

DEPARTMENT OF THE ARMY
TECHNICAL MANUAL

**DIRECT SUPPORT AND GENERAL SUPPORT
MAINTENANCE MANUAL
(INCLUDING REPAIR PARTS AND SPECIAL
TOOLS AND DEPOT MAINTENANCE
REPAIR PARTS LISTS)
FOR**

**TELESCOPE MOUNT: M146 (1240-00-864-0348),
ELBOW TELESCOPE: M118A2
(1240-01-092-2693),
ELBOW TELESCOPE: M118A3
(1240-01-317-9241),
TELESCOPE MOUNT: M145 (1240-00-871-2969),
TELESCOPE MOUNT: M145A1
(1240-01-313-6842),
PANORAMIC TELESCOPE: M117
(1240-00-864-2930),
PANORAMIC TELESCOPE: M117A2
(1240-00-106-7754),
FIRE CONTROL QUADRANT: M15
(1290-00-896-2236)
PERISCOPE: M42 (1240-00-864-2933),
LINKAGE ASSEMBLY (1240-00-871-5475),
AND LINKAGE ASSEMBLY (1030-01-317-9117)**

**M146 TELESCOPE 2-1
MOUNT MAINTENANCE**

**M118A2/M118A3 ELBOW 3-1
TELESCOPE MAINTENANCE**

**M145/M145A1 TELESCOPE 4-1
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**M117/M117A2 PANORAMIC 5-1
TELESCOPE MAINTENANCE**

**M15 FIRE CONTROL 5.1-1
QUADRANT MAINTENANCE**

**M42 PERISCOPE 6-1
MAINTENANCE**

**LINKAGE ASSEMBLY 7-1
MAINTENANCE**

**EXPENDABLE AND 8-1
DURABLE ITEMS LIST**

**REPAIR PARTS AND SPECIAL
TOOLS LIST (RPSTL)
(INCLUDING DEPOT MAINTENANCE D-1
REPAIR PARTS)**

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

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LINKAGE ASSEMBLY (1240-00-871-5475),
AND LINKAGE ASSEMBLY (1030-01-317-9117)**

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: Director, U.S. Army Armament and Chemical Acquisition and Logistics Activity, ATTN: AMSTA-AC-NML Rock Island, Illinois 61299-7630.

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CHAPTER 1 INTRODUCTION

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Section I. General Information

1-1. SCOPE

Type of manual: Direct and general support maintenance.

Model numbers and equipment name: M146 telescope mount, M118A2/M118A3 elbow telescope, M145/M145A1 telescope mount, M117/M117A2 panoramic telescope, M15 fire control quadrant, M42 periscope, and linkage assembly.

Purpose of equipment: Used on the M109A2/M109A3/M109A4/M109A5/M109A6 howitzer to provide sighting and targeting capabilities.

1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be prescribed by DA PAM 738-750, The Army Maintenance Management System (TAMMS).

1-3. OFFICIAL NOMENCLATURE, NAMES, AND DESIGNATIONS

<u>OFFICIAL NOMENCLATURE</u>	<u>COMMON NAME</u>
Howitzer, medium, self-propelled 155mm, M109A2/M109A3/M109A4/M109A5/M109A6	Howitzer
M42 tank periscope	M42 periscope
O-ring	Preformed packing
Quadrant, fire control, M15	M15 quadrant
Wormshaft housing	Cross-level mechanism

1-4. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR'S)

If your equipment needs improvement, let us know, send us an EIR. EIRs will be prepared using SF Form 368 (Quality Deficiency Report). EIRs should be mailed directly to Director, U.S. Army Armament and Chemical Acquisition and Logistics Activity, Attn.: AMSTA-AR-QAW-A (R)/Customer Feedback Center, Rock Island, Illinois 61299-7300.

1-4.1. CORROSION PREVENTION AND CONTROL (CPC)

Corrosion Prevention and Control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problem with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.

While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem.

If a corrosion problem is identified, it can be reported using Standard Form 368, Quality Deficiency Report. Use of key words such as "corrosion", "rust", "deterioration", or "cracking" will assure that the information is identified as a CPC problem.

The form should be submitted to: Commander, U.S. Army Armament Research, Development and Engineering Center, ATTN: AMSTA-AR-QAW-A (R) /Customer Feedback Center, Rock Island, IL 61299-7300.

Section II. Equipment Description and Data

1-5. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

a. M146 Telescope Mount.

(1) The M146 telescope mount provides an adjustable support for the M118A2/M118A3 elbow telescope. The M146 telescope mount consists of a yoke, a bracket, an elevation bracket, a base plate, an elevation knob mechanism, a deflection knob mechanism, and a cable assembly.

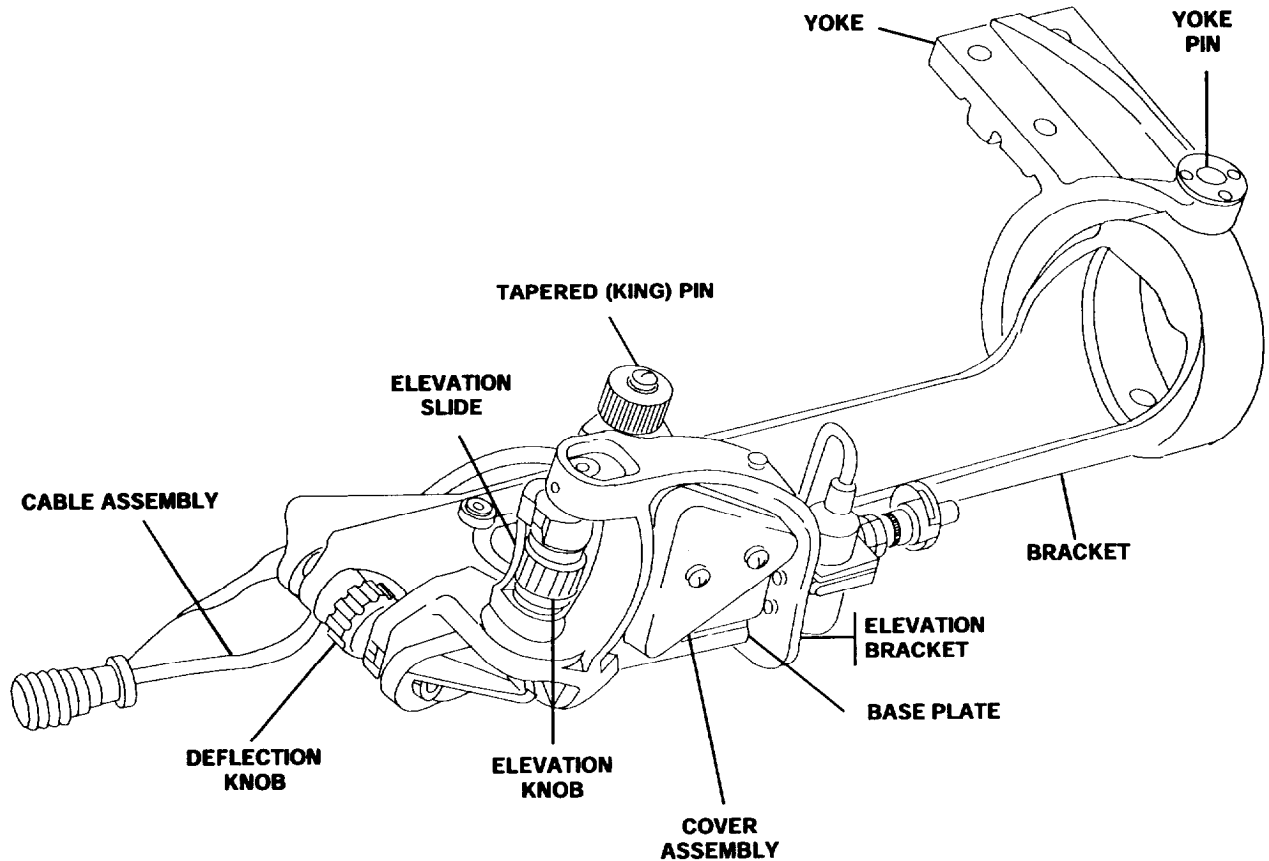
(2) The yoke and the base plate are bolted to the howitzer cradle. The yoke has a pair of machined crosskeys that fit into corresponding slots in pads machined onto the cradle to prevent shifting of the yoke during recoil. The yoke is secured to the bracket by two yoke pins which fit into the opposite ends of a vertical bore in the bracket. The bracket is secured to the main bracket of the M146 telescope mount.

(3) The M118A2/M118A3 elbow telescope is supported in elevation by an elevation slide which travels on an arc about the center of the telescope ball which fits into the forward end of the bracket. A keyed ratchet on the elevation slide engages a slot on the main bracket to brace the M118A2/M118A3 elbow telescope against recoil. Lateral movement of the elevation knob mechanism is prevented by a retainer plate which acts as a "T" slot key. The M118A2/M118A3 elbow telescope is held in position by a tapered (king) pin which fits into matching holes on the telescope housing.

(4) The M146 telescope mount adjusts the M118A2/M118A3 elbow telescope for boresighting and ballistic corrections by means of an elevation knob machined with an internal acme screw thread. Turning the elevation knob raises the elevation slide, pivoting the M118A2/M118A3 elbow telescope vertically about the telescope ball. Elongated holes in the elevation bracket permit an adjustment of ± 10 mils in elevation. Each revolution of the elevation knob represents an 8-mil angular change in elevation. Elevation corrections are measured on a dial of angular deviations scored in tenths of a mil and numbered 1, 2, 3, 4, 5, 6, and 7 mils. A spring-loaded elevation ratchet automatically locks the controls at all even line increments on the elevation dial.

(5) The deflection knob causes the M146 telescope mount to pivot about the yoke pins. Each revolution of the deflection knob represents an 8-mil angular change in deflection. The deflection knob is an acme nut and screw arrangement similar to the elevation knob. A correction dial, similar to that described in (4) is provided for the deflection mechanism. A spring-loaded deflection ratchet automatically locks the controls at all even line increments on the deflection dial.

(6) The cable assembly, which is held to the M146 telescope mount by means of external clips, supplies 24-volt dc power from the vehicle supply to the M118A2/M118A3 elbow telescope through a standard quick-disconnect sealed connector.



M146 TELESCOPE MOUNT

1-5. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES - continued

b. M118A2/M118A3 Elbow Telescope.

(1) The M118A2/M118A3 elbow telescope is the basic direct fire instrument used for positioning the weapon in azimuth and elevation on targets visible from the weapon. The M118A2/M118A3 elbow telescope is mounted, by means of spherical seats and retaining kingpin, on the M146 telescope mount. The M118A2/M118A3 elbow telescope is a 4-power, fixed-focus telescope with a 10° field of view. It consists of three major subassemblies: the eyepiece and erector lens subassembly (also referred to as the eyepiece arm), the reticle cage and cant corrector subassembly, and the objective and diaphragm subassembly. These are the basis of telescope control and adjustment.

(2) Eyepiece and erector lens subassembly (eyepiece arm).

(a) This subassembly pivots about the line of sight of the M118A2/M118A3 elbow telescope. It is operated by means of an external lock-release lever and can be locked in position at any desired angle. Although the travel of the eyepiece arm is normally limited to $\pm 20^\circ$ from the horizontal, it is possible to depress the limiting stops to allow 180° rotation of the eyepiece arm. The eyepiece is fitted with a rubber eyeshield which serves to eliminate unnecessary light and to maintain proper eye distance while sighting through the M118A2/M118A3 elbow telescope.

(b) This subassembly also contains the eyelens and field lens, the relay (erector) lenses and the Amici prism.

(c) Enclosed in separate housing on the eyepiece arm is a variable resistor (rheostat) which controls illumination of the reticle.

(d) A valve on the eyepiece arm provides for pressurization of the M118A2/M118A3 elbow telescope.

(3) The reticle cage and cant corrector subassembly. This section provides movement of the M118A2/M118A3 elbow telescope and contains the precollimated ballistic reticle. A pair of wormshaft assembly (cant correction) knobs are used in conjunction with the level assembly. The level vial is used by the gunner to cross-level the cant corrector whenever it is in a canted position. For easy viewing, the level vial is provided with a mirror.

(4) Objective and diaphragm subassembly. This subassembly contains the objective lens, diaphragms, collective lens, and erector lenses.

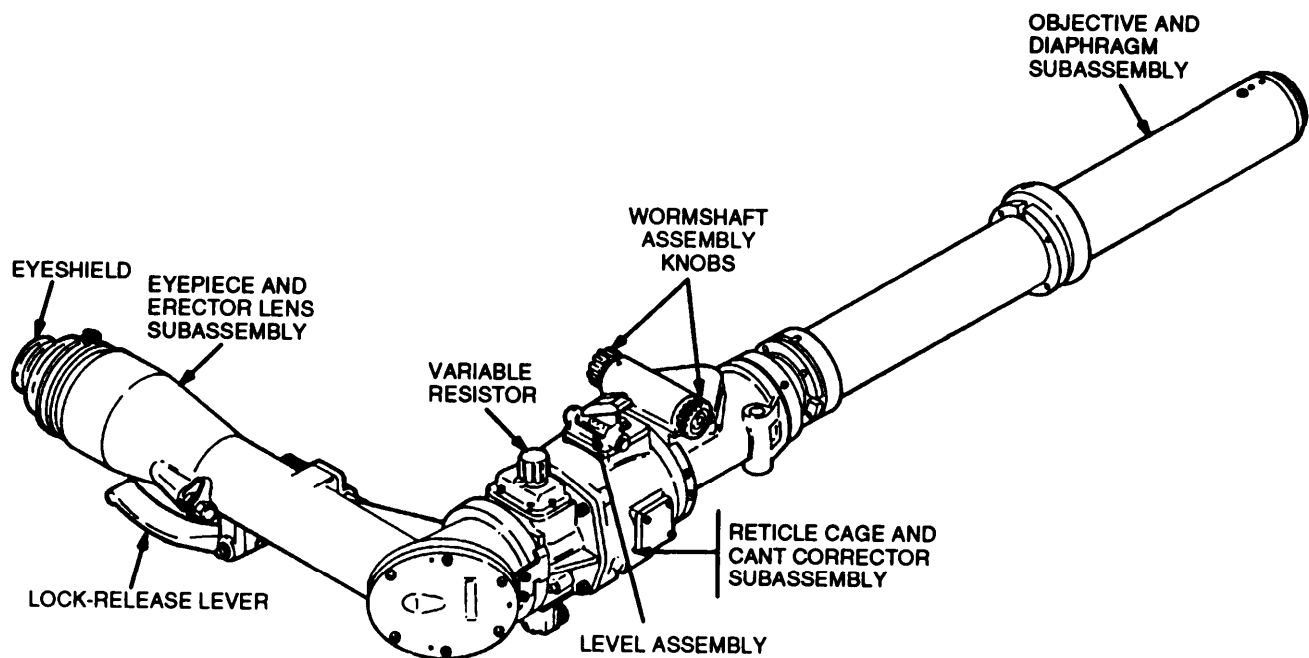
(5) Optical system. All optical components of the M118A2/M118A3 elbow telescope are internally mounted in the three main subassemblies as previously described. The optical system is composed of a window, an objective lens, a diaphragm, a collective lens, a first erector lens, a diaphragm, a second erector lens, a collective lens, three reticles (either of which can be moved into a common focal plane), a first relay (erector) lens, an Amici prism, a second relay (erector) lens, a field lens, and an eyelens. All optical elements are fixed in position and hermetically sealed in the M118A2/M118A3 elbow telescope.

(a) The window is mounted in a threaded cell in the objective end of the forward tube. It protects the optical system from dirt, dust, and moisture.

(b) The objective lens is a cemented doublet-type which is mounted directly behind the window in an independently sealed cell. It forms an inverted and reverted image of the target at the diaphragm.

(c) The diaphragm, which functions as a field of view stop, limits the field of view to the desired value and at the same time provides a well-defined cutoff to the field of view. It is located in the focal plane of the objective lens.

(d) The first collective lens is a piano-convex lens retained in a tubular sleeve by the threaded cell that supports the diaphragm. The function of the collective lens is to form a well-defined image of the target to the first erector lens.



M118A2/M118A3 ELBOW TELESCOPE