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Pacemaker

Crown GRAPHIC

and

Speed GRAPHIC

INSTRUCTION AND

REFERENCE MANUAL

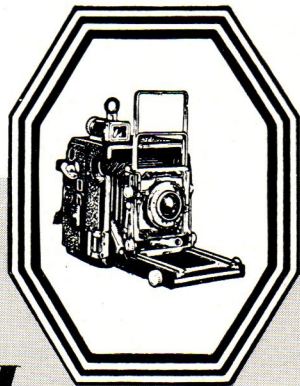
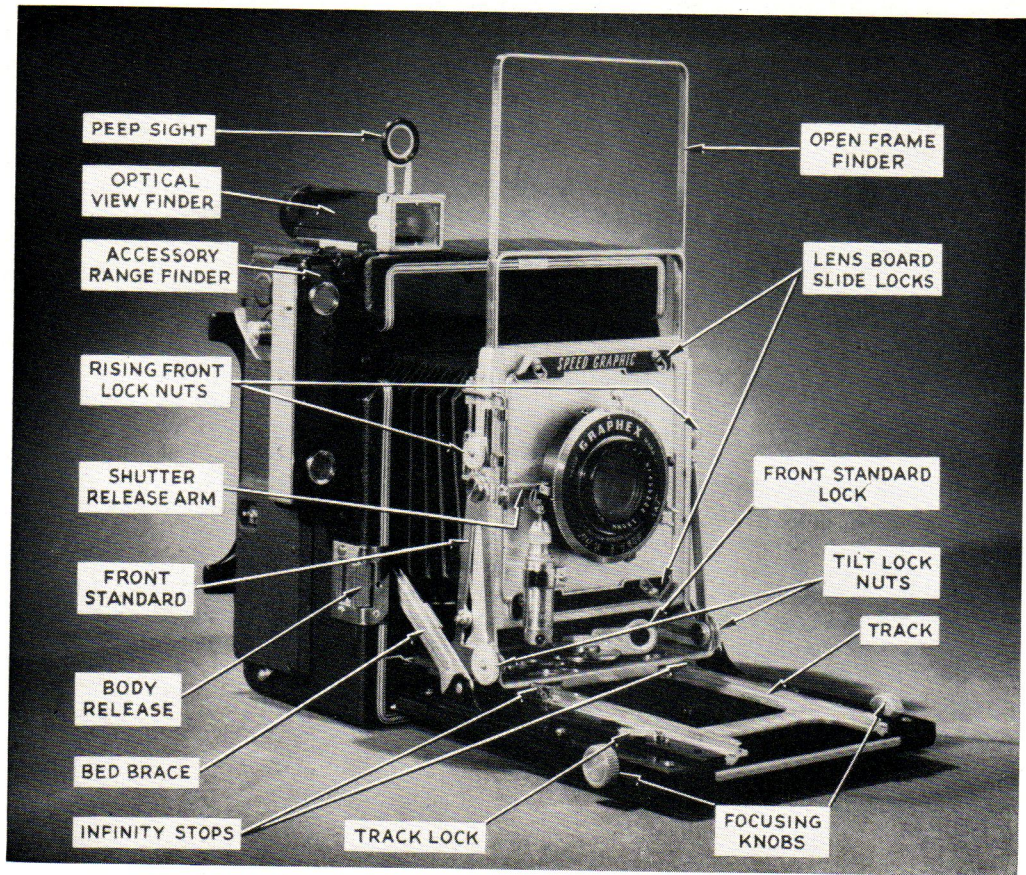


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PEEP SIGHT

OPTICAL VIEW FINDER

ACCESSORY RANGE FINDER

RISING FRONT LOCK NUTS

SHUTTER RELEASE ARM

FRONT STANDARD

BODY RELEASE

BED BRACE

INFINITY STOPS

TRACK LOCK

OPEN FRAME FINDER

LENS BOARD SLIDE LOCKS

FRONT STANDARD LOCK

TILT LOCK NUTS

TRACK

FOCUSING KNOBS



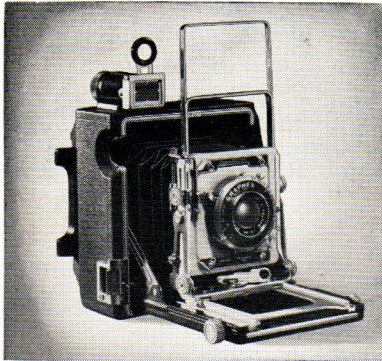


Fig. 1a Pacemaker Crown Graphic

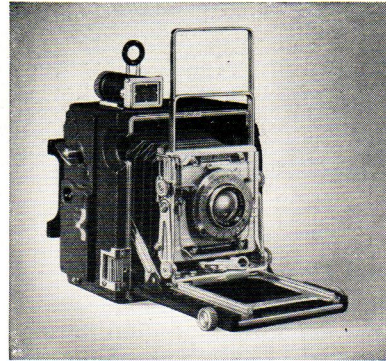


Fig. 1b Pacemaker Speed Graphic

INTRODUCTION

You have purchased a Pacemaker Graphic Camera, which has been designed, engineered and produced to give you lasting service. Every effort has been made to make this camera easy to use and yet most versatile; however, it is a precision instrument and we recommend that these instructions be carefully followed. We suggest you review this manual with your camera in hand. You will find your camera has many points of excellence and we hope that this booklet will help you to use it to the best advantage.

All six of the Pacemaker Graphic Cameras have the same general design, construction and operational features. The Crown Graphic (fig. 1a) and the Speed Graphic (fig. 1b) cameras are fundamentally the same, except for the focal plane shutter, which is found in only the Speed Graphic cameras. This booklet will cover both models as well as all three sizes of the cameras—"23", "34", and "45". These numbers are derived from the film sizes of $2\frac{1}{4} \times 3\frac{1}{4}$, $3\frac{1}{4} \times 4\frac{1}{4}$ and 4×5 accepted by the respective sizes of the Pacemaker Graphic Cameras.

NOTE: References to the right or left side of the camera refer to parts of the camera when viewed from the back or operating position, unless otherwise stated.

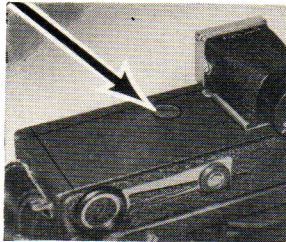


Fig. 2a

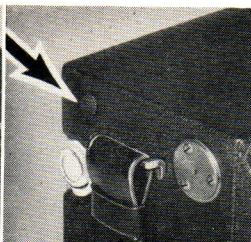


Fig. 2b

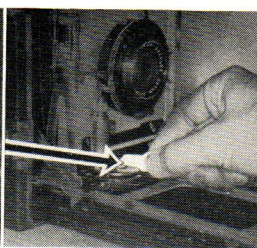


Fig. 3



Fig. 4

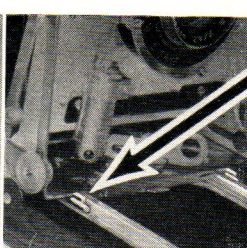


Fig. 5a

OPERATION

Opening and Closing the Camera: To open the camera, press the release button at the top center (fig. 2a) or top left side of the camera body (fig. 2b), and pull the bed down until the bed braces snap into the full locked position. Swing the front standard lock out straight then pull the front standard forward against both of the infinity stops. Be sure that both sides of the standard are firmly against the infinity stops. Turn the lock to the right or left to secure the front standard firmly. The lock does not have to be pressed all of the way back—simply turn until it tightens (fig. 3). The camera is then ready for focusing upon infinity, or nearby distances by the use of the two focusing knobs at the front of the camera.

To close the camera, *first move the track all of the way back into the camera body*. Next unlock the front standard by swinging the front standard lock forward. Move the entire front standard back into the camera body as far as possible and lock it in place. Depress the bed braces and close the front, making sure it locks (fig. 4). **CAUTION:** Always check to be sure that the sliding track is moved *all* of the way back into the camera body before closing the camera.

Infinity Stops: The infinity stops of the Pacemaker Graphic Cameras are actually reference points for focusing scale and rangefinder adjustments. They are hinged to allow the front standard to be located anywhere on the camera track. With the hinged infinity stop raised, a constant reference point is provided and the lens can be focused on infinity as well as all other distances by use of the focusing scale, the coupled rangefinder or the ground glass (fig. 5-a). The hinged infinity stops may be lowered to allow placing the front standard in any desired position as when using the double extension bellows (fig. 5-b).

The infinity stop position has been set so that a finer degree of adjustment is possible and focus can be checked without the necessity of shifting the front standard along the track.

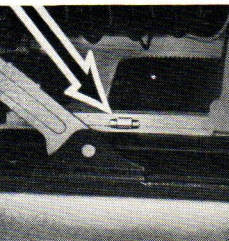


Fig. 5b



Fig. 6

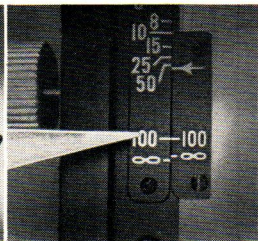


Fig. 7a

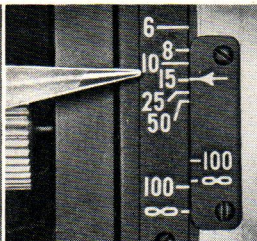


Fig. 7b

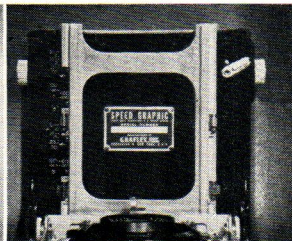


Fig. 8

Focusing: Focusing is accomplished by turning either of the knobs at the front of the camera bed (fig. 6). Use the focusing scale, the rangefinder or the ground glass for determining critical focus. Only ground glass focusing permits checking composition and depth of field simultaneously. This will be discussed more fully in succeeding sections of this manual.

The focusing scales on the Graphic Cameras are of the modified vernier-type with one part carried on the camera bed and the other on the sliding track. The distances indicated are measured from the film position (which is a constant non-moving reference point) to the subject. Each focusing scale has been calibrated especially for the lens supplied with it. If this scale is used with any other lens, even of the same make, speed and rated focal length, out of focus pictures may result. Each lens must have its own focusing scale, calibrated especially for it.

Focus on greater distances by matching the figures for the measured subject distance indicated on each scale (fig. 7-a). For shorter distances, use the pointer at the front of the scale and set opposite the figure representing the subject distance (fig. 7-b).

When several lenses are to be used interchangeably on the camera, additional stops and focusing scales can be fitted to the camera bed. Depending upon the combination of the focal length of the lenses selected, as many as two sets of scales can be fitted to the $2\frac{1}{4} \times 3\frac{1}{4}$ cameras, three sets to the $3\frac{1}{4} \times 4\frac{1}{4}$ and four sets to the 4×5 cameras (fig. 8). The proper scaling of a lens requires special equipment and is best done at one of the authorized Graflex Service Departments.

After the lens has been focused as desired, lock the sliding track in position by pulling the track lock out to the right (fig. 9). CAUTION: This must be unlocked before attempting to turn the focusing knob since otherwise, the bed mechanism is likely to be damaged.

Because of their compact design, Pacemaker Graphic "23" cameras have in place of the track lock a small adjustment screw which can be used to control tension on the sliding track. This screw has been adjusted at the factory to the normal tension and will permit movement of the track

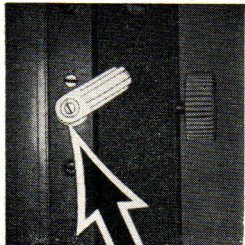


Fig. 9

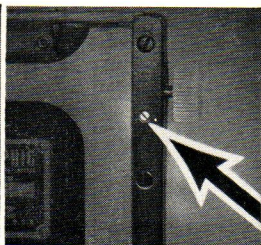


Fig. 10



Fig. 11a



Fig. 11b

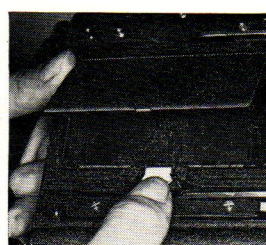


Fig. 12

for focusing without any further adjustments (fig. 10). If necessary, tension can be increased or decreased by turning the screw as required.

Rangefinders: Your camera may be fitted with a coupled rangefinder which will afford additional speed and convenience in focusing. By looking through the eyepiece at the rear of the rangefinder, it will be possible to see two distinct image areas, one lying within the other (fig. 11a). As the camera is focused, the rangefinder mechanism will be operated in such a way as to cause the centrally located image to move vertically. When the image in this area exactly coincides with the image in the larger area, the rangefinder will be in correct adjustment for that subject or any other subject matter at an equal distance from the camera (fig. 11b). Remember that if the rangefinder is to be used with any other lens, it must be readjusted for such lens.

Ground Glass: The ground glass allows you to check the composition and sharpness of the image exactly as it will appear on the film. The focusing hood can be opened for inspection of the ground glass by pressing in on the small hood release latch at the bottom center (fig. 12). With the focusing hood open, set the shutter or shutters of the camera on Time and open. (See section on shutter operation.) Turn the focusing knob on the front of the camera until the image seen on the ground glass is sharp. By closing the diaphragm, you will be able to determine the area of sharpness or depth of field which will be included at a given diaphragm opening. By removing the 4-sided all-metal viewing hood, you will be able to examine the corners and margins of the ground glass area, either with or without a magnifier for critical composition and sharpness of focus. To remove the hood for close examination of the corners of the ground glass, press outward on the hood release clip at either side and lift the hood off (fig. 13). Remember to close and cock the shutter being used to make the exposure before fitting the film attachment to the camera and withdrawing the slide. To close the viewing hood, press inward on the side wings (fig. 14a), pull lower flap up, hold it flat

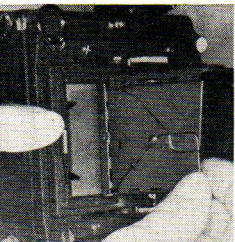


Fig. 13

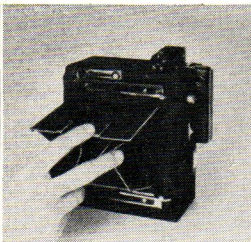


Fig. 14a

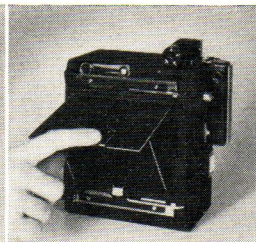


Fig. 14b



Fig. 15

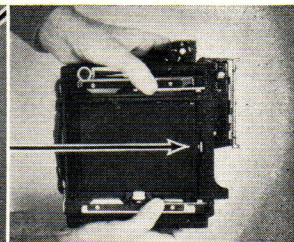


Fig. 16

and pull the top down to lock (fig. 14b). In the event that the top door and the attached wings spring free, fold the lower flap all of the way up, swing the wings in against the top door and pull it down to latch. Upon release, the hood will then swing open properly.

Camera Backs: Your camera may be fitted with any one of three different backs, the Graflok Back, the Graflex Back, or the Graphic Back. All of the Pacemaker Graphic Camera Backs allow ground glass focusing through the panel at the back of the camera. This is the only type of focusing that permits simultaneous checking of the composition, sharpness and depth of field exactly as it will be reproduced on the film.

The **Graflok Back** accepts only Graphic attachments with the raised lock rib light trap. The spring loaded focusing panel frame pulls back to accept all Graphic sheet film holders and film pack adapters (fig. 15) and is instantly removable to permit the attachment of the Graphic roll film holder and Graflarger Back by means of the Graflok slide locks.

Remove the focusing panel of the Graflok Back by depressing the two knurled chrome-plated supporting arms and slide the panel slightly to the right where it may be lifted off (fig. 16). To reattach the focusing panel, fit it to the back of the camera and slide to the left, until the arms catch beneath the hooks at the top and bottom (fig. 17).

Graphic Grafmatic film holders and film pack adapters can be used with the focusing panel attached or removed. Roll holders and Graflarger Backs require removal of the panel and are held in place by means of the slide locks which should be moved to the right to open and to the left to lock. Remember to move both top and bottom slide locks (fig. 18).

The **Graflex Back** accepts only Graflex film holders, film pack adapters, film magazines and Graflex roll holders. Graflex attachments have light trap slots cut into the flat sides of the holder at the handle end. The focusing panel can be removed by sliding the slide lock to the right, thereby per-

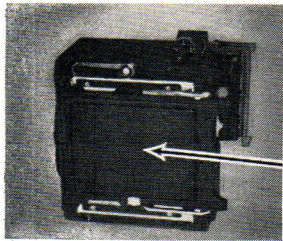


Fig. 17

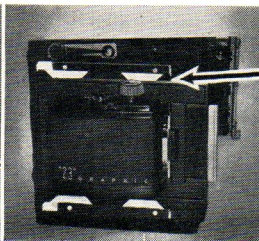


Fig. 18

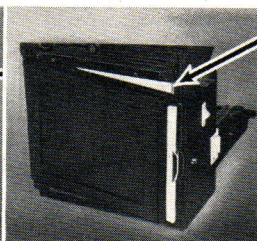


Fig. 19

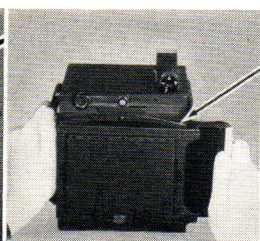


Fig. 20



Fig. 21

mitting attachment of the regular Graflex film holders and other accessories which will be held securely in place by the slide locks (fig. 19).

The **Graphic Back** accepts only Graphic film holders and Graphic film pack adapters, which have the raised lock rib construction and which slide into the back beneath the focusing panel (fig. 20). Specific instructions for removal of the focusing panel for attaching thicker accessories such as the roll holder and the Graflarger back are provided with these accessories.

Viewfinders: Composition of the subject matter may be accomplished by any one of three different methods with the Graphic cameras—ground glass, optical viewfinder and open frame viewfinders. Ground glass focusing has already been discussed.

Optical and open frame viewfinders in general should not be relied upon to give a critical indication of the amount of subject matter to be secured on the negative since the area that will be seen, depends largely upon the relative distance and position between the eye and the viewfinder. This factor which varies considerably among individuals is also greatly influenced by whether or not the user wears glasses. The optical viewfinder is often preferred in order to define the limits of the field and it may be fitted with masks of different sizes to correspond with various focal lengths of lenses and film sizes. Many photographers use the open frame finder for all types of photography, rather than merely for action photography. Both finders are used to best advantage when the eye is held as close as possible to the rear element.

Both finders include parallax adjustment settings, since the lens and viewfinder are not located on the same plane. This adjustment for parallax must be made so that the same field seen through the viewfinder will be recorded on the film. This is especially important at close distances. Pictures of groups of people with the tops of their heads missing are examples of failure to correct for this condition.

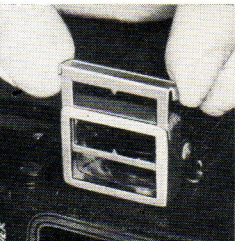


Fig. 22

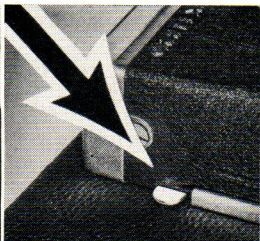


Fig. 23



Fig. 24

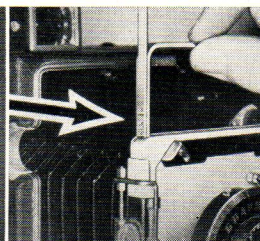


Fig. 25

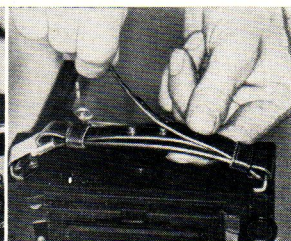


Fig. 26

For parallax adjustment of the tubular viewfinder, set the eyepiece dial by placing the number, which most closely corresponds to the distance from the subject, opposite the line along the top center of the viewfinder. As shown, the dial is set for 15' (fig. 21). Other distances include 6', 8' and infinity. Interchangeable masks at the front indicate the field of view with various focal length lenses and negative sizes (fig. 22).

The following table indicates the various masks which are available for different focal length lenses and negative sizes: A special finder is provided for wide angle lenses, since the optical system of the standard finder does not include a wide enough field. When ordering the wide angle viewfinder from your Graflex dealer, specify film size and focal length of lens used. See section on wide angle lenses for details.

TABLE SHOWING STANDARD MASKS FOR VARIOUS FILM SIZES AND FOCAL LENGTH LENSES

2 1/4 x 3 1/4 Lens	3 1/4 x 4 1/4 Lens	4 x 5 Lens	Mask No.	2 1/4 x 2 1/4 Lens	Mask No.
3 1/4" - 3 7/8"	4 1/2" - 4 3/4"	5" - 5 7/8"	4	3 1/2" - 4 1/2"	12
3 5/16" - 4 1/2"	4 13/16" - 5 1/4"	5 5/16" - 6 3/8"	3	9 1/16" - 11 7/8"	13
4 9/16" - 5"	5 5/16" - 6"	6 7/16" - 6 3/8"	2	4 7/16" - 5"	14
5 1/16" - 6"	6 1/16" - 7"	6 1 1/16" - 8 1/2"	9	5 1/16" - 6"	15
6 1/16" - 7 1/2"	7 1/16" - 8"	8 8/16" - 9 1/2"	10	6 1/16" - 7 1/2"	17
7 7/16" - 7 3/4"	8 1/16" - 8 1/2"	9 9/16" - 10 1/2"	11		
7 13/16" - 9 1/2"	8 9/16" - 12"	10 10/16" - 13 1/2"	8		
9 7/16" - 11 7/8"	12 1/16" - 13 7/8"	13 3/16" - 15"	7		
11 15/16" - 13"	13 15/16" - 16"	15 15/16" - 16 7/8"	6		
	16 1/16" - 20"	16 15/16" - 20"	5		

Should it be desired to remove the optical viewfinder from the top of the camera, depress the flat spring at the left front of the finder base and slide the entire assembly forward out of its mounting shoe (fig. 23).

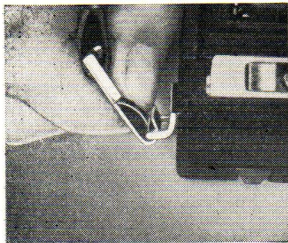


Fig. 27

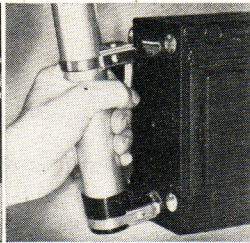


Fig. 28

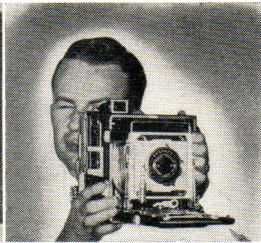


Fig. 29

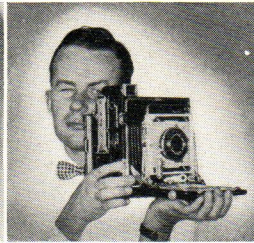


Fig. 30

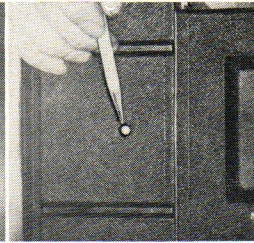


Fig. 31

The open finder consists of two parts—the rear peepsight and the front open frame part of the finder. Swing the rear peepsight to the vertical position and raise the front open frame of the finder to its full height (fig. 24). It will be found easier to pull the lower section upward first, thus providing access to the knurled finger grips on the upper section, which then can be pulled upward as far as possible. The finder is fitted with click stops, indicating parallax adjustment settings for 8', 15' and infinity. To adjust for parallax, move the lower cross member up or down until the desired setting is obtained as indicated by the markings on the right side of the finder (fig. 25).

This finder is usable with normal and long focal length lenses, but is not recommended for telephoto or wide angle lenses. When cleaning the front lens of the finder use a soft cloth. Do *not* scrub. Do *not* use lens cleaner.

Adjusting the Handle: The adjustable handle of the Pacemaker Graphic Camera has been designed to custom fit your hand. If you desire a good, tight handle, merely take up on the snap buttons and conversely to loosen the handle, extend it and resnap the buttons (fig. 26).

To unhook the handle in order to provide access to the tripod socket in the side of the camera, press inward on the spring or leaf at the base of the handle and slip the entire clip off the lug at the bottom of the camera (fig. 27). The handle can also be completely removed for attachment of the Graflite battery case to the left side of the camera (fig. 28).

Holding the Camera: There are two convenient methods of holding the camera. One method is to slip the hand underneath the handle strap with the fingers curving around the edge of the camera body (fig. 29). The other method is to place the palm of the hand beneath the bed with the fingers curved over the front of the bed, pulling the camera back firmly (fig. 30). In either position, be sure to hold the camera so that the release can be squeezed back easily, to avoid camera movement. Be sure to brace your arms against your body to prevent movement and increase the sharpness of your negatives, especially those exposed at slower shutter speeds.

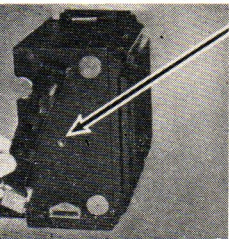


Fig. 32

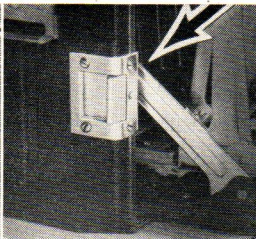


Fig. 33

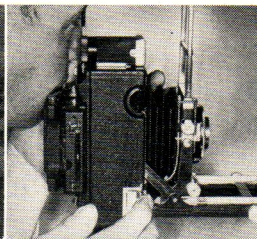


Fig. 34

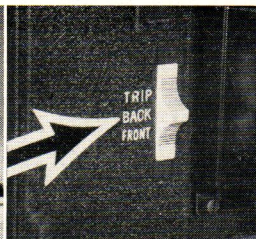


Fig. 35

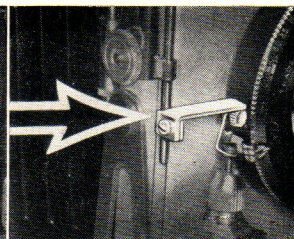


Fig. 36

Tripod Socket: There are two tripod sockets in each Pacemaker Graphic Camera. The tripod socket in the base permits attachment to any standard tripod (fig. 31). The tripod socket in the side of the camera is used when making vertical pictures and is made accessible when the handle has been unhooked and lifted upward (fig. 32).

Body Release Operation: All of the Pacemaker Graphic Cameras have a built-in body release located at the lower right corner at the front of the camera (fig. 33). This feature and its convenient location make it possible to trip the shutter by squeezing the release lever with the forefinger while holding the camera firmly with both hands (fig. 34).

The Speed Graphic Cameras have a shutter selector to allow selective tripping of either the front or focal plane shutter from the same release point. When the shutter selector slide is in the central position opposite the word "BACK" (fig. 35), the focal plane shutter will be tripped when the body release is pressed. When the slide is all the way down opposite the word "FRONT," the front shutter will be tripped when the body release is pressed. To push the shutter selector up press in on the lower half and push up. Conversely to lower press in on the upper section and push down.

The shutter at the front of the camera is tripped when pressure on the body release is transmitted by the cable, actuating the shutter release arm. Extra lensboards and shutter release arm kits are available for standard lens and shutter combinations. The release arms are held in place on the plunger rod by means of a small set screw (fig. 36) and can quickly be positioned in such a way as to insure easy and accurate tripping of the front shutter. Do not position these arms down too far, as then the shutter will not operate properly for Time or Bulb exposures.

Focal Plane Shutters: All Pacemaker Graphic Cameras are normally equipped with a between-the-lens front shutter. An additional feature of the Speed Graphic Camera is the focal plane shutter at the back of the camera. This shutter has a wide selection of accurate governor controlled speeds, and a higher speed range than between-the-lens shutters. It also allows the use of telephoto or other lenses which may not be mounted in shutters.

It is very difficult to make a recommendation as to which shutter should be used at any given time. Focal plane shutters are especially efficient at the higher speeds, and the Graflex focal plane

shutters are unexcelled for high-speed photography. The front shutter is necessary for speeds slower than $1/30$ th of a second and for synchronization with standard flash lamps. Flash lamps having a long effective peak duration and designated by the letters FP are required for focal plane shutter synchronization. Many photographers prefer to use the front shutter through its entire range of speeds while others find it convenient to use the focal plane shutter for all speeds or for speeds of $1/100$ th second and faster. The choice of which shutter to use must remain a matter of personal preference at the option of the individual photographer.

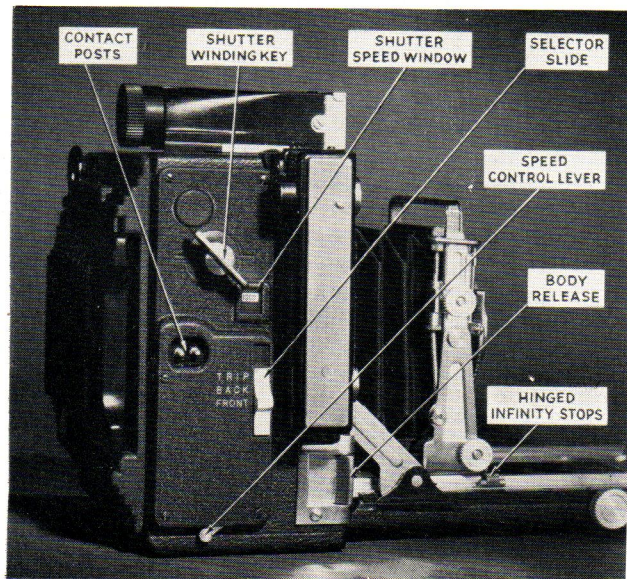


Illustration of
Focal Plane Shutter Controls

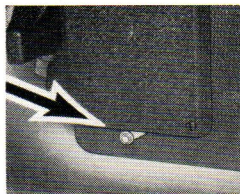


Fig. 37

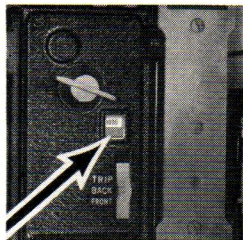


Fig. 38

The focal plane shutter of the Pacemaker Speed Graphic Cameras, consists essentially of a durable, light-tight curtain having four rectangular openings or slits of different widths. The ends of the curtain are wound on rollers at the top and bottom of the camera and in making the exposure, the selected opening passes in front of the film as it moves downward from the top to the spring-loaded bottom roller. The exposure time is governed by the width of the opening selected and the speed with which it passes across the film.

Through the use of a governor, any one of three apertures in the curtain can be made to pass across the film at either of two different rates of speed, thus providing a total of six different instantaneous shutter speeds. The fourth or open position is used for focusing and making of time exposures. The governor which is engaged or disengaged by the shutter speed control lever at the bottom of the camera (fig. 37) assures smooth and even travel of the shutter curtain across the opening at the back of the camera. The speeds produced by this shutter may be read directly in the shutter speed window (fig. 38).

Shutter speeds may be changed by moving the speed control lever for the governor and/or turning the large winding key or by tripping the shutter allowing it to run down to a slower speed. With the speed control lever moved toward the back of the camera, the mask in the shutter speed window will be raised to expose the following figures as the shutter is wound: 50, 250, 1000. With the lever moved forward to engage the governor, the following figures will be seen as the shutter is wound: 30, 120, 500. These numbers indicate the exposure time in terms of fractional parts of a second. The accuracy of the shutter speeds thus produced is within the recommendations of the American Standards Association.

Before making an exposure with the focal plane shutter, it will be necessary to open the front shutter as indicated in the instructions for Time exposure for the particular shutter fitted to the camera. The focal plane or back shutter may be released for making exposures by either

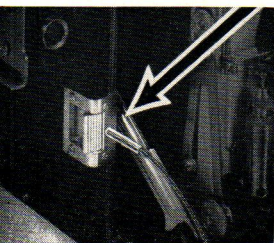


Fig. 39

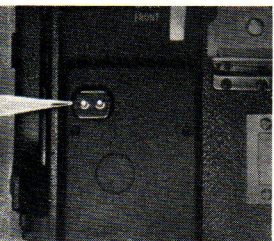


Fig. 40

of the following two methods. When the shutter selector slide is in the central position with the raised portion opposite the word BACK, tripping the body release will allow the focal plane shutter to run down from one setting to the next, producing the shutter speed indicated in the shutter speed window. The shutter may also be released by pressing inward and upward on the bottom of the shutter selector slide so as to prevent firing a flash lamp if it is connected to the focal plane synchronization outlet. Be sure that this slide is opposite the word BACK after the curtain has been allowed to run down to the desired setting.

To maintain peak efficiency of the focal plane shutter, it is advisable to allow the curtain to run down to the open (O) or fully closed position before putting the camera away.

Caution: Because one of the openings in the shutter curtain passes in front of the film holder each time the shutter is moved (either in winding it or releasing it), the film must be protected from accidental exposure by placing the slide in the film holder or closing the front shutter.

Time Exposures: The Graflex focal plane shutter may also be used for making Time exposures. Move the speed control lever toward the back of the camera to disengage the governor, then wind or release the focal plane shutter until the letter T appears in the shutter speed window. When making Time exposures, it is preferable to release the shutter by means of a heavy-duty metal cable release (Kodak Metal or Effen PAC are very satisfactory) threaded into the cable release socket of the body release (fig. 39). Press the release to allow the focal plane shutter to run down to the full open position, showing the letter O in the shutter speed window. Press the release again to close the shutter at the end of the exposure time.

Focal Plane Shutter Flash Synchronization: The focal plane shutters of all of the Pacemaker Speed Graphic Cameras incorporate built-in-flash synchronization. The synchronizer connection is located at the left side of the shutter housing below the winding key (fig. 40).

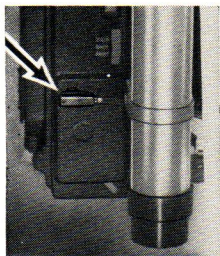


Fig. 41

Attach the Graflite battery case to the camera. Plug the Graflite cord into the synchronizer outlet on the camera and the SHUTTER outlet in the battery case (fig. 41).

Since the length of curtain travel is different for each size of Pacemaker Speed Graphic Camera, the effective flash peak requirements vary. Hence, instructions for flash synchronization with the Speed Graphic "23" Cameras vary slightly from those for the larger Speed Graphic "34" and "45" Cameras.

In the Speed Graphic "23" Cameras, the shutter speeds of 1/1000th, 1/500th, and 1/250th may be synchronized with the #31 and #2A flash lamps which have the necessary long peak of flash to insure even exposure of the entire negative at these speeds while the curtain opening passes from the top to the bottom across the film. We do not recommend that flash lamps be used with any of the other instantaneous speeds and these are marked in red as a reminder that they are not to be used for flash synchronization. If desired, the bayonet base #6 and FP-26 flash lamps may be used at the top shutter speed only.

For Speed Graphic "34" and "45" Cameras, only the #31 and #2A flash lamps will allow even exposure while the curtain opening passes across the film. They may be satisfactorily synchronized at speeds of 1/1000th and 1/250th of a second. Because of the mechanical principles of the shutter and minor variations in flash lamps, synchronization cannot be obtained at other instantaneous speeds. Speeds marked in red serve as a reminder that they are not to be used for flash synchronization.

All types of flash lamps as well as high-speed units may be used with the Time exposure setting by means of the built-in contacts. The curtain should be set for the making of a Time exposure, previously outlined in this booklet, and the lamp will be fired as the curtain reaches the full open position. Thus the Graflex focal plane shutter will not fire a flash lamp when the shutter curtain is wound or when the shutter is released with the shutter selector slide, since a secondary switch connected to the body release makes it necessary to release the focal plane shutter by the body release in order to fire the flash lamp.

NOTE: If the focal plane shutter has not been used frequently, the focal plane synchronizer contacts may become oxidized. To insure good contacts for flash, wind and release the curtain several times.

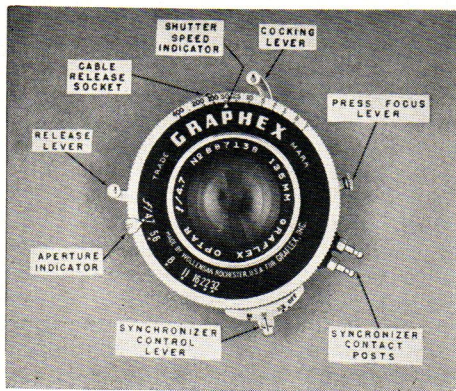


Fig. 42 Fully Synchronized Graphex Shutter

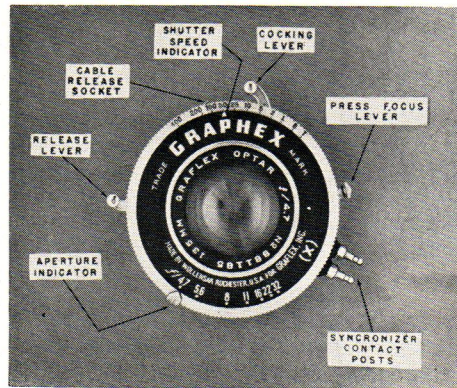


Fig. 43 Graphex (X) Shutter

Graphex Shutters: The Graphex Shutters are precision built, high-speed between-the-lens (front) shutters designed for accurate control of exposure over a wide range of speeds. The No. 1 and No. 2 shutters have a speed range of from one second to 1/400th, whereas the larger No. 3 shutters have a speed range of from one second to 1/200th. All have Time and Bulb settings. Graphex fully synchronized shutters have built in contacts with an adjustable delay mechanism for firing Class F, Class M flash lamps and the Class X high speed electronic flash units (fig. 42). Graphex (X) shutters have built in contacts which provide for a zero delay and are synchronized only for firing the Class X high speed electronic flash units (fig. 43). All Graphic shutters may be solenoid operated for synchronizing Type M lamps at all speeds.

Operation: The numbers on the knurled rim or collar correspond to instantaneous exposures in terms of fractions of a second. Turn the outer knurled ring until the desired shutter speed is opposite the pointer on the face of the shutter. Additional pressure will be required in turning to 1/400 to overcome resistance of the booster spring. The shutter speed setting is more easily changed before cocking the shutter. Settings between marked speeds will not give intermediate exposure times.

If you have a Speed Graphic, be sure that the focal plane shutter is open. If you are using flash synchronization, see instructions concerning synchronization with the Graphex Shutter before cocking the shutter. Use a film exposure guide or meter for determining the correct diaphragm opening to be used at any given shutter speed. Set the shutter speed control ring and the diaphragm pointer at the base or left side of the shutter. Move the cocking lever at the top of the shutter clockwise to the right. A red dot will be uncovered indicating that the shutter has been cocked. Be sure the shutter selector slide of the Speed Graphic is set at FRONT. Hold the camera steady and carefully squeeze the body release to make the exposure. If you have a flash synchronizer attached to the camera and a solenoid synchronized with the shutter, you must release the shutter by pressing the button on the battery case.

For convenience in opening the shutter for ground glass focusing, the Press Focus Lever at the right side of the shutter may be used. Cock the shutter in the normal way and depress the Press Focus Lever until the shutter is opened. To close the blades again, move the Press Focus Lever outward and upward, the shutter may then be tripped in the normal manner. Do not trip it to close the blades.

The Graphex Shutters must be cocked for Time and Bulb as well as for instantaneous exposure. The Time exposure setting is used when exposures of fairly long duration are to be made. Set the shutter on T and cock it. Press the release lever once to open the shutter and again to close it. Do not recock the shutter when set on T after the blades have been opened.

For relatively short exposure times, the Bulb (B) setting should be used. In this case, set the shutter speed control ring on B and cock. The shutter will open and remain open as long as the shutter release lever is held down.

A cable release attached to either the body release or directly to the Graphex Shutter is recommended for Time and Bulb exposures. A sturdy tripod or other firm support should always be used for Time and Bulb as well as instantaneous exposures slower than 1/50th of a second.

Flash Synchronization with Graphex Shutters. All Graphex Shutters can be solenoid operated. For full details concerning such use see your flash synchronizer manual. When using a solenoid with a Graphex Shutter with built-in synchronization mechanism, BE SURE to set the shutter synchronizer control lever to the OFF position; otherwise, a double delay will be produced, resulting in poor or virtually no exposure. Some Graphex Shutters do not require a solenoid for synchronization purposes.

Graphex Shutters with Full Synchronization. A special built-in mechanism allows synchronization with the flash lamp without the use of an external tripper. To set the built-in gear train which will produce synchronization for the various types of flash lamps, move the synchronizer control lever to the position corresponding to the type of lamp being used, *before* cocking the shutter. This adjusts the delay of the operation of the shutter to correspond with the correct ignition lag of the lamp being used. The following table indicates some of the more widely used flash lamps:

Class X	high speed electronic units not tripped by a relay or solenoid	
Class F (5ms) gas-filled	SM, SF	bayonet base
Class M (20ms) wire filled	No. 5, Press 25	bayonet base
	No. 11, No. 22, No. 2, Press 40, etc.	screw base

Due to the characteristic build-up in light intensity produced by the wire filled lamps, (Class M) special provision has been made to utilize the maximum light output of the lamp at the shutter speed selected. For this reason, two M settings have been provided to insure full exposure. The black M setting should be used at the faster shutter speeds which are marked in black, and red M settings should be used at the slower shutter speeds which are marked in red. For gas-filled Class F (SM or SF) lamps or high-speed electronic flash not incorporating a delay or relay, use the F-X setting. F is marked in red indicating that only the red-marked shutter speeds should be used for this type lamp. Set the control lever at OFF if flash is not being used.

With the connecting cord on the two contact posts at the right side of the shutter and the plug at the other end attached to the SHUTTER (series) outlet of the battery case, correct synchronization should be obtained. Since the electrical circuit is closed within the shutter itself, the body release should be used to trip the shutter and no attempt should be made to operate it by using the button on the battery case.

Electronic Flash: There are two basic types of electronic flash units. One has a zero delay and is known as class X. This type unit is fired without delay as soon as the circuit is closed and should be used with the F-X setting of the fully synchronized shutter. The other type of electronic unit is tripped by means of a built-in electrical, mechanical relay. This should be used in conjunction with a solenoid which may be used on any of the Graphex Shutters. It is not recommended that such units be used with a built-in synchronizer delay mechanism, since this mechanism was intended to fire flash lamps only. The contact may not be long enough to hold the relay down and in any event, the relay may cause an arcing within the shutter as the contact points open. These points were merely intended to close an electrical circuit and not to open it and therefore frequent servicing will be required if a relay is connected with them.

Flash Synchronization with the Graphex (X) Shutter: The Graphex (X) Shutter may be identified by the letter X on the faceplate near the contact posts. It's built-in synchronization mechanism was designed for firing Class X high speed electronic flash lamps having a zero delay. Synchronization with the standard Class M flash lamps is effected by means of an external solenoid which trips the shutter when the button on the battery case is pressed. This type shutter permits additional versatility in flash lamp positioning, since the bulb can be fired from a position off the camera with a suitable connecting cord attached to the solenoid for tripping the shutter. Further details concerning this type of synchronization will be found in the Graflite flash manual.

The two contact posts on the rim of the shutter are provided for the connecting cord of the X type high-speed electronic flash unit. Should there be any questions regarding wiring or circuit details for connecting an X type shutter to a high-speed unit, the manufacturer of the high-speed unit should be consulted. If a solenoid is attached to the shutter, the high-speed flash units fired by means of a mechanical relay may be used, providing the built-in delay of the solenoid corresponds to the delay mechanism of the flash unit relay. As in all cases, the instructions provided by the manufacturer of the electronic flash unit should be followed.

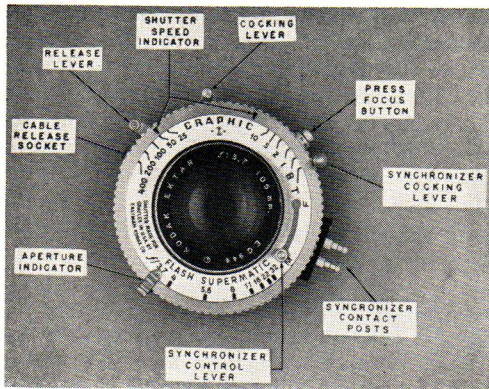


Fig. 44 Flash Supermatic Shutter

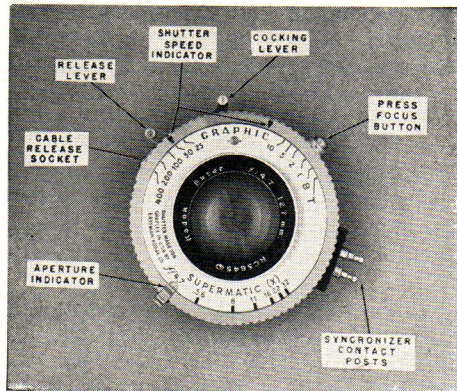


Fig. 45 Supermatic (X) Shutter

Supermatic Shutters: Supermatic Shutters are rim-set shutters having a wide range of speeds which provide for an accurate control of exposure. The No. 1 and No. 2 shutters have a speed range of from one second to 1/400th, whereas the larger No. 3 shutters have a speed of from one second to 1/200th. Both have Time and Bulb settings.

The Flash Supermatic Shutter has built-in contacts with an adjustable synchronizer delay mechanism for firing Class F, Class M flash lamps, and the Class X high speed electronic flash units (fig. 44). The Supermatic (X) Shutter has built-in contacts which provide for zero delay and is synchronized only for firing the Class X high speed electronic flash units (fig. 45).

Operation: Turn the outer knurled ring until the pointer is opposite the shutter speed number for the exposure required. Additional pressure may be required in turning to 1/400th to overcome resistance of a booster spring. The shutter speed setting is more easily changed before cocking the shutter. Settings between the marked speeds will not give intermediate exposure times. Set the diaphragm pointer at the base or left side of the shutter using a film exposure guide or a meter for determining the correct diaphragm opening to be used at any given shutter speed. Move the cocking lever at the top of the shutter to the right. It is necessary to set the focal plane shutter to the 0 position when using the front shutter for making exposures. Be sure the shutter selector slide of the Speed Graphic is set at FRONT. Hold the camera steady and carefully press the shutter or body release to make the exposure.

For convenience in opening the shutter for ground glass focusing, the press focus button at the top right side of the shutter may be used. Cock the shutter in the normal manner and *hold this button down* while pressing downward on the shutter release lever to open the shutter blades. The shutter blades may be closed again by merely recocking the shutter, automatically setting it for tripping in the normal manner.

The Supermatic Shutters must be cocked for Time and Bulb as well as for instantaneous exposures. To make a Time exposure, set the shutter on T and cock it. Press the release lever once to open the shutter and again to close it. This setting is used when exposures of fairly long duration are to be made. For relatively short exposure times, the B setting should be used. In this case, set the shutter speed control ring on B and cock. The shutter blades will open and remain open as long as pressure is maintained on the release. A cable release attached either to the body release or directly to the cable release socket of the shutter is recommended for Time and Bulb exposures. If the cable release is to be attached directly to the shutter, it may be necessary to remove the lensboard and turn it 180° so that the cable release is located on the opposite side. This will avoid interference with the body release plunger. A sturdy tripod or other firm support should always be used for Time and Bulb as well as instantaneous exposures slower than 1/50th of a second.

Flash Synchronization with Flash Supermatic Shutters: Set the synchronizer adjustment button on the face of the shutter to the position corresponding to the type of lamp being used. To do this lift the button slightly and slide to position. The following table indicates the types of some of the more widely used flash lamps:

Type X	high speed electronic flash units not tripped by relay or solenoid	
Type F (5 ms) gas filled	SM, SF	bayonet base
Type M (20ms) wire filled	No. 5, Press 25	bayonet base
	No. 11, No. 22, No. 2, Press 40, etc.	screw base

After the shutter has been cocked in the normal manner, move the synchronizer cocking lever at the right side of the shutter down as far as possible. Attach the connecting cord to the two contact posts at the right side or base of the shutter and attach the other end to the *shutter* (series) outlet of the battery case. Trip the shutter by the body release, but do not attempt to operate it by using the button on the battery case. Satisfactory synchronization may not be obtained if a solenoid is used.

Electronic Flash: There are two basic types of electronic flash units. One has a zero delay and is known as the class X. This means that the tube is fired without delay as soon as the circuit is closed. These tubes may be used satisfactorily on the Supermatic (X) and Flash Supermatic Shutters, but in the latter instance the synchronizer cocking lever must not be pulled down after the shutter is cocked. Since this shutter has a built-in resistor, some flash units may require modification by the manufacturer to insure proper firing of the flash tube. If necessary, the resistor can be shorted out by grounding the upper contact post to the shutter housing. This can best be accomplished by fitting a metal strip to the shutter case so that it touches the post and is held in place by the small screw that holds the insulating block in position. To accomplish this take a thin piece of brass about $\frac{1}{8}$ " wide and $\frac{1}{4}$ " long and drill a hole through it near one end using a No. 52 twist drill. Remove the top terminal block screw and slip the piece of brass over it, and replace it, letting the brass strip bear against the top prong. This connection must be broken when conventional flash lamps are being used.

The other type of electronic unit is tripped by means of a built-in electrical mechanical relay. This should be used in conjunction with a solenoid, which may be used on any Supermatic (X) Shutter. It is *NOT* recommended that such units be used with the built-in synchronizer delay mechanism of the Flash Supermatic Shutter, since this mechanism was intended to fire flash lamps only. The

contact may not be long enough to hold the relay down and in any event, the relay may cause an arcing within the shutter as the contact points are open. They were designed to close an electrical circuit, but not *open* it and consequently frequent servicing will be required if a relay is connected with them.

Flash Synchronization with the Supermatic (X) Shutters: This type of shutter may be identified by the letter (X) on the faceplate following the word Supermatic. The built-in synchronization mechanism of this shutter was designed to fire the electronic flash units having a zero delay if the flash unit is connected to the contact posts on the shutter. When using the standard type M flash lamps, a solenoid should be employed to obtain synchronization. In many instances, the solenoid provides for greater flexibility in the manipulation of the flash lamp, since the shutter may be tripped and the flash lamp fired from a position away from the camera through the use of a suitable extension cord. Further details concerning solenoid hookups will be found in the Graflite instruction manual.

If a high speed electronic flash unit having a mechanical relay is being used, a solenoid should be used for establishing the delay needed for synchronization.

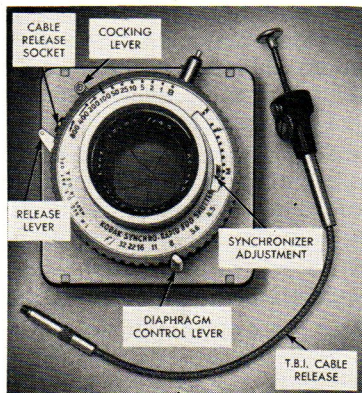


Fig. 46 Synchro Rapid 800 Shutter

The Kodak Synchro Rapid 800 Shutter: The 800 shutter is a rim-set, cocking shutter which has a range of ten speeds from one to 1/800 second including Bulb (B) for time exposures. Built-in synchronization is provided for type F, type M and high speed electronic flash units having zero delay (fig. 46).

The shutter may be tripped by means of the built in body release or the special T.B.I. cable release. The cable release should be used for making Time exposures or for tripping the shutter at the slower speeds to avoid camera movement.

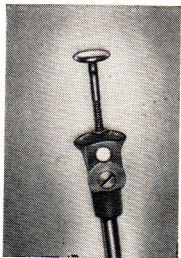


Fig. 47

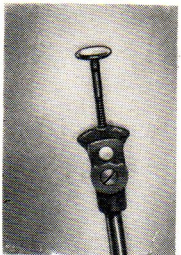


Fig. 48

Operation: To set the appropriate shutter speed for a given diaphragm opening, turn the outer knurled ring until the index marker is opposite the shutter speed selected. A little more effort is needed to set the speed index opposite the 800 dot. It is easier to set the shutter speed before cocking the shutter. Setting between the marked speeds will not give intermediate speeds. To cock the shutter, move the cocking lever to the right.

The size of the lens opening (f-setting) which has been determined for the selected shutter speed, according to an exposure guide or meter, can be adjusted by moving the diaphragm control lever across the f-number scale located on the lower section of the shutter face. A duplicate scale with pointer is provided on the top rim of the shutter and can be seen from above for greater convenience.

The shutter may be released for making the exposure by pressing the body release or with the cable release supplied. The T.B.I. cable release is supplied with the 800 shutter for convenience in making time exposures and for holding the shutter open for ground glass focusing. To attach the T.B.I. cable release, remove the cable release screw from the rim of the shutter and screw the cable release into the socket. The small wheel on the side of the cable release head should be turned so that the knurled section is up under the small button (fig. 47) so that the plunger can be pressed in the normal manner to trip the shutter at the instantaneous speeds.

For bulb or time exposures, set the shutter speed index at B and cock the shutter in the normal manner. The knurled wheel on the cable release should be turned so that the notch in the edge is directly below the small button (fig. 48). When the plunger is pressed, it will stay down, holding the shutter blades open until the small button on the cable release head is pressed.

The cable release should be used when making pictures at speeds slower than 1/50 second and the camera should be on a firm support such as a tripod.

Flash Synchronization: The 800 shutter has built-in contacts with adjustable timing delay for providing accurately controlled flash synchronization with class F (gas-filled), Class M (wire-filled) lamps and X type high speed electronic flash units having a zero delay. It is not intended to be solenoid operated for synchronization purposes.

Attach the standard ASA bayonet connecting cord to the bayonet post on the shutter rim. When using class F lamps, set the selector on F. Effective synchronization can be obtained with this type lamp at all speeds up to and including 1/400 second. Set the selector at M for the wire-filled flash lamps. This setting provides a 20 millisecond delay which is the time required for the lamp to reach its most effective light output.

In addition to having specified settings for the three classes of flash lamps, the scale is marked off so that the time lag of the shutter contacts can be adjusted to a finer degree for special purposes. With shutter speeds slower than 1/100 second using the type M lamps, fuller exposure will result if the selector is set one or two dots toward the F setting. With the selector set to the end of the scale, two dots beyond M, the synchronization is set for the longest delay. Use this setting with Type M lamps at 1/800 speed.

If a B-C (Battery Capacitor) unit is being used for a power supply, it is likely that the flash peak will occur earlier than with regular batteries. In such instances, the selector should be moved in the direction of the X setting, a dot or two from the normal setting.

Caution: *DO NOT* insert flash lamp in reflector when the shutter is open as the lamp will fire and may cause a burn.

Electronic Flash: The X setting is provided for high speed electronic flash units having no time lag. It is merely necessary to set the selector on X and connect the cord from the post to the lamp. Tripping the shutter in the normal manner will fire the flash unit in synchronization with the shutter. This shutter is not made for use with electronic flash units which are flashed by means of heavy duty relays or solenoids. Such units may completely destroy the shutter contacts.

Front Movements: Your Pacemaker Graphic camera is fitted with a heavy duty-U-shaped front standard frame which rides on the sliding track and holds the lensboard and lens. Provision has been built into this front standard to allow vertical, lateral and tilting movements of the lens. These movements permit centering the image on the film within certain limits, without swinging or tilting the camera as might otherwise be necessary with resultant unwanted convergence of vertical or horizontal parallel lines.

The focusing scales, rangefinder and viewfinder have been prepared so that they may be used only when the lens is in a normal position, centered with respect to the film. Therefore, the ground glass must be used for focusing and image placement whenever the front standard movements are employed, and the rangefinder, viewfinder and focusing scales can not be used in such instances.

When it is desired to photograph an object higher than the camera, you normally point the camera upward to include all of the subject. If the subject is a building and, of course, has a flat, vertical surface, the resulting negative will then show convergence of lines which you know are parallel. This is the phenomenon which makes some photographs of tall buildings look as though they were leaning backwards. It is sometimes referred to as distortion because we have come to consider that all vertical parallel lines should be reproduced as such, but actually it is a true rendering of linear perspective. Interestingly enough, this does not have to be the case with respect to horizontal lines, since this creates an illusion of depth. The familiar convergence of railway tracks is well known to all.

Although linear perspective can be altered greatly during the subsequent enlargement of the negative, it is often desirable to minimize this effect as much as possible when making the original exposure. This is accomplished by keeping the back of the camera (the film) as nearly parallel as possible to the surface being photographed, and then by adjusting the position of the lens up or down to bring the desired subject matter into place on the ground glass. It is for this reason, that view cameras have generous swings, tilts, lateral movements and in some instances, vertical movements of both the front and back of the camera. These can be used to provide complete control over the appearance of the lines on the ground glass. To a degree, these same corrections have been built into your Pacemaker Graphic Camera. However, as is the case with the view camera, not all of the swings, tilts and adjustments can be employed to full advantage with any one given lens. For instance, it may be necessary in some instances to use a slightly longer focal length lens than might otherwise be used for general photography, since the lens is moved off the optical axis of the camera when the movements are used. This means it is advisable to use a longer focal length lens which has wider covering power and will thus insure a good image over the entire negative, even with the lens moved away from its normal position in front of the camera.

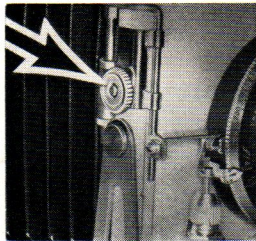


Fig. 49

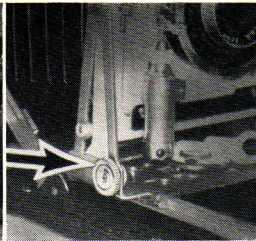


Fig. 50

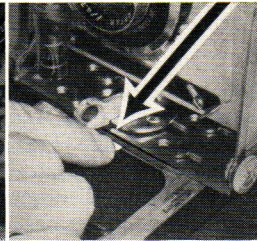


Fig. 51

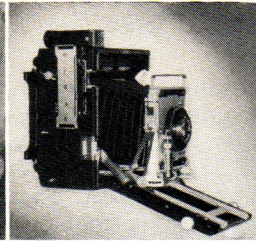


Fig. 52

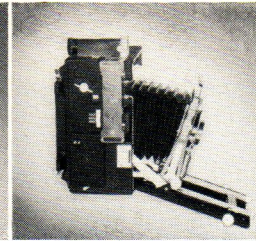


Fig. 53

The vertical and horizontal movements of the front standard are of assistance in centering the image on the film without tilting the camera. Loosening the two knurled nuts at the sides of the front standard will allow it to be lifted vertically (fig. 49). This adjustment may be used extensively when making photographs of buildings from a low vantage point. The knurled nuts at the base of the front standard are used to lock the tilting adjustment in the desired position (fig. 50). The front standard may be shifted to one side or the other after releasing the front standard lock and then depressing the lateral shift catch (fig. 51). After shifting the front standard, lock in position with the front standard lock.

When making a photograph from an elevated position the image can be centered by depressing the bed braces, lowering the bed and tilting the front standard back all the way so that the lensboard is parallel to the film plane. If any further adjustment is required to center the image, the front standard can then be raised slightly as previously described (fig. 52).

Tilting the front standard is helpful when it is desired to bring a greater amount of subject matter into sharp focus than is otherwise possible. To tilt the lens back, loosen the knurled nuts at the base of the front standard, press the top back and lock. This adjustment will permit photographing an overhead ceiling display. The front may be tilted forward for photographing subject material on a horizontal plane lying below the level of the camera, by depressing the bed braces and lowering the bed with the front standard on it (fig. 53). The sliding track should be rolled back just as far as possible before bringing the bed of the camera to the normal or closed position. Be sure to recenter all movement before closing the camera and always lock in place.

Double Extension Bellows (Closeup Photography): When using the camera for closeup photography, the lens is placed at a greater distance than normal from the film plane (fig. 54). This will necessitate a change in the exposure determination, since the f-values engraved on the shutter are based on a relationship existing only when the lens is at the infinity position. For closeup photog-

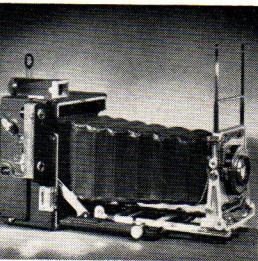


Fig. 54

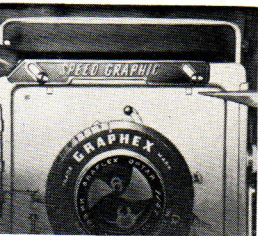


Fig. 55

raphy, your exposures should be determined in accordance with the following table: The bellows extension factor is found by dividing the actual focal length of the lens into the lens-to-film distance. For instance, if the lens has a focal length of 152mm (6") and the lens-to-film distance is 190mm (7½") the bellows extension factor is 1.25. These lens-to-film distances can be determined closely enough by measuring from the film plane to the approximate center of the lens.

Bellows Extension Factor	Ratio of Image to Object Size	Exposure Factor*
1.125	1:8	1.265*
1.25	1:4	1.56*
1.5	1:2	2.25*
1.75	1:1.5	3.06*
2.	1:1	4.*

*Increase your exposure by the indicated amount, just as when using a filter having the same factor. For instance, if the factor is 2, expose twice as long—1/5 second instead of 1/10 second.

Lenses and Lensboards: The Pacemaker Graphic Cameras are designed to accept a wide variety of lenses. Some of these lenses may be in a barrel mount, although most of them are now in a shutter. All of them have standard diaphragm openings and therefore, require no change in exposure calculations.

Lensboards are interchangeable on Pacemaker Graphic Cameras by moving the slide locks at the top and bottom. Make sure that the raised lock pads (fig. 55) are at the top and bottom and will be contacted by the slide locks. Both slide locks must be moved so that the lensboard can be lifted (not tilted) outward, without damage to the lensboard light lock.

If additional lenses are desired, your Graflex Dealer can arrange to have these fitted to lensboards, which are available for currently listed lens and shutter combinations for convenient fitting. Be sure that your dealer also obtains for you infinity stops, focusing scales and additional masks for the tubular viewfinder.

If a lens is mounted in a shutter it will be found that the shutter cannot rotate on the lensboard, since it is held firmly in place by means of a locating pin. If for some reason the lens must be removed from the lensboard, it will be necessary to loosen the flange or lockring from the back of the lensboard.

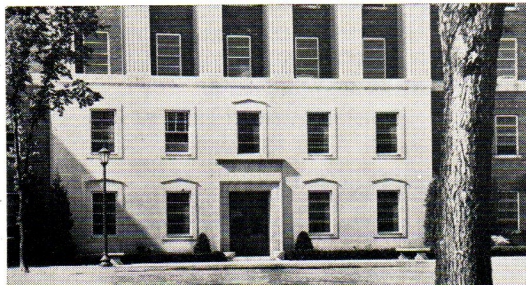
To photograph large objects at close range a short focal length lens or even a wide angle lens may be used. For a larger image of an object at a distance and for portraits with large images and pleasing perspective a long focal length lens or telephoto lens should be used. For a comparison of the image sizes with the various focal length lenses, fig. 56 will illustrate the magnification at a fixed subject distance.



(3½'') 90mm Graflex Wide Angle Optar



(5¼'') 135mm Graflex Optar



(10'') 25cm Graflex Tele-Optar



(15'') 38cm. Graflex Tele-Optar

Fig. 56

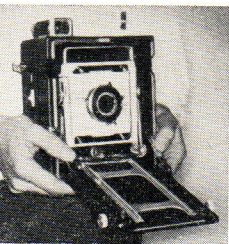


Fig. 57

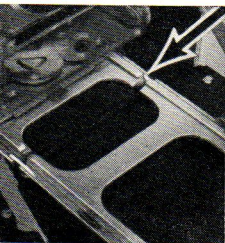


Fig. 58

Telephoto Lenses: For a larger image of objects at a distance, use a long focus or a telephoto lens. A true telephoto lens requires a bellows extension of approximately one-half its focal length. While it produces a larger image of a given subject, the field of view of such a lens is narrower than that of a lens with normal focal length. Telephoto lenses are very useful when photographing subjects at a distance or making better portraits, since the camera can be placed farther away for better perspective and still produce the large image desired on the negative. Telephoto lenses have standard diaphragm openings and are generally complete anastigmat lenses requiring no change in exposure calculations whatsoever. The use of a telephoto or long focal length lens may require moving the front standard of the camera forward from its normal position. This is simplified by the hinged infinity stops provided.

Wide Angle Lenses: A wide angle lens is made according to a special design. It has a focal length shorter than that of a lens normally designed to cover a given negative area. However, this special design will still enable it to cover the larger negative with a good sharp image. Since wide angle lenses have a short focal length, and must be placed closer to the film, it may be necessary to position the front standard towards the rear of the front track or even on the rear track within the camera body. In such a position, the front bed is likely to be included in the field of view and should, therefore, be dropped (fig. 57). Depressing the bed braces will allow the front bed to be dropped. Make sure that the sliding track is rolled all of the way into the camera body before dropping or raising the bed (fig. 58).

The table below indicates the usual position of the bed when the various camera and wide angle lens combinations currently listed are used.

Position of Bed When Wide Angle Lens is Used

Lens	Crown "23"	Speed "23"	Crown "34"	Speed "34"	Crown "45"	Speed "45"
65MM Optar W.A.	Normal	—	Drop	—	—	—
80MM W.F. Ektar	Normal	Normal	Normal	Drop	—	—
88MM B&L W.A.	—	—	Normal	Normal	Drop	Drop
90MM Optar W.A.	—	—	Normal	Normal	Drop	Drop
100MM W.F. Ektar	—	—	Normal	Normal	Normal	Normal

Note that the focusing scales for such camera and lens combinations will align properly only when the bed is in the correct position. In any event, the rangefinder cannot be used. Some wide angle lens and camera combinations permit fitting the infinity stops in front of the front standard on the bed track. Other combinations may require fitting the stops to the track within the camera body, *behind* the front standard. In such an instance the stops will be accessible when the front standard has been pulled all of the way out and the sliding track racked forward as far as possible.

Your dealer can supply you with an accessory optical viewfinder for use with wide angle lenses.

Masks for Wide Angle Viewfinders

Negative Size

W.A. Lens	2¼x3¼	3¼x4¼	4x5
65mm	4	*	**
90mm	**	4	none required
88mm	**	4	none required
80mm	3	4	**
100mm	**	3	4

* We do not have a mask recommended for the 65mm lens when used with the Crown Graphic "34" Camera, since this lens includes considerably more angle of view than can be seen through the viewfinder with no mask at all.

** Lens indicated not recommended for use with this camera.

FILM ACCESSORIES

Sheet Film Holders: Graphic and Graflex sheet film holders accept two sheets of film, one in each side. This film is packed in a box interleaved with a sheet of black paper and can be handled only in total darkness. The following instructions will help you to load a sheet film holder, but you may wish to practice in the light with a piece of exposed film. To load, open the slide lock, remove the slide from the holder and open the end flap. Next slide the film into the slots formed by the metal flanges or lips on three sides of the film septum. Handle the film by the edges only, keeping the film code notch in the upper right corner as shown (fig. 59). In the wider holders, it may be easier to insert the film if it is bowed slightly. Make sure that the film has been slipped into the film holder as far as it will go with the edge beneath all three sides. If the bottom retaining flap does not seat smoothly, the film has not been pushed under the upper end of the septum. Replace the dark slide with the bright side with the raised dots of the handle facing outward indicating that the film is ready to be exposed. Turn the catch or hook to prevent unintentional withdrawal. After exposure reinsert the slide with the black side of the handle facing outward, indicating that the film has been exposed.

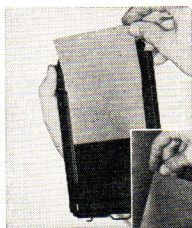


Fig. 59

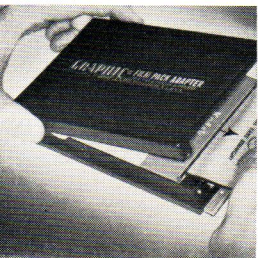


Fig. 60

Film Pack Adapter: This accepts a pack containing 12 pieces of film in a metal container which may be loaded into the adapter and unloaded in subdued light.

To load—open the pack adapter cover by pressing inward on *both* release buttons at the end. Insert the pack with the opening toward the dark slide (fig. 60). Straighten out the paper tabs and close the back of the adapter, making sure that both of the catches lock. With the dark slide of the adapter in place, pull out and tear off the safety tab before making the first exposure. After the last exposure (No. 12) has been made and the tab pulled, the exposed pack is somewhat self-protected and may be removed from the adapter in subdued light. Handle it only by its edges and protect it by rewrapping it in its original foil wrapping and box. Additional instructions accompany each film pack.

Grafmatic Film Holder: Grafmatic film holders containing six sheets of film in individual septums are available in certain sizes. Featuring easy and quick changing of the film, these holders fit beneath the focusing panel of Graflok backs. The Grafmatic holders for the Graflex type backs are attached in the same manner as the regular double sheet film holders. Instructions for loading and using the Grafmatic film holders accompany each unit.

Roll Film Holder: Roll film holders are available for Graflok, Graflex and Graphic backs. The latter will require the use of a “Spring Kit,” which is available. These holders use the inexpensive 120 roll film, black and white or color, and feature automatic spacing. Both the Model “22” roll holder which produces twelve $2\frac{1}{4} \times 2\frac{1}{4}$ pictures and the “23” roll holder producing eight $2\frac{1}{4} \times 3\frac{1}{4}$ pictures are available for any of the above mentioned backs. Special instructions applicable to the loading and use of the roll holders accompany each holder.

Care and servicing of the camera. The coating applied to the surfaces of your lens reduces reflections within the optical system and is an important factor in producing sharper images and clearer color transparencies. The camera lens must be kept clean at all times. Never touch the glass of a lens with the fingers. Fingerprints can corrode the highly polished surfaces and ruin the objectives. The coating which is now being applied to lens surfaces is almost as hard as the average optical glass. While no special precautions are necessary for cleaning the surfaces of coated lenses, they should be handled as carefully as all fine lenses. All surface grit and dust should first be removed with a soft

camel's hair brush before the lens is cleaned with a fine lens tissue or a soft cloth, such as a well laundered linen handkerchief. Do not apply pressure on the cloth. Simply breathe on the surface of the lens and wipe gently with an easy, circular motion. If a lens cleaning fluid specifically recommended by a lens manufacturer is to be used, do not apply it directly to the lens surface. Instead place a drop or two on the lens tissue or cloth and wipe the lens with the moistened material. *Do not unscrew* the lens elements from the shutter; under normal conditions cleaning of the inside surfaces will be unnecessary.

Shutters contain springs to regulate the speed and these should *not* be left in their stressed or cocked positions over long periods of time. The front shutter should always be released before putting the camera away, and the shutter speed ring should be turned away from the highest speed. The focal plane shutter should also be allowed to run down to the full open or even the fully closed position. *Never oil a shutter.* An occasional drop of fine machine or sewing machine oil may be placed on the slide at the front shutter release. This is the vertical bar to which the shutter release arm is fastened. Do not oil or otherwise lubricate the cable release.

Handle your camera carefully. A fine camera is primarily an instrument rather than a machine. While Graflex products have won a reputation for sturdiness, even under adverse conditions, your Pacemaker Graphic camera should be given reasonable care. It has been very carefully constructed and can give you the type of performance which is rightfully expected from high-grade photographic equipment. Protect it as much as possible from accidental shocks, jars and blows and be sure that any one using the camera is properly instructed in its method of operation. Should you lose this instruction manual or desire additional copies, they may be obtained from your Graflex dealer or nearest Graflex Service Department.

While it is recommended that all servicing of the camera should be accomplished only by a trained camera repairman at one of the Graflex Service Departments or a Graflex Service Parts dealer, it may be necessary to make adjustments in the field from time to time.

The infinity stops on the Pacemaker Graphic camera may be moved if necessary. We do not recommend this adjustment, but if necessary, the instructions given below should be followed very carefully. It will be noted that each stop has two screws, one, a cone-pointed, and the other, a flat-end screw. The front standard with the lens has been correctly positioned, not only with respect to the

distance from the film plane, but also with respect to squareness with it. The infinity stops should be moved back against the base of the front standard and locked with the flat-end screws. Then move the front standard back and run a number 53 drill through the other screw hole in the stop and give several turns to merely break the tough alumilite finish of the track. The cone-pointed screws should then be screwed home into these holes locking the infinity stops firmly in place. Because of the care and facilities required to properly position these stops, we recommended that they be moved only by a competent camera service man.

Any adjustment of the built-in body release or the cable release should be attempted only by a skilled camera repairman.

If the rangefinder appears to be out of synchronization, the manufacturer's instruction manual may be of help to you in making the necessary adjustments. Above all make only one adjustment at a time and check the instructions very carefully.

A common characteristic of rangefinders is a lateral (sideways) shift of one image, which prevents complete superimposition of one image on the other. This can usually be corrected. The Kalart Rangefinder has an adjustment screw placed on the outside of the rangefinder housing. It should be turned with a screwdriver while sighting through the eyepiece. Only a very slight adjustment is needed to align these images and when this has been accomplished, back the screw off slightly to avoid strain on the adjustment lever. For full instructions refer to the manufacturer's instruction manual.

If the Hugo Meyer Rangefinder needs side image adjustment, it is accomplished by means of the two adjustment screws on the right side. Loosen one and tighten the other an equal amount until correct adjustment has been obtained.

APPLIED PHOTOGRAPHY

Correct Exposure: While the final goal of most photographers is a satisfactory print, the first aim of the camera user is a negative in which at least the main subject of interest is sharply defined and is of a density that will permit making a good print. This density will depend upon the light with which the subject is illuminated, the speed of the film, the processing the film is subsequently given, and upon the lens and shutter settings in relation to these quantities. Using a good exposure

meter will simplify to a considerable extent, combining the above factors to obtain the proper exposure. The price of one of the better photo-electric models will be repaid many-fold in good negatives and general satisfaction.

The exposure meter will only go so far as to present you with a rather wide choice of lens apertures and shutter speeds, telling you that if you choose $f/11$ (for example) then you must set the shutter for 25 ($1/25$); or that if you wish to use $1/100$ in order to stop some faster motion you must set the lens aperture to $f/5.6$.

“Increasing the shutter speed” means that a shorter exposure is given—as, for example, in changing from $1/50$ to $1/100$. In other words, the shutter passes light for a shorter length of time.

“A larger stop” or “opening up the lens” means that the actual diameter of the aperture of the lens is increased, and hence more light is passed by the lens in a given length of time. The smaller $f/$ numbers indicate larger apertures— $f/8$ being larger than $f/16$, $f/3.5$ larger than $f/5.6$, etc.

The relation between these combinations of aperture and shutter speed is really very simple, and knowing one of them is sufficient to give you any other. The rule is simply this: every time you open up the lens one stop (or one $f/$ number), double the shutter speed; and vice versa.

For example, suppose the correct exposure would be $1/50$ at $f/16$. If your subject is going to move, a speed of $1/200$ th may be needed to stop the action. You know that this will require opening up the lens, so you proceed to do so, counting as you go from stop to stop; starting at the next larger will be $f/11$, for which you double the speed—(going to $1/100$ th); the following stop is $f/8$, for which you double the speed again—(going to $1/200$ th). And there you have it: $f/8$ at $1/200$ th. The exposure meter dials will be found to bear the same relations between the combinations offered.

Like so many so-called “rules,” the above one also has an exception which applies to only some lenses at maximum aperture. Going from $f/32$ to progressively larger apertures calling for a doubling of shutter speed as we go down the list, the ideal diaphragm scale would be marked:

$f/32, 22, 16, 11, 8, 5.6, 4, 2.8, 2, 1.4, 1.$

The lens on your new Graphic probably has just these same stops indicated from $f/32$ to $f/5.6$. But, if its maximum aperture is $f/4.5$ or $f/4.7$, that figure will follow the 5.6 without being

twice as fast; it is only about 50% faster and would, therefore, call for a 50% increase in shutter speed instead of the 100% set by our rule.

Any of these combinations which the exposure meter offers you will give the same density of negative; but the sharpness of the negatives and the amount of subject which will appear to be in good focus will vary with the exact combination you choose. The choice which the photographer must make will be a compromise between the need for stopping motion (calling for the higher shutter speeds and the larger lens apertures) and the desire to have the greatest amount of material in sharp focus (calling for smaller lens apertures and slower speeds).

Of the two, stopping motion is probably the more important since without it you may have a negative in which *nothing* is sharp. Stopping motion will be explained more fully in the following section. Finally, we shall consider the factors which control just how much of the scene, in addition to the object on which you actually focused, will appear sharp—assuming that all motion was stopped. For further details concerning focus, see section on Depth of Field.

Stopping Motion: If the subject you intend to photograph is moving, its image on the film will likewise move. It will move some during even 1/1000th second, although only about 1/10th as far as it will during 1/100th second. All the photographer can hope to do is to give a short enough exposure so that the motion of the image on his film will not be objectionable. Just what constitutes "objectionable" depends both on the observer and upon the use to which the negative is to be put. A negative which is to be enlarged 10 times or to be printed in a magazine must be sharper than if it were to be reproduced in its original size. And a print which is apt to be examined through a reading glass must naturally be sharper than one to be seen from a distance only, as a highway billboard.

Not knowing precisely how his negative may be used, the average photographer must aim at "average acceptability," and it is on this basis that the following table has been compiled. It allows the photographer to take into account the four factors which are present at the time of his exposure: Namely, the focal length of his lens, the distance he will be from the subject when he releases the shutter, the velocity with which the subject will be moving at the instant of exposure, and the direction of its motion relative to the direction in which he is pointing his camera.

SUGGESTED SHUTTER SPEEDS TO STOP MOTION AT RIGHT ANGLES TO THE CAMERA WHEN THE SUBJECT MOVES 10 MILES PER HOUR

Distance from subject in feet	Approximate Focal Length in Inches				
	4	5	6	7	8
12	1/500	1/600	1/700	1/800	1/1000
25	1/250	1/300	1/350	1/400	1/500
50	1/125	1/150	1/170	1/200	1/250
100	1/70	1/80	1/90	1/100	1/125

These speeds are only approximate, and have been "rounded off" to give numbers easy to multiply and divide. The need of greater accuracy is doubtful in view of the uncertain speed of the object to be photographed.

The above table applies to a subject moving 10 miles per hour at right-angles to the camera. In all probability your subject will be doing something different. If so, modify the shutter speed called for in the above table by the following rules:

- * *Double the speed of the shutter for double the velocity of the subject.*
- ** *Half the shutter speed for half the velocity.*
- * *Double the shutter speed for half the distance to the subject.*
- ** *Half the shutter speed for double the distance.*
- * *Double the shutter speed for double the focal length.*
- ** *Half the shutter speed for half the focal length.*

Use one-third of the shutter speed if the subject is coming directly toward you or going directly away from you.

Use two-thirds the shutter speed if it is coming or going at 45 degrees.

When in doubt, use the next higher speed.

* —1/100 instead of 1/50, for example.

**—1/50 instead of 1/100, for example.

The following table gives the approximate velocity with which some common objects might move. In using this table, it must be borne in mind that portions of the subject may move faster than the subject itself. For example: the arms and legs of a person walking or running; the oars of a boat; the wings of a bird; the spokes of an automobile or wagon wheel. Usually a higher shutter speed will be required to completely "freeze" an object than to merely stop its forward motion. This table is based on the rate of movement of the object as a whole.

- 5 mph. Pedestrians. Foliage in a light breeze. Rowboats.
- 10 mph. Children playing. Swimmers.
- 20 mph. Foot races. Boat races. Street traffic. Divers. Jumpers. Football and baseball games. Sail boats.
- 40 mph. Horse races. Highway traffic. Power boats.
- 60 mph. Trains. Motorcycle races. Birds in flight.
- 100 mph. up. Airplanes. Auto races.

Depth of Field: Although we may focus most precisely on a certain portion of an object, we all know that things slightly nearer to the camera as well as some slightly farther away will also appear sharp in the final print. The field of sharp focus extends farther behind the object focused on, than in front. This range of distances within which all objects *appear* equally sharp is called the depth of field.

As in the case of stopping motion considered in the preceding paragraph, our acceptance of sharpness will depend upon the nature of the print and how it is viewed; and the sharpness to be demanded of a negative for making such prints must depend upon the amount of enlargement contemplated. Depth of field, therefore, is not a precise physical quantity which can be measured. Lens manufacturers put out more or less complicated tables under the heading "depth of field," or less correctly "depth of focus," which some photographers find useful. The great majority of camera users, however, find the following easily-remembered facts enough of a guide for all practical purposes.

1. *The greater the distance to the object focused on, the greater the depth of field for a given focal length and relative aperture.*

2. *The greater the focal length of the lens, the less the depth of field at a given relative aperture and distance.*
3. *The greater the lens aperture (the smaller the $f/$ number), the less the depth of field for a given focal length and distance.*
4. *The sharp field is deeper behind the object focused on than in front of it.*

If you want the greatest possible amount of material to appear sharp in your picture, stop the lens down as far as you can without requiring an exposure time so long that movement becomes objectionable. If, on the other hand, you wish to minimize the background or nearer objects by purposely throwing them out of focus, open up the lens to one of its larger apertures. If you want the maximum sharpness of the precise point on which you focus without regard to what is nearer or farther away, choose a lens aperture approximately half way between the greatest and the smallest which your lens can give.

Negative Defects: Although special instructions regarding film handling and processing are furnished by the manufacturer of each particular type of film, a few extra precautions must be exercised to prevent objectionable negative defects. Extreme care must be taken in handling the films to prevent abrasion marks and fogged areas which would otherwise effect the appearance of the final print.

When loading or unloading the film holders, the film should always be handled by the edges to prevent scratches or finger marks. All of the holders should be dusted with a soft camel's hair brush prior to loading the film, thereby lessening the possibility of the appearance of small microscopic clear spots over the negative area caused by dust particles. Although hardly visible to the naked eye, these marks will be greatly magnified when enlargements are made.

Even if these precautions are followed religiously objectionable markings may still occur in development. By following the processing instructions supplied by the manufacturer, a technically perfect negative should result granted that correct technique was followed in making the exposure. However, if these negatives are not agitated properly during development, certain blemishes such as dark streaks or blotches are likely to result. When the negatives are first placed in the developing solution small air bubbles may cling to the emulsion surface of the film. If tray development is

being used, shuffling the negatives from the bottom of the pile to the top will wipe off these surface air bubbles and also provide uniform agitation. In the case of tank development, rap the hanger sharply against the side or bottom of the tank once or twice as soon as the film is immersed in the solution. This will serve to dislodge any bubbles clinging to the film surface. Failure to follow these steps may result in the formation of small round transparent spots scattered over the entire negative area.

If upon examination of the negative dark streaks and shaded edges are found, it indicates that these areas may have received more development than normal. This may be caused by insufficient agitation or too rapid a change of developer solution in these particular areas. In some cases when film hangers are used and the agitation applied is quite active, the developer will be forced through the holes in the edges of the hangers quite forcefully and the overdeveloped areas will appear as dark streaks running inward from the edges of the negative. Sufficient agitation will be obtained by merely lifting the hangers gently from the tank once every one or two minutes and allowing the developer solution to drain off before reimmersing them. It has been noticed that in certain instances where the films in the tank or the tank itself is agitated a great deal during development, the developer tends to flow in certain currents or eddies and as these strike the film they produce uneven development at that point. If when following the tank development procedure uneven densities are produced of such a nature that they appear to be caused by uneven development rather than as a result of exposure to light, we would suggest that test exposures be made of the sky or some other area of even tone. Develop one of these in a tray and the other in a tank following the usual procedure carefully. If necessary, put some old negatives into the tank if it complies with your normal procedure to have a full rack when developing. If you find that the tray-developed negative is free of uneven densities, we would then suggest that you alter development technique or consult the manufacturer of the tank as to the recommended method of agitation.

Your Graflex Dealer stands ready to assist you in answering questions pertaining to the camera and its use, and that over-the-counter discussions of your pictures or the use of the camera will be very helpful to you. GRAFLEX products are handled through these dealers throughout the country and orders for parts or accessories should always be placed with your nearest Graflex dealer. The GRAFLEX Service Sales Departments are equipped to inspect, clean and adjust all Graflex products, and to fit accessories and special lenses to Graphic and Graflex cameras. While all correspondence on the subject should be addressed to the Service Department nearest you, your Graflex dealer will be glad to take care of the details of packing and shipping any equipment to be sent in for attention. We strongly recommend having the camera thoroughly checked after it has been in use for a few months. Periodic checking thereafter is good insurance against equipment failure and dissatisfaction.

The GRAFLEX Technical Service Department is anxious to help you get the most out of your Pacemaker GRAPHIC camera. Do not hesitate to write to us about any photographic problem which you may have. When your questions relate to the actual making of pictures please be sure to send in your negatives and such exposure data as you may happen to have available.

The registration card packed with your camera when it left the factory, should be filled out completely and returned to us promptly. If you did not receive a registration card with your camera, write for one today. The serial number of your camera will be found stamped into the name plate attached to the bed of your camera. Always give this number when corresponding with reference to your camera.

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