TM 11-1366

WAR DEPARTMENT TECHNICAL MANUAL

RADAR SET AN/MPG-1

AND

RADAR SET AN/FPG-1

TECHNICAL OPERATION MANUAL

GENERAL DESCRIPTION, OPERATING INSTRUCTIONS, AND EQUIPMENT PERFORMANCE LOG

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

201

WAR DEPARTMENT *15 MARCH 1945*

THIS ADDENDA WILL REMAIN IN EFFECT ONLY UNTIL THE INFORMATION IS PUBLISHED IN AN OFFICAL WAR DEPARTMENT PUBLICATION.

ADDENDA

28 MAY 1945

ADDENDA TO

TM 11-1366

RADAR SET AN/MPG-1 AND RADAR SET AN/FPG-1 TECHNICAL OPERATION MANUAL

The following information, published on Order No. 2612-MPD-44, corrects portions of TM 11-1366, 15 March 1945. The serial numbers of the equipment affected are:

Radar Set AN/MPG-1 — Serial No. 8 to 95 Incl.

Personnel using the equipment and having custody of this technical manual will enter suitable notations beside each affected paragraph and figure in the technical manual to indicate the presence of this supplementary information.

ADDENDA VIII

VIII-1. SHELTER HO-17A.

To paragraph 1-19 add the following:

	Length (in.)	Width (in.)	Height (in.)	WEIGHT (lbs.)
SHELTER HO-17A	138	75	65	1,945

VIII-2. CONVERSION FOR TRAVEL

Interchange positions of tower parts nos. 10 and 35 shown at the right-center of Figure 2-2. A corrected version of this trailer loading diagram appears as Figure 26 in the Circuit Label Book.

VIII-3. REMOTE INDICATING GROUP.

In Figures 1-17 and 1-27 the ringer crank for Telephone EE-8 added to the remote indicating group should appear at the upper right-rear corner of Indicator Cabinet CY-311.

VIII-4. PEDESTAL.

In Figure 2-43, move J-2603 to a position diagonally opposite the location shown.

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TM 11-1366

RADAR SET AN/MPG-1 AND RADAR SET AN/FPG-1 TECHNICAL OPERATION MANUAL

The following information, published on Order No. 2612-MPD-44, corrects portions of TM 11-1366, 15 March 1945. This addenda covers all serial numbers.

Personnel using the equipment and having custody of this technical manual will enter suitable notations beside each affected paragraph and figure in the technical manual to indicate the presence of this supplementary information.

Page 1-27. Par. 1-17. Add the following material after paragraph 1-17*i*:

j. Detector Amplifier AN/UPA-1. The detector amplifier (fig. 1-13.2) is used in connection with Synchroscope TS-28/UPN to check the shape of the r-f output pulse.

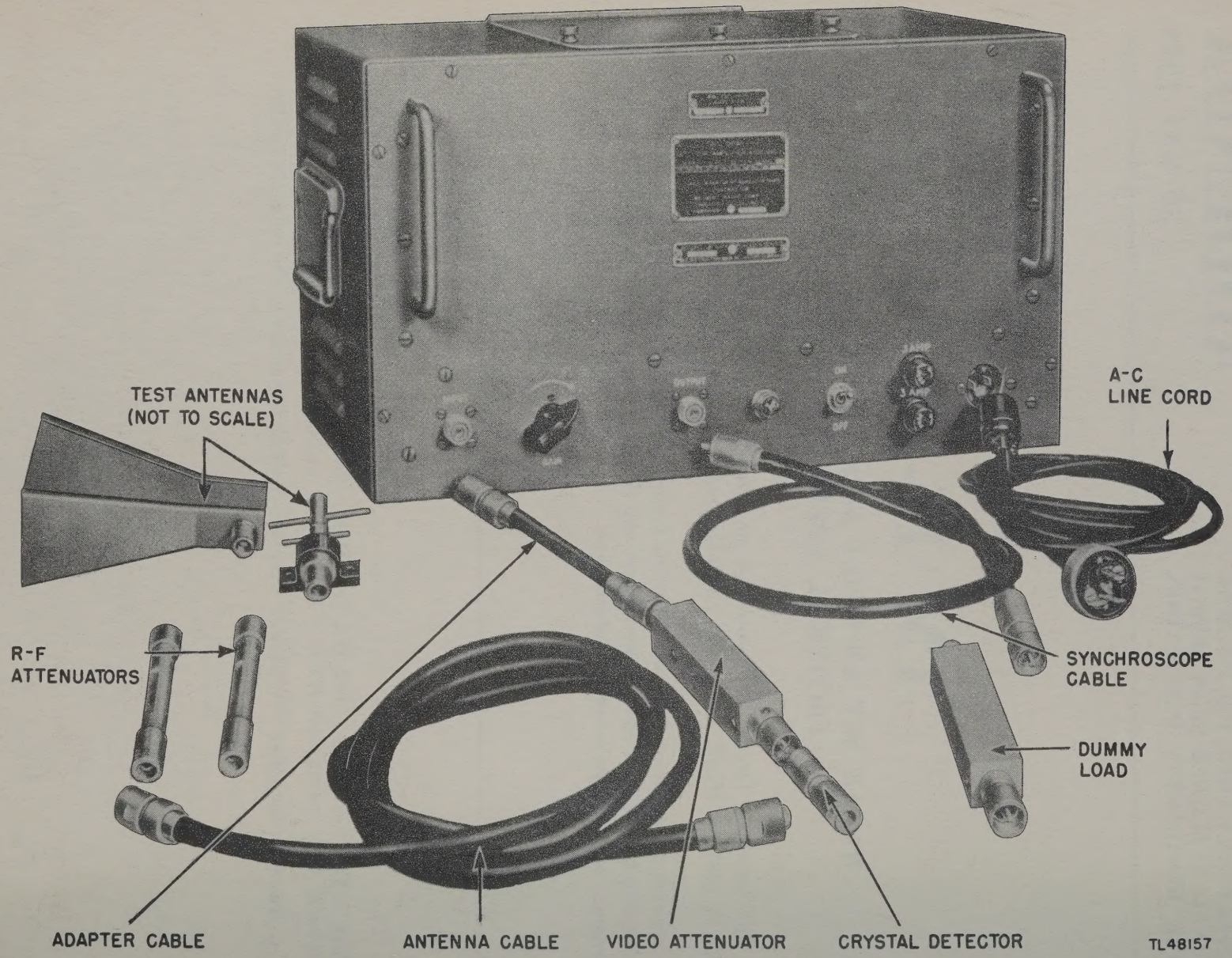


Figure 1-31.2 Dectector Amplifier AN/UPA-1

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ADDENDA

15 MARCH 1945

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ADDENDA I

ELECTRONIC REGULATOR

I-1. DELETION OF ELECTRONIC REGULATOR.

In all models of Radar Set AN/MPG-1 the electronic regulator (power panel removable chassis) has been removed. As a result, the following material is to be changed:

a. Delete the electronic regulator from figures 1-12, 1-23, 3-1 through 3-6, 3-8, 3-14, and 3-19.

b. Delete the regulator switching links from figure 1-22.

c. Delete Step No. 7 (write-up and figure 3-9) from the starting procedure.

d. Delete Item 7 in paragraph 4-5. On the sample log sheet (fig. 4-1), do not fill in Item 7.

ADDENDA II

TOWER AB-50/MPG-1

II-1. ADDITION OF CATWALK TRAP DOOR.

Add figure 2-20.1 to the discussion on page 2-18 (par. 2-13d).

II-2. ADDITION OF DERRICK.

Add figure 2-20.1 to the discussion on page 2-23 (par. 2-17e).

ADDENDA III

TELESCOPE

III-1. CHANGE IN MODEL OF TELESCOPE USED.

Telescope M75C replaces Telescope M17, which is shown in figure 3-32.

ADDENDA IV

CABLES

IV-1. STORAGE OF CABLES.

In paragraph 5-2**b**, delete " . . . and stow in the front portion of the trailer those cables which were installed during the setting-up procedure (par. 2-21**b**).", and substitute the following therefor: the cables which were installed during the setting-up procedure (par. 2-21**b**), and wind them on their corresponding reels. After all the tower parts have been stored within the trailer, store the cable reels in the rear portion of the trailer.

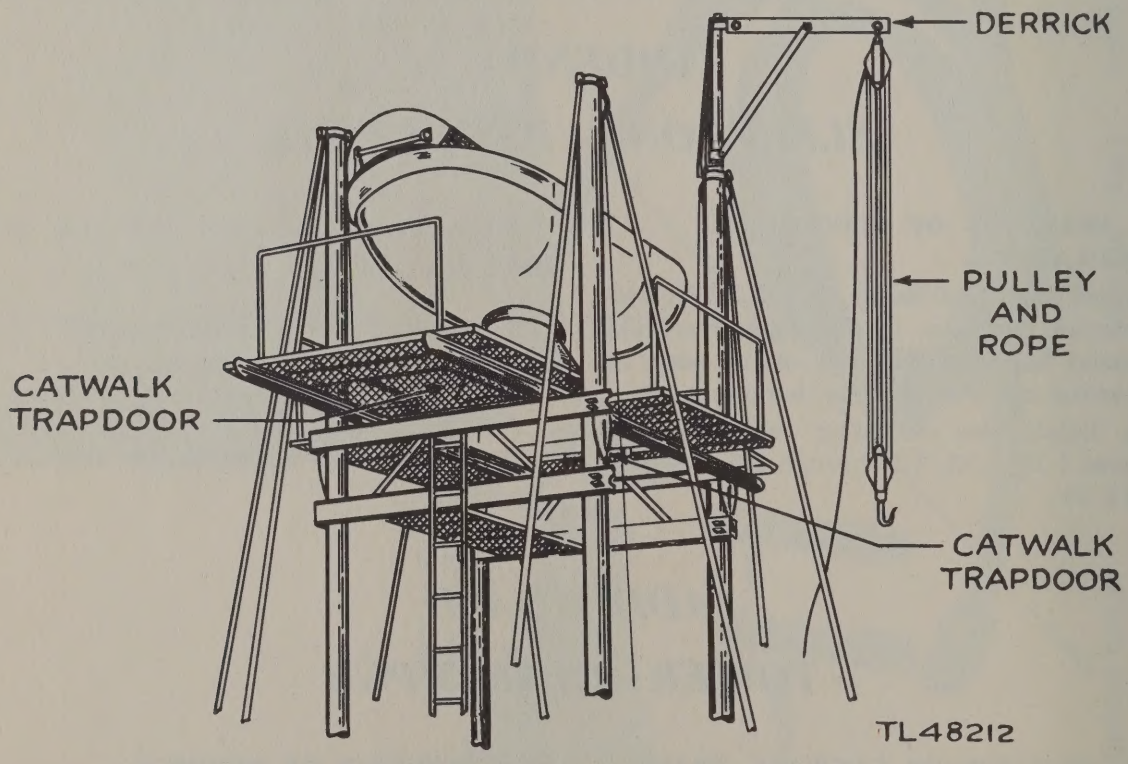


Figure 2-20.1. Catwalk trap doors and derrick installed.

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ADDENDA V

INSTALLATION

V-1. CABLING.

a. At the beginning of paragraph 2-20, CABLING, insert the following:

> **CAUTION:** To avoid damage to cables, do not bend them into an arc with less than a 6-inch radius. Cables connecting to the modulator are particularly liable to damage because of their exposed location.

b. Add the following at the end of paragraph 2-20**a**: After all cables passing through the trailer hatch have been installed, tie the canvas blackout cover around them. Leave enough slack in the console cables to allow pulling the console away from the wall of the trailer.

ADDENDA VI

TEST EQUIPMENT

VI-1. CRYSTAL RECTIFIER TEST SET TS-268/U.

Delete Crystal Rectifier Test Set TS-268/U from figure 1-31, and substitute figure 1-31.1.

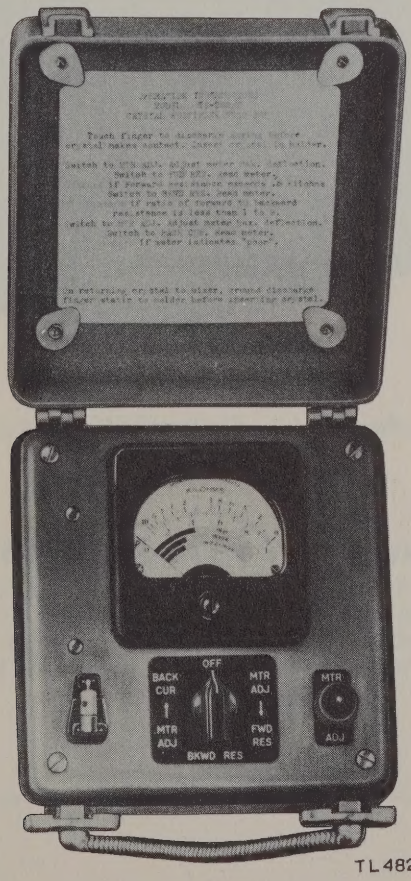


Figure 1-31.1. Crystal Rectifier Test Set TS-268/U.

ADDENDA VII

MAJOR COMPONENTS

VII-1. SHELTER HO-17A.

a. At the end of subparagraph 1-7d, add the following:

"**e.** Spare parts for Radar Set AN/MPG-1 are packed in Shelter HO-17A (fig. 1-8.1)."

b. Add Shelter HO-17A to the list of major components, paragraph 1-18.

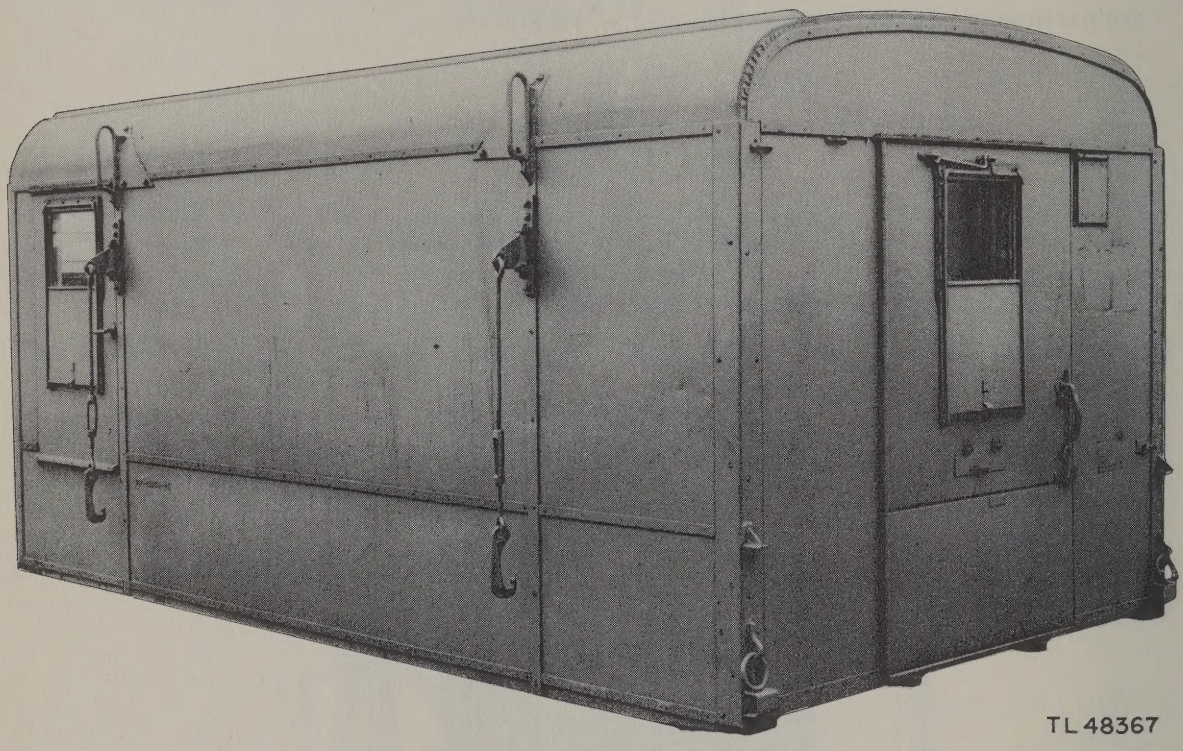


Figure 1-8.1 Shelter HO-17A.

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WAR DEPARTMENT,
WASHINGTON 25, D. C., 15 MARCH 1945.

TM 11-1366, Radar Set AN/MPG-1 and Radar Set AN/FPG-1, Technical Operation Manual, is published for the information and guidance of all concerned.

[A. G. 300.7 (8 Aug 44).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

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

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REFERENCE NOTICE

TM 11-1366, TECHNICAL OPERATION MANUAL, is one of three technical manuals on Radar Set AN/MPG-1 which, with certain supplementary information (see note below), also covers Radar Set AN/FPG-1, the fixed version of Radar Set AN/MPG-1. TM 11-1366 is used in conjunction with TM 11-1466, PREVENTIVE MAINTENANCE MANUAL, and TM 11-1566, SERVICE MANUAL. This manual, TM 11-1366, includes a general description of the radar set, instructions for installation and operation, and directions for the use of the Equipment Performance Log. It is intended that this manual will acquaint radar operators and radar repairmen with the general operating features of the equipment and provide a practical guide on how to use it. This book is an introduction to the radar set and forms the basis for further study and work with the equipment.

NOTE FOR RADAR SET AN/FPG-1

Radar Set AN/FPG-1 is a fixed version of Radar Set AN/MPG-1. For additional information required to make TM 11-1366, TM 11-1466, and TM 11-1566 cover Radar Set AN/FPG-1, refer to Technical Bulletins which will be packed with Radar Set AN/FPG-1 and listed in FM 21-6.

DESTRUCTION NOTICE

WHY —To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN—When ordered by your commander.

HOW —1. Smash — Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.

2. Cut — Use axes, handaxes, machetes.

3. Burn — Use gasoline, kerosene, oil, flame throwers, incendiary grenades.

4. Explosives — Use firearms, grenades, TNT.

5. Disposal — Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

WHAT—1. Smash — Magnetrons, waveguide, antenna assembly, transmitter, all tubes, meters, variable capacitors, relays, spare parts, power unit.

2. Cut — All cables, all tires.

3. Burn — The Equipment Performance Log, the Station Record Book, and all technical manuals.

4. Bury or Scatter — Remains of magnetrons and all other parts after destroying their usefulness.

DESTROY EVERYTHING

WARNING

HIGH VOLTAGE

is used in the operation
of this equipment.

DEATH ON CONTACT

may result if personnel fail to
observe safety precautions.

Be careful not to contact high-voltage connections or 115-volt a-c input connections when installing or operating this equipment.

Before working inside the equipment, after the power has been turned off, always short-circuit the high-voltage capacitors.

Extremely Dangerous Potentials

exist in the following units:

Modulator MD-36/MPG-1

Radar Transmitter T-92/MPG-1

Console CY-230/MPG-1

Rectifier Cabinet Assembly CY-232/MPG-1

Indicator Cabinet Assembly CY-234/MPG-1

Power Panel SB-25/MPG-1

Radar Receiver R-115/MPG-1

FIRST AID TREATMENT FOR ELECTRIC SHOCK

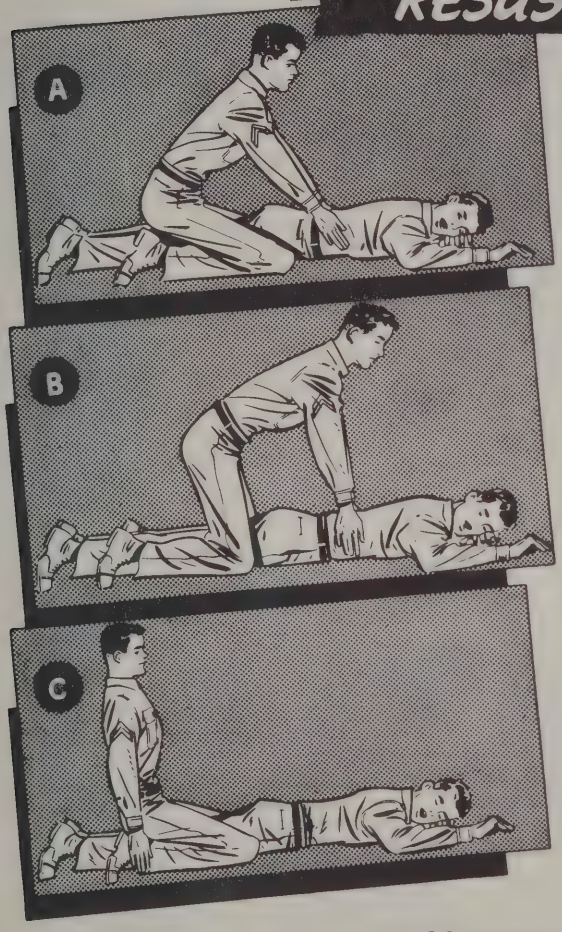
I. FREE THE VICTIM FROM THE CIRCUIT IMMEDIATELY.

Shut off the current. If this is not **immediately** possible, use a dry nonconductor (rubber gloves, rope, board) to move either the victim or the wire. Avoid contact with the victim. If necessary to cut a live wire, use an axe with a dry wooden handle. Beware of the resulting flash.

II. ATTEND INSTANTLY TO THE VICTIM'S BREATHING.

Begin resuscitation at once on the spot. Do not stop to loosen the victim's clothing. Every moment counts. Keep the patient warm; Wrap him in any covering available. Send for a doctor. Remove false teeth or other obstructions from the victim's mouth.

RESUSCITATION



POSITION

1. Lay the victim on his belly, one arm extended directly overhead, the other arm bent at the elbow, the face turned outward and resting on hand or forearm, so that the nose and mouth are free for breathing (fig. A).

2. Straddle the patient's thighs, or one leg, with your knees placed far enough from his hip bones to allow you to assume the position shown in figure A.

3. Place your hands, with thumbs and fingers in a natural position, so that your palms are on the small of his back, and your little fingers just touch his lowest ribs (fig. A).

FIRST MOVEMENT

4. With arms held straight, swing forward slowly, so that the weight of your body is gradually brought to bear upon the victim. Your shoulders should be directly over the heels of your hands at the end of the forward swing (fig. B). Do not bend your elbows. The first movement should take about. 2 seconds.

SECOND MOVEMENT

5. Now immediately swing backward, to remove the pressure completely (fig. C).

6. After 2 seconds, swing forward again. Repeat this pressure-and-release cycle 12 to 15 times a minute. A complete cycle should require 4 or 5 seconds.

CONTINUED TREATMENT

7. Continue treatment until breathing is restored or until there is no hope of the victim's recovery. Do not give up easily. Remember that at times the process must be kept up **for hours.**

8. During artificial respiration, have someone loosen the victim's clothing. Wrap the victim warmly; apply hot bricks, stones, etc. Do not give the victim liquids until he is fully conscious. If the victim must be moved, keep up treatment while he is being moved.

9. At the first sign of breathing, withhold artificial respiration. If natural breathing does not continue, immediately resume artificial respiration.

10. If operators must be changed, the relief operator kneels behind the person giving artificial respiration. The relief takes the operator's place as the original operator releases the pressure.

11. Do not allow the revived patient to sit or stand. Keep him quiet. Give hot coffee or tea, or other internal stimulants.

HOLD RESUSCITATION DRILLS REGULARLY



Figure 1-1. Radar Set AN/MPG-1.

CHAPTER 1

GENERAL DESCRIPTION

SECTION I. INTRODUCTION

1-1. SCOPE OF MANUAL.

This manual deals with the methods of installation and operation of Radar Set AN/MPG-1. It is a practical guide on how to use the equipment. It presents an explanation of the chief functions of each major group of components, but omits discussions of circuit theory. A separate manual, TM 11-1566, Service Manual, has been prepared on the theory, trouble shooting, and repair of the radar set. This manual also includes a detailed description of the Equipment Performance Log, instructions for filling in the log items, and corrective measures to be applied while the radar set is in operation.

1-2. PURPOSE OF RADAR SET AN/MPG-1.

Radar Set AN/MPG-1 (fig. 1-1) is a mobile, medium range radar unit designed for use with seacoast artillery. The functions of the radar set are:

a. To supply exact present position data on targets within 28,000 yards to gun directors or other gun positioning apparatus.

b. To search for approaching surface craft and to supply data on the range (distance) and azimuth (direction) of detected targets. The maximum operating range of the equipment is 80,000 yards.

c. To supply "splash spotting" data for correcting artillery fire.

SECTION II. BASIC PRINCIPLES

1-3. DETERMINATION OF DIRECTION.

The energy radiated by the antenna of Radar Set AN/MPG-1 is confined to a very narrow beam around the axis of the antenna. This is similar to the beam of light from the reflector of a searchlight.

a. An object within the range of the radar set, when struck by the beam of high-frequency radio energy, reflects a portion of this energy back to the point of origin of the beam. This reflected energy is known as an "echo" and the object from which the energy is reflected is called a "target." Since the beam of radiated energy is very narrow, an echo is received at the radar set only when the beam is pointed directly at the target. The direction (or azimuth) of a target from which an echo is received is indicated, therefore, by the position (pointing direction) of the antenna.

b. The azimuth of a target is its horizontal-clockwise direction with reference to a specified direction. Radar Set AN/MPG-1 uses true south as a reference direction. In figure 1-2, imaginary reference line OS starts at the antenna of the radar unit and extends toward true south. With the target at position B, the line OB represents the direction of the target in azimuth. The angle between lines OS and OB is the amount the antenna has been rotated horizontally from true south in order to point at the target. This angle is the azimuth of the target and is measured in degrees by Radar Set AN/MPG-1.

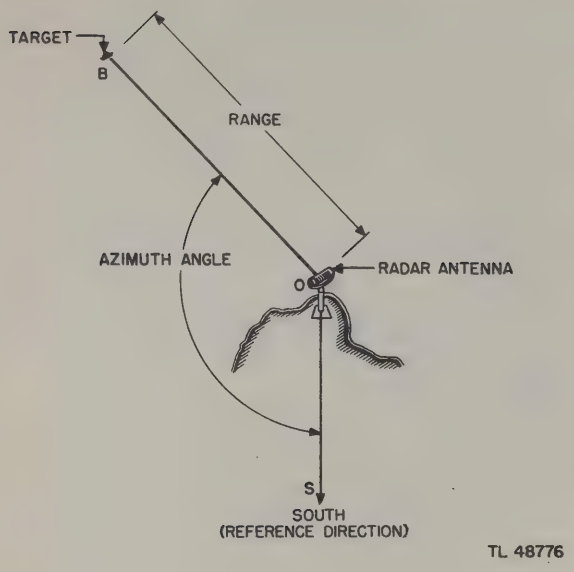


Figure 1-2. Meaning of azimuth and range.

1-4. MEASUREMENT OF RANGE.

a. The range of a target is the distance between the target and the radar set. Range is indicated in figure 1-2 by the length of the line OB. Target range is measured in yards by Radar Set AN/MPG-1.

b. Determination of range is based on the time required for a radio signal to leave the transmitting equipment, travel to the target, and return as an echo from the target to the receiving equipment. The velocity of a radio signal is constant and has been measured very accurately. A radio wave takes 6.1 millionths of a second (6.1 microseconds) to make a round trip between a transmitter and a target 1,000 yards apart. Thus, if the round trip is found to require 61 microseconds, the range (distance) to the target is 10,000 yards. Actual calculations of the time required for a signal to make a round trip between transmitter and target are made within the equipment by a range-measuring device. In this manner, the exact range, in yards, of a particular target may be read on the indicating components.

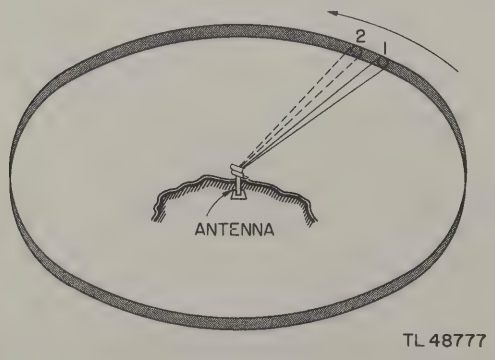


Figure 1-3. Continuous azimuth scanning.

1-5. HOW THE EQUIPMENT SECURES INFORMATION.

The chief function of Radar Set AN/MPG-1 is to provide exact present position data on targets within 28,000 yards. It is used also to give warning of approaching surface craft within a range of 80,000 yards. These functions are accomplished in the following manner:

a. Searching. Depending on the tactical situation, Radar Set AN/MPG-1 employs either continuous azimuth or sector azimuth scan for searching.

(1) Continuous Azimuth Scanning (fig. 1-3). For continuous searching in azimuth, the antenna is rotated in a complete circle by the antenna drive motor. Since the velocity of the radio wave is so much greater than the speed at which the antenna rotates, a transmitted pulse can leave the antenna, go out to the target at point 1, and return to the antenna before the antenna has had time to turn to point 2. By turning through the entire 360 degrees several times a minute, the radar system scans or searches the area in all azimuth directions around its location.

(2) Azimuth Sector Scanning (fig. 1-4). If targets of interest appear in only part of the total search area, the antenna may be made to search the particular sector in which targets appear. This type of operation, called *sector scan,* may be accomplished in either of two ways. In the first method, the beam is swept back and forth automatically over a preselected sector of a circle (fig. 1-4). The width and the position of the scanning sector may be adjusted to include any desired area within 80,000 yards of the antenna. In the second method, the antenna is made to rotate back and forth, so as to scan a desired sector, by holding a switch alternately in one position and then in another. This type of operation is known as *slew scan.*

b. Tracking. In tracking a selected target, automatic rotation of the antenna is stopped. The antenna is then rotated only as much as is necessary for it to follow the course of the target. However, at this time, the radar beam itself is made to automatically sweep or scan a sector approximately 10 degrees wide. An area or segment approximately 10 degrees wide and 2,000 yards deep (fig. 1-5), located anywhere within the 28,000-yard tracking range of the equipment, is then kept under constant observation. By positioning the antenna (with operating handwheels and aided tracking mechanisms) so as to keep the target exactly and continuously in the center of this area, accurate tracking of the target is obtained. The exact range and azimuth of the target may then be read on indicating dials. Range and azimuth data on the target is also transmitted electrically to a gun-data computer which controls artillery fire.

1-6. TARGET PRESENTATION.

a. Plan Position Indicator (PPI). While searching for targets, the position (range and azimuth) of all targets within the maximum range of the equipment is displayed on the plan position indicator. This cathode-ray tube, also known as the PPI scope, may be considered the searching indicator for all targets located within the range of the equipment.

(1) Figure 1-6 illustrates the face of the PPI scope used in the set. The rim of the circular tube is surrounded by a calibrated scale divided into 360 equal divisions, each division representing 1 degree. Radiating outward from the center of the tube toward its edge is a fine line developed by the cathode-ray beam. This direction-indicating line or sweep trace moves like the spoke of a wheel in accordance with the rotation of the antenna. The sweep trace indicates the direction in which the antenna is pointing, and when associated with the scale of degrees around the outside of the tube, gives the direction of the target in azimuth.

(2) A target echo appears as a bright spot along the sweep trace. The distance (range) to the target is determined by noting the distance from the center of the tube to the target echo, or more exactly, by noting the position of the target relative to a single range mark ring or to a series of concentric range mark rings.

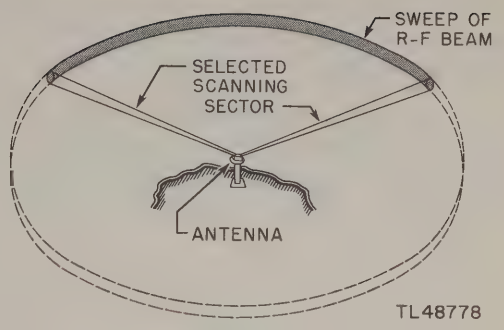


Figure 1-4. Sector azimuth scanning.

b. B-type Indicator (B-scope). While tracking a selected target, the target echo is displayed on a B-type indicator. This cathode-ray tube, also known as the B-scope, may be considered to be the tracking indicator of the radar set.

(1) Figure 1-7 shows the face of the B-scope while tracking a target. In this type of scope, the *azimuth* of targets is represented by *horizontal* distances from the center of the screen, and the *range* of targets

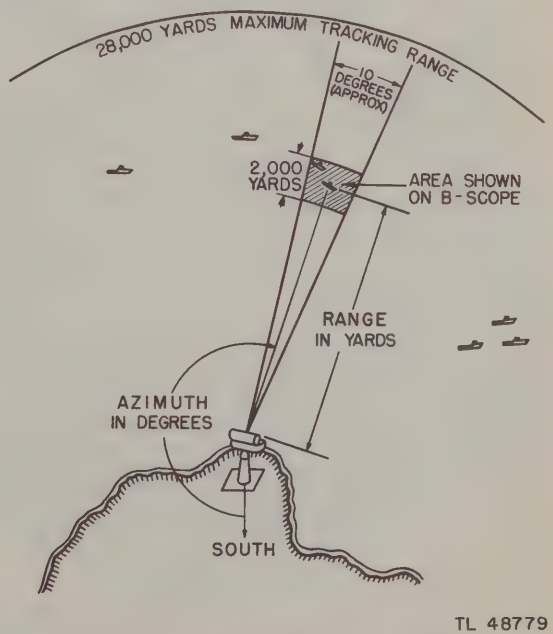


Figure 1-5. Segment observed while tracking.

is indicated by *vertical* distances from the center of the screen. The tube displays targets in a segment approximately 10 degrees wide and 2,000 yards deep.

(2) The B-scope displays six fine lines, three vertical and three horizontal, all of which are generated electronically. The intersection of the center vertical and the center horizontal lines represents an "on target" position. In tracking a target, handwheels are operated to keep the target echo in this position and the position of the target is indicated by range- and azimuth-indicating dials. The left and right vertical lines represent azimuth directions 1 degree on either side of the azimuth direction indicated by the dials. The upper and lower horizontal lines represent ranges 1,000 yards greater and 1,000 yards less than the range indicated by the range dials.

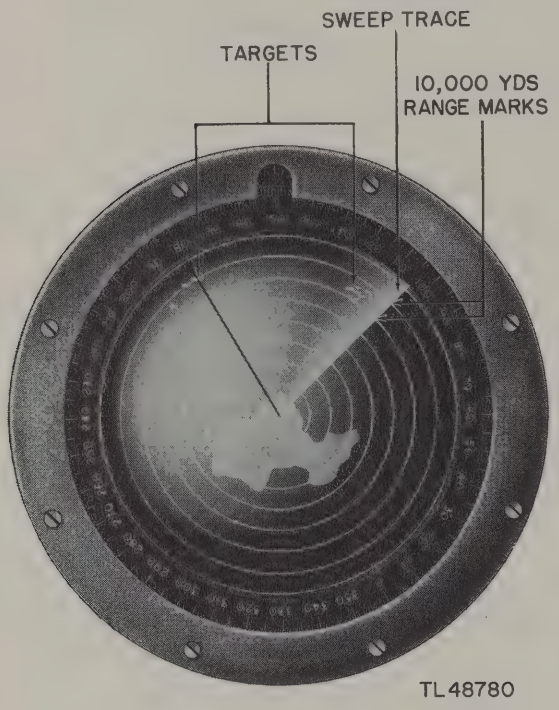


Figure 1-6. PPI scope presentation.

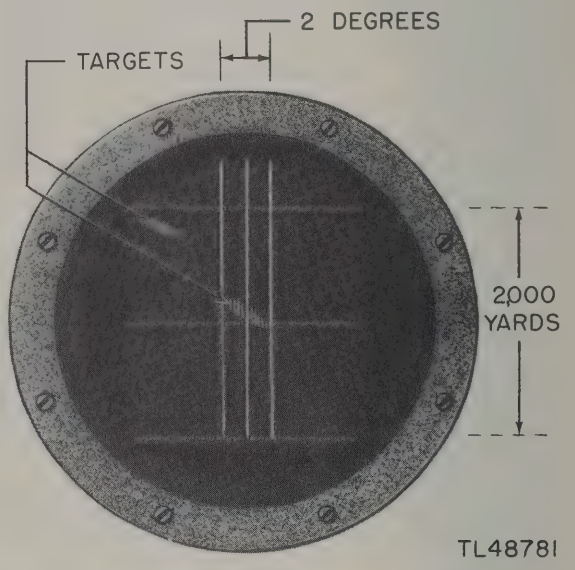


Figure 1-7. B-scope presentation.

SECTION III. LOCATION AND DESCRIPTION OF COMPONENTS

1-7. LOCATION.

When in transit, the components of Radar Set AN/MPG-1 are shipped in Trailer V-9/MPG-1. When the radar set is in use, however, some of the components are located within the trailer, while the remaining components are outside the trailer. The major components, and their location while in use, are shown in figure 1-8.

a. Trailer V-9/MPG-1 may be used either as a semi-trailer or as a full trailer. When used as a semi-trailer, it is drawn by a 5 to 6 ton, 4-by-4 truck-tractor. When used as a full trailer, it may be towed by a truck or tractor, the pintle of which may have a height between 18 and 40 inches. Conversion from semi-trailer to full trailer is made by the addition of a dolly supplied as part of the trailer.

b. The entire trailer body is water-tight so that it may be floated and towed through rough water. The trailer is provided with permanently-attached hooks and a removable sling for loading and unloading on and off ships. Hinged doors at the rear of the trailer permit the removal of the antenna assembly from the trailer prior to mounting on the

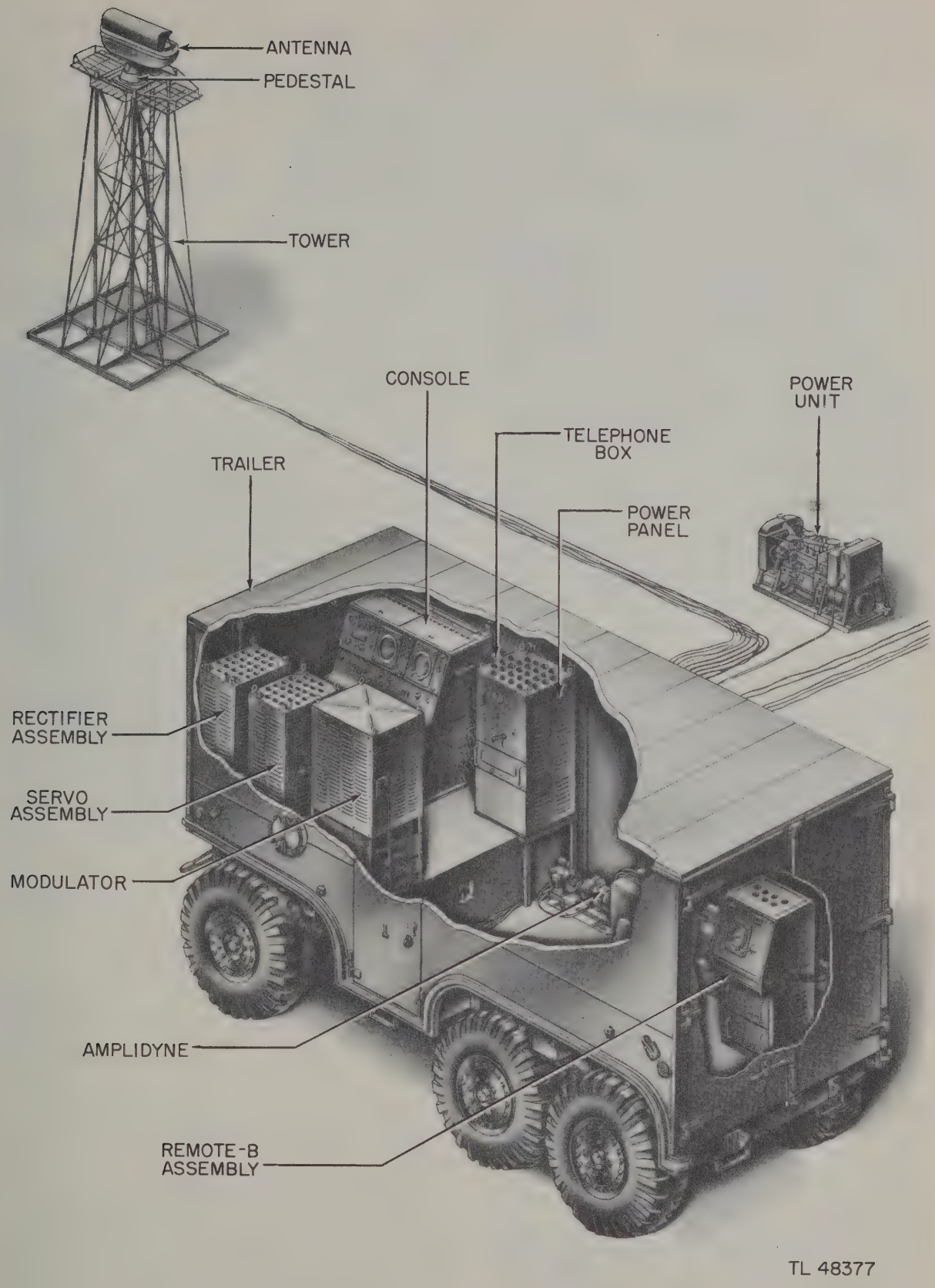


Figure 1-8. Radar Set AN/MPG-1 in use, location of components.

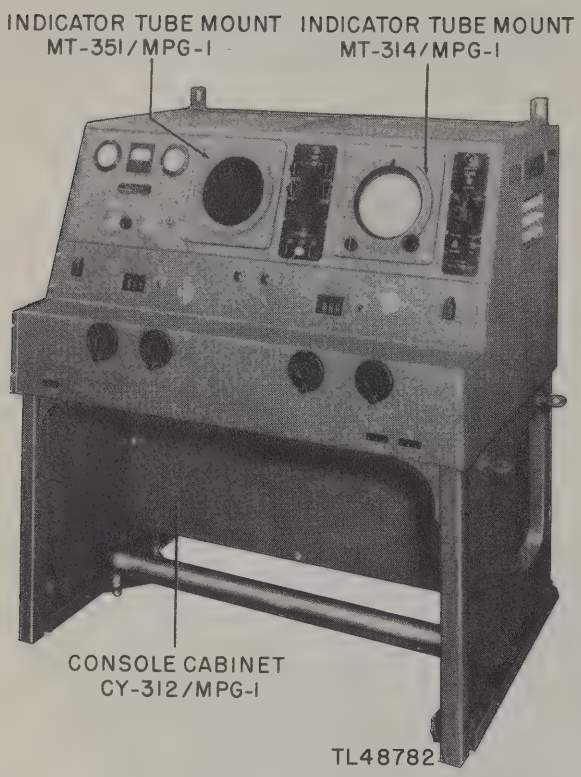


Figure 1-9. Console CY-230/MPG-1.

tower. The power unit is loaded into and removed from the trailer through a door in the left side of the trailer body. Access to the interior of the trailer is obtained normally through a small door at the front end. A removable ladder is supplied for the purpose. Two intake ventilator blower motors, operating on 110-volt a-c single-phase power, and equipped with air filters, are supplied with the trailer. A blackout switch is mounted on the front of the trailer, near the curb side. The trailer is illuminated by ceiling lights which may be supplied with either 6-volt or 110-volt power. The trailer is equipped with brakes of the compressed-air application type and includes a safety braking system so arranged that, if the trailer accidentally should become disconnected from the towing vehicle, the trailer brakes will be applied automatically, and held for at least 10 minutes.

c. The general specifications of the trailer are as follows:

Gross weight, fully loaded, approximate	25,000 pounds
Over-all length, drawbar upright, approximate	240 inches
Drawbar length, approximate	60 inches
Over-all width	96 inches
Length of body, inside, approximate	228 inches
Width of body, inside, approximate	89 inches
Maximum over-all height, fully loaded	126 inches
Ground clearance, minimum, trailer fully loaded	17 inches
Trailer tires	14.00-20, 12 ply
Trailer tire pressure, maximum	90 pounds

d. The trailer is divided into two areas: a large area (approximately 12 feet long) in the rear, with a ceiling clearance of 84 inches to allow the antenna and pedestal to be stowed for transit, and a smaller, elevated area (approximately 7 feet long), with a ceiling height of 60 inches, at the front of the trailer. Several of the components of the radar set are installed in the front section of the trailer (fig. 1-8). When the equipment is in use, the components of the radar set are distributed as follows.

(1) Along the right wall of the trailer body, from front to rear, are the console, the power panel, and the amplidyne (servo motor generator).

(2) Along the left wall of the trailer body, from front to rear, are installed the rectifier assembly, the servo assembly, and the modulator.

(3) The indicator assembly (remote indicator) may be used anywhere within the trailer or in its immediate vicinity, since it is connected to other components of the radar set by 25-foot cables.

(4) Mounted at the top of the tower used with the radar set are the complete antenna assembly and the pedestal which supports it.

(5) The power unit is placed at any convenient spot near the trailer.

1-8. DESCRIPTION.

a. Console (fig. 1-9). Console CY-230/MPG-1 is a large assembly which includes the main operating controls, target and data indicators and several mechanical and electrical assemblies. Its component parts are listed as follows:

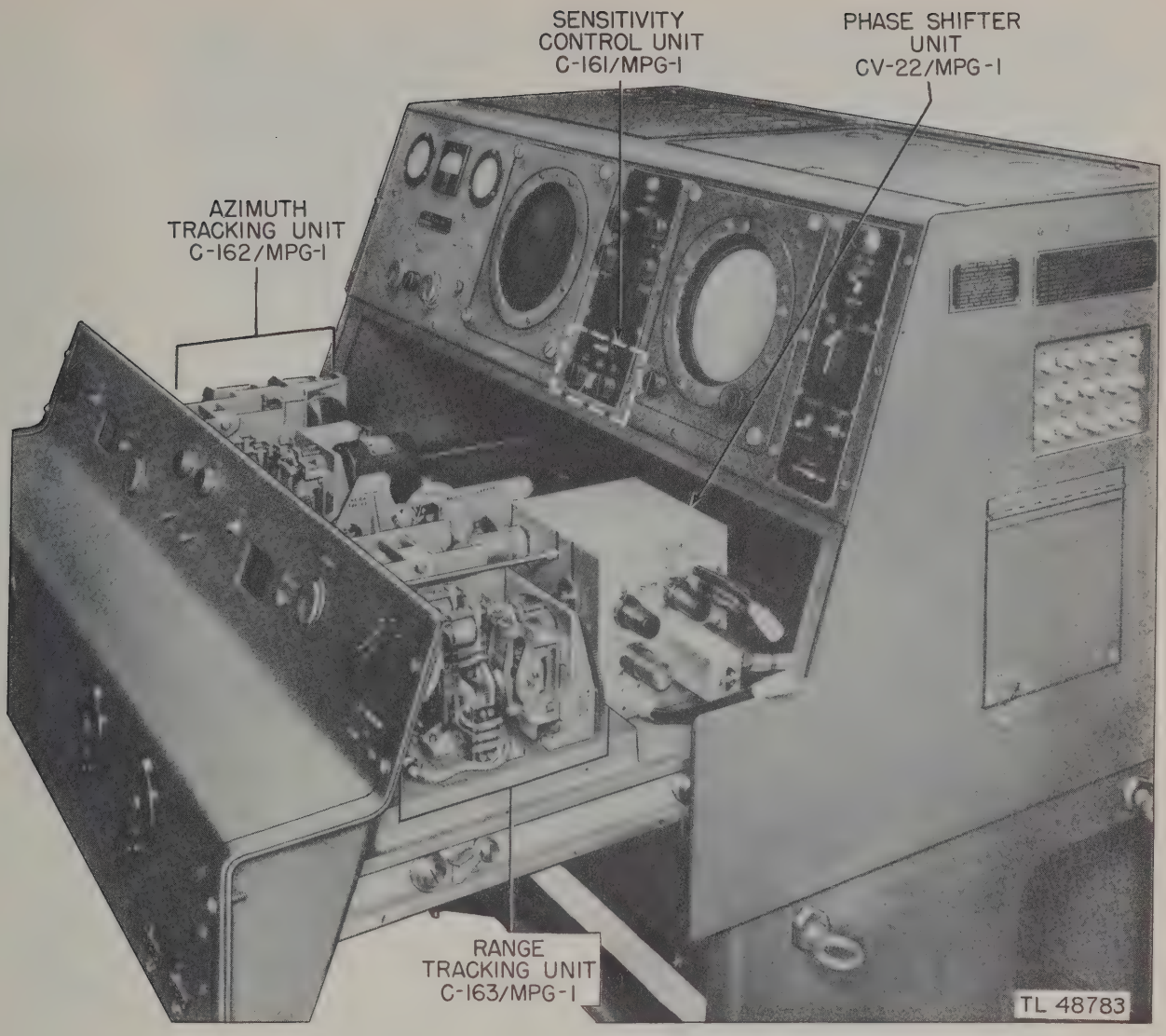


Figure 1-10. Console, center section partially withdrawn.

(1) Console Cabinet CY-312/MPG-1. The console cabinet is approximately 48 inches long, 33 inches wide, and 50 inches high. The cabinet is divided into three main sections. The upper section has a sloping front panel on which are mounted many of the operating controls. The two display scopes are also mounted in the upper section of the cabinet. The center section, which may be pulled forward from the rest of the cabinet, houses the tracking units. Four handwheels at the front of this section are used in selecting and tracking a target, while the azimuth and range dials are read through two windows on the front panel. The lower section of the console houses some of the components which are necessary to supply power to the circuits of the console. Access to this section is obtained through a panel at the rear of the cabinet.

(2) Indicator Tube Mount MT-314/MPG-1. The PPI mount supports the PPI scope which presents the information obtained in searching the area surrounding the radar set. This assembly, mounted in the upper, right-hand portion of the console, includes mechanical gearing associated with the functioning of the PPI scope.

(3) Indicator Tube Mount MT-351/MPG-1. The B-scope mount houses the B-

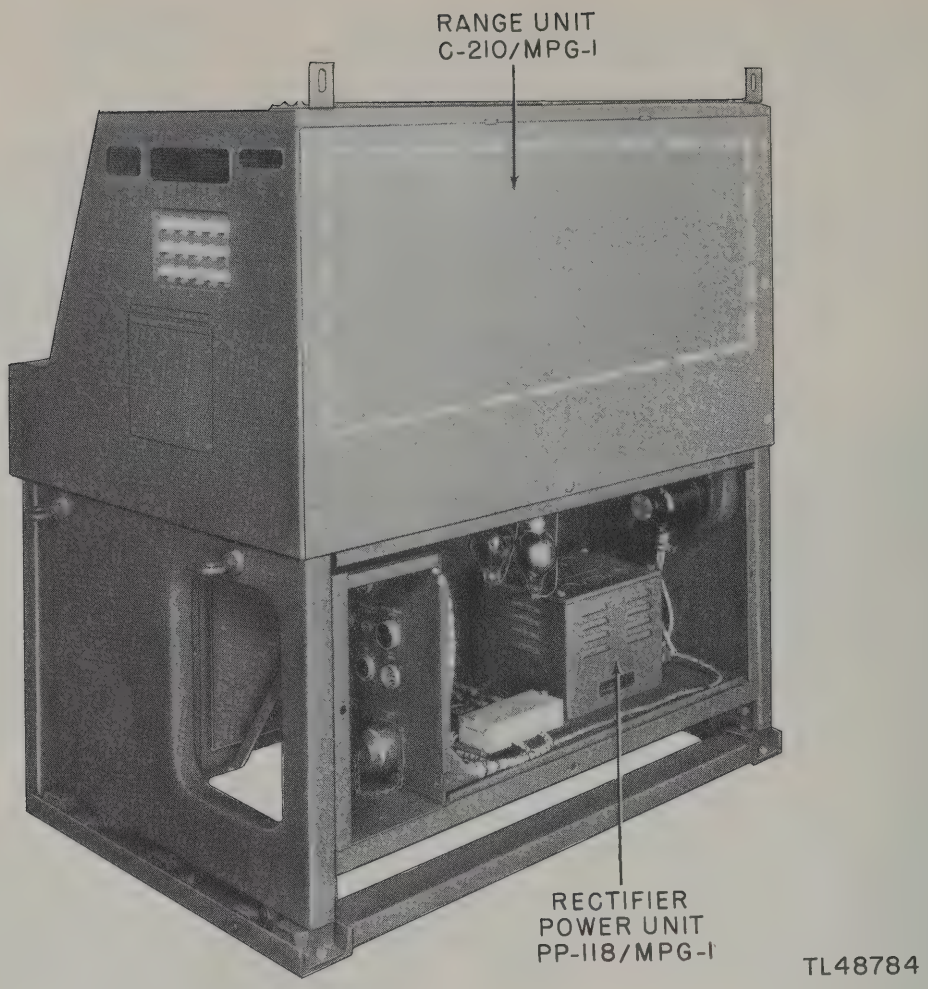


Figure 1-11. Console, rear view, lower panel removed.

scope, which is used in tracking a target. The mount is approximately 15 inches long, 8 inches wide, and 8 inches high.

(4) Phase Shifter Unit CV-22/MPG-1. The phase shifter is an electrical chassis, one component of which is mechanically coupled to the range tracking unit. The phase-shifter unit, together with the range tracking unit and azimuth tracking unit, is located in the center section of the console (fig. 1-10). This section of the cabinet has been designed to be dustproof.

(5) Range Tracking Unit C-163/MPG-1. The range tracking unit (fig. 1-10) is a mechanical assembly, by means of which a target is tracked in range. At the front of the unit are two handwheels which are used in *ranging* the target, and three dial indicators which display the range of the target in yards.

(6) Azimuth Tracking Unit C-162/MPG-1. The azimuth tracking unit is a mechanical assembly by means of which a target is tracked in azimuth. It includes two handwheels and three dial indicators. The dials display the azimuth of the target in degrees and hundredths of a degree.

(7) Sensitivity Control Unit C-161/MPG-1. The sensitivity time control (STC) unit is mounted behind the control panel of the console cabinet (fig. 1-10). The unit includes circuits and controls which regulate the gain of the receiver.

(8) Range Unit C-210/MPG-1. The range unit is located in the top rear section

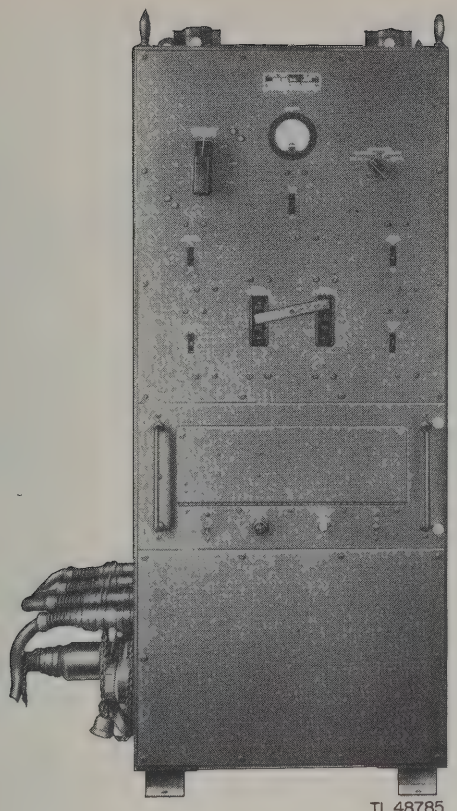


Figure 1-12. Power Panel SB-25/MPG-1.

of the console cabinet and is accessible by removing the upper rear panel (fig. 1-11). The range unit is a large chassis which includes the greater portion of the electronic circuits of the console.

(9) Rectifier Power Unit PP-118/MPG-1. This power unit, the 4-kv supply, is located in the lower section of the console cabinet (fig. 1-11). The unit supplies high operating d-c voltages to the two oscilloscopes of the console.

b. Power Panel (fig. 1-12). Power Panel SB-25/MPG-1 is a cabinet approximately 24 inches long, 18 inches wide, and 56 inches high. The primary power lines are connected to the power panel which distributes power to the system components.

c. Amplidyne. The amplidyne, Servo Motor Generator PU-52/MPG-1 (fig. 1-13), is an a-c driven motor generator which supplies power to the antenna drive motor. The amplidyne is approximately 33 inches long, 13 inches wide, and 12 inches high.

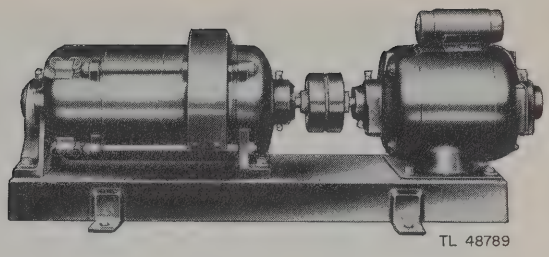


Figure 1-13. Servo Motor Generator PU-52/MPG-1.

d. Rectifier Assembly (fig. 1-14). Rectifier Cabinet Assembly CY-232/MPG-1 is an assembly of the components listed below. Its major function is to supply the necessary d-c voltages to the components of the console.

(1) Rectifier Cabinet CY-309/MPG-1. The cabinet is a shock-mounted steel frame rack in which are mounted the other components of the rectifier assembly. The cabinet, which includes interconnecting cables for the rectifier components, is approximately 19 inches long, 19 inches wide, and 50 inches high.

(2) Rectifier Control Panel C-164/MPG-1. The control panel is a junction box and receptacle panel for rectifier unit com-

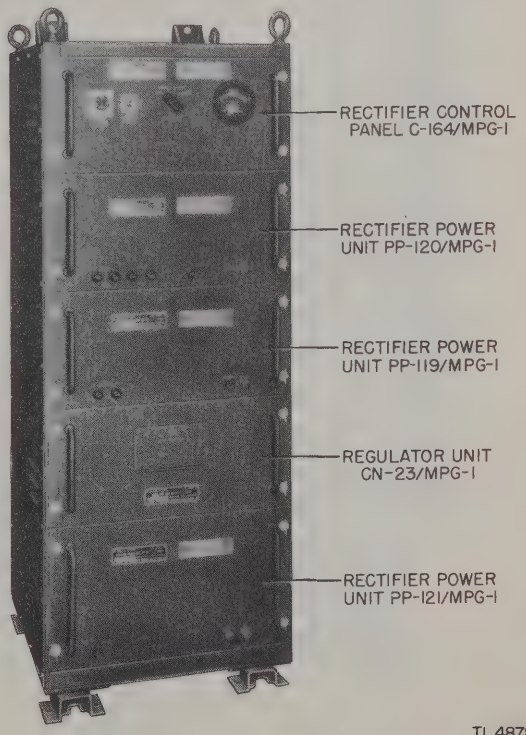


Figure 1-14. Rectifier Cabinet Assembly CY-232/MPG-1.

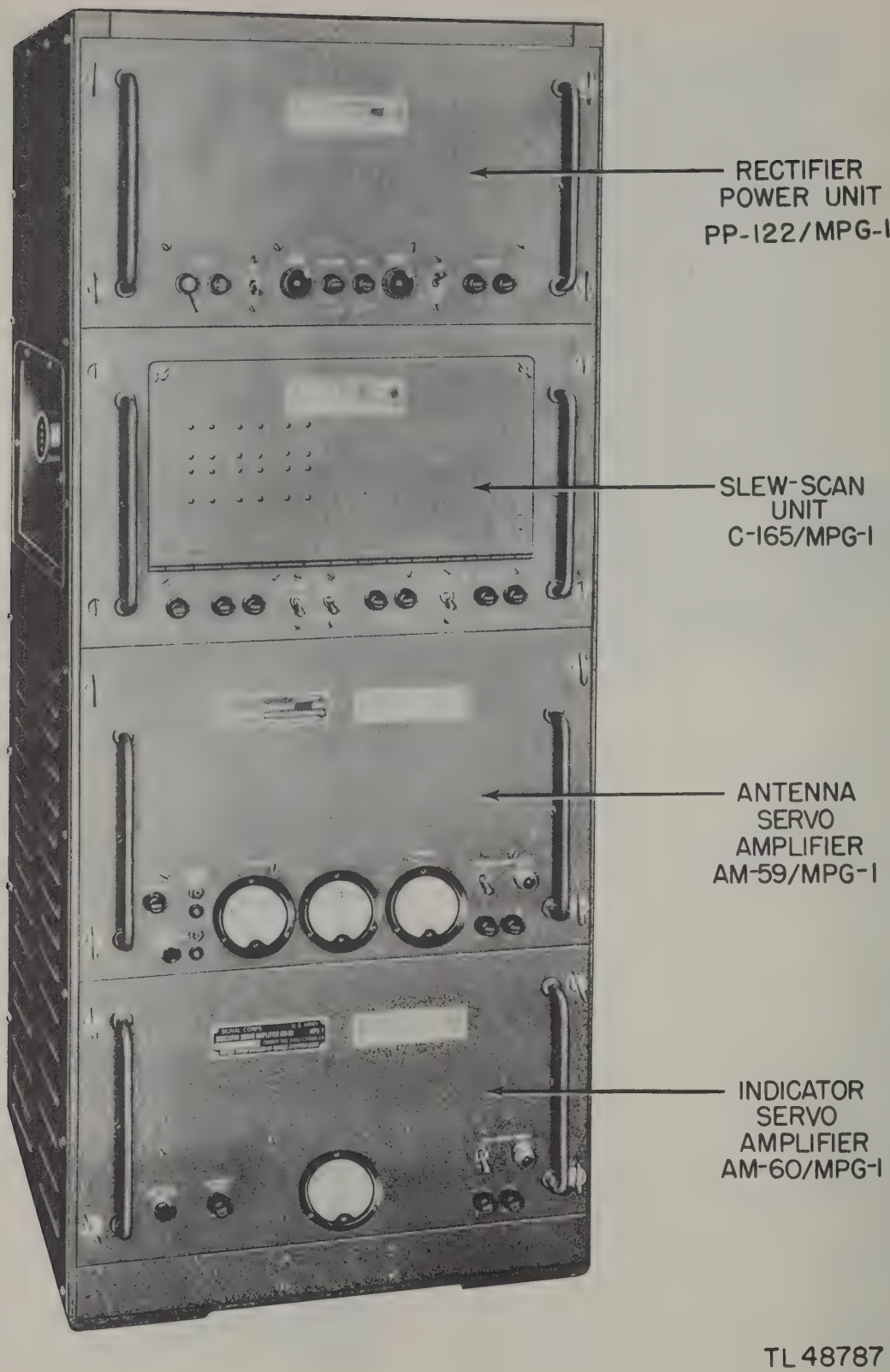


Figure 1-15. Servo Cabinet Assembly CY-233/MPG-1.

ponents. It includes a d-c voltmeter, a selector switch, and relays.

(3) Rectifier Power Unit PP-120/MPG-1. This rectifier unit supplies 500-volt d-c to the range unit of the console. Six fuses and two small pilot lights are mounted on the front panel of the rectifier unit. An identical unit is located in the remote-B assembly (Indicator Cabinet Assembly CY-234/MPG-1).

(4) Rectifier Power Unit PP-119/MPG-1. This rectifier unit supplies regulated –150-volt d-c to the circuits of the console. Three fuses and one pilot lamp are mounted on the front panel of the unit.

(5) Regulator Unit CN-23/MPG-1. The regulator unit supplies regulated 300-volt d-c to the components of the console. Spare fuses for the components of the rectifier assembly are mounted behind a hinged cover plate on the front panel of the regulator unit.

(6) Rectifier Power Unit PP-121/MPG-1. This rectifier unit supplies unregulated 460-volt d-c to the 300-volt regulator. Five fuses and two pilot lamps are mounted on the front panel of the unit.

e. Servo Assembly (fig. 1-15). Servo Cabinet Assembly CY-233/MPG-1 includes mechanical and electrical components whose functions are associated with the positioning of the antenna. Its component parts are listed below.

(1)Servo Cabinet CY-310/MPG-1. The cabinet is a shock-mounted steel frame rack for mounting servo components. It includes interconnecting cables for the components of the servo assembly. The cabinet is approximately 19 inches long, 19 inches wide, and 50 inches high.

(2) Rectifier Power Unit PP-122/MPG-1. The rectifier unit supplies d-c power to the rotating-feed-assembly drive motor in the antenna assembly. Six fuses, two pilot lamps, and two on-off switches are mounted on the front panel of the unit.

(3) Slew-Scan Unit C-165/MPG-1. The slew-scan unit contains a shock-mounted mechanical assembly which consists of a drive motor, reduction gearing. a selsyn generator, and a dial and cam for setting the angle of sector scan. In setting the sector-scan dial, access to the dial is obtained through the hinged cover on the front panel of the unit. Six fuses and three toggle switches are located on the front panel. The unit also functions as a junction box for the other servo components since all connections to the servo assembly are made through the cable receptacles mounted on the left side of the slew-scan unit.

(4) Antenna Servo Amplifier AM-59/MPG-1. The antenna servo amplifier receives a voltage from the selsyn control transformers in the antenna pedestal and supplies an amplified d-c output to the amplidyne control winding. Three meters, three fuses, one toggle and one push-button type switch, one pilot lamp, and four test jacks are located on the front panel of the unit.

(5) Indicator Servo Amplifier AM-60/MPG-1. The PPI servo amplifier is used in synchronizing the rotation of the PPI sweep trace with the rotation of the antenna. One meter, three fuses, one pilot lamp, and one toggle and one push-button type switch are mounted on the front panel of the unit.

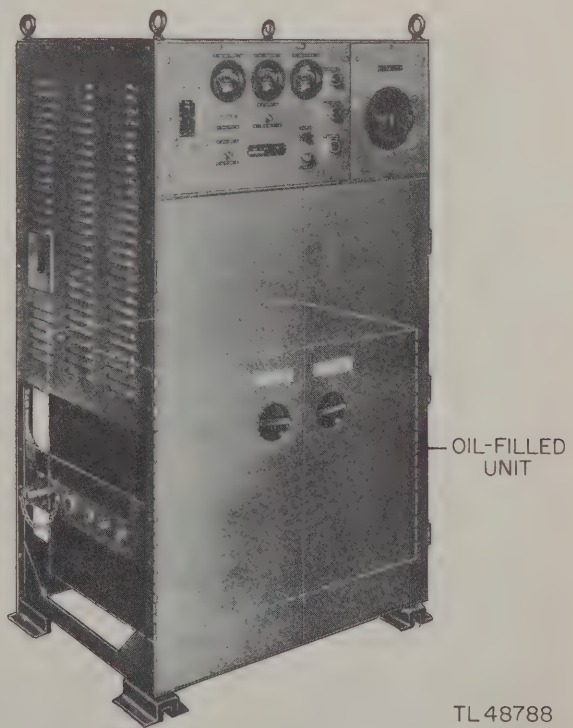


Figure 1-16. Modulator MD-36/MPG-1.

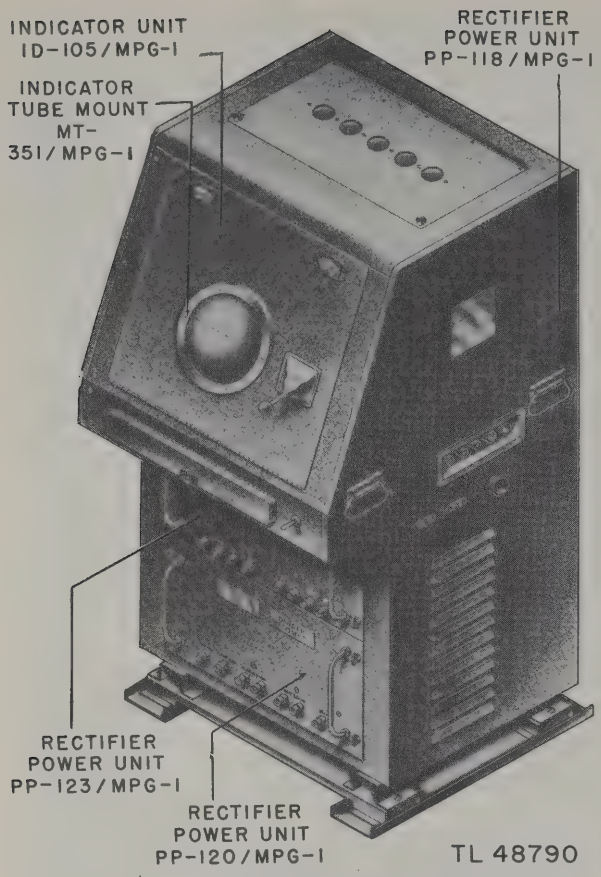


Figure 1-17. Indicator Cabinet Assembly CY-234/MPG-1.

f. Modulator (fig. 1-16). Modulator MD-36/MPG-1 supplies a high-power pulse to the transmitter tube. Control switches, meters, pilot lights, and a power variac are on the control panel in the upper section of the cabinet. Two doors give access to the interior of the cabinet. The lower half of the cabinet contains a sealed oil-filled unit in which are all the high-voltage components of the modulator. Cable connections to the modulator unit are made through the receptacles on the left side of the modulator. The cabinet is approximately 30 inches long, 24 inches wide, and 56 inches high.

g. Remote-B Assembly (fig. 1-17). Indicator Cabinet Assembly CY-234/MPG-1 is used for spotting the fall of shot and for correcting artillery fire. The unit is intended for use anywhere within the trailer or in its immediate vicinity, since it is connected to other components of the radar set through 25-foot lengths of cable. The assembly includes the following components:

(1) Indicator Cabinet CY-311/MPG-1. The cabinet houses the other components of the remote-B assembly. It is approximately 30 inches long, 19 inches wide, and 50 inches high.

(2) Indicator Unit ID-105/MPG-1. The indicator unit includes the electrical circuits associated with the B-type remote oscilloscope, as well as a cursor for reading splash corrections.

(3) Rectifier Power Unit PP-123/MPG-1. The remote 300-volt supply furnishes regulated 300-volt d-c to the circuits of the remote B-scope.

(4) Indicator Tube Mount MT-351/MPG-1. This unit is identical to the unit mounted in the console cabinet (fig. 1-9). The mount supports a B-type scope.

(5) Rectifier Power Unit PP-118/MPG-1. This rectifier unit supplies the 4,000-volt d-c required for the operation of the cathode-ray tube. The unit is identical to that in the console (fig. 1-11).



Figure 1-18. Tower AB-50/MPG-1.

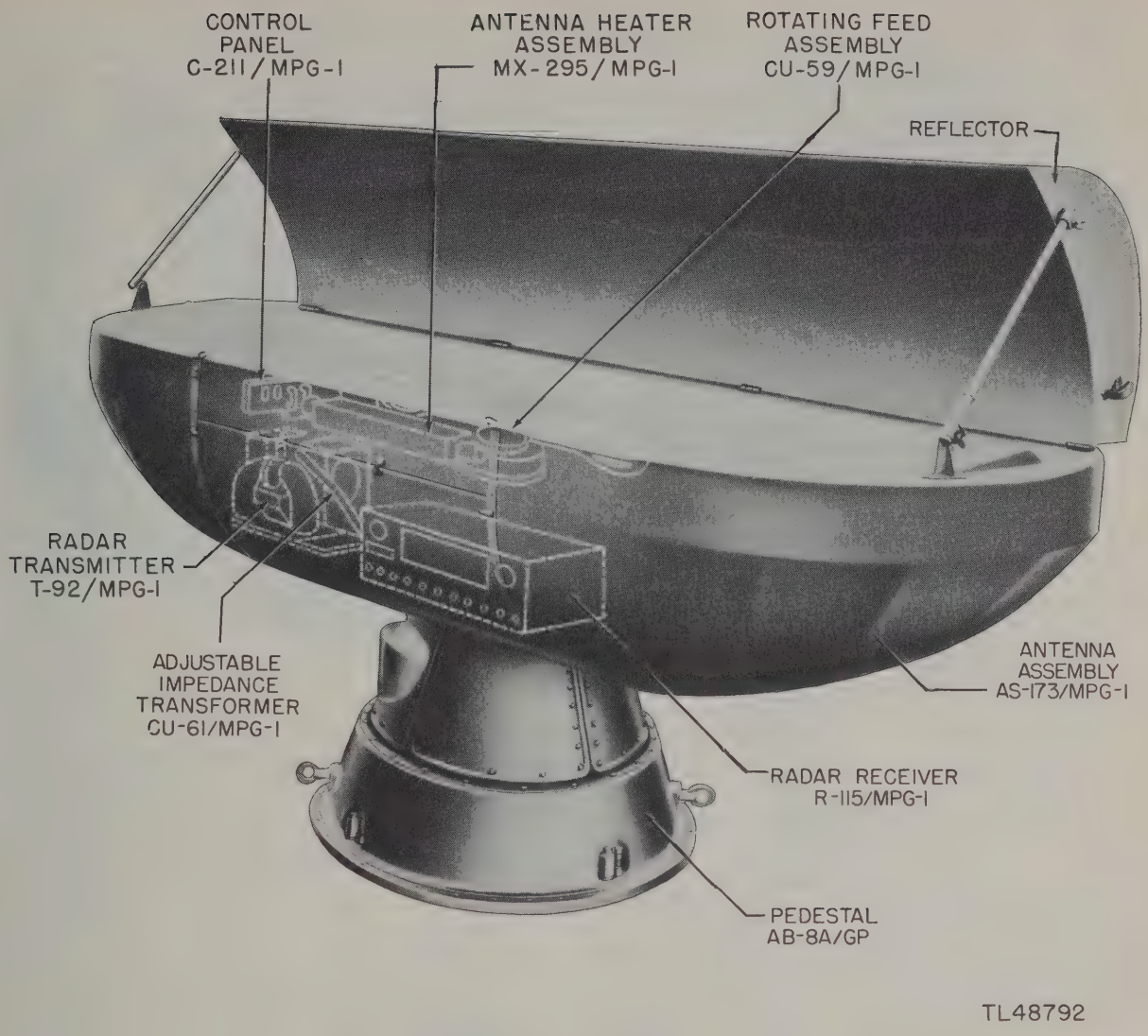


Figure 1-19. Pedestal and antenna, front view.

(6) Rectifier Power Unit PP-120/MPG-1. The 500-volt supply is identical to that in the rectifier assembly (fig. 1-14). It supplies a 500-volt d-c output.

h. Tower (fig. 1-18). Tower AB-50/MPG-1 is a 25-foot steel tower used to support the antenna and the antenna pedestal. The tower is equipped with an elevator-type platform and consists of four vertical 5-inch steel tubes each of which is supported by four 2-inch steel struts. The elevator platform is raised with two hand winches supplied with the unit. The tower is reinforced with diagonal cross-braces between the vertical supports. The base of the tower consists of 8-inch steel channels to which the remainder of the tower is bolted. Sandbags may be placed around the base of the tower to insure that an exceptionally strong wind will not overturn the tower. In travel, the tower parts are transported in the rear of the trailer.

i. Pedestal (fig. 1-19). Pedestal AB-8A/GP supports the antenna of the radar set. It includes slip rings for connecting components of the antenna to other components of the radar set. It also contains the antenna drive motor, two selsyn control transformers, and a selsyn generator.

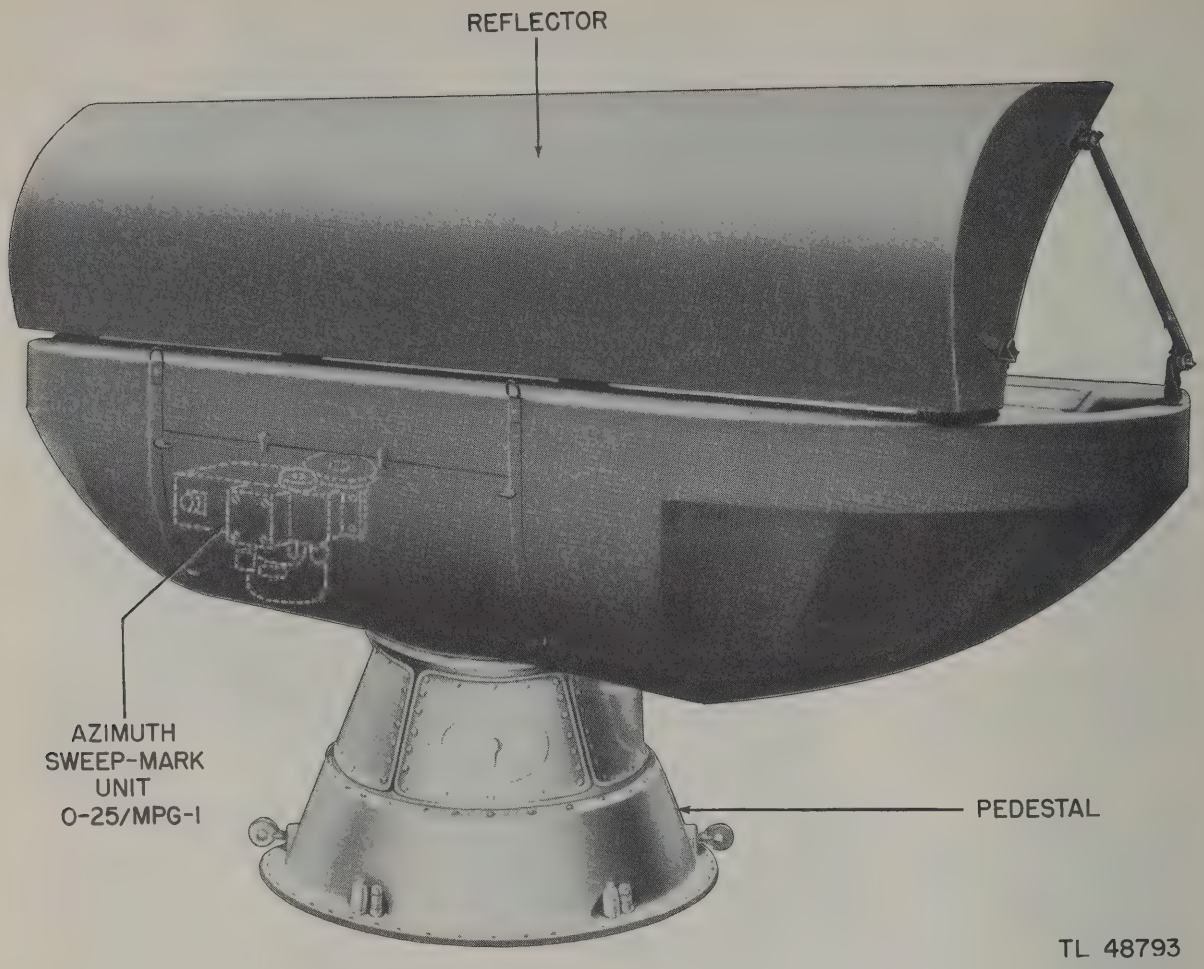


Figure 1-20. Pedestal and antenna, rear view.

j. Antenna. The entire antenna, which is mounted on the pedestal, is called Transmit-Receive System RF-28/MPG-1. The antenna and pedestal are mounted on a dolly to facilitate loading into the trailer for transportation. The components included in the antenna are listed below.

(1) Antenna Assembly AS-173/MPG-1. The radiating antenna (fig. 1-19) consists of a plywood shell with a reflector and a built-in horn. The shell houses the remaining components of the antenna. The reflector is hinged to the shell. Adjustable supporting rods at each end of the reflector allow its angle of tilt to be changed slightly.

(2) Rotating Feed Assembly CU-59/MPG-1. The rotating feed assembly is located within the plywood shell directly above the center of the pedestal. The assembly consists of a rotating joint, four antenna feed arms, a gear mechanism, and a drive motor.

(3) Azimuth Sweep-Mark Unit O-25/MPG-1. The sweep-mark unit generates voltages required by the B-scope while tracking a target. It is mounted on the rotating feed assembly and mechanically coupled to it (fig. 1-20). The unit includes a special variable capacitor and slotted, rotating disks with associated electronic and phototube circuits.

(4) Radar Transmitter T-92/MPG-1. The transmitter (fig. 1-19) generates the radio signals which are radiated into space. The assembly consists of a step-up pulse transformer, magnetron, magnet, blower, and base plate.

(5) Radar Receiver R-115/MPG-1. The receiver is located within the plywood housing and close to the transmitter. A hinged panel in the front of the receiver case gives access to the interior. A meter is mounted at the left, and a small cathode-ray tube at the right, of the hinged panel. The controls for the receiver and the cathode-ray tube are at the front of the case, below the hinged panel.

(6) Adjustable Impedance Transformer CU-61/MPG-1. The transformer (squeeze box) consists of a slotted section of waveguide between the transmitter and the receiver (fig. 1-19) with an adjustable clamp.

(7) Directional Coupler CU-62/MPG-1. The directional coupler consists of a section of waveguide located between the receiver and the rotating feed assembly. It provides a means of coupling to an r-f test set.

(8) Antenna Heater Assembly MX-295/MPG-1. The antenna heater (fig. 1-19), which removes moisture from the horn, consists of a heater assembly, thermostat, terminal board, and two blower motors.

(9) Control Panel C-211/MPG-1. The antenna control panel (fig. 1-19) is a phenolic board on which are mounted fuses for the antenna heaters and blowers, an antenna heater relay, two 115-volt, 60-cycle utility outlets, a telephone bell and bell switch, and the on-off switch for the rotating-feed drive motor.

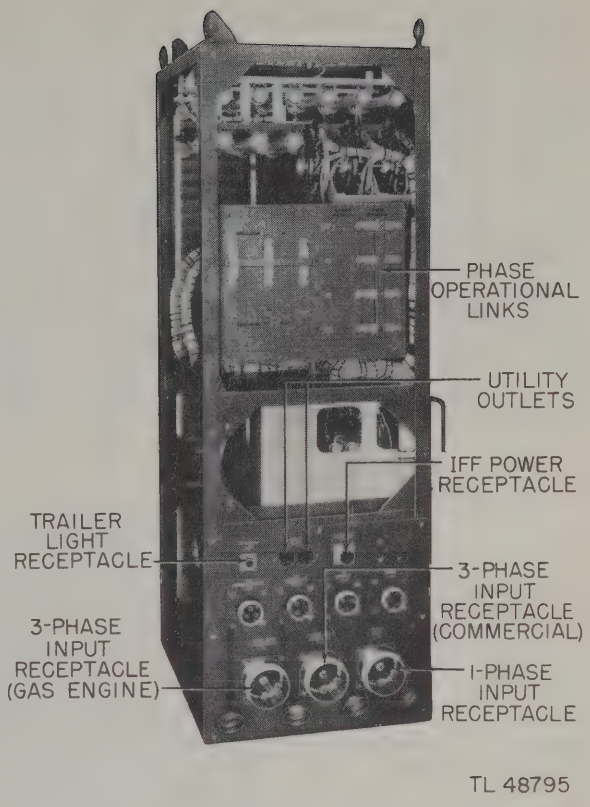


Figure 1-22. Power panel, side view, panels removed.

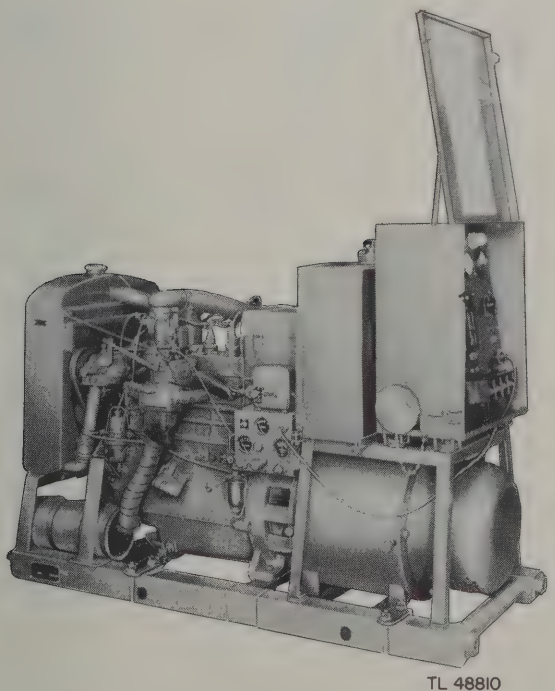


Figure 1-21. Power Unit PU-26/U.

k. Power Unit (fig. 1-21). Power Unit PU-26/U is supplied with Radar Set AN/MPG-1 for use where commercial power is not available. The unit is a gasoline-engine generator supplying a three-phase, 60-cycle output. It is mounted on steel skids. For transportation, the power unit is loaded into the trailer through the door in the left side of the trailer body.

1-9. POWER CONTROL AND DISTRIBUTION.

The primary power lines are connected to Power Panel SB-25/MPG-1 (fig. 1-12) which contains voltage regulators and distributes power to the components of the radar set. The system as a whole is operated on either three-phase or single-phase power. Changing from single-phase to three-phase

operation is accomplished by means of switching links located at the side of the power panel (fig. 1-22). Manual voltage regulators with ganged tap switches permit simultaneous adjustment of voltage for either three-phase or single-phase operation. Five separate power on-off switches are provided in the outgoing power lines to the antenna heaters, IFF and trailer lights, rectifier assembly and console, servo assembly, and modulator. A voltmeter and circuit selector switch on the front panel of the unit allows the voltage supplied the modulator, the console, or the servo assembly to be checked. Both a commercial source of three-phase power and the gasoline-driven motor generator may be connected to the power panel through the receptacles on the left side of the cabinet (fig. 1-22). Either of the two sources of power may be selected by means of two switches on the front panel (fig. 1-12). Because of a lever arrangement, it is impossible for both switches to be turned on at the same time. In this manner, switching from one power source to the other is accomplished readily in the event of power failure.

SECTION IV. FUNCTIONING OF COMPONENTS

1-10. GROUPING OF COMPONENTS.

The components of Radar Set AN/MPG-1 have been divided into six groups, depending upon their connection with the different functions performed by the equipment as a whole. In broad outline, these paragraphs tell what each group of components does. A detailed theoretical treatment of the functioning of each component is presented in TM 11-1566, along with schematic and wiring diagrams. The tower and the trailer are not considered in this discussion since they do not contribute to the electrical functioning of the radar set. The groups are as follows:

a. Power group.
b. Transmitter group.
c. Receiver group.
d. Timing and indicating group.
e. Remote indicating group.
f. Antenna positioning and tracking group.

1-11. POWER GROUP.

a. Function. The power group (fig. 1-23) supplies and distributes power to the radar components and utilities.

b. Description. The power source for Radar Set AN/MPG-1 must supply 60-cycle, 115-volt power, which may be either three-phase or single-phase. The three-phase power source may be either commercial or the gasoline-driven Power Unit PU-26/U. The single-phase power source, if available, may be either a generator or commercial source. As previously discussed (par. 1-9) the primary power lines are connected to Power Panel SB-25/MPG-1. The power panel controls the distribution of power to individual components of the radar set.

1-12. TRANSMITTER GROUP.

a. Function. The transmitter group components (fig. 1-24) produce the radio-frequency (r-f) pulses which are sent out into space and, after striking a target, return to the radar set as target echoes. To distinguish between transmitted and received signals, the radio energy is produced in the form of short bursts or pulses.

b. Description.

(1) Modulator MD-36/MPG-1 furnishes the energy for the pulses of r-f energy that are transmitted a definite number of times per second. It receives timing or trigger voltage pulses from the timing and indicating group, forms them into pulses of the proper shape and amplitude, and applies these pulses to the transmitter located in the plywood shell of the antenna assembly.

(2) The pulses from the modulator are applied to Radar Transmitter T-92/MPG-1 through a long length of cable and a rotating joint at the base of the antenna pedestal. The joint is necessary since the antenna must rotate in azimuth. The transmitter assembly includes a step-up pulse transformer, a magnetron and magnet, a blower, and a base plate. Before application to the mag-

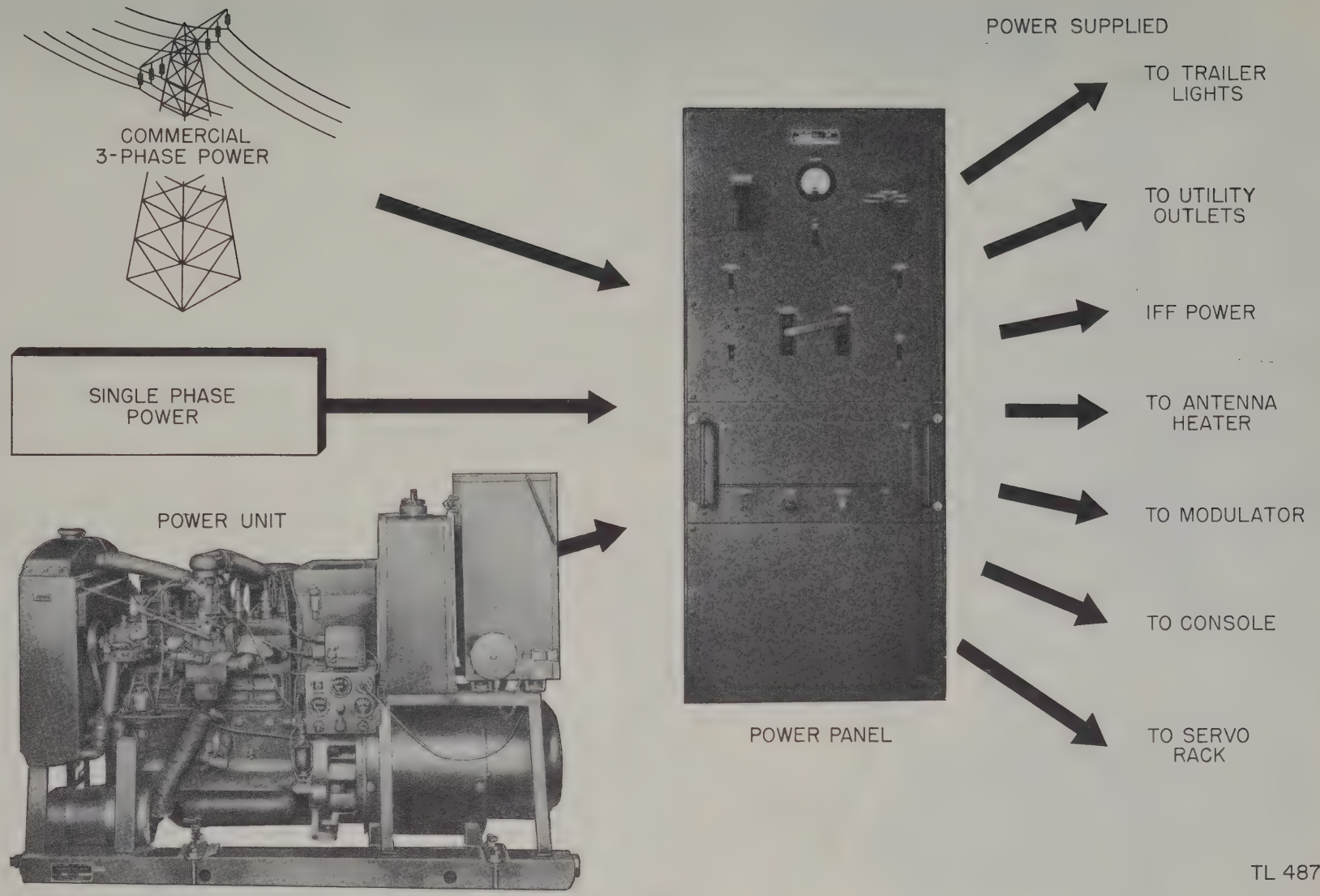


Figure 1-23. Power group.

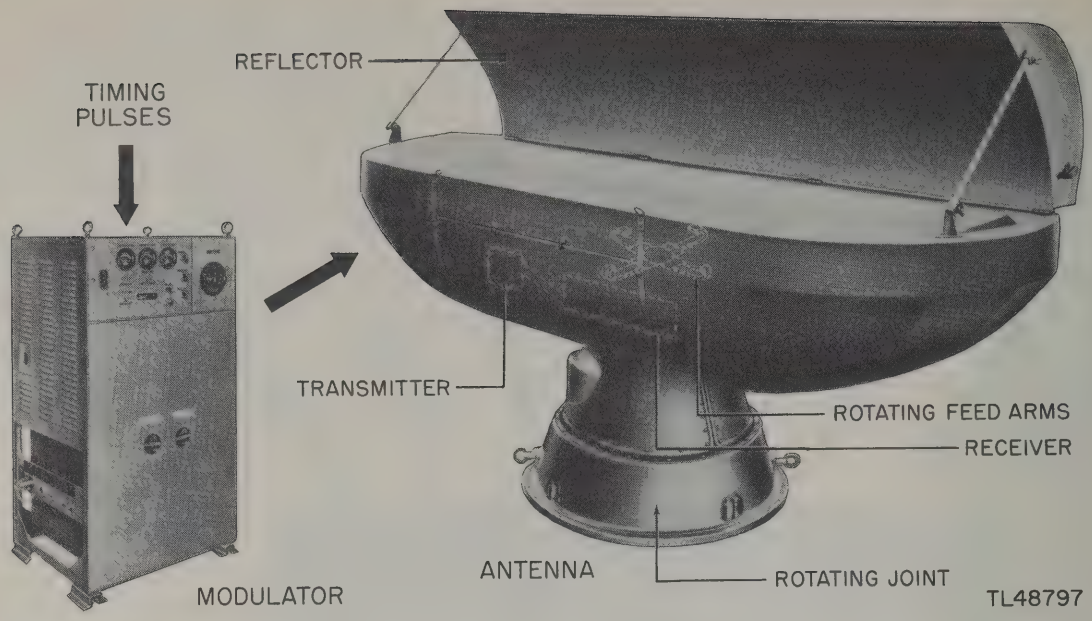


Figure 1-24. Transmitter group.

netron oscillator, the pulses from the modulator are stepped up by the pulse transformer. The magnetron oscillator generates the r-f pulses which are radiated into space.

(3) The pulses of r-f energy generated by the magnetron oscillator are transmitted through waveguides passing through the receiver to the rotating feed assembly. A unit, known as a T-R switch, in the receiver prevents the large amount of transmitter energy from entering and damaging the receiver components. A section of waveguide, known as the directional coupler, connected between the receiver and rotating feed assembly, has a branch from which transmitter energy may be coupled to an r-f test set for measurement of transmitter power output. After the pulses pass through the feed arms, they are radiated from a horn built into the antenna assembly. The emitted energy is focused by the reflector (fig. 1-19) into a narrow beam around the axis of the antenna.

(4) While searching for targets (PPI operation), the rotating-feed assembly does not rotate. The radar beam then scans through 360 degrees of azimuth or through a sector of azimuth, depending on whether the antenna assembly as a whole rotates through a full 360 degrees of azimuth or through a preselected azimuth sector. While tracking a target (B-scope operation), automatic rotation of the antenna assembly is stopped. The rotating-feed arms then rotate, and the angle at which the radar beam leaves the antenna varies through an angle of approximately 10 degrees. In this manner, while tracking a target, the radar beam is made to scan a sector approximately 10 degrees wide although automatic rotation of the antenna assembly is stopped.

1-13. RECEIVER GROUP.

a. Function. The function of the receiver group (fig. 1-25) is to convert the energy which is reflected by a target into the proper form for application to the timing and indicating group.

b. Description.

(1) Echoes, in the form of radio waves which are reflected from a target, are picked up by the antenna and fed through the horn and rotating-feed arm assembly to Radar Receiver R-115/MPG-1. The T-R switch, which during transmission allows only a small portion of the transmitted pulse to en-

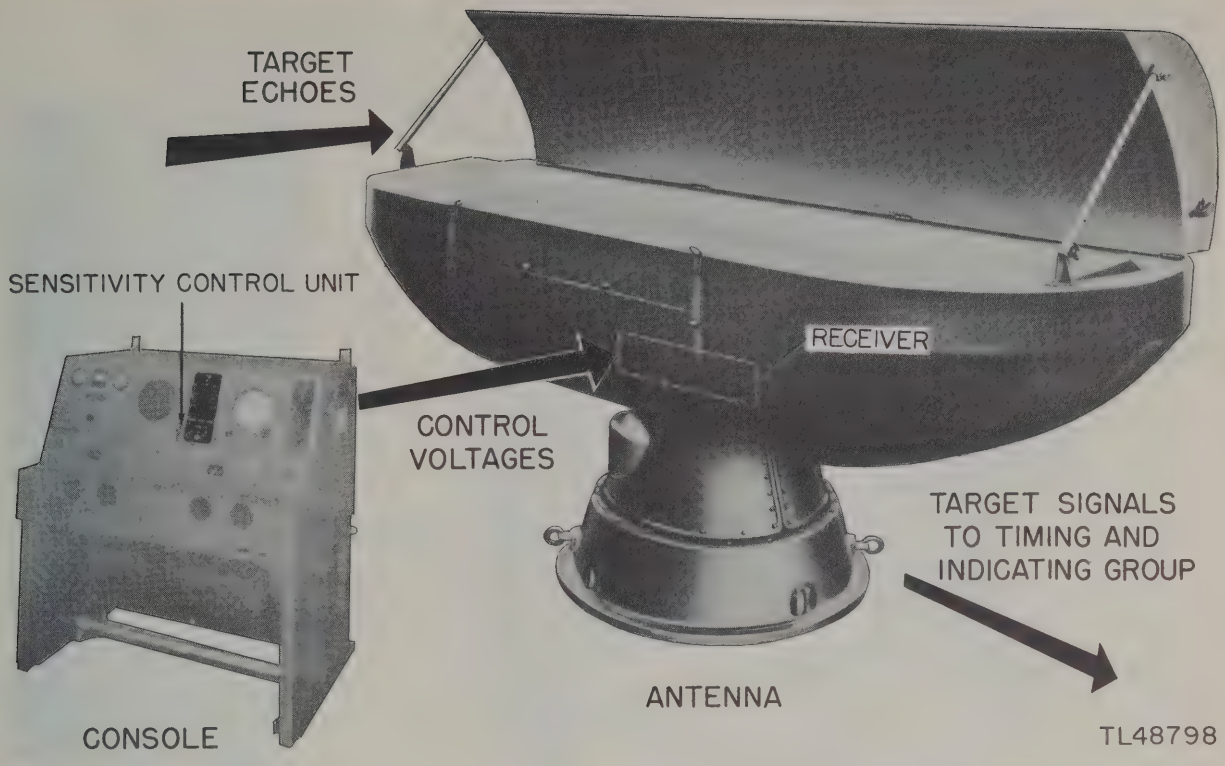


Figure 1-25. Receiver group.

ter the receiver circuits, admits the received signals to the crystal mixer. An additional device in the receiver unit, known as an anti-T-R switch, prevents the weak received signals from being lost in the transmitter oscillator.

(2) The local oscillator, with an automatic frequency control (AFC) circuit, furnishes a stable frequency to the mixer so that the combination of the local oscillator and received signals gives intermediate frequency (i-f) signals which can be easily amplified. The i-f output of the crystal mixer is amplified and detected. A signal of sufficient amplitude to give a visual indication on the display units is obtained from the receiver.

(3) A small type-A oscilloscope in the receiver (fig. 3-27) is used in performing certain receiver and radar system tests. A d-c meter (fig. 3-27) may be used to indicate crystal current. Controls for the receiver and the oscilloscope are included on the front panel.

(4) An additional unit associated with the receiver group, Sensitivity Control Unit C-161/MPG-1 (STC), is located behind the control panel of the console (fig. 1-10). The unit gives manual control over the gain of the receiver and also includes circuits which are designed to increase the sensitivity of the receiver during the reception of echoes from more distant targets. In normal operation, only the controls on the console panel are used in controlling the operation of the receiver.

1-14. TIMING AND INDICATING GROUP.

a. Function. The timing and indicating group (fig. 1-26) has two major functions. These functions are:

(1) To supply exact timing voltages to the components of the radar set in order to synchronize the action of all components.

(2) To display target azimuth and range data during search and to display target echoes during tracking. While tracking a target, accurate range and azimuth information is given by the antenna positioning and tracking group.

b. Description.

(1) The range unit, located at the rear of the console, supplies the greater portion

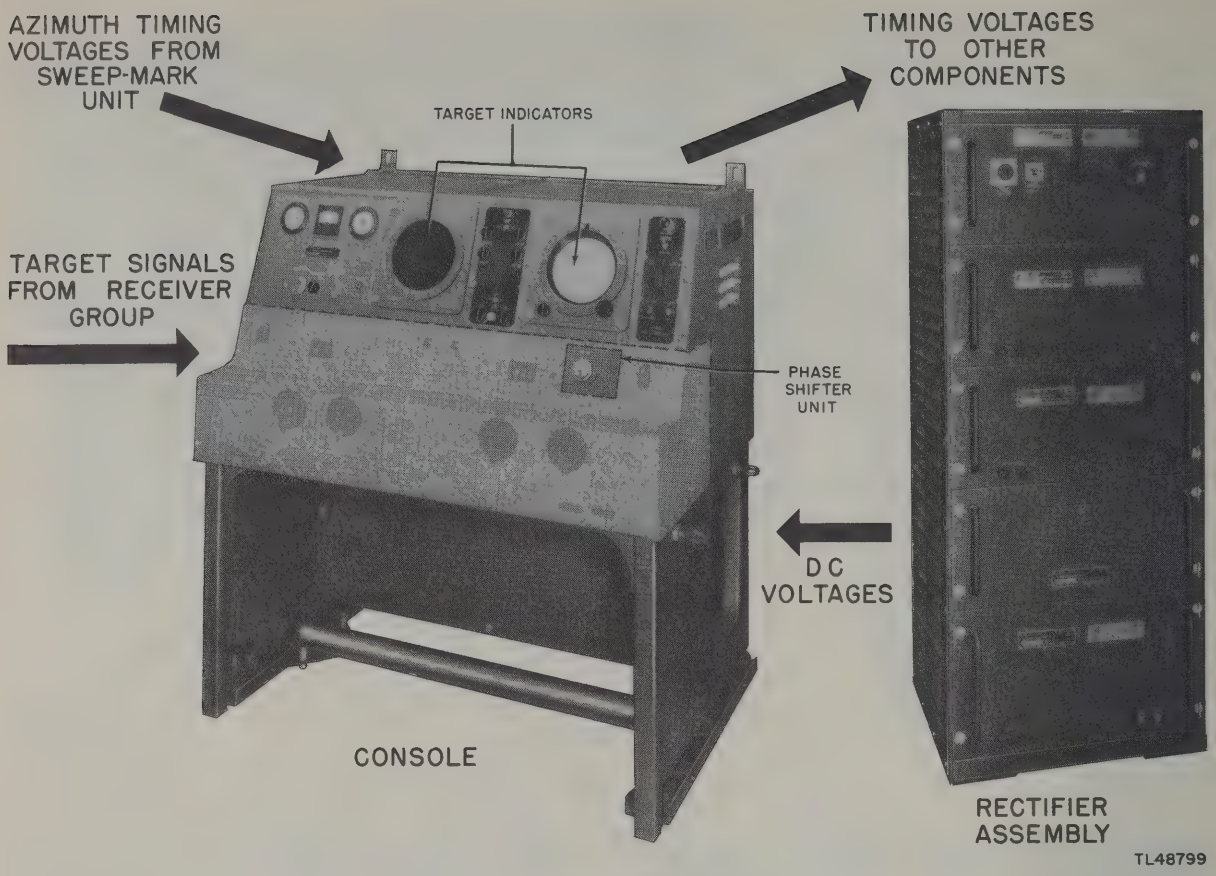


Figure 1-26. Timing and indicating group.

of the timing voltages required by the components. Timing voltages generated in the console are accurately controlled by the phase shifter unit in the center section of the console. Among the voltages the range unit supplies are timing pulses to the modulator, range marks to the PPI scope, sweep and blanking voltages to the PPI scope, azimuth and range sweep voltages to both the B-scope and the remote B-scope, and timing pulses to the receiver sensitivity control unit. This phase shifter unit includes the crystal oscillator which provides the master timing for the entire radar set. Timing voltages for the azimuth sweep of the B-scope are supplied by the sweep-mark unit in the antenna.

(2) A general description of target presentation on the PPI and B-scopes was given in paragraph 1-6. In search for targets (PPI operation), the PPI scope is used; in tracking a target (B-operation), the B-scope is used. Two alternative maximum ranges of PPI operation are available, 30,000 and 80,000 yards. On the 80,000-yard range, eight fixed 10,000-yard electronic range marks are provided to facilitate target range estimations. On the 30,000-yard range, instead of fixed marks, a single, electronic, variable range mark is provided which makes closer range estimations possible. To track a target, B-operation is used. The B-scope then displays all targets in a sector approximately 10 degrees wide and 2,000 yards deep. (A complete description of the operating procedure used in tracking a target is given in chapter 3, section III.) In B-operation, accurate azimuth and range of a target is indicated by azimuth and range dials. It is impossible to operate the PPI and B-scope simultaneously from synchronizing pulses originated by Radar Set AN/MPG-1. However, provision has been made for operating the B-scope and the PPI scope simultaneously if synchronizing pulses and target echoes are supplied to the local PPI scope from a remotely located, separate search set. This makes it possible for the operators of Radar

Set AN/MPG-1 to keep the surrounding area under observation while tracking specific targets on the B-scope. This type of operation is known as PPI-remote-and-B operation.

(3) Most of the d-c voltages required for the operation of the components in the timing and indicating systems are supplied by the components of Rectifier Cabinet Assembly CY-232/MPG-1. This supply provides potentials of –150 volts, +500 volts, and +300 volts regulated to the console components. An additional power unit, Rectifier Power Unit PP-118/MPG-1, located in the lower section of the console, supplies the high voltages required for the operation of the two scopes.

1-15. REMOTE INDICATING GROUP.

a. Function. The function of the remote indicating group (fig. 1-27) is to spot the fall of shot and to supply data for correcting artillery fire.

b. Description. The remote indicating group consists of Indicator Cabinet Assembly CY-234/MPG-1. The assembly includes a B-type scope which displays an image similar to that presented by the local B-scope in the console. Error in artillery fire is determined on the scope by means of a cross-hair positioning mechanism. The observed error data is transmitted to the gun-data computer and artillery fire is corrected. The remote B-indicator unit receives its timing and sweep voltages from the range unit of the timing and indicating group. The d-c voltages required for the operation of its component circuits are obtained from the three rectifier units included in the assembly.

1-16. ANTENNA POSITIONING AND TRACKING GROUP.

a. Function. The antenna positioning and tracking group performs two major functions. These are as follows:

(1) In searching, to turn the antenna through 360 degrees in azimuth (or through any desired scanning sector) and, at the same time, to rotate the PPI sweep trace so that its angular position on the screen corresponds continuously to the azimuth pointing direction of the antenna.

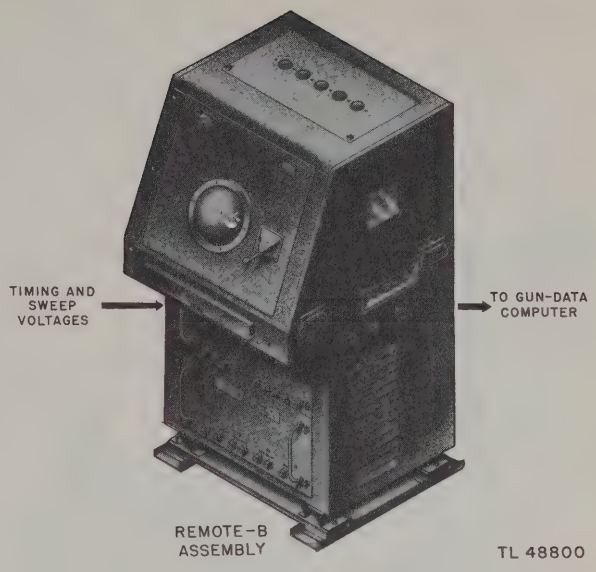


Figure 1-27. Remote indicating group.

(2) In tracking, to position the antenna so that it may be kept "on target" continuously and, at the same time, to supply accurate present position data on the target. The data is supplied visually (on dials) to the operators of the radar set and electrically to the gun-data computer.

b. Description. Figures 1-28, 1-29, and 1-30 illustrate the functioning of the antenna positioning and tracking group while searching and while tracking. Two separate selsyn systems are involved in PPI operation (search), the PPI selsyn system (fig. 1-28) and the antenna selsyn system (fig. 1-29). In B-operation (tracking), the antenna selsyn system (fig. 1-30) differs in some respects from that used in PPI operation.

(1) The PPI selsyn system (fig. 1-28) rotates the PPI sweep trace in synchronism with the rotation of the antenna. A selsyn generator in the antenna pedestal is geared to the rotation of the antenna at a 1:1 ratio, and a selsyn control transformer in the PPI unit is geared to the deflection yoke of the PPI scope at a 1:1 ratio. The generator and control transformer are connected electrically so that a discrepancy in the positions of their rotors causes an error voltage to be obtained from the control transformer. The error voltage is rectified by the PPI servo amplifier and an amplified d-c voltage is supplied to the PPI drive motor. The drive motor turns the deflection yoke in a direction

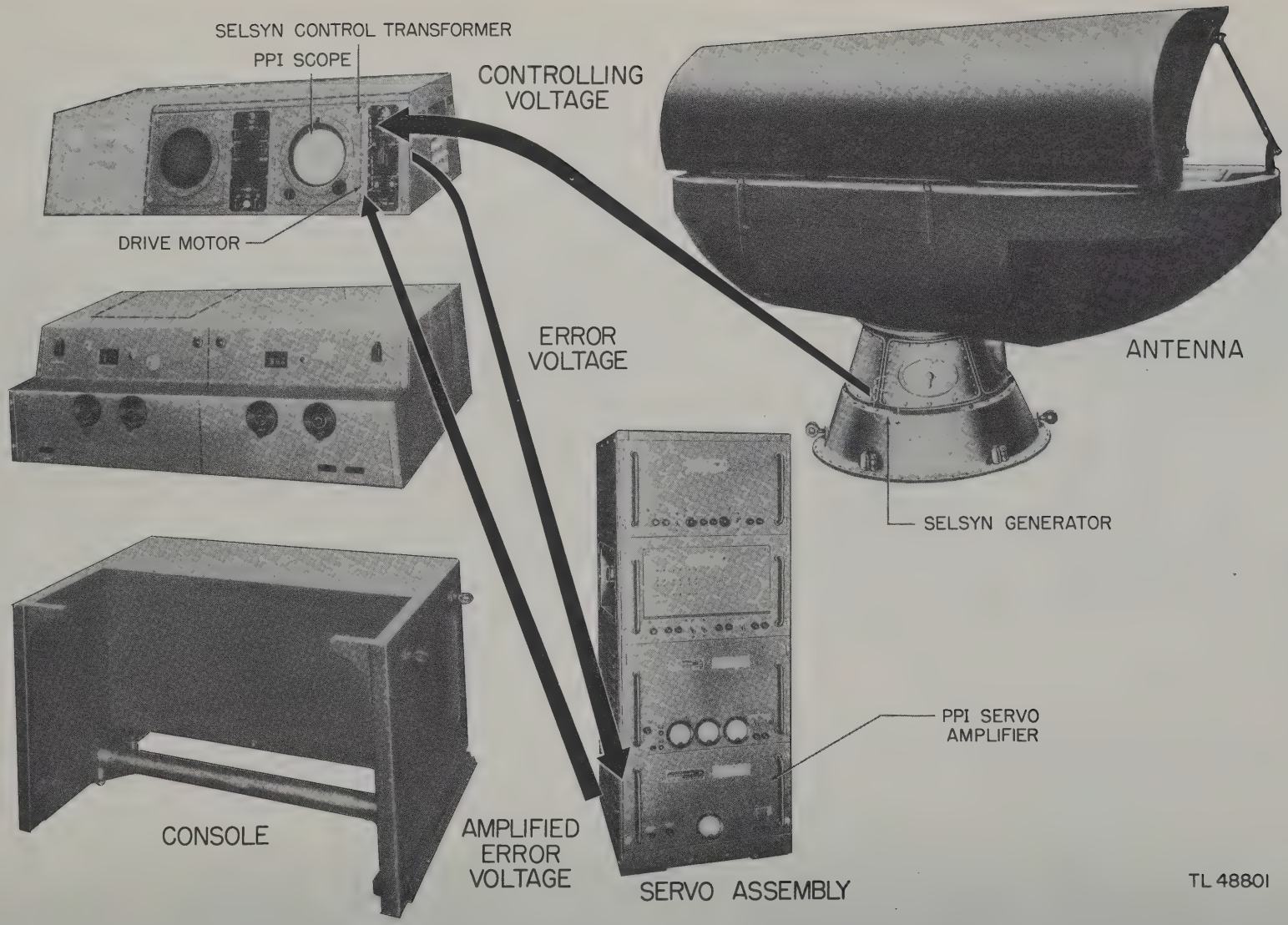


Figure 1-28. Antenna positioning and tracking group, PPI selsyn system.

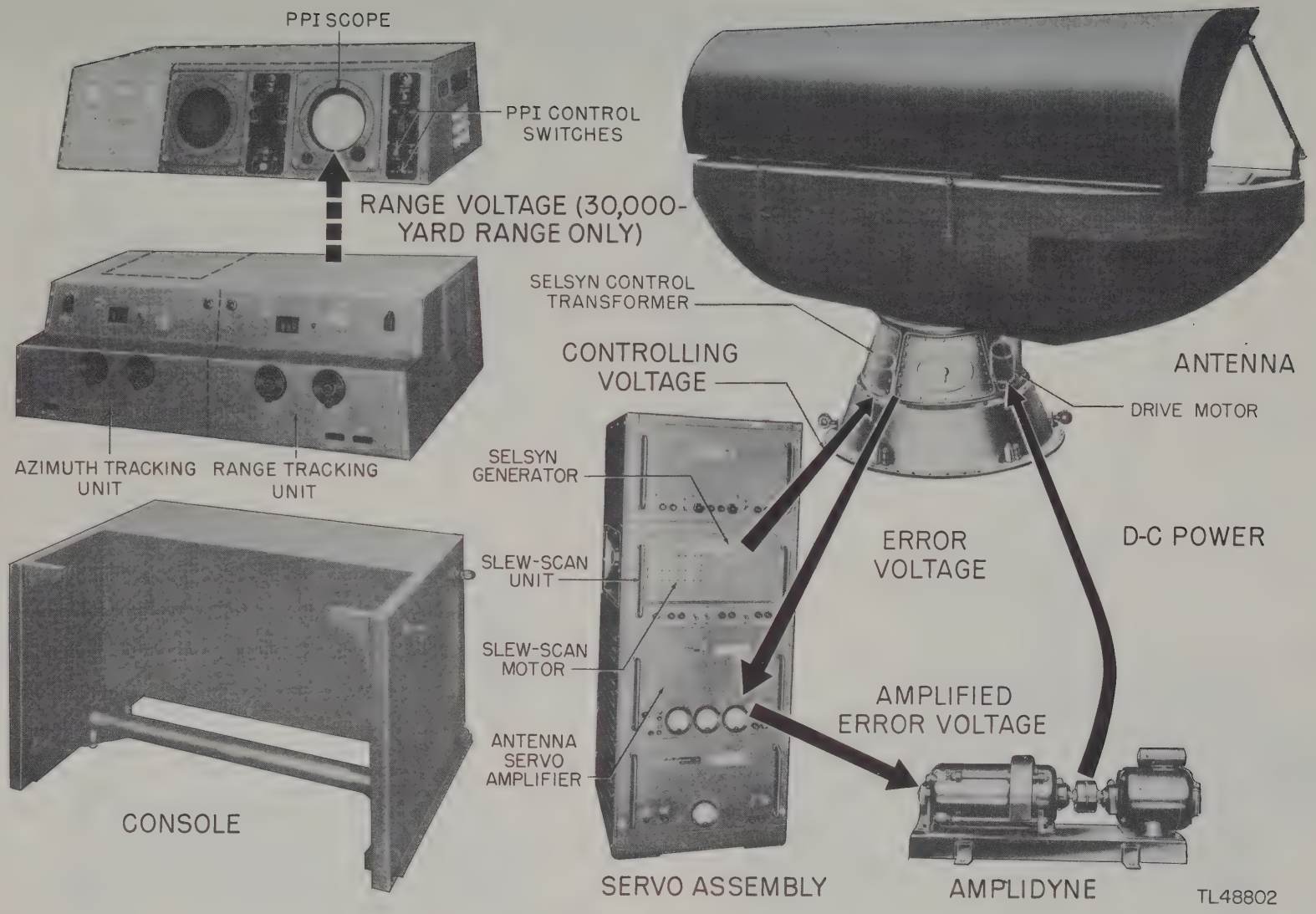


Figure 1-29. Antenna selsyn system, PPI operation.

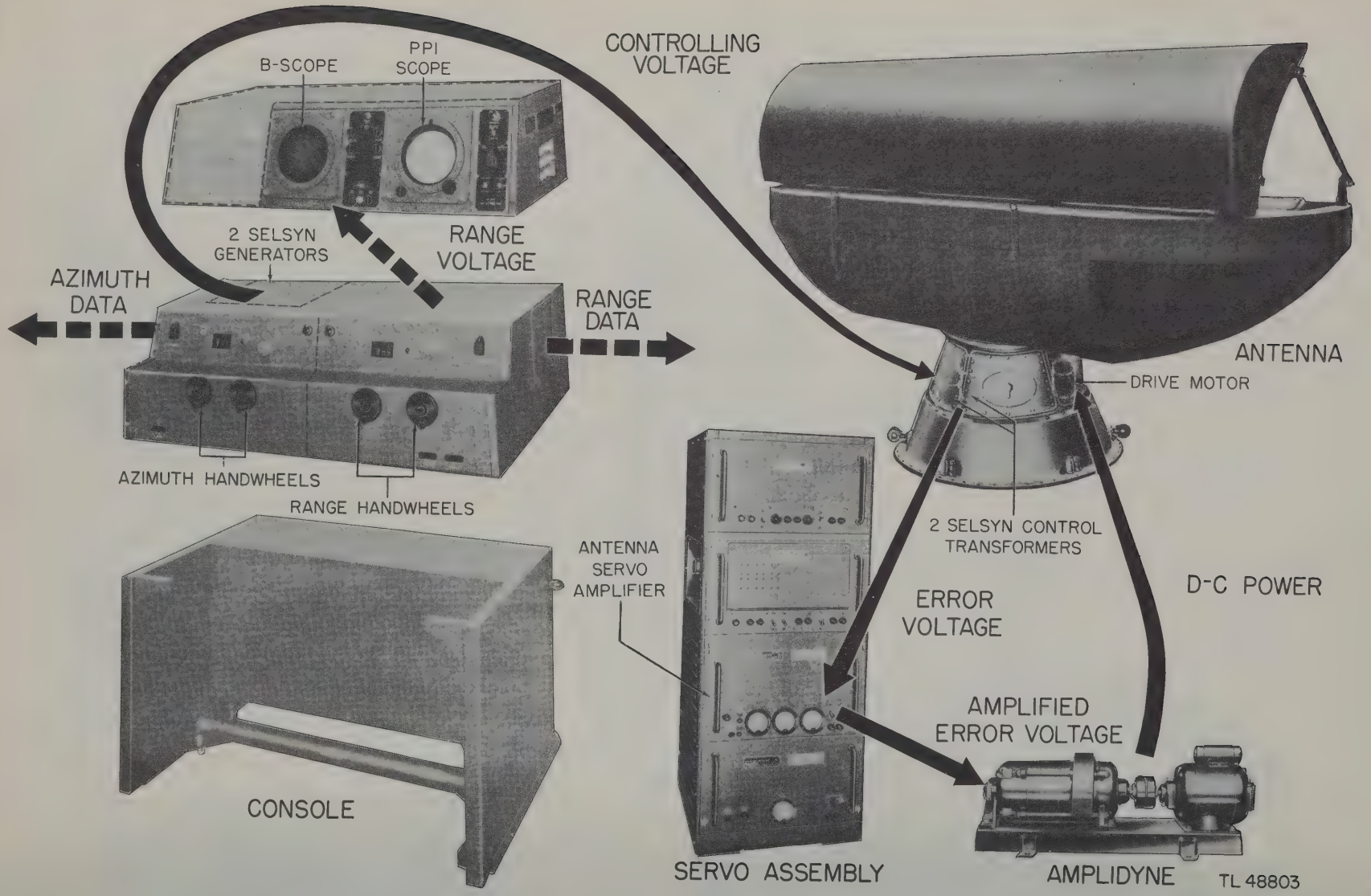


Figure 1-30. Antenna selsyn system, B-operation.

which reduces the error voltage. In this manner the PPI deflection yoke and sweep trace are made to rotate in synchronism with the antenna.

(2) The functioning of the selsyn system which drives the antenna during search is indicated in figure 1-29. A motor in the slew-scan unit drives a selsyn generator which is connected electrically to one of two selsyn control transformers in the antenna pedestal. The control transformer is geared to rotate with the antenna. A discrepancy in the position of the rotors of the two selsyns causes an error voltage to be supplied to the antenna servo amplifier. The rectified and amplified error voltage is used to excite the amplidyne control winding, causing the amplidyne to generate d-c power for the antenna drive motor. The drive motor turns the antenna in a direction which reduces the error voltage. The motor in the slew-scan unit thus indirectly controls the rotation of the antenna. When the direction of rotation of the slew-scan motor is reversed, as is the case in sector and slew scanning, the direction of antenna rotation also reverses. Figure 1-29 indicates that while searching on the 30,000-yard range, the range tracking unit supplies a range voltage to the PPI scope. This voltage, which is used in generating the variable range mark, is controlled by the range tracking handwheels. The range of a target is indicated by the range dials when the variable range mark is made to pass through a target echo.

(3) In B-operation, two selsyn generators and two selsyn control transformers are used in the antenna selsyn system (fig. 1-30). This arrangement gives a finer control over the antenna position. In B-operation, the selsyn generators used are located in the azimuth tracking unit and are geared to the azimuth handwheels. The operation of the selsyn system is similar to that discussed in subparagraph *(2)*. The error voltage developed in the selsyn control transformers in the antenna pedestal controls the antenna drive motor through the antenna servo amplifier and the amplidyne. Motion of the antenna is thus controlled indirectly by the azimuth handwheels. As previously mentioned (par. 1-12), while tracking a target the radar beam is made to scan a sector approximately 10 degrees wide by the rotating feed arms. Simultaneously, the azimuth sweep-mark unit in the pedestal supplies a voltage which corresponds to the position of the beam at any instant. At the same time, the range tracking unit supplies the B-scope circuits with a voltage which determines the range position of the B-scope display. This voltage, as well as the azimuth and range data voltages supplied to the gun-data computer, is indicated by broken arrows in figure 1-30.

SECTION V

TEST EQUIPMENT, TOOLS, AND PHYSICAL SPECIFICATIONS

1-17. TEST EQUIPMENT.

The test equipment (fig. 1-31) supplied with Radar Set AN/MPG-1 is listed below. In transportation, all the test equipment is packed in the trailer. Instructions on the use and application of these test units are included in TM 11-1566, Service Manual.

a. Synchroscope TS-28/UPN. The test synchroscope is used for viewing waveforms as an aid in trouble shooting.

b. Fluxmeter TS-15B/AP. The fluxmeter is used to check the field strength of the magnet used with the magnetron.

c. Tube Tester. A Precision model 920-P tube tester is used to check the condition of vacuum tubes.

d. Voltmeter IS-189. The test meter, Simpson model 260 meter, is used to measure resistances, d-c voltages and currents, and power level in decibels.

e. Modulator Dummy Load TS-264/MPG-1. The dummy load is used as an artificial load for the modulator unit in performing certain system checks.

f. Test Set TS-147/UP. The test set is used to perform certain over-all performance



Figure 1-31. Test equipment for Radar Set AN/MPG-1.

tests. With some equipments, Test Set TS-35/AP has been supplied. This accomplishes the same general functions as Test Set TS-147/UP.

g. Voltmeter TS-363/U. The vacuum tube voltmeter is used in making voltage measurements in high-resistance circuits.

h. Spectrum Analyzer TS-148/UP. The spectrum analyzer is used to check the frequency spectrum of the transmitter output.

i. Crystal Rectifier Test Set TS-268/U. The crystal checker is used to check the back-to-front resistance ratio of crystals.

1-18. LIST OF MAJOR COMPONENTS.

A list of the major components of Radar Set AN/MPG-1 is given below.

LIST OF MAJOR COMPONENTS

Name	*Signal Corps designation*
Trailer	Trailer V-9/MPG-1
Modulator	Modulator MD-36/MPG-1
Power panel	Power Panel SB-25/MPG-1
Pedestal	Pedestal AB-8A/GP
Tower	Tower AB-50/MPG-1
Antenna	Transmit-Receive System RF-28/MPG-1
Horn and reflector	Antenna Assembly AS-173/MPG-1
Transmitter	Radar Transmitter T-92/MPG-1
Antenna heater	Antenna Heater Assembly MX-295/MPG-1
Antenna control panel	Control Panel C-211/MPG-1
Squeeze box	Adjustable Impedance Transformer CU-61/MPG-1
Directional coupler	Directional Coupler CU-62/MPG-1
Rotating feed	Rotating Feed Assembly CU-59/MPG-1
Receiver	Radar Receiver R-115/MPG-1
Sweep-mark unit	Azimuth Sweep-Mark Unit O-25/MPG-1
Console	Console CY-230/MPG-1
Console cabinet	Console Cabinet CY-312/MPG-1
STC unit	Sensitivity Control Unit C-161/MPG-1
Phase shifter	Phase Shifter Unit CV-22/MPG-1
Range unit	Range Unit C-210/MPG-1
PPI mount	Indicator Tube Mount MT-314/MPG-1
4-kv supply	Rectifier Power Unit PP-118/MPG-1
B-scope mount	Indicator Tube Mount MT-351/MPG-1
Azimuth tracking unit	Azimuth Tracking Unit C-162/MPG-1
Range tracking unit	Range Tracking Unit C-163/MPG-1
Rectifier assembly	Rectifier Cabinet Assembly CY-232/MPG-1
Rectifier rack	Rectifier Cabinet CY-309/MPG-1
Rectifier control panel	Rectifier Control Panel C-164/MPG-1
−150-volt supply	Rectifier Power Unit PP-119/MPG-1
500-volt supply	Rectifier Power Unit PP-120/MPG-1
300-volt supply	Rectifier Power Unit PP-121/MPG-1
300-volt regulator	Regulator Unit CN-23/MPG-1
Remote-B assembly	Indicator Cabinet Assembly CY-234/MPG-1
Remote-B rack	Indicator Cabinet CY-311/MPG-1
Remote B-scope	Indicator Unit ID-105/MPG-1
B-scope mount	Indicator Tube Mount MT-351/MPG-1
4-kv supply	Rectifier Power Unit PP-118/MPG-1
500-volt supply	Rectifier Power Unit PP-120/MPG-1
Remote 300-volt supply	Rectifier Power Unit PP-123/MPG-1
Servo assembly	Servo Cabinet Assembly CY-233/MPG-1
Servo rack	Servo Cabinet CY-310/MPG-1
PPI servo amplifier	Indicator Servo Amplifier AM-60/MPG-1
Antenna servo amplifier	Antenna Servo Amplifier AM-59/MPG-1
Feed motor supply	Rectifier Power Unit PP-122/MPG-1
Slew-scan unit	Slew-Scan Unit C-165/MPG-1
Amplidyne	Servo Motor Generator PU-52/MPG-1
Telephone box	Telephone Box TA-14/MPG-1

1-19. WEIGHTS AND DIMENSIONS OF COMPONENTS.

Weights in pounds and dimensions in inches of the major components of Radar Set AN/MPG-1 are given in the table below.

WEIGHTS AND DIMENSIONS OF MAJOR COMPONENTS

COMPONENT	DIMENSIONS			WEIGHT (lb.)
	Length (in.)	Width (in.)	Height (in.)	
CONSOLE CY-230/MPG-1	52	34	53½	—
Azimuth Tracking Unit C-162/MPG-1	24	21¾	7 3/16	90
Console Cabinet CY-312/MPG-1	52	34	50½	437
Indicator Tube Mount MT-314/MPG-1	16½	11	12	32
Indicator Tube Mount MT-351/MPG-1	15	8	8	7
Phase Shifter Unit CV-22/MPG-1	11¼	7½	6½	8¼
Range Unit C-210/MPG-1	45¼	17	7¼	50
Range Tracking Unit C-163/MPG-1	24	21¾	7 3/16	90
Rectifier Power Unit PP-118/MPG-1	12	8½	9	16
Sensitivity Control Unit C-161/MPG-1	13¾	5	6	4¼
INDICATOR CABINET ASSEMBLY CY-234/MPG-1	30	19½	50½	—
Indicator Cabinet CY-311/MPG-1	30	19½	50½	75
Indicator Unit ID-105/MPG-1	28	19	15	75
Indicator Tube Mount MT-351/MPG-1	15	8	8	7
Rectifier Power Unit PP-118/MPG-1	12	8½	9	16
Rectifier Power Unit PP-120/MPG-1	19	11 15/16	8¾	39
Rectifier Power Unit PP-123/MPG-1	19	16⅞	10½	64
MODULATOR MD-36/MPG-1	30½	24½	59	985
PEDESTAL AB-8A/GP	48	48	33	1,000
POWER PANEL SB-25/MPG-1	24	18¼	56¼	500
RECTIFIER CABINET ASSEMBLY CY-232/MPG-1	21¼	19	50½	—
Rectifier Control Panel C-164/MPG-1	19	11 15/16	8¾	17
Rectifier Cabinet CY-309/MPG-1	19½	19	50½	123
Rectifier Power Unit PP-119/MPG-1	19	11 15/16	8¾	27
Rectifier Power Unit PP-120/MPG-1	19	11 15/16	8¾	39
Rectifier Power Unit PP-121/MPG-1	19	16 15/16	10½	95
Regulator Unit CN-23/MPG-1	19	11 15/16	8¾	11
SERVO MOTOR GENERATOR PU-52/MPG-1	33½	13¼	13	178
SERVO CABINET ASSEMBLY CY-233/MPG-1	21¼	19	50½	—
Antenna Servo Amplifier AM-59/MPG-1	19	18 1/16	13¾	50
Indicator Servo Amplifier AM-60/MPG-1	19	12	10½	31
Rectifier Power Unit PP-122/MPG-1	19	16 15/16	10½	56
Servo Cabinet CY-310/MPG-1	19½	19	50½	121
Slew-Scan Unit C-165/MPG-1	19	18 1/16	11½	52
TELEPHONE BOX TA-14/MPG-1	13½	6	26	30
TOWER AB-50/MPG-1	224½	224½	315	6,200
TRAILER V-9/MPG-1	240	98	130	12,175
TRANSMIT-RECEIVE SYSTEM RF-28/MPG-1	143	57	*44⅞	—
Adjustable Impedance Transformer CU-61/MPG-1	—	—	—	1½
Antenna Assembly AS-173/MPG-1	143	57	*44⅞	800
Antenna Heater Assembly MX-295/MPG-1	48¾	5¾	8	30

* Height is 44⅞ inches with reflector down, 55⅜ inches with reflector up.

COMPONENT	DIMENSIONS			WEIGHT (lb.)
	Length (in.)	Width (in.)	Height (in.)	
Azimuth Sweep-Mark Unit O-25/MPG-1	17½	14	12	35½
Control Panel C-211/MPG-1	23½	4	6	5
Radar Receiver R-115/MPG-1	31	18½	8½	115
Radar Transmitter T-92/MPG-1	15½	12½	14	50
Rotating Feed Assembly CU-59/MPG-1	37¾	37¾	18 1/16	250
Directional Coupler CU-62/MPG-1	—	—	—	1¼

1-20. TOOLS.

The tools for Radar Set AN/MPG-1 are listed below. The tools are illustrated in figures 1-32, 1-33, and 1-34, in which the numbers correspond to the first column in the table.

EQUIPMENT TOOLS

No.	Quantity	Name and Description of Tool	Signal Corps Stock No.
57	1	AX: 36″ handle; lineman's; single-bit.	6Q1236
62	1	BAR: wrecking; gooseneck claw and pinch point; ¾″x24″.	
72	6	BATTERY: 1½v; cell.	3A30
63	2	BATTERY: 1½v; type A.	3A23
71	12	BLADES: 12″; 32 teeth.	6Q8012-32
51	4	BLOCK: steel; 2″ triple sheave; double hook eye; for ⅜″ manila rope.	
1	1	BOX: tool; 22″x8″ or 9″	6Q11822
73	1 box	BOLTS: assorted bolts and nuts.	
18	1	BRUSH: varnish; ½″ wide; 6″ long approx.	
41	1	CHISEL: cold; ⅝″x6½″.	6Q19810-6.5
64	1 qt.	DRY-CLEANING SOLVENT.	
53	2	CROWBAR: 5½ ft.; pinch point.	
59	1	DRILL: electric; ¼″ Jacobs chuck with key; 115v, 75w; 3 speed.	
42	1	DRILL: hand; ⅜″ chuck capacity; 13¾″ length.	6Q32005-5.1
14	1	DRILL SET: twist; straight shank; 1/16″ to ½″ in steps of 1/64″ (29 drills).	6Q367D1.1
15	1	DRILL SET: twist; straight shank; No. 1 to 60.	6Q36700.1
20	1	FLASHLIGHT: plastic case; focusing; 2-cell; right-angle type.	6Z4002
27	1	FILE: half round; double cut; 8″.	6Q38123-8
26	1	FILE: mill; second cut; 8″.	6Z38253-8
28	1	FILE: round; bastard; 8″; tapered.	6Q38500-8
49	1	FRAME: hacksaw; 8″ to 12″.	6Z41002
17	1	GREASE GUN: hand-operated; Alemite push-type fitting.	
22	1	HAMMER: claw; 1½ lb.	6Q49457
21	1	HAMMER: machinist's; ball peen; 16 oz.; 14″.	6Q49716
55	1	HAMMER: sledge; cross peen blacksmith; 14 lbs; 36″ handle.	6Q50230-14
29	1	HANDLE: file; adjustable.	6Q51132-8
—	1	HANDLE: wrench; steel; for r-f feed; ½″x17″.	
10	1	KNIFE: electrician's.	6Q60211A
74	6	LAMPS: Mazda; incandescent; No. 248.	6Z6802.4
75	6	LAMPS: Mazda; incandescent; 3v.	6Z6802.9
70	2	LAMPS: Mazda; incandescent; 120v; 50w.	6Z6820-1
58	1	LAMP: trouble; 110v; 50-foot extension cord; plug and guard.	6Z6895
16	1	LANTERN: Delta model A1095 Redbird, or equal.	6Z6900A
13	1	LEVEL: metallic; 12″	6Q63012
56	1	MATTOCK: pick; 36″ handle; head approximately 20″.	6R716
4	1	PADLOCK: with 2 keys.	6Z7494.1
69	2	PASTE: soldering; 2-oz. can.	6N4102
48	1	PLIERS: diagonal cutting; 6″.	6R4730-6

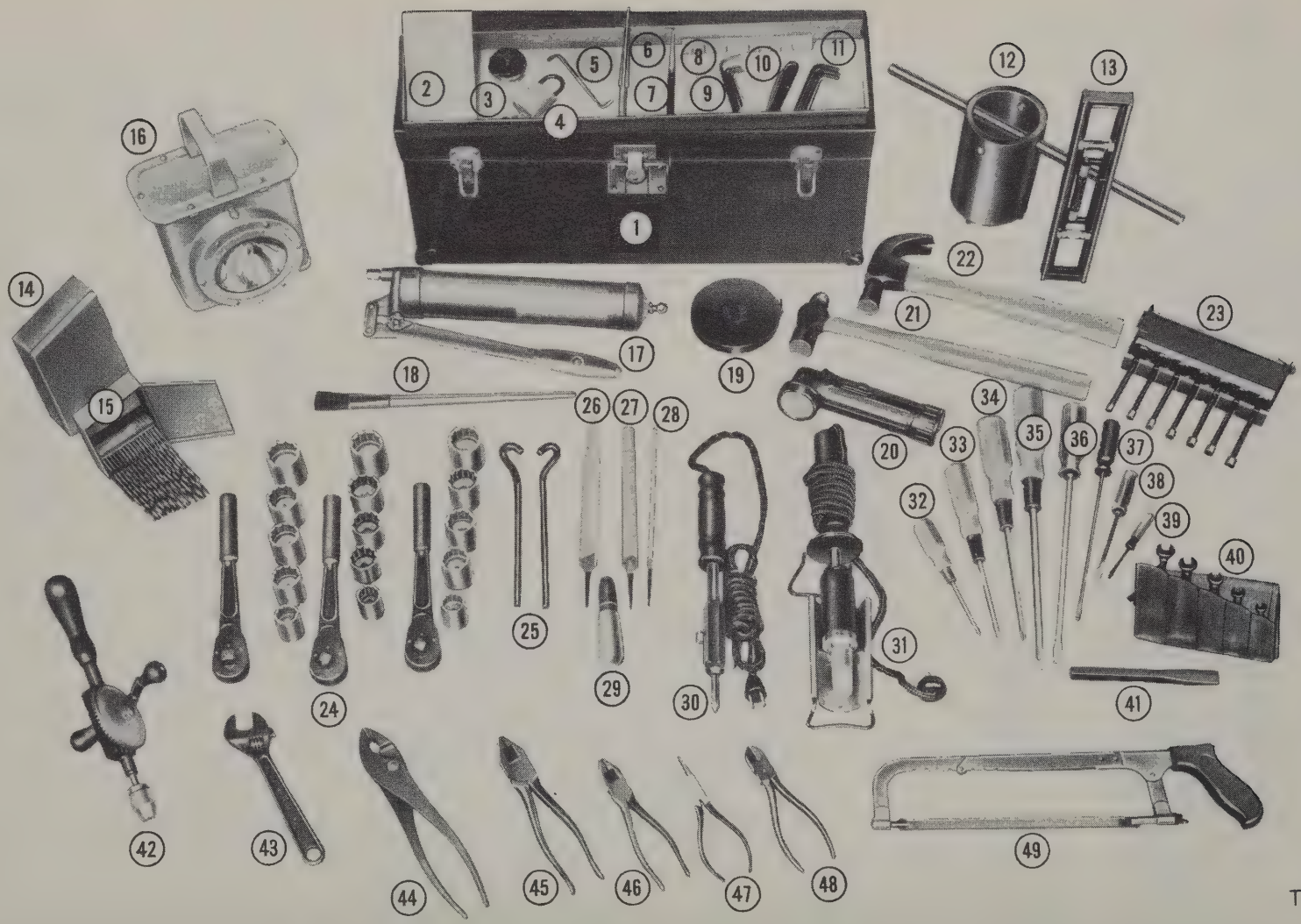


Figure 1-32. Equipment hand tools.

No.	Quantity	Name and Description of Tool	Signal Corps Stock No.
44	1	PLIERS: gas; 10″.	6R4725B
47	1	PLIERS: long nose; 6″.	6R4748-6
46	1	PLIERS: lineman's; 6″.	6R4777-6
45	1	PLIERS: side cutting; 8″.	6R4777-8
7	1	PUNCH: center; octagon; 5/8″x5″.	6R7508
6	1	REAMER: taper; 1/8″ to 1/2″; complete with handle.	6R8652
—	400 ft.	ROPE: 1/2″ diameter; manila or sisal.	6Z7906
50	500 ft.	ROPE: 3/8″ diameter; manila or sisal.	6Z7904A
3	1	RULE: push-pull; steel; 6 ft.	6R9629
8	1	RULE: steel; 6″.	6R9906
66	6	SANDPAPER: flint; # 000; 9″x14″.	
66	6	SANDPAPER: flint; # 1/2; 9″x11″.	
39	1	SCREWDRIVER: 1 3/4″x1/8″; round blade.	
38	1	SCREWDRIVER: 3″x3/16″; round blade.	
37	1	SCREWDRIVER: 8″x5/32″; round blade.	
36	1	SCREWDRIVER: 10″; square blade.	
5	1	SCREWDRIVER: off-set; 1/4″x4″.	6R18334-1
32–35	1 set	SCREWDRIVERS: Phillips screws; Nos. 1, 2, 3, and 4.	6R19103
—	1	SCRIBER: machinist's; 1/8″x8″; 5/8″ taper at one end.	
54	1	SHOVEL: size No. 2; short D-handle; round point; 37″.	6R22019
65	2	SOLDER: roll; 1 lb; rosin core	6N7531.2
30	1	SOLDERING IRON: 100w; 3/8″ tip.	6R24618
31	1	SOLDERING IRON: 300w; 7/8″ tip.	6R24623
19	1	TAPE: measuring; steel; 3/8″ wide; 100 ft. long.	6R36026
67	1	TAPE: roll; friction; 3/4″; 1 lb.	6N8583
68	1	TAPE: roll; rubber; splicing compound.	6N8594
52	1	VISE: machinist's; jaw width 3″; jaw opening 4″.	6R47030
24	3 sets	WRENCH: 10″; 6 sockets each; sockets for 13/16″, 1″, 1 1/16″, 1 1/8″, 1 1/4″ hexagonal nuts, 3/4″x3/4″ square nut.	
—	1	WRENCH: 5/8″; 12 point; steel; for r-f feed; 7/8″x6 9/16″.	
—	1	WRENCH: 1″; 12 point; steel; for r-f feed; 1 1/2″x6 7/8″.	
43	1	WRENCH: adjustable; 8″.	6R55008
12	1	WRENCH: spanner; steel; for r-f feed; cylindrical; 3 5/8″ diameter x6″ long.	
—	1	WRENCH: 1 1/2″; 12 point; off-set handles; steel; for r-f feed; 2″x7 1/8″.	
25	3	WRENCH: turnbuckle.	C65417
9	1 ea.	WRENCHES: Allen setscrew wrenches for Nos. 4, 6, 8, 10, 1/4″, and 3/8″ screws.	
11	1 ea.	WRENCHES: Allen cap wrenches for No. 10; 5/16″; 3/8″, and 1/2″ screws.	
60	2	WRENCHES: open end; 1 1/4″ and 1 5/8″ opening.	
61	2	WRENCHES: open end; 1″ and 1 1/8″ opening.	
2	1	WRENCH KIT: Bristol setscrew wrenches for Nos. 4, 6, 8, and 10 screws.	6R57938
40	1	WRENCH SET: 5 pieces; with cloth case; 1 5/32″x13/32″, 7/16″x3/8″, 11/32″x5/16″, 9/32″x1/4″, and 7/32″x3/16″.	
23	1	WRENCH SET: nut drivers; 7 pieces; 3/16″ to 3/8″.	6R58553

1-21. ELECTRICAL POWER REQUIREMENTS.

Radar Set AN/MPG-1 requires a primary power source supplying at least 9.3 kilovolt-amperes (kva). This requirement does not include power for gun directors, guns, etc. Power requirements are as follows:

a. Source. Commerical or generator.

b. Phase. Single phase or three phase.

c. Voltage. The line voltage must be between 105 and 125 volts phase to phase. The voltage is regulated at 115 volts by components of the radar set.

d. Frequency. The frequency at the input to the equipment must be 60 cycles, ±2 cycles.

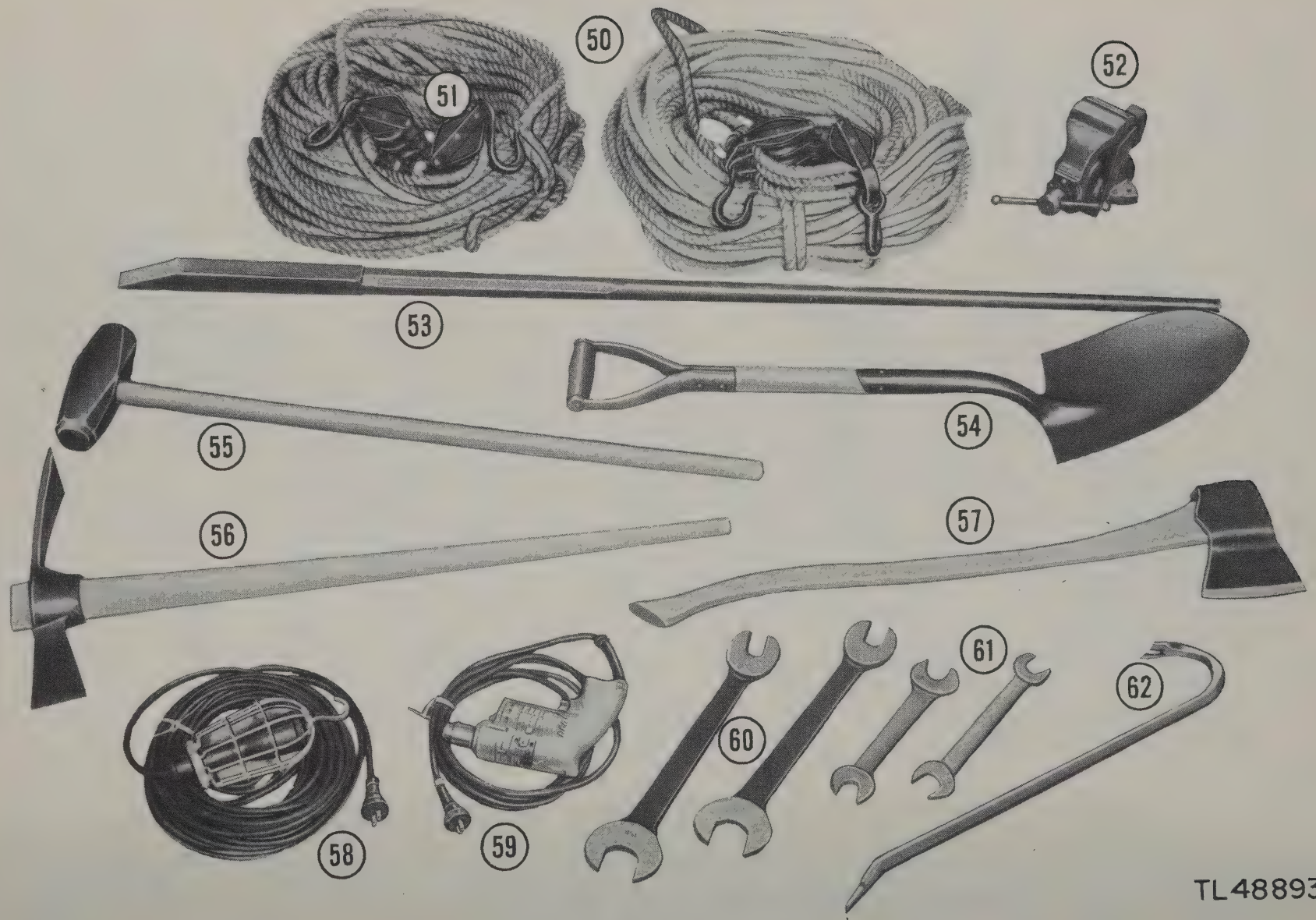


Figure 1-33. Equipment erection tools.



Figure 1-34. Equipment tool material.

CHAPTER 2

INSTALLATION

SECTION I. SITING

2-1. SELECTION OF SITE.

Optimum performance of Radar Set AN/MPG-1 is obtained only when the installation of the set is made in a suitable location. Consequently, careful consideration should be given to the selection of the site.

a. General Considerations. The ultra-high-frequency waves transmitted and received by the radar set travel in straight lines (disregarding refraction) like the light beam from a searchlight. Since these radio waves cannot penetrate solid obstructions like mountains, hills, buildings, or trucks, it is necessary that the path from the antenna of the radar set to the target be free from solid obstacles. A hill or mountain would tend to create a blind spot for the equipment. For example, a hill between the antenna and the sea would make it impossible for the radar set to detect the presence of surface craft anywhere in the obstructed area. For this reason, the antenna is mounted on a tower in order to keep the interference from small hills, trees, metal buildings, transmission lines, or other obstructions at a minimum.

b. Technical Considerations. Since the horizon is always a factor limiting the distance of unobstructed line of sight, it is important that the antenna be located high enough to place the horizon at a sufficient line-of-sight distance. In addition to using a steel tower, necessary antenna height may be obtained by locating the equipment on high ground.

(1) Although the radar set may detect the presence of low-flying aircraft, its chief function is to search for and track surface craft. For optimum performance of this function, therefore, the radar equipment must be located close to the sea. The height of the antenna above sea level will determine the line-of-sight distance to the horizon.

(2) As the height of the superstructure of surface targets increases, the distance of an unobstructed line of sight increases. Thus, a ship with tall masts may be detected farther beyond the horizon than a ship with short masts. This effect is important in determining the effective range of the radar set.

(3) Another factor which increases the effective range of the radar unit is atmospheric refraction (bending) of the radio beam as it travels between antenna and target. The amount of bending experienced by the radio beam depends upon atmospheric conditions and is subject to variations.

(4) The effect of the above factors on range is indicated in figure 2-1. The formula upon which the chart is based has been derived from the assumption that normal atmospheric refraction has the effect of increasing the earth's radius by one-third. The use of the chart is explained in the two examples given below.

(a) The maximum PPI range of the equipment is 80,000 yards. If, at this maximum range, it is desired to know the antenna height necessary for the detection of a surface vessel whose superstructure gives it an effective height of 100 feet above sea level, the following procedure is used. Target height is marked off (in feet) on the right-hand scale of figure 2-1, and range is marked

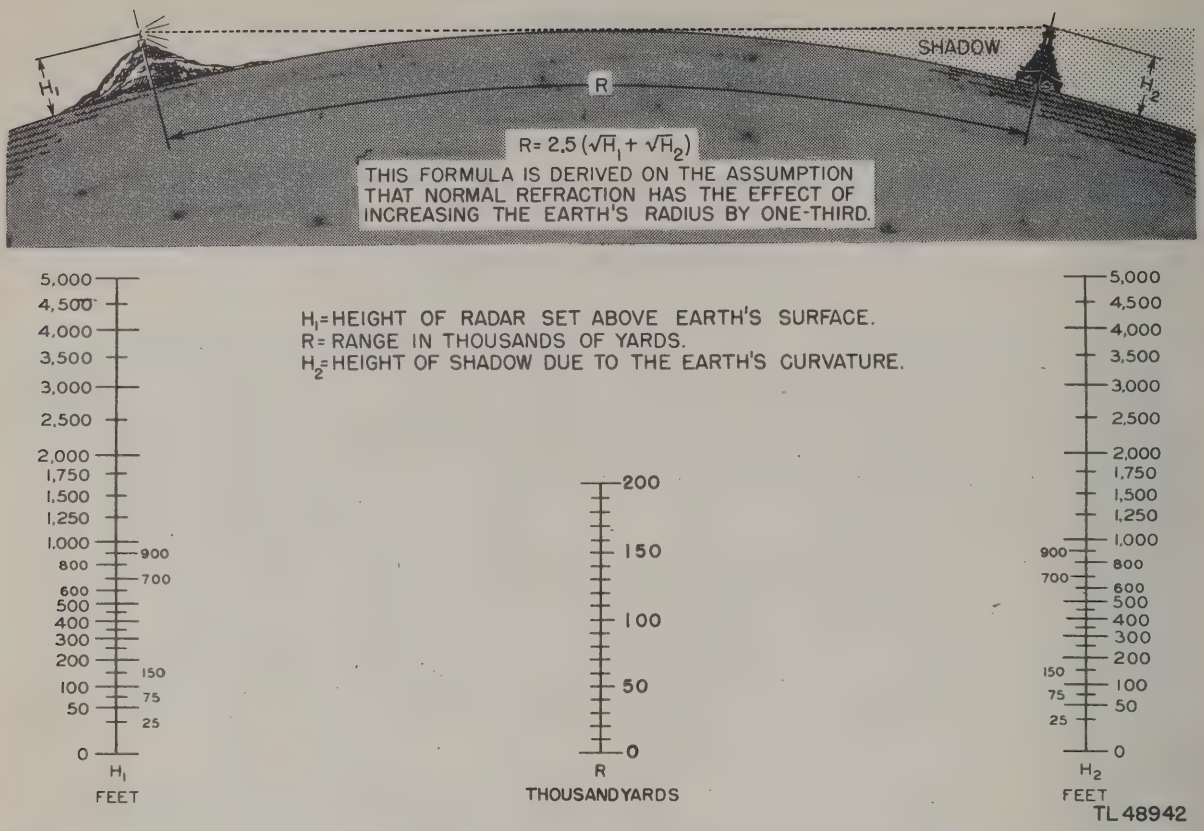


Figure 2-1. Target range chart.

(in thousands of yards) on the center scale. A straight line is drawn between the point representing 100 feet on the right-hand scale and the point representing 80,000 yards on the center scale. If this line is extended so that it intersects the left-hand scale (representing antenna height), it is seen that the antenna height must be approximately 450 feet.

(b) If it is required to know the maximum range at which a 50-foot target may be detected with an antenna located 200 feet above sea level, the point representing 200 feet on the left-hand scale of figure 2-1 is connected with a straight line to the point representing 50 feet on the right-hand scale. By observing the point at which this line intersects the center scale, the maximum range at which the target may be detected is determined to be approximately 53,000 yards.

c. Special Considerations.

(1) Obstructions such as mountains may, under certain conditions, prove of value. Since they block the path of radio waves, they may be used to prevent interference between near-by radar sets. It is advantageous to know that, when other conditions permit, having such an obstruction between two radar sets will enable each to operate without interference from the other. The obstruction acts as a shield between the two sets. Such a shield would be ideal if the tactical mission of two radar sets required scanning over certain azimuth angles only, and the obstruction were located in the inactive sector of each set.

(2) As the height of the antenna above sea level is increased, the effective range of the radar set is also increased. At the same time, however, because of the narrow vertical width of the radar beam, the minimum range at which targets may be kept under observation also increases. For this reason, locating the antenna at too great a height above sea level is to be avoided.

2-2. SITING OF TRAILER, TOWER, AND POWER UNIT.

After the general location for the radar set has been selected, the exact location of the trailer, tower, and power unit must be determined. To a great extent, this selection will be determined by the length of the interconnecting cables and by the maximum allowable inclination of site. First, a comparatively level site should be chosen for the tower before the trailer is pulled into position for unloading the tower parts and the antenna. The base of the tower is square, approximately 18 feet 9 inches on each side. The maximum inclination of any side (determined by the limits of adjustment of the vertical members of the tower) should not be more than 1 foot. If a naturally level site cannot be found, it will be necessary to grade an area of adequate size. After the tower parts and the antenna have been removed from the trailer (par. 2-11), the trailer may be drawn to any suitable spot for unloading the power unit (par. 2-12) and then moved to the site selected for it. The trailer should be located on comparatively level ground. Because of the length of the cables supplied with the equipment, the trailer site should be located:

a. Not more than 110 feet from the tower site.

b. Not more than 140 feet from the power unit, but preferably near-by.

c. Not more than 140 feet from a source of commercial 3-phase or single-phase power, if either is to be used.

SECTION II. SETTING UP THE EQUIPMENT

2-3. GENERAL INSTRUCTIONS.

A personnel of approximately eight trained men is required for rapid and efficient erection of the tower. Although a comparatively untrained crew should follow the instructions for the erection in the order presented in the following paragraphs, trained personnel will find that several steps may be performed simultaneously, or may even be interchanged, for more efficient installation. To prevent loss in transportation, all bolts and nuts required for the erection of the tower, with the exception of 36 identical 1-inch eyebolts, are captivated (attached to the members they fasten). If several strong planks (approximately 1 inch thick and 8 feet long) are available, and if the ladder sections supplied with the tower are used as shown in several illustrations of this chapter, no difficulty will be experienced in reaching the more remote parts of the tower during the erection.

2-4. LOCATION OF COMPONENTS IN TRANSPORTATION.

The location of the component parts of the tower and of the radar set during shipping is shown in figures 2-2 and 2-3. In transportation, the remote-B assembly is placed in the elevated section (platform) of the trailer, between the power panel and the modulator. The power unit, which is loaded and unloaded through the side door of the trailer, is located directly behind the trailer platform. The tower parts are distributed within the rear portion of the trailer, being placed on either side of the antenna and pedestal assembly and below the dolly on which the pedestal is mounted. Four cable reels are stored in the extreme rear of the trailer and a tool box containing the hand tools for the radar set is placed between the power unit and the amplidyne. Spare tubes and small units of test equipment are stored in a storage compartment in the power panel.

2-5. UNLOADING OF TOWER PARTS.

After the tower site has been selected (and graded, if necessary), the trailer should be drawn into position so that the rear of the trailer faces the tower site. Unload the tower parts through the rear doors and place all similar parts together. Each major component of the tower is numbered to assist in identifying parts and erecting the tower. The numbers shown in the figures of this chapter illustrating the erection of the tower correspond to the numbers on the parts themselves

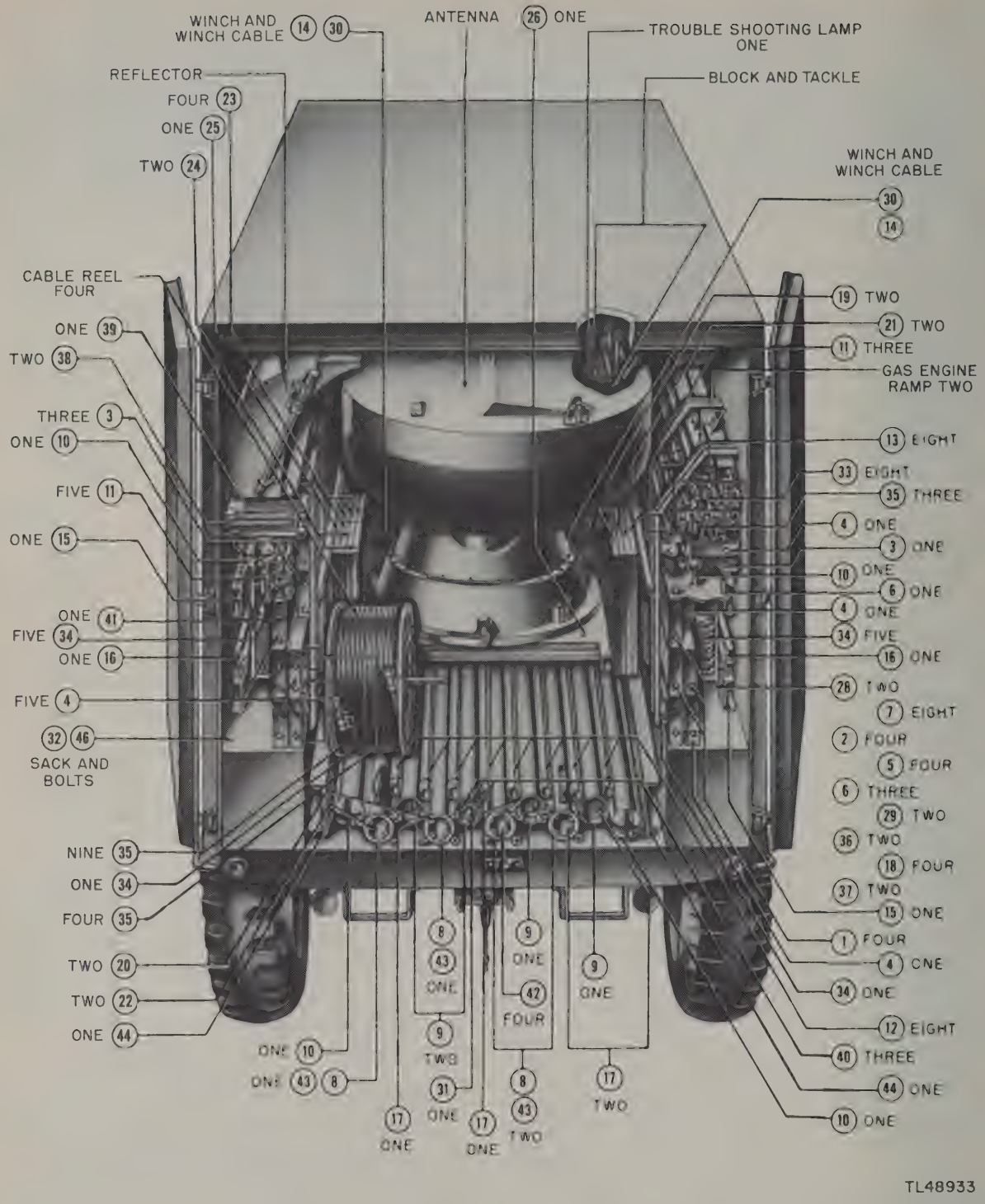


Figure 2-2. Location of components during travel, rear view of trailer.

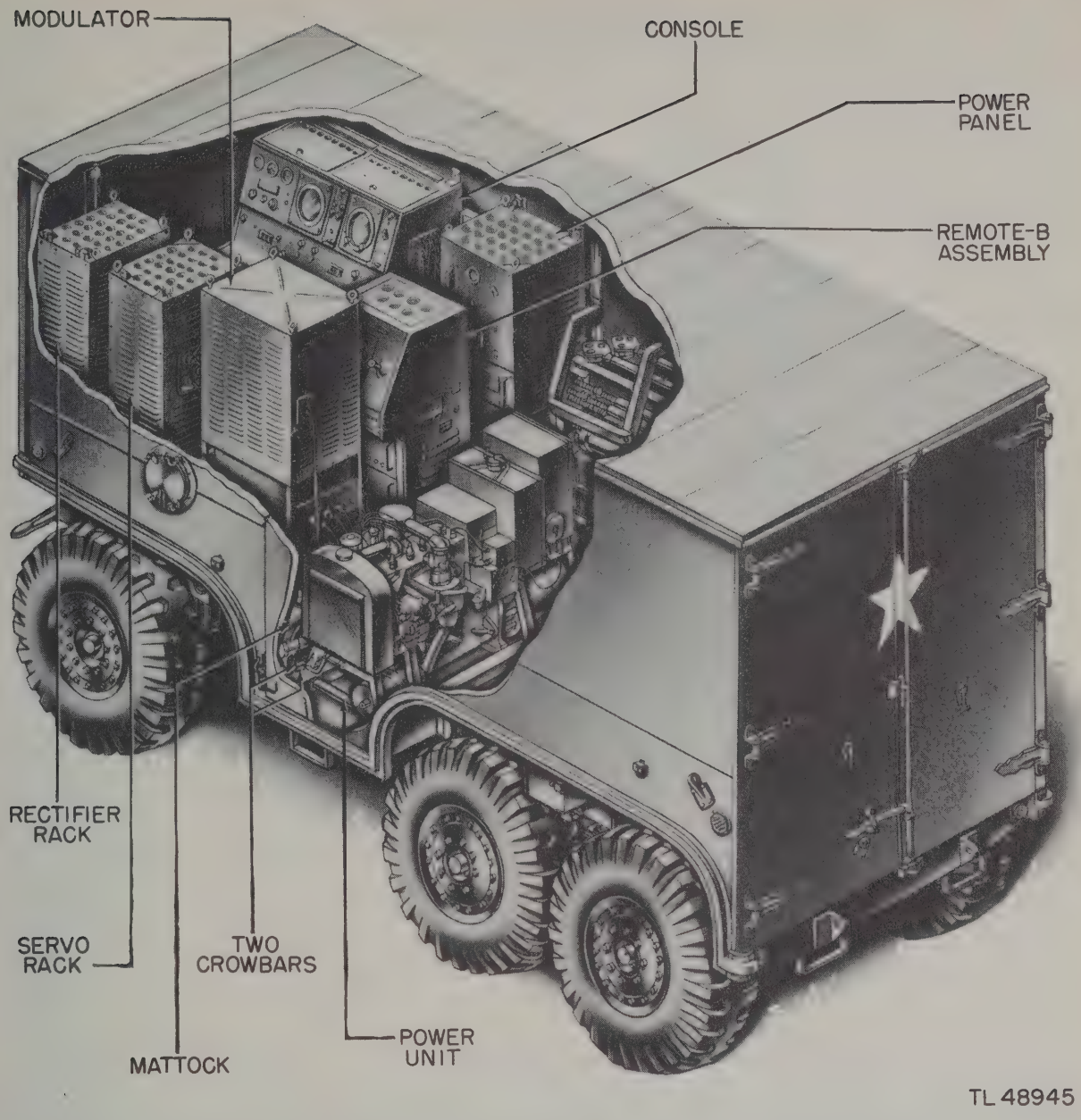


Figure 2-3. Location of components during travel, cutaway view of trailer.

and, in general, represent the order in which the parts are assembled. A list of the tower parts, showing the erection number of each part, is given below.

LIST OF TOWER PARTS

Erection No.	Name	Quantity
1	Long base channel	4
2	Extension base channel	4
3	Short base channel	4
4	Medium base channel	8
5	Joining L-plate	4

LIST OF TOWER PARTS (Contd.)

Erection No.	Name	Quantity
6	Center base plate	4
7	Triangular bracket	8
8	Upper main tubular section (without sheaves)	2
8A	Upper main tubular section (with sheaves attached)	2
9	Center main tubular section	4
10	Lower main tubular section	4
11	Upper section of tension guy member	8
12	Center section of tension guy member	8
13	Lower section of tension guy member	8
14	Cable with fittings attached	2
15	Elevator section	2
16	Dolly rail	2
17	End-catwalk support channel	4
18	Side-catwalk support arm	4
19	End catwalk	2
20	End-catwalk handrail	2
21	Side catwalk	2
22	Side-catwalk handrail	2
23	Connecting catwalk	4
24	Catwalk trap door	2
25	Lower catwalk	1
26	Antenna dolly	1
27	Dolly-wheel clamp	4
28	Elevator tie-off bracket (without roller)	2
29	Elevator tie-off bracket (with roller)	2
30	Winch	2
31	Winch-coupling bar	1
32	Eyebolt (with nut)	44
33	Compression guy member	8
34	Horizontal brace	12
35	Diagonal brace	16
36	Winch handle	2
37	Ramp-joining plate	2
38	Ladder, upper and lower section	2
39	Ladder, center section	1
40	Ramp brace	3
41	Winch-securing angle	1
42	Diagonal handrail	4
43	Elevator-leveling coupler	4
44	Connecting bracket (dolly ramp to trailer)	2
45	Cable cover	1
46	Sack for bolts	1
47	Derrick	1

2-6. ASSEMBLING TOWER BASE.

An exploded view of the tower base, showing the interrelation of parts, is shown in figure 2-4. To assemble the base of the tower, follow the procedure given below.

a. The four long base channels (1) are equipped with captivated bolts at each end. Fasten the four long channels to form the center square of the antenna base. Make certain that the arrangement shown in figure 2-4 is followed and that the edge of the channel marked TOP is placed upward. Tighten the bolts only to finger-tightness until the remaining base channels are bolted in position.

b. The four extension base channels (2) have L-plates attached (fig. 2-4). By means of the four captivated bolts, attach the extension channels to the ends of the long base channels, making certain that the edge marked TOP is placed upward. Tighten all bolts to finger-tightness only.

c. Each of the four short base channels (3) has two captivated bolts at one end. By means of these bolts, fasten the short base channels to the long channels, with the edge

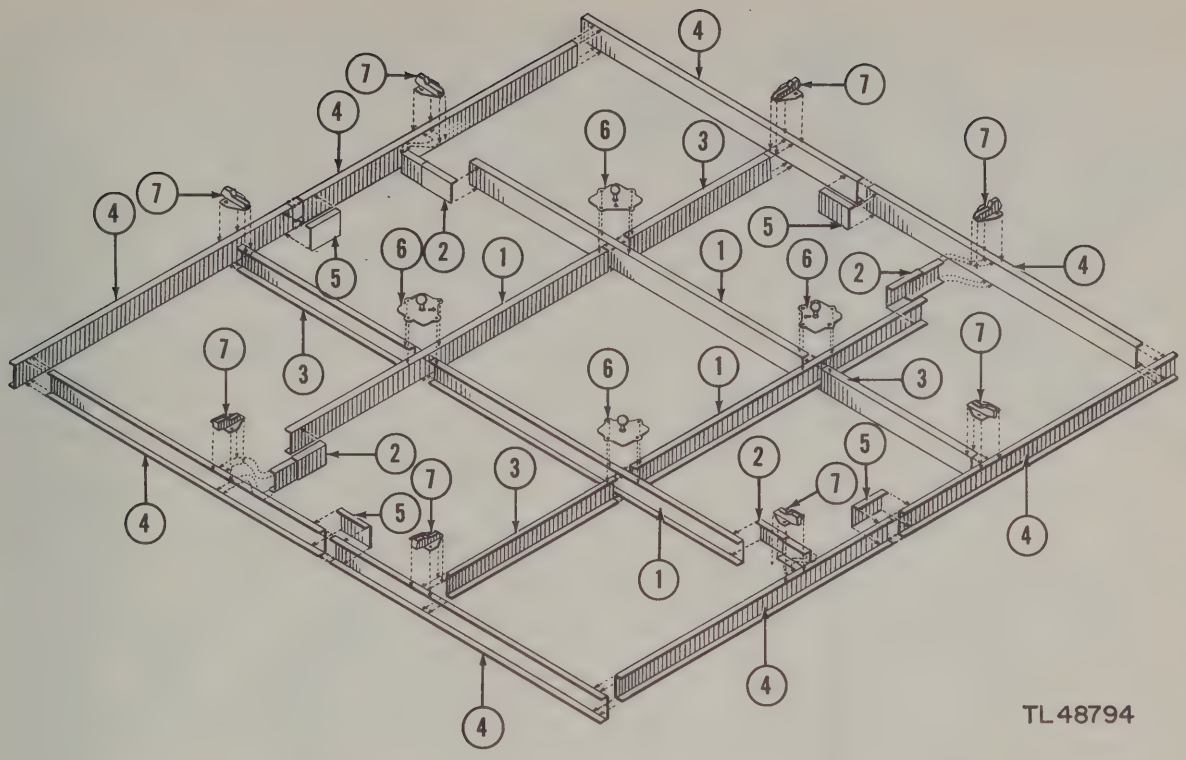


Figure 2-4. Tower base, exploded view.

marked TOP placed upward. The bolts should be screwed in to finger-tightness only.

d. The eight medium base channels (4) are interchangeable. Bolt these channels to the long base channels and to each other so as to complete the outer square of the tower base. Make certain that the edge marked TOP is placed upward. Bolt the four joining L-plates (5) to the medium base channels.

e. Tighten all bolts previously left loose and check each member for rigidity of connection.

f. Bolt the four center base plates (6) (with ball attached) at the corners of the inner square of the tower base. Each center base plate has one straight edge. Make certain that the straight edge faces in toward the center of the base as shown in figure 2-4.

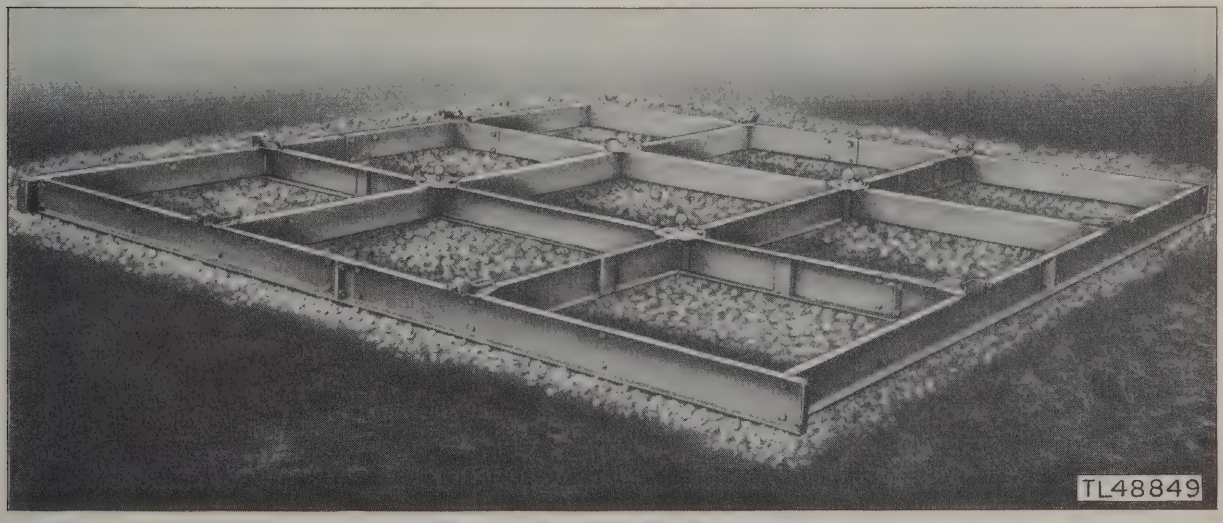


Figure 2-5. Tower base, assembled.

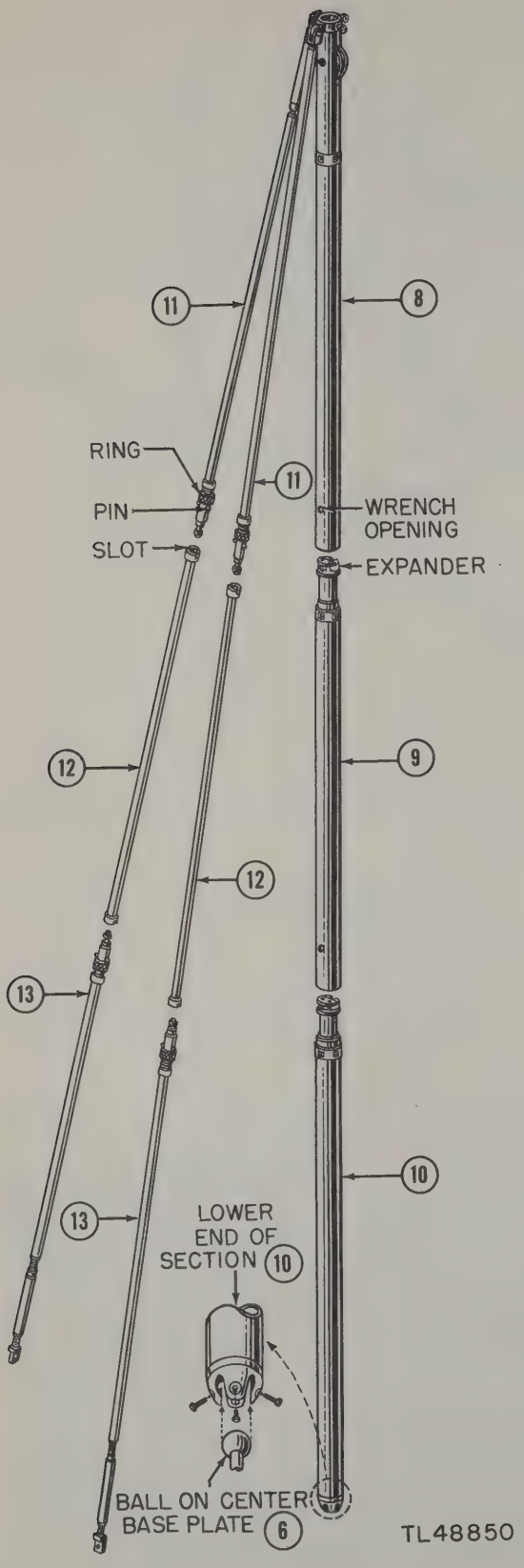


Figure 2-6. Assembly of main tubular member and tension guy members.

These base plates support the four main vertical tubular members.

g. Bolt the eight triangular brackets (7) to the base as shown in figure 2-4. The triangular brackets support the tension and compression guy members of the tower. At this point in the tower erection, the base has been completely assembled (fig. 2-5).

2-7. ASSEMBLY OF MAIN TUBULAR AND TENSION GUY MEMBERS.

After the base of the tower has been completely assembled, the main vertical tubular members (center posts) and the tension guy members must be assembled and installed. Refer to figure 2-6 in assembling these members. Two of the four upper center-post sections have sheaves (pulleys) attached. If sufficient personnel is available, all four main tubular-and-guy-member assemblies may be assembled at one time. These are assembled on the ground and then lifted into place. However, the two assemblies which do *not* have sheaves attached should be erected before the others. The two upper center-post sections without sheaves are numbered (8), and the two upper sections with sheaves attached are numbered (8A). However, the assembly procedure for all the center posts is the same. Proceed as follows:

a. In transportation, the two upper guy-members sections (11) are detached from the upper main tubular section (8) (fig. 2-6). Insert the center main tubular section (9) into section (8). A wrench is supplied which may be inserted into an aperture in section (8) to fasten the two tubular members together. The expander on section (9) exerts sufficient pressure against the sides of the tubular section (8) to keep the two members fastened securely.

b. One end of the lower center-post section (10) has a socket designed so that it can be mounted on the ball of the center base plate. The other end is equipped with an expander similar to that on section (9). Insert section (10) into section (9) and fasten the two tubular sections together.

c. The assembly of the two tension guy members is identical. Fasten section (11) to section (8). Insert the square end of the upper guy-member section (11) into the cen-

ter section (12). By twisting section (12), make certain that the two sections are fastened securely so that the pin on section (11) slips into the milled slot of section (12). Tighten the knurled ring on the upper member until the pin is held firmly in the slotted section.

d. In a similar manner, fasten the lower guy member section (13) to section (12).

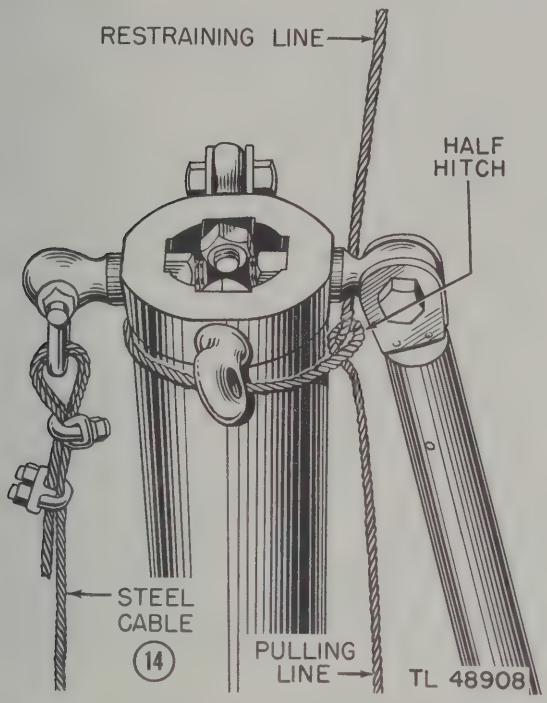


Figure 2-7. Main tubular member, cable and line attached.

2-8. ERECTING MAIN TUBULAR AND TENSION GUY MEMBERS.

After the center posts and the tension guy members have been assembled, they are to be erected in the sequence described below.

a. If the two steel cables (14) used to raise the tower elevator are not already attached to those two upper center-post sections which do *not* have sheaves, attach them as shown in figure 2-7. These two center-post assemblies are the first to be erected.

b. Wind a 1/2-inch rope with a half hitch around the upper end of the tubular section so that one end of the line may be used to aid in lifting the tubular section upright while the other end may be used as a restraining line (fig. 2-7). The rope is part of the equipment tools supplied with the radar set.

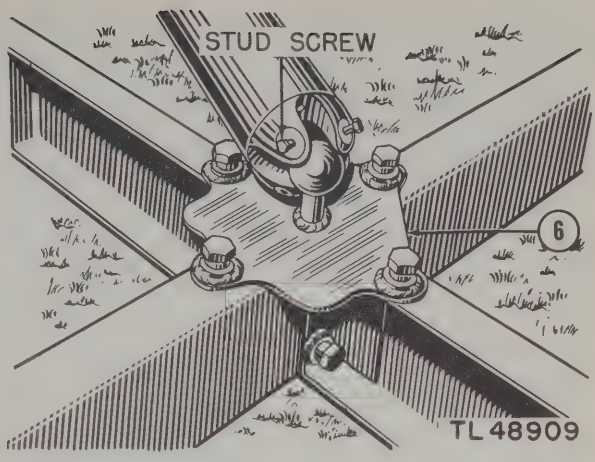


Figure 2-8. Main tubular member and ball support.

c. Make certain that the four stud screws at the lower end of the main tubular section (fig. 2-8) are loosened. With sufficient personnel available, place the main tubular section so that its socket rests against the ball on the center base plate (6). For ease in lifting, the main tubular section should be placed so that it extends *diagonally outward* from the center base plate. At the same time, the tension guy members should be placed to

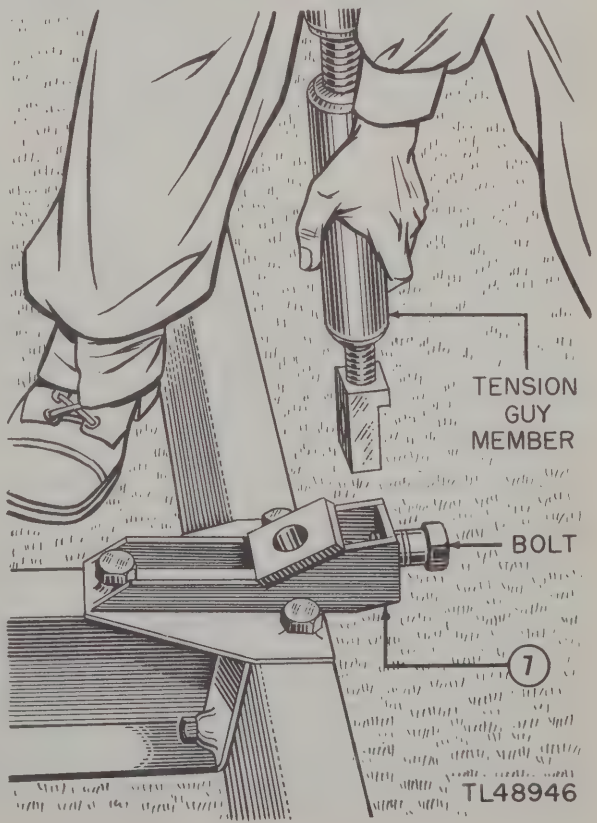


Figure 2-9. Inserting tension guy member in triangular bracket.

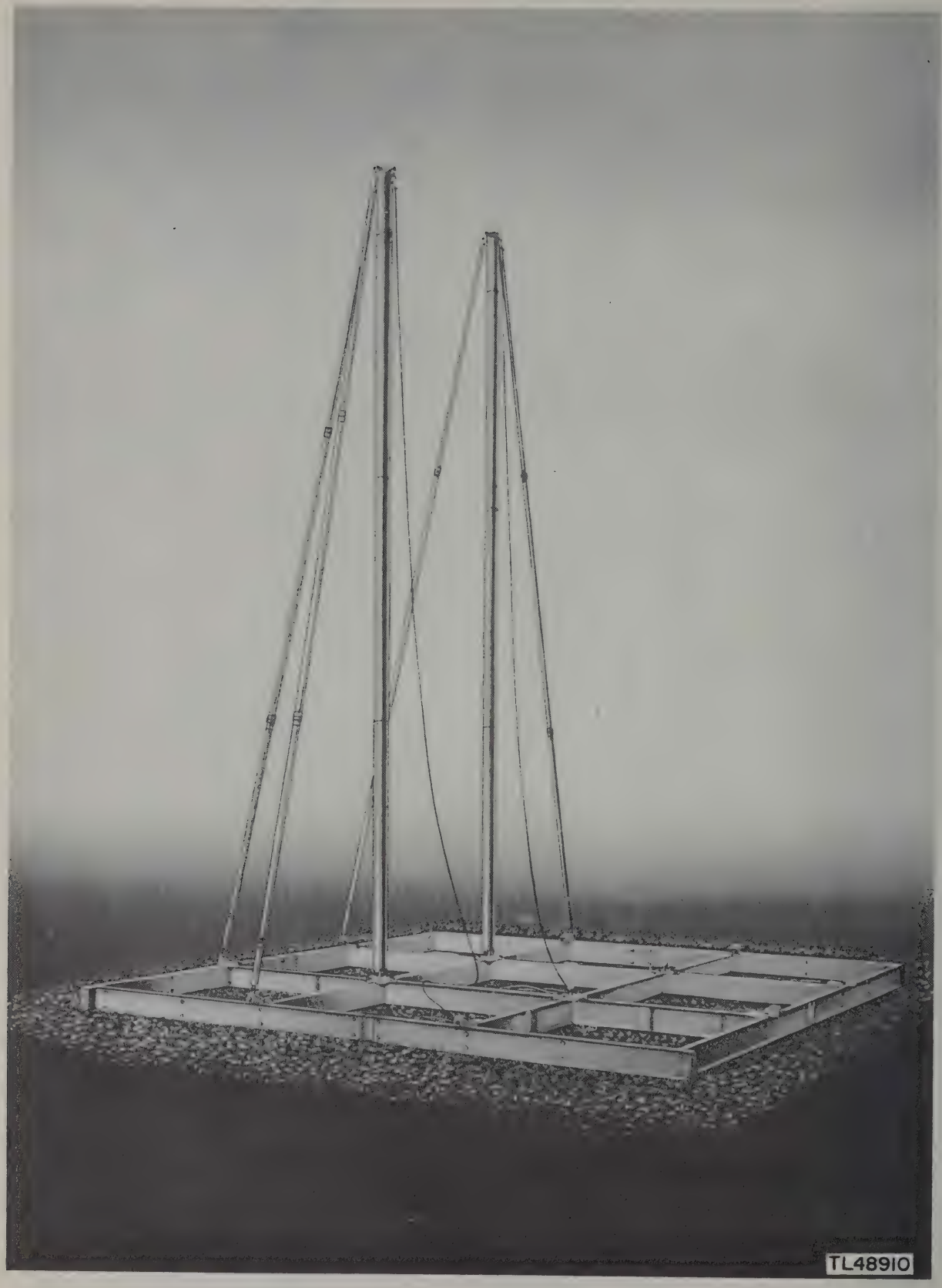


Figure 2-10. Two main tubular members in place.

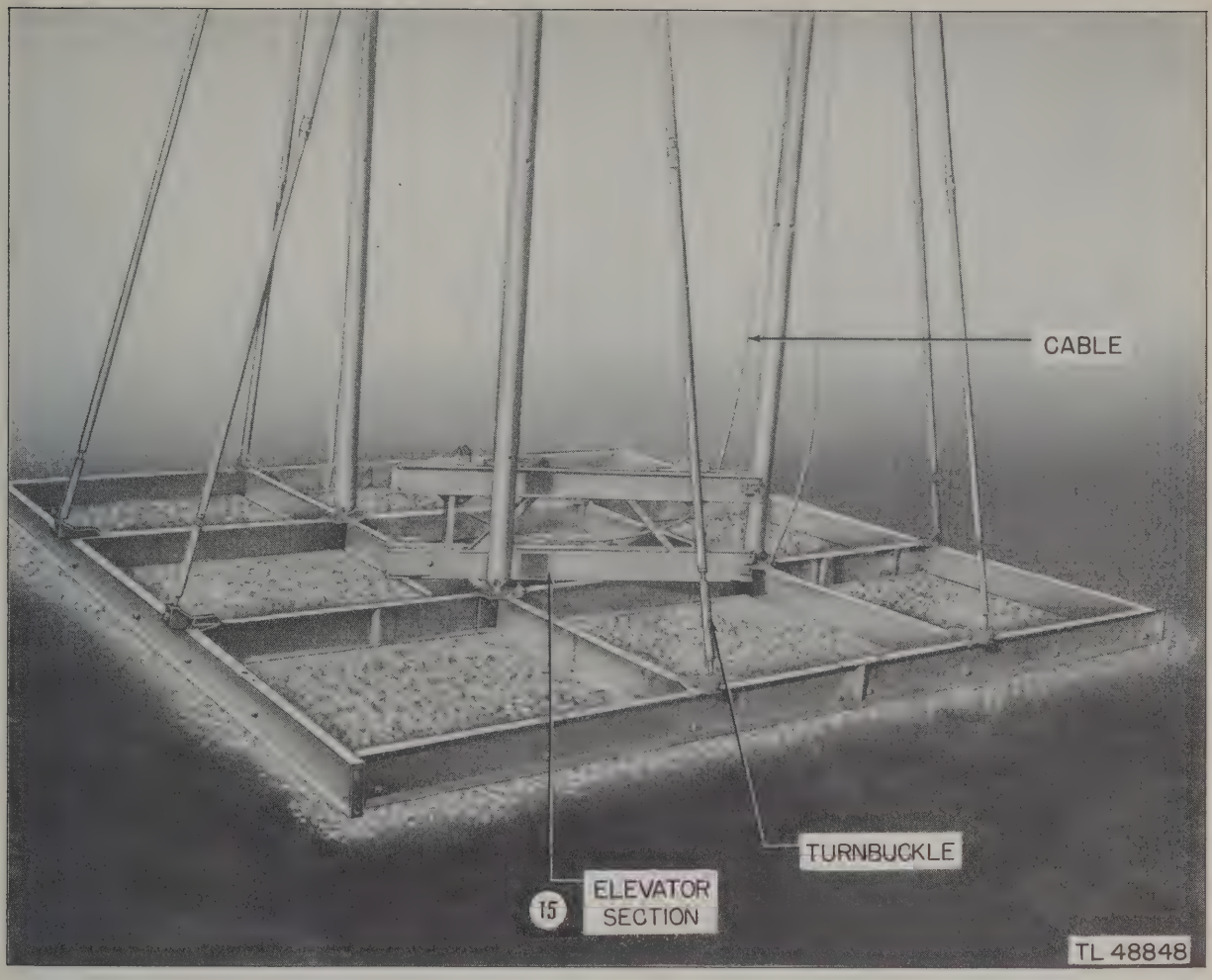


Figure 2-11. Cable passed through elevator section.

form a large angle on either side of the main tubular section. Tighten the four stud screws so that the tubular center post will not slide off the ball as it is lifted.

d. Make certain that the bolts at the rear of the triangular brackets (7) are loose (fig. 2-9). With two men at each of the tension guy members, one man at each end of the 1/2-inch rope, and two to four men on the center post, start to lift the upper end of the center post. Make certain that the lower end continues to rest on the ball of the center base plate (6).

e. Keeping the tension guy members under the center post at all times so that the post does not swing laterally, raise the main tubular section until it is nearly vertical. In order to insert the lower end of the tension guy members in the triangular bracket (7), the center post will have to be tilted slightly beyond the vertical position (toward the center of the base). Assign an additional man to the restraining end of the 1/2-inch rope. Tilt the post sufficiently past the vertical position and drop the lower ends of the tension guy members, *one at a time*, into the triangular bracket (fig. 2-9).

f. After the tension members have been inserted in the triangular brackets, tighten the bolts at the rear of the brackets so as to fasten the guy members securely. Loosen the 1/2-inch rope so that it may be used for raising the other center posts.

g. To elevate the second tubular member, proceed exactly as above. The steel cable must be attached to the upper section of the post before the assembly is lifted into position. The two center posts, with the cables attached, are shown in position in figure 2-10.

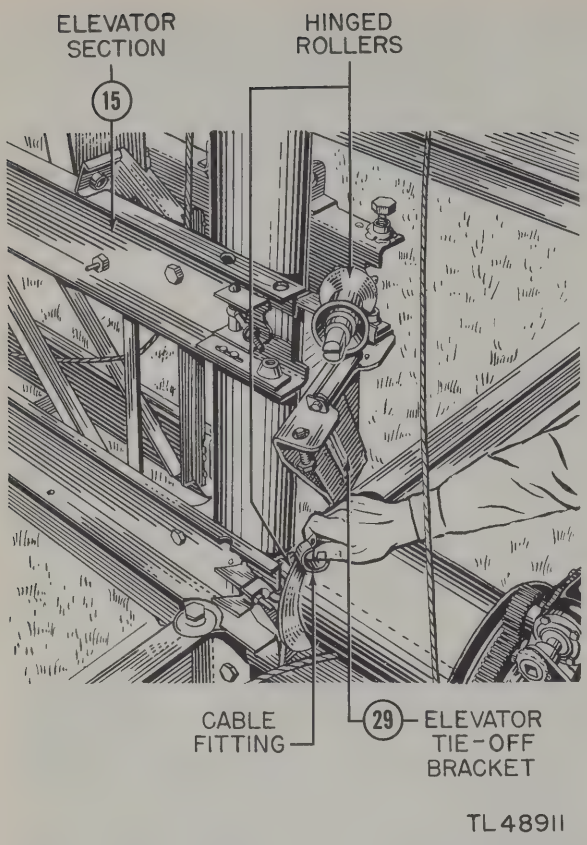


Figure 2-12. Installing elevator section and cable.

h. Two elevator sections (15) are required for the tower assembly (fig. 2-11). Each elevator section has two sheaves or pulleys attached. Before the third main tubular section (with sheave attached) can be erected, the cable must be passed through the elevator section (15) and under the sheaves as indicated in figure 2-11. In passing the cable through the elevator section, make certain that the elevator is placed in such a position that the side marked INSIDE faces the center of the base, and the side marked TOP is placed upward. When this is done, the two hinged rollers at one end of the elevator section (fig. 2-12) should face the center post with the sheave attached. The cable is then passed through and over the pulley attached to the upper center-post section. In this manner, the third center post may be erected with the cable fully installed.

i. The last main tubular section, also equipped with a sheave, is installed in a similar manner.

j. After the main tubular members have been installed, they must be plumbed (adjusted to be vertical). The lower section of each tension guy member is equipped with a turnbuckle which is used for this purpose (fig. 2-11). A level is supplied with the equipment tools. Place the level against that side of the center post which faces the turnbuckle being adjusted and, with a turnbuckle wrench, turn the turnbuckle until the main tubular member is vertical. Remember that both tension members must be adjusted in this manner before the center post is plumb.

2-9. INSTALLING ELEVATOR AND WINCHES.

a. To install each elevator section (15), open the two hinged rollers located at one end of the section (fig. 2-12). Tilt the elevator so that it may be placed in position with the center posts inserted between facing channels of the elevator. Fasten the hinged rollers securely as shown in figure 2-13 and install an elevator tie-off bracket at each end of the elevator sections. The two brackets without rollers (28) are bolted to the elevator sections at the ends removed from the winches. The two brackets with rollers attached (29) are fastened to the elevator sec-

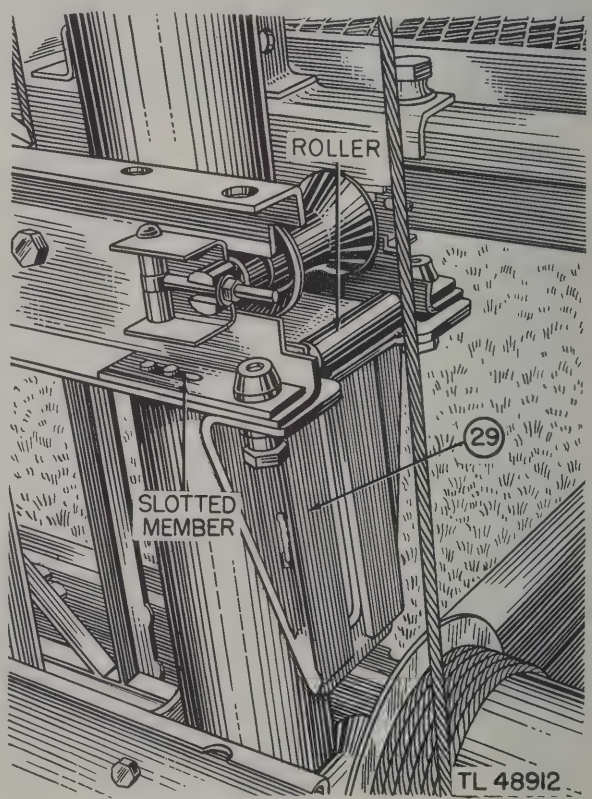


Figure 2-13. Hinged roller and tie-off bracket in place.

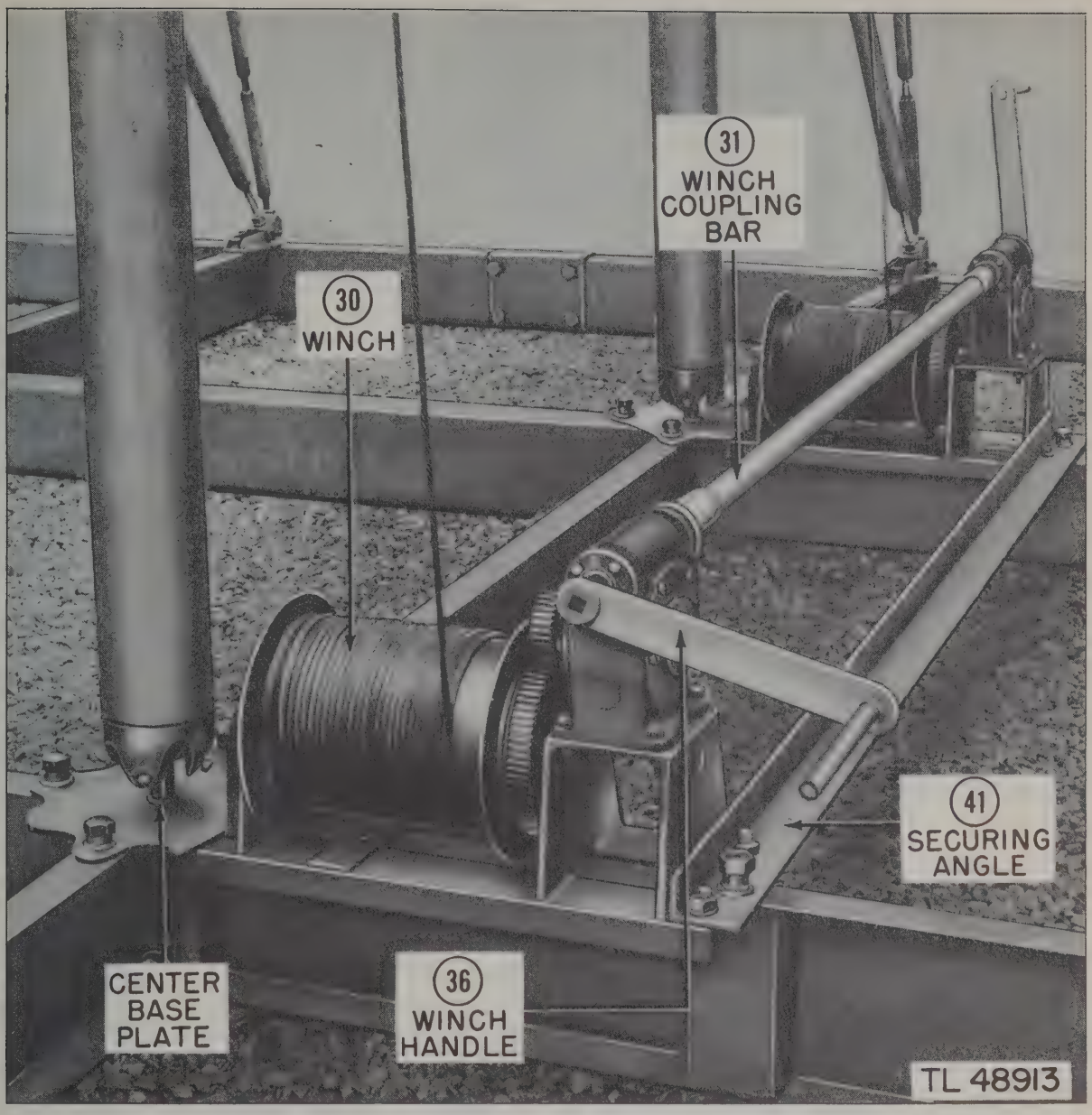


Figure 2-14. Winches installed.

tions at the ends close to the winches (fig. 2-13). The position of the brackets is adjustable because of the slotted member to which they are fastened. At this time, install the brackets so they are removed as far as possible from the main tubular member. In this manner, the brackets will not bind against the center posts as the elevator is raised. In addition, the small roller which forms part of bracket (29) will prevent damage to the cable as the elevator approaches the top of the tower.

b. The two winches (30) are permanently mounted on brackets. Slip the drum-end of the bracket under the center base plate as shown in figure 2-14. Bolt the securing angle (41) between the two winches and bolt the angle to the tower base. Install the two winch handles (36) and insert the cable fitting shown in figure 2-12 into the opening provided in the winch drum. Wind each winch independently (in the direction in which the ratchet in the speed-reducer mechanism is heard to click) until the slack is removed from each cable, or until the elevator section starts to rise. *Do not raise the elevator sections.* After the winches have been equalized in this man-

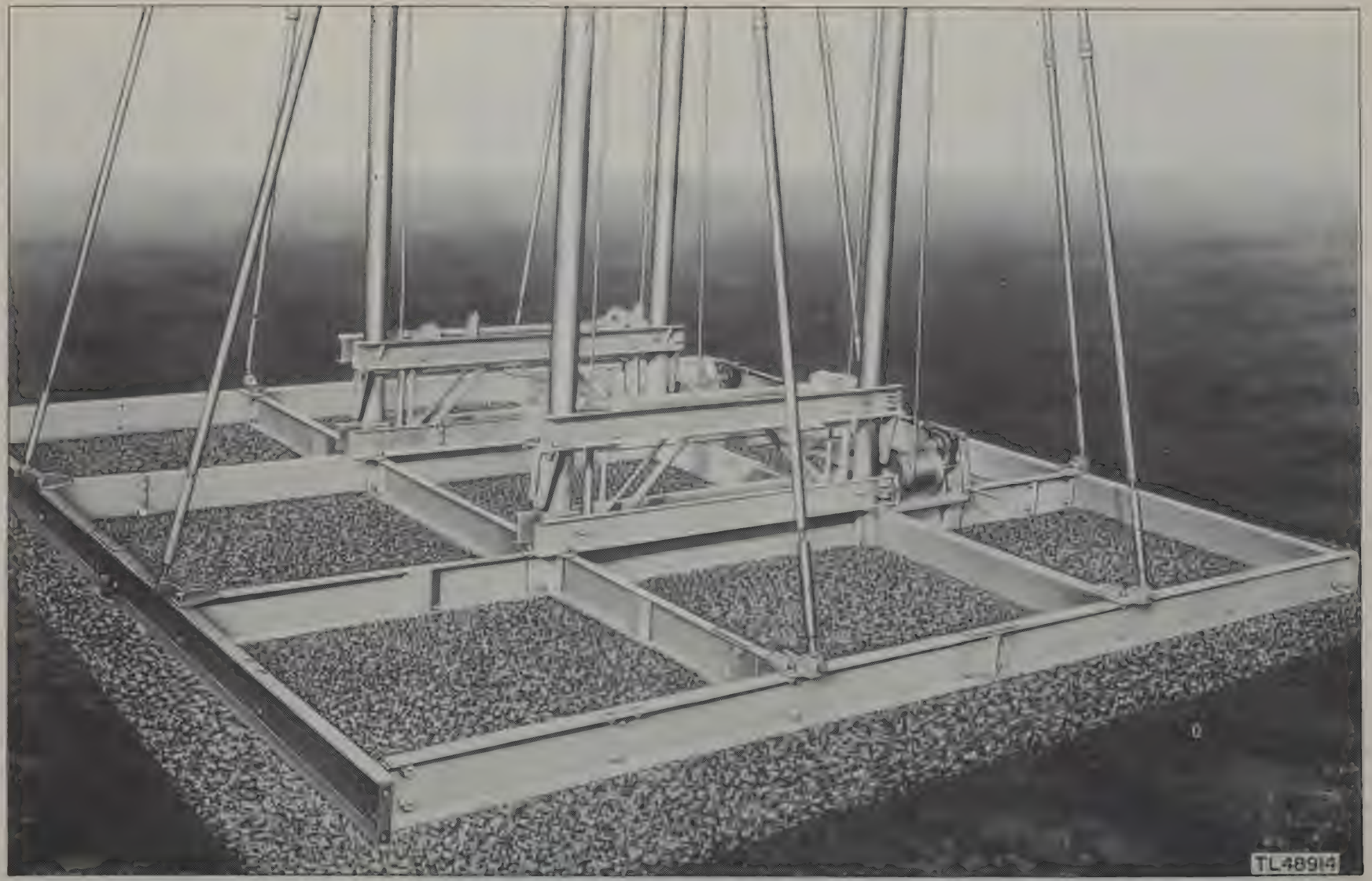


Figure 2-15. Elevator sections installed.

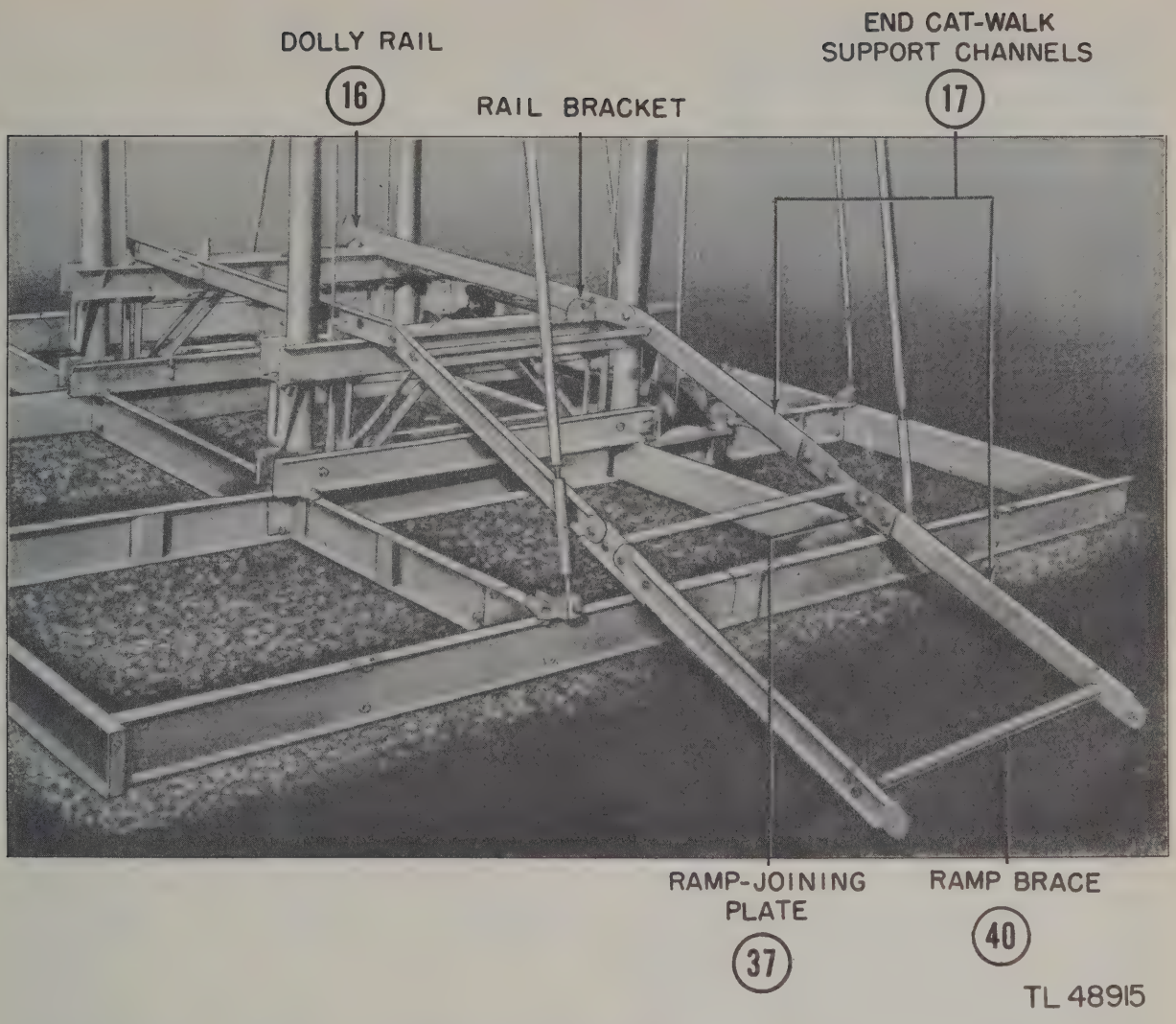


Figure 2-16. Dolly ramp installed.

ner, install the winch-coupling bar (31) so that the winches will turn in unison (fig. 2-14). One end of the winch-coupling bar is telescopic so that it may be pushed in while connecting the bar to the two winches. Figure 2-15 shows the tower with the elevator sections, the elevator tie-off brackets, and the winches installed.

2-10. INSTALLING DOLLY RAMP.

The dolly ramp is used to unload the antenna and pedestal from the trailer. Some of the parts used in the ramp assembly are used elsewhere in the tower, while others are supplied specifically for this purpose.

a. Install the two dolly rails (16) by bolting them to the rail brackets on the elevator sections (fig. 2-16). One end of each rail must be bolted tightly to the brackets. The other end has a slotted aperture (fig. 2-17) into which a milled bolt is inserted. After the bolt is passed through the slotted aperture, turn the bolt through 90 degrees and tighten the nut attached to it to finger-tightness to insure that the bolt will not slip out. The nut is not to be tightened completely until the elevator has been raised to the top of the tower.

b. The end-catwalk support channels (17) have two captivated bolts at each end (fig. 2-16). In assembling the dolly ramp, the bolt nearer the end of the support channel is used to bolt the channel to the *outer* surface of the dolly rail. The second bolt is used to fasten one of the ramp braces (separators) between opposite channels. These separators (40) are used only in the dolly ramp assembly.

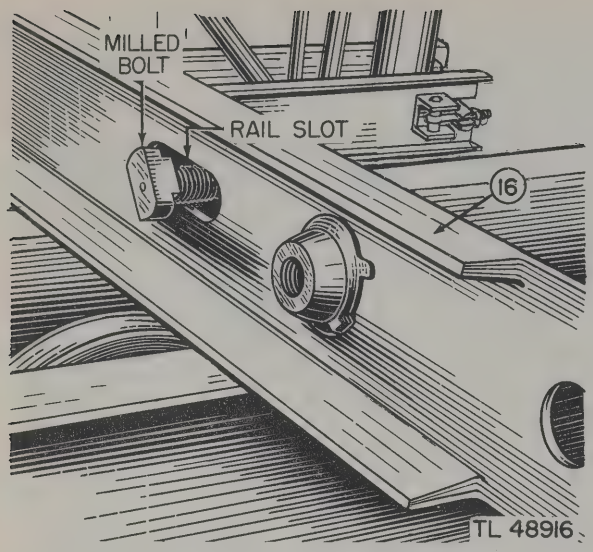


Figure 2-17. Installing dolly rail.

c. By means of the ramp-joining plates (37), fasten the second pair of support channels to the pair already bolted to the dolly rails. The ramp-joining plates must be bolted to the inner surface of the catwalk support channels.

d. Install the remaining ramp braces as shown in figure 2-16. Make certain that all bolts are tightened properly.

2-11. INSTALLING ANTENNA DOLLY.

After the dolly ramp has been installed, the antenna assembly, mounted on the dolly, may be removed from the trailer and fastened to the tower elevator. Proceed as follows:

a. Fasten the free end of the ramp securely to the tracks on which the dolly rests within the trailer. Special brackets (44) are provided for this purpose. In addition to moving the trailer into a suitable position, it may be necessary to raise the elevator before the ramp can be fastened to the trailer tracks.

b. Raise the elevator a few inches and check to see that both elevator sections rise together. If not, disconnect the winch-coupling bar (fig. 2-14) and turn the winches separately until the two elevator sections are balanced properly. Replace the winch-coupling bar. If either end of the elevator sections rises more than the other, rock the elevator back and forth on the cables until the elevator is balanced.

c. See that the elevator does not bind against any of the center posts, and raise the elevator until the dolly rails, the ramp, and the trailer tracks are approximately level. If the elevator does bind against the main tubular members, it may be necessary to readjust the turnbuckles on the tension guy members (fig. 2-11).

d. Remove the antenna reflector from the trailer, taking care not to damage it.

e. Rope and blocks are supplied with the equipment tools. Attach one end of a block and fall to the pulling eye mounted on the rear of the antenna pedestal (fig. 3-35), and the other end to the side of the elevator away from the trailer.

f. Attach one end of a restraining block and fall to the pulling eye at the front of the antenna pedestal and the other end to the pulling eye mounted in the trailer near the power unit.

g. Make certain that both pulling tackles are tight, and remove the wheel clamps which fasten the dolly to the trailer tracks.

h. Allow the dolly to roll out of the trailer by releasing one pulley line slowly and pulling in on the other. Use crowbars, if necessary, to insure that the dolly wheels ride on the ramp.

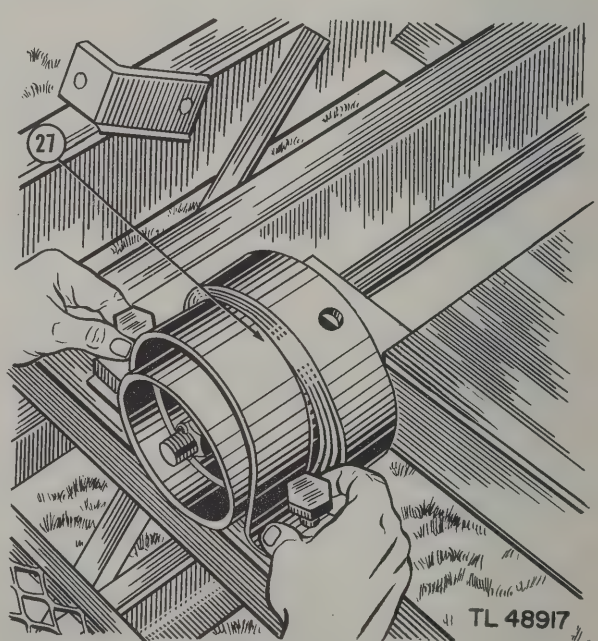


Figure 2-18. Bolting wheel clamp in place.

i. When the dolly has been placed in position on the tower elevator, bolt the wheel clamps (27) securely to the dolly rails (fig. 2-18). Pull on the pulley lines and check to see that the dolly cannot be moved in either direction along the rails.

j. Fasten the reflector to the antenna by means of the four split hinges. Secure the two rods which support the reflector at each end.

k. Disconnect the block and fall and place it in the trailer so that it will be available for unloading the power unit.

l. Unfasten the dolly ramp from the dolly rails and disassemble it.

2-12. UNLOADING POWER UNIT.

At this stage of the installation procedure, the power unit may be unloaded.

a. Move the trailer to the site selected for the power unit. The power unit is unloaded through the side door of the trailer.

b. Disconnect the cables which are connected to the modulator and place them behind the modulator so that they will not interfere with the unloading of the power unit.

c. Secure a block and fall between the power unit and the pulling eye mounted in the trailer near the amplidyne.

d. Also connect a block and fall between the end of the power unit nearest the door and any convenient point outside the trailer.

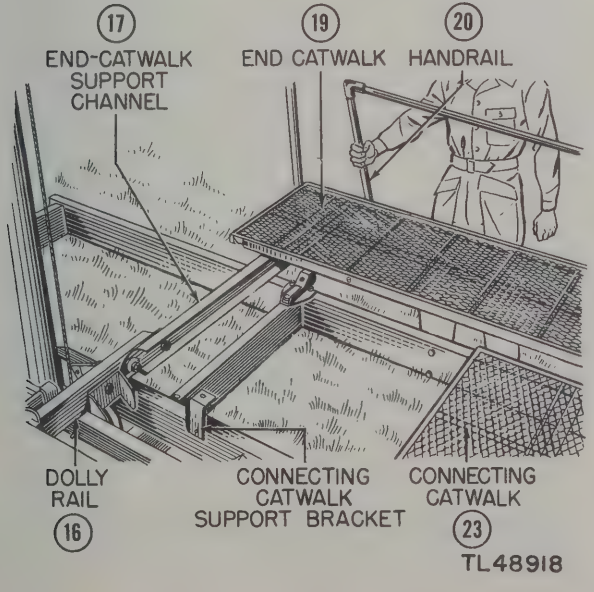


Figure 2-19. Installing catwalks.

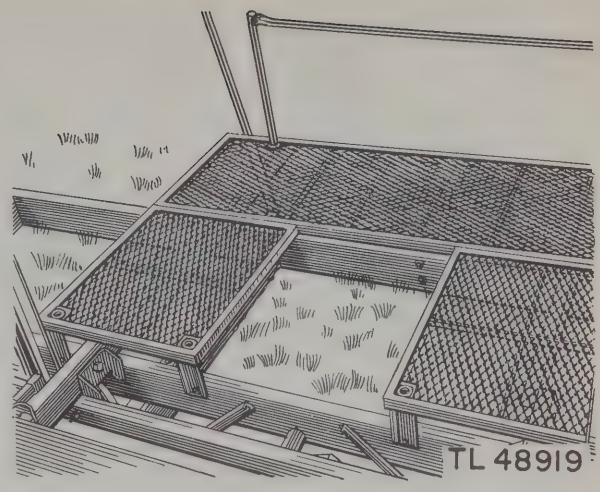


Figure 2-20. End and connecting catwalks installed.

e. Assemble the ramp supplied especially for unloading the power unit.

f. Connect the ramp to the brackets mounted near the door of the trailer and carefully unload the power unit.

g. Three ground rods, each 1-1/4 inches in diameter and approximately 5 feet long, are supplied with the equipment. Each rod is attached to a ground cable which has a lug on its free end. To ground the power unit, fasten the lug on one of the ground cables to any convenient bolt on the unit and drive the rod vertically into the ground. The other two rods are used to ground the tower and the trailer.

h. The trailer may now be moved to the site selected for it and prepared for use as described in paragraphs 2-18 and 2-19.

2-13. INSTALLING ELEVATOR CATWALKS.

The catwalks are installed before the elevator is raised.

a. Connect the end-catwalk support channels (17) to the dolly rails (fig. 2-19). Both captivated bolts at one end of the support channel are used to bolt the channel to the *inner* surface of the dolly rail.

b. Bolt the connecting catwalks (23) to the support brackets mounted on the elevator. Each section of connecting catwalk is secured by two bolts.

c. Place the end catwalk (19) in position, and bolt the handrail (20) securely to the catwalk support channels. The end and connecting catwalks are shown installed in figure 2-20.

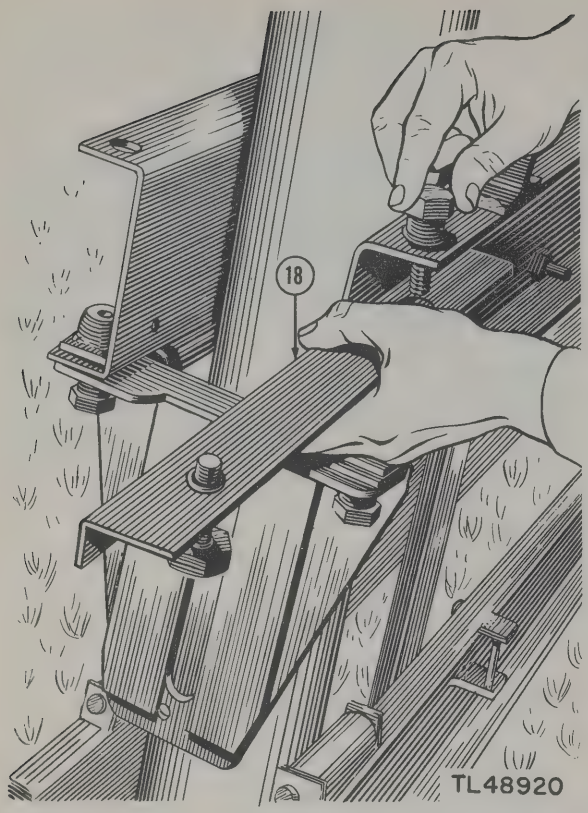


Figure 2-21. Installing side-catwalk support arm.

d. Install the catwalk trap door (24) in place between the two connecting catwalks.

e. Bolt the side-catwalk support arm (18) to the elevator (fig. 2-21). The side catwalk (21) is fastened to the support arms by means of the side-catwalk handrail (22).

f. The lower catwalk gives access to the cable connectors at the bottom of the pedestal. To install the lower catwalk (25) merely slide the catwalk between the lower, inner channels of the elevator sections (fig. 2-22). The catwalk is kept in place by the fasteners attached to the lower channels of the elevator.

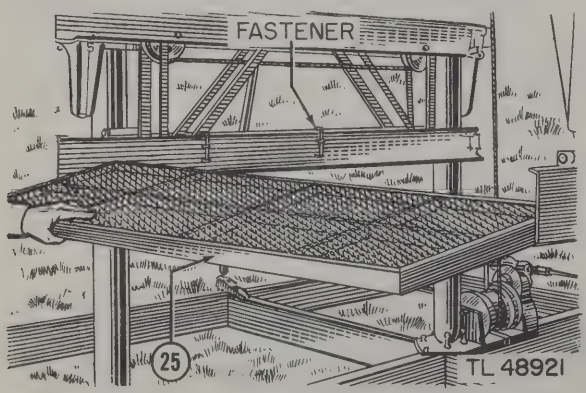


Figure 2-22. Installing lower catwalk.

2-14. INSTALLING COMPRESSION GUY MEMBERS AND LOWER HORIZONTAL BRACES.

Before installing the compression guy members and the lower horizontal braces, the elevator must be raised so that it clears the openings at the upper end of the lower section of the center post (fig. 2-23).

a. If the elevator does not rise evenly, or if it binds against the main tubular members, perform the steps described in subparagraphs 2-11**b** and **c**. Make certain that the antenna clears the four center posts, for it is damaged easily.

b. After the elevator has been raised to a sufficient height, fasten the 1-inch eyebolts (32) for the compression guy members (33) to the center posts (fig. 2-24). To reach the openings for the eyebolts, it may be necessary to suspend a ladder section from the elevator. The eyebolts are similar to those used for the horizontal braces (fig. 2-26). Leave the nut backed away from the center post.

c. Insert the lower end of the compression guy member (33) into the triangular bracket on the tower base (fig. 2-25), and secure the captivated bolt at the upper end to the eyebolt (fig. 2-24). Tighten the nut on the eyebolt against the main tubular member.

d. Fasten the eyebolts for the horizontal braces to the center posts (fig. 2-26), leaving the nuts backed away from the main tubular member.

e. The horizontal braces (34) have, at each end, a triangular connector with three captivated bolts. The center bolt is used to attach the horizontal brace to the eyebolt (fig. 2-27). The length of the horizontal braces is not adjustable. If any difficulty is experienced in fitting a horizontal brace to the eyebolts, turn the eyebolts until the brace fits easily. Tighten the nuts on the eyebolts against the center posts. Horizontal braces are installed on all four sides of the tower.

f. After the horizontal braces have been installed, tighten the adjusting nuts on the compression guy members against the triangular brackets to exert a compressing force on the guy members. The tower, with the compression guy members and the lower horizontals completely installed, is shown in figure 2-28.

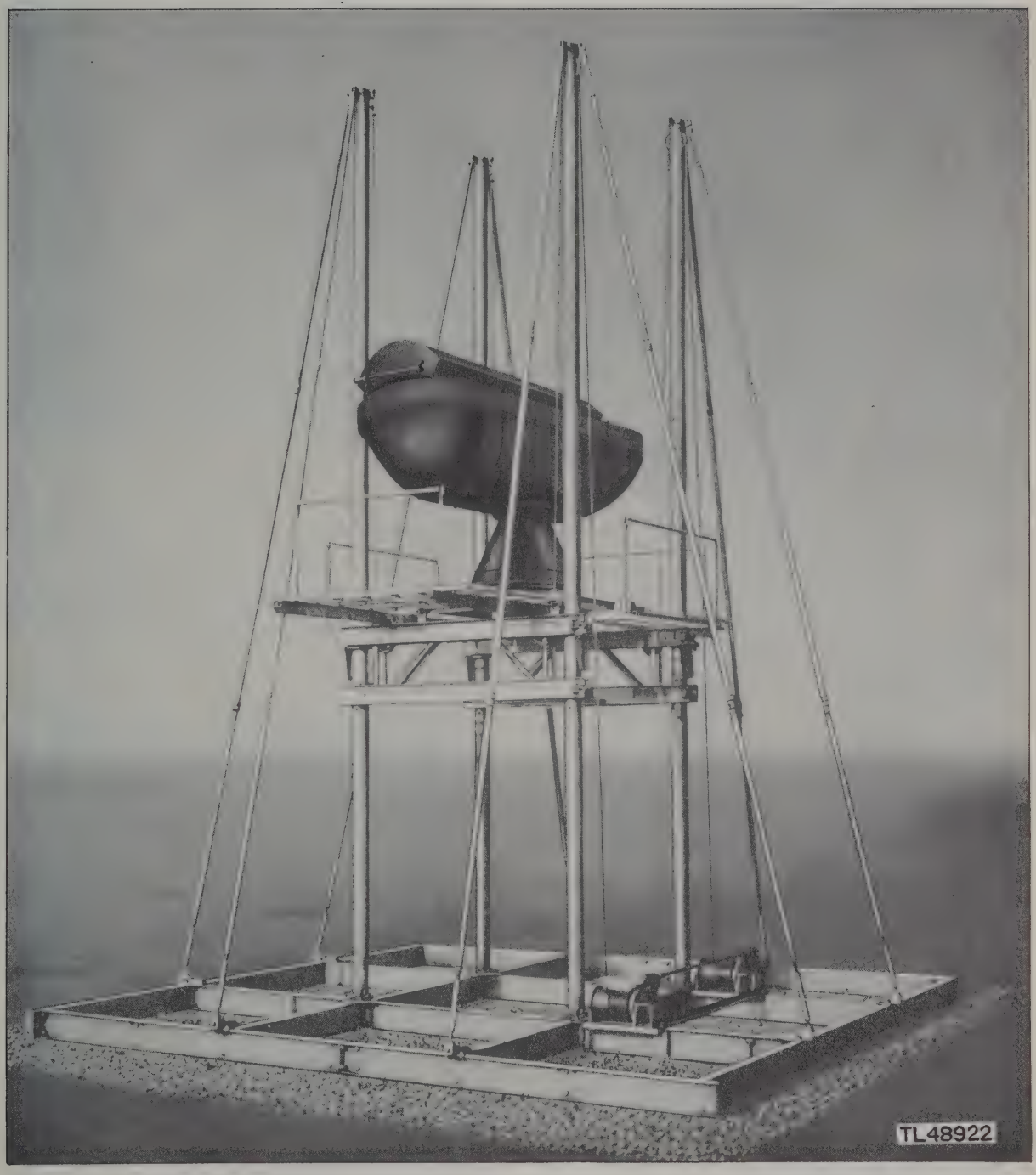


Figure 2-23. Installing horizontal braces and compression members, elevator raised.

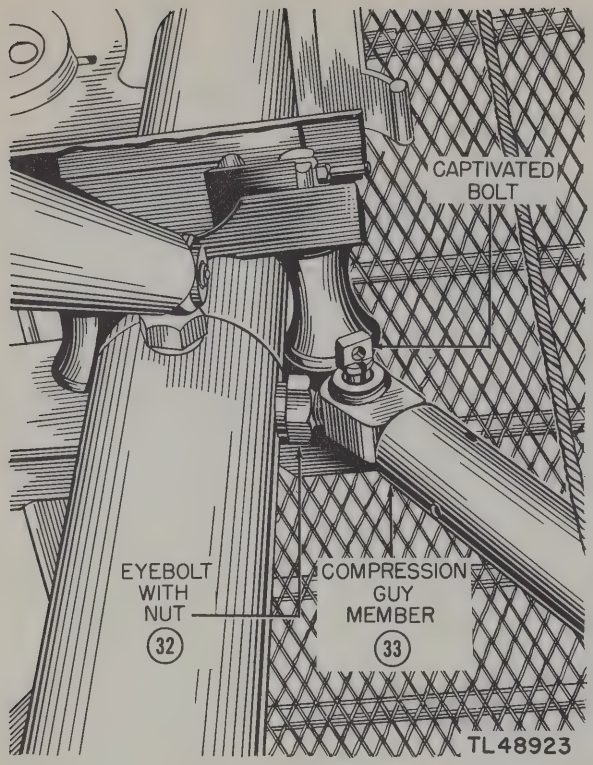


Figure 2-24. Installing compression guy member.

2-15. INSTALLING REMAINING BRACES.

The procedure for installing the remaining braces, both horizontal and diagonal, is similar to that described in the preceding paragraph.

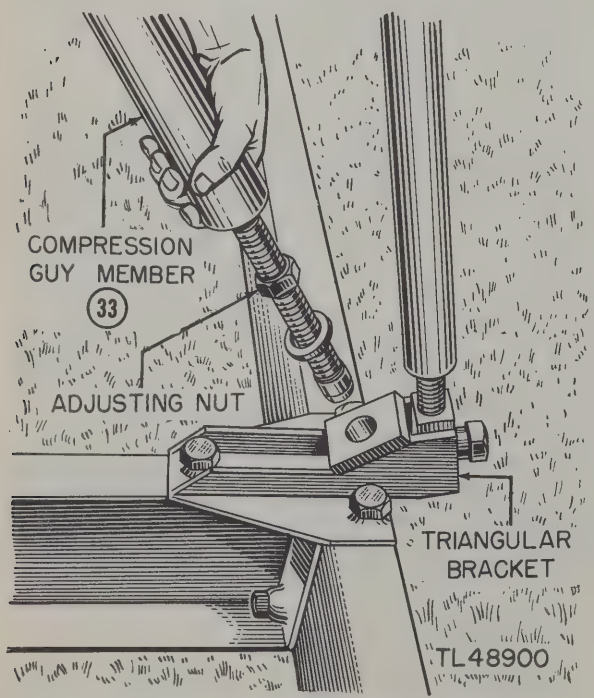


Figure 2-25. Connecting lower end of compression guy member.

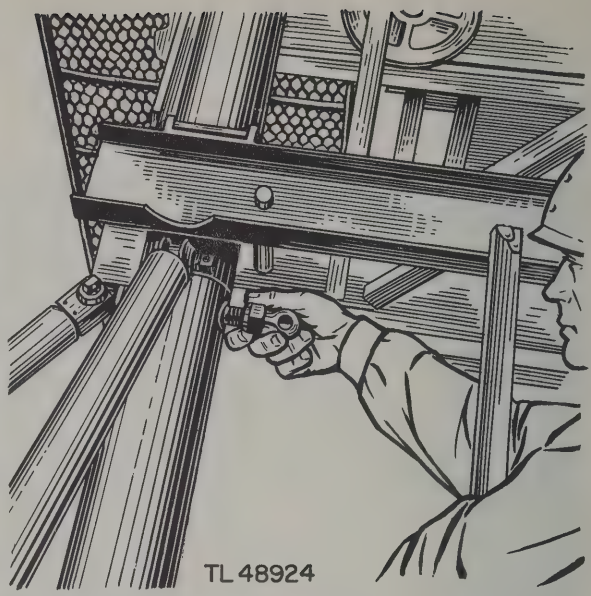


Figure 2-26. Installing eyebolt for horizontal brace.

a. Raise the elevator until it clears the openings for the next set of eyebolts. Install the eyebolts and the center horizontal braces. Figure 2-29 illustrates how the ladder sections may be used to assist the installing personnel in reaching the less accessible portions of the tower.

b. The diagonal braces (35) are fastened between the horizontal braces (fig. 2-30) and are held in place by the captivated bolts on the horizontal braces. The length of the diagonal braces is adjusted by means of turnbuckles (fig. 2-30). After the braces have

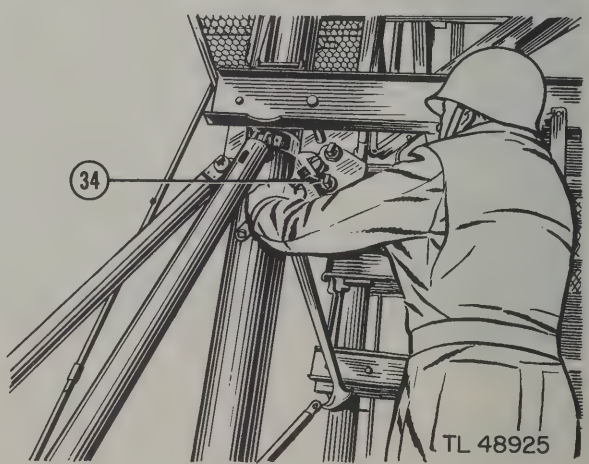


Figure 2-27. Installing horizontal brace.

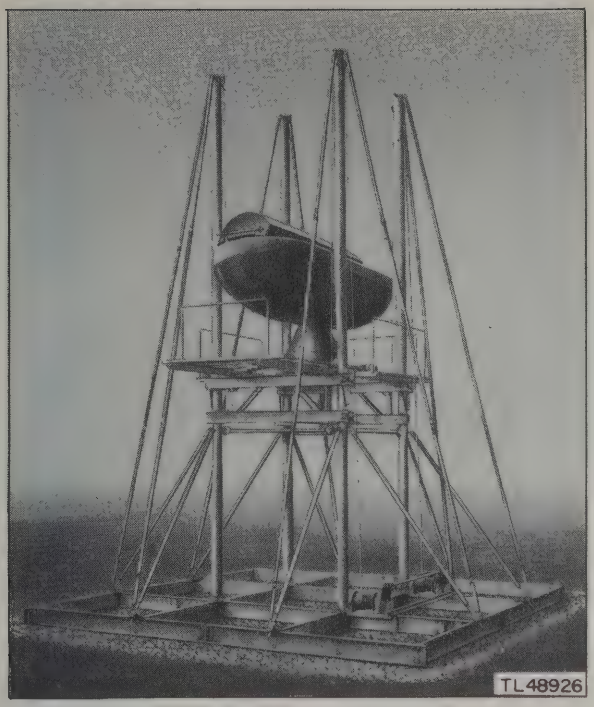


Figure 2-28. Compression guy members and lower horizontal braces installed.

been installed, tighten the turnbuckles with the wrench supplied for the purpose. The lower diagonals, two on each side of the tower, are shown installed in figure 2-31.

c. To install the upper diagonals, the elevator must be raised to the top of the tower. Install the upper horizontal braces and secure the diagonals between the upper and the center horizontal braces. Tighten the turnbuckles on the diagonal braces.



Figure 2-29. Use of ladder sections in installing braces.

2-16. INSTALLING ELEVATOR SUPPORT ASSEMBLIES AND TIE-OFF BOLTS.

The elevator support assemblies (leveling couplers, each consisting of a supporting bolt, wingnut, and chain) suspend the elevator from the four center posts, while the tie-off bolts prevent the elevator from swaying.



Figure 2-30. Installing diagonal brace.

a. Before installing the support assemblies (43), securely tighten the nuts on the milled bolts which fasten one end of the dolly rails to the elevator. These nuts were previously turned to finger-tightness (par. 2-10**a**).

b. Insert the supporting bolt in the eyebolt at the top of the center post and fasten the wingnut to the bolt (fig. 2-32).

c. Attach the free ends of the chain to the wingnut.

d. By means of a wrench, adjust the supporting bolts in turn until the antenna dolly is level in both directions.



Figure 2-31. Lower diagonals installed.

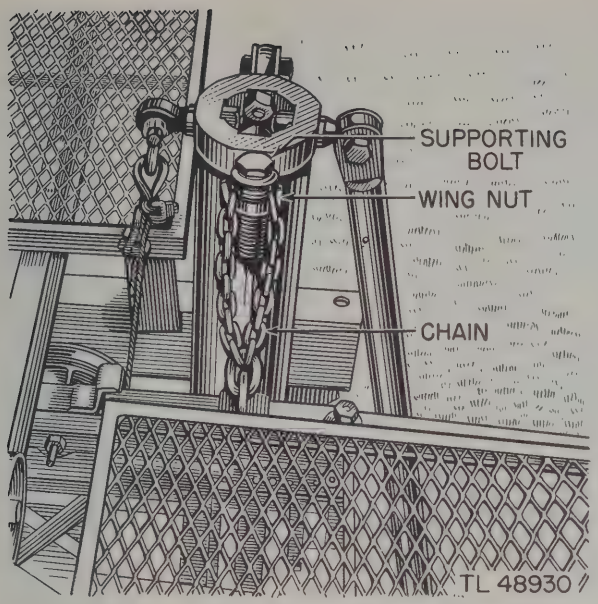


Figure 2-32. Elevator support assembly installed.

e. The elevator tie-off brackets (28) and (29) were installed originally as far as possible from the center posts (par. 2-9a). Loosen the bolts which secure the brackets to the elevator.

f. Insert a 1-inch eyebolt through the slot in each bracket, and fasten the brackets securely to the main tubular members (fig. 2-33). It may be necessary to readjust the turnbuckles on the lower sections of the tension guy members (fig. 2-11).

g. Tighten the locknut on each eyebolt so that the bracket is flat against the center post.

h. Tighten the bolts which secure the brackets to the elevator.

i. Slowly slack off on the winch cables so that the support assemblies bear the weight of the elevator.

2-17. FINAL TOWER-ERECTION STEPS.

The final steps in the erection of the tower are to install the ladder sections, the diagonal handrails, the derrick, and the ground rod. The connection of cables to the antenna and to the other components of the radar set is described in paragraph 2-20.

a. The ladder consists of three sections. The upper and lower sections (38) are longer than the center section (39). Fasten the upper section to the elevator, as shown in figure 2-34, and hook the center section to the inner surface of the upper section. The lower ladder section fastens to the outer surface of the center section.

b. Secure the ladder sections to the horizontal braces of the tower. Clamps with chains attached are fastened to the ladder sections for this purpose. Make certain that the chains are tight and that the ladder does not sway.

c. Connect the four diagonal handrail sections (42) between the end-catwalk and the side-catwalk handrails.

d. Ground the tower by connecting one of the ground rods to the tower base and driving the rod into the ground (par. 2-12g).

e. Fasten the derrick (47) to the top of one of the upper center-post sections (8A), and install a single block and tackle. This pulley may be used to lift cables and test equipment to the top of the tower.

2-18. PARKING TRAILER.

After the power unit is unloaded from the trailer (par. 2-12), the trailer may be drawn

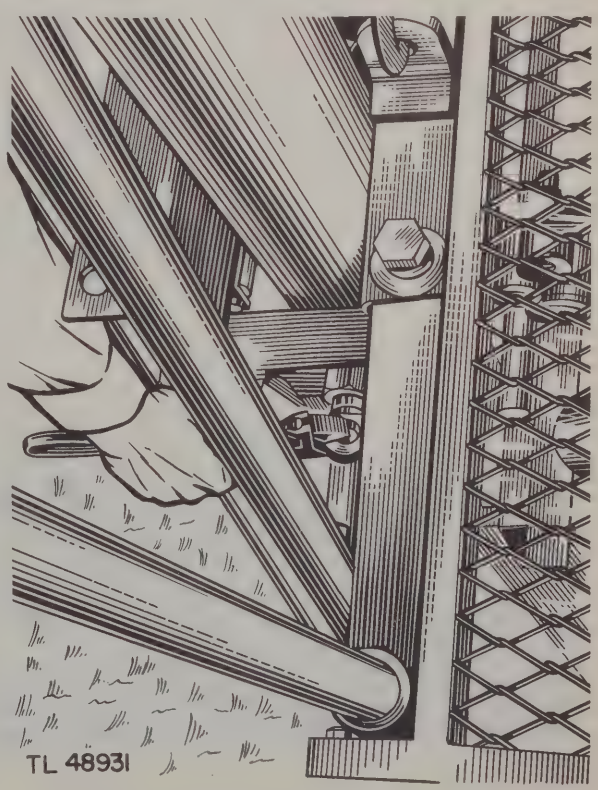


Figure 2-33. Installing elevator tie-off bolt.



Figure 2-34. Tower completely erected.

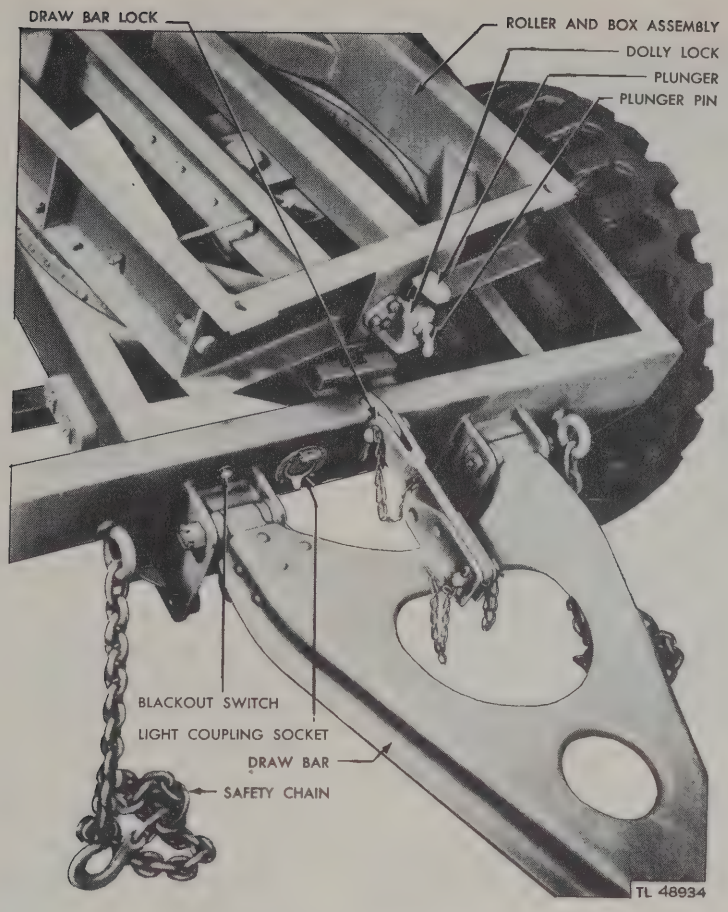


Figure 2-35. Trailer dolly controls.

to the site selected for it and parked. Since the trailer may have been operated as a full trailer or as a semi-trailer, the procedure for uncoupling the towing vehicle in either case is described below. Refer to TM 9-884, the trailer instructional manual, for a more complete description of the operation of the trailer.

a. Uncoupling Towing Vehicle From Full Trailer.

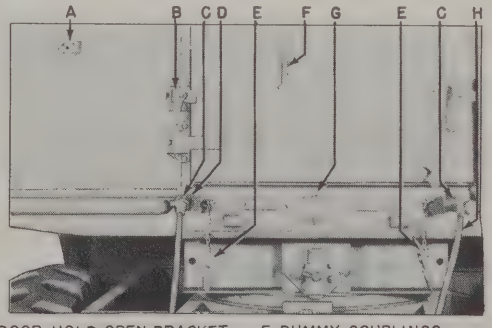
(1) Place two chock blocks against the rear wheels of the trailer on the downgrade side. The chock blocks, attached to chains to prevent loss, are stowed in metal boxes under the wheel housing on the right and left sides of the trailer.

(2) Unfasten the two safety chains (fig. 2-35) from the towing vehicle.

(3) Close the two air cut-out cocks at the rear of the towing vehicle and disconnect the two air hoses (fig. 2-36).

NOTE: Do not allow the ends of the air hoses to drag on the ground; dirt may enter the brake system.

(4) Install two dummy couplings on the brake couplings of the trailer (fig. 2-36) to prevent dirt and other foreign matter from entering the trailer brake system.



A-DOOR HOLD-OPEN BRACKET
B-DOOR TIGHTENING LUGS
C-BRAKE COUPLING
D-BRAKE AIR HOSE SERVICE
E-DUMMY COUPLINGS
F-DOOR HOLD-OPEN LATCH
G-COUPLING SOCKET
H-BRAKE AIR HOSE EMERGENCY

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Figure 2-36. Trailer controls, front view.

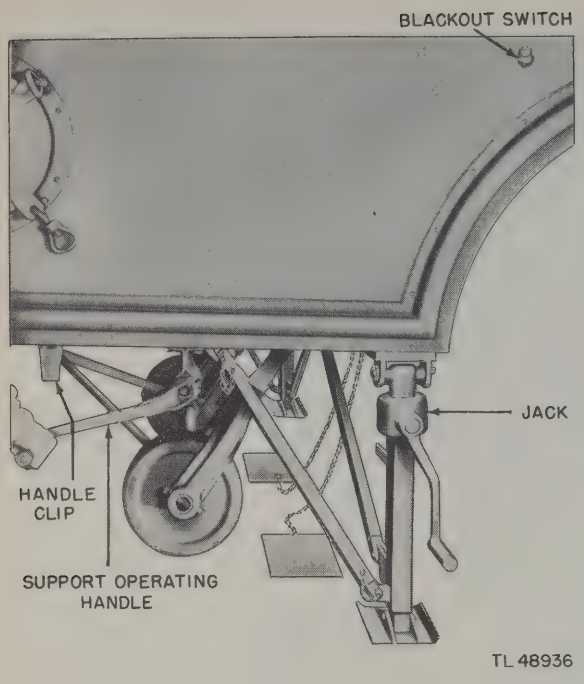


Figure 2-37. Trailer supports.

(5) Pull the light jumper cable from the coupling socket (fig. 2-36).

(6) Open the pintle hook on the towing vehicle, lift the drawbar out, and move the towing vehicle forward.

(7) Ground the trailer by connecting to the trailer one of the ground rods as explained in paragraph 2-12g.

b. Uncoupling Towing Vehicle from Semitrailer.

(1) Place chock blocks against the downgrade side of the rear tires. The chock blocks are stowed in metal boxes under the wheel housing on either side of the trailer.

(2) Unfasten the support operating handle from the handle clip (fig. 3-37) and wind the support wheels (landing gear) down until the stop is reached.

(3) Close the two cut-out cocks at the rear of the towing vehicle.

(4) Disconnect both air hoses (fig. 2-36). Breaking the emergency air line first automatically sets the semi-trailer brakes. Make certain that the two dummy hose couplings are installed on the trailer couplings and that the tractor hoses are coupled together, in order that dirt and other foreign matter will not enter the braking system.

(5) Disconnect the light jumper cable (fig. 2-36).

(6) Push back the operating handle on the coupler until the latch can be heard to drop in behind the lug on the plunger. The plunger will then be held in the unlocked position until the tractor-truck is withdrawn.

(7) Check again to be sure that the chock blocks are set firmly in position and that the support wheels are completely down. Pull the tractor-truck ahead slowly until the two units are separated.

(8) Ground the trailer by connecting to the trailer one of the ground rods as explained in paragraph 2-12g.

2-19. INSTALLING TRAILER VENTILATOR.

In transportation, one of the trailer ventilators is dismounted to allow stowing of the reflector and the blower motor of the other ventilator is removed to give sufficient clearance for the rest of the antenna assembly. Before replacing the ventilators, the remote-B assembly and the tools and equipment stowed in the front of the trailer (fig. 2-3) should be moved. Proceed as follows:

a. Unbolt the remote-B assembly from the trailer platform and move it to the spot in which it is to be operated. This may be within the trailer (fig. 1-8) or in its immediate vicinity.

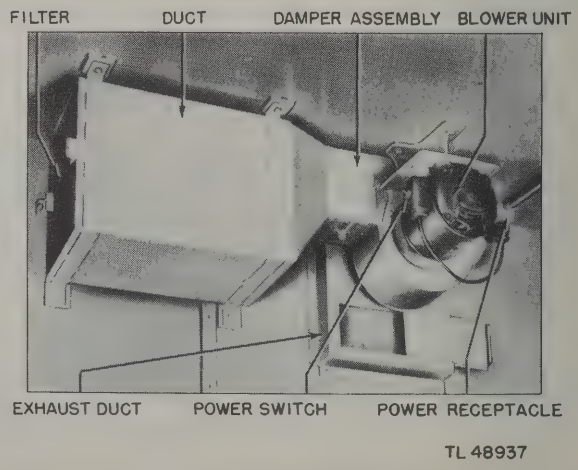


Figure 2-38. Trailer ventilating unit.

b. Move the tools and equipment which are stowed in the front of the trailer to any convenient spot within the trailer.

c. One of the trailer ventilating units, completely installed, is shown in figure 2-38. Mount the exhaust duct over the trailer hatch and bolt it to the wall of the trailer by means of the small screws along its outer edge.

d. Fasten the blower unit to the trailer ceiling. Three bolts are used for this purpose.

e. Slide the duct and air filter unit onto the damper assembly and secure the four bolts which fasten the unit to the trailer ceiling and wall.

f. See that the power switch is turned off, and plug the power cord into the power receptacle.

g. Make certain that the trailer hatch is open for proper operation of the ventilating unit.

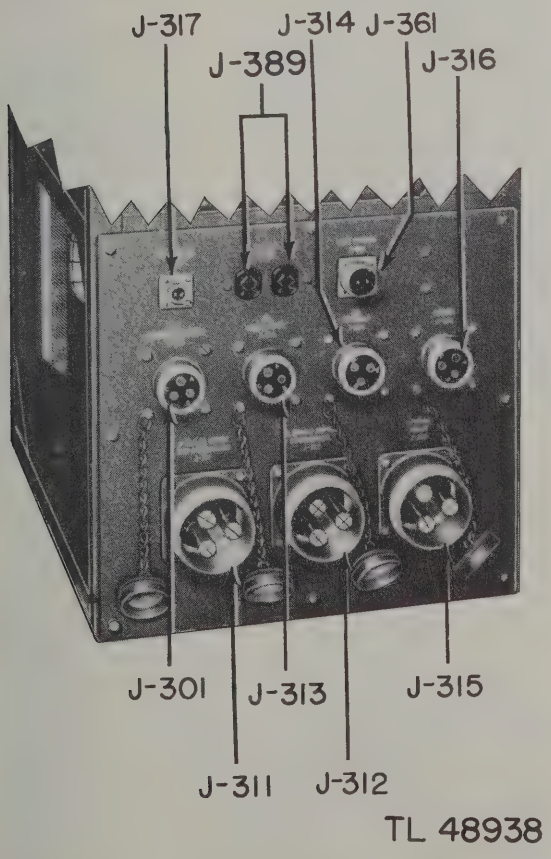


Figure 2-39. Power panel, cable receptacles.

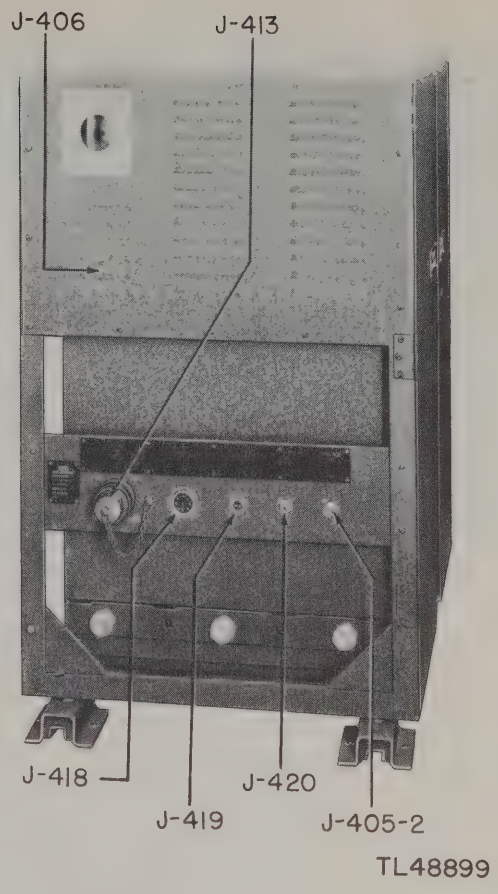


Figure 2-40. Modulator, cable receptacles.

h. Install the blower motor for the other ventilating unit.

2-20. CABLING.

a. All the external cables for the radar set are given in the cable check list (par. 2-21). Each cable is numbered at both ends, with numbers that correspond to those given in the first column of the check list. The units connected by each cable, as well as the receptacle numbers, are given in the second and third columns. Figures 2-39 through 2-46 help to identify the cable receptacles. The general function of each cable is given in column 4, while the number of wires, wire size, length, and Signal Corps nomenclature for the cables is given in columns 5 through 8. In transportation, the cables are wound on four reels. One reel is used for cable 111, a second reel for cables 106 through 110, a third reel for cables 102 and 103, and the fourth reel for cables 101 and 105.

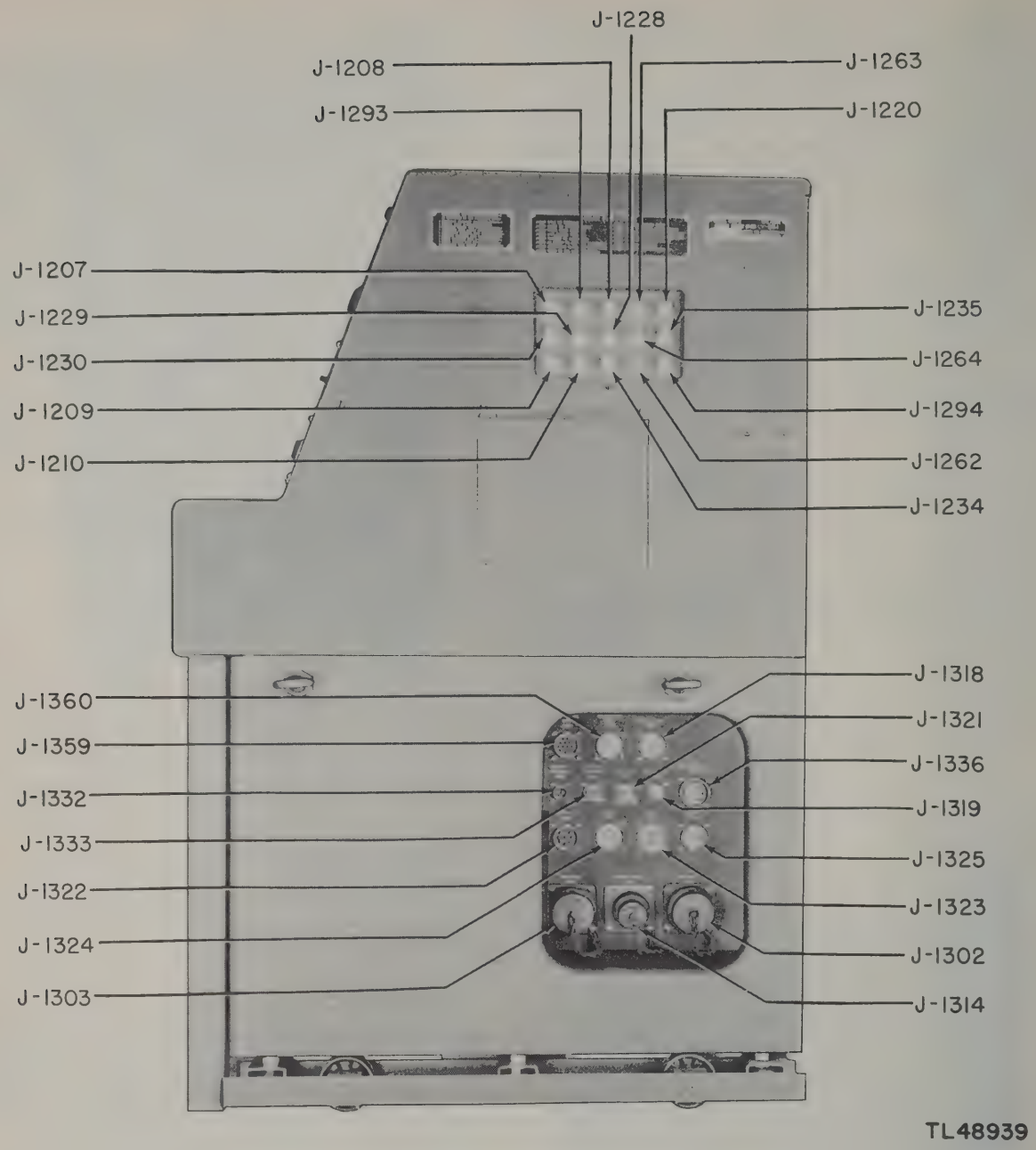


Figure 2-41. Console, cable receptacles.

b. The check list is divided into four subparagraphs. Paragraph 2-21**a** lists those cables which are already installed. Check the connections at both ends of these cables and make certain that they are secure.

c. Paragraph 2-21**b** lists those cables which have to be connected whenever the equipment is moved to a new site.

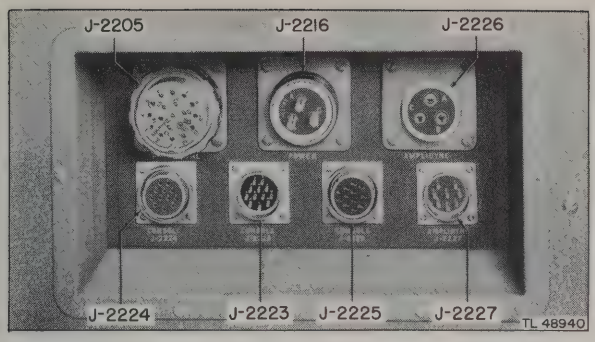


Figure 2-42. Servo rack, cable receptacles.

(1) Cables 101 through 110 are connected between the antenna pedestal and other components of the radar set. Using a block and the tower derrick, raise one end of these cables up the outside of the tower. Pass the cables through the cable clamps provided on the elevator sections, and plug the cables into the proper receptacles (fig. 2-43). In this manner, the receptacles will not have to bear the weight of the cables. Lash the vertical sections of the cables to the center posts to prevent damage to the cables. Secure a canvas cover, tower part (45), under the pedestal dolly to protect the cable receptacles from adverse weather conditions. Pass the other end of the cables through the trailer hatch and connect each cable to the proper receptacle as shown in the check list.

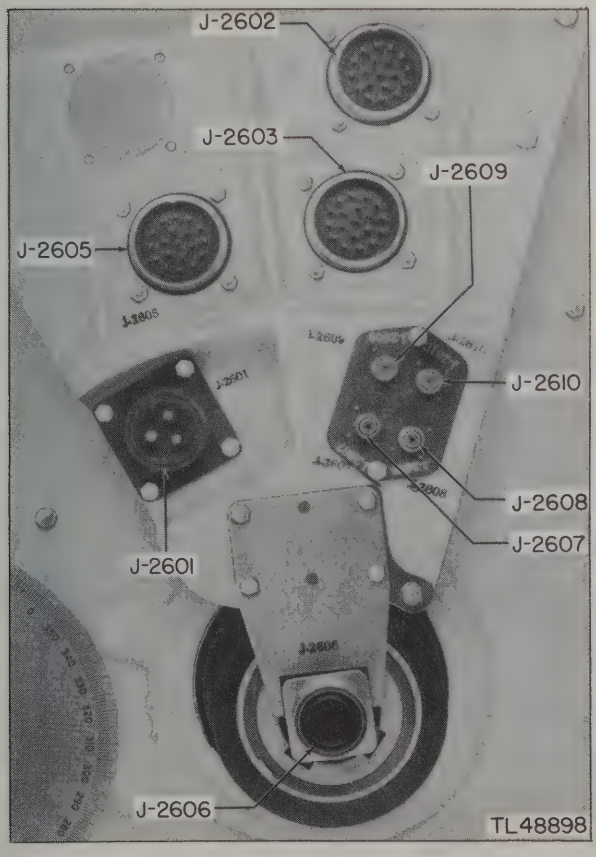


Figure 2-43. Pedestal base, cable receptacles.



Figure 2-44. Rectifier rack, cable receptacles.

(2) Cables 111, 112, and 115 are connected between the power panel and the power source. Cable 111 is connected to the power unit supplied with the radar set, cable 112 to a commercial source of 3-phase power (if available), and cable 115 to a source of single-phase power (if available). The studs on the power unit to which cable 111 is to be connected are shown in figure 2-46.

d. Paragraph 2-21**c** lists those cables which have to be connected at one end only, since the other end is connected already.

(1) Cables 113, 118, 119, and 120 connect to the modulator. They are included in

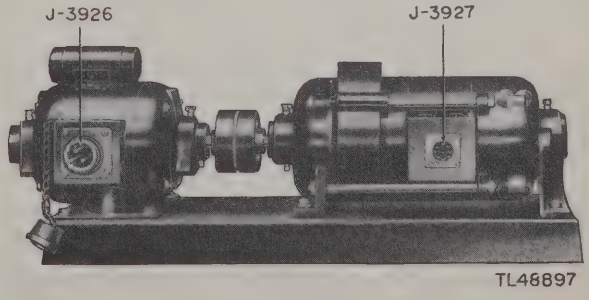


Figure 2-45. Amplidyne, cable receptacles.

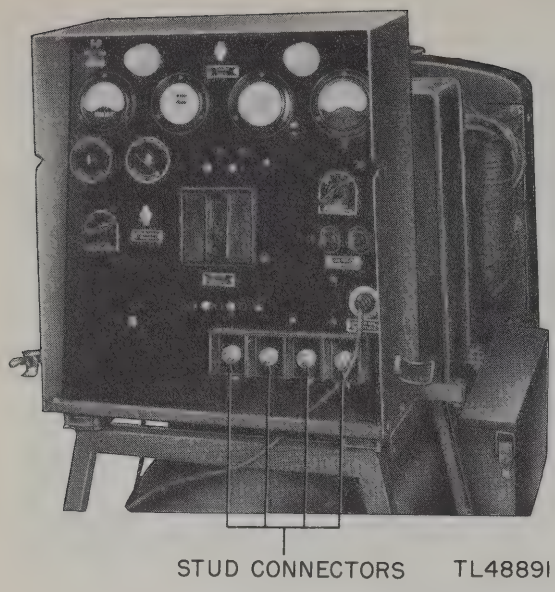


Figure 2-46. Power unit control panel.

this section of the check list because they were disconnected from modulator while unloading the power unit from the trailer. Reconnect these cables to the modulator, if this has not already been done, and check that the other ends of the cables are connected securely to the proper receptacles.

(2) Cables 128 through 133 connect the remote-B assembly to the console and to the telephone junction box. Since the assembly is moved and mounted on the trailer platform during transportation, these cables are disconnected at the remote-B assembly end. Replace these connections and check to see that the other ends of the cables are fastened securely to the proper receptacles.

e. Paragraph 2-21**d** enumerates those cable connections which are required for test purposes only. Cables 146 and 154 are used to connect the r-f test set to the receiver in performing system checks; cables 193 and 194 connect the test synchroscope and the console.

f. Paragraph 2-21**e** lists those cables which are connected when the radar set is used with additional equipment.

(1) Cables 134, 135, and 136 are used to connect the console to a separate radar search set. These cables will be used only if such a set is to be operated in conjunction with Radar Set AN/MPG-1.

(2) Cables 157 and 158 are connected to the telephone junction box. These cables are used for phone and data connections to the gun-data computer.

(3) Cables 161 through 164 connect the radar set components to any IFF equipment which may be used in conjunction with the radar set. If IFF equipment is not used, these cables are not connected.

g. After the cabling has been completed, the equipment is ready for use. To start the equipment, follow the procedure given in chapter 3. *Make certain that the preliminary adjustments given at the beginning of chapter 3 are performed first to avoid damaging the equipment.* After all the preliminary adjustments have been made, and steps 1 and 2 of the starting procedure have been performed, the operation of the trailer lights and ventilators may be checked. The trailer light switch is located on the trailer ceiling near the front door (fig. 2-47), and the power switches for the ventilator units are mounted on the units themselves (fig. 2-38). Check to see that the trailer hatches, through which air is drawn by the ventilators, are open.

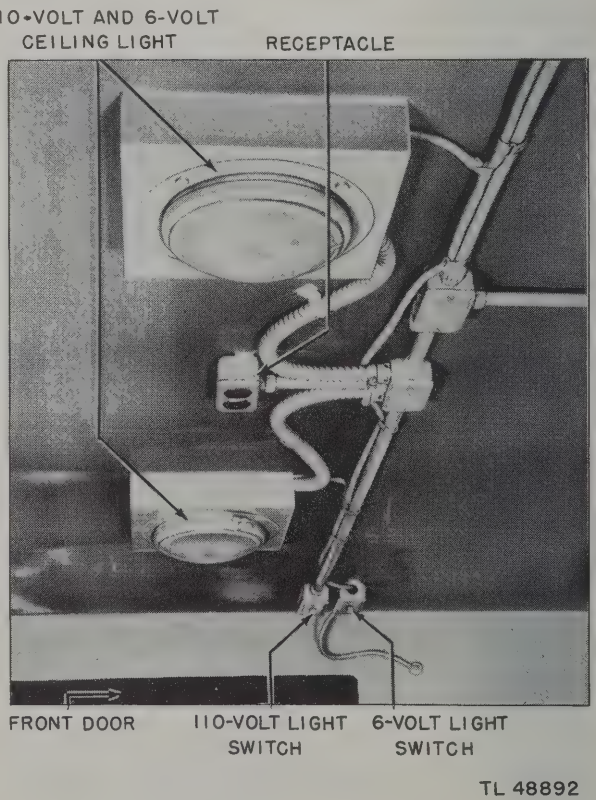


Figure 2-47. Trailer ceiling lights.

2-21. CHECK LIST OF CABLES.

a. Cables Already Connected.

Cable No.	From	To	Function	No. of Wires In Cable	Wire Size AWG No.	Length (ft)	Signal Corps Nomenclature
114	Power panel J–314	Console J–1314	Console power	3	8	5	Cord CX–716/MPG–1
116	Power panel J–316	Servo rack J–2216	Servo power	3	8	20	Cord CX–716/MPG–1
117	Power panel J–317	Lights (receptacle on trailer)	Lights	2	14	5	Cord CX–719/MPG–1
121	Console J–1321	Rectifier rack J–3821	Rectifier input	2	14	20	Cord CX–722/MPG–1
122	Rectifier rack J–3822	Console J–1322	Rectifier output	9	18	20	Cord CX–723/MPG–1
123	Servo rack J–2223	Console J–1323	Servo control	13	18	20	Cord CX–724/MPG–1
124	Servo rack J–2224	Console J–1324	Servo control	13	18	20	Cord CX–724/MPG–1
125	Servo rack J–2225	Console J–1325	Servo control	13	18	20	Cord CX–724/MPG–1
126	Servo rack J–2226	Amplidyne J–3926	Amplidyne input	3	8	30	Cord CX–716/MPG–1
127	Amplidyne J–3927	Servo rack J–2227	Amplidyne output	9	18	30	Cord CX–720/MPG–1
159	Telephone box J–4159	Console J–1359	Computer data	13	18	5	Cord CX–724/MPG–1
160	Telephone box J–4160	Console J–1360	Phone	13	18	5	Cord CX–724/MPG–1

b. Cables to Be Connected.

Cable No.	From	To	Function	No. of Wires In Cable	Wire Size AWG No.	Length (ft)	Signal Corps Nomenclature
101	Power panel J–301	Pedestal J–2601	Antenna heater power	3	8	150	Cord CX–716/MPG–1
102	Console J–1302	Pedestal J–2602	Receiver control	20	7 No. 15 13 No. 18	150	Cord CX–717/MPG–1
103	Console J–1303	Pedestal J–2603	Xmtr voltages, Az voltages, and data	20	7 No. 15 13 No. 18	150	Cord CX–717/MPG–1

Cable No.	From	To	Function	No. of Wires In Cable	Wire Size AWG No.	Length (ft)	Signal Corps Nomenclature
105	Servo rack J–2205	Pedestal J–2605	Servo control	20	7 No. 15 13 No. 18	150	Cord CX–717/MPG–1
106	Modulator J–406	Pedestal J–2606	Magnetron pulse	1	Pulse	250	Cord CG–317/U
107	Console J–1207	Pedestal J–2607	STC	1	Coaxial	150	Cord CG–284A/U
108	Console J–1208	Pedestal J–2608	Video	1	Coaxial	150	Cord CG–284A/U
109	Console J–1209	Pedestal J–2609	Azimuth sweep	1	Coaxial	150	Cord CG–284A/U
110	Console J–1210	Pedestal J–2610	Azimuth mark	1	Coaxial	150	Cord CG–284A/U
111	Power unit (studs)	Power panel J–311	Power	3	1	150	Cord CX–718/MPG–1
112	Commercial power source	Power panel J–312	Power	3	1	150	
115	Single-phase power	Power panel J–315	Power	3	1	150	

c. Cables Partially Connected.

Cable No.	From	To	Function	No. of Wires In Cable	Wire Size AWG No.	Length (ft)	Signal Corps Nomenclature
113	Power panel J–313	Modulator J–413	Modulator power	3	8	20	Cord CX–716/MPG–1
118	Modulator J–418	Console J–1318	Xmtr control	9	18	20	Cord CX–720/MPG–1
119	Modulator J–419	Console J–1319	Pulse relay	2	14	20	Cord CX–721/MPG–1
120	Modulator J–420	Console J–1220	Modulator trigger	1	Coaxial	20	Cord CG–284A/U
128	Console J–1228	Remote-B assembly J–828	Video	1	Coaxial	25	Cord CG–284A/U
129	Console J–1229	Remote-B assembly J–829	Range gate	1	Coaxial	25	Cord CG–284A/U
130	Console J–1230	Remote-B assembly J–830	Azimuth sweep	1	Coaxial	25	Cord CG–284A/U

Cable No.	From	To	Function	No. of Wires In Cable	Wire Size AWG No.	Length (ft)	Signal Corps Nomenclature
131	Telephone box J–4131	Remote-B assembly J–831	Remote-B phone	13	18	25	Cord CX–724/MPG–1
132	Console J–1332	Remote-B assembly J–832	Azimuth blanking	2	14	25	Cord CX–721/MPG–1
133	Console J–1333	Remote-B assembly J–833	Remote-B input power	2	14	25	Cord CX–721/MPG–1

d. Test Cables.

Cable No.	From	To	Function	No. of Wires In Cable	Wire Size AWG No.	Length (ft)	Signal Corps Nomenclature
146	Receiver J–3046	R-f test set	Sweep trigger	1	Coaxial	5	Cord CG–284A/U
154	Receiver J–3054	R-f test set	Test set power input	2	14	5	
193	Console	Synchroscope	Video	1	Coaxial	5	
194	Console	Synchroscope	Trigger	1	Coaxial	5	

e. Cables to Auxiliary Equipment.

Cable No.	From	To	Function	No. of Wires In Cable	Wire Size AWG No.	Length (ft)	Signal Corps Nomenclature
134	Remote radar	Console J–1234	Video	1	Coaxial	150	
135	Remote radar	Console J–1235	Sync	1	Coaxial	150	
136	Remote radar	Console J–1336	Servo	9	18	150	
157	Gun-data computer	Telephone box (studs)	Computer data	6 pair field wire	19	150	
158	Remote phone	Telephone box (studs)	Phone	12 pair field wire	19	150	
161	Power panel J–361	IFF equipment	Power	2	12	10	
162	Console J–1262	IFF equipment	Sync	1	Coaxial	30	
163	Console J–1263	IFF equipment	Range	1	Coaxial	30	
164	Console J–1264	IFF equipment	Calibration	1	Coaxial	30	

CHAPTER 3

OPERATION

SECTION I. STARTING AND STOPPING PROCEDURES

3-1. PRELIMINARY ADJUSTMENTS.

Before starting Radar Set AN/MPG-1, certain preliminary adjustments and checks are to be made to avoid loss of time and to prevent damage to the equipment when power is first applied. Therefore, before step No. 1 of the starting procedure is performed, check the equipment to see that:

a. All power switches, (1) through (7), on the upper half of the power panel (fig. 3-1) are in the OFF position.

b. Depending on the type of power supplied, the phase links in the power panel (fig. 1-22) are connected as follows:

(1) Single-phase Power Source. If single-phase power is being used, the phase links are connected in the 1 PHASE OPERATION position.

(2) Three-phase Power Source. If three-phase power from either Power Unit PU-26/U (fig. 1-21) or a commercial source is being used, the phase links are connected to the 3 PHASE OPERATION position as shown in figure 1-22.

c. On the modulator (fig. 3-1), the MOD. PLATE VOLTS powerstat (10) is in the minimum position and the AC LINE SWITCH (11) is off. The spare-active tubes switch (12) is in the ACTIVE TUBES position.

d. On the rectifier control panel (fig. 3-1), the control switch (13) is set to ON.

e. On the console (fig. 3-1), all operating controls are in the extreme counterclockwise position, and all switches are off, except for the following:

(1) The selector switch (14) is in the PPI LOCAL position.

(2) The PPI range switch (15) is set to 80,000 yards.

(3) The PPI slew-scan switch (16) is in the PPI SLEW position.

(4) The AFC switch (17) is on.

(5) The azimuth and range DATA TRANSMISSION switches (18) and (19) are set to TRACK.

(6) The expanded-normal switch (20) is set to NORMAL.

f. On the servo rack, all on-off switches (21) through (26) are on and the scan switch (27) is set to CONT. SCAN.

g. On the receiver (fig. 3-27), all variable operating controls are in the extreme counterclockwise position, and all switches are off, except for the following:

(1) The receiver gain local-remote switch is set to REMOTE.

(2) The receiver tuning local-remote switch is set to REMOTE.

h. All panels and chassis of the radar set are in place.

i. The azimuth lock on the antenna pedestal (fig. 3-35) is turned out, and the antenna reflector is positioned at the zero mark on the reflector supporting rods.

j. In the pedestal, the safety switch (fig. 3-23) is set to ON.

k. The power unit (fig. 1-21) is operating and is supplying 114-116 volts at a frequency of 59-61 cps. Refer to TM 11-976 for complete information on Power Unit PU-26/U.

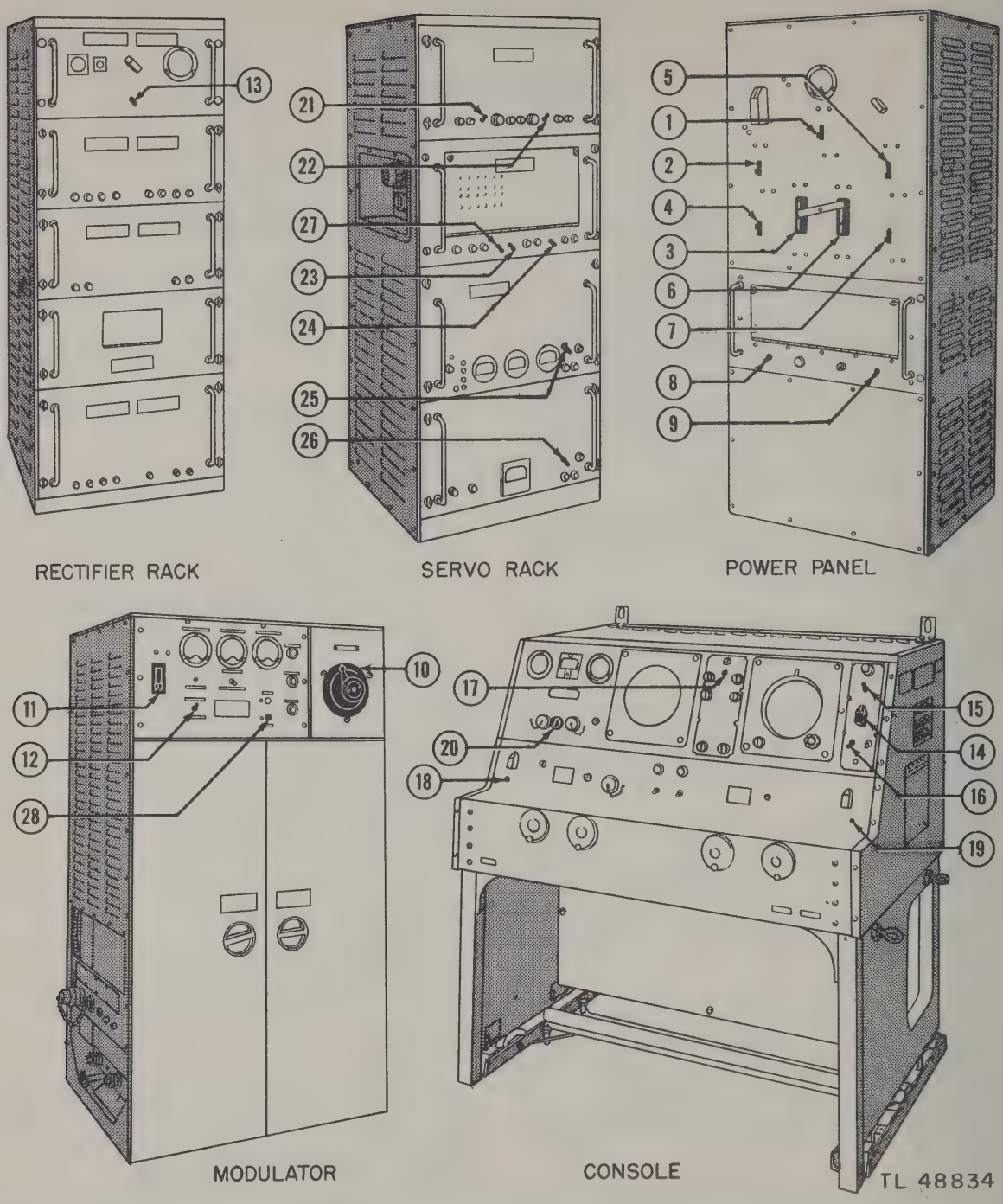
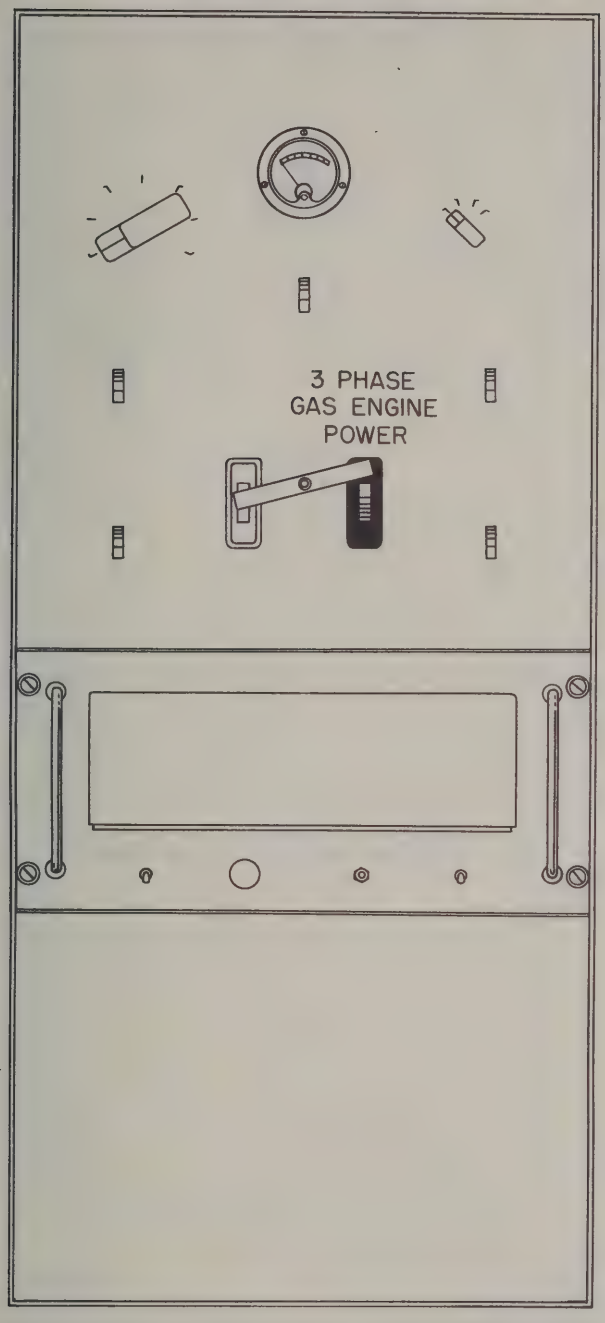


Figure 3-1. Starting procedure, preliminary adjustments.

3-2. STARTING PROCEDURE.

Follow the steps listed below when starting Radar Set AN/MPG-1 after the installation, cabling, and preliminary adjustments are completed. For convenience in identifying switches, controls, and pilot lights, refer to the figure which accompanies each step. In certain steps of the starting procedure, normal indications may not be obtained because the component involved is misaligned. Paragraph references to the specific alignment procedures in section II are included in those steps in which alignment may be necessary. In addition, reference is made to those adjustments which should be made when the equipment is started for the first time after moving to a new site.

STEP No. 1



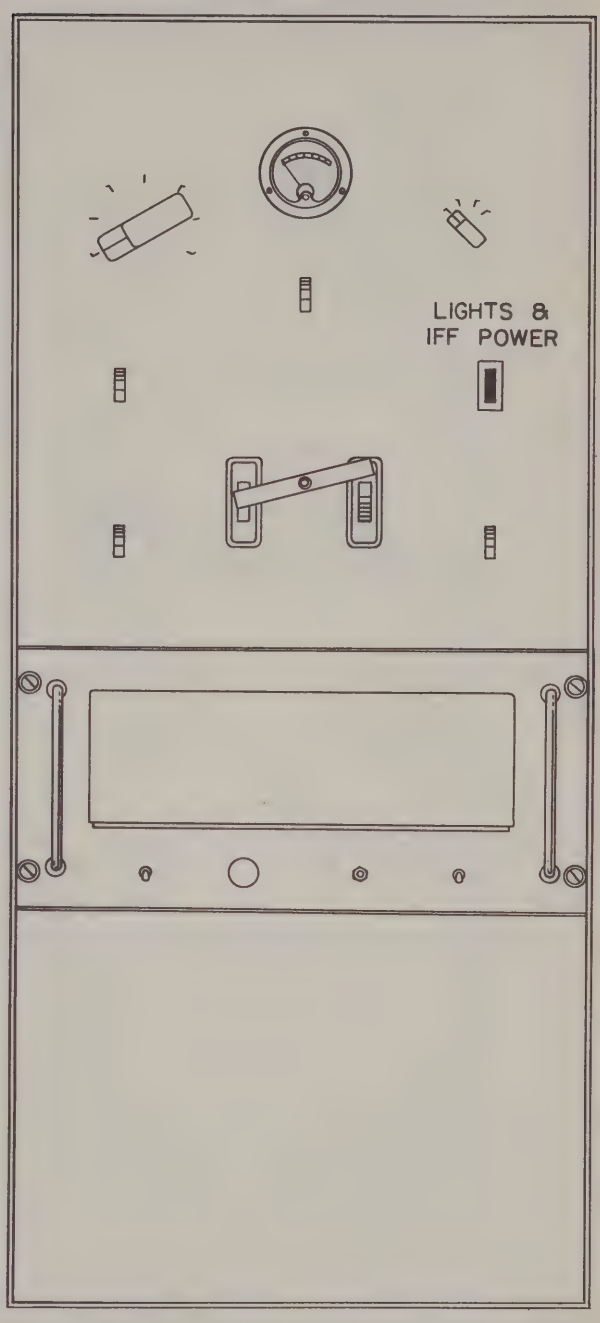
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Figure 3-2. Starting procedure, step No. 1.

a. Throw the 3 PHASE GAS ENGINE POWER switch on the power panel (fig. 3-2) to ON.

NOTE: If three-phase commercial power is used, throw on the 3 PHASE COMMERCIAL POWER switch instead of the switch above. If single-phase power is used, omit step No. 1.

STEP No. 2



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Figure 3-3. Starting procedure, step No. 2.

b. Throw the LIGHTS & IFF POWER switch on the power panel (fig. 3-3) on. Power should be available at the IFF POWER jack, the TO LIGHTS jack, and the UTILITY outlets on the left side of the power panel (fig. 1-22).

STEP No. 3

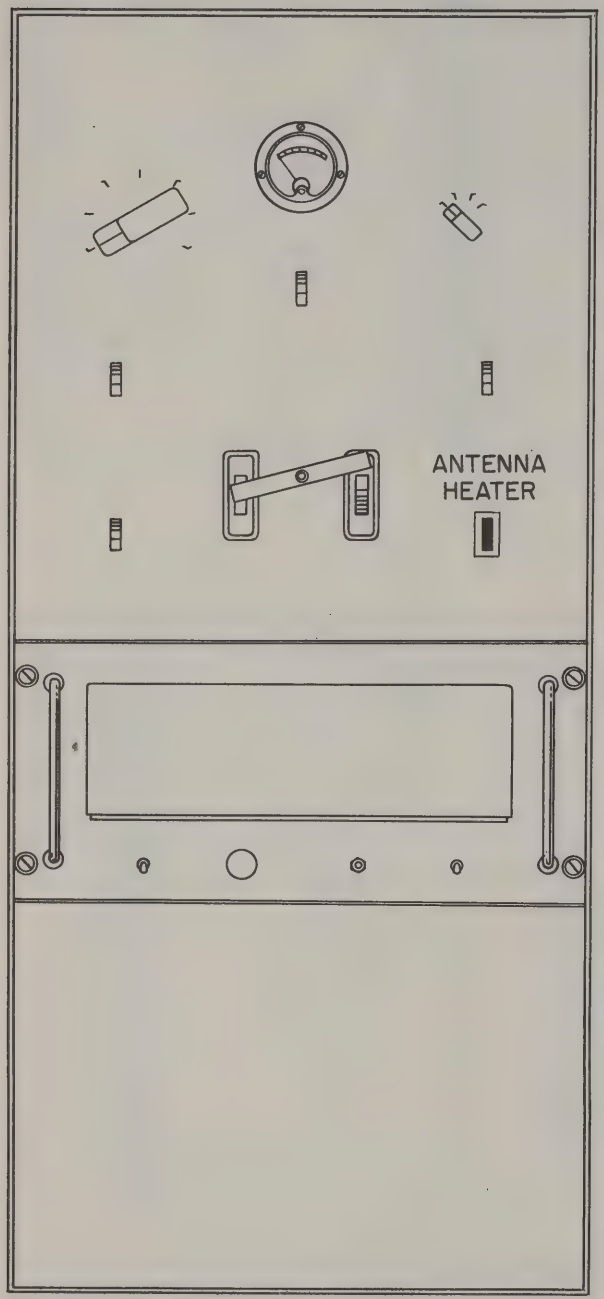


Figure 3-4. Starting procedure, step No. 3.

STEP No. 4

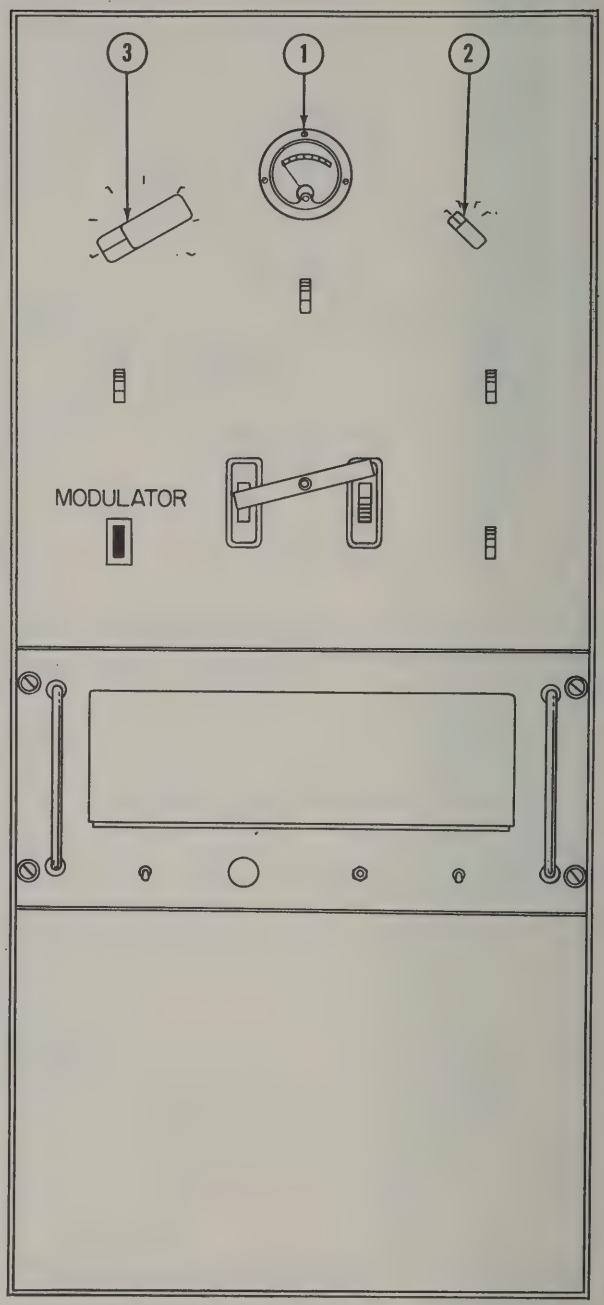


Figure 3-5. Starting procedure, step No. 4.

c. Throw the ANTENNA HEATER switch on the power panel (fig. 3-4) to ON. Power should be available at the utility outlets on the antenna control panel (fig. 1-19).

d. Throw the modulator switch on the power panel (fig. 3-5) on. With the voltmeter switch in the MOD. UNREG. AB position, the voltmeter will indicate between 112 and 118 volts. If the voltage read is not within the above limits, adjust the transformer switch (3) to correct the reading.

STEP No. 5

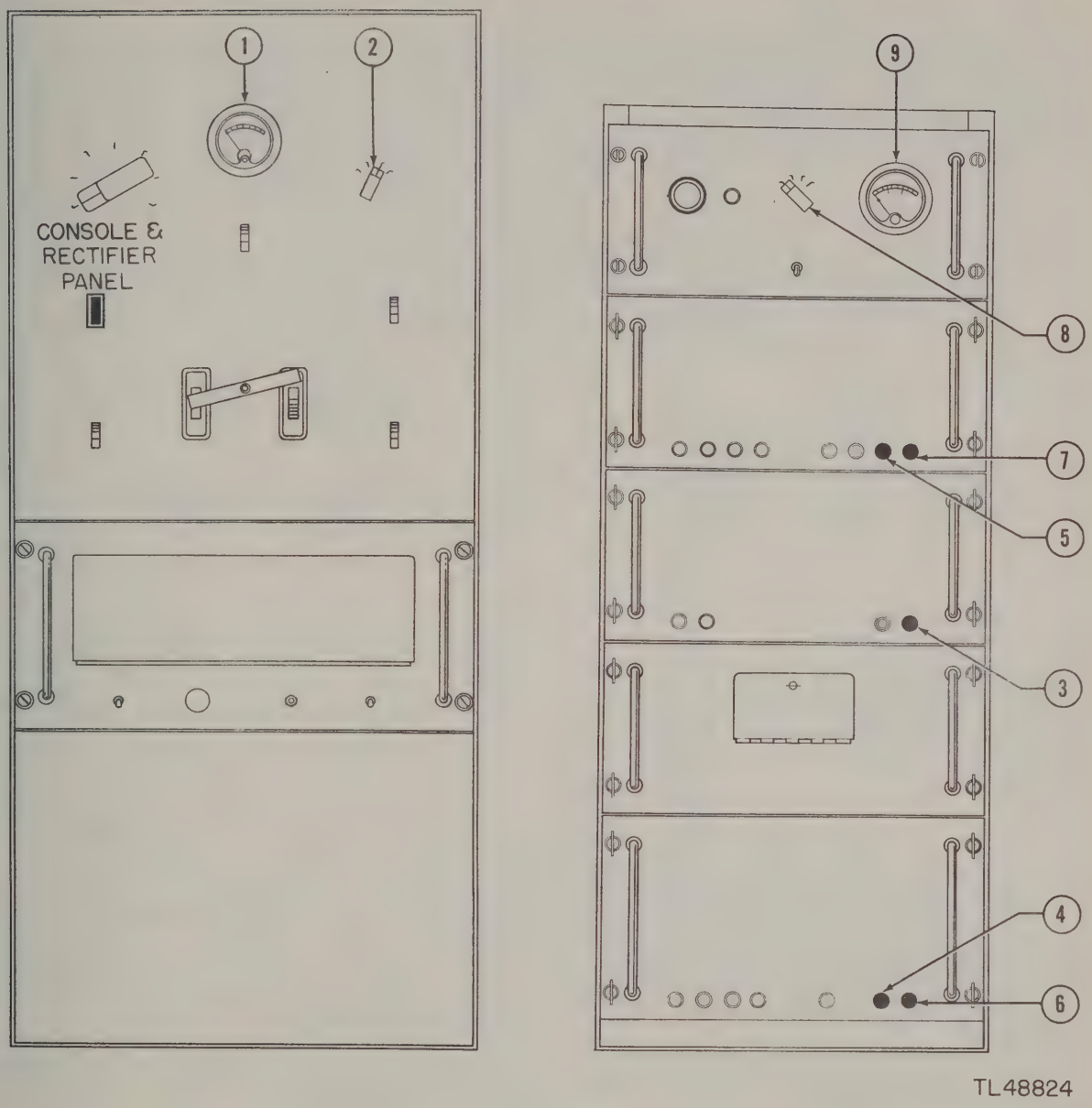


Figure 3-6. Starting procedure, step No. 5.

e. Throw the CONSOLE & RECTIFIER PANEL switch on the power panel (fig. 3-6) to ON.

(1) The voltmeter (1) will indicate 112 to 118 volts with the voltmeter switch (2) in the CONSOLE BC position.

(2) The following lamps on the rectifier rack and console (fig. 3-7) should light:

(a) Filament and high-voltage lamp (3) on the –150-volt supply.

(b) Filament lamp (4) on the 300-volt supply.

(c) Filament lamp (5) on the 500-volt supply.

(d) Azimuth and range dial lights (10) and (11) on the tracking drawer.

STEP No. 5 (Contd)

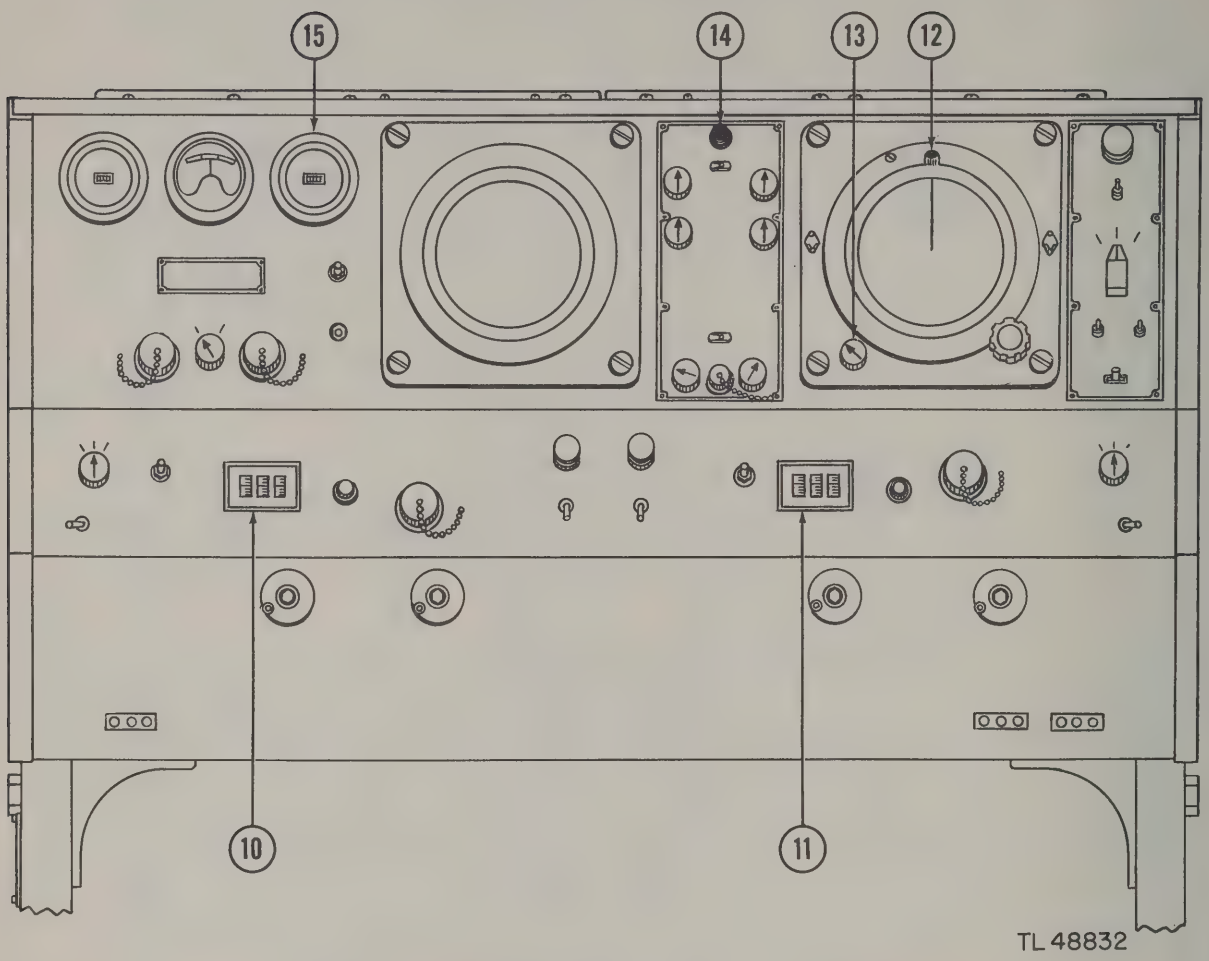


Figure 3-7. Starting procedure, step No. 5 continued.

(e) PPI azimuth scale lamp (12) on the PPI tube mount. The intensity of this light is controlled by the control knob (13) in the lower left-hand corner of the PPI scope cover plate.

(3) The intake blower motor in the console can be heard to start.

(4) The voltmeter (9) on the rectifier rack will indicate between 148 and 152 volts with the meter range switch (8) in the –150-volt position (par. 3-6a).

(5) The CONSOLE HOURS meter (15) on the console will begin to record the hours of operation (in tenths of an hour) of the circuits in the console.

(6) After a time delay of approximately 23 seconds, the time-delay and high-voltage relays in the rectifier rack can be heard to close. The following indications can be observed:

(a) The high-voltage lamp (6) on the 300-volt supply lights.

(b) The high-voltage lamp (7) on the 500-volt supply lights.

(c) The rectifier rack voltmeter (9) indicates 298 to 302 volts with the meter range switch (8) in the 300-volt position (par. 3-6b).

(d) With the meter range switch in the 500-volt position, the voltmeter indicates between 496 and 504 volts (par. 3-6c).

CAUTION: In step No. 6, the antenna should not be rotated until it has been leveled properly (par. 3-7).

STEP No. 6

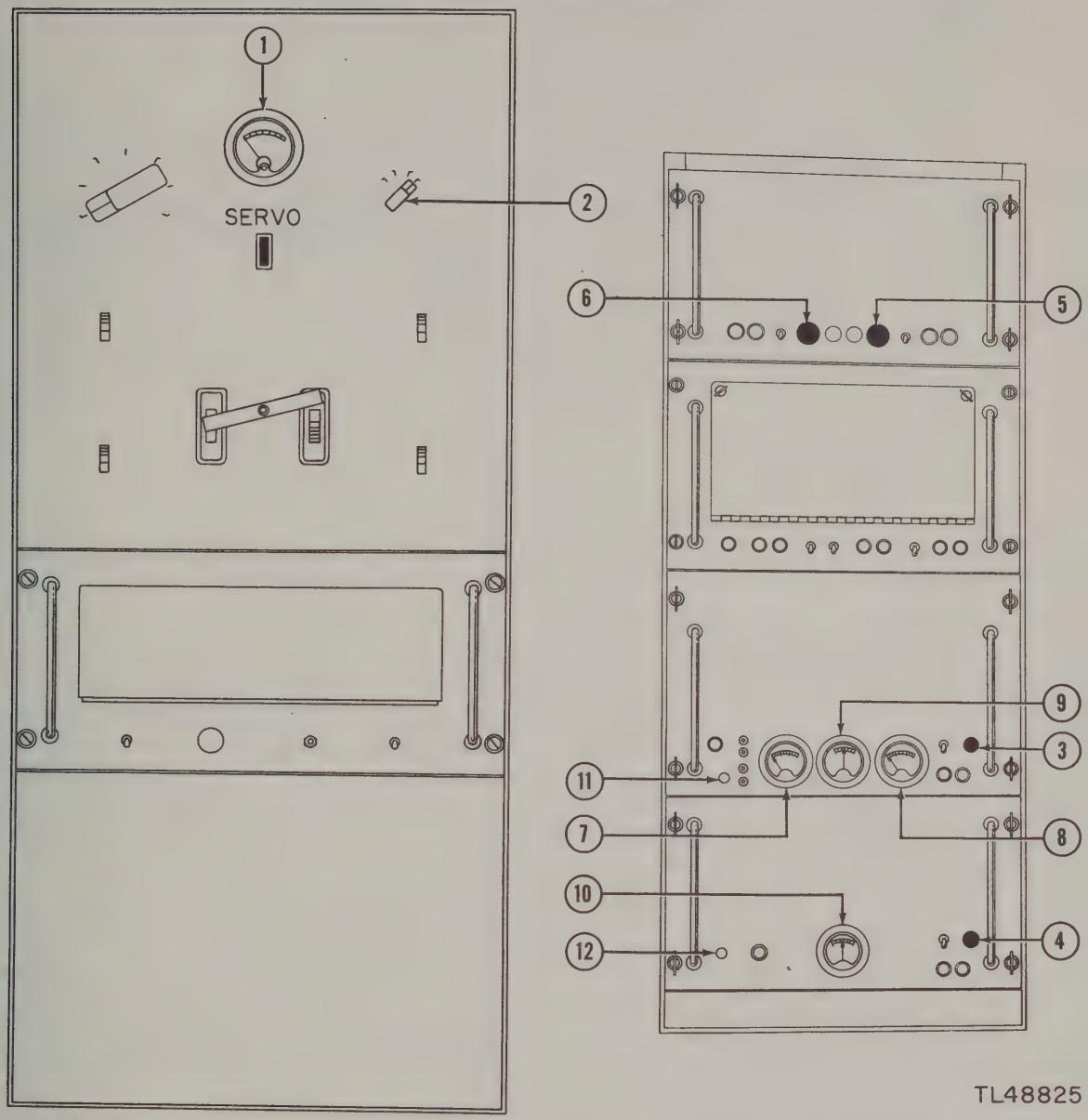


Figure 3-8. Starting procedure, step No. 6.

f. Throw the servo switch on the power panel (fig. 3-8) on.

(1) With the voltmeter switch (2) in the SERVO AC position, the voltmeter (1) will indicate 112 to 118 volts.

(2) The antenna servo power light (3), the PPI servo power light (4), and the filament supply light (5) should come on.

(3) After a time delay of approximately 30 seconds, the time-delay and amplidyne-power relays in the servo rack can be heard to close. The amplidyne (fig. 1-13) starts to operate, and the plate supply light (6) glows.

(4) The 6L6 PLATE meters (7) and (8) should indicate approximately the same value of currents between 20 and 25 milliamperes (par. 3-7).

(5) The error meters (9) and (10) should indicate zero with the antenna stationary (or with buttons (11) and (12) depressed) and should move within the white area of the scales with the antenna rotating.

STEP No. 7

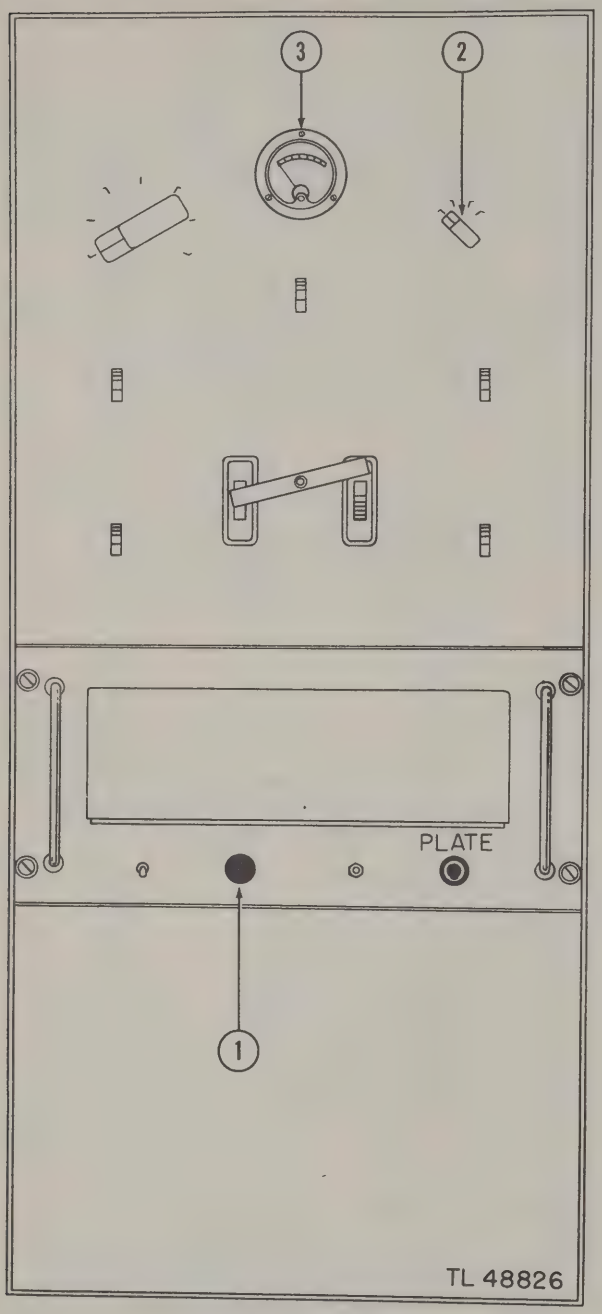


Figure 3-9. Starting procedure, step No. 7.

g. Hold the PLATE switch on the electronic voltage regulator (fig. 3-9) to the ON position momentarily and then release the switch. Provided 10 to 15 seconds have elapsed since step No. 4 was performed, the plate voltage light (1) on the regulator should come on and should stay lighted.

STEP No. 8

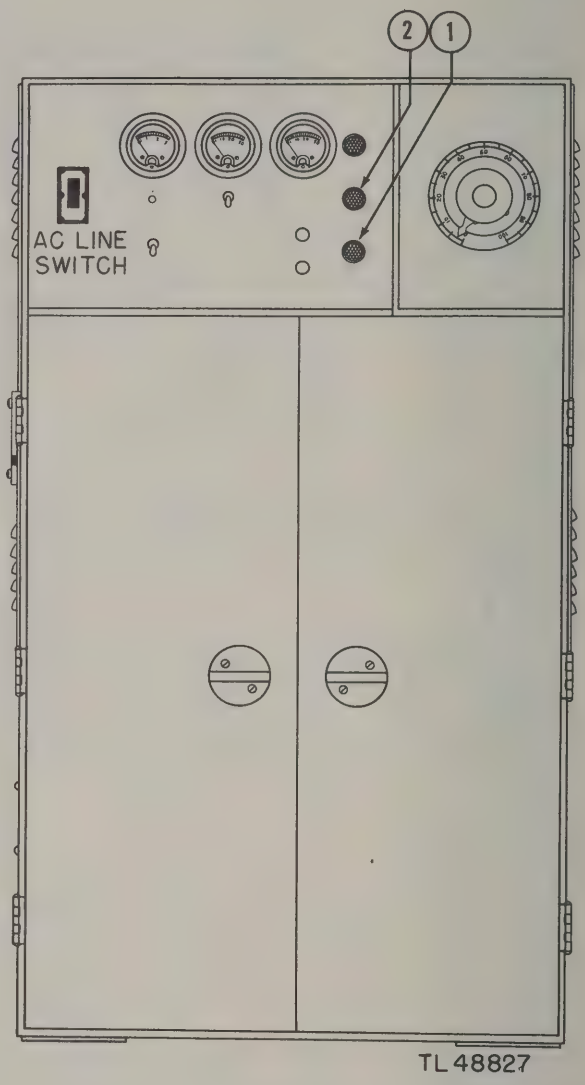


Figure 3-10. Starting procedure, step No. 8.

h. Turn the AC LINE SWITCH on the modulator (fig. 3-10) to ON. The following lights on the modulator should glow:

(1) The FILAMENTS light (1).

(2) The L.V. PLATE light (2).

NOTE: The 3-minute time delay relay in the high-voltage plate circuit is energized in this step. Before step No. 10 can be performed, 3 minutes must elapse.

STEP No. 9

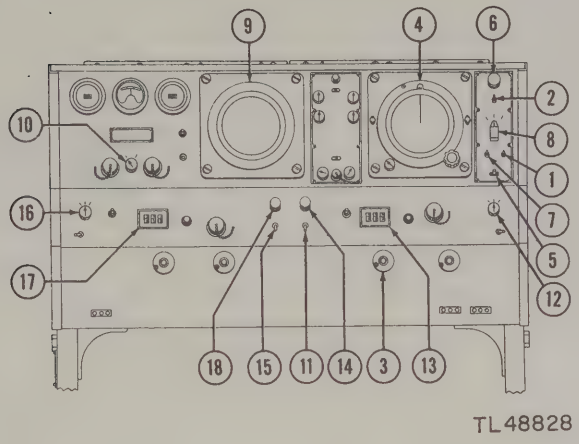


Figure 3-11. Starting procedure, step No. 9.

i. Check the controls on the console (fig. 3-11).

(1) Turn the PPI MARKS switch (1) to ON. Eight range marks should appear along the PPI sweep trace. With the range switch (2) in the 30,000-yard position, a single range mark, the position of which is controlled by the range slewing handwheel (3), should appear on the PPI scope (4) (par. 3-11).

(2) Throw the PPI SLEW switch (5) alternately to the LEFT and RIGHT positions. Check the movements of the PPI sweep trace and the antenna. The procedure for aligning the display components with the telescope and the antenna is given in paragraphs 3-13 through 3-15.

NOTE: The antenna FEED CENTER warning light (6) should go out immediately after the PPI SLEW switch is operated. If the light remains on, maintenance personnel should be consulted before the antenna is operated further.

(3) Turn the slew-scan switch (7) to the PPI SCAN position, and check the continuous movements of the PPI sweep and the antenna.

(4) Throw the selector switch (8) to the B-position. In normal B-operation, the pattern on the B-scope (9) should appear as shown in figure 3-44, with no targets present (par. 3-9).

(5) Turn the expanded-normal switch (10) to EXPANDED. While turning the range slewing handwheel (3), check the pattern on the B-scope. The distance between the vertical azimuth marks should change as the handwheel is turned (par. 3-9). The center vertical mark should remain stationary in this check.

(6) Turn the range AIDED TRACKING switch (11) on, and check the range tracking unit for a change in rate. Throw the range switch (12) to both the SLOW and FAST positions, and observe the movement of the range dials (13) in each position of the switch. The range light (14) should glow when the aided tracking switch is turned on.

(7) Turn on the azimuth AIDED TRACKING switch (15) and check the azimuth tracking unit for a change in rate. Throw the azimuth rate switch (16) to both the SLOW and FAST positions and observe the movement of the azimuth dials (17) in each position of the switch. The azimuth light (18) should glow when the aided tracking switch is turned on.

(8) Check the pattern on the remote B-scope with the pattern shown in figure 3-45. No targets or shell splashes will be present.

STEP No. 10

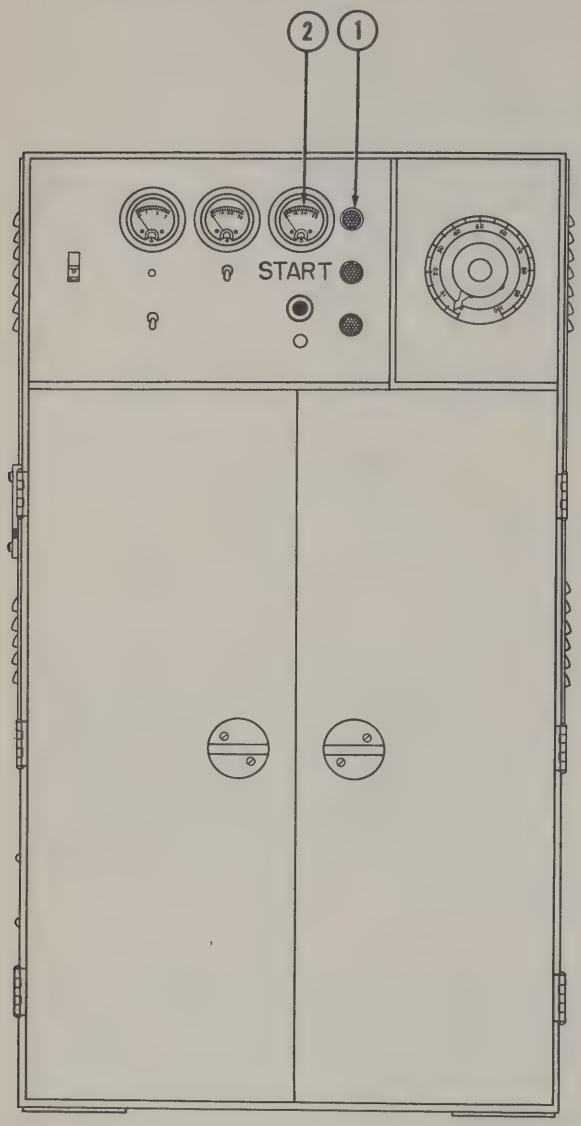


Figure 3-12. Starting procedure, step No. 10.

j. Provided at least 3 minutes have elapsed since step No. 8 was performed, push the START button on the modulator (fig. 3-12).

(1) The H.V. PLATE light (1) glows.

(2) The MOD. PLATE VOLTS meter (2) will indicate approximately 5 kv. This value depends upon the minimum position of the powerstat.

(3) The TRANSMITTER HOURS meter (fig. 3-21) will begin to record the modulator plate hours in tenths of an hour.

STEP No. 11

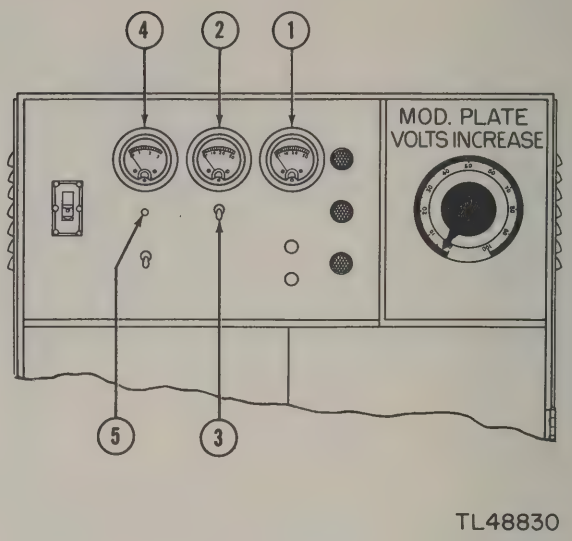


Figure 3-13. Starting procedure, step No. 11.

k. Increase the setting of the MOD. PLATE VOLTS powerstat on the modulator (fig. 3-13) while observing the MOD. PLATE VOLTS meter (1) and MAG.-MOD. CURRENT meter (2). The meter readings should increase steadily as the powerstat setting is increased, thereby assuring normal operation. The switch (3) below the MAG.-MOD. CURRENT meter should be in the MAG. CURRENT position for this step. With the powerstat at near the maximum stop, the PPI and B-scopes should indicate the presence of any target within the range of the radar set (par. 3-8). The following values (representing proper operation) will be read on the three modulator meters:

(1) Magnetron current (MAG.-MOD. CURRENT meter (2)), 10 to 12.5 ma.

(2) Modulator plate voltage (MOD. PLATE VOLTS meter (1)), 10 to 12.5 kv.

(3) Modulator plate current (MAG.-MOD. CURRENT meter (2) with meter switch (3) in MOD. PLATE-SCALE X 2 position), 21 to 28 ma.

(4) Modulator grid current (MOD. GRID CURRENT meter (4) with push button (5) below meter depressed), 0.4 to 0.7 ma.

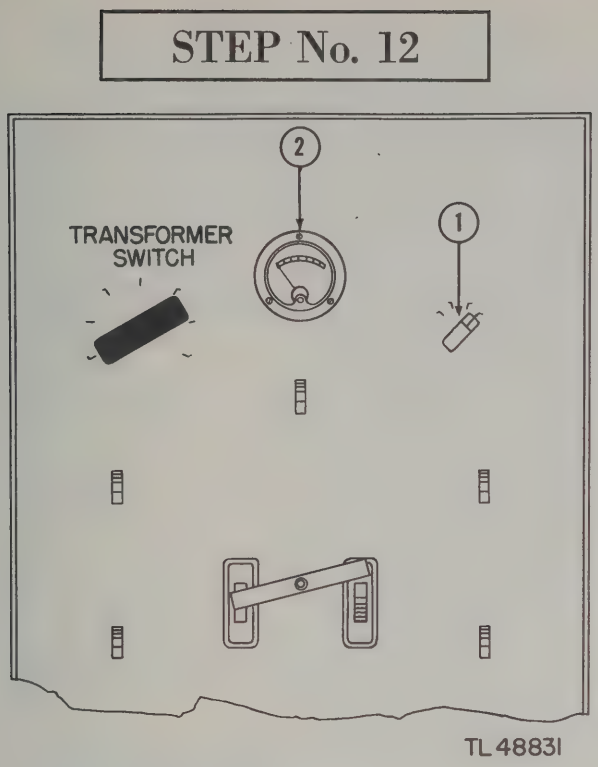


Figure 3-14. Starting procedure, step No. 12.

l. Turn the voltmeter switch (1) on the power panel to the SERVO AC position and adjust the transformer switch (fig. 3-14) so that the voltmeter (2) indicates 115 volts.

3-3. NORMAL STOPPING PROCEDURE.

The following procedure is recommended for stopping the radar set.

a. Turn the MOD. PLATE VOLTS powerstat (fig. 3-13) in a counterclockwise direction to minimum stop.

b. Depress the STOP button (28) (fig. 3-1) on the modulator.

c. Turn the AC LINE SWITCH (fig. 3-10) on the modulator to OFF.

d. Turn the modulator switch (fig. 3-5) on the power panel to OFF.

e. Turn the SERVO switch (fig. 3-8) on the power panel to OFF.

f. Turn the CONSOLE & RECTIFIER PANEL switch (fig. 3-6) to OFF.

g. Turn the antenna heater switch (fig. 3-4) to OFF.

h. Turn the LIGHTS & IFF POWER switch (fig. 3-3) to OFF.

i. Throw the 3 PHASE GAS ENGINE POWER (or 3 PHASE COMMERCIAL POWER) switch (fig. 3-2) to OFF.

3-4. EMERGENCY STOPPING PROCEDURE.

In an emergency, it may be necessary to turn off the radar set in the shortest possible time. To do this, simply turn the AC LINE SWITCH on the modulator (fig. 3-10) to OFF and the 3 PHASE GAS ENGINE POWER (or 3 PHASE COMMERCIAL POWER) switch on the power panel to OFF. When starting the set again, be sure that the preliminary adjustments outlined in paragraph 3-1 are followed.

SECTION II. ALIGNMENT PROCEDURES

3-5. GENERAL.

After Radar Set AN/MPG-1 has been put into operation according to the starting procedure, certain components and systems must be aligned prior to the tactical use of the set. In contrast to the adjustments which are made during the technical operation of the radar set, the procedures discussed in this paragraph are made only when the set is initially installed and at infrequent intervals thereafter. These alignment procedures may be performed individually according to the needs of the radar set. However, at the time of the initial installation, the entire series of procedures should be undertaken in the order presented in this section. Because of the physical location of the components of Radar Set AN/MPG-1, several of the procedures below require the attention of at least two men. The responsibility of each man should be defined clearly before beginning the alignment of any component. Communications between the trailer and the tower is carried on by means of a telephone and bell system.

3-6. RECTIFIER RACK.

Before any adjustments are made in the radar set, the voltages supplied by the rectifier rack are to be checked and, if necessary, corrected. Use the METER RANGE switch and the rectifier rack voltmeter (fig. 3-15) to check the following voltages:

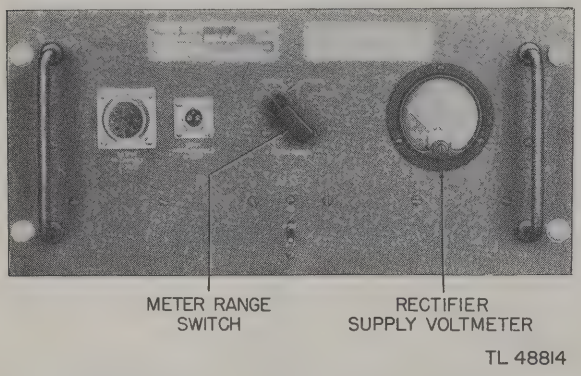


Figure 3-15. Rectifier control panel.

a. –150-volt Supply. With the METER RANGE switch turned to the –150-volt position, the voltmeter should indicate between –148 and –152 volts. To correct an abnormal reading, loosen the four fasteners on the –150-volt supply and pull the chassis forward. With a screwdriver, adjust the –150V ADJUST control, located on the upper side of the chassis (fig. 3-16), until the voltage is within the given limits.

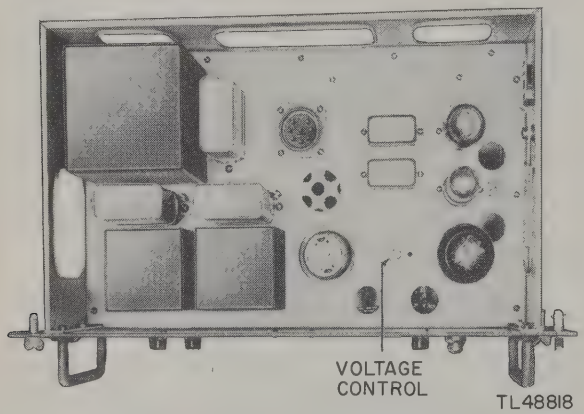


Figure 3-16. –150-volt supply.

b. 300-volt Supply. The voltmeter should indicate 298-302 volts with the METER RANGE switch in the 300-volt position. The voltage control can be reached by loosening the fasteners on the 300-volt regulator unit and pulling the chassis forward. The 300V ADJUST control, located on the upper side of the chassis (fig. 3-17), is adjusted until the meter indicates within the above limits.

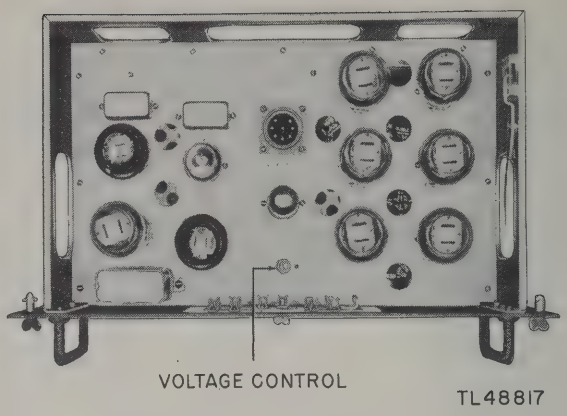


Figure 3-17. 300-volt supply.

c. 500-volt Supply. With the METER RANGE switch in the 500-volt position, the rectifier rack voltmeter should indicate 496-504 volts. The 500V ADJUST control, located on the 500-volt supply (fig. 3-18), is used for voltage correction. Vary the control with a screwdriver until the voltage is within the limits set.

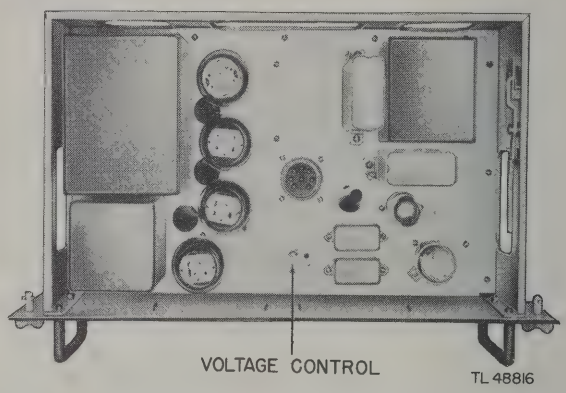


Figure 3-18. 500-volt supply.

3-7. SERVO SYSTEM.

The presence of targets on the scopes is not necessary in this alignment procedure, so that the set need not be put into operation according to the starting procedure except as specified below. Before the servo system is aligned, the antenna is leveled as described in subparagraph **c** below.

a. Turn the 3 PHASE GAS ENGINE POWER switch and the SERVO switch on the power panel (fig. 3-19) to ON.

b. Turn the following switches on the servo rack (fig. 3-20) to ON:

(1) AMPLIDYNE switch.

(2) ANTENNA SERVO POWER switch.

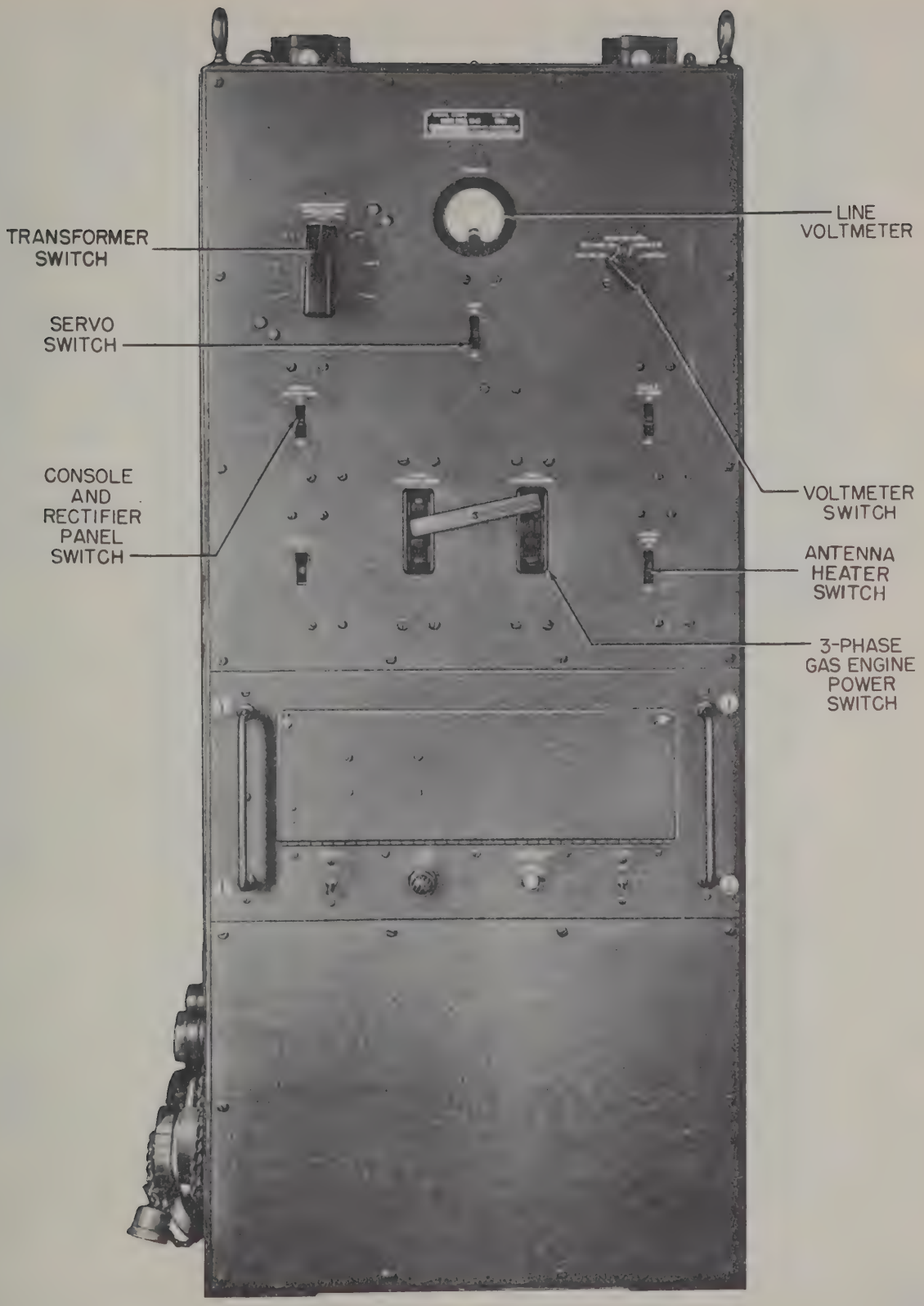


Figure 3-19. Power panel.

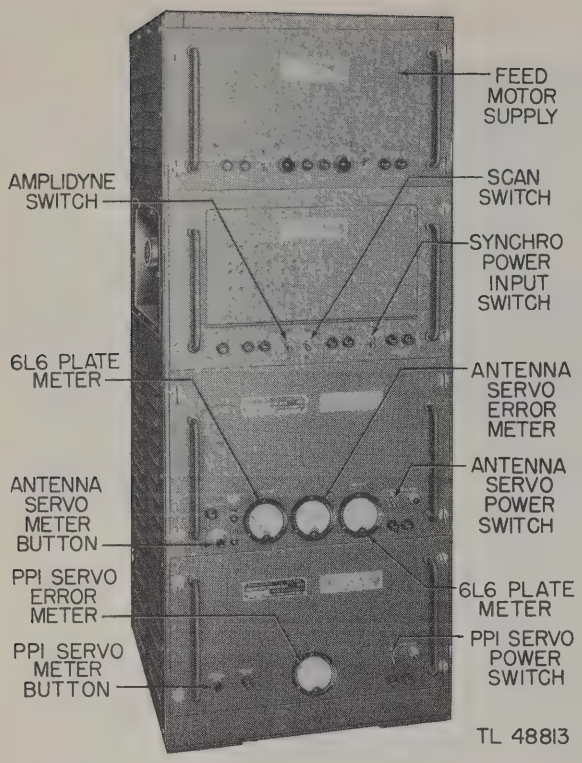


Figure 3-20. Servo rack.

(3) SYNCHRO POWER INPUT switch.

c. Throw the selector switch on the console (fig. 3-21) to the B-position and level the antenna. The leveling procedure is as follows:

(1) Four leveling screws and four adjacent locking nuts are mounted around the base of the pedestal (fig. 3-35). Turn the azimuth slewing handwheel (fig. 3-36) until both ends of the antenna are located above leveling screws.

(2) Loosen the locking nuts, place a level lengthwise on the flat portion of the antenna, and adjust the two leveling screws under the antenna until the antenna is level. Tighten the corresponding locking nuts.

(3) Turn the antenna through 90 degrees so that its two ends are located above the two unadjusted leveling screws. Repeat the leveling process.

(4) Rotate the antenna slowly through a full revolution and check that the antenna is level for all azimuth positions. If necessary, readjust the leveling screws.

d. On the console (fig. 3-21), throw the selector switch to the PPI LOCAL position and the PPI SLEW-SCAN switch to SLEW.

e. To reach the various controls behind the front panel of the antenna servo amplifier (fig. 3-22) release the fasteners on the amplifier drawer and withdraw the chassis so that the mechanical stop is engaged.

f. Set the antenna into motion by means of the PPI SLEW control (fig. 3-21) and observe the antenna servo error meter (fig. 3-20). If the meter movement is extremely erratic (an indication that the antenna is hunting), adjust the 1/1 SYNCHRO ANTI-HUNT control (fig. 3-22) so that the meter needle moves only within the white area of the scale.

g. With the antenna stationary and the antenna servo PUSH TO ZERO METER button (fig. 3-20) depressed, adjust the METER BALANCE control (fig. 3-22) so that the error meter indicates zero.

h. Adjust the AMPLIFIER BALANCE control (fig. 3-22) so that the error meter indicates zero with the antenna stationary.

i. The two 6L6 PLATE current meters (fig. 3-20) should indicate approximately the same value between 20 and 25 ma. Set the AMPLIFIER BIAS control (fig. 3-22) so that these readings are obtained. Readjust the AMPLIFIER BALANCE potentiometer so that the error meter indication is still zero.

j. Turn the AMPLIDYNE switch (fig. 3-20) to OFF and the selector switch on the console (fig. 3-21) to the B-position. Remove the cover from the selsyn compartment (fig. 3-23) at the antenna, and tighten the clamping screws on each of the antenna selsyns. Withdraw the tracking panel in the console and tighten the clamping screws on the 1:1 azimuth selsyn generator (fig. 3-24).

k. Remove the relay switch tube (fig. 3-22) from the amplifier, and uncover the synchronizing relay (fig. 3-22).

l. While one operator holds the armature of the relay closed with an insulated rod (fig. 3-25), turn the AMPLIDYNE switch on, and observe the indication on the antenna azimuth scales when the antenna comes to rest.

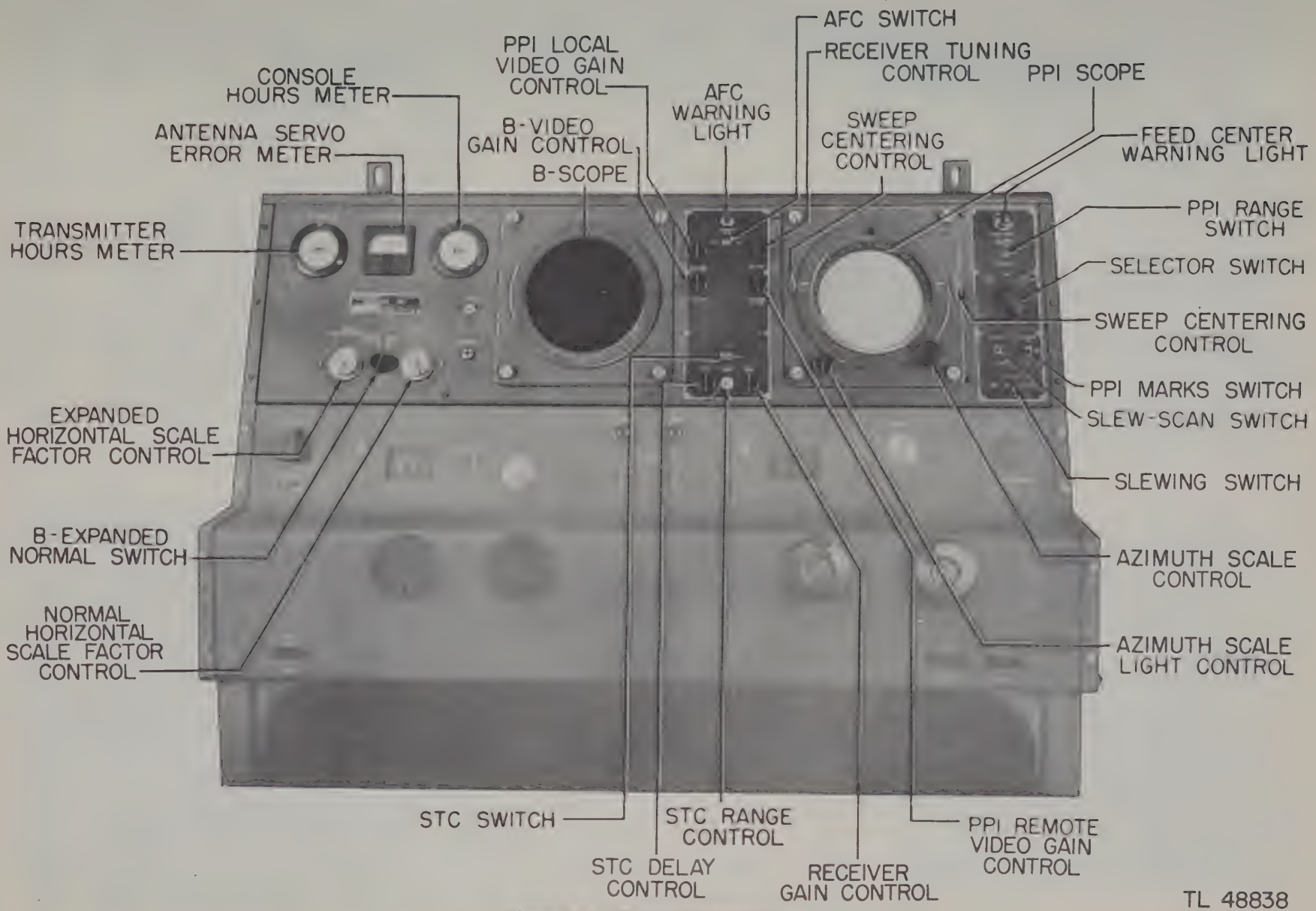


Figure 3-21. Console control panel.

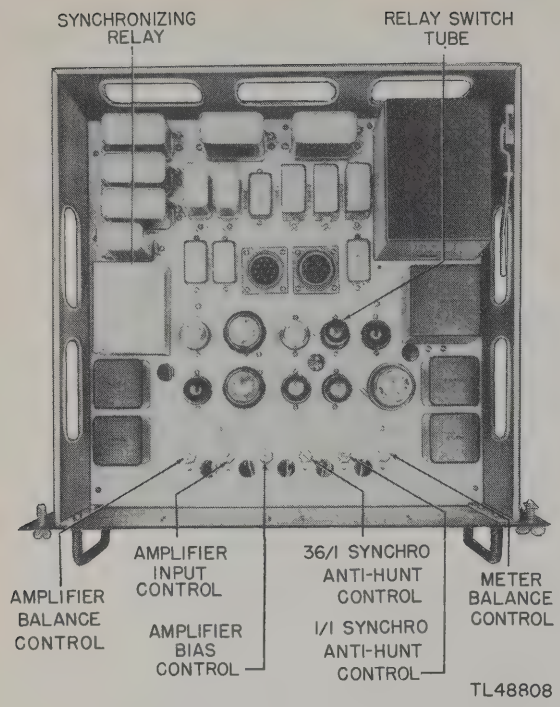


Figure 3-22. Antenna servo amplifier.

m. Release the relay armature and again note the reading of the azimuth scales on the antenna. If the antenna moved when the armature was released, rotate the stator of the 36:1 azimuth selsyn generator (fig. 3-24) until the antenna resumes its original position. Tighten the clamping screws on the 36:1 selsyn generator and replace the relay switch tube.

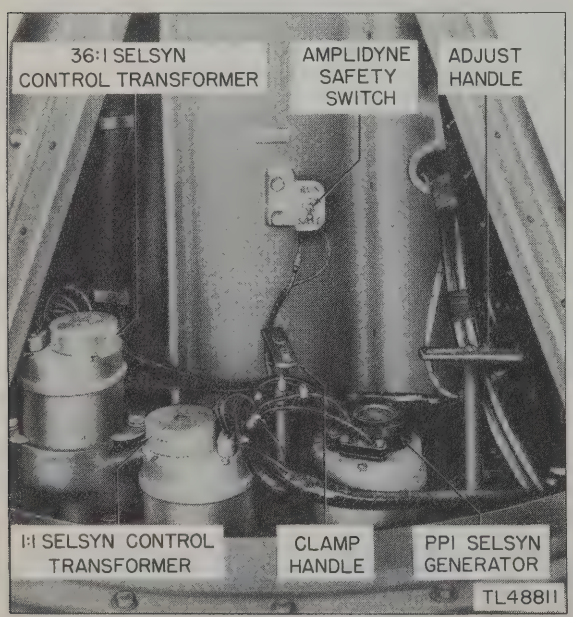


Figure 3-23. Antenna selsyn compartment.

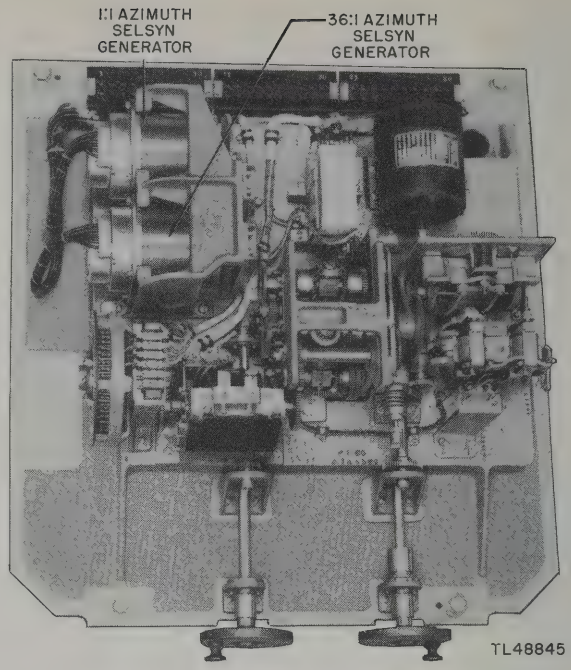


Figure 3-24. Azimuth tracking unit.

n. While turning the azimuth slewing handwheel (fig. 3-36), observe the response of the antenna to the movement of the handwheel. The antenna should respond to the rotation quickly with a minimum of hunting.

(1) If the antenna starts and stops too slowly, vary the setting of the AMPLIFIER

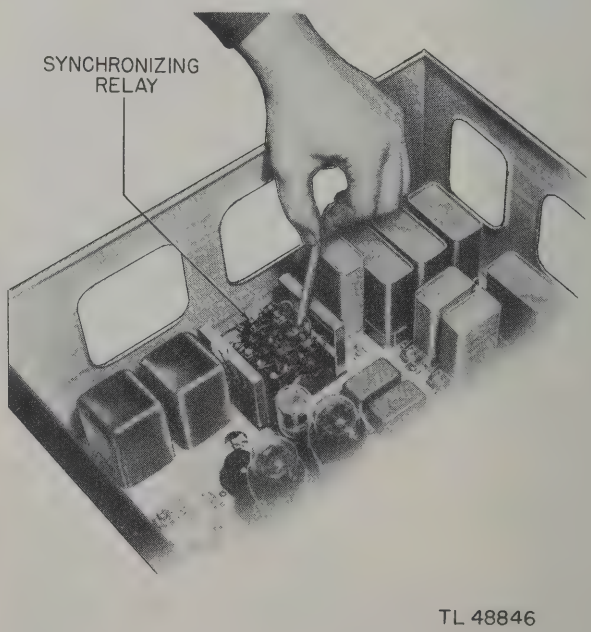


Figure 3-25. Selsyn zeroing procedure.

INPUT control (fig. 3-22) until the movement is satisfactory. Indications of this movement can be observed on the antenna servo error meter.

(2) If the antenna hunts excessively, set the 36/1 SYNCHRO ANTI-HUNT control (fig. 3-22) so that this condition is eliminated. Vary the setting of the two controls in this step alternately until the antenna movement is satisfactory.

> **NOTE:** If, while the antenna is slewing, the error meter indicates *consistently* in the red areas, adjust the AMPLIFIER INPUT control so that the meter needle moves within the white area of the scale.

o. If the proper operation of the antenna cannot be obtained with the adjustments in subparagraph **n**, readjust the AMPLIFIER BIAS potentiometer (fig. 3-22) so that the 6L6 PLATE current meters indicate some new value of current between 20 and 25 ma. Then repeat steps **h** and **n**.

p. Throw the selector switch (fig. 3-21) to PPI LOCAL and, with the antenna slewing, adjust the 1/1 SYNCHRO ANTI-HUNT control (fig. 3-22) so that the antenna operates smoothly.

q. Turn the CONSOLE & RECTIFIER PANEL switch on the power panel (fig. 3-19) to ON. Turn the PPI SERVO POWER switch on the servo rack (fig. 3-20) to ON.

r. To reach the controls behind the front panel of the PPI servo amplifier (fig. 3-26), release the fasteners on the amplifier drawer and slide the chassis forward.

s. Increase the REC. GAIN control (fig. 3-21) until the sweep appears on the PPI scope. If the sweep cannot be produced by means of the REC. GAIN control, increase the setting of the PPI CRT BIAS adjustment (fig. 3-30).

t. Set the antenna into motion by means of the PPI SLEW control, and observe the PPI error meter (fig. 3-20). If the meter movement is extremely erratic, adjust the ANTI-HUNT control (fig. 3-26) so that the meter needle moves only within the white area of the scale.

u. Depress the PUSH TO ZERO METER button (fig. 3-20) and set the METER BALANCE adjustment to make the error meter indicate zero.

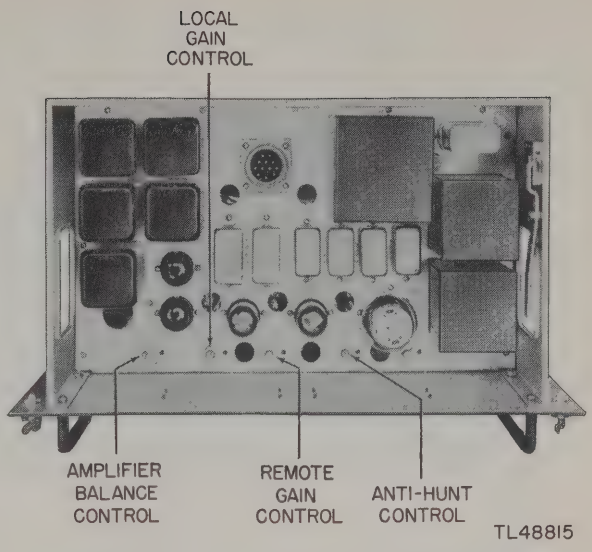


Figure 3-26. PPI servo amplifier.

v. Adjust the AMPLIFIER BALANCE control (fig. 3-26) until the error meter indicates zero with the antenna stationary.

w. Set the antenna into motion by means of the PPI SLEW control, and observe the response of the PPI sweep to the starting and stopping of the antenna. If the sweep movement is erratic (i.e. the sweep hunts), or the response to the antenna is not rapid enough, vary the LOCAL GAIN and ANTI-HUNT controls (fig. 3-26) until the sweep responds accurately to the antenna movement. These adjustments are interacting and must be performed with care.

3-8. RECEIVER.

All necessary adjustments can be made directly at the receiver, without using any of the controls on the console. To obtain optimum performance from the receiver system, perform the following steps in the order given with the entire radar set on:

a. Turn the STC switch on the console (fig. 3-21) to OFF.

b. Release the six lugs which secure the hinged hatch cover on the antenna, and lower the cover.

c. Line up the antenna with a near-by stationary target sighted by the telescope (par. 3-13).

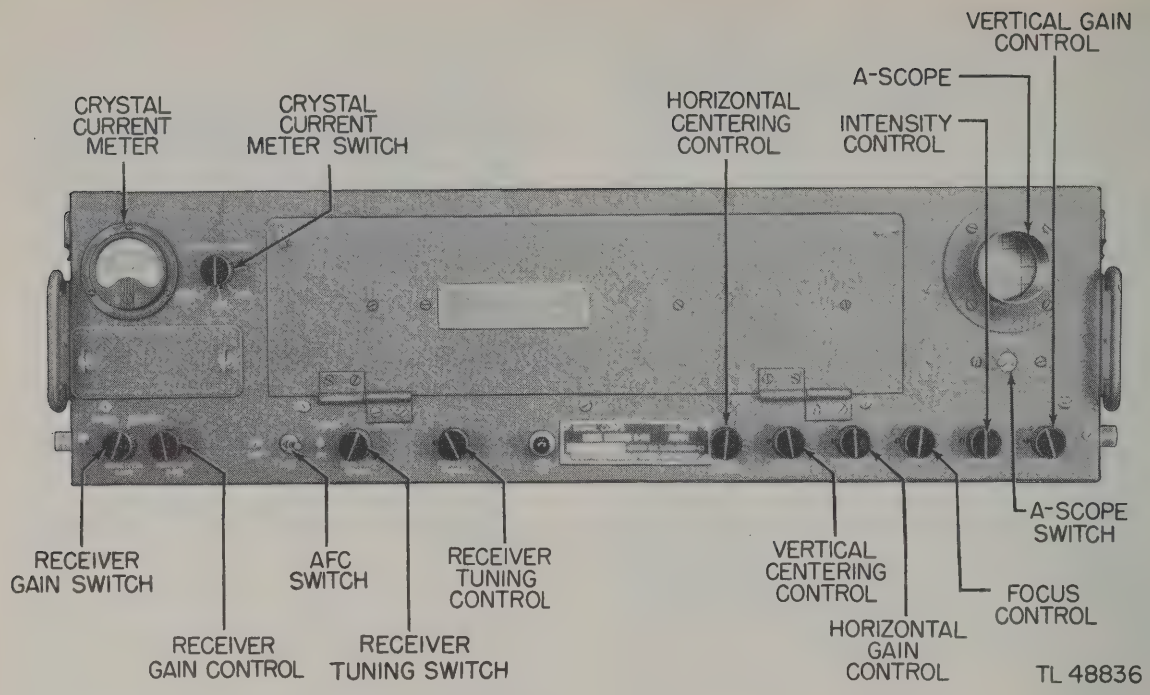


Figure 3-27. Receiver.

d. Turn the AMPLIDYNE switch off.

e. Turn the RECEIVER GAIN and RECEIVER TUNING switches on the receiver (fig. 3-27) to the LOCAL position.

f. Set the RECEIVER GAIN, RECEIVER TUNING, and INTENSITY controls (fig. 3-27) to the extreme counterclockwise position.

g. Set the AFC switch to OFF.

h. Throw the A SCOPE switch to ON.

i. Adjust the A-scope INTENSITY and FOCUS controls (fig. 3-27) for a sweep trace of normal brilliance and clarity.

j. Position the trace on the A-scope with the HORIZ. CENTER and VERTICAL CENTER controls (fig. 3-27).

k. Increase the setting of the RECEIVER GAIN control until grass begins to appear on the A-scope. In the steps that follow, never allow the scope pattern to become saturated.

l. Adjust the HORIZONTAL GAIN and VERTICAL GAIN controls (fig. 3-27) for optimum appearance of the A-scope trace.

m. Vary the RECEIVER TUNING control for an echo of maximum amplitude and stability on the A-scope as shown in fig. 3-28. If an echo cannot be obtained on the scope with the RECEIVER TUNING control, manually move the feed arms until the echo from the selected fixed target appears.

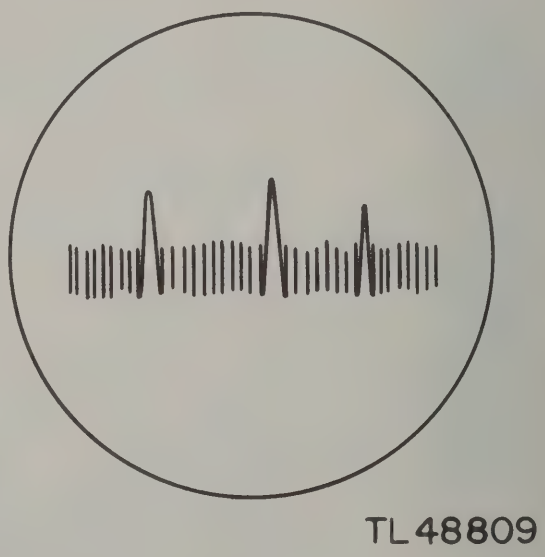


Figure 3-28. Typical A-scope pattern.

CAUTION: Whenever the RECEIVER TUNING control is adjusted, the signal and AFC crystal currents must be checked (fig. 3-27). Throw the CRYSTAL CURRENT switch (fig. 3-27) alternately to the

SIGNAL and the AFC positions while watching the meter. If either current reading is not between 0.4 and 0.6 ma, adjust the appropriate crystal coupling screw (fig. 3-29) until the current is between these limits. To make the crystal coupling adjustments, remove the top cover of the receiver. With a screwdriver, turn the coupling screws on the converter assembly (fig. 3-29) until the crystal current meter indicates approximately 0.5 ma.

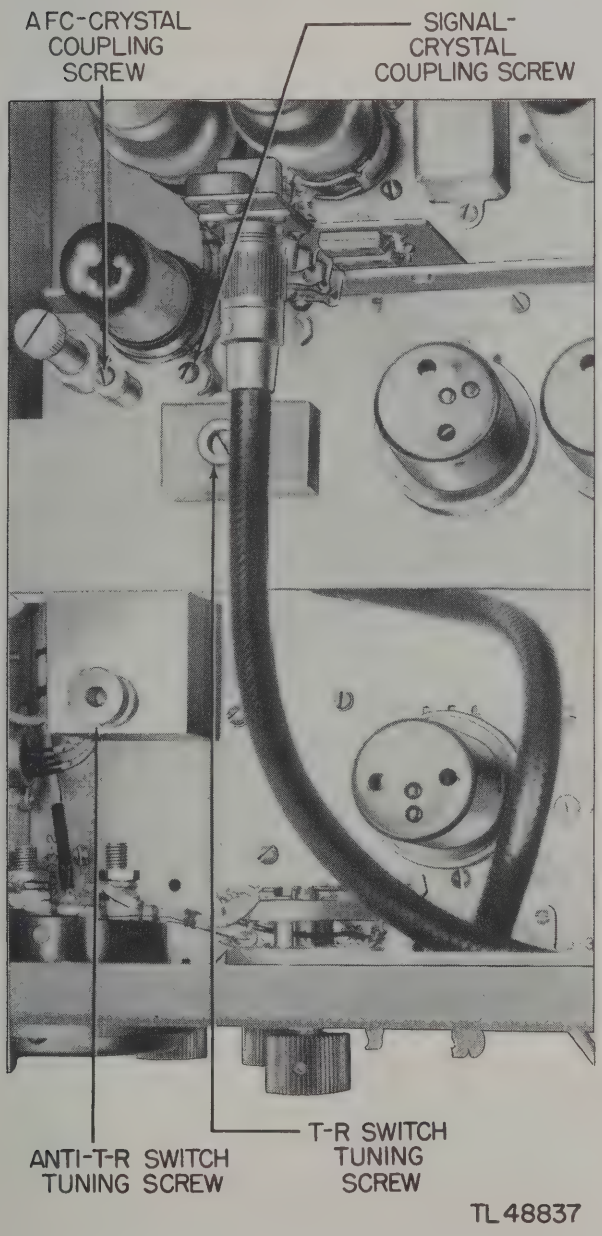


Figure 3-29. Receiver, klystron, and crystal assembly.

n. Turn the AFC switch to ON.

o. Readjust the RECEIVER TUNING control for an echo of maximum amplitude and stability on the A-scope. Turn down the RECEIVER GAIN control until the grass disappears.

p. Adjust the T-R switch tuning screw (fig. 3-29) for maximum signal on the A-scope.

q. Adjust the anti-T-R switch tuning screw (fig. 3-29) for maximum signal on the A-scope. Decrease the setting of the RECEIVER GAIN control as the echo amplitude increases.

> **CAUTION:** When adjusting the crystal coupling screws and the T-R and anti-T-R switch tuning screws, avoid contact with the local oscillator tube which is at a high potential above ground.

r. After completing the tuning procedure at the receiver and before securing the antenna hatch cover, throw the following switches to the positions indicated:

(1) The A SCOPE switch to OFF.

(2) The RECEIVER GAIN and RECEIVER TUNING switches to REMOTE.

(3) The AFC switch to OFF.

s. Turn the AMPLIDYNE switch on the servo rack to ON.

t. Adjust the console REC. TUNE control (fig. 3-21) for maximum display of signals on the PPI scope.

3-9. B-SCOPE.

The following procedure for putting the B-scope (fig. 3-21) into proper operation is to be carried out only at the direction of the person in charge, because several of the controls are critical to adjust.

a. Throw the selector switch to the B-position.

b. Turn the VIDEO GAIN B control to its midposition.

c. Turn the REC. GAIN control to the extreme counterclockwise position.

d. Turn the expanded-normal switch to NORMAL.

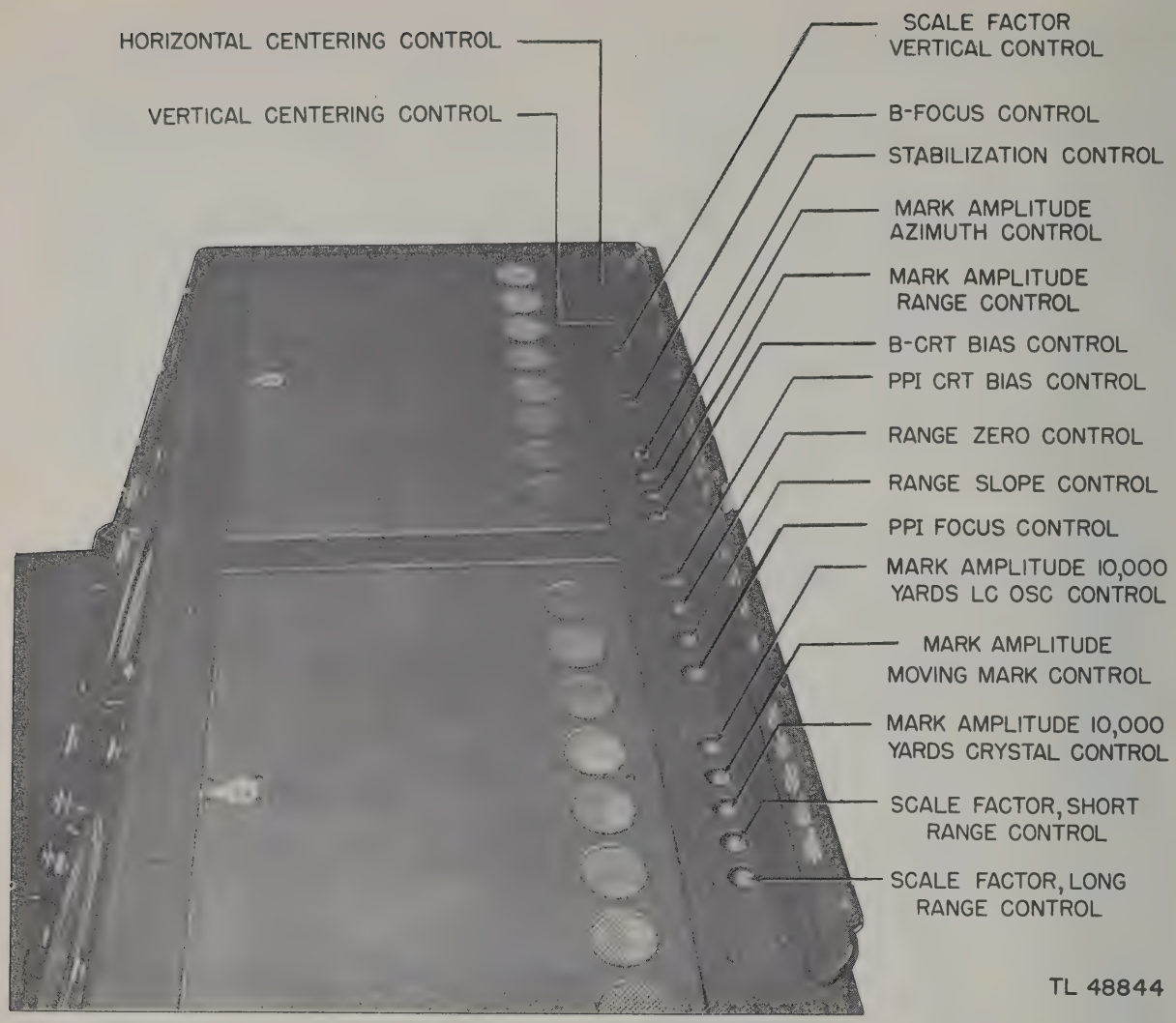


Figure 3-30. PPI and B-scope alignment controls.

e. With the entire radar set on, turn the B CRT BIAS control (fig. 3-30) until a sweep appears on the B-scope. Turn the control counterclockwise until the sweep just disappears.

f. Increase the setting of the MARK AMPL. AZIMUTH control (fig. 3-30) to obtain azimuth marks of normal intensity.

g. Adjust the STABILIZATION control (fig. 3-30) for stationary azimuth marks.

h. Increase the setting of the MARK AMPL. RANGE control (fig. 3-30) to obtain range marks of normal intensity.

i. Adjust the B FOCUS control (fig. 3-30) for optimum appearance of the pattern on the B-scope screen.

j. Set the SWEEP GATE ADJUST control until three range marks (horizontal marks) appear on the B-scope. The control is reached through the top left opening of the console.

k. Vary the settings of the HORIZ. CENTERING and VERTICAL CENTERING controls (fig. 3-30) until the pattern shown in figure 3-44 is centered on the scope screen.

l. Adjust the SCALE FACTOR VERTICAL control (fig. 3-30) so that there is approximately 5 inches between the first and third horizontal lines.

m. Remove the cover plate from the NORMAL HORIZ. SCALE FACTOR adjustment on the front of the console (fig. 3-21) and set the control so that there is approximately

1 inch between the first and third vertical marks.

n. Turn the expanded-normal switch to the EXPANDED position, and set the range slewing handwheel to make the RANGE dials indicate zero yards. A single vertical line should appear on the B-scope.

> **NOTE:** If the vertical line does not appear on the scope, the expansion potentiometer and the range potentiometer in the range tracking unit require adjustment. These potentiometers are factory preset, and adjustments are made only by maintenance personnel.

o. Using the range slewing handwheel (fig. 3-36), set the RANGE dials to 11,430 yards.

p. Remove the cover plate from the EXPANDED HORIZ. SCALE FACTOR adjustment on the front of the console (fig. 3-21) and set the control so that the vertical lines on the scope do not move when switching from normal to expanded B-operation.

> **NOTE:** If the pattern does not remain on the scope when the range is changed, some adjustment is necessary in the range unit. Refer to paragraph 3-10.

3-10. RANGE UNIT.

To insure proper operation of the range unit, it is necessary to establish the correct relationships between the range dials, range potentiometer, and phase shifter in the console. The following steps are to be performed in the order given with the entire radar set on, and prior to the adjustments on the PPI scope (par. 3-11).

a. Throw the selector switch to B.

b. Turn the AFC switch to ON.

c. Using the range slewing handwheel, set the RANGE dials to zero yards.

d. Adjust the REC. GAIN control so that noise and the transmitter pulse appear on the B-scope without any blooming.

e. While watching the B-scope, vary the setting of the RANGE ZERO potentiometer (fig. 3-30). Set the control midway between the two points where the scope pattern becomes unstable.

> **NOTE:** If the transmitter pulse does not appear in step **d**, or if the scope pattern is not stable over most of the RANGE ZERO control range, the range potentiometer requires adjustment (ch. 23, TM 11-1566).

f. Set the RANGE dials to 1,000 yards with the range slewing handwheel.

g. Remove the cover of the RANGE ZERO adjustment on the front of the tracking panel (fig. 3-36). Set the control so that the leading edge of the transmitter pulse coincides with the –1,000-yard mark on the B-scope.

h. While observing the B-scope, increase the range with the range slewing handwheel. Adjust the RANGE SLOPE control (fig. 3-30) so that the pattern is visible up to 28,000 yards.

> **NOTE:** The adjustment of the RANGE SLOPE control will probably necessitate a readjustment of the RANGE ZERO control and of the slope control.

3-11. PPI SCOPE.

Steps **a** through **p** of the following procedure are performed after the radar set has been put into operation by steps 1-9 of the starting procedure (par. 3-2).

a. Throw the selector switch (fig. 3-21) to PPI LOCAL and the PPI RANGE switch to 80,000 YDS.

b. Turn the STC and the PPI MARKS switches to OFF.

c. Turn the following controls to the extreme counterclockwise position:

(1) VIDEO GAIN PPI LOCAL.

(2) VIDEO GAIN PPI REM.

(3) REC. GAIN.

d. Turn the scan switch on the servo rack (fig. 3-20) to the CONT. SCAN position.

e. Adjust the PPI CRT BIAS control (fig. 3-30) until a sweep appears on the scope, and obtain optimum clarity of the sweep by adjusting the PPI FOCUS control (fig. 3-30).

> **NOTE:** When the azimuth slewing handwheel is turned, the sweep should rotate about a single point. Maintenance personnel should be consulted if this condition does not exist.

f. Uncover the CENT. controls on the PPI scope (fig. 3-21) and alternately adjust the controls until the sweep is centered.

g. Turn the PPI SLEW-SCAN switch to the SCAN position.

h. With the PPI MARKS switch turned to ON, adjust the MARK AMPL. 10,000 YDS XTAL control (fig. 3-30) until the range marks are of normal intensity.

i. By means of the SCALE FACTOR LONG RANGE control (fig. 3-30), position the eight range marks so that the eighth range mark circle appears just inside the circumference of the scope.

> **NOTE:** Do not confuse the small circle at the center of the scope with the range marks. Eight mark circles should appear in addition to this smaller circle on the scope.

j. Throw the PPI RANGE switch to 30,000 YDS, and turn the range slewing handwheel until the RANGE dials indicate 10,000 yards.

k. Adjust the MARK AMPL. MOVING MARK control (fig. 3-30) for normal intensity of the single mark circle.

l. Turn the range slewing handwheel until the RANGE dials indicate 30,000 yards.

m. Set the SCALE FACTOR SHORT RANGE adjustment (fig. 3-30) so that the range mark circle appears just inside the circumference of the scope.

n. Reduce the setting of the PPI CRT BIAS control until the sweep just disappears. Readjust the MARK AMPL. MOVING MARK control for normal intensity and the PPI FOCUS control for optimum appearance of the range mark circle.

o. Throw the PPI RANGE switch to 80,000 YDS.

p. Readjust the MARK AMPL. 10,000 YDS XTAL control for normal intensity of the eight range mark circles.

q. Perform steps 10 through 12 of the starting procedure (par. 3-2).

r. Increase the settings of the VIDEO GAIN PPI LOCAL and REC. GAIN controls (fig. 3-21) until targets and grass appear on the scope. Vary the controls until the maximum signal-to-noise ratio is obtained.

> **NOTE:** It is desirable that the same relative signal-to-noise ratio is obtained on both the PPI and B-scopes, so that the REC. GAIN control is the only control which requires adjustment when switching from PPI to B-operation. To accomplish this, throw the selector switch to the B-position and adjust the VIDEO GAIN B control (fig. 3-21) in connection with the adjustments given above until the two signal-to-noise ratios are relatively the same. In doing this it may be found that the MARK AMPL. AZIMUTH, MARK AMPL. RANGE, and B FOCUS controls (fig. 3-30) require readjustment (pars. 3-9**f**, **h**, and **i**).

3-12. STC UNIT.

The procedure described below is performed with the radar set started through step 9 of the starting procedure (pars 3-1 and 3-2).

a. Throw the selector switch (fig. 3-21) to PPI LOCAL, the PPI RANGE switch to 80,000 YDS, and the following console switches to the ON position.

(1) STC switch.

(2) AFC switch.

(3) PPI MARKS switch.

b. Turn the PPI SLEW-SCAN switch to the SLEW position.

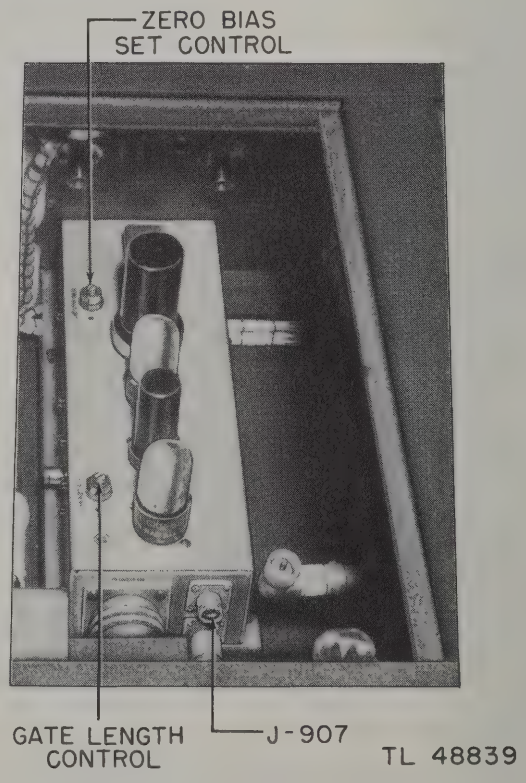


Figure 3-31. STC alignment controls.

c. Increase the setting of the REC. GAIN control until a high level of grass appears on the PPI scope.

d. Open the top right door on the console, and connect the vacuum-tube voltmeter between the center lead of coaxial connector J-907 on the STC unit (fig. 3-31) and ground. Turn the REC. TUNE control completely clockwise and the STC DELAY control completely counterclockwise. Adjust the ZERO BIAS SET control on the STC unit (fig. 3-31) until the meter indicates zero volts. Reverse the meter leads and check the setting just made. Connect the cable to J-907 when the adjustment is completed.

e. Turn the STC DELAY control (fig. 3-21) to the extreme clockwise position.

f. Turn the STC GATE LENGTH control (fig. 3-31) until that part of the PPI sweep nearest the outer circumference of the scope begins to disappear. Vary the movement of the control to bring the sweep length to the eighth range mark.

g. Vary the STC RANGE control (fig. 3-21) until that part of the PPI sweep nearest the center of the scope begins at approximately 14,000 yards instead of at zero yards.

h. Complete the starting procedure (steps 10 through 12) and throw the PPI SLEW-SCAN switch to SCAN.

i. Adjust the REC. GAIN control for normal intensity of targets beyond 14,000 yards.

j. Adjust the STC DELAY control for normal intensity of targets between zero and 14,000 yards.

3-13. ALIGNMENT OF TELESCOPE WITH ANTENNA REFLECTOR.

The telescope (fig. 3-32) is used to indicate accurately the direction in which the antenna is pointing. To do this, the optical axis of the telescope must be adjusted to the electrical axis of the antenna reflector. This alignment is made with the radar set in B-operation.

a. Set the selector switch to the B-position and the expanded-normal switch to NORMAL.

b. Observe the pattern on the B-scope and select a target for tracking. A surface vessel that is moving toward or away from the radar set and holding its course is preferred.

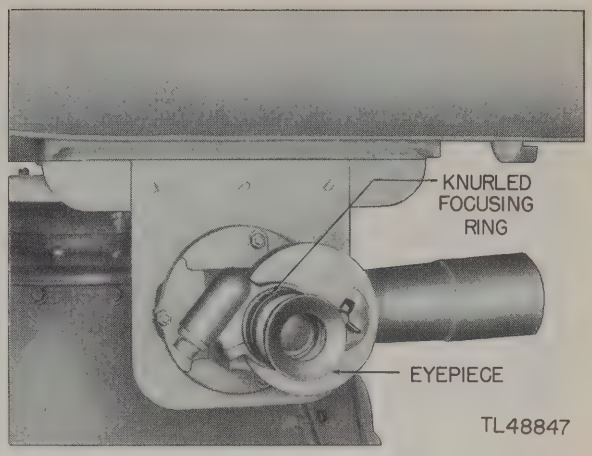


Figure 3-32. Telescope.

c. Look for the target through the telescope and adjust the knurled ring (fig. 3-32) for proper focusing. If the axis of the telescope agrees with the electrical axis of the antenna, the target will be visible through the telescope and will be located at the cross hairs exactly as the target echo is located at the center lines on the B-scope (fig. 3-44).

d. If the target is not visible through the telescope or if the target location is not correct, the position of the telescope must be changed. Movement of the telescope in elevation can be made by loosening the bolts which hold it to the mounting plate. The telescope can be moved in azimuth by loosening the bolt which holds the mounting plate to the antenna. When the telescope has been adjusted so that the selected target is at the cross hairs, tighten the holding bolts.

3-14. ALIGNMENT OF DISPLAY COMPONENTS.

It is necessary to establish the correct relationship of the PPI sweep with the sector-scan dial and the azimuth indicating dials, before aligning the antenna with these display components.

a. Turn the selector switch (fig. 3-21) to PPI LOCAL and the PPI SLEW-SCAN switch (fig. 3-21) to SLEW.

b. With the radar set in operation through step 9 of the starting procedure (par. 3-2), note the azimuth of the PPI sweep. Open the door on the front of the slew-scan unit (fig. 3-33) and check the reading of the sector-scan dial.

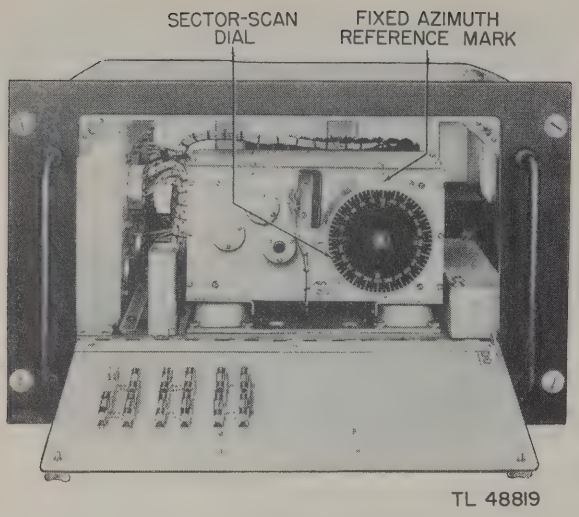


Figure 3-33. Slew-scan unit.

c. If the readings of the sweep and dial are not identical, proceed as follows:

(1) Remove the feed motor supply (fig. 3-20) from the servo rack.

(2) Reach into the slew-scan unit and loosen the three clamping screws on the rear of the sector-scan selsyn (fig. 3-34).

(3) While observing the PPI scope, rotate the selsyn case into the position which makes the azimuth of the PPI sweep correspond to the reading of the sector-scan dial (fig. 3-33). Tighten the selsyn case into this position. Replace the feed motor supply.

(4) Remove the PPI scope cover plate and position the fixed reference mark so that the sweep indicates the *exact* azimuth of the sector-scan dial.

d. Note the reading of the azimuth indicator scales on the antenna (fig. 3-35).

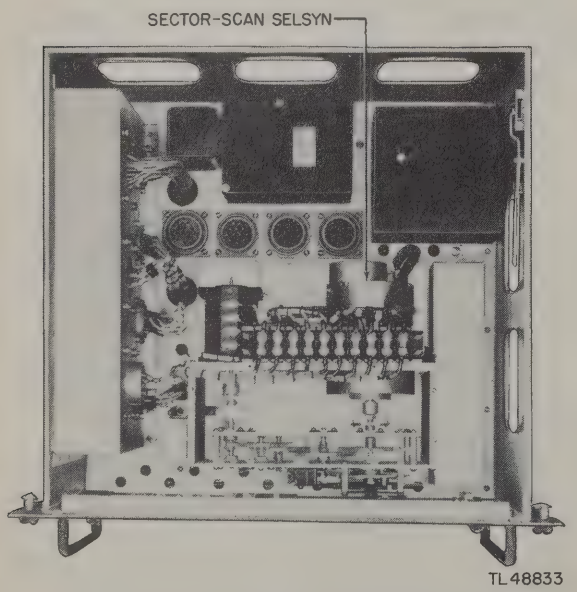


Figure 3-34. Slew-scan unit, top view.

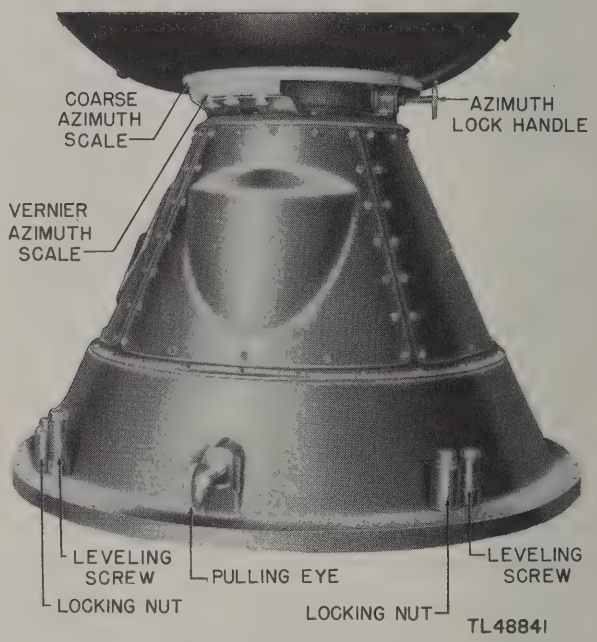


Figure 3-35. Antenna pedestal.

e. With the azimuth slewing handwheel (fig. 3-36), set the AZIMUTH dials to indicate the same azimuth as the PPI sweep and sector-scan dial.

NOTE: The azimuth DETENT WARN. light (fig. 3-36) should be out when the desired azimuth is indicated on the dials.

f. Throw the selector switch to the B-position.

g. Again note the reading of the azimuth indicator scales on the antenna. If the reading is not the same as the one in subparagraph **d** above, adjust the AZ. ZERO control on the console (fig. 3-36) until the azimuth scales indicate the original azimuth.

NOTE: It is not necessary that the reading of the antenna indicating scales correspond to the readings of the sweep, sector-scan dial, and azimuth dials at this time.

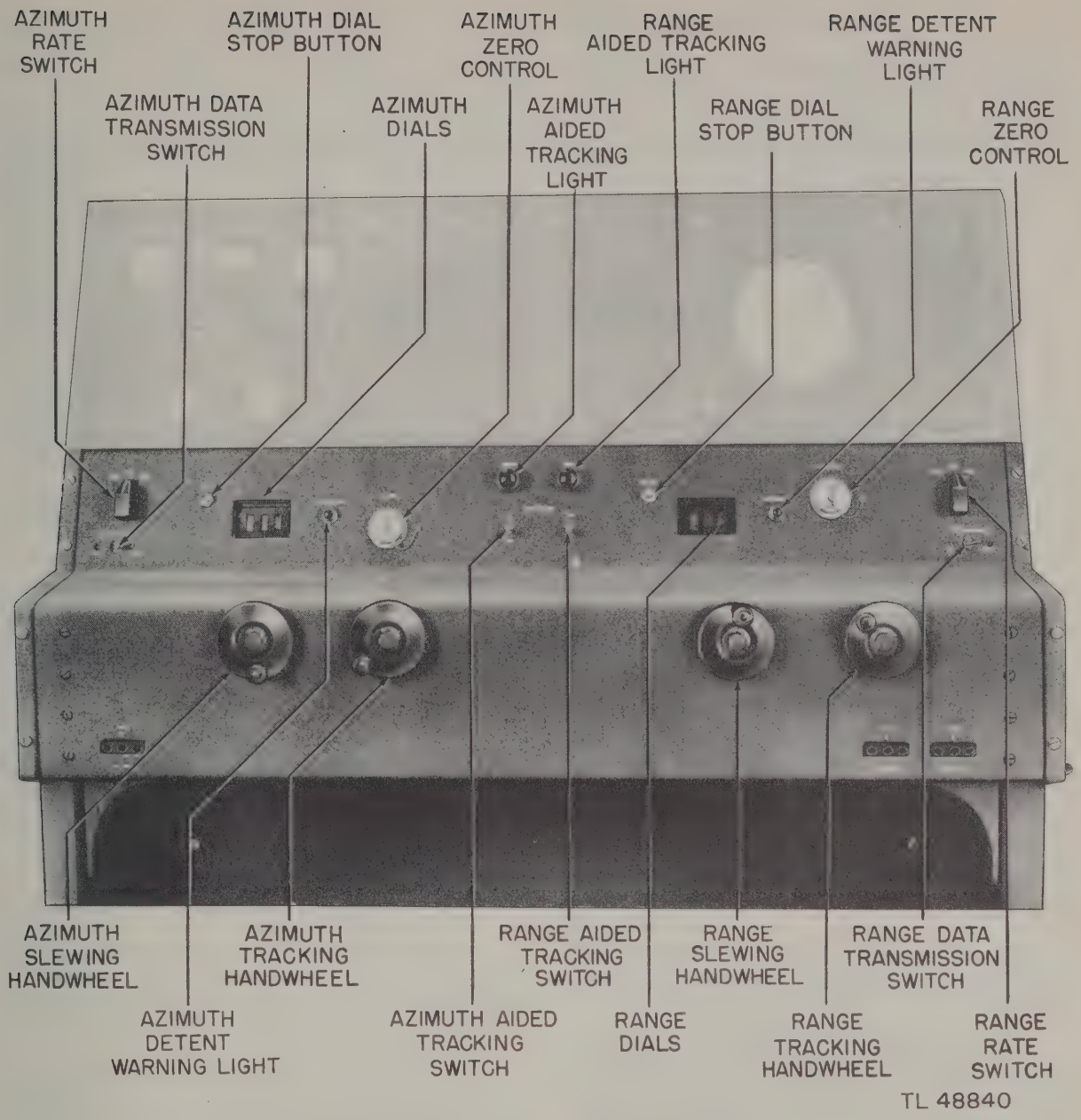


Figure 3-36. Console, tracking controls.

3-15. ALIGNMENT OF ANTENNA WITH DISPLAY COMPONENTS.

Once the PPI scope, sector-scan dial, and azimuth indicating dials bear the same relationship to each other, the antenna can be aligned with respect to these display components. When aligning the antenna with the display components, it is necessary that the azimuth of a fixed target be known accurately. This target should be clearly visible from the top of the tower so that it can be used in orienting the antenna by means of the telescope. To simplify the following procedure, assume that the azimuth of the selected target is 245.28 degrees.

a. Put the radar set into complete operation according to the starting procedure (par. 3-2). Set the selector switch to B-operation and the expanded-normal switch to NORMAL.

b. Since the optical axis of the telescope has been adjusted to the radar beam axis of the antenna (par. 3-13), the telescope (fig. 3-32) is used at the start of this alignment

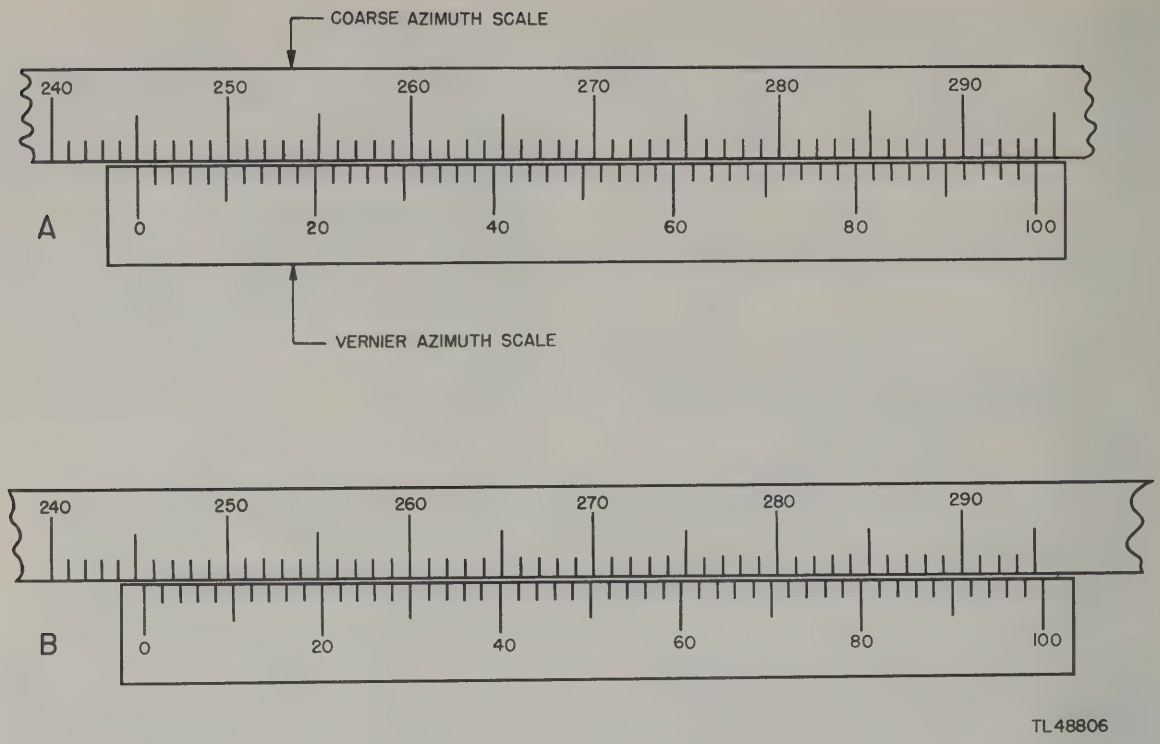


Figure 3-37. Antenna azimuth scales.

procedure. Position the antenna so that the selected target appears at the telescope cross hairs.

c. By means of the azimuth tracking handwheel, accurately position the selected target on the B-scope.

d. On the antenna, set the azimuth indicating scales (fig. 3-35) at the known azimuth. The procedure is as follows:

(1) Loosen the holding bolts on the coarse azimuth scale, and set the 245-degree mark (the value to be used in this example) opposite zero on the vernier scale as shown in figure 3-37A. Tighten the holding bolts.

(2) Loosen the left and right knurled fasteners on the vernier azimuth scale. Note that the position of the 28 mark on the vernier scale is between the 258- and 259-degree marks on the coarse scale. By means of the center knurled knob, move the vernier scale to the *right* until the 28 mark appears opposite the 259-degree mark on the coarse scale (fig. 3-37B). Tighten the knurled fasteners. The antenna azimuth indicating scales are now set correctly in accordance with the known azimuth of the target.

e. By means of the azimuth slewing handwheel (fig. 3-36), set the AZIMUTH dials to indicate the exact azimuth of the target.

> **NOTE:** The azimuth DETENT WARN. light (fig. 3-36) should be out when the desired azimuth is indicated on the dials.

f. Check the reading of the azimuth indicating scales on the antenna (fig. 3-35). If the scales do not indicate the azimuth of the target, proceed as follows:

(1) Remove the hatch cover from the slip-ring compartment in the pedestal base. Reach into the selsyn compartment and push down the ADJUST handle (fig. 3-23) so that the gears can be felt to mesh. With the handle depressed, turn it slightly until the antenna starts to rotate. With an operator observing the B-scope, release the ADJUST handle the instant the target echo appears "on target" on the scope.

(2) Turn the AZ. ZERO adjustment on the front of the console (fig. 3-36) until the target echo is positioned accurately on the B-scope.

(3) If necessary, reset the antenna indicator scales to the *exact* target azimuth.

3-16. SECTOR AZIMUTH SCAN ADJUSTMENT.

Depending upon the tactical conditions, the radar set can be adjusted to scan a desired sector. The *width* of the sector can be varied between 45 and 350 degrees. Once the desired sector has been decided upon, the sector-scan mechanism is set as follows:

a. Lower the door in the front panel of the slew-scan unit (fig. 3-33) and loosen the nut at the center of the sector-scan dial.

b. Set the desired sector by moving the two sector markers (fig. 3-38) so that the *straight* edges of the markers indicate on the dial the selected sector.

c. Tighten the nut, and check the operation of the radar set in sector scanning.

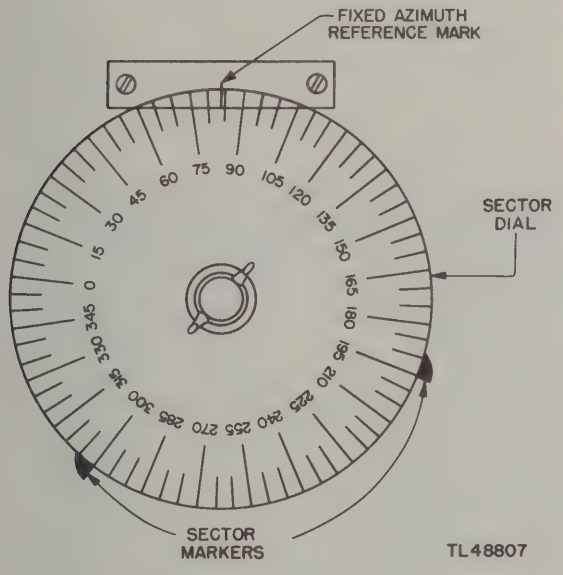


Figure 3-38. Sector-scan dial.

3-17. MINIMUM DISCERNIBLE RECEIVED SIGNAL.

After the alignment procedures described in paragraphs 3-6 through 3-16 have been performed, the minimum received signal which is discernible on the PPI scope should be obtained by means of test equipment. Refer to chapter 13, TM 11-1566 for the test procedure.

3-18. REMOTE B-SCOPE.

The alignment procedure used for putting the remote-B system into proper operation is similar to the procedure used in aligning the local B-scope. The following procedure is suggested for adjusting the focusing, centering, and scale factor controls on the remote B-scope:

a. Check the cables between the console and the remote-B assembly. Check the voltage on the power panel voltmeter with the meter switch in the CONSOLE BC position (fig. 3-19).

b. Align the B-scope on the console according to the procedure given in paragraph 3-9.

c. Turn the MODULATOR switch on the power panel to OFF. Turn the REC. GAIN control on the console fully counterclockwise.

d. Turn the CRT BIAS control on the remote B-scope clockwise until the sweep is visible. Then, turn the control counterclockwise until the sweep just disappears. The azimuth and range marks should now be visible.

e. Adjust the FOCUS control until the marks are focused sharply.

f. Turn the VERTICAL CENTERING control until the –1,000-yard range mark is approximately 1 inch from the bottom of the scope screen.

g. Adjust the HORIZONTAL CENTERING control until the zero azimuth mark is centered on the screen.

h. Set the VERTICAL SCALE FACTOR control until the vertical sweep is approximately 5 inches long.

i. Adjust the HORIZONTAL SCALE FACTOR control until the horizontal sweep is approximately 5 inches long.

j. Turn the MODULATOR switch on the power panel to ON, and increase the setting of the REC. GAIN control.

k. Using a known fixed target as a reference, adjust the VIDEO GAIN, FOCUS, and CRT BIAS controls for optimum pattern on the scope.

SECTION III. TECHNICAL OPERATION

3-19. GENERAL.

a. Radar Set AN/MPG-1 is designed for use with seacoast artillery. The set supplies range and azimuth data on targets to gun positioning apparatus, and splash spotting data for artillery fire correction. No attempt is made in this manual to discuss the tactical factors involved in the use of the equipment.

b. The set also can be used in conjunction with a remote radar set. When so used, scanning data is obtained from the remote radar set, while tracking data is obtained from the local set. The selector switch on the console is set to the PPI REMOTE AND B position for this type of operation. The PPI and B-scopes then have the same appearance as described in paragraphs 3-20 through 3-23 except that the PPI sweep rotates in synchronism with the remote radar antenna.

c. The set is capable of four types of operation. The recommended procedure for each is given in paragraphs 3-20 through 3-23.

3-20. CONTINUOUS AZIMUTH SCANNING.

a. Components Used for Continuous Azimuth Scanning. All Components of the radar set, with the exception of the sector-scan mechanism, tracking system, and B-scope, must function normally for efficient continuous azimuth scanning. The controls and indicating devices on the console used in this type of operation are shown in figure 3-39. The set must have been aligned previously and tuned according to the procedures in section II of this chapter if the information furnished by the radar set is to be of value.

b. Uses of Continuous Azimuth Scanning. Radar Set AN/MPG-1 operates in continuous azimuth scanning to provide information on the location of surface vessels within the maximum range of the set. The PPI scope is designed to give azimuth and range in-

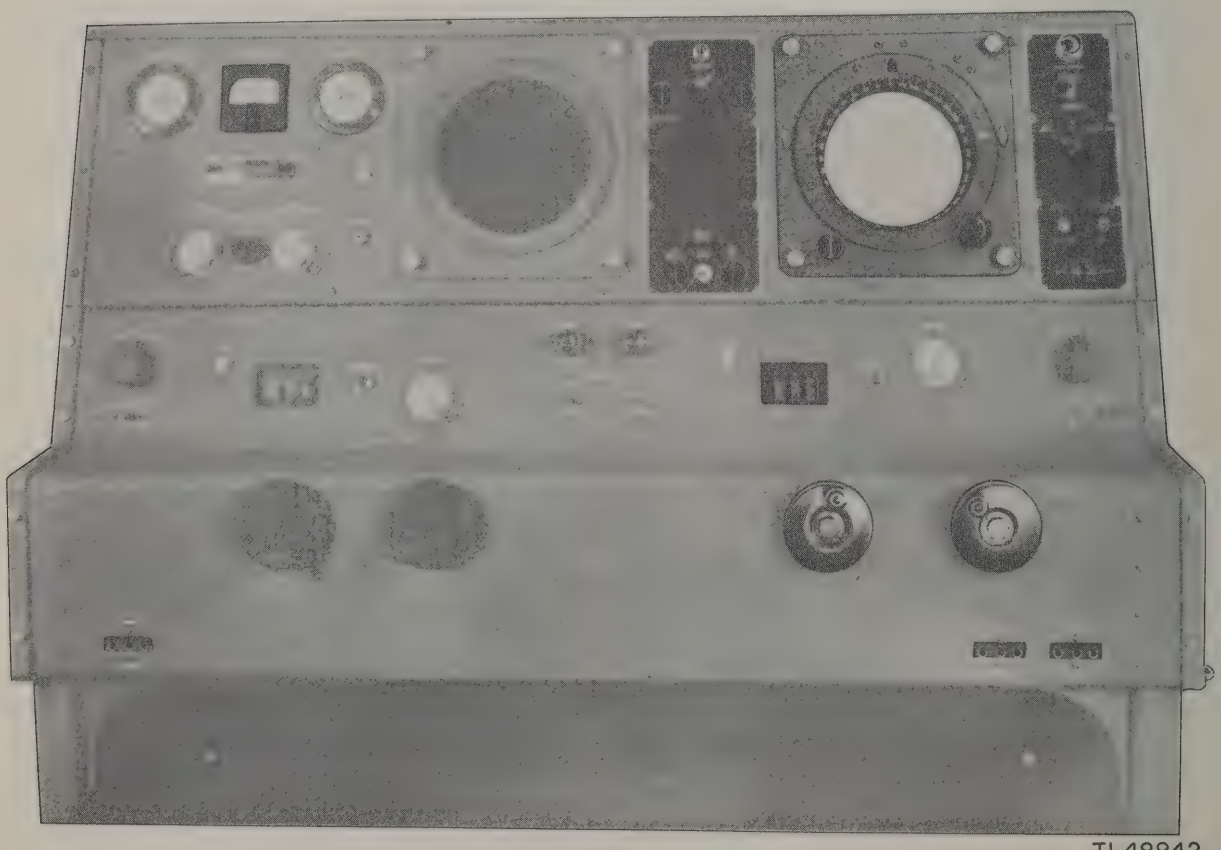


Figure 3-39. Controls and indicating devices used for scanning.

formation. Range between zero and 28,000 yards also is presented on the range dials.

(1) Azimuth of Targets. During continuous azimuth scanning, the radial sweep line on the PPI scope (fig. 3-40) rotates in synchronism with the rotation of the antenna. If the radar set is oriented correctly, the direction indicated on the azimuth scale by the sweep line is the direction in which the axis of the antenna is pointed. Consequently, the direction in which the antenna is pointing at any given time can be read on the azimuth scale of the PPI scope (fig. 3-40). The azimuth of a target is read at the reference mark at the top of the scope (fig. 3-40) by positioning the azimuth indicating line over the target signal. Figure 3-40 shows a target signal at 150 degrees azimuth over which the azimuth indicating line has been placed.

(2) Slant Range of Targets. Slant range of targets is indicated on the PPI scope by the position of a target echo in relation to the range mark rings. These rings are produced electronically and may be made to appear on the scope by means of the PPI MARKS switch (fig. 3-21). With the sweep stationary, the marks appear as bright spots along the sweep trace at points which correspond to fixed distances in yards. When the sweep rotates, each bright spot traces an illuminated ring (fig. 3-40). On long range PPI operation, eight concentric rings appear on the scope. On short range PPI operation, a single ring, the diameter of which is changed by the range slewing handwheel, is used for approximate indications of range.

c. Appearance of Target Echoes On PPI Scope. It is important that the operator be able to distinguish between permanent echoes, atmospheric disturbances, and moving target echoes when the radar set is scanning continuously in azimuth. Only by constant observation and interpretation of the pattern on the PPI scope can the operator put the equipment to the best possible use.

(1) Permanent Echoes and Ground Clutter. The PPI scope will show an irregular, bright pattern of light in the center, the size and outline of which depends upon the nature of the surrounding area (fig. 3-40). Near-by permanent echoes produce more intense signals which merge with the ground clutter pattern on the scope.

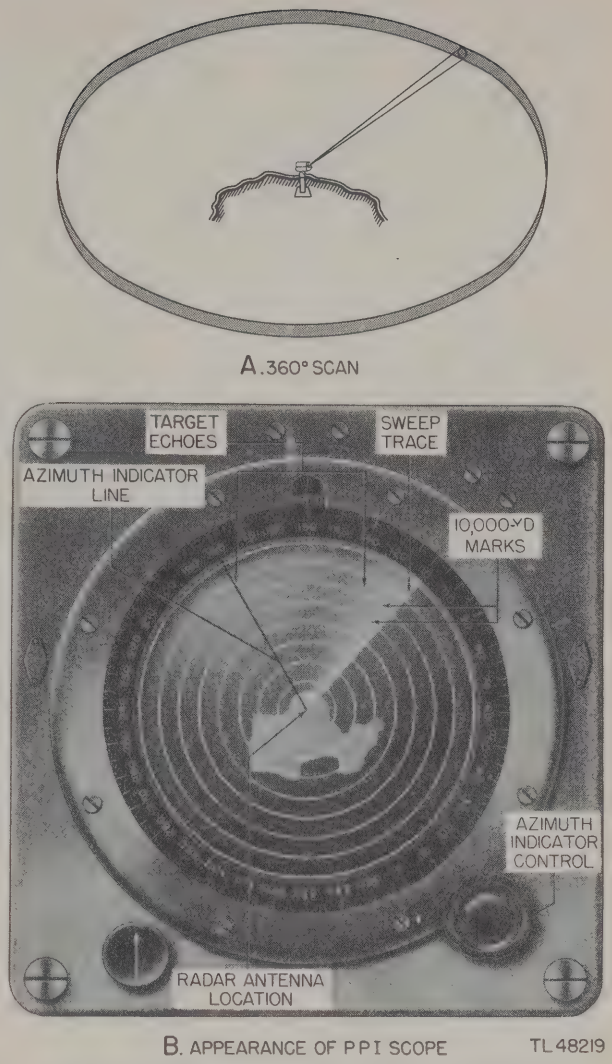
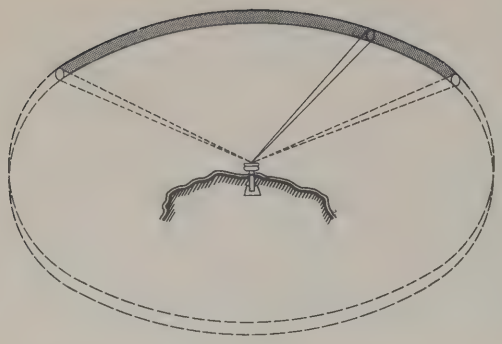


Figure 3-40. PPI operation, continuous azimuth scanning.

(2) Atmospheric Disturbances. Electrical noise and atmospheric disturbances appear as bright spots on the scope and, when first observed, may be confused with target echoes. They can be distinguished from true target echoes, however, because they appear once and then disappear. Regular echoes produce a persistent spot which moves slowly across the screen. False echoes appear and disappear without any regularity in form or position.

(3) Target Echoes. Target echoes appear as short traces of light or as bright spots having an elliptical shape (fig. 3-40). The size and shape of echo patterns depend entirely upon the nature and number of targets



A. SECTOR SCAN



B. APPEARANCE OF PPI SCOPE

Figure 3-41. PPI operation, sector azimuth scanning.

which cause the echoes. The ability to distinguish between stationary and moving targets is based on the fact that a moving target will cause a moving echo, whereas a stationary target will cause an echo which remains fixed in azimuth and range.

(a) Change In Range. Changes in range are shown by changes in the position of the echo with respect to the range mark rings. If the targets between 60,000 and 70,000 yards (fig. 3-40) begin to move toward the antenna, the echoes will disappear from their present positions on the scope and assume new positions closer to the center of the screen. The time required for the antenna (and sweep line) to make one rotation is less than the persistency of the screen, so that the bright spots shown in fig. 3-40 would appear faintly in the background along with the bright spots representing the new positions of the targets.

(b) Changes in Azimuth. Echoes from a surface vessel moving in a straight line across the radar beam would appear on the PPI screen as a bright spot changing continuously in azimuth and range. By adjusting the azimuth scale control (fig. 3-40), the operator can keep the azimuth indicating line (fig. 3-40) always over the moving target echo, and can read the azimuth of the target at the fixed reference mark (fig. 3-40).

d. Adjustments For Continuous Azimuth Scanning. The following adjustments are necessary for this type of operation:

(1) Turn the scan switch on the servo rack (fig. 3-20) to CONT. SCAN.

(2) Turn the selector switch on the console (fig. 3-21) to PPI LOCAL.

(3) Turn the slew-scan switch on the console (fig. 3-21) to PPI SCAN.

(4) Turn the range switch on the console (fig. 3-21) to 80,000 YDS.

(5) Turn the range mark switch on the console (fig. 3-21) to the ON position.

(6) Turn the AFC switch on the console (fig. 3-21) to the ON position.

(7) Adjust the receiver gain control on the console (fig. 3-21) for just enough brilliance on the PPI scope to show signals as individual bright spots on the screen.

3-21. SECTOR AZIMUTH SCANNING.

a. Components Used In Sector Azimuth Scanning. In addition to the components used during continuous azimuth scanning, the sector-scan mechanism is used in this type of operation.

b. Uses of Sector Azimuth Scanning. Sector scanning has essentially the same functions as continuous scanning except that only a desired sector in azimuth is covered. The tactical situation may demand that the radar set be used to search a particular sector of the total azimuth coverage. In Radar Set AN/MPG-1, this operation is performed automatically. However, if it is desired that the width and location of the scan sector be changed readily, in accordance with the immediate tactical situation, manual sector

scanning is available. This type of operation is called *slew scan.* As shown in figure 3-41, the presentation in sector azimuth scanning consists of a map of the selected area on the PPI scope. The size and position of the sector may be changed to include any desired area within 80,000 yards of the radar antenna. In figure 3-41, the scan sector is between 80 and 220 degrees. In sector-scan operation, targets appear in the same form as in continuous scan operation.

c. Adjustments For Sector Azimuth Scanning. Depending upon whether automatic sector scanning or slew scanning is desired, certain adjustments are made in this type of operation. The adjustments are as follows:

(1) Automatic Sector Scanning.

(a) Turn the scan switch on the servo rack (fig. 3-20) to SECTOR.

(b) Set the desired sector by adjusting the sector-scan markers in the slew-scan unit according to the procedure given in paragraph 3-16.

(c) Turn the slew-scan switch on the console (fig. 3-21) to PPI SCAN.

(2) Manual Sector Scanning (Slew Scan).

(a) Turn the scan switch on the servo rack (fig. 3-20) to SECTOR.

(b) Turn the slew-scan switch to PPI SLEW.

(c) In order to slew a desired sector, hold the PPI SLEW switch (fig. 3-21) alternately in the LEFT and RIGHT positions.

d. Procedure. With the radar set scanning the selected sector, the operator continues to observe the direction of movement on long range PPI operation. When the range of the target reaches 30,000 yards, the PPI range switch should be turned to the 30,000 YDS position. The presentation in short-range operation is an enlarged map of part of the 80,000-yard presentation with the exception that only a single range ring appears on the PPI scope (fig. 3-42). The radius of this ring may be varied, so that the ring passes through the target, and the distance to the target may be read directly on the range dials. Azimuth is determined in the same manner as in long-range operation.

3-22. MANUAL TRACKING.

a. Components Used For Manual Tracking. All components of the radar set, with the exception of the sector-scan mechanism, aided tracking system, and PPI scope, must function normally for manual tracking. The controls and indicating devices on the console, used in this type of operation, are shown in figure 3-43.

b. Uses of Manual Tracking. Radar Set AN/MPG-1, in manual tracking operation, provides accurate range and azimuth data on targets within 28,000 yards of the set. The B-scope provides a map which represents a selected section of the PPI search area approximately 10 degrees wide and 2,000 yards deep. The segment appearing on the B-scope is determined by the azimuth of the antenna and the setting of the range-measuring circuits of the radar set. The range and azimuth data at the center point of the map on the B-scope can be read from the range and azimuth dials (fig. 3-44).

(1) Azimuth Of Targets. As shown in figure 3-44, there are three vertical lines (electronically generated) on the B-scope. The left line designates the azimuth of a target (as indicated on the azimuth dials) minus 1 degree, and the right line represents target azimuth (as indicated on the azimuth dials) plus 1 degree. The center line represents exact target azimuth. The azimuth tracking

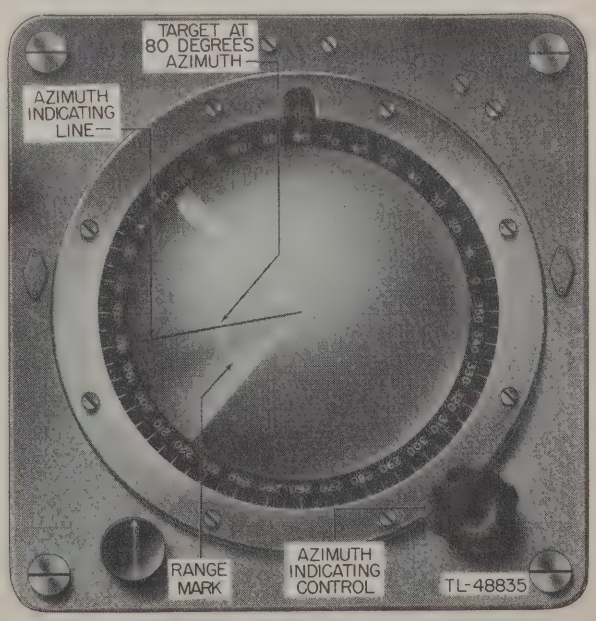


Figure 3-42. Short range PPI operation.

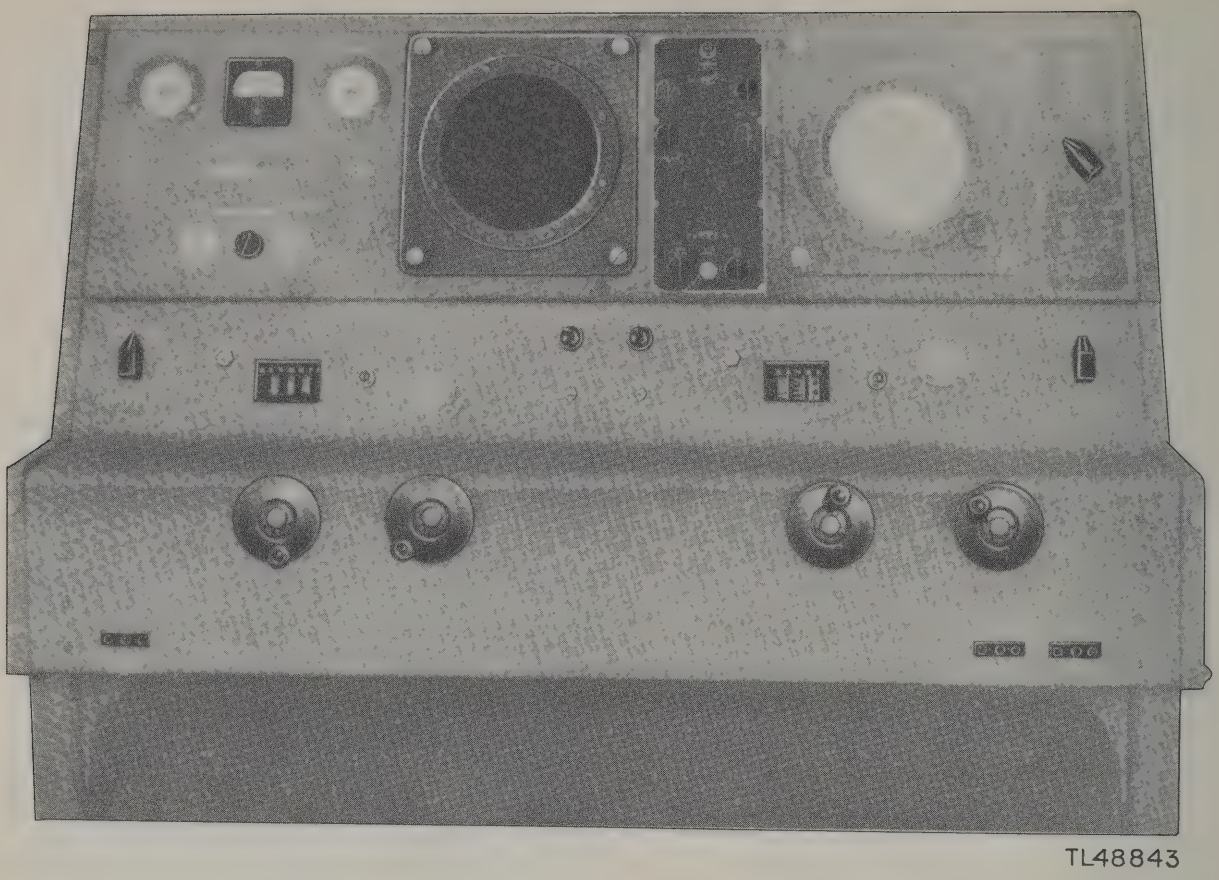


Figure 3-43. Controls and indicating devices used for tracking.

handwheel is operated to keep the target echo continuously intersected by this center line. When the target is positioned properly on this line, the azimuth dials provide an accurate indication of target azimuth in degrees.

(2) Range Of Targets. Besides the three vertical azimuth lines on the B-scope, there are three horizontal lines indicating range (fig. 3-44). The upper and lower lines represent ranges 1,000 yards greater and 1,000 yards less, respectively, than the range indicated by the range dials. The center line designates exact target range. The range tracking handwheel is operated to keep the target echo continuously positioned on this center line (fig. 3-44).

c. Appearance Of Targets On B-scope. Figure 3-44 shows the relationship between the appearance of the B-scope on normal operation and a map of the target area. The range of the target echo at the center of the screen is 17,452 yards from the antenna and the target azimuth is 201.15 degrees from the reference direction (south). If the target moves from its present position (at the intersection of the two center lines), the range and azimuth tracking handwheels may be turned to keep the echo in the proper position. As shown in figure 3-44, the azimuth and range dials indicate the exact position of the "on target" echo. The appearance of targets on the B-scope more nearly represents their actual size and form than their appearance on the PPI scope. With experience in observing target echoes, an operator can become proficient in identifying most echoes on the B-scope. The use of expanded-B operation helps the operator to recognize the individual target more easily.

d. Adjustments For Manual Tracking. The following adjustments are necessary for normal-B operation with manual tracking:

(1) Turn the selector switch on the console (fig. 3-21) to the B-position.

(2) Turn the expanded-normal switch (fig. 3-21) to NORMAL B.

(3) Adjust the receiver gain control so that target echoes appear with the proper brilliance in relation to noise on the screen.

e. Manual Tracking Procedure. Once the echo has been properly "marked" on the PPI scope (fig. 3-42), and operation has been switched to the B-scope, manual tracking of the target is carried on as follows:

(1) Set the azimuth dials to indicate the azimuth of the target, as read on the PPI azimuth scale. Turn the azimuth slewing handwheel for large changes in azimuth and the azimuth tracking handwheel for the final positioning of the target echo at the center vertical line.

NOTE: If the azimuth detent warning light (fig. 3-36) is on after the azimuth slewing handwheel is turned, move the handwheel until the light goes out before using the tracking handwheel.

(2) Turn the range slewing handwheel until the echo appears between the upper and lower horizontal lines. Position the target on the center horizontal line, as shown in figure 3-44, with the range tracking handwheel.

NOTE: If the range detent warning light (fig. 3-36) is on after the range slewing handwheel is turned, move the handwheel until the light goes out before using the tracking handwheel.

(3) Keep the echo at the intersection of the center lines by means of the tracking handwheels. Readings of azimuth and range should now be valid. This data is transmitted electrically to gun-data computers which control artillery fire.

3-23. AIDED TRACKING.

a. Description. Aided tracking enables the operator to follow the target with more accuracy and smoothness than is possible with manual tracking. When a target has been selected and positioned on the B-scope by manual tracking as described in paragraph 3-22, the aided tracking mechanism may be turned on. By operating the tracking handwheels, the speed of the motors in the range and azimuth tracking units can be controlled to keep the B-scope "on target."

b. Procedure. With the target echo properly positioned at the center lines on the B-scope (fig. 3-44), the following procedure is suggested when switching from manual to aided tracking.

(1) Turn the two AIDED TRACKING switches on the console (fig. 3-36) to the ON position.

(2) Depending upon the estimated rate at which the target is moving, as indicated on the B-scope, set the tracking rate switches (fig. 3-36) to the SLOW or FAST position.

(3) While watching the B-scope, turn the two tracking handwheels until the cor-

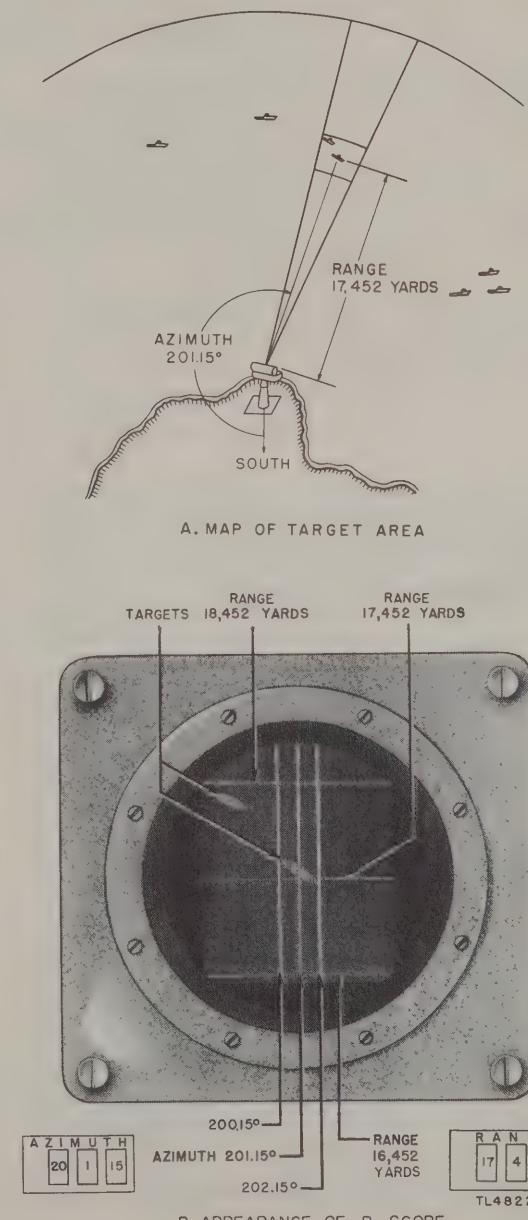


Figure 3-44. Normal B-scope operation.

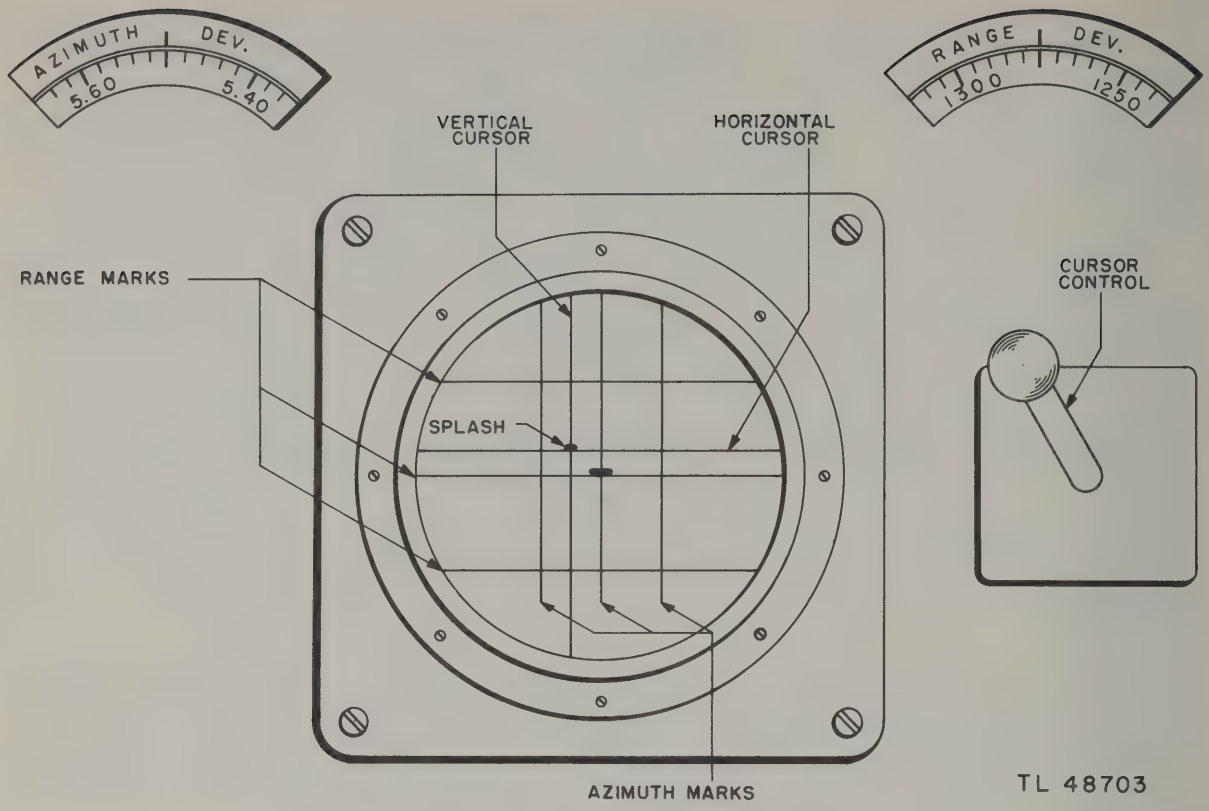


Figure 3-45. Remote B-scope operation.

rect rate is set into the aided tracking mechanism, as indicated by a continuous "on target" appearance of the scope.

3-24. REMOTE-B OPERATION.

Besides the two scopes mounted on the console of Radar Set AN/MPG-1, there is a second B-type scope (fig. 1-17) supplied with the set. This unit, known as the remote B-scope, visually presents the fall of shot at the target and provides data for correcting artillery fire.

a. Appearance Of Targets. The presentation of targets on the remote B-scope is similar to regular B-scope presentation. As shown in figure 3-45, three horizontal lines and three vertical lines, representing range and azimuth respectively, appear on the scope. As in the case of the local B-scope, the area presented is approximately 10 degrees wide and 2,000 yards deep. The appearance of targets and shell splashes is identical to the appearance on the console B-scope.

b. Correction Data Controls. In addition to the six electronically generated lines on the scope, single vertical and horizontal cross hairs are scribed in a cursor over the face of the scope. The cursor can be moved, by means of a lever (fig. 3-45), to position the cross hairs over a target signal. By positioning the cross hairs on the bright spot representing the shell splash, range and azimuth deviation data can be read on the two dials above the scope (fig. 3-45). The indications on the deviation dials represent the range (in yards) and the azimuth (in degrees) of the shell splash in relation to the target location. When the cross hairs are set at the center of the scope in an "on target" position, the range deviation dial indicates 1,000 yards and the azimuth deviation dial indicates 6 degrees. During operation, the indications of the two dials are noted and the information is transmitted by telephone to the operator of the gun-data computer.

CHAPTER 4

EQUIPMENT PERFORMANCE LOG

4-1. PURPOSE.

a. General. An Equipment Performance Log (EPL) has been developed to insure the most efficient technical operation of Radar Set AN/MPG-1. The front of the log sheet is shown in figure 4-1 and the reverse side is shown in figure 4-2. Regular and conscientious use of this *chart of technical operation* will assure the most efficient functioning of the radar set.

b. Functions. The Equipment Performance Log has several functions, as follows:

(1) It directs routine and systematic checks of the equipment performance while the set is on the air and eliminates careless and haphazard methods of technical operation.

(2) It presents the conditions of normal equipment performance and indicates the operating tolerance outside of which meter readings should not be permitted to go, except in emergencies.

(3) It reveals the signs of abnormal functioning and indicates the need for the application of corrective measures. The log trains operating personnel to recognize the evidences of abnormality and to apply corrective measures where possible while the set is on the air.

(4) It aids in the prevention of major break-downs. When signs of irregular operation are discovered, total break-down often may be avoided if the set is turned off immediately and the necessary repair is made.

(5) It provides complete records of equipment performance, since checks are required several times during the operating period of the day. This visible record gives each succeeding watch an itemized picture of the functioning of all components. The more important information on the log may be transferred each day to the Station Record Book, where it can be studied when occasion demands.

4-2. DESCRIPTION.

The Equipment Performance Log comes in pad form and consists of the following parts:

a. Abridged Instructions. For easy reference, an abridged and simplified form of the major instructions for using the EPL is given in the front of each log pad.

b. Log Sheets. There are 35 regular log sheets in each AGF log pad. Each sheet is divided into sections. These sections are divided into items which appear on the front and the back of the sheet.

(1) Front of Log Sheet. The front of the log sheet (fig. 4-1) contains the heading, which consists of Roman numeral items I through VII, and the main part of the log sheet, which consists of Arabic numerals items 1 through 59. Items 1 through 59 may be grouped as indicated below:

(a) Three-times-daily Items. With the exception of items 35, 36, 39, and 40, items 1 through 49 are to be filled in three times a day.

(b) Once-daily Items. Items 35, 36, 39, and 40, are to be filled in daily.

(c) Blank Item Spaces. These spaces are provided for item entries directed by the person in charge.

(d) Weekly Summary Items. Items 50 through 53 are to be filled in once a week.

(e) Signature of Person Keeping Log. Items 54 through 58 provide space for the technician to sign his name and log the time he comes on and goes off duty.

(f) Numbering Log Sheet. Item 59 provides a space for numbering the log sheet.

(2) Back of Log Sheet. The back of the log sheet (fig. 4-2) is divided into the following parts:

(a) Heading. Items I through VI form the heading.

(b) Section A. This space, labeled NOTES, is provided for the description of any abnormal condition and an explanation of the steps that were taken to correct that condition.

(c) Sections B and C. These spaces are provided for a report on the components and the parts installed or removed from the set. Section B is labeled COMPONENT RECORD; section C is labeled PART RECORD.

(d) Section D. This space is provided on the back of the log sheet for such additional entries as are necessary.

4-3. GENERAL INSTRUCTIONS FOR FILLING IN LOG SHEET.

Specific instructions for filling in the separate items and sections of the log sheet are given in paragraphs 4-5 and 4-6. However, the following general rules apply to filling in all items:

a. Normal Condition. The condition of the equipment is considered to be normal if it is operating within the normal tolerance values. Keep the set operating between the points designated by the instructions.

b. Log Entries. Make the proper entries on the log sheet at the correct time intervals and according to the instructions given for each item. Use one log sheet for each 7-day period. The actual reading obtained or observation made is the one recorded on the log sheet, regardless of whether the reading or observation is normal or abnormal. If an entry cannot be made, or if an abnormal condition is found while readings are being taken, enter an asterisk (*) in the appropriate space on the front of the log sheet. Notify the person in charge if an abnormal condition is likely to cause damage to equipment. On the reverse side of the log sheet in section A, explain the reason for the asterisks and state what was done to correct the condition. If an abnormal condition is discovered at any time other than when the readings are being taken, make a note in section A, but omit the asterisk on the front of the log sheet. In general, a meter reading is to be considered abnormal if it is not within the range of values (tolerances) shown in the brackets to the right of the item title on the front of the log sheet. In addition, any sudden shift in a meter reading, even though it is still within the tolerance range, is to be regarded with suspicion, investigated thoroughly, and explained in section A on the back of the log sheet.

c. Method of Making Entries. Make all entries with ink or indelible pencil if either is available. If a mistake is made, do not erase it. Cross out the incorrect entry, and make a new one above it. Do not use ditto marks. Write as neatly as possible; the log sheet is a part of the permanent record. Accuracy is of primary importance, and the entries must be legible enough to be used as a reference.

d. Tolerances. Tolerances may be defined as the low and high values for normal operation. They appear in the brackets to the right of the item titles. Do not permit meter indications to go above or below the stated values. By using specified corrective measures and adhering to the indicated tolerances, operators will be able to keep break-downs at a minimum.

e. Optimum Values. Enter the optimum operating values, such as the meter indications that represent most efficient operation, in the column of parentheses to the right of the brackets.

f. Limits. In certain tactical situations it may be necessary to keep the set on the air regardless of its performance. At such a time it is important for the technician to know at what point he may expect the radar set to fail. Limits, where known, will be found in the discussion of individual items.

g. Units. Make all entries in terms of the units (volts, degrees, hours, etc.) given in

the last column of parentheses to the right of the item titles. The following symbols and abbreviations are used in the units column.

Hr-Min	Hour and minute (i.e. 2245)
°F	Degrees Fahrenheit
Kyd	Kiloyards (thousands of yards)
OK	Unit in good working order
N*	Abnormal condition
Kv	Kilovolts
Ma	Milliamperes
Abbrev	Abbrevation for condition of humidity (see item 5)
Kw	Kilowatts

h. Italicized Items. Check the items printed in *italics* frequently. Keep these items under close watch; they tend to standardize operating conditions by providing a general check on the over-all efficiency of the equipment. Apply corrective measures whenever necessary.

i. Change of Watch Procedure. If a change of watch coincides with a log starting time, both the incoming and outgoing technician takes a set of readings together. If it is not time to take log readings when the new shift reports for duty, the incoming technician checks the last set of readings with the technician being relieved. If the operation of the set is normal, the incoming technician signs the log sheet, thereby assuming responsibility for the performance of the radar set. If the operation is abnormal, make a note in section A and state where the abnormality occurs. Both technicians initial the entry in section A.

4-4. CORRECTIVE MEASURES.

Specific corrective measures to be taken while the set is on the air are not described in the log pad. In paragraph 4-5 they are presented in detail with the discussions of specific procedures for the log items. Corrective measures are measures which can be taken while the set is on the air and are not trouble-shooting procedures. Specific trouble-shooting procedures are given in TM 11-1566.

> **NOTE:** Whenever an item is abnormal, and no corrective measures are given, or those given do not correct the abnormal item, notify the person in charge.

4-5. HOW TO FILL IN FRONT OF LOG SHEET.

ITEM I—RADAR SET AND SERIAL NO.

Enter the serial number of the radar set. The serial number of the set is obtained from the shipping list which is sent to the person in charge.

ITEM II

There is no entry for this item.

ITEM III—ORGANIZATION.

Enter the official designation of the company, platoon, regiment, or other organization charged with the operation of the radar set.

ITEM IV—ADDRESS.

Enter the complete official mailing address of the organization.

ITEM V—LOCATION.

Enter the geographical location of the radar set if within the continental limits of the U. S. A. Otherwise, leave the space blank.

ITEM VI—DATES.

Enter the dates covered by the log sheet.

ITEM VII—SIGNATURE.

After the log sheet has been completed, the person in charge of the radar set checks the log sheet and signs it.

ITEM 1—LOG STARTING TIME.

Sample Entry:

1 Log Starting Time	[A] ( ) (Hr-Min)	0800	1300	2230

Log Entry. Enter in the brackets to the right of the item title the suffix for the time zone in which the station is located. For instance, if the station is located in Italy, enter A. Obtain the *official time zone suffix* from the person in charge. Three columns (A, B, and C) are provided on the log sheet for each day's operation. Begin the first set of log entries in

NOTICE: THIS SHEET IS CLASSIFIED RESTRICTED BECAUSE THE ENTRIES WERE NOT MADE ON A SET IN USE IN THE FIELD. ALL SHEETS ON REGULAR OPERATING SETS ARE CONFIDENTIAL WHEN FILLED IN.

EQUIPMENT PERFORMANCE LOG

RESTRICTED WHEN BLANK
CONFIDENTIAL WHEN FILLED IN

I. RADAR SET AN/MPG-1 SERIAL NO. 487

II.

III. ORGANIZATION 803 C.A. Gun Battery

IV. ADDRESS Lowlands, New Jersey

V. LOCATION Newbury Point

VI. DATES: FROM 18 Feb THROUGH 24 Feb 1945

VII. SIGNATURE C. R. Johnson, Capt. C.A. (Person in Charge)

Month: February Year: 1945

			Sunday 18			Monday 19			Tuesday 20			Wednesday 21			Thursday 22			Friday 23			Saturday 24		
Day:			A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Start First Set of Log Entries 15 Minutes After Station Goes On the Air.																							
1 Log Starting Time	[ ]	( ) ( )	0010	1115	1815	0005	1120	1800	0005	1115	1815	0015	1120	1820	0007	1115	1805	0015	1115	1810	0020	1120	1805
2 Weather Conditions	[ ]	( ) ( )	●	○	○	○	○	●	F	S	F	●	○	○	R	R	F	F	●	●	●	○	○
3 Temperature Outside	[ ]	( ) ( ) °F	38	44	36	32	46	44	38	30	35	30	31	29	33	34	30	29	34	32	36	46	44
4 Temperature Inside	[ ]	( ) ( ) °F	68	72	70	68	72	72	68	68	69	71	71	69	71	71	70	68	72	70	68	72	71
5 Humidity	[ ]	( ) ( ) Abbrev	M	L	L	L	L	M	H	H	H	M	L	L	H	H	VH	H	M	M	M	L	L
6 Power Unit (PU-26/U)	[Oper Cond]	( ) ( ) OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
POWER PANEL																							
7 *A-c Voltage to Modulator (Reg)*	[114-116]	( ) ( ) Volts																					
8 *A-c Voltage to Modulator (Unreg)*	[112-118]	( ) ( ) Volts	115	118	117	115	122*	116	116	116	115	115	115	113	113	113	113	114	114	113	115	115	114
9 *A-c Voltage to Console & Rectifier*	[112-118]	( ) ( ) Volts	115	118	117	116	122*	117	115	115	115	116	116	115	116	117	116	116	115	115	114	113	115
10 *A-c Voltage to Servo*	[112-118]	( ) ( ) Volts	115	118	117	115	122*	116	114	115	115	114	115	114	115	115	114	115	114	113	115	115	116
RECTIFIER RACK																							
11 –150 Volts D-c Supply	[148-152]	( ) ( ) Volts	150	150	145*	150	152	149	151	150	150	149	149	149	150	151	150	149	149	150	149	150	151
12 300 Volts D-c Supply	[298-302]	( ) ( ) Volts	300	301	300	301	301	300	301	301	300	298	299	299	300	300	299	299	300	300	301	299	300
13 500 Volts D-c Supply	[496-504]	( ) ( ) Volts	502	502	503	501	500	501	502	503	501	501	500	500	499	500	500	501	500	500	501	500	501
MODULATOR																							
14 Modulator Grid Current	[0.4-0.7]	( ) ( ) Ma	.6	.6	.5	.5	.6	.6	.6	.5	.5	.6	.6	.65	.6	.7	.7	.55	.6	.6	.6	.55	.6
15 Modulator Plate Voltage	[10.0-12.5]	( ) ( ) Kv	12.5	12.0	12.0	12.0	12.0	12.5	12.0	11.5	11.0	11.5	11.0	11.5	11.0	11.5	11.0	10.5	12.0	12.0	12.0	11.5	11.5
16 Modulator Plate Current	[21-28]	( ) ( ) Ma	24.5	23.5	22.0	24.0	24.5	25.0	23.0	23.5	23.5	23	23	22.5	22.0	22.5	22.0	21.5	24.0	23.5	23.0	22.5	22.5
17 *Magnetron Current*	[10.0-12.5]	( ) ( ) Ma	12.5	12.0	11.5	11.0	11.5	11.5	11.0	11.	11.5	11.0	11.5	12.0	11.5	11.5	12.0	11.0	12.0	12.0	12.0	11.5	11.5
CONSOLE																							
18 Console Hours	[ ]	( ) ( ) Hours	2540	2646	2716	2735	2837	2945	300.5	310.6	317.6	323.6	333.7	340.7	346.5	356.5	363.5	369.6	379.3	386.2	392.4	402.4	409.1
19 Transmitter Hours	[ ]	( ) ( ) Hours	247.5	257.5	264.5	270.4	280.6	287.5	293.4	303.0	310.0	316.0	326.1	333.1	338.9	348.9	355.9	362.0	371.7	378.6	384.2	394.2	399.9
20 PPI Oscilloscope	[Oper Cond]	( ) ( ) OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
21 B-Oscilloscope	[Oper Cond]	( ) ( ) OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
22 Range Zero	[Oper Cond]	( ) ( ) OK-N*	OK	OK	N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
23 Receiver Gain Control	[ ]	( ) ( ) Setting	6	3	5	5	4	7	7	6	4	5	7	6	5	8	6	6	5	3	4	6	7
24 Receiver Tuning	[ ]	( ) ( ) Setting	8	11	10	9	11	12	11	9	10	9	11	12	1	11	10	9	11	12	12	11	11
25 STC Delay	[Oper Cond]	( ) ( ) OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
26 Range Tracking Unit	[Oper Cond]	( ) ( ) OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
27 Azimuth Tracking Unit	[Oper Cond]	( ) ( ) OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
28 Antenna Servo Error	[White Area - 0]	( ) ( ) OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
29 Blower Motor (Console)	[Oper Cond]	( ) ( ) OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	N*	OK	OK	OK	OK	OK	OK	OK	OK
30 REMOTE B-SCOPE	[Oper Cond]	( ) ( ) OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
SERVO RACK																							
31 PPI Servo Error	[White Area - 0]	( ) ( ) OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
32 Antenna Servo Plate Current (Left)	[20-25]	( ) ( ) Ma	22	24	22	23	23	24	22	22	21	22	22	22	23	23	22	22	23	23	23	22	22
33 Antenna Servo Plate Current (Right)	[20-25]	( ) ( ) Ma	22	23	23	22	22	23	22	21	22	22	22	23	22	22	22	23	23	22	22	23	22
34 SERVO MOTOR GENERATOR	[Oper Cond]	( ) ( ) OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
ANTENNA																							
35 Magnetron Blower Motor	[Oper Cond]	( ) ( ) OK-N*		OK			OK			OK			OK			OK			OK			OK	
36 Antenna Heater Blower Motors	[Oper Cond]	( ) ( ) OK-N*		OK			OK			OK			OK			OK			OK			N*	
37 A-Oscilloscope	[Oper Cond]	( ) ( ) OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
38 Signal AFC Crystal Currents	[0.4-0.6]	( ) ( ) Ma	0.5/0.6	0.5/0.5	0.5/0.5	0.5/0.6	0.5/0.4	0.5/0.5	0.5/0.5	0.6/0.5	0.5/0.4	0.4/0.4	0.4/0.5	0.3/0.5	0.5/0.5	0.5/0.6	0.5/0.5	0.5/0.5	0.5/0.5	0.5/0.5	0.5/0.5	0.5/0.6	0.5/0.6
OVERALL CHECKS																							
39 Minimum Discernible Received Signal	[20 %]	(35) ( ) Db		40			33			42			40			35			37			42	
40 Power Output	[20 %]	(100) ( ) Db		110			105			108			103			102			109			105	
41 *Orientation* (Az 281.6 Ra 12.5 0)	[±.05/±.020]	( ) ( ) OK-N*	OK	OK	N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
42 *Maximum Range of Ships*	[ ]	( ) ( ) Kyd	75	78	72	79	77	78	77	72	76	75	75	70	72	71	72	22*	75	76	77	79	75
43 *Maximum Range of Permanent Echoes*	[ ]	( ) ( ) Kyd	45	45	45	49	49	45	49	45	45	45	49	49	45	45	45	26*	45	45	45	45	49
44 *Ground Clutter Range*	[ ]	( ) ( ) OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	N*	OK	OK	OK	OK	OK
45 Log Finishing Time	[ ]	( ) ( ) Hr-Min	0027	1128	1828	0020	1134	1817	0020	1127	1828	0031	1137	1833	0022	1132	1818	0045	1128	1822	0036	1134	1837
46 Operating Time ON		( ) ( ) Hr-Min	0000	1100	—	0000	1100	—	0000	0935	1100	0000	1100	—	0000	1100	—	0000	0045	1100	0000	1100	—
47 Operating Time OFF		( ) ( ) Hr-Min	1000	—	2400	1000	—	2400	0902	1000	2400	1000	—	2400	1000	—	2400	0033	1000	2400	1000	—	2400
48 Operating Time TOTAL		( ) ( ) Hr-Min	1000	—	1300	1000	—	1300	0902	0025	1300	1000	—	1300	1000	—	1300	0033	0915	1300	1000	—	1300
49 Break-down Time TOTAL		( ) ( ) Hr-Min	0000	0000	0000	0000	0000	0000	0033	0000	0000	0000	0000	0000	0000	0000	0000	0016	0000	0000	0000	0000	0000

WEEKLY SUMMARY		TOTALS
50 Hours of Operation	(Hr-Min)	160-11
51 Break-down Time	(Hr-Min)	0-49
52 Console Hours	(Hr-Min)	166-44
53 Transmitter Hours	(Hr-Min)	166-11

SIGNATURE OF PERSON KEEPING LOG	54 Rank	55 Date	57 On	58 Off
Harold Green	T/Sgt	2/18	0000	0800
William Owens	T/A	2/18	0800	1600
Walter Coggan	M/Sgt	2/18	1600	2400
Harold Green	T/Sgt	2/19	0000	0800
Richard Andrews	T/5	2/19	0800	1600
Walter Coggan	M/Sgt	2/19	1600	2400
Richard Andrews	T/5	2/20	0000	0800
William Owens	T/A	2/20	0800	1600
Walter Coggan	M/Sgt	2/20	1600	2400
Harold Green	T/Sgt	2/21	0000	0800
William Owens	T/A	2/21	0800	1600

SIGNATURE OF PERSON KEEPING LOG	Rank	Date	On	Off
Albert Conboy	Cpl	2/21	1600	2400
Harold Green	T/Sgt	2/22	0000	0800
William Owens	T/A	2/22	0800	1600
Walter Coggan	M/Sgt	2/22	0800	1600
Harold Green	T/Sgt	2/23	0000	0800
William Owens	T/A	2/23	0800	1600
Walter Coggan	M/Sgt	2/23	1600	2400
Harold Green	T/Sgt	2/24	0000	0800
Richard Andrews	T/5	2/24	0800	1600
Walter Coggan	M/Sgt	2/24	1600	2400

Make entries in ink. Do not use ditto marks.
Place an asterisk (*) after an abnormal entry.

59 Sheet No. 3

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Figure 4-1. Sample log sheet, front.

column A about 15 minutes after starting the radar set. Fill in column C shortly before shutting down the set. If the operating period is longer than 3 hours, make a set of entries in column B near the middle of the operating period.

ITEM 2—WEATHER CONDITIONS.
Sample Entry:

2 Weather Conditions	[ ] ( ) (Symbols)	○	○	F

Log Entry. Use one or more of the following symbols to indicate the general condition of the weather. In case of any unusual wind or weather conditions, such as aurora (northern lights), which are not included in this list of symbols, enter an asterisk (*) after the log entry and give a description of the condition and any effects on equipment performance under NOTES.

Weather conditions	*Symbol*	*Weather conditions*	*Symbol*
Clear sky	○	Rain	R
Overcast sky	●	Snow	S
Fog	F	Freezing rain	ZR
Haze	H	Sleet	E
Smoke	K	Hail	AP
Dust	D	Thunderstorm	
Mist	M	Lightning visible	

ITEM 3—TEMPERATURE OUTSIDE.
Sample Entry:

3 Temperature Outside	[ ] ( ) (°F)	25	29	40

Log Entry. Record in the log space to the nearest degree the outside temperature in degrees Fahrenheit.

ITEM 4—TEMPERATURE INSIDE.
Sample Entry:

4 Temperature Inside	[ ] ( ) (°F)	60	65	70

Log Entry. Record in the log space to the nearest degree the inside temperature in degrees Fahrenheit.

ITEM 5—HUMIDITY.
Sample Entry:

5 Humidity	[ ] ( ) (Abbrev)	L	L	VH

Log Entry. Enter in the log space one of the following abbreviations which indicates the estimated humidity:

Very Low (air very dry).....VL
Low (air dry).....L
Moderate .....M
High (air damp).....H
Very High (air very damp)....VH

In order to log the humidity without a hygrometer, it is necessary to judge the humidity from the *feel* of the air and from its other effects. The humidity is probably high when: clothing feels damps; there is rain, fog, or haze (from water vapor) ; sweat fails to evaporate; moisture condenses on cold surfaces, the walls of the building *sweat;* the air seems warm and close, damp, or muggy. The humidity is probably low when: the skin and lips chap, the air is cold and crisp, damp clothes dry quickly, visibility is good, or when the nasal passages are drier than usual.

ITEM 6—POWER UNIT.
Sample Entry:

6 Power Unit (PU-26/U) [Oper Cond] ( ) (OK-N*)	OK	OK	N*

Log Entry. Enter in the parentheses immediately to the right of the item title the nomenclature of the power unit in use. Enter OK in the log space if the power unit voltage is steady between 114 and 116 volts, and has a frequency of between 59 and 61 cycles per second. If the power unit does not meet the above requirements, enter N* and explain under NOTES, section A. Power Unit PU-26/U is shown in figure 1-21. The line voltage and frequency reading must be obtained at the power unit.

ITEM 7—A-C VOLTAGE TO MODULATOR, REGULATED.
Sample Entry:

7 *A-c Voltage to Modulator (Reg)* [114-116] ( ) (Volts)	114	115	110*

Log Entry. With the VOLTMETER SWITCH (fig. 3-19) on the power panel set at the MOD. REG. AB position, note the voltmeter reading to the nearest volt.

Corrective Measures. If the meter reading shows only a slight deviation from the desired reading, a minor voltage adjustment can be made by means of the ADJUST MOD. REG. TO 115 VOLTS control on the electronic regulator (fig. 3-19). If an extreme setting of the control is necessary, trouble may be present in the regulator, and reference should be made to chapter 15, TM 11-1566.

ITEM 8—A-C VOLTAGE TO MODULATOR, UNREGULATED.
Sample Entry:

8 *A-c Voltage to Modulator (Unreg)* [112-118] ( ) (Volts)	115	116	120*

Log Entry. With the VOLTMETER SWITCH (fig. 3-19) on the power panel set at the MOD. UNREG. AB position, note the voltmeter reading to the nearest volt.

Corrective Measures. The TRANSFORMER SWITCH at the left of the meter on the power panel (fig. 3-19) can be adjusted to change the meter reading. Move the switch knob until the voltage is within the limits given above.

ITEM 9—A-C VOLTAGE TO CONSOLE AND RECTIFIER.
Sample Entry:

9 *A-c Voltage to Console and Rectifier* [112-118] ( ) (Volts)	115	116	120*

Log Entry. With the VOLTMETER SWITCH set at the CONSOLE BC position, note the voltmeter reading to the nearest volt.

Corrective Measures. When the TRANSFORMER SWITCH (fig. 3-19) was adjusted in item 8 above, the reading for item 9 should have been corrected to within the limits of voltage allowed. If the voltage is outside these limits, refer to chapter 15, TM 11-1566.

ITEM 10—A-C VOLTAGE TO SERVO.
Sample Entry:

10 *A-c Voltage to Servo*	[112-118] ( ) (Volts)	114	115	110*

Log Entry. With the VOLTMETER SWITCH set at the SERVO AC position, note the voltmeter reading to the nearest volt.

Corrective Measures. When the TRANSFORMER SWITCH was adjusted in item 8 above, the reading for item 10 as in the case of item 9, should have been corrected to within the limits of voltage allowed. If the voltage is outside these limits, refer to chapter 15, TM 11-1566.

ITEM 11— –150 VOLTS D-C SUPPLY.
Sample Entry:

11 –150 Volts D-c Supply	[148-152] ( ) (Volts)	–150	–150	–142*

Log Entry. Enter in the log space the –150-volt rectifier voltage, as indicated on the rectifier power panel meter (fig. 3-15). If the voltage is not between –148 and –152 volts, add an asterisk (*) after the entry. To obtain this reading, turn the METER RANGE switch (fig. 3-15) to the –150V position, and read to the nearest 2 volts.

Corrective Measures. This reading should remain steady and within the limits established. If it does not, refer to chapter 18, TM 11-1566.

ITEM 12—300 VOLTS D-C SUPPLY.
Sample Entry:

12 300 Volts D-c Supply	[298-302] ( ) (Volts)	300	301	248*

Log Entry. Enter in the log space the 300-volt rectifier voltage, as indicated on the rectifier power panel meter. If the voltage is not between 298 and 302 volts, add an asterisk (*) after the entry. This reading is obtained by turning the METER RANGE switch (fig. 3-15) to the 300-volt position and reading the meter to the nearest 2 volts.

Corrective Measures. Same as item 11 above.

ITEM 13—500 VOLTS D-C SUPPLY.
Sample Entry:

13 500 Volts D-c Supply	[496-504] ( ) (Volts)	500	500	422*

Log Entry. Enter the 500-volt rectifier voltage, as read on the rectifier control panel meter. Add an asterisk (*) to the entry if the voltage is not between the limits set (496-504 volts). To obtain this reading, turn the METER RANGE switch to the 500-volt position, and read the meter to the nearest 2 volts.

Corrective Measures. Same as item 11 above.

ITEM 14—MODULATOR GRID CURRENT.
Sample Entry:

14 Modulator Grid Current	[0.4-0.7] ( ) (Ma)	.6	.6	.2*

Log Entry. If the meter marked MOD. GRID CURRENT on the panel of the modulator (fig. 3-13(4)) reads between 0.4 and 0.7 ma, enter the value only. If it does not read between these limits, enter the value followed by an asterisk (*). To obtain the reading, depress the PUSH TO READ button below the meter (fig. 3-13(5)), and read meter to nearest 0.05 ma.

Corrective Measures. There is no panel adjustment for this current reading. Therefore, first switch from active to spare tubes, by means of the SPARE TUBES-ACTIVE TUBES SWITCH (fig. 3-1(12)), and if this fails to correct the abnormal reading, refer to chapter 15, TM 11-1566.

ITEM 15—MODULATOR PLATE VOLTAGE.
Sample Entry:

15 Modulator Plate Voltage	[10-12.5] ( ) (Kv)	12.5	12.0	9.5*

Log Entry. Enter the reading of the MOD. PLATE VOLTS meter on the modulator panel (fig. 3-13(1)) to the nearest 0.05 kilovolt. If the voltage is not between the limits set (10-12.5 kv) add an asterisk (*) to the entry and explain under NOTES.

Corrective Measures. To the right of the meter is a control marked MOD. PLATE VOLTS (fig. 3-13) which can be adjusted until the correct reading is obtained on the meter. If a correct reading cannot be obtained within the limits of this control setting, switch from active to spare tubes. If this fails to correct the reading, refer to chapter 15, TM 11-1566.

ITEM 16—MODULATOR PLATE CURRENT.
Sample Entry:

16 Modulator Plate Current	[21-28] ( ) (Ma)	27.5	27	19*

Log Entry. If the meter on the modulator panel (fig. 3-13(2)) marked MAG.-MOD. CURRENT reads between 21 and 28 ma, enter in the log space the value only. If the reading is abnormal, enter the value followed by an asterisk (*). The switch located below the meter (fig. 3-13(3)) should be in the MOD. PLATE-SCALE X 2 position for this reading. Read meter to nearest 0.5 ma.

Corrective Measures. There is no panel adjustment for this control. Therefore, first switch from active to spare tubes, and if this fails to produce a normal reading, refer to chapter 15, TM 11-1566.

ITEM 17—MAGNETRON CURRENT.
Sample Entry:

17 *Magnetron Current*	[10-12.5] ( ) (Ma)	12.5	12.5	13.0*

Log Entry. With the switch located below the MAG.-MOD. CURRENT meter in the MAG. CURRENT position, read the meter to nearest 0.5 ma. The meter should indicate between 10 and 12.5 ma on both PPI and B-operation. If both readings are within the limits set, enter the value of the current on B-operation. If either reading is abnormal,

enter the value followed by an asterisk (*) and explain under NOTES.

Corrective Measures. If the current is abnormal when the modulator plate voltage (item 15) is at its proper value, switch from active to spare tubes. If this fails to correct the reading, refer to chapter 15, TM 11-1566.

ITEM 18—CONSOLE HOURS.
Sample Entry:

18 Console Hours	[ ] ( ) (Hours)	22.6	26.8	30.9

Log Entry. Enter the reading of the CONSOLE HOURS meter (fig. 3-21) to the nearest 1/10 hour.

ITEM 19—TRANSMITTER HOURS.
Sample Entry:

19 Transmitter Hours	[ ] ( ) (Hours)	14.3	18.5	22.6

Log Entry. Enter the reading of the TRANSMITTER HOURS meter (fig. 3-21) to the nearest 1/10 hour.

ITEM 20—PPI OSCILLOSCOPE.
Sample Entry:

20 PPI Oscilloscope	[Oper Cond] ( ) (OK-N*)	OK	OK	N*

Log Entry. Enter OK if the PPI scope (fig. 3-21) is operating normally; enter N* if it is not and explain under NOTES. The PPI scope is operating normally if:

a. The PPI FOCUS control can be adjusted to obtain correct focus.

b. The PPI focus CENT. controls can be adjusted to center the sweep trace on the screen.

c. The PPI CRT BIAS control can be adjusted to produce a trace of proper brilliance.

d. The trace is steady on the screen.

e. When the PPI MARKS ON switch is thrown to the ON position, eight range marks appear on both long range local and remote operation. A single variable mark appears on short range local operation and three marks on short range remote operation.

f. The SCALE FACTOR adjustments (LONG RANGE and SHORT RANGE) can be set to obtain maximum usable area of the screen for both long and short ranges.

g. The amplitude of these range marks can be adjusted for proper brilliance by means of the following controls: MARK AMPL. 10,000 YDS. XTAL; MARK AMPL. MOVING MARK; MARK AMPL. 10,000 YDS. L.C. OSC.

h. The VIDEO GAIN-PPI LOCAL control can be adjusted for proper intensity of targets on the screen.

> **CAUTION:** The settings of the PPI FOCUS, PPI CRT BIAS, and VIDEO GAIN-PPI LOCAL controls are very critical and should be adjusted only by an experienced operator or repairman.

ITEM 21—B-OSCILLOSCOPE.
Sample Entry:

21 B-Oscilloscope	[Oper Cond] ( ) (OK-N*)	OK	OK	N*

Log Entry. Enter OK if the B-scope (fig. 3-21) is operating normally; enter N* if it is not and explain under NOTES. The B-scope is operating normally if:

a. The B FOCUS control can be adjusted to obtain correct focus.

b. The HORIZ. CENTERING and VERTICAL CENTERING controls can be adjusted for proper centering.

c. The B CRT BIAS control can be adjusted to produce a pattern of proper brilliance.

d. The EXPANDED B control causes the pattern on the B-scope to increase as the range is increased, and the NORMAL B control holds the pattern constant in size as the range changes.

e. The SCALE FACTOR controls (NORMAL HORIZ. and EXPANDED HORIZ.) cause the pattern to increase horizontally on normal and expanded B-operation. On normal operation, set the angle marks 1 inch apart at a range of 22,500 yards. On expanded operation at the same range, set the the angle marks 1/2 inch apart.

f. The MARK AMPL. RANGE and AZIMUTH controls can be adjusted to produce the proper brilliance for range and azimuth marks.

g. The STABILIZATION control can be adjusted to keep the pattern steady on the screen.

h. The SCALE FACTOR VERTICAL control can be adjusted to change the vertical size of the scope pattern.

i. The VIDEO GAIN B control can be adjusted to bring targets to proper brilliance on the screen.

> **CAUTION:** The B FOCUS, B CRT BIAS, and the VIDEO GAIN B controls are very critical in their settings and should be adjusted only by an experienced operator or repairman.

ITEM 22—RANGE ZERO ADJUSTMENT.
Sample Entry:

22 Range Zero	[Oper Cond] ( ) (OK-N*)	OK	OK	N*

Log Entry:

a. Set the range dial to 1,000 yards.

b. Enter OK if, on B-operation, the main transmitter pulse is seen with its leading edge on the –1,000-yard mark. Otherwise, enter N* and explain under NOTES.

Corrective Measures. If the pulse does not appear at this mark, adjust the RANGE ZERO control (fig. 3-21) on the console.

ITEM 23—RECEIVER GAIN CONTROL.
Sample Entry:

23 Receiver Gain Control	[ ] ( ) (Setting)	6	7	5

Log Entry. Enter in the log space the setting of the receiver gain control on the console (fig. 3-21). Make the entries according to an imaginary scale numbered like the face of a clock. For instance: ⊖ is 3 o'clock, ⊖ is 9 o'clock, ⊘ is 5 o'clock, and ⊘ is 10 o'clock. Enter the normal setting of the control that produces grass on the PPI scope screen.

Corrective Measures. Turn the receiver gain control to maximum, and adjust the receiver tuning control (fig. 3-21) so that video signals appear on the scope. If no signals appear, refer to chapter 17, TM 11-1566.

ITEM 24—RECEIVER TUNING.
Sample Entry:

24 Receiver Tuning	[ ] ( ) (Setting)	6	7	5

Log Entry: Enter the setting of the REC. TUNE control in the log space. Refer to item 23 for the method of logging. Enter that setting of the control which produces video signals on the PPI and B-scope screens.

Corrective Measures. If the control does not produce video signals, refer to chapter 17, TM 11-1566.

ITEM 25—STC DELAY.
Sample Entry:

25 STC Delay	[Oper Cond] ( ) (OK-N*)	OK	OK	N*

Log Entry. Enter OK if the STC DELAY control varies the intensity of the sweep on the PPI scope for ranges between 0 and 14,000 yards. Otherwise, enter N* and explain under NOTES.

ITEM 26—RANGE TRACKING UNIT.
Sample Entry:

26 Range Tracking Unit	[Oper Cond] ( ) (OK-N*)	OK	OK	N*

Log Entry. Enter OK if a check shows the range tracking unit to be in good working order. If not, enter N*.

a. Check both handwheels (fig. 3-36) on both manual and aided tracking (fast and slow rates).

b. Check to see that the range counter records correctly with the changes in range.

ITEM 27.—AZIMUTH TRACKING UNIT.
Sample Entry:

27 Azimuth Tracking Unit	[Oper Cond] ( ) (OK-N*)	OK	OK	N*

Log Entry. Enter OK if a check shows the azimuth tracking unit to be in good working order. If not, enter N*.

a. Check both handwheels (fig. 3-36) on both manual and aided tracking (fast and slow rates.)

b. Check to see that the azimuth counter records correctly with changes in azimuth.

ITEM 28—ANTENNA SERVO ERROR.
Sample Entry:

28 Antenna Servo Error	[White Area-0] ( ) (OK-N*)	OK	OK	N*

Log Entry. Enter OK if the antenna servo error meter (fig. 3-21) reads as follows on both local and remote operation under the conditions stated below. Otherwise, enter N* and explain under NOTES.

a. When the antenna is stationary, the meter should read zero.

b. When the antenna is rotating, the needle should move consistently within the white area of the meter, although momentary deflections into the red areas are permissible.

c. When the PUSH TO ZERO METER button (fig. 3-20) is depressed, the meter should read zero.

ITEM 29—BLOWER MOTOR (CONSOLE).
Sample Entry:

29 Blower Motor (Console) [Oper Cond] ( ) (OK-N*)	OK	OK	N*

Log Entry. Enter OK in the log space if the operating condition of the blower motor is satisfactory; otherwise, enter N*.

ITEM 30—REMOTE B-SCOPE.
Sample Entry:

30 REMOTE B-SCOPE [Oper Cond] ( ) (OK-N*)	OK	OK	N*

Log Entry. Enter OK if the remote B-scope is operating normally. Enter N* if it is not. The remote B-scope is operating normally if:

a. The remote B FOCUS control can be adjusted to obtain correct focus.

b. The HORIZ CENTERING and VERTICAL CENTERING controls can be adjusted for proper centering.

c. The remote B CRT BIAS control can be adjusted to produce a pattern of proper brilliance.

d. The scale factor controls can be adjusted to change the horizontal and vertical size of the scope pattern.

e. The VIDEO GAIN B control can be adjusted to bring the targets to proper brilliance on the screen.

f. The several controls which affect the range marks can be adjusted to produce proper presentation of marks on the remote B-scope.

ITEM 31—PPI SERVO ERROR.
Sample Entry:

31 PPI Servo Error [White Area-0] ( ) (OK-N*)	OK	OK	N*

Log Entry. Enter OK if the PPI servo error meter (fig. 3-20) reads as follows on both local and remote operation under the conditions stated below. Otherwise, enter N* and explain under NOTES.

a. When the antenna is stationary, the meter should read zero.

b. When the antenna is rotating, the needle should move consistently within the white area of the meter, although momentary deflections into the red areas are permissible.

c. When the PUSH TO READ METER button on the servo rack (fig. 3-20) is depressed, the meter should read zero.

ITEM 32—ANTENNA SERVO PLATE CURRENT.
Sample Entry:

32 Antenna Servo Plate Current (Left) [20-25] ( ) (Ma)	22	23	16*

Log Entry. The 6L6 PLATE meters, located on the panel of the antenna servo amplifier (fig. 3-20), normally should read between 20 and 25 ma. Enter the reading in the log space. If the reading is not within the limits set, enter the value followed by an asterisk (*).

a. Read the left-hand meter to the nearest milliampere for this item, and the right-hand meter for item 33.

b. In items 32 and 33 the antenna must be stationary. An error voltage will change the meter readings above and below the tolerances given.

ITEM 33—ANTENNA SERVO PLATE CURRENT.
Sample Entry:

33 Antenna Servo Plate Current (Right) [20-25] ( ) (Ma)	22	23	16*

Log Entry. Follow directions given for item 32, except read the right-hand meter on the antenna servo amplifier to the nearest milliampere. The readings obtained in items 32 and 33 should be within 5 percent of each other. If they are not, refer to chapter 22, TM 11-1566.

ITEM 34—SERVO MOTOR GENERATOR.
Sample Entry:

34 SERVO MOTOR GENERATOR [Oper Cond] ( ) (OK-N*)	OK	OK	N*

Log Entry. Enter OK in the log space if the operating condition of the servo motor generator is satisfactory; otherwise, enter N*.

ITEM 35—MAGNETRON BLOWER MOTOR.
Sample Entry:

35 Magnetron Blower Motor [Oper Cond] ( ) (OK-N*)	OK	OK	N*

Log Entry. *Once daily* enter OK in the log space if the operating condition of the magnetron blower motor is satisfactory; otherwise, enter N*.

ITEM 36—ANTENNA HEATER BLOWER MOTORS.
Sample Entry:

36 Antenna Heater Blower Motors [Oper Cond] ( ) (OK-N*)	OK	OK	N*

Log Entry: *Once daily* enter OK in the log space if the operating condition of the blower motors is satisfactory; otherwise, enter N*.

a. Unless the weather is adverse, these motors may not be in use. To check them, turn the ANTENNA HEATER switch on the power panel (fig. 3-19) to the ON position.

b. After the motors have been on for approximately 5 minutes, proper operation of the thermostat can be checked by listening for repeated clicks at the thermostat.

ITEM 37—A-OSCILLOSCOPE.
Sample Entry:

37 A-Oscilloscope [Oper Cond] ( ) (OK-N*)	OK	OK	N*

Log Entry. Enter OK if the A-scope (fig. 3-27) is operating normally; enter N* if it is not and explain under NOTES. The A-scope is operating normally if:

a. The FOCUS control can be adjusted to obtain correct focus.

b. The INTENSITY control can be adjusted to produce a pattern of proper brilliance.

c. The VERTICAL CENTER and HORIZONTAL CENTER controls can be adjusted to place the pattern properly in the center of the scope screen.

d. The VERTICAL GAIN and HORIZONTAL GAIN controls can be adjusted to give the proper size pattern on the screen both vertically and horizontally.

e. The pattern is steady on the screen.

ITEM 38—SIGNAL AND AFC CRYSTAL CURRENTS.
Sample Entry:

38 Signal/AFC Crystal Currents	[0.4-0.6] ( ) (Ma)	0.5 / 0.44	0.6 / 0.6	0.2* / 0.7*

Log Entry. Enter to the nearest milliampere the reading of the crystal current meter on both the SIGNAL and AFC positions of the meter switch (fig. 3-27). Divide the log space by a diagonal line from the lower left corner to the upper right corner; enter the signal crystal current in the upper left half of the space and the AFC crystal current in the lower right half of the space. For any abnormal value, add an asterisk (*) after the entry and explain under NOTES.

ITEM 39—MINIMUM DISCERNIBLE RECEIVED SIGNAL.
Sample Entry:

39 Minimum Discernible Received Signal	[20%] (95) (Db)	94	88	75*

Log Entry. Measure the receiver sensitivity *once daily* according to the procedure given in chapter 13, TM 11-1566. On the log sheet enter in decibels the reading of the attenuation dial on the test set. Enter in the optimum value parentheses the maximum decibel reading to be expected from the minimum signal discernible on the PPI scope. In the open brackets enter the permissible percentage variation in the decibel reading. The two latter entries will be made by the person-in-charge. Add an asterisk (*) to any reading which exceeds the percentage of variation permitted.

ITEM 40—POWER OUTPUT.
Sample Entry:

40 Power Output	[ ] ( ) (Db)	90	85	40*

Log Entry. Enter *once daily* in decibels the average transmitted power output as measured with test equipment. Follow with an asterisk any abnormal reading. This check will be carried out by maintenance personnel and the person in charge of the radar set according to the procedure given in chapter 13, TM 11-1566. This test is a comparative one and must be made with the same test set and under exactly the same conditions each time.

ITEM 41—ORIENTATION.
Sample Entry:

41 *Orientation* (Az. 281 Ra. 12.5)	[ ] ( ) (OK-N*)	OK	OK	N*

Log Entry:

a. Enter in the open parentheses, immediately to the right of the item title, the correct azimuth in degrees and range in kiloyards of the permanent echo which has been selected for this test by the person in charge.

b. Enter in the brackets the tolerances specified by the person in charge.

c. Enter OK in the log space if the azimuth and range of the permanent echo are within the tolerances. Enter N* if they are not.

ITEM 42—MAXIMUM RANGE OF SHIPS.
Sample Entry:

42 *Maximum Range of Ships*	[ ] ( ) (Kyd)	15	75	0*.

Log Entry. Enter in the log space the range in kiloyards of the most distant ship target observed since the last set of entries was made.

ITEM 43—MAXIMUM RANGE OF PERMANENT ECHOES.
Sample Entry:

43 *Maximum Range of Permanent Echoes* [ ] ( ) (Kyd)	42	42	5*

Log Entry. Enter in the log space in kiloyards the range of the most distant permanent echo observed since the last set of entries was made.

ITEM 44—GROUND CLUTTER RANGE.
Sample Entry:

44 *Ground Clutter Range* [ ] ( ) (OK-N*)	OK	OK	N*

Log Entry. Enter in the brackets to the right of the item title the minimum and maximum limits of the normal ground clutter as observed on the PPI scope. This entry shall be made by the person in charge. Enter OK in the log if the pattern is normal; if any unusual change is observed, enter N* and explain under NOTES. The explanation should contain the new limits of the ground clutter, the azimuth of the minimum and maximum limits, the time of the change, and its duration.

ITEM 45—LOG FINISHING TIME.
Sample Entry:

45 Log Finishing Time [ ] ( ) (Hr-Min)	0020	0842	1628

Log Entry. In the log space, record to the nearest minute the time at which the entries for items 1 to 44 are completed. If for any reason it is impossible to finish the set of entries after it is once started, place an asterisk (*) in the log space and explain under NOTES.

Remarks. This item is not intended as a check on the person keeping the log. The sole purpose is to obtain general information which may be of assistance in improving the performance of the set. Accuracy in filling out the log is the most important consideration.

ITEM 46—OPERATING TIME, ON.
Sample Entry:

46 Operating Time, ON (Hr-Min)	0000	0955	

Log Entry. Enter the time (using the 24-hour system) that the station goes *on the air* after each shut-down period. If the station is on the air at midnight, enter 0000 in column A for the following day.

ITEM 47—OPERATING TIME, OFF.
Sample Entry:

47 Operating Time, OFF (Hr-Min)		0842*	2400

Log Entry. Enter the time (using the 24-hour system) that the station goes *off the air*. The time of each shut-down, whatever the cause, should be entered. If the station continues in operation until midnight, enter 2400 in the last column used. If the station goes off the air because of a break-down or some other accidental cause, place an asterisk (*) after the time entry and make a complete explanation under NOTES in section A.

ITEM 48—OPERATING TIME, TOTAL.
Sample Entry:

48 Operating Time, TOTAL	(Hr-Min)		0842	1405

Log Entry. Enter the length of time of each period *on the air*. To get the length of time, subtract the ON entry from the OFF entry (item 47 less item 46). For example, if the station is running at midnight the previous day, the station has, in effect, begun operation at 0000. If it shuts down at 0842, the total is 0842 minus 0000, or 0842. Later, the set is placed into operation and runs for the remainder of the day and on to the next day. The last OFF entry, 2400, is changed to 2360 for the purpose of subtracting from it the last recorded ON entry, 0955. The difference is 1405. If 0955 had been subtracted from 2400 instead of 2360, an incorrect answer would have been obtained.

ITEM 49—BREAK-DOWN TIME, TOTAL.
Sample Entry:

49 Break-down Time, TOTAL	(Hr-Min)	0000	0113	0000

Log Entry. Enter the total time spent in repairing each break-down. Normally, the break-down time is found by subtracting the OFF entry from the next ON entry. If more than three break-downs occur during the day, record the additional break-down time periods under NOTES.

ITEMS 50 THROUGH 53—WEEKLY SUMMARY.

Log Entries:

a. Hours of Operation (Item 50). Enter the total number of hours and minutes that the station was *on the air* during the 7-day period. To obtain this total time of operation, add all of the entries in item 48, Operating Time, Total. Check section A, NOTES for any periods of operation during the week which were not entered on the front of the log because of lack of space.

b. Break-down Time (Item 51). Enter the total number of hours and minutes that the station was *off the air* during the weekly period *because of a break-down or other accidental causes.* Do *not* include the time the set was off for the purpose of routine preventive maintenance. Refer to item 47, Operating Time, Off for any entries followed by an asterisk (*). Check the corresponding note in section A to find out whether the set was shut down because of a break-down or some other accidental cause, and whether all of the following period off the air was spent in trouble shooting and repair. Find the sum of all the break-down periods (item 49) for the week, and enter this total in item 51.

c. Console Hours (Item 52). Enter to the nearest 1/10 hour the total time indicated on CONSOLE HOURS meter (fig. 3-21) for the present week. To get this figure, subtract the last entry in item 18 on last week's log sheet from the last entry in item 18 on this week's sheet.

d. Transmitter Hours (Item 53). Enter to the nearest 1/10 hour the total time registered by the TRANSMITTER HOURS meter (fig. 3-21) for the present week. To get this figure, subtract the last entry in item 19 on last week's log sheet from the last entry in item 19 on this week's sheet.

ITEMS 54 THROUGH 58 – SIGNATURE OF PERSON KEEPING LOG.

Log Entries:

a. Signature (Item 54). Enter the signature of the technician keeping the log. The signature is to be entered when he reports for duty.

b. Rank (Item 55). Enter the rank of the technician keeping the log.

c. Date (Item 56). Enter the date on which the technician comes on duty.

d. On (Item 57). Enter the time (using the 24-hour system) the technician comes on duty.

e. Off (Item 58). Enter the time (using the 24-hour system) the technician is relieved from duty.

ITEM 59—LOG SHEET No.

Log Entry. Number the log sheets in order: 1, 2, 3, etc., as they are used.

4-6. HOW TO FILL IN BACK OF LOG SHEET.

a. Heading I-VI. Fill in the heading at the start of each new log sheet (fig. 4-2).

(1) I-III-IV-V. Fill in these items by following the instructions for the corresponding items on the front of the log sheet (par. 4-5).

(2) II-Distance from Sea. Record the distance in feet or miles; indicate the number and the unit of distance used.

(3) VI-Elevation. Enter the elevation of the equipment above sea level in feet.

b. Section A, Notes. When an asterisk is used on the front of the log sheet, indicating an abnormal condition, give the following information under NOTES, section A:

(1) Item number.

(2) Time and date that abnormal condition was found.

(3) Description of the condition together with the cause.

(4) What was done about it.

(5) Initials of the technician making the note.

c. Section B, Component Record.

(1) General. Fill in section B whenever a component is removed and whenever a component is installed. No entries are required in spaces blanked out by diagonal rulings. Entries for the component removed are to be made on one of the three lines marked TAKEN OUT—A, B, and C. Entries for the components installed are to be made on one of the three lines marked PUT IN—A, B, and C. Some examples of components in Radar Set AN/MPG-1 are: antenna servo amplifier, 300-volt regulator, directional coupler, receiver, etc.

(2) Columns 1 to 4. Record the name and the type, serial, and order numbers of each component—the component taken out and the component put in. Find the name, and the type, serial, and order numbers on the nameplate of the component.

(3) Column 5—Service Dates, In. In column 5, enter the date that the component taken out was originally installed. Find the date of the original installation in the station records. In the case of a component put in, simply enter the date on which the installation is made.

(4) Column 6—Service Dates, Out. In this space, record the date that the component is taken out.

(5) Column 7—Hour Meter Readings, In. In this space enter the console hour meter reading at the time the component taken out was originally placed in service. Get the information from the Station Record Book. In the case of a component being put in, simply enter the console hour meter reading at the time the installation is made.

(6) Column 8—Hour Meter Readings, Out. In column 8 enter the console hour meter reading at the time the component is taken out. This reading is usually the same as that entered in the PUT IN space in column 7.

(7) Column 9—Hour Meter Readings, Total. In column 9 enter the total time the component taken out has been in use. To get this figure, subtract the time recorded in column 7 from the time recorded in column 8. Enter the difference in column 9.

I. RADAR SET AN/MPG-1 _____ III. ORGANIZATION 803 C.A. Gun Battery V. LOCATION Newbury Point

II. DISTANCE FROM SEA 1320 Feet IV. ADDRESS Lowlands, New Jersey VI. ELEVATION 58 Feet

Sections A, B, C, and D

SECTION B — COMPONENT RECORD

MAKE ENTRIES IN THIS PANEL WHEN A COMPONENT IS TAKEN OUT OR PUT IN

COMPONENT		1 NAME OF COMPONENT	2 NAMEPLATE TYPE NO.	3 NAMEPLATE SER. NO.	4 NAMEPLATE ORDER NO.	5 SERVICE DATES IN	6 SERVICE DATES OUT	7 HOUR METER READINGS IN	8 HOUR METER READINGS OUT	9 HOUR METER READINGS TOTAL	10 REASON FOR REMOVING COMPONENT	11 DISPOSITION OF REMOVED COMPONENT	12 WORK DONE BY—
TAKEN OUT	A	Radar Receiver	R-115/MPG-1	487	2807-MPD-44	6 Feb	20 Feb	55.7	309.6	254.2	Inoperative	Repair by replacing C-3015-1	W. G. Owens
" "	B												
" "	C												
PUT IN	A	Radar Receiver	R-115/MPG-1	522	2807-MPD-44	20 Feb		310.1					W. G. Owens
" "	B												
" "	C												

SECTION C — PART RECORD

MAKE ENTRIES IN THIS PANEL WHEN PART OR TUBE IS TAKEN OUT OR PUT IN

PART		1 NAME OF COMPONENT CONTAINING PART	2 TYPE NO. COMPONENT	3 SER. NO. COMPONENT	4 ORDER NO. COMPONENT	5 REFERENCE SYMBOL	6 NAME OF PART	7 DESCRIPTION OF PART MANUFACTURER—TYPE—SERIAL NO.—ELECTRICAL RATING—SIZE	8 FUNCTION OF PART AND LOCATION FROM SCHEMATIC	9 NEW, USED, OR REBUILT	10 DISPOSITION OF PART TAKEN OUT
TAKEN OUT	A	Radar Receiver	R-115/MPG-1	487	2807-MPD-44	C-3015-1	Capacitor	Cornell-Dubilier, paper, 600V, 4MF	Filter Capacitor, Power Supply		Discarded
" "	B	Radar Transmitter	T-92/MPG-1	487	2807-MPD-44	V-2821	Magnetron	Western Electric, Jan-10-5L, 5335	Transmitter Oscillator Tube		Returned to Supply
" "	C										
PUT IN	A	Radar Receiver	R-115/MPG-1	487	2807-MPD-44	C-3016-1	Capacitor	Cornell-Dubilier, paper, 600V 4MF	Filter Capacitor Power Supply	New	
" "	B	Radar Transmitter	T-92/MPG-1	487	2807-MPD 44	V-2821	Magnetron	Western Electric, Jan 10-5L, 5342	Transmitter Oscillator Tube	New	
" "	C										

PART		11 SERVICE DATES IN	12 SERVICE DATES OUT	13 HOUR METER READINGS IN	14 HOUR METER READINGS OUT	15 HOUR METER READINGS TOTAL	16 SPARES AT SET	17 WHERE DID YOU GET THE PART?	18 SYMPTOM OF FAILURE	19 FAULT	20 WHAT CAUSED THE FAULT?	21 ACTION TAKEN AND RESULTS	22 WORK DONE BY—
TAKEN OUT	A	5 Feb	20 Feb	0	309.6	309.6			No received signals	Shorted	Don't Know	Capacitor removed	W. G. Owens
" "	B	5 Feb	20 Feb	0	369.6	369.6			Poor operation	Bad Tube	don't know	Tube removed	H. B. Brown
" "	C												
PUT IN	A	20 Feb		309.6			14	Spare parts bot				New Capacitor installed, O.K	W. G. Owens
" "	B	23 Feb		369.6			3	Spare parts stock				New tube installed, O.K.	H. B. Brown
" "	C												

SECTION D — REMARKS — RADAR OFFICER

SECTION A — NOTES — SECTION A

ENTER EACH ABNORMAL CONDITION FOUND AND STEPS TAKEN TO CORRECT IT

ITEM NO.	TIME AND DATE	
11	1800 Feb 19	Low Voltage from -150 VDC supply - adjusted R-3706
22	"	Transmitter pulse not Received. M.C. adjusted, range 200 Yards. M.C.
41	"	Range reading inaccurate. Checked by Instrument M.C.
47	0915 Feb 19	Received Transmitter Replaced with O Pear Receiver W.G.O
10	"	Received R.S.A
9	"	Received Transmitter
8	"	Low voltage from -300 VDC supply. Adjusted R-3506 H.B.G.
12	0915 Feb	Poor traces on scope. Adjusted.
30	"	Proved control. H.B.G.
29	0915 Feb	Ground connection inspected. H.B.G.
47	"	Replaced fuse F-1306-5 H.B.G.
42	1000 Feb 22	Crystal showed high leakage signal output
43	0029 Feb 23	Poor operation replaced tube H.B.G.
44	"	Magnetron replaced tube H.B.G.
36	1038 Feb 23	Antenna Gear motor Inoperative. Replaced Fuse F-5001-1 RSA

WHEN COMPLETED SEND LOG SHEET TO UNIT RADAR OFFICER.

IF ADDITIONAL SPACE IS REQUIRED TEAR OUT ANOTHER LOG SHEET AND ATTACH TO THIS ONE.

SHEET No. 3 TL 48896

Figure 4-2. Sample log sheet, back.

(8) Column 10—Reason for Removing Component. In this space, explain briefly why the component was removed. For example, it may have failed, it may have been running below optimum performance, or it may have been removed for inspection or servicing.

(9) Column 11 — Disposition of Removed Component. In this space explain exactly what was done with the component after it was removed.

(10) Column 12—Work Done By. This space is provided for the signature of the technician who removed or installed the component.

d. Section C, Part Record.

(1) General. Fill in section C whenever a part or tube is removed or installed. In addition, enter all repairs made on spare equipment. No entries are required in spaces blanked out by diagonal rulings. Entries for a part or tube which has been removed are to be made on one of the three lines marked TAKEN OUT—A, B, and C. Entries for a part or tube installed are to be made on one of the three lines marked PUT IN—A, B, and C. The description of a part or tube entered on line A, B, or C in column 1 through 10 must be continued on the corresponding line in column 11 through 22.

(2) Columns 1 to 4. Record the name and the type, serial, and order number of the component from which the part or tube was removed or in which the part or tube was installed. This information appears on the nameplate of the component or in the Station Record Book.

(3) Column 5—Reference Symbol. In column 5 write down the reference symbol of the part or tube put in or taken out. This symbol appears on the schematic diagram of the component concerned or on the part or tube itself.

(4) Column 6—Name of Part. In this space record the name of the part put in or taken out. The name of the part or tube can be found on the schematic diagram of the component concerned.

(5) Column 7—Description of Part. In this space give a brief description of the part put in or taken out. Some of this information may be obtained from the maintenance parts list. Additional information can be found on the part itself. In this description of the part, the name of the manufacturer, the manufacturer's type and catalogue number, the electrical rating of the part, its size, etc., must be included.

(6) Column 8—Function of Part and Location. In this column enter the function of the part put in or taken out and its location. In describing the location of electrical parts, locate them in relation to other parts or tubes with which they are associated. For example: 1st i-f plate-load resistor, bypass capacitor in video amplifier, etc.

(7) Column 9—New, Used, or Rebuilt. State whether the part or tube which has been put in is new, used, or rebuilt.

(8) Column 10—Disposition of Part Taken Out. State exactly what was done with the part or tube after it was removed. Example: part destroyed, returned to depot, repaired for spare, etc.

(9) Column 11—Service Date, In. In column 11 enter the date that the part or tube taken out was originally installed. Find the date of the original installation in the Station Record Book. In the case of a part or tube being PUT IN, simply enter the date on which the installation is made.

(10) Column 12—Service Date, Out. In this space record the date on which the part or tube is taken out.

(11) Column 13—Hour Meter Readings, In. In this space enter the console hour meter reading at the time the part or tube taken out was *originally* placed in service. Find this reading in the Station Record Book. In the case of a part or tube being put in, simply enter the console hour meter reading at the time the installation is made.

(12) Column 14—Hour Meter Readings, Out. In column 14 enter the console hour meter reading at the time the part or tube is taken out.

(13) Column 15—Hour Meter Readings, Total. Under TOTAL in column 15, record the total time the part or tube taken out has been in use. To obtain this figure,

subtract the time in column 13 from the time in column 14. Enter the difference in column 15.

(14) Column 16—Spares at Set. In column 16 give the number of spares of the part or tube put in that are on hand at the set after the installation is made.

(15) Column 17—Where Did You Get the Part? Answer this question as clearly as possible. Find out where the part put in came from and explain in the space provided. Examples of entries that might be made are: had part here at set; from Holabird Signal Depot; from another set in this area.

(16) Column 18—Symptom of Failure. In the case of a part or tube failure, describe the first indication that the part or tube was faulty. By symptoms are meant first evidences of trouble. Symptoms can usually be detected through the senses of sight, smell, hearing, or touch. Some examples are: abnormal meter reading, the odor of burning insulation, smoke, the hissing noise of an arc, and the heat of an overloaded part.

(17) Column 19—Fault. In this space describe exactly what fault developed in the part or tube that was removed. Some examples of vacuum tube faults are: open filament, low emission, shorted elements, gassy tube, microphonic tube, etc. Some examples of electrical faults are: dielectric defective, dielectric break-down, insulation break-down, open circuit, short circuit, arcing, sticking contacts, etc. Some mechanical faults are: a broken, bent or cracked part, frayed leads, frozen bearings, stripped threads, etc. This column refers only to a part or tube that has been taken out.

(18) Column 20 — What Caused the Fault? In column 20 explain what caused the fault to occur, using additional space in section A if necessary. Describe any external condition which may have contributed to the fault. Indicate the first or primary cause if it is known. Some examples of causes of faults are: wear and tear in operation, shelf wear, excessive heat, excessive current (overload), high humidity, careless handling, lack of lubrication, improper operation, corrosion, excessive strain, improper adjustment, defective material, accidental damage, error in wiring, lack of ventilation, failure of some other part, loose connections, etc.

(19) Column 21—Action Taken and Results. In this column briefly describe what was done about the fault. In addition, explain briefly what results were obtained.

(20) Column 22—Work Done By. The technician who performed the repair or replacement will sign his name in this column.

e. Section D, Remarks. Space is provided in section D for suggestions and recommendations from the men in the field relative to improvements in equipment, or more efficient technical operating procedures.

f. Sheet Numbers. Enter the sheet number in the bottom right-hand corner. This number must be the same as the number on the front of the log.

CHAPTER 5

CONVERSION FOR TRAVEL

5-1. GENERAL.

In general, the procedure for disassembling and stowing the components of Radar Set AN/MPG-1 is the reverse of the setting-up procedure described in chapter 2. The following paragraphs describe the operations which must be performed, and the precautions which must be taken, to prepare the radar set for transport. Whenever necessary, refer to the installation procedure described in chapter 2.

5-2. PRELIMINARY STEPS.

a. There are two positions, one-half revolution apart, in which the antenna may be stopped so that it will clear the four center posts when the elevator is lowered. In only one of the two positions, however, will the brake lining on the antenna come into contact with the brake operated by the azimuth lock handle on the pedestal (fig. 3-35). Stop the antenna in this position and tighten the azimuth lock knob. Check *carefully* to see that the antenna clears the center posts when the elevator is lowered.

b. Remove and stow in the front portion of the trailer those cables which were installed during the setting-up procedure (par. 2-21**b**). Use a handline to lower the cables which are connected to the antenna pedestal.

c. Disconnect the cables from the modulator and remote-B assemblies (par. 2-21**c**).

d. Carefully mount the remote-B assembly in its traveling position on the trailer platform (fig. 2-3).

e. See that all the components in the trailer are fastened securely but are free to move on their shockmountings.

f. Remove the entire ventilator unit on the left side of the trailer, to allow the reflector to be mounted as shown in figure 2-2. Also remove the blower motor of the ventilator unit (fig. 2-38), on the right side of the trailer, so that the antenna will have sufficient clearance during loading. Mount these components in their traveling positions near the power unit.

g. Remove the ground rods of the trailer, power unit, and tower.

5-3. MOVING TRAILER.

The power unit is to be stowed in the trailer before step **i** of paragraph 5-4 of the tower disassembly procedure has been performed. The towing vehicle is coupled to the trailer (used as either a semi-trailer or full trailer) as described below.

a. Coupling Towing Vehicle to Semi-trailer. Before attempting to couple the truck to the semi-trailer, be sure the coupler (mounted on the towing vehicle) is cocked. This is accomplished by pushing back the operating handle until the latch can be heard to drop in behind the lug on the plunger. Refer to the technical manual furnished with the towing vehicle.

(1) Place a light film of general purpose grease on the king pin and the apron plate.

(2) Place two chock blocks against the rear tires of the semi-trailer.

(3) Back the towing vehicle under the front end of the trailer so the king pin, which protrudes below the apron plate on the semi-trailer, is centered, or nearly so, on the jaws of the coupler. Continue backing slowly until the coupler jaws lock firmly to the king pin.

(4) Inspect the trailer connection. If the coupler hook lock handle is at the "in"

position and the hook lever is practically at the center line of the coupler, the unit is coupled properly.

(5) Connect the air hose to the trailer (fig. 2-36). Be sure the service air hose connection is connected to the service trailer air line, and the emergency air hose is connected to the emergency air line. Both hoses and trailer connections are tagged.

(6) Open the cut-out cocks at the rear of the towing vehicle and connect the light jumper cable.

(7) Raise the support wheels (landing gear) and turn the support handle in a clockwise direction until the stop is reached. Place the support hand crank in the clip at the side of the trailer frame (fig. 2-37).

(8) Remove the chock blocks from under the wheels and place the chock blocks in the stowage compartments on either side of the trailer.

b. Coupling Towing Vehicle to Full Trailer.

(1) Place two chock blocks against the rear wheels of the trailer.

(2) Place the dolly drawbar in the unlocked position by removing the cotter pin and locking pin from the drawbar lock (fig. 2-35). Check the latch on the dolly lock to make certain the latch is up (unlocked position).

(3) Open the pintle hook on the towing vehicle. While one man holds the drawbar at a level position, back the towing vehicle until the pintle hook and the drawbar eye meet. Place the drawbar eye into the pintle hook and lock the pintle hook.

(4) Couple the safety chain hook to the eyes at the rear of the towing vehicle. Make certain the safety chains are threaded through the large holes next to the end of the drawbar.

(5) Connect air hoses to the trailer (fig. 2-36). Make certain that the emergency line from the towing vehicle is connected to the emergency line of the trailer, and that the service line of the towing vehicle is connected to the service line of the trailer.

(6) Open the cut-out cocks at the rear of the towing vehicle. This will supply air to the trailer brake system. Operate the brake lever and see that the trailer brakes function properly.

(7) Connect the light jumper cable to the socket on the front end of the *trailer* (fig. 2-36) and *not* to the socket on the dolly.

(8) Remove the chock blocks from under the rear wheels and place them in the stowage compartments under the wheel housings on either side of the trailer.

5-4. TOWER DISASSEMBLY.

The procedure used in disassembling the tower is given below. In general, it is the reverse of the erection procedure. As the tower is disassembled, the captivated bolts on each member should be screwed out into the member itself to protect the threads.

a. Turn the winches until the cables lift the elevator a small amount. Remove the elevator tie-off bolts and the elevator support chains (figs. 2-32 and 2-33).

b. Coil 100 feet of the center section of a 200-foot rope on the elevator platform. This will leave two free ends of rope of 50-foot length each. Tie the rope to the top of one of the center posts nearest the winch so that one 50-foot length of rope hangs to the outside of the posts (away from the elevator). Tie the other free end of the rope to the adjacent center post *away* from the winch so that the other 50-foot length also hangs to the outside of the posts. Be careful not to tie or pull ropes over sharp metal edges.

c. With a second 200-foot length of rope, repeat this procedure with the other two center posts.

d. Remove the upper horizontal and diagonal braces.

e. With a man riding on the elevator to insure that the coiled ropes do not become fouled as they uncoil, lower the elevator until the next section of the horizontal and diagonal braces may be removed.

f. Repeat this procedure and thus remove all the braces and the compression guy members.

g. Disassemble the catwalk structure.

h. Assemble the ramp required for loading the power unit into the trailer. The load-

ing procedure is the reverse of the unloading procedure described in paragraph 2-12.

i. Assemble the antenna dolly ramp and lower the elevator to the trailer level. *Remove the reflector from the antenna.* Using the method described in paragraph 2-11, load the antenna into the trailer and bolt the dolly to the trailer tracks.

j. Lower the elevator to the ground, unhook the cables from the winches, disassemble the ramp and elevator, and remove them from the tower. This will leave the four center posts with the tension guy members and ropes attached.

k. To lower the center posts, personnel should be stationed as follows:

(1) Two or three men to the inside restraining rope (formerly coiled on the elevator).

(2) One man on the free end of the rope (used as a guide rope).

(3) Two men per tension guy member.

(4) Two men at the foot of the center post.

l. Tighten the turnbuckles on the tension members to shorten the members as much as possible. Unfasten the tension members at the bottom. Tilting the post toward the center of the base, lift the tension guy members out of the brackets one at a time. Rest the lower ends of the tension members on the ground.

m. Lower the post away from the tower center, using the tension members as props during the process. Move the tension members alternately, 1 to 2 feet at a time. The men assigned to the center post should move out toward the end of the center post to aid in the lowering process. Be sure to keep the tension members 5 to 10 feet on either side of the center post at all times, moving the lower ends outward from the tower base.

n. After the post is down, loosen the small stud screws at the bottom of the post (fig. 2-8) and lift the post clear of the ball support.

o. Lower the other three center posts in a similar manner and disassemble them.

p. Disassemble the base.

5-5. FINAL OPERATIONS.

After the tower has been disasssembled, all parts should be stowed in the trailer. Mount the reflector securely against the left side of the trailer, and stow the tower parts as shown in figure 2-2. See that all components are secure and will not slide around while the trailer is in motion. Carefully close all doors and hatches and fasten all lugs and latches tightly. The trailer is now watertight and ready for travel.

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