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The 2¼ x 3¼
MINIATURE

SPEED GRAPHIC

INSTRUCTION AND REFERENCE MANUAL

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GRAFLEX, INC.

ROCHESTER 8, N. Y., U. S. A.



Figure 1 — 2¼ x 3¼ Miniature Speed GRAPHIC with 101 mm Kodak Ektar Lens, elements coated, in Supermatic Shutter with built-in synchronization fitted with No. 25FA GRAFLEX Flashing Unit and accessory range finder.

A Description of your 2¼ x 3¼ Miniature Speed GRAPHIC Camera

Your new 2¼x3¼ Miniature Speed GRAPHIC Camera is truly small in size—but big in performance. It is a versatile all-purpose camera equal to many picture opportunities. The Miniature Speed GRAPHIC not only embraces all the famous Speed GRAPHIC features, but offers in addition built-in focal-plane shutter synchronization for shutter speeds of from 1/70 second to 1/1000.

The choice of two shutters, between-the-lens and focal-plane, affords the user a wide range of shutter speeds from a very short exposure to a relatively long one. Focusing is possible with either ground glass, synchronized rangefinder or focusing scale, permitting the camera user three different methods in coping with the demands of the subject at hand and the lenses used. Composition is possible with three distinct viewfinders. For most accurate composition, the ground glass should be used. The tubular viewfinder which has a correction for parallax will sometimes be the more convenient under some circumstances and the wire frame finder is preferred by many photographers for action shots.

Interchangeable lens boards provide a choice of lenses for the many fields of photography in which this camera is capable of working. Double extension bellows aids in the photography of small objects and in the use of long-focus lenses.

Accommodation can be provided for the use of flash synchronizers—for between-the-lens shutters—an expedient which has been known to make the difference between *good* pictures and *no* pictures on many occasions. Focal-plane synchronization is a built-in feature of this camera.

The choice of negative materials—including film packs, sheet film and plates—is equalled by but few cameras. And finally, and perhaps most important, all these features have been accomplished without a sacrifice of rigidity or without a departure from good photographic manufacturing practice.

A fine camera is primarily an instrument rather than a machine. GRAFLEX products have won a reputation for sturdiness and con-

tinued functioning under adverse conditions, but this should in no sense be considered an invitation to abuse these cameras. More damage is probably done by people handling things with which they are not familiar than by the normal wear of service. To insure the long and trouble-free life of which your camera is capable, follow and study these directions as you handle it for the first time. Above all, do not twist any knobs or push any buttons on this camera until you know what this booklet tells about them. Do not lend your camera to anyone not familiar with it, or without instructing him in how to use it. If you lose this book or want additional copies, write us.

The serial number is stamped into the under side of the top of the right front of the body as you face the camera and consists of six digits about ¼" high. Always give this number in correspondence regarding your camera. After carefully reading this manual, refer to pages 39 through 42 for step-by-step instructions on operating this camera.

Opening the Camera

To open the camera, depress the bed release button on the top of the camera. As the bed opens downward, its fall may be checked with the right hand. Lower the bed down until the spring-actuated bed braces lock the bed in extended position.

Turn one of the knurled focusing knobs, which are located on either side of the front edge of the bed, until the sliding track has been racked back as far as it will go, before attempting to pull out the front standard. To loosen the front standard, press together the finger grips of the front standard clamp and draw the front standard out to the infinity stops. Release the finger grips and the front standard will remain locked in this position. When the sliding track has been racked back and the front standard drawn out to the infinity stops, the lens which is carried by the front standard is focused on infinity and is in position for focusing with either rangefinder or scales. (Figure 1)

To Close the Camera: Rack the sliding track back fully. Press the finger grips of the front standard clamp and slide the front standard as far into the camera box as it will go. Depress the bed braces and raise the bed until it snaps in position.

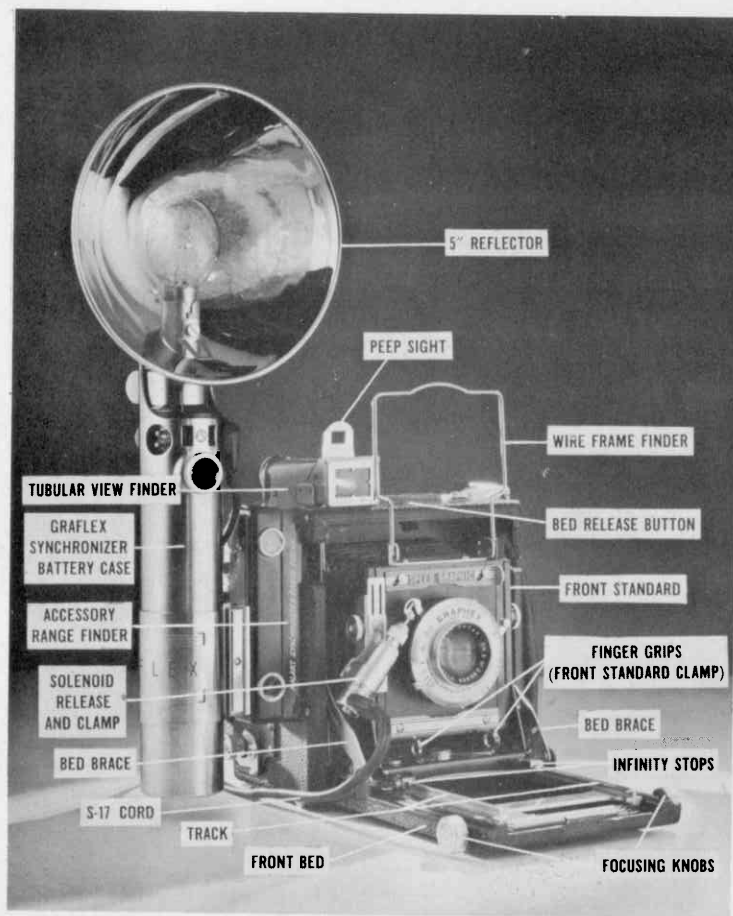


Fig. 2—Miniature Speed GRAPHIC fitted with 101 mm GRAFLEX Optar Lens, elements coated, in GRAPHEX Shutter and No. 25 GRAFLEX Flash Synchronizer complete with Solenoid release.

Shutters

The Speed GRAPHIC camera is usually provided with two shutters; the focal-plane shutter and a between-the-lens shutter. For slow exposures (durations longer perhaps than $1/50$) a between-the-lens shutter is often preferable. The shutter built around the lens of your $2\frac{1}{4} \times 3\frac{1}{4}$ Miniature Speed GRAPHIC is an excellent example of this type. For action requiring exposures shorter than about $1/50$, the focal-plane shutter has never been surpassed in efficiency. And no focal-plane shutter has ever surpassed that in your Speed GRAPHIC in dependability. The built-in focal-plane synchronization which is one of the outstanding features of your $2\frac{1}{4} \times 3\frac{1}{4}$ Speed GRAPHIC permits flash synchronization at all shutter speeds from $1/70$ to $1/1000$ (explained in later section). Naturally, only one of these shutters can be used at a time; the one not being used must be set open during the exposure (as will be explained below).

Some of the more recent between-the-lens shutters now have built-in mechanism for flash synchronization which eliminates the need of external synchronized release or tripper. Different flash lamps have a different ignition lag, which is the time that elapses between the closing of the switch to the battery and the instant the flash reaches a useful level. Most flash lamps have a lag of either five or twenty milliseconds as indicated in the following table:

	5 milliseconds Type "F" lamp (gas filled)	20 milliseconds Type "M" lamp (wire or foil filled)
GE and Westinghouse	SM	No. 22, No. 11, No. 5, etc.
Wabash	SF	No. 2, Press 25, 40, etc.

Each shutter having built-in flash synchronization has a means of adjustment to allow its use with these different lamps. Details are given with instructions for each individual shutter.

A shutter locating pin which fits into the lensboard prevents the shutter from being rotated on the lensboard.

The GRAPHEX Shutter

The GRAPHEX shutter to which is fitted the GRAFLEX Optar lens is rim set with 9 speeds from 1 to $1/400$ second plus "Bulb"

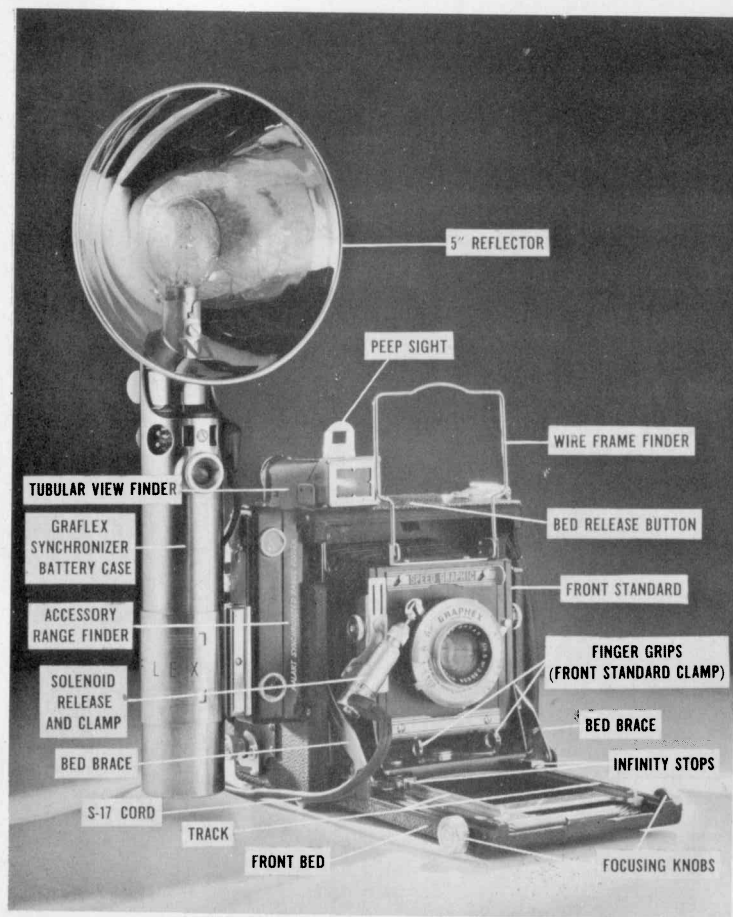


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GE and Westinghouse	SM	No. 22, No. 11, No. 5, etc.
Wabash	SF	No. 2, Press 25, 40, etc.

Each shutter having built-in flash synchronization has a means of adjustment to allow its use with these different lamps. Details are given with instructions for each individual shutter.

A shutter locating pin which fits into the lensboard prevents the shutter from being rotated on the lensboard.

The GRAPHEX Shutter

The GRAPHEX shutter to which is fitted the GRAFLEX Optar lens is rim set with 9 speeds from 1 to $1/400$ second plus "Bulb"

and "Time" (on earlier models from 1/2 to 1/400 second plus "Bulb" and "Time.") The knurled rim carries the designations "T," "B," 1, 2, 5, 10, etc., (the numbers corresponding to instantaneous exposures of 1, 1/2, 1/5, 1/10 sec., etc.) and the desired shutter speed setting should be set directly opposite the arrow.

The desired speed setting may be changed before or after cocking the shutter, but it is more easily accomplished before cocking. Settings between the marked speeds will not give intermediate exposure times. When turning the knurled rim to the 1/400 setting, a slight additional pressure will be required to overcome the resistance of the booster spring. The GRAPHEX shutter must be cocked for all exposures, including "Time" and "Bulb" as well as instantaneous exposures, by means of the cocking lever and it is released by depressing the release lever. (Figure 3) When set on "T," the first pressure opens the shutter and the second permits it to close. On the "B" setting, the shutter remains open as long as pressure is maintained on the release lever.

The cable release socket is next to the cocking lever. The aperture scale and aperture pointer are at the bottom of the face of the shutter. (Figure 3)

The diaphragm may be set to the desired position by the aperture indicator.

The Press-Focus Lever, at the right side of the shutter, may be used for opening the cocked shutter blades for focusing purposes, eliminating the necessity of resetting the shutter to the "Time" setting for checking the focus on the ground glass. To open the shutter blades after cocking, move the Press-Focus Lever clockwise and inward. To close the shutter blades, move the lever counter-clockwise. This lever will not function unless the shutter is cocked and does not interfere in any way with the normal operation of the shutter.

Synchronization with the GRAPHEX Shutter

When using a GRAPHEX shutter with built-in synchronization for flash photography, the flattened right angle connection of the A-20 connecting cord attaches to the contact posts which extend from the shutter.

The other end of the cord must be plugged into the **SERIES OUTLET** at the **BACK** of the **GRAFLEX** battery case.

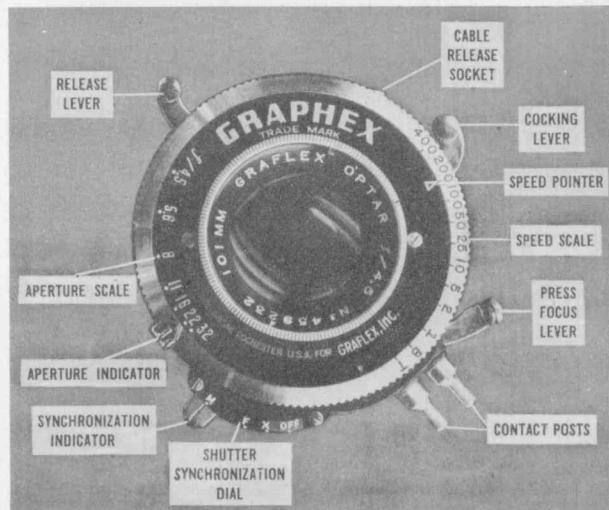


Fig. 3

The 101mm Graflex Optar No. 1 Graphex Shutter with built-in synchronization.

This outlet is reached by unscrewing and swinging down the pivoted red push button switch at the back of the **GRAFLEX** battery case. Synchronization is effected only when the shutter is released manually or with a cable release.

Built-in synchronization eliminates the need of an external synchronized solenoid release or tripper. Synchronization is accomplished by a special gear train controlled by a dial setting arrangement at the bottom of the shutter when set to the "M" or "F" settings. This train is automatically engaged as the shutter is cocked. A click stop arrangement permits accurate setting of the synchronizer mechanism for synchronization with standard flash lamps at position "M" (20 milliseconds), SM and SF lamps at position "F" (5 milliseconds), Kodatron at position "X" (instantaneous contact) and the "off" position is for use without flash lamps. The shutter synchronization control lever must be set at the correct position on the dial for the lamp being used in order to obtain proper synchronization. (The "M," "F" and "X" references are according to ASA Standards. The new shutter bears the markings M, F, X, and OFF; "M" corresponding to 20 milliseconds, "F" corresponding to 5 milliseconds, etc. The "M" or 20 millisecond type

of flash bulbs include such lamps as GE and Westinghouse, No. 22, 11, 5 and Wabash No. 2, Press 40 and 25. The "F" or "5" millisecond type of flash lamps include the SM and SF lamps. The "X" or "O" type includes the Kodatron and other speedlamps.)

The shutter synchronization indicator lever should be moved to the proper position for the lamp being used before cocking the shutter because the special train gear is automatically engaged as the shutter is cocked.

Make certain that the click stop arrangement is definitely engaged in its detent at the "X" and "F" positions before using the shutter. Beyond the position "X," intermediate settings may be used and will give intermediate delay times.

GRAPHIX shutters without built-in synchronization may be used for flash photography through the use of a synchronizer complete with solenoid. The GRAFLEX flash synchronizer (with solenoid) is available in 2 and 3-cell models with 5" reflector for small bayonet-base lamps and 7" reflector for the larger medium screw-base lamps.

The Supermatic Shutter

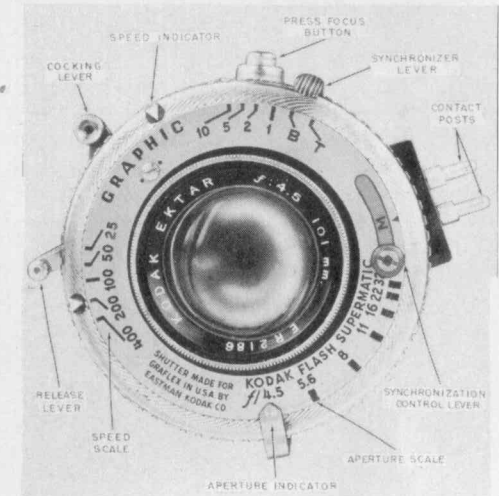
The Kodak Supermatic Shutter is rim-set with 9 speeds from 1 to 1/400 plus "Time" and "Bulb." The blade arrester or Press-Focus Button is built into the Supermatic shutters used with Speed GRAPHIC Cameras. Some shutters incorporate a built-in delayed action mechanism ("self-timer"), whereas in the newer models this has been replaced by built-in synchronization mechanism.

The speed scale on the upper face of the shutter is divided into two sections, each with its own speed pointer on the rim of the shutter. The shutter is adjusted for exposures of 1/400, 1/200, 1/100, 1/50 and 1/25 by turning the outside knurled collar or rim until one of the speed pointers is opposite the 400, 200, 100, 50 or 25 index line. These speeds are generally safe for hand-held use.

Adjust the shutter for exposures of 1/10, 1/5, 1/2, 1 and "B" and "T," by turning the outside knurled collar until the other speed pointer is opposite the 10, 5, 2, "B" or "T" index line.

Intermediate settings will not give intermediate speeds. The speed setting may be changed before or after cocking the shutter.

Fig. 4—The 101mm. Kodak Ektar lens, elements coated in Supermatic Shutter, with built-in Synchronization.



After cocking the shutter, hold down the press focus button while tripping the release lever to open the shutter blades for a quick check of the image on the ground glass.

Set the diaphragm at the desired aperture by moving the aperture pointer to the desired $f/$ number. The newer shutters have a click stop into which the aperture pointer will drop.

Cock the shutter for all speeds, including "T" and "B" by pushing the cocking lever clockwise until it catches. To make an exposure, move the shutter release lever counter clockwise. To make a "Time" (T) exposure, press the release lever to open the shutter and again to close it. For a "Bulb" (B) exposure, press the release lever to open the shutter; shutter will close when pressure is released.

Flash Photography with Supermatic Shutter Having Built-In Synchronization

Fig. 4 illustrates the latest supermatic shutter with built-in synchronization. This shutter does not incorporate the delayed action mechanism. The lever previously used for the delayed action with earlier shutters must be cocked on the present shutters before synchronization can be made. It is now called the synchronizer lever.

Attach flattened right angle connection of the A-20 Connecting Cord to the contact posts or prongs extending from the side of the shutter. The other end of the cord must be plugged into the **SERIES OUTLET** which is at the **BACK** of the battery case on the **GRAFLEX Flash Synchronizer Battery Case**. This outlet is reached by unscrewing and swinging down the red push button switch. (Figure 8)

Synchronization is accomplished by a gear train within the shutter and cocked by the lever previously used to cock the self timer. Adjustment for 5 and 20m. sec. lamps is made by loosening the binding screw in the slot on the face of the shutter. Moving this to the left until the letter "M" is opposite the arrow allows adjustment for 20m. sec. lamps and to the right until the letter "F" is opposite the arrow for 5m sec. lamps. After loosening the screw and moving the indicator to the desired position, tighten the binding screw securely.

Set the aperture pointer, adjust the shutter speed ring, and cock the shutter as usual. Push the synchronizer lever (previously used to cock the self timer) toward the two contact posts on the shutter rim as far as it will go. The shutter is ready to provide positive flash lamp synchronization when the exposure lever is pressed. Caution: Do not use the Press-Focus Button without first disconnecting the connecting cord or removing the flash lamp.

The Compur Shutter

The Compur shutter differs in operation from the **GRAPHEX** and **Supermatic** shutters. (Figure 5) The Compur must not be cocked for "T" or "B" setting. For these two settings do not use the cocking lever at all, the shutter is operated solely by the release lever. With the shutter set for "T," the first pressure on the release will open the shutter and the second will close it. On the "B" setting, pressure on the release lever will open the shutter and relieving this pressure will permit it to close. Otherwise, the Compur must be cocked for all instantaneous exposures.

The Compur Shutter illustrated is of the "rim-set" variety. The knurled rim carries the designation "T," "B," 1, 2, 5, 10, 25, etc., (corresponding to instantaneous exposures of 1, 1/2, 1/5, 1/10 sec., etc.) To set the shutter for a designated exposure, the rim must be rotated until the desired speed is opposite the arrow on the top of the shutter facing.

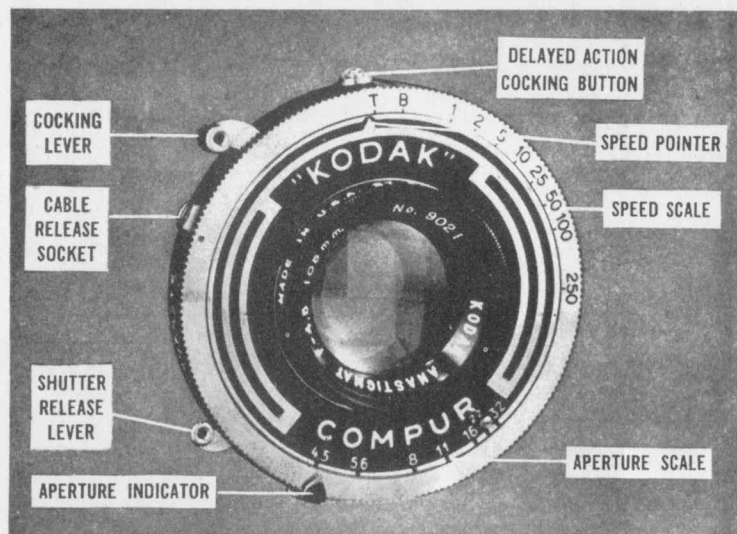


Fig. 5—The Compur Shutter.

The desired lens aperture is set by moving the pointer of the diaphragm control along the scale carrying these aperture designations on the face of the shutter.

In the case of this rim-set shutter, a delay of approximately ten seconds in the release of the shutter will automatically be produced if after the shutter is cocked the delayed action button behind the cocking lever is moved back and the cocking lever is then pushed still farther to the right. Pressure on the release lever or the cable release will actuate the delay mechanism, and after approximately 10 seconds the shutter itself will operate and make the exposure. To prevent damage to the shutter, this delayed-action mechanism must never be used with the highest shutter speed.

The following additional precautions should always be observed:

Never cock a Compur shutter when it is set for "T" or "B"

Never attempt to move from an instantaneous setting to "T" or "B" or change from or to the highest shutter speed while shutter is cocked.

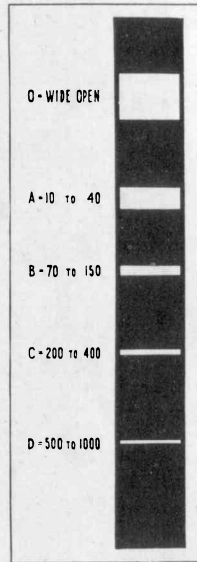


Fig. 6 — Focal-Plane Curtain.

Focal-Plane Shutter

The efficient focal-plane shutter with which this camera is provided consists essentially of a durable light-tight curtain (Figure 6) having five rectangular openings or slits of different sizes. The exposure is made when the desired opening passes in front of the film or plate. The exposure time is governed by the width of the focal-plane shutter opening and by the tension of the spring which causes the curtain to move at various speeds when the mechanism is released. Whenever the focal-plane shutter is used, the front shutter must be open on "Time."

The controls for the focal-plane shutter are located on the right side of the camera housing (as normally used from the back), and appear as in Figure 7.

The Shutter Speed Table on the bed of the camera includes numbers representing exposure times customarily referred to in terms of fractions of a second, obtainable

with the various combinations of curtain apertures A, B, C and D and tension numbers 1 through 6.

These reference letters and numbers are changed progressively from O to D in the slit aperture window by turning the shutter-winding key counter-clockwise, and from 1 to 6 in the spring tension window by turning the spring tension control counter-clockwise. In so doing, any combination of curtain opening and tension setting may be obtained for the required shutter speed. Example—for an instantaneous exposure of $1/280$, use curtain slit "C" and tension setting No. 3. With this same curtain slit, shutter speeds of $1/200$, $1/240$, $1/320$, $1/360$ and $1/400$ are also available by changing the spring tension setting. (Figure 7)

When the shutter has been set in accordance with the above directions, the exposure is made by carefully squeezing the focal-

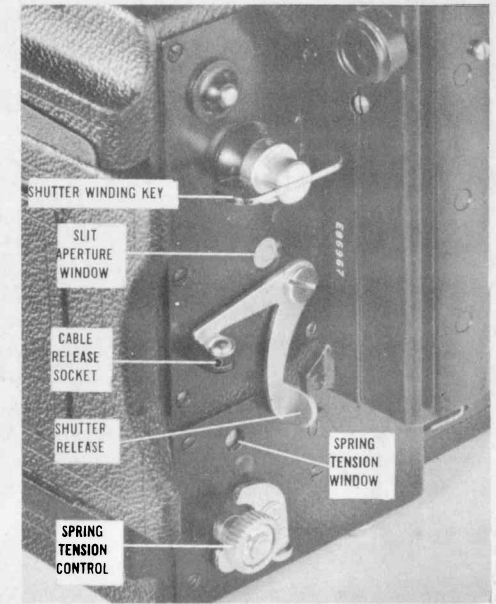


Fig. 7 — The Focal-Plane Shutter Control Panel.

plane shutter release or the plunger of the cable release, which can be attached to the focal-plane shutter release. Fig. 7.

To make a time exposure with the focal-plane shutter, wind or release the curtain until "T" (Time) appears in the slit aperture window. Set the tension at 1; place the camera upon a rigid support; open the shutter with one pressure upon the release, and terminate the exposure by a second pressure.

CAUTION: Because one of the curtain slits passes in front of the picture aperture every time the curtain is moved (either in winding it or in releasing it), it is necessary to protect any film in the camera from unintentional exposure by having the slide in the film holder while the focal-plane shutter is being set; otherwise injurious fogging of the film is liable to result.

Flash Synchronization

The Miniature Speed GRAPHIC can be used for flash synchronization by any one of three different methods. These consist of:

(1) Focal-plane synchronization, which is a built-in feature of this camera and which will permit synchronization at all shutter speeds from 1/70 to 1/1000 with the recommended flash lamps. (2) Between-the-lens shutter synchronization for shutters not incorporating the built-in synchronization mechanism. (3) Between-the-lens shutter synchronization for shutters which incorporate the built-in mechanism.

Focal-Plane Synchronization

With focal-plane synchronization, which is unsurpassed for use with fast action shots, the required accessories will be in the nature of a flashing unit consisting of a battery case, reflector, battery case support and a connecting cord. The connecting cord is connected from the socket in the back of the camera to the series outlet on the battery case. (On the GRAFLEX battery case, this series outlet is beneath the red push button switch and it is made available by unscrewing the switch and swinging it down.) See Figure 8 which illustrates the 2¼ x 3¼ Speed GRAPHIC with GRAFLEX Flashing Unit properly attached for focal-plane synchronization.

All flash lamps to be satisfactorily used with the focal-plane shutter should have a useful flash duration of at least 30 milliseconds. The Nos. 6 and 31 Photoflash and the Nos. 2 and 2A Superflash lamps meet this requirement.

Proper synchronization with the above lamps is possible at all shutter speeds from 1/70 to 1/1000 which include all possible combinations with shutter slits B, C and D at the various tension settings. Synchronization should never be attempted with any of the focal-plane shutter speeds that are obtained with curtain slit A. (This slit appears in red on the slit aperture window as a caution.) All flash lamps can be used at the T setting of the shutter.

For reasons of economy the smaller of the above flash lamps may be preferred. These lamps may be used for most satisfactory results from speeds beginning with 1/100 and faster when the camera is held in its normal picture taking position.

When vertical pictures are to be made or if synchronized speeds not falling within the above-mentioned range are desired, the increased illumination as furnished over a longer period of time by the Nos. 31 and 2A flash lamps is recommended.

(For information regarding other flash lamps and their possible use with your camera, please communicate with GRAFLEX, Inc.)

Attach the battery case and reflector to the camera according to the instructions accompanying each unit. Insert the connecting cord into the socket in the back of the camera. Insert the other end of the connecting cord into the series outlet on the back of the battery case. (Figure 8) See instructions accompanying it. The flash lamp will be fired as the focal-plane shutter is released in the normal manner. Caution: To prevent accidental firing of the flash lamp, insert it in the battery case socket after the shutter has been set to the desired speed.

For proper exposures with flash lamps used with focal-plane shutter, see table below.

When using focal-plane synchronization, be sure that the front shutter is on "T" and open.

Exposure Table for Using Flash Lamps with the Focal-Plane Shutter

The following table may be used as a guide for approximate shutter settings. It is based on the use of Eastman Super XX or films of similar speeds with flash lamps recommended for focal-plane synchronization.

Distance	Shutter Speeds		
	1/100	1/280	1/700
6 feet	f/32	f/22	f/11
10 feet	f/22	f/16	f/8
15 feet	f/16	f/11	f/5.6
20 feet	f/11	f/8	f/4

For faster or slower shutter speeds than those indicated, refer to the charts prepared by the flash lamp manufacturers.

Between-the-lens Shutter Synchronization — with Solenoid Release

All between-the-lens shutters that do not incorporate the built-in synchronization mechanism require a flash synchronizer with a release whose function is to release the shutter at the proper instant so that the shutter is fully open when the flash lamp has reached its peak. Figure 2 illustrates a 101mm GRAFLEX Optar lens in GRAPHEX shutter fitted with a No. 25 GRAFLEX Flash Synchronizer complete with solenoid release. The release must be properly positioned in relation to the shutter release lever. The solenoid release supplied with the GRAFLEX Flash Synchronizer is installed on the Miniature Speed GRAPHIC front standard (Figure 2) so that it may be removed when the camera is to be closed, and reinstalled without disturbing the shutter synchronization. See Synchronizer Manual for full details.

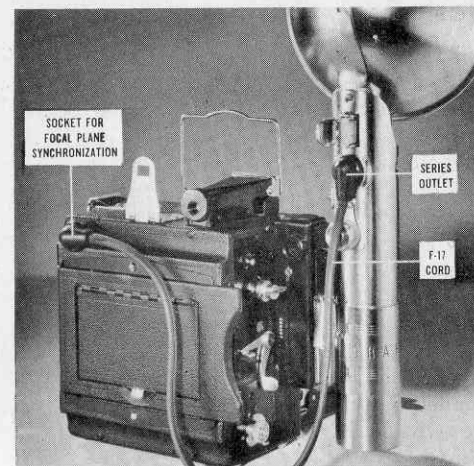
To operate the synchronizer after it is in place, the focal-plane shutter is first opened by setting "0" in the slit aperture window, the front shutter is set for one of its highest speeds and cocked, a flash lamp is inserted in the socket, and the button for closing the circuits on the rear of the battery case is pressed to make the exposure. With a correctly adjusted outfit using any flash lamp designed for between-the-lens shutter synchronization the shutter will be opened and closed while the flash is at its maximum intensity. Recommended lens apertures and shutter speeds should be obtained from tables furnished by makers of the lamps.

Shutter with Built-In Synchronization

The more recently supplied shutters are complete with built-in mechanism automatically producing synchronization. Complete instructions appear on Pages 8, 9, 11 and 12.

With a shutter having built-in synchronization, the required accessories will be in the nature of a flashing unit consisting of a battery case, reflector, battery case support and a cord extending to the shutter. This cord should be attached to the shutter and to a Series Outlet in the battery case. This outlet is usually at the back of the battery case, sometimes on the underside of the head.

Fig. 8—The 2¼x3¼ Miniature Speed GRAPHIC with F-17 cord connected for focal-plane synchronization. The series outlet on the back of the battery case is also used for connecting the A-20 cord when between-the-lens shutters with built-in synchronization are used.



In the GRAFLEX Battery Case, it is beneath the red push button switch and is made available by unscrewing the switch and swinging it down. (Figure 8)

Synchronization with a shutter having built-in synchronization is made by releasing the shutter either manually or with a cable release. Figure 1 illustrates a 101mm Kodak Ektar lens in Supermatic Shutter with built-in synchronization fitted with a GRAFLEX Flashing Unit. See also pages 7 through 12.

Ground-Glass Focusing for Flash

When a magnetic release is in place, its finger may be in such a position as to make the front shutter inoperative for either "Time" or "Bulb" exposures. As far as the flash synchronizer itself is concerned this is of no importance, but it may be exceedingly annoying when ground-glass focusing must immediately precede use of the flash. This difficulty has been overcome with certain shutters through the introduction of the Press-Focus Button and Press-Focus Lever built into the Supermatic and GRAPHEX shutters, previously described.

Flash Equipment

Two sizes of flash synchronizers and flashing units are offered for use with the $2\frac{1}{4}\times 3\frac{1}{4}$ Miniature Speed GRAPHIC cameras. For synchronizing between-the-lens shutters that do not incorporate the built-in synchronization mechanism, the efficient two-cell solenoid release of the GRAFLEX Flash Synchronizer will permit the satisfactory use of a two-cell battery case for general all-around flash synchronization using one lamp. However, for heavy-duty and multiple-flash use or with other synchronizers, the use of three cells in the battery case is advised. In this way, dependable synchronization with any suitable synchronizer can be expected. Refer to the exposure tables supplied by the manufacturer of the flash lamp for correct exposure when using the front shutter. With bayonet-base lamps, be sure the reflector is of the type recommended by the manufacturer of the flash lamp. The 5" reflector of the GRAFLEX Flash Synchronizer is of the latest approved design.

For focal plane shutter synchronization and for between-the-lens shutters that do incorporate the built-in shutter synchronization mechanism the GRAFLEX Flashing Units in either the two-cell or three-cell models are used for general all-around flash or for multiple flash. (Complete instructions for the GRAFLEX Flash Synchronizers, GRAFLEX Flashing Units and accessory equipment are given in the manuals which accompany them.)

Lenses

The lens of your $2\frac{1}{4}\times 3\frac{1}{4}$ Miniature Speed GRAPHIC is mounted in a shutter incorporating an iris diaphragm, and the shutter is held on the lensboard by a flange attached to the back. The lensboard is held in place in the front standard by a slide lock. Each lens should have its own lensboard.

To remove the lensboard, move the slide lock in the direction of the slots, holding the board at the top to prevent its falling out. Then lift it out by grasping the shutter.

The diaphragm scale (aperture scale in Figures 3, 4 and 5) is marked in f/ numbers, indicating the relative sizes of the opening, secured by moving the diaphragm control lever. Full information

on this subject will be found on Pages 31 and 32 under the heading Correct Exposures.

Your camera, when fitted with a lens whose focal length is approximately equal to the diagonal of the negative, will give a "normal" angular coverage or field of view—that is, about 45° to 50° .

Other things being equal, a short-focus lens will have a greater depth of field and angle of view than the normal focal length, while long-focus and telephoto lenses have a smaller depth of field and angle of view.

Equal f/ numbers have the similar values on all lenses, regardless of focal length.

Coated Lenses

The coating of lenses is one of the most recent accomplishments in the optical industry. A coated lens will have a brownish-purple color on the surface. This color is similar to the tarnish or iridescent color that was previously considered detrimental in lenses. The process of coating deposits a metallic salt, such as magnesium fluoride, on the surface of the lens in an extremely high vacuum.

The coating of lenses is done only on the air glass surfaces and not on the cemented surfaces. The advantages of coating photographic lenses are an increase in transmitted light by a reduction in light loss caused by internal reflections, a definite increase in brilliance or contrast of the image and the elimination of flare spots due to multiple reflections within the lens. Every surface of a lens that is coated will increase the light transmission. However, with most standard lenses, this increase in light transmission will not be noticeable due to the exposure latitude of most of the films currently available. The added brilliance of the finished picture due to the coating of the lens surfaces should be noticeable and should result in finer photographs.

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 easy circular motions. If a lens cleaning fluid (only those specifically recommended by lens manufacturers) is to be used, do not apply it directly on the lens surface. Instead place a drop or two on the lens tissue or cloth and wipe the lens with the moistened material.

Telephoto Lens

For a larger image of objects at a distance, use a long-focus lens or a telephoto. The latter type is often preferable because its special design does not require so great an increase in bellows extension and still gives a larger image. Needless to say, the field of view of a long-focus or telephoto lens is smaller than that of a normal focal length.

Accessory telephoto lenses for your camera may be in the form of attachments or complete photographic objectives. If the former, complete instructions will accompany them. If the latter, use them in the same manner as you use the lens now fitted to the camera for they are supplied with standard diaphragm openings which are just as fast as the same openings on the standard lens. *See also "Double Extension Bellows," page 27.*

Focusing

The focusing scales on Speed GRAPHIC Cameras are of the vernier type, one part carried on the camera bed and the other on the sliding track. The distance indicated is that from the subject to the film or ground glass. To focus on any known distance, turn the focusing knob until the lines corresponding to that distance on the two parts of the focusing scale lie exactly next to each other. When the front standard has been pulled against the infinity stops and locked and the lines opposite the infinity marks (∞) on the two scales coincide, the camera will be focused on very distant objects (infinity). To focus sharply on an object 15 feet from the ground glass, for example, turn the focusing knobs until the lines marked 15 on each scale coincide as shown in Figure 9.

The lens of your camera has been supplied with the focusing scale calibrated especially for it. To use this scale with any other lens, even of the same make, speed and rated focal length, may result in out-of-focus pictures.

If the lens and shutter on the front standard moves too easily on the sliding track, tighten the set screw in the bed beside the right hand focusing knob.

Ground-glass focusing must naturally be done with both shutters open (as in making a "Time" exposure as described in the section on Shutters), and preferably with the camera on a tripod and the lens set at its maximum aperture. The ground glass is made accessible by pulling down on the small latch (Figure 11) which allows the focusing panel cover to spring up. After use, the hinged door is pressed back into its closed position to prevent damage to it or to the glass focusing screen. Accurate focus on the ground glass screen can be obtained by varying the position of the lens with either focusing control knob.

The focusing panel in a GRAPHIC Back recedes to permit the entrance of a GRAPHIC Film Holder or Film Pack Adapter so that the film will lie in the focal plane where the image is formed.

If your camera has a GRAFLEX Back, it will accept the GRAFLEX focusing panel interchangeably with the GRAFLEX film and plate attachments.

Rangefinder Focusing

This camera, as illustrated, is equipped with an accessory internally-coupled rangefinder (Figures 1, 2, 7 and 8). Before leaving the factory it was adjusted so as to synchronize (i. e. give an exact indication of critical focus) with the particular lens with which your Speed GRAPHIC was equipped. Any change in lens, even if the focal lengths are nominally the same, will require a checking and probable readjustment of this rangefinder if it is to be used for the most accurate focusing. Such a re-synchronization should be attempted only by one with such experience; and then only in

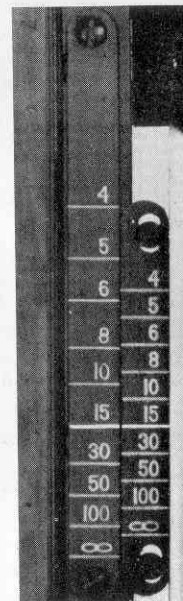


Fig. 9—Vernier-type focusing scale.

accordance with the procedure recommended by the manufacturer of the accessory.

To use the rangefinder look through the small window in its side nearest the back of the camera (or through the extension eyepiece attached to the rangefinder), being sure to keep fingers or other obstructions away from the two windows in its front side. Move the camera until the object to be focused on is in the center of the field visible through the rangefinder. Careful examination will now reveal a smaller and brighter field in approximately the center of a larger one, and this smaller field contains a second image which can be shifted by turning the focusing control on the camera bed. A little practice will enable you to locate the small field in the exact center of the larger one without conscious effort, and this exact centering is necessary to the most accurate use of this accessory. A critical focus is indicated for that object or portion thereof which shows a single image in this central field of the rangefinder. A double image is indicative of "out of focus," and may be corrected by turning the focusing control in the proper direction. Whenever possible, rangefinder focusing is facilitated by picking a portion of the object which presents sharp lines of good contrast.

Although this rangefinder is a great convenience in focusing, it does not tell you the exact amount of the scene which will be included on the negative. That is the function of a viewfinder, described in the next section.

Viewfinders

Three methods are available to the user of a Speed GRAPHIC for knowing how much of a given scene will be included in the negative. For most purposes the tubular viewfinder mounted on top of the camera near the rangefinder will be used. Details of the means by which this finder can be adjusted for parallax and for different focal-length lenses are shown in Figure 10. The small dial at the back of the finder has four markings, which can be aligned with the white line at the top of the finder. Notches assist in locating the four points so that subjects at distances of 4', 8', 15' and (infinity), respectively will be centered by the camera lens on the ground glass when the subject is centered in the finder. When using the finder, set this dial for the distance to the subject.

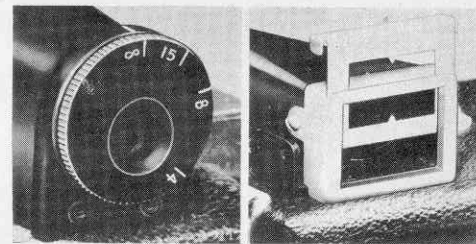


Fig. 10 — The tubular viewfinder — front and rear view.

Caution: Be sure that the front standard of the camera is centered. To center the front standard, loosen both of the knurled nuts on either side of the front standard and slide it up or down until the top of the sliding section is flush with the top of the metal guides.

The size of the front aperture in this finder determines the maximum field of view seen through it, and may be changed by the insertion of new masks to correspond with the fields covered by lenses of various normal and long focal lengths. The mask supplied with the camera was chosen to match the lens fitted to it. Each mask is identified by a number, and data concerning their use will be found in a special circular available on request.

The wire frame finder is brought into action by raising the peepsight from its folded position against the rear of the camera top and by lifting the frame from its folded position in front of the front standard (Figures 1 and 8). This finder must be folded down before the front standard can be returned to the camera housing preparatory to folding up the bed. This wire frame finder permits you to observe the picture full-size and from eye level and is therefore well suited to the following of moving subjects. In use, place the eye as close as possible to the peepsight so that the area being viewed will be delineated by the marginal limits of both the peepsight and the frame finder.

Viewfinders in general should not be relied upon to give too accurate an indication of the exact limits of the picture to be secured on the negative, since the amount visible depends upon the posi-

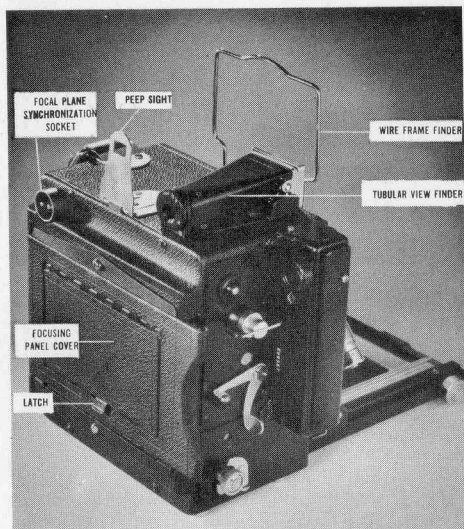


Fig. 11 — Showing rear, top and right sides of Miniature Speed GRAPHIC.

tion at which the observer holds his eye which varies between individuals and is greatly influenced by whether or not the user wears glasses. They are used to best advantage when your eye is held as close as possible to the rear element of the finder. When very accurate composition is necessary, place the camera on a tripod and use the ground glass. For access to the ground glass, depress the latch at the rear of the camera and the spring actuated focusing panel cover will swing free. (Figure 11)

The Wide-Angle Lens

The use of wide-angle lenses will sometimes make it necessary to drop the camera bed so that it will not cut into the field of view. To drop the bed on the Miniature Speed GRAPHIC, depress the bed braces and partially close the bed. The bed braces should then be slipped off the studs located inside the camera body. The slots on the bed braces have an intermediate position where the bed

braces may be easily slipped off the studs. The bed will then swing down and the front standard can be positioned on the track within the camera body. To focus the lens, move the front standard slowly in and out by grasping the two finger grips of the front standard lock (On the $2\frac{1}{4} \times 3\frac{1}{4}$ Miniature Speed GRAPHIC it won't be necessary to drop the camera bed unless lenses of extreme wide angle are to be used.)

To close the bed, move the front standard as far back as it will go into the camera body, attach the bed braces to their respective studs and raise the bed until it snaps into position.

Double Extension Bellows

When using lenses with long focal length or when using the average lens at very close distances, it sometimes becomes necessary to extend the front standard beyond the point permitted by the accurately preset infinity stops in order to obtain the additional bellows extension required. It is quite essential that the infinity stops be left in the position set at the factory, if the equipment is to be used again in the normal way, including rangefinder or scale focusing. This extra bellows extension may be gained by "jumping" the front standard over the infinity stops without disturbing their accurately set position. To do this: rack the front standard as far back into the camera body as it will go and rack the sliding track forward about one inch, pull the front standard forward and slip it off the stationary track that is attached to the bottom of the camera body. The sliding track should then be racked all the way back and the front standard should be carried forward and refitted to the front end of the sliding track. Neither the rangefinder nor focusing scales can be used with the lens extended in this manner; focusing must be done on the ground glass.

Rising Front

In general, when it is desired to photograph an object higher than your head, you point the camera upward, and if the subject (such as a building) happens to have a flat vertical surface, the resulting negative is apt to show an unwanted converging of lines which you know are parallel. This is the phenomenon which makes

some photographs of tall buildings look as though they were leaning backward. This is not "distortion" but a true rendering of linear perspective—even though it may not always be pleasing.

Although the linear perspective can be altered greatly during subsequent enlargement of the negative, it is often desirable to minimize the effect as much as possible in the original exposure. This can be done by keeping the back of the camera (the film) as nearly parallel as possible to the surface being photographed, and by then bringing into the field these parts slightly higher by raising the lens.

On your new Miniature Speed GRAPHIC, the lens may be raised from its normal position after loosening the knurled nuts on either vertical side of the front standard (Figure 1). Before making an exposure, the lens should be locked in its raised position by again tightening the knurled nuts. Before any attempt is made to return the front standard to the camera housing (as in preparation for closing the front bed), the lensboard must be lowered back to its normal position. The sliding section of the front standard must be lowered until it is flush with the metal guides on both sides. Lock it in place by tightening the two knurled nuts.

Film and Plate Holders

Film Pack Adapters, Holders for sheet film, (cut film) and plates, as well as Magazines for sheet film, are available for use with the Speed GRAPHIC. The Magazine, however, is usable only with the GRAFLEX Back. It is described in detail in the special instruction pamphlet which accompanies it.

Blowing or brushing out the empty holders before loading will help prevent the occurrence of "dust spots" in the finished negative.

Film Pack Adapter

The Film Pack Adapter can be loaded or unloaded in full daylight, but the direct sun should be definitely avoided; and deep shade becomes more essential as higher-speed films are used. Always make sure that the slide is inserted before the adapter is removed from the camera.

To load the Film Pack Adapter, open its hinged back by first releasing the pair of catches or buttons located at the edge nearest

the slot (the edge from which the slide can be withdrawn). Then insert the metal film pack, handling it by its edges, so that its paper tabs protrude through the slot in the adapter when the hinged back is closed, and so that the aperture in it faces the aperture in the front of the Adapter. (Save the paper and metal foil in which this film pack was wrapped so that it may again be protected from light as soon as it is removed from the Adapter.)

Before the first exposure can be made the outside tab (bearing the number 0) must be withdrawn and torn from the pack. Further instructions accompany each pack. After the last tab (number 12) has been pulled, the exposed film pack is somewhat self-protected and may be removed from the Adapter. Handle is only by its edges. Re-cover it with its foil wrapping and return it to the box.

Sheet Film Holders

Loading or unloading a sheet film holder should be done only in total darkness; in order to acquire the skill necessary for this, you may wish to practice in the light with a piece of exposed film.

To find the emulsion side or light sensitive surface of a piece of sheet film in the dark, note the position of the notches cut along one of its shorter edges. The emulsion side will be facing you when the unnotched short side of the film is nearest you and the notches are in the upper right-hand corner. Always handle the film by its edges and never touch the front (emulsion) surface.

To load a sheet film holder, first remove the slide. Now, while bending the bottom retaining edge of the holder out from the position which it occupied when the slide was in place, slip the piece of sheet film in under the two film-retaining guides so that the emulsion side will be next to the slide when it is replaced. It will facilitate insertion of the film if you bow it slightly. After the film has been slid into the holder as far as it will go, the hinged bottom edge of the holder can be returned to its normal position. If the bottom retaining edge does not seat smoothly, the film has not been pushed under the upper guide at the other end.

Replace the slide after the film is properly inserted. Rotatable catches are provided to prevent unintentional withdrawal of a slide.



Fig. 12—The 2¼x3¼ Miniature Speed Graphic in action.

Raised dots on the slide handle can be used to identify exposed and unexposed films. Load the holder with the dots on the outside and after exposure replace the slide with dots facing in.

To unload the holder, the reverse procedure is followed.

Fitting Holders to the Camera

Accessories such as the GRAPHIC holders are inserted in the GRAPHIC Back in the opening presented when the focusing panel is separated from the main body of the camera, by drawing back on its two ears. The holder should be held by its sides and pushed in until its raised edge drops into the recess in the back of the camera; this insures a light-tight fit and eliminates the possibility of drawing the holder out of the camera as the slide is removed.

To remove the holder, insert the slide, pull the holder slightly away from the back of the camera at the handle end, and push the other end with the left hand. It then comes out very easily.

GRAFLEX film and plate holders, Film Pack Adapters and Magazines are loaded with film in the same manner as the corresponding GRAPHIC accessories. Like the accessory GRAFLEX focusing panel, this type of film and plate accessory is held in place on the camera by the retaining strip at the bottom and the slide lock on top. After fitting these accessories to the camera, make sure that the slide lock is pushed down as far as possible.

Correct Exposure

While the final goal of most photography must be admitted to be a satisfactory print, the first goal of the camera user is a negative in which at least the main subject of interest is sharply defined and of a density which 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. The best advice is undoubtedly to cut through all of this complication by learning to use a good exposure meter, for the price of one of the better photo-electric models will be repaid many-fold in good negatives and general satisfaction.

But 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 then 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 without even a pencil. 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.

Suppose for example that you know the correct exposure would be $1/50$ at $f/16$. But your subject is going to move and you have estimated that $1/200$ th will be needed to stop it on the negative. 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 relation 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 Speed 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. A similar caution must be observed if you have an $f/3.5$ objective, as the marking $f/4$ will follow $f/3.5$ even though the 2-to-1 exposure factor does not lie between these two apertures.

Any of these combinations which the exposure meter offers you will give the same density on the negative; but the sharpness of those negatives and the amount of subject which will appear to be in good focus will vary with the exact combination you choose. And 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; suggestions regarding it will therefore be given next. 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—assuring that all motion was stopped—and that goes under the heading Depth of Field.

Stopping Motion

If the subject you intend to photograph is moving, its image on the plate will likewise move. It will move some during even $1/1000$ th second, although only about $1/10$ th as far as it will during $1/100$ th 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. And 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 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.

		Approximate Focal Length in Inches				
		4	4-1/8	4-3/8	4-1/2	5
Distance	12	1/500	1/500	1/600	1/600	1/600
Subject	25	1/250	1/250	1/300	1/300	1/300
In	50	1/125	1/125	1/150	1/150	1/150
Feet	100	1/70	1/70	1/80	1/80	1/80

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 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 born 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 completely to "freeze" an object than merely to 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. Sailboats.
- 40 mph. Horse races. Highway traffic. Power boats.
- 60 mph. Trains. Motorcycle races. Birds in flight.
- 100-300 mph. 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 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 do, however, put out tables under the heading "depth of field," or less correctly "depth of focus," which some photographers find useful. The following table can be used as a guide. It shows the nearest and farthest objects which appear equally sharp when lenses of different focal lengths are focused at varying distances from the camera with lenses stopped at f/8.

<i>Distance focused upon at stop f/8</i>	<i>6 ft.</i>	<i>12 ft.</i>	<i>25 ft.</i>	<i>50 ft.</i>	
Focal Length of Lens	4"	61"-88"	8¾'-18¾'	14¼'-103'	20' to Infinity
	4½"	62"-86"	9'-18'	15'-82'	21' to Infinity
	4¾"	62"-85"	9¼'-17'	15½'-66'	22' to Infinity
	5"	65"-81"	9¾'-15½'	17'-48'	25' to Infinity

A great majority of camera users, however, find the following easily-remembered facts valuable as 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 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 at the precise point on which you focus without regard to what is nearer or farther away, choose a lens aperture approximately halfway between the greatest and the smallest which your lens can give.

The hyperfocal distance is the nearest point to the camera that has satisfactory sharpness when the lens is focused on infinity. This distance varies with the size of the stop used.

By focusing an object at the hyperfocal distance of the stop used, objects from one-half this distance to infinity will be satisfactorily sharp.

Example: For a 4½ inch lens, focus at 30 feet, use stop f/11, and objects will be in reasonably sharp focus from 15 feet to infinity. The table below shows the nearest point to the camera that has satisfactory sharpness with lenses of different focal lengths when focused at infinity.

Hyperfocal Distances

Stop f/		3.5	4.5	5.6	8	11	16	22	32
Focal Length of Lens	4"	76'	59'	48'	33'	24'	16'	12'	8'
	4½"	81'	63'	51'	36'	26'	18'	13'	9'
	4¾"	91'	71'	57'	40'	29'	20'	14'	10'
	5"	120'	93'	75'	52'	38'	26'	19'	13'

Holding the Camera

The strap, on the side of the camera housing opposite to that on which the focal-plane shutter controls are located, is designed for holding the outfit in use as well as for carrying it when not in its case. Holding this in the left hand or slipping the hand under the strap and gripping the edge of the body (as you prefer) leaves the right hand free for focusing, shutter operation, and film changing. Bracing your arms against your body will increase the steadiness with which you can hold the camera and therefore increase the sharpness of your negatives, especially those exposed at the slower shutter speeds.

Tripod Sockets

The Speed GRAPHIC is provided with two tripod sockets in the camera housing. The one for vertical pictures is under the carrying strap and is made accessible by unlatching this strap at its upper end; the top strap lug slips out of its clip when the spring forming the top part of the latter is pressed downward.

Care of the Camera

This camera is carefully constructed, and with proper care will give the type of performance which is rightfully to be expected from high-grade equipment. Although it is strong enough to withstand normal shocks incident to shipping and actual use, it should be handled with proper care so as to avoid injuries to the more sensitive parts such as lenses, shutters, rangefinder, etc.

The lenses must be kept clean at all times. Never touch the glass of a lens with the fingers. Finger prints corrode the highly polished surfaces and ruin the objectives. A soft brush, such as goes under the name "camel's hair," is usually sufficient for removing dust and lint from lenses, and a small rubber ear syringe is also handy for blowing off dust. If additional cleaning seems to be called for, use tissue made for that purpose; or if this is not available a soft, freshly-laundered unstarched unused linen handkerchief. Breathing on the lens before applying the tissue is accepted as good practice, but the use of household cleaning fluid should be avoided. Never unscrew the lens elements from the shutter; under normal conditions cleaning of the inside surfaces will be unnecessary.

Shutters contain springs that regulate their speed, and these should not be left over long periods in their stressed (or cocked) condition. The front shutter should always be released before putting the camera away. The spring tension on the focal-plane shutter returned to 1 and the curtain returned to 0. Adoption of these practices will maintain a maximum efficiency in the operation of these shutters. Never oil a shutter.

Filters require the same care as lenses. The mount should be checked to see that it does not exert undue pressure on the filter, and care should be exercised to make sure that the filter is attached squarely and accurately to the lens.

Before loading a sheet film holder, dust off both sides of the slides as well as the interior of the accessory. A reasonably stiff paint brush, having unused bristles which will not shed, is well suited to this purpose. The ear syringe will be useful here, too, to remove dust from the inaccessible edges.

Important points in closing the camera :

1. Center the lens.
2. Rack the track back to infinity.
3. Move the front standard back into the camera body.
4. Release slit and tension of the focal-plane shutter and make sure that the between-the-lens shutter is not cocked or set at its highest speed.
5. Make sure the bed locks securely in its closed position.

Making an Exposure with a Between-the-Lens Shutter

1. Open camera—pull out front standard with lens to infinity position.
2. Determine field of view (required subject to camera distance)—with either tubular viewfinder, wire frame finder or ground glass.
3. Determine exposure for type of film being used—use an exposure meter or an exposure chart.
4. Set shutter for correct shutter speed and diaphragm opening.
5. Focus the lens—with either rangefinder, focusing scales or ground glass.
6. Make certain focal-plane shutter is open ("O").
7. Insert film holder or film pack adapter and pull out slide.
8. Cock shutter.
9. Compose picture with viewfinder.
10. Make exposure by releasing shutter manually or with cable release.
11. If a film holder is used, replace slide and turn holder for next exposure. If film pack in film pack adapter was used, pull tab of exposed film.

Making a Synchronized Flash Exposure with a Between-the-Lens Shutter with a GRAFLEX Flash Synchronizer and GRAFLEX Flashing Unit

1. Open camera—pull out front standard with lens to infinity position.
2. Attach synchronizer battery case to bracket on camera. Attach reflector to battery case.
- *3. Attach solenoid release to mounting bracket on front standard.
- **4. Attach connecting cord (F-17) from solenoid release to one of the two circular parallel outlets in the front of the battery case.
5. Determine field of view (required subject to camera distance)—with either tubular viewfinder, wire frame finder or ground glass.
6. Determine exposure—find guide number or flash number for type of film, flash lamp and choice of shutter speed.
7. Set shutter for correct shutter speed and diaphragm opening.
8. Focus the lens—with either rangefinder, focusing scales or ground glass.
9. Make certain focal-plane shutter is open (“O”).
10. Insert film holder or film pack adapter and pull out slide.
11. Cock the shutter and the Synchronizer lever.
12. Insert flash bulb.
13. Compose picture with view finder.
- ***14. Make exposure by pressure on the red contact button of the main switch located at the back of the battery case.
15. If a film holder is used, replace slide and turn holder for next exposure. If film pack in film pack adapter was used, pull tab of exposed film. Eject burned bulb.

NOTES:—FOR SHUTTERS HAVING BUILT-IN SYNCHRONIZATION.

*Step No. 3—eliminate.

**For step No. 4, Connect connecting cord (A-20) from contact prongs on side of shutter to series outlet at back of battery case.

***For step No. 14—Make exposure by manually releasing shutter release lever or with cable release.

Making an Exposure with the Focal-Plane Shutter

1. Open camera—pull out front standard with lens to infinity position.
2. Set front shutter on “T” (Time) and open.
3. Determine field of view (required subject to camera distance)—with either tubular viewfinder, wire frame finder or ground glass.
4. Determine exposure for type of film being used—use an exposure meter or an exposure chart.
5. Focus the lens—with either rangefinder, focusing scales or ground glass.
6. Set focal-plane shutter for correct shutter speed by using the correct combination of curtain aperture and spring tension (diaphragm setting is made on front shutter).
7. Insert film holder or film pack adapter and pull out slide.
8. Compose picture with view finder.
9. Make exposure by squeezing focal plane shutter release lever.
10. If a film holder is used, replace slide and turn holder for next exposure. If film pack in film pack adapter was used, pull tab of exposed film and replace slide.

Making a Synchronized Flash Exposure with the Focal-Plane Shutter and a GRAFLEX Flashing Unit

1. Open camera—pull out front standard with lens to infinity position.
2. Determine field of view (required subject to camera distance)—with either tubular viewfinder, wire frame finder or ground glass.
3. Attach synchronizer battery case to camera and reflector to battery case.
4. Attach connecting cord (F-17) from focal-plane socket on left rear of camera to series outlet on back of battery case.
5. Determine exposure—find guide number or flash number for type of film, flash lamp and choice of shutter speed (use only flash lamps recommended for focal-plane use).
6. Focus lens—with either rangefinder, focusing scales or ground glass.
7. Set focal-plane shutter for correct shutter speed by using the correct combination of curtain aperture and spring tension. (Diaphragm setting is made on front shutter).
8. Insert film holder or film pack adapter and pull out slide.
9. Insert flash bulb.
10. Compose picture with viewfinder.
11. Make exposure by squeezing focal-plane shutter release lever.
12. If a film holder was used, replace slide and turn holder for next exposure. If a film pack in film pack adapter was used, pull tab of exposed film and replace slide.

Double-Extension Bellows (for Close-up Photography)

When using the camera for close-up photography, the lens is placed at a greater distance than normal from the focal plane (film position). This will necessitate a change in the exposure, since the $f/$ values engraved on the lens are based on a relationship existing only when the lens is at the infinity position. For close-up photography, we recommend that your exposures be determined in accordance with the following table. The lens-to-film distance (bellows draw) can be determined approximately by measuring from the diaphragm of the lens back to the plane occupied by the film (the ground glass).

Reproduction Ratio (Image size to Object size)	Bellows Draw	Exposure Factor*
1:8	1.125f	1.215*
1:4	1.25 f	1.75*
1:2	1.5 f	2*
1:1.5	1.75 f	2.25*
1:1	2 f	4*

f—focal length

For black-and-white photography with standard films, you will find that the latitude of the film will compensate for much of the change in exposure so that no allowance for extension will be required unless copying close to full-size (1:1). However, for color photography, we would recommend that you follow this table very closely because of the limited latitude of color materials.

*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.

Flash Exposure Tables - Between-the-lens shutters

(For information on flash lamps and shutter speeds recommended for focal-plane synchronization, see pages 16 and 17.)

The following tables, supplied through the courtesy of the makers of the General Electric and the Wabash Flash Lamps, cover most of the widely used lamps for between-the-lens shutter synchronization. For further details as well as for exposure information when other lamps are used, we refer you directly to their literature.

Determine the film speed (supplied by the manufacturer) and the shutter speed with which the picture is to be taken. From the table for the lamp indicated, locate the flash factor or guide number for that particular film speed and shutter speed. For example, with a film having a speed rating of 64 Weston or 100 G-E, the numerical factor for a G-E Photoflash No. 22 would be 310 if a shutter speed of 1/200 were used. Divide this factor by the distance in feet between the lamp and subject to obtain the recommended f number. In this example if the lamp is 10 feet from the subject, a diaphragm opening of f/31 would be recommended. Use the closest diaphragm opening which would be f/32. If two light sources are used and quite closely in line with each other and the subject, use the next smaller diaphragm opening. However, if the ratio of the distances of the lamps from the subject is 2 to 1 or more, or they strike the subject at angles of more than 20°, use the guide number for the lamp nearest to the subject (generally close to the lens axis) as the additional lamp should be considered as fill-in lighting. This will not effect the basic exposure as determined by the position of the principal flash lamp, which is usually on or near the camera.

	<i>Tungsten</i>		<i>Kodachrome</i>					
	<i>Film</i>	<i>Weston</i>	<i>16</i>	<i>32</i>	<i>64</i>	<i>125</i>	<i>Type B-Type A</i>	
	<i>Rating</i>	<i>G-E</i>	<i>24</i>	<i>48</i>	<i>100</i>	<i>200</i>		
GE Mazda	T, B 1/25, 1/50, 1/100		70	100	140	195	30	50
Photoflash SM	1/200, 1/250		55	80	110	155	20	35
GE Mazda	1/25, 1/50		135	190	270	380	65	90
Photoflash No. 5	1/100		115	160	225	315	55	75
	1/200, 1/250		95	135	190	265	35	60
	1/400, 1/500		65	90	130	180	—	—

GE Mazda									
Photoflash No. 11	T, B 1/25, 1/50	150	210	295	415	70	100		
	1/100	125	180	255	355	55	80		
	1/200, 1/250	105	150	210	295	35	65		
	1/400, 1/500	75	105	150	210	—	—		
GE Mazda									
Photoflash No. 22	T, B 1/25, 1/50	220	310	440	615	90	145		
	1/100	190	270	380	530	75	115		
	1/200, 1/250	155	220	310	435	50	90		
	1/400, 1/500	110	155	220	310	—	—		
Wabash									
No. SF	T, B 1/25, 1/50, 1/100	80	110	155	210	35	55		
	1/200	60	85	120	165	25	40		
Wabash									
Press 25	T, B 1/25, 1/50	160	230	340	400	70	100		
	1/100	110	160	230	300	60	85		
	1/200	80	110	160	230	40	70		
	1/400	65	90	130	180	20	45		
Wabash									
Press 40	T, B 1/25, 1/50	160	230	340	450	75	110		
	1/100	110	160	230	300	60	90		
	1/200	80	110	160	220	40	75		
	1/400	60	90	140	200	30	50		
Wabash									
No. 2	T, B 1/25, 1/50	230	320	450	550	95	150		
	1/100	180	250	340	450	80	120		
	1/200	120	160	230	320	55	95		

The above tables for SM, No. 5, SF, and Press 25 are based on the use of reflectors especially designed for Midget lamps.

SYMBOLS: "T"—Time, "B"—Bulb
 "KB"—Kodachrome Type "B"
 "KA"—Kodachrome Type "A"

When using any color film, refer to the literature supplied by the film and lamp manufacturer for full details concerning the correct filter to use in order to be assured of proper color rendition.

The GRAFLEX Service Departments are equipped to inspect, clean and adjust all GRAFLEX products, and to fit accessories and special lenses to Speed GRAPHIC and GRAFLEX cameras. All correspondence on this subject should be addressed to the Service Department nearest to you.

The GRAFLEX Technical Department is anxious to help you get the most out of your Miniature Speed GRAPHIC. Do not hesitate to write us about any photographic problem you may have. When your questions have to do with the actual making of pictures, be sure to send in your negatives.

The Registration Card attached to your camera when it left the factory should be filled out completely and accurately, and returned to us promptly. It furnishes us with information that facilitates answering your letters, and assures a permanent record of your equipment that may prove valuable in case of theft or loss. If you did not receive a Registration Card with your camera, write today for another.

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