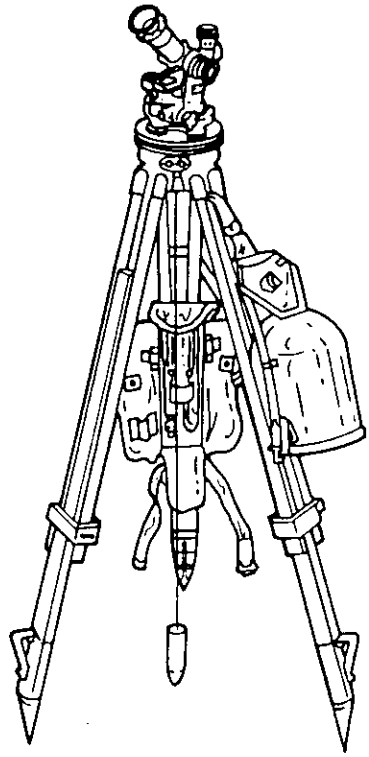
ARMY TM 9-1290-262-24&P
MARINE CORPS TM 00476C-24&P
AIR FORCE TO 49A7-3-72/74
SUPERSEDES COPY DATED
28 JUNE 1982 AND 1 APRIL
1983. SEE PAGE i FOR DETAILS.

TECHNICAL MANUAL

UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL (INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST)

AIMING CIRCLE, M2A2, W/E (1290-01-067-0687)(EIC:3SC)



HEADQUARTERS, DEPARTMENT OF THE ARMY
SEPTEMBER 1994

WARNING

Do not point the telescope directly at the sun unless the filter is used to prevent possible serious damage to your eyes.

FIRST AID

For additional first aid data, see FM 21-11,

LIST OF EFFECTIVE PAGES

Dates of issue for original and changed pages are:

Original ..... 0 ..... 22 September 1994
Change ..... 1 ..... 1 December 1999

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 190, CONSISTING OF THE FOLLOWING:

Page No.	*Change No.	Page No.	*Change No.
Front Cover	0	Figure C-7 - C-9-1	0
Warning Page	0	Figure C-10 - C-10-1	1
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B blank Added	1	D-1 - D-2	0
Change Instruction Sheet	1	E-1 - E-10	0
Authentication Page, Change 1	1	I-1 - I-2	1
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C-1 - C-8	0	Metric Chart	0
Figure C-1 - C-5-1	0	Back Cover	0
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ARMY TM 9-1290-262-24&P
MARINE CORPS TM 00476C-24&P
AIR FORCE TO 49A7-3-72/74
C1

CHANGE

NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *1 December 1999*

TECHNICAL MANUAL
UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT
MAINTENANCE MANUAL
(INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST)

AIMING CIRCLE, M2A2, W/E
(1290-01-067-0687) (EIC:3SC)

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

Army TM 9-1290-262-24&P, 22 September 1994, is changed as follows:

1. Remove old pages and insert new pages as indicated below.
2. New or changed material is indicated by a vertical bar in the margin of the page.
3. Added or revised illustrations are indicated by a vertical bar adjacent to the illustration or miniature pointing hands in the affected areas.

Remove Pages	Insert Pages
None	A/B blank
None	Authentication Page
i and ii	i and ii
C-5-1 through Figure C-7	C-5-1 through Figure C-7
C-9-1 through Figure C-11	C-9-1 through Figure C-11
I-1 through I-4	I-1 through I-4
I-7 through I-10	I-7 through I-10

By Order of the Secretary of the Army:

ERIC K. SHINSEKI
General, United States Army
Chief of Staff

Official:

JOEL B. HUDSON
Administrative Assistant to the Secretary of the Army

410004

DISTRIBUTION: To be distributed in accordance with the Initial Distribution Number (IDN) 9920001 requirements for Army TM 9-1290-262-24&P.

***ARMY TM 9-1290-262-24&P**
MARINE CORPS TM 00476C-24&P
AIR FORCE TO 49A7-3-72/74

TECHNICAL MANUAL
Army No. 9-1290-262-24&P
Marine Corps No. 00476C-24&P

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington D.C., 22 September 1994

TECHNICAL ORDER
Air Force No. 49A7-3-72/74

UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL (INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST) FOR AIMING CIRCLE M2A2, W/E (1290-01-067-0687) (EIC: 3SC)

Current as of 1 December 1999 for Appendix C

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, U.S. Army Tank-automotive and Armaments Command - Rock Island, ATTN: AMSTA-LC-CIP-WT, Rock Island, IL 61299-7630. A reply will be furnished to you. Marine Corps users submit NAVMC 10772 to: Commander, Marine Corps Logistics Bases (Code 850), Albany, GA 31704-5000. Marine Corps units should also respond to MARCORSYSCOM, ATTN: (CBG) with a copy of the NAVMC 10772 or via Naval message. Air Force users submit AFTO Form 22, Technical Order System Publications Improvement Report and Reply to: WR-ALC/LZDTA, Robins AFB, GA 31098-5330.

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

TABLE OF CONTENTS

*This manual supersedes Army TM 9-1290-262-24, 28 June 1982, and Army TM 9-1290-262-24P,1 April 1983, including all changes.

HOW TO USE THIS MANUAL

GENERAL. References in the manual are to pages and other technical manuals.

INDEXES. This manual is organized to help the user quickly find the information needed. There are five useful indexes.

a. Front Cover Index. Is a tabbed index of chapters and appendixes (keyed to tabbed pages in the manual).

b. Table of Contents. Lists in order all chapters, sections, and appendixes. Gives page references.

c. Nomenclature Cross-References List and List of Abbreviations.

(1) Nomenclature Cross-Reference List. Gives an alphabetical list of common item names used in the manual. Official nomenclature is given for each item (p 1-2).

d. Symptom Index. Located just before the troubleshooting table in each maintenance chapter. Lists possible malfunctions and corrective actions. References pages of the troubleshooting tables.

e. Alphabetical Index. Located at the end of the manual. An extensive subject index for everything in the manual. Gives page references.

MAINTENANCE PROCEDURES. There is a maintenance paragraph for each assembly. Each chapter contains detailed procedures for the maintenance tasks.

a. Detailed Procedures. Contain an initial setup plus step-by-step procedures.

(1) Initial Setup. Gives a list of everything needed in order to do the maintenance task on a component of a fire control instrument.

(2) Step-By-Step Procedures. Are illustrated maintenance procedures authorized in Maintenance Allocation Chart (MAC) (appx B) and Repair Parts and Special Tools List (RPSTL) (appendix C).

b. Troubleshooting. Included in each chapter are procedures for direct support or general support troubleshooting.

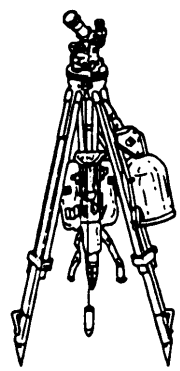
c. Test and Adjustment. Immediately follow the maintenance sections. List inspections and tests required to ensure the serviceability of each fire control instrument.

CHAPTER 1

CHAPTER INDEX

Section I. GENERAL INFORMATION

Section Index



AIMING CIRCLE M2A2 W/E

1-1. SCOPE.

a. Type of Manual: Unit, Direct Support, and General Support Maintenance

b. Model Number and Equipment Name: M2A2 Aiming Circle, W/E.

c. Purpose of Equipment: Provides precise measurement of azimuth and elevation angles of a ground or aerial target with respect to a preselected baseline as required for orientation of artillery weapons.

1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750, The Army Maintenance Management System. Marine Corps personnel will use TM 4700-15/1 (Equipment Record Procedures).

1-3. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE. Evacuate the aiming circle, if at all possible. If the aiming circle cannot be evacuated, destroy it by smashing the optics and mounting.

1-4. PREPARATION FOR STORAGE OR SHIPMENT. U.S. Army personnel will refer to page 2-10. Marine Corps personnel will refer to MCO P4450.7 (Marine Corps Warehousing Manual) for preparation for storage.

1-5. OFFICIAL NOMENCLATURE, NAMES, AND DESIGNATIONS. This listing includes nomenclature cross-references used in this manual.

Common Name	Official Nomenclature
Eccentric	Eccentric seat
Eccentric ring	Machine thread plug
Locking knob	Electrical dial-knob lock
Objective assembly	Optical cell assembly
Objective lens	Optical cell lens
Pivot	Shouldered shaft
Self-sealing screw	Machine screw
Stop ring	Key washer
Worm shaft cap	Ball socket seat

1-6. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR). US Army, if your M2A2 aiming circle needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Tell us why a procedure is hard to perform. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to the address specified in DA PAM 738-750. Marine Corps personnel, if your M2A2 aiming circle has a defect or nonconforming condition which limits or prohibits the item from fulfilling its intended purpose submit a Product Quality Deficiency Report in accordance with MCO 4855.10 (Product Quality Deficiency Report) and TM 4700-15/1 (Equipment Record Procedures). Marine Corps personnel, if your M2A2 aiming circle needs improvement which relates directly to savings in manhours, materials, supplies, equipment, or money, or to increased effectiveness in carrying out the programs or missions of your Command, refer to MCO 1650.17 (Beneficial Suggestion Awards Program). Air Force users submit Materiel Deficiency Report (MDR) and Quality Deficiency Report (QDR) in accordance with TO 00-35D-54, TM, USAF, Materiel Deficiency Reporting and Investigating System, to WR-ALC/LZBS, Robins AFB, GA 31098-5330

Section II. EQUIPMENT DESCRIPTION AND DATA

Section Index

1-7. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

a. The aiming circle looks very similar to a surveyor's transit.

b. Rugged construction allows the aiming circle to be operated under a wide range of weather conditions.

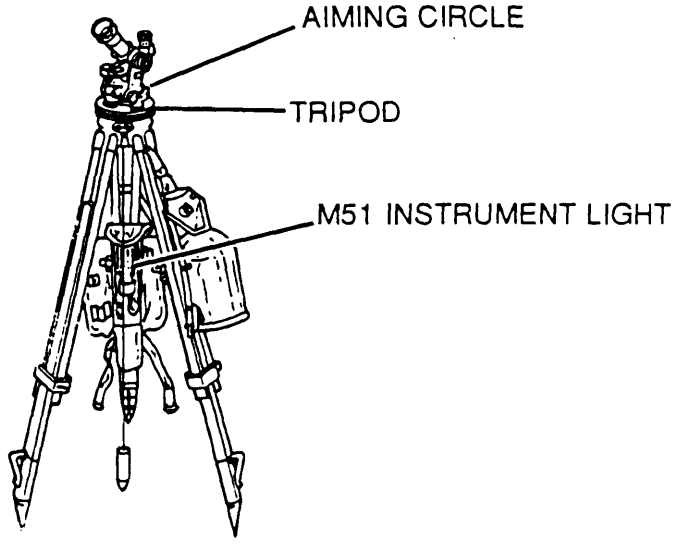
c. The aiming circle is used for precise measurement of azimuth and elevation angles.

d. The telescope is a low power, fixed focus instrument. The elbow bend in the telescope makes the instrument easier for the operator to use.

e. A mounting mechanism provides the elbow telescope with unlimited azimuth movements and limited elevation movements.

f. The aiming circle can be used to shoot the sun or for general topographical surveying.

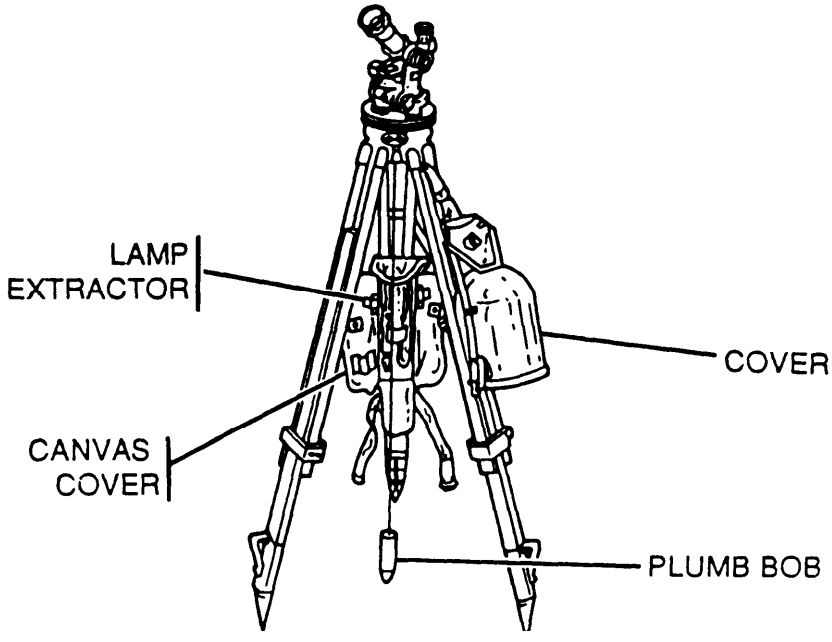
1-8. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.



a. Aiming Circle. Mounts on the tripod head. The aiming circle consists of an elbow telescope that is provided with leveling screws, level indicating vials, and elevation and azimuth scales.

b. Tripod. Consists of three legs hinged to a flat tripod head. The wooden legs are adjustable in length. The flat tripod head contains a screw assembly that secures the aiming circle to the tripod head. The screw also contains a hook for hanging the plumb bob string.

c. M51 Instrument Light. The tube contains two batteries, a rheostat type switch, and two wire cables, each with a specialized light.



d. Cover. The aluminum dome is provided with two cover latches and a webbed carving strap.

e. Plumb Bob. Consists of a pointed cylindrical weight with a nylon string and slide adjuster.

f. Canvas Cover. Contains pockets for storing the instrument light, plumb bob, and lamp extractor.

g. Lamp Extractor. Consists of a metal tube with a rubber cap at each end.

1-9. EQUIPMENT DATA. Refer to TM 9-1290-262-10.

Section III. PRINCIPLES OF OPERATION

1-10. AIMING CIRCLE WITH EQUIPMENT. A portable instrument used to measure elevation and azimuth angles. With the aid of a filter, the aiming circle can be used to shoot the sun.

a. AIMING CIRCLE. Secured on the head of the tripod with the instrument fixing screw. Three baseplate screws and two tube levels are used to level the aiming circle. The elbow telescope when slewed in azimuth or elevation provides angle readings on the mil scales or on the reticle.

b. TRIPOD. Provides a flat, stable platform for the aiming circle.

c. M51 INSTRUMENT LIGHT. Provides light to operate the aiming circle at night.

d. COVER. Protects the aiming circle when not in use.

e. CANVAS COVER. When attached to the tripod, serves as a cover for two lamp extractors, instrument light M51, and plumb bob.

f. LAMP EXTRACTOR. Used to remove or install the lamps in the M51 instrument light.

Section IV. REPAIR PARTS; TOOLS; SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

Section Index

1-11. COMMON TOOLS AND EQUIPMENT.

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE), CTA 50-970, or CTA 8-100, as applicable to your unit.

1-12. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

Special tools, TMDE, and support equipment are identified in the maintenance allocation chart (MAC), appendix B. Instructions for fabricating special tools and test equipment are provided in appendix E.

1-13. REPAIR PARTS.

Repair parts are listed and illustrated in appendix C.

CHAPTER 2

UNIT MAINTENANCE INSTRUCTIONS

CHAPTER INDEX

Section I. SERVICE UPON RECEIPT

Section Index

2-1. SERVICE UPON RECEIPT.

Table 2-1 contains instructions for performing services required upon the receipt of this equipment. See also TM 9-1290-262-10. Marine Corps personnel will use MCO P4610.19 (Transportation and Travel Record of Transportation Discrepancies). Marine Corps personnel, if your M2A2 Aiming Circle has been damaged during shipment, or if shipment is incomplete, or if incorrec Spar/Repair Parts are received, or if incorrect quantity is received, submit a ROD, Standard Form 364, refer to MCO 4430.3.

Table 2-1. Service Upon Receipt-M2A2 Aiming Circle, W/E

LOCATION	ITEM	ACTION
1. Container	External surfaces	(1) Inspect for signs of rough handling such as broken or missing boards. (2) Inspect for signs of poor storage such as mildewed or rotted boards.
2. M2A2 Aiming Circle W/E	a. Components	Checking unpacked equipment: (1) inspect the equipment for damage incurred during shipment. if the equipment has been damaged, report the damage on SF 364, Report of Discrepancy (ROD). (2) Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA PAM 738-750.

2-1. SERVICE UPON RECEIPT (cont).

Table 2-1. Service Upon Receipt—M2A2 Aiming Circie, W/E (cont)

LOCATION	I T E M	ACTION
2. M2A2 Aiming Circle W/E (continued)	a. Components (continued)	(3) Check for data plates to see if equipment has been modified.
		Inspect:
		(1) Canvas cover for tears or mildew.
		(2) Plumb bob for corrosion or a broken string
		(3) Lamp extractor for corrosion.
		(4) Back plate for corrosion.
	b. M2A2 aiming circle	Inspect for:
		NOTE The M2A2 aiming circle has a Polaris 2 reticle installed in the elbow telescope reticle assembly. This reticle is for use in the northern hemisphere only; accuracy maintained from the years 1986 thru 1996. N86-96 is etched on lower Ieft hand portion of reticle.
		1) Damage to optical system.
		2) Loose or missing parts.
		(3) Corrosion on bare surfaces.
		(4) Corrosion on level adjusting screws.
		(5) Damaged compass or compass locking lever.
		(6) Damaged or broken level vials and covers.
		(7) Knobs that are too loose or can't be turned.
		(8) Cracked or cut gasket on base plate.
		9) Damaged or stripped threads in the base plate plug.
	c.Fire control tripod	Inspect for:
		1) Loose or missing parts or screws.
		2) Corrosion on bare surfaces.
		3) Corrosion on clamping screws.

Table 2-1. Service Upon Receipt-M2A2 Aiming Circle, W/E (cont)

LOCATION	ITEM	ACTION
2. M2A2 Aiming Circle W/E (continued)	c. Fire control tripod (continued)	(4) Corrosion on tripod screw. (5) Broken wooden legs. (6) Mildewed or rotted webbed strapping.
	d. M51 instrument light	Inspect for: (1) Broken or frayed wires. (2) Loose or missing parts. (3) Knob that can't be turned. (4) Dented or corroded battery case.
	e. Access cover	Inspect for: (1) Loose or missing parts. (2) Dents or holes in cover. (3) Mildewed or rotted webbed strapping.

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

Section Index

2-2. GENERAL.

The PMCS procedures contained in table 2-2 have been provided to keep this equipment in good operating condition and ready for its primary mission.

2-3. PMCS PROCEDURES.

a. Item number column. Numbers in this column are for reference. When completing DA Form 2404, Equipment Inspection and Maintenance Worksheet, include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must do checks and services for the internals listed.

b. Interval column. This column tells you when you must do the procedure in the procedure column. BEFORE procedures must be done before you operate or use the equipment for its intended mission. DURING procedures must be done during the time you are operating or using the equipment for its intended mission. AFTER procedures must be done immediately after you have operated or used the equipment.

2-3. PMCS PROCEDURES (cont).

c. Item to be checked or serviced column. This column identifies the item to be checked or serviced.

d. Procedure column. This column gives the procedure you must do to check or service the item listed in the Item to be Checked or Serviced column to know if the equipment is ready or available for its intended mission or for operation. You must do the procedure at the time stated in the inteval column.

e. Not Fully Mission Capable If: column. Information in this column tells you what faults will keep your equipment from being capable of performing its primary mission. If check and service procedures reveal faults listed in this column, do not operate the equipment. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

Table 2-2. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES

Item No.	Interval	Item to be Checked or Serviced	Procedure	Not Fully Mission Capable If:
1	Monthly	M2A2 Aiming Circle	Check for deterioration or other damage affecting proper seal. Tighten loose screws and nuts. Purge elbow telescope if optical system shows signs of fogging or traces of humidity. Refer to TM 750-116.	

Section III. UNIT TROUBLESHOOTING

Section Index

2-4. TROUBLESHOOTING INFORMATION.

a. The symptom index can be used as a quick guide to troubleshooting. Common malfunctions are listed in alphabetical order, under each major assembly which appears in MAC order, with page number references to the troubleshooting table where a test or inspection and corrective action are provided.

b. There is no unit level troubleshooting on the M2A2 Aiming Circle. The table lists the common malfunctions which you may find during the operation or maintenance of the M51 Instrument Light. You should perform the tests/inspections and corrective actions in the order listed.

c. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If malfunction is not listed or is not corrected by listed corrective actions, notify direct support maintenance.

d. The following symptom index can be used for a quick reference to symptoms covered in the troubleshooting chart.

SYMPTOM INDEX

Table 2-3. UNIT TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
M51 INSTRUMENT LIGHT

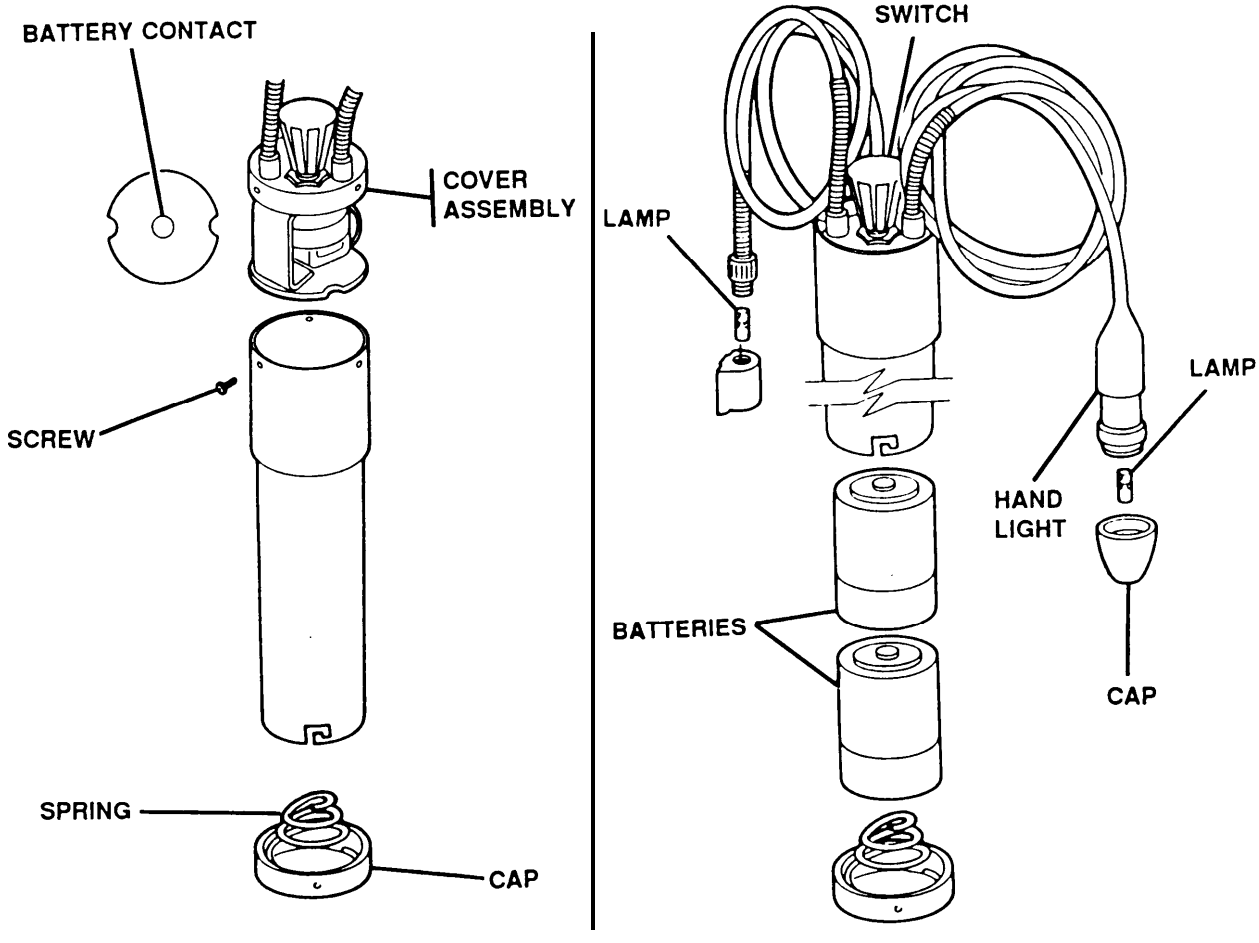


Table 2-3. UNIT TROUBLESHOOTING (cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. LAMPS DO NOT LIGHT.
Step 1. Turn switch on, and check to see if both lamps light.
a. Replace batteries. Refer to TM 9-1290-262-10.
b. Replace defective lamps (p 2-8).
c. If lamps still do not light, replace M51 instrument light.
d. Clean and stretch compression spring in cap.
e. Clean battery contact at base of switch.
Step 2. Rotate switch to check bracket lamp.
If bracket lamp does not brighten, replace M51 instrument light.

Section IV. UNIT MAINTENANCE PROCEDURES

Section Index

2-5. M2A2 AIMING CIRCLE AND ELBOW TELESCOPE—MAINTENANCE INSTRUCTIONS.

This task covers: a. Disassembly b. Inspection/repair c. Reassembly d. Service

INITIAL SETUP

Tools and Special Tools
Electronic system maintenance tool kit (SC 5180-95-CL-B29)
Fire control purging kit (SC 4931-95-CL-J54)

Materials/Parts
Self-sealing screw (2) (8204922)

References
TM 750-116

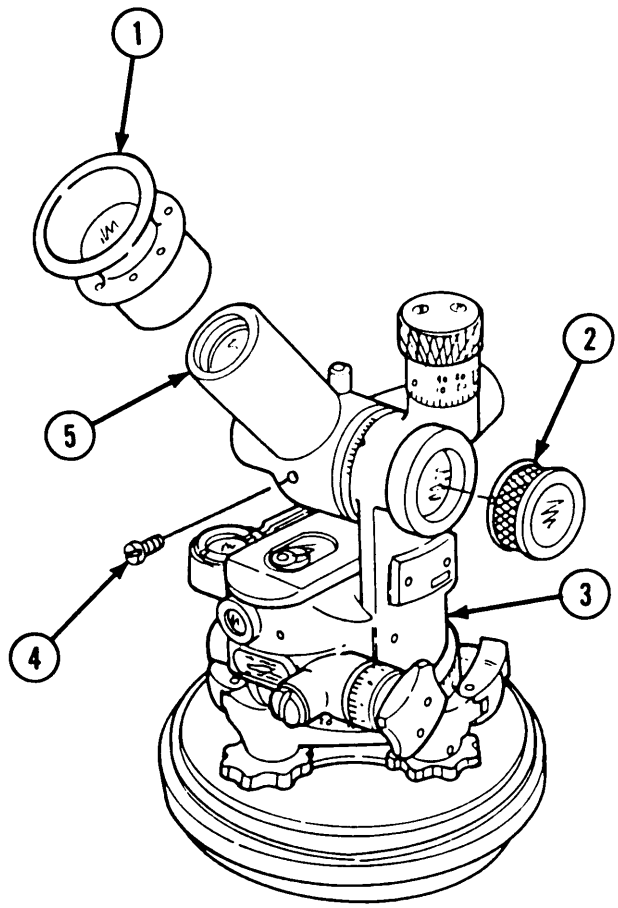
DISASSEMBLY

1 Remove eyeshield (1) and filter (2) from aiming circle (3).

NOTE

Early models may have only one self-sealing screw (4).

2 If damaged; remove two self-sealing screws (4) from elbow telescope (5).



INSPECTION/REPAIR

1 Inspect eyeshield for cracks, splits, and rubber deterioration.

2 Inspect filter for cracks or discoloration.

3 Inspect for broken, damaged, or missing parts. Repair is by replacement of authorized parts which do not meet inspection criteria. Refer to appendix C.

REASSEMBLY

1 If removed, install two new self-sealing screws (4) in elbow telescope (5).

2 Install filter (2) and eyeshield (1) on aiming circle (3).

SERVICE

Purge elbow telescope if optics are cloudy, or show traces of humidity. Refer to TM 750-116.

2-6. M51 INSTRUMENT LIGHT-MAINTENANCE INSTRUCTIONS.

This task covers: a. Disassembly b. Inspection/Repair c. Reassembly

INITIAL SETUP

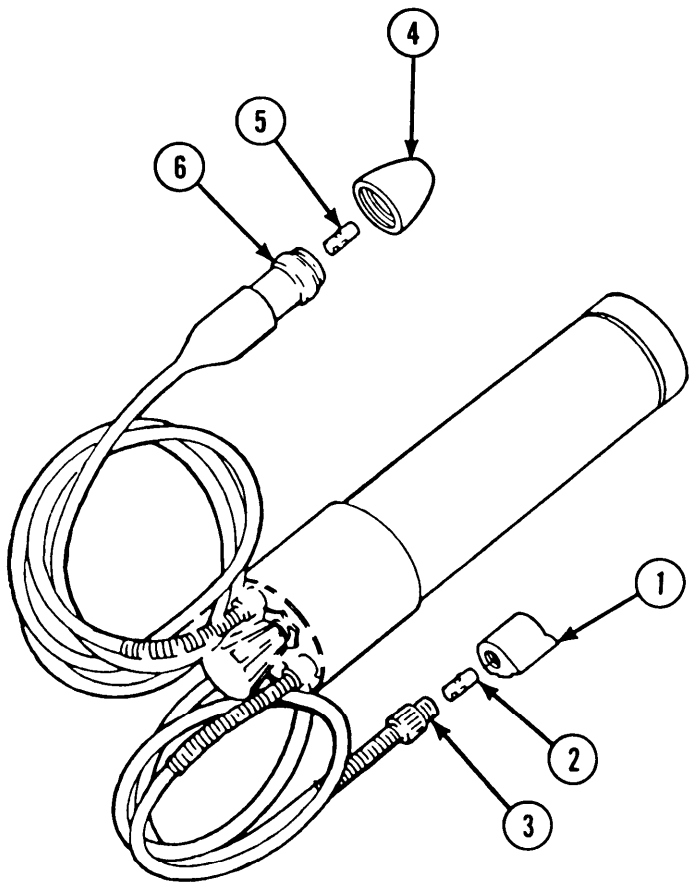
Tools and Special Tools
Electronic system maintenance tool kit
(SC 5180-95-CL-B29)
Lamp extractor

References
TM 9-1290-262-10

DISASSEMBLY

1 Unscrew mounting bracket (1) and incandescent lamp (2) from lead cable (3), using lamp extractor, if necessary.

2 Unscrew electrical cap (4) and incandescent lamp (5) from lead wire (6), using lamp extractor, if necessary.



INSPECTION/REPAIR

1 Inspect incandescent lamps (2 and 5), electrical cap (4) and mounting bracket (1) for cracks, broken filaments, broken glass bulb, or corrosion on base. Refer to TM 9-1290-262-10.

2 Repair is by replacement of authorized parts which do not meet inspection criteria. Refer to appendix C.

REASSEMBLY

1 Install incandescent lamp (5) and electrical cap (4) on lead wire (6), using lamp extractor, if necessary.

2 Install incandescent lamp (2) and mounting bracket (1) on lead cable (3), using lamp extractor, if necessary,

Section V. PREPARATION FOR STORAGE OR SHIPMENT

Section Index

2-7. DEFINITION OF ADMINISTRATIVE STORAGE.

a. The requirements specified herein are necessary to maintain the M2A2 Aiming Circle in administrative storage in such a way as to achieve maximum readiness.

b. Placement of equipment in administrative storage can be for short periods of time not to exceed 90 days when a shortage of maintenance effort exists. The equipment should be ready for use within time factors determined by the directing authority. During storage, appropriate maintenance records will be kept.

c. Equipment placed in administrative storage should be capable of being readied to perform its mission within 24 hours or as otherwise prescribed by the approving authority. Before equipment is placed in administrative storage, current maintenance services should be completed, shortcomings and deficiencies should be corrected, and all modification work orders (MWOs) should be applied. Marine Corps users will, before placing equipment in Administrative Storage and/or Stock, ensure that the equipment is MISSION CAPABLE or as otherwise prescribed by the approving authority. Before equipment is placed in administrative storage, all Modification Instructions (Ml) and Technical Instructions (Tl) should be applied.

d. Report equipment in administrative storage in Materiel Condition Status Report and Unit Status Report as prescribed for all reportable equipment. See AR 220-1 and AR 700-138.

e. Perform inspections, maintenance services, and lubrications in accordance with applicable technical manuals.

f. Records and reports to be maintained for equipment in administrative storage are those prescribed by DA PAM 738-750. Marine Corps personnel will refer to MCO P4450.7 (Marine Corps Warehousing Manual) for preparation for storage.

g. Perform applicable services on a quarterly basis.

2-8. SECURITY. Instructions contained herein do not modify security procedures and requirements for classified or pilferable items. See AR 380-5 and Physical Security Update.

2-9. STORAGE SITE. Select the best available site for administrative storage. Separate stored equipment from equipment in use. Conspicuously mark the area "Administrative Storage." Covered space is preferred.

2-10. STORAGE PLAN. Store equipment so as to provide maximum protection from the elements and to provide access for inspection and maintenance. Anticipate removal or deployment problems and take suitable precautions.

2-11. MAINTENANCE SERVICES AND INSPECTION. Prior to storage, perform the next scheduled preventive maintenance service (monthly, quarterly, or semiannually). Inspect and approve equipment prior to storage. Do not place equipment in storage in NMC condition.

2-12. CORRECTIONS OF SHORTCOMINGS AND DEFICIENCIES. Correct all shortcomings and deficiencies prior to storage, or obtain a deferment from the approving authority for uncorrected shortcomings.

2-13. GENERAL CLEANING, PAINTING, AND PRESERVATION.

a. Clean the equipment of dirt, grease, and other contaminants IAW this manual.

NOTE

Air circulation under draped covers reduces deterioration from moisture and heat.

b. Sunlight, heat, moisture (humidity), and dirt accelerate deterioration. Install all covers authorized for the equipment. Close and secure all openings except those required for venting and draining. Seal openings to prevent entry of rain, snow, or dust. Place equipment and provide blocking or framing to allow for ventilation and water drainage. Support cover away from surfaces that may rust, rot, or mildew.

c. For further information and instructions regarding corrosion prevention and control, refer to TM 43-0139.

2-14. PREPARATION OF FIRE CONTROL INSTRUMENTS.

Thoroughly clean and dry fire control instruments and coat unpainted surfaces with grease (item 6, appx D).

b. Wrap all optical glass with lens paper (item 7, appx D) and fasten with tape.

c. Store all instruments on racks or in cases or protect with covers.

2-15. CARE OF EQUIPMENT IN ADMINISTRATIVE STORAGE.

a. Maintenance Services. After equipment has been placed in administrative storage, suspend all regularly scheduled preventive maintenance services and inspect and exercise as specified herein.

b. Inspection. Inspection will usually be visual and must consist of at least a walk-around examination of all equipment to observe any deficiencies that may have occurred. Inspect equipment in open storage weekly and that in covered storage monthly.

c. Rotation. To ensure utilization of assigned materiel, rotate items in accordance with any rotational plan that will keep equipment in an operational condition and reduce maintenance effort.

d. Removal From Administrative Storage. Remove preservative materials. Perform the next scheduled preventive maintenance service and prepare equipment for service as outlined in this manual.

e. Servicing. Resume the maintenance service schedule in effect at the commencement of storage, or service the equipment before the scheduled dates in order to produce a staggered maintenance workload.

CHAPTER 3

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

CHAPTER INDEX

Section I. DIRECT SUPPORT TROUBLESHOOTING

Section Index

3-1. TROUBLESHOOTING INFORMATION.

a. The symptom index can be used as a quick guide to troubleshooting. Common malfunctions are listed in alphabetical order, under each major assembly which appears in MAC order, with page number references to the troubleshooting table where a test or inspection and corrective action are provided.

b. The table lists the common malfunctions which you may find during the operation or maintenance of the M2A2 Aiming Circle or its components. You should perform the tests/inspections and corrective actions in the order listed.

c. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify general support maintenance.

d. The following symptom index can be used for a quick reference to symptoms covered in the troubleshooting chart.

3-1. TROUBLESHOOTING INFORMATION (cont)

SYMPTOM INDEX

Table 3-1. DIRECT SUPPORT TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
M2A2 AIMING CIRCLE
RETICLE DOES NOT BECOME ILLUMINATED.
Step 1. Attach a serviceable M51 instrument light to the elbow telescope. Turn switch on.
Step 2. Check for dirt on optical instrument window.
Wipe off optical instrument window, using lens paper (item 7, appx D).
Step 3. Recheck reticle for illumination.
If reticle is not illuminated, notify general support maintenance.
2. PARALLAX PRESENT IN OBJECTIVE SYSTEM.
Check objective cell assembly adjustment.
Notify general support maintenance.
3. TELESCOPE RETICLE HAS POOR DEFINITION.
Notify general supped maintenance.
4.. IMAGE IS POORLY DEFINED.
Notify general support maintenance.
5. IMAGE IS TILTED.
Notify general support maintenance.
6. RETICLE IS TILTED.
Notify general support maintenance.

Table 3-1. DIRECT SUPPORT TROUBLESHOOTING (cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
M2A2 AIMING CIRCLE (CONT)
7. ELEVATION KNOB HAS LIMITED MOVEMENT.
Step 1. Turn elevation knob to elevate or depress elbow telescope.
Step 2. Check that elbow telescope moves 1130 mils in elevation and 430 mils in depression.
Step 3. Check for missing or improperly positioned key washers.
Replace or reposition key washers. Refer to page 3-12.
Step 4. Recheck elevation worm shaft for limited movement.
Replace worm shaft. Refer to page 3-12.
8. ELEVATION MICROMETER SCALE SLIPS.
Step 1. Check that screws are tight.
If screws are tight, loosen screws and adjust micrometer scale dial. Refer to page 3-12.
Step 2. Check for stripped threads on screws and in adapter.
a. Replace screws or adapter. Refer to page 3-12.
b. Adjust micrometer scale dial. Refer to page 3-12.
9. AZIMUTH MICROMETER SCALE SLIPS.
Step 1. Check that screws are tight.
a. If screws are tight, loosen screws and micrometer scale dial. Refer to page 3-12.
b. Adjust scales and tighten screws. Refer to page 3-12.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 2. Check for stripped threads on screws and in adapter.

a. Replace screws or adapter. Refer to pages 3-12.

b. Adjust micrometer scale dial. Refer to page 3-12.

10. AZIMUTH THROWOUT MECHANISM BINDS.

Step 1. Check for burrs on index scale dial or on bearing surface on housing. Refer to page 3-12.

Remove burrs. Refer to TM 9-254.

Step 2. Check for bent worm shaft.

Replace worm shaft. Refer to page 3-12.

Step 3. Check for binding in azimuth knob throwout mechanism.

a. Replace adapter or worm shaft. Refer to page 3-12.

b. If binding is still present, notify general support maintenance.

11. ORIENTATION THROWOUT MECHANISM BINDS.

Step 1. Check for burrs on shoe or on bearing surface on housing.

Remove burrs. Refer to TM 9-254.

Step 2. Check for bent worm shaft.

Replace worm shaft. Refer to page 3-12.

Step 3. Check for binding in orienting knob.

a. Replace shoe or worm shaft. Refer to page 3-12.

b. If binding is still present, notify general support maintenance.

Table 3-1. DIRECT SUPPORT TROUBLESHOOTING (cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
M2A2 AIMING CIRCLE (CONT)
12. AZIMUTH THROWOUT MECHANISM DOES NOT RETURN TO MESH WHEN RELEASED.
Step 1. Check for weakness in helical compression spring.
Replace defective helical compression spring. Refer to page 3-12.
Step 2. Check for binding in azimuth throwout mechanism.
Refer to malfunction 10 for azimuth throwout mechanism trouble-shooting instructions.
13. ORIENTATION THROWOUT MECHANISM DOES NOT RETURN TO MESH WHEN RELEASED.
Step 1. Check for weakness in helical compression spring.
Replace defective helical compression spring. Refer to page 3-12.
Step 2. Check for binding in orientation throwout mechanism.
Refer to malfunction 11 for orienting throwout mechanism trouble-shooting instructions.
14. BACKLASH PRESENT IN ELEVATION MECHANISM.
Step 1. Check for loose worm shaft cap.
Adjust worm shaft cap. Refer to page 3-12.
Step 2. Check worm shaft ball for out-of-roundness.
If worm shaft ball is out of round, replace worm shaft. Refer to page 3-12.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 3. Check for worn or damaged worm shaft. Refer to page 3-12.

Step 4. Check for improperly seated ball socket seat.

Reseat ball socket seat. Refer to page 3-12.

Step 5. Check for setscrews that are set to tight against worm shaft cap or ball socket seat.

Adjust setscrews against worm shaft cap or ball socket seat. Refer to page 3-12.

Step 6. Check for loose pin in adapter.

Reposition pin in adapter. Refer to page 3-12.

Step 7. Recheck for backlash.

If backlash is still present, notify general support maintenance.

5. BACKLASH PRESENT IN AZIMUTH MECHANISM.

Step 1. Check for loose worm shaft cap.

Adjust worm shaft cap. Refer to page 3-12.

Step 2. Check for broken spring.

Replace spring. Refer to page 3-12.

Step 3. Check worm shaft ball for out-of-roundness.

If worm shaft ball is out of round, replace worm shaft. Refer to page 3-12.

Step 4. Check for worn or damaged worm shaft. Refer to page 3-12.

Step 5. Check for improperly seated ball socket. Refer to page 3-12.

Table 3-1. DIRECT SUPPORT TROUBLESHOOTING (cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
M2A2 AIMING CIRCLE (CONT)
Step 6. Check for setscrews that are set too tight against worm shaft cap or ball socket seat. Adjust setscrews against worm shaft cap or socket seat. Refer to page 3-12.
Step 7. Check for loose pin in adapter. Reposition pin in adapter. Refer to page 3-12.
Step 8. Recheck for backlash. If backlash is still present, notify general support maintenance.
16. BACKLASH PRESENT IN ORIENTING MECHANISM.
Step 1. Check for loose worm shaft cap. Adjust worm shaft cap. Refer to page 3-12.
Step 2. Check for broken spring. Replace spring. Refer to page 3-12.
Step 3. Check worm shaft ball for out-of-roundness. If worm shaft ball is out of round, replace worm shaft. Refer to page 3-12.
Step 4. Check for worn or damaged worm shaft. Replace worn or damaged worm shaft. Refer to page 3-12.
Step 5. Check for improperly seated ball socket seat. Reseat ball socket seat. Refer to page 3-12.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
Step 6. Check for setscrews that are set too tight against worm ball cap or socket. Adjust setscrews against worm shaft cap or ball socket seat. Refer to page 3-12. Step 7. Recheck for backlash. If backlash is still present, notify general support maintenance.
7. ELEVATION MECHANISM BINDS. Step 1. Check for backlash. Adjust elevation mechanism to remove backlash. Refer to page 3-12. Step 2. Check for bent worm shaft. Replace worm shaft. Refer to page 3-12. Step 3. Check worm shaft ball for out-of-roundness. If worm shaft ball is out of round, replace worm shaft. Refer to page 3-12. Step 4. Check for worn or damaged worm shaft. Replace worm shaft. Refer to page 3-12. Step 5. Recheck for binding. If binding is still present, notify general support maintenance.

Table 3-1. DIRECT SUPPORT TROUBLESHOOTING (cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
M2A2 AIMING CIRCLE (CONT)
18. AZIMUTH MECHANISM BINDS.
Step 1. Check for backlash.
Adjust azimuth mechanism. Refer to page 3-12.
Step 2. Check for bent worm shaft.
Replace worm shaft. Refer to page 3-12.
Step 3. Check worm shaft ball for out-of-roundness.
If worm shaft ball is out of round, replace worm shaft. Refer to page 3-12.
Step 4. Check for worn or damaged worm shaft.
Replace worm shaft. Refer to page 3-12.
Step 5. Recheck for binding.
If binding is still present, notify general support maintenance.
9. COMPASS NEEDLE FAILS TO TURN FREELY WHEN UNLOCKED.
Turn compass needle to UNLOCKED and check compass needle action.
If compass needle does not pivot freely, notify general support maintenance.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
M24 FIRE CONTROL TRIPOD
20. AIMING CIRCLE FAILS TO REST PROPERLY ON TRIPOD.
Step 1. Check for marred joint surface on base plate and tripod head.
Repair aiming circle, refer to page 3-12; or repair fire control tripod, refer to page 3-30.
Step 2. Check for stripped threads on base plate plug.
Repair threads or replace base plate plug. Refer to page 3-12.
Step 3. Recheck seating of aiming circle on tripod.
If aiming circle still does not seat properly, notify general suppott maintenance.
21. FIRE CONTROL TRIPOD UNSTABLE; LEVEL BUBBLES WILL NOT REMAIN CENTERED.
Check for defective clamp or leg assembly.
a. Repair fire control tripod. Refer to page 3-12.
b. If fire control tripod is still unstable, replace tripod.

Section II. DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Section Index

3-2. M2A2 AIMING CIRCLE—MAINTENANCE INSTRUCTIONS.

This task covers:

a. Disassembly
b. Cleaning
c. Repair
d. Reassembly
e. Sealing

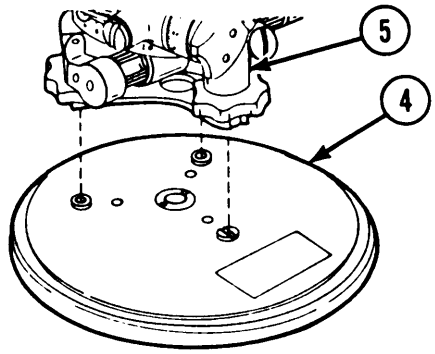
INITIAL SETUP

Tools and Special Tools
Electronic system maintenance tool kit (SC 5180-95-CL-B29)
Fire control purging kit (SC 4931-95-CL-J54)
instrument and fire control shop set (SC 4931-95-CL-A07)
Pinned tubular wrench (fig. E-1, appx E) (9333797)
Torque wrench adapter (fig. E-2, appx E) (9333796)

Materials/Parts
Aircraft grease (item 6, appx D)
Cleaning compound (item 5, appx D)
Denatured alcohol (item 2, appx D)
Lens paper (item 7, appx D)
Lockwasher (2) (MS35333-103)
Optical cleaning compound (item 4, appx D)
Sealing compound (item 8, appx D)
Washer (8211688)
Washer (3) (8211667)

Refereneces
TM 9-254
TM 750-116

Equipment Conditions
Pg 2-6 M2A2 aiming circle partially disassembled



DISASSEMBLY

NOTE

Ensure that compass lock-release lever is in LOCKED position.

1 Hold cover (1) in open position.

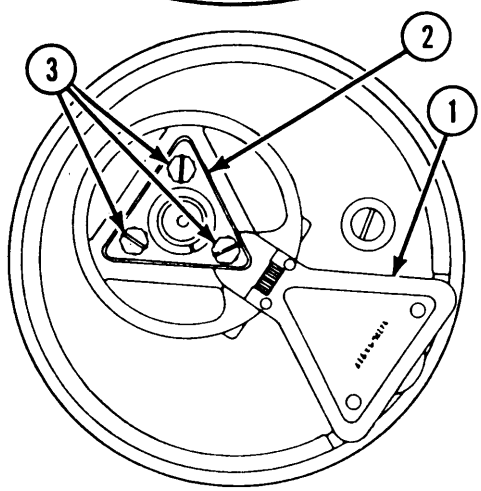
2 Press in on locking plate (2).

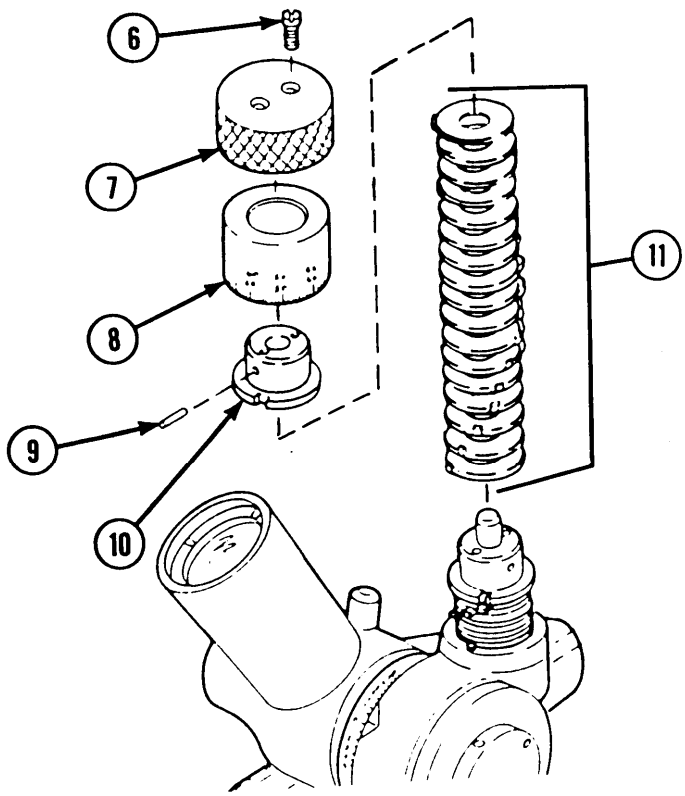
NOTE

Do not remove screws from base plate assembly at this time.

3 Unscrew three screws (3).

4 Remove base plate (4) from aiming circle (5).





5 Remove two screws (6), knob (7), and micrometer scale dial (8).

NOTE

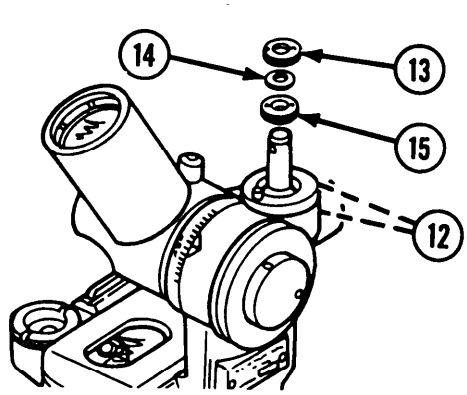
If adapter has two notches, scribe a line marking the notch that mates with the tab.

6 Remove pin (9), adapter (10), and 17 stop rings (11).

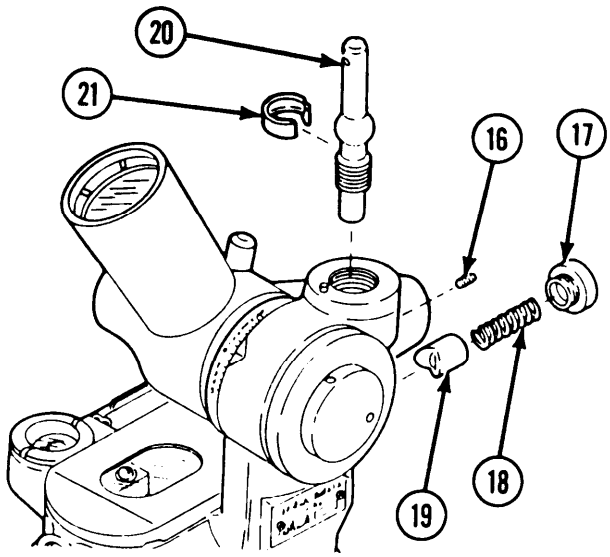
3-2. M2A2 AIMING CIRCLE—MAINTENANCE INSTRUCTIONS. (cont)

DISASSEMBLY (cont)

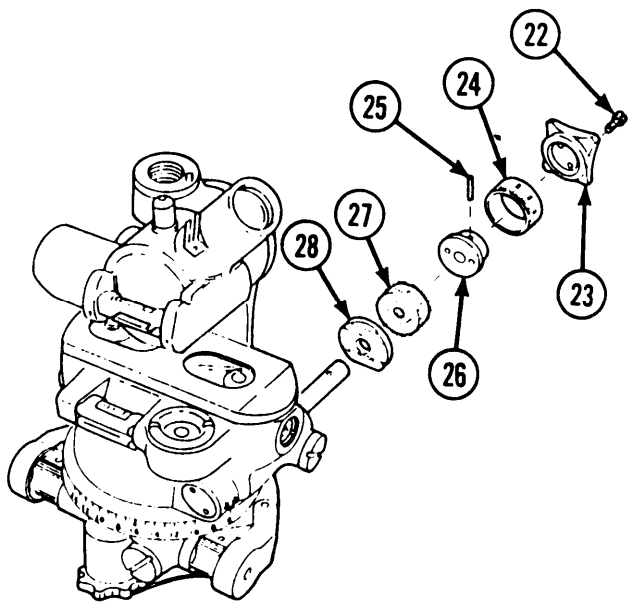
7 Loosen top two setscrews (12). Use pinned tubular wrench (fig. E-1, appx E) to remove externally threaded ring (13), washer (14), and worm shaft cap (15). Discard washer (14).



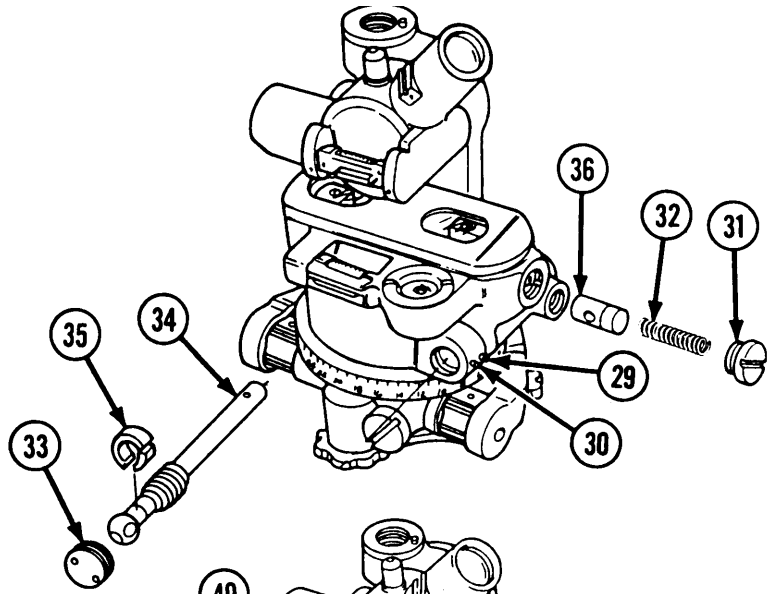
8 Loosen setscrew (16). Remove machine thread plug (17), spring (18), sleeve bushing (19), worm shaft (20), and ball socket seat (21).



9 Remove two screws (22), knob (23), scale dial (24), pin (25), adapter (26), washer (27), and index (28). Discard washer.

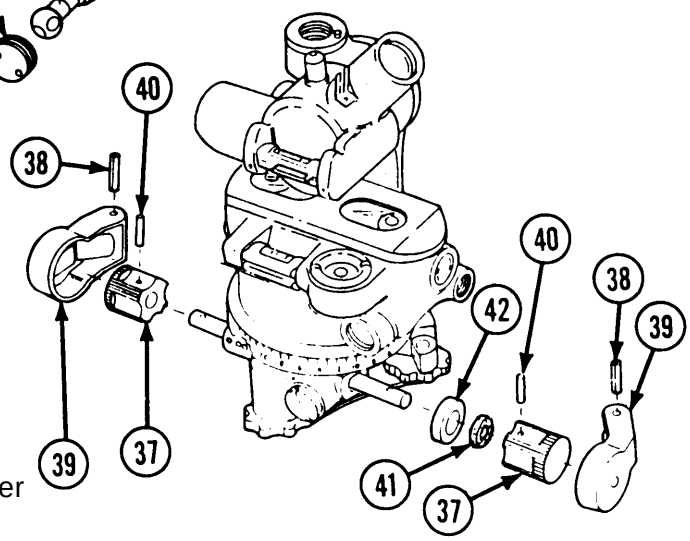


10 Loosen setscrews (29 and 30). Remove machine thread plug (31), spring (32), worm shaft cap (33), worm (34), ball socket seat (35), and sleeve bushing (36).



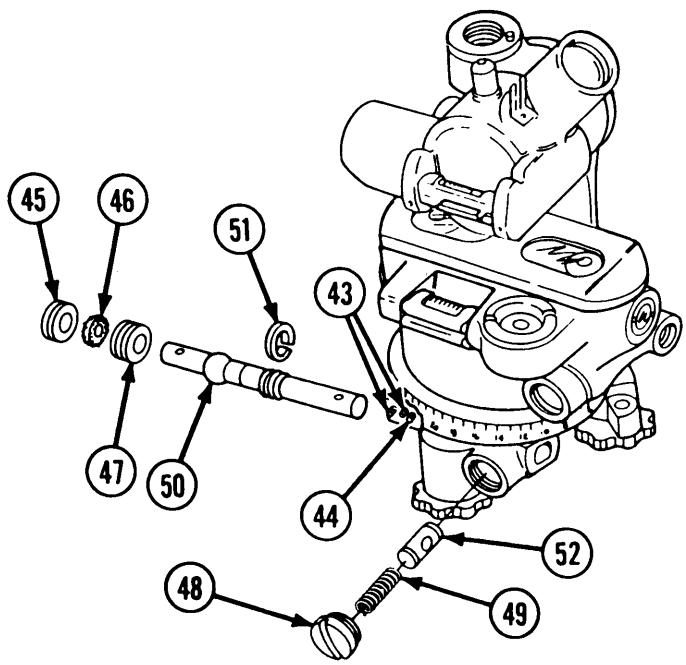
11 Scribe a line on left hand knob (37) to mark it for reassembly.

12 Remove two spring pins (38), two covers (39), two pins (40), two knobs (37), washer (41), and shoe (42). Discard washer.



13 Loosen setscrews (43 and 44). Remove externally threaded ring (45), washer (46), and worm shaft cap (47) using pinned tubular wrench (fig. E-1, appx E). Discard washer.

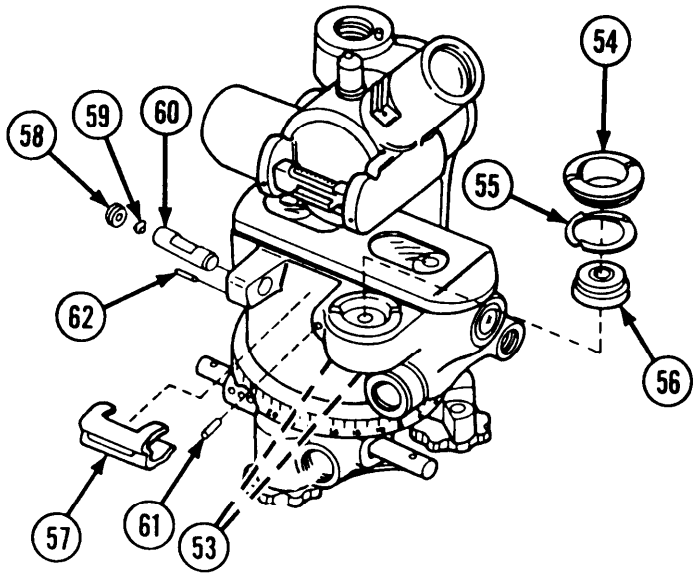
14 Remove screw (48), spring (49), worm (50), ball socket seat (51), and bushing (52).



3-2. M2A2 AIMING CIRCLE—MAINTENANCE INSTRUCTIONS. (cont)

DISASSEMBLY (cont)

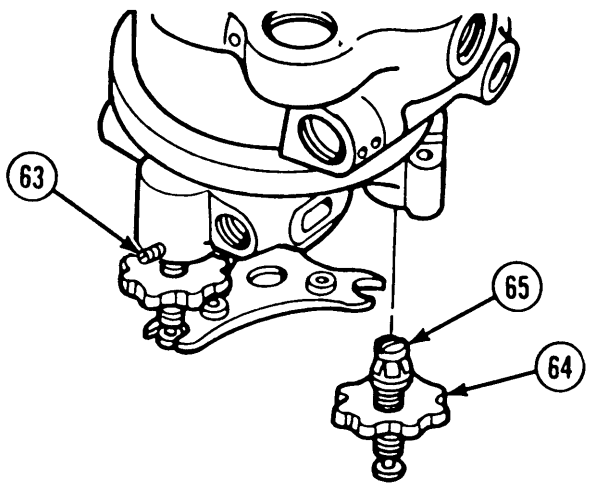
15 Loosen setscrews (53). Remove externally threaded ring (54), shim (55), circular level (56), level vial cover (57), eccentric ring (58), eccentric (59), and level vial (60). Remove pin (61) and pins (62) only if damaged.



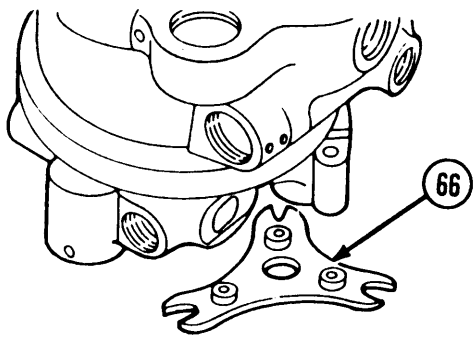
16 Loosen three setscrews (63).

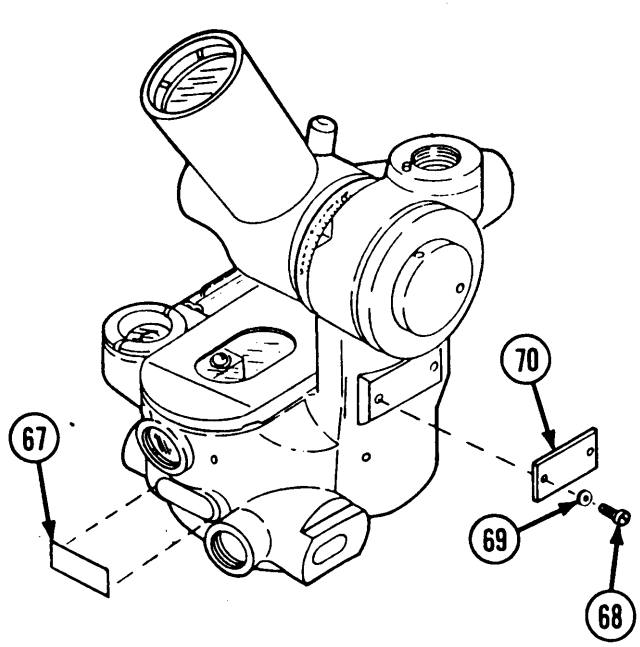
17 Unscrew three locking knob assemblies (64) as far as they will go.

18 Using a spanner wrench, unscrew three clamps (65), and remove three locking knobs (64).



19 Remove spring plate (66).





20 If damaged, remove instruction plate (67).

21 Remove two screws (66), two lockwashers (69), and identification plate (70).

CLEANING

CAUTION

Do not dip the aiming circle body assembly in cleaning compound.

1 Clean all machined metal parts with cleaning compound (item 5, appx D).

2 Clean all optical surfaces with alcohol (item 2, appx D) or optical cleaning compound (item 4, appx D).

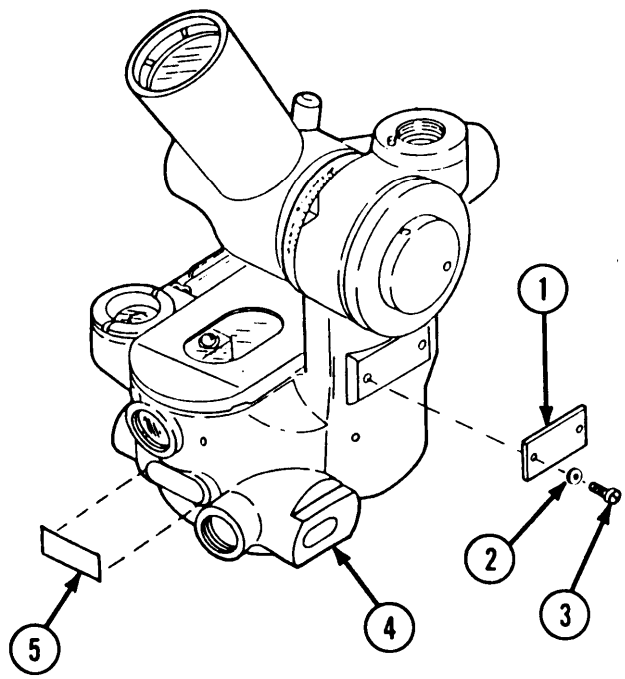
REPAIR

Repair is by replacement of authorized pads as required. Refer to appendix C.

REASSEMBLY

1 Install identification plate (1), two new lockwashers (2) and two screws (3) on body assembly (4).

2 If removed, install new instruction plate (5) on body assembly (4).



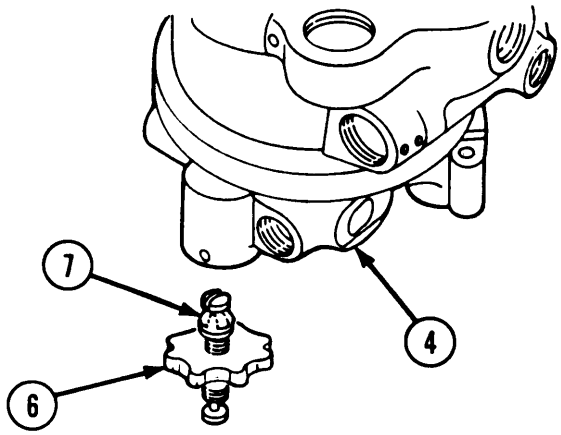
3-2. M2A2 AIMING CIRCLE—MAINTENANCE INSTRUCTIONS. (cont)

REASSEMBLY (cont)

3 Apply aircraft grease (item 6, appx D) to threads of three locking knob assemblies (6).

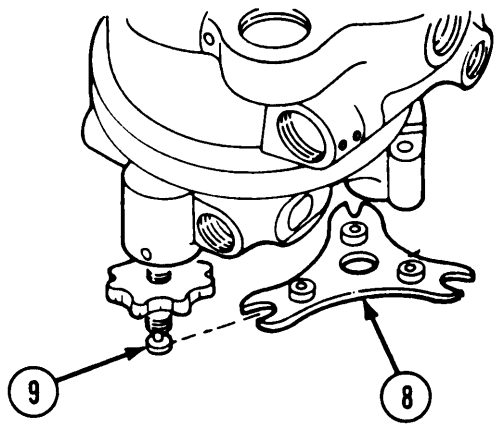
4 Turn clamp (7) out to end of screw on each locking knob assembly (6).

5 Install one locking knob assembly (6) by turning clamp (7) one or two turns into body assembly (4).



6 Position spring plate (8) with heads of its three threaded inserts pointed toward aiming circle.

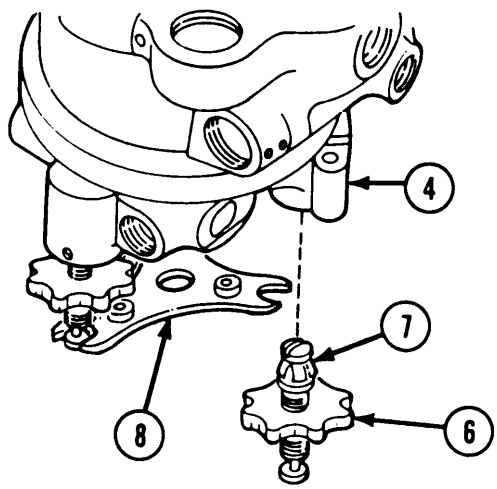
7 Slip one spring plate fork into the groove on outer end of locking knob assembly screw (9).



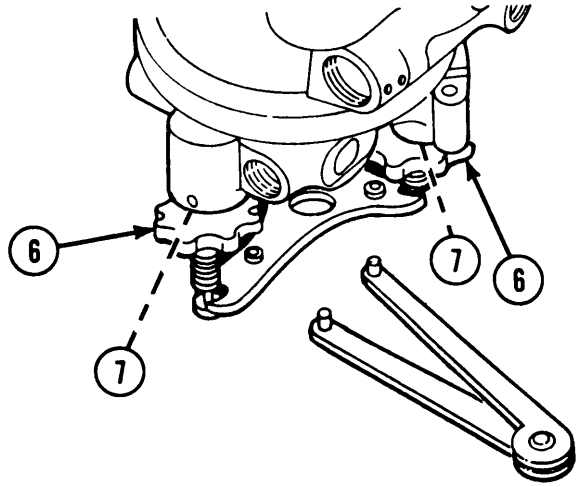
8 Hold spring plate (8) in this position and install remaining two locking knobs as follows:

a. Slip groove in locking knob (6) into spring plate fork.

b. Install locking knob (6) by turning clamp (7) one or two turns into body assembly (4).

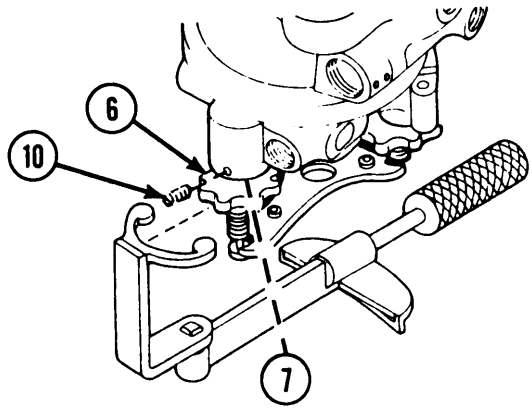


9 Using a spanner wrench, turn three clamps (7) alternately until movement of knob assembly (6) feels firm.



10 Attach torque wrench with torque wrench adapter (fig. E-2, appx E) to locking knob (6) and adjust tightness of each clamp (7) until a torque of 32.0 to 68.0 in.-oz (3.6 to 7.6 N-m) is reached at the locking knob.

11 Apply sealing compound (item 8, appx D) to three setscrews (10). Tighten three setscrews securely.



12 If removed, install two new pins (11 and 12).

13 Aline pin on bottom of circular level (13) with hole in body assembly receptacle.

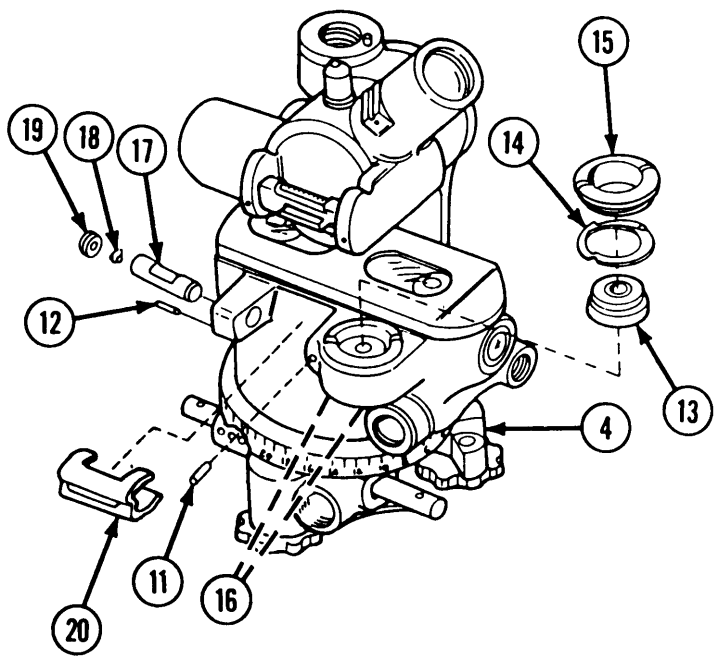
14 Insert circular level (13) into body assembly (4).

15 Insert shim (14), flat side down, and install ring (15). Tighten securely, using pinned tubular wrench (fig. E-1, appx E). Set-screws (16) will be tightened during collimation.

16 Install level vial (17).

17 Install eccentric (18) and eccentric ring (19). Do not tighten eccentric ring.

18 Install level vial cover (20).



3-2. M2A2 AIMING CIRCLE—MAINTENANCE INSTRUCTIONS. (cont)

REASSEMBLY (cont)

19 Lightly lubricate sleeve bushing (21), ball socket seat (22), worm shaft (23), and all bearing or working surfaces within the body assembly with grease (item 6, appx D).

20 Install sleeve bushing (21) with hole toward worm shaft (23).

21 Install ball socket seat (22) on worm side of worm shaft (23).

22 Start worm shaft (23) into body assembly. Aline slot in ball socket seat (22) with setscrew (24) using setscrew hole (25) as a guide.

23 To install worm shaft (23) in body assembly, slip worm shaft through hole in bushing (21), and rotate worm onto the internal gear until the ball socket seat (22) is in place within body assembly.

24 Check that slot in ball socket seat (22) is still alined with setscrew hole in body assembly.

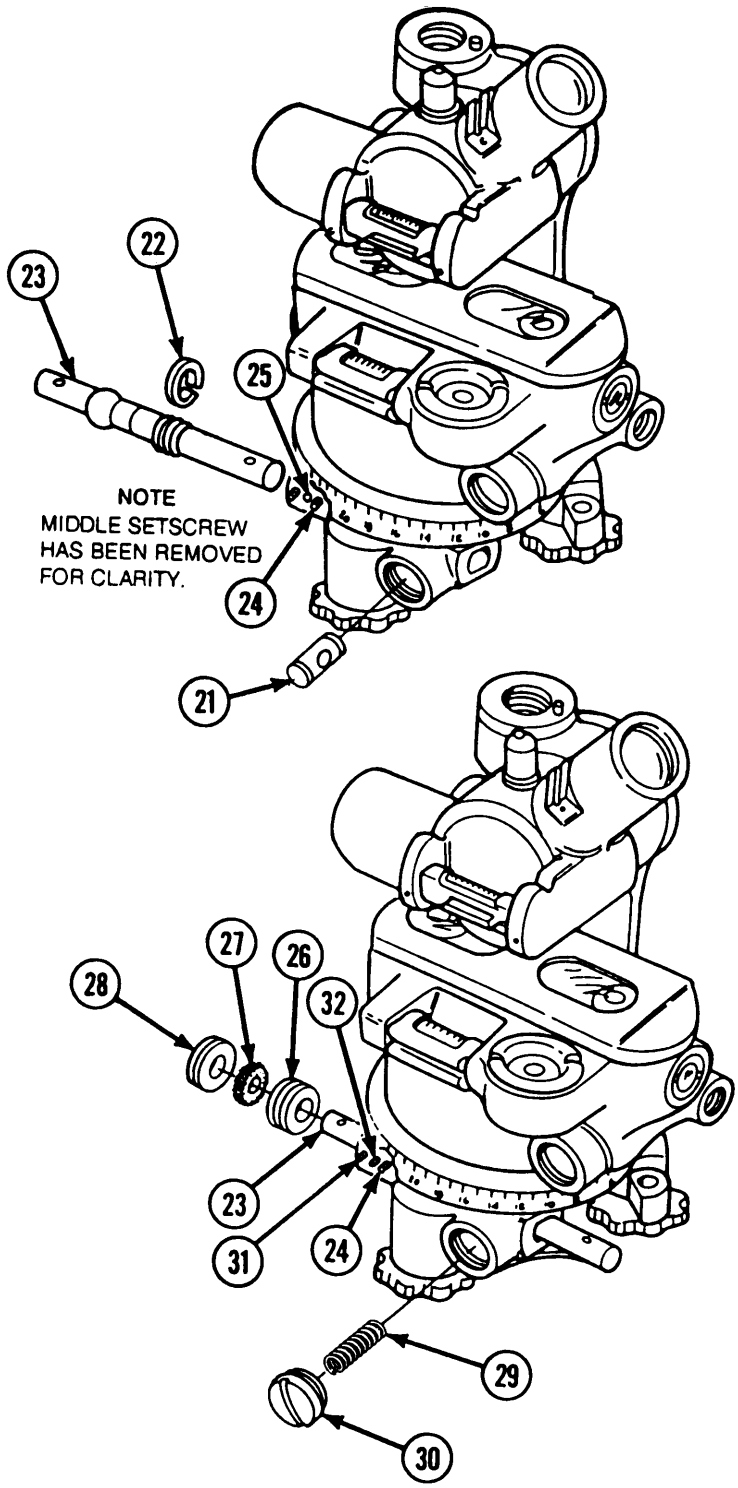
NOTE
Setscrew (24) will be tightened during backlash adjustment. Refer to page 3-42.

25 Lightly lubricate worm shaft cap (26), new washer (27), externally threaded ring (28), and spring (29) with grease (item 6, appx D).

26 Install worm shaft cap (26) on worm shaft (23) until bearing contact with worm shaft ball is made.

27 Press washer (27) into groove in externally threaded ring (28).

28 Install externally threaded ring (28), washer side first, until contact with worm shaft cap (26) is made.



29 Install spring (29) and screw (30). Tighten screw securely. Setscrews (31 and 32) will be tightened during backlash adjustment. Refer to page 3-42.

30 Lightly lubricate shoe (33) and new washer (34) with grease (item 6, appx D).

31 Press washer (34) into groove in shoe (33).

32 Install shoe (33) on worm shaft (23) with washer (34) facing outward.

33 Aline curved side of shoe (33) with curved side of housing. Press into place.

NOTE

In the following step, knob bearing scribe mark should be installed on left end of shaft.

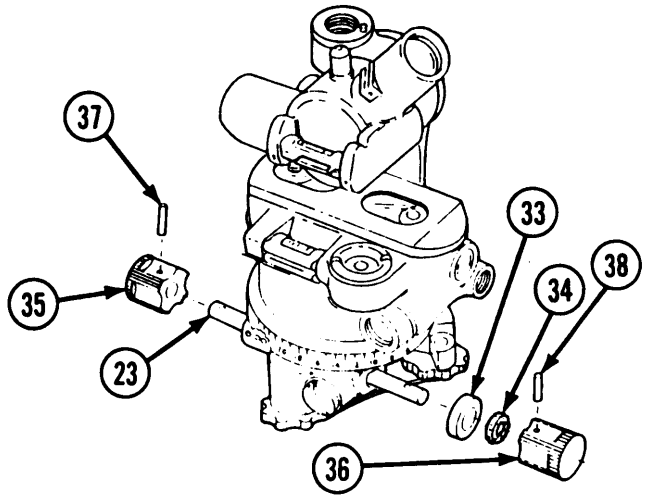
34 install knob (35) on left end of worm shaft (23) and aline pin holes with pin holes in worm shaft.

35 install knob (36) and aline pin holes with pin holes in shaft.

36 install pins (37 and 38).

NOTE

if a new worm shaft was installed, proceed as follows:



37 Push knob (35) on shaft. Leave a clearance of about 0.05 in. (1.27 mm) between knob and body assembly.

38 Using hole in knob (35) as a guide, drill a No. 52 hole in shaft and ream for No. 6/0 pin. install pin (38).

39 Push knob (36) on shaft. Leave a clearance of no more than 0.015 inch between knob and shoe (33).

40 Using hole in knob (36) as a guide, drill a No. 52 hole in shaft and ream for No. 6/0 pin. install pin (38).

47 Aline pin holes in two covers (39) with pin holes (40) in body assembly and install two spring pins (41). Close covers over knobs.

3-2. M2A2 AIMING CIRCLE—MAINTENANCE INSTRUCTIONS. (Cont)

REASSEMBLY (cont)

42 Lightly lubricate sleeve bushing (42), ball socket seat (43), worm shaft (44), worm shaft cap (45), spring (46), and all bearing or working surfaces within body assembly with grease (item 6, appx D).

43 Install sleeve bushing (42) with hole toward worm shaft (44).

44 Place ball socket seat (43) on worm side of ball and aline slot in ball socket seat with setscrew hole (47) in body assembly.

45 To install worm shaft (44) in body assembly, slip worm shaft through hole in sleeve bushing (42).

46 Rotate worm onto internal worm gear until ball socket seat (43) is in place within body assembly.

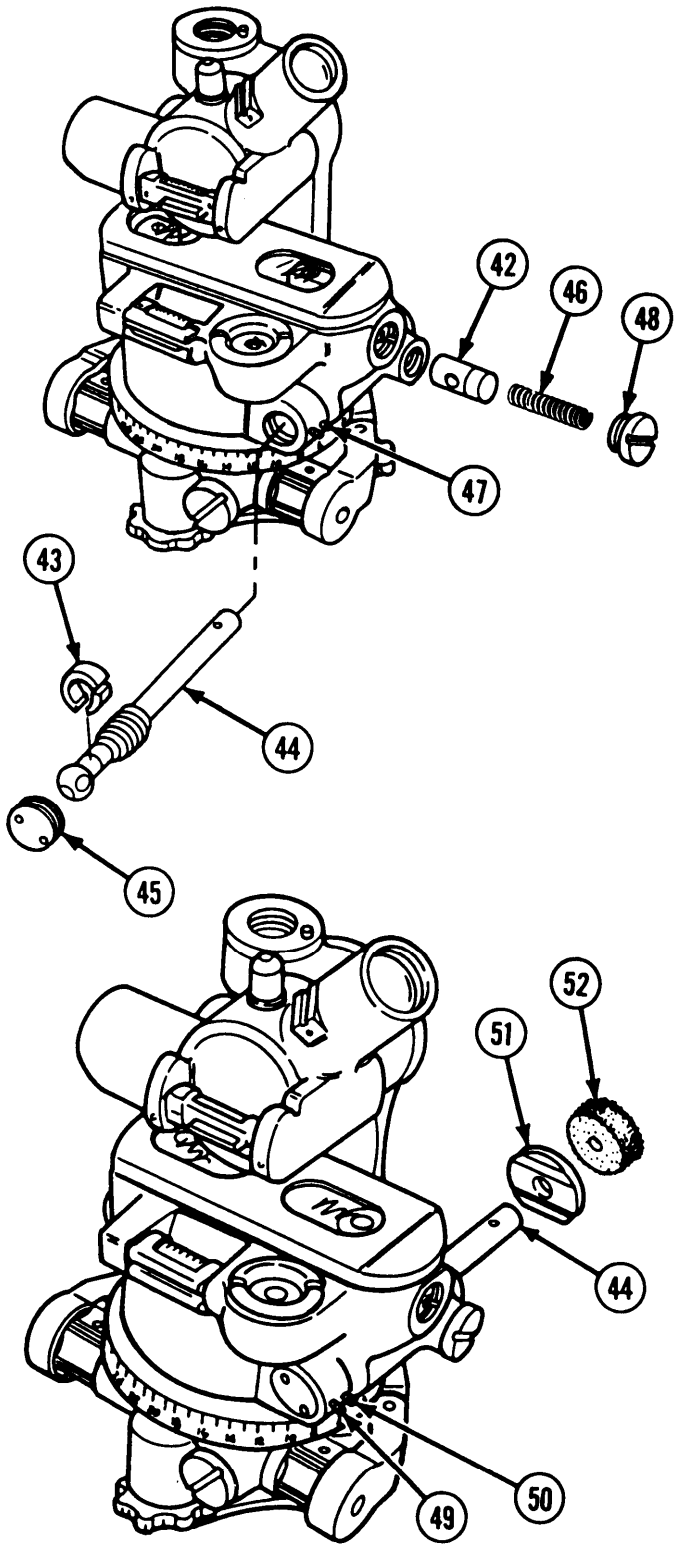
47 Check that slot in ball socket seat (43) is still alined with setscrew hole (47) in housing.

48 Install worm shaft cap (45) until bearing contact with worm ball is made.

49 Install spring (46) and plug (48). Tighten machine thread plug securely. Tightening of setscrews (49 and 50) will be done during backlash adjustment.

50 Lightly lubricate azimuth index scale dial (51) and new washer (52) with grease (item 6, appx D).

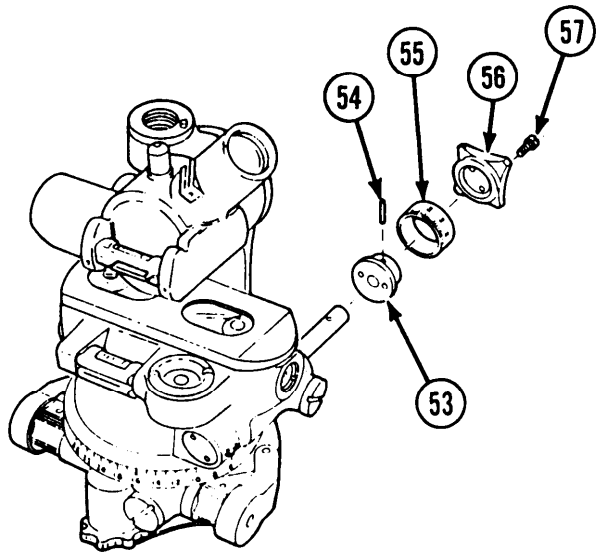
51 Install azimuth index scale dial (51) with its curved side in contact with the housing curved side and the index line facing out.



52 Install flat washer (52) and adapter (53) on worm shaft (44). Aline adapter pin hole with pin hole in shaft and install taper pin (54).

NOTE

If a new worm was installed, perform steps 53 thru 55 as follows:



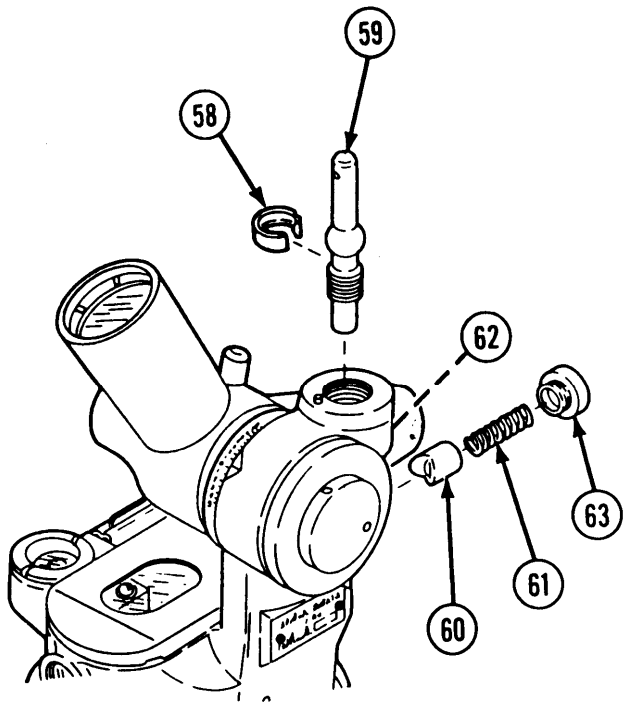
53 Position scale dial (55) over adapter (53) and push toward azimuth index (51). Leave a clearance of no more than 0.015 in. (0.381 mm) between scale dial and azimuth index.

54 Remove scale (55), but do not move adapter (53).

55 Using hole in adapter (53) as a guide, drill a No. 52 hole in worm shaft and ream for No. 6/0 pin. Install pin (54).

56 Install scale dial (55), knob (56), and two screws (57). Do not tighten screws until. after collimation adjustment.

57 Lightly lubricate ball socket seat (58), worm shaft (59), sleeve bushing (60), spring (61), and all bearing and working surfaces inside body assembly with grease (item 6, appx D).



58 Place ball socket seat (58) on worm side of ball, alining slot in ball socket seat with setscrew hole in housing.

59 To install worm shaft (59) in body assembly, push in and rotate worm onto internal gear until ball socket seat (58) is in place within body assembly.

60 Check that slot in ball socket seat (58) is still alined with setscrew hole in body assembly.

NOTE

Setscrew (62) will be tightened during backlash adjustments.

61 Install sleeve bushing (60), spring (61), and machine thread plug (63). Tighten machine thread plug (63) securely.

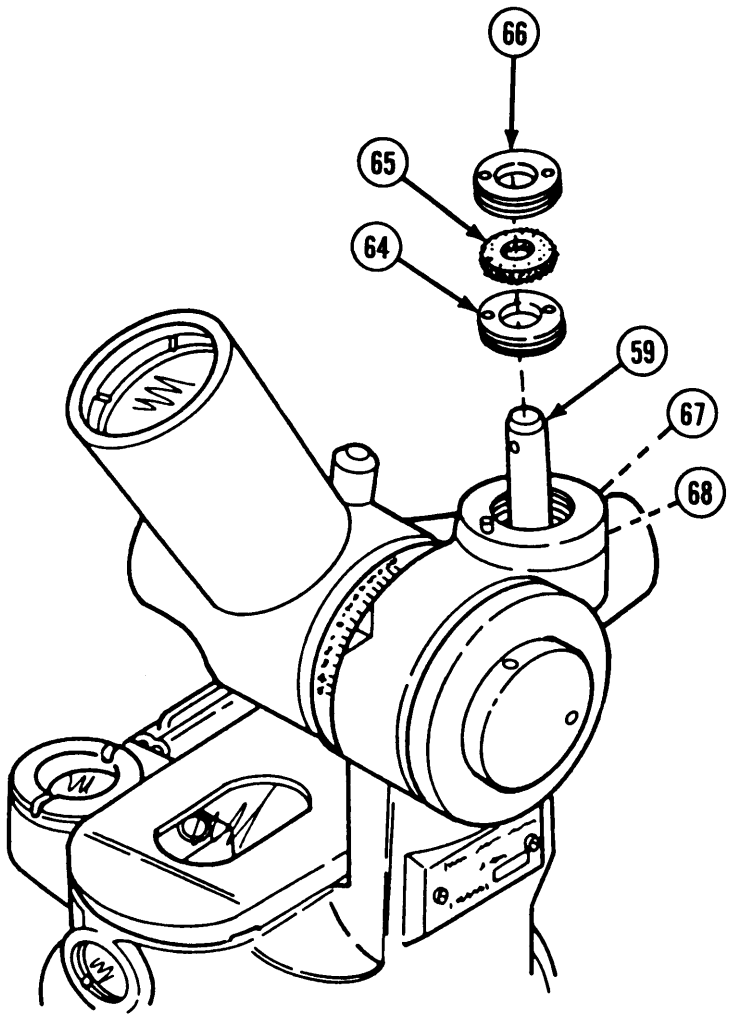
3-2. M2A2 AIMING CIRCLE—MAINTENANCE INSTRUCTIONS. (cont)

REASSEMBLY (cont)

62 Using pinned tubular wrench (fig. E-1, appx E), install worm shaft cap (64) on worm shaft (59) until bearing contact with worm ball is made.

63 Apply grease (item 6, appx D) to new washer (65) and install in recess in externally threaded ring (66).

64 Using pinned tubular wrench (fig. E-1, appx E), install externally threaded ring (66), washer side first, until contact with worm shaft cap (64) is made. Setscrews (67 and 68) will be tightened during backlash adjustments.



65 Lightly lubricate 17 stop rings (69) with grease (item 6, appx D).

66 Turn worm shaft (59) until elbow telescope objective end (70) touches body assembly. Then back off one-half turn.

67 Install 17 stop rings (69) with tabs pointed upward and spaced to let rings lie flat.

68 Install and turn adapter (71) until tab (72) of top stop rings fits into notch (73) in adapter.

69 Turn adapter (71) counterclockwise until it stops turning.

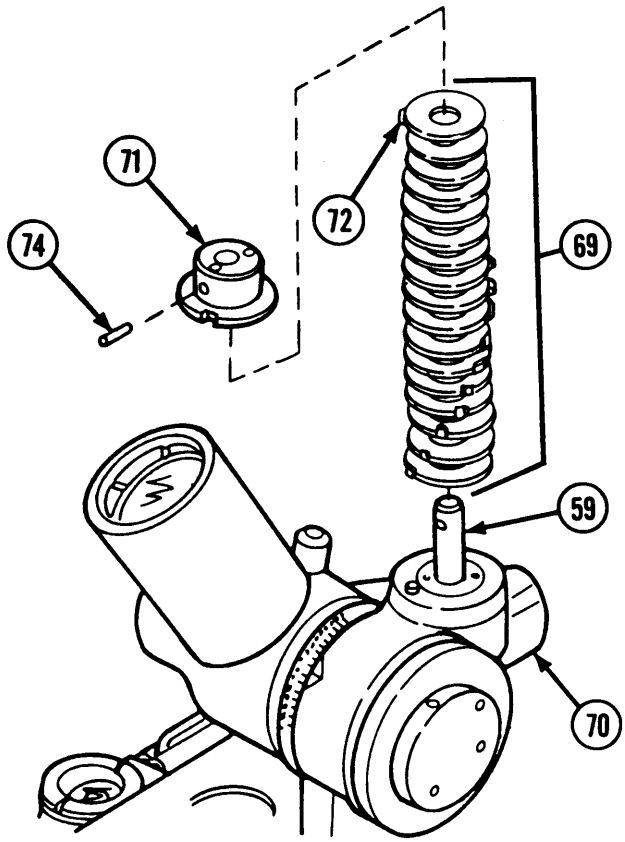
70 Back adapter (71) off clockwise until pin holes are alined and install pin (74).

NOTE

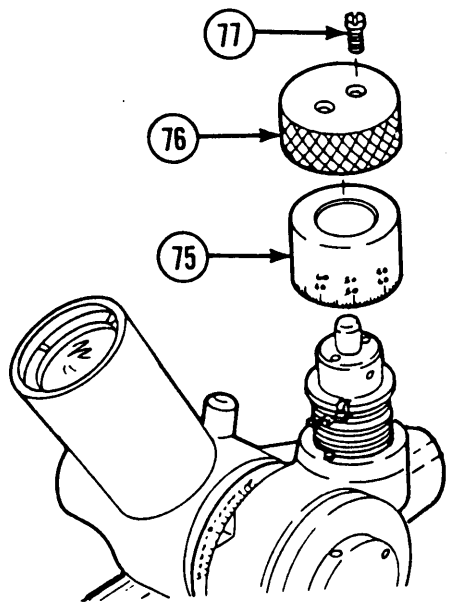
If a new worm was installed, perform steps 71 and 72.

71 Insert 0.003-inch thickness gage blade between adapter (71) and top stop ring.

72 Push down on adapter (71) and using adapter pin hole as a guide, drill a No. 52 hole in worm shaft (59) and ream for No. 6/0 pin. Install pin (74).



73 Install scale dial (75) and knob (76). Install two screws (77) loosely. Tightening will be done during collimation adjustments.



3-2. M2A2 AIMING CIRCLE—MAINTENANCE INSTRUCTIONS. (cont)

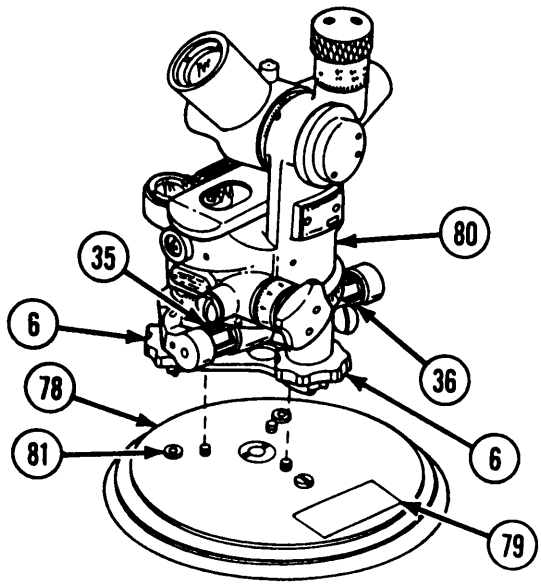
REASSEMBLY (cont)

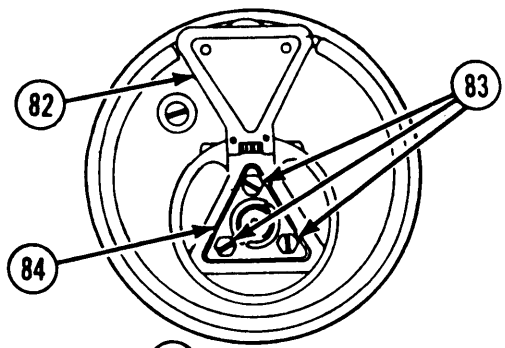
74 Position aiming circle plate base (78) with notation pad (79) facing you.

75 Place aiming circle (80) on aiming circle plate base (78) with orienting knobs (35 and 36) parallel and next to notation pad (79).

76 Set ball ends of three locking knobs (6) into sockets of aiming circle plate base inserts (81).

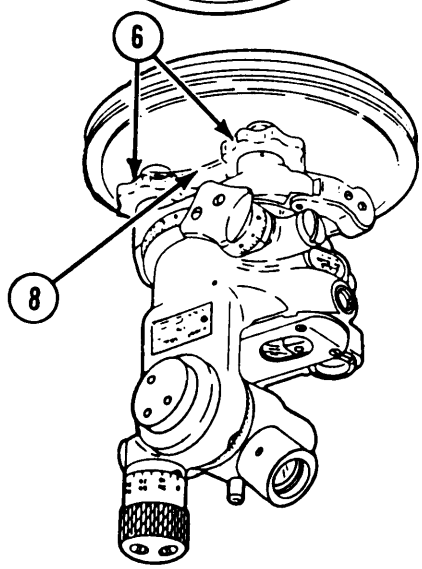
77 Hold aiming circle (80) and aiming circle plate base (78) together. Turn the two units upside down.





78 Hold cover (82) in open position and turn adjusting screws (83) just enough to catch in spring plate (8).

79 Press in on locking plate (84) and turn adjusting screws (83) up tight, but not tight enough to bind screws on locking knobs (6) or to bend spring plate (8).



SEALING

Refer to TM 750-116 for purging and charging procedures.

3-3. ELBOW TELESCOPE—MAINTENANCE INSTRUCTIONS.

This task covers:

a. Disassembly
b. Cleaning
c. Repair
d. Reassembly

INITIAL SETUP

Tools and Special Tools
Electronic system maintenance tool kit (SC 5180-95-CL-B29)

Materials/Parts
Brush (item 3, appx D)
Denatured alcohol (item 2, appx D)
Lens paper (item 7, appx D)
Self-sealing screw (2) (8204922)

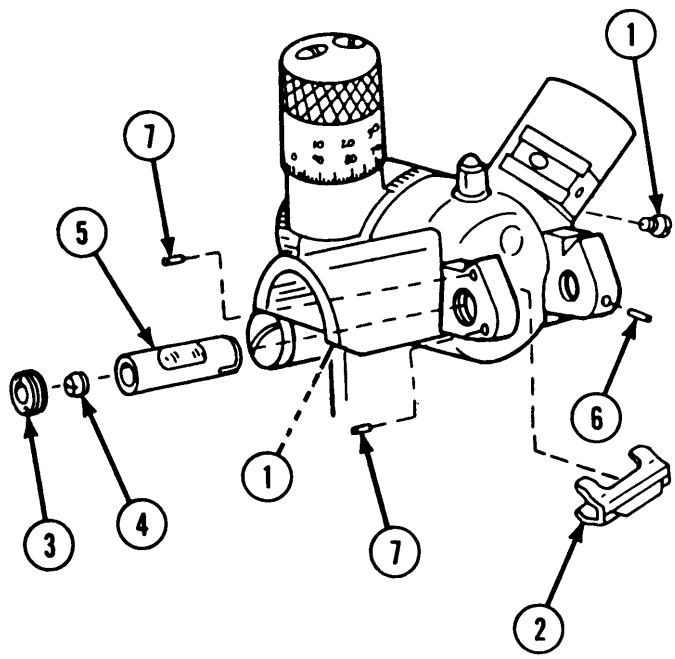
References
TM 9-254
TM 750-116

DISASSEMBLY

NOTE

- Early models may have only one self-sealing screw (1).
- Do not remove pins unless they are bent or broken.

Remove two self-sealing screws (1), level vial cover (2), eccentric ring (3), eccentric (4), level vial (5), pin (6), and two pins (7).



CLEANING

Clean all parts per TM 9-254.

REPAIR

Repair is by replacement of authorized parts as required. Refer to appendix C.

3-3. ELBOW TELESCOPE—MAINTENANCE INSTRUCTIONS. (cont)

REASSEMBLY

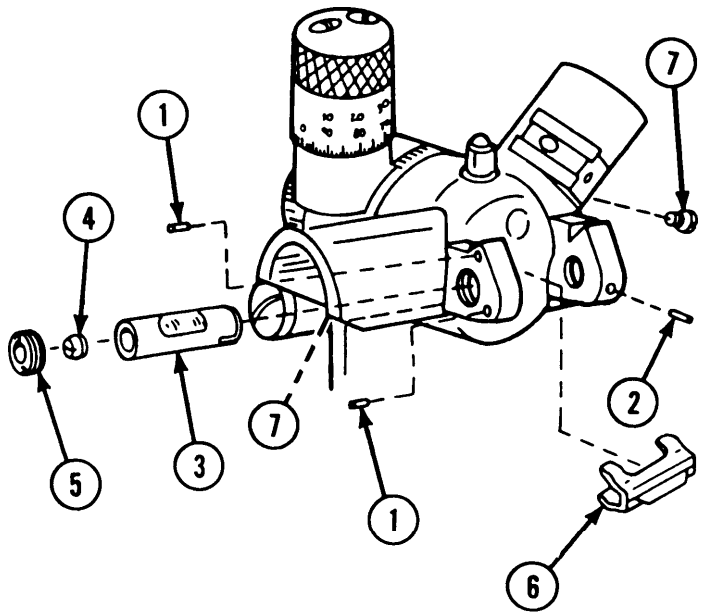
1 If removed, drive in two pins (1) until they extend 0.060 ± 0.010 in. (1.524 ± 0.254 mm) beyond the far surface.

2 If removed, drive in pin (2) until it is flush with outer surface.

3 Install level vial (3) so that slot engages the pin (2).

4 Loosely install eccentric (4) and eccentric ring (5).

5 Snap level vial cover (6) in place and install two new self-sealing screws (7).



NOTE

Leveling and optical elements will be tightened and sealed after elbow telescope assembly is assembled to the aiming circle and all adjustments performed. Purge and charge. Refer to TM 750-116.

3-4. AIMING CIRCLE PLATE BASE-MAINTENANCE INSTRUCTIONS

This task covers:

a. Disassembly
b. Cleaning
c. Repair
d. Reassembly

INITIAL SETUP

Tools and Special Tools
Electronic system maintenance tool kit (SC 5180-95-CL-B29)

Materials/Parts
Gasket (8211732)
Sealing compound (item 8, appx D)
Synthetic rubber adhesive (item 1, appx D)

References
TM 9-254

DISASSEMBLY

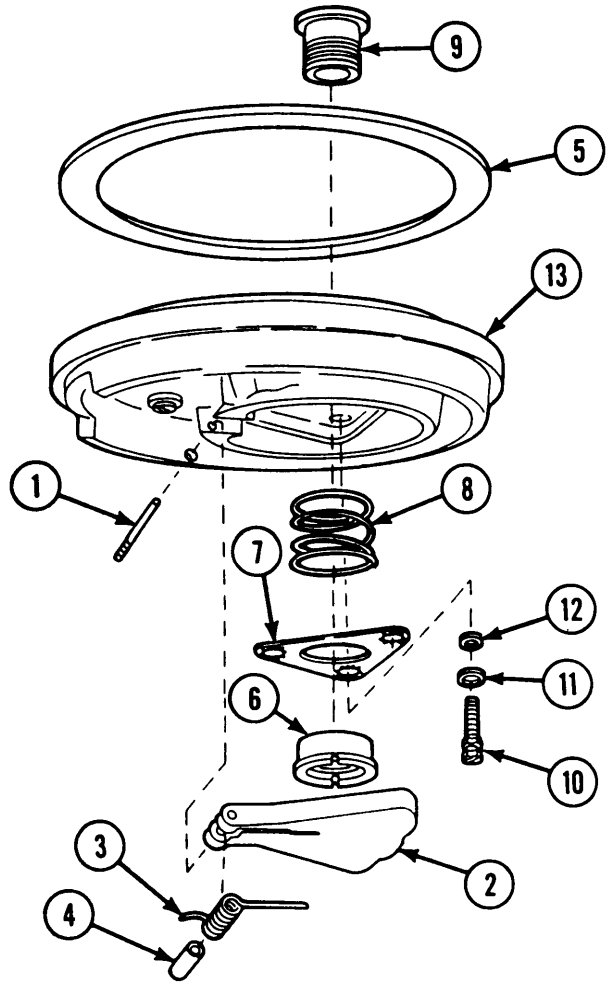
Remove setscrew (1), cover (2), torsion helical spring (3), spacer (4), gasket (5), sleeve nut (6), plate spacer (7), spring (8), plug (9), three screws (10), three washers (11), and three gaskets (12) from base plate (13).

CLEANING

Clean all parts per TM 9-254.

REPAIR

Repair is by replacement of authorized parts as required. Refer to appendix C.



REASSEMBLY

1 Apply sealing compound (item 8, appx D) to underside of flange on plug (1).

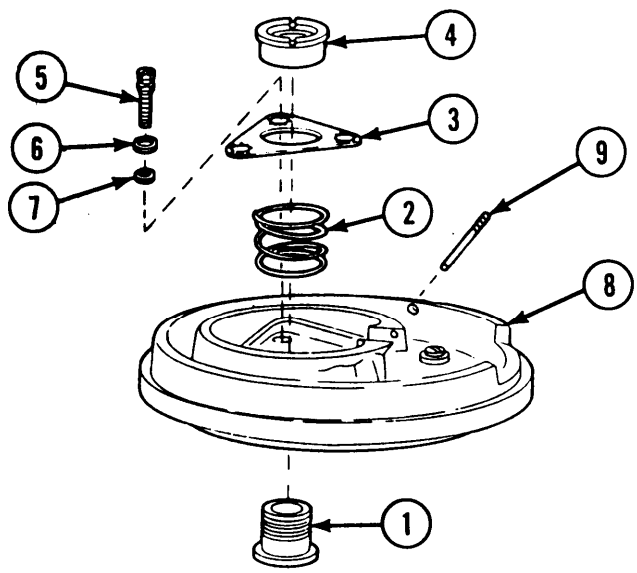
2 Install plug (1) and hold in position.

3 Install spring (2), plate spacer (3), and sleeve nut (4).

4 Turn sleeve nut (4) while holding plug (1) and tighten securely.

5 Install three screws (5) with gaskets (6) and washers (7) in base plate (8).

6 Insert setscrew (9) through first hinge hole in base plate (8).



3-4. AIMING CIRCLE PLATE BASE—MAINTENANCE INSTRUCTIONS. (cont)

REASSEMBLY (cont)

7 Insert sleeve spacer (10) in torsion helical spring (11).

8 Place torsion helical spring (11) in position in cover (12) hinge hole as shown.

9 Position the cover group on the base plate (8) and aline the holes for the setscrew (9).

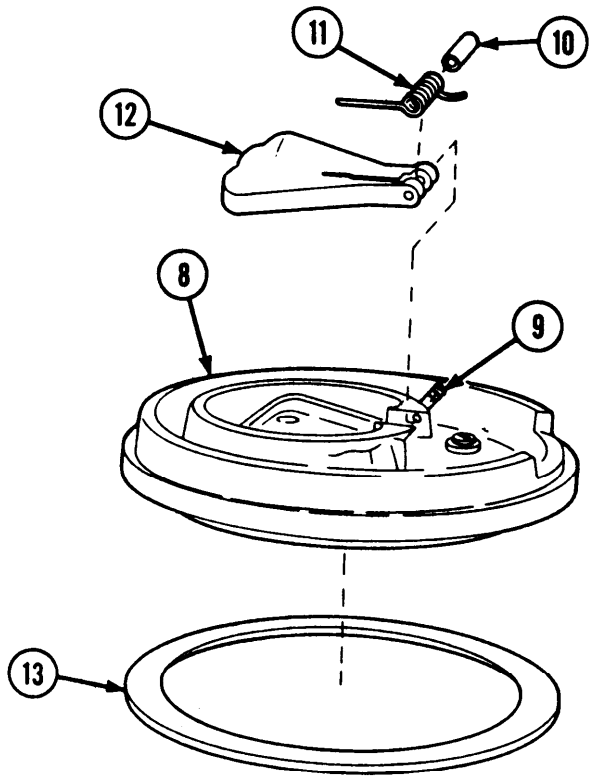
10 Push setscrew (9) in until only the threads show.

11 Apply sealing compound (item 8, appx D) to setscrew threads.

12 Screw in setscrew (9) and tighten securely.

13 Apply synthetic rubber adhesive (item 1, appx D) to new gasket (13) and its base plate mating surface.

14 Allow adhesive to dry until tacky, then position and press new gasket (13) firmly in place.



3-5. M24 AIMING CIRCLE TRIPOD AND COVER ASSEMBLY--MAINTENANCE INSTRUCTIONS.

This task covers:

a. Disassembly
b. Cleaning
c. Repair
d. Reassembly

INITIAL SETUP

Tools and Special Tools
Electronic system maintenance tool kit (SC 5180-95-CL-B29)

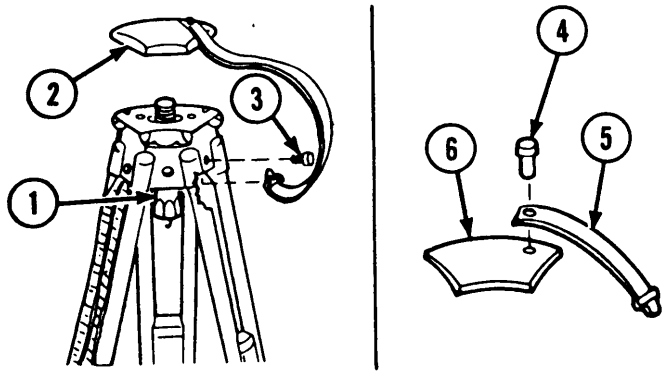
Materials/Parts
Sealing compound (item 8, appx D)
Tubular rivet (MS16535-162)

References
TM 9-254

DISASSEMBLY

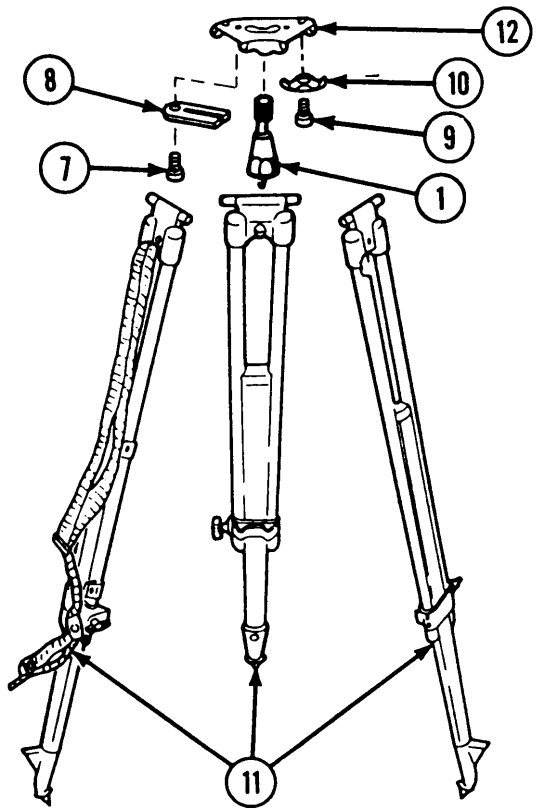
1 Loosen screw assembly (1) to release cover assembly (2). Remove screw (3) and cover assembly (2).

2 Remove tubular rivet (4) and retaining strap (5) from cover (6).



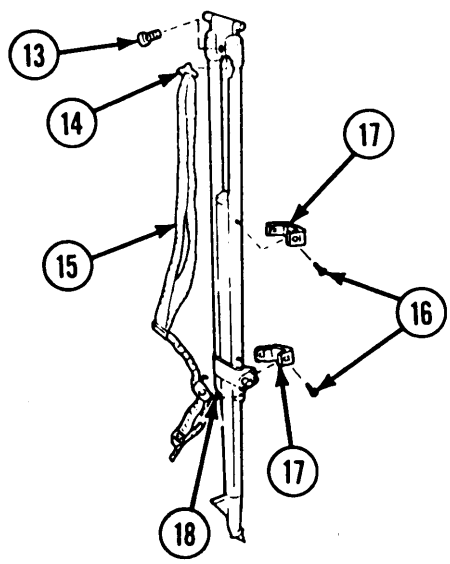
3 Remove screw (7), plate spacer (8), and screw assembly (1).

4 Remove three screws (9), three bridge clamps (10), and three leg assemblies (11) from head (12).



5 Remove screw (13) and loop (14) with carrying strap (15).

6 Remove four wood screws (16), clamps (17), and retaining strap (18).



CLEANING

Clean all parts per TM 9-254.

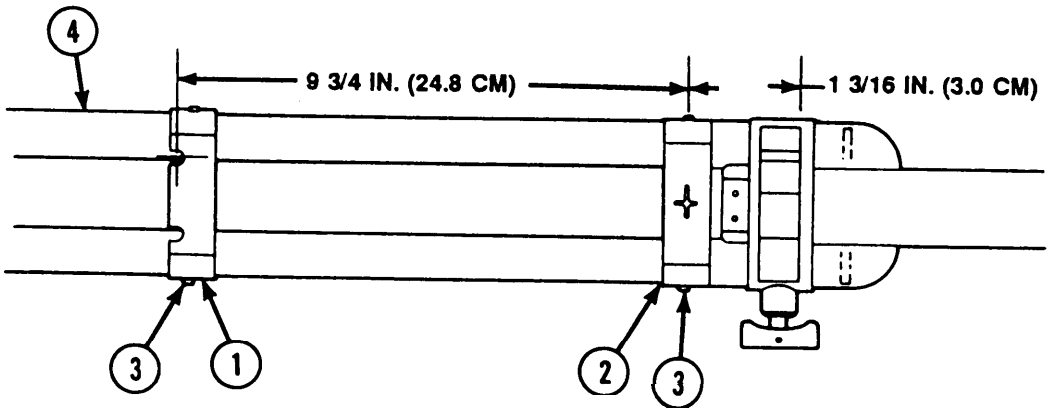
REPAIR

1 If head is broken or damaged, repair is by replacement of next higher assembly.

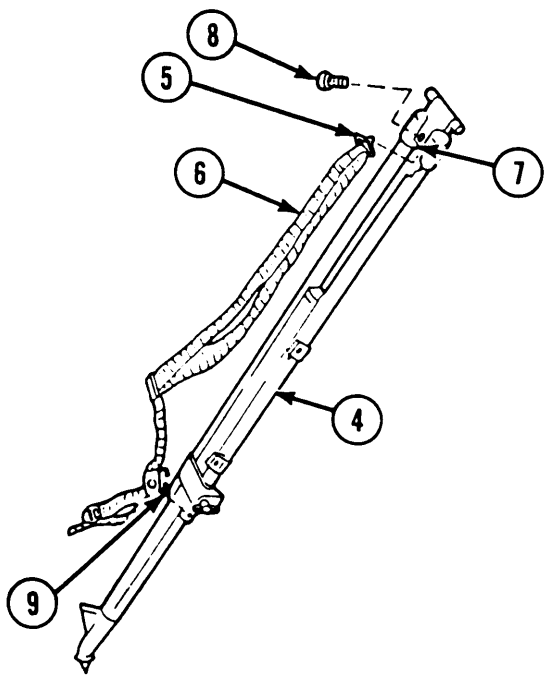
2 Repair is by replacement of authorized parts as required. Refer to appendix C.

3-5. M24 AIMING CIRCLE TRIPOD AND COVER ASSEMBLY—MAINTENANCE INSTRUCTIONS. (cont)

REASSEMBLY



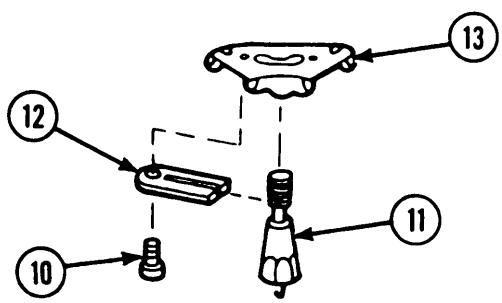
1 Install clamp (1), retaining strap (2), and four wood screws (3) on leg assembly (4) as shown.



2 Insert upper loop (5) of strap assembly (6) in hinge slot (7) of leg assembly.

3 Install screw (8). Tighten securely.

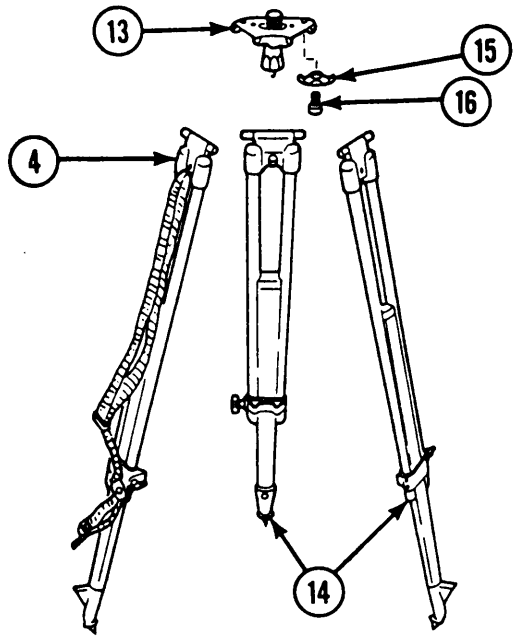
4 Install lower loop (9) of strap assembly (6) on leg assembly (4).



5 Apply sealing compound (item 8, appx D) to screw (10).

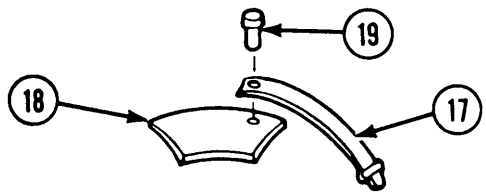
6 Install screw assembly (11) and plate spacer (12) in head (13).

7 install and tighten screw (10).

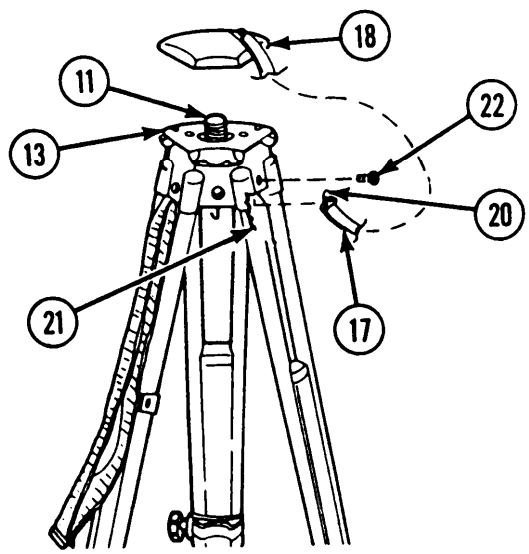


8 Install leg assembly (4), two leg assemblies (14), three tripod bridge clamps (15), and three screws (16) on head (13).

9 Apply sealing compound (item 8, appx D) to three screws (16) and tighten.



10 Secure retaining strap (17) to cover (18) with new tubular rivet (19).



11 Position cover (18) on head (13). Secure by tightening screw assembly (11).

12 Insert loop (20) in hinge slot (21).

13 Install screw (22). Tighten securely.

3-6. ACCESS COVER AND COVER STRAP ASSEMBLY-MAINTENANCE INSTRUCTIONS.

This task covers:

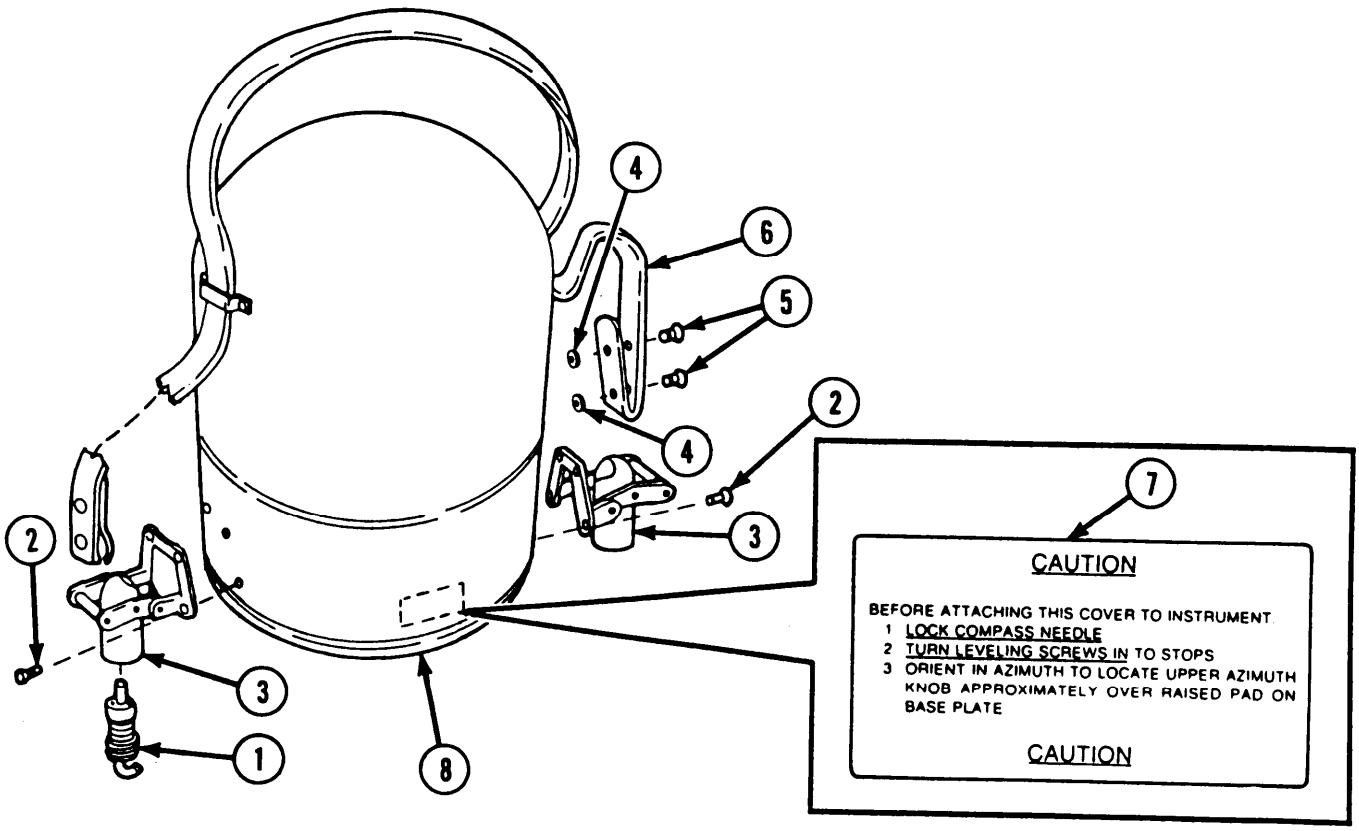
a. Disassembly
b. Cleaning
c. Repair
d. Reassembly

INITIAL SETUP

Tools and Special Tools
Electronic system maintenance tool kit (SC 5180-95-CL-B29)

Materials/Parts
Metallic eyelet and washer (4) (MIL-E-20652/1
Sealing compound (item 8, appx D)
Solid rivet (8) (MS20470DD3-5)

References
TM 9-254



DISASSEMBLY

1 Using adjustable face spanner wrench, unscrew and remove two catches (1).

2 Remove eight solid rivets (2) and two cover latch assemblies (3).

3 Remove four metallic washers (4), four metallic eyelets (5), and webbing strap (6) from two cover latch assemblies (3).

4 If damaged, remove decal (7).

CLEANING

Clean all parts per TM 9-254.

REPAIR

1 If cover is broken or damaged, repair is by replacement of next higher assembly.

2 Repair is by replacement of authorized parts as required. Refer to appendix C.

REASSEMBLY

1 Fold webbing strap (6) over two cover latch assemblies (3) and aline rivet holes.

2 Install four new metallic eyelets (5) and four new metallic washers (4).

3 Position two cover latch assemblies (3) on cover (8) and aline rivet holes.

4 Install eight new solid rivets (2).

5 Spot sealing compound (item 8, appx D) in two places on threads of each cover latch assembly (3).

6 Using adjustable face spanner wrench, install two catches (1).

7 If decal (7) has been removed, peel backing paper off new decal, and position inside cover (8). Press firmly in place.

Section III. DIRECT SUPPORT TEST AND ADJUSTMENT PROCEDURES

Section Index

3-7. TEST AND ADJUSTMENT PROCEDURES.

This task covers:

a. Adjustment of target
b. Backlash in elevation worm
c. Check of elevation worm torque
d. Backlash in azimuth worm
e. Backlash in orienting worm
f. Elevation stop mechanism
g. Magnetic needle repeatability test

INITIAL SETUP

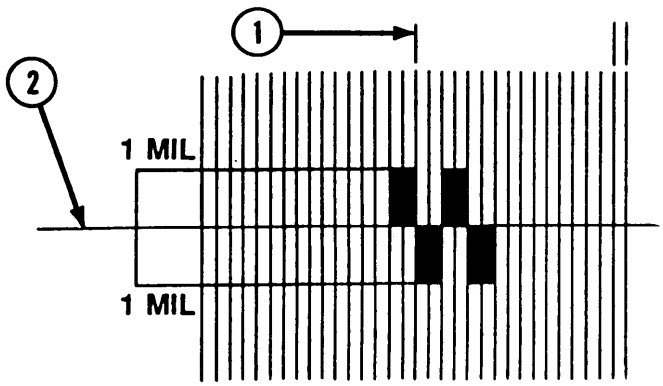
Tools and Special Tools
Electronic system maintenance tool kit (SC 5180-95-CL-B29)
Instrument and fire control shop set (SC 4931-95-CL-A07)
0-80 in.-oz torque wrench
Pinned tubular wrench (fig. E-1, appx E)
Test target (fig. E-6, appx E)

Materials/Parts
Sealing compound (item 8, appx D)

References
TM 9-254
TM 9-1290-262-10

Equipment Conditions
M2A2 aiming circle mounted on tripod and leveled (TM 9-1290-262-10)

ADJUSTMENT OF TARGET



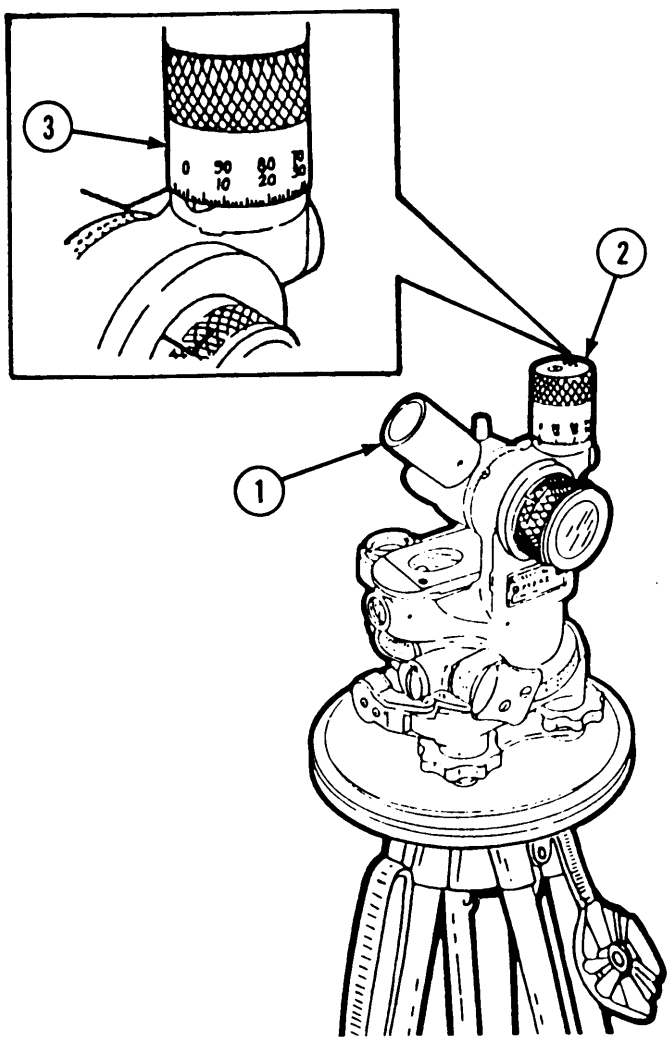
Adjust position of the test target (fig. E-6, appx E) until its vertical (1) and horizontal (2) crosslines coincide with reticle lines on the aiming circle.

$$\text{Mil size} = \frac{\text{Target distance (inches)}}{1000}$$

BACKLASH IN ELEVATION WORM

NOTE

During setup, the aiming circle line of sight should be directed toward the test target.



1 While sighting through elbow telescope eyepiece (1), rotate elevation knob (2) to superimpose aiming circle horizontal reticle line on test target horizontal line.

2 Record reading of elevation micrometer scale (3).

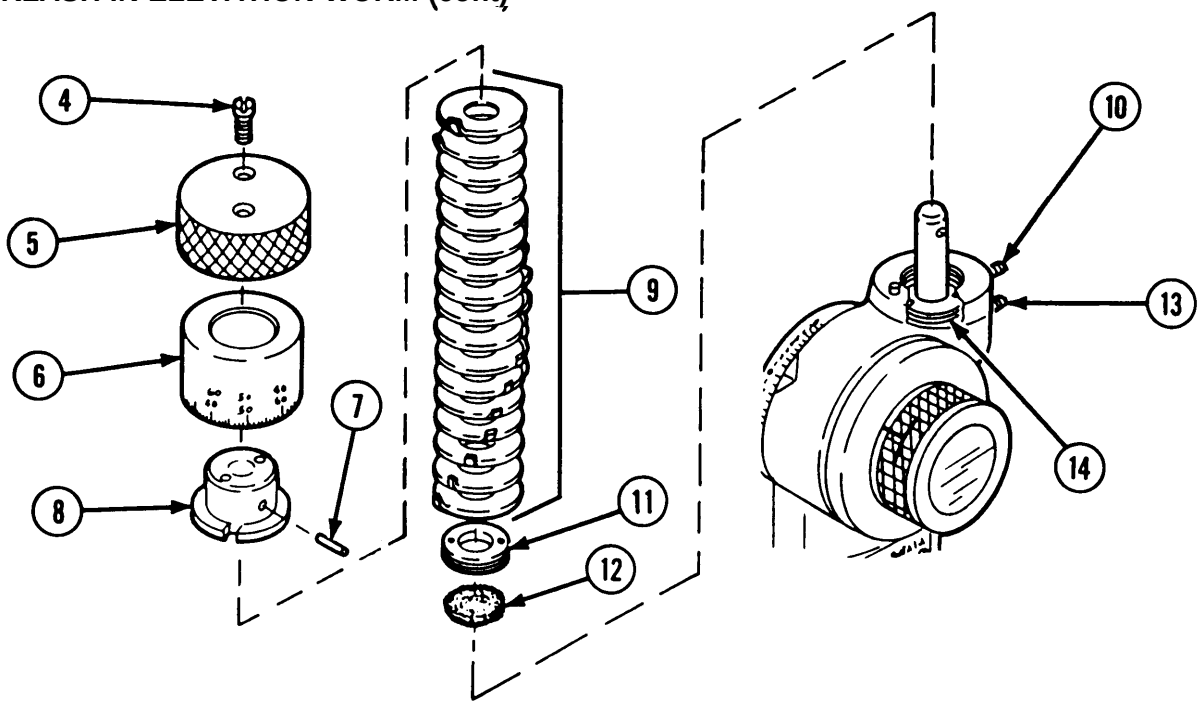
3 Rotate elevation knob (2) two full turns clockwise.

4 Rotate elevation knob (2) counterclockwise to record reading without overtravel.

5 Sight through elbow telescope. Error between aiming circle horizontal reticle and test target horizontal line should not exceed 0.6 roil. If tolerance is exceeded, proceed to steps 6 thru 17. If tolerance is met, proceed to torque test, page 3-39.

3-7. TEST AND ADJUSTMENT PROCEDURES (cont).

BACKLASH IN ELEVATION WORM (cont)



6 Remove aiming circle from tripod.

7 Remove two screws (4), knob (5), scale (6), taper pin (7), adapter (8), and 17 stop rings (9).

8 Loosen top setscrew (10).

9 Using pinned tubular wrench (fig. E-1, appx E), remove ring (11) and felt washer (12).

10 Loosen middle setscrew (13).

11 Using pinned tubular wrench (fig. E-1, appx E), tighten seat (14), being careful not to bind elevating worm.

12 Tighten middle setscrew (13).

13 Install felt washer (12) and ring (11).

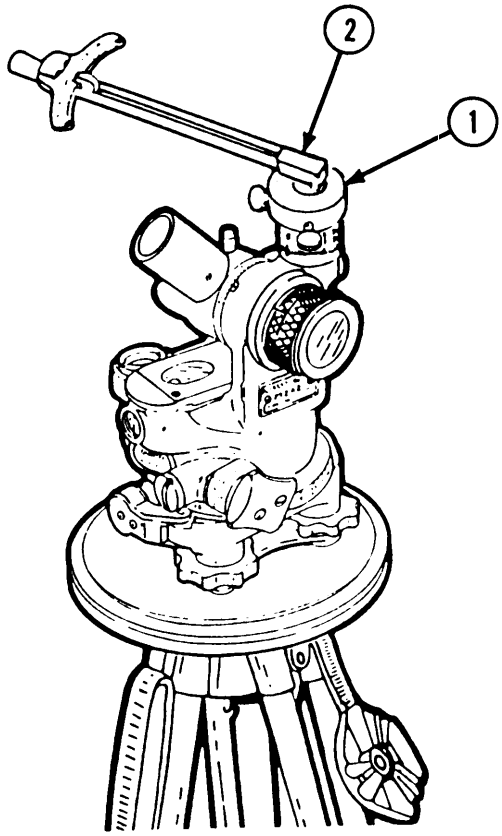
14 Tighten top setscrew (10).

15 Install 17 stop rings (9), adapter (8), taper pin (7), scale (6), knob (5), and two screws (4).

16 Repeat steps 1 thru 5.

17 Repeat steps 6 thru 16 until backlash (error in elevation reading) does not exceed 0.6 mil.

CHECK OF ELEVATION WORM TORQUE



1 Install adapter (1) on elevation knob.

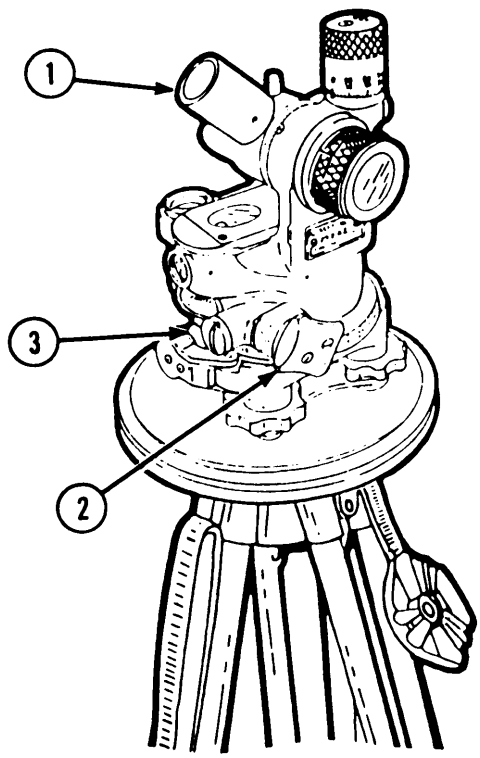
2 Install 0 to 80 in.-oz torque wrench (2) on adapter.

3 Check for a running torque of 12.00 to 28.00 in.-oz (0.08 to 0.20 N-m).

4 If torque is out of tolerance, repeat steps 6 thru 17 of backlash in elevation worm test, page 3-37, and recheck torque.

5 Fill setscrew holes with sealing compound (item 8, appx D).

BACKLASH IN AZIMUTH WORM



1 While looking through elbow telescope eyepiece (1), rotate azimub knob (2) to superimpose aiming circle vertical reticle line on test target vertical line.

2 Record reading of azimuth micrometer scale (3).

3 Rotate azimuth knob two full turns clockwise.

4 Rotate azimuth knob counterclockwise to recorded reading without overtravel.

5 Sight through elbow telescope. Error between aiming circle vertical reticle and test target vertical line should not exceed 0.4 roil. If tolerance is exceeded, proceed to steps 6 thru 9. If tolerance is met, proceed to orienting worm backlash adjustment, page 3-42.

3-7. TEST AND ADJUSTMENT PROCEDURES (cont).

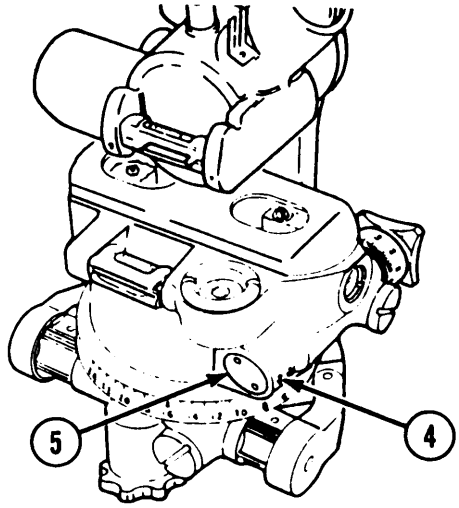
BACKLASH IN AZIMUTH WORM (cont)

6 Remove aiming circle from tripod.

7 Loosen setscrew (4).

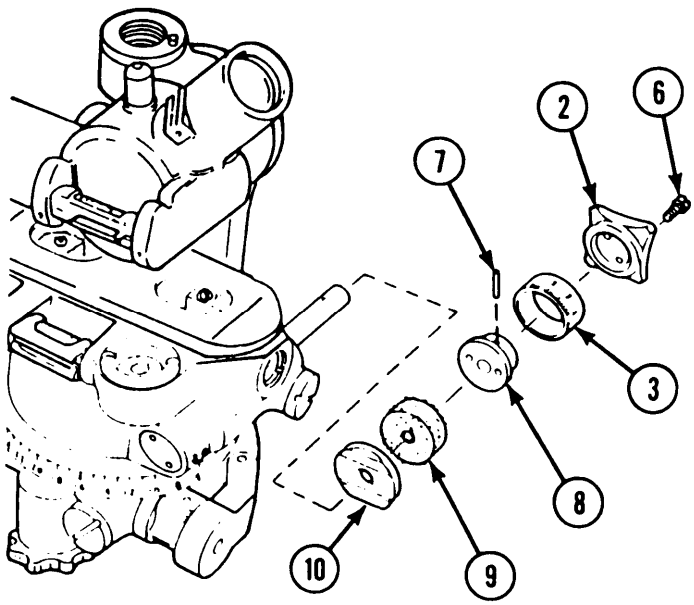
8 Tighten worm shaft cap (5), being careful not to bind worm.

9 Tighten setscrew (4).



10 Repeat steps 1 thru 5. If excessive backlash is still present, proceed to step 11.

11 Remove two screws (6), azimuth knob (2). azimuth micrometer scale (3), taper pin (7), adapter (8), felt washer (9), and index (10).



12 Remove plug (11) and spring (12).

13 Loosen two setscrews (4 and 13).

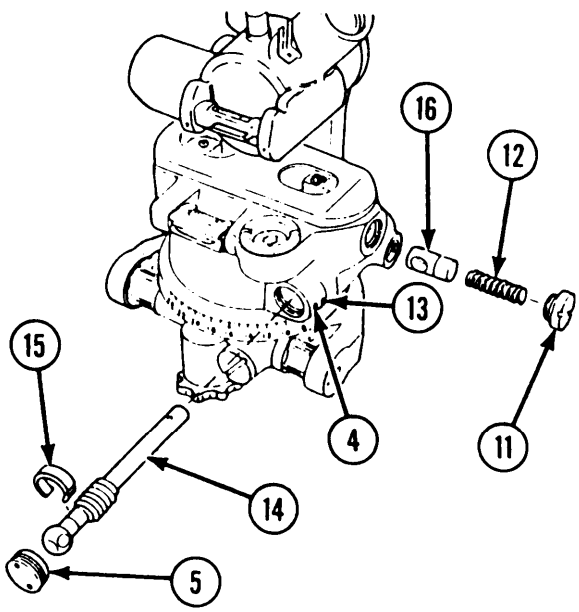
14 Remove worm shaft cap (5), worm (14). ball socket seat (15), and bushing (16).

15 Perform worm ball and gear tests (TM 9-254).

16 Install bushing (16), ball socket seat (15), worm (14), and worm shaft cap (5).

17 Tighten two setscrews (4 and 13).

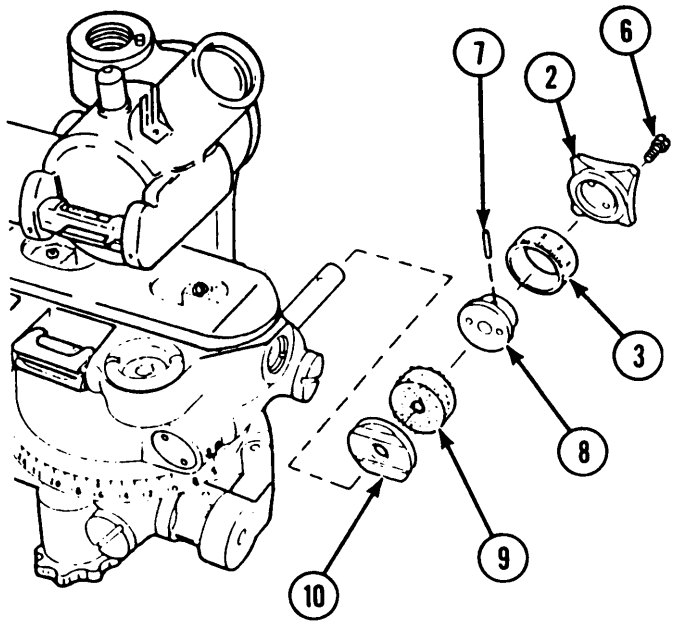
18 Install spring (12) and plug (11).



19 Install index (10), felt washer (9), adapter (8), taper pin (7), azimuth micrometer scale (3), azimuth knob (2), and two screws (6).

20 Recheck for backlash. Repeat steps 1 thru 5.

21 Repeat steps 6 thru 20 until azimuth worm backlash does not exceed 0.4 roil.

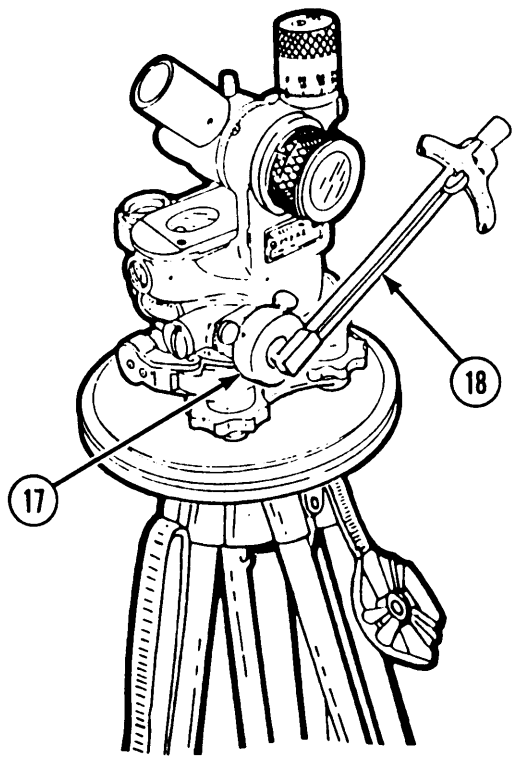


22 Install adapter (17) on azimuth knob.

23 Install O to 80 in.-oz torque wrench (18) on adapter (17) and check for a running torque of 12.00 to 36.00 in.-oz (0.08 to 0.25 N-m).

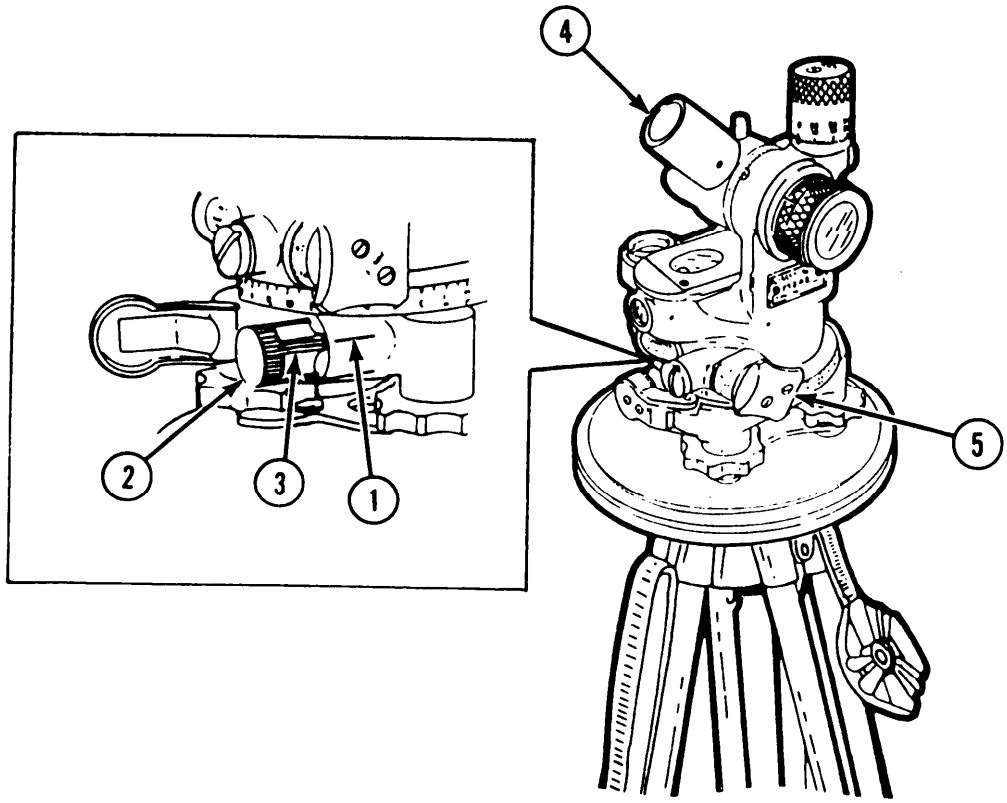
24 If torque is out of tolerance, repeat steps 6 thru 21 and recheck torque.

25 Fill setscrew holes with sealing compound (item 8, appx D).



3-7. TEST AND ADJUSTMENT PROCEDURES (cont).

BACKLASH IN ORIENTING WORM



1 Put a reference line (1) on worm housing at center line of left orienting knob (2).

2 Aline one of center ribs (3) on orienting knob with reference line marked on center rib.

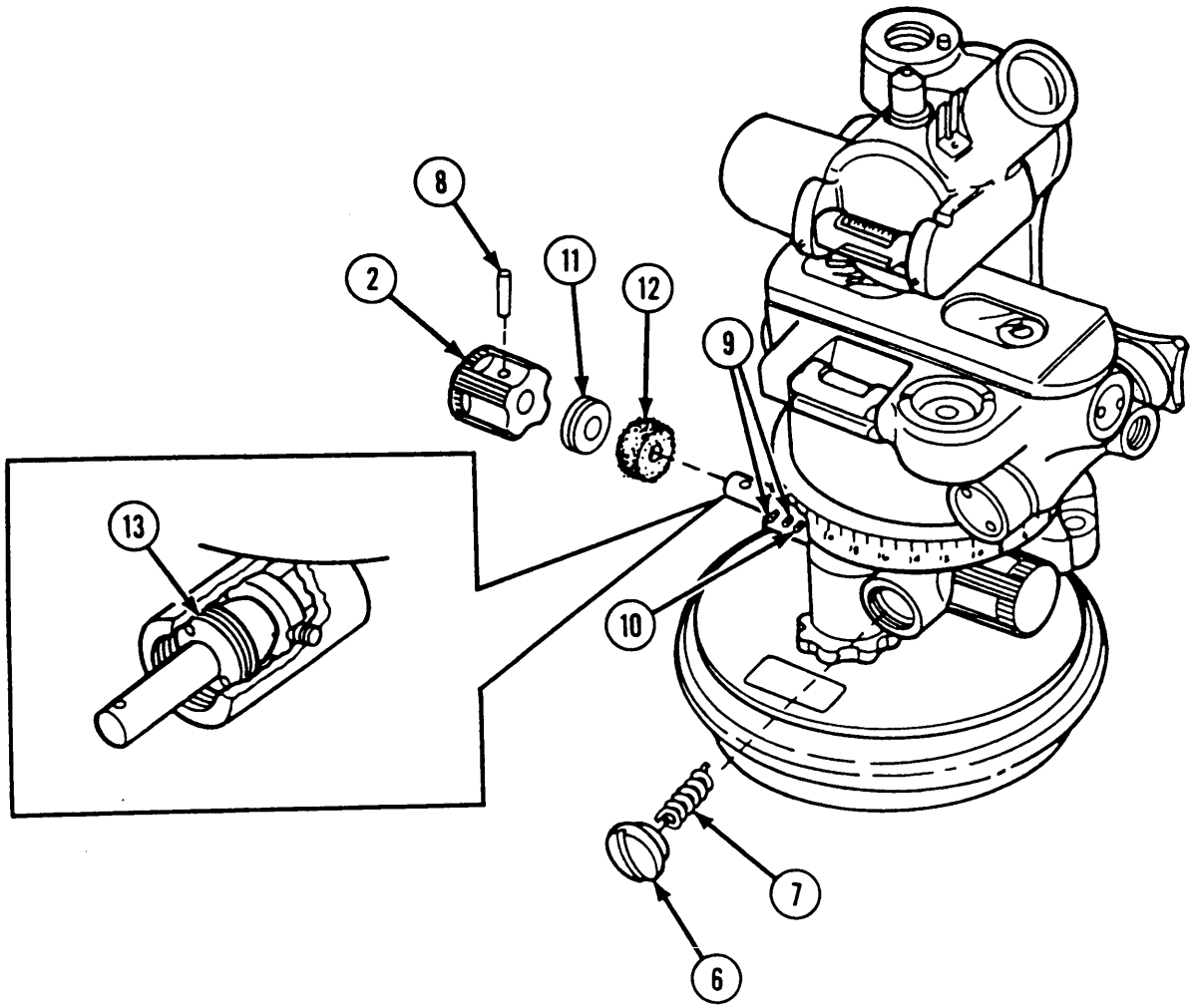
3 While looking through elbow telescope eyepiece (4), rotate azimuth knob (5) to superimpose aiming circle vertical reticle line on test target vertical line.

4 Rotate left orienting knob (2) two full turns clockwise.

5 Rotate left orienting knob (2) counterclockwise two full turns to aline marked center rib (3) without overtravel.

6 Sight through elbow telescope eyepiece (4). Error between aiming circle vertical reticle and test target vertical line should not exceed 0.6 roil. If tolerance is exceeded, proceed to step 7. If tolerance is met, proceed to elevation stop mechanism procedures, page 3-44.

7 Remove aiming circle from tripod.



8 Remove plug (6) and spring (7).

9 Install new spring (7) if old one is broken. Reinstall plug (6).

10 Remove pin (8) and left orienting knob (2).

11 Loosen setscrews (9 and 10) if tight.

12 Remove externally threaded ring (11) and washer (12).

13 Tighten wormshaft cap (13), being careful not to bend worm.

14 Tighten setscrew (10).

15 Install washer (12), externally threaded ring (11), left orienting knob (2), and pin (8).

16 Tighten setscrews (9).

17 Repeat steps 1 thru 6.

3-7. TEST AND ADJUSTMENT PROCEDURES (cont).

BACKLASH IN ORIENTING WORM (cont)

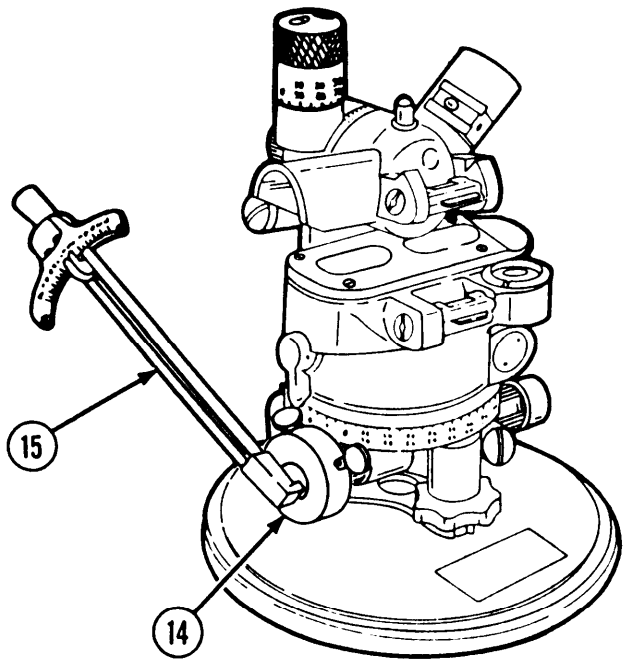
18 Install adapter (14) on orienting knob.

19 Install 0 to 80 in.-oz torque wrench (15) on adapter and check for a running torque of 24.00 to 48.00 in.-oz (0.17 to 0.34 N-m).

20 Remove torque wrench and adapter.

21 If torque is out of tolerance, repeat steps 7 thru 20 and recheck torque.

22 Fill setscrew holes with sealing compound (item 8, appx D).



ELEVATION STOP MECHANISM

1 Bring elbow telescope reticle into coincidence with test target (fig. E-6, appx E).

2 Set all scales, indexes, and micrometers to zero.

3 Rotate elevation micrometer knob (1) to elevate elbow telescope to limit of stop rings. Elbow telescope must not touch housing cover (2). Reading on aiming circle elevation scale and micrometer must beat least 1130 roils above horizontal.

4 Rotate elevation micrometer knob (1) to depress elbow telescope to limit of stop rings. Elbow telescope must not touch housing cover (2). Reading on aiming circle elevation scale and micrometer must be at least 430 roils below horizontal.

5 If conditions of steps 3 and 4 above cannot be met, proceed to steps 6 thru 17.

6 Remove 2 screws (3), elevation micrometer knob (1), micrometer scale (4), taper pin (5), adapter (6), and 17 stop rings (7).

7 Turn worm shaft (8) until elbow telescope objective end touches main housing. Then back off one-half turn.

8 Install 17 stop rings (7) with tabs pointed upward and spaced to let stop rings lie flat.

9 Install and turn adapter (6) until tab of top stop ring fits into notch in adapter flange.

10 Turn adapter (6) counterclockwise until it stops turning.

11 Back off adapter (6) clockwise until tapered pin holes are alined.

12 Install taper pin (5).

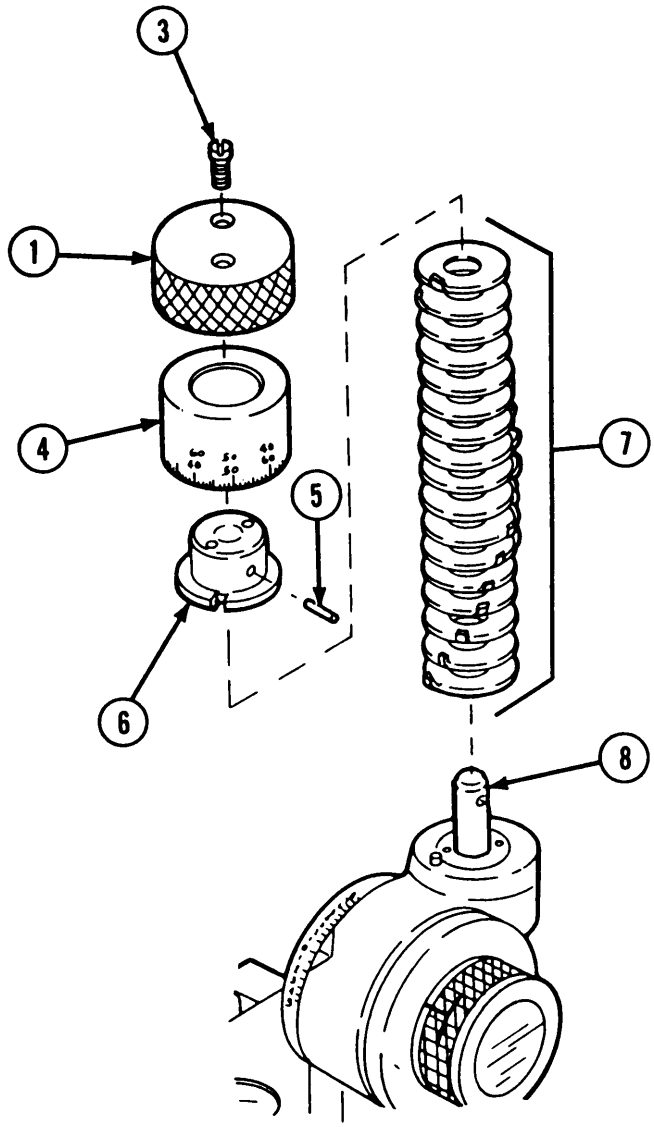
13 Install elevation micrometer scale (4), elevation micrometer knob (1), and two screws (3).

14 Bring elbow telescope reticle into coincidence with collimator reticle.

15 Zero elevation micrometer scale (4) and tighten screws.

16 if minimum elevation and depression limits are met or elbow telescope touches housing cover, replace 17 stop rings (7). Refer to steps 6 thru 15 above.

17 Repeat steps 1 thru 5.



3-7. TEST AND ADJUSTMENT PROCEDURES (cont).

MAGNETIC NEEDLE REPEATABILITY TEST

1 Rotate aiming circle so that N on housing faces in the general direction of north.

2 Unlock magnetic needle.

3 Look through magnifier (1) and turn aiming circle to aline end of needle with edge of a reticle line.

4 Hold steel block (2) close enough to aiming circle to deflect magnetic needle to one side as far as it will go.

5 Look through magnifier (1), then remove steel block (2).

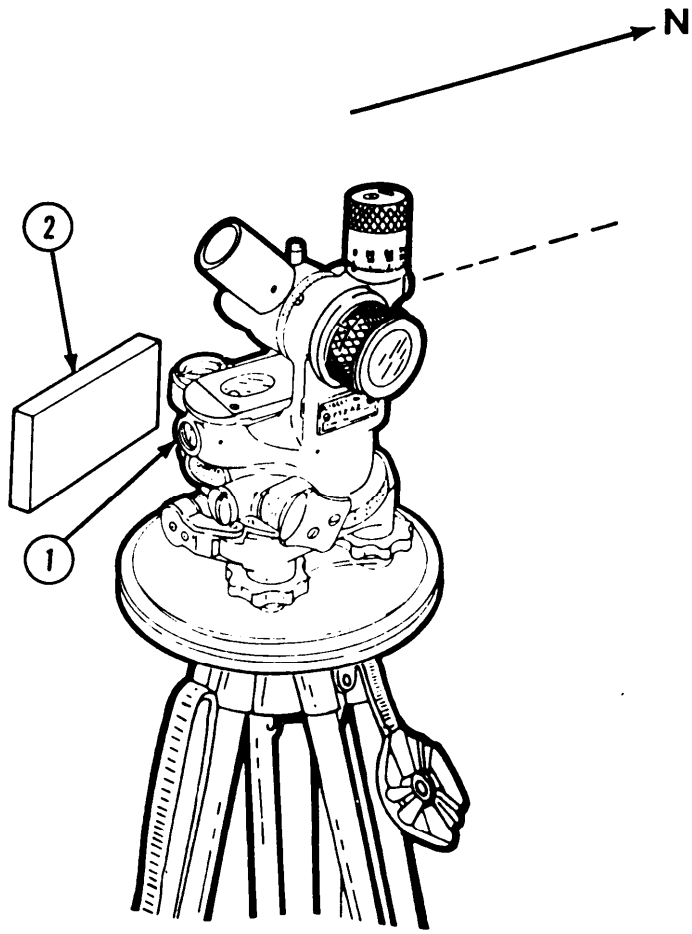
6 Observe and note needle position relative to reticle line after needle has come to rest.

7 Hold steel block (2) close enough to aiming circle to deflect magnetic needle to other side as far as it will go.

8 Look through magnifier (1), then remove steel block (2).

9 Observe and note needle position relative to reticle line after needle has come to rest.

10 In steps 6 and 9, needle should return to its original position within 0.5 mil (the approximate width of a reticle line). If needle does not return to its original position within 0.5 mil, notify next higher maintenance level.



CHAPTER 4

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

CHAPTER INDEX

Section 1. GENERAL SUPPORT TROUBLESHOOTING

Section Index

4-1. TROUBLESHOOTING INFORMATION.

a. The symptom index can be used as a quick guide to troubleshooting. Common malfunctions are listed in alphabetical order, under each major assembly which appears in MAC order, with page number references to the troubleshooting table where a test or inspection and corrective action are provided.

b. The table lists the common malfunctions which you may find during the operation or maintenance of the M2A2 Aiming Circle or its components. You should perform the tests/Inspections and corrective actions in the order listed.

c. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

d. The following symptom index can be used for a quick reference to symptoms covered in the troubleshooting chart.

4-1. TROUBLESHOOTING INFORMATION (cont).

SYMPTOM INDEX

Table 4-1. GENERAL SUPPORT TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
M2A2 AIMING CIRCLE
1. RETICLE DOES NOT BECOME ILLUMINATED.
Step 1. Attach a serviceable M51 instrument light to the elbow telescope. Turn switch on.
Step 2. Check for dirt on optical instrument window.
Remove optical instrument window. Refer to page 4-5. Clean thoroughly using optical lens cleaning compound (item 4, appx D) and lens paper (item 7, appx D).
Step 3. Check position of reticle assembly.
Adjust position of reticle assembly. Refer to page 4-16.
Step 4. Inspect reticle assembly for defects.
Replace defective reticle assembly. Refer to page 4-5.

Table 4-1. GENERAL SUPPORT TROUBLESHOOTING (cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
2. PARALLAX PRESENT IN OPTICAL SYSTEM.
Check objective cell assembly adjustment.
Adjust objective cell assembly. Refer to page 4-12.
3. TELESCOPE RETICLE HAS POOR DEFINITION.
Step 1. Check setting of eyepiece assembly focus.
Adjust eyepiece assembly focus. Refer to page 4-16.
Step 2. Inspect eyepiece assembly for defects.
Repair eyepiece assembly. Refer to page 4-5.
Step 3. Check reticle assembly for incorrect installation.
Install reticle assembly correctly. Refer to page 4-5.
4. IMAGE IS POORLY DEFINED.
Step 1. Check for faulty objective cell assembly lenses.
Repair objective cell assembly. Refer to page 4-12.
Step 2. Check eyepiece assembly focus.
Adjust eyepiece assembly focus. Refer to page 4-16.
Step 3. Check optical cell assembly for parallax.
Adjust optical cell assembly. Refer to page 4-16.
Step 4. Check optical instrument prism for defects.
Replace optical instrument prism. Refer to page 4-5.
Step 5. Recheck image definition.
If image is still poorly defined, replace M2A2 aiming circle.

4-1. TROUBLESHOOTING INFORMATION (cont).

Table 4-1. GENERAL SUPPORT TROUBLESHOOTING (cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
M2A2 AIMING CIRCLE (CONT)
5. IMAGE IS TILTED. Check for proper location of optical instrument prism. a. Replace optical instrument prism. Refer to page 4-5. b. If image is still tilted, replace M2A2 aiming circle.
6. RETICLE IS TILTED. Check position of reticle assembly. a. Adjust position of reticle assembly. Refer to page 4-16. b. If reticle is still tilted, replace M2A2 aiming circle.
7. COMPASS NEEDLE FAILS TO TURN FREELY WHEN UNLOCKED. Turn compass needle to UNLOCKED and check compass needle action. If compass needle does not pivot freely, repair M2A2 aiming circle. Refer to page 4-5.

Section II. GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Section Index

4-2. M2A2 AIMING CIRCLE-MAINTENANCE INSTRUCTIONS.

This task covers:

a. Disassembly
b. Cleaning
c. Repair
d. Reassembly

INITIAL SETUP

Tools and Special Tools
Electronic system maintenance tool kit (SC 5180-95-CL-B29)
Instrument and fire control shop set (SC 4931-95-CL-A07)
pinned tubular wrench (fig. E-1, appx E)
pivot wrench (fig. E-7, appx E)

Material/Parts
Aircraft grease (item 6, appx D)
Cleaning compound (item 5, appx D)
Denatured alcohol (item 2, appx D)
Optical cleaning compound (item 4, appx D)
Sealing compound (item 8, appx D)

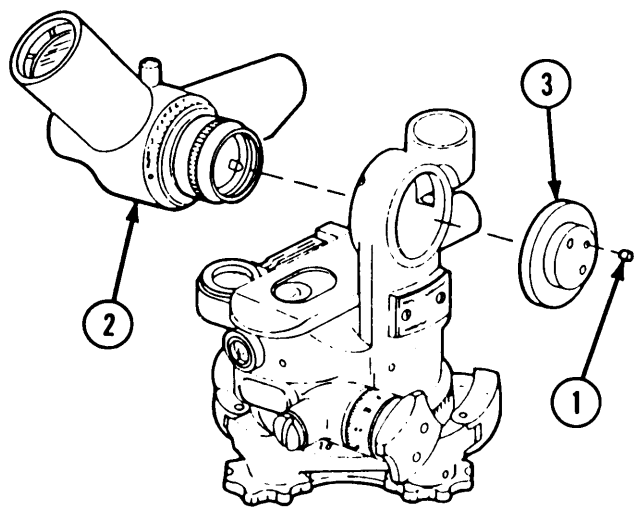
References
TM 9-254

DISASSEMBLY

1 Remove setscrew (1).

2 Hold elbow telescope (2) to keep it from turning and, using spanner wrench, unscrew cover assembly (3).

3 Remove elbow telescope (2).

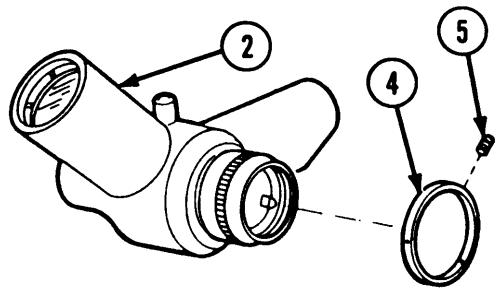


4-2. M2A2 AIMING CIRLCE—MAINTENANCE INSTRUCTIONS (cont).

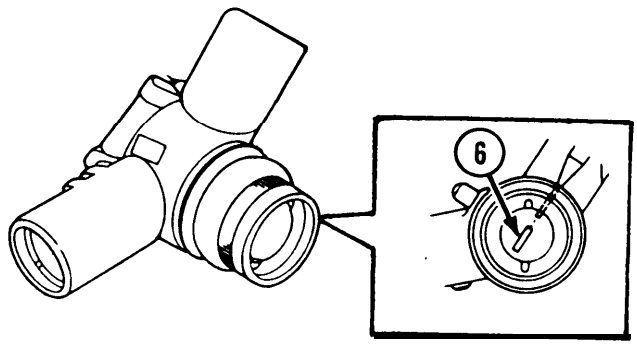
DISASSEMBLY (cont)

4 Scribe a mark across elevation indicator (4) and elbow telescope (2).

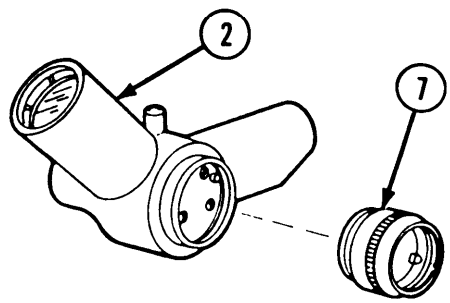
5 Remove three setscrews (5) and elevation indicator (4).



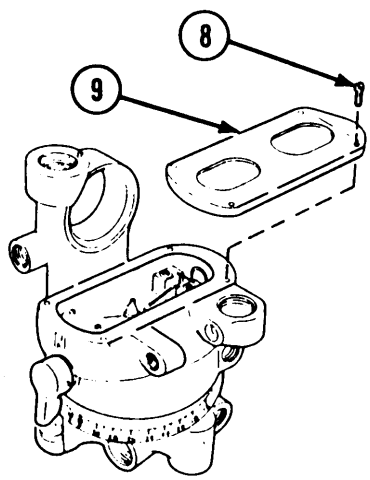
6 To remove pin (6), drive through until it drops out in bore of gear.



7 Using tubular wrench (fig. E-1, appx E), unscrew elevating gear (7) from elbow telescope (2).

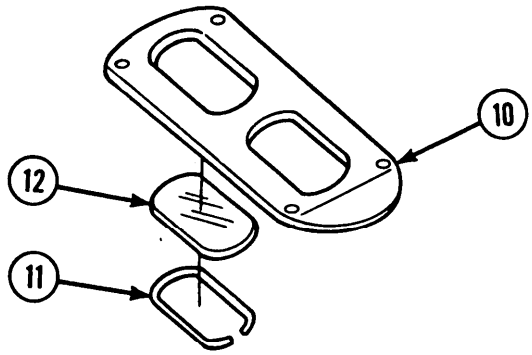


8 Remove four screws (8) and access cover (9).



9 Scrape old sealing compound from groove in underside of cover (10).

10 If damaged, remove two retaining rings (11) and two observation windows (12) by scraping old sealing compound from groove around window holes in cover (10).



11 Remove screw (13) and magnifier (14).

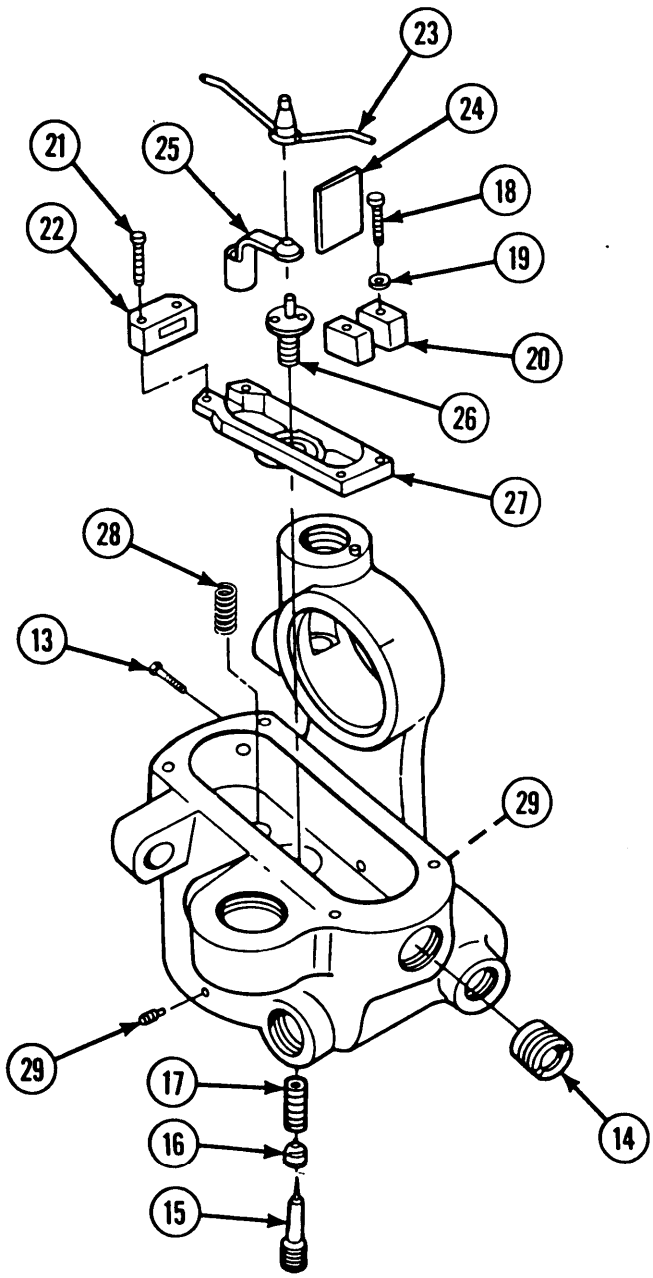
12 Using pivot wrench (fig. E-7, appx E), remove pivot (15), setscrew (16), and sleeve (17).

13 Remove two screws (18), two washers (19), damper (20), two screws (21), damper (22), and compass needle (23).

14 If damaged, remove reticle (24) from damper (20).

15 Remove plunger assembly (25), screw (26), holder (27), and spring (28).

16 If damaged, remove setscrews (29).



4-2. M2A2 AIMING CIRCLE—MAINTENANCE INSTRUCTIONS (cont).

DISASSEMBLY (cont)

NOTE
Ensure that lock-release lever (30) is in LOCKED position.

17 Remove taper pin (31).

18 Remove lock-release lever (30).

19 Unscrew and remove externally threaded ring (32), and remove preformed packing (33) and shaft (34).

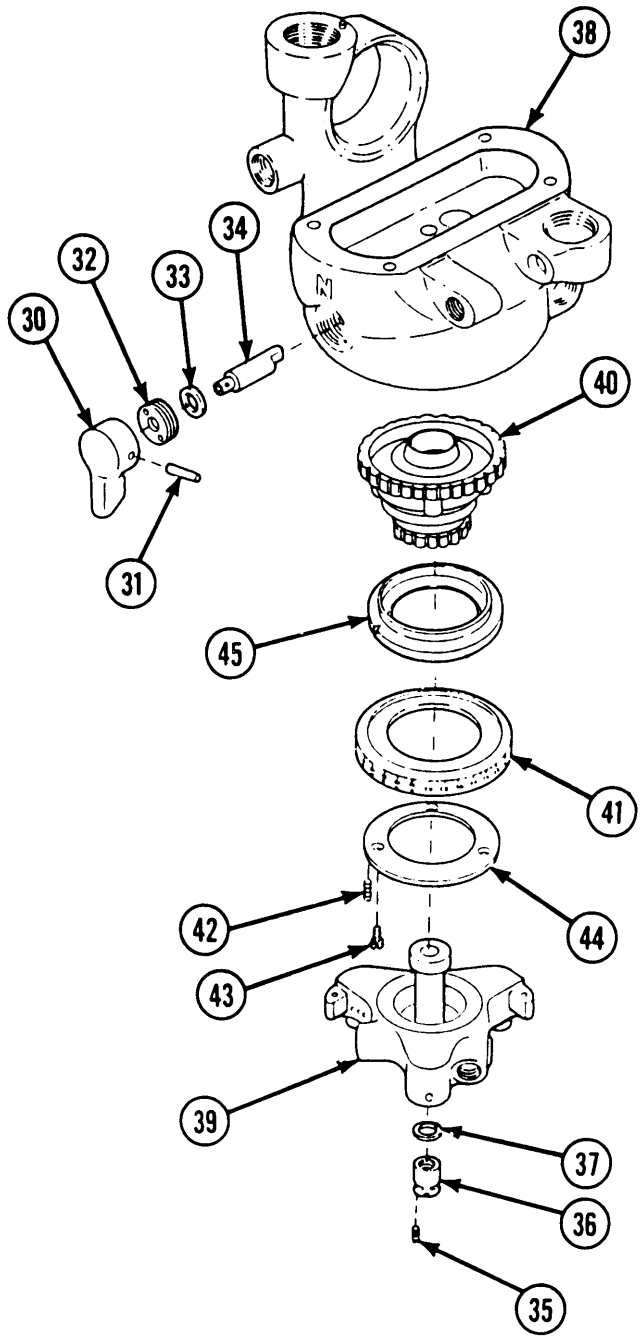
20 Remove two setscrews (35), round plain nut (36), and washer (37).

21 Remove housing assembly (38) from housing (39).

22 Remove worm gear (40) from housing (39).

23 Remove scale dial (41) with attached parts from housing (39).

24 Remove setscrew (42), three screws (43). retainer (44) and scale dial (41) from retainer (45).



CLEANING

CAUTION
Do not dip the aiming circle body assembly components in cleaning compound.

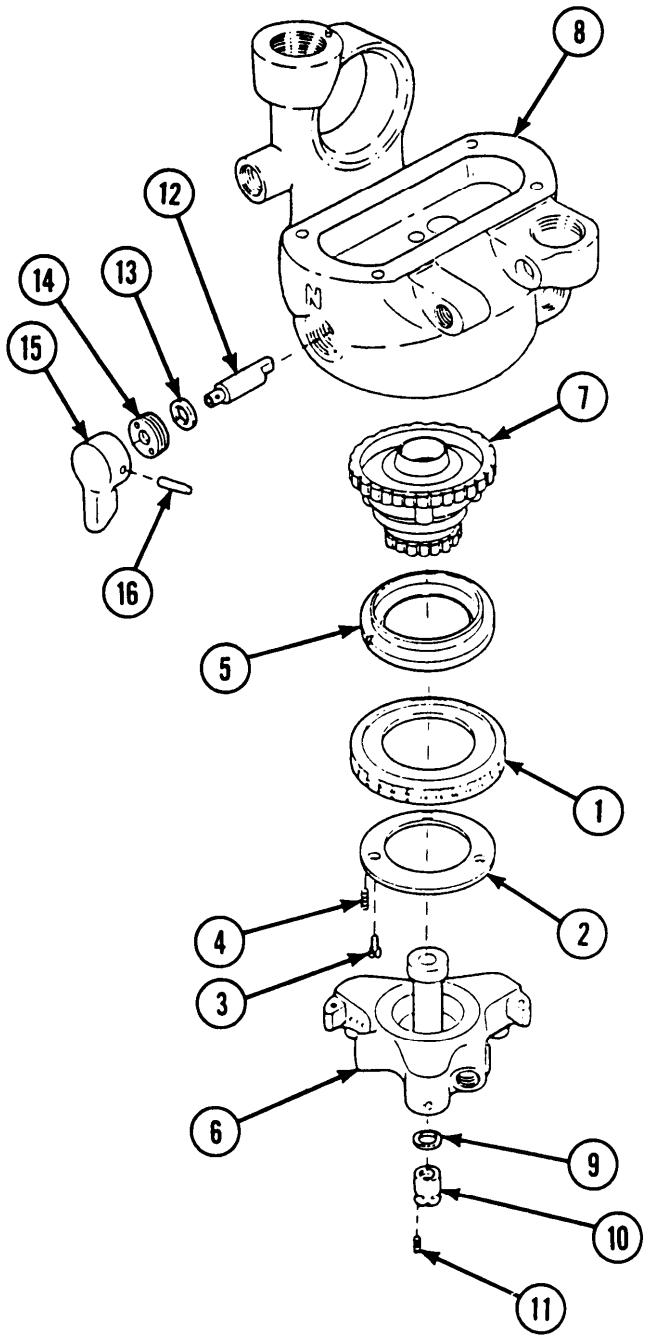
1 Clean all machined metal parts with cleaning compound (item 5, appx D).

2 Clean all optical surfaces with denatured alcohol (item 2, appx D) or optical cleaning compound (item 4, appx D).

REPAIR

Repair is by replacement of authorized parts as required. Refer to appendix C.

REASSEMBLY



1 Install scale dial (1), retainer (2), three screws (3), and setscrew (4) in retainer (5).

2 Install scale dial (1), with attached parts, on housing (6).

3 Install worm gear (7) on housing (6).

4 Install housing assembly (8) on housing (6).

5 Install washer (9) and round plain nut (10). Torque round plain nut to washer (9). Torque round plain nut to 20 to 24 in.-lb (27 to 33 N-m) and install two setscrews (11).

6 Install shaft (12), preformed packing (13), and externally threaded ring (14).

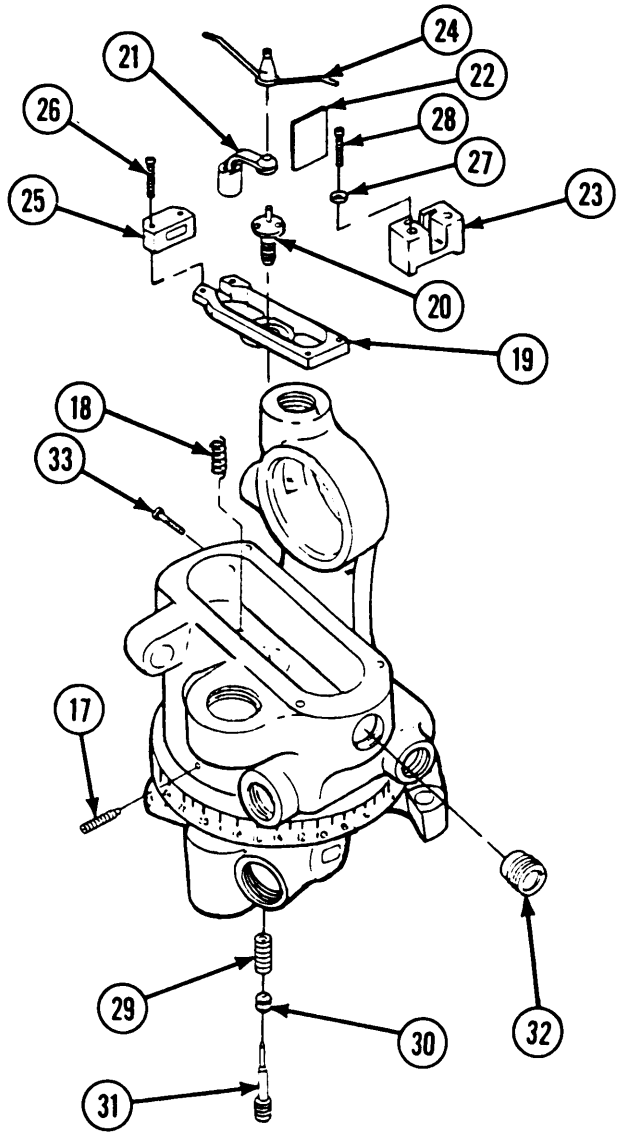
7 Install lock-release lever (15) on shaft (1 2).

8 Aline pin holes in lock-release lever (15) and shaft (12).

9 Install taper pin (16).

4-2. M2A2 AIMING CIRCLE—MAINTENANCE INSTRUCTIONS (cont).

REASSEMBLY (cont)



10 If removed, install setscrew (17).

11 Install spring (18), holder (19), screw (20), and plunger assembly (21).

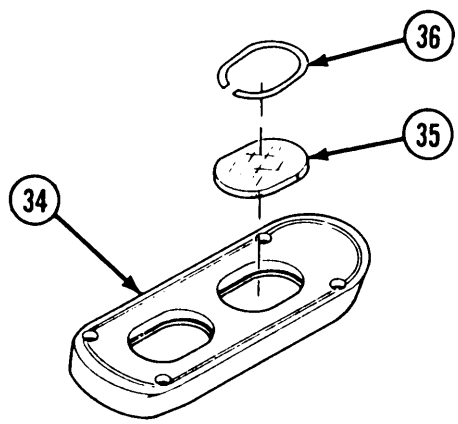
12 If reticle (22) was removed, apply sealing compound (item 8, appx D) in groove of damper (23) and install reticle, etched and polished end facing out.

13 Install compass needle (24), damper (25), two screws (26), two washers (27), and two screws (28).

14 Install sleeve (29) and torque to 8.00 to 10.00 in.-lb. (0.90 to 1.13 N-m). Secure sleeve with setscrew (30).

15 Install pivot (31) and torque to 8.00 in.-lb (0.90 N-m).

16 Install magnifier (32) and screw (33).



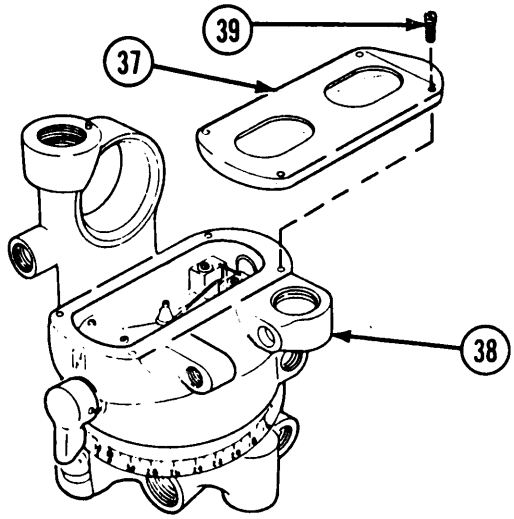
17 Turn cover (34) upside down.

18 Apply sealing compound (item 8, appx D) in groove around window holes.

19 Press two observation windows (35) into place.

20 Press two retaining rings (36) into place.

21 Apply sealing compound (item 8, appx D) in groove in underside of cover (34).



CAUTION

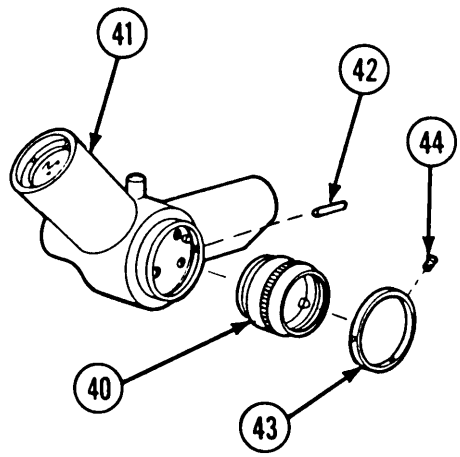
Compass needle must be in the UNLOCKED position before installing access cover.

22 Position access cover (37) on body assembly (38) and install four screws (39).

NOTE

If old elevating gear is being installed, proceed with step 23. If new elevating gear is being installed, go to step 25.

23 Screw elevating gear (40) into elbow telescope (41) and aline holes for headless straight pin (42).



24 Install pin (42). Drive in pin until outer surface is flush with elbow telescope surface. Go to step 28.

25 Screw elevating gear (40) tightly into elbow telescope (41).

26 Using pin hole in elbow telescope as a guide, drill and ream hole for 3/32 in. diameter pin.

27 Install pin (42). Drive in pin until outer surface is flush with elbow telescope surface.

28 Install elevation indicator (43) on shoulder of elbow telescope (41). Face scale graduations to outside and aline scribe marks.

29 Install but do not tighten three setscrews (44). Setscrews will be tightened during collimation adjustment. Refer to page 4-30.

4-2. M2A2 AIMING CIRCLE—MAINTENANCE INSTRUCTIONS (Cont).

REASSEMBLY (cont)

30 Lightly lubricate all bearing and working surfaces of elbow telescope (41), cover assembly (44), and interior of large bore of body assembly (38) with grease (item 6, appx D).

31 Slide elevating gear (40) on elbow telescope (41) through large bore of body assembly (38).

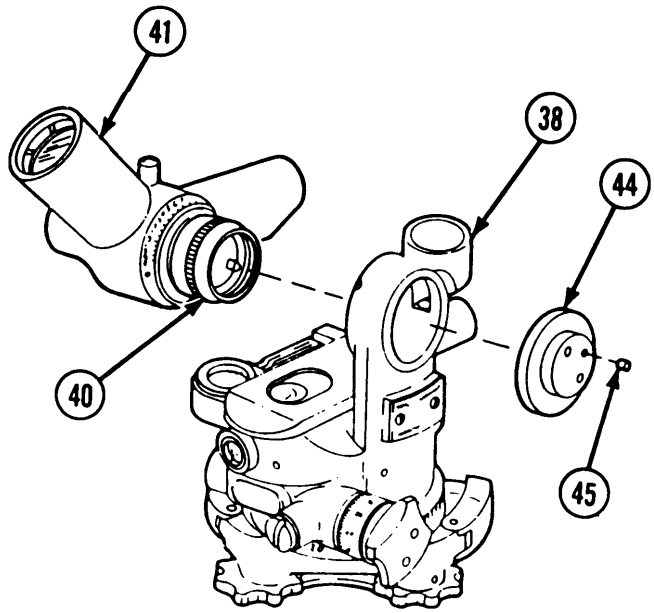
32 Support elbow telescope (41) in position.

33 Install cover assembly (44). Tighten as far as it will go. Then back off slightly to aline holes in cover assembly and elevating gear (40) for setscrew (45).

34 Install cover assembly (44). Tighten as far as it will go. Then back off just far enough for the elbow telescope (41) to rotate without binding.

35 Using setscrew hole in cover assembly (44) as a guide, spot drill hole in elevating gear (40) to depth of drill bit point, using a 0.093-in. diameter drill.

36 Install setscrew (45).



4-3. ELBOW TELESCOPE—MAINTENANCE INSTRUCTIONS

This task covers:

a. Disassembly
b. Cleaning
c. Repair
d. Reassembly

INITIAL SETUP

Tools and Special Tools
Electronic system maintenance tool kit (SC 5180-95-CL-B29)
Prism shelf remover (fig. E-4, appx E)

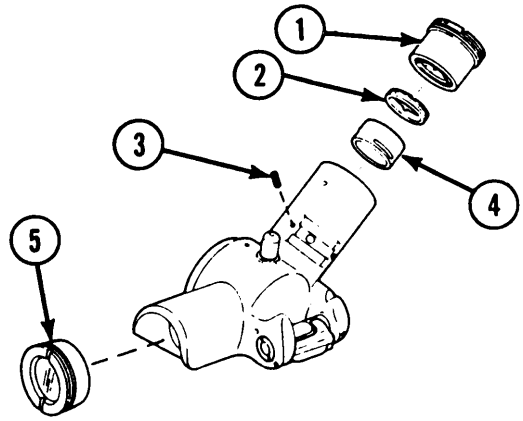
Materials/Parts
Sealing compound (item 8, appx D)

References
TM 9-254
TM 750-116

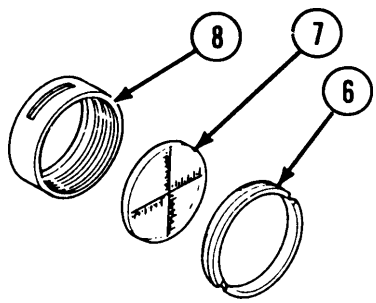
Equipment Conditions
Pg. 4-5 Elbow telescope removed

DISASSEMBLY

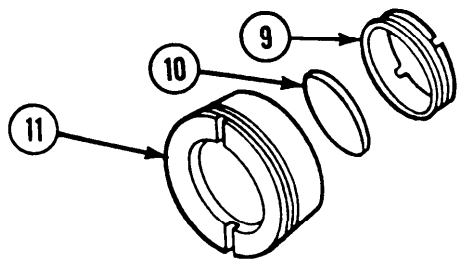
1 Remove eyepiece assembly (1), externally threaded ring (2), four setscrews (3), reticle assembly (4), and objective assembly (5).



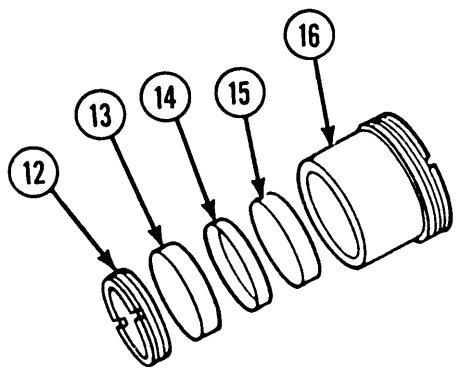
2 If damaged, remove externally threaded ring (6) and reticle (7) from cell (8).



3 If damaged, remove externally threaded ring (9) and objective lens (10) from optical element cell (11).



4 If damaged, remove externally threaded ring (12), lens (13), spacer (14), and lens (15) from optical element cell (16).

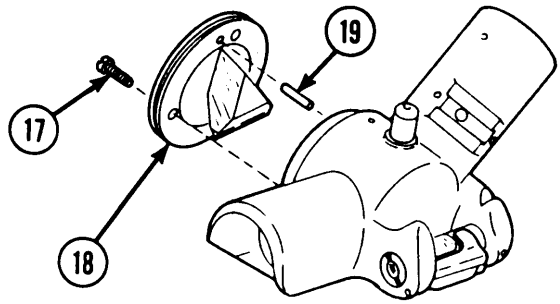


4-3. ELBOW TELESCOPE—MAINTENANCE INSTRUCTIONS (cont).

DISASSEMBLY (cont)

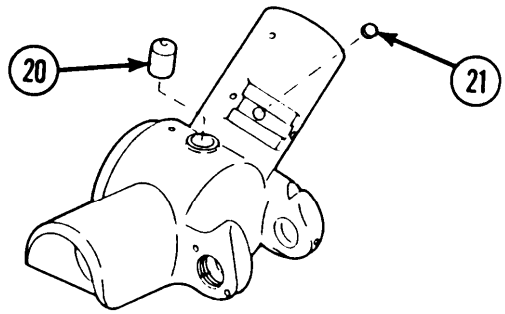
NOTE
Do not remove pin unless it is bent or broken.

5 Using prism shelf remover (fig. E-4, appx E), remove three screws (17), prism (18), and pin (19).



6 If damaged, twist and pull out reflector (20).

7 If damaged, push out window (21).



CLEANING

Clean all parts per TM 9-254.

REPAIR

1 If telescope subassembly is broken or damaged, repair is by replacement of next higher assembly.

2 Repair is by replacement of authorized parts as required. Refer to appendix C.

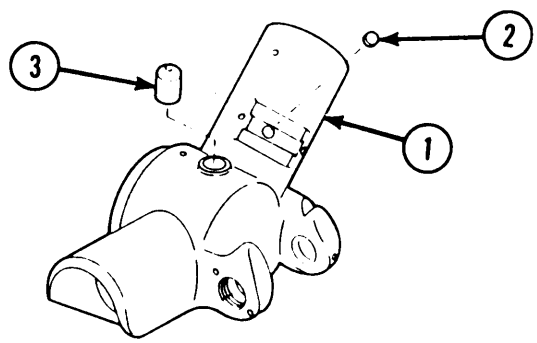
REASSEMBLY

NOTE
Perform steps 1 thru 3 only if reflector and window were removed.

1 Apply sealing compound (item 8, appx D) to window and reflector seats in telescope body (1).

2 Place and press window (2) and reflector (3) firmly into seats.

3 Remove excess sealing compound.

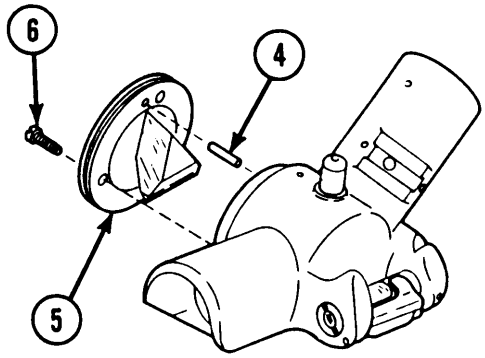


4 If removed, drive in pin (4).

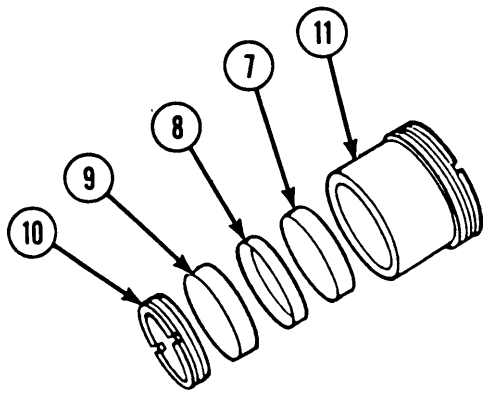
5 Install prism (5) and aline hole in flange with pin (4). Press firmly in place.

6 Apply sealing compound (item 8, appx D) to the underside of three screws (6).

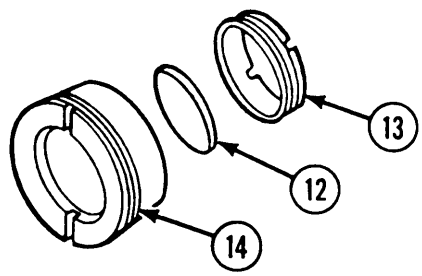
7 Install three screws (6) and tighten securely.



8 If removed, install lens (7), spacer (8), lens (9), and externally threaded ring (10) on optical element cell (11).



9 If removed, install objective lens (12) and externally threaded ring (13) on optical element cell (14).



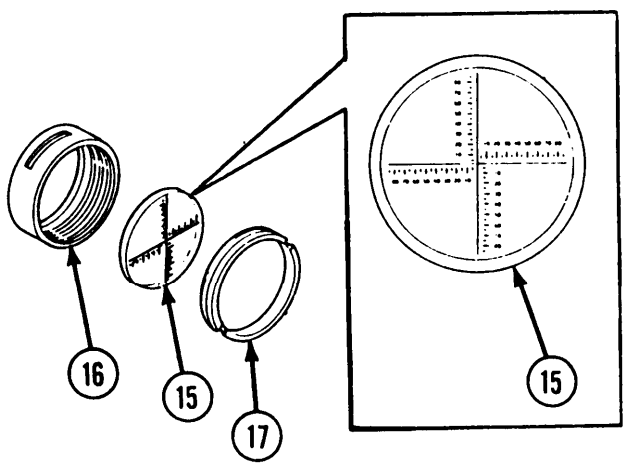
10 If removed, place reticle (15), etched side first, in cell (16).

11 Screw externally threaded ring (17) into cell but do not tighten.

12 Adjust position of reticle in cell so that top of crosshair is to right of slot.

13 Tighten externally threaded ring (17).

14 Spot seal externally threaded ring (17) to cell (16) at two saw slots using sealing compound (item 8, appx D).



4-3. ELBOW TELESCOPE—MAINTENANCE INSTRUCTIONS (cont).

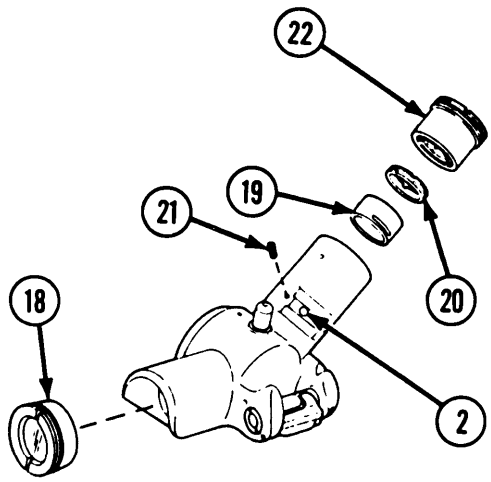
REASSEMBLY (cont)

15 Loosely install objective assembly (18).

16 Install reticle assembly (19) with etched side facing prism and illumination slot facing window (2).

17 Loosely install externally threaded ring (20) and four setscrews (21).

18 Loosely install eyepiece assembly (22).



NOTE

Leveling and optical elements will be tightened and seated after elbow telescope assembly is assembled to the aiming circle and all adjustments performed. Purge and charge, refer to TM 750-116.

Section III. GENERAL SUPPORT TEST AND ADJUSTMENT PROCEDURES

Section Index

4-4. TEST AND ADJUSTMENT PROCEDURES.

This task covers:

a. Setting up azimuth test fixture
b. Installing and leveling aiming circle on azimuth test fixture adapter
c. Eyepiece focus
d. Parallax of objective assembly
e. Parallax of magnifier assembly
f. Definition
g. Reticle tilt
h. Reticle illumination
i. Collimation
j. Circular error test
k. Lift test

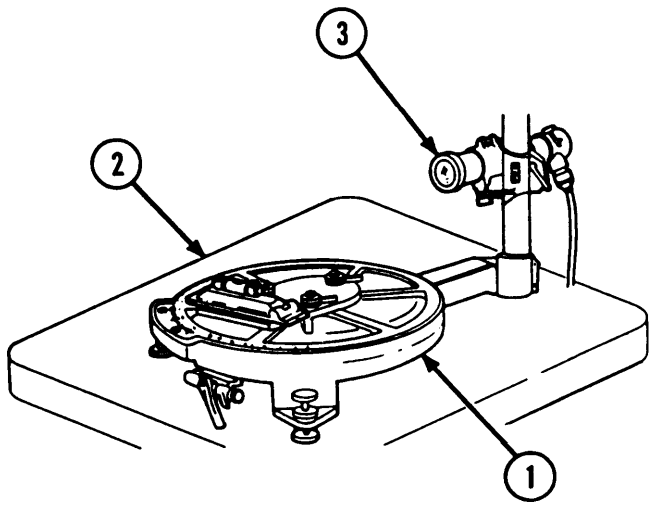
INITIAL SETUP

Tools and Special Tools
Azimuth test fixture (4931-00-769-1596)
Azimuth test fixture adapter (fig. E-3, appx E)
Electronic system maintenance tool kit (SC 5180-95-CL-B29)
Pinned tubular wrench (fig. E-1, appx E)

Materials/Parts
Alcohol (item 2, appx D)
cleaning compound (item 4, appx D)
Sealing compound (item 8, appx D)

References
TM 750-116

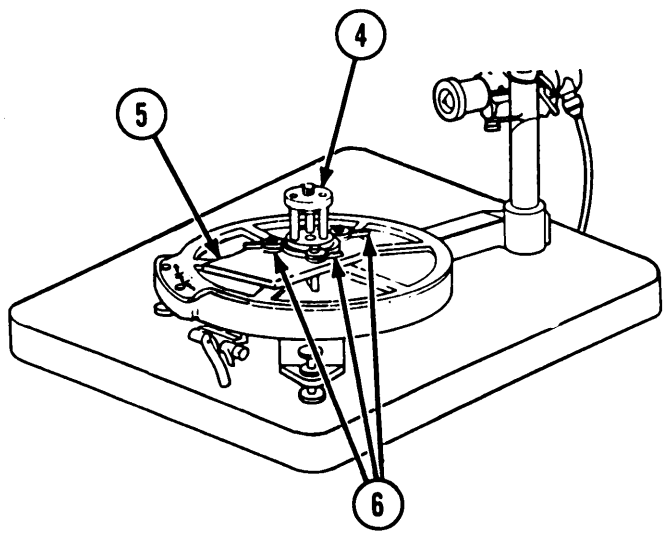
SETTING UP AZIMUTH TEST FIXTURE



1 Select and level a heavy steel table or other suitable platform. Place azimuth test fixture (1) on table or platform (2).

2 Install projector collimator (3) on azimuth test fixture.

3 Cross level the azimuth test fixture (1).



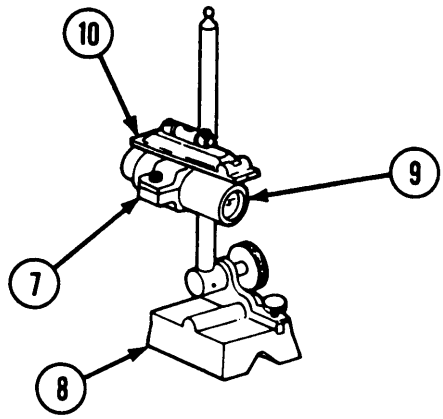
4 Place azimuth test fixture adapter (4) (fig. E-3, appx E) on azimuth test fixture support plate (5) and secure in position with three cam locks (6).

4-4. TEST AND ADJUSTMENT PROCEDURES (cont).

SETTING UP AZIMUTH TEST FIXTURE (cont)

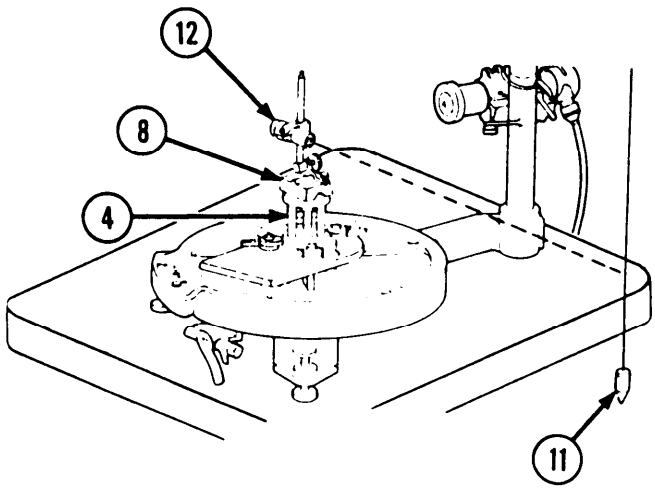
5 Install collimating telescope holder (7) on rod of universal surface gage (8).

6 Install collimating telescope (9) in collimating telescope holder (7). Place precision level (10) on telescope holder (7). Level telescope holder. Adjust collimating telescope to a height of 6.8 in. (17.3 cm).



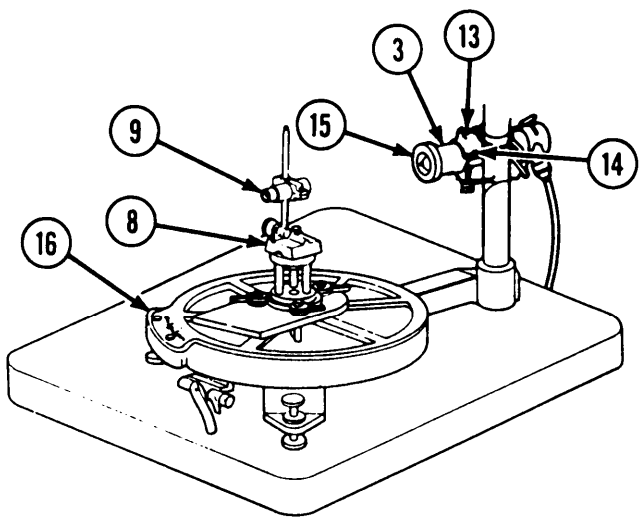
7 Place universal surface gage (8) with holder and collimating telescope on azimuth test fixture adapter (4).

8 Direct line-of-sight of collimating telescope at plumb line (11). Loosen holder locking screw (12) and rotate collimating telescope until its vertical reticle line coincides with plumb line along entire length. Tighten holder locking screw (12).



9 Turn universal surface gage (8) until collimating telescope line-of-sight is directed toward the projector collimator (3). Raise or lower and, if necessary, level projector collimator level (13) to aline line-of-sight of projector collimator (3) with collimating telescope (9). Projector collimator reticle must be plumb with collimating telescope reticle.

10 If projector collimator reticle is not plumb with telescope reticle, loosen collimator holding screws (14) and rotate projector collimator (3) until its vertical reticle is plumb with telescope reticle. Tighten collimator holding screws.



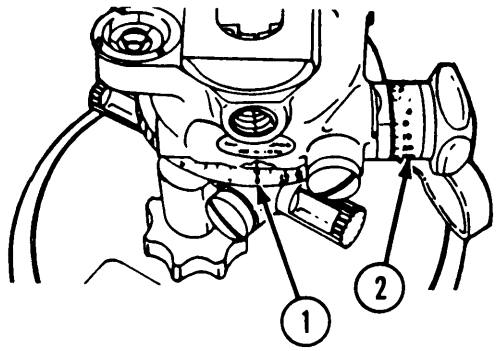
11 Remove universal surface gage (8) with installed collimating telescope (9) from azimuth test fixture.

12 Adjust collimator objective scale (15) to indicate 50 yd (46 m).

13 Rotate azimuth ring (16) of azimuth test fixture to zero.

INSTALLING AND LEVELING AIMING CIRCLE ON AZIMUTH TEST FIXTURE ADAPTER

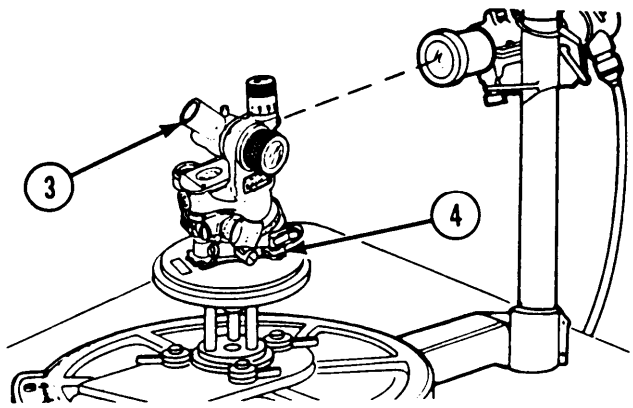
1 Check that when index scale coincides with zero graduation line on azimuth scale (1), azimuth micrometer scale (2) also indicates zero.



2 Place azimuth mechanism shaft approximately parallel to and above orienting mechanism shaft.

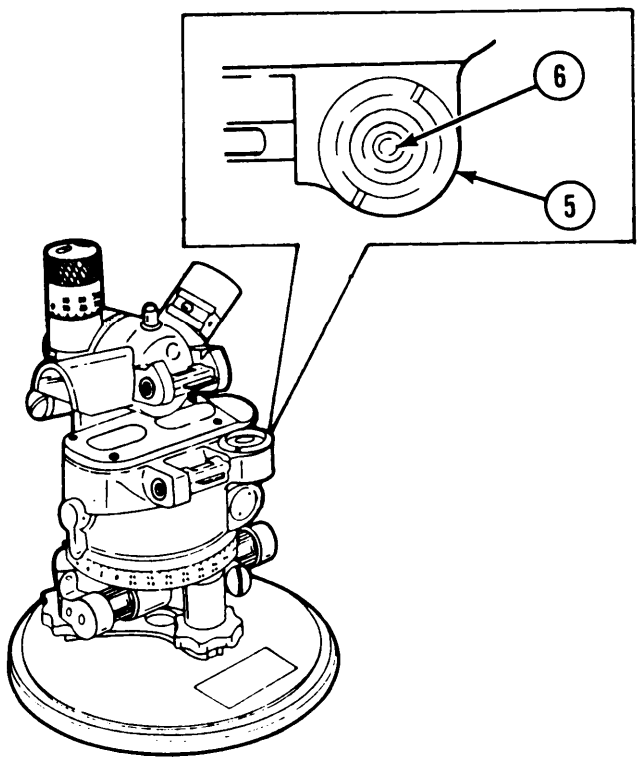
3 Place and secure aiming circle (3) on azimuth test fixture adapter with line of sight of aiming circle directed into projector collimater.

4 Turn three knob assemblies (4) counterclockwise until they stop.



5 Turn three knob assemblies (4) clockwise approximately four turns.

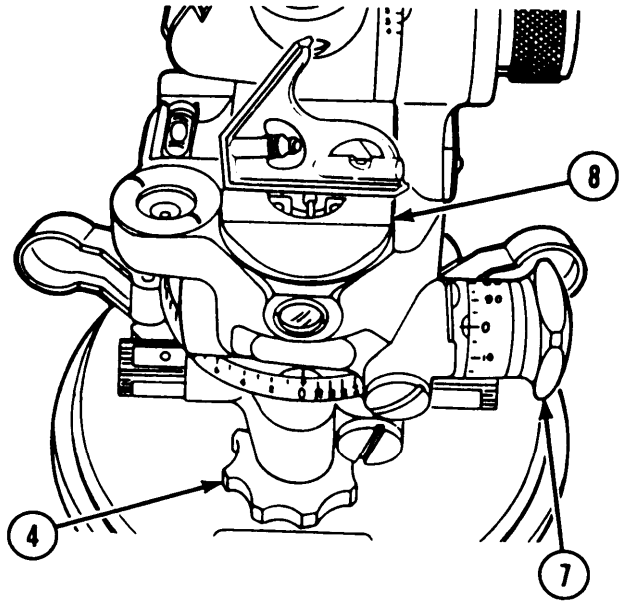
6 Check circular level (5). Bubble should be centered, not to exceed one half the line forming the red circle (6) throughout 6400 roils revolution of aiming circle. If bubble remains centered, proceed to step 11. If not, go to step 7.



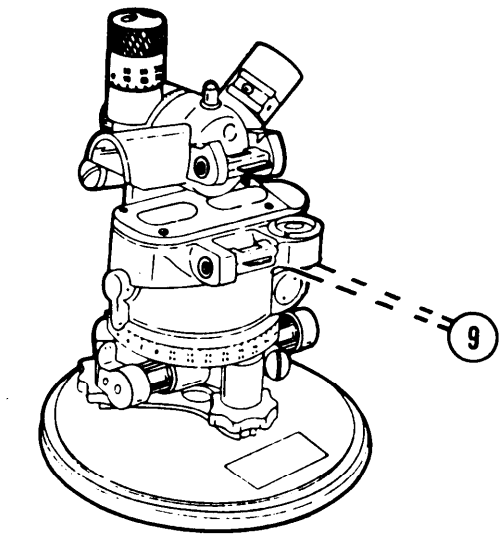
4-4. TEST AND ADJUSTMENT PROCEDURES (cont).

INSTALLING AND LEVELING AIMING CIRCLE ON AZIMUTH TEST FIXTURE ADAPTER (cont)

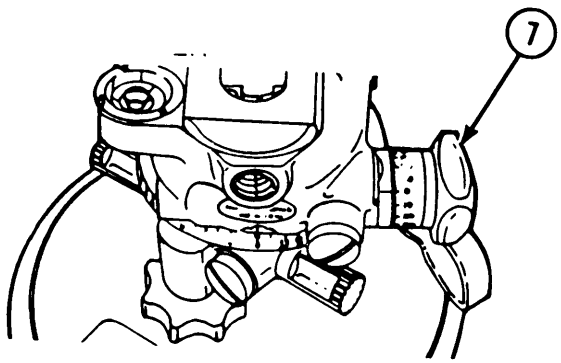
7 Turn aiming circle to zero by fast traversing with azimuth knob (7). Place machinist's square on cover (8) and cross level by adjusting knob assemblies (4).



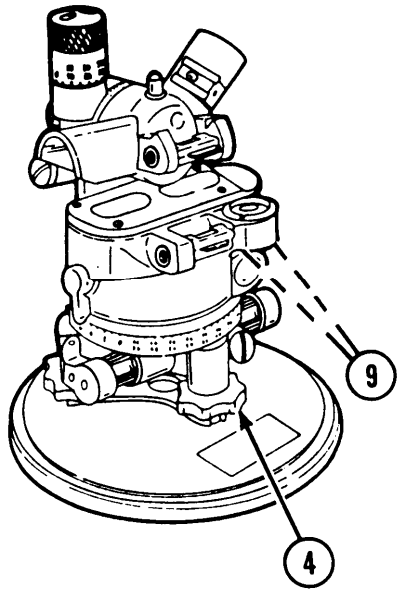
8 Eliminate all error in circular vial by adjusting two setscrews (9).



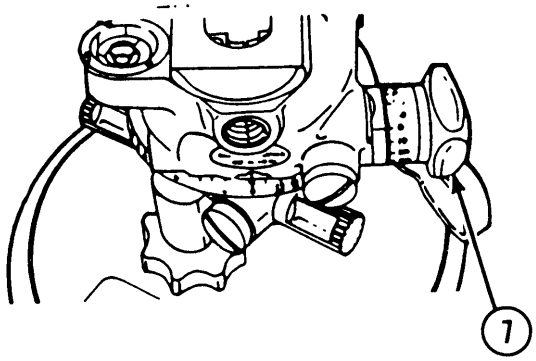
9 Rotate aiming circle to 3200 mils using azimuth knob (7).



10 If circular level bubble does not stay centered, eliminate half the error by adjusting either of two setscrews (9) and eliminate remaining error by adjusting the knob assemblies (4).



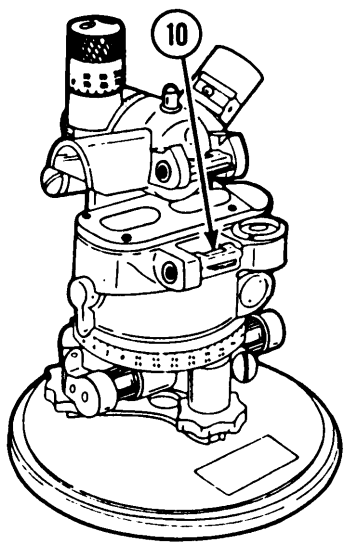
11 Return aiming circle to zero using azimuth knob (7). Circular level vial bubble should remain centered. If not, repeat steps 7 thru 10 until circular level vial bubble stays centered.



NOTE

In steps 12 thru 21 below, tube level vial will be referred to as azimuth level vial.

12 Using azimuth knob (7), turn aiming circle in four settings of 1600-mil increments. Azimuth level vial (10) bubble should remain centered at each position. If it remains centered, proceed to eyepiece focus adjustment. Refer to page 4-23. If the azimuth level vial (10) bubble does not remain centered, proceed to step 13.

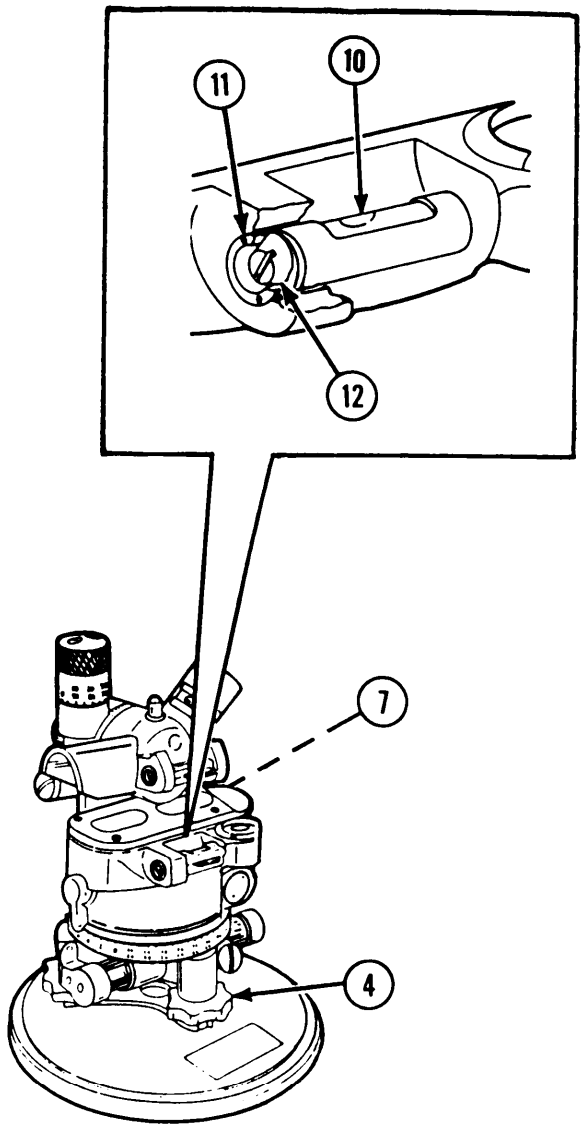


4-4. TEST AND ADJUSTMENT PROCEDURES (cont).

INSTALLING AND LEVELING AIMING CIRCLE ON AZIMUTH TEST FIXTURE ADAPTER (cont)

NOTE

In steps 13 thru 21, azimuth level vial (10) bubble should stay centered and not exceed the width of a vial graduation.



13 Turn aiming circle to zero using azimuth knob (7). Eliminate all error in azimuth level vial (10) by loosening plug (11) and turning eccentric (12) right or left, as required, to center level vial bubble.

14 Hold eccentric (12) in adjustment with screwdriver while tightening plug (11) with spanner wrench.

15 Rotate aiming circle to 3200 roils using azimuth knob (7).

16 if azimuth level vial (10) bubble does not stay centered, eliminate half the error by adjusting eccentric (12) and remaining error by adjusting knob assembly (4).

17 Return aiming circle to zero using azimuth knob (7). Azimuth level vial (10) bubble should remain centered. If not, repeat steps 13 thru 16 until azimuth level vial bubble remains centered.

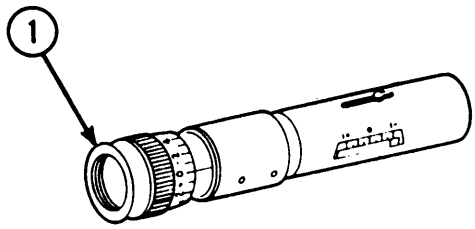
18 Turn aiming circle to 1600 roils using azimuth knob (7). If azimuth level vial (10) bubble is not centered, eliminate all error by adjusting knob assembly (4).

19 Return aiming circle to zero using azimuth knob (7). Azimuth level vial (10) bubble should remain centered. If not, repeat steps 13 thru 16.

20 Using azimuth knob (7), rotate aiming circle in four settings of 1600-mil increments. Azimuth level vial (10) bubble should remain centered. If not, repeat steps 11 thru 16.

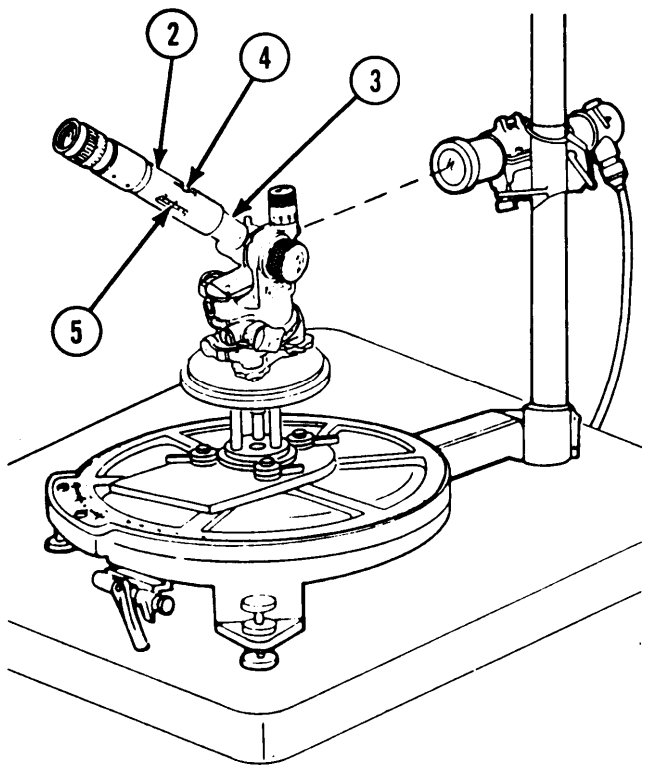
21 If azimuth level vial (10) bubble does not center after performing above steps, repeat steps 7 thru 20.

EYEPIECE FOCUS



1 Direct aiming circle line-of-sight into collimator.

2 Look into dioptometer eyepiece (1) and turn eyepiece until reticle is in sharpest focus.



3 Hold dioptometer (2) up to elbow telescope eyepiece (3).

4 Slide dioptometer scale knob (4) until elbow telescope reticle is in sharpest focus.

5 Remove dioptometer (2). Dioptometer scale (5) should read between -0.75 and -1.0. If not, proceed to step 6.

6 Screw elbow telescope eyepiece in or out, as required.

7 Repeat steps 4 thru 6 until dioptometer scale (5) reads between -0.75 and -1.0.

4-4. TEST AND ADJUSTMENT PROCEDURES (cont).

PARALLAX OF OBJECTIVE ASSEMBLY

1 Direct aiming circle (1) line-of-sight into collimator (2).

2 Adjust collimator (2) for a distance of 50 yd (46 m).

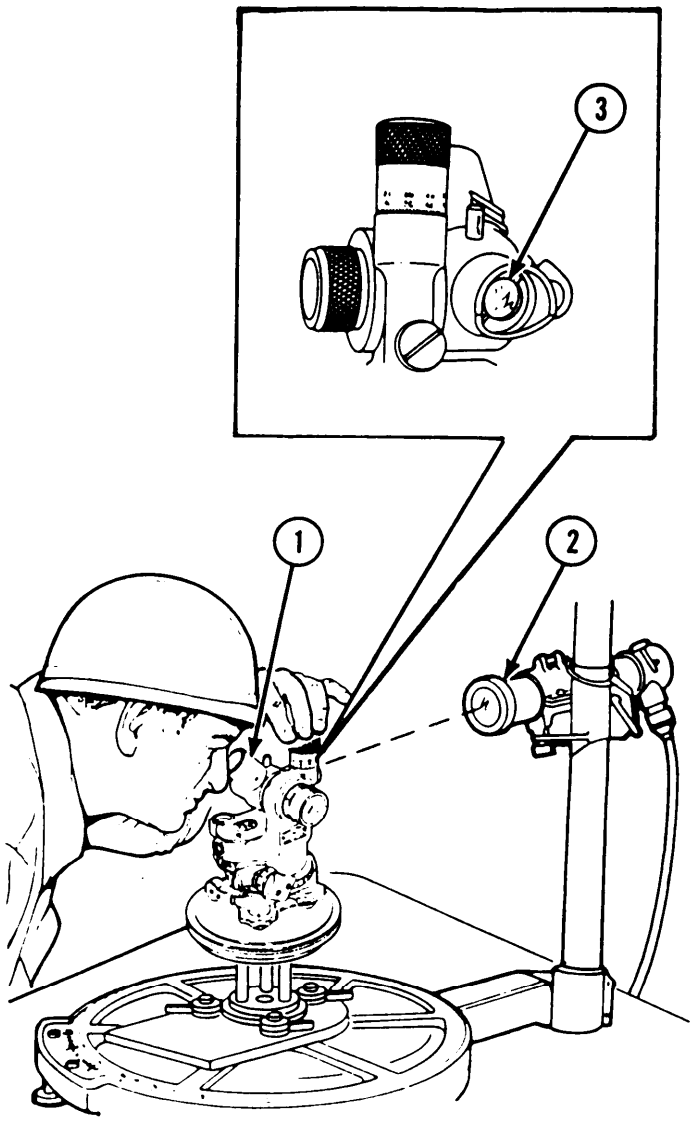
3 Check parallax between image of collimator reticle and aiming circle reticle at the center of field of view. Parallax must not exceed 0.3 roil. Parallax between telescope reticle and projector collimator shall be near zero at 50 yd (46 m), and shall not exceed 0.3 mils over a range of 30 to 150 yd (27 to 137 m).

4 Sight through aiming circle eyepiece at normal eye distance. Move your head 1/4 inch from side to side and up and down. If image of collimator reticle appears to move with respect to aiming circle reticle, parallax is present. Amount of parallax is indicated against markings on collimator reticle.

5 Screw objective assembly (3) in or out as required. Repeat step 4.

6 If parallax cannot be eliminated, replace objective assembly. Repeat steps 4 and 5 until parallax is eliminated.

7 Spot seal edge of objective assembly to telescope body in two places with sealing compound (item 8, appx D).



PARALLAX OF MAGNIFIER ASSEMBLY

1 Turn aiming circle so that the letter N on the aiming circle body is pointing in the general direction of north.

2 Place hand light (1) from M51 instrument light over the housing cover window. Light should illuminate damper and needle reticle.

3 Look into dioptometer (2) eyepiece and turn eyepiece until reticle is in sharpest focus.

4 Hold dioptometer (2) against magnifier (3).

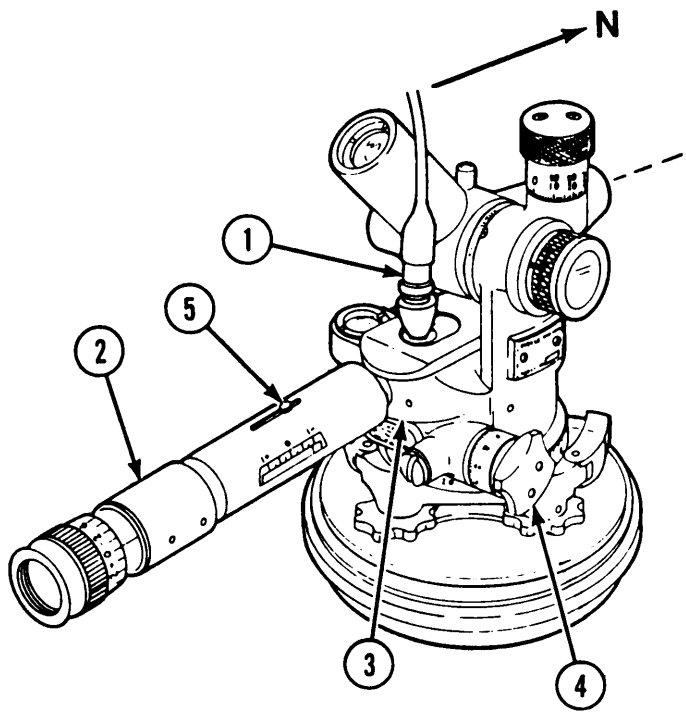
5 Unlock compass needle. Rotate aiming circle azimuth knob (4) until etched line on compass needle is next to, but not touching, dioptometer reticle.

6 Slide dioptometer knob (5) for sharpest focus of compass needle etching. Dioptometer scale reading should be between 0 and -0.50.

7 Screw magnifier assembly in or out, as required.

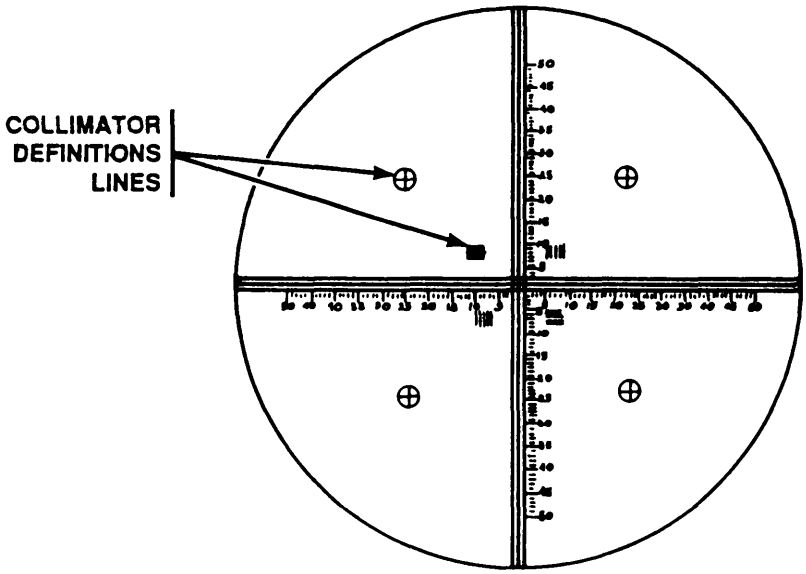
8 Repeat step 3 and check parallax. It must not exceed 1 mil (one reticle line width).

9 Seal magnifier assembly by injecting sealing compound (item 8, appx D) into the two injection sealing ports. See TM 750-116.



4-4. TEST AND ADJUSTMENT PROCEDURES (cont).

DEFINITION



1 Look into dioptometer eyepiece and turn eyepiece until reticle is in sharpest focus.

2 Look at a target 45 inches away. Slide objective lens in or out to bring target in sharpest focus.

3 Hold dioptometer up to aiming circle eyepiece and check that collimator definition lines are in sharp focus. If the lines are in sharp focus, remove dioptometer and proceed to the next adjustment procedure. If lines are not in sharp focus, proceed with steps 4 thru 9.

4 Recheck eyepiece focus. Refer to page 4-23.

5 Recheck parallax of objective assembly. Refer to page 4-24.

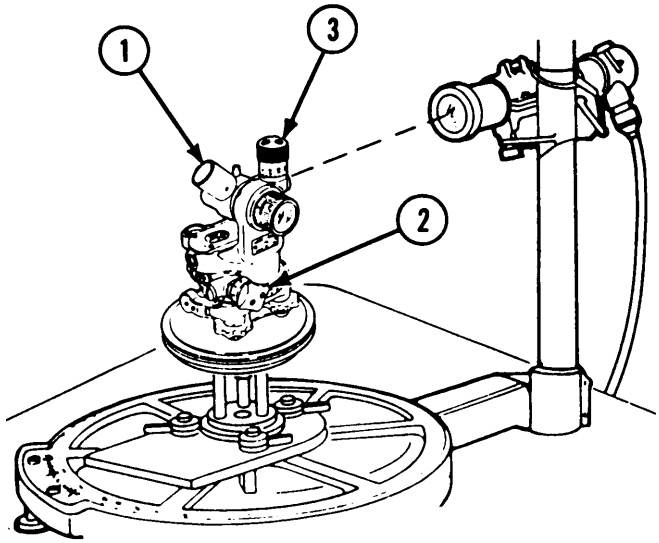
6 Check prism installation. Refer to page 4-12.

7 If definition is still poor, replace prism. Refer to page 4-12.

8 Recheck parallax of objective assembly. Refer to page 4-24.

9 Repeat steps 1 thru 3.

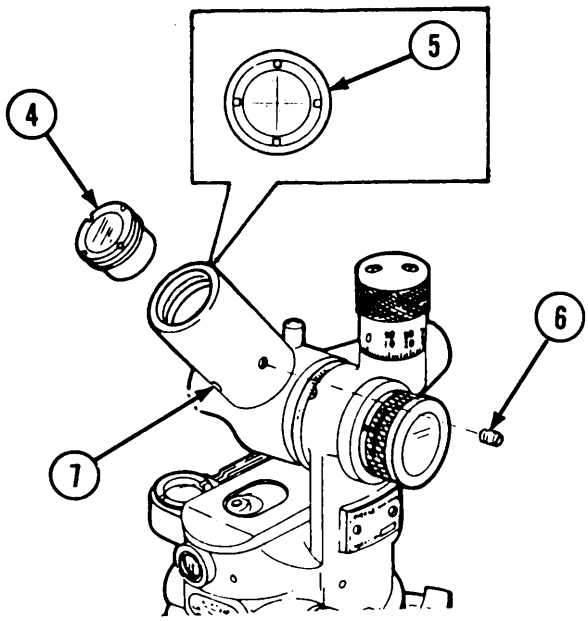
RETICLE TILT



1 Direct aiming circle line-of-sight into collimator and look into aiming circle eyepiece (1).

2 Turn azimuth knob (2) and elevation knob (3) to bring aiming circle reticle into coincidence with collimator reticle.

3 Aiming circle reticle must be plumb collimator reticle within 0.6 mil. If reticle is plumb, proceed to reticle illumination test. Refer to page 4-28. If reticle is not plumb, proceed to step 4.

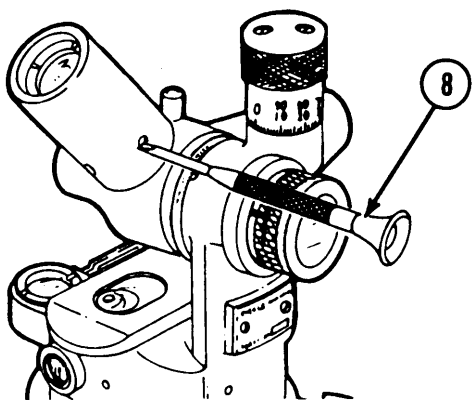


4 Remove eyepiece assembly (4) and loosen reticle retaining ring (5).

5 Install and focus eyepiece assembly (4). Refer to page 4-23.

6 Remove two horizontal aiming circle reticle setscrews (6).

7 Loosen two vertical aiming circle reticle setscrews (7).



8 Insert jeweler's screwdrivers (8) in two horizontal setscrew holes to turn aiming circle reticle.

9 Turn aiming circle reticle until plumb with collimator reticle within 0.6 mil.

4-4. TEST AND ADJUSTMENT PROCEDURES (cont).

RETICLE TILT (cont)

10 Tighten two vertical setscrews (7).

11 Install two horizontal setscrews (6).

12 Remove eyepiece assembly (4).

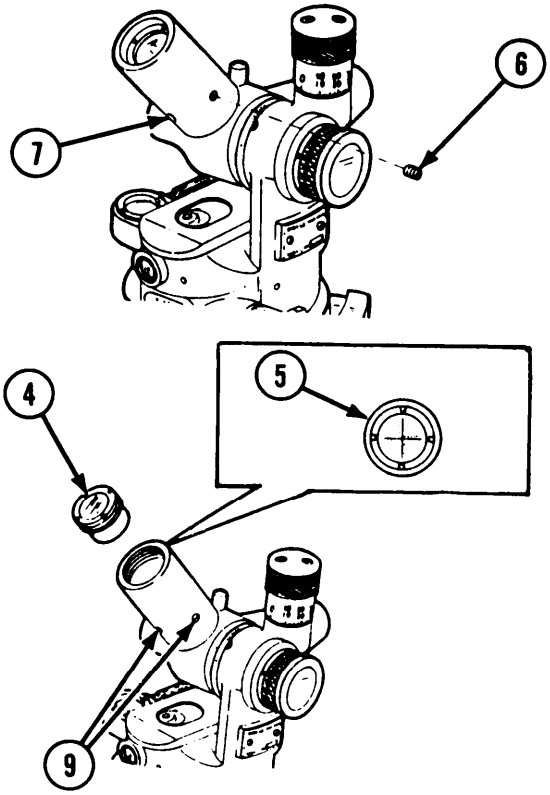
13 Tighten retaining ring (5) and spot seal in two places with sealing compound (item 8, appx D).

14 Install and focus eyepiece. Refer to page 4-24.

15 Recheck aiming circle reticle for plumb within 0.6 mil.

16 If reticle is still tilted, repeat steps 4 thru. 15. Then repeat steps 1 thru 3.

17 Fill four setscrew holes (9) with sealing compound (item 8, appx D).



RETICLE ILLUMINATION

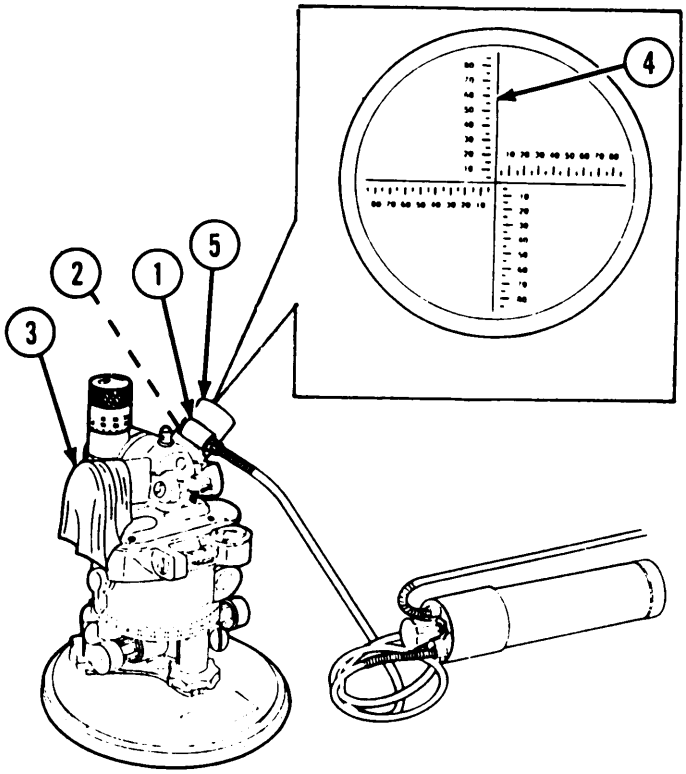
1 install M51 instrument light lamp bracket (1) in the elbow telescope slotted bracket (2).

NOTE

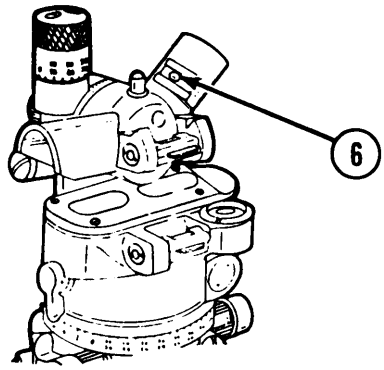
If M51 instrument light is not available, any other suitable source of light may be directed at red window.

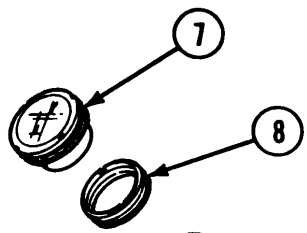
2 Cover objective end of elbow telescope (3) and turn on instrument light.

3 All reticle (4) markings must appear clearly defined and be easily read when viewed through aiming circle eyepiece (5). If reticle is clearly illuminated, proceed to collimation test. Refer to page 4-30. if reticle is not clearly illuminated, proceed to step 4.



4 Clean optical window (6) with cleaning compound (item 4, appx D).





5 Repeat steps 1 thru 3. If reticle etchings do not become properly illuminated, proceed to step 6.

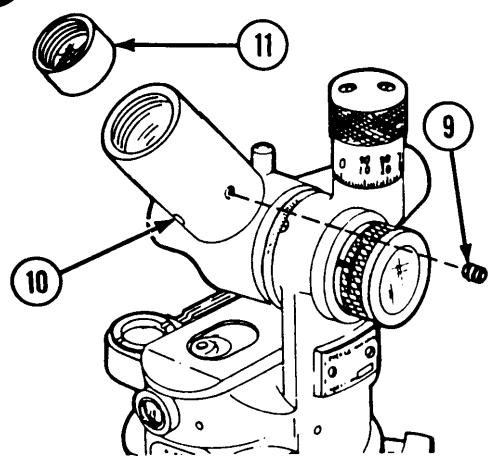
6 Remove eyepiece assembly (7).

7 Remove externally threaded ring (8).

8 Remove two horizontal setscrews (9).

9 Loosen two vertical setscrews (10).

10 Remove reticle assembly (11).

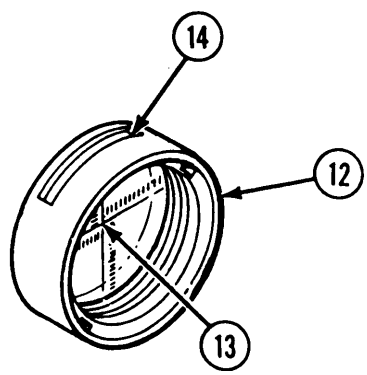


11 Loosen externally threaded ring (12).

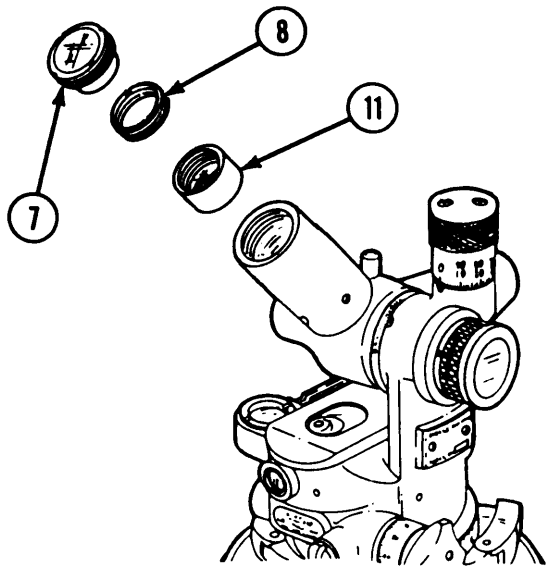
12 Adjust position of reticle (13) in cell (14) so that top of crosshair is to right of slot as shown.

13 Tighten externally threaded ring (12).

14 Spot seal edge of externally threaded ring to cell in two places with sealing compound (item 8, appx D).



4-4. TEST AND ADJUSTMENT PROCEDURES (cont).



15 Clean reticle assembly with alcohol (item 2, appx D).

16 Install reticle assembly (11).

17 Install externally threaded ring (8) loosely.

18 Install eyepiece assembly (7).

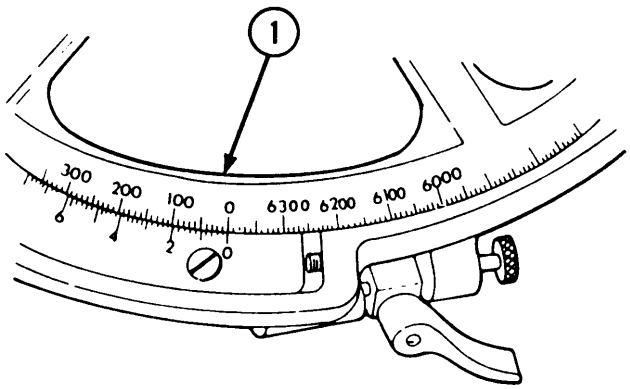
19 Repeat eyepiece focus, page 4-23.

20 Repeat definition, page 4-26.

21 Repeat reticle tilt, page 4-27.

22 Repeat steps 1 thru 18 above.

COLLIMATION



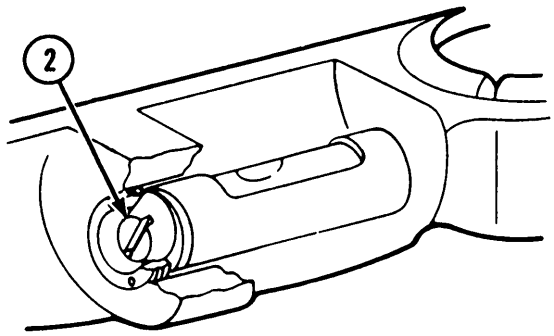
1 Set up test equipment. Refer to page 4-17.

2 Install and level aiming circle on azimuth test fixture adapter. Refer to page 4-19.

3 Rotate azimuth ring (1) of test fixture to zero. Rotate aiming circle to zero.

4 Direct aiming circle line-of-sight into project collimator.

5 Level elbow telescope tube level vial by adjusting the eccentric (2).

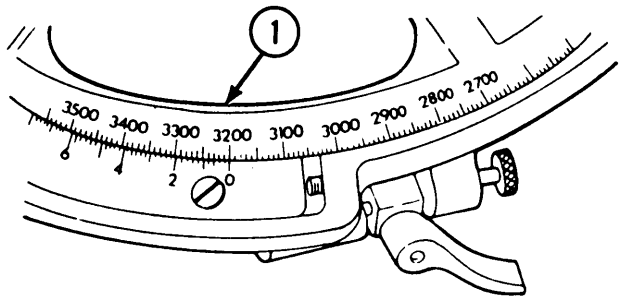


6 Rotate azimuth ring (1) of test fixture to 3200 mils

NOTE

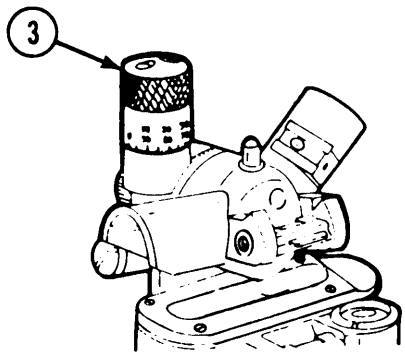
Elbow telescope tube level bubble should stay centered.

7 If elbow telescope tube level bubble does not remain centered, eliminate half the error with aiming circle elevation knob (3) and remaining error with the eccentric (2).



8 Return azimuth ring (1) of test fixture and aiming circle to zero.

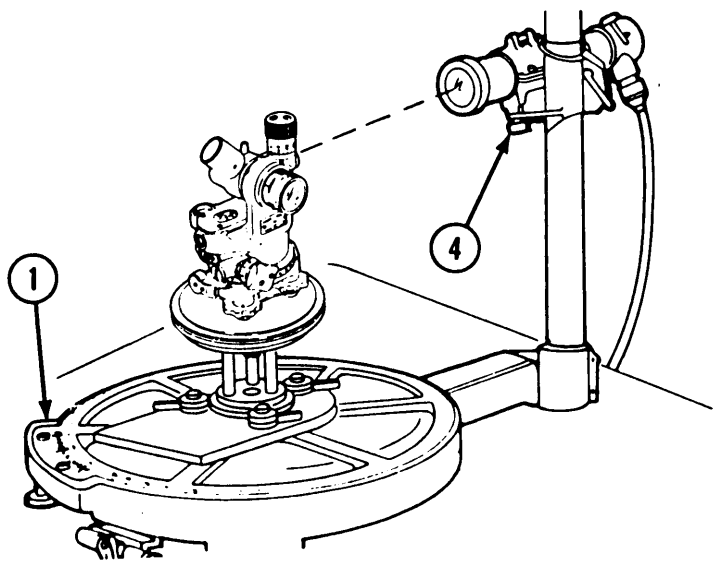
9 The elbow telescope tube level bubble should remain centered. if not, repeat steps 4 thru 8 until elbow telescope tube level bubble remains centered.



10 With azimuth ring (1) of test fixture and aiming circle set to zero, superimpose aiming circle reticle lines with projector collimator reticle by adjusting projector collimator leveling screws.

11 Rotate azimuth ring (1) of test fixture to 3200 mils Rotate aiming circle to 3200 mils.

12 Look through elbow telescope. The point of intersection of elbow telescope reticle lines and projector collimator reticle lines must coincide within 0.1 mil. If within 0.1 mil, proceed to step 17. If not within 0.1 mil, proceed to step 13.



13 Eliminate half the error with projector collimator adjusting screws (4) and remaining error with two reticle adjusting screws. Refer to page 4-27.

14 Return azimuth ring (1) of test fixture and aiming circle to zero.

4-4. TEST AND ADJUSTMENT PROCEDURES (cont).

COLLIMATION (cont)

15 Aiming circle reticle lines and projector collimator reticle lines should remain within 0.1 mil tolerance. If not, repeat steps 10 thru 14 until tolerance is met.

16 Loosen two elevation micrometer knob screws (5).

17 Hold elevation knob (6) and turn elevation micrometer scale (7) to register zero.

18 Tighten two elevation micrometer knob screws (5).

19 Recheck that elbow telescope reticle is still in coincidence with collimator reticle.

20 Turn elevation knob (6) until all three elevation scale setscrews (8) are accessible.

21 Loosen three elevation scale setscrews (8).

22 While sighting through elbow telescope eyepiece (9), turn elevation knob (6) to bring elbow telescope reticle into coincidence with collimator (10) reticle.

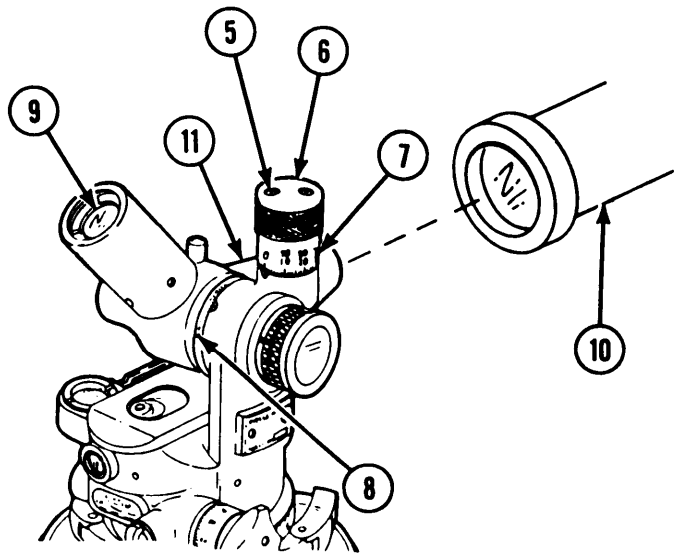
23 Turn elevation scale (11) to register zero.

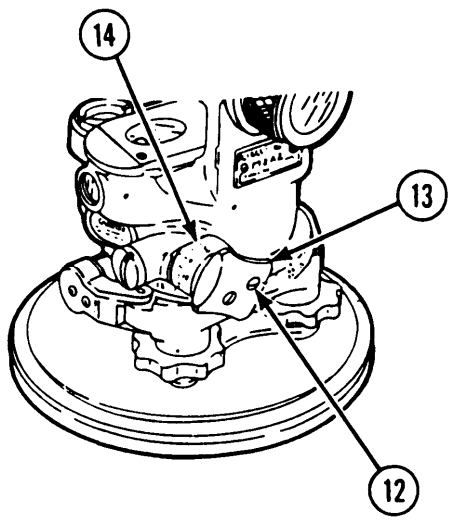
24 Tighten three elevation scale setscrews (8).

25 Loosen two azimuth micrometer knob screws (12).

26 Hold azimuth knob (13) and turn azimuth micrometer scale (14) to register zero.

27 Tighten two azimuth micrometer knob screws (12).





CIRCULAR ERROR TEST

NOTE

Circular error can be present in aiming circle even though worm and worm gear mechanisms operate smoothly and do not have excessive backlash. Error is due to poorly spaced worm gear teeth.

1 Set azimuth ring (1) of test fixture to zero.

2 Rotate azimuth knob (2) to set aiming circle azimuth index and micrometer scale to zero.

3 Using orienting knob (3) quick release, direct aiming circle elbow telescope line-of-sight into collimator.

4 Using orienting knob (3), adjust aiming circle to superimpose elbow telescope vertical reticle line on collimator vertical reticle line.

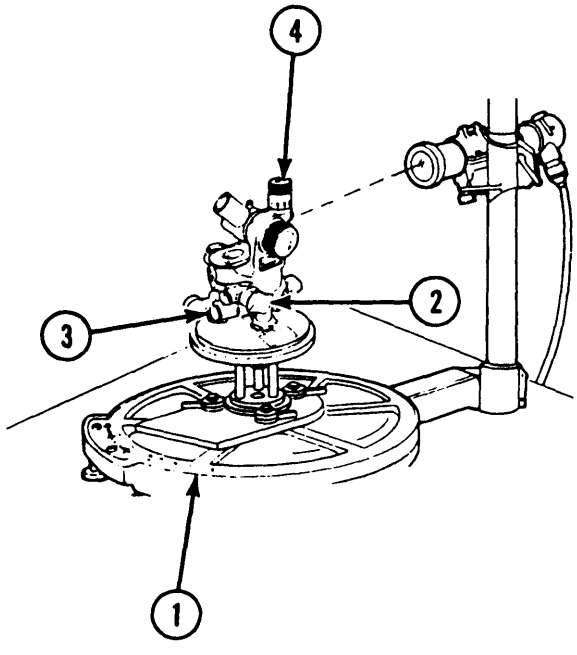
5 Using elevation knob (4), superimpose aiming circle horizontal reticle line on collimator horizontal reticle line.

6 Offset test fixture azimuth ring (1) 800 mils counterclockwise.

7 Rotate azimuth knob (2) to set aiming circle to 800 mils.

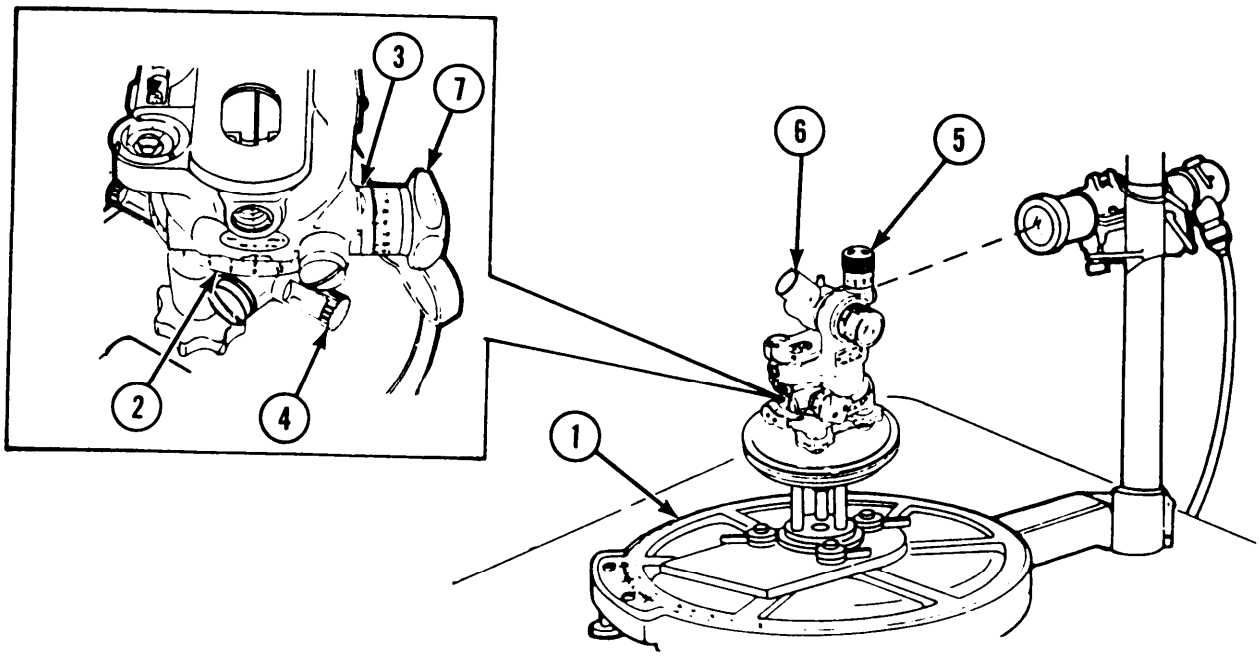
8 Look through elbow telescope eyepiece. Error between aiming circle verticle reticle line and collimator vertical reticle line should not exceed 0.7 mils. If tolerance is exceeded, refer to azimuth worm backlash test and adjustment, page 3-39.

9 Repeat steps 7 and 8 at 800-mil intervals until the complete circle is made.



4-4. TEST AND ADJUSTMENT PROCEDURES (cont).

LIFT TEST



1 Set azimuth ring (1) of test fixture to zero.

2 Set aiming circle azimuth index (2) and micrometer scale (3) to zero.

3 Using orienting knob (4) quick release, direct aiming circle elbow telescope line-of-sight into collimator.

4 Using orienting knob (4), adjust aiming circle to superimpose elbow telescope vertical reticle line on collimator vertical reticle line.

5 Using elevating knob (5), superimpose aiming circle horizontal reticle line on collimator horizontal reticle line.

6 Sight through elbow telescope eyepiece (6) and turn aiming circle azimuth knob (7) 20 mils in one direction. Turn aiming circle back to starting point, then 20 mils in opposite direction and back again to starting point. Elbow telescope horizontal reticle line must not rise more than 0.4 mil during these azimuth swings.

7 Repeat step 6 every 1600 mils through one complete revolution using orienting knob (4). If elbow telescope horizontal reticle line rises more than 0.4 mil, repeat steps 1 thru 6.

APPENDIX A

REFERENCES

A-1. TECHNICAL MANUALS.

TM 9-1290-262-10	Operator's Manual for Aiming Circle M2 W/E (1290-00-614-0008) and M2A2 W/E (1290-01-067-0687)
TM 9-254	General Maintenance Procedures for Fire Control Materiel
DA PAM 738-750	The Army Maintenance Management System (TAMMS)
TM 750-116	General Procedures for Purging and Charging of Fire Control Instruments
TM 43-0139	Painting Instructions for Army Materiel
TM 4700-15/1	U.S. Marine Corps Technical Manual Equipment Record Procedures

A-2. COMMON TABLES OF ALLOWANCES.

CTA 8-100	Army Medical Department Expendable/Durable Items
CTA 50-970	Expendable Items (Except: Medical Class V, Repair Parts and Heraldic Items)

A-3. FIELD MANUAL.

FM 21-11	First Aid for Soldiers

A-4. SUPPLY CATALOGS.

SC 4931-95-CL-A07	Shop Set, Instrument and Fire Control: Field Maintenance, Basic, Less Power and Shop Set, Instrument and Fire Control: Field Maintenance, Basic MAP only
SC 4931-95-CL-J54	Purging Kit, Fire Control: Organizational, Direct and General Support Maintenance
SC 5180-95-CL-B29	Tool Kit, Electronic System Maintenance

A-5 FORMS.

AFTO Form 22	Technical Order System Publications Improvement Report and Reply
DA Form 2028	Recommended Changes to Equipment Technical Publications
DA Form 2028-2	Recommended Changes to Publications and Blank Forms
DA Form 2404	Equipment Inspection and Maintenance Worksheet
NAVMC 10772	Recommended Changes to Publications/Logistics-Maintenance Data Coding
SF 364	Report of Discrepancy (ROD)
SF 368	Product Quality Deficiency Report (PQDR)

A-6 OTHER.

AR 220-1	Unit Status Reporting
AR 380-5	Department of the Army Information Security Program
AR 700-138	Army Logistics Readiness and Sustainability
MCO 1650.17	Beneficial Suggestion Awards Program
MCO 4855.10	Product Quality Deficiency Report
MCO P4450.7	Marine Corps Warehousing Manual
MCO P4610.9	Transportation and Travel Record of Transportation Discrepancies

A-7 TECHNICAL ORDERS.

TO 00-35D-54	TM, USAF, Materiel Deficiency Reporting and Investigating System

APPENDIX B

MAINTENANCE ALLOCATION CHART (MAC)

Section I. INTRODUCTION

B-1. THE ARMY MAINTENANCE SYSTEM MAC.

a. This introduction (section 1) provides a general explanation of all maintenance and repair functions authorized at various maintenance levels under the standard Army Maintenance System concept.

b. The Maintenance Allocation Chart (MAC) in section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance levels, which are shown on the MAC in column (4) as:

Unit - includes two subcolumns, C (operator/crew) and O (unit) maintenance.

Direct Support - includes an F subcolumn.

General Support - includes an H subcolumn.

Depot - includes a D subcolumn.

c. Section Ill lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from section Il.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

B-2. MAINTENANCE FUNCTIONS. Maintenance functions are limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition; e.g., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

B-2. MAINTENANCE FUNCTIONS (CONT).

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and assigned maintenance level is shown as the 3d position code of the SMR code.

i. Repair. The application of maintenance services[1] including fault location/troubleshooting[2], removal/installation, and disassembly/assembly[3] procedures, and maintenance actions[4] to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying Army equipment/components.

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[1]Services-inspect, test, service, adjust, align, calibrate, and/or replace.

[2]Fault location/troubleshooting—The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or unit under test (UUT).

[3]Disassembly/assembly—The step-by-step breakdown (taking apart) of a spare/functional group coded item to the level of its least component, that is assigned an SMR code for the level of maintenance under consideration (i.e., identified as maintenance significant).

[4]Actions—Welding, grinding, riveting, straightening, facing, machining, and/or resurfacing.

B-3. EXPLANATION OF COLUMNS IN THE MAC, SECTION II.

a. Column 1, Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the item names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Function. Column 3 lists the functions to be performed on the item listed in Column 2. (For detailed explanation of these functions, see paragraph B-2.)

d. Column 4, Maintenance Level. Column 4 specifies each level of maintenance authorized to perform each function listed in Column 3, by indicating work time required (expressed as man-hours in whole hours or decimals) in the appropriate subcolumn. This work-time figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate work-time figures are to be shown for each level. The work-time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance levels are as follows:

C	Operator or crew maintenance
0	Unit maintenance
F	Direct support maintenance
L	Specialized Repair Activity (SRA)[5]
H	General support maintenance
D	Depot maintenance

e. Column 5, Tools and Test Equipment reference code. Column 5 specifies, by code, those common tools sets (not individual tools), common TMDE, and special tools, special TMDE, and special support equipment required to perform the designated function. Codes are keyed to tools and test equipment in Section Ill.

f. Column 6, Remarks. When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks contained in Section IV.

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[5]This maintenance level is not included in Section II, column 4 of the Maintenance Allocation Chart. Functions to this Ievel of maintenance are identified by a work-time figure in the “H” column of Section II, column (4), and an associated reference code is used in the Remarks column 6. This code is keyed to Section IV, Remarks, and the SRA complete repair application is explained there.

B-4. EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENTS, SECTION III.

a. Column 1, Reference Code. The too and test equipment reference code correlates with a code used in the MAC, Section II, column 5.

b. Column 2, Maintenance Level. The lowest level of maintenance authorized to use the tool or test equipment

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National Stock Number. The National Stock Number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer's part number, model number, or type number.

B-5. EXPLANATION OF COLUMNS IN REMARKS, SECTION IV.

a. Column 1, Remarks Code. The code recorded in column 6, Section II.

b. Column 2, Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

Section II. MAINTENANCE ALLOCATION CHART FOR M2A2 AIMING CIRCLE

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct Support	General Support	Depot		
Group Number	Component/ Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment Ref Code	Remarks
00	AIMING CIRCLE W/E, M2A2	Inspect	0.1			0.5			
		Replace		0.1					
		Repair				25.0			
01	AIMING CIRCLE, M2A2	Inspect	0.1	0.1					
		Service	0.1	0.3				6	
		Adjust			0.5			1,2,3,8,9	
		Replace		0.1					
		Repair		0.1	10.0	17.0		3,4,5,6,7,9, 10	

Section II. MAINTENANCE ALLOCATION CHART FOR M2A2 AIMING CIRCLE (cont)

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct Support	General Support	Depot		
Group Number	Component/ Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment Ref Code	Remarks
0101	TELE-SCOPE, ELBOW	Inspect		0.1	0.1	0.1			
		Service		0.2		0.2		6	
		Replace				0.5		9	
		Repair				3.0		9	
0102	PLATE BASE, AIMING CIRCLE	Inspect			0.1				
		Replace			0.5				
		Repair			1.0			9	
02	TRIPOD, AIMING CIRCLE, M24	Inspect	0.1						
		Replace		0.5					
		Repair			1.0			9	
03	COVER, ACCESS	Inspect	0.1						
		Replace		0.3					
		Repair			1.0			9	
04	LIGHT, INSTRU-MENT, M51	Inspect	0.1						
		Replace		0.1					
		Repair		0.1				9	

Section III. TOOLS AND TEST EQUIPMENT FOR M2A2 AIMING CIRCLE

TOOL OR TEST EQUIP REF CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL STOCK NO.	TOOL NUMBER
1	H	AZIMUTH TEST FIXTURE	4931-00-769-1596	7691596
2	H	AZIMUTH TEST FIXTURE ADAPTER	—	9333800
3	F	PINNED TUBULAR WRENCH	—	9333797
4	H	PIVOT WRENCH	—	9333798
5	H	PRISM SHELF REMOVER	—	9333795

SECTION III. TOOLS AND TEST EQUIPMENT
FOR
M2A2 AIMING CIRCLE (CONT)

TOOL OR TEST EQUIP REF CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL STOCK NO.	TOOL NUMBER
6	O	PURGING KIT, FIRE CONTROL	4931-00-065-1110	SC 4931-95-CL-J54
7	F	SHOP SET, INSTRUMENT AND FIRE CONTROL	4931-00-754-0740	SC 4931-95-CL-A07
8	F	TEST TARGET		
9	O	TOOL KIT, ELECTRONIC SYSTEM MAINTENANCE		SC 5180-95-CL-B29
10	F	TORQUE WRENCH ADAPTER		9333796

SECTION IV. REMARKS FOR M2A2 AIMING CIRCLE

NOT APPLICABLE.

APPENDIX C

UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS LIST

Section I. INTRODUCTION

C-1. SCOPE.

This RPSTL lists and authorizes spares and repair parts; special tools; special test, measurement, and diagnostic equipment (TMDE); and other special support equipment required for performance of unit, direct support and general support maintenance of the M2A2 aiming circle. It authorizes the requisitioning, issue, and disposition of spares, repair parts, and special tools as indicated by the Source, Maintenance, and Recoverability (SMR) codes.

C-2. GENERAL.

In addition to Section 1, Introduction, this Repair Parts and Special Tools List is divided into the following sections:

a. Section II. Repair Parts List. A list of spares and repair parts authorized by this RPSTL for use in the performance of maintenance. The list also includes parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in ascending alphanumeric sequence, with the parts in each group listed in ascending figure and item number sequence. Bulk materials are listed in item name sequence. Repair parts kits are listed separately in their own functional group within Section II. Repair parts for reparable special tools are also listed in this section. Items listed are shown on the associated illustration(s)/figure(s).

b. Section III. Special Tools List. A list of special tools, special TMDE, and other special support equipment authorized by this RPSTL (as indicated by Basis of Issue (BOI) information in DESCRIPTION AND USABLE ON CODE column) for the performance of maintenance.

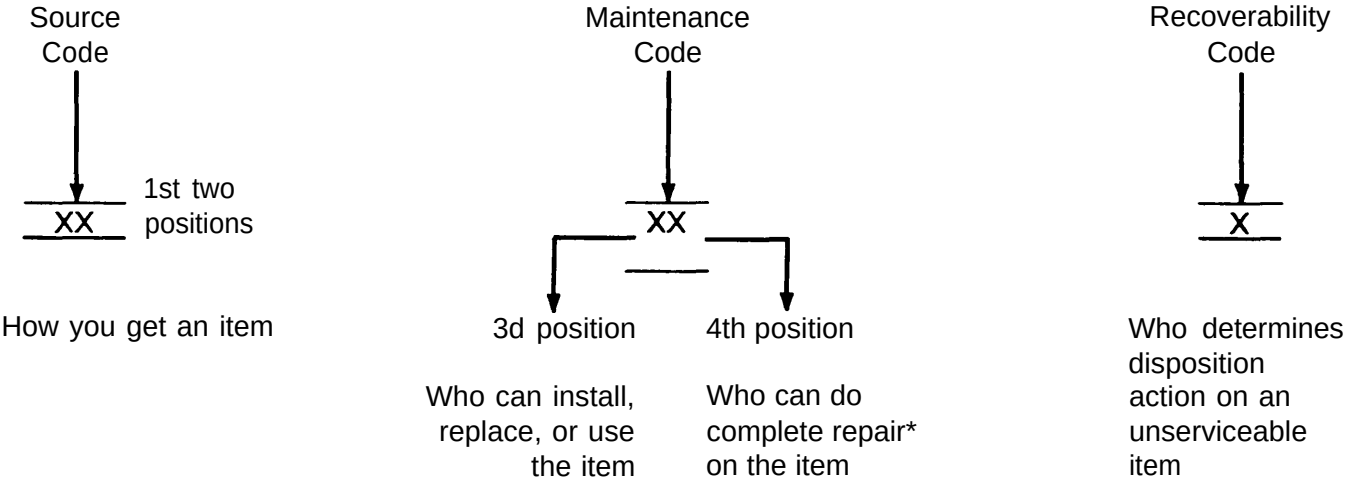
c. Section IV. Cross-reference Indexes. A list, in National Item Identification Number (NIIN) sequence, of all National stock numbered items appearing in the listing, followed by a list in alphanumeric sequence of all part numbers appearing in the listing. National stock numbers and part numbers are cross-referenced to each illustration figure and item number appearance. The figure and item number index lists figure and item numbers in alphanumeric sequence and cross-references NSN, CAGEC, and part numbers.

C-3. EXPLANATION OF COLUMNS (SECTIONS II AND III).

a. ITEM NO. (Column (1)). Indicates the number used to identify items called out in the illustration.

C-3. EXPLANATION OF COLUMNS (SECTIONS II AND III) (CONT).

b. SMR CODE (Column 2)). The Source, Maintenance, and Recoverability (SMR) code is a 5-position code containing supply/requisitioning information, maintenance level authorization criteria, and disposition instruction, as shown in the following breakout:



*Complete Repair: Maintenance capacity, capability, and authority to perform all corrective maintenance tasks of the "Repair" function in a use/user environment in order to restore serviceability to a failed item.

(1) Source Code. The source code tells you how to get an item needed for maintenance, repair, or overhaul of an end item/equipment. Explanations of source codes follow:

CODE	EXPLANATION
PA PB PC** PD PE PF PG	Stocked items; use the applicable NSN to request/requisition items with these source codes. They are authorized to the level indicated by the code entered in the 3d position of the SMR codes. **NOTE: Items coded PC are subject to deterioration.
KD KF KB	Items with these codes are not to be requestedequisitioned individually. They are part of a kit which is authorized to the maintenance level indicated in the 3d position of the SMR code. The complete kit must be requisitioned and applied.

MO - (Made at unit/ AVUM Level)
MF - (Made at DS/ AVIM Level)
MH - (Made at GS Level)
ML - (Made at Specialized Repair Act (SRA))
MD - (Made at Depot)

Items with these codes are not to be requested/requisitioned individually. They must be made from bulk material which is identified by the part number in the DESCRIPTION AND USABLE ON CODE (UOC) column and listed in the Bulk Material group of the repair parts list in this RPSTL. If the item is authorized to you by the 3d position code of the SMR code, but the source code indicates it is made at a higher level, order the item from the higher level of maintenance.

AO - (Assembled by unit/AVUM Level)
AF - (Assembled by DS/AVIM Level)
AH - (Assembled by GS Level)
AL - (Assembled by SRA)
AD - (Assembled by Depot)

Items with these codes are not to be requested/requisitioned individually. The parts that make up the assembled item must be requisitioned or fabricated and assembled at the level of maintenance indicated by the source code. if the 3d position code of the SMR code authorizes you to replace the item, but the source code indicates the item is assembled at a higher level, order the item from the higher level of maintenance.

XA - Do not requisition an "XA"-coded item. Order its next higher assembly (Also, refer to the NOTE below.)

XB - If an "XB" item is not available from salvage, order it using the CAGEC and part number given.

XC - Installation drawing, diagram, instruction sheet, field service drawing, that is identified by manufacturer's part number.

XD - Item is not stocked. Order an "XD''-coded item through normal supply channels using the CAGEC and part number given, if no NSN is available.

NOTE: Cannibalization or controlled exchange, when authorized, may be used as a source of supply for items with the above source codes, except for those source coded "XA" or those aircraft support items restricted by requirements of AR 750-1.

(2) Maintenance Code. Maintenance codes tell you the level(s) of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth positions of the SMR code as follows:

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

C-3. EXPLANATION OF COLUMNS (SECTIONS II AND III) (CONT).

Code	Application/Explanation
C	-Crew or operator maintenance done within unit or aviation unit maintenance.
O	-Unit or aviation unit level can remove, replace, and use the item.
F	-Direct support or aviation intermediate level can remove, replace, and use the item.
H	-General support level can remove, replace, and use the item.
L	-Specialized repair activity can remove, replace, and use the item.
D	-Depot level can remove, replace, and use the item.

(b) The maintenance code entered in the fourth position tells whether or not the item is to be repaired and identifies the lowest maintenance level with the capability to do complete repair (i.e., perform all authorized repair functions). (NOTE: Some limited repair may be done on the item at a lower level of maintenance, if authorized by the Maintenance Allocation Chart (MAC) and SMR codes.) This position will contain one of the following maintenance codes:

Code	Application/Explanation
O	-Unit or aviation unit is the lowest level that can do complete repair of the item.
F	-Direct support or aviation intermediate is the lowest level that can do complete repair of the item.
H	-General support is the lowest level that can do complete repair of the item.
L	-Specialized repair activity is the lowest level that can do complete repair of the item.
D	-Depot is the lowest level that can do complete repair of the item.
Z	-Nonreparable. No repair is authorized.
B	-No repair is authorized. (No parts or special tools are authorized for the maintenance of the “B’’-coded item). However, the item may be reconditioned by adjusting, lubricating, etc., at the user level.

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

Recoverability Code	Application/Explanation
Z	-Nonreparable item. When unserviceable, condemn and dispose of the item at the level of maintenance shown in 3d position of SMR code.
O	-Reparable item. When uneconomically reparable, condemn and dispose of the item at the unit or aviation unit level.
F	-Reparable item. When uneconomically reparable, condemn and dispose of the item at the direct support or aviation intermediate level.
H	-Reparable item. When uneconomically reparable, condemn and dispose of the item at the general support level.
D	-Reparable item. When beyond lower level repair capability, return to depot. Condemnation and disposal of item not authorized below depot level.
L	-Reparable item. Condemnation and disposal not authorized below Specialized Repair Activity (SRA).
A	-Item requires special handling or condemnation procedures because of specific reasons (e.g., precious metal content, high dollar value, critical material, or hazardous material). Refer to appropriate manuals/directives for specific instructions.

c. CAGEC (Column (3)). The Contractor and Government Entity Code (CAGEC) is a 5-digit alphanumeric code which is used to identify the manufacturer, distributor, or Government agency, etc., that supplies the item.

d. PART NUMBER (Column (4)). Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements to identify an item or range of items.

NOTE: When you use an NSN to requisition an item, the item you receive may have a different part number from the part ordered. (The parts are interchangeable.)

e. DESCRIPTION AND USABLE ON CODE (UOC) (Column (5)). This column includes the following information:

(1) The Federal item name and, when required, a minimum description to identify the item.

(2) The physical security classification of the item is indicated by the parenthetical entry which is a physical security classification abbreviation (e.g., Phy Sec Cl (C)—Confidential, Phy Sec Cl (S)—Secret, Phy Sec Cl (T)—Top Secret).

C-3. EXPLANATION OF COLUMNS (SECTIONS II AND III) (CONT).

(3) Items that are included in kits and sets are listed below the name of the kit or set.

(4) Spare/repair parts that make up an assembled item are listed immediately following the assembled item line entry.

(5) Part numbers for bulk materials are referenced in this column in the line item entry for the item to be manufactured/fabricated.

(6) When the item is not used with all serial numbers of the same model, the effective serial numbers are shown on the last line(s) of the description (before UOC).

(7) The usable on code, when applicable (see paragraph C-5, Special Information).

(8) In the Special Tools List section, the basis of issue (BOI) appears as the last line(s) in the entry for each special tool, special TMDE, and other special support equipment. When density of equipment supported exceeds density spread indicated in the basis of issue, the total authorization is increased proportionately.

(9) The statement "END OF FIGURE" appears just below the last item description in Column 5 for a given figure in both Section II and Section III.

f. QTY (Column (6)). The QTY (quantity per figure column) indicates the quantity of the item used in the breakout shown on the illustration figure, which is prepared for a functional group, sub-functional group, or an assembly. A "V" appearing in this column in lieu of a quantity indicates that the quantity is variable and the quantity may vary from application to application.

C-4. EXPLANATION OF COLUMNS (SECTION IV).

a. NATIONAL STOCK NUMBER (NSN) INDEX.

(1) STOCK NUMBER column. This column lists the NSN by National Item Identification Number (NIIN) sequence. The NIIN consists of the last nine digits of the NSN (i.e., 5305-01-674-1467). When using this column to locate an item, ignore the first 4 digits of the NSN. However, the complete NSN should be used when ordering items by stock number.

(2) FIGURE column. This column lists the number of the figure where the item is identified/ located. The figures are in numerical order in Section II and Section III.

(3) ITEM column. The item number identifies the item associated with the figure listed in the adjacent FIG. column. This item is also identified by the NSN listed on the same line.

b. PART NUMBER INDEX. Part numbers in this index are listed by part number in ascending alphanumeric sequence (i.e., vertical arrangement of letter and number combination which places the first letter or digit of each group in order A thru Z, followed by the numbers 0 thru 9 and each following letter or digit in like order).

(1) CAGEC column. The Contractor and Government Entity Code (CAGEC) is a 5-digit alphanumeric code used to identify the manufacturer, distributor, or Government agency, etc., that supplies the item.

(2) PART NUMBER column. Indicates the primary number used by the manufacturer (individual, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements to identify an item or range of items.

(3) STOCK NUMBER column. This column lists the NSN for the associated part number and manufacturer identified in the PART NUMBER and CAGEC columns to the left.

(4) FIG. column. This column lists the number of the figure where the item is identified/located in Sections II and Ill.

(5) ITEM column. The item number is that number assigned to the item as it appears in the figure referenced in the adjacent figure number column.

c. FIG. AND ITEM NUMBER INDEX.

(1) FIGURE column. This column lists the number of the figure where the item is identified/located in Sections II and Ill.

(2) ITEM column. The item number is that number assigned to the item as it appears in the figure referenced in the adjacent figure number column.

(3) STOCK NUMBER column. This column lists the NSN for the item.

(4) CAGEC column. The Contractor and Government Entity Code (CAGEC) is a 5-digit alphanumeric code used to identify the manufacturer, distributor, or Government agency, etc., that supplies the item.

(5) PART NUMBER column. Indicates the primary number used by the manufacturer (individual, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements to identify an item or range of items.

C-5. SPECIAL INFORMATION.

a. FABRICATION INSTRUCTIONS. Bulk materials required to manufacture items are listed in the Bulk Material Functional Group of this RPSTL. Part numbers for bulk materials are also referenced in the description column of the line item entry for the item to be manufactured/fabricated. Detailed fabrication instructions for items source coded to be manufactured or fabricated are found in appendix E.

b. ASSEMBLY INSTRUCTIONS. Detailed assembly instructions for items source coded to be assembled from component spare/repair parts are found in this maintenance manual. Items that make up the assembly are listed immediately following the assembly item entry or reference is made to an applicable figure.

C-5. SPECIAL INFORMATION (CONT).

c. INDEX NUMBERS. Items which have the word BULK in the figure column will have an index number shown in the item number column. This index number is a cross-reference between the National Stock Number/Part Number Index and the bulk material list in Section II.

C-6. HOW TO LOCATE REPAIR PARTS.

a. When National Stock Number or Part Number is Not Known:

(1) First. Using the table of contents, determine the assembly group or subassembly group to which the item belongs. This is necessary since figures are prepared for assembly groups and subassembly groups, and listings are divided into the same groups.

(2) Second. Find the figure covering the assembly group or subassembly group to which the item belongs.

(3) Third. Identify the item on the figure and use the Figure and Item Number Index to find the NSN.

b. When National Stock Number or Part Number is Known:

(1) First. Using the National Stock Number or the Part Number Index, find the pertinent National Stock Number or Part Number. The NSN index is in National Item identification Number (NIIN) sequence (see para C-4.a.(1)). The part numbers in the Part Number Index are listed in ascending alphanumeric sequence (see para C-4.b.). Both indexes cross-reference with the illustration figure and item number of the item you are looking for.

(2) Second. After finding the figure and item number, verify that the item is the one you are looking for, then locate the item number in the repair parts list for the figure.

C-7. ABBREVIATIONS. Not applicable.

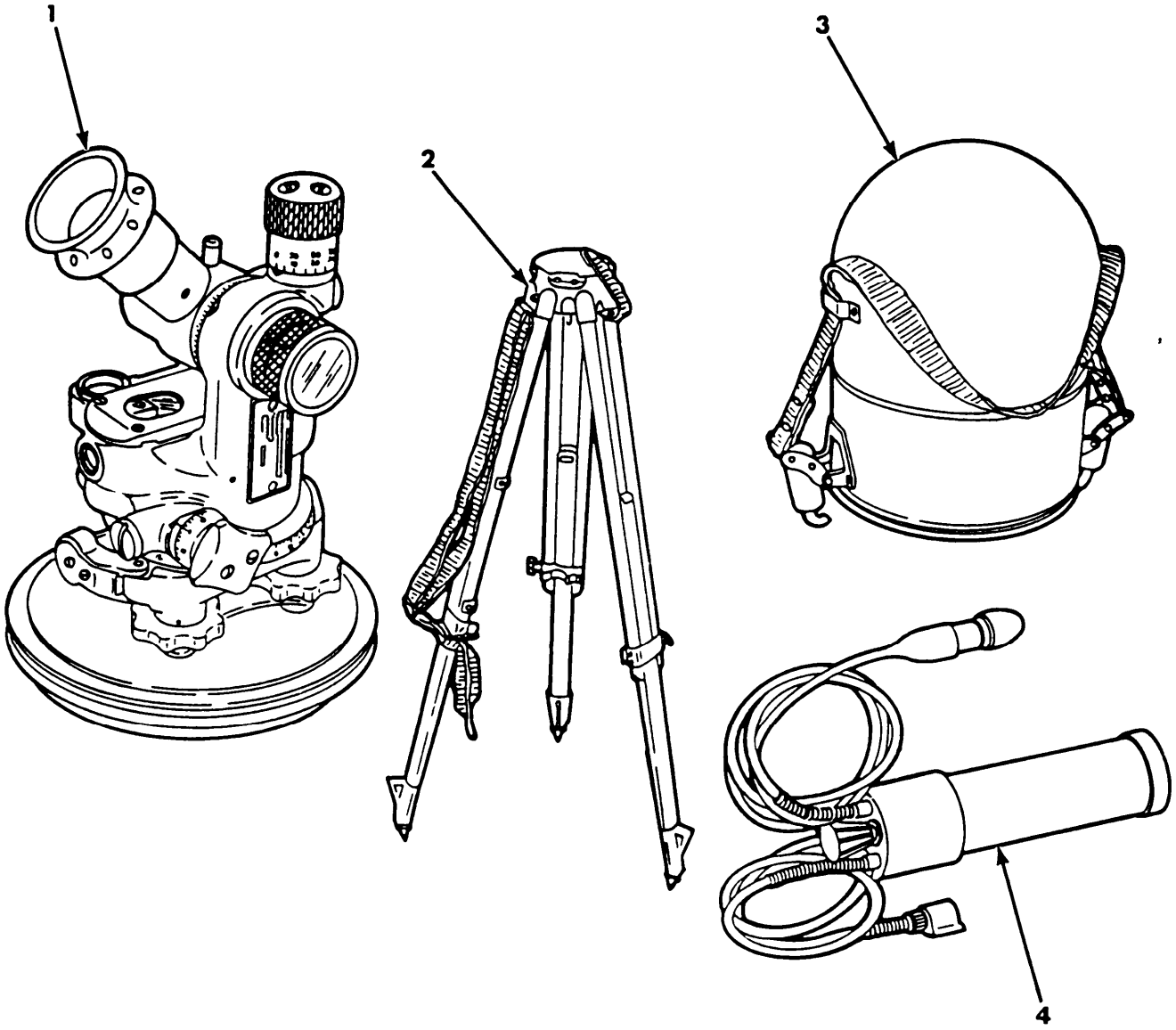


Figure C-1. Aiming Circle, M2A2 W/E 11785090.

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES (UOC)	(6) QTY
				GROUP 00 FIG. C-1 AIMING CIRCLE,M2A2 W/E 11785090	
1	XAOHH	19200	11834483	AIMING CIRCLE ,M2A2	1
2	PAOFF	19200	8242777	TRIPOD,FIRE CONTROL AIMING CIRCLE	1
3	PAOFF	19200	8211749	COVER,ACCESS	1
4	PAOOO	19200	8293478	LIGHT,INSTRUMENT ,M51	1
				END OF FIGURE	

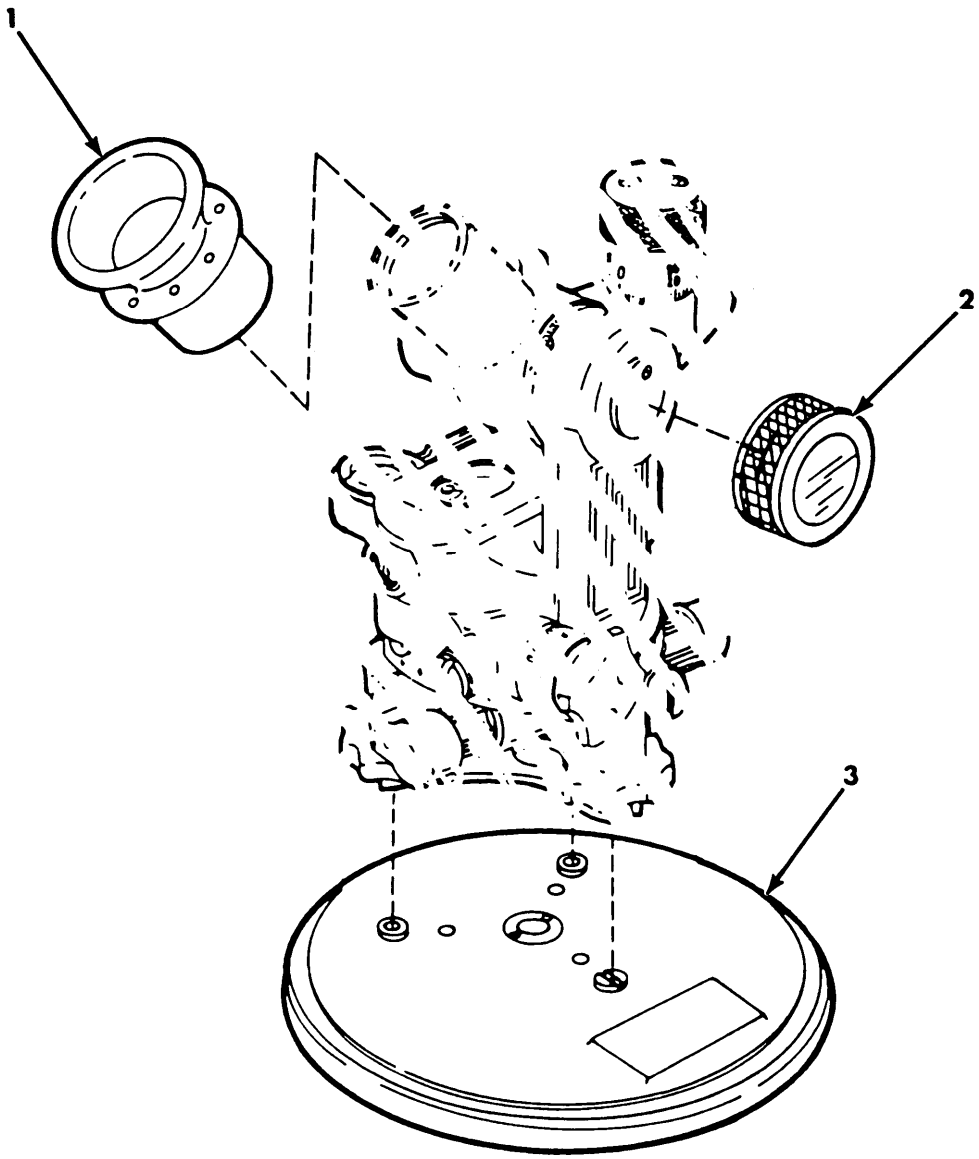


Figure C-2. Aiming Circle, M2A2 11834483.

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES (UOC)	(6) QTY
				GROUP 01 FIG.C-2 AIMING CIRCLE,M2A2 11834483	
1	PAOZZ	19200	7647149	EYESHIELD,OPTICAL	1
2	PAOZZ	19200	7647146	FILTER,OPTICAL	1
3	AFFFF	19200	8226976	PLATE BASE,AIMING CIRCLE SEE FIG.C-11 ASSY BKDN	1
				END OF FIGURE	

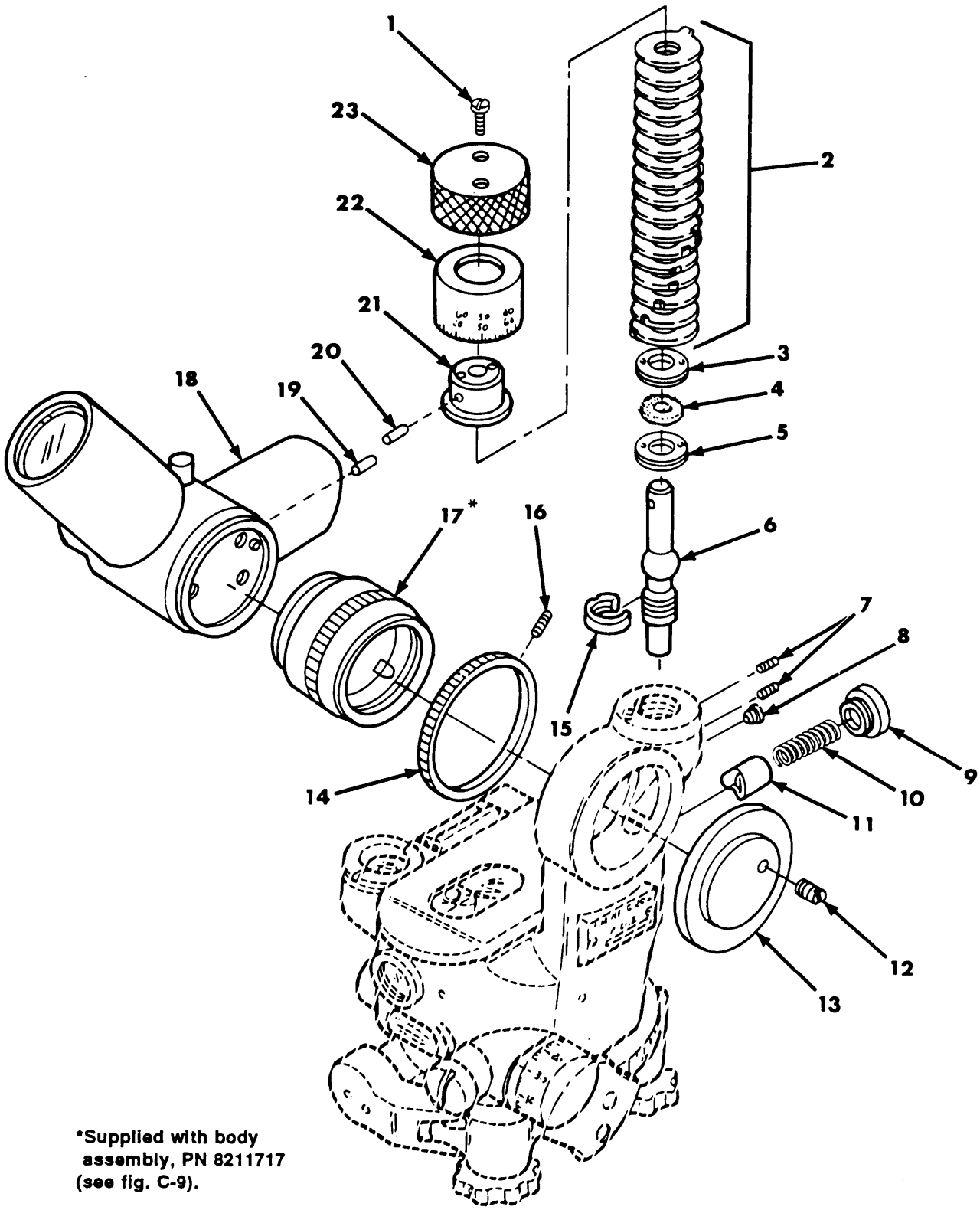


Figure C-3. Aiming Circle, M2A2 (Elbow Telescope Parts) 11834483.

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES (UOC)	(6) QTY
				GROUP 01 FIG.C-3 AIMING CIRCLE,M2A2 (ELBOW TELESCOPE PARTS) 11834483	
1	PAFZZ	96906	MS35273-15	SCREW,MACHINE	2
2	PAFZZ	19200	8211697	WASHER,KEY	17
3	PAFZZ	19200	8211698	RING,EXTERNALLY	1
4	PAFZZ	19200	8211667	WASHER,FLAT	1
5	PAFZZ	19200	7680256	SEAT,BALL SOCKET	1
6	PAFZZ	19200	11835091	WORM SHAFT	1
7	PAFZZ	96906	MS51033-221	SETSCREW	2
8	PAFZZ	19200	7680236	SETSCREW	1
9	PAFZZ	19200	8211704	PLUG,MACHINE THREAD	1
10	PAFZZ	19200	8211670	SPRING,HELICAL,COMPRESSION	1
11	PAFZZ	19200	8205627	BUSHING,SLEEVE	1
12	PAHZZ	96906	MS51033-218	SETSCREW	1
13	PAHZZ	19200	8211747	COVER ASSEMBLY	1
14	PAHZZ	19200	10554737	INDICATOR, ELEVATION	1
15	PAFZZ	19200	7680257	SEAT,BALL SOCKET	1
16	PAHZZ	19200	8213735	SETSCREW	3
17	PAHZZ	19200	8211708	GEAR ELEVATING	1
18	PAHHH	19200	8211640	TELESCOPE,ELBOW	1
19	PAHZZ	19200	7647159-2	PIN,STRAIGHT	1
20	PAFZZ	19200	8213732-2	PIN	1
21	PAFZZ	19200	8211716	ADAPTER	1
22	PAFZZ	19200	11834484	DIAL,SCALE	1
23	PAFZZ	19200	10554738	KNOB	1
				END OF FIGURE	

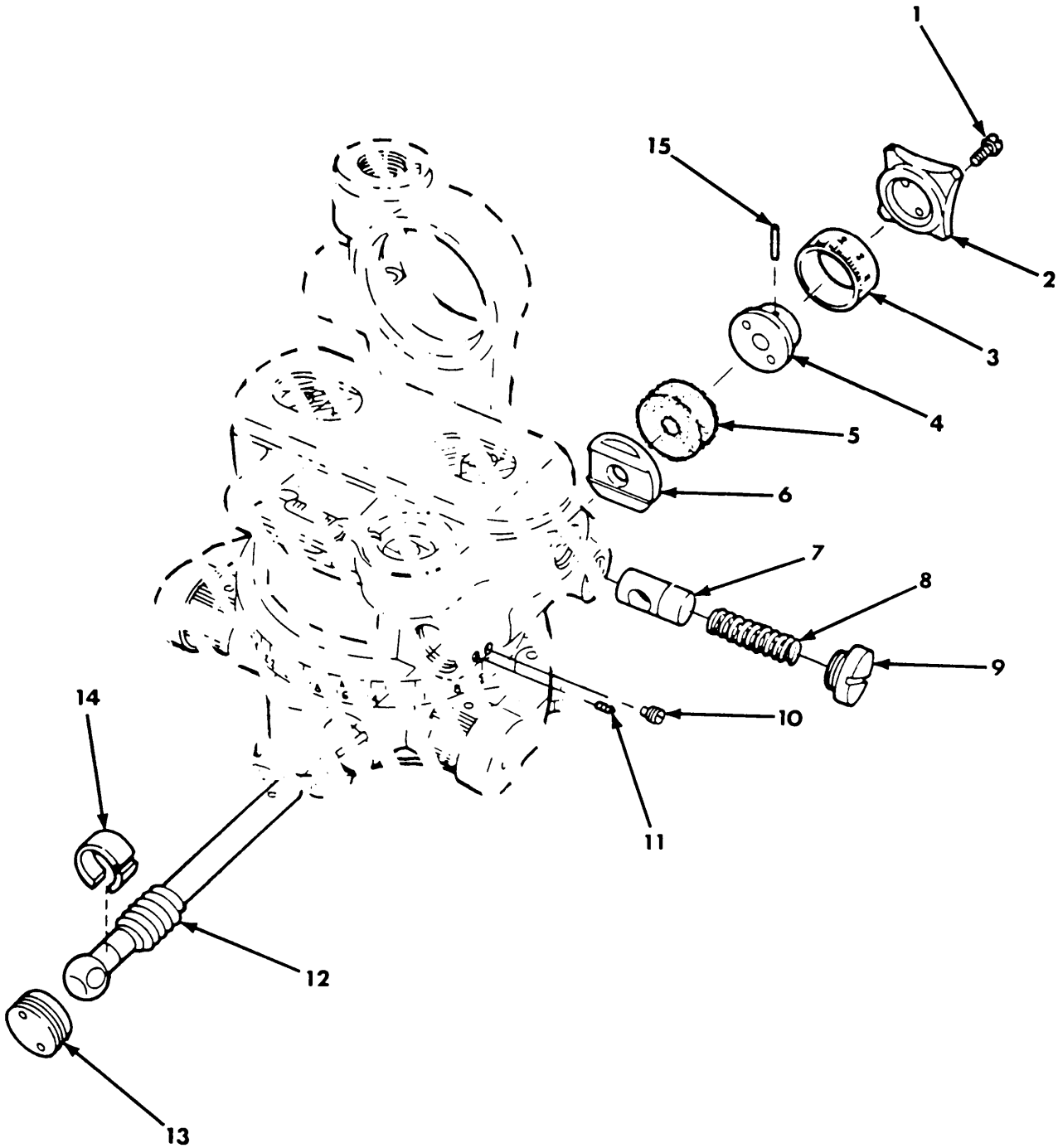


Figure C-4. Aiming Circle, M2A2 (Azimuth Parts) 11834483.

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES (UOC)	(6) QTY
				GROUP 01 FIG.C-4 AIMING CIRCLE,M2A2 (AZIMUTH PARTS) 11834483	
1	PAFZZ	96906	MS35273-15	SCREW,MACHINE	2
2	PAFZZ	19200	8211687	KNOB	1
3	PAFZZ	19200	8211706	DIAL,SCALE	1
4	PAFZZ	19200	8211716	ADAPTER	1
5	PAFZZ	19200	8211688	WASHER,FLAT	1
6	PAFZZ	19200	8211702	DIAL,SCALE	1
7	PAFZZ	19200	8205628	BUSHING,SLEEVE	1
8	PAFZZ	19200	8211670	SPRING,HELICAL,COMPRESSION	1
9	PAFZZ	19200	8211704	PLUG,MACHINE THREAD	1
10	PAFZZ	19200	7680236	SETSCREW	1
11	PAFZZ	96906	MS51033-218	SETSCREW	1
12	PAFZZ	19200	8211709	WORM	1
13	PAFZZ	19200	7680255	SEAT,BALL SOCKET	1
14	PAFZZ	19200	7680257	SEAT,BALL SOCKET	1
15	PAFZZ	19200	8213732-2	PIN	1
				END OF FIGURE	

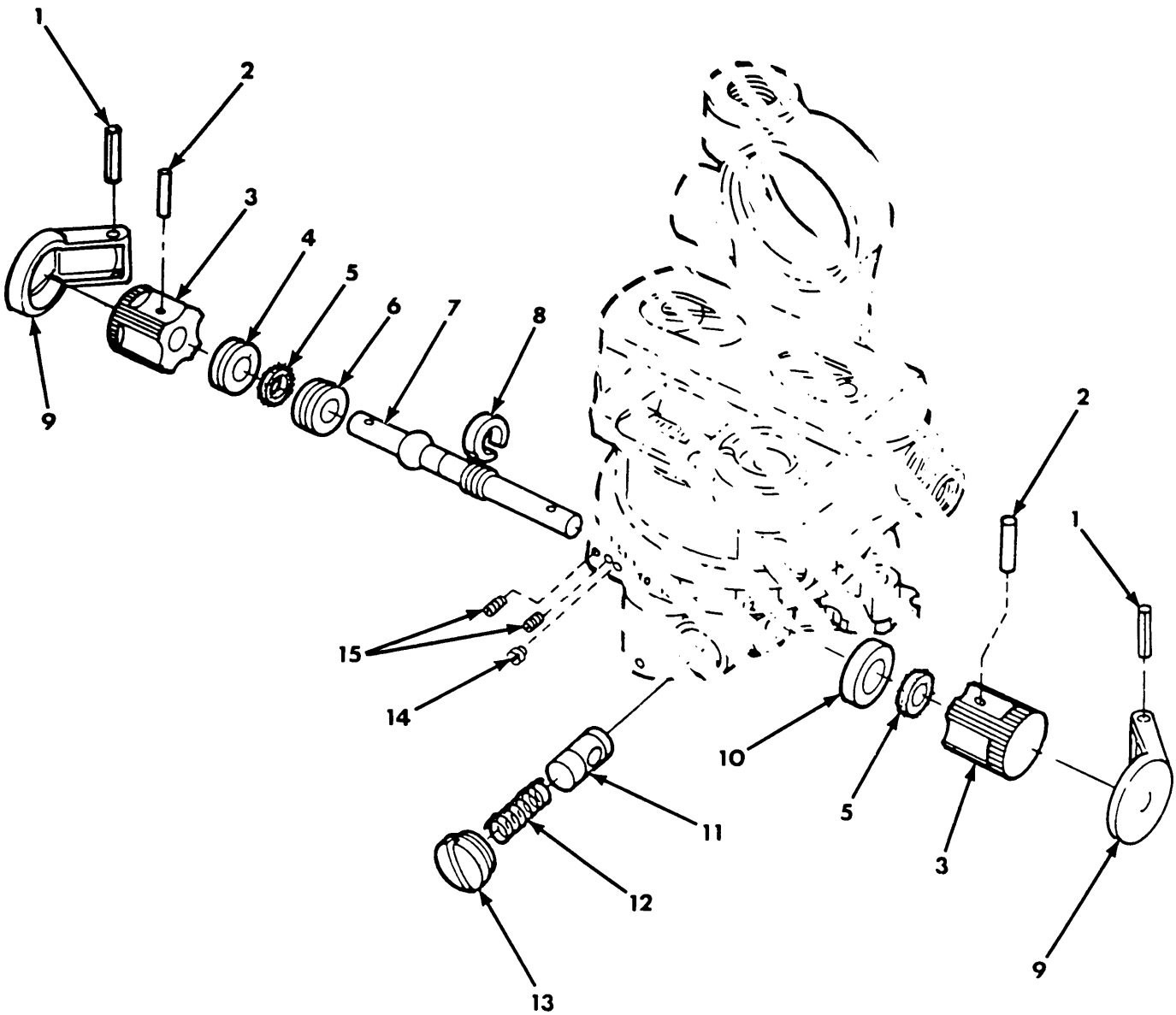


Figure C-5. Aiming Circle, M2A2 (Orientation Parts) 11834483.

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 01	
				FIG.C-5 AIMING CIRCLE,M2A2 (ORIENTATION PARTS) 11834483	
1	PAFZZ	19200	7681329	PIN,SPRING	2
2	PAFZZ	19200	8213732-3	PIN	2
3	PAFZZ	19200	8211666	KNOB	2
4	PAFZZ	19200	8211698	RING,EXTERNALLY THREADED	1
5	PAFZZ	19200	8211667	WASHER,FLAT	2
6	PAFZZ	19200	7680256	SEAT,BALL SOCKET	1
7	PAFZZ	19200	8211668	WORM SHAFT	1
8	PAFZZ	19200	7680257	SEAT,BALL SOCKET	1
9	PAFZZ	19200	8211723	COVER	2
10	PAFZZ	19200	8211746	SHOE	1
11	PAFZZ	19200	8205628	BUSHING,SLEEVE	1
12	PAFZZ	19200	8211670	SPRING,HELICAL,COMPRESSION	1
13	PAFZZ	19200	7681327	SCREW,EXTERNALLY THREADED	1
14	PAFZZ	19200	7680236	SETSCREW	1
15	PAFZZ	96906	MS51033-218	SETSCREW	2

END OF FIGURE

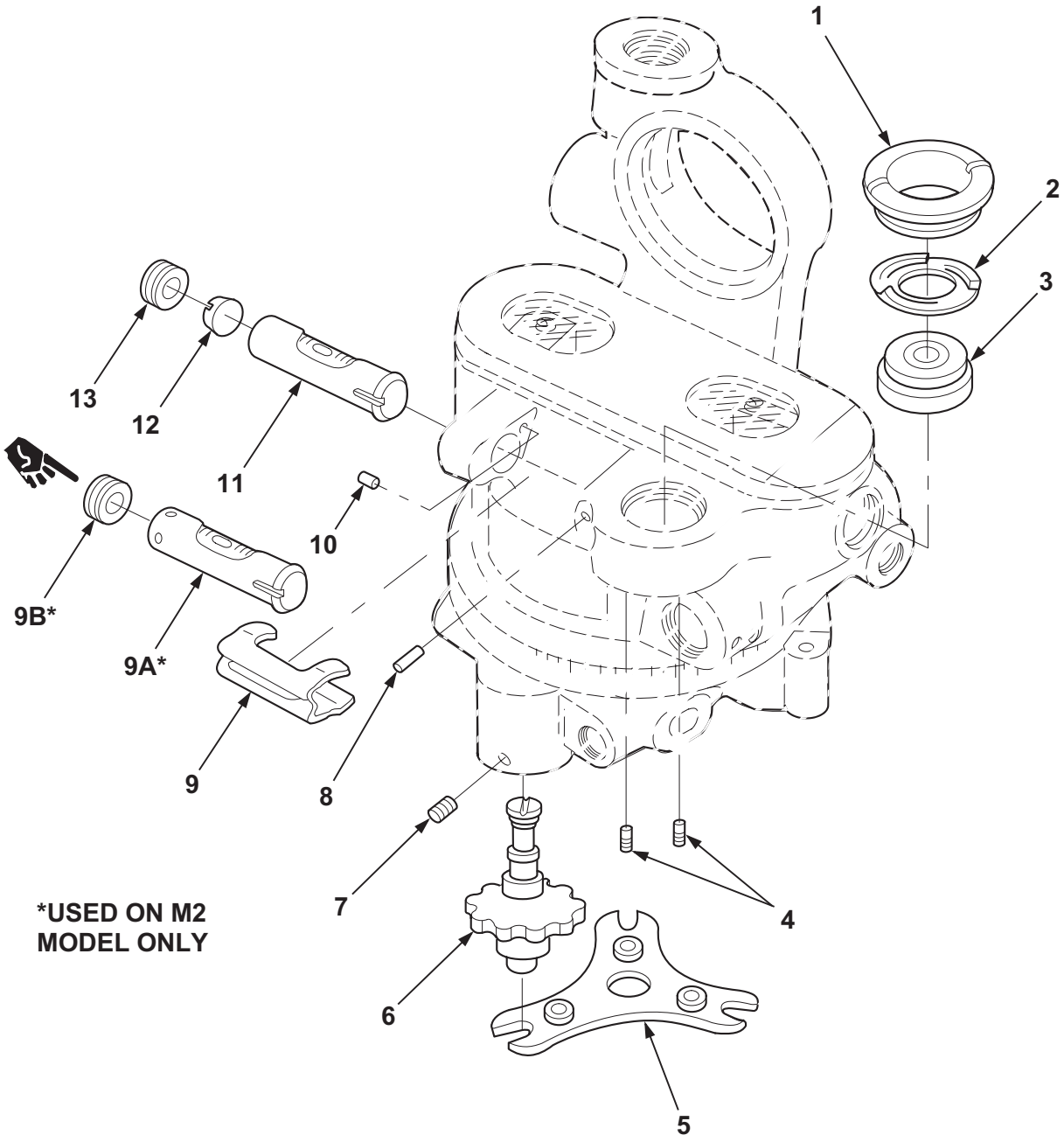


Figure C-6. Aiming Circle, M2A2 (Leveling Parts) 11834483.

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 01	
				FIG.C-6 AIMING CIRCLE,M2A2 (LEVELING PARTS) 11834483	
1	PAFZZ	19200	8211678	RING,EXTERNALLY THREADED	1
2	PAFZZ	19200	8211677	SHIM	1
3	PAFZZ	19200	8211676	LEVEL,CIRCULAR	1
4	PAFZZ	96906	MS51033-219	SETSCREW	2
5	PAFZZ	19200	8226969	PLATE,SPRING	1
6	PAFZZ	19200	8211660	DIAL-KNOB LOCK,ELECTRIC	3
7	PAFZZ	96906	MS51033-218	SETSCREW	3
8	PAFZZ	19200	7647159-1	PIN,STRAIGHT,HEADLESS	1
9	PAFZZ	19200	8566629	COVER,LEVEL VIAL	1
*9A	PAFZZ	19200	8211662	VIAL,LEVEL (USED ON M2 ONLY)	1
*9B	PAFZZ	19200	8211659	PLUG (USED ON M2 ONLY)	1
10	PAFZZ	19200	7647159-4	PIN,STRAIGHT,HEADLESS	1
11	PAFZZ	19200	11729650	VIAL,LEVEL	1
12	PAFZZ	19200	11729649	SEAT,ECCENTRIC	1
13	PAFZZ	19200	11729648	PLUG,MACHINE THREAD	1

END OF FIGURE

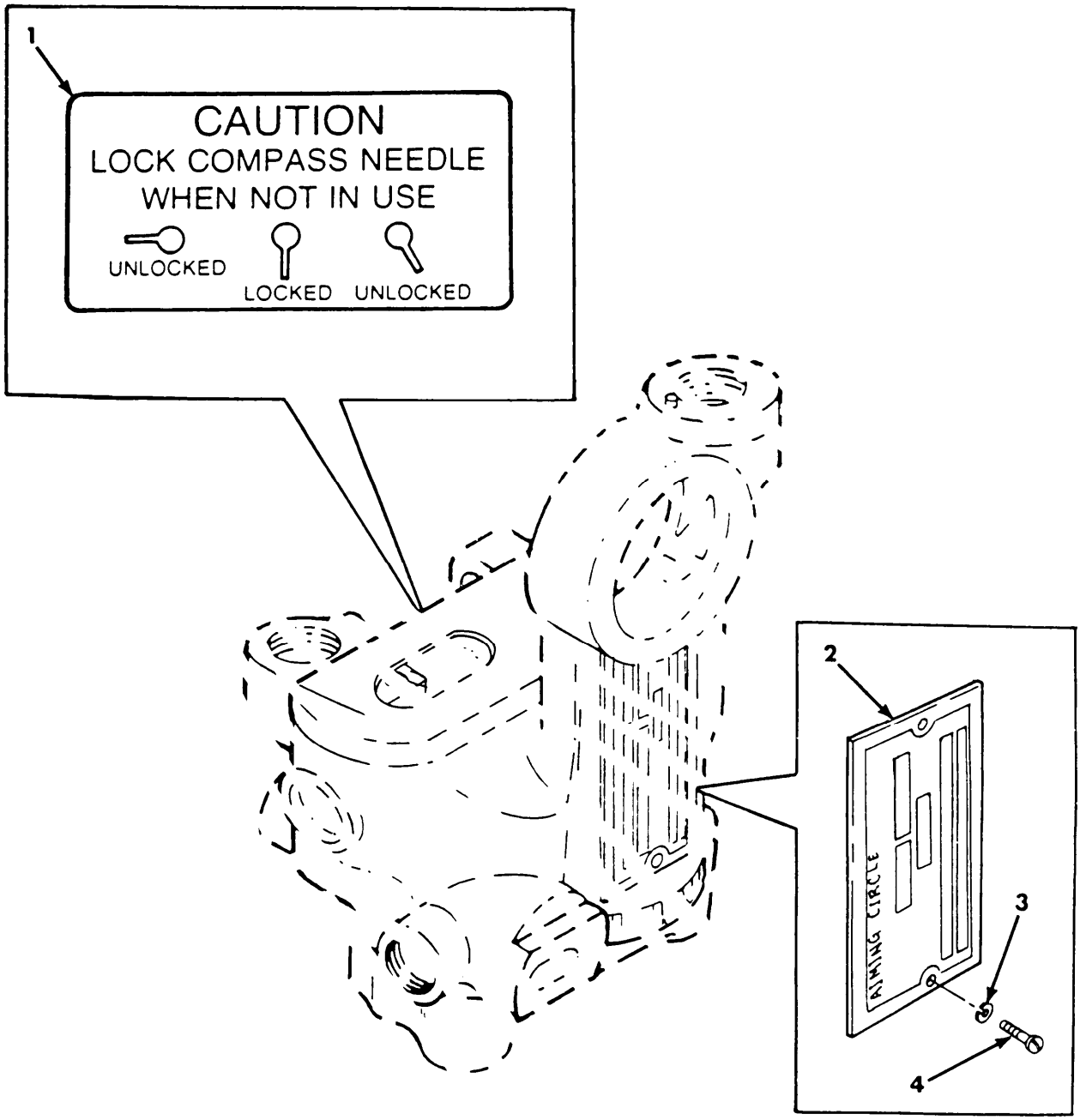


Figure C-7. Aiming Circle, M2A2 (Identification and Instruction Plates) 11834483.

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES (UOC)	(6) QTY
				GROUP 01 FIG.C-7 AIMING CIRCLE,M2A2 (IDENTIFICATION AND INSTRUCTION PLATES) 11834483	
1	PAFZZ	19200	11748292	PLATE,INSTRUCTION	1
2	PAFZZ	19200	11834485	PLATE,IDENTIFICATION	1
3	PAFZZ	96906	MS35333-103	WASHER,LOCK	2
4	PAFZZ	96906	MS35215-1	SCREW,MACHINE	2
				END OF FIGURE	

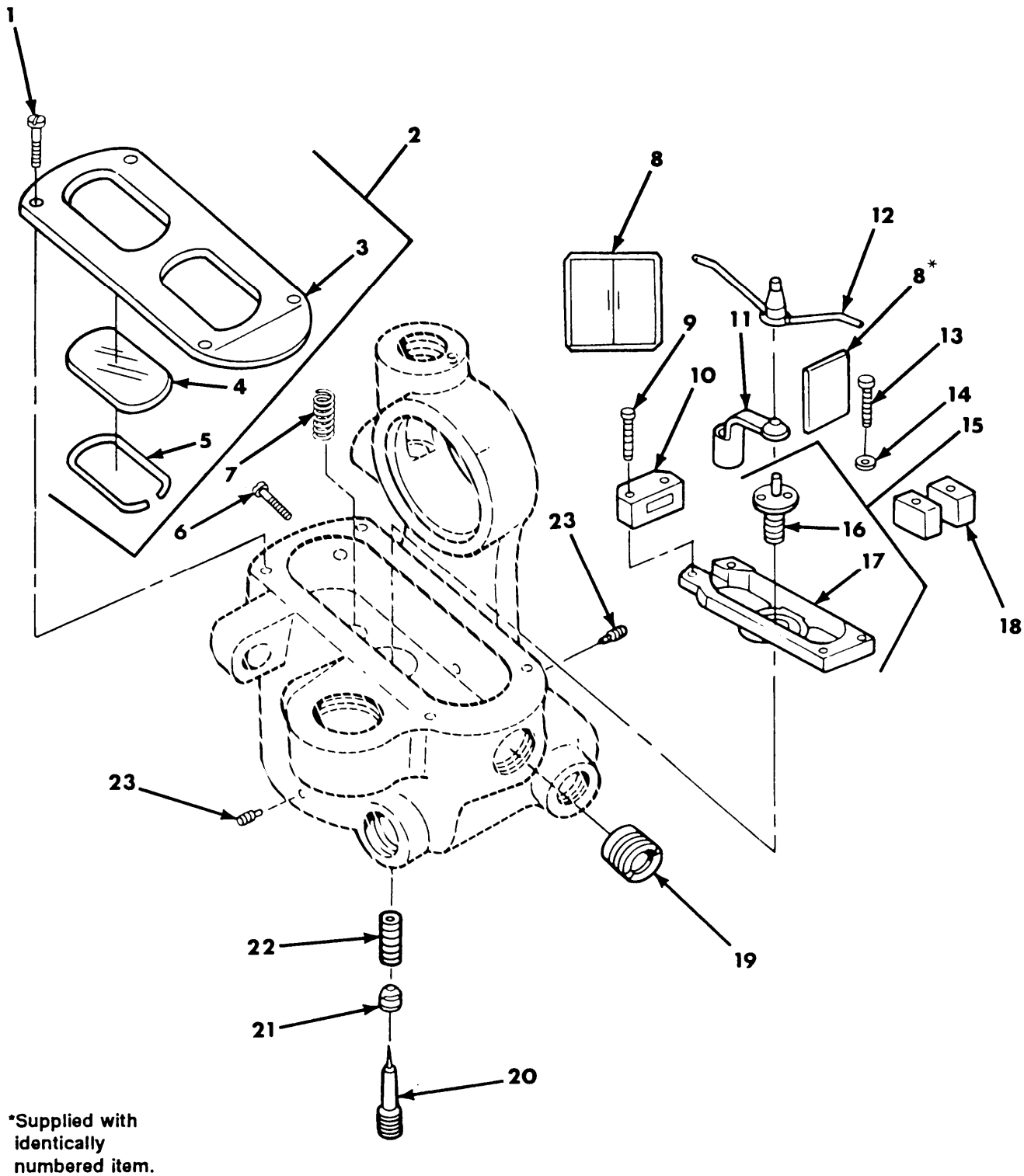


Figure C-8. Aiming Circle, M2A2 (Compass Parts) 11834483; Cover, Access 7596883; and Holder 7595146.

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES (UOC)	(6) QTY
				GROUP 01,0103,0104 FIG.C-8 AIMING CIRCLE,M2A2 (COMPASS PARTS) 11834483,COVER,ACCESS 7596883,AND HOLDER 7595146	
1	PAHZZ	96906	MS35199-5	SCREW,MACHINE	4
2	PAHHH	19200	7596883	COVER,ACCESS	1
3	XAHZZ	19200	7596884	..COVER	1
4	PAHZZ	19200	7596886	..WINDOW,OBSERVATION	2
5	PAHZZ	19200	7596885	..RING,RETAINING	2
6	PAOZZ	19200	8204922	SCREW, MACHINE	1
7	PAHZZ	19200	8211675	SPRING,HELICAL COMPRESSION	1
8	PAHZZ	19200	5039633	RETICLE,OPTICAL	1
9	PAHZZ	96906	MS35215-7	SCREW,MACHINE	2
10	PAHZZ	19200	8211686	DAMPER,OPTICAL CELL	1
11	PAHZZ	19200	8634461	PLUNGER ASSEMBLY	1
12	PAHZZ	19200	8213178	NEEDLE,COMPASS	1
13	PAHZZ	96906	MS35215-8	SCREW,MACHINE	2
14	PAHZZ	96906	MS15795-902	WASHER,FLAT	2
15	AHHHH	19200	7595146	HOLDER	1
16	PAHZZ	19200	8204917	..SCREW	1
17	PAHZZ	19200	8211703	..HOLDER, DAMPER	1
18	PAHZZ	19200	8211724	DAMPER,RETICLE	1
19	PAHZZ	19200	6135660	MAGNIFIER	1
20	PAHZZ	19200	8204919	SHAFT,SHOULDERED	1
21	PAHZZ	19200	8213734	SETSCREW	1
22	PAHZZ	19200	8205507	SLEEVE	1
23	PAHZZ	19200	10548080	SETSCREW	2
				END OF FIGURE	

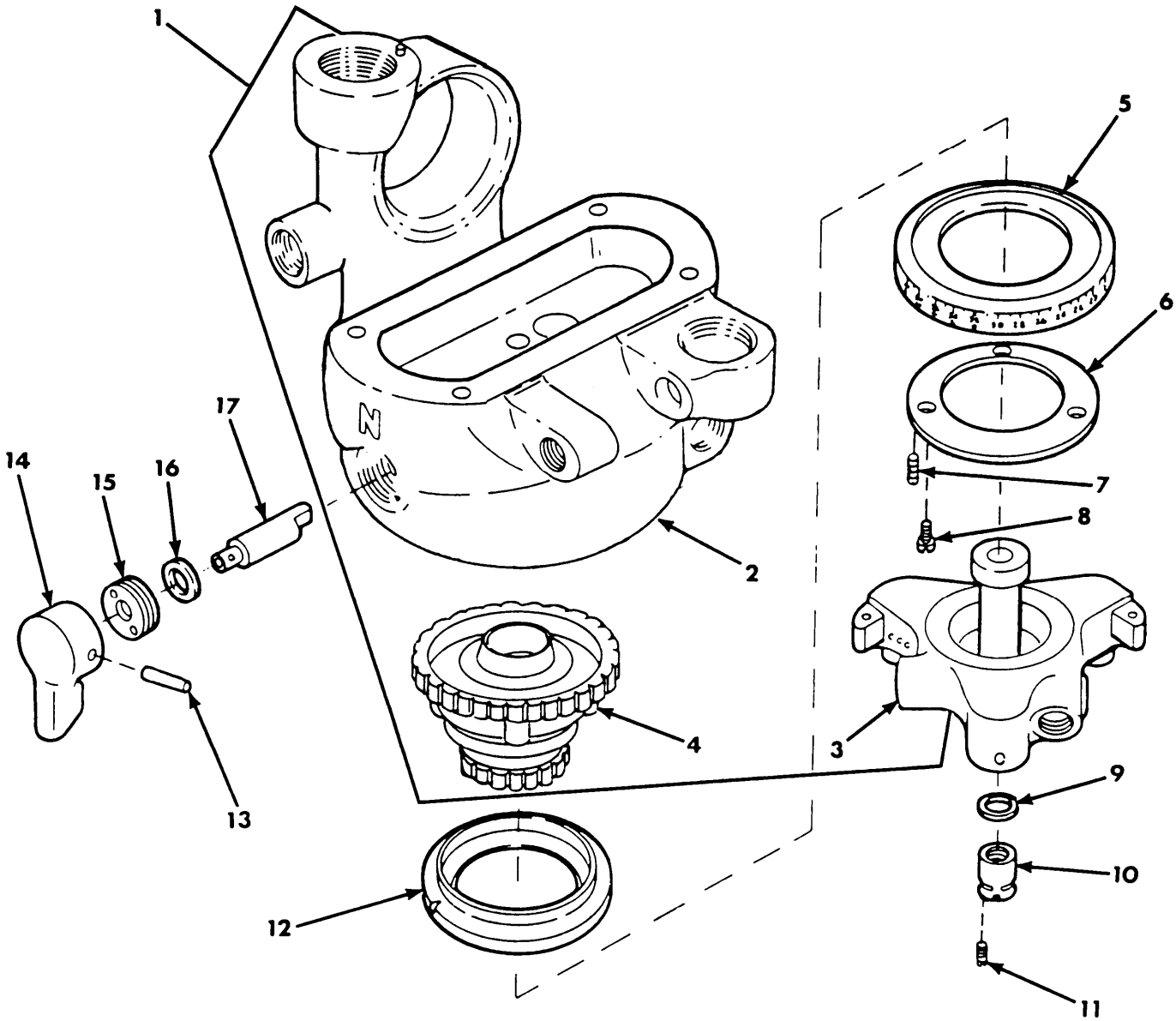


Figure C-9. Aiming Circle, M2A2 (Locking, Azimuth Gear, and Housing Parts) 11834483 and Body Assembly 8211717.

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUPS 01,0105	
				FIG.C-9 AIMING CIRCLE,M2A2 (LOCKING AZIMUTH GEAR AND HOUSING PARTS) 11834483 AND BODY ASSEMBLY 8211717	
1	XAHHH	19200	8211717	BODY ASSEMBLY	1
2	XAHZZ	19200	8211725	..HOUSING ASSEMBLY	1
3	XAHZZ	19200	8211712	..HOUSING	1
4	XAHZZ	19200	8211693	..WORM GEAR	1
5	PAHZZ	19200	8211691	DIAL,SCALE	1
6	PAHZZ	19200	8205509	RETAINER	1
7	PAHZZ	19200	8213735	SETSCREW	1
8	PAHZZ	96906	MS35214-15	SCREW,MACHINE	3
9	PAHZZ	19200	8211714	WASHER,FLAT	1
10	PAHZZ	19200	8205506	NUT,PLAIN,ROUND	1
11	PAHZZ	19200	8213736	SETSCREW	2
12	PAHZZ	19200	8205508	RETAINER,PACKING	1
13	PAHZZ	19200	8213732-2	PIN TAPER	1
14	PAHZZ	19200	8211664	LEVER,LOCK-RELEASE	1
15	PAHZZ	19200	8211694	RING,EXTERNALLY THREADED	1
16	PAHZZ	19200	8226965	PACKING,PREFORMED	1
17	PAHZZ	19200	8211673	SHAFT	1

END OF FIGURE

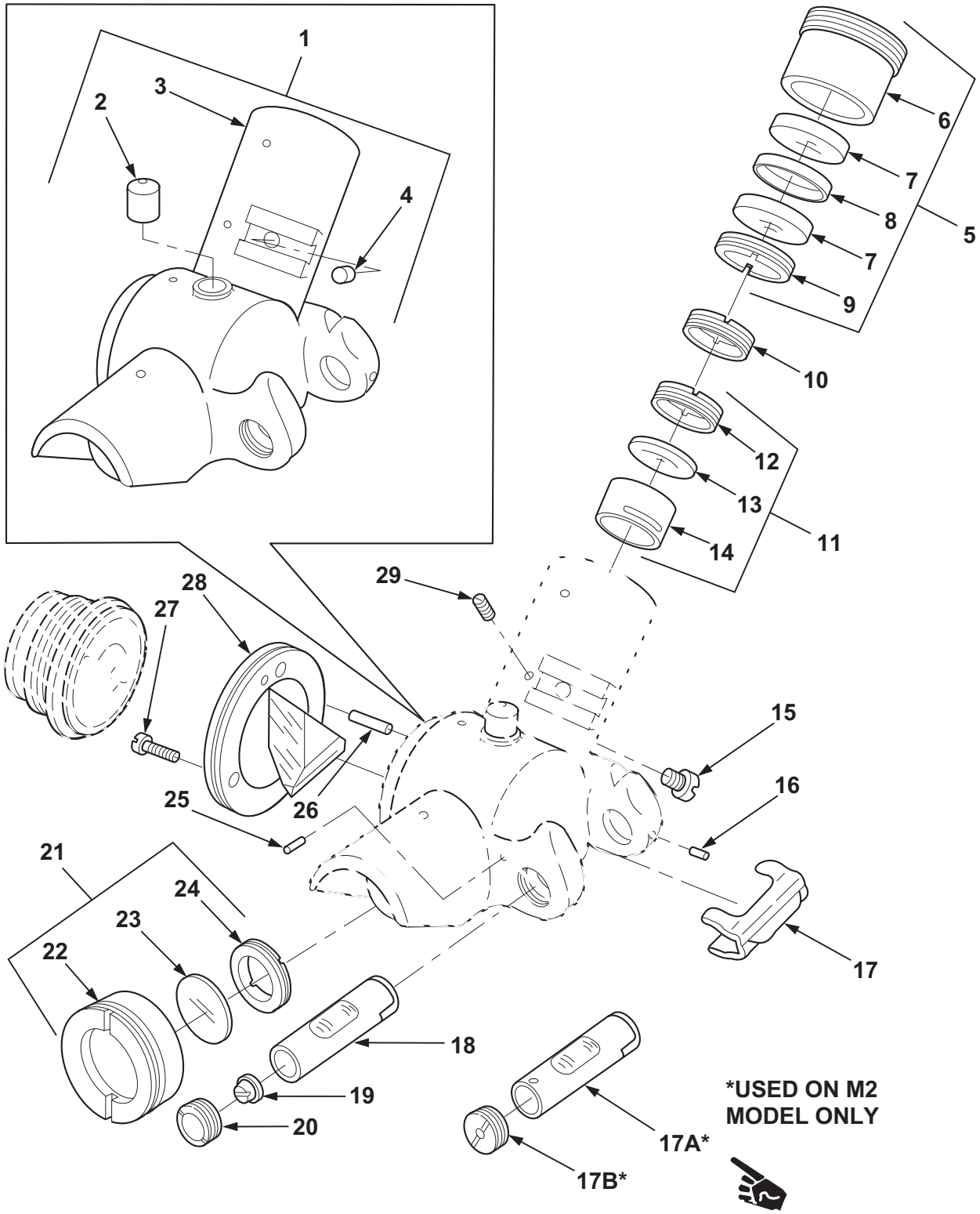


Figure C-10. Elbow Telescope 8211640; Eyepiece Assembly, Optical 8211641; Reticle Assembly 9362776; Cell Assembly, Optical 8211643; and Telescope Subassembly 8211647.

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUPS 0101,010101,010102,010103, 010104	
				FIG.C-10 TELESCOPE,ELBOW 8211640, EYEPIECE ASSEMBLY,OPTICAL 8211641,RETICLE ASSEMBLY 9362776,CELL ASSEMBLY, OPTICAL 8211643,AND TELESCOPE SUBASSEMBLY 8211647	
1	XAHHH	19200	8211647	TELESCOPE SUBASSEMB	1
2	PAHZZ	19200	8211663	..REFLECTOR	1
3	XAHZZ	19200	8211653	..BODY,TELESCOPE	1
4	PAHZZ	19200	8211655	..WINDOW,OPTICAL INSTRUMENT	1
5	AHHHH	19200	8211641	EYEPIECE ASSEMBLY, O	1
6	PAHZZ	19200	8211654	..CELL,OPTICAL ELEMENT	1
7	PAHZZ	19200	5037651	..LENS,OPTICAL INSTRUMENT	2
8	PAHZZ	19200	8211721	..SPACER,OPTICAL ELEMENT	1
9	PAHZZ	19200	8211722	..RING,EXTERNALLY THREADED	1
10	PAHZZ	19200	8211652	RING,EXTERNALLY THREADED	1
11	XAHHH	19200	9362776	RETICLE ASSEMBLY	1
12	PAHZZ	19200	8211701	..RING,EXTERNALLY THREADED	1
13	PAHZZ	19200	11785525	..RETICLE,OPTICAL INSTRUMENT	1
14	PAHZZ	19200	8245954	..CELL	1
15	PAOZZ	19200	8204922	SCREW,MACHINE	2
16	PAFZZ	19200	7647159-1	PIN,STRAIGHT,HEADLESS	1
17	PAFZZ	19200	8566629	COVER,LEVEL VIAL	1
*17A	PAFZZ	19200	8211662	VIAL,LEVEL (USED ON M2 ONLY)	1
*17B	PAFZZ	19200	8211659	PLUG (USED ON M2 ONLY)	1
18	PAFZZ	19200	11729650	VIAL,LEVEL	1
19	PAFZZ	19200	11729649	SEAT,ECCENTRIC	1
20	PAFZZ	19200	11729648	PLUG,MACHINE THREAD	1
21	AHHHH	19200	8211643	CELL ASSEMBLY,OPTIC	1
22	PAHZZ	19200	8211657	..CELL,OPTICAL ELEMENT	1
23	PAHZZ	19200	5036359	..LENS,OPTICAL INSTRUMENT	1
24	PAHZZ	19200	8211658	..RING,EXTERNALLY THREADED	1
25	PAFZZ	19200	7647159-4	PIN,STRAIGHT,HEADLESS	1
26	PAHZZ	96906	MS16555-618	PIN,STRAIGHT,HEADLESS	1
27	PAHZZ	21450	117585	SCREW,MACHINE	3
28	PAHZZ	19200	8211648	PRISM,OPTICAL INSTRUMENT	1
29	PAHZZ	19207	544354	SETSCREW	5

END OF FIGURE

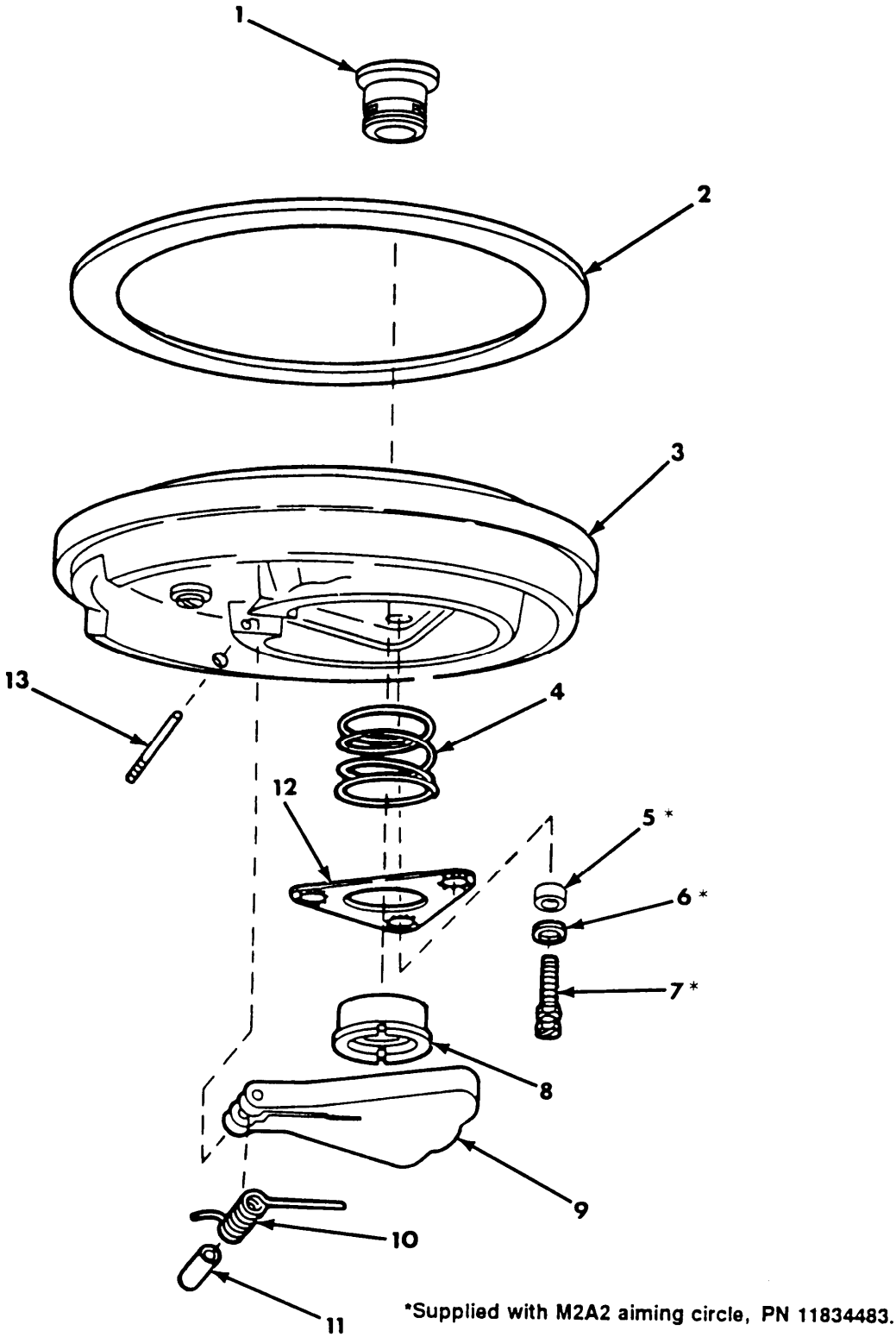


Figure C-11. Plate Base, Aiming Circle 8226976.

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES (UOC)	(6) QTY
				GROUP 0102 FIG.C-11 PLATE BASE,AIMING CIRCLE 8226976	
1	PAFZZ	19200	8204913	INSERT,SCREW THREAD	1
2	PAFZZ	19200	8211732	GASKET	1
3	PAFZZ	19200	7694522	PLATE,BASE	1
4	PAFZZ	19200	8226960	SPRING,HELICAL,COMPRESSION	1
5	PAFZZ	19200	8205471	GASKET	3
6	PAFZZ	19200	8226964	WASHER,FLAT	3
7	PAFZZ	19200	8213733	SCREW,SHOULDER	3
8	PAFZZ	19200	8226970	NUT,SLEEVE	1
9	PAFZZ	19200	8226968	COVER,AIMING CIRCLE	1
10	PAFZZ	19200	8226962	SPRING,HELICAL,TORSION	1
11	PAFZZ	19200	7693809	SPACER,SLEEVE	1
12	PAFZZ	19200	8226975	SPACER,PLATE	1
13	PAFZZ	19200	7681330	SETSCREW	1
				END OF FIGURE	

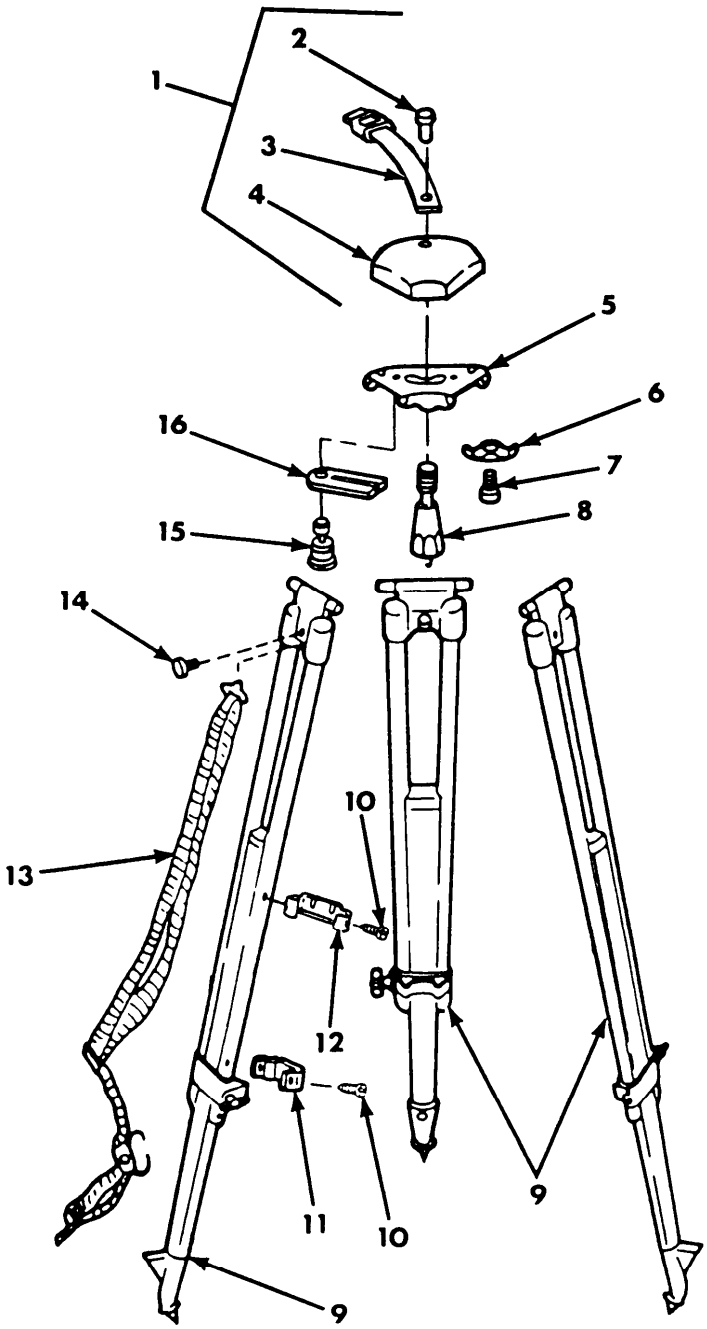
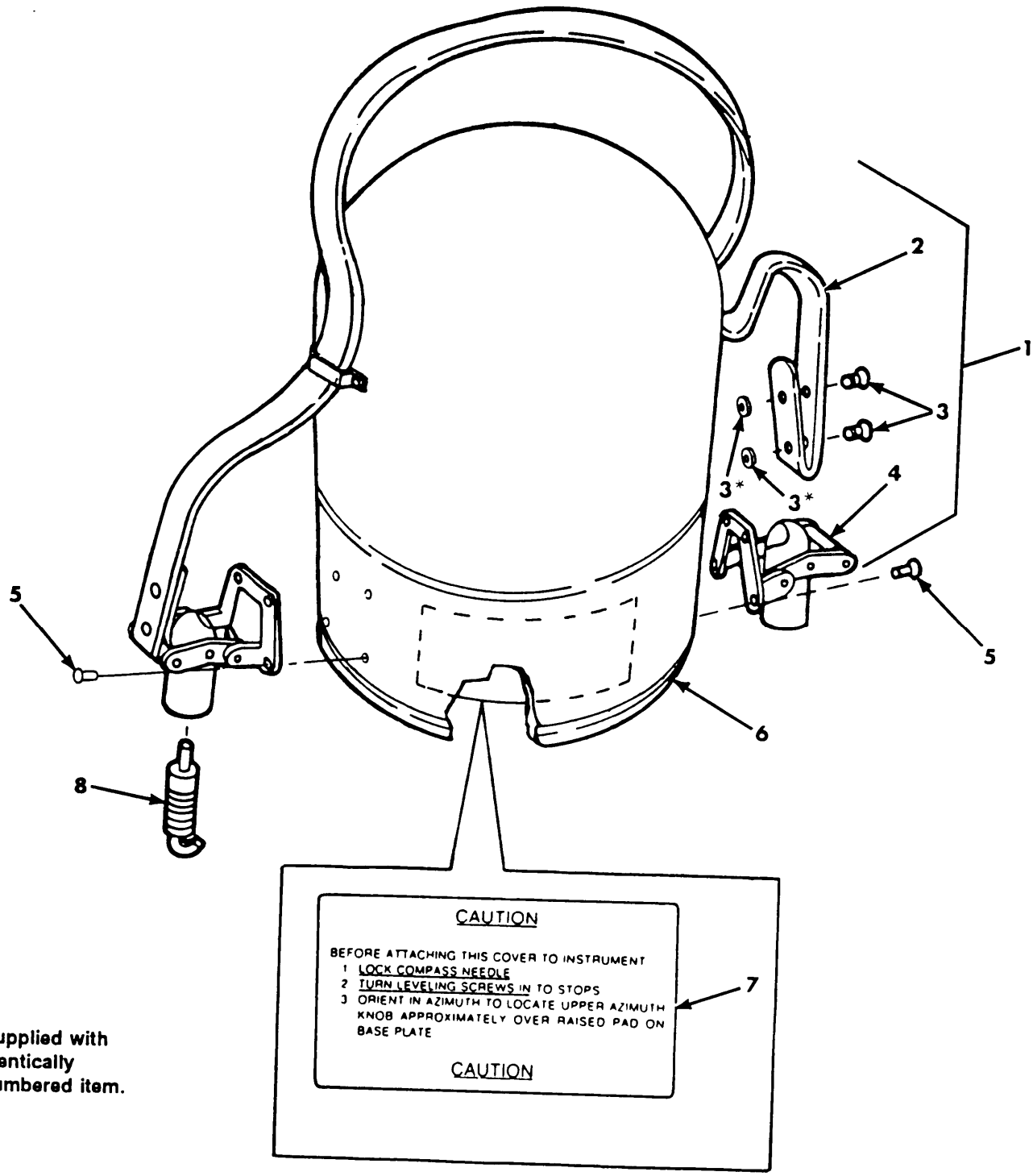


Figure C-12. Tripod, Aiming Circle, M24 8242777 and Cover Assembly 8216550.

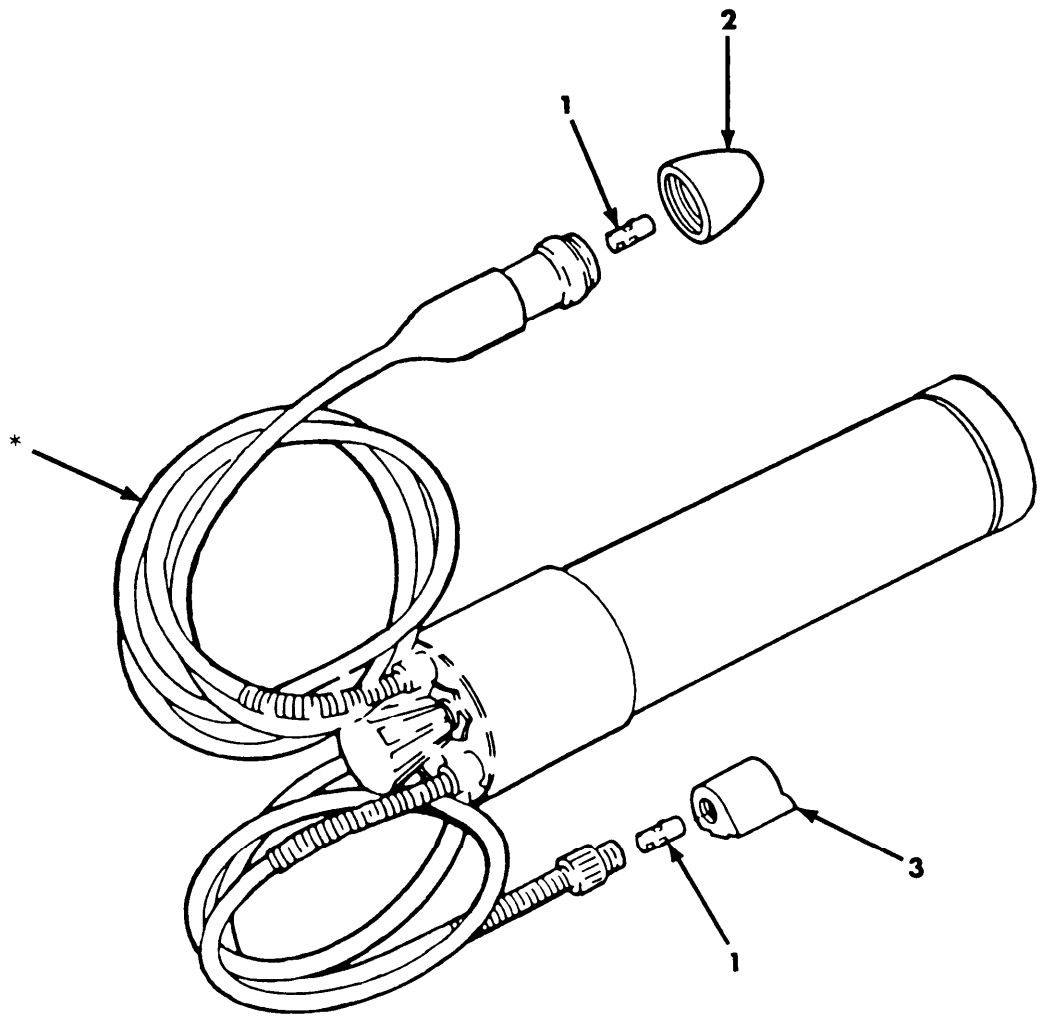
(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES (UOC)	(6) QTY
				GROUP 02,0201 FIG.C-12 TRIPOD,FIRE CONTROL AIMING CIRCLE 8242777 AND COVER ASSEMBLY 8216550	
1	AFFFF	19200	8216550	COVER ASSEMBLY	1
2	PAFZZ	96906	MS16535-162	..RIVET,TUBULAR	1
3	PAFZZ	19200	8216549	..STRAP,RETAINING	1
4	PAFZZ	19200	8242761	..COVER,ACCESS	1
5	XAFZZ	19200	8242755	HEAD	1
6	PAFZZ	19200	8261637	CLAMP,BRIDGE	3
7	PAFZZ	19200	8293482	SCREW,MACHINE	3
8	PAFZZ	19200	8242771	SCREW ASSY	1
9	PAFZZ	19200	8242776	LEG ASSY	3
10	PAFZZ	96906	MS16198-2	SCREW,WOOD	4
11	PAFZZ	19200	8211756	CLAMP	1
12	PAFZZ	19200	8211757	STRAP,RETAINING	1
13	PAFZZ	19200	8216551	STRAP ASSY	1
14	PAFZZ	19200	8293481	SCREW,MACHINE	3
15	PAFZZ	19200	8242768	SCREW,SHOULDER	1
16	PAFZZ	19200	8242764	SPACER,PLATE	1
				END OF FIGURE	



***Supplied with identically numbered item.**

Figure C-13. Cover Access 8211749 and Strap Assembly, Cover 8211748.

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES (UOC)	(6) QTY
				GROUPS 03,0301 FIG.C-13 COVER,ACCESS 8211749 AND STRAP,COVER ASSEMBLY 8211748	
1	AFFFF	19200	8211748	STRAP,COVER ASSEMBLY	1
2	PAFZZ	19200	7680234	..STRAP,WEBBING	1
3	PAFZZ	81349	MIL-E-20652/1	..EYELET,METALLIC AND WASHER, METALLIC	4
4	PAFZZ	19200	8211731	..LATCH ASSEMBLY,COVER	2
5	PAFZZ	96906	MS20470DD3-5	RIVET,SOLID	8
6	XAFZZ	19200	8211735	COVER	1
7	PAFZZ	19200	8211711	DECAL	1
8	PAFZZ	19200	7694553	CATCH	2
				END OF FIGURE	



***No further disassembly authorized.**

Figure C-14. Light, Instrument, M51 8293478.

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES (UOC)	(6) QTY
				GROUP 04 FIG.C-14 LIGHT,INSTRUMENT,M51 8293478	
1	PAOZZ	96906	MS51608-3	LAMP,INCANDESCENT	2
2	PAOZZ	19200	5179387	CAP,ELECTRICAL	1
3	PAOZZ	19200	8211760	BRACKET,MOUNTING	1
				END OF FIGURE	

APPENDIX D

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

D-1. SCOPE.

This appendix lists expendable/durable supplies and materials you will need to operate and maintain the M2A2 aiming circle. This listing is for informational purposes only, and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970. Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

D-2. EXPLANATION OF COLUMNS.

a. Column 1—Item Number. This number is assigned to the entry in the listing for referencing when required.

b. Column 2—Level. This column identifies the lowest level of maintenance that requires the listed item.

O—Unit Maintenance
F—Direct Support Maintenance
H—General Support Maintenance

c. Column 3—National Stock Number (NSN). This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column 4—Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Commercial and Government Entity Code (CAGEC) in parentheses followed by the part number.

e. Column 5—Unit of Measure (U/M)/Unit of Issue (U/I). This measure is expressed by a two-character alphabetical abbreviation (e.g., EA, IN, PR). If the unit of measure differs from the unit of issue as shown in the Army Master Data File (AMDF), requisition the lowest unit of issue that will satisfy your requirements.

SECTION II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M/ U/I
1	H	8040-00-290-4301	ADHESIVE: SYNTHETIC RUBBER, OIL RESISTANT CLASS A (81349) MIL-A-5092A	QT
2	H	6810-00-201-0907	ALCOHOL: DENATURED GRADE III (81348) OE 760 5 GAL. CAN	GL
3	O	7920-00-205-0565	BRUSH: DUSTING LENS (81348) H-B-1654	EA
4	O	6850-00-392-9751	CLEANING COMPOUND,OPTICAL LENS: (81349) MIL-C-43454 2 OZ BTL	OZ
5	H	6850-00-597-9765	CLEANING COMPOUND: (81349) MIL-S-18718 1 GAL.	GL
6	H	9150-00-985-7247	GREASE,AIRCRAFT AND INSTRUMENT: (81349) MIL-G-23827 5 LB CAN	CN
7	O	6640-00-436-5000	PAPER,LENS (81349) NNN-P-40 1 REAM	PG
8	H	8030-00-878-9520	SEALING COMPOUND: TYPE 1 (81349) MIL-S-11030 1 PT	PT

APPENDIX E

ILLUSTRATED LIST OF MANUFACTURED ITEMS

E-1. INTRODUCTION

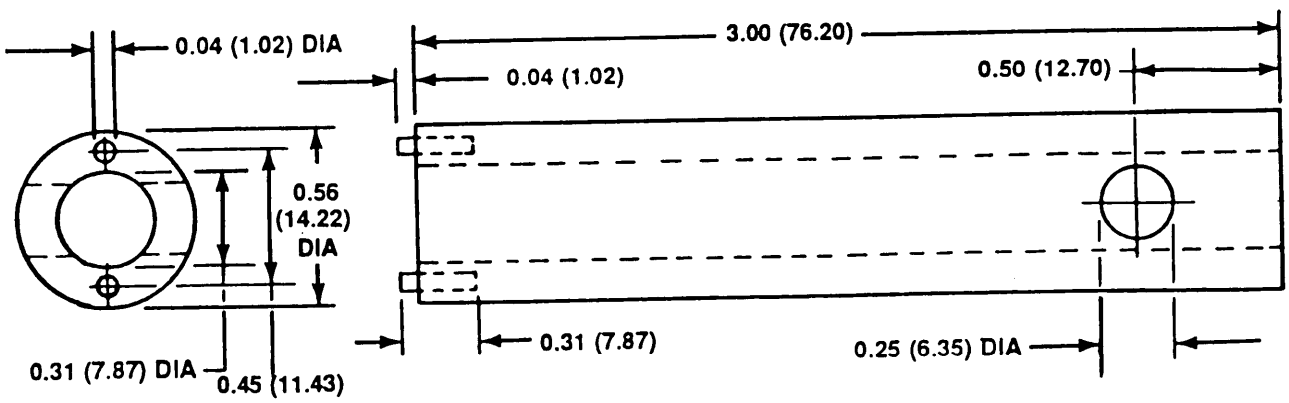
a. This appendix includes complete instructions for making items authorized to be manufactured or fabricated at general support maintenance level.

b. A part number index in alphanumeric order is provided for cross-referencing the part number of the item to be manufactured to the figure which covers fabrication criteria.

c. All bulk materials needed for manufacture of an item are listed by part number or specification number in a tabular list on the illustration.

E-2. MANUFACTURED ITEMS PART NUMBER INDEX

E-3. MANUFACTURED ITEMS ILLUSTRATIONS.

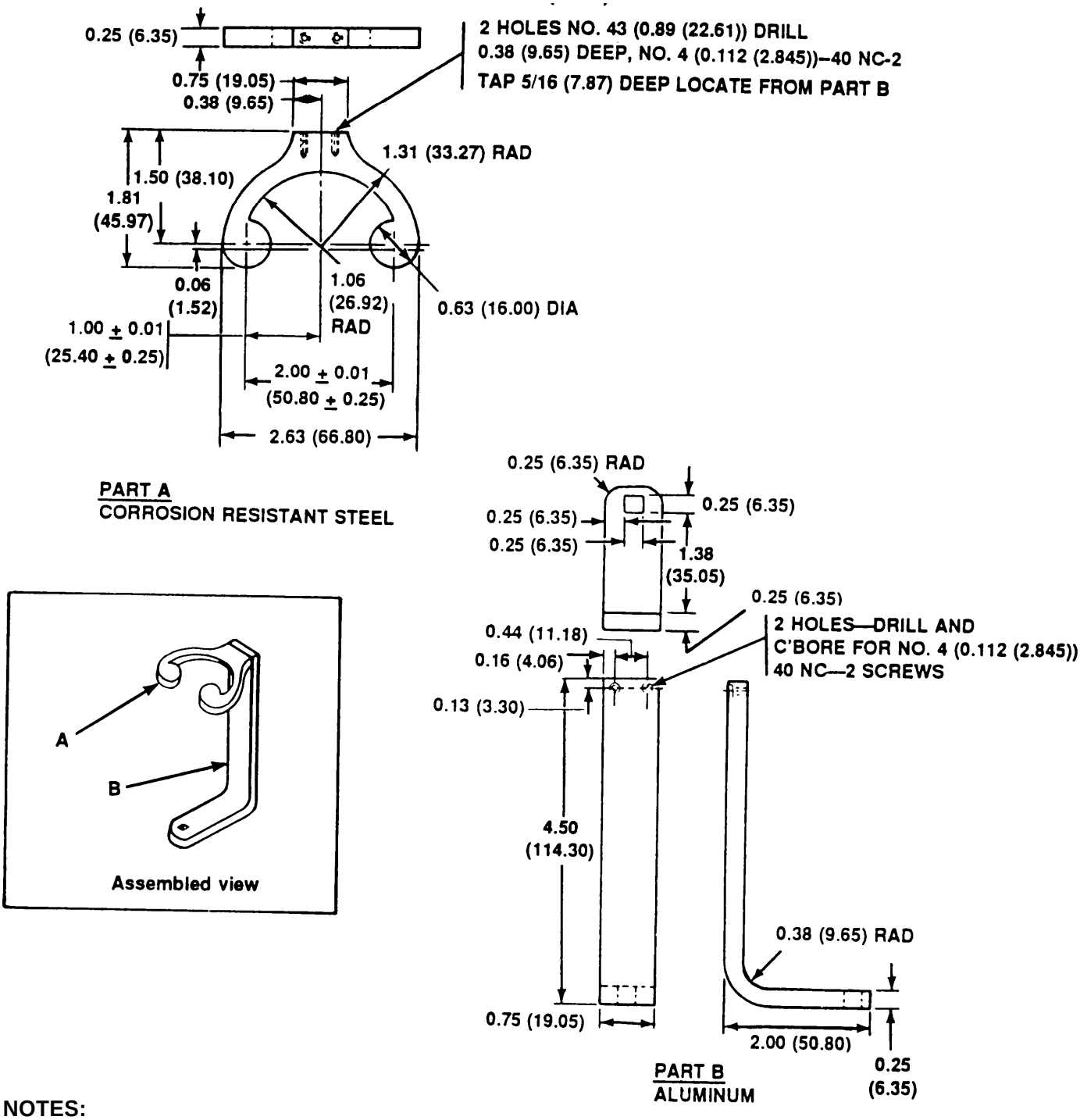


NOTES:

1. FABRICATE FROM MILD STEEL DRILL ROD.
2. ALL DIMENSIONS ARE IN INCHES WITH METRIC CONVERSION TO MILLIMETERS IN PARENTHESES.

Figure E-1. Pinned Tubular Wrench 9333797.

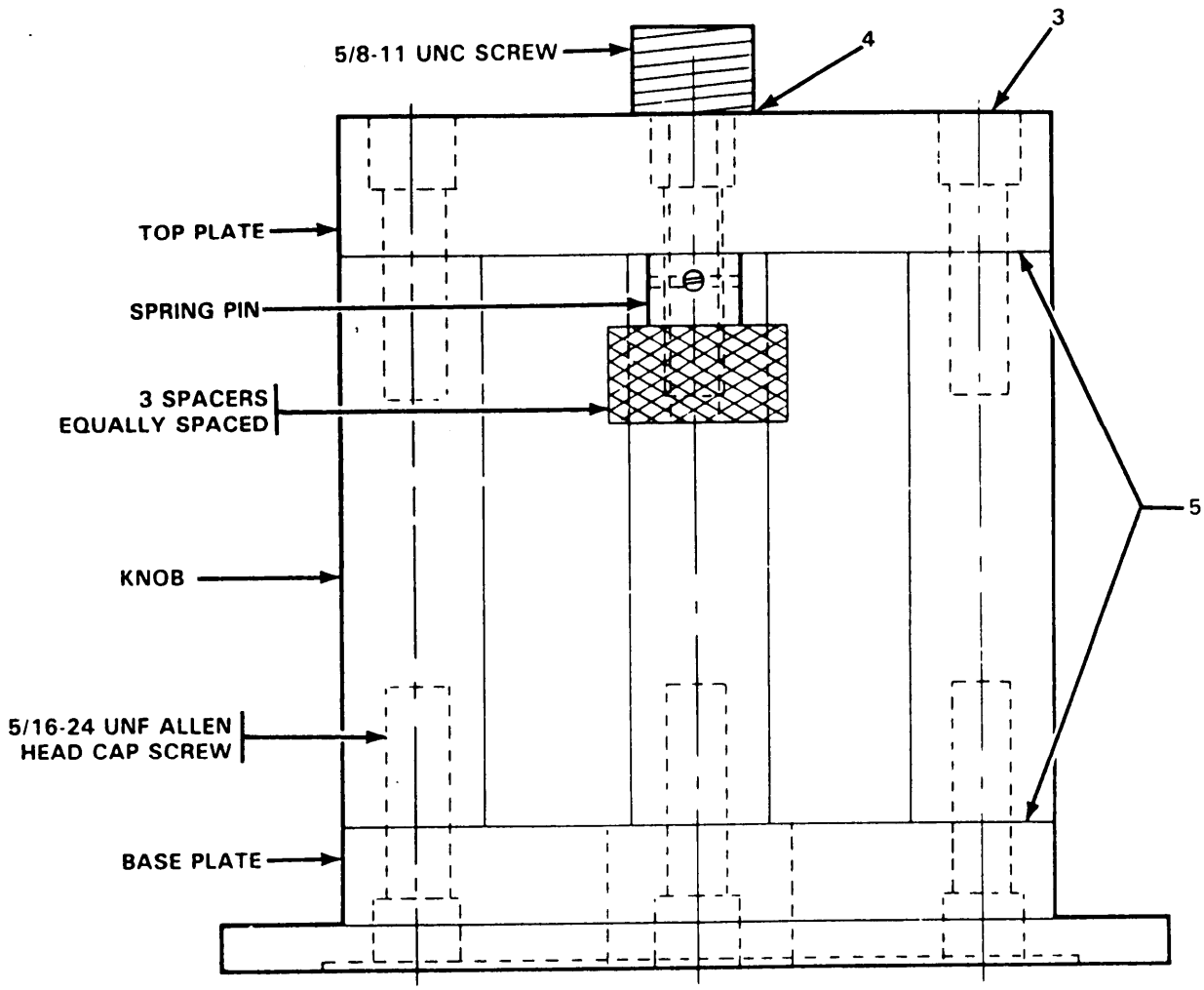
E-3. MANUFACTURED ITEMS ILLUSTRATIONS (cont).



NOTES:

1. FABRICATE FROM: PART A - CORROSION RESISTANT STEEL
   PART B - ALUMINUM
2. ALL DIMENSIONS ARE IN INCHES WITH METRIC CONVERSION TO MILLIMETERS IN PARENTHESES.

Figure E-2. Torque Wrench Adapter 9333796.



NOTES

1. FABRICATE FROM MILD STEEL.
2. ALL DIMENSIONS ARE IN INCHES WITH METRIC CONVERSION TO MILLIMETERS IN PARENTHESES.
3. DIMENSION TOLERANCES:
   DECIMALS ± 0.005
   FRACTIONS ± 1/64
4. GRIND TOP PLATE PARALLEL TO BASE PLATE AFTER ASSEMBLY.
5. USE 0.010 SHIM FOR CLEARANCE BETWEEN SCREW AND TOP PLATE WHEN TIGHTENING SETSCREW IN KNOB. THEN DRILL HOLE THROUGH KNOB AND SCREW SHAFT FOR 1/16-IN. DIA X 1/2-IN. LONG SPRING PIN. INSTALL SPRING PIN.
6. GRIND TO AID IN ASSEMBLY.

Figure E-3. Azimuth Test Fixture Adapter 9333800 (1 of 5).

E-3. MANUFACTURED ITEMS ILLUSTRATIONS (cont).

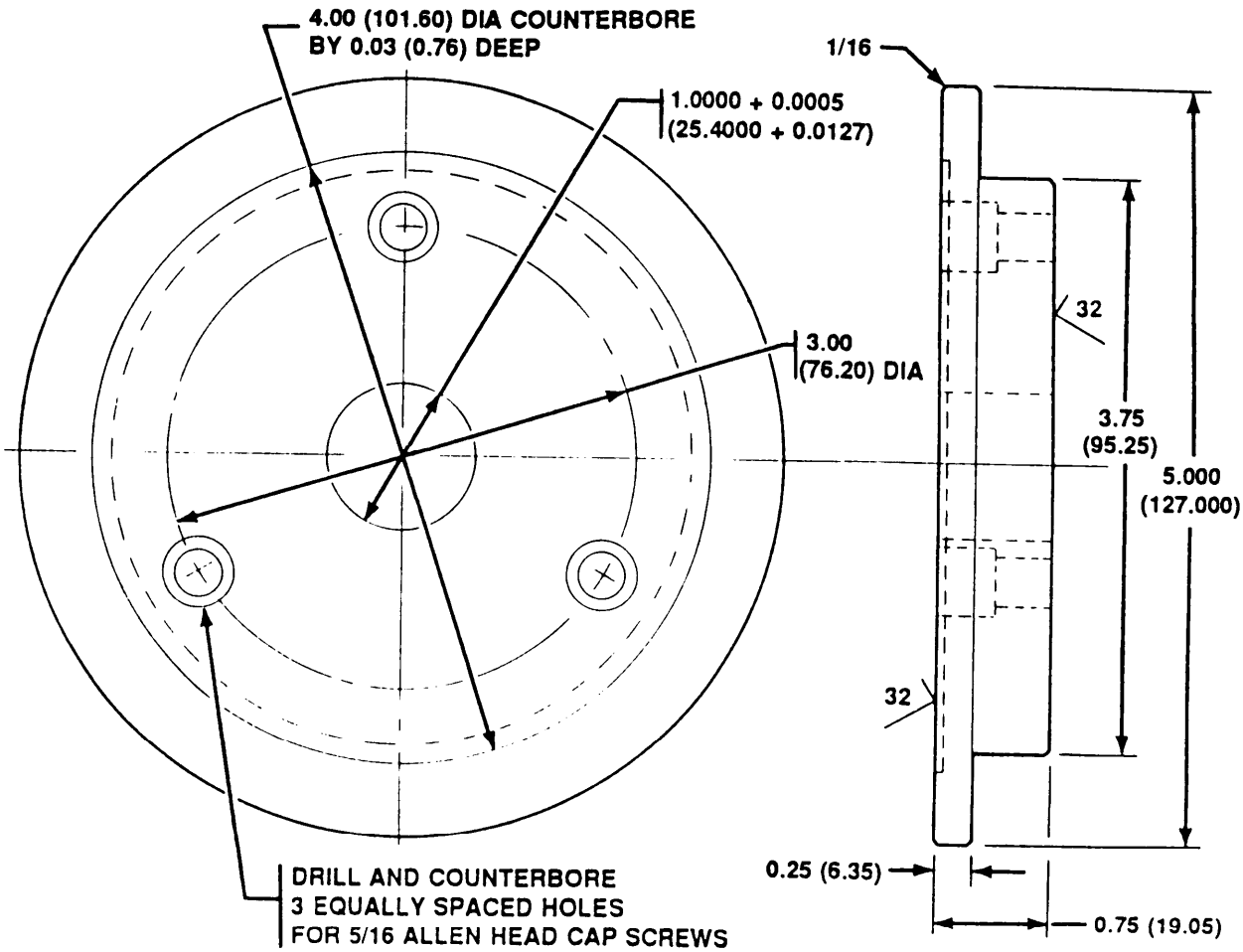


Figure E-3. Azimuth Test Fixture Adapter 9333800 (2 of 5).

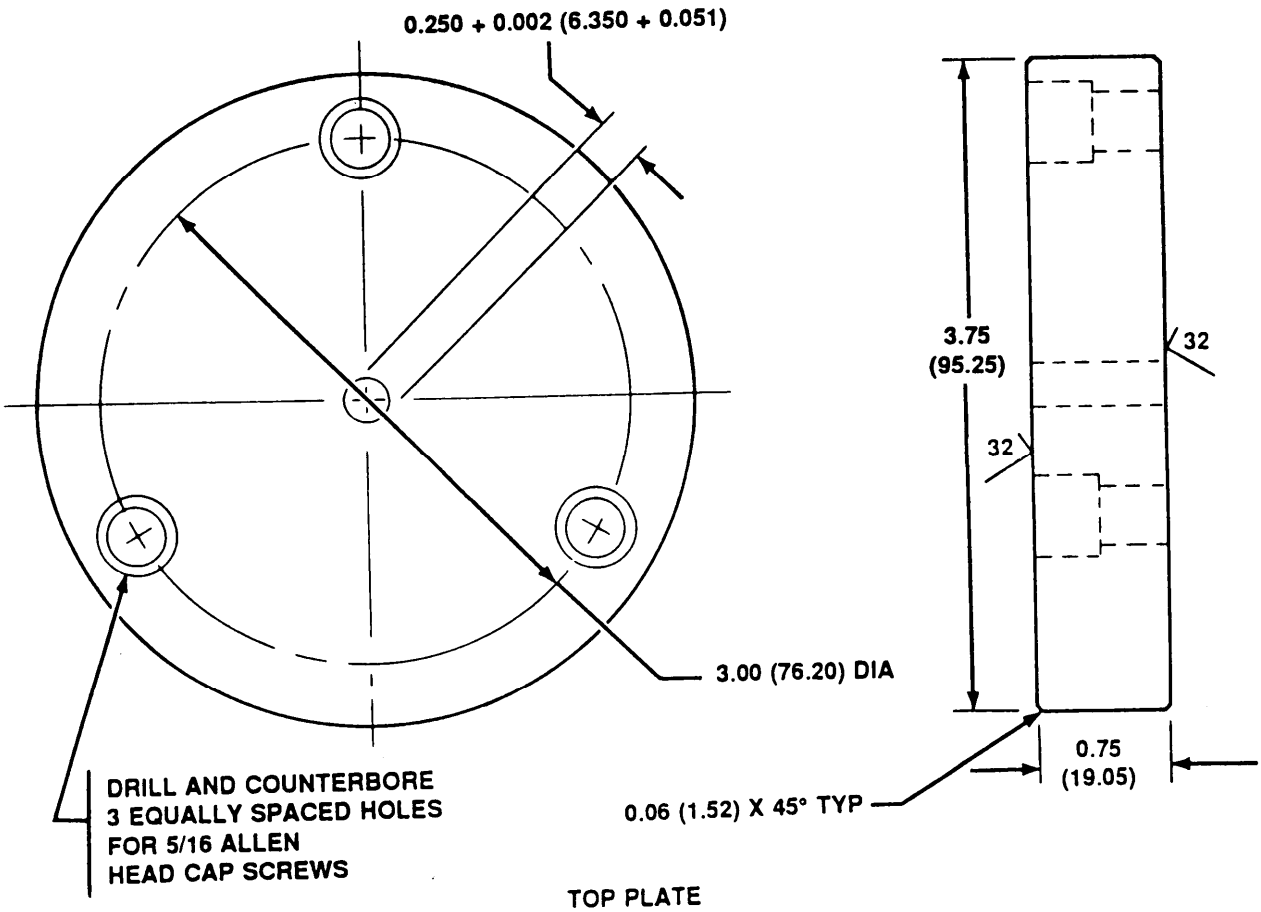


Figure E-3. Azimuth Test Fixture Adapter 9333800 (3 of 5).

E-3. MANUFACTURED ITEMS ILLUSTRATIONS (cont).

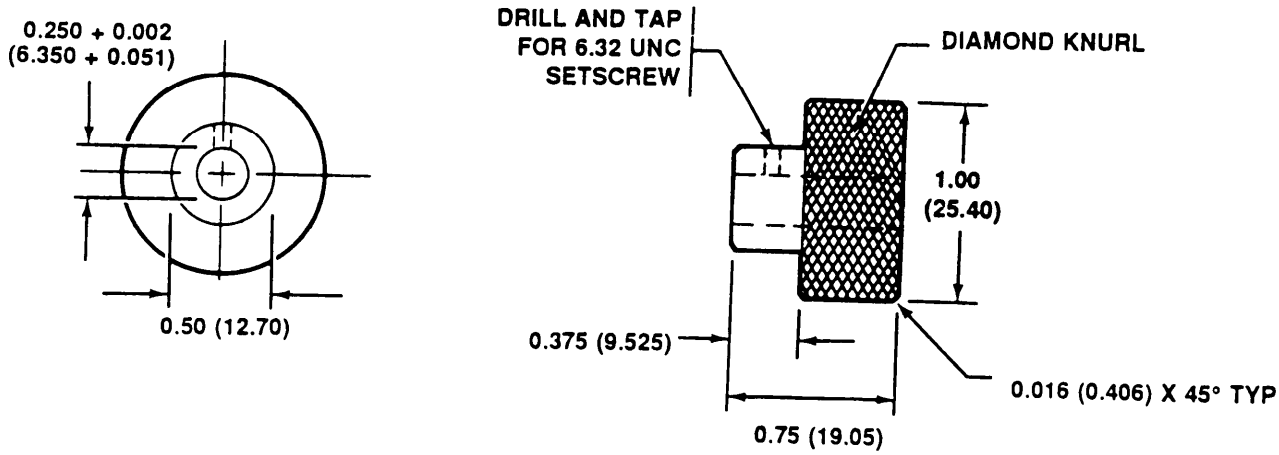


Figure E-3. Azimuth Test Fixture Adapter 9333800 (4 of 5).

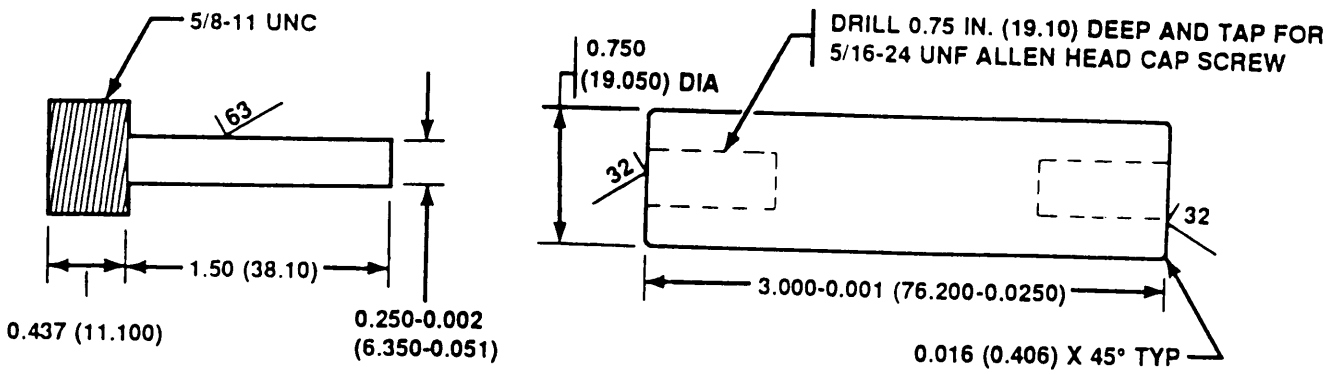
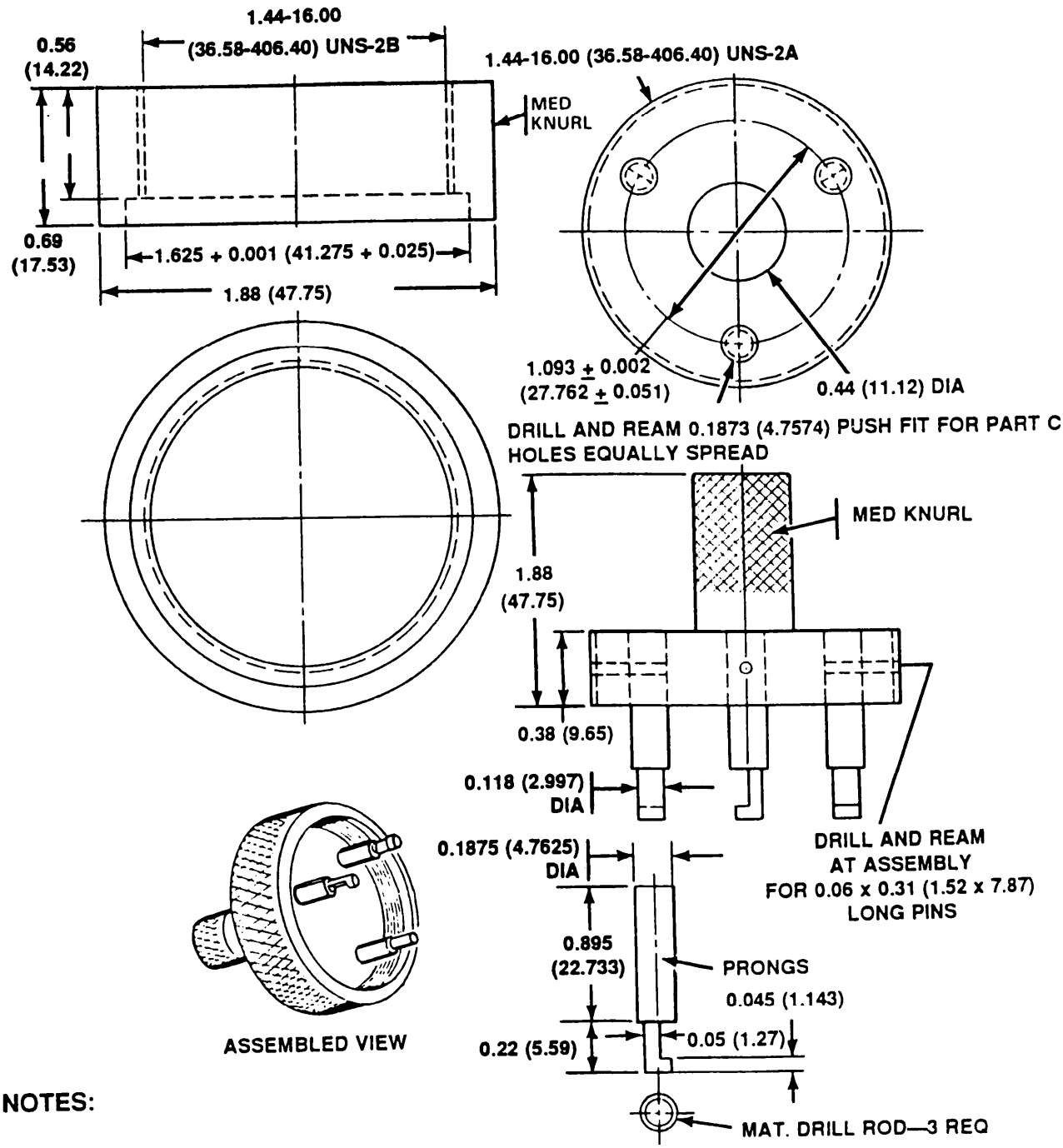


Figure E-3. Azimuth Test Fixture Adapter 9333800 (5 of 5).



NOTES:

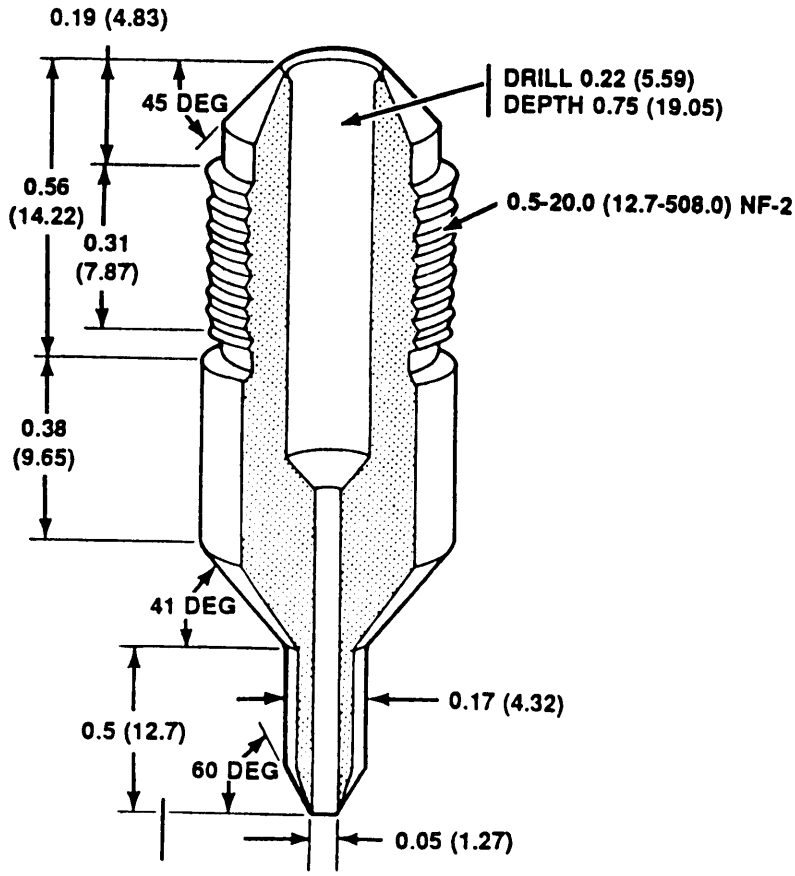
1. FABRICATE FROM:
   PARTS A & B - ALUMINUM.
   PART C - DRILL ROD.

2. ALL DIMENSIONS SHOWN ARE IN INCHES WITH METRIC CONVERSION TO MILLIMETERS IN PARENTHESES.

3. PART NO. 9333795

Figure E-4. Prism Shelf Remover 9333795.

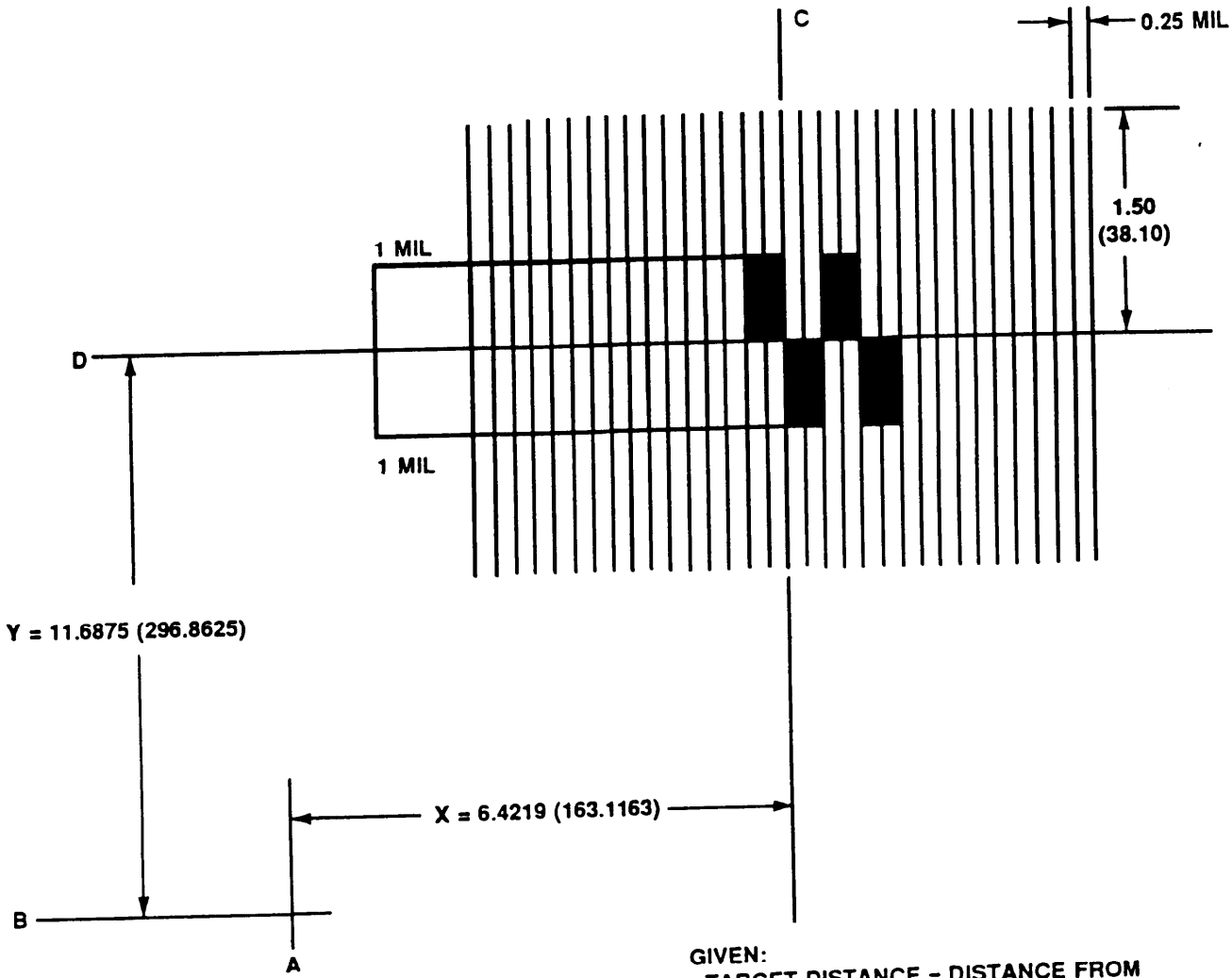
E-3. MANUFACTURED ITEMS ILLUSTRATIONS (cont).



NOTES:

1. FABRICATE FROM 1/2-IN. DIA STOCK, STAINLESS STEEL.
2. ALL DIMENSIONS SHOWN ARE IN INCHES WITH METRIC CONVERSION TO MILLIMETERS IN PARENTHESES.

Figure E-5. Grease Gun Injection Adapter 11785096.



NOTES:

1. USE ANY SUITABLE MATERIAL.
2. ALL DIMENSIONS SHOWN ARE IN INCHES WITH METRIC CONVERSION TO MILLIMETERS IN PARENTHESES, EXCEPT THOSE MARKED MIL.
3. OUTSIDE DIMENSIONS OF TARGET ARE 15.00 INCHES WIDE X 18.00 INCHES HIGH.

Figure E-6. Test Target

E-3. MANUFACTURED ITEMS ILLUSTRATIONS (cont).

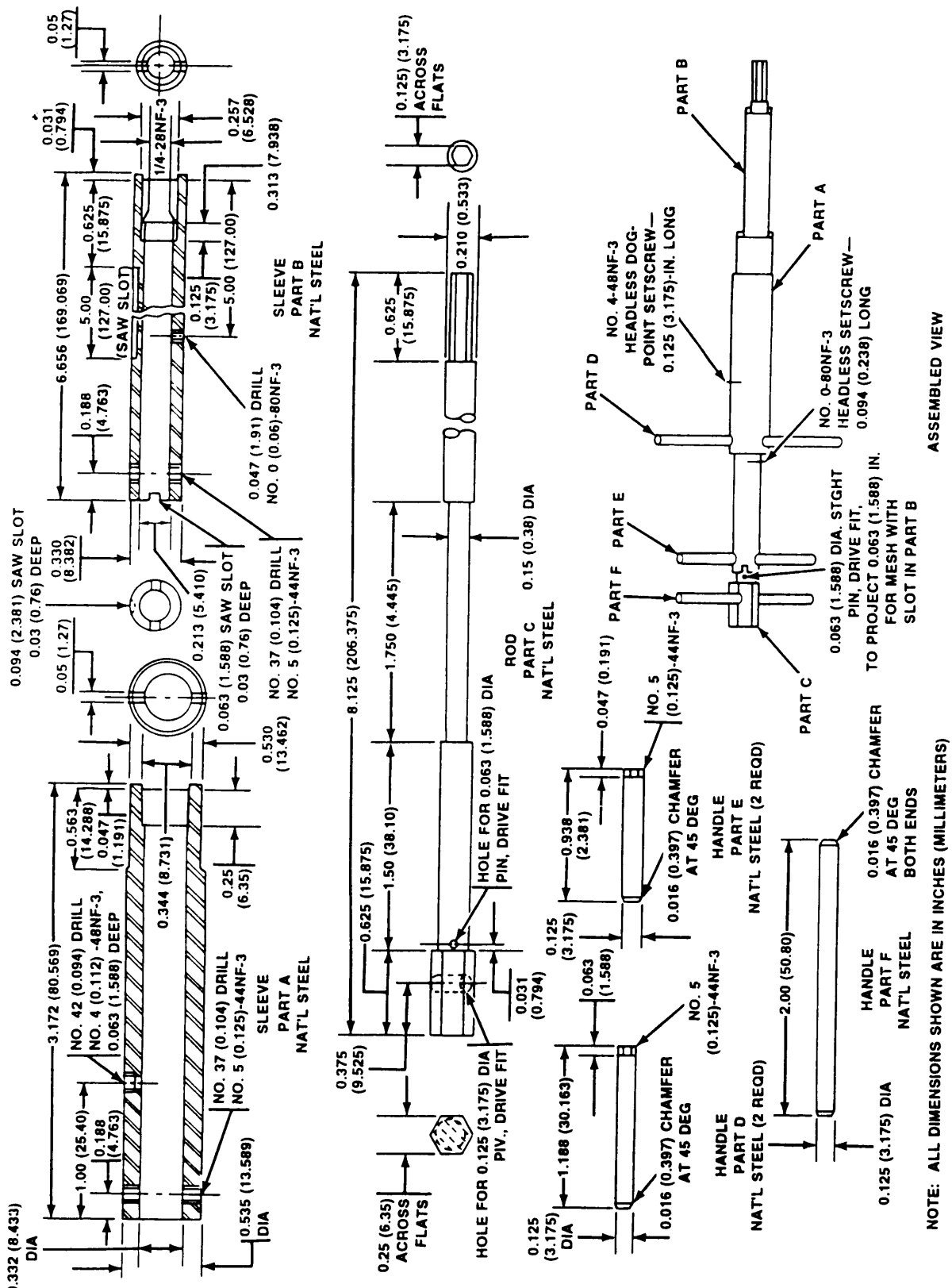


Figure E-7. Pivot Wrench 933798.

CROSS-REFERENCE INDEXES

NATIONAL STOCK NUMBER INDEX

STOCK NUMBER	FIG.	ITEM
5310-00-022-1117	C-7	3
5310-00-045-5201	C-8	14
5305-00-057-9584	C-8	1
5305-00-058-3976	C-3	12
	C-4	11
	C-5	15
	C-6	7
5305-00-058-3977	C-6	4
5305-00-058-3979	C-3	7
5305-00-074-8950	C-9	11
5305-00-074-8951	C-8	21
5315-00-074-8954	C-3	19
5305-00-075-4858	C-8	6
	C-10	15
5315-00-076-6003	C-3	20
	C-4	15
	C-9	13
1290-00-113-9687	C-12	6
1240-00-114-1091	C-6	9
	C-10	17
1290-00-155-8312	C-2	2
6650-00-155-8331	C-2	1
1240-00-157-0762	C-3	18
1290-00-167-8364	C-3	17
1290-00-167-8367	C-11	9
5355-00-173-6991	C-5	3
5305-00-173-6992	C-3	16
	C-9	7
5340-00-180-6962	C-13	2
5305-00-207-7463	C-9	8
5310-00-221-9777	C-3	4
	C-5	5
5310-00-240-0046	C-4	5
6650-00-346-8152	C-10	28
1240-00-346-8154	C-10	6
1240-00-346-8155	C-10	22
1290-00-346-8156	C-10	2
5340-00-346-8157	C-9	14
3040-00-346-8158	C-9	17
1290-00-346-8160	C-6	3
5355-00-346-8165	C-4	3
1290-00-346-8168	C-5	9
3040-00-346-8170	C-5	10
5340-00-346-8171	C-1	3
1290-00-346-8175	C-12	11
5340-00-346-8176	C-12	12
5340-00-346-8178	C-14	3
5340-00-346-8180	C-12	3
1290-00-346-8181	C-12	13
1290-00-346-8182	C-6	5
1290-00-346-8183	C-12	9
1290-00-346-8184	C-1	2
6695-00-346-8186	C-1	4
5305-00-419-9560	C-11	7
6650-00-503-6359	C-10	23
6650-00-503-7651	C-10	7
6650-00-503-9633	C-8	8
5355-00-505-5476	C-4	2
5340-00-513-2177	C-6	9B
	C-10	17B
5365-00-513-2178	C-3	9
	C-4	9
5310-00-514-9111	C-3	2
5999-00-517-9387	C-14	2
5365-00-527-5485	C-6	2
5305-00-531-0937	C-5	13
5305-00-546-6336	C-12	8
3040-00-546-9721	C-5	7
1290-00-546-9723	C-4	12
1290-00-547-4613	C-6	9A
	C-10	17A
5365-00-589-4120	C-8	5
5305-00-591-9317	C-10	29
5365-00-597-2511	C-3	3
	C-5	4
5365-00-597-2533	C-9	15
5330-00-599-8755	C-9	16
5320-00-602-6974	C-13	5
6650-00-613-5660	C-8	19
5305-00-629-9867	C-8	16
5340-00-629-9868	C-11	1
3040-00-629-9869	C-8	20
6240-00-635-9800	C-14	1
5330-00-641-3470	C-11	2
5365-00-663-0707	C-10	9
5310-00-663-4696	C-9	9
5360-00-664-4637	C-3	10
	C-4	8
	C-5	12
5360-00-664-4638	C-8	7
5365-00-664-4683	C-10	10
5365-00-664-4736	C-10	24
1290-00-692-1514	C-4	13
1290-00-692-1515	C-3	5
	C-5	6
1290-00-692-1516	C-3	15
	C-4	14
	C-5	8
5365-00-692-1518	C-6	1
5360-00-692-1519	C-11	10

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STOCK NUMBER	FIG.	ITEM
5315-00-702-9651	C-10	26
7690-00-727-4634	C-13	7
5355-00-754-4118	C-8	12
9340-00-830-1633	C-8	4
3120-00-836-9424	C-3	11
5305-00-836-9426	C-3	8
	C-4	10
	C-5	14
5330-00-838-5301	C-11	5
3120-00-840-5870	C-4	7
	C-5	11
5305-00-865-8651	C-12	10
1290-00-873-1915	C-13	8
1290-00-886-3035	C-8	11
5310-00-895-6490	C-9	10
5340-00-895-6491	C-8	22
1290-00-904-9375	C-3	21
	C-4	4
5305-00-905-4598	C-11	13
5315-00-926-1853	C-5	2
5320-00-928-2763	C-12	2
5315-00-943-2156	C-6	8
	C-10	16
5315-00-946-4678	C-5	1
5305-00-954-8110	C-7	4
5305-00-954-8116	C-8	9
5305-00-984-8248	C-3	1
	C-4	1
5355-00-995-1988	C-6	6
1290-01-011-3329	C-6	11
	C-10	18
5365-01-011-3330	C-6	13
	C-10	20
5310-01-016-7543	C-11	6
5325-01-016-7912	C-13	3
5305-01-068-8786	C-12	7
5340-01-069-4542	C-8	2
1260-01-069-6667	C-3	14
9905-01-070-3398	C-7	2
5355-01-071-4644	C-3	23
5355-01-076-3235	C-3	22
3040-01-080-6048	C-3	6
1240-01-081-5346	C-10	4
9905-01-081-9029	C-7	1
5340-01-082-7977	C-3	13
5365-01-082-7978	C-9	6
5355-01-082-7979	C-9	5
5365-01-082-7980	C-11	12
1290-01-082-7981	C-6	12
	C-10	19
5305-01-084-7049	C-8	13
5310-01-084-7066	C-11	8
5330-01-084-7073	C-9	12
5305-01-085-3220	C-10	27
5360-01-086-5350	C-11	4
5315-01-088-8676	C-6	10
	C-10	25
5365-01-092-5845	C-11	11
5355-01-092-6549	C-4	6
5305-01-092-7833	C-12	14
5305-01-106-3255	C-12	15
5340-01-106-3282	C-12	4
1290-01-107-2046	C-8	18
1290-01-107-2047	C-8	10
1290-01-107-2048	C-8	17
1290-01-107-2049	C-11	3
6650-01-107-7552	C-10	14
5365-01-127-9617	C-12	16
1290-01-128-5861	C-13	4
1240-01-132-0737	C-10	8
6650-01-152-8516	C-10	13
5365-01-254-4812	C-10	12
5305-01-374-0384	C-8	23

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CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
81349	MIL-E-20652/1	5325-01-016-7912	C-13	3
96906	MS15795-902	5310-00-045-5201	C-8	14
96906	MS16198-2	5305-00-865-8651	C-12	10
96906	MS16535-162	5320-00-928-2763	C-12	2
96906	MS16555-618	5315-00-702-9651	C-10	26
96906	MS20470DD3-5	5320-00-602-6974	C-13	5
96906	MS35199-5	5305-00-057-9584	C-8	1
96906	MS35214-15	5305-00-207-7463	C-9	8
96906	MS35215-1	5305-00-954-8110	C-7	4
96906	MS35215-7	5305-00-954-8116	C-8	9
96906	MS35215-8	5305-01-084-7049	C-8	13
96906	MS35273-15	5305-00-984-8248	C-3	1
			C-4	1
96906	MS35333-103	5310-00-022-1117	C-7	3
96906	MS51033-218	5305-00-058-3976	C-3	12
			C-4	11
			C-5	15
			C-6	7
96906	MS51033-219	5305-00-058-3977	C-6	4
96906	MS51033-221	5305-00-058-3979	C-3	7
96906	MS51608-3	6240-00-635-9800	C-14	1
19200	10548080	5305-01-374-0384	C-8	23
19200	10554737	1260-01-069-6667	C-3	14
19200	10554738	5355-01-071-4644	C-3	23
19200	11729648	5365-01-011-3330	C-6	13
			C-10	20
19200	11729649	1290-01-082-7981	C-6	12
			C-10	19
19200	11729650	1290-01-011-3329	C-6	11
			C-10	18
19200	11748292	9905-01-081-9029	C-7	1
21450	117585	5305-01-085-3220	C-10	27
19200	11785525	6650-01-152-8516	C-10	13
19200	11834483		C-1	1
19200	11834484	5355-01-076-3235	C-3	22
19200	11834485	9905-01-070-3398	C-7	2
19200	11835091	3040-01-080-6048	C-3	6
19200	5036359	6650-00-503-6359	C-10	23
19200	5037651	6650-00-503-7651	C-10	7
19200	5039633	6650-00-503-9633	C-8	8
19200	5179387	5999-00-517-9387	C-14	2
19207	544354	5305-00-591-9317	C-10	29
19200	6135660	6650-00-613-5660	C-8	19
19200	7595146		C-8	15
19200	7596883	5340-01-069-4542	C-8	2
19200	7596884		C-8	3
19200	7596885	5365-00-589-4120	C-8	5
19200	7596886	9340-00-830-1633	C-8	4
19200	7647146	1290-00-155-8312	C-2	2
19200	7647149	6650-00-155-8331	C-2	1
19200	7647159-1	5315-00-943-2156	C-6	8

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CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
19200	7647159-1	5315-00-943-2156	C-10	16
19200	7647159-2	5315-00-074-8954	C-3	19
19200	7647159-4	5315-01-088-8676	C-6	10
			C-10	25
19200	7680234	5340-00-180-6962	C-13	2
19200	7680236	5305-00-836-9426	C-3	8
			C-4	10
			C-5	14
19200	7680255	1290-00-692-1514	C-4	13
19200	7680256	1290-00-692-1515	C-3	5
			C-5	6
19200	7680257	1290-00-692-1516	C-3	15
			C-4	14
			C-5	8
19200	7681327	5305-00-531-0937	C-5	13
19200	7681329	5315-00-946-4678	C-5	1
19200	7681330	5305-00-905-4598	C-11	13
19200	7693809	5365-01-092-5845	C-11	11
19200	7694522	1290-01-107-2049	C-11	3
19200	7694553	1290-00-873-1915	C-13	8
19200	8204913	5340-00-629-9868	C-11	1
19200	8204917	5305-00-629-9867	C-8	16
19200	8204919	3040-00-629-9869	C-8	20
19200	8204922	5305-00-075-4858	C-8	6
			C-10	15
19200	8205471	5330-00-838-5301	C-11	5
19200	8205506	5310-00-895-6490	C-9	10
19200	8205507	5340-00-895-6491	C-8	22
19200	8205508	5330-01-084-7073	C-9	12
19200	8205509	5365-01-082-7978	C-9	6
19200	8205627	3120-00-836-9424	C-3	11
19200	8205628	3120-00-840-5870	C-4	7
			C-5	11
19200	8211640	1240-00-157-0762	C-3	18
19200	8211641		C-10	5
19200	8211643		C-10	21
19200	8211647		C-10	1
19200	8211648	6650-00-346-8152	C-10	28
19200	8211652	5365-00-664-4683	C-10	10
19200	8211653		C-10	3
19200	8211654	1240-00-346-8154	C-10	6
19200	8211655	1240-01-081-5346	C-10	4
19200	8211657	1240-00-346-8155	C-10	22
19200	8211658	5365-00-664-4736	C-10	24
19200	8211660	5355-00-995-1988	C-6	6
19200	8211663	1290-00-346-8156	C-10	2
19200	8211664	5340-00-346-8157	C-9	14
19200	8211666	5355-00-173-6991	C-5	3
19200	8211667	5310-00-221-9777	C-3	4
			C-5	5
19200	8211668	3040-00-546-9721	C-5	7

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CAGEC	PART NUMBER	STOCK NUMBER	FIG	ITEM
19200	8211670	5360-00-664-4637	C-3	10
			C-4	8
			C-5	12
19200	8211673	3040-00-346-8158	C-9	17
19200	8211675	5360-00-664-4638	C-8	7
19200	8211676	1290-00-346-8160	C-6	3
19200	8211677	5365-00-527-5485	C-6	2
19200	8211678	5365-00-692-1518	C-6	1
19200	8211686	1290-01-107-2047	C-8	10
19200	8211687	5355-00-505-5476	C-4	2
19200	8211688	5310-00-240-0046	C-4	5
19200	8211691	5355-01-082-7979	C-9	5
19200	8211693		C-9	4
19200	8211694	5365-00-597-2533	C-9	15
19200	8211697	5310-00-514-9111	C-3	2
19200	8211698	5365-00-597-2511	C-3	3
			C-5	4
19200	8211701	5365-01-254-4812	C-10	12
19200	8211702	5355-01-092-6549	C-4	6
19200	8211703	1290-01-107-2048	C-8	17
19200	8211704	5365-00-513-2178	C-3	9
			C-4	9
19200	8211706	5355-00-346-8165	C-4	3
19200	8211708	1290-00-167-8364	C-3	17
19200	8211709	1290-00-546-9723	C-4	12
19200	8211711	7690-00-727-4634	C-13	7
19200	8211712		C-9	3
19200	8211714	5310-00-663-4696	C-9	9
19200	8211716	1290-00-904-9375	C-3	21
			C-4	4
19200	8211717		C-9	1
19200	8211721	1240-01-132-0737	C-10	8
19200	8211722	5365-00-663-0707	C-10	9
19200	8211723	1290-00-346-8168	C-5	9
19200	8211724	1290-01-107-2046	C-8	18
19200	8211725		C-9	2
19200	8211731	1290-01-128-5861	C-13	4
19200	8211732	5330-00-641-3470	C-11	2
19200	8211735		C-13	6
19200	8211746	3040-00-346-8170	C-5	10
19200	8211747	5340-01-082-7977	C-3	13
19200	8211748		C-13	1
19200	8211749	5340-00-346-8171	C-1	3
19200	8211756	1290-00-346-8175	C-12	11
19200	8211757	5340-00-346-8176	C-12	12
19200	8211760	5340-00-346-8178	C-14	3
19200	8213178	5355-00-754-4118	C-8	12
19200	8213732-2	5315-00-076-6003	C-3	20
			C-4	15
			C-9	13
19200	8213732-3	5315-00-926-1853	C-5	2

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CAGEC	PART NUMBER	STOCK NUMBER	FIG	ITEM
19200	8213733	5305-00-419-9560	C-11	7
19200	8213734	5305-00-074-8951	C-8	21
19200	8213735	5305-00-173-6992	C-3	16
			C-9	7
19200	8213736	5305-00-074-8950	C-9	11
19200	8216549	5340-00-346-8180	C-12	3
19200	8216550		C-12	1
19200	8216551	1290-00-346-8181	C-12	13
19200	8226960	5360-01-086-5350	C-11	4
19200	8226962	5360-00-692-1519	C-11	10
19200	8226964	5310-01-016-7543	C-11	6
19200	8226965	5330-00-599-8755	C-9	16
19200	8226968	1290-00-167-8367	C-11	9
19200	8226969	1290-00-346-8182	C-6	5
19200	8226970	5310-01-084-7066	C-11	8
19200	8226975	5365-01-082-7980	C-11	12
19200	8226976		C-2	3
19200	8242755		C-12	5
19200	8242761	5340-01-106-3282	C-12	4
19200	8242764	5365-01-127-9617	C-12	16
19200	8242768	5305-01-106-3255	C-12	15
19200	8242771	5305-00-546-6336	C-12	8
19200	8242776	1290-00-346-8183	C-12	9
19200	8242777	1290-00-346-8184	C-1	2
19200	8245954	6650-01-107-7552	C-10	14
19200	8261637	1290-00-113-9687	C-12	6
19200	8293478	6695-00-346-8186	C-1	4
19200	8293481	5305-01-092-7833	C-12	14
19200	8293482	5305-01-068-8786	C-12	7
19200	8566629	1240-00-114-1091	C-6	9
			C-10	17
19200	8634461	1290-00-886-3035	C-8	11
19200	9362776		C-10	11

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FIGURE AND ITEM NUMBER INDEX

FIG.	ITEM	STOCK NUMBER	CAGEC	PART NUMBER
C-1	1		19200	11834483
C-1	2	1290-00-346-8184	19200	8242777
C-1	3	5340-00-346-8171	19200	8211749
C-1	4	6695-00-346-8186	19200	8293478
C-2	1	6650-00-155-8331	19200	7647149
C-2	2	1290-00-155-8312	19200	7647146
C-2	3		19200	8226976
C-3	1	5305-00-984-8248	96906	MS35273-15
C-3	2	5310-00-514-9111	19200	8211697
C-3	3	5365-00-597-2511	19200	8211698
C-3	4	5310-00-221-9777	19200	8211667
C-3	5	1290-00-692-1515	19200	7680256
C-3	6	3040-01-080-6048	19200	11835091
C-3	7	5305-00-058-3979	96906	MS51033-221
C-3	8	5305-00-836-9426	19200	7680236
C-3	9	5365-00-513-2178	19200	8211704
C-3	10	5360-00-664-4637	19200	8211670
C-3	11	3120-00-836-9424	19200	8205627
C-3	12	5305-00-058-3976	96906	MS51033-218
C-3	13	5340-01-082-7977	19200	8211747
C-3	14	1260-01-069-6667	19200	10554737
C-3	15	1290-00-692-1516	19200	7680257
C-3	16	5305-00-173-6992	19200	8213735
C-3	17	1290-00-167-8364	19200	8211708
C-3	18	1240-00-157-0762	19200	8211640
C-3	19	5315-00-074-8954	19200	7647159-2
C-3	20	5315-00-076-6003	19200	8213732-2
C-3	21	1290-00-904-9375	19200	8211716
C-3	22	5355-01-076-3235	19200	11834484
C-3	23	5355-01-071-4644	19200	10554738
C-4	1	5305-00-984-8248	96906	MS35273-15
C-4	2	5355-00-505-5476	19200	8211687
C-4	3	5355-00-346-8165	19200	8211706
C-4	4	1290-00-904-9375	19200	8211716
C-4	5	5310-00-240-0046	19200	8211688
C-4	6	5355-01-092-6549	19200	8211702
C-4	7	3120-00-840-5870	19200	8205628
C-4	8	5360-00-664-4637	19200	8211670
C-4	9	5365-00-513-2178	19200	8211704
C-4	10	5305-00-836-9426	19200	7680236
C-4	11	5305-00-058-3976	96906	MS51033-218
C-4	12	1290-00-546-9723	19200	8211709
C-4	13	1290-00-692-1514	19200	7680255
C-4	14	1290-00-692-1516	19200	7680257
C-4	15	5315-00-076-6003	19200	8213732-2
C-5	1	5315-00-946-4678	19200	7681329
C-5	2	5315-00-926-1853	19200	8213732-3
C-5	3	5355-00-173-6991	19200	8211666
C-5	4	5365-00-597-2511	19200	8211698
C-5	5	5310-00-221-9777	19200	8211667
C-5	6	1290-00-692-1515	19200	7680256

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FIGURE AND ITEM NUMBER INDEX

FIG.	ITEM	STOCK NUMBER	CAGEC	PART NUMBER
C-5	7	3040-00-546-9721	19200	8211668
C-5	8	1290-00-692-1516	19200	7680257
C-5	9	1290-00-346-8168	19200	8211723
C-5	10	3040-00-346-8170	19200	8211746
C-5	11	3120-00-840-5870	19200	8205628
C-5	12	5360-00-664-4637	19200	8211670
C-5	13	5305-00-531-0937	19200	7681327
C-5	14	5305-00-836-9426	19200	7680236
C-5	15	5305-00-058-3976	96906	MS51033-218
C-6	1	5365-00-692-1518	19200	8211678
C-6	2	5365-00-527-5485	19200	8211677
C-6	3	1290-00-346-8160	19200	8211676
C-6	4	5305-00-058-3977	96906	MS51033-219
C-6	5	1290-00-346-8182	19200	8226969
C-6	6	5355-00-995-1988	19200	8211660
C-6	7	5305-00-058-3976	96906	MS51033-218
C-6	8	5315-00-943-2156	19200	7647159-1
C-6	9	1240-00-114-1091	19200	8566629
C-6	9A	1290-00-547-4613	19200	8211662
C-6	9B	5340-00-513-2177	19200	8211659
C-6	10	5315-01-088-8676	19200	7647159-4
C-6	11	1290-01-011-3329	19200	11729650
C-6	12	1290-01-082-7981	19200	11729649
C-6	13	5365-01-011-3330	19200	11729648
C-7	1	9905-01-081-9029	19200	11748292
C-7	2	9905-01-070-3398	19200	11834485
C-7	3	5310-00-022-1117	96906	MS35333-103
C-7	4	5305-00-954-8110	96906	MS35215-1
C-8	1	5305-00-057-9584	96906	MS35199-5
C-8	2	5340-01-069-4542	19200	7596883
C-8	3		19200	7596884
C-8	4	9340-00-830-1633	19200	7596886
C-8	5	5365-00-589-4120	19200	7596885
C-8	6	5305-00-075-4858	19200	8204922
C-8	7	5360-00-664-4638	19200	8211675
C-8	8	6650-00-503-9633	19200	5039633
C-8	9	5305-00-954-8116	96906	MS35215-7
C-8	10	1290-01-107-2047	19200	8211686
C-8	11	1290-00-886-3035	19200	8634461
C-8	12	5355-00-754-4118	19200	8213178
C-8	13	5305-01-084-7049	96906	MS35215-8
C-8	14	5310-00-045-5201	96906	MS15795-902
C-8	15		19200	7595146
C-8	16	5305-00-629-9867	19200	8204917
C-8	17	1290-01-107-2048	19200	8211703
C-8	18	1290-01-107-2046	19200	8211724
C-8	19	6650-00-613-5660	19200	6135660
C-8	20	3040-00-629-9869	19200	8204919
C-8	21	5305-00-074-8951	19200	8213734
C-8	22	5340-00-895-6491	19200	8205507
C-8	23	5305-01-374-0384	19200	10548080
C-9	1		19200	8211717
C-9	2		19200	8211725

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C-9	4		19200	8211693
C-9	5	5355-01-082-7979	19200	8211691
C-9	6	5365-01-082-7978	19200	8205509
C-9	7	5305-00-173-6992	19200	8213735
C-9	8	5305-00-207-7463	96906	MS35214-15
C-9	9	5310-00-663-4696	19200	8211714
C-9	10	5310-00-895-6490	19200	8205506
C-9	11	5305-00-074-8950	19200	8213736
C-9	12	5330-01-084-7073	19200	8205508
C-9	13	5315-00-076-6003	19200	8213732-2
C-9	14	5340-00-346-8157	19200	8211664
C-9	15	5365-00-597-2533	19200	8211694
C-9	16	5330-00-599-8755	19200	8226965
C-9	17	3040-00-346-8158	19200	8211673
C-10	1		19200	8211647
C-10	2	1290-00-346-8156	19200	8211663
C-10	3		19200	8211653
C-10	4	1240-01-081-5346	19200	8211655
C-10	5		19200	8211641
C-10	6	1240-00-346-8154	19200	8211654
C-10	7	6650-00-503-7651	19200	5037651
C-10	8	1240-01-132-0737	19200	8211721
C-10	9	5365-00-663-0707	19200	8211722
C-10	10	5365-00-664-4683	19200	8211652
C-10	11		19200	9362776
C-10	12	5365-01-254-4812	19200	8211701
C-10	13	6650-01-152-8516	19200	11785525
C-10	14	6650-01-107-7552	19200	8245954
C-10	15	5305-00-075-4858	19200	8204922
C-10	16	5315-00-943-2156	19200	7647159-1
C-10	17	1240-00-114-1091	19200	8566629
C-10	17A	1290-00-547-4613	19200	8211662
C-10	17B	5340-00-513-2177	19200	8211659
C-10	18	1290-01-011-3329	19200	11729650
C-10	19	1290-01-082-7981	19200	11729649
C-10	20	5365-01-011-3330	19200	11729648
C-10	21		19200	8211643
C-10	22	1240-00-346-8155	19200	8211657
C-10	23	6650-00-503-6359	19200	5036359
C-10	24	5365-00-664-4736	19200	8211658
C-10	25	5315-01-088-8676	19200	7647159-4
C-10	26	5315-00-702-9651	96906	MS16555-618
C-10	27	5305-01-085-3220	21450	117585
C-10	28	6650-00-346-8152	19200	8211648
C-10	29	5305-00-591-9317	19207	544354
C-11	1	5340-00-629-9868	19200	8204913
C-11	2	5330-00-641-3470	19200	8211732
C-11	3	1290-01-107-2049	19200	7694522
C-11	4	5360-01-086-5350	19200	8226960
C-11	5	5330-00-838-5301	19200	8205471
C-11	6	5310-01-016-7543	19200	8226964
C-11	7	5305-00-419-9560	19200	8213733

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C-11	9	1290-00-167-8367	19200	8226968
C-11	10	5360-00-692-1519	19200	8226962
C-11	11	5365-01-092-5845	19200	7693809
C-11	12	5365-01-082-7980	19200	8226975
C-11	13	5305-00-905-4598	19200	7681330
C-12	1		19200	8216550
C-12	2	5320-00-928-2763	96906	MS16535-162
C-12	3	5340-00-346-8180	19200	8216549
C-12	4	5340-01-106-3282	19200	8242761
C-12	5		19200	8242755
C-12	6	1290-00-113-9687	19200	8261637
C-12	7	5305-01-068-8786	19200	8293482
C-12	8	5305-00-546-6336	19200	8242771
C-12	9	1290-00-346-8183	19200	8242776
C-12	10	5305-00-865-8651	96906	MS16198-2
C-12	11	1290-00-346-8175	19200	8211756
C-12	12	5340-00-346-8176	19200	8211757
C-12	13	1290-00-346-8181	19200	8216551
C-12	14	5305-01-092-7833	19200	8293481
C-12	15	5305-01-106-3255	19200	8242768
C-12	16	5365-01-127-9617	19200	8242764
C-13	1		19200	8211748
C-13	2	5340-00-180-6962	19200	7680234
C-13	3	5325-01-016-7912	81349	MIL-E-20652/1
C-13	4	1290-01-128-5861	19200	8211731
C-13	5	5320-00-602-6974	96906	MS20470DD3-5
C-13	6		19200	8211735
C-13	7	7690-00-727-4634	19200	8211711
C-13	8	1290-00-873-1915	19200	7694553
C-14	1	6240-00-635-9800	96906	MS51608-3
C-14	2	5999-00-517-9387	19200	5179387
C-14	3	5340-00-346-8178	19200	8211760

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By Order of the Secretary of the Army:

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General, United States Army
Chief of Staff

Official:

MILTON H. HAMILTON
Administrative Assistant to the Secretary of the Army
07255

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METRIC CHART

THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 Lb
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches
1 Sq Meter = 10,000 Sq Centimeters = 10.76 5q Feet
1 Sq Kilometer = 1,000,000 Sq Meters = 0.386 Sq Miles

CUBIC MEASURE

1 Cu Centimeter = 1000 Cu Millimeters = 0.06 Cu Inches
1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

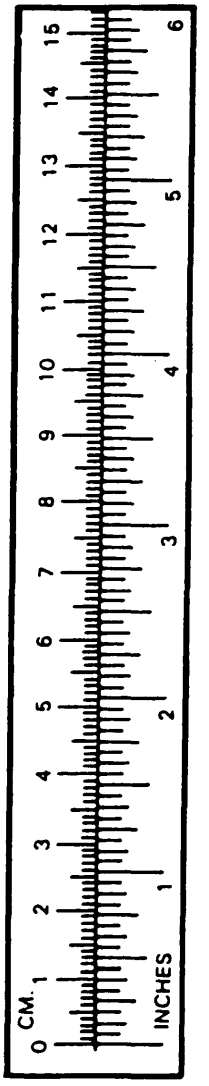
TEMPERATURE

5/9 (°F -32) = °C
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5 C° +32 = F°

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square inch	Kilopascals	6.895
Mlles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet.	3.280
Meters	Yards.	1.094
Kilometers	Miles.	0.621
Square Centimeters	Square inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	.2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals.	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621



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