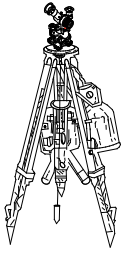
ARMY TM 9-6675-262-10

MARINE CORPS TM 00476C-OR/1

TECHNICAL MANUAL
OPERATOR MANUAL
FOR

AIMING CIRCLE M2 W/E
NSN: 1290-00-614-0008 (EIC 3SC)
AND
M2A2 W/E
NSN: 6675-01-067-0687 (EIC 3SC)



SUPERSEDURE NOTICE: This manual supersedes Army TM 9-1290-262-10, Marine Corps TM 00476C-OR/1 dated 15 April 1981, including all changes.

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HEADQUARTERS, DEPARTMENT OF THE ARMY
HEADQUARTERS, US MARINE CORPS
06 DECEMBER 2013

PCN 18400476100

WARNING SUMMARY

This warning summary contains general safety warnings and hazardous materials warnings that must be understood and applied during operation and maintenance of this equipment. Failure to observe these precautions could result in serious injury or death to personnel. Also included are explanations of safety and hazardous materials icons used within the technical manual.

First Aid Notice

For first aid information, refer to FM 4-25.11. Any additional first aid data not described in FM 4-25.11 shall be described in this section.

GENERAL SAFETY WARNINGS DESCRIPTION

WARNING

Do not look into the telescope while aimed directly at the sun unless the filter is used. Serious eye damage can result. If damage occurs, seek immediate medical attention.

WARNING

Wear gloves when operating equipment in extreme cold climates to prevent injury.

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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. Reports, as applicable by the requiring Service, should be submitted as follows:

(a) **(A) Army** - Mail your letter or DA Form 2028, Recommended Changes to Publications and Blank Forms, directly to: U.S. Army TACOM Life Cycle Management Command, ATTN: AMSTA-LCL-IM / TECH PUBS, MS 727 6501 E. 11 Mile Road, Warren, MI 48397-5000. You may also send in your recommended changes via electronic mail or by fax. Our fax number is DSN 786-1856 or Commercial (586) 282-1856. Our e-mail address is tacomlcmc.daform2028@us.army.mil.
(b) **(MC) Marine Corps** - Submit notice of discrepancies or suggested changes on a NAVMC 10772. The NAVMC may be submitted using either of the following: a. The preferred method of submittal is using https://portal.logcom.usmc.mil/sites/pubs/default.aspx. Problems or questions regarding the NAVMC 10772 program should be reported by calling DSN 567-7628 or DSN 567-5017 (Commercial number is (229) 639-7628 or (229) 639-5017). b. The alternate method of submittal does not require a Common Access Card (CAC) to access the form. Click on http://navalforms.daps.dla.mil/web/public/forms, select the "Keyword Search" button, enter "10772" in the Search Criteria Box. Under "type" click on download page button. Click on PDF icon. Enter user data in the appropriate fields. Must have users contact information block filled with Unit address and telephone number. Click on the “Envelope” icon in the tool bar. Select "Send Copy,” click on "OK". When the PDF document is created, an Outlook Email screen will open with the .PDF as an attachment. On the TO: line type SMB.LOG.Tech.Pubs.fct@usmc.mil. In the body of the email, type any additional information you wish to provide. Click “SEND”. A reply will be furnished to you.

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TABLE OF CONTENTS

CHAPTER 1
GENERAL INFORMATION, EQUIPMENT DESCRIPTION, AND THEORY OF OPERATION

GENERAL INFORMATION

SCOPE

This technical manual contains instructions for operation and maintenance of the Aiming Circle.

Type of Manual: Operator Manual

Model Number and Equipment Name: M2/M2A2 Aiming Circle

Purpose of Equipment: The Aiming Circle is a portable instrument used to measure elevation and azimuth angles for Field Artillery and Mortar target acquisition.

MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by (as applicable) DA PAM 750-8, The Army Maintenance Management System (TAMMS) Users Manual; DA PAM 738-751, Functional Users Manual for the Army Maintenance Management Systems - Aviation (TAMMS-A); or AR 700-138, Army Logistics Readiness and Sustainability. Maintenance forms and records used by Marine Corps personnel are prescribed by TM 4700-15/1.

Accidents involving injury to personnel or damage to materiel will be reported on DA Form 285, U.S. Army Accident Report in accordance with AR 385-40. Explosives and ammunition malfunctions will be reported in accordance with AR 75-1. When applicable, add references to SB 742-1, Inspection of Supplies and Equipment Ammunition Surveillance Procedures.

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your Aiming Circle needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you do not like about your equipment. Let us know why you do not like the design or performance.

All non-Aviation/Missile EIRs and PQDRs must be submitted through the Product Data Reporting and Evaluation Program (PDREP) Web site. The PDREP site is: https://www.pdrep.csd.disa.mil/.

If you do not have Internet access, you may submit your information using an SF 368 (Product Quality Deficiency Report). You can send your SF 368 using email, regular mail, or fax using the addresses/fax numbers specified in DA PAM 750-8, The Army Maintenance Management System (TAMMS) Users Manual. We will send you a reply.

Marine Corps: If your Aiming Circle needs improvement, send us an EIR. You, the user, are the only one who can tell us what you do not like about your equipment. Let us know why you do not like the design or performance. The preferred method for submitting Product Quality Deficiency Reports (PQDRs) is through the Marine Corps Electronic Product Support Web site at http://logcom.usmc.mil/pqdr/. If the above method is not available to you, put it on a Standard Form (SF) 368, Product Quality Deficiency Report, and mail it to us at: Marine Corps Logistics Command, PQDR Section (L15), 814 Radford Blvd., Ste 20330, Albany, GA 31704.

CORROSION PREVENTION AND CONTROL (CPC)

Corrosion prevention and control of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items. The term “corrosion” means the deterioration of a material or its properties due to a reaction of that material with its chemical environment. An example is the rusting of iron. Corrosion damage in metals can be seen, depending on the metal, as tarnishing, pitting, fogging, surface residue, and/or cracking. Plastics, composites, and rubbers can also degrade (also considered to be corrosion based on the above definition of corrosion). Degradation is caused by thermal (heat), oxidation (oxygen), solvation (solvents), or photolytic (light, typically ultraviolet) processes. The most common exposures are excessive heat or light. Damage from these processes will appear as cracking, softening, swelling, and/or breaking. The US Army has defined the following nine (9) forms of corrosion used to evaluate the deterioration of metals. These shall be used when evaluating and documenting corrosion.

UNIFORM (or general attack): Affects a large area of exposed metal surface, like rust on steel or tarnish on silver. It gradually reduces the thickness of the metal until it fails.
CREVICE: Occurs in crevices created by rubber seals, gaskets, bolt heads, lap joints, dirt or other surface deposits. It will develop anywhere moisture or other corrosive agents are trapped and unable to drain or evaporate.
SELECTIVE LEACHING: One element, usually the anodic element of an alloy, corrodes away, leaving the cathodic element. This can create holes in metal.

INTERGRANULAR: Metal deterioration caused by corrosion on the bonds between or across the grain boundaries of the metal. The metal will appear to be peeling off in sheets, flaking, or being pushed apart by layers. A particular type of intergranular corrosion is exfoliation.
PITTING: This can result from conditions similar to those for crevice corrosion. Pits can develop on various materials due to their composition. Rifle boxes are big victims of pitting.
EROSION: Results when a moving fluid (liquid or gas) flows across metal surface, particularly when solid particles are present in the fluid. Corrosion actually occurs on the surface of the metal, but the moving fluid washes away the corrosion and exposes a new metal surface, which also corrodes.
FRETTING: Occurs as a result of small, repetitive movements (e.g., vibration) between two surfaces in contact with each other. It's usually identified by a black powder corrosion product or pits on the surface.
GALVANIC: Occurs when two different types of metal come in contact with each other, like steel bolts on aluminum, for example. This is a common problem on aircraft because of their mix of metals.
STRESS: Term used to describe corrosion cracking and corrosion fatigue.

Where an item is not ready/available due to one of these forms of corrosion, it shall be recorded as a corrosion failure in the inspection record and the appropriate code (170) for corrosion shall be used when requesting/performing maintenance.

SF Form 368, Product Quality Deficiency Report should be submitted to the address specified in DA PAM 750-8, The Army Maintenance Management System (TAMMS) Users Manual.

NOMENCLATURE CROSS-REFERENCE LIST

COMMON NAME	OFFICIAL NOMENCLATURE
AIMING CIRCLE	SURVEYING SET, FIELD ARTILLERY BATTALION

LIST ABBREVIATIONS / ACRONYMS

ASSY	Assembly
ATTN	Attention
AZ	Azimuth
BII	Basic Issue Item
BOI	Basis of Issue
CAGEC	Commercial and Government Entity Code
COEI	Component of End Item
CONT	Continued
DA	Department of Army
DA PAM	Department of the Army Pamphlet
EA	Each

EL	Elevation
EOL	End of Orienting Line
HMMWV	High-Mobility Multi-Purpose Wheeled Vehicle
HORIZ	Horizontal
HORZ	Horizontal
HQ	Headquarters
IAW	In Accordance With
Lb	Pound
ILLUS	Illustration
NSN	National Stock Number
OL	Orienting Line
OS	Orienting Station
PMCS	Preventative Maintenance
PN	Part Number
QTY	Quantity
RQR	Required
SCP	Survey Control Point
SF	Standard Form
SOP	Standard Operating Procedures
TACOM	Tank-automotive and Armaments Command
TB	Technical Bulletin
TAMMS	The Army Maintenance Management System
TM	Technical Manual
TO&E	Table of Organization and Equipment
TOE	Table of Equipment
U/I	Unit of Issue
U/M	Unit of Measure
VERT	Vertical

END OF WORK PACKAGE

EQUIPMENT DESCRIPTION AND DATA

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

Your Aiming Circle is used to measure azimuth and elevation angles of a ground or aerial target with respect to a preselected base line. The operating instructions in this manual apply to both the M2 and M2A2 Aiming Circle.

DIFFERENCES BETWEEN MODELS

The maximum elevation range has been increased from 800 Mils on the M2 model to 1100 Mils on the M2A2 model and is visually identifiable by locating the elevation scale (Figure 1, Item 2) on the Aiming Circle and reading the maximum elevation printed on the scale. The Elevation Knob (Figure 1, Item 1) on the M2A2 is visually identifiable by the cross-hatched design on a round adjusting knob at the top of the instrument. The body of the M2A2 also differs slightly and can be visually identified as having a sloped Compass Compartment window assembly (Figure 1, Item 3), related to the increased range of motion necessary to accommodate the increase in elevation range of the Elbow Telescope assembly.

Table 1. Differences Between M2 and M2A2

	M2	M2A2
Weight, Aiming Circle with Cover	9Lbs.	9 Lbs.
Weight, Aiming Circle with Equipment	21 Lbs.	21 Lbs.
Azimuth Rotation	Unlimited	Unlimited
Elevation (Maximum)	800 Mils	1100 Mils
Depression (Maximum)	400 Mils	400 Mils
Telescope Power	4 Power	4 Power
Field of View	10 Degrees	10 Degrees

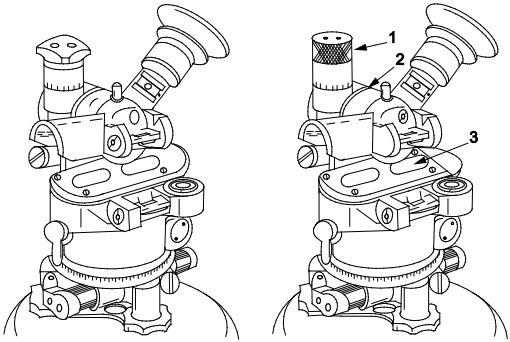

Figure 1. M2 and M2A2 Aiming Circle.

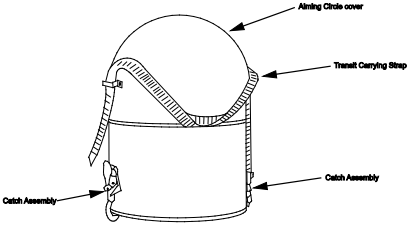

Figure 2. Aiming Circle With Cover Installed.

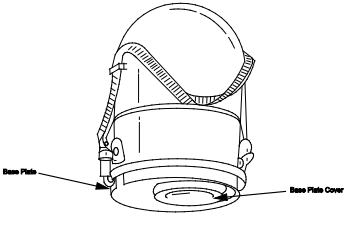

Figure 3. Aiming Circle w/Cover, Base Plate Cover View.

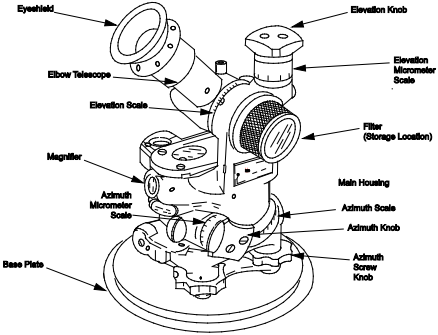

Figure 4. M2 Aiming Circle With Cover Removed.

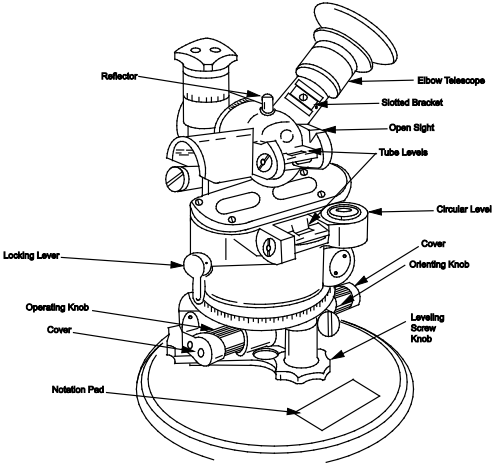

Figure 5. Aiming Circle Component Identification.

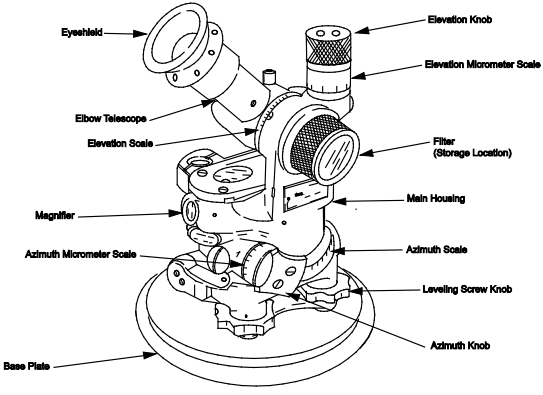

Figure 6. M2A2 Aiming Circle With Cover Removed.

END OF WORK PACKAGE

THEORY OF OPERATION

PRINCIPLES OF OPERATION

Changing the maximum telescope elevation from 800 to 1100 Mils permits greater use of the Aiming Circle. The Aiming Circle is basically a telescope mounted on a base which permits exact azimuth and elevation measurements. The main housing is placed in a true level condition by using two types of levels: (1) Circular Level which is used for coarse leveling, and (2) Tube Levels which are used for fine leveling. A tube level on the elbow telescope permits the elbow telescope to be adjusted to a true horizontal line of sight.

A magnetic compass is located in an oblong box on top of the main housing. The magnetic compass needle can be seen through a window or through the magnifier. Zero azimuth heading with respect to magnetic north or any other selected compass treading can be made by turning the orienting knobs or the azimuth knob. Elevation angle of the telescope is adjusted by turning the elevation knob. Azimuth and elevation angles up to 85 mils can be read from the horizontal and vertical centerline on the reticle while looking through the elbow telescope.

END OF WORK PACKAGE

CHAPTER 2
OPERATOR INSTRUCTIONS

DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS

DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS

1. The circular level (Figure1, Item 1) is used for coarse leveling of the Aiming Circle, while the tube level (Figure 1, Item 2) is one of two tube levels that are used for fine leveling of the Aiming Circle.

2. The cover (Figure 1, Item 3) protects the tube level vial from possible breakage and is to be rotated to open or close it.

3. The leveling screw knob (Figure 1, Item 4) is one of three screw knobs that are used to center the bubble in the tube level and circular level. Rotating the knob clockwise will raises the instrument, while rotating the knob counterclockwise lowers the instrument.

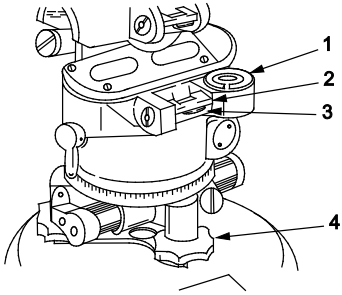

Figure 1. Aiming Circle Levels and Controls.

4. Each graduation on the azimuth micrometer scale (Figure 2, Item 1) is equal to 1 mil numbered at 10-mil intervals. Black numbers 0-100 mils on the scale read azimuth.

5. The azimuth knob (Figure 2, Item 2) adjusts the elbow telescope in azimuth.

6. Each graduation on the azimuth scale (Figure 2, Item 3) is equal to 100 mils numbered at 200-mil intervals. Black numbers 0-6400 mils read azimuth. This forms the main azimuth scale.

7. Red numbers 0-3200 mils read azimuth. The lower row of graduations parallels the 3200- to 6400-mil upper graduations. This permits the Aiming Circle to be used with other instruments having scales graduated 0-3200 mils.

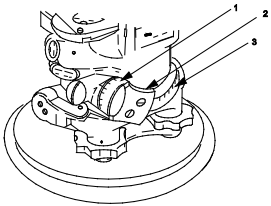

Figure 2. Aiming Circle Azimuth Controls Identification.

NOTE

In fast azimuth traversing, the elbow telescope moves in multiples of 100 mils (for example, 100, 200, 300, etc).

The azimuth knob always repeats itself in the same relative position (for example, 170, 270, 370, etc). The azimuth micrometer scale reading is not affected by fast traversing.

1. For fast azimuth traversing of elbow telescope, pull and hold azimuth knob (Figure 3, Item 1) in direction of the arrow labeled with a number 1. By hand, turn main housing to desired azimuth. Release azimuth knob and turn azimuth knob for normal operation.

2. For fast azimuth traversing of Aiming Circle, open covers on both orienting knobs (Figure 3, Item 1) and (Figure 3, Item 2), pull and hold orienting knob in direction of arrow labeled with a number 2. By hand, turn Aiming Circle to desired azimuth. Release orienting knob. Either orienting knob can be turned for normal operation. Close both covers.

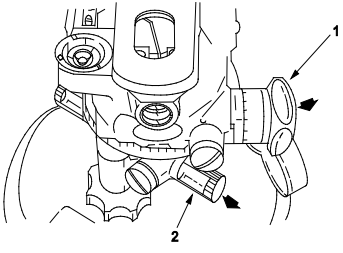

Figure 3. Aiming Circle Additional Azimuth Control Functions.

1. The elevation knob (Figure 4, Item 1) adjusts the elbow telescope elevation. The elevation micrometer scale (Figure 4, Item 2) is numbered at 10-mil intervals, with each graduation being 1 mil. The black numbers 0-100 mils read elevation and the red numbers 0-100 mils read depression.
2. The elevation scale (Figure 4, Item 3) is numbered at 100-mil intervals, with each graduation being 100 mils. The black numbers 0-1100 mils read elevation and the red numbers 0-400 read depression.
3. The elbow telescope tube level (Figure 4, item 4) shows when the elbow telescope is level.

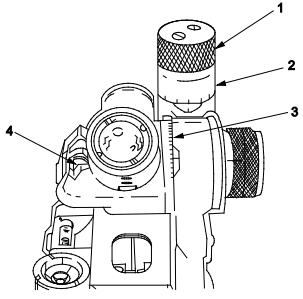

Figure 4. Aiming Circle Elevation Controls.

1. The elevation knob (Figure 5, Item 1) adjusts the elbow telescope elevation. The elevation micrometer scale (Figure 5, Item 2) is numbered at 10-mil intervals, with each graduation being 1 mil. The black numbers 0-100 mils read elevation and the red numbers 0-100 mils read depression.
2. The elevation scale (Figure 5, Item 3) is numbered at 100-mil intervals, with each graduation being 100 mils. The black numbers 0-800 mils read elevation and the red numbers 0-400 read depression.
3. The elbow telescope tube level (Figure 5, item 4) shows when the elbow telescope is level.

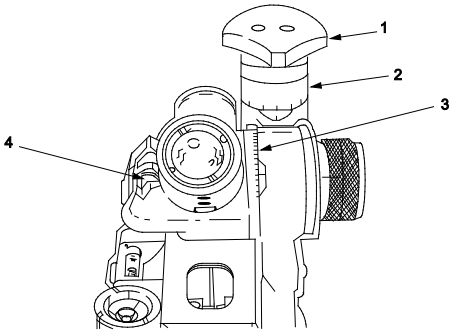

Figure 5. Aiming Circle Elevation Controls and Scales.

WARNING

Do not look into the telescope while aimed directly at the sun unless the filter is used. Serious eye damage can result. If damage occurs, seek immediate medical attention.

1. The optical filter (Figure 6, Item 1) is shown in in-use position and is used to protect your eye from sun rays. The optical filter is mounted over the eyepiece end of the telescope when used for observations on the sun. When not in use, it is stored on the filter post on the right side of the telescope, above the serial number plate.

2. The slotted bracket (Figure 6, Item 2) is used for mounting the M51 instrument light bracket light (Figure 6, Item 7). The reticle is lighted through the hole.

3. The reticle (Figure 6, Item 3), as seen through the telescope, has horizontal and vertical centerlines that are graduated to give azimuth and elevation angles while the operator is looking through the elbow telescope. Each graduation is 5 mils and each scale reads 0 – 85 mils. The Polaris 2 Reticle is installed in most Aiming Circles. This includes the reticle pattern described above as well as three concentric circles used for aligning stars for the Polaris 2 method of astronomic observations.

4. Open sight (Figure 6, Item 4) allows fast telescope orientation. The reflector (Figure 6, Item 5) allows backsighting by artillery weapon's fire control instruments. The reflector can be lighted at night with the M51 instrument light hand light. The eyeshield (Figure 6, Item 6) blocks light entering your eye from the side.

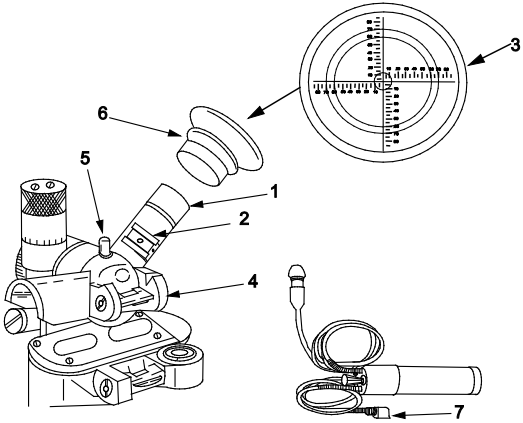

Figure 6. Aiming Circle Elbow Telescope.

1. Turn and hold the locking lever (Figure 7, Item 1) in this position. Releasing the locking lever will let it return to the locked position. The magnetic compass needle movement may be observed through the compass compartment window assembly (Figure 7, Item 5).

2. The locking lever (Figure 7, Item 2) is in the locked position and the magnetic compass cannot move. Keep it in this position when magnetic compass is not used or when carrying or transporting the Aiming Circle.

3. The locking lever (Figure 7, Item 3) is in the unlocked position and stays in this position until turned to locked position. The magnetic compass moves.

4. The North end of the magnetic compass needle is indicated by N (Figure 7, Item 4) on the main housing.

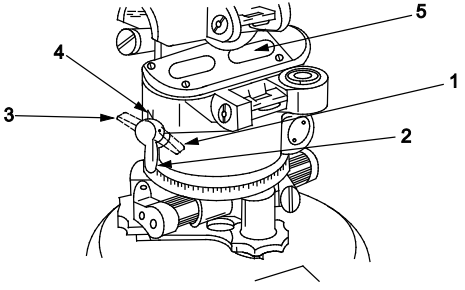

Figure 7. Magnetic Compass Lever.

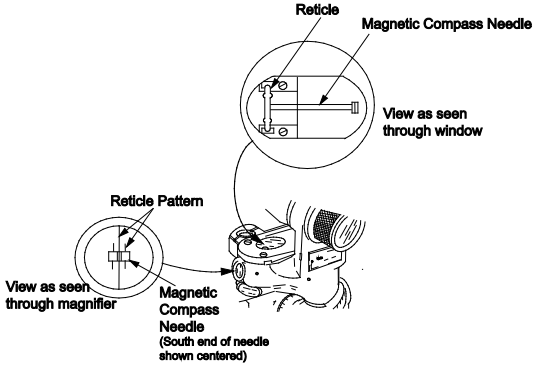

Figure 8. Aiming Circle Magnetic Compass Identification.

NOTE

The notation pad is used for recording declination constant, scale readings, settings or other data using soft lead pencil.

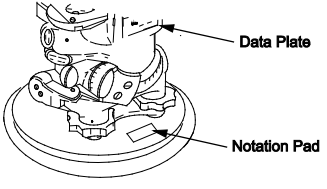

Figure 9. Data Plate and Notation Pad Identification.

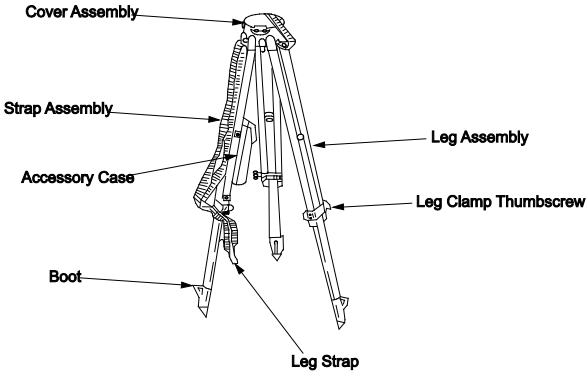

Figure 10. M24 Tripod for the Aiming Circle.

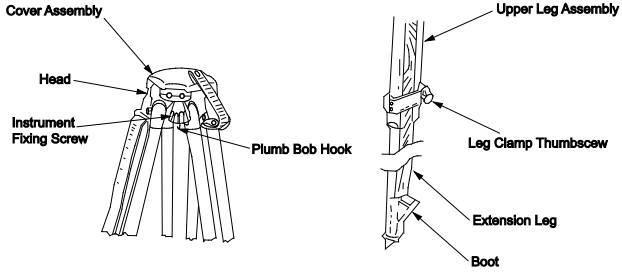

Figure 11. M24 Tripod Close-Up View.

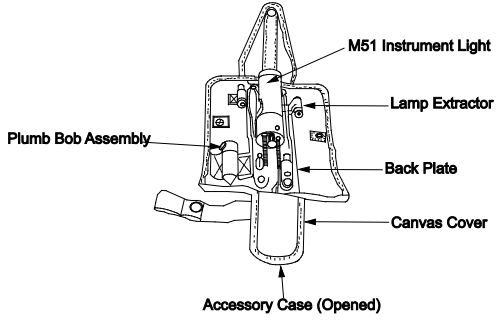

Figure 12. Accessory Case Component Locations.

DESCRIPTION/USE OF OPERATOR CONTROLS AND INDICATORS – (Continued)

1. The hand light (Figure 13, Item 1) is for general purpose use and lighting the reflector. The rheostat knob (Figure 13, Item 2) can be rotated to turn the lamps on or off and to increase or decrease bracket light brightness.
2. The bracket light (Figure 13, Item 3) attaches to elbow telescope slotted bracket and lights up the telescope reticle.

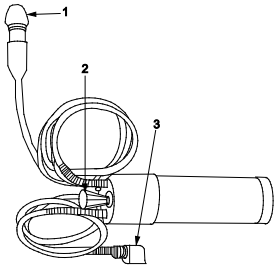

Figure 13. M51 Instrument Light.

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OPERATION UNDER USUAL CONDITIONS
GENERAL OPERATING PROCEDURES

INITIAL SETUP:

N/A

EMPLACING THE TRIPOD

1. Unstrap tripod legs (Figure 1, Item 1), loosen leg clamp thumbscrews (Figure 1, Item 2) and fully extend each leg to desired length. Tighten leg clamp thumbscrews (Figure 1, Item 3).

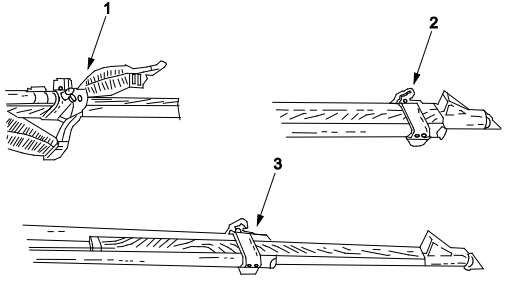


Figure 1. M24 Tripod Leg Extension.

NOTE

Point one leg in the direction of sighting. For convenient illumination adjustments during night sighting, place tripod leg with M51 instrument light next to your left leg.

2. Spread M24 tripod legs (Figure 2, Item 1) and (Figure 2, Item 3) and position center of tripod over the orienting station (Figure 2, Item 2).

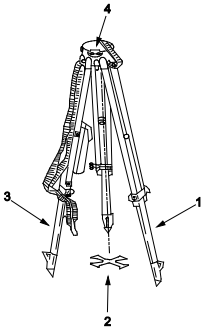


Figure 2. M24 Tripod Emplacement.

NOTE

On steep slopes, place two tripod legs on the downhill side.

The more level the tripod plate head during the initial setup, the easier it is to level the Aiming Circle's circular bubble.

EMPLACING THE TRIPOD- (Continued)

3. Place M24 tripod plate head (Figure 2, Item 4) upright, leg boots toward the ground. Step on leg boots (Figure 3, Item 1) and (Figure 3, Item 2) to set tripod firmly in place.

4. Bring tripod head (Figure 3, Item 3) into approximate level position by adjusting the length of the tripod legs (Figure 3, Item 4). Make sure leg clamp thumbscrews (Figure 3, Item 5) are tight.

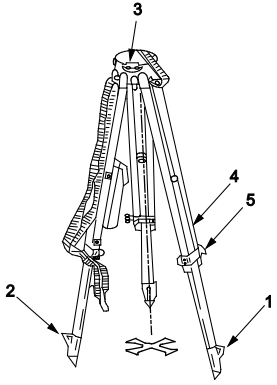


Figure 3. M24 Tripod Emplacement.

END OF TASK

INSTALLING THE AIMING CIRCLE ON TRIPOD

1. Unscrew the screw assembly (Figure 4, Item 1) and remove tripod cover assembly (Figure 4, Item 2) from tripod head (Figure 4, Item 3).

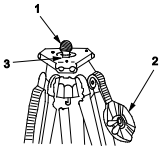


Figure 4. M24 Tripod w/Cover Assembly Removed

2. Center screw assembly (Figure 5, Item 1) as shown below.

3. Open base plate cover (Figure 5, Item 2) and place Aiming Circle on tripod head (Figure 5, Item 6).

NOTE

Before tightening screw assembly, position base plate cover so it is pointing toward you.

4. Turn screw assembly (Figure 5, Item 1) into threaded hole on Aiming Circle until screw is snug.

5. Release catch assemblies (Figure 5, Item 3) and remove cover (Figure 5, Item 4) from Aiming Circle. Hang Aiming Circle cover on the tripod cover assembly (Figure 5, item 5).

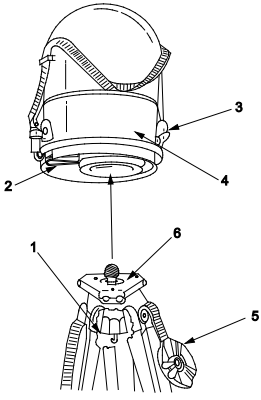


Figure 5. Aiming Circle and M24 Tripod Installation.

6. Check the circular level (Figure 6, Item 1). The bubble should be approximately centered. If it is way off, re-adjust legs until bubble is approximately centered.

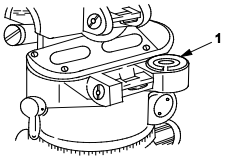


Figure 6. Circular Level Bubble Check.

END OF TASK

POSITIONING THE AIMING CIRCLE OVER AN ORIENTING STATION

1. Remove plumb bob assembly (Figure 7, Item 1) from canvas cover and hang the string on tripod plumb bob hook (Figure 7, Item 2).

2. Adjust length of string until plumb bob just misses touching the orienting station (Figure 7, item 3).

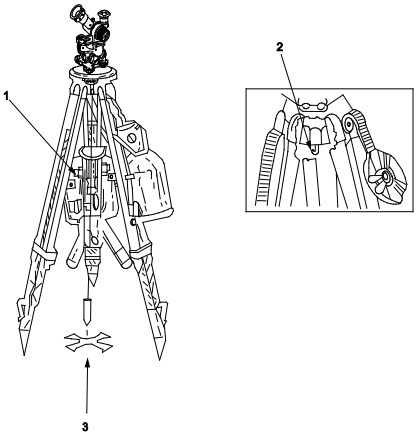


Figure 7. Aiming Circle with Plumb Bob Extended.

3. If necessary, adjust position of tripod until plumb bob is approximately over the center of the orienting station.

4. Check the circular level (Figure 6, Item 1). The bubble should be approximately centered. If the bubble moves outside of the circle, re-adjust legs until bubble is approximately centered.

5. Position the Aiming Circle accurately over the orienting station (Figure 7, Item 3). Loosen screw assembly (Figure 7, Item 2) and carefully slide Aiming Circle on the tripod head (Figure 5, Item 6) until the plumb bob is pointing directly over the orienting station. After completion of placing the Aiming Circle directly over the orienting station, tighten screw assembly (Figure 7, Item 2).

END OF TASK

LEVELING AIMING CIRCLE

NOTE

For general use of Aiming Circle, such as laying artillery and mortars, centering the bubble in the circular level provides sufficient accuracy. If more accurate leveling is required, such as survey work, the main housing tube level bubble must be centered.

1. Turn Aiming Circle leveling screw knobs (Figure 8, Item 1) until the bubble is centered in the circular level (Figure 8, Item 2).

2. Check that circular level bubble stays centered while fast traversing the Aiming Circle through 6400 mils. Spot check at 1600-mil intervals that bubble is centered.

3. If circular level bubble does not stay centered, repeat Steps 1 and 2.

4. Uncover main housing tube level (Figure 8, Item 3). Adjust leveling screw knobs until bubble in main housing tube level (Figure 8, Item 3) is centered.

5. Turn Aiming Circle in azimuth and watch the bubble in the main housing tube level (Figure 8, Item 3). The bubble must stay centered while the Aiming Circle is turned through 6400 mils. Spot check at 1600-mil intervals.

6. If the bubble in the main housing tube level (Figure 8, Item 3) does not stay centered, turn leveling screw knobs (Figure 8, Item 1) to center bubble in main housing tube level (Figure 8, Item 3).

7. Turn Aiming Circle in azimuth to another azimuth setting. Again, turn leveling screw knobs (Figure 8, Item 1) to center bubble in main housing tube level (Figure 8, Item 3).

8. Repeat the turning of the Aiming Circle in azimuth and the turning of the leveling screw knobs (Figure 8, Item 1), as necessary.

9. The main housing tube level bubble must remain centered while the Aiming Circle is turned through 6400 mils. Spot check at 1600-mil intervals.

LEVELING AIMING CIRCLE- (Continued)

NOTE

In the following step, the circular level bubble must also remain centered.

10. Check elbow telescope tube level bubble (Figure 8, Item 4). Aiming Circle must be in the level position. Turn elevation knob (Figure 8, Item 1) to set elevation scale (Figure 8, Item 3) to zero. The elevation micrometer scale (Figure 8, item 2) must also read zero.

11. The elbow telescope tube level bubble (Figure 8, Item 4) should be centered.

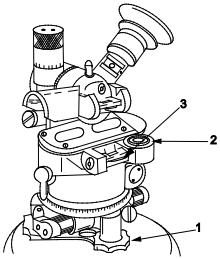


Figure 8. Leveling the Aiming Circle.

END OF TASK

OPERATIONS IN LOW LIGHT CONDITIONS

1 During times of limited natural light and night operation when light is needed to set up and operate the Aiming Circle:

2 Uncoil the bracket light wire and slip the bracket light (Figure 9, Item 1) dovetail into the slot on the elbow telescope.

3 Uncoil the hand light wire (Figure 9, Item 2) if you need the hand light (Figure 9, Item 3). Turn rheostat knob (Figure 9, Item 4) to ON. The hand light will remain at full brightness.

4 Turn rheostat knob (Figure 9, Item 4) to decrease brightness of the bracket light lamp.

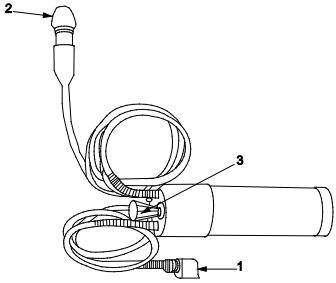


Figure 9. M51 Instrument Light.

END OF WORK PACKAGE

OPERATION UNDER UNUSUAL CONDITIONS

INITIAL SETUP:

N/A

UNUSUAL ENVIRONMENT / WEATHER

Extreme Cold

WARNING

Wear gloves when operating equipment in extreme cold climates to prevent injury.

CAUTION

Damage will occur to sight glass if exposed to an immediate heat source while operating in extreme cold climates.

NOTE

Ensure aiming circle is stored in a moisture free environment.

Always store Aiming Circle outdoors in an environmentally protected storage container.

Use an anti-condensation container to bring Aiming Circle indoors. This will allow the Aiming Circle to warm up without condensation forming on it.

Do not touch optical surfaces.

If Aiming Circle equipment is exposed to indoor storage temperatures after operating in extreme cold climates, ensure all moisture is wiped dry with a clean dry cloth. When cleaning or drying lenses and windows, always use lens paper designated for cleaning optical surfaces.

Never apply heat directly to the Aiming Circle.

Inspect it frequently, looking for rust or corrosion and checking for operation of all controls.

UNUSUAL ENVIRONMENT / WEATHER – (Continued)

Always ensure that Aiming Circle is stored in a clean dry container and protected from the environment.

Extreme Heat

NOTE

Inspect Aiming Circle frequently, looking for rust, corrosion or fungus. Check operation of all controls.

Keep Aiming Circle clean and wipe off hand prints after use.

Dusty and Sandy Areas

NOTE

Keep Aiming Circle clean and covered when not in actual use.

Keep dust and sand from collecting on working parts.

Wet and Salty Areas

NOTE

Keep Aiming Circle clean and dry and keep covered when not in actual use.

Inspect Aiming Circle frequently, looking for rust or corrosion. Check operation of all controls.

END OF WORK PACKAGE

CHAPTER 3
PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

PMCS INTRODUCTION

INTRODUCTION

The Preventative Maintenance Checks and Services (PMCS) table (WP 0010, Table 1) provides easy access to the schedule of checks and services for the Aiming Circle. Service intervals are periods of time within which the equipment must be checked and serviced to maintain full operation and reduce failures.

Warnings and Cautions. Always observe the WARNINGS and CAUTIONS appearing in your PMCS table. Warnings and cautions appear before applicable procedures. You must observe the warnings and cautions to prevent serious injury to yourself and others or to prevent your equipment from being damaged.

EXPLANATION OF TABLE ENTRIES

Item Number. Numbers in this column are for reference only. When completing DA Form 2404 or DA Form 5988-E (Equipment Inspection and Maintenance Record), do checks and services for the intervals listed in the sequence described in accordance with DA PAM 750-8.

Interval. This column tells you when you must do the procedure in the procedure column. Be sure to complete the appropriate maintenance forms whether a check, test, or service is performed. There are three (3) intervals listed: Before (B), During (D), and After (A).

Item to Be Inspected or Serviced. This column provides the location and the item to be inspected or serviced. The items listed in this column are divided into groups indicating the portion of the equipment of which they are a part. Under these groupings, the items to be inspected are to be identified by as few words as clearly identify the item, usually the common name.

Procedure. This column contains a brief description of the procedure by which the check is to be performed to know if the equipment is ready or available for its intended mission or for operation. It contains all the information required to accomplish the checks and services, including appropriate tolerances, adjustment limits, and instrument and gage readings. You must do the procedure at the time stated in the interval column.

Equipment Not Ready/Available If. This column contains the criteria which will cause the equipment to be classified as not ready/available because of inability to perform its primary mission. If you perform check and service procedures that show faults listed in this column, do not operate the equipment. Follow standing operating procedures for maintaining the equipment or reporting equipment failure.

END OF WORK PACKAGE

PREVENTIVE MAINTENANCE CHECKS AND SERVICES

INITIAL SETUP:

N/A

Table 1. Preventive Maintenance Checks and Services.

Item No.	Interval	Item to be Checked or Serviced	Procedure	Equipment Not Ready / Available If:
1	B/A	AIMING CIRCLE	Clean exposed surfaces of optical elements with lens tissue.	Any optical surfaces are chipped or cracked.
2	B	AIMING CIRCLE	Check that base plate cover pivots freely.	Base plate cover is missing, broken, or binds.
3	B/D	AIMING CIRCLE	Check for looseness or binding in azimuth, orienting, and elevation knobs.	Any of the controls have looseness, sticking, or binding.
4	B	AIMING CIRCLE	Check for loose or damaged level vials.	Level vials are loose or broken.
5	D	AIMING CIRCLE	Turn azimuth knob until azimuth scale reads 0. Check that azimuth micrometer scale also reads 0 and that circular level bubble and main housing tube level bubble remain centered while the Aiming Circle is rotated through 6400 mils.	Scales will not match up and /or level bubbles will not remain centered.
6	D	AIMING CIRCLE	Turn elevation knob until elevation scale reads 0. Check that elevation micrometer scale also reads 0 and that elbow telescope tube level bubble is centered.	Scales will not match up and/or level bubble is not centered.

Table 1. Preventive Maintenance Checks and Services – (Continued).

Item No.	Interval	Item to be Checked or Serviced	Procedure	Equipment Not Ready / Available If:
7	B	M24 TRIPOD	Check that tripod legs are not cracked or broken and do not bind.	Tripod legs are cracked or broken or bind.
			Check the leg clamp thumb screws to ensure they securely hold the tripod legs in place.	Leg clamp thumb screws do not securely hold the tripod legs in a locked position.
			Check that accessory case is complete.	Accessory case or any of its components are missing.
8	A	COVER	Check that cover properly attaches to and seats on the Aiming Circle base plate.	Cover will not attach and seat properly over Aiming Circle.
9	B	M51 INSTRUMENT LIGHT	Check that bracket light and hand light illuminate.	Bracket light and hand light will not illuminate.
			Check to ensure that batteries are present and charged.	Batteries are missing or do not have a charge.
			Check that bracket light can be dimmed with rheostat.	Bracket light will not dim.
			Check that there is no leakage/corrosion on batteries or inside the instrument light tube.	Batteries are leaking or if there is corrosion inside the instrument light tube.

END OF WORK PACKAGE

CHAPTER 4
MAINTENANCE INSTRUCTIONS

SERVICE UPON RECEIPT

INITIAL SETUP:

References

TM 9-6675-262-24&P
TM 9-6675-262-10, WP 0009
AR 735-11-2
DA Form 2404
DA Form 5988-E
DA Pam 25-30
DD 361

INTRODUCTION

The M2 or M2A2 Aiming Circle has no internal parts or assemblies replaceable by Crew-Level personnel. For maintenance and/or repair actions beyond those described in this Operator Manual, see TM 9-6675-262-24&P

SERVICE UPON RECEIPT TASKS

1. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD 361, Transportation Discrepancy Report. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with applicable service instructions (e.g., for Army instructions, see AR 735-11-2).
2. Check to see if the equipment has been modified. Determine whether there are Modification Work Orders (MWOs) pertaining to the equipment, DA Pam 25-30, Consolidated Index of Army Publications and Blank Forms.
3. Upon receipt of the M2 or M2A2 Aiming Circle, fill out hard copies of DA Form 2404 or DA Form 5988-E, Equipment Inspection and Maintenance Record.

SERVICE UPON RECEIPT

No special sitting or shelter procedures are required for M2 or M2A2 Aiming Circle maintenance tasks.

SERVICE UPON RECEIPT OF MATERIEL

The Operator is authorized by the Preventive Maintenance Checks and Services chart (PMCS) (WP 0009) to perform troubleshooting and inspection tasks that may lead to removal, replacement, and cleaning of components. There are no Crew-Level troubleshooting procedures.

INSTALLATION INSTRUCTIONS

No special installation instructions are required for maintenance of the M2 or M2A2 Aiming Circle.

END OF WORK PACKAGE

OPERATOR REMOVAL / REPLACEMENT PROCEDURES

INITIAL SETUP:

N/A

HAND LIGHT LAMP REMOVAL

WARNING

Take extra caution that you do not point the telescope directly at the sun unless the filter is used. Serious eye damage can result.

NOTE

Be sure to keep your Aiming Circle clean and dry. If it gets wet, wipe it off with a clean, dry cloth. Keep the Aiming Circle covered when you are not using it. Keep the optical elements clean and dry. This will prevent etching of the glass surfaces. Use only lens tissue paper on optical surfaces. Keep the azimuth and elevation scales clean and dry. This will prevent corrosion of the surfaces.

NOTE

Do not force the rotation of any knob past its stop limit and be sure not to turn screws or other parts of the Aiming Circle that are not a part of your operation. Ensure that you do not tighten leveling knobs, instrument fixing screw, or elevation knob past a snug contact. Also, do not scratch or damage optical elements or place cover on the Aiming Circle if it is covered with moisture or condensation. Avoid dropping, banging or beating the Aiming Circle. This equipment contains sensitive and precise azimuth and elevation knobs.

1. To remove hand light lamp, unscrew cap (Figure 1, Item 1) from lead wire (Figure 1, Item 2).
2. Unscrew lamp (Figure 1, Item 3) from lead wire (Figure 1, Item 2). Use lamp holder extractor (Figure 1, Item 4) stored in accessory case.

HAND LIGHT LAMP REPLACEMENT

1. Push glass bulb of lamp (Figure 1, Item 3) into lamp extractor (Figure 1, Item 4).
2. Screw lamp (Figure 1, Item 3) into lead wire (Figure 1, Item 2) and remove lamp extractor (Figure 1, Item 4).

3. Screw cap (Figure 1, Item 2) onto lead wire (Figure 1, Item 2).

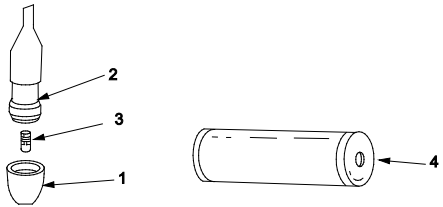


Figure 1. Replacing M51 Instrument Light.

END OF TASK

BRACKET LIGHT LAMP REMOVAL

1. To remove bracket light lamp, unscrew light bracket (Figure 2, Item 1) from lead cable (Figure 2, Item 2).
2. Unscrew lamp (Figure 2, Item 3) from lead cable (Figure 2, Item 2) and use lamp extractor (Figure 1, Item 4) stored in accessory case.

BRACKET LIGHT LAMP REPLACEMENT

1. Push glass bulb of lamp (Figure 2, Item 3) into lamp extractor (Figure 1, Item 4).

BRACKET LIGHT LAMP REPLACEMENT – (Continued)

2. Screw lamp (Figure 2, Item 3) into lead cable (Figure 2, Item 2) and remove lamp extractor (Figure 1, Item 4).
3. Screw light bracket (Figure 2, Item 1) onto lead cable (Figure 2, Item 2).

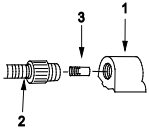


Figure 2. Bracket Light Lamp Removal and Installation.

END OF TASK

BATTERY REMOVAL

1. Press cap assembly (Figure 3, Item 1) and turn counterclockwise.
2. Remove cap assembly (Figure 3, Item 1) from light tube (Figure 3, Item 2).
3. Remove D-cell batteries (Figure 3, Item 3) and (Figure 3, Item 4) from light tube (Figure 3, Item 2).

BATTERY REPLACEMENT

1. Insert two D-cell batteries (Figure 3, Item 3) and (Figure 3, Item 4) in light tube (Figure 3, Item 2).
2. Align pins in cap assembly (Figure 3, Item 1) with slots in light tube (Figure 3, Item 2).
3. Press in on cap assembly (Figure 3, Item 1) and turn clockwise to lock it in place.

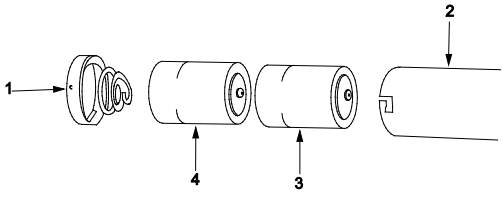


Figure 3. M51 Instrument Light Battery Removal and Installation.

END OF TASK

END OF WORK PACKAGE

REFERENCES

SCOPE

This work package lists forms and publications that are referenced in this manual or that contain information applicable to the operation and maintenance of the

MARINE CORPS ORDERS

MCO 4855.10	Product Quality Deficiency Report (PQDR)

FIELD MANUALS

FM 4-25.11	First Aid

FORMS

DA Form 285	U.S. Army Accident Report
DA Form 2028	Recommended Changes to Publications and Blanks Forms
DA Form 2404	Equipment Inspection and Maintenance Record
DA Form 5988-E	Equipment Inspection and Maintenance Record
DD 361	Transportation Discrepancy Report (TDR)
NAVMC 10772	Recommended Changes to Publications/Logistics-Maintenance Data Coding
SF 368	Product Quality Deficiency Report (PQDR)

MISCELLANEOUS PUBLICATIONS

AR 75-1	Malfunctions Involving Ammunition and Explosives
AR 700-138	Army Logistics Readiness and Sustainability
AR 735-11-2	Reporting of Item and Packaging Discrepancies
DA PAM 25-30	Consolidated Index of Army Publications and Blank Forms

DA PAM 738-751	Functional Users Manual for the Army Maintenance Management Systems- Aviation (TAMMS-A)
DA PAM 750-8	The Army Maintenance Management System (TAMMS) Users Manual

TECHNICAL MANUALS

SB 742-1	Inspection of Supplies and Equipment Ammunition Surveillance Procedures
TM 00476C-OR/1	Operator Manual for Aiming Circle M2 W/E and M2A2 W/E
TM 9-6675-262 -24&P	Technical Manual for Field and Sustainment Maintenance to include Repair Parts and Special Tools List
TM 4700-15/1	Marine Corps Ground Equipment Record Procedures

END OF WORK PACKAGE

CHAPTER 5
SUPPORTING INFORMATION
COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS

INTRODUCTION

Scope

This work package lists COEI and BII for the Aiming Circle to help you inventory items for safe and efficient operation of the equipment.

General

The COEI and BII information is divided into the following lists:

Components of End Item (COEI). This list is for information purposes only and is not authority to requisition replacements. These items are part of the Aiming Circle. As part of the end item, these parts must be with the end item whenever it is issued or transferred between property accounts. Items of COEI are removed and separately packaged for transportation or shipment only when necessary. Illustrations are furnished to help you find and identify the items.

Basic Issue Items (BII). These essential items are required to place the Aiming Circle in operation, operate it, and to do emergency repairs. Although shipped separately packaged, BII must be with the Aiming Circle during operation and when it is transferred between property accounts.

Listing these items is your authority to request/requisition them for replacement based on authorization of the end item by the Table of Organization and Equipment/Modified Table of Organization and Equipment (TOE/MTOE). Illustrations are furnished to help you find and identify the items.

Explanation of Columns in the COEI and BII List

Column (1) Illus Number. Gives you the number of the item illustrated.

Column (2) National Stock Number (NSN). Identifies the stock number of the item to be used for requisitioning purposes.

Column (3) Description, Part Number/Commercial and Government Entity Code (CAGEC). Identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The stowage location of COEI and BII is also

Explanation of Columns in the COEI and BII List – (Continued)

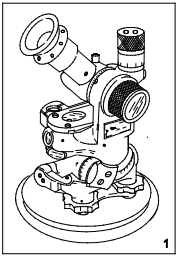
included in this column. The last line below the description is the CAGEC (in parentheses) and the part number.

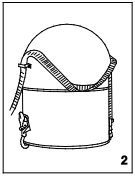
Column (4) Usable On Code. When applicable, gives you a code if the item you need is not the same for different models of equipment.

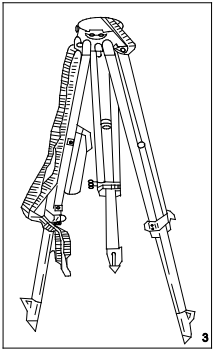
Column (5) U/I. Unit of Issue (U/I) indicates the physical measurement or count of the item as issued per the National Stock Number shown in column (2).

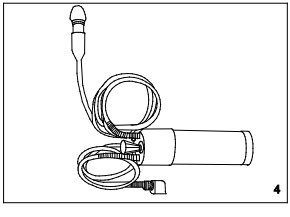
Column (6) Qty Rqr. Indicates the quantity required.

COMPONENTS OF THE END ITEM (COEI)









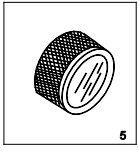
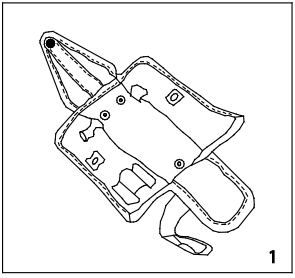


Table 1. Components of End Item (COEI)

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER (NSN)	(3) DESCRIPTION, PART NUMBER/(CAGEC)	(4) USABLE ON CODE	(5) U/I	(6) QTY RQR
1	1290-00-614-0008	Aiming Circle M2, 8211637/ (19200)	N/A	EA	1
1	6675-01-067-0687	AIMING CIRCLE M2A2, 11834483/(19200)	N/A	EA	1
2	5340-00-346-8171	COVER, 8211749/ (19200)	N/A	EA	1
3	6695-00-346-8186	LIGHT, INSTRUMENT, M51, 8293478/ (19200)	N/A	EA	1
4	1290-00-346-8184	TRIPOD, AIMING CIRCLE, M24, 8242777/ (19200)	N/A	EA	1
5	1290-00-155-8312	FILTER, OPTICAL INSTRUMENT 7647146/ (19200)	N/A	EA	1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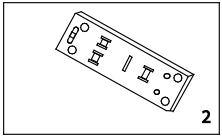
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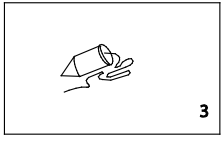
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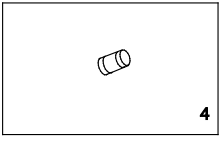
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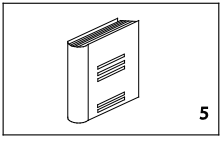
5

Table 2. Basic Issue Items

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER (NSN)	(3) DESCRIPTION, PART NUMBER/(CAGEC)	(4) USABLE ON CODE	(5) U/I	(6) QTY RQR
1	2540-00-346-8147	COVER, CANVAS, 7659605/ (19200)	N/A	EA	1
2	5340-00-346-8177	PLATE, BACK, 8211759/(19200)	N/A	EA	1
3	1290-00-346-8185	PLUMB BOB ASSEMBLY, 8261635	N/A	EA	1
4	5120-00-505-5477	EXTRACTOR, LAMP, 8293477/ (19200)	N/A	EA	2
5	N/A	OPERATOR MANUAL, TM 9-6675-262-10 AIMING CIRCLE M2 W/E (1290-00-614-0008) AND M2A2 W/E (6675-01-067-0687)	N/A	EA	1

END OF WORK PACKAGE

EXPENDABLE AND DURABLE ITEMS LIST

INTRODUCTION

Scope

This work package lists expendable and durable items that you will need to operate and maintain the Aiming Circle. This list is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items); CTA 50-909, Field and Garrison Furnishings and Equipment; or CTA 8-100, Army Medical Department Expendable/Durable Items.

Explanation of Columns in the Expendable/Durable Items List

Column (1) Item No. This number is assigned to the entry in the list and is referenced in the narrative instructions to identify the item (e.g., Use brake fluid (WP 0098, Item 5)).

Column (2) Level. This column identifies the lowest level of maintenance that requires the listed item (C = Crew).

Column (3) National Stock Number (NSN). This is the NSN assigned to the item which you can use to requisition it.

Column (4) Item Name, Description, Part Number/(CAGEC). This column provides the other information you need to identify the item. The last line below the description is the part number and the Commercial and Government Entity Code (CAGEC) (in parenthesis).

Column (5) U/I. Unit of Issue (U/I) code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

Table 1. Expendable and Durable Items List.

(1) ITEM NO.	(2) LEVEL	(3) NATIONAL STOCK NUMBER (NSN)	(4) ITEM NAME, DESCRIPTION, PART NUMBER/(CAGEC)	(5) U/I
1	C	6135-00-120-1020	BATTERY, DRY: 1.5 V MS75059 (96906)	EA
2	C	6240-00-635-9800	LAMP, INCANDESCENT: MS51608-3 (96906)	EA
3	C	6640-00-663-0832	PAPER, LENS: tissue sheet NNN-P-40, type 1 (81348)	EA

END OF WORK PACKAGE

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MARINE CORPS TM 00476C-OR/1

By Order of the Secretary of the Army:

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