TM 9-1240-259-35

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

FIELD AND DEPOT MAINTENANCE MANUAL

TELESCOPE M103

HEADQUARTERS, DEPARTMENT OF THE ARMY

JULY *1961*

Technical Manual
No. 9-1240-259-35

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *31 July 1961*

TELESCOPE M103

SECTION I
INTRODUCTION

Section 1. GENERAL

1. Scope

a. This manual contains instructions for the information of personnel responsible for field and depot maintenance of telescope M103, which is beyond the scope of the tools, equipment, or supplies normally available to using organizations.

b. This manual contains a description of telescope M103. It also specifies troubleshooting procedures, disassembly, repair, overhaul, and assembly of telescope M10 3 peculiar to field and depot maintenance. The instructions in this manual are intended for maintenance specialists who have been thoroughly trained in maintenance practices.

c. The maintenance functions contained in this manual describe the concept of IROAN (Inspect and Repair Only As Neces - sary). This technique is applicable to the maintenance of telescope M103 and all associated repairable equipment at all echelons of maintenance. It does not change or lower the required quality of mainte - nance or prescribed serviceability standards.

d. The appendix contains a list of current references including supply and technical manuals, forms, and other available publications applicable to telescope M103. The maintenance allocation chart is included in TM 9-1015-223-12. TM 9-1240-259-35P lists repair parts, special tools, and equipment authorized to field and depot personnel.

e. Operation, lubrication, and all maintenance operations allocated to using organizations in performing maintenance work within their scope for telescope M103 are contained in TM 9-1015-223-12.

f. This first edition is being published in advance of complete technical review. Any errors or omissions will be forwarded on DA Form 2028 direct to the Commanding Officer, Raritan Arsenal, Metuchen, N. J., ATTN: ORDJR-OPRA.

2. Maintenance Allocation and Parts

a. Fie1d maintenance responsibilities prescribed in this manual will apply as reflected in the maintenance allocation chart in TM 9-1015-223-12 and as reflected by the allocation of repair parts and tools listed in TM 9-1240-259-35P.

b. Depot maintenance responsibilities will provide for complete overhaul of telescope M103 as reflected by the IROAN concept for the purpose of repairing or overhauling an unserviceable item.

c. Depot maintenance parts are listed in TM 9-1240-259-35P which is the authority for requisitioning replacements. Parts not listed therein but required by depot shops may be requisitioned and will be supplied, if available, when the need is substantiated. Requisitions for parts not listed in TM 9-1240-259-35P will contain a complete justification of requirements. Requisitions for assemblies will be held to a minimum. Whenever possible, overhaul of assemblies will be held to a minimum. Whenever possible, overhaul of assemblies will be accomplished. When feasible, local fabrications may be required for those parts unable to be supplied.

3. Forms, Records, and Reports

a. General. Responsibility for the proper execution of forms, records, and reports rests upon the Commanding 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 of work performed. The forms, record, and reports establish the work required, the progress of the work, and the status of the matriel upon completion of its repair.

b. Authorized Forms. The forms generally applicable to units maintaining this materiel are listed in the appendix. For instruction on the use of these forms, refer to FM 9-3 and FM 9-4. For a listing of all forms, refer to DA Pam 310-2.

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

d. Reports of unsatisfactory Equipment or Materials. Any deficiencies detected 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 cited regulations.

Section II. DESCRIPTION AND DATA

4. General

This section provides an overall description of the major item and includes a reference to the materiel with which it is used. It also describes the assemblies and how they tie into the complete telescope MI03.

5. Description

a. General. Telescope MI03 (fig. 1) is a lightweight, hermetically-sea1ed, 3-power, fixed-focus optical instrument equipped with a ballistic-type reticle *(fig. 2).* the telescope can be quickly inserted or removed from telescope mount M110, Which is mount on the left of 90-mm rifie M67. Clamp and bracket assembly *7659949* is provided to mount instrument light 8246214 to the front bracket assembly of the rifle. The instrument light supplies the source of light to illuminate the reticle for night operations. Carrying case 8575980 is also provided to protect telescope MI03 during transit or storage.

b. Main Assemblies. Telescope M103 (fig. 1) consists of an Offset housing and holder Which are treated as main assemblies throughtout the test.

(1) The housing assemble contains the eyepiece assembly and incloses the prism, forming the larger diameter leg of the instrument. The eyepiece assembly cosists of the eyelens, field lens, and reticle as - sembly.The eyelens rests against an internal shoulder of the cell, and is held in place by a separator. The field lens rests the separator, and is held in Place by an aluminum alloy retainer. The reticle and level vial are contained in the end of the eyelens cell in a reticle cell assembly. An additional retainer holds the reticle in the reticle cell. A dovetail slot to acccept the instrument light bracket is machined on boss of the house just above counterbored hole. The counterbored hole is provided for mounting a cylindrical red glass window, to enable both the reticle and the level vial to be illuminated. The red glass provides this illuination with a minimum losss of target contrast. A rubber eyeshield is also provided and fits over flange on the end of the houseing. The eyeshield protects the observer's eye from glare and prevents injury during the firing of the weapon.

(2) The holder contains the objective cell assembly, provides the mountting surface for the prism cluster, and forms the smaller diameter leg of the instrument. The Abbe type prism cluster is bonded to the surface of a disk-shaped flange at at the end of the holder. A conically-shaped shoulder, machined

on the holder near the flange, provides an accurate seating for the telescope in telescope mount M110. Three segments of a left-hand helical thread, with a lead three times the pitch, are machined on the surface of the holder near the end opposite the flange to engage mating threads in telescope mount M110. An axial slot (keyway) machined in the holder accepts a key of the spring assembly of the telescope mount on installation in the mount. The engraved index mark on the slot enables the telescope to be properly alined with the mount for installation.

6. Data

a. Optical Characteristics.

Magnification	3X
Diameter of exit pupil	0.250
Field of view	10°
Eyepiece focus fixed at	-1 diopter
Equivalent focal length of objective	3.601 in.
Equivalent focal length of eyepiece	1.202 in.

b. Physical Characteristics.

Length	6–1/4 in.
Diameter	2-3/4 in.
Weight	15 oz.

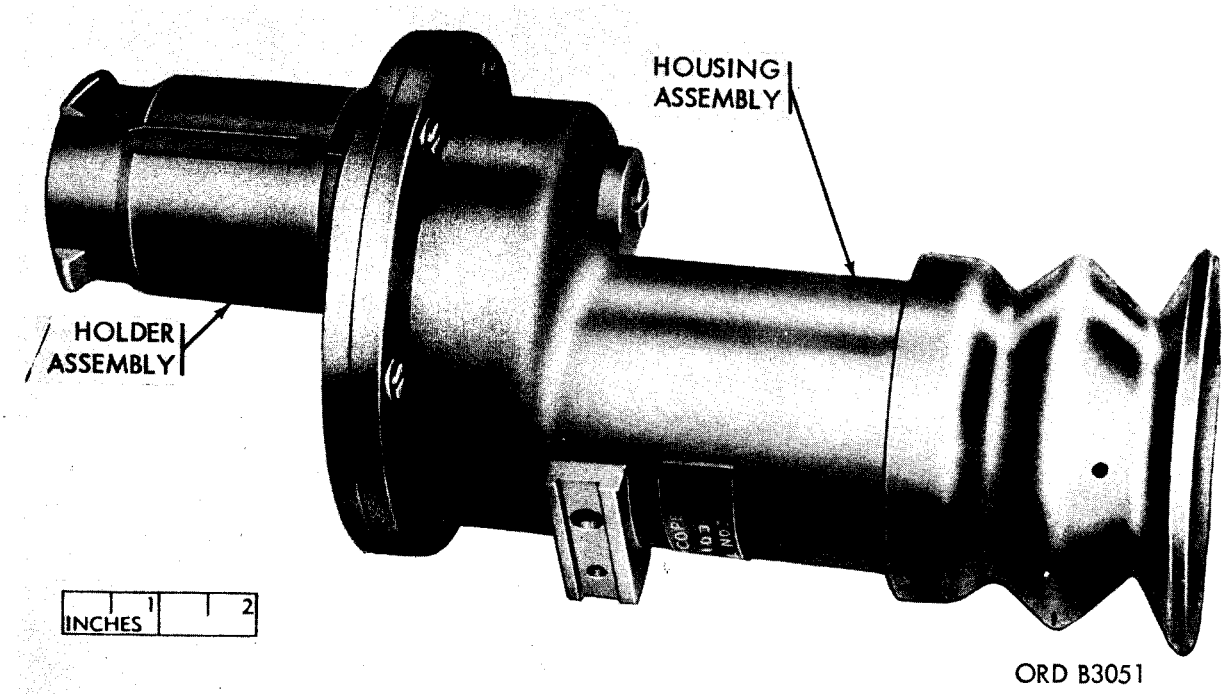


Figure 1. Telescope M103.

Figure 2. Diagram of optical system.

CHAPTER 2

TOOLS AND EQUIPMENT

7. General

Tools and equipment over and above those available to the using organization are supplied to field and depot maintenance units for repair, overhaul, and adjustment of telescope M103.

8. Common Tools and Equipment

Standard and commonly used tools and equipment having general application to this materiel are authorized for issue by tables of allowances and tables of organization and equipment.

9. Special Tools and Equipment

The tools and equipment specially designed for maintenance of the materiel are listed in table I for information only. For requisitioning replacements refer to TM 9-1240-259-35P.

Table I. Special Tools and Equipment for depot maintenance

Item	Identifying number	Referencea		use
		Fig.	Par.	
ADAPTER, teat	8213875	13, 17	42b, *430*	Hold telescope mount M110 to the "J" support of telescope test fixture, and universal vibration tester.
[1]FIXTURE, telescope test..	7573980	3, 17 18, 19	10, 43o, 44	Mount telescope M103 when testing.
Bracket ashy	7680659	3	10 *a*	Hold mirror in place on the "J" support.
Collimator, projector	7573291	3, 17, 18	10 *a* (l), 430	Target when testing telescope M103.
"J" support.	7680666	3	10 *a* (2)	Secure test adapter to telescope test fixture.
Mirror, reflecting.	5181003	1 4	43 c	Auto collimate the projector collimator.
TELESCOPE , collimating . .	5549108 (18-T-540-250)			Plumbing the reticle in the projector collimator on the telescope test fixture.
TESTER, universal vibration.	7560085	4, 13	11, 42 *b* (3)	Check for loose parts or dirt in the telescope.
WRENCH, spanner, pin-type.	8213920		43	Secure or remove ring assembly 8634485 on telescope mount M110.
WRENCH, spanner, tubular.	4931-345-1391 (41-W-3726 - 58)	9	33, 34 *a* 36, 37	Remove or install retaining ring 7659748 and objective cell assembly 7659742.
WRENCH, spanner, tubular.	5120-345-1400 (41-W-3726-98)	9	32 *a*, 38	To remove or install retaining ring 7659750.

[1]To hold telescope M108 during teat or inspection proceduree, use telesoope mount M110.

10. Telescope Test Fixture 7573980

a. The telescope test fixture (fig. 3) consists basically of a machined base with provisions for mounting the projector collimator 7573291, various supports, and adapters. The projector collimator is fixed rigidly on one end of the base. At the opposite end is a fixed support capable of mounting various supports and adapters. The movable telescope support, located between the fixed support and the projector collimator, also mounts various supports and adapters and may be moved in either direction on the base to accommodate telescopes of various lengths. The

movable support is utilized to mount telescope M103 to the base of the fixture.

(1) The projector collimator is an optical device similar to an ordinary straight tube telescope. It does not, however, have an erecting system as do most other telescopes. The collimator serves as a convenient indoor testing target during test and adjustments and final inspection. The target provided by the collimator is always uniform as far as intensity of illumination and clarity of image are concerned.

(2) the projector collimator is a telescope with its eyepiece end machined to accommodate a lamp housing, which is provided with a clamping screw so that it may be secured to the collimator. The. lamp hewing is equipped with a 7-1/2-watt lamp assembly, an extension cord with a plug, and a switch for connecting to a 110-volt outlet. The collimator contains a reticle pattern which is graduated in mils. The 1-mil square at the center is positioned so that any test, adjustment or inspection necessitating 1/2-mil tolerance may be accurately made. The positioning of the objective lens of the projector collimator is controlled by the adjustable objective scale. This Scale is graduated so the objective can be accurately positioned, setting the projector collimatir to the required distance at which parallax of telescope M103 may be checked. The scale is graduated with an infinity mark and four other marks representing 500, 200, 100, and 75 yards in range.

11. Universal Vibration Tester 7560085

The universal vibration tester (fig. 4), in conjunction with an appropriate adapter for telescope M103, is used to simulate conditions of shock and vibration normally encountered in the use of sighting and fire control materiel. Through its use, loose dirt and improperly secured components which would affect the efficient operation of the telescope, are revealed.

12. Fabricated Tools

Specially designed tools for inspection of telescope M103 during repair and overhaul are listed in table II. These tools may be fabricated for use in depot maintenance of the telescope, but will not be available throgh supply channels. Dimensionl detail drawomgs are furnished herein to enable depot shops to fabricate these tools locally.

Table II. Fabricated Tools

Item	References		Use
	Fig.	Par.	
ADAPTER, alinement test.	5	43	To support the collimating telescope on the telescope test fixture.
ADAPTER, with setup block.	6	43	To establish required relationship of alinement test adapter and collimating telescope.

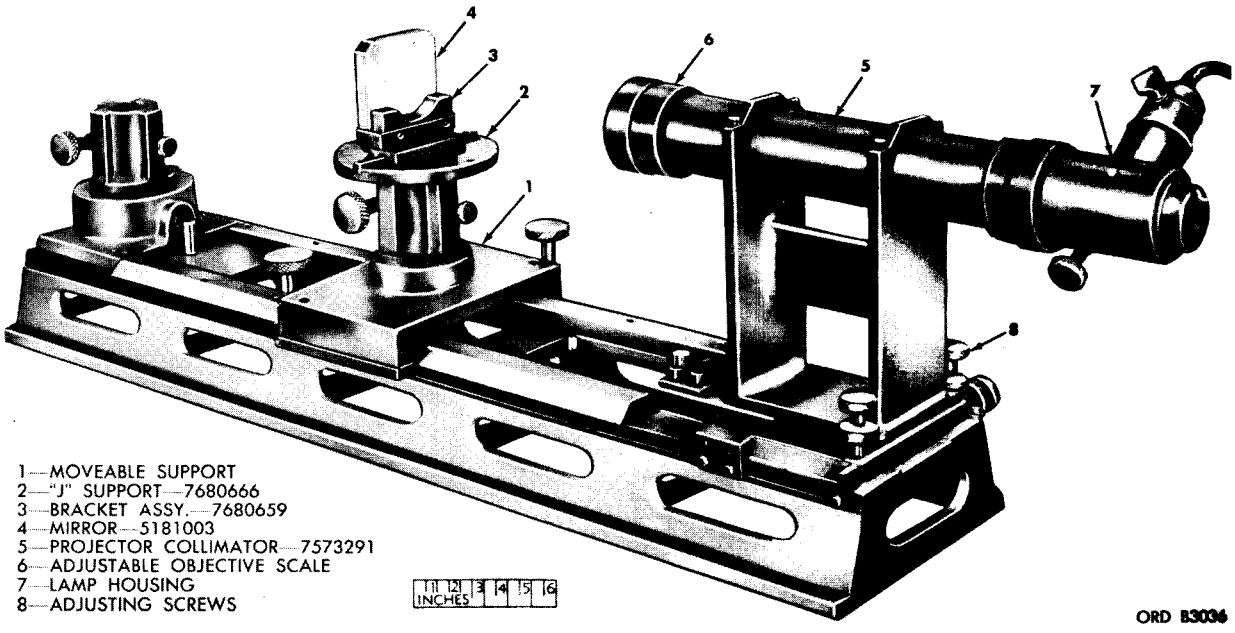


Figure 3. Telescope test fixture 7573980.

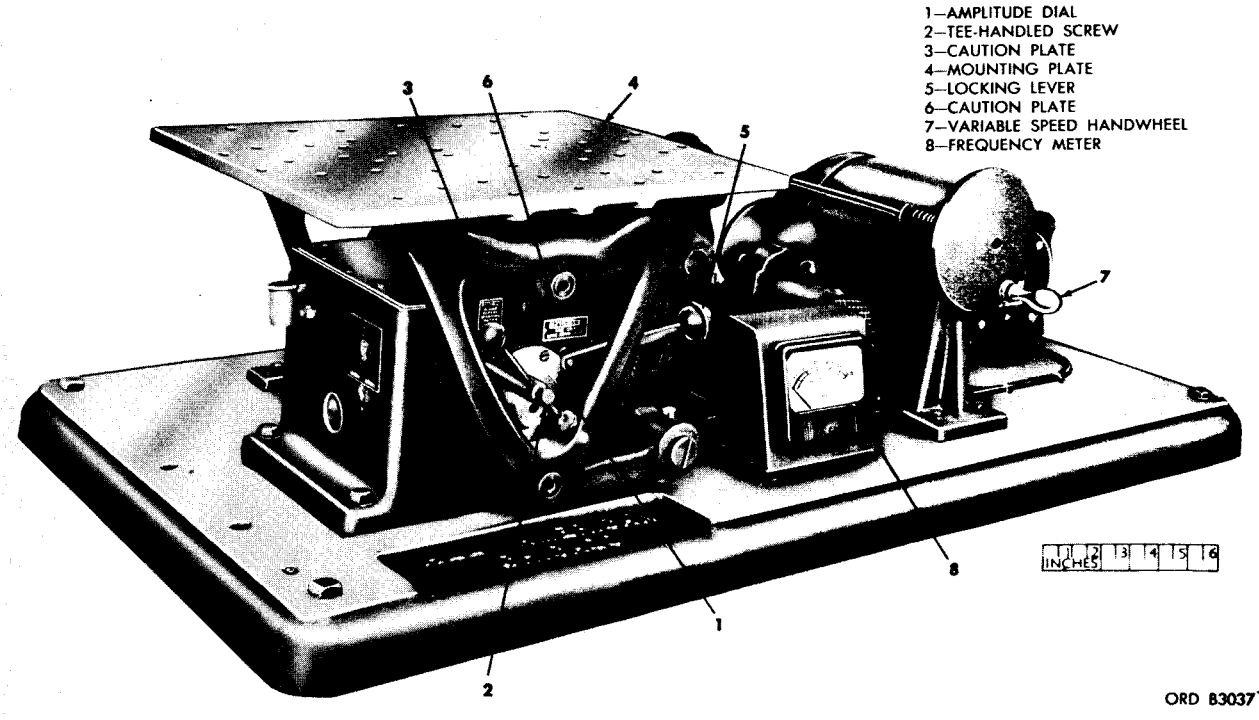
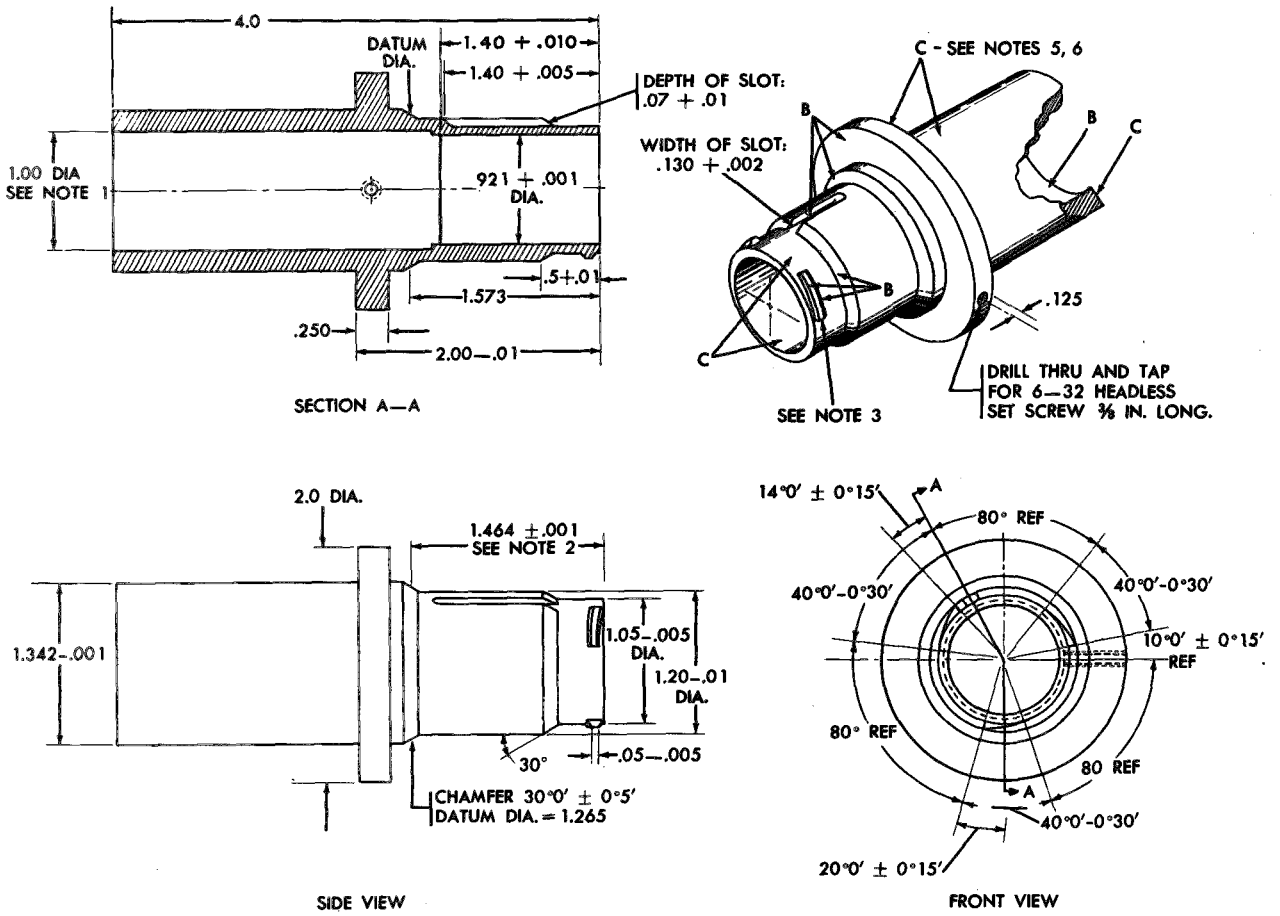


Figure 4. Universal vibration tester 7560085.



NOTES:

1 - SLIP FIT TO SUIT COLLIMATING TELESCOPE 5549108
2 - REFERENCE TO SHARP LEADING EDGE AT PITCH DIA.
3 - 25Q0 PITCH, .7500 LEAD, 90° INCLUDED ANGLE, 12°2′ HELIX ANGLE, 1.200-.005 IN. MAJOR DIAMETER.
4 - ALL DIMENSIONS ARE SHOWN IN INCHES.
5 - SURFACES MARKED "S" ARE TO BE@ FINISH.
6 - SURFACES MARKED "C" ARE TO BE@ FINISH.
7 - MAT'L 4340 SAE TOOL STEEL.

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Figure 5. Alinement test adapter.

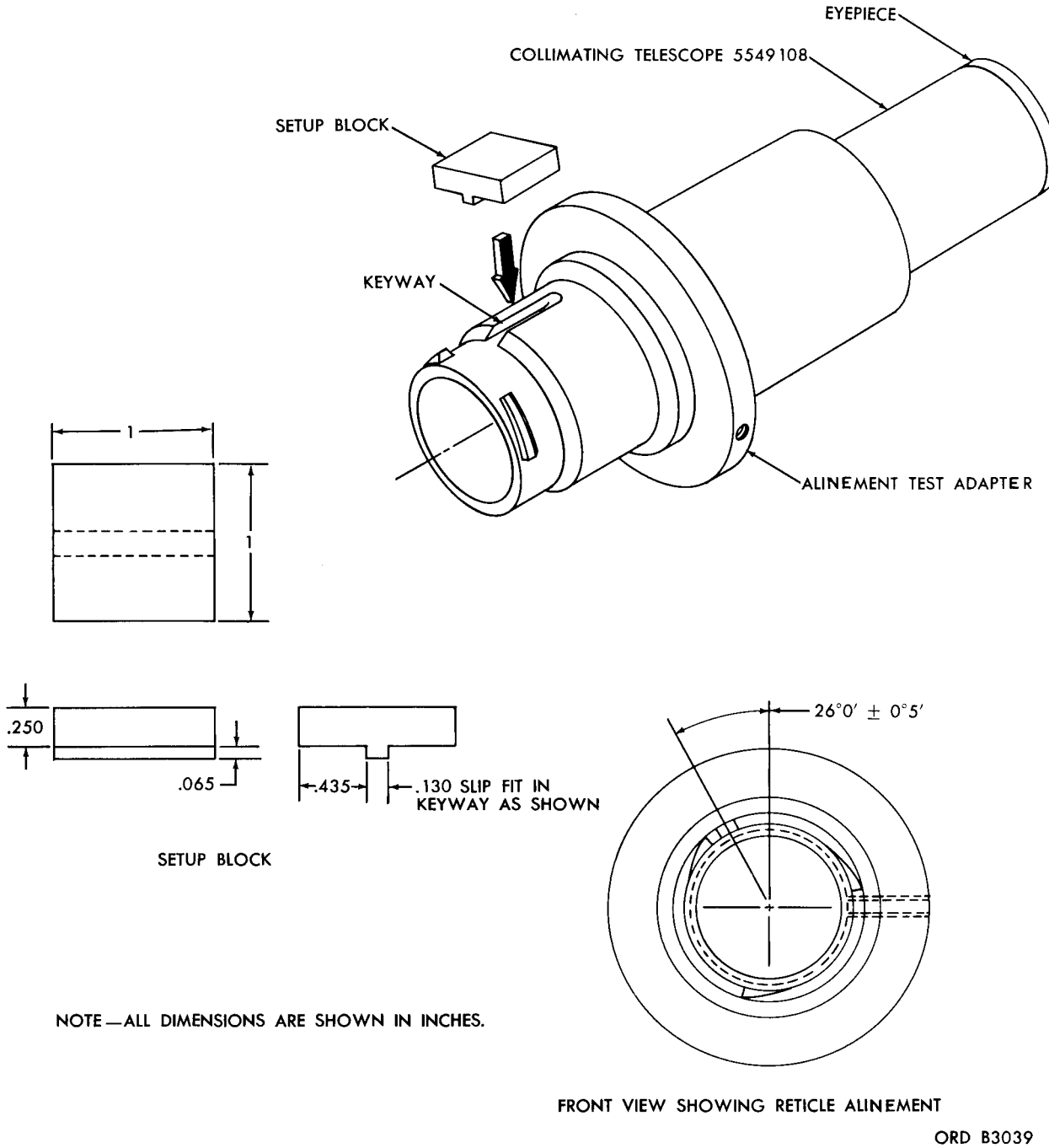

Figure 6. Setting-up collimating telescope to adapter.

CHAPTER 3
INSPECTION

Section I. GENERAL

13. Scope

This chapter provides specific instructions for the technical inspections by Ordnance maintenance personel of telescope M103 either in the hand of troops or when received for repair in Ordnance shops. It also defines the in-process inspection of materiel during repair and overhaul and the final inspection after repair or overhaul has been completed.

14. Purpose of Inspection

Inspection is primarily for the purpose of determing the condition of an item, i.e., serviceable or unserviceable; recognizing conditions Which would cause failure; assuring proper allocation of maintenance policies at prescribed levels; and determining the ability of a unit accomplish its maintenance and supply missions.

15. Categories of Technical inspection

In generl, 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 recived for repair in field or depot maintenance shops. Upon completion of an inspection for serviceabiliy, 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 17 through 20.

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

d. Final Inspection. This is an acceptance inspection performed by a final inspector, after repair or overhaul has been completed, to insure that the materiel is acceptable according to established standards. Detailed instructions are contained in paragraphs 46 through 52.

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.

16. Classification of Materiel

Alll Ordnance materiel 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 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. The definition of unserviceable property is further broken down into property which is unserviceable but economically repairable and property which is unserviceable and not economically repairable.

Section II. INSPECTION OF TELESCOPE M103 IN THE HANDS OF TROOPS

17. General

This section provides specific instructions for the technical inspection by Ordnance maintenance personnel of telescope M103 and its associated equipment in the hands of troops. This section amplifies the general instructions contained in TM 9-1100 insofar as the instructions pertain to inspection of this equipment. The inspection procedures and standards listed below apply to all telescopes. In general, if telescope M103 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 item may be considered serviceable.

18. 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, refer to paragraph 3.

19. General Inspection

a. Completeness. Examine the instrument carefully to be sure that all component parts are present. Particularly check for the presence of telescope eyeshield, lamp bracket, setscrews, wingnuts, clamp screws, and nameplates.

b. Appearance. The appearance of telescope M103 is an indication of its general condition and will show the treatment it has received. Examine for dented surfaces, bent or broken parts, and other evidence of damage or misuse which might indicate need for repair.

(1) *Nameplates and Indexes.* Inspect indexes and lettering on nameplates to insure that they are clearly defined and easily read.

(2) *Paint and finish.* Inspect for bare spots or damaged finish which expose bare metal surfaces and lead to corrosion. If finish is too badly damaged, a complete refinishing will be necessary.

c. *Modification Work Orders.* All modification work orders must be applied. Refer to DA Pam 310-4 and the current modification work order files for modfication work orders issued subsequent to this printing.

20. Inspection of Optical Elements

a. General. When inspection is made through the eyepiece and objective ends of the telescope, there shall be no objectionable dirt, smears, scratches, digs, condens ate, fungus growth, chips, fractures, or cement separations.

b. Rubber Eyeshield. The rubber shall be free of deterioration, cuts or tears, and shall fit properly with its mating part.

c. *Reticle Illumination Window.* The reticle illumination window shall not be broken, and shall be securely sealed and fastened in the body.

d. Sealing. The sealing shall be free of apparent leaks or openings.

e. *Illumination.* The lighting, when turned on, should illuminate the reticle pattern so that the markings are clearly defined when observed in a darkened room.

f. Definition. The telescope shall produce a sharp and clear image at the center of the field of view, when observing a distant target.

g. *Parallax.* Parallax is apparent motion of the reticle pattern with respect to the image of a distant target as seen through the eyepiece. If parallax is

present, it can be seen if the eye of the observer is shifted slightly up and down or from side to side. It is caused by incorrect positioning of the objective assembly so that the eyepiece is not focused to produce a short reticle pattern and a sharp image at the same time. If not corrected, parallax will render all reticle measurements inaccurate. Refer to the sections covering overhaul and assembly when checking parallax.

h. Collimation. A telescope is collimated when its optical axis coincides with its mechanical or geometric axis. Telescope M103 collimation procedure is contained in paragraph 44 of this manual.

Section III. ORDNANCE SHOP INSPECTION

21. General

Technical inspection performed by the Ordnance repair shop on receipt of materiel timed in for repair, determines the extent of the repairs required and provides the basis for requisition the parts, assemblies, or supplies necessary to accomplish the repairs. Often the inspection in the shop may be the same as that performed by inspection in the field. It may disclose additional necessary repairs not indicated by the using organization during the field inspection. See FM 9-3 and FM 9-4 for addititionl information on inspections. See also the final inspection portion of' this manual.

22. Inspection

The impactions given for telescope M103 in the hands of troops, paragraphs 17 through 20, are pertinent also to the Ordnance shop.

Section IV. PREIMBARKATION INSPECTION

23. General

Inspection for outward appearance of telescope M103 is of importance as well as inspection of mechanical condition. Where any doubt exist as to the utiliy of an assembly or of the complete telescope, that assebly or the complete telescope must be replaced by a truly serviceable item. Equipment, when inspected, must approach new equipment standards of operation and appearnace, and the workmanship and quality of the end product must reflect the highest standards obtainble. To assure that all items, insofar as practicable, possess original appearance, it desired that items normally painted be repainted if the painted sufaces show signs of damage.

24. Inspection

a. Generl. Use pertinent specifications and standards as guides to insure satisfactory performance and acceptability of the telescope.

b. Modification Work Orders. Any modification listed in current DA Pam 310-4 or modification work order list, other than those designated as optional will be applied during repair or overhaul.

c. Moistureproofing and Fungusproofing. Moistureproofing and fugusproofing of telescope M103 involves only the painting of outside surfaces, proper lubrication, and proper sealing of all components.

CHAPTER 4

TROUBLESHOOTING

25. Purpose

Troubleshooting is a systematic isolation and remedy of malfunctions and defective components by means ofs symptoms and test. Close adherence to the procedures covered herein will materially reduce the time required to locate trouble and restore the equipment to normal operation. The scope and level of Ordnance maintenance will govern the test and remedies which may be applied.,

26. Procedure

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

Table III. Troubleshooting

Malfunction	Probable cause	Corrective action
Broken or loose level vial	Telescope dropped	Replace reticle assembly or level vial (fig. 11) (par. 33).
	Defective or improperly applied adhesive sealing.	Reseal in accordance with (par. 35).
Cutoff in field of view except for level vial effects.	Prism separated from holder or defective.	Replace prism assembly (fig. 12) (par. 34) .
Parallax exists	Objective assembly improperly positioned or contains defective lens.	Turn objective assembly in or out (par. 44) or replace defective lens.
Poor definition of image	Condensate present in instru-	Disassemble, clean, assemble and reseal.
	Defective optical elements, objective assembly, or Abbe prism.	Replace defective elements and recheck.
Poor definition of reticle	Reticle improperly adjusted in relation to eyelens.	Reposition reticle assembly (par. 37).
	Defective reticle, eyelens or field lens.	Determine defective component and replace (par. 37).
	Condensate present in telescope .	Disassemble, clean assemble and reseal.
Poorly illuminated reticle and level vial.	Dirty or defective reticle window.	Clean or replace window.
	Slot in reticle cell not positioned correctly.	Adjust eyepiece cell assembly until slot alines with window.
Reticle tilt	Improper positioning of eyepiece assembly.	Adjust eyepiece assembly (fig. 18) (par. 44).
	Improper relationship between reticle vertical vial.	Adjust reticle in reference to level (par. 39).
Telescope does not seat properly within telescope mount M110.	Rust, dirt, paint, or burs present on mounting surfaces.	Remove burs or clean surfaces.
	Thread segments or rear angular locating surface defective.	Replace the prism assembly (fig, 12) (par. 34).

CHAPTER 5
REPAIR AND OVERHAUL

Section I. GENERAL

27. Scope

This chapter contains specific maintenance instuctions for the repair and overhaul of telescope M103. When it is found during inspection, that equipment does not meet the required performance charactaristics, overhaul in accordance with the IROAN of concept (inspect and repair Only as Necessary). This technique will be used, involving a minimum of disassembly in order to replace or repair a defective component. There are no repair parts authorized for field maintenance (3rd and 4th echelons) except associated equipment covered in paragraphs 46 through 52 of this manual.

28. References

Operator and organizational maintenance of telescope M103 is covered in TM 9-1015-223-12, which also contains boresighting and installation procedures. General maintenance procedures are furnished in TM 9-254 and personnel should become familiar with its contents before attempting the procedures described in this manual.

Section II. DISASSEMBLY

29. General

This section describes disassembly of telescope M103 completely to its smallest component. If reptar or overhaul is confined to one assembly, remove only the component necessary to effect the repair and overhaul.

30. Holder Assembly, Housing Assembly, and Eyeshield

Remove eyeshield and holder assembly from housing assembly in acccordance with Iegend sequence (fig. 7).

31. Eyepiece Assembly and Reticle Window

a. remove eyepiece assembly from housing and disassemble in legend sequence (fig. 8).

Note. The eyepiece assembly must be pushed from the housing; therefore, disassembly to the extent prescribed in paragraph 30 is required.

b. If reticle window and retaining ring have to be replaced, it will be necessary to clean away all the glass and sealing compound. Remove the staking burs.

32. Cell Assembly

a. Using tubular spanner wench 5120-345-1400, remove retainer (fig. 9).

b. disassemble cell assembly in legend sequence (fig. 10).

33. Reticle Assembly

a. Using tubular spanner wrench 4931-345-1391, remove retainer. disassemble in legend sequence (fig. 11).

b. If level vial is to be replaced clean all foreign matter from mounting hole.

34. Holder Assembly

a. Remove and disassemble objective cell assembly from prism assembly in legend sequence (fig. 12), using tubular wrench 4931-345-1391.

b. Remove setscrews from sealing parts.

Caution: Care should be used in disassembly of other components not to damage the prism. The Abbe prism cluster is bonded to the holder forming the prism assembly and is not to be removed.

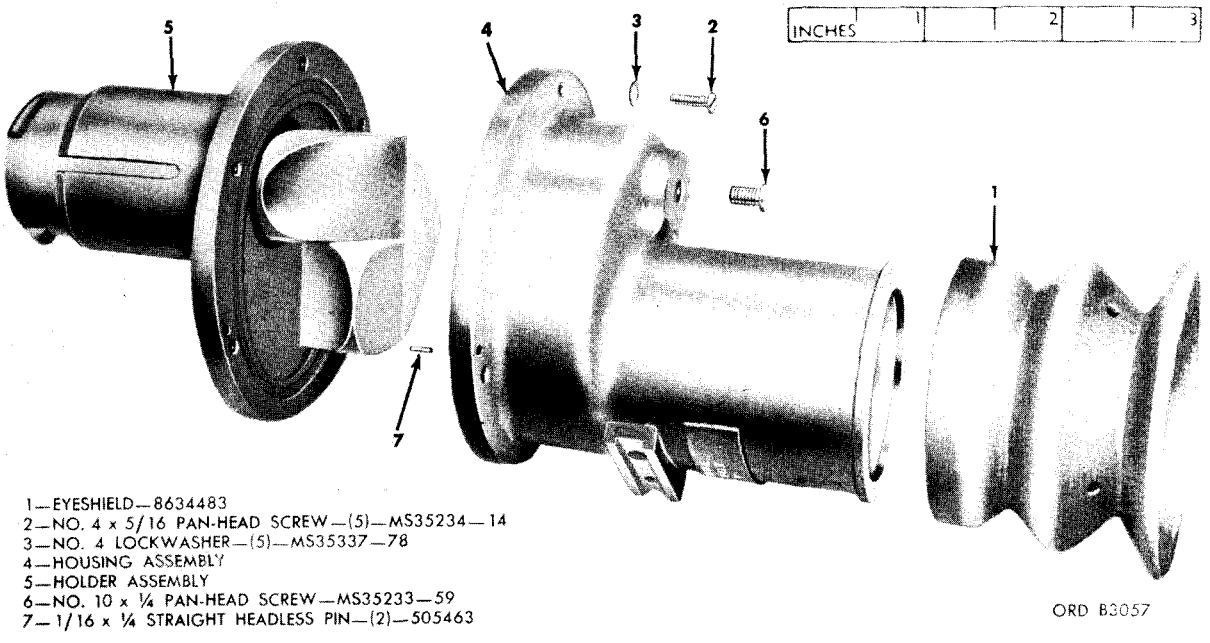

Figure 7. Telescope M103-partial exploded view.

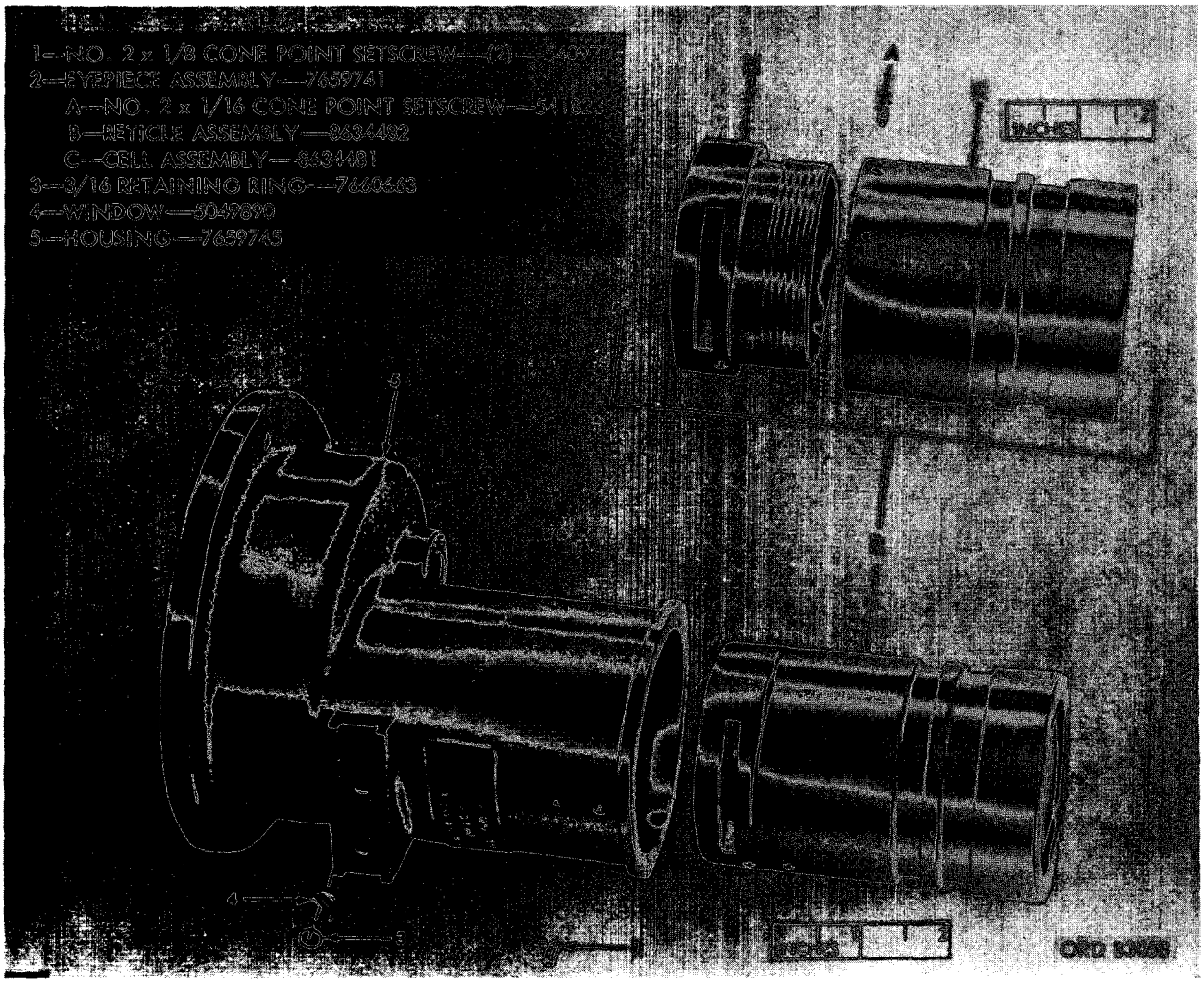

Figure 8. Telescope M103—partial exploded view.

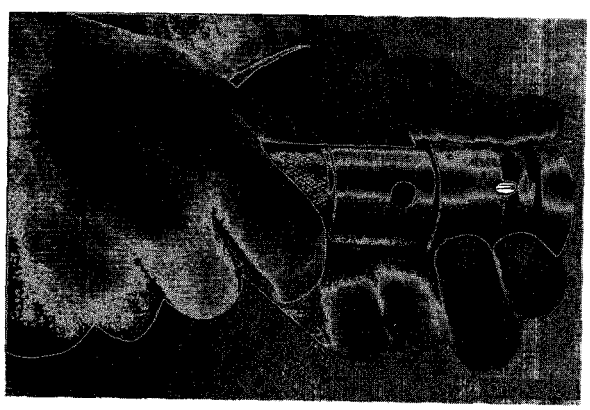

Figure 9. Typical applicatios of tubular spanner wrench.

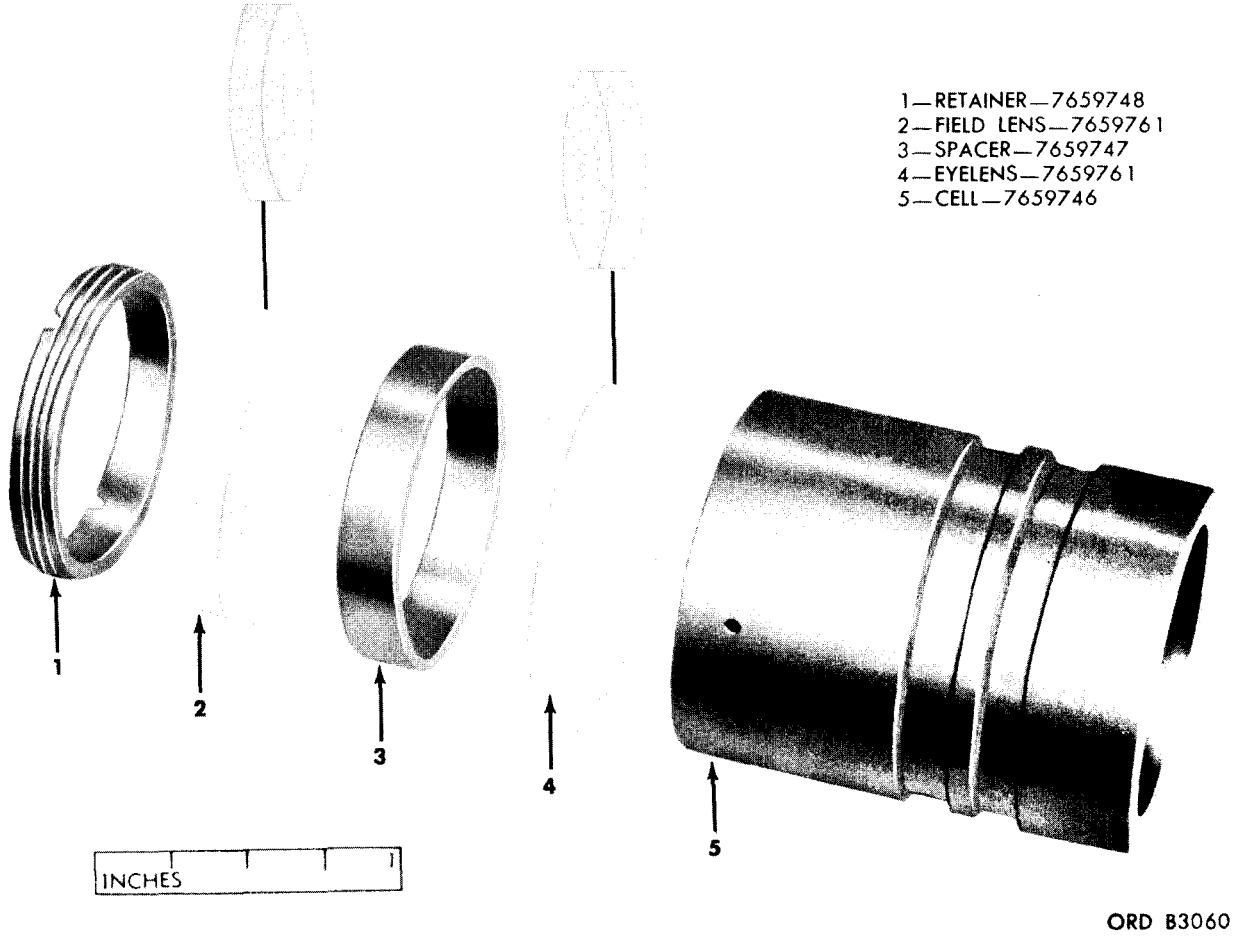

Figure 10. Cell assembly—exploded view.

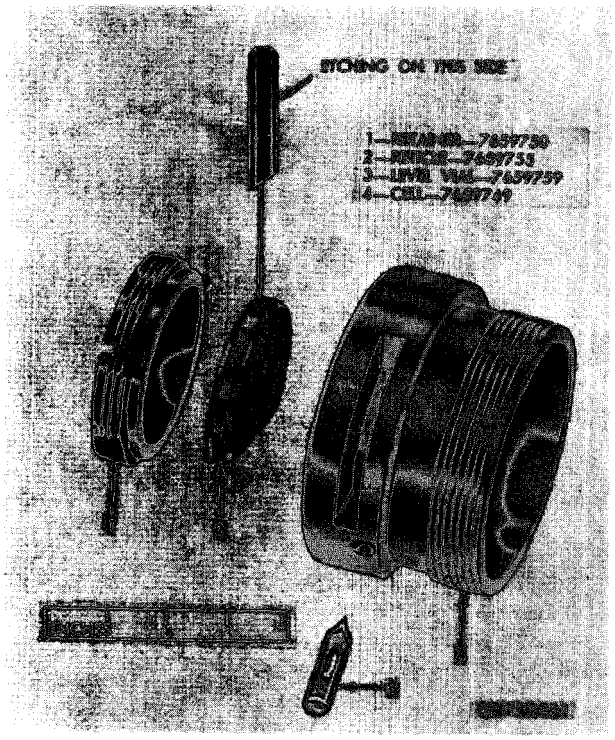

Figure 11. Reticle assembly-exploded view.

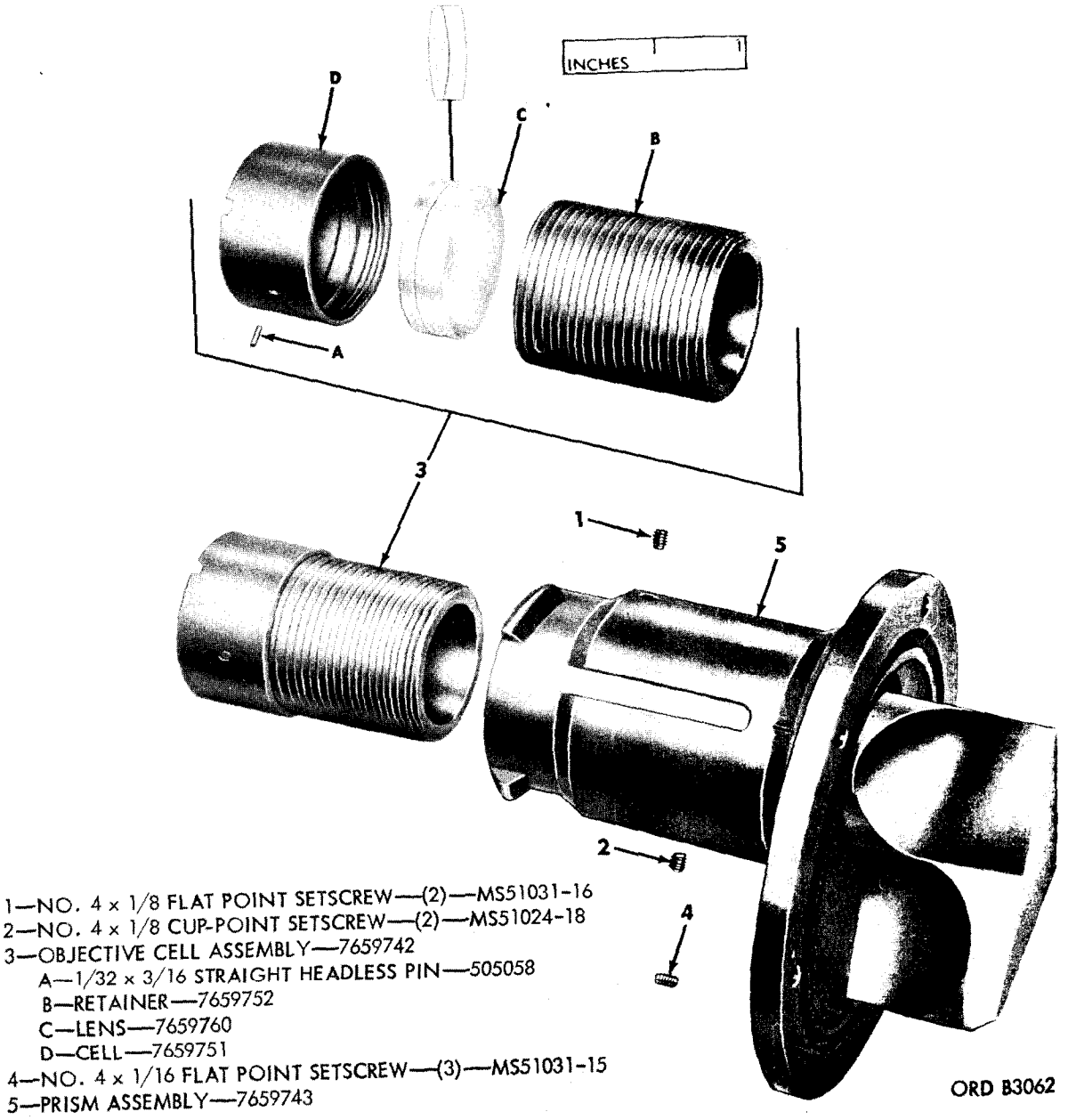

Figure 12. Holder assembly—partial exploded view.

Section III. ASSEMBLY

35. General

a. painting. Paint all exposed surfaces so that the equipment will have the appearance of a new item. Refer to TM 9-2851 for detailed instructions on painting. Bearing surfaces, sliding surf aces, mating surfaces, screw threads and all other critical surf aces must not show traces of paint or primer. Painting of the parts should be done at the most practicable stage of assembly.

b. Lubrication. For parts requiring grease, use aircraft and instrument grease MIL-G-3278.

c. sealing. For parts requiring sealing, there are two types used, adhesive curing sealing Compound MIL-S-11031, and non-curing sealing compound MIL-S-11030.

36. Holder Assembly

a. Apply adhesive curing type sealing compound to the lens seating surface of cell, prior to installing lens. Use tubular wrench 4931-345-1391, to install objective cell assembly, and assemble in accordance with reversed legend sequence (fig. 12).

b. Final positioning and sealing of the objective cell assembly will be done at the time of test and adjustments.

37. Reticle Assembly

Assemble reticle assembly in reverse legend sequence (fig. 11), using tubular spanner wrench 4931-345-1391 to install the retainer. If level vial is replaced it will be sealed with adhesive curing type sealing compound

38. Cell Assembly

Apply adhesive curing type sealing compound to the eyelens seating surface of cell, prior to installing lens. Assemble in reverse legend sequence (fig. 10). Install the retainer using tubular spanner wrench 5120-345-1400

39. Eyepiece Assembly

a. Install reticle assembly into the cell assembly in reverse legend sequence (fig. 8).

b. Using a 3X dioptometer, check eyepiece focus (the relationship between the eyelens and the reticle). The reading on the dioptometer should be within the limits of -0.75 and -1.0 diopter. Turn reticle assembly in or out of cell assembly, for proper setting.

Note. Prior to installing the eyepiece assembly in the housing, place in a precision "V" block on a leveled and crossleveled surface plate. Rotate the assembly until the bubble indicates true level. Viewing through the eyepiece ascertain that the vertical line on the reticle coincides with a true vertical, as established by a plumb line. If alinement is required loosen retainer and establish the required plumb of the reticle. Secure retainer and cheek.

c. Apply noncuring sealing compound to the window seating surface, install window and retaining ring. Stake the ring in four places to the housing.

d. Install eyepiece assembly into telescope housing in reverse legend sequence (fig. 8).

e. Final positioning and sealing will be done at time of test and adjustments.

40. Holder Assembly, Housing Assembly, and Eyeshield

a. Install the holder resemble and eyeshield to the housing assembly in reverse sequence (fig. 7).

b. Sealing of the holder assembly to the housing assembly will be done at time of test and adjustments.

Section IV. TEST AND ADJUSTMENTS

41. General

the test and adustments that follow are performed after the telescope has been completely resembled. The tools and equipment necessary to perform these tests and adjustments are listed in tables Iand II.

42. Vibration Test

Prior to other inspection, the telescope must be vibrated for 2 minutes at a constant frequency of 30 cycles per second with an amplitude of 1/16 inch (1/8-inch maximum excursion) on universal vibration tester 7560085 (fig. 4).

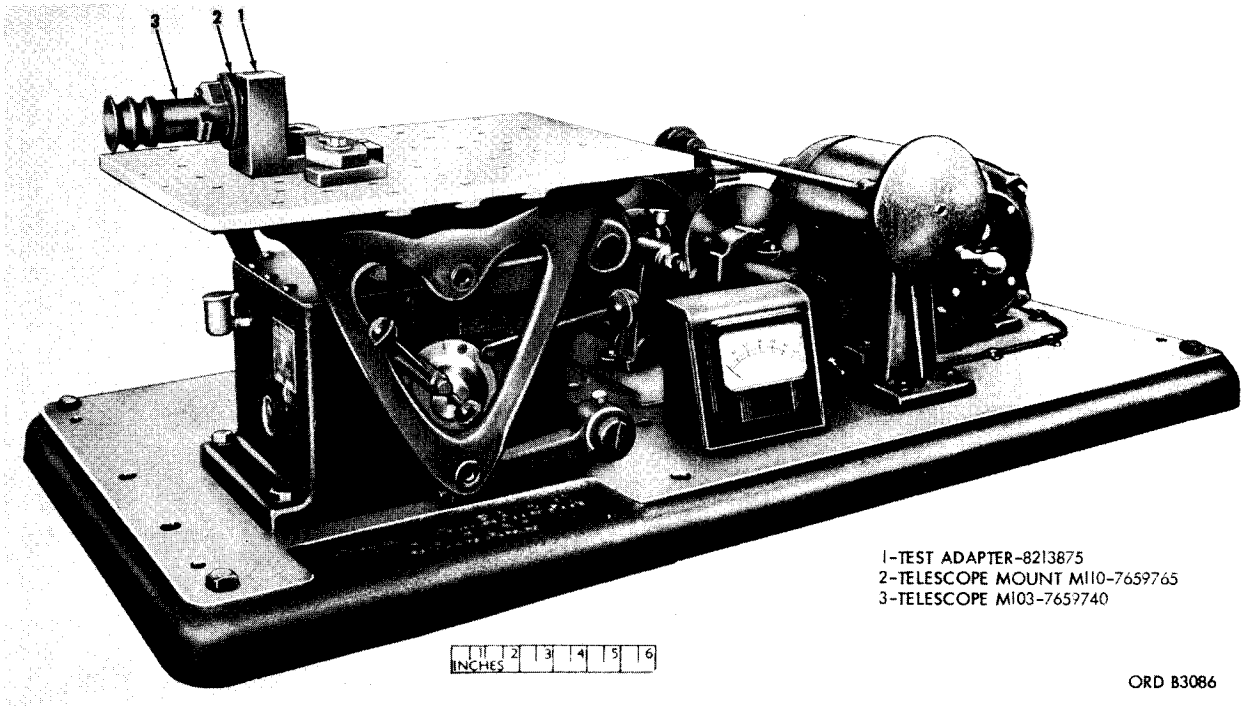

Figure 13. Vibration test setup.

a. Secure test adapter 8213875 (fig. 13) with telescope mount M110 to vibration tester, with necessary clamps.

b. Install the telescope in the mount and vibrate for 2 minutes.

c. After being subjected to the vibration test, the telescope should show no evidence of dirt, chips, fractures, loose components, or cement separation in the system when viewed through the eyepiece and objective end. If any of the above mentioned defects are present, they must be corrected and the telescope vibrated again.

43. Setup Test Equipment

Prior to testing and adjusting of telescope M103, set up the test equipment as in *a* through *o* below.

a. Place the telescope test fixture 7573980 (fig. 3), on a flat, stable, leveled surface.

b. Install "J" support 7680666 in the movable support of the fixture.

c. Clamp collimating telescope 5549108 in a percision "V" block on a leveled surface plate (fig. 14). Loosen clamp and rotate collimating telescope in "V" block until one of the reticle lines coincides with a true vertical line as established by a plumb line. Secure telescope with clamp and check setting.

d. Place the "V" block on the "J" support. Adjust the support, placing collimating telescope approximately at the same height as the projector collimator. Position the "V" block on the support until the telescope line of sight is directed into the projector collimator.

e. Loosen the four socket-head capscrews on the clamps of the projector collimator support assembly. Rotate the projector collimator until the vertical reticle line is in coincidence with the vertical reticle line of the collimating telescope. Tighten the screws securing the projector collimator and recheck settings. Remove "V" block from "J" support.

f. Rotate the adjustable objective scale (fig. 3) until the 100-yard range mark is indexed.

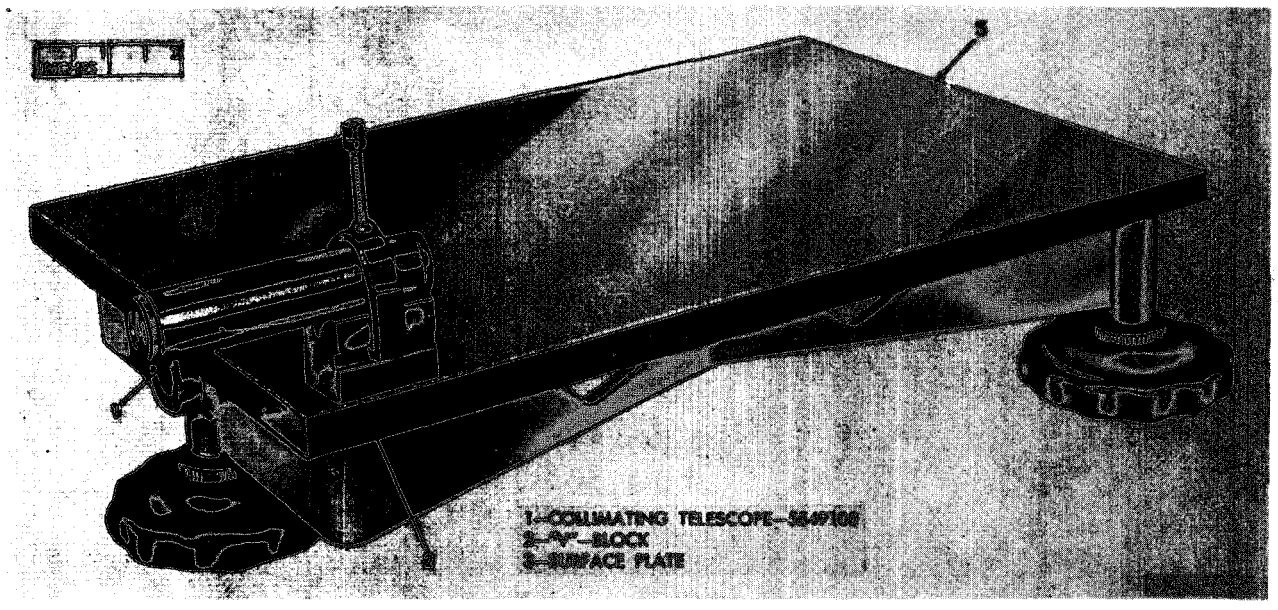

Figure 14. Plumbing reticle of collimating telescope.

g. Rotate the lamp housing until the 90-degree opening is approximately horizontal. Remove the diffusion screen and insert the extension cord lamp housing, plugging the other end to a 110-volt outlet.

h. Install bracket assembly 7680659 on "J" support and insert reflecting mirror 5181003 into the bracket assembly. The reflecting surface of the mirror must face the projector collimator (fig. 3).

i. Sight through the opening in the lamp housing. The reflected image and real image of the projector collimator reticle should be superimposed. Adjusting screws with locks are provided on the collimator support for superimposing. Remove the mirror and bracket from the "J" support. Replace diffusion screen and remove lamp socket from 90-degree opening, and install in the end of lamp housing.

j. Place alinement test adapter in precision "V" block and clamp lightly (fig. 15). Clamp "V" block to an adjustable angle plate that has been secured to a leveled and crossleveled surface plate. Insert setup block in keyway of alinement test adapter and with a dial indicator attached to a height gage, indicate entire surface of setup block. Rotate alinement test adapter and adjust "F" block until a zero reading over the entire surface is attained. Secure "V" block and adapter and recheck.

k. Loosen locknut at base of adjustable angle plate. With a vernier bevel protractor, set angle plate to 26 degrees ±0 minutes, to the left of the vertical (fig. 16).

1. Insert collimating telescope 5549108 (fig. 6) into the alinement test adapter and rotate collimating telescope in adapter until one of the reticle lines coincides with a true vertical line as established by a plumb line. Tighten setscrew in adapter securing collimating telescope and recheck reticle plumb (fig. 16).

m. Install test adapter 8213875 (fig. 17) on "J" support 7680666.

n. Install telescope mount M110 on test adapter using pin type spanner wrench 8213920.

o. Install alinement test adapter (fabricated) with collimating telescope into telescope mount M110 (fig. 17). Raise or lower "J" support to put reticle of collimating telescope in alinement with the projector collimator., Slide the movable support untill a sharp image of "the projector collimator is viewed through the collimating telescope, and lock support in this position. Rotate azimuth boresight worm of mount and superimpose vertical reticle line of collimating telescope on center vertical reticle line of projector collimator. Rotate

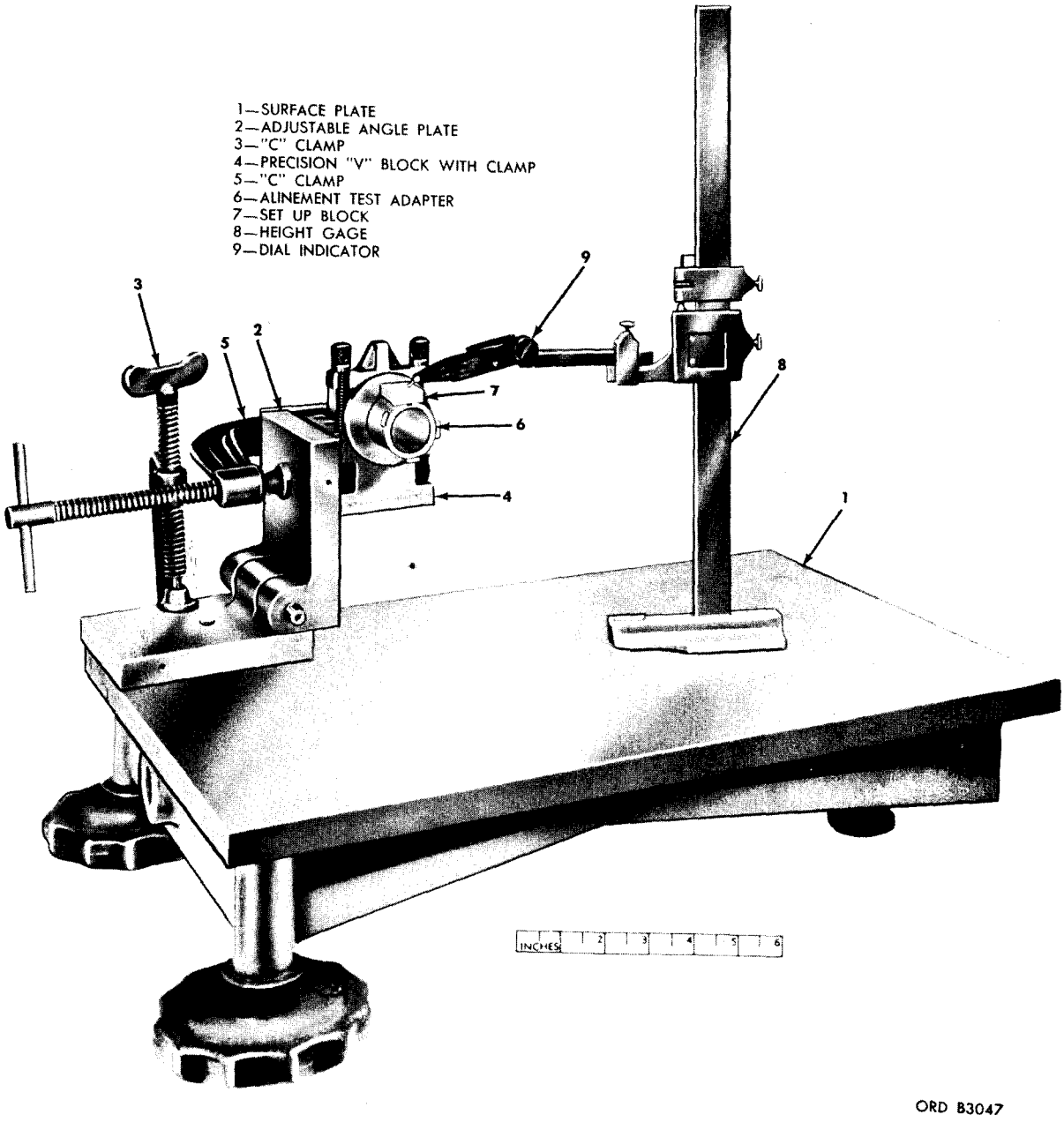

Figure 15. Setting-up alinement test adapter.

elevation boresight worm until the hori - zontal reticle line of collimating telescope intersects the verticle reticle line of the projector collimator at the 15-mil refer- ence line, below the center. Remove aline - ment test adapter from telescope mount M11O.

p. Install telescope M103 into telescope mount (fig. 18).

44. Test and Adjustments

a. Collimation.

(1) *Test.* The line of sight through the the boresight cross of telescope M103, shall fall 45 ±5 roils above the center of the projector col- limator.

(2) Adjustment. Collimation errors

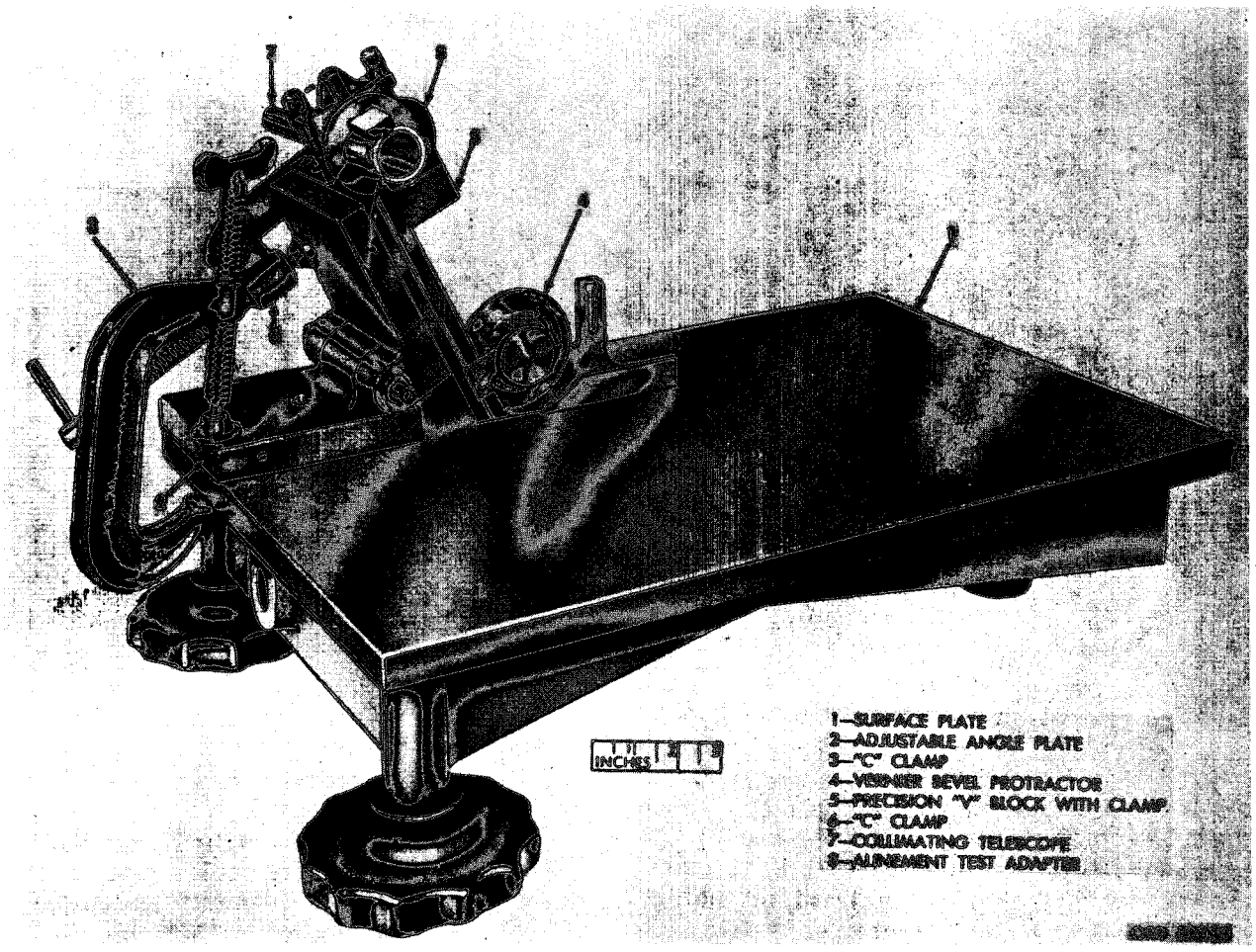

Figure 16. Alining collimating telescope to adapter.

may be due to various causes. Thread segments and the conically shaped shoulder on the prism assembly may be dirty or damaged; inspect, clean, repair, or replace as necessary. defective reticle, cemented optical elements or optical cells may not be concentric; inspect, repair, or replace as necessary.

b. Reticle plumb.

(1) *Test.* With the telescope positioned, the vertical centerline of the reticle pattern shall not deviate from the image of the projector collimator vertical centerline (fig. 18).

(2) *Adjustment.* Loosen setscrews holding eyepiece cell assembly and turn until reticle is plumb.

Note. If level vial bubble is not centered, the reticle assembly should be disassembled to establish the proper relationship of the Ievel vial and the reticle as described in paragraph 33.

c. Illumination.

(1) *Test.* Illuminate reticle, with an instrument light 8246214. The etchings shall appear clearly defined (and the bubble in the level vial shall be legible when observed in a darkened area) (fig. 18).

(2) *Adjustment.* Disconnect the in stument light. Clean all dirt, paint, grease, or other foreign matter from the exterior of the widow. Check for obstruction on inside of window and alinement of slot in reticle cell and repeat test.

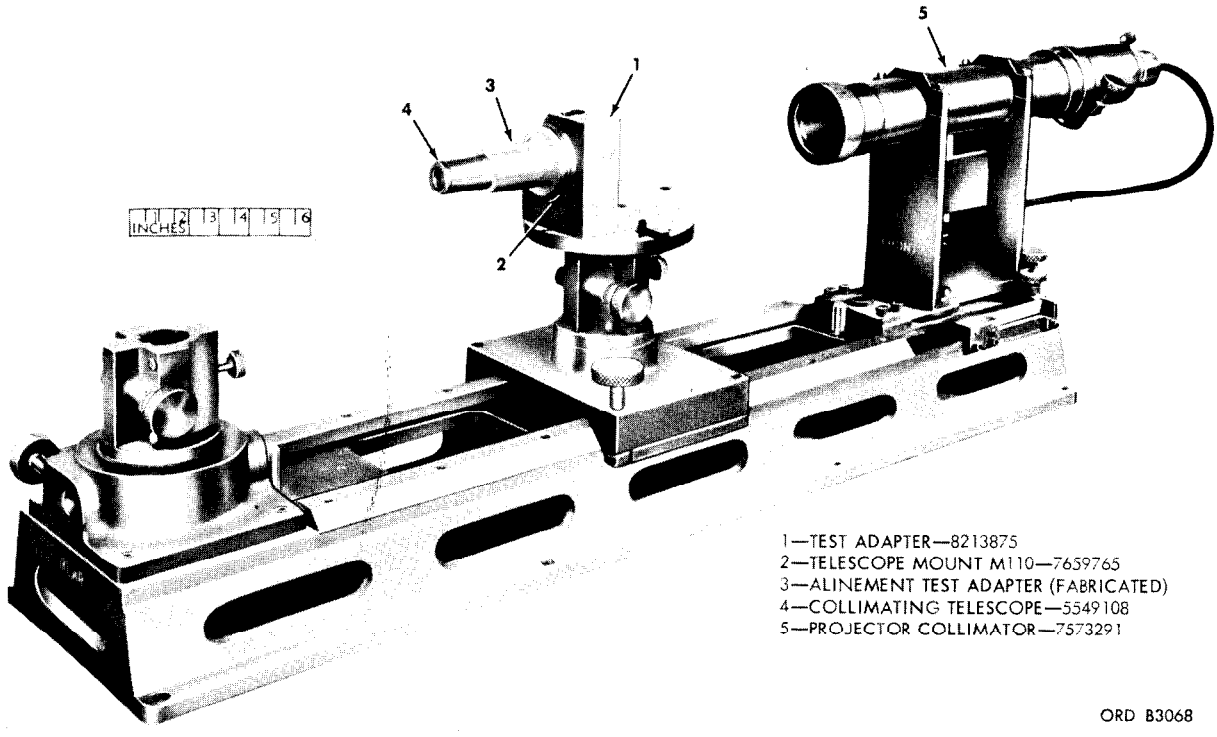

Figure 17. Alinement of telescope mount M110 to projector collimator.

d. Eyepiece Focus.

(1) *Test.* Eyepiece focus test is made with the aid of a 3X dioptometer. Place the dioptometer (fig. 19) against the eyepiece assembly. The reticle must appear in sharpest focus at the center of the field. At this point the dioptometer should have a reading between -0.75 and -1.0 diopter.

(2) *Adjustmennt.* The proper reading on the dioptometer is achieved by adjusting the reticle assembly of telescope M103 as described in paragraph 39.

e. *Definition of Field.* A sharp, clear image should appear at the center of the field, when checked with the aid of a dioptometer as outlined in (2) above.

f. Parallax.

(1) *Test.* View the image through the eyepiece of the telescope. Move the head about 1/4 inch from side to side and up and down at normal eye distance from the telescope. If the image of the projector collimator reticle appears to move with respect to the telescope reticle, parallax is present. The amount of parallax may be determined from the graduated projector collimator reticle.

(2) *Adjustment.* Parallax is removed by moving the objective assembly in or out, using tubular spanner wrench 4931-345-1391. If adjustment of the objective assembly does not eliminate parallax remove and disassemble, check all optical components, also metal parts for mechanical errors. Reassemble and install.

45. Sealing

a. General. When it has been determined that the telescope M103 is in a serviceable condition, those assemblies not sealed during assembly should be sealed at this time.

b. Application of Sealing Compound. The compound is applied depending on the

available equipment, the area to be filled, and the design or type of joint. Sealing may be done with the sealing compound gun, using adapters to fit the injection ports.

Select an adapter having the proper orifice and the size and length of thread which is appropriate for the drilled and tapped injection port and the void to be filled.

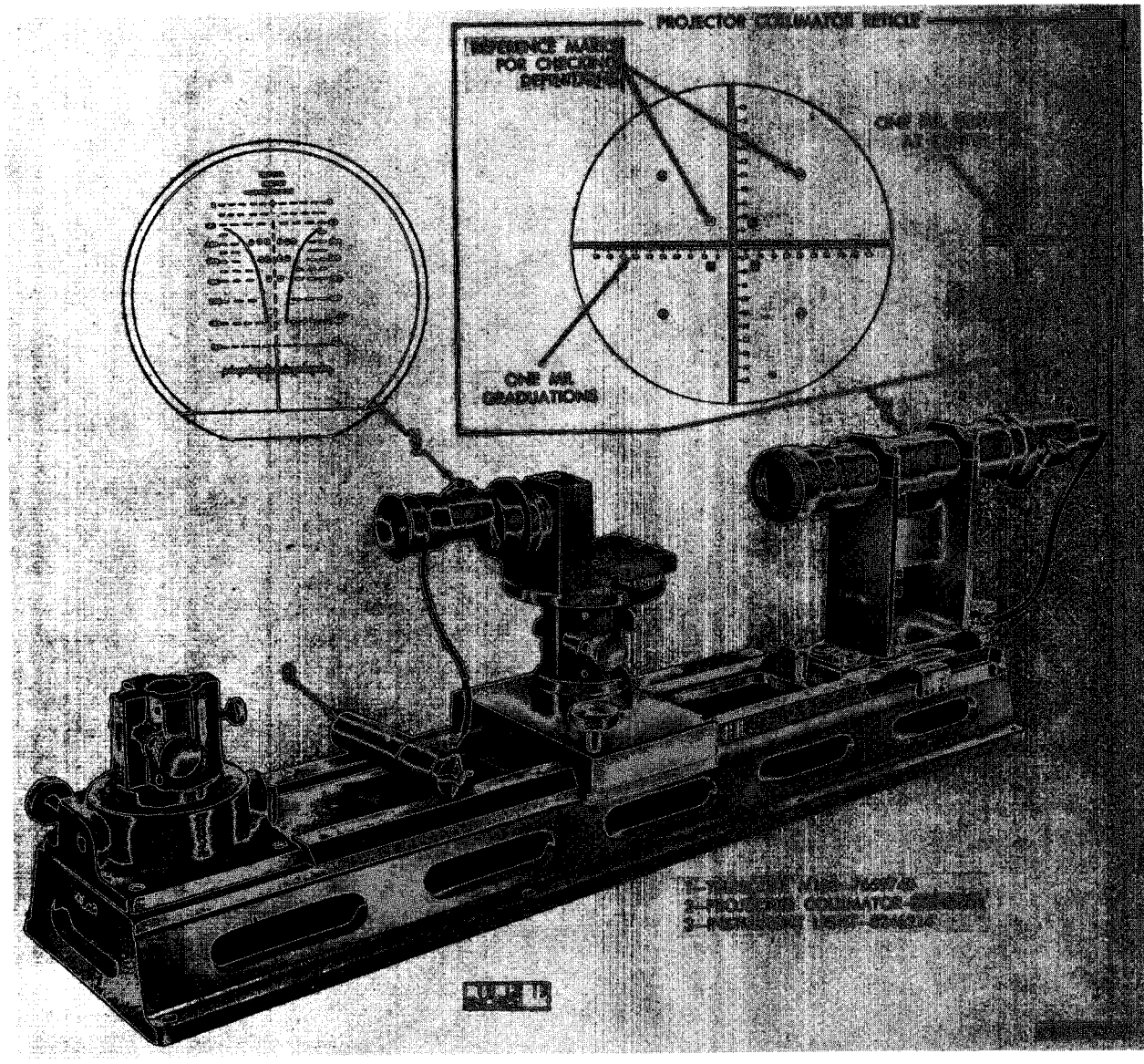

Figure 18. Testing telescope M103.

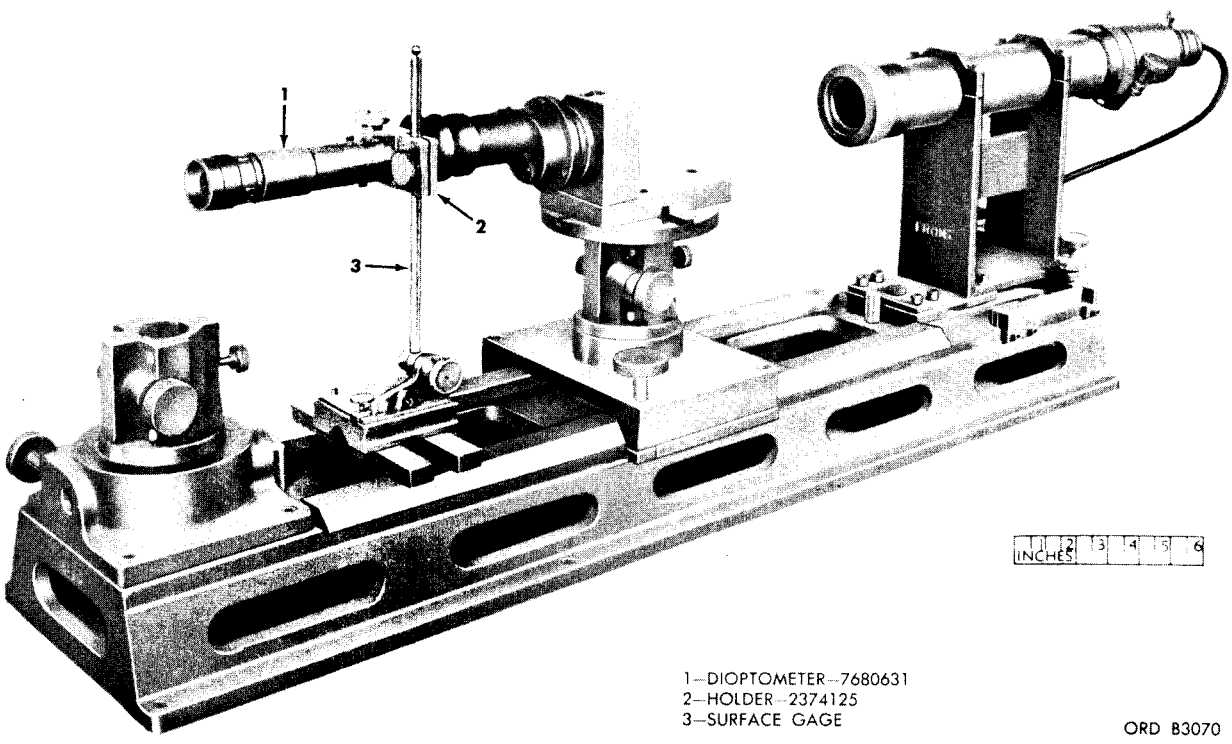

Figure 19. Testing telescope w/dioptometer,

CHAPTER 6

EQUIPMENT ISSUED WITH TELESCOPE M1033

Section I. GENERAL

46. Purpose

the purpse of this chapter is to outline the maintenance procedures for inspection and repair of the associated equipment issued with telescope M103.

47. References

The description and maintenance responsibilities required will apply as reflected in the maintenance allocation chart in TM 9-1015-223-12 and as reflected by the allocation of repair Parts listed in TM 9-1240-259-35P.

Section II. INSPECTION

48. General

The inspection of associated equipment will be of a general nature to determine the extent of the required repair. For overall inspection procedures, refer to paragraphs 13 through 24.

Section III. DISASSEMBLY

49. Instrument Light 8246214

Disassemble instrument light in legend sequence (fig. 20).

50. Clamp and Bracket Assembly 7659949

Disassemble clamp and bracket assembly in legend sequence (fig. 21).

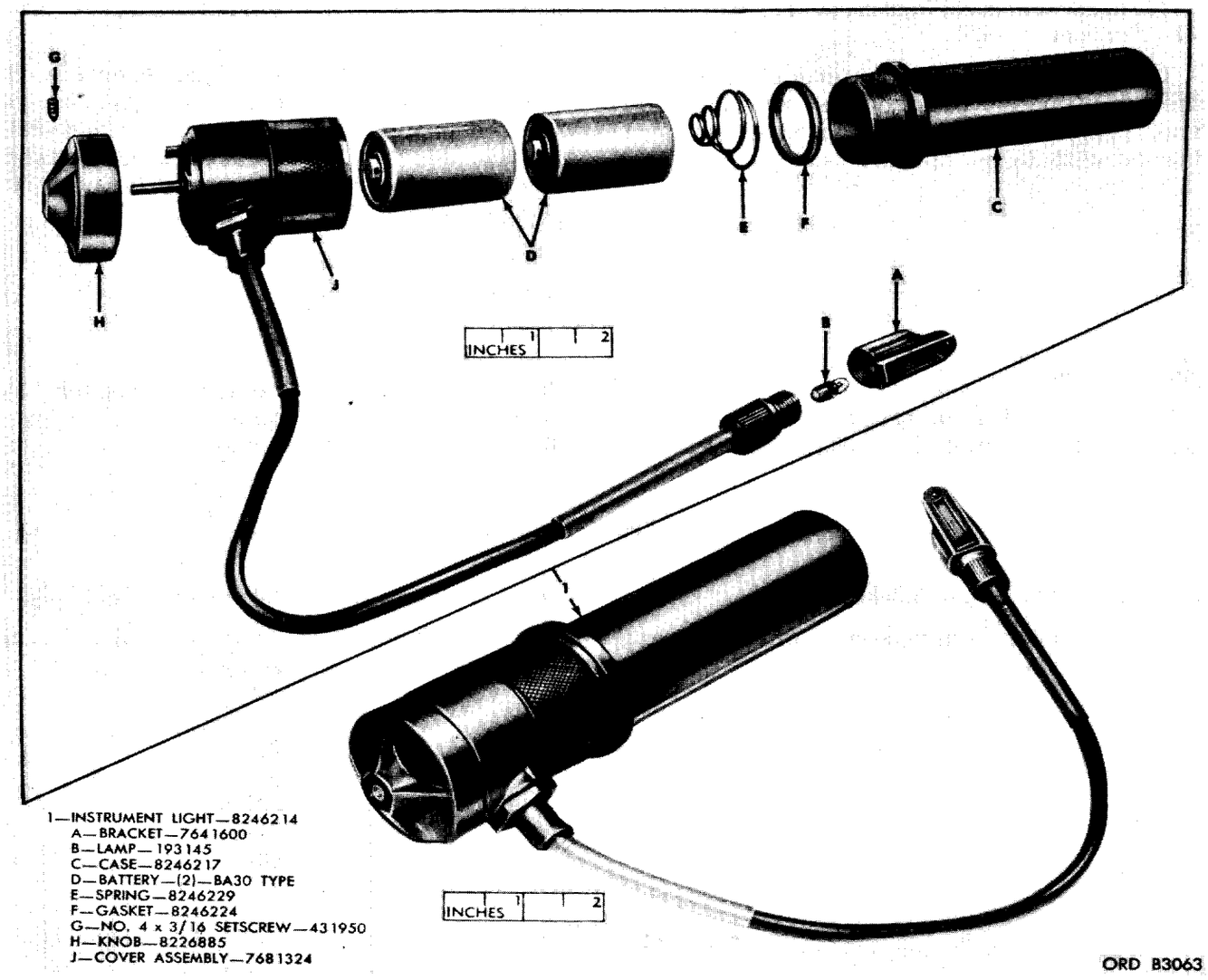

Figure 20. Instrument light 8246214—partial exploded view.

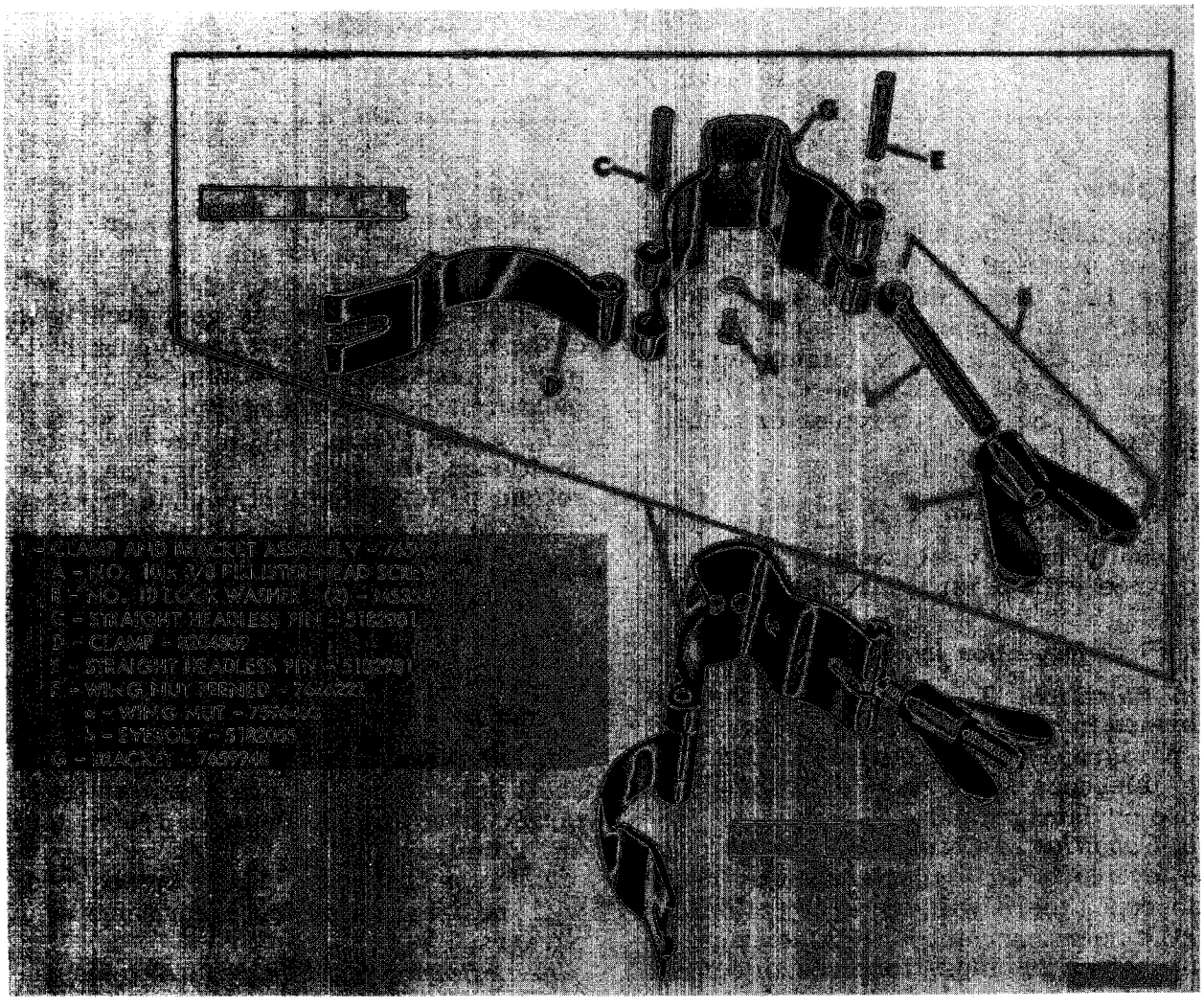

Figure 21. Clamp and bracket assembly 7659949—exploded view.

Section IV. ASSEMBLY

51. Instrument Light 8246214

Assemble instrument light in reverse legend sequence (fig. 20).

52. Clamp and Bracket Assembly 7659949

Assemble clamp and bracket assembly in reverse legend sequence (fig. 21).

CHAPTER 7
FINAL INSPECTION

53. General

Final inspection is performed after repair or overhaul has been completed to insure that the materiel is serviceable according to established serviceability standards. Any item containing defects disclosed by the final inspection will be returned to the shop for repair or adjustment.

54. Visual Inspection

Visually inspect telescope M103 in accordance with paragraphs 15 through 24.

55. Final Inspection for Acceptance

a. Vibration. Telescope M103 shall be vibrated in the same manner as described in paragraph 42. Subsequent to vibration, the telescope shall show no evidence of loose or damaged parts.

b. Condition of Optics. Viewing through the eyepiece and objective ends of the telescope, there will be no objectionable dirt, smears, scratches, digs, condensate, fungus growth, chips, fractures, or cement separation. The shading or shadowing technique will be used to determine the presence of objectionable condensate or smears. Shadowing is the- technique of looking into the eyepiece or objective end of the telescope, slight obliquely so as to obtain reflections from a particular surface in the optical system. With this method, the surfaces of the internal optical elements are drab gray in appearance and all defects (condensate, scratches, etc.) show up as white particles.

c. Collimation. When positioned in accordance with paragraph 44 the line of sight through the boresight cross shall be 60 ±5 roils above the geometric axis of the mount and shall be parallel laterally to the geometric axis within ±5 roils as measured in the horizontal plane.

d. Reticle Plumb. With the telescope positioned, the vertical centerline of the reticle pattern shall not deviate from the image of the projector collimator vertical line by more than 2 degrees.

Note. Two degrees is equivalent to the angle subtended by a 3.0 mil block at one extremity of the 0 to 700 meter vertical reticle line when the other extremity of the vertical line is in coincidence with the vertical reticle line of the projector collimator.

e. Parallax. Parallax at the optical axis shall not exceed 0.3 mil when viewing a target at any range between 100 meters and infinity.

f. Eyepiece Focus. The eyepiece focus will be performed in accordance with paragraph 39.

g. Definition of Field. The telescope must produce a sharp and clear image at the center of the field when checked with the aid of an auxiliary telescope.

h. Illumination. With the reticle illuminated by an instrument light 8246214, the reticle scale and level vial must appear clearly defined when observed in a darkroom.

i. Sealing. Sealing will be in accordance with the latest Ordnance drawings for tele - scope M103.

CHAPTER 8
PROCESSING AND PACKAGING

56. General

Refer to TM 9-200 (boxed materiel) and m 9-299/1 (imboxed materiel) for processing and packing instruction at levels A, B, and C.

57. Optical Components

Cover all windows or optical elements with at least four thicknesses of neutral lens tissue and secure in place with water-resistant presssure-sensitive adhesive tape. Cover the lens tissue with cellulosic cushioning material and secure in place with pressure-sensitive tape.

APPENDIX

REFERENCES

1. Publication Indexes

The following publication indexes 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.

Index of Army Motion Pictures, Film Strips, Slides and Phono-Recordings.	DA Pam 108-1
Military Publications:	
Index of Administrative Publications	DA Pam 310-1
Index of Blank Forms	DA Pam 310-2
Index of Graphic Training Aids and Devices	DA Pam 310-5
Index of Supply Manuals; Ordnance	DA Pam 310-29
Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.	DA Pam 310-4
Index of Training Publications.	DA Pam 310-3

2. Supply Manuals

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

a. Destruction to Prevent Enemy Use.	
Ammunition: Explosives, Bulk Propellants, Explosive Devices.	SM 9-5-1375
b. General.	
Introduction	ORD 1
c. *Repair and Overhaul.*	
Brushes, Paints, Sealers, and Adhesives	SM 9-1-8000
Fuels, Lubricants, Oils, and Waxes	SM 9-1-9100
Hardware and Abrasives	SM 9-l-53(*)
Maintenance and Repair Shop Equipment	SM 9-1-4900
Special Tool Sets for Sighting and Fire Control Materiel Used with Small Arms, Automatic Guns, Mortars, and Field Artillery (SNL Group F).	ORD (*) SNL J-32
Tool Kit, Fire Control Repairman (Oral Dwg No. 7540665) (MOS 402.20) (5180-357-7735).	SM 9-4-5180-A61
Tool Kit, Instrument Repairman's (Oral Dwg No. 7540666) (MOS 403.20) (5180-357-7743).	SM 9-4-5180-A62

3. Forms

The following forms pertain to this materiel:

DA Form 5-31, Shop Job Order Register
DA Form 9-1, Materiel Inspection Tag
DA Form 9-12, Inspection of Ordnance Equipment
DA Form 9-79, Part Requisition
DA Form 9-80, Job Order File

See DA Pam 310-29, Index of supply manuals Ordnance Corps, for published manuals of the Ordnance section of the Department of the Army.

DA Form 9-81, Exchange Part or Unit Identification Tag
DA Form 421, Stock Record Card
DA Form 468, Unsatisfactor Equipment Report
DA Form 811, Work Request and Job Order
DA Form 828, Job Time Ticket-individual
DA Form 829, Rejection Memorandum
DA Form 1546, Request for Issue or Turn-In
DA Form 1739, Command Maintenance Inspection - Fire Control Equipment Inspection Report - Ordnance Equipment
DA Form 2028, Recommended Changes to DA Technical Manual, Parts List or supply Manual 7, 8, or 9
DD Form 6, Report of Damaged or Improper Shipment
DD Form 250, Materiel Inspection and Receiving Report

4. Other Publications

a Camouflage.	
Camouflage, Basic Principles and Field Camouflage	FM 5-20
b. Deconfmimtion.	
Decontamination	TM 3-220
Small Unit Procedures in Atomic, Biological, and Chemical Warfare.	FM 21-40
c. Destruction to Prevent Enemy Use.	
Explosives and Demolitions	FM 5-25
Ordnance Ammunition Service.	FM 9--5
Safety: Regulations for Firing Ammunition for Training, Target Practice, and Combat.	AR 385-63 AFR 50-13
d. General.	
Logistics (General):	
Malfunction involving Ammunition and Explosives	AR 700-1300-8
Unsatisfactory Equipment Report.	AR 700-38
Military Symbols	FM 21-30 AFM 55-3
Military Terms, Abbreviations, and Symbols:	
Autthorized Abbreviation and Brevity Codes	AR 320-50
Dictionary of United States Army Terms	AR 320-5
Military Training	FM 21-5
Ordnance Direct Support Service	FM 9-3
Ordnance General and Deptot Service	FM 9-4
Principles of Fire Control Materiel	TM 9-3305-2
SafetyAccident Reporting Records	AR 385-40
Shop Mathematics	TM 9-2820
Techniques of Military Instruction	FM 21-6
e. *Maintenance.*	
Field and Depot Maintenance Repair Parts and Special Tool Lists for Telescope M103.	TM 9-1240-259-35P
Field Control Materiel: Lubrcation	TB 9-2835-1
Generl Maintenace Procedures for Fire Control Materiel . . .	TM 9-254
Grease, Aircraft and Instrument (For Low and High Temperature).	MIL-G-3278
Ispection of Ordnance Materiel in Hands of Troops.	T M 9 - 1 1 0 0

Instruction Guide: Elementary Optics and Applications to Fire Control Instruments.	TM 9-2601
Lubrication	TM 9-2835
Maintenance and Care of Hand Tools	TM 9-867
Maintenance of Supplies and Equipment: Command Maintenance Inspection.	AR 750-8
Spot Check Inspection and Reports; Ordnance Corps Materiel	AR 750-925
Northern Operations	FM 31-71
Operation and Maintenance of Ordnance Materiel in Extreme Cold Weather, 0° to -65° F.	TM 9-207
Ordnance Maintenance: Materials Used for Cleaning, Preserving, Abrading, and Cementing Ordnance Materiel; and Related Materials Including Chemicals.	TM 9-247
Painting Instructions for Field Use	TM 9-2851
f. Operation.	
Artillery Materiel and Associated Equipment	TM 9-2300
Auxiliary Sighting and Fire Control Equipment	TM 9-575
Operator and Organizational Maintenance for 90-mm Rifle M67	TM 9-1015-223-12
g. *Shipment and Storage.*	
General Packaging Instructions for Ordnance General Supplies .. O	TM 9-200
Issue of Supplies and Equipment: Preparation, Processing, and Documentation for Requisitioning, Shipping, and Receiving	AR 725-5
Logistics (General): Report of Damaged or Improper Shipment ..	AR 700-58
Marking and Packing of Supplies and Equipment: Marking of Supplies for Shipment	AR 746-80
Preservation, Methods of	MIL-P-116
Processing of Unboxed Self-Propelled and Towed Class II Ordnance General Supplies and Related Materiel for Shipment and Storage	TB 9-299/l
Protection of Ordnance General Supplies in Open Storage	TB ORD 379
Standards for Oversea Shipment and Domestic Issue of Ordnance Materiel Other than Ammunition and Army Aircraft	TB ORD 385
Storage of Shipment of Supplies and Equipment: Preservation, Packaging and Packing	AR 740-15
Storage of Supplies and Equipment: Storage and Materials Handling	TM 743-200-1

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9–7	

Ng: None.
USAR: Unitd-Same aa Active Army except allowance is one copy to each unit.
For explation of abbreviations used, see AR 320-50.