TM 11-5825-231-10

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR'S MANUAL

DIRECTION FINDER SET AN/TRD-15



HEADQUARTERS, DEPARTMENT OF THE ARMY

APRIL 1966

WARNING

Be careful when working on the 115-volt ac line connections. SERIOUS INJURY or DEATH may result from contact with these terminals.

DON'T TAKE CHANCES!

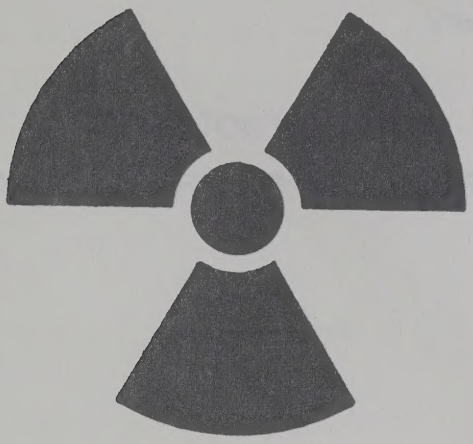
EXTREMELY DANGEROUS VOLTAGES EXIST IN THE FOLLOWING UNITS OF DIRECTION FINDER SET AN/TRD-15:

INDICATOR, AZIMUTH IP-669/TRD ----------4,000 volts

OSCILLOSCOPE 120B ----------2,500 volts

WARNING

RADIATION HAZARD



STD-RW-2

Co	60
Ni	63
Ra	226

Tube types OB2WA used in this equipment contains radioactive material (para 1-5*e* and *j*). These tubes are potentially hazardous when broken; see qualified medical personnel and the Safety Director if you are exposed to or cut by broken tubes.

Never place radioactive tubes in your pocket.

Use extreme care not to break radioactive tubes while handling them.

Never remove radioactive tubes from cartons until ready to use them.

Refer to paragraph 5-1 on handling, storage, and disposal of radioactive material.

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TECHNICAL MANUAL
No. 11-5825-231-10

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *20 April 1966*

OPERATOR'S MANUAL
DIRECTION FINDER SET AN/TRD-15

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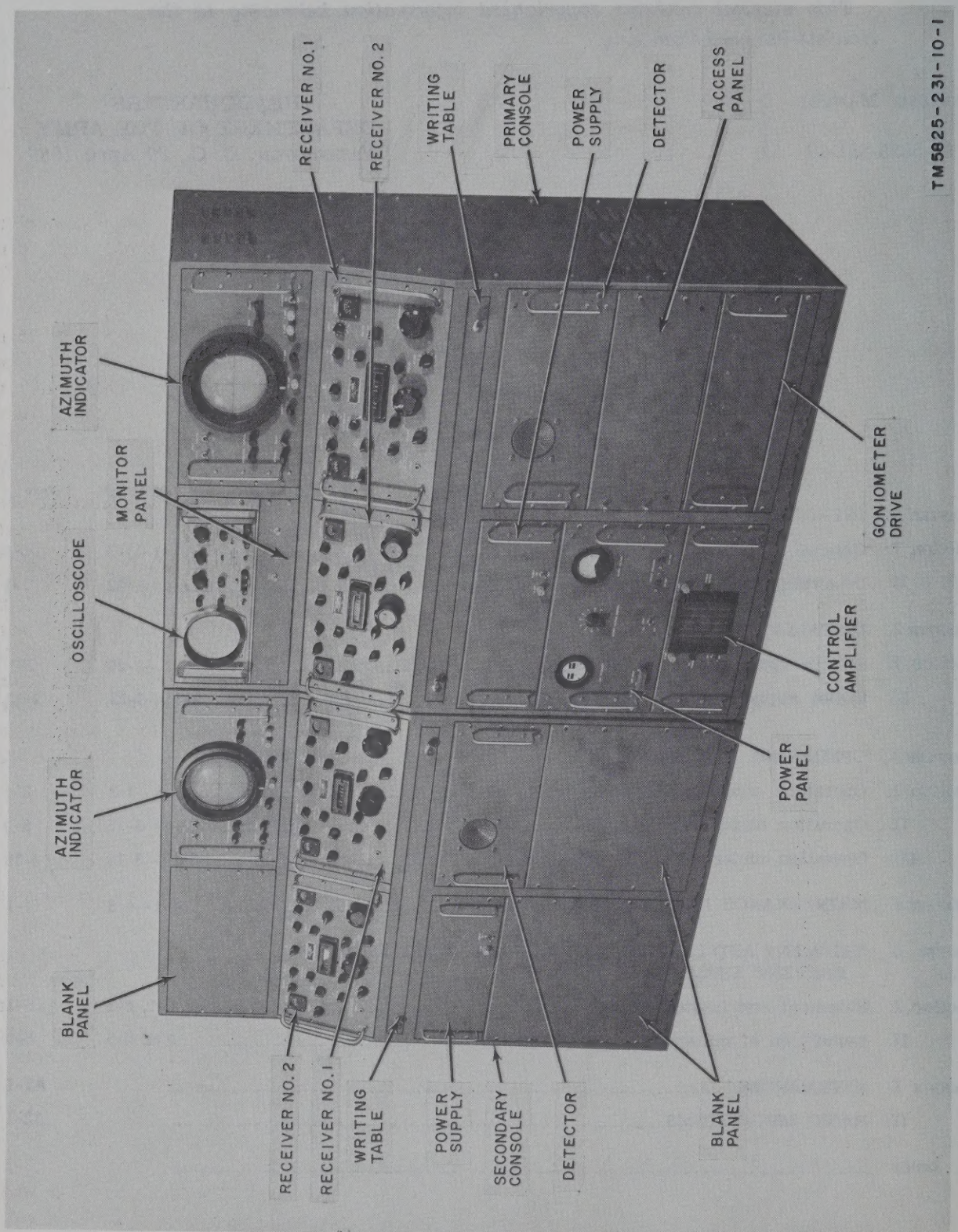


Figure 1-1. Direction Finder Set AN/TRD-15, operating consoles.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope

a. This manual describes Direction Finder Set AN/TRD-15 (fig. 1-1) and covers its installation, operation, and operator's maintenance. It includes operation under usual and unusual conditions, cleaning and inspection of the equipment, and replacement of parts available to operator's maintenance.

b. The maintenance allocation chart (MAC) is in TM 11-5825-231-25.

1-2. Index of Publications

Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment. DA Pam 310-4 is an index of current technical manuals, technical bulletins, supply manuals (types 7, 8, and 9), supply bulletins, lubrication orders, and modification work orders that are available through publications supply channels. The index lists the individual parts (-10, -20, -35P, etc.) and the latest changes to and revisions of each equipment publication.

1-3. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions in TM 38-750.

b. Report of Damaged or Improper Shipment. Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700-58 (Army), NAVSANDA Publication 378 (Navy), and AFR 71-4 (Air Force).

c. Reporting of Equipment Manual Improvements. The direct reporting of errors, omissions, and recommendations for improving this manual by the individual user is authorized and encouraged. DA Form 2028 (Recommended Changes to DA Publications) will be used for reporting these improvements. This form will be completed using pencil, pen, or typewriter and forwarded direct to Commanding General, U. S. Army Electronics Command, ATTN: AMSEL-MR-(NMP)-MA, Fort Monmouth, N. J. 07703.

Section II. DESCRIPTION AND DATA

1-4. Purpose and Use

a. Direction Finder Set AN/TRD-15 is a dual console radio direction finder which operates in the frequency range of 1.5 to 20 megacycles (mc).

b. The primary function of the system is to obtain hearing information of communications signals picked up by the antenna array. This information is displayed on a continuously sensed cathod ray tube. Functionally, the two consoles are identical and can be used for direction finding on different signals simultaneously. The No. 1 receiver in each console is always required for direction finding. If the signal is frequently modulated, both receivers are required.

c. Signal monitoring can be done with any one of four receivers. The No. 1 receiver can use either antenna for monitoring and has a speaker for listening. The No. 2 receiver uses the monitor antenna and requires a headset for listening. Simultaneous direction finding and monitoring can be accomplished with either console, provided the signal is not frequency modulated.

d. The block diagram of figure 1-2 illustrates the usage of the AN/TRD-15. As shown, the primary console is receiving an amplitude-

modulated (am) signal and the secondary console a frequency modulated (fm) signal.

e. The primary and secondary consoles differ physically in that different alternating current (ac) input panels are used and that the following components are contained in the primary console only.

(1) Oscilloscope 120B (Hewlett-Packard).

(2) Amplifier, Electronic Control AM-3545/TRD.

(3) Drive, Goniometer-Rotary Coupler TG-126/TRD.

(4) Antenna input panel.

(5) Panel, Power Distribution SB-1747/TRD.

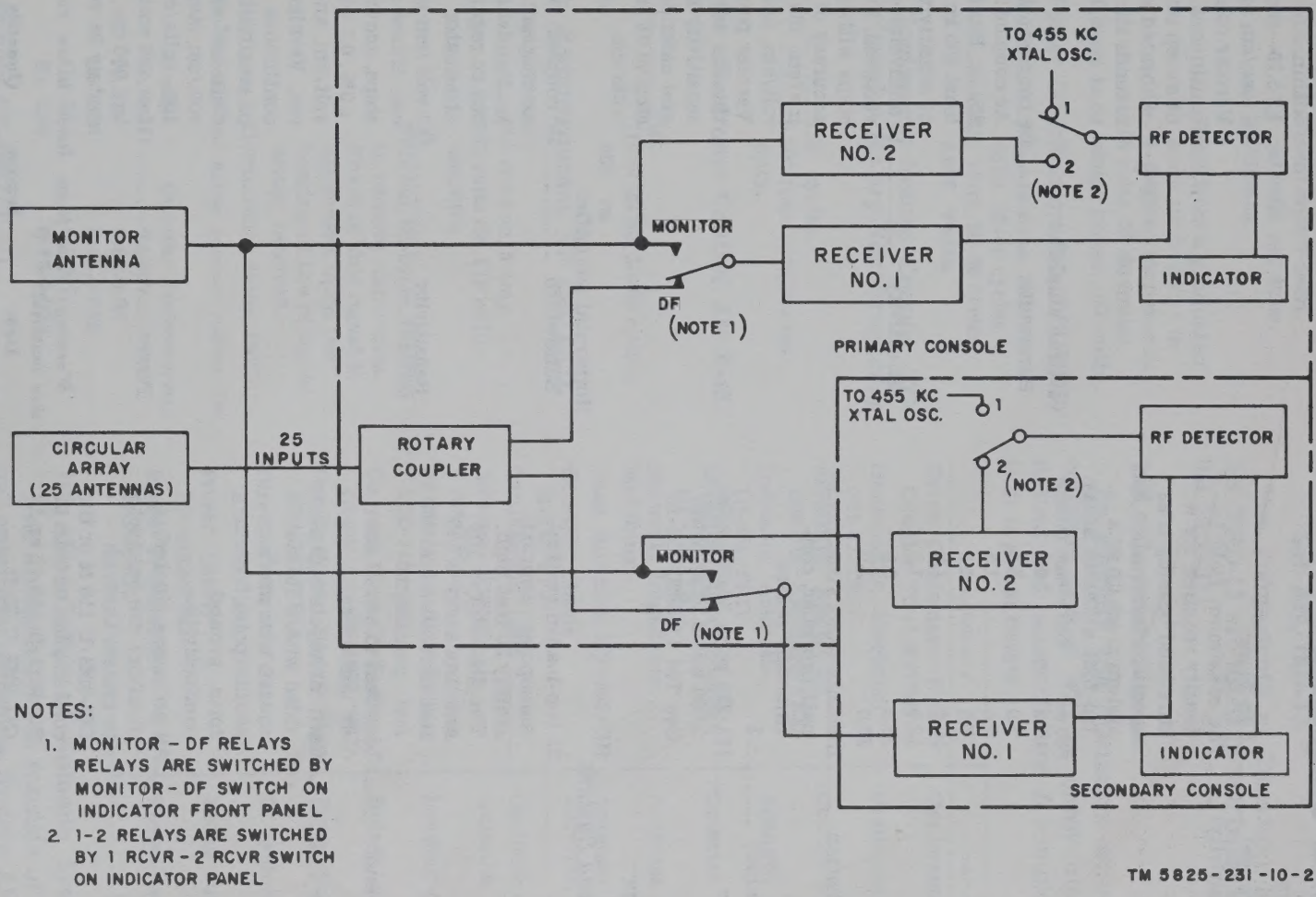


Figure 1-2. Direction Finder Set AN/TRD-15, block diagram showing typical operation.

1-5. Technical Characteristics

a. System.

Frequency range[1] ------ 1.5 to 20 mc.

Bearing sensitivity[1] ---- The maximum field intensity required for a threshold bearing is as specified below when the system is set up as a 150-foot antenna array.

Freq mc	*Field strength uv/meter*
1.5	9.0
3.0	3.5
5.0	1.5
7.0	1.5
10.0	1.0
12.0	1.5
15.0	3.0
20.0	3.0

Bearing indiation ----- Instantaneous visual, one-half propeller, continuously sensed.

Bearing accuracy ------ ±2°.

Input power ---------- 115/230 volts, 50/60 cycles, 2,000 watts total power. See TM 11-5820-358-10

b. Receiver.

c. Antenna System.

Df antenna ---------- 25 top-loaded vertical monopoles approximately 30 feet high. The diameter of the antenna array is 150 feet minimum and 300 feet maximum.

Monitor antenna ------ Identical to one of the df antennas.

Counterpoise ---------- Each monopole is provided with a 10-foot square wire mesh counterpoise for uniform ground conductivity.

Cables ---------- All antennas (including monitor) are connected to system through CG-92G/U 110 ft or the combination of both the CG-92G/U 110 ft and CG-92G/U 75 ft.

d. Oscilloscope 120B.

Sweep range ---------- One usec/centimeter (cm) to at least 0.4 sec/cm. Fifteen calibrated sweeps accurate to within ±5%, in a 1,2,5,10—sequence, from 5 usec/cm to 200ms/cm. Vernier control permits continuous adjustment of sweep time between calibrated steps, and extends the 200 ms/cm to at least 0.5 sec/cm.

Vertical amplifier:

Bandwidth ---------- Dc coupled: dc to 450 kc. Ac coupled: 2 cps to 450 kc. Bandwidth is at least 450 kc regardless of sensitivity setting.

Sensitivity ---------- 10 millivolts/cm to 100 volts°cm. Four calibrated steps with attenuator accuracy of ±3%, 10 mv/cm, 100 mv/cm, 1 volt/cm, and 10 volts/cm. Vernier permits continuous adjustment of sensitivity between steps, and extends 10-volt/cm step to at least 100 volts/cm.

Horizontal amplifier:

Bandwidth ---------- Dc coupled: dc to 300 kc. Ac coupled: 2 cps to 300 kc. Bandwidth is at least 300 kc regardless of attenuator setting.

Sensitivity ---------- O.1 volt/cm to 100 volts/cm. Three calibrated steps, accurate within ±5%, 0.1 volt/cm, 1 volt/cm, and 10 volts/cm. Vernier permits continuous adjustment of sensitivity between steps and extends 10-volt/cm step to at least 100 volts/cm.

Power ---------- 115 or 230 volts ±10%, 50 to 1,000 cps, approximately 95 watts.

Warning: **The items listed below contain radioactive material:**

Item	*Isotope*	*Quantity (microcuries)*
6627/0B2WA	Co 60	0.0067
6627/0B2WA	Ni 63	0.01-0.05
6627/0B2WA	Ra 226	0.45-0.055
5651WA	Co 60	0.0067
5651WA	Ra 226	0.45-0-055

1 The frequency range and sensitivity are dependent to some extent on the direction finder (df) antenna installation. See paragraph 2-7.

e. Indicator, Azimuth IP-669/TRD.

Display ---------- Visual on a 7-inch cathode ray tube.
Sense ---------- Automatic.
Tubes ---------- 11.
Bearing ---------- Read from a graduated scale (0° to 360°) in 1-degree increments.
Input power ---------- 115 volts, 50-60 cycles, single phase, 100 watts.

f. Panel, Power Distribution SB-1747/TRD.

Input requirements ---- 115 ±10 volts, 230 ±20 volts, 50-60 cycles.
Power output ---------- 115 volts, 50-60 cycles, 2,000 watts.

g. Drive, Goniometer-Rotary Coupler TG-126/TRD and Coupler, Rotary Radiofrequency CU-1096/TRD.

Frequency ---------- 180 cycles.
Speed ---------- 5,400 rpm, continuous duty.

h. Amplifier, Electronic Control AM-3545/TRD.

Transistors ---------- 10.
Input power requirements 115 volts ac, 50-60 cycles, 900 va.

i. Detector, Radiofrequency RF-159/TRD.

Input power requirements:
Filament ---------- 6.4 volts ac, 5 amp.
B+ supply ---------- 250 volts dc, 175 milliamperes.
Tubes ---------- 18.
Output ---------- Filtered, 90-cycle, filtered to remove harmonics. Phase of this signal is dependent upon the bearing of the rf signal being received.
Rectifier ---------- Germanium diode, IN270.

Warning: The items listed below contain radioactive material:

Item	*Isotope*	*Quantity (microcuries)*
6627/0B2WA	Co 60	0.0067
6627/0B2WA	Ni 63	0.01-0.05
6627/0B2WA	Ra 226	0.45-0.055
5651WA	Co 60	0.0067
5651WA	Ra 226	0.45-0-055

j. Power Supply PP-4482/TRD.

Input power requirements 115 volts ac, 150 va.
Power output ---------- 6.4 volts ac, 6.2 amp; 250 volts dc; 200 milliamperes.
Tubes ---------- 4.

1-6. Components of Direction Finder Set AN/TRD-15

The components of Direction Finder Set AN/TRD-15 are listed in the basic issue items list (app II).

1-7. Common Names

To simplify the discussion which follows, common names will be substituted for full names and nomenclature. A complete tabulation is given below:

Nomenclature	Common Name
Drive, Goniometer-Rotary Coupler TG-126/TRD.	Goniometer drive.
Goniometer, Electrical GO-42/TRD.	Goniometer.
Amplifier, Electronic Control AM-3545/TRD.	Control amplifier.
Indicator, Azimuth IP-669/TRD.	Azimuth indicator.
Detector, Radiofrequency RF-159/TRD.	Detector.
Network, Impedance Matching	Antenna coupler.
Base, Antenna MT-865/GR	Antenna base.
Receiver, Radio R-725/URR	Receiver.
Oscilloscope 120B	Oscilloscope.
Antenna System AN/TRA-32	Antenna.
Antenna Loading Disk MX-1168/GR.	Loading disk.
Coupler, Rotary, Radio frequency CU-1096/TRD.	Rotary coupler.
Panel, Power Distribution SB-1747/TRD.	Power panel.
Direction Finder Set AN/TRD-15.	Df system.
Power supply PP-4482/TRD.	Power supply.
Radio Transmitter T-279/UR.	Target transmitter.

1-8. Description of Antenna System

The antenna system consists of 26 individual antennas (Antenna System AN/TRA-32). Each AN/TRA-32 consists of a vertical monopole antenna (Antenna Assembly AS-1882/GR) mounted on a base (Base, Antenna MT-865/GR) centered on a 10-foot square wire mesh (Counterpoise, Antenna Group MX-

4487/G) and supported by a set of guys (Guy Set OA-7908/G).

a. Antenna Assembly AS-1882/GR (fig. 1-3).

(1) Mast Section AT-445/GR is a ¾-inch diameter steel tube (⅛-inch wall thickness, painted finish) approximately 75 inches long. An internally threaded sleeve in the upper end of this section is used to attach the antenna loading disk. A locking lever at the lower end of this section is used to clamp the section to the section below.

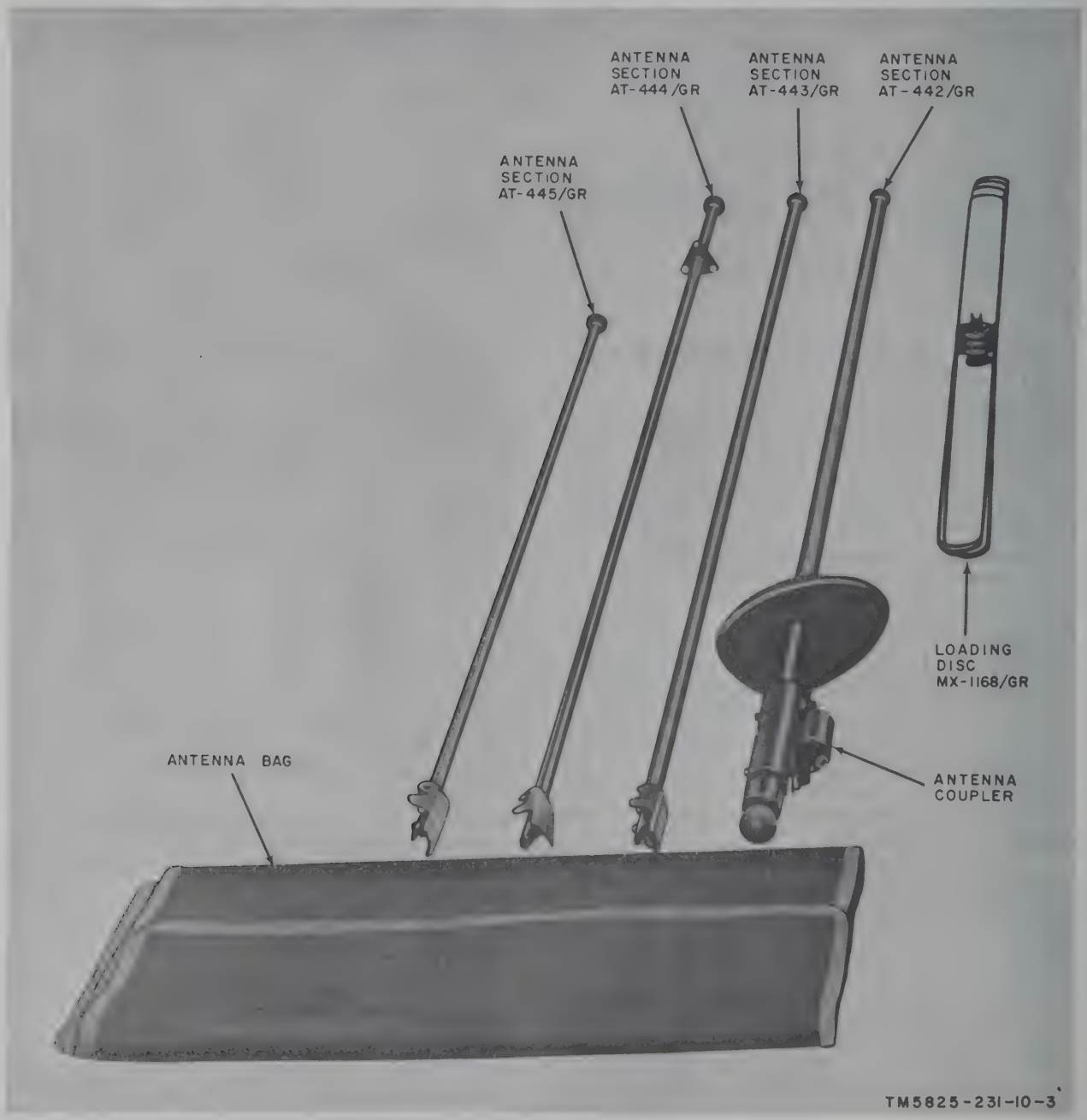


Figure 1-3. Antenna Assembly AS-1882/GR.

(2) Mast Section AT-444/GR is similar to Mast Section AT-445/GR except that it is a ⅞-inch diameter tube, approximately 100 inches long, and has a guy plate fastened to the upper end of the section. A locking lever at the lower end of this section is used to clamp the section to the section below.

(3) Mast Section AT-443/GR is similar to Mast Section AT-444/GR except that it is a 1-1/16-inch diameter steel tube, approximately 100 inches long, and has no guy plate. A locking lever at the lower end of the section is used to clamp the section to Mast Section AT-442/GR.

(4) Mast Section AT-442/GR is a 1¼-inch diameter steel tube (¼-inch wall thickness), approximately 100 inches long. The mast insulator is built into this mast section near its bottom. A ball at the lower end attaches the mast socket in the mast base. In the removable cylindrical antenna coupler, located on the side of the mast insulator above the ball, are two terminating resistors and an antenna cable connector. A rubber hood protects the cylindical housing.

(5) Antenna Loading Disk MX-1168/GR (3/16-inch outside diameter tubing, 0.028 inch wall thickness, painted finish) consists of four 5½-foot loops which are arranged symmetrically about a common axis. The loading disk is mounted to the top of Mast Section AT-445/GR. The purpose of the loading disk is to improve sensitivity and balance in the low frequency range. The loading disk may be collapsed for shipment or storage purposes.

b. Base, Antenna MT-865/GR (fig. 1-5). Base, Antenna MT-865/GR is a 2-foot square wooden platform with a socket for the mast ball. A cutaway portion of the socket allows the mast to be lowered to a horizontal position. In addition, there are three screws on the socket for adjusting the mast vertically. Two pins are provided, one to lock the ball in the socket, the other to keep the mast vertical. In the platform, four holes are provided through which oval-head steel stakes are driven to anchor the base to the ground. One guy plate for attaching the adjacent antenna guy is secured to the base.

c. Guy Set OA-7908/G (fig. 1-4). The guy set includes three 30-foot wire guys, four Guy Stakes GP-111/G, two ground straps, two locating pins, and five Stakes GP-2 for anchoring the antenna base.

d. Counterpoise, Antenna Group MX-4487/G (fig. 1-5). The antenna counterpoise system assures uniform ground conductivity for all 25 antennas of the quasi-doppler array and the monitor antenna. The system is composed of 26 individual sections, one for each antenna of the array. Each counterpoise is approximately 10 feet square when unfolded and consists of nine sections of mesh made of 12-gage, stranded, tinned copper wire. Each counterpoise has two wooden rods at either end, four in all. The nine sections are joined to one another by strips of tinned copper braid. The counterpoise is anchored to the ground by metal clamps which fit over the wooden rods. The counterpoise is grounded by driving the ground rod into the ground next to the connection provided on the counterpoise and connecting the two by means of the screw provided.

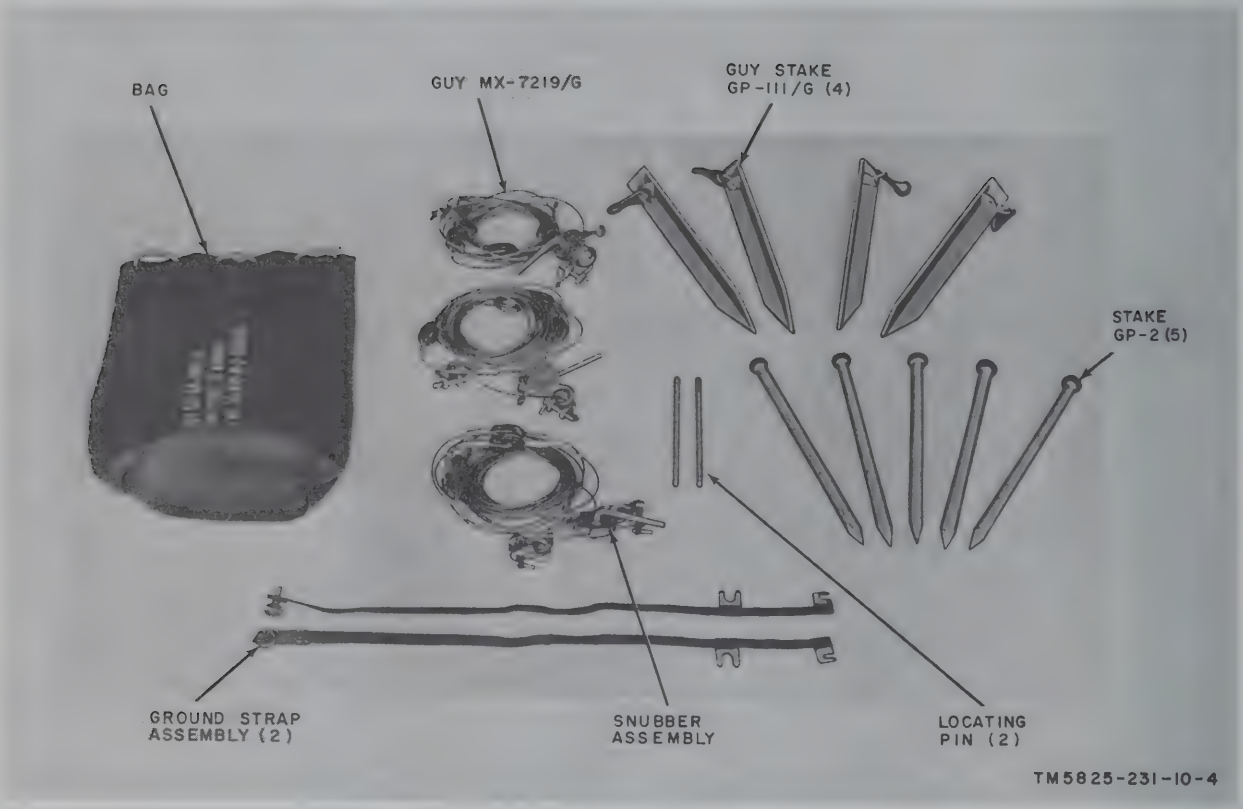


Figure 1-4. Guy Set OA-7908/G.

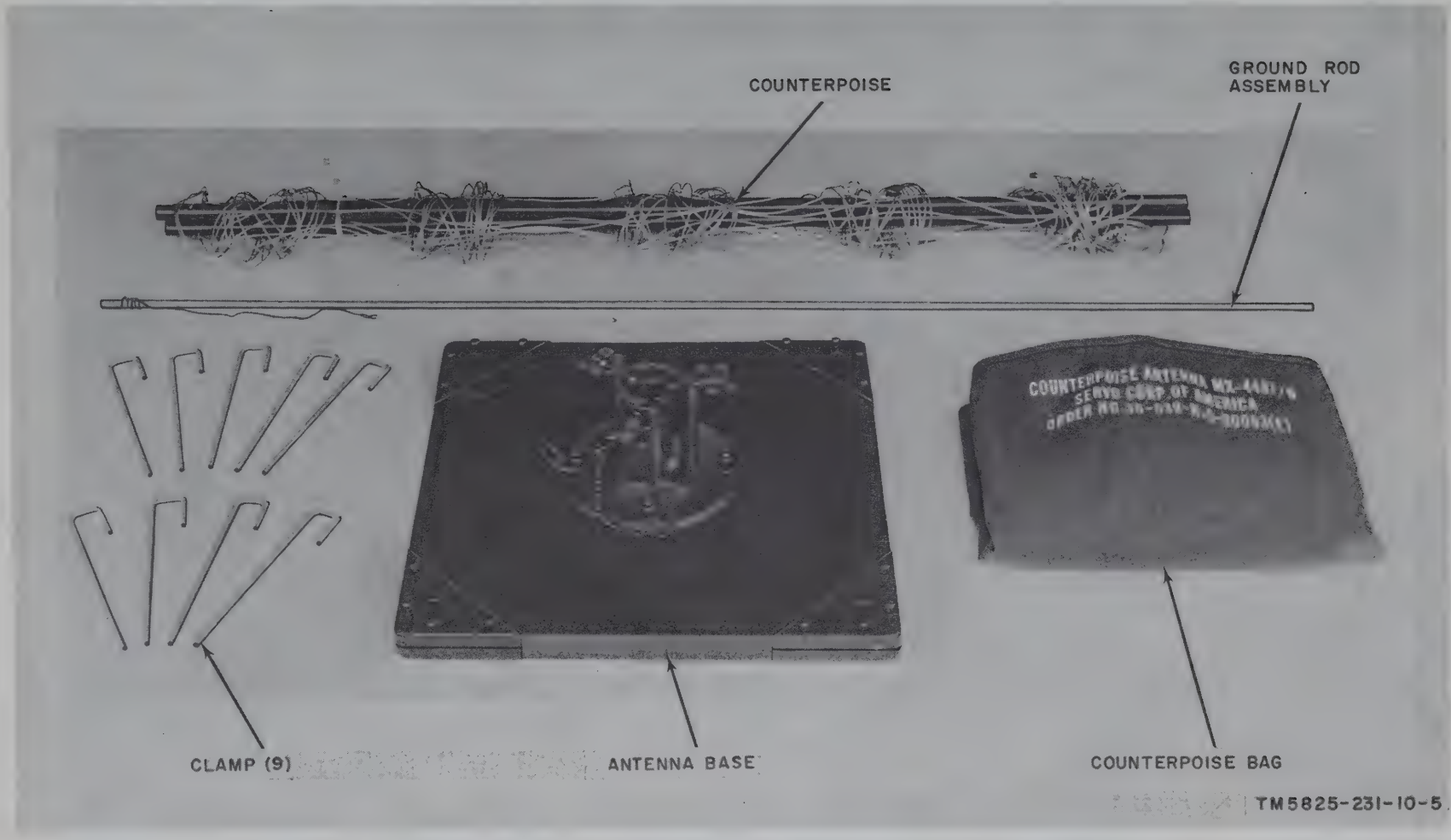


Figure 1-5. Base, Antenna MT-865/GR and Counterpoise, Antenna Group MX-4487/G.

1-9. Primary and Secondary Consoles

(fig. 1-1)

The consoles are functionally the same and each contains an azimuth indicator, a detector, a power supply, and two receivers mounted in identical cabinets. The receivers in each console are referred to as receiver No. 1 and receiver No. 2. In addition, the primary console contains the power panel, oscilloscope, goniometer drive, control amplifier, antenna input panel (fig. 1-12), ac primary panel, and monitor panel. The secondary console contains the ac secondary panel (fig. 1-13) which connects to the ac primary panel to obtain power.

1-10. Electrical Equipment Cabinet

a. The electrical equipment for each console is housed in two reinforced aluminum cabinets (fig. 1-1). The dimensions of the primary and secondary cabinets are identical, approximately 54 inches high, 40 inches wide, and 27 inches deep.

b. To permit access to all units for cable installation and servicing, two doors are provided on the rear of the cabinet; also, the two side panels have been designed for quick removal. Both the rear doors and the side panels are provided with air vents to increase cooling.

c. Each cabinet contains nine pairs of rails for mounting units of the df systems. All nine pairs are used in the primary cabinet; only five pairs are used in the secondary cabinet. Stops are located on each rail to prevent strain on the unit front panels.

d. Connections from the antenna system are made to the antenna input panel located on the back of the primary cabinet (fig. 1-12).

e. All units are installed from the front in the openings provided for this purpose.

f. Each cabinet contains a retractable drawer for use as a writing table for the operator. To remove the drawer, proceed as follows.

(1) Loosen the knob handles by rotating counterclockwise.

(2) Grasp the two knob handles and slide toward center of drawer; then pull out and up on the drawer at the same time (the drawer is stored in the cabinet at approx a 45° angle).

(3) Lower the drawer until it snaps into place.

1-11. Description of Goniometer Drive

The goniometer drive (fig. 1-6) includes a drive motor, a rotary coupler, a magnetic sync pulse generator, and two goniometers. The rotary coupler and one goniometer are driven directly. The other goniometer and the sync pulse generator are driven by a toothed pulley and timing belt arrangement. The assembly mounts on a chassis 12-1/16 inches wide by 17-3/16 inches long, with a standard rack mounting panel 19 inches wide by 10½ inches high. The goniometer drive is mounted at the bottom of the primary cabinet. Support rails enable the unit to be pulled forward to permit the goniometer or belt to be changed or orientation adjustments to be made.

a. Drive Assembly. The drive assembly consists of a motor, two goniometer housings, and a drive belt. The housings are of aluminum castings, primed and painted. The motor is a synchronous induction type which operates on 115 volts and 180 cycles and rotates at 5,400 revolutions per minute (rpm). It is approximately 3¼ inches in diameter and 7½ inches long.

b. Rotary Coupler. The rotary coupler is circular and includes 25 jacks equally spaced around its outer circumference. The antenna signals are coaxially coupled to the rotary coupler through the connectors located on the rear of the primary console. The impedance is 50 ohms input and 100 ohms output. The rotary coupler is 5¼ inches long by 6¼ inches in diameter. It is made of aluminum and is primed and painted.

c. Chassis. The goniometer drive chassis also contains the coaxial relays for switching the signal in the various modes of the df system.

d. Goniometers. The goniometers are cylindrical units which are end mounted and have one flat side which serves as a backplate for connectors. Mounted on the end of the rotor

shaft is a constant velocity flexible coupling. The primary goniometer coupling is attached with setscrews to the drive motor. The secondary goniometer coupling is attached with setscrews to a jackshaft. The drive motor shaft and jackshaft are fitted with toothed pulleys. The drive belt is a timing belt which provides a means for rotating the secondary goniometer in synchrony with the motor shaft, and also drives the sync-pulse generator affixed to the other end of the jackshaft. Internally, the goniometer contains two stator windings: a rotating armature with a rotor winding and a rotary transformer winding. Each unit is 5½ inches high, by 4½ inches wide, by 8½ inches long.

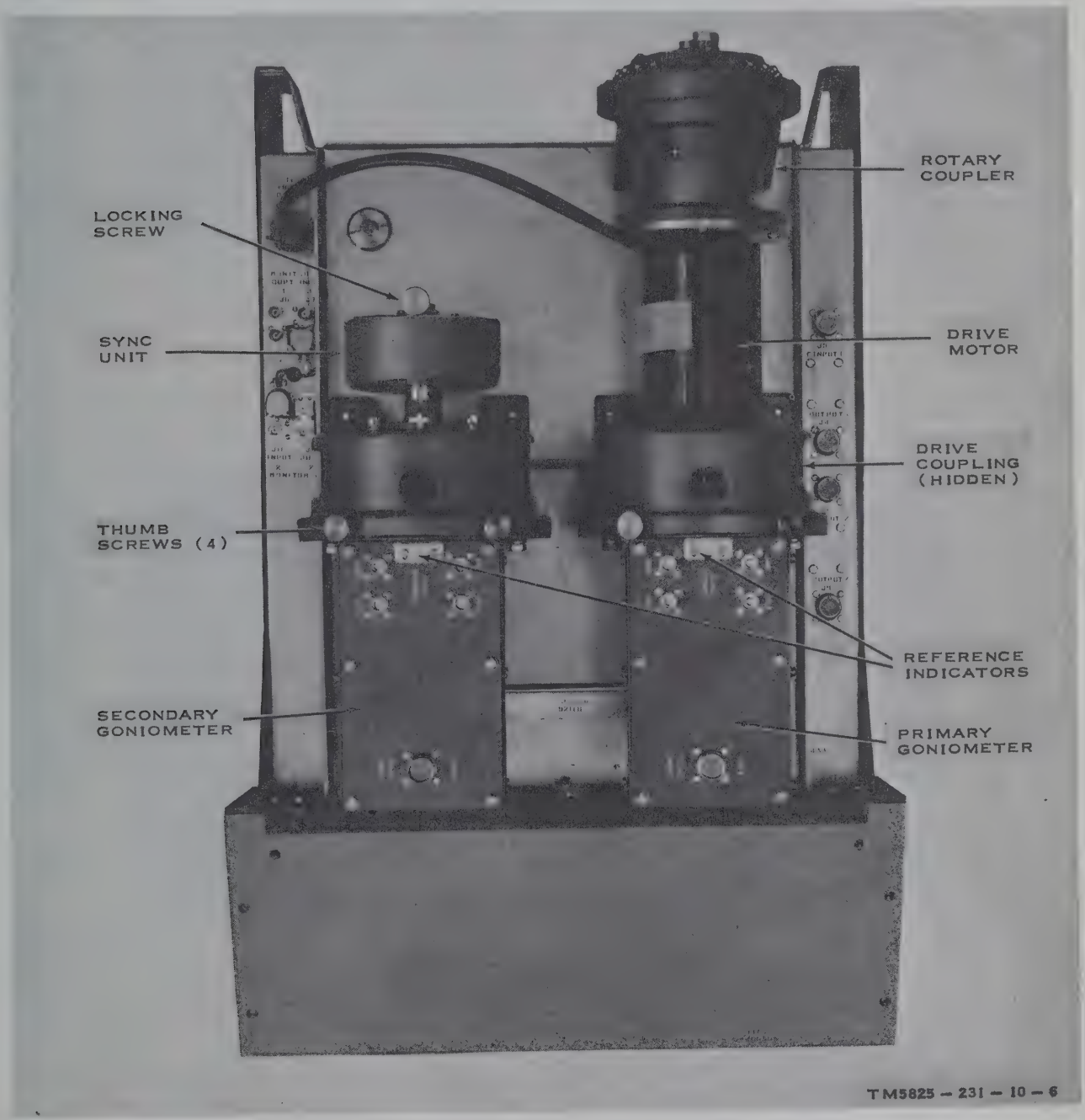


Figure 1-6. Drive, Goniometer-Rotary Coupler TG-126/TRD.

1-12. Description of Receiver

a. Receiver, Radio R-725/URR (fig. 1-7) is a modified R-390A/URR which is covered in TM 11-5820-358-10.

b. The modification consists of changing the intermediate frequency (IF) strip and adding a transformer.

c. The new IF strip is a direct replacement for the one used in the R-390A/URR. Both the physical dimensions and the external cable connections remain unchanged. The new IF strip utilizes an electrical filter to reduce phase error.

d. The transformer is used to isolate the filament of the local oscillator, and the filament is biased to eliminate heater-to-cathode leakage. Thus, the system hum is considerably reduced.

1-13. Description of Azimuth Indicator

a. Indicator, Azimuth IP-669/TRD (fig. 1-8) consists of a chassis 17 by 17 inches with a standard rack mounting control panel 19 inches wide by 10½ inches high, complete with 10 tubes including a 7-inch cathode ray tube. The operating controls, power control switches, and alidade scale assembly are mounted on the front panel. Handles are provided on the front panel to facilitate removal of the indicator for servicing.

b. The indicator is provided with an alidade and a lighted azimuth scale around the 7-inch cathode ray tube. Etched crosshairs on the rotatable alidade aid user in reading the bearings. The alidade assembly permits accurate bearing determination to be read from the propeller-shaped visual display. A viewing hood and adapter (fig. 1-19) are used under adverse lighting conditions.

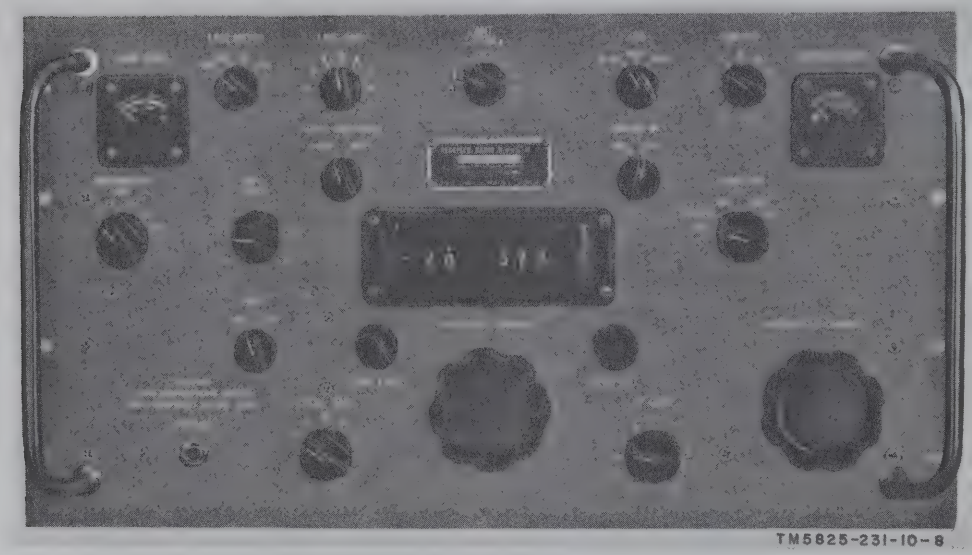


Figure 1-7. Receiver, Radio R-725/URR.

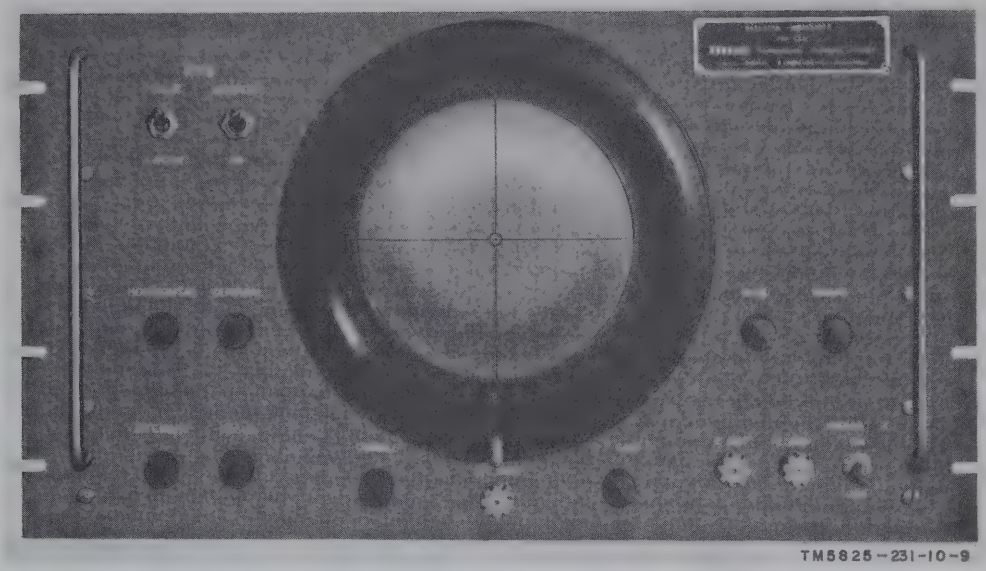


Figure 1-8. Indicator, Azimuth IP-669/TRD.

1-14. Description of Power Panel

a. The power panel (fig. 1-9) acts as a control and distribution point for the power fed from a commercial source or a mobile power unit to the console. The power panel contains an autotransformer with a voltage control for adjusting the output voltage to 115 volts when the input voltage is between 105 and 125 volts or 210 and 250 volts. A line frequency meter, an output voltmeter, two circuit breakers, an input switch, and a switch for applying the load are located on the front panel. Two input connectors, one 115 volt and one 230 volt ac, and three output connectors are provided on the back of the chassis.

b. The power panel is 10½ inches high, 9¾ inches deep, and 19 inches wide.

1-15. Description of Power Supply

a. Power Supply PP-4482/TRD (fig. 1-10) consists of a standard 19-inch by 7-inch panel and chassis.

b. The power supply contains four tubes, a transformer, and various associated components for rectification of the ac input and regulation of the direct current (dc) voltage. These components are mounted on the chassis. The POWER switch and line fuse are located on the front panel.

1-16. Description of Detector

a. Detector, Radiofrequency RF-159/TRD (fig. 1-11) is a narrow-band, high-gain device consisting of a standard 19-inch panel mounted on a chassis, 8¾ inches high by 20⅛ inches long by 19 inches wide.

b. The detector consists of 18 tubes mounted on the chassis with their associated components.

c. The detector receives the 455-kilocycle (kc) IF signal from the receiver (both receivers when system is in the 2 RCVR mode of operation) and extracts the bearing information. This information is then routed to the azimuth indicator for the visual presentation.

d. The loudspeaker mounted on the front panel supplies the audio for the system. The loudspeaker receives its input from receiver No. 1 through the AUDIO INPUT jack, located at the rear of the chassis.

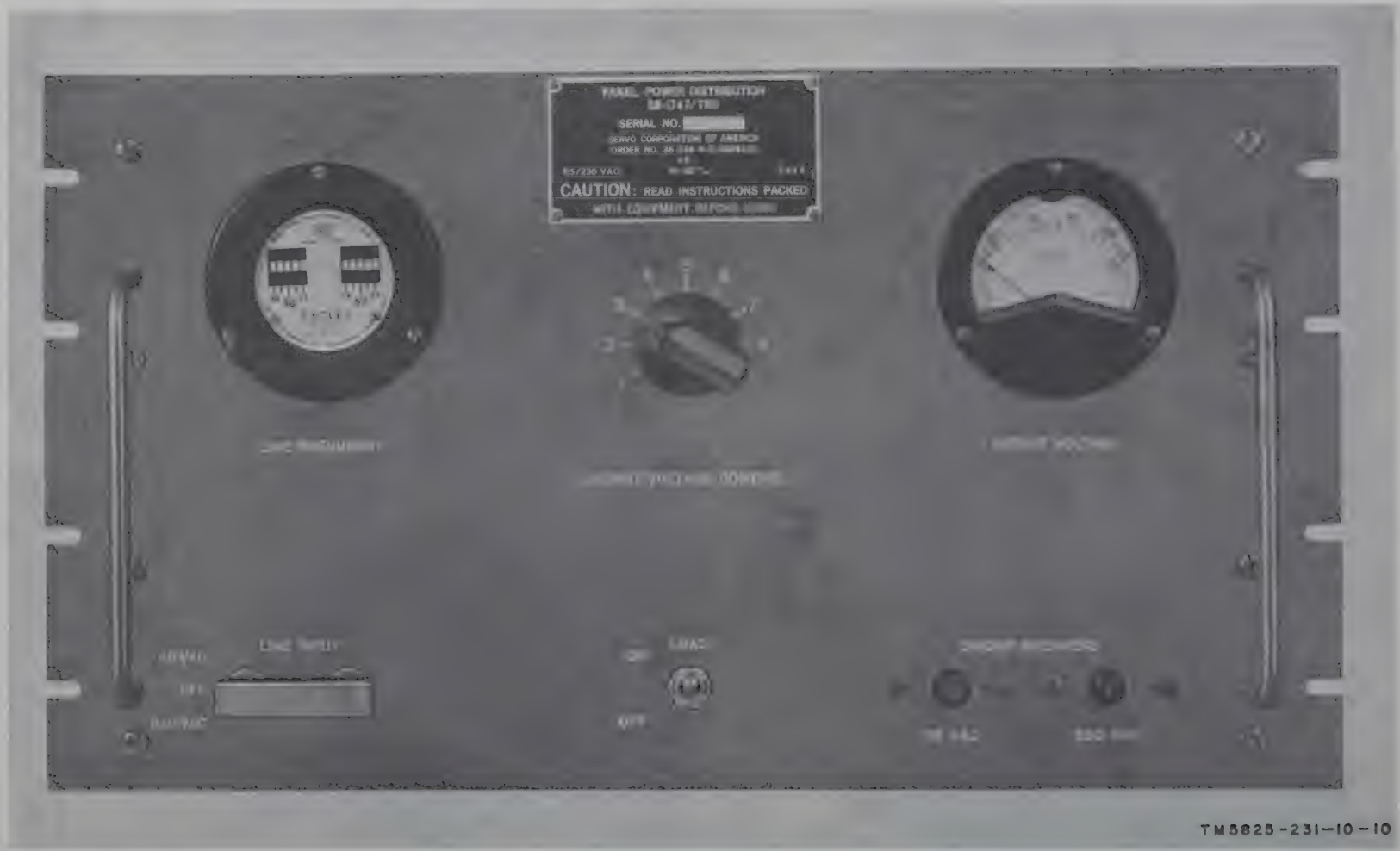


Figure 1-9. Panel, Power Distribution SB-1747/TRD.



Figure 1-10. Power Supply PP-4482/TRD.

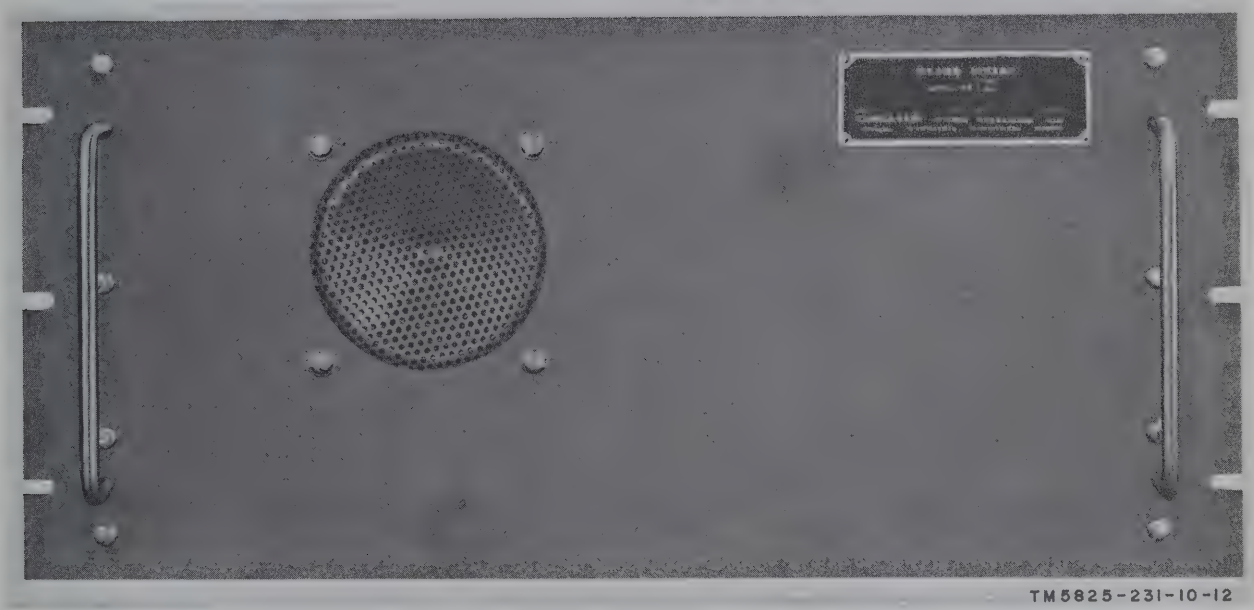


Figure 1-11. Detector, Radiofrequency RF-159/TRD.

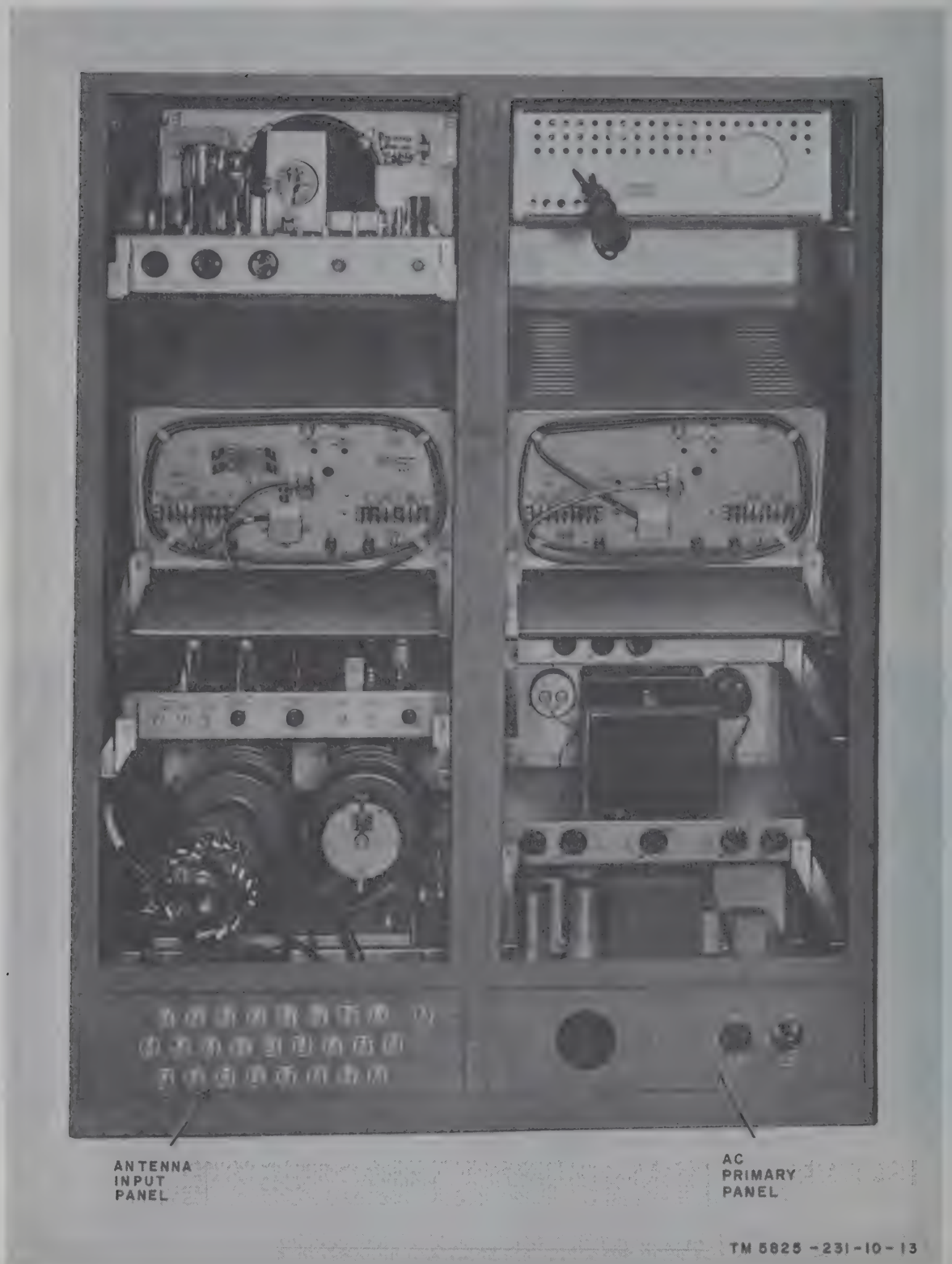


Figure 1-12. Primary console, rear view.

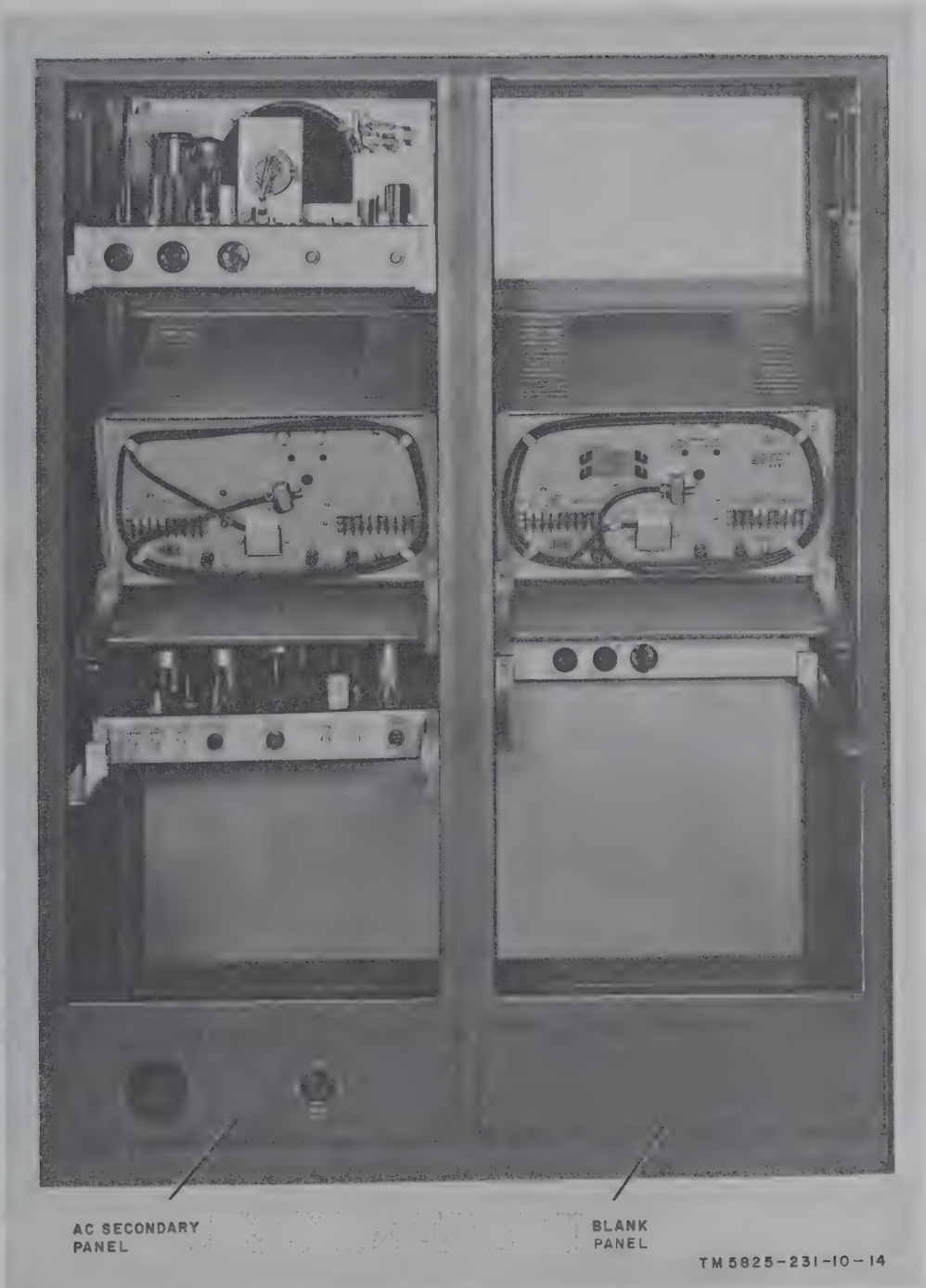


Figure 1-13. Secondary console, rear view.

1-17. Description of Control Amplifier

a. The control amplifier (fig. 1-14) consists of a standard 19 by 7-inch panel and a 2- by 15- by 17-inch chassis.

b. A sealed assembly tuning fork oscillator, transistors, four transformers, and associated components are located on the chassis. The power ON-OFF switch, AC POWER and POWER OUTPUT indicators, and fuses are located on the panel.

1-18. Description of Oscilloscope

a. Oscilloscope 120B (fig. 1-15) is a complete oscilloscope and contains its own power supply and sweep circuits.

b. The oscilloscope is a rack mount-type with the standard 19- by 7½-inch panel. It has a depth of 18¾ inches. The operating controls are located on the front panel.

1-19. Cables

A total of 124 cables are supplied with the equipment. The nomenclature (including length) and the points between which each connects are listed in paragraph 2-19.

1-20. Description of Target Transmitter

(fig. 1-16)

a. Radio Transmitter T-279/UR is a self-contained, battery-powered, portable unit intended for use as a signal source for calibrating and checking the operation of the direction finder equipment in the field. It emits a low-power continuous wave (cw) or modulated continuous wave (mcw) signal. For identification of the signal, an audiofrequecy *tick* is superimposed on the radiofrequency (RF) signal approximately every 2 seconds. The target transmitter feeds a monopole antenna mounted on the top of the transmitter case.

b. All component parts are mounted on an assembly consisting of a vertical chassis, a top panel, and two horizontal chassis, which form one integral unit. The assembly is housed in a sheet steel case and is secured to the case by four screws. All operating controls are mounted on the top panel and are protected by a hinged cover. This cover is splash-proofed by means of a rubber gasket around the edge and is equipped with a metal carrying handle. A neon lamp, which is part of the ticking circuit, is housed in a panel indicator light assembly mounted on the top panel. The neon lamp is also used as a power ON indicator.

c. The antenna consists of five telescoping, chromium plated brass sections adjustable to a 5 foot length. The telescoped sections may be stored within the base by sliding the sections through the insulated bushing mounted on the top panel. Splash-proofing of the feed-through bushing is accomplished by a rubber seal. A spring clip under the insulator makes contact with the antenna, holding it in position, and also connecting it to the transmitter circuits.

d. One 1.5-volt Battery BA-404/U supplies the required filament power. The 135-volt "B" Battery BA-424/U supplies all operating potentials for the remaining circuits.

1-21. Minor Components

The minor components are illustrated in figure 1-18.

1-22. Additional Equipment Required

The following equipments are not supplied as part of Direction Finder Set AN/TRD-15 but are needed for use with the set:

a. One Power Unit PU-294/G or equivalent.

b. One shelter of suitable size.

c. One Battery BA-404/U, FSN 6135-164-8779.

d. One Battery BA-424/U, FSN 6135-164-8762.

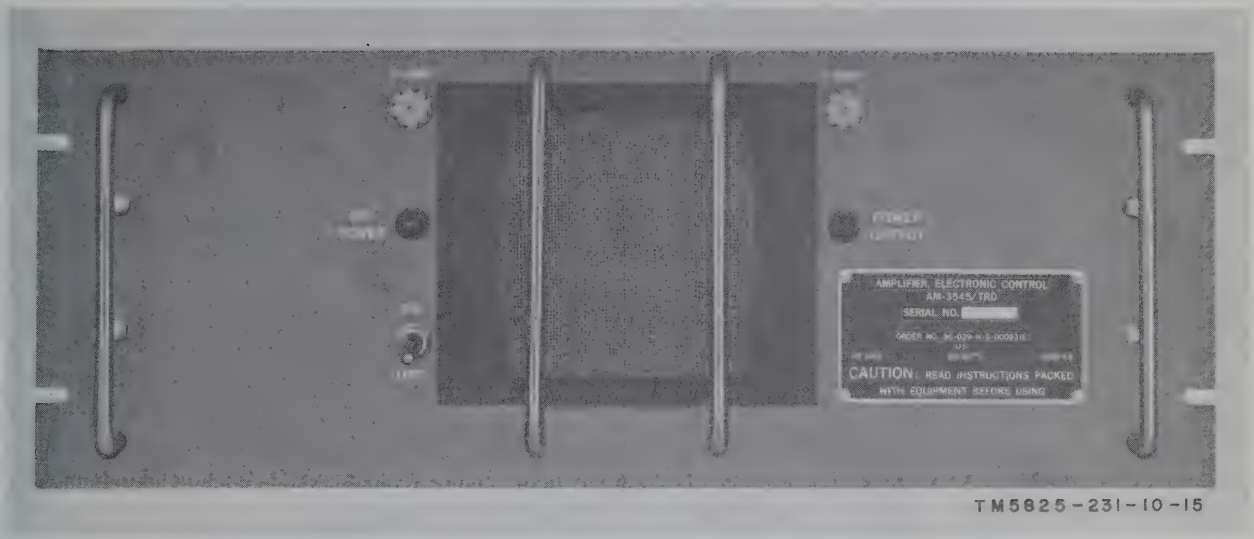


Figure 1-14. Amplifier, Electronic Control AM-3545/TRD.

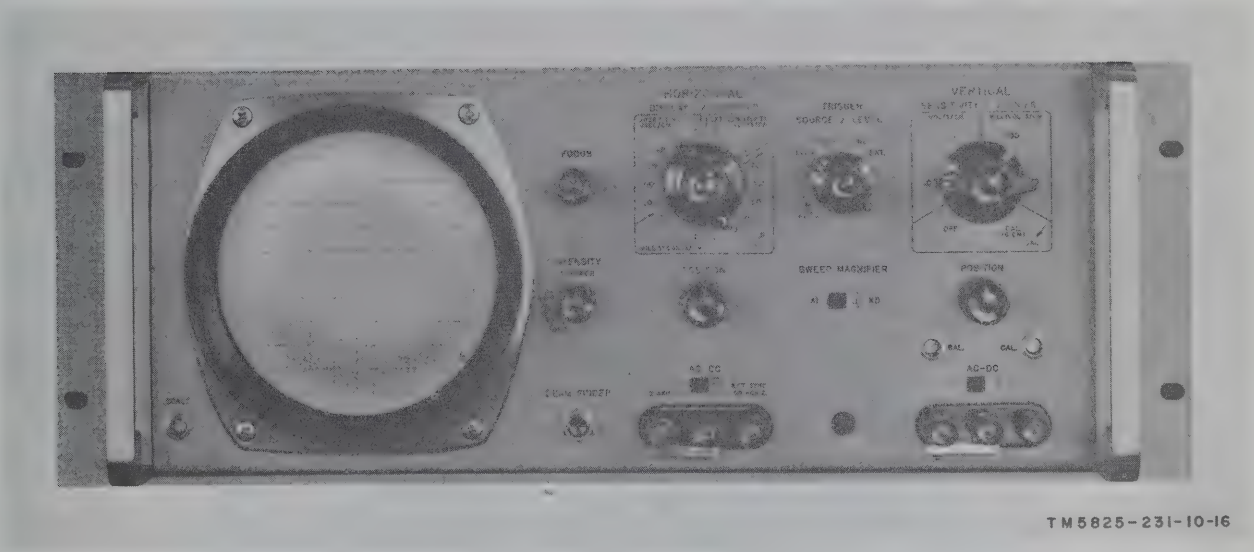


Figure 1-15. Oscilloscope 120B (Hewlett-Packard Model).



Figure 1-16. Radio Transmitter T-279/UR.

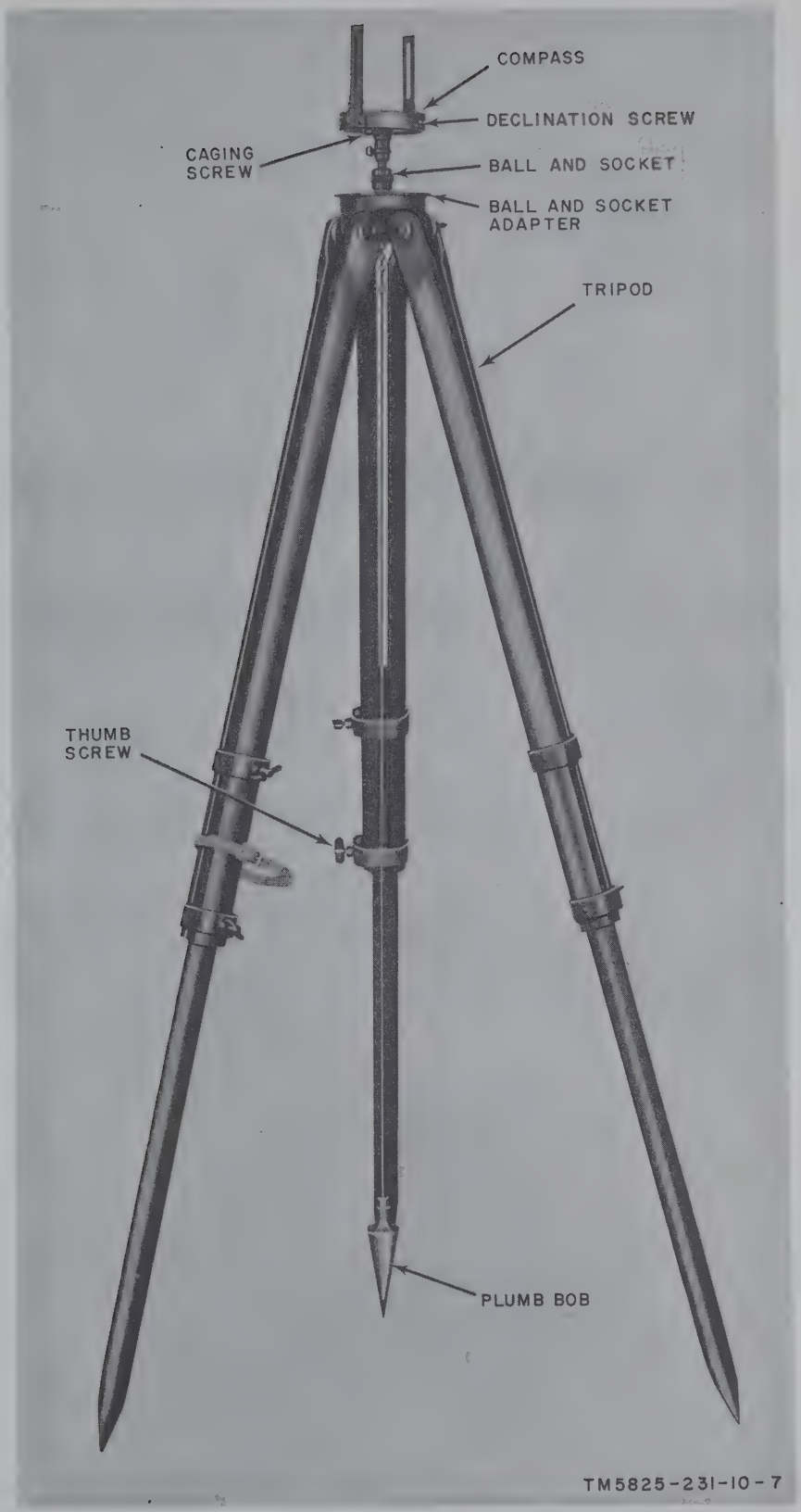


Figure 1-17. Compass assembly.

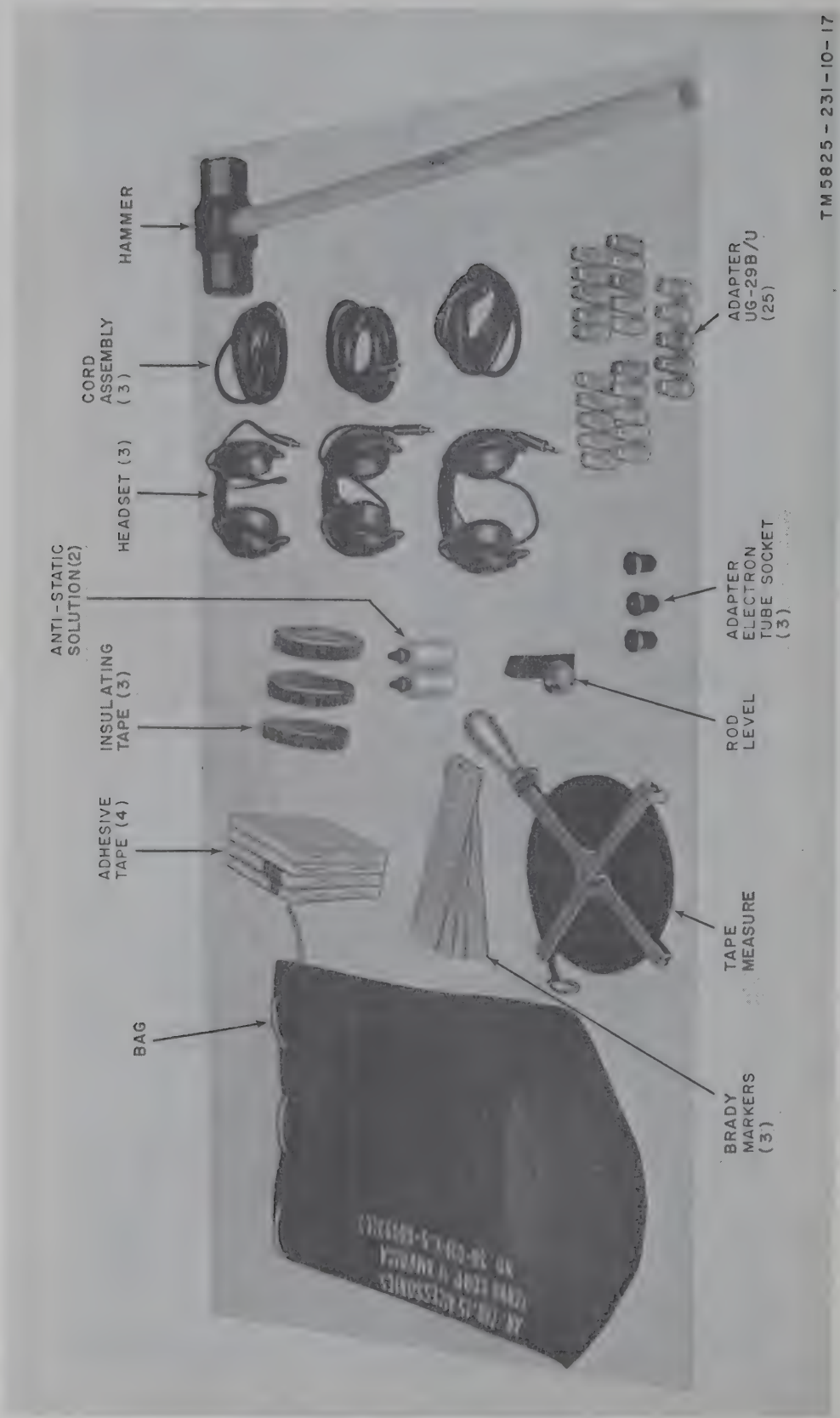


Figure 1-18. Minor components.

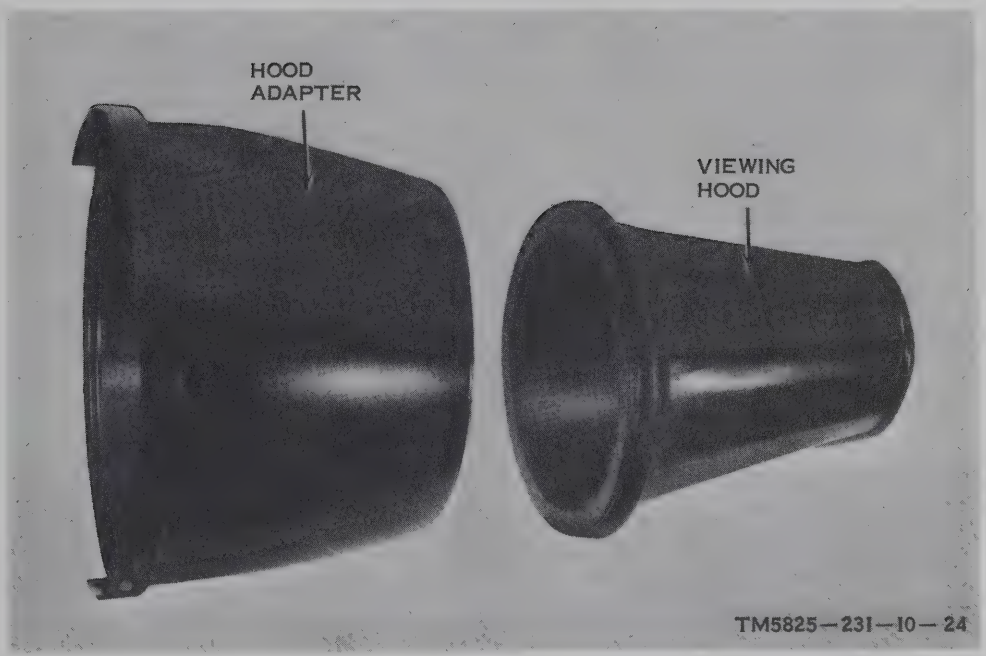


Figure 1-19. Viewing hood and adapter.

CHAPTER 2

INSTALLATION

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

2-1 . Unpacking

a. Packaging Data. When packed for shipment, the components of Direction Finder Set AN/TRD-15 are placed in cartons and packed in six wooden boxes. A typical shipping box and its contents are shown in figure 2-1.

Box No.	Dimensions (in.)	Volume (cu ft)	Unit weight (lb)	Contents of box
1 of 6	66 by 51 by 66	128	1,344	Accessories, cabinets (2), cables.
2 of 6	44 by 88 by 30	67.2	1,553	Indicators (2), oscilloscope, receivers (4), power panel, control amplifier, goniometer drive, detectors (2), power supplies (2), blank panel.
3 of 6	66 by 116 by 48	213	2,786	Antenna assemblies (less base and counterpoise).
4 of 6	44 by 87 by 33	73.1	1,286	Counterpoise bags, ground stakes.
5 of 6	63 by 132 by 35	169	2,826	Guy sets, antenna bases.
6 of 6	66 by 82 by 43	135	1,868	Cables.
Total weight 11,663 lb				

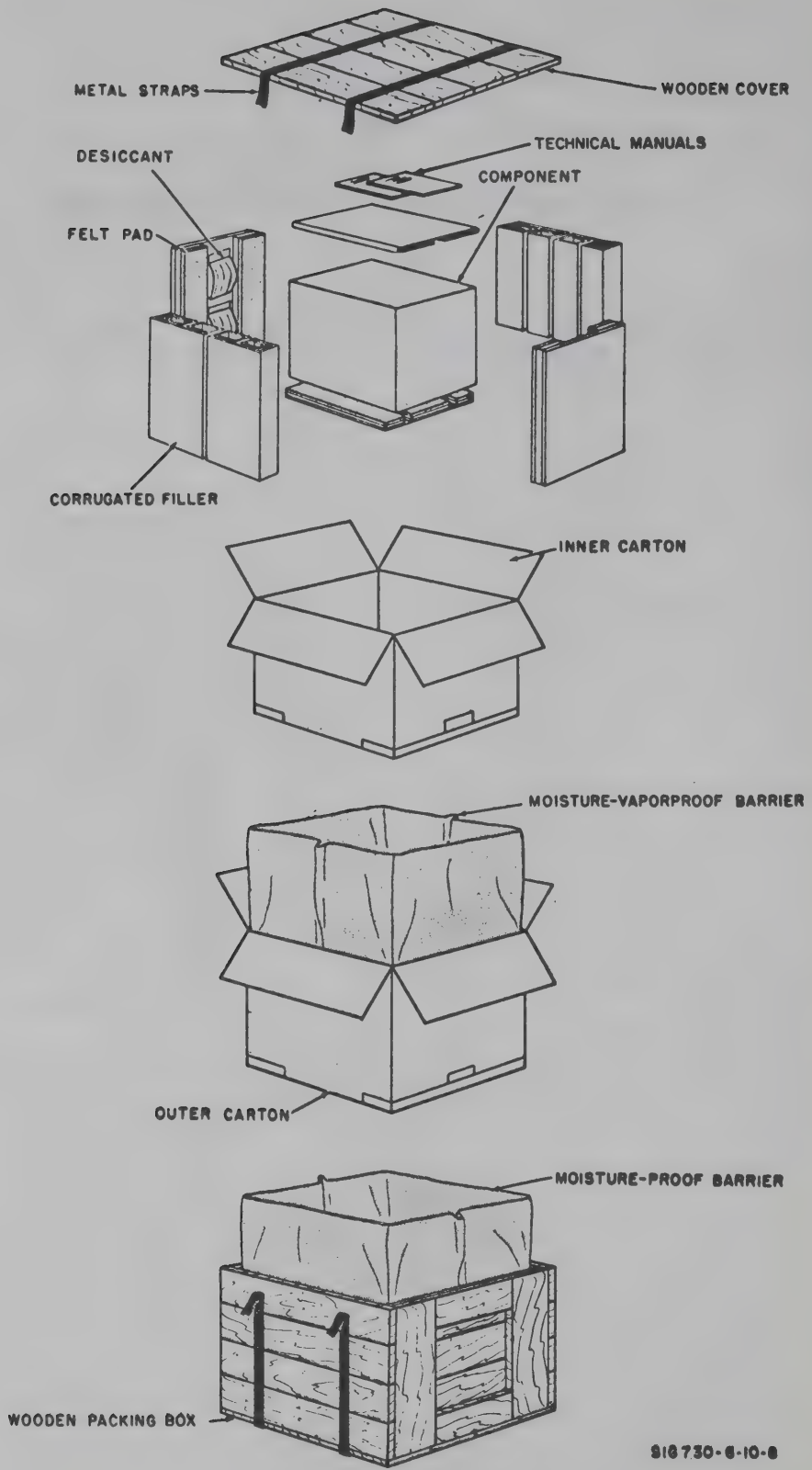


Figure 2-1. Typical packaging.

b. Removing Contents. Perform all the procedures outlined below when unpacking equipment in wooden boxes (fig. 2-1). When unpacking equipment in cartons, omit the procedures given in (1), (2), and (3) below.

(1) Carefully cut and fold back the metal straps.

(2) Remove nails from top and one side of box with a nailpuller. Remove the top and one side. Do not attempt to pry open because the equipment may become damaged.

(3) Open the moisture proof barrier that covers the carton inside the box. Remove the carton.

(4) Open the carton and the moisture-vaporproof barrier within the carton. Open the inner carton and remove the contents.

2-2. Checking Unpacked Equipment

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6 (para 1-3).

b. See that the equipment is complete as listed on the packing slip. If a packing slip is not available, check the equipment against the basic issue items list (app. II). Report all discrepancies in accordance with TM 38-750. Shortage of a minor assembly or part that does not affect functioning of the equipment should not prevent use of the equipment.

c. If the equipment has been used or reconditioned, see whether it has been changed by a modification work order (MWO). If the equipment has been modified, the MWO number will appear on the front panel near the nomenclature plate. Check to see whether the MWO number (if any) and appropriate notations concerning the modification have been entered in the equipment manual.

Note. Current MWO's applicable to the equipment are listed in DA Pam 310-4.

2-3. Site Selection

a. Technical Requirements for a Good Site.

(1) The site area should be substantially flat for at least 150 yards from the center of the antenna system with not more than a gentle slope for several times that distance.

(2) The area should be the highest level available in the general vicinity. A site in a sharply defined valley is usually unsatisfactory.

(3) Mountainous or hilly country should be avoided when possible.

(4) The antenna system should be as far inland as possible from the shorelines of large bodies of water to avoid coastal refraction errors. If the installation must be made on or near the coast, the flattest area should be selected. Direction finding accuracy is greatest when signals from the target area cross the coastline at right angles.

(5) The earth surrounding the antenna system should have uniformly high conductivity and equal moisture content. Areas evenly covered with grass or vegetation usually meet this requirement. Rocky or sandy soil has low conductivity; however, an area with uniform low conductivity is preferable to an area of high conductivity which is spotted with rock or sand or has varying moisture content.

(6) Regions abruptly showing bare spaces of the earth should be avoided. Such spaces usually indicate the presence of rock or mineral outcroppings or underground streams.

(7) The site should be as far as possible from tall trees, buildings, wire fences, power or telephone lines, radio antennas, railroad tracks, sharp ground contours (mountains, cliffs, and ravines), buried conductors (cables and pipelines), chimney stacks, water towers, rivers, lakes, streams, and main highways.

(8) Listed below are recommended distances to be maintained between the

antenna system and various obstructions to minimize their effect on the accuracy of bearings.

Obstruction	Distance to be maintained
Scattered trees and single, small buildings.	200 yards.
Wire fences	300 yards.
High cliffs and deep ravines	More than 1 mile.
Buried metallic conductors (other than telephone lines to Direction Finder Set AN/TRD-15).	300 yards.
Chimney stacks and water towers.	500 yards.
Overhead conductors and railroad tracks (power and telephone lines and antennas).	500 yards.
Rivers, streams, and lakes	600 yards.
Forests and metal structures.	500 to 1,000 yards.
Mountains	5 to 25 miles.

b. Electrical Inspection. After the most favorable area has been selected by visual inspection, it is desirable, if possible, to make the electrical tests in paragraph 95 of TM 11-476.

2-4. Site Preparation

a. Location of Antenna System. Clear and level off an area of adequate size (para 2-7) for erection of the antenna system.

b. Location of Shelter. The shelter (not supplied with this equipment) used to house the primary and secondary consoles must be located near the center of the circular antenna array.

c. Location of Power Unit. Where commercial power is unavailable and a power unit is required, clear and level an area approximately 150 feet from the shelter.

2-5. Tools and Equipment Required for Installation

Tools and equipment required for installation of Direction Finder Set AN/TRD-15 are listed below. The use of each item is also listed.

Quantity (ea)	Tool or equipment and use
1	Hammer 850H; used for driving guy stakes and locating pins.
1	Compass; used for sighting (locating antenna positions) and orientation.
1	Ball and socket; used for mounting the compass.
1	Tripod; used for setting up the compass.
1	Plumb bob; used for setting compass directly over locating pin.
1	Rod level; used to check vertical linearity of antennas.
1	Tape measure; used for intstalling antennas and guys.

2-6. General Installation Instructions

The following information is supplied to aid in the proper installation of the antennas. Accuracy of bearing information is definitely related to the accuracy of antenna installation; therefore, the installation instructions must be followed carefully.

2-7. Locating Individual Antenna

The standard array diameter of 150 feet is the maximum that will permit useful operation over the whole band. If the system is to be used exclusively below 10 mc or on signals to 20 mc arriving at vertical angles above 60° (very close signals just beyond groundwave range), it is advantageous to use a 300-foot diameter array. Twenty-five antenna masts are spaced equally around a circle having a radius of 75 feet (fig. 2-2). The monitor antenna is located approximately in the center of the circle. A position for the target transmitter to be used during orientation must be located at least 100 feet beyond the periphery of the antenna array. A point beyond the north antenna is usually selected, but any azimuth can be used.

Note. The following instructions cover the installation of the 150-foot diameter array using 110-foot cables.

a. North Antenna. The north antenna posi-

tion must be located, before locating the remaining antennas. Proceed as follows:

(1) Locate approximate center of the prepared site and drive a locating pin vertically into the ground, using the 8-pound hammer 850H. Allow a few inches of the pin to protrude above the ground.

(2) Set up the compass and tripod in accordance with figure 1-17 and the following instructions:

(*a*) Unstrap the tripod legs.

(*b*) Open the tripod legs and insert them into the ground. With the thumbscrews (on tripod legs) adjust legs for desired height.

(*c*) Attach the ball and socket adapter to the tripod. The large diameter, threaded section of the adapter screws into the tripod.

(*d*) Screw the ball and socket onto the adapter.

(*e*) Screw the compass onto the ball and socket.

(*f*) Attach the plumb bob to the ball and socket adapter.

(*g*) Locate the compass and tripod assembly directly over the locating pin; use the plumb bob.

(*h*) Using the spirit level on the compass, level the compass by adjusting the ball and socket joint.

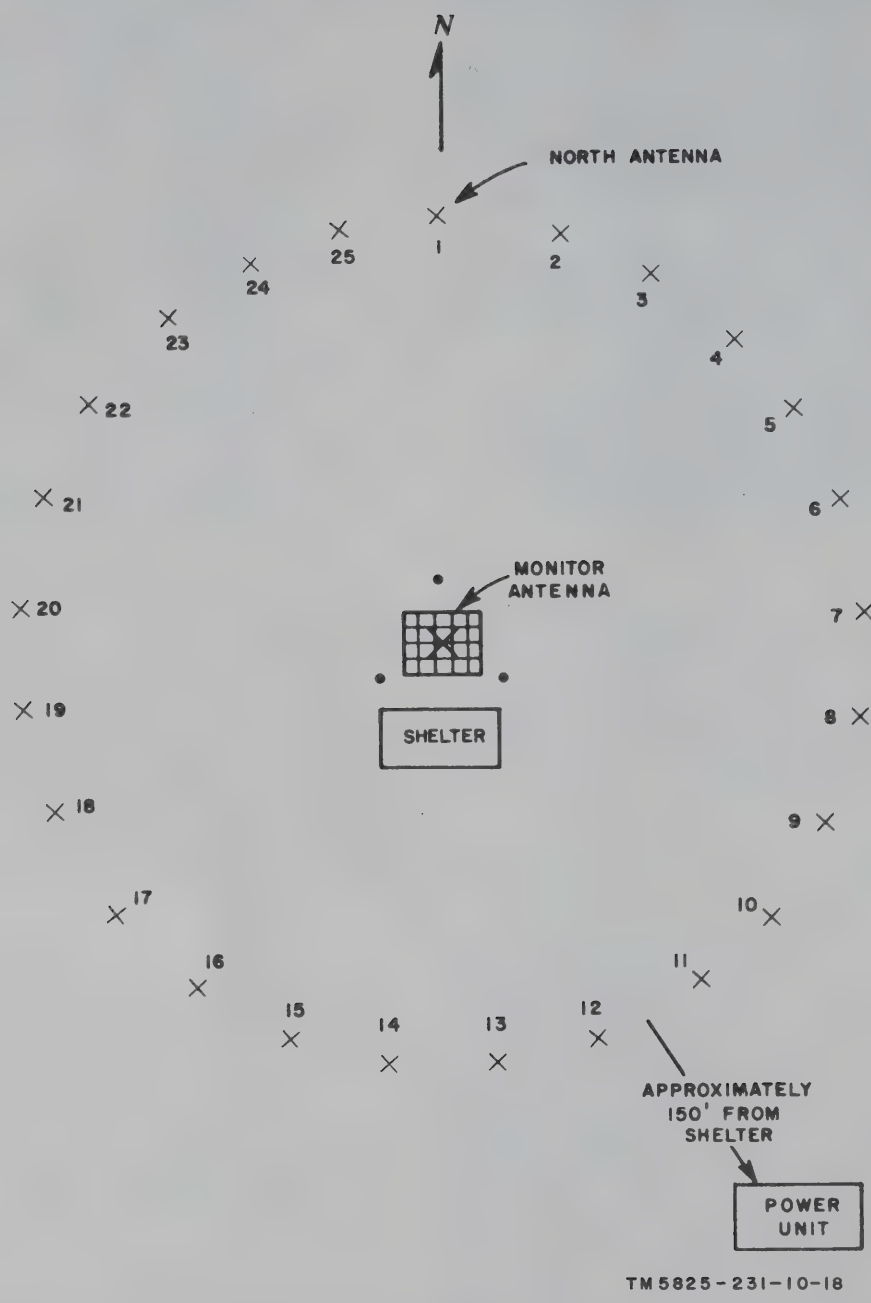


Figure 2-2. A typial site layout.

Note. Magnetic declination may be defined as the angle between true north and the direction indicated by a magnetic compass. This angle varies for different locations on the earth and changes continuously. It is necessary, therefore, to use local charts or maps which show declination and the annual change in declination. West declination signifies that magnetic north is west of true north; east declination signifies that magnetic north is east of true north.

(*i*) By referring to a suitable map, determine the magnetic declination for the locality in which the df system

is to be installed. With a screwdriver, turn the declination screw on the rim of the compass to rotate the scale so the 0-360° mark moves away from the index for the number of degrees and in the direction which will compensate for the magnetic declination.

Example: To compensate for a magnetic declination of 12° west, rotate the compass scale so that the index points to the 348° mark (360° minus 12°).

(*j*) Release the compass needle and rotate the compass until the north end of the needle and the 0-360° mark on the compass coincide. The viewing sites then point to true north.

(3) Locate the true north locating pin (fig. 2-3), using the compass and the measuring tape. The north locating pin must be exactly 75 feet from the center locating pin. When the exact location is determined, drive the true north locating pin into the ground by the use of the 8-pound hammer. This is the location for antenna No. 1.

c. Locating Remaining Antennas.

(1) Without moving the tripod, advance the compass sight 14¼°, and locate the pin for antenna No. 2 75 feet from the center locating stake. Drive the pin for antenna No. 2 into the ground.

(2) Repeat the procedure given in (1) above for each of the antennas in the circle; use the table in figure 2-4 for the exact location. *Each antenna must be exactly 75 feet from the center locating stake.*

2-8. Locating Guy Stakes GP-111/G

(fig. 2-5)

Each antenna is secured with three guy wires. One is attached to the base of the adjacent antenna, one to an inner guy stake, and one to an outer guy stake. The guy stakes, provided are made of angle iron. Locate the guy stakes in accordance with figure 2-4. Position the stakes with the eye snap toward the antenna location. Using the 8-pound hammer, drive the guy stakes into the ground.

Note. When setting up for a 300-foot diameter array, a third guy stake, 18 feet in the direction of the adjacent antenna, is used instead of attaching to the adjacent antenna.

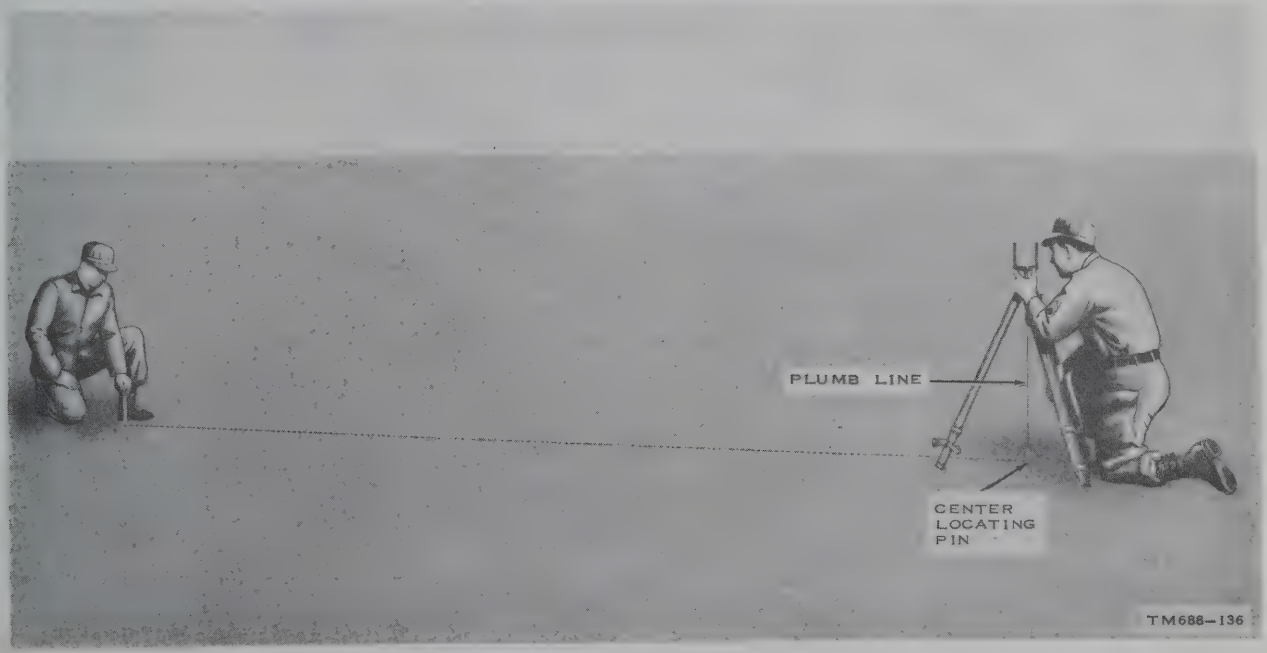
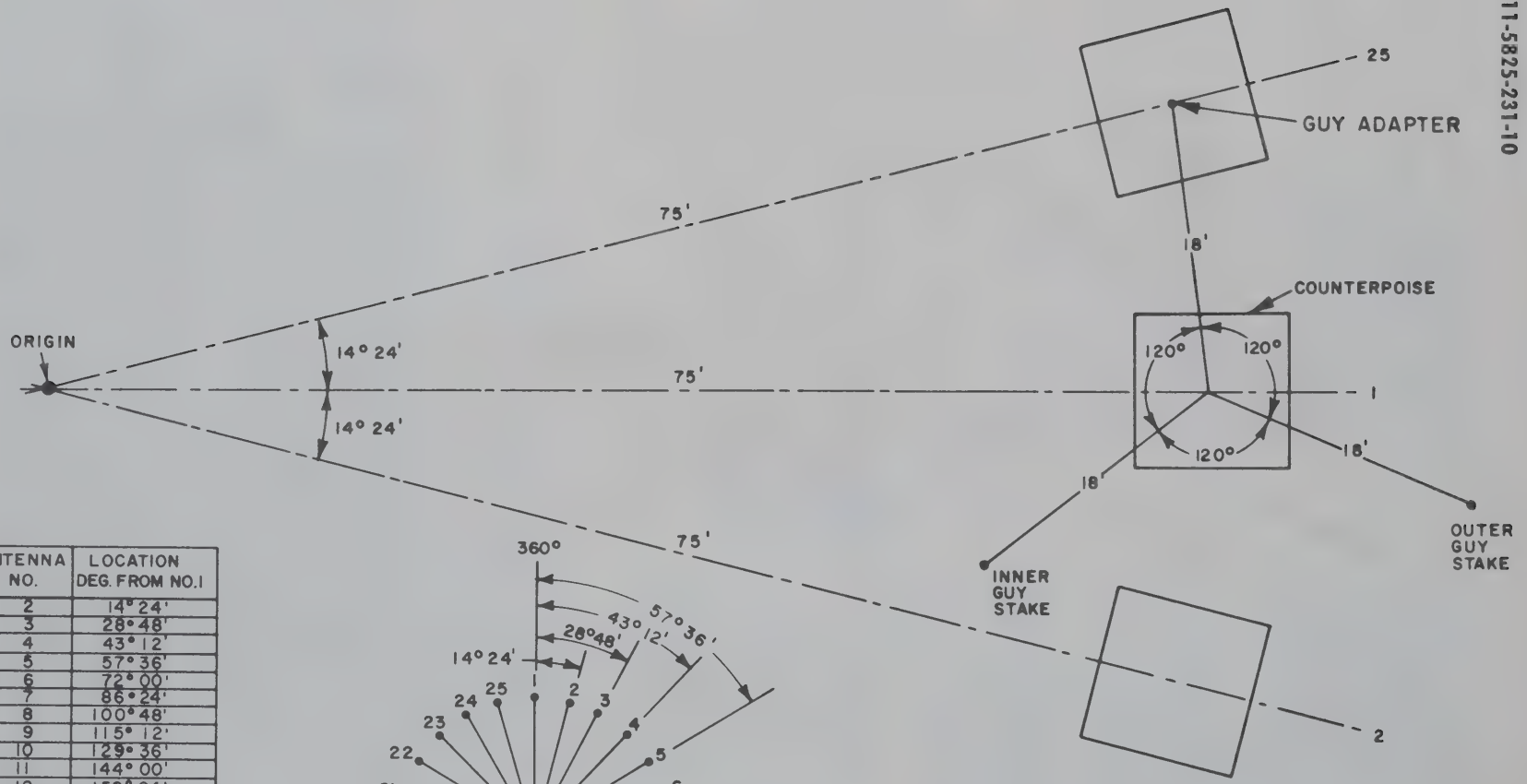
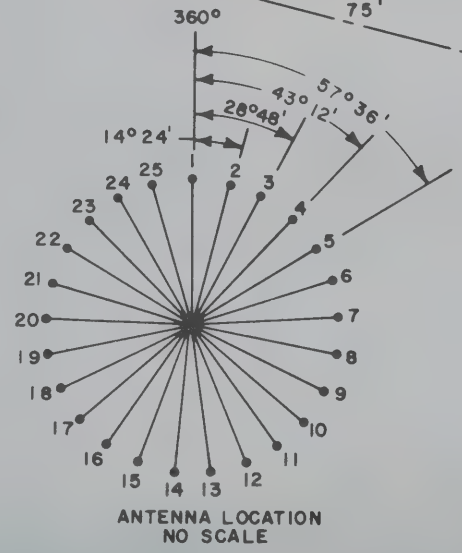


Figure 2-3. Locating position for antenna locating pins.



ANTENNA NO.	LOCATION DEG. FROM NO.1
2	14° 24'
3	28° 48'
4	43° 12'
5	57° 36'
6	72° 00'
7	86° 24'
8	100° 48'
9	115° 12'
10	129° 36'
11	144° 00'
12	158° 24'
13	172° 48'
14	187° 12'
15	201° 36'
16	216° 00'
17	230° 24'
18	244° 48'
19	259° 12'
20	273° 36'
21	288° 00'
22	302° 24'
23	316° 48'
24	331° 12'
25	345° 36'



TM5825-231-10-19

Figure 2-4. Antenna and guy stake location.

2-9. Counterpoise Installation

a. Wire mesh counterpoise (10 feet by 10 feet), a 6-foot grounding rod, and eight counterpoise clamps are used with each antenna.

b. To install the counterpoise, proceed as follows:

(1) Place the counterpoise mesh over the antenna locating pin.

(2) Unroll the mesh part way until a braided wire strap is visible.

(3) Rotate the mesh until the half with the braided strap unrolls toward the center locating pin (fig. 2-5).

(4) Complete the unrolling of the mesh.

(5) At this point the counterpoise forms a 5- by 10-foot rectangle. Unfold the counterpoise to form the 10-foot square.

(6) Position the center of the counterpoise over the antenna locating pin.

(7) Press a counterpoise clamp into place at each end of the four wooden rods (fig. 2-6).

(8) Place the pointed end of the 6-foot ground rod next to the braided strap on the counterpoise mesh.

(9) Drive the ground rod vertically into the ground, using the 8-pound hammer, until the wire wrapped around the upper end of rod is just flush with the surface.

(10) Place the lug, on the wire attached to the ground rod, under the screw on the braided strap connector and tighten.

(11) Repeat the procedures given in (1) through (10) above for each of the remaining antennas.

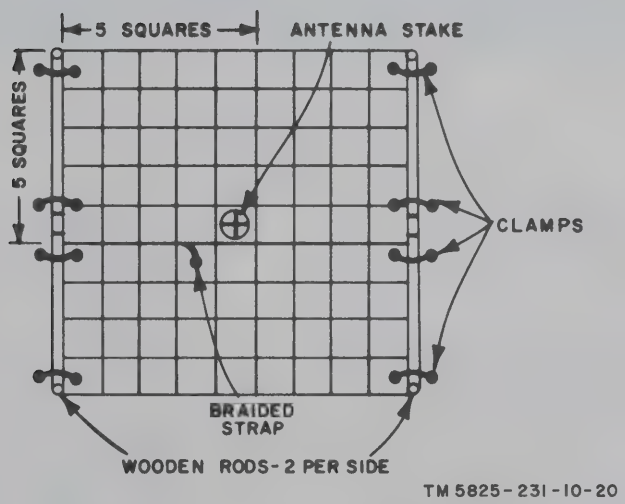


Figure 2-5. Counterpoise installation.



Figure 2-6. Counterpoise clamp installation.

2-10. Antenna Base Installation

a. Each antenna base has a sighting hole through the bottom (fig. 2-7), centered under the casting. This permits siting the antenna locating pin when placing the base on the counterpoise. Do not move the locating pin when installing the antenna base.

b. Install antenna base as follows:

(1) Remove the upper and lower retaining pins (fig. 2-7).

(2) Loosen the locknuts on the leveling screws and back the leveling screws out until they are flush with the inside wall of the socket in the casting.

(3) Lift the base and center it over the antenna locating stake. Use the sighting hole for this operation. Position the base so that one guy adapter faces the direction of the clockwise adjacent antenna.

(4) Position a stake (GP-2) in each of the four corner holes and drive them into the ground with the 8-pound hammer. Do not move the antenna base while driving the base stakes into the ground.

(5) Repeat the procedures given in (1) through (4) above for each of the remaining antennas.

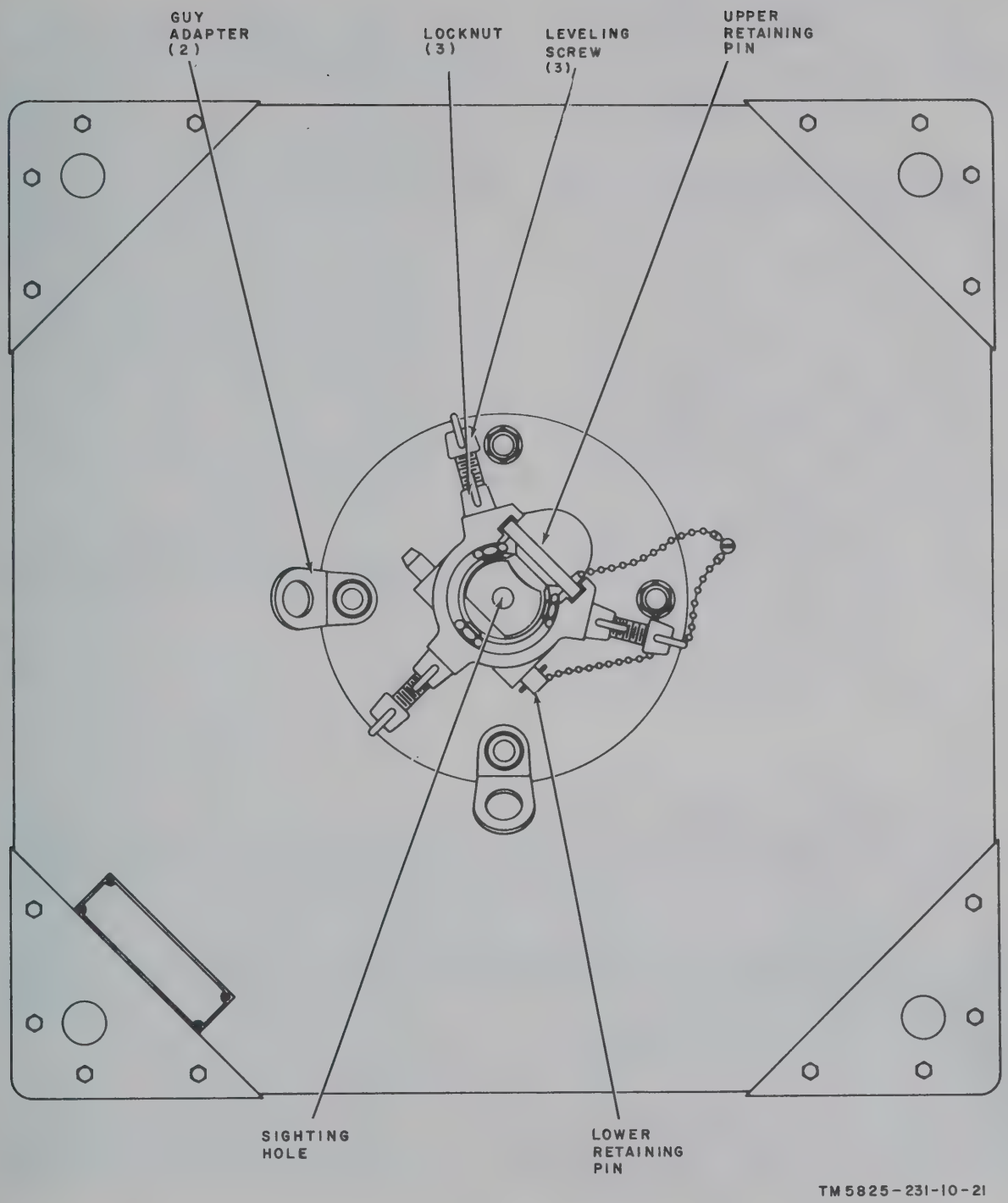


Figure 2-7. Antenna base installation.

2-11. Antenna Assembly

a. Remove the antenna coupler from the lower section by loosening the thumbscrews. Lay the coupler aside to prevent damage while assembling the antenna.

Caution: **Avoid getting dirt in the mast joints.**

b. Arrange the antenna sections and the loading disk neatly on the ground adjacent to the base.

c. Complete the antenna asembly using the following procedure:

(1) Place the ball end of the lower section, AT-442/GR, in the base mount socket and allow it to lie parallel to the ground through the slot in the casting. Insert the lower retaining pin; lock in place.

(2) Join the remaining antenna sections. Refer to figure 2-8. Lock each clamp after joining the mast sections.

(3) Open the loading disk until the angles formed by the loops are visually equal. Screw the loading disk to the fourth antenna section. See figure 2-9.

(4) Hook three guys on the mast guy plate located on the third section (Mast Section AT-444/GR). Carefully stretch the guys out toward the base to keep them from becoming tangled.

2-12. Antenna Erection

a. Stand facing the base of the antenna and grasp the antenna firmly with both hands at a point just below the guy plate.

b. Raise both hands over head (fig. 2-10) and carefully step under the antenna.

c. Slowly walk toward base of antenna, moving hands ahead one at a time as required.

d. When the antenna is upright and almost balanced in the base socket, complete the following procedures:

(1) Slide the upper retaining pin into place and lock.

(2) Still supporting the antenna, loosely position the three leveling screws until they hold the antenna in the middle of the base socket.

(3) Position the antenna until the antenna coupler mounting screws face the center of the antenna array.

Note. The procedures given in (4) below are used when setting up for the 150-foot diameter array. For a larger array, the guy adapter on the adjacent antenna cannot be used (the antennas are too far apart). Instead, a third stake is used. It is positioned approximately 18 feet in the direction of the counterclockwise adjacent antenna.

(4) Fasten one guy wire to the guy adapter of the counterclockwise adjacent base (fig. 2-4).

Caution: **Avoid crossing the guys.**

(5) Fasten one guy to the outer guy stake and the remaining guy to the inner stake.

(6) Sight along the antenna from two points at right angles to each other, and adjust the guys until the antenna stands straight up and down. Check vertical orientation, using rod level, while guys are being tightened.

(7) Loosen the wingnut and the thumbscrew on the snubber assembly and thread the guy through the snubber in the direction indicated by the arrow.

(8) Tighten the thumbscrew; turn the handle away from the arrow and lock the wingnut.

(9) Fasten the snubber to the guy stake by use of the shackle.

Caution: **Avoid overtightening the guy; the antenna can be permanently bent and rendered useless.**

(10) To further tighten the guy, loosen the wingnut and pull the loose end of the guy until the guy is taut. Lock the wingnut.

2-13. Installation of Antenna Coupler and Ground Strap

(fig. 2-11)

a. Examine the connection lugs on the antenna coupler and clean if required. Repeat for the shoulders of the connection studs on the antenna.

b. With the coaxial connector on the antenna coupler facing down, complete the following procedures:

(1) Slide the lower connection lug in place.

(2) With a twisting motion, position the upper lug and firmly tighten the thumbnut on the antenna. Leave the lower connection loose.

(3) Examine the lugs on the grounding strap and clean if required. Place the end U-shaped lug under the thumbnut on the lower antenna coupler connection stud.

(4) Firmly tighten the thumbnut on the ground connection lug and the antenna lug.

(5) Loosen the locknut on the leveling screw nearest the assembly and examine the face of the nut exposed; clean if required.

(6) Slide the second lug over the leveling screw and firmly tighten the locknut.

(7) Place the loose end of the ground strap near a counterpoise wire.

(8) Clean the counterpoise wire and slide the split connector over it (thumbscrew up) until the wire falls into the groove cut into the face of the connector.

(9) Tighten the thumbscrew until the wire is firmly grasped and makes a good electrical connection.

(10) Flatten any portion of the counterpoise that may have been accidentally bent upward.

(11) Repeat the procedures in this paragraph for each of the remaining antennas.



Figure 2-8. Joining mast sections.



Figure 2-9. Installing loading disk.



Figure 2-10. Antenna erection.

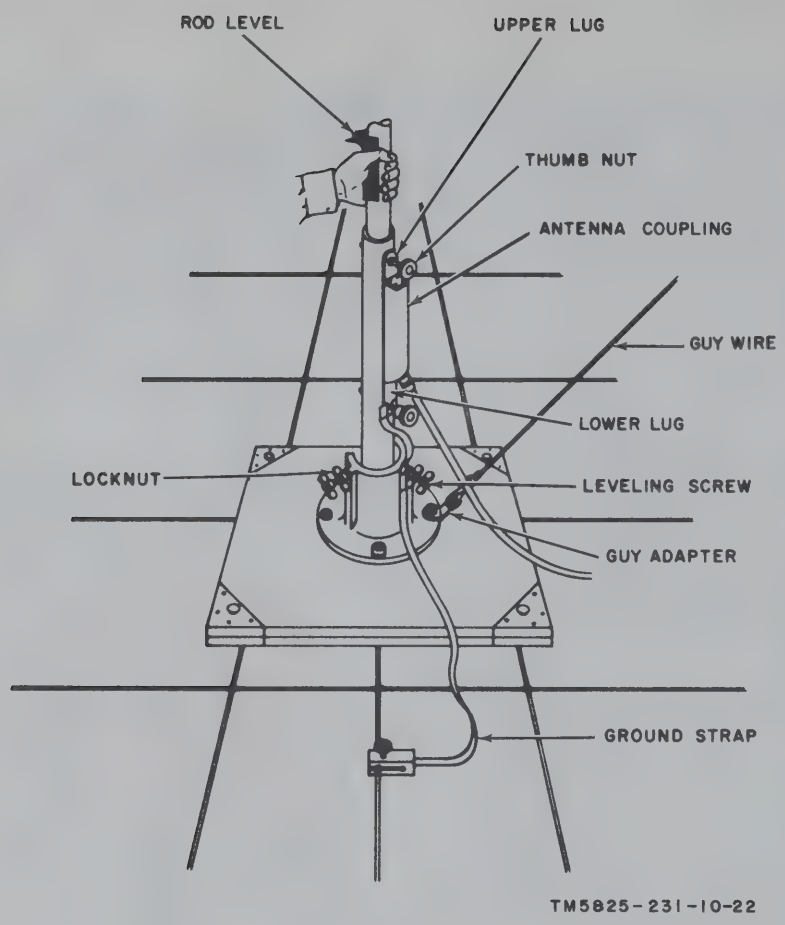


Figure 2-11. Antenna base connections.

2-14. Final Check of Antenna Position

Check to see that each antenna is properly positioned by completing the following procedures:

a. With the compass properly positioned over the center locating pin, obtain an angle reading for each antenna.

b. Compare the angles read with those called for in the table shown in figure 2-4.

c. Any reading greater or less than the angle called for, by more than 1°, must be corrected by lowering the antenna and repositioning the base.

2-15. Monitor Antenna Installation

The monitor antenna may be installed at any convenient location. Installation procedures are the same as for individual antennas on the array (paras 2-8 through 2-13) except that a locating pin is not required and that the guy stakes are installed aproximately 18 feet from the antenna base and 120° apart in any direction.

2-16. Shelter and Power Unit Installation

a. The shelter and power unit are not supplied as part of the system; therefore, specific instructions for locating and erecting are not

covered in this manual. The manual covering the particular shelter used must be consulted.

b. The following information is supplied only as a guide.

(1) The shelter must be near the center of the antenna array.

(2) The cable entrance to the shelter must be positioned so that the antenna cables will reach.

(3) The power unit should be mounted as far from the shelter as possible to minimize noises and fumes in the shelter.

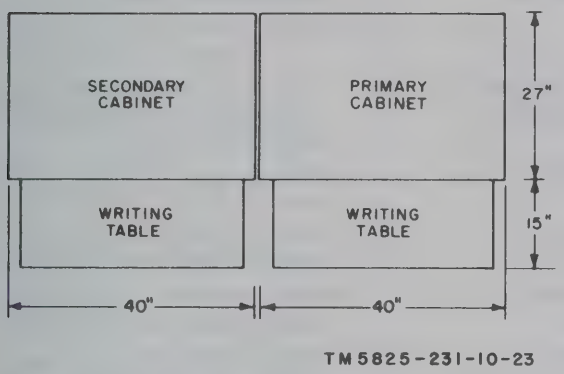


Figure 2-12. Console dimensions.

2-17. Placement of Electrical Cabinets Within Shelter

a. Two electrical cabinets are used with Direction Finder Set AN/TRD-15. The dimensions (fig. 2-12) are the same for both cabinets.

b. Access space must be available between the rear of the cabinets and the wall of the shelter.

c. The cable entrance duct must be near the primary cabinet.

d. The operator should not be able to see any bright light when he looks up.

e. Operator's efficiency and comfort must be considered at all times.

2-18. Placement of Units Within Cabinets

a. Identify each unit before placing it in the electrical cabinet.

(1) Carefully lift the goniometer drive and position the rear on the support rails in the lower right-hand side of the primary cabinet. Slide the unit in until the front panel is flush with the cabinet edges.

(2) Place the detector on the support rails in the opening just above the goniometer drive. Slide the unit in until the panel is flush with the cabinet edges.

(3) Place the remaining units in their respective positions (fig. 1-1).

(4) Attach al front panels to the cabinets by the use of the rack and panel screws with a cup washer under the head of each screw.

2-19. Cable Installation

Note. Check to see that all power switches are in the OFF position before installing cables.

Install the cables as shown in the following chart. Connect Cable Assembly, Power CX-11520/U to J1 of the power panel for 230-volt operation and to J2 for 115-volt operation. Brady markers are supplied for antenna RF cable identification. Apply a marker to the console end of each cable as it is connected to the antenna to indicate the jack number to which it connects at the console.

Nomenclature	Qty.	From	To
Cable Assembly, RF CG-92G/U 75 ft.	26	25 df antennas and monitor antenna.	J1-J25 and J26 of primary console.
Cable Assembly, RF CG-92G/U 110 ft.	26	Df antennas No. 1 through 25 and monitor antenna.	J1 through J25 respectively and J26 of primary console.
Cable Assembly, RF CG-409G/U 3 ft.	1	J4 of primary detector.	J116 of primary receiver No. 1.
Cable Assembly, RF CG-409G/U 3 ft.	1	J4 of secondary detector.	J116 of secondary receiver No. 1.

Nomenclature	Qty.	From	To
Cable Assembly, RF CG-409G/U 4 ft, 6 in	1	J1 of primary azimuth indicator.	J6 of primary detector.
Cable Assembly, RF CG-409G/U 4 ft, 6 in.	1	J1 of secondary azimuth indicator.	J6 of secondary detector.
Cable Assembly, Power CG-409G/U 5 ft.	1	J3 of primary detector.	J116 of primary receiver No. 2.
Cable Assembly, Power CG-409G/U 5 ft.	1	J3 of secondary detector.	J116 of secondary receiver No. 2.
Cable Assembly, RF CG-409G/U 5 ft, 6 in.	1	J1 of goniometer drive.	J30 of monitor panel.
Cable Assembly, RF CG-409G/U 6 ft.	4	J3, J4, J5, J6 of primary azimuth indicator.	J1, J2, J3, J4 respectively on primary goniometer on goniometer drive.
Cable Assembly, RF CG-409G/U 6 ft; 6 in.	1	J5 of primary detector.	J29 of monitor panel.
Cable Assembly, RF CG-409G/U 12 ft.	4	J3, J4, J5, J6 of secondary azimuth indicator.	J1, J2, J3, J4 respectively on secondary goniometer on goniometer drive.
Cable Assembly, RF CG-833A/U 4 ft; 6 in.	1	J6 of goniometer drive.	J103 of primary receiver No. 1.
Cable Assembly, RF CG-833A/U 5 ft.	1	J11 of goniometer drive.	J103 of primary receiver No. 2.
Cable Assembly, RF CG-833A/U 7 ft.	1	J12 of goniometer drive.	J103 of secondary receiver No. 1.
Cable Assembly, RF CG-833A/U 10 ft.	1	J7 of goniometer drive.	J103 of secondary receiver No. 2.
Cable Assembly, RF CG-109B/U 2 ft.	1	J27 of rotary coupler.	J3 of goniometer drive.
Cable Assembly, RF CG-109B/U 2 ft; 6 in.	1	J26 of rotary coupler.	J8 of goniometer drive.
Cable Assembly, RF CG-1079B/U 5 ft; 6 in.	1	J4 of goniometer drive.	J104 of primary receiver No. 1.
Cable Assembly, RF CG-1079B/U 6 ft.	1	J2 of primary azimuth indicator.	J405 of primary goniometer on goniometer drive.
Cable Assembly, RF CG-1079B/U 9 ft.	1	J9 of goniometer drive.	J104 of secondary receiver No. 1.
Cable Assembly, RF CG-1079B/U 12 ft.	1	J2 of secondary azimuth indicator.	J40-5 of secondary goniometer on goniometer drive.
Cable Assembly, RF CG-3177/U 2 ft.	25	J1 through J25 of primary console.	J1 through J25 of rotary coupler.
Cable Assembly, RF CG-3178/TRD 2 ft.	1	J26 of primary console.	J7 and J11 of goniometer drive.
Cable Assembly, RF CG-3211/U 1 ft.	2	SYNC and IF jacks of monitor panel.	Sync and vertical input of oscilloscope.
Cable Assembly, Power CX-2378/U 5 ft.	1	J11 of primary azimuth indicator.	J5 of goniometer drive.
Cable Assembly, Power CX-2378/U 8 ft.	1	J11 of secondary azimuth indicator.	J10 of goniometer drive.
Cable Assembly, Power CX-11180/U 5 ft.	1	J27 of primary console.	J1 of secondary console.
Cable Assembly, Power CX-11180/U 5 ft; 6 in.	1	J9 of primary azimuth indicator.	J4 of power panel.

Nomenclature	Qty.	From	To
Cable Assembly, Power CX-11181/U 6 ft.	1	J28 of primary console.	115/230-volt ac 50-60 cps power source.
Cable Assembly, Power CX-11221/U 3 ft.	1	TB103 (pins 6-7) of primary receiver No. 1.	J2 of primary detector.
Cable Assembly, Power CX-11221/U 3 ft.	1	TB103 (pins 6-7) of secondary receiver No. 1.	J2 of secondary detector.
Cable Assembly, Power CX-11222/U 3 ft; 6 in.	1	J13 of goniometer drive.	J2 of control amplifier.
Cable Assembly, Power CX-11224/U 2 ft; 6 in.	1	J5 of power panel	J1 of control amplifier.
Cable Assembly, Power CX-11223/U 3 ft.	1	J2 of primary power supply.	J8 of primary detector.
Cable Assembly, Power CX-11223/U 3 ft.	1	J2 of secondary power supply.	J8 of secondary detector.
Cable Assembly, Power CX-11226/U 6 ft.	1	J8 of secondary azimuth indicator.	J1 of secondary power supply.
Cable Assembly, Power CX-11226/U 6 ft.	1	J8 of primary azimuth indicator.	J1 of primary power supply.
Cable Assembly, Power CX-11520/U 2 ft; 4 in.	1	J28 of primary console.	J1 (230 volts) or J2 (115 volts) of power panel.
Cable Assembly, Power CX-11227/U 5 ft; 4 in.	1	J9 of secondary azimuth indicator.	J1 of secondary console.
Cable Assembly, Power CX-11228/U 3 ft; 4 in.	1	J10 of primary azimuth indicator.	J1 of primary detector.
Cable Assembly, Power CX-11228/U 3 ft; 4 in.	1	J10 of secondary azimuth indicator.	J1 of secondary detector.
Cable Assembly, Power CX-11229/U 2 ft; 4 in.	1	J3 of power panel.	J27 of primary console.

2-20. Battery Installation in Radio Transmitter T-279/UR

Since the target transmitter is shipped without batteries, one 1.5-volt Battery BA-404/U and one 135-volt Battery BA-424/U must be requisitioned and installed as follows:

a. Open the cover and check to see that the ON-OFF switch is at OFF.

b. Turn the target transmitter on its side and unscrew the four knurled holddown screws (fig. 1-16) on the bottom.

c. Pull the chassis assembly out of the case.

d. Unscrew the lower holdown screws and lift off the lower plate.

e. Set the 135-volt Battery BA-424/U in place with its socket adjacent to the plug.

f. Connect the plug and replace the lower plate, locating the antenna guide block under the antenna. Tighten the knurled holddown screws.

g. Turn the target transmitter right side up.

h. Open the battery clamp on the center plate by unscrewing the knurled screw.

i. Slide the 1.5-volt Battery BA-404/U in place with the socket facing the hole in the end bracket. Connect the plug and close the battery clamp. Tighten the knurled screw.

j. Return the chassis into its case and tighten the knurled holddown screws on the bottom of the case.

Section II. INITIAL ADJUSTMENT OF EQUIPMENT

2-21. Preoperational Procedures

The equipment is properly calibrated and adjusted internally when it leaves the factory. If the bearing indication is not correct, however, the equipment must be calibrated. Perform the procedures in paragraphs 2-22 and 2-23 to assure correct bearing indications.

2-22. Primary Console Calibration

a. Turn on the equipment as instructed in paragraphs 3-10 and 3-11.

b. At the orientation point selected at the time of station erection, set up the target transmitter to transmit on a clear channel near 2 megacycles.

c. On the primary receiver, tune in the target using the receiver in the 2-kc bandwidth position.

d. Adjust the azimuth indicator DF GAIN for minimum propeller hub size and obtain proper length indication by means of the azimuth indicator SIZE control. Observe and record the number of degrees indicated and whether to the right or left of the 0-360° mark.

e. If the bearing indication is less than 15° off, turn off the equipment, loosen the two thumbscrews (fig. 1-6) on the primary drive housing and rotate the goniometer the desired number of degrees (using the 15-0-15 degree markers inscribed on the drive housing). Tighten the thumbscrews, insuring that the goniometer does not move.

Caution: **Be sure to unscrew the locking pin on the sync unit before applying power.**

f. If the bearing indication is more than 15° off, turn off the control amplifier, and turn down the locking screw (fig. 1-6) on the rear of the sync unit to lock the rotary coupler in position. Observe the azimuth of the straight line on the indicator. Loosen the setscrews on the motor side of the drive coupling and rotate the goniometer rotor until the straight line moves the same number of degrees but in the opposite direction of the previously observed bearing error. Tighten the setscrews. Unscrew the locking pin and apply power to the control amplifier. Perform the procedure given in *e* above if bearing indicated is not accurate.

2-23. Secondary Console Calibration

After the primary indicator has been properly aligned, the secondary indicator must be checked and adjusted if necessary. Proceed as follows:

a. Repeat procedures given in paragraph 2-22*d* for the secondary indicator.

b. Shut off the motor power and allow the motor to stop rotating.

c. Loosen the second goniometer from its support and slip the timing belt around until the indication on the secondary indicator coincides as closely as possible with that of the primary indicator. Tighten the goniometer back on its mount and start the motor.

d. Observe the amount of misalignment. If the amount of misalignment is more than 2° to the right or left of the 0-360° mark, repeat procedures given in *b* and *c* above. If the amount of misalignment is less than ±2°, apply the procedures given in paragraph 2-22*e*.

e. Check to see that both indicators are now properly aligned.

f. Shut off the target transmitter.

CHAPTER 3

OPERATING INSTRUCTIONS

Section I. OPERATOR'S CONTROLS AND INDICATORS

3-1. Damage From Improper Settings

a. A cathode ray tube display with the intensity of the beam set too high can burn holes in the phosphorescent coating of the tube. When power is applied to the azimuth indicator, check to see that the intensity is not too high.

b. Improper setting of the FOCUS control on the azimuth indicator could result in an erroneous reading of bearing information.

3-2. Azimuth Indicator Controls

(fig. 3-1)

Control	Function
INDICATOR switch	Turns indicator on and off.
MODE:	
1 RCVR-2 RCVR switch.	Selects single receiver or dual receiver df mode of operation. 2 RCVR position is used when received carrier is not of constant frequency.
MONITOR-D.F. switch.	Selects monitor antennas or antenna array for input to No. 1 receiver. Blanks indicator screen in MONITOR position.
HORIZONTAL control	Centers the cathode ray tube pattern horizontally.
VERTICAL control	Centers the cathode ray tube pattern vertically.
INTENSITY control	Varies the brightness of the cathode ray tube pattern.
FOCUS control	Adjusts the sharpness of the cathode ray tube pattern.
DIMMER control	Varies the degree of light on the azimuth scale.
D.F. GAIN control	Varies the df signal level into the azimuth indicator to display best propeller pattern.
SIZE control	Varies the size of the pattern.
SHAPE control	Adjusts no-signal pattern shape to conform to the circular alidade scale.

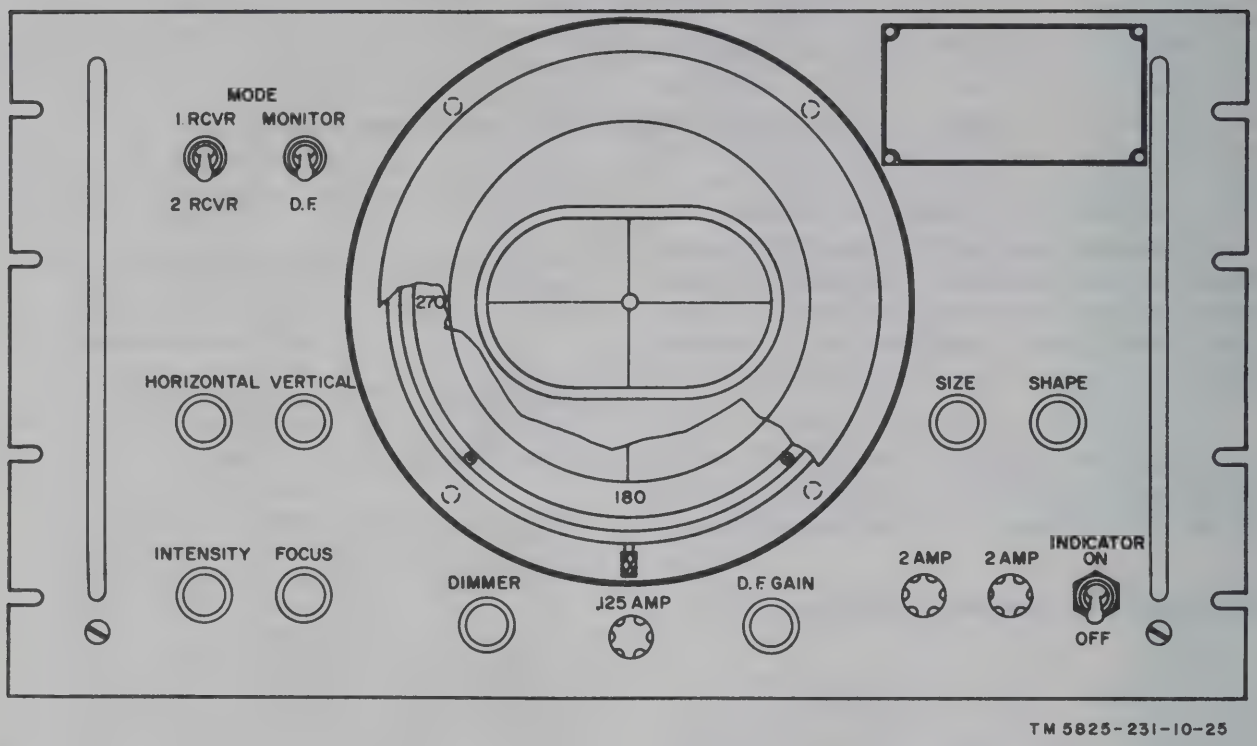


Figure 3-1. Azimuth indicator controls and indicators.

3-3. Power Supply PP-4482/TRD Controls (fig. 3-2)

Control	Function
POWER switch	Turn power supply on and off.
Ac power lamp	When illuminated, indicates that switch is in ON position.

3-4. Panel, Power Distribution SB-1747/TRD Controls (fig. 3-3)

Control	Function
LINE INPUT	Turns power panel on and off. Selects proper line voltage.
LOAD	Connects and disconnects load from power panel.
CIRCUIT BREAKERS button.	Protective device overload on 115VAC input line. Push to reset.
230VAC button	Protective device prevents overload on 230VAC input line. Push to reset.
OUTPUT VOLTAGE CONTROL switch.	Adjusts output to proper operating voltage for system (115-volt nominal).
LINE FREQUENCY meter.	Indicates frequency of line voltage.
OUTPUT VOLTAGE meter.	Indicates output voltage.

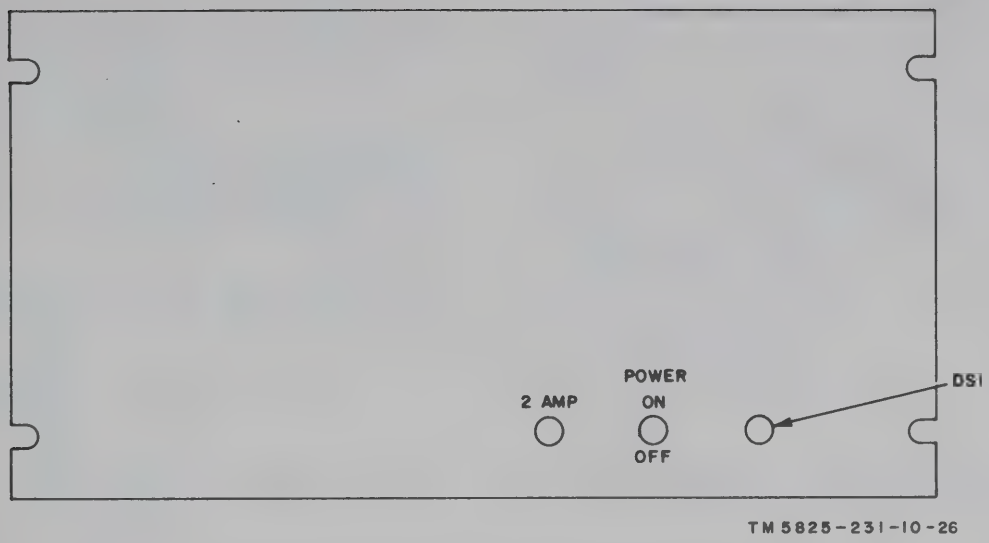


Figure 3-2. Power supply controls and indicators.

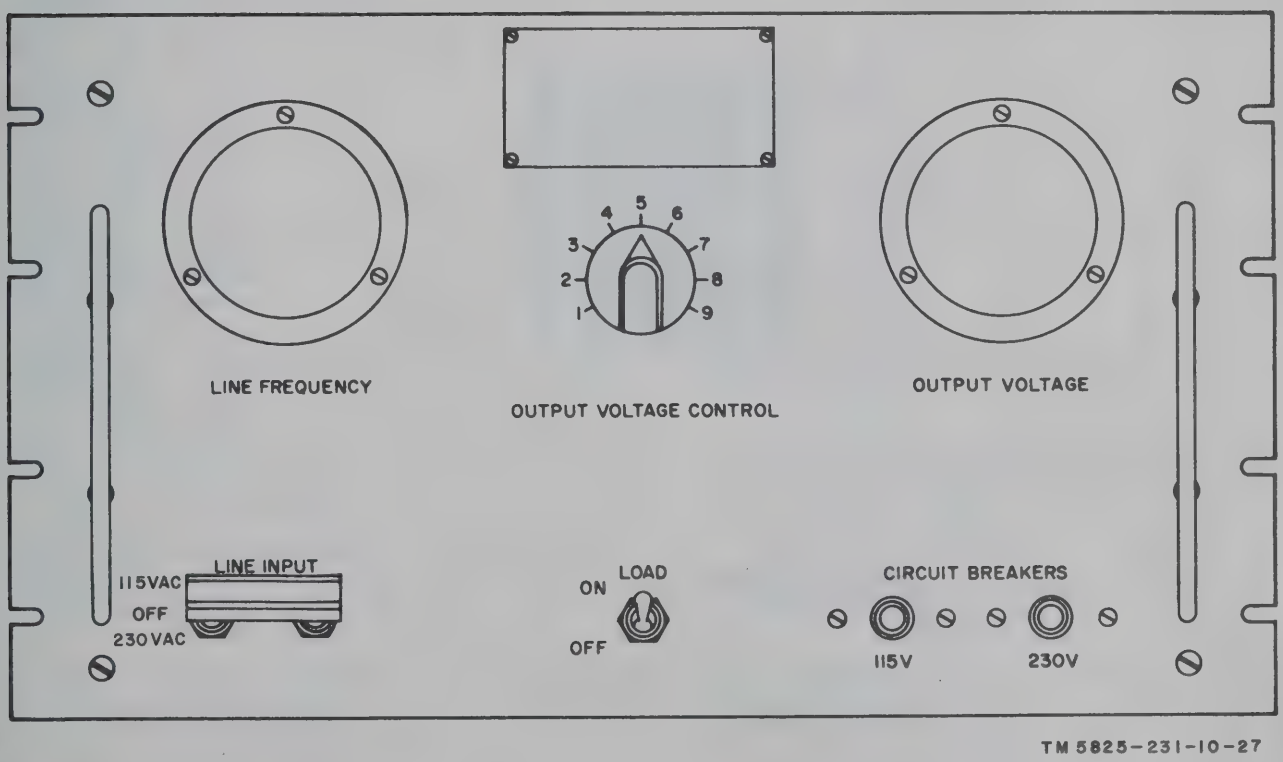


Figure 3-3. Power panel controls and indicators.

3-5. Amplifier, Electronic Control AM-3545/TRD Controls and Indicators

(fig. 3-4)

Control	Function
ON-OFF switch	Turns control amplifier on and off.
AC POWER lamp	Indicates that ON-OFF switch is in ON position when illuminated.
POWER OUTPUT lamp.	Indicates control amplifier is supplying power to goniometer drive when illuminated.

3-6. Receiver, Radio R-725/URR Controls and Indicators

(fig. 3-5)

Control	Function
LINE LEVEL meter	Indicates level of balanced line audio output.
LINE METER switch	Meter switch has four positions: *Sw Pos.* — *Effect* OFF — Disconnects meter from balanced line output. +10 — Adds 10 volume units to LINE LEVEL meter vu indication. 0 — Reads LINE LEVEL meter directly. −10 — Subtracts 10 volume units from LINE LEVEL meter indication.
LINE GAIN control	Controls level of signal applied to balanced line output terminals.
AGC switch	Determines rapidity of change in gain of receiver for a change of signal strength.
LIMITER switch and control.	Increasing clockwise rotation of control increases reduction of static interference.
CARRIER LEVEL meter.	Indication of 0 db with RF GAIN control at 10 corresponds to an input signal of approximately 2 microvolts.
BANDWIDTH KC switch.	Causes the receiver to reject frequencies that differ from the carrier frequency by more than the amount adjusted for.
BFO switch	Makes cw signals audible.
BFO PITCH control.	Varies tone when receiving cw signals.
AUDIO RESPONSE switch.	*Sw Pos.* — *Effect* SHARP — 800-cps tone is loudest; used for cw. WIDE — Most voice frequencies are heard.
BREAK IN switch	Permits break-in operation if proper connections have been made at rear panel.
FUNCTION switch	Function switch has five positions. *Sw Pos.* — *Effect* OFF — Receiver is turned completely off. STAND BY — Receiver inoperative, but ready for instant use. AGC — Receiver operative, with gain controlled automatically. MGC — Receiver operative, with gain controlled by RF GAIN control or by an external control. CAL — Permits calibration of the tuning system at 100-kc checkpoints.
ANT TRIM control	Permits peaking of received signal to maximum value.
DIAL LOCK	When turned clockwise, locks KILOCYCLE CHANGE control to prevent accidental change of setting.
ZERO ADJ	When turned clockwise, disengages frequency indicator from KILOCYCLE CHANGE control for calibration purposes.
LOCAL GAIN control.	Controls level of af signal applied to local headset or loudspeaker.

Control	Function
RF GAIN control	Manual control of amplification of received signal.
MEGACYCLE CHANGE control.	Selects any one of 32 tuning bands in steps of 1 megacycle; changes reading of first two digits of frequency indicator.
KILOCYCLE CHANGE control.	Tunes receiver to any frequency within a 1-megacycle band; changes reading of last three digits of frequency indicator.
PHONES jack	Provides means of connecting headset to receiver.

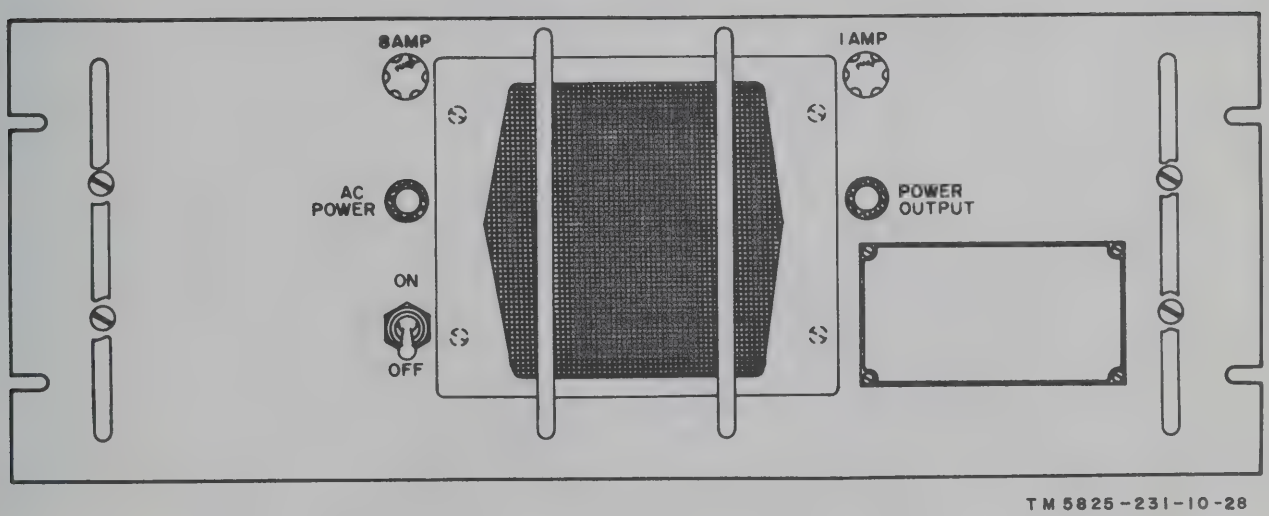


Figure 3-4. Control amplifier controls and indicators.

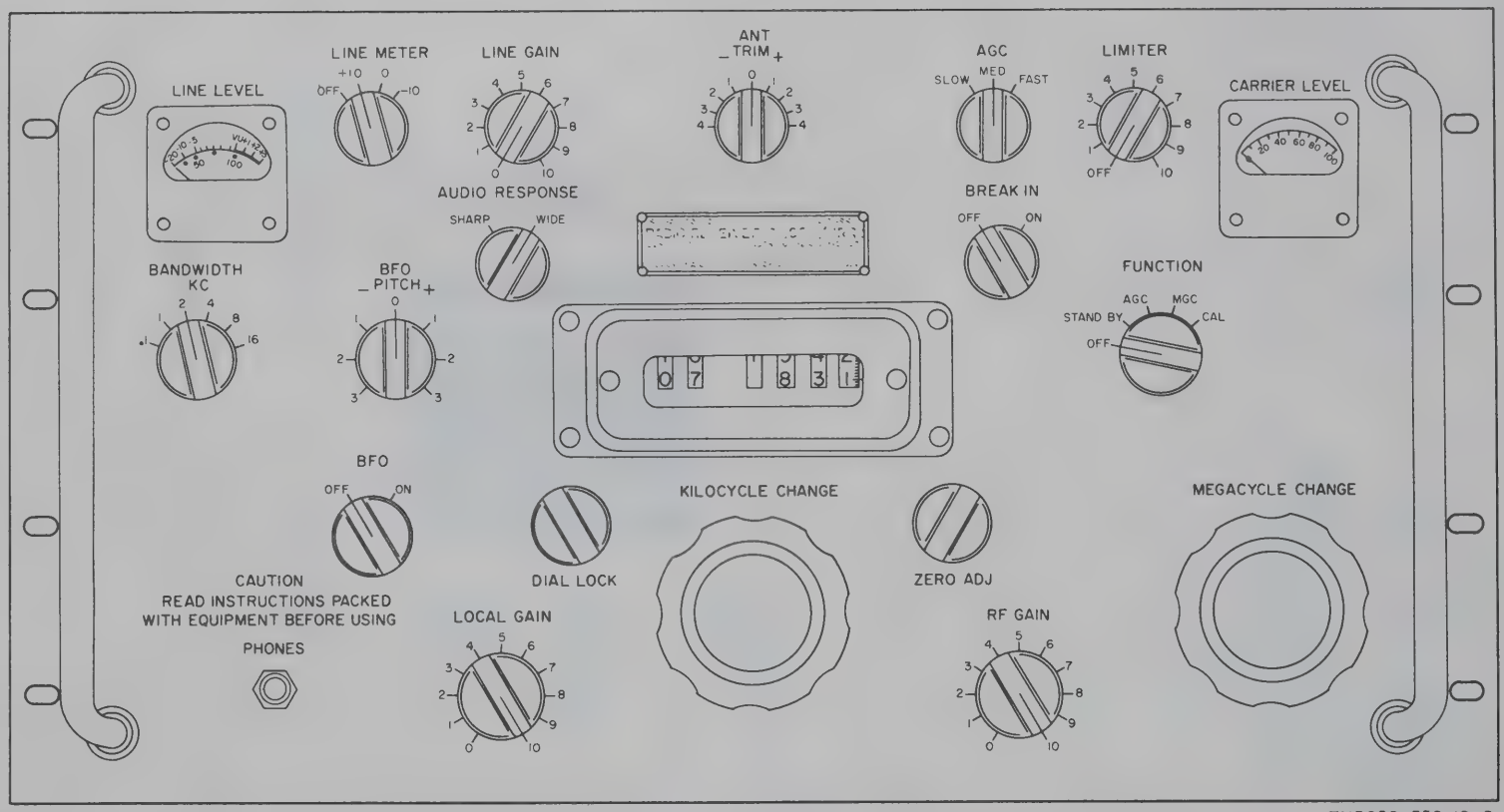


Figure 3-5. Receiver controls and indicators.

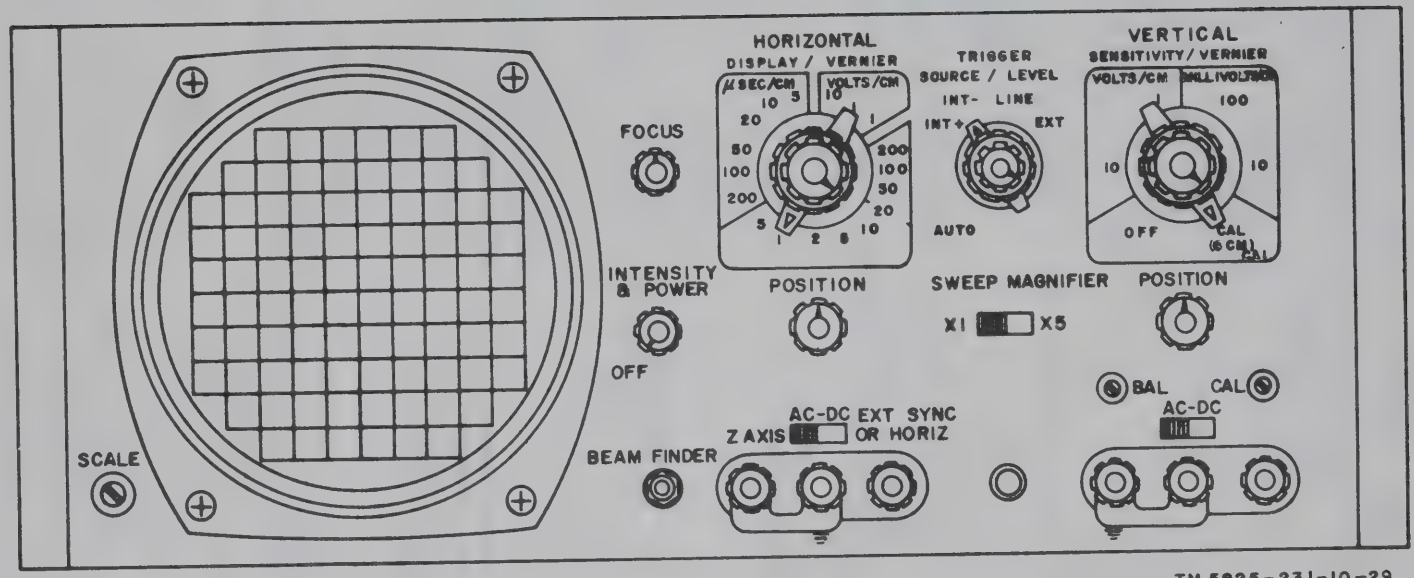


Figure 3-6. Oscilloscope controls and indicators.

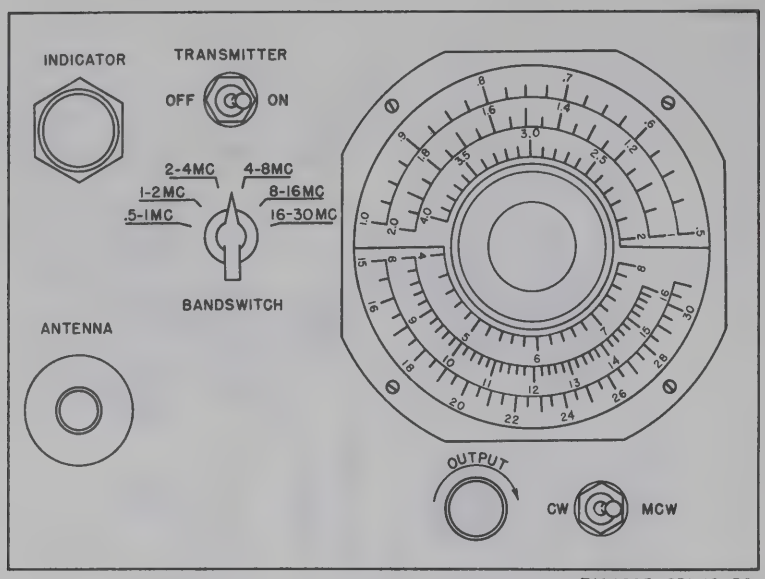


Figure 3-7. Target transmitter controls and indicators.

3-7. Oscilloscope 120B Controls

(fig. 3-6)

Control	Function
FOCUS control	Adjusts the sharpness of the cathode ray tube pattern.
HORIZONTAL:	
VERNIER control	Adjusts sensitivity between ranges.
DISPLAY switch	Selects sweep speed or external sweep sensitivity.
POSITION control	Controls horizontal position of cathode ray tube display.
AC-DC switch	Selects ac or dc coupling of input signals to horizontal amplifier.
EXT SYNC OR HORIZ jack.	External sync on horizontal amplifier input.
Z AXIS jack	Input for intensity modulation signal.
INTENSITY & POWER control and switch.	Adjusts intensity of cathode ray tube and turns oscilloscope on and off.
SCALE screwdriver	Aligns trace with graticule.
BEAM FINDER button.	Returns beam to cathode ray tube face regardless of horizontal and vertical POSITION settings.
TRIGGER:	
LEVEL control	Adjusts level of trigger point on sync signal.
SOURCE switch	Selects sweep synchronization.
SWEEP MAGNIFIER: X1-X5 switch.	Multiplies sweep speed selected by HORIZONTAL DISPLAY.
VERTICAL:	
SENSITIVITY switch.	Selects vertical deflection sensitivity.
VERNIER control.	Adjusts sensitivity between ranges.
POSITION control	Controls vertical position of cathode ray tube display.
BAL screwdriver	Adjusts for no vertical shift with rotation of vertical VERNIER.
CAL screwdriver	Adjusts calibration of vertical input.
AC-DC switch	Selects ac or dc coupling for vertical amplifier.
Jack (lower right-hand corner of front panel).	Input to vertical amplifier.

3-8. Radio Transmitter T-279/UR Controls

(fig. 3-7)

Control	Function
BANDSWITCH	Selects frequency band.
TRANSMITTER	In ON position, connects transmitter to battery power.
INDICATOR light	Flashes at approximate 2-second intervals when power is on.
CW-MCW	Selects the signal, either continuous wave (CW) or modulated continuous wave (MCW).
OUTPUT control	Potentiometer for adjusting output power.
Tuning control	Tunes target transmitter to desired frequency by means of the tuning dial. Frequency will be within band selected by BANDSWITCH.

Section II. OPERATION UNDER USUAL CONDITIONS

3-9. Types of Operation

a. The primary and secondary consoles are functionally the same; hence, *b* and *c* below apply to either console.

b. Direction finding a signal that has a constant carrier frequency requires the use of only the No. 1 receiver and the df antenna. The signal can be monitored at the same time, using the speaker in the control amplifier, or receiver No. 2 can be used with a headset to monitor the same signal or a different signal which may be of any type.

c. Direction finding a signal that does not have a constant carrier frequency requires the use of both receivers and both antennas. The signal can be monitored with the speaker or with a headset connected to receiver No. 2 since both receivers are tuned to the same frequency in this mode.

Note. If receiver No. 1 is used for monitoring while connected to the df antenna, the audio will be modulated by the rotary coupler.

3-10. Starting Procedure

a. At the power panel, set the LINE INPUT switch to 115VAC or 230V (whichever line voltage is available); set the LOAD switch to OFF and the OUTPUT VOLTAGE CONTROL for a 115-volt ac indication on the OUTPUT VOLTAGE meter.

b. Check the control amplifier LINE FREQUENCY meter. The equipment is designed for 50- to 60-cycle operation.

c. Set the control amplifier and the power supply ON-OFF switches to ON. Check to see that the control amplifier AC POWER and POWER OUTPUT lamps and the power supply ac power lamp are illuminated.

d. At the azimuth indicator front panel, set the INDICATOR switch to ON, MONITOR-DF switch to DF, and 1 RCVR-2 RCVR switch to 1 RCVR.

e. At the receiver No. 1, front panel, set the BANDWIDTH KC selector switch to 2 and rotate the RF GAIN control fully clockwise. The BFO switch must be in OFF position.

Note. Use of the 2-kc bandwidth is mandatory for direction finding.

f. Set the receiver FUNCTION switch to STAND BY to apply power and then rotate to AGC position.

g. Set the receiver AGC switch to FAST and adjust the LOCAL GAIN for audible level from the speaker.

Note. Before proceeding to *h* below, allow 20 minutes for the equipment to warm up. Readjust the power panel OUTPUT VOLTAGE CONTROL switch, if necessary.

h. At the oscilloscope front panel, rotate the INTENSITY & POWER control switch clockwise to apply power to the unit. After a 30-second warmup, depress the BEAM FINDER button and adjust the trace for intensity. Rotate the POSITION controls to adjust position of the trace.

3-11. Operating Procedure

a. Adjust the azimuth indicator INTENSITY control until illumination is observed on the screen of the cathode ray tube.

***Caution:* Avoid excess brightness because the tube may become damaged.**

b. Rotate the FOCUS control until a sharply defined circle is obtained.

c. Adjust the HORIZONTAL and VERTICAL controls to center the circle with respect to horizontal and vertical axes.

Note. The circle in *c* above must be centered or bearing errors will result.

d. Adjust the DIMMER control for comfortable azimuth scale viewing.

e. Adjust the SIZE control until the extremities of the illuminated area are just within the inner diameter of the azimuth scale.

f. Adjust the SHAPE control to obtain a circular pattern. Readjust the SIZE control if necessary.

Note. The azimuth indicator was properly aligned during manufacture and normally will not require realignment.

g. Readjust the INTENSITY control for comfortable viewing level and adjust the FOCUS control for a clearly defined perimeter of the circle.

h. Using the receiver MEGACYCLE CHANGE and KILOCYCLE CHANGE controls, tune receiver until a signal is obtained. Adjust the KILOCYCLE CHANGE control and ANT TRIM control for maximum indication on the CARRIER LEVEL meter.

i. At the azimuth indicator, adjust the D.F. GAIN control for a normal pattern (fig. 3-8) and bisect pattern with alidade crosshairs to read bearing accurately.

Note. If a normal pattern cannot be obtained, see paragraph 3-14.



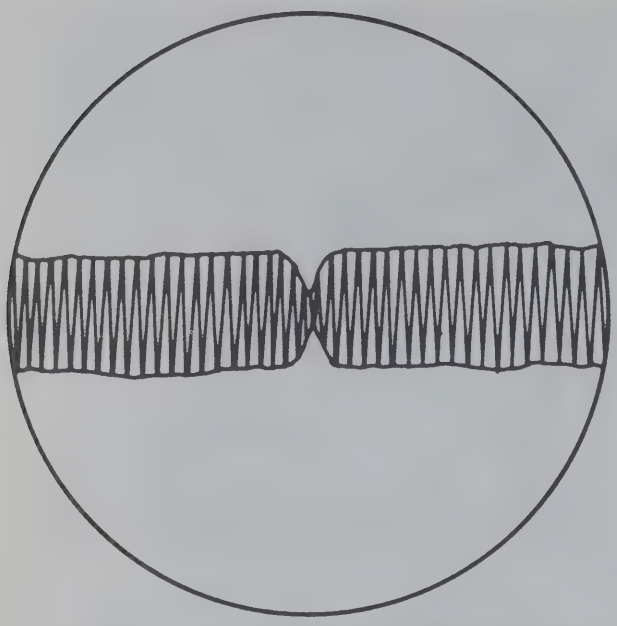
Figure 3-8. Indicator display, normal pattern.

3-12. Oscilloscope Operating Procedure

a. The oscilloscope is provided primarily for monitoring the 455-kc intermediate frequency appearing at the rear of the receiver. The oscilloscope time base is synchronized with the direction finder scan rate of 90 cycles per second (cps) by means of a pulse derived from the goniometer drive. The time base is adjusted so that one scan of the direction finder antenna system is displayed.

b. The display is a continuous monitor of the individual antenna outputs. A faulty antenna cable or connection in the antenna feed will be immediately observed as a *hole* in the IF pattern displayed (fig. 3-9).

c. Adjust FOCUS and INTENSITY & POW-



TM 5825-231-10-31

Figure 3-9. Oscilloscope display with one antenna input missing.

ER for best presentation. For display of the IF pattern, the oscilloscope controls must be set as follows:

Control	*Setting*
SWEEP TIME	1 millisecond (ms).
TRIGGER	EXT.
AC-DC switch	AC.
VERTICAL SENSITIVITY.	Adjust for best display.
SWEEP MAGNIFIER.	X1.

3-13. General Operating Information

a. Be very careful to insure that the receiver is accurately tuned throughout the range. The bearing pattern will split or distort if tuning is not accurate or if the D.F. GAIN control is improperly set.

b. The chart below lists the various types of signals and their characteristics, together with recommendations for reading them.

Signals and characteristics

Type of signal	Characteristics	How or when to read bearing most effectively
On-off keying (icw).	Sharp half-propeller when keying is on. Pattern splatters around in all directions when keying is off.	Read when keying is on; use crosshairs. Bearing may also be read using afterglow.
Steady cw or amplitude modulated signal.	Sharp propeller tip.	Read any time; use crosshairs.
Frequency shift keying (dual receiver mode).	During keying, pattern will bounce to both sides of bearing.	Watch the bounce and set the crosshairs at the midpoint about which the pattern is bouncing or read bearing from afterglow.
Weak signal	Characteristics are as described above for the type signal received except signals influenced by noise.	Watch the bounce and set the crosshairs at the midpoint about which the pattern bounces. Read bearing from afterglow.

3-14. Dual Receiver Mode of Operation

a. The dual receiver mode must be used when the signal contains fm.

b. For dual receiver mode of operation, set the 1 RCVR-2 RCVR switch on the indicator to 2 RCVR.

c. Tune receiver No. 2 in the same manner as receiver No. 1 and to the same signal.

3-15. Stopping Procedure

To turn off the Direction Finder Set AN/TRD-15, set the LINE INPUT switch on the power panel to the OFF position.

Section III. OPERATING UNDER UNUSUAL CONDITIONS

3-16. General

The operation of Direction Finder Set AN/TRD-15 may be difficult in regions where extreme heat, humidity and moisture, sand conditions, etc, prevail. Procedures for minimizing the effect of these unusual operating conditions are given in paragraphs 3-17, 3-18, and 3-19.

3-17. Operation in Arctic Climates

Subzero temperatures and climatic conditions associated with cold weather affect the efficient operation of the equipment. Instructions and precautions for operation under such adverse conditions follow.

a. Keep the equipment warm and dry. Stow the transmitter in the heated shelter until it is to be used.

b. Improvise any means for preventing the transmitter batteries from freezing. To prevent heat loss when the transmitter is carried outside, place the transmitter in a bag lined with kapok, spun glass, fiber materials, animal skins, or woolen cloth.

c. When the equipment has been exposed to the cold and is brought into a warm shelter, moisture will form on it until it reaches room temperature. When the equipment has reached room temperature, dry it thoroughly. This condition also arises when equipment warms up during the day after exposure during a cold night.

3-18. Operation in Tropical Climates

High relative humidity causes condensation of moisture on the equipment whenever the temperature of the equipment becomes lower than that of the surrounding air. To minimize this condition, place a lighted electric bulb under each equipment and keep the forced ventilation operating in the shelter.

3-19. Operation in Desert Climates

a. Conditions similar to those encountered in tropical climates often prevail in desert areas. Use the same measures to insure proper operation of the equipment.

b. The main problem with equipment operation in desert areas is the large amount of sand or dirt which enters the moving parts of the equipment. The best precaution is to make the shelter in which the equipment is located as dustproof as possible with available materials. Hang wet sacking over the windows and doors; cover the inside walls with heavy paper.

c. Be very careful to keep the equipment as free from dust as possible by keeping the cabinets closed. Make frequent preventive maintenance checks.

d. Because of sudden wind squalls, to which desert areas are subject, be extremely careful regarding the security of the counterpoise, the guys of the antenna, and the lines and cables outside the shelter.

CHAPTER 4

MAINTENANCE INSTRUCTIONS

4-1. Scope of Operator's Maintenance

The following is a list of maintenance duties normally performed by the operator of Direction Finder Set AN/TRD-15:

Operator's daily preventive maintenance checks and services (para 4-4).

Operator's weekly preventive maintenance checks and services (para 4-5).

Cleaning (para 4-6).

Troubleshooting (para 4-7).

Repairs and adjustments:

Replacement of alidad indicator lamps (para 4-8*a*).

Replacement of other lamps (para 4-8*b*).

Replacement of fuses (para 4-8c).

4-2. Tools and Equipment Required for Operator's Maintenance

No special tools or equipment are required to perform operator's maintenance on Direction Finder Set AN/TRD-15.

4-3. Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurence of trouble, to reduce downtime, and to assure that the equipment is serviceable.

a. Systematic Care. The procedures given in paragraphs 4-4 through 4-6 cover routine systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. Preventive Maintenance Checks and Services. The preventive maintenance checks and services charts (paras 4-4 and 4-5) outline functions to be performed at specific intervals. These checks and services are to maintain Army electronic equipment in a combat serviceable condition; that is, in good general (physical) condition and in good operating condition. To assist operators in maintaining combat serviceability, the charts indicate what to check, how to check, and what the normal conditions are; the *References* column lists the paragraphs that contain detailed repair or replacement procedures. If defects cannot be remedied by the operator, higher category of maintenance or repair is required. Reports and records of these checks and services must be made in accordance with the requirements set forth in TM 38-750.

4-4. Operator's Daily Preventive Maintenance Checks and Services Chart

Sequence No.	Item to be inspected	Procedure	References
1	Exterior surfaces	Clean primary and secondary consoles, panels, and meter glasses.	Para 4-6.
2	Intercabling and connecteors.	Check all interconnecting cables and connectors for cracks and breaks. Replace cables that have cracks or broken connectors.	
3	Headset	Clean headset	Para 4-6.
4	Antennas, bases	Remove rust and corrosion	Para 4-6.
5	Knobs, dials, and switches.	While making operating checks (items 6 through 11), observe that mechanical action of each knob, dial, and switch is smooth and free of external or internal binding.	

Sequence No.	Item to be inspected	Procedure	References
6	LINE INPUT switch (power panel).	Set to line voltage used (115V or 230) and check to see that OUTPUT VOLTAGE meter reads 115VAC.	Para 4-7.
7	OUTPUT VOLTAGE CONTROL (power panel).	Adjust OUTPUT VOLTAGE CONTROL for reading of 115 vac on OUTPUT VOLTAGE meter.	Para 4-7.
8	ON-OFF switch (control amplifier).	Set to ON and check to see that —	
		a. AC POWER lamp lights	Para 4-7.
		b. Goniometer drive motor runs	
		c. POWER OUTPUT lamp lights	Para 4-7.
9	INDICATOR switch (azimuth indicator).	Set switch to ON and check to see that —	
		a. Alidade lamps light	Para 4-7.
		b. Display appears on indicator cathode ray tube.	Para 4-7.
10	POWER switch (power supply).	Set switch to ON and check to see that ON lamp (on power supply) lights.	Para 4-7.
11	FUNCTION switch (receiver).	Set to AGC and tune in a signal. Propeller pattern should indicate a bearing.	Paras 3-6 and 3-10.

4-5. Operator's Weekly Preventive Maintenance Checks and Services Chart

Sequence No.	Item to be inspected	Procedure	References
1	Guy wires	Check guy wires for proper tension.	
2	Antennas	Inspect antennas for straightness.	
3	Cable clamps	Check for loose cable clamps on all external cables.	
4	Goniometer drive belt.	Turn all power off and check goniometer drive belt for signs of wear.	
5	Normal operation	Check df system during normal operation.	Para 4-4.
6	Counterpoise mesh	Chek counterpoise mesh for proper grounding.	Para 2-9.
7	Guy stakes	Check guy stakes for proper seating.	
8	Antenna base stakes.	Check antenna base stakes for proper seating.	

4-6. Cleaning

Inspect the exterior of both consoles and all units within the consoles. The exterior surfaces should be free of dirt, grease, and fungus.

a. Remove loose dirt with a clean soft cloth.

Warning: **Prolonged breathing of cleaning compound is dangerous; make sure that adequate ventilation is provided. Cleaning compound is flammable; *do not* use near a flame. Avoid contact with the skin; wash off any that spills on your hands.**

b. Remove grease, fungus, and ground-in dirt from the cases; use a cloth dampened

(not wet) with cleaning compound (FSN 7930-395-9542).

c. remove dirt from plugs and jacks with a brush.

Caution: **Do not press on the meter faces (glass) when cleaning; the meter may become damaged.**

d. Clean the front panels, meters, and control knobs; use a soft clean cloth. If dirt is difficult to remove, dampen the cloth with water; mild soap may be used for more effective cleaning.

4-7. Troubleshooting Chart

Item No.	Trouble symptom	Probable Trouble	Checks and corective measures
1	OUTPUT VOLTAGE indicate 115VAC. meter does not	Circuit breakers open and/or improper seating of power input cables.	Check circuit breakers. If circuit breakers are closed, check seating of power input cables.
2	With ON-OFF switch on control amplifier set to ON:		
	a. AC POWER lamp does not light.	*a.* Pilot lamp loose in socket or burned out and/or fuse is defective.	*a.* Check fuse; replace if necessary. If fuse is good, check seating of pilot lamp. Replace if necessary.
	b. POWER OUTPUT lamp does not light.	*b.* Pilot lamp loose in socket or burned out.	*b.* Check seating of pilot lamp. Replace if necessary.
3	POWER ON lamp on power supply does not light.	Defective power supply fuse and/or pilot lamp loose in socket or burned out.	Check fuse and replace if necessary. Check pilot lamp for proper seating and replace if necessary.
4	Lamps around indicator alidade do not light.	Defective fuses (2 AMP) and/or defective alidade lamps.	Check fuses and replace if necessary. Check lamps and replace as necessary.
5	Display does not appear on indicator cathode ray tube.	Defective fuse (.125 AMP).	Check fuse and replace if necessary.
6	With target transmitter TRANSMITTER switch at ON, indicator does not display correct bearing.	Goniometer misadjusted	Adjust goniometer in accordance with paragraph 2-21.

4-8. Repairs and Adjustments

a. Replacement of Indicator Alidade Lamps.

(1) Remove the screws that hold the alidade.

(2) Press in on the pilot lamp and turn it counterclockwise to unlock.

(3) Pull the defective lamp out and replace it with a new one. Push the lamp in and twist it clockwise to lock.

b. Replacement of Control Amplifier, Azimuth Indicator, Power Supply, and Detector Power ON Pilot Lamps.

(1) Turn the glass indicator jewel counterclockwise and pull out to expose defective lamp.

(2) Press in on the lamp and turn counterclockwise to unlock.

(3) Pull the defective lamp out and replace it with a new one. Push the lamp in and twist it clockwise to lock.

c. Replacement of Fuses in Df System.

(1) Twist the fuse cap counterclockwise to unlock.

(2) Pull the cap out and remove the defective fuse from the cap.

(3) Replace the defective fuse with a new one and insert the cap and fuse back into the fuse holder.

(4) Push in on the fuse cap and twist clockwise to lock.

CHAPTER 5

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

5-1. Handling, Storage, and Disposal of Radioactive Material

Follow the procedures for safe handling, storage, and disposal of radioactive materials as directed by TB SIG 225, AR 40-580, and AR 755-380.

5-2. Disassembly of Equipment

The following instructions are recommended as a guide for preparing the df system for shipment and storage:

a. Antenna System. Disassembly of all 26 antennas is the same. Follow the procedures in the order listed below:

(1) Disconnect the cable (CG-92G/U 75 ft or CG-926G/U 110 ft) from the antenna coupler (fig. 2-11).

(2) Remove the antenna coupler by loosening the thumb nuts on the antenna (lower mast section). Slide the upper end out (left to right); then lift up to remove the assembly.

(3) Loosen the guy wires.

(4) Disconnect the guys.

(5) Holding the antenna in an upright position, pull out on the upper retaining pin on the antenna base (fig. 2-7).

(6) Slowly walk away from the base, moving hands back, one at a time, until antenna is low enough for the removal of the loading disk.

(7) Unscrew the loading disk from the upper mast section (fig. 2-9).

(8) Unlock and remove the lower retaining pin.

(9) Unlock the clamps on the antenna sections and place the sections in the antenna container.

(10) Remove the guy stakes and the base stakes and place them in their container.

(11) Set the antenna base aside and remove the counterpoise ground strap from the ground rod by removing the holding screw.

(12) Remove the counterpoise clamps and the ground rod. Fold the counterpoise in half with the two wooden rods on each end.

(13) Rol up the counterpoise from each end toward the center.

(14) Place the counterpoise and clamps in the counterpoise container.

b. Consoles. Disconnect all cabling before proceeding. Remove the units as follows:

(1) Remove the rack and panel screws from the front panels of all the units.

(2) Slide the units forward and remove them from the console.

5-3. Protecting Transported Equipment

a. Equipment that is to be removed from service for periods exceeding approximately 2 weeks, or equipment that is to be shipped for use by other personnel or activities, is normally repackaged by higher maintenance category personnel. Refer equipment to organizational maintenance personnel for repackaging.

b. If this equipment is to be transported over short distances under control of the using unit for immediate re-use, place each unit in a corrugated cardboard or wooden box and place padding over the control panels. Use rags or crumpled paper for padding.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

5-4. Authority for Demolition

Demolition of the equipment will be accomplished only upon the order of the commander. The destruction procedures outlined in paragraph 5-5 will be used to prevent further use of the equipment.

5-5. Methods of Destruction

Use any of the following methods to destroy the equipment:

Warning: **Use extreme care when smashing the cathode ray tube. Strike the cathode ray tube lightly on the neck next to the base.**

a. Smash. Smash the controls, tubes, switches, capacitors, transformers and meters; use sledges, axes, hammers, or crowbars.

b. Cut. Cut the power cord and slash the radiofrequency shields; use axes, handaxes, or machetes.

Warning: **Be extremely careful with explosives and incendiary devices. Use these items only when the need is urgent.**

c. Burn. Burn cords and technical manuals; use gasoline, kerosene, oil, flamethrowers, or incendiary grenades.

d. Bend. Bend panel, cabinets, and antenna sections.

e. Explode. If explosives are necessary, use firearms, grenades, or TNT.

f. Dispose. Bury or scatter the destroyed parts or throw them into waterways.

APPENDIX I

REFERENCES

AR 700-52	Licensing and Control of Sources of Ionizing Radiation
AR 755-380	Disposal of Unwanted Radioactive Material
DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, Lubrication Orders, and Modification Work Orders
TB SIG 225	Identification and Handling of Radioactive Signal Items
TM 11-476	Radio Direction Finding
TM 11-5820-358-10	Operator's Manual: Radio Receiver R-390A/URR
TM 38-750	Army Equipment Record Procedures

APPENDIX II

BASIC ISSUE ITEMS

Section I. INTRODUCTION

A2-1. General

This appendix lists items supplied for initial operation and for running spares. The list includes tools, parts, and material issued as part of the major end item. The list includes all items authorized for basic operator maintenance of the equipment. End items of equipment are issued on the basis of alowances prescribed in equipment authorization tables and other documents that are a basis for requisitioning.

A2-2. Columns

Columns are as follows:

a. Federal Stock Number. This column lists the 11-digit Federal stock number.

b. Designation by Model. Not used.

c. Description. Nomenclature or the standard item name and brief identiying data for each item are listed in this column. When requisitioning, enter the nomenclature and description.

d. Unit of Issue. The unit of issue is each unless otherwise indicated and is the supply term by which the individual item is counted for procurement, storage, requisitioning, allowances, and issue purposes.

e. Expendability. Nonexpendable items are indicated by NX. Expendable items are not annotated.

f. Quantity Authorized. Under "Items Comprising an Operable Equipment," the column lists the quantity of items supplied for the initial operation of the equipment. Under "Running Spare Items" the quantities listed are those issued initially with the equipment as spare parts. The quantities are authorized to be kept on hand by the operator for maintenance of the equipment.

g. Illustration. The "Item No." column lists the reference designations that appear on the part in the equipment. These same designations are also used on any illustrations of the equipment. The numbers in the "Figure No." column refer to the illustrations where the part is shown.

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY AUTH	ILLUSTRATION	
						FIGURE NO.	ITEM NO.
5825-069-8763		DIRECTION FINDER SET AN/TRD-15		NX		1-1	
		ITEMS COMPRISING AN OPERABLE EQUIPMENT					
ORD THRU AGC		TECHNICAL MANUAL TM 11-5825-231-10			2		
		NOTE: For technical manuals the quantity indicates the maximum number of copies authorized for packing (or issue) with the equipment. Where a number of these equipments are concentrated in a small area, the quantity on hand may be reduced to practical levels. Excess publications must be returned to publication supply centers through AG channels.					
5825-918-6991		AMPLIFIER, ELECTRONIC CONTROL AM-3545/TRD-15: Sig dwg SM-D-535706		NX	1	1-14	
5985-926-0178		ANTENNA SYSTEM AN/TRA-32			26		
5975-782-6950		CABINET, ELECTRICAL EQUIPMENT CY-4873/TRD		NX	1	1-1	
5995-985-8357		CABLE ASSEMBLY, RADIOFREQUENCY CG-3211/U: 1 ft; Sig dwg SM-D-535854			2		W10,11
5995-905-8291		CABLE ASSEMBLY, RADIOFREQUENCY CG-92G/U: 110 ft excluding term; Sig dwg SM-D-5358521		NX	26		
5995-905-8292		CABLE ASSEMBLY, RADIOFREQUENCY CG-92G/U: 75 ft excluding term; Sig dwg SM-D-535852			26		
5995-889-0751		CABLE ASSEMBLY, RADIOFREQUENCY CG-409G/U: 3 ft lg; SC-D-68284			2		W1
5995-823-2885		CABLE ASSEMBLY, RADIOFREQUENCY CG-409G/U: 4 ft 6 in lg; Sig dwg SC-D-68284			2		W2,4
5995-905-6415		CABLE ASSEMBLY, RADIOFREQUENCY CG-409G/U: 5 ft lg; Sig dwg SC-D-68284			2		W3,6
5995-905-6413		CABLE ASSEMBLY, RADIOFREQUENCY CG-409G/U: 5 ft 6 in lg; Sig dwg SC-D-68284			1		W4
5995-905-7194		CABLE ASSEMBLY, RADIOFREQUENCY CG-409G/U: 6 ft lg; Sig dwg SM-D-68284			4		W5-8
5995-905-6416		CABLE ASSEMBLY, RADIOFREQUENCY CG-409G/U: 6 ft 6 in lg; Sig dwg SC-D-68284			1		W9
5995-985-8402		CABLE ASSEMBLY, RADIOFREQUENCY CG-409G/U: 12 ft lg; excluding term; Sig dwg SM-D-68284		NX	4		
5995-905-7185		CABLE ASSEMBLY, RADIOFREQUENCY CG-833A/U: 4 ft 6 in lg; Sig dwg SM-D-535850			1		W39

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY AUTH	ILLUSTRATION	
						FIGURE NO.	ITEM NO.
		AN/TRD-15 (continued)					
5995-905-7184		CABLE ASSEMBLY, RADIOFREQUENCY CG-833A/U: 5 ft lg; Sig dwg SM-D-535850			1		W40
5995-912-7076		CABLE ASSEMBLY, RADIOFREQUENCY CX-833A/U: 7 ft lg excluding term; Sig dwg SM-D-535850		NX	1		
5995-905-7183		CABLE ASSEMBLY, RADIOFREQUENCY CG-833A/U: 10 ft lg excluding term; Sig dwg SM-D-535850		NX	1		
5995-823-3065		CABLE ASSEMBLY, RADIOFREQUENCY CG-1079B/U: 2 ft lg; Sig dwg SM-D-180808			1		W41
5995-905-9489		CABLE ASSEMBLY, RADIOFREQUENCY CG-1079B/U: 2 ft 6 in lg; Sig dwg SM-D-180808			1		W42
5995-905-9488		CABLE ASSEMBLY, RADIOFREQUENCY CG-1079B/U: 5 ft 6 in lg; Sig dwg SM-D-180808			1		W43
5905-905-9487		CABLE ASSEMBLY, RADIOFREQUENCY CG-1079B/U: 6 ft lg; Sig dwg SC-D-180808			1		W38
5995-912-1879		CABLE ASSEMBLY, RADIOFREQUENCY CG-1079B/U: 9 ft lg excluding term; Sig dwg SM-D-180808		NX	1		
5995-903-7730		CABLE ASSEMBLY, RADIOFREQUENCY CG-1079B/U: 12 ft excluding term; Sig dwg SM-D-180808		NX	1		
5995-905-8293		CABLE ASSEMBLY, RADIOFREQUENCY CG-3177/U: 2 ft lg; Sig dwg SM-D-535833			25		W12-36
5995-911-3688		CABLE ASSEMBLY RADIOFREQUENCY CG-3178/TRD-15: 4 ft lg; Sig dwg SC-D-535855			1		W37
6150-926-0810		CABLE ASSEMBLY, POWER ELECTRICAL CX-11480/U: 5 ft lg; Sig dwg SM-D-133083			1		
6150-926-0809		CABLE ASSEMBLY, POWER ELECTRICAL CX-11481/U: 8 ft lg excluding term; Sig dwg SM-D-133083		NX	1		W2
6150-905-6013		CABLE ASSEMBLY, POWER ELECTRICAL CX-11221/U: 3 ft lg; Sig dwg SM-D-535857			2		W47,5
6150-905-6012		CABLE ASSEMBLY, POWER ELECTRICAL CX-11222/U: 3 ft 6 in lg; Sig dwg SM-D-536071			1		W50
6150-905-6417		CABLE ASSEMBLY, POWER ELECTRICAL: CX-11223/U: 3 ft; Sig dwg SM-D-535859			2		W48,3
6150-905-7191		CABLE ASSEMBLY, POWER ELECTRICAL CX-11224/U: 2 ft 6 in lg; Sig dwg SM-D-535851			1		W46
6150-905-8136		CABLE ASSEMBLY, POWER ELECTRICAL CX-11226/U: 6 ft lg; Sig dwg 535860			2		W52,2

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY AUTH	ILLUSTRATION	
						FIGURE NO.	ITEM NO.
		AN/TRD-15 (continued)					
5995-999-5359		CABLE ASSEMBLY, POWER ELECTRICAL CX-11520/U: 2 ft 4 in lg;			1		W45
6150-905-7552		CABLE ASSEMBLY, POWER ELECTRICAL CX-11228/U: 3 ft 4 in lg; Sig dwg SM-D-535858			2		W8
6150-905-7553		CABLE ASSEMBLY, POWER ELECTRICAL CX-11229/U: 2 ft 4 in lg; Sig dwg SM-D-535845			1		W44
6150-926-0779		CABLE ASSEMBLY, POWER, ELECTRICAL CX-11227/U: 5 ft 4 in lg; Sig dwg SM-D-535863			1		W7
6150-926-0780		CABLE ASSEMBLY, POWER, ELECTRICAL CX-11180/U: 5 ft 6 in lg excluding term; Sig dwg SM-D-535861		NX	1		
6150-905-7555		CABLE ASSEMBLY, POWER ELECTRICAL CX-11180/U: 5 ft lg; Sig dwg SM-D-535861			1		W51
6150-905-7186		CABLE ASSEMBLY, POWER, ELECTRICAL CX-11181/U: 6 ft excluding term; Sig dwg SM-D-535862		NX	1		
5995-164-7716		CORD ASSEMBLY CD-307A: 6 ft 6 in lg			2		
5985-985-9158		COUPLER, ROTARY, RADIOFREQUENCY CU-1096/TRD-15: Sig dwg SM-D-535791		NX	1	1-6	
5825-914-9872		DETECTOR, RADIOFREQUENCY RF-159/TRD		NX	2	1-11	
5950-914-6807		DRIVE, GONIMETOR-ROTARY COUPLER TG-126/TRD: Sig dwg SM-D-535819		NX	1	1-6	
5950-913-1219		GONIOMETER, ELECTRICAL GO-42/TRD-15: Sig dwg SM-D-535731		NX	2	1-6	
5825-918-6992		INDICATOR, AZIMUTH IP-669/TRD-15: Sig dwg SM-D-535767		NX	1	1-8	
6625-061-1874		OSCILLOSCOPE: Rack mounted; Hewlett, Packard Model 120B/AR			1	1-15	
5985-922-7705		PANEL, ANTENNA INPUT: Sig dwg SM-B-536040			1	1-12	
5825-923-2467		PANEL ASSEMBLY AC PRIMARY: Sig dwg SM-B-536036			1	1-12	
5825-926-0025		PANEL ASSEMBLY: AC Secondary; Sig dwg SM-B-536034			1	1-13	
5975-923-2503		PANEL, BLANK: Sig dwg SM-C-535729-1			1		
		PANEL, BLANK: Sig dwg SM-C-535729-2 (M5WA3-B648)			1		

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY AUTH	ILLUSTRATION	
						FIGURE NO.	ITEM NO.
		AN/TRD-15 (continued)					
		PANEL, BLANK: Sig dwg SM-C-535729-3 (M5WA3-B651)			1		
5975-999-4635		PANEL, BLANK: Sig dwg SM-C-535729-4			1		
5975-941-2360		PANEL, BLANK: Sig dwg SM-C-535729-5			1		
5825-940-8120		PANEL, MONITOR: .19 in lg X 3.47 in w; Sig dwg SM-B-536038			1	1-1	
6110-914-8793		PANEL, POWER DISTRIBUTION SB-1747/TRD-15: Sig dwg SM-D-535843			1	1-9	
5825-914-8831		POWER SUPPLY PP-4482/TRD: Sig dwg SM-D-535841		NX	1	1-10	
5825-503-3418		RADIO TRANSMITTER T-279/UR			1	1-16	
5820-926-0180		RECEIVER, RADIO R-725/URR: Freq range .54 to 32 mc; Sig dwg SM-B-535881		NX	4	1-7	
		ACCESSORIES GROUP					
6760-939-7420		ADAPTER TRIPOD HEAD: 4-1/2 in dia; Brunson Inst p/n 825 & 830; Sig dwg SM-B-112624			1	1-17	
6625-260-1441		ADAPTER, TUBE, SOCKET: 7 pin miniature; Alden Prod part #977STMIN; Sig dwg SM-B-535839			3	1-18	
5935-149-3952		ADAPTER, CONNECTOR UG-29/U			25	1-18	
9160-392-8087		ANTI-STATIC SOLUTION: Chemical Development type 2M	oz		20	1-18	
8105-926-2038		BAG, COTTON DUCK: For storage of accessories; 10-1/2 in lg X 5-1/2 in w X 1-1/2 in d; Sig dwg SM-C-536046			1	1-18	
5825-092-0966		BALL AND SOCKET SHAFT ASSEMBLY: Connects compass to tripod; 2-5/8 in lg X 1-1/8 in dia; Brunson Inst p/n 850; Sig dwg SM-B-112625			1	1-17	
7690-999-0844		CARD, MARKER: Tape stripe numbered 1 thru 33; Brady Co. W.H. p/n B600PS1-33			4	1-18	
6605-568-4805		COMPASS, MAGNETIC UNMOUNTED: 4 in dia X 5-7/32 in lg; w/leather carring case; Sig dwg SM-C-112622			1	1-17	
5120-251-4489		HAMMER: Stanley Tool p/n 850H			1	1-18	
5965-504-6370		HEAD SET, ELECTRICAL H-113/U			2	1-18	

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY AUTH	ILLUSTRATION	
						FIGURE NO.	ITEM NO.
		AN/TRD-15 (continued)					
6675-663-8113		LEVEL ROD: Kueffel & Esser Cat no. 6299; Sig dwg SM-B-112623			1	1-18	
5210-945-0141		PLUMB BOB: Keuffel & Esser p/n 830010 with point no. 830035			1	1-17	
8135-926-2030		TAPE: 1/2 in w; color brown; Fed spec PPP-T-66, type 1, class B			1	1-18	
8135-926-2033		TAPE: 1/2 in w; color yellow; Fed spec PPP-T-66, type 1, class B			1	1-18	
8135-926-2032		TAPE: 1/2 in w; color blue; Fed spec PPP-T-66, type 1, class B			1	1-18	
8135-926-2031		TAPE: 1/2 in w; color green; Fed spec PPP-T-66, type 1, class B			1	1-18	
5970-184-2003		TAPE, INSULATION: Boston Woven Hose & Rubber Co. p/n 882L			3	1-18	
5210-243-2878		TAPE, MEASURING: Steel; 300 ft; Luqkin Rule p/n 1279X			1	1-18	
5825-392-6550		TRIPOD: For mtg compass; Brunson Inst cat no. 225, p/n 799G1; Sig dwg SM-C-112615			1	1-17	
		ANTENNA SYSTEM AN/TRA-32					
5985-926-0156		ANTENNA ASSEMBLY AS-1882/GR		NX	1	1-3	
5895-030-2964		BASE, ANTENNA MT-865/GR			1	1-5	
5985-926-0227		COUNTERPOISE, ANTENNA MX-4487/G			1	1-5	
4010-782-6951		GUY SET OA-7908/G		NX	1	1-4	
		ANTENNA AS-1882/GR GROUP					
5985-378-4721		ANTENNA SECTION AT-442/GR			1	1-3	
5985-378-4722		ANTENNA SECTION AT-443/GR			1	1-3	
5985-378-4723		ANTENNA SECTION AT-444/GR			1	1-3	
5985-392-9061		ANTENNA SECTION AT-445/GR			1	1-3	
5925-284-4240		ANTENNA LOADING DISK MX-1168/GR			1	1-3	
5985-985-9154		CASE, ANTENNA: Cotton duck; 120 in lg X 90 in w; Sig dwg SM-D-535789			1	1-3	

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY. AUTH	ILLUSTRATION	
						FIGURE NO.	ITEM NO.
		AN/TRD-15 (continued)					
5905-392-9480		NETWORK IMPEDANCE MATCHING: Sig dwg SM-C-131870			1	1-3	
		COUNTERPOISE, ANTENNA GROUP MX-4487/G					
8105-918-0648		BAG, COTTON DUCK: For storage of counterpoise equipment; 10 ft 4 in lg X 28 in w o/a; SM-D-535786			1	1-5	
5825-049-7686		CLAMP: Steel; 10-13/16 in lg X 1-3/8 in w inside dim; Sig dwg SM-B-132344			8	1-5	
5985-999-1434		COUNTERPOISE: 10 ft 5 in lg X 10 ft 1-1/2 in w; Sig dwg SM-D-535784			1	1-5	
5975-284-6089		GROUND ROD ASSEMBLY: 6 ft lg; Sig dwg SM-B-132347			1	1-5	
		GUY SET OA-7908/G GROUP					
4130-910-4489		BAG, COTTON DUCK: 10 in dia X 24 in h; Sig dwg SM-D-535765			1	1-4	
5975-782-6949		GUY MX-7219/G		NX	3	1-4	
4030-097-3203		STAKE GP-111/G			3	1-4	
5825-569-0354		PIN LOCATING: Sig dwg SM-B-131824			1	1-4	
4030-187-5061		STAKE, GROUND GP-2: Sig dwg SM-B-61956			4	1-4	
5995-537-5568		STRAP, GROUND: Sig dwg SM-C-131904			1	1-4	
		DRIVE GONIMETOR-ROTARY COUPLER TG-126/TRD					
3030-999-4416		BELT, POSITIVE DRIVE: Sig dwg SM-B-536056			1		
		INDICATOR, AZIMUTH IP-669/TRD					
		ADAPTER, HOOD: Sig dwg SM-D-535960 (M5WA3-A889)			1	1-19	
5825-992-8119		HOOD, VIEWING: Sig dwg SM-C-536010			1	1-19	
		RUNNING SPARE ITEMS					
		DIRECTION FINDER SET AN/TRD-15					
5985-926-0178		ANTENNA SYSTEM AN/TRA-32			2		

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY AUTH	ILLUSTRATION	
						FIGURE NO.	ITEM NO.
		AN/TRD-15 (continued)					
5995-905-8293		CABLE ASSEMBLY, RADIOFREQUENCY CG-3177/U: 2 ft lg; Sig dwg SM-D-535833			2		
5995-164-7716		CORD ASSEMBLY CD-307A: 6 ft 6 in lg			1		
5950-913-1219		GONIOMETER, ELECTRICAL GO-42/TRD-15: Sig dwg SM-D-535731			2		
		ACCESSORIES GROUP					
5935-149-3952		ADAPTER, CONNECTOR UG-29/U			5		
5965-504-6370		HEADSET, ELECTRICAL H-113/U			1		
		AMPLIFIER, ELECTRONIC CONTROL AM-3545/TRD					
5920-665-2881		FUSE, CARTRIDGE: 1 amp, 250 v; MIL type F03A250V1A			5		
5920-284-7732		FUSE, CARTRIDGE: 8 amp; 250 v; MIL type F03A250V8A			3		
6240-223-9092		LAMP, NEON: MIL std MS25252NE2D			1		
5960-837-7262		TRANSISTOR: MIL type 2N697			6		
		ANTENNA SYSTEM AN/TRA-32					
		COUNTERPOISE, ANTENNA GROUP MX-4487/G					
5825-049-7686		CLAMP: Steel; 10-13/16 in lg X 1-3/8 in w inside dim; Sig dwg SM-B-132344			1		
		GUY SET OA-7908/G GROUP					
4030-097-3203		STAKE GP-111/G			1		
5825-569-0354		PIN LOCATING: Sig dwg SM-B-131824			1		
4030-187-5061		STAKE, GROUND GP-2: Sig dwg SM-B-61956			1		
5995-537-5568		STRAP, GROUND: Sig dwg SM-C-131904			1		
		DETECTOR, RADIOFREQUENCY RF-159/TRD					
5955-250-0568		CRYSTAL UNIT, QUARTZ: 455 kc; MIL type CR45/U			1		

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY AUTH	ILLUSTRATION	
						FIGURE NO.	ITEM NO.
		AN/TRD-15 (continued)					
5955-926-0229		CRYSTAL UNIT QUARTZ: 550 kc; Sig dwg SM-B-536054-1			1		
5955-926-0228		CRYSTAL UNIT QUARTZ: 555 kc; Sig dwg SM-B-536054-2			1		
5960-188-3602		ELECTRON TUBE: MIL type 6BH6			1		
5960-503-0607		ELECTRON TUBE: MIL type 6AK5WB			2		
5960-676-9016		ELECTRON TUBE: MIL type 6922			2		
5960-284-3002		ELECTRON TUBE: MIL type 5750/6BE6W			1		
5960-262-0167		ELECTRON TUBE: MIL type 12AT7WA			1		
5960-636-2218		ELECTRON TUBE: MIL type 6189/12AU7WA			1		
		DRIVE GONIMETOR-ROTARY COUPLER TG-126/TRD					
3030-999-4416		BELT, POSITIVE DRIVE: Sig dwg SM-B-536056			1		
6605-226-2011		COUPLER, SHAFT: For 1/4 in shaft; Thomas Div. p/n 25CC			1		
3010-999-2262		COUPLER, SHAFT: For 5/16 in to 3/8 in shafts; Chain Belt Co. p/n 37CC			1		
		INDICATOR, AZIMUTH IP-669/TRD					
5955-926-0230		CRYSTAL UNIT, QUARTZ: 72 kc; Sig dwg SM-D-536055			1		
5960-999-4422		ELECTRON TUBE: Sig dwg SM-B-535834; Thomas Elec. p/n 7E23P7M			1		
5960-262-3763		ELECTRON TUBE: MIL type 0B2WA			1		
5960-193-5111		ELECTRON TUBE: MIL type 5R4WGY			1		
5960-166-7674		ELECTRON TUBE: MIL type 6AS7G			1		
5960-681-9802		ELECTRON TUBE: MIL type 6AU6WB			1		
5960-082-4109		ELECTRON TUBE: MIL type 12AX7WA			1		
5960-230-5240		ELECTRON TUBE: MIL type 5693			1		
5960-284-3002		ELECTRON TUBE: MIL type 5750/6BE6W			1		

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY AUTH	ILLUSTRATION	
						FIGURE NO.	ITEM NO.
		AN/TRD-15 (continued)					
5960-669-6861		ELECTRON TUBE: MIL type 6005/6AQ5W			1		
5960-636-2218		ELECTRON TUBE: MIL type 6189/12AU7WA			1		
5920-284-9455		FUSE, CARTRIDGE: 1/8 amp; MIL type F02B250V1/8A			5		
5920-228-7882		FUSE, CARTRIDGE: 2 amp; MIL type F02B125V2A			5		
6240-155-8706		LAMP, INCANDESCENT: MIL std MS15571-2			2		
		OSCILLOSCOPE					
5960-617-4919		ELECTRON TUBE: MIL type 6AQ5			1		
5960-681-9802		ELECTRON TUBE: MIL type 6AU6			1		
5960-557-6780		ELECTRON TUBE: MIL type 6C4WA			1		
5960-690-9991		ELECTRON TUBE: MIL type 6DJ8			1		
5960-729-6963		ELECTRON TUBE: MIL type 6U8A			1		
5960-617-8686		ELECTRON TUBE: MIL type 12AU7			2		
5960-636-0106		ELECTRON TUBE: MIL type 12B4A			1		
5960-230-5231		ELECTRON TUBE: MIL type 5642			1		
5960-262-0286		ELECTRON TUBE: MIL type 5651WA			1		
5960-999-4423		ELECTRON TUBE: Cathode ray; Hewlett-Packard p/n 5083-035-3			1		
5920-280-9328		FUSE, CARTRIDGE: 1-1/2 amp; 125 v; MIL type F02D1R50B			5		
4935-761-8898		LAMP, GLOW: Hewlett-Packard p/n 1450-0048			1		
6240-839-4625		LAMP, GLOW: Hewlett-Packard p/n G84D			1		
		POWER SUPPLY PP-4482/TRD					
5960-193-5111		ELECTRON TUBE: MIL type 5R4WGY			1		

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY AUTH	ILLUSTRATION	
						FIGURE NO.	ITEM NO.
		AN/TRD-15 (continued)					
5960-166-7674		ELECTRON TUBE: MIL type 6AS7G			1		
5960-230-5240		ELECTRON TUBE: MIL type 5693			1		
5960-262-3763		ELECTRON TUBE: MIL type 0B2WA			1		
5920-974-6125		FUSE, CARTRIDGE: 2 amp; 250 v; MIL type F02A250V2A			5		
6240-155-8706		LAMP, INCANDESCENT: MIL std MS15571-2			1		
		RECEIVER, RADIO R-725/URR					
5960-188-3564		ELECTRON TUBE: MIL type 0A2			1		
5960-188-3551		ELECTRON TUBE: MIL type 6AK6			1		
5960-188-6589		ELECTRON TUBE: MIL type 6BJ6			2		
5960-188-8515		ELECTRON TUBE: MIL type 6C4			1		
5960-548-5068		ELECTRON TUBE: MIL type 6DC6			1		
5960-262-0221		ELECTRON TUBE: MIL type 26Z5W			1		
5960-262-1357		ELECTRON TUBE: MIL type 5654/6AK5W			1		
5960-264-2089		ELECTRON TUBE: MIL type 5749/6BA6W			1		
5960-262-0210		ELECTRON TUBE: MIL type 5814WA			1		
5960-636-2218		ELECTRON TUBE: MIL type 6189/12AU7W			1		
5920-256-2188		FUSE, CARTRIDGE: 1/8 amp; 250 vdcw; MIL type F02GR125A			5		
5960-543-0425		FUSE, CARTRIDGE: 1/4 amp; 250 vdc; MIL type F02GR250B			5		
5920-284-6786		FUSE, CARTRIDGE: 3 amp; 250 vdc; MIL type F02D3R00B			5		
6240-179-1814		LAMP, GLOW: 1/4 w; GE type NE-45			1		
6240-155-7857		LAMP, INCANDESCENT: 6 v, 0.20 amp; Fed spec W-L-111 trade no. 328			1		
5905-681-4707		RESISTOR, THERMAL: MIL type TJ311M01			1		

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By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

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J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

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NG: State AG (3).
USAR: None.
For explamation of abbreviations used, see AR 320-50.

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