

TM 9-1731D

WAR DEPARTMENT TECHNICAL MANUAL

ORDNANCE MAINTENANCE

AZIMUTH INDICATORS M20 AND M21 FOR TANKS AND GUN MOTOR CARRIAGES

RESTRICTED. DISSEMINATION OF RESTRICTED MATTER.
No person is entitled solely by virtue of his grade or position
to knowledge or possession of classified matter. Such matter
is entrusted only to those individuals whose official duties
require such knowledge or possession. (See also paragraph
23b, AR 380-5, 15 March 1944.)

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16 JUNE 1945

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WAR DEPARTMENT
Washington 25, D. C., 16 June 1945

TM 9-1731D, Ordnance Maintenance: Azimuth Indicators M20 and M21 for Tanks and Gun Motor Carriages, is published for the information and guidance of all concerned.

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BY ORDER OF THE SECRETARY OF WAR:

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Chief of Staff.

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(For explanation of symbols, see FM 21-6.)

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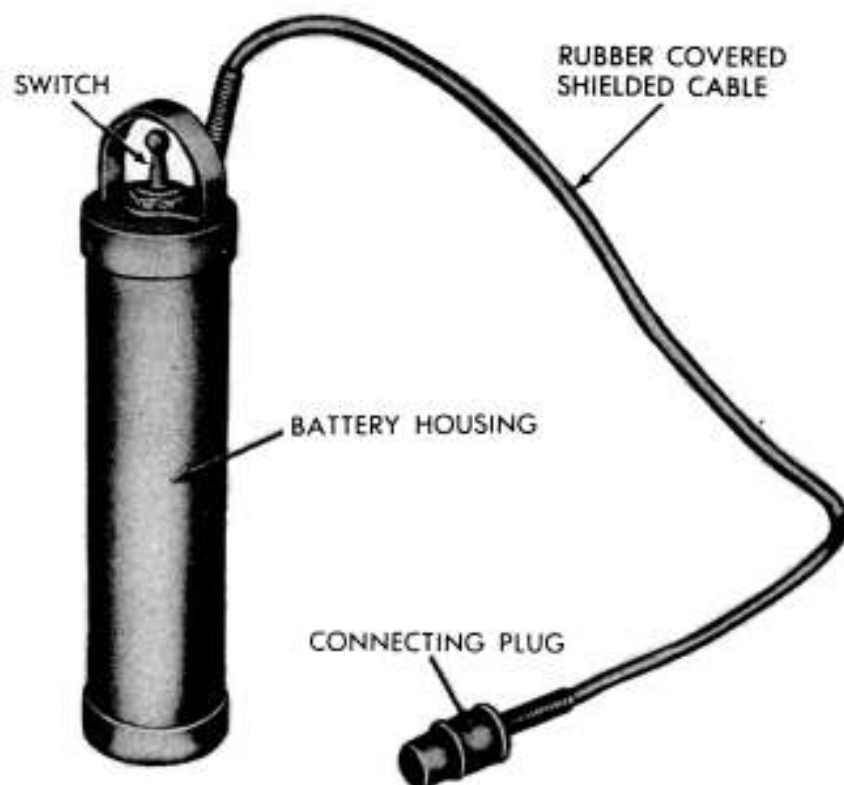
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RA PD 337981

Figure 1 — Azimuth Indicators M20 and M21



RA PD 337979

Figure 2 — Azimuth Indicator Lighting System

RESTRICTED**Section I****INTRODUCTION****1. SCOPE.**

a. These instructions are published for the information and guidance of personnel responsible for third and higher echelons of maintenance on Azimuth Indicators, M20 and M21. They contain information on maintenance which is beyond the scope of the tools, equipment or supplies normally available to using organizations. This manual does not contain information which is intended primarily for the using arm, since such information is available to ordnance maintenance personnel in 100-series TM's and FM's.

b. This manual contains a description of, and procedure for disassembly, inspection, repair and assembly of the Azimuth Indicators, M20 and M21.

2. RECORDS.

a. Forms and records applicable for use in performing prescribed operations are listed below with a brief explanation of each.

(1) W.D., A.G.O. FORM NO. 462, PREVENTIVE MAINTENANCE SERVICE AND TECHNICAL INSPECTION WORK SHEET FOR FULL-TRACK AND TANK-LIKE WHEELED VEHICLES. This form will be used for all semi-monthly or monthly maintenance services and for technical inspections of these vehicles.

(2) W.D., A.G.O. FORM NO. 468, UNSATISFACTORY EQUIPMENT REPORT. This form will be used for reporting manufacturing, design, or operational defects in materiel with a view to improving and correcting such defects, and for use in recommending modifications on materiel. This form will not be used for reporting failures, isolated materiel defects, or malfunctions of materiel resulting from fair wear and tear or accidental damage; nor for the replacement, repair, or the issue of parts and equipment. It does not replace currently authorized operational or performance records.

(3) W.D., A.G.O. FORM NO. 478, MWO AND MAJOR UNIT ASSEMBLY REPLACEMENT RECORD. This form carried with the vehicle, will be used by all personnel completing a modification or major unit assembly (engine, transmission, transfer case, tracks, etc.) replacement to record clearly the description of work completed, date, vehicle hours and/or mileage, and MWO number or nomenclature of unit assembly. Personnel performing the operations will initial in the column provided. Minor repairs, parts and accessory replacements will not be recorded.

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(4) W.D., A.G.O. FORM No. 10-144 (TALLY SHEET, INCOMING). This form may be used to record all incoming materials or supplies pending negotiation of a final voucher. It may also be used in exchanging vehicles, parts or tools, or in lieu of shipping tickets.

(5) W.D., A.G.O. FORM No. 10-145 (TALLY SHEET, OUTGOING). This form may be used to record all outgoing materials or supplies pending negotiations of the final voucher. It may also be used in exchanging vehicles, parts or tools, or in lieu of shipping ticket.

(6) W.D., A.G.O. FORM No. 9-71 (LOCATOR AND INVENTORY CONTROL CARD). This form may be used as a bin tag, locator card or inventory control card in maintaining spare parts stocks. This form is for tactical units only.

(7) W.D., A.G.O. FORM No. 9-76 (REQUEST FOR JOB ORDER). This form may be used by any officer or authorized person requiring production, repair, alteration, inspection, or any other type of work from another organization, department, or echelon. Not required for second or third echelon repairs.

(8) W.D., A.G.O. FORM No. 9-77 (JOB ORDER REGISTER). This form will be prepared, when job orders are used, in single copy only, by service echelons to furnish a chronological order and record of job order numbers and related information.

(9) W.D., A.G.O. FORM No. 9-78 (JOB ORDER). This form properly executed, may be used as an authority for work. No work of any nature will be performed in a service echelon shop keeping a cost accounting-type record system without a properly authenticated job order.

(10) W.D., A.G.O. FORM No. 9-79 (PARTS REQUISITIONED). This form will be used as an interdepartmental shop requisition to request parts where job orders are required.

(11) W.D., A.G.O. FORM No. 9-80 (JOB ORDER FILE). This folder may be used to hold under one cover all shop papers and records incident to a particular job order or to a particular vehicle.

(12) W.D., A.G.O. FORM No. 9-81 (EXCHANGE PART OR UNIT IDENTIFICATION TAG). This tag, properly executed, may be used when exchanging unserviceable items for like serviceable assemblies, subassemblies, parts, vehicles and tools.

Section II

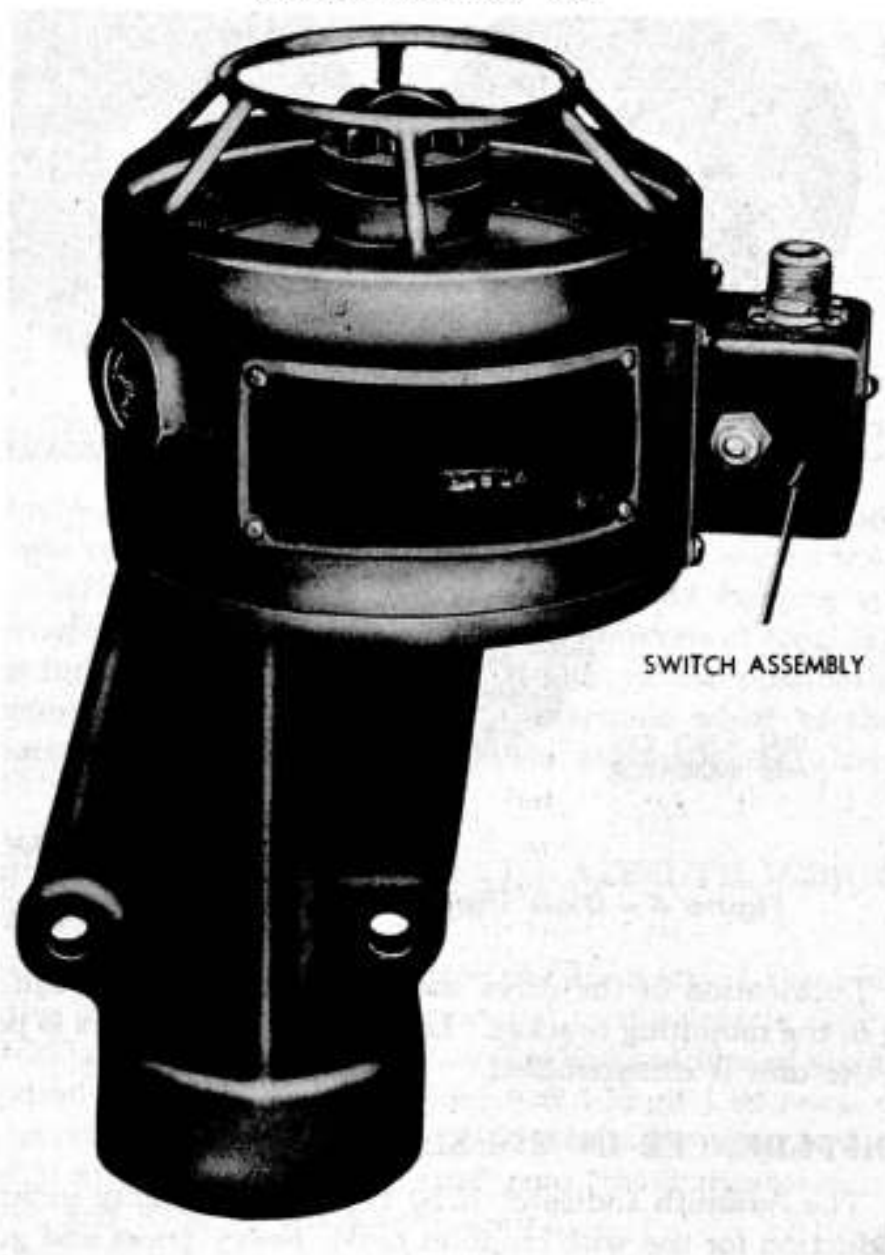
DESCRIPTION

3. DESCRIPTION.

a. The Azimuth Indicators, M20 and M21 (fig. 1) consist of a mounting bracket and gear housing, together with the necessary

Description

AZIMUTH INDICATOR M19



SWITCH ASSEMBLY

RA PD 337978

Figure 3 — Azimuth Indicator M19

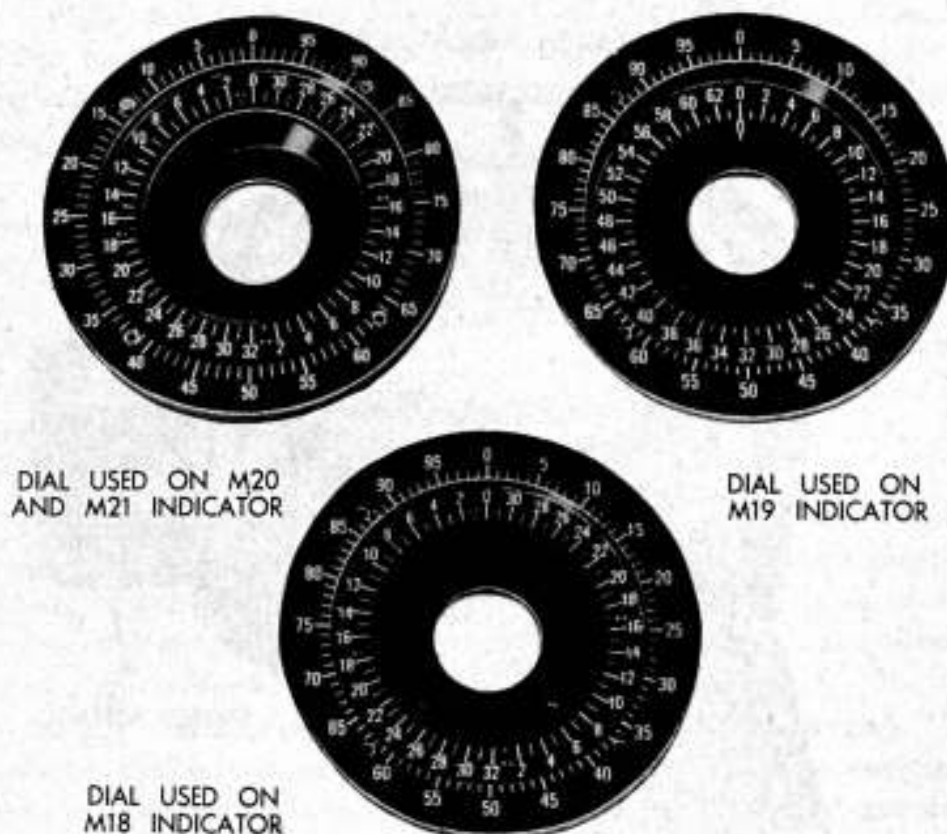
gears, dials and pointers, arranged so the tank turret ring gear drives the pointers through the gearing to indicate, by means of dials graduated in mils, the position of the gun in relation to a given point.

b. The dials are made legible by indirect lighting supplied by two small lamps, whose power is derived from two external flashlight batteries or vehicle power plant (fig. 2). A switch, located on top of the battery case, controls the lamps. The pointers are tipped with luminous paint.

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RA PD 337980

Figure 4 — Dials Used on Azimuth Indicators

c. Lubrication of the drive shaft is maintained through a grease fitting in the mounting bracket. Lubrication of the gears is performed when the unit is disassembled.

4. DIFFERENCES IN MODELS.

a. The Azimuth Indicator M20 (fig. 1) is the only indicator now in production for use with medium tanks, heavy tanks and gun motor carriages. This indicator is mounted on a bracket 7 inches in height, and has a dial graduation 0-3200-0-3200.

b. The Azimuth Indicator M21 (T12) (fig. 1) is similar to the Azimuth Indicator M20 except that it has a 4½-inch mounting bracket, the drive gear is smaller, and the internal gears are coarser. Except for the indicated differences, the parts are interchangeable.

c. In addition to Azimuth Indicators M20 and M21, the Azimuth Indicators M18, M19, and T12 were formerly used. The Azimuth Indicators M18 and M19 (fig. 3) are similar except for the dials. The dial of the Azimuth Indicator M19 (fig. 4) is graduated from 0 to 6400 mils. The dial of the Azimuth Indicator M18 is graduated 0-3200-0-3200 mils. The Azimuth Indicator T12 is similar to Azi-