

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

FIELD AND DEPOT
MAINTENANCE

TELESCOPE
MOUNT
M90 (T183)



TECHNICAL MANUAL }
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DEPARTMENT OF THE ARMY

TELESCOPE MOUNT M90 (T183)

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. These instructions are published for the use of personnel responsible for field and depot maintenance of telescope mount M90 (T183). This manual does not contain information which is intended primarily for the using organization, since such information is available to ordnance maintenance personnel in the pertinent operator's technical manual or field manual.

b. This manual contains a description of and procedures for inspection, disassembly, repair and rebuild, and assembly of the telescope mount M90 (T183).

c. The appendix contains a list of current references, including supply manuals, technical manuals, and other available publications applicable to the materiel.

d. Operation, lubrication, and all maintenance operations allocated to using organizations in performing maintenance work within their scope for the telescope mount M90 (T183) are contained in TM 9-3058.

e. This first edition is being published in advance of complete technical review. Any errors or omissions will be brought to the attention of the Chief of Ordnance, Department of the Army, Washington 25, D. C., ATTN: ORDFM, using DA Form 468 (Unsatisfactory Equipment Report).

2. Field and Depot Maintenance Allocation

The publication of instructions for complete disassembly and rebuild is not to be construed as authority for the performance by field maintenance units of those functions which are restricted to depots and arsenals. In general, the prescribed maintenance responsibilities will apply as reflected in the allocation of maintenance parts listed in the appropriate columns of Department of the Army Supply Manual ORD 8 SNL F-392 and tools listed in ORD 6 SNL J-32. Instructions for depot maintenance are to be used by maintenance companies in the field only when the tactical situation makes the repair functions imperative. Provisions of parts listed in the depot stock guide column of ORD SNL F-392 will be made to field maintenance only when the emergency nature of the maintenance to be performed has been certified by a responsible officer of the requisitioning organization.

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3. Forms, Records, and Reports

a. General. Responsibility for the proper execution of forms, records, and reports rests upon the officers of all units maintaining this equipment. However, the value of accurate records must be fully appreciated by all persons responsible for their compilation, maintenance, and use. Records, reports, and authorized forms are normally utilized to indicate the type, quantity, and condition of materiel to be inspected, to be repaired, or to be used in repair. Properly executed forms convey authorization and serve as records for repair or replacement of materiel in the hands of troops and for delivery of materiel requiring further repair to ordnance shops in arsenals, depots, etc. The forms, records, and reports establish the work required, the progress of the work within the shops, and the status of the materiel upon completion of its repair.

b. Authorized Form. The forms generally applicable to units maintaining this materiel are listed in the appendix. For a complete listing of all forms, refer to current DA Pam 310-2.

For instructions on the use of these forms, refer to FM 9-10.

Additional forms applicable to the using personnel are listed in the operator's manual.

c. Field Reports of Accidents. The reports necessary to comply with the requirements of the Army safety program are prescribed in detail in SR 385-10-40. These reports are required whenever accidents involving injury to personnel or damage to materiel occur.

d. Report of Unsatisfactory Equipment and Materials. Any deficiencies detected in the equipment covered herein which occur under the circumstances indicated in AR 700-38 should be immediately reported in accordance with the applicable instructions in those regulations.

Section II. DESCRIPTION AND DATA

4. Description

Telescope mount M90 (T183) (fig. 1) consists, primarily, of a socket and a drive worm assembled in the mount and controlled by the cant correction knob and the adjustment worms. This

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device mounts on the rear bracket of the 106-mm recoilless rifle M40 (T170E1) (fig. 2). The bore of the socket incorporated in the telescope mount is slotted, keyed, and tapered to accommodate the slotted and tapered objective end of the elbow telescope -M92D (T168E1) (fig. 2), and a round nut (fig. 1) is provided to lock the elbow telescope in place.

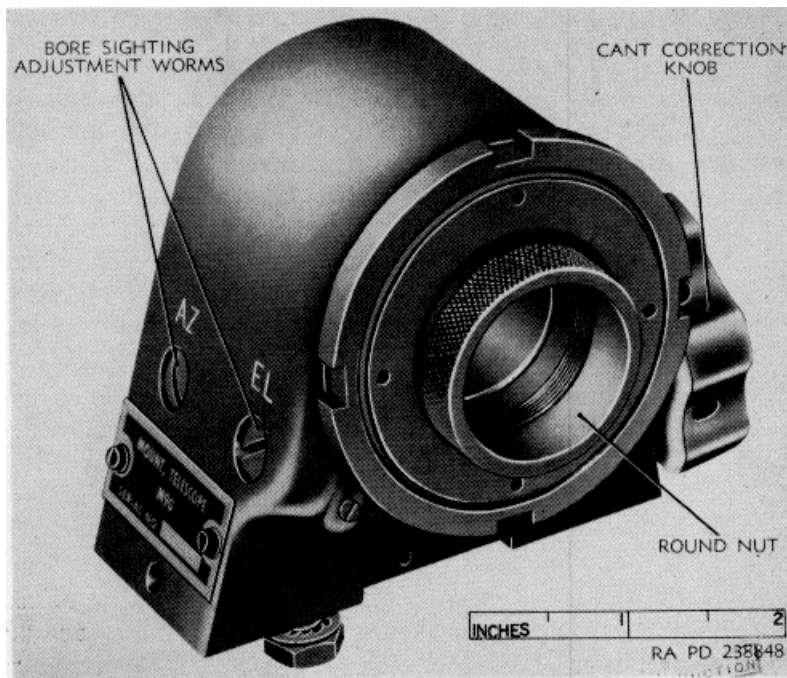


Figure 1. Telescope mount M90 (T183)- three-quarter left rear view.

5. Functional Description

When the cant correction knob in the telescope mount is turned right or left at least 21° to, either side of the midpoint of the knob's range of travel, the mount, through the combined rotations of the drive worm and the gear segment of the socket, will provide cant correction to the elbow telescope M92D. When the azimuth adjustment worm AZ (fig. 1) is turned, it will deflect the elbow telescope reticle cross at least 11 mils to either the right or left of a vertical target line. When the elevation adjustment worm EL (fig. 1) is turned, it will deflect the elbow telescope reticle cross at least 11 mils above or below a horizontal target line.

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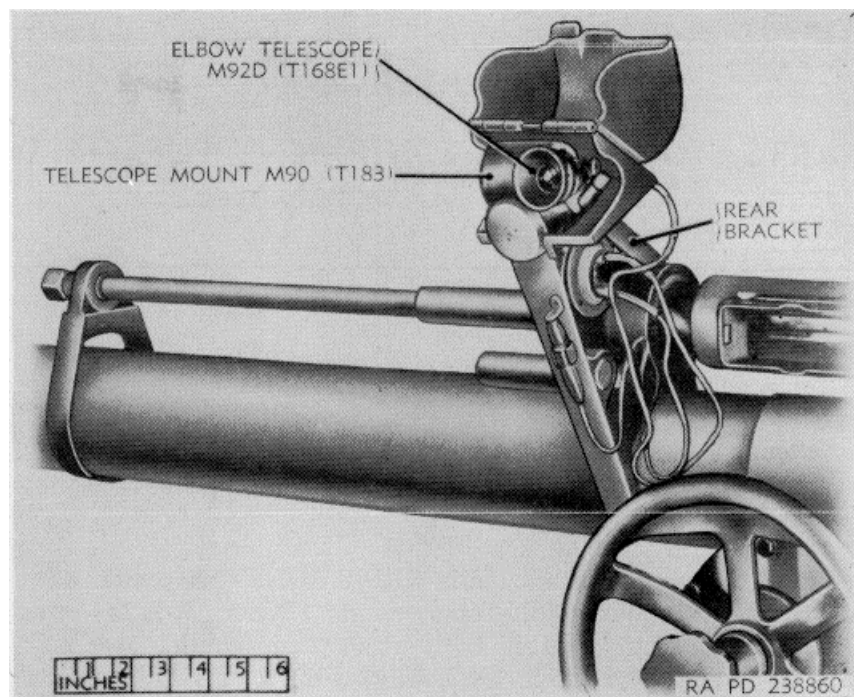


Figure 2. Telescope mount M90 (T183) installed on rear bracket of 106-mm recoilless rifle M40 (T170E1).

6. Tabulated Data

a. General.

Length	3 11/16 in.
Width	2 9/16 in.
Height	2 15/16 in.
Weight	3 lb

b. Mechanical Characteristics.

Cant correction knob:	
Range, right or Left.....	21° minimum, or 3 ½ turns
Bore sighting adjustment worms:	
Azimuth, deflection right or left.....	11 mils minimum
Elevation, deflection up or down	11 mils minimum

CHAPTER 2

PARTS, TOOLS, AND EQUIPMENT FOR FIELD AND DEPOT MAINTENANCE

7. General

Tools, equipment, and maintenance parts over and above those available to the using organization are supplied to ordnance field maintenance units and depot shops for maintaining, repairing, and rebuilding the materiel.

8. Parts

Maintenance parts are listed in ORD 8 SNL F-392 which is the authority for requisitioning replacements. Parts not listed in an ORD 8 manual, but required by depot shops in rebuild operations, may be requisitioned from the listing in the corresponding ORD 9 manual and will be supplied if available, when the need is substantiated. Requisitions for ORD 9 parts will contain a complete justification of requirements.

9. Common Tools and Equipment

Standard and commonly used tools and equipment having general application are authorized for issue by TA and TOE.

10. Special Tools and Equipment

The special tools and equipment tabulated in table I are listed in ORD 6 SNI, J-122. This tabulation contains only those special tools and equipment necessary to perform the operations describe in this manual. It is included for information only, and is not to be used as a basis for requisitions.

Table I. Special Tools and Equipment for Field and Depot Maintenance

Item	Identifying No.	References		Use
		Fig.	Par.	
DIOPTOMETER_ target adjusting	7680631 (J022-7680631)	4.....	11, 44 46-48	To sight on while telescope mount.
TESTER, vibration, universal.	7560085 (J022-7560085)	5.....	12, 48 51	To simulate shock and test for

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Table I. Special Tools and Equipment for Field and Depot Maintenance-Continued

Item	Identifying No.	References		Use
		Fig.	Par.	
WRENCH, spanner, face, adjustable, Ord design, type 2, 0.07 x 0.062 in pin.	41-W-3248-125 (J022-7680631)	3.....	39, 41g, 41i, 45c	loose parts in telescope mount. To remove and assemble retainer and ball cap.

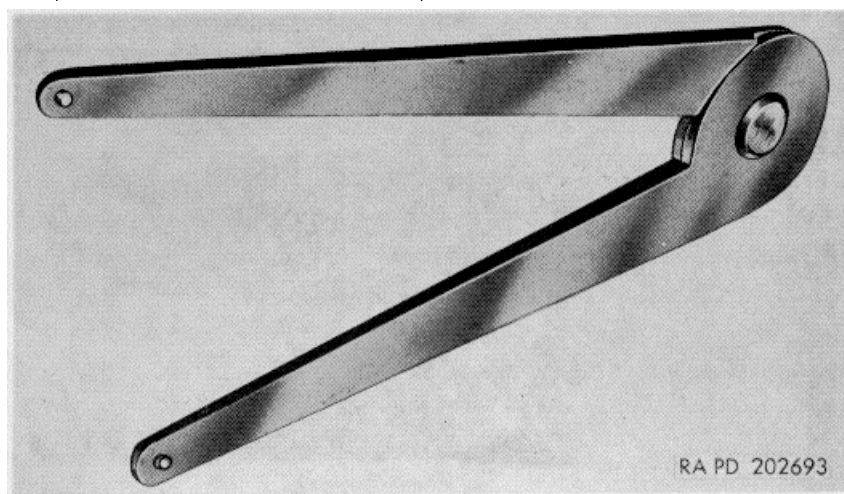


Figure 3. Adjustable face spanner wrench 41-W-3248-125.

11. Diptometer 7680631

The diptometer 7680631 (fig. 4) is a small collimating telescope. It has a focusing eyepiece with a diopter scale, a stationary reticle crossed by two lines intersecting at right angles, and an adjustable objective with a diopter scale and index. The eyepiece scale has a range of from +4 to -4 diopters, and the scale for the objective is graduated from +1 to -1 diopter.

12. Universal Vibration Tester 7560085

a. *General.* The universal vibration tester 7560085 (fig. 5) is used with an appropriate adapter to simulate conditions of shock and vibration that are normally encountered in the use and during the life of the telescope mount M90 (T183).

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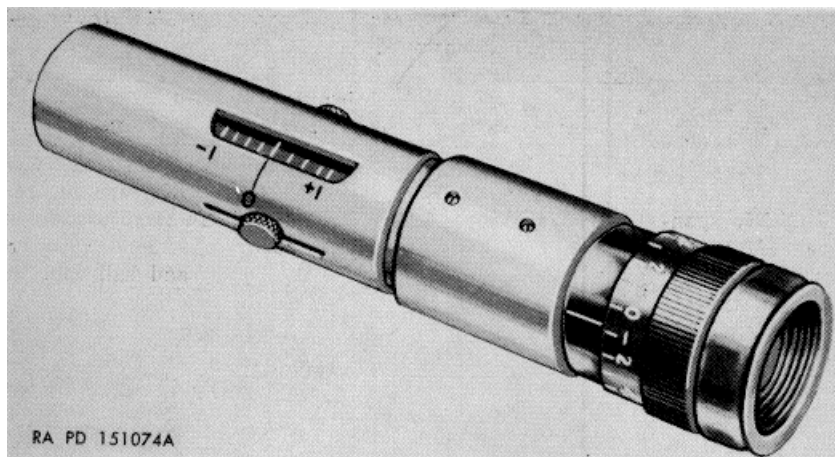


Figure 4. Dioptrimeter 7680631

Through its use, loose dirt and improperly secured components which would affect the efficient operation of the telescope mount are revealed.

b. Description. Amplitude and frequency of the vibrator are adjusted as required by the specifications of the telescope mount M90 (T183). Frequency of vibration is controlled by adjusting the speed of rotation of the tester, as indicated on the frequency meter (fig. 5). This is accomplished by adjustment of the belt driven variable speed pulley by means of the variable speed hand wheel. Amplitude is adjusted by the tee-handled screw (fig. 5) at the side of the vibrator. Refer to instruction plates and caution plates attached to the vibration tester. A timer switch (fig. 5), wired into the electrical circuit, is present for the time of vibration required.

13. Improvised Tools and Equipment

The list of improvised tools and equipment in table II applies only to field and depot organizations performing major rebuild work on telescope mount M90 (T183). Illustrations giving dimensioned details are included to enable these maintenance organizations to fabricate these tools and equipment locally, if desired, until such time as authorized ORD 6 items are made available. These tools are essential for rebuild but are not available for issue.

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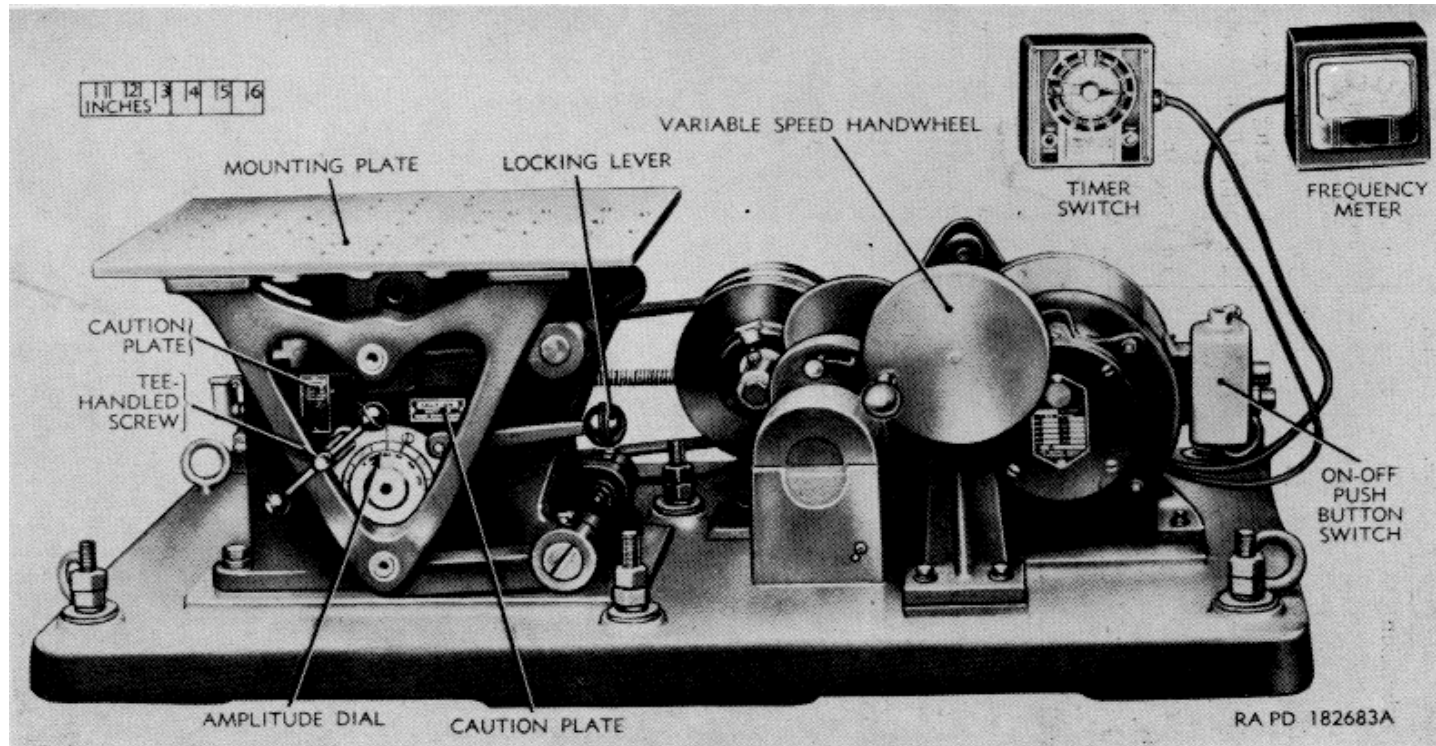
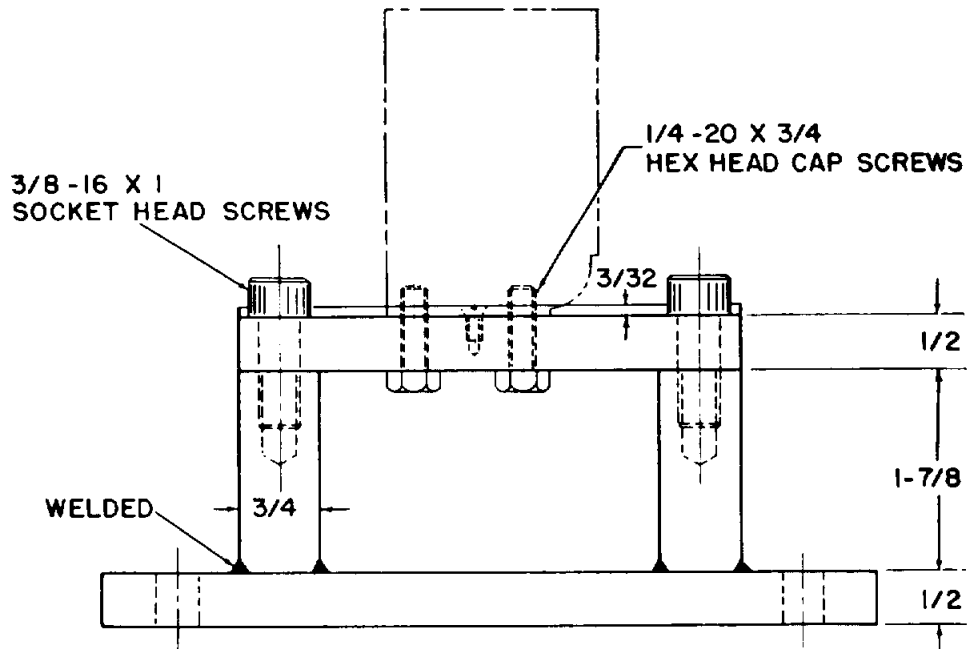
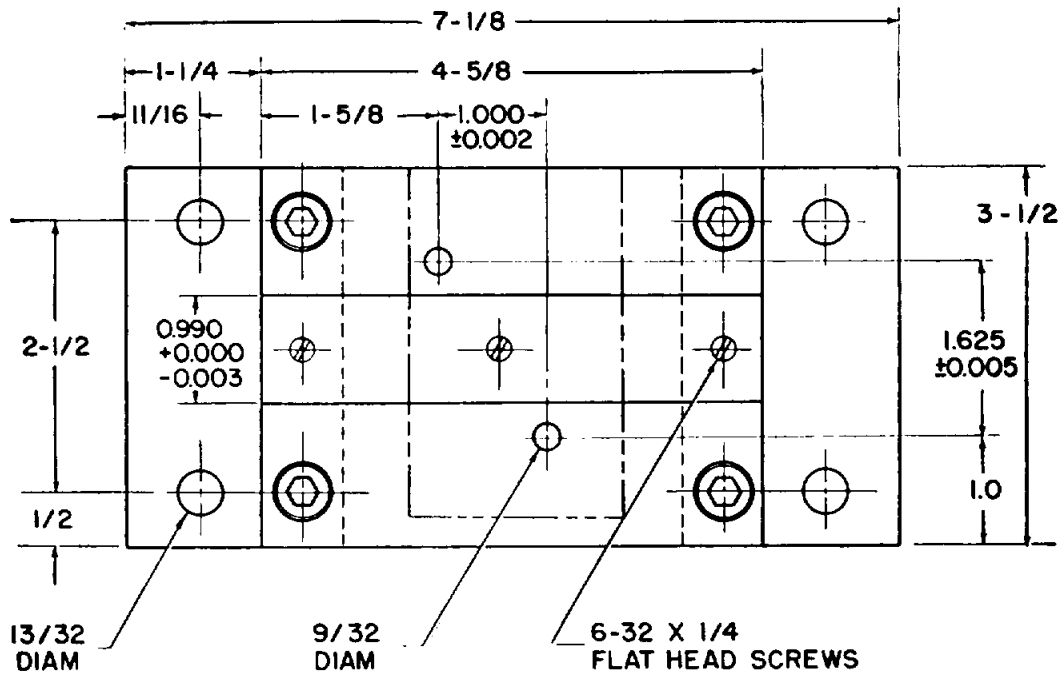


Figure 5. Universal vibration tester 7560085.

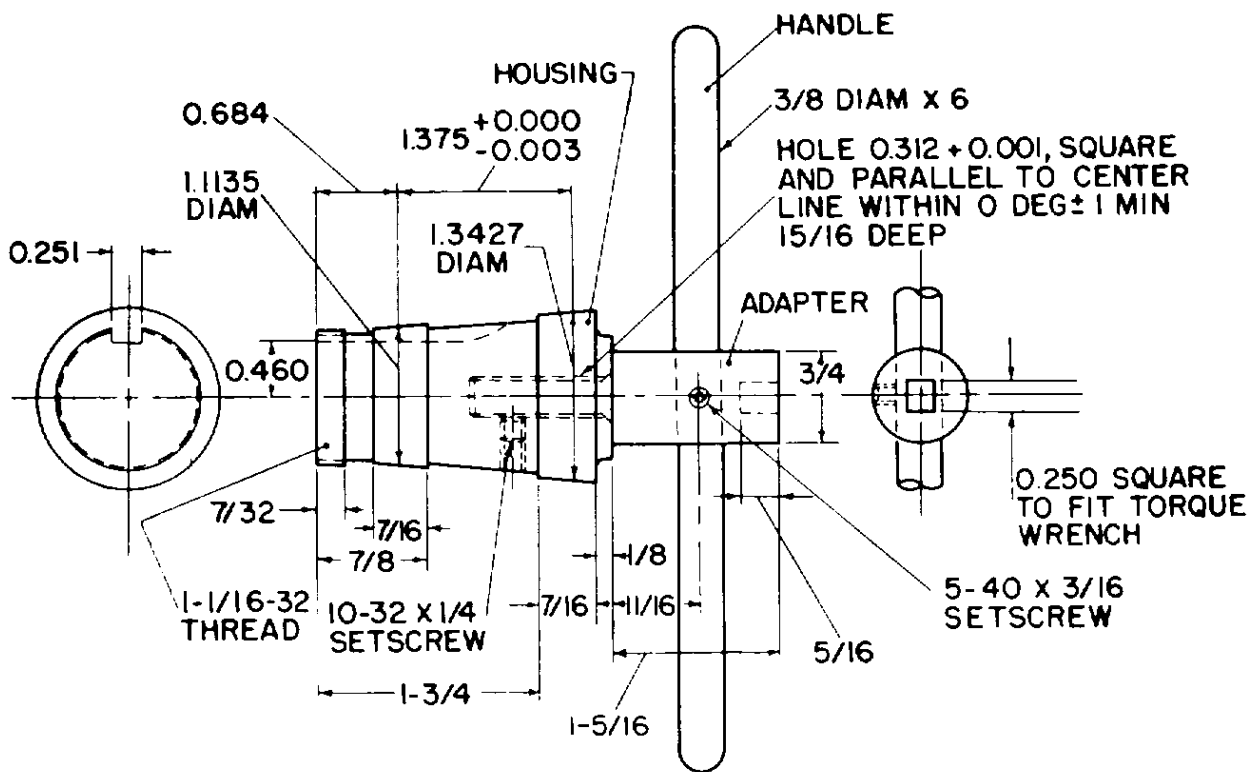
Table II. Improvised Tools and Equipment for Field and Depot Maintenance
Continued

Item	References		Use
	Fig.	Par.	
ADAPTER, vibration tester.	6	48	To support telescope mount on vibration tester 7560085
FIXTURE, final inspection	12	44-48	To mount telescope mount for testing purposes.
HOLDER, dioptometer -----	9	44,46-48	To support dioptometer 7680631
HOLDER, telescope (simulated)	7	41g	To test and adjust socket.
LEVELLING PLAT-FORM.	8	45a	To level improvised telescope holder.
TARGET, wall -----	10	44, 46-48	Used with dioptometer 7680631 to test and adjust telescope mount.
WRENCH, hook spanner, diameter of circle $2\frac{3}{8}$ in. Length overall 8 in.	11	39, 41	To remove and assemble $2\frac{3}{8}$ in. OD locknut.



MATERIAL: STEEL
 NOTE: ALL DIMENSIONS SHOWN ARE IN INCHES
 RA PD 238850

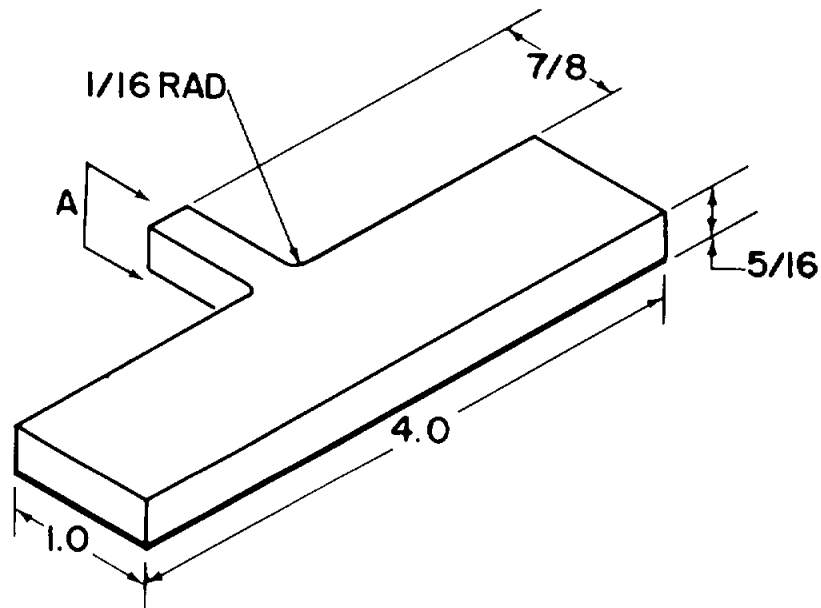
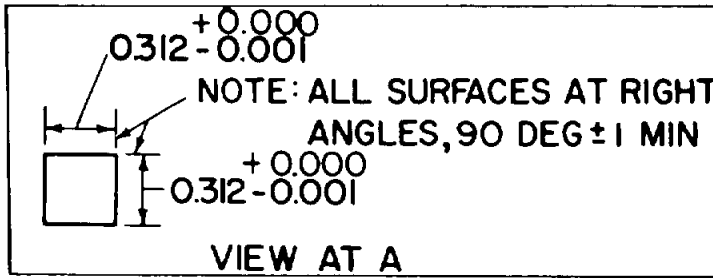
Figure 6. Improvised vibration tester adapter.



MATERIAL: STEEL, 1-1/2 DIAM STOCK
 NOTE: ALL DIMENSIONS SHOWN ARE IN INCHES

RA PD 238851

Figure 7. Improvised telescope holder.



MATERIAL: STEEL
NOTE: ALL DIMENSIONS
SHOWN ARE IN INCHES
RA PD 238852

Figure 8. Improvised levelling platform.

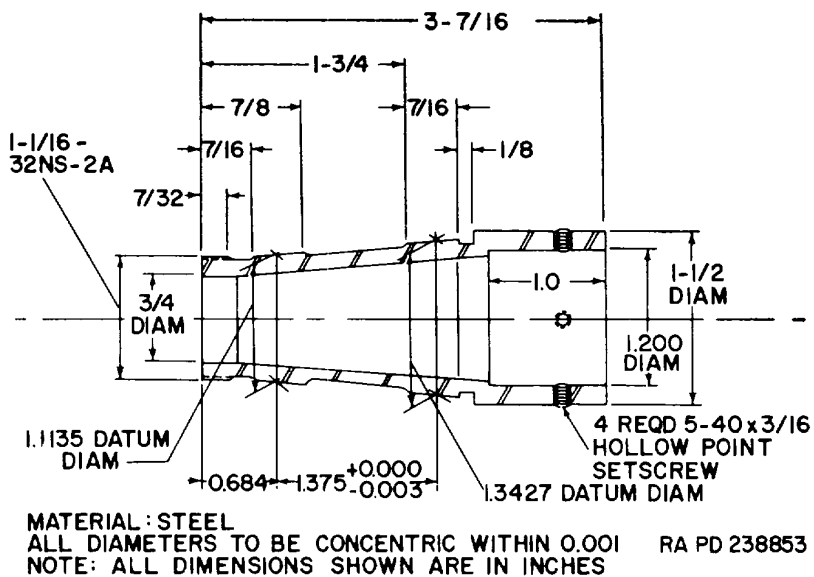


Figure 9. Improved diopmeter holder.

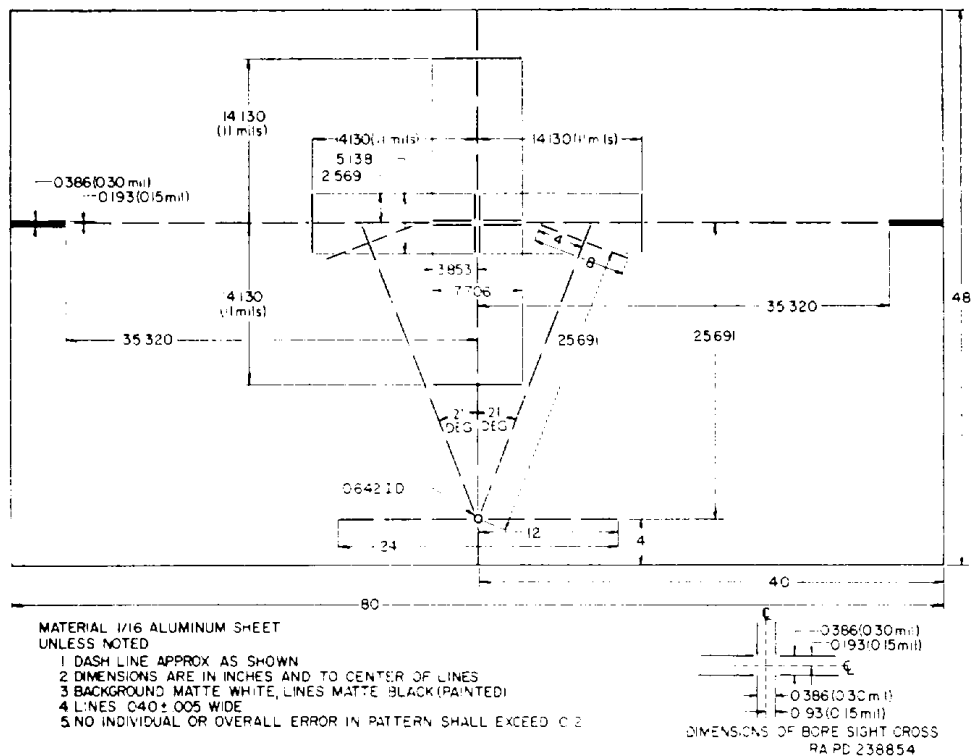
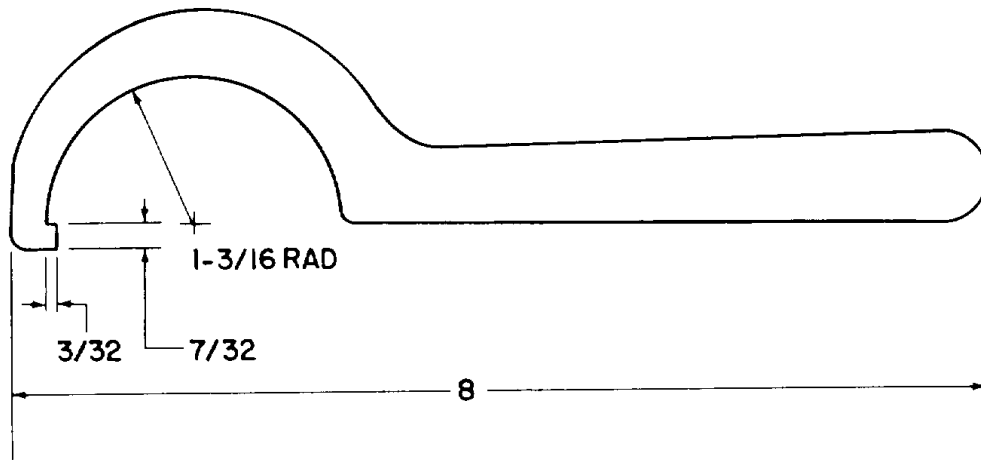


Figure 10. Improved wall target.



MATERIAL: STEEL
NOTE: ALL DIMENSIONS SHOWN ARE IN INCHES

RA PD 238855

Figure 11. Improvised hook spanner wrench.

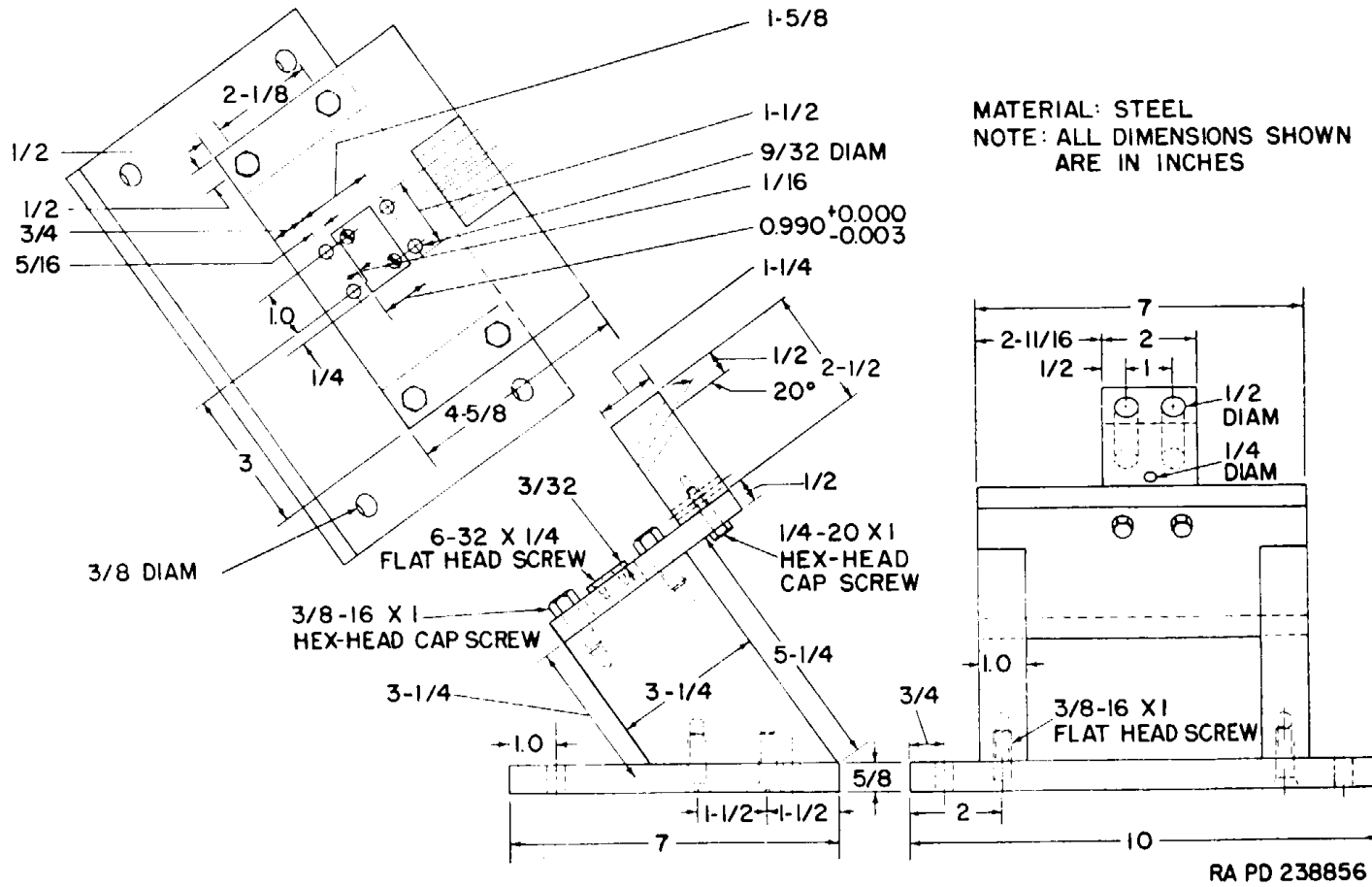


Figure 12. Improvised final inspection fixture.

CHAPTER 3

INSPECTION

Section I. GENERAL

14. Scope

This chapter provides specific instructions for the technical inspections by ordnance maintenance personnel of telescope mount M90 (T183) either in the hands of troops or when received for repair in ordnance shops. It also defines the in-process inspection of materiel during repair and rebuild and the final inspection after repair and rebuild has been completed.

15. Purposes of Inspection

Inspection is primarily for the purpose of-

- (1) Determining the condition of an item, i.e., serviceable or unserviceable.
- (2) Recognizing conditions which would cause failure.
- (3) Assuring proper application of maintenance policies at prescribed levels.
- (4) Determining the ability of a unit to accomplish its maintenance and supply missions.

16. Categories of Technical Inspections

In general, there are five categories of inspection performed by ordnance maintenance personnel:

a. Overall Inspection. This is an overall inspection performed periodically on *all* materiel in the hands of troops. It is also performed on materiel received for repair in field or depot maintenance shops. Upon completion of an inspection for serviceability, materiel will be declared either serviceable or unserviceable.

This inspection may be limited in scope, such as an inspection of materiel in the hands of troops, or detailed in scope, such as an ordnance shop inspection. Detailed procedures are presented in paragraphs 18 through 20.

b. Preembarkation Inspection. This inspection is performed on materiel in the hands of troops alerted for overseas duty to insure that such materiel will not become unserviceable or worn out in a relatively short time. It prescribes a higher percentage

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of remaining usable life in serviceable materiel to meet a specific need beyond minimum serviceability.

c. In-Process Inspection. This inspection is performed by the repair technician and or floor inspector in the process of repairing or rebuilding the materiel and its components. It insures that all parts conform to prescribed standards, that the workmanship is in accordance with approved methods and procedures, and that deficiencies not disclosed by the technical inspection are found and corrected. Detailed instructions are contained in chapter 5.

d. Final Inspection. This is an acceptance inspection performed by a final inspector after repair and rebuild has been completed, to insure that the materiel is acceptable according to established standards. Detailed instructions are contained in chapter 6.

e. Spot Check Inspection. This is a periodic overall inspection performed on only a percentage of the materiel in each unit to determine the adequacy and effectiveness of organizational and field maintenance.

17. Classification of Materiel

All ordnance materiel after inspection is classified as described in *a* and *b* below.

a. Serviceable. Serviceable property consists of all new or used supplies which are in condition for issue for the purpose intended and all supplies which can be placed in such condition through pre-issue test or inspections, in-storage deprocessing through pre-issue tests or inspections, in-storage deprocessing, installation of accessories, correction of minor deficiencies which have developed since the item was last classified as serviceable, application of modification work orders for which parts are available, or assembly of available components.

b. Unserviceable. Unserviceable property consists of all supplies which are not serviceable (*a* above). The definition of unserviceable property is further broken down into the following subclassifications: property which is unserviceable but economically repairable, and property which is unserviceable and not economically repairable.

Section II. INSPECTION OF TELESCOPE MOUNT M90 (T183) IN HANDS OF TROOPS

18. General

This section provides specific instructions for the technical inspection by ordnance maintenance personnel of telescope mount M90 (T183) in the hands of troops.

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Also, this section amplifies the general instructions contained in TM 9-1100 so far as the instructions pertain to inspection of telescope mount M90 (T183). Personnel making these inspections will acquaint themselves with the malfunctions indicated in table III, paragraph 26 which are the most common deficiencies of the telescope mount M90 (T183). In general, if the telescope mount M90 (T183) is complete and performs its intended function properly, if all modification work orders classified as urgent have been completed, and if all defects as disclosed by the inspection have been corrected, the telescope mount M90 (T183) may be considered serviceable.

19. Forms and Reports

Authorized forms and reports for technical inspections are prescribed in TM 9-1100. For additional authorized forms and reports for field and depot maintenance see paragraph 3.

20. Inspection of Mechanical Components

a. Completeness. Examine the telescope mount M90 (T183) carefully to be sure that all component parts are present. Particularly, check to see if the following items are missing: set-screws, four hex-head cap screws, and lockwashers (par. 42a); spring pin (par. 41(7)); gib (par. 41j); alinement key (par. 41d); and identification plate (par. 41k).

b. Appearance. The appearance of the telescope mount M90 (T183) indicate its general condition and reflect the type of care and treatment it has received. Visually examine for cracked or dented surfaces, bent or broken parts, fungicidal growth, moisture and corrosion, and other evidence of damage or misuse that might indicate a need for repair.

c. Functioning of Mechanical Components. Mechanical components must operate smoothly without binding or rough motion throughout their entire range. Moving parts must be free of grit and must be properly lubricated.

- (1) *Indication for cant correction.* Turn the cant correction knob clockwise until the limit of its movement has been reached. Then turn the knob counterclockwise until the limit of its movement has been reached, and note the number of turns made by the knob. There will have been at least 7 turns of the knob. The number of turns made by the knob during its range of movement will be equally divided, with at least 3 ½ , complete turns (21°) made on either side of the center or level position.

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- (2) *Backlash in cant correction mechanism.* Zero the cant correction mechanism by centering the bubble in the level vial located on the elbow telescope M92D. Place a thin pencil mark on the edge of the (movable) socket and extend this mark to the (fixed) mount. Turn the cant correction knob to the right as far as its limit of movement will permit. Then turn the knob back until the two marks line up.

Note. Be careful that the two marks do not pass each other. If the mark on the socket overshoots the mark on the mount, start the test over again.

Check and see if the bubble in the level vial is centered. If it is not, continue turning the knob until the bubble is centered. Place a second mark on the mount opposite the mark on the edge of the socket. The distance between the two pencil marks on the mount indicates the amount of backlash present in the mechanism. A difference of one thirty-second inch between the marks indicates approximate 1.0 mil backlash. The amount of backlash in the mechanism must not exceed 1.0 mil.

- (3) Movement of (azimuth) adjustment worm. With an elbow telescope M92D installed in the telescope mount M90 (T183), sight through the telescope at a vertical target line. When the azimuth adjustment (fig. 1) is rotated, it should reflect the reticle cross to the right or left of the vertical target line at least 11 mils without undue irregularities, friction, or looseness.
- (4) Movement of (elevation) adjustment worm. With an elbow telescope M92D installed in the telescope mount M90 (T183), sight through the telescope at a horizontal target line. When the elevation adjustment worm EL (fig. 1) is rotated, it should deflect the reticle cross above and below the horizontal target line at least 11 mils undue irregularities, friction or looseness.

d. Sealing. Inspect to determine whether special screw and all setscrews have been sealed.

e. Modification Work Orders All urgent modification orders must have been applied. Check on application of all authorized modifications to see that no unauthorized alterations have been made, or that work beyond the authorized scope of the unit is being attempted. No modification orders have been issued at time of preparation of this manual; however, check the index in DA Pam 310-4 and the current modification work order files for any modification work orders promulgated subsequently.

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f. Identification Plate. Inspect numbers and lettering on the identification plate to see that they are clearly defined and easily read. Inspect lettering AZ and EL on the mount to see that they are clearly defined.

g. Paint and Finish. Inspect for bare spots or damaged finish which expose base metal surfaces and lead to corrosion. Determine whether condition of surface warrants touchup or complete refinishing. Refer to TM 9-2851.

h. Lubrication. Bearing surfaces and other movable parts will be clean, properly lubricated, and free from rust and other foreign matter. Check to see that the materiel is properly lubricated in accordance with the lubrication instructions in paragraph 33. See TB 9-2835-1.

i. Mounting Surface. The mounting surface of the mount will be free of corrosion and will not be damaged in any way that will prevent proper seating of the telescope mount on the primary mount of the weapon. Even small nicks or burs should be cause for rejection.

j. Cracks. The bronze casting of the telescope mount should be inspected for cracks and breaks.

Section III. ORDNANCE SHOP INSPECTION

21. General

Technical inspection performed by the ordnance repair shop upon receipt of materiel turned in for repair determines the extent of repairs required, and provides the basis for requisitioning the parts, assemblies, or supplies necessary to accomplish the repairs. Often this inspection in the shop may be the same as that performed by inspectors in the field. It may disclose additional necessary repairs not indicated by the using organization during the field inspection. Refer to TM 9-2602 and FM 9-10 for additional information on inspection.

22. Inspection

The instructions given for the inspection of telescope mount .M90 (T18'3) in the hands of troops (pars. 18 through 20) are pertinent also to ordnance shop inspection. Refer to paragraph 26, table III, for specific malfunctions, their possible causes, and corrective measures that may be encountered during inspection. The ordnance shop inspector will refer to paragraphs 43 through 49 for specific tests that can be made during ordnance shop inspection.

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Section IV. PREEMBARKATION INSPECTION

23. General

Inspection for outward appearance of the telescope mount M90 (T183) is of importance as well as inspection of mechanical condition. Where any doubt exists as to the utility of the telescope mount M90 (T183), that telescope mount must be replaced by a truly serviceable item. Equipment, when inspected, must approach new equipment standards of operation and appearance, and the workmanship and quality of the end product must reflect the highest standards obtainable. To assure that all items, so far as practicable possess original appearance, it is desired that items normally painted be repainted if the painted surfaces show signs of damage.

24. Inspection

a. General. The specifications, standards, and operations intended as a guide to insure satisfactory performance and acceptability of the telescope mount M90 (T183) are indicated in paragraphs 17 through 20.

b. Modification Work Orders. All modifications indicated in paragraph 20e other than those designated as optional must have been applied. For those modifications not yet accomplished, requisitions will be submitted to the appropriate agency for the necessary material to be forwarded to the unit when available.

c. Moisture Proofing and Fungus Proofing. No moisture proofing or fungus proofing, other than painting of outside surfaces, is required for this equipment.

CHAPTER 4
TROUBLESHOOTING

25. Purpose

Troubleshooting is the systematic isolation of defective components by means of symptoms, tests to determine the defective components, and application of remedies. The scope of the level of ordnance maintenance will govern the tests and remedies which may be applied.

26. Procedure

The troubleshooting procedure described in table III is one of determining, upon occurrence of malfunctions noted, the probable cause, then taking the necessary corrective action.

Table III. Troubleshooting

Malfunction	Probable causes	Corrective action
Backlash in cant correction mechanism exceeding 1.0 mil.	Loose ball cap ----- (par. 45c). Drive worm ball out of round. Ball socket not seated properly. Drive worm excessively worn or damaged. Setscrews too tight against ball cap or ball socket. Teeth of socket excessively worn or damaged . Loose 2.0-inch OD retainer. Worn or damaged worm plunger. Weak compression spring. Ball cap too tight -----	Tighten loose ball cap Replace drive worm (pars. 39c and 41i). Reseat ball socket in mount (par. 41i). Replace drive worm (pars. 39c and 41i). Loosen setscrews slightly (par. 41i). Replace socket (par. 41f). Tighten 2.0-inch OD retainer. Replace worm plunger (par. 41i). Replace compression spring (par. 41i). Adjust ball cap (par. 45c).
Binding in cant correction mechanism.		

Malfunction	Probable causes	Corrective action
Cant correction knob does not correct for 21° (approximately 3 ½ , turns) cant right or left.	<p>Bent drive worm-----</p> <p>Setscrews too tight against ball cap and ball socket.</p> <p>2.0-inch OD retainer too tight.</p> <p>Dirty and/or unlubricated parts.</p> <p>Improper assembly -----</p>	<p>Straighten (par. 31) or replace drive worm (par. 41i).</p> <p>Loosen setscrews slightly (par. 41i).</p> <p>Loosen 2.0-inch OD retainer.</p> <p>Clean (par. 32) and lubricate (par. 33) parts.</p> <p>Check assembly (par. 41).</p>
Binding or rough motion of bore sighting adjustment worms.	<p>Gear teeth jammed by a foreign body or by nicks and burs.</p> <p>Gear teeth jammed by a foreign body or by nick; and burs..</p>	<p>Disassemble drive worm (par. 39c) and socket (par. 39d), scrape or file nicks and burs (par. 28c), clean (par. 32), lubricate (par. 33), and assemble (par. 41).</p> <p>Disassemble adjustment worms and worm gears (par. 39d), scrape or file nicks and burs (par. 28c), clean (par. 32), lubricate (par. 33), and assemble (par. 41).</p>
<p>Erratic motion of bore sighting adjustment worms as observed through elbow telescope M92D).</p> <p>Telescope mount does not fit snugly on rear bracket.</p>	<p>Worn gimbal shoes -----</p> <p>Loose or worn gib-----</p>	<p>Disassemble (par. 39d) and replace shoes (par. 41f)</p> <p>Tighten (par. 42a) or replace gib (par. 41j)</p>
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CHAPTER 5
REPAIR AND REBUILD

Section I. GENERAL MAINTENANCE

27. General

a. Information and instructions contained herein are supplementary to instructions for the using organization contained in TM 9-3058.

b. This chapter contains general and specific maintenance instructions for the repair and rebuild of each major component. In the following sections specific adjustments, repairs, and rebuild procedures are described in order to restore each major component to a serviceable condition.

28. General Methods

It is the responsibility of the shop foreman to exercise constant care at all times to see that the proper tools are used and that the correct shop procedures are followed. In-process inspection will be constantly made during repair and rebuild, since final acceptance of the assembled materiel depends largely upon the care exercised in process. General maintenance producers are as indicated in a through *g* below.

a. Tools. Use only tools that fit snugly on parts. Tools that do not fit will fail or cause damage to the corners of bolt heads, nuts, screws, etc.

b. Preparation for Repair Work. When repairing instruments, clean oil, grease, and dirt from the parts in order to avoid soiling individual parts and cleaned subassemblies. If a replacement is indicated salvage all serviceable parts from rejected subassemblies.

c. Handling of Disassembled Parts. A parts tray or suitable receptacle should be provided so that parts, as removed, can be placed in their respective positions in relation to the assembled telescope mount M90 (T183). Large assemblies or housings should be placed on a clean, dry work bench and carefully located so as to prevent loss or breakage. Always keep the relative position of parts until the telescope mount M90 (T183) is completely assembled. This is especially important where the materiel is

assembled by a technician other than the one who disassembled it.

When parts are to remain disassembled for any length of time, keep bare metal surfaces clean and free of rust. Clean these surfaces with dry-cleaning solvent or mineral spirits paint thinner, wipe dry, and apply a light film of aircraft instrument lubricating oil. Before assembling parts, wipe off this oil, clean the parts with dry-cleaning solvent or mineral spirits paint thinner, and lubricate in accordance with the instructions given in paragraph 33.

d. Scribing and Marking Metal Parts. As each part is removed, its exact position in relation to the assembly should be established by suitably scribed reference marks if it is necessary to return it to its exact original position. A straightedge and a scribe should be used for scribing. Never scribe marks on threads or bearing surfaces. A straight edge and a pencil should be used for marking threads and bearing surfaces.

e. Removal of Burs. Burs should be removed with a stone or fine file. Where burs are apparent on closely fitted mating surfaces, they can be removed by lapping the surfaces with abrasive grade pumice. If burs appear on threaded surfaces, go over damaged threads with a thread chaser.

f. Removal of Corrosion or Rust. All metal parts should be inspected for corrosion or rust.. If corrosion or rust is found, the part should be polished immediately with crocus cloth and coated with a light film of aircraft instrument lubricating oil.

g. Removal of Broken Screws or Bolts. If the screw or bolt is broken above the surface, it may be possible to slot it with a swiss-pattern file or hacksaw and remove it with a screwdriver. If the screw or bolt is broken below the surface, drill a hole in the center of the broken screw and remove it with a screw extractor.

Caution: Use a drill small enough so that the threads are not damaged in the part from which the broken screw is being removed.

29. Removal of Setscrews

a. General. Mechanical components are frequently locked in position by the use of setscrews. Disassembly of components without removing these setscrew one of the greatest causes of damage to fire control instruments. It is, therefore, necessary, before the removal of any parts of the telescope mount 90 (T183), to determine the presence of setscrews by reference to the pertinent disassembly instructions and illustrations.

b. Removal of Undamaged Setscrews. When a setscrew is to be removed, it may be necessary to dig out or scrape off dirt or

covering paint. A sharpened piece of hard wood or brass wire are good tools for this purpose. Do not use a jeweler's screwdriver as this action may damage both the screwdriver blade and the threads in the screw hole. When the head of the setscrew can be seen, insert a screwdriver of the proper size and remove the setscrew.

c. Precautions. If the setscrew will not back out when normal pressure is applied with the screwdriver, do not force it. It may have been sealed in position with orange shellac, varnish, or another fixing agent. If so, apply a few drops of alcohol to the setscrew head and allow it to soak for a few minutes. Again insert the screwdriver and exert a slight back-and-forth pressure. Repeat this process until the setscrew can be removed by normal pressure.

d. Removal of Damaged Setscrews.

(1) If the slot of a setscrew below the surface is damaged and the setscrew is not too small, it may be possible to drill a small hole in it and remove it with a screw extractor. If the setscrew is near the surface, it may be possible to slot it sufficiently with a swiss-pattern file or other sharp-pointed instrument, and remove it with a jeweler's screwdriver, thus saving time that would be spent in drilling.

(2) If the setscrew can not be removed as in (1) above, the best method, usually, is to drill out the setscrew and tap the hole for the next larger size setscrew. If this is to be done, set up the part to be drilled in a firm position on a drill press, with the drill parallel to the setscrew hole, and carefully drill out the setscrew. It is good practice to use the tap drill of the next larger setscrew that is to be used as a replacement.

(3) A setscrew that can be turned but which does not back out indicates a stripped thread condition. It may be possible to back out the setscrew if the part held in place by the setscrew can be turned enough to put slight stress on it, thus allowing those threads still undamaged to engage. It may then be possible to work the setscrew out of the hole.

e. Staking. Staking is a process employed to secure two parts together by striking one of the parts, adjacent to the part to be locked in position, with a center punch and hammer. This forces surface metal against the part, thereby locking it in position. Staking should be accomplished with as light taps of the hammer as possible, but with a heavy enough blow to prick the work and bring the metal to the desired shape. Staking is frequently used

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to lock setscrews in position, and should be looked for if a setscrew will not back out easily

30. Drilling and Tapping for Setscrews

Drilling and tapping of setscrew holes is sometimes necessary after an instrument has been adjusted. Drill and tap size must be determined by checking the dimensions of the setscrew in ORD 9 SNL F-392. Whenever a hole is drilled and tapped, remove all burrs and chips from the parts before final assembly. When drilling a shallow seating hole for a securing screw, use a drill slightly smaller than the inside diameter of the setscrew hole. Do not drill clear through the part in which the setscrew seat is being made. Just a touch of the drill will be sufficient. When the threads in the setscrew hole are damaged, tap with the proper sized tap.

31. Worm and Worm Gear Mechanisms

a. General. The worm and worm gear principle is used in telescope mount M90 (T183) as a means of rotating the socket for cant correction. Figure 13 illustrates a typical worm and worm gear mechanism. Note that lateral movement of the worm is prevented by the worm ball cap which is threaded for adjustment, and that the worm is held in mesh by a spring and plunger arrangement on one end. Before proceeding with any maintenance work in connection with this type of mechanism, all maintenance work for the worm, as outlined in *b* below, must have been performed.

b. Maintenance of Worm. For a worm to operate properly, it must be absolutely true and straight so as to prevent the worm from being thrown off center at each revolution and causing a binding action in the worm and worm gear mechanism. If such binding occurs, it is frequently due to a bend or, more often, several bends in the worm. In such cases, the entire worm should be replaced. However, it may sometimes be necessary to try to locate and straighten these bends. No specific procedure can be outlined. Generally, the entire length of the worm must be continually tested during the straightening process, and straightened to a point where the worm thread will be no more than 0.001 inch off center when the worm is rotated in its bearings. Care must be taken to avoid damaging the worm thread or any of the bearing surfaces, while straightening the worm.

c. Maintenance of Ball. The worm ball plays an important part in obtaining a smooth, nonbonding movement free from backlash, and the ball, therefore, must be perfectly round. An out-of-round ball provides a poor bearing surface and will cause

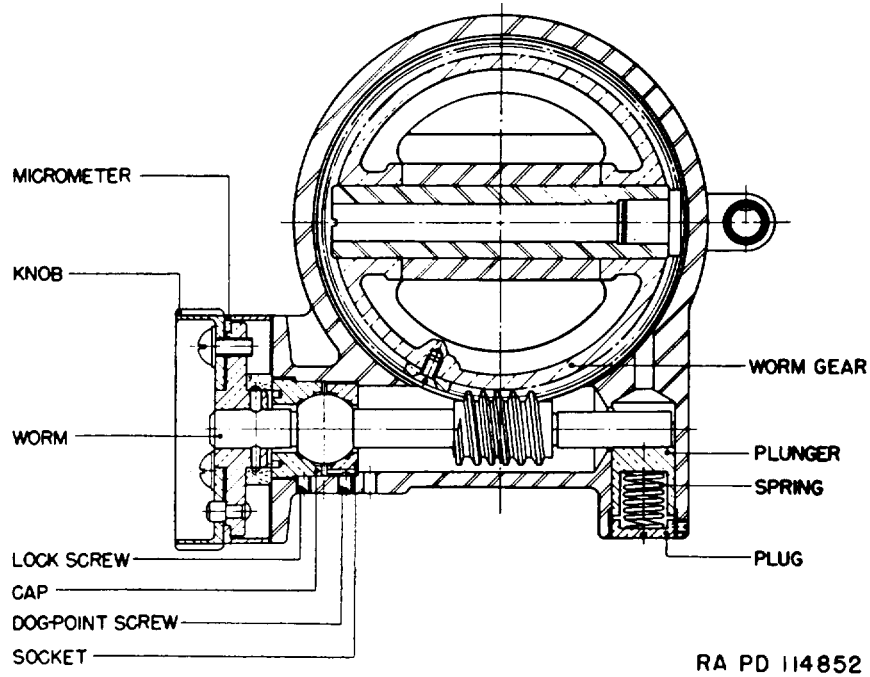


Figure 13. Typical worm and worm and gear mechanism.

binding in the throw out mechanism, besides being a source of backlash trouble. To true an out-of-round ball (when a replacement part is not available) without removing an excessive amount of metal, use a ball truing tool as shown in figure 14.

d. *Fitting Plunger to Housing.* The plunger must fit in the housing without any side play. If it fits loosely, the worm will have side play which will appear as backlash. In order to facilitate handling of a new plunger, when fitting, select a piece of brass or steel rod, a little larger in diameter than the spring hole in the plunger, and turn a slight taper on the end of it. Then force the plunger tightly on the rod. The rod must not turn within the plunger. Lap the plunger in the housing so that the plunger will be free enough to move smoothly up and down when a slight finger pressure is exerted against it.

c. *Fitting Plunger to Worm.*

(1) The worm must fit in the grooved surface of the plunger without any side play. If side play is present, this will appear as backlash, as in the case of a loose fitting plunger. Before lapping in, relieve the central portion of the grooved surface. This is done so that the worm

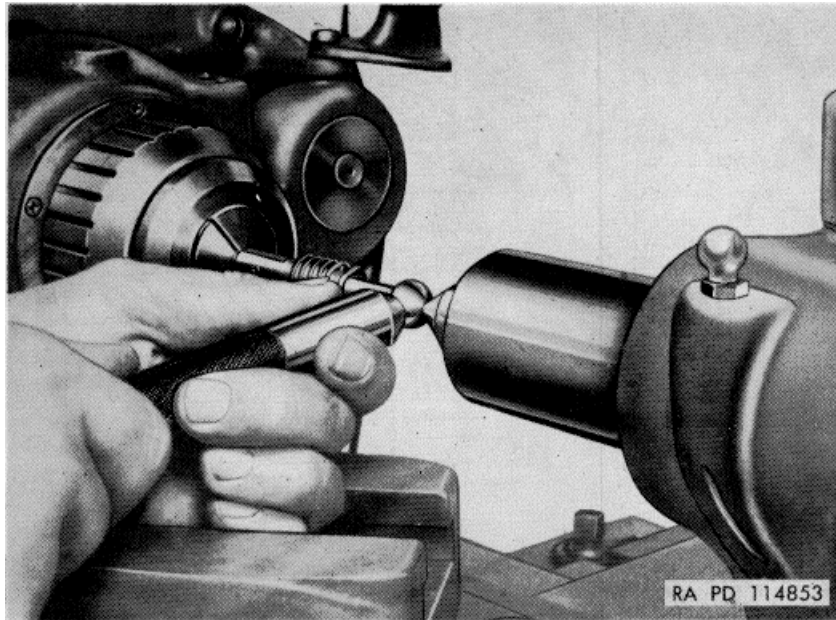


Figure 14. Use of ball truing tool

will itself in deeper, reducing the possibility of developing side play.

(2) Mount the worm in the housing and adjust the ball cap so that there will be no end play in the worm. Apply a thin coating of lapping compound (fine abrasive grade pumice) to the plunger's grooved surface and then insert the plunger into the housing. Insert the plunger spring. Screw in the plug until it is flush with the surface of the housing. Lap in by turning the worm a few turns in each direction. Remove the plunger and clean it in solvent so that the grooved surface can be observed. Lap until there is complete contact of the worm in the grooved surface of the plunger and worm and clean parts thoroughly. Assemble into housing and check for side play.

f. Fitting Worm to Worm Gear Segment.

(1) Before lapping is started, always clean the parts thoroughly and examine the teeth for nicks, burs, and sharp edges. If a new worm is to be installed, place the worm in a lathe chuck, and with the lathe running at slow speed, file a slight radius on the corners of the worm thread whether a new or old worm is used, it is

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always best to check the gear mesh before lapping is started. Wipe a fine coat of Prussian blue on the worm thread and assemble the instrument. Turn the worm over the entire range of movement and then disassemble. Check for high spots, bottoming, etc. Scrape off the high spots. If an old Worm is bottoming in the worm gear segment, set the worm up in a lathe and turn off about 0.010 inch from the outside diameter of the worm thread. Recheck to insure that the worm is not bottoming on the gear segment

(2) If a new bottoms in the worm gear segment, then the teeth of the worm gear segment are worn excessively and a new socket should be installed. When the bearing of a new worm on an old worm gear segment is checked, it may be found that the new worm is riding on the corners of the worm thread, because the old worm had a larger radius on the corners. Do not increase the radius on the new worm. Examine the corners of the teeth of the worm gear segment. If there is a visible ridge, scrape it off with a three-cornered scraper. If no ridge is visible, proceed to lap in the worm until an even, smooth movement is obtained and the bearing is shown on the sides of the teeth of the worm and worm gear segment. lapping worm and segment, better results will be obtained by removing the spring behind the plunger and installing a solid plug. In this manner, any minute high spot which might be rolled over will be removed, thus increasing the perfection of the fit. After lapping is finished, place the worm in a lathe and increase the radius on the corners of the worm thread. This is done so that, as the movement wears, the worm move in without developing a bearing on the corners of the thread. A corner bearing will prevent the worm from moving into proper mesh, and backlash will develop

32. Cleaning

a. *General.* Use dry-cleaning solvent or mineral spirits paint thinner to clean or grease or oil from all metal parts of the telescope mount M90 (T183). For general information regarding cleaning materials and services, refer to TM 9-8501.

b. *General Precautions in Cleaning.*

(1) Dry-cleaning solvent and mineral spirits paint thinner are inflammable and should not be used near an open

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materials are used. Use only in well ventilated places. In addition, they evaporate quickly and have a drying effect on the skin. If used without gloves, they may cause cracks in the skin and, in the case of some individuals, a mild skin irritation or inflammation.

- (2) The use of Diesel fuel oil, gasoline, or benzene (benzol) for cleaning is prohibited.
- (3) Avoid getting petroleum products, such as dry-cleaning solvent or mineral spirits paint thinner, on rubber parts as the petroleum product will deteriorate the rubber.

33. Lubrication

a. General. Lubrication of the telescope mount M90 (T183) should be performed very carefully as even a very slight amount of overlubrication will often render an item unfit for use. Excess lubricant may congeal and render close fitting parts inoperative. Lubricants for the telescope mount M90 (T183) function also as rust preventives. It is important that they be applied carefully. It is essential that all parts to be lubricated be cleaned thoroughly prior to the application of the lubricant as corrosion may develop under grease if all foreign matter has not been removed. Specific lubrication instructions are contained in the assembly section.

b. Grease. For all parts of the instrument for which grease has been indicated in the pertinent assembly instructions, aircraft and instruments grease will be used. Grease will normally be applied to all bearing or contact surfaces which move relative to one another and to all unprotected metal surfaces even though they are not working surfaces.

c. Oil. When a general purpose oil is required use aircraft instrument lubricating oil. Oil will normally be used to treat bare metal surfaces when parts are to remain disassembled for any length of time. The only use of oil during assembly is to lubricate felt washers by dipping.

34. Sealing With Class I Noncuring Sealing Compound -52-C-3258-500

All setscrews must be sealed with class I noncuring sealing compound -52-C-3258-500 after the telescope mount M90 (T183) has been repaired, assembled, and adjusted. The surfaces to which the noncuring sealing compound will be applied must be thoroughly cleaned before the sealing operation, since the presence of dirt, grease, or oil reduces adhesion of the compound.

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35. Painting

Paint all exposed surfaces so that the equipment will have the appearance of a new item. Refer to TM 9-2851 for detailed information on painting.

36. Identification Plate

If the identification plate becomes illegible, it must be cleaned and the background filled in.

Section II. DISASSEMBLY, REBUILD, AND ASSEMBLY

37. General

In this section, specific instructions and procedures are given for the disassembly, rebuild, and assembly of the telescope mount M90 (T183) in order to restore each major component to its serviceable condition.

38. Removal of Telescope Mount M90 (T183) from Rear Bracket

a. General. If the elbow telescope M92D is secured in the telescope mount M90 (T183), remove the telescope, as outlined in *b* below before attempting to remove the mount.

b. Removal of Elbow Telescope M92D. Support the telescope with one hand (fig.15), while using the other hand to unscrew the round nut that secures it to the telescope mount. Turn the round nut counterclockwise to unscrew it. When free, remove the telescope from the mount.

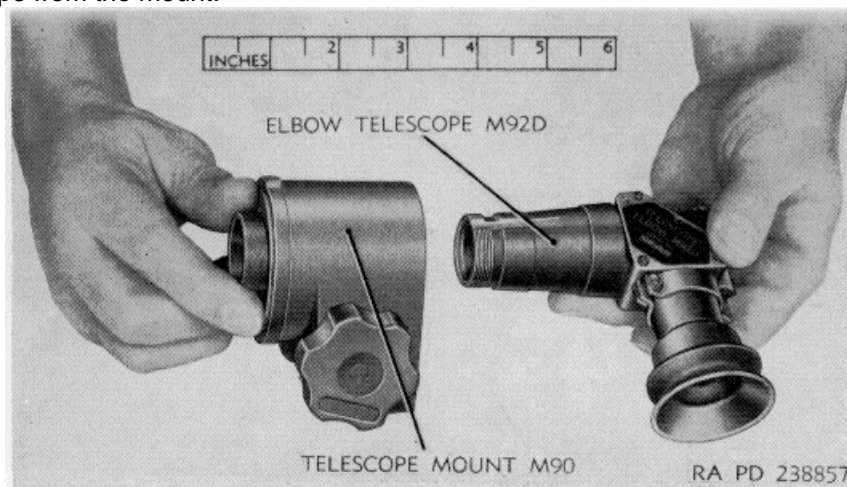


Figure 15. Removal of elbow telescope M92D from telescope

c. *Removal of Telescope Mount M90 (T183).* Remove the four hex-head cap screws and lockwashers (fig. 16) that secure the telescope mount M90 (T183) to the rear bracket of the weapon. To free the mount, loosen the special dog-point setscrew that locks the gib, located in the base of the mount, to the integral key plate on the mounting pad of the rear bracket, then lift the mount off the bracket.

39. Disassembly of Telescope Mount M90(T183)

a. Remove the two fillister-head screws and lockwashers (fig.16), and then remove the identification plate from the mount.

b. Remove the gib (fig. 16) from its slot in the base of the mount by taking out the special dog-point setscrew 8299676, the slotted end of which is located just below the identification plate.

Note. On later models, special dog-point setscrew 8299750 (inset, fig. 16) is used. Before this setscrew can be removed, it must be released by reaching into a slot adjacent to the gib slot in the base of the mount, and removing the snap ring 587547 from the setscrew. The setscrew can then be removed, thus freeing the gib.

c. To disassemble the drive Worm (fig. 16) and related parts, proceed as outlined in (1) through (5) below.

- (1) Drive out the spring pin that secures the (cant correction) knob to the drive worm, and remove the knob and felt washer from the end of the drive worm.
- (2) Remove the flat-point setscrew that secures the slotted plug, then unscrew and remove the plug, compression spring, and worm plunger.

Caution: As the plug is unscrewed, spring pressure may cause plug and spring to fly out unless care is taken to prevent it.

- (3) Remove the flat-point setscrew that secures the ball cap, and the special dog-point setscrew that secures the ball socket.
- (4) Using adjustable spanner wrench 41-W-3248-125 (fig. 3) remove the ball cap (fig. 16).
- (5) Unscrew and remove the drive worm, and slip the ball socket off the worm.

d. To disassemble the socket and related parts, proceed as outlined in (1) through (12) below.

- (1) Remove the two special dog-point setscrews that secure the two adjustment worms (fig. 16), then back out and remove the worms.
- (2) Using the improvised hook spanner wrench (fig. 11), remove the lockout (fig. 16) from the retainer.

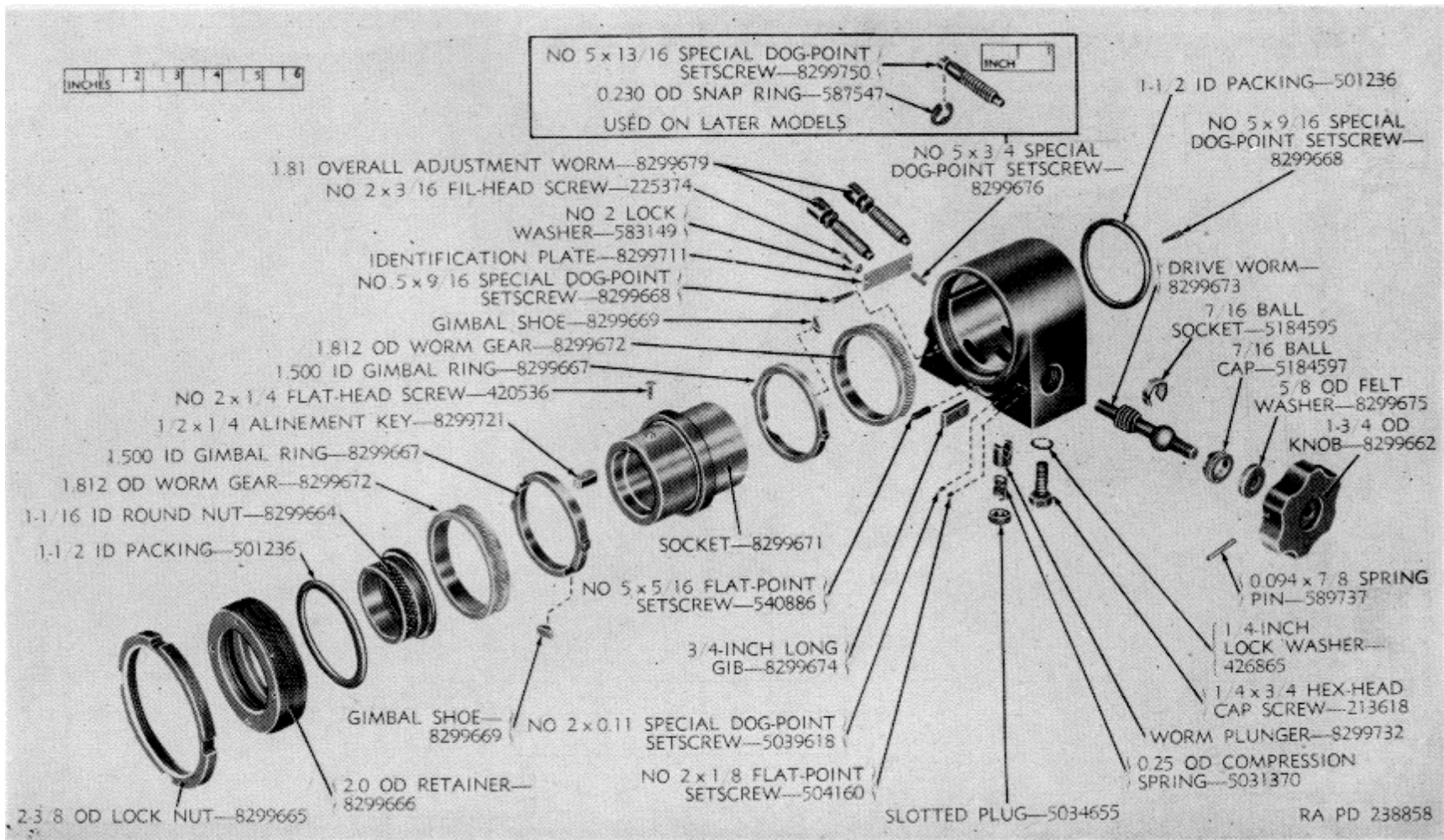


Figure 16. Telescope mount M90 (T183) -exploded view.

- (3) Using adjustable spanner wrench 41-W-3248-125 (fig. 3), remove the retainer (fig. 16) from the mount. This will release the round nut. Pry the packing out of its channel in the retainer.
- (4) With the mount (fig. 16) turned on its back so that the socket is in a vertical position, use finger pressure from the rear of the mount to ease the socket up out of the mount far enough to permit removal of the (elevation) worm gear and (elevation) gimbal ring.
- (5) Mark (par. 28*d*) both the (elevation) worm gear and socket. Then lift the worm gear off the socket. Do this carefully so as not to disturb the gimbal shoes on which it rests.
- (6) Mark (par. 28*d*) both the gimbal shoes while in their indents in the (elevation) gimbal ring and the gimbal ring itself, then remove the shoes.
- (7) Mark (par. 28*d*) the (elevation) gimbal ring and the mount, then remove the gimbal ring from the mount.
- (8) Turn the assembly upside down so that it now rests on the protruding socket, and then carefully ease the mount up wards just enough to make the (azimuth) gimbal ring accessible. Mark (par. 28*d*) the gimbal ring and the mount.
- (9) Continue to ease the mount upwards until it can be removed from the socket. Do this very carefully so as not to disturb the gimbal shoes on the (azimuth) gimbal ring.
- (10) Follow the marking and removal procedures given in (5), (6), and (7) above to remove the (azimuth) gear, gimbal shoes, and the (azimuth) gimbal ring from the socket.

Note. The procedures in (5) through (10) above, must be performed with great care, otherwise the gimbal shoes may drop out before they can be marked. Since their fit is critical (par.41*f*), they must be assembled in exactly the same gimbal ring indents from which they came. Also, the gimbal rings must be so marked that they can be assembled in the mount in exactly the same relative positions.

- (11) Remove the alignment key (fig. 16) from the bore of the socket by removing the flathead screw that secures it to the socket.
- (12) Pry out the packing from its channel at the end of the bore of the mount.

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40. Rebuild

All rebuild instructions are adequately described in paragraphs 27 through 36. Before proceeding with assembly, make sure that all parts are serviceable. Clean (par. 32) and inspect all mechanical parts to determine that they are free of corrosion, rust, dents, cracks, chips, burs, and damaged threads. Replace or repair all defective parts.

41. Assembly of Telescope Mount M90 (T183)

a. Inspect the mount (fig. 16) for serviceability (par. 17), with particular attention to the mounting surfaces of the base and the shoulder opposite the $\frac{3}{4}$ -inch long gib. These surfaces must be free from even the most minute nicks and burs. File and/or lap as necessary. If the base mounting surfaces are badly nicked or scored, replace the mount. Refer to paragraph 32 and thoroughly clean the mount accordingly. Apply a light film of aircraft and instruments grease to all unpainted surfaces. Insert the 1 $\frac{1}{2}$ inch ID packing into its channel in the bore of the mount.

b. Carefully examine the 1 $\frac{1}{2}$ -inch ID packing (fig. 16) to determine whether it is serviceable. If the packing is torn, damaged, or unfit for its intended purpose, replace the packing. Refer to paragraph 32 and thoroughly clean the packing accordingly. Insert the 1 $\frac{1}{2}$ -inch ID packing into its channel in the bore of the mount.

c. Inspect the socket (fig. 16) for signs of wear, as outlined in (1) and (2) below.

(1) The most critical wear points on the socket are the sides of the external collar. These sides must be parallel to each other within 0.005 inch full indicator reading. Laps as necessary to achieve this tolerance.

(2) Check the teeth of the gear segment for signs of wear. If signs of wear are found, proceed as outlined in paragraph 31f.

d. Lightly grease (par. 33) both the socket and the $\frac{1}{2}$ x $\frac{1}{4}$ alignment key (fig. 16) and assemble the key in the keyway in the bore of the socket and secure the key to the socket with a No. 2x $\frac{1}{4}$ 14 flathead screw.

e. Inspect the 1.500-inch ID gimbal rings (fig. 16) and 1.81 inch OD worm gears for signs of wear and adherence to tolerances as outlined in (1) and (2) below.

(1) The faces of the gimbal ring must be parallel to each other within 0.001 inch full indicator reading. If this requirement cannot be met, replace the gimbal ring. (2) The numbered face of each worm gear is square with the axis of the circular pitch of the gear teeth. The

opposite face is machined at an angle of 0', 45 minutes, plus or minus 0°. 1 minute to the numbered face. As a result of this requirement, the maximum thickness of the worm gear is 0.324 inch. At a point 180° from the maximum point, the minimum thickness is 0.300 inch. Use a micrometer to check these dimensions. If the maximum and minimum micrometer readings do not check the above figures, replace the worm gear.

f. Refer to paragraph 32 and thoroughly clean both 1.500-inch ID gimbal rings (fig. 16), both 1.812-inch OD worm gears, and all four gimbal shoes. Apply a light film of aircraft and instruments grease (par. 33) to all unpainted surfaces. Then, proceed to assemble the socket and related parts as outlined in (1) through (12) below.

- (1) With the socket (fig. 16) in a vertical position on the bench, larger internal diameter upward, assemble the (azimuth) gimbal ring over the end of the socket in accordance with the marks made during disassembly (par.39d), so that the flat side of the gimbal ring rests on the shoulder of the socket.
- (2) Assemble the proper pair of gimbal shoes (fig.16) in the gimbal ring indents in accordance with the marks made during disassembly (par. 39d).

Note. If gimbal shoes must be replaced, the following critical requirement must be met before replacement shoes are assembled. With the gimbal ring laid flat side down on a surfact plate, two gimbal shoes are installed in the gimbal ring indents. A straightedge laid across the flat surfaces of the shoes must be parallel to the opposite (flat) side of the gimbal ring within 0.001 inch full indicator reading. Lap shoes if necessary to meet this requirement, then mark (par.28d) both shoes and the gimbal ring and proceed to assemble them as previously mentioned.

- (3) Assemble the 1.812-inch OD (azimuth) worm gear (fig.16) over the end of the socket in accordance with the marks made during disassembly (par. 39d), so that the bearing or angled surface (e (2) above) rests on the gimbal shoes.
- (4) Inspect the mount (fig. 16) as outlined in a above, and assemble it over the socket just far enough to retain the gimbal shoes in place.

Note. Perform this operation very carefully, or the gimbal shoes will drop out of place.

Then set the mount down on the bench so that the socket projects vertically upward the mount.

- (5) Rotate the (azimuth) gimbal ring around the socket until its lugs are aliened with the slots in the bore of the

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mount, in accordance with the orientation marks made during disassembly (par. 39d). Push the socket into the bore of the mount far enough to engage the lugs of the gimbal ring in the slots.

(6) Assemble the 1.500-inch ID (elevation) gimbal ring (fig. 16) over the end of the socket so that its flat side bears against the shoulder of the socket.

(7) Assemble the proper pair of gimbal shoes in the gimbal ring indents in accordance with the marks made during disassembly (par. 39d).

Note. If replacement gimbal shoes are being installed, proceed as indicated in (2) above.

(8) Rotate the (elevation) gimbal ring around the socket until its lugs are aligned with the slots in the bore of the mount, in accordance with the orientation marks made during disassembly (par. 39d). Push the socket into the mount just far enough to engage the lugs of the gimbal ring in the slots.

(9) Assemble the 1.812-inch OD (elevation) worm gear (fig. 16) over the end of the socket, in accordance with the marks made during disassembly (par. 39d), so that the bearing or angled surface rests on the gimbal shoes.

(10) Now push the socket completely home into the bore of the mount, taking care that the (elevation) worm gear follows into the bore and seats properly on the gimbal shoes.

Note. Perform this operation very carefully, otherwise the gimbal shoes may be displaced.

(11) Carefully examine the 11/16-inch ID round nut (fig. 16) to determine whether it is serviceable. If there is corrosion, rust, dents, cracks, chips, nicks or burs, or damage to the internal threads or to the shoulder, replace or repair the defective part. Refer to paragraph 32 and thoroughly clean the round nut accordingly. Apply a light film of aircraft and instruments grease (par. 33) to all unpainted surfaces, excluding the knurled part. Place the round nut against the end of the socket with its shoulder in contact with the socket.

(12) Determine, after careful examination, whether the 2.0-inch OD retainer (fig. 16) is serviceable. If there is corrosion, rust, dents, cracks, chips, nicks or burs, or damage to the threads or bearing surfaces, replace or repair the defective part. Refer to paragraph 32 and thoroughly clean the retainer accordingly. Apply a light film of aircraft and instruments grease (par.33) to all

unpainted surfaces. Insert the 1½-inch ID packing into its channel in the bore of the retainer. Place the retainer over the 11/16-inch ID round nut and screw it, by hand, into the mount in order to secure the socket and its related parts in place.

g. Before proceeding further with assembly, the torque of the socket must be adjusted as outlined in (1) through (6) below.

(1) Install the improvised telescope holder (fig. 7) in the socket of the telescope mount, as thus far assembled.

Note. This improvised telescope holder is designed to simulate the body of an elbow telescope M92D, and it is installed in the socket in the same manner as an elbow telescope M92D (par. 42 b).

(2) Turn the improvised telescope holder's handle back and forth several times to check for smooth movement of the socket. If the movement is not smooth, check for improper assembly of the socket, dirt, and or lack of lubrication.

(3) Using a torque wrench applied to the square socket on the end of the improvised telescope holder, check the torque of the socket, for a reading between 15 and 20 inch-pounds.

Note. If this reading is not obtained, then, using the adjustable spanner wrench 41 W-3248-125 (fig. 3), tighten or loosen the 2.0-inch OD retainer (fig. 16) until a torque reading of between 15 and 20 inch-pounds is obtained.

(4) Again work the improvised telescope holder's handle back and forth several times to check for smooth movement of the socket, then make a final check on the torque reading.

(5) After the correct torque reading and smooth movement have been obtained determine, after a careful examination _whether the 2 3/8 -inch OD locknut (fig. 16) is serviceable. If there is corrosion, rust, dents, cracks, chips, nicks or burs, or damage to the threads or bearing surface, replace or repair the defective part. Thoroughly clean (par.32) and then apply a light film of aircraft and instruments grease (par.33) to the locknut. Screw the locknut onto the 2.0-inch OD retainer. Tighten the locknut with the improvised hook spanner wrench (fig.11).

(6) While observing through the hole in the mount which accommodates the (drive worm (fig. 16), turn the socket by means of the improvised telescope holder's handle until the gear segment cut in the shoulder of the socket

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faces toward the base of the mount, ready for engagement with the drive worm, then remove the improvised telescope holder from the socket.

h. Carefully examine the two 1.81-inch overall adjustment worms (fig. 16) to determine whether they are serviceable. If there is corrosion, rust, dents, cracks, chips, nicks or burs, or damage to the threads, replace or repair the defective worm. Thoroughly clean (par. 32) and then apply a light film of aircraft and instruments grease (par. 33) to the adjustment worms. Insert the two adjustment worms in the AZ and EL holes of the mount and, using a screwdriver, run them in till they will not penetrate the mount any further. Secure them to the mount with two No. 5 x 9/16 special dog-point setscrews.

i. To assemble the drive worm (fig. 16) and related parts, proceed as outline(I in (1) through (7) below.

(1) Refer to paragraph 31 for correct worm maintenance procedures and to determine that the worm is straight and true, the ball not out of round, and that the teeth of the worm are not excessively worn, bent, or burred. Thoroughly clean (par. 32) and then apply a light film of aircraft and instruments grease to the drive worm.

(2) Thoroughly clean (par. 32) the 7/16-inch ball socket (fig. 16) and then apply a light film of aircraft and instruments grease. Place the ball socket between the ball and the worm thread of the drive worm, concave side facing the ball.

(3) Insert the drive worm with ball socket into the mount so as to engage the threads of the worm with the gear segment of the socket. By hand, screw the drive worm into the mount as far as it will go.

(4) Reach into the mount with a pointed instrument and turn the 7 16-inch ball socket on the drive worm until the notch on the outside diameter of the ball socket is alined with the setscrew hole in the mount. Then secure the ball socket to the mount with the No.2 x 0.11 special dog-point setscrew (fig. 16).

Note. Exact alinement of the ball socket within the mount is important because the dog-point of the setscrew must engage the notch in the ball socket.

(5) Thoroughly clean (par. 32) the 7/16-inch ball cap (fig.16) and then apply a light film of aircraft and instruments grease. Using the adjustable spanner wrench 41-3248-125 (fig. 3), screw the ball cap into the mount, but do not tighten it.

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Note. After tests and adjustments (par. 45c), the ball cap will be secured to the mount with a No.2 x 1/8 flat-point setscrew.

(6) Thoroughly clean (par.32) the worm plunger (fig.16), 0.25-inch OD compression spring, and the slotted plug. Apply a light film of aircraft and instruments grease to the worm plunger and to the compression spring. Insert the worm plunger, notched end first, into the well in the base of the mount. Make certain the worm plunger operates freely. Follow with the 0.25-inch OD compression spring and secure spring and plunger by screwing in the slotted plug. Secure the plug to the mount with a No. 5X5/16 flat-point setscrew.

(7) Dip the 5/8-inch OD felt washer (fig. 16) in aircraft instrument lubricating oil (par. 33c) and assemble it over the end of the drive worm, followed by the 1 3/4 -inch OD (cant correction) knob. Aline the holes and secure the knob to the drive worm with a 0.094x7/8 spring pin.

Note. If the drive worm and/or (cant correction) knob must be replace, place the knob on the worm so that the end of the worm is flush with the counterbored surface in the knob. Temporarily secure the knob to the worm by installing a No. 41(0.096) drill. Insert an 0.094x7/8 spring pin into this hole. Remove and discard the setscrew from the tapped hole.

j. Carefully examine the 3/4 -inch long gib (fig.16) and the No. 53/4 special dog-point setscrew 8299676 that secures it in the mount, in order to determine whether they are serviceable. If either one of these parts according to paragraph 32. Apply a light film of aircraft and instruments grease to the gib and to the special dog-point setscrew. Insert the gib into its slot in the base of the mount and secure it by screwing the special dog-point setscrew into the mount just far enough for the dog-point to engage the hole in the gib and thus retain the gib in its slot.

Note. In later models, a No 5x13/16 special dog-point setscrew with the (inset, fig. 16) is used. After assembly, this setscrew is secured with the 0.230-inch OD snap ring which seats in a channel cut in the setscrew. This channel is accessible through a slot cut in the base of the mount, adjacent to the gib slot.

k. Attach the identification plate (fig. 16) to the mount with two No. 2x3/16 fillister-head screws and two No. 2 lockwashers.

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42. Installation of Telescope Mount M90 (T183) on 106-MM Rifle M40

a. Installation of Telescope Mount M90 (T183). Install the telescope mount on the mounting pad of the rear bracket (fig. 2). Tighten the No. 5 x $\frac{3}{4}$ or No. 5 x 13/16 (par.41j) special dog point setscrew (fig. 16) which, in turn, will tighten the $\frac{3}{4}$ -inch long gib against the key that is an integral part of the mounting pad of the rear bracket, and take up any clearance that may exist. Secure the telescope mount to the bracket with four $\frac{1}{4}$ x $\frac{3}{4}$ hex-head cap screws and four $\frac{1}{4}$ -inch lockwashers.

b. Installation of Elbow Telescope M92D. Insert the objective end of the elbow telescope M92D into the socket of the telescope mount M90 (T183) so that the $\frac{1}{2}$ x $\frac{1}{4}$ alignment key (fig. 16) in the socket of the mount fits into the keyway in the body of the telescope. Secure the telescope in the mount by tightening clockwise by hand (fig. 15) the 1 1/16-inch ID round nut (fig. 16) on the telescope mount.

Section III. TESTS AND ADJUSTMENTS

43. General

The tests and adjustments described in paragraphs 44 through 49 will be performed after repair, rebuild, and assembly of the telescope mount M190 (T183) have been completed. Some adjustment instructions were indicated during the pertinent assembly procedures where they can be more readily performed with a minimum of disassembly required. The necessary special and improvised tools and equipment listed in tables I (par. 10) and 11 (par. 13) will be utilized as they are needed.

44. Setup Procedure for Improvised Final Inspection Fixture

Setup the improvised final inspection fixture as outlined in *a* through *g* below.

a. The improvised final inspection fixture (fig. 12) on a surface plate and cross-level the base plate of the improvised fixture.

b. To check out the improvised final inspection fixture, a properly adjusted telescope mount M90 (T183) is required. To properly adjust and install this mount, proceed as outlined in (1) through (4) below.

(1) Place the mount, base down, on a surface plate.

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- (2) Using a gage and indicator, set the indicator tip on the lower inside edge of the exposed end of the socket.
- (3) Turn the EL adjustment worm until the minimum height reading is obtained. At this minimum height reading, set the indicator at zero and continue to turn the EL adjustment until the maximum height reading is obtained. Divide the maximum height reading by two. Then continue turning the EL adjustment worm until this halfway reading is reached, as shown on the indicator. The bore axis of the socket will then be horizontal and parallel with the base.
- (4) Remove the mount from the surface plate and install it on the improvised final inspection fixture, securing it temporarily with the four ¼-inch hex-head cap screws provided with the mount.

c. Install the improvised dioptometer holder (fig. 9) in the mount and install the dioptometer 7680 (fig. 4) in the improvised holder, securing it temporarily the four setscrew (fig. 9) provided in the improvise holder for that purpose.

d. Set up a plumb line in front of the dioptometer 768131, focus the doptometer on the plumb line, loosen the setscrews ,securing the dioptometer to the improvised holder, and rotate it in the improvised holder until one of the reticle crosslines coincides exactly with the plumb line as seen by an observer looking through the dioptometer. Secure the dioptometer in the improvised holder in that position by tightening the four setscrews.

e Set up the improvised wall target (fig 10) at a distance of 107 feet 6 inches from the dioptometer 7680631 and adjust its position until an observer looking through the dioptometer (focused for that distance) reports that the crossline of the dioptometer reticle is centered exactly within the cross of the improvised wall target, and the vertical line of the improvised wall target is truly plumb when checked with a plumb line. Secure the improvised wall target in that position.

f. Without disturbing focus adjustments, remove as a unit the dioptometer 7680631 and its improvised holder from the mount, and remove the mount from the improvised final inspection fixture.

g. Install (b above) on the improvised final inspection fixture, the telescope mount M90 (T183) to be inspected.

45. Backlash

a. *Setup for Inspection.* With the telescope mount M90 (T183) installed on the improvised final inspection fixture (par .44), prepare for inspection as outlined in (1) through 4) below.

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(1) Loosen the No. 10-32 x ¼ setscrew (fig. 7) that secures the adapter to the housing. Remove, as a unit, the handle and the adapter.

(2) Insert, where the adapter was previously located, the improvised levelling platform (fig. 8) and secure it with the No. 10-32 x ¼ setscrew.

Note. Aline the improvised levelling platform so that it is horizontal when the keyway slot in the housing is upright (vertical).

(3) Install (par. 41g (1)) the improvised telescope holder with improvised platform into the socket of the telescope mount M90 (T183) under inspection.

(4) Place a machinist's level on the improvised levelling platform.

Note. If the bubble in the machinist's level is not centered, turn the cant correction knob (fig. 1) until the bubble is centered.

b. Inspection. Place a thin pencil mark on the edge of the movable) socket and extend this mark to the (fixed) mount. Turn the cant correction knob to the right as far as its limit of movement will permit. Then, turn the knob back, until the two marks lineup.

Note. Be careful that the two marks do not pass each other. If the mark on the socket over-shoots the mark on the mount start the test over again.

Check and see if the bubble in the machinist's level is centered. If it is not, continue turning the knob until the bubble is centered. Place a second mark on the mount opposite the mark on the edge of the socket. The distance between the two pencil marks on the mount indicates the amount of backlash present in the mechanism. A difference of one thirty-second inch between the marks indicates approximately 1.0-mil backlash. The amount of backlash in the mechanism must not exceed 1.0 mil.

c. Adjustment. To eliminate backlash, remove (par. 39c) the (cant correction) knob (fig. 16) and felt washer from the end of the drive worm. Remove the No. 2 x 1/8 flat-point setscrew (fig. 16) that secures the ball cap. Using the adjustable face spanner wrench 41-W-3248-125 (fig. 3), tighten the ball cap (fig. 16) until repeated inspection indicates that backlash has been eliminated. Place (par. 41i) the felt and knob back on the end of the drive worm, and secure the ball cap in the mount with a No. 2 x 1/8 ,flat-point setscrew. The knob must turn in either direction (clockwise or counterclockwise) without undue irregularities , friction, or looseness.

Note. If excessive backlash cannot be removed by adjusting ball cap, proceed as outlined in d below.

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d. Installation of Replacement Items.

- (1) Remove the drive worm (par. 39c) and socket with related parts (par. 39d).
- (2) Perform maintenance procedures as outlined in paragraph 31.
- (3) If the socket and related parts were removed in (1) above, assemble the socket (par. 41f through h) Install the drive related parts (par. 41).
- (4) Repeat adjustment as indicated in c above.

46. Cant Correction

a. Inspection. With the telescope mount M190 (T183) installed on the improvised final inspection fixture and with the dioptometer 7680631 and its, improvised holder installed in the mount (par.44), the conditions indicated in (1) and (2) below should be met.

- (1) The cant correction knob should rotate the dioptometer 7680631 at least 21 (3 ½ turns) each side of the midpoint of the knob's full range of travel. Observe through the dioptometer 7680631 and check the range of movement against the 21° lines marked on the improvised wall target (fig. 10). The knob should turn in either direction (clockwise or counterclockwise) without undue irregularities, friction, or looseness.
- (2) While observing through the doptometer 7680631, and starting with the dioptometer reticle crosslines in the exact center of the wall target cross, the dioptometer reticle cross should not deviate from that position by more than 0.15 mil when the (cant correction) knob is turned throughout its range of movement.

Note. The parallel lines of the wall target cross are separated by 0.30 mil.

b. Adjustment. Check for improper assembly of the telescope mount M90 (T183) (par. 41), inadequate cleaning (par. 32), and/ or lack of lubrication (par. 33).

Notes. If binding or rough motion still persists, check the maintenance instructions for worm and worm gear mechanisms (par. 31) and /or for backlash (par. 45)

47. Adjustment Worms

a. Inspection. With the telescope mount M90 T183) installed in the improvised final inspection fixture par. 44), and while observing the improvised wall target (fig. 10) through the dioptometer 7680631, the conditions indicated in (1) and (2) be met when the adjustment worms (fig. 16) are turned one at a time with a screwdriver inserted through one of

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the guide holes provided in the pilot block of the improvised final inspection fixture (fig. 12) for the purpose.

- (1) The azimuth adjustment worm should deflect the dioptometer reticle cross at least 11 mills to the right and left of the vertical line on the improvised wall target.

Note. The short vertical lines, that cross the main horizontal line of the improvised wall target, are displaced 11 mils on each side of the wall target cross.

- (2) The elevation adjustment worm should deflect the dioptometer reticle cross at least 11 mils above and below the horizontal line on the improvised wall target.

Note. The short horizontal lines, that cross the main vertical line of the improvised wall target, are displaced 11 mils above and below the wall target cross.

- b. *Adjustment.* If the requirements cannot be met, disassemble the telescope mount M90 (T183). Check the teeth and face of the worm gears and the teeth of the adjustment worms for nicks and burs. Remove the burs (par. 28e). Assemble telescope mount M90 (T183) (par. 41) and repeat inspection as indicated in a above.

48. Vibration

a. Setup Procedure.

- (1) With the telescope mount M90 (T183) installed in the improvised final inspection fixture (par. 44), adjust the mount so that the dioptometer reticle cross coincides exactly with the center of the wall target cross.
- (2) Without disturbing adjustments, remove, as a unit, the dioptometer 7680631 and its improvised holder from the mount, and the mount from the improvised final inspection fixture.
- (3) Mount the improvised vibration tester adapter (fig. 6) on the universal vibration tester 7560085 (fig. 5) and install the telescope mount M90 (T183) on the improvised vibration adapter. Secure the mount to the improvised vibration adapter with the four ¼-inch hexhead cap screws provided with the telescope mount M90 (T183).
- (4) Vibrate the telescope mount between 2 and 2½ minutes at an amplitude of not less than one-sixteenth of an inch (one-eighth of an inch total displacement) and a frequency of 30 cycles per second. Refer to paragraph 12b for instructions on vibration tester control settings.

b. *Inspection.* After having been vibrated as outlined in a (4) above, the mount should not be damaged and /or contain loose
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parts, and when again installed on the improvised final inspection fixture with the dioptometer 7680631 and its improvised holder in position, the conditions indicated in (1) and (2) below should be met.

- (1) The dioptometer reticle cross should not have shifted by more than 0.15 mil from the position established in a (1) above.

Note. The parallel lines of the wall target cross are separated by 0.30 mil.

- (2) The horizontal line of the dioptometer reticle should not have shifted from the horizontal line of the improvised wall target by more than the angle subtended by 0.15 mil at the extremity of the horizontal reticle line when the other extremity of the line is in coincidence with the horizontal line of the improvised wall target.

Note. The two short parallel lines, located at both ends of the improvised wall target's main horizontal line, are separated from the main horizontal line by 0.15 mil and from one another by 0.30 mil.

c. *Adjustment.*

- (1) Recheck and adjust the torque of the socket (par. 41 g).
- (2) Inspect the two special dog-point setscrews, that lock the adjustment worms in place, for looseness and for wear.
- (3) Repeat the procedures in a and b above.

49. Sealing After Tests and Adjustment

a The external recessed setscrews must be sealed with class I noncuring sealing compound 52-C-3258-500, as specified in (1) through (4) below.

- (1) Coat with class I noncuring sealing compound the No. 5 x 5/16 flat-point setscrew that locks the slotted plug (fig. 16) to the mount.
- (2) Coat with class I noncuring sealing compound the threads of the No. 2 x 0.11 special dog-point setscrew that secures the ball socket (fig. 16) to the mount.
- (3) Coat class I noncuring sealing compound the threads of the No. 2 x 1/8 flat-point setscrews that secures the ball cap (fig. 16) to the mount.
- (4) Coat class I noncuring sealing compound the threads of the two No. 5 x 9/16 special dog-point setscrews secure the adjustment (fig. 16) to the mount.

b. After inserting the setscrews, plug the remainder of the holes class I noncuring sealing compound 52-C-3258-500.

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CHAPTER 6

FINAL INSPECTION

50. General

Final inspection is performed after repair and rebuild have been completed to insure that the materiel is serviceable according to established serviceability standards. It includes the inspection procedures detailed in chapter 3, a general visual inspection for proper assembly of the telescope mount, and a functional check to make sure that the system is in working condition and can function properly. In general, the instrument must be complete and must present the appearance of a new instrument, and all moving parts must function properly, without irregularities and undue friction or looseness.

51. Inspection

With the telescope mount M90 (T183) installed on a suitable testing fixture, and with the center line of its socket horizontal and parallel to the base, the conditions indicated in a through g below shall be met.

a. Vibration. Install dioptometer 7680631 and its improvised dioptometer holder in the telescope mount M90 (T183). Aline the dioptometer reticle cross so that it coincides with the main horizontal and vertical dash reference lines in the improvised wall target. Remove, as a unit, the dioptometer and its improvised holder from the telescope mount M90 (T183). Then remove the mount and install it on the universal vibration tester 7560085. Vibrate between 2 and 2¹/₂ minutes at an input amplitude of not less than one-sixteenth inch (one-eighth inch total displacement) and a frequency of 30 cycles per second.

Note. After vibration, the telescope mount M90 (T183) should show no evidence of damage or loose parts.

Remove the mount from the vibration tester and install it on the testing fixture. Install the dioptometer 7680631 and the improvised dioptometer holder, which were previously removed as a unit, into the mount. Check the telescope mount M90 (T183) as indicated in (1) and (2) below.

- (1) The dioptometer reticle cross should not have shifted from the main horizontal and vertical dash reference lines in the target by more than 0.15 mil.

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- (2) The horizontal reticle line should not have shifted from the image of the horizontal target reference line by more than the angle subtended by 0.15 mil at the extremity of the horizontal reticle line when the other extremity of the line is in coincidence with the reference line.

b Backlash. The amount of backlash in the cant correction mechanism should not exceed 1.0 mil, or one-fourth of an inch movement as measured on the circumference of the (cant correction) knob.

c. Cant Correction.

- (1) The (cant correction) knob should move the elbow telescope M92D at least 21° (3 ½ , turns of the knob) each side of the midpoint of the knob's full range of travel, and the knob should turn smoothly without irregularities, friction, or looseness.
- (2) Throughout the range of movement of the cant correction knob, the elbow telescope reticle cross should not deviate more than 0.15 mil from a selected point on a target.

d. Adjustment Worms.

- (1) The (azimuth) adjustment worm should deflect the elbow telescope reticle cross at least 11 mils to the right or left of a vertical target reference line.
- (2) The (elevation) adjustment worm should deflect the elbow telescope reticle cross at least 11 mils above or below the horizontal target reference line.

e. Lubrication All moving parts should be lubricated with aircraft and instruments grease, as listed in ORD 3 SNL K-1, at the time of repair and rebuild.

f Sealing All external setscrew holes (with the exception of the special dog-point setscrew that secures the gib) must show sufficient evidence of sealing compound to indicate that the telescope mount M90 (T183) is completely sealed.

g Painting Paint should be in good condition and neither chipped nor cracked. The paint should afford protection against rust and corrosion and the telescope mount M90 (T183) should present an appearance similar to that of a new piece of equipment.

**APPENDIX
REFERENCES**

1. Publication Indexes

DA Pamphlets of the 310-series and DA Pam 108-1 should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to materiel covered in this manual.

2. Supply Manuals

The following supply manuals of the Department of the Army supply manual pertain to this materiel:

a Destruction to Prevent Enemy Use.

Ammunition Explosives, Bulk Propellants, and Explosive Devices SM 9-5-1375

b General.

Index of Supply Manuals-Ordnance Corps DA Pam 310-29
Introduction..... ORD 1

c Repair and Rebuild.

Abrasives, Adhesives, Cleaners, Preservatives, Recoil Fluids, Special Oils, and Related Items..... ORD 3 SNL K-1
Fire Control Major Items and Major Combinations For Use With Small Arms, Automatic Guns, Mortars, and Field Artillery.....ORD 3 SNL F-1
Miscellaneous Hardware ORD 5 SNL H-2
Soldering, Metallizing, Brazing and Welding Materials; Gases and Related Items ORD 3 SNL K-2
Special Tool Sets for Sighting and Fire Control Materiel Used With Small Arms, Automatic Guns, Mortars, and Field Artillery (SNL Group F) ORD 6 SNL J-32
Standard Hardware ORD 5 SNL H-1
Tool Set, Fire Control Repairman..... ORD 6 SNL J-10, sec 13
Tool Set, Instrument Repairman (MOS 3922) ORD 6 SNL J-10, sec 14

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d Sighting and Fire control Equipment..
 Mount, telescope, M90ORD (*) SNL F-392

3 Forms

<i>DA Form</i>	<i>Title</i>
9-71	Locator and Inventory Control Card.
9-77	Job Order Register.
9-78	Job Order.
9-79	Parts Requisition.
9-80	Job Order File.
9-81	Exchange Part or Unit Identification Tag.
421	Stock Record Card.
446	Issue Slip.
447	Turn-in Slip.
468	Unsatisfactory Equipment Report.
811	Work Request and Job Order.
828	Job Time Ticket--Individual.
829	Rejection Memorandum.
865	Work Order.
866	Consolidation of Parts.
867	Status of Modification Work Order.

<i>DD Form</i>	<i>Title</i>
6	Report of Damaged or Improper Shipment.

4 Other Publications

The following explanatory publications contain information pertinent to this materiel and associated equipment:

- a. Camouflage.*
 Camouflage, Basic Principles FM 5-20
- b. Decontamination.*
 DecontaminationTM 3-220
 Defense Against CBR AttackFM 21-40
- c. Destruction to Prevent Enemy Use.*
 Explosives and DemolitionsFM 5-25
 Ordnance Service in the FieldFM 9-5
- d. General.*
 Artillery Materiel and Associated EquipmentTM 9-2300
 Inspection of Ordnance Materiel in Hands of TroopsTM 9-1100
 Safety: Accident ReportingSR 385-10-40
 Unsatisfactory Equipment Report.....AR 700-38

* See DA Pam 310-29 for published types of manuals of the Ordnance section of the Department of the Army supply manual.

e Operation.

Cal. .50 Spotting Rifle M8; 106-mm Rifle M40; and 106-mm Rifle Mount M79 TM 9-3058

f Repair and Rebuild.

Abrasive, Cleaning, Preserving, Sealing, Adhesive,
and Related Materiel Issued for Ordnance Materiel TM 9-850

Fire Control Materiel: Lubrication TB 9-2835-1

Instruction Guide: Elementary Optics and
Applications to Fire Control Instruments TM 9-2601

Instruction Guide: Instrument Repairman TM 9-2602

Lubrication TM 9-2835

Maintenance and Care of Hand Tools..... TM 9-867

Operation and Maintenance of Optical Coating
Equipment TM 9-1501

Ordnance Maintenance and General Supply in the Field..... FM 9-10

Painting Instructions for Field Use..... TM 9-2851

g Shipment and Storage.

Army Shipping Document..... TM 38-705

Instruction Guide: Ordnance Preservation, Packaging,
Packing, Storage, and Shipping TM 9-1005

Marking and Packing of Supplies and Equipment:
Marking of Oversea Supply SR 746-30-5

Operational List of Packaging Specifications
and Instructions (General Supplies) 1

Ordnance Storage and Shipment Chart-Group F..... SB 9-OSSC-F

Preservation, Packaging, and Packing of Military
Supplies and Equipment..... TM 38-230

Processing of Motor Vehicles and Related
Unboxed Materiel for Shipment and Storage SB 9-4

Protection of Ordnance General Supplies in Open
Storage TB ORD 379

Report of Damaged or Improper Shipment AR 700-58

Standards for Oversea Shipment and Domestic
Issue of Ordnance Materiel Other than
Ammunition and Army Aircraft..... TB ORD 385

¹ Copies may be obtained from Rossford Ordnance Depot, Toledo 1, Ohio, ATTN: ORDWD-P.

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