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# TM 11-2378

WAR DEPARTMENT TECHNICAL MANUAL

*U.S. Dept. of Army*

## TIMER PH-191-A



**RESTRICTED.** DISSEMINATION OF RESTRICTED MATTER. The information contained in restricted documents and the essential characteristics of restricted materiel may be given to any person known to be in the service of the United States and to persons of undoubted loyalty and discretion who are cooperating in Government work, but will not be communicated to the public or to the press except by authorized military public relations agencies. (See also par. 28, AR 380-5, 15 Mar. 1944.)

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WAR DEPARTMENT

4 OCTOBER 1944

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WAR DEPARTMENT,  
WASHINGTON 25, D.C.,          4 OCTOBER 1944.

TM 11-2378, Timer PH-191-A, is published for the information and guidance of all concerned.

[A. G. 300.7 (18 May 44).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,  
*Chief of Staff.*

OFFICIAL:

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*Major General,*  
*The Adjutant General.*

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(For explanation of symbols see FM 21-6.)

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TM 11,2378  
1944

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## DESTRUCTION NOTICE

**WHY** —To prevent the enemy from using or salvaging this equipment for his benefit.

**WHEN**—When ordered by your commander.

- HOW**
1. Smash—Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.
  2. Cut —Use axes, handaxes, machetes.
  3. Burn —Use gasoline, kerosene, oil, flame throwers, incendiary grenades.
  4. Explosives—Use firearms, grenades, TNT.
  5. Disposal —Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

### USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

- WHAT**
1. Smash—Flashlight.
  2. Cut —Connecting cords.
  3. Burn —Carrying case, base, lensboard frame.
  4. Bend —Channel, septum, slide, weight.
  5. Bury or scatter—All that remains.

## DESTROY EVERYTHING

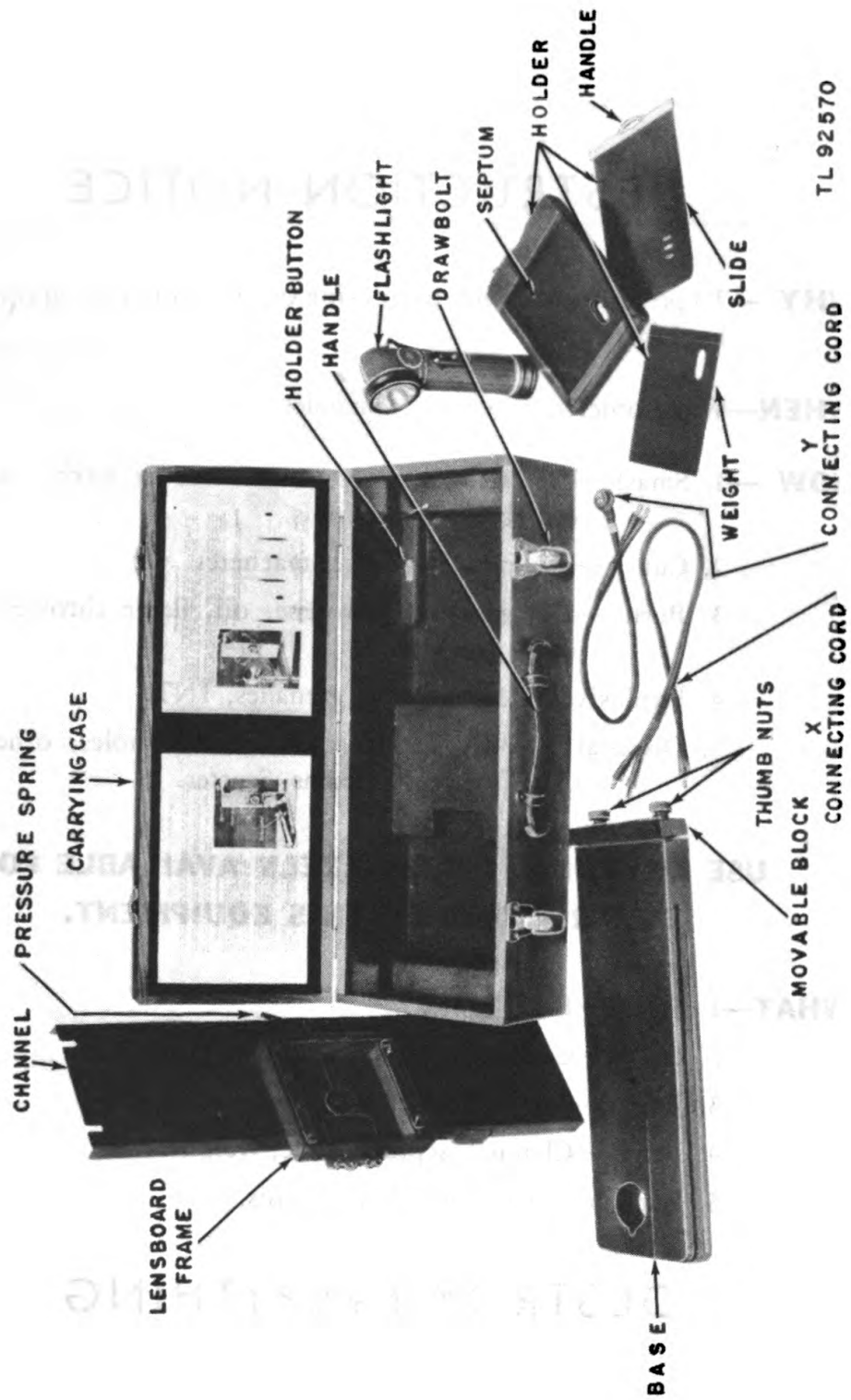


Figure 1. Timer PH-191-A.

# RESTRICTED

## SECTION I DESCRIPTION

### 1. GENERAL.

The Graflex gravity-type synchronizer tester, Timer PH-191-A (fig. 1) is a portable, self-contained device designed to check the accuracy of the adjustment of electro-magnetic photoflash synchronizers. The timer consists of a wooden base, a steel channel which accommodates the electrical mechanism, a special sheet-film holder, a flashlight, two electrical cables, called connecting cords, and a wood carrying case.

### 2. LIST OF COMPONENTS, WEIGHTS, AND DIMENSIONS.

When packed, Timer PH-191-A weighs 11.75 pounds and measures  $22\frac{3}{4}$  by 6 by 9 inches. It consists of the following components:

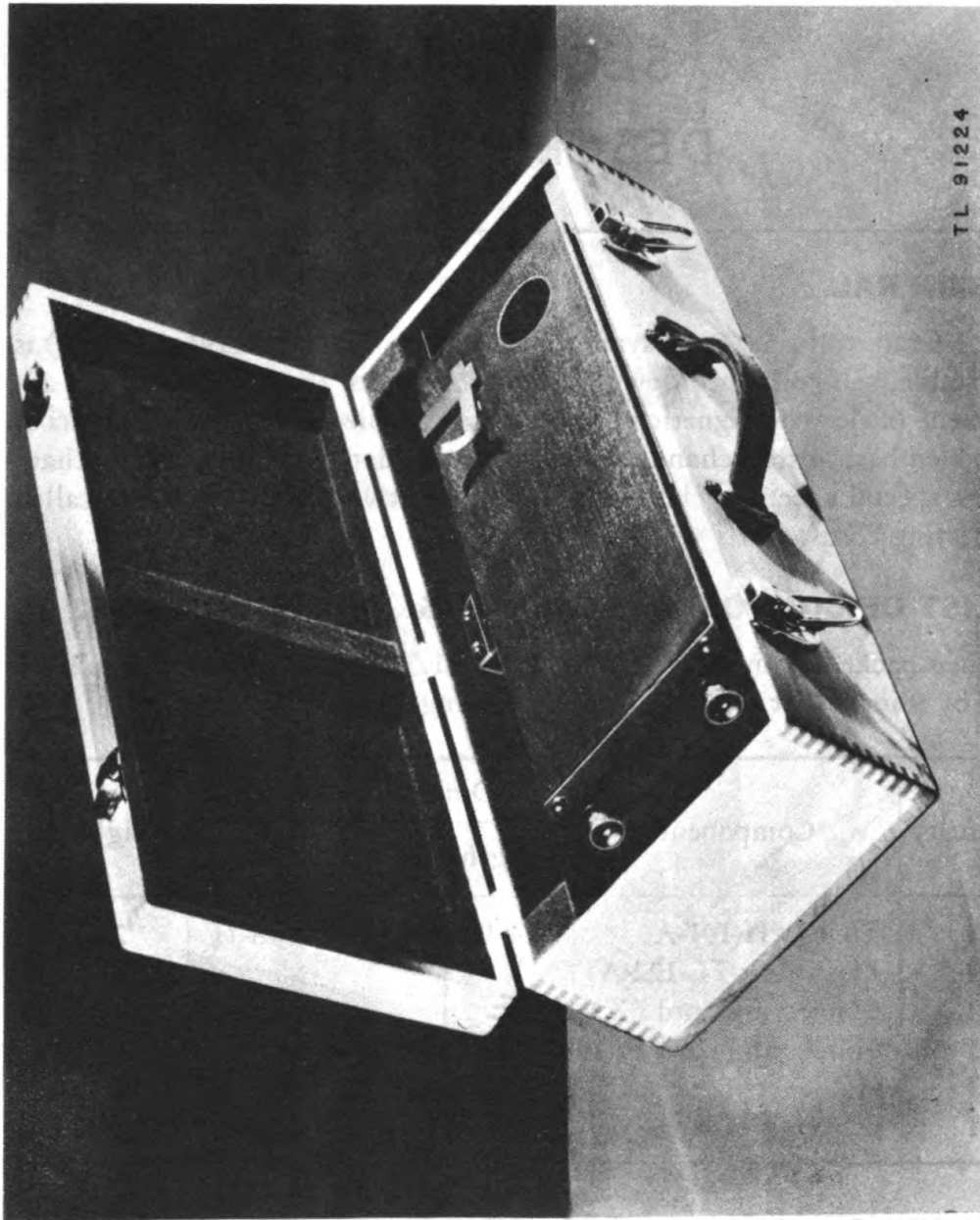
Quantity	Component	Dimensions (in.)			Weight (lb)
		Length	Width	Height	
1	Timer PH-191-A	$14\frac{1}{2}$	$4\frac{3}{4}$	$18\frac{7}{8}$	2.81
1	Flashlight TL-122-A	7			0.81
1	Connecting cord (X)	21			
1	Connecting cord (Y)	17			
1	Holder	$6\frac{3}{4}$	$4\frac{3}{4}$		0.75
1	Carrying case	$19\frac{3}{4}$	7	$5\frac{1}{4}$	5.88

### 3. TIMER PH-191-A (figs. 3, 4, and 5).

**a. Base (fig. 5).** The wooden base has a hole in one end, which holds the battery case of the synchronizer being tested. At the other end of the base is a movable block, which holds the channel in a vertical position when the thumbnuts are tightened.

**b. Channel (fig. 5).** (1) The steel channel is designed to hold a lens-board frame in position on the front, and to guide the film holder so that it makes contact with a microswitch located on the right side. A bracket on the back supports the flashlight in relative position to the shutter being tested. On the side of the channel, opposite the microswitch, is a pressure





*Figure 2. Timer PH-191-A in case.*

spring designed to force the holder next to the finger of the microswitch. The channel measures  $4\frac{3}{4}$  by  $18\frac{11}{16}$  inches and weighs 1.44 pounds.

(2) A single hole at the left and three holes at the right of the channel are placed at the height of the flashlight lamp. A disk with two holes is pivoted around the center of the three holes, so that when it is in its lower position, the arm covers the single hole at the left and exposes all three on the right.

(3) The lensboard frame (fig. 3) located on the front of the channel has the same type of slide lock and retaining strip as Camera PH-47-E. This lensboard frame holds the shutter during testing in alignment with the flashlight lamp.

#### **4. FLASHLIGHT (figs. 1 and 5).**

Flashlight TL-122-A is held in position by a bracket on the back of the channel so that its light shows through the shutter being tested. The flashlight is used with visual test only.

#### **5. CONNECTING CORDS X AND Y (fig. 1).**

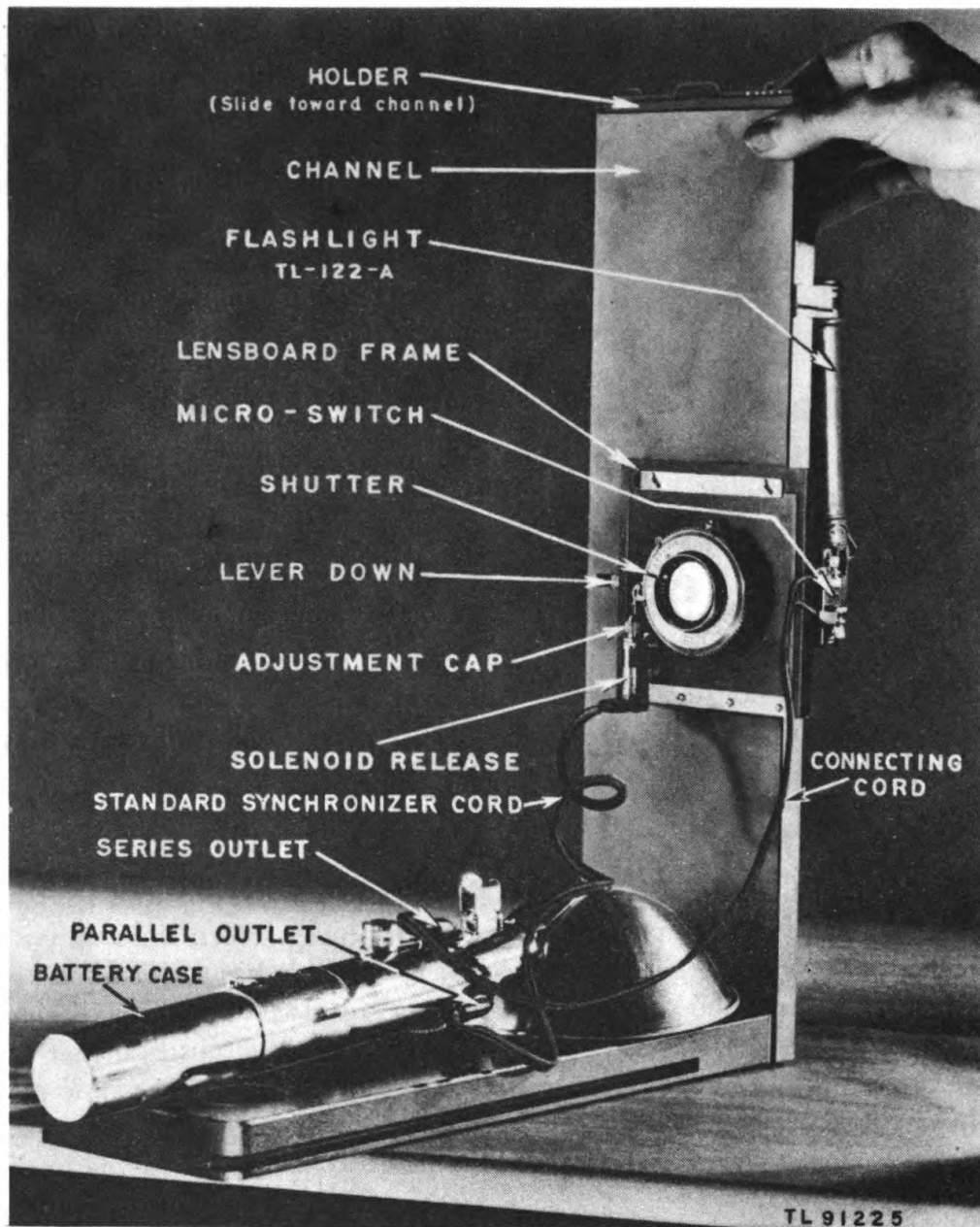
Two connecting cords are furnished with this equipment. The Y cord, with pin-plugs on one end and a female receptacle on the other, is used in testing the Graflex synchronizer; the X cord, with pin-plugs on both ends, is used in testing the Mendelsohn synchronizer.

#### **6. HOLDER (fig. 1).**

This special holder has a steel weight next to the septum and has one slide. The weight and septum have an oval opening which lines up with three small slots in the slide. The top slot in the slide has a blue filter, the center slot is open, and the lowest slot has a red filter. In testing the synchronizer, the holder falls through the channel in such a position that the hole in the weight and septum as well as the three slots in the slide pass behind the three holes in the channel. As the holder falls through the channel it strikes the spring finger on the microswitch, which actuates the flash synchronizer.

#### **7. CARRYING CASE (figs. 1 and 2).**

The wood carrying case is  $19\frac{3}{4}$  by 7 by  $5\frac{1}{4}$  inches; its weight is 5.88 pounds. It has a hinged lid, with a leather carrying handle and two drawbolts.



*Figure 3. Timer PH-191-A, set up for visual test.*

# SECTION II

## INSTALLATION AND OPERATION

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### 8. INSTALLATION.

Remove Timer PH-191-A from its carrying case and set up as shown in figure 3. Loosen the knurled thumbnuts to allow the movable block to extend from the base, and insert the slotted end of the channel between the block and the base, with the lensboard frame facing the opposite end of the base. Tighten the thumbnuts to secure the channel in position.

### 9. PREPARATION FOR USE (fig. 3).

**a.** Remove the lensboard, shutter, lens, and tripper, as one unit, from the camera, and install it in the lensboard frame on the front of the channel. Place the battery case as shown in figure 3.

**b.** Connect the solenoid release to the parallel outlet on the battery case of the synchronizer being tested, using *synchronizer* connector cord.

**c.** Locate the series outlet on the battery case being tested.

(1) On the Graflex synchronizer, the series outlet may be found by unscrewing the button on the back of the battery case.

(2) On the Mendelsohn synchronizer, the series outlet may be found on either side of the button on the back of the battery case.

**d.** Connect the battery case to the microswitch.

(1) Using connecting cord Y (fig. 1) for the Graflex synchronizer, connect the female receptacle to the series outlet and insert the pin plugs in the clips located on the side of the microswitch.

(2) Using connecting cord X (fig. 1) for the Mendelsohn synchronizer, insert the pin-plugs on one end in the series outlet, and the pin-plugs on the other end in the clips located on the side of the microswitch.

**e.** Test the circuits by pressing lightly on the operating lever of the microswitch (the finger extending into the channel). This should cause the solenoid release to operate in the normal manner as though the battery case switch were closed.

### 10. OPERATION.

The actual test of the synchronizer may be made by the visual adjustment or the photographic adjustment, or both methods may be used.

**a. Visual Adjustment (figs. 3 and 5).** This test does not require the use of a flash lamp or photographic paper. Make the adjustment in a dark or dimly lighted room, so that the colored slots in the slide will be easily visible.

(1) Set the lever in its horizontal position so that all three holes in the right side of the channel are opened and the single hole at the left side of the channel is covered by the lever.

(2) Set the shutter at its highest speed, cock it, and open the diaphragm of the lens to its maximum aperture.

(3) If the two cells are not in Flashlight TL-122-A, remove the end cap and install them properly. Pull out the wire loop in the cap on the base of the flashlight and turn the cap until the loop projects from the flashlight in exactly the same direction as the reflector. Place the loop over the extreme top projection of the flashlight bracket on the rear of the channel and allow the flashlight to hang down with its reflector facing the channel and opposite the three holes.

(4) Light the flashlight.

(5) Place the holder at the top of the channel with its slide facing toward the channel, making sure that it is in such a position that the three slots will pass behind the three corresponding holes in the channel.

(6) Place the eye directly in front of the lens.

(7) Hold the holder (fig. 3) so that the bottom edge of the grey band on the top of the slide is exactly even with the top of the channel, and allow it to fall freely by relaxing the pressure of the forefinger. The holder will press the spring finger of the microswitch, thus actuating the flash synchronizer.

(8) If properly synchronized, the shutter should show all three colors (red, white, and blue) in their proper position, simultaneously and with equal brightness, as the shutter opens and closes. If the shutter is not properly synchronized (that is, if it is fast or slow) proceed as follows:

(a) When the synchronizer is fast, it trips the shutter before the lamp reaches the peak of its intensity, and red appears at the top or red at the center and white at the top with blue not appearing. Correct this condition in the Graflex synchronizer, by turning the cap of the solenoid release counterclockwise; correct in the Mendelsohn synchronizer by turning the adjusting pointer of the tripper counterclockwise in the direction of the arrow marked SLOW. Repeat the tests until all three colors appear in their correct position.

(b) When the synchronizer is slow, it trips the shutter after the flash lamp has passed its peak of intensity, and blue appears at the bottom or blue at the center and white at the bottom. To correct, turn either the cap

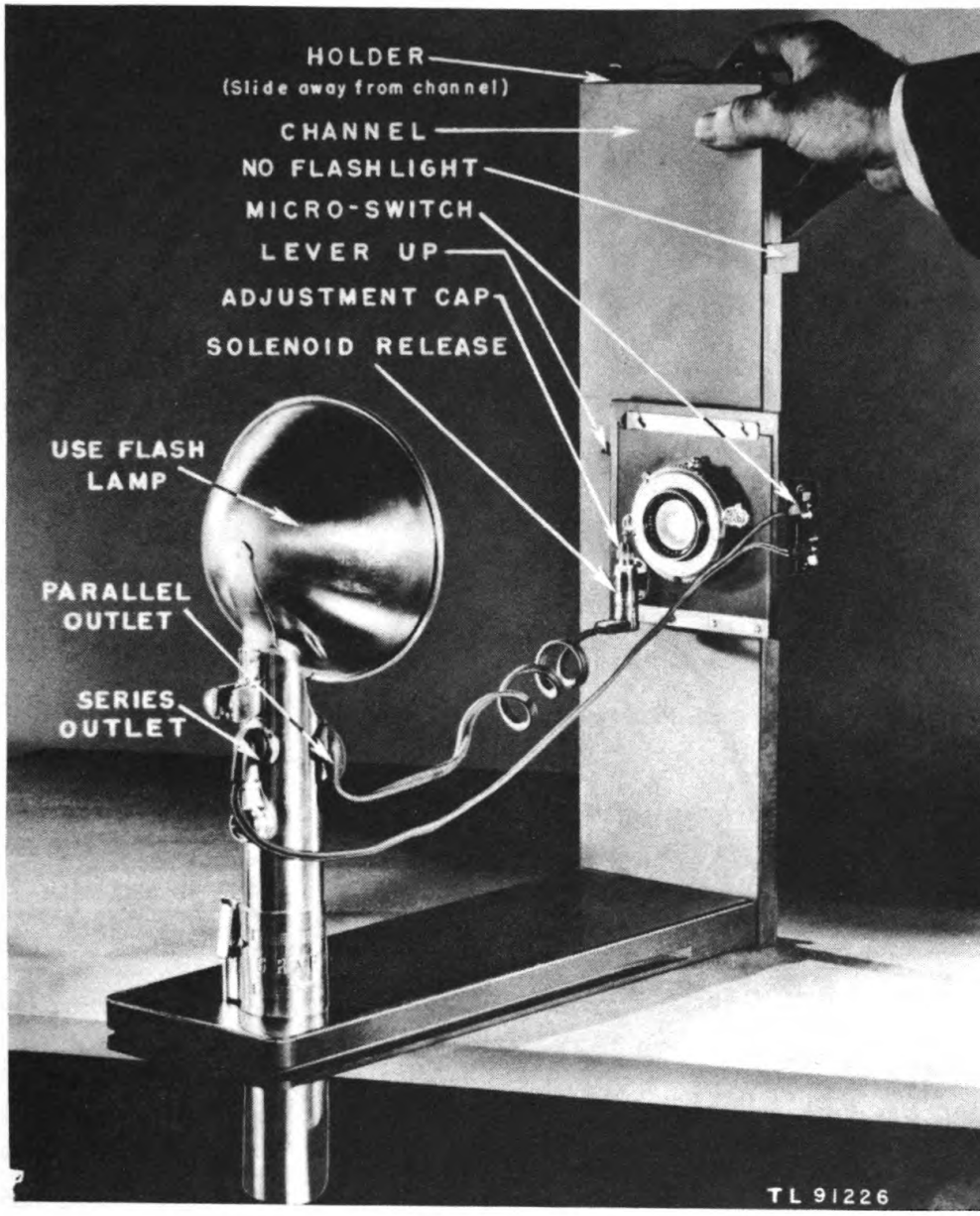


Figure 4. Timer PH-191-A, set up for photographic test.

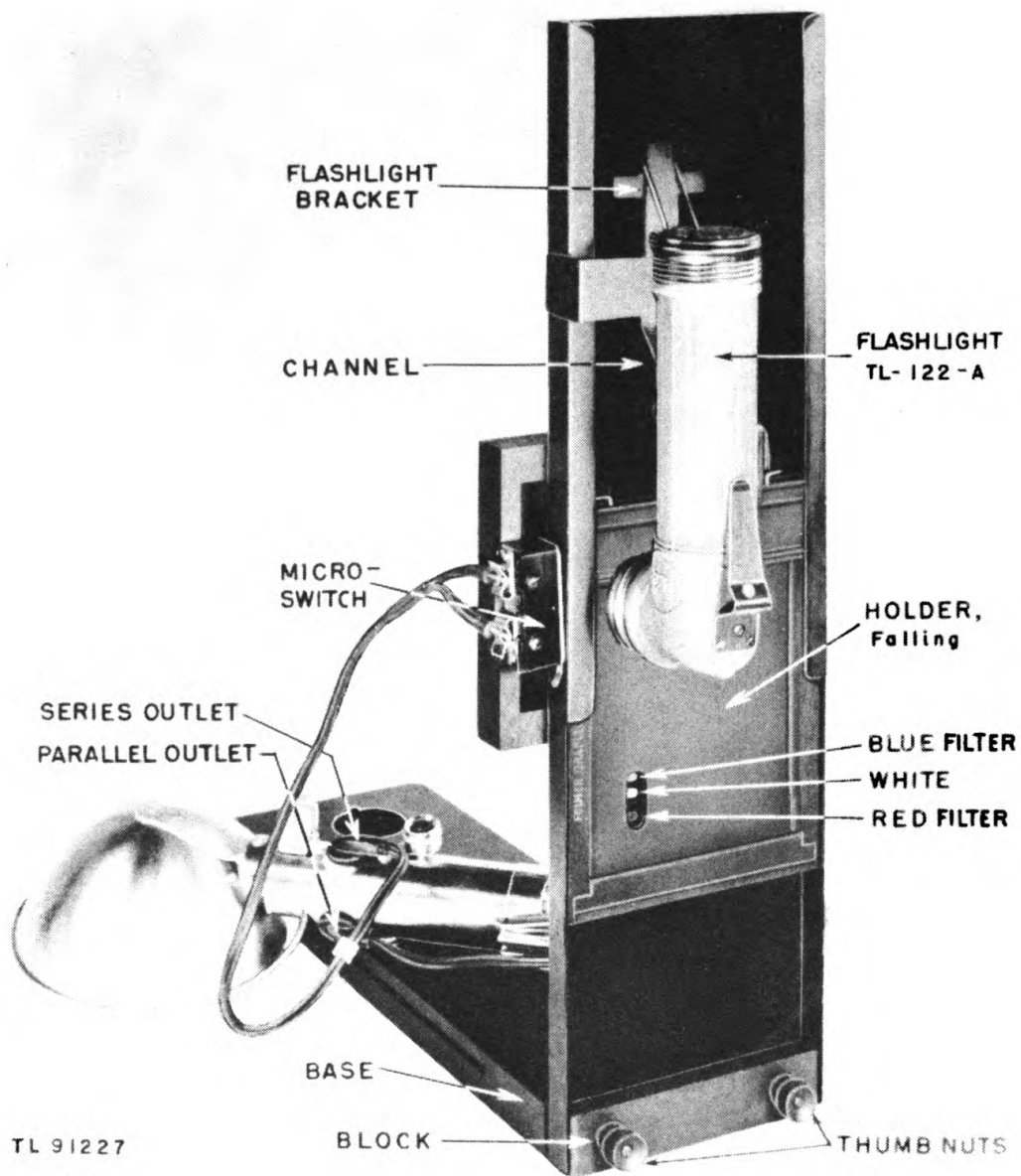


Figure 5. Timer PH-191-A, back view.

of the Graflex solenoid release, or the adjusting pointer of the Mendelsohn tripper, in a clockwise direction, repeating the tests until all three colors appear in their correct position.

**b. Photographic Test (fig. 4).** The photographic test, employing a flash lamp and photographic paper, assures an accurate recording of tripper performance, thereby permitting a more precise adjustment.

(1) Raise the lever as far as it will go so that the top and the bottom holes at the right side of the channel are completely covered and the small single hole at the left side of the channel is open as is the center one of the three holes.

(2) Locate the timer so that the end of the base which has the hole overhangs the edge of the table, and place the battery case in position as indicated in figure 4.

(3) Insert the flash lamp in the socket of the battery case. Use a lamp designed for a between-the-lens shutter, not one designed for a focal-plane shutter.

**NOTE:** Flashlight TL-122-A is not used in making this test.

(4) Set the shutter at its highest speed, cock it, and open the diaphragm of the lens to its maximum aperture.

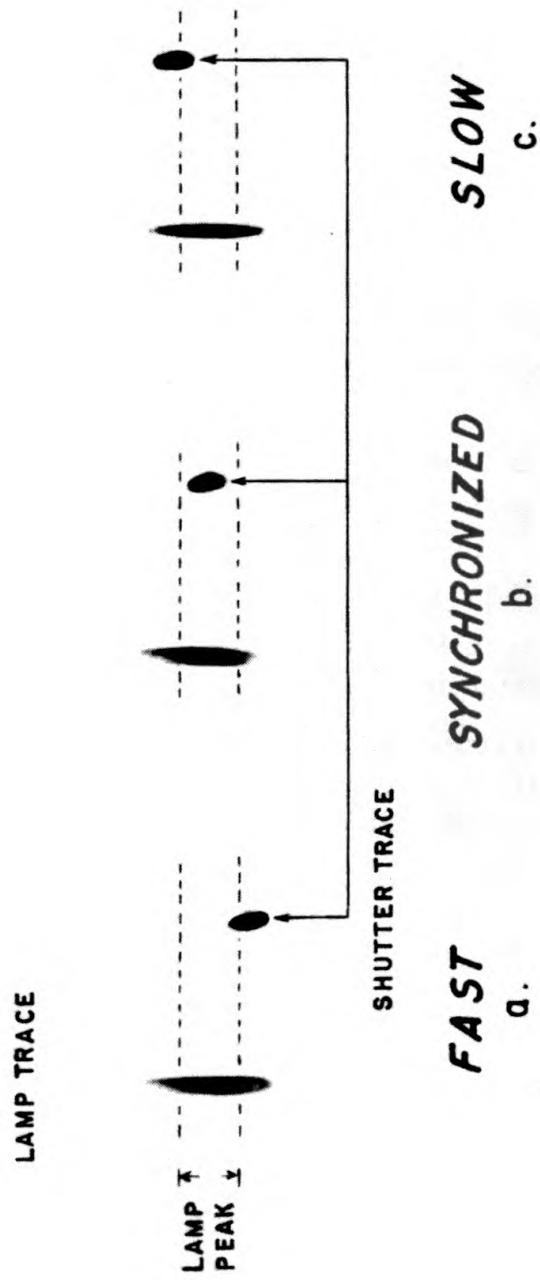
**CAUTION:** It is essential that this adjustment be made in a room that is dark or only very dimly lighted because it requires the use of photographic printing paper that must not be fogged. A yellow or orange safelight will afford sufficient illumination.

(5) Insert a piece of 4- by 5-inch contact printing paper, of high contrast grade, in the septum of the holder (at the open side of the holder, opposite the slide with the colored windows). Place the holder at the top of the channel with the sensitized paper facing toward the channel and hold as shown in figure 4.

(6) Permit the holder to fall by relaxing the forefinger. As the holder falls in the channel it closes the microswitch, causing the lamp to flash and the solenoid release to trip the shutter. This causes two traces to be exposed on the paper in the holder, the single hole at the left being open during the whole time the lamp is lit, and the single hole at the right being open only during the time the shutter is open.

(7) Process the paper, arresting development as soon as possible after appearance of the images. This will prevent overdevelopment of the images, which would result in loss of differentiation between the darkest area, representing the peak of the lamp trace, and the lighter areas, exposed during the increasing and decreasing illumination at the beginning and end of the flash.





TL 91228

Figure 6. Timer PH-19X-A, test traces.

(8) Compare the results with those shown in figure 6. The dotted lines in this figure were added to facilitate identification of the peak of the lamp flash. The long trace (tapered at each end) at the left is made by the light that passes through the left-hand hole, and corresponds to the total period of illumination of the flash lamp. The trace at the right is formed by the light passing through the shutter during the time it was open, and indicates the time relationship of the shutter exposure to the lamp flash.

(a) The shutter trace, to indicate perfect synchronization, should lie opposite the darkest and broadest portion of the lamp trace (fig. 6b).

(b) When the synchronizer is fast (that is, when it trips the shutter before the lamp reaches its maximum intensity) the shutter trace will be near the bottom of the lamp trace (fig. 6a). Turn the adjusting nut counter-clockwise to slow the synchronization of the tripper.

(c) When the synchronizer is slow (that is, when it trips the shutter after the lamp has reached the peak of its illumination) the shutter trace lies near the top of the lamp trace (fig. 6c). Turn the adjusting nut clockwise to speed up the synchronization of the shutter.

(d) If adjustment was made, make a second test to check the new setting.

# SECTION III

## FUNCTIONING OF PARTS

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### **11. PRINCIPLES OF OPERATION.**

The purpose of Timer PH-191-A is to test the accuracy of the flash synchronization and to show the adjustment necessary to give perfect synchronization.

**a.** Since the velocity of the falling holder is constant, the time interval from the instant the contact closes the circuit until the slots in the holder are in alignment with the shutter, will be duplicated with reasonable accuracy, thus affording the means of testing.

**b.** The actual testing is accomplished by the pressure of the falling holder against the finger of the switch, which in turn closes the circuit, causing the battery to light the lamp and trip the shutter. If perfectly synchronized, the slots in the holder should be in direct alignment with the shutter at the time the bulb is lighted.

# SECTION IV

## MAINTENANCE

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**NOTE:** Failure or unsatisfactory performance of equipment will be reported on W. D., A. G. O. Form No. 468. If this form is not available, see TM 38-250.

### 12. GENERAL.

Timer PH-191-A has been constructed and designed so that, with proper care, little or no maintenance is required.

### 13. INSPECTION.

**a.** Make the connections as indicated in paragraph 9. Before starting the actual test, cock the shutter and press on the switch finger which extends into the back of the channel. Pressure on this finger should cause the shutter to trip, exactly as it would if the finger release button of the battery case were used. If the shutter does not trip, refer to the trouble and remedy chart (par. 20).

### 14. LUBRICATION.

No lubrication of any kind is required for Timer PH-191-A.

### 15. MOISTUREPROOFING AND FUNGIPROOFING.

Moistureproofing and fungiproofing are not required with this equipment.

### 16. REPLACEMENT OF SWITCH.

**NOTE:** Before removing the switch, place the holder in the channel and ease it down to the finger of the microswitch. Move it slowly past the finger. Mark the channel at the bottom of the holder the exact instant the microswitch clicks. Repeat two or three times, striking an average, and erase all but the average mark. This mark forms a guide for proper alignment of the microswitch in reassembly.

**a. Removal.** (1) Remove the two screws, two lockwashers, and two hexagonal nuts which hold the switch to the channel plate.

(2) Remove the two screws holding the clips to the side of the switch, removing the clips at the same time.

**b. Replacement.** (1) Place the clips in position on the side of the new switch, securing with two screws removed in (subpar. **a** (2)).

(2) Place the switch in position on the channel plate.

(3) Place the lockwashers on the two screws, extending the screws through the switch and the channel plate.

- (4) Secure the screws with hexagonal nuts.
- (5) Check the position of the switch as follows:
  - (a) Place a test bulb in the battery case socket.
  - (b) Connect the microswitch to the series outlet on the battery case (fig. 4).
  - (c) Insert the holder in the channel, easing it down to the microswitch finger.
  - (d) Move the holder slowly with the finger, observing the exact time that the test lamp ignites. Make a pencil mark on the channel at the bottom of the holder at the point where the lamp ignited. Repeat two or three times, marking the channel each time. If any variation appears, strike the average, erasing all other marks. If there is more than  $\frac{1}{8}$ -inch difference between the marks, loosen the lower screw holding the microswitch, moving the switch until correct markings are obtained. The upper screw should not be loosened, since it acts as a pivot.

## 17. REPLACEMENT OF PRESSURE SPRING.

**a. Removal.** Straighten the prongs, using small pliers, so that the spring may be removed. Remove the spring.

**b. Replacement.** (1) Place the new spring over the prongs on the side of the channel.

(2) Press the prongs toward the center, in order to retain the spring in its original position.

(3) Be sure the spring extends into the slot far enough to exert pressure on the holder.

## 18. REPLACEMENT OF LENSBOARD FRAME ASSEMBLY.

**a. Removal.** (1) Unscrew and remove the four screws, from the back of the channel, which hold the lensboard frame assembly in position.

(2) Remove the lensboard frame assembly from its position on the channel.

**b. Replacement.** (1) Set the new lensboard frame assembly in the following position on the channel:

(a) Place the part with the sliding lock at the top.

(b) Place the small slot on the side over the lever arm.

(c) Place the opposite side flush with the switch (not the channel plate).

(2) Insert screws from the back of the channel and tighten.

## 19. REPLACEMENT OF BUMPER.

**a. Removal.** Remove the three nails holding the bumper to the movable

block on the end of the base, and remove the bumper. Clean the base, removing old glue and residue of the bumper.

**b. Replacement.** Before replacing the bumper, place a small quantity of glue along the movable block. Place the bumper in position and secure with three wire nails.

## 20. TROUBLES, CAUSES, AND REMEDIES.

<i>Symptom</i>	<i>Possible cause</i>	<i>Remedy</i>
Shutter will not trip.	Exhausted batteries in synchronizer battery case.	Replace batteries.
	Moisture in solenoid release.	Dry solenoid release. Refer to TM 11-2352.
Flash lamp will not ignite.	Exhausted batteries in synchronizer battery case.	Replace batteries.
	Poor connections.	Be sure all connecting cords are properly connected.
	Holder not making contact with the switch.	Be sure the pressure spring exerts sufficient pressure against the holder to force it against the finger of the switch; if it does not, bend until it presses firmly against the holder.

## SECTION V SUPPLEMENTARY DATA

### 21. MAINTENANCE PARTS LIST FOR TIMER PH-191-A.

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
Fig. 1	8A3830-191A/C1	CABLE ASSEMBLY, power: used to connect microswitch to batt.; RC; oval; $\frac{1}{4}$ " x $\frac{1}{8}$ " x $\frac{1}{8}$ " lg; #18AWG, two 41-strand #34; Gencable #POSJ cond; 2 phone tips 0.082" diam x 7/16" lg ea end; rubber-insulated; no color coding; p/o Sig C Timer PH-191-A.	1				**	**	*
Fig. 1	8A3830-191A/C2	CABLE ASSEMBLY, power: used as connector for synchronizer; RC; oval; $\frac{1}{4}$ " x $\frac{1}{8}$ " x $\frac{1}{8}$ " lg, #18AWG, two 41-strand #34; Gencable #POSJ cond; 2 phone tips 0.082" diam x 7/16" lg 1 end; other end right-angle, peanut-size, female connector; no color coding; p/o Sig C Timer PH-191-A.	1				**	**	*
Fig. 5	8A3830-191A/F1	FILTER, light: blue; cellulose acetate strip; 0.009" thk x $\frac{3}{8}$ " wd x $\frac{5}{8}$ " lg; Graflex #27743; unmounted; p/o Sig C Timer PH-191-A.	1				**	**	*
Fig. 5	8A3830-191A/F2	FILTER, light: red; cellulose acetate strip; 0.009" thk x $\frac{3}{8}$ " wd x $\frac{5}{8}$ " lg; Graflex #27744; unmounted; p/o Sig C Timer PH-191-A.	1				**	**	*

Fig. 1	8A3830-191A/H1	<p>HOLDER, photographic film: 4" x 5"; double septum; wooden frame painted black; w/elongated hole <math>\frac{3}{8}</math>" x 1" w/round ends through both plates; center 1-5/16" from side, 1-3/4" from bottom; p/o Sig C Timer PH-191-A.</p>	1				**
Fig. 1	8P8-545	<p>SLIDE, film holder: hard rubber; 4" x 5" holder; 6-3/8" x 4-1/4" x 1/32" thk; w/3 elongated, round-end holes <math>\frac{1}{8}</math>" x 5/16" wd; centers 1-1/8" from side; 5/16" wd; 5/16" apart; bottom hole center 1-1/8" to bottom of slide; top hole covered w/blue filter; bottom covered w/red; middle open; p/o photographic film holder Graflex #27783; u/w Sig C Timer PH-191-A.</p> <p>NOTE: "CABLE ASSEMBLY" mentioned above is referred to as "connecting cord" in text.</p>	1			**	*

\*Indicates stock available.

\*\*Indicates parts may be requisitioned as needed from Depot Stocks.



