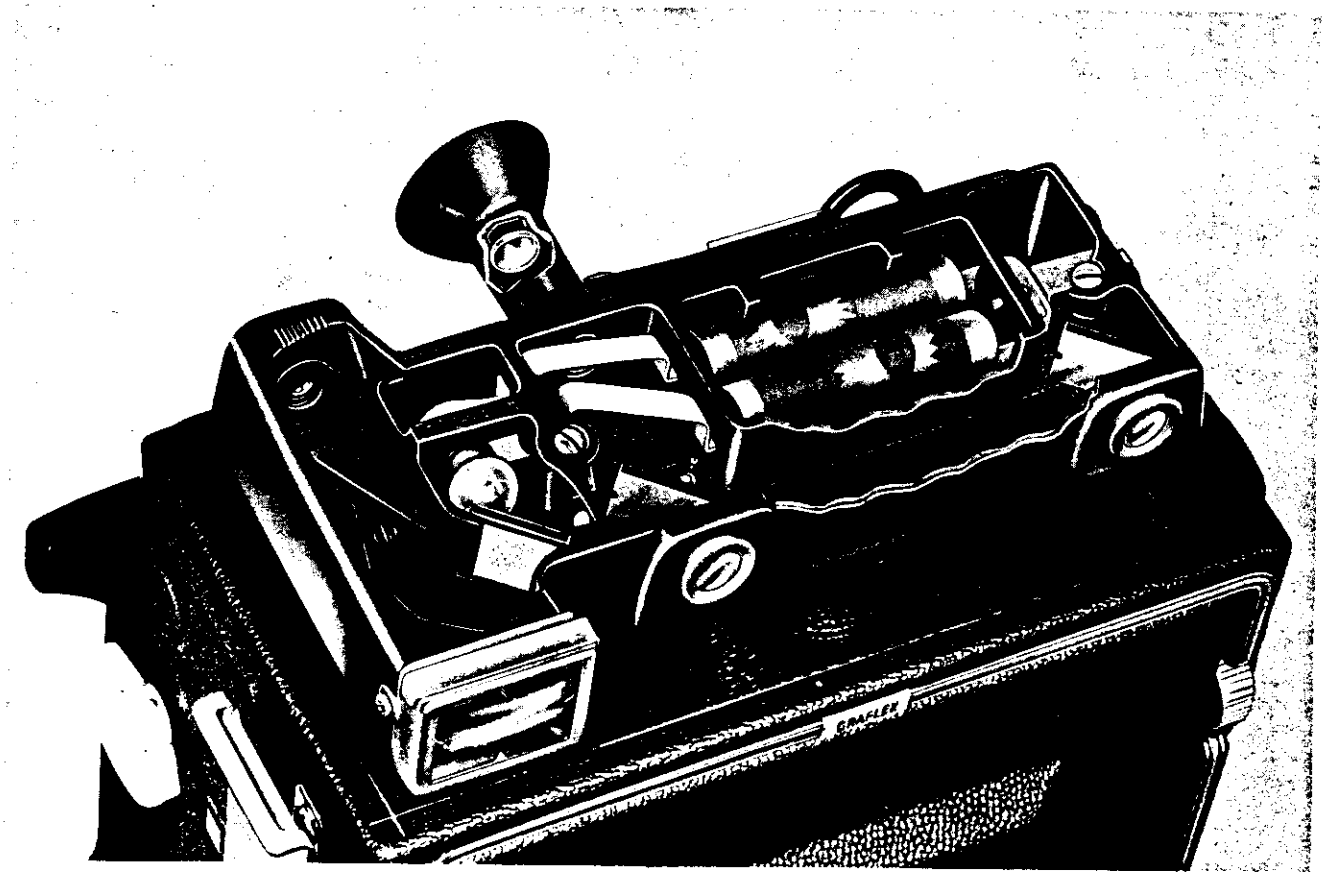
GRAPHIC® RANGEFINDER
WITH *Viewfinder and Rangelite* ®

SERVICE INSTRUCTIONS
and
PARTS CATALOG



193-156

GRAFLEX, INC.
ROCHESTER, N.Y.

Printed in U.S.A.

TABLE OF CONTENTS

PARTS CATALOG

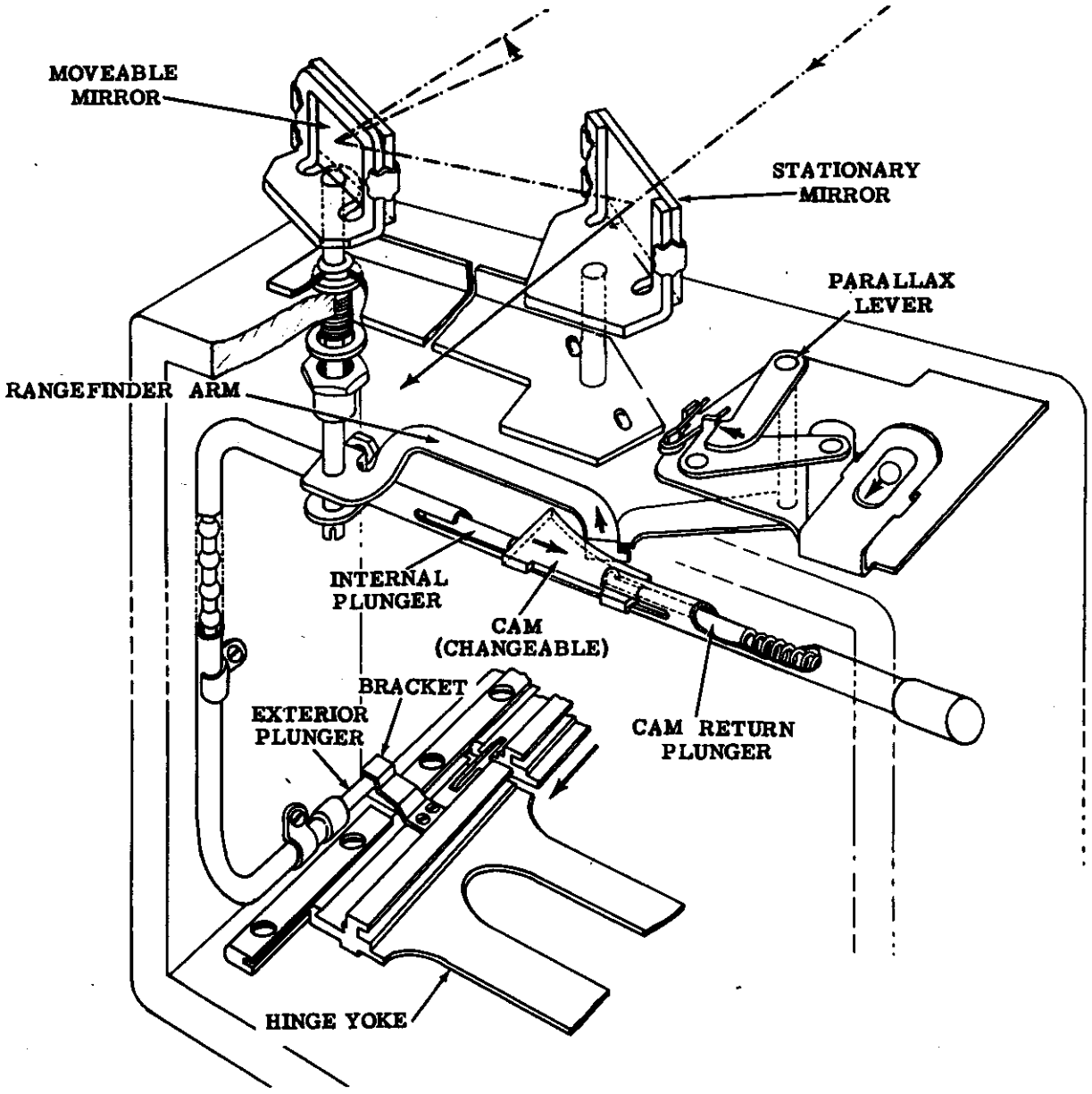


Figure 1. RANGEFINDER OPERATION.

1. INTRODUCTION

The Graphic Rangefinder with viewfinder and rangelite is mounted to and becomes an integral part of the top of the Pacemaker Speed or Crown Graphic "45" cameras. Once the rangefinder is assembled to the camera and adjusted it can be used with a wide variety of lenses through the use of interchangeable lens cams. Lenses may vary in focal length from wide angle through tele-photo. The viewfinder and rangelite are incorporated as part of the assembly.

2. OPERATION (Figure 1)

To adjust the rangefinder it is important to understand its operation. A bracket on the left side of the hinge yoke actuates an external plunger. This plunger, part of the tube assembly, transmits its motion through a column of balls or balls and spacers in a formed tube to an internal plunger that pushes the cam to the right; a spring loaded plunger returns the cam and column and plungers to their original position upon removal of pressure by the actuating bracket to the left. The yoke is moved in or out for focusing. The rangefinder arm rides on the cam; motion of the arm, caused by the cam, is transmitted to the movable mirror shaft on which the arm is mounted to deflect the image. The movable image is reflected to the transparent mirror and back through the eyepiece. The stationary image adjusting screw, on the stationary bracket, tilts that mirror so that the images coincide in respect to height.

The parallax actuator levers, attached to a common shaft, ride under spring pressure on the rangefinder arm. This lever slides the parallax mask up or down in the base of the parallax assembly, thus automatically correcting for parallax.

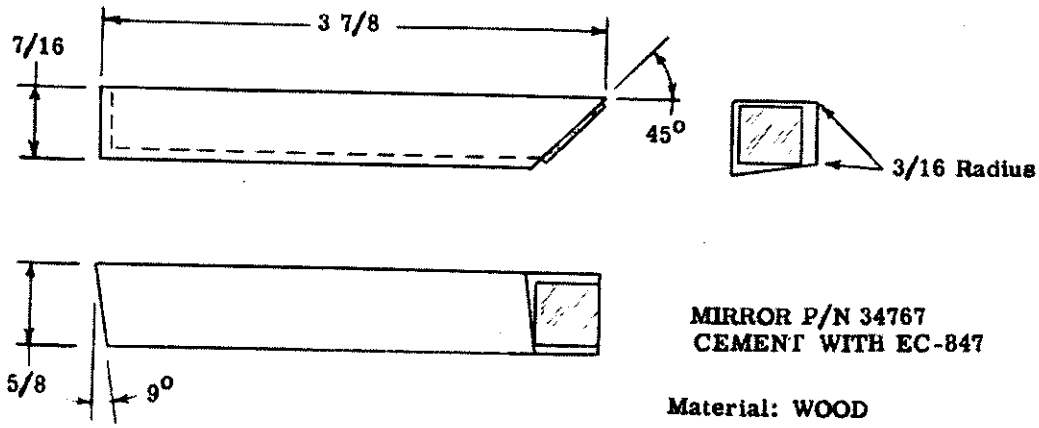


Figure 2. LAMP ALIGNING BLOCK

The rangelite, having its switch button on the left side, is operated by pressing the momentary contact switch. Batteries contained in the housing operate the lamp. Image of the bulb filament is projected from a fixed mirror through a projection lens and on the transparent stationary mirror. At this point, part of the light is transmitted and part is reflected to the movable mirror and both light beams fall on the subject. When the filament image, reflected by the two rangefinder mirrors, coincides the camera lens is in focus at that point.

3. ADJUSTMENT

3.1. Special Tools:

a. Master Cam (1 inch long X .032 inch thick X 0.437 ± .0001 inch wide), used to set infinity.

b. Lamp aligning block (figure 2), used to simplify focusing of Rangelite.

3.2 Adjustment: Adjustment differs from past practices .... the rangefinder is adjusted to infinity; then, the lens, focusing scales and infinity stops are positioned as follows:

a. Remove the rangefinder housing by unscrewing two slotted screws on the top and lift housing straight up. Pull front standard forward and unsnap the inner cover by lifting one and then the other of the end hooks from the slot in the base plate.

b. Assemble the master cam gage in the cam slot (figure 3). The bid yoke must be back as far as possible. Assemble the yoke bracket and slide to a position that presses on the lower tube plunger to cause the master cam to line up with the edge of the rangefinder arm (figure 4).

NOTE: 1. The above proceedure must be followed due to the fact that the .437 (infinity point) varies in respect to the "line-up edge" on

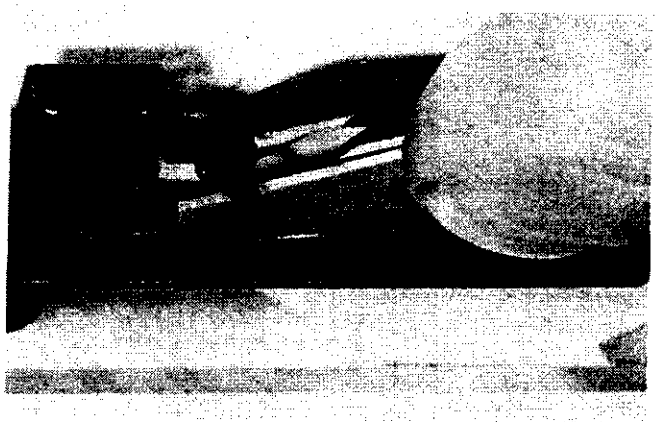


Figure 3. CAM INSERTING

production lens cams. Thus, lens cams are not interchangeable between similar lens or cameras without consideration of rangefinder adjustment; however multiple fitting can be made on one camera and the lens and their matching cams can be interchanged with other cameras if the initial infinity is considered.

2. For multiple fitting that include 10 to 15 inch focal lengths, see paragraph 3.3.

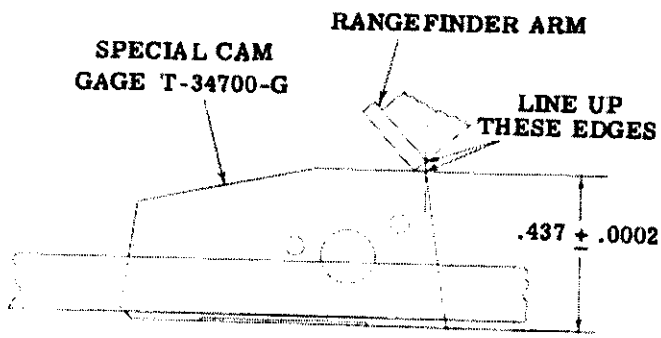


Figure 4. MASTER CAM - PRE-INFINITY SETTING

c. To set rangefinder infinity, sight the rangefinder on a target of 500 feet or more. Move the yoke forward about 1/8 inch and lock the yoke with lever on front right corner. Adjust the moveable mirror shaft by loosening the 3/16 inch hexagonal rangefinder arm screw. Turn the mirror mount while observing the movable image in the fixed mirror. When the images are aligned, tighten the hex head screw. Adjust double vision by turning the set screw on the fixed mirror mount (figure 5). Observe infinity and readjust if necessary. Remove master cam.

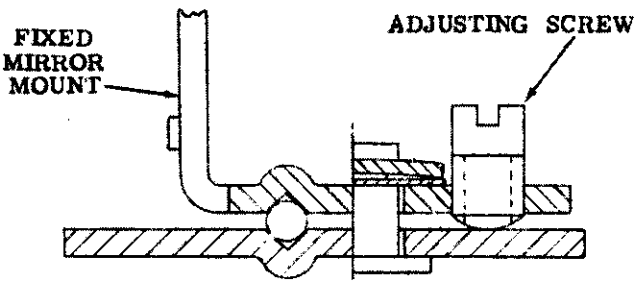


Figure 5. DOUBLE IMAGE ADJUSTMENT

d. The lens cam must be selected to suit the lens being fitted. If a focusing scale has been fitted to the lens, refer to the number stamped on the back of the scale when ordering cam. If cam and scale is required, measured the lens movement to the neares quired, measure the lens movement to the nearest thousands of an inch from infinity (500 feet or more is sufficient) to the following near distance:

Lens Focal Length	Near Distance (Target to film plane)
3 to 7 inch	4 feet
7 to 15 inch	10 feet

To be assured of accurate measurement of a lens, it may be shipped to the nearest Graflex Service Department for collimation and selection of cam and scales.

e. Assemble the required lens cam (figure 3) and focus rangefinder at infinity and lock bed. Assemble rangefinder housing and secure with its mounting screws under normal tension. Check the image at infinity to be sure that it has not shifted due to assembly of the housing. Unlock the bed yoke and move forward to set the scales at the nearest marked distance. Check the rangefinder image at this distance measured from the film plane to the target.

f. Focus rangefinder on infinity and lock yoke. Assemble lensboard and move front standard so that lens focuses sharp infinity target on the ground glass. Use a square to check squareness of front standard on yoke. Lock standard when square and infinity is sharp. Move infinity stops against front standard and tighten flat point headless set screw on front of stop. Check ground glass, rangefinder and focusing scales at the nearest scale distance measured from the target to the film plane. Center punch yoke through the rear stop screw hole and assemble cone point headless set screw.

g. Assemble rangefinder housing and secure with two oval fillister head screws, #6-32 x 7/8 inch long.

h. Batteries are positioned in the rear rangefinder housing. Slip two penlite batteries into the openings, alternating top and bottom position. Replace the cover by slipping one end into the opening; press in the other end and move flush (figure 6). Lamp should light when red button on left is pressed.

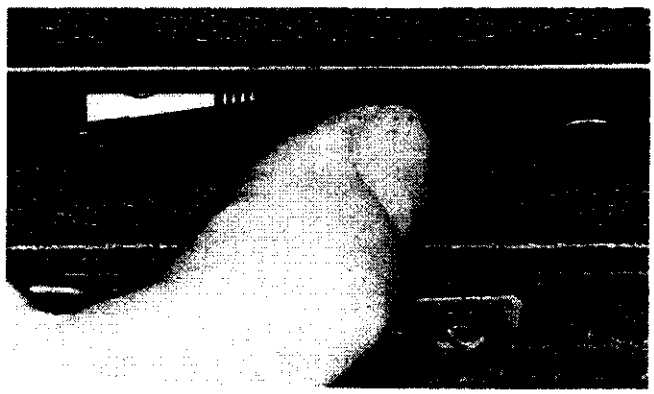


Figure 6. INSERTING BATTERY COVER

i. The cam retainer spring, selected to suit the diameter of the lens, is snapped around the lens flange so that the cam can be stored on the rear of the lensboard (figure 7).

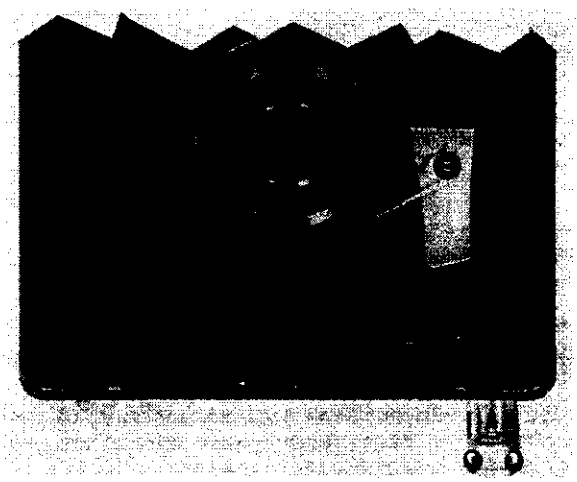


Figure 7. CAM WITH RETAINER SPRING

3.3 Multiple Fitting:

a. Same camera. If additional lens are fitted to one camera, perform only the adjustment specified in subparagraphs 3.2e and f.

NOTE: Long focus lenses (10 to 15 inch telephoto) can be fitted and in this case it is advisable to use the cam of the longest lens as the master cam due to the very slight slope of the cam. In this instance it will be necessary to adjust the rangefinder infinity as required in subparagraphs 3.2b and c.

b. Different camera. If special lens are to be used on a different camera, set up the infinity for the second camera as required in subparagraphs 3.2b and c. Take consideration of the preceeding NOTE on long focus lenses.

NOTE: Remember to order and attach duplicate focusing scales to the second camera.

3.4 Special Adjustments:

a. Malfunctions

MALFUNCTION	CAUSE	REMEDY
1. Infinity not constant.	Loose base plate.	(Early Model) Cut out covering and install seating washer (par. 3.4.b). Tighten rangefinder base lock nut.
2.	Loose rangefinder arm.	Tighten hex head screw and seal threads with Glytol cement.
3.	Loose rangefinder bracket.	Replace screws (par. 3.4.c).
4. Double image.	Adjustment not stable.	Readjust, see figure 5.
5. Close target does not range.	Short tube plunger.	(Early Model) Use longer plunger (par. 3.4.d)
6. No parallax adjustment.	Spring broken or unhooked.	Remove housing and service spring, see figure 8.
7. No Rangelite.	Weak batteries.	Replace with new batteries.
8.	Lamp burned out.	Replace and focus (par. 3.2.f).
9.	Contacts deformed.	Replace or reform.

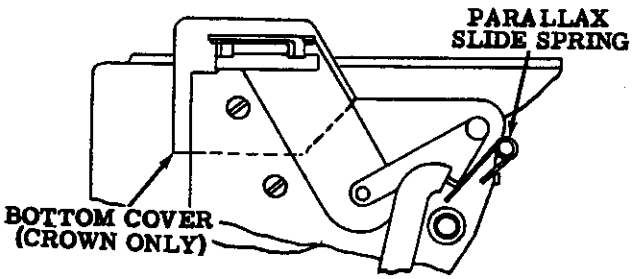


Figure 8. VIEWFINDER PARALLAX SLIDE SPRING

b. Rangefinder base seat washer is positioned on top of the case below the movable mirror to provide a firm mounting surface for the base.

1) Remove the rangefinder arm by loosening its hex head screw.

2) Remove the special hex head base lock nut.

NOTE: This nut is more accessible if the tube is removed. To remove tube, spread tabs on top tube bracket and remove tube clamps on side of camera.

3) Lift rangefinder base from top of camera.

4) Cut covering from around base mounting hole so that 19/32 diameter washer (P/N 30473-P68) will lay on the mahogany body.

5) Apply Wood-Lok on both sides of washers, position and reassemble. Tighten nut to a torque of 8 to 12 inch pounds when the base is parallel to the front of camera body within 0.010 inch.

6) Reassemble all other parts; apply Wood-Lok to wood screws on side tube clamps, see following paragraph c.

c. Rangefinder actuating bracket must be mounted tight on the rear yoke section. Early models will require replacement of clamp screws with a special flat head screw (P/N 34932), figure 9.

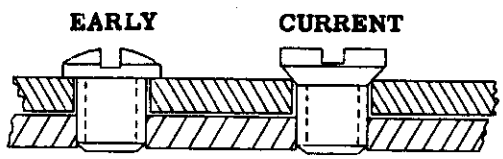


Figure 9. BRACKET SCREWS

d. Lower tube plunger was made longer. An early model plunger will extend about 13/16 inch from the tube cap while a latter model will extend about 7/8 inch. An old plunger can be replaced as follows (figure 10).

1) Remove the bed bracket.

2) Lay the camera on its back, remove the lens cam and use a long nose pliers to loosen the plunger tube cap.

3) Remove the cap and plunger.

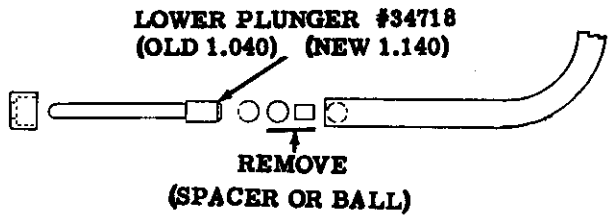


Figure 10. PLUNGER REPLACEMENT

4) Due to the longer plunger, it will be necessary to remove one spacer tube or ball. If the tube contains both spacer tubes and balls, remove the spacer tube. Insert a scribe in the lens cam slot and press on the plunger to bring the ball to the end of the tube so that it can be picked off with tweezers.

WARNING: Do not tip the camera so that balls and or spacers will fall out of tube. There are approximately 71 or 72 balls, or 44 balls, and 42 spacers alternating with a ball at lower end. The tube must be removed to measure the correct loaded dimension (figure 11). Vary components by adding one ball or removing one spacer or by selective use of left plunger or any combination of these three variations.

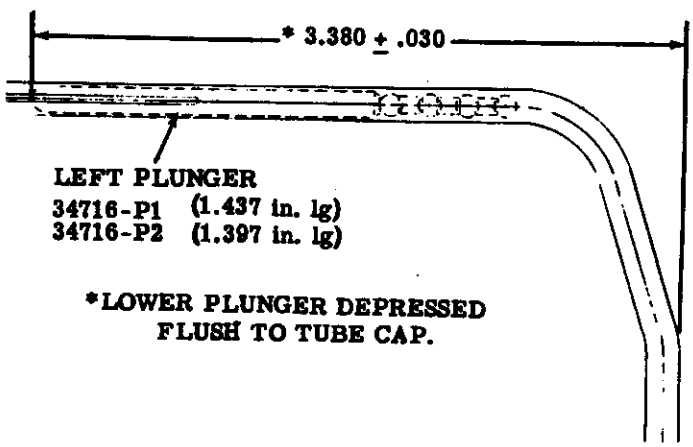


Figure 11. LOADED TUBE DIMENSION.

e. Tube Clamp. A second tube clamp has been added to hold the horizontal position of the tube more ridged. The figure below illustrate the location of the tube and its clamps (figure 12).

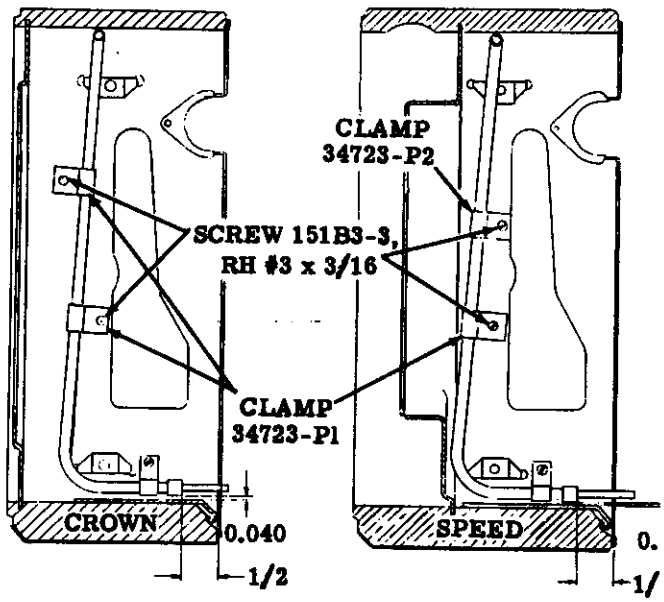


Figure 12. TUBE CLAMPS

f. PRECAUTIONS: The major difficulty will be image jump caused by one of the following:

1) Rangefinder arm rubs on center bed latch or on tube bracket. Loosen screw and lower arm on shaft.

2) Cam might have been misused. Check cam surface for nicks or burrs and polish with very fine stone.

3) Very rare, but the spring inside mirror shaft bushing may be too loose and allow image to flicker.

CAUTION: If spring is too tight, image will have additional back lash.

4) Mirror shaft bushing not tight. The nut on bushing must be very snug and shaft must rotate freely after its assembly.

4. MATERIALS

4.1. Wood-Lok Cement. Apply to (1) Rangefinder base seat washer, (2) Tube clamp wood screws, (3) Parallax base screws.

4.2. Glyptol Cement. Apply to (1) Rangefinder arm screw, (2) Parallax lever screw, (3) Actuator bracket screws.

4.3. Molycote (Powered Graphite). Apply to (1) Tube spacers and balls, (2) Parallax slide.

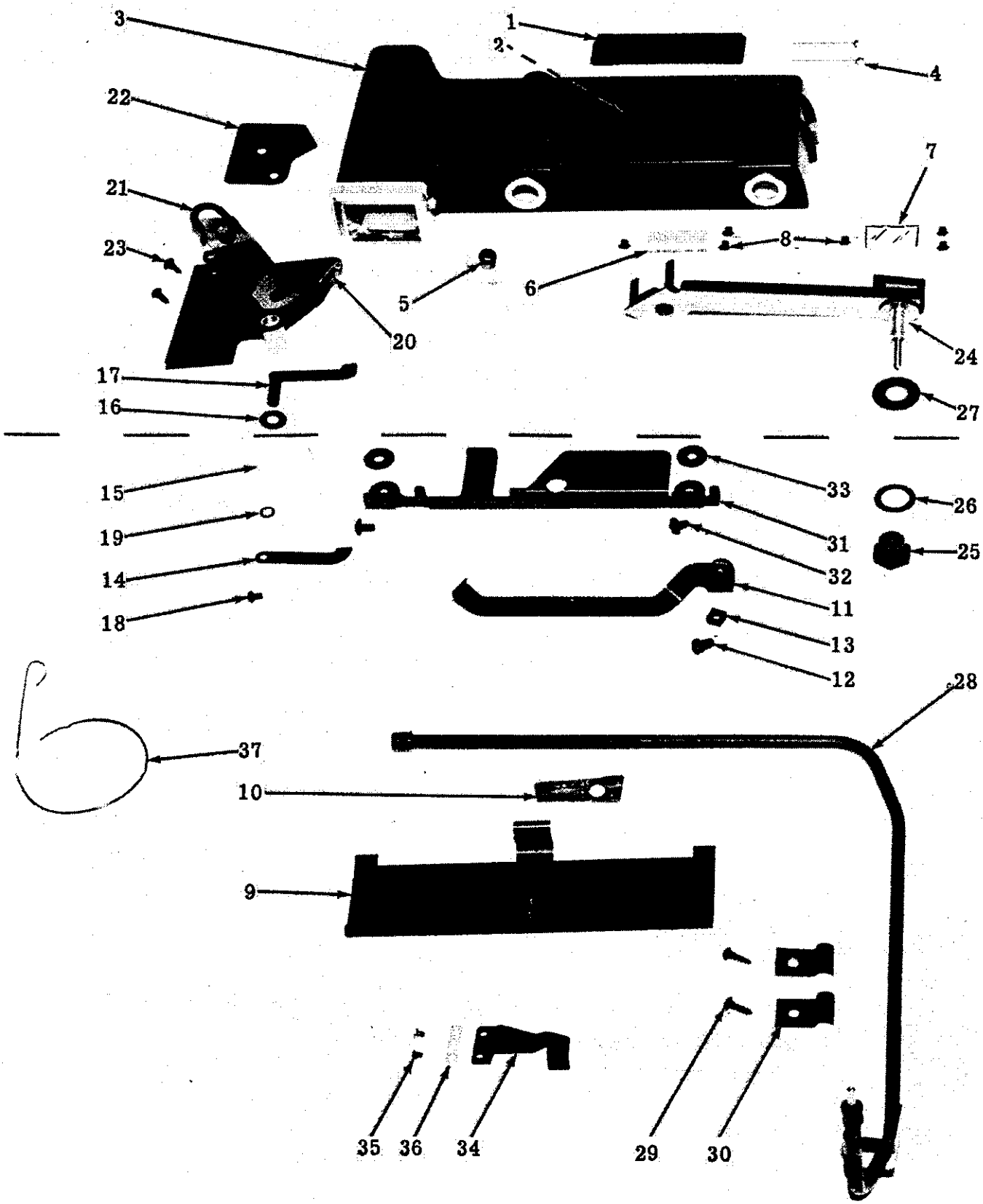


Figure 1. GRAPHIC RANGEFINDER-VIEWFINDER COMPLETE

Figure and Index No.	Part Number	1 2 3 4 5	Nomenclature	Qty.	Unit List Price
			GRAPHIC RANGEFINDER-VIEWFINDER		
1 -	Cat #3001		Graphic Rangefinder-Viewfinder - Consists of all parts listed in Column 1. Parts listed in Columns 2, 3 etc. are parts or subassemblies of the assembly listed below in preceeding column. Listed in disassembly order down; assemble from bottom up.		
-1	34748-G1	.	Cover Assy - Battery Compartment	1	.50
-2	Battery	.	Battery - Use Penlite, Size AA (Eveready 815 or equal)	2	Ref
-3	34743-G1	.	Housing Complete-Rangefinder-Viewfinder (See figure 2 for parts)	1	13.50
			Attaching Parts		
-4	106B6-14	.	Screw-Machine, Oval Fil H, #6-32 X7/8 in. lg, brass, chrome plate	2	.04
-5	34847	.	Spacer-Tubular (Early Models)	1	.08
			---***---		
-6	34711	.	Mirror - Transparent	1	.45
-7	34712	.	Mirror - Opaque	1	.50
			Attaching Part		
-8	32416-P1	.	Retainer - Mirror	6	.04
			---***---		
-9	34768-G1	.	Cover Assembly	1	.75
-10	¢ Cat #3011	.	Cam-with purchase of new lens from Graflex		2.00
	¢ Cat #3012	.	Cam-Customer's property-lens listed by Graflex		2.00
	¢ Cat #3013	.	Cam-Customer's property-non Graflex listed lens with movement within range of Graflex listed lens (90mm and 127mm thru 162mm focal length, etc.)		2.00
	¢ Cat #3014	.	Cam-Non Graflex listed lens of focal length other than those included in listing of Cat #3013 above, and falling within the range of 88mm to 380mm.		8.00
	‡ Cat #9473	.	Collimation Service		2.00
-11	34734-P1	.	Arm - Rangefinder	1	.75
			Attaching Part		
-12	30776	.	Screw-Machine, Hex h, #5-40 x 3/16 in. lg, steel, black oxide	1	.07
-13	34721	.	Nut-Square, #5-40, 0.093 in. thk 0.187 in. sq, brass, ebonol	1	.07
			---***---		
-14	34733-P1	.	Lever - Inner, parallax actuating.	1	.10
-15	34752	.	Spring-Parallax lever	1	.05
-16	30473-P78	.	Washer (Top lever assy) - Flat, 0.163 IDX 0.250 OD x 0.020 in. thk, brass	1	.02
-17	34728-G1	.	Lever Assy - Top, parallax actuating	1	.45
			Attaching Part		
-18	102-2-2	.	Screw-Machine, RD h, #2-56 x 1/8 in. lg, steel, black oxide	1	.01
-19	221-2	.	Washer-Lock, #2 screw, 3/16 in. diam, Shakeproof No. 1202	1	.01
			---***---		
-20	34760	.	Spring-Parallax slide	1	.05
-21	34737-G1	.	Parallax Base Complete	1	2.50
-22	34791	.	Cover-Bottom of viewfinder (Crown only)	1	.15
			Attaching Part		
-23	151B2-3	.	Screw (Parallax base) - Wood, Rd h, #2 x 3/16 in. lg, brass, ebonol	2	.01
			---***---		

¢Cam Selection: When ordering cams for Cat #3012, 3013 or 3014, measure the lens movement to the nearest thousands of an inch, from true infinity to the near distance tabulated below. True infinity may be considered at 1000 X focal length squared - for example, a 5 inch lens should be focused at about 2100 ft.

Lens Focal Length	Near Distance to which Lens movement should be measured.
3" - 7"	4 ft
7" - 15"	10 ft

‡ Collimation of customer's lens ship to the nearest Graflex Service Department for measurement.

RANGEFINDER HOUSING

Figure and Index No.	Part Number	1 2 3 4 5	Nomenclature	Qty.	Unit List Price
1-24	34702-G2	.	Base - Rangefinuer	1	5.75
	Attaching Parts				
-25	34713	.	Nut-Special, rangefinder base lock	1	.12
-26	35473-P5	.	Washer (Inner) - Flat, 0.328 ID X 0.750 OD X 0.020 in thk steel, black oxide	1	.02
-27	30473-P68	.	Washer (Outer) - Flat, 0.265 ID X 0.593 OD X 0.032 in thk steel, ebonol	1	.02
	---***---				
-28	34739-G1	.	Tube Assembly	1	6.80
	34718	.	. Plunger-Lower	1	.10
	Attaching Parts				
-29	151B3-3	.	Screw (Tube clamp) - Wood	2	.01
-30	34723-P1	.	Clamp - Upper, tube (2 req. on Crown; 1 req. on Speed)	2	.10
	34723-P2	.	Clamp - Upper, tube (1 req. on Speed)	1	.10
	---***---				
-31	34724-P1	.	Bracket - Tube	1	.75
	Attaching Parts				
-32	112B3-3	.	Screw (Tube bracket) - Machine	3	.01
-33	30473-P46	.	Washer (Tube bracket) - Flat	2	.01
	---***---				
-34	34715-P1	.	Bracket - Rangefinder actuating	1	.35
	Attaching Parts				
-35	34932	.	Screw (Bracket) - Special Flat h, #1-64 X 0.109 in. lg, brass nickel	2	.03
-36	32432	.	Plate - Clamp, actuating bracket	1	.20
	---***---				
-37	34756-P1	.	Spring - 1-11/32 ID (use with #2 & 3 shutters)	1	.12
	34756-P2	.	Spring - 1-11/32 ID (use with #2 Compur)	1	.12
	34784	.	Spring - 1-3/16 ID (use with #1 shutters)	1	.12

ACCESSORY ITEMS

Cat #3055	Rangescope - 1.5 X eyepiece	See Price List
Cat #3060	Wide Angle Lens Viewfinder Adapter	See Price List

As further check, reference the part number stamped on back of focusing scale as well as the lens frame and focal length.

HOUSING COMPLETE

2-	34743-G1		Housing Complete	Ref	See Index 1-3
-1	30473-P20	.	Washer-Flat, 0.124 ID X 0.203 OD X 0.010 in. thk, stainless steel	1	
-2	34759	.	Spring-Rangelite switch, 9/64 ID, 3/8 in. lg, 0.012 music wire	1	.03
-3	34757	.	Switch - Rangelite	1	.15
-4	34758	.	Button-Rangelite	1	.25
-5	34753	.	Contact - Lamp base	1	.40
-6	34761	.	Clamp - Lamp base	1	.15
-7	34751	.	Contact - Lamp base clamp	1	.25
	Attaching Part				
-8	30921-P34	.	Screw (Lamp clamp and contact) - Self-tapping, pan h, #2-1/4 X 1/4 in. lg, tin plate	1	.03
	---***---				
-9	25794	.	Lamp - 2.47 volt minature screw base, General Electric #14 or equal	1	.15
-10	34788	.	Lens - Rangelite	1	.50
	Attaching Part				
-11	30540-P7	-	Washer (Rangelite lens) - Spring, 0.250 ID X 0.375 OD X 0.080 in. thk, 0.007 in. thk steel	1	.08
	---***---				
-12	34767	.	Mirror - Rangelite	1	.35

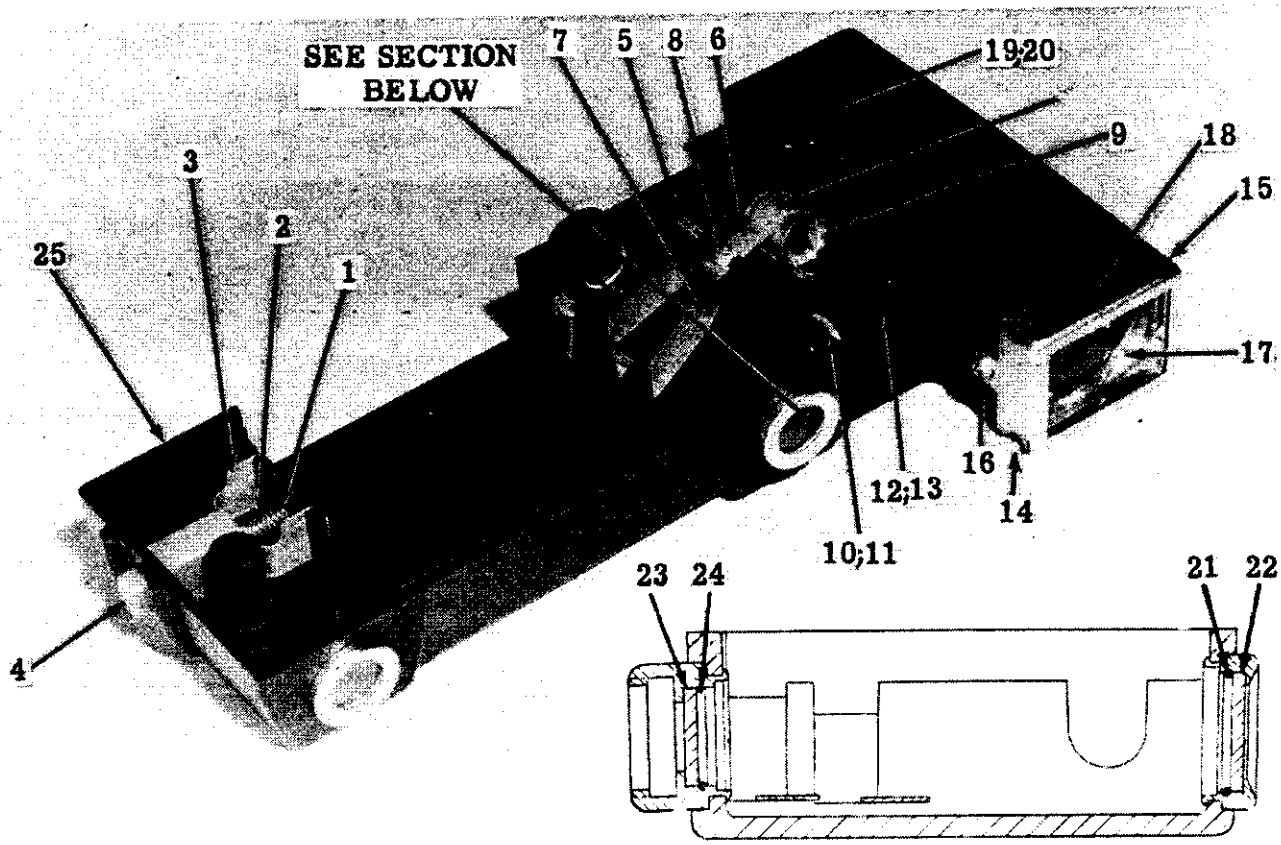


Figure 2. RANGEFINDER HOUSING

Figure and Index No.	Part Number	1 2 3 4 5	Nomenclature	Qty.	Unit List Price
			Attaching Part		
-13	32406	.	Retainer - Rangelite mirror.	2	.10
			---***---		
-14	Cat #9105	.	Mask (Specify Mask number, see price list.)	1	See Price List
-15	30714-P1	.	Cap - Objective lens	1	.60
			Attaching Part		
-16	30921-P36	.	Screw (Cap) - Self-Tapping, pan h, = #2 X 1/8 in. lg, chrome plate	2	.04
			---***---		
-17	31249-P1	.	Lens - Objective	1	2.00
-18	31119-P2	.	Spring (Objective lens) - Flat	1	.04
-19	34714	.	Retainer - Rear Viewfinder lens	1	.15
-20	34763	.	Lens - Rear, viewfinder	1	.90
-21	30442-P10	.	Ring - Front rangefinder window	2	.04
-22	34765	.	Window - Front, rangefinder	2	.10
-23	30442-P11	.	Ring - Rear rangefinder window	1	.04
-24	30770	.	Window - Rear rangefinder	1	.10
-25	34744-G1	.	Housing -Basic Assembly	1	6.00
	34745-P1	. .	Housing (order next higher assy - 34744-G1)	NP	NHA
	34746-P1	. .	Bezel (" " " " ")	NP	NHA
	34747-P1	. .	Eyepiece(" " " " ")	NP	NHA

NP - Not Procurable
NHA - Next Higher Assembly

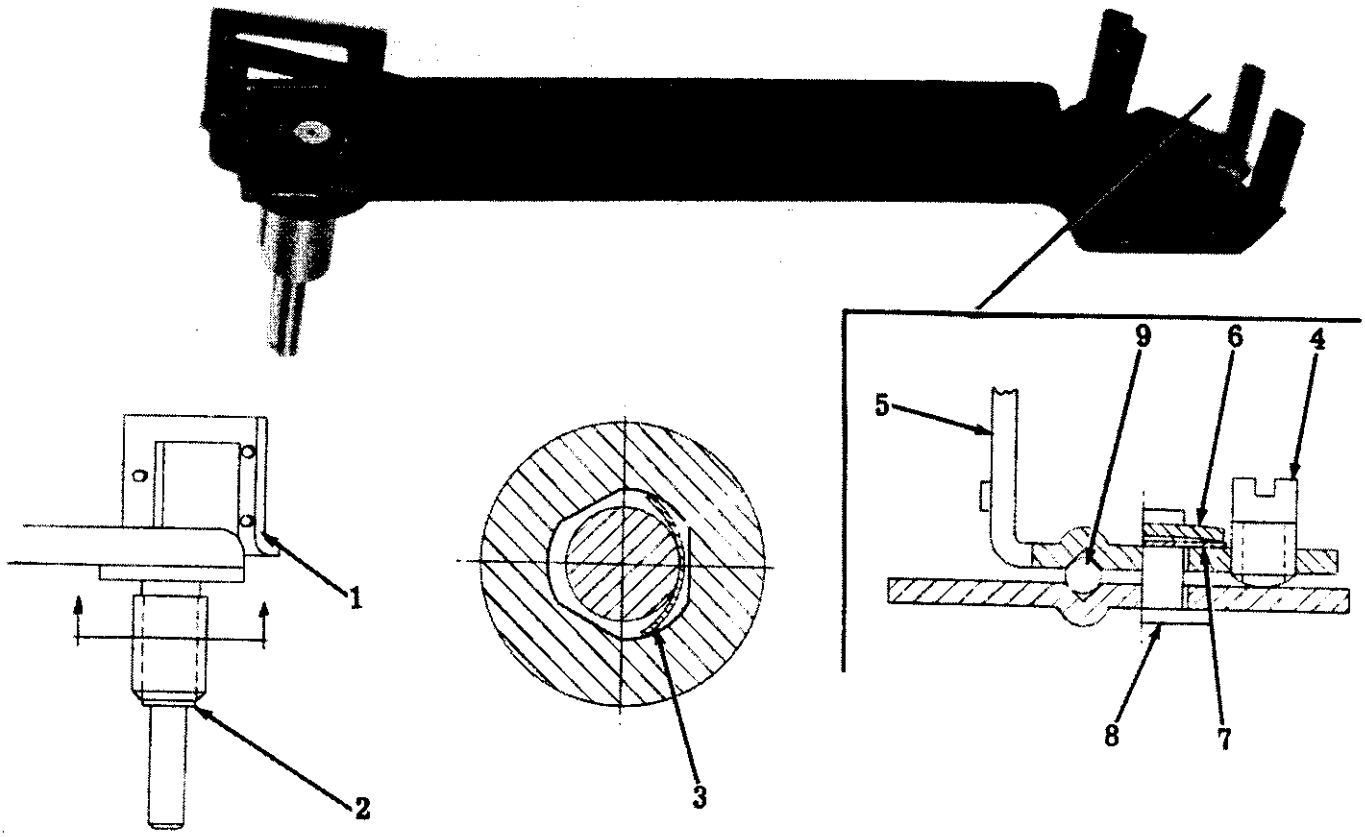


Figure and Index No.	Part Number	1 2 3 4 5	Nomenclature	Qty.	Unit List Price
			RANGEFINDER BASE		
3	34702-G2		Base Complete - Rangefinder	Ref	See index 1-24
-1	34705-G1	.	Mount Assy - Rotating mirror	1	2.25
	Attaching Part				
-2	30241-P6	.	Ring-Retaining, "C", 0.101 in. ID	1	.04
	---***---				
-3	32417-P1	.	Spring-Rotating mirror mount assy shaft (0.0035 thick)	1(AR)	.05
	32417-P2	.	Spring-Rotating mirror mount assy. shaft (0.005 thick)	1(AR)	.05
-4	34702-G1	.	Base Assembly	1	3.75
-5	34709	. .	Screw (Image Adjusting) - Set, rd pt, #4-80 X 0.187 in. lg, steel	1	.05
-6	34710-P1	. .	Mount - Transparent Mirror	1	.45
	Attaching Parts				
-7	30241-P16	. .	Ring - Retaining "C", 0.100 in. ID	1	.04
-8	30473-P15	. .	Washer-Flat, 0.147 ID X 0.281 OD X 0.010 in. thk, brass . .	1	.02
-9	34708	. .	Stud - Transparent Mirror Mount	1	.05
	---***---				
-10	30539-P2	. .	Ball - Steel, 0.2187 in. diam	2	.01
-11	34704	. .	Bearing (order next higher assy. 34702-G1)	NP	NHA
-12	34703-P1	. .	Base (order next higher assy. 34702-G1)	NP	NHA

NP - Not Procurable
NHA - Next Higher Assembly