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TECHNICAL MANUAL

OPERATOR'S MANUAL FOR

RADAR SET AN/MPQ-4A

(NSN 5840-00-543-0759)

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HEADQUARTERS, DEPARTMENT OF THE ARMY
APRIL 1977

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WARNING

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT

Be careful when working the 440-volt plate and power supply circuit, or on the 120-volt ac line connections.

DON'T TAKE CHANCES!
EXTREMELY HIGH VOLTAGES
EXIST IN THE FOLLOWING UNITS:

Duplexer tr tube assembly	700 volts
Power Supply PP-1588/MPQ-4A	700 volts
Azimuth and Range Indicator IP-375/MPQ-4A	14,000 volts
Modulator-transmitter	26,000 volts

GASOLINE HANDLING

Do not refuel the power unit and do not handle or leave open gasoline containers or plastic gasoline containers in the vicinity of the radar while the radar transmitter is on.

MICROWAVE RADIATION HAZARD

Potentially hazardous levels of microwave radiation exist immediately in front of Reflector, Antenna AT-684/MPQ-4A. Turn off the transmitter before standing on the radar trailer in front of the reflector. When it is absolutely necessary to utilize the telescope while the transmitter is turned on, remain in a crouched position while making observations through the telescope, and use maximum antenna elevation angles whenever possible.

IONIZING RADIATION HAZARD

Potentially hazardous ionizing radiation may exist within the transmitter compartment. If the radar is on and radiating with the transmitter compartment door open, keep 3 feet away from the type 5949A thyratron tube. If it is necessary to work within 3 feet of this tube while the set is operating with the transmitter compartment door open, keep exposure to a minimum and limit to no more than 1 hour per week.

RADIATION HAZARD



STD-RW-2

Tube types OB2WA and 6560/BL-35 (tr tube) used in this equipment contain radioactive material. These tubes are potentially hazardous when broken; see qualified medical personnel and the Safety Director if exposed to or cut by broken tubes. Be extremely careful when replacing these tubes, and follow safe procedures in their handling, storage, and disposal.

Never place radioactive tubes in your pocket.

Be extremely careful not to break radioactive tubes while handling them.

Never remove radioactive tubes from carton until ready to use.

SELENIUM RECTIFIERS

When overheated, selenium rectifiers give off poisonous fumes (smell like garlic or rotten eggs) that are harmful to the human body. When the odor is first noticed, shut off equipment and evacuate the area. DO NOT reenter the area until it has been well ventilated. DO NOT handle selenium rectifiers that have been overheated (even after cooling) with the bare hands, to avoid contact with toxic selenium compounds.

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WARNING

Adequate ventilation should be provided while using TRICHLOROTRIFLUOROETHANE. Prolonged breathing of vapors should be avoided. The solvent should not be used near heat or open flame; the products of decomposition are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

WARNING

Do not connect power cable pigtail wires to power source according to color codes in AR 385-30 or national electrical code. Use connection instructions in this manual. Damage to equipment will result from improper wire connections.

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TECHNICAL MANUAL
No. 11-5840-208-10

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *15 April 1977*

OPERATOR'S MANUAL FOR RADAR SET AN/MPQ-4A (NSN 5840-00-543-0759)

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 back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, New Jersey 07703-5007.

In either case, a reply will be furnished direct to you.

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*This manual supersedes TM 11-5840-208-10, 3 June 1960, and TM 11-5840-208-ESC.

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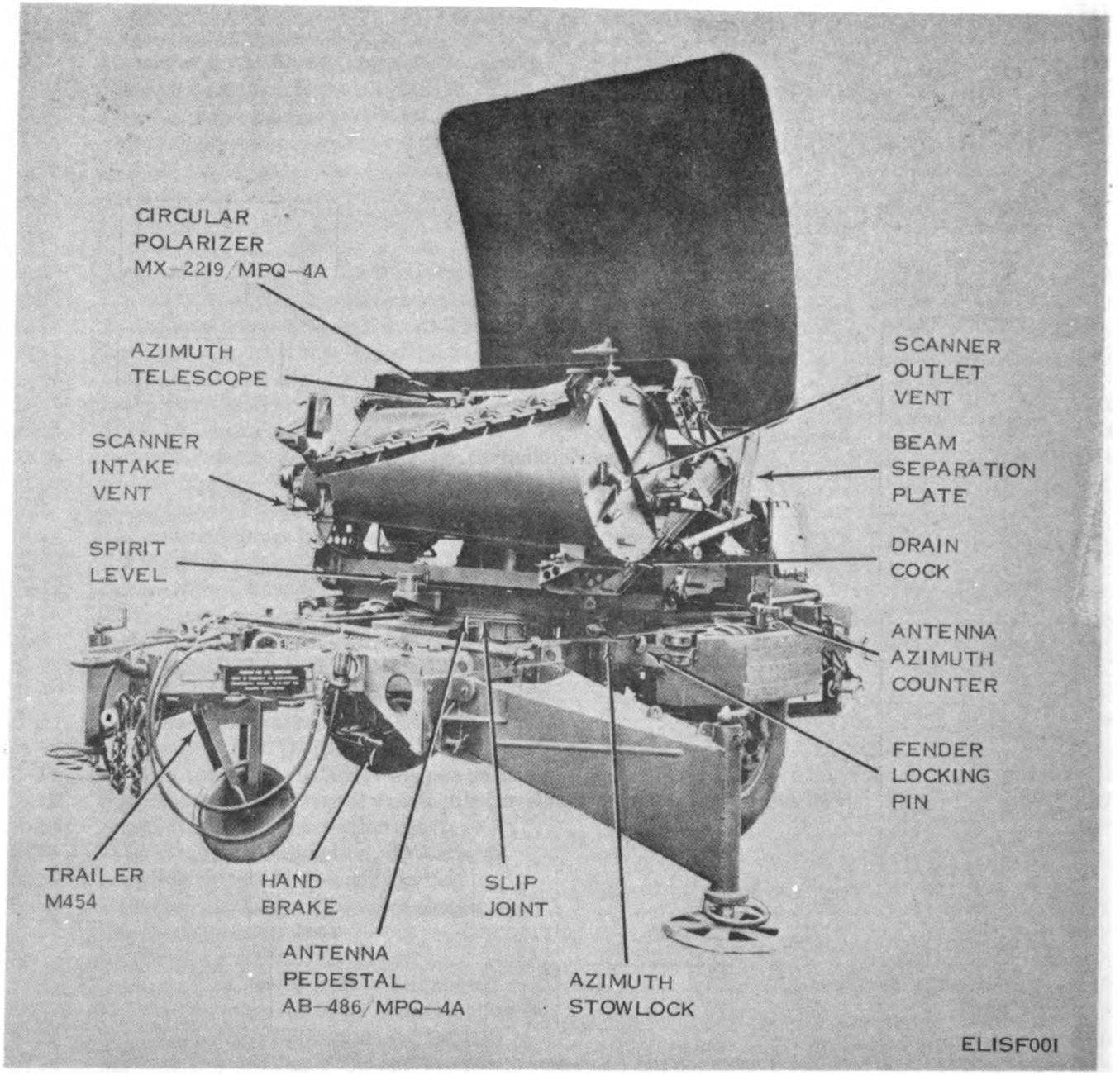

Figure 1-1. Radar Set AN/MPQ-4A, front view.

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CHAPTER 1
INTRODUCTION

Section I. GENERAL

1-1. Scope

a. This manual describes Radar Set AN/MPQ-4A (fig. 1-1); and contains instructions for the installation, operation to detect and locate weapons and impact areas, and operator's maintenance of the AN/MPQ-4A. Detailed tactical employment and position requirements, and procedures used during conduct of radar gunnery missions, are covered in FM 6-161, Radar Set AN/MPQ-4A.

b. An asterisk in parentheses is used to indicate models of an item of equipment that are sufficiently alike to be treated as a single model throughout the manual, thus: Electric Desiccant Dehydrator HD-264(*)/MPQ-4A represents the HD-264/MPQ-4A and the HD-264A/MPQ-4A. When portions of these like models differ enough to require separate treatment, applicable portions are identified throughout the manual.

1-2. Consolidated Index of Army Publications and Blank Forms

Refer to the latest issue of DA Pam 310-1 to determine whether there are new editions, changes or additional publications pertaining to the equipment.

1-3. Maintenance Forms, Records, and Reports

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750 as contained in Maintenance Management Update.

b. Report of Packaging and Handling Deficiencies. Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR 4140.55/NAVMATINST 4355.73A/AFR 400-54/MCO 4430.3H.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D/DLAR 4500.15.

1-4. Reporting Equipment Improvement Recommendations (EIR)

If your AN/MPQ-4A 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 the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-PA-MA-D, Fort Monmouth, New Jersey 07703-5023. We'll send you a reply.

1-5. Administrative Storage

Administrative storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PMCS charts before storing. When removing the equipment from administrative storage, the PMCS should be performed to assure operational readiness. Disassembly and repacking equipment for shipment or limited storage is covered in SB 38-100.

1-6. Destruction of Army Electronics Materiel

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

1-7. Deleted.

1-7.1 Hand Receipt (-HR) Manuals

This manual has a companion document with a TM number followed by "-HR" (which stands for Hand Receipt). The TM 11-6625-2706-12 consists of preprinted hand receipts (DA Form 2062) that list and item related equipment (i.e., BII and AAL) you must account for. As an aid to property accountability, additional -HR manuals may be requisitioned from the Commander, Baltimore AG Publications Center, 2800 Eastern Blvd., Baltimore, MD 21220 in accordance with the procedures in chapter 3, AR 310-2 and DA Pam 310-10.

Section II. DESCRIPTION AND DATA

1-8. Purpose and Use

a. Radar Set AN/MPQ-4A is a mobile, beam-intercept (nontracking) radar. It was designed primarily to locate hostile mortars and other high-trajectory weapons. However, it is also used to locate howitzers and other low-trajectory weapons, locate projectile impact areas, and observe artillery registration and adjust fire (radar gunnery).

b. Provision is made for removing Control-Indicator Group OA-1256/MPQ-4A (fig. 1-2) for remote operation, and emplacing it up to 150 feet (45.7 meters) away. Other operating components of the AN/MPQ-4A are also shown in figure 1-2.

c. Provision is also made for the acceptance of simulated video and countermeasures signals from Radar Target Signal Simulator AN/TPA-7 to facilitate operator training.

d. Power for operating the equipment is furnished by Trailer-Mounted, Gasoline-Engine-Driven Generator Set PU-304C/MPQ-4A. The PU-304C/MPQ-4A trailer is also used to stow and transport some AN/MPQ-4A components (fig. 1-8).

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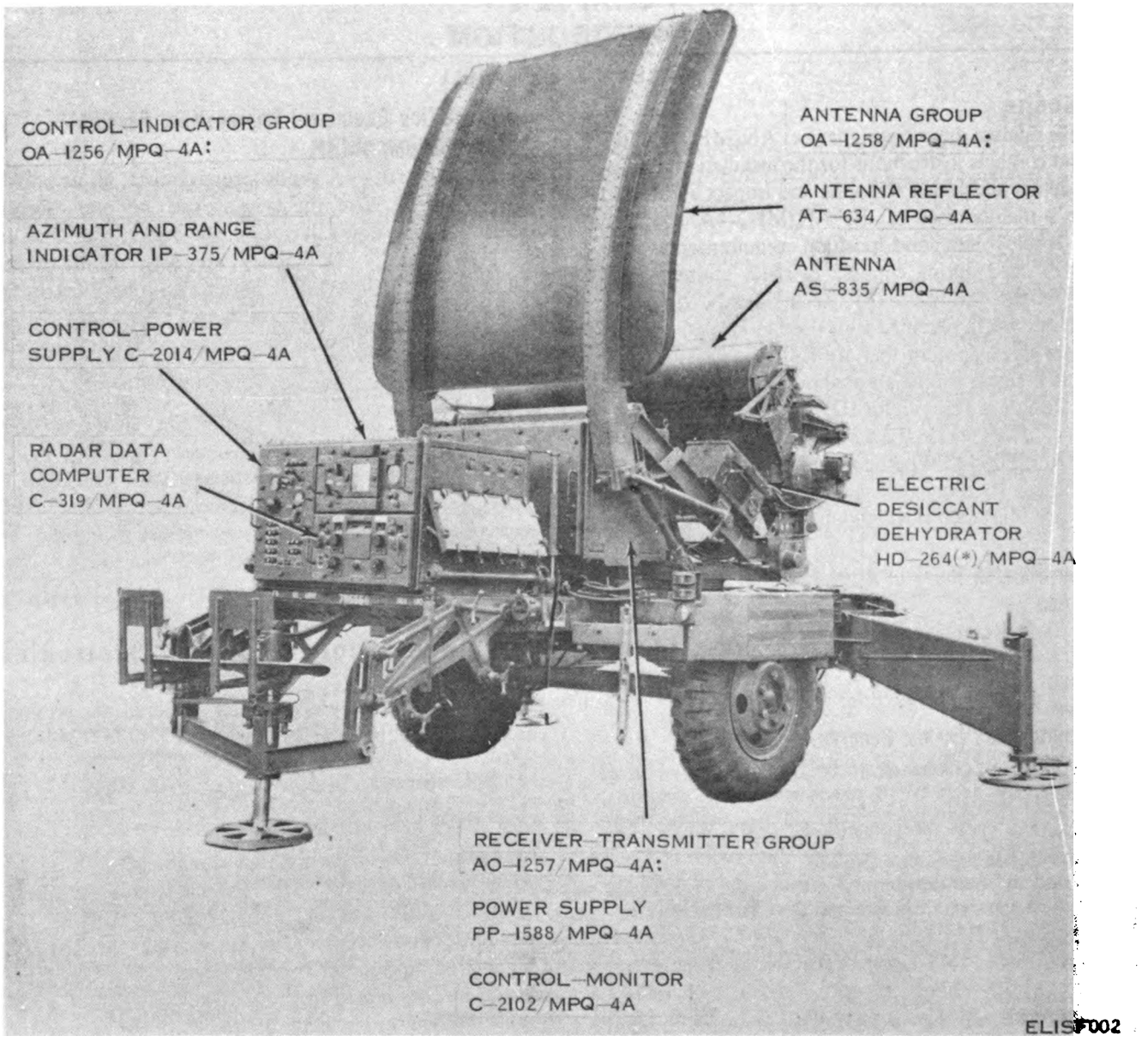

Figure 1-2. Radar Set AN/MPQ-4A, rear view.

1-9. Tabulated Data

WARNING

The tubes listed below contain radio active material:

Tube type	Isotope	Quantity (microcuries)
OB2WA	Ni 63	0.01-0.05
OB2WA	Co 60	0.0067
6560/BL-35	Co 60	0.25

a. General.

Range:

Maximum..... 15,000 meters.
Minimum..... 225 meters.
Accuracy..... ± 15 meters.
Resolution ..... 50 meters.
Determination ..... By accurate timing sweep and

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	range strobe (calibrated with crystal delay line).
Azimuth:	
Coverage	445-mil fixed sector scanning; antenna will fix through 6,400 mils.
Accuracy	± 1.5 mils.
Determination	By mechanically driven marker coil and magnet in scanner.
Elevation(beam):	
Coverage	– 100 mils to + 200 mils.
Accuracy	± 1 mil.
Determination	Calibrated antenna elevation synchro varies as the elevation of the lower beam.
Shelter:	
Size	51.5 inches deep, 82 inches wide, 50-99 inches high.
Material	Canvas.
Use	Operators.
Radar emplacement time	15 to 30 minutes by a crew of 6 trained men.

b. Transmitting System.

Frequency	16,000 megahertz per second ± 160 MHz (K_u band).
Wavelength	1.875 centimeters.
Peak power	50 kilowatts minimum*
Average power	65 watts*
Pulse repetition rate	7,000 Hertz per second*
Pulse width	0.25 microsecond.
Duty cycle	0.00175.
Source of rf power	Magnetron (type 7452).

c. Rf System.

Transmission line	K_u band waveguide.
Radiating element	Line source horn.
Reflector	Aluminum parabolic cylinder.
Horizontal beam width	17.8 mils.
Vertical beam width	14.25 mils.
Number of beams	2.
Vertical beam separation	36 mils.
Type of scan	Foster, dual beam.
Attenuation of lobes	18 db.
Scanning rate	17 per second.
Duplexer:	
Type	Short slot hybrid.
Tr tubes	1 dual tube, type 6560

d. Receiving System.

Type	Linear log (superheterodyne).
Operating frequency	16,000 MHz (K_u band).
Local oscillator	Klystron (type SRU-210).
Local oscillator frequency	15,970 MHz ± 160 MHz.
Crystals	3 (type 1N78C).
Intermediate frequency	30 MHz.
Bandwidth	5 MHz.
Sensitivity	– 96 dbm.
Input impedance	400 ohms (approx).
Maximum gain	110 db.

e. Synchronizing System.

Master oscillator	Hartley oscillator in indicator.
System triggers	Modulator trigger generator in indicator.

f. Indicating System.

Presentation	B-scope.
Indicator (crt)	5½-inch electromagnetic deflection, type K-1413P7, metalized cathode-ray tube.
Indicator high voltage	14,000 volts.
Echo interpretation	Dual beam operation: 2 intensified dots. Single beam operation: beginning and end of intensified projectile trace.
Sweep ranges	0 to 15,000 meters; 3,750 meters (delayed).
Range markers	0, 2,000, 4,000, 6,000, 8,000, 10,000, 12,000 and 14,000 meters.

g. Computing System.

Type	Analog.
Limits of operation:	
Range	16,365 meters.
Elevation	– 100 to + 200 mils.
Present altitude	± 9,999 meters.
Present azimuth	0 to 6,400 mils.
Present elevation	– 100 to + 200 mils.
Present slant range	15,000 meters.
Easting coordinate	0 – 16,355 meters.
Northing coordinate	0 – 16,355 meters.

h. Antenna Positioning System

Azimuth:	
Drive system	Ac motor driven.
Types of operation	Manual or motor driven.
Continuous rotation speed	1-2 rpm through 6,400 mils.
Elevation:	
Drive system	Ac motor driven.
Type of operation	Motor driven.

i. Power Unit.

Output	120/208 volts, 400 Hz, 4 wire, 3 phase, 10 kW.
Fuel consumption	2.5 gallons per hour.

j. Power Requirements.

Current drain (standby)	9 amperes (ϕ1)
	11.2 amperes (ϕ2)
	8.2 amperes (ϕ3)
Current drain (radiate)	10.2 amperes (ϕ1)
	11.3 amperes (ϕ2)
	19.7 amperes (ϕ3)

*When using measured average power and duty cycle to calculate peak power, 10% deadtime must be considered.

1-10. Items Comprising an Operable Equipment

Refer to Appendix B for the Components of End Item List. Table 1-1 contains the dimensions and weight of the components.

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Table 1-1 Dimensions and Weights

NSN	Qty	Nomenclature	Fig No.	Dimensions (in.)			Wt (lb)
				Depth	Width	Height	
5840-00-543-0537	1	Antenna Group OA-1258/MPQ-4A, including:	1-2	66	90.53	66.5[a]	1,998
5840-00-574-7526	1	Antenna AS-835/MPQ-4A	1-2	34 od (large end)	66	15 od (small end)	1,109
5840-00-588-0854	1	Cavity, Tuned FR-111/MPQ-4A	1-5	4.5	5.66	9.61	10
5840-00-574-2496	1	Circular Polarizer MX-2219/MPQ-4A	1-1	15	76	13	39
5985-00-537-4386	1	Coupler, Directional CU-399/MPQ-4A	1-6	5	2.63	2.13	2
5840-00-583-0305	1	Mount, Telescope, Assembly	4-4				
5840-00-543-0543	1	Pedestal, Antenna AB-486/MPQ-4A	1-1	48	42	19.5	546
5840-00-543-0535	1	Reflector, Antenna AT-634/MPQ-4A	1-2	2.5	90.53	66.5	283
1240-00-593-6415	1	Telescope, Azimuth: M62A2F	1-1				
4440-00-542-4159	1	Dehydrator, desiccant, Electric HD-264/MPQ-4A or HD-264A/MPQ-4A	1-2	20.62	13.75	10.19	46
5840-00-543-0538	1	Control-Indicator Group OA-1256/MPQ-4A, including:	1-2	31.34	53.12	28.42	571
5840-00-586-7738	1	Computer, Radar Data CP-319/MPQ-4A	1-2	26	20	12	120
5840-00-543-0536	1	Control-Power Supply C-2014/MPQ-4A	1-2	17.12	16.6	24.34	111
5840-00-543-0544	1	Indicator, Azimuth and Range IP-375/MPQ-4A	1-2	25.78	12.25	23.87	100
5840-00-586-7739	1	Receiver-Transmitter Group OA-1257/MPQ-4A including:	1-2	30.28	49.32	29.5	560
5840-00-543-0545	1	Amplifier, Intermediate Frequency AM-1538/MPQ-4A	1-3	19.5	2.5	2.5	4
5840-00-543-0546		Amplifier, Trigger Pulse AM-1537/MPQ-4A	1-4	18.62	5.22	8.30	13
5840-00-557-6255	1	Control-Monitor C-2102/MPQ-4A	1-2				
5840-00-543-0665	1	Control, Receiver C-2105/MPQ-4A	1-3	10.68	3.38	3.72	2
5840-00-543-0542	1	Control, Receiver C-2016/MPQ-4A	1-3	9.5	5.38	5.1	4
5840-00-543-0534	1	Duplexer CU-476/MPQ-4A	1-3	6	6.56	5	4
5840-00-542-6253	1	Power Supply PP-1588/MPQ-4A	1-2	24	8.3	14.1	46.5
2330-00-709-5847	1	Chassis, Trailer: 2 1/2-ton, 2-wheel, M454	2-2	192	96	36.75	1,858
5840-00-614-5218	2	Seat, Equipment Operator	2-4				
5840-574-7527	2	Support, Operator's Seat MT-1798/MPQ-4A	1-8	7.5	7.5	20.5	12
5410-00-936-8720	1	Shelter, Electrical Equipment S-134A/MPQ-4A	1-8	51.5[b]	41[b]	13[b]	175
5410-00-631-5697	2	Blower Assembly, Shelter Intake HD-339/MPQ-4A	1-8	15.1	11.62	11.62	20
5840-00-591-4743	1	Stand, Control-Indicator MT-1733/MPQ-4A	1-7	48.76	24.5	7.75[c]	15
8130-00-281-8183	1	Reel, Cable RC-413/MPQ-4A	1-8	28	12	28	14
8130-00-292-1109		Reel, Cable RC-419/MPQ-4A	1-8	36	30.5	36	30
5120-00-614-6467	1	Wrench, Tee Handle (compartment catch release tool)					
5995-00-542-6664	1	Cable Assembly, Special Purpose, Electrical CX-2771/U (W701)	2-14		101 ft 0 in.lg		
5995-00-542-6257	1	Cable Assembly, Special Purpose, CX-3898/U (W702)	2-14		6 ft 8 in.lg		
5995-00-542-6248	1	Cable Assembly, Special Purpose, CX-4103/U (W703)	1-8		150 ft 0 in.lg		
5995-00-578-6889	2	Cable Assembly, Power, Electrical CX-3904/U (W704, W708)	2-14		3 ft 0 in.lg		
5995-00-280-3416	4	Cable Assembly, Radio Frequency CX-783A/U (W705, W706, W707, and W741)	2-14		3 ft 0 in.lg		
5995-00-578-6890	1	Cable Assembly, Power, Electrical CX-3902/U (W709)	2 14		3 ft 0 in.lg		
5995-00-542-6251	1	Cable Assembly, Power, Electrical CX-3905/U (W710)	2-14		6 ft 6 in.lg		
5995-00-542-6414	1	Cable Assembly, Power, Electrical CX-4062/U (W716)	2-14		4 ft. 6 in.lg		
5995-00-578-6891	1	Cable Assembly, Power, Electrical CX-3902/U (W717)	2-14		4 ft 0 in.lg		
5995-00-542-6415	1	Cable Assembly, Power, Electrical CX-4104/U (W718)	2-14		4 ft 0 in.lg		
5995-00-542-6416	1	Cable Assembly, Power, Electrical CX-4016/U (W719)	2-14		3 ft 9 in.lg		
5995-00-553-8193	1	Cable Assembly, Power, Electrical CX-4015/U (W720)	2-14		4 ft 2 in.lg		
5995-00-542-6413	1	Cable Assembly, Power, Electrical CX-4010/U (W721)	2-14		2 ft 0 in.lg		
5995-00-553-8192	1	Cable Assembly, Power, Electrical CX-3901/U (W722)	2-14		6 ft 8 in.lg		

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Table 1-1 Dimensions and Weights—Continued.

NSN	Qty	Nomenclature	Fig. No.	Dimensions (in.)			Wt (lb)
				Depth	Width	Height	
5995-00-553-8195	1	Cable Assembly, Power, Electrical CX-4012/U (W723)	2-14		1 ft 2 in.lg		
5995-00-542-6451	1	Cable Assembly, Power, Electrical CX-4009/U (W724)	2-14		2 ft 6 in.lg		
5995-00-553-7712	1	Cable Assembly, Power, Electrical CX-4013/U (W725)	2-14		4 ft 2 in.lg		
5995-00-542-6421	1	Cable Assembly, Power, Electrical CX-4011/U (W726)	2-14		6 ft 0 in.lg		
5995-00-542-6422	2	Cable Assembly, Power, Electrical CX-4014/U (W728, W729)	2-14		3 ft 0 in.lg		

[a]Height is 66.5 inches with reflector down; 122.5 inches with reflectors up.
[b]These are folded dimensions. Shelter is 51.5 inches deep, 82 inches wide, and 50 to 99 inches high (adjustable) when assembled.
[c]Height is 7.75 inches folded, 31 inches standing.

1-11. Expendable Consumable Supplies and Materials

Refer to Appendix D for the Expendable Supplies and Materials List.

1-12. Functional Items Required for Operation

On each, Generator Set, Gasoline Engine, Trailer Mounted PU-304C/MPQ-4A (NSN 6115-00-056-8421), is required for operation to power the radar set. The generator set is not part of the radar set, and must be requisitioned by the user.

1-13. Common Names

A list of nomenclature and common name assignments for Radar Set AN/MPQ-4A and its major components are given below.

Nomenclature	Common name
Radar Set AN/MPQ-4A	Radar
Amplifier, Intermediate Frequency AM-1538/MPQ-4A	If amplifier
Amplifier, Trigger Pulse AM-1537/MPQ-4A	Trigger amplifier
Antenna AS-835/MPQ-4A	Scanner
Antenna Group OA-1258/MPQ-4A	Antenna group
Blower Assembly, Shelter, Intake HD-279/MPQ-4A[a]	Shelter intake blower
Blower Assembly, Shelter, Exhaust HD-278/MPQ-4A[b]	Shelter exhaust blower
Cavity, Tuner FR-11/MPQ-4A	Echo box
Circular Polarizer MX-2219/MPQ-4A	Circular polarizer
Computer, Radar Data CP-318/MPQ-4A	Computer
Control-Indicator Group OA-1258/MPQ-4A	Control-Indicator group
Control-Monitor C-2102/MPQ-4A	Control-monitor
Control-Power Supply C-2014/MPQ-4A	Control-power supply
Case, Accessories CY-2201/MPQ-4A	Transit case
Receiver Control C-2016/MPQ-4A	Afc assembly
Receiver Control C-2015/MPQ-4A	Stc assembly
Coupler, Directional CU-399/MPQ-4	Directional coupler
Dehydrator, Electric Desiccant HD-264A/MPQ-4A	Dehydrator
Duplexer CU-476/MPQ-4A	Duplexer
Generator Set PU-304C/MPQ-4[a]	Power unit

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Nomenclature	Common name
Indicator, Azimuth and Range IP-375/MPQ-4A	Indicator panel
Pedestal, Antenna AB-486/MPQ-4A	Pedestal
Power Supply PP-1588/MPQ-4A	Low-voltage power supply
Receiver-Transmitter Group OA-1257/MPQ-4A	Reciever-transmitter group
Reel, Cable RC-413/MPQ-4	Power cable reel
Reel, Cable RC-419/MPQ-4	Remote cable reel
Reflector, Antenna AT-634/MPQ-4A	Reflector
Trailer, Cargo, Ordnance type M-105AL	Cargo trailer
Shelter, Electrical Equipment S-134/MPQ-4A[a]	Operator's shelter
Shelter, Electrical Equipment S-134/MPQ-4A[a]	Operator's shelter
Stand, Control-Indicator MT-1733/MPQ-4A	Remoting stand
Support, Operator's Seat MT-1798/MPQ-4A	Remoting seat support
Chassis, Trailer: 2½-ton, 2-wheel, M454 (V-130/MPQ-4A) (TM 9-2330-234-15)	Radar trailer
Cable Assembly, Special Purpose, Electrical, CX-2771/U (101 ft 0 in.)	Power cable W701
Cable Assembly, Special Purpose, Electrical CX-3898/U (6 ft 8 in.)	Pedestal control cable W702
Cable Assembly, Special Purpose, Electrical CX-4103/U (150 ft 0 in.)	Remote control cable W703
Cable Assembly, Power, Electrical CX-3904/U (3 ft 0 in.) (2 ea)	Cable W704, W708
Cable Assembly, Radio Frequency CG-783A/U (3 ft 0 in.) (4 ea)	Cable W705, W706, W707 and W741
Cable Assembly, Power, Electrical CX-3902/U (3 ft. 0 in.)	Cable W709
Cable Assembly, Power, Electrical CX-3905/U (6 ft 6 in.)	Cable W710
Cable Assembly, Power, Electrical CX-3900/U (3 ft 0 in.)[a]	Cable W711
Cable Assembly, Power, Electrical CX-4062/U (4 ft 6 in.)	Cable W716
Cable Assembly, Power, Electrical CX-3902/U (4 ft 0 in.)	Cable W717
Cable Assembly, Power, Electrical CX-4104/U (4 ft 0 in.)	Cable W718
Cable Assembly, Power, Electrical CX-4016/U (3 ft 9 in.)	Cable W719
Cable Assembly, Power, Electrical CX-4015/U (5 ft 2 in.)	Cable W720
Cable Assembly, Power, Electrical CX-4010/U (2 ft 0 in.)	Cable W721
Cable Assembly, Power, Electrical CX-3901/U (6 ft 8 in.)	Cable W722
Cable Assembly, Special Purpose, Electrical CX-4012/U (1 ft 2 in.)	Cable W723
Cable Assembly, Power, Electrical CX-4009/U (2 ft 6 in.)	Cable W724
Cable Assembly, Power, Electrical CX-4013/U (4 ft. 2 in.)	Cable W725
Cable Assembly, Power, Electrical CX-4011/U (6 ft 0 in.)	Cable W726
Cable Assembly, Special Purpose, Electrical (5 ft 8 in.)	Cable W727
Cable Assembly, Power, Electrical CX-4014/U (3 ft 0 in.) (2 ea)	Cable W728 and W729
Cable Assembly, Power, Electrical CX-3903/U (1 ft 10 in.)[a]	Cable W730
Cable Assembly, Special Purpose, Electrical (7 ft 6 in.) (2 ea)[b]	Cable W1901

[a]Used in Model AN/MPQ-4A, serial numbers 1 through 24.
[b]Used in Model AN/MPQ-4A, serial numbers 25 and above.

1-14. Description of Equipment

Radar Set AN/MPQ-4A is a mobile unit completely self-contained in two trailers. One trailer contains the radar; the second trailer contains the power source required for field operation of the equipment.

a. Radar Trailer. The radar trailer, when prepared for transit, appears as shown in figure 2-2. When prepared for operation, it appears as shown in figure 1-1. The main operating components of the radar (fig. 1-2) consist of an antenna group, receiver-transmitter group, control-indicator group, and a dehydrator.

(1) *Antenna Group 1258/MPQ-4A.* The antenna group is mounted on the radar trailer and consists of the antenna pedestal, antenna, and antenna reflector. The pedestal provides a rotatable base for the antenna and antenna reflector giving a full 6,400-mil area of coverage. It also provides means of elevating or depressing the radar beam.

(2) *Receiver-transmitter group.* The receiver-transmitter group is mounted on the antenna pedestal and generates the rf energy which is fed to the antenna. It contains the transmitter and associated power supplies as well as the if. amplifier and afc assembly.

(3) *Control-indicator group.* The control-indicator group is mounted on the radar trailer but can be removed for remote operation of the radar. It provides accurate synchronizing pulses for the radar and contains all the operating controls. It has a B-scope indicator for target (echo) presentation and an analog computer to solve the weapon location problem. The power supplies for the group are self-contained.

(4) *Dehydrator.* The dehydrator is mounted on the antenna group and provides dry air under pressure for the rf (waveguide) sections to prevent arcing and equipment malfunction.

b. Power Unit. The power unit consists of a cargo trailer and mounted power unit. The cargo trailer (fig. 1-8) is a two-wheel, 1-1/2-ton trailer, containing the power unit. The power unit provides all the power required by the radar for operation. The cargo trailer is also used to transport the operator's shelter (fig. 1-8), interconnecting cables, and spare parts for the radar.

1-15. Description of Receiver-Transmitter Group OA-1257/MPQ-4A

a. Receiver-Transmitter Cabinet. The receiver-transmitter cabinet contains a receiver compartment

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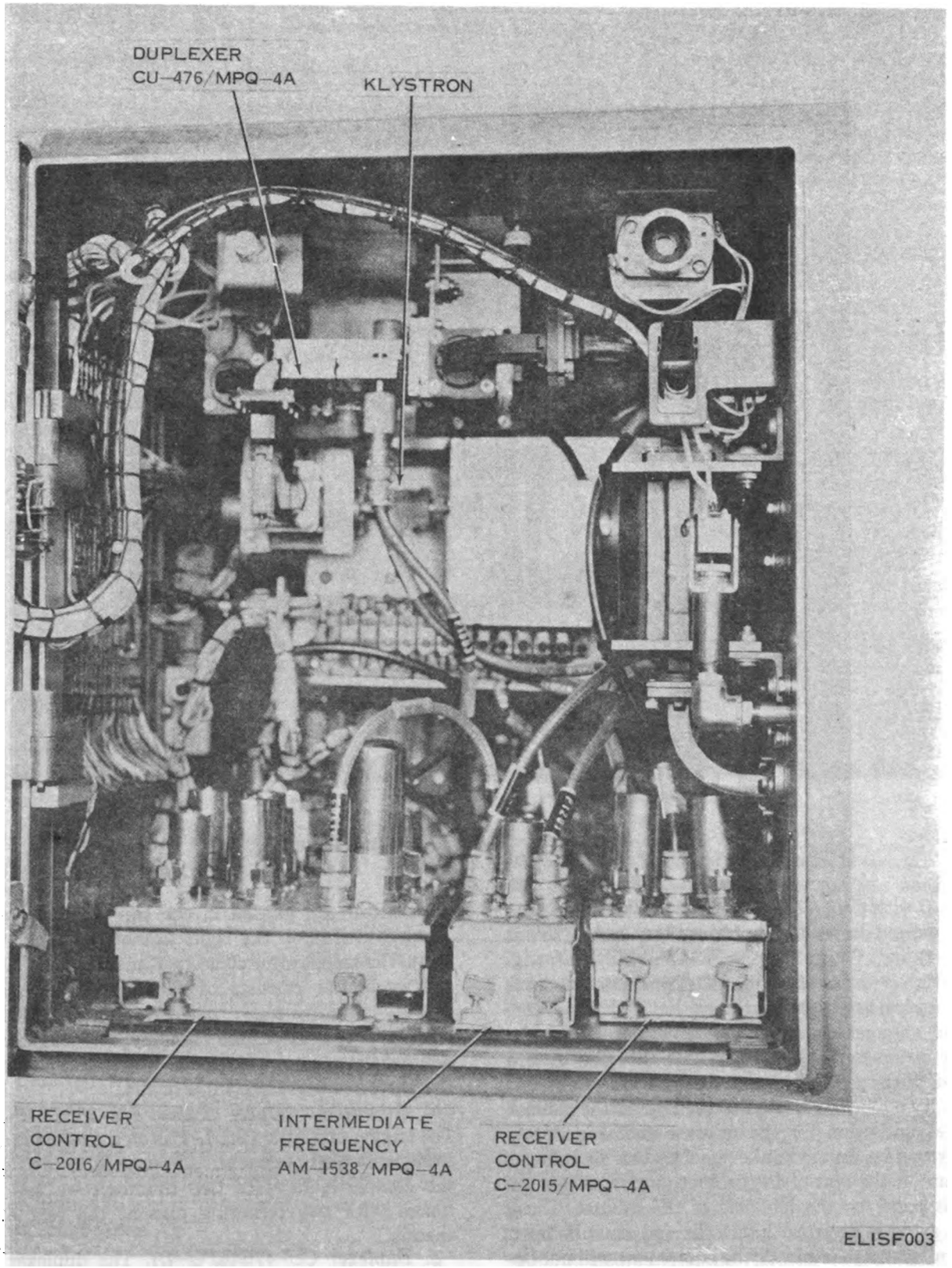

Figure 1-3. Receiver compartment, Receiver-Transmitter Group OA-1257/MPQ-4A.

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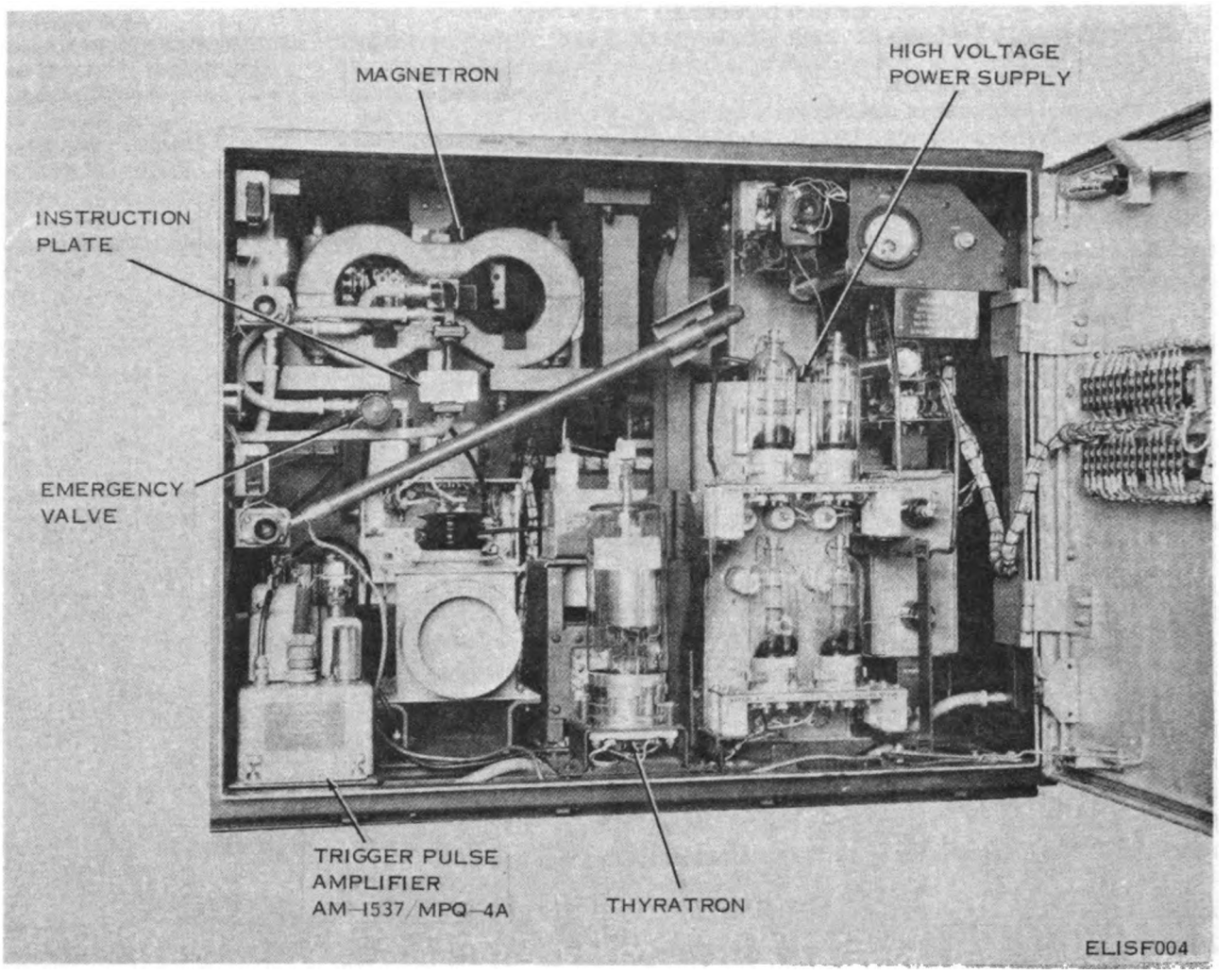

Figure 1-4. Transmitter compartment, Receiver-Transmitter Group OA-1257/MPQ-4A.

(fig. 1-3) with Control-Monitor C-2102/MPQ-4A (fig. 1-2) mounted on its door, a transmitter compartment (fig. 1-4) and, Power Supply PP-1588/MPQ-4A (fig. 1-2) which is on drawer slides. The compartments contain electrical safety interlocks, so that high direct current (dc) voltages are removed when either door or the drawer is opened. Each door and the drawer are secured with pawl fasteners located on the front panels. Two blowers located at the rear of the cabinet provide ventilation for the receiver and transmitter compartments. An air intake panel and an air exhaust panel are at the rear of the cabinet, with a second air exhaust panel on the left side of the cabinet. These panels actuate electrical interlocks and must be open to permit passage of air, or the equipment will not operate.

b. Modulator and Transmitter. The modulator and transmitter are located in the transmitter compartment, which is on the right side of the cabinet (fig. 1-4). The transmitter consists of magnetron QK-324; the modulator consists of the trigger amplifier (*c* below), high-voltage power supply, hydrogen thyratron, and associated circuitry. The magnetron is secured between two brackets, which are mounted at the top left side of the compartment.

c. Amplifier, Trigger Pulse AM-1537/MPQ-4A. The trigger amplifier (fig. 1-4) is on the left side of the transmitter compartment. It is secured to the floor of the compartment with two thumbscrews and positioned with two centering pins at the rear of the chassis.

d. Duplexer CU-476/MPQ-4A. The duplexer (fig. 1-3) is mounted in center of the receiver compartment, which is on the left side of the receiver-transmit-

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ter group (fig. 1-2). It is secured in position by a bracket, waveguide coupling connectors, and connections to the klystron flange.

e. Control Receiver C-2016/MPQ-4A. The automatic frequency control (afc) assembly (fig. 1-3) is on the left side of the receiver compartment. It is secured to the bottom of the compartment with two thumbscrews and positioned with two centering pins at the rear of the chassis.

f. Amplifier, Intermediate Frequency AM-1538/MPQ-4A. The intermediate frequency (if.) amplifier (fig. 1-3) is in the front center of the receiver compartment, immediately to the right of the afc assembly. It is fastened to the bottom of the compartment with two thumbscrews and positioned with a centering pin at the rear of the chassis.

g. Control Receiver C-2015/MPQ-4A. The sensitivity time control (stc) assembly (fig. 1-3) is mounted on the right side of the receiver compartment. It is secured to the bottom of the compartment with two thumbscrews and positioned with a centering pin at the rear of the chassis.

h. Control-Monitor C-2102/MPQ-4A (fig. 1-2). The control-monitor is on the front door of the receiver compartment. It has three meters, a meter selector switch, a local-oscillator tuning switch, and an afc-manual switch. Also, four receptacles on the panel are for test purposes, plus a 120-volt, 400 hertz per second (Hz) convenience outlet.

i. Power Supply PP-1588/MPQ-4A (fig. 1-2). The low-voltage power supply is located below the receiver compartment. It is mounted on drawer slides and may be fully extended from the cabinet. Three fuses, with indicator lamps, are mounted on the left of the front panel. Also, three spare fuses are located to the right of the indicator lamps.

1-16. Description of Control-Indicator Group OA-1256/MPQ-4A

(fig. 1-2)

a. Control-Indicator Cabinet. The control-indicator cabinet contains three drawer assemblies containing the indicator, computer, and control-power supply. These assemblies are equipped, with drawer slides and may be fully extended from the cabinet. All three drawers are electrically interlocked, and high voltage dc is removed when any drawer is opened. Each drawer is secured with pawl fasteners located on the front panels. An air intake panel is located on the left side of the cabinet and an air exhaust panel is located on the right side. These panels actuate interlocks and must be opened to permit passage of air, or the equipment will not operate.

WARNING

Do not extend more than one drawer at a time when the component is remotely operated. The cabinet is heavy and may tip with all drawers fully extended.

b. Indicator, Azimuth and Range IP-375/MPQ-4A. The indicator is located on the top right side of the cabinet in a removable drawer. A reflection plotter assembly is mounted on the center of the front panel, directly in front of the crt. The panel also contains two range selector switches, a video beam selector switch, two timer buttons, a time indicator, a reset switch for the timer, and a lamp which indicates that the computer controls are not set in detent position. Other adjustment controls are located behind hinged covers mounted above and below the reflection plotter.

c. Computer, Radar Data CP-319/MPQ-4A. The computer is housed in a removable drawer directly below the indicator. The six control knobs on the front panel are used to manually set into the computer the information obtained from the indicator.

d. Control-Power Supply C-2014/MPQ-4A. The control-power supply is in a drawer on the left side of the control-indicator cabinet. The upper right corner of the front panel mounts the controls for operating the remote power unit, starting or stopping the equipment, and applying power to all assemblies. Directly above these controls are four panel lamps which indicate proper operation. Two meters with associated selector switches are provided for voltage and current checks. Seven fuses are mounted on the lower portion of the control panel. An indicator lamp and a spare fuse are located to the left of each fuse. Four additional blown-fuse indicator lamps are used to indicate the condition of fuses mounted at the rear of the control panel.

1-17. Description of Antonna Group OA-1258/MPQ-4A

(fig. 1-2)

a. Pedestal, Antenna AB-486/MPQ-4A. The pedestal consists of a stationary lower portion which is secured to the radar trailer chassis, and a rotating upper section upon which the reflector and scanner are mounted. The lower portion of the pedestal is suspended on three ball joints, the sockets of which are securely fastened to the radar trailer frame. The main power cable from the control-indicator group mates with a connector on the right side of the lower portion. The azimuth drive motor and azimuth data synchros are also located in the lower portion of the pedestal. The upper or rotating portion has connectors on the top surface for cabling to the receiver, transmitter, scanner drive motor, reticle lamp control box, elevation actuator motor, and elevation synchro. The rotating portion also contains hinged mountings for the elevation actuators and the reflector support structure. An azimuth counter (fig. 3-9), which counts the number of mils that the upper portion of the pedestal ro-

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tates, is attached to the radar trailer chassis. The elevation counter (fig. 3-8) on the antenna supporting structure indicates the elevation of the lower scan.

b. Reflector, Antenna AT-634/MPQ-4A. The reflector is mounted on two supporting beams which are fastened to the antenna support structure. This structure, in turn, is attached to a pair of hinged brackets on the rotating upper pedestal. The extreme lower ends of the reflector support beams are secured to the antenna support structure to insure rigid support of the reflector during operation. Two manually operated cranks are used to raise or lower the reflector. Two locking screws mounted on each side of the support structure are used to lock the reflector firmly in position.

c. Antenna AS-835/MPQ-4A. This antenna is a Foster-type scanner which consists of two concentric cones. The scanner is mounted on the upper surface of the antenna support structure, near the point at which the structure is hinged to the rotating upper pedestal. The scanner drive motor is mounted on the small end-bell and is cabled to a connector on the top surface of the rotating pedestal.

1-18. Description of Chassis, Trailer; 2½-Ton, 2-Wheel, M454
(fig. 1-1)

The two-wheel radar trailer mounts the antenna group, receiver-transmitter group, control-indicator group, and the dehydrator. TM 9-2330-234-15 contains complete information on the radar trailer. Three hinged outriggers permit leveling of the radar trailer when the equipment is on a slope not exceeding 90 mils. Two swing-out seat supporters (fig. 2-40) are mounted at the rear of the radar trailer for use during operation. The two operators' seats and a spirit level are located at the front end of the trailer. The ground stake (fig. 2-8) is clamped in position immediately forward of the control-indicator cabinet. A standard military-type fire extinguisher (fig. 2-2) is on the curbside front of the radar trailer.

1-19. Generator Set PU-304C/MPQ-4
(fig. 1-8)

The power unit consists of a 10-KW generator set mounted on a 1-1/2-ton trailer with storage space for accessories and spares. The generator is bolted to the floor of the cargo trailer and is operated in that position. Two cable reels, mounted at the front of the trailer, hold the power and remote control cables. The operators' shelter is strapped to brackets on the inside rear of the trailer. A spare magnetron is packed in the transit case (Case, Accessories CY-2201/MPQ-4A) that is mounted on the roadside rear of the trailer. Spare parts are carried in the transit case on top of the magnetron case. The control-indicator stand is strapped to the operator's shelter. The two blower transit cases are stowed at the rear curbside of the trailer.

1-20. Dehydrators, Electric Desiccant HD-264/MPQ-4A and HD-264A/MPQ-4A
(fig. 1-2)

The dehydrators is an automatic device which supplies dry air to the waveguide sections in Radar Set AN/MPQ-4A. A pressure gage and dry air indicator are set in a recess of the right side of the front panel. On the left side of the panel is a ventilator grill for air intake and exhaust. The grill has a hinged cover which must be raised before the equipment will operate properly. An air outlet is located on the left side of the rear panel. A valve for purging equipment waveguide sections of moisture is located on the right side of the dehydrator. On the HD-264A/MPQ-4A only, a circuit breaker is located above the pressure gage.

1-21. Minor Components

a. Cavity, Tuned FR-111/MPQ-4A (fig. 1-5). Cavity, Tuned FR-111/MPQ-4A is an echo box used with the radar to check radar system performance within the frequency range of 15,800 to 16,200 megaHertz. It is bracket-mounted on the reflector-support bar and is connected to the directional coupler by waveguide. A control knob and calibrated scale on the front panel provide for manual tuning. The complete assembly is enclosed in a metal case with a captive transit cover. The cover contains an azimuth angle versus frequency chart to be used during orientation.

b. Coupler, Directional CU-399/MPQ-4 (fig. 1-6). The directional coupler is a special section of waveguide with a frequency range of 15,700 to 16,300 megaHertz. It is bidirectional with a nominal attenuation of 20 decibels (db), and is used to sample the rf energy in the main waveguide. This rf energy is fed into the echo box through a connecting section of waveguide.

c. Circular Polarizer MX-2219/MPQ-4A. The circular polarizer (fig. 1-1) is used to reduce the clutter caused by rain, snow, fog, etc. It is mounted above the rf output horns on the scanner and may be retracted and stowed when not in use.

d. Azimuth Telescope. The telescope (fig. 1-1) is mounted on the top center of the scanner. It is used during azimuth orientation of the radar.

1-22. Accessories
(fig. 1-8)

The following items are provided as accessory equipment with the radar. They are carried on the cargo trailer of the power unit.

a. Reel, Cable RC-413/MPQ-4. The power cable reel is used to stow power cable W701 when the equip-

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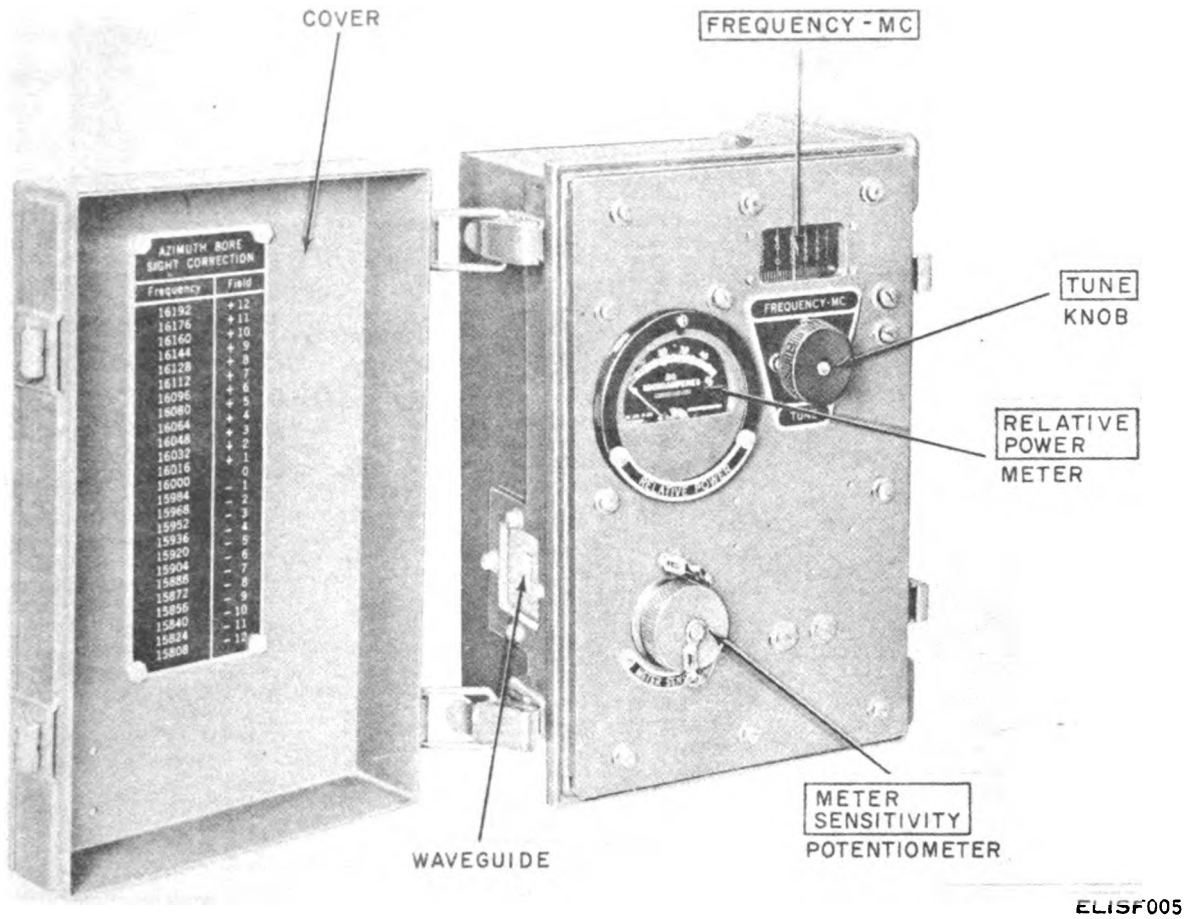

Figure 1-5. Tuned Cavity FR-111/MPQ-4A.

ment is in transit.

b. Reel, Cable RC-419/MPQ-4. The remote cable reel is used to stow remote control cable W703 when the equipment is in transit.

c. Stand, Control-Indicator MT-1733/MPQ-4A. The remoting stand (fig. 1-7) is used to mount the control-indicator group during remote operation.

d. Shelters, Electrical Equipment S-134/MPQ-4A and S-134/MPQ-4A (fig. FO-1). The operator's shelter is provided for the operator's use at the control-indicator group during both local and remote operation. Components of the operator's shelter include the canvas, equipment picture frame, ground stakes, and web straps. These items are carried in a transit case assembly which is also designed to form the roof and framework of the operator's shelter. Provision is made for mounting the two blower assemblies (carried separately on the power unit), for attaching the canvas to the shelter frame, and for securing the shelter to the control-indicator group. The ground stakes and web straps are used to moor the shelter after assembly is completed. On the S-134A/MPQ-4A, exhaust vents are provided at the entrance side of the shelter for maximum ventilation.

e. Support, Operator's Seat MT-1798/MPQ-4A. Two of these supports are supplied. They are used during remote operation, when the two operator's seats on the radar trailer are detached and moved to the remote site.

f. Blower Assembly, Shelter, Intake HD-339/MPQ-4A (fig. FO-1). Two of these shelter intake blowers are provided as part of the ventilating system for Shelter, Electrical Equipment S-134A/MPQ-4A. They also contain lamps for illumination in the shelter.

1-23. Cables

a. The cable assemblies are all rubber-covered cables and are shown pictorially connected on figure 2-14.

b. The ground cable (fig. 2-8) is a rubber-covered

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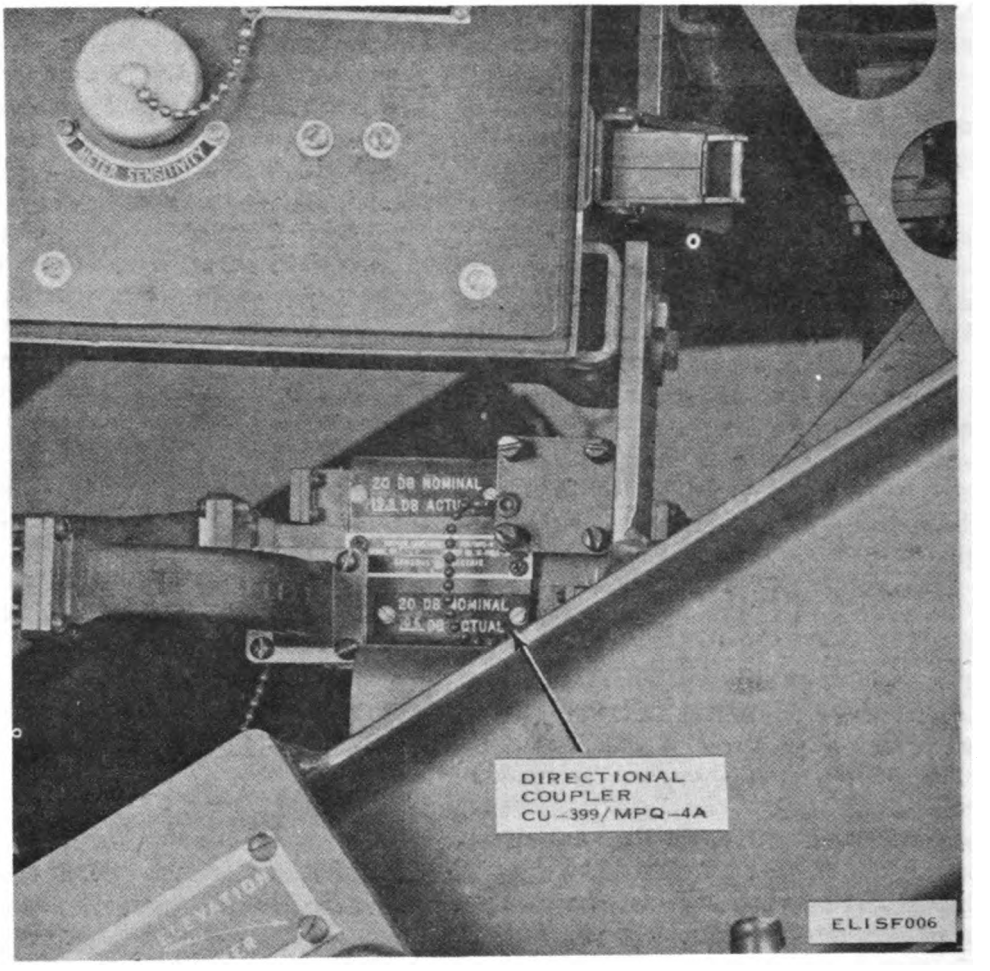

Figure 1-6. Directional Coupler CU-399/MPQ-4A.

flexible cable. It connects between an external terminal on the radar trailer and a clamp secured to the ground stake.

1-24. Differences in Models

The operator's shelter provided with sets, serial numbers 25 and above, was changed to a later model than the shelter provided with sets, serial numbers 1 through 24. Intake and exhaust blowers provided with the original shelter model have been replaced by the same type intake blowers (Blower Assembly, Shelter, Intake HD-339/MPQ-4A) supplied with the later model.

Section III. BASIC PRINCIPLES

1-25. Introduction
(fig. 3-15)

a. During one scanning cycle, Radar Set AN/MPQ-4A causes its beam to scan the same 445-mil horizontal sector twice, with one sector displaced approximately 35 mils above the other. The antenna may be positioned to scan any 445-mil sector. The limit for the elevation angle of the lower beam scan is from −100 to +200 mils. A B-scope presents upper and lower beam intercepts (echoes). The horizontal displacement of the intercept (echo) from the center of the B-scope indicates the horizontal angle from the center of sector of scan to the projectile intercept point. The vertical displacement of the intercept (echo) from the lower edge of the B-scope indicates the slant range of the projectile from the radar. By placing strobes over these two intercepts consecutively with separate mechanical controls, information is fed to the computer, where, with previously inserted radar orientation data, computations are performed which locate the weapon, both in polar coordinates from the radar and in grid coordinates. Time between the appearance of the two intercepts obtained from the two scans is inserted into the computer to improve location data. Dif-

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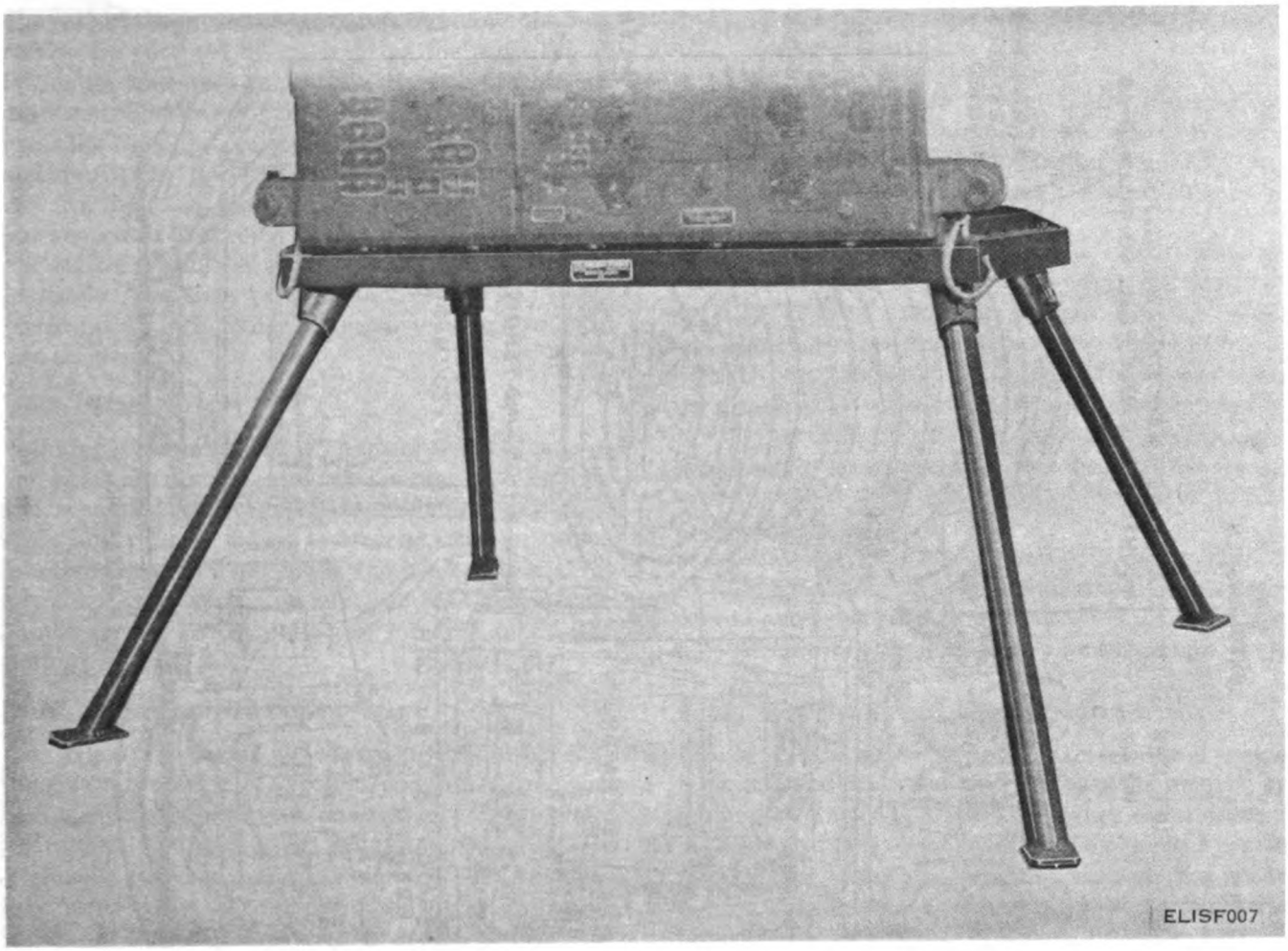

Figure 1-7. Control-Indicator Stand MT-1733/MPQ-4A.

ference in altitude between the radar and weapon position is also inserted into the computer to improve location data.

b. The reflected energy from the projectile is picked up by the antenna and a dot of light (intercept) appears momentarily on the B-scope. Since the elevation angle of the lower beam scan and the azimuth of the center of the scanned sector scan are known, the center of the dot represents the three-dimensional space coordinates of the point where the projectile intercepts the lower beam scan, expressed as elevation angle, azimuth, and slant range. As the projectile intercepts the upper beam scan, another dot of light (intercept) appears on the B-scope, representing a second set of three-dimensional coordinates. These coordinates of elevation angle, azimuth, and slant range locate the point in space where the projectile was intercepted by the upper beam scan. By using the SECONDS timer on the indicator, the operator can measure the time the projectile takes to travel from the lower scan to the upper scan. These two points on the trajectory of the projectile and the time interval are used in the computer to calculate the coordinates of that end of the trajectory nearest the projectile intercept.

c. Figure FO-2 presents the weapon location geometry of the weapon. Part A, top view of the radar and weapon sites, shows the paths of the upper and lower beam scans. Part B is a side view of the same sector on the contour map. R_u is the slant range of the upper scan intercept R_L, the slant range of the lower scan intercept, and R_w the slant range of the weapon. In part C, E_u is the elevation angle of the supper scan, E_L is the elevation angle of the lower scan. H is the difference in altitude between the radar and the weapon. Part D is another top view of the area. A_u is the azimuth of the

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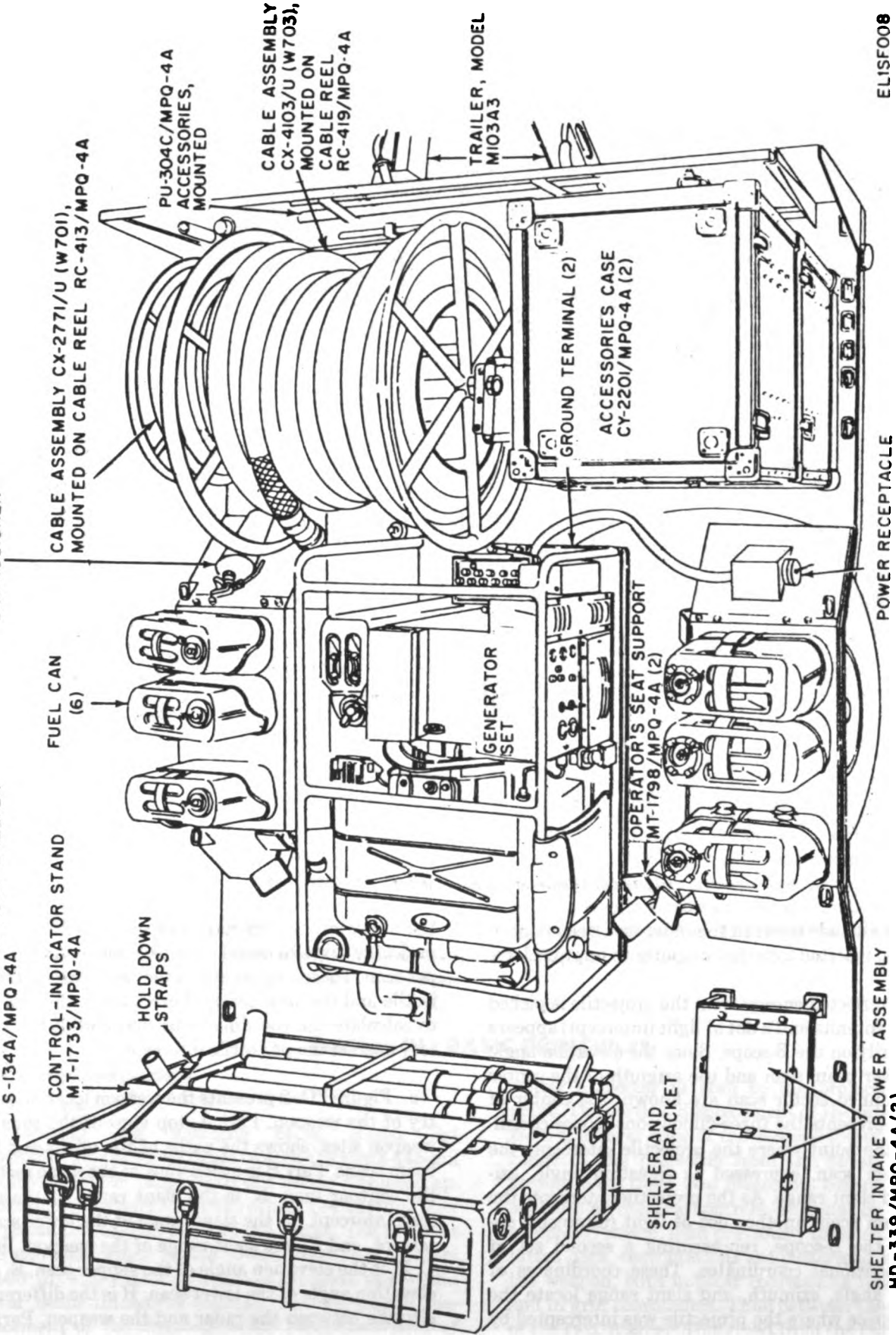

Figure 1-8. Generator Set PU-304C/MPQ-4A, overall view showing location of stowed AN/MPQ-4A components.

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lower scan intercept, and A_w is the azimuth of the weapon.

1-26. Target Characteristics

The path of the projectile is a curve; therefore, the best results are obtained by intercepting the projectile as low on its trajectory as possible. Here the path is almost a straight line. Figure 3-11 shows the difference in results when the projectile is intercepted at high (A) and low (B) elevation angles. If the projectile is moving upward, the calculation results will be the location of the weapon. If the projectile is moving downward, the calculation result will be the point of impact of the projectile. The time between intercepts (ΔT) is inserted into the computer to improve calculated location accuracy.

1-27. Scanning

Scanning is accomplished by a Foster dual-beam scanner which alternately scans two sectors 445 mils wide and separated vertically by approximately 35 mils. The scanner can be moved to cover any 445-mil sector in a complete 6,400-mil circle, and has an internal rotation speed of approximately 1,020 revolutions per minute (rpm). The scanner also provides pulses for timing purposes.

1-28. B-Scope Presentation

a. When a projectile intercepts either scan, an echo pulse is returned to the receiver, amplified, and presented on the B-scope as an intensified dot. In normal operations, the upper beam presentation is displaced vertically approximately 750 meters. This provides separation of the video presentations when the upper and lower scan (beam) intercepts are at, or near, the same range and azimuth.

b. The position of the echo pulse (dot) in a vertical direction indicates the range of the intercept, and the position of the echo pulse (dot) in a horizontal direction indicates the azimuth of the intercept.

1-29. Range Determination

The range of the intercept (target) is the distance from the radar to the target. This range information is inserted into the computer by the operator by using the LOWER BEAM RANGE and Δ RANGE controls.

1-30. Azimuth Determination

a. The azimuth of the target is the clockwise angle measured from grid north to the radar-to-target line. When the projectile intercepts the lower and upper beams, azimuths A_L and A_u (para 1-23) are obtained.

b. Azimuth information, with the exception of weapon azimuth, is inserted into the computer through the azimuth servosystem and by settings of the LOWER BEAM AZIMUTH and Δ AZIMUTH controls.

1-31. Determination of Weapon or Impact Position

a. During installation of the radar, the easting, northing, and altitude (height) of the radar are determined. This information is mechanically inserted into the computer and locates or sets the radar map location into the computer.

b. The grid reference of weapon or impact position is obtained from the computer after the radar operator positions azimuth and range strobes over the upper and lower scan (beam) intercepts presented on the B-scope. A more accurate solution is obtained when the time interval between the upper and lower scan intercepts is manually inserted into the computer. The time interval between intercepts is measured by the operator using the B-scope and the SECONDS timer on the indicator panel.

c. Additional accuracy is obtained by inserting the possible altitude of the weapon or impact point into the computer and rereading the coordinates. This possible altitude is determined from a contour map.

1-32. Single Beam Operation

Provisions are made in the radar set for a single beam mode of operation used to locate the weapon, or the impact point of the projectile, when the trajectory of the projectile is so shallow that the projectile passes through the lower beam but not through the upper beam. In such cases, only a single representation of the projectile appears on the indicator; however, because of the shallow trajectory the projectile is repeatedly scanned by the lower beam for a longer period of time. This action results in a short intensified projectile trace line on the radar set indicator that provides a minute graph of the changing range and azimuth of the projectile. The beginning of this intensified projectile trace is the point at which the projectile enters the lower beam, and the end of the intensified trace is the point at which the projectile leaves the lower beam. These two points determine the weapon position, or the point of impact, of the projectile the same way as in dual beam operation (para 1-23 through 1-29) when the two points are provided by separate presentations as the projectile passes, in turn, through each of the beams. In single beam operation, the lower end of the intensified projectile trace on the indicator is used as though it were a lower beam intercept point, and the upper end of the projectile trace is used as though it were an upper beam intercept point.

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CHAPTER 2
INSTALLATION

Section I. SERVICE UPON RECEIPT OF RADAR SET AN/MPQ-4A

2-1. Siting

Radar Set AN/MPQ-4A will operate best when installed in a suitable location. Careful consideration must be given to the selection of the radar site.

a. General Considerations. The ultrahigh frequency waves transmitted and received by the radar travel in a straight line. These waves cannot penetrate solid objects, such as mountains, hills, or buildings, so the path from the radar to the target area must be free of solid obstructions. The ideal radar site is generally a saucer-shaped depression. The only conclusive test of any radar site is successful operation from that site. A reasonably level spot, free of obstructions, is required to install the radar trailer and power unit. Suitable protection should be available for the control-indicator group when it is operated remotely (within 150 feet of the radar trailer). The power unit must be installed within 100 feet of the control-indicator group.

b. Technical Considerations. One of the chief considerations when choosing a site is the effect it will have on the maximum range of the radar. The maximum range of Radar Set AN/MPQ-4A is 15,000 meters. There should be a clear line of sight within this range, and the site should allow for intercept of the mortar projectile as low on the projectile trajectory as possible. Figure 2-1 is a typical screening crest profile for use in choosing a scanning elevation in the azimuth of search. Refer to FM 6-161 for detailed site selection considerations.

2-2. Unpocking

a. Packaging Data. When packed for export shipment, Radar Set AN/MPQ-4A consists of the radar trailer, which mounts all the radar components, and the power unit, which carries accessories and spare parts.

b. Unpacking Radar Trailer.

(1) Remove the tarpaulin (fig. 2-2) which covers the entire equipment; be careful to avoid damaging antenna components. Cables, connectors, and other projecting points may be damaged if the tarpaulin snags on any one of these points.

NOTE

When removing the tarpaulin, do not unlace the rear corners.

(2) Remove the 20 screws that secure the large endbell on the scanner and take out the two bags of desiccant inside the scanner. Replace the large endbell.

(3) Remove the copper wire which holds the drain cock on the scanner (fig. 1-1) in a closed position.

(4) Remove the water-resistant tape which covers the slip joint on the pedestal.

(5) Open the control-power supply drawer and remove the two bags of desiccant located below the drawer.

(6) Open the low-voltage power supply drawer and remove the two bags of desiccant located below the drawer.

c. Unpacking Power Unit (fig. 1-8 and TM 5-6115-365-15). Untie the ropes that secure the front and rear tarpaulin flaps on the cargo trailer. Throw the flaps up over the trailer roof and tie them together. In addition to the power unit, the trailer carries the following items:

(1) Blower Assembly, Shelter Intake HD-339/MPQ-4A (2).

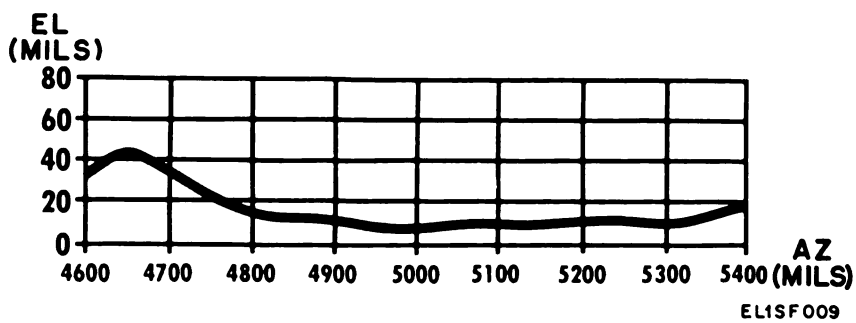

Figure 2-1. Typical screening crest profile.

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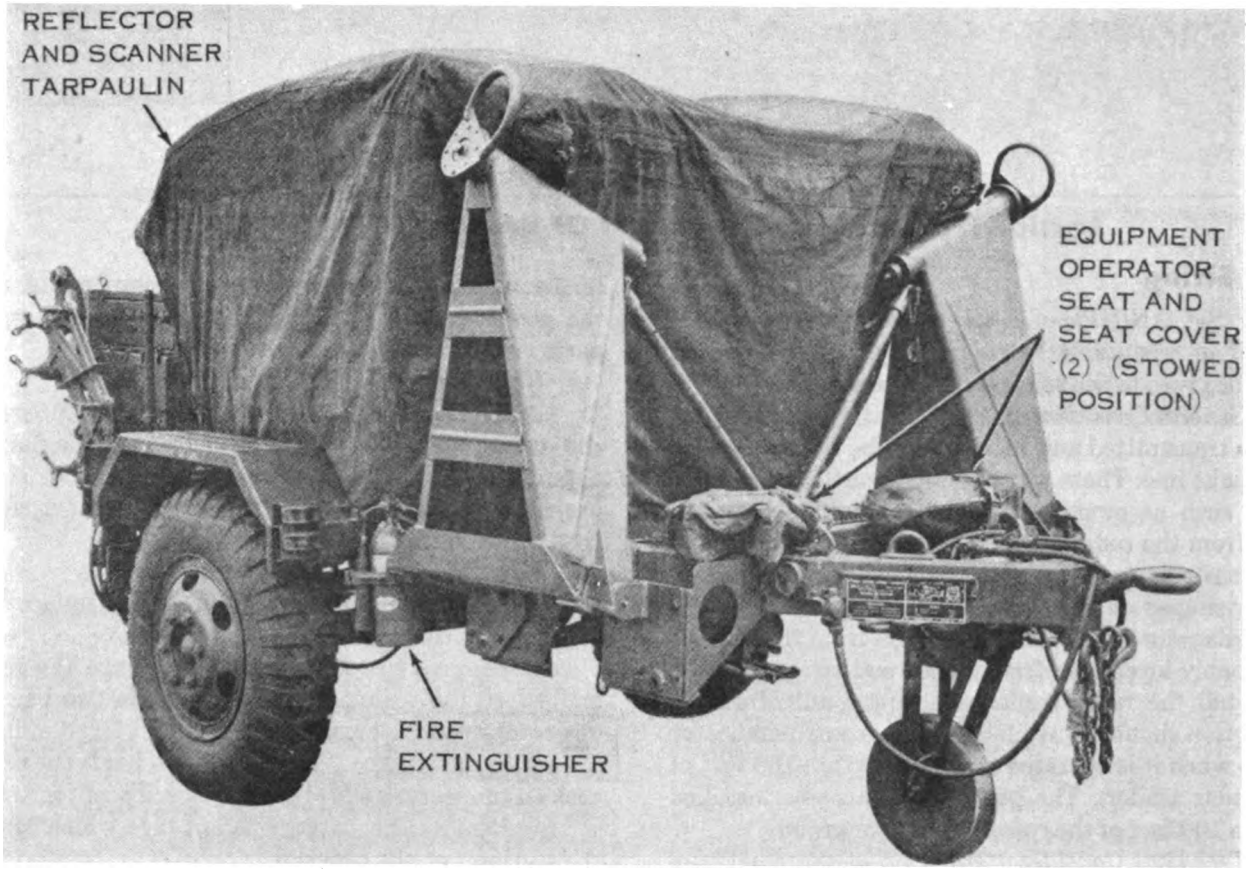

Figure 2-2. Radar Set AN/MPQ-4A, prepared for transit.

(2) Stand, Control-Indicator MT-1733/MPQ-4A.

(3) Support, Operator's Seat MT-1798/MPQ-4A (2).

(4) Reel, Cable RC-413/MPQ-4 (power cable).

(5) Reel, Cable RC-419/MPQ-4 (remote cable).

(6) Case, Accessories CY-2201/MPQ-4A (contains one tube, QK-324).

(7) Case, Accessories CY-2201/MPQ-4A (contains running spares, technical manuals, and circuit label books).

(8) Shelter, Electrical Equipment S-134A/MPQ-4A.

2-3. Checking

a. After removing the tarpaulin from the radar, examine the equipment for damage. Any deformation may offset reflector orientation with respect to the scanner and result in improper equipment operation. Damage to any part of the antenna group may result in reduced structural strength. All antenna hardware should be checked and tightened where necessary.

WARNING

This equipment contains radioactive materials. Read and follow the instructions given in TB 43-0116.

b. Check to see that the equipment is complete as listed on the packing slip or in the items comprising an operable equipoment (para 1-10), and the basic issue items list (BIIL) and items troop installed or authorized list (ITIAL) (app B).

c. If the equipment has been used or reconditioned, check to see whether it has been changed by a modification work order (MWO). If modified, the MWO number will appear near the nomenclature plate. Indicate the MWO number on the associated schematic diagrams.

2-4. General Installation Instructions

The installation procedures given in this paragraph through paragraph 2-10 are applicable for initial installation and for installation after long or short hauls. Refer also to paragraphs 2-1, 2-2, and 2-3 for siting and checking the equipment.

a. Six men are required to install Radar Set AN/MPQ-4A. An experienced crew can set the equipment up for local operation in 30 minutes or less.

b. Select a site for the equipment as outlined in paragraph 2-1.

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c. Install and set up the radar in the order given below. A detailed outline of these steps is given in paragraphs 2-5 through 2-11.

(1) Installation of radar trailer.
(2) Installation of power unit.
(3) Erection of reflector.
(4) Local operation.
(5) Remote operation.
(6) Cabling and connections.
(7) Cabling check.

NOTE

Certain cables must be connected during the installation procedure.

d. All hardware required to assemble or install the radar is chained or clipped to the components near the location where it is used.

e. Most of the interconnecting cables have male connectors at one end and female connectors on the other. The remainder are terminated with lug terminals or lamp sockets, termination depending on the type of connection to be made. Cables, connectors and receptacles of the components are equipped with captive protective caps to prevent damage to the threaded parts.

2-5. Installation of Radar Trailer

a. When the radar trailer is pulled into an operating site it should, if possible, be situated with the lunette facing uphill; the surrounding ground can then be used to best advantage when leveling the radar. The outrigger arms can accommodate only a maximum slope of 90 mils. Movement of the radar trailer on the elevation jacks will be reduced to a minimum if the lunette is facing uphill.

b. Remove the three outrigger pads from their stowed location on the curbside fender support. Place the outrigger pads on the ground at the left side, right side, and rear of the trailer.

WARNING

Be extremely careful when performing the next operation. Three persons are required to lower the rear outrigger arm, one at each end, and one at the center post.

c. Release the rear outrigger arm by unscrewing the transit locking screws and loosening the pivot screw on each side of the radar trailer (fig. 2-3). Lower the outrigger arm.

d. Reassemble the outrigger arm with the operational locking screws found on each side (fig. 2-4).

e. Center the rear outrigger pad directly under the jackscrew.

f. Lower the caster wheel (landing wheel) to carry the lunette load of the trailer and set the handbrakes. Turn off the air valves on the prime mover; disconnect the airhose coupling and the trailer power cable from the prime mover, and attach them to the clamps on the trailer. With two persons, lift the lunette off the pintle, move the prime mover away, and lower the weight onto the caster wheel carefully.

g. Release the right and left outrigger arms by disconnecting the locking pins (fig. 2-5) on the support rod, and lower the outrigger arms. Secure the outrigger arms to the trailer with the locking screws (fig. 2-6).

h. Center the right, left, and rear outrigger pads under the jackscrews. Operate the ratchet handcrank to lower the jackscrews until they contact the outrigger pads.

i. See that the operational locking screws (*d* above) and the locking screws (*g* above) are securely tightened.

CAUTION

In the following operation, BE EXTREMELY CAREFUL when applying pressure at the handwheel. A force of 1 pound at the handwheel drive pinion will result in a load of approximately 1 ton at the lockpin, because of the mechanical advantage of the gear train. Excessive pressure at the handwheel with the stowlock engaged will result in permanent damage to the equipment. THIS PROCEDURE IS TO BE USED ONLY BY TRAINED PERSONNEL.

j. Disengage the azimuth stowlock (fig. 1-1). If loading causes binding of the stowlock, gently apply a counter force to overcome the loading by use of the azimuth handwheel. Disengage the locking pin to place the handwheel shaft in the desired position. The azimuth handwheel should be pushed all the way in for this operation.

k. Rotate both wheel fenders outward by disengaging the locking pins (fig. 1-1).

l. Rotate the antenna carefully by using the azimuth handwheel (fig. 2-7). Check for striking or binding between components as the antenna rotates.

m. Remove the waterproof cover from the spirit level assembly (fig. 1-1). Level the radar by adjusting the jackscrews until the level bubble is within the inner scribed circle. Rotate the antenna to other azimuth positions and recheck the position of the level bubble. The leveling operation should be accomplished with a minimum extension of the jackscrews so that the available adjustment is not exhausted. This also holds antenna silhouette height to a minimum. The majority of the weight should be removed from the trailer wheels for maximum stability.

n. Remove the protective caps from the intake and exhaust vents on the scanner (fig. 1-1).

NOTE

In initial installation, the intake vents on the small end bell will be covered with a humidity

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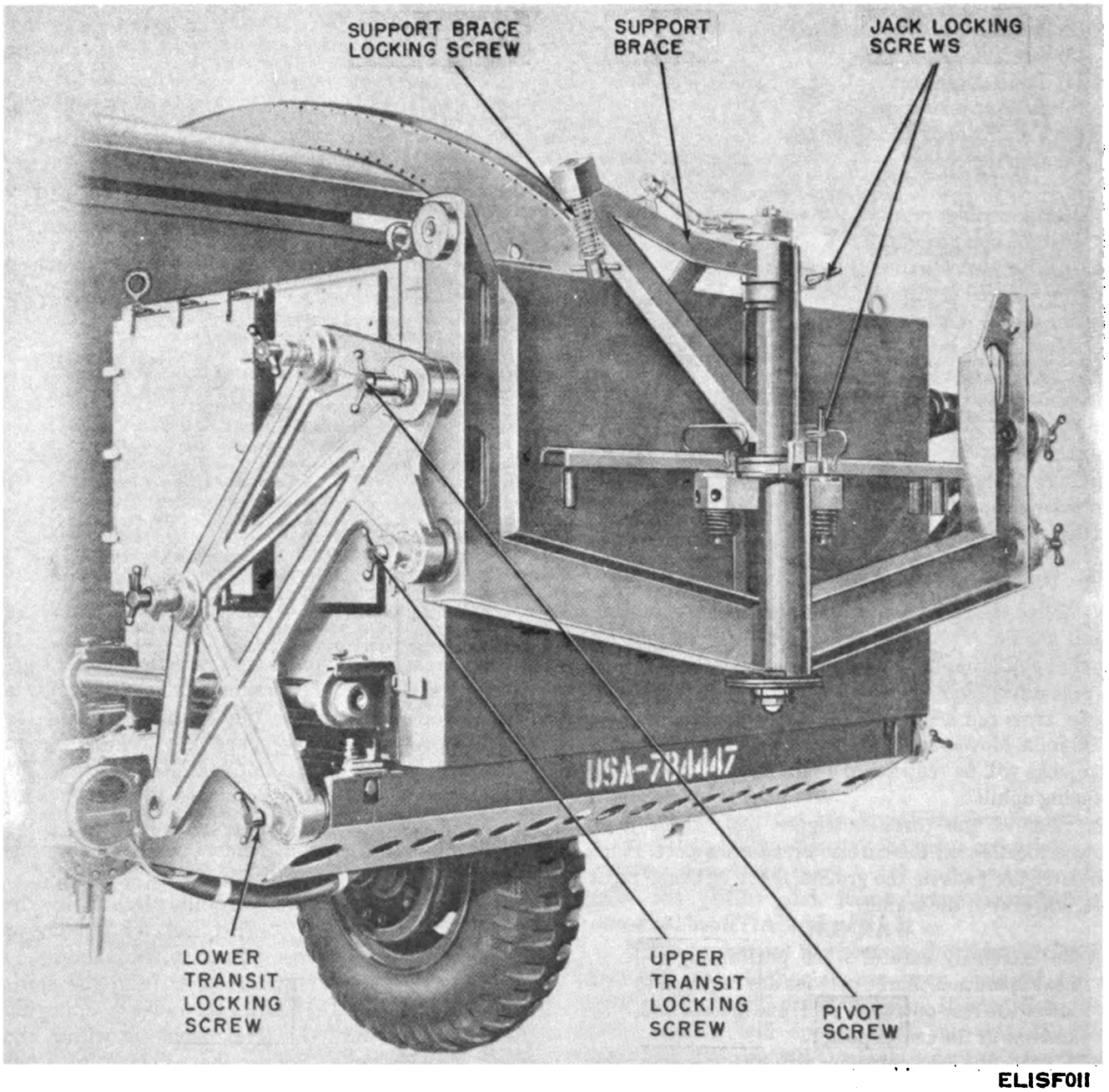

Figure 2-3. Rear outrigger arm in transit position.

indicator cap. The indicator cap will be blue if scanner humidity is normal. Remove the cap and put it in a safe place until required for limited storage. If the indicator cap is pink, excessive moisture exists inside the scanner. In this case, open the draincock (fig. 1-1) on the large end of the scanner, and when starting the radar, allow the scanner to operate for at least 30 minutes before applying radiate power.

o. Remove the ground stake (fig. 2-8) from the radar trailer by opening the clamp and removing the ground stake from the sleeve attached to the frame. Uncoil the ground cable. Drive the ground stake at least half its length into the ground. Make certain that the ground cable is properly secured and makes good electrical contact at both the radar trailer chassis and the ground stake.

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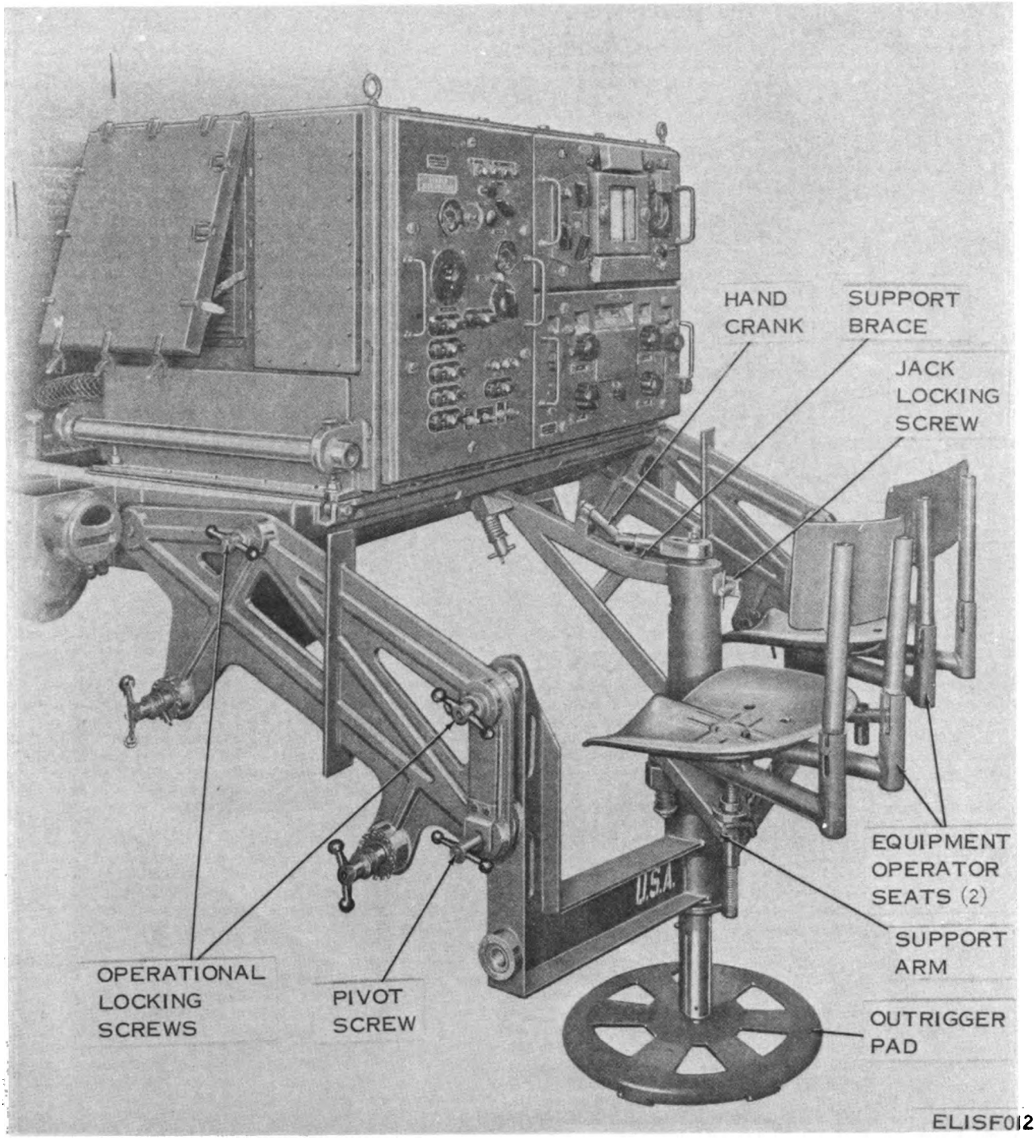

Figure 2-4. Rear outrigger arm in operational position.

p. If equipment is being installed for the first time, perform the following additional steps:

(1) Open the control-power supply drawer and remove the two bags of desiccant located below the drawer. In addition, remove the humidity indicator card from the drawer and note whether the spots on the card are blue. Untape the eyebolts from the cabinet handles and replace them in the four holes on top of the cabinet.

(2) Open the low-voltage power supply drawer and

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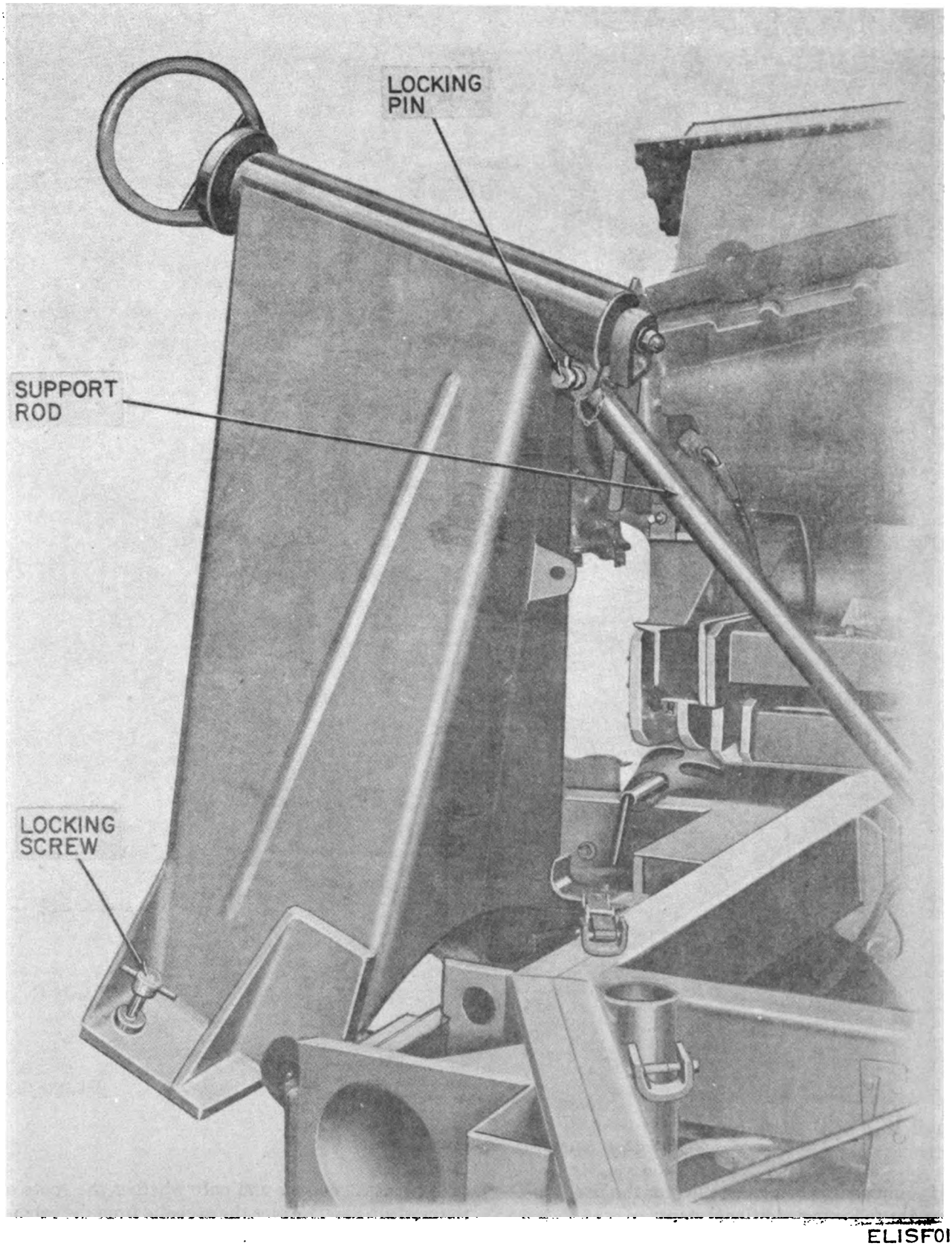

Figure 2-5. Side outrigger arm in transit position.

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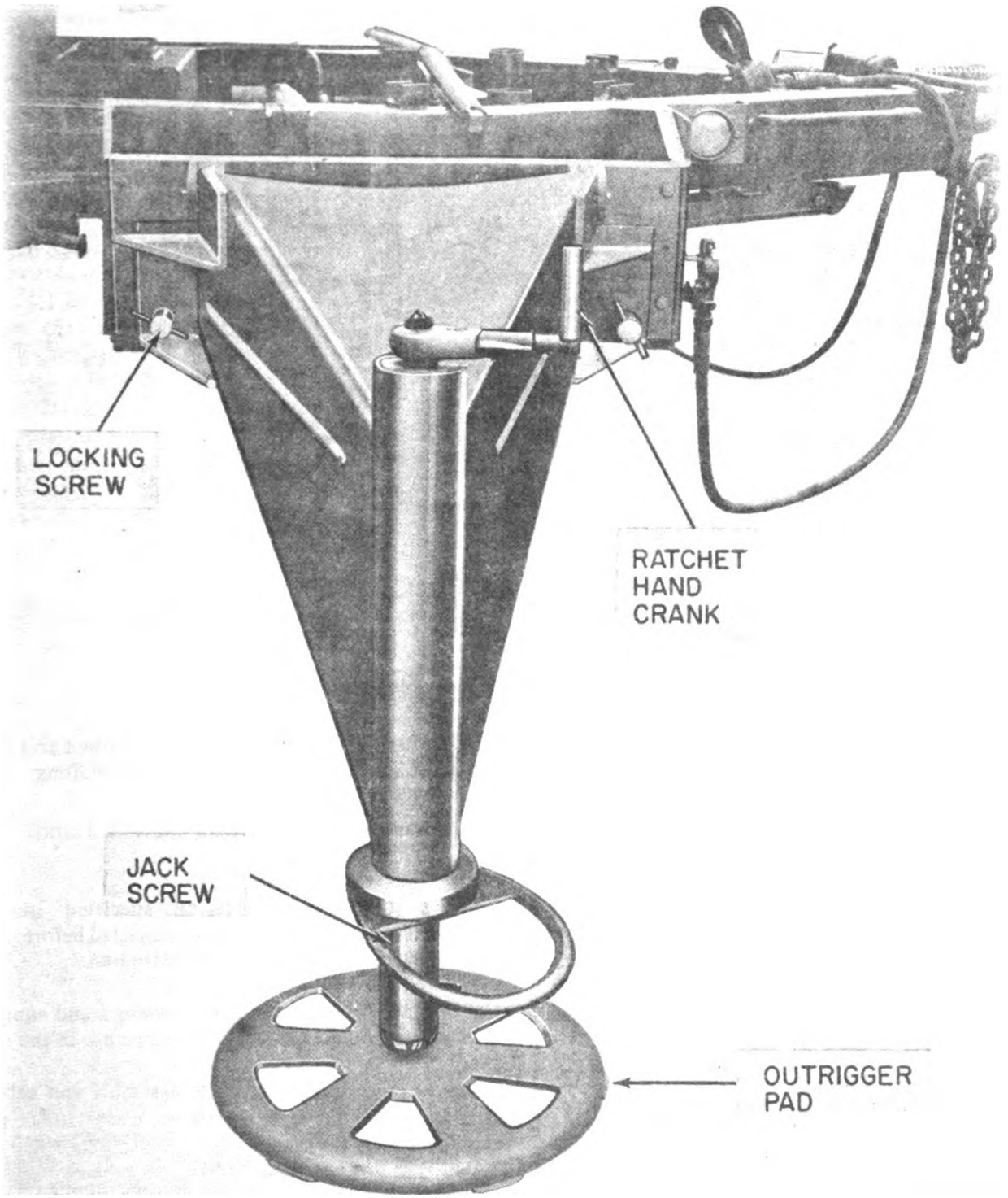

Figure 2-6. Side outrigger arm in operational position.

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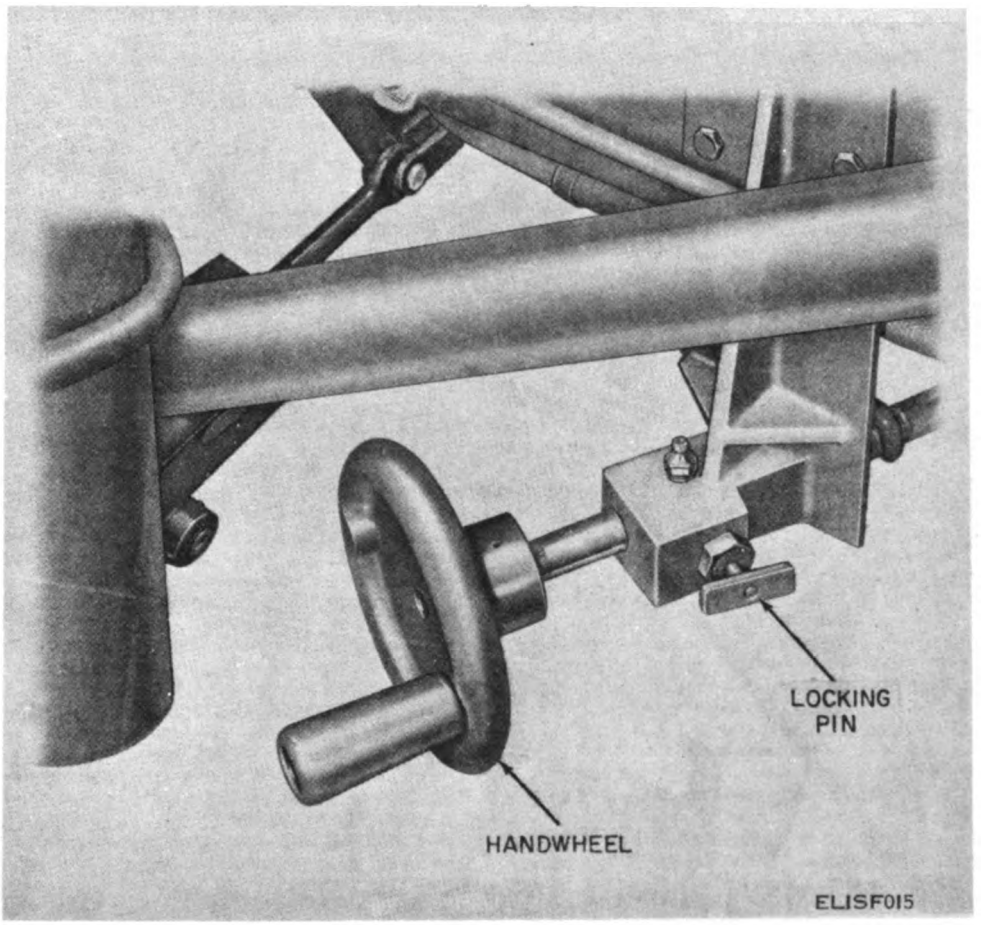

Figure 2-7. Azimuth handwheel and locking pin.

remove the two bags of desiccant located below the drawer. Remove the humidity indicator card from the bottom of the transmitter compartment and note whether the spots on the card are blue.

NOTE

If the spots on the humidity indicator card are pink, the radar should be operated on filament power only for several hours or until the interiors of the cabinets are completely dry. This will prevent arcing when the high voltages are turned on.

2-6. Installation of Power Unit

a. Select a level, protected site within 100 feet of the control-indicator group. Before detaching the power unit from the prime mover, set the handbrakes and lower the caster wheel to carry the lunette load. Disconnect the airhose coupling and the power cable from the prime mover, and attach them to clamps on the trailer. Detach the power unit from the prime mover and move the prime mover away. At the rear of the power unit, drop the support leg into position.

b. Roll up and secure the end flaps of the trailer tarpaulin. Make a visual check of the generator before starting it to be sure the equipment is intact and has not been damaged in shipping and handling. For further checks, see TM 5-6115-365-15.

2-6.1 Power Connections (fig. 2-7.1 and 2-14)

WARNING

The grounding connection specified in paragraph 2-5, step *o* must be completed before power is connected to the AN/MPQ-4A.

a. Preliminary Procedures.

(1) Make sure that all circuit breakers and equipment power switches in the assemblage are in the *off* position.

(2) Remove the power cable assembly and cable reel (fig. 1-8) from the assemblage.

b. Connection to Generator Set.

WARNING

In 5-wire, 3-phase power distribution, one conductor must be made neutral by connecting a No. 6 electrical wire between the selected generator L-Ø terminal and earth ground to avoid electrical shock.

CAUTION

Before connecting electrical power between

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Generator Set PU-304C and Radar Set AN/MPQ-4A, ensure that the generator selector switch, located behind the front panel of the generator set, is positioned to the 120 V, 3 ph setting. Any other control setting may result in damage to the AN/MPQ-4A.

NOTE

When making power connections on Generator Set PU-304C, refer to the applicable generator set technical manual and Technical Bulletin TB 43-0125.

To provide power from Generator Set PU-304C to Radar Set AN/MPQ-4A, proceed as follows:

(1) Connect one end of power cable CX-2771/U (W701) to mating receptacle on Generator Set PU-304C (fig. 2-7.1).

(2) Connect other end of power cable CX-2771/U (W701) to Jack J1001 on Control Indicator Group OA-1256/MPQ-4A of Radar Set AN/MPQ-4A (fig. 2-14).

2-7. Erection of Reflector

The reflector is stowed in a hinged forward position during transit, and rests on stowing pads mounted on the endbells of the scanner. To erect the reflector for operation (fig. 1-1), proceed as follows:

a. Release the reflector clamps (fig. 2-9) and pivot the clamps clear of the reflector.

b. Decouple the reflector support arm (fig. 2-10) from the lock assembly as follows:

(1) Unscrew the locknut at the bottom of the arm as far down as it will go on the eyebolt.

(2) Unscrew the T-handle nut at the top of the arm as far up as it will go on the lock assembly.

(3) Twist the support arm counterclockwise (ccw) until it is clear of the lock assembly.

c. Raise the reflector by turning the handcranks attached to the linear actuators (fig. 2-11), one on each side of the antenna support structure. Turn the cranks until the reflector support beams seat securely against the pads on the antenna support structure.

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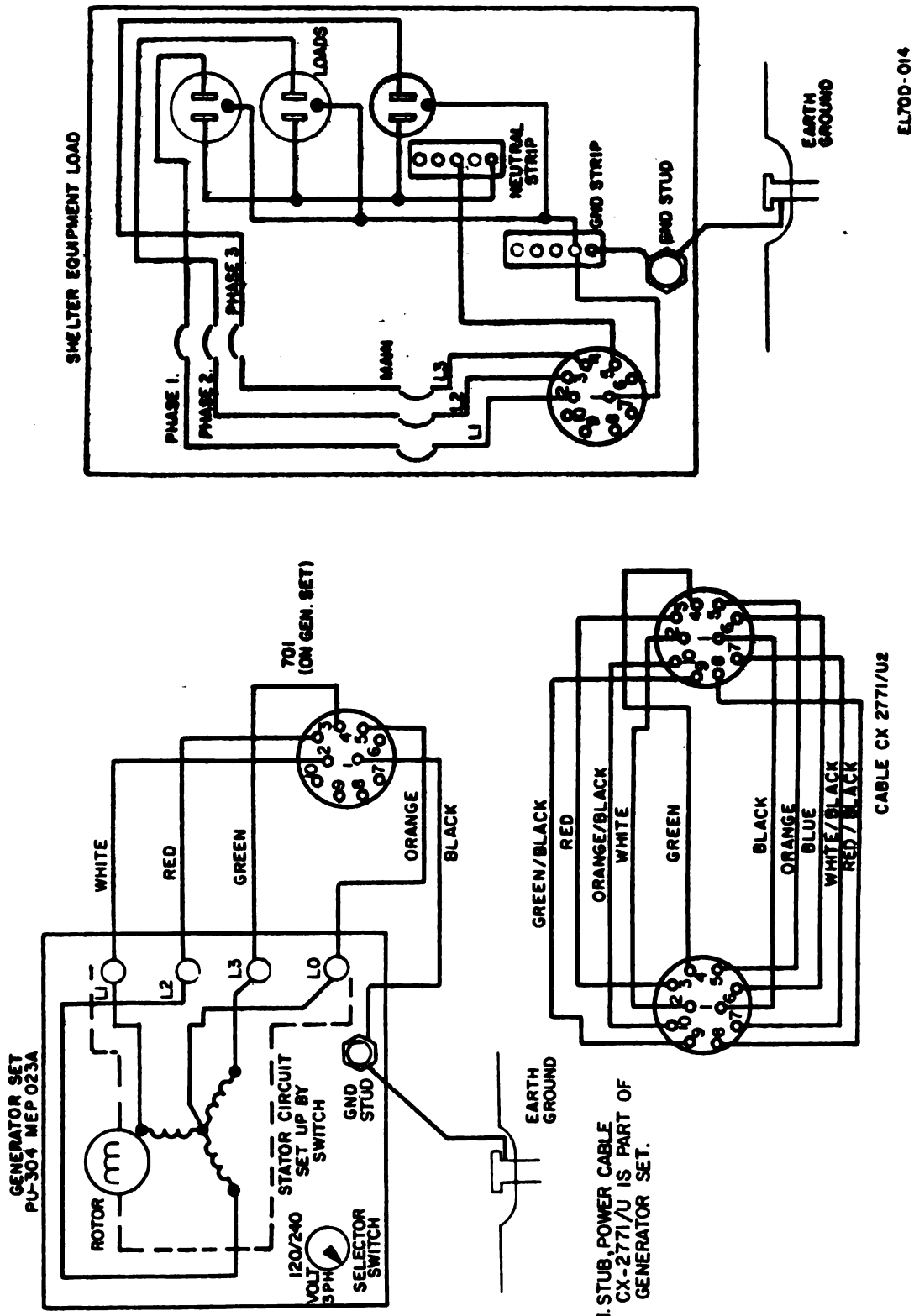

Figure 2-7.1. Generator Set PU-304C Hookup.

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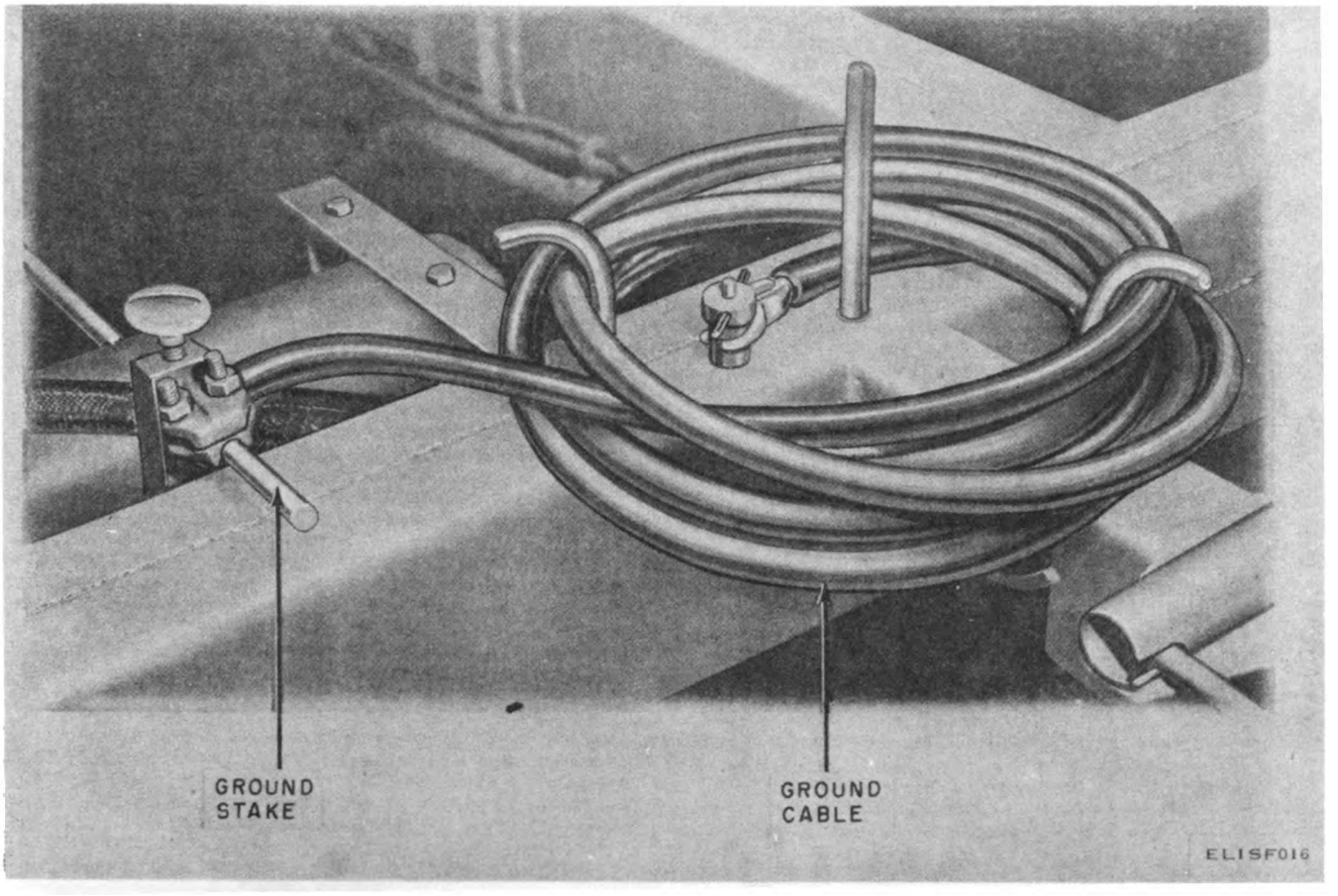

Figure 2-8. Ground stake and cable.

d. Secure the reflector in its operating position by pulling out the locking pins and swinging the lock assembly (fig. 2-4) up into the slot on the bottom of the reflector support beams. Tighten the lock assembly to lock the reflector securely in position.

e. Swing the reflector support arm upright and screw it into the stud on the stow bracket (fig. 2-12). Tighten down the eyebolt on the top of the cabinet. Screw the locknut up against the bottom of the support arm and tighten securely.

2-8. Local Operation

During local operation, the control-indicator group is operated in position on the radar trailer (fig. 2-4).

a. Installation of Operators' Seats (fig. 2-4).

(1) Swing the support arms on the rear jack assembly into operating position.

(2) Remove the two seats from their stowed positions on the forward portion of the radar trailer.

(3) Place the seats in the sockets on the support arms and align them with locating pins.

b. Installation of Operators' Shelter. Figure FO-1 shows the assembly of Shelter, Electrical Equipment S-134A/MPQ-4A.

(1) Release the straps which secure the operators' shelter (fig. 1-8) in the power unit.

(2) Carry the case to the operating site.

(3) Place the transit case on its side (A), release the latch locks, and open the case (B).

(4) Remove the main canvas, picture frame, leg braces, ground pads, stakes, and web straps from the case.

(5) Loosen the two eyebolts from the top front of the control-indicator cabinet.

(6) Remove the control-indicator transit cover and stow on top of the control-indicator cabinet.

(7) Place the equipment picture frame (C) and attached canvas in position on the front of the control-indicator cabinet. Lock the picture frame in place with the nine latches. Secure at the top with the two eyebolts ((5) above).

(8) Snap the bottom portions of the equipment side wall to the mounting flanges on the rear jack support braces (D). Secure the bottom edges with the zippers.

(9) Loosen the two locking screws on the jack as-

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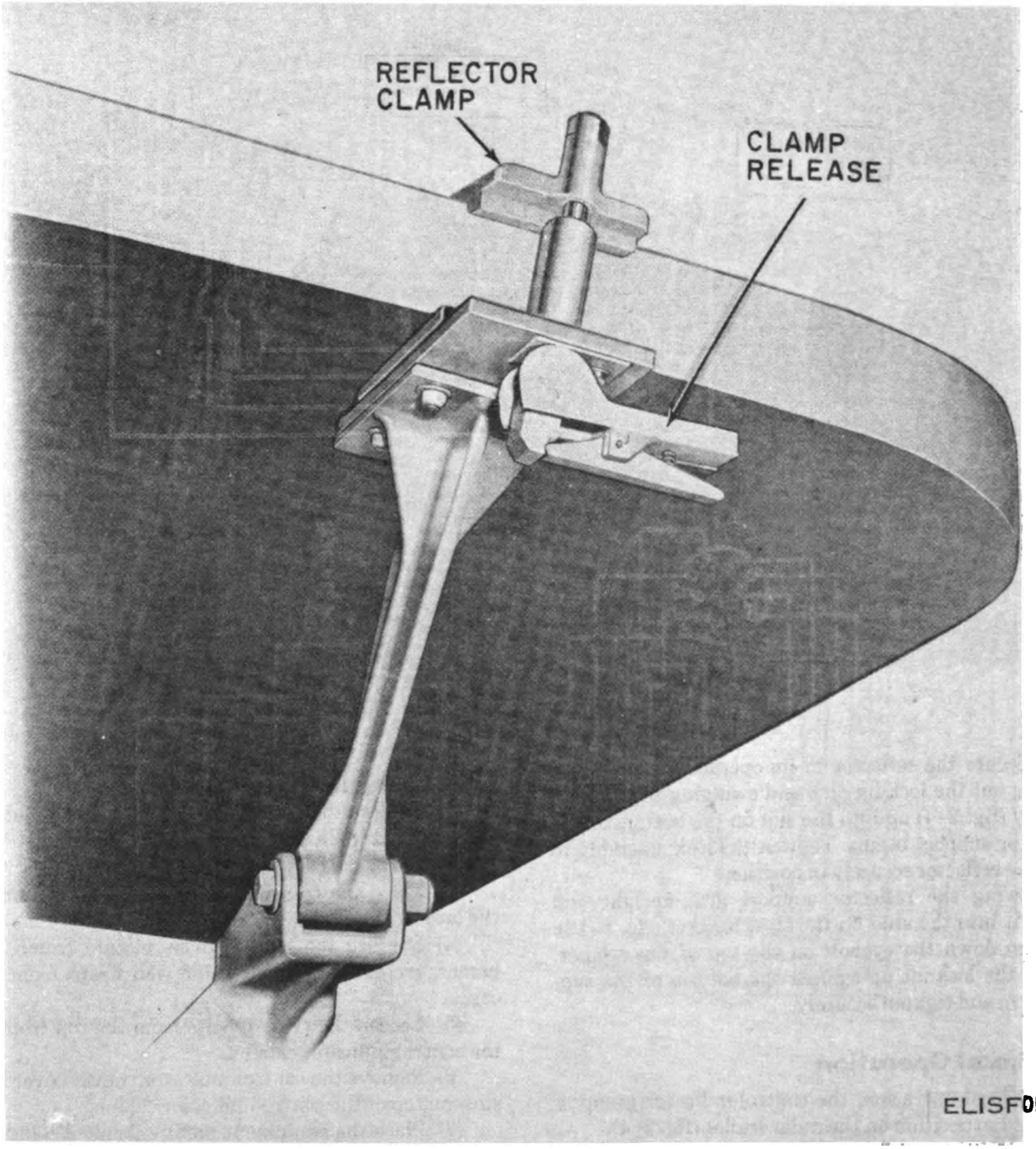

Figure 2-9. Antenna Reflector AT-634/MPQ-4A in transit position, partial view.

sembly and swing the support brace into position (fig. 2-4). Fasten the support brace to the radar trailer with the locking screw. Tighten the two locking screws on the jack.

(10) Position the case with the blower mounting frames away from the control-indicator cabinet (D). Swing the frames into a vertical position and lock into position with the leg braces.

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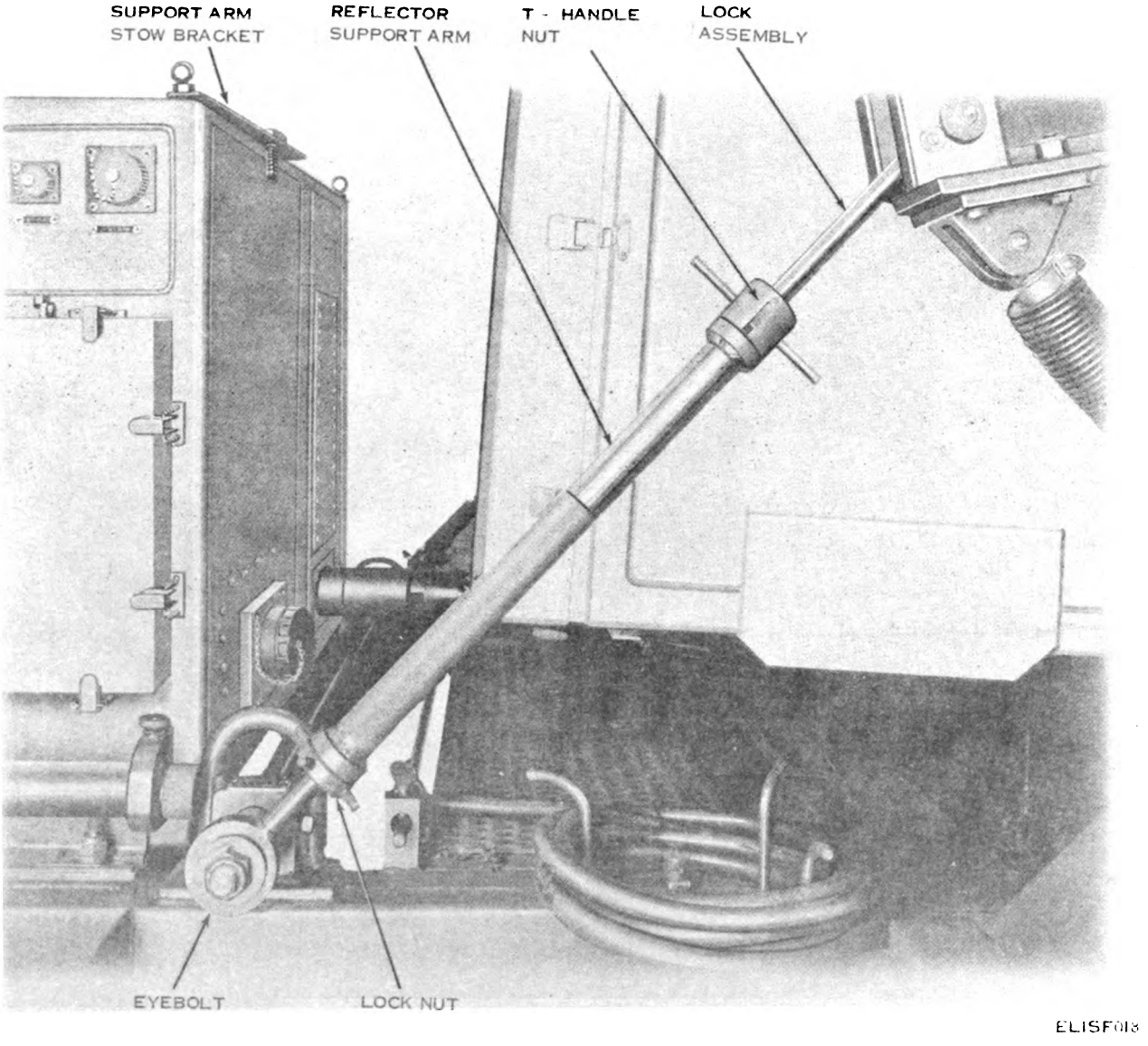

Figure 2-10. Reflector support arm in transit position.

(11) Erect the entrance side legs and lock into position with the leg braces. Position the ground pads on the legs and lock in place.

(12) Place the case on edge, overturn, and position on cabinet, mating the slots on the blower mounting frames with the lock studs on the picture frame (E). Tighten the two lock studs.

(13) Adjust the leg heights to level and support the transit case which now forms the shelter roof.

(14) Place the main tarpaulin over the top and sides of the transit case and secure it to the equipment side wall with the zippers.

(15) Moor the operators' shelter with the eight ground stakes and eight web straps. Tie the protective flaps in place over the top portion of each web strap (F).

(16) Remove the two blower cases from their stowed position on the power unit.

(17) Position the intake blower in the blower mounting frame in the right front corner of the operators' shelter. Secure with the three clamps.

(18) Position the exhaust blower in left front blower mounting frame and secure with the three clamps.

(19) Open the blower case covers inside the operators' shelter and lock in position with the door locks (F). See that all switches are in the *off* position.

(20) Open the blower case covers outside the oper-

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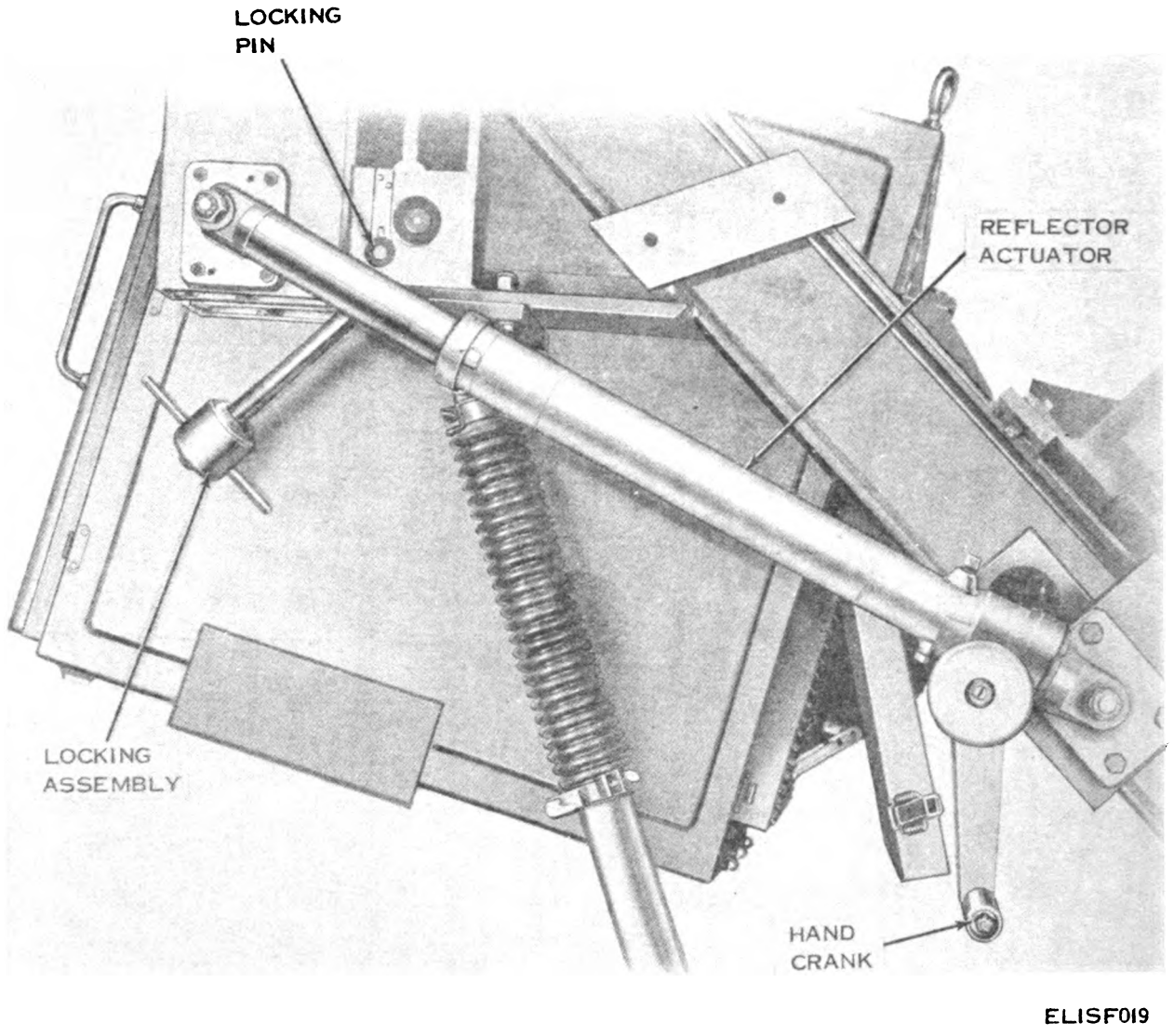

Figure 2-11. Reflector lock assembly and actuator handcrank.

ators' shelter and lock in position with the door locks.

(21) Check the installation for light leakage and adjust as required.

(22) On S-134A/MPQ-4A, see that the shelter vents are open for maximum ventilation.

c. Cables. Install the cables for local operation as outlined in paragraph 2-10.

2-9. Remote Operation

In remote operation, the control-indicator group is operated up to 150 feet from the antenna trailer. Avoid the area immediately in front of the antenna, or within the radiation path of the antenna as it sweeps the target area. Disconnect all cables from the control-indicator group before moving it to a remote position.

a. Installation of Remoting Stand. Remove the remoting stand (fig. 1-7) for the control-indicator from the power unit trailer and assemble as follows:

(1) Place the stand upside down on the ground.

(2) Insert one of the legs in the socket mounted at the corner of the stand.

(3) Pull the retainer pin (fig. 2-13) out far enough to allow the leg sufficient passage.

(4) Rotate the leg until it locks into place.

(5) Repeat (1) through (4) above for the other three legs.

(6) Place the remoting stand in its remote location.

(7) Remove the two quick release pins from the top of the stand and lay them aside.

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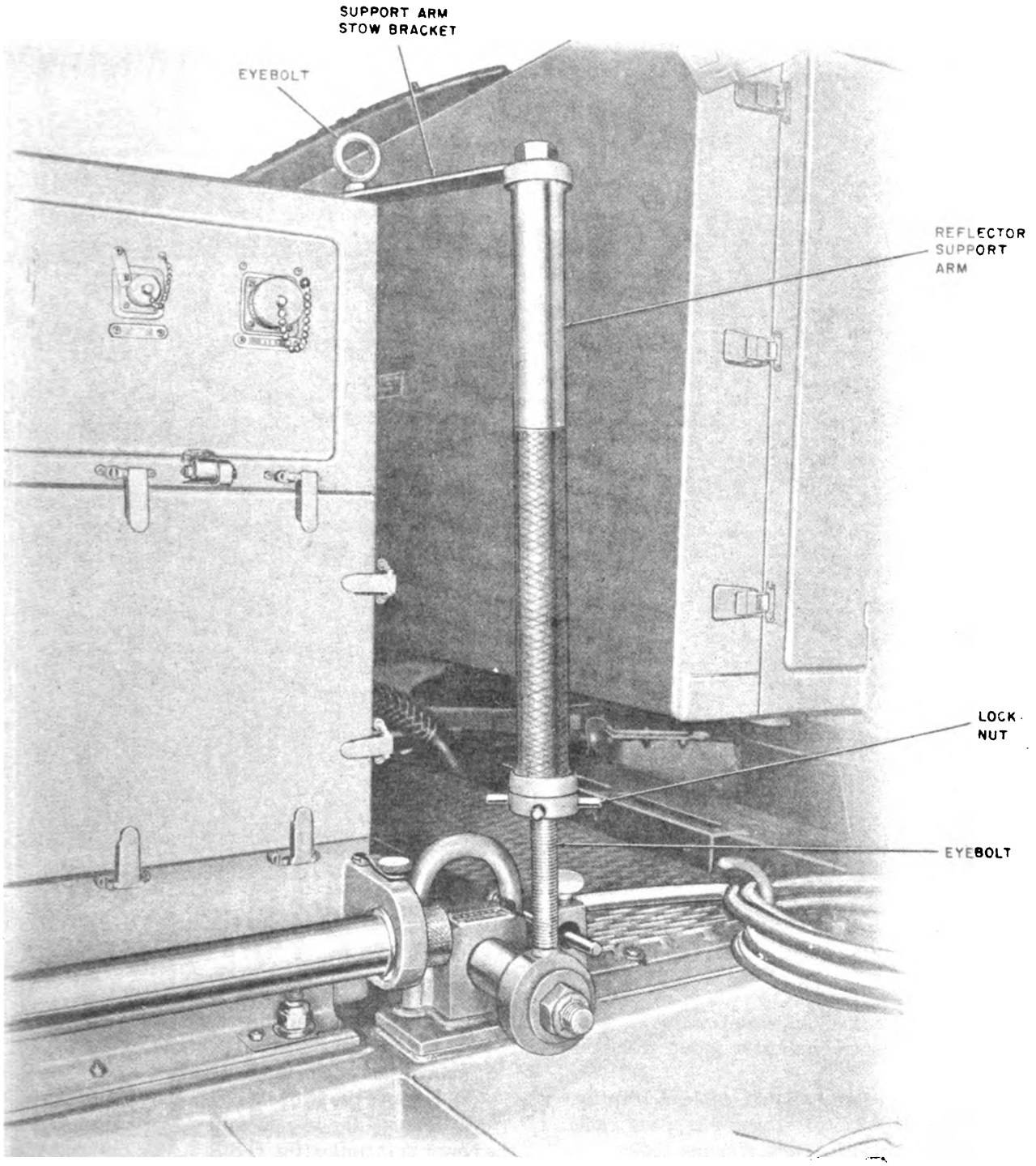

Figure 2-12. Reflector support arm in stowed position.

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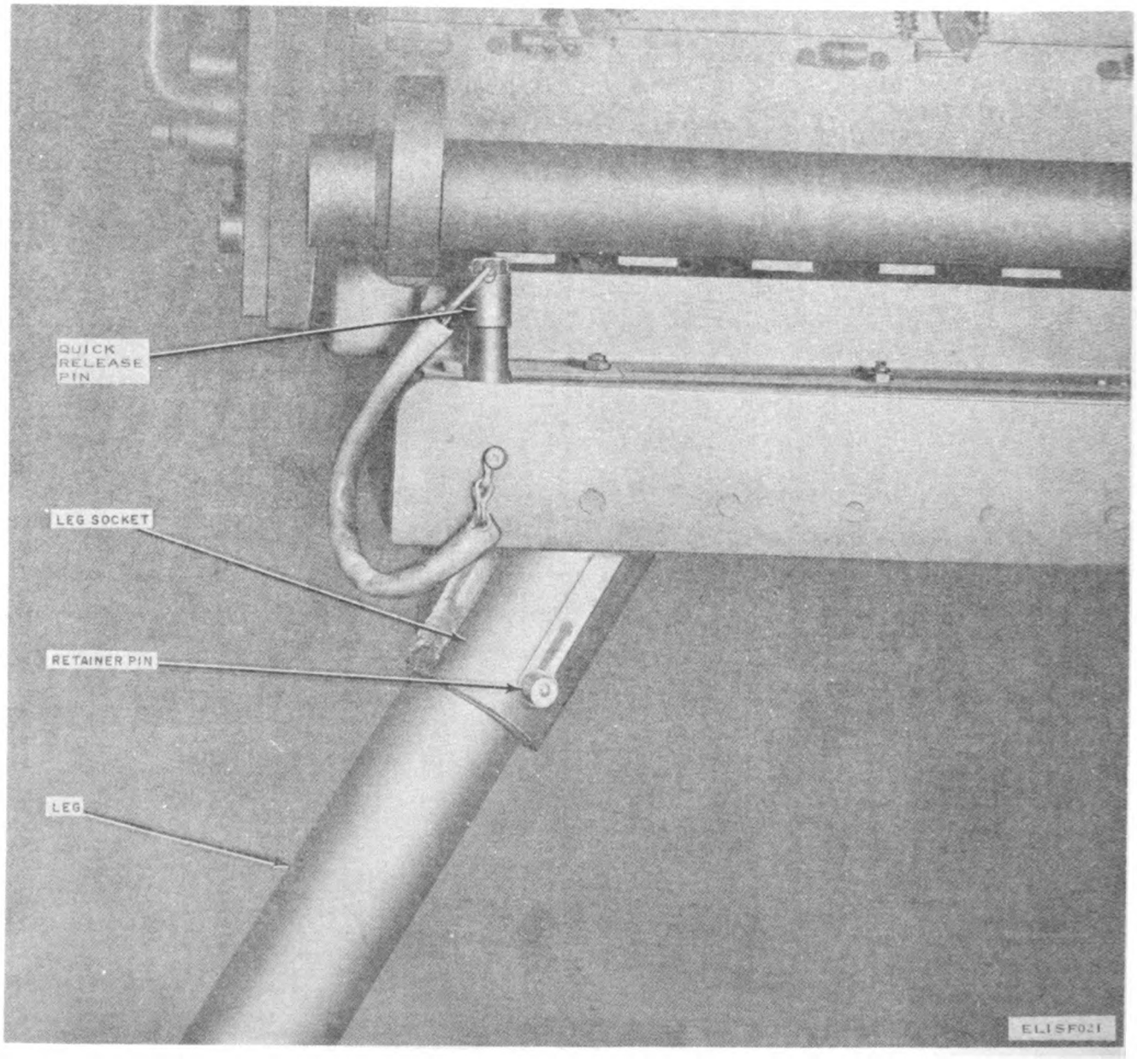

Figure 2-13. Control-Indicator Stand MT-1733/MPQ-4A, partial view.

b. Installation of Control-Indicator Group.

(1) Unbolt the control-indicator group from the radar trailer.

(2) Disconnect pedestal control cable W702 (fig. 2-14) from jack J1002, and disconnect power cable W701 (fig. 2-14) from jack J1001, if connected.

(3) Extend the tubular carrying handles and, with four to six men, carry the cabinet to the remote site. (This component weighs approximately 570 pounds.)

(4) Slide the cabinet into position on the stand and mate the slots on the cabinet with the positioning holes in the stand. Insert the two pip pins through the holes to secure the cabinet to the stand.

c. Installation of Operators' Seats.

(1) Remove the two seats from the radar trailer.

(2) Remove the two operators' seat supports from the power unit trailer (fig. 1-8).

(3) Release the strap on each seat support to unlock the legs.

(4) Extend the legs into position.

(5) Place each seat in the sockets on the supports and position with the two pins on each base.

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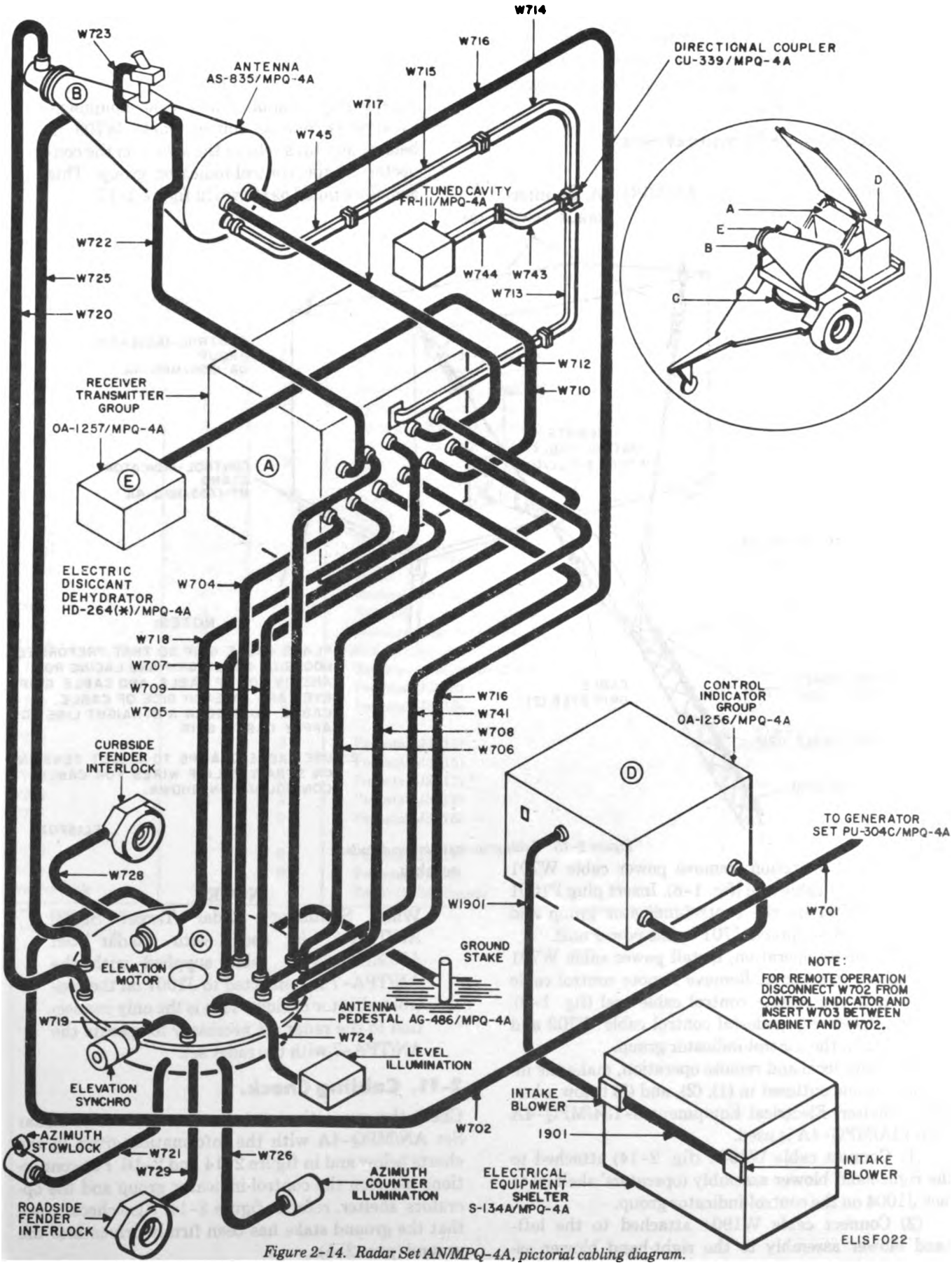

Figure 2-14. Radar Set AN/MPQ-4A, pictorial cabling diagram.

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(6) Adjust the height of each seat as desired.

d. Installation of Operators' Shelter. To install the shelter, follow the procedure given in paragraph 2-8.

e. Cables. Install the cables for remote operation as outlined in paragraph 2-10.

2-10. Cabling and Connections (fig. 2-14)

The components of Radar Set AN/MPQ-4A are interconnected by cables. Most of these cables are in place when the equipment is received. Connect the remaining cables as follows:

NOTE

A cable grip is supplied with some equipment to support remote control cable W703 (*b* below), and thus relieve the strain on the connector at the control-indicator group. This grip is installed as shown in figure 2-15.

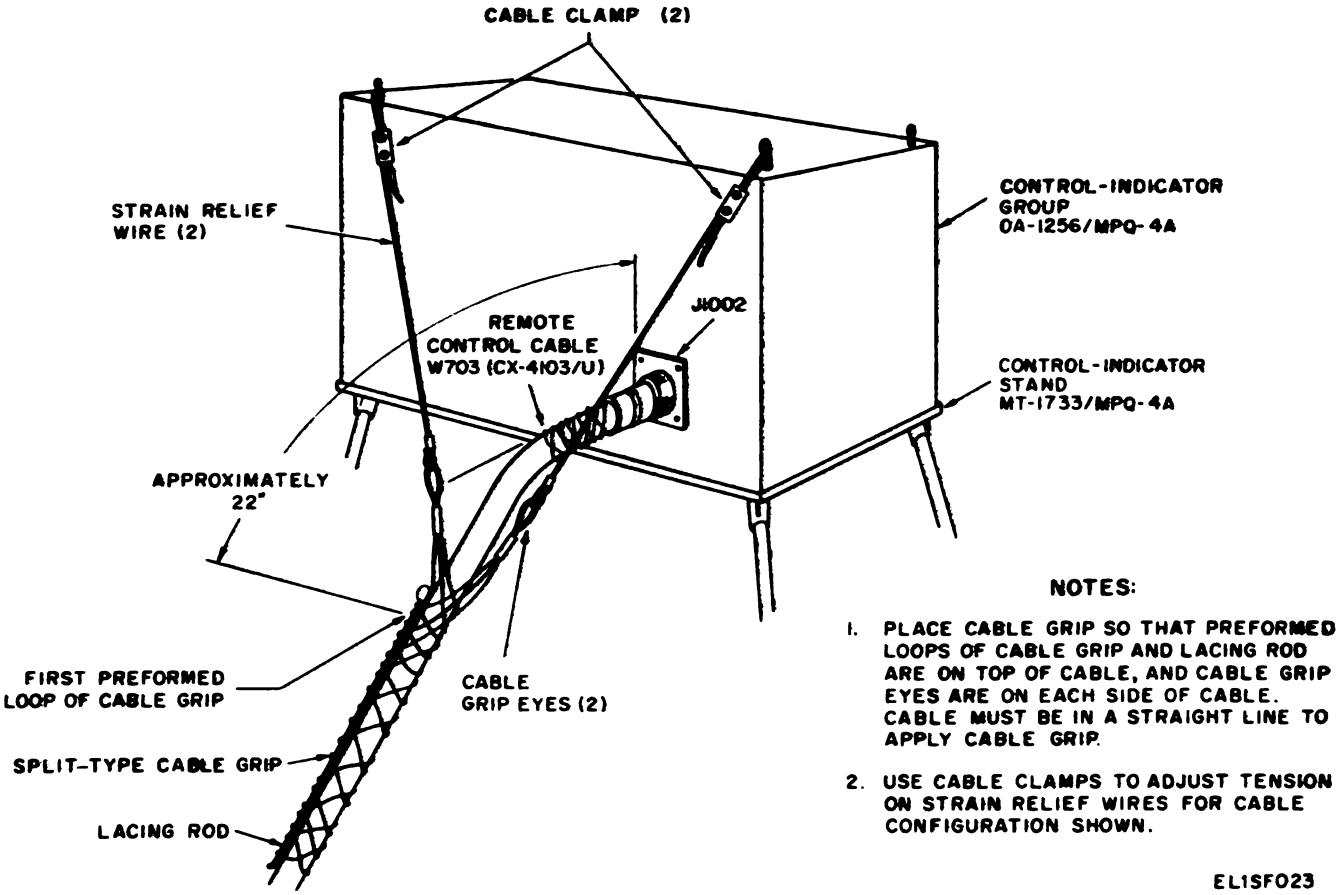

Figure 2-15. Cable grip, installation details.

a. For local operation, remove power cable W701 from the power cable reel (fig. 1-8). Insert plug P1001 into jack J1001 on the control-indicator group and plug P701 into receptacle J701 on the power unit.

b. For remote operation, install power cable W701 as indicated in *a* above. Remove remote control cable W703 from the remote control cable reel (fig. 1-8). Connect it between pedestal control cable W702 and jack J1002 on the control-indicator group.

c. For both local and remote operation, make the interconnections outlined in (1), (2), and (3) below when either Shelter, Electrical Equipment S-134/MPQ-4A or S-13A/MPQ-4A is used.

(1) Connect cable W1901 (fig. 2-14) attached to the right-hand blower assembly (operators' shelter) to jack J1004 on the control-indicator group.

(2) Connect cable W1901 attached to the left-hand blower assembly to the right-hand blower assembly.

NOTE

When Simulator, Radar Target Signal AN/TPA-7 is used with Radar Set AN/MPQ-4A, a cable supplied with the AN/TPA-7 is connected to J1007 on the control-indicator cabinet. This is the only connection to the radar set necessary to operate the AN/TPA-7 with the radar set.

2-11. Cabling Check.

Check the connections between components of Radar Set AN/MPQ-4A with the information given in the charts below and in figure 2-14 and 2-16. For connections between the control-indicator group and the operators' shelter, refer to figure 2-14. Also check to see that the ground stake has been firmly driven into the ground (para 2-5).

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a. Cables to be Connected (fig. 2-14).

Cable No.	Length		Connects	
	Ft	In	From	To
Power cable W701	101	0	Control-indicator group (J1001)	Power Unit (J701)
Remote Control Cable W703	150	0	Control-indicator group (J1002) remote operation only.	Cable W702 (P1002)
W1901	7	6	Control-indicator (J1004)	Right shelter blower
W1901	7	6	Left shelter blower	Right shelter blower

b. Cables to be Checked (fig. 2-14, 2-16).

Cable No.	Length		Connects	
	Ft	In	From	To
W702	6	8	Control-indicator (J1002) for local operation; cable W703 (P704) for remote operation.	Pedestal (J3010)
W704	3	0	Receiver-transmitter (J2001)	Pedestal (J3001)
W705	3	0	Receiver-transmitter (J2004)	Pedestal (J3006)
W706	3	0	Receiver-transmitter (J2005)	Pedestal (J3007)
W707	3	0	Receiver-transmitter (J2-06)	Pedestal (J3004)
W708	3	0	Receiver-transmitter (J2002)	Pedestal (J3002)
W709	3	0	Receiver-transmitter (J2003)	Pedestal (J3003)
W710	6	6	Receiver-transmitter (J2012)	Dehydrator (J3301)
W702[a]			Receiver-transmitter	W713
W713[a]			Directional coupler	W715
W715[a]			W714	W745
W745[a]			W715	Scanner
W743[a]			Directional coupler	W744
W744[a]			W743	Echo box
W717	4	0	Receiver-transmitter (J2009)	Scanner (J3202)
W718	4	0	Receiver-transmitter (J2010)	Elevation motor (J3012)
W722	6	8	Receiver-transmitter (J2013)	Reticle lamp control (J3204)
W723[b]	1	2	Reticle lamp control (J3205)	Reticle lamp (X13201)
W741	3	0	Receiver-transmitter (J2008)	Pedestal (J3005)
W716	4	6	Pedestal (J3008)	Scanner (J3203)
W719	3	9	Pedestal (J3013)	Elevation synchro (J3014) on antenna support structure
W720	5	2	Pedestal (J3011)	Scanner motor (J3201)
W721	2	0	Pedestal (J3015)	Azimuth stow switch
W724	2	6	Pedestal (J3017)	Level Illumination (J3021)
W725	4	2	Pedestal (J3018)	Scanner limit switches (J3207)
W726	6	0	Pedestal (J3016)	Azimuth counter illumination (J3020)
W728	3	0	Pedestal (J3019)	Curbside fender interlock
W729	3	0	Pedestal (J3009)	Roadside fender interlock
Ground cable			Radar trailer chassis	Ground stake

[a]Waveguide section.
[b]Shielded cable.

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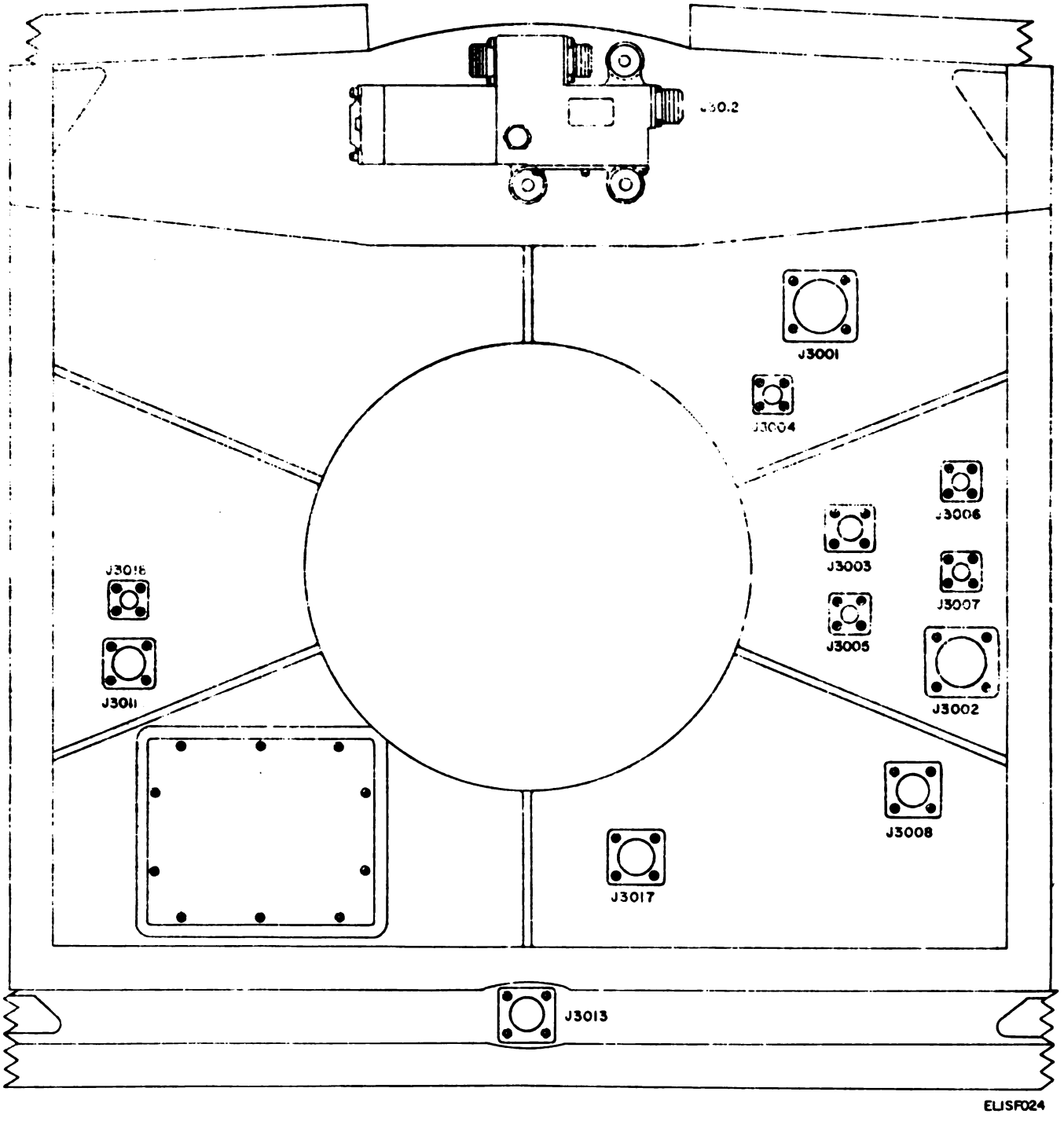

Figure 2-16. Antenna Pedestal AB-486/MPQ-4A, partial top view.

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CHAPTER 3
OPERATING INSTRUCTIONS

Section I. CONTROLS, INSTRUMENTS, AND INDICATORS

WARNING

Potentially hazardous levels of microwave radiation exist immediately in front of the antenna reflector. Potentially hazardous ionizing radiation may exist within the transmitter compartment. Before operating or working on or around the equipment, observe the precautions in the radiation hazard warnings inside of the front cover.

3-1. General

Haphazard operation or improper setting of the controls can cause damage to electronic equipment. For this reason, it is important to know the function of every control. The actual operation of the equipment is discussed in sections II and III of this chapter.

3-2. Control-Monitor C-2102/MPQ-4A
(fig. 3-1)

The chart below lists the controls, instruments, and indicators of the control-monitor on the receiver-transmitter group and the functions of each item.

Control	Function
VIDEO TEST jack	Test jack for measuring output of if. amplifier (for maintenance use only).
OUTPUT PULSE TEST jack	Test jack for checking output pulse to magnetron (for maintenance use only).
L.O. CAVITY RAISE-LOWER switch	Adjustment for varying frequency of local oscillator V1501.
AFC OUTPUT jack	Test jack for measuring afc voltage (for maintenance use only).
TEST METER SELECTOR switch	A six-position switch which connects the meter to various circuits in the receiver and power supply.
	Position — *Function*
	XTAL — Indicates current in if. crystal No. 1 (CR1501).
	XTAL 2 — Indicates current in if. crystal No. 2 (CR1502).
	AFC XTAL — Indicates current in afc crystal (CR1503).
	+300 V X100 — Indicates output voltage of +300-volt supply for afc and stc assembles.
	+150 V X50 — Indicates output voltage of +150-volt supply for afc and if assembles.
	−300 V X100 — Indicates output voltage of −300-volt supply for afc and stc assembles.
TEST METER	Indicates crystal currents or low-voltage power supply voltages.
120V 400 outlet	Convenience outlet for 120-volt, 400 Hz power (for maintenance use only).
A.F.C.-MANUAL switch	Selects either MANUAL or A.F.C. operation of local oscillator frequency.
	NOTE This switch is interconnected with the AFC-MANUAL switch on Control-Power Supply C-2014/MPQ-4A (para 3-5). When either of these switches is in the MANUAL position, the local oscillator frequency is controlled manually.
MAGNETRON HOURS meter	Indicates number of hours of magnetron operation.
MAGNETRON CUR meter	Indicates magnetron current.
HVPS CURRENT TEST jack	Test jack for measuring current in high-voltage secondary of T1101 (for maintenance use only).

3-3. Power Supply PP-1588/MPQ-4A
(fig. 3-2)

The chart below lists the indicators and fuses of the low-voltage power supply and the function of each item.

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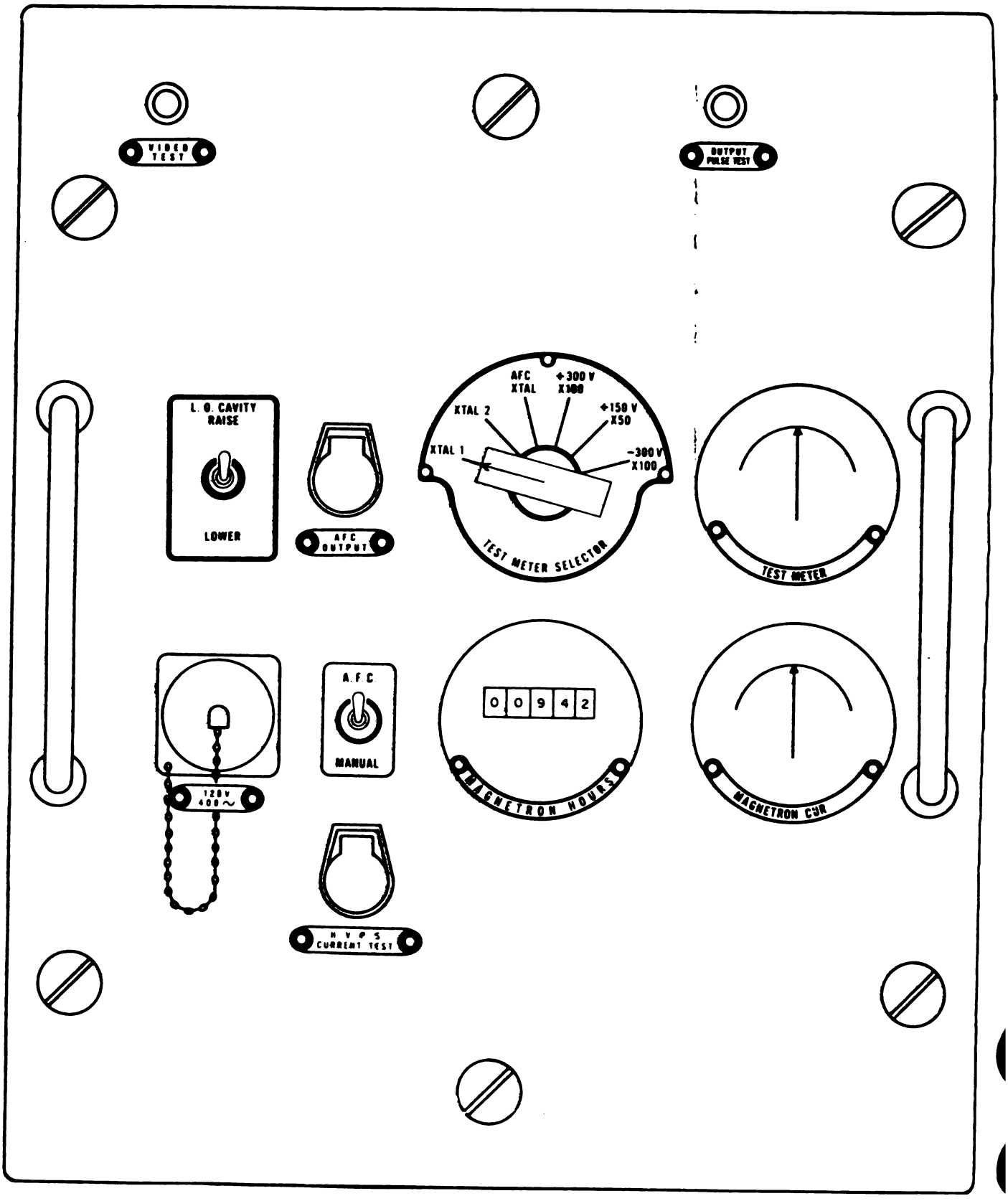

Figure 3-1. Control Monitor C-2102/MPG-4A. front panel.

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Control	Function
.125 AMP fuse	Protects the +300-volt dc supply.
+300 V DC indicator lamp	Indicates blown fuse in the +300-volt dc supply.
SPARE .125 AMP fuse	Spare fuse for the +300-volt dc supply.
.250 AMP fuse	Protects the +150-volt dc supply.
+150 V DC indicator lamp	Indicates blown fuse in the +150-volt dc supply.
SPARE .250 AMP fuse	Spare fuse for the +150-volt dc supply.
.062 AMP fuse	Protects the −300-volt dc supply.
−300 V DC indicator lamp	Indictes blown fuse in the −300-volt dc supply.
SPARE .062 AMP fuse	Spare fuse for the −300-volt dc supply.

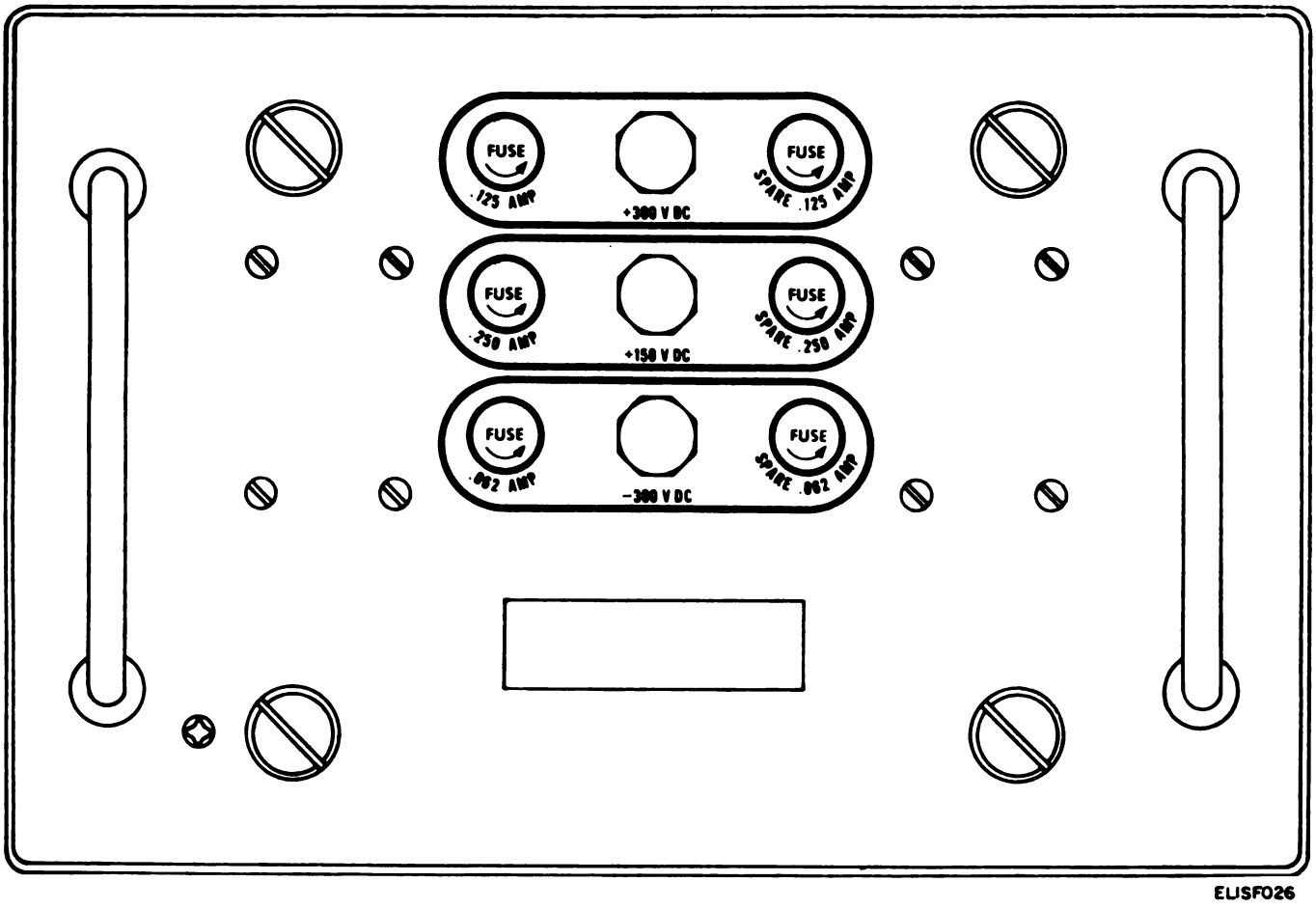

Figure 3-2. Power Supply PP-1588/MPQ-4A, front panel.

3-4. Indicator, Azimuth and Range IP-375/MPQ-4A

(fig. 3-3)

The chart below lists the controls, instruments, and indicators of the indicator and the function of each item.

Control	Function
PLOTTER DIMMER control	Varies brightness of plotter illumination.
IF GAIN control	Varies sensitivity of receiver (also varies the gain of circuits in Simulator, Radar Target Signal AN/TPA-7 when the AN/TPA-7 is connected and operated with Radar Set AN/MPQ-A).
VIDEO control	Adjusts video gain.
FOCUS control	Adjusts the focus of the electron beam in the B-scope indicator.
INTENSITY control	Adjusts the brightness of the B-scope indicator.
PANEL DIMMER control	Varies illumination of front panel control marking

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Control	Function
SET DETENT indicator lamp	Indicate that computer Δ RANGE and Δ AZIMUTH controls are not in detent.
BEAM VIDEO selector switch	In UPPER position, selects the video from the upper beam (scan) for B-scope display. In LOWER position, selects the video from the lower beam (scan). In BOTH position, applies the video from both beams (scans) to the B-scope indicator.
RANGE SELECTOR switch	Sets indicator for 15000 M or 3750 M range.
B-SCOPE indicator (CRT)	Provides a visual presentation of intercept points. Range information is presented in the vertical plane and azimuth information is presented in the horizontal plane.
EXPANDED SWEEP DELAY X-1000 M switch.	Places the 3750 M range anywhere on the 15000 M sector in 1,500-meter steps. Also used to select any 3750-meter sector of the 15000 M range for expansion.
TIMER switch (left)	Used to start or stop SECONDS timer. Also reverses the beam video when BEAM VIDEO selector switch is in either LOWER or UPPER position.
TIMER switch (right)	Used to start or stop SECONDS timer. Also reverses the beam video when BEAM VIDEO selector switch is in either LOWER or UPPER position.
SECONDS timer	Indicates time interval between first and second actuation of either TIMER button.
RESET switch	Pushbutton used to return SECONDS timer pointer to zero.
MARKERS ON switch	Inserts 2,000-meter marks for range calibration and disables stc circuits.
AZIMUTH MARK control	Adjusts the intensity of azimuth strobe.
RANGE ZERO adjustment	Adjusts timing of modulator trigger pulse with respect to start of vertical sweep.
RANGE SLOPE adjustment	Adjusts the slope of the timing sweep on the crt.
RANGE MARK control	Adjusts range mark intensity.
RANGE SHIFT-ON switch	In ON position, displaces the upper scan presentation from the lower scan presentation by 750 meters for easy viewing of in-flight projectiles.

3-5. Control-Power Supply C-2014/MPQ-4A

(fig. 3-4)

The chart below lists the controls, instruments, and indicators of the control-power supply and the function of each item.

Control	Function
POWER UNIT indicator lamp	Indicates power is available to the radar.
MAIN POWER ON & INTLK CLOSED indicator lamp.	Indicates that computer and indicator interlocks are closed and ac is being applied to the control-indicator group.
READY indicator lamp	Indicates 5-minute delay relay has closed and high voltage may be applied.
RADIATE indicator lamp	Indicates transmitter is operating.
MAGNETRON CURRENT meter.	Indicates magnetron current.
POWER UNIT START-STOP switch	Remotely starts or stops generator. **NOTE** Switch must be held in STOP position until generator comes to a complete stop.
START switch	Used to start the transmitter.
STOP switch	Used to shut off transmitter.
MAIN POWER switch	Controls application of power to the complete radar set.
MAGNETRON POWER variac	Adjusts magnetron current for proper operation.
440 V DC indicator lamp	Indicates blown fuse for the +440-volt dc supply to the indicator.
TEST METER	Used to check the dc operating voltages for the indicator and the afc crystal current.
TEST METER SELECTOR switch	A six-position switch used to connect the TEST METER to circuits in the control-power supply and receiver. Position and function information follows:

Position	*Function*
OFF	Disconnects TEST METER from circuits.
440 V X100	Measures +440-volt output supply for indicator.
220 V X50	Measures +220-volt output supply for indicator.
27 V X10	Measures +27-volt output supply

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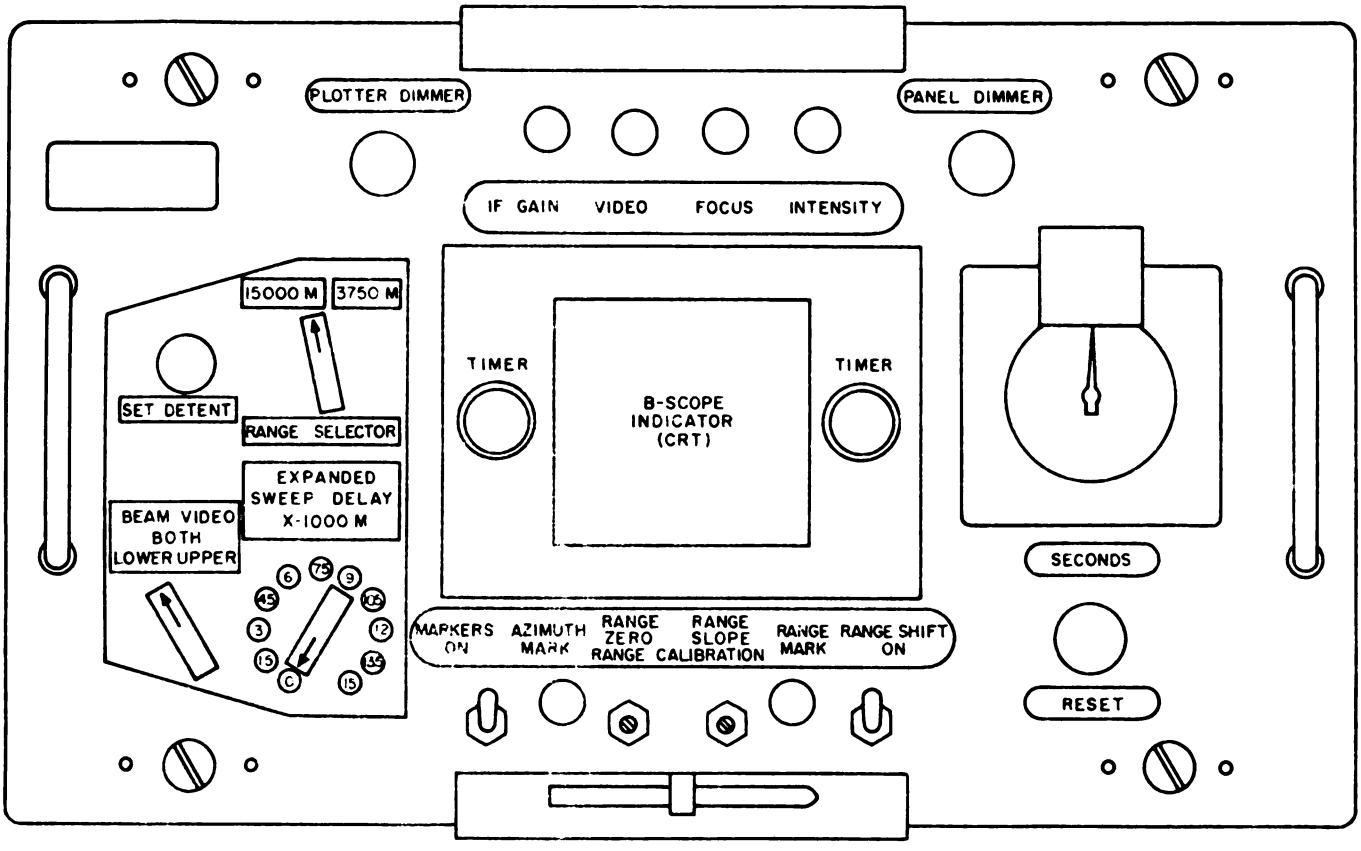

Figure 3-1. Azimuth and Range Indicator IP-375/MPQ-4A, front panel.

Control	Function
	−220 V X50 — Measures −220-volt output supply for indicator.
	AFC XTAL CUR — Measures afc crystal current.
SPARE .5 AMP fuse	Indicates blown fuse for the +220 V DC IND indicator.
+220 V DC IND indicator.	
.5 AMP fuse	Protects the +220-volt dc supply to the indicator.
SPARE .25 AMP fuse	Spare for .25 AMP fuse.
+220 V DC COMPUTER indicator lamp.	Indicates blown fuse for the +220-volt dc supply to the computer.
.25 AMP fuse	Protects the +220-volt dc supply to the computer.
SPARE .125 AMP fuse	Spare for .125 AMP fuse.
−220 V DC IND indicator lamp.	Indicates blown fuse for the −220-volt dc supply to the indicator.
.125 AMP fuse	Protects the −220-volt dc supply to the indicator.
SPARE 10 AMP fuse	Spare for upper 10 AMP fuse.
120 V AC indicator lamp	Indicates blown fuse (upper 10 AMP) for the 120-volt, line L2, ac supply to the control-indicator group and pedestal.
10 AMP fuse (upper)	Protects the 120-volt, line L2, ac supply to control-indicator group and pedestal.
120 V AC indicator lamps (three)	Right lamp indicates blown fuse for 120-volt, line L1A, ac supply to the computer and pedestal.
	Center lamp indicates blown fuse for the 120-volt, line L2A, ac supply to the computer and pedestal.
	Left lamp indicates blown fuse for the 120-volt, line L3A, ac supply to the computer and pedestal.
SPARE 20 AMP fuse	Spare for 20 AMP fuse.
120 V AC indicator	Indicates blown fuse (20 AMP) for the 120-volt, line L3, ac supply for magnetron power.
20 AMP fuse	Protects the 120-volt, line L3, ac supply for magnetron power.
SPARE 5 AMP fuse	Spare for 5 AMP fuse.
+27 V DC indicator lamp	Indicates blown fuse for +27-volt dc supply.

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Control	Function
5 AMP fuse	Protects the +27-volt dc supply.
SPARE 10 AMP fuse	Spare for lower 10 AMP fuse.
120 V AC indicator lamp	Indicates blown fuse (lower 10 AMP) for the 120-volt, line L1, ac supply to the control indicator group.
10 AMP fuse (lower)	Protects the 120-volt, line L1, ac supply to the control indicator group.
ELEVATION RAISE-LOWER switch	In the RAISE position, raises antenna beam; in the LOWER position, lowers antenna beam.
AZIMUTH CCW-CW switch	In the CW position, rotates antenna clockwise in azimuth; in the CCW position, rotates antenna counterclockwise in azimuth.
AFC-MANUAL switch **NOTE** This switch is interconnected with the A.F.C.-MANUAL switch on Control-Monitor C-2101/MPQ-4A (para). When either of these switches is in MANUAL position, the local oscillator frequency is controlled manually.	Maintains specified frequency of local oscillator when in AFC position. MANUAL position is used when adjustments are made with L.O. switch.
L.O. RAISE-LOWER switch	With the switch in the RAISE position, increases the local oscillator frequency; in LOWER position, decreases the local oscillator frequency.

3-6. Computer, Radar Data CP-319/MPQ-4A

(fig. 3-5)

The chart below lists the controls, instruments, and indicators of the computer and the function of each item.

Control	Function
Δ TIME SECONDS counter	Indicates time correction factor in seconds and tenths of seconds.
Δ time control	Used to set the time interval between upper and lower beam intercepts into the computer. This control is located directly below the TIME Δ SECONDS counter.
AZIMUTH ORIENT indicator lamp	Lights when LOWER BEAM AZIMUTH control is in detent and the B-scope azimuth strobe is lined up with the center of the lower beam.
LOWER BEAM ELEVATION counter	Indicates lower beam elevation angle in + or − mils.
AZIMUTH ORIENT-OFF DETENT RELEASE switch (detent switch)	A three-position switch which allows various controls to be set in or out of detent. *Position* / *Function* AZIMUTH ORIENT — Allows LOWER BEAM AZIMUTH control to be placed in detent. OFF — Releases LOWER BEAM AZIMUTH control from detent and allows RANGE and Δ AZIMUTH to be placed in detent. DETENT — Releases Δ RANGE and Δ AZIMUTH controls from detent. (When this happens, SET DETENT lamp on the indicator will light.)
SINGLE BEAM indicator lamp	Lights when SINGLE BEAM-DUAL BEAM switch is set to SINGLE BEAM.
SINGLE BEAM-DUAL BEAM switch	Switches computer to process inputs derived from either single beam or dual beam indicator presentations. SINGLE BEAM position is used to make computations from polar coordinate data obtained from single beam indicator presentations that are characteristic of low-angle trajectory projectiles that intercept only lower radar beam. DUAL BEAM position is used to make computations from polar coordinate data obtained from normal dual beam indicator presentation when high-angle trajectory projectiles intercept both upper and lower radar beams.
RANGE METERS counter	Indicates range of lower beam range strobe; or indicates computed range from radar to weapon. Both values are given in METERS.
Δ RANGE control	Used to set the range of the upper beam intercept into the computer.
LOWER BEAM RANGE control	Used to set the range of the lower beam intercept into

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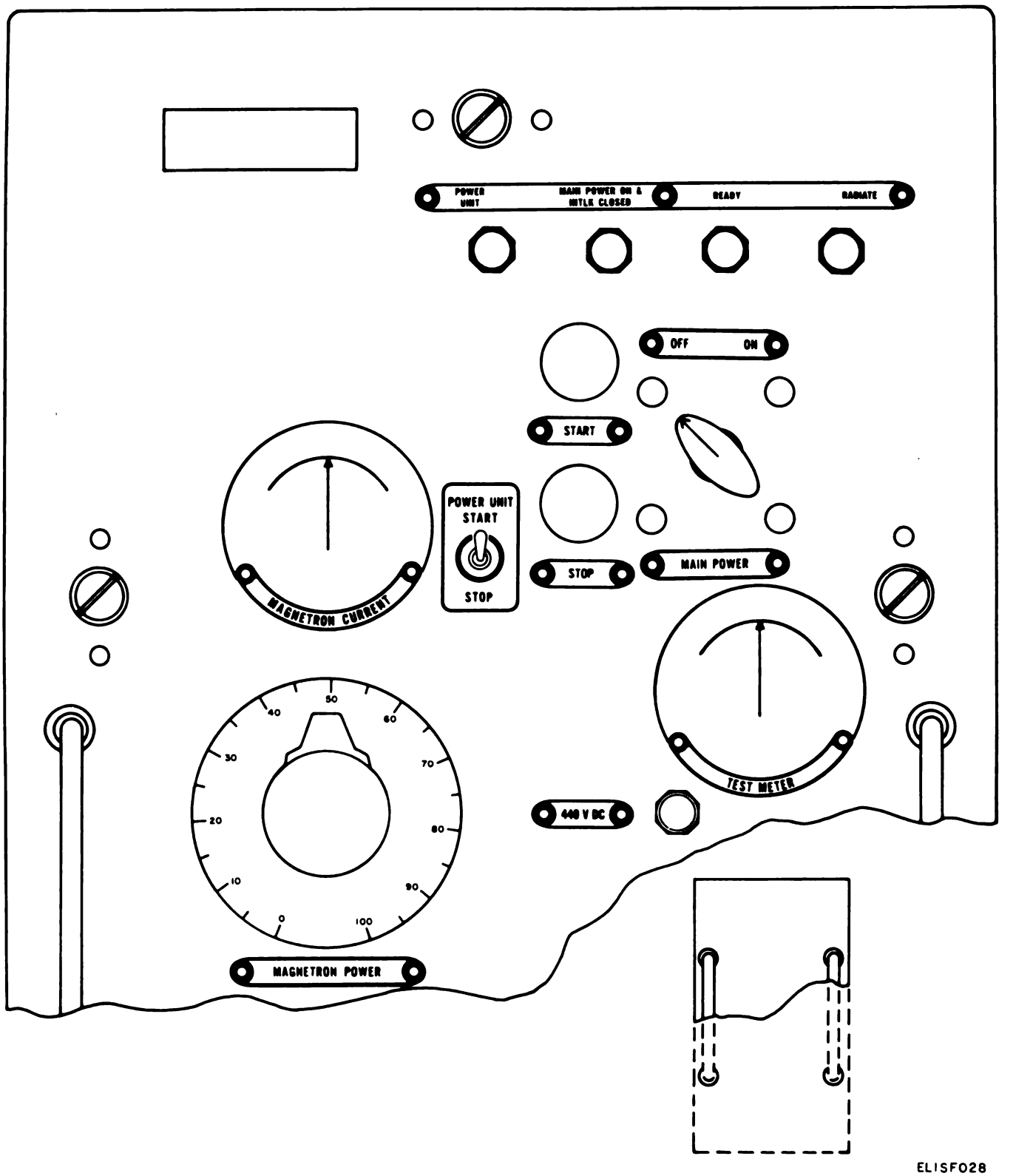

Figure 3-4. Control-Power Supply C-2014/MPQ-4A, front panel (sheet 1 of 2).

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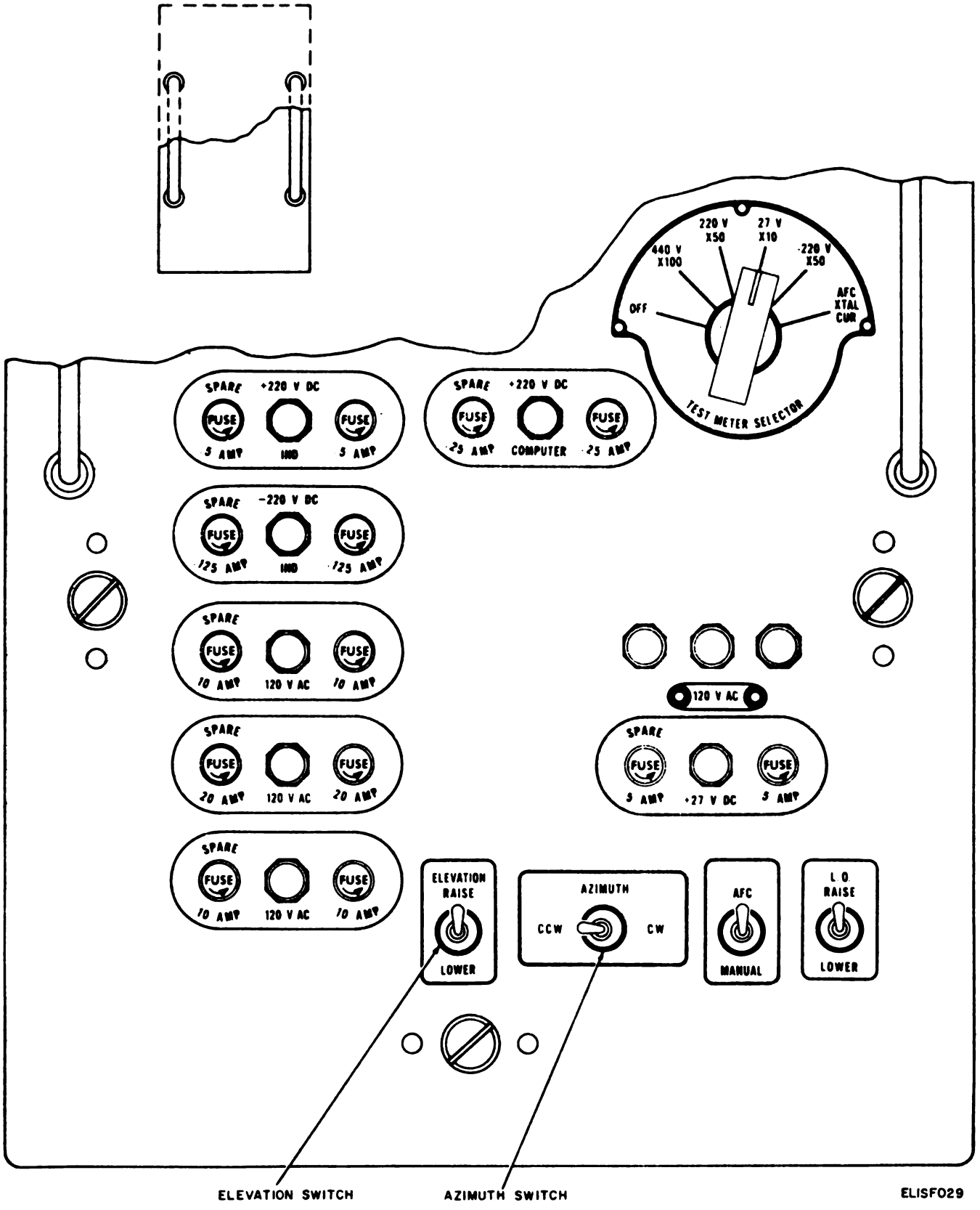

Figure 3-4.② Control-Power Supply C-2014/MPQ-4A, front panel (sheet 2 of 2).

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Control	Function
	the computer.
WEAPON LOCATION EASTING and NORTHING METERS counters.	Indicates coordinates of weapon in meters.
RADAR LOCATION EASTING and NORTHING counters.	Indicates coordinates of radar in meters.
RADAR LOCATION EASTING SUBT-ADD switch.	Controls a slewing motor used to set the RADAR LOCATION EASTING counter.
AZ ORIENT SUBT-ADD switch .	Controls a slewing motor used to set the AZIMUTH counter.
RADAR LOCATION NORTHING SUBT-ADD switch.	Controls a slewing motor used to set the RADAR LOCATION NORTHING counter.
DIMMER control	Controls brightness of panel lights.
AZIMUTH MILS counter	Indicates azimuth of lower beam azimuth strobe; or indicates computer azimuth of radar to weapon. Both values are given in mils.
Δ AZIMUTH control	Used to set the azimuth of the upper beam intercept into the computer.
LOWER BEAM AZIMUTH control	Used to set the azimuth of the lower beam intercept into the computer.
DOUBTFUL SOLUTION indicator lamp.	Lights when problem exceeds the design limits of the computer.
Weapon HEIGHT METERS counter	Indicates weapon altitude in meters.
Weapon height meters control . . .	Used to set the weapon altitude into the computer. This control is located directly below the HEIGHT counter.
RADAR HEIGHT METERS counter	Indicates altitude of radar in meters.
RADAR HEIGHT adjustment . . .	A screwdriver adjustment for setting in RADAR HEIGHT (altitude) at time of installation (located below RADAR HEIGHT METERS counter).

3-7. Antenna Group OA-1258/MPQ-4A

The following chart lists the controls, instruments, and indicators on the antenna group and the function of each item.

Control	Function
Reticle illumination control (located on telescope bracket (fig. 1-1)).	Controls intensity of reticle lamp.
Telescope (fig. 1-1)	Used in optical orientation of the radar and to determine the field correction.
Spirit level (fig. 1-1)	Used in leveling the radar trailer. Controls the intensity of the level lamp.
Level illumination control (located on spirit level (fig. 1-1)).	
Azimuth stowlock (fig. 1-1)	Locks the pedestal to the trailer to prevent movement in azimuth during transit. Also opens the azimuth drive circuit when engaged.
Antenna azimuth counter (fig. 3-9).	Indicates the azimuth of the antenna in mils.
NOTE A spring clip attached to the antenna azimuth counter, when set in the notch on the counter hand crank, disengages the counter from the radar set. Premature wear or damage to the counter may be prevented by disengaging it when not in use following installation and alignment procedures.	
Azimuth counter illumination control (located on antenna azimuth counter (fig. 1-1)).	Controls intensity of azimuth counter lamp.
Azimuth handwheel (fig. 2-7).	Drives the antenna mechanically when shaft is pushed all the way in. With shaft in midway position, antenna may be turned by hand. With shaft pulled all the way out, antenna is controlled by AZIMUTH switch on control-power supply panel.
ELEVATION-DEPRESSION (antenna elevation) counter (fig. 3-8).	Indicates the elevation or depression of the center of the lower beam in mils.
ELEVATION-DEPRESSION counter illumination control (located on antenna elevation counter (fig. 3-8)).	Controls the intensity of elevation counter lamp.

3-8. Dehydrators, Electric Desiccant HD-264/MPQ-4A and HD-264A/MPQ-4A

(fig. 1-2, 3-10)

The following chart lists the controls and indicators on the dehydrators and the function of each.

Control	Function
Dry air indicator	Indicates relative humidity of air supplies to waveguide of radar set. Normal dry air indication is blue.
Pressure gage.	Indicates pressure in waveguide of radar set. Normal reading is approximately 16 psi.
CIRCUIT BREAKER toggle switch (HD-264A/MPQ-4A only).	Starts dehydrator when activated if vent filter cover is raised.
Filter cover starting switch	Applies power to dehydrator through fuses (HD-264/MPQ-4A) or CIRCUIT BREAKER (HD-264/MPQ-4A) when filter cover is raised.
Purge valve	Used to purge equipment waveguide sections of moisture. It is located at right side of dehydrator.

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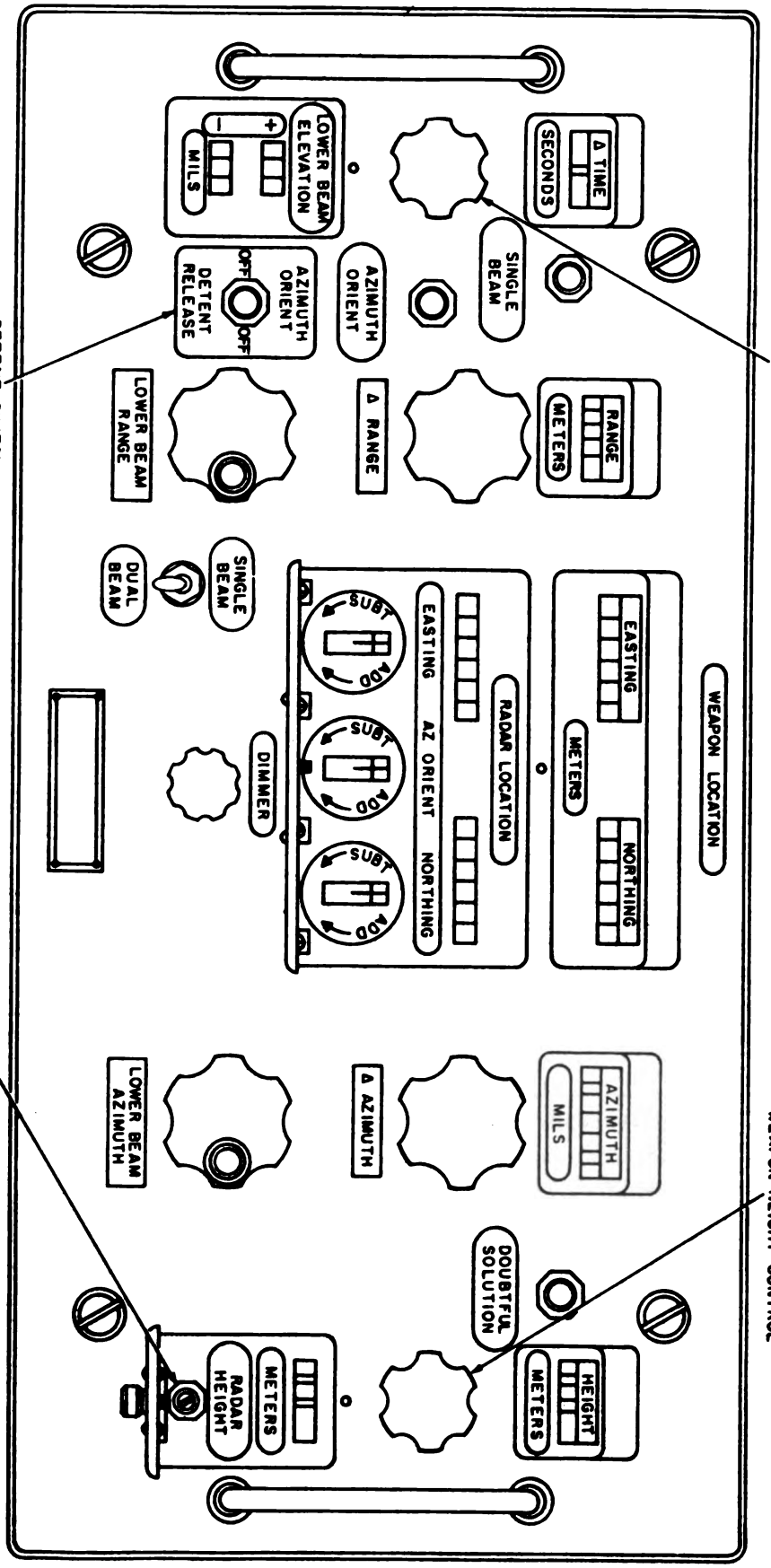

Figure 3-6. Radar Data Computer CP-319/MPQ-4A, front panel.

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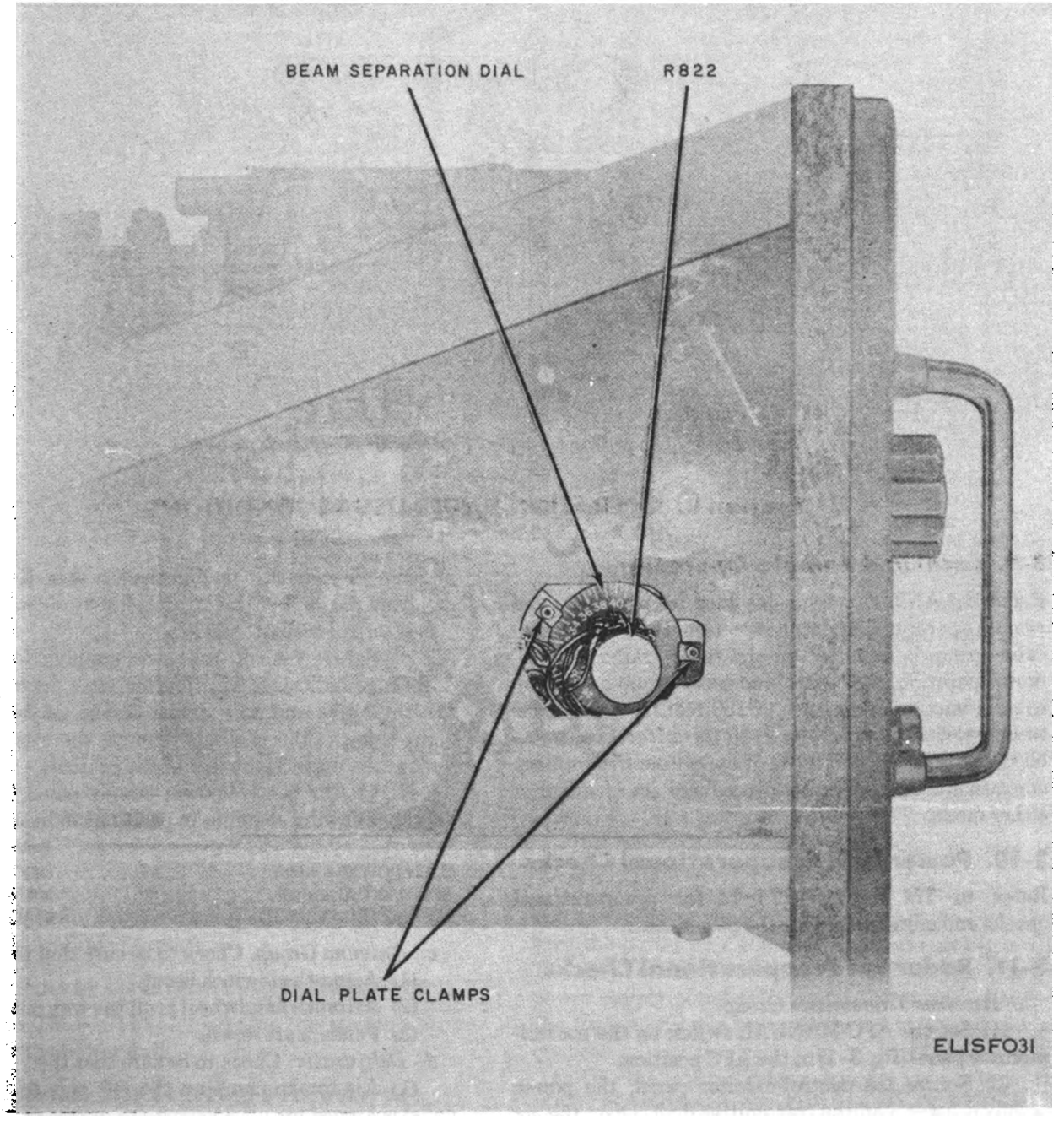

Figure 3-6. Radar Data Computer CP-319/MPQ-4A, partial left side view.

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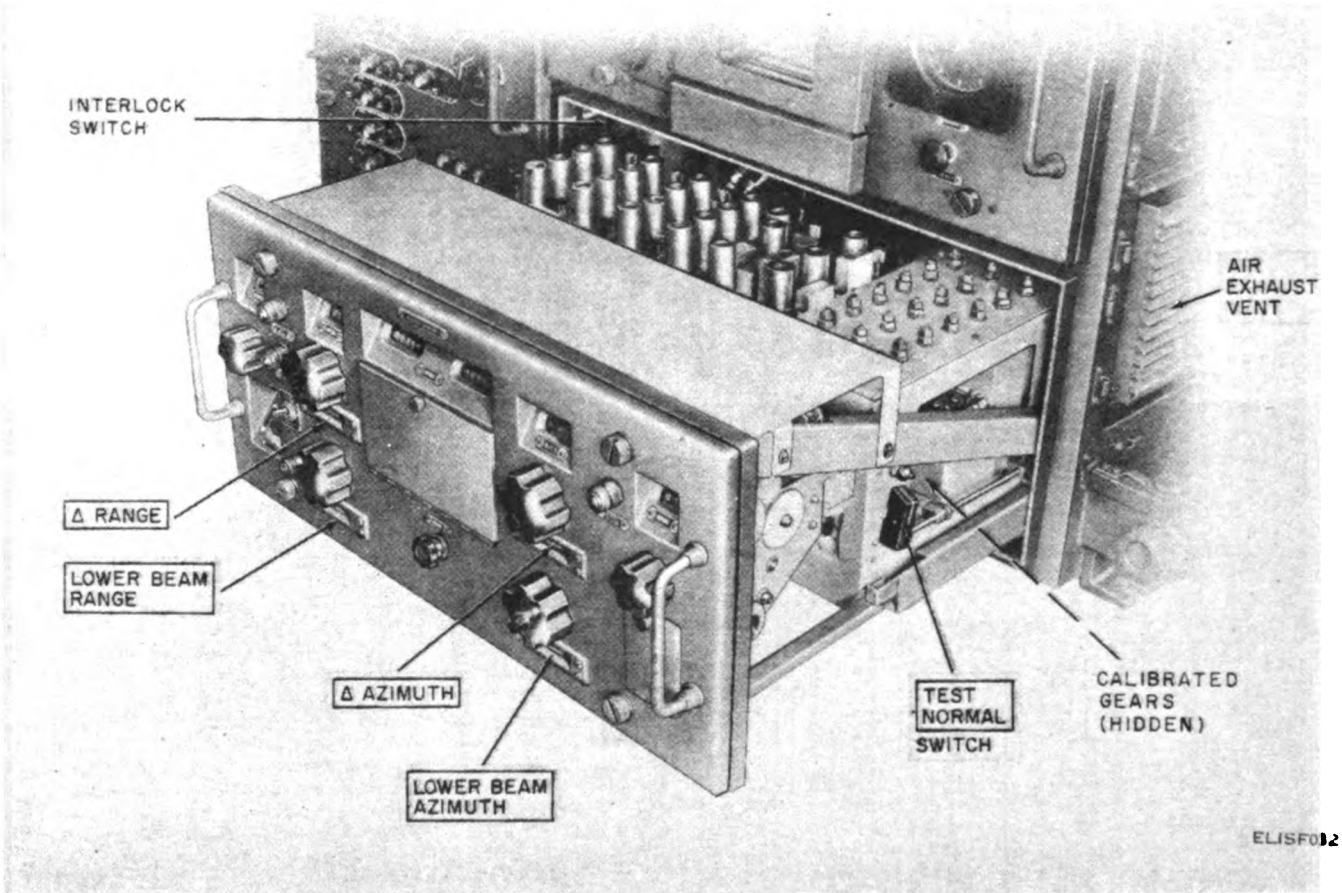

Figure 3-7. Radar Data Computer CP-319/MPQ-4A, right oblique view.

Section II. OPERATION UNDER USUAL CONDITIONS

3-9. Local and Remote Operation

Radar Set AN/MPQ-4A is designed for both local and remote operations. In local operation, the control-indicator group is mounted on the radar trailer. For remote operation, the control-indicator group may be located a maximum distance of 150 feet from the radar trailer. Refer to paragraph 2-10 for differences in cabling between the two types of operation. Preliminary adjustments and operating procedures are identical in either mode.

3-10. Power Unit Preoperational Checks

Refer to TM 5-6115-275-14 for preoperational checks and adjustments for the power unit.

3-11. Radar Set Preoperational Checks

a. Receiver-Transmitter Group.

(1) Set the AFC-MANUAL switch on the control-monitor panel (fig. 3-1) to the AFC position.

(2) Secure the control-monitor panel, the power supply drawer, and the transmitter door. Open the air intake and air exhaust panel on the rear of the cabinet and the air exhaust panel on the left side. Remove the cap from the vent at the upper left rear of the cabinet.

b. Control-Indicator Group.

(1) Secure the control-power supply, the azimuth and range indicator, and the computer drawers. Open the air intake and air exhaust panels on the left and right sides of the cabinet. Remove the cap from the vent at the upper right rear of the cabinet.

(2) On the control-power supply panel (fig. 3-4), set the following switches in positions indicated:

Control	*Position*
MAIN POWER switch	OFF
AFC-MANUAL switch	MANUAL
TEST METER SELECTOR switch	27 V X10

c. Antenna Group. Check to be sure that the:

(1) Azimuth stowlock is out.

(2) Azimuth handwheel is all the way out.

(3) Fenders are down.

d. Dehydrator. Check to be sure that the:

(1) Air intake panel on the left side of the front panel is hinged up.

(2) The purge valve is open.

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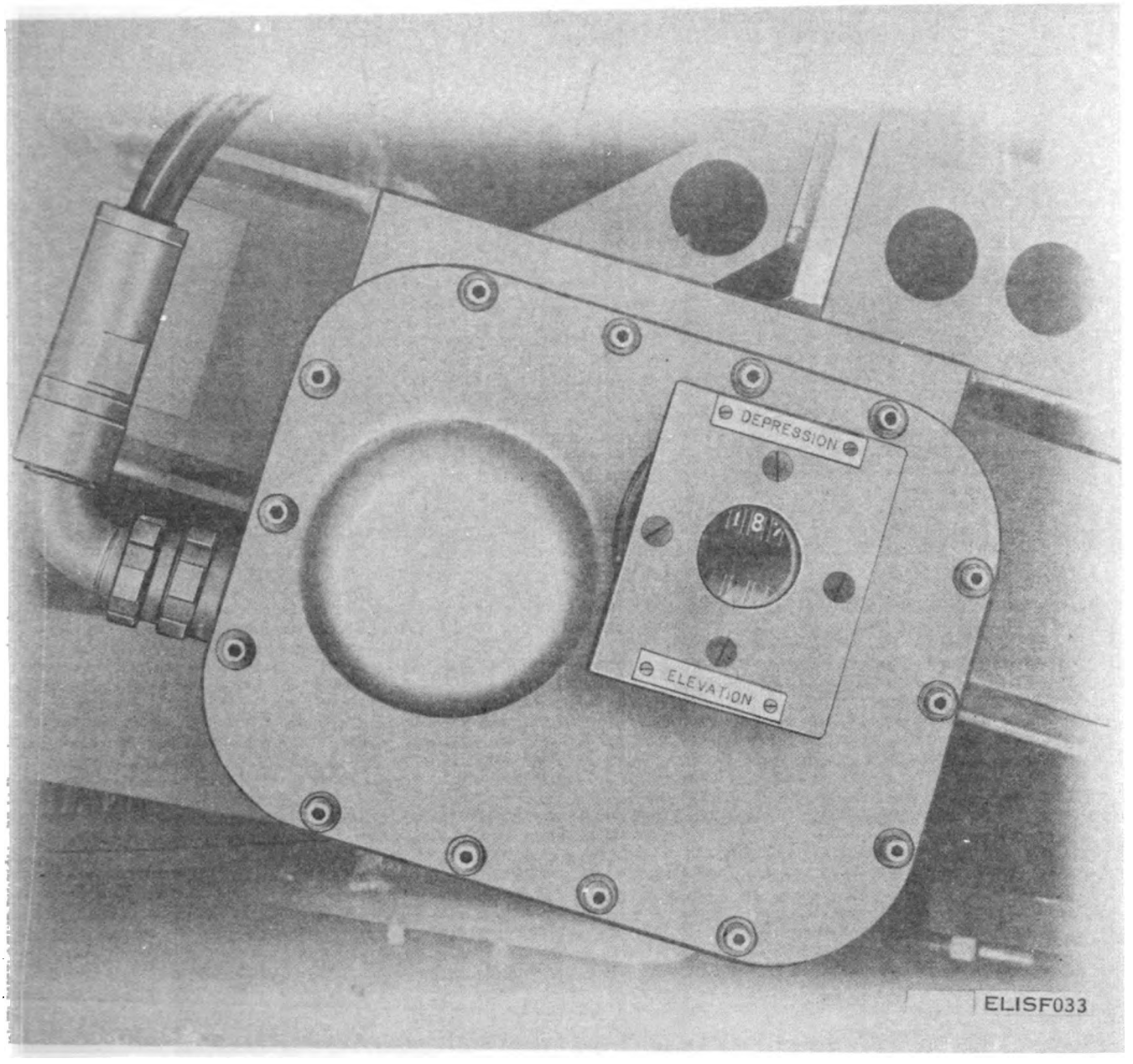

Figure 3-8. Antenna ELEVATION-DEPRESSION counter.

(3) Circuit breaker switch is in the ON position (HD-264A/MPQ-4A only).

3-12. Power Unit Starting Procedures

Refer to TM 5-6115-275-14 for the starting procedure for the power unit.

3-13. Radar Set Starting Procedures

a. Check the power unit outputs. When the proper voltage and frequency requirements have been met, turn the power unit 400-Hertz circuit breaker to ON. The POWER UNIT indicator lamp on the control-power supply panel will light if the output phases of the generator have been connected in the proper sequence.

b. On the control-power supply panel, turn the MAIN POWER switch to ON. The MAIN POWER ON & INTLK CLOSED indicator lamp should light, and

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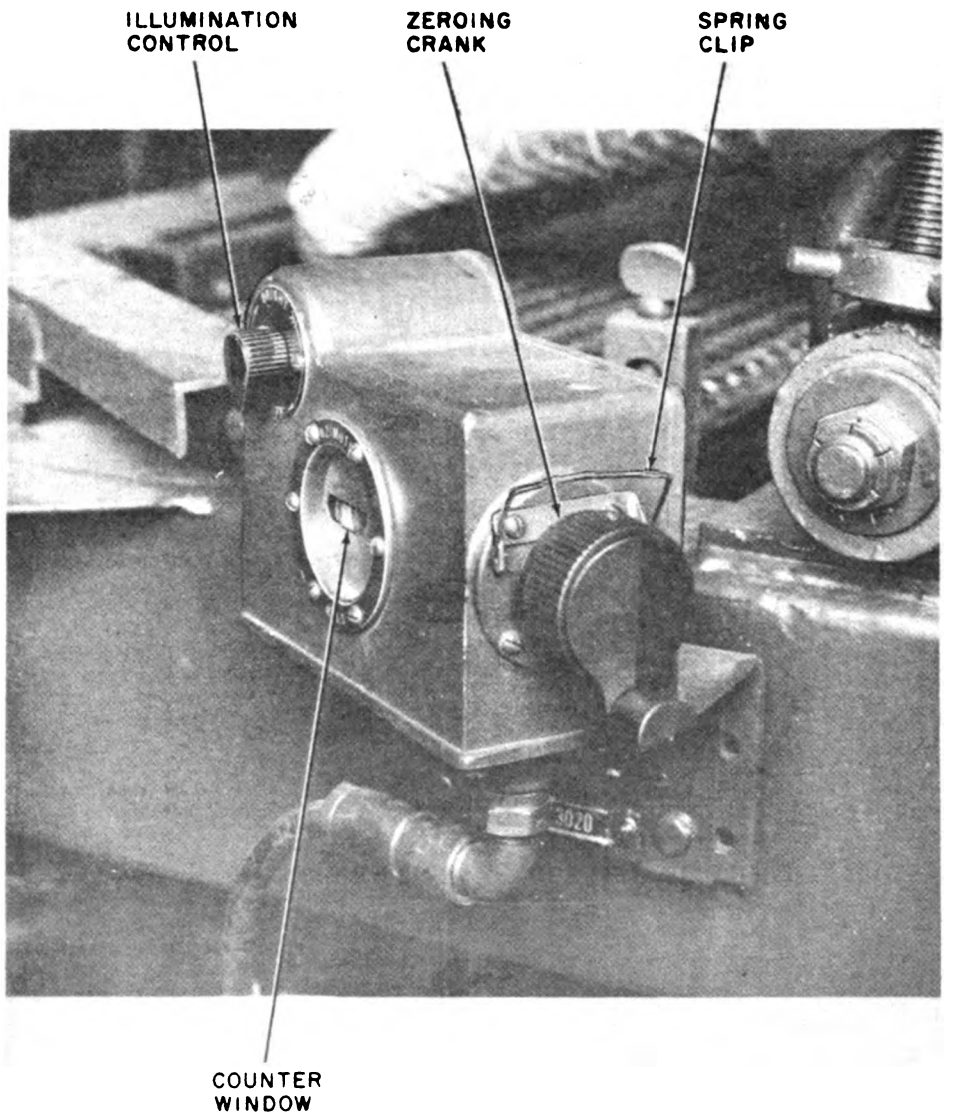

Figure 3-9. Antenna azimuth counter.

the TEST METER should indicate 27 volts. If the meter does not indicate 27 volts ± 2 volts, immediately turn the MAIN POWER switch to OFF. Check the power input voltages and connections. If the 27-volt fuse blows, immediately turn the MAIN POWER switch to OFF. Check the cable connections between the control unit and the pedestal for proper mating.

c. Check the operation of the three system blowers.

(1) Check the blowers in the receiver-transmitter cabinet by holding a piece of paper to the rear of the receiver-transmitter. If the inrushing air draws the paper against the receiver-transmitter compartment, the blower is operating. This check must be performed at both intake vents on the rear of the compartment to insure the operation of both the main blower and the magnetron blower.

(2) Check the blower on the control-indicator group. If air is being discharged at the exhaust vent on the right side of the cabinet, the blower is operating.

d. While waiting for the 5-minute delay relay to close, and the waveguide to be purged, perform the following checks and adjustments:

(1) Thirty seconds after closing all drawers, rotate the TEST METER SELECTOR switches on the con-

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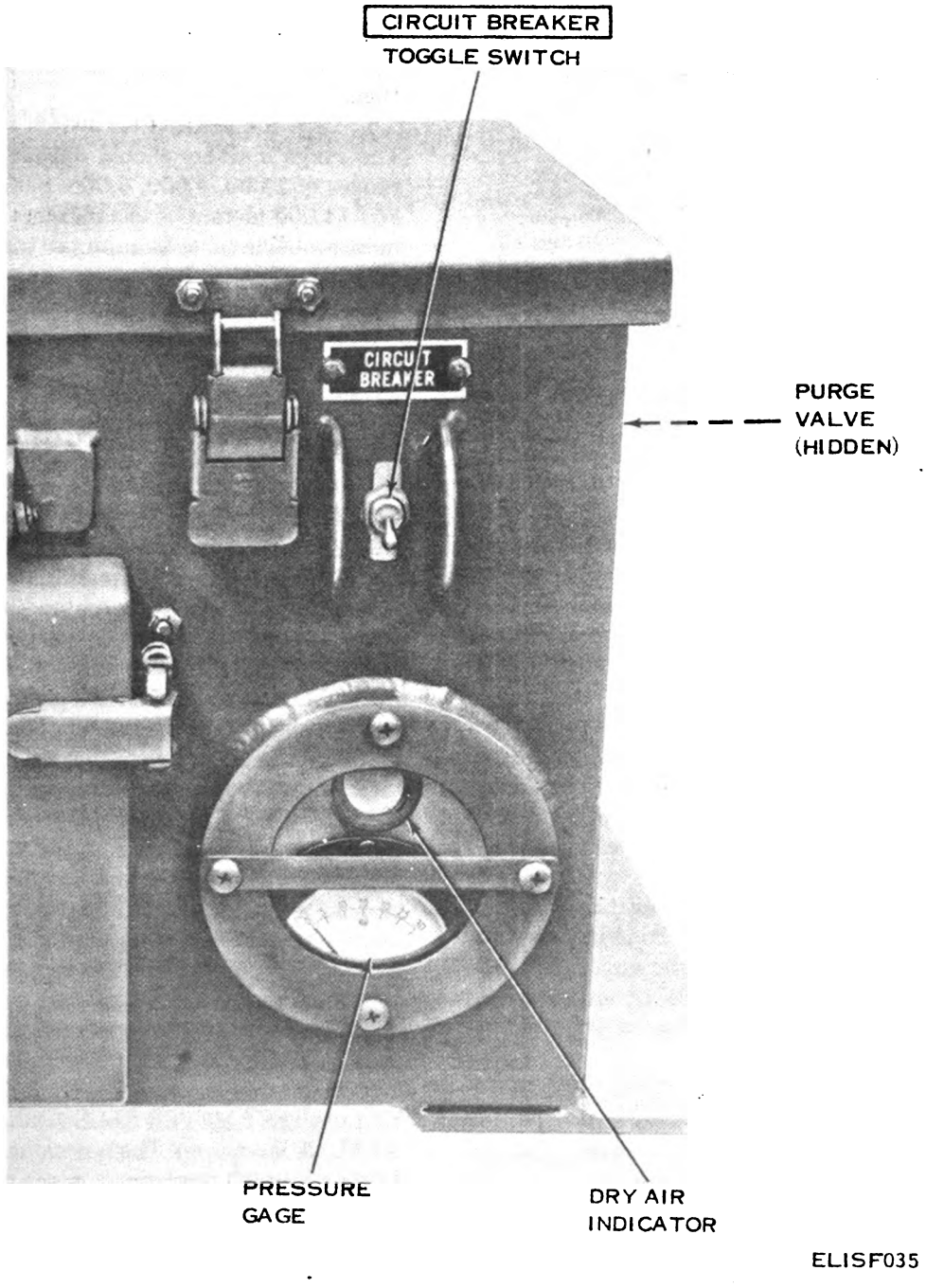

Figure 3-10. Electric Desiccant Dehydrator HD-264A/MPQ-4A, partial front view.

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trol-power supply panel (fig. 3-4) and on the control-monitor panel through the positions listed below. The meter readings should be as indicated below.

Position	Typical reading
440 V X100	440 volts ± 5
220 V X50	220 volts ± 5
27 V X10	27 volts ± 2
−220 V X50	−220 volts ± 5
AFC XTAL CUR	2.5 ± 0.5

NOTE

Return the TEST METER SELECTOR switch, located on the control monitor panel, to the AFC XTAL CUR position (fig. 3-1).

Position	Typical reading
XTAL 1	2.5 ± 0.5
XTAL 2	2.5 ± 0.5
AFC XTAL	2.5 ± 0.5
+300 V X100	300 volts ± 5
+150 V X50	150 volts ± 5
−300 V X100	−300 volts ± 5

NOTE

Crystal current readings of 2.5 indicate a current of 0.5 ma.

(2) Turn the AZIMUTH CCW-CW switch on the control-power supply panel to the CW position and then to the CCW position. The antenna and the azimuth counter on the computer should rotate accordingly.

(3) Operate the ELEVATION switch. With the switch in the RAISE position, the reflector should tilt upward and the elevation counter should increase. With the switch in the LOWER position, the reflector should tilt downward and the elevation counter should decrease.

e. After the 5-minute delay, the READY indicator lamp on the control-power supply panel should light. Close the purge valve and check to see that the dehydrator pressure gage builds up to approximately 16 pounds per square inch (psi) and that the dry air indicator is blue.

f. Adjust the MAGNETRON POWER variac to 0. Press the START button. The RADI ATE indicator lamp should light. Adjust the variac until the MAGNETRON CURRENT meter reads 18 milliamperes (ma).

CAUTION

Do not operate the magnetron at a current of less than 13 ma.

g. Rotate the VIDEO control (fig. 3-3) to its maximum position and the IF GAIN control to its minimum position.

h. With the RANGE SELECTOR switch in the 15000 M position, adjust the INTENSITY control until raster is just visible. The raster is a predetermined pattern of scanning lines which provides substantially uniform illumination of the cathode-ray tube.

i. Move the RANGE SELECTOR switch to the 3750 M position. If the intensity of the raster changes noticeably, have the radar repairman technician adjust the intensity balance.

j. Adjust the FOCUS control for the sharpest lines and images.

k. Adjust the IF GAIN control until the background noise is barely visible.

l. Adjust the RANGE MARK control until the range strobe is visible.

m. Adjust the AZIMUTH MARK control until the azimuth strobe is visible.

n. Place the AFC-MANUAL switch in the AFC position.

o. Turn the MARKERS switch to the ON position. The range markers should appear on the B-scope at ranges of 2,000, 4,000, 6,000, 8,000, 10,000, 12,000, and 14,000 meters. If the markers do not appear, the most probable cause is improper tuning of the local oscillator.

p. Tune the local oscillator as follows:

(1) Place the AFC-MANUAL switch in the MANUAL position.

(2) Operate the L.O. RAISE-LOWER switch on the control-power supply panel to the RAISE position until the markers appear. If no markers appear within 40 seconds, move the L.O. RAISE-LOWER switch to the LOWER position. If markers do not appear within 2 minutes, notify the radar repair technician.

(3) When the range markers appear, operate the L.O. RAISE-LOWER switch to the RAISE position and then to the LOWER position until maximum marker intensity is obtained. Return the AFC-MANUAL switch to the AFC position. The marker intensity should remain unchanged. If a decrease in marker intensity occurs, the afc circuit requires adjustment by the radar repair technician.

(4) Two local oscillator frequencies will cause the range markers to appear at full brilliance — one 30 megaHertz above and one 30 megaHertz below the transmitter frequency. The lower frequency is correct and is the only frequency at which the afc circuit will *lock in.* The afc circuit is operating properly if the range marker intensity remains unchanged and the afc crystal current is steady when the AFC-MANUAL switch is placed in the AFC position. The AFC crystal current may be measured on the TEST METER by setting the TEST METER SELECTOR switch in the AFC XTAL CUR position. The normal meter reading is 2.5. During normal operations, place the TEST METER SELECTOR switch in the AFC XTAL CUR position.

(5) If the range markers fade out entirely when the AFC-MANUAL switch is placed in the AFC position, the local oscillator is probably tuned to the wrong frequency. To correct this, place the AFC-MANUAL switch in the MANUAL position and operate the L.O.

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RAISE-LOWER switch to the LOWER position until the range markers reappear. Adjust the local oscillator for maximum intensity of the range markers. Return the AFC-MANUAL switch to the AFC position. No change in marker intensity should occur.

3-14. Ringtime Check

The purpose of the ringtime check is to determine the overall efficiency of the transmitter and receiver. The ringtime check is performed as follows:

a. Turn on the radar set and adjust the antenna elevation to minimize clutter on the B-scope.

b. On the control-power supply panel, check the MAGETRON CURRENT meter reading to insure a reading of 18 milliamperes.

c. On the indicator panel, set the RANGE SELECTOR switch to the 15000 M position.

CAUTION

Do not operate the magnetron at a current less than 13 milliamperes.

d. Turn the MARKERS switch to the ON position.

d. On the echo box (fig. 1-5), rotate the TUNE knob until a peak reading is obtained on the RELATIVE POWER meter.

f. On the indicator panel, rotate the EXPANDED SWEEP DELAY switch until the bright band covers the area where the noise on the B-scope starts to build up.

g. Set the RANGE SELECTOR switch to the 3750 M position.

h. Adjust the IF GAIN control for maximum ringtime display.

i. With the LOWER BEAM RANGE control on the radar data computer panel (fig. 3-5), place the range strobe over the point where the noise starts to build up.

j. Read the RANGE counter to obtain the ringtime distance. The minimum acceptable ringtime is 1,200 meters.

k. Detune the echo box.

l. Return the RANGE SELECTOR switch on the indicator panel to the 15000 M position.

NOTE

The automatic frequency control can be checked by the ringtime display. The ringtime measured with the AFC-MANUAL switch in the AFC position should not differ by more than 50 meters from the ringtime measured with it in the MANUAL position.

3-15. Azimuth Collimation Check

The purpose of the azimuth collimation check is to determine the angular separation between the optical axis and the center of scan. The procedure for performing this check is given in *a* through *e* below.

a. Determine the field correction as follows:

(1) Turn on the transmitter and allow the set to operate at least 30 minutes.

(2) On the echo box (fig. 1-5), rotate the TUNE knob until a peak reading is obtained on the RELATIVE POWER meter.

(3) Read the frequency of the transmitter on the FREQUENCY-MC scale above the echo box TUNE knob.

(4) Apply the frequency obtained in (3) above to the chart on the inside of the echo box cover, interplating if necessary. The value obtained is called the field correction. Figure 3-14 is a schematic drawing showing the results of a collimation check.

b. Select any target which can be positively identified both on the B-scope and through the orienting telescope. This target can be improvised, if necessary, and should be at least 500 meters from the radar. Place the RANGE SELECTOR switch in the 3750 M position, and position the EXPANDED SWEEP DELAY switch to a range which will display the desired target.

c. Move the radar in azimuth and elevation until the target is centered in the orienting telescope.

CAUTION

The azimuth handwheel on the frame of the radar should be used to move the antenna in azimuth. If the AZIMUTH switch on the control-power supply panel is used to move the antenna by small amounts, the azimuth brake may be damaged.

d. On the computer panel, set the DETENT switch in the AZIMUTH ORIENT position, and place the Δ AZIMUTH control and the LOWER BEAM AZIMUTH control in detent.

e. The azimuth strobe should be off the center of the echo on the B-scope by the amount of the field correction. The strobe should be to the left if the correction is negative or to the right if the correction is positive. To verify the distance between the strobe and the center of the echo, note the azimuth reading; then place the DETENT switch in the OFF position, use the LOWER BEAM AZIMUTH control to move the azimuth strobe over the center of the echo, and read the azimuth counter. The difference between the two readings should be the value of the field correction.

3-16. Antenna Azimuth Orientation

The purpose of azimuth orientation is to set the correct azimuth reading on the computer panel AZIMUTH counter. There are two methods of orienting the antenna for azimuth — the electrical method and the optical method.

a. Electrical Method.

(1) On the indicator panel, turn the RANGE SELECTOR switch to the 3750 M position and the EXPANDED SWEEP DELAY switch to the range which

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will display the orienting point. Rotate the antenna until it is pointed generally toward the orienting point. Move the antenna in elevation, if necessary, until the orienting point appears as a target on the B-scope.

(2) On the computer panel, set the DETENT switch to the OFF position and place the Δ AZIMUTH control in detent

(3) Rotate the LOWER BEAM AZIMUTH control until the azimuth strobe bisects the target (orienting point) on the B-scope.

NOTE

It may be necessary to adjust the IF GAIN control on the indicator panel to reduce the size of the echo so that it may be accurately bisected.

(4) On the computer panel, remembering the predetermined azimuth, hold the AZ ORIENT switch in the ADD (or SUBT) position until the AZIMUTH counter indicates the azimuth to the orienting point.

(5) Set the DETENT switch at AZIMUTH ORIENT and place the LOWER BEAM AZIMUTH control in detent. Note the reading of the azimuth counter on the counter. Apply the field correction, with its sign changed, to the computer AZIMUTH counter reading. Set the resulting figure into the azimuth counter on the radar frame.

b. Optical Method. When the optical method of orientation is used, the orienting telescope is used to sight on the orienting point.

(1) Position the antenna so that the orienting point is centered in the telescope. Set the azimuth to the orienting point on the azimuth counter on the radar trailer frame.

(2) On the computer panel, set the DETENT switch to the AZIMUTH ORIENT position and place the Δ AZIMUTH control and the LOWER BEAM AZIMUTH control in detent.

(3) Apply the field correction, as indicated by its sign, to the azimuth to the orienting point. The result will be the corrected orienting azimuth.

Example:

When the field correction is positive:

Azimuth to the orienting point . .	1,653 mils
Field correction	+4 mils
Correcting orienting azimuth . .	1,657 mils

When the field correction is negative:

Azimuth to the orienting point . .	1,653 mils
Field correction	−4 mils
Corrected orienting azimuth . .	1,649 mils

(4) On the computer panel, hold the AZ ORIENT switch in the ADD (or SUBT) position until the AZIMUTH counter indicates the corrected azimuth.

(5) Move the antenna in azimuth and elevation until a target echo which can be easily identified, is found. Read and record the azimuth and range to this target. This target can be used for future orientation checks and as an electrical orienting point during periods of poor visibility.

(6) If correct results are not obtained during azimuth collimation, notify the radar repair technician. If no radar repair technician is available, the equipment may still be operated by applying the difference in azimuth between the orienting telescope and the B-scope. The difference should be applied the same way as the field correction obtained from the echo box.

3-17. Elevation Orientation Check

The purpose of an elevation orientation check is to verify the alignment of the orienting telescope with elevation dials. This check is used in applications such as a high-burst registration. The checkpoint may be a fixed point of known elevation, or it may be a fire control instrument, such as an aiming circle. To perform the elevation orientation check:

a. Check the level of the set.

b. Position the antenna so that the checkpoint is centered in the orienting telescope.

c. Determine the correct elevation to the checkpoint from the antenna ELEVATION-DEPRESSION counter on the frame of the radar. Record for future reference any error greater than 1 mil. Any vertical angle correction (VAC) recorded must be applied to mean elevation deviation spottings for high-burst registrations.

3-18. Range Calibration

The purpose of range calibration is to align the range circuits so that the actual range will be indicated on the range counter. Before range calibration is performed, the generator must be hooked to the radar and power turned on, the transmitter must be on, and the local oscillator must be tuned.

a. The procedure for performing range calibration with the range markers is as follows:

(1) On the indicator panel (fig. 3-3), turn the RANGE SHIFT switch to the OFF position.

(2) On the computer panel (fig. 3-5), set the DETENT switch to the OFF position and set the Δ RANGE control to detent. This action will allow any given range to be set into the computer.

(3) Set the range strobe to 2,000 meters by using the LOWER BEAM RANGE control.

(4) On the indicator panel (fig. 3-3), set the RANGE SELECTOR switch to the 3750 M position.

(5) Set the EXPANDED SWEEP DELAY switch to position 0.

(6) Set the markers switch on the ON position. An adjustment of the IF GAIN control may be necessary to cause the markers to appear at proper intensity.

(7) If the range marker does not fall exactly over the strobe, adjust the RANGE ZERO control until it does.

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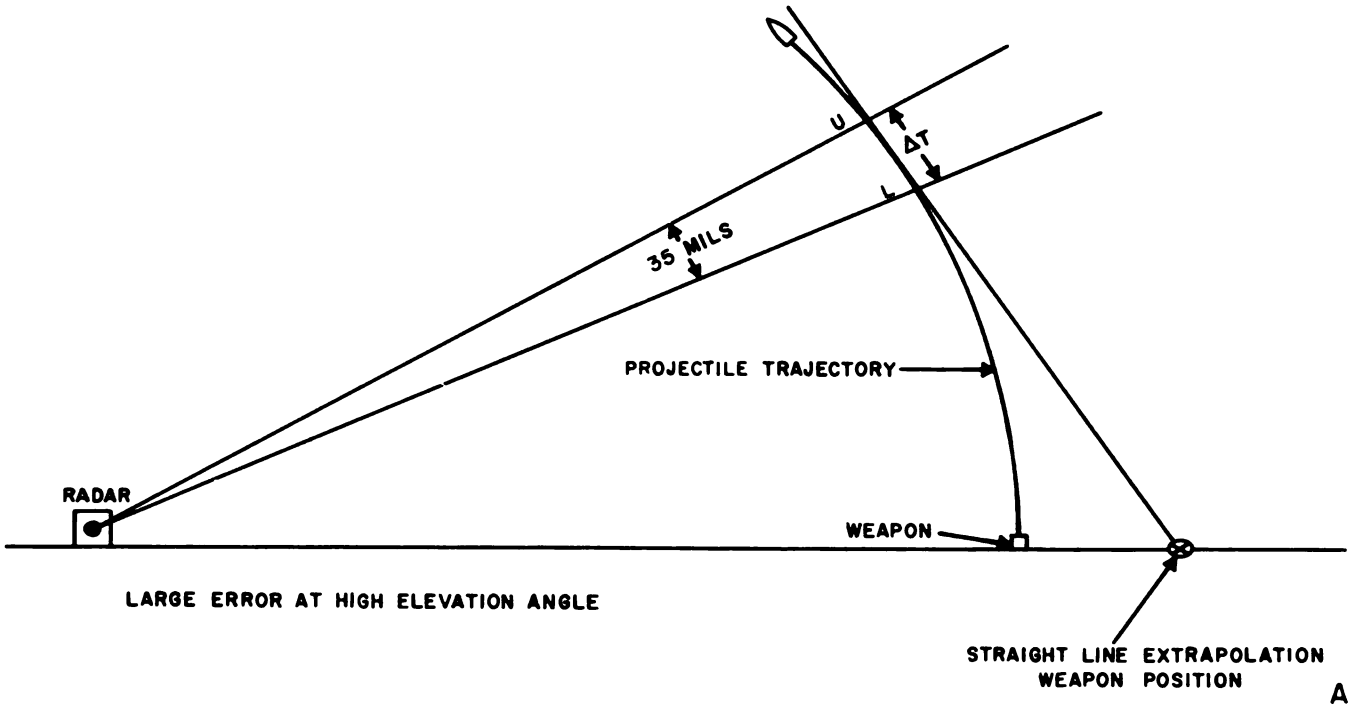

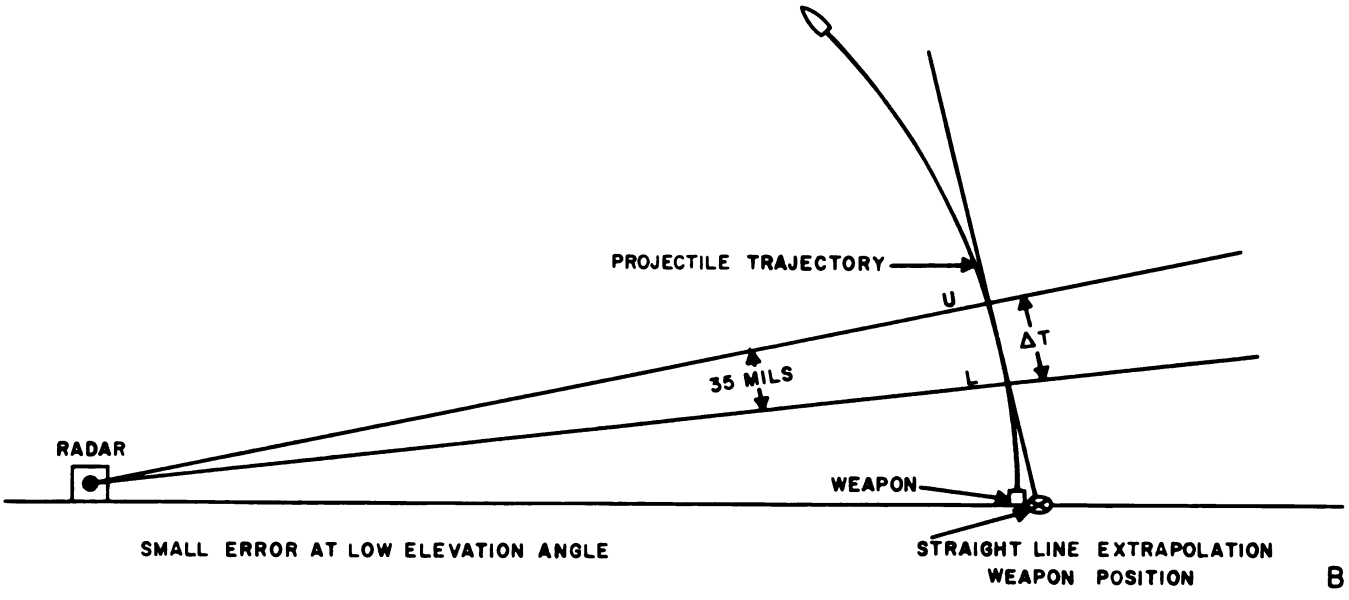

NOTES:

1. ΔT IS ELAPSED TIME BETWEEN L AND U.
2. WHEN T IS INSERTED IN COMPUTATIONS, THE CURVILINEAR EXTRAPOLATION APPROXIMATES VERY CLOSELY THE ACTUAL SHELL TRAJECTORY.

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Figure 3-11. Straight line extrapolation of weapon position.

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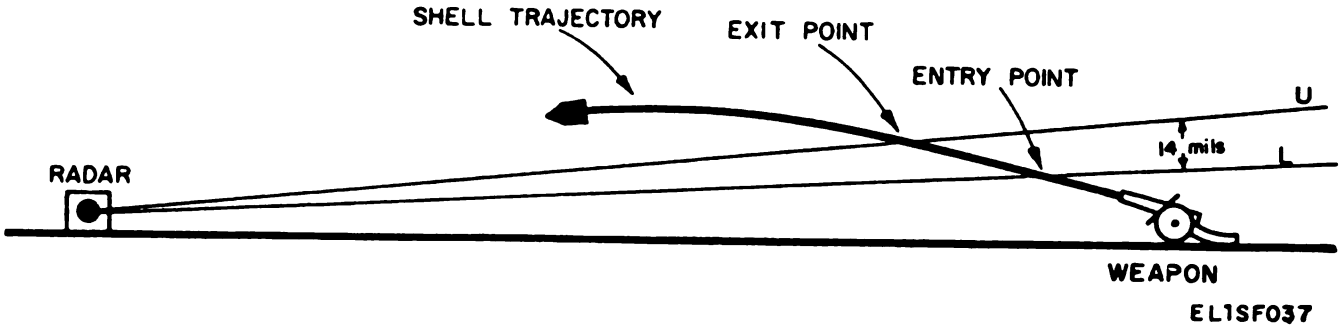

Figure 3-12. Single-beam interception of a projectile traveling along a low-angle trajectory.

AZIMUTH BORE SIGHT CORRECTION	
FREQUENCY	FIELD
16192	+12
16176	+11
16160	+10
16144	+9
16128	+8
16112	+7
16096	+6
16080	+5
16064	+4
16048	+3
16032	+2
16016	+1
16000	0
15984	−1
15968	−2
15952	−3
15936	−4
15920	−5
15904	−6
15888	−7
15872	−8
15856	−9
15840	−10
15824	−11
15808	−12

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Figure 3-13. Azimuth boresight correction chart.

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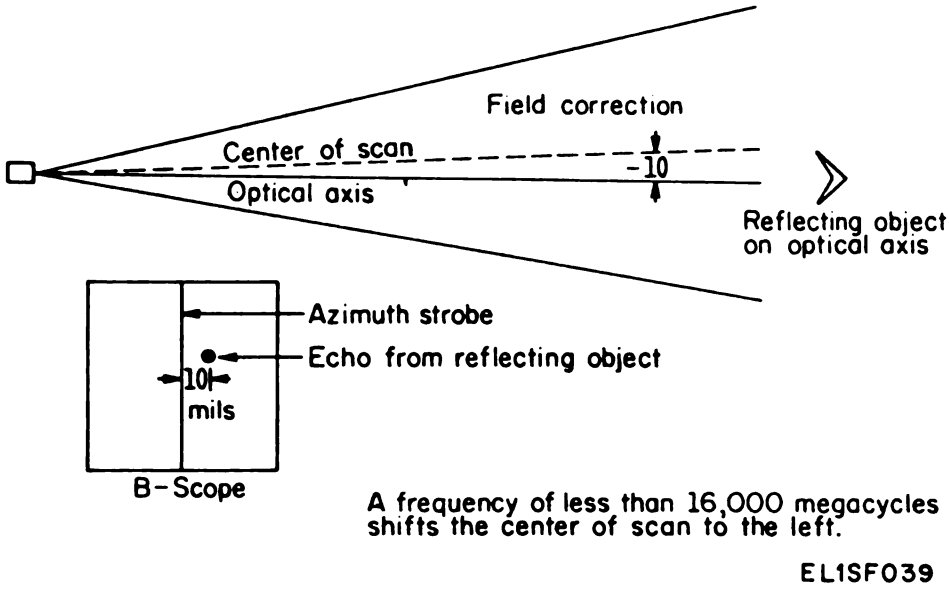

Figure 3-14. Typical azimuth collimation check results.

(8) Set the EXPANDED SWEEP DELAY switch to position 12.

(9) Set the range strobe to 14,000 meters.

(10) If the range marker does not appear exactly over the strobe, adjust the RANGE SLOPE control until it does.

(11) Since the RANGE ZERO and RANGE SLOPE controls interact, recheck the RANGE SLOPE adjustment at 14,000 meters after each change in RANGE ZERO at 2,000 meters.

b. To verify the range calibration, measure the range to an electrical target with the radar set. This reading should be within 20 meters of the surveyed range.

3-19. Computer Alignment Checks

The purpose of the computer alignment check is to insure that the computer is providing accurate locations.

a. Compare the reading on the ELEVATION-DEPRESSION counter on the antenna with the reading on the LOWER BEAM ELEVATION counter on the computer as follows:

(1) Use the ELEVATION switch on the control-power supply panel to position the antenna in elevation so that the following readings are obtained on the LOWER BEAM ELEVATION counter on the computer panel: −100, −50, 0, 50, 100, 150, and 200 mils.

(2) Check to be sure that the readings on the antenna ELEVATION-DEPRESSION counter correspond to those in (1) above. If the readings are not within 2 mils, notify the radar repair technician.

b. Check the azimuth controls on the computer panel and the B-scope on the indicator panel as follows:

(1) Set the DETENT switch to the OFF position, and place the Δ AZIMUTH control in detent.

(2) Rotate the LOWER BEAM AZIMUTH control clockwise. The AZIMUTH counter reading should *increase,* and the B-scope azimuth strobe should move to the right.

(3) Rotate the LOWER BEAM AZIMUTH control counterclockwise. The AZIMUTH counter reading should *decrease,* and the B-scope azimuth strobe should move to the left.

(4) With a white grease pencil, make a short, thin, vertical line on the face of the B-scope where the strope appears.

(*a*) Using the LOWER BEAM AZIMUTH control, superimpose the azimuth strobe over the vertical line. Make the last movement of the LOWER BEAM AZIMUTH control in a clockwise direction. Note the reading on the AZIMUTH counter.

(*b*) Repeat (*a*) above, making the last movement of the LOWER BEAM AZIMUTH control in a counterclockwise direction. Note the reading on the AZIMUTH counter.

(*c*) The two readings obtained in (*a*) and (*b*) above should agree. If the readings do not agree, notify the radar repairman.

(5) Set the DETENT switch to the DETENT

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RELEASE position and check to see that the SET DETENT indicator light on the indicator panel is on.

(6) Rotate the ▵ AZIMUTH control clockwise. The AZIMUTH counter reading should *decrease,* and the B-scope azimuth strobe should move to the right.

(7) Rotate the ▵ AZIMUTH control counterclockwise. The AZIMUTH counter reading should *increase,* and the B-scope azimuth strobe should move to the left.

c. Check the range controls on the computer panel and the B-scope on the indicator panel as follows:

(1) Rotate the LOWER BEAM RANGE control clockwise. The RANGE COUNTER reading should *increase,* and the B-scope range strobe should move *up.*

(2) Rotate the LOWER BEAM RANGE control counterclockwise. The RANGE counter reading should *decrease,* and the B-scope range strobe should move *down.*

(3) Rotate the ▵ RANGE control clockwise. The RANGE counter reading should *decrease,* and the B-scope range strobe should move *up.*

(4) Rotate the ▵ RANGE control counterclockwise. The RANGE counter reading should *increase,* and the B-scope range strobe should move *down.*

(5) Move the DETENT switch to the OFF position and place the ▵ RANGE and ▵ AZIMUTH controls in detent. The SET DETENT indicator light should go out.

d. On the computer panel, check the RADAR HEIGHT computer by rotating its adjustment screw. The RADAR HEIGHT counter reading should change, and the weapon HEIGHT counter reading should also change the same amount.

e. On the computer panel, check the weapon HEIGHT counter by rotating its control knob. Only the reading on the weapon HEIGHT counter should change.

f. On the computer panel, check the RADAR LOCATION counters and the WEAPON LOCATION counters as follows:

(1) Hold the RADAR LOCATION EASTING switch in the SUBT position. Both EASTING counter readings should decrease.

(2) Hold the RADAR LOCATION EASTING switch in the ADD position. Both EASTING counter reading should increase.

(3) Repeat (1) and (2) above with the RADAR LOCATION NORTHING switch for both NORTHING counter readings.

g. Check the accuracy of the AZIMUTH counter movement as follows:

(1) Set the antenna azimuth counter to zero by using the counter handcrank.

(2) Turn the RADAR LOCATION AZ ORIENT switch on the computer until the AZIMUTH counter reads zero.

NOTE

Do not disturb any of the computer controls during the next procedure.

(3) Using the AZIMUTH CCW-CW switch, rotate the antenna clockwise in increments of approximately 800 mils from 800 to 6.400 mils. If the antenna passes the specified azimuth positions, do not jog the antenna back in the opposite direction.

(4) At each of the 800-mil increment positions, the computer AZIMUTH counter reading must equal the antenna azimuth counter reading within ± mil.

(5) Repeat the procedure given in (1) through (4) above, rotating the antenna counterclockwise.

h. After all the components of the computer have been checked, check the accuracy of the computer. The accuracy check consists of a series of four problems (table 3-1) which are set into the computer. Each day and/or each time the set is moved, the operator should perform the accuracy check and compare the output data against the solutions furnished by the radar repair technician. The accuracy check for dual beam operation is performed as follows:

(1) Be sure that the computer drawer is open and that the INTERLOCK SHORT switch is closed (fig. 3-7).

WARNING

Dangerous voltages exist within the cabinet.

(2) Check to see that the reading on the BEAM SEPARATION dial (fig. 3-6) on the left side of the computer drawer is the same as that on the beam separation plate on the antenna.

(3) Insert the radar location data into the computer.

(*a*) Use the EASTING and NORTHING switches to set the EASTING and NORTHING counters to zero.

NOTE

If the actual radar location data has already been inserted into the computer, it is not necessary to set the EASTING and NORTHING counters to zero. Algebraically add the actual radar EASTING and NORTHING to the WEAPON LOCATION EASTING and NORTHING (the answer to the problem) and compare the resulting values with the problem solution furnished by the radar repair technician.

(*c*) Set the SINGLE BEAM-DUAL BEAM switch to DUAL BEAM.

(4) Set the radar at the proper angle of elevation.

(5) Set the DETENT switch to its OFF position.

(6) Place the ▵ RANGE and ▵ AZIMUTH controls in detent.

(7) Insert the azimuth, using the AZIMUTH switch on the control-power supply panel and the LOWER BEAM AZIMUTH control on the computer

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panel, or by using the AZIMUTH ORIENT switch and the LOWER BEAM AZIMUTH handwheel on the computer.

NOTE

To prevent undue wear and tear on the azimuth drive portion of the antenna positioning assembly, the azimuth orient switch should be used to insert the azimuth instead of the ANTENNA AZIMUTH CCW-CW switch.

CAUTION

If the antenna CCW-CW switch is used to insert the azimuth do not jog the antenna back and forth to obtain an exact reading on the azimuth counter. Getting the azimuth to within ±170 mils with the antenna positioning switch is sufficient to allow use of the lower beam azimuth handwheel on the computer to complete the insertion of the exact azimuth reading desired.

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(8) Insert the lower beam range.

(9) Turn the TEST-NORMAL switch (fig. 3-7) to the TEST position.

(10) Set the DETENT switch to DETENT RELEASE.

(11) Insert the upper beam azimuth with the Δ AZIMUTH control.

(12) Insert the upper beam range with the Δ RANGE control.

(13) Turn the TEST-NORMAL switch (fig. 3-7) to the NORMAL position.

(14) Insert the time with the Δ TIME control.

(15) Insert the weapon height into the computer.

(16) Check the WEAPON LOCATION EASTING and NORTHING against the problem solution furnished by the radar repairman.

(17) The error in either easting or northing should not exceed 20 meters, the sum of the errors in easting and northing should not exceed 36 meters. If the answer to any problem is out of tolerance, notify the radar repair technician.

Table 3-1. Computer Accuracy Check (Dual Beam Operation)

Problem number	Lower beam azimuth	Elevation	Lower beam range	Upper beam azimuth	Upper beam range	Time	Weapon height	Output data	
								Easting	Northing
1	0000	+20	8,000	0030	8,200	2.0	300		
2	1600	+40	5,000	1620	5,100	2.0	400		
3	3200	+10	8,000	3170	7,800	1.5	50		
4	4800	+40	5,000	4780	4,900	4.0	200		

i. The operator can check the accuracy of the computer for single beam operation by performing the test problems in the computer accuracy check for single beam operation contained in table 3-2. It is assumed that the requirements of normal dual beam operational check (*h* above) have been met. The accuracy of the computer during single beam operation is not acceptable when the computer solution of any problem contains an error of more than 40 meters for weapon easting or northing; or more than 70 meters for combined easting and northing, or more than 0.15 for C. Follow the instructions given below for setting the values given in table 3-2 in to the computer.

(1) On the computer, set RADAR LOCATION EASTING and NORTHING counters to 000000 METERS.

(2) Set SINGLE BEAM-DUAL BEAM switch to SINGLE BEAM.

(3) Set weapon HEIGHT and RADAR HEIGHT counter to 1000 METERS.

(4) With the detent switch in the OFF position, set Δ RANGE AND Δ AZIMUTH handwheels in detent.

(5) For each problem in table 3-2 with the TEST-NORMAL switch on the right side of the computer at TEST, set Δ T, Hw, R1, AZ, E1, Δ R and Δ A as given in the chart. Then set the TEST-NORMAL switch to NORMAL and read weapon range (Rw), weapon azimuth (Aw), weapon easting (Ew), weapon northing (Nw) and C-solutions on the computer and compare these solutions with those given in the table.

NOTE

When setting AZ into the computer, first use the AZ ORIENT switch, followed by a fine setting using the LOWER BEAM AZIMUTH control. Just before setting Δ R and Δ A into the computer, set the detent switch to DETENT RELEASE.

(6) Repeat the above procedures for the remaining problems. If the readings are not within the tolerances outlined above, then notify the radar mechanic.

(7) Return the SINGLE BEAM-DUAL BEAM switch to DUAL BEAM and close the computer drawer.

Table 3-2. Computer Accuracy Check (Single Beam Operation)

Problems								Correct solutions				
Problem No	Δ_T	H_w	R_L	A_Z	E_L	Δ_R	Δ_A	R_W	A_W	E_W	N_W	C
1	0.0	0930	5000	6390	07	0	+10	5000	0000	000000	005000	1
2	0.0	1000	5000	0000	21	+100	0	5103	0000	000000	005103	1.03
3	0.0	1000	6000	1600	28	−100	0	5856	1600	005856	000000	1.44
4	0.0	1000	5600	0800	28	+50	0	5677	0800	004014	004014	1.53
5	0.0	1070	4500	5600	35	−50	0	4457	5600	996849	003151	.86
6	0.0	1000	4900	3990	21	0	+10	4900	4000	996536	996536	1

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3-20. Radar Location Data

After completing the computer accuracy check, establish the grid reference of the radar by inserting the true radar location into the computer as follows:

a. Use the RADAR LOCATION EASTING and NORTHING switches to insert the grid reference of the radar location into the computer.

b. Use the RADAR HEIGHT knob to insert the altitude of the radar in *meters* into the computer.

c. If maps are available, determine the average altitude of the terrain in the area of interest in meters and insert this altitude into the weapon HEIGHT counter on the computer. If maps are not available, insert the altitude of the radar into the weapon HEIGHT counter.

3-21. Locating Targets
(fig. 3-15)

a. Operate the AZIMUTH switch to CW or CCW to rotate the antenna until it covers the 445-mil sector of expected target area. The radar will scan this 445-mil sector for projectile intercepts which will be indicated on the B-scope.

b. Operate the ELEVATION switch to position the reflector so that the elevation angle is 10 mils above the highest hill in the scanned area. At this point, ground clutter should decrease to a minimum. (Use the telescope to determine the elevation angle for the top of the highest hill.)

c. As the antenna scans a sector, two indications of the projectile will appear on the screen a short interval apart (A, fig. 3-16). At the instant the first intercept is seen on the B-scope, press either of the two TIMER buttons to start the SECONDS timer. Mark the intercept position with a grease pencil. When the second intercept appears, press either TIMER button again to stop the SECONDS timer. Mark the second intercept. The elapsed time between intercepts appears on the SECONDS timer.

NOTE

The procedure described above is a search presentation and normally is not used to obtain data for computing weapon position. The normal use for this presentation is to determine the general location of expected activity; weapon position computation may be made from the indications observed by following the procedure for computing the weapon position as outlined in paragraph 3-22.

d. When the approximate range of the weapon is known, the search is normally conducted, using range shift, intensification of the expected intercept display area (B, fig. 3-16), and beam blanking (para 3-24). Un-

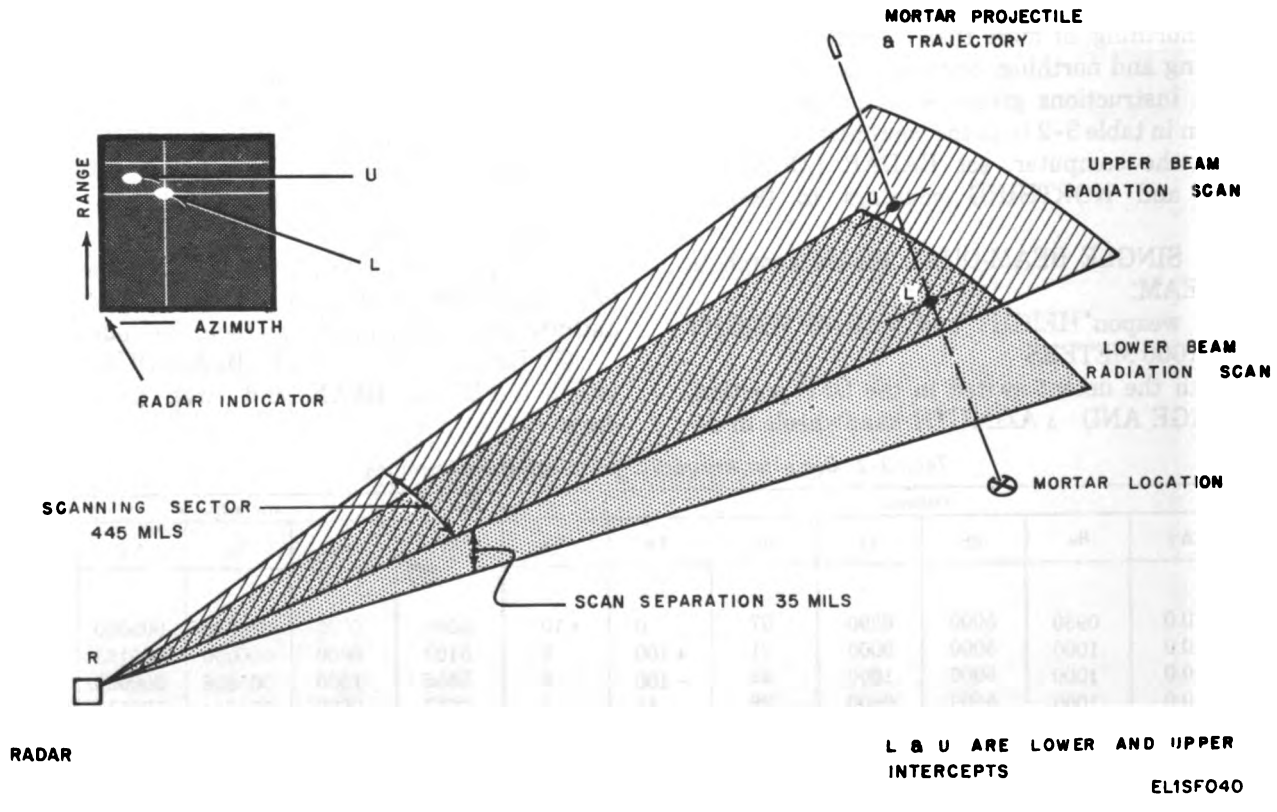

Figure 3-15. Scanning pattern for weapon location.

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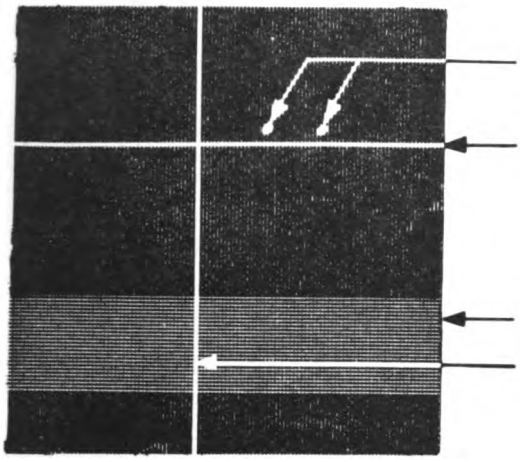
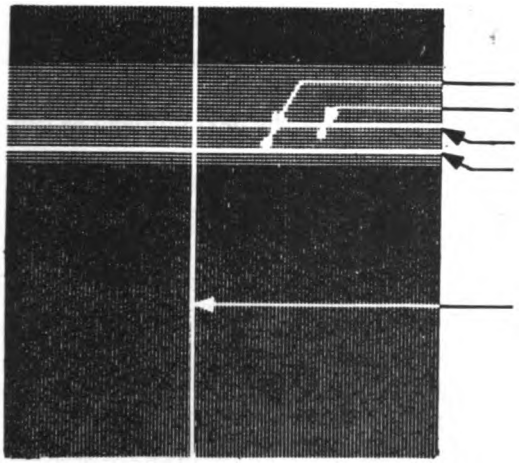


RANGE SELECTOR = 15000M
EXPANDED SWEEP DELAY = 3
RANGE SHIFT = OFF

RADAR SEARCH PRESENTATION

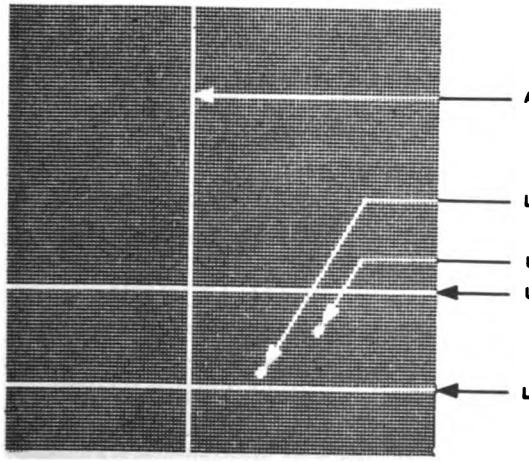
A



RANGE SELECTOR = 15000M
EXPANDED SWEEP DELAY = 10.5
RANGE SHIFT = ON

RADAR SEARCH PRESENTATION WITH 750 METER RANGE STEP

B



RANGE SELECTOR = 3750M
EXPANDED SWEEP DELAY = 10.5
RANGE SHIFT = ON

EXPANDED SWEEP PRESENTATION

C

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Figure 3-16. B-scope presentation of received signals.

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der these conditions, only the LOWER beam display will be visible until the lower beam intercept occurs. The instant the lower beam intercept appears, the operator presses either TIMER button which starts the SECONDS timer and switches the beam blanking so that only the UPPER beam display will be visible. The upper beam intercept will appear approximately 750 meters farther out in range (para 3-4) due to the range shift of the upper beam display on the B-scope indicator. The operation is identical with that described in *c* above and the weapon location may be computed by following the procedure outlined in paragraph 3-22. The use of the range shift enables the operator to read the beam intercepts more accurately then was the case in *c* agove.

e. When the expected intercept range is known and will appear within a 3750 M segment of the 15000 M (meter) operating range, the RANGE SELECTOR is set to the 3750 M position. The EXPANDED SWEEP DELAY X-1000 M selector is set to the position which corresponds to the range segment in which intercept is expected to occur. The B-scope expanded sweep presentation will appear as shown at C, figure 3-16. (The 3750 meters filling the face of the B-scope indicator can be any 3750 meters of the 15000 meter possible range.) Marking of the intercept positions and measurement of elapsed time are described in *c* and *d* above.

NOTE

The expanded sweep presentation described above is normally used when weapon position computations are made. It allows the operator to obtain more accurate range and azimuth intercept position data with a resultant improvement in computed weapon position accuracy.

3-22. Computing Weapon Position

Place the detent switch in the OFF position and detent the Δ AZIMUTH and Δ RANGE handwheels.

a. Turn the LOWER BEAM RANGE control, on the computer, until the lower beam range strobe intersects the first (lower beam) intercept on the B-scope (A, fig. 3-17).

b. Turn the LOWER BEAM AZIMUTH control until the azimuth strobe intersects the lower beam intercept (A, fig. 3-17).

c. Place the detent switch in the DETENT RELEASE position.

d. Rotate the Δ RANGE control until the upper beam range strobe intersects the second (upper beam) intercept on the B-scope (B, fig. 3-17).

e. Rotate the Δ AZIMUTH control until the azimuth strobe intersects the upper beam intercept (B, fig. 3-17).

f. Rotate the control below the Δ TIME counter until the time between the two intercepts (para 3-21) on the B-scope appears on the counter.

g. Read the WEAPON LOCATION EASTING and NORTHING counters to obtain the uncorrected rectangular coordinates of the weapon. Uncorrected polar coordinates of the weapon may be read from the RANGE and AZIMUTH counters.

h. Plot the uncorrected location of the weapon on a contour map. If the altitude of the weapon differs from that of the radar, set the weapon altitude on the weapon HEIGHT counter. This action may change the weapon location coordinates. If a significant change occurs, the new weapon location should be replotted and a new altitude inserted into the computer. This procedure should be repeated until the difference between successive altitude readings are less than 10 meters for dual beam operation and no difference for single beam operation.

i. Make certain that the DOUBTFUL SOLUTION indicator lamp is not on.

j. Read the final values on the WEAPON LOCATION EASTING and NORTHING counters to obtain the location of the weapon.

k. Prepare the computer for the next problem as follows:

(1) Place the detent switch in the OFF position.

(2) Reset the Δ RANGE and Δ AZIMUTH controls to the detent position.

(3) Reset the weapon HEIGHT counter to the same value as the RADAR HEIGHT counter and return the Δ TIME counter to zero.

(4) On the indicator, press the RESET switch to return the SECONDS timer to zero.

(5) The equipment is now ready for the next problem.

3-23. Computing Impact Area

Radar Set AN/MPQ-4A may be used to compute the impact area of outgoing (friendly) mortar and high-angle artillery rounds. The observed presentation will be identical with the scope pattern in figure 3-15, except that the projectile will be moving downward and the upper beam intercept will appear on the B-scope first (fig. 3-18).

a. Rotate the LOWER BEAM RANGE control until the lower range strobe intersects the second (lower beam) intercept on the B-scope.

b. Rotate the LOWER BEAM AZIMUTH control until the azimuth strobe intersects the lower beam intercept.

c. Set the detent switch to DETENT RELEASE.

d. Rotate the Δ RANGE control until the upper range strobe intersects the first (upper beam) intercept on the B-scope.

e. Rotate the Δ AZIMUTH control until the azimuth strobe intersects the upper beam intercept.

f. Rotate the control below the Δ TIME counter un-

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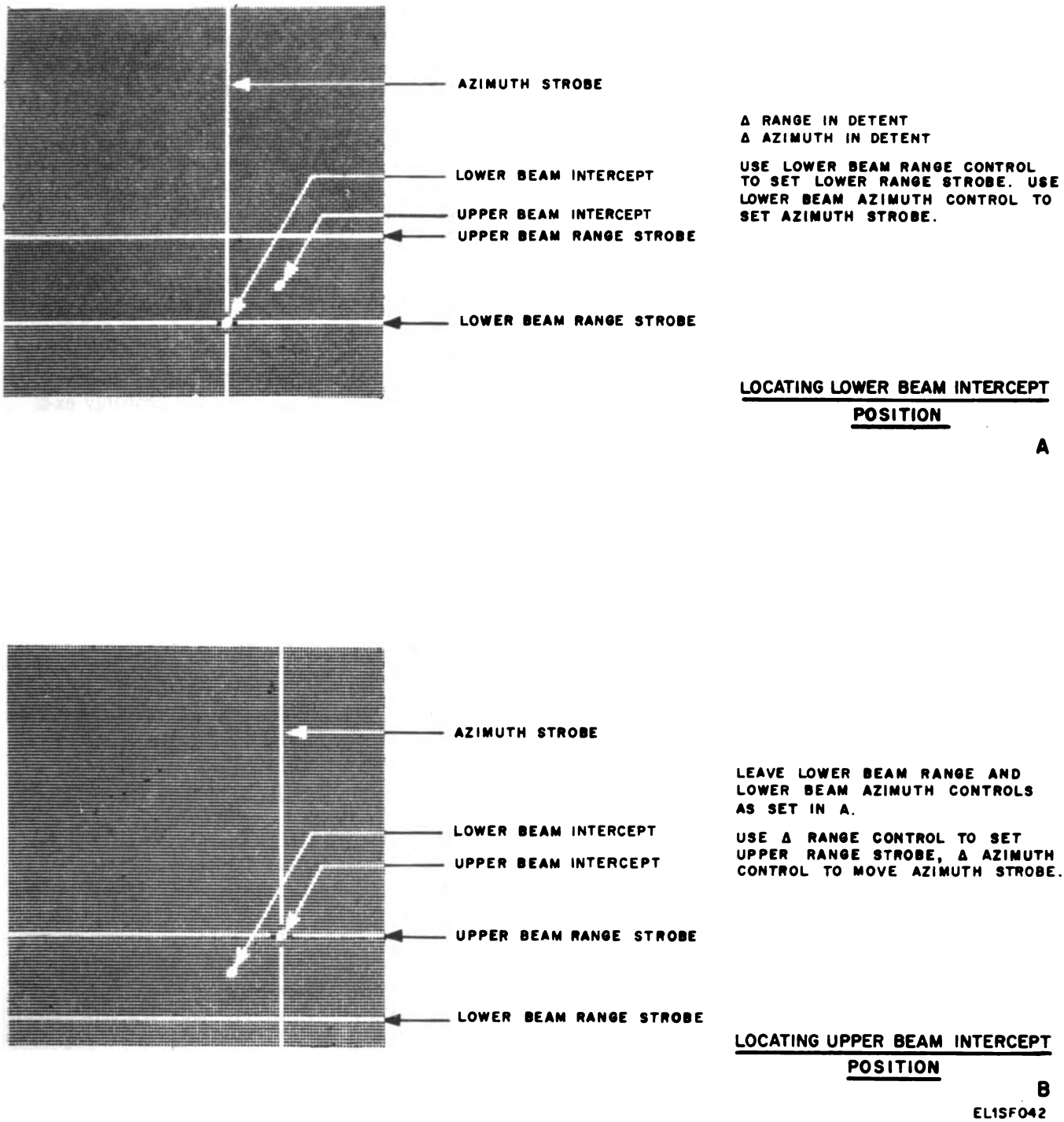

Figure 3-17. Use of strobes on B-scope.

til the time between the appearance of the intercepts is indicated on the counter.

g. Read WEAPON LOCATION EASTING and NORTHING counters to obtain the uncorrected rectangular coordinates of the impact. Uncorrected polar coordinates of the impact may be read from the RANGE and AZIMUTH counters.

h. Plot the uncorrected location on a contour map. If the altitude of the impact differs from that of the radar, set the indicated altitude of the impact on the weapon HEIGHT counter. This may change the impact location coordinates. If a significant change is made in the computed impact location, the new location should be plotted and a new altitude set into the computer. This procedure should be repeated until the difference between successive altitude readings is no greater than 10 meters for dual beam operation and no difference for single beam operation.

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i. Make sure that the DOUBTFUL SOLUTION indicator lamp is not lighted.

j. Read the final values on the WEAPON LOCATION EASTING AND NORTHING counters for the location of the impact area.

k. Prepare the computer for the next problem as follows:

(1) Place the detent switch in the OFF position.

(2) Reset the ∆ RANGE and ∆ AZIMUTH controls to the detent position.

(3) Reset the weapon HEIGHT counter to the same value as the RADAR HEIGHT counter and return the ∆ TIME counter to zero.

(4) On the indicator, press the RESET switch to return the SECONDS clock to zero.

(5) The equipment is now ready for the next problem.

3-24. Beam Video Blanking

a. Video blanking is provided in the indicator to eliminate any difficulty in determining whether an intercept is in the upper or lower beam (scan). Turn the BEAM VIDEO switch to LOWER. Only the lower beam video can be seen on the screen. When an intercept appears and the TIMER button is pressed, the video is switched from the lower beam to the upper beam; therefore, the next intercept which appears on the scope will be an upper beam intercept and can be marked without confusion. When the TIMER button is pressed again to stop the timer, the video is once again switched to the lower beam.

b. When the BEAM VIDEO is set to UPPER, the upper beam video will appear on the B-scope. This presentation will remain until the clock is started, at which time the video is switched to the lower beam.

c. With the switch in the BOTH position, the video from both beams is displayed on the B-scope for search operation.

3-25. Single Beam Oporation
(fig. 3-19)

a. Set the scanning elevation between +20 and +35 mils whenever scanning area conditions permit.

b. When a presentation, characteristic of a low-angle projectile, appears on the B-scope, mark each end of the projectile trace line. Note the point of entry.

c. Set the computer SINGLE BEAM-DUAL BEAM switch to SINGLE BEAM. Observe that the SINGLE BEAM lamp lights.

d. With the ∆ RANGE and ∆ AZIMUTH handwheels in detent, use the LOWER BEAM RANGE and AZIMUTH handwheels to strobe the mark on the B-scope that represents the lower beam entry point (beginning of the projectile trace line).

e. With the ∆ RANGE and ∆ AZIMUTH handwheels released from detent, use these handwheels to strobe the remaining mark on the B-scope.

NOTE

If range shift operation is being used, use the lower range strobe to strobe both marks on the B-scope (*d* and *e* above) because both marks represent lower beam data.

f. Set the ∆ TIME counter to 0.6 SECONDS.

NOTE

It is possible to measure ∆ time when the low-angle projectile presentation appears and insert this time onto the computer; however, this procedure is not recommended because the error in measurement will probably exceed the actual elapsed time.

g. Read the uncorrected rectangular coordinates of the weapon on the WEAPON LOCATION EASTING and NORTHING counter.

h. Compensate for the difference in altitude between the radar and the weapon.

3-25.1 Strobing a Trace that Exceeds the Computer Limits

The following procedure permits an extended approximate weapon location to be made of the computer limitations. When the entry mark has been strobed normally but the △ AZIMUTH and △ RANGE controls cannot be rotated far enough to strobe the exit mark.

a. Rotate the △ AZIMUTH and △ RANGE controls to their limits toward the exit mark (fig. 3-17.1).

b. Mark this limit and record the range and azimuth to the point. Note the direction of travel of the △ RANGE and △ AZIMUTH counters.

c. Measure the distance from the exit mark to where the strobe stopped (fig. 3-17.2) by using the LOWER BEAM AZIMUTH and RANGE handwheels.

d. Subtract the smaller from the larger to determine the distance (fig. 3-17.2).

e. Return the lower beam azimuth and lower beam range to the limit point. The range and azimuth counters should read the same as in *b*, above.

f. Using the LOWER BEAM AZIMUTH and RANGE handwheels, move the strobes in the same direction, noted in *b* above, and the same distance (fig. 3-17.3) as in fig. 3-17.2. Figure 3-17.3 shows where the strobes would be after using the lower beam handwheels.

g. Read the weapon location from the WEAPON LOCATION EASTING and NORTHING counters.

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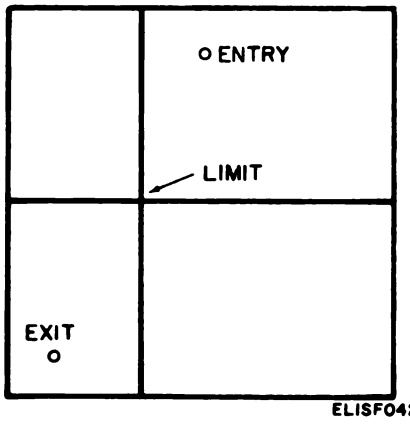

Figure 3-17.1. Strobes have reached their limit.

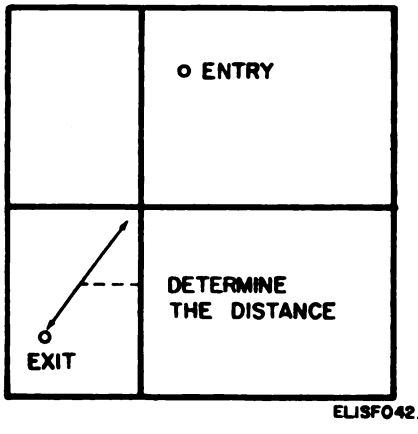

Figure 3-17.2. Distance from strobe limit to exit mark.

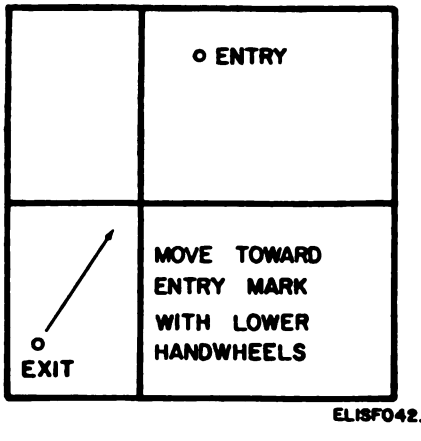

Figure 3-17.3. Strobing by using the lower beam handwheels.

3-26. Stopping Equipment

The equipment may be put in standby (nonradiating condition) during short periods of enemy inactivity or as directed by proper authority.

a. Radar.

(1) Turn the MAGNETRON POWER control fully counterclockwise.

(2) Press the STOP switch on the control-power supply to turn off the transmitter. This action removes the high voltage from the modulator and the transmitter becomes inoperative, but ready for immediate use. The RADIATE indicator lamp goes out, while the READY indicator lamp remains on. The radar is now in standby operation.

(3) Elevate the antenna to approximately +175 mils.

(4) Turn the MAIN POWER switch to the OFF position. The READY indicator lamp and the MAIN POWER ON & INTLK CLOSED indicator lamp will go out.

b. Power Unit.

(1) Place the CIRCUIT BREAKER in the OFF position.

(2) Allow the engine to run at rated speed from 3 to 5 minutes.

(3) Place the START-STOP switch in the STOP position.

(4) Place the fuel selector valve in the OFF position.

(5) Perform the after-operation maintenance check.

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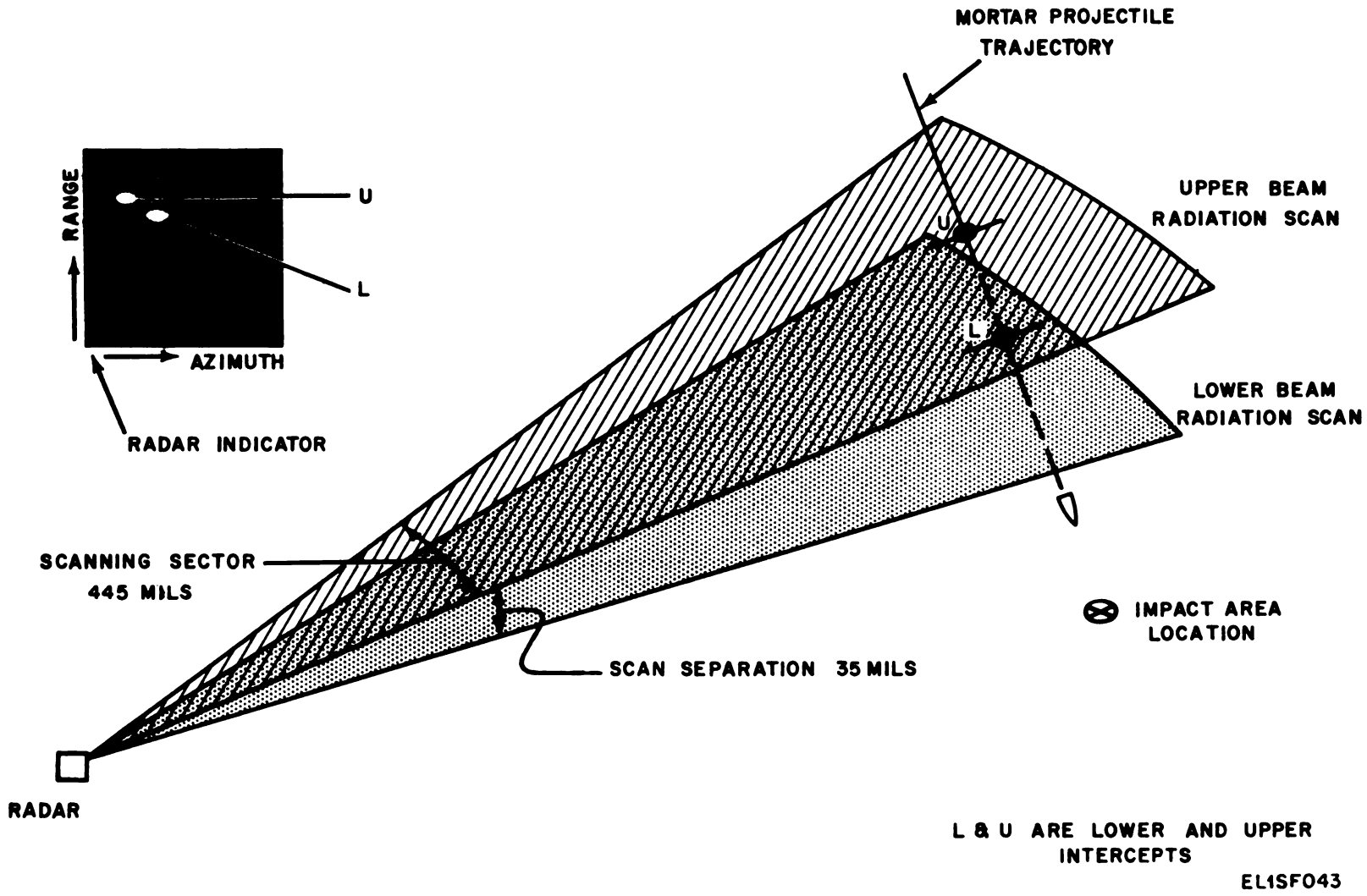

Figure 3-18. Scanning pattern for impact area location.

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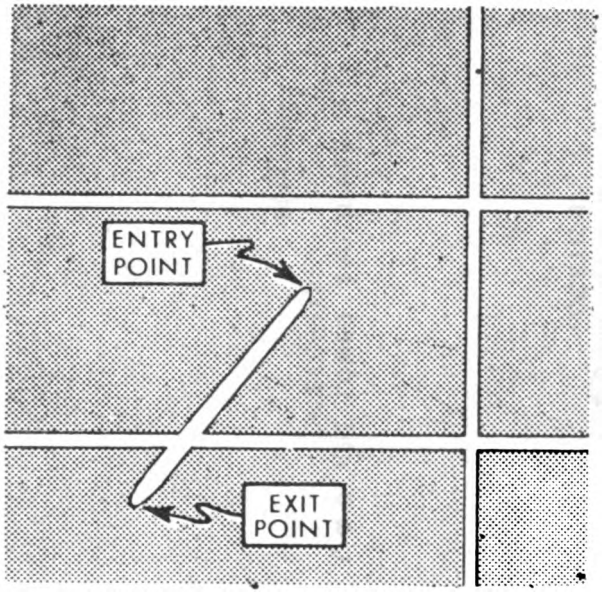
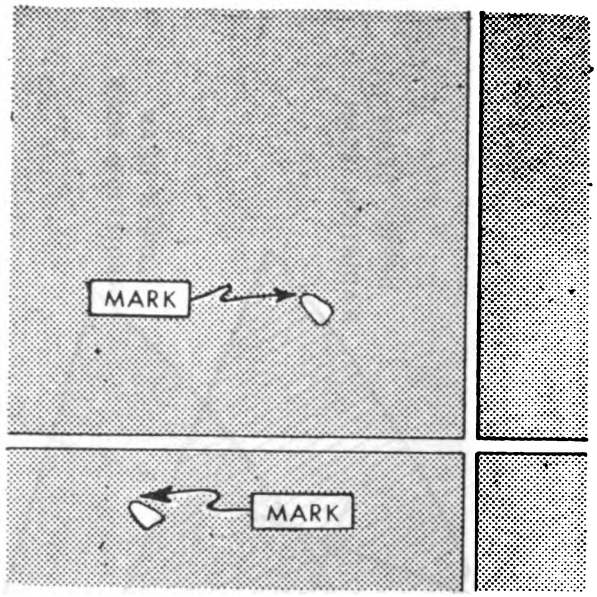
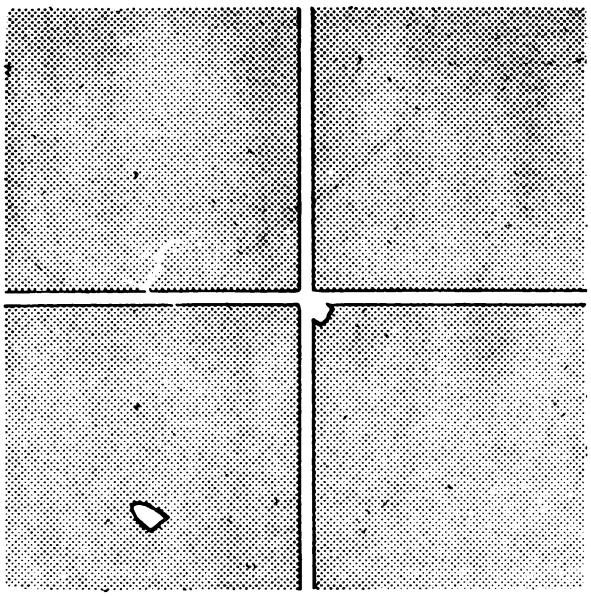


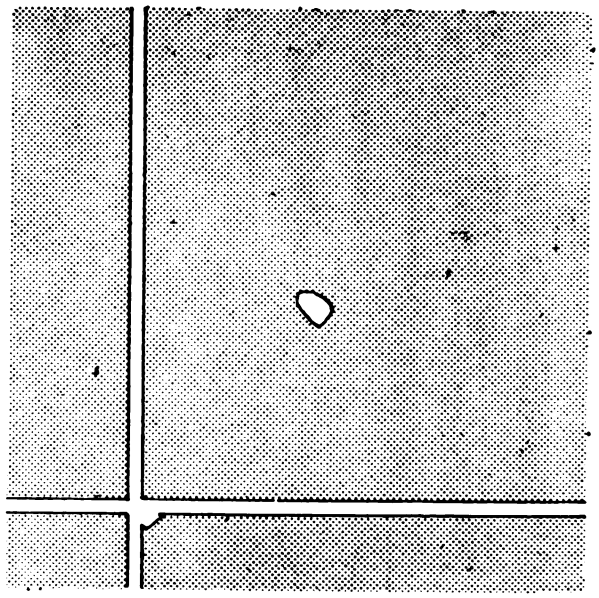
A. B-SCOPE PRESENTATION OF A LOW-ANGLE PROJECTILE.



B. B-SCOPE PRESENTATION WITH ENTRY AND EXIT POINTS MARKED SINGLE BEAM-DUAL-BEAM SWITCH SET AT SINGLE BEAM AND RANGE SHIFT OFF.



C. STROBING THE ENTRY POINT.



D. STROBING THE EXIT POINT.

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Figure 3-19. Marking and strobing of low-angle projectile entry and exit points on B-scope.

Section III. OPERATION UNDER UNUSUAL CONDITIONS

3-27. Operation Using Circular Polarizer (fig. 3-20)

The circular polarizer is provided for use with the radar when operating conditions are hampered by rain, fog, clouds, etc. Whenever weather conditions cause cluttering of the B-scope indicator, the circular polarizer should be placed in the operating position and a comparison made to determine whether a reduction of clutter has been achieved. Since the circular polarizer reduces the effective range of the radar, it should not be used unless an improvement in operating conditions is noted.

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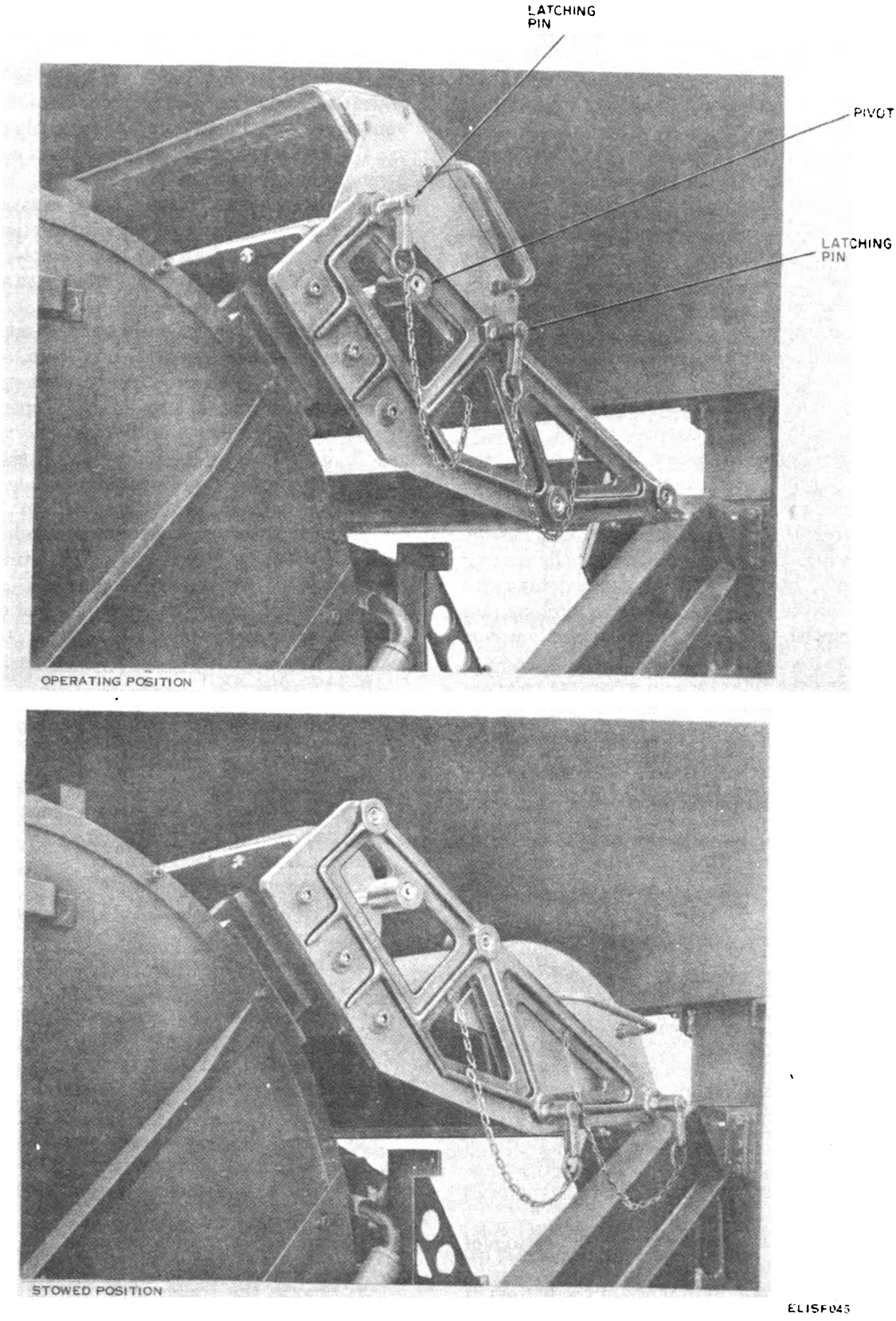

Figure 3-20. Circular Polarizer MX-2219/MPQ-4A, operating and stowed positions.

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a. Positioning of Circular Polarizer Using Two Persons. The circular polarizer normally is positioned by two persons performing identical functions at each end of the circular polarizer. To change the position, proceed as follows:

(1) *Operating to stowed position.* Press the button on the end of each latching pin and withdraw the latching pins (allow the latching pins to fall free on the retaining chains). With two persons acting in unison, lift the polarizer by the U -bolt handles and , at the same time, swing the polarizer toward the reflector. Lower the polarizer gently into its stowed position and replace the latching pins.

(2) *Stowed to operating position.* Press the button on the end of each latching pin and withdraw the latching pins. With two persons acting in unison, lift the polarizer by the U -bolt handles and, at the same time, swing the polarizer toward the scanner. Lower the polarizer gently into its operating position and replace the latching pins.

b. Positioning of Circular Polarizer by One Person. If only one person is available to position the circular polarizer, first release and withdraw the latching pins on both ends of the polarizer. After the latching pins have been removed, the person should be positioned on the top of the receiver-transmitter cabinet between the scanner and the reflector and grasp the polarizer near its center. The polarizer can then be lifted and positioned easily. After positioning has been accomplished, the latching pins are replaced.

3-28. Deep-Fording Radar Trailer

To deep-ford the radar trailer, procedures must be followed to prevent water from entering parts of the radar. To prepare the equipment for deep-fording, proceed as follows:

a. For preparation of the trailer, see TM 9-2330-234-15.

b. Prepare the equipment as outlined in paragraphs 3-30 and 3-31 with the following modification.

(1) After the antenna has been placed in the stowed position, remove all dirt, grease, and corrosion from the edges for the slip joint (fig. 1-1) between the upper and lower antenna sections.

(2) Tape the slip joint; be sure a good waterproof seal is obtained at all points (use TAPE, pressure-sensitive, adhesive, cloth back, oil and water resistant (NSN 8135-00-269-8089).

(3) Tape each of the drain plugs in the bottom of the receiver-transmitter cabinet.

(4) Tape each of the drain plugs in the bottom of the control-indicator cabinet.

(5) Close the drain cock on the large end of the scanner.

(6) See that all gaskets around vent panels and transit case covers are in good condition and that the vent panels and transit covers are securely fastened.

(7) Replace and tighten the end caps on each cable assembly before stowing the cables.

(8) Replace and tighten all plug caps on the radar to prevent water seepage into the connections.

c. After deep-fording had been completed, the following measures should be undertaken as soon as possible:

(1) Remove transit covers and inspect equipment for water. If some seepage has occurred, wipe the affected area as dry as possible and allow complete air drying before placing the equipment in operation.

(2) Open the scanner drain cock.

(3) Remove the tape from around the slip joint and the drains of the control-indicator and receiver-transmitter cabinets.

(4) Remove the end caps from each cable and plug. Inspect for leakage and allow to air-dry if leakage has occurred.

(5) Wipe all unpainted parts dry and coat with a light coating of engine oil.

(6) Process the trailer according to instructions in TM 9-2330-234-15.

3-29. Deep-Fording Cargo Trailer

CAUTION

The entire cargo trailer and contents cannot be deep-forded. The generator must be removed before the cargo trailer and remaining components are deep-forded.

a. Preforfding Instructions.

(1) See TM 9-2330-213-14 for instructions on the cargo trailer.

(2) Prepare the equipment as outlined in paragraph 3-33 with the following modifications:

(*a*) Check the waterproof gaskets on each transit case and tighten the covers securely.

(*b*) Replace and tighten the end caps on the power and remote cables.

b. Afterfording Instructions.

(1) Open each transit case to check for water seepage. If seepage has occurred, remove contents, wipe as dry as possible, and then allow complete air drying before repacking.

(2) Remove cable end caps and check for water seepage. Air-dry if seepage has occurred.

(3) Process the trailer according to instructions contained in TM 9-2330-213-14.

Section IV. PREPARATION FOR MOVEMENT

NOTE

Of Simulator, Radar Target Signal AN/TPA-7 is being used with Radar Set AN/MPQ-4A, disconnect the AN/TPA-7 (TM

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11-5840-287-12) from the radar set before performing any of the following procedures.

3-30. Disassembly of Equipment for Transport

a. Initial Steps.

(1) On the control-power supply panel, press the ELEVATION switch to RAISE or LOWER until the computer LOWER BEAM ELEVATION counter reads approximately 175 mils. Make sure that there is no interference with the rear vent panels on the receiver-transmitter group cabinet ((5) below).

(2) Press the STOP button.

(3) Turn the MAIN POWER switch to OFF.

(4) After 3 to 5 minutes press the POWER UNIT switch to STOP and hold until the power unit comes to a complete stop.

(5) Close and secure the two vent panels on the control-indicator group cabinet, the three vent panels on the receiver-transmitter group cabinet, and the vent panel on the dehydrator. Replace the vent caps on each end of the scanner.

b. Cables.

(1) Remove power cable W701 connected between the control-indicator group and the power unit. Replace the cable on the power cable reel (fig. 1-8).

(2) If equipment is in remote operation, remove remote control cable W703 connected between the control-indicator group and pedestal control cable W702. Replace the cable on the remote cable reel (fig. 1-8).

(3) Disconnect cable W1901 from jack J1004 on the control-indicator group. Stow the cable in the right-hand shelter intake blower in the operators' shelter.

(4) Disconnect cable W1901 between the two blower assemblies in the operator's shelter. Stow the cable in the left-hand shelter intake blower.

c. Disassembly of Operators' Shelter (fig. FO-1).

(1) Close the inside and outside covers on both blower assemblies.

(2) Unclamp the two blower assemblies and replace them in the cargo trailer (fig. 1-8).

(3) Remove the eight ground stakes and web straps which moor the shelter to the ground (F).

(4) Unfasten the canvas walls and fold for stowage.

(5) Loosen the two lock studs which secure the blower mounting plates to the equipment picture frame (E). Retract the entrance side legs. Lift off the transit case and place in on the ground upside down (D). Remove the ground pads from the entrance side legs.

(6) Unlock the entrance side legs by removing the two leg braces (D) and fold the legs into the transit case. Replace the braces and ground pads in the case (B).

(7) Unlock the blower mounting frames by removing the leg braces and fold the frames into the case. Replace the leg braces in their stowed position in the case.

(8) Remove the rear outrigger support brace, loosen the two eyebolts and unlock the nine latches that secure the equipment picture frame to the control-indicator group cabinet (C). Stow the frame in the transit case. Tighten down the two eyebolts.

(9) Remove the indicator transit cover from the top of the cabinet and secure the cover to the cabinet.

(10) Replace the ground stakes, web straps, and picture frame in the transit case (B). Place the folded canvas over these items in the transit case.

(11) Close and latch the transit case.

(12) Transport the case to the cargo trailer and secure it in position with the straps provided (A).

d. Control-Indicator Group. If the control-indicator group has been operating in a remote position, proceed as follows:

(1) Pull out the pip pins that secure the control-indicator group cabinet to the remoting stand.

(2) Extend the two carrying handles to their transport position.

(3) Lift the cabinet by these handles and carry it to the radar trailer. Four to six persons are required for this operation.

(4) Bolt the cabinet in position on the radar trailer.

e. Disassembly of Remoting Stand.

(1) Place the stand upside down on the ground.

(2) Pull out the retainer pin (fig. 2-13) which holds each leg in its socket and remove each of the four legs.

(3) Release the leg-stowing clamp by pulling out the retainer pin.

(4) Replace the four legs in their stowed position and secure the clamp by pushing the retainer pin back in place. Stow the four leg-retaining pins in the holes provided on the top of the stand.

(5) Replace the remoting stand on the cargo trailer (fig. 1-8).

f. Disassembly of Operators' Seats (Remote).

(1) Lift the seats free of supports and place them on the ground.

(2) Replace the two seat supports on the cargo trailer (fig. 1-8).

(3) Replace the two operators' seats in their forward position on the radar trailer.

g. Disassembly of Operators' Seats (Local).

(1) Remove the seats from the support arms by lifting them straight up from their sockets.

(2) Swing the support arms into their stowed position on the rear jack assembly of the radar trailer.

(3) Replace the two seats in their stowed position

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on the front of the radar trailer.

3-31. Securing Antenna Group for Over-the-Road Transit

a. Release the reflector by loosening the locking pins and disengaging the locking screws on the bottom of the reflector support beams (fig. 2-11).

CAUTION

Check to see that the circular polarizer is in its stored position before lowering the reflector.

b. Lower the reflector by turning the handcranks attached to the elevation actuators (fig. 2-11). Turn the cranks until the reflector rests on the stowing bars.

c. Secure the reflector with the clamps provided (fig. 2-9).

3-32. Preparing Radar Trailer for Transit

a. Remove the ground stake from the ground and recoil the cable. Clamp the stake in its stowed position on the radar trailer (fig. 2-8).

b. Replace the waterproof cover on the spirit level assembly.

c. Rotate both wheel fenders inward to their transit position and secure them with locking pins.

d. Place the azimuth stowlock (fig. 1-1) in its engaged position.

e. Put the azimuth handwheel (fig. 2-7) in the transit (midway) position.

f. Retract the jackscrew on the rear outrigger arm by the ratchet handcrank (fig. 2-4).

g. Retract the jackscrews on the right and left outrigger arms by means of the associated handcranks (fig. 2-6).

h. Unscrew the operational locking screws that secure the outrigger arms to the radar trailer frame (fig. 2-6). Raise the outrigger arms and swing them into the stowed position on the radar trailer. Secure the arms to the support rods with the locking pins provided (fig. 2-5).

i. Replace the three outrigger pads in the radar trailer on the curbside fender support.

j. After visually inspecting the radar trailer to see that everything is secure, place the tarpaulin over the reflector and scanner.

k. Couple the trailer to the prime mover by means of the lunette. Connect the safety chains, airhose coupling, and signal cable to the prime mover.

l. Remove the rear outrigger support brace from the radar trailer frame. Loosen the two locking screws on the jack and swing the support brace into its transit position (fig. 2-3). Tighten the jack locking screws.

m. Release the rear outrigger arm by unscrewing the operational locking screws and loosening the pivot screw on each side of the trailer. Raise the outrigger arm to a stowed position. Reassemble the arm with the transit locking screws provided (fig. 2-3). Tighten the pivot screw.

n. Pull out the locking pin on the caster wheel and raise the wheel into its transit position.

o. Release the handbrakes. The radar trailer is now ready for transit.

3-33. Preparing Cargo Trailer for Transit (fig. 1-8)

a. Make a visual check of the cargo trailer. Use the loading diagram to see that all accessories are stowed and in their proper position.

b. Place the tarpaulin over the power unit.

c. Secure the covers of all gasoline cans.

d. Tie down the tarpaulin on the cargo trailer.

e. Release the support leg at the rear of the trailer and swing it into transit position.

f. Couple the trailer to the prime mover by means of the lunette. Connect the safety chains, airhose coupling, and signal cable to the prime mover.

g. Pull out the locking pin on the caster wheel and raise the wheel into the transit position.

h. Release the handbrakes. The cargo trailer is now ready for transit.

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CHAPTER 4
MAINTENANCE INSTRUCTIONS

Section I. TOOLS, MATERIALS, AND LUBRICATION

NOTE
If Simulator, Radar Target Signal AN/TPA-7 is being used with Radar Set AN/MPQ-4A, disconnect the AN/TPA-7 (TM 11-5840-287-12) from the radar set before performing maintenance procedures in this chapter.

4-1. Tools and Materials Required

a. The tools required are listed in section III of appendix B. The tools are normally stored in the tool box mounted in the curbside of the radar trailer.

b. The materials required are listed in table 1-2.

4-2. Lubrication

No lubrication is required for the operator to perform.

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

4-3. Preventive Maintenance

a. The preventive maintenance checks and services chart (para 4-5) outline inspections to be made at specific intervals. These inspections are made to determine that the equipment is in good general (physical) condition, in good operating condition, and likely to remain combat serviceable. If the equipment is not used daily, the cleaning operations should be performed before operation, after any extended shutdown, or once a week while the equipment is kept in *standby* condition. Report any deficiencies using the proper forms (TM 38-750).

b. The maintenance services should be scheduled concurrently with the periodic service schedule of the radar trailer, the cargo trailer, and the generator set.

4-4. Preventive Maintenance Checks and Services (PMCS)

a. General. Before performing PMCS, note the following:

(1) *Before you operate.* Always keep in mind the CAUTIONS and WARNINGS. Perform your before (B) PMCS.

(2) *While you operate.* Always keep in mind the CAUTIONS and WARNINGS. Perform your during (D) PMCS.

(3) *After you operate.* Be sure to perform your after (A) PMCS.

b. Item Number Column. Use the number in this column for the *TM number* column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, when recording results of PMCS.

c. Interval Column. A dot (•) in the column indicates when the check is to be made.

d. For Readiness Reporting, Equipment Is Not Ready/Available If: Column. This column contains the standards which will cause the equipment to be reported not ready or not available because it cannot perform its primary mission.

4-5. Operator/Crew PMCS

Within the designated interval, the checks are to be performed in the order listed in the chart below.

B—Before A—After
D—During W—Weekly

Item No.	Interval B	D	A	W	Item to be inspected	Procedures	For Readiness Reporting, Equipment is Not Ready/Available if:
1	•		•		Equipment	*a.* See that the units are clean and dry; free of grease, dirt, rust, corrosion, and fungus (para 4-9). *b.* See that painted surfaces are free of bare spots, rust, and corrosion.	
2	•		•		Cords and cables	See that cords and cables are not frayed, cut, broken or kinked. Frayed or cut cable insulation should be covered with friction tape over rubber tape.	
3	•				Meters and indicators	See that meters and indicators are free of physical damage.	

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Item No.	Interval B	D	A	W	Item to be inspected	Procedures	For Readiness Reporting, Equipment is Not Ready/Available if:
4		•			Controls and switches	While making the operational check (item 5), observe that the controls and switches operate smoothly without backlash, binding, or scraping.	
5		•			Equipment operation	*a.* Perform the operator's check (para 4-7) to determine that the equipment operates normally.	The operator's checklist cannot be completed.
						b. Make certain that there is no unbalance or moving parts interference of the scanner rotor (vibration and audible indications).	The scanner rotor does not operate normally.
						CAUTION Continued operation of an unbalanced scanner rotor will damage the scanner assembly.	
						c. See that there is no oil leakage in the elevation assembly.	
						d. Perform the radar performance test to determine that the radar performance figure is normal (para 4-8).	The radar performance figure is not normal.
						e. Check accuracy of computer as directed in paragraph 3-19.	The computer is not accurate.
6				•	Air filters	See that filters are free of dirt, dust, lint, and other foreign matter that might obstruct free passage of air through the filter element (para 4-12).	
7				•	Mountings	Determine that all bolts, nuts, washers are in place and properly tightened. Mountings must show no evidence of weakness or deformity.	

Section III. TROUBLESHOOTING

4-6. Troubleshooting

a. General. The checklist given in paragraph 4-7 will help the operator to locate trouble in the equipment. The list gives the item to be checked, the conditions under which the item is checked, the normal indications of correct operation, and the corrective measures that may be taken by the operator.

b. Action or Condition. For some items, the information given in the *Action or condition* column consists of various switch and control settings under which the item is to be checked. For other items, it represents an action that must be taken to check normal indications given in the *Normal indications* column.

c. Normal Indications. The normal indications listed include the visible or audible signs that the operator should perceive when the items are checked. If these signs are not normal, the operator should apply the recommended corrective measures.

d. Corrective Measures. The corrective measures listed are those the operator can make without assistance from the unit repair technician. If the set is completely inoperative or if the recommended corrective measures do not give results, troubleshooting by the unit repair technician is necessary. However, if the tactical situation calls for it, and the system is not completely inoperative, the operator must maintain the radar in operation as long as possible.

4-7. Operator's Checklist

	Item No.	Item	Action or condition	Normal indications	Corrective measures
P	1	Cables	Check connections (para 2-11).	No disconnected cables.	Tighten or connect.
R	2	Drawers and front doors.	Must be closed.	All drawers and doors closed.	Close drawers and doors tightly.
E					
P	3	Blower panels	Must be open.	All blower panels open.	Open panels.
A	4	POWER UNIT switch (fig. 3-4).	Operate to START. **NOTE** If operating conditions permit, the power unit should be	POWER UNIT lamp goes on.	Check item 1. Check the power unit to see that the ON-OFF switches are ON and the IGNITION MANUAL START-RE-
R					
A					
T					

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	Item No.	Item	Action or condition	Normal indications	Corrective measures
ORY START EQUIPMENT PERFORMANCE			started at the power unit and frequency and voltage checked before applying power to the radar (TM 5-6115-365-15).		MOTE START switches are in REMOTE START position (TM 5-6115-365-15). Replace lamp.
	5	MAIN POWER switch.	Turn to ON.	120 V AC blown fuse lamps do not go on. MAIN POWER ON & INTLK CLOSED lamp lights. READY lamp lights after 5-minute period.	Check items 2 and 3. Replace defective fuses (fig. 3-4) three fuses on lower left side. Replace MAIN POWER ON & INTLK CLOSED and READY lamps.
	6	Blowers		Two blowers in receiver-transmitter and one blower in control-indicator operate.	Check 120 V AC blown fuse indicator lamps (fig. 3-4) above +27 V DC lamp and fuses. If fuse indicator lamps light, call unit repair technician to replace fuses.
	7	ELEVATION switch (fig. 3-4).	Operate first in RAISE then in LOWER position.	Reflector first tilts back, then tilts forward.	Check item 1. Check 120 V AC blown fuse indicator lamps (fig. 3-4) above +27 V DC fuses. If fuse indicator lamps light, call unit repair technician to replace fuses.
	8	AZIMUTH switch	Operate first in CW, then in CCW position.	Antenna should move in azimuth correspondingly.	Check item 1. Check stowlock. Check position of azimuth handwheel. Check to see that fenders are down.
	9	Dehydrator	Hinge up air input cover on front panel. Set power circuit breaker to on (HD-264A/MPQ-4A only). Purge the dehydrator by opening the purge valve on the right side of the dehydrator, and running the dehydrator for at least 5 minutes. Close the valve after purging and allow pressure to build up, automatically shutting off dehydrator motor at approximately 16 psi.	Pressure gage reads approximately 16 psi. Dry air indicator shows blue.	Check hose connection to waveguide. Replace desiccant chamber if indicator shows pink (para 4-13).
	10	START switch (fig. 3-4).	Press START button.	RADIATE lamp lights.	Close transmitter door tightly. Check dehydrator pressure (item 9). Check items 2 and 3. Replace RADIATE lamp. Higher category maintenance required.
	11	MAGNETRON POWER control.	Adjust for normal magnetron current.	18 ma on MAGNETRON CURRENT meter (fig. 3-4).	NOTE Check MAGNETRON CUR meter on transmitter (fig. 3-1). If reading can be adjusted to 18 ma, set may be operated until repair is made.
	12	TEST METER SELECTOR switch (fig. 3-4).	Rotate switch to AFC XTAL CUR.	2.5 ±.5 (may fluctuate; if AFC-MANUAL switch is in AFC position).	Perform items 13 and 14.
	13	TEST METER SELECTOR switch (fig. 3-1).	Rotate switch to XTAL 1.	2.5 ±.5 (may fluctuate; see 12 above).	Perform item 14.
			Rotate switch to XTAL 2.	2.5 ±.5 (may fluctuate; see 12 above).	Perform item 14.
	14	L.O. RAISE-LOWER switch	On control-monitor, set A.F.C.-MANUAL switch to A.F.C. On control-power supply, set AFC-	Maximum range marker intensity on B-scope.	Recheck item 11. Higher category maintenance re-

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Item No.	Item	Action or condition	Normal indications	Corrective measures
	(fig. 3.4).	MANUAL switch to MANUAL. Operate L.O. RAISE-LOWER switch up or down as required.		quired.
		Set control-power supply AFC-MANUAL switch to AFC.	No change in video signal on B-scope.	Higher category maintenance required. If operation is normal in MANUAL (above), equipment may be operated in MANUAL until repairs are made. Repeat adjustment for maximum range marker intensity at 15-minute intervals if operating in MANUAL.
15	Indicator B-scope (fig. 3-3).	Observe screen with RANGE SELECTOR switch in 15000 M position.	Screen should have visible raster.	Adjust INTENSITY control (fig. 3-3) for desired raster brightness. Adjust FOCUS control for sharpest definition.
16	EXPENDED SWEEP DELAY switch.	Switch from 0 through 15 consecutively.	Intensified portion of sweep (3,750 meter band) should move from bottom to top of screen in successive steps of 1,500 meters.	Higher category repair required. Equipment may be operated without expanded sweep until repair is made.
17	RANGE SELECTOR switch.	Switch to 3750 M position.	Full vertical sweep on screen with selected 3,750 meter band filling the entire face of the B-scope.	Higher category repair required. Equipment may be operated in 15000 M position until repair is made.
18	VIDEO control	Turn knob fully clockwise.	Increased signal and noise intensity on scope screen.	Higher category maintenance required.
19	IF GAIN control	Turn knob clockwise or counterclockwise.	Signal and noise intensity increases with clockwise rotation, decreases with counterclockwise rotation. Set to threshold of noise with VIDEO control fully clockwise.	Higher category maintenance required.
20	MARKERS ON switch.	Turn MARKERS ON switch to ON.	Markers occur at 2,000, 4,000, 6,000, 8,000, 10,000, 12,000 and 14,000 meters if system is radiating, AFC is properly locked on, and receiver gain is sufficient.	Higher category maintenance required. Equipment may be operated until repair is made if movement of range strobe appears normal when computer controls are operated.
21	RANGE MARK control.	Turn RANGE MARK control clockwise or counterclockwise.	Adjusts intensity of range strobe as desired.	Higher category maintenance required. Equipment may be operated until repair is made if range strobe remains visible so intercept position can be determined.
22	AZIMUTH MARK control.	Turn knob clockwise or counterclockwise.	Adjusts intensity of azimuth strobe as desired.	Higher category maintenance required. Equipment may be operated until repairs are made if azimuth strobe remains visible so intercept position can be determined.
23	RANGE SHIFT switch.	Switch to ON	Displaces upper beam presentation approximately 750 meters above lower beam presentation.	Higher category maintenance required. Equipment may be operated until repair is made without range shift.
24	BEAM VIDEO switch.	Switch to BOTH position. Operate ELEVATION switch until a convenient lower beam fixed target appears on crt.	Target appears on screen.	Higher category maintenance required.
		Switch BEAM VIDEO switch to UPPER position.	Target disappears on screen.	Higher category maintenance required. Equipment may be operated with BEAM VIDEO switch in BOTH position until repair is made.

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	Item No.	Item	Action or condition	Normal indications	Corrective measures
			Press ELEVATION switch to LOWER until upper beam video is obtained on crt.	Target reappears on screen.	Higher category maintenance required. Equipment may be operated with BEAM VIDEO switch in BOTH position until repair is made.
			Switch BEAM VIDEO to LOWER position.	Target disappears from screen.	Higher category maintenance required. (*See* above.)
	25	TIMER switches	With BEAM VIDEO switch in BOTH position, operate ELEVATION switch until a convenient lower beam fixed target appears on crt. Switch BEAM VIDEO to LOWER and press either TIMER button.	Timer starts and target disappears from screen.	Higher category maintenance required. If timer operates normally but beam switching is defective, see 24 above. If beam switching is normal but timer does not start, higher category maintenance is required.
			Press ELEVATION switch to LOWER until the target reappears as upper beam video. Press either TIMER button.	Timer stops and target disappears from screen.	Higher category maintenance required. (*See* above.)
	26	RESET switch	Press to reset timer to zero.	Timer hands will return to zero.	Higher category maintenance required. Equipment may be operated until repair is made by estimating time between intercepts.
	27	PLOTTER DIMMER control.	Turn clockwise or counterclockwise to vary illumination of plotter scale.	Illumination will vary with rotation of control.	Replace pilot lamps (para 4-11).
	28	PANEL DIMMER control.	Turn clockwise or counterclockwise to vary illumination of front panel.	Illumination will vary with rotation of control.	Higher category maintenance required.
S T O P	29	STOP switch (fig. 3-4).	Press STOP button.	RADIATE lamp goes out.	Higher category maintenance required. Perform item 30 to stop equipment.
	30	MAIN POWER switch.	Switch to OFF.	READY and MAIN POWER ON & INTLK CLOSED lamps go out. Radar inoperative.	Higher category maintenance required. Turn off circuit breaker at power unit.
	31	POWER UNIT switch.	Switch to STOP (must be held depressed until power unit comes to a complete stop).	POWER UNIT lamp goes out.	Higher category maintenance required. Stop power unit manually at the unit.

4-8. Radar Performance Test

The echo box furnished with each radar is used to test radar system performance. Ringtime and afc operation can be checked by using the echo box in conjunction with the indicator B-scope and the computer.

a. Ringtime Daily Record. The ringtime, relative power, and transmitter frequency should be measured and recorded on a chart similar to the one shown in figure 4-1. The measurements should be made and recorded whenever the radar has been moved from one site to another, and whenever maintenance has been performed on any of the system components; this is to establish a new set of reference (performance) figures. Ringtime should also be checked and recorded on a daily basis for comparison with previous entries. Day-to-day readings may show a progressive deterioration of system effectiveness. It is often possible to anticipate the end of life for the magnetron by comparison of the day-to-day entries. The magnetron will slowly change frequency throughout its operating life; as the magnetron deteriorates, the rate of change in frequency will generally increase with operating time. If the readings of the RELATIVE POWER meter on the echo box are progressively lower day by day, the magnetron power output is probably decreasing and this rate of decrease also increases toward and end of magnetron life. Any repairs or adjustments made to the system components should be entered under REMARKS at the time the new reference figures are recorded. (See note, *b* below.)

b. Checking Ringtime. It is difficult to measure ringtime on a B-scope with a high degree of accuracy; therefore, it is important that ringtime measurements be made as carefully as possible and preferably by the same observer each day. To check ringtime, proceed as follows:

(1) Turn on the radar as directed in paragraphs 3-11 and 3-14.

(2) Adjust the MAGNETRON CURRENT meter reading to 18 ma.

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DAILY RECORD FORM FOR CHECKING RING TIME

DATE	FREQUENCY (MC/S)	OPERATING TIME SINCE LAST READING	READING OF RELATIVE POWER	RING TIME (METERS)	OBSERVER	REMARKS

NOTE:
MAGNETRON CURRENT METER READING SHOULD BE SET AT 18 MA.

EL1SF046

Figure 4-1. Daily record sheet for checking ringtime.

(3) Set the indicator RANGE SELECTOR switch to 15000 M.

(4) Turn the MARKERS ON switch to ON (disables STC).

(5) Tune the echo box (fig. 1-5) for peak reading on the RELATIVE POWER meter.

(6) Rotate the EXPANDED SWEEP DELAY switch until the intensified band covers the area where the noise begins to build up.

(7) Carefully retune the echo box for a peak reading on the RELATIVE POWER meter.

(8) Turn the VIDEO GAIN fully clockwise and adjust the IF GAIN control for maximum ringtime.

(9) Rotate the computer LOWER BEAM RANGE control until the range strobe coincides with the point where the noise first starts to appear on the crt (fig. 4-2).

(10) Read the RANGE counter on the computer to obtain the ringtime range and record it on a chart similar to the one in figure 4-1. Compare the result with the previous readings.

NOTE

The minimum acceptable ringtime is 1,200 meters.

(11) Record the transmitter frequency indicated on the echo box. The accuracy of this reading is ± 10 MHz.

(12) Detune the echo box before normal radar operations.

NOTE

The METER SENSITIVITY control on the echo box adjusts the meter to read between one-third and two-thirds of full-scale deflection. If the maximum readings obtained in the above steps do not fall within these limits, adjustment can be made with the METER SENSITIVITY control. Such an adjustment, however, will also have an effect on the daily meter readings and should, therefore, be made only if absolutely necessary.

c. Checking Afc Operation.

(1) With the equipment in operation, set the RANGE SELECTOR switch to 15000 M.

(2) Place the control-power supply (fig. 3-1) AFC-MANUAL switch in the MANUAL position and operate the L.O. CAVITY switch until maximum marker

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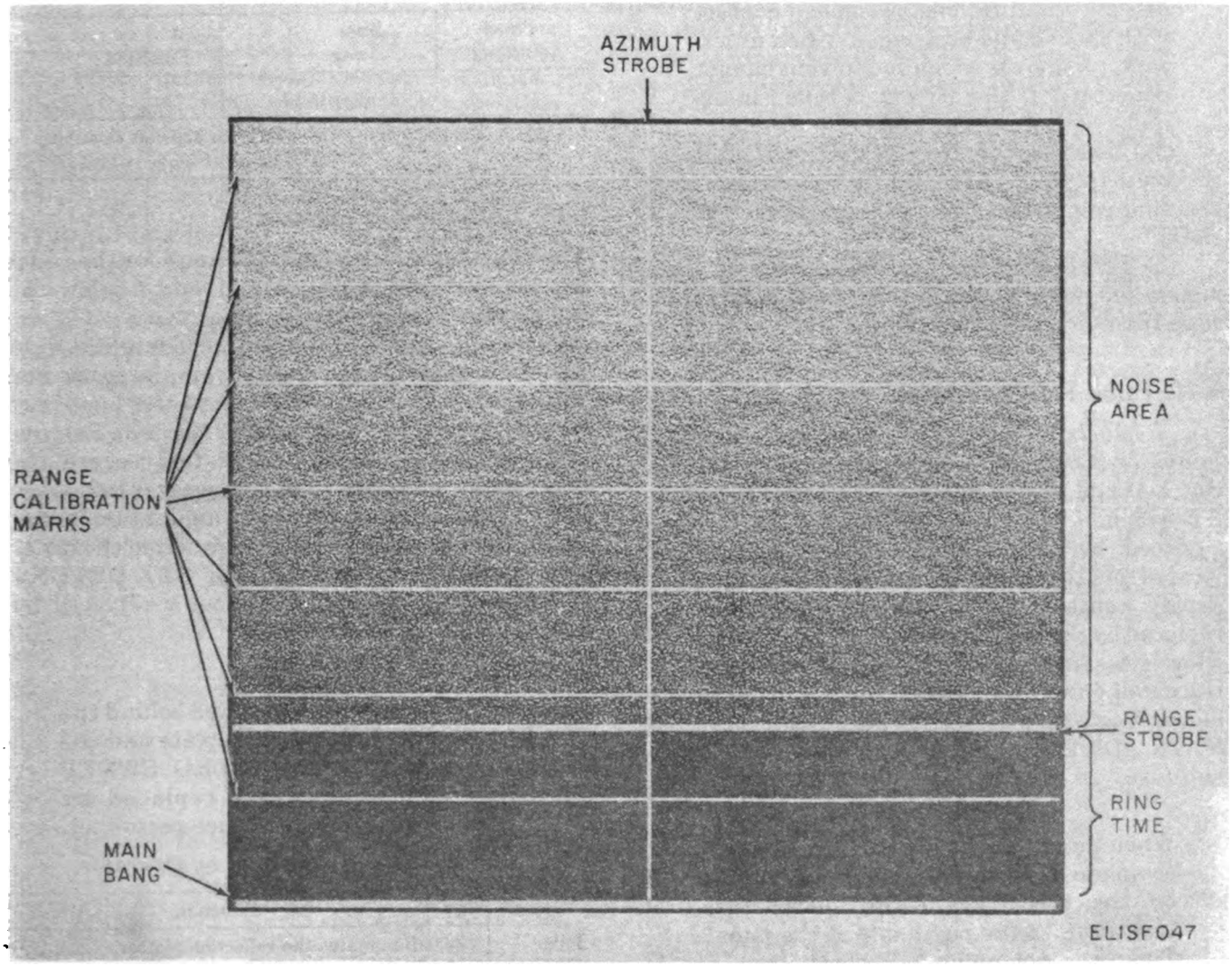

Figure 4-2. B-scope presentation of echo box ringtime.

intensity is obtained.

(3) Return the AFC-MANUAL switch to AFC.

(4) If the marker intensity decreases, the afc assembly is not working properly and higher category of maintenance is required.

Section IV. MAINTENANCE

4-9. General Preventive Maintenance Techniques

a. Use #000 sandpaper to remove corrosion.

CAUTION

Use only clean water or soap and water to clean radome window and circular polarizer. Cleaning compounds may cause equipment damage. Do not paint or touch up existing paint on radome window or circular polarizer. Equipment damage will result.

b. Use a clean, dry, lint-free cloth or a dry brush for cleaning.

WARNING

Adequate ventilation should be provided while using TRICHLOROTRIFLUOROETHANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame; the products of decomposition are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE

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dissolves natural oils, prolonged contact with skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician.

(1) If necessary, clean parts, except for electrical contacts, with a cloth or brush moistened with cleaning compound, then wipe parts dry with a cloth.

(2) Clean electrical contacts with a cloth moistened with trichlorotrifluoroethane, then wipe them dry with a dry cloth.

4-10. Fuse Replacement

a. Replacing Fuses. The blown fuse indicator lamps on Control-Power Supply C-2014/MPQ-4A (fig. 3-4) and Power Supply PP-1588/MPQ-4A (fig. 3-2) will light when fuses are blown. All fuses to be replaced by the operator are cartridge type, located on the front panels. The control-power supply contains four internal fuses that are replaced by the unit repair technician. The fuse for Blower Assembly Shelter, Intake HD-339/MPQ-4A is located on its front panel. Be sure to replace a blown fuse with a correctly rated spare. Turn the MAIN POWER switch to OFF before replacing and fuse.

NOTE

When the control-power supply panel is in complete darkness, a faint glow is visible on the three 120 V AC blown fuse indicators at the right side of the panel. This does not indicate a blown fuse. A blown fuse is indicated by a brilliant glow.

b. Fuses Replaced by Operator.

Panel marking	Fuse rating	Function
Control-power supply (fig. 3-42)		
10 AMP (lower)	250 v, 10 amp	Fuse for 120-volt ac supply, line L1, to control-indicator group.
10 AMP (upper)	250v, 10 amp	Fuse for 120-volt ac supply, line L2, to pedestal.
20 AMP	125 v, 20 amp	Fuse for 120-volt ac supply, line L3, to magnetron.
.5 AMP	250 v, .50 amp	Fuse for +220-volt dc supply to indicator.
.25 AMP	250 v, .250 amp	Fuse for +220-volt dc supply to computer.
.125 AMP	250 v, .125 amp	Fuse for −220-volt dc supply to indicaor.
5 AMP	250 v, 5 amp	Fuse for +27-volt dc supply.
Low-voltage power supply (fig. 3-3)		
.125 AMP	250 v., 125 amp	Fuse for +300-volt dc supply.
.250 AMP	250 v., 250 amp	Fuse for +150-volt dc supply.
.062 AMP	250 v., .062 amp	Fuse for −300-volt dc supply.
Shelter intake blower		
5 AMP	250 v, 5 amp	Fuse for 120-volt ac supply to shelter blowers and lamps.

4-11. Lamp Replacement

The indicator and illumination lamps for the radar are listed in the charts in b, d, and *f* below. All lamps have bayonet-type bases.

a. Indicator Lamp Replacement. There are eight illumination lamps and one indicator lamp used on the indicator. The four reflection plotter lamps are directly behind the plotter cover (fig. 4-3). Remove the eight Phillips-head screws that secure the cover to the panel and remove the cover to replace these lamps. To reach the time illumination lamps, loosen the two Phillips-head screws from the timer hood and remove the hood. The SET DETENT indicator lamp on the front panel is replaced by unscrewing the protective cap.

NOTE

The illumination lamp located behind the RANGE SELECTOR nameplate and the one behind the EXPANDED SWEEP DELAY nameplace are replaced by higher category maintenance personnel.

b. Indicator Lamps Replaced by Operator.

Symbol	Type	Function
I101	44	Illuminates the reflection plotter.
I102	44	Illuminates the reflection plotter.
I103	44	Illuminates the reflection plotter.
I104	44	Illuminates the reflection plotter.
I105	44	Illuminates the timer.
I106	44	Illuminates the timer.
I107	44	Illuminates the RANGE SELECTOR nameplate (replaced at organizational level).
I108	44	Illuminates the EXPANDED SWEEP DELAY nameplace (replced at organizational level).
I109	44	Indicates the computer Δ RANGE and Δ AZIMUTH controls are not in detent.

c. Control-Power Supply Lamp Replacement. The indicator lamps for the control-power supply are on the front panel (fig. 3-4). Unscrew the protective caps to replace the lamps.

d. Control-Power Supply Lamp Complement. All six 120 V AC blown fuse indicator lamps use type NE51 bulbs.

Panel marking (fig. 3-4)	Type	Function
440 V DC	NE51	Indicates internal fuse is blown.
IND	NE51	Indicates .5 AMP fuse is blown.
COMPUTER	NE51	Indicates .25 AMP fuse is blown.
IND	NE51	Indicates .125 AMP fuse is blown.

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Panel marking (fig. 3-4)	Type	Function
POWER UNIT	NE51	Indicates power unit has started.
RADIATE	47	Indicates transmitter is operating.
READY	47	Indicates high voltage may be applied.
+27 V DC	47	Indicates 5 AMP fuse is blown.
MAIN POWER ON & INTLK CLOSED	47	Indicates ac is being applied to control-indicator group.

e. Computer Lamp Replacement. The three indicator lamps (SINGLE BEAM, AZIMUTH ORIENT, and DOUBTFUL SOLUTION) for the computer are on the front panel (fig. 3-5). Unscrew the protective cap to reach the lamps. Four nameplate illustration lamps are attached to the rear of the applicable nameplates (*f* below and fig. 3-7). To replace a nameplace lamp, remove the four Phillips-head screws and pull out the nameplate and attached lamp.

NOTE

The counter illumination lamps are mounted at the rear of the control panel and are replacement items for higher category of maintenance personnel.

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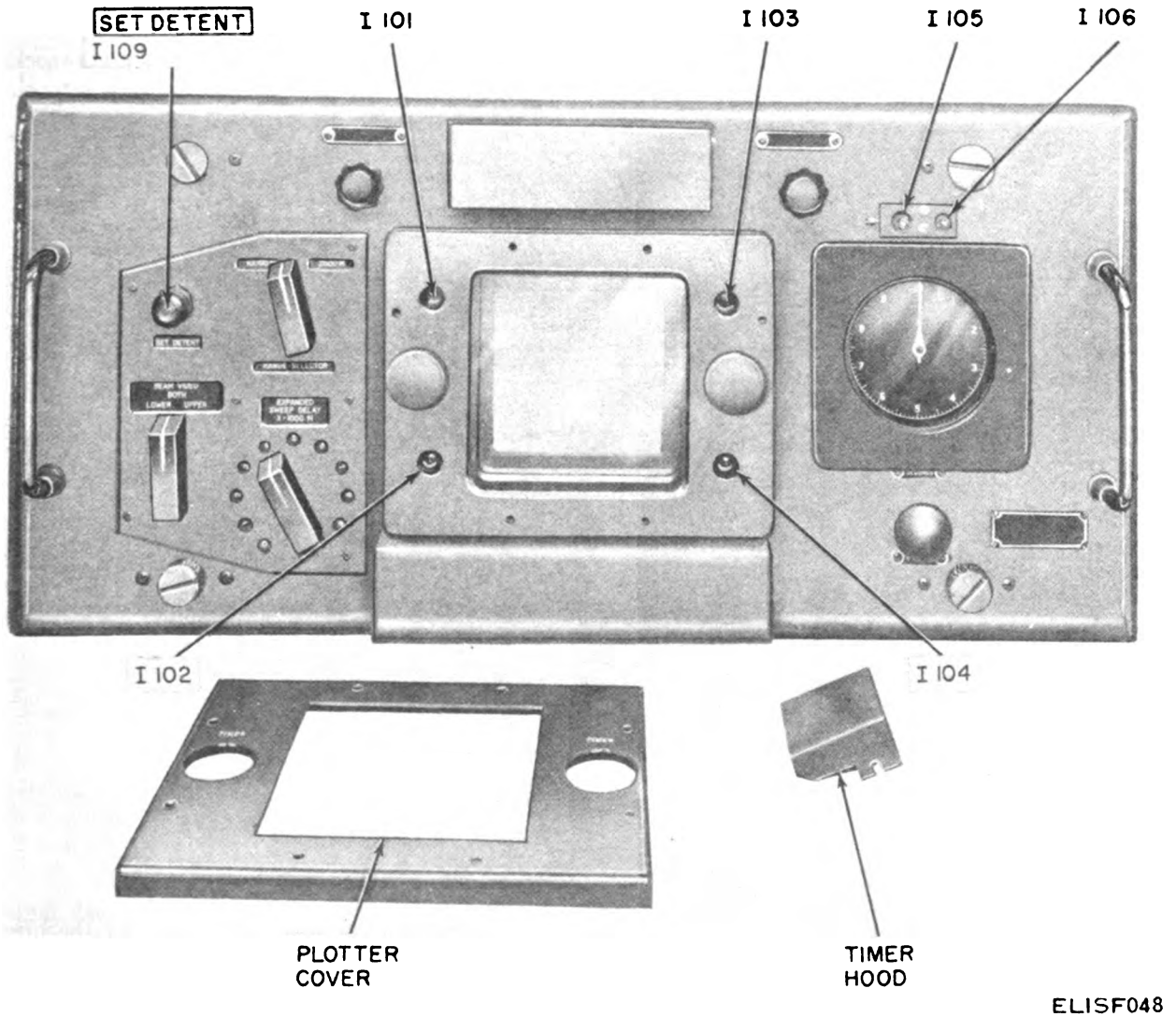

Figure 4-3. Azimuth and Range Indicator IP-375/MPQ-4A, front view, illumination lamps uncovered.

f. Computer Lamps Replaced by Operator.

Panel marking	Symbol	Type	Function
	I 1864	44	Indicates computer is switched to single beam operation.
DOUBTFUL SOLUTION	I 1852	44	Indicates problem exceeds design limits of computer.
Δ AZIMUTH	I 1859	44	Illuminates the Δ AZIMUTH nameplate.
LOWER BEAM AZIMUTH	I 1860	44	Illuminates the LOWER BEAM AZIMUTH nameplate.
Δ RANGE	I 1861	44	Illuminates the Δ RANGE nameplate.
LOWER BEAM RANGE	I 1862	44	Illuminates the LOWER BEAM RANGE nameplate.
AZIMUTH ORIENT	I 1863	44	Indicates LOWER BEAM AZIMUTH control is in detent.

g. Shelters, Electrical Equipment S-134/MPQ-4A and S-134A/MPQ-4A Lamp Replacement. The two overhead illumination lamps in the shelter are located in the blower case covers and are type 10C7/DC. Also, a neon-type blown fuse indicator lamp (NE-51) is located on each of the shelter intake blower front panels. Remove the protective caps to replace these lamps.

h. Low-Voltage Power Supply Lamp Replacement. The indicator lamps for this assembly are on the front panel (fig. 3-2) and are protected by removable caps. All three blown fuse indicator lamps are neon-type NE-51.

i. Antenna Group Lamp Replacement. Four lamps are located in the antenna group. Three of these lamps (type 51) are organizational replacement items: azimuth counter illumination lamp I3001; elevation counter illumination lamp I 3003; and level illumination lamp I 3002. Telescope reticle illumination lamp I3201

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is replaced by the operator. Replace I 3201 as follows:

(1) Slide the illumination housing off the telescope (fig. 4-4).

(2) Unscrew the square lamp housing from the lamp socket.

(3) Replace lamp I 3201. (This lamp is a type 325, 3-volt, 0.19-ampere lamp.)

(4) Screw the lamp housing back on the socket.

(5) Slide the illumination housing into place on the telescope.

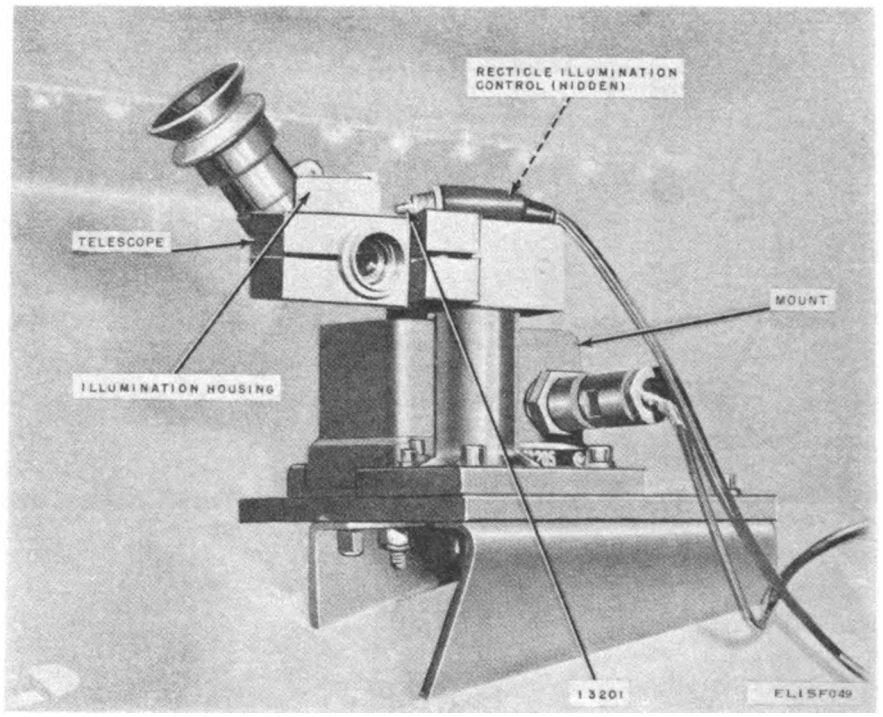

Figure 4-4. Telescope assembly, replacement of reticle illumination lamp.

4-12. Air Filter Cleaning and Replacement

Oil-filled, mesh-type air filters are used in the radar; they may be cleaned when necessary. The procedure used to clean the filters is given in *a* below. Removal and replacement of the filters are covered in *b* through *f* below. The dehydrator line filter is replaced at organizational category.

a. Cleaning Air Filters.

(1) Immerse the filter in a shallow container filled with Cleaning Compound.

(2) Agitate the filter to remove all dirt.

(3) Shake excess compound from the filter and allow the filter to dry thoroughly.

(4) Lay the filter down flat with the arrow pointing downward.

(5) With a paint brush, spread a thin coating of oil on the top surface of the filter. Use oil, lubricating, general purpose: FED VV-L-800 or FED VV-L-820.

(6) The filter may be installed immediately.

b. Control-Indicator Group Cabinet Left-Side Air Intake Filter.

(1) Release the 12 latches around the air vent panel (fig. 4-5), and remove the 2 top shoulder screws and nuts

(2) Raise the panel and disconnect the hinge on each side by removing the shoulder screw that connects each hinge to the panel. Lay the panel aside.

(3) Remove the 18 Phillips-head screws that secure the vent to the cabinet.

(4) Lift the filter out of the vent and clean as directed in *a* above.

(5) Replace the filter in the vent, with the arrow pointing *in* toward the cabinet.

(6) Secure the vent to the cabinet with the 18 Phillips-head screws and reconnect the two hinges with the two shoulder screws.

(7) Secure the panel in place with the 2 shoulder screws and nuts, and the 12 latches.

c. Control-Indicator Group Cabinet Right-Side Air Exhaust Filter.

(1) Release the 14 latches around the panel (similar to fig. 4-5) and remove the 2 top shoulder screws and nuts.

(2) Raise the panel and disconnect the hinge on each side by removing the shoulder screw that connects each hinge to the panel. Lay the panel aside.

(3) Remove the 13 Phillips-head screws and 6 stop nuts that secure the vent to the cabinet.

(4) Lift the filter out of the vent and clean as

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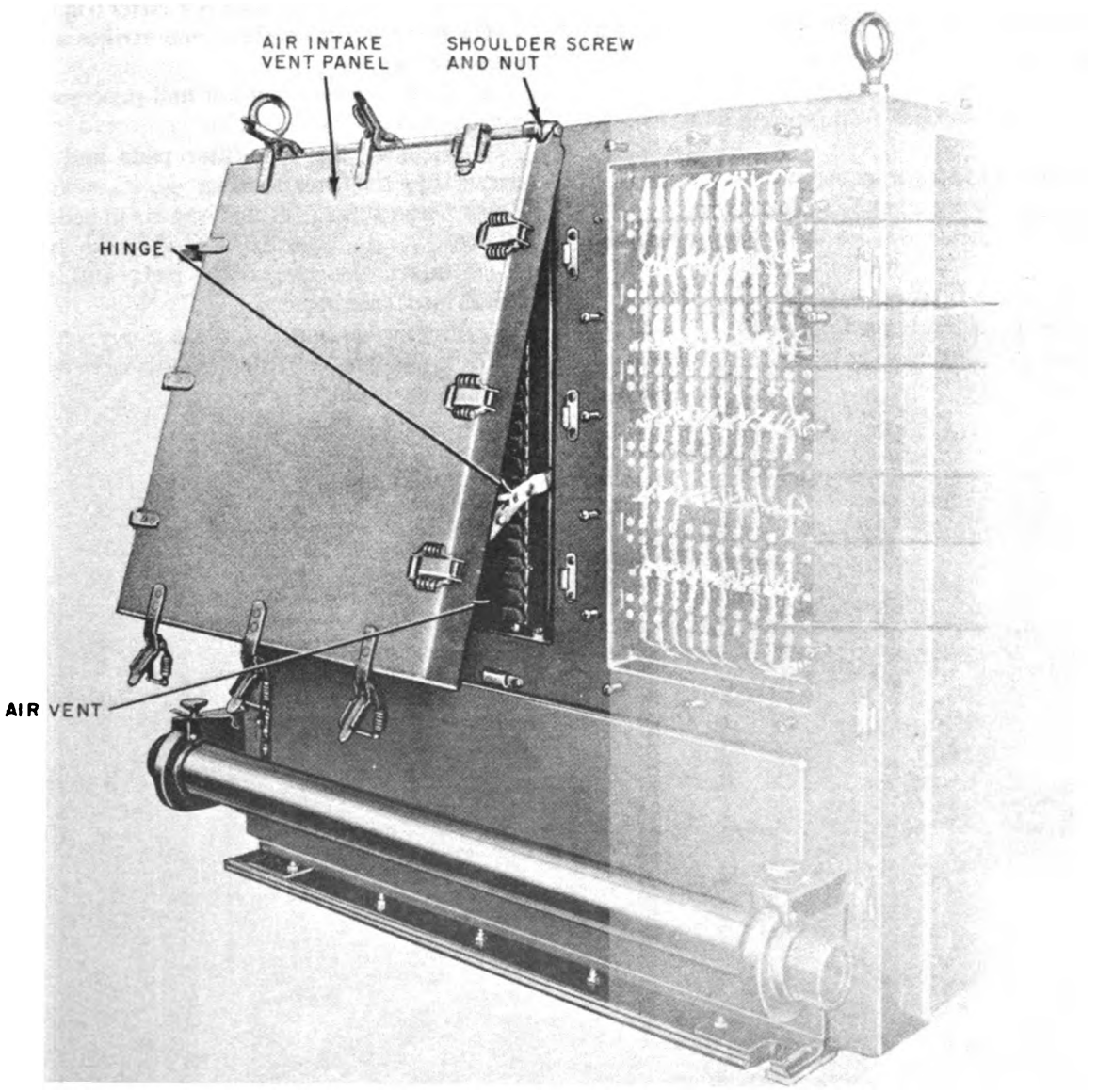

Figure 4-5. Control-Indicator Group OA-1256/MPQ-4A, left side view.

directed in *a* above.

(5) Replace the filter in the vent, with the arrow pointing *out* from the cabinet.

(6) Secure the vent to the cabinet with the 13 Phillips-head screws and 6 stop nuts.

(7) Reconnect the two hinges with the two shoulder screws.

(8) Secure the panel in place with the two shoulder screws and nuts, and the 14 latches.

d. Receiver-Transmitter Group Cabinet Air Filters. Two air filters are located on the rear left side of the cabinet and covered with one large air vent panel (fig. 4-6). To remove and replace either filter, proceed as follows:

(1) Release the 13 latches around the panel and remove the 2 top shoulder screws and nuts.

(2) Raise the panel and disconnect the center hinge by removing the shoulder screw that connects it to the panel. Lay the panel aside.

(3) Remove the eight roundhead screws that secure the vent to the cabinet.

(4) Lift the filter out of the vent and clean as directed in *a* above.

(5) Replace the filter in the vent, with the arrow pointing *in* toward the cabinet.

(6) Secure the vent to the cabinet with the eight roundhead screws.

(7) Reconnect the center hinge with the shoulder

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screw.

(8) Secure the panel in place with the 2 shoulder screws and nuts, and the 13 latches.

e. Dehydrator Vent Filter (fig. 4-7).

(1) Release six catches from strikes and remove cabinet cover.

(2) Loosen vent filter brace screw.

(3) Turn filter brace away from vent filter.

(4) Lift vent filter out of vent and clean as directed in *a* above.

(5) Replace vent filter in vent.

(6) Rotate vent filter brace over vent filter.

(7) Tighten vent filter brace screw.

(8) Secure cabinet cover.

f. Dehydrator Compressor Air Filter (fig. 4-8).

(1) Remove six catches from strikes and remove cabinet cover.

(2) Loosen screw and nut and unscrew the cover from the filter housing.

(3) Remove the two filter pads and two filter screens from the filter housing.

(4) Clean filter pads and screens in sudsy solution and dry.

(5) Insert the two filter pads and two filter screens into filter housing.

(6) Screw on cover.

(7) Tighten screw and nut to secure cover.

(8) Secure cabinet cover.

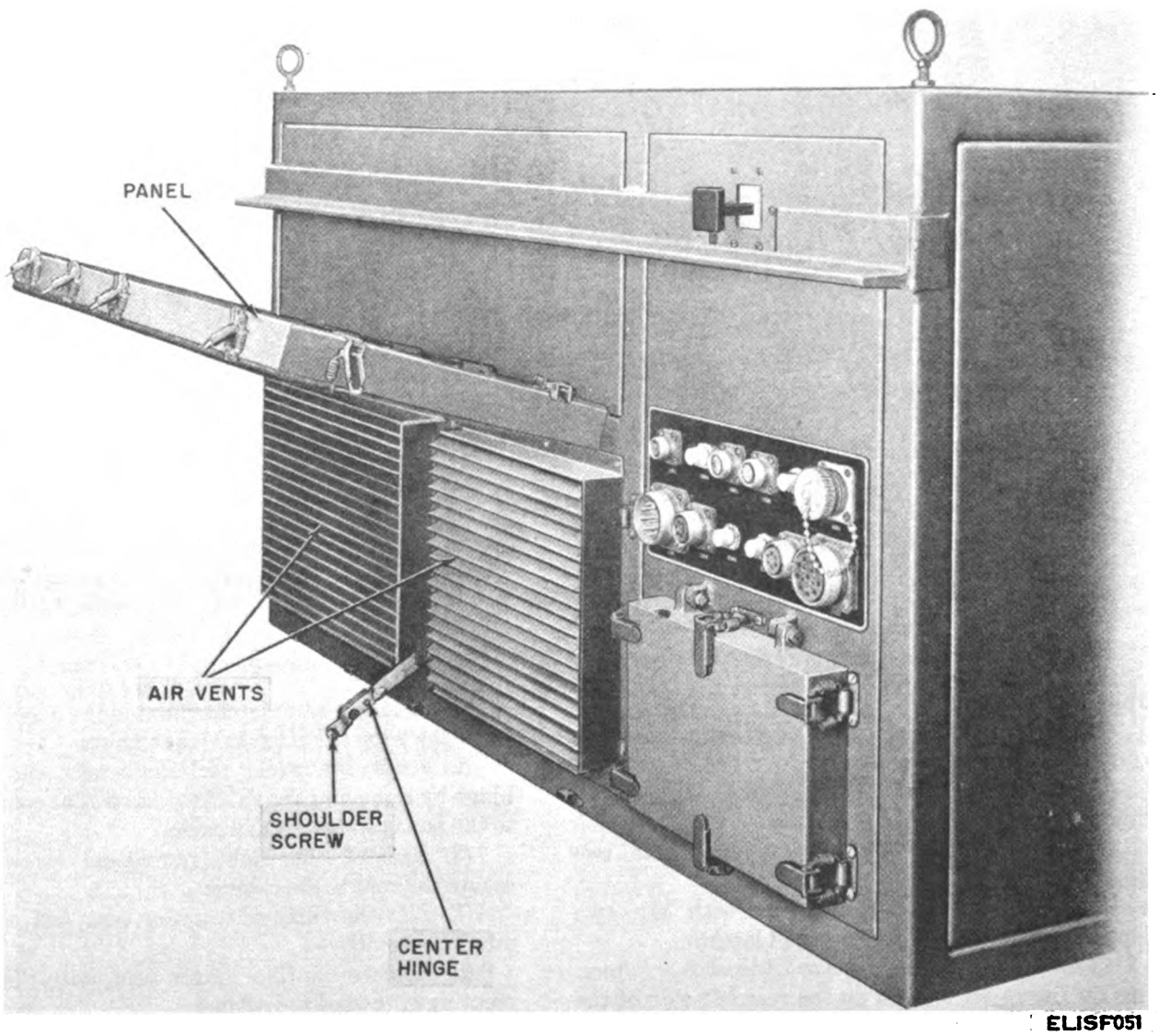

Figure 4-6. Receiver-Transmitter Group OA-1257/MPQ-4A, rear view.

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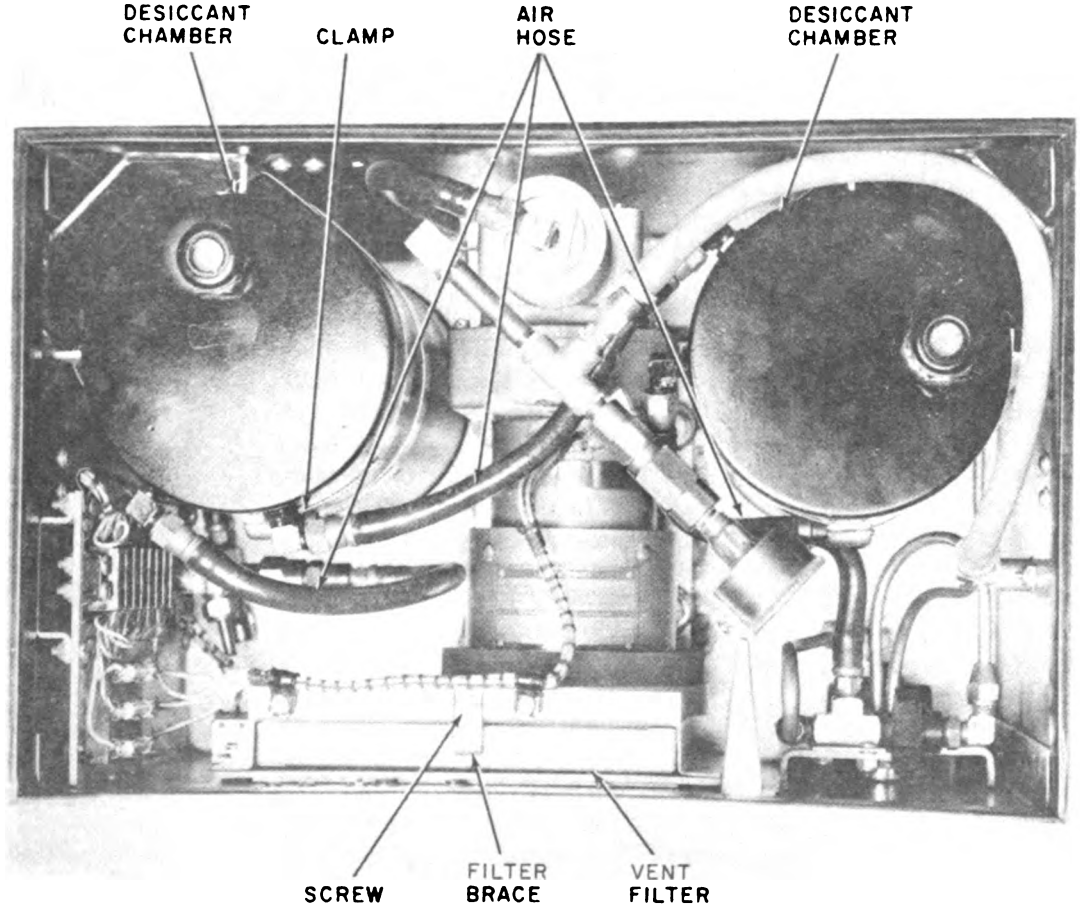

Figure 4-7. Electric Desiccant Dehydrator HD-264/MPQ-4A, cover removed, top view.

4-13. Replacement of Desiccant Chamber (fig. 4-7)

The dry-air indicator located in top of each chamber provides a means for inspecting condition of desiccant. Color should be blue; not pink or white. The desiccant in the drying chamber can be reactivated by baking chamber and desiccant in an oven at 250° to 300° Fahrenheit for 3 hours, after making certain inlet and outlet ports are open. After baking, if chambers are not installed in the dehydrator cabinet, make certain the inlet and outlet ports are sealed.

a. Remove six catches from strikes and remove cabinet cover.

WARNING

Be sure power is off before servicing the unit. Severe, possibly fatal, shock may result from contact with the electrical circuits of the dehydrator.

b. Remove air hoses from drying chambers by loosening hose attaching nuts; be careful to prevent damage to fittings.

c. Remove drying chambers by loosening clamps.

d. Insert replacement drying chambers through clamps and secure by tightening worm screws on clamps.

e. Connect air hoses to drying chambers.

f. Secure cabinet cover.

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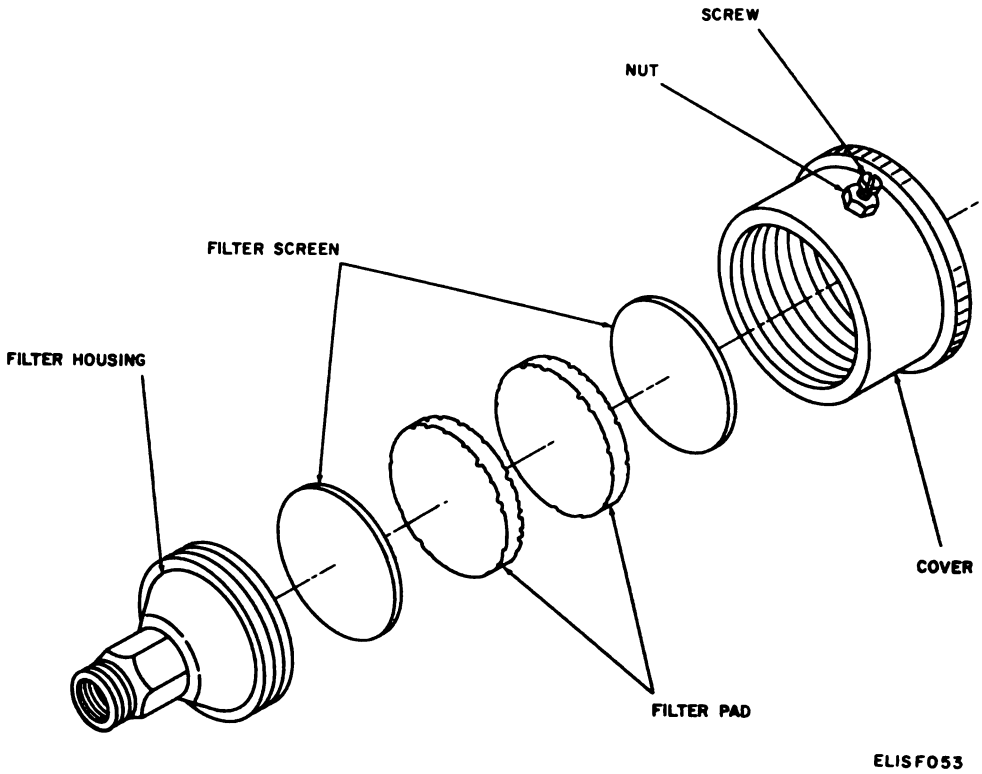

Figure 4-8. Dehydrator compressor filter assembly, disassembled.

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APPENDIX A
REFERENCES

AR 735-11-2	Reporting of Transportation Discrepancies in Shipment.
CTA 50-970	Expendable Items (Except: Medical, Class V, Repair Parts, and Heraldic Items).
DA Pam 310-1	Consolidated Index of Army Publications and Blank Forms.
DA Pam 738-750	The Army Maintenance Management System (TAMMS).
SB 708-42	Federal Supply Code for Maufacturers; United States and Canada — Code to Name (Cataloging Handbook H4-2).
TB 43-0116	Identification of Radioactive Items in the Army Supply System.
TB 43-0125	Installation of Communications-Electronic Equipment Hookup of Electrical Cables to Mobile Generator Sets on Fielded Equipment to Meet Electrical Safety Standards
TM 5-6115-275-14	Operator's, Organizational, intermediate (Field) (Direct Support and General Support) and Depot Maintenance Manual: Generator Set, Gasoline Engine Driven, Skid Mounted, Tubular Frame, 10KW, AC, 120/208V, 3 Phase, and 120/240V, Single Phase, Less Engine: DOD Models MEP-018A, 60Hz, (NSN 6115-00-889-1447) and MEP-023A, 400Hz (NSN 6115-00-926-0843) (NAVFAC P-8-6145-14; TO 35C2-3-452-1).
TM 5-6115-365-15	Operators, Organizational, DS, GS, and Depot Maintenance Manual Including Repair Parts and Special Tools List: Generator Set, Gasoline and Diesel Engine Driven, Trailer Mounted, PU-236A/G, PU-236/G, NSN 6115-00-393-1709; PU-236B/G, NSN 6115-00-738-6334; PU-253A/U, NSN 6115-00-697-2402; PU-304C/MPQ-4, NSN 6115-00-056-8421; PU-332/G, NSN 6115-00-577-8471; PU-332A/G, NSN 6115-00-738-8336; PU-375A/G, PU-375/G, NSN 6115-00-753-2231; PU-375B/G, NSN 6115-00-931-6789; PU-401/M, NSN 6115-823-2217; PU-402/M, NSN 6115-00-722-[illegible]760; PU-406/M, NSN 6115-00-738-6342; PU-409/M, NSN 6115-00-702-3343; PU-409A/M, NSN 6115-00-733-6338; PU-495/G, NSN 6115-00-823-2278; PU-551/G, NSN 6115-00-889-1307; PU-564A/G, NSN 6115-00-728-6341; PU-564B/G, NSN 6115-00-179-2789; PU-617/M, NSN 6115-00-738-6335; PU-618/M, NSN 6115-00-738-6337; PU-619/M, NSN 6115-00-738-6339; PU-620/M, NSN 6115-00-738-6340; PU-625/G, NSN 6115-00-837-3915; PU-628/G, NSN 6115-00-087-0873; PU-629/G, NSN 6115-00-937-5555; PU-631/G, NSN 6115-00-059-5172; PU-656/G, NSN 6115-00-939-3296; PU-650B/G, NSN 6115-00-258-1622; PU-625/G, FSN 6115-873-3915; PU-628/G, FSN 6115-087-0873; PU-629/G, FSN 6115-937-5555; PU-631/G. FSN 6115-059-5172; PU-656/G, FSN 6115-989-3296.
TM 9-2330-213-14	Operator's, Organizational, Direct and GS Maintenance Manual (Including Repair Parts and Special Tools List) Chassis Trailer: 1-½ ton, 2-wheel, M103A1 (2330-835-8629), M103A2 (2330-049-8050), M103A3 (2330-141-8052), M103A3C (2330-542-2181), M103A4 (2330-141-8051), M103A4C (2330-542-2182); Trailer Cargo: 1-½ ton, 2-wheel, M104 (2330-754-0509), M104A1 (2330-835-8630), M105A1 (2330-835-8631), M105A2 (2330-141-8050), M105A2C (2330-542-5689); Trailer, Tank, Water: 1-½ ton, 2-wheel, 400 Gallon, M107A1 (2330-835-8633), M107A2 (2330-141-8049), M107A2C (2330-542-5688); Trailer, Van, Shop: Folding Sides, 1-½ ton, 2-wheel, M448 (2330-631-5692).
TM 9-2330-234-15	Operator's, Organizational, Direct Support, and GS Maintenance Manual (Including Repair Parts and Special Tools List): Chassis, Trailer: 2-½ ton, 2-wheel. M454 (2330-709-5847).
TM 11-5840-287-12	Operator's, Organizational Maintenance Manual: Simulator, Radar Target Signal AN/TPA-7.
TM 11-5895-1012-10	Operator's Manual Technical Control Facility (General).
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).

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APPENDIX B
COMPONENTS OF END ITEM LIST

SECTION I. INTRODUCTION

B-1. Scope

This appendix lists integral components of and basic issue items for the AN/MPQ-4A to help you inventory items required for safe and efficient operation.

B-2. General

This Components of End Item List is divided into the following sections:

a. Section II. Integral Components of the End Item. These items, when assembled, comprise the AN/MPQ-4A and must accompany it whenever it is transferred or turned in. The illustrations will help you identify the items.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the AN/MPQ-4A in operation, to operate it and to perform emergency repairs. Although shipped separately packed they must accompany the AN/MPQ-4A during operation and whenever it is transferred between accountable officers. The illustrations will assist you with hard to identify items. This manual is your authority to requisition replacement BII, based on TOE/MTOE authorization of the end item.

B-3. Explanation of Columns

a. Illustration. This column is divided as follows:

(1) *Figure Number.* Indicates the figure number of the illustration on which the item is shown.

(2) *Item Number.* The number used to identify the item called out in illustration.

b. National Stock Number. Indicates the National stock number assigned to the item and which will be used for requisitioning.

c. Part Number. Indicates the primary number used by the manufacturer, which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards and inspection requirements to identify an end item or range of items.

d. Description. Indicates the Federal item name and if required, a minimum description to identify the end item.

e. Location. The physical location of each item listed is given in this column. The lists are designed to inventory all items in one area of the major item before moving on to an adjacent item.

f. Usable on Code. Not applicable.

g. Quantity Required (Qty Reqd). This column lists the quantity of each item required for a complete major item.

h. Quantity. This column is left blank for use during an inventory. Under the Rcv'd column, list the quantity you actually receive on your major item. The Date columns are for use when you inventory the major item at a later date, such as for shipment to another site.

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SECTION II INTEGRAL COMPONENTS OF END ITEM

(1) ILLUSTRATION (A) FIG NO.	(1) ILLUSTRATION (B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NUMBER FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
1-2		5840-00-543-0537	OA-1258/MPQ-4A (80058)	Antenna Group including:			1				
1-2		5840-00-574-7526	AS-835/MPQ-4A (80058)	Antenna			1				
1-5		5840-00-588-0854	FH-111/MPQ-4A (80058)	Cavity, Tuned FR			1				
1-1		5840-00-574-2496	MX-2219/MPQ-4A (80058)	Circular Polarizer			1				
1-6		5985-00-537-4386	CU-399/MPQ-4A (80058)	Coupler, Directional			1				
4-4		5840-00-583-0305	572D153G1 (24454)	Mount, Telescope, Assembly			1				
1-2		5840-00-543-0543	AB-486/MPQ-4A (80058)	Pedistal, Antenna			1				
1-2		5840-00-543-0535	AT-634/MPQ-4A (80058)	Reflector, Antenna			1				
4-4		1240-00-593-6415	7659889 (19200)	Telescope, Elbow Azimuth:			1				
1-2		4440-00-896-5951	HD-264/MPQ-4A or HD-264A/MPQ-4A (24446)	Dehydrator, Desiccant, Electric			1				
1-2		5840-00543-0538	OA-1256/MPQ-4A (80058)	Control-Indicator Group including:			1				
1-2		5840-00-586-7738	CP-319/MPQ-4A (80058)	Computer, Radar Data			1				
1-2		5840-00-543-0536	C-2014/MPQ-4A (80058)	Control-Power Supply			1				
1-2		5840-00-543-0544	IP-575/MPQ-4A (80058)	Indicator, Azimuth and Range			1				
1-2		5840-00-586-7739	OA-1257/MPQ-4A (80058)	Receiver-Tranmitter Group including:			1				
1-2		5840-00-543-0545	AM-1538/MPQ-4A (80058)	Amplifier, Intermidiate Frequency			1				
1-4		5840-00-543-0546	AM-1537/MPQ-4A (80058)	Amplifier, Trigger Pulse			1				
1-2		5840-00-557-6255	C-2102/MPQ-4A (80058)	Control-Monitor			1				
1-3		5840-00-543-0665	C-2015/MPQ-4A (80058)	Control, Receiver			1				
1-3		5840-00-543-0542	C-2016/MPQ-4A (80058)	Control, Receiver			1				
1-3		5840-00-543-0534	CU-476/MPQ-4A (80058)	Duplexer			1				
1-2		5840-00-542-6253	PP-1588/MPQ-4A (80058)	Power Supply			1				
2-2		2330-00-709-5847	8736308 (19209)	Chassis, Trailer: 2-1/2-ton, 2-wheel M454 (TM 9-2330-234-15)			1				
2-4		5840-00-614-5218	SM-A-285239 (80063)	Seat, Equipment Operator			2				
1-8		5840-00-574-7527	MT-1798/MPQ-4A (80058)	Support, Operator's Seat			2				

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SECTION II INTEGRAL COMPONENTS OF END ITEM

(1) ILLUSTRATION (A) FIG NO.	(1) ILLUSTRATION (B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NUMBER FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	(8) QUANTITY DATE	(8) QUANTITY DATE	(8) QUANTITY DATE
1-6		5840-00-612-6861	SC-DL-332377 (80063)	Case, Accessories CY-2201/MPQ-4A			2				
		5840-00-614-5217	SM-C-286472 (80063)	Cover, Telescope:			1				
2-?		4210-00-270-4512	MIL-E-468, Type I (81349)	Extinguisher, Fire, Carbon Dioxide: 5 LB. Capacity			1				
		5120-00-223-9127	GGG-H-86, Type G Class II (81348)	Hammer, Hand: 3 LB.			1				
1-4		5975-00-877-6841	SM-B-285043 (80063)	Rod, Discharge			1				
2-8		5975-00-777-6781	MIL-R-11461 (81349)	Rod, Ground			1				
		7110-00-690-7271	A5759 (15814)	Seat Cover, Chair, Straight			2				
2-?		5840-00-893-2043	SM-C-285993 (80063)	Tarpaulin: Reflector and Scanner			1 *				
		5840-00-765-9615	SM-D-286470 (80063)	Tarpaulin Cover, Asimuth Counter			1				
		6625-00-643-1640	999STMIN (01009)	Adapter, Test: Electron Tube Test Socket			1				
		6625-00-260-1441	282-1041P1 49956	Adapter, Test: Electron Tube Test Socket			1				
		4930-00-250-8038	M39018-03-0672 (81349)	Grease Gun, Hand			1				
		5120-00-293-2243	SM-B-331830 (80063)	Key, Socket Head Screw: Non-Magnetic Type: Dual 3/32 IN. and 5/32 IN. W.			1				
		5120-00-264-3795	GGG-W-631, Type I, Class 1 (81348)	Wrench, Open End, Adjustable TL-111: 0 to 3/4 IN., 6 IN. LG.			1				
		5120-00-449-8083	GGG-W-631, Type I, Class 1 (81348)	Wrench, Open End, Adjustable TL-112: 0 to 1 1/2 IN., 10 IN. LG.			1				
		5120-00-224-2596	GGG-W-00-657, Type III, Class 3 (81348)	Wrench, Socket: 5/16 IN. Hex			1				
		5120-00-222-1499	GGG-W-00657, Type I, Class 3 (81348)	Wrench, Socket: 7/16 IN. Hex			1				
		5120-00-277-9075	GGG-W-665, Type I, Class 1	Wrench, Spanner: ADJ. Hook Type: 1 1/4 IN. to 3 IN. DIA.			1				
		5120-00-277-9076	GGG-W-665, Type I, Class 1 (81348)	Wrench, Spanner: ADJ. Hook Type: 2 IN. to 4 3/4 IN. DIA.			1				
				Technical Manual TM 11-5840-208-10			1				
				Lubrication Order 6011-5840-208-20			1				

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(1) ILLUSTRATION (A) FIG NO.	(1) ILLUSTRATION (B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NUMBER FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
1-7		5840-00-591-4743	MT-1733/MPQ-4A (80058)	Stand, Control-Indicator			1				
1-8		8130-00-281-8183	RC-413/MPQ-4A (80058)	Reel, Cable			1				
1-8		8130-00-292-1109	RC-419/MPQ-4A (80058)	Reel, Cable			1				

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(1) ILLUSTRATION (A) FIG NO.	(1) ILLUSTRATION (B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NUMBER FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	(8) QUANTITY DATE	(8) QUANTITY DATE	(8) QUANTITY DATE
		5120-00-614-6467	SMB122070 (80063)	Wrench, Tee Handle (Compartment Catch Release Tool)			1				
2-14		5995-00-542-6664	CX-2771/U (80058)	Cable Assembly, Special Purpose, Electrical (W701)			1				
2-14		5995-00-542-6257	CX-3896/U (80058)	Cable Assembly, Special Purpose, Electrical (W702)			1				
1-8		5995-00-542-6248	CX-4103/U (80058)	Cable Assembly, Special Purpose, Electrical (W703)			1				
2-14		5995-00-578-6889	CX-3904/U (80058)	Cable Assembly, Power, Electrical (W704, W708)			2				
2-14		5995-00-280-3416	CX-783A/U (80058)	Cable Assembly, Radio Frequency (W705, W706, W707, and W741)			4				
2-14		5995-00-578-6891	CX-3902/U (80058)	Cable Assembly, Power, Electrical (W709)			1				
2-14		5995-00-542-6251	CX-3905/U (80058)	Cable Assembly, Power, Electrical (W710)			1				
2-14		5995-00-542-6414	CX-4062/U (80058)	Cable Assembly, Power, Electrical (W716)			1				
2-14		5995-00-578-6891	CX-3902/U (80058)	Cable Assembly, Power, Electrical (W717)			1				
2-14		5995-00-542-6415	CX-4104/U (80058)	Cable Assembly, Power, Electrical (W718)			1				
2-14		5995-00-542-6416	CX-4016/U (80058)	Cable Assembly, Power, Electrical (W719)			1				
2-14		5995-00-553-8193	CX-4015/U (80058)	Cable Assembly, Power, Electrical (W720)			1				
2-14		5995-00-542-6413	CX-4010/U (80058)	Cable Assembly, Power, Electrical (W721)			1				
2-14		5995-00-553-8192	CX-3901/U (80058)	Cable Assembly, Power, Electrical (W722)			1				
2-14		5995-00-553-8195	CX-4012/U (80058)	Cable Assembly, Power, Electrical (W723)			1				
2-14		5995-00-542-6451	CX-4009/U (80058)	Cable Assembly, Power, Electrical (W724)			1				
2-14		5995-00-553-7712	CX-4013/U (80058)	Cable Assembly, Power, Electrical (W725)			1				
2-14		5995-00-542-6421	CX-4011/U (80058)	Cable Assembly, Power, Electrical (W726)			1				
2-14		5995-00-542-6422	CX-4014/U (80058)	Cable Assembly, Power, Electrical (W728, W729)			2				

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SECTION III BASIC ISSUE ITEMS

(1) ILLUSTRATION (A) FIG NO.	(1) ILLUSTRATION (B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NUMBER FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	(8) QUANTITY DATE	(8) QUANTITY DATE	(8) QUANTITY DATE
		4440-00-555-8324	M-18622D (90486)	Desiccant Container, Dehumidifier			2				
		5960-00-262-3763	MIL type OB2WA (81349)	Electron Tube			1				
		5960-00-262-1703	MIL type 5R4WGA (81349)	Electron Tube			4				
		5960-00-166-7667	MIL type 6AH6 (81349)	Electron Tube			1				
		5960-00-262-0152	MIL type 6AU6WA (81349)	Electron Tube			5				
		5960-00-262-0161	MIL type 6L6WGB (81349)	Electron Tube			1				
		5960-00-262-0167	MIL type 12AT7WA (81349)	Electron Tube			6				
		5960-00-296-2698	Bomac Labs cat No. BL-35 (50450)	Electron Tube			1				
		5960-00-592-8532	Varian Assoc. type No. VA94B (88236)	Electron Tube			1				
		5960-00-636-2164	Raytheon type No. QK-324 (49956)	Electron Tube			1				
		5960-00-262-0198	MIL type 577 (81349)	Electron Tube			2				
		5960-00-538-6581	CRT; Dumont Labs type No. K1413P7 (30669)	Electron Tube			1				
		5960-00-262-1357	MIL type 5654/ 6AK5W (81349)	Electron Tube			3				
		5960-00-193-5136	MIL type 5687 (81349)	Electron Tube			2				
		5960-00-237-6917	MIL type 5725/ 6AS6W (81349)	Electron Tube			2				
		5960-00-262-0185	MIL type 5726/ 6AL5W (81349)	Electron Tube			3				
		5960-00-264-2089	MIL type 5749/ 6BA6W (81349)	Electron Tube			1				
		5960-00-193-5145	MIL type 5751 (81349)	Electron Tube			3				
		5960-00-262-0210	GE type No. 5814A (93199)	Electron Tube			1				
		5960-00-247-8748	MIL type 5842 (81349)	Electron Tube			1				
		5960-00-248-3058	MIL type 5933 (81349)	Electron Tube			2				
		5960-00-592-2064	GE type No. 5949A (93199)	Electron Tube			1				
		5960-00-669-6861	MIL type 6005/ 6AQ5W (81349)	Electron Tube			2				

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(1) ILLUSTRATION (A) FIG NO.	(1) ILLUSTRATION (B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NUMBER FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	(8) QUANTITY DATE	(8) QUANTITY DATE	(8) QUANTITY DATE
		5960-00-543-1001	MIL type 6080WA (81349)	Electron Tube			1				
		5960-00-262-1355	MIL type 6130 (81349)	Electron Tube			1				
		5960-00-608-0232	Chatham cat No. 6336A (04814)	Electron Tube			1				
		5920-00-229-1312	MIL type F02GR062A (81349)	Fuse, Cartridge, 0.062 amp			5				
		5920-00-356-2188	MIL type F02GR125A (81349)	Fuse, Cartridge, 0.125 amp			5				
		5920-00-043-2641	MIL type F02GR250A (81349)	Fuse, Cartridge, 0.250 amp			5				
		5920-00-549-0031	GE No. 78X483 (93199)	Fuse, Cartridge, 1/4 amp			5				
		5920-00-356-2193	MIL type F02GR500A (81349)	Fuse, Cartridge, 0.5 amp			5				
		5920-00-280-3547	MIL type F03GR500A (81349)	Fuse, Cartridge, 5 amp			4				
		5920-00-280-5002	MIL type F03G10R0A (81349)	Fuse, Cartridge, 10 amp			6				
		5920-00-284-9219	MIL type F03D20R0B (81349)	Fuse, Cartridge, 20 amp			3				
		5920-00-229-1343	Buss type No. ABU-20 amp	Fuse, Cartridge, 20 amp			5				
		6240-00-223-9100	GE No. ME-51 (93199)	Lamp, Glow, 1/25 v min			3				
		6240-00-157-2887	GE No. 44 (93199)	Lamp, Incandescent, 6-8 v			4				
		6240-00-155-8706	GE No. 47 (93199)	Lamp, Incandescent, 6-8 v			2				
		6240-00-260-0399	GE No. 10C7/DC (93199)	Lamp, Incandescent. 115-125 v			1				
		6240-00-019-3145	GE No. 325 (93199)	Lamp, Incandescent, 3 v			1				
		6240-00-019-0877	GE No. 1251 (93199)	Lamp, Incandescent, 24-28 v			4				
		6240-00-044-6914	GE No. 1683 (93199)	Lamp, Incandescent, 24-28 v			1				
		5945-00-642-5544	SMC-110079P1 (80063)	Relay, Armature			1				
		5945-00-577-0422	SMC-110079P2 (80063)	Relay, Armature			1				
		5945-00-646-5745	GE No. C7709993P3 (93199)	Relay, Armature			1				
		5945-00-501-8715	GE part/dwg No. C7713323P4 (93199)	Relay, Thermal, Spst			1				
		5945-00-577-0439	GE part/dwg No. C7713323P5 (93199)	Relay, Thermal, Spst			1				
		5961-00-993-6710	Microwave Assoc type No. 1N78C (96341)	Semi-conductor Device, Diode			6				
		5960-00-272-9085	MIL type 1N78 (81349)	Semi-conductor Device, Diode			1				

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APPENDIX C
ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

C-1. Scope

This appendix lists additional items you are authorized for the support of the AN/MPQ-4A.

C-2. General

Section II. identifies items that do not have to accompany the AN/MPQ-4A and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TOE or JTA.

C-3. Explanation of Listing

National stock numbers, descriptions and quantities are provided to help you identify and request the additional items you require to support this equipment.

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SECTION II ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION PART NUMBER AND FSCM USABLE ON CODE	(3) UNIT OF MEAS	(4) QTY AUTH
6115-00-056-8421	Generator Set, PU-304C/MPQ-4A 80058	EA	1
	Consisting of:		
6115-00-548-1379	Generator Set, Gasoline Engine PU-107A/U 80058	EA	1
2330-00-835-8613	Trailer, Cargo M105A1 19207	EA	1

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APPENDIX D
EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

D-1. Scope

This appendix lists expendable supplies and materials you will need to operate and maintain the AN/MPQ-4A. 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 and is referenced in the narrative instructions to identify the material.

b. Column 2- Level. This column identifies the lowest level of maintenance that requires the listed item.

C — Operator/Crew

c. Column 3- National Stock Number. 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 part number followed by the Federal Supply Code for Manufacturer (FSCM), if applicable.

e. Column 5 - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by an abbreviation (e.g., ea, in., pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

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SECTION II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NO.	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION PART NO. AND FSCM	(5) UNIT OF MEAS
1	C	8020-00-721-9657	Brush, Paint; Flat, 1-1/2 in. wd. FED-SPEC H-B-451 81348	EA
2	C	8305-00-205-3496	Cloth, Cotton; Cheesecloth CCCC 440 81348	Yard
3	C	8010-00-145-0147	Enamel, Semigloss; Olive-drab (X24087) 81348	Gallon
4	C	9150-00-190-0906	Grease, Automotive and Artillery (GAA) MIL-G-10924; 81349	Pound
5	C	3455-01-007-5498	Insulating Compound; Electrical, Silicone Coating No. SL-1 81470	Pint (Pound)
6	C	9150-00-985-7031	Oil, Lubricating, Aircraft Turbine Engine; MIL-O-6081A Grade 1010; 81349	Quart
7	C	9150-00-823-8068	Oil, Lubricating, Gear; P61 Fluid; 71984	Quart
8	C	9150-00-281-9438	Oil, Lubricating, General Purpose; MIL-L-7870; 81349	Quart
9	C	9150-00-027-8533	Oil, Lubricating, General Purpose; FED-VV-L-800 or 820; 81348	Quart
10	C	5350-00-264-3485	Paper, Abrasive; Flint, Closed Coating, Extra Fine Grade FED-SPEC-PP-105; 81348	Pkg (Roll)
11	C	7510-00-164-8917	Pencil, White; FED-SPEC-SS-P-201; 81348	EA
12	C	9390-00-093-4788	Tape, Pressure, Sensitive; Adhesive, Cloth Back, Oil and Water Resistant L-S-300; 81348	Roll (Pkg)
13	C	6850-00-597-9765	Cleaning Compound; 81348	Gallon
14	C	6850-00-105-3084	Trichlorotrifluoroethane; Freon, Type TF; 81348	Can (16 oz)

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS



SOMETHING WRONG WITH THIS MANUAL?

THEN. . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM, TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)
Commander
Stateside Army Depot
ATTN: AMSTA-US
Stateside, N.J. 07703

DATE 10 July 1975

PUBLICATION NUMBER	DATE	TITLE
TM 11-5840-340-12	23 Jan 74	Radar Set AN/[illegible]-76

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
2-25	2-28			Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°. REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of [illegible] knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.
3-10	3-3		3-1	Item 5, Function column. Change "2 db" to "3db." REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.
5-6	5-8			Add new step f.1 to read, "Replace cover plate removed in step e.1, above." REASON: To replace the cover plate.
		F03		Zone C 3. On J1-2, change "+24 VDC to "+5 VDC." REASON: This is the output line of the 5 VDC power supply. + 24 VDC is the input voltage.

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
SSG I. M. DeSpiritof 999-1776

SIGN HERE: SSG I. M. DeSpiritof

DA FORM 1 AUG 74 2028-2 (TEST)

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR MANUAL "FIND," MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

HISA 1686-75

TEAR ALONG DOTTED LINE

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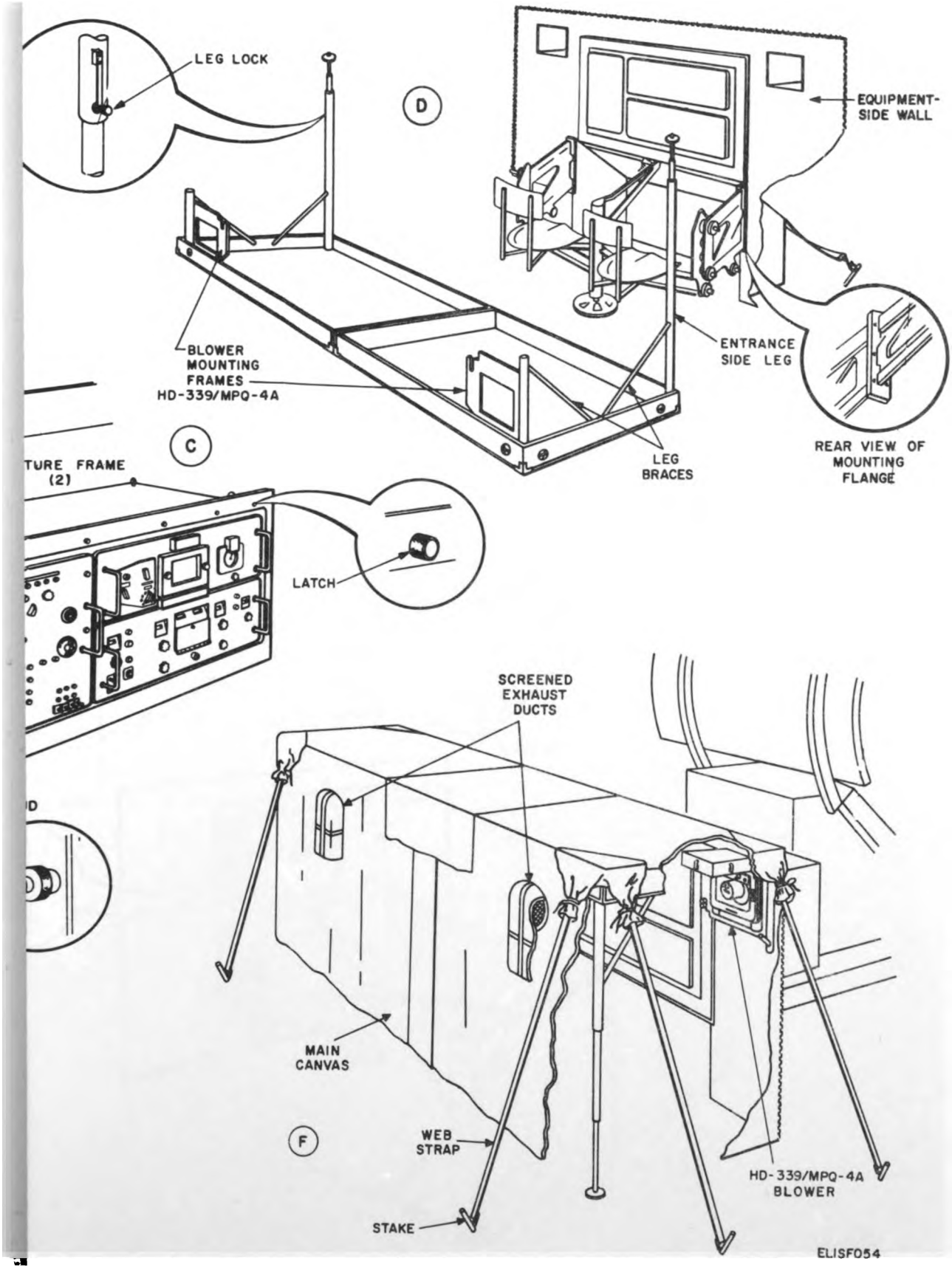

Figure FO-1. Assembly of Electrical Equipment Shelter S-134A/MPQ-4A.

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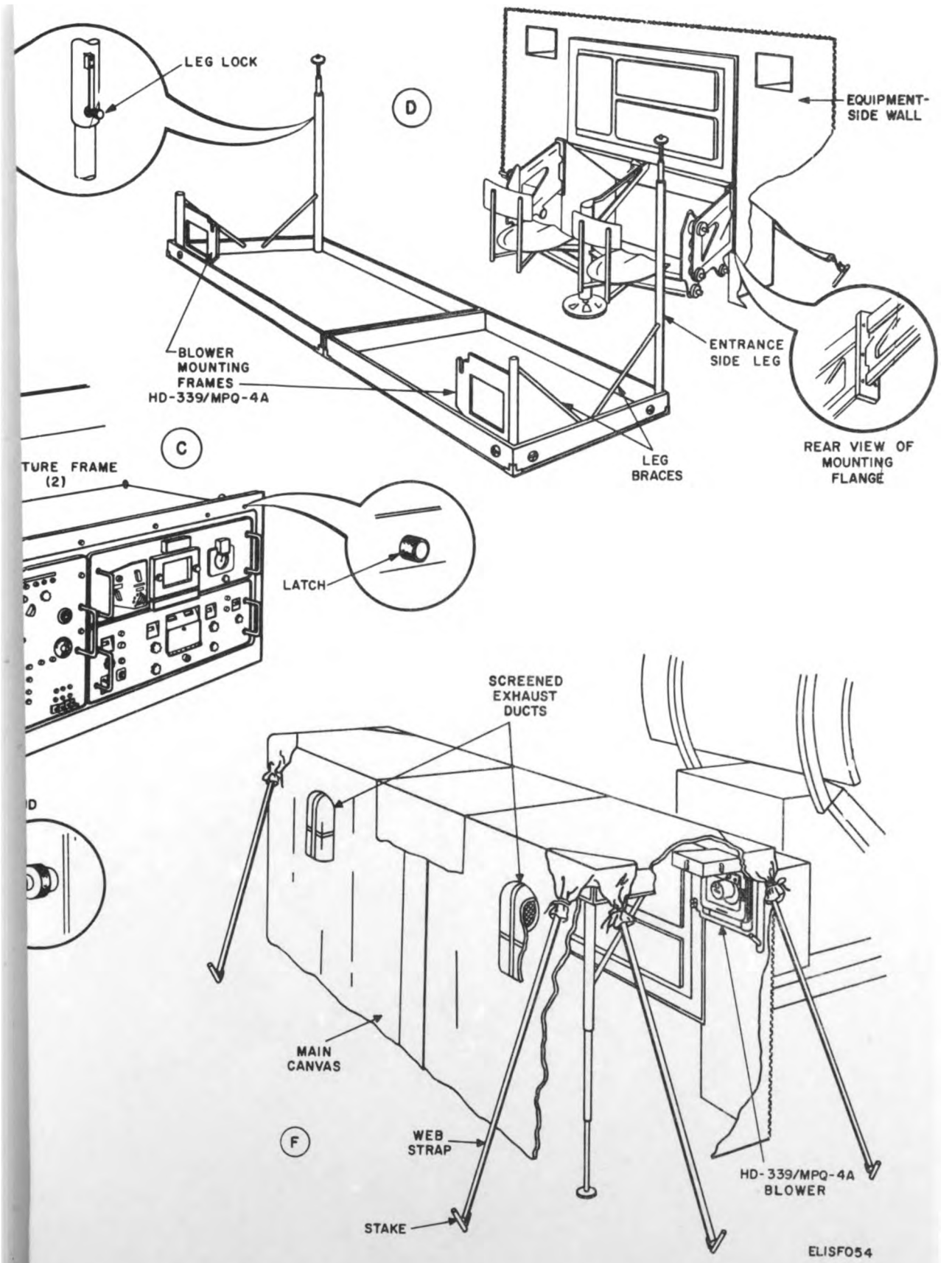

Figure FO-1. Assembly of Electrical Equipment Shelter S-134A/MPQ-4A.

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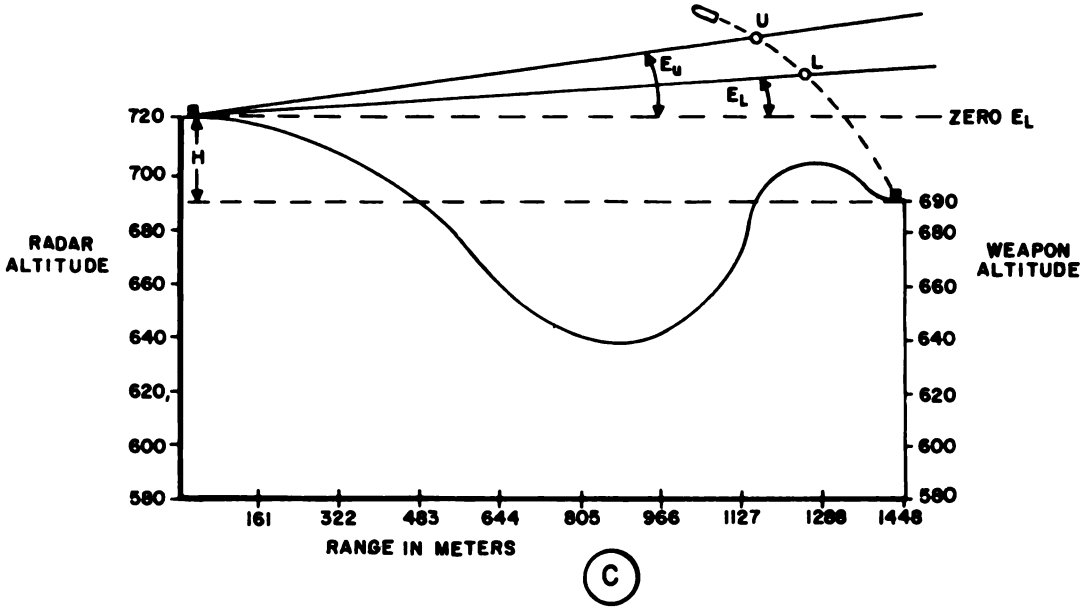

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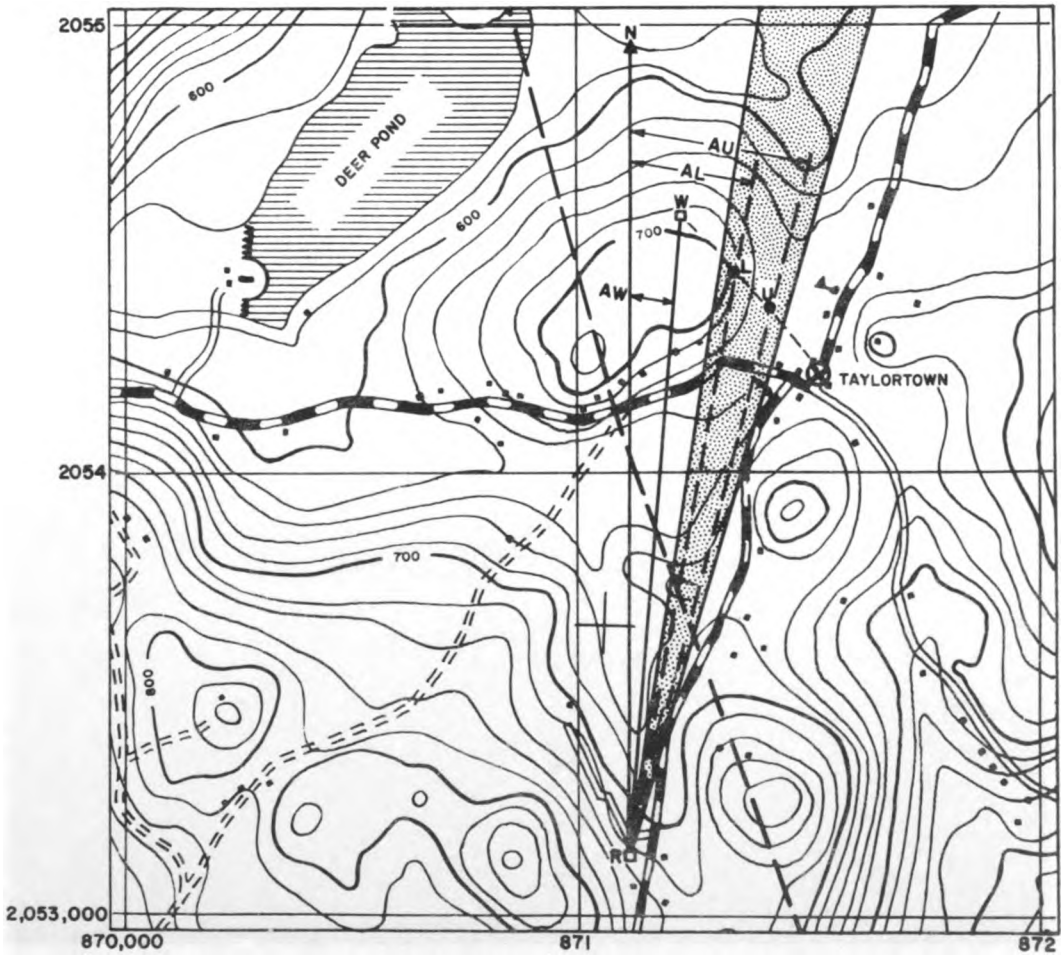

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Figure FO-2. Weapon location geometry.

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