

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**

WAR DEPARTMENT

15 MARCH 1945

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.

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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

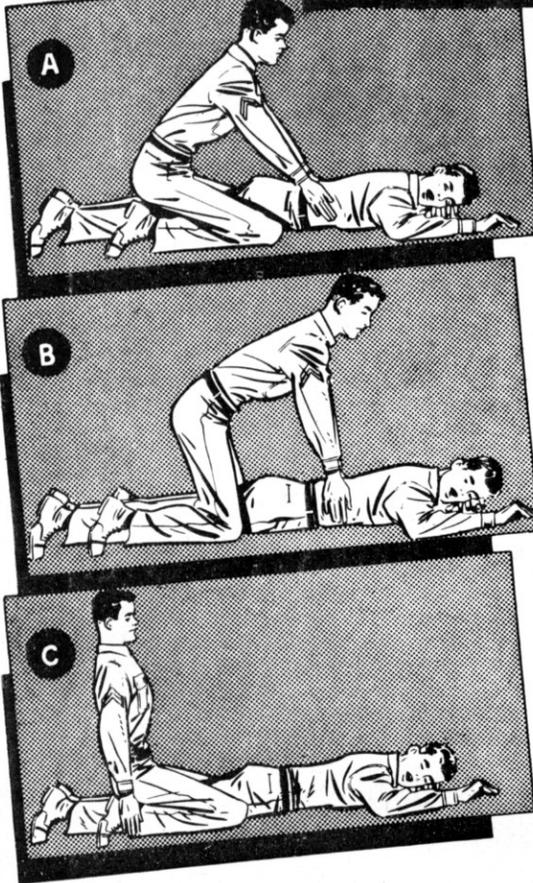
I. FREE THE VICTIM FROM THE CIRCUIT IMMEDIATELY.

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

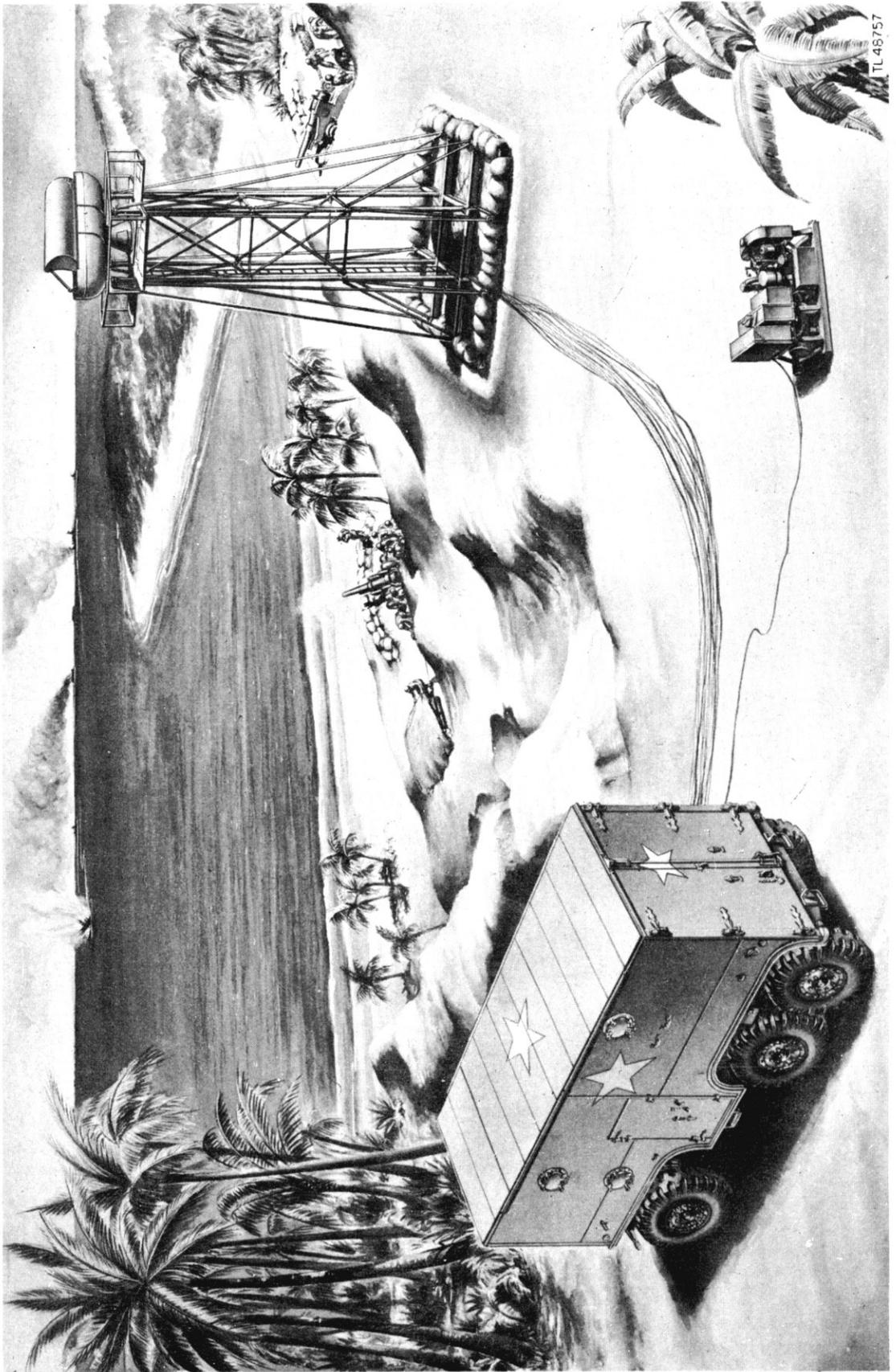


Figure 1-1. Radar Set AN/MPG-1.

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.

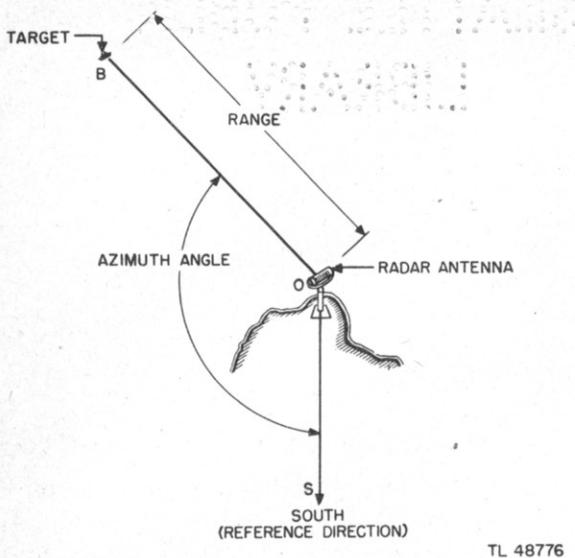


Figure 1-2. Meaning of azimuth and range.

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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

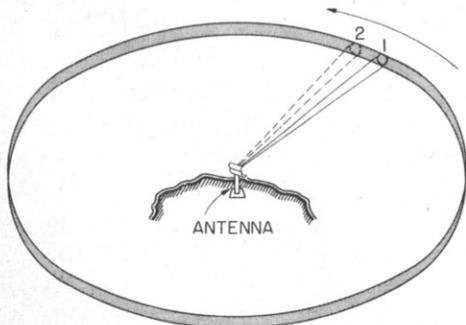


Figure 1-3. Continuous azimuth scanning.

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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.

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

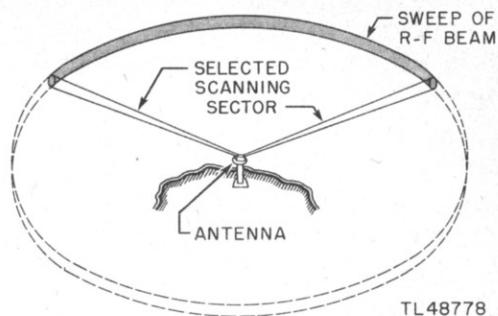


Figure 1-4. Sector azimuth scanning.

the position of the target relative to a single range mark ring or to a series of concentric range mark rings.

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

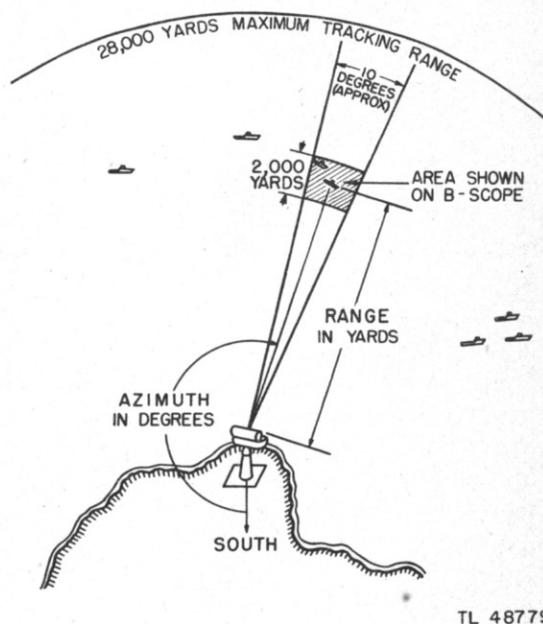


Figure 1-5. Segment observed while tracking.

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.

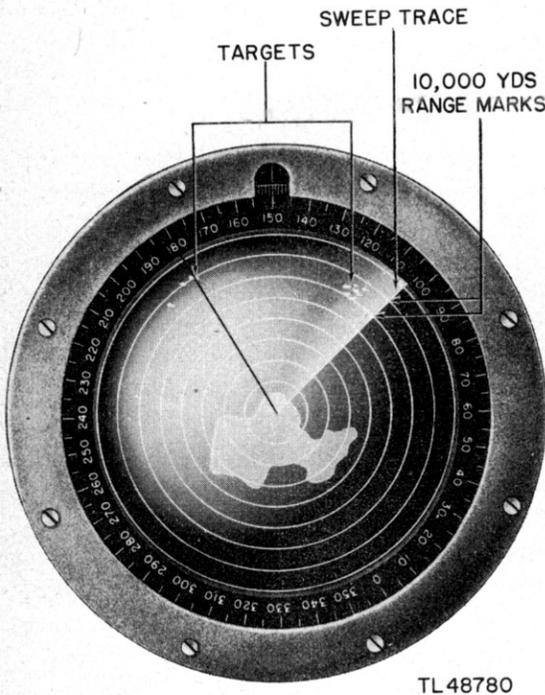


Figure 1-6. PPI scope presentation.

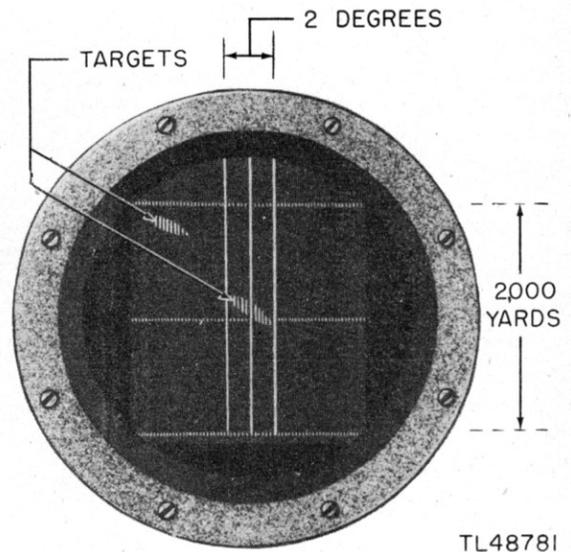


Figure 1-7. B-scope presentation.

SECTION III. LOCATION AND DESCRIPTION OF COMPONENTS

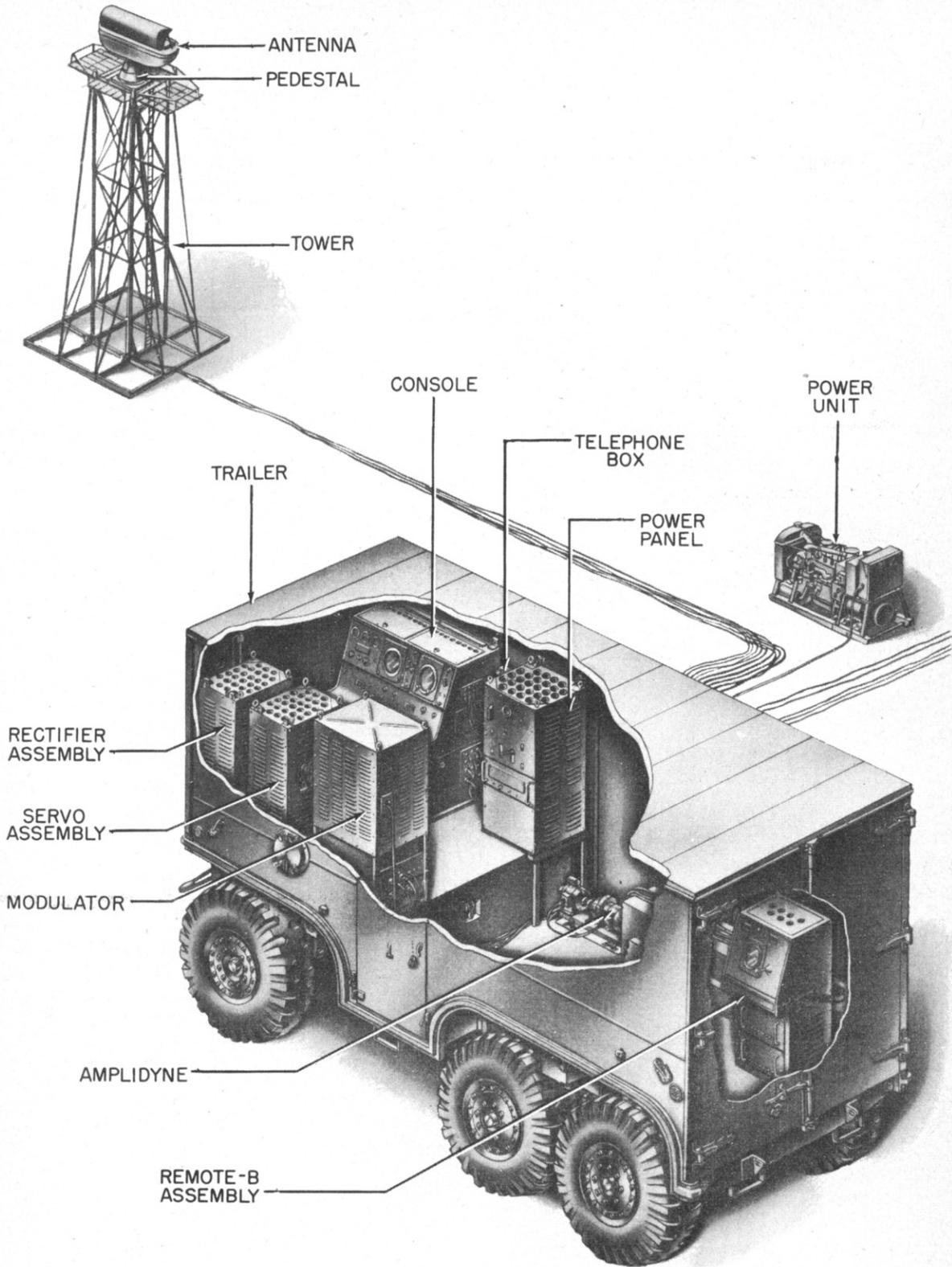
1-7. LOCATION.

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



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

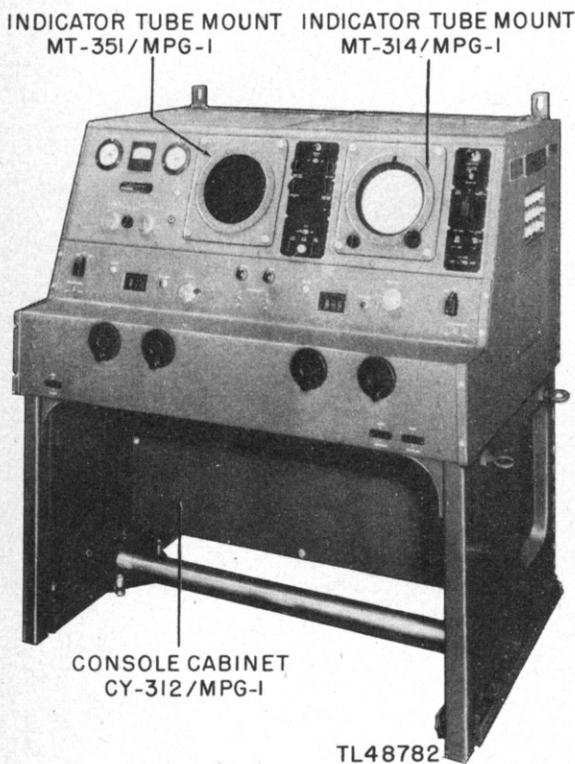


Figure 1-9. Console CY-230/MPG-1.

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,
 approximate240 inches
 Drawbar length, approximate.....60 inches
 Over-all width96 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 loaded17 inches
 Trailer tires14.00-20, 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:

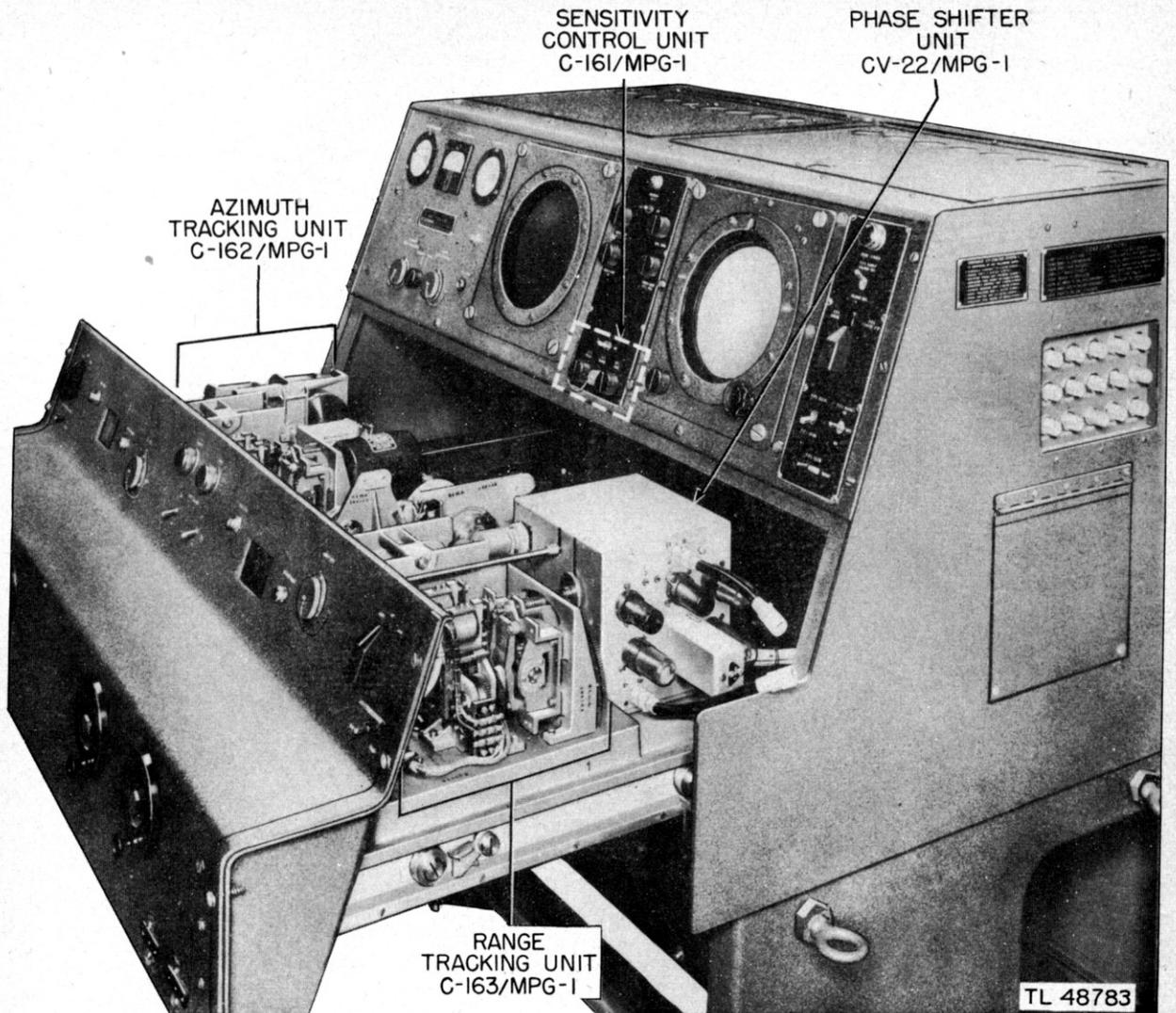


Figure 1-10. Console, center section partially withdrawn.

(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-

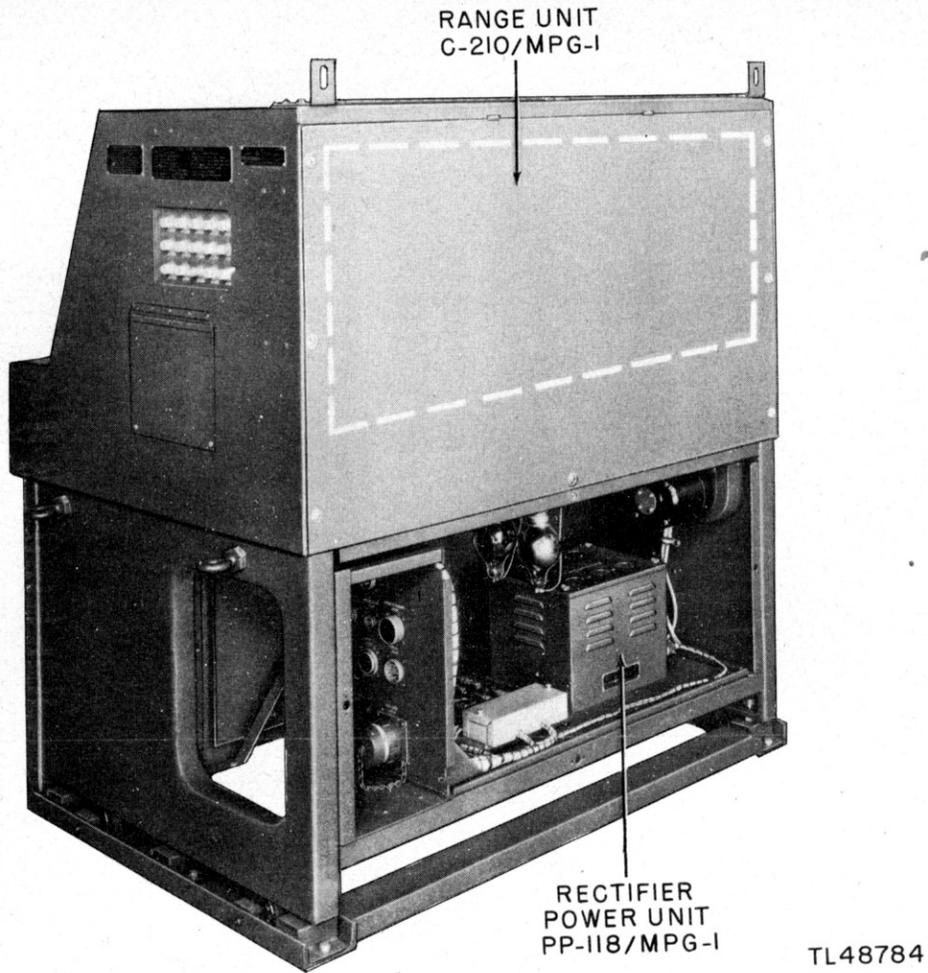


Figure 1-11. Console, rear view, lower panel removed.

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

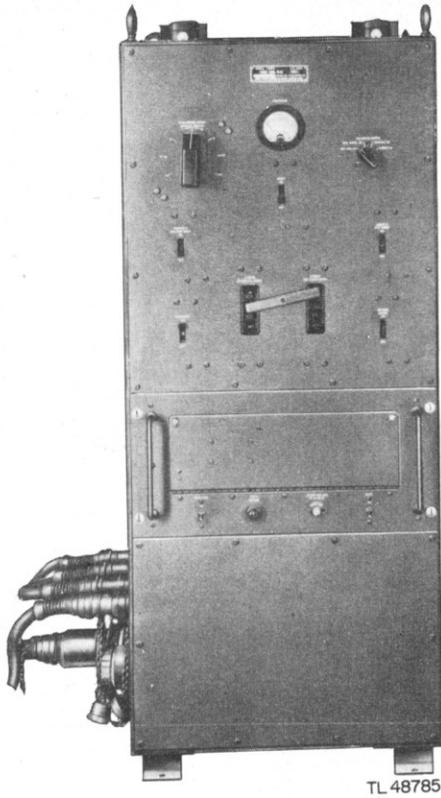


Figure 1-12. Power Panel SB-25/MPG-1.

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.

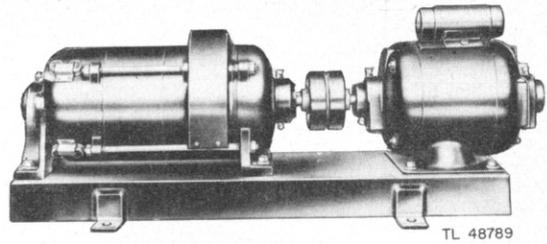


Figure 1-13. Servo Motor Generator PU-52/MPG-1.

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-

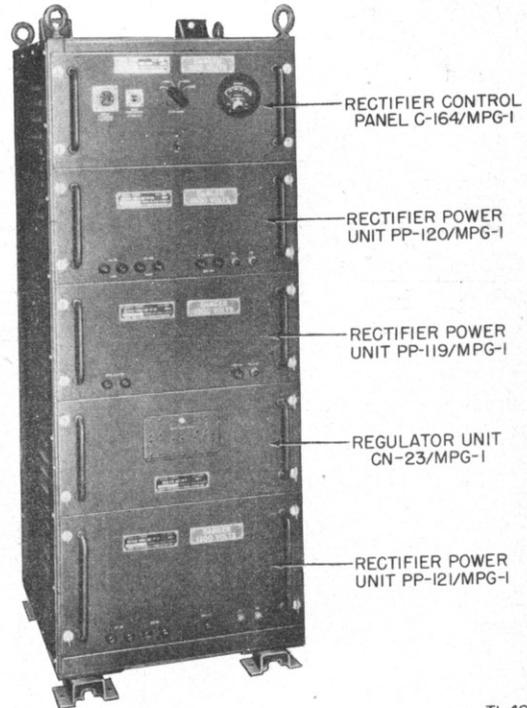
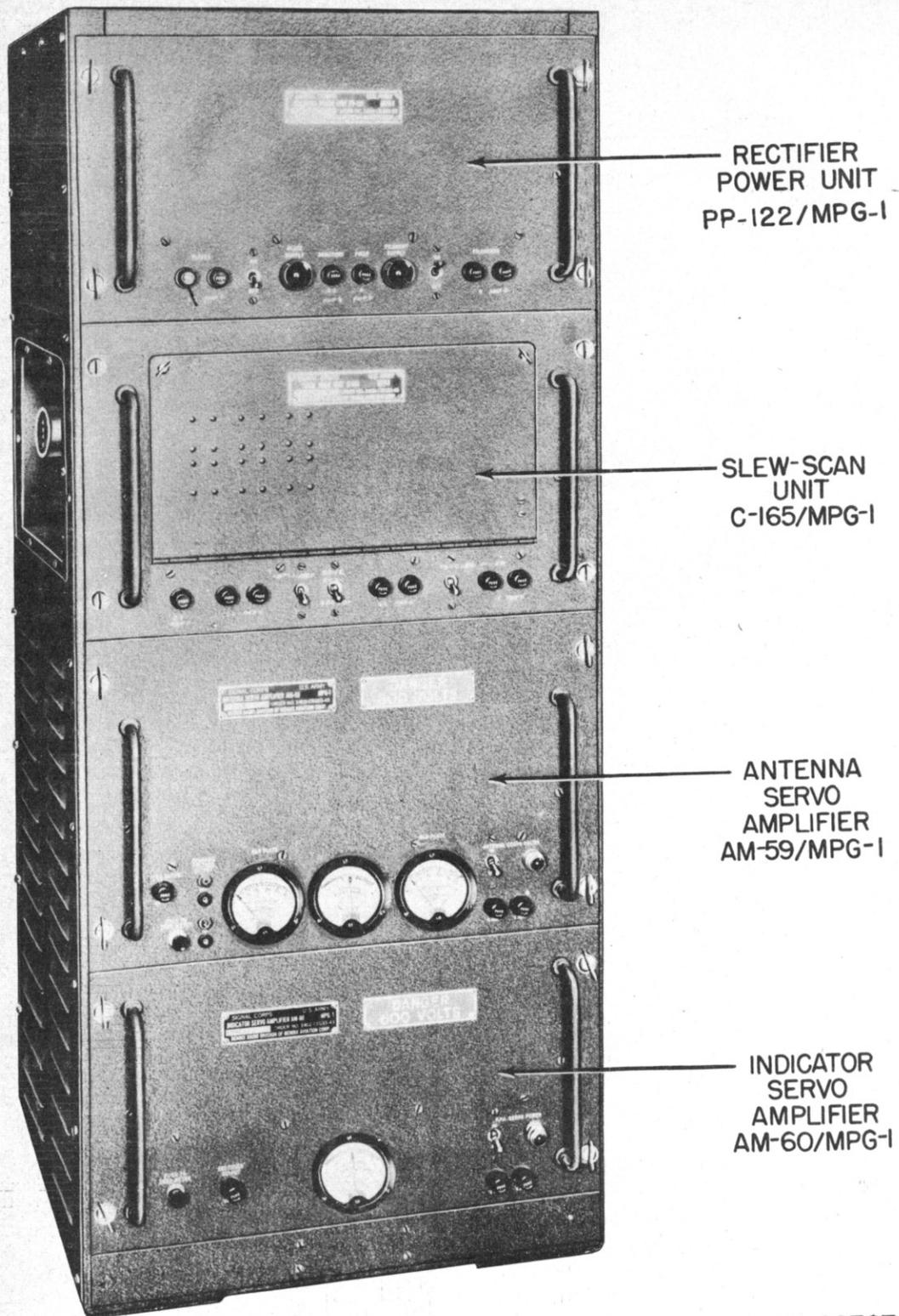


Figure 1-14. Rectifier Cabinet Assembly CY-232/MPG-1.



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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 gen-

erator, 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.

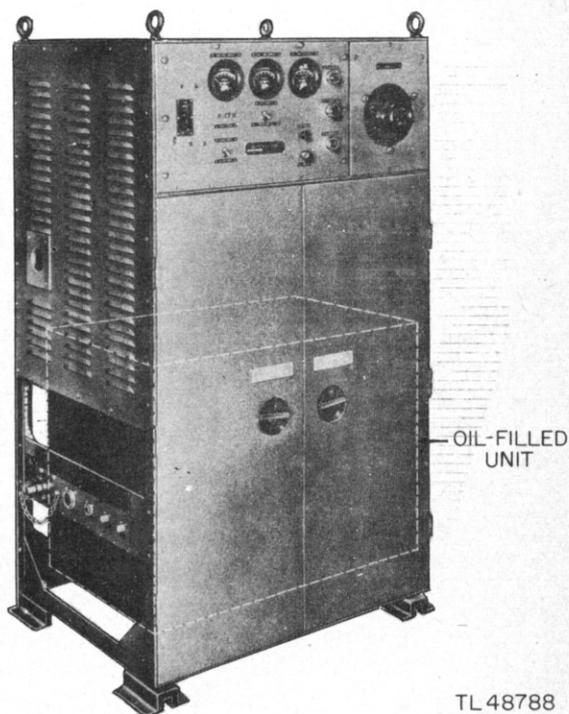


Figure 1-16. Modulator MD-36/MPG-1.

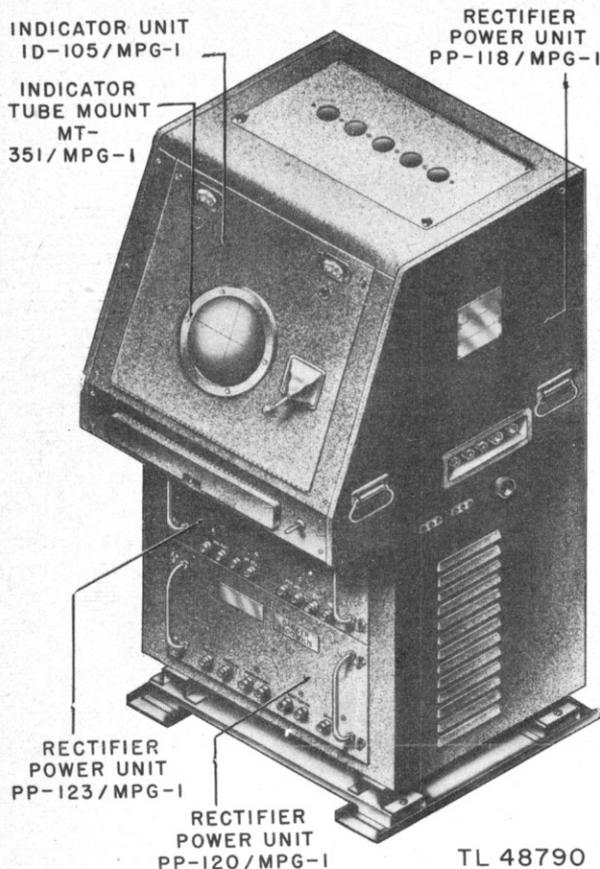


Figure 1-17. Indicator Cabinet Assembly
CY-234/MPG-1.

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).

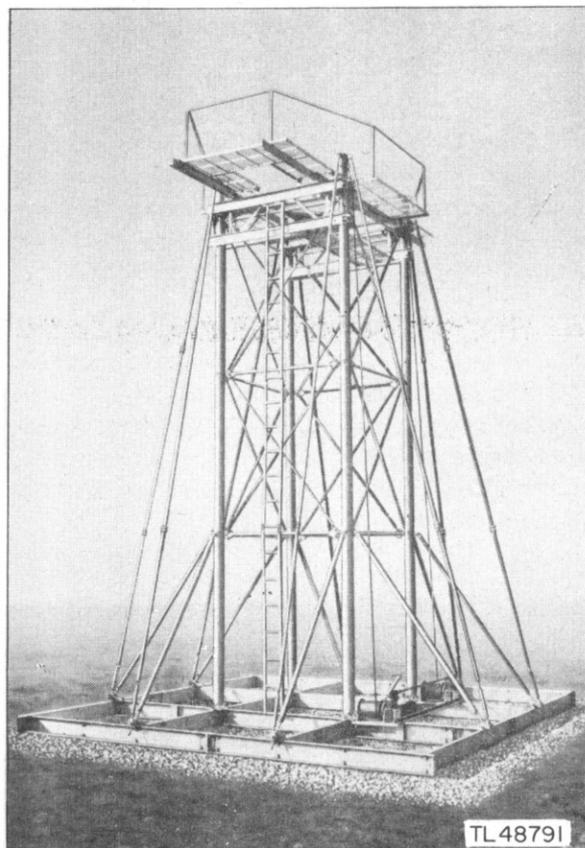
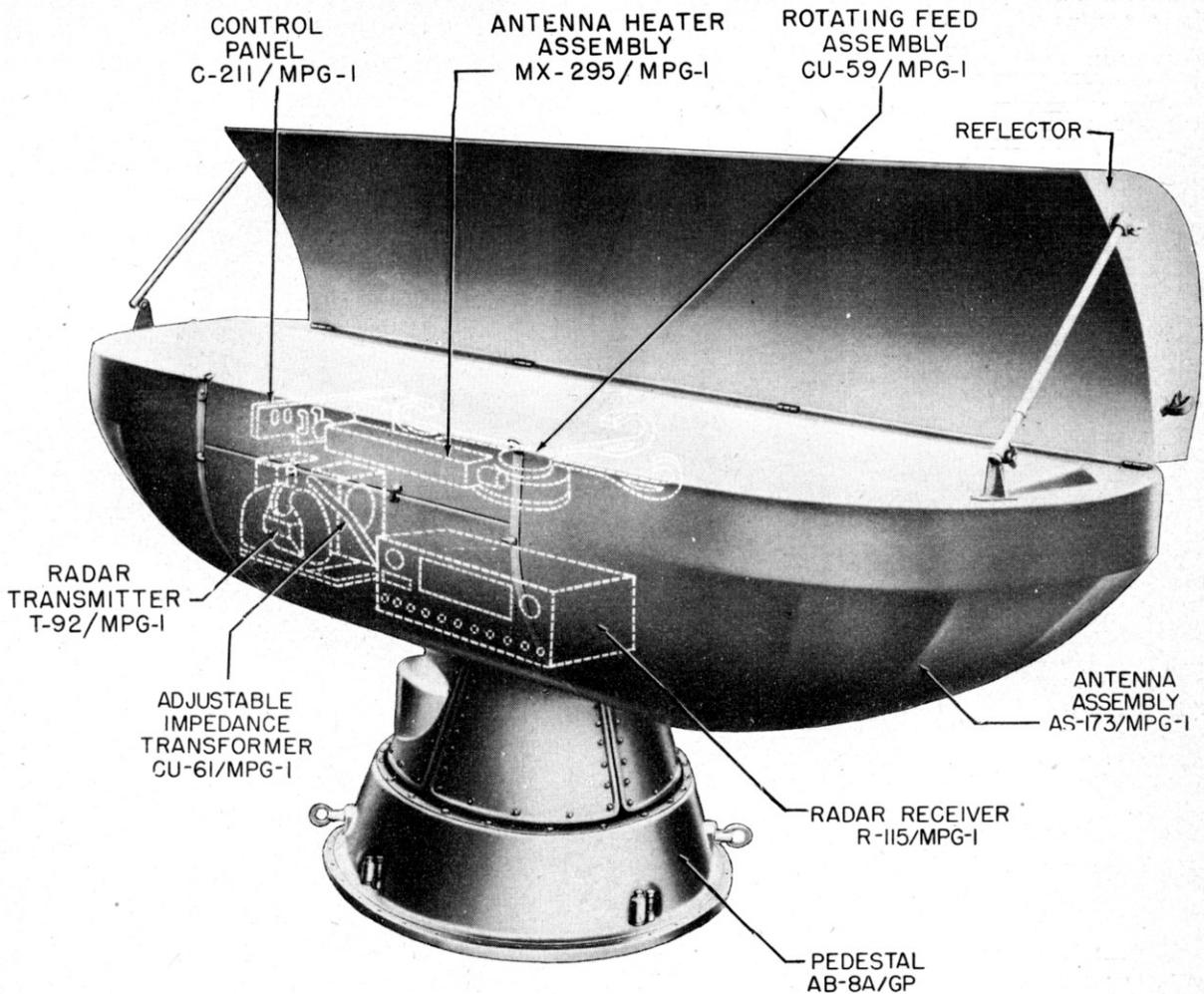


Figure 1-18. Tower AB-50/MPG-1.



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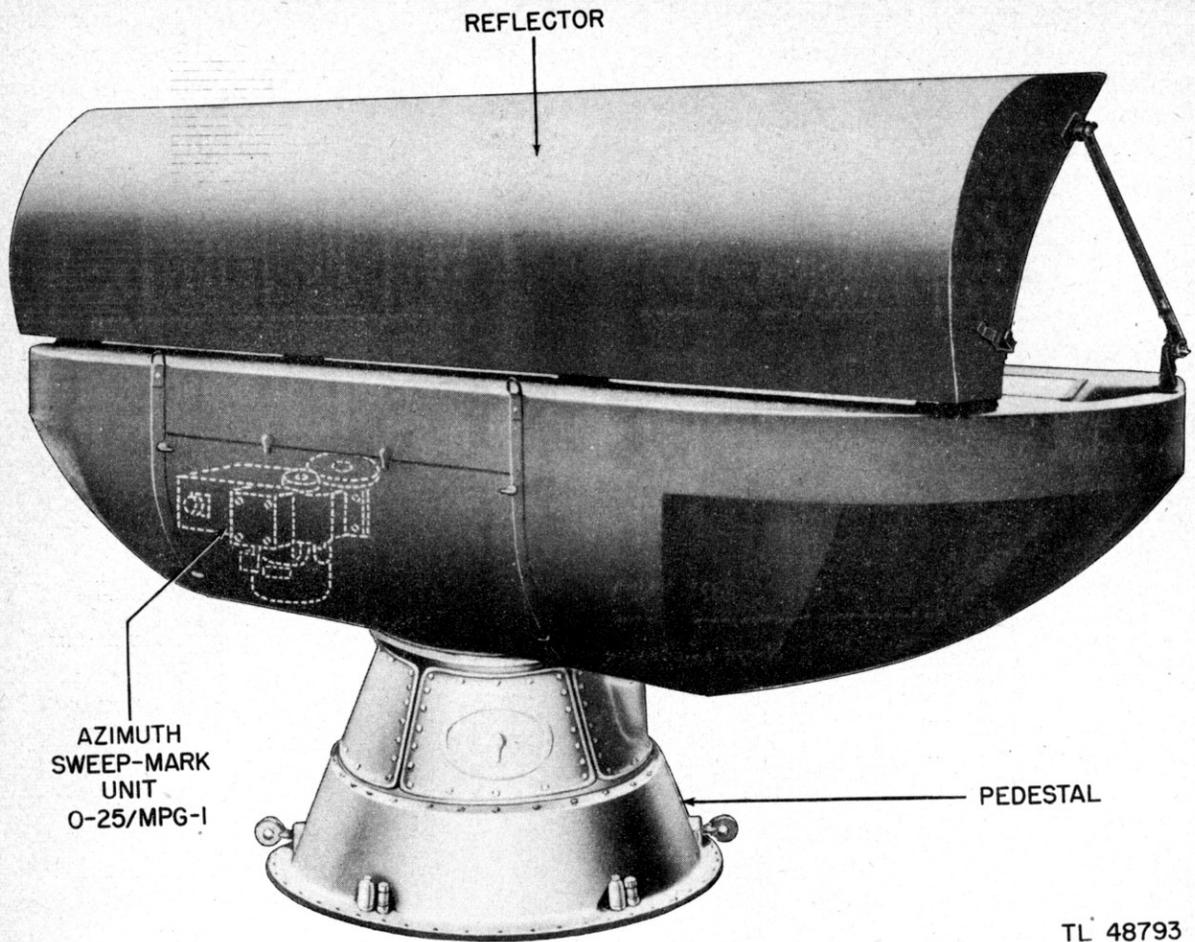
Figure 1-19. Pedestal and antenna, front view.

(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.



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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.

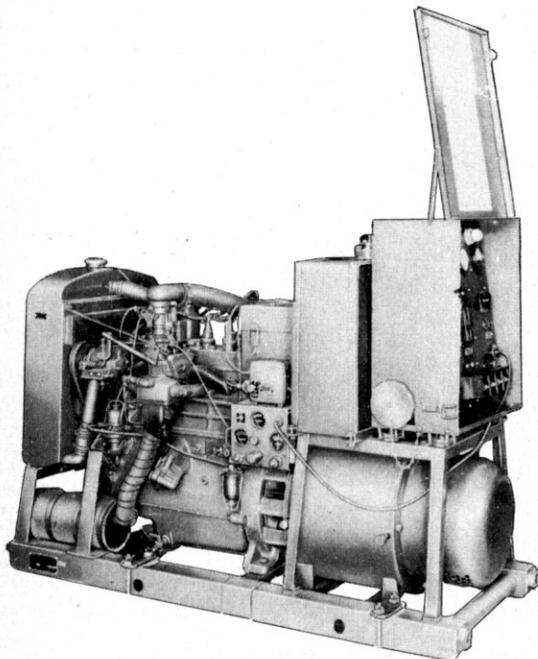
(5) *Radar Receiver R-115/MPG-1.* The receiver is located within the plywood housing and close to the transmitter. A hinged panel in the front of the receiver case gives access to the interior. A meter is mounted at the left, and a small cathode-ray tube at the right, of the hinged panel. The controls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

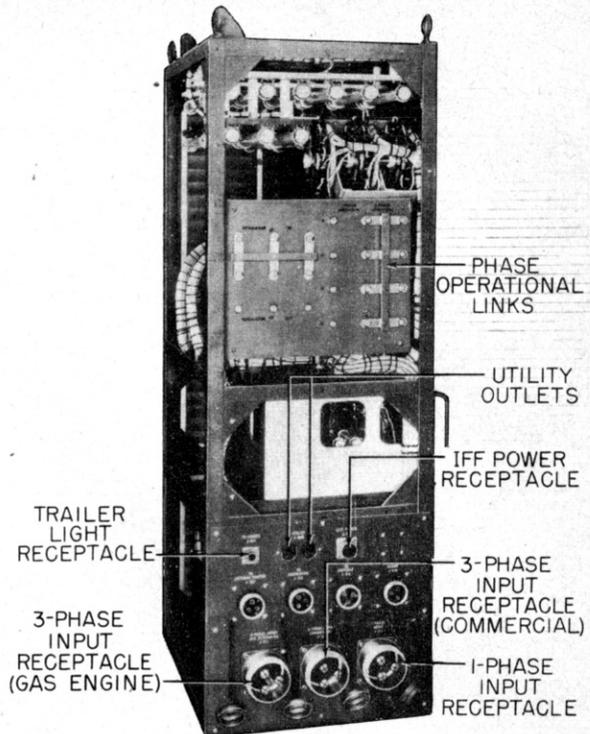
(8) *Antenna Heater Assembly MX-295/MPG-1.* The antenna heater (fig. 1-19), which removes moisture from the horn, consists of a heater assembly, thermostat, terminal board, and two blower motors.

(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



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



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

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.

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-

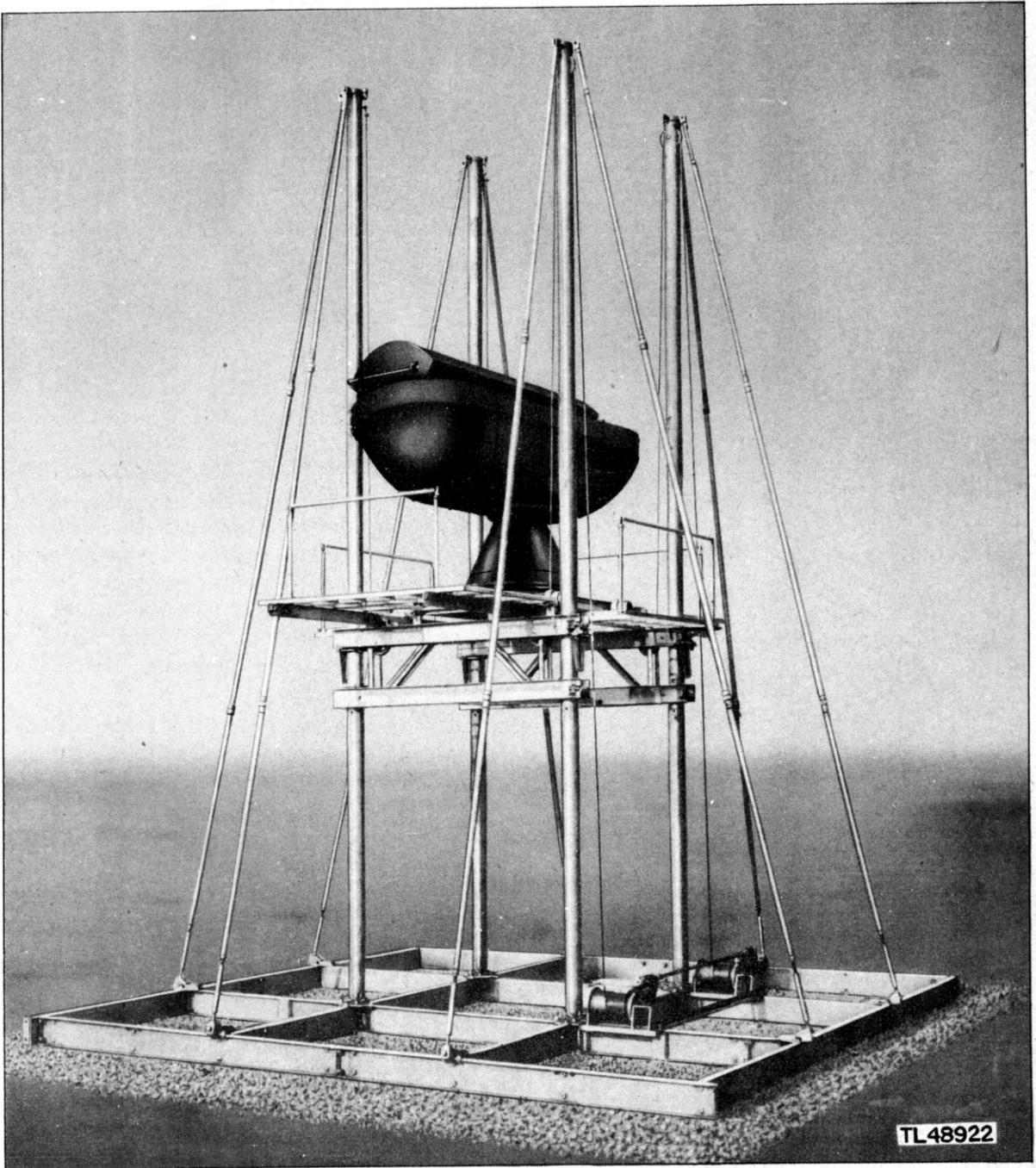


Figure 2-23. Installing horizontal braces and compression members, elevator raised.



Figure 2-34. Tower completely erected.

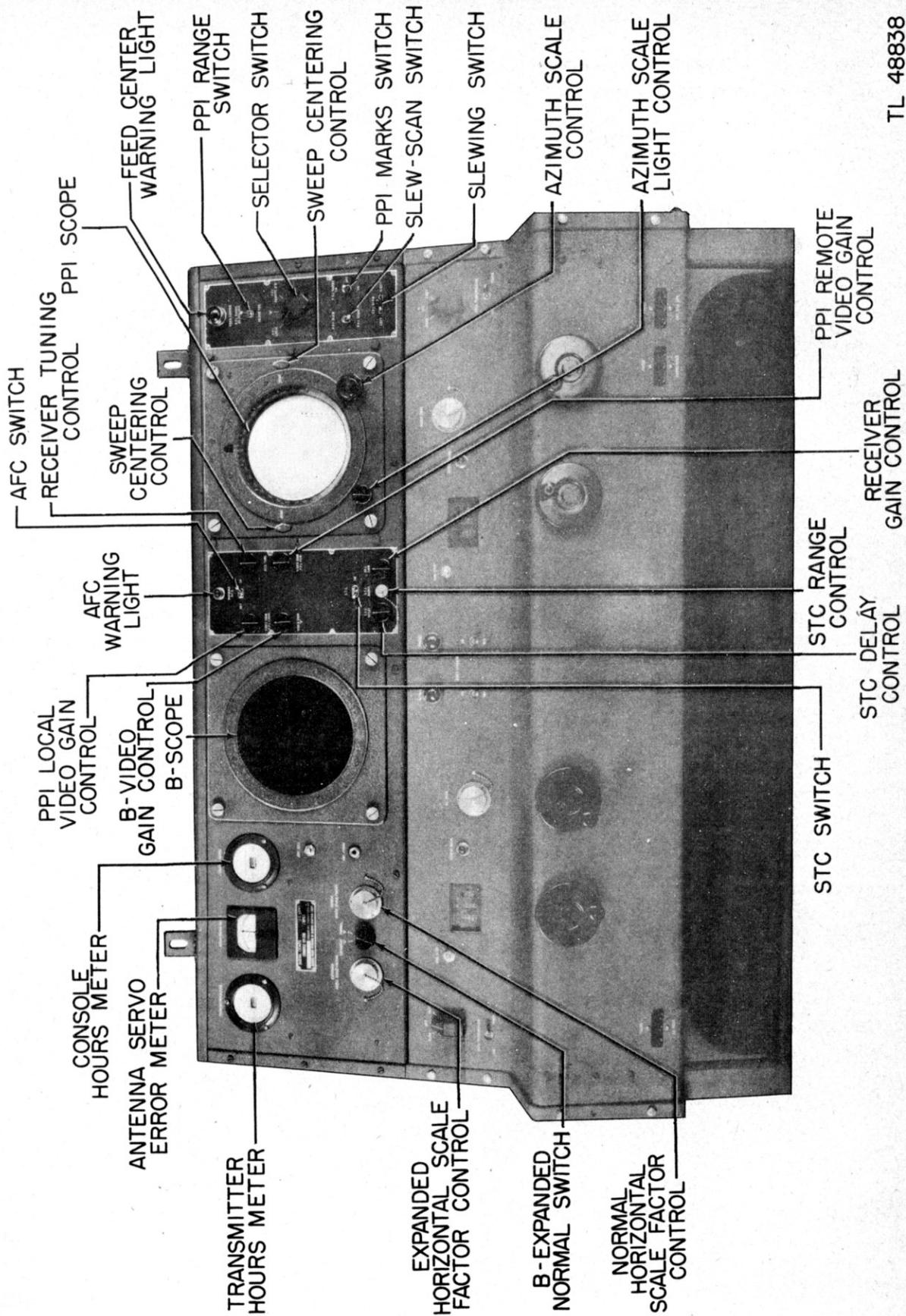


Figure 3-21. Console control panel.

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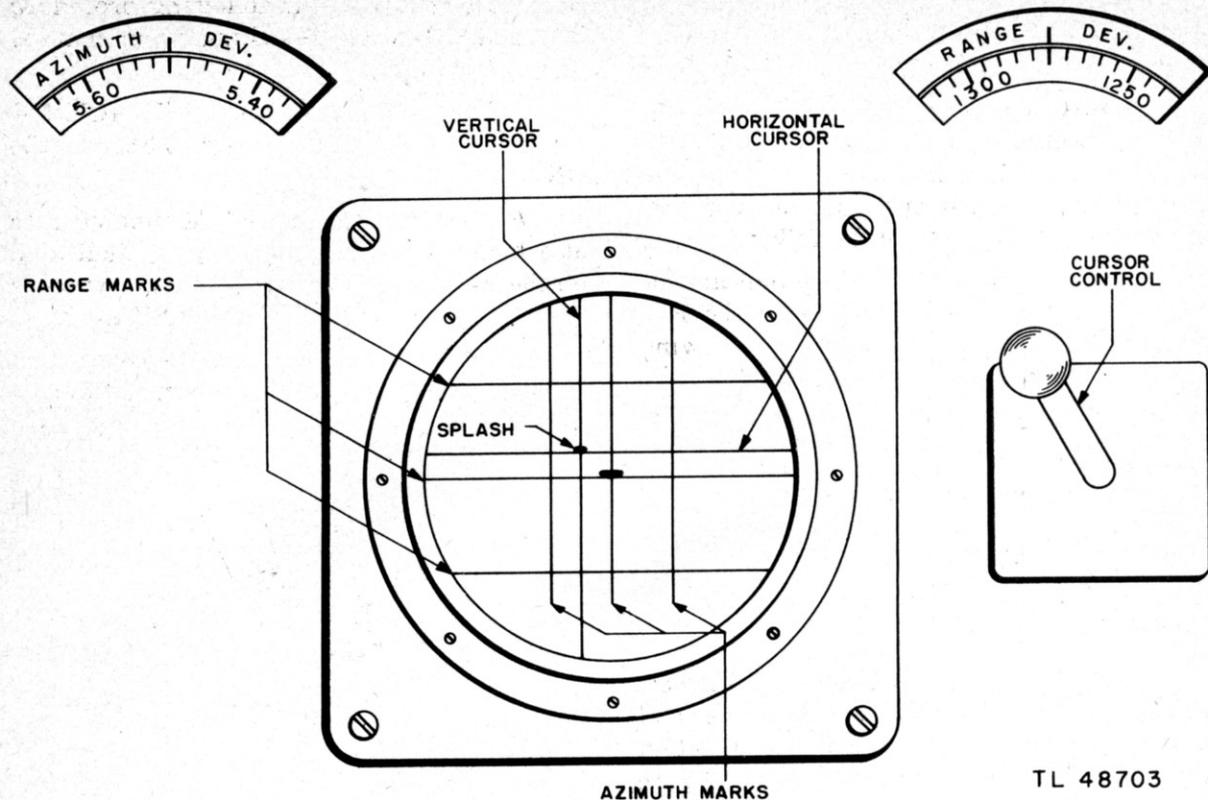


Figure 3-45. Remote B-scope operation.

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.