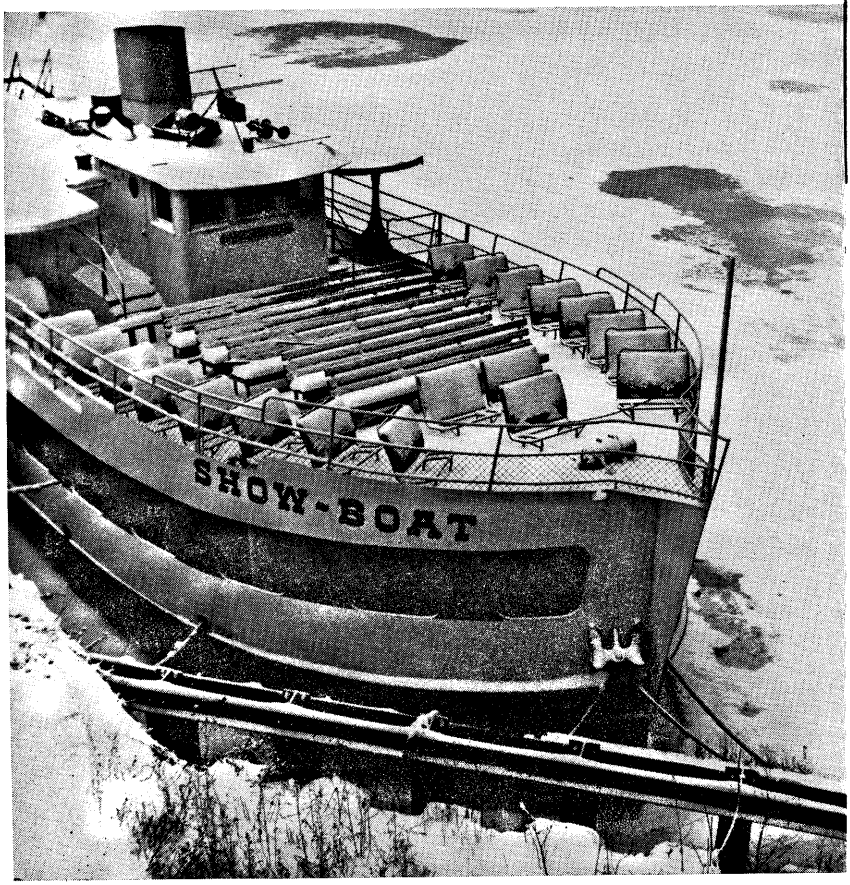
A light object side by side with a dark one poses some real problems for the photographer. A correct exposure for the light object will result in an underexposure for the dark one and vice versa. Thus, suppose you were taking a picture of two people standing side by side. Assume that one is dark-skinned and the other of fair complexion. If you expose for the fair subject the other will be underexposed and hence will look darker than he really is. If you expose for the dark subject, the fair one will be overexposed to the point of not showing any skin texture in the print. The solution is either to compromise by striking an average or to expose for the one subject that counts the most. With black-and-white film, I think it better to expose for the brighter subject and to adjust for the darker one

by "dodging" the subject when the print is made with the enlarger. If you guess wrong and have overexposed a critical portion, then you must "burn" it in, in accordance with standard procedures.

Adjustments for Processing

Your exposure practices must take into account the treatment that your film receives when it is developed, whether you do it your-

Photographer must balance his exposure carefully in a scene such as this one, in which subject matter ranges from bright white to rich blacks. Once more, this picture utilizes the full frame of the Mamiya C. Taken with an 80mm lens by Edwin A. Vorpe.



self or have it done for you. The first thing you should do, therefore, is to standardize on your processing service or on your own developing techniques. Then, you can expect a consistency in processing which will serve as a guide for your future exposure estimates.

If your films consistently come back looking very dense, it is an indication that you need to use shorter exposures or smaller lens apertures or both. If your films generally look thin, this is an indication that you are underexposing. You need to make some adjustment, whether it is due to your estimates or to your exposure meter, assuming that the shutter of the lens is in good working order.

Tips on Using Exposure Meters

This section describes the use of reflected-light meters which you point toward the subject. The other type of meter is the incident-light meter, which you point toward the light source itself. The former is used more commonly, although there are arguments for and against both. Most reflected-light meters are sold with translucent masks which you fit over the window of the meter so that it can be used, optionally, as an incident-light meter.

For low light-level readings, special exposure meters are available, although many of the more popular brands are sold with amplifiers as accessories or as built-in features.

In the material which follows, we shall cover several of the basic rules in taking readings with exposure meters.

The Rules in Brief

Here are a few rules, easily memorized, which assure good results with exposure meters:

1. Aim directly at the subject, in a straight line with the picture-taking position of the camera.
2. Don't waver from this position as you take your reading, because if you move the exposure meter, you may get unsatisfactory results.
3. When a correct exposure of a single object or center of interest within a larger field of view is essential, move in as close as you can to take your reading, still in line with the final picture-taking position of the camera.

4. When taking close-up readings, hold the meter so that you do not cast a shadow in the path of your meter.

Portraits and Specific Objects

When taking a portrait in bright sunlight, point the light cell of the meter close to the subject's face, from 6 to 12 inches away. Measuring both the light and shadow sides of the face, you will get two different readings. Your exposure should be for the average of these two readings. Observe rule #4 as you take the reading. The technique just described should also be used when you are taking photographs of specific objects rather than of mixed subjects or scenery.

Group Pictures and Mixed Scenes

With a mixture of light and dark objects in a group or scene, you could take readings of each and then take an average. This troublesome procedure is not really necessary. If you stand far enough away from your group to take it all in, as your camera would, your meter will form its own electronic computations for you. The important thing is to point it directly toward the center of the scene with the meter tilted slightly downward to avoid taking in any of the sky. When photographing in color, however, you might decide to sacrifice some qualities one way or the other by taking a reading of the one color area which you wish to be predominantly well-exposed.

Landscapes and Distant Scenery

Inaccessible Objects

In landscapes and distant scenery, point the meter downward at an angle midway between the horizon line and your feet. If you don't do this, the meter will be influenced unduly by the excessive amount of light in the sky and your picture will be badly under-exposed for the ground objects.

If you are unable to approach your subject close enough to take a meter reading, hold the open palm of your hand about 6 to 12 inches away from the light cell of the meter and take a reading. Of course, your hand must reflect the same kind of light as does the

Selecting a high vantage point from which to take your picture, helps increase the feeling of space. This full frame composition is made more interesting by the contrast of lines. Taken with 135mm lens by Edwin A. Vorpe.

subject. The flesh tones of your hand are sufficiently neutral as to constitute an average subject. Another more dependable technique is to use a gray card with an 18% reflectance. This is available from photo dealers.

If your subject is darker or lighter than your own flesh tones or your gray card, you can make arbitrary adjustments one way or the other.

Exposure Techniques Without a Meter

For most standard situations, one can take satisfactory pictures, adequately exposed, without an exposure meter. In fact, except under rather difficult or unusual conditions, many professionals prefer to estimate exposures based upon their own working experience. The key to it is to remember certain basic exposure situations and to adjust for marked variations from those conditions. These will be discussed below.

Exposure Tables

Enclosed with each package of film, you will usually find a small instruction sheet which gives exposure, filter and developing data. The exposure data covers outdoor photography, flash photography and sometimes flood photography.

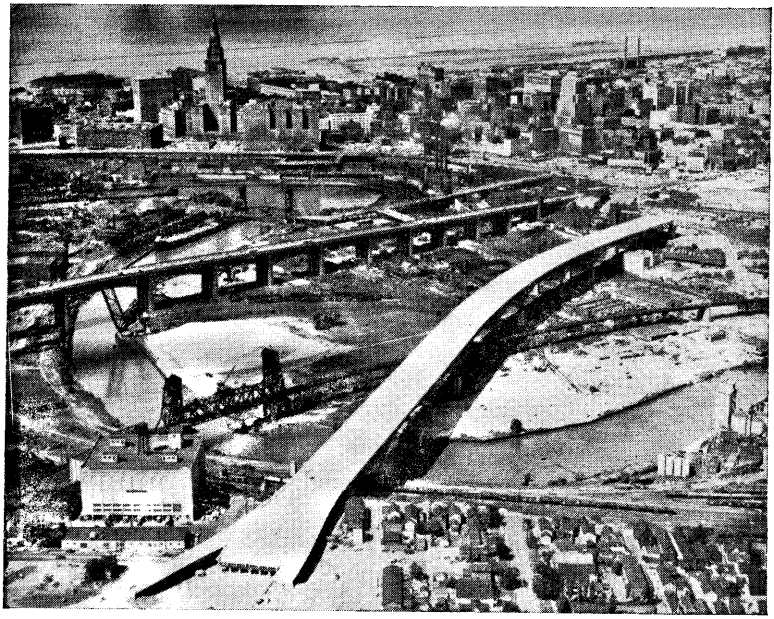
The outdoor exposure tables included in the leaflet will usually cover most ordinary picture-taking situations. A typical exposure table divides the range of probable lighting conditions into four, as follows:

1. Bright sun
2. Hazy sun
3. Bright overcast or cloudy bright
4. Dull overcast or open shade on bright day.

Each of these lighting conditions represents one *f*/stop more or less. For example, if bright sun calls for an exposure of *f*/22 at 1/60, hazy sun would call for *f*/16 at 1/60, while for bright overcast and dull overcast, respectively, the successive changes would be to *f*/11 and *f*/8.

These exposure tables are usually stated for average conditions covering the period from mid-spring to late summer. During the remainder of the year you should either double the exposure or follow the suggested table literally without taking advantage of the safety factor.

For unusually bright light conditions, such as beaches, snow scenes and high and distant mountain scenes, you may need to make a further adjustment by either halving the bright sun exposure or closing the diaphragm down one additional stop.



This aerial view of a bridge under construction is a good example of lens definition. Taken with 80mm lens by William A. Ashbolt.

I find it quite convenient, especially when using a film with which I am not too familiar, to slip the exposure table into my wallet. For any given light condition, then, all I need do is look down the one column for the suggestions on exposure of different kinds of subjects under that kind of lighting.

How to Estimate Exposure

The key to estimating exposure for outdoor picture-taking is to remember the basic exposure in bright sunlight for average subjects. It is then a simple matter to make the wider opening in the lens diaphragm to adjust for lighting conditions as they change. Remembering that each of the four basic lighting conditions represents one full lens stop, you can adjust quite easily.

If your main subject or the subject area itself is predominantly

dark, you would then double the average exposure. If your main subject is predominantly light, you would cut your exposure for an average subject under the given light conditions in half.

This is one of the big advantages of standardizing film. After a while you come to know your lighting conditions and subjects without being confused as to the speed and latitude of the film you are using.

Close-Range Exposure Adjustments

Theoretically, the exposure adjustments you make on the camera are correct only when it is focused at infinity. When you rack the bellows out, the lens is further away from the film plane. The *f*/stops engraved on the lens are no longer accurate.

This can be seen when you divide the diameter of the lens into the distance of the lens away from the film plane. The further away the lens is, the bigger will be the denominator of the resulting fraction and it is the denominator which represents the *f*/stop.

As a practical matter, you need not make any adjustments in exposure at most working distances unless you are photographing objects at fairly close range. On the left side of the camera (see Fig. 3-1) you will note an engraved scale just above the focusing knob. This scale has exposure correction factors for all lenses except the 65mm wide-angle.

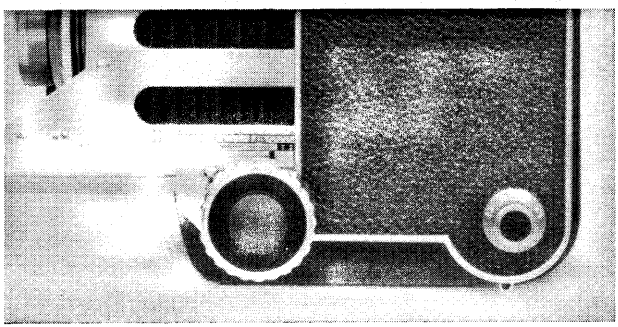


Fig. 3-1. Close-range exposure adjustments are indicated on engraved scales at left side of bellows housing.

To use this correction scale, assume that you are using the 80mm lens. After the subject has been carefully focused in the ground glass, note the correction factor on the scale, as shown in Fig. 3-1. The small black indicator mark just above the focusing knob points to the end of the range marked X-2. This means you must increase the exposure to twice normal, either by adjustment of the shutter or the *f*/stop. This is the equivalent of using a filter with a factor of 2X. For example, if your exposure meter reading indicates a setting of 1/60 at *f*/8, then the corrected setting should be either 1/30 at *f*/8 or 1/60 at *f*/5.6

4

Using the Interchangeable Lenses

One of the main advantages of the Mamiya C is the ability to interchange lenses, thereby enabling you to use the camera under a wide variety of picture-taking situations, whether you are covering sports, making close-ups or doing architectural photography. The full range of available lenses is as follows:

65mm *f*/3.5	105mm *f*/3.5
80mm *f*/2.8	135mm *f*/4.5
	180mm *f*/4.5

Some General Rules on Focal Length

When you select a lens of any particular focal length for a given camera, you are really concerned with the field of view which you want to cover. If you want to bring a distant object in close, you need to select a lens having a narrow field of view so that it will concentrate on less of the field of view seen by the eye. The lenses which have the narrowest field of view are called telephoto lenses because they appear to bring objects closer. As a practical matter, they record the same objects as seen from the same distance in larger

dimensions on the ground glass and on the film as compared to the performance of lenses of shorter focal length and wider fields of view. Lenses having a field of view wider than the so-called normal lens are generally called *wide-angle* lenses.

In Figures 4-1 through 4-5, you can see the different areas of image covered by each of the Mamiya C lenses listed above. All these pictures were taken from the same distance, the only change made being in the lens used. You will note that the picture taken with the 65mm wide-angle lens (Fig. 4-1) covers the entire object, much of its stand and the exhibition area in which it is located. The coverage of the 180mm lens, as seen in Fig. 4-5, takes in little more than the female figure.

One of the important things you must bear in mind when you use lenses of different focal length is that the depth of field (as shown in the accompanying tables later in this chapter) for the same distance and *f*/stop is increasingly shallower as the focal length becomes longer. Hence, when you use lenses of longer focal length, you may need to use smaller *f*/stops.

The lens of a longer focal length introduces another problem. The longer the focal length, the more important it is that you hold the camera as steady as possible during the moment of exposure. While you should avoid movement or vibration under any circumstances, the effect will be more obvious when using the telephoto lens. The reason is that you have greater magnification and hence you can see the effects of image displacement more clearly.

Use of the Different Lenses

The Normal Lens

The normal lens, that with which the camera is originally equipped, is an all-purpose lens. It is called *normal* because it is presumed to cover about the same field of view as the human eye.

The rule-of-thumb for determining the focal length for a normal lens is to select one of about the same length as the diagonal of the film frame. The diagonal of the film frame of the Mamiya C is approximately 80mm. This happens to be the focal length of the normal lens of this camera. Any lens shorter than 80mm is considered to be a wide-angle lens, while any lens greater than that is

Figs. 4-1 to 4-5. A demonstration of the angle of view and magnification power of the different Mamiya C lenses. All photos taken from same position.

considered to be a telephoto lens of moderate or greater length.

The normal focal length lens will cover most picture-taking situations.

The Wide-Angle Lens

The moderate wide-angle lens for the Mamiya C is of a special design which permits it to protrude beyond the front of the camera. The extra coverage is sufficient in most cases to enable you to take pictures indoors of room scenes when you cannot back off sufficiently to cover what you want with a normal lens. Professional photographers and photo-journalists find a wide-angle lens to be indispensable for this reason. It is used extensively in architectural photography as well as in taking pictures of large groups.

The wide-angle lens, coupled with the close-focusing feature of the Mamiya C, enables you to cover a wider field when you are copying documents or other materials.

Telephoto Lenses

Each of the long focal lenses—105mm, 135mm and 180mm—fulfills a special need. In general, these lenses enable you either to work at a greater distance from your subject, if you prefer, or to bring the subject in larger, from the same distance.

Any of these three lenses is suited for portraiture, although the 105mm lens is particularly useful in taking group portraits. A long focal length lens is important in portraiture because it avoids giving undue prominence to the foremost features of the face.

The 135mm and 180mm lenses will be found most useful in covering outdoor events and indoor sports and stage photography. In the latter two categories, the 180mm lens will be found particularly convenient to use. The special construction of this lens makes it easy to use with the camera without throwing it off balance as would be the case with a lens of long physical size.

How to Interchange Lenses

The changing of lenses is done very simply. The mechanisms built into the camera and the procedure which you must follow

The 80mm lens is the one most suited to the greatest variety of picture situations. It is ideal for news photography. Photo by Dudley Brumbach.

automatically assure that when you remove a lens the film in the camera is protected against exposure to the light. These procedures are explained below.

Lenses, Steps in Changing C2

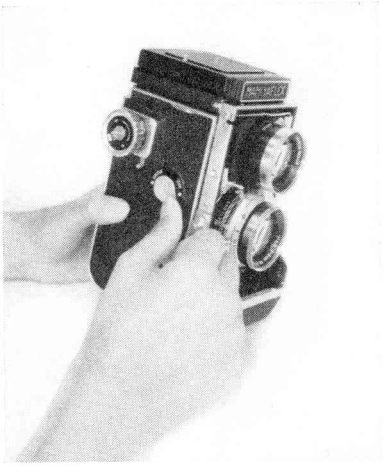
1. The camera must be focused at infinity. That is, the focusing knob should be turned so that the lens assembly is drawn back as close as possible to the body of the camera.

2. Turn the lens change lever (3) until the little arrow points to the "unlock" position, as shown in Fig. 4-7.

3. Unhook the lens locking spring (4). To do this you must push down and pull forward in two separate and successive motions. See Fig. 4-8.

4. Now remove the lens assembly, grasping it by the top lens. See Fig. 4-9.

5. Insert the new lens assembly and secure it in place by returning the lens locking spring to its original position, doing the reverse of what you did in Step 3.



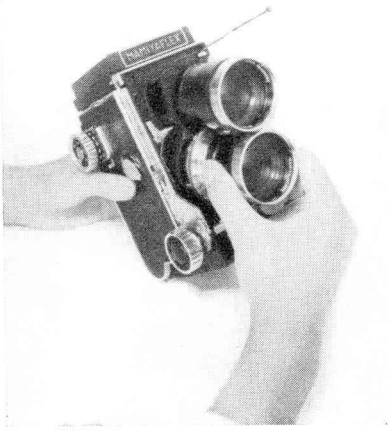


Fig. 4-7 (Above, left). Turning the lens change lever to the unlock position.

Fig. 4-8 (Above, right). Unhooking the lens locking spring.

Fig. 4-9 (Left). Removing the lens assembly.

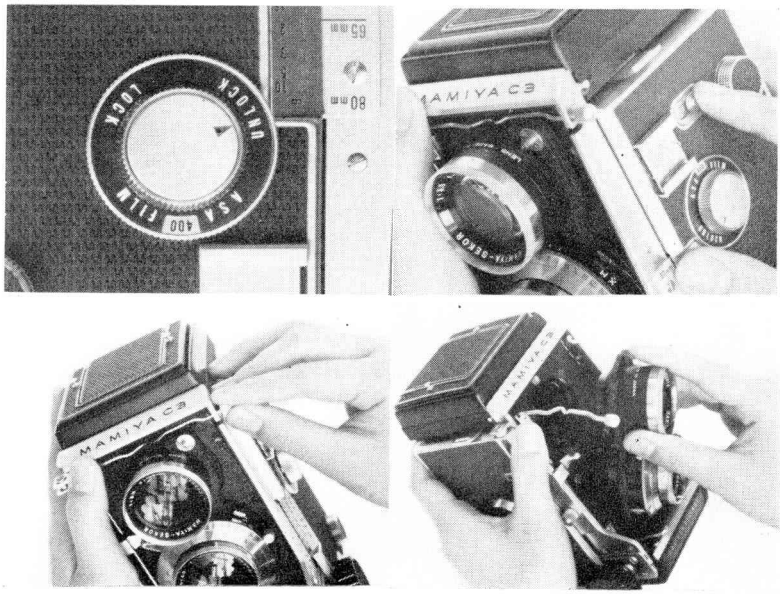
6. Turn the lens change lever back to the "lock" position. If you forget to do this, a red warning signal will be seen underneath the ground glass as you try to focus. Unless you restore the lens change lever to the locked position, no picture can be taken because the film will be covered.

Changing Lenses, C3

1. The camera must be focused at ∞ before removing or fitting a lens-shutter assembly. Turn the focusing knob (1) to make certain that the lens mount is fully retracted into the camera body.

2. Turn the lens-shutter assembly change knob (22) to "UNLOCK." See Figure 4-10.

3. Push the lens-shutter catch lock button (23) toward the front of the camera. See Figure 4-11.



Figs. 4-10, 11, 12, 13. Steps in changing lenses on Mamiya C3. Check text.

4. Press down the knurled head of the lens-shutter assembly catch (24), and allow it to swing out forward. See Figure 4-12. The lens-shutter assembly can then be lifted out. See Figure 4-9.

5. To attach a lens-shutter assembly, lower it carefully into position on the lens mount. Then secure it by replacing the lens-shutter assembly catch (24), and turning the lens-shutter assembly change knob (22) to "LOCK." The catch lock button (23) will return automatically to the lock position.

6. A red warning signal visible under the ground glass screen indicates that the lens-shutter assembly change knob (22) is at "UNLOCK" position, with light barred from entering the camera through the lens. You would not be able to take pictures unless you turn the knob back to the "LOCK" position.

Masking the Sports Finder

The opening of the front cover of the standard focusing hood provides the correct frame for eye-level viewfinding when the standard 80mm focal length is in use. When using one of the lenses of longer focal length, fit the auxiliary mask provided for each of the lenses on the mask stud (30). See Fig. 4-11. An optical auxiliary finder mask is also available for the 65mm wide-angle lens.

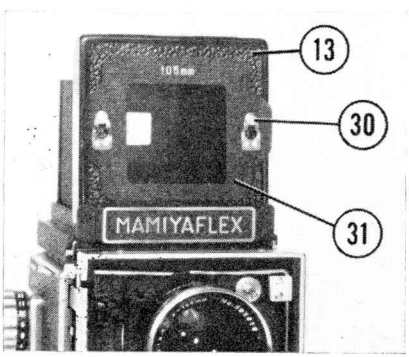


Fig. 4-11. Auxiliary finder mask for 105mm lens.

7

Flash Photography

This chapter, in addition to describing the mechanics of synchronizing flash with the Mamiya C, describes the various types of flash equipment, rules for flash exposure and techniques for achieving special effects.

Mechanics of Flash Photography

Camera Flash Connections

Each Mamiya C lens assembly is wired internally to permit the firing of a flash unit in precise synchronization with the action of the shutter. The connector cord of the flash unit fits over the small protruding flash contact on the lens board adjacent to the top of the viewing lens. The simplest way to attach a flash unit is to slide the foot of a flash attachment into the accessory shoe (26) on the side of the camera. The connector cord of the flash unit may then be slipped over the synchro-flash tip (12) where it will be held by its own spring pressure.

Just above the cocking lever of the taking lens, you will note a

sliding indicator (11) and the letters M and X. Position M gives the correct time lag for Class M flash bulbs (20 milliseconds to peak intensity) and will give accurate synchronization at all shutter speeds through 1/500 sec. Position X is for zero delay (or no lag) and is used with electronic flash at any shutter speed and flash bulbs at a speed of 1/30 sec. or slower.

Equipment for Combustible Flash

The typical flash unit for combustible (one-time) bulbs consists of a plastic case which houses a power source, a reflector which is usually collapsible and a connector cord to fit over the flash contact on the camera. The power source inside the flash unit usually consists of one or more small batteries and a B-C (battery-capacitor) unit. The latter acts as a storage tank between the battery and the camera in order to assure some uniformity of light output.

There are many different kinds of bulb flash units available from

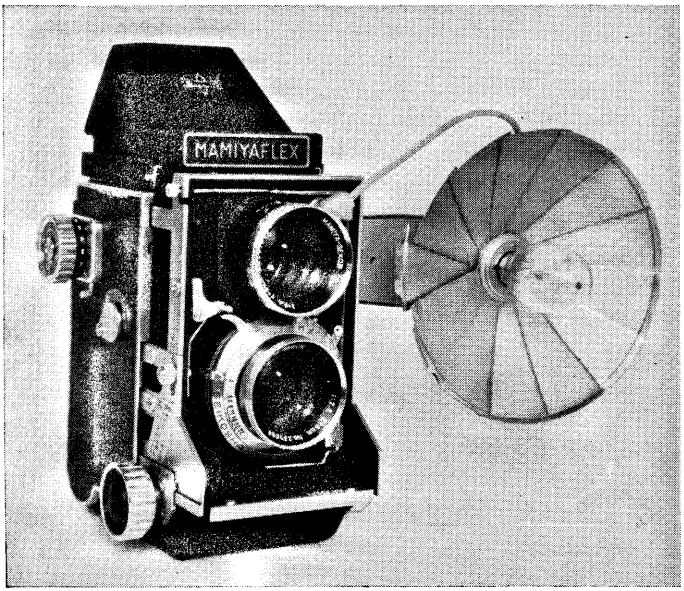


Fig. 7-1. The Mamiya C2 equipped with a B-C flash unit and Mirror finder.

most photographic dealers with slight variations among them in their physical features. Fig. 7-1 shows a Mamiya B-C unit mounted on the Mamiya C2. It is designed to accept the bayonet-base bulb, such as the 5 or 25. For the smaller, pinless bulb, such as the M-2, the M-5 and the M-25, flash units with smaller, bowl-shaped as well as collapsible reflectors are available. It is possible, however, to use these pinless bulbs with a flash unit designed to accept the bayonet base by obtaining from your photographic dealer, for a few pennies, a small adaptor which fits into the flash unit.

If you desire, you can also use one of the AG-1 flash units for extreme portability of the unit and flash bulb, provided this is really necessary with a camera of the size of the Mamiya C. Although any flash bulb can be used with the Mamiya C Class M bulbs are to be preferred. Their light output packs the greatest amount of power of the small flash bulbs. This is an advantage because it permits you to use the fastest shutter speeds, in order to avoid movement, and the smallest lens apertures for greatest depth of field. Favorite Class M bulbs are the 5 and 25.

Flash bulbs with a blue coating can be used with Daylight Color film. These bulbs are identified by the letter B after the number. With a blue-dye solution like Jen-Dip, you can color your own bulbs for daylight color flash. Clear flash bulbs are used with Type F color film. For special use, your photo dealer can obtain amber bulbs for use with tungsten-balanced (3200°K) color films.

Electronic Flash

The lamp of an electronic flash unit may be used over and over again for thousands of exposures. While an electronic flash unit costs more initially, this is offset by a low upkeep and a low cost per exposure—provided you use it sufficiently.

The size of electronic flash units has tended to become smaller and smaller as a result of the utilization of transistors. A typical unit for the amateur now may contain the power supply as well as the flash head in one combined unit. Other electronic flash equipment, especially in professional sizes, has a separate power supply, which may be carried in a case suspended from the shoulder with a connector cord to a flash head which may be mounted on the camera in the same manner as a B-C flash unit.

Flash units typically have peak durations of + or — 1/1000 sec. Hence, their effect is to freeze action.

The flash contact on the Mamiya C2 should always be set at X when used with electronic flash.

Basic Rules of Flash Exposure

Characteristics of Flash Illumination

The further away the flash illumination travels from its course, the weaker is its intensity. This can be noted especially when you take a picture of a subject which includes objects extended in depth away from the source of illumination. Thus, if you take a picture at a party and expose for the center of a group of people, those in front will have a burned-out appearance while those toward the back will come out very dark. This is noticeably true when taking pictures at close distances. It is less obvious if you can back away from the subject. using one of the telephoto lenses of the Mamiya C.

The behavior of light in this way is called the "inverse square law." It may be stated as follows: *The intensity of light varies inversely with the square of its distance from its source.* For example, compare the intensity of light at 5 ft. and 10 ft. from the flash unit. Squaring each of these distances gives you 25 and 100 respectively. Thus, although the difference in distances is in the ratio of 1:2, the difference in light intensity is in the ratio of 1:4. Stated otherwise, a person 5 ft. from the flash unit would receive four times the amount of light as someone twice as far away—or 10 ft.

Now, when you back further away from your subject, using a telephoto lens in order to compensate for the greater distance, you can reduce this contrast in illumination. For example, compare the distances of 15 and 20 ft. away from the source of illumination. Squaring both gives you 225 and 400 respectively. Now the drop-off in light intensity is in the ratio of approximately 1:2. While there is still quite a difference here, it is not quite as pronounced and, with black-and-white film and color negative film, can be adjusted in enlarging.

With the aid of an extension flash connector cord, you can place your flash unit at a greater distance from the subject. This enables

The high speed flash of an electronic flash unit stops action cold and gives utmost clarity to this picture of a swimmer breaking the surface. Taken with the 135mm lens by George Bailey.

you to work at close distances with the camera while you obtain the advantage of greater depth of flash illumination.

Light Reflectance

Exposure for a given subject is determined by the amount of light reflected by that subject. Two other kinds of reflectance come into play here: One is the reflector in back of the lamp itself and the other is the extent to which any surrounding surfaces reflect light onto the subject.

Each flash bulb size is intended for use with a corresponding size of reflector. The No. 5 or 25 bulbs are usually used with reflectors ranging in size from 4 inches to 6 inches. The M-2, M-5 or M-25 bulbs work best with a 3-inch *parabolic* reflector. The newly released AG-1 bulbs operate best with a 2-inch parabolic reflector. The deeper the reflector, the more concentrated is the beam of light reflected by it.

For portability, however, flash units commonly are sold with collapsible, fan-type reflectors. Typically, these have a pebbled satin finish whose purpose is to spread the light in a more diffuse pattern, which is preferable for color and for portraiture. The carton of flash bulbs may give you a flash guide number for use in conjunction with a polished reflector, even though these seem largely to have gone out of fashion. Usually, you can increase the lens opening one-half *f*/stop beyond that which would be necessary if you were to use a polished reflector.

When taking pictures within an enclosed area, the walls and ceiling act as a secondary giant reflector. Because of the extreme rapidity with which light travels, it has time to bounce off the ceiling and walls back onto the subject before the shutter closes. The smaller the room and the lighter and brighter its surfaces, the more brilliant will be the reflectance of light on the subject itself.

The guide numbers given on the carton of flash bulbs assume that pictures are to be taken in a room of average size with walls and furnishings of medium-light characteristics. The inverse square law, described above, has its effect here, also. Since the light must bounce off the interior surfaces onto the subject, it is obvious that the further it has to travel, the more diminished will be its effect. Accordingly, the higher the ceiling, the more distant the walls, the darker the walls and floor, and the softer or more porous the surfaces, the less powerful will be the light reflected from all these surfaces onto the subject.

The practical rule to bear in mind is that you must open the lens somewhat wider, perhaps as much as one *f*/stop, when taking pictures in a very large enclosed area, or you may need to close the lens down by one-half to one full *f*/stop when working in a very small light-colored room.

Diaphragm and Shutter in Flash Photography

The relationship of lens diaphragm and shutter is not quite the same in flash photography as in the taking of pictures with a continuous light source. There is no difference in the functioning of the lens aperture, for it will continue to regulate the volume of light admitted through the lens, depending upon whether it is opened wider or narrower. Changes in the shutter speed may or may not affect the amount of illumination entering the camera, depending upon whether you use electronic flash or bulb flash. If you use one-time bulbs, faster shutter speeds will reduce the amount of light entering the camera but not in the same proportion as when working in continuous light. When the flash is fired, the illumination rises to a peak of brilliance and then subsides. With an electronic flash unit of almost any make, the duration of the peak illumination is so short as to be covered by the fastest of the shutter speeds. With a flash bulb, however, you will get the full output of the bulb only when the shutter is set for about 1/30 sec. At faster shutter speeds, you begin biting into some of the light output but not in proportion to the reduction in the open shutter duration. The differences in light utilization, at different shutter speeds, may be seen in the table of exposure guide numbers included under the next subhead. For other flash bulbs, consult the table usually included with the carton of bulbs.

Exposure Guide Numbers

The exposure guide number system simplifies the computing of flash exposure. A single guide number takes into account the light source, lamp reflector, shutter speed, and room characteristics for the various films. (See the accompanying table: P stands for polished reflector and S stands for satin-finish reflector.)

Under the guide number system, you divide the distance of the subject from the lamp into the guide numbers in order to obtain the required *f*/stop. For example, with a guide number of 80 and a shooting distance of 10 feet, you would get *f*/8. Intermediate *f*/stops not shown on the lens mount can be taken care of by turning the *f*/stop ring to an intermediate setting.

No. 5—with 4 to 6 inch Reflector

With "M" synchronization..... use any shutter speed.

"X" or "F" synchronization.....use 1/30 second or slower.

Tungsten Film Exposure Index	12	16	20	25	32	40 50 64	80 100 125	160 200 250	500 640 800
Shutter Open to 1/30	P-95 S-75	P-110 S-90	P-120 S-100	P-130 S-110	P-150 S-130	P-190 S-160	P-260 S-220	P-380 S-320	P-650 S-550
1/60	P-80 S-65	P-95 S-75	P-110 S-85	P-120 S-95	P-130 S-110	P-170 S-130	P-240 S-190	P-340 S-260	P-600 S-480
1/125	P-70 S-60	P-80 S-70	P-90 S-80	P-100 S-90	P-120 S-100	P-150 S-120	P-200 S-180	P-300 S-240	P-500 S-440
1/250	P-60 S-48	P-70 S-55	P-80 S-65	P-90 S-70	P-100 S-80	P-120 S-100	P-180 S-140	P-240 P-200	P-440 S-360
1/500	P-48 S-40	P-55 S-44	P-65 S-50	P-70 S-55	P-80 S-65	P-100 S-80	P-140 S-110	P-200 S-160	P-360 S-280

Using the Flash Characteristics

Although the falling off of light, when using flash, is a disadvantage, you can put it to effective use under certain circumstances. You can also take advantage of the high-peaking characteristics of flash. For the one, the advantage is in background control, while for the other the advantage is in stopping action.

Background Control

To concentrate attention on a specific subject, you can eliminate or subdue the background by removing objects from it, by control of lighting, or by varying the distance of the subject from the background. In portraiture, where this is most important, you take advantage of the inverse square law by moving your subject further away from or closer to the background as best suits your needs. For example, with a dark-haired subject you would want the background lighter, while with a light-haired subject you would want the background darker. This is independent of the color of the background itself, provided it is not black, or nearly so.

Another means of lightening a background is to direct a flash

When the cat's away, the mice will play — with kitten. Picture was taken with two electronic flash units through glass cage. Taken with 80mm lens by Charley Darneal.

from the side or rear of the subject onto the background, making sure that none of the direct rays of the flash point toward the camera lens. A lenshood should be used to shield the lens from stray light.

If the subject must be close to the wall, remove the flash from the camera body and hold it a little higher in order to bring the shadow lower and away from the head. Then, if you take your picture on a level with the subject's head or slightly below, you may eliminate the shadow completely.

Avoid glare reflection and hot spots on background subjects or surfaces. Shooting at a slight angle in relation to the background wall or line of objects will minimize this.

Stopping Action

To stop action as well as to minimize the risk of camera movement, use the flash at higher shutter speeds, even though with combustible flash bulbs this means use of lower guide numbers. Another advantage of the higher shutter speed is that it excludes extraneous light when working indoors. You have a different kind of problem, however, when working outdoors with daylight fill-in flash.

With electronic flash units, the inherently fast exposure is sufficient to stop most action, regardless of the shutter speed of the camera. The longer the shutter is opened, however, the more it is possible for the sharpness of the image to become contaminated by the entrance of extraneous and irrelevant light. Accordingly, unless you had a special reason for admitting some of the existing light (as in daylight fill-in flash), it is ordinarily best to synchronize electronic flash at one of the faster shutter speeds.

Special Flash Techniques

The discussion of flash exposure up to now has assumed the use of a single flash unit with the bulb itself accompanied by a reflector for normal operation. This type of lighting is highly directional and is accompanied by the advantages and disadvantages of the diminishing intensity of single-point illumination. The variations in flash technique now to be described are intended to offset or modify single-flash characteristics.

Bounce Flash

In *bounce* lighting, the flash unit is pointed toward a room surface—usually the ceiling or wall—from which the light is then reflected onto the subject. The purpose of this is twofold: First the light is softened as it is reflected away from the intermediate surfaces; second, since the light travels a greater distance by this indirect route, it is more uniform in its intensity, as described above. When the flash is pointed at a sharp angle toward the ceiling, the effect is that of natural room lighting. This is characterized by dark shadows in the eyesockets and under the chin, although they are not

as sharply delineated and as opaque as with similar shadows created by sunlight. For older people, when taking portraits, this technique is not flattering because it emphasizes facial wrinkles and cavities. Other techniques of bounce flash can overcome this, as explained below.

Bounce flash is most satisfactory with black-and-white film. It can be used when taking color pictures when the walls and ceiling are white or a very light, neutral gray. Colored walls or ceilings will impart their own tones to the light when it reaches the subject and hence you'll have some contamination of the color of the subject itself.

The basic procedure is to point the flash toward the ceiling or wall, directing it at a spot midway between the flash and the subject. The light will then bounce off at an angle toward the subject. The further away you are, when bouncing light off the ceiling, the more you will overcome the tendency toward dark eye sockets. This is due to the light traveling at a more oblique angle toward and away from the ceiling. Remember, however, that when using this technique, the extended light travel requires wider lens apertures, so you are limited somewhat in how far you can back away. The bounce-flash technique is of particular advantage when taking pictures of groups of people who are spaced at varying distances from the camera and light source.

Unusual effects, particularly in portraiture (especially to get away from wrinkles), can be achieved by bouncing the flash off a wall—sometimes off a mirror—giving you at one time the effect of front- and back-lighting. The technique of bounce flash really brings individual inventiveness into play. For the ultimate in shadowless flash photography, multiple bounce-flash can be tried. Don't forget to use the lenshood in order to limit the light which strikes the lens directly.

The *f*/stop setting is ordinarily computed by rule-of-thumb. In a room of average size with medium to light walls and ceilings, you would increase the lens aperture by two or three *f*/stops over that called for in straight flash. Your actual practice will be modified with experience in different working areas. A more precise approach is to double the distance from the flash to the reflecting point on a wall or ceiling and then, after computing exposure for that total

distance, you would open the lens aperture as much as one additional *f*/stop to make up for the loss of light because of the poor reflectance qualities of ceilings and walls, not to mention draperies and rugs.

When there is time beforehand, exposure can be computed by the method of simulation. Take a floodlamp and point it at the subject; then take an exposure meter reading. Next, turn the floodlamp toward the reflecting point on a ceiling or wall and take another reading with your exposure meter. The difference between the two readings will give you the adjusting factor for that picture-taking set-up, when using the flash unit itself.

Since bounce flash requires that you use wider apertures, ordinary room light needs to be taken into account. If the existing light is very bright, you may need to reduce the diameter of the lens diaphragm by one or two *f*/stops, depending upon exposure conditions.

Off-Camera Flash

The off-camera technique is a favorite in flash portraiture. When the flash is held a little higher and off to the side, as in the typical Rembrandt-type of portrait lighting, you get better light modeling of the face with a more natural shadow pattern. The typical, head-on flash from the position of the camera does not represent a natural kind of lighting you would encounter in real life. While you have some latitude in the length of the connector cord that normally comes with the flash unit, to permit your holding it away from the camera, it may be possible for you to obtain extensions permitting the unit to be held at a greater distance. Consult your photo dealer.

Little if any allowance in your exposure needs to be made when taking pictures under this method.

Multiple Flash

With multiple flash, you begin to approach the flexibility of studio lighting. In fact, by setting up multiple sources of illumination, you can have greater control over shadows and highlights. Thus in portraiture, one bulb may be held at the camera and another off to the side and high over the subject. Another arrangement would be to fire two flash bulbs, one on either side of the subject, with one at a greater distance from the subject than the other. In fact,

almost any of the varied lighting arrangements for portraiture can be used most effectively.

The mechanics of it, with flash bulbs, is to connect additional units to the one at the camera, using extension cords. The average B-C flash unit will fire two or three bulbs with its own power. If the flash unit does not have its own connections for additional units, you can slip an intermediate, multiple outlet plug over the flash contact on the lens board.

Another technique, without using extension cords, is to use open flash. When you give a signal to assistants, they fire as many additional units as you desire.

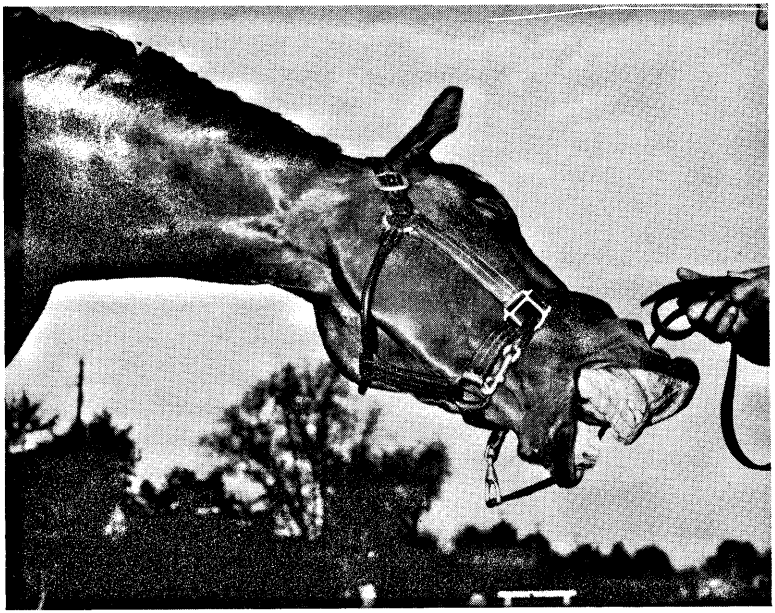
A more modern approach is to use *slave* units. Although these can be used with flash bulbs, shutter synchronization is more easily accomplished with electronic flash units and slave units. There is no limit to the number of slave units that can be fired by remote control without the inconvenience of a web of extension cords.

Exposure is computed as though you were using only one lamp, provided there is only one main light source, with the others used for fill-in of shadows. Depending on the angle from which additional lamps are fired, you may need to make some allowance for additional light reflected onto the subject—perhaps using about one-half *f*/stop smaller. The effect of back-lighting can be ignored for purposes of exposure. If more than one bulb is fired from the main picture-taking position, multiply the guide number for one lamp by the square root of the total number of lamps used. Thus, for two bulbs, multiply by 1.4; for three bulbs, multiply by 1.7; and for four bulbs, multiply by 2.

Outdoor Fill-In Flash

The main purpose of outdoor flash is to fill in the hard shadows made by the brilliant directional lighting of the sun. This is particularly important in color photography where the very limited latitude cannot tolerate wide contrast in highlight and shadow areas. Dramatic effects are achieved in portraits when the subject's back is to the sun with flash used to fill in the dark side of the face. When the sun is coming from the side, flash may be used to illuminate the other side of a face.

Another purpose for outdoor flash is to give punch and depth to



Flash was used to fill in the shadow side of this portrait and brings out the lustrous tone of horse's coat. Taken with 80mm lens by Gean A. Baron.

subjects poorly illuminated by flat, shadowless outdoor light.

The basic exposure technique is to take a reading of the subject under existing outdoor lighting conditions. The camera is then set for the appropriate shutter speed and *f*/stop. Then, to find the distance from the subject at which you should fire the flash unit, divide the *f*/stop into the exposure guide number. This gives you a point at which both daylight and flash illumination are in balance. Now, you can vary the distance of the flash for whatever effect you wish to achieve.

For example, if you want to emphasize the sunlit part of the subject, the fill-in flash should be subordinate. You would therefore move back somewhat in order to subordinate the effect of the flash. The further back you move, with the same lens and shutter settings, the weaker will be the fill-in flash, while the illumination from daylight will remain a constant.

If you move in closer, you need not go very far before you will "burn up" the flash side of the subject unless you reduce the *f*/stop or, with flash bulbs, increase the shutter speed. If you do this, however, the sunless portion will be underexposed. Accordingly, if you wish to give prominence to the flash-illuminated side of the subject, you should move in only very slightly.

If you wish to have the subject enlarged on the film frame, you have a choice of moving in closer or using a telephoto lens. To move in closer, you can diminish the brilliance of the flash, so as not to tamper with the daylight lens setting, by covering the reflector with a thickness of handkerchief. One thickness is the equivalent of one *f*/stop. As a rule-of-thumb, by placing one thickness of handkerchief over the flash, you can move in one-third of the way from the original distance to the subject. A second approach to distance control is to carry less powerful flash bulbs for use under these circumstances.

With combustible flash bulbs, you can also manipulate distances by using faster shutter speeds. Of course, for the daylight portion of the exposure, the faster shutter speed is offset by a wider lens aperture. For the flash portion, however, the faster shutter speed gives you a lower guide number and hence enables you to move in closer. This will not work with electronic flash.