DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR'S MANUAL

PROCESSING EQUIPMENT

PH-406 AND PHOTOGRAPHIC

FILM PROCESSING

UNIT ES-20(1)

This reprint includes all changes in effect at the time of publication; changes 3 through 6.

HEADQUARTERS, DEPARTMENT OF THE ARMY

MAY 1958

WARNING
HIGH VOLTAGE
is used in this equipment.

DEATH ON CONTACT
may result if safety precautions are not observed.
When making connections or changing lamps be sure that no power is applied to the equipment.

Changes in force: C 2 and C 3

Operator's Manual

PROCESSING EQUIPMENT PH-406 AND PHOTOGRAPHIC FILM

PROCESSING UNITS ES-20(1) AND ES-20(2)

CHANGE
No. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *15 September 1966*

TM 11-405-10, 28 May 1958, is changed as indicated so that the manual also applies to the following equipment:

Nomenclature	*Order No.*	*Serial No.*
Photographic Film Processing Unit ES-20(2).	AF 33(657)-15966	1 through 250

The title of this manual is changed as shown above.

Note. The parenthetical reference to a previous change (example: page 1 of C 2 indicates that pertinent material was published in that change.

Page 3, chapter 1. Add the following note. Make the following below the title of chapter 1.

Note. Photographic Film Process Unit ES-20(2) is similar to Photographic Film Processing Unit ES-20(1). Information in this manual applies to both units unless otherwise specified.

Paragraph 2c (page 1 of C2) is superseded as follows:

c. The direct reporting by the individual user of errors, omissions, and recommendations for improving this manual is authorized and encouraged. DA Form 2028 (Recommended Changes to DA Publications) will be used for reporting these improvement recommendations. This form will be completed using pencil, pen, or typewriter and forwarded direct to Commanding General, U.S. Army Electronics Command, ATTN: AMSEL-MR-NMP-AD, Fort Monmouth, N.J. 07703.

Paragraph 4*a*, line 1. Change "or Photographic Projective Printer EN-16(1)" to Photographic Projection Printer EN-16(1), or Photographic Projection Printer EN-91A.

Page 4, paragraph 4*a*. Make the following changes:

Line 2. Change "or EN-16(1)" to EN-16 (1), or EN-91A.

Line 4. After "lens sets" add (PH-129(*) unless otherwise specified or PH-639(*)/TF.

After line 4, add:

Condenser lens set (EN-91A)	.....	6-1/2-inch diameter variable condenser lens set.

After line 7, add:

EN-91A	.....	2-inch focal length. 3-1/2-inch focal length. 5-3/8-inch focal length.

Line 9. Change "or PH-639(*)/TF" to PH-639(*)/TF, or EN-91A.

After line 18, add:

EN-91A	.....	1- by 1-1/2-inch aperture for 35-mm film. 2-1/4- by 2-1/4-inch aperture

2.2- by 2.75-inch aperture.
2-1/4- by 3-1/4-inch aperture.

Paragraph 4*b*. After line 16, add:

Photographic Darkroom Safelight FM-173A:
Voltage requirement 105 to 120 volts ac or dc.
Type ..... Safelight.
Filters..... Three light filters: brownish green, red, and dark green.

Photographic Processing Tank PH-594A/PFQ:
Type ..... Daylight-developing tank.
Film type ..... 35-mm, 70-mm, and No, 120 roll film.

Paragraph 5. The first three sentences are superseded as follows:

The components of Processing Equipment PH-406 and Photographic Film Processing Units ES-20(1) and ES-20(2) are listed in a below. The major components of Printer PH-129 (*), Printer PH-639 (*)/TF, Photographic Projection Printer EN-16(1), and Photographic Projection Printer EN-91A are listed in b below. The asterisk (*) indicates the equip- ment with which the particular component is supplied.

Page 7. Add figure 3.1 after figure 3.

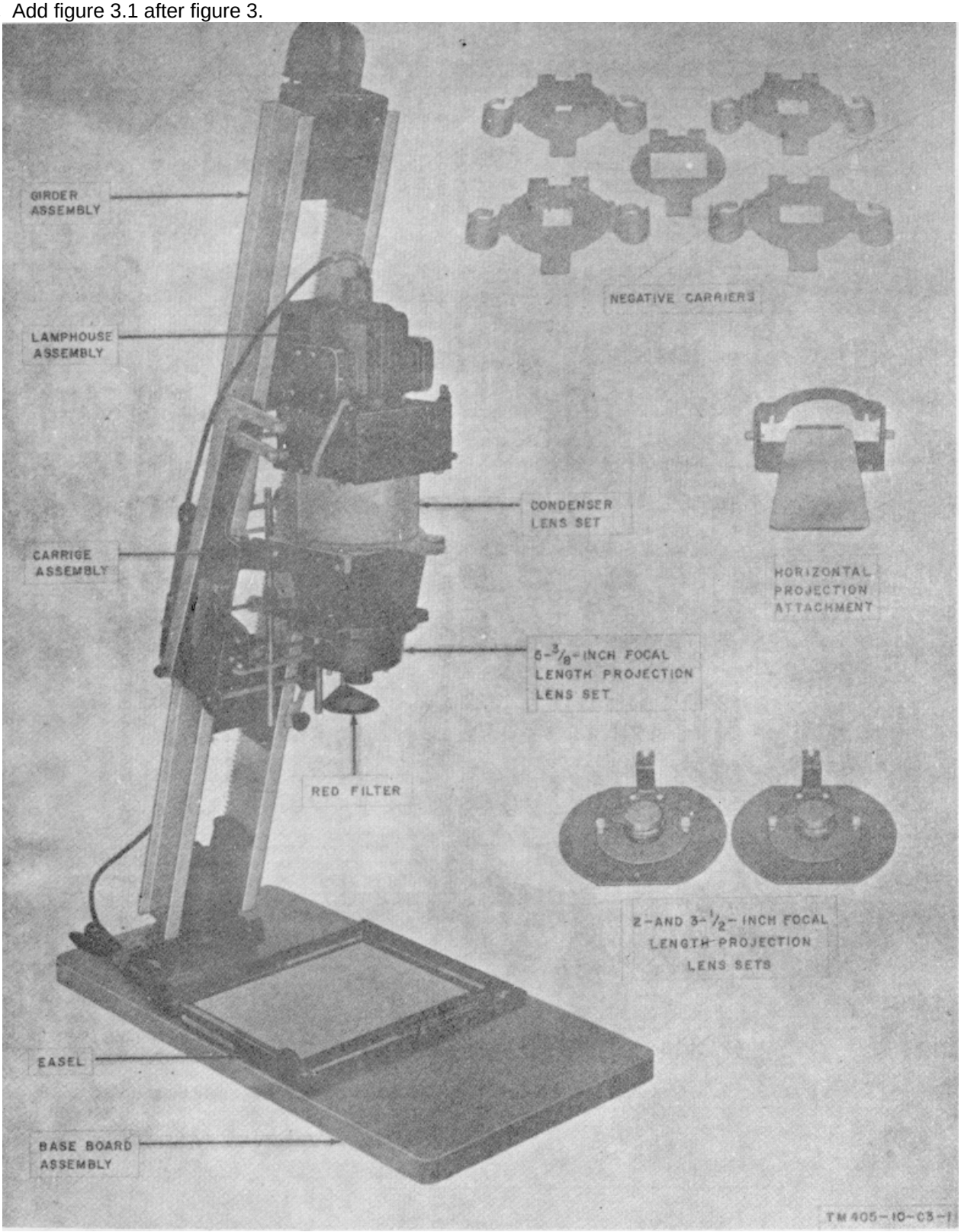


Figure 3.1. Photographic Projection Printer EN-91A.

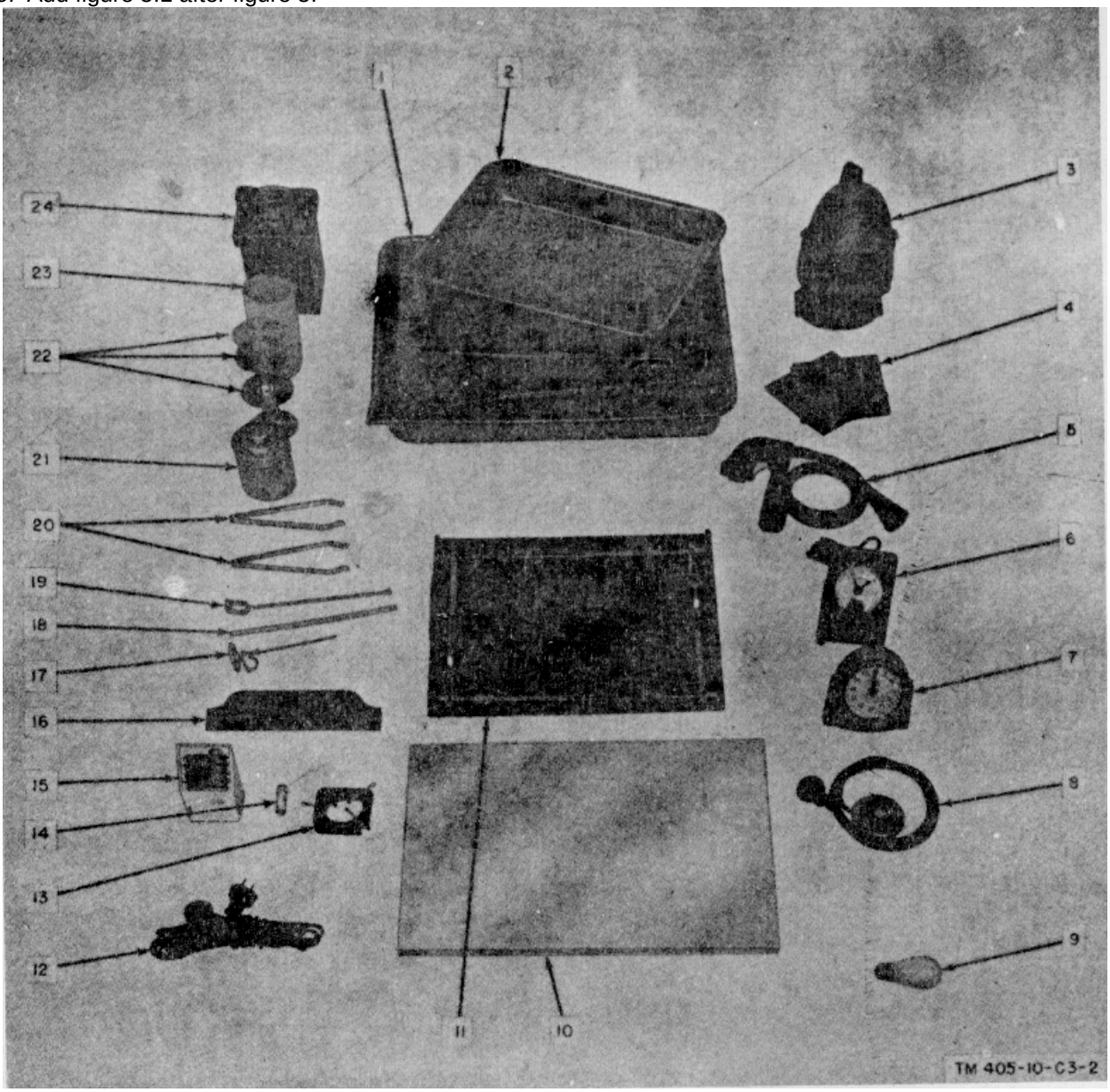
Page 9, paragraph 5. Delete subparagraph *a* and substitute:

a. Components of PH-406, ES-20(1), and ES-20(2).

PH-406	ES20(I)	ES-20(2)	Fig. No.	Qty	Item	Dimension, (in.)	Weight (lb)
(*)			1, 2	1	Printer PH-129-(*) or Printer PH-639(*) TF (b below)	18 x 26 x 48	80
						18 x 27 x 51	80
(*)			4	1	Adapter cable	4	6 oz
(*)			4	1	Battery cable assembly	15 lg	14 oz
(*)			6	1	Carrying case No. 1	13-1/2 x 20 x 38	41
(*)			7	1	Carrying case No. 2	13-1/2 x 30 x 21	48-1/2
(*)			6	1	Carrying case No. 3	9-1/2 x 12 x 21	13
(*)			4	1	Tank PH-256-A	5-1/2 x 6 x 7	3/4
(*)			4	1	Timer PH-29-C	2-1/4 x 5 x 5-1/2	1-1/4
(*)			4	1	Tray PH-164-A	2-1/2 x 14 x 17	4-1/2
	(*)		3	1	Photographic Projection Printer EN-16(1) *(b* below)	17 x 28-7/8 x 52	63
	(*)		8	1	Carrying case No. 1	13-1/2 x 20 x 38	60
	(*)		9	1	Carrying case No. 2	13-1/2 x 20 x 38	60
	(*)		8	1	Carrying case No. 3	11-1/8 x 11-1/8 x 16	2
		(*)	3.1	1	Photographic Projection Printer EN-91A	18 x 34 x 68-5/8	69
		(*)	9.1	1	Carrying case No. 1	18-3/4 x 19-3/4 x 62-1/8	80
		(*)	9.1	1	Carrying case No. 2	16 x 23-11/16 x 34-3/16	60
		(*)	9.2	1	Carrying case No. 3	5/8 x 15 x 24	15
		(*)	5.1	1	Photographic Processing Tank PH-594A/PFQ, including:	4-1/2 x 3-9/16 dia	1-7/8
		(*)	5.1	1	35-mm reel	1-5/8 x 3-1/4 dia	3-1/2 oz
		(*)	5.1	1	70-mm reel	2-5/8 x 3-1/4 dia	4 oz
		(*)	5.1	1	No. 120 reel	3 x 3-1/4 dia	4-1/2 oz
	(*)	(*)	5, 5.1	1	Photographic Processing Tank FM-8(1)	5-1/2 x 6 x 7	3/4
	(*)	(*)	5, 5.1	1	Stop. Timer FM-103(1).		
	(*)	(*)	5, 5.1	1	Tray PH-166-A	3 x 19-3/4 x 24	6-1/2
(*)	(*)	(*)	4, 5, 5.1	1	Foot Switch PH-424	3/4 x 3 dia	12-3/4
(*)	(*)	(*)	4, 5, 5.1	1	Graduate PH-11	6 x 3-7/8 dia	1
(*)	(*)	(*)	4, 5, 5.1	1	Interval Timer FN-5(1) or Timer PH-426-(*)	3 x 5 x 5	2-1/2
(*)	(*)	(*)	4, 5	1	Lamp PH-422-A including:		
			4, 5	1	Light filter, Wratten OA (green-yellow)	3/16 x 5-1/2 dia	4 oz
			4, 5	1	Light filter, Wratten No. 2 (red)	3/16 x 5-1/2 dia	4oz
			4, 5	1	Light filter, Wratten No. 3 (dark green	3/16 x 5-1/2 dia	4 oz
			5	1	Power cable assembly	10 ft	3/4
			4, 5	1	Incandescent lamp, 10-watt, 115-volt	3/4 x 2 dia	1 oz
			4, 5	1	Incandescent lamp, 10-watt, 6-volt	3/4 x 2 dia	1 oz
		(*)	5.1	1	Photographic Darkroom Safelight FM-173A including:		
		(*)	5.1	1	Light filter, Wratten OC (brownish-green)	3/16 x 5-1/2 dia	4oz
		(*)	5.1	1	Light filter, Wratten No. 2 (red)	3/16 x 5-1/2 dia	4oz
		(*)	5.1	1	Light filter, Wratten No. 3 (dark green)	3/16 x 5-1/2 dia	4 oz
		(*)	5.1	1	Variable contrast filter set	1-5/16 x 2-3/4 x 4-1/2	5 oz

(*)	(*)	(*)	4, 5, 5.1	12	Plate PH-152A	14 x 20	1-3/4 n
(*)	(*)		4, 5	1	Power cable	25ft	1-1/2 U
(*)	(*)	(*)	4, 5, 5.1	1	Paddle PH-80	1-1/2 x 13	3/8oz
(*)	(*)	(*)	4, 5, 5.1	1	Rod PH-230	3/4 dia x 10	1 oz
(*)	(*)	(*)	4, 5, 5.1	1	Siphon PH-244 or Siphon PH-244-A	1-1/4 x 5 x 7	3/4
(*)	(*)	(*)	4, 5, 5.1	1	Squeegee PH-348	1 x 2-3/4 x 10	1/2
(*)	(*)		4, 5	1	Tank PH-186 or Photographic Processing Tank FM-12(1)	3-1/4 x 5-1/4 dia	1-1/4
(*)	(*)	(*)	4, 5, 5.1	1	Thermometer PH-660/U	1-3/4 dia x 6	4oz
(*)	(*)	(*)	4, 5, 5.1	2	Tongs PH-373-A	3/4 x 2-1/4 x 9-1/2	3/4oz
(*)	(*)	(*)	4, 5, 5.1	3	Tray PH-161-A	2-1/2 x 11 x 14	3
(*)	(*)		4, 5	1	Set of spare parts consisting of:		
			4, 5	2	Lamp, 10-watt, 115-volt	3/4 x 2 dia	1 oz
			4, 5	2	Lamp, 10-watt, 6-volt	3/4 x 2 dia	1 oz

Page 10. Add figure 5.1 after figure 5.



1 Tray PH-166A
2 Trays PH-161A
3 Photographic Darkroom Safelight FM-173A
4 Light filters
5 Siphon PH-244A
6 Interval Timer FN-5(1)
7 Stop Timer FM-103(1)
8 Foot Switch PH-424
9 Spare lamp
10 Plates PH-152-A
11 Projection Printing Easel FN-10(1)
12 Power cable (25-foot)
13 Variable contrast filter holder
14 Variable contrast filter antistatic solution
15 Variable contrast filters
16 Squeegee PH-348
17 Thermometer PH-660/U
18 Rod PH-230
19 Paddle PH-80
20 Tongs PH-373-A
21 Photographic Processing Tank PH-594A/PFQ
22 Film reels
23 Graduate PH-11
24 Photographic Processing Tank FM-8(1)

Figure 5.1. Minor components of Photographic Film Processing Unit ES-20(2).

Page 11, paragraph 5. Delete subparagraph b and substitute:

b. Components of PH-129(*), PH-639(*)/ TF, EN-16(l), and EN-91A. The major components of the PH-129(*), PH-639(*)/TF, EN-16(1), and EN-91A are listed in the chart below. For detailed component information, refer to the applicable manual listed in appendix I.

PH-129	PH-129-A	PH-129-B	PH-639/TF	PH-639A/TF	EN-16(1)	EN-91A	Qty	Item
(*)	(*)	(*)	(*)	(*)	(*)		1	Condenser lens assembly, 3-1/2-inch.
(*)	(*)	(*)	(*)	(*)	(*)	(*)	1	Condenser lens assembly, 6-1/2-inch.
						(*)	1	Variable condenser lens.
(*)	(*)	(*)	(*)	(*)	(*)	(*)	1	Projection lens, 2-inch.
						(*)	1	Projection lens, 3-1/2 inch.
				(*)	(*)	(*)	1	Projection lens, 5-3/8-inch.
(*)	(*)	(*)	(*)				1	Projection lens, 5-1/2-inch.
(*)	(*)	(*)	(*)	(*)	(*)	(*)	1	Dustless negative carrier.
(*)	(*)	(*)	(*)	(*)	(*)		1	Glass negative carrier.
(*)	(*)	(*)	(*)	(*)	(*)	(*)	1	Rapid-shift negative carrier (33-mm roll film).
						(*)	1	Rapid-shift negative carrier (70-mm roll film).
						(*)	1	Rapid-shift negative carrier (2.2 x 2.75 aperture).
						(*)	1	Rapid-shift negative carrier (2-1/4 x 3-1/4 inch aperture).
(*)	(*)	(*)	(*)	(*)	(*)	(*)	1	Red filter.
						(*)	1	Color filter holder.
						(*)	1	Heat absorbent glass.
						(*)	1	Horizontal projection attachment.
(*)		(*)					1	Holder PH-349 or PH-349-A.
	(*)		(*)	(*)			1	Board PH-317 or PH-317A.
					(*)	(*)	1	Projection Printing Easel FN-10 (1).
					(*)		1	Photographic Paper Holder FN-9(1).
		(*)					1	Color Head Attachment PH-688/U.
	(*)		(*)	(*)			3	Incandescent lamp, 6-volt, 28-watt.
(*)		(*)					3	Incandescent lamp, 115-volt, 75-watt.
					(*)		4	Incandescent lamp, 115-volt, 75-watt.
						(*)	1	Incandescent lamp, 115-volt, 75-watt.

Page 13, paragraph 7. Make the following changes: to (figs. 4, 5, and 5.1).

Subparagraph *a.* Change "(figs. 1, 2, and 3)" to (figs. 1, 2, 3, and 3.1)

Subparagraph *b.* Change "(figs. 4, 5, and 5.1)" to (figs. 4, 5, and 5.1)

Page 14, paragraph 9. Delete the chart and substitute:

Item	PH-129	PH-129-A	PH-129-B	PH-639/TF	PH-639/TF	EN-16(1)	EN-91A
Power source	105- to 120-volt ac or 6- to 8-	105- to 120-volt ac or dc. volt de.	105- to 120- volt ac or 6- to 8-	105- to 120-volt ac or 6- to 8- volt dc.	105- to 120-volt ac or 6- to 8- volt dc.	105- to 120-volt ae or de.	105- to 120-volt ac or de. I O
Easel (para 5b):							
Maximum paper size.	11 x 14 inches	11 x 14 inches	8 x 10 inches.	8 x 10 inches	8 x 10 inches	11 x 14 inches	11 x 14 inches.
Maximum **margin** width.	3 inches_____	3 inches_____	3/4inch_____	3/4 inch_____	3/4 inch_____	1/2 inch_____	3/4 inch._____
Projection lens sets	Refer to para-graph 5b.						
Projection_____	Vertical_____	Vertical_____	Vertical_____	Vertical_____	Vertical_____	Vertical or hori-zontal	Vertical or hori-zontal.
Projection lens openings	F/4.5 through f/32	F/4.5 through f/32	F/4.5 through f/32	F/4.5 through f/32	F/4.5 through f/32	F/4.5 through f/32	F/4.5 through f/32.
Dustless negative carrier aperture	3-5/8 x 4-5/8 inches	3-5/8 x 4-5/8 inches	3-5/8 x 4-5/8 inches	3-5/8 x 4-5/8 inches	3-5/8 x 4-5/8 inches	5 x 7 inches	1 x 1-1/2 inches. 2-1/4 x 2-1/4 inches. 2.2 x 2.75 inches. 2-1/4 x 3-1/4 inches. 4 x 5 inches.

Page 15. Add figures 9.1 and 9.2 after figure 9

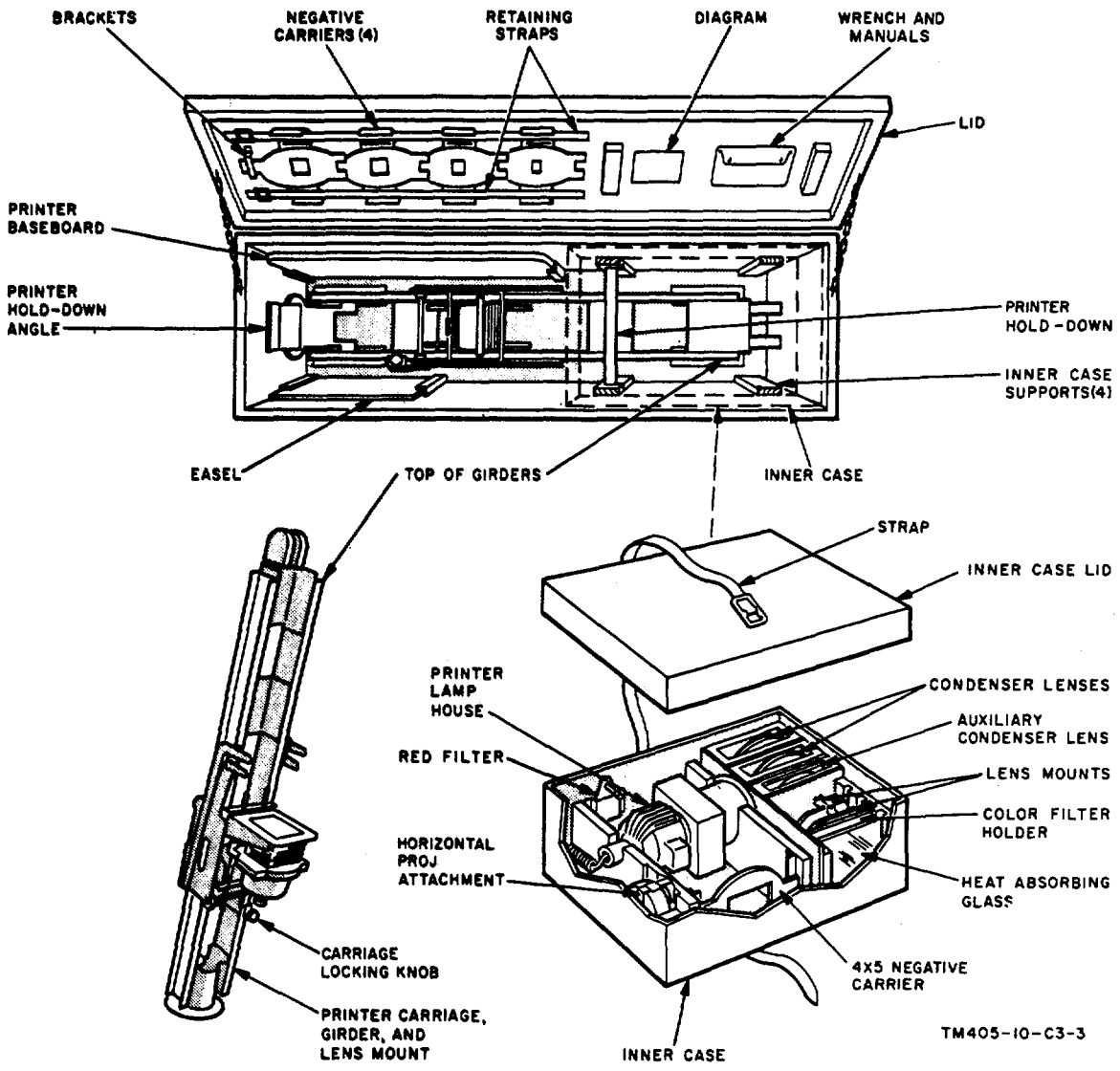


Figure 9.1. Components of ES-20(2) packed in carrying case No. 1

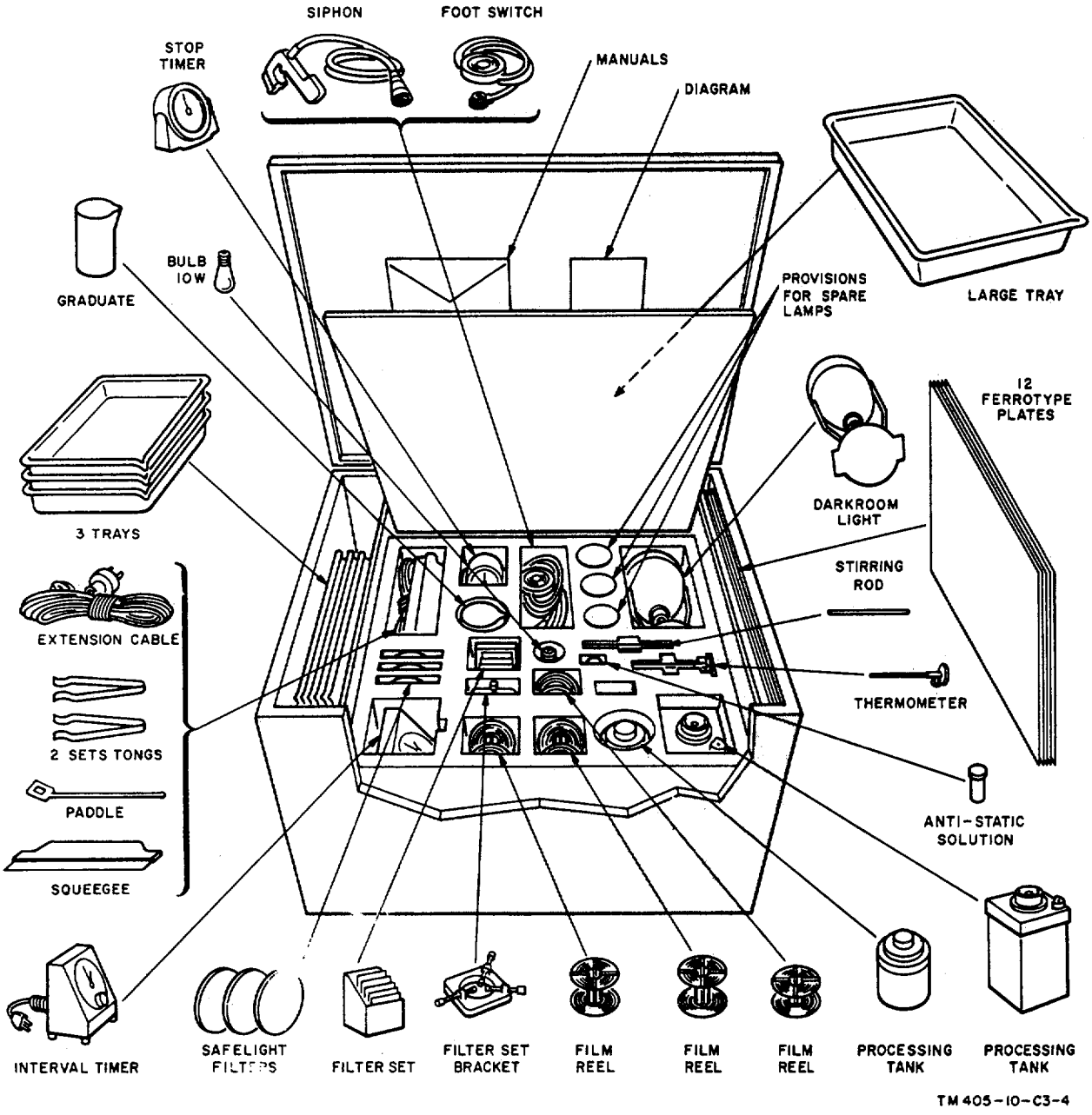


Figure 9.2. Components of ES-20(2) packed in carrying case No. 2.

Page 16, paragraph 10. Make the following changes:

Heading. Change "(fig. 10)" to (figs. 10 and 10.1).

Subparagraph a. After the last sentence, add: The dimensions of packing case No. 1 for the ES-20(2) are 22 by 23 by 65 inches; its approximate volume is 19 cubic feet; and its total weight is 240 pounds. The dimensions of packing case No. 2 for the ES-20(2) are 19 by 27 by 37 inches; its approximate volume is 11 cubic feet; and its total weight is 160 pounds.
After figure 10, add figure 10.1.

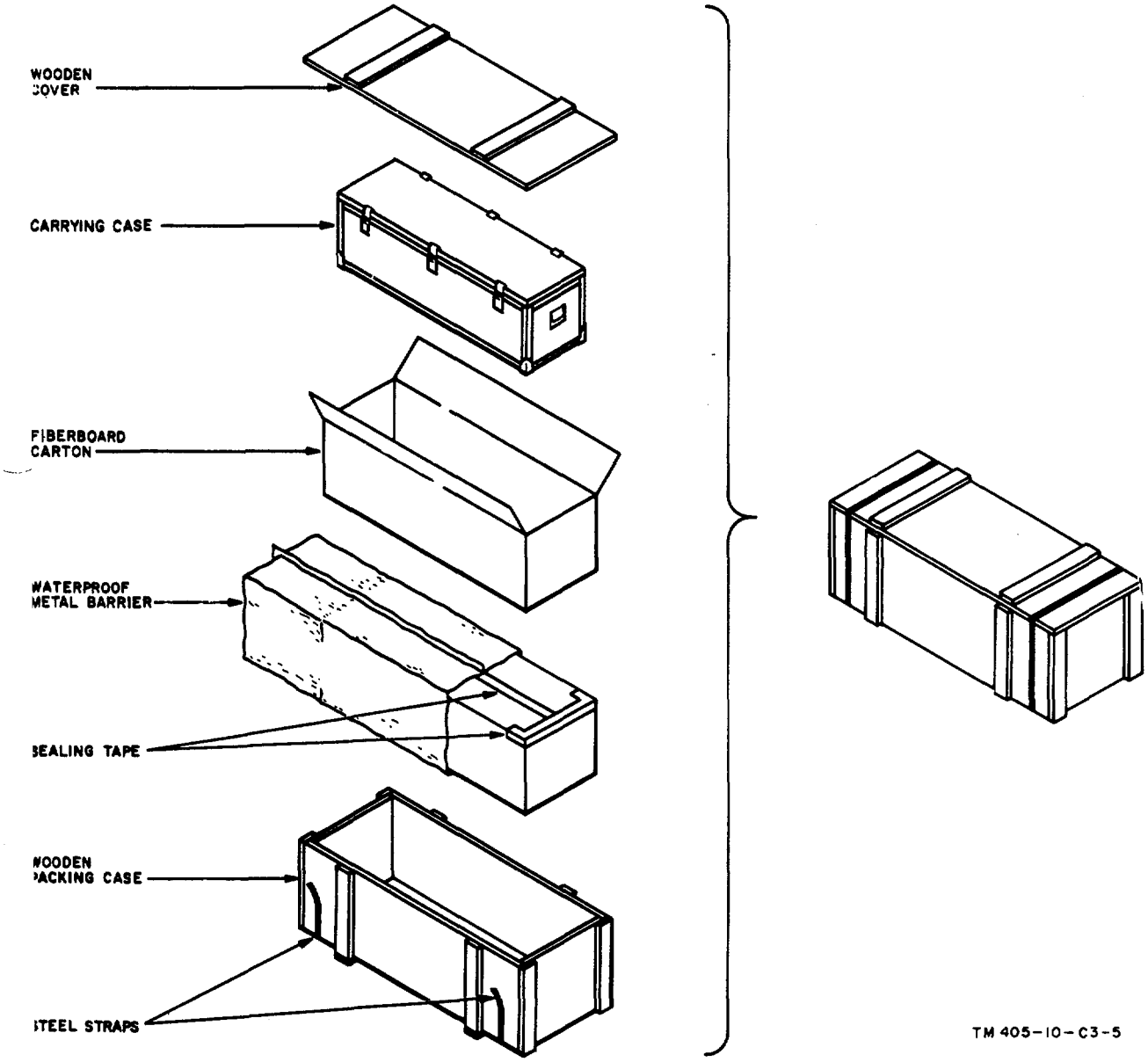


Figure 10.1. Packaging diagram, ES-20(2).

Page 17, paragraph 14a, heading. Change "or EN-16(1)" to EN-16(1), or EN-91A.
Figure 11, caption. Change "or EN-16 (1)" to EN-16(1), or EN-91A.
Page 19, paragraph 15. After subparagraph b, add:
c. Photographic Projection Printer EN-91A.

Control	Function
Control lever (fig. 16.1).	In forward position, raises lamp house assembly. In rear position, 'lowers lamp house assembly.
Control lever stop	Locks control lever in forward (raised) position.
ON-OFF switch (fig. 11).	In ON position, applies power to printer. In OFF position, shuts off power to printer.
Handwheel (fig. 16.1).	Controls distance of carriage assembly from easel, thereby controlling the size of the enlargement.
Focusing knob -	Controls distance of projection lens from film to permit focus adjustment.
Carriage locking knob.	Locks carriage assembly in position on girder assembly.
Diaphragm ring ..... and f/32	Sets lens opening between f/4.5

.

Page 22. Add figure 16.1 after figure 16.

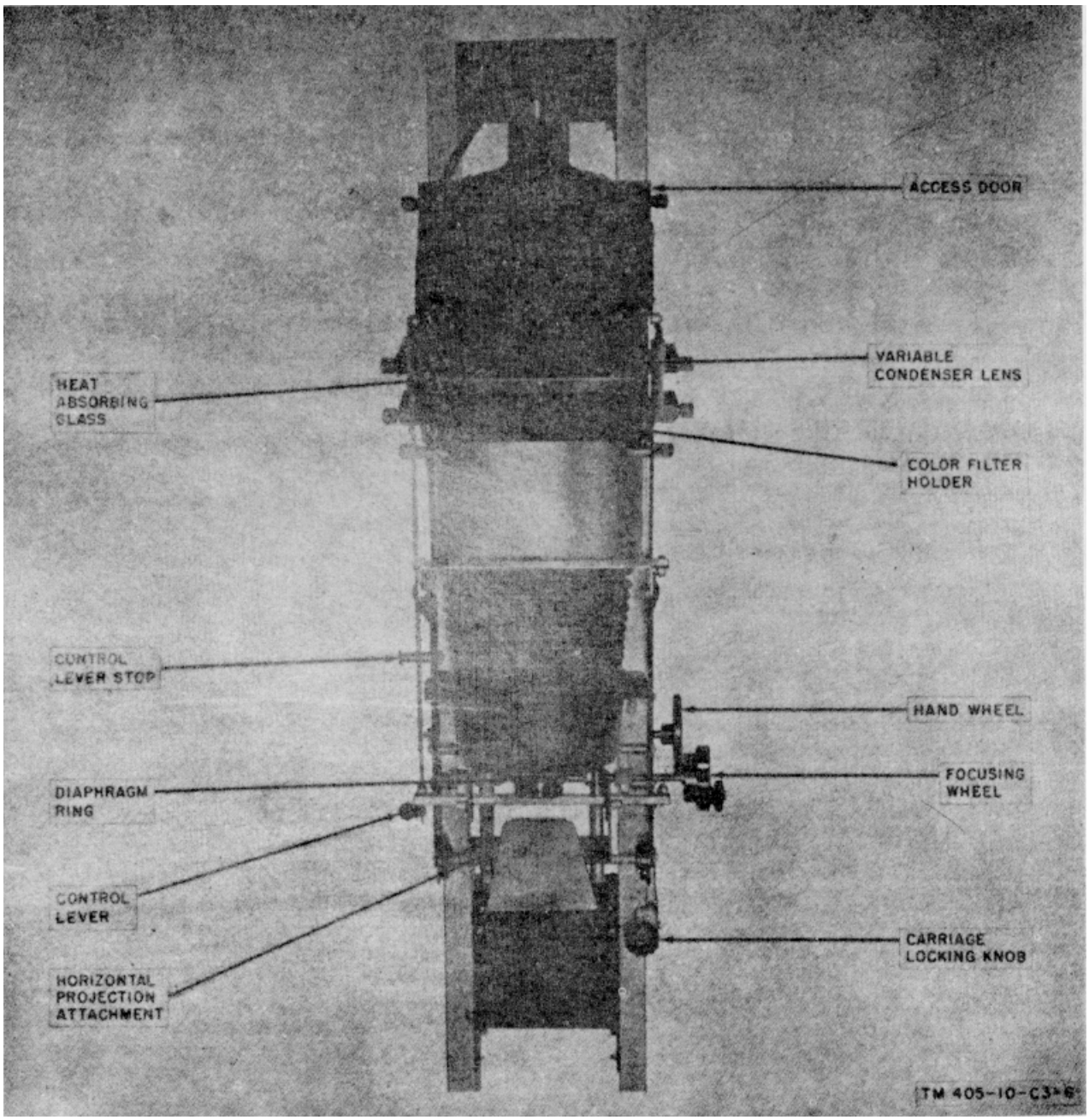


Figure 16.1. Photographic Projection Printer EN-91A, operating controls and related equipment.

Page 26, paragraph 17. Make the following changes:

Subparagraph *a,* heading. Change "General" to PH-129-(*), PH-689(*)/TF, or EN- 16(1).

Add subparagraph *a.1* after subparagraph a.

a.1 EN-91A. Use the chart below to select the projection lens set and to determine the variable condenser lens position.

Negative size	Projection lens set	Variable condenser lens position
4- x 5-inch	5--3/8-inch	1
2-1/4 x 21/4 or 2-1/4 3-1/4-inch.	3-1/2-inch.....	2
35-mm.....	2-inch.....	3

Subparagraph b (1) heading. Change "or PH-639(*)/TF" to PH-639(*)/TF, or EN- 91A.

Page 27, paragraph 17c(1), heading. Change "or PH-639(*)/TF (fig. 2)" to PH-639(*)/ TF, or EN-91A (figs. 2 and 3.1).

Paragraph 18a(2). Add subparagraph (8) after subparagraph (2).

(3) EN-91A.

(a) Place the negative, emulsion (dull) side down, on the lower plate.

(b) Press the upper plate against the lower plate.

Page 29, paragraph 18c (page 1 of C 2).

Make the following changes:

After the second sentence, add:

Four rapid-shift negative carriers are supplied with the EN-91A (fig. 25.1).

Add subparagraph (8) after subparagraph (2).

(3) EN-91A (fig. 25.1).

(a) Hold the negative carrier so that the concave side of the film holder faces upward.

(b) Insert the roll of film in the left side of the negative carrier.

(c) Pass the film, emulsion side down, between the upper and lower plates of the negative carrier until the frame to be enlarged is centered in the aperture.

(d) Press the upper plate against the lower plate.

Page 31. Add figure 25.1 after figure 25.

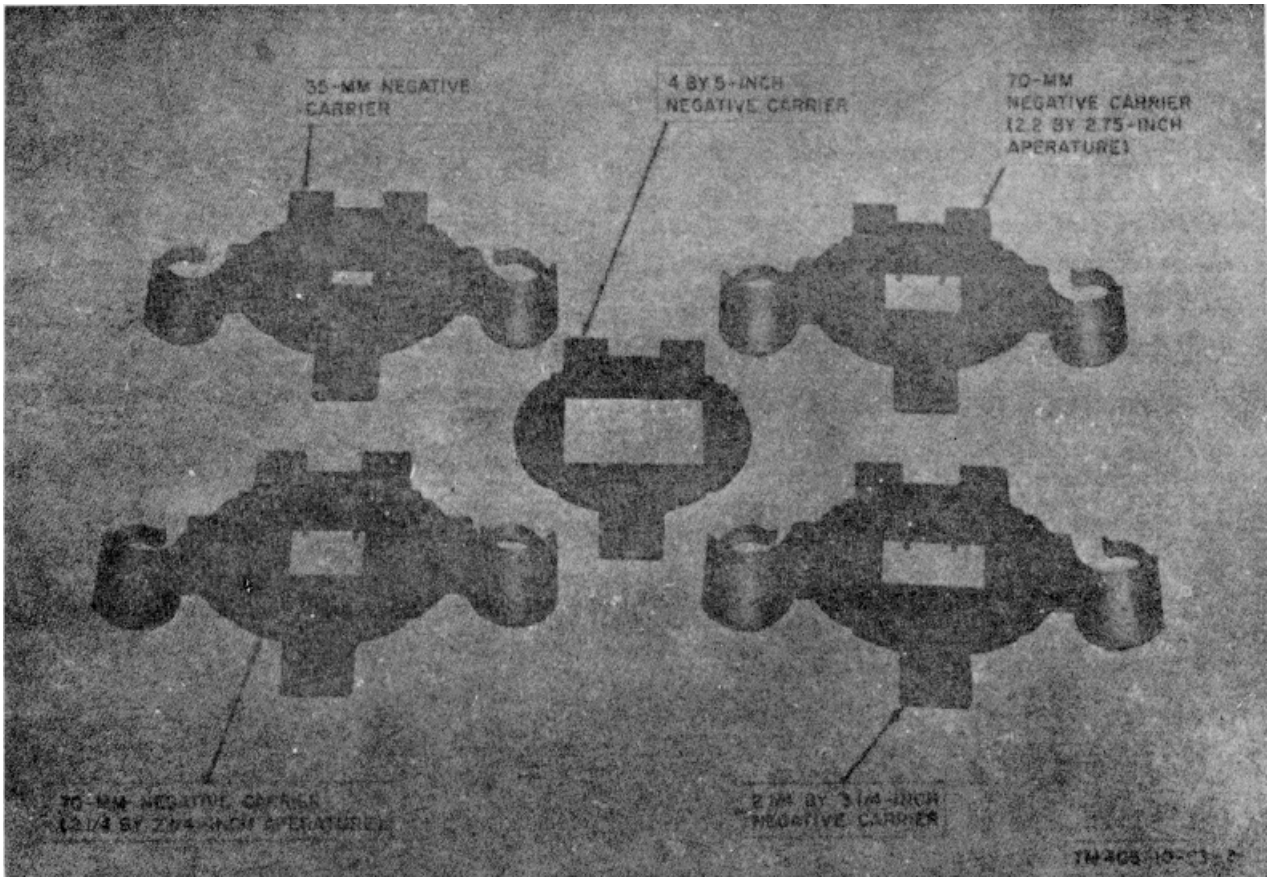


Figure 25.1. Negative carriers furnished with EN-20(2).

Page 82, paragraph 19a. Make the following changes:

Heading. Change "and PH-639 (*) /TF" to PH-639(*)/TF, and EN-91A.

Subparagraph (1). Add:

"and 16.1" after fig. 14.

Subparagraph (3) *(b).* Add subparagraph (c) after subparagraph *(b).*

(c) For negative carrier supplied with ES-20(2), place the negative carrier on the film stage bridge so that the locating pins are positioned in the cutout.

Page 33, paragraph 21, heading (page 1 of C 2). Change "or PH-639(*)/TF" to PH- 639(*)/TF, or EN-91A..

Page 34, paragraph 21a(7). After "fig. 15, " add: or 16.1.

Page 39. Add paragraph 25.1 after paragraph 25.

25.1. Developing Roll Film Using Photographic Processing Tank PH-594A/PFQ (fig. 31.1)

a. Fill the tank with enough developer to cover the reel that is to be used.

b. Turn off the darkroom lights.

c. Disassemble the film cartridge or separate the film from the protective paper and tear the paper off the ends of the film.

d. Hold the reel in the left hand and the film

in the right hand with the emulsion (dull) side toward the center of the reel.

e. For 85-mm film, attach the end of the film to the core of the reel so that the film will pass around the outside of the core guide wires as shown in A, figure 81.2.

f. For other films, slide the end of the film under the clip as shown in B, figure 31.2. Center the film under the clip.

g. Turn the reel to wind the film on the reel. When winding, hold the film gently between the thumb and forefinger. The film will slide into the grooves between the coils of the reel smoothly and naturally when held gently enough to take its own course. Keep the rolled up portion of the unreeled film approximately 1-1/2 to 2 inches from the point from where the film enters the grooves of the reel.

h. Place the reel in the tank and place the cover on the tank and the cap on the cover.

i. Turn on the darkroom lights.

j. At the start of development, invert and gently rock the tank. Repeat this procedure every 2 minutes.

k. When the developing time has elapsed, remove the cap and pour the developer solution from the tank body.

l. Rinse, fix, wash, and dry the negatives (para. 26).

Add figures 31.1 and 31.2 after figure 31.

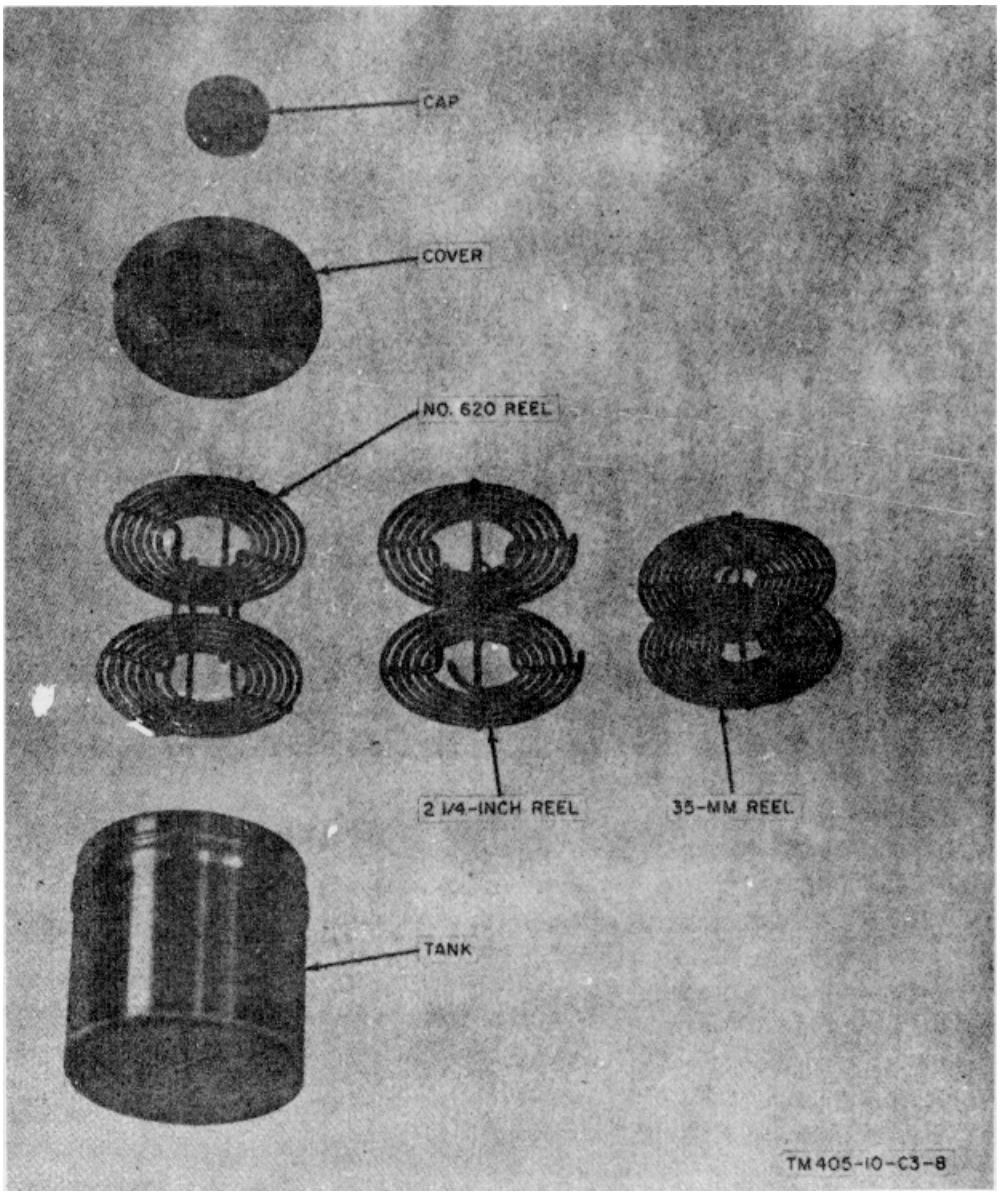


Figure 31.1. Photographic Processing Tank PH-594A/PFQ, components.

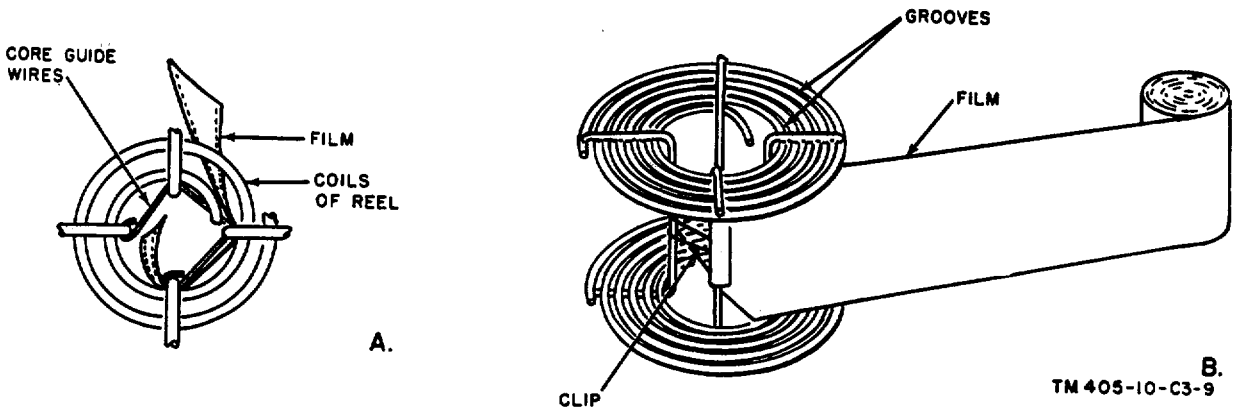


Figure 31.2. Method of threading film.

Page 40, paragraph 28, line 2. Change "Unit ES-20(1)" to Units ES-20(1) and ES-20(2).

Page 42, paragraph 31 (page 1 of C 2). In line 3, change "Unit ES-20(1)" to Units ES- 20(1) and ES-20(2).

Paragraph 34, line 3 (page 2 of C 2). Change "Unit ES-20(1)" to Film Processing Units ES-20(1) and ES-20(2).

Paragraph 34.1, chart (page 2 of C 2). Make the following changes:

Sequence No. 1, Procedure column. Change "(figs. 1, 2, and 3)" to (figs. 1, 2, 3, and 3.1).

Sequence No. 2, Procedure column. Change "(fig. 2)" to (figs. 2 and 3.1).

Paragraph 34.2, chart (page 3 of C 2). Make the following changes:

Sequence No. 2, Procedure column. Change "(figs. 6 through 9)" to (figs. 6 through 9.2).

Sequence No. 3, Procedure column. Change "(figs. 4 and 5)" to (figs. 4, 5, and 5.1).

Paragraph 34.3 (page 3 of C 2). Make the following changes:

Line 2. Change "and 3" to:
3, and 3.1.
Change "(figs. 4 and 5)" to (figs. 4, 5, and 5.1).
Line 3. Change "(figs. 6-9)" to (figs. 6 through 9.2).

Page 48, figure 34. Delete the caption and substitute: Figure 34. Lamp PH-422-A or Photographic Darkroom Safelight FM-173A, disassembled.

Page 49, paragraph 36b(2). Add subparagraph (3) after subparagraph (2).

(3) EN-91A.
- (a) Loosen the thumbscrew (not shown) that secures the variable condenser lens housing to the upper lamp housing:
- (b) Remove the upper lamp house and unscrew the printer lamp.
- (c) Check the condition of the light cone (reflector) in the upper lamp house. If the light cone is dirty, clean with a clean, lint-free cloth.
- (d) Replace the printer lamp.
- (e) Position the upper lamp house on the variable condenser lens housing.
- (f) Tighten the thumbscrew.

Page 50, paragraph 37. Make the following changes:

Subparagraph *e.* After subparagraph *e,* add:
(PH-129-(*) or PH-639(*)/TF only).

Subparagraph g. Change "(figs. 6 and 7 or 8 and 9)" to (figs. 6 and 7, 8 and 9, or 9.1 and 9.2).

Page 51, appendix I (page 3 of C 2). Make the following change:

Change the title of "TM 38-750" to Army Equipment Record Procedures.

By Order of the Secretary of the Army:

HAROLD K. JOHNSON
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:
USASA (2)
CNGB (1)
CC-E (7)
Dir of Trans (1)
CofEngrs (1)
TSG (1)
CofSptS (1)
USACDCEA (1)
USACDCCBRA (1)
USACDCCEA (1)
USACDCCEA:
    Ft Huachuca (1)
USACDCOA (1)
USACDCQMA (1)
USACDCTA (1)
USACDCADA (1)
USACDCARMA (1)
USACDCAVNA (1)
USACDCARTYA (1)
USACDCSWA (1)
USAMC (5)
USCONARC (5)
ARADCOM (5)
ARADCOM Rgn (2)
OS Maj. Comd (4)
USARYIS (5)
LOGCOMD (2)
USAMICOM (4)
USASTRATCOM (4)
MDW (1)
Armies (2)
Corps (2)
USAC (3)
5th USASA Fld Sta (5)
318th USASA Bn (5)
319th USASA Bn (5)
Svc Colleges (2)
USASCS (60)
USAMPS (5)
USATC Armor (2)
USATC Engr (2)
USATC Inf (2)
USASTC (2)
WRAMC (1)
Army Pic Cen (2)
USACDCEC (10)
Instl (2) except
    Ft Monmouth (70)
    Ft Hancock (4)
    Ft Gordon (10)
    Ft Huachuca (10)
    Ft Carson (25)
    Ft Knox (12)
WSMR (5)
Gen Dep (2)
Sig Sec, Gen Dep (5)
Sig Dep (12)
A Dep (2) except
    LBAD (14)
    SAAD (30)
    TOAD (14)
    LEAD (10)
    SHAD (3)
    NAAD (5)
    SVAD (5)
    CHAD (3)
    ATAD (10)
Sig FLDMS (2)
AMS (1)
USAERDAA (2)
USAERDAW (13)
USACRREL (2)
USARMIS:
    Argentina (5)
    Costa Rica (5)
    Ecuador (5)
Units org under fol TOE
    (2 copies each):
    5-52
    5-112
    5-115
    5-116
    5-600
    5-605
    7
    8-650
    11-6
    11-12
    11-27
    11-36
    11-66
    11-95

11-96
11-117
11-127
11-155
11-157
11-158
11-500 (AA-AC, FB, FF, FI, FM-FE
11-587
11-592
11-597
11-608
17
19-500 (1, D)
30-17
30-18
30-25
30-500 (AA-AC, AF, FA, FC, GA, GE, KB)
37

NG: None.

USAR: None.

For explanation of abbreviations used, see AR 320-50.

CHANGE)
)
No. 1)

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 28 November 1966

TM 11-405-10, 28 May 1958, is changed as follows:

Note. The parenthetical reference to a previous change (example: page 1 of C 2) indicates pertinent material was published in that Change.

Page 52, appendix II (page 3 of C 2). Delete and substitute.

APPENDIX II
BASIC ISSUE ITEMS

Section I. INTRODUCTION

1. General

This appendix lists items for Processing Equipment PH-406 and Photographic Film Processing Units ES-20(1) and ES-20(2), the component items comprising it, and the items which accompany it, or are required for installation, operation, or operator's maintenance.

2. Explanation of Columns

An explanation of the columns in section II is given below.

a. Source, Maintenance, and Recoverability Codes, Column 1.

(1) Source code, column 1a. Not used.

(2) Maintenance code, column lb. The lowest category of maintenance authorized to install the listed item is noted here. The maintenance code used is as follows:

Code	Explanation
O	Organizational maintenance

(3) Recoverability code, column 1c. The information in this column indicates whether unserviceable items should be returned for recovery or salvage. Recoverability code and its explanation is as follows:

Note. When there is no code indicated in the recoverability column, the part will be considered expendable.

Code	Explanation
R	Applies to repair parts and assemblies that are economically repairable at PSU and GSU activities and are normally furnished by supply on an exchange basis.

b. Federal Stock Number, Column 2.The Federal stock number for the item is indicated in this column.

c. Description, Column 3. The Federal item name, a five-digit manufacturer's code, part number, and when required, the model designator (*), which indicates different models of the end equipment, are included in this column.

d. Unit of Issue, Column 4. The unit used as a basis of issue (e.g. ea, pr, ft, yd, etc.) is noted in this column.

e. Quantity Incorporated in Unit Pack, Column 5. Not used.

f. Quantity Incorporated in Unit, Column 6. The total quantity of the item used in the equipment is given in this column.

g. Quantity Authorized, Column 7. The total quantity of an item required to be on hand and necessary for the operation and maintenance of the equipment is given in this column.

h. Illustration, Column 8.

(1) Figure number, column 8a. The number of the illustration in which the item is shown is indicated in this column.

(2) Item or symbol number, column 8b. The call out number used to reference the item in the illustration appears in this column.

3. Federal Supply Codes

This paragraph lists the Federal supply code with the associated manufacturer's name.

Code	Manufacturer
13693	Columbian Enameling and Stamping Co. Inc
19139	Eastman Kodak Co.
54880	Simmon Bros. Inc
81342	Evan's Signal Laboratory
82318	Du Pont E I De Nemours and Co. Inc
89644	Nikor Products Co.

BASIC ISSUE ITEMS LIST

(1) Basic Issue Items List												(4)	(5)	(6)	(7)	(8) Illustrations	
(a) Source Code	(b) Maint. Code	(c) Rec. Code	(2) National Stock Number	Model 1	2	3	4	5	6	(3) Description		Unit of Issue	Qty Inc In Unit Pack	Qty Inc In Unit	Qty Auth	(a) Figure Number	(b) Item or Symbol Number
										PROCESSING EQUIPMENT PH-406 AND PHOTOGRAPHIC FILM PROCESSING UNITS ES-20(1) & ES-20(2)							
			6780-356-5666	*	*					PROCESSING EQUIPMENT PH-406 AND PHOTOGRAPHIC FILM PROCESSING UNIT ES-20(l): Accessories necessary to process black and white neg and prints from 35 mm to 4 X 5 in.		ea					
			6740-959-6974				*			PHOTOGRAPHIC FILM PROCESSING UNIT ES-20(2): Accessories necessary to process black and white neg prints from 35 mm to 4 X 5 in; 54880; 9-112-0035		ea.					
										MODEL DESIGNATION NOTE							
										NOTE: Model column 1 refers to PH-406, Model column 2 refers to ES-20(1), and Model column 3 refers to ES-20(2).							
			ORD THRU ACC	*	*	*				TECHNICAL MANUAL TM 11-405-10		ea.			2		
										NOTE: For technical manuals the quantity indicates the maximum number of copies authorized for packing (or issue) with the equipment. Where a number of these equipment's are concentrated in a small area, the quantity on hand may be reduced to practical levels. Excess publications must be returned to publication supply centers through AG channels.							
	O	R	6150-908-9125	*	*	*				CABLE ASSEMBLY, POWER, ELECTRICAL: 54880; 235-001		ea		1	1	5.1	12
	O	R	6740-191-6936	*						CABLE ASSEMBLY, POWER, ELECTRICAL: 54880; 235-036		ea		1	1	4	22
			6740-408-5159	*						CARRYIN, CASE, PHOTOGRAPHIC EQUIPMENT: 54880; 235-038		ea		1	1		
			6760-597-5249		*					CARRYING CASE, PHOTOGRAPHIC EQUIPMENT: Elwood Pattern Works No. 434		ea.		1	1		

BASIC ISSUE ITEMS LIST

(1) Basic Issue Items List												(4)	(5)	(6)	(7)	(8) Illustrations	
(a) Source Code	(b) Maint. Code	(c) Rec. Code	(2) National Stock Number	Model 1	2	3	4	5	6	(3) Description		Unit of Issue	Qty Inc In Unit Pack	Qty Inc In Unit	Qty Auth	(a) Figure Number	(b) Item or Symbol Number
										PH-406, ES-20(1) and ES-20(2) (continued)							
			6760-597-5250		*					CARRYING CASE, PHOTOGRAPHIC EQUIPMENT: Elwood Pattern Works No. 436		ea.		1	1		
			6760-597-5355		*					CARRYING CASE, PHOTOGRAPFHC EQUIPMENT: Elwood Pattern Works No. 435		ea.		1	1		
			6760-250-9185	*						CARRYING CASE, PHOTOGRAPHIC EQUIPMENT: 54880; 235-039		ea.		1	1		
			6760-408-5160	*						CARRYING CASE, PHOTOGRAPHIC EQUIPMENT: 54880; 235-037		ea.		1	1		
			6760-963-4088		*					CASE, PHOTOGRAPHIC EQUIPMENT: 54880; 9-412-0003		ea		1	1		
			6760-963-4092		*					CASE, PHOTOGRAPHIC EQUIPMENT: 54880; 9-412-0002		ea		1	1		
			6740-823-9815		*					EASEL, PHOTOGRAPHIC PAPER: FN-10; MIL-H-13216A		ea		1	1	5.1	11
			6760-959-4561		*					FILTER SET, Light: 82348, plastic filter varigam paper		ea		1	1	5.1	15
			6640-752-7678	*	*	*				GRADUATE PH-11		ea.		1	1	5.1	23
			6740-408-5005	*	*					HOLDER, PHOTOGRAPHIC PAPER-FN-9(1) BOARD PH-317		ea		1	1	4	1
			6760-498-9918	*	*	*				PADDLE, PRINTPHOTOGRAPHIC PH-80		ea		1	1	5.1	19
			6740-251-8028	*	*	*				PLATE, FERROTYPE, PHOTOGRAPHIC PH-152A		ea		12	12	5.1	10
			6740-243-2921	*						PRINTER, PROJECTION PH-637/TF; PH-637A/TF; PRINTER PH-129A		ea		1	1	2	1
			6740-200-4351		*					PRINTER, PROJECTION, PHOTOGRAPHIC EN-16(1)		ea		1	1	3	1
	0	R	6740-926-5220			*				PRINTER, PROJECTION PHOTOGRAPHIC EN-91A; 54880, D2VXL		ea		1	1	4.1	1

BASIC ISSUE ITEMS LIST

(1) Basic Issue Items List																	
(a) Source Code	(b) Maint. Code	(c) Rec. Code	(2) National Stock Number	Model 1	2	3	4	5	6	(3) Description	(4) Unit of Issue	(5) Qty Inc In Unit Pack	(6) Qty Inc In Unit	(7) Qty Auth	(8) Illustrations (a) Figure Number	(b) Item or Symbol Number
										PH-406, ES-20(1) and ES-20(2) (continued)						
			6640-408-5676	*	*	*				ROD STIRRING PH-230	ea		1	1	5.1	18
			6740-247-1730	*	*	*				SAFELIGHT, DARKROOM PHOTOGRAPHIC FM-173A: GG-S-86b; Type 1 style 2	ea		1	1	5.1	3
			6740-224-9612	*	*	*				SIPHONE, PHOTOGRAPHIC TRAY AUTOMATIC PH-244, PH-244A	ea		1	1	5.1	5
			7920-205-2002			*				SQUEEGEE PH-248	ea		1	1	5.1	16
			7920-222-2617	*	*					SQUEEGEE PH-348	ea.		1	1	4	4
			5930-240-3599	*	*	*				SWITCH FOOT PH-424	ea		1	1	5.1	8
			6740-243-2854	*	*					TANK, PROCESSING PHOTOGRAPHIC FM-12(1) TANK DEVELOPING PH-186	ea		1	1	9	
			6740-224-9562	*	*	*				TANK PROCESSING PHOTORAPHIC FM-8(1), TANK PH-256A	ea1		1	5.1	24	
			6740-926-5214			*				TANK PROCESSING PHOTOGRAPHIC PH-594A/PFQ: 89644; Quick fill	ea		1	5.1	21	
			6760-521-0656	*	*	*				THERMOMETER SELF-INDICATION BIMETALLIC PH-660/U	ea		1	1	5.1	17
			6645-2-3-8018	*	*	*				TIMER INTERVAL FN-5(1), TIMER INTERVAL PH-426, PH-426A, B, C	ea		1	1	5.1	6
			6645-243-9470	*	*	*				TIMER, STOP FM-103(1): 19139; Kodak timer	ea		1	1	5.1	7
			6740-963-4880	*	*	*				TONGS, PHOTOGRAPHIC PRINT PH-373A: 13693; 316SS	ea		2	2	5.1	20
			6740-243-2943	*	*					TRAY PH-161A	ea		3	3	4	12
			6740-243-2942	*						TRAY PH-164A	ea		1	1		
			6740-543-4050		*					TRAY, PROCESSING PHOTOGRPHIC PH-161A: 13693, 1620	ea		1	1	5.1	1
			6740-926-5221		*					TRAY PROCESSING PHOTOGRAPHIC: 81342; RR-7-646A type 1 size 2	ea		3	3	5.1	2

BASIC ISSUE ITEMS LIST

(1) Basic Issue Items List																	
(a) Source Code	(b) Maint. Code	(c) Rec. Code	(2) National Stock Number	Model 1	2	3	4	5	6	(3) Description	(4) Unit of Issue	(5) Qty Inc In Unit Pack	(6) Qty Inc In Unit	(7) Qty Auth	(8) Illustrations (a) Figure Number	(b) Item or Symbol Number
										pH-406, E3-20(1) and ES-20(2) (Continued)						
			6750-243-2944			*				TRAY PH-166A NOTE: No accessories, tools or test equipment are to be issued with this equipment NOTE: No basic issue items are mounted in or on this equipment.	ea.		1	1	4	12

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:
Active Army:

USASA (2)
CNGB (1)
OCC-E (7)
Dir of Trans (1)
CofEngrs (1)
TSG (1)
CofSptS (1)
USAARENBD (2)
USACDCEA (1)
USACDCCBRA (1)
USACDCCEA (1)
USACDCCEA Ft Huachuca (1)
USACDCOA (1)
USACDCQMA (1)
USACDCTA (1)
USACDCADA (1)
USACDCARMA (1)
USACDCAVNA (1)
USACDCARTYA (1)
USACDCSWA (1)
USAMC (5)
USCONAR((5)
ARADCOM (5)
ARADCOM Rgn (2)
OS Maj Comd (4)
LOGCOMD (2)
USAMICOM (4)
USASTRATCOM (4)
USAESC (70)
MDW (1)
Armies (2)
Corps (2)
USAC (3)
1st Cav Div (5)
5th USASA Fll Sta (5)
318th USASA Bn (5)
319th USASA Bn (5)
Svc Colleges (2)
USASCS (60)
USASESCS (5)
USAADS (2)
USAAMS (2)
USAARMS (2)
USAIS (2)
USAES (2)
IISAMPS (5)
USATC Armor (2)
USATC Engr (2)
USATC Inf (2)
USASTC (2)
WRAMC (1)
Army Pic Cen (2)
USACDCEC (10)
Instl (2) except
    Fort Hancock (4)
    Fort Gordon (10)
    Fort Huachuca (10)
WSMR (5)
    Fort Carson (25)
    Fort Knox (12)
Army Dep (2) except
    LBAD (14)
    SAAD (30)
    TOAD (14)
    LEAD (7)
    SHAD (3)
    NAAD (5)
    SVAD (5)
    CHAD (3)
    STAD (10)
GENDEPS (2)
Sig Sec GENDEPS (5)
Sig Dep (12)
Sig FLDMS (2)
AMS (1)
USAERDAA (2)
USAERDAW (13)
USACRREI, (2)
USAPA (10)
USARMIS: Costa Rica (5)
    Ecuador (5)
    Argentina (5)
Units org under fol TOE:
    5-52 (2)
    5-112 (2)
    5-115 (2)
    5-116 (2)
    5-600 (2)
    5-605 (2)
    7 (2)
    8-650 (2)
    11-6 (2)

1-35 (2)
11-56 (2)
11-57 (2)
11-95 (2)
11-96 (2)
11-117 (2)
11-127 (2)
11-155 (2)
11-157 (2)
11-158 (2)
11-500 (FB, FF, FI, FM, FN) (2)
11587 (2)
11-592 (2)
11-597 (2)
11-608 (2)
17 (2)
19-500 (LD) (2)
30-25 (2)
30-26 (2)
30-28 (2)
30-500 (2)
37 (2)

NG: State AG (3), units-same as Active Army except allowance is one (1) copy to each unit.

USAR: None.

For explanation of abbreviations used, see AR 320-50.

Changes in force: C 3, C 4, and C 5

CHANGE

No. 5

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 6 September 1968

Operator's Manual

PROCESSING EQUIPMENT PH-406 AND PHOTOGRAPHIC FILM

PROCESSING UNITS ES-20(1), ES-20(2), AND ES-20(3)

TM 11-405-10, 28 May 1958, is changed as follows:
The manual is changed so that it applies to the following equipment:

Nomenclature	Contract No.	Serial No.
Photographic Film Processing Unit ES-20 (3).	F 33(657)-67-C-0865	1 through 84

The title is changed as shown above.

Note. The parenthetical reference to a previous changes (example: "page 1 of C 3") indicates that pertinent material was published in that change.

***This change supersedes C 2, 26 August 1963.**

Page 3, chapter 1 (page 1 of C 3). Add the following note below the title of chapter 1.

Note. Photographic Film Processing Unit ES-20(3) is similar to Photographic Film Processing Units ES-20(1) and ES-20(2). Information in this manual applies to all three units unless otherwise specified.

Paragraph 1 (as deleted by C 2, 26 Aug 63). Delete subparagraph e.

(As added by C 2, 26 Aug 63), delete and substitute paragraph 1.1 after paragraph 1.

1.1. Indexes of Equipment Publications

a. DA Pam 310-4. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

(Page 1 of C 3 and as deleted by C 2, 26 Aug 63), delete paragraph 2 and substitute:

2. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions given in TM 38750.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Report of Packaging and Handling Deficiencies) as prescribed in AR 700-58 (Army), NAVSUP Publication 378 (Navy), AFR 71-4 (Air Force), and MCO P4610-5 (Marine Corps).

c. Discrepancy in Shipment Report (DISREP) (SF361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF361) as prescribed in AR 55-38 (Army), NAVSUP Publication 459 (Navy), AFM 75-34 (Air Force), and MCO P4610.19 (Marine Corps).

d. Reports of Equipment Publication Improvements. Report of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to Commanding General, U. S. Army Electronics Command, ATTN: AMSELME-NMP-AD, Fort Monmouth, N. J. 07703.

Paragraph 4a, line 1 (page 1 of C 3). Change "or Photographic Projective Printer EN-16(1)" to Photographic Projection Printer EN-16(1), Photographic Projection Printer EN-91A, or Photographic Projection Printer EN-91B.

Page 4, paragraph 4. Make the following changes:

Subparagraph a (page 1 of C 3). Make the following changes:

Line 2. Change "or EN-16(1)" to EN16(1), EN-91A, or EN-91B.

After line 4, add:

Condenser lens set (EN-91B) .....165-mm diameter.

After line 7, add:

Projection lens sets (EN-91B)....50-mm focal length.
90-mm focal length.
135-mm focal length.

After line 3, add:

Projection Printing Easel

FN-10 (2) .....Holds enlarging paper up to 11 by 14 inches in size with adjustments for margins up to 3/4 inch in width.

After line 18, add:

EN-91B negative carriers:

35-mm roll .....1 by 11/2 inch aperture.
70-mm roll .....21/4 by 21/4 inch aperture.
21/4 by 31/4 inch roll.....21/4 by 31/4 inch aperture.
4 by 5 inch cut film .....4 by 5 inch aperture.

Subparagraph b (page 2 of C 3). Make the following changes:

Line 1. Change "and Stop Timer FM103(1)" to Stop Timers FM-103(1) and FM103(2).

Line 7. Change "or Interval Timer FN5(1)" to Interval Timer FN-5(1) or FN-5(2).

Line 17. Change "or Photographic Processing Tank FM-8(1)" to Photographic Processing Tank FM-8(1) or Photographic Tank FM-8(2).

(Page 2 of C 3) Change "Photographic Processing Tank PH-594A/PFQ" to Photographic Processing Tank PH-594A/PFQ or PH594A/U.

Paragraph 5 (page 2 of C 3). Delete the first two sentences and substitute: The components of Processing Equipment PH-406 and Photographic Film Processing Units ES-20(1), ES-20(2), and ES-20(3) are listed in a below.

The major components of Printer PH-129(*), Printer PH-639 (*)/TF, Photographic Projection Printers EN-16(1), EN-91A, and EN-91B are listed in b below.

Page 7, figure 3 (page 3 of C 3). Add figure 3.2 after figure 3.1.

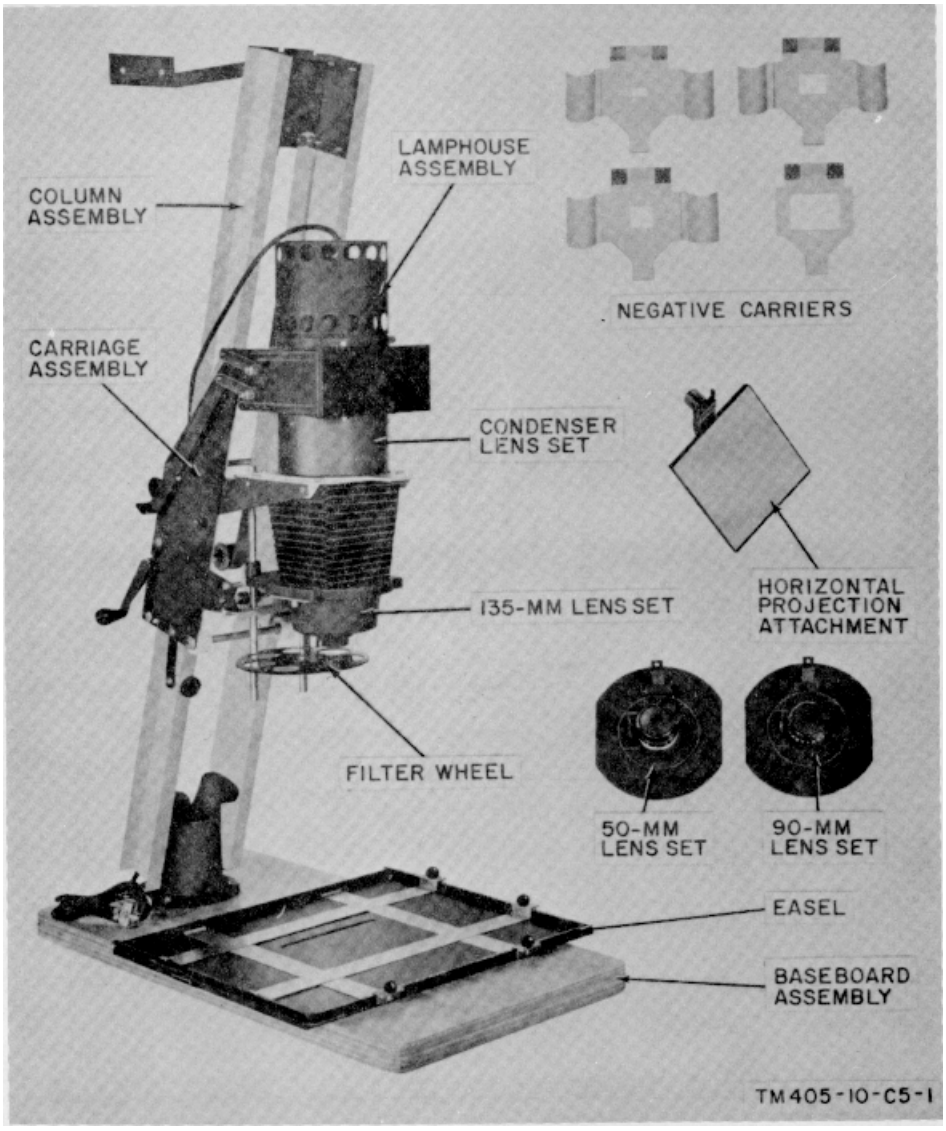


Figure 3.2. Photographic Projection Printer EN-91B.

Page 9, paragraph 5 (page 4 of C 3). Delete subparagraph a and substitute:

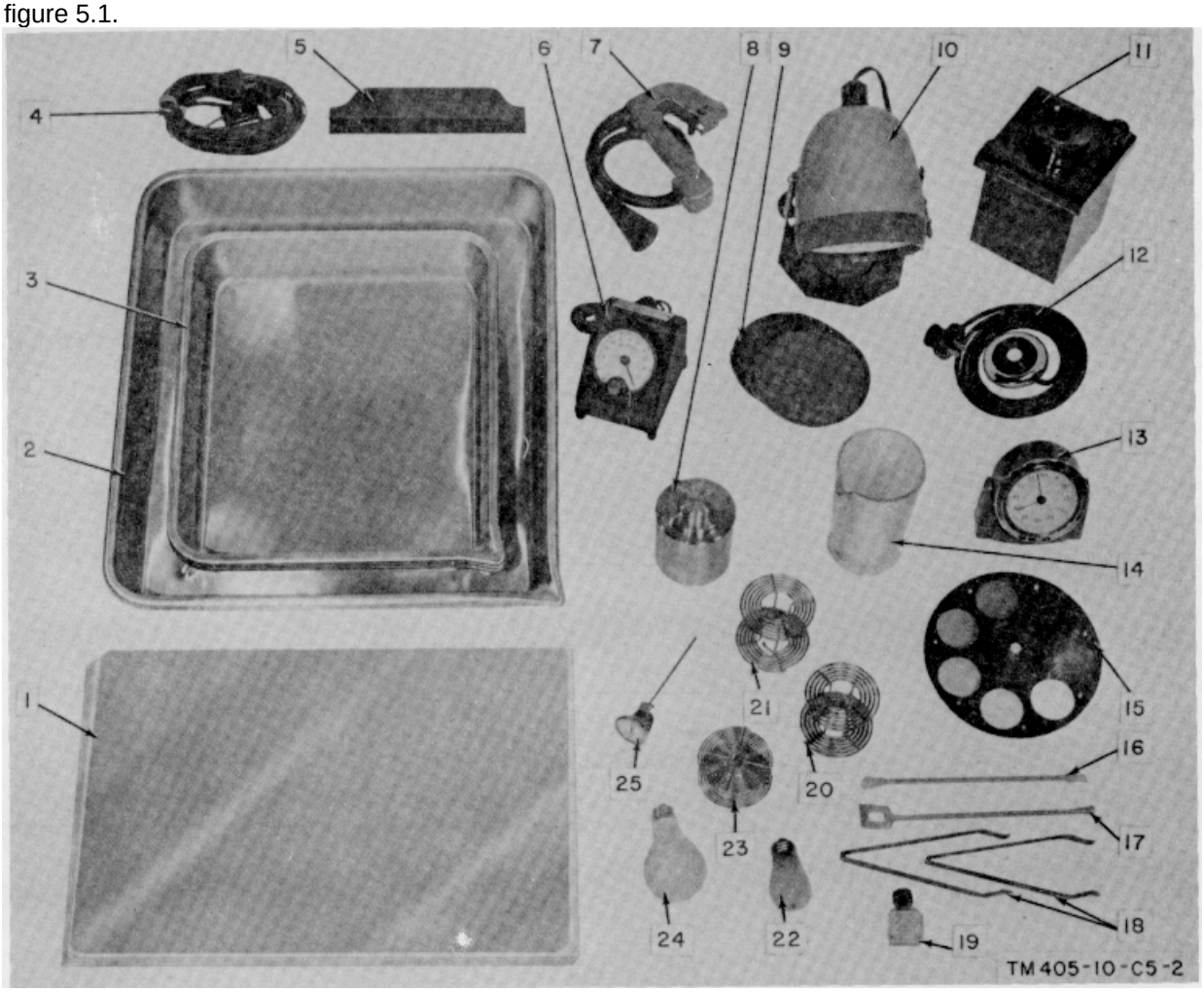
a. Components of PH-406, ES-20(1), ES-20(2), and ES-20(3).

PH-406	ES-20(1)	ES-20(2)	ES-20(3)	Fig. No.	Qty.	Item	Dimensions (in.)	Weight (lb)
(*)				1, 2	1	Printer PH-129(*) or PH-639(*)/TF (b below).	18 x 26 x 48 18 x 27 x 51	80 80
(*)				4	1	Adapter cable	4	6 oz.
(*)				4	1	Battery cable assembly	15 lg	14 oz.
(*)				6	1	Carrying case No. 1	13 1/2 x 20 x 38	41
(*)				7	1	Carrying case No. 2	131/2 x 30 x 21	48 1/2
(*)				6	1	Carrying case No. 3	9 ½ / x 12 x 21	13
(*)				4	1	Tank PH-256-A	51/2 x 6 x 7	¾
(*)				4	1	Timer PH-29-C	2 1/4 x 5 x 5 ½	1 1/4
(*)				4	1	Tray PH-164-A	2' 1/2 x 14 x 17	4 1/2
	(*)			3	1	Photographic Projection Printer EN-16(1) (b below).	17 x 2 7/8/ x 58	63
	(*)			8	1	Carrying case No. 1	131/2 x 20 x 38	60
	(*)			9	1	Carrying case No. 2	131/2 x 20 x 38	60
	(*)			8	1	Carrying case No. 3	111/8 x 111/8 x 16	2
		(*)		3.1	1	Photographic Projection Printer EN-91A.	18 x 34 x 68 5/8	69
		(*)		9.1	1	Carrying case No. 1	18 ¾ x 19 ¾ x 62 1/8	80
		(*)		9.1		Carrying case No. 2	16 x 23 11/16 x34 3/16	60
		(*)		9.2	1	Carrying case No. 3	8 5/8 x 15 x 24	15
		(*)	(*)	5.1, 5.2	1	Photographic Processing Tank PH-594A/PFQ or PH-594A/U, including:	4 ½ x 3 9/16 dia.	1m 1
		(*)	(*)	5.1, 5.2		35-mm reel	1 5/8 x 3 ¼ dia.	33 ½ oz.
		(*)	(*)	5.1, 5.2		70-mm reel	2 5/8 x 3 ¼ dia.	4 oz.
		(*)	(*)	5.1, 5.2		No. 120 reel	3 x 3 dia	4 ½ oz.
		(*)	(*)	5, 5.1, 5.2	1	Photographic Processing Tank FM-8(1) or FM-8(2).	5 ½ x 6 x7	3/4
	(*)	(*)	(*)	4, 5, 5.1 5.2	1	Stop Timer FM-103(1) or FM-103(2)		
		(*)		5, 5.1	1	Tray PH-166-A	3 x 19 ¾ x 24	6 1/2
(*)	(*)	(*)	(*)	4, 5, 5.1 5.2	1	Foot Switch PH-424	3 ¼ x 3 dia.	12 ¾ oz.
(*)	(*)	(*)	(*)	4, 5, 5.1, 5.2	1	Graduate PH-11	6 x 3 7/8	1
(*)	(*)	(*)	(*)	4, 5, 5.1	1	Interval Timer FN-5(1) Timer PH-426 (8), or Timer FN-5(2).	3 x 5 x 5	2 1/2
(*)	(*)	(*)		4, 5	1	Lamp PH-422-A, including:		
						Light filter, Wratten OA (green-yellow).	3 3/16 x 5 ½ dia.	4 oz.
				4, 5	1	Light filter, Wratten No. 2 (red)	3 3/16 x 5 ½ dia.	4 oz.

PH-406	ES-20(1)	ES-20(2)	ES-20(3)	Fig. No.	Qty.	Item	Dimensions (in.)	Weight (lb)
				4, 5	1	Light filter, Wratten No. 3 (dark green).	3 3/6 x 51/2 dia.	4oz.
				5	1	Power cable assembly	10 ft	3/4
			(*)	4, 5, 5.2	1	Incandescent lamp, 10-watt, 115-volt.	¾ x 2 dia.	1 oz.
				4, 5	1	Incandescent lamp, 10-watt, 6-volt.	3/4 x 2 dia.	1 oz.
		(*)	(*)	5.1, 5.2	1	Photographic Darkroom Safelight FM-173A, including:		
		(*)	(*)	5.1, 5.2	1	Light filter, Wratten OC (brownish-green).	3/16 X 51/2 dia.	4 oz.
		(*)	(*)	5.1, 5.2	1	Light filter, Wratten No. 2 (red).	3/16 X 5/2 dia.	
4 oz								
		(*)	(*)	5.1, 5.2	1	Light filter, Wratten No. 3 (dark green).	3/16 X 51/2 dia.	4 oz.
		(*)	(*)	5.1, 5.2	1	Variable contrast filter set	15A/6 x 234 x 4/2	5 oz.
(*)	(*)	(*)	(*)	4, 5, 5.1, 5.2	12	Plate PH-152A	14 x 20	1 3/4
(*)	(*)		(*)	4, 5, 5.2	1	Power cable	25 ft.	1 1/2
(*)	(*)	(*)	(*)	4, 5, 5.1,	1	Paddle PH-80	11½h x 13	m oz.
(*)	(*)	(*)	(*)	4, 5, 5.1, 5.2	1	Rod PH-230	3/4 x 10 dia.	1 oz.
(*)	(*)	(*)	(*)	4, 5, 5.1, 5.2	1	Siphon PH-244 or PH-244-A	1 ¼ x s x 7	3/4
(*)	(*)	(*)	(*)	4, 5, 5.1,	1	Squeege PH-348	1 x 2¾: x 10	1/2
(*)	(*)			4, 5	1	Tank PH-186 or Photographic Processing Tank FM-12(1).	3 1/4 x 5 1/4 dia.	1 1/4
(*)	(*)	(*)	(*)	4, 5, 5.1, 5.2	1	Thermometer PH-660/U	1 3/4 x 6 dia.	4 oz.
(*)	(*)	(*)	(*)	4, 5, 5.1, 5.2	2	Tongs PH-373-A	¾ x 2 ¼ x 9 ½	
3/4 oz.								
(*)	(*)	(*)	(*)	4, 5, 5.1, 5.2	3	Tray PH-161-A	2'/2 x 11 x 14	3
(*)	(*)			4, 5	1	Set of spare parts consisting of:		
(*)	(*)		(*)	4, 5, 5.2	2	Lamp, 10-watt, 115-volt	3/4 x 2 dia.	1 oz.
(*)	(*)			4, 5	2	Lamp, 10-watt, 6-volt	3/4 x 2 dia.	1 oz.
(*)		1				Photographic Film Processing Unit ES-20(3).		
			(*)		1	Photographic Projection Printer EN-91B.	18 x 34 x 68 5/8	70

PH-406	ES-20(1)	ES-20(2)	ES-20(3)	Fig. No.	Qty	Item	Dimensions (in.)	Weight (lb)
			(*)		1	Projection Printing Easel FN-10(2).	17%3x 147/16 x 7/s	61/2
			(*)		1	Carrying case No. 1	64% x 18 x 22½h	216
			(*)		1	Carrying case No. 2	34 x 23/2 x 161/s	120
			(*)		1	Carrying case No. 3	24 x 145/s x 1134	1/4
			(*)	5.2	1	Filter wheel assembly	73/ x 1 I	
			(*)	5.2	1	Photographic processing tray.	314 x 16 x 20	4

Page 10, figure 5 (page 6 of C 3). Add figure 5.2 after figure 5.1.



1 Plate PH-152-A
2 Tray
3 Tray PH-161-A
4 Power cable (25 foot)
5 Squeegee PH-348
6 Interval Timer FN-5(2)
7 Siphon PH-244-A
8 Photographic Processing Tank Ph-594A/U
9 Light filters
10 Photographic Darkroom Safelight FM-173A
11 Photographic Processing Tank FM-8 (2)
12 Foot Switch PH-424
13 Stop Timer FM-103(2)
14 Graduate PH-11
15 Filter wheel
16 Rod PH-230
17 Paddle PH-80
18 Tongs PH-373-A
19 Antistatic solution
20 Film reel No. 120
21 Film reel, 70-mm
22 Lamp safelight
23 Film reel, 35-mm
24' Lamp printer
25 Thermometer PH-660/U

Figure 5.2. Minor components of Photographic Film Processing Unit ES-20(3).

Page 11, paragraph 5 (page 7 of C 3). Delete subparagraph b and substitute: b. Components of PH-129(*), PH-639(*)/TF, EN-16(1), EN-91A, and EN-91B. The major components of the PH-129(*), PH-639 (* /TF, EN-16(1), EN-91A, and EN-91B are listed in the chart below. For detailed component information, refer to the applicable manual listed in appendix I.

PH-129	PH-129A	PH-129B	PH-639/TF	PH-639A/TF	EN-16(1)	EN-91A	EN-91B	Qty.	Item
(*)	(*)	(*)	(*)	(*)	(*)			1	Condenser lens assembly, 3 1/2 inch.
(*)	(*)	(*)	(*)	(*)	(*)	(*)		1	Condenser lens assembly, 61/2 inch.
						(*)	(*)	1	Variable condenser lens.
(*)	(*)	(*)	(*)	(*)	(*)	(*)		1	Projection lens, 2-inch.
(*)								1	Projection lens, 3 1/2 inch.
(*)	(*)	(*)						1	Projection lens, 5 3/8 inch.
(*)	(*)	(*)	(*)					1	Projection lens, 5 1/2 inch.
(*)	(*)	(*)	(*)	(*)	(*)	(*)		1	Dustless negative carrier.
(*)	(*)	(*)	(*)	(*)	(*)			1	Glass negative carrier.
(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	1	Rapid-shift negative carrier (35-mm roll film) 1 x 1 1/2 inch aperture.
						(*)		1	Rapid-shift negative carrier (70-mm roll film) 2 1/4 x 2 1/4 inch aperture.
						(*)	(*)	1	Rapid-shift negative carrier (2.2 x 2.75 aperture).
						(*)	(*)	1	Rapid-shift negative carrier (2 1/4 x 3 1/4 inch aperture).
(*)	(*)	(*)	(*)	(*)	(*)	(*)		1	Red filter.
						(*)	(*)	1	Color filter holder.
						(*)	(*)	1	Heat absorbent glass.
						(*)	(*)	1	Horizontal projection attachment.
(*)	.	(*)						1	Holder PH-349 or PH-349A.
	(*)	(*)	(*)					1	Board PH-317 or PH-317A.
					(*)	(*)	(*)	1	Projection Printing Easel

PH-129	PH-129A	PH-129B	PH-639/TF	PH-639A/TF	EN-16(1)	EN-91A	EN-91B	Qty.	Item
									FN-10(1) or FN-10(2).
					(*)			1	Photographic Paper Holder FN-9(1).
		(*)						1	Color Head Attachment PH-688/U.
	(*)		(*)	(*)				3	Incandescent lamp, 6-volt, 28-watt.
(*)		(*)						3	Incandescent lamp, 115-volt 75-watt.
					(*)			4	Incandescent lamp, 115-volt, 75-watt
						(*)		1	Incandescent lamp, 115-volt, 75-watt.
							(*)	1	Filter wheel assembly.
							(*)	1	Condenser lens set, 611/s inch.
							(*)	1	50-mm projection lens set.
							(*)	1	90-mm projection lens set.
							(*)	1	135-mm projection lens set.
							(*)	1	Negative carrier (4 x 5 inch aperture cut film).

Page 13, paragraph 7 (page 7 of C3). Make the following changes:

Subparagraph a, heading Change “(fig. 1, 2, 3, and 3.1)” to (fig. 1, 2, 3.1, and 3.2).

Subparagraph b heading. Change “(fig. 4, 5, and 5.1)” to “(fig. 4, 5, 5.1, and 5.2).

Page 15, figure 9 (page 9 of C 3). Add figures 9.3 and 9.4 after figure 9.2

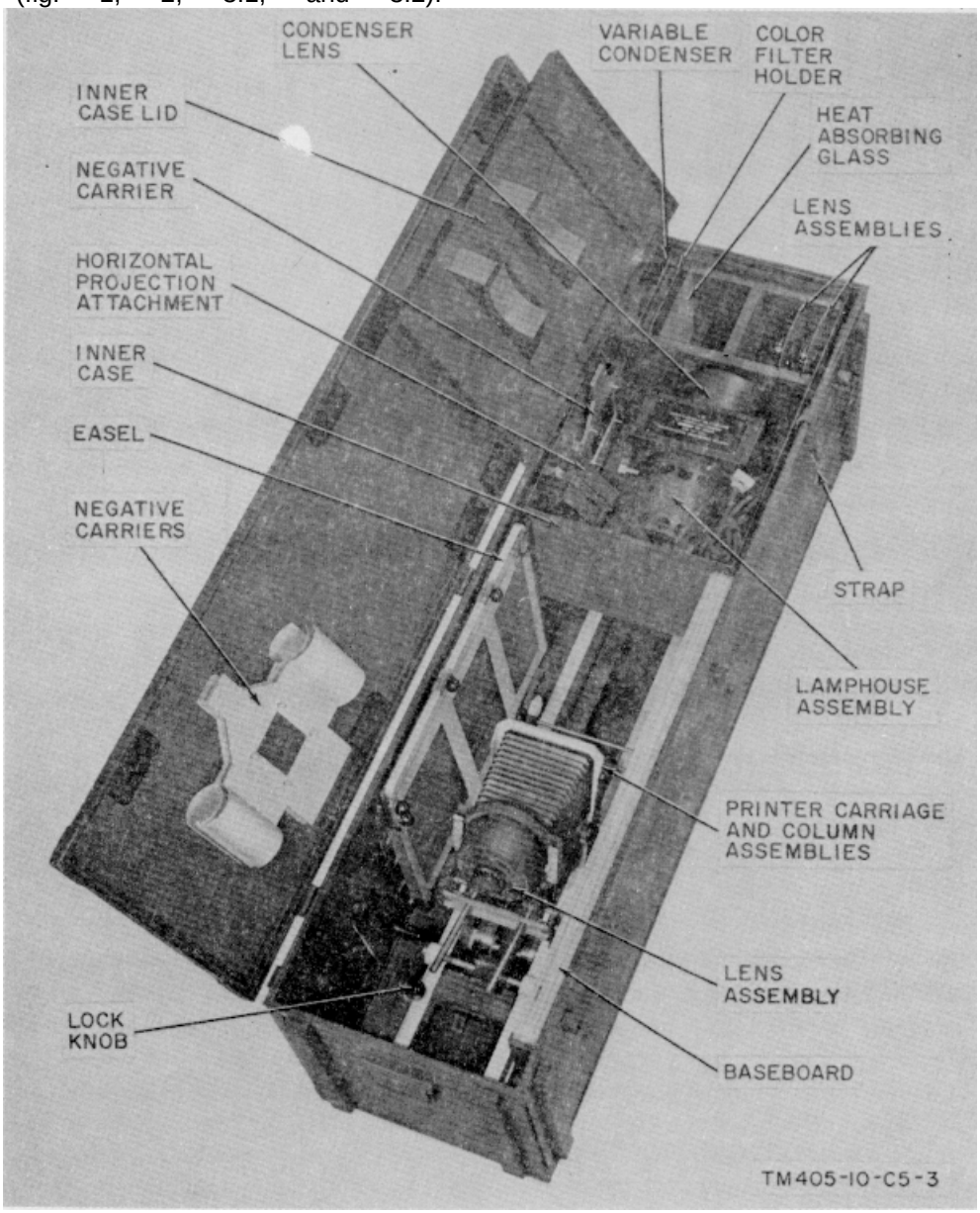


Figure 9.3. Components of ES-20 (3) packed in carrying case No.1

Item	PH-129	PH-129A	PH-129B	PH-639/TF	PH-639A/TF	EN-16(1)	EN-91A	EN-91B
Power source	105 to 120 volts ac or dc	105 to 120 volts ac or 6 to 8 volts dc	105 to 120 volts ac or dc dc	105 to 120 volts ac or 6 to 8 volts dc.	105 to 120 volts ac or 6 to 8 volts	105 to 120 volts ac or dc	105 to 120 volts ac or dc	105 to 120 volts ac or dc. ,
Easel (para 5b)								
Maximum paper size	11 x 14 in	11 x 14 in	8 x 10 in	8 x 10 in	8 x 10 in	11 x 14 in	11 x 14 in	11 x 14 in.
Maximum margin width	3 inches	3 inches	3/4 inch	3/4 inch	3/4 inch	½ inch	3/4 inch	3/4 inch
Projection lens sets	Refer to paragraph 5b							
Projection	Vertical	Vertical	Vertical	Vertical	Vertical or hori-zontal	Vertical or hori-zontal	Vertical or hori-zontal	Vertical or hori zontal
Projection lens openings	F/4.5 through f/32	F/4.5 through f/32	F/4.5 through f/32	F/4.5 through f/32	F/4.5 through f/32	F/4.5 through f/32	F/4.5 through f/32	F/4.5 through f/32.
Dustless negative carrier	3 5/8 x 4 5/8 inches	3 5/8 x 4 5/8 inches	3 5/8 x 4 5/8 inches	3 5/8 x 4 5/8 inches	3 5/8 x 4 5/8 inches	5 x 7 inches	1 x 1 ½ inches 2 1/4 x 2 ¼ inches, 2 ¼ x 2 ¼ inches 2.2 x 2.75 inches, 2 ¼ x 3 ¼ inches 4 x 5 inches	1 x 1 ½ inches 2 1/4 x 2 ¼ inches 2 ¼ x 3 ¼ inches 4 x 5 inches

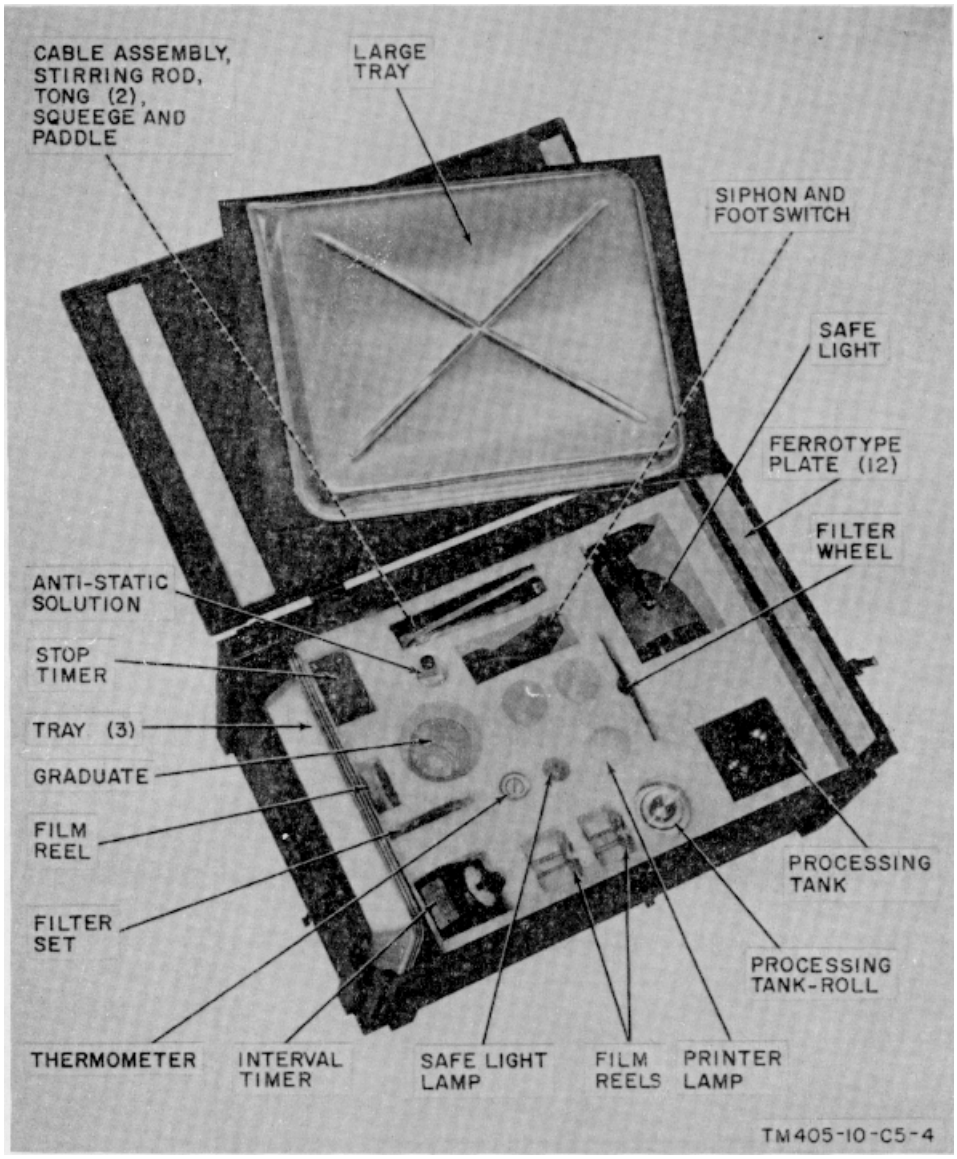


Figure 9.4. Components of ES-20(3) packed in carrying case No.2

Page 16, paragraph 10a (page 11 of C 3). After the last sentence, add: The dimensions of the outer wooden packing case for the ES-20(3) are 64y2 by 18 by 22 18 inches; its approximate volume is 8.5 cubic feet; and its total weight is 216 pounds. The dimensions of the inner fiberboard carton for the ES-20(3) are 34 by 23/2 by 161/8 inches and its approximate volume is 7.5 cubic feet; and its total weight is 120 pounds.

Figure 10.1 (page 11 of C 3). Add to the caption: and ES-20(3).

Paragraph 11 (as changed by C 2, 26 Aug 63). Delete subparagraph c and substitute.

c. See that the equipment is complete as listed on the packing slip. If a packing slip is not available, check the equipment against the repair parts and special tools list (appx II). Report all discrepancies in accordance with TM 38-750. Shortage of a minor assembly or part that does not affect proper functioning of the equipment should not prevent use of the equipment.

Page 17, paragraph 12a (as added by C 2, 26 Aug 63). After the last line, add: b. Interior Requirements.

Paragraph 14a, heading (page 12 of C 3). Change "or EN-91A" to EN-91A or EN-91B.

Figure 11. Make the following changes: Delete the caption and substitute: Connection diagram for 105to 120-volt ac or dc of PH-129, PH-129B, EN-16(1), or EN-91B.

Change "NOTE" to read NOTES

Designate the existing note, "1."

Add the following:

2. NO LAMPHOLDER POWER CORD SWITCH IS USED ON THE EN-91B.

Page 19, paragraph 15. After subparagraph c (page 12 of C 3), add:

d. Photographic Projection Printer EN-91B.

Control	Function
Control lever (fig. 16.2).	In forward position raises lamp house assembly. In rear position lowers lamp house assembly.
Control lever stop	Holds control lever in forward (raised) position.
Lock knob.....	Secures control lever in rear (operating) position.
Crank	Controls distance of carriage assembly from easel, thereby controlling the size of the enlargement.
Focusing knob	Increases or decreases distance of projection lens to negative for focusing.
Carriage lock knob	Secures carriage assembly in position on column assembly.
Diaphragm ring	Sets lens opening between f/4.5 and f/32.

Page 22, figure 16 (page 13 of C 3). Add figure 16.2 after 16.1.

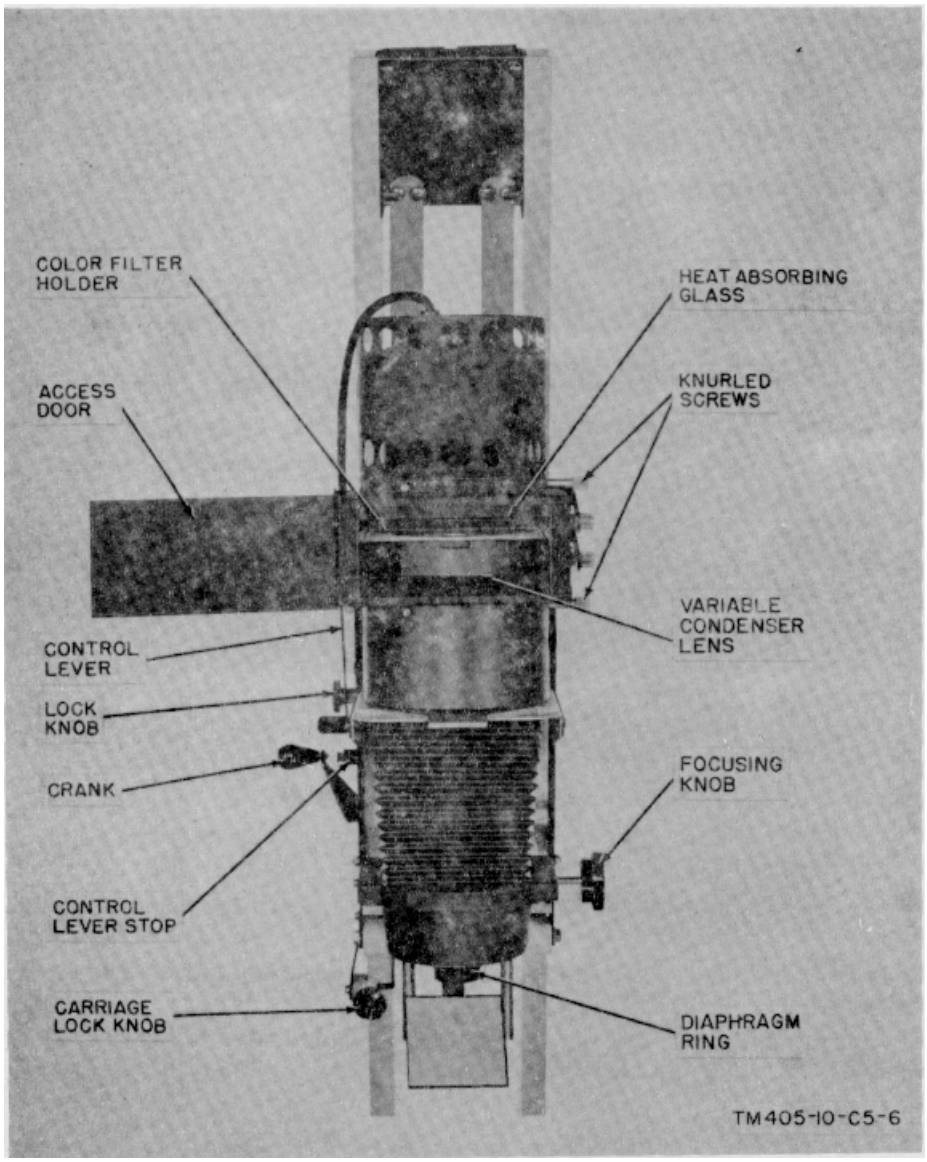


Figure 16.2. Photographic Equipment Printer EN-91B,operating controls and related equipment.

Page 23, paragraph 16a. Delete the heading and substitute: a. PH-29-C or FM-103(2) (fig. 17).

Figure 17. Add to the caption: or FM-103(2).

Page 24, paragraph 16. After subparagraph d, add:

d.1. Interval Timer FN-5(2) (fig. 20.1).

Control or indicator	Function
Start cycle pushbutton...	Starts automatic timing of exposure when pushed down.
Time selector knob	Sets indicator pointer to desired time interval.
Indicator pointer	Indicates time interval selected.
	Indicates time left before time interval has elapsed.

Page 26, figure 20. Add figure 20.1 after 20.

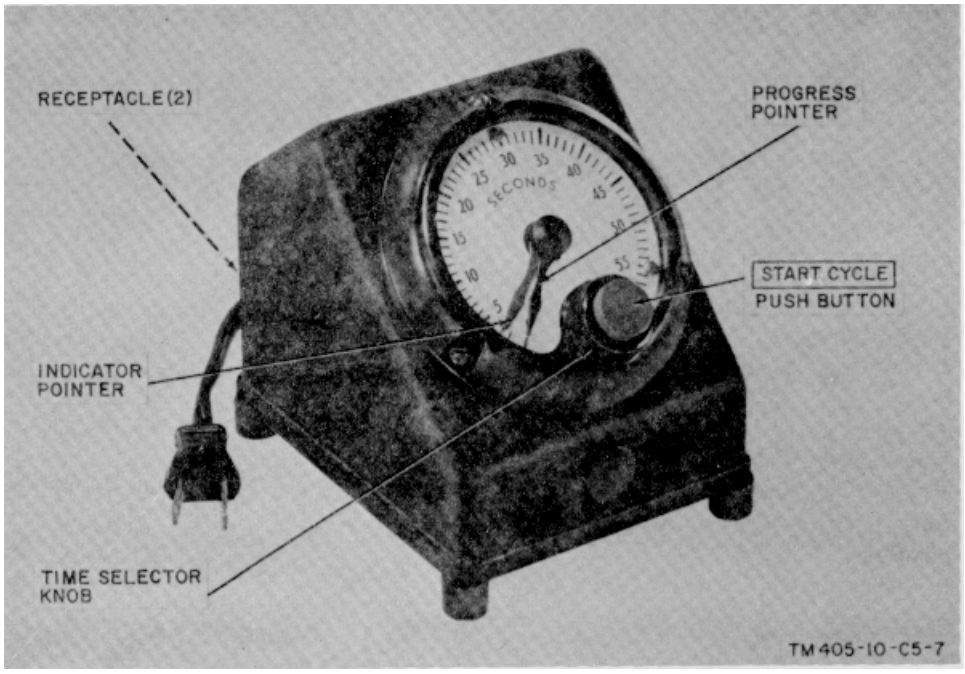


Figure 20.1. Interval Timer FN-5(2), front view.

Paragraph 17. Make the following changes:

Subparagraph a (page 14 of C 3). Add "or EN-91B" to the heading.

Subparagraph b(1l) (page 14 of C 3). Change "or EN-91A" to EN-91A or EN-91B.

Page 27, paragraph 17. Make the following changes: Subparagraph b(2). Add subparagraph (2.1) after subparagraph (2).

(2.1) EN-91B.

(a) Loosen the knurled screws (fig. 16.2) on the base of the variable condenser lens housing and lift off the upper lamp house.

(b) Open the access door and pull out the color filter drawer.

(c) Slide out the condenser lens assembly and insert a replacement.

(d) Replace the color filter drawer and close the access door.

(e) Replace the upper lamp house and secure it with the knurled screws.

figure Interval Timer FN-5(2), front view.

Subparagraph c(1), heading (page 14 of C 3). Change "or EN-91A (fig. 2 and 3.1)" to EN-91A (fig. 2 and 3.1) or EN-91B (fig. 3.2).

Paragraph 18. Make the following changes: Subparagraph a, line 3. Change "(par.

26)" to (para 27).

Subparagraph a(3), heading (page 14 of C 3). Change "EN-91A" to EN-91A or EN-91B.

Subparagraph b, line 4. Change "(par.

26)" to (para 27).

Page 29, paragraph 18c. Make the following changes: Line 4. Change "(par. 26)" to (para 27).

(Page 14 of C 3 and as changed by C 2, 26 Aug 63), after the third sentence, add: Three rapid-shift and one 4by 5-inch cut film negative carriers are supplied with the EN-91B.

Page 31, figure 25 (page 15 of C 3). Add figure 25.2 after figure 25.1.

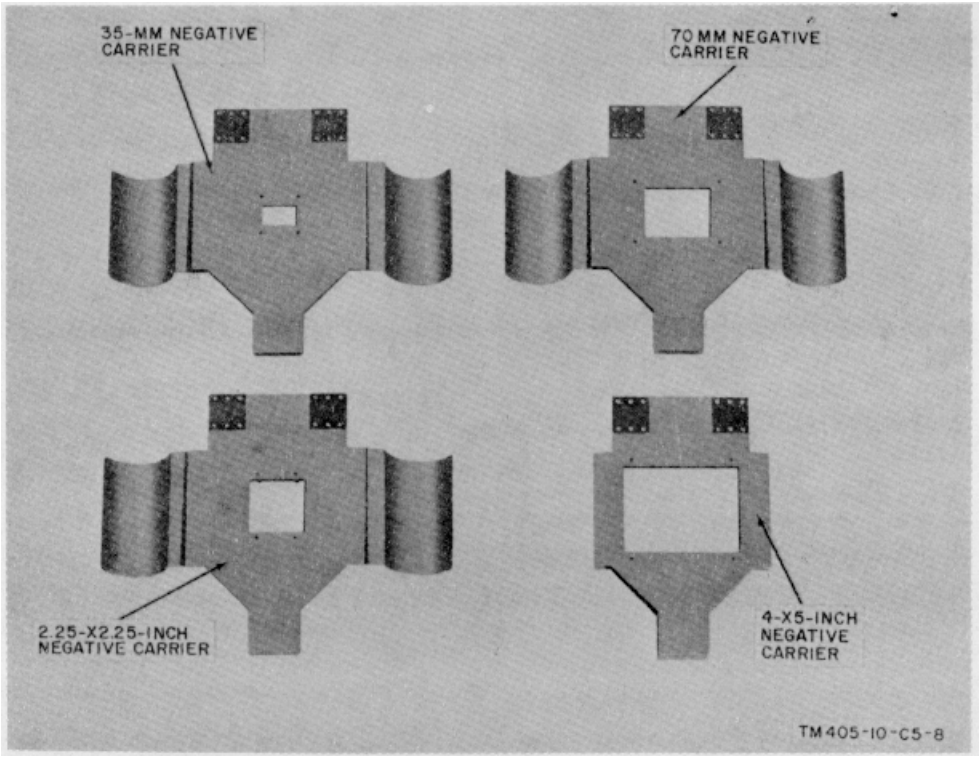


Figure 25.2. Negative carriers furnished with ES-20(3).

Page 32, paragraph 19a (page 15 of C 3). Make the following changes:

Heading. Change "and EN-91A" to EN91A and EN-91B.

Subparagraph (1). Change "and 16.1" to 16.1 and 16.2.

Subparagraph (3), line 2. Change "(fig. 2)" to (fig. 2 and 3.2).

Subparagraph (3) (c), line 2 (page 15 of C 3). Change "ES-20(2) (fig. 25.1)" to ES-20(2) (fig. 25.1) and ES-20(3) (fig. 25.2).

Page 33, paragraph 20. Add subparagraph e after subparagraph d.

e. FN-10(2) (fig. 28.1).

(1) Raise the hinged frame until it is locked in the open position by the support.

(2) Place a sheet of photographic enlarging paper, emulsion side up, on the base of the easel. Slip one edge of the photographic paper into the paper slot corresponding to the desired print size.

(3) Lower the hinged frame.

(4) With the adjusting knobs, move the masking blades until the area of photographic paper visible is equal to the desired enlargement.

(5) Position the easel on the enlarger baseboard (fig. 3.2).

Paragraph 21. Make the following changes:

Subparagraph a, heading (page 15 of C 3). Change "or EN-91A" to EN-91A or EN-91B.

Subparagraph (3). Delete entirely.

Subparagraph (4) (as changed by C 2, 26 Aug 63). Make the following changes:

Line 1. Change "(par. 17)" to (para 18).

Line 2. Change "(par. 18)" to (para 19).

Page 34, paragraph 21a. Make the following changes:

Subparagraph (7) (page 15 of C 3). Change "or 16.1" to 16.1 or 16.2.

Subparagraph (8). Delete and substitute: Turn the crank to raise or lower the enlarger carriage assembly until the size of the projected image is approximately the size of the desired print.

Page 35, paragraph 23a, heading. Change "Timer PH-29-C (fig. 17)" to Timer PH-29-C or FM-103(2) (fig. 17).

Figure 28. Add figure 28.1 after figure 28.

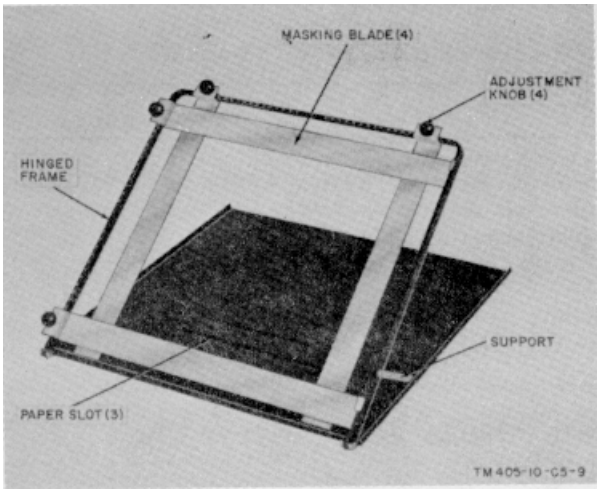


Figure 28.1. Projection Printing Easel EN-10(2).

Page 36, paragraph 24a. Make the following changes:

Heading. Change "Tank PH-526A (fig. 29)" to Tank PH-526A or FM-8(2) (fig. 29).

First sentence. Delete and substitute: To develop 4by 5-inch cut film by using Tank PH-526A or FM-8(2), proceed as follows:

Page 39, paragraph 25.1 (page 15 of C 3). Add "or PH-594A/U" to the heading.

Figure 31.1 (page 17 of C 3). Delete the caption and substitute.

Tank PH-594A/PFQ or PH-594A/U, components.

Page 40, paragraph 28, line 2 (page 18 of C 3). Change "Units ES-20(1) and ES-20(2)" to ES-20(1), ES-20(2), and ES-20(3).

Page 42 (page 18 of C 3 and as changed by C 2, 26 Aug 63).

Delete paragraphs 31 through 34 and substitute:

31. Scope of Maintenance

The maintenance duties assigned to the operator of Processing Equipment PH-406 and Photographic Film Processing Units ES-20(1), ES-20(2), and ES-20(3) are listed below with references to the paragraphs covering the specific maintenance functions.

a. Daily preventive maintenance checks and services (para 34.1.
b. Weekly preventive maintenance checks and services (para 34.2).
c. Cleaning (para 34.3).
d. Equipment performance checklist (para 35).
e. Repairs (para 36).

32. Materials Required for Maintenance

a. Cleaning compound (FSN 7930-395-9542).
b. Lens cleaner (FSN 7930-392-9751).
c. Lens tissue (FSN 6640-393-2093).
d. Textile cloth (FSN 8305-267-3015).

33. Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to insure that the equipment is serviceable.

a. Systematic Care. The procedures given in paragraphs 34.1 through 35 cover routine systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. Preventive Maintenance Checks and Services. The preventive maintenance checks and services charts (para 34.1 and 34.2) outline functions to be performed at specific intervals. These checks and services are to maintain Army electronic equipment in a combat serviceable condition; that is, in good general (physical) condition and in good operating condition. To assist operators in maintaining combat serviceability, the chart indicates what to check, how to check, and what the normal conditions are. The References column lists the illustrations, paragraphs, or manuals that contain detailed repair or replacement procedures. If the defect cannot be corrected by the operator, higher category of maintenance or repair is required. Records and reports of these checks and services must be made in accordance with the requirements set forth in TM 38-750.

34. Preventive Maintenance Checks and Services Periods

Preventive maintenance checks and services of Processing Equipment PH-406 and Photographic Film Processing Units ES-20(1), ES-20(2), and ES-20(3) are required at daily (para 34.1) and weekly (para 34.2 intervals. In addition to the routine daily checks and services, the equipment should be rechecked and serviced immediately before going on a mission and as soon as possible after completion of the mission.

(As added by C 2. 26 Aug 63), add paragraphs 34.1, 34.2, and 34.3

34.1. Daily Preventive Maintenance Checks and Services Chart

Seq No.	Item	Procedure	Reference
1	Exterior surfaces	Clean exterior surfaces of enlarger (fig. 1, 2, 3.1, and 3.2).	
2	Lenses	Check condenser and projection lenses (fig. 2, 3.1, and 3.2) for dust, dirt (para 34.3), scratches, and cracks.	
3	Condenser lens assembly.	Check condenser lens assembly (fig. 1 and 3.2) for secure engagement with knurled screws (para 17b); tighten loose knurled screws.	
4	Operation	Operate equipment according to equipment performance checklist (para 35), items 1 through 11, 13, 14, and 16 through 19.	Para 36.

34.2. Weekly Preventive Maintenance Checks and Services Chart

Seq No.	Item	Procedure
1	Cords and cables	Check power cords and power and adapter cables for cut or frayed insulation (fig. 11, 12, 13, and 13.1).
2	Carrying cases	Check carrying cases (fig. 6 through 9.4) for wear and breakage; check cover for a secure fit.
3	Minor components	Check minor components (fig. 4, 5, 5.1, and 5.2) for dirt, wear, and breakage.

34.3. Cleaning

Inspect the exteriors of the enlarger (fig. 1, 2, 3, 3.1, and 3.2), minor components (fig. 4, 5, 5.1, and 5.2), and carrying cases (fig. 6 through 9.4). The exterior surfaces should be free from dust, dirt, grease, and fungus.

a. Remove dust and loose dirt with a clean, soft cloth.

Warning: Cleaning compound is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

b. Remove grease, fungus, and ground-in dirt from the cases; use a cloth dampened (not wet) with cleaning compound.

c. Clean lenses with lens tissue. If necessary, dampen lens tissue with lens cleaner; wipe lens dry with clean lens tissue.

Page 44 (as deleted by C 2, 26 Aug 63).
Delete figure 32.

Page 45 (as deleted by C 2, 26 Aug 63).
Delete figure 33.

Page 46, paragraph 35b, chart, "Corrective measures" column.

(As changed by C 2, 26 Aug 63), make the following changes: Item No. 2, last line. Change "(and 13)" to 13 and 13.1.

Item No. 4a, last line. Change "(and 13)" to (13 and 13.1).

Item No. 5, second line. Change "(and PH-639(*)/TF)" to PH-639(")/TF, EN-91A, and EN-91B.

Item No. 7a. Delete "(par. 33b)." Item No. 9, second line. Delete "(par. 34b)."

Item No. 10, second line. Change "(par. 33b)" to (para 34.3).

Page 47, paragraph 35b, chart, "Action or condition" column.

Item No. 15 (as changed by C 2, 26 Aug 63). Change "par. 26b(2)-(9))" to (para 27b(2) through (9)).

Page 49, paragraph 36b(2) (page 18 of C 3).

Make the following changes: Heading. Change "(EN-16(1))" to EN16(1) or EN-91B.

Subparagraph (a). Change "(fig. 3)" to (fig. 3) EN-16(1) and (fig. 3.2) EN-91B.

Page 50, paragraph 37. Make the following changes: Subparagraph c (as changed by C 2, 26 Aug 63).

Change "(par. 33)" to (para 34.3).

Subparagraph g. Add the following after subparagraph g: h. For the EN-91B, proceed as follows:

(1) Remove the filter wheel or horizontal projection attachment, whichever is in position on the printer.

(2) Remove the lens board assembly and negative-carrier from the printer.
(3) Remove the column assembly from the baseboard.
(4) Place the components in their respective carrying cases (fig. 9.3 and 9.4).

Page 51, appendix I (page 19 of C 3 and as changed by C 2, 26 Aug 63). Delete and substitute:

APPENDIX I

REFERENCES

Following is a list of applicable references which are available to the operator of the processing set:

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	U. S. Army Equipment Index of Modification Work Orders.
TM 11-401	Elements of Signal Photography.
TM 11-405-25	Organizational, DS, GS, and Depot Maintenance Manual: Processing Equipment PH-406 and Photographic Film Processing Units ES-20(1) and ES-20 (2).
TM 11-487F	Directory of U. S. Army Signal Equipments: Pictorial Equipment.
TM 11-2339	Printers PH-129 and PH-129-A, Photographic Enlargers.
TM 11-2339A	Printers PH-129-B, PH-639/TF, and PH-639A/TF and Photographic Projection Printers EN-7(1), EN-18(1), and EN-18A1.
TM 11-2339B	Photographic Projection Printer EN-16(1).
TM 38-750	Army Equipment Record Procedures.

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

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WRAMC (1)
AA-AE) Army Pic Cen (2)
AV Spt Cen (5)
Instl (2) except
Fort Gordon (10)
Fort Huachuca (10)
WSMR (5)
Fort Carson (25)
Fort Knox (12)
Army Dep (2) except
LBAD (14)
SAAD (30)
TOAD (14)
LEAD (7)
SHAD (3)
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5-101	11-117
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5-115	11-155
5-116	11-157
5-195	11-158
5-196	11-500(AA-AC)
5-215	11-587
5-216	11-592
5-402	11-597
5-500 (AA-AE)	19-500
8-650	30-17
11-5	30-18
11-6	30-25
11-38	30-28
11-56	30-500(AA-AE)
11-57	57
11-95	67

NG: State AG (3): units-same as active Army except allowance is one (1) copy per unit.
USAR: None.
For explanation of abbreviations used, see AR 320-50.

Changes in force: C 3, C 4, C5, and C 6

TM 11-405-10
C6

Change

No. 6

HEADQUARTERS,
DEPARTMENT OF THE ARMY
Washington. D.C. 28 December 1973

PROCESSING EQUIPMENT PH-406 AND PHOTOGRAPHIC FILM PROCESSING UNITS ES-20(1), ES-20(2), AND ES-20(3)

TM 11-405-10, 28 May 1958. is changed as follows:

Page 3, paragraph 1.1. Delete paragraph 1.1 and substitute:

1.1. Indexes of Publications

a. DA Pam, 310-4. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes. or additional publications pertaining to the equipment.

b. DA Pam310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

Paragraph 2. Delete paragraph 2 and substitute:

2. Maintenance Forms and Records

Maintenance forms. records. and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

Paragraph 2.1 added as follows:

2.1. Reporting of Errors

The reporting of errors. omissions. and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028, Recommended Changes to Publications, and forwarded direct to Commander, US Army Electronics Command, ATTN: AMSEL-MA-S, Fort Monmouth, NJ 07703.

Page 12. After paragraph 6 add:

6.1. Items Comprising an Operable Equipment

FSN	QTY	Nomenclature. part No . and mfr code	Usable on code
		NOTE Number 1 refers to PH-406; number 2 refers to ES-20(1); and number3 refers to ES-20(2).	
		NOTE The part number is followed by the applicable 5-digit Federal supply code for manufacturers (FSCM) identified in SB 70842 and used to identify manufacturer, distributor, or Government agency. etc.	
6150-908-9125	1	Cable Assembly, Power. Electrical: 235-001: 54880	1, 2., 3
6740-191-6936	1	Cable Assembly, Power, Electrical: 235-036; 54880	
6740-823-9815	1	Easel. Photographic Paper: FN-10; MIL-H-13216A	3
6760-959-4561	1	Filger Set, Light: plastic filter varigam paper; 82348	3
6740-752-7678	1	Graduate PH-11	1, 2, 3
6740-408-5005	1	Holder, Photographic Paper FN-9(1) Board PH-317	1, 2
6760-498-9918	1	Paddle. Printphotographic PH-80	1. 2, 3

FSN	QTY	Nomenclature. part No . and mfr code	Usable on code
6740-251-8028	12	Plate. Ferrotype, Photographic PH-152A	1, 2, 3
6740-243-2921	1	Printer. Projection PH-637/TF; PH-637A/TF; Printer PH-129A	1
6740-2004351	1	Printer. Projection, Photographic EN-16(1)	2
6740-926-5220	1	Printer. Projection. Photographic EN-91A; 54880, D2VXL	3
6640-408-5676	1	Rod Stirring PH-230	1, 2, 3
6740-247-1730	1	Safelight. Darkroom Photographic FM-173A; GG-S-86b;	1, 2, 3
Type 1 style 2			
6740-224-9612	1	Siphon. Photographic Tray Automatic PH-244, PH-244A	1, 2, 3
7920-205-2002	1	Squeegee PH-248	3
7920-222-2617	1	Squeegee PH-348	1, 2
5930-240-3599	1	Switch Foot PH-424	1, 2, 3
6740-243-2854	1	Tank. Processing Photographic FM-12(1) Tank Developing	1,2
PH-186			
6740-224-9562	1	Tank. Processing Photographic FM-8(1) Tank PH-256A	1, 2, 3
6740-926-5214	1	Tank Processing Photographic PH-594A/PFQ: 89644; Quick fill	3
6760-521-0656	1	Thermometer, Self-Indication Bimetallic PH-660/U	1, 2, 3
6645-223-8018	1	Timer. Interval FN-5(1). Timer Interval PH-426. PH-426A, B. C	1, 2,3
6645-243-9470	1	Timer, Stop FM-103(1): 19139: Kodak timer	1, 2, 3
6740-963-4880	2	Tongs, Photographic Print PH-373A: 316SS; 13693	1, 2, 3
6740-243-2943	3	Tray PH-161A	1, 2
6740-243-2942	1	Tray PH-164A	1
6740-543-4050	1	Tray. Processing Photographic PH-161A: 1620; 13693	3
6740-926-5221	3	Tray, Processing Photographic: type 1 size 2; RR-7-646A; 81342	3
6750-243-2944	1	Tray PH-166A	2

Page ,52, appendix II. Delete appendix II and substitute:

APPENDIX II
BASIC ISSUE ITEMS LIST (BIIL) AND ITEMS TROOP INSTALLED OR AUTHORIZED LIST (ITIAL)

Section I. INTRODUCTION

1. Scope

This appendix lists only basic issue items required by the crew/operator for installation, operation, and maintenance of Processing Equipment PH-406 and Photographic Film Processing Units ES-20(1), ES-20(2), and ES-20(3).

2. General

This Basic Issue Items and Items Troop Installed or Authorized List is divided into the following sections:

a. Basic Issue Items List Section II. A list, in alphabetical sequence, of items which are furnished with, and which must be turned in with the end item.

b. Items Troop Installed or Authorized List--Section III. Not applicable.

3. Explanation of Columns

The following provides an explanation of columns found in the tabular listings:

a. Illustration. Not applicable.

b. Federal Stock Number. Indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Part Number. Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or government activity), which

controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements, to identify an item or range of items.

d. Federal Supply Code for Manufacturer (FSCM) The FSCM is a 5-digit numeric code used to identify the manufacturer, distributor, or Government agency, etc., and is identified in SB 70842.

e. Description. Indicates the Federal item name and a minimum description required to identify the item.

f: Unit of Measure (U/M). Indicates the standard of basic quantity of the listed item as used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation, (e.g., ea, in., pr, etc.). When the unit of measure differs from the unit of issue, the lowest unit of issue that will satisfy the required units of measure will be requisitioned.

g. Quantity Furnished with Equipment (Basic Issue Items Only). Indicates the quantity of the basic issue item furnished with the equipment.

4. Special Information.

Usable on codes are included in Column 5. Uncoded items are applicable to all models. Identification of the usable on codes are as follows:

Code	Used on
1	PH-406
2	ES-20(1)
3	ES-20(2)

Section II. BASIC ISSUE ITEMS LIST

(1) ILLUSTRATION (A) FIG.	(B) ITEM	(2) FEDERAL STOCK NUMBER	(3) PART NUMBER	(4) FSCM	(5) DESCRIPTION USUABLE ON CODE	(6) UNIT OF MEAS	(7) QUANTITY FURN WITH EQUIP
		6740-408-5159	235-038	54880	CARRYING CASE, PHOTO GRAPHIC EQUIPMENT 1	EA	1
		6760-597-5249	434	20365	CARRYING CASE. PHOTO GRAPHIC EQUIPMENT 2	EA	1
		6760-597-5250	436	20365	CARRYING CASE, PHOTO GRAPHIC EQUIPMENT 2	EA	1
		6760-597-5355	435	20365	CARRYING CASE, PHOTO GRAPHIC EQUIPMENT 2	EA	1
		6760-250-9185	235-039	54880	CARRYING CASE, PHOTO GRAPHIC EQUIPMENT 1	EA	1
		6760-408-5160	235-037	54880	CARRYING CASE. PHOTO GRAPHIC EQUIPMENT 1	EA	1
		6760-963-4088	9412-0003	54880	CASE, PHOTOGRAPHIC EQUIPMENT 3	EA	1
		6760-963-4092	9-412-0002	54880	CASE, PHOTOGRAPHIC EQUIPMENT 3	EA	1

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army,
Chief of Staff.

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USAARENBD(10)	ATS(1)	5-112	11-117
UISAMB(1)	Instl (2)except	5-115	11-127
AMC (1)	Fort Gordon (10i	5-116	11-1,58
TRADOC (2)	Fort Huachuca (10)	5-195	11-500 (AA-AC)
ARADCOM (2)	WSMR (1)	5-196	19-500
ARADCOM Rgn (2)	Fort Carson (5)	5-215	30-17
OS Maj Comd (4)	Ft Richardson (ECOM Ofc) (2)	5-216	30-18
LOGCOMDS (31	Army Dep (2) except	5-402	30-25
MICOM (2)	LBAD (14)	5-500	30-500
TECOM (2t	SAAD (30i	8-650	57
tUSACC(4)	TOAD(14)	11-38	67
MDW (1)	ATAD (10)		
Armies (2)	USA Dep (2)		
Corps (2)	Sig Sec USA Dep (2)		
HISA (ECOM) (211	Sig Dep (2)		
SvCollege (1)	Sig FLDMS (1		
AV Comm Cen (1)	USAERDAW (1)		
USASESS (5)	USAERDAA (1)		
USAADS (2)	MAAG (1		
USAFAS (2)	USARMIS (1)		

NG: State AG (3):
USAR: None
For explanation of abbreviations used, see AR 310-50.

TECHNICAL MANUAL
No. 11-405-10

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 28 May 1958

PROCESSING EQUIPMENT PH-406 AND PHOTOGRAPHIC FILM PROCESSING UNIT ES-20(1)

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* This manual supersedes so much of TM 11-405, 14 August 1951, including C 1, 25 January 1954 and C 2, 23 August 1955, as pertains to operator's instructions.

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CHAPTER 1

INTRODUCTION

Section I. GENERAL.

1. Scope

a. This manual contains information on the installation, operation, and operator's maintenance of Processing Equipment PH-406 and Photographic Processing Unit ES-20(1).

b. Two appendixes are included in this manual:
Appendix I, References.
Appendix II, Repair Parts and Special Tool Lists.

c. The Maintenance Allocation Chart is located in appendix II of TM 11-405-25.

d. Official nomenclature followed by (*) is used to indicate all models of the equipment covered in this manual. Thus, Printer PH-129(*) represents Printers PH-129, PH-129-A, and PH-129-B; Printer PH-639 (*)/TF represents Printer PH-639/TF and PH-639A/TF; and Interval Timer PH-426-(*) represents Interval Timers PH-426, PH-426-A, and PH-426-C.

e. Forward all comments on this publication direct to Commanding Officer, U. S. Army Signal Publications Agency, Fort Monmouth, N. J.

2. Forms and Records

a. Unsatisfactory Equipment Reports.

(1) Fill out and forward DA Form 468 (Unsatisfactory Equipment Report) to Commanding Officer, U. S. Army Signal Equipment Support Agency, Fort Monmouth, N. J., as prescribed in AR 700-38.

(2) Fill out and forward AFTO Form 29 (Unsatisfactory Report) to Commander, Air Materiel Command, Wright-Patterson Air Force Base, Ohio, as prescribed in AF TO OO0 35D-54.

b. Damaged or Improper Shipment. Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700-58 (Army) and AFR 71-4 (Air Force).

c. Preventive Maintenance Form. Prepare DA Form 11-256 (figs. 32 and 33) (Maintenance Check List for Signal Equipment (Photographic Developer, Projector, Dryer, Contact and Projection Printer)) in accordance with the instructions on page 1 of the form.

Section II. DESCRIPTION AND DATA 3.

3. Purpose and Use

Processing Equipment PH-406 an Photographic Film Processing Unit ES-20(1) are used in processing exposed still-camera film and in producing and processing projection prints from processed film. Either system processes cut film (up to 4 by 5 inches) and roll film (35 millimeter). The equipment is portable and is intended primarily for field use.

4. Technical Characteristics

a. Major Components.

Printer PH-129-(*), Printer PH-639(*)/TF, or Photographic Projective Printer EN-16(1):

Type	Projection.
Negative size	35-mm film and cut film up to 4 x 5 inches.
Enlargements:	
35-mm negatives	16 diameters maximum.
4- by 5-inch negatives	4 diameters maximum.

Voltage Requirements:	
PH-129; PH-129-B or EN-16(1)	105- to 120-volt dc or 60-cycle ac.
PH-129-A and PH-639(*) /TF	105- to 120-volt ac or 6- to 8volt dc.
Condenser lens sets	3 1/2-inch diameter set.
	61-inch diameter set.
Projection lens sets:	
PH-639A/TF or EN-16(1)	2-inch focal length.
	5 3/8-inch focal length.
PH-129-(*) or PH-3-639/TF	2-inch focal length.
	5 1/2-inch focal length.
Projection lens openings:	
PH-129-(*) or PH-639(*) /TF	F/4.5 through f/32.
EN-16(1) F/4.5 through f/22.	
Holders PH349 and PH-349-A	Holds enlarging paper up to 11 by 14 inches in size, with adjustments for margins up to 3 inches in width.
Boards PH-317 and PH-317-A	Holds enlarging paper up to 8 by 10 inches in size, with adjustments for margins up to % inch in width.
Projection Printing Easel FN-10(1)	Holds enlarging paper up to 11 by 14 inches in size, with adjustments for margins up to % inch in width.
Dustless negative carrier:	
PH-129-(*) or PH-639(*) /TF	3 5/8- by 4 5/8-inch aperture.
EN-16(1) 4- by 5-inch aperture	4- by 5-inch aperture
Glass negative carrier	4- by 5-inch aperture.
Rapid-shift negative carrier	1- by 1 1/2-inch aperture (for 35-mm film).
b. Minor Components.	
Timer PH-29-C and Stop Timer FM-103(1):	
Power Source	Spring motor.
Time range	1 second to 60 minutes.
Timer PH-42-C:	
Voltage requirement-	105- to 120-volt ac.
Time range	1 second to 55 seconds.
Timer PH-426, PH-426-A or Interval Timer FN-5 (1):	
Voltage requirements _	105- to 120-volt ac.
Time range	1second to 60 seconds.
Foot Switch PH-424:	
Type	Foot pressure actuated
Voltage requirement	6- to 8-volt dc or 105- to 120-volt dc.
Lamp PH-422A:	
Voltage requirement	10- to 120-volt ac or dc or 6- to 8volt dc.
Type	Safelight.
Filters	Three light filters; green-yellow, red, and dark-green.
Tank PH-186 or Photographic Processing Tank FM-12(1):	
Type	Daylight-developing tank.
Film type	35-mm roll-film.
Film capacity	66 inches.
Tank PH-256-A or Photographic Processing Tank FM-8(1):	
Type	Daylight-developing tank.
Film type	Cut-film up to 4 by 5 inches.
Film capacity	12 negatives.
Thermometer PH-660/U	Bimetallic, self-indicating; 0°' to +140' F.

5. Components

The components of Processing Equipment PH-406 and Photographic Film Processing Unit ES-20(1) are listed in a below. The major components of Printer PH-129-(8), Printer PH-639 (*)/TF, and Photographic Projection Printer EN-16(1) are listed in b below. The asterisk indicates the equipment with which the particular component is supplied.

AGO 5894A

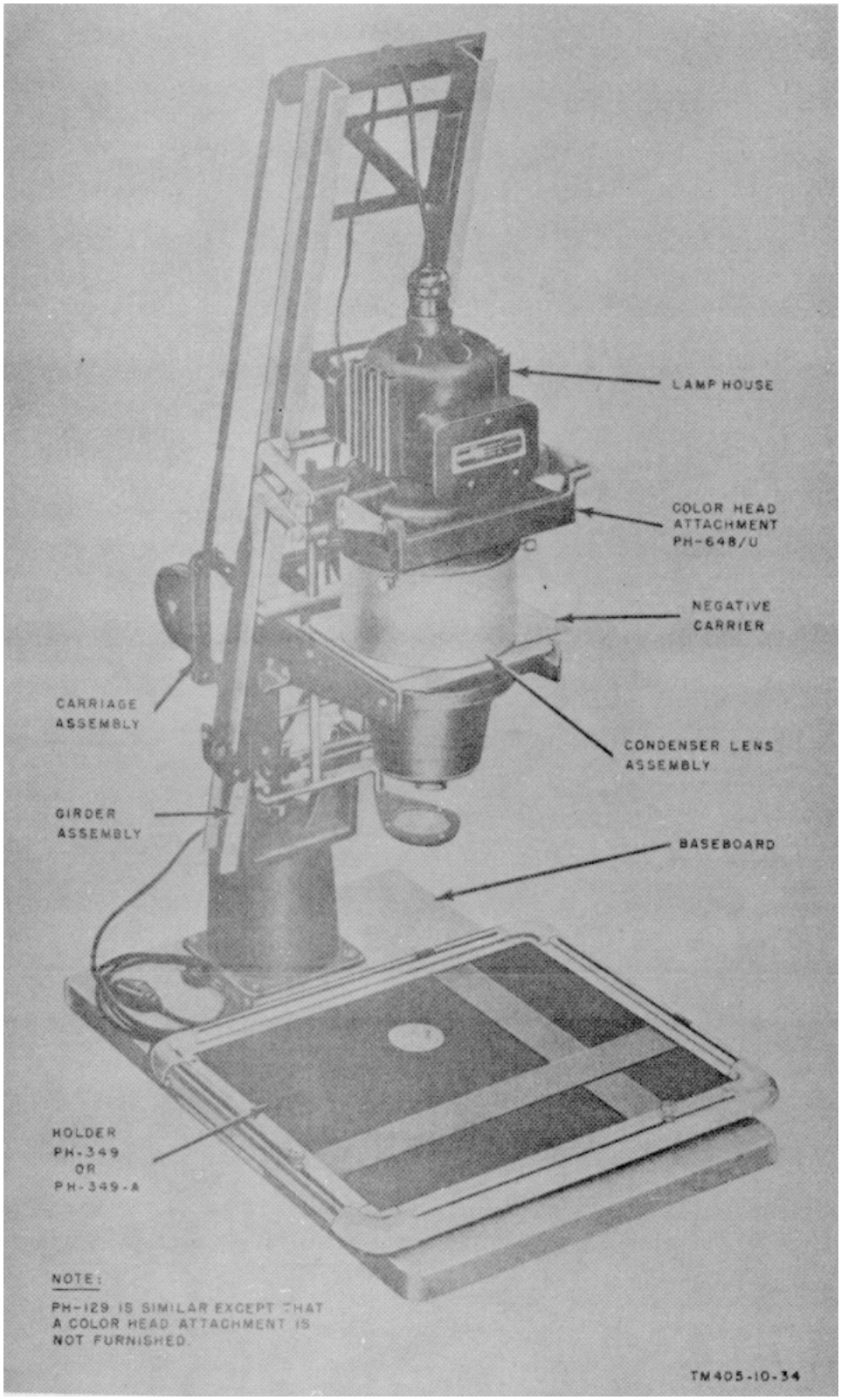


Figure 1. Printer PH-129-B

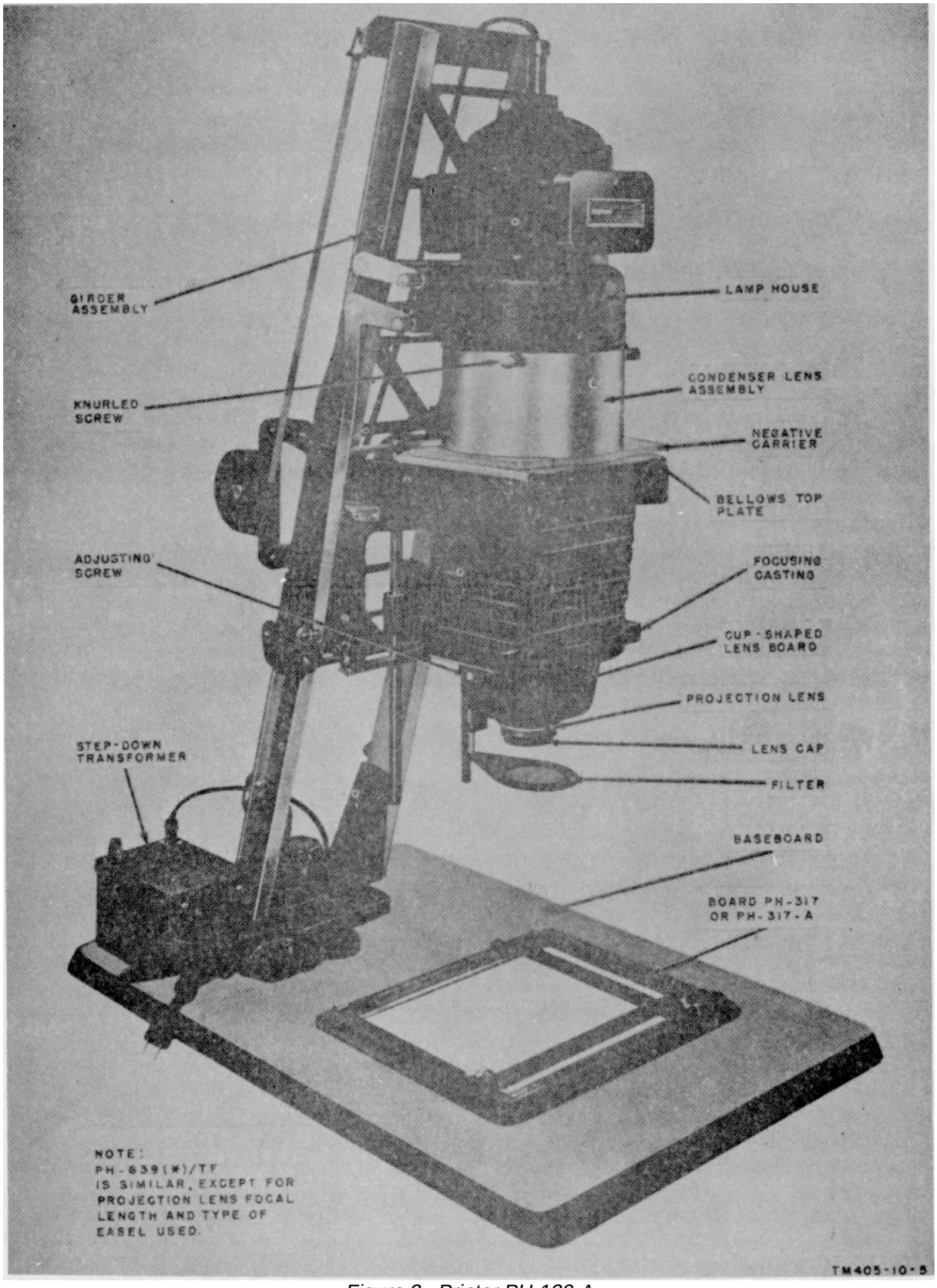


Figure 2. Printer PH-129-A

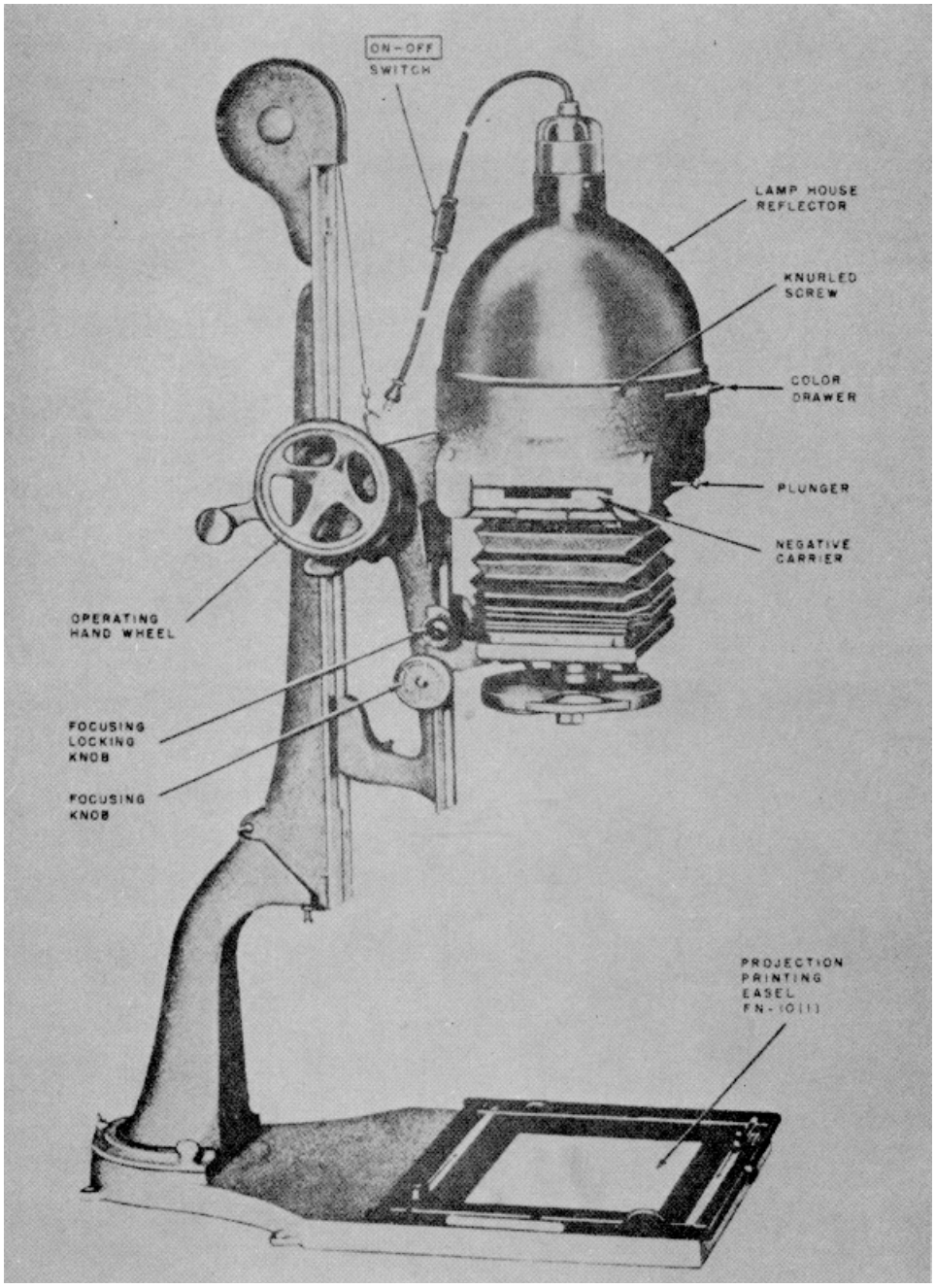
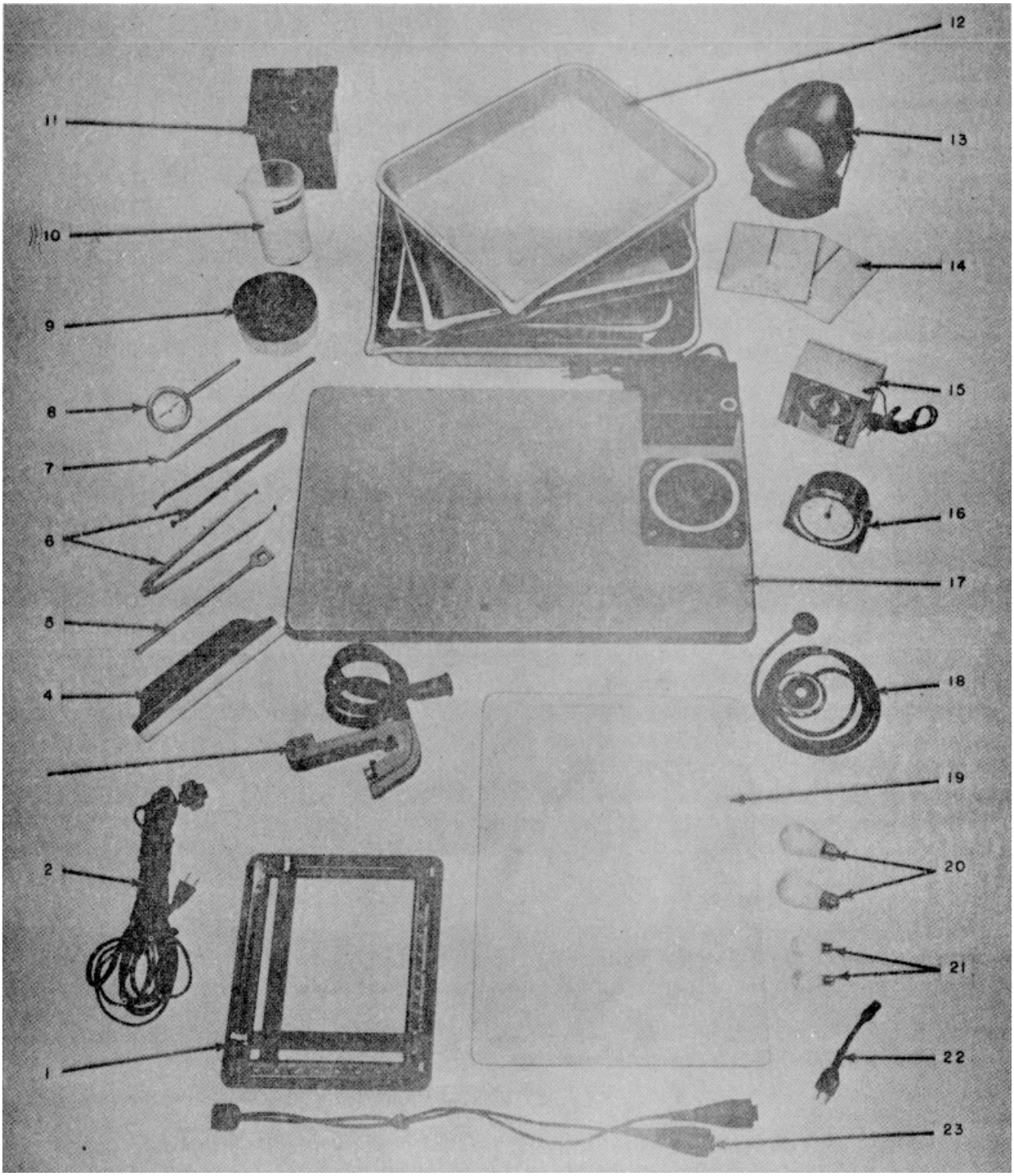


Figure 3. Photographic Projection Printer EN-16(1).



TM405-10-29

Figure 4. Minor components of Processing Set PH-406.

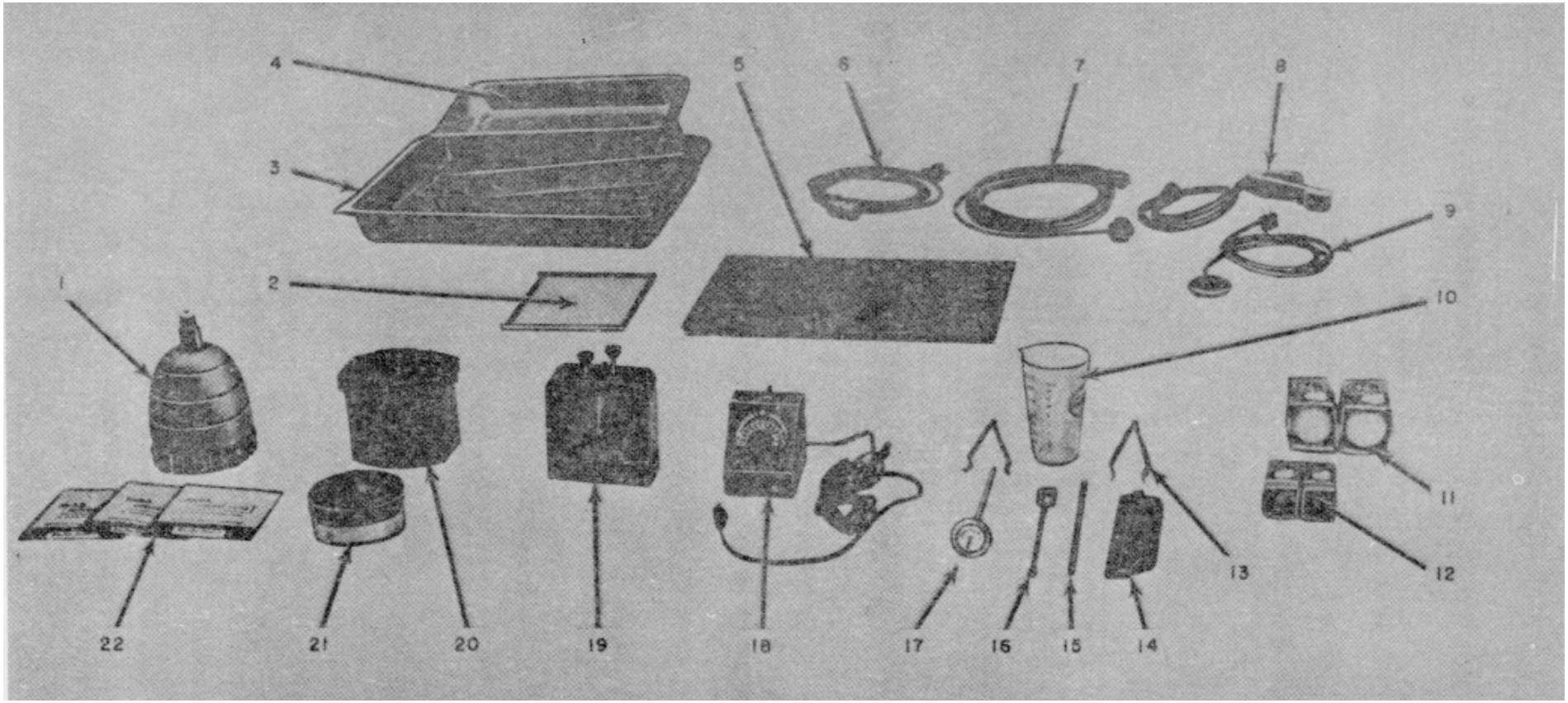
AGO 5894A

1	Board PH-317, Board PH-317-A, Holder PH-349, or Holder PH-349-A	12	Trays (Trays PH-161-A and PH-164-A)
2	Power cable (25-foot)	13	Lamp PH-422-A
3	Siphon PH-244 or Siphon PH-244-A	14	Light filters
4	Squeegee PH-348	15	Timer PH-426-(*) or Interval Timer FN-5 (1)
5	Print paddle	16	Timer PH-29-C
6	Tongs PH-373-A	17	Baseboard (supplied with PH-i29-(*) o; PH-639 (*)/TF)
7	Rod PH-230	18	Foot Switch PH-424
8	Thermometer PH-660/U	19	Plates PH-152-A
9	Tank PH-186 or Photographic Processing Tank FM-12 (1)	20	Spare lamps (115-volt)
10	Graduate PH-11	21	Spare lamps (6-volt)
11	Tank PH-256-A	22	Adapter cable
		23	Battery cable assembly

Figure 4-Continued.

a. Components of PH-406 and ES-20 (1).

PH-406	ES-20(1)	Fig. No.	Quan-Tity	Item	Dimensions (in.)	Weight (lb.)
(*)		1, 2	1	Printer PH-129-(*) or Printer PH-639(*) /TF	18 x 26 x 48	80
				(see b below)	18 x 27 x 51	80
(*)		4	1	Adapter cable	4	6 oz
(*)		4	1	Battery cable assembly	15 lg	14 oz
(*)		6	1	Carrying case No. 1	13 ½ x 20 x 38	41
(*)		7	1	Carrying case No. 2	13 ½ x 30 x 21	48 ½
(*)		6	1	Carrying case No. 3	9 ½ x 12 x 21	13
(*)		4	1	Tank PH-256-A	5 ½ x 6 x 7	¾
(*)		4	1	Timer PH-29-C	2 ¼ x 5 x 5 ½	1 ¼
(*)		4	1	Tray PH-164-A	2 ½ x 14 x 17	4 ½
	(*)	3	1	Photographic Projection Printer EN-16(1) (see b below).	17 x 28 7/8 x 52	63
	(*)	8	1	Carrying case No. 1	13 ½ x 20 x 38	60
	(*)	9	1	Carrying case No. 2-	13 ½ x 20 x 38	60
	(*)	8	1	Carrying case No. 3	11 1/8 x 11% x 16	2
	(*)	5	1	Photographic Processing Tank FM-8 (1)	65 ½ x 6 x 7	¾
	(*)	5	1	Stop Timer FM-103(1)		
	(*)	5	1	Tray PH-166-A	¾ x 19 ¾ x 24	61/2
(*)	(*)	4, 5	1	Foot Switch PH-424	¾ x 3 dia	12 ¾ oz
(*)	(*)	4, 5	1	Graduate PH-11	3 7/8 x dia x 6	1
(*)	(*)	4, 5	1	Interval Timer FN-5(1) or Timer PH-426-(*)	3 x 5 x 5	2 ½
(*)	(*)	4, 5	1	Lamp PH-422-A including:		
		4, 5	1	Light filter, Wratten OA (green-yellow)	3/16 x 5 ½ dia	4 oz
		4, 5	1	Light filter, Wratten No. 2 (red)	3/16 x 5 ½ dia	4 oz
		4, 5	1	Light filter, Wratten No. 3 (dark-green)	3/16 x 5 ½ dia	4 oz
		5	1	Power cable assembly	10 ft	¾
		4, 5	1	Incandescent lamp, 10-watt, 115-volt	¾ x 2 dia	1 oz
		4, 5	1	Incandescent lamp, 10-watt, 6-volt	¾ x dia	1 oz
(*)	(*)	4, 5	12	Plate PH-152-A	14 x 20	1 ¾
(*)	(*)	4, 5	1	Power cable	25 ft	1 ½
(*)	(*)	4, 5	1	Print Paddle	1 ½ x 13	3/8 oz
(*)	(*)	4, 5	1	Rod PH-230	¾ dia x 10	1 oz
(*)	(*)	4, 5	1	Siphon PH-244 or Siphon PH-244-A	1 ¼ x 5 x 7	¾
(*)	(*)	4, 5	1	Squeegee PH-348	1 x 2 ¾ x 10	½
(*)	(*)	4, 5	1	Tank PH-186 or Photographic Processing Tank FM-12(1).	3 ¼ x 5 ¼ dia	1 ¼
(*)	(*)	4, 5	1	Thermometer PH-660/U	1 ¾ dia x 6	4 oz
(*)	(*)	4, 5	2	Tongs PH-373-A	¾ x 2 ¼ x 9 ½	¾ oz
(*)	(*)	4, 5	3	Tray PH-161-A	2 ½ 11 x 14	3
(*)	(*)	4, 5	1	Set of spare parts consisting of:		
		4, 5	2	Lamp, 10-watt, 115-volt	¾ x 2 dia	1 oz
		4, 5	2	Lamp, 10-watt, 6-volt	¾ x 2 dia	1 oz



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1 Lamp PH-422-A
2 Photographic Paper Holder FN-9(1)
3 Tray PH-166-A
4 Trays PH-161-A
5 Plates PH-152-A
6 Power cable (10-foot)
7 Power cable (25-foot)
8 Siphon PH-244 or Siphon PH-244-A
9 Foot Switch PH-424
10 Graduate PH-11
11 Spare lamps (115-volt)
12 Spare lamps (6-volt)
13 Tongs PH-373-A
14 Squeegee PH-348
15 Rod PH-230
16 Print paddle
17 Thermometer PH-660/U
18 Interval Timer FN-5 (1)
19 Stop Timer FM-103(1)
20 Photographic Processing Tank FM-8(1)
21 Tank PH-186 or Photographic Processing Tank FM-12(1)
22 Light filters

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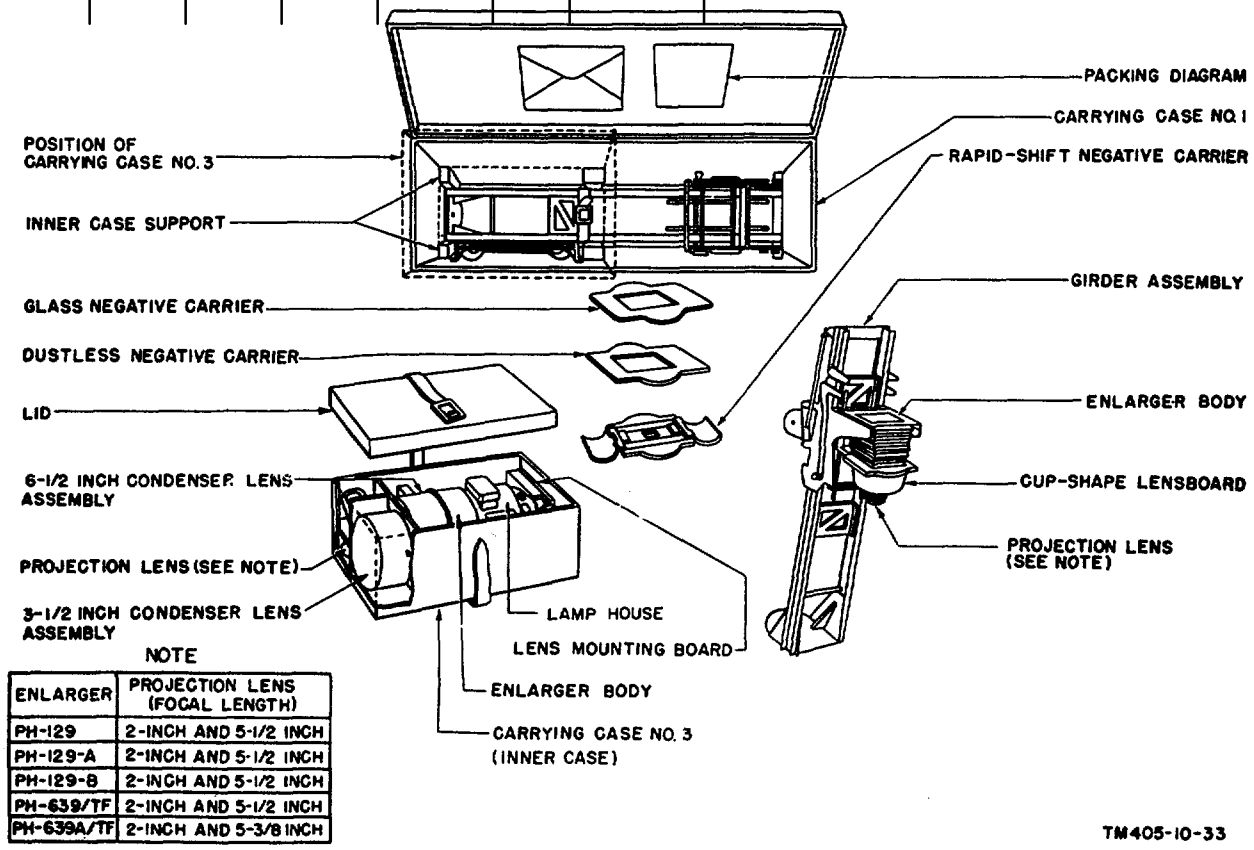
Figure 5. Minor components of photographic Film Processing Unit ES-20(1).

b. Components of PH-129-(*), PH-639(*) /TF, and EN-16(1). The major components of the PH-129-(*), the PH-639(*)/TF, and the EN-16(1) are listed in the chart below. For detailed component information refer to the applicable technical manual listed in appendix I.

PH-129	PH-129-A	PH-129B	PH-639/TF	PH-639A/TF	EN-16(1)	Quantity	Item
(*)	(*)	(*)	(*)	(*)	(*)	1	Condenser lens assembly, 3 ½ -inch.
(*)	(*)	(*)	(*)	(*)	(*)	1	Condenser lens assembly, 6 ½ -inch.
(*)	(*)	(*)	(*)	(*)	(*)	1	Projection lens, 2-inch.
				(*)	(*)	1	Projection lens, 5 3/8 -inch.
(*)	(*)	(*)	(*)			1	Projection lens, 5 ½ -inch.
(*)	(*)	(*)	(*)	(*)	(*)	1	Dustless negative carrier.
(*)	(*)	(*)	(*)	(*)	(*)	1	Glass negative carrier.
(*)	(*)	(*)	(*)	(*)	(*)	1	Rapid-shift negative carrier.
(*)		(*)				1	Holder PH-349 or PH-349-A.
	(*)		(*)	(*)		1	Board PH-317 or PH-317-A.
					(*)	1	Projection Printing Easel FN-10(1).
					(*)	1	Photographic Paper Holder FN-9(1).
		(*)				1	Color Head Attachment PH-648/U.
	(*)		(*)	(*)		3	Incandescent lamp, 6-volt, 28-watt.
(*)		(*)				3	Incandescent lamp, 116-volt, 76-watt.
					(*)	4	Incandescent lamp, 115-volt, 7S-watt.



NOTE

ENLARGER	PROJECTION LENS (FOCAL LENGTH)
PH-129	2-INCH AND 5-1/2 INCH
PH-129-A	2-INCH AND 5-1/2 INCH
PH-129-B	2-INCH AND 5-1/2 INCH
PH-639/TF	2-INCH AND 5-1/2 INCH
PH-639A/TF	2-INCH AND 5-3/8 INCH

Figure 6. Components of PH-406 packed in carrying case No. 1.

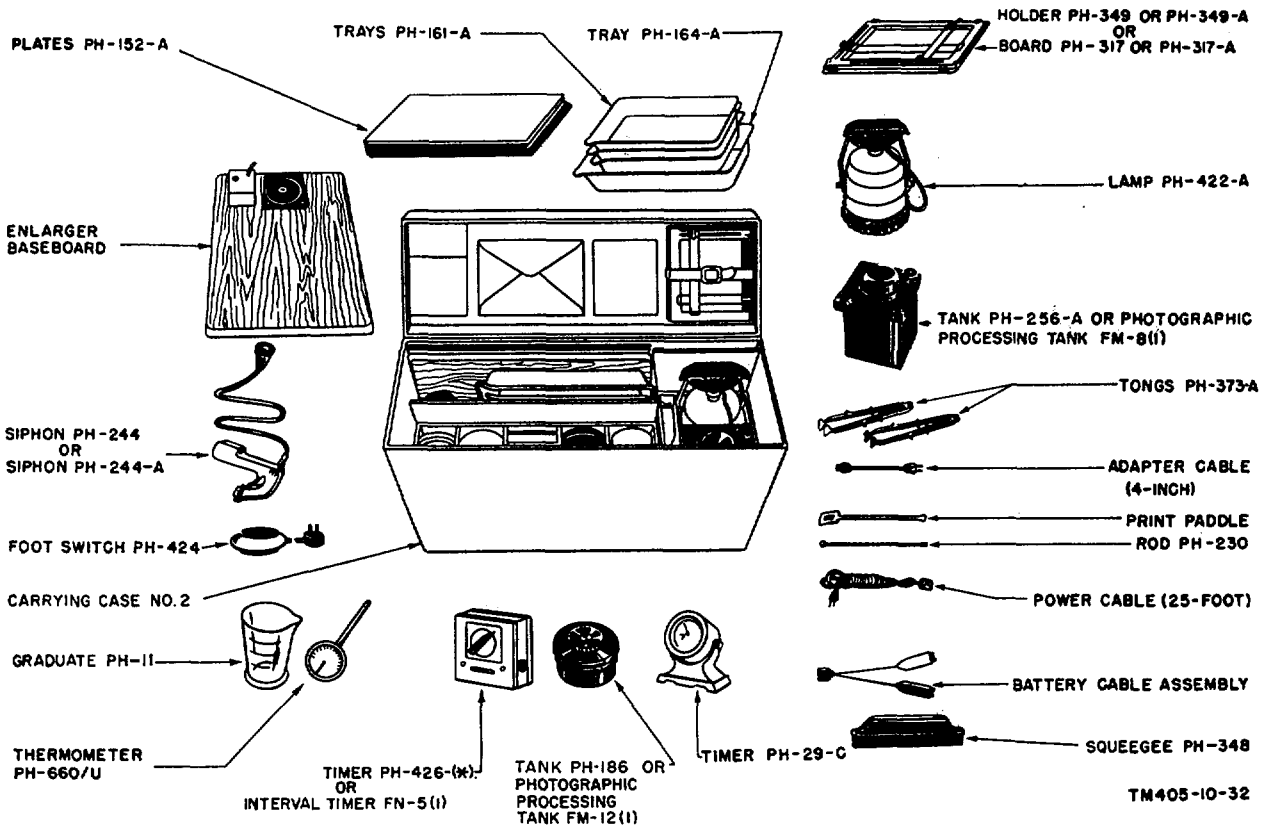


Figure 7. Components of PH-406 packed in carrying case No. 2.

6. Common Names

Nomenclature	Common name
Processing Equipment PH-406 or Photographic Film Processing Unit ES-20 (1).	Processing set
Printers PH-129, PH-129A, PH-129-B, PH-639/TF, or PH-639A/TF, and Photographic Projection Printer EN-16(1).	Enlarger
Siphons PH-244 or PH-244-A	Siphon
Plate PH-152-A	Ferrotype plate
Foot Switch PH-424	Foot switch
Tank PH-186 or Photographic Processing Tank FM-12(1)	Roll-film tank
Tank PH-256-A or Photographic Processing Tank FM-8(1)	Cut-film tank
Timer PH-29-C or Stop Timer FM-103(1)	Continuous timer
Interval Timer FN-5(1), Timers PH-426, PH-426-A, or PH-426-C	Interval timer
Projection Printing Easel FN-10(1), Board PH-317 or PH-317-A, and Holder PH-349 or PH-349-A.	Easel
Thermometer PH-660U	Thermometer
Trays PH-373-A, PH-161-A, PH-164-A, or PH-166-A	Tray

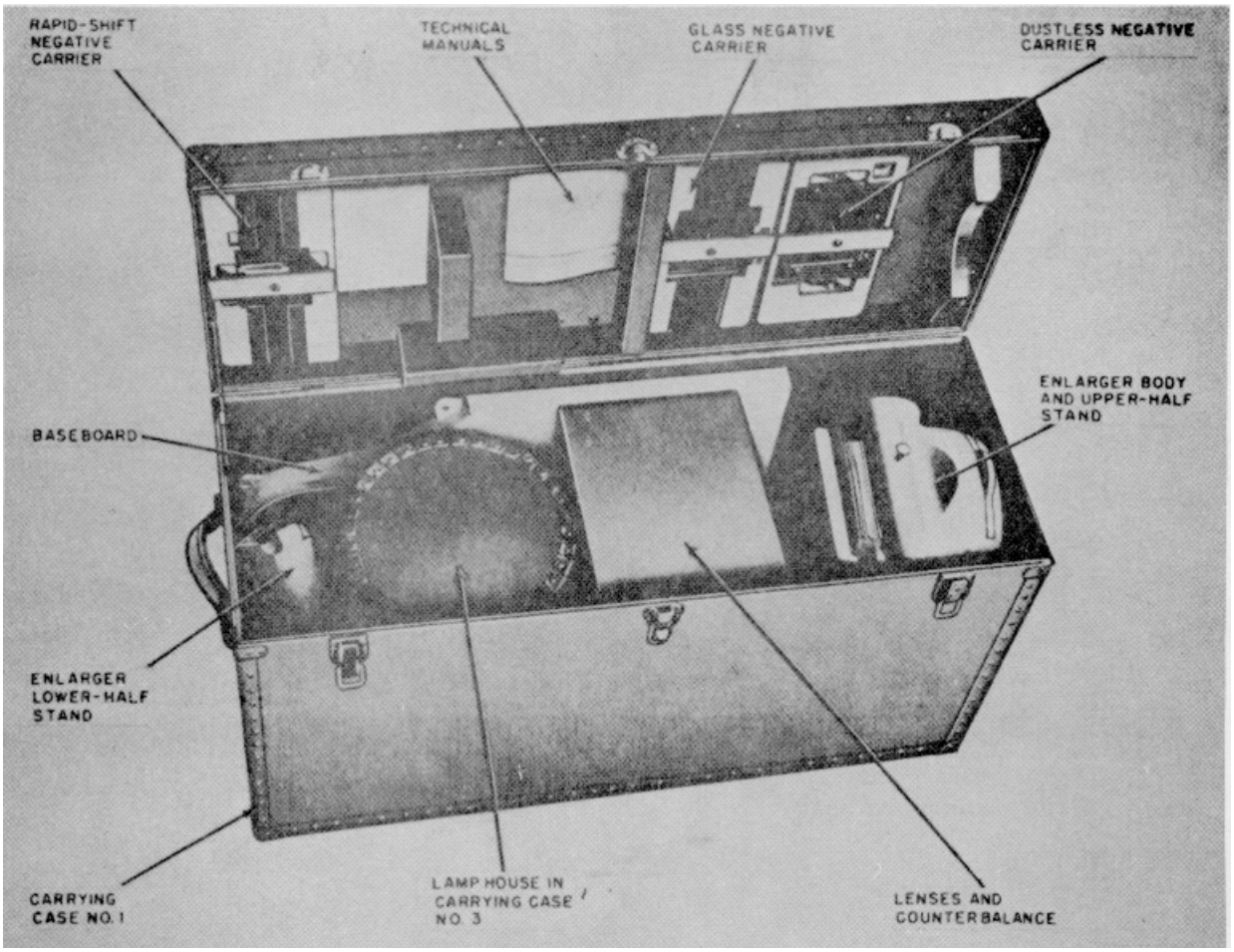


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Figure 8. Components of ES-20(1) packed in carrying case No. 1

7. Description of Processing Set

The processing set consists of an enlarger (a below) and the minor components (b below) required for processing film.

a. Enlarger (figs. 1, 2, and 3). The enlarger is a projection-type printer consisting of an upright support assembly (or girder assembly), a lamp house, two condenser lens sets, two projection lenses, an easel and associated items.

b. Minor Components (figs. 4 and 5). The minor components of the processing set consist of tanks (cut-film and roll-film), timers (continuous and interval timers), a safelight, a thermometer, and associated components (par. 5a) required for processing film.

8. Additional Equipment Required

A storage battery (6- to 8-volt, 100-ampere hour capacity), not supplied with the equipment, is required when the PH-129-A or the PH639 (*)/TF is used as described in paragraph 14b (2).

Note. The PH-129-A and the PH-639(*)/TF are to be operated from a storage battery power source (par. 14b(2)) only under emergency conditions.

9. Differences in Models

The following chart lists the differences in the enlargers.

Item	PH-129	PH-129-A	PH-129-B	PH-639/TF	PH-639A/TF	EN-16(1)
Power source	105- to 120-volt ac or dc.	105- to 120-volt ac or 6- to 8-volt dc.	105- to 120-volt ac or dc.	105- to 120-volt ac or 6- to 8-volt dc.	105- to 120-volt ac or 6- to 8-volt dc.	105- to 120-volt ac or dc.
Easel (par 5b.):						
Maximum mar-size.	11 x 14 inches	11 x 14 inches	8x10 inches	8x10 inches	8x10 inches	11 x 14 inches
Maximum mar-gin width.	3 inches	3 inches	¾ inch	¾ inch	¾ inch	½ inch
Projection lens sets	Refer to paragraph 5b.					
Projection lens open-ings.	F/4.5 through f/32	F/4.5 through f/32	F/4.5 through f/32	F/4.5 through f/32	F/4.5 through f/32	F/4.5 through f/32
Dustless negative carrier aperture.	3 5/8 x 4 5/8 inches	3 5/8 x 4 5/8 inches	3 5/8 x 4 5/8 inches	3 5/8 x 4 5/8 inches	3 5/8 x 4 5/8 inches	5 x 7 inches

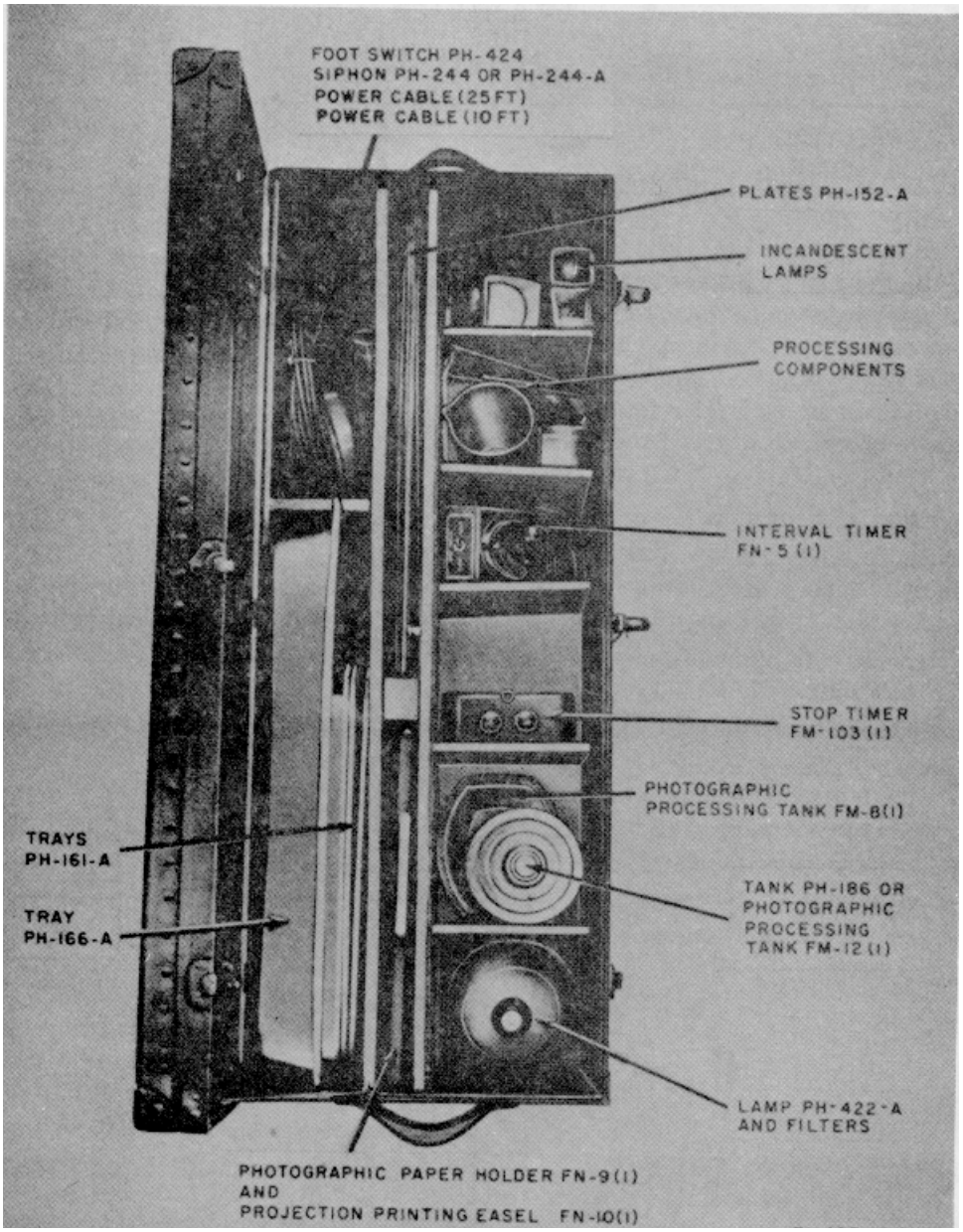

Figure 9. Components of ES-20(1) packed in carrying case No. 2.

10. Uncrating and Unpacking (fig. 10)

a. Packaging and Packing Data. When packaged for shipment the packaged processing set is packed in two wooden packing cases. The dimensions of each wooden packing case are 18 by 24 by 44 inches and the approximate volume of each is 11 cubic feet. The total weight of wooden packing case No. 1 is 180 pounds, and that of wooden packing case No. 2 is 165 pounds.

b. Uncrating. The following uncrating procedures apply to each wooden packing case.

(1) Cut the metal straps and remove them from the wooden packing case.
(2) Remove the nails from the wooden cover with a nail puller, and remove the wooden cover.
(3) Open the waterproof barrier and the outer fiberboard carton and expose the metal container.
(4) Carefully open the metal container and the inner fiberboard carton.
(5) Remove the carrying case.

c. Unpacking.

(1) Open carrying cases No. 1 and 2 and carefully remove the contents. Remove carrying case No. 3 from carrying case No. 1.

(2) Remove all protective wrappings, wadding, and preservative materials.

(3) Open and remove the contents from carrying case No. 3.

(4) Remove dust from all components with a soft, lint-free cloth.

11. Checking Unpacked Equipment

a. Check the projection and condensing lenses; be sure that they are not broken, cracked or otherwise damaged. *Do not touch the lens surfaces.*

b. Check the bellows for tears, rips, and cuts. Check all metal components to see that they are not bent or broken.

c. Check the equipment against the parking list. When no packing list accompanies the equipment, the table of components (par. 5) and/or the packaging data (par. 10*a*) may be used as a

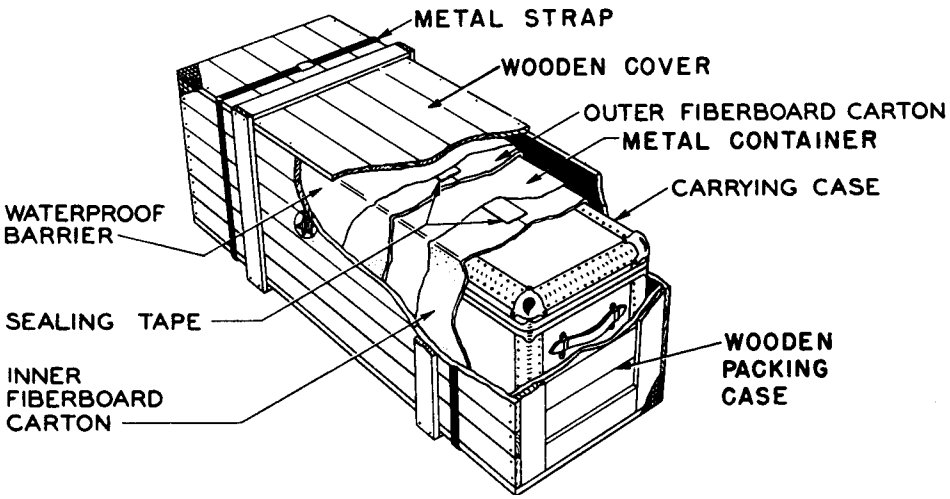

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Figure 10. Packaging diagram.

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general check to indicate the equipment which *probably* has been shipped.

d. Check the overall equipment for any loss or damage that might have occurred during shipment. If the equipment has been damaged or is incomplete, refer to paragraph 2.

e. If the equipment has been used or reconditioned, check to see whether it has been changed by a modification work order (MWO). If modified, the MWO number will be marked on the front of the enlarger body.

12. Siting

a. Exterior Requirements. The site where the processing set will be located is governed by the tactical situation and by the type of housing facilities available (tents, buildings, etc.). If possible, choose a location where a fiat area is available for setting up the equipment. Be sure that drainage facilities are adequate.

(1) General. After locating the shelter in which the processing set is to be placed, make the necessary arrangements for darkroom operation. Equip all windows with material to prevent the passage of light. Shelters should be light tight.

Note. Refer to TM 11-401 for details of shelter (darkroom) requirements.

(2) Space Requirements. Operating personnel must have sufficient space and table area to allow the work of developing and printing. The minimum space required is 8 by 8 by 8 feet.

(3) Electrical requirements. For the power requirements of the enlarger and the safelight refer to paragraph 4.

(4) Water requirements. Large quantities of fresh water (running water for 8 to 12 changes) are needed for washing prints and negatives.

13. Assembly and Installation The processing set must be assembled and installed on the site (par. 12) at which it is to be operated. At this time arrangements should be made to secure the services of organizational maintenance personnel for assembly and installation of the equipment.

14. Connections

Determine the voltage, type of current available, and the type of enlarger to be used (par. 4). Check to see that all switches are in the OFF position. See that the corrective voltage lamps (110-volt or 6-volt) are in the safelight and in the enlarger body. If the lamp must be changed, refer to paragraph 36a.

a. PH-129, PH-129-B, or EN-16 (1). Connect the power cable (25-foot) to a 105- to 120-volt ac or dc power source. Connect the remainder of the equipment as follows:

(1) If the power source is ac, connect the equipment as shown in figure 11.

(2) If the power source is dc, replace the interval timer with a foot switch.

b. PH-129-A or PH-639(*)/TF. The procedure for connecting the PH-129-A or the PH639(*)/TF to an ac power source is covered in (1) below. The procedure for connecting to a dc power source is covered in (2) below.

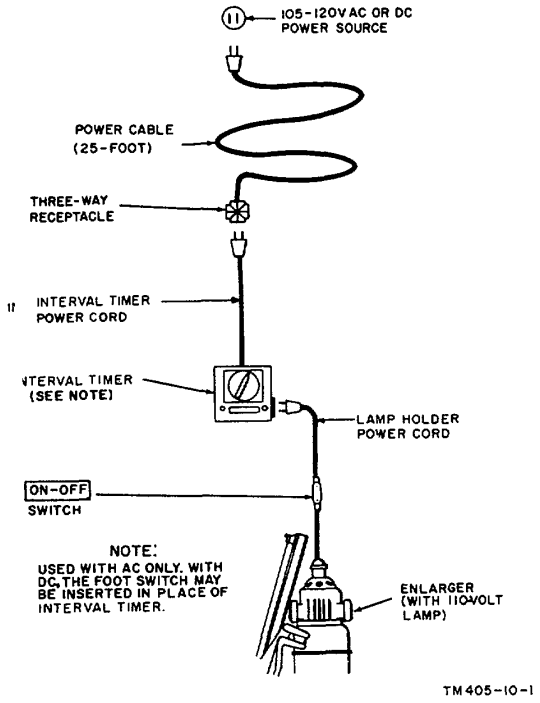

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Figure 11. Connection diagram for 105- to 120-volt ac or dc of PH-129, PH-1 29-B, or EN-16(1).

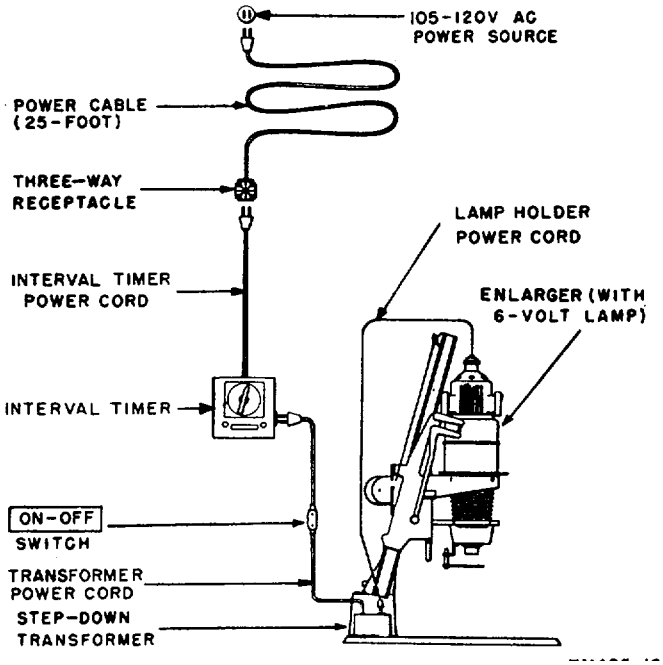

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Figure 12. Connection diagram for 105- to 120-volt ac of PH-129-A or PH-639(*)!TF.

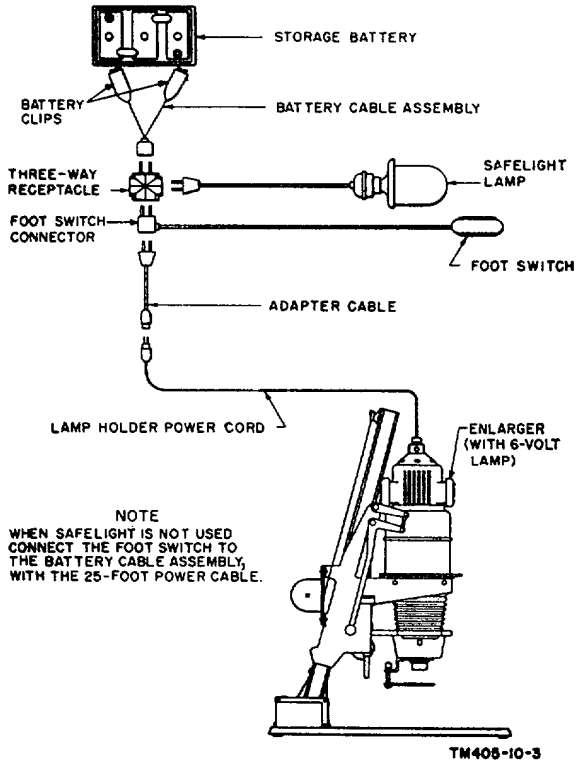

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Figure 13.. Connection diagram for 8- to 8-volt do of PH-12D-A or PH-40(*) /TF.

(1) Ac connections (fig. 12). For 110-volt ac operation proceed as follows:
   (a) Connect the lamp holder power cord to the stepdown transformer.
   (b) Connect the transformer power cord to the interval timer.
   (c) Connect the interval timer power cord to the three-way receptacle.
   (d) Connect the 25-foot power cable to the power source.

(2) Dc connections (fig. 13). For 6- to 8volt dc operation, using a storage battery power source, proceed as follows: Note. The PH-129-A or the PH-639(*)/ TF is to be operated from a storage battery power source only under emergency conditions. Check to see that the correct type of storage battery is being used (par. 8).
   (a) Check to see that a 6-volt safelight lamp is being used (par. 36a).
   (b) Connect the equipment as shown in figure 13.

CHAPTER 3
OPERATING INSTRUCTIONS

Section I. CONTROLS AND INDICATORS

15. Major Component Controls

a. Printer PH-129-(*) or Printer PH-689(*)/TF.

Control	Function
Control lever (fig. 14)	In forward position raises condenser lens assembly. In rear position lowers condenser lens assembly.
Control lever stop	Locks control lever in forward (raised) position.
ON-OFF switch (figs. 11 and 12)	In ON position applies power to enlarger. In OFF position shuts off power from enlarger. Note. This switch must be left in the ON position when either the foot switch or the interval timer is being used.
Carriage locking knob (fig. 15)	Clockwise rotation locks the enlarger body on girder assembly. Counterclockwise rotation releases the enlarger body to permit movement on girder assembly.
Focusing knob	Clockwise rotation raises the projection lens and bellows. Counterclockwise rotation lowers the projection lens and bellows.
Diaphragm ring (f/stop)	Clockwise rotation increases projection lens aperture. Counterclockwise rotation decreases projection lens aperture.

b. Photographic Projection Printer EN-16(1).

Control	Function
ON-OFF switch (fig. 3)	In ON position applies power to enlarger. In OFF position shuts off power from enlarger.
Operating hand wheel	Clockwise rotation lowers enlarger body. Counterclockwise rotation raises body.
Operating hand wheel locking knob (fig. 16).	Clockwise rotation locks enlarger body on main body slide way. Counterclockwise rotation releases enlarger body to permit movement on main body slide way.
Focusing knob (figs. 3 and 16)	Clockwise rotation raises projection lens. Counterclockwise rotation lowers projection lens.
Focusing locking knob (fig. 3)	Clockwise rotation locks focusing knob. Counterclockwise rotation releases focusing knob.
Diaphragm ring (f/stop) (fig. 16)	Clockwise rotation increases projection lens aperture. Counterclockwise rotation decreases projection lens aperture.
Plunger (fig. 3)	Secures negative carrier in correct position.

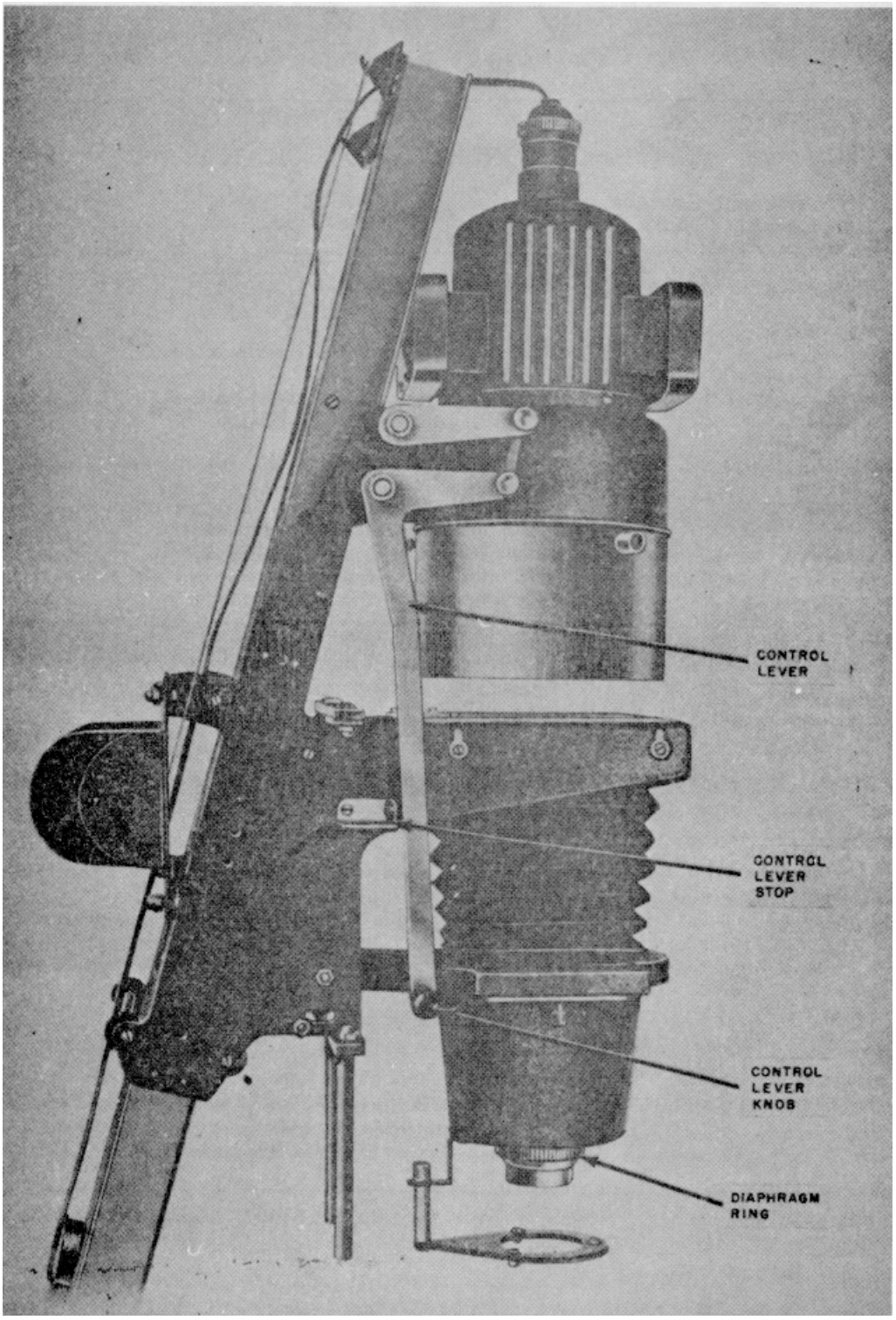

Figure 14. Printer PH-129-(*) or Printer PH-639(*) TF, left-side controls.

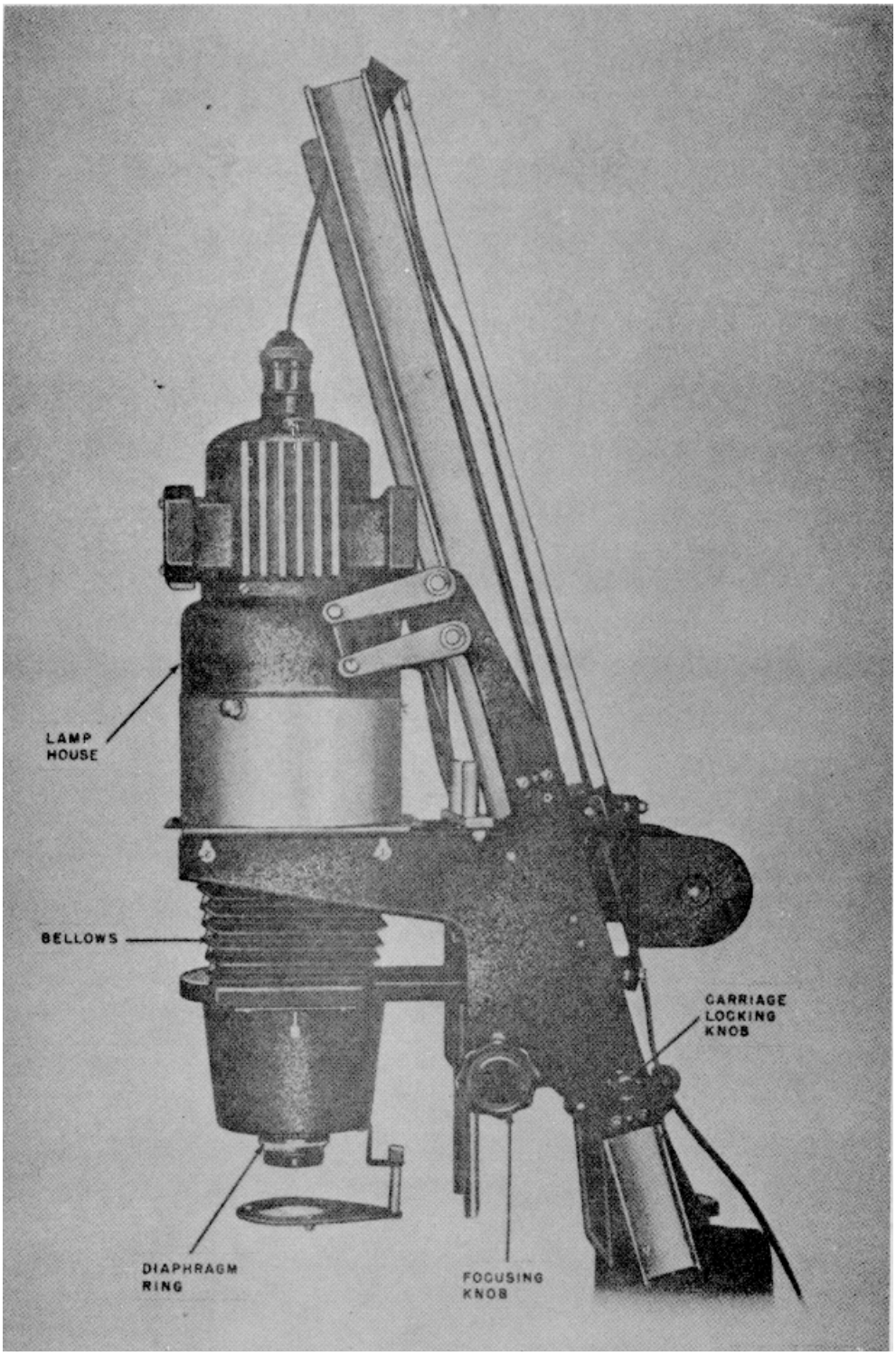

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Figure 15. Printer PH-129-(*) or Printer PH-639(*)TF, right-side controls.

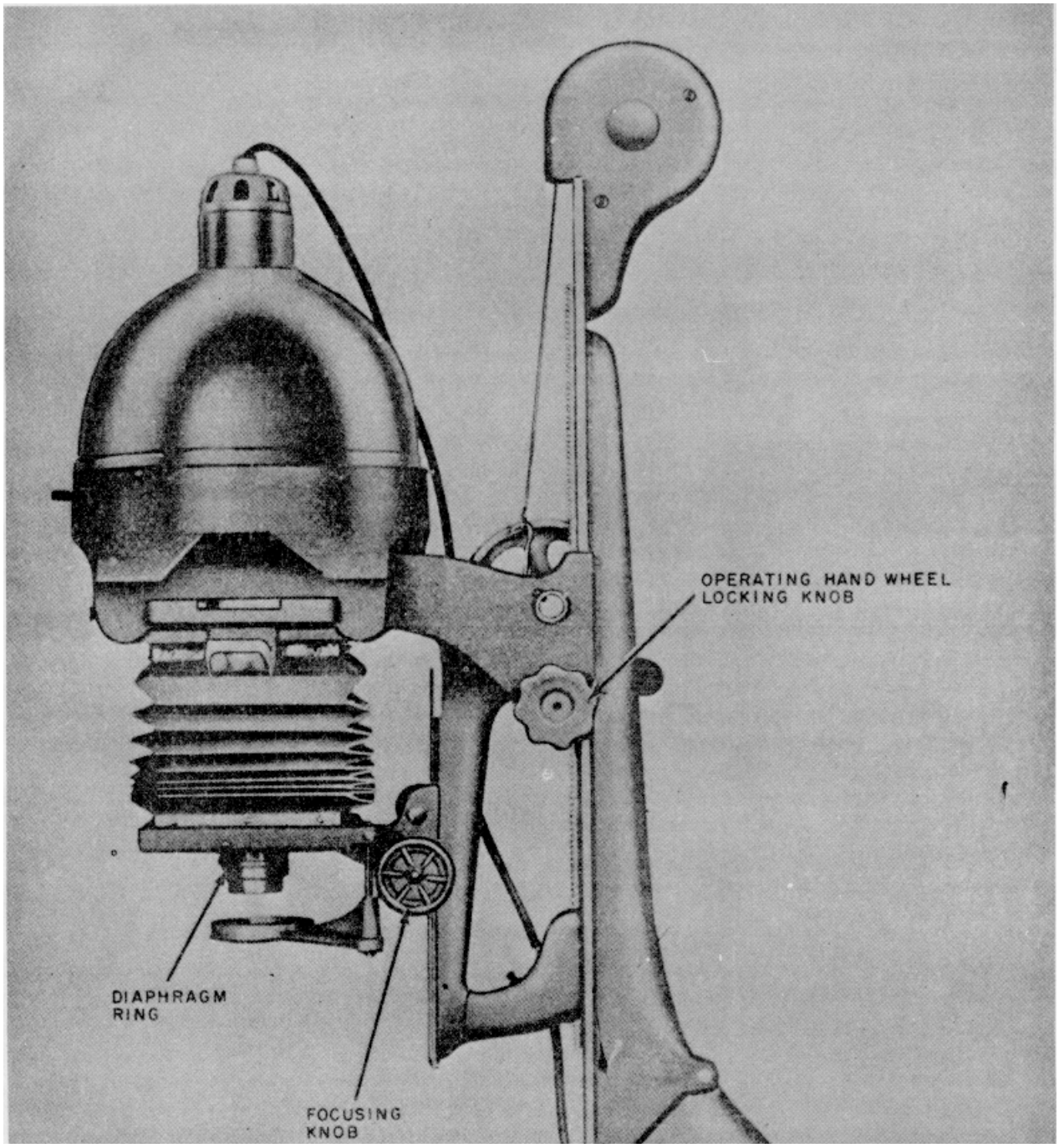

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Figure 16. Photographic Projection Printer EN-16(1), right-side controls.

16. Minor Component Controls and Indicators

a. Timer PH-29-C (fig. 17).

Control or indicator	Function
Minute-hand setting knob	Resets minute hand on face of timer.
Minute hand	Indicates continuous time interval in minutes.
Second-hand setting knob	Resets second hand on face of timer.
Second hand	Indicates continuous time interval in seconds.
Spring winding knob	Clockwise rotation winds spring motor.
START-STOP lever	In START position starts spring motor. In STOP position stops spring motor.
Speed regulator	In F position increases spring motor speed. In S position decreases spring motor speed.

b. Stop Timer FM-103(1) (fig. 5).

Control or Indicator	Function
Minute hand	Indicates continuous time interval in minutes.
Second hand	Indicates continuous time interval in seconds.
START-STOP push button	In START position starts spring motor. In STOP position stops spring motor.
RETURN-TO-ZERO push button	Resets hands to 60 (zero).
Spring winding knob	Clockwise rotation winds spring motor.
Speed regulator	In F position increases spring motor speed. In S position decreases spring motor speed.

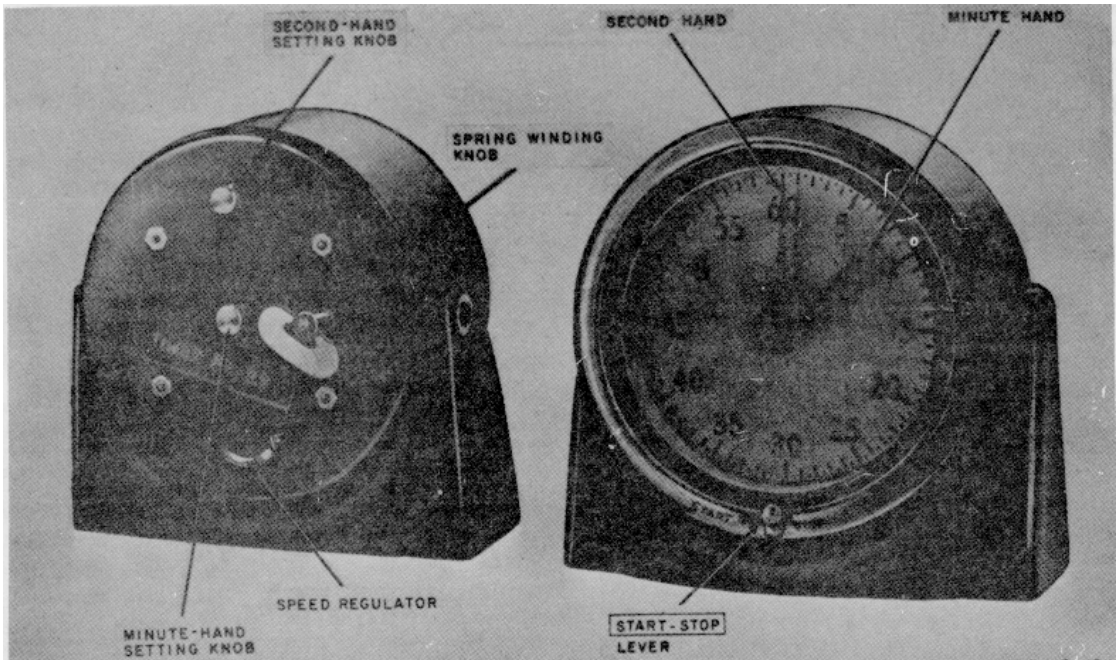

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Figure 17. Timer PH-29-C.

c. Timer PH-426-(*) (figs. 18 and 19).

Control or indicator	Function
TIME-FOCUS switch	In FOCUS position keeps enlarger lamp on for indefinite period. In TIME position keeps enlarger lamp on for preset period.
PUSH-button switch (START CYCLE switch on PH-426-C).	When pushed in, starts interval timer operation for preset time period.
Indicator pointer	Indicates passing of preset interval.
Pointer	Indicates number of seconds to which unit is set.
Pointer knob (part of pointer on PH-426-C).	Used to set interval timer to desired time interval.
STOP-TIMING switch (PH-426C only).	In STOP position stops timing cycle. In TIMING position continues timing cycle.

d. Interval Timer FN-5(1) (fig. 20).

Control or indicator	Function
TIME-STOP TIMING FOCUS toggle switch.	In TIME position permits automatic timing cycle. In STOP TIMING position turns off the projection lamp. In FOCUS position turns on projection lamp
START CYCLE push button	Starts automatic timing of exposure when pushed down.
Time selector knob	Sets indicator pointer to desired time interval.
Indicator pointer	Indicates time interval selected.
Progress pointer	Indicates time left before time interval has elapsed.

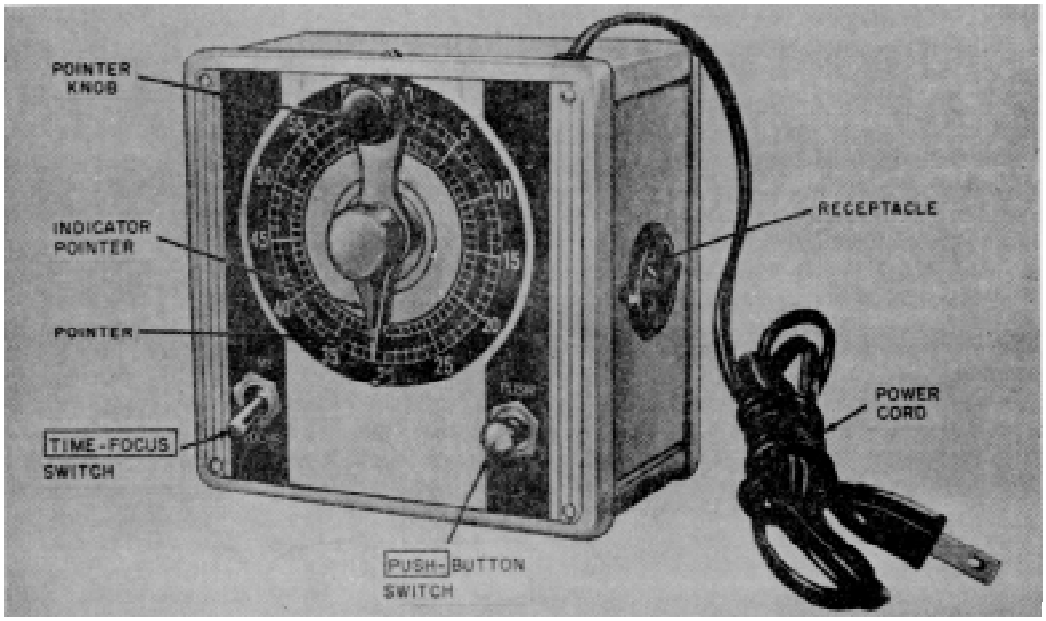

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Figure 18. Timer PH-426 or PH-426-A.

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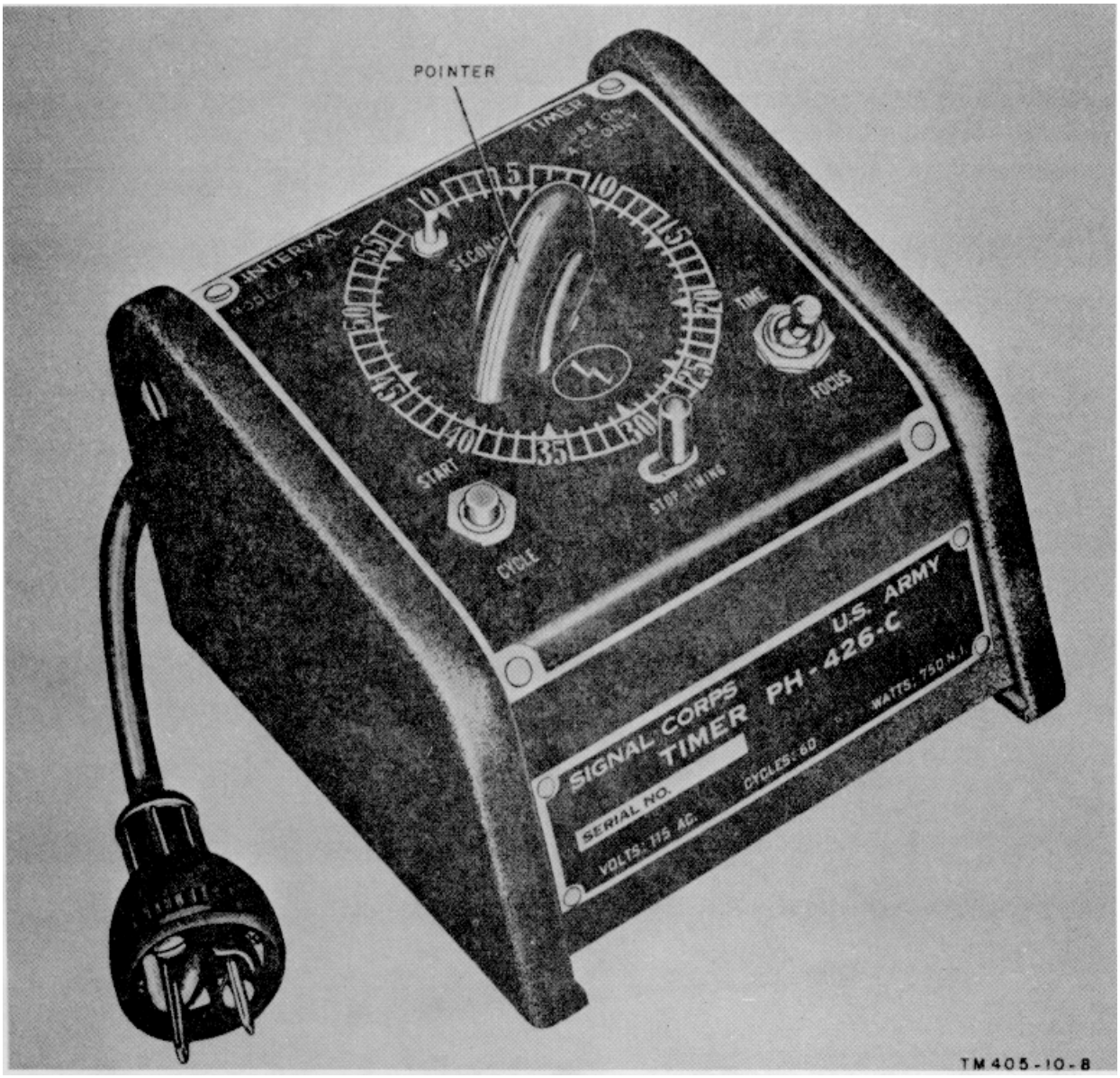

Figure 19. Times PH-426-C.

e. Safelight and Foot Switch.

Control	Function
Safelight ON-OFF switch (fig 34)	In ON position turns on safelight lamp. In OFF position turns off safelight lamp.
Foot switch (fig 13)	When pressed, turns on enlarger lamp When released, turns off enlarger lamp.

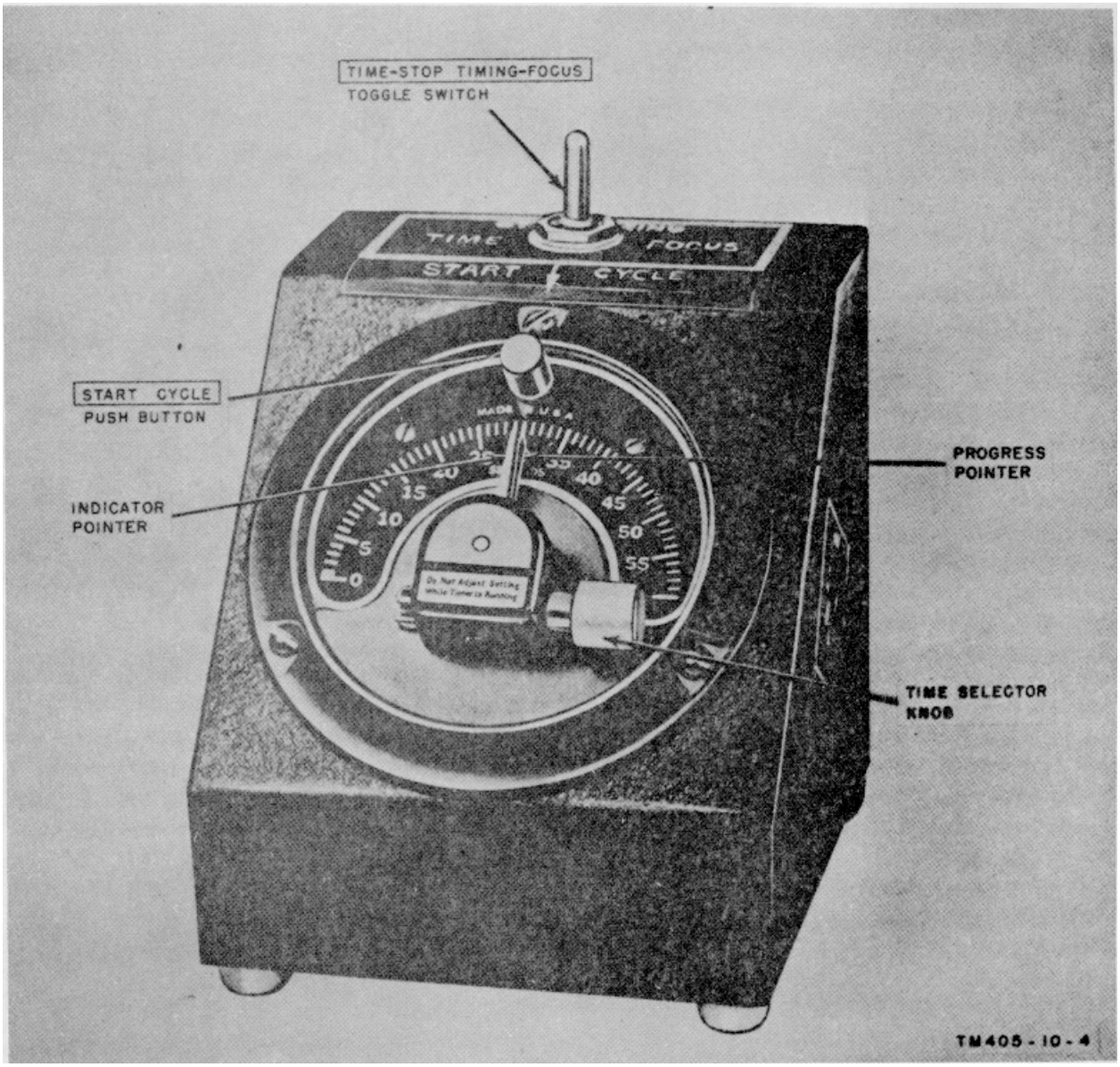

Figure 20. Interval Timer FN-5(1), front view.

Section II. PREOPERATIONAL PROCEDURES

17. Changing Lenses

a. General. If the negatives to be enlarged are 35-mm or larger, but less than 21/4 inches square , use the 31/2-inch condenser lens assembly square, use the 3½/2-inch condenser lens assembly and the 2-inch projection lens. If the negatives are larger than 21/¼ inches square, use the 61/2inch condenser lense assembly and the appropriate projection lens listed below.

(1) PH-129-(*) or PH-639/TF, 51/½-inch projection lens

(2) PH-639A/TF or EN-16(1), 5: 1/8-inch projection lens.

Note. Always clean the lenses before placing them in the equipment (par. 33b).

b. Changing Condenser Lens Assembly.

(1) PH-129-(*) or PH-639(*)/TF.

(a) Pull the control lever (fig. 14) forward and over the control lever stop.

(b) Loosen the knurled screws (fig. 2) on the base of the lamp house.

(c) Rotate the condenser lens assembly counterclockwise, to disengage the assembly housing from the knurled screws, and remove the condenser lens assembly.

Note. Check to be sure that all elements are secure within the assembly housing.

(d() Hold the replacement condenser lens assembly so that the notches in the assembly housing engage the knurled screws on the base of the lamp house.

(e) Turn the condenser lens assembly clockwise until the knurled screws are fully engaged.

(f) Tighten the knurled screws.

(g) Release the control lever (fig. 14).

'2) EN-16(1).

(a) Loosen the knurled screws (fig. 3) on the base of the lamp house reflector and lift off the lamp house reflector.

(b) Pull out the color drawer.

(c) Lift out the condenser lens assembly (not shown) and insert the replacement condenser lens assembly.

(d) Replace the color drawer and the lamp house reflector.

(e) Tighten the knurled screws.

c. Changing Projection Lens.

(1) PH-129-(*) or PH-639(*)/TF (fig. 2).

(a) Rotate the lens board (cup-Shaped or flat) approximately 1/4 turn until it is disengaged from the focusing casting.

(b) Hold the lens board of the replacement projection lens so that the straight sides are parallel to the long sides of the baseboard.

(c) Insert the lens board in the focusing casting, and turn it 1/4 turn to lock it in position. (If the lens board does not turn easily, loosen the adjusting screws.)

(2) EN-16(1) (fig. 3).

(a) Loosen the thumbscrew (not shown) that holds the projection lens to the focusing assembly frame. (A clip (not shown) will release the lens board.).

(b) Remove the projection lens.

(c) Insert the replacement projection lens. Make sure that the lip on the lens board (not shown) slips into the slot in the focusing frame.

(d) Replace the clip (not shown) and tighten the thumbscrew.

18. Loading Negative Carriers

a. Dustless Negative Carrier. The dustless negative carrier is used when 4by 5-inch negatives are to be enlarged (par. 26).

(1) PH-406 (A, fig. 21).

(a) Separate the upper plate (not shown) from the lower plate.

(b) Place the negative, emulsion (dull) side down, on the lower plate.

(c) Set the upper plate on the lower plate and match the locating studs on the lower plate with the corresponding holes on the upper plate.

(2) ES-20(1) (fig. 22).

(a) Turn the spring clip and release the upper section.

(b) Raise the upper section.

(c) Insert the negative, emulsion (dull) side down, into the lower section.

(d) Move the upper section into plae4 on the lower section.

(e) Secure the upper section with the spring clip and the latch fastener.

b. Glass Negative Carrier. The glass negative carrier is used when a portion of a 4by 5-inch negative or a negative smaller than 4 by 5 inches is to be enlarged (par. 26).

(1) PH-406 (fig. 23).

(a) Separate the upper plate from the lower plate.

(b) Lift the glass out of the lower plate.

(c) Ease the glass past the retaining spring clips on the upper plate.

(d) Clean both glasses with a camel's hair brush. If fingerprints or foreign matter remains, wash each glass and dry it with a soft, clean, lint-free cloth.

(e) Replace the glass in the lower plate and in the upper plate.

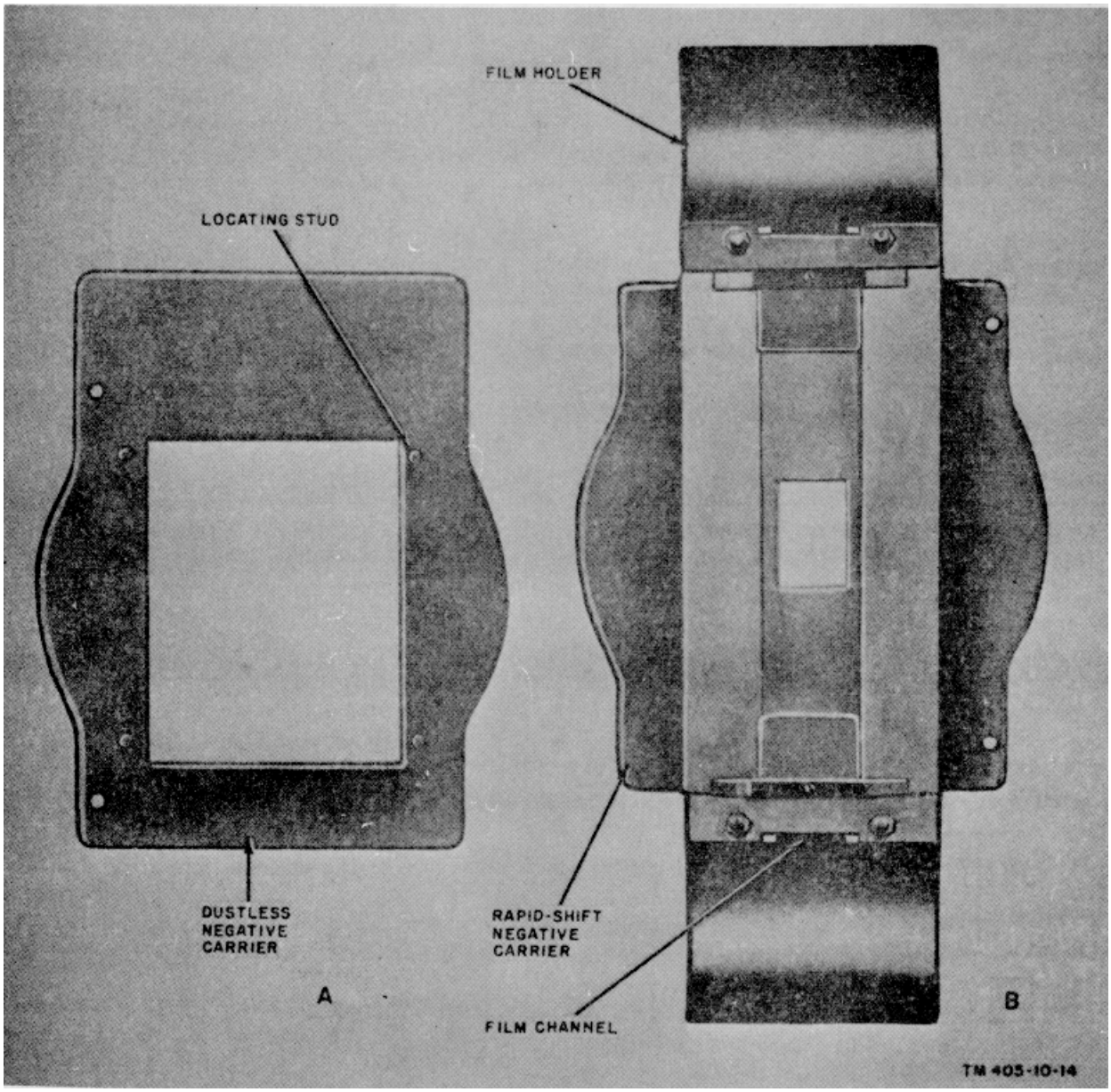

Figure 21. Dustless negative carrier and rapid-shift negative carrier furnished with PH-406.

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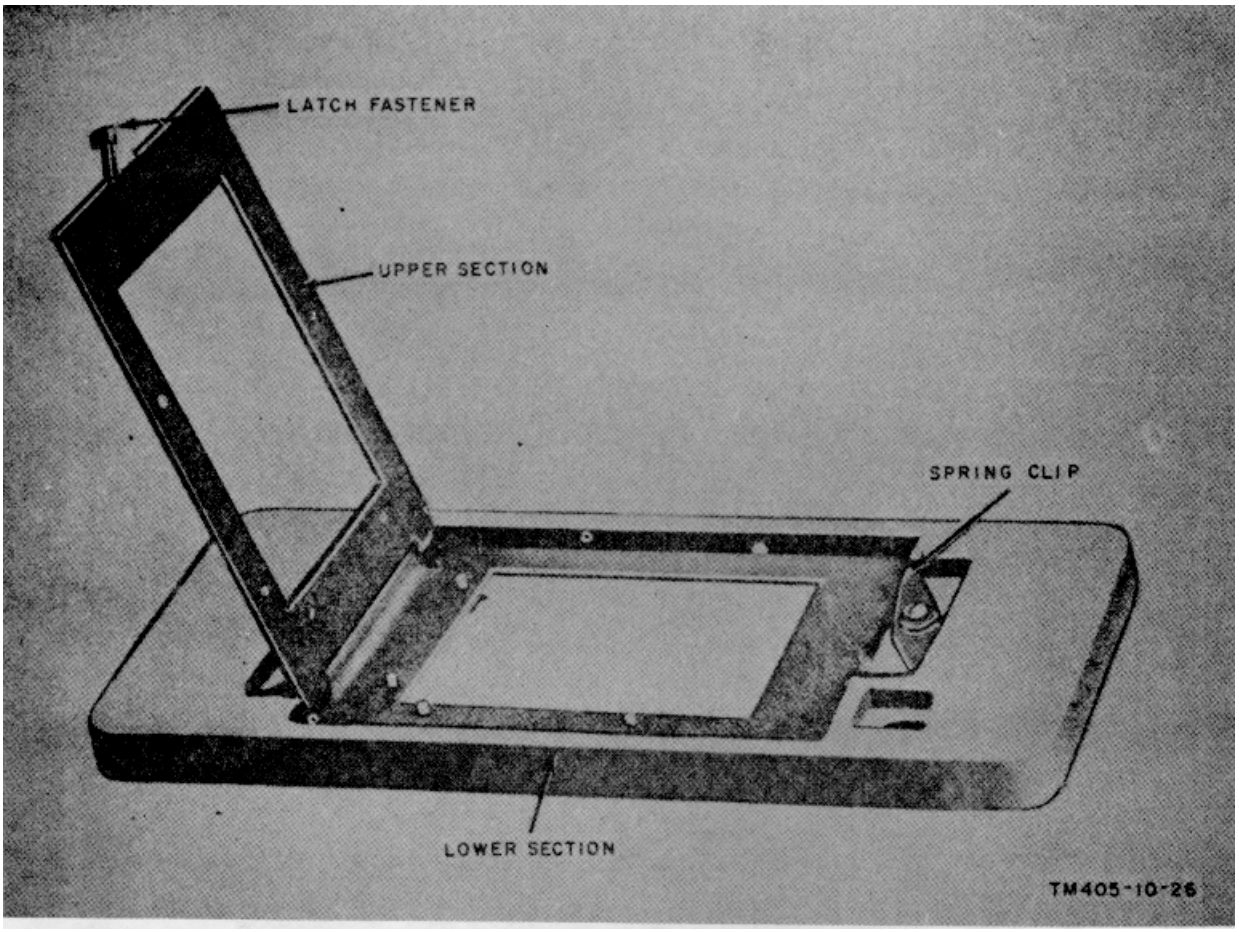

Figure 22. Dustless negative carrier furnished with ES-20(1).

(f) Place the negative, emulsion (dull) side down, on the glass in the lower plate. Mask any area of the aperture not covered by the negative.

(g) Position the upper plate on the lower plate by matching the locating studs with the holes in the upper plate.

(2) ES-20(1) (fig. 24).

(a) Turn the spring clips to release the glass plates.

(b) Remove both glass plates from the holder.

(c) Clean both glass plates ((1) (d) above).

(d) Replace the thin glass plate in the holder.

(e) Place the negative, emulsion side down, on the thin glass plate.

(f) Mask any area of the aperture not covered by the negative.

(g) Place the thick glass plate over the negative.

(h) Fasten the thick glass plate with the spring clips.

c. Rapid-Shift Negative Carrier. The rapid shift negative carrier is used with 35-mm roll film. When a single cut frame of 35-mm film is to be enlarged (par. 26), use the glass negative carrier.

(1) PH-406 (B, fig. 21).

(a) Hold the rapid-shift negative carrier so that the concave side of the film holder faces upward.

(b) Insert the end of the film roll, emulsion side down, into one end of the film channel.

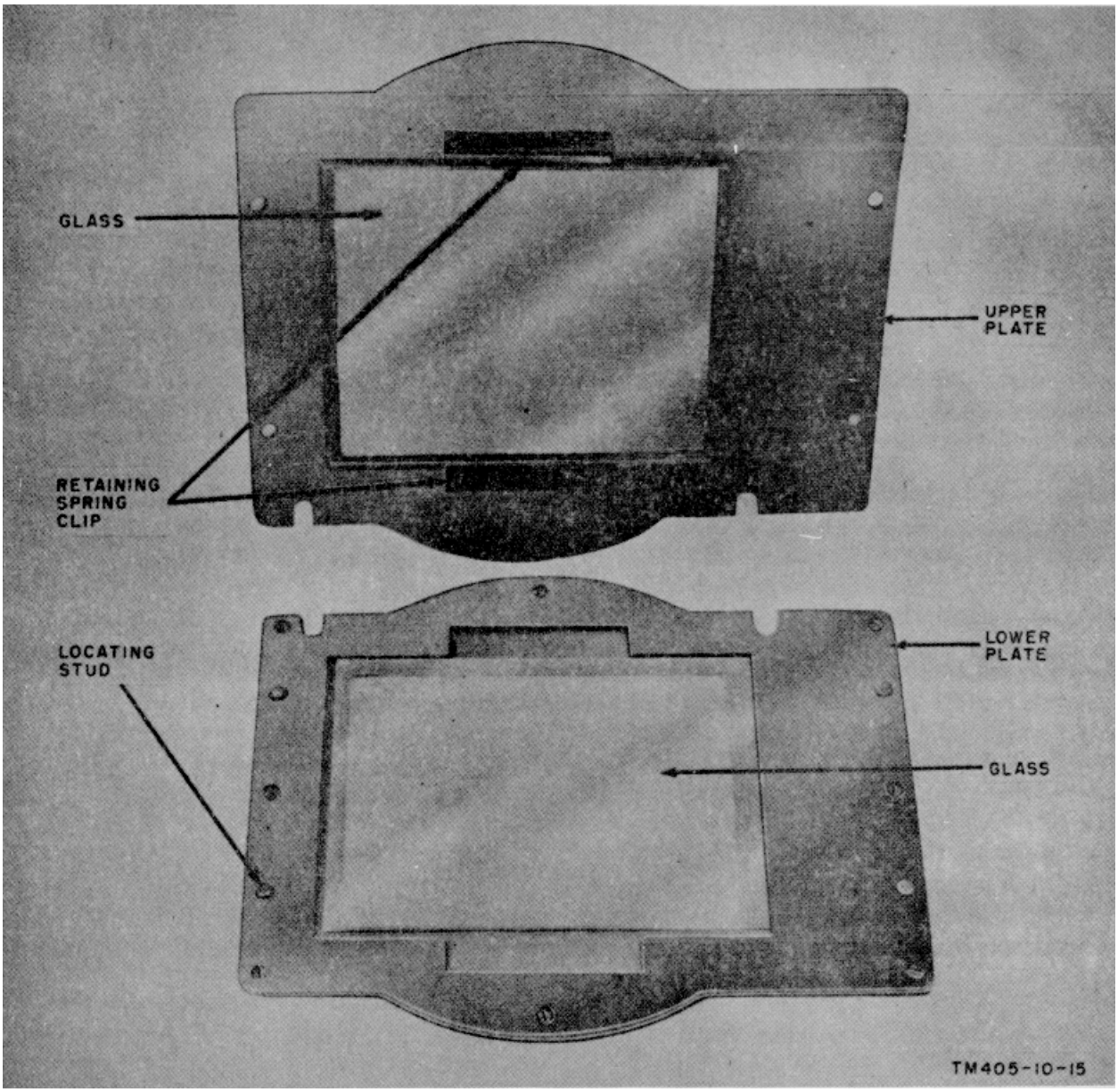

Figure 23. Glass negative carrier, opened , furnished with PH-406

(c) Slide the end of the film roll through the film channel until the frame to be enlarged is centered in the aperture. The remaining rolled film should rest on the film holder.

(2) ES-20(1) (fig. 25).

(a) Remove the spring clips and remove the upper holder.

(b) Place the film roll in the carriage, emulsion side down, on the lower holder and center the frame to be enlarged in the aperture.

(c) Replace the upper holder and fasten the spring clips. (The plunger rod is used to move the film to the next frame.)

d. *Unloading Negative Carriers.* To unload the rapid-shift negative carrier, grasp the edges of the film and remove the film roll. To unload any one of the other negative carriers, open the negative carrier and remove the negative.

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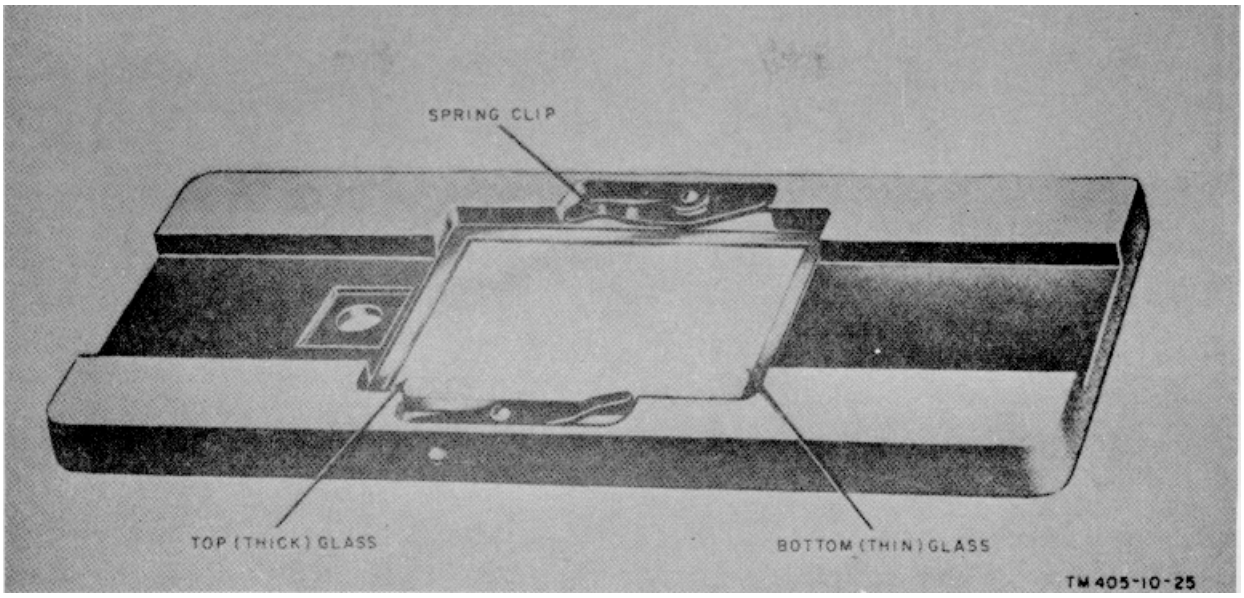

Figure 24. Glass negative carrier, furnished with ES-20(1).

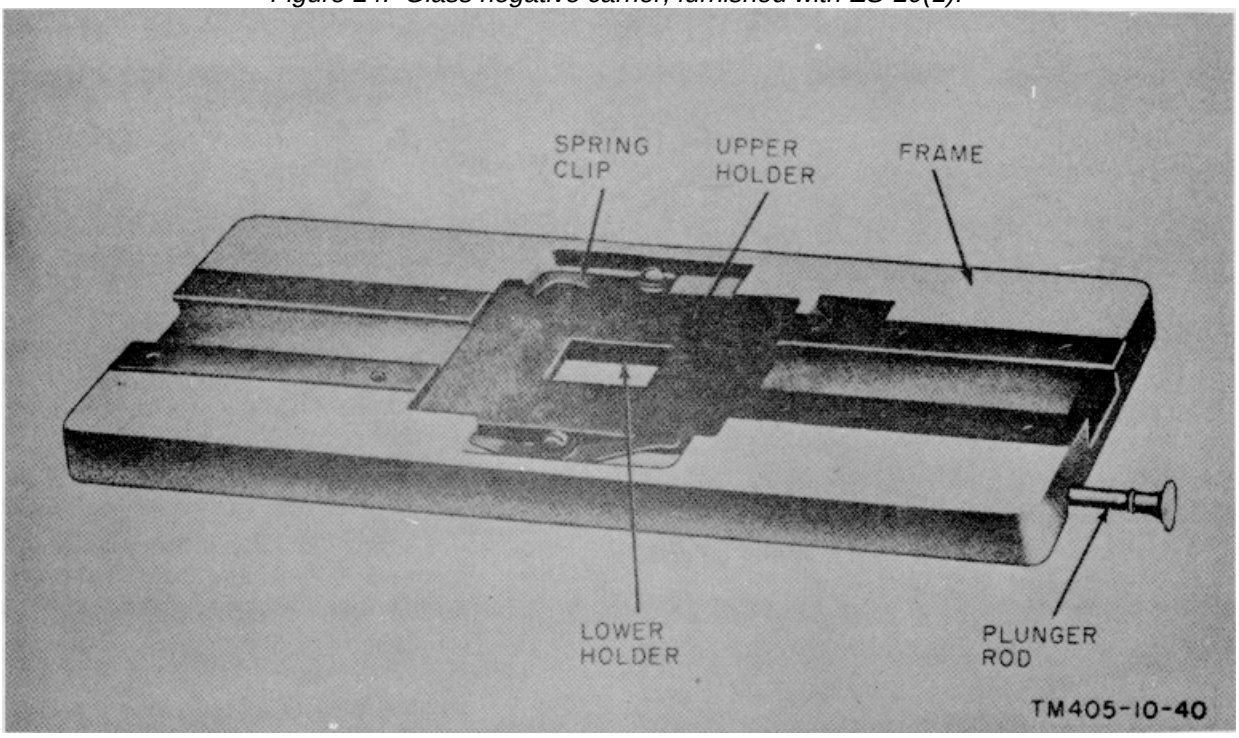

Figure 25. Rapid-shift negative carrier, furnished with ES-20)(1).

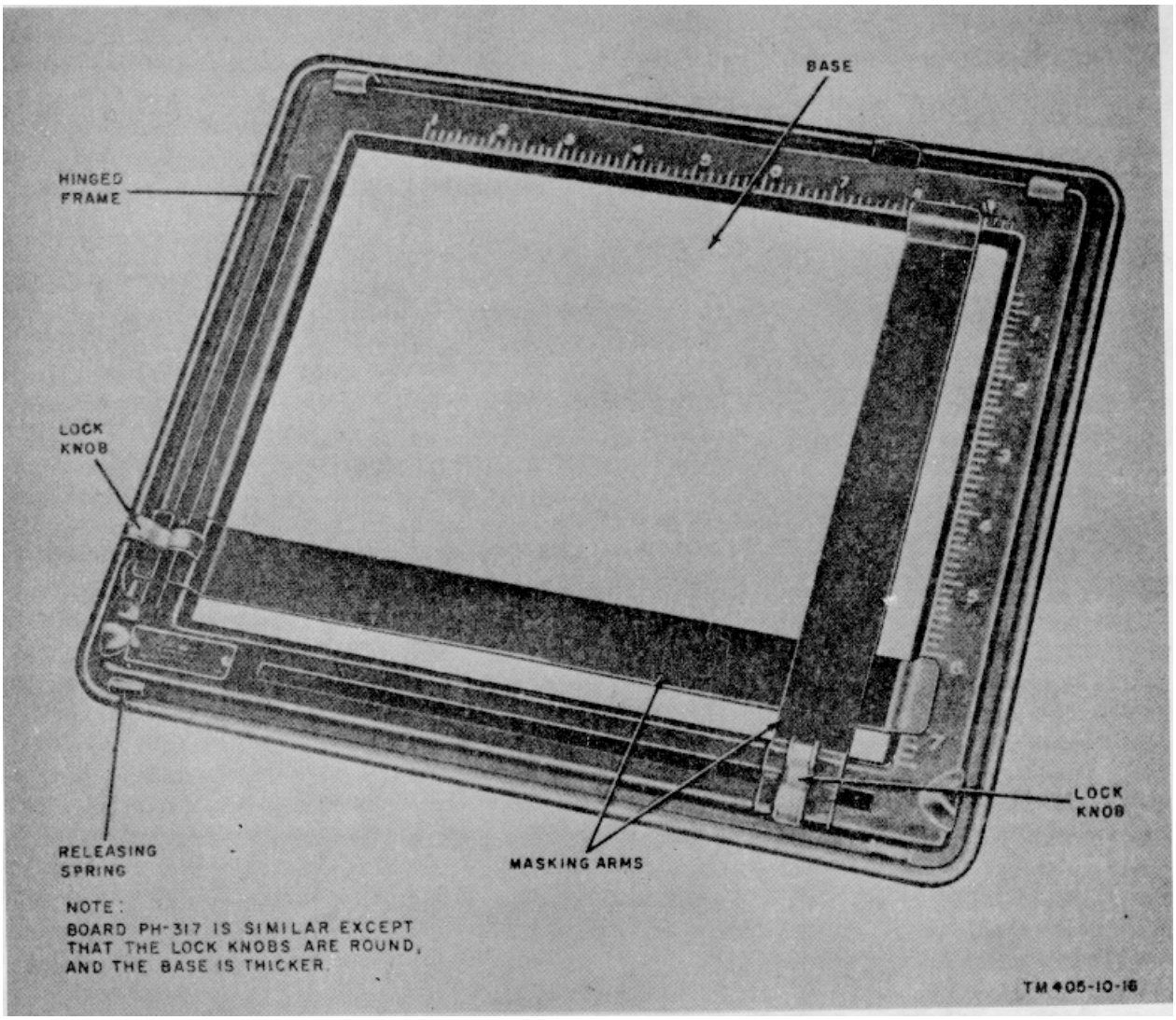

Figure 26. Board PH-317-A.

19. Loading Enlarger

Insert the negative carrier into the enlarger body as indicated in a or b below.

a. PH-129-(*) and PH-639(*)/TF.

(1) Raise the condenser lens assembly and the lamp house by moving the control lever (fig. 14) forward.

(2) Lock the control lever in the forward position by placing it in front of the control lever lock.

(3) Position a negative carrier on the bellows top plate (fig. 2) as follows

(a) For dustless negative carrier and rapid-shift negative carrier (fig. 21), place the carrier on the bellows top plate. Match the guide holes in the carrier with the locating studs at the outer edge of the bellows top plate.

(b) For glass negative carrier (fig. 23), place the glass negative carrier on the bellows top plate so that the U shaped slots of the carrier are positioned against the locating studs on the bellows top plate.

(4) Return the control lever (fig. 14) to its original position.

(5) To remove a negative carrier, raise the condenser lens assembly ((1) and (2) above) and lift the negative carrier off the bellows top plate.

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*b. EN-16(1)*l

(1) Pull the plunger (fig. 3) on the enlarger body out about one-fourth inch.

(2) Insert the negative carrier (any type) into the enlarger body and release the plunger.

(3) When the plunger fits into the hole in the front of the negative carrier, the negative carrier is centered in the enlarger body.

(4) To remove the negative carrier, pull the plunger on the enlarger body out about one-fourth inch and withdraw the negative carrier.

20. Loading Easel

Note. Before loading the easel, turn off the room lights and turn on the safelight.

a. PH-317 or PH-317-A (fig. 26).

(1) Raise the hinged frame by depressing the releasing springs.

(2) Place a sheet of photographic enlarging paper, emulsion side up, on the base of the easel.

(3) Lower the hinged frame.

(4) Release the masking arms by turning the lock knobs counterclockwise.

(5) Set the masking arms so that the visible area of photographic enlarging paper is equal to the desired size of the enlargement to be made.

(6) Lock the masking arms in position by turning the lock knobs clockwise.

(7) Place the easel on the enlarger baseboard (fig. 1).

b. PH-349.

(1) Raise the hinged frame.

(2) Set the margin guide to the desired margin.

Note. When the hinged (frame is raised, a margin guide is revealed in the upper, lefthand corner of the easel. By sliding this guide in the easel grooves away from or toward the center of the holder, the white margin of the final print can be varied from % to 12 inch.

(3) Place a sheet of photographic enlarging paper, emulsion side up, on the base of the easel, with the upper, left-hand corner of the paper against the margin guide.

(4) Lower the hinged frame.

(5) Set the masking arms so that the visible area of photographic enlarging paper is equal to the desired size of the enlargement to be made.

(6) Place the easel on the enlarger baseboard (fig. 1).

c. PH-349-A (fig. 27).

(1) Raise the hinged frame.

(2) Set the margin-setting dial to the margin desired by alining the pertinent dial setting with the index mark.

Note. The white margin around the finished print may be varied from id to N inch.

(3) Place a sheet of photographic enlarging paper, emulsion side up, on the base of the easel with the upper left-hand corner of the paper against the margin guide.

(4) Lower the hinged frame.

(5) Perform the procedures given in a(4) through (7) above.

d. FN-10(1) (fig. 28).

(1) Release the releasing spring and raise the hinged frame.

(2) Place the photographic enlarging paper, emulsion side up, on the base of the easel.

(3) Set the masking arms so that the visible area of the photographic enlarging paper is equal to the desired size of the enlargement to be made.

(4) Lower the hinged frame and lock it in place with the releasing spring.

(5) Place the easel on the enlarger baseboard (fig. 1).

21. Focusing

a. PH-129-(*) or? PH-639(*)/TF.

(1) Connect the equipment to the source of power (par. 14).

(2) Remove the lens cap from the projection lens and turn the diaphragm ring clockwise to the f/4.5 position.

(3) Move the enlarger ON-OFF switch to the ON position.

(4) Load a negative carrier (par. 17) and insert it in the enlarger body (par. 18).

(5) Load the easel with a sheet of plain white paper (par. 20).

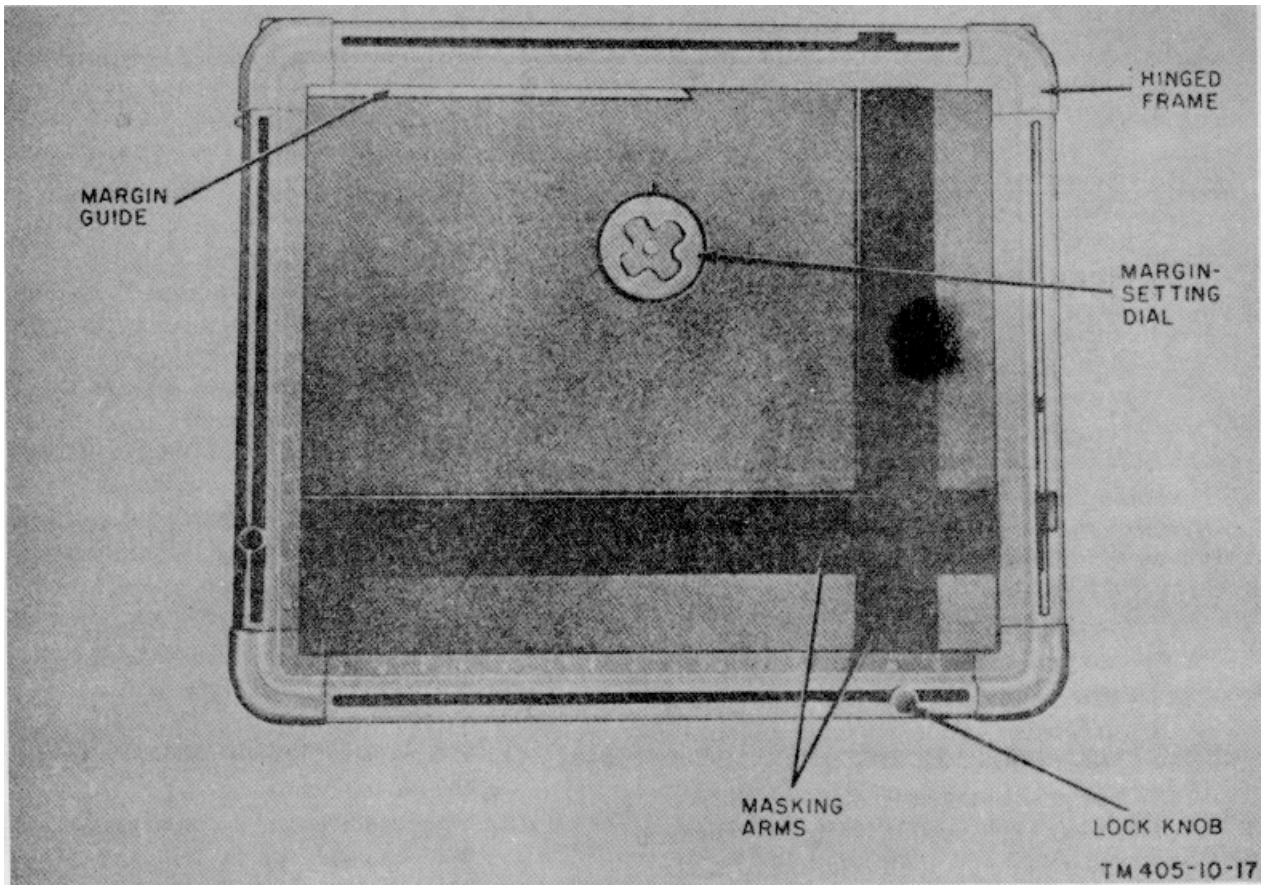

Figure 27. Holder PH-349-A.

(6) Turn the room lights off and the safelight on.

Note. For ac operation turn the TIMEFOCUS switch of the interval times to FOCUS. For de operation, if the foot switch is used, depress the foot switch.

(7) Loosen the carriage locking knob (fig. 15).

(8) Raise or lower the enlarger body until the size of the projected image is approximately the size of the desired print.

Note. The greater the distance between the easel and the negative, the greater the size of the projected image.

(9) Tighten the carriage locking knob.

(10) Lengthen or shorten the bellows by turning the focusing knob until the projected image is in sharp focus.

Note. It may be necessary to adjust alternately the enlarger body position and the bellows several times before the required projected image size and focus are obtained.

(11) Adjust the f/stop opening of the projection lens by turning the diaphragm ring until the desired illumination of the projected image is obtained.

Note. Each f/stop with a larger number reduces by one-half the amount of light that reaches the easel, and the exposure time must be doubled.

(12) Turn the TIME-FOCUS switch of the interval timer to TIME (ac operation) or release the foot switch (dc operation).

(13) Turn off the safelight and turn on the room lights.

b. EN-16(1).

(1) Perform the procedures outlined in a (1) through (6) above.

(2) Loosen the operating handwheel locking knob (fig. 16).

(3) Raise or lower the enlarger body, by turning the operating handwheel (fig.

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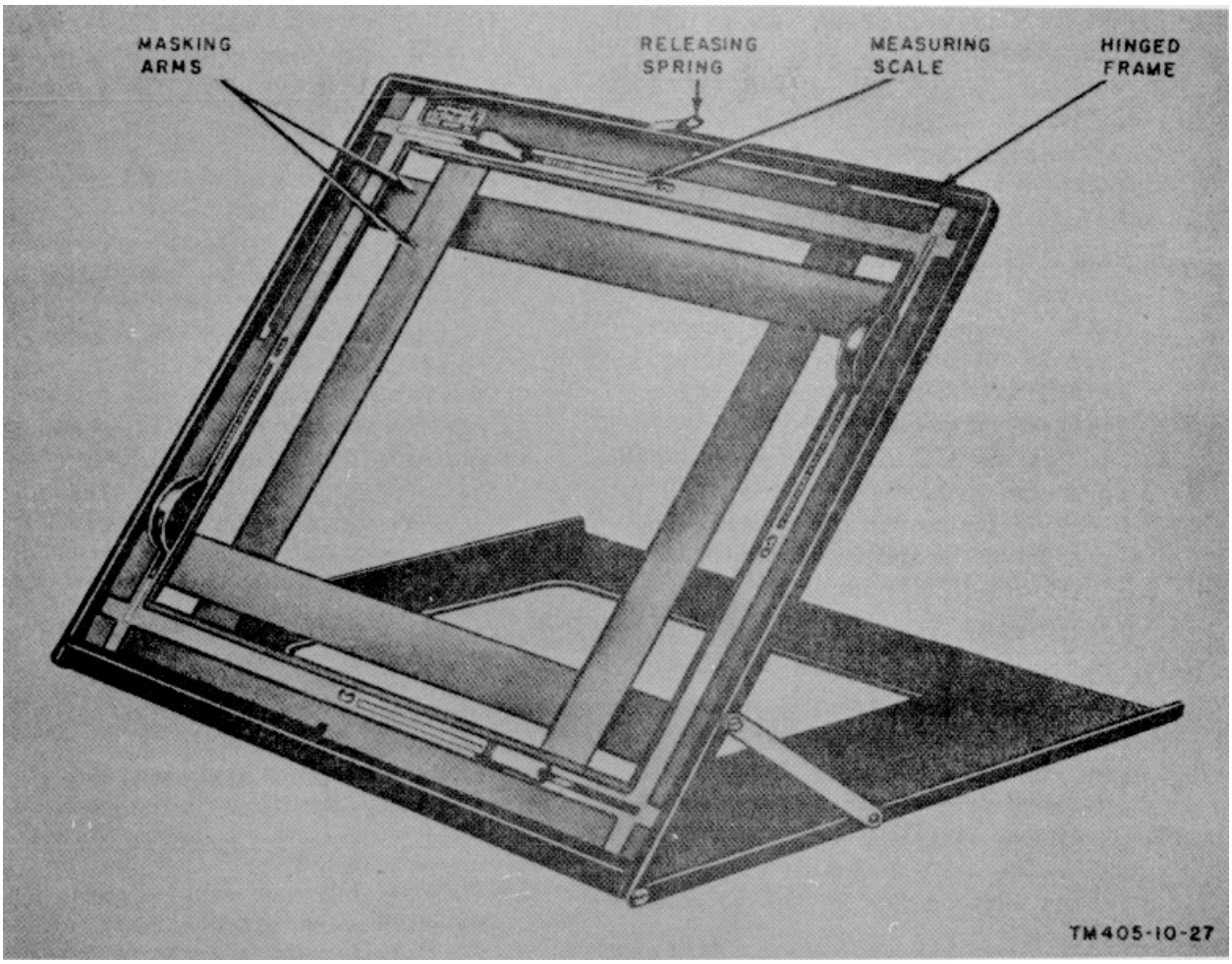

Figure 28. Projection Printing Easel FN-10(1).

3), until the size of the projected image is approximately the size of the desired print.

(4) Tighten the operating handwheel locking knob (fig. 16).

(5) Loosen the focusing locking knob (fig. 3).

(6) Lengthen or shorten the bellows, by turning the focusing knob, until the projected image is in sharp focus.

(7) Tighten the focusing locking knob.

(8) Perform the procedures outlined in a(ll) through (13) above.

22. Preparing Solutions

a. The standard solutions used in developing, rinsing, and fixing are usually made by dissolving prepaired powders in water. Carefully follow the mixing instructions on the packages.

b. If prelared powders are not available, raw chemicals can be used to prepare solutions. For detailed information on the preparation of solutions, and for making and processing of photographic negatives and prints, refer to TM 11401.

Section III. OPERATION UNDER USUAL CONDITIONS

23. Operation of Timers

a. Timer PH-29-C (fig. 17).

(1) Turn the spring winding knob clockwise until the spring motor is fully wound. Be careful not to overwind the lock spring motor.

(2) Set the minute hand and the second hand at 60.
(3) Push the START-STOP lever to START.
(4) When the required time has elapsed, as indicated by the timer hands, push the START-STOP lever to STOP.

b. Stop Timer FM-103 (1).
(1) Wind the spring motor (a(1) above).
(2) Set the minute hand and the second hand to 60 (zero) by pressing the RETURN-TO-ZERO push button on the top of the case.
(3) Push the START-STOP push button, on the top of the case, to START.
(4) When the desired time has elapsed, as indicated by the timer hands, push the START-STOP push button to STOP.

c. Timer PH-426 or PH-426-A (fig. 18).
(1) Connect the PH-426 or the PH-426-A in the circuit (par. 14).
(2) Push the TIME-FOCUS switch to FOCUS, and make any necessary enlarger adjustments (par. 21).
(3) Push the TIME-FOCUS switch to TIME.
(4) Set the pointer to the desired exposure time.
(5) Press the PUSH BUTTON switch to start the timing cycle. When the desired time has elapsed, the unit will automatically shut off.

d. Timer PH-426-C (fig. 19).
(1) Perform the procedures in c(l) through (4) above.
(2) Press the START CYCLE push button to start the timing cycle. When the desired time has elapsed, the timer will automatically shut off.
(3) To make additional identical exposures, press the START CYCLE push button each time an exposure is to be started.
(4) To stop the timing cycle during an exposure, push the STOP-TIMING switch to STOP.

e. Interval Timer FN(1) (fig. 20).
(1) Connect the FN-5 (1) in the circuit (par. 14).
(2) Push the TIME-STOP TIMINGFOCUS toggle switch to FOCUS, and make any necessary enlarger adjustments (par. 21).
(3) Push the TIME-STOP TIMING FOCUS toggle switch to TIME.
(4) Turn the time selector knob to set the pointers on the desired exposure time.
(5) Press the START CYCLE push button to start the timing cycle. When the desired time has elapsed, the timer will automatically shut off.
(6) To make additional identical exposures, push the START CYCLE push button each time an exposure is to be started.
(7) To stop the timing cycle during an exposure, push the TIME-STOP TIMING-FOCUS toggle switch to STOP TIMING.

24. Developing Cut Film

a. Tank PH-526-A (fig. 29). To develop 4by 5-inch cut film by using Tank PH-256-A, proceed as follows:
(1) Insert the film loading panels into the outermost grooves in the tank body.
Note. For smaller film sizes, use appropriately spaced grooves.
(2) Place the tank body with the pouring spout to the right rear.
(3) Place the film guide at the right edge of the tank body so that the indentations in the base of the film guide fit over the projections on the light baffle.
(4) In total darkness, insert the 4-inch width (narrow width) of an exposed cut film into the slot in the center of the film guide.
Note. The cut film is correctly positioned for insertion into the film guide when the notch in the edge of the film is in the upper righthand corner.
(5) Grasp the projecting ends of the film guide. Gently pull the film guide toward the left of the tank body until the next projection on the light baffle is engaged by the indentations in the base of the film guide.
(6) Insert another exposed cut film.
(7) Continue this loading process ((4)-(6) above) until all the exposed films are loaded or until the capacity (12 cut films) of the PH-256-A is reached.

(8) Remove the film guide and insert the film keeper into its slots in the tank body.
(9) Place the light trap, with the projections pointing upward, over the panel. The circular cut-out in the light trap must be adjacent to the pouring spout.
(10) Place the cover over the light baffle lip and then press the cover into place.
(11) Turn on the darkroom lights.
(12) Check the temperature of the developer solution (TM 11-401) with the thermometer, start the continuous timer (par. 23a or b), and pour the developer solution into the tank body through the hole in the center of the cover.
(13) Gently rock the PH-256-A (parallel to the film) to dislodge any air bubbles that may be clinging to the films. Occasionally, rock the PH-256-A during development to provide agitation.
(14) When the continuous timer indicates that the required developing time has elapsed, drain the developer solution from the PH-256-A.
(15) Rinse, fix, and wash the negatives (par. 26).

b. Photographic Processing Tank FM-8 (1) (fig. 30). To develop 4by 5-inch cut film with the FM-8 (1), proceed as follows:

(1) Adjust the FM-8(1) for the 4by 5inch cut film (or smaller) by sliding the short hub reel onto the main reel shaft until it clicks into the desired position.
(2) Attach the film feeder to the main reel as follows:

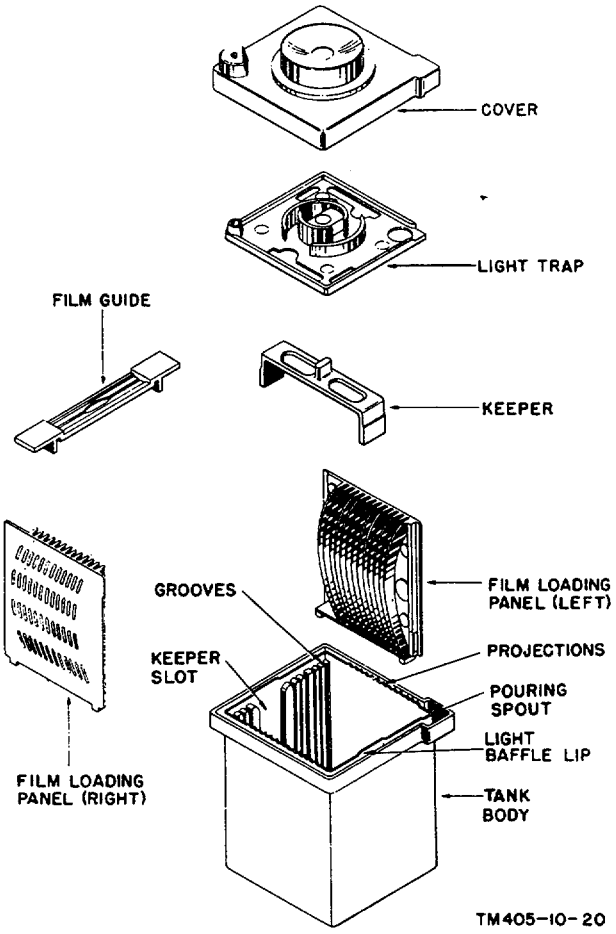

Figure 29. Talk PH-256-A.

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(a) Compress the U-clamp on the film feeder.
(b) Insert the end of the U-clamp into the top of the main reel shaft. At the same time, fit the two large holes in the film feeder over the mounting studs.
(c) Push the film feeder down as far as it will go. The guide wire should rest against the short curved edge of the main reel and of the short hub reel.
(d) Release the U-clamp.

(3) Place the assembled reel, with the short hub reel on the bottom, on an even surface.
(4) Slide the carriage to either end of the rail.
(5) In total darkness, insert the 4-inch width (narrow width) of an exposed film into the guide wire of the film feeder.

Note. The cut film is correctly positioned for insertion into the assembled reel when the notch in the edge of the film is in the upper right-hand corner.

(6) Lightly tap the edge of the film until it drops completely into the slot.

Note. The film may be loaded with the emulsion (dull) side in or out. However, to avoid scratching the film, the film should be loaded with the emulsion on the inside of the curve formed by the grooves.

(7) Move the carriage to the next notch and slide in the next film.
(8) Continue this loading process ((5)(7) above) until all the exposed films are loaded or until the capacity (12 cut films) of the FM-8(1) is reached.
(9) Remove the film feeder and place the loaded reel in the tank body with the studs toward the bottom.
(10) Place the cover securely on the tank body, turn on the room lights.
(11) Check the temperature of the developer solution (TM 11-401), start the continuous timer (par. 23a or b), and pour the developer solution into the tank body through the hole in the center of the cover.
(12) To agitate the developer solution (to dislodge air bubbles that may be clinging to the film), insert the agitator through the hole in the cover. Engage it with the inner cross member of the reel, then turn it gently.
(13) For stronger agitation, hold both pouring ends and rock the entire unit.

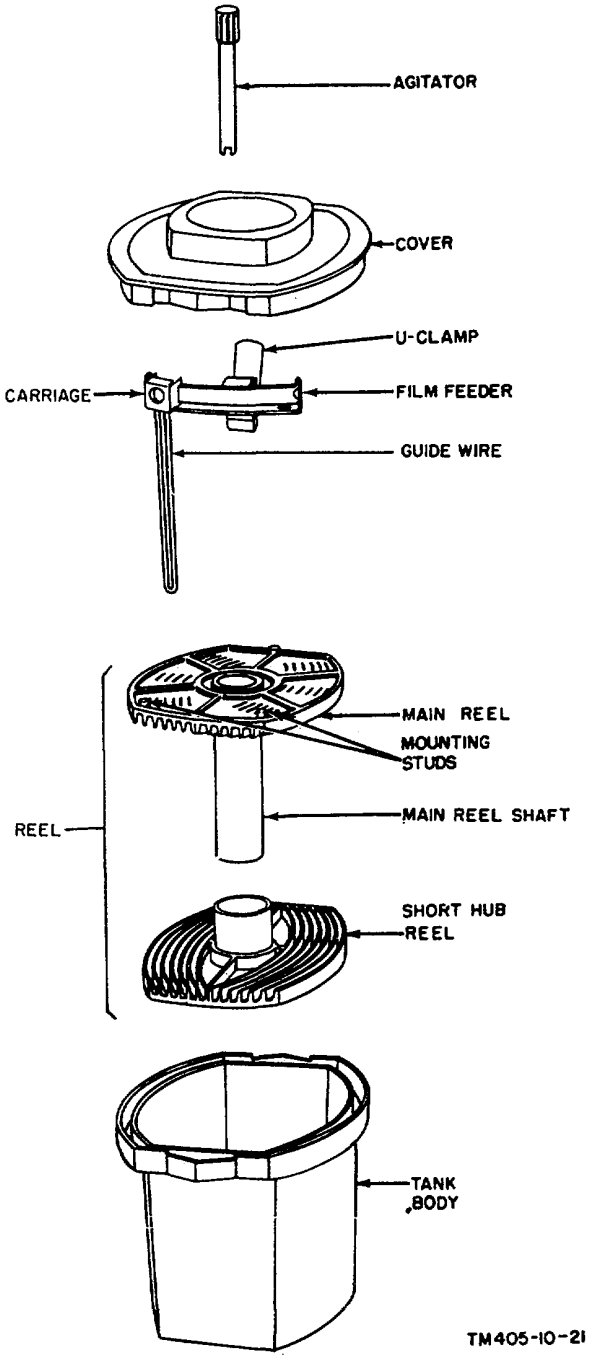

Figure 30.Photographic Processing Tank FM-3(1)

(14) When the desired developing time has elapsed, pour out the developer solution.
(15) Rinse, fix, and wash the negatives (par. 26).

25. Developing Roll Film (fig. 31)

To develop roll film by using Tank PH-186 or Photographic Processing Tank FM-12(1), proceed as follows:

a. Place the upper film flange on the lower film flange and secure with the thumbscrew.

b. Turn off the darkroom lights and disassemble the film cartridge.

c. Insert the end of the exposed film roll, with the emulsion (dull) side in, in the slots of the upper and lower film flanges; gently push the remaining film into the reel.

d. Place the reel in the tank body (with the thumbscrew on top).

e. Turn on the darkroom lights.

f. Check the temperature of the developer solution (TM 11-401), start the continuous timer, and pour the developer solution into the tank body through the light proof hole in the cover.

g. Insert the agitator through the light proof hole and turn the reel.

h. Remove the agitator and place the cap over the light proof hole.

i. Gently rock the roll film tank to accelerate the developing action and to eliminate air bubbles. Repeat the rocking action several times during the developing process.

j.. When the desired developing time has elapsed, remove the cap and pour the developer solution from the tank body.

k. Rinse, fix, and wash the negative (par. 26).

26. Processing Negatives

After the film (cut or roll) has been developed (par. 24 or 25), process the negatives as follows':

Note. All processing solutions should be maintained at the specified temperatures.

a. Rinsing.

(1) Circulate rinse water among the negatives. The usual rinsing time is from 30 to 60 seconds (TM 11-401).

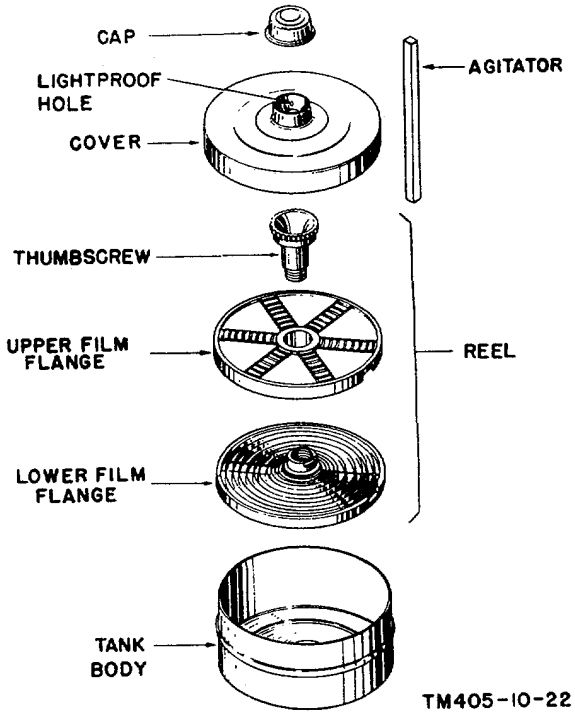

Figure 31. Task PHI-186 or Photographic Processing Tank FM-12(1).

(2) Pour out the rinse water.

b. Fixing.

(1) Fill the tank (cut-film or roll-film) with fixing solution (par. 22).
(2) Gently rock the tank to start the fixing process.
(3) Allow the tank to stand still until the fixing is complete. The usual fixing time is from 10 to 15 minutes or twice the time it takes the film to clear (TM 11-401).

Note. After the fixing process is complete, light will not harm the negatives.

(4) Pour out the fixing solution.

c. Washing.

(1) Wash the negatives with fresh, running water for at least 30 minutes.
(2) Pour out the washing water.
(3) Remove the negatives from the tank and wipe excess water from both sides of each negative.

d. Drying. Hang the negatives up to dry in a clean, dust-free area.

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27. Making Enlargements

a. Starting Procedures.

(1) Connect the enlarger to the source of power (par. 14).

(2) Load the appropriate negative carrier (par. 18), and insert the negative carrier into the enlarger body (par. 19).

(3) Load the easel (par. 20) with a sheet of plain white paper.

(4) Focus (par. 21) the projected image on the plain white paper.

(5) Determine the correct exposure time (TM 11-401). If an interval timer is being used, set it to the desired exposure time (par. 23).

(6) Remove the plain white paper from the easel.

(7) Turn the room lights off and turn on the safelight.

b. Print Processing Procedures.

(1) Make the required number of prints.

(2) Develop the exposed photographic enlarging paper for the appropriate length of time (TM 11-401).

(3) Rinse the prints in shortstop solution.

Note. Exhausted shortstop solution is a frequent source of trouble. Prepare fresh shortstop solution when the acid becomes neutralized.

(4) Fix the prints in accordance with the manufacturer's instructions for the materials being used.

(5) Use the siphon on the tray and wash the prints thoroughly in fresh, running water.

(6) Turn the room lights on and the safelight off. (7) If glossy prints are to be ferrotyped, soak the prints in ferrotype solution. Place the prints, emulsion side down, on clean ferrotype plates, and use the squeegees to attain perfect contact between the prints and the ferrotype plates.

(8) Dry and trim the prints.

(9) Place the dried prints under a weight on a clean, smooth surface to prevent curling.

c. Stopping Procedures.

(1) Turn the enlarger ON-OFF switch (fig. 3, 11, or 12) to the OFF position.

(2) Remove the negative carrier from the enlarger body.

(3) Remove the negative from the negative carrier. Place the negative in its preserver (protective envelope).

(4) Disconnect the enlarger from the source of power.

(5) Replace the lens cap on the projection lens and cover the enlarger with an appropriate dust cover.

Section IV. OPERATION UNDER UNSUAL CONDITIONS

28. Unusual Conditions

Processing Equipment PH-406 and Photographic Film Processing Unit ES-20 (1) are designed to be used indoors in a darkroom shelter. However, when the equipment has been stored outdoors or in shelters where extreme temperatures or climatic conditions are encountered, the special procedures outlined in paragraphs 29 and 30 should be followed before the equipment is placed in operation.

29. Operation in Arctic Climates

a. Transfer the equipment from the cold to the warmer temperature and allow it to remain at room temperature for approximately 6 hours before removal from the carrying cases.

b. Do not open the carrying cases before the equipment has reached room temperature. Condensation on the equipment may cause permanent damage. Whenever possible, inclose the equipment in water-repellent material, while the equipment is in the cold atmosphere, and then transfer it to the warmer room. The water-repellent material must inclose the equipment as airtight as possible. Keep this covering on until the equipment has reached room temperature. This procedure will further eliminate the possibility of condensation on the equipment.

c. Before operating the equipment (pars. 23 thru para 27) clean and dry any water that has condensed on the moving parts. Use a clean, lint-free cloth for this operation. Clean the projection lens

and condenser lens assemblies with the lens tissue. If moisture has condensed on the inside surface of the projection lens or condenser lenses, leave the lamp turned on until the moisture evaporates.

30. Operation in Tropical and Desert Areas

When the processing set is used under conditions of extreme heat and humidity, such as in desert or tropical regions, observe the following precautions.

a. Desert Regions. Before using the equipment in desert regions, use a soft-bristled brush to remove sand and other foreign matter on the surfaces of the equipment. Dust the negative carriers before loading. Use a camel's hair brush and clean all lens outer-glass surfaces before using lens tissue. Lens tissue will scratch the glass elements if they have not been dusted previously.

b. Tropical Regions. In climates of high humidity, such as in the tropics, inspect the equipment daily for traces of fungus, mold, mites, and metallic corrosion. Remove all fouling immediately. Lubricate the enlarger after cleaning (refer to the applicable technical manual listed in appendix I).

CHAPTER 4
OPERATOR'S MAINTENANCE INSTRUCTIONS

31. Scope of Operator's Maintenance

Operator's maintenance for the processing set consists of the following:

a. Preventive maintenance (par. 33).

b. Troubleshooting by using equipment performance checklist (par. 35).

c. Replacement of defective lamps (par. 36).

d. Checking electrical connections (par. 14).

32. Tools and Materials Required

a. Tools.

(1) Camel's-Hair Brush TL72.

(2) Camel's-hair brush (SigC stock No. 6Z1451).

b. Materials.

(1) Lint-free cloth.

(2) Lens tissue.

(3) Cleaning Compound (Federal stock No. 7930-395-9542).

(4) Lens cleaner (SigC stock No. 8A819).

33. Preventive Maintenance

a. DA Form 11-256 (figs. 32 and 33). DA Form 11-256 is a preventive maintenance check list to be used by the operator. Items not applicable to the equipment are lined out. References in the ITEM block are to items in this paragraph that contain additional maintenance information pertinent to the item. Follow the instructions on page 1 of the form.

b. Items. The information given below supplements DA Form 11-256. The item numbers correspond to the ITEM numbers on the form.

Item	Maintenance procedure
2	Clean the projection lenses and the condenser lens assemblies with a camel's-hair brush. If additional cleaning is required, use lens tissue; do not use water or household-type cleaning fluids. Clean all other components of the processing set with an air syringe and lint-free cloth. If necessary, clean metal components with a lint-free cloth slightly moistened with Cleaning Compound. ***Warning***: Cleaning Compound is flammable and its fumes are toxic Do not use near a flame; provide adequate ventilation.
5	Check the timers (continuous and interval) for accurate timing Examine the controls and pointers for looseness.
7	Hand-tighten accessible screws, nuts, and bolts.
8	Refer to item 2 above.
11	For lubricating procedure for the enlarger, refer to its applicable technical manual listed in appendix I.

34. Visual Inspection

a. Inspect the equipment carefully for loose or missing nuts, bolts, and screws. Replace any that are missing, and hand-tighten any that are loose. Do not use excessive force.

b. With a negative carrier in place in the enlarger, turn the ON-OFF switch to ON to see that there are no light leaks through the bellows or lens board.

c. Check the roll-film tank and the cut-film tank to be sure that there are no light leaks and that the covers fit securely.

d. Check the negative and photographic print processing components to be sure that they are in good condition and do not require repair and/ or replacement.

35. Equipment Performance Checklist

a. General. This checklist is used to check systematically the equipment performance. All corrective measures that the operator can perform are given in the *corrective measures* column. If the action taken by the operator does not correct the fault, additional maintenance is required by higher echelon personnel. The operator should note on the repair tag how the

equipment performed and the corrective measures taken. Start at the beginning of the checklist and follow each step in sequence to locate trouble. However, if trouble is suspected in a particular area, check at that point first and continue the steps in the order listed.

b. Checklist. The checklist below can be used for either ac or dc operation. For ac operation, perform only those procedures which apply to ac, and for dc operation, perform only those procedures which apply to dc. If no exceptions are stated within a procedure, then that procedure applies to both ac and dc operations.

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MAINTENANCE CHECK LIST FOR SIGNAL EQUIPMENT
PHOTOGRAPHIC DEVELOPER, PROJECTOR, DRYER, CONTACT AND PROJECTION PRINTER
(AR 750-625)

EQUIPMENT NOMENCLATURE: PROCESSING EQUIPMENT PH-406

EQUIPMENT SERIAL NUMBER: NA

INSTRUCTIONS

This form may be used for a period of one month by using the correct dates and weeks of the month. It is to be used as a Preventive Maintenance check list for Signal equipment in actual use, or for a check on equipment prior to issue.

1. For detailed Preventive Maintenance instructions see:
   a. The Technical Manual *(in TM 11 series)* for the equipment. *(See DA Pamphlet Number 310-4)*
   b. The Supply Bulletin *(SB 11-100 series)* for the equipment. *(See DA Pamphlet Number 310-4)*
   c. The Department of the Army Lubrication Order. *(See DA Pamphlet Number 310-4)*

2. The following action will be taken by either the Communications Officer/ Chief for 1st echelon, or the Inspector for higher echelon:
   a. Enter Equipment Nomenclature and Serial Number.
   b. Strike out items that do not apply to the equipment.

FOLD

3. Operator/Inspector will enter in the columns entitled CONDITION, on the proper line, a notation regarding the condition, using symbols specified under LEGEND.

4. After operator completes each daily inspection he will initial over the appropriate dates under "Daily Condition for Month", then return form to his supervisor.

TYPE OF INSPECTION

OPERATOR	2/3 ECHELON	DATE	SIGNATURE
✓		6 Dec. 57	W. Pitrone

U. S. GOVERNMENT PRINTING OFFICE 1957 O—427139

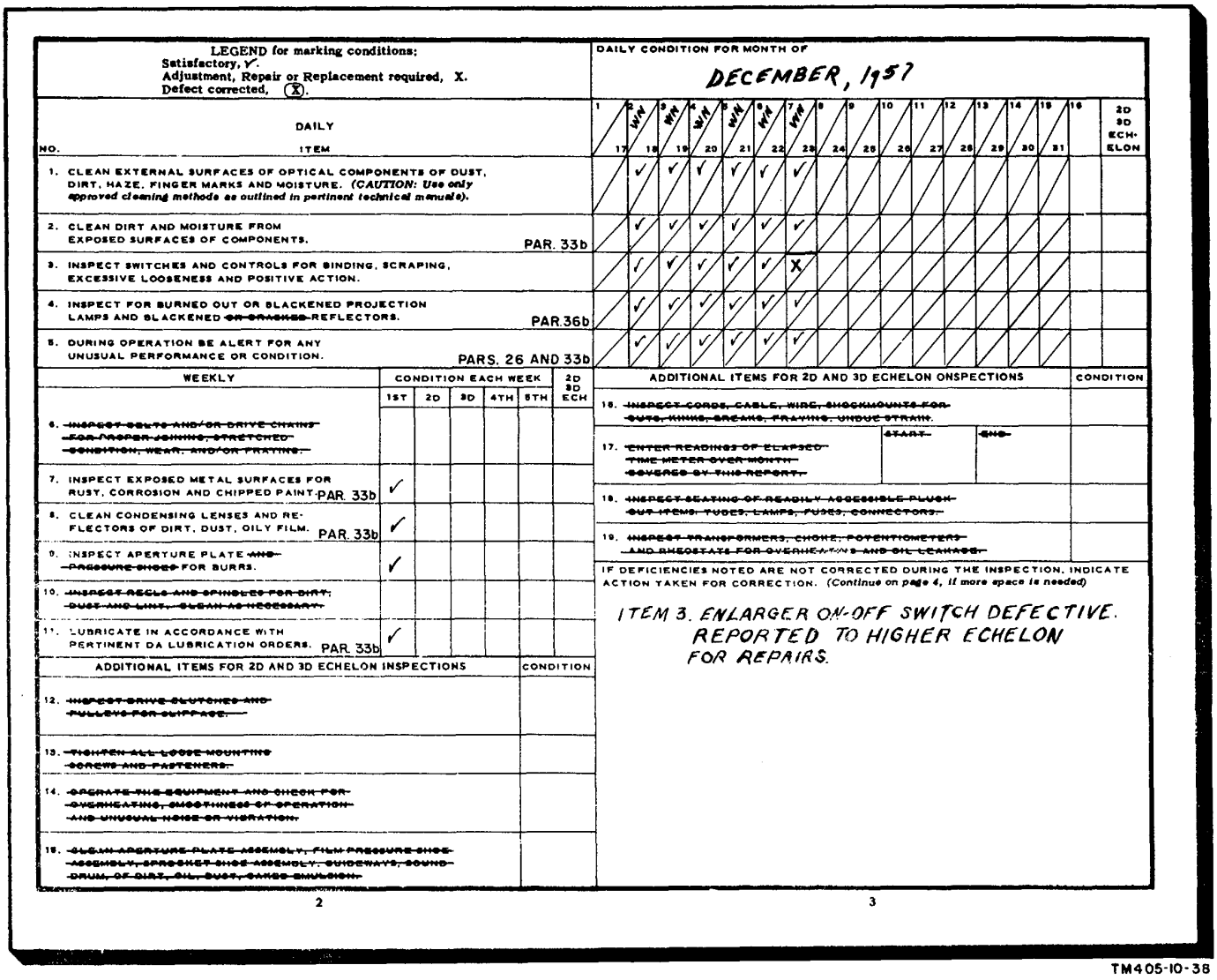
4

DA FORM 1 MAY 57 11-256

REPLACES DA FORMS 11-256, 1 JUN 55 AND 11-257, 1 DEC 55, WHICH ARE OBSOLETE.

TM405-10-37

Figure 32. DA Form 11-256, pages 1 and 4.



LEGEND for marking conditions:
Satisfactory, ✓.
Adjustment, Repair or Replacement required, X.
Defect corrected, (X).

DAILY CONDITION FOR MONTH OF DECEMBER, 1957

NO.	DAILY ITEM	1	2 W/W	3 W/W	4 W/W	5 W/W	6 W/E	7 W/W	8	9	10	11	12	13	14	15	16	2D 3D ECHELON
		17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
1.	CLEAN EXTERNAL SURFACES OF OPTICAL COMPONENTS OF DUST, DIRT, HAZE, FINGER MARKS AND MOISTURE. *(CAUTION: Use only approved cleaning methods as outlined in pertinent technical manuals).*		✓	✓	✓	✓	✓	✓										
2.	CLEAN DIRT AND MOISTURE FROM EXPOSED SURFACES OF COMPONENTS. PAR. 33b		✓	✓	✓	✓	✓	✓										
3.	INSPECT SWITCHES AND CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS AND POSITIVE ACTION.		✓	✓	✓	✓	✓	X										
4.	INSPECT FOR BURNED OUT OR BLACKENED PROJECTION LAMPS AND BLACKENED ~~OR CRACKED~~ REFLECTORS. PAR 36b		✓	✓	✓	✓	✓	✓										
5.	DURING OPERATION BE ALERT FOR ANY UNUSUAL PERFORMANCE OR CONDITION. PARS. 26 AND 33b		✓	✓	✓	✓	✓	✓										

WEEKLY	CONDITION EACH WEEK 1ST	2D	3D	4TH	5TH	2D 3D ECH
6. ~~INSPECT BELTS AND/OR DRIVE CHAINS FOR PROPER JOINING, STRETCHED CONDITION, WEAR, AND/OR FRAYING.~~						
7. INSPECT EXPOSED METAL SURFACES FOR RUST, CORROSION AND CHIPPED PAINT. PAR. 33b	✓					
8. CLEAN CONDENSING LENSES AND REFLECTORS OF DIRT, DUST, OILY FILM. PAR. 33b	✓					
9. INSPECT APERTURE PLATE ~~AND PRESSURE SHOES~~ FOR BURRS.	✓					
10. ~~INSPECT REELS AND SPINDLES FOR DIRT, DUST AND LINT. CLEAN AS NECESSARY.~~						
11. LUBRICATE IN ACCORDANCE WITH PERTINENT DA LUBRICATION ORDERS. PAR. 33b	✓					

ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS	CONDITION
12. ~~INSPECT DRIVE CLUTCHES AND PULLEYS FOR SLIPPAGE.~~	
13. ~~TIGHTEN ALL LOOSE MOUNTING SCREWS AND FASTENERS.~~	
14. ~~OPERATE THE EQUIPMENT AND CHECK FOR OVERHEATING, SLUGGISHNESS OF OPERATION AND UNUSUAL NOISE OR VIBRATION.~~	
15. ~~CLEAN APERTURE PLATE ASSEMBLY, FILM PRESSURE SHOE ASSEMBLY, SPROCKET SHOE ASSEMBLY, GUIDEWAYS, SOUND DRUM, OF DIRT, OIL, DUST, OXIDE EMULSION.~~	

ADDITIONAL ITEMS FOR 2D AND 3D ECHELON ONSPECTIONS	START	END	CONDITION
16. ~~INSPECT CORDS, CABLE, WIRE, SHOCKMOUNTS FOR CUTS, KINKS, BREAKS, FRAYING, UNDUE STRAIN.~~			
17. ~~ENTER READINGS OF ELAPSED TIME METER OVER MONTH COVERED BY THIS REPORT.~~			
18. ~~INSPECT SEATING OF READILY ACCESSIBLE PLUG-OUT ITEMS: TUBES, LAMPS, FUSES, CONNECTORS.~~			
19. ~~INSPECT TRANSFORMERS, CHOKE, POTENTIOMETERS AND RHEOSTATS FOR OVERHEATING AND OIL LEAKAGE.~~			

IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING THE INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION. *(Continue on page 4, if more space is needed)*

ITEM 3. ENLARGER ON-OFF SWITCH DEFECTIVE. REPORTED TO HIGHER ECHELON FOR REPAIRS.

2 3

TM405-10-38

Figure 33. DA Form 11-256, pages 2 and 3.

	Item No	Item	Action or condition	Normal indication	Corrective measures
PREPARATORY	1	Enlarger	Connect to power source (par14).		
	2	Safelight ON-OFF switch (fig 34)	Move to ON position	Safelight lamp lights	Check that correct lamp is being used (par 14). Check for defective lamp (par 36). Check ON-OFF switch and power cord connectors (figs 11, 12, and 13).
	3	Enlarger ON-OFF switch (figs 3, 11, and 12).	Move to ON position.		
	4	Enlarger lamp:			
		a Interval timerTIME FOCUS switch (ac operation)	a Move to FOCUS and then to a TIME	Enlarger lamp lights and then goes off	Check that lens cap has been removed from projection lens. Check ON-OFF switch and all circuit connections (figs 11, 12, and 13).
		b Foot switch (dc operation)	b Press button and then release	b Enlarger lamp lights and then goes off.	Check for defective lamp (par 36).
	5	Negative carrier	Insert a loaded negative carrier into enlarger body (par 19)	Negative carrier should fit in place	Check locating holes and studs on PH-129-(*) and PH-639(*)/TF (par 19). Check action of plunger on EN-16 (1) (par 19).
	6	Easel	Load easel with plain white paper.		
	7	Condenser lens assembly	a Interval timer TIME-FOCUS switch in FOCUS position (ac operation) b Press foot switch button (de oper-	Image should be free of spots, streaks, and lines	Check condenser lens assembly for cracks, dirt, or scratches (par. 33b). Check negative for foreign matter ation) or scratches.
	8	Enlarger body	Raise or lower as required for correct enlargement size (par 21)	Image should be of desired size	Check the movement of the enlarger body. Check that correct condenser lens assembly and projection lens are being used (par 17).
	9	Bellows	Lengthen or shorten bellows as required for sharp focus (par 21)	Image should be in sharp focus No extraneous light comes from bellows	Check that bellows has no light leaks (par 34b). Check that condenser lens assembly and projection lens are in correct position (par 17).
	10	Projection lens	Adjust f/stop opening (par 21)	Image should be sharp and clear	Check focusing (par 21). Clean projection lens (par 33b).

TM 11-405-10

	Item No	Item	Action or condition	Normal indication	Corrective measures
PREPARATORY	11	Enlarger lamp	a Interval timer TIME-FOCUS switch in TIME position (ac operation). b Release pressure on foot switch button (dc operation).	Enlarger lamp goes off.	
	12	Easel	Load easel with photographic enlarging paper (par 20)	Supplies correct margin and size of print	Check masking arms for positive action. Readjust masking arms to desired positions (par 20).
	13	Timer: a Interval time (ac operation) b Continuous timer (dc operation).	a Set for desired exposure time (par 23c, d, or e). b Set to zero (par 23a or b).		
	14	Exposure	a Start (par 23c, d, or e) interval timer (ac operation) b Start (par 23a or b) continuous timer and press foot switch button (dc operation)	a Enlarger lamp lights and then goes off after exposure time elapses b Enlarger lamp lights Continuous timer indicates exposure time (Release pressure on foot switch button and enlarger lamp goes off.)	Replaces enlarger lamp (par 36b). For ac operation, check interval timer connections (fig 11 or 12). For dc operation, check foot switch connections and winding of continuous timer.
OPERATION	15	Exposed photographic enlarging paper	Process exposed photographic enlarging paper (par 26b(2)-(9))	Desired print is developed	Check that negative is in negative carrier. Check expiration date of photographic enlarging paper. Check solutions (par 22). Check processing procedures (TM 11-401).
STOPPING	16	Power cord	Disconnect from power source.		
	17	Safelight	Turn on room lights and turn off safelight.		
	18	Negative carrier	Remove from enlarger body and unload.		
	19	Lens cap	Place on projection lens.		

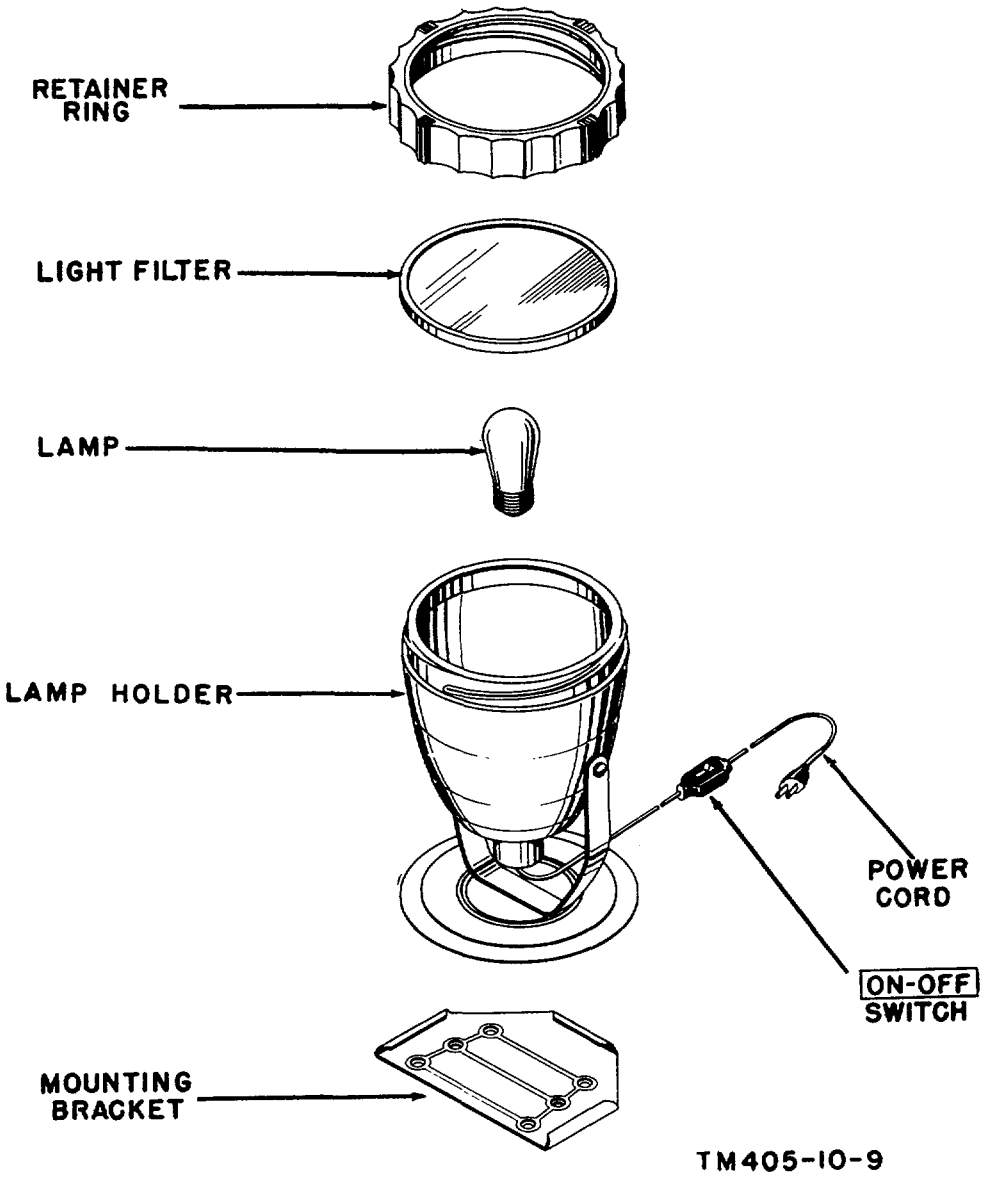


Figure 34. Lamp PH-422-A, disassembled.

36. Repairs

a. Safelight (fig. 34). If replacement of the lamp in the safelight is necessary, proceed as follows:

(1) Remove the lamp holder from the mounting bracket.
(2) Unscrew the retainer ring and remove the light filter. Be careful not to drop the light filter.
(3) Unscrew and remove the lamp.
(4) Screw the replacement lamp into the lamp holder.
(5) Replace the light filter and the retainer ring.
(6) Replace the lamp holder in its mounting bracket.

b. Enlarger Lamp. If the lamp in the enlarger body must be replaced (par. 35b), proceed as follows:

(1) PH-129-(*) or PH-639 (*)/TF.
(a) Pull the control lever (fig. 14) forward and over the control lever stop.

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(b) Loosen the knurled screws (fig. 2) and remove the condenser lens assembly.
(c) Remove the lamp (not shown) from inside the lamp house.
(d) Check the condition of the reflector in the lamp house. If it is dirty, remove the projection lens, clean the reflector with a clean lint-free cloth, and then replace the projection lens.
(e) Insert a replacement lamp in the lamp house.
(f) Replace the condenser lens assembly and hand-tighten the knurled screws.
(g) Return the control lever (fig. 14) to its original position.

(2) EN-16 (1).
(a) Loosen the knurled screws (fig. 3).
(b) Remove the lamp house reflector.
(c) Check the condition of the inside of the lamp house reflector. If the inside of the lamp house reflector is dirty, clean it with a clean lint-free cloth.
(d) Remove the lamp and insert a replacement lamp.
(e) Replace the lamp house reflector and hand-tighten the knurled screws

CHAPTER 5
SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT A

37. Disassembly of Processing Set

Disassemble the processing set for packaging as follows:

a. Disconnect all power cord connections.

b. Disconnect the safelight.

c. Clean all components (par. 33) and stack in readiness for packaging.

d. Remove the condenser lens assembly from the enlarger body.

e. Remove the enlarger body from the girder assembly.

f. Remove the girder assembly from the basebard.

g. Place the components in their respective carrying cases (figs. 6 and 7 or 8 and 9).

38. Repackaging Processing Set for Shipment or Limited Storage

Repackaging of the processing set is covered in TM 11-405-25.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

39. Authority for Demolition

Demolition of the equipment will be accomplished only upon the order of the commander. Use the destruction procedures outlined in paragraph 40 to prevent further use of the equipment.

40. Methods of Destruction

a. If complete destruction of the equipment cannot be accomplished in the time available, destroy the following components in the order given

(1) Condenser lens assemblies.
(2) Projection lenses.
(3) Enlarger.
(4) Remaining components of the processing set.

b. Use any of the following methods:

(1) *Smash.* Smash the lenses, timers, and all metal components; use sledges, axes, handaxes, pickaxes, hammers, or crowbars.
(2) *Cut.* Cut all cords, cables, and wiring; use axes, handaxes, or machetes.
(3) *Burn.* Burn cords, cables, manuals, and film; use gasoline, kerosene, oil, flame throwers, or incendiary grenades.
(4) *Explode.* If explosives are necessary, use firearms, grenades, or TNT.
(5) *Dispose.* Bury or scatter the destroyed parts in slit trenches, foxholes, or other holes, or throw them into streams.

APPENDIX I
REFERENCES

Following is a list of references applicable and available to the operator of the processing set.

AR 380-5	Military Security.
AR 700-38	Logistics (General) Unsatisfactory Equipment Report.
AR 700-58	Logistics (General) Report of Damaged or Improper Shipment.
TM 11-401	Elements of Signal Photography.
TM 11-405-25	Processing Equipment PH-406 and Photographic Film Processing Unit ES-20 (1).
TM 11-487F	Directory of Signal Corps Equipment, Photographic Equipment.
TM 11-2339	Printers PH-129 and PH-129-A, Photographic Enlargers.
TM 11-2339A	Printers PH-129-B, PH-639/TF, PH-639A/TF, and Photographic Projection Printer EN-7 (1).
TM 11-2339B	Photographic Projection Printer EN-16(1).

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APPENDIX II
OPERATOR MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS LIST FOR PROCESSING UNIT PHOTOGRAPHIC FILM ES-20(1) (Includes Processing Equipment PH-406)

Section I. General

1. Scope

a. General. This appendix lists items supplied for initial operation and for running spares and accessories. The list includes tools, accessories and similar material issued as part of the major end item. This portion lists the basic allowance data for parts and accessories required for maintenance of PROCESSING UNIT PHOTOGRAPHIC FILM ES-20(1); PROCESSING EQUIPMENT PH-406. These equipment's are issued on the basis of allowances prescribed in equipment authorization tables and other documents which are a basis for requisitioning.

b. Columns.

(1) Federal or technical service stock number. The stock number column lists the 11-digit Federal stock number assigned by the Cataloging Division, OASD (S&L). In the absence of a Federal stock number, the technical service stock number will be used for requisitioning purposes.

(2) Source code. Repair parts source, maintenance and recoverability code symbols provide information on the use and availability of repair parts according to their functional application. The following are source code-repair parts definitions in accordance with AR 70018.

(a) Technical Service Supply Sources Code 11 indicates a stock Signal Corps part. Refer to AR 310-2 for Technical Service identifying number.

(b) The most efficient and practical source or method of supply for the part.

1. Code P is applied to repair parts 52 general which are high mortality parts; procured by technical services, stocked in and supplied from the technical service depot system, and authorized for use at indicated maintenance echelons.
2. Code P1 is applied to repair parts which are low mortality parts procured ,by technical services, stocked only in and supplied from technical service key depots, and authorized for installation at indicated maintenance echelons.

(c) The lowest maintenance echelon authorized to install the repair part.

1. "O" Organizational Maintenance (lst and 2d echelon).
2. "F" Field Maintenance (3d echelon).
3. "H" Field Maintenance (4th echelon).
4. "D" Depot Maintenance (5th echelon).

(d) The recoverability aspects of the part.

1. Code R-Repairable. Applied to repair parts and assemblies which are economically repairable and, when available, are furnished by supply on an exchange basis.
2. Code S-Salvageable. Applied to repair parts which may be placed in "Ready for Issue" condition by cleaning, replating, anodizing, adjusting, welding, etc.

(3) Designation by model. This column lists parts for two or more models of a particular equipment or when differences in the same model occur. A dagger (t) indicates the model in which the part is used.

(4) Description. Nomenclature or the standard item name and brief identifying data for each item is listed in this column. When requisitioning, enter the nomenclature and description on the requisition.

(5) Unit of issue. The unit of issue is the supply medium by which the individual item is counted for procurement, storage, requisitioning, allowances and issue purposes.

(6) Expandability. Expendable items are indicated by the letter X; nonexpendable items are indicated by NX.

(7) Quantity authorized. Under "Items Comprising an Operable Equipment" the column lists the quantity of items supplied for the initial operation of the equipment. Under "Running Spares and Accessories" the quantities listed are those issued initially with the equipment as spare parts. The quantities are authorized to be kept on hand by the operator for maintenance of the equipment.

(8) Illustration. The illustration columns refer to either the diagrams or illustrations in which the item appears. References appearing in the item number column are a combination of signs or symbols used for identification of the items appearing in illustrations or schematic diagrams shown in another portion of this manual, supplemental circuit labels or technical bulletins.

[[AG 413.55 (21 Mar 58)]

2. Abbreviations

AWG .....American Wire Gauge
Simmon Bros .....Simmon Brothers
cond .....conductor
dia .....diameter
dwg.....drawing
min .....minimum
neg .....negative
o/a .....overall
term .....terminal

3. Comments or Suggestions

Any comments concerning omissions and discrepancies in this appendix will be prepared on DA Form 2028 and forwarded directly to Commanding Officer, U. S. Army Signal Equipment Support Agency, Fort Monmouth, N. J., ATTN: SIGFM/ES-ML.

By Order of *Wilber M. Brucker,* Secretary of the Army:

MAXWELL D. TAYLOR,
General, United States Army,
Chief of Staff.

Official:

HERBERT M. JONES,
Major General, United States Army,
The Adjutant General.

Distribution:
Active Army:

ASA (2)
CNGB (1)
Technical Stf, DA (1) except CSigO (30)
Technical Stf Bd (1)
USA Arty Bd (1)
USA Armor Bd (1)
USA Inf Bd (1)
USA Air Def Bd (1)
USA Abn & Elct Bd (1)
USA Avn Bd (1)
USA Armor Bd Test Sec (1)
USA Air Def Bd Test Sec (1)
USA Arctic Test Bd (1)
USCONARC (5)
US ARADCOM (2)
OS Maj Comd (5)
Log Comd (5)
MDW (1)
Armies (5)
Corps (2)
USA Corps (Res) (1)
Div (2)
USATC (2)
Ft & Camp (2)
Svc Colleges (5)
Br Svc Sch (5) except USASCS (25)
Gen Depots (2) except Atlanta Gen Depot (None)
Sig Sec, Gen Depots (10)
Sig Depots (17)
Fld Comd, AFSWP (5)
Engr Maint Cen (1)
Army Pictorial Cen (2)
WRAMC (1)
AFIP (1)
AMS (1)
Port of Emb (OS) (2)
Trans Terminal Comd (2)
Army Terminals (2)
OS Sup Agcy (2)
USA Sig Pub Agcy (8)
USA Sig Cornm Engr Agcy (1)
USA Comm Agcy (2)
TASSA (13), Chicago Rgn Ofc (1)
USA Sig Eqp Spt Agcy (2)
USA White Sands Sig Agcy (13)
Yuma Test Sta (2)
USA Elct PG (1)
Sig Fld Maint Shops (3)
Sig Lab (5)
Mil Dist (1)
Sectors, USA Corps (Res) (1)
JBUSMC (2)
Units org under fol TOE:
8-650 (2)
11-7 (2)
11-15 (2)
11-16 (2)
11-18 (2)
11-57 (2)
11-96 (2)
11-127 (2)
11-128 (2)
11-500 (AA-AE) (2)
11-557 (2)
11-587 (2)
11-592 (2)
11-597 (2)
30-500 (2)
32-500 (2)
39-51 (2)
3961 (2)

NG: State AG (6), unit—same as Active Army, Except allowance is one copy to each unit.
USRA: None.
For explanation of abbreviations used, see AR 320-50.

*U.S. GOVERNMENT PRINTING OFFICE: 1994 - 342-4211/80978
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