TM 11-6525-200-12

TECHNICAL MANUAL

OPERATION'S AND ORGANIZATIONAL MAINTENANCE MANUAL

PORTABLE RADIOGRAPHIC X-RAY PROCESSING MACHINE

HEADQUARTERS, DEPARTMENT OF THE ARMY
APRIL 1973

TECHNICAL MANUAL
No. 11-6525-200-12

HEADQUARTERS
DEPARTMENT OF THE ARMY
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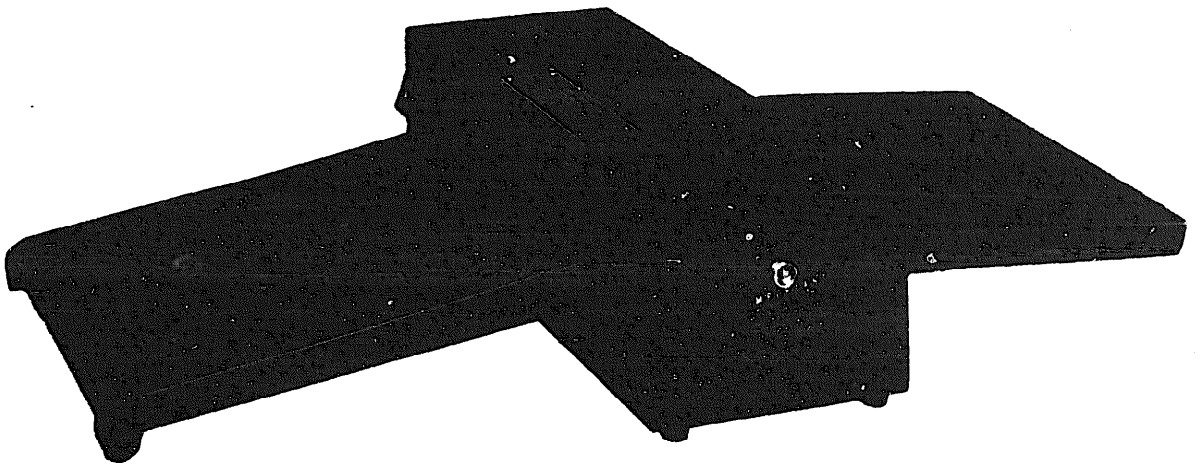
LIST OF ILLUSTRATIONS



EL6525-200-12-TM-1

Figure 1-1. Portable radiographic X-ray processing machine, in use.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope

This manual covers Portable Radiographic X-Ray Processing Machine (fig. 1-1) used with X-Ray Apparatus System AN/TAQ-2. Chapter 1 provides a general description and the technical characteristics of the equipment. Installation, functioning, and operation of the equipment are covered in chapter 2. Operator's preventive maintenance is covered in chapter 3. Organizational maintenance, including preventive maintenance, adjustments, and replacements, is covered in chapter 4. The Maintenance Allocation Chart is in appendix B.

1-2. 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 Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modifications work orders (MWO's) pertaining to the equipment.

1-3. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions in TM 38-750.

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 PUB 378 (Navy)/AFR 71-4 (Air Force)/ and MCO P4030.29 (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 PUB 459 (Navy)/AFM 75-34 (Air Force)/ and MCO P4610.19 (Marine Corps).

d. Reporting of Equipment Manual Improvements. The reporting of errors, omissions, and recommendations for improving this manual 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-M, Fort Monmouth, NJ 07703.

1-4. Administrative Storage and Equipment Destruction

a. For procedures, forms and records, and inspections required during administrative storage of this equipment (TM 740-90-1).

b. Destroying the equipment to prevent enemy use will be done under the direction of the commanding officer in accordance with those procedures outlined in TM 750-244-2.

Section II. DESCRIPTION AND DATA

1-5. Purpose and Use

a. The portable X-ray processing machine is designed for processing Polaroid-type X-ray film using a small portable, daylight processing unit. This equipment eliminates the need for bulky generators, darkrooms, tanks, and chemicals.

b. The portable paper and developer processing machine is designed for use with field-type X-ray machines that use Polaroid-type X-ray film. The cassette, the developer chemical pods are broken, and then the developing solution is spread evenly across the surface of the print for processing. This equipment permits the use of X-ray apparatus in remote areas and reduces the time between the initial exposure and the processing of the finished film.

1-6. Technical Characteristics

Type	Portable, X-ray film daylight processing unit, manually operated.
Power source	Mechanical self-contained, spring-driven drum.
Timer range	0 to 60 seconds.
X-ray film cassette	Picker-Polaroid type.
X-ray film packet	Type 3000X (paper, positive black and white radiograph). Type TLX (mylar film, translucent radiograph).
Film developing time:	
3000X film packet	10 seconds.
TLX film packet	45 seconds.

1-7. Component (fig. 1-2)

The X-ray processing machine (FSN 6525-E30-3274) is 8 9/16 wide; 7 1/16 high, and 19 1/4 deep; and weighs 18 pounds. The equipment is a self-contained, self-sustaining unit used with the AN/TAQ-2. The film processing unit used with the processor is described in detail in paragraph 1-9.

1-8. Description

a. The portable film processing unit is housed

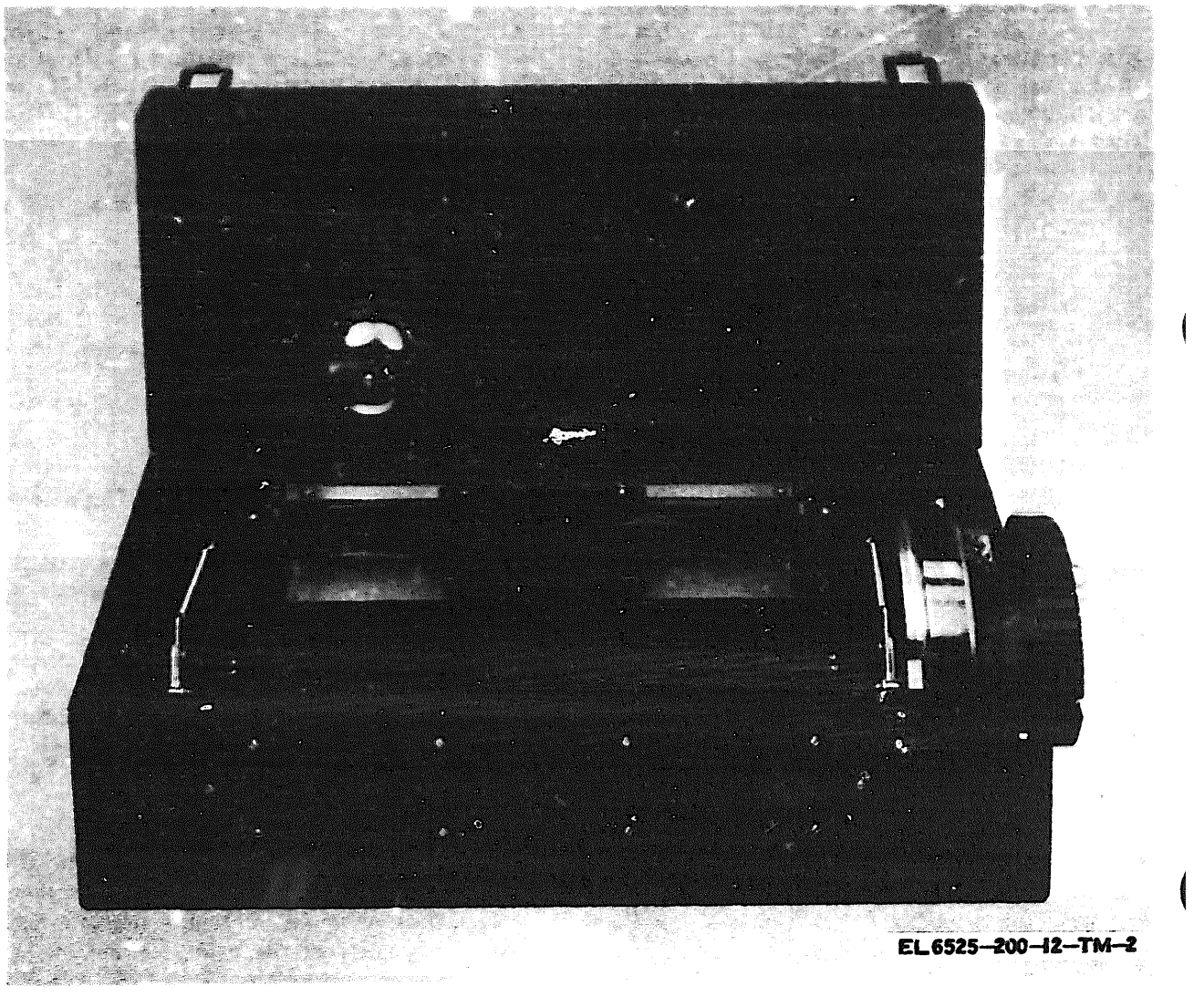


Figure 1-2. Radiographic paper and developer assembly processing machine, unit open.

in an aluminum container with a carrying handle. The unit is opened by unlocking two catches on the cover.

b. The film processing unit includes a processing bell timer located on the cover and a film winding knob located on the front of the unit. An opening is provided on the left-hand side of the unit for the cassette sleeve through which the exposed X-ray film cassette is placed into the unit for processing. An opening is also provided on the right-hand side of the unit to which the packet receptacle is secured and functions as a darkroom for the film during the processing period. The packet receptacle is held taut by two stiffeners.

c. The main frame of the film processing unit is an aluminum casting which consists of a base and three upright pieces. Two rollers are supported on the main frame and consist of a neoprene covering on an aluminum shaft. The bottom roller is driven by the driving mechanism located between the two uprights closest to the film winding knob. A speed governor is located at the other end of the bottom roller which limits the speed at which the bottom roller can be driven. The roller pressure can be adjusted by two spring-loaded screws on the upper roller arms.

1-9. Additional Equipment Required (fig. 1-3)

The film processing unit is designed to be used with the Picker-Polaroid type X-ray film cassette; other standard type X-ray cassettes cannot be used with this unit. These items are not part of the film processing unit and must be requisitioned separately.

a. X-Ray Film Cassette (Picker-Polaroid Type).

(1) The Picker-Polaroid type X-ray film cassette is constructed especially for the Polariod-type X-ray film packets.

(2) The cassette is constructed of stainless steel. One side of the cassette contains a window of an opaque, X-ray penetrable material. This

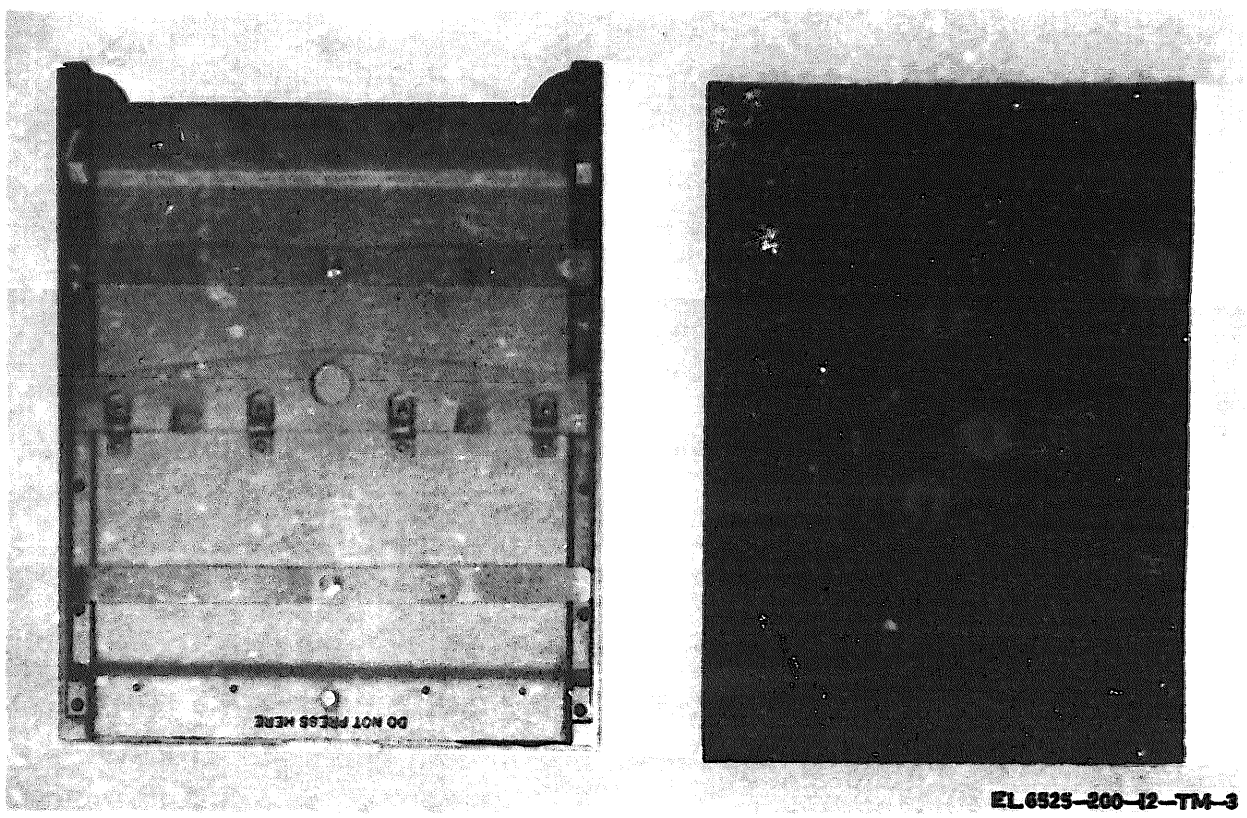


Figure 1-3. Additional equipment required.

side is placed upward during the X-ray exposure of the loaded film. The other side of the cassette is fitted with two standard-type spring straps which are rotated counterclockwise to unlock and clockwise to lock their ends into grooves on the cassette frame. Located at the center, between the spring straps, is a sheet metal pressure release. This pressure release, when raised to a perpendicular position, relieves the pressure on the film packet so that it can be drawn from the cassette by the rollers in the film processing unit.

b. X-Ray Film Packet (Polaroid Type).

(1) Polaroid types 3000X and TLX X-ray film packets are available for use with this equipment. The 3000X type produces a positive paper black and white radiograph. Type TLX is a mylar film and produces a translucent radiographic film which may be studied directly or reviewed through a source of light placed behind it.

(2) Both film packets are assembled the same way; each has a negative in an opaque paper envelope, a chemical pod, a film tab, and a positive film. All of these parts are joined by a folded paper strip which is torn away in the film loading process. A major difference in the two film packets is the length of their individual developing periods.

CHAPTER 2

INSTALLATION AND OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

2-1. Unpacking
(fig. 2-1)

a. Packaging and Packing Data. The film processing unit is packed and shipped in one container. The dimensions of the container are 8 1/2 inches wide by 6 1/4 inches high by 20 inches deep. It weighs 23 pounds and has a volume of 0.6 cubic feet.

b. Unpacking.

(1) Cut the metal straps that bind the wooden crate and remove the metal straps.

(2) Remove the nails that hold the top of the crate with a nailpuller. Remove the top wooden cover.

(3) Cut the waterproof barrier which incloses the corrugated fiberboard carton, and remove the carton.

(4) Open the corrugated fiberboard carton by cutting the gummed tape that seals the lid.

(5) Remove the film processing unit from the carton.

(6) If possible, save the carton and shipping crate for repackaging.

2-2. Checking Unpacked Equipment

During shipment. If the equipment has been damaged, report the damage on DD Form 6 (para 1–3).

b. See that the equipment is complete as listed on the packing slip. This list contains a complete list of component items available for repair or replacement.

c. If the equipment has been used or reconditioned, see whether it has been changed by a modification work order. If the equipment has been modified, the MWO number will appear on the front panel near the nameplate. Check to see whether the MWO number (if any) and appropriate notations concerning the modification have been entered in the equipment manual.

NOTE

Current MWO's applicable to the equipment are listed in DA Pam 310–7.

2-3. Installation

The film processing unit is designed as a portable field unit; therefore, no special installation instructions are required. The operator should place the film processing unit on a flat, level surface when using the unit and allow at least 18 inches on the left-hand side and 14 inches on the right-hand side for extending the cassette sleeve and packet receptacle, respectively.

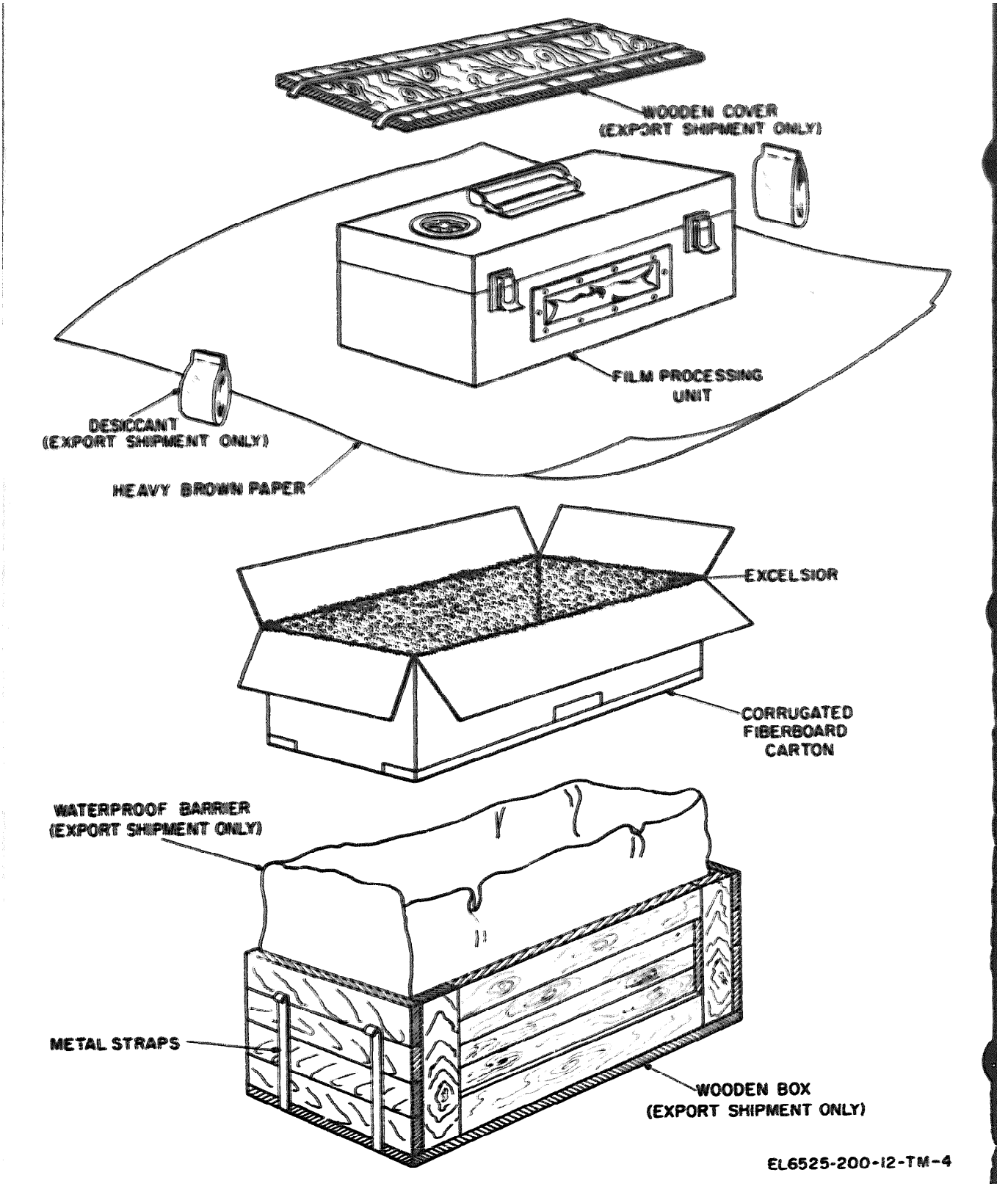


Figure 2-1. Typical packaging.

Section II. FUNCTIONING OF EQUIPMENT

2-4. Introduction

a. The film processing unit (fig. 1-1) is a small portable field unit designed to process Polaroid-type X-ray film. The equipment is manually operated and requires no external power or water source. The basic operation of the unit consists of inserting the exposed X-ray film cassette into the film processing unit which automatically withdraws the film from the cassette, breaks the chemical pods, and spreads the developing solution evenly across the surface of the print. The film is then fed into a lighttight packet receptacle to complete the developing process. A bell timer is included which indicates time in seconds.

b. The overall physical description of the film processing unit is described in paragraph 2-5 and the operation capabilities are covered in paragraphs 2-6, 2-7, and 2-8.

2-5. Description of Equipment (figs. 2-2 and 2-3)

a. The main frame of the film processing unit consist of a base and three upright pieces. Located between the two uprights on the right side are two drums. The smaller drum is used for the storage of the negator spring which supplies power for the driving mechanism. Attached to the larger (winding) drum is a bronze internal gear which transfers the rotation of the winding drum to the lower roller through the spur gear.

b. The negator spring is an assembly of two pieces of equal length. The two springs are coiled together on the storage drum in the rotational direction of their natural coil. They are attached to the winding drum in the counterrotational direction of their coil.

c. Between the center and left upright are two neoprene-covered aluminum rollers. The lower roller is secured to the base of the frame by pillow block bearings at each end of the roller shaft. The right end of the lower roller shaft is pressed into a hexagonal-shaped end piece for coupling to the driving mechanism. Secured to the left end of the lower roller shaft is a two-piece speed governor.

d. The upper roller shaft is bearing mounted at each end by two arms which in turn are pivoted from two other arms connected by a crossbar. Each of these second arms is pivoted from a point on the upper inside surfaces of the

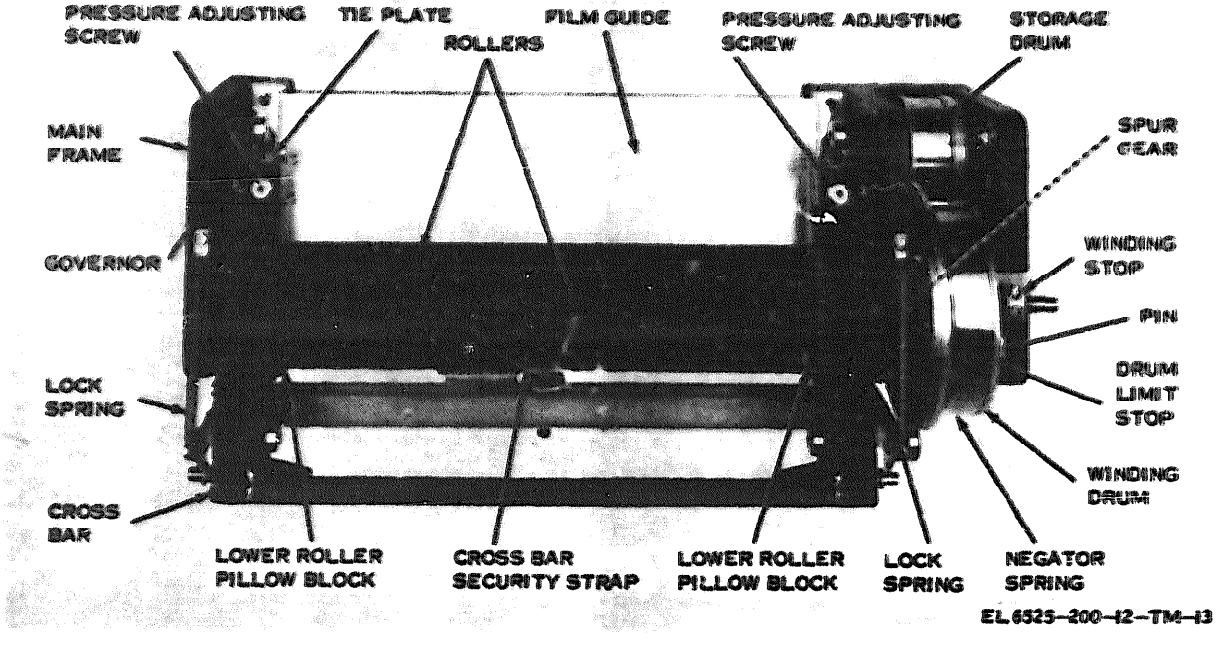


Figure 2-2. Main frame, top view.

main frame uprights. They also contain adjustable spring-loaded pressure screws which exert their pressure on the arms that contain the upper roller when the crossbar is locked in the down position.

c. The upper roller locking mechanism is secured to the lower front of the main frame base by two pivot arms. When the crossbar is pressed downward, the pins of the crossbar engage the locking mechanism at both ends of the crossbar and hold the upper roller in contact with the lower roller. The cam follower, located on the right side of the locking mechanism, exerts and relieves the pressure necessary for proper operation of the locking mechanism through the adjusting screw tab mounted on the cam follower shaft.

2-6. Operation of Winding Mechanism (fig. 2-4)

a. Rotation of the winding knob counterclockwise causes the mounting plate to turn in the same direction. As the winding knob is turned, the release cam attached to the mounting plate engages the winding cam secured to the winding drum shaft. The release cam is held in this position by the ratchet spring. At this point, the winding knob is locked to the winding drum shaft. Continued rotation of the winding knob causes the winding drum to rotate counterclockwise and unwind the negator spring from the storage drum. The negator spring wraps around the winding drum in the counterrotational direction of it's natural coil. The negator spring is prevented from returning to its naturally coiled position on the storage drum by the release cam engaged in the notch of the winding cam.

b. The pawl engaging the ratchet prevents clockwise rotation of the winding knob in addition to keeping tension on the ratchet spring. The winding mechanism is sufficiently wound when the pin on the winding drum contacts the winding stop mounted on the main frame upright (fig. 2-2). The drum limit stop on the outside of the winding drum limits the clockwise rotation of the winding drum as the negator spring recoils itself on the storage drum.

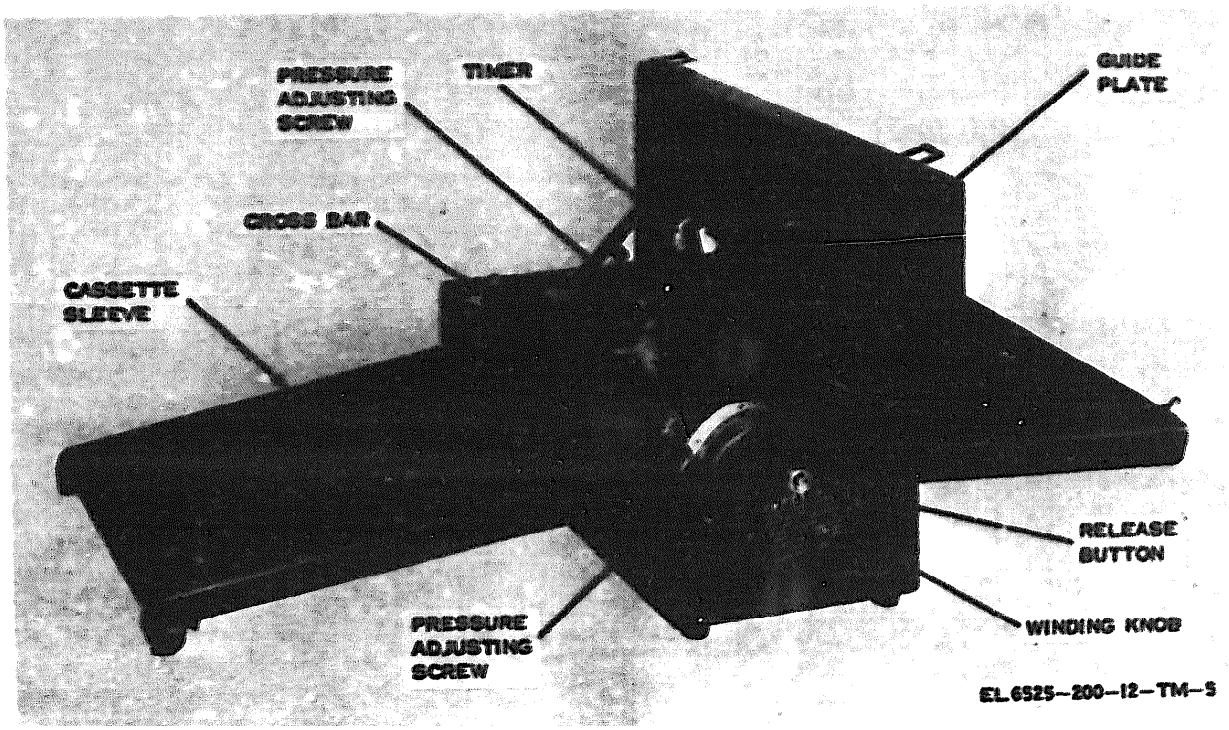


Figure 2-3. Main frame, front view.

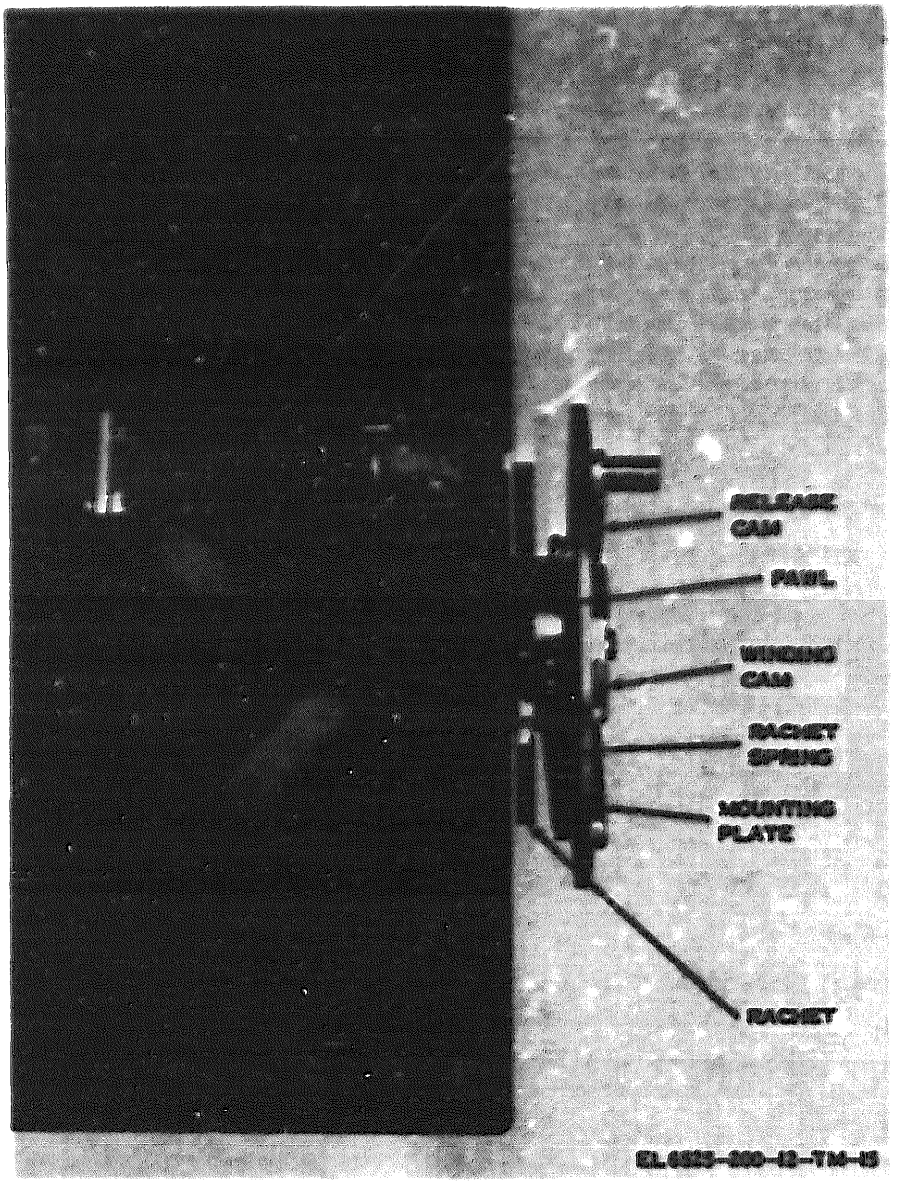


Figure 2-4. Winding and release cam mechanism.

2-7. Upper Roller Operation

a. The paper film tab of the X-ray film packet is placed between the upper and lower rollers. When the winding drum is released, the roller mechanism withdraws the film from the cassette, breaks the chemical pod containing the developer, and spreads the developer evenly across the surface of the film. The operation of the lower roller is covered in paragraph 2–8.

b. When the crossbar of the upper roller assembly is pressed downward, the pins at each end of the crossbar engage two locking mechanisms and are held down so that the upper roller is in contact with the lower roller (fig. 2–3). The two locking mechanisms pivot on lugs located on the lower front surface of the main frame base and are connected together by the lock tie bar. The pivot for the right side locking mechanism is the cam follower shaft which has a pressure tab at one end and applies pressure to the center of the lock tie bar and the locking mechanism in a direction opposite to the lock springs at the top end of the locking mechanism arms. The cam

follower at the other end of the lock tie bar travels along the surfaces of the winding drum and internal gear. As the winding knob is rotated counterclockwise, the cam follower exerts pressure through the pressure tab on the lock tie bar to each locking mechanism. When the winding drum unwinds (clockwise rotation), the cam follower enters the indent (moves inward) in the periphery of the winding drum and internal gear at the completion of the cycle, thus relieving the pressure on the locking mechanism. The upper roller is caused to move away from the lower roller by the two lift springs mounted on the main frame uprights that apply a continuous upward force against the pins at the ends of the crossbar.

2-8. Operation of Driving Mechanism

a. As the release button on the winding knob is pressed, the release cam (fig. 2–4) is disengaged from the notch in the winding cam, thus allowing the negator spring to return to its naturally coiled position on the storage drum and causing the winding drum and the internal gear to rotate clockwise. Clockwise rotation of the internal gear results in clockwise rotation of the spur gear (fig. 2–2) and the spring-loaded lower roller coupling meshed with the hexagonal shaped end piece on the right side of the lower roller. This action causes the lower roller to rotate clockwise and in operation, results in withdrawal of the X-ray film from the cassette. At the completion of the unwind cycle, the cam follower (fig. 2–3) enters the indent in the periphery of the winding drum and the internal gear, thus relieving the pressure on the upper roller carriage locking mechanism. The two lift springs mounted on the main frame uprights apply a continuous upward force on the pins at the ends of the crossbar and at this point causes the upper roller to move away from the lower roller. The parting of the rollers prevents smearing excess developing chemicals onto the roller surfaces at the completion of the X-ray film travel.

b. The speed at which the rollers rotate is limited by the braking action of the two-piece speed governor on the left end of the bottom roller (fig. 2–2). Centrifugal force throws each half of the governor against the brass governor cylinder pressed into the main frame upright. The governor spring attached to each governor weight determines the amount of force required for braking action. The braking action of the governor improves the fidelity of the developing process.

Section III. OPERATION AND OPERATING CONTROLS

2-9. General

The section describes, locates, and illustrates the location of the controls for the proper operation of the equipment. Figure 2–5 shows the location and paragraph 2–10 lists the controls and indicates their functions.

2-10. Controls (fig. 2-5)

Control	Function
Winding knob	Winds spring-driven cam.
Release button	Operates spring-driven cam that causes rollers to rotate.
Timer	Indicates time in seconds (0–60).
Rollers	Draw film from cassette, break chemical pods, and spread developer evenly across film surface.
Crossbar	Locks upper roller in contact with lower roller.
Pressure adjusting screw.	Adjusts pressure of rollers.
Cassette sleeve	Provides means of inserting exposed film cassette into unit.
Pocket receptacle	Provides storage of processed film during developing period.

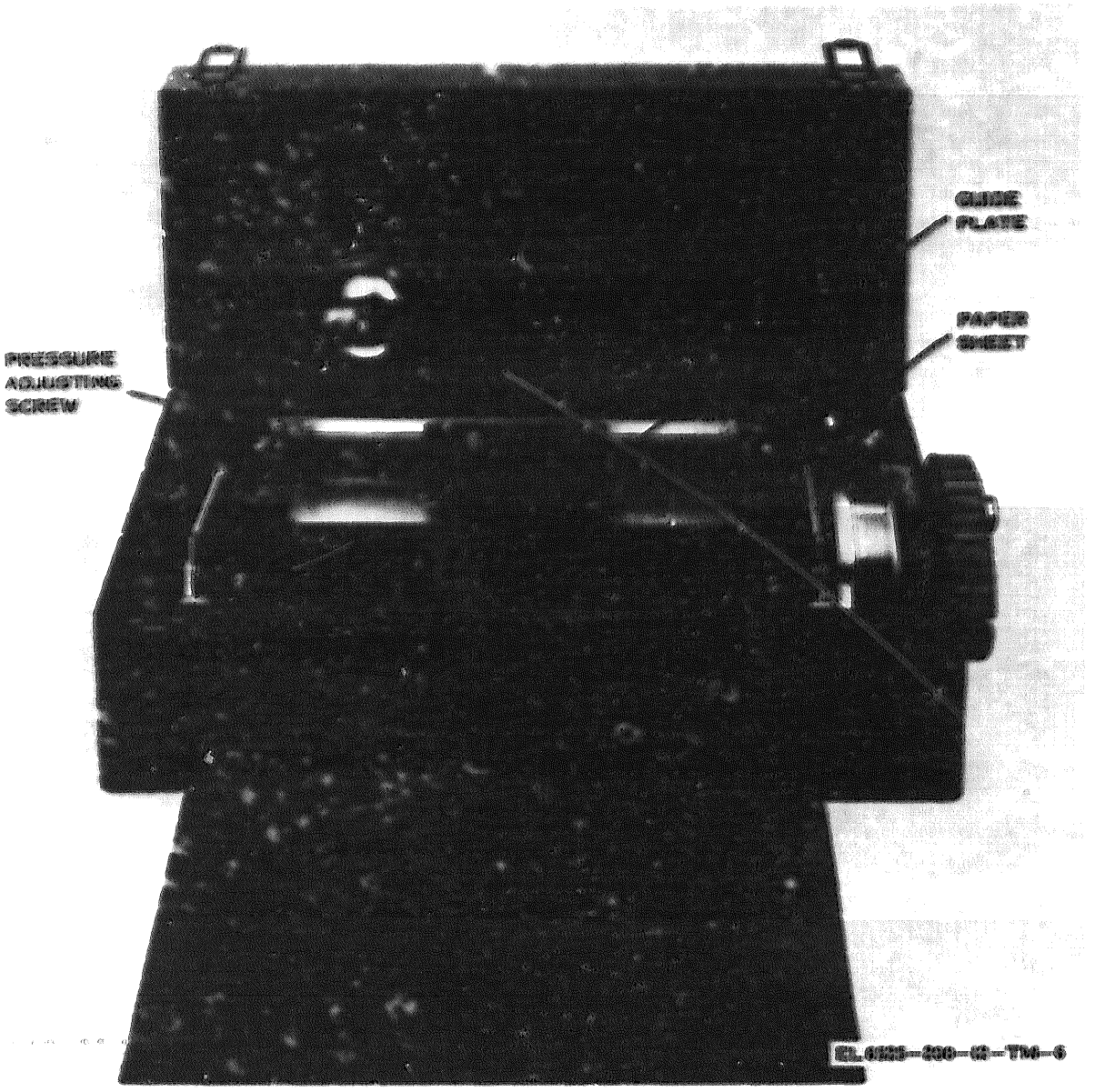


Figure 2-5. Film processing unit operating controls.

Section IV. OPERATION UNDER USUAL CONDITIONS

2-11. Preloading Procedures

Prepare the film processing unit for operation as follows:

a. Place the film processing unit on a flat, level surface with the winding knob toward the operator.

b. Pull the cassette sleeve and packet receptacle from the openings on each side of the unit to their full extent.

c. Unlock the catches on the cover and open the unit.

d. Remove the two packet receptacle stiffeners from the securing strap.

e. Place each stiffener into the stiffener sockets located below the packet receptacle frame.

f. Place the loops on the outer end of the packet receptacle over the stiffener hook so that the entire packet receptacle is flat.

g. Remove the crossbar securing strap from the crossbar. Fold the strap in half and place it under the lower roller against the bottom of the container. Be sure the crossbar securing strap will not interfere with the rotation of the lower roller.

h. Check the roller pressure for the particular type of film being used as indicated below (fig. 2-6).

(1) Cut two strips of paper 0.003 inch thick about 1 inch wide from a paper pad (FSN 7530-285-3083).

(2) Place one strip of paper at the left side, and one strip on the right side, between the two rollers (fig. 2-6).

(3) Turn the pressure adjusting screw clockwise to increase roller pressure and counterclockwise to decrease roller pressure. The paper strips should be pulled through without tearing the paper.

NOTE

Pressures settings will vary from unit to unit. The pressure settings on each side of the rollers should be 7 1/4 pounds for 3000X film and 5 1/2 pounds for TLX film.

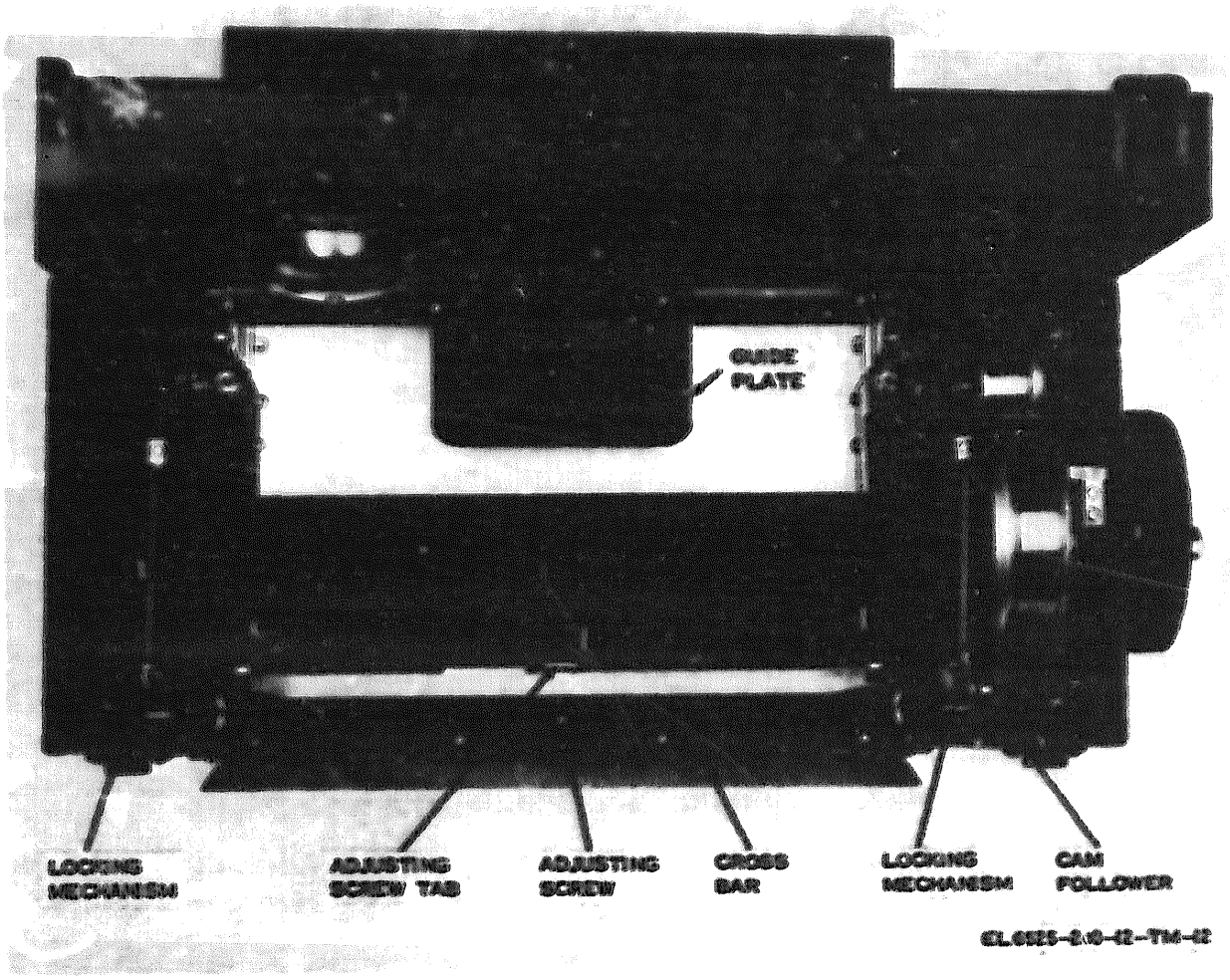


Figure 2-6. Roller pressure adjustment setup.

2-12. Operating Procedures

Process an exposed X-ray film packet in a Picker-Polaroid type cassette as follows:

a. Rotate the winding knob counterclockwise until the release button moves to the upper end of the groove in which it is located.

NOTE

At this point the winding knob mechanism is locked to the winding drum shaft and more resistance will be encountered as the winding drum is rotated.

b. Grasp the winding knob and continue to rotate it counterclockwise almost 1 complete turn until the pin protruding from the winding drum contacts the winding stop mounted on the main frame.

NOTE

Some difficulty may be experienced in rotating the winding knob. This is only momentary and will improve as the operator continues to rotate the winding knob.

c. Insert the cassette into the open end of the cassette sleeve on the left, and position it to the extreme depth of the cassette guide, which is located on the roller pillow blocks (fig. 2-7).

d. Lift up the crossbar and insert the film tab between the two rollers.

e. Press the crossbar downward to lock its mechanism so the upper roller is pressed against the lower roller.

f. Close the cover of the film processing unit.

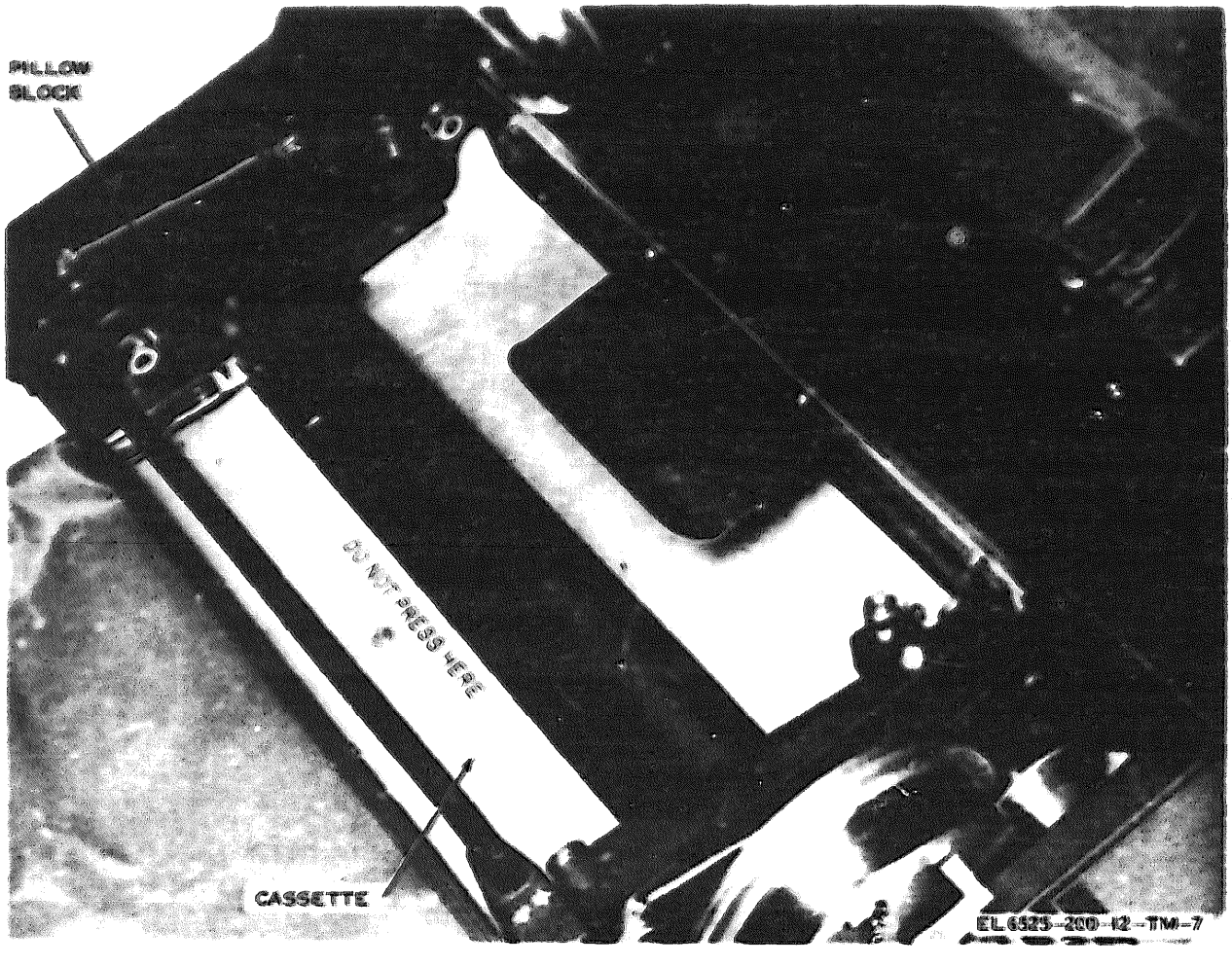


Figure 2-7. Loading cassette into film processing unit.

g. Reach into the cassette sleeve on the left and lift up the cassette pressure release.

h. Fold the end of the cassette sleeve under to prevent light leak.

i. Rotate the timer knob clockwise to some point past the period required for the processing time of the X-ray film packet used as follows:

(1) TLX film packet processing time: 45 seconds.

(2) 3000X film packet processing time: 10 seconds.

NOTE

Refer to the film packet instructions for details concerning developing time in extreme cold weather or excessive heat.

j. Press the release button on the winding knob as the timer pointer arrives at the processing time mark required. Hold the release button down until the winding mechanism is unwound completely.

k. Allow the film packet to remain within the darkened film processing unit until the timer bell indicates expiration of the required processing time.

l. Open the film processing unit and remove the film packet.

m. While holding one thumb on the blotting paper frame, at the bottom of the packet, lift the corner of the positive radiograph and strip it away, all in one motion.

n. If the radiograph is to be preserved, coat the surface with the proper film coater as follows:

(1) TLX film: white coater.

(2) 3000X film: pink coater.

o. Remove the cassette from the cassette sleeve.

2-13. Strapping Procedures

If the film processing unit is to be left standing for immediate reuse, proceed to *a* below. When the equipment is to be moved or stored, proceed to *b* below.

a. Letting Equipment Stand for Immediate Reuse. If the equipment is to be left standing for immediate reuse, perform the following operations:

(1) Clean the inside of the unit cassette sleeve, and packet receptacle with an air syringe or approved cleaning compound.

(2) Remove any developing chemical or foreign material on or imbedded into the roller surfaces using a clean soft cloth and warm water or an approved cleaning compound. Dry rollers thoroughly with a clean, lint-free cloth.

(3) Close the cover and fasten the two catches to prevent any foreign material from accidentally falling into the unit.

(4) Fold the cassette sleeve to prevent dirt or sand from entering the inside of the sleeve.

b. Repacking Equipment. When the equipment is to be moved or stored, proceed as instructed in *a*(1) and (2) above, and continue as follows:

(1) Remove the stiffeners and wind them around the straps into a package.

(2) Secure the crossbar in the down position with the crossbar securing strip.

(3) Carefully fold the sides of the cassette sleeve, roll up, and push into opening at the side of the unit. Close the cover and fasten the latch.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

2-14. Operation in Arctic Areas

NOTE

Refer to the X-ray film packet instructions for details concerning handling and storage of X-ray film under these conditions.

Although this equipment has been designed to operate under adverse temperature and humidity conditions, operation of the equipment may be difficult in regions where extreme cold prevails. Subzero temperatures and climatic conditions associated with cold weather may cause unsatisfactory operation. Observe the following precautions:

a. Equipment operated at low temperatures should be kept at low temperature storage when not in use.

b. When equipment has been exposed to the cold and is brought into a warm room, condensation will form until it reaches room temperature.

Dry the equipment thoroughly. To avoid condensation, transfer the equipment from the cold to the warmer temperatures by gradual stages.

2-15. Operation in Tropical and Desert Areas

Refer to the X-ray film packet instructions for details concerning handling and storage of X-ray film under these conditions.

When the equipment is used under conditions of extreme heat and humidity, such as desert and tropical regions, observe the following precautions:

a. Desert Regions. The principal problem arising in connection with equipment operation in desert areas is the large amounts of sand, dust, and dirt encountered. Although the equipment has been designed for field operations, observe the following to minimize adverse sand and dust conditions:

(1) Cover the equipment with a suitable protective covering. This will minimize dust or sand penetration into the equipment and form grit which could damage certain parts of the equipment, particularly the rollers.

(2) Most desert regions experience a considerable temperature drop at night. This could cause moisture condensation on the equipment. To prevent this, keep the equipment covered with a suitable protective covering. If condensation forms, dry equipment thoroughly.

(3) Before using the equipment in desert regions, use a soft-bristled brush to remove sand or other foreign matter from the interior of the equipment (especially the roller surfaces), cassette sleeve, and the packet receptacle.

b. Tropical Regions. In climates of high humidity, such as the tropics, inspect the equipment daily for fungus, mold, mites, and metallic corrosion. Remove all fouling immediately. Lubricate after cleaning.

NOTE

When practicable, store the film processing unit in an adequately ventilated cabinet, and place a desiccant inside the cabinet.

2-16. Operation in Maritime, High Altitude Low Temperature, or Rainy Areas

NOTE

Refer to the X-ray film packet instructions for details concerning handling and storage of X-ray film under these conditions.

To prevent corrosion from salt-laden air or salt water spray and rusting from condensation or moisture when the equipment is stored, wipe all exposed metal parts with a soft cloth, moistened with an approved preservative lubricating oil. After the equipment has been stored or used under rainy, dusty, or dirty conditions, clean all parts as soon as possible.

CHAPTER 3

OPERATOR'S MAINTENANCE

3-1. Scope of Operator's Maintenance

The maintenance duties assigned to the operator of the film processing unit are listed below together with a reference to the paragraphs covering the specific maintenance function. The duties assigned do not require any special tools or test equipment.

a. Weekly preventive maintenance checks and services (para 3-3).

b. Cleaning (para 3-4).

c. Troubleshooting (para 3-6).

d. Repairs and adjustments (para 3-7).

3-2. Operator's Preventative Maintenance

Operator's preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to assure that the equipment is serviceable.

a. Systematic Care. The procedures given in paragraphs 3-3 and 3-4 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 chart (para 3-3) outline functions to be performed at specific intervals. These checks and services are to maintain Army photographic 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 charts indicate 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 remedied 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.

3-3. Weekly Preventative Maintenance Checks and Services Charts

Paragraph No.	Item	Procedure	References
1	Exterior surface	Clean the film processing unit container	(Para 3-4a).
2	Cassette sleeve and packet receptacle	Examine cassette sleeve and packet receptacle for cracks or tears. Repair with approved opaque tape. Clean the interior and exterior cassette sleeve and packet receptacle.	(Para 3-4b).
3	Interior of unit	Clean the inside of the unit	(Para 3-4c).
4	Controls	While making the operational checks (item 5), observe that the mechanical action of each control is smooth and free from binding.	(Para 3-5).
5	Operational check	Check operation of film processing unit	(Para 3-5).
6	Mounting	Tighten loose nuts or bolts. Replace missing hardware as required. NOTE Do not tight pivot screws.	

3-4. Cleaning

a. Exterior. Inspect the exterior of the equipment. The exterior surfaces should be clean, free of dust, dirt, grease, and fungus. Clean the exterior as follows:

(1) Remove dust and loose dirt with a clean soft cloth. If difficulty in removing dirt occurs, dampen the cloth with water; mild soap may be used to make the cleaning more effective.

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

b. Cassette Sleeve and Packet Receptacle. Inspect the inside and outside of the cassette sleeve and packet receptacle. They should be clean, free of dust, dirt, grease, and fungus. Clean these items as follows:

(1) Remove dust and loose dirt with a clean soft cloth or an air syringe. If difficulty in removing dirt occurs, dampen the cloth with water; mild soap may be used to make the cleaning more effective.

(2) Remove grease and fungus from the cassette sleeve and packet receptacle with an approved cleaning compound.

c. Interior. Inspect the interior of the equipment. The interior should be clean, free of dust, dirt, grease, and fungus. Clean the interior as follows:

(1) Remove dust and loose dirt with an air syringe. If difficulty in removing dirt occurs, dampen a clean soft cloth with water; mild soap may be used to make the cleaning more effective.

(2) Remove grease and fungus from the interior with an approved cleaning compound.

d. Rollers. Inspect the upper and lower rollers. The rollers should be clean, free of dust, dirt, grease, and developing chemical. Clean the rollers as follows:

NOTE

The lower roller may be rotated freely by placing a screwdriver between the right pillow block and the coupling (fig. 3–1) by disengaging the hexagonal-shaped end of the roller shaft.

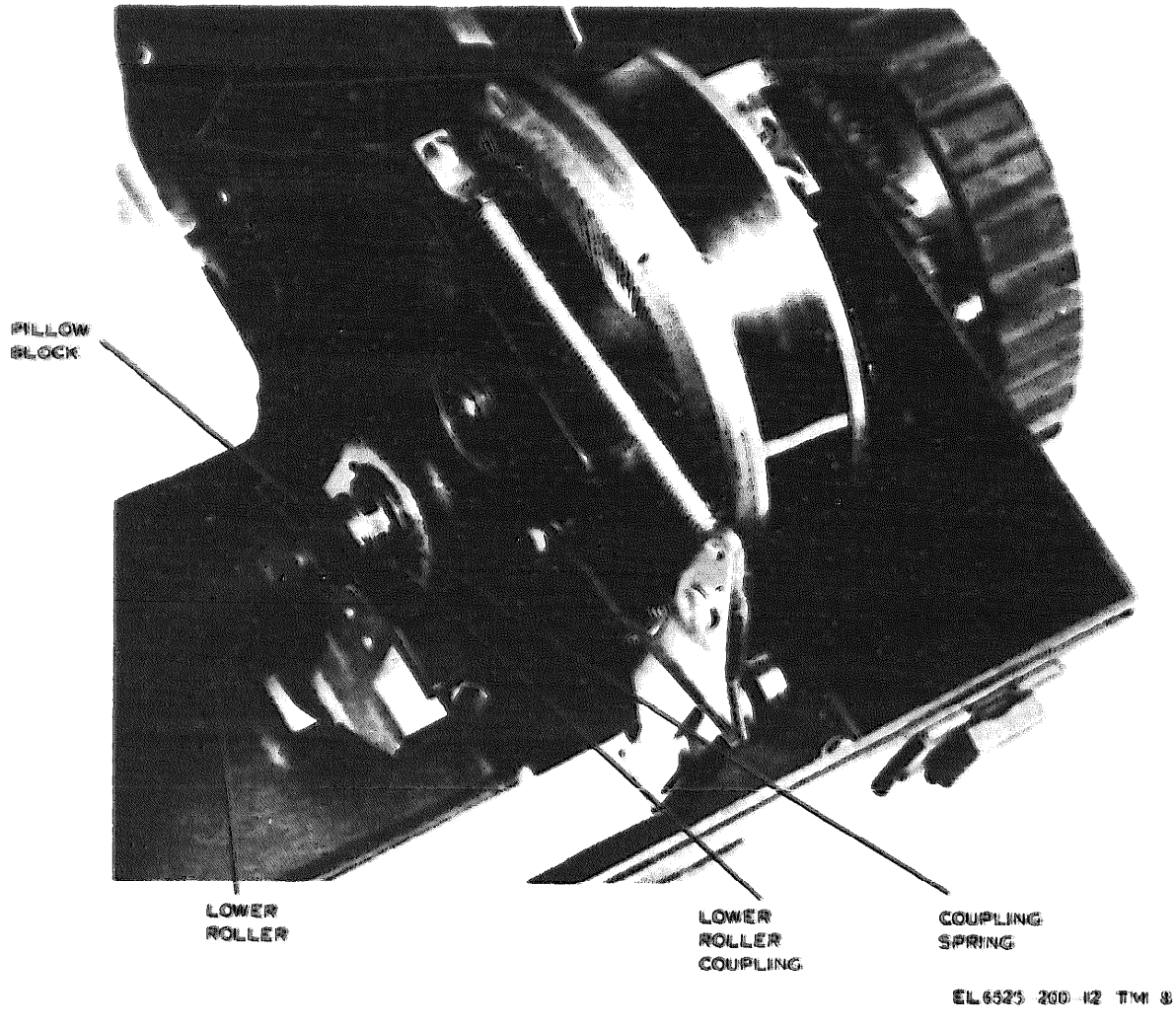


Figure 3-1. Disengaging lower roller for cleaning.

(1) Remove any foreign material imbedded into the roller surfaces.

(2) Remove dust and loose dirt with a clean soft cloth and warm water. Dry the rollers with a lint-free soft cloth.

(3) Remove any developing chemical on the roller surfaces immediately with a clean damp cloth.

3-5. Operational Check

Perform an operational check to insure that the film processing unit is in a serviceable condition.

a. Prepare the equipment for operation as described in paragraph 2-9.

b. Rotate the winding knob counterclockwise until the release button moves to the upper end of the groove in which it is located.

NOTE

At this point the winding knob mechanism is locked to the winding drum shaft and more resistance will be encountered as the winding drum is rotated.

c. Grasp the winding knob and continue to rotate it counterclockwise almost 1 complete turn until the pin protruding from the winding knob contacts the winding stop mounted on the main frame.

NOTE

Some difficulty may be experienced in rotating the winding knob. This is only momentary and will improve as the operator continues to rotate the winding knob.

d. Press the crossbar downward to lock its mechanism. The upper roller should be pressed against the bottom roller.

e. Depress the release button on the winding knob until the winding mechanism unwinds completely. Both rollers should rotate while the winding mechanism is being unwound; the upper roller should move away from the lower roller when the winding mechanism is unwound completely.

f. Check operation of bell timer by rotating the timer knob clockwise to some point past 10. The bell should sound when the timer knob returns to zero.

g. Stop the equipment as described in paragraph 2-12.

3-6. Troubleshooting Chart

Trouble symptom	*Probable trouble*	*Check and corrective measures*
NOTE		
If mechanical difficulties are encountered with the film processing unit, higher category repair is required.		
Winding knob does not turn	*a.* Previously wound	Make certain that winding knob is not wound. Press release button and rotate winding knob counterclockwise.
	b. Foreign obstruction	Examine interior of unit for foreign obstruction or crossbar securing strap preventing lower roller to rotate. If trouble cannot be corrected, higher category repair is required.
Cassette does not seat firmly when placed into cassette guide.	Cassette guide clips loose or bent	Check for bent cassette guide clips or loose attaching hardware. Straighten clips or tighten loose hardware.
Winding mechanism does not unwind	Release button not fully depressed	Make certain that release button is fully depressed. If trouble is not corrected, higher category of repair is required.
Upper roller assembly does not return to up (unlocked) position.	Upper roller carriage lock spring bracket loose.	Check upper roller carriage lock spring bracket for loose or missing attaching hardware. If trouble is not corrected, higher category of repair is required.
Film does not feed through rollers properly.	Adjustment of upper roller pressure required.	Check upper roller pressure and adjust as necessary (para 2-11).

Trouble symptom	Probable trouble	Check and corrective measures
Poor quality, gray, washed out print	Developing time too short	Check accuracy of timer against a watch with a second hand.
	NOTE	
	Refer to film packet for details concerning developing time in extreme cold weather or excessive heat.	
One edge or corner of print not developed properly.	a. Dirt or dried developer at the ends of the rollers.	a. Check the ends of the rollers for dirt, dried developer, etc. Clean rollers as necessary (para 3-4d).
	b. Improper roller pressure at one end of rollers.	b. Check roller pressure as described in paragraph 2-11. If trouble is not corrected, higher category of repair is required.
Repeated spots on the print	Dirt or dried developer on the rollers.	Check rollers for dirt, dried developer, or foreign material on or imbedded in the rollers. Clean rollers as necessary (para 3-4d).
U-shaped white area any size on print	Dirt or dried developer on the ends of the rollers.	Check the ends of the rollers for dirt, dried developer, and foreign material. Clean rollers as necessary (para 3-4d).

3-7. Repairs and Adjustments

a. Repairs. Refer to maintenance personnel if repair or replacement of parts is required.

b. Adjustments. Refer to paragraph 2-11 for the procedure to adjust the roller pressure.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE

Section I. GENERAL

4-1. Scope of Organizational Maintenance

a. This chapter contains instructions covering organizational maintenance for the film processing unit. It concludes instructions for performing preventive and periodic maintenance services, general functions, and repair or replacement functions to be performed at the organizational category.

b. Included in the chapter are illustrations showing exploded views and detailed parts lists of the portable, radiographic X-ray processing machine (FSN 6525–E30–2274). These views are included so the operator and organizational maintenance personnel can perform disassembly or adjustments required for operation and preventive maintenance. If troubleshooting indicates a replacement or a repair part is required, which is not available to maintenance personnel, return the complete unit to Transportation Officer, Fort Holibard, MD 21219 (IMSO) for disposition, requesting repair or replacement.

4-2. Tools, Materials, and Test Equipment Required

Tools, materials, and test equipment required for maintenance are listed below.

a. Tools.

(1) Key set, socket head hexagonal (FSN 5120–595–9244).

(2) Pliers, retaining ring, (FSN 5120–288–9717).

(3) Screwdriver, flattip (FSN 5120–278–1283).

(4) Screwdriver, flattip (FSN 5120–729–6393).

b. Materials.

(1) Adhesive (Pittsburg plate glass (Part G580–20 or equivalent)).

(2) Adhesive (U.S. Rubber Co., New York, N.Y., Part No. 6244).

(3) Air syringe or source of low pressure, clean, dry compressed air.

(4) Cleaning cloth.

(5) Approved cleaning compound.

(6) Lubricating oil, general purpose (LO) (FSN 9150–273–2384).

(7) Paper pad (FSN 7530–285–3083).

(8) Sandpaper, fine.

(9) Pliers, retaining ring (FSN 5120-239-8250).

c. Test Equipment.

(1) Scale, spring pull (FSN 6670–989–2520).

(2) Watch, stop (FSN 6645–719–8670).

4-3. Organizational Preventative Maintenance

Preventive maintenance is the systematic care, inspection, and servicing of equipment to maintain it in serviceable condition, prevent breakdowns, and assure maximum operational capability. Preventive maintenance is the responsibility of all categories concerned with the equipment and includes the inspection, testing, and repair or replacement of parts and subassemblies that inspection and tests indicate would probably fail before the next scheduled periodic service. Preventive maintenance checks and services of the film processing unit at the organizational category are made at monthly intervals unless otherwise directed by the commanding officer. The preventive maintenance checks and services should be scheduled concurrently with the periodic service schedule for the field X-ray machine.

4-4. Monthly Maintenance

Perform the maintenance functions indicated in

the monthly preventive maintenance checks and services chart (para 4–5) once each month. A month is defined as approximately 30 calendar days of 8-hour-per-day operation. If the equipment is operated 16 hours a day, the monthly preventive maintenance checks and services should be performed at 15-day intervals. Adjustment of the maintenance interval must be made to compensate for any unusual operating conditions. Equipment maintained in a standby (ready for immediate operation) condition must have monthly preventive maintenance. Equipment in limited storage (requires service before operation) does not require monthly maintenance.

4-5. Monthly Preventative Maintenance Checks and Services Chart

Sequence No.	Item to be inspected	Procedure	Reference
1	Exterior	See that the equipment is clean	(Para 3-4).
2	Preservation	Check all surfaces for evidence of fungus. Remove rust and corrosion, and spot-paint bare spots.	(Para 3-4).
3	Cassette sleeve and packet receptacle.	Examine for cracks, holes, parting of seams, etc. Repair or replace.	(Para 4-13, 4-14).
4*	Lubrication	Lubricate the equipment	(Fig. 4-1, 4-2; para 4-8).

*To be accomplished weekly instead of monthly, in desert areas.

4-6. Quarterly Maintenance

Quarterly maintenance checks and services on the film processing unit are required. Periodic weekly and monthly services constitute a part of the quarterly maintenance checks and services and must be performed concurrently. All deficiencies of shortcomings will be recorded in accordance with the requirements of TM 38–750. Perform all checks and services listed in the quarterly preventive maintenance checks and services chart (para 4–7) in the sequence listed.

4-7. Quarterly Preventative Maintenance Checks and Services Chart

Sequence No.	Item to be inspected	Procedure	Reference
1	Completeness	See that the equipment is complete	(Para 1-6).
2	Publications	See that all publications are complete, serviceable, and current.	DA Pam 310-4.
3	Modifications	Check DA Pam 310-7 to determine if new applicable MWO's have been published. All URGENT MWO'S must be applied immediately. All NORMAL MWO'S must be scheduled.	TM 38–750 and DA Pam 310-7.
4	Mounting	See that all nuts, bolts, and washers are correctly positioned and properly tightened. Replace missing hardware. **NOTE** Do not tighten screws on upper roller carriage assembly.	(Fig. 4-3).
5	Controls	While making the operating check (item 6), observe that the mechanical action of each control is smooth and free of external or internal binding.	None.
6	Operational check	Check operation of film processing unit	(Para 2–11).

4-8. Lubrication
(fig. 4-1 and 4-2)

CAUTION

When lubricating, make sure no oil is applied to the surfaces of the neoprene rollers. Lubricants on the rollers will affect quality of prints.

a. The symbol M stands for a period of 1 month. A month consists of 30 days of normal 8-hour operation. If the equipment is operated more than 8 hours a day, the lubrication intervals should be adjusted accordingly. *For example,* if the equipment is operated 16 hours a day instead of 8, the equipment will have to be lubricated at 15-day intervals instead of monthly.

b. All ball bearings used in this equipment are of the double-shield type. They have been factory-lubricated and require no further lubrication.

c. Clean the areas to be lubricated with a brush dipped in an approved cleaning compound. Do not drip cleaning compound into the equipment.

d. The lubrication points for this equipment are shown in figures 4–1 and 4–2. To lubricate the release cam pivot, remove the winding knob. Refer to paragraph 4–16 for the winding knob removal procedure. This equipment can be lubricated with the main frame in the container. Figure 4–2 shows the main frame removed from the container for clarity only.

e. The component parts of the equipment are fabricated either of aluminum, stainless steel, or bronze and should not require more than a drop of oil on the pivot screws and bearing surfaces. Apply oil sparingly to the teeth of the gears. Rotate the winding knob as necessary to expose all gear teeth for lubrication. When oiling the locking mechanism pivots, dip a piece of wire into the oil to collect a small drop on the end. Transfer the oil to the cam follower by touching the wire to the locking mechanism pivots.

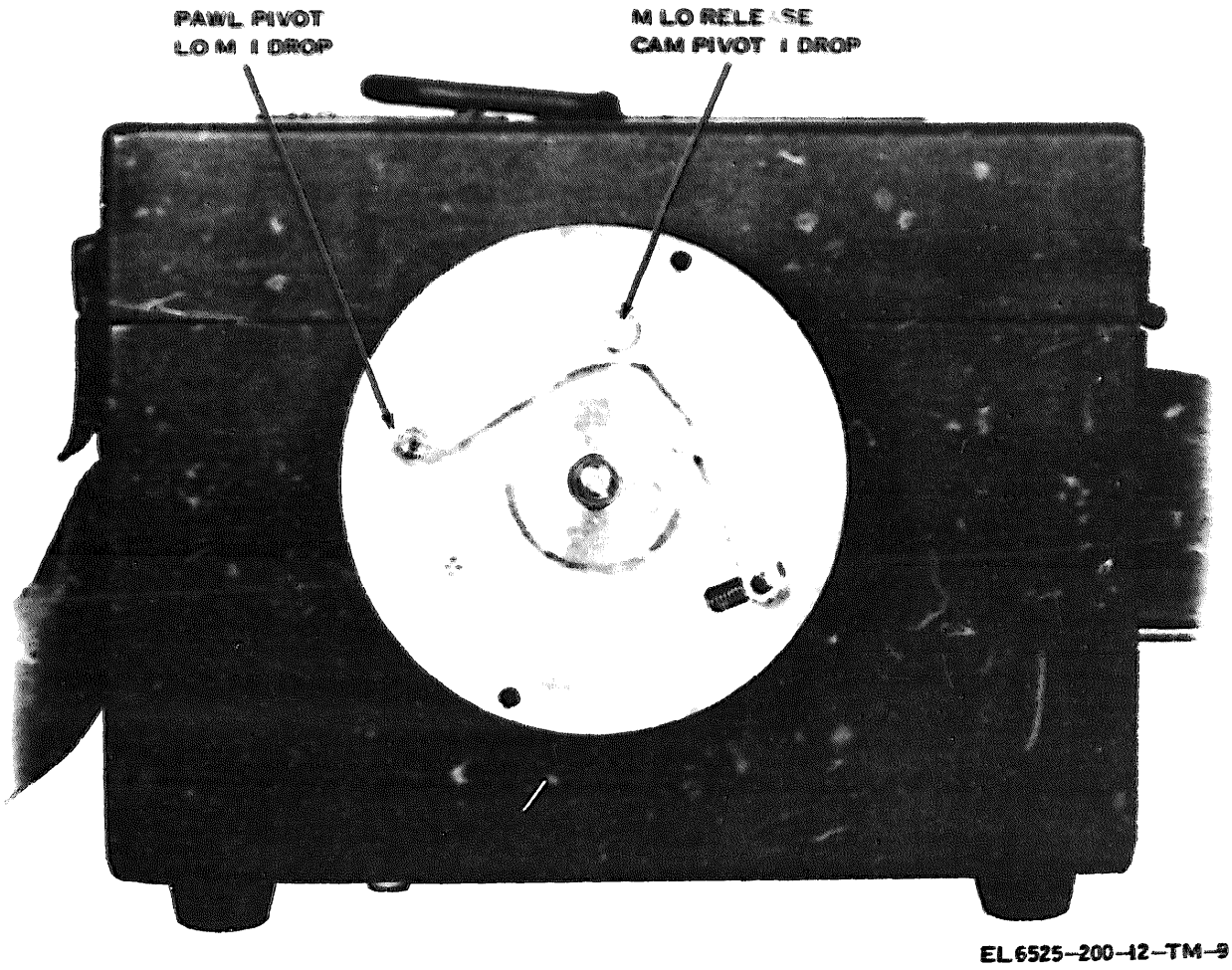


Figure 4-1. Film processing unit lubricating chart for winding drum.

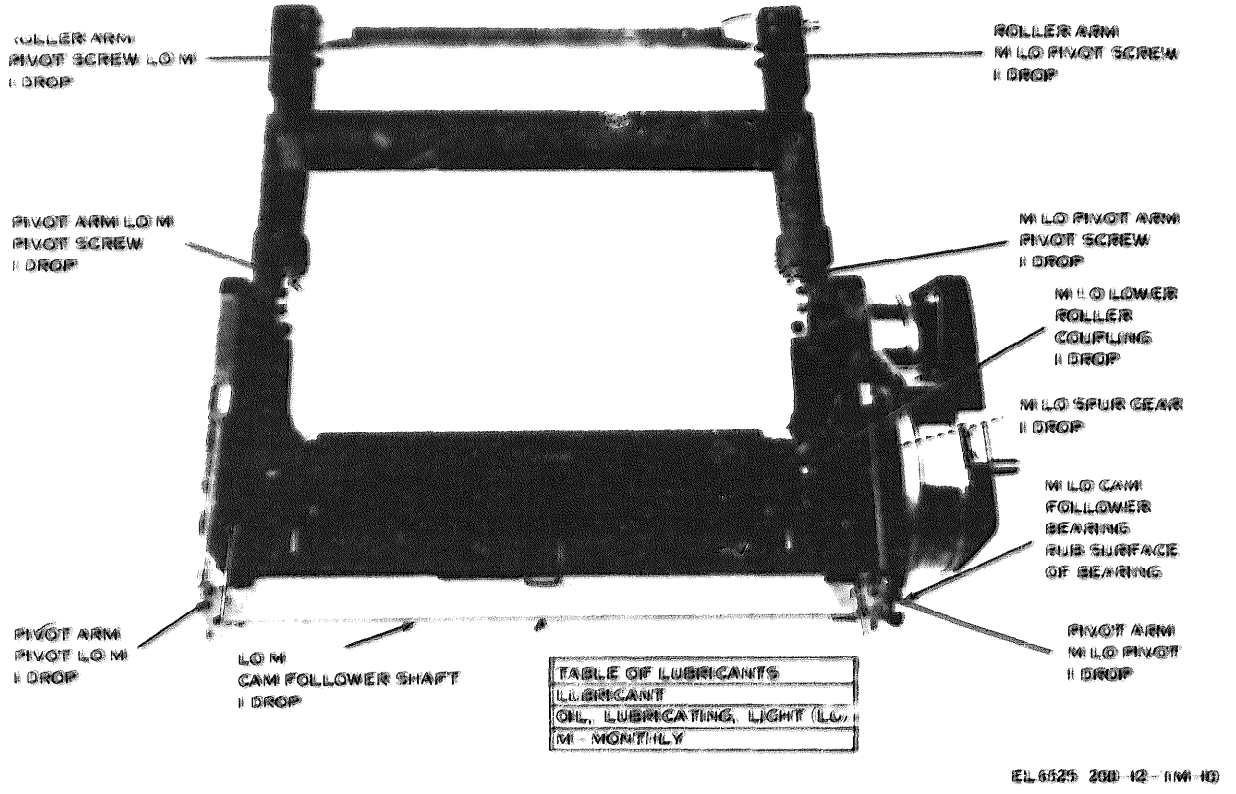


Figure 4-2. Film processing unit lubrication chart for main frame.

Section II. TROUBLESHOOTING PROCEDURES

4-9. General Information

Troubleshooting of this equipment is based on the operational check in the quarterly maintenance checks and services chart. To troubleshoot the equipment, perform the operational check (para 4–7) and proceed through the operational check until an abnormal condition or result is observed. When an abnormal condition or result is observed, refer to the troubleshooting chart.

a. Organization of General Troubleshooting Procedures. The first step in servicing a defective equipment is to sectionalize the fault. Sectionalization means tracing the fault to a major component. The second step is to localize the fault. Localization means tracing the fault to the defective section. The third step, isolation, means tracing the fault to the defective part. Some faults, such as winding knob does not turn winding drum, improper roller pressure, cr binding of mechanical components, can often be isolated by sight or hearing. The majority of faults, however, must be isolated by detailed mechanical checks.

b. Sectionalization Check. After the trouble has been sectionalized, make a general operational test of the suspected unit. The general operational test serves as a check of the sectionalizing test.

(1) *Visual inspection.* The purpose of visual inspection is to locate faults without testing components. All visual signs should be analyzed to help localize the fault to a particular unit. Mechanical faults are most often localized through visual inspection.

(2) *Operational tests.* Operational tests indicate the general location of trouble. In many instances the tests will help in determining the exact nature of the fault.

c. Localization. The trouble symptoms listed

in the troubleshooting chart (para 4–11*c*) will aid in localizing trouble to a section and the component part. The chart lists the symptom of, and remedies for, the most common troubles that can be encountered in the film processing unit.

d. Preliminary Check. Before removing the main frame from the container, conduct a thorough and practical test to determine the conditions that might exist. Examine the section believed to be causing the trouble and note the following when applicable:

(1) Operation of winding knob and winding mechanism.

(2) Response of rollers when release button is pressed.

e. Corrective Measures. If corrective measures indicated do not result in the correction of trouble and parts or replacement is required over and above that available to organizational personnel, return the entire unit for higher category of maintenance as outlined in paragraph 4–1.

4-10. Operational Checks

Perform the following checks and observe the mechanical operation during each step to isolate the trouble to the defective section of part.

a. Visual Inspection.

(1) Examine the cassette sleeve and packet receptacle for holes or other damage. Make certain that the seams have not parted.

(2) Inspect the rollers for dried up developer or foreign materials imbedded onto the surfaces of the rollers. Check the upper and lower rollers for smoothness of rotation.

NOTE

The lower roller may be rotated freely by placing a screwdriver between the right pillow block and the spring-loaded lower roller coupling by disengaging the hexagonal-shaped end of the roller shaft (fig. 3–1).

(3) Check for loose or missing hardware.

(4) Check upper roller pressure.

(5) Check operation and accuracy of bell timer with a stopwatch.

b. Operating Check.

(1) Rotate the winding knob counterclockwise until the release button moves to the upper end of the groove in which it is located.

NOTE

At this point, the release cam engages the winding cam.

(2) Grasp the winding knob and continue to rotate counterclockwise until the pin protruding from the winding drum contacts the stop mounted on the main frame.

NOTE

Resistance will occur as the cam follower enters the indent in the periphery of the winding drum and the internal gear. This is only momentary and will improve as the operator continues to rotate the winding knob.

(3) Press the crossbar downward to lock the upper roller against the lower roller.

(4) Press the release button on the winding knob until the winding mechanism unwinds completely. Both rollers should rotate while the winding mechanism unwinds; the upper roller should move away from the lower roller when the cycle is completed.

4-11. Localizing Troubles

a. General. If the proper results are not obtained by performing the operational tests, the trouble should be localized to the individual section of the unit. Depending on the nature of the operational symptoms, one or more of the localizing procedures will be necessary. When following the procedures results in localization of trouble to a particular section, use the techniques outlined below to isolate the trouble to a particular part.

b. Use of Chart.

(1) The troubleshooting chart is designed to supplement the operator's and organizational troubleshooting charts and the operational checks. If operational symptoms are not known, begin at item 1 of the operator's troubleshooting chart (para 3–6) and proceed as directed.

(2) The troubleshooting chart lists the symptoms which the maintenance man observes while making the operational checks. This chart also indicates a method of localizing trouble to the individual sections or components of the equipment.

a. Troubleshooting Chart

Item No.	Symptom	Probable trouble	Correction
1	Winding knob turns but does not operate driving mechanism.	a. Loose winding cam or release cam.	a. Remove winding knob (para 4-15) and check to see that winding cam or release cam screw is not loose or missing. Tighten or replace screw and washer.
		b. Loose ratchet spring or pawl	b. Remove winding knob (para 4-15) and check for loose ratchet spring or pawl. Place loop of ratchet spring on release cam or tighten or replace screw attaching pawl to mounting plate. If trouble is not corrected, higher category of repair is required.
2	Winding knob does not turn or binds.	a. Foreign obstruction	a. Examine interior of unit for obstructions that prevent lower roller from operating freely.
		b. Lower roller or governor binding.	b. Disengage lower roller from lower roller coupling with a screwdriver. Rotate lower roller by hand. If lower roller does not rotate freely, examine lower roller bearings for defects or governor for loose parts causing binding. Replacement of defective bearings will be required or repair of loose parts.
		c. Spur gear or internal gear binding.	c. If lower roller rotates freely, inspect internal gear for burrs, dirt, etc. Examine spur gears and remove burrs, dirt, or corrosion if necessary. Replacement of spur gear required.
	Upper roller does not lock into position when crossbar is pressed downward.	a. Locking mechanism requires adjustment.	Adjust locking mechanism (para 4-20).
		b. Adjusting screw tab loose	Tighten or replace missing screws adjusting screw tab to cam follower rod. If trouble cannot be corrected, a higher category of repair is required.
3	Winding knob turns but negator spring does not wind on winding drum.	a. Negator spring not secured to winding drum.	Uncoil negator spring from winding drum and check screw attaching end of negator spring to winding drum. Tighten or replace missing screw.
		b. Winding drum not secured to winding drum shaft.	Remove negator spring from winding drum and check setscrew securing winding drum to winding drum shaft. Tighten setscrew.
4	Winding mechanism does not unwind when release button is pressed.	Loose release cam	Remove winding knob and check to see that release cam is secured to mounting plate. Tighten or replace screw. If trouble cannot be corrected, higher category of maintenance is required.
5	Upper roller does not return to up (unlocked) position.	Locking mechanism requires adjustment.	Adjust locking mechanism. If trouble is not corrected, higher category of maintenance is required.
6	Upper roller does not lock in down position when crossbar is pressed downward.	a. Cam follower loose	Check screw attaching cam follower rod. Tighten or replace missing screw.

Item No.	Symptom	Probable trouble	Correction
		b. Cam follower block loose	Check screw attaching cam follower block to main frame. Tighten or replace screws.
7	Winding mechanism does not unwind when release button is pressed.	Defective storage drum bearings	Remove negator spring from storage drum (para 4-21) and check storage drum for free rotation. Replace defective bearings if available.
8	Lower roller does not rotate smoothly when release button is pressed.	a. Defective lower rolling coupling mechanism.	Inspect hexagonal-shaped end piece on right side of lower roller for signs of wear. Also examine the roller coupling and spear gear shaft for signs of wear. Replace defective part if available.
		b. Defective governor	Inspect governor for loose parts, broken spring, etc. Replace parts. Check setscrew securing governor to lower roller shaft. Tighten or replace setscrew.
9	Upper roller does not return to up (unlocked) position.	Pivot arms not secured to lock tie bar or are bent.	Check screws attaching pivot arms to lock tie bar. Tighten or replace missing screws, making certain that pivot arm is in cutout of lock tie bar. Examine pivot arms for distortion. Repair or replace pivot arms if available.

Section III. REPAIRS, ADJUSTMENTS, AND REPLACEMENT OF PARTS

4-12. Repairs, Adjustments, and Replacement Techniques

a. General. Paragraphs 4–13 through 4–31 contain information required by maintenance personnel for performing maintenance on the film processing unit. Most of the parts in the film processor can be reached and replaced without special procedures or tools.

b. Considerations Before Disassembly. Sectionalizing trouble in the equipment can simplify repairs by limiting the work to the defective area. Repairs that can be made by disassembly of the particular parts that operate as a group to perform a function are outlined below.

(1) *Cassette sleeve and packet replacement.* Repairs to the cassette sleeve and packet receptacle can be made without removing the main frame from the container. Refer to paragraphs 4–14 and 4–15 for removal and replacement procedures.

(2) *Winding knob.* Repairs to the component parts mounted under the winding knob can be made by removing the release button and winding knob. Refer to paragraph 4–16 for removal and replacement procedure.

(3) *Upper roller assembly.* Repairs or adjustments to the upper roller assembly can be made without removing the main frame from the container. Refer to paragraph 4–18 for assembly and disassembly of the upper roller assembly.

(4) *Lower roller and speed governor.* Repairs to the lower roller and associated speed governor can be made by removing the main frame from the container. Refer to paragraph 4–19 for disassembly and assembly of the lower roller speed governor.

(5) *Negator spring.* Removal and replacement of the negator spring can be made by removing the main frame from the container. Refer to paragraph 4–21 for removal and replacement procedures.

(6) *Winding drum.* Repairs to the winding drum can be made by removing the main frame from the container. Also, the negator spring must be removed from the winding drum. Refer to paragraph 4–22 for disassembly and assembly of the winding drum.

(7) *Spur gear.* Repairs to the spur gear can be made by removing the main frame from the container. Also, the lower roller and winding drum must be removed. Refer to paragraph 4–24 for replacement of spur gear.

4-13. Timer Replacement
(fig. 4-3)

a. To replace the timer, carefully pry the timer knob (1) off the timer shaft with a screwdriver.

b. Hold the underside of the timer (3) and remove the hexagonal nut (2) attaching the timer to the cover.

c. Reinstall the timer by replacing the hexagonal nut and the timer knob.

4-14. Cassette Sleeve Replacement
(fig. 4-3)

a. Removal.

(1) Remove the 10 machine screws (5) and hexagonal nuts (6) attaching the cassette sleeve frame (7) and cassette sleeve (8) to the container (45).

(2) Remove the cassette sleeve frame (7) and cassette sleeve (8).

b. Cleaning and Inspecting.

(1) Clean the interior and exterior of the cassette sleeve with water and a mild soap or approved cleaning compound. Remove any adhesive on the cassette sleeve and cassette sleeve frame.

(2) Examine the cassette sleeve for cracks, holes, or parting of the seams. Repair holes with a suitable opaque tape. Seal defective seams with adhesive.

c. Replacement.

(1) Position the flanges of the cassette sleeve (8) inside the container (45) for fastening to the container.

(2) Apply one coat of adhesive to the side of the cassette sleeve frame (7) facing the flanges of the cassette sleeve (8).

(3) Position the cassette sleeve (8) and cassette sleeve frame (7) against the side of the container (45) for fastening. Make certain the cassette sleeve flanges are wrinkle free and flat against the side of the container.

(4) Fasten the cassette sleeve frame (7) and cassette sleeve (8) to the container (45) with the 10 machine screws and nuts.

4-15. Packet Receptacle Replacement or Repair

a. Remove the 10 machine screws and hexagonal nuts that attach the packet receptacle to the main frame.

b. Remove the frame and packet receptacle.

c. Clean, adjust, and repair packet receptacle.

d. Replace packet receptacle and replace machine screws and hex nuts.

4-16. Winding Knob Removal
(fig. 4-3)

NOTE

Before removing the winding knob, depress the release button to make sure the winding mechanism is unwound.

a. Removal. Remove the winding knob and associated parts as follows:

(1) Remove the retaining ring (11) which holds the release button (12) to the stub shaft on the release cam (23). Remove the release button from the shaft.

(2) Remove the two machine screws (13) and washers (14) that attach the winding knob (15) to the mounting plate (25) and remove the winding knob.

(3) Remove the machine screw (16) and flat washer (17) that attach the winding cam (18) to the winding shaft drum and remove the winding cam and the winding clutch key.

NOTE

The mounting plate (25) and associated parts may be removed from the winding shaft drum as a unit at this point for removing the main frame from the container.

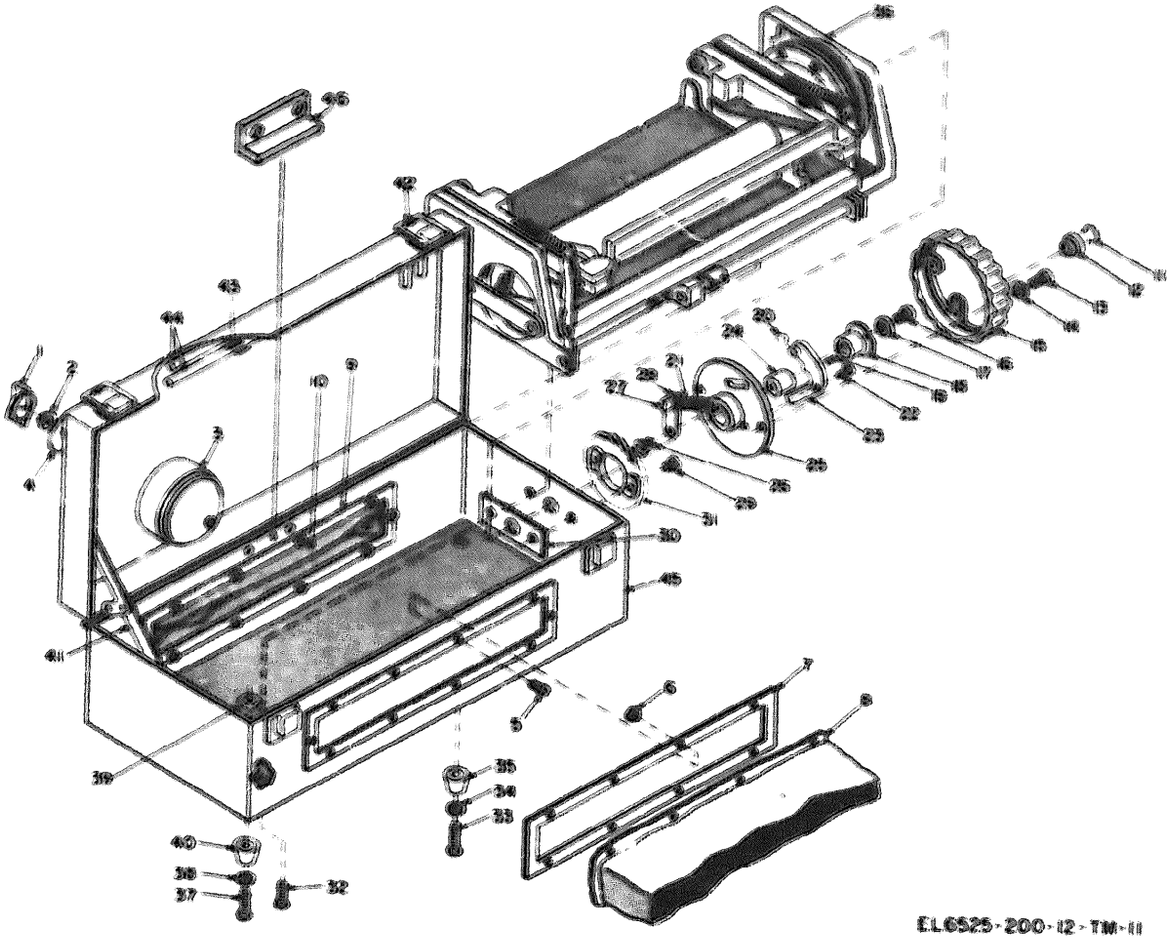
(4) Remove the retaining ring (20) and the end of the ratchet spring (21) from the stub shaft on the release cam (23).

(5) Remove the mounting plate shoulder screw (22) that attaches the release cam (23) to the mounting plate (25) and remove the release cam.

(6) Remove the mounting plate shoulder screw (26) that attaches the pawl (27) to the mounting plate and remove the pawl cotter pin (28), and ratchet spring (21) as a unit.

(7) Remove the two machine screws (29) that secure the mounting plate (30) and ratchet (31) to the container (45).

b. Cleaning and Inspecting.



1. Knob
2. Hex nut
3. Timer
4. Dial plate
5. Machine screw (4–40 NC–2 x ⅜ in. lg, pan hd, cres)
6. Hex. nut (4–40, light)
7. Cassette sleeve frame
8. Cassette sleeve
9. Packet receptacle frame
10. Packet receptacle
11. Retaining ring
12. Release button
13. Machine screw (8–32 NC–2 x 5/16 in. lg, pan hd, cres)
14. Internal tooth washer (No. 8, cres)
15. Winding knob
16. Machine screw (6–32 NC–2 x 5/16 in. lg, pan hd, cres)
17. Flat washer (No. 6, cres)
18. Winding cam
19. Winding clutch key
20. Retaining ring
21. Ratchet spring
22. Shoulder screw (5/16 dia x 1/2 in. lg)
23. Release cam
24. Ball bearing
25. Mounting plate
26. Shoulder screw (5/16 dia x 1/2 in. lg)
27. Pawl
28. Cotter pin (1/16 dia x 5/16 in. lg, cres)
29. Machine screw (8–32 NC–2 x 3/8 in. lg, fh, cres)
30. Mounting plate
31. Ratchet
32. Machine screw (10–32 NF–2 x 7/16 in. lg, pan hd, cres)
33. Machine screw (10–32 NF–2 x 3/4 in. lg, pan hd, cres)
34. Flat washer (No. 8, cres)
35. Bumper
36. Main frame
37. Machine screw (10–32 NF–2 x 5/8 in. lg, pan hd, cres)
38. Flat washer (No. 8, cres)
39. Hex. nut (10–32, light, cres)
40. Bumper
41. Stay
42. Catch
43. Clip (delete)
44. Packet receptacle stiffener (part of item 96, fig 4–4)
45. Container
46. Guide plate

Figure 4-3. Main frame removal, exploded view.

(1) Clean all parts with an approved cleaning compound.

(2) Inspect the parts for defects. Examine the ratchet spring for distortion or breaks. Check the ratchet gear for burrs.

(3) Lubricate the ratchet gear and the pawl and release the cam pivot points.

c. Reassembly. Reassemble the winding knob as follows:

(1) Replace the mounting plate and ratchet to the container frame.

(2) Replace the pawl, cotter pin, and the ratchet spring as a unit on the mounting plate and replace the pawl with the mounting plate shoulder screw.

(3) Replace the release cam, attaching the ratchet spring and retaining ring on the stub shaft of the release cam.

(4) Replace the winding cam, winding clutch key, and winding knob.

(5) Reassemble the winding knob component parts, then replace the release button and retaining ring.

4-17. Main Frame Removal
(fig. 4-3)

a. Removal. Remove the main frame (36 from the container (45) as follows:

(1) Remove the winding knob and associated parts as described in paragraph 4-16.

(2) Remove the three machine screws (32) one machine screw (33), flat washer (34) an rubber bumper (35) located in the bottom right hand corner of the container (45).

(3) Pull the cassette sleeve (8) and packi receptacle (10) from the openings on each sid of the container (45) so as not to interfere wit the removal of the main frame (36).

(4) Remove the two hexagonal screws an guide plate fro... the frame of the unit.

(5) Lift up on the left side of the mai frame (36) and slide it to the left so the wind ing drum clears the hole in the right side of th container (45). Remove the main frame fro the container.

4-18. Upper Roller Carriage Disassembly
(fig. 4-4)

NOTE

The upper roller carriage can be removed as an assembly. To remove the upper roller only, proceed to *d* below.

a. Use a 3/16-inch Allen wrench and remove the two pivot shoulder screws (1). Remove the upper roller carriage.

b. Remove the two spring plungers (2) on the pivot arms (3 and 4).

c. Remove the two machine screws (5) on each end of the crossbar (6) and remove the crossbar.

d. Remove the four machine screws (7) that hold the tie plates (8) to the pivot arms (3 and 4) and the upper roller arms (10 and 11).

e. Use a 5/16-inch Allen wrench and remove the two pivot shoulder screws (9) that hold the upper roller arms (10 and 11) to the pivot arms (3 and 4).

f. Use retaining ring pliers and remove the retaining rings (12) from each end of the upper roller (13) shaft.

4-19. Lower Roller and Governor Disassembly and Reassembly
(fig. 4-4)

a. Disassembly.

(1) Remove the main frame from the container (para 4-16).

(2) Turn the main frame (36) over and remove the two machine screws (16) that fasten the lower roller pillow blocks (17 and 18) to the main frame.

(3) Disengage the lower roller coupling (20) from the right side of the lower roller (31) by inserting a screwdriver between the lower roller coupling (20) and the roller pillow block (18).

NOTE

Place the lower roller coupling (20) and coupling spring (21) aside until the lower roller is assembled to the main frame.

(4) Lift up the right-hand end of the lower roller (31) so that the governor clears the main frame casting, and remove the lower roller and the governor.

(5) Remove the governor spring (22) from the governor weights (25) in to reach the setscrew (27) in the hub of the governor rotor (23). Remove the setscrew (27) and the governor assembly from the lower roller (31) shaft.

(6) Remove the two retaining rings (30) from each end of the lower roller (31) shaft and . off the roller pillow blocks (17 and 18).

b. Reassembly.

(1) Insert the right-hand end of the lower roller (31) shaft containing the hexagonal shaft pin (32) into the right-hand roller pillow block (18). Secure the lower roller shaft to the roller pillow block with the retaining ring (30).

(2) Insert the left-hand end of the lower roller (31) shaft into the left-hand roller pillow block (17). Secure the lower roller shaft to the roller pillow block with the retaining ring (30).

CAUTION

Make sure the setscrew (27) on the governor rotor (23) is properly seated in the hole on the left end of the lower roller shaft. Improper sections of the setscrew will result in damage to the shaft and in excessive speed due to slippage.

(3) Slide the governor rotor (23) on the left end of the lower roller (31) shaft and align the hole in the hub of the governor rotor with the hole in the shaft. Secure the governor rotor to the lower roller shaft with the setscrew (27).

(4) Install the governor spring (22) on the governor weights (25).

(5) Carefully place the lower roller and pillow blocks into the main frame (99) casting by tilting the left-hand side downward and positioning the lower roller shaft into the lower roller end support (33).

(6) Place the coupling spring (21) against the side of the ball bearing (93) and hold in position.

(7) Place the lower roller coupling (20) on the hexagonal shaped end of the spur gear shaft (92) and hold both the lower roller coupling and the coupling spring in position.

(8) While exerting pressure on the lower roller coupling (20) and coupling spring (21), align the hexagonal shaft pin (32) on the lower roller shaft with the lower roller coupling (20). Press downward on the pillow blocks (17 and 18) to engage the dowel pins (19) in the base of the main frame (99).

(9) Hold the lower roller in position and turn the main frame (99) over. Fasten the lower roller pillow blocks (17 and 18) to the main frame with the two machine screws (16).

4-20. Upper Roller Pressure and Locking Mechanism Adjustment (fig. 4-5)

a. Upper roller pressure adjustment is required after reassembly. Refer to paragraph 2-11.

b. Adjust the upper roller locking mechanism as follows:

(1) When the roller carriage does not lock when pressed downward, rotate the adjusting screw clockwise one turn. Continue to turn the adjusting screw clockwise one-half turn until the crossbar is locked in the down position.

(2) If the roller carriage is not released at the end of the unwind cycle, turn the adjusting screw counterclockwise one-half turn until the crossbar is released.

(3) Repeat (1) and (2) above until the locking mechanism operates properly.

4-21. Negator Spring Replacement (fig. 4-4)

a. Removal.

(1) Remove the main frame from the container (para 4-17).

(2) Remove the two machine screws (39) which secure the winding stop (40) to the main frame upright.

(3) While holding the winding drum (52) with one hand, insert a screwdriver between the drum stop limit spring (51) and the side of the winding drum. Allow the winding drum to turn slowly as the negator spring (42) returns to the storage drum (61).

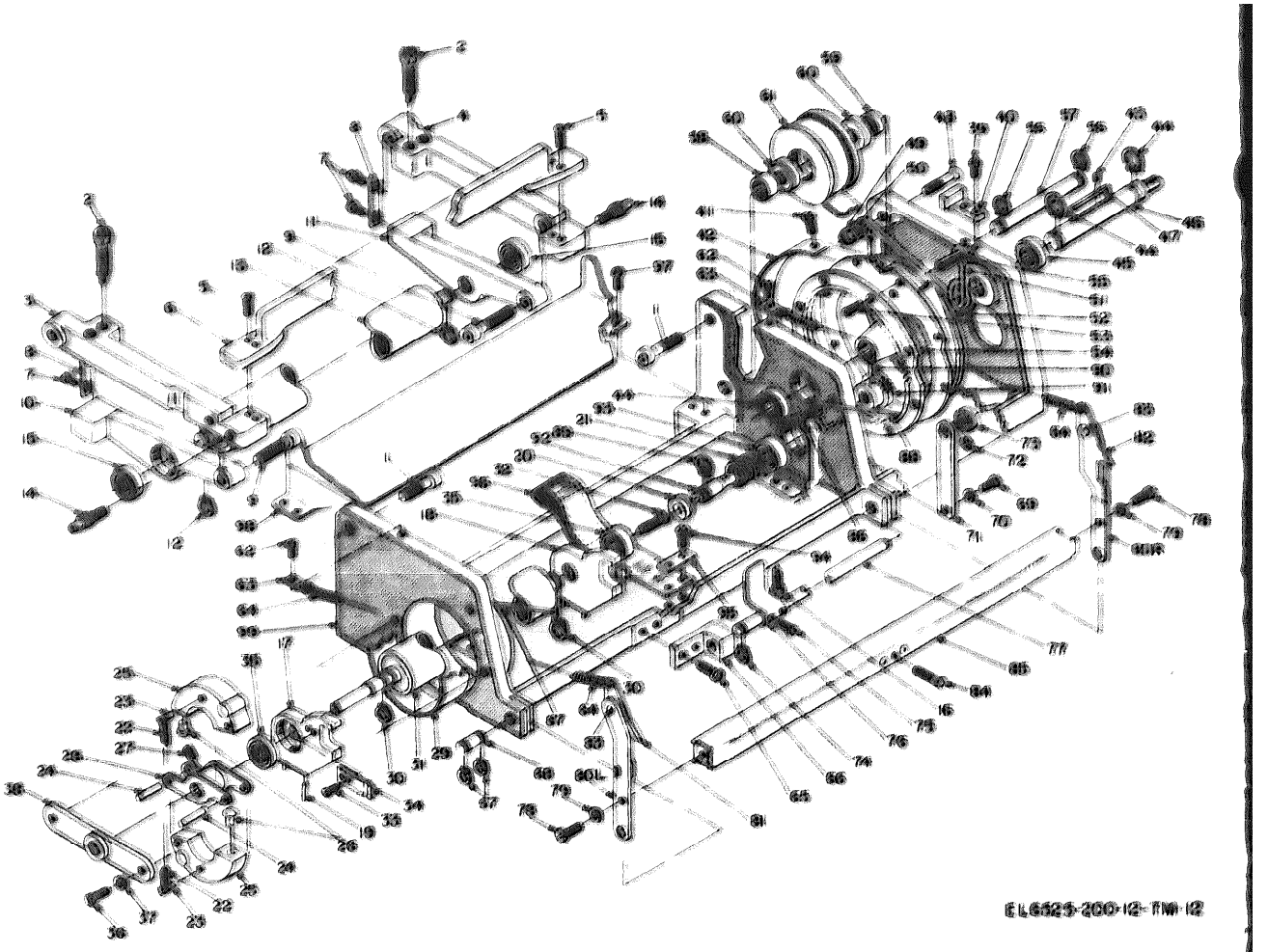
(4) Repeat (3) above once more because the winding drum (52) has one full turn of the negator spring (42) on its surface at all times.

(5) While holding the winding drum (52) in position, remove the machine screw (41) which secures the end of the negator spring (42) to the winding drum.

NOTE

If the instruction in (5) above is accomplished carefully, the machine screw should remain in the hole of the negator spring.

(6) Hold one end of the doubled negator spring (42) tightly. Remove the machine screw (41) from the hole and place it back into the hole in the opposite direction. The spring may now be coiled off the storage drum (61).



1. Pivot shoulder screw (5/16-18, 1/2 in. lg thd, 3/8 d x 1/2 in. lg)
2. Spring plunger
3. LH pivot arm
4. RH pivot arm
5. Machine screw (6-32 NC-2 x 1/2 in. lg, rd hd, cres)
6. Cross bar
7. Machine screw (5-40 NC-2 x 3/16 in. lg, rd hd, cres)
8. Tie plate
9. Pivot shoulder screw (5/16, 1/2 in. lg thd, 3/8 d x 5/8 in. lg)
10. LH upper roller arm
11. RH upper roller arm
12. Retaining ring
13. Upper roller
14. Pivot arm stud (1/4-20 NC-2)
15. Ball bearing
16. Machine screw (10-32 NF-2 x 1/2 in. lg, fil h, crew)
17. LH roller pillow block
18. RH roller pillow block
19. Dowel pin (0.125 dia x 1/2 in. lg, cres)
20. Lower roller coupling
21. Coupling spring
22. Governor spring
23. Rod (1/8 dia x 1/2 in. lg, cres)
24. Dowel pin (1/8 dia x 3/4 in. lg, sst)
25. Governor weight
26. Bumper
27. Setscrew (6-32 NC-2 x 1/4 in. lg, sch, cres)
28. Governor rotor
29. Governor cylinder
30. Retaining ring
31. Lower roller
32. Hexagonal shaft pin
33. Machine screw (10-32 NF-2 x 1/2 in. lg, fil h, cres)
34. Cassette guide clip
35. Ball bearing
36. Machine screw (6-32 NC-2 x 3/8 in. lg, pan hd, cres)
37. Internal tooth washer (No. 6, cres)
38. Lower roller end support
39. Machine screw (6-32 NC-2 x 3/8 in. lg, pan hd, cres)
40. Winding stop
41. Machine screw (8-32 NC-2 x 5/16 in. lg, pan hd, cres)
42. Negator spring
43. Setscrew (6-32 NC-2 x 1/2 in. lg, sch., cres)
44. Retaining ring
45. Ball bearing
46. Winding drum shaft
47. Winding drum shaft key (1/8 x 1/8 x 1-5/32 in. lg, key stock)
48. Machine screw (10-32 NF-2 x 1-5/32 in. fh, cres)
49. Hex. nut (10-32, light)
50. Flat washer (No. 10, cres)
51. Drum stop limit spring
52. Winding drum
53. Machine screw (6-32 NC-2 x 5/16 in. lg, fh, cres)
54. Internal gear
55. Roll pin (3/16 dia x 3/4 in. lg, cres)
56. Retaining ring
57. Storage drum shaft
58. LH storage drum collar
59. RH storage drum collar
60. Ball bearing
61. Storage drum
62. Machine screw (6-32 NC-2 x 1/4 in. lg, pan hd, cres)
63. Spring anchor
64. Lock spring

Figure 4-4. Main frame, exploded view.

65. Machine screw (6-32 NC-2 x 1/2 in. lg, pan hd, cross)
66. Cam follower shaft pillow block
67. Retaining ring
68. Pivot arm stud
69. Machine screw (6-32 NC-2 x 5/16 in. lg, pan hd, cross)
70. Internal tooth washer (No. 6, cross)
71. Cam follower arm
72. Retaining ring
73. Ball bearing
74. Retaining ring
75. Machine screw (6-32 NC-2 x 3/8 in. lg, pan hd, cross)
76. Adjusting screw tab
77. Cam follower shaft
78. Machine screw (6-32 NC-2 x 1/4 in. lg, pan hd, cross)
79. Internal tooth washer (No. 5 cross)
80. Pivot arm
81. R.H upper roller carriage lock
82. L.H upper roller carriage lock
83. Lock rivet
84. Machine screw (6-32 NC-2 x 7/8 in. lg, hex. hd, cross)
85. Lock tie bar
86. Machine screw (10-32 NF-2 x 7/16 in. lg, pan hd, cross)
87. L.H lift spring
88. R.H lift spring
89. Retaining ring
90. Roll pin (3/16 dia x 3/4 in. lg cross)
91. Spur gear
92. Spur gear shaft
93. Ball bearing
94. Machine screw (6-32 NC-2 x 1/4 in. lg, pan hd, cross)
95. Sensing strap plate
96. Cross bar sensing strap
97. Machine screw (6-32 NC-2 x 1/4 in. lg, pan hd, cross)
98. Film guide
99. Main frame

Figure 4-4-Continued

b. Replacement.

(1) Grasp one end of the negator spring (42) and uncoil a sufficient length to start the negator spring around the storage drum (61).

(2) Continue to feed the negator spring (42) onto the storage drum until the end with the machine screw (41) is now held in hand.

NOTE

If possible, clamp the main frame to a workbench while performing the instruction (3) below.

(3) Grasp the negator spring (42) firmly in one hand and pull enough off the storage drum to form about a 4-inch loop.

(4) Secure the negator spring (42) with the machine screw (41) into the threaded hole in the recess of the winding drum (52). Allow the negator spring to snap down onto the winding drum surface.

(5) Turn the winding drum (52) counterclockwise and insert the screwdriver between the winding drum side and the drum stop limit spring (51) so that the hook on the limit spring detains the roll pin (55) protruding on the side of the winding drum.

(6) Repeat (5) above once more so that slightly more than one full turn of negator spring is wound onto the surface of the winding drum.

(7) Replace the winding stop (40) to the main frame with the two machine screws (39).

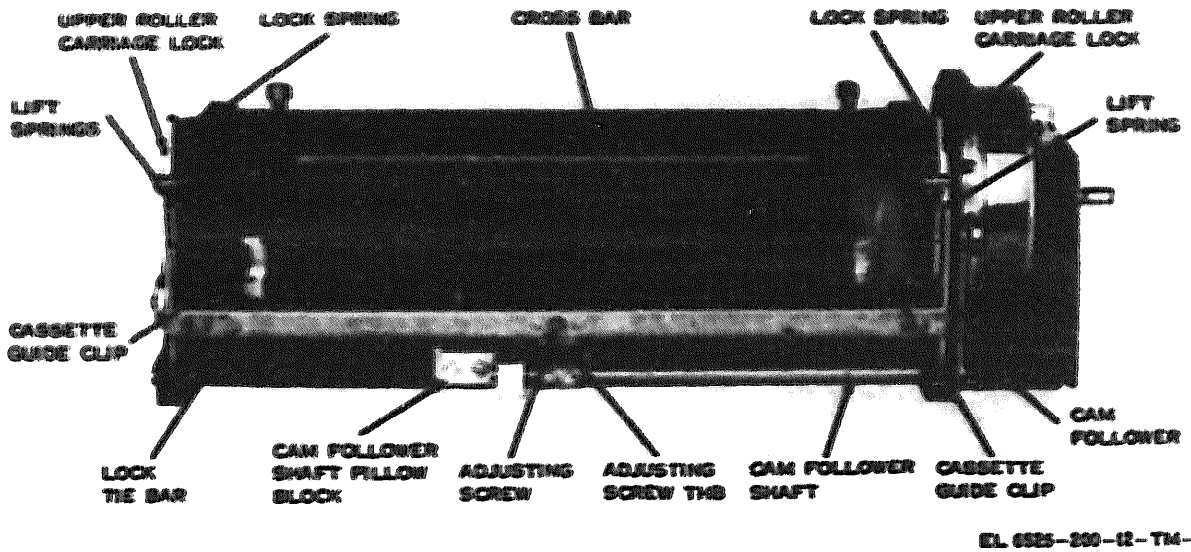


Figure 4-5. Upper roller locking mechanism adjustment.

4-22. Winding Drum Disassembly (fig. 4-4)

a. Perform the procedure in paragraph 4-21 and remove the negator spring from the winding drum.

b. Insert an Allen wrench through the 1/4-inch hole located in line with the indent on the winding drum surface and remove the socket head setscrew (43) which secures the winding drum hub to the winding drum shaft key (47).

c. Use retaining ring pliers and remove the retaining ring (44) from the winding knob end of the winding drum shaft (46).

d. Place a small diameter drift punch into the threaded hole at the end of the winding drum shaft (46) so that the punch bottoms and does not damage the threads.

e. Gently tap the drift punch while rotating the winding drum (52) so that the large winding drum shaft key (47) in the winding drum shaft (46) slowly works the inner ball bearing (45) out of the main frame casting. Remove the ball bearing (45) and winding drum shaft (46).

f. Loosen the machine screw (48), hexagonal nut (49), and flat washer (50) which secure the drum stop limit spring (51) to the main frame casting.

g. Swing the drum stop limit spring (51) back out of the way and remove the winding drum (52).

4-23. Upper Roller Locking Mechanism Disassembly (fig. 4-4)

a. Remove the main frame from the container (para 4–17).

b. Remove the machine screw (62) that secures the spring anchors (63) to the main frame.

c. Remove the two machine screws (65) that secure the cam follower shaft pillow block (66) to the main frame base.

d. Remove the two retaining rings (67) and pivot arm stud (68) that secure the pivot arm (80) to the main frame.

e. Remove the machine screw (69) and internal tooth washer (70) that secure the cam follower arm (71) to the main frame and remove the cam follower assembly. Lift the locking mechanism assembly from the main frame.

f. Remove the retaining ring (72) that attaches the cam follower shaft (77) to the cam follower shaft pillow block (66) and remove the cam follower shaft (77) and adjusting screw tab (76).

g. Remove the two machine screws (78) and internal tooth washers (79) that secure the pivot arms (80) to the lock tie bar (85) and remove the pivot arms.

4-24. Spur Gear Replacement (fig. 4-4)

a. Remove the main frame from the container (para 4–17).

b. Remove the lower roller (para 4–19) and winding drum (para 4–22).

c. Remove the retaining ring (89) that attaches the spur gear shaft (92) to the main frame.

d. Remove the roll pin (90) that secures the spur gear (91) to the spur gear shaft (92) and lift off the spur gear.

4-25. Cassette Sleeve and Packet Receptacle Repair and Cleaning

a. Inspect the cassette sleeve and packet receptacle for holes, condition of seams, etc. Repair small holes with opaque tape. If the seams have parted, cement seams with adhesive (U.S. Royal Part No. 6244 or equivalent). Remove excessive adhesive.

b. Clean the inside and outside of the cassette sleeve and packet receptacle with a clean soft cloth moistened with water and mild soap.

4-26. Upper Roller Carriage Repair and Cleaning

a. Inspect the upper roller carriage parts for dirt and foreign accumulations. Clean the parts with an approved cleaning compound.

b. Examine the upper roller for dried developer or foreign material imbedded into the surfaces of the roller. Clean the roller surfaces with a clean cloth moistened with water and a mild soap. Dry with a lintfree soft cloth.

c. Check to see that the upper roller rotates freely. Replace damaged bearings.

d. Lubricate the pivot shoulder screws during assembly of the upper roller carriage.

e. Adjust the upper roller pressure in accordance with paragraph 2–11 after assembly.

4-27. Lower Roller and Governor Repair and Cleaning

a. Inspect the lower roller for dirt, dried developer, or foreign material imbedded into the surfaces of the roller. Clean the roller surfaces with a clean cloth moistened with water and a mild soap. Dry with a lint-free soft cloth.

b. Inspect the governor for dirt or foreign obstructions. Examine the governor spring for distortion or cracks.

c. Examine the phenolic rod on the governor weight for excessive wear or cracks. Replace the governor weight if defective.

d. Examine the surfaces of the governor cylinder pressed into the main frame for dust or dirt and make sure the surface is clean and free of obstructions.

e. Check to see if the lower roller rotates freely after assembly.

4-28. Negator Spring Cleaning

Examine the negator spring for dust, dirt, or metal filings especially between the two springs. Clean the negator springs with an approved cleaning compound.

4-29. Winding Drum Repair and Cleaning

NOTE

The winding drum (52, fig. 4–5) and the internal gear (54) are a matched set. To replace these parts, replace them as a new assembly.

a. Inspect the surfaces of the winding drum for dust, dirt, or metal filings. Clean the winding drum with an approved cleaning compound.

b. Examine the internal gear for dirt, broken teeth, or burrs. Clean the internal gear with an approved cleaning compound. Lubricate the teeth of the internal gear during assembly.

c. Examine the spur gear that meshes with the internal gear for dirt, corrosion, broken teeth, or burrs. Remove any corrosion present; clean with an approved cleaning solvent. Lubricate the spur gear during assembly.

4-30. Upper Roller Loading Mechanism Repair and Cleaning

a. Inspect the springs and levers for wear and distortion. Check to see that the cam follower bearing rotates freely.

b. Inspect the locking mechanism for dirt, dust, or grease. Clean with an approved cleaning compound. Lubricate the pivot areas after reassembly.

c. If necessary, during final testing, adjust the screw in the lock tie bar for proper locking and releasing of the upper roller carriage.

4-31. Final Testing

When the film processor has been repaired or parts replaced affecting the operation or operating controls, an operational check is required. Follow the procedures described in paragraph 3–5.

APPENDIX A

REFERENCES

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	Index of Modification Work Orders.
TM 38–750	The Army Maintenance Management Systems (TAMMS).
TM 740–90–1	Administrative Storage of Equipment.
TM 750–244–2	Procedures for Electronics Materiel to Prevent Enemy Use (Electronics Command).

APPENDIX B

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

B-1. General

This appendix provides a summary of the maintenance operations covered in the equipment literature for the Portable Radiographic X-Ray Processing Machine. It authorizes categories of maintenance for specific functions on repairable items and components including the tools and equipment required to perform each function. Maintenance is limited to that which can be performed at the organizational level with standard supplies available through normal supply channels. If troubleshooting indicates repair which cannot be performed at this level, return the complete unit to: Transportation Officer (IMSO) Fort Holibard, MD 21219. This appendix may be used as a plan for maintenance operations.

B-2. Explanation of Format for Maintenance Allocation Chart

a. Group Number. Not used.

b. Component, Assembly, Nomenclature. This column lists the item names of component units, assemblies, and modules on which maintenance is authorized.

c. Maintenance Function. This column indicates the maintenance category at which performance of the specific maintenance function is authorized. Authorization to perform a function at any category also includes authorization to perform that function at higher categories. The codes used represent the various maintenance categories as follows:

Code	Maintenance category
C	Crew/operator
O	Organizational maintenance
F	Direct support maintenance
H	General support maintenance
D	Depot maintenance

d. Tools and Equipment. The numbers appearing in this column refer to specific tools and equipment which are identified by these numbers in section I.

e. Remarks. Self-explanatory.

B-3. Explanation of Format for Tool and Test Equipment Requirements

The columns in the tool and test equipment requirements table are as follows:

a. Tools and Equipment. The numbers in this column coincide with the numbers used in the tool and equipment column of the MAC. The numbers indicate the applicable tool for the maintenance function.

b. Maintenance Category. The codes in this column indicate the maintenance category normally alloted the facility.

c. Nomenclature. This column lists tools, test and maintenance equipment required to perform the maintenance functions.

d. Federal Stock Number. This column lists the Federal Stock Number.

e. Tool Number. Not used.

(Next printed page is B-3)

SECTION II MAINTENANCE ALLOCATION CHART

GROUP NUMBER	COMPONENT ASSEMBLY NOMENCLATURE	MAINTENANCE FUNCTIONS											TOOLS AND EQUIPMENT	REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
	X-RAY PROCESSING MACHINE	C	C D						D	D	D			Operational test.

TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOLS AND EQUIPMENT	MAINTENANCE CATEGORY	NOMENCLATURE	FEDERAL STOCK NUMBER	TOOL NUMBER
1	O	HAMMER, ARMOR HOE	5120-00-240-8078	
2	O	KIT, SET, COMBAT HEAD, CREW SER	8465-00-926-6010	
3	O	PLIERS, WIRING HOOK	5120-00-240-8078	
4	O	PLIERS, STRIPPING TOOL	5120-00-926-6010	
5	O	PUNCH, HOOK	5120-00-240-8078	
6	O	SCALE, SPRING FULL	6605-00-926-6010	
7	O	SCREWDRIVER, FLAT TIP	5120-00-240-8078	
8	O	SCREWDRIVER, FLAT TIP	5120-00-926-6010	
9	O	WATCH, STOP	6645-00-240-8078	
10	O	WRENCH, ADJUSTABLE	5120-00-926-6010	

By Order of the Secretary of the Army:

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Active Army:

CNGB (1)
TSG (1)
WRAMC (1)
MFSS (5)
USAMB (2)
AMC (1)
USACDC (1)
USACDCCEA (1)
TECOM (1)
LEAD (4)
LEAD (4)
SAAD (5)
TOAD (5)
LOGCOMD (2)

NG & USAR: None

For explanation of abbreviations used, see AR 310-50

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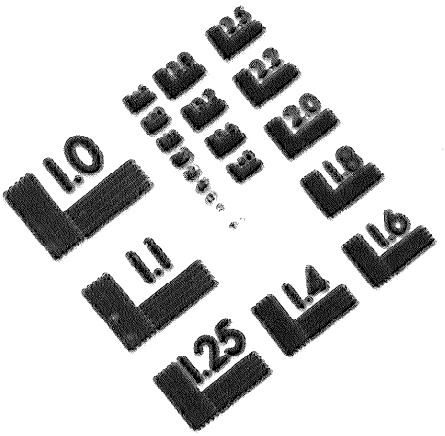

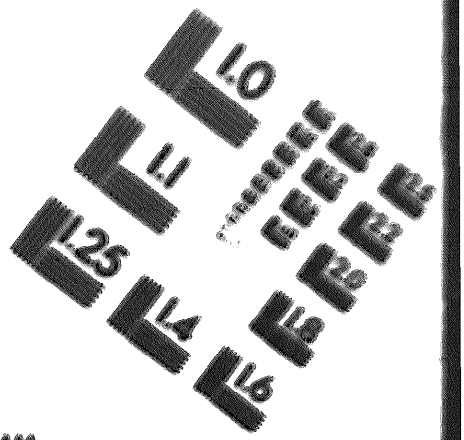

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2.0 mm (e= 1.27 mm)

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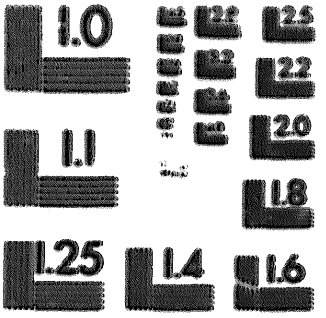
12345678905¢£/%#½¼¾—=+ ×&@*



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2.0 mm (e= 1.27 mm)

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2.5 mm (e= 1.77 mm)

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abcdefghijklmnopqrstuvwxyz
12345678905¢£/%#½¼¾—=+ ×&@*

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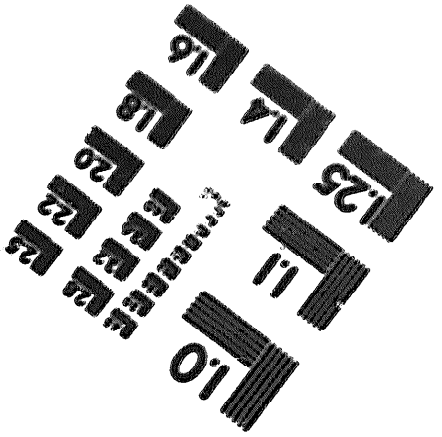

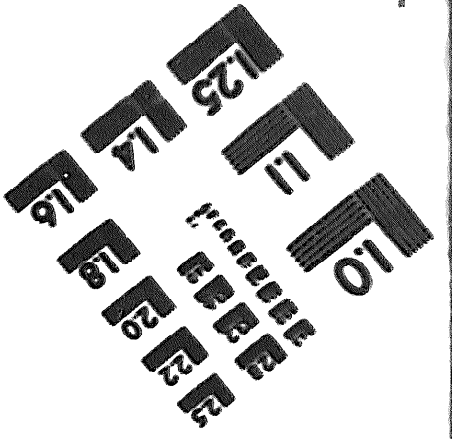

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