TM 9-1290-325-12/1

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

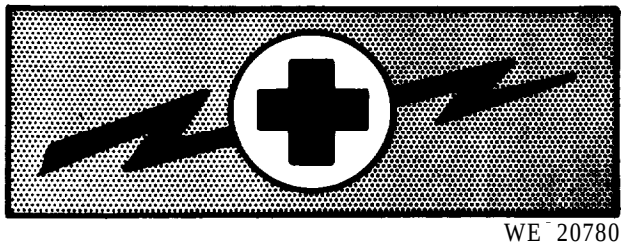
OPERATOR AND ORGANIZATIONAL
MAINTENANCE MANUAL
INCLUDING REPAIR PARTS AND
SPECIAL TOOLS LIST

RADAR CHRONOGRAPH SET: M36, W/E (1290-861-7105)

This copy is a reprint which includes current pages from Changes 1 through 5.

HEADQUARTERS, DEPARTMENT OF THE ARMY
JANUARY 1968

WARNING



WE 20780

HIGH VOLTAGE

is used in the operation of this equipment

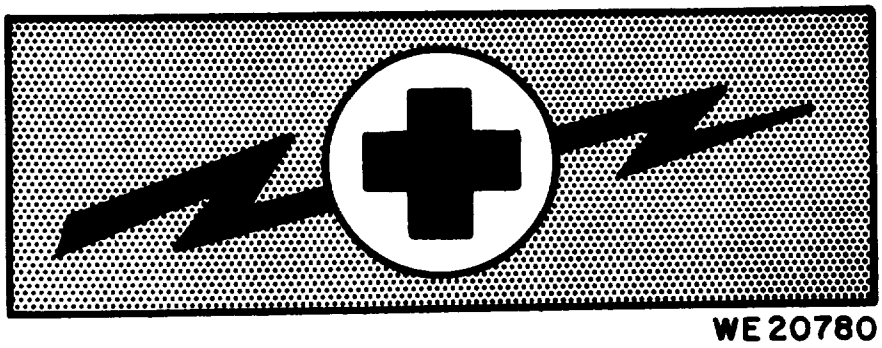
DEATH ON CONTACT

may result if personnel fail to observe safety precaution
Learn the areas containing high voltage in each piece of equipment
Be careful not to contact high-voltage or 115-volt ac input connections when installing or operating this equipment
Before working inside the equipment, turn power off and ground points of high potential before touching them

EXTREMELY DANGEROUS POTENTIALS

exists in the following units:

Klystron
Voltage multiplier
Power supply



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Voltage multiplier
Power supply

WARNING

POTENTIAL RADIATION HAZARD

WHEN RADAR IS ENERGIZED, PERSONNEL SHOULD NOT BE WITHIN 6 FEET OF THE RADIATING FEEDHORN (LOCATED IN CENTER OF DISH) IN THE DIRECTION OF THE TRANSMITTED BEAM.

WE 51652

TECHNICAL MANUAL
No. 9-1290-325-12/1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 15 January 1968

RADAR CHRONOGRAPH SET: M36, W/E (1290-861-7105)

* This manual supersedes TM 9-1290-325-12/1, 8 October 1963, and TM 9-1290-325-20P, 22 March 1963.

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1-1. Scope

a. This manual contains instructions for operator and organizational maintenance of radar chronograph set, M36 and associated equipment (1290-861-7105).

b. Maintenance responsibilities will apply as reflected in the maintenance allocation chart and by allocation of repair parts and special tools.

1-2. Forms, Records, and Reports

a. Authorized Forms. Refer to DA Pam 310-2 and TM 38-750.

b. Reporting of Equipment Publication Improvements. Report of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commander, Frankford Arsenal, ATTN: SARFA-MA, Philadelphia, PA. 19137.

c. Materiel Failure Report. Failure of materiel will be reported in accordance with TM 38-750.

d. Report of Accidents. Injury to personnel or damage to materiel. Refer to AR 385-40.

Section II. DESCRIPTION AND DATA

1-3. Description of Radar Chronograph Set M36

a. General Description. Radar chronograph set, M36 (fig. 1-1) is a portable electronic instrument which measure weapon projectile velocities ranging from 70 to 1800 meters per second. The radar chronograph is designed for mounting on tripod assembly (fig. 1-2) or on utility truck M151 (fig. 1-3). Connections for power are made through a power input connector located on the rear chronograph panel. Prime power must be supplied from generator set through cable and reel assembly.

b. Basic Principles. The basic principle upon which the radar chronograph set M36 (fig. 1-1) operates is the doppler frequency-shift effect. In essence, the doppler shift principle states that the frequency of a wave motion, in this case, radio waves, will appear to change whenever the observer or the source is in motion with respect to the other. In this application, the frequency of the transmitted radar signal is changed by the motion of the projectile from which it is reflected. The difference in frequency between the transmitted and received (echo) signals is measured and used as a measure of projectile velocity. The radar chronograph transmits a continuous wave signal at an X-band frequency of 10,500 mc and receives an echo signal (returned from a projectile in flight) having a changed frequency. This frequency shift (doppler effect) is measured and converted by means of electronic circuitry to a velocity figure which is read directly in meters per second. This reading, which represents the projectile velocity measured over a small portion of its outer trajectory, may be converted to muzzle velocity.

Figure 1-1. Radar chronograph set M36 and associated equipment.

by means of special extrapolation tables contained in TM 9-1290-325-12/2.

c. Radar Chronograph. The radar chronograph (fig. 1-4) is the main component of the radar chronograph set, M36. Essentially, it consists of a complete radar transmitter-receiver with special circuitry for comparing outgoing and incoming frequencies and for converting the result into velocity terms on a direct readout display. Transistors are utilized in the electronic circuitry wherever signal frequencies and power levels permit. This gives the radar chronograph a high degree of portability, compactness, coolness of operation, ruggedness, and stability. The whole unit consists of six major assemblies contained in a two-section aluminum case. The smaller front section mounts the antenna reflector (fig. 1-5) and contains the waveguide and amplifier-detector (IF) assemblies.

Figure 1-2 Radar chronograph mounted on tripod.

On the left hand side of the front section are two LEAKAGE ADJUSTMENT control knobs numbers 1 and 2 (fig. 1-6). All other operating controls are located on the rear panel. The rear section contains four plug-in assemblies; the audio amplifier (fig. 1-4), digital display indicator, power supply and AFC assemblies. The first three of these are accessible from the rear panel and are held in place by captive screws. The AFC assembly can be made accessible by loosening four key lock fasteners and swinging open the hinged front section, For access to all four assemblies, the complete rear panel may be pulled out on its guide rails after loosening ten screws. Air vents with filters are located at the bottom of the rear section for intake and exhaust of the air circulated by the cooling fans. The two sections are hinged together to permit opening for access to the waveguide and IF amplifier assemblies, and to the AFC assembly. A dovetail-slotted mounting plate is located on top of the rear section. The dovetail-slotted plate is used for mounting the sighting telescope XM128. On both sides of the rear section are trunnion plates (fig. 1-4) which support the radar chronograph in the mount. An elevation scale is fastened on the right hand side of the radar chronograph case.

d. Indicator Digital Display A5. (fig. 1-7). This assembly is located at the upper left hand side of the rear cabinet section, The assembly contains 19 plug-in modules. For easy identification of the divider and decade counter modules, the divider modules (and the adjacent chassis surface) are painted orange (with the exception of A5A17 which is painted black). Also located on top of the chassis are two plug-in crystals A5Y1 and A5Y2 which are used with A5A7 and A5A10 respectively. Located at the end of the chassis is potentiometer A5R7 which is used for setting the calibration signal level.

e. Power Supply A6 (fig. 1-8). The power supply assembly is located at the lower left hand side of the rear case section, and is fastened to the rear panel by four captive screws. The power supply circuits are enclosed within a cover which is fastened down by

Figure 1-3. Radar chronograph mounted on utility truck M151.

means of 16 screws. All electrical connections are made through connector A6P1 located at the inner end of the chassis. Two guide pins, located at the end of the chassis, mate with sockets in the main chassis frame.

f. Amplifier Audio Frequency A3 (fig. 1-9). This assembly is located at the upper right hand side of the rear case section, and is fastened to the rear panel by means of four captive screws. The audio amplifier consists of a chassis on which are mounted nine bandpass filters (A3FL1 through A3FL9), plug-in module A3A1 (audio amplifier subassembly), and plug-in module A3A2 (low-pass filter). The audio amplifier subassembly A3A1 is secured to the chassis by two captive screws. Plug-in module A3A2 is provided with a knob for pulling it from its socket, and is secured by a cover plate which is held down by two screws. Two guide pins, located at the end of the chassis, mate with sockets in the main chassis frame.

g. Control Frequency A2 (fig. 1-10). This assembly is located below the audio frequency amplifier A3. It is made accessible by opening the hinged front case section of the cabinet. The frequency control (AFC) assembly is fastened to the side of the main chassis frame by two captive screws. Test points J1, J2, and J3 are located on the front surface of the assembly. Adjustment controls marked BAL and AFC are also located here. At the rear is connector P1 which is used for making electrical connections to the chronograph circuitry.

h. Amplifier Detector A4 (fig. 1-11). This assembly is located in the right hand side of the front case section. On the panel of this assembly is the A4M1 internal monitor meter and selector switch. Electrical connections are made through connector A4J1 located on the lower left hand side of the panel, and four coaxial cables which carry signals to and from the waveguide assembly A1.

i. Radar Chronograph Mount. The radar chronograph mount (fig. 1-12) is an all metal assembly which supports the radar chronograph

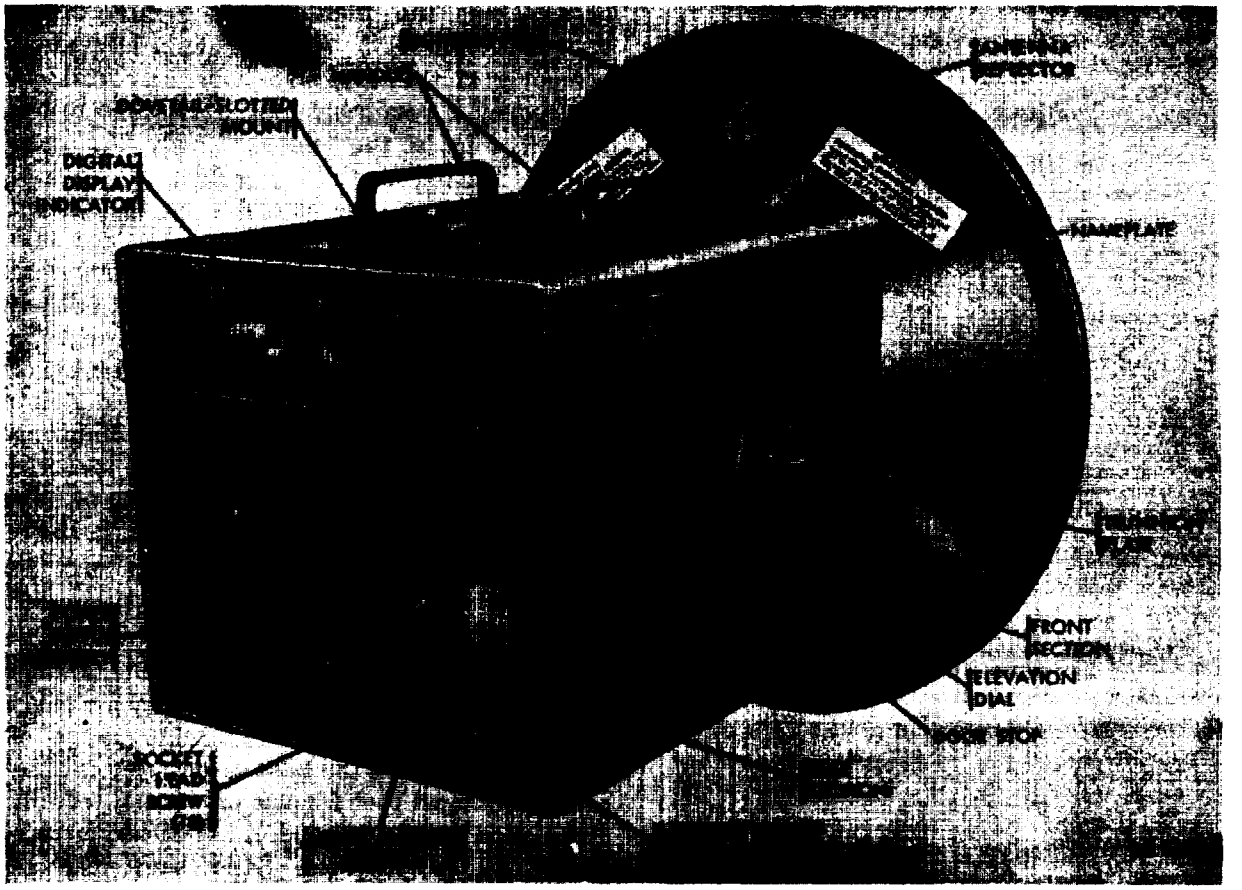

Figure 1-4. Radar chronograph.

rigidly while providing for leveling, azimuth, and elevation adjustments. The assembly consists of two main parts, the lower of which mounts on the tripod or vehicle mounting bracket and provides adjustments for leveling, and the upper yoke-shaped structure which supports the radar chronograph and provides adjustments for azimuth and elevation. The lower part of the radar chronograph mount has a vial-type bubble level for leveling the base, a drive knob which turns a sector gem for adjusting the elevation level of the upper part., and a lock-handle which locks the elevation level setting. A travel lock pin is used during transit to secure the upper and lower sections together. The upper part of the radar chronograph mount has an azimuth deflection scale (graduated in mils of azimuth angle) and a lock-handle for locking the azimuth setting. On the right arm of the yoke structure is an elevation lock-handlle and a dial pointer (used with the elevation scale fastened on the radar chronograph) for adjusting the elevation of the radar chronograph. Another leveling vial at the bottom of the yoke is used for leveling the yoke structure. On the left arm of the yoke structure is a mounting pin with a lock-handle for securing the radar chronograph unit to the mount. By means of these adjustments, scales, and leveling vials, it is possible to aim the radar beam of the radar chronograph along the expected projectile trajectory in the same manner as the weapon is aimed.

j. Telescope Straight XM128. Telescope straight XM128 (fig. 1-1) is a monocular, fixed-focus type telescope having an offset in

Figure 1-5. Radar chronograph antenna.

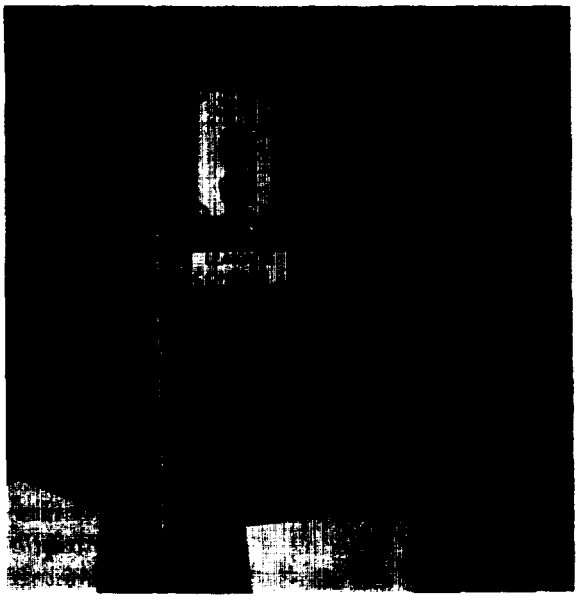

Figure 1-6. Leakage adjustment controls.

the geometric and optical axis. The telescope body houses an optical system consisting of an eyepiece assembly, optical instrument reticle, erecting prism, objective assembly, and indicator light lens. The objective assembly is installed within a removable cover. A dovetail groove in the telescope body provides a means of attaching the illumination portion of instrument light M53. A sunshade is located on the cover at the objective end. An eyeshield secured by a retaining ring is attached to the viewing end of the telescope body. An open sight is located on the top portion of the telescope body. The shoe assembly on the bottom of the telescope body acts as the locating surface for the telescope and has a retaining stop at one end to confine its location. It is used for optical aiming of the radar chronograph antenna. The telescope is mounted on the top of the radar chronograph rear section and sights through a screen in the parabolic antenna reflector. When not in use, the telescope is stored in its carrying case M87. Maintenance of telescope XM128 is contained in TM 9-1240-211-35.

1-4. Description of Associated Equipment

a. Tripod Assembly. The tripod assembly (fig. 1-13) is an all metal heavy duty assembly having adjustable legs for a wide range of height settings. At the base of each leg is a removable hinged foot for use on normal terrain. For use in sand and mud, a set of larger auxiliary feet is provided. Sand bags may be placed on these feet for added stability. The tripod leg length can be varied by means of telescoping tubular leg extensions. Each leg extension is provided with calibration numbers which can be observed through a viewing port on each leg assembly. The three legs may be set to different lengths for appropriate leveling on irregular ground. The legs can be secured in position by tightening each of the three leg clamp hand knobs. The placement angle for the legs is held by the stay rods, the guide tube, and the spider assembly. When the tripod is folded the legs are held in place by the stay rod latch. The legs are released by pressing the latch upward. The spider assembly, which controls the position of the leg frames by means of the hinged stay rods, moves up or down along the guide tube. The spider assembly can be fixed at any point on the guide tube by tightening the spider hand knob. The top of the tripod consists of a circular leveling base adapter with three lock handles for securing the radar chronograph mount.

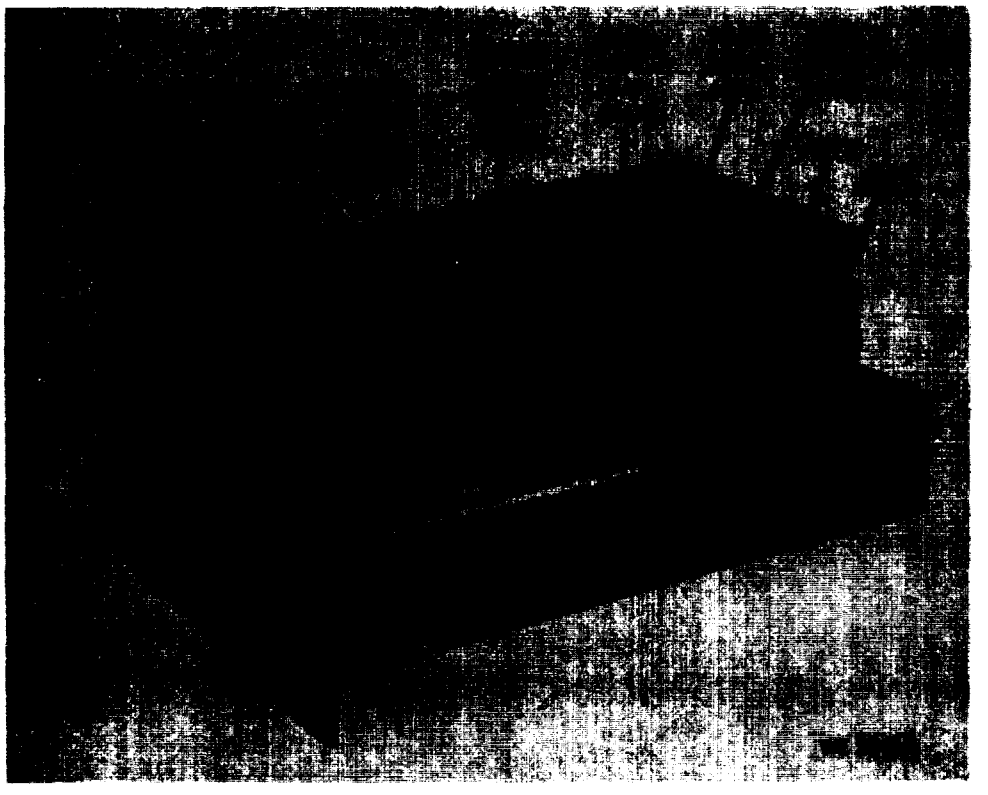

Figure 1-7. Indicator digital display A5.

b. Cable and Reel Assembly. The power and microphone cables of the radar chronograph are stored on a dual reel assembly (fig. 1-1) when not in use. The two reels are secured to a mounting base plate by four key-lock fasteners. The cable and reel assembly may be used either with or without the mounting base plate. The power cable assembly on one reel connects to the generator set and the input jack of the radar chronograph. The other cable connects to a microphone and the microphone input jack of the radar chronograph. This three-conductor cable is also used to connect the radar test receiver 1290-620-0052 to the radar chronograph during the optical alinement operation.

c. Microphone. The microphone (fig. 1-1) is used to initiate the radar chronograph measurement sequence, is of a dynamic type and is specifically designed for ruggedness to withstand the shock of the weapon's muzzle blast. The microphone is placed on the ground approximately 2 feet forward of the chronograph and line perpendicular to the weapon gun tube axis at a distance of 12 feet from the gun tube axis. The voltage produced by the microphone (upon being struck by the weapon blast) is used to trigger the counting circuits of the radar chronograph.

d. Radar Teat Receiver. The test receiver (fig. 1-1) is a wave-guide cavity containing a crystal diode. The test receiver is mounted on the aiming post and connected through the special purpose and microphone cables to the chronograph automatic reliability rater for alining the chronograph optical system with the radar axis. During this alinement, the test receiver intercept transmitted energy from the chronograph which is modulated at distinct frequencies and then radiated back to the chronograph.

e. Instrument Light M53. During night operations, the instrument light (fig. 1-14) is used to illuminate the reticle of telescope XM128. The instrument light consists princi-

Figure 1-8. Power supply A6.

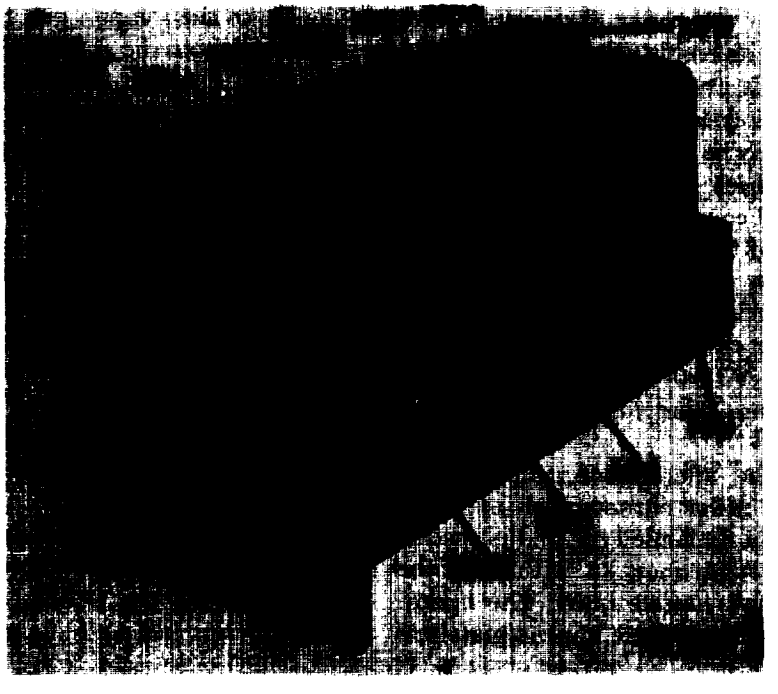

Figure 1-9. Amplifier audio frequency A3.

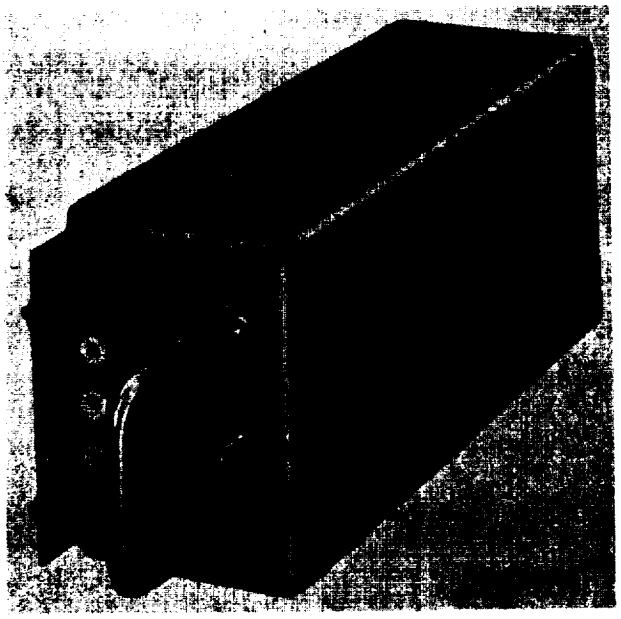

Figure 1-10. Control frequency A2.

pally of a two-cell battery case, two flashlight batteries (Signal Corps, type BA-30 dry cell), a rheostat knob, and two wire leads terminated in a hand light and a telescope reticle light. For this application a lamp bracket assembly (fig. 1-1) is screwed onto the reticle light. This adapter bracket has a dovetail foot which mates with the dovetail slot on telescope XM128. The hand light has a pushbutton on-off switch and is used as a movable light for illuminating the elevation and azimuth scales and the chronograph panel. The rheostat knob on the battery case controls the intensity of the reticle light. Rotated fully counterclockwise, it turns the reticle lamp off.

f. Installation Bracket (Jeep Mounting). This bracket (fig. 1-1) is used for mounting the radar chronograph on the utility truck M151. The bracket is of double angle folded steel construction. An adapter plate similar to that on the tripod is attached to the top of the bracket by means of three screws.

g. Adapter Assembly. The adapter assembly (fig. 1-1) is comprised of a bracket and mounting clamp, Two cable assemblies mounted on the main bracket are for connecting to generator output terminals and ground. Connectors of the cable assemblies, which are mounted on the main bracket, are for mating with Radar Chronograph power cable connectors. These two connectors are provided in the event two chronographs are to be operated simultaneously. The necessary mounting hardware is supplied as components of the adapter assembly.

h. Repair Parts Kit. The repair parts kit (fig. 1-1) contains replacement lamps and fuses (fig. 1-15) for the radar chronograph 10525300 and the instrument light M53. The lamps and fuses are contained in a specially designed box which provides cushioning for each piece. For shipping and storage the box is immobilized within the accessory transit case in the special recess provided.

i. Chronograph Automatic Reliability Rater (CARR). The chronograph automatic reliability rater (fig. 1-16) test device consists of a small metal box and a 1-1/2 foot cable. The box contains ten crystal oscillators and two delay circuits. One delay circuit has ten different time delays corresponding to the ten delays available in the radar chronograph M36. The other delay circuit is a fixed gate and width delay. The CARR test device is capable of continuously modulating the test receiver horn at ten distinct frequencies. It also is capable after any one of ten time delays of modulating the test receiver horn at any one of ten frequencies for a period of time that is consistent with the gate period in the radar chronograph.

j. Cable Assembly-Special Purpose. The four-inch special purpose cable (fig. 1-1) is used for connection between the radar test receiver when installed on aiming post M1A2, and the microphone cable of cable and reel assembly. The microphone cable is then connected to the "HORN" output of chronograph automatic reliability rater (CARR) for purposes of alining the chronograph optical system with the radar axis.

k. Identification Plate. An identification plate is mounted on the right hand side of the case in the upper rear corner of the radar chronograph (fig. 1-2). The plate indicates the name of the equipment, part number, serial number, and date of inspection after manufacture.

1-5. Tabulated Data

a. Radar Chronograph.

Weight	112.00 lb.
Height	28.00 in.
Width	26.00 in.
Depth	26.00 in.
Antenna reflector focal length	7.20 in.
Operating frequency	10.50 K mc

b. Radar Chronograph Mount.

Weight	39.00 lb.
Height	26.00 in.
Width	21.00 in.
Depth	8.00 in.

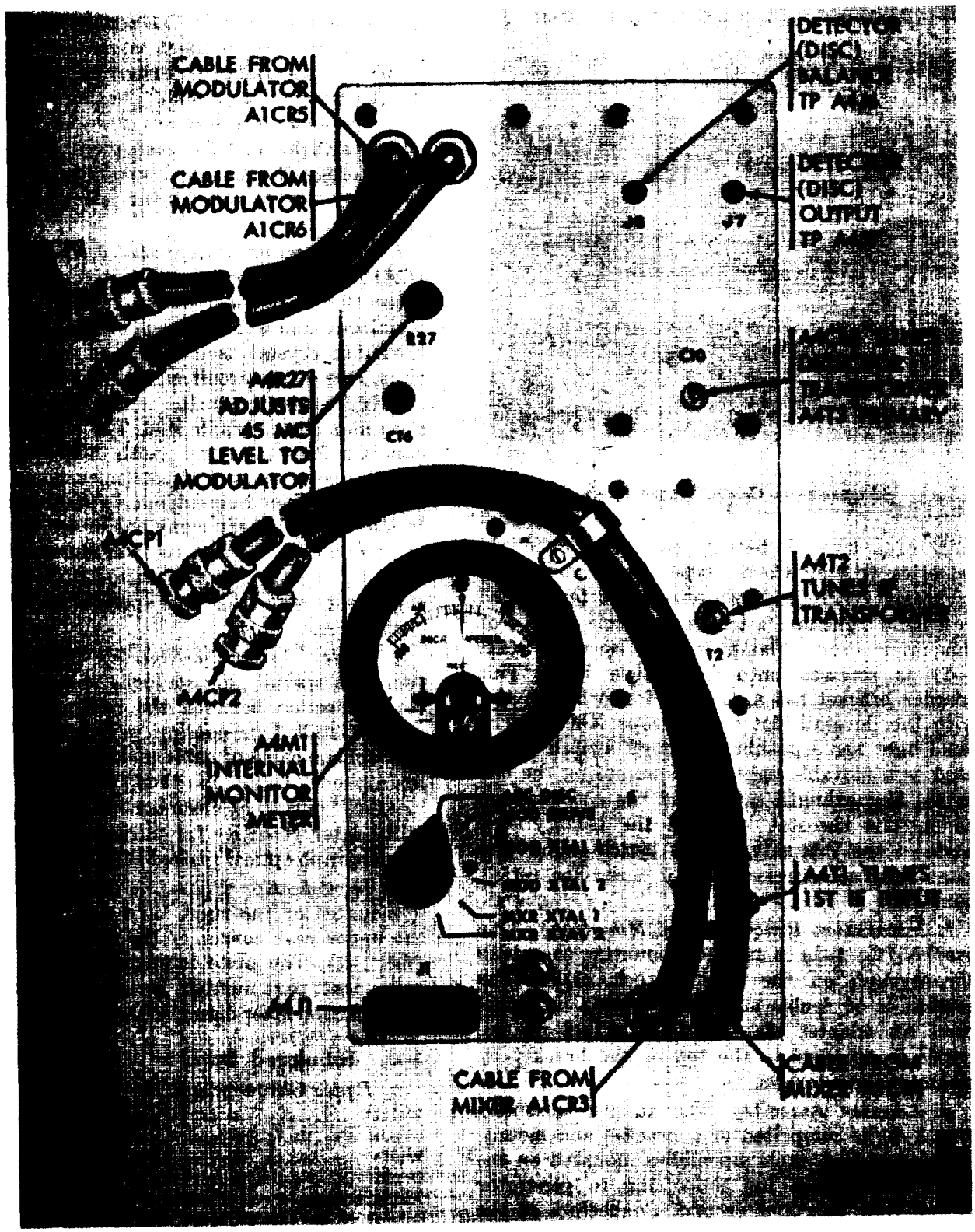

Figure 1-11. Amplifier detector A4.

c. Tripod Assembly.

Weight	47.50 lb.
Maximum height	40.00 in.
Minimum height	24.75 in.
Maximum leg length	52.00 in.
Minimum leg length	31.50 in.
Overall length (folded)	33.25 in.
One auxiliary foot	3.00 lb.

d. Installation Bracket (Jeep Mounting).

Weight	26.00 lb.
Height	15.50 in.
Width	13.50 in.
Depth	10.00 in.

e. Microphone.

Weight	1.50 lb.
Diameter	5.00 in.
Depth	3.00 in.

f. Cable and Reel Assembly.

Weight	34.50 lb.
Height	13.00 in.
Width	10.80 in.
Depth	21.20 in.
Power cable length	75.00 ft.
Microphone cable length	50.00 ft.

f.1 Adapter Assembly.

Weight	6.0 lb.
Width	4.00 in.
Length	10.00 in.

g. Telescope, Straight XM128

(1) Physical characteristics

Width---------- 7.50 in.
Length ---------- 3.00 in.
Height---------- 3.375 in.
Weight---------- 19.50 oz.

(2) Optical characteristics

Power---------- 3X
Field of View---------- 13° 20 min.
Exit pupil diameter------- 0.30 in.
Apparent field of view----- 40°
Effective focal length:
Objective---------- 4.123 in.
Eyepiece---------- 1.374 in.

h. Container, Reusable

Weight (empty) ---------- 114.00 lb
Weight (full)---------- 269.00 lb
Length ---------- 50.00 in.
Width ---------- 35.00 in.
Height ---------- 33.125 in.

i. Radar Chronograph Accessories Case

Weight (empty)---------- 22.50 lb
Weight (full) ---------- 83.00 lb
Length ---------- 37.25 in.
Width ---------- 19.25 in.
Height ---------- 13.25 in.

j. Radar Teat Receiver

Weight ---------- 1.00 lb
Width---------- 4.50 in.
Height---------- 5.75 in.

k. Carrying Case M87

Length---------- 8.875 in.
Width ---------- 5.50 in.
Height ---------- 5.25 in.
Weight ---------- 3.00 lb

l. Instrument Light M53

Leads (2)----------2 ft, extends to 6 ft
Length (excluding leads)--7.25 in.
Diameter ---------- 1.875 in.
Diameter at rheostat-------- 2.625 in.
Weight ---------- 0.75 lb (without batteries)
One battery weight---------0.15 lb

m. Chronograph Automatic Reliability Rater

Weight---------- 5.0 lb
Length---------- 9.75 in.
Width---------- 5.50 in.
Height---------- 4.75 in.

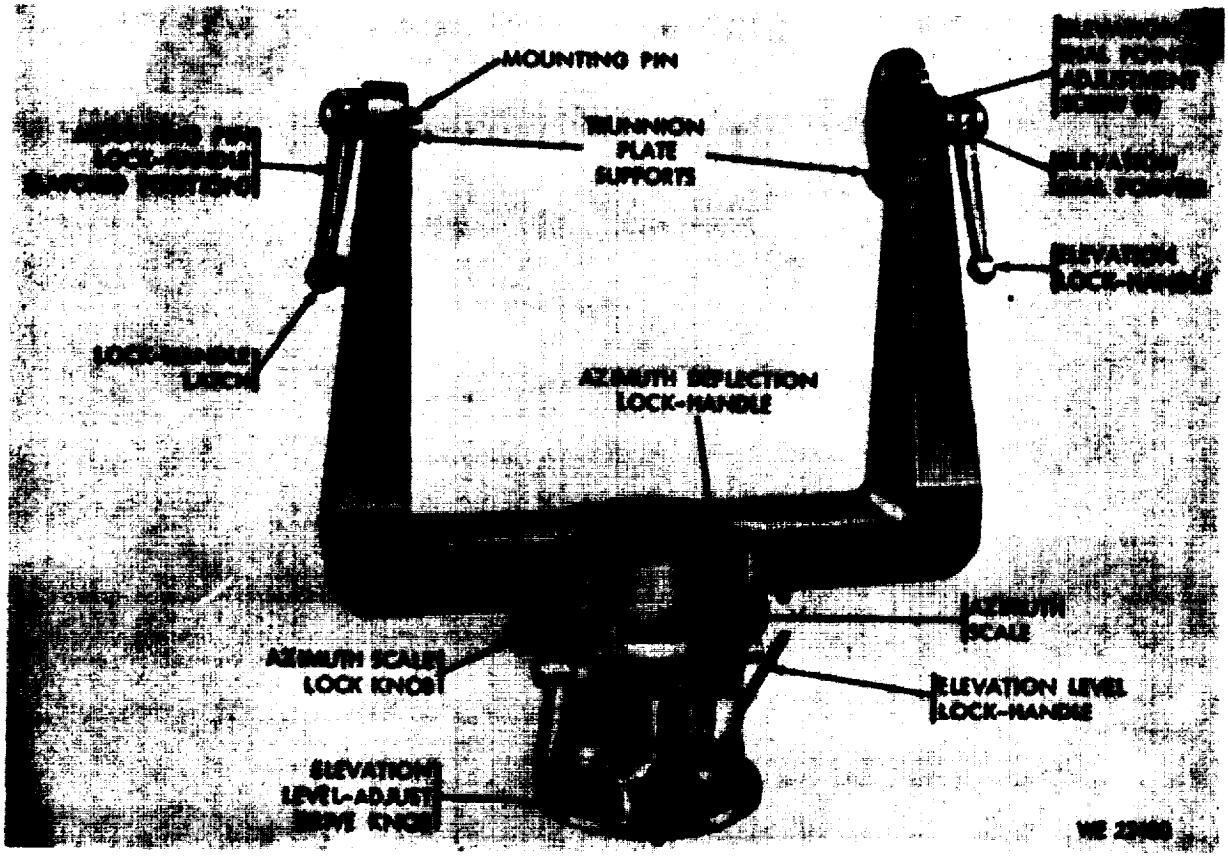

Figure 1-12. Radar chronograph mount.

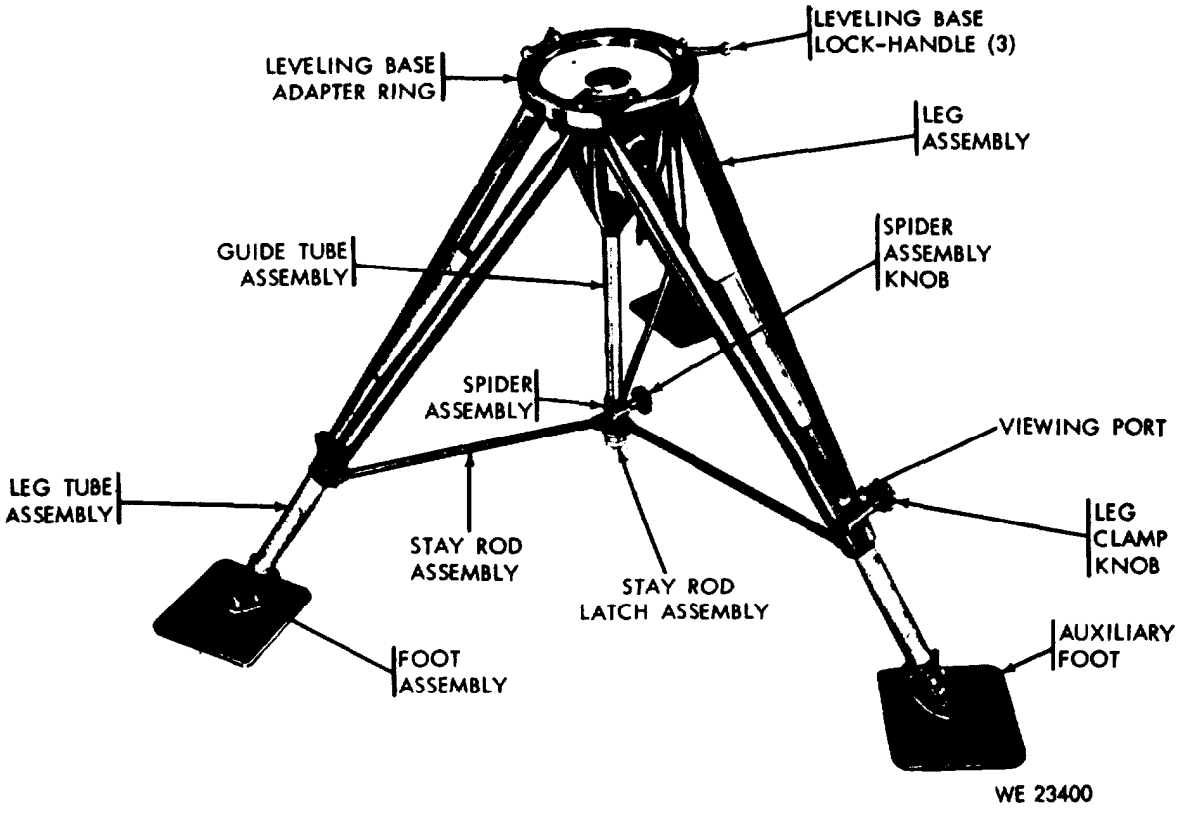

Figure 1-13. Tripod assembly.

Figure 1-14. Instrument light M53.

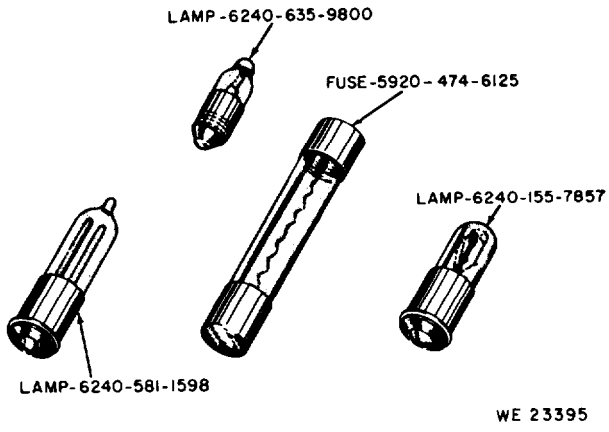

Figure 1-15. Components of repair parts kit.

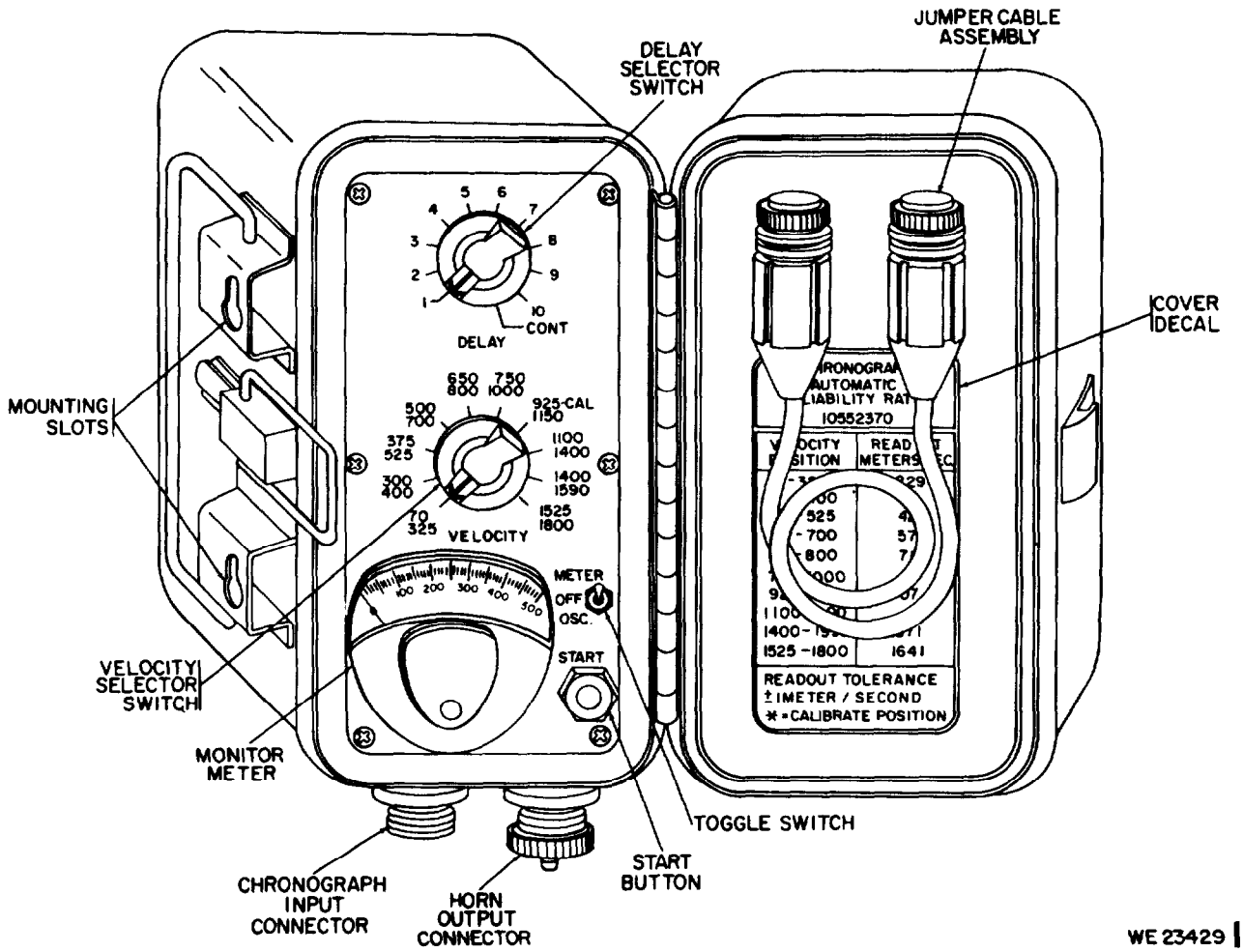

Figure 1-16. Chronograph automatic reliability rater.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

2-1. General

a. When new, used, or reconditioned materiel is first received by the using organization, it is the responsibility of the officer in charge to determine whether the materiel has been properly prepared for service by the supplying organization and to be sure it is in condition to perform the function.

b. Make a record of any missing parts, tools, and equipment, and of any malfunctions. Correct any deficiencies as quickly as possible.

2-2. Duties

The organizational mechanic performs the inspection to determine whether the materiel has been properly prepared for service and is in condition to perform its assigned mission. It is the duty of the operator to assist the organizational mechanic in the performance of these services.

2-3. Services

Upon receipt of radar chronograph set M36 by a using organization, the following operations will be performed:

a. Unpacking.

(1.) Place the radar chronograph accessories case and reusable container as near the operating location as possible. Case and container must be in upright positions for unpacking.

(2) Press relief valve buttons on the case and container (fig. 2-1) to equalize internal and external air pressures.

(3) Remove security seals from the case and container latches. Release latches and remove top sections.

(4) Loosen straps holding upper cradle assembly to lower cradle assembly (fig. 2-2)), in reusable container, remove upper cradle assembly, and lay in top section.

Caution: Because of its weight and bulk it is necessary for three men to lift and position the chronograph in order to avoid injury to personnel or damage to equipment.

(5) Using hand grips located on both arms of the yoke structure of the chronograph mount, together with hands positioned on the rim of the antenna reflector, carefully lift chronograph from container.

(6) Remove equipment from accessories case.

(7) Inspect all equipment as indicated in f below.

b. Setting Up for Tripod Assembly Mounted Operation.

(1) Unpack chronograph and tripod as indicated in a above.

(2) Place tripod in upright position and release tripod legs from their latched position by pushing upward against spring pressure on stay rod latch (fig. 1-13).

(3) Loosen spider assembly knob and spread legs fully.

(4) Tighten spider assembly knob.

(5) If tripod is to be used on soft ground, attach the three large auxiliary feet by screwing their threaded mounting studs into the mating holes in the normal feet and turning until tight.

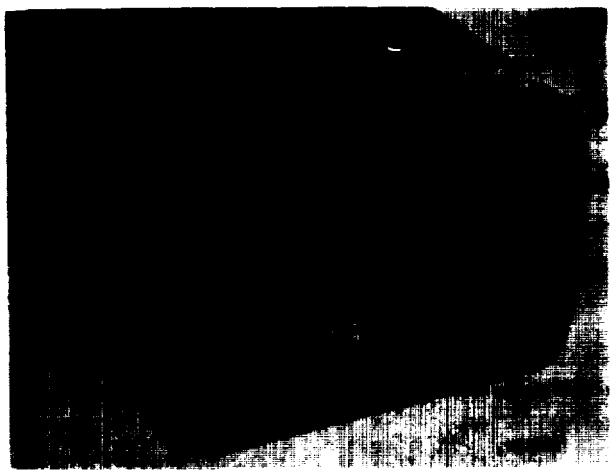

Figure 2-1. Radar chronograph accessories case showing relief.

(6) Extend tripod legs to obtain desired height by loosening leg clamp knobs and pulling out each leg until desired number is seen through viewing port. Retighten knob.

Note. Tripod height will normally be adjusted to place center of chronograph antenna approximately four feet from the ground.

(7) Position the three leveling base lock handles so that they will not interfere with installation of chronograph mount into leveling base adapter ring.

(8) Place chronograph and mount on top of tripod and seat the base of mount into leveling base adapter ring.

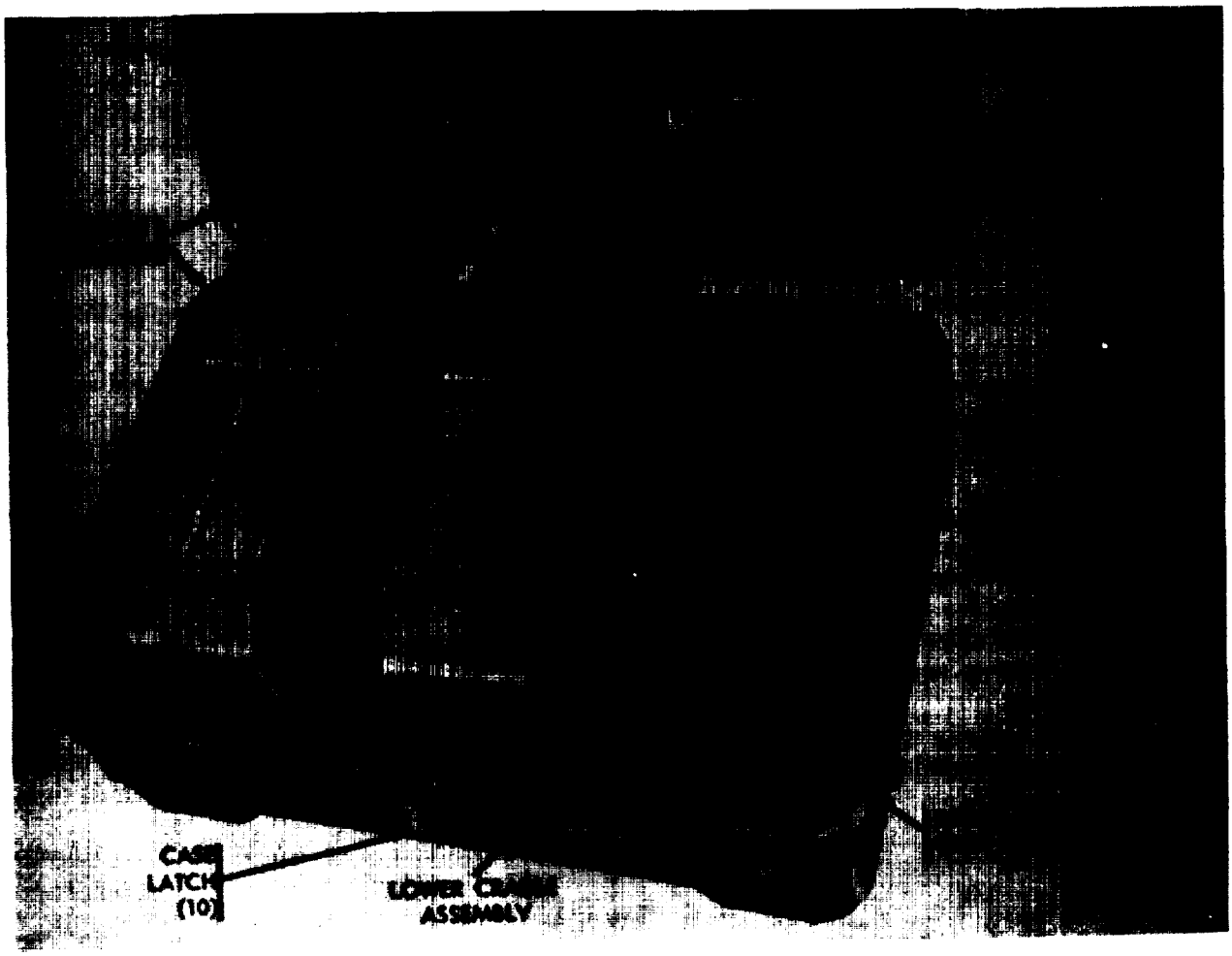

Figure 2-2. Radar chronograph with mount in reusable container.

(9) Lock mount in place by turning leveling base locking handles on tripod into a radial position.

(10) Loosen leveling base lock handles and rotate chronograph mount while observing leveling base vial (fig. 2-3). When the leveling bubble shows that the vial is on a level line, relock base lock handles. Recheck the leveling bubble for level indication.

(11) Loosen azimuth deflection lock knob (fig. 2-4) on leveling base and rotate chronograph until azimuth deflection dial pointer coincides with white stripe on leveling base. Retighten azimuth deflection lock knob. Withdraw travel lock pin from leveling base.

(12) Loosen elevation leveling lock handle (fig. 2-3).

(13) Turn elevation level adjust drive knob (fig. 2-) until bubble in level on mount yoke arm is centered.

(14) Lock elevation leveling mechanism by tightening elevation leveling lock handle. Check vial bubble to see that it is still centered.

(16) Check leveling by loosing azimuth deflection lock knob and rotating mount 1600 mils in each direction. The bubble in the mount level should not move more than one vial division from center if chronograph is properly leveled.

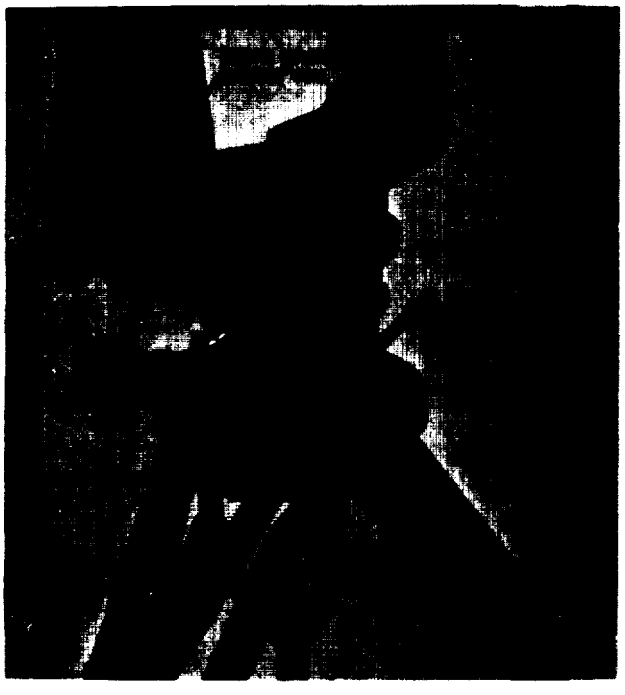

Figure 2-3. Chronograph mount on tripod, showing azimuth deflection level adjust controls.

(16) If bubble does shift more than one vial division repeat (12) through (15) above.

c. Setting Up for Utility Truck M151 Operation.

(1) Remove chronograph with mount and accessories from transit cases as indicated in a above.

(2) Install chronograph and mount on utility truck M151 installation bracket by seating base of mount into leveling base adapter ring. (fig. 2-5).

NOTE

The M151 truck must have the installation mounting bracket attachment performed as described in TM 9-1290-325-34.

(3) Lock mount in place by means of leveling base lock handles.

(4) Place utility truck M151 in desired location, in an approximately level attitude.

(6) Repeat b (10) through (16) above.

d. Installation of Accessories.

(1) Remove telescope XM128 from carrying case M87 (stowed in radar chronograph accessories case).

(2) Loosen two screws on right side of telescope guide block.

(3) Press down on telescope mount retaining spring on top of chronograph rear section (fig. 2-6), insert telescope dovetail mount into mating dovetail recess, release spring, and slide telescope forward until locked in position.

(3.1) Hold telescope securely against left side of telescope guide block. Retighten two screws on right side of telescope guide block.

(4) Remove microphone from accessory transit case and cable and reel assembly from stowage.

(5) Reel out sufficient microphone cable to permit convenient placement of microphone and connect the end of cable to the microphone and to the microphone input jack on chronograph near panel.

(6) Reel out sufficient power cable to connect generator to chronograph input connector.

CAUTION

Prior to connecting adapter assembly electrical leads to engine generator, place the generator voltage output se-

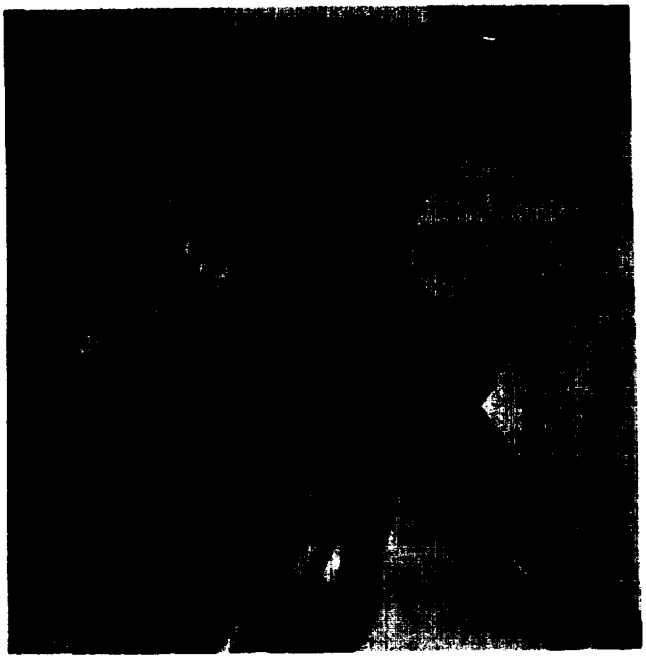

Figure 2-4. Chronograph mount on tripod, showing azimuth deflection level adjust controls.

lector switch (fig. 2-24) to the 120 volt position to prevent damage to the Radar Chronograph electrical currents.

(7) Install adapter assembly to frame of engine generator 6115-917-7354. Refer to para. 2-14.1 for installation procedure.

e. Lubrication. No lubrication during operation or operator maintenance is required for the radar chronograph. For lubrication of the generator set, the utility truck, and the cargo trailer, refer to the appropriate instruction book.

f. Inspection. Upon receipt of the equipment make a visual inspection for obvious physical damage, such as, cracked, bent or broken parts, corrosion, scratches, chips, dents, and missing knobs or other parts. Detailed inspection of the materiel is covered in paragraphs 2-6 through 2-8.

g. Storage. Return chronograph and equipment to container and case until ready for operational setup.

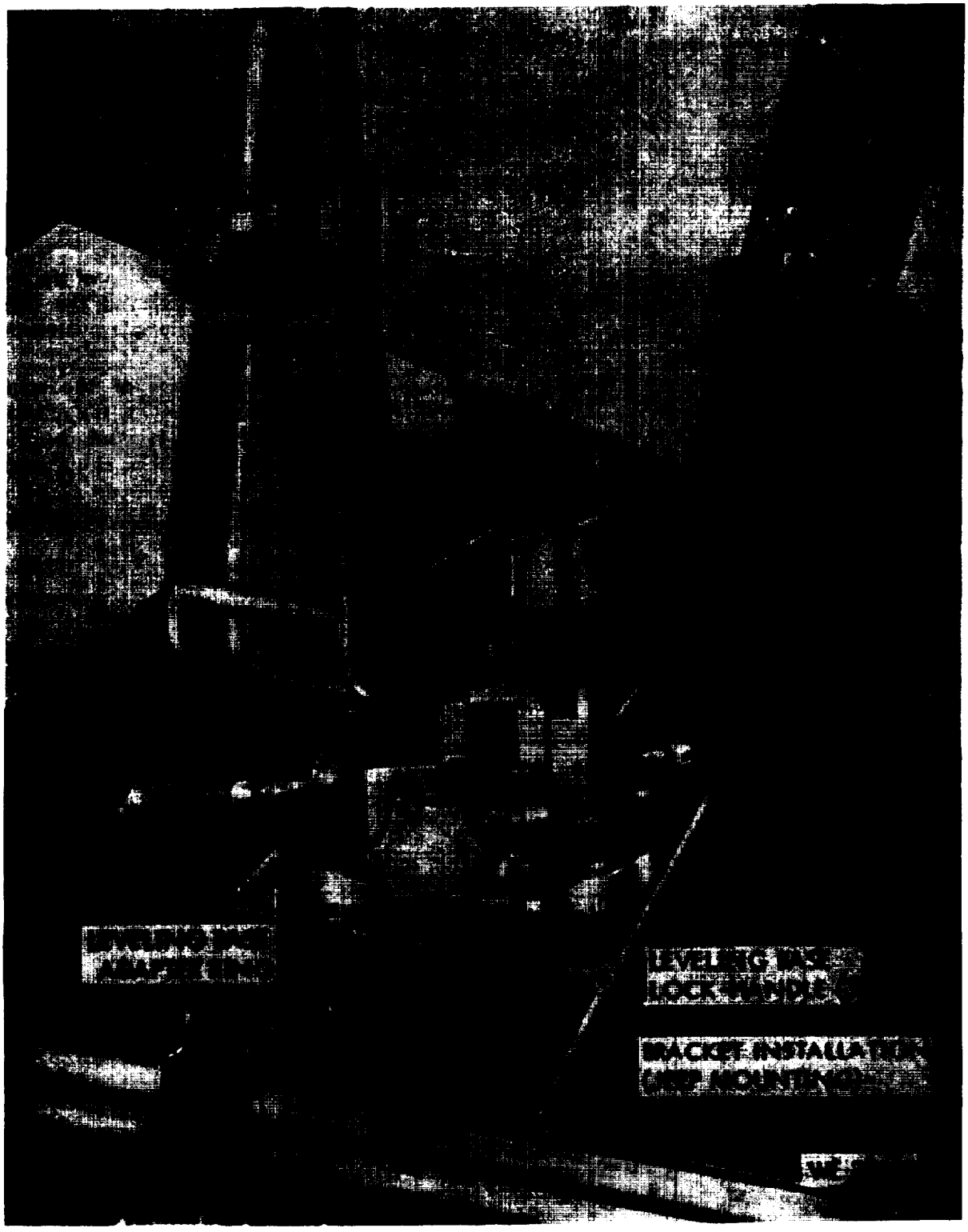

Figure 2-5. Chronograph and mount installed on utility truck M151 bracket installation.

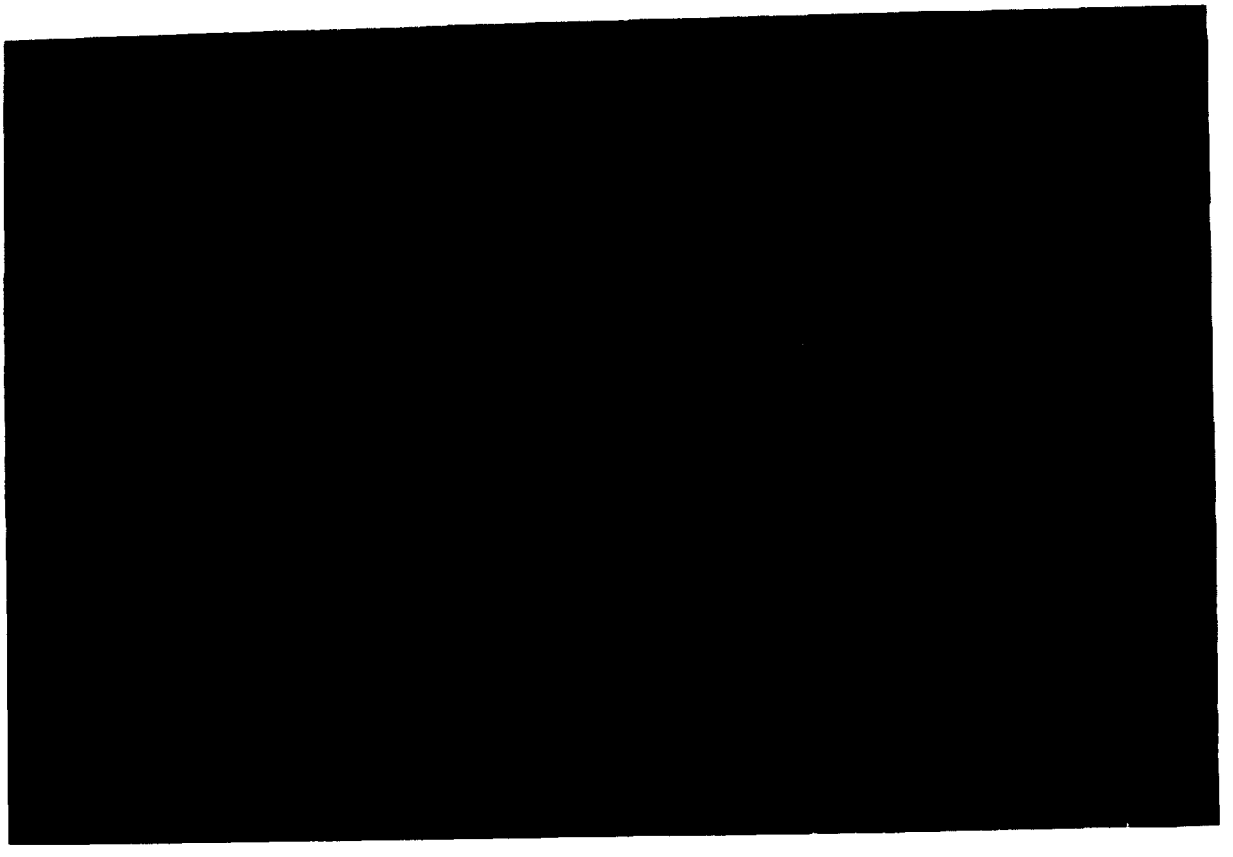

Figure 2-6. Installing telescope XM128.

Section II. CONTROLS AND INSTRUMENTS

2-4. General

This section describes, locates, illustrates and furnishes the operator with sufficient information pertaining to the various controls and instruments provided for the proper operation of the radar chronograph set M36.

2-5. Controls and Instruments

Refer to table 2-1.

Table 2-1. Control and Instrument

Control or instrument	Function	Reference
	Radar Chronograph External Controls, Indicators, and Connectors	
Digital indicators	Set of five digital readout (Nixie) tubes used for indicating projectile velocity in meters per second.	Figure 2-7
DELAY selector switch	Ten-positions switch for selecting the desired delay between firing of the weapon and the initiation of velocity measurement.	Figure 2-7
RESET switch	Resets counter circuits in readiness for next counting.	Figure 2-7

Table 2-1. Controls and Instruments - Continued

Control or Instrument	Function	Reference
RESET indicator light	Indicates when the resetting action is completed.	Figure 2-7
MIC SENS (microphone sensitivity) control	Controls microphone sensitivity to the point where circuit will be triggered by weapon blast but not by extraneous noise.	Figure 2-7
CAL 1-OPER-CAL 2 switch	Three-position toggle switch, spring-loaded to the OPER (operate) position. In CAL 2 position initiates a self check of chronograph circuit functions. In CAL 1 position permits checking the microphone and associated circuits by tapping the microphone.	Figure 2-7
AUDIO output connector	Permits headphone monitoring of the audio frequency signal (not used by operator).	Figure 2-7
VELOCITY selector switch	Permits selection of the one of ten velocity ranges in which the projectile velocity is expected to fall. This increases the chronograph selectivity, reducing the effects of rendom noise.	Figure 2-7
POWER INPUT connector	115-volt power at 400 cycles per second is supplied to the chronograph through this connector.	Figure 2-7
POWER ON-OFF switch	Toggle switch applies power to the chronograph circuits. Switch is provided with a guard to prevent switch from being accidentally turned off during operation.	Figure 2-7
POWER indicator light	Panel light is illuminated when POWER ON-OFF switch is activated.	Figure 2-7
Fuse holders	Two fuse holders on the chronograph rear panel have built-in indicating lights which show when one of the power line fuses is defective.	Figure 2-7
ELAPSED TIME meter	Meter records total chronograph operating time and displays it in a digital form.	Figure 2-7
MICROPHONE input connector	Count initiating signal from the microphone is normally fed to the chronograph through this connector.	Figure 2-7
MONITOR SELECTOR switch	Permits measurements of five different circuit voltages: LINE, B+, AGCV, LEAKAGE and SIGNAL.	Figure 2-7
MONITOR meter	Meter indicates whether the five different circuit voltages are in or out of the tolerence range. Normal point for most voltages is indicated by a red line on the dial face. A tolerance range is indicated by a green region on each side of the red line. Dial is numerically calibrated from 0 to 100.	

Table 2-1. Controls and Instruments - Continued

Control or instrument	Function	Reference
LEAKAGE ADJUSTMENT controls 1 and 2	These controls are used in combination and are adjusted to minimize the amount of transmitted energy entering the receiving circuits. When the MONITOR SELECTOR switch (fig. 2-7) is set to LEAKAGE and these controls are adjusted properly, the MONITOR meter (fig. 2-7) will indicate in the green region of its scale.	
	Radar Chronograph Internal Controls and Adjustments	
Internal monitor selector switch	Switch permits selection of one of six different currents for application to the internal monitor meter: AFC DISC, MOD DRIVE, MOD XTAL 1, MOD XTAL 2, MXR XTAL 1, and MXR XTAL 2.	Figure 2-8
Internal monitor meter	Meter gives an indication of the current selected by the internal monitor selector switch. The meter is of the center-zero type, and the scale is calibrated to 100 microamperes on each side.	Figure 2-8
A4R27	Potentiometer is used to set the output level of the 45 mc oscillator signal.	Figure 2-8
A4C10	Variable capacitor is used to tune the primary of the detector transformer, A4T3.	Figure 2-8
A4T1 adjustment	This adjustment is used to tune the first IF coil by varying the slug position.	Figure 2-8
A4T2 adjustment	This adjustment is used to tune the second IF transformer by varying the slug position.	Figure 2-8
SAL potentiometer (A2R10)	Control is used to adjust the balance of the differential amplifier.	Figure 2-9
AFC potentiometer (A2R16)	Control is used to adjust the output level of the 230 KC oscillator.	Figure 2-9
	Radar Chronograph Mount Controls	
Elevation level adjust drive knob	The elevation level adjust drive knob is a hand-operated knob which turns a worm gear driving a sector gear to the movable upper part of the mount assembly. Turning the sector gear pivots the upper member about a horizontal axis, thereby tilting the upper member backward or forward to establish the initial level position (read on the upper leveling vial).	Figure 2-4

Table 2-1. Controls and Instruments-Continued

Control or instrument	Function	Reference
Elevation level lock handle	This handle turns a steel bolt which is used to clamp together the upper and lower parts of the mount after initial leveling adjustment of the upper member has been made. The bolt passes through a slot in the upper member into a threaded hole in the lower member.	Figure 2-3
Travel lock pin	The travel lock pin is used to lock the movable parts of the mount in a Axed position during shipment. It is retained in the locked position by a spring-loaded catch and held captive by a chain to avoid loss when not in use.	Figure 2-4
Azimuth deflection lock handle	The deflection lock handle is used to clamp the arm in position after rotating to the desired azimuth setting.	Figure 2-4
Azimuth scale lock knob	Turning of knob clockwise locks the scale in position after it has been set to the initial zero position.	Figure 2-4
Elevation lock handle	Lock handle is used to tighten a friction lock which secures the chronograph in the desired elevation position.	Figure 1-12
Mounting pin lock handle	This handle is used to lock the mounting pin which engages the left side of the chronograph with the mount when the handle is in the latched position. Turning the handle to the position shown in figure 2-10 disengages the lock and permits the pin to be retracted, releasing the chronograph.	Figure 2-10
Lock handle latch	The latch is a spring-loaded locking assembly, used to hold the mounting pin lock handle in the locked position. When the latch is not in use it can be pushed into the mount arm and held in place by a spring-loaded quick release latch pin.	Figure 2-10
	Tripod Assembly Controls	
Leg clamp knobs	Used to clamp the sides of the split leg members against the sliding tubular leg sections to secure them in the desired extended position.	Figure 1-13
Stay rod latch assembly	The stay rod latch is a circular, grooved, spring-loaded catch, mounted on the lower end of the guide tube assembly. When the legs are folded, three catches on the stay rods engage.	Figure 1-13
Spider assembly knob	This knob located at the center of the spider assembly, is used to clamp the spider assembly against the guide tube after the legs have been spread out fully.	Figure 1-13
Leveling base lock handles	These three handles, located on the leveling bar adapter ring on top of the tripod, are used to clamp the lower part of the chronograph mount in the adapter ring. When the handles are turned to a radial position, the eccentric cam portion of the inner end overlaps the edge of the bottom member of the mount and applies sufficient pressure to keep the mount from rotating or pulling out. The amount of clamping pressure may be adjusted by tightening down the lock handle retaining nuts on their threaded studs. Before tightening these handles the lower member of the mount should be rotated until the lower leveling vial indicates that the lower mount plane is level.	Figure 1-13

Table 2-1. Controls and Instrument-Continued

Control or instrument	Function	Reference
Aiming post M1A2	Used to support the radar test receiver during the chronograph optical alinement procedure. During night operations, it is used to support the aiming post light M14.	Figure 2-11
Aiming post light M14	To illuminate the aiming posts for night operation.	Figure 2-12
Light chest M21	Used to store and transport the aiming post light M14, along with spare batteries and lamps.	Figure 2-13
Fire control quadrant M1A1	Used for the purpose of checking the accuracy of the elevation scale.	Figure 2-14
Aiming circle M2	Used during the radar chronograph optical alinement for orienting the radar test receiver and chronograph antenna.	----------
Adapter assembly	Installed on engine generator set 6115-917-7354, permitting use of the generator as a power source of the radar chronograph.	Figure 2-11.1

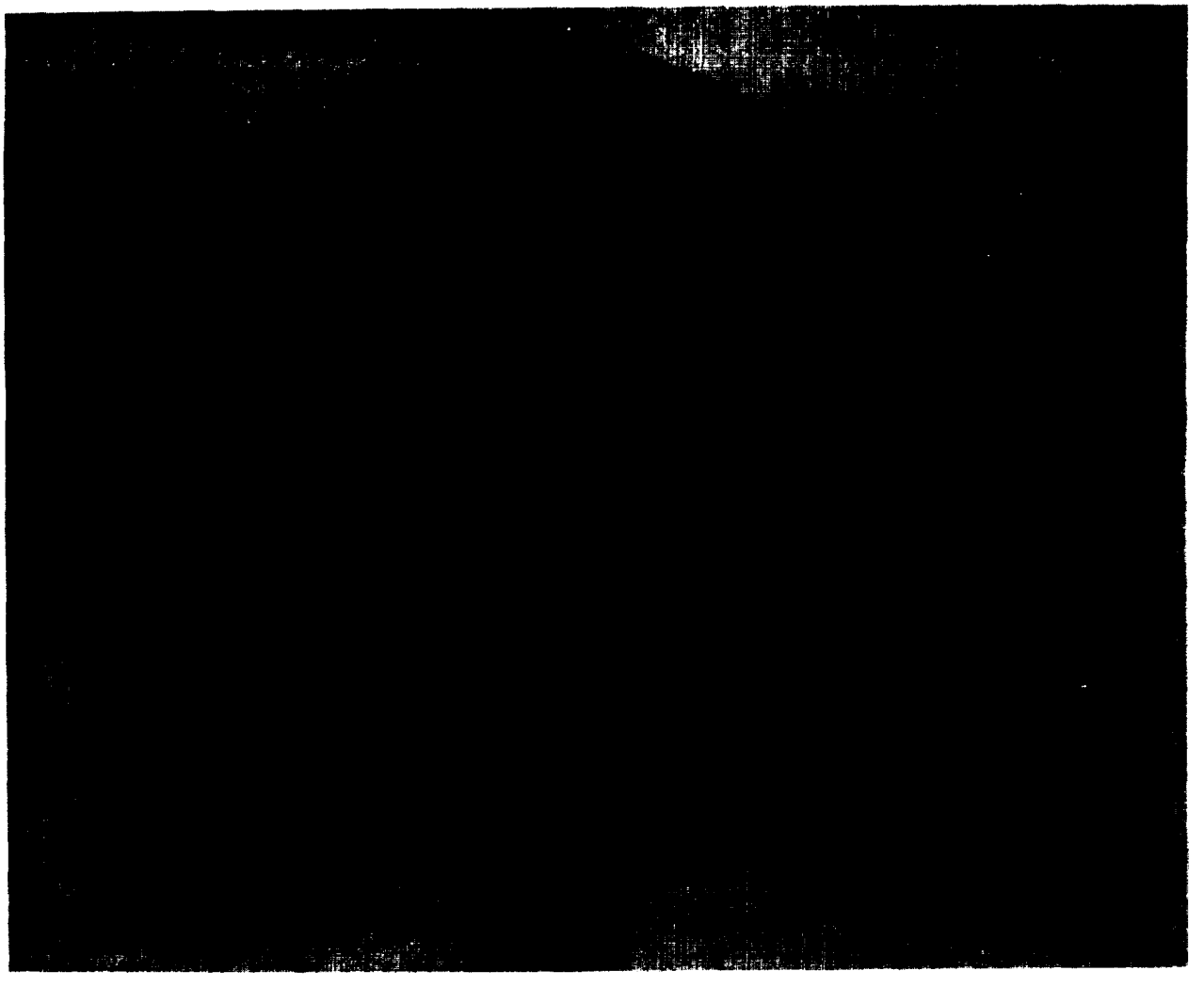

Figure 2-7. Chronograph showing rear panel controls and indicators.

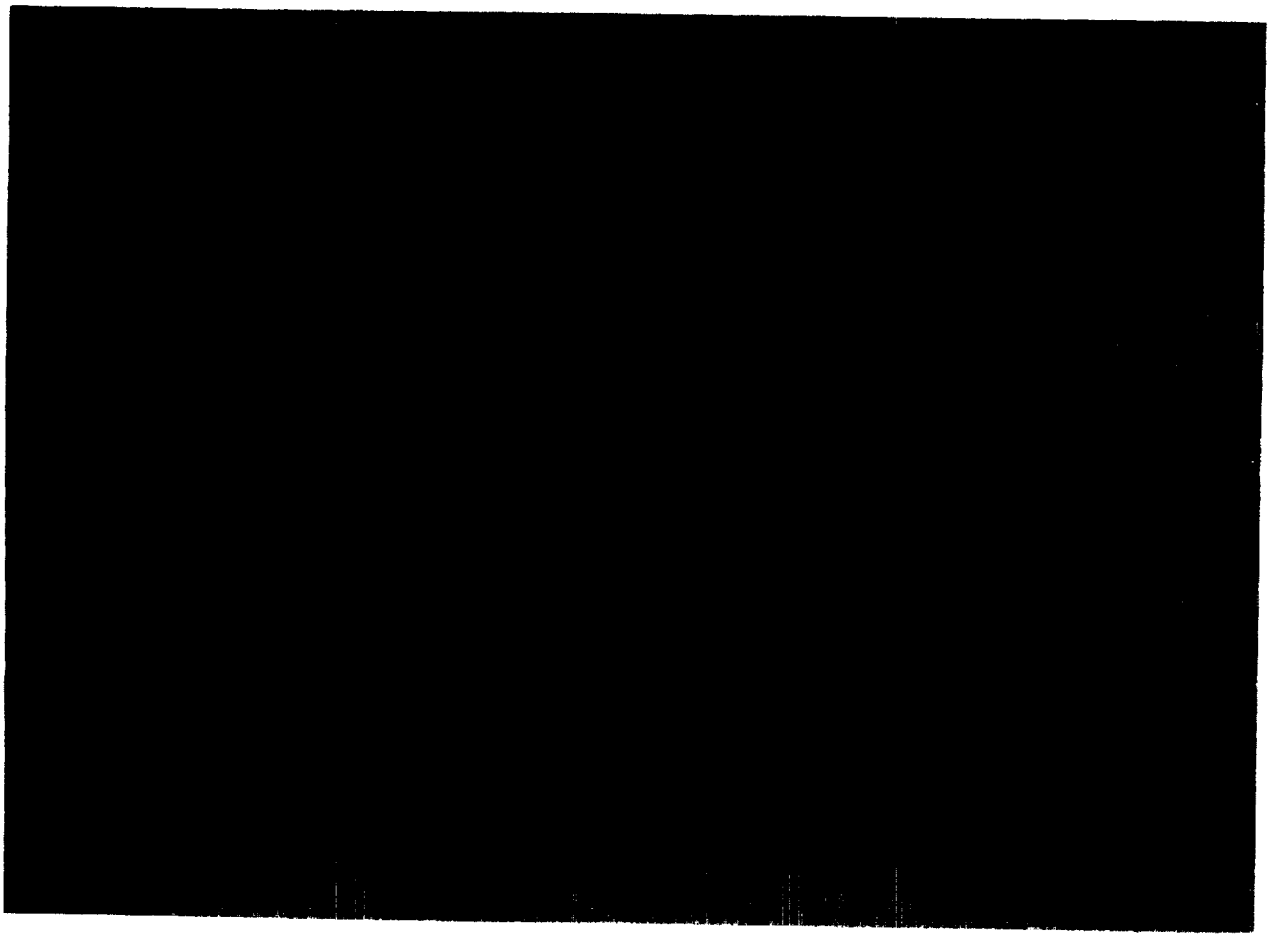

Figure 2-8. Chronograph front section-inside view.

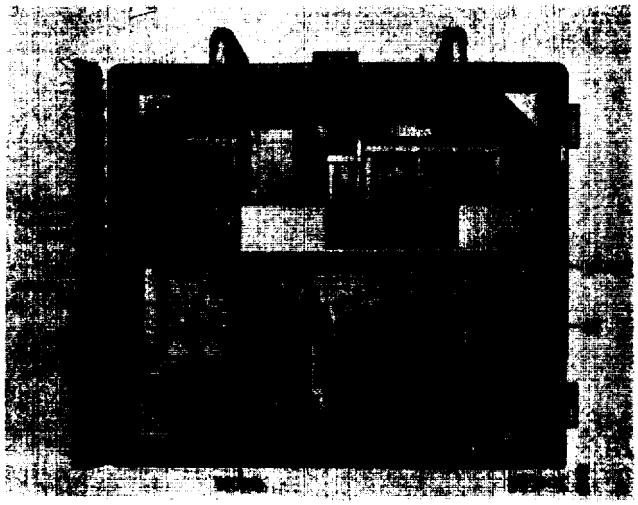

Figure 2-9. Chronograph rear section-inside view.

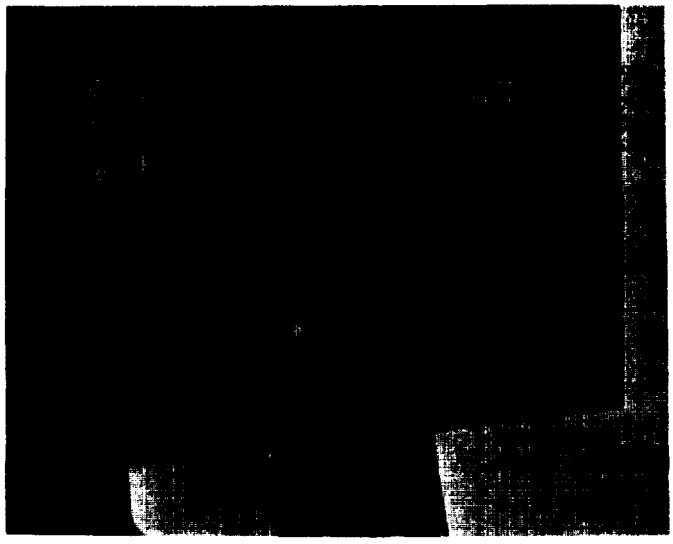

Figure 2-10. Mounting pin lock handle in unlatched position.

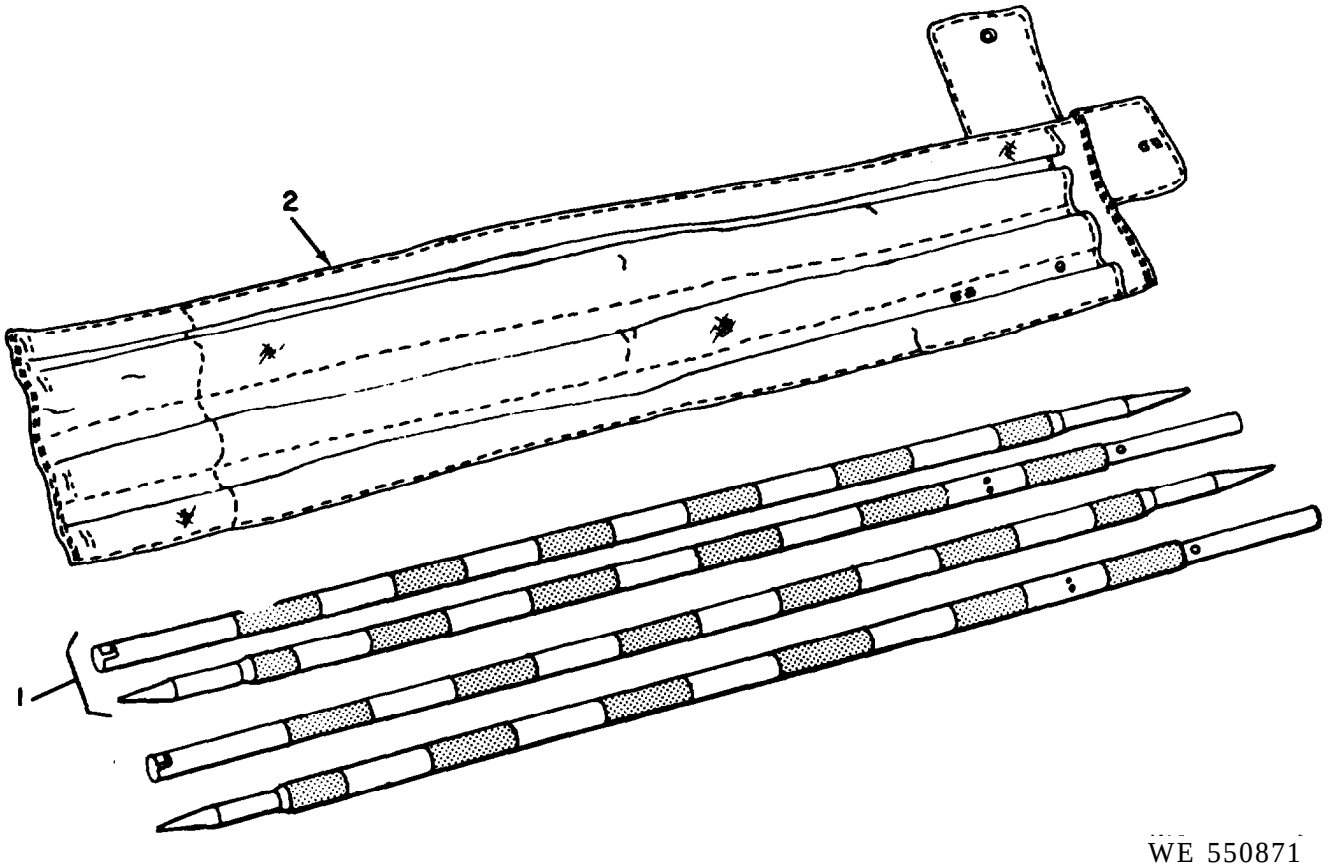

Figure 2-11. Post aiming M1A2 and aiming post cover M401.

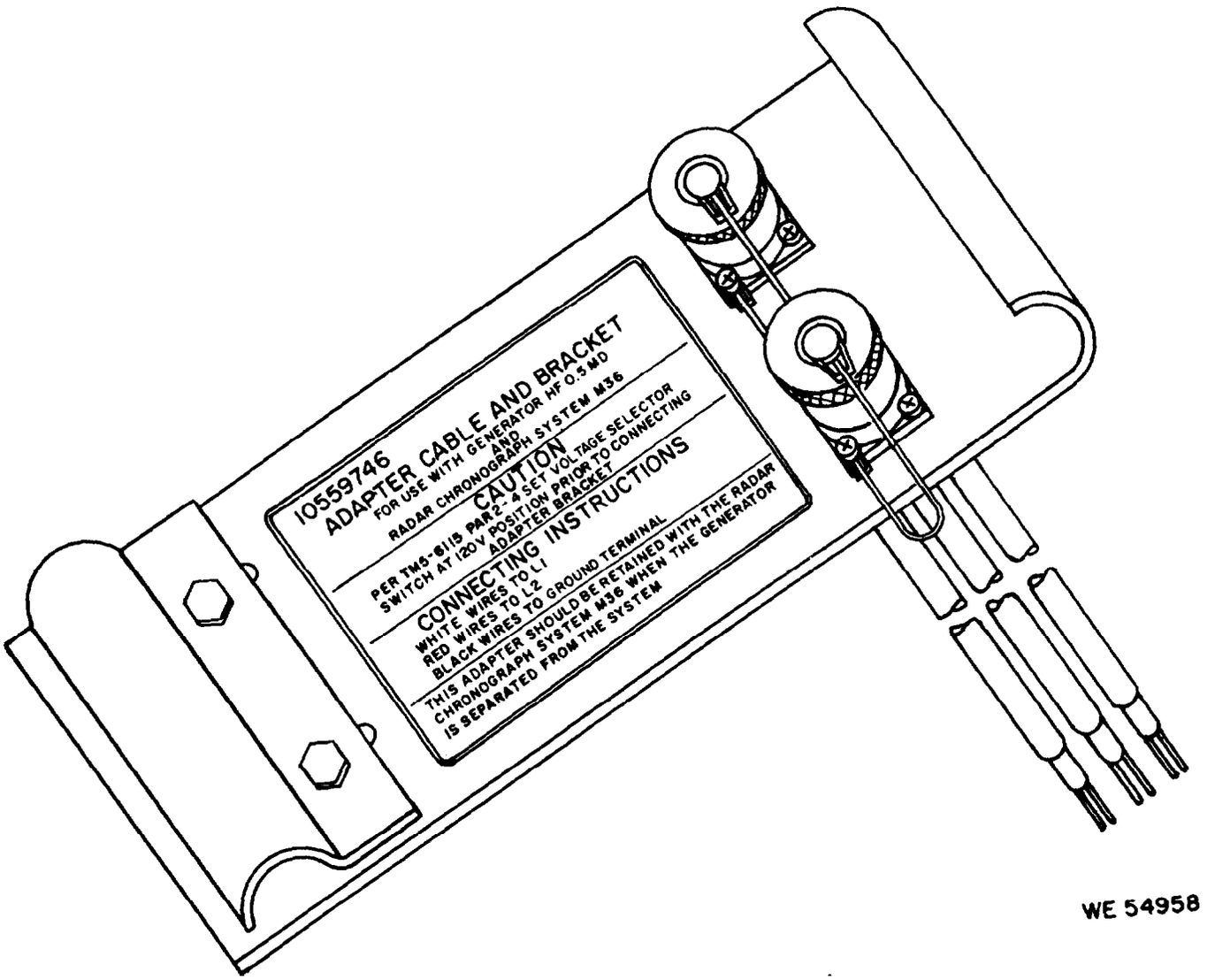

Figure 2-11.1. Adapter assembly-assembled view.

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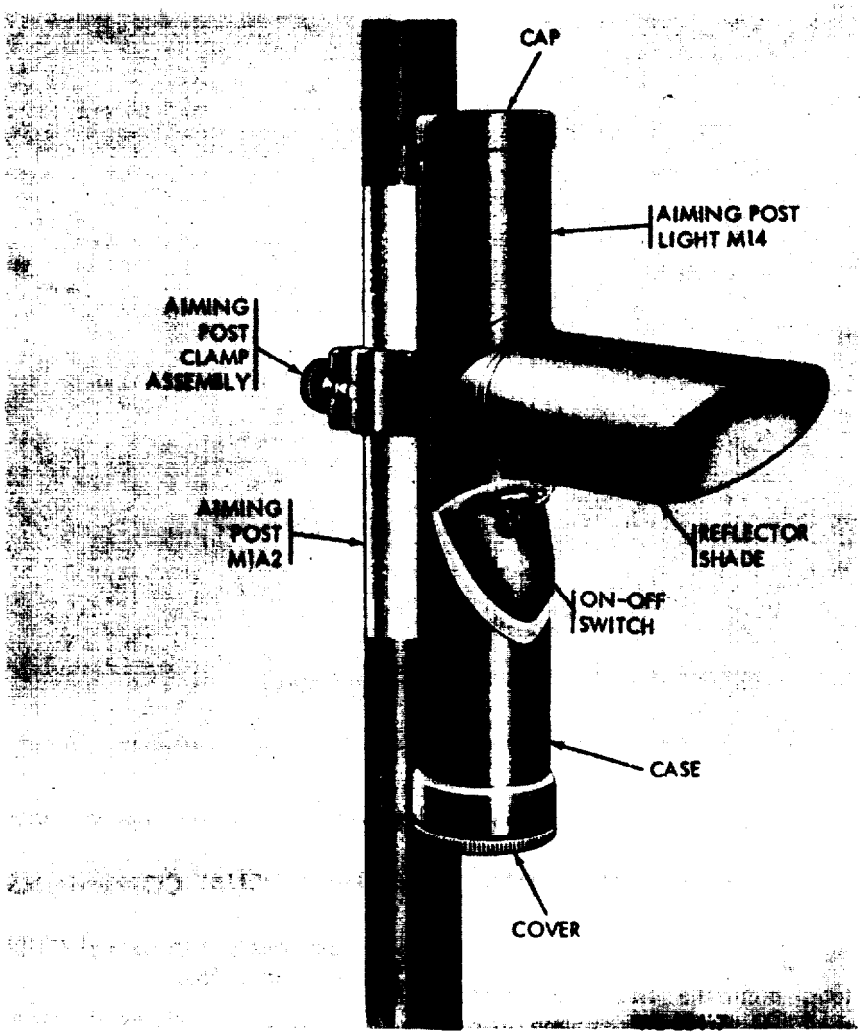


Figure 2-12. Light aiming post M14-installed view

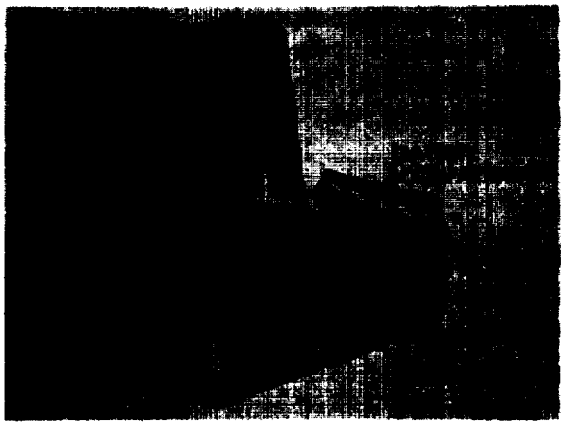


Figure 2-13. Chest light M21.

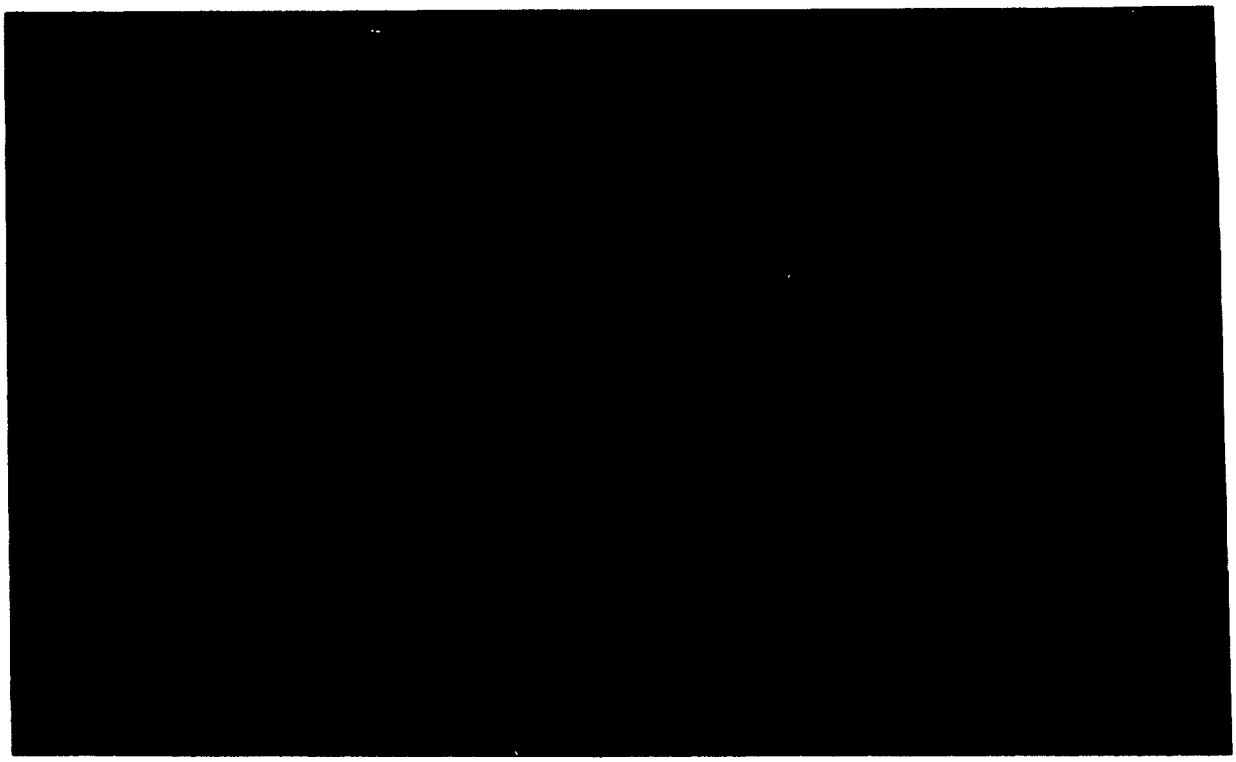


Figure 2-14. Quadrant fire control M1A1 and carrying case M82.

Section III. OPERATION UNDER USUAL CONDITIONS

2-6. General

This section contains instructions for the proper care of the materiel, preparation for operation, and the operation of the radar chronograph set M36 under conditions of moderate temperature and humidity. Every organization equipped with this chronograph must thoroughly train its personnel in the procedures for operating this equipment. For operation under unusual conditions see paragraphs 2-18 through 2-22.

2-7. Care in Handling

Radar chronograph set M36 will not stand abuse. Inaccuracy or malfunctions will result from mistreatment. Any instrument which cannot be adjusted or corrected by the authorized procedure must be brought to the attention of organizational maintenance personnel for necessary repairs. Adjustments other than those expressly authorized will not be performed by the operator.

a Unnecessary turning of screws or other parts not incident to the use of the instrument is forbidden.

b. Stops are provided on instruments to limit the travel of the moving parts. Do not attempt to force the rotation of any knob beyond the stop limit.

c. Keep the instrument as clean and dry as possible. If the radar chronograph set is wet, dry it carefully.

d. When not in use, keep the equipment covered and protected from dust and moisture.

e. Do not point the telescope XM128 directly at the sun as the heat of the focused ray may damage optical elements.

f. Keep all exposed surfaces of telescope XM128 clean and dry to prevent corrosion and/or etching of the optical elements.

2-8. Preparation for Use

a. General. Before using the chronograph, the operator should ascertain that the optical and radar axis alinement has been checked using the radar test receiver (para 2-14) and that the elevation calibration has been checked using the fire control quadrant (para 2-17). If the optical and radar axes are improperly alined or if the elevation scale is misadjusted, the chronograph aiming will be seriously hindered. Before actual operation the operator should also perform the preoperating checks and adjustments indicated in paragraph 2-14. The chronograph must be positioned so that when it is properly aimed, the predicted projectile trajectory will pass through the conical radar beam at the desired point. The aiming system of the chronograph must also correlated with that of the weapon to facilitate rapid aiming. The chronograph is located, prior to orientation, to the right or left of the weapon with its vertical (azimuth rotational axis) axis and the gun trunnion axis lying approximately on the same vertical plane. In this position the vertical axis of the chronograph should be at a distance of between 8 and 10 feet (no greater than 10 feet) from the weapon gun bore axis. The distance between any outer surface of the chronograph and weapon should be no less than 1 foot. The microphone is placed on the ground approximately 2 feet forward of the chronograph on a line perpendicular to the weapon gun tube axis at a distance of 12 feet from the gun tube axis.

NOTE

When the chronograph is jeep-mounted, it may be necessary to place the microphone on the windshield (windshield lowered) or hood of the jeep to obtain proper microphone location. The microphone should not be placed *beneath the jeep*.

b. Setting Up for Operation. Set up for operation as indicated in paragraph 2-3b and 2-3c. In addition, place generator set near equipment so that adapter assembly can be installed and power cable can be connected.

2-9. Operational Checks and Adjustments

Before operating the radar chronograph and chronograph automatic reliability rater certain procedures are performed to assure that the system will function properly. These procedures include checking the input voltage, leveling the mount, tuning the leakage tuner cavity to obtain minimum leakage of signal from the transmitter to the receiver, checking that AGC voltage is normal, and checking the calibration of the counting and indicating circuits.

Figure 2-15 is rescinded.

a. Radar Chronograph.

(1) Start generator engine and adjust generator for an output of 115 volts at 400 cycles per second.

(2) Set chronograph POWER switch (fig. 2-7) to ON and note that power lamp lights and blowers operate. Allow a minimum warmup period of five minutes before making further adjustments.

NOTE

Operation under unusual temperature conditions may require a longer warmup period.

(3) Set chronograph MONITOR SELECTOR switch (fig. 2-7) to LINE position and then to B+ position, noting that in both positions the meter needle falls close to red line (70) in the middle of the green region (A, fig. 2-16).

(4) Set chronograph MONITOR SELECTOR switch (fig. 2-7) to LEAKAGE position.

(6) Adjust LEAKAGE ADJUSTMENT 1 and LEAKAGE ADJUSTMENT 2 controls (fig. 1-6), in combination to obtain a maximum indication (optimum tuning or minimum leakage) on MONITOR meter (A, fig. 2-16) (should be near red' line in center of green region).

(6) Set MONITOR SELECTOR switch (fig. 2-7) to AGCV position and set VELOCITY SELECTOR switch (fig. 2-7) to the lowest range (70-325). AGC voltage reading on MONITOR meter (A, fig. 2-16) should be near red line.

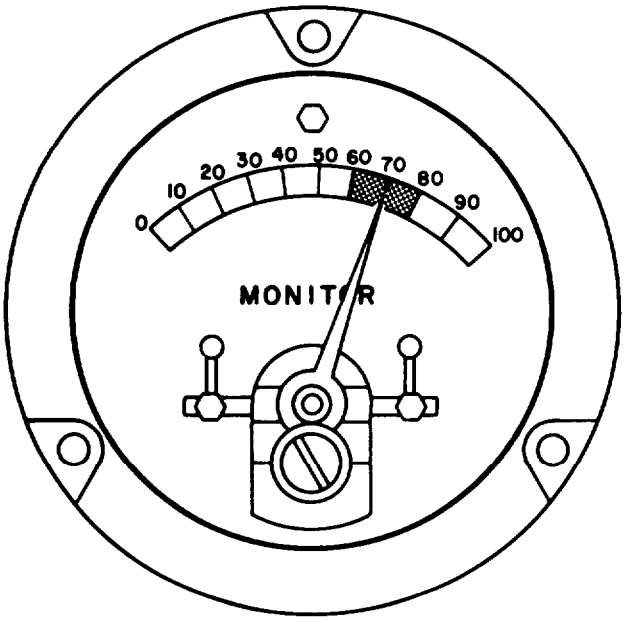
(7) Set MONITOR SELECTOR switch (fig. 2-7) to SIGNAL Position. Check that the MONITOR meter reading is less than 20 (providing another indication that the leakage signal is properly reduced).

(8) If reading is more than 20 (B, fig. 2-16) detune slightly and repeat (4) through (7) above.

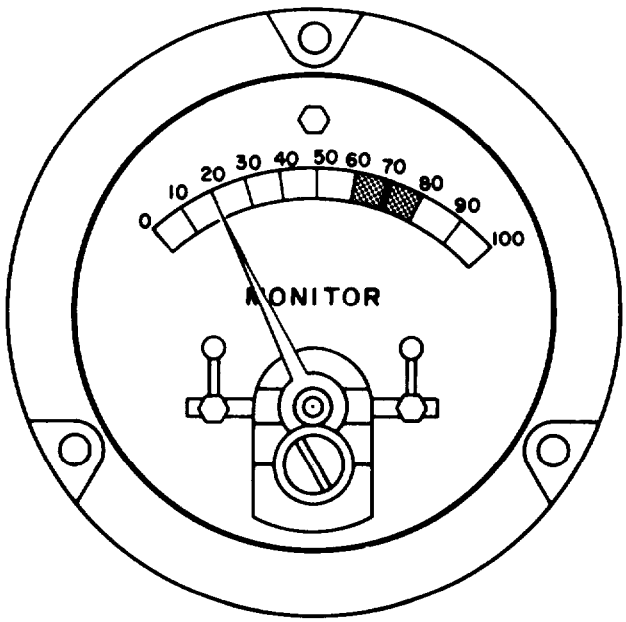
NOTE

Because leakage signal level will be influenced by external reflections, any change in position of chronograph of the weapon may cause the signal level to change, affecting receiver sensitivity. For best results (4) through (7) above should be performed after any change in position or aiming, and periodically during extended periods of operation.

(9) Check function of RESET circuits by depressing RESET switch and noting that RE-



A. READING IN THE LINE, B+, LEAKAGE, AND THE AGC V POSITION OF THE MONITOR SELECTOR



B. READING IN THE SIGNAL POSITION OF THE MONITOR SELECTOR

WE 23396

Figure 2-16. Monitor meter readings.

SET lamp lights and digital indicators (fig. 2-7) show 0000.0.

(10) Set up for anticipated calibrating reading by setting VELOCITY selector switch (fig. 2-7) to 925-1150 position.

(11) Momentarily place CAL 1-OPER-CAL 2 switch (fig. 2-7) in CAL 2 position and note that digital indicators read between 1070.0 and 1070.7 and that MONITOR meter needle is deflected into the green region (between 80 and 90).

(12) Depress RESET switch (fig. 2-7) and note that RESET lamp lights and digital indicators read 0000.0.

(13) Momentarily place CAL 1-OPER-CAL switch (fig. 2-7) in CAL 1 position and at the same time tap microphone sharply. Note that digital indicators read between 1070.0 and 1070.7 and that MONITOR meter needle is deflected into the green band. (This checks the microphone and associated circuitry.)

b. Chronograph Automatic Reliability Rater (CARR)-Pre-Operational Instructions and Set-up.

(1) Mount chronograph on tripod.

(2) Install radar test receiver on aiming post (fig. 2-17) so that center of test receiver will be at least four feet from ground. Wrap a piece of colored tape 9½ inches from center of test receiver (horn) on aiming post.

(3) Check to insure that dipole feed is located in the geometric center of the antenna dish by measuring from the outer edge of rivets in the antenna dish to the front edge of the white teflon cover on the dipole. This distance should be 9¼ inch ± $^{1}/_{16}$ inch. If the measurement is out of tolerance, notify direct or general support maintenance for corrective action.

(4) Set aiming post in the ground at a distance of 10 feet to 50 feet in front of chronograph. Make certain that the test receiver is in line with diople feed in center of antenna dish.

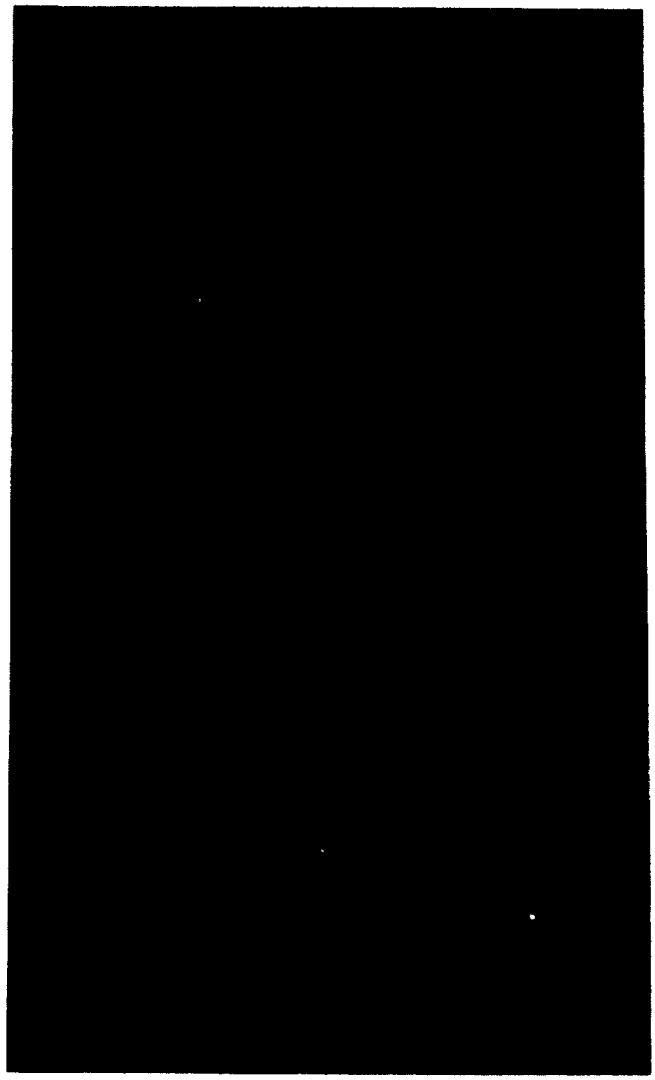
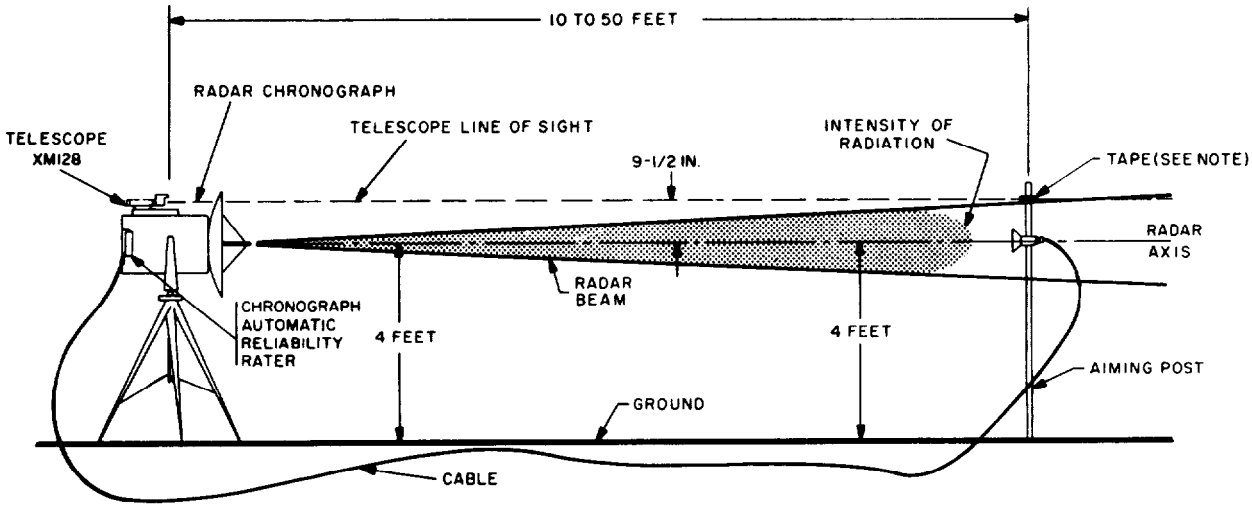


Figure 2-17. Radar test receiver mounted on aiming post M1A2.

(5) Install CARR simulator as shown in figure 2-18 on the mounting nuts located on the right hand side of chronograph.



NOTE: THE TELESCOPE LINE OF SIGHT IS AIMED AT THE TAPE (LOCATED AT 9-1/2 INCHES ABOVE THE CENTER OF THE HORN) OF THE AIMING POST. THE HORN IS ABOUT FOUR FEET ABOVE THE GROUND.

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Figure 2-18. Setup for alinement of radar chronograph optical system.

(6) Reel out sufficient microphone cable to connect, test receiver to CARR simulator HORN OUTPUT CONNECTOR.

(7) Connect jumper cable ends (fig. 1-16) to MICROPHONE input connector (fig. 2-7) and CARR simulator CHRONOGRAPH INPUT CONNECTOR.

(8) Turn on chronograph and prepare for normal operation.

c. Chronograph Automatic Reliability Rater (CARR) Optical Alinement Check.

(1) Set the toggle switch on the CARR simulator to the METER position.

(2) Adjust deflection and elevation settings of chronograph for maximum indication on MONITOR meter (fig. 1-16) of CARR simulator. Lock the chronograph in position of maximum meter indication.

(3) While sighting through XM128 telescope, adjust the screws in telescope base (fig. 2-19) until the horizontal cross-hair is on the 9½-inch tape mark and the vertical cross-hair is in the center of the test receiver as shown in figure 2-20.

Note. Azimuth adjustment screws must be loosened to permit elevation adjustment of telescope mount.

(4) Observe that the sight pattern is in the position of maximum meter indication on the CARR simulator MONITOR METER (fig. 1-16).

(5) If the change in the sight pattern is not correct within ±5 mils, repeat 2 through 4 above.

d. Chronograph Automatic Reliability Rater (CARR) Operational Check Procedure.

(1) Set the toggle switch on the CARR simulator to the OFF position.

(2) Set, the DELAY selector switch on the CARR simulator to CONT.

(3) Place the VELOCITY selector switch on the CARR simulator and the Radar Chronograph M36 to the 70-325 position. Set, the radar chronograph M36 MIC SENS control to 10.

(4) Sight through the XM128 telescope and verify that the sight, picture is as shown in figure 2-20.

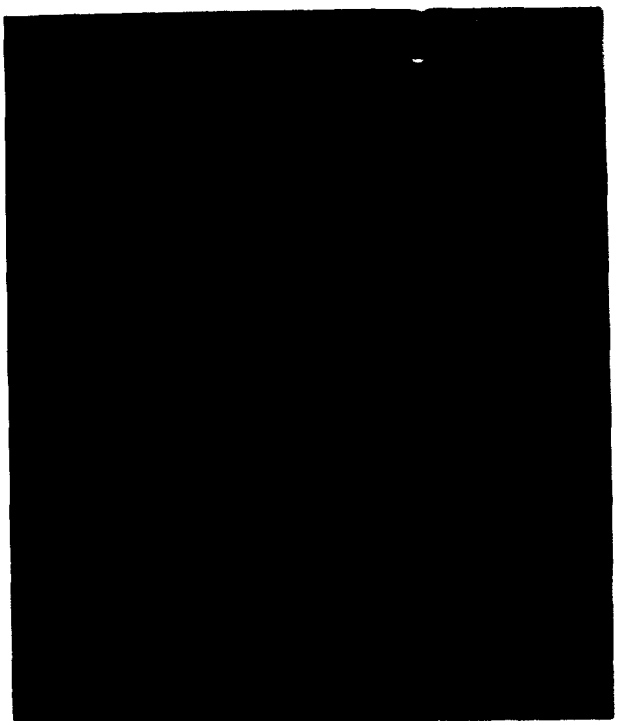

Figure 2-19. Telescope mount adjusting screws.

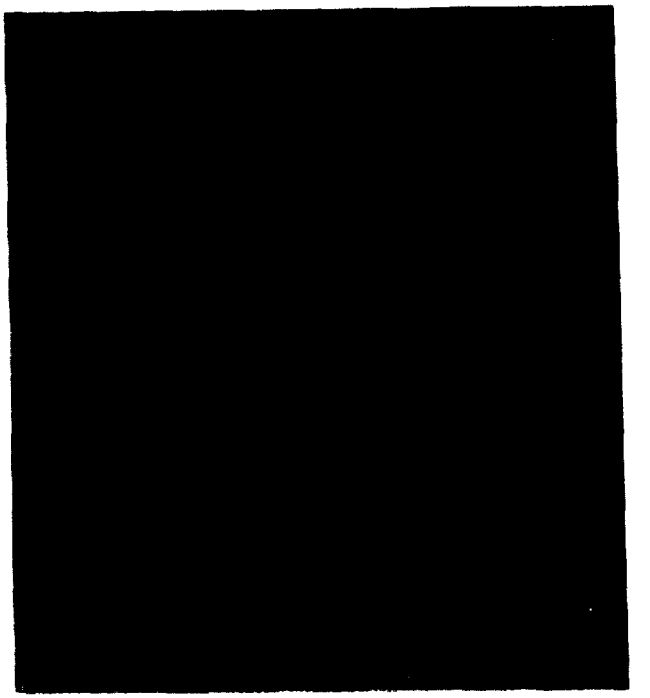

Figure 2-20. Telescope reticle cross-hairs alined with test receiver.

(5) Set MONITOR SELECTOR switch (fig. 2-7) to SIGNAL position and adjust LEAKAGE controls for a MONITOR meter reading of less than 20. It may be necessary to readjust the LEAKAGE controls so that the LEAKAGE position reads in the green band while the SIGNAL position reads less than 20.

(6) Set toggle switch (fig. 1-16) to OSC position.

(7) MONITOR meter (fig. 2-7) should indicate a SIGNAL reading in green band or higher.

(8) Set DELAY selector switch (fig 2-7) to 1 position and depress RESET switch. RESET lamp should light and digital indicators show 0000.0.

(9) Depress START button (fig. 1-16). RESET lamp should extinguish and digital indicators should show the value within the tolerance indicated on cover decal (fig. 1-16).

(10) Sequence the VELOCITY selector switch ranges of radar chronograph and CARR simulator through the remaining positions keeping them in coincidence. Depress RESET switch (fig. 2-7) and START button (fig. 1-16) at each velocity position and verify digital indicators show the value within the tolerance indicated on the cover decal (fig. 1-16).

(11) Set VELOCITY selector switch of the radar chronograph (fig. 2-7) and CARR simulator (fig. 1-16) to CAL position. Sequence the CARR and CHRONOGRAPH delay switches, through the settings shown in table 2-2. Verify that the readout of the display indicators is as shown in table 2-2.

(12) Set MIC SENS control (fig 2-7) to position 5. Depress RESET switch and note that RESET lamp lights and digital indicators read 00000.0.

(13) Depress START button (fig. 1-16). RESET lamp should extinguish and digital indicators should show 1070 within the tolerance indicated on cover decal (fig. 1-16).

Table 2-2. Delay Settings

Radar chronograph delay setting	CARR Delay	Digital display indicator reading (MPS)
1	1	1070
2	1	INCORRECT
2	2	1070
2	3	INCORRECT
8	3	1070
4	3	INCORRECT
4	4	1070
4	5	INCORRECT
5	5	1070
6	5	INCORRECT
6	6	1070
6	7	INCORRECT
7	7	1070
8	7	INCORRECT
8	8	1070
8	9	INCORRECT
9	9	1070
10	9	INCORRECT
10	10	1070

2-10. Correlation of Chronograph with Weapon

In order to aim the radar beam of the chronograph so that it intercepts the expected projectile trajectory at the desired point (fig. 2-21), and to permit quick readjustment of the chronograph aim with any change in the weapon aim by simply following the fire commands issued for the weapon, it is necessary to correlate the weapon and chronograph aiming systems before actual operation.

a. Common Aiming Point Procedure.

(1) With the weapon in the initial direction of lay and the panoramic telescope referred to the aiming point note the referred deflection.

(2) Check that the chronograph is leveled by means of leveling vials on the mount yoke and leveling base.

(3) Aim weapon panoramic telescope at an aiming point as specified in the appropriate weapon manual.

(4) Read azimuth deflection on weapon panoramic telescope. Record this reading only.

(5) Release the azimuth deflection lock handle.

(6) Sight through telescope XM128 (on the chronograph) at the common aiming point (fig. 2-22).

(7) Tighten the azimuth deflection lock handle.

(8) Release the azimuth scale lock knob.

(9) Rotate the azimuth deflection scale to 0 .

(10) Tighten the azimuth scale lock knob.

(11) Release the azimuth deflection lock handle.

(12) Rotate the yoke until the azimuth deflection scale indicates the same reading as that of the weapon panoramic telescope in (4) above.

(13) Tighten the azimuth deflection lock handle.

(14) Release the azimuth scale lock knob and rotate deflection scale to the reading noted in (1) above.

(15) Tighten the azimuth scale lock knob.

(16) Chronograph is now optically alined with axis of gun tube.

(17) Check weapon elevation angle.

(18) With chronograph still aimed at common aiming point, check that elevation reading of chronograph is the same as that of the weapon.

(19) If elevation readings on weapon and chronograph do not agree, loosen chronograph elevation dial pointer adjustment screws (fig. 2-23), adjust pointer for agreement, and retighten dial pointer adjustment screws.

(20) Chronograph is now optically alined with axis of gun tube.

(21) Release the azimuth scale lock knob.

(22) Rotate azimuth scale to same base deflection used by gunner.

(23) Tighten the azimuth scale lock knob.

(24) The M36 chronograph is now ready to follow fire commands given to gunner.

b. Reciprocal Laying Procedure.

(1) With the weapon in the initial direction of lay and the panoramic telescope referred to the aiming point note the referred deflection.

(2) Check that the chronograph is leveled by means of leveling vials on the mount yoke and leveling base.

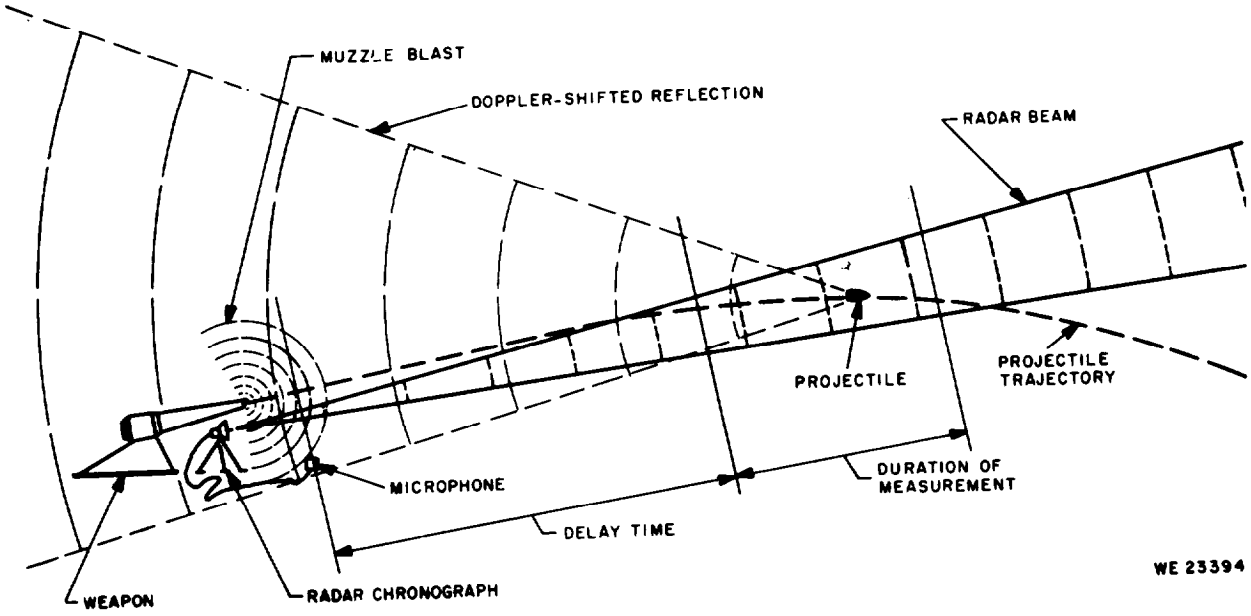

Figure 2-21. Diagram of projectile trajectory and radar beam.

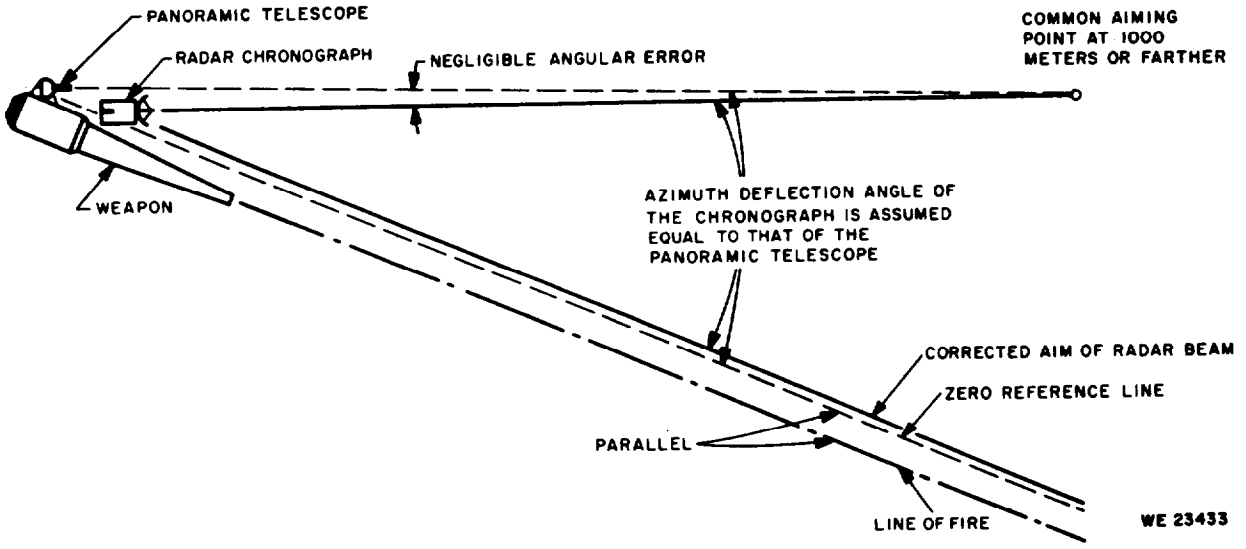

Figure 2-22. Diagram of common aiming point method.

(3) Aim weapon panoramic telescope to chronograph telescope XM128.

(4) Release chronograph deflection and elevation locking handles and move chronograph to direct telescope XM-128 at panoramic telescope.

(5) Mutually adjust chronograph and panoramic telescope until the vertical hair of each telescope is centered on the front lens of the other. Record the deflection setting of the panoramic telescope.

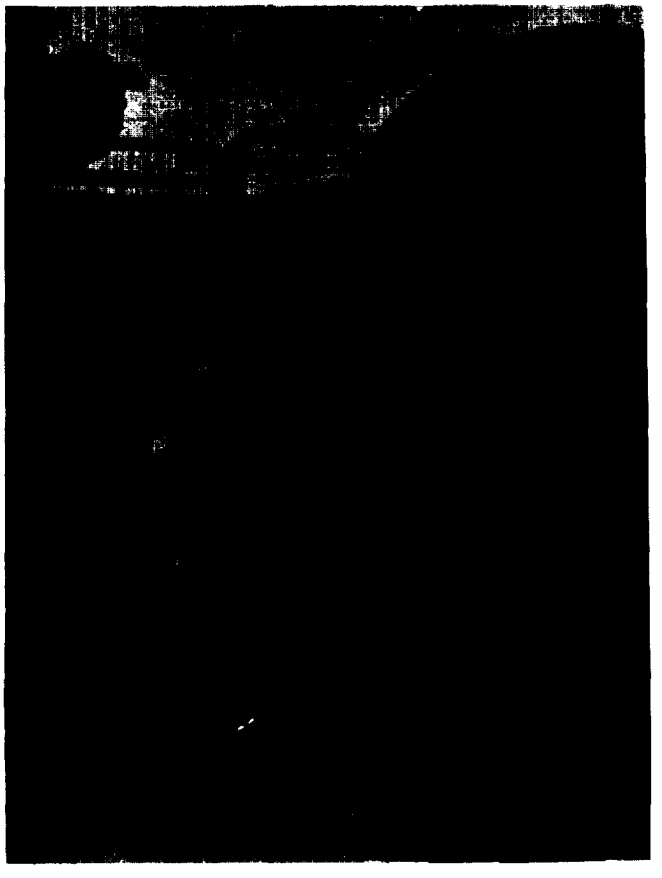

Figure 2-23. Elevation scale and dial pointer adjustment screws.

(6) Tighten chronograph deflection and elevation locking handles.

(7) Release chronograph azimuth scale lock knob (fig. 2-4) and rotate chronograph deflection scale to 0.

(8) Tighten chronograph azimuth scale lock knob. Loosen deflection lock handle.

(9) Rotate the yoke until the azimuth deflection scale indicates the same reading as that of the weapon panoramic telescope in (5) above.

(10) Releast chronograph azimuth scale lock knob and rotate deflection scale to the reading noted in (1) above.

(11) Tighten chronograph azimuth deflection lock handle.

(12) Return weapon panoramic telescope to the deflection setting noted in (1) above. The chronograph deflection scale is now set to the same common deflection as that of the weapon and can track weapon deflection by following fire commands.

(13) Release chronograph elevation locking handle and rotate the chronograph in the yoke until chronograph elevation agrees with that of weapon.

(14) Complete aiming procedure by retightening elevation lock handle.

c. Aiming Circle Method.

(1) Check that the chronograph is leveled by means of leveling vials on the mount yoke and leveling base.

(2) Mutually adjust chronograph and aiming circle until the vertical hair of each telescope is centered on the front lens of the other. Record the deflection setting of the aiming circle.

(3) Chronograph operator records reading from aiming circle.

(4) Tighten the azimuth deflection lock handle.

(5) Release the azimuth scale lock knob.

(6) Rotate azimuth deflection scale to 0.

(7) Tighten the azimuth scale lock knob.

(8) Release the azimuth deflection lock handle.

(9) Rotate the yoke until the azimuth deflection scale indicates the same azimuth angle recorded in (3) above.

(10) Tighten the azimuth deflection lock handle.

(11) Release the azimuth scale lock knob.

(12) Rotate azimuth scale and set it on the weapon referred deflection.

(13) Tighten the azimuth scale lock knob.

(14) The chronograph is now ready to follow fire commands given to gunner.

2-11. Operation

Before operation, observe WARNING of POTENTIAL RADIATION HAZARD, cited below. Check that all the required preliminary steps given in paragraph 2-9 have been performed, then proceed as follows:

WARNING
POTENTIAL RADIATION HAZARD
When radar is energized, personnel should not be within 6 feet of the radiating feedhorn (located in the center of dish) in the direction of the transmitted beam.

a. Set chronograph MIC SENS control (fig. 2-7) to 8. Check RESET lamp. If lamp goes out because of extraneous noise, reduce microphone sensitivity as required.

b. Set chronograph DELAY selector switch to delay position 3.

c. Set chronograph VELOCITY selector switch to the velocity range required for the particular weapon and charge used (see extrapolation table).

d. Set MONITOR SELECTOR to SIGNAL position. The chronograph is now ready to operate.

e. Notify gunner that chronograph is ready for operation.

f. As weapon fires, note that MONITOR meter needle is deflected, that RESET lamp goes out, and that digital indicator reading changes. Record final reading of digital indicators (this reading may be converted later to muzzle velocity by means of extrapolation table),

g. Momentarily depress RESET switch to place chronograph in readiness for next round. Check that RESET lamp lights and digital indicator shows 0000.0.

h. Listen for fire commands between rounds; make azimuth and elevation changes as required.

i. When operation is completed, turn off power at chronograph, and turn off generator.

j. Disconnect and stow all chronograph set components.

k. Disconnect the adapter assembly 1290-181-5303 from the generator set. The adapter assembly should be returned with the radar chronograph set, M36 when the generator is separated from the system.

Section IV. OPERATION OF MATERIEL USED IN CONJUNCTION WITH RADAR CHRONOGRAPH SET M36

2-12. General

This section contains description and instructions for the setup and operation of the materiel used in conjunction with the radar chronograph set M36. This materiel includes generator set, utility truck 2320-542-4783 and cargo trailer 2330-738-9509. Instructions are also given for the use of fire control quadrant M1A1, 1290-719-7156 and for the use of radar test receiver and chronograph automatic reliability rater.

2-13. Chronograph Automatic Reliability Rater (CARR)

The basic use for which the CARR simulator is utilized is a field system tester for radar chronograph M36. The CARR simulator is a ten-crystal oscillator, two monostable flip-flops, and a 500 microampere dc meter. Accessory equipment to the simulator is a 1½-foot three-wire jumper cable. The simulator has slots (fig. 1-16) designed for mounting on chronograph. The radar chronograph transmits a continuous wave signal at an X-band frequency of 10,500 mc. This energy is intercepted by the crystal diode in the radar test receiver (fig. 1-1). The CARR simulator modulates this intercepted energy at any one of ten crystal controlled frequencies. This modulated energy is reflected back to the receiver section of the chronograph where it is processed for amplification, counting, and display. In the continuous mode of operation when the START button (figs. 1-16) is depressed on the simulator, a start trigger is internally generated in the CARR simulator and sent through the jumper cable to the chronograph. This trigger initiates the gate timing sequence in the chronograph. When the counting gate opens in the chronograph the reflected modulated RF energy from the radar test receiver is counted for one gate period (42.8 msec) and displayed on the digital indicators (fig. 2-7). For each selected frequency on the CARR simulator, there is a distinct readout on the digital indicators. In the gated mode of operation when the START button is depressed on the CARR simulator, a start trigger is internally generated in the CARR simulator and sent through the jumper cable to the chrono-

graph. This start trigger initiates the gate timing sequence in the chronograph and the internally generated start trigger also initiates the internal gate timing sequence in the CARR simulator. The simulator gates out a burst of crystal controlled modulating signal to the radar test receiver. When the counting gate in the chronograph coincides with the gated out signal from the CARR simulator the correct readout is displayed on the nixie tubes of the digital display. Conversely, if the gates do not coincide, the readout on the digital display is incorrect. The 500 micro-amp dc meter is utilized in alining the telescope XM128 of the chronograph with the radar beam. This is accomplished by aiming the radar beam at the radar test receiver. The crystal diode in the test receiver rectifies the intercepted radar energy and the amount of rectified current is indicated on the meter mounted in the CARR simulator. With a maximum current indication on the meter, the telescope is positioned so that the cross-hairs in the telescope pattern are properly alined on the test receiver. This completes the alinement of the radar beam with the telescope.

2-14. Optical Alinement Procedure Using Radar Test Receiver and Chronograph Automatic Reliability Rater (CARR)

Optical alinement checks should be performed at regular monthly intervals or when troubleshooting indicates misalinement between the telescope XM128 line of sight and the longitudinal axis of the radar beam. The check should be performed in a flat, open surface where there are no reflecting surfaces within 200 feet in front of the chronograph antenna. The center of the reflector should be at least four feet above the ground to minimize ground reflections.

a. Utility Truck M151. This 1/4 ton, 4 x 4 utility truck is designed as a general purpose personnel or cargo-type carrier for use over all types of roads as well as cross-country terrain, and in all weather conditions. It will ford hard bottom water crossings to a depth of twenty-one inches. The vehicle is powered by a four-cylinder overhead valve, in-line, liquid cooled, gasoline engine, located forward of the passenger compartment under the hood, A four-speed conventional type synchro-mesh transmission with transfer case transmits power to the front and rear axles. Operator's maintenance is contained in TM 9-2320-218-10.

b. Cargo Trailer M100. This vehicle is a two-wheel general purpose cargo carrier designed to carry a maximum load of 500 pounds cross-country. The body and frame are one piece welded construction. The body is water tight and will float the trailer and a 500-pound load in fording operations. Two drain valves are- provided, one in the front, and one in the rear of the floor. The trailer is equipped with two tail lights which are operated from the towing vehicle. An inter-vehicular cable is provided for connecting the trailer electrical system with that of the towing vehicle. This cable is stowed in the storage box mounted on the left front of the body. An "A" frame drawbar is bolted to the frame side members. It provides for towing connections and for a support leg. The support leg is retractable and is used to keep the trailer upright when the trailer is not connected to a towing vehicle. A canvas cover is provided for covering the trailer body. Operator's maintenance is contained in TM 9-871A.

c. Generator Set HF-0.5 MD. The generator set (fig. 2-24) is used to power the chronograph set operation. The generator is driven directly from the model 1A0 8-111 engine. It is a 0.5 kilowatt, 120 or 240 volt, 400-cycle, a.c. single phase, generator, fully radio interference suppressed and fungus-proofed.

d. Engine. The Military Standard Engine (Model 1A0 8-111) is a 4-stroke cycle, overhead valve, air-cooled engine. It is fully radio interference-suppressed and fungus-proofed. This is a one-cylinder engine which develops 1-1/2 horsepower at 3,600 rpm.

2-14.1 Installation of Adapter Assembly 1290-181-5303

(fig. 2-24.1)

CAUTION

Prior to connecting adapter assembly electrical leads to engine generator, place the generator voltage output selector switch (fig. 2-24) to the 120 volt position to prevent damage to the Radar Chronograph electrical circuits.

a. Install bracket 10559745 (fig. 2-24.1) on frame of generator set 6115-917-7354 as shown installed in (fig. 2-24).

b. Install clamp 10559744 and secure with two screws 5305-579-5238, two flat washers 5310-582-5677, two lock washers 5310-543-2740 and two nuts 5310-903-5966 (fig. 2-24.1).

c. Connect the adapter assembly electrical wire leads to engine generator output as follows :

(1) Connect two white wires to generator set terminal L1.

(2) Connect two red wires to generator set terminal L2.

(3) Connect two black wires to generator set ground terminals.

NOTE

Plate instruction 10559747 (fig. 2-24.1) indicates proper connecting instructions of wire leads to engine generator output terminals.

(4) Adapter assembly should be retained with Radar Chronograph Set: M36 when the generator is separated from the system.

2-15. Installation of Instrument light M53

For operation at night, instrument light M53 is used as a source of illumination for the reticle of telescope XM128 and for the scales and controls. To install instrument light M53 on the telescope, proceed as follows :

a. Remove instrument light from case stowed in chronograph accessories case.

b. Remove protective cap from reticle light (fig. 1-14) and return cap to case.

c. Screw lamp bracket assembly (fig. l-l) on to reticle light.

d. Slide dovetail foot on lamp bracket assembly into dovetail slot provided on lower left side of telescope XM128 (fig. 2-25).

e. Turn knob on instrument light case clockwise to turn on reticle light and adjust light to desired level.

f. To operate hand-held lamp on instrument light, press the pushbutton switch on the handle and direct light beam as desired.

2-16. Installation of Aiming Post light M14

TO provide an aiming point for optical alinement that is visible at night, the aiming post light (fig. 2-12) is clamped to the aiming post with the lamp at the same height as the tape would be for daylight alinement. The light is turned on by means of the toggle switch, and the lamp shield is turned toward the weapon and chronograph so that the light is visible to both. If two aiming posts are used, they are made distinguishable by placing a red filter in front of one light and a green filter in front of the other. When radar chronograph optical alinement is done at night, the aiming post light can be used to provide a visible reference.

2-17. Using Fire Control Quadrant Ml Al with Radar Chronograph Set

After optical alinement check or adjustment, the elevation scale should be checked for proper calibration as outlined below :

a. Remove the telescope from chronograph mount.

b. Place fire control quadrant M1A1 on telescope mount (fig. 2-26).

c. Adjust the quadrant until the bubble is centered in the vial. Note the quadrant elevation reading.

d. Loosen the two elevation dial pointer adjustment screws (fig. 2-19).

e. Set elevation dial pointer to the elevation reading noted in c above.

f. Tighten the two dial pointer adjustment screws and recheck elevation reading.

NOTE

The elevation scale calibration is independent of the optical alinement check or adjustment and may be performed separately. (For example, if the elevation scale is replaced, it may be calibrated without optical alinement.) However, anytime an optical alinement adjustment is made, the elevation scale calibration must be checked.

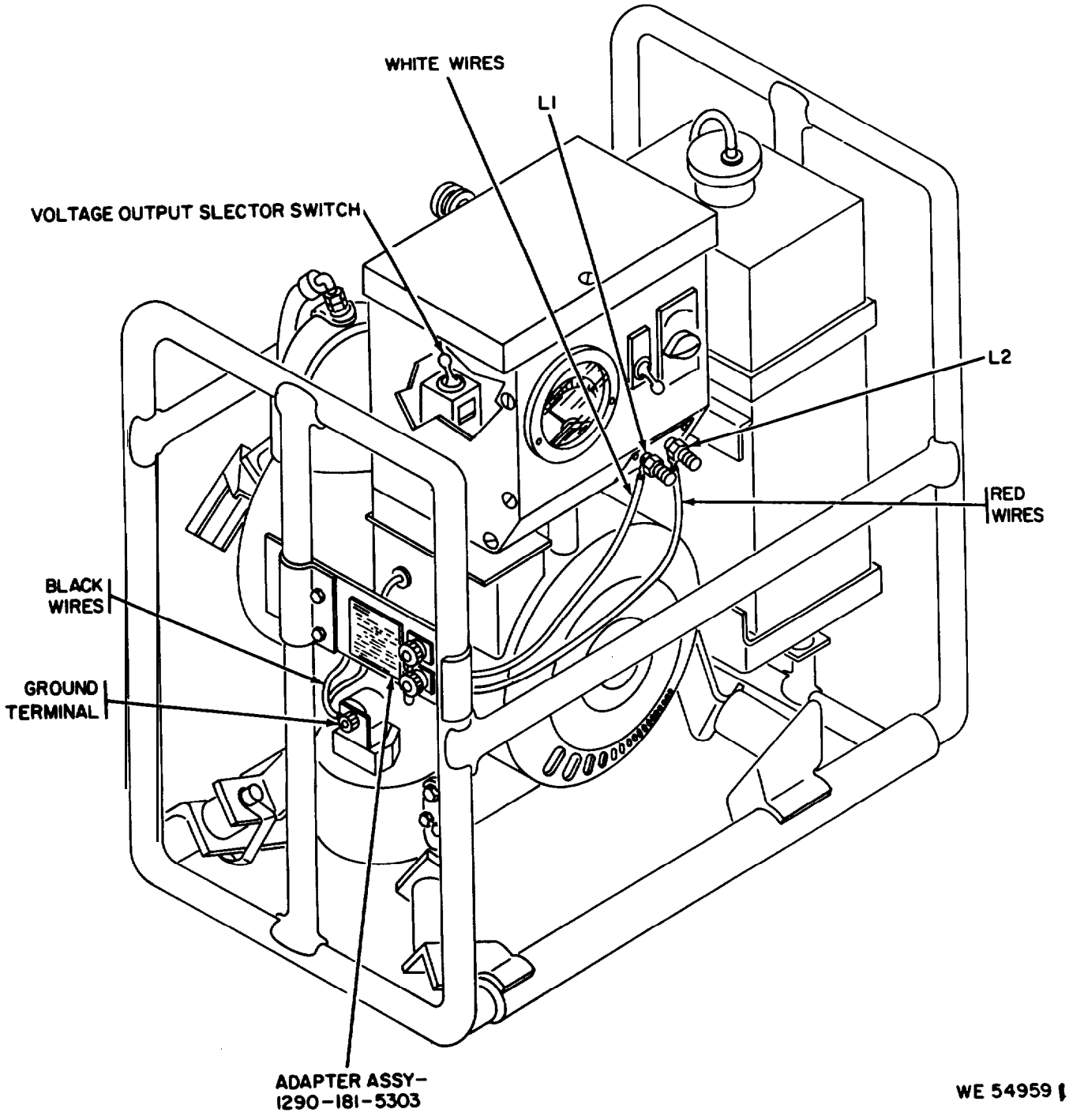

Figure 2-24. Generator Set HF-0.5 MD.

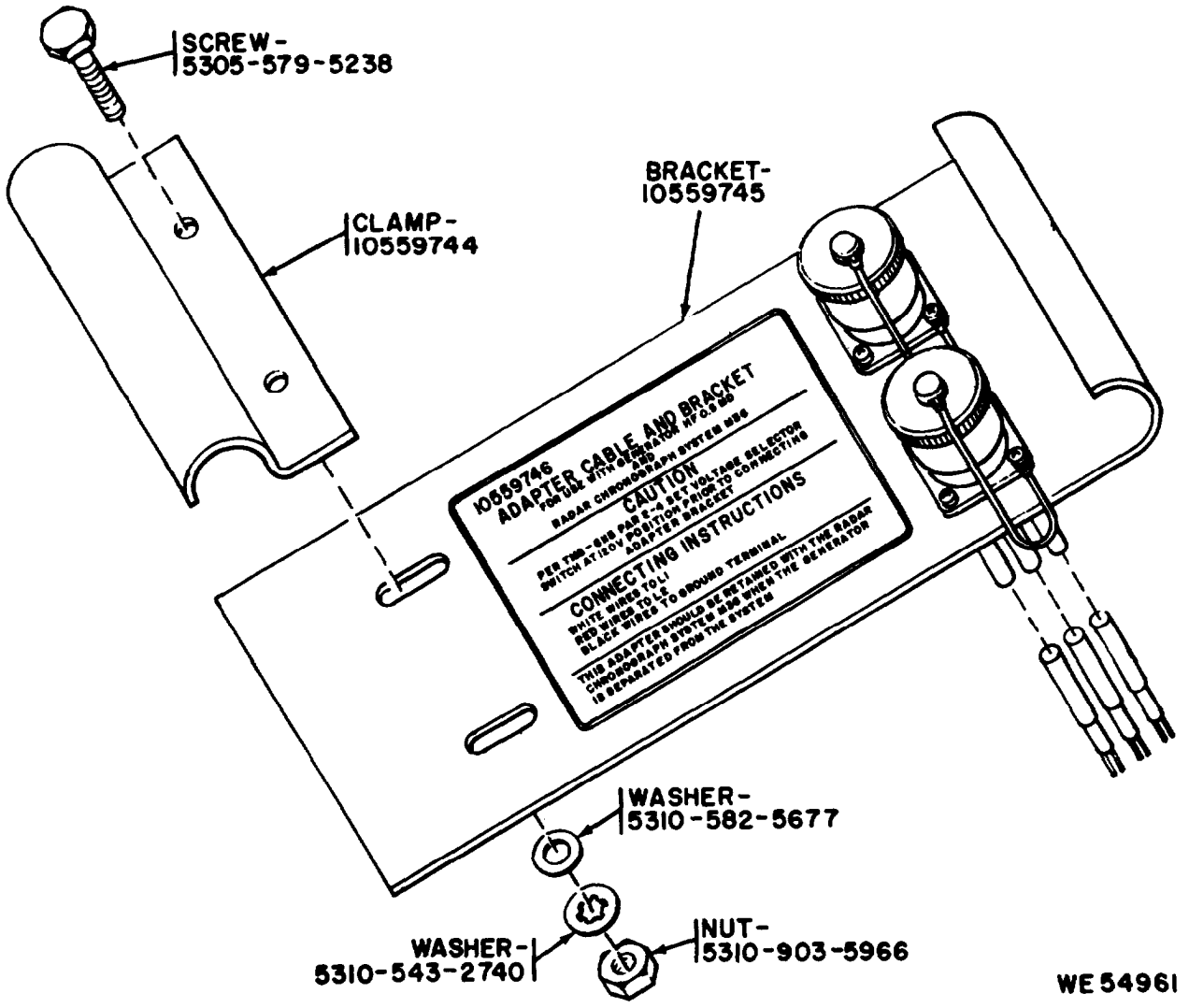

Figure 2-24.1, Adapter Assembly-partial exploded view.

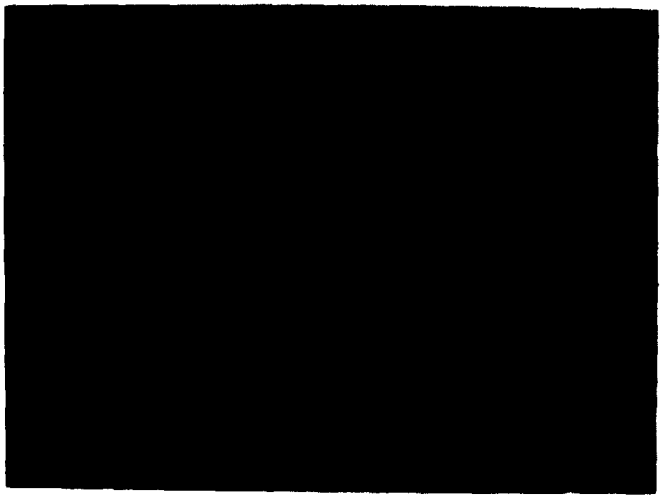

Figure 2-25. Installing instruments light *M53* on *telescope XMl28 for night operation.*

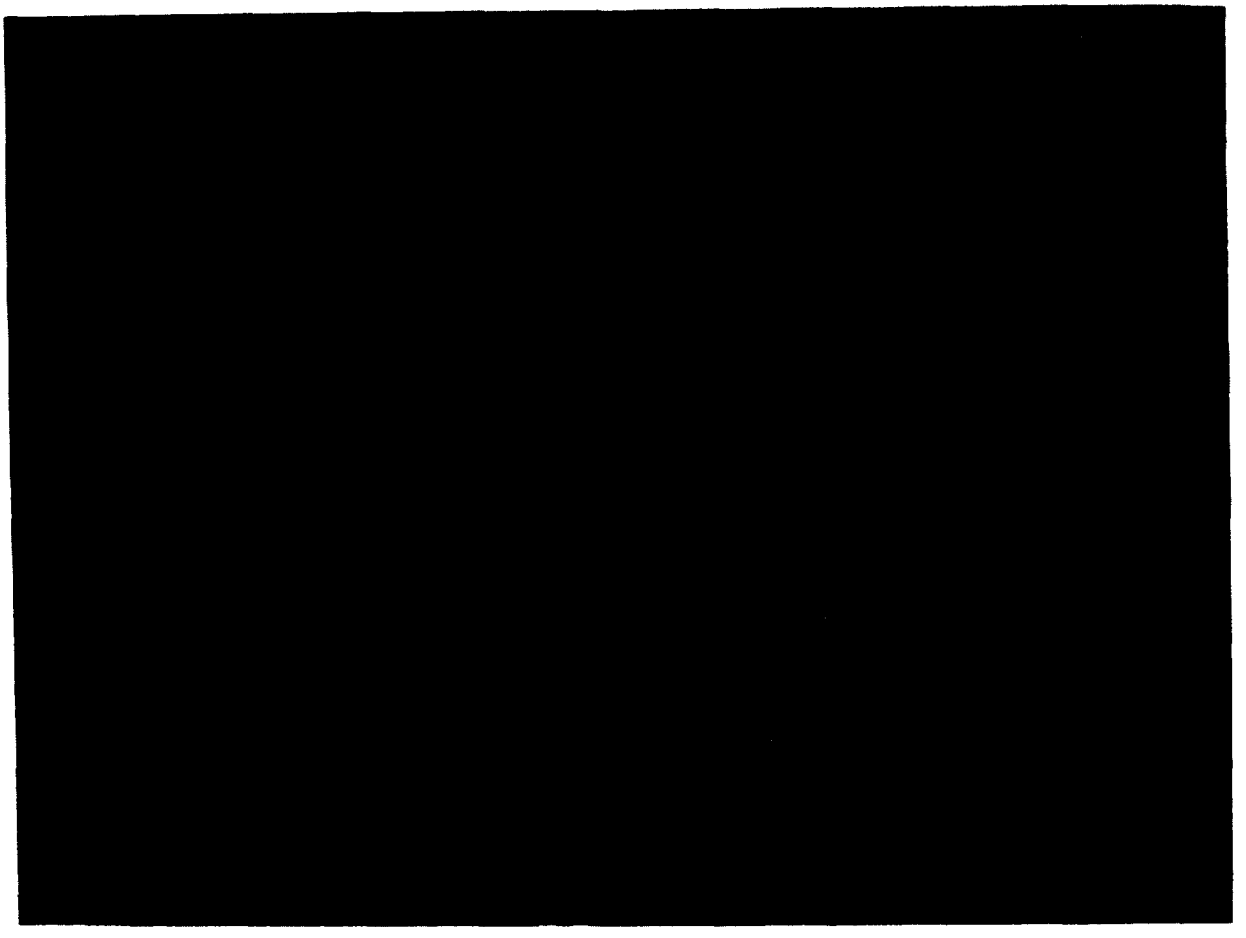

Figure 2-26. Fire control quadrant M1A1 on chronograph.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

2-18. General Conditions

In addition to the normal operating procedures for usual conditions, special instructions for operation under unusual conditions are contained herein. In addition to the normal preventive maintenance service, special care in cleaning and lubricating must be observed where extremes of temperature, humidity, and atmospheric conditions are present or anticipated. Proper cleaning, lubrication, storage, and handling of lubricants not only insure operation and functioning but also guard against excessive wear of the working parts and deterioration of the materiel.

2-19. Operation in Extreme Cold

In climates where the temperature is consistently below zero degrees F, it is necessary to prepare materiel for cold weather operation. For description of operations in extreme cold, refer to TM 9-207.

***Caution.*- It is imperative that approved extreme cold weather practices and precaution be followed. TM 4-207 must be. considered as essential supplement to this manual.**

a. Avoid breathing on the rear panel causing condensation which might freeze and obscure control positions or calibration.

b. Exercise the various controls through their entire range, at intervals as required, to aid in keeping them from freezing in place and to reduce the effort required to operate them.

c. When chronograph is not in use,. pay particular attention to potecting it with proper covers. Keep covers in place as much of the time as firing conditions permit, to prevent snow and ice from entering the working parts.

d. See FM 31-70 for additional information on operation in the arctic.

2-20. Operation In Extreme Heat

a. Avoid prolonged exposure to the direct rays of the sun; provide shade as much as possible.

b. Cover equipment when not in use to protect from excessive accumulation of moisture.

c. Perspiration from the hands in a contributing factor to rusting because it contains acids and salts. After handling materiel, clean and wipe dry.

2-21. Operation in Humid or Salty Atmosphere

a. Inspect mechanisms frequently when operating in hot moist areas.

b. Moist and salty atmospheres have a tendency to emulsify oils and grease and destroy their rust-preventive qualities. Inspect all parts frequently for corrosion. Keep covers in place as much of the time as firing conditions permit.

2-22. Operation in Dusty or Sandy Conditions

a. Clean the chronograpn more frequently when operating in sandy areas. Exercise particular care to keep sand out of the mechanisms when carrying out inspecting operations.

b. Keep covers in place as much of the time as firing conditions permit. Shield parts from flying sand with tarpaulins during d&assembly and assembly operations.

CHAPTER 3

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, SPECIAL TOOLS, AND EQUIPMENT

3-1. Repair Parts

Repair parts and equipment issued to the using organization for operating and maintaining the radar chronograph set M36 are listed in the Basic Issue Items List, section II of ap pendix B.

3-2. Tools and Equipment

Tools and equipment having general application to this materiel are listed in section IV of appendix B.

Section II. LUBRICATION AND PAINTING

3-3. General

Lubrication is not required for normal operation or maintenance of the materiel.

3-4. Painting

Preparation for painting procedures are described in detail in TM 3-213.

3-5. Cleaning

a. General. Any special instructions required for specific mechanism or parts are contained in the pertinent section. General cleaning instructions are as outlined in *b* through *g* below.

b. Metal Parts.

(1) Use dry cleaning solvent or mineral spirits paint thinner to clean or wash grease or oil from all metal parts of the radar chronograph set M36.

(2) After the parts have been cleaned, dry them thoroughly and apply a light grade of aircraft instrument lubricating oil to all parts having unpainted polished surfaces to prevent rusting.

c. Rubber Parts. Clean gaskets (located between chronograph front and rear sections) and telescope eyeshield (fig. B-1, App B) with warm water. Apply a light coating of powdered talcum to preserve the rubber.

d. Air Filters. To clean the air filters located at the bottom of the radar chronograph (fig. 3-1) loosen the six dzus fasteners holding each air filter retaining plate to the rear case section and remove the filters; then proceed to the following:

(1) Immerse air filters in trichloroethane solvent and agitate to aid cleaning action.

(2) Remove filters from solvent and shake to remove excess solvent.

(3) Allow filters to dry, then spray a small amount of light lubricating oil into filter mesh.

(4) Allow excess oil to drain off before reinstalling filters.

e. Glass and Plastic Surfaces. Moisture due to condensation may collect on the windows of the instrument when the temperature of the parts is lower than that of the surrounding air. This moisture, if not excessive, can be removed by placing the instrument in a warm place or wiping with a soft, lint-free. cloth.

f. General Precautions in Cleaning.

(1) Dry cleaning solvent or mineral spirits paint thinners are inflammable

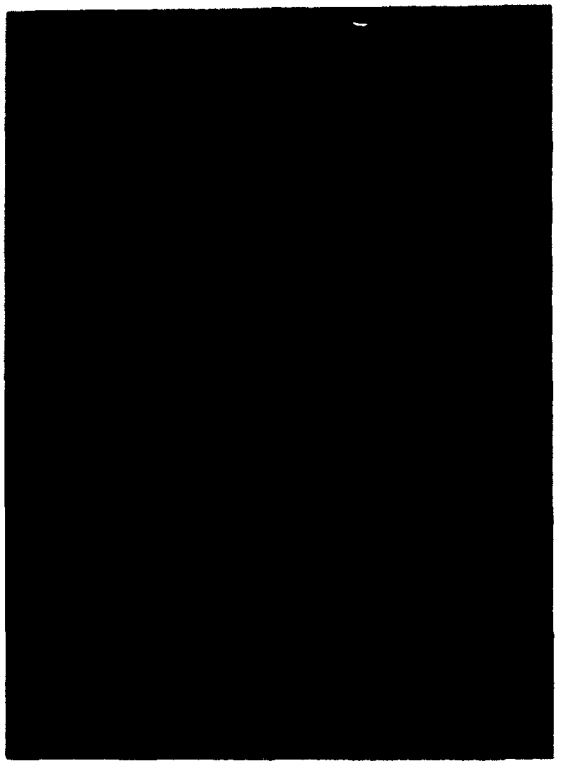

Figure 3-1. Chronograph bottom view showing air filters removed.

and should not be used near an open flame. Fire extinguishers should be provided when these materials are used, Use only in well ventilated places.

(2) These cleaners evaporate quickly and have a drying effect on the skin. If used without gloves, they may cause cracks in the skin and, in some individuals, a mild irritation or inflammation.

(3) The use of diesel fuel oil, gasoline, or benzine (benzol) for cleaning is prohibited.

g. Paint and Finish. Organizational maintenance personnel will perform both touch up and complete paint refinishing on fire control materiel when required. Care will be exercised when repainting fire control materiel to prevent paint from covering scales, lenses, bearing surfaces, telescope seats, etc., in order to maintain these and like surfaces in efficient working condition.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-6. Preventive Maintenance Checks and Services

a. Daily Inspection. Refer to table 2-1.

b. Intermediate Inspection. Refer to table 3-2.

3-7. Reporting Deficiencies

The "sequence number" column of tables 3-1 and 3-2 provides the identification numbers which are to be used when reporting uncorrected deficiencies on DA Form 2404 (see TM 38-750).

Table 3-1. Preventive Maintenance Checks and Services

Sequence number	Required every	Item and procedure	Paragraph/ reference
1	Pre-operation	*All components*- Clean, wipe dry inspect for evidence of corrosion or paint chipping.	2-7c
2	Pre-operation	*Chronograph and Tripod*- External visual examination for mechanical damage.	
3	Pre-operation	*Telescope XM128-Visual* examination of eyeshield and sunshade for signs of deterioration, fungus growth, and dirt.	3-5c
4	Pre-operation	*Chrongraph-Check* that all operating controls move without binding. Check that ventilation blowers are operating. Check illumination of indicator and reset lamps.	2-7b
5	Pre-operation	*Radar Test Receiver-External* visual examination for mechanical damage.	----

Table 3-1. Preventive Maintenance Checks and Services -Continued

Sequence No.	Required every	Item and procedure	Paragraph/ reference
6	Pre-operation ---------	Tripod Exercise each tripod leg to observe that telescoping legs move without binding.	
7	Pre-operation --------	Bracket Installation-Inspect for loose hardware (jeep mounting) ----------.	
8	Pre-operation --------	Microphone-External visual examination for mechanical damage ----------.	
9	Pre-operation --------	Instrument Light M53-Visual examination of wire leads for frayed or broken insulation.	
10	Pre-operation --------	Cable and Reel Assembly-Visual examination for cracked insulation, fraying, loose wires, and damage to connectors.	
11	Pre-operation --------	Lamp Bracket- Visual examination for damaged threads or broken window.	
12	Pm-operation --------	Chronograph Automatic Reliability R&r-External visual examination for mechanical damage.	
13	Pm-operation --------	Adapter Assembly -Visual examination of wire leads for frayed or broken insulation, missing mounting hardware and/or damaged components.	

Table 3-2. Preventive Maintenance Checks and Services

Sequence No.	Required every	Item and procedures	Paragraph/ reference
1	Intermediate ----------	Radar Chronograph-Check components for damage ----------	2-3 *f*
2	Intermediate ----------	Chronograph and Tripod- Use common hand tools to tighten loose hardware.	
3	Intermediate ----------	Special Purpose Cable-Check for cracked insulation, fraying, loose wire, and damaged connector.	2-3 *f*
4	Intermediate ----------	Microphone-Check for loose hardware or damaged connector using common hand tools.	
6	Intermediate ----------	Bracket Installation (Jeep Mounting) -Check adapter plate for loose or damaged hardware using common hand tools.	

Section IV. TROUBLESHOOTING

3-8. General

This section contains instructions for troubleshooting the radar chronograph set.

3-9. Scope

Troubleshooting is a systematic isolation and remedy of malfunctions and defective components by means of symptoms and tests. Malfunctions not correctable by actions listed in table 3-3 will be referred to direct support maintenance.

Table 3-3. Troubleshooting

Malfunction	Probable cause	Corrective action
1. POWER lamp does not light when power switch is on. [1 2 3]	a POWER lamp is defective. b. Burned out fuse. a. No power input from generator.	a. Replace POWER lamp (para 8-20). b. Replace fuse (para 8-21). c. Adjust generator output. Notify DS maintenance.
2 One or both blowers fail to operate. [1 2 3]	a.. Defective blower motor. b. Defective wiring. c. Defective starting capacitor.	a. Notify DS maintenance. b. Notify DS maintenance. c. Notify DS maintenance.
3. MONITOR SELECTOR switch fails to operate (as shown by meter). [1 2 3]	a. Defective MONITOR SELECTOR switch. b. Defective wiring.	a. Notify DS maintenance. b. Notify DS maintenance.
4. Incorrect LINE voltage reading on external monitor meter.'	a. Output of generator not correct b. Blown fuse A6F1 or A6F2. c. Defective MONITOR meter.	a. Adjust generator and notify DS maintenance b. Replace fuse. c. Notify DS maintenance.
5. MONITOR meter indicates above green band with MONITOR SELECTOR in B+ position.'	a. Low output from -500V section of power supply. b. High 22V or 170V output.	a. Replace POWER SUPPLY subassembly A6 (para 8-18). b. Replace POWER SUPPLY subassembly A6 (para 8-18).

See footnotes at end of table.

Table 3-3. Troubleshooting-Continued

Malfunction	Probable cause	Corrective action
6. MONITOR meter indicates full scale with MONITOR SELECTOR in B+ position.'	- 500V absent.	Replace POWER SUPPLY subassembly A6 (para 3-18).
7. MONITOR meter indicates ¼ scale or less with MONITOR SELECTOR in B+ position.'	Either 22V or 170V absent.	Replace POWER SUPPLY subassembly A6 (para 3-18).
8. MONITOR meter indicates below normal AGC reading with MONITOR SELECTOR in AGC V position. [1]	Excessive noise.	*a*. Adjust LEAKAGE CONTROLS 1 and 2 (para 2-9). *b*. Replace AUDIO AMPLIFIER subassembly A3 (para 3-16). *a*. Replace IF subassembly A4 (pars 3-12).
9. MONITOR meter will not indicate below green band with MONITOR SELECTOR in LEAKAGE position (indicating lower than expected leakage signal) . [1]	*a*. Klystron not oscillating.	*a*.. Check AFC adjustment. Replace klystron if necessary (para 3-24).
	b. Mixer crystal diode CR3 or CR4 defective,	*b*. Replace crystal diode CR3 and/or CR4, if defective, check crystal currents on internal monitor meter (para 3-13).
	c. Defective modulator crystal diode (CR5 or CR6).	*c*. Replace CR5 and/or CR6 (para 3-18).
	d. Defective 45mc oscillator in IF assembly.	*d*. Replace IF subassembly A4 (para 3-12).
10. MONITOR meter will not indicate in green band with MONITOR SELECTOR in LEAKAGE position (indicating high level of leakage signal) . [1]	*a*. IF amplifier oscillating.	*a*. Replace IF subassembly A4 (para 3-12).
	b. Defective waveguide.	*b*. Notify DS maintenance.
	c. Incorrect AFC adjustment.	*c*. Adjust AFC (para 3-24).
	d. Incorrect LEAKAGE ADJUSTMENT.	*d*. Adjust LEAKAGE CONTROLS 1 and 2 (para 2-9).
11. MONITOR meter indicates below green band scale with MONITOR SELECTOR in signal position and CAL 1-OPER-CAL 2 switch in CAL 2 position and VELOCITY selector in 925-1150 position (indicating low calibration signal level). [1]	*a*. 75 kc oscillator (AGA10) not operating.	*a*. Replace DIGITAL COUNTER subassembly AS (para 3-17).
	b. Audio amplifler A3 not operating.	*b*. Replace AUDIO AMPLIFIER subassembly A3 (para 3-16).
	c. Counter subassembly ASAS not operating.	*c*. Replace DIGITAL COUNTER subassembly AS (para 3-17).
	d. Defective VELOCITY selector switch.	*d*. Notify DS maintenance.
12. Counter does not indicate when CAL 1-OPER-CAL 2 switch is in CAL 2 position.'	*a*. Same as 11 above.	a. *Check* all steps in 11 above.
	b. Faulty counter assembly.	*b*. Replace DIGITAL COUNTER subassembly (para 3-17).
13. Internal meter indicates greater than ±2 μa with selector in AFC DISCR position.'	*a*. AFC not alined.	a. Replace AFC subassembly A2 (para 3-15).
	b. Discriminator crystal diodes CR1 and/or CR2 defective.	b. Replace diodes CR1 and/or CR2 (para 3-13).
	c. AFC not adjusted.	c. Adjust AFC (para 3-24).

See footnotes at end of table.

Table 3-3. Troubleshooting-Continued

Malfunction	Probable cause	Corrective action
14. Internal meter indicates leas than +40 to +70 µa with elector in MOD DRIVE position. 1	a. A4R27 improperly adjusted.	a. Replace IF subassembly A4 (pars 3-12).
	b. 45 mc oscillator not operating.	b. Replace IF subassembly A4 (para 3-12).
	c. Modulator crystal diode CR5 or CR6 defective.	c. Replace crystal diode CR5 and/or CR6 (para 3-13).
15. Internal meter indicates less than +45 to +90 µa with selector in MOD XTAL 1 position and/or less than -45 to -90 µa with selector in MOD XTAL 2 position. 1	a. Klystron not oscillating. b. Modulator crystal CR5, CR6 defective.	a. Replace klystron (para 3-14). b. Replace modulator crystal diode CR5 and/or CR6 (para 3-13).
16. Internal meter indicates more than -20 to -80 pa with selector in MXR XTAL 1 position and/or more than +20 to +80 µa with selector in MXR XTAL 2 position.1	LEAKAGE adjustment incorrect (too much leakage).	a. Adjust LEAKAGE 1, 2 controls to minimize leakage (para 2-9). b. Replace IF subassembly A4 (para 3-12).
17. Internal meter indicates less than -20 to -80 µa with selector in MXR XTAL 1 position and/or less than + 20 to +80 µa with selector in MXR XTAL 2 position.1	a. Klystron not operating. b. Mixer crystal CR3 and/or CR4 defective. c. 45 mc oscillator not operating.	a. Replace klystron. b. Replace crystal diode CR3 and/ or CR4 (para 3-13). c. Replace IF subassembly A4 (para 3-12).
18. Some, but not all counter indicators fail to light. 1 2 3	a. Defective counter indicators.	a. Replace DIGITAL COUNTER subassembly A5 (para 3-17).
	b. Defective counter assembly.	b. Replace DIGITAL COUNTER subassembly A5 (pars 3-17).
19. All counter indicators fail to light. 1 2 3	a. Defective RESET switch.	a. Replace DIGITAL COUNTER A5 (para 3-17).
	b. Defective counter assembly.	b. Replace DIGITAL COUNTER A5 (para 3-17).
	c. Defective power supply.	c. Replace POWER SUPPLY A6 (para 3-18).
20. Counter assembly fails to reset (indication other than 00000).1 2 3	Defective counter assembly.	Replace DIGITAL COUNTER subassembly A5 (para 3-17).
21. RESET indicator fails to light 1 2 3 --	a. Defective clamp. b. Defective counter module A5A6.	a. Replace lamp (para 3-19). b. Replace DIGITAL COUNTER subassembly A5 (para 3-17).
22. Blower B1 or B2 excessively noisy. 1 2 3	Defective blower.	Notify DS maintenance.
23. RESET indicator lamp stays 9 lit when microphone is tapped. 1	a. Defective microphone. b. Defective microphone cable c. Defective counter A5A5, A5A4, or A5A3. d. Microphone sensitivity incorrect.	a. Replace microphone. b. Notify DS maintenance. c. Replace DIGITAL COUNTER subassembly A5 (para 3-17). d. Adjust microphone sensitivity.
24. RESET indicator lamp goes out and counter indicators fail to read correctly when microphone is tapped and CAL 1-OPER-CAL 2 switch is in CAL 1 position.1	Defective counter assembly.	Replace DIGITAL COUNTER subassembly A5 (para 3-17).
25. Counting accuracy consistently off compared with standard readings indicated on CARR simulator decal.'	a. Counting period off due to frequency in A5A7. b. Klystron frequency off.	a. Replace DIGITAL COUNTER subassembly A5 (para 3-17). b. Replace klystron (para 3-14).

See footnotes at end of table.

Table 9-9. Troubleshooting-Continued

Malfunction	Probable cause	Corrective action
26. Calibrate count consistently off; counter appears to operate normally. [1]	A5A10 oscillator frequency off 75 kc.	Replace DIGITAL COUNTER subassembly A5 (para 3-17).
27. With P1 diaconnected AFC not adjustable. [1]	a. Defective AFC.	a. Replace AFC subassembly A2 (para 3-15).
	b. Defective discriminator crystal diodes CR1 and/or CR2.	b. Replace CR1 and/or CR2 discriminator crystal diode (para 3-13).
18. No meter indication on CARR simulator.*	a. Incorrect alinement or radar chronograph and radar test receiver.	a. Realine chronograph and test receiver.
	b. Toggle switch on CARR simulator incorrectly positioned.	b. Set toggle switch on CARR simulator in METER position.
	c. Defective diode in radar test receiver.	c. Replace diode (IN263) (para 3-23).
	d. Open wire in coaxial cable.	d. Notify DS maintenance.
	e. Open wire in 50 ft. cable.	e. Notify DS maintenance.
	f. Defective klystron in radar chronograph.	f. Replace klystron (para 3-14).
	g. Defective radar chronograph	g. Notify DS maintenance.
	h. Defective MONITOR METER in CARR simulator.	h. Replace CARR simulator.
19. MONITOR meter cannot be made to indicate in green band or higher with switch in SIGNAL position.*	a. Incorrect alinement of radar chronograph and radar test receiver.	a. Realine radar chronograph and test receiver.
	b. Toggle switch on CARR simulator incorrectly positioned.	b. Set toggle switch on CARR simulator in OSC position.
	c. DELAY selector on CARR simulator incorrectly positioned.	c. Set DELAY selector on CARR simulator in CONT position.
	d. VELOCITY selector switch on radar chronograph and CARR simulator not in coincident positions.	d. Set VELOCITY selector switches on chronograph and CARR simulator in coincident positions.
	e. Defective CARR jumper cable.	e. Replace jumper cable.
	f. Defective radar chronograph.	f. Notify DS maintenance.
	g. Defective CARR simulator.	g. Replace CARR simulator.
30. RESET indicator light fails to light and/or COUNTER assembly fails to indicate all zeros when reset. [1 2 3]	a. Defective lamp.	a. Replace lamp (para 3-19).
	b. Defective counter module A5A6.	b. Replace DIGITAL COUNTER subassembly A5 (para 3-17).
	c. Defective CARR simulator.	c. Replace CARR simulator.
31. RESET indicator lamp does not extinguish when START button on CARR simulator is depressed. [2]	a. MIC SENS control on radar chronograph set too low.	a. Reset MIC SENS control to position 10.
	b. Defective CARR jumper cable.	b. Replace jumper cable.
	c. Defective counter module A5A6.	c. Replace DIGITAL COUNTER subassembly A5 (para 3-17).
	d. Defective CARR simulator.	d. Replace CARR simulator.
32. Gross incorrect readout on radar chronograph.*	a. Defective radar chronograph.	a. Notify DS maintenance.
	b. Defective CARR simulator.	b. Replace CARR simulator.
33. Out of tolerance readout on radar chronograph as indicated on CARR simulator decal.*	a. Incorrect alinement of radar chronograph and radar test receiver.	a. Realine radar chronograph and test receiver.
	b. Defective radar chronograph.	b. Notify DS maintenance.
	c. Defective CARR simulator.	c. Replace CARR simulator.

See footnotes at end of table.

Table 3-3. Troubleshooting -Continued

Malfunction	Probable cause	Corrective action
34. Incorrect readout on radar chronograph (as per table 2-2-delay settings) . [2]	a. Defective counter assembly in chronograph. b. Defective CARR simulator.	a. Replace DIGITAL COUNTER subassembly A5 (para 3-17). b. Replace CARR simulator.

[1] During testing or preoperational checks.
[2] During use of CARR simulator.
[3] During chronographing.

Section V. REPAIR OF RADAR CHRONOGRAPH SET M36

3-10. General

This section contains general and specific instructions for repair of radar chronograph set M36. Specific repairs and inspections within the scope of the organizational level of maintenance arc described in order to restore the material to a serviceable condition.

3-11. Removal and Replacement of Eyeshield and Sunshade (Fig. B1)

Note. Numbers listed below refer to figure B1 located in appendix B.

a. Remove eyeshield (2) by expanding and removing retaining ring (1) from groove in eyeshield. Pull sunshade (3) off body assembly (4').

b. Replace eyeshield (2) by expanding inside diameter of eyeshield slightly, and sliding over the end of eyepiece assembly until end of eyeshield completely covers all of the circular grooves.

c. Expand retaining ring (1) and replace in groove in eyeshield.

d. Replace sunshade (3) on body assembly (4).

3-12. Removal and Replacement of Detector Amplifier Assembly A4 (IF Amplifier Detector) (Fig. 3-2)

a. Disconnect P3, P4, P5 and P6 from waveguide assembly A1.

b. Loosen two retaining screws on P9 and disengage P9 from J1.

c. Remover detector amplifier A4 from cabinet.

d. Procedure for replacement of the detector amplifier A4 is obvious and does not require detailed explanation.

e. Reconnects P3, P4, P5 an P6 to waveguide assembly A1.

3-13. Removal and Replacement of Waveguide Diodes (Fig. B2)

Note. Numbers located below refer to figure B2 located in appendix B.

The waveguide assembly includes six diode semiconductor devices. Two are in the discriminator (CR1 and CR2) ; two are in the mixer (CR3 and CR4) ; and two are in the modulator (CR5 and CR6). The diodes are located directly underneath connectors having corresponding. numbers (fig. 3-2). To remove and replace these diodes proceed as follows :

a. Unscrew knurled diode holder cap (1).

b. Remove cap (1) along with holder (2) and diode semiconductor device (3).

c. Remove diode (3) from holder (2) noting polarization.

d. Replace diode (3), holder (2) and cap (1) in appropriate socket, noting diode polarization.

3-14. Removal and Replacement of Klystron Electron lube (Fig. B2)

Note. Numbers locked below refer to figure B2 located in appendix B.

a. Disconnect klystron leads from terminal board TB2 (fig. .3-2), identifying each lead connection.

b. Remove four screws (6), washers (5) and nuts (4) which hold klystron electron tube (7) to waveguide section.

c. Replace with new klystron electron tube (7), securing with screws (6), washers (5), and nuts (4). Care must be taken in tightening the cap screws so that the tube flange is not distorted and the tube pinch-off is not cracked.

d. Connect klystron electron tube lends to terminal board TB2.

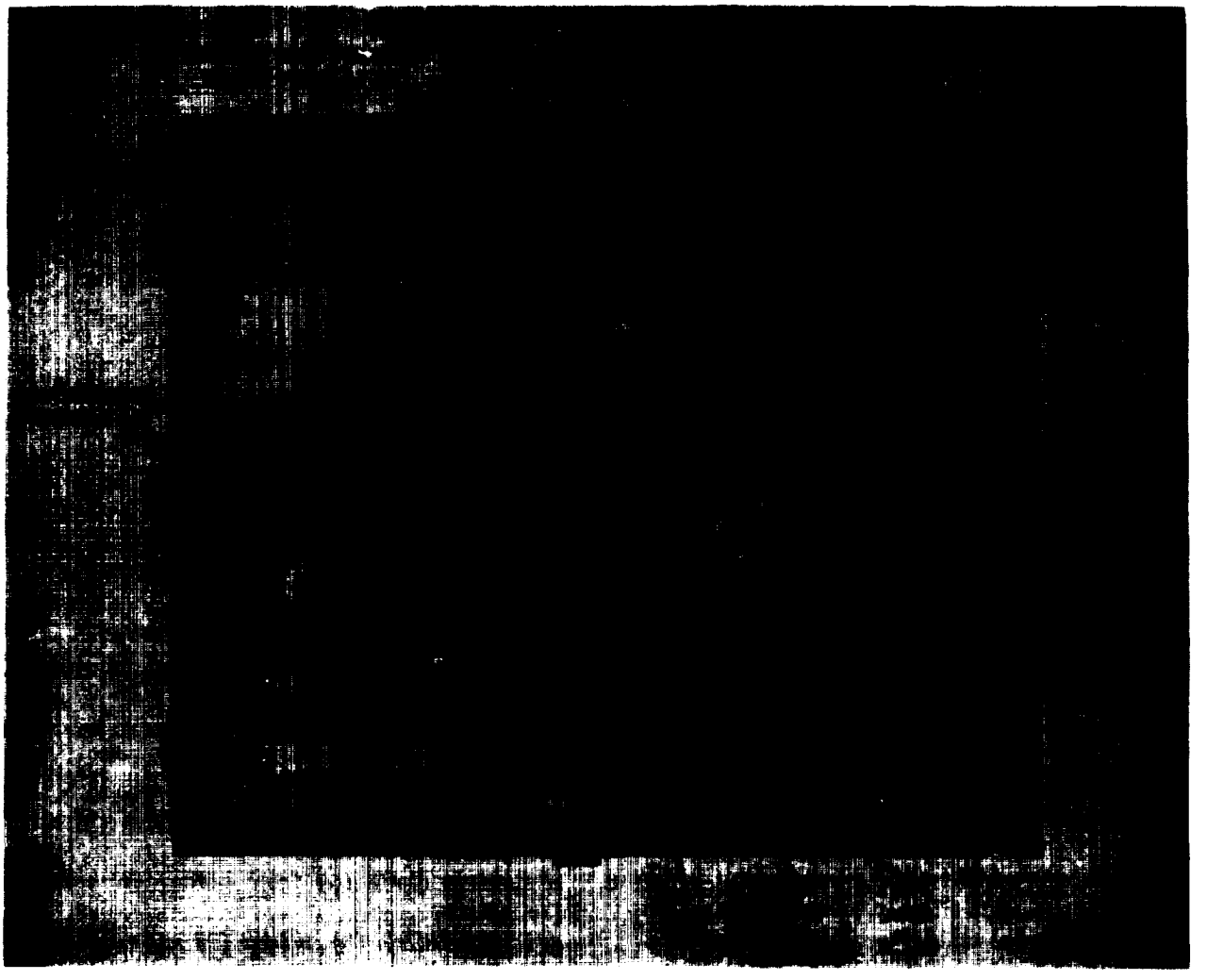

Figure 3-2. Removal and replacement of detector amplifier assembly A_4.

3-15. Removal and Replacement of Frequency Control A2 (Fig. 3-3)

a. To remove frequency control A2 from chronograph cabinet, loosen two captive screws holding frequency control to main frame, and pull forward to disengage electrical connector.

b. Procedure for replacement. of frequency control A2 is obvious and does not require detailed explanation.

3-16. Removal and Replacement of Audio Frequency Amplifier A3 (Fig. 3-4)

a. To remove audio frequency amplifier A3 from chronograph case, remove four socket head screws ou panel, pull forward to disengage electrical connector, and slide A3 assembly out.

b. Procedure for replacement. of audio frequency amplifier A3 is obvious and does not require detailed explanation.

3-17. Removal and Replacement of Digital Display Indicator AS (Fig. 3-4)

a. To remove digital display indicator A5 from chronograph case, remove four socket. head screws on panel, pull forward to disengage electrical connector, and slide A5 assembly out.

b. Procedure for replacement of digital display indicator A5 is obvious and does not require detailed explanation.

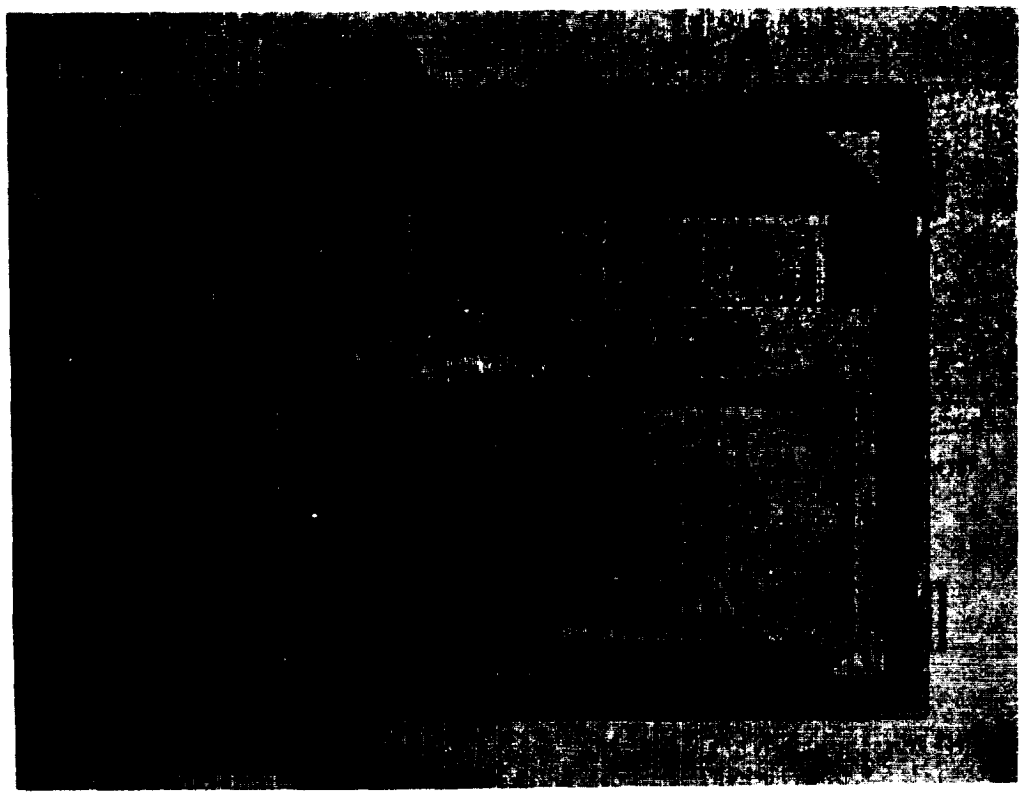

Figure 3-3. Removal and replacement of frequency control A2.

3-18. Removal and Replacement of Power Supply A6 (Fig. 3-4)

a. To remove power supply A6 from cabinet, remove four socket head screws on panel, pull forward to disengage electrical connector, and slide A6 assembly out.

b. Procedure for replacement of power supply A6 is obvious and does not require detailed explanation.

3-19. Removal and Replacement of Reset lamp (Fig. B-3)

Note. Numbers listed below refer to figure B3 located in appendix B.

a. Turn indicator light (1) counterclockwise end remove from panel.

b. Remove lamp (2) from indicator light.

c. Insert new lamp (2) into indicator light (1).

d. Replace indicator light (1) in panel ; screw into place by rotating clockwise.

3-20. Removal and Replacement of POWER ON lamp (Fig. B3)

Note. Numbers listed below refer to figure B3 located in appendix B.

a. Turn indicator light (3) counterclockwise and remove from panel.

b. Remove lamp (4) from indicator light.

c. Insert new lamp (4) into indicator light (3).

d. Replace indicator light in panel: screw into place by rotating clockwise.

3-21. Removal and Replacement of Fuses (Fig. B-3)

Note. Numbers listed below refer to figure B3 located ln appendix B.

a. Turn fuse holder (B) counterclockwisc. and remove from panel.

b. Remove fuse (6) from fuse holder.

c. Insert new fuse (6) into fuse holder (5).

d. Replace fuse holder (5) into panel; screw into place by rotating clockwise.

Figure 3-4. Radar chronograph with telescope XM128.

3-22. Removal and Replacement of lamps in Instrument Light M53 (Fig. B-4)

Note. Numbers listed below refer to figure B-4 in appendix B.

a. Unscrew the window (3) from the handlight or the protective cap (4) from the reticle light of the instrument light M53.

b. Unscrew and remove the lamp (5) from the handlight or from the reticle light.

c. Replace the lamp (5) with a new one and screw back the window (3) on the handlight or the protective cap (4) on the reticle light of instrument light M53.

d. Dry-cell type batteries are used in instrument light M53. Unscrew cap (1) and remove batteries (2) from case (6) whenever the lights are not in use. Chemical reactions setup in an exhausted battery will damage the tube body.

e. Replace batteries (2) and screw on cap (1) when lights are to be used.

3-23. Removal and Replacement of Diode in Radar lest Receiver (Fig. B5)

Note. Numbers listed below refer to figure B5 in appendix B.

a. Unscrew knurled diode holder cap (1).

b. Remove cap (1) along with holder (2) and diode semiconductor device (3) from radar test receiver.

c. Remove diode (3) from holder (2), noting polarization.

d. Replace diode (3), holder (2) and cap (1) on test receiver noting diode polarization.

3-24. Adjustments

a. Disconnect plug P1 from its mating connector (fig. 2-8).

b. Set internal monitor selector switch to AFC DISC (fig. 2-8).

c. Rotate AFC adjust A2R16 (fig. 2-9) and null the needle on the internal meter to read 0 ± 5 microamperes.

d. Reconnect plug P1 to the mating connector and note that the internal meter reads 0±5 microamperes.

e. Set internal monitor selector switch (fig. 2-8) to MOD DRIVE.

f. Adjust A4R27 control (fig. 2-8) until the needle of the internal monitor indicates a reading between +70 and +80 microamperes.

NOTE

This adjusts the modulator drive level.

3-25. Crystal Current Tests

a. Modulator Crystal Current Tests. When checking the modulator crystal currents, perform a through c of paragraph 2-9 and proceed to the following :

(1) Set internal monitor selector switch to MOD XTAL 1 (fig. 2-8) and note that internal monitor meter indicates between +45 and +90 microamperes.

(2) Set internal monitor selector switch to MOD XTAL 2 and note that internal monitor meter indicates between -46 and -90 microamperes.

NOTE

If current readings are low, the crystals may need replacement.

b. Mixer Crystal Current Tests. The leakage adjustments must be completed before mixer crystal current can be checked. When checking the mixer crystal currents, perform a through c of paragraph 2-9 and proceed to the following:

(1) Set internal monitor selector switch to MXR XTAL 1 (fig. 2-8) and adjust LEAKAGE ADJUSTMENT 1 and 2 controls (fig. 1-6) for minimum current indication on internal monitor meter. The internal monitor meter should indicate between -20 and -80 microamperes.

(2) Set internal monitor selector switch to MXR XTAL 2 (fig. 2-8). The internal monitor meter should indicate between +20 and +80 microamperes.

3-26. Inspection

Inspection of the radar chronograph set is limited to visual checks to see that the set is correctly assembled, properly secured, and in good condition. Perform completely the procedures outlined in paragraph 3-6 and preventive maintenance tables 3-1 and 3-2. Any defects or improper operating characteristics, the correction of which is found to be beyond the scope of the operator or organizational level, must be reported to the attention of higher category or level of maintenance.

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CHAPTER 4

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

4-1. General

Commanders are responsible for insuring that all material issued or assigned to their command is maintained in a serviceable condition and is properly cared for, and that the personnel under their command comply with technical instructions. Lack of time, lack of trained personnel, or lack of proper tools may result in a unit being incapable of performing maintenance for which it is responsible. In such oases, unit commanders with the approval of their commanders, may place materiel that is beyond the maintenance capability of the unit in administrative storage or return it to supply agencies. When preparing the radar chronograph set M36 for administrative storage or for shipment, the unit commander will be responsible for processing the materiel in such a manner as to protect it against corrosion, deterioration and physical damage during shipment or during periods of administrative storage.

4-2. Administrative Storage Instructions

Administrative storage is restricted to a period of 90 days and must not be extended, unless the materiel is reprocessed in accordance with the following procedures:

a. Storage Procedure.

(1) Perform a quarterly preventive maintenance (PM) service on the materiel intended for administrative storage. This maintenance will consist of inspecting, cleaning, servicing, preserving, lubricating, adjusting and minor replacement of repair parts, if required.

(2) Materiel will be stored in a humidity controlled storage area.

b. Inspection in Administrative Storage.

(1) Visual inspection of materiel in administrative storage must be conducted at least once each month. A record of these inspections will be maintained and noted on a tag. Tags are to be attached to the materiel in a conspicuous location.

(2) When rust or deterioration is found, necessary reprocessing for administrative storage will be immediately accomplished.

4-3. Shipping Instructions

a. Preparation for Shipment. The chronograph when removed from storage for shipment need not be repackaged unless inspection reveals it to be inadequately packaged or when it is necessary because of anticipated in-transit weather or shipping conditions. Packaging must not be removed or disturbed except as it is necessary to insure that the chronograph is complete and serviceable. If packaging has been removed, it must be repackaged prior to shipment as prescribed in *d* through *g* below.

b. Description of Reusable Container. The case for shipping and storing the radar chronograph with its attached mount is a specially designed reusable plastic container (fig. 4-1). The two-piece case, formed of high impact plastic, provides protection against moisture, vapor, and physical shocks which might dam-

age the radar chronograph and its mount. Special cushioning cradles are provided in the upper and lower sections of the case. The two sections are held together by ten adjustable latches. A two way automatic relief valve in the pressure-tight case automatically opens to equalize internal and external air pressures whenever the differential exceeds 1.5 pounds per square inch. Before opening the case the pressure relief valve is manually opened by pressing a button. The transit case is provided with four carrying handles, two 1ocated at each end.

c. Description of Radar Chronograph Accessories Case. The accessories for the chronograph are shipped and stored in a specially designed reusable plastic container (fig. 4-2). The two piece case, formed of high impact plastic, provides protection against water and vapor, and protects against physical shock by means of special cushioning in both upper and lower sections, which is arranged to form cavities for equipment storage. The two sections are held together by ten latches. A two-way automatic relief valve in the pressure-tight case opens to equalize internal and external air pressure whenever the differential exceeds 1.5 pounds per square inch. The valve is manually opened by pressing a button before opening the case.

d. Cleaning. Remove shop dirt and all other foreign matter from metal surfaces of the chronograph set by wiping with cloths soaked in dry cleaning solvent 6860-264-9037 (55-gallon drum) [1] or mineral spirits paint thinner 8010-246-6115 (55-gallon drum) [1] . Do nut apply solvent to electrical equipment or rubber

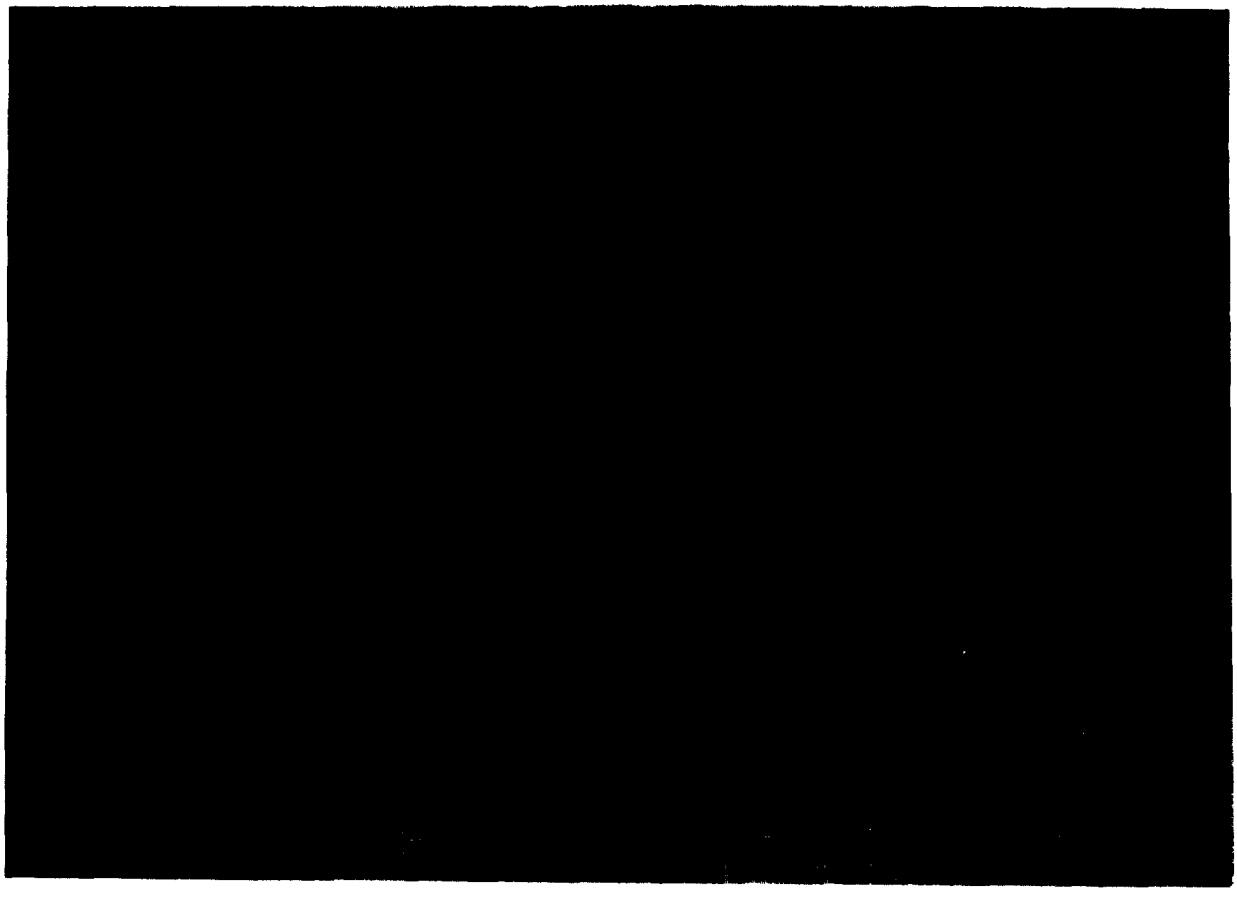

Figure 4-1. Reusable container.

[1] If larger or smaller size than that indicated is required, refer to pertinent supply manual for applicable stock numbers.

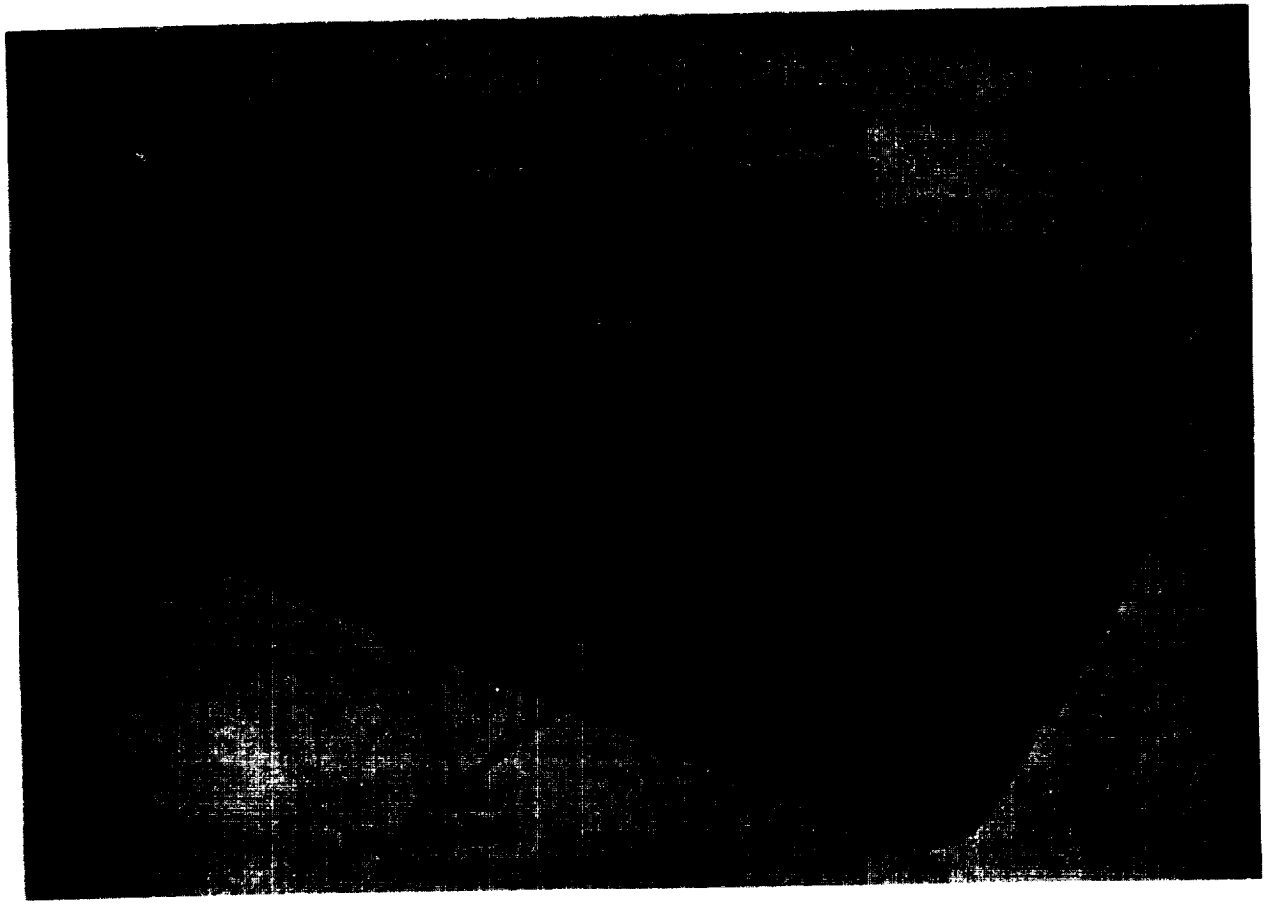

Figure 4-2. Radar chronograph accessories case.

parts of any kind; use trichloroethane 6810-664-0385 (5-gallon can)[1] to clean electrical equipment and related items such as wiring, insulation, contact points, etc. Use warm water for cleaning rubber parts.

Note. Cloth or synthetic rubber gloves must be used to protect hands from solvents.

e. Drying. All components must be thoroughly dried so that all cleaning residues are removed immediately after cleaning.

f. Packaging. All components of the chronograph are to be returned to their original reusable containers for storage. To package proceed as follows:

(1) Disconnect all cables from chronograph connectors and screw connector protective caps into place.

(2) Rtemove telescope XM128 from chronograph and place it in carrying case M87, Stow telescope and case in chronograph accessories case (fig. 4-3).

(3) Loosen leveling base (lock handle.

(4) Turn elevation level-adjust drive knob until travel-lock pin can be pushed in to engage sector gear.

(5) Loosen the three tripod leveling base lock handles, turn to release the leveling base, and lift off chronograph and mount. Rest on clean padded surface.

(6) Loosen the elevation lock handle on the mount yoke and swivel the chronograph unit into a position with the antenna pointing away from the

[1] If a larger or smaller size than that indicated is required, refer to pertinent supply manual for applicable stock numbers.

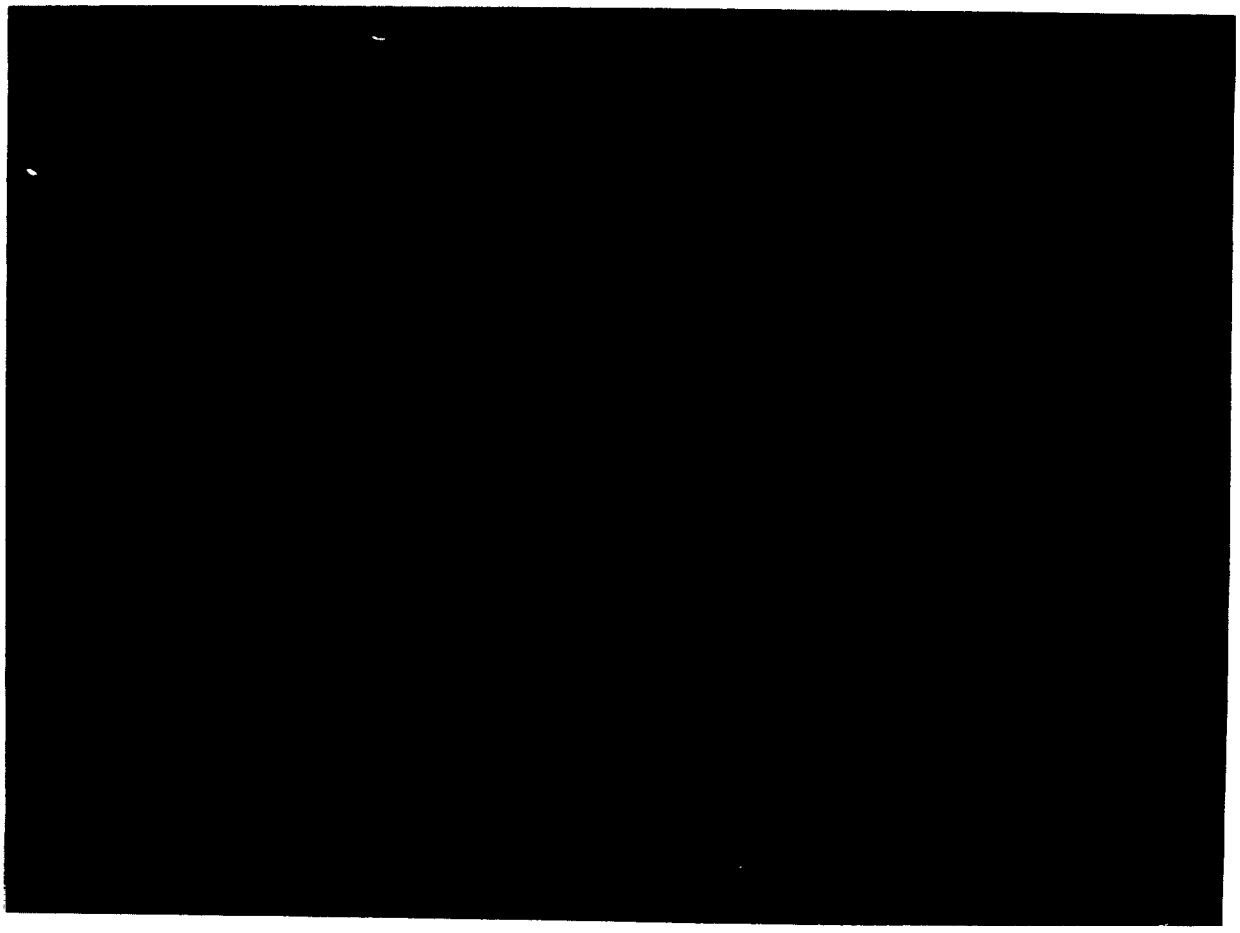

Figure 4-3. Radar chronograph accessories case showing compartments.

mount base (1600-mil position on chronograph elevation scale),

(7) Tighten elevation lock handle.

(8) Install protective cover (fig. 1-1) on antenna reflector.

(9) Lift chronograph and mount and carefully place in lower cradle section of chronograph reusable container with chronograph handles up (fig. 4-4).

(10) Put upper cradle section in place and strap down.

(11) Close chronograph container cover and engage and seal latches.

(12) Loosen tripod spider hand knob to release spider assembly, and fold legs in until stay rod latch engages with stay rods.

(13) Loosen leg clamp hand knobs and retract telescoping leg tube assemblies.

(14) Place tripod in chronograph accessories case (fig. 4-3). If auxiliary feet were in use, first clean them and place on bottom of cushion cavity with studs in holes provided.

(15) Remove microphone from cable, and package the microphone, and place in proper compartment of chonograph accessories case.

(16) Place radar test receiver and special purpose cable assembly in special plastic case and insert into proper compartment in chronograph accessories case.

(17) Place chronograph automatic reliability rater (CARR) into proper com-

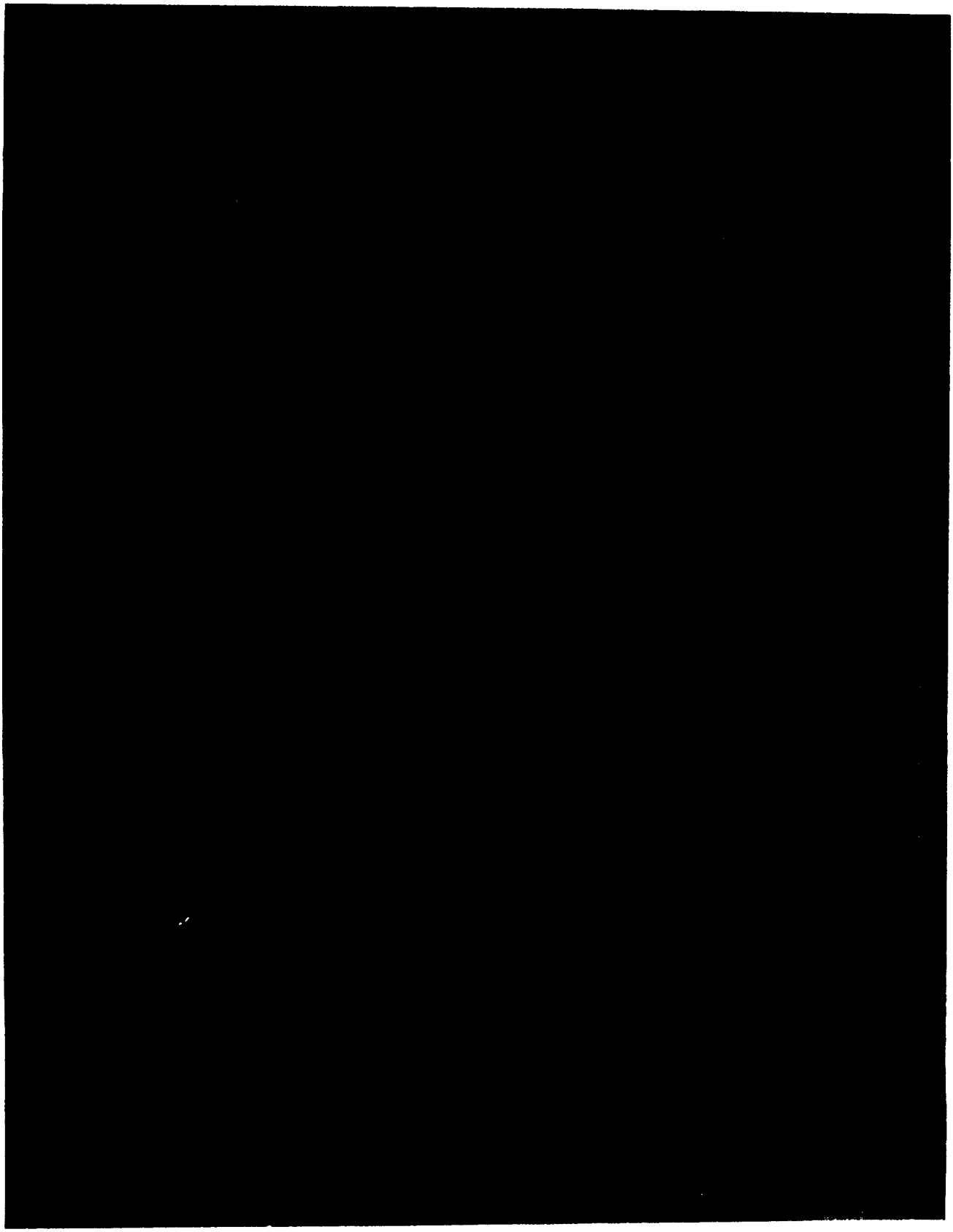

Figure 4-4. Chronograph and mount in reusable container.

partment in chronograph accessories case.

(18) Remove lamp bracket assembly from reticle light of instrument light M53, wrap in grade A barrier material (ML-B-121), and fasten to the light case with tape. Replace protective cap.

(18.1) Remove adapter assembly from frame of generator set, screw connector protective caps into place, wrap in grade A barrier material (MIL-B-121), and immobilize in the tripod area of the accessory case.

(19) Place accompanying publications TM 9-1290-325-12/1, TM 9-1290-325-12/2, and equipment logbook binder 7510-889-3494, in chronograph accessories case.

(20) Check that repair kit is in proper compartment of chronograph acceasories case.

(21) Close chronograph accessories case cover, engage latches, and apply security seals.

g. Packing and Marking Instructions.

(1) *Packing.* With the exception of the installation bracket (jeep mounting) no packing other than that provided in the transit and storage cases is required. The installation bracket shall be immobilized by bracing or blocking in a snug fitting wooden box conforming to PPP-B-621, class 2, style 4. The installation hardware and instruction sheet shall be placed in a polyethylene bag and firmly secured to the bracket.

(2) *Marking.* Marking shall conform to MIL-STD-129. Each box shall be "set" identified and shall indicate box number of the set and serial numbers as required. Marking identification for boxes 1 and 2 of 4 (reusable container and radar chronograph accessories case), shall be clearly typed on printed cards and inserted into their respective card holders.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

4-4. General

a. Destruction of the radar chronograph set M36, when subject to capture or abandonment in the combat zone will be undertaken by the using army only when, in the judgment of the unit commander concerned, such action is necessary in accordance with orders of or policy established by the Army commander.

b. The information that follows is for guidance only. Certain of the procedures outlined require the use of explosives and incendiary grenades that normally may not be authorized items of issue to the using organization. The issue of these and related materials and the conditions under which destruction will be affected are command decisions in each case, according to tactical situation. Of the several means of destruction, those most generally applicable are :

(1) *Mechanical.* Requires axe, pick mattock, sledge, crowbar, hammer, or .similar implement to smash meters, antenna assemblies, modules, tubes, control panels, etc.

(2) *Burning.* Requires gasoline, oil, incendiary grenades, flame throwers, kerosene, or other flammables to bum cords, cables, spare parts, literature, etc.

(3) Demolition. Requires suitable ammunition or such explosives as grenades, powder charges, or explosive compounds to demolish material where feasible or necessary.

(4) *Gunfire.* Includes artillery, machine guns, rifles using grenades, and launchers using antitank rockets. Under some circumstances, hand grenades may be used.

(5) *Disposal.* Requires burying in the ground, dumping in waterways or marshes, or scattering so widely- as to preclude recovery of essential parts which have not been completely destroyed. In general, destruction of essential parts followed by burning will usually be sufficient to render the materiel useless. However, selection of the particular method of destruction requires imagination and resourcefulness in the utilization of the facilities at hand under the existing conditions. Time is usually critical.

c. If destruction to prevent enemy use is resorted to, the materiel must be so badly damaged that it cannot be restored to a usable condition in the combat zone either by repair or cannibalization. Adequate destruction requires that all parts essential to the operation of the materiel, including essential spare parts, be destroyed or damaged beyond repair. However, when lack of time and personnel prevents destruction of all parts, priority is given to the destruction of those parts most difficult to replace. Equally important, the same essential parts must be destroyed on all like materiel so that the

enemy cannot construct one complete unit from several damaged ones.

d. If destruction by demolition or gunfire is directed, due consideration should be given to the observance of appropriate safety precautions.

4-5. Demolition of the Chronograph Set

a. Method No. 1 -Mechanical Means.

(1) Disconnect the chronograph from its source of power.

(2) Remove the chronograph and the mount from their mounted position and place them on the ground.

(3) Unlock all socket head screws on the rear panel and remove all main assemblies from the case.

(4) Open the hinged front section so as to expose the waveguide and IF amplifier assemblies.

(5) Using an axe, pick mattock, sledge hammer, or other heavy implement, destroy the chronograph by smashing the digital indicator display, audio amplifier, power supply, IF amplifier, waveguide and AFC assemblies. Smash the meter panel, switches, blowers, subassemblies, tubes, terminal boards, antenna feed and reflector, chronograph control panels, scales, sector gear of the mount, and the chronograph case, Break or bend the yoke shaped part of the mount so as to render the mount useless.

b. Method No. 2-Burning.

(1) Disconnect the chronograph from its source of power.

(2) Remove the chronograph and the mount from their mounted position and place them on the ground.

(3) Unlock all socket head screws on the rear panel and remove all main assemblies from the case.

(4) Open the hinged front section so as to expose the waveguide and IF amplifier assemblies as well as the interior of the chronograph case.

(6) Place the component parts of the chronograph on a pile of combustible materials. Pour gasoline or kerosene over the chronograph component parts and over the combustible materials. Ignite and take cover a safe distance away from the materiel to be burned.

(6) If a flame thrower or an incendiary grenade is available, bum the materiel by using one or both of these flammable so as to develop a hot fire which will render the materiel useless.

***Warning:* When using flammables, extreme care must be observed so as not to incur painful burns or poisoning from inhalation of toxic vapors.**

c. Method No. 3-Demolition. Use explosives to complete demolition or to cause maximum damage, before burning, when time does not permit complete demolition by other means. Power charges fragmentation grenades or incendiary grenades may be used. Incendiary grenades usually are most effective if destruction of small parts and wiring is desired.

(1) Disconnect the chronograph from it source of power.

(2) Remove the chronograph and the mount from their mounted position and place them on the ground.

(3) Open the hinged front section so as to expose the interior of the chronograph two-section case.

(4) Insert small powder charges to destroy the interiors, but for quick destruction of the component parts in ‘the chronograph, use fragmentation or incendiary grenades. Get away from the unit after the grenade is placed.

d. Method No. 4-Gunfire. Generally, this method is applicable only when the chronograph is to be destroyed in conjunction with other equipment.

(1) Place the chronograph in the area where other equipment and materiel are to be destroyed by means of gunfire.

(2) With the aid of artillery, machine guns, rifle grenades, or launchers using antitank rockets, fire directly toward the materiel or equipment. Use as much ammunition as necessary to completely destroy or render the materiel and equipment useless.

e. Method No. 5-Disposal. Bury or scatter destroyed parts or throw them into nearby waterways or marshes. This is particularly important if a number of parts have not been completely destroyed.

Figure B-1. Telescope XM128

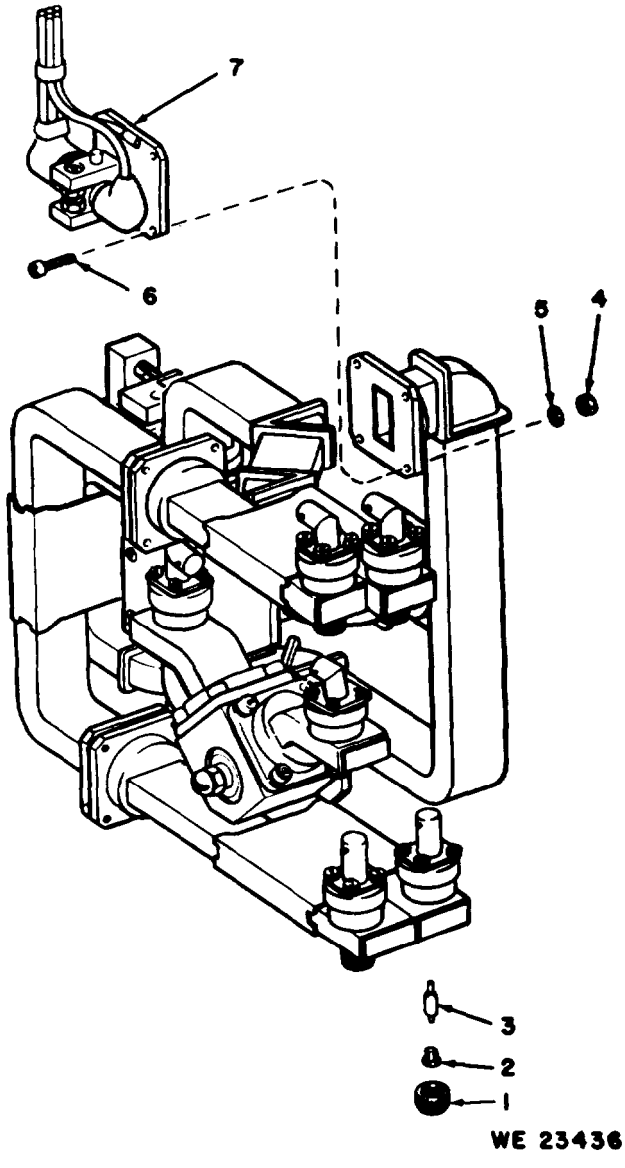

Figure B-2. Waveguide assembly.

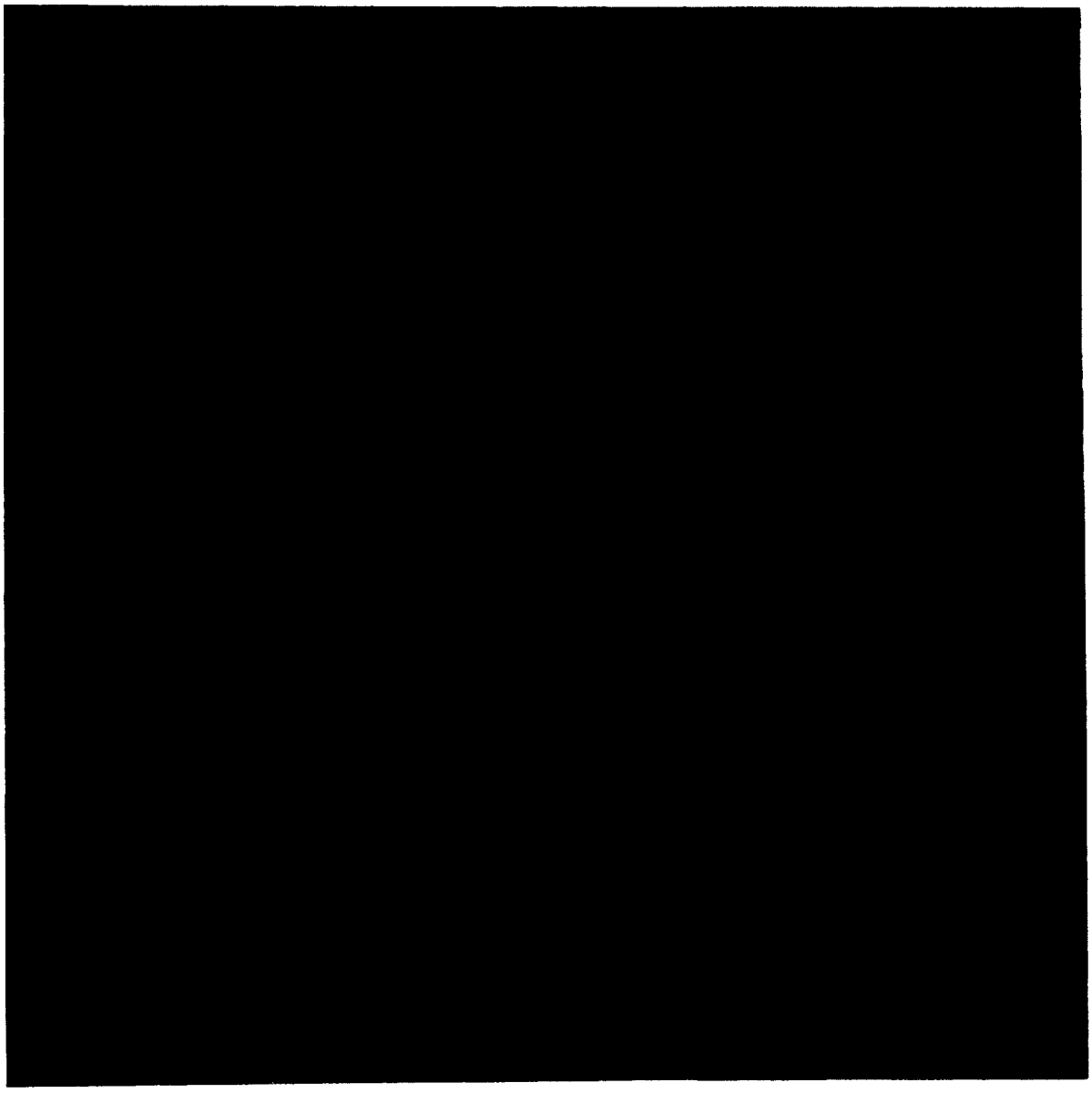

Figure B-3. Panel mounted lamp assemblies and fuses.

Figure B-4. Instrument light M53.

APPENDIX A

REFERENCES

A-1. Publications Indexes

The following publication indexes should be consulted frequently for latest changes or revisions of references given in the appendix and for new publications relating to materiel covered in this manual.
Index of Administrative Publications ----------DA Pam 310-1
Index of Blank Forms ----------DA Pam 310-2
Index of Doctrinal, Training and Organizational Publications ----------DA Pam 310-3
Index of Supply Catalogs and Supply Manuals (excluding types 7, 8, and 9) ---------DA Pam 310-6
Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8, and 9), Supply Bulletins, and Lubrication Orders ----------DA Pam 310-4
Military Publication U.S. Army Equipment Index of Modification Work Orders ---DA Pam 310-7

A-2. Other Publications

a. General

Accident Reporting and Records ----------AR385-40
Army Maintenance Management System (TAMMS)----------38-750
Authorized Abbreviations and Brevity Codes----------AR 310-50
Camouflage----------F M 6-20
Operator, Organizational and Field Maintenance Manual Cargo Trailer M100 (1/4, ton 2 wheels) ----------TM 9-871A
Dictionary of United States Army Terms ---------- AR 310-25
Firing Tables for Cannon, 155-MM Howitzer M1, M1A1 and M46, Firing Projectile, HE, M107, Projectile, HE M107B2, Projectile, Smoke, WP, M105; Projectile, Smoke, WP, M110; Projectile, Smoke, BE, M116 and M116B1 (HC and Colored) ; Projectile, Gas, Persistent, HD, M110; Projectile, Gas Persistent, H, M110 ; Projectile, Gas, Nonpersistent, GB, M121; Projectile Illuminating, M118 Models----------FT155-A-3
First Aid for Soldiers ----------FM21-11
Malfunction involving Ammunition and Explosives----------AR 75-1
Report Control Symbol AMC-182 (MIN) ----------
Military Symbols ----------FM 21-30

b. Maintenance.

Care, Handling, Preservation and Destruction of Ammunition ----------TM 9-1300-206
DS, GS, and depot maintenance repair parts and special tools list for Radar chronograph set: M86 w/E(1290-861-7106) ----------TM 9-1290-325-35P
Direct support and general support maintenance manual : Radar chronograph set: M86 w/E(1290-861-7106) ---------- TM 9-1290-325-34
DS, GS, and depot maintenance manual including repair parts and special tool lists for Telescope, straight : XM128,1240-087-5527)---------- TM 9-1240-211-35
Northern Operations ---------- FM 81-71
Operation and Maintenance of Ordnance Material in extreme cold weather -0" to -66" ----------TM 9-207
Operator's manual for Truck, utility : ¼-ton, 4 X 4, M151 (2320-542-4788) ----------TM 9-2820-218-10
Operator's and organizational maintenance manual : Radar chronograph set : M36 w/E (1290-861-7106) ----------TM9-1290-325-12/2

Operator, organizational, direct support, general support and depot maintenance manual : Generator set, gasoline engine driven, 0.5 kw(less engine) ac, 120/240 v, 60 hertz, 1 ph, DOD model MEP-014A(6115-923-4469) ac 120/240 v, 400 Hertz---------- TM 5-6115-329-15
Organizational direct and general support and depot maintenance repair parts and special tool lists : Generator set, gasoline engine driven (less engine) 0.5 kw, ac, 120/240 v, '60 hertz, 1 ph, DOD model MEP-014A, (6115-923-4469) ac, 120/240 v, 400 hertz, 1 ph, DOD model MEP-019A, FSN 6115-940-7862,28 v, dc DOD model MEP-024A, FSN 6115-940-7867-IPH-DOD model MEP-019A, FSN 6175-940-7862,28 v, dc, DOD model MEP-024A, FSN 6116-940-7867 ----------TM 5-6115-329-25P

c. Shipping and Storage.

Barrier Material ---------- MIL-B-121D
Marking and Packing of Supplies and Equipment : Marking of Supplies for Shipment----------S--746-30-6
Packaging Data Radar Chronograph Set M36 ----------MIL-P-14232/(P10525235)
Preservation, Methods of ---------- MIL-P-116E
Preservation, Packaging ; Packing and Marking of Items of Supply ----------AR 700-15
Color Marking and Preparation of Equipment for Shipment ----------AR 746-1
Publications for Packaging Ordnance and General Supplies ---------- SB 746-1
Report of Packaging and Handling Deficiencies ---------- AR 700-58
Reusable Accessory Shipping Container for Radar Chronograph Set M36 ---------- MIL-C-60230
Reusable Plastic Shipping Container for Radar Chronograph, 10526300 With Mount Radar Chronograph 10512507 ---------- MIL-C-60228
Storage and Materials Handling----------TM 743-200-1
Storage and Supply Activities Covered and Open Storage ----------SB 740-1

APPENDIX B
BASIC ISSUE lTEMS LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED LIST AND OPERATOR AND ORGANIZATIONAL MAINTENANCE SUPPORT (INCLUDING REPAIR PARTS)

Section I. INTRODUCTION

B-1. Scope

This appendix lists basic issue items; items troop installed or authorized; repair parts; and other support equipment required for operation and performance of organizational support maintenance of the Radar Chronograph.

B-2. General

This Basic Item, Items Troop Installed or Authorized, Repair Parts is divided into the following sections;

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

b. Section III - Items Troop Installed or Authorized List. A list, in alphabetical sequence, of items which, at the discretion of the unit commander, may accompany the end item, but should not be turned in with the end item.

c. Section IV -Repair Parts List. A list of repair parts authorized for use in the performance of maintenance. The list also includes parts which must be removed for replacement of the authorized parts. Parts lists are listed in figure and item number sequence. Bulk materials are listed in FSN sequence.

d. Section VI -Federal Stuck Number and Part Number Index. A list, in ascending numerical sequence, of all Federal stock numbers appearing in the listings, followed by a list, in alphameric sequence, of all part numbers appearing in the listings. Federal stock number and part numbers are referenced to each illustration figure and item number appearance. This index is followed by a cross-reference list of reference designations to figure and item numbers when applicable.

B-3. Explanation of Columns

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

a. *Illustration.* This column is divided as follows:

(1) *Figure number.* Indicates the figure number of the illustration in which the item is shown.

(2) *Item number.* The number used to identify each item called out in the illustration.

b. Source, Maintenance, and Recoverability Codes (SMR).

(1) *Source Code.* Source codes are assigned to support items to indicate the manner of acquiring support items for maintenance, repair, or overhaul of end items. Source codes are entered in the first and second positions of the Uniform SMR Code format as follows:

Code	*Definition*
PA	Item procured and stocked for anticipated or known usage.
PB	Item procured and stocked for insurance purposes because essentiality dictates that a minimum quantity be available in the supply system.
PC	Item procured and stocked and which otherwise would be coded PA, except that it is deteriorative in nature.
PD	Support item, excluding support equipment, procured for initial issue or outfitting and stocked only for subsequent or additional initial issues or outfittings. Not subject to automatic replenishment.
PE	Support equipment procured and stocked for initial issue or outfittings to specified maintenance repair activities
PF	Support equipment which will not be stocked but which will be centrally procured on demand.
PC	Item procured and stocked to provide for sustained support for the life of the equipment. It is applied to an item peculiar to the equipment which, because of probable discontinuance or shutdown of production facilities, would prove uneconomical to reproduce at a later time.
KD	An item of a depot overhaul/repair kit and not purchased separately. Depot kit defined as a kit that provides items required at the time of overhaul or repair.
KF	An item of a maintenance kit and not purchased separately. Maintenance kit is defined as a kit that provides an item that can be replaced at organizational. or intermediate levels of maintenance
KB	Item included in both a depot overhaul/repair kit and a maintenance kit.
MO	Item to be manufactured or fabricated at the organizational level.
MF	Item to be manufactured or fabricated at the direct support maintenance level.
MH	Item to be manufactured or fabricated at the general support maintenance level.
MD	Item to be manufactured or fabricated at the depot maintenance level.
AO	Item to be assembled at organizational level.
AF	Item to be assembled at the direct support maintenance level.
AH	Item to be assembled at the general support maintenance level.

Code	Definition
AD	Item to be assembled at the depot maintenance level.
XA	ltem in not procured or stocked because the requirements for the item will result in the replacement of the next higher assembly.
XB	Item is not procured or stocked. If not available through salvage. requisition.
XD	A support item that is not stocked. When required. item will be procured through normal supply channels.

NOTE

Cannibalization or salvage may be used as a source of supply for any items source coded above except those coded XA, XO, and aircraft support items as restricted by AR 700-42

(2) *Maintenance code.* Maintenance codes are assigned to indicate the levels of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth positions of the Uniform SMR Code format as follows:

(a) The maintenance code entered in the third position will indicate the lowest maintenance level authorized to remove, replace, and use the support item. The maintenance code entered in the third position will indicate one of the following levels of maintenance.

Code	Application/Explanation
C	Crew or operator maintenance performed within organizational maintenance.
0	Support item is removed, replaced, used at the oganizational level.
I	Support item is removed, replaced, used by direct support element of integrated direct support maintenance
F	Support item is removed, replaced, and used at the direct support level.
H	Support item is removed, replaced, used at the general support level
D	Support items that are removed replaced, used at depot mobile &pot, specialized repair activity only.

NOTE

Codes "I" and "F" will be considered the same by direct support units

(b) The maintenance code entered in the fourth position indicates whether the item is to be repaired and identifies the lowest maintenance level with the capability to perform complete repair (i.e., all authorized maintenance functions This position will contain one of the following maintenance codes.

Code	Application/Explanation
0	The lowest maintenance level capable of complete repair of the support item is the organizational level
F	The lowest maintenance level capable of complete repair of the support item is the direct support level.
H	The lowest maintenance level capable of complete repair of the support item is the general support level.
D	The lowest maintenance level capable of complete repair of the support item is the depot level, performed by (enter applicable activity) depot, mobile depot or specialized repair activity.
L	Repair restricted to designated specialized repair activity.
Z	Non reparable. No repair is authorized.
B	So repair is authorized. The item may be reconditioned by adjusting, lubricating, etc., at the user level. No parts or special tools are procured for the maintenance of this item.

(3) *Recoverability code.* Recoverability codes are assigned to support items to indicate the disposition action on unserviceable items. The recoverability code is entered in the fifth position of the Uniform Code format as follows:

Code	Application/Explanation
Z	Nonreparable item. When unserviveable. condemn and dispose at the level indicated in position 3.
0	Reparable item. When uneconomically reparable, condemn and dispose at organizational level,
F	Reparable item. When uneconomically reparable, condemn and dispose at the direct support level.
H	Reparable item. When uneconomically reparable, condemn and dispose at the general support level.
D	Reparable item. When beyond lower level repair capability return to &pot. Condemnation and disposal not authorized below depot level
L	Reparable item. Repair, condemnation, and disposal, not authorized below depot/specialized repair activity level.
A	Item requires special handling or condemnation procedures because of specific reasons (i.e., precious metal content, high dollar value, critical material or hazardour material). Refer to appropriate manuals/directives for specific instructions.

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

d. Part Number. Indicates the primary number used by the manufacturer (individual, company, firm, corporation or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements, to identify an item or range of items. For BIIL and ITIAL, see explanation of description column, para *f.*

NOTE

When a stock numbered item is requisitioned, the repair part received may have a different part number than the part being replaced.

e. Federal Supply Code for Manufacturer (FSCM). The FSCM is a 5 digit numeric code listed in SB 708-42 which is used to identify the manufacturer, distributor, or Government agency, etc. For BIIL and ITIAL, see explanation of description column, para *f.*

f. Description. Indicates the Federal item name and, if required, a minimum description to identify the item. (In BIIL and ITIAL only, the following will be used: "The last line for each item in the BIIL and ITIAL indicates the part number with the FSCM in parentheses').

g. Unit of Measure (U/M). Indicates the standard of the basic quantity of the listed item as used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr, etc.)

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

i. Quantity Authorized (Items Troop Installed or Authorized Only). Indicates the quantity of the item authorized to be used with the equipment.

j. Quantity Incorporated in Unit. Indicates the quantity of the item used in the breakout shown on the illustration figure, which is prepared for a functional group. A 'V" appearing in this column in lieu of a quantity indicates that no specific quantity is applicable, (e.g., shims, spacers, etc.).

B-4 Special Information

Action change codes indicated in the left-hand margin of the listing page denote the following:

N - Indicates an added item
C - Indicates a change in data
R - Indicates a change in FSN only

B-5. How to Locate Repair Parts

a. When Federal Stock Number or Part Number Is Unknown:

(1) *First.* Using the table of contents, determine the functional group or subgroup i.e., radar chronograph and telescope within which the repair part belongs This is necessary since illustrations are prepared for functional groups or subgroups, and listings are divided into the same groups.

(2) *Second.* Find the illustration covering the functional group or subgroup to which the repair part belongs

(3) *Third.* Identify the repair part on the illustration and note the illustration figure and item number of the repair part.

(4) *Fourth.* Using the Repair Parts Listing, find the figure and item number noted on the illustration.

b. When Federal Stuck Number or Part Number is Known.

(1) *First.* Using the Index of Federal Stock Numbers and Part Numbers, find the pertinent Federal stock number or part number. This index is in ascending FSN sequence followed by a list of part numbers in ascending alphameric sequence, cross-referenced to the illustration figure number and item number.

(2) *Second.* After finding the figure and item number, locate the figure and item number in the repair parts lists

B-6. Abbreviations

Abbreviations	*Explanation*
blk	black
clr	clear
cres.	corrosion-resistant steel
dia	diameter
fl	flat
fnsh	finish
hlcl	helical
id	inside diameter
intl	internal
l	long
lkg	locking
nkl	.nickel
NO	number
od	outside diameter
plstc	plastic
psvt	.passivate
scr	screw
sp	special purpose
t	teeth
thk	thick
UNC	unified coarse thread
UNF	unified fine thread
w	wide

Section II. BASIC ISSUE ITEMS LIST

(1) Illustation (a) Fig No.	(1) Illustation (b) Item No.	(2) Federal stock number	(3) Description Part Number & FSCM / Usable on Code	(4) Qty furn with
		1210-765-4351	CASE CARRYING M87 7654351 (19200)	1
		1290-804-9421	CASE RADAR ACCESSORIES 8566361 (19200)	1
		1290-804-9408	CONTAINER REUSABLE 8566360 (19200)	1

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) Federal Stock No.	(2) Description Part Number & FSCM / Usable on Code	(3) U/M	(4) Qty Auth
1290-167-8311	CABLE ASSEMBLY, SPECIAL PURPOSE ELECTRICAL 10559174 (19200)		1

Section IV. REPAIR PARTS LIST

(1) Illustration (a) Fig No.	(1) Illustration (b) Item No.	(2) SMR code	(3) Federal stock number	(4) Part number	(5) FSCM	(6) Description Usable on Code	(7) u/m	Qty inc in unit
1-4		PAOZZ	1290-179-5284	11728162	19200	DECAL:	EA	2
1-4		PAOZZ	5305-959-1909	MS16996-11	96906	SCREW. CAP, SOCKET HEAD: CRES, PSVT FNSH. NO. 10-32UNF-3A, .5/8 L	HD	18
1-7		PAOHH	1290-020-2369	8215501	19200	INDICATOR, DIGITAL DISPLAY:	EA	1
1-8		PAOHH	1290020-2372	10512499	19200	POWER SUPPLY:	EA	1
1-9		PAOHH	1290-020-2379	10512508	19200	AMPLIFIER, AUDIO FREQUENCY:	EA	1
		PAOZZ		10525373	19200	AMPLIFIER, AUDIO FREQUENCY, SUB-ASSEMBLY:		1
1-10		PAOHH	1290-863-5644	10524410	19200	CONTROL FREQUENCY:	EA	1
1-11		PAOHH	1290-870-3749	10525674	19200	AMPLIFIER, DETECTOR:	EA	1
B1		PAOZZ	5340-598-0994	7583435	19200	RETAINING RING:	EA	1
B1		PAOZZ	6650-764-0108	7640180	19200	EYESHIELD:	EA	1
B1		PAOZZ	1240-763-4555	7634555	19200	SUNSHADE TELESCOPE OBJECTIVE:	EA	1
B2		PAOZZ	5961-018-3292	10525239	19200	CAP, DIODE HOLDER:	EA	7
B2		PAOZZ	5960-083-2786	10525462	19200	HOLDER SEMICONDUCTOR DEVICE DIODE:	EA	7
B2		PAOZZ	5961-548-8171	10525479	19200	DIODE SEMICONDUCTOR DEVICE: TYPE 1N263	EA	7
B2		PAOZZ	5310-271-4645	MS35649-84	96906	NUT, PLAIN, HEXAGON: CRES, PSV'T FNSH, NO. 8-32UNC-2B. 11/-32 W, 1/8 THK	HD	1
B2		PAOZZ	5310-054-1830	MS35338-80	96906	WASHER, LOCK SPLIT, HLCL, CRES, PSVT FNSH, 0.296 OD, 0.046 THK, NO. 8 SCR SIZE	HD	1
B2	6	PAOZZ	5305-988-7603	MS16995-27	96906	SCREW, CAP, SOCKET HEAD: CRES, PSVT FNSH, NO. 8-32UNC-3A, =5/8 L	HD	1
B2	7	PAOZZ	5960-083-2793	10525618	19200	ELECTRON TUBE KLYSTRON: PN VA 24:	EA	1
2.24-1		PAOZZ	5305-579-5238	MS35307-309	96906	SCREW, CAP, HEXAGON HEAD: CRES, PSVT FNSH, 1/4-20UNC-2A, 1.125 L	EA	2
B3	1	PAOZZ	6210-034-0905	1052411-2	19200	INDICATOR LIGHT: CLR, 0.44 DIA, 1.03 L	EA	1
B3	3	PAOZZ	6210-974-3875	10531860	19200	INDICATOR LIGHT: PLSTC, SP, BLK NKL FNSH, TYPE 101-5030-931	EA	1
2.24-1		PAOZZ	5310-903-5866	MS51971-1	96906	NUT. PLAIN, HEXAGON: CRES, PSVT FNSH, 1/4-20 UNC-2B, 0.428 W, 0.212 THK	EA	2
2.24-1		PAOZZ	5310-543-2740	MS35333-74	96906	WASHER, LOCK: FL, INTL T, LKG 0256 ID, 0.460 OD, 0.023 THK, 1/4 SCR SIZE	EA	2
2.24-1		PAOZZ	5310-582-5677	MS15795-810	96906	WASHER, FLAT: CRES, PSVT FNSH, 0.281 ID, 0.625 OD, 0.080 THK 1/4 SCR SIZE	EA	2

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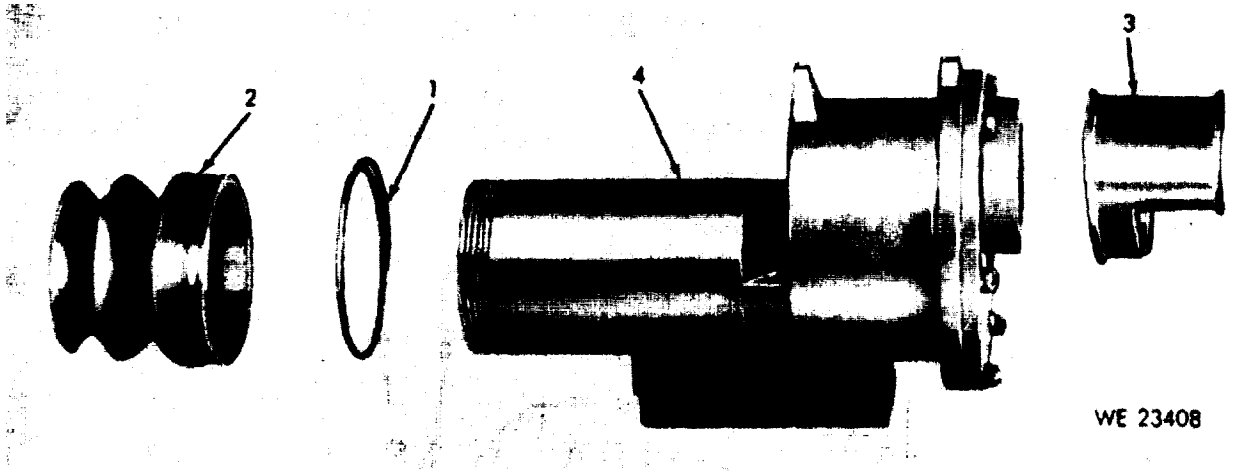

Figure B-1. Telescope XM 128

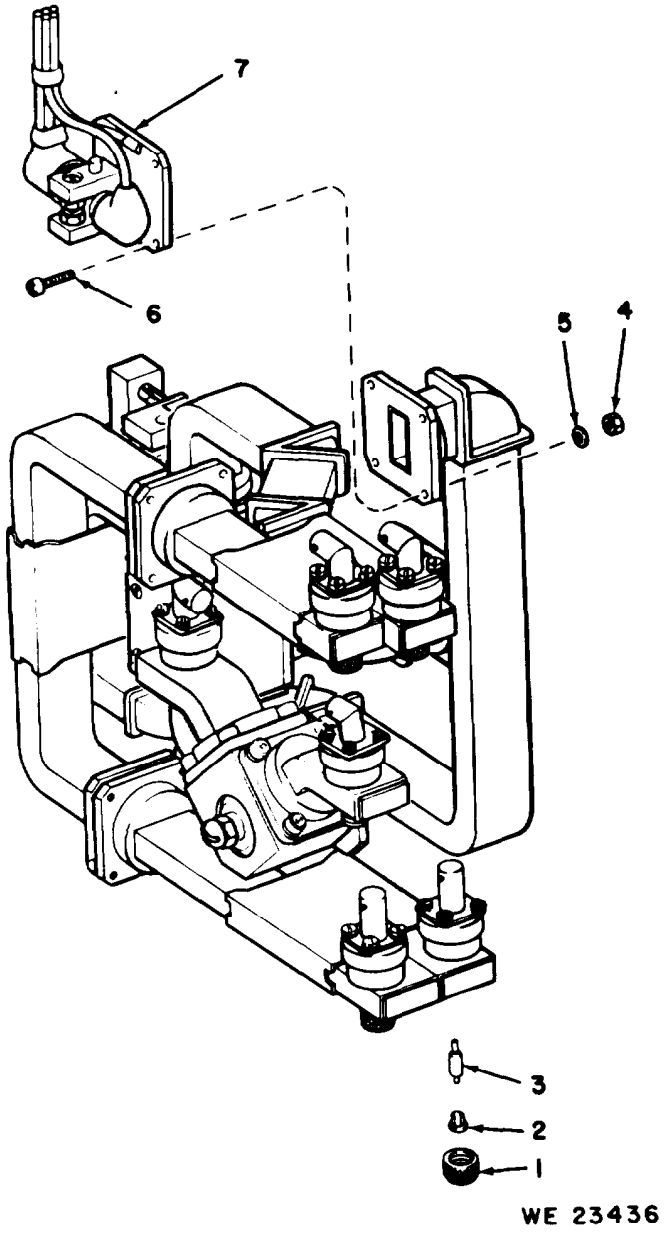

Figure B-2. Wareguide assembly

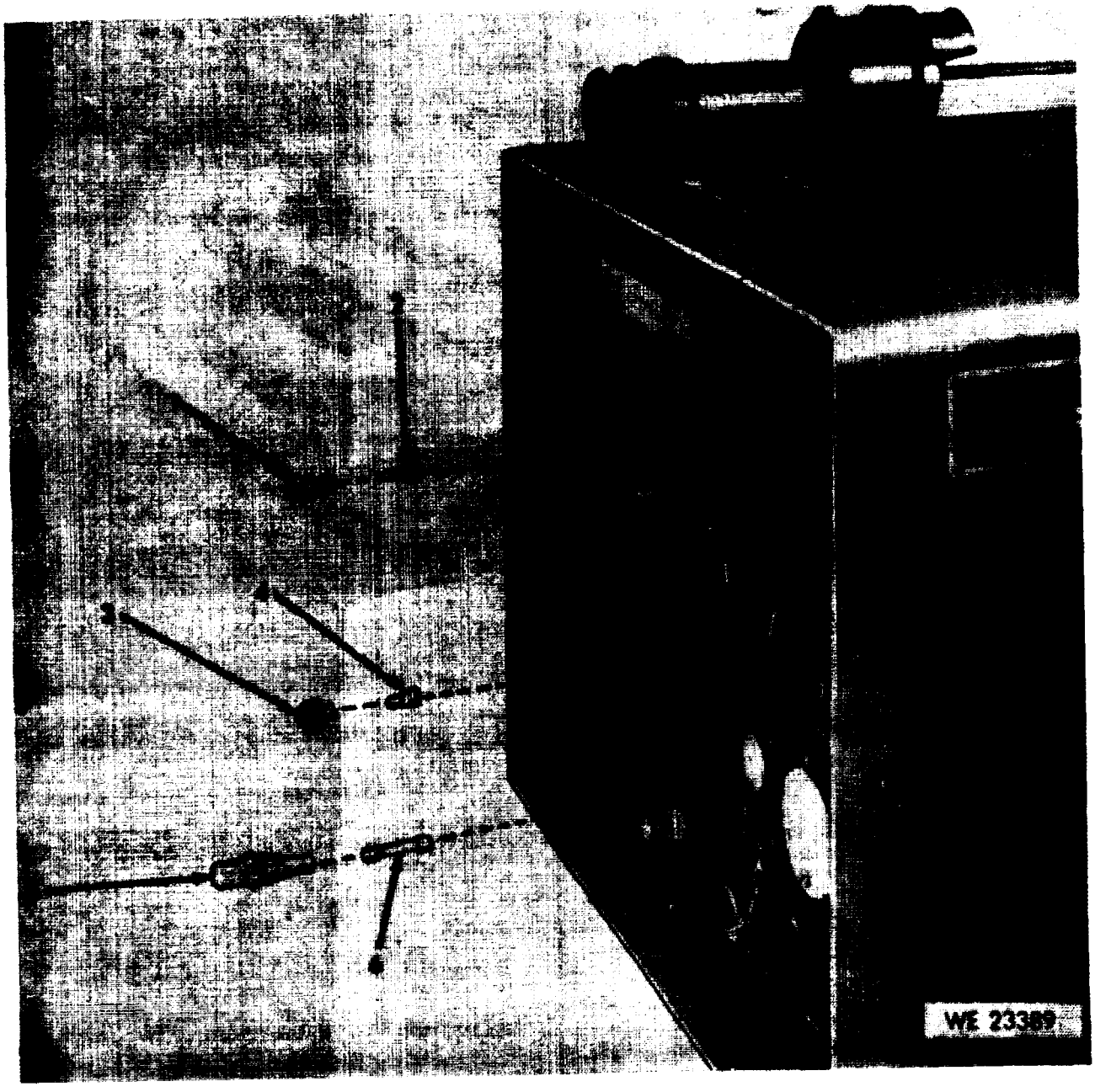

Figure B-S. Panel mounted lamp assemblies and fuses.

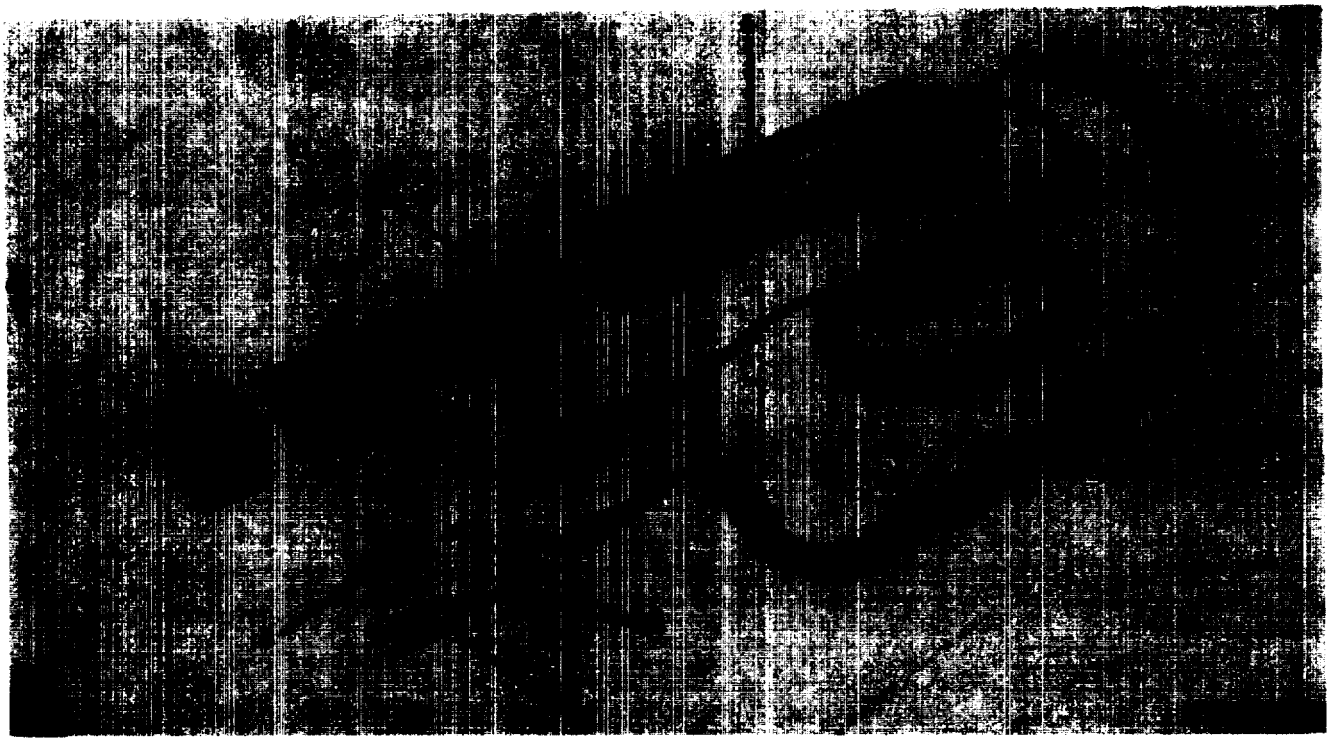

Figure B-4. Instrument light M53.

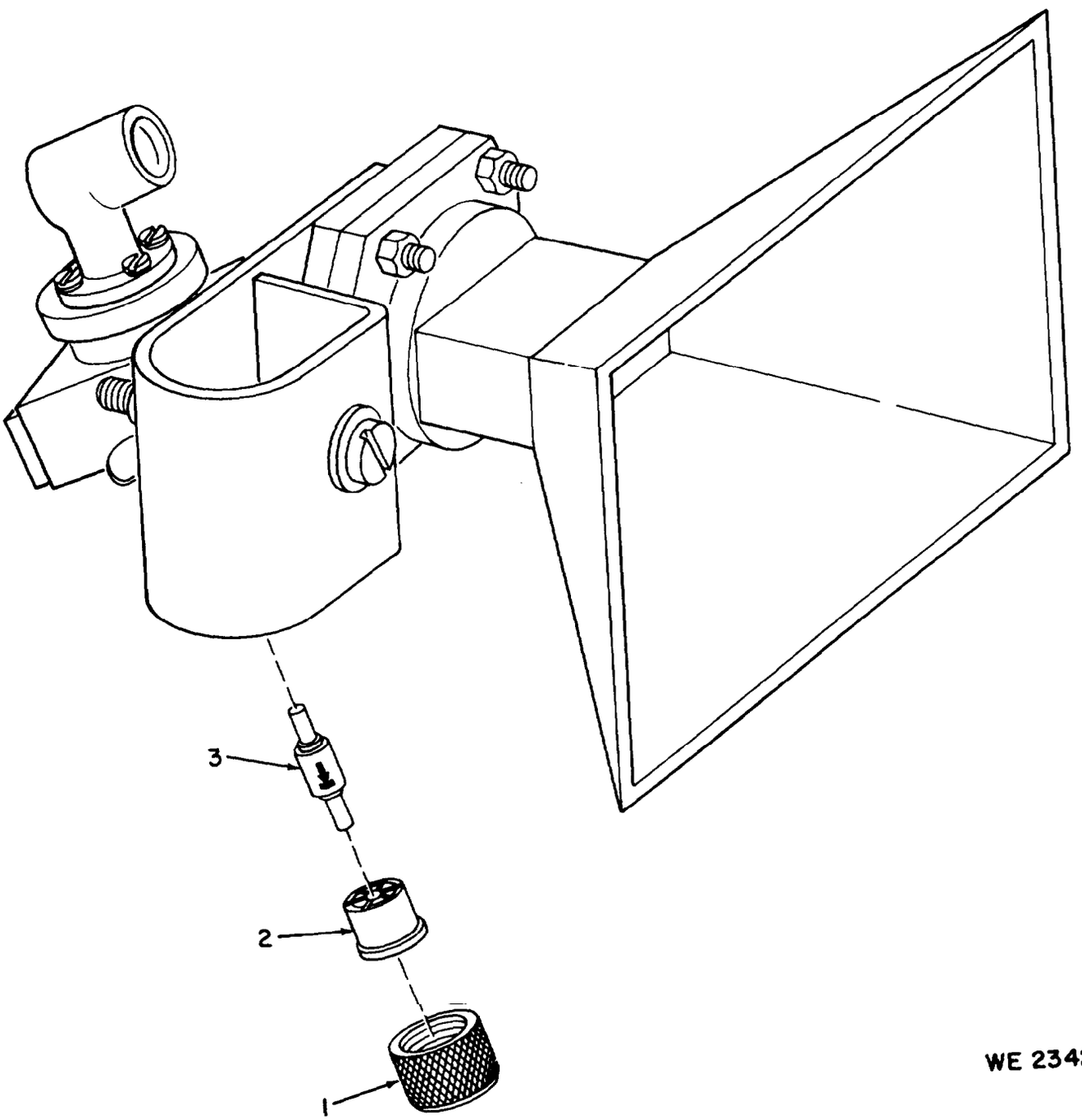

Figure B-5. Radar test receiver.

Section VI. INDEX
FEDERAL STOCK NUMBERS AND REFERENCE NUMBERS
CROSS REFERENCE TO FIGURE AND ITEM NUMBER

Stock Number	*Figure No.*	*Item No.*
1240-089-1876	1-1	-
1240-763-4555	B1	3
1240-765-4351	1-1	-
1290-020-2369	1-7	-
1290-020-2372	1-8	-
1290-020-2379	1-9	-
1290-022-9844	1-1	-
1290-087-5527	1-1	-
1290-167-8311		-
1290-179-5264	1-4	-
1290-181-5303	1-1	-
1290-535-7617	2-11	-
1290-535-7629	2-12	-
1290-620-0052	1 - 1	-
1290-653-7993	2-11	-
1290-654-5472	2-13	-
1290-719-7156	2-14	-
1290-764-1600	1-1	-
1290-765-4351	1-1	-
1290-804-9408	1-1	-
1290-804-9421	1-1	-
1290-861-7105	1-1	-
1290-862-0005	1-1	-
1290-863-3194	1-1	-
1290-863-3195	1-1	
1290-863-5644	1-10	-
1290-870-3749	1-11	-
1290-937-6200	1-1	-
5305-579-5238	2-24.1	-
5305-959-1909	1-4	-
5305-988-7603	B2	6
5310-054-1830	B2	5
5310-271-4645	B2	4
5310-543-2740	2-24.1	-
5310-582-5677	2-24.1	-
5310-903-5966	2-24.1	-
5340-598-0994	B1	1
5920-583-6092	B3	5
5920-892-9292	B3	6
5960-083-2973	B2	7
5960-083-2786	B2	2
5961-018-3292	B2	1
5961-548-8171	B2	3
5995-949-9621	1-1	-
6135-120-1020	B4	2
6210-034-0905	B3	1
6210-974-3875	B3	3
6240-155-7857	B3	4
9840-581-1598	B3	2
6240-635-9800	B4	5
6650-764-0180	B1	2
7510-889-3494		-

Reference Number	*Mfg No.*	*Fig. No.*	*Item No.*
MS1579S-810	96906	2-24.1	-
MS16995-27	96906	B2	6
MS16996-11	96906	1-4	-
MS25237-328	96906	B3	4
MS35307-309	96906	2-24.1	-
MS35333-74	96906	2-24.1	-
M535338-80	96906	B2	-
MS35649-84	96906	B2	-
MS51971-1	96906	2-24.1	5
MS90078-11-1	96906	B3	4
81349		B4	-
193145	21450	B4	6
5800940	19200	1-1	2
6537993	12900	2-11	5
6545472	19200	2-13	-
7197156	12900	2-14	-
7197188	19200	2-12	-
7583435	19200	B1	-
7634555	19200	B1	-
7640180	19200	B1	1
7641600	19200	1-1	3
7654351	19290	1-1	2
7673015	19200	B1	-
7687114	19200	2-11	-
8215501	19200	1-7	4
8215513	19200	1-1	-
8213855	19200	1-1	-
8213856	19200	1-1	-
8566360	19200	1-1	-
8566361	19200	1-1	-
8566401	19200	1-1	-
8579651	19200	B4	6
8579656	19200	B4	1
8579676	19200	B4	4
8579669	19200	B4	3
10512499	19200	1-8	
10512507	19200	1-1	-
10512508	19200	1-9	-
10525235	19200	1-1	-
10525239	19200	B2	1
10525300	19200	1-1	-
10525411-2	19200	B3	1
10525412	19200	B3	2
10525462	19200	B2	2
10525479	19200	B2	3
10525510	19200	1-10	-
10525550	19200	2-8	-
10525559	19200	1-1	-
10525618	19200	B2	7
10525674	19200	1-11	-
10531859	19200	B3	5
1053860	19200	B3	3
19531933	19200	1-1	-
10540459	19200	1-1	-
10552370	19200	1-1	-
10553463	19200	1-1	-
10559174	19200		-
10559746	19200	1-1	-
11728162	19200	1-4	-

(The next numbered page is 89)

APPENDIX C

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

C1. Scope

The maintenance allocation chart identifies for each component and assembly of the end item the maintenance operations that must be performed, and assigns each of these operations to the lowest level of maintenance capable of performing the task in terms of the availability of time, tools, test and support equip ment, skills, and employment of the item.

C2. General

The maintenance allocation chart is divided into four sections.

a. Section II contains definitions of the several classes of maintenance operations.

b. Section III is the maintenance assignment portion and contains the following data elements.

(1) *Group number.* The numerical scheme for grouping related components and assemblies.

(2) *Component Assembly Nomenclature.* A listing of the components and assemblies applicable to the end item and requiring maintenance. An assembly is a group of two or more physically connected or related parts which is capable of disassembly. A component is a group of connected assemblies and parts which is capable of operation independently, but which may derive its power from another source.

(3) *Maintenance Function.* The assignment of each item's maintenance operation to the lowest level of maintenance is recorded in the appropriate column by the maintenance level symbol “C” for operator/crew, “0” for organizational, “F” for direct support, “H” for general support and "D" for depot maintenance.

(4) *Tools and Equipment.* A reference code column for any special tool or test requirement with identification in section IV.

(6) *Remarks.* A reference code column for items which have supplemental instructions in section V.

APPENDIX C

MAINTENANCE ALLOCATION CHART (TM 38-715-1)	Date 17 October 1967
Nomenclature of End Item or Component	RADAR CHRONOGRAPH SET: M36

SECTION II - GENERAL

This Maintenance Allocation Chart designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of field maintenance tasks upon this end item or component will be consistent with the assigned maintenance operations which are defined as follows:

Operation	*Definition*
Inspect	To verify serviceability and to detect incipient failure by close examination.
Test	To verify serviceability and to detect incipient failure by use of common and special tools and equipment such as gauges, meters, or other electrical, electronic, or mechanical devices and by operation of the material.
Service	To clean, preserve, weigh, recharge, lubricate, perform minor adjustments, or paint materiel and to replenish fuels, lubricants, compounds, oxygen, and air, and so forth as appropriate.
Adjust	To correct malfunctions by maintaining within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics as to the specified values.
Align	To adjust two or more items or components so their functions are properly synchronized. To place or bring into line.
Calibrate	To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.
Install	To set up for use in an operational environment, such as a generator in an emplacement, a radar at a site, or a gun mount on a vehicle.
Replace	To substitute like serviceable parts, assemblies or components for other items, due to actual or anticipated failure or malfunction.
Repair	To restore an item to serviceable condition through correction or a specific failure or unserviceable condition.
Overhaul	To restore an item to a completely servieable condition as prescribed by maintenance serviceability standards.
Rebuild	To restore an item to a standard as nearly as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through complete disassembly of the item, inspection of all parts or components, repair or replacement of specifications subsequent reassembly of the item.

Nomenclature of End Item or Component	RADAR CHRONOGRAPH SET: M36

SECTION III - MAINTENANCE ASSIGNMENT

Group No. (a)	Component Assembly Nomenclature (b)	Maintenance Function (c)											Tools and Equipment (d)	Remarks
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
i.O	Chronograph, Assembly ----------	C	F	C	C	----	----	----	----	F	D	----	1,2,3,5,6,7,10, 11, 12, 13, 14.	a, b, c, d, g
1.1	Cabinet Assembly----------	C	----	C	----	----	----	----	----	F	D	----	----------	a,c g
1.1.1	Slides, Frame Assy----------	----	----	F	----	----	----	----	----	----	----	----	----------	c
1.1.2	Fan----------	----	----	----	----	----	----	----	F	----	----	----	----------	f
1.1.3	Air Filters----------	C	----	C	----	----	----	----	F	----	----	----	----------	a,c,f
1.2	Cover,Protective Antenna----------	C	----	C	----	----	----	----	O	----	----	----	----------	a,c,f
1.3	Panel, Assembly----------	O	----	O	----	----	----	----	----	D	D	----	----------	
1.3.1	Connectors----------	----	----	----	----	----	----	----	F	----	----	----	----------	f
1.3.2	Meter----------	----	----	----	----	----	----	----	F	----	----	----	----------	f
1.3.3	Switch Rotary ----------	----	----	----	----	----	----	----	F	----	----	----	----------	f
1.4	Antenna----------	O	----	O	----	----	----	----	F	F	----	----	----------	a, c, f,
1.4.1	Antenna Subassembly----------	----	----	----	----	----	----	----	F	----	----	----	----------	f
1.5	Waveguide Assembly----------	O	F	O	F	----	----	----	H	H	D	----	3, 10, 7, 12, 13, 14-	a, c, d, f, g,
1.5.1	Tuner----------	----	----	----	----	----	----	----	F	----	----	----	----------	f
1.5.2	Klyston----------	----	O	----	F	----	----	----	O	----	----	----	3, 10, 7, 12,13, 14	b, f
1.5.3	Diodes& Holders----------	----	O	----	----	----	----	----	O	----	----	----	11, ----------	b, f
1.6	IF Amplifier/Phase Detector----------	O	O	O	O	----	----	----	O	D	D	----	3, 10, 4, 2 ----------	a, b, c, f, g
1.6.1	Meter----------	----	----	----	----	----	----	----	F	----	----	----	----------	f
1.6.2	Coaxial Cable----------	----	----	----	----	----	----	----	F	----	----	----	----------	f
1.6.3	Connectors----------	----	----	----	----	----	----	----	F	----	----	----	----------	f
1.6.4	Subassembly 10525655 PCB----------	----	----	----	----	----	----	----	----	F	----	----	----------	
1.6.5	Subassembly 10525651 PCB----------	----	----	----	----	----	----	----	----	F	----	----	----------	
1.7	Control, Automatic Frequency (AFC)----------	O	O	O	O	----	----	----	O	F	D	----	1, 10, 2----------	a,b, c d, f, g
1.7.1	Subassembly 10525468 PCB----------	----	----	----	----	----	----	----	----	F	----	----	----------	
1.7.2	Subassembly 10525469 PCB----------	----	----	----	----	----	----	----	----	F	----	----	----------	
1.8	Indicator, Digital Display----------	O	O	O	----	----	----	----	O	F	D	----	1, 2, 4, 8, 9, ---------	a, b, c, f, g
1.8.1	Switch, Rotary----------	----	----	----	----	----	----	----	F	----	----	----	----------	f
1.8.2	Switch, Throw----------	----	----	----	----	----	----	----	F	----	----	----	----------	f
1.8.3	Connectors----------	----	----	----	----	----	----	----	F	----	----	----	----------	f
1.8.4	Indicator, Digital----------	----	----	----	----	----	----	----	F	----	----	----	----------	f
1.8.5	Counter, Decade Frequency Dividers----------	----	----	----	----	----	----	----	F	----	----	----	----------	f
1.8.6	Counter, Decade Frequency Dividers----------	----	----	----	----	----	----	----	F	----	----	----	----------	f
1.8.7	Gate, Oscillator----------	----	----	----	----	----	----	----	F	----	----	----	----------	f
1.8.8	Generator, Pulse----------	----	----	----	----	----	----	----	F	----	----	----	----------	f
1.8.9	Amplifier, Audio/Radio Frequency----------	----	----	----	----	----	----	----	F	----	----	----	----------	f

Nomenclature of End Item or Component	RADAR CHRONOGRAPH SET: M36

SECTION III-MAINTENANCE ASSIGNMENT

Group No. (a)	Component Assembly Nomenclature (b)	Maintenance Function (c)											Tools and Equipment	Remarks
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
1. 8. 10	Oscillator								F					f
1. 8. 11	Generator, Gate								F					f
1. 8. 12	Indicator, Reset								F					f
1. 8. 13	Oscillator, 75 KC								F					f
1. 8. 14	Gate, Delay								F					f
1. 8. 15	Crystal 95.648 KC								F					f
1. 8. 16	Crystal 75 KC								F					f
1. 8. 17	Subassembly 10525416 PCB									F				
1. 8. 18	Subassembly 10549950 PCB									F				
1. 9	Amplifier, Audio	0	0	0					0	F	D		1,4,8,10	a, b, c, f, g
1.9. 1	Connectors									F				
1. 9. 2	Filter, Band Pass									F	I			f
1. 9. 3	Filter, Low Pass								F					f
1. 9. 4	Switeh, Rotary								F					f
1. 9. 5	Amplifier, Audio								F					
1. 9. 5. 1	Subassembly 10525419 PCB									F				
1. 9. 5. 2	Subassembly 10525388 PCB									F				
1. 9. 6	Subassembly 10525389									F				
1.10	Power Supply	0	0	0	F				0	F	D		1, 10	a, b, c, f, g
1. 10. 1	Switch, Throw								F					f
1. 10. 2	Filter								F					f
1. 10. 3	Transformer								F					f
1. 10. 4	Subassembly 10531845 PCB									F				
1. 10. 5	Subassembly 10531846 PCB									F				
2. 0	Microphone	C	0	C					0	F				a, b, c, f
3. 0	Mount, Radar Chronograph	C		C					F	F				a, c, f, g
3.1	Level Vial Assembly	C		C					F					a, c, f
4. 0	Tripod Assembly	C		C					C	F				a, c, f, g
5. 0	Radar Test Receiver	O	F	0					0	F				a, b, c, f, g
6. 0	Rater, Chronograph	C	D	C	D				0	F	D		1, 2, 4	a, b, c, f, g
6.1	Cable Assy, Special Purpose	O		0					0					a, c, f
7. 0	Cable Assy and Reel	C		C						F	D			a, c, g
7.1	Cable Assemblies	C	C	C					F	F				a, b, c, f
7. 2	Reel,Cable	C		C					F					a, c, f
8.0	Cable, Special Purpose (8566401)	0	0	0										a, b, c,
9.0	Bracket, Installation (Jeep Mounting)	C		C						F	D			a, c, g,
10.0	Telescope XM128	C	F	C	F				0	F	D			a, b, c, f, g

Section III. MAINTENANCE ASSIGNMENT

Group Number	Component Assembly b	Maintenance Function c										Tools and Equipment d	Remarks e
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild	
10.1	Eyeshield	C		C					O				a,c
10.2	Sunshade	C		C					O				a,c
10.3	Case, Carrying M87	C		C					O				a,c
10.4	Light, Instrument, M53	C		C					O				a,c
10.4.1	Bracket, Lamp Assy	C		C					O				a,c
11.0	Adapter Assembly	C		C					O	F			a,cr,f
12.0	Generator Set, gasoline engine driven, 0.5 kw, AC, 120/240 volts, 400 Hertz, 1 PH, Model HF-0.5 MD												
13.0	Trailer, Cargo, 1/4 Ton Two-Wheeled M100												Stock Item
14.0	Truck, Utility, 1/4 Ton 4x4, M151A1												Stock Item

Nomenclature of End Item or Component RADAR CHRONOGRAPH SET: M36

Section IV. TOOL AND TEST EQUIPMENT REQUIREMENTS

Tool or Test Reference Code	Maintenance category	Nomenclature	FSN	Tool Number
1.	O, DS, GS, D	Tool Kit, Radar & Radio Repairman, TK87/U	5180-690-4452	
2.	DS, GS, D	Oscilloscope Type AN/USM-50A	6625-668-4676	
3.	DS, GS, D	Frequency Meter FR-126/U	6625-787-6248	
4.	DS, GS, D	Voltmeter, Electronic Type ME-30 A/U	6625-669-0742	
5.	DS, GS, D	Crystal Detector Mount 440A	6625-581-5802	
6.	DS, GS, D	Multimeter TS-352/U	6625-242-5023	
7.	DS, GS, D	Attenuator 20db Variable, Hewlett-Packard X375A; 8.2-12.4 KMC or equivalent	4931-604-3855	
8.	DS, GS, D	Signal Generator 150 AN/USM 44	6625-669-4031	
9.	DS, GS, D	Signal Generator TS-382 D/U	6625-192-5094	
10.	DS, GS, D	Vacuum Tube Voltmeter TS-505/U	6625-243-0562	
11.	DS, GS, D	Test Set, Crystal Unit Rectifier TS-268/U	6625-188-5851	
12.	DS, GS, D	Wattmeter AN/URM 98	6625-566-4990	
13.	DS, GS, D	Adapter, Waveguide HPX281A	5928-553-6082	
14.	DS, GS, D	Thermistor Mount 487B	6625-656-2454	
15.	GS, D	Transistor Testor AN/USM-136	4931-991-6793	
16.	GS, D	Test Set Electrics System	4931-863-5650	
17.	GS, D	Instrument Light Tester	4931-536-5558	

Nomenclature of End Item or Component RADAR CHRONOGRAPH SET: M36

SECTION V REMARKS

Reference Code	Remarks
a	*Inspection.* The inspection function of verifying serviceability of the Radar Chronograph Set is allocated to the operation. Inspection of components of the Radar Chronograph is allocated to organizational support
b	*Test.* Self-test of the Radar Chronograph is accomplished by organizational support By means the self-test features, i.e, internal and external monitor meters, use of the chronograph rater, microphone, test receiver, and troubleshooting guide, malfunctioning modules can be detected. module testing is completed at the direct support level utilizing test equipment allocated at that level.
c	*Service.* The service function relates primarily to the periodic application of preventive maintenance service included in the Preventive Maintenance Tables.
d	*Adjust.* The operator adjusts the leakage control through use of knobs and associated monitor meter externally located on the chronograph. Organizational Support per forma adjustment of Potentiometer A2R16 on the A2 Frequency (AFC), and adjusts Potentiometer A4R27 for modulator drive on the A4 IF Amplifier Detector utilizing the internal monitor meter.
e	*Replace.* All Radar Chronograph modules and assemblies are replaced as indicated by the Maintenance Allocation Chart.
f	*Repair.* Repair function is assigned to direct support, general support and depot as indicted by the Maintenance Allocation Chart This repair includes replacement of defective components of assemblies and sub-assemblies which involves use of special-tools and test equipment allocated at these levels.
g	*Overhaul.* Overhaul function is allocated at depot level.

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By Order of the Secretary of the Army:

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To be distributed in accordance with DA Form 12-41, Organizational Maintenance for Radar Chronograph Set.

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TM 9-1290-325-12/1 RADAR CHRONOGRAPH SET: M36 (1290-861-7105)—1967

PIN: 027341-000