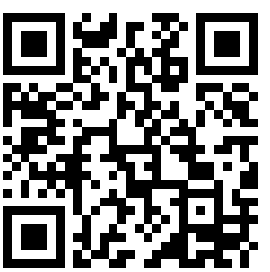

WAR DEPARTMENT TECHNICAL MANUAL TMII-1340

TECHNICAL OPERATION MANUAL

FOR

RADIO SET AN/TPS-3

GENERAL DESCRIPTION, OPERATING INSTRUCTIONS
AND EQUIPMENT PERFORMANCE LOG

RESTRICTED

WAR DEPARTMENT • 1 MARCH 1944

Incl.-3

WAR DEPARTMENT TECHNICAL MANUAL

TM 11-1340 Restricted

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WAR DEPARTMENT,
WASHINGTON 25, D. C., 1 MARCH, 1944

TM 11-1340, War Department Technical Manual, Technical Operation Manual for Radio Set AN/TPS-3, is published for the information and guidance of all concerned.

[A. G. 300.7 (23-Aug. '44)]
By order of the Secretary of War:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

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

DISTRIBUTION:

X

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

WARNING

HIGH VOLTAGE

is used in the operation of this equipment.

DEATH ON CONTACT

may result if operating personnel fail to observe safety precautions.

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TABLE OF CONTENTS—Continued

LIST OF ILLUSTRATIONS

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—The transmitter tube. Smash receiver and indicator units (units are readily removable from console). Smash modulator unit; be sure oil sealed compartment is destroyed. Smash pulse transformer, T-R assembly, and transmission line system in lower part of console. Smash power unit; be sure the rotary spark gap is destroyed. Smash the antenna assembly.

2. Cut—Wiring, electrical connections, co-axial cable, and dipoles.

3. Burn—Tent, antenna frame, and console. Use power unit gasoline and oil.

4. Bend—Antenna shaft and transmission lines.

5. Bury or scatter—Scatter transmitter tube after smashing. Bury and scatter remains which will not burn.

DESTROY EVERYTHING

SAFETY NOTICE

Voltages used in this equipment are high enough to endanger life and may be fatal if contacted by operating personnel. Operators must be careful not to contact high-voltage plate circuits or 115-volt a-c input connections while checking or servicing equipment.

Extreme caution must be exercised when adjusting the frequency of the transmitter. Dangerously high voltages are present in the power supplies of the receiver and modulator units. High-voltage capacitors in these power supplies must be discharged manually.

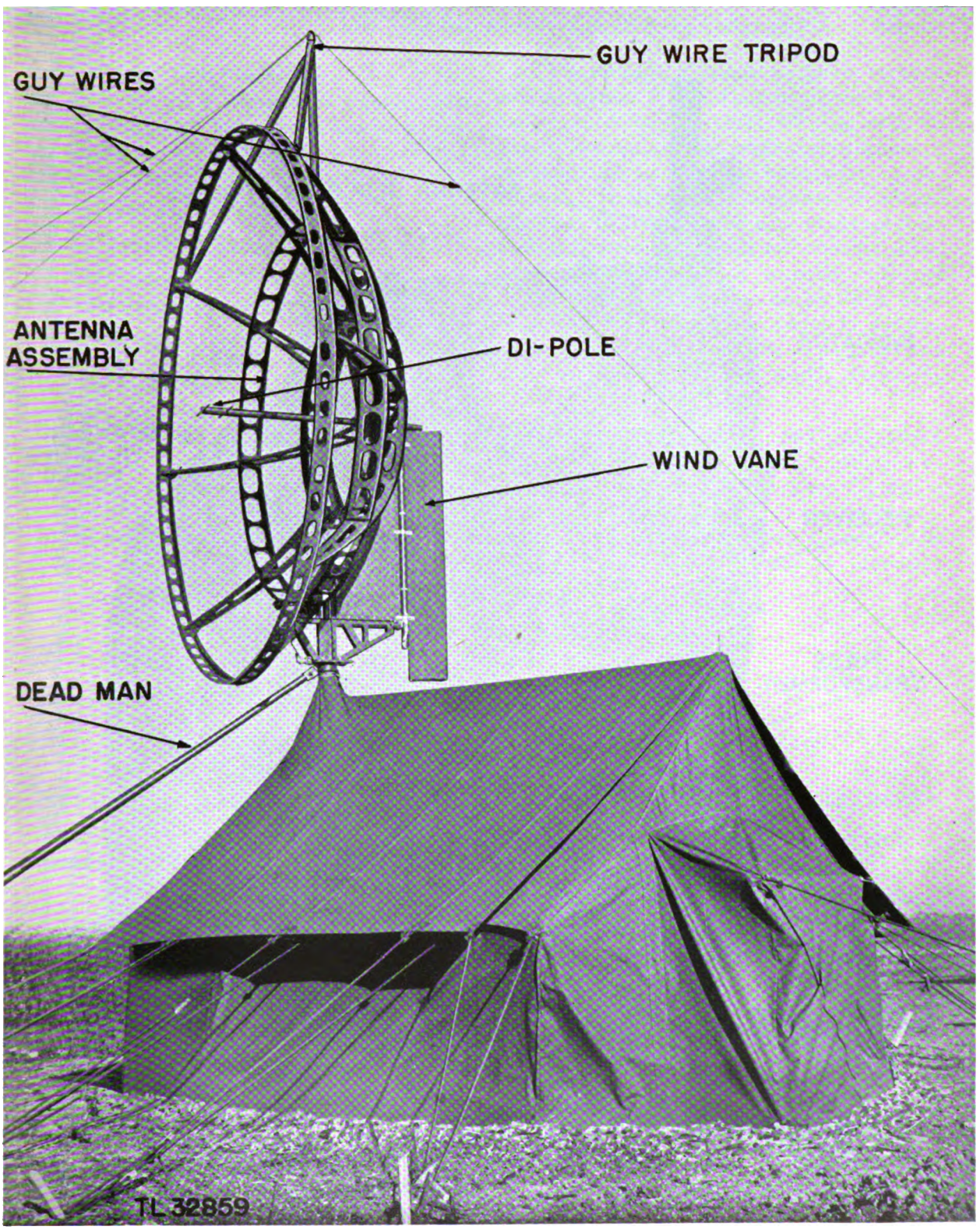


Figure 1. Radio Set AN/TPS-3.

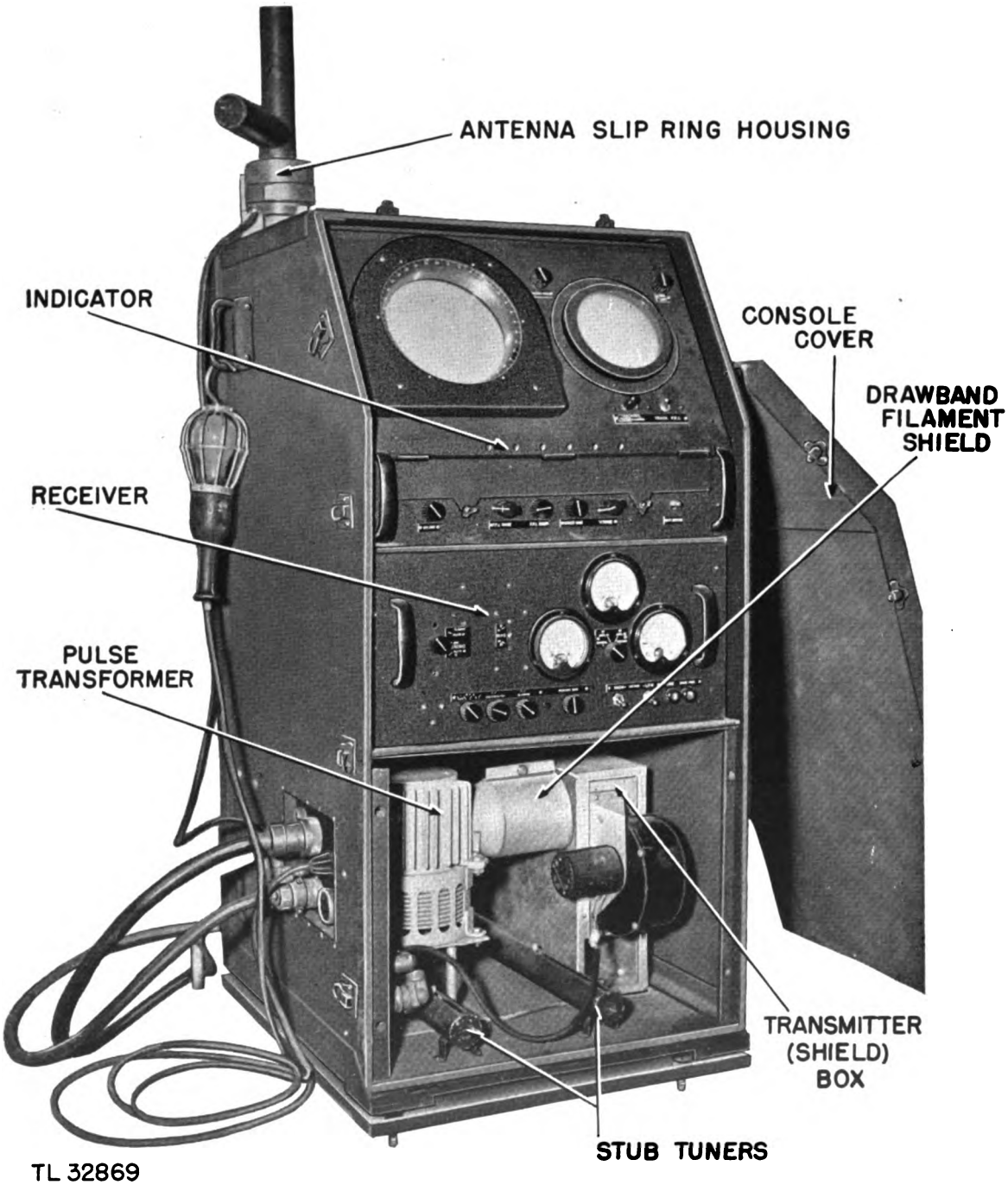


Figure 2. Console with Lower panel removed.

CHAPTER 1

GENERAL FUNCTIONS

1. SCOPE OF THE MANUAL

a. This manual is prepared to acquaint radar operators and repair men with the general features and technical operation of Radio Set AN/TPS-3. The major chapters of the manual are as follows:

1. GENERAL FUNCTIONS.
2. COMPONENTS AND ACCESSORIES.
3. INSTALLATION AND OPERATION.
4. EQUIPMENT PERFORMANCE.
5. CHECKS MADE DURING STARTING.

b. The manual is concerned primarily with the installation and technical operation of the radio set. 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 11-1540, has been prepared on the theory and repair of the set.

c. The earmarks of normal equipment performance are given in chapter 4 and are tabulated on the Equipment Performance Log. The log calls for making systematic checks while the equipment is operating and for recording information on performance. It specifies the conditions of efficient operation. By indicating the signs of normal functioning, it provides the basis for detecting abnormalities and for applying necessary corrective measures. The information on the log sheets, when carefully analyzed, should be useful to everyone concerned with the way the radio set performs. Log sheets are available in pads bearing Form No. WDSC 257.

2. PURPOSE OF RADIO SET AN/TPS-3.

Radio Set AN/TPS-3 is a portable, medium long range, radar unit designed for early warning against aircraft. See figures 1, 2, and 3. In general, its function is to search for approaching aircraft and to provide range (distance) and azimuth (direction)

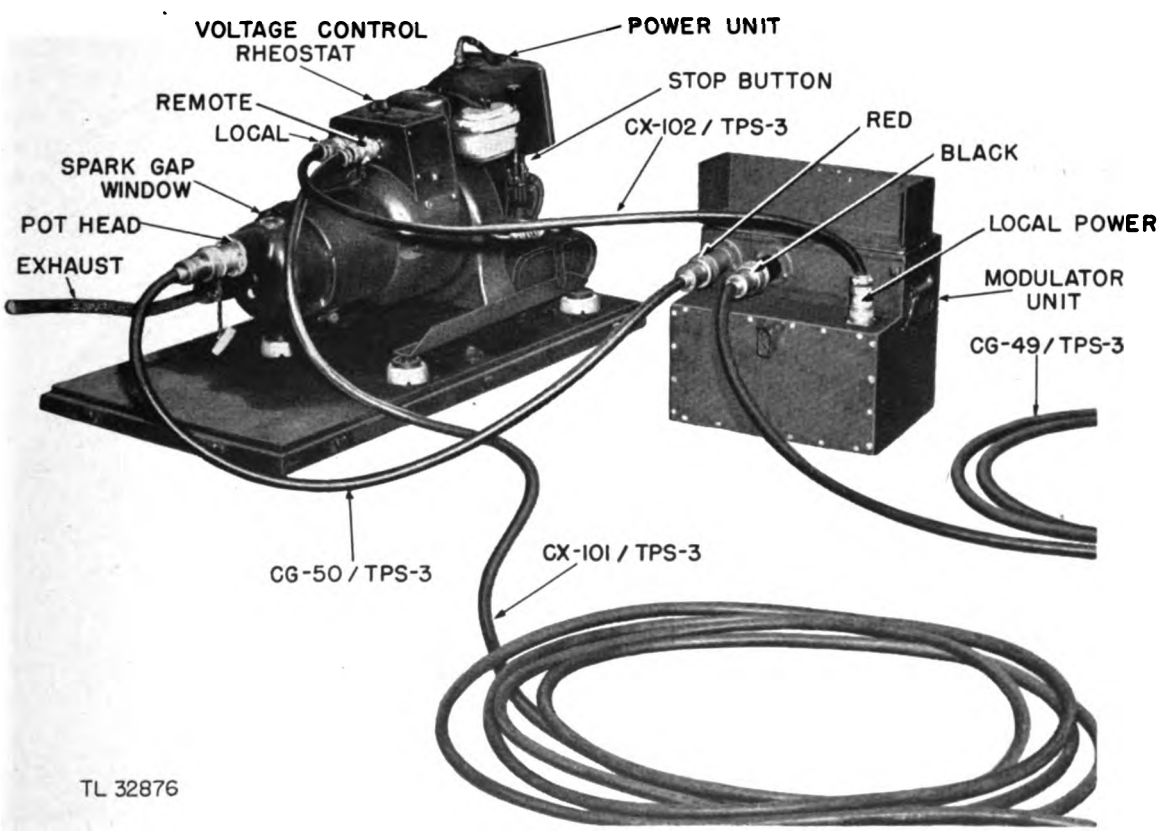


Figure 3. Power unit and modulator.

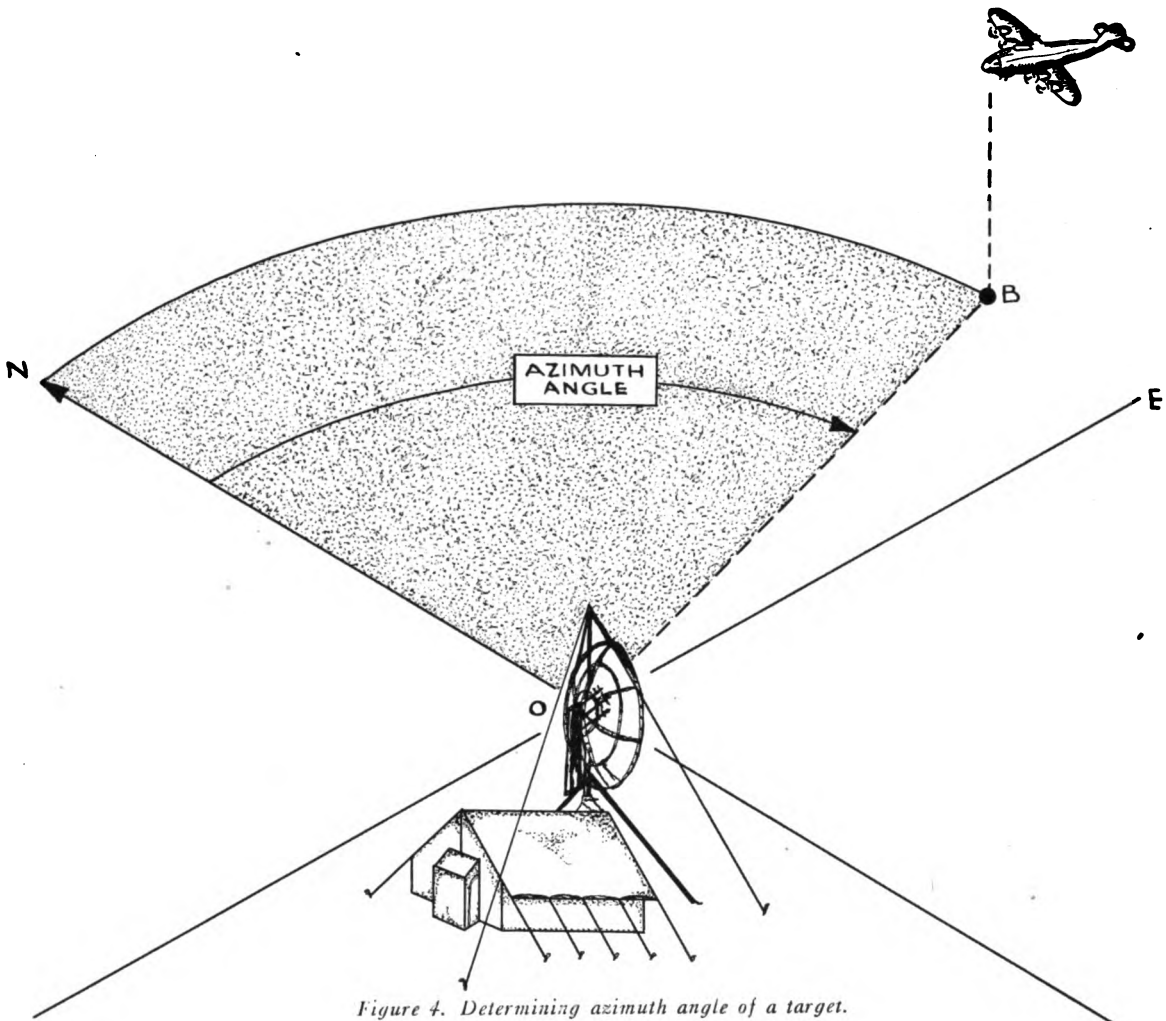
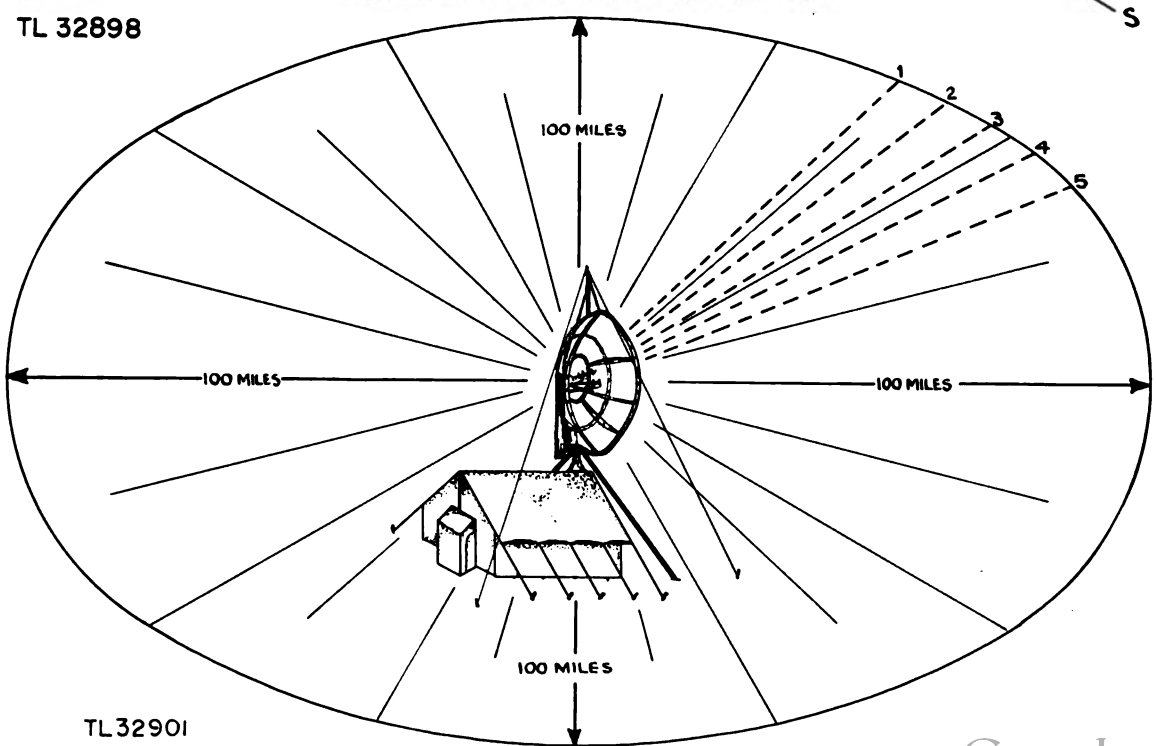


Figure 4. Determining azimuth angle of a target.

TL 32898



TL32901

Figure 5. Scanning in azimuth.

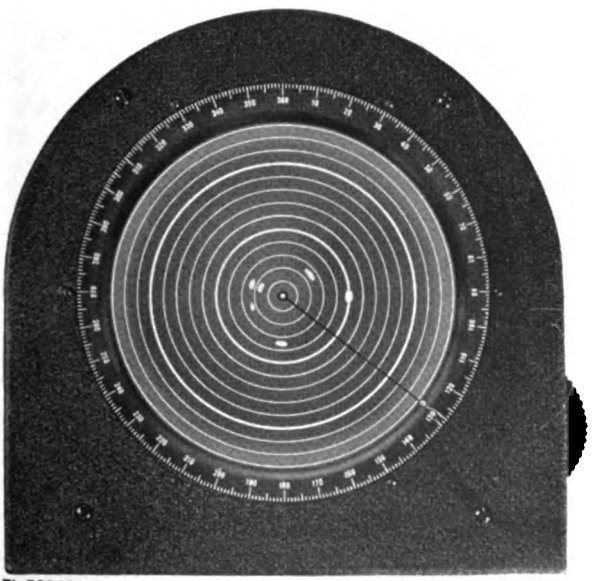
information on them. The maximum range of the equipment is 100 miles.

3. MEANING OF AZIMUTH. As shown in figure 4, the azimuth, or azimuth angle, of a target is its horizontal clockwise direction with respect to a specified reference direction. In the figure, the reference direction is True North. An imaginary reference line ON starts at the radar unit and extends toward True North. With the target above position B, the line OB is the direction of the target in azimuth. The angle between lines ON and OB is the amount that the antenna has been turned horizontally from True North in order to point at the target in azimuth. This angle is the azimuth of the target and is expressed in degrees.

4. MEANING OF RANGE.

a. The range of a target is the direct distance, in miles, between the target and the radar unit.

b. In Radio Set AN/TPS-3, as in other radar units, the range to a target is determined by converting time into distance. The time involved is that required for a radio signal (main pulse) to leave the transmitting antenna, travel to the target, bounce back from the target, and return as an echo to the receiver. The change-over from time to distance is possible because the velocity of radio waves is constant and has been measured. It is known that a radio wave takes approximately 10.7 microseconds (millionths of a second) to make a round-trip between the transmitter and a target which is one mile distant. Thus, if a round-trip is found to require 107 microseconds, the range of the target is 10 miles. Actual calculations of range by radar operators are made unnecessary by having a picture of the target echo appear on the calibrated screen of a cathode-ray tube. The main pulse occurs to the left of the zero point on the scale while the echo appears at a point along the scale which corresponds to the range of the target.



TL 32903

Figure 6. PPI scope pattern.

5. SCANNING.

a. Scanning is a process of examining space with radio waves sent out from the rotating antenna of the radar unit. If a target such as an airplane is in the path of the waves and less than 120 miles away, its presence is detected. When scanning or searching through 360 degrees in azimuth, the antenna describes a circle, completing about five revolutions in one minute.

b. Since the speed of the radio wave is very much faster than the speed with which the antenna turns, it is possible for a radio wave to leave the antenna, go out to a target and bounce back again to the antenna before the latter has had time to turn completely away from the direction of the target. Imagine a circle with the antenna located at its center and the boundary on all sides 120 miles from the antenna (limited by the range of the set). Turning the antenna in all directions would be scanning the area bounded by this circle.

c. Now, if this area is divided into 360 equal sections, with each section numbered in sequence, as shown in figure 5, a target located in section 1 would be struck by the waves sent out from the antenna aimed in that direction, and would reflect the signal back to the antenna before the latter turned into the direction covered by section 2. By moving through each of the 360 parts of a circle several times a minute, the radar system can scan or search the area in all azimuth directions around its location.

6. TARGET INFORMATION INDICATORS.

a. Radio Set AN/TPS-3 employs two target indicators. The range and azimuth of all targets being scanned, and within the 120 miles range of the equipment, are displayed on the screen of the plan position indicator. This cathode-ray tube, also known as the PPI scope, can be considered as the searching indicator for all targets located within a range of about 120 miles.

b. Figure 6 illustrates the face of the plan position indicator (PPI) tube used in the set. The rim

of the circular tube is surrounded by a calibrated scale divided into 360 equal divisions, each division representing one degree. Radiating outward from the center of the tube toward its edge, is a fine line developed by the cathode-ray beam. This is the direction indicating line or sweep trace and 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 degree scale around the outside of the tube gives the direction of the target in azimuth.

c. A target echo appears as a bright spot along the direction indicating line and the distance (range) to the target is determined by noting the distance of the target echo from the center of the tube, or more exactly, by noting its position relative to the series of concentric rings. These rings are made electronically and are spaced to represent distances of 10 miles on the 120-mile range. Thus, a bright spot located midway between the second and third rings, counting from the center, would represent a target 25 miles from the equipment. The PPI tube illustrated in figure 6 shows several targets, the farthest being about 50 miles from the equipment and in a direction 90° from the reference direction.

d. In addition to the PPI scope, which is used primarily for searching and direct azimuth reading, a 5-inch "A"-scope is incorporated on the right of the indicator panel for more accurate readings in range and as a tuning device. It is also calibrated with marker pips. These pips are made electronically and occur at ten-mile intervals with a larger pip at the 50 and 100-mile markers. The marker-pips appear across a horizontal sweep line on the "A"-scope and extend in a downward direction, as shown in figure 7. Echoes from targets appear on the horizontal sweep in an upward direction, as shown in figure 7.

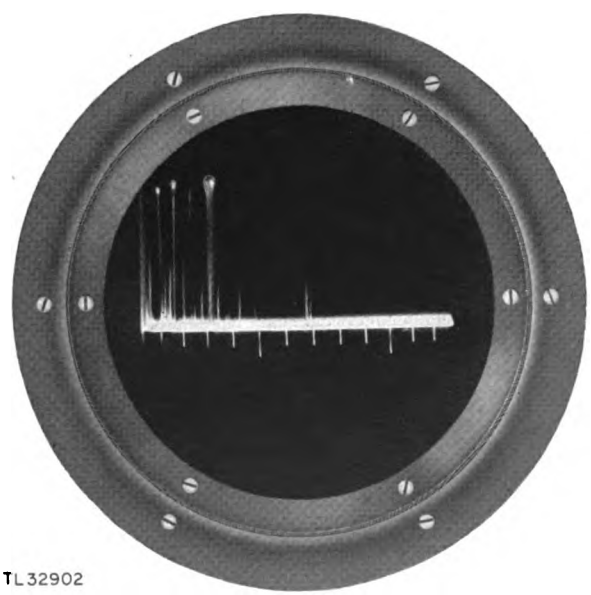


Figure 7. "A" scope pattern.

CHAPTER 2

COMPONENTS AND ACCESSORIES

7. MAJOR COMPONENTS OF RADIO SET AN/TPS-3. This radio set consists of the combinations of major units indicated below. The approximate weight is given for each major assembly.

Component	Component No.	Weight in pounds	Dimensions
Antenna assembly.	AS-74/TPS-3		
Console cabinet.	CY-69/TPS-3	110	
Cable.	CG-50/TPS-3		
Cable.	CX-101/TPS-3		
Cable.	CX-102/TPS-3		
Cable.	CG-49/TPS-3		
Indicator.	ID-51/TPS-3	50	
Modulator.	MD-16/TPS-3	75	
Power unit.	PU-6/TPS-1	128	
Receiver.	R-59/TPS-3	50	
Tent and Accessories.	S-4/TPS-3	185	
Tool box.		16	
Transmitter.	T-52/TPS-3		

8. CONSOLE. The console (fig. 2) consists of an indicator, receiver and anti-jamming circuit, power supply in the receiver chassis, transmitter, pulse transformer for stepping-up the voltage to the transmitter, and a t-r system. The weight of the complete console exclusive of antenna is 200 pounds. The console is housed in a light-weight plywood cabinet.

9. ANTENNA. The antenna system (fig. 1) consists of a steel mast, which supports the 10-foot parabolic reflector. Associated with the antenna are two rigid supporting members which join at the upper end of the mast and constitute the main support for the entire assembly. Additional support is provided by means of three guy wires which attach to the top of the parabolic reflector. These guy wires together with the rigid supporting members are securely anchored to the ground and provide satisfactory support for the set in winds as high as 60 miles per hour.

10. TENT. The tent (fig. 1) furnished with Radio Set AN/TPS-3 is a durable canvas shelter. The tent is furnished complete with all ropes, stakes, poles, etc., necessary for its erection. The tent dimensions are as follows: base, 9 x 9 ft; walls, 3 ft in height; ridge pole, 7 ft in height; light-proof entrance extends 2 ft from front of tent and is 4 ft 7 in. in height. A fly is furnished for use over the top of the tent. This affords a greater protection against the direct rays of sunlight and makes the interior of the tent sufficiently dark on a bright day. In addition to its light-proofing qualities, the fly is also useful for keeping the tent cool in the sunlight. The tent is provided with a light-proof entrance with a flap so that personnel may enter and leave without appreciably brightening the inside of the tent. The tent is closed on both ends with heavy zippers. The sod cloth which runs around the bottom of the tent should be buried in the ground for maximum protection against wind when operating in cold climates.

11. MODULATOR UNIT. The modulator unit (fig. 3) consists of a small completely sealed box in which is located all of the high-voltage generating equipment necessary for operation of the set. One compartment of this box is accessible for replacement of tubes. Two cables are furnished which connect between the spark gap on the generator and the modulator, and the modulator and the console. These cables are constructed so that the modulator can be located near the generator; both units are located about 50 feet from the console.

12. POWER UNIT. The power unit (fig. 3) consists of a single cylinder, 2 cycle gasoline-engine-driven generator and a rotating spark gap. The unit furnishes 115-volt 400-cycle ac for operation of the main console, and 24-volt dc for operation of the relay, antenna drive motor, blowers, and fan. Refer to TM 11-933 for complete information on the power unit.

13. ACCESSORIES. Radio Set AN/TPS-3 is shipped complete with tubes in position. In addition,

enough spare tubes and other parts are included for four months' continuous operation. The set is also provided with the tools required for installation and operation. Test equipment sufficient for minor repairs, maintenance and frequency adjustments is also provided with the radio set.

14. VACUUM TUBE COMPLEMENT.

a. Receiver.

Quantity	Type
1	VR105-30
1	VR150-30
2	2 x 2
2	GL-446A
14	6AC7
1	6H6
1	955
3	5U4G

b. Indicator.

Quantity	Type
1	5CP1
1	7BP7
18	6SN7GT
3	6AG7
7	6V6GT
2	6H6GTG

c. Transmitter.

Quantity	Type
1	VT-158

d. Modulator.

Quantity	Type
1	705A
2	532A

e. T-R System.

Quantity	Type
1	532A

15. SPARE TUBES. Since a great many spare tubes are provided with this set, most of them are packed in a separate crate. The remainder are located in the box containing tools and miscellaneous operating equipment. This separation of the spare tubes is made so that the box of separate spare tubes may be left behind if the set must be carried over difficult terrain by hand. However, if operation is contemplated for a period of more than two or three weeks, the residual spare tubes should be included with the rest of the equipment.

Tube type	Immediate spares (Packed with tools and test equipment)	Residual spares
VR105-30	1	2
VR150-30	1	2
VT158	0	4
2 x 2	1	7
446A	2	13
532A	1	34
5CP1	0	6
5U4G	3	9
6AC7	1	58
6AG7	1	11
6H6	1	5
6H6GTG	1	5
6SN7GT	2	40
6V6GT	1	26
7BP7	0	6
705A	1	11
955	1	5

16. ASSOCIATED ITEMS. The following additional items are required for complete installation and operation of Radio Set AN/TPS-3.

a. Thermo-couple Unit. A weather-proof thermo-couple (fig. 17) and two short dipole arms which mount within the parabolic reflector are furnished. A small bracket is provided for the dipole arms, and these connect down through the hinge assembly of the main mast. This thermo-couple unit provides an indication of power output and is useful in tuning the set.

b. Connecting Cables. Two high-voltage connecting cables are supplied to connect between the modulator, generator, and console (fig. 3). These cables are color coded for ease in assembly. Two separate four-conductor cables are also provided for power transmission between the generator and the console, and the generator and modulator.

c. Cable Installation. The four cables, which are easily and quickly installed, constitute the main part of the interconnections between components.

In addition to these, a cable runs from the slip rings on the antenna mast down to the multiple-plug terminal board of the console. This cable carries the thermocouple current to the meter on the receiver panel. The tent, fan cable, and IFF cable, if used, must also be connected to the multiple-plug terminal board of the console. There are also two 115-volt sockets on the console terminal board. These may be used for a soldering iron or lamp.

d. Connections. Connections between the receiver, indicator, transmitter, and T-R system are located within the console itself. Connections are made by means of ceramic-insulated plugs located on the chassis of each unit. These plugs engage receptacles mounted on the rear wall of the console. When the receiver and indicator are slid into place, all connections are automatically made, and no other cables are used. If it is necessary to do work inside the receiver or the indicator chassis, the units may be removed from the console. It is possible to operate the set with the receiver or indicator units removed from the console by using special extension cables and multiple-plug terminal boards.

CAUTION: Under no conditions should the set be turned on unless the high-voltage connecting cables between generator and modulator, and between modulator and console, are securely in place.

e. Leveling Platform. A leveling platform (fig. 8) is provided so that the set can be placed on the ground and leveled.

f. Test Equipment. The following test equipment (fig. 29) is provided with the set for making minor repairs and maintenance:

(1) Volt-ohmmeter.

(2) 400 cycle (reed-type) frequency meter.

(3) Absorption type r-f wavemeter.

g. Tool Equipment. The following tools are provided with the set:

Quantity	Description
1	Carpenter's level.
1	Cold chisel, 5/8" by 6½".
1	Cutters.
1	Extension cable, indicator.
1	Extension cable, receiver.
1	File, triangular 6", with handle.
1	File, half round, with handle, 10".
1	Funnel.
1	Gasoline drum, 5 gals.
1	Hack saw and blade.
12	Hack saw blades.
1	Hand axe.
1	Jack knife, 3 blades.
1	Ladder, 8 ft.
1	Lampcord, socket, and lamp.
1	Mattock, trench.
1	Measure, quart.
1	Pliers, long nose.
1	Pliers, gas, 6".
1	Pliers, gas, 10".
1	Rope, manila, 15 ft.
1	Screwdriver, 1/8" x 3".
1	Screwdriver, bakelite handle.
6	Screwdriver, 5/16" x 6".
1	Screwdriver, 1/8" x 10".
1	Screwdriver, 3/16" x 4".
1	Shovel.
1	Shorting wire clip lead, for modulator.
1 lb	Solder, rosin core.
1	Soldering-iron, 60 watt.
½ lb	Tape, friction.
1 roll	Tape, cellulose acetate, 72 yds.
1	Wrench, Allen head, 1/8".

17. **PACKING SPECIFICATIONS.** Radio Set AN/TPS-3 comes complete in five transit cases. Two types of packing are required; air-transport packing and overall export packing. Most of the items are packaged both in a light-weight plywood box and in a heavy export shipping crate. For the sake of clarity the former will be called the "air transport case" and the latter the "export crate." There is a maximum weight limit of 200 lbs. on the air transport case, but there is no weight limit on the export crate. Below is a description of each crate, together with its contents.

a. Crate No. 1. This crate contains the indicator chassis, receiver chassis with the console and transmitter, and other items (fig. 2). The console itself is made of lightweight plywood, and is furnished with a removable cover for the front. With this cover in place, the console unit is sealed and entirely suitable for air transport. The receiver and indicator chassis are in a waterproof packing. The air transport case fits into the export crate for shipping when needed.

b. Crate No. 2. The modulator (fig. 3) is housed in a completely sealed metal box with a carrying handle on each end. No air transport case is provided for it since the box itself is considered

as such. However, the unit must be cushioned if packed in the export crate since a severe shock might open the seal of the box and allow oil to leak out.

c. Crate No. 3. All miscellaneous equipment used in operation is packed in a plywood air transport case referred to as the "coffin." This air transport case is export-packed for shipment in an export crate. The following equipment is contained in the coffin:

Quantity	Description
1	VR105-30 tube.
1	VR150-30 tube.
1	2X2 tube.
2	GL-446A tube.
1	532A tube.
3	5U4G tube.
1	6AC7 tube.
1	6AG7 tube.
1	6H6 tube.
1	6H6GTG tube.
2	6SN7GT tube.
1	6V6GT tube.
1	705A tube.
1	955 tube.
1	Lamp cord, socket, and lamp.
1	Lamp bulb.
1	Carpenter's level.
1	Cutters.
1	Pliers, long nose.
1	Pliers, gas 6″.
1	Pliers, gas 10″.
6	Screwdrivers, 5/16″ x 6″.
1	Screwdrivers, 1/8″ x 10″.
1	Screwdrivers, 3/16″ x 4″.
1	Screwdrivers, 1/8″ x 3″.
1	Allen head wrench, 1/8″.
1	Soldering iron.
1	Shovel.
1	Mattock, trench.
1	Screwdriver, bakelite handle.
1	File, 6″ triangular, with handle.
1	File, 10″ half round, with handle.
1	Jacknife.
12	Blades, hacksaw.
1	Cold chisel, 5/8″ x 6½″.
1	Axe, hand.
1 lb.	Solder, rosin core.
1	Tape, friction, ½ lb. roll.
1	Tape, cellulose acetate, 72 yd. roll.
15 ft	Rope, Manila.
1	Drum, gasoline, 5 gal.
1	Quart measure.
1	Funnel.
1 set	Generator spare parts.
1 set	Generator tools.
1	Volt-ohmmeter with leather case.
1	Frequency meter in box.
1	Wavemeter in box.
1	Extension cable, receiver.
1	Extension cable, indicator.
1	Modulator shorting wire and clip assembly.
1	Tent fan and cable.
1	Cable and connector, long.
1	Cable and connector, short.
1	Coaxial cable and connector, long.
1	Coaxial cable and connector, short.
1	Antenna, single head.
1	Antenna, triple head.
4	Console mounting feet.
2	Technical manuals.
1	Thermocouple and dipole.
1	Transmission line connector rod.

d. Crate No. 4. This crate contains the parabolic reflector. Crate number 4 contains three smaller boxes suitable for air transport.

e. Crate No. 5. This package contains sections of the plumbing and parabolic reflector accessories, tent stakes, and the tent. The tent bundle is strapped to the ladder. As such, it is suitable for air transport, and no air transport case is required. For shipping however, an export crate is necessary. The following material is included in this crate:

Quan.	Description
1	Coaxial plumbing up to hinge, including slip rings and slip ring cable.
1	Structural and transmission line assembly
1	Windvane and transmission line assembly
1	Top bearing support, top bearing and guy wire assembly.
2	Legs.
25	Tent stakes and tent pegs.
3	Guy-wire stakes.
1	8-ft. ladder.
2	Tent poles.
1	Ridge pole.
2	Erecting poles.
2	Deadmen assemblies (supporting members).
1	Tent.

f. Crate No. 6. Residual spare tubes are contained in this crate.

CHAPTER 3

INSTALLATION AND OPERATION

SECTION I

SITING AND INSTALLATION

18. SELECTION OF SITE.

a. Terrain Features. To obtain maximum performance from Radio Set AN/TPS-3, it is important to use care in selecting the site for installation. The surrounding terrain should be as free as possible from obstructions such as buildings, large trees, etc. The range of the set is greatly increased if the antenna radiates over flat land for at least ¼ mile, or better still, if the surface is sea water. This is because the transmitted and received signals are reinforced by reflection. The flat land or sea water act as reflecting surfaces. If the antenna is confronted with hilly country, both the transmitted and received signals will be scattered since this effect of reinforcement of the signals by reflection is not produced.

b. Obstructions. Never locate the set near high hills or abruptly rising ground. If it is impossible to find a location clear of all obstructions, place the set so that it is clear in the direction which is most important.

19. ANTENNA ELEVATION.

The higher the antenna is located above the reflecting surface, the smaller will be the angle of the main lobe with the ground. Thus if the set is placed on a high location, the radiated energy falls very close to the ground and in this way facilitates the detection of low-flying aircraft. If placed on a low site, the angle of the main lobe increases and thus permits the detection of high-flying aircraft. A high location has the advantage of facilitating the early detection of low-flying aircraft. Therefore, when the set is used for early-warning purposes, a high location is best. On the other hand, if better coverage of close-range high-flying aircraft is required, it is better to place the set on a low site.

20. TENT LOCATION.

a. Sunlight penetrates the ends of the tent and brightens up the inside considerably. It is usually best, therefore, to place the tent in a position such that the ridge pole runs east and west. The bright mid-day sun will then strike the top of the tent, which is protected by the fly.

b. Choose ground that is sufficiently soft so that stakes may be driven in easily, and yet not so soft that they might tear loose. If the set must be located on very soft ground, pile rocks or sand bags on the two deadmen and the three top guy-wire stakes.

21. SETTING UP THE EQUIPMENT.

a. Precaution. Be careful when installing this equipment. It has been designed for minimum weight, and it is therefore not as rugged as heavier equipments. Care should be used when erecting the antenna since careless handling of the parabolic reflector may damage it and require that it be sent back to a depot for repair. Carefully unpack the components of the Radio Set AN/TPS-3. Check each item against the list provided. Be sure each article has its identifying tag.

b. Unpacking, Cleaning, and Inspection. (1) Remove the heavy export packing from all crates. Be careful not to damage the equipment with crow bars or other tools which are used.

(2) Unpack crate No. 3. This crate contains all of the tools which are needed for assembly. Always be sure to return tools to the chest when you are through using them. If a special tool is lost, delay may result.

(3) Next, unpack the console, receiver, and indicator from crate No. 1.

NOTE: Remove the heavy shorting wire from across the terminals on the back of the OUTPUT UNITS meter on the receiver panel. Remove the front cover from the console, and slide the indicator and receiver into their places within the console. Then replace the front cover.

CAUTION: Never use the handles on the front panel of the indicator to lift the unit into the console. Instead, grasp the chassis firmly on both sides by inserting the fingers through the openings in the lower side of the frame. This will prevent damage to the equipment within the console during the time that the antenna is being assembled. If it is raining at the time the tent is erected, it is best to leave the receiver and indicator within their waterproof packing until the complete set is installed and the tent is erected. Never allow water to get into the receiver, indicator or console.

22. SETTING UP THE CONSOLE AND ANTENNA SUPPORTS.

a. The ground under the leveling platform of the console must be as firm and flat as possible so that the leveling platform will neither sink into it, nor wobble when the console is mounted on it. Although leveling legs are provided on the console (fig. 8), there is insufficient adjustment on these leveling legs to take care of unusual variations.

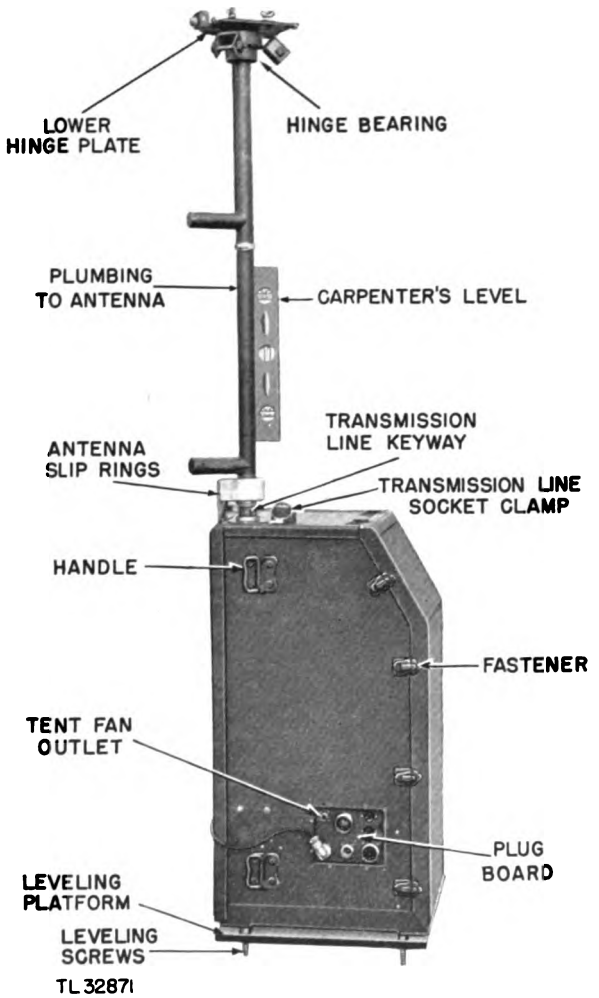


Figure 8. Console in the leveling position.

b. Remove the four leveling legs for the console, the four washers, and the console mounting platform from the tool chest. Mount the legs on the console. After the ground has been levelled, place the base board on the ground. Then place the console with the four pointed ends of the levelling legs extending through the holes in the bottom board and spiking into the ground.

c. Next, unpack the antenna export crate No. 4, and the tent and ladder export crate No. 5. Remove the main mast of the antenna from the tent and ladder crate, and insert this in the top of the console, as follows: Remove the protecting cover from the top of the console. Note that the inner conductor coming up through the console is square. When inserting the main antenna mast into the console, this square conductor must fit into the square hole on the inside of the inner conductor of the antenna mast. See figure 8A. While one man holds the antenna mast over the console, another should examine the square shaft coming up through the console and align it with the inside of the inner conductor of the mast. These two slip together easily when they are aligned. Slide the mast down into the console as far as it will go, and align the tongue on the mast with the groove in the piece which is fastened to the console. Place the clamp around the mast and tighten it. Be sure that the clamp is near the end of the fingers of the antenna mast.

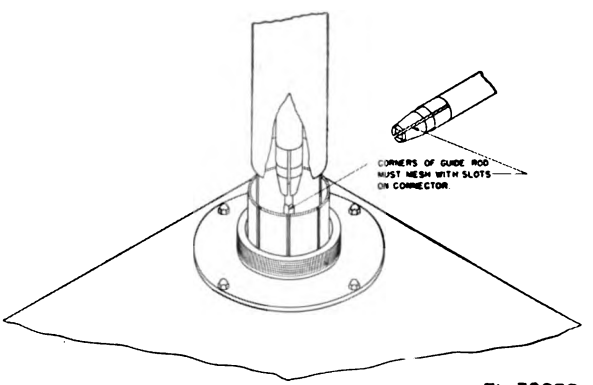


Figure 8a. Main mast console socket.

d. To level the console, place the carpenter's level on the right side of the mast and adjust the two leveling feet on the right at the same time, or the two feet on the left at the same time (fig. 8). After leveling in this direction, place the carpenter's level on the front of the mast. Move the two front, or the two back screws simultaneously. With a little practice the set can be leveled in a few minutes.

e. Obtain the two deadmen (supporting members) from crate No. 5 (fig. 1). Attach the end of these members to the top hinge plate of the antenna mast by placing bolts through the clevis in the hinge plate and tightening the nut on the end of the bolt. Be careful not to upset the leveled console. If the antenna mast is strained the console will have to be

leveled once more. After the deadmen have been fastened, extend them to their full length, and stake them down to the ground. The exact position is not important, but it is usually best to have one deadman extend straight back away from the console, and the other one 120° around to the left. They must always be 120° apart.

f. Keep the supporting members as long as possible, since maximum support is obtained at full length. After burying the lower ends and tamping the ground, tighten the adjusting nuts which control the length. Check the level of the console.

23. SETTING UP THE ANTENNA.

a. Unpack the sections of the parabolic reflector from the three air-transport cases. Select a fairly flat piece of ground a few feet away from the console, and lay the various sections of the parabolic reflector together on the ground as shown in figure 9. Note that each of the outer sections is painted in color on the edge where it meets the central hub (fig. 10). Line up the colors of the outer sections with the color painted on the central hub.

b. With all of the sections of the parabolic reflector in their proper places, begin the assembly. There are six screwdrivers ($\frac{5}{16}$ inch x 6 inches) which fit the screws exactly. To save time, use six men to assemble the parabolic reflector. Begin the assembly by having one man hold up the central hub, while another holds the outer section adjacent to it, and a third man fastens in the camlock screws (fig. 11). Be sure the camlock pin is in correct alignment with the slot, so that these screws may be tightened easily. Only a quarter turn is required to snap them into place.

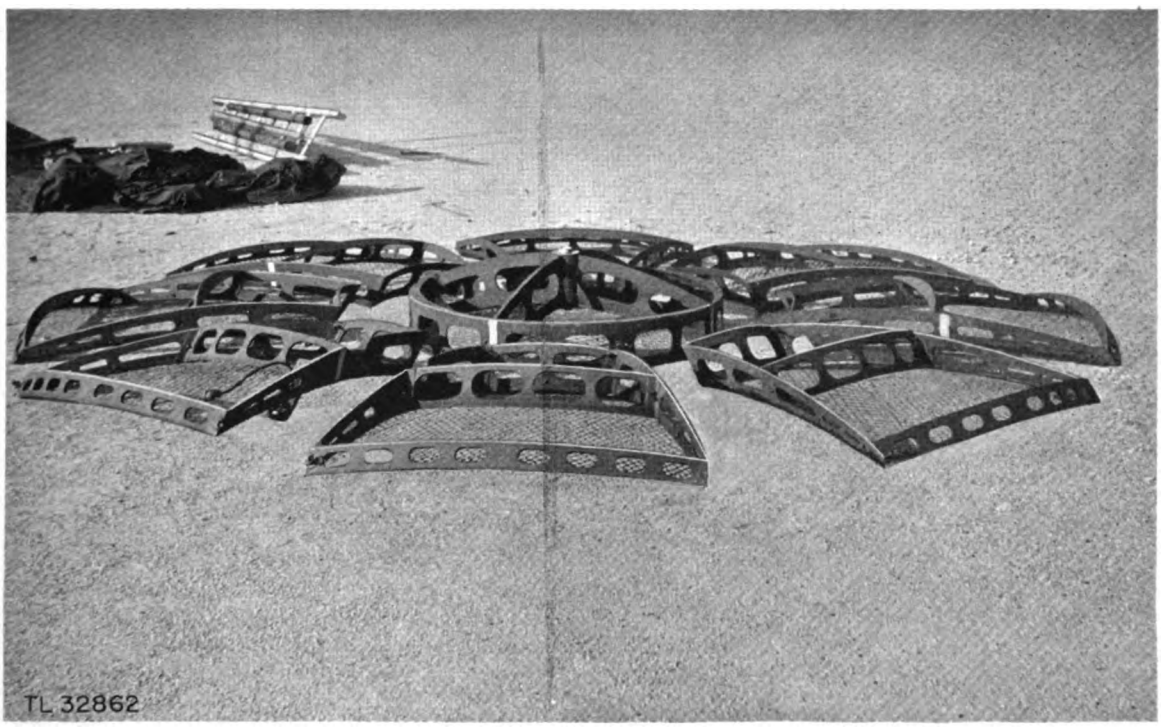


Figure 9. Parabolic reflector laid out for assembly.

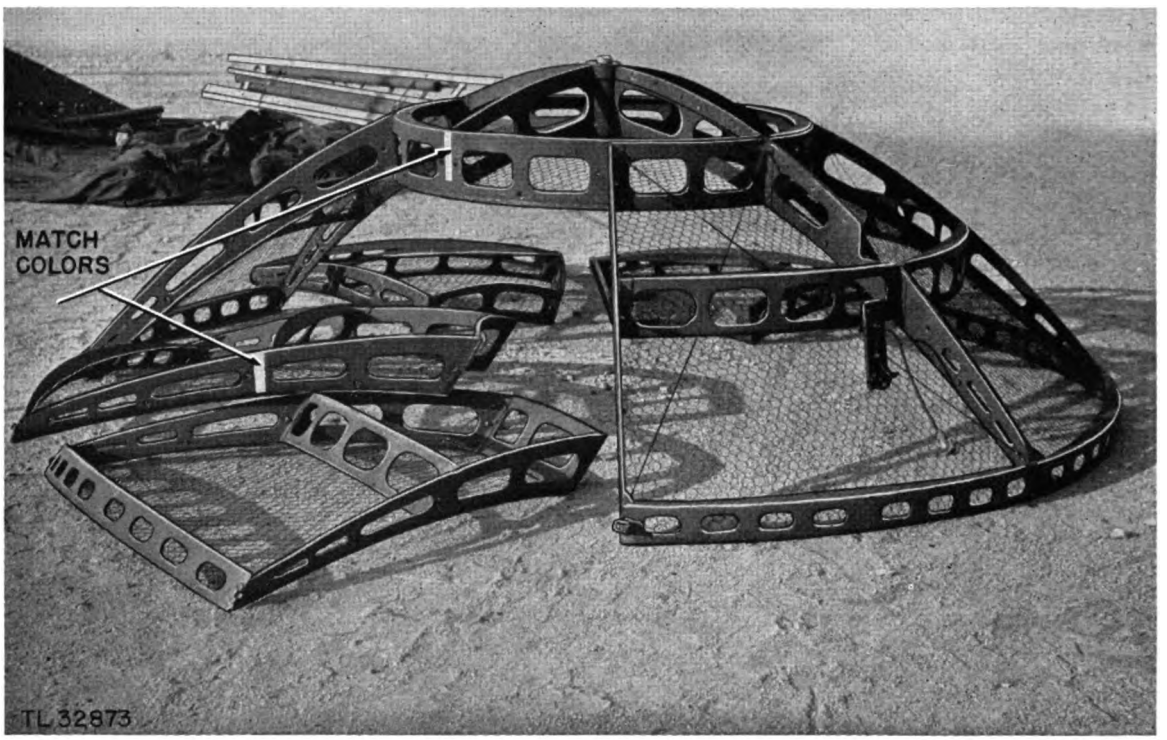


Figure 10. Parabolic reflector assembly color-coded.

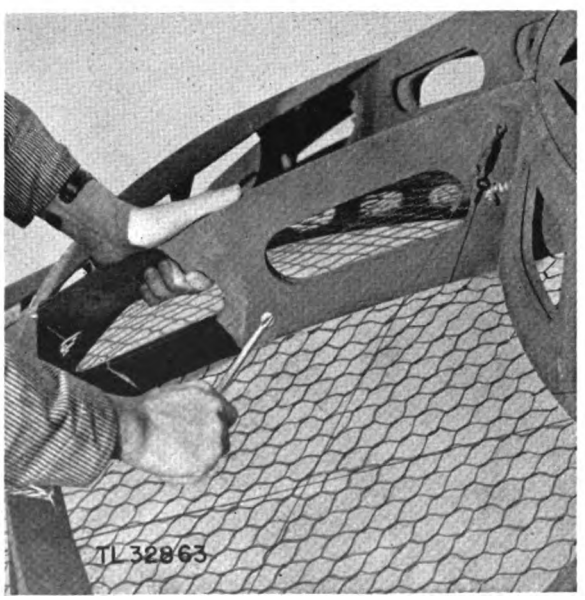


Figure 11. Tightening camlock on antenna assembly.

c. After one wing has been fastened on the central hub, all other wings can be assembled together. When the complete parabolic reflector is assembled, check each camlock to make sure it is in place. All camlocks must be fastened. Otherwise the parabolic reflector may not withstand high winds. Also make sure that the catches around the outer edge of the parabolic reflector are snapped together (fig. 12).

Figure 12. Tightening clamp on antenna assembly.

d. Obtain from crate No. 5 the support and transmission line assembly. Attach this piece to the proper vertical member of the parabolic reflector with a single bolt as shown in figure 13. Only one rib in the parabolic reflector accommodates this piece, and may be identified by a deep notch.

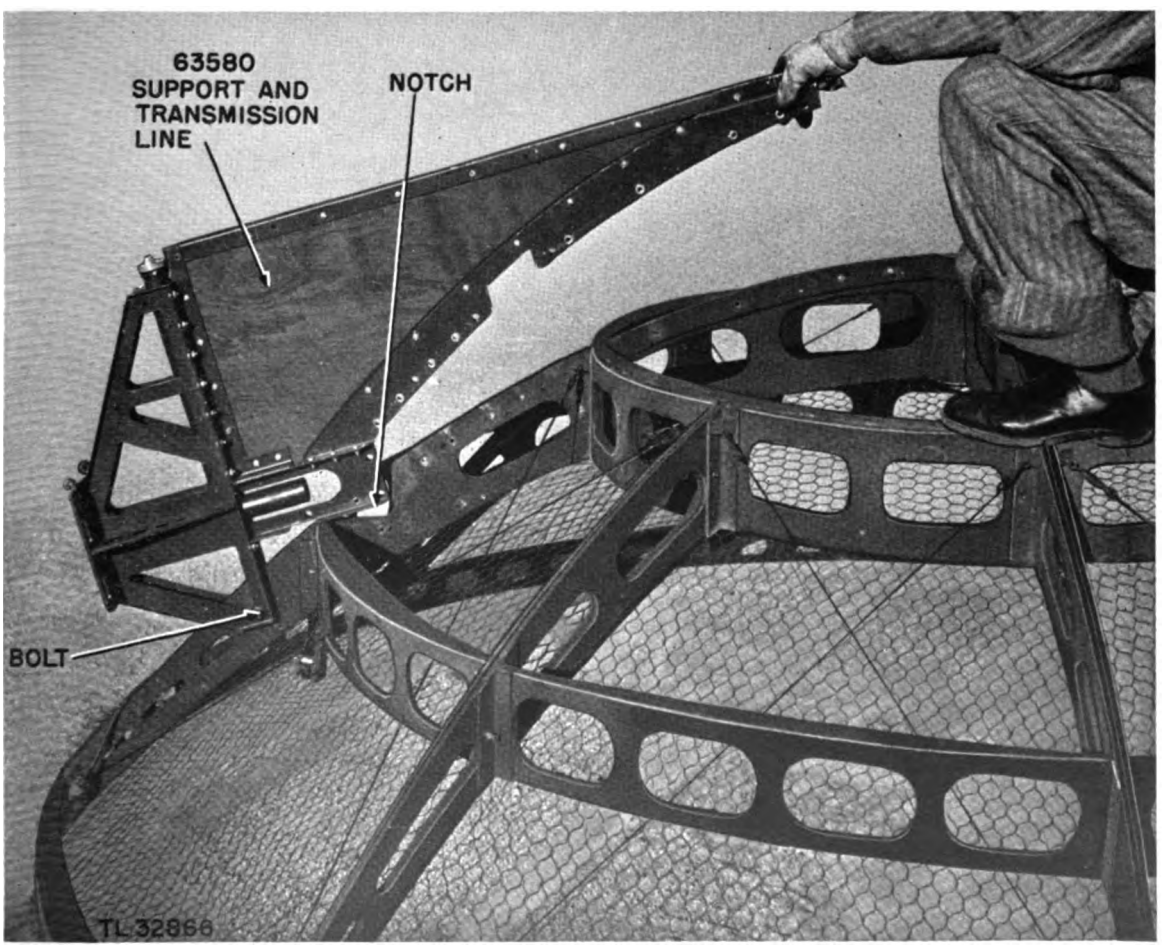


Figure 13. Assembling of upper mast.

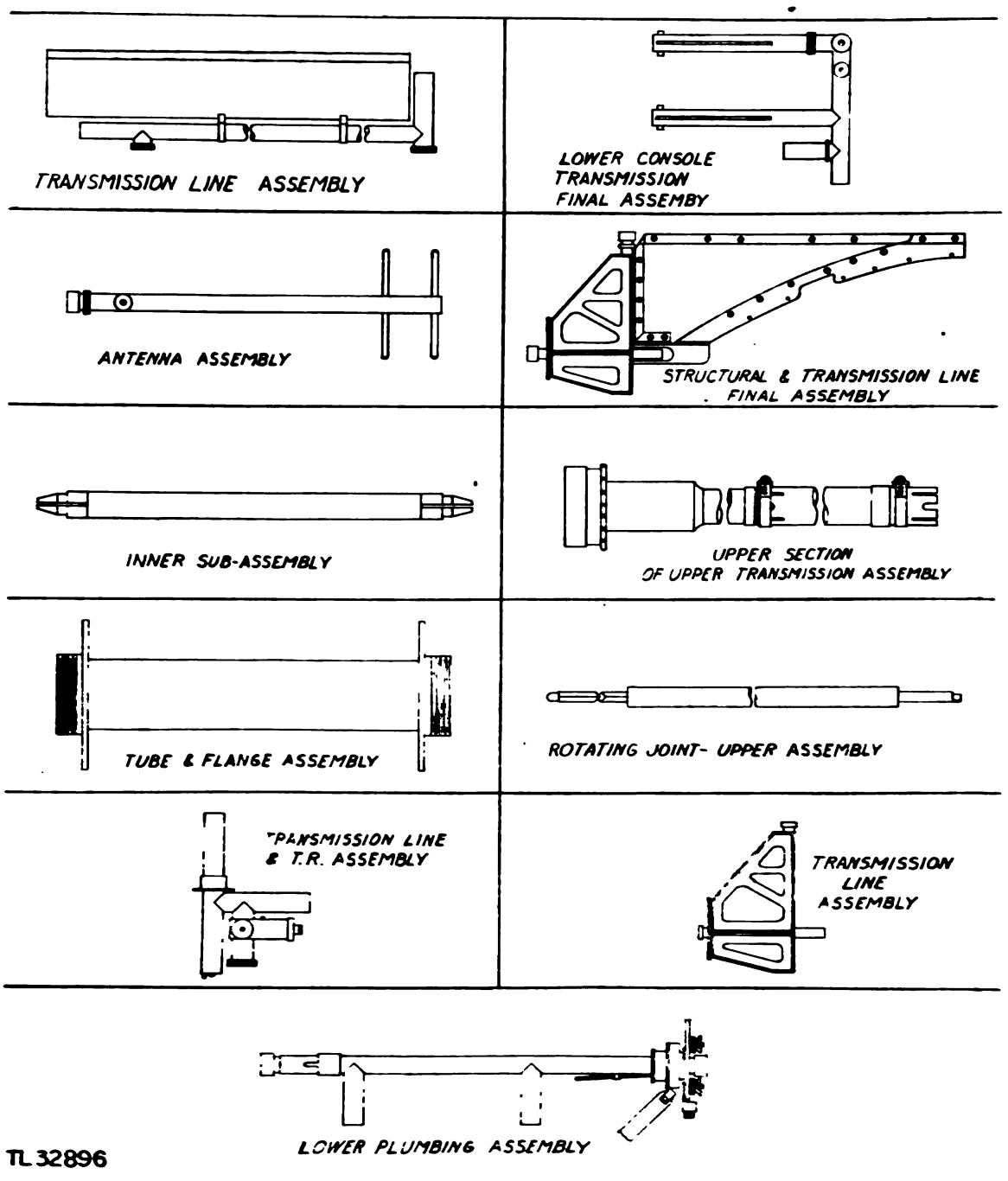


Figure 13a. Plumbing details.

e. After the transmission line piece is bolted, swing it down into place and install the 4-20 screws through the web of the triangular piece and the parabolic reflector. Make sure all of the bolts are tightened.

f. Remove the wind vane and transmission line assembly from crate No. 5. Install this assembly on the back of the support and transmission line piece as shown in figure 14. Place it in position, and screw down the two coupling rings on the trans-

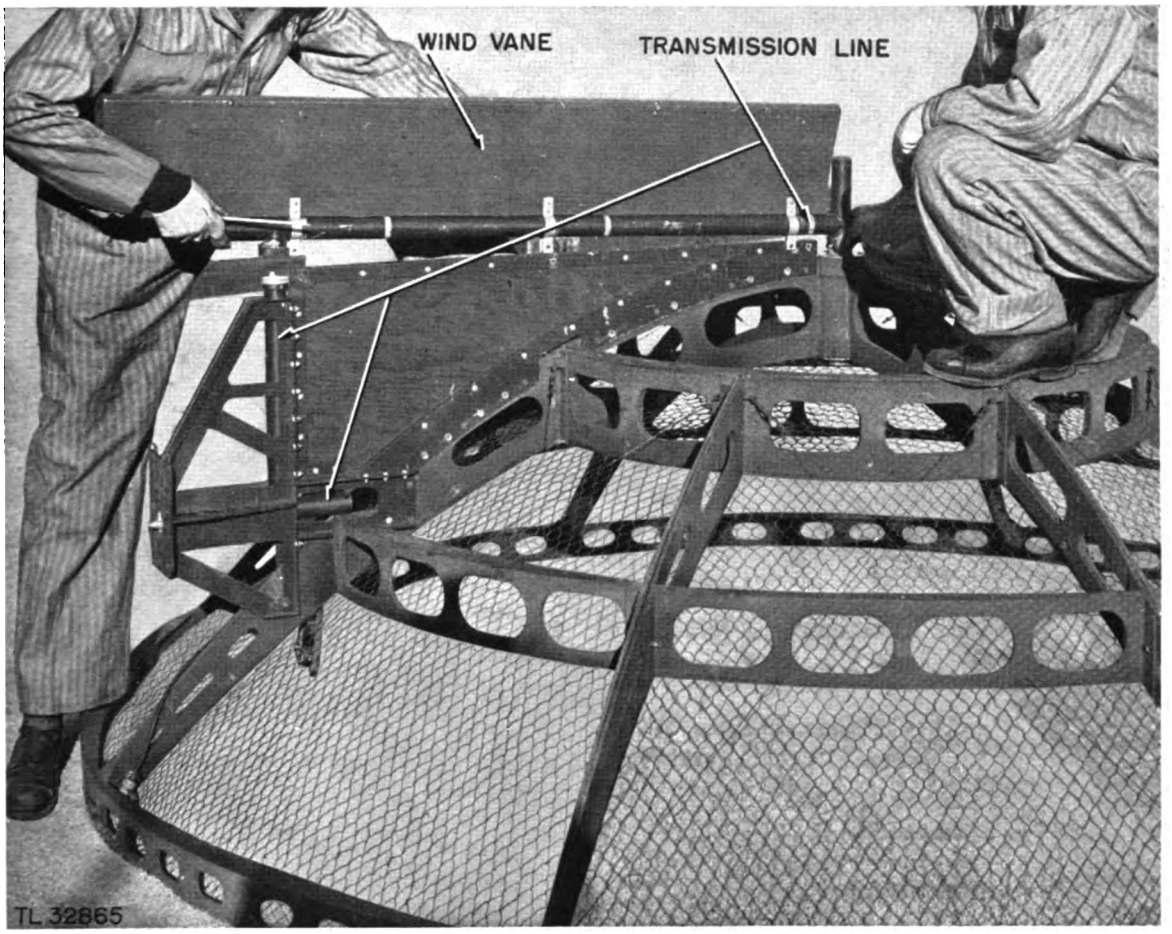


Figure 14. Assembling of wind vane.

mission line. Do this before the three ¼-20 bolts are inserted through the clamp on the transmission line. When finished, make sure both of the knurled coupling rings are finger tight and that the three bolts are tight.

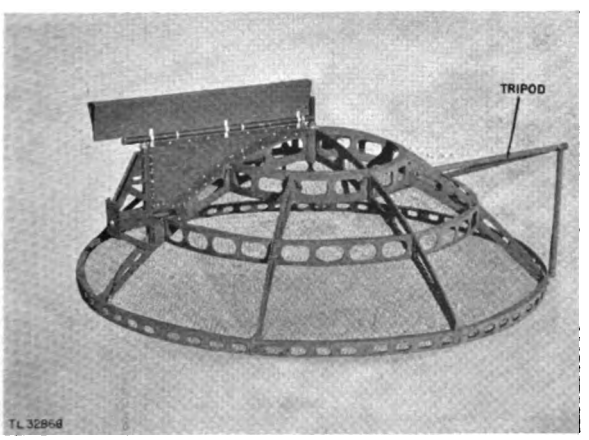


Figure 15. Parabolic reflector assembled without dipole.

g. Attach the top tripod and guy wire assembly to the proper rib of the parabolic reflector. Note that in figure 15 this assembly is fastened on the far side of the parabolic reflector away from the transmission line. Be sure that all bolts and wing nuts are tight on the top tripod assembly.

h. Next, have three men grasp the outer edge of the parabolic reflector and tilt it up to allow one man to enter the inside and install the dipole.

i. BE SURE THAT THE CENTRAL CONNECTING PIN IS INSERTED THROUGH THE HUB OF THE PARABOLIC REFLECTOR. WITHOUT THIS INNER CONDUCTOR THE SET WILL NOT OPERATE.

j. Make sure that the inner conductor of the dipole engages the inner conductor which passes through the hub of the parabolic reflector. Orient the dipole as shown in figure 16 and screw home the knurled ring.

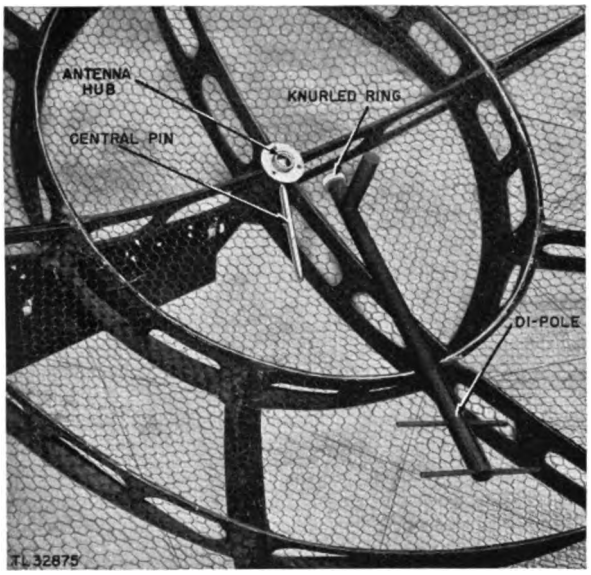
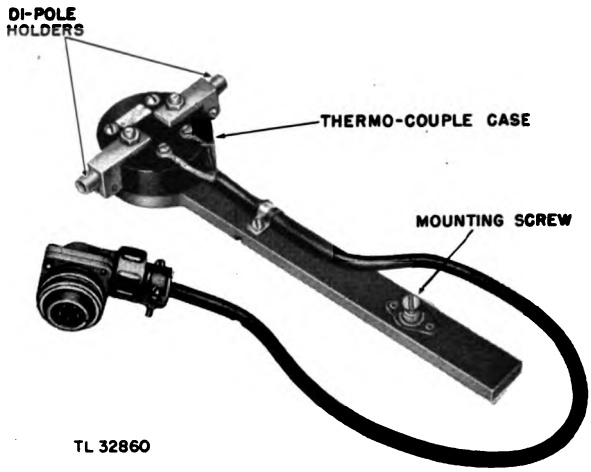


Figure 16. Parabolic reflector with dipole and pin.

k. Obtain the thermocouple dipole assembly (fig. 17) from crate No. 3 and install it, together with its supporting bracket, on the rib of the parabolic reflector nearest the structural transmission line assembly. Holes are provided in this rib for fastening the thermocouple.

l. With the dipole and transmission line equipment in place, do not set the parabolic reflector down so that the dipole hits the ground. Likewise, do not allow it to roll over.



Fiaure 17. Thermocouple.

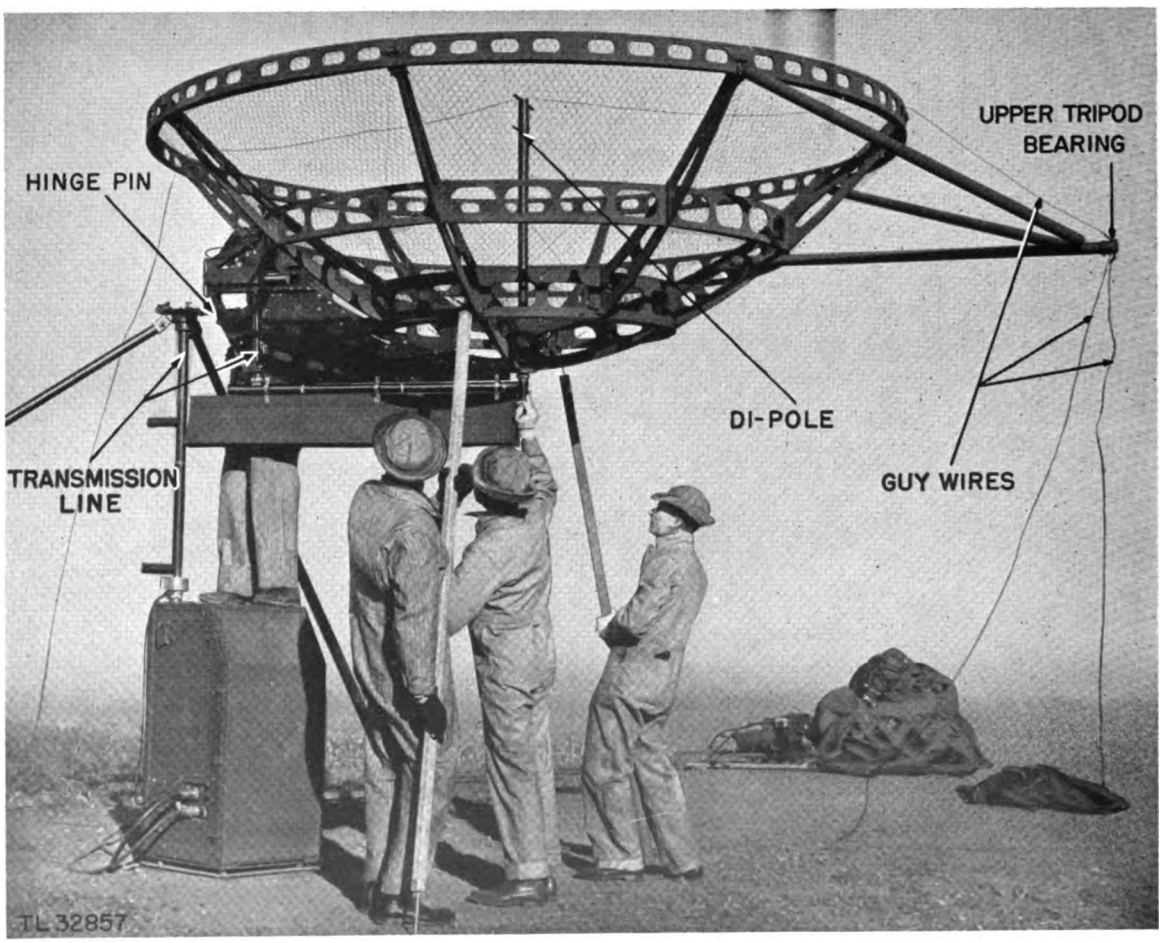


Figure 18. Erecting the antenna (a).

24. ERECTING THE ANTENNA.

a. Have five or six men turn over the parabolic reflector (so the open end is up) and carry it to the console. Make sure the guy wires are clear and free. Do not attempt to erect the antenna during a high wind.

b. With the antenna approximately in place as shown in figure 18, let one man stand on the console and insert the hinge pin. The pin fits through the holes in the hinge plates on the mast and the hinge plates on the antenna (fig. 18*a*). The console will support the weight of one man, but he should keep his feet near the edges of the console.

c. After the hinge pin has been inserted in place, rest the parabolic reflector on the lifting poles. Two men must hold it. Then have three other men take hold of the guy wires.

d. Have the man standing on the console make sure that the wing nuts and clamps on the four screws which extend through the lower hinge plate are in the proper position to fall into the slot of the upper hinge plate (fig. 18*a*). The parabolic reflector is then ready to be swung up. Swing the reflector into place by using the two lifting poles, with some help obtained by pulling on one guy wire in the direction the antenna is being swung up. Be very careful that the parabolic reflector does not twist and damage the hinge plate or the transmission line. The two men with the lifting poles should push equally.

(1) It should be noted that the two inner conductors are engaged just before the reflector is guided to the full perpendicular position.

(2) Once the reflector is in a perpendicular position, hold it in place with the three guy wires until the four fastening bolts in the hinge are pulled down tight.

e. Extend the guy wires out as far as they will go and stake them down to the ground. These guy wires are very important in supporting the reflector and must be kept 120° apart, i.e., equally spaced.

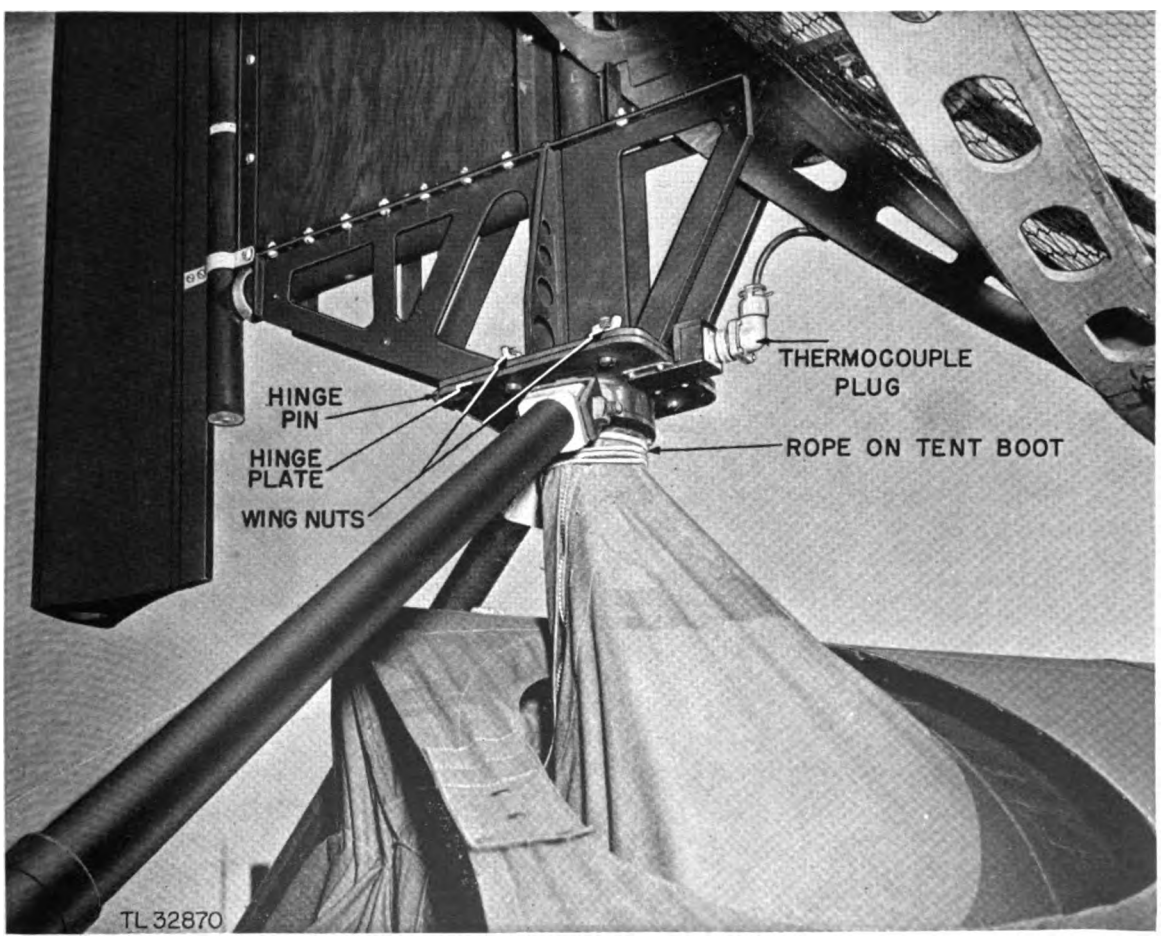


Figure 18a. Hinge plate assembly.

Make certain that the reflector is kept perpendicular to the ground.

f. After the reflector has been erected, and the guy wires securely staked down and tightened, detach the two lifting poles. Again check the level of the main mast. If it is off, correct it by means of the guy wires.

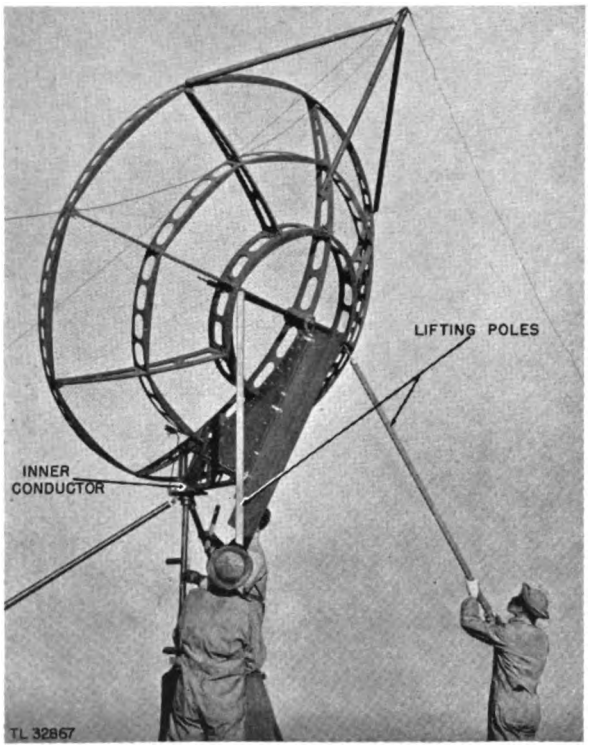


Figure 19. Erecting the antenna (b).

25. ERECTION OF TENT. The erection of the tent must be as accurate as possible to avoid interference with the antenna drive. The procedure is as follows:

a. Unroll the tent and place it near the operating position. Place the ridge pole (the long pole with a hole at each end) inside of the tent. Insert the pins in the tent poles through holes in the ridge pole, and through the grommets (eyelets) in the tent so that they project out.

b. Straighten out all the ropes and pull the tent up. Look for the bearing that fastens to the zipper and boot just below the hinge plate of the antenna mast. The boot fits tightly around this bearing, and the zipper may then be started and run down to the bottom of the tent. Tie the rope around the boot and bearing (fig. 20). When the zipper is closed, the tent poles may be located in the best position, and ropes of the tent may be staked down. Drive the stakes 8 or 10 feet from the tent. It is unnecessary to do any actual tying of the ropes if the stakes are driven in the ground at an angle so that the loops will not slip off.

c. For operation in cold climates, it is desirable to bury the sod cloth in the ground. In warmer climates this is unnecessary, but it should be securely staked down to prevent light from leaking into the tent.

d. Another stake should be driven in the ground about 10 feet from the entrance to the tent. This stake is used to hold the rope at the entrance to the tent. Stake down the sod cloth all around the entrance. Unroll the fly and fold it back up in such a manner that the ropes extend outward from the ends of the bundle. Throw the bundle over the top of the tent, and straighten it out. Place the two holes over the pins projecting out of the tent, and then tie down the ropes to the same stakes used to hold the tent.

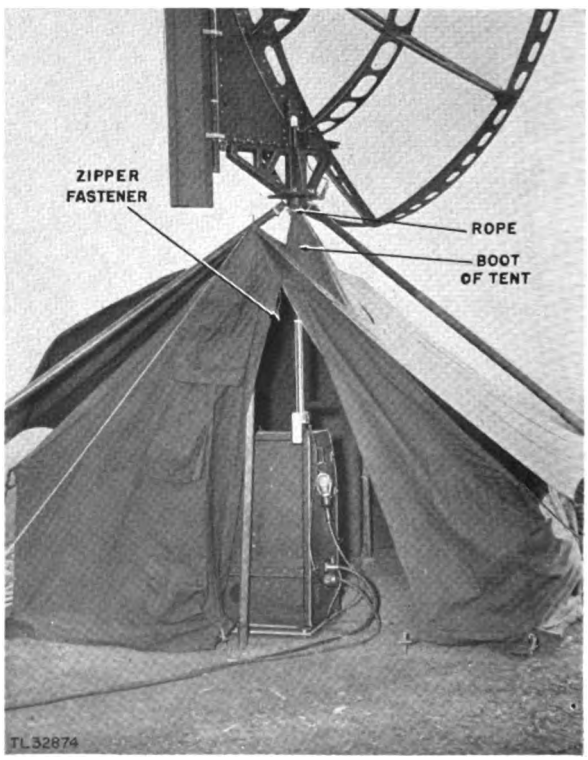


Figure 20. Console in the tent.

26. SETTING UP POWER UNIT AND MODULATOR (fig. 3).

a. Keep the modulator unit out of the direct rays of the sun. A good location is near or under a small tree or bush. The modulator dissipates considerable heat and should be kept in a reasonably free space where air can circulate around it.

b. The high-voltage equipment in the modulator is covered with oil. There is an air space on top. If the modulator is tilted more than about 5° (slope of 1 to 10), part of the high-voltage equipment will be exposed and damage may result.

c. Remove Cable CX-101/TPS-3 and high-voltage Cable CG-49/TPS-3 from the tool chest. High-voltage Cable CG-49/TPS-3 (the one with the black connecting plugs) is inserted into the receptacle marked MODULATOR on the console terminal-board. Insert Cable CX-101/TPS-3 into the receptacle marked GENERATOR POWER on the console terminal board.

d. Run these two 50 foot cables to the site which has been chosen for the generator and modulator units. Locate this site as far from the console as the cables permit to reduce the noise of the generator in the tent. At the console end, where the cables leave the tent, bury the cables 4 inches in the ground. Lay these cables about 2 or 3 feet from the tent, and then run them along on the ground to the generator position.

e. Insert the plug of Cable CG-49/TPS-3 (black) into the black receptacle of the modulator (fig. 3). Push the plug all of the way into the receptacle, and make sure that the rubber gasket on the receptacle sets firmly against the shoulder of the plug before screwing on the knurled ring. When the ring is screwed on, a water-tight seal is made. If rain water gets into this assembly, it must be taken apart and cleaned. See TM 11-1540.

f. Remove the short high-voltage Cable CG-50/TPS-3 (red) from the tool box, and install one end of it in the red receptacle on the modulator. Put the other end in the head of the generator. To obtain a water-tight seal, make sure that these plugs are properly set, and that the gasket on the receptacle fits firmly against the shoulder of the plug. Care in assembling these plugs will insure trouble-free operation during rain storms.

g. Install the other end of the four-conductor Cable CX-101/TPS-3 (the 50 foot length which goes to the console) into the REMOTE plug of the gasoline engine generator.

h. Obtain the four-conductor Cable CX-102/-TPS-3 (the short one), and install it between the LOCAL receptacle of the gasoline-engine generator and the receptacle on the top shelf of the modulator. When this installation is complete it should look like the illustration in figure 3.

i. Remove the two square plugs in the bottom of the housing of the generator to allow the gases generated by the spark to escape. These plugs are necessary only to keep dirt out of the spark wheel when the unit is in transit. See TM 11-933.

j. Turn the engine over slowly by hand, and check through the peep hole in the spark gap housing to see how many electrodes are on the wheel. There should be three; if there are six, three must be removed. See TM 11-933.

k. Locate the modulator so that the hot exhaust gases from the engine do not strike the modulator (fig. 3). Keep all cables clear of engine exhaust. Insert the cable from the slip ring assembly of the antenna mast into the terminal board on the console. The receptacle for this plug is labeled SLIP RING.

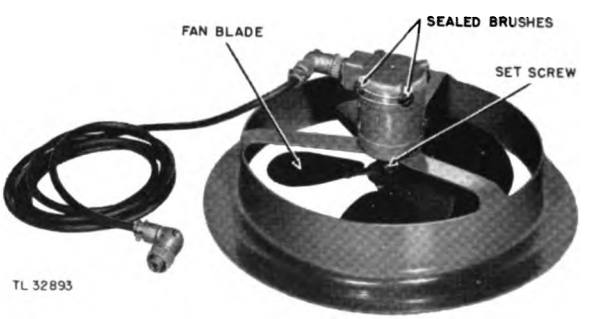


Figure 21. Tent fan.

27. INSTALLATION OF TENT FAN.

Next install the tent fan (fig. 21) in the tent. Slip the housing for the fan through the boot of the tent, and nail the housing to the tent pole. Make sure that the tent boot does not interfere with the rotation of the fan blades. This fan rotates so that it blows air out through the tent. Plug the cable attached to the fan motor into the console terminal board receptacle marked TENT FAN (fig. 8).

SECTION II
STARTING AND TUNING PROCEDURES

28. PREPARING THE SET FOR USE. With the proper installation procedures completed, Radio Set AN/TPS-3 appears as shown in figure 1. The equipment is now ready to be adjusted for operation. The procedures have been grouped so that they can be conveniently followed as specified.

a. If the equipment is new and is being placed into operation for the first time, or if the equipment has been in use but is being installed at a new site, perform the operations listed below in paragraphs 29 and 30.

29. VISUAL INSPECTION.

a. Examine the cable connections at the receptacles of all components. All clamping rings must be tight. Remove the front cover from the console box and take out the indicator and receiver. Inspect for damage which may have occurred in setting up the equipment. Make sure that all of the tubes are firmly seated in the sockets and that none is broken.

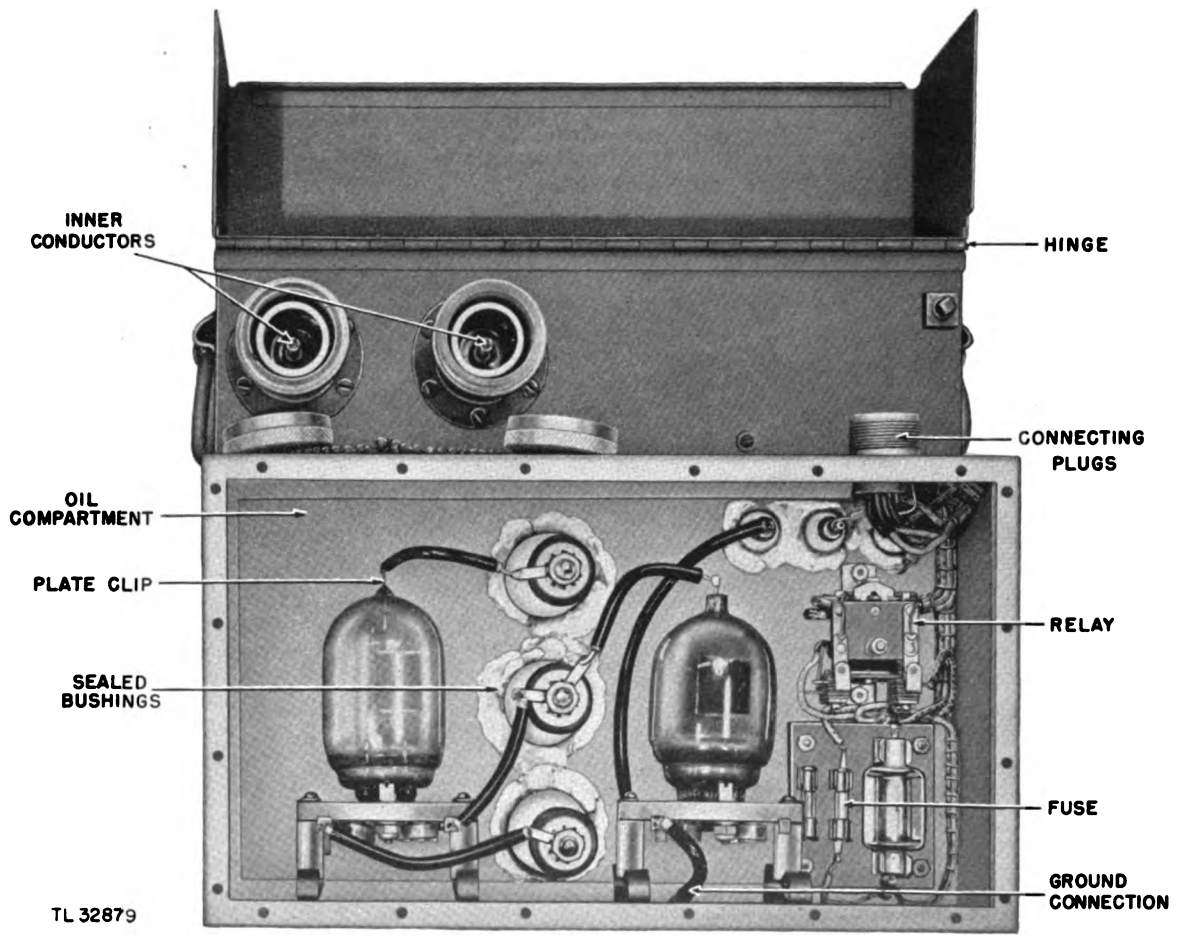


Figure 22. Modulator box with front cover removed.

b. Remove the front cover of the modulator box, and inspect the interior (fig. 22). (Do not open this compartment if it is raining.) Make sure that the tubes are not broken, and that they are all in the sockets. Replace the cover.

c. Remove the two exhaust hole covers on the rear of the console. **Never operate the set with these covers on (fig. 27).**

d. Remove the bottom front cover of the console to enable adjustments to be made on the equipment. This cover, together with the ventilating fan (fig. 38) may be left off for short periods of time while the set is being tuned up or being serviced. For continuous operation this cover must be on, and the fan running so that the set is properly ventilated. If the preceding instructions have been followed carefully, the set is now ready for operation.

e. The entire procedure of setting up Radio Set AN/TPS-3 for operation or packing for removal to a new site can be done in approximately one hour by a skilled crew.

f. When the set is left at night or is off the air for any reason, put on the front cover, and replace the gasket covers on the two exhaust holes. The set is then tightly sealed, and collection of moisture in the equipment is prevented.

30. PRELIMINARY ADJUSTMENTS. Before starting the generator for the first time, several points must be checked to make sure the equipment is ready for operation.

WARNING: Never attempt to operate the set unless both high-voltage cables are securely in place. This prevents serious damage to the equipment and removes high-voltage danger to personnel.

a. Step No. 1. Since there is no switch on the transmitter blower, the tent fan, or the console ventilating fan, check to make sure they turn freely before the generator is started.

b. Step No. 2. Make sure the antenna switch (TRACK-PPI switch) is in TRACK position so the antenna does not rotate. See figure 23.

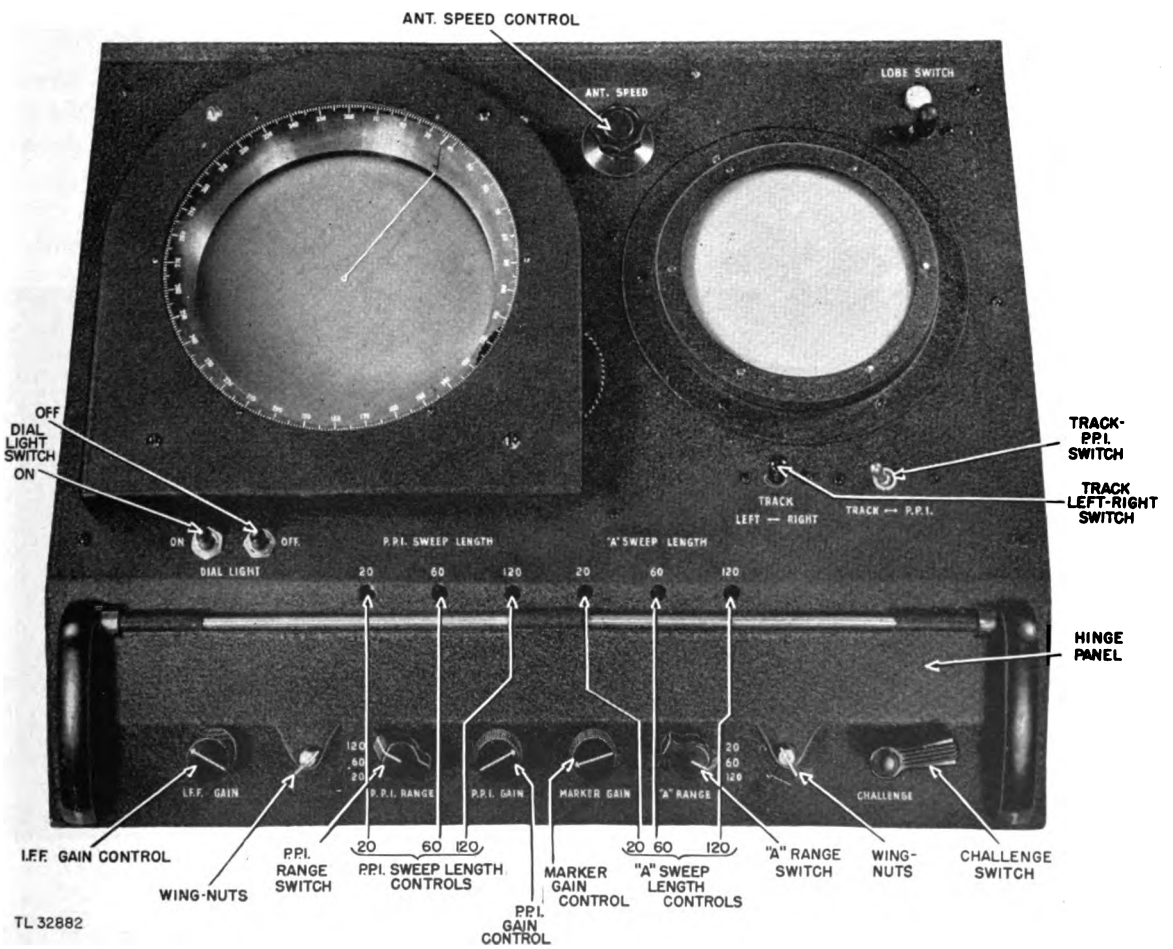


Figure 23. Indicator chassis, panel closed.

c. Step No. 3. Check to see if the TRACK LEFT-RIGHT switch is in its normal center position. See figure 23.

d. Step No. 4. Make sure that the MAIN POWER SUPPLY switch and the TRANSMITTER switch are in the OFF position. See figure 24.

e. Step No. 5. Inspect the high-voltage cables and both power cables, and make sure that both high voltage cables and both power cables are in their correct places. See figure 3.

f. Step No. 6. Remove the transmitter and console vent caps at the rear of the console (fig. 27).

g. Step No. 7. Remove the small square cover plate on the bottom front of the transmitter box. Make sure the protective housing (draw band shield) around the filament leads is in place between the pulse transformer and the transmitter tube box. See figure 2.

h. Step No. 8. Check to see that the modulator is level. The slope should not exceed 1 to 10. See figure 3.

i. Step No. 9. Remove the two pipe plugs on the power unit housing. This provides an outlet for the gases produced by the spark. See TM 11-933.

31. STARTING PROCEDURE. The detailed steps in the starting procedure follow below. They should be thoroughly mastered. For convenience refer to figures 3, 20, 23, and 26. In these figures, the numbers and letters correspond exactly to the numbers and letters in the text.

a. Step No. 1.

(1) Place the POWER UNIT in operation (see TM 11-933). Open the valve on top of the fuel tank about two turns. Choke the engine by operating the priming pump two or three times. Lock the priming pump (to prevent flooding while operating) by pushing down on the plunger knob until the snap lock fastens around the plunger cap.

(2) Wind the starter rope on the starter plate in the direction of the arrow (counter-clockwise), and pull the rope hard to give a quick spin to the engine. Repeat if necessary.

(3) If the engine falters after starting, operate the priming pump until the engine warms up.

(4) If the engine does not start after 10 spins, it may be flooded. Open drain-cock on crankcase and spin the engine a few times to expel the raw fuel. Close the drain-cock and spin the engine again until it starts.

b. Step No. 2. After a delay of not less than one minute, throw the MODULATOR OFF-ON switch on the generator control box to the ON position. See TM 11-933.

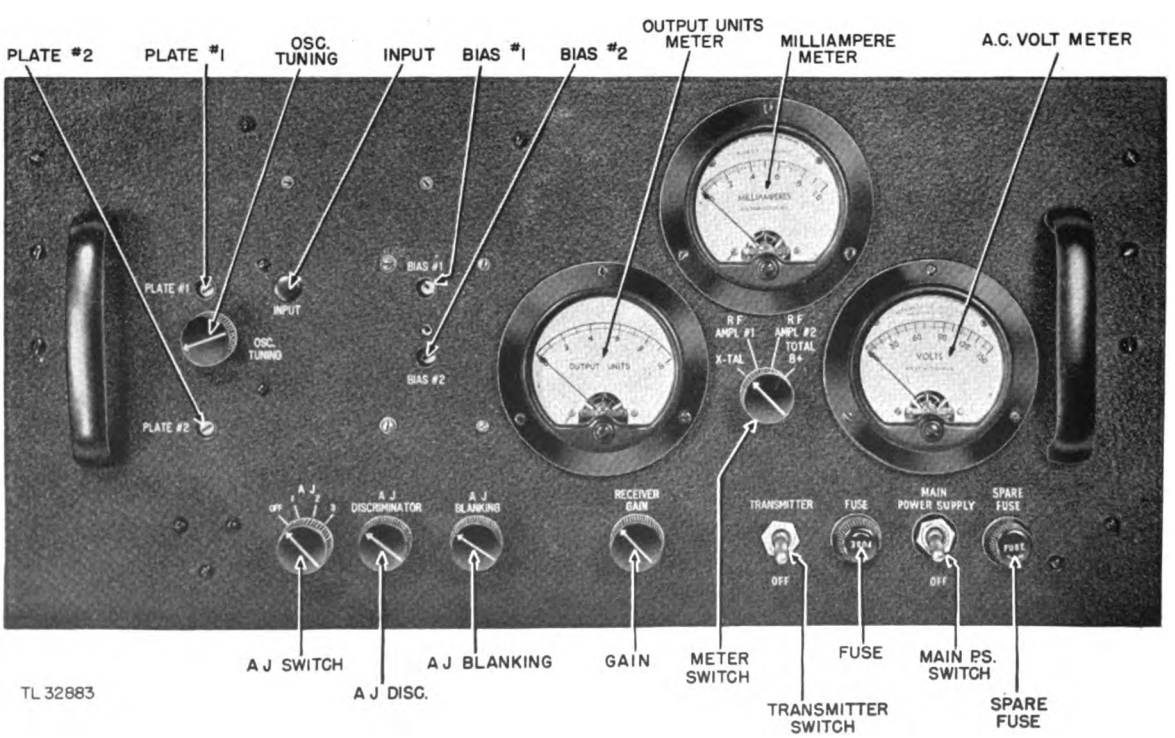


Figure 24. Front panel of receiver.

c. Step No. 3. With the generator operating, see that the tent fan, the console ventilating fan, and the transmitter tube blower are working properly. Feel for the air stream. Do not, however, place any additional load on the generator until it has warmed up about 30 seconds and is running smoothly.

d. Step No. 4. Check the rotation of the antenna. This is done by having one man stand outside the rear of the tent to observe the antenna while another operates the TRACK LEFT-RIGHT switch on the indicator panel of the console. If the zipper at the rear end of the tent is open (fig. 20), the man outside can observe the rotating antenna and warn the man inside should the antenna run into an obstruction. To rotate the antenna, first turn the ANT. SPEED control (fig. 23) in the top center of the indicator panel about ¾ of the way counterclockwise. The antenna TRACK LEFT-RIGHT switch should then be pushed either to the right or to the left.

(1) After the set has been erected, under no circumstances should the antenna be rotated at high speed in the PPI position without first checking to make sure that it is not obstructed.

(2) Once it has been determined that the antenna is free to rotate, the MAIN POWER SUPPLY switch may be turned on (fig. 24).

e. Step No. 5.

(1) Set METER SWITCH on the receiver to TOTAL B+ position.

(2) Throw the MAIN POWER SUPPLY switch on the receiver panel to the ON position and wait for at least 30 seconds to allow the filament to reach operating temperature.

(3) The jeweled pilot light on the indicator should glow indicating that power is being supplied. In addition, the counter-knob panel lights should go on. The PPI indicator dial light should go on when the ON button is pressed (fig. 23).

(4) Check immediately the filaments of the transmitter tube. These filaments heat up within a few seconds, and the light is visible when the small square cover plate in the bottom front of the transmitter tube box is removed (fig. 25). Remove the screws for access. If the filaments light, replace the front cover of the box. If they do not light, remove the power and check the fuses which are located on the left side of the console just in front of the terminal board.

f. Step No. 6.

(1) Read the voltmeter on the receiver. Adjust the VOLTAGE CONTROL RHEOSTAT at the power unit so that this voltmeter reads 115 volts. Do not exceed 110 volts when the radio set is operated with IFF.

(2) The generator speed and voltage output should then be checked. Obtain from the tool kit the reed-type frequency meter (fig. 29), and the two test leads (included with the volt-ohmmeter). Use the test leads to connect the frequency meter to two tip jacks provided on the terminal board of the generator. The meter will then indicate frequency by vibration of the proper reed. This will be observed as the reed seems to grow longer. The frequency should be between 400 and 410 cycles/sec. In general, the generators are set for this operation at the factory, and adjustment of the speed is not necessary.

g. Step No. 7.

(1) Check the meter reading when the meter switch is in the "TOTAL B+" position. If a reading between 0.5 to 0.7 is not secured, *immediately shut off the main power supply switch.* See TM 11-1540 for corrective measures.

(2) Check the readings of the current meter on the receiver for proper readings at the positions:

	Readings
X-TAL	: Meter reads 0.4 to 0.6 ma.
RF AMPL. No. 1	: Meter reads 0.5 to 0.6 ma.
RF AMPL. No. 2	: Meter reads 0.5 to 0.6 ma.
TOTAL B+	: Meter reads 0.5 to 0.7 ma.

h. Step No. 8. After a delay of not less than one minute, throw the TRANSMITTER switch (fig. 24), located on the receiver panel, to the ON position. If a sizzling noise emanates from the console, the r-f system is out of tune. This condition is not dangerous. However, if violent arcing is heard, turn the TRANSMITTER switch to the OFF position immediately. Refer to TM 11-1540 for corrective measures.

i. Step No. 9. Check the spark through the viewing window on the power unit (fig. 3). All the sparking should take place between the pins. It is not necessary that all the discharges be at one point on the stationary pin; they may be spread along its length. See TM 11-933.

j. Step No. 10.

(1) Both the "A"-scope and PPI scope screens should light up and show a sweep line on each as shown in figures 6 and 7. If the presentation is not like the pictures shown, adjust the "A"-scope intensity until a horizontal sweep line appears on the "A"-scope. Next adjust the "A" FOCUS control until a sharply defined line is obtained. See figure 26.

(2) Adjust the PPI INT. control until the sweep line is visible on the PPI scope. Set the PPI FOCUS control to obtain a sharp, narrow line on the PPI scope. See figure 26.

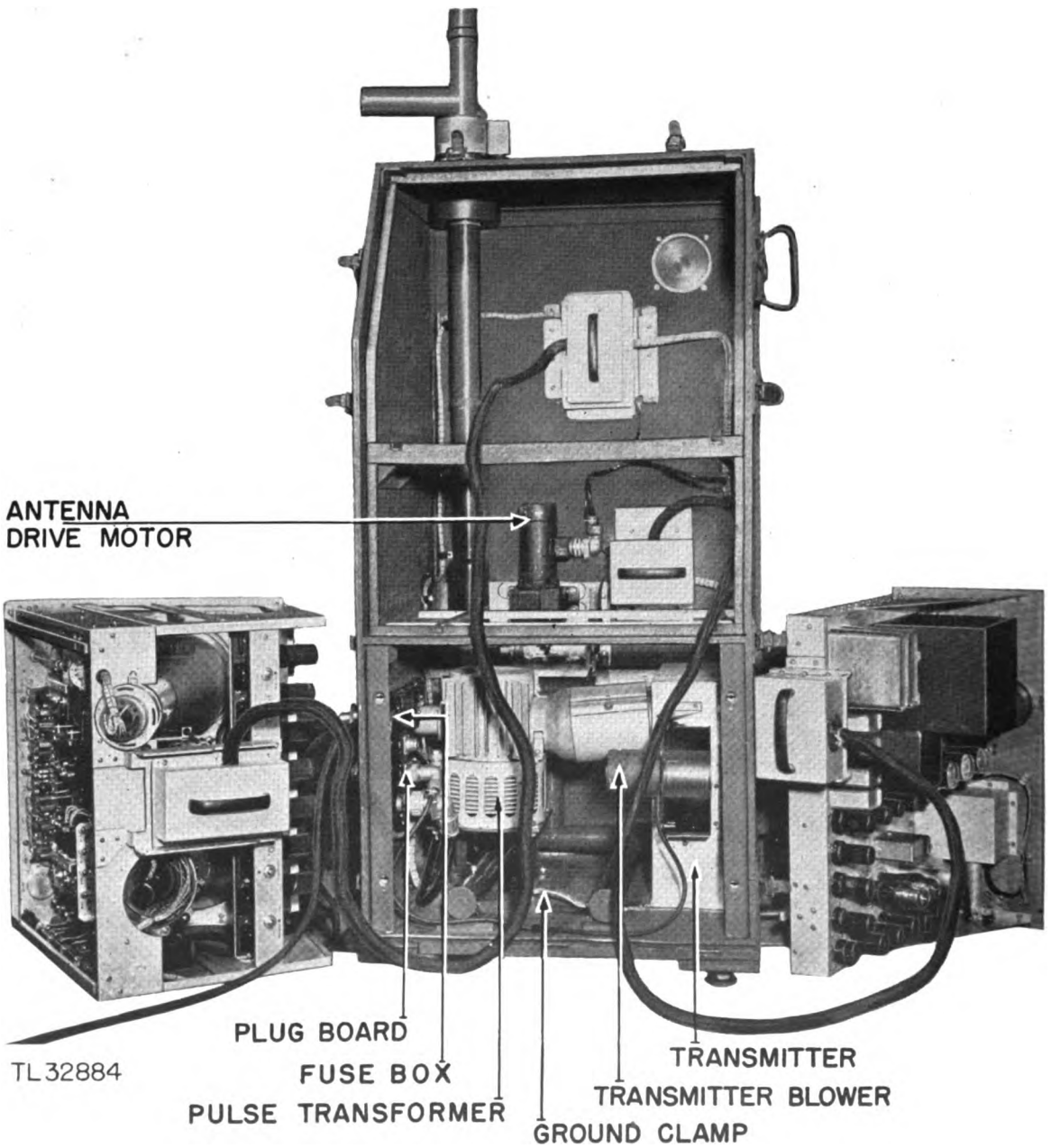


Figure 25. Console with chassis removed.

(3) The RECEIVER GAIN control on receiver panel should be increased if no grass is seen on the "A"-scope (fig. 24). About 1/8 inch of grass is sufficient. Make sure the PPI GAIN control on the indicator panel is turned up enough to show some noise on the PPI scope.

(4) If the meter readings on the receiver panel are correct, transmitter noise will be at a minimum (output meter on receiver panel indicating output). Likewise, sweeps on the indicator unit will be normal and the echoes (pips pointing upward on the "A"-scope screen along the sweep line) should be seen on the screen. Rotate the antenna until it is pointed True North or to some other known azimuth. Check the position of the PPI sweep trace to see that it is set at the same azimuth. If it is not lined up—

1. Remove the lower front panel of the console.

2. Carefully reach between the pulse transformer and the transmitter unit. Revolve the knurled wheel mounted on the shaft directly above the selsyn transformer in the lower left hand corner until the sweep trace is lined up, as shown in figure 27.

(5) If the meter readings, transmitter noise, and scope presentations are not correct, refer to the complete tuning procedure which follows in paragraph 32. For occasional routine tuning up during the normal operation of the set, see the simplified tuning procedure in paragraph 34.

32. COMPLETE TUNING PROCEDURE.

a. Step No. 1. AVOID CONTACT WITH THE TRANSMITTER UNIT UNLESS ALL POWER FROM THE CONSOLE AND GENERATOR IS SHUT OFF. Set the transmitter on frequency. To do this set the shorting bar of the lecher line on the filaments of the transmitting tube VT 158, at the half-way position on the adjusting slot. See figure 28. Care should be taken to see that this shorting bar is clamped tight before the unit is operated. To get at the filament line, remove the metal cover plate which connects the pulse transformer to the transmitter box, located in the bottom of the console. Using a small screwdriver, loosen the set screw to permit movement of the shorting bar. This adjustment can be made by reaching through the 4-inch opening on the side of the transmitter box.

b. Step No. 2. Start up the generator as prescribed in TM 11-933 and Step No. 6 under Preliminary Adjustment. Adjust the voltage control by means of the knurled knob on the top of the generator control box. Have someone inside the tent observe the 150 volts a-c meter on the receiver panel (fig. 24) while this adjustment is being made. With the entire console and the modulator running, this voltage should be set accurately at 115 volts. Little change in this voltage occurs when the modulator is shut off because a special compensator within the generator boosts the voltage when the modulator is turned on. The voltage should always be adjusted with the modulator running. When IFF equipment is operating, this reading should be 110 volts.

c. Step No. 3. Throw the MAIN POWER SUPPLY switch on the receiver panel to the ON position. Allow the filaments to warm up for at least 30 seconds in all cases, before the high voltage is applied.

d. Step No. 4. Throw the TRANSMITTER switch on the receiver panel, to the ON position.

e. Step No. 5. Tune the two stub tuners located at the bottom center of the console (fig. 25) for maximum deflection on the output meter on the receiver panel. This reading will vary with different climatic conditions, since the current to operate it is fed through slip rings on the antenna mast and from a thermocouple unit at the small dipole assembly within the parabolic reflector. Moisture, dirt, dust, corrosion, etc., cause this reading to vary, and consequently the actual reading is not important. The output units meter (fig. 24) is used simply as a tuning device. It will normally read slightly less than half scale. As maximum power output is approached, sparking in the transmitter disappears. The point of maximum power may not coincide exactly with minimum transmitter noise. It is preferable to adjust the stub tuners for minimum transmitter noise since this later is the more stable point of operation.

f. Step No. 6. To adjust the anti T-R spark gap (fig. 27) turn the knurled screw clockwise until the contacts touch. Now turn the screw counter-clockwise for about 1/8 of a turn. This gives a gap clearance of approximately 1/16 inch.

g. Step No. 7. The transmitter is now feeding energy to the antenna at approximately the correct operating frequency. The exact frequency should now be checked. To do this, insert the tubular absorption type frequency meter loop through the special openings provided on the transmission line shaft (above the slip ring housing) and adjust the slider on the frequency meter for maximum brilliancy of the neon bulb within the tubular meter. Note the reading. If the frequency is too low, SHUT OFF *ALL* POWER and move the shorting bar, connected to the transmitting tube filaments, toward the filament pins; if the frequency reading is too high, move the shorting bar away from the pins. Turn on the power. Repeat the tuning of the stub tuners at the bottom of the console until the transmitter is operating with maximum output at the desired frequency.

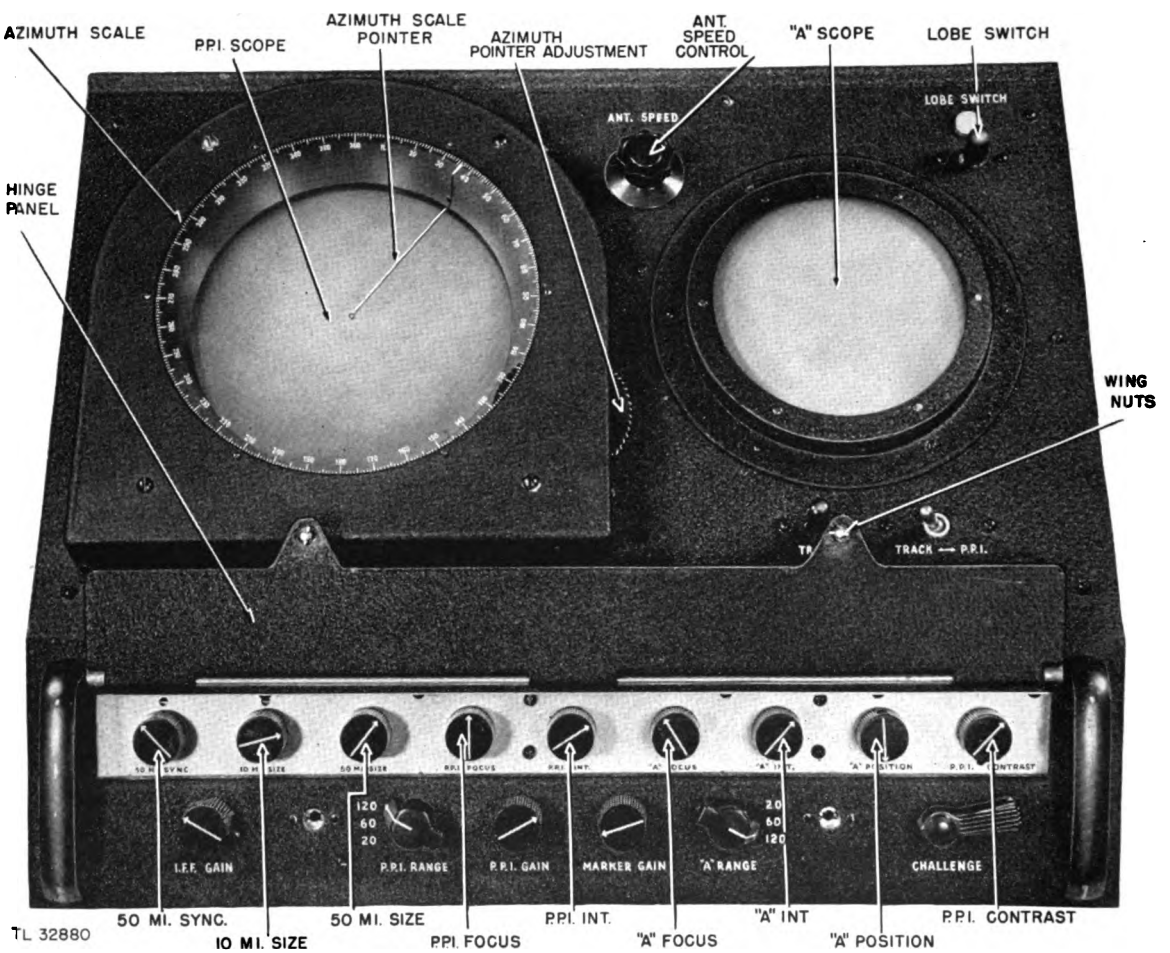


Figure 26. Indicator chassis, panel open.

h. Step No. 8. Next, adjust the indicator (fig. 23, 26) since visual indications on the scopes are used in tuning the receiver. With the "A" INT and PPI INT controls in counter-clockwise positions, advance the "A"-scope intensity until a horizontal sweep line appears on the "A"-scope. Next, adjust the "A"-FOCUS control until a sharply defined line appears. Under the hinge-panel of the indicator unit is located the "A"-POSITION control. Adjust this control until the horizontal sweep line is positioned in the center of the face of the "A"-scope. Length of the sweep line can be set by the "A" SWEEP LENGTH control (fig. 23) on the front panel.

i. Step No. 9. Increase the PPI INT control until the sweep line is visible on the PPI scope. If necessary, adjust position of the trace on the PPI

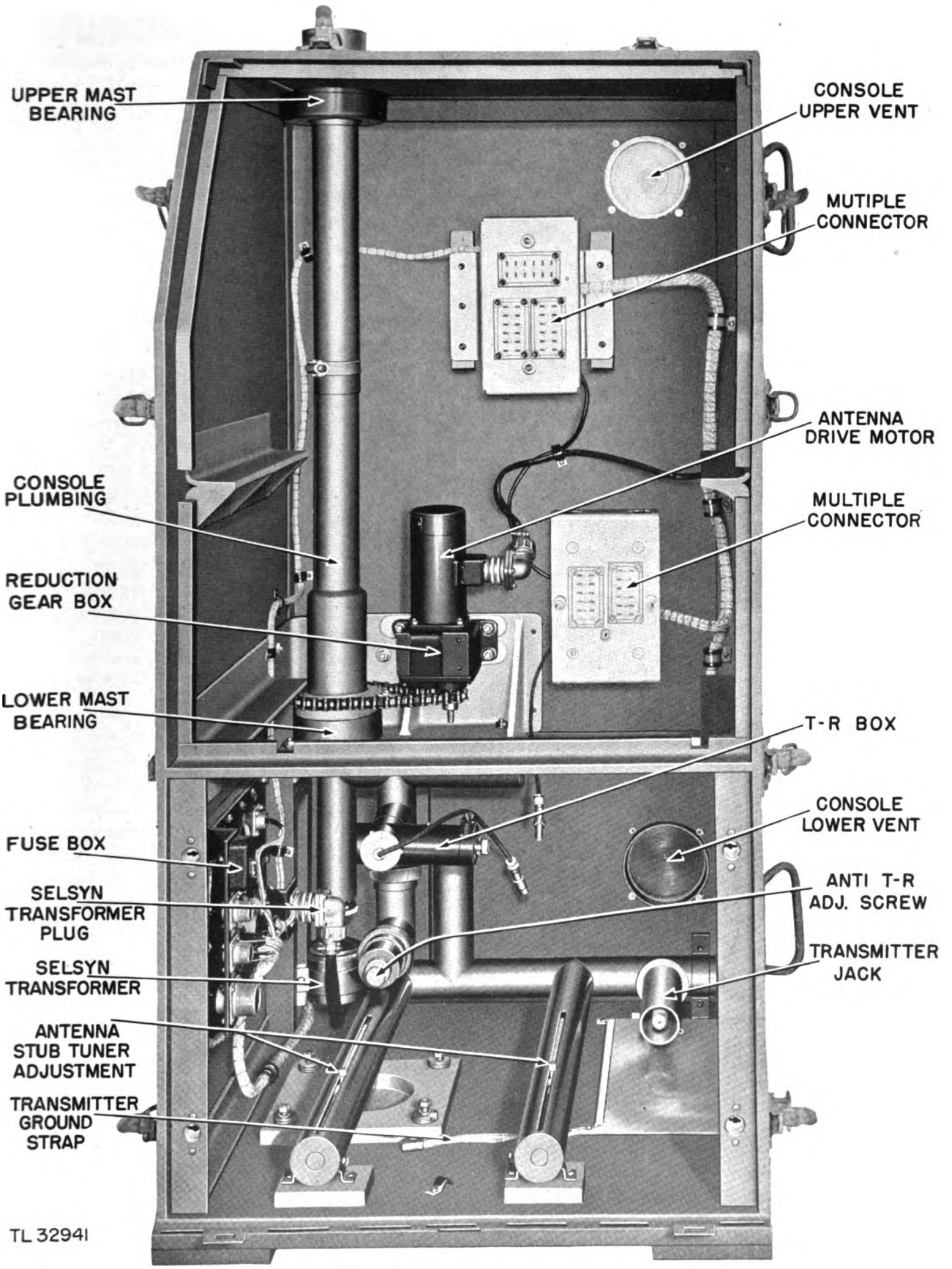


Figure 27. Console showing plumbing.

scope. To do this, remove the indicator unit from the console. Make sure both the TRANSMITTER and the MAIN POWER SUPPLY switches are in the OFF position before removing the indicator.

CAUTION: Never use the handles on the front panel of the indicator to lift the unit from the console. Instead, grasp the chassis firmly on both sides by inserting the fingers through the openings in the lower side of the frame.

Connect the indicator to the cabinet using the extension cable (fig. 25). Then turn on the power again. Next, center the PPI trace in such a manner that the trace starts from the center of the tube. There are two ways to center the sweep on the PPI tube.

(1) It may be centered electrically by means of the two centering controls located on the tube shelf chassis of the indicator (fig. 30).

(2) It may be centered mechanically by moving the focus coil.

(3) It is usually best to center the trace electrically by means of the potentiometers on the rear of the chassis, but if they do not have enough range then centering must be done by moving the focus coil. See TM 11-1540.

j. Step No. 10. Set the range switches for both scopes (figs. 23, 26) on the 120-mile range (full clockwise position) and then adjust the 10 MI. SIZE control until the small markers along the horizontal sweep line of the "A"-scope are approximately ⅛ inch long. Notice that the 12 marker pips extend downward from the main trace. Note also that two of these marker pips are longer than the others. These long pips should occur on the fifth and tenth markers and indicate 50 and 100 miles respectively. If they are not on the fifth and tenth pips, adjust the control marked 50 MI. SYNC until they are on these pips. The 50-mile pips may be adjusted to convenient sizes by means of the control marked 50 MI. SIZE. Size of all markers may be adjusted simultaneously by means of the MARKER GAIN control (fig. 23). Do not make these pips too large because if the marker circles on the PPI tube are too intense, it is possible that a target near them will be obscured.

k. Step No. 11. Having made the correct settings on the PPI. shut off power, remove the extension cable, and return the indicator to its proper position in the console box (fig. 2). Turn on the power.

l. Step No. 12. Adjust the lengths of the indicator sweep. There are three controls available through the holes in the front panel, just below the scope. Reading from left to right, these controls are as follows:

No. 1. PPI..... 20 mile range
No. 2. PPI..... 60 mile range
No. 3. PPI.....120 mile range

(1) There are three GATE controls which vary the length of the sweep. These are located on a bakelite strip in the underside of the chassis (fig. 31). They are usually set by the manufacturer and require no further adjustment. In addition there are three similar gate controls for the "A"-scope sweep.

(2) It is important to differentiate between these GATE controls and the SWEEP LENGTH controls. The GATE controls determine the length of time during each cycle that the cathode-ray tube is illuminated. For example, on the 20-mile sweep, the cathode-ray tube is only illuminated for about 214 microseconds of the total 5,000 microseconds which exists between successive transmitter pulses. The SWEEP LENGTH controls increase the amplitude of the sweep voltage thereby effectively changing the length of the sweep. The PPI sweep length should be adjusted so that the trace line extends from the center of the face of the scope to the outer edge.

(3) Note that the range markers on the PPI scope appear as dots along the sweep line which extends from the center of the face of the scope to the outer edge, and in a direction (azimuth) dependent upon the direction the antenna is pointed. As the antenna is rotated through the 360°, the markers (dots) along the sweep line produce concentric circles on the face of the scope (fig. 6).

m. Step No. 13. If the concentric circles are not perfectly circular when the antenna is rotating, an adjustment of the CIRCULARITY control, located at the rear of the indicator, will remedy this effect (fig. 30).

n. Step No. 14. Throw the TRACK PPI switch to the PPI position and reduce the antenna speed to approximately 4 rpm. Make sure the RECEIVER GAIN is turned up to show approximately ¼ inch of noise on the "A"-scope screen. Turn the PPI GAIN control until the screen of the PPI tube starts to light up with a fine lacy pattern, similar to dense snowfall, between the rings drawn by the 10-mile markers.

o. Step No. 15. Adjust the PPI FOCUS control so that the marker rings appear as sharp as possible. Targets located within the selected range will cause the screen to light up strongly in certain places. If the patterns drawn in this manner appear to be strongly blurred, their appearance can be improved by the adjustment of the PPI CONTRAST control. Under normal conditions the CONTRAST control should be turned up almost to maximum. When changing the PPI RANGE, readjust the intensity and focus slightly. For reading the azimuth scale during tracking, push the ON switch of the dial light for one second. Turn light off during alert-operation for better screen contrast.

p. Step No. 16. Next tune the receiver (fig. 24). Throw the meter switch on the receiver panel to the TOTAL B+ position and check the total current drain of the receiver and indicator. This current drain should be about 0.6 ma., as read on the 0-1 milliammeter.

q. Step No. 17. Check the crystal current (X-TAL position) and the r-f amplifier currents (1st R-F AMPL. and 2nd R-F AMPL. positions). The following table shows the normal readings on the meter:

Switch position	Meter reading
X-TAL	0.4 to 0.9 ma.
R-F AMPL. No. 1	0.5 to 0.6 ma.
R-F AMPL. No. 2	0.5 to 0.6 ma.
TOTAL B+ Current	0.5 to 0.7 ma.

r. Step No. 18. Increase the RECEIVER GAIN control until receiver noise, grass, is seen on the "A"-scope, and set PPI GAIN control on indicator panel until the noise appears along the sweep line on the PPI scope. If no receiver noise is visible on the "A"-scope or the PPI scope, check to make sure the AJ switch is on the OFF position. If no signals can be seen on the "A" or PPI scopes after the AJ switch is set to the OFF position, the following procedure should be followed:

(1) Set the T-R tuning slug in the middle of the slot in which it slides.

(2) Rotate, in succession, the OSC. TUNING, PLATE NO. 2, PLATE NO. 1, and INPUT controls. Three of these are screwdriver adjustments and one, the OSC. TUNING control, is knob-adjusted. The three controls are located on the front panel of the receiver (fig. 24) for convenient operation. If no signals appear on the "A"-scope screen, the INPUT, PLATE NO. 1, and PLATE NO. 2 controls should be turned several turns counter-clockwise. Now slowly turn the OSC. TUNING control through its range until signals do appear on the "A"-scope screen. If no signals appear, rotate the antenna to another position and repeat the OSC. TUNING adjustment until an echo does appear. Each control, successively, should be tuned for maximum height of an echo on the "A"-scope from a fixed target located some distance from the set.

(3) While turning the PLATE No. 2 control, the milliammeter switch should be set to read crystal current (X-TAL), and as the tuning control is turned in a clockwise direction, the crystal current increases gradually to a peak and then falls off sharply. The proper point of operation is near this peak point, and the meter should read between 0.5 and 0.7 milliamperes.

(4) Set the meter switch in the R-F AMPL. No. 1 position and adjust BIAS No. 1 control until the meter reads 0.6 ma. Now set the meter switch to R-F AMPL. No. 2 position and set BIAS No. 2 control until the meter again reads 0.6 ma. Check currents before making adjustments. These controls are factory set and should need very little adjusting.

(5) Obtaining fixed echoes may be difficult if the equipment is located in extremely flat country where no fixed targets are available and where planes are scarce. It is very difficult to tune the set on a plane because of the fading character of the signal. However, if no fixed targets can be seen, a plane must be employed. If only a nearby fixed target is obtained, reduce the receiver gain until the signal is just above the base line on the "A"-scope.

(6) Readjust the T-R slug in the T-R system (fig. 27) for maximum size of the signal on the "A"-scope.

(7) Readjust the local oscillator for maximum size of signal.

s. Step No. 19. Readjust the T-R slug, the OSC. TUNING, PLATE NO. 2, PLATE NO. 1, and INPUT controls. It will be found that these con-

trols are interlocked slightly, and it will be advantageous to go over them to be sure that the set is operating at its peak performance.

t. Step No. 20. It is well at this time to rotate the antenna and select some fixed target as far away as possible. If possible, identify it, note the exact range, and the intensity of the signal and record this data. This data will be useful for future reference in case it is necessary to change the frequency of the system, change a tube, or make other repairs.

33. CHANGING FREQUENCIES. Do not change the frequency of the transmitter unless requested to do so, or unless the unit is being interfered with by neighboring sets. To change the frequency, proceed as follows:

WARNING: Do not attempt to touch the transmitter unit under any circumstances unless all power is removed.

a. Remove the cylindrical protecting shield which covers the filament wires between the pulse transformer and the transmitter tube shield. The fila-

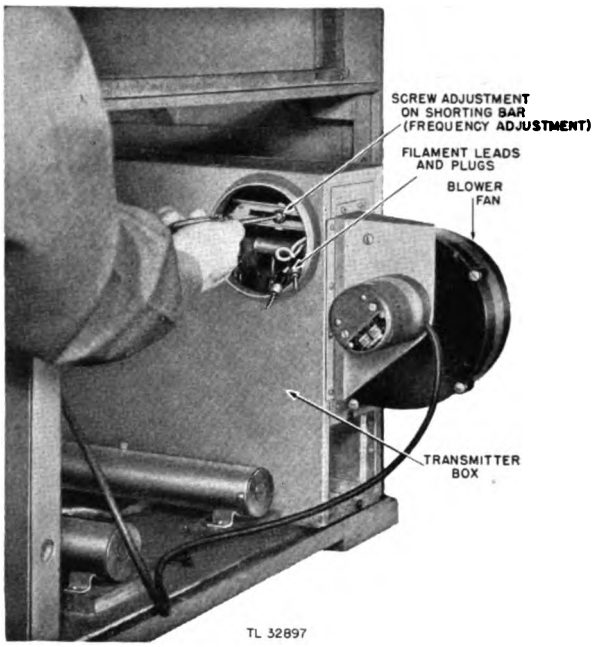


Figure 28. Changing frequency of transmitter.

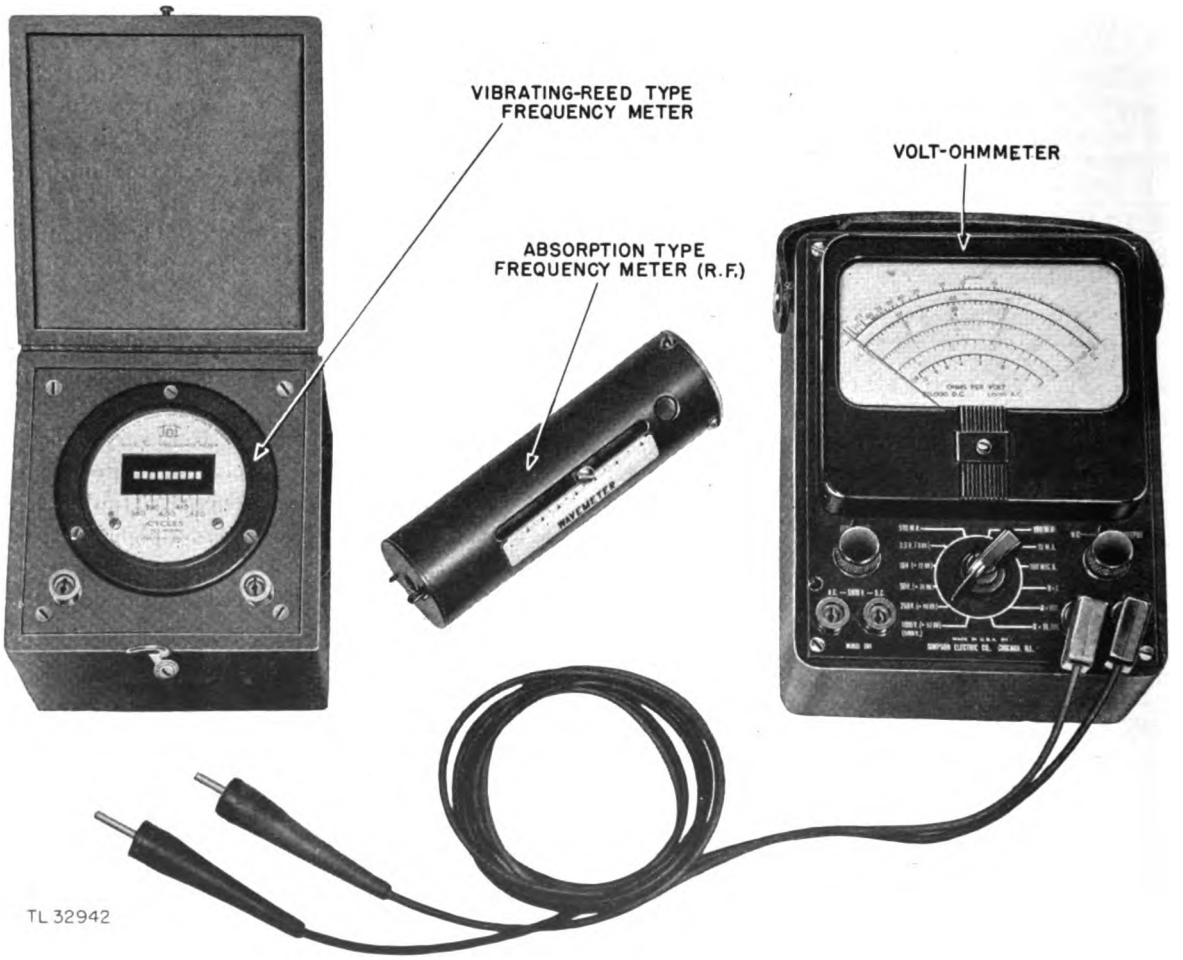


Figure 29. Test equipment.

ment line is then visible within the transmitter tube box (fig. 28). Note that on the line there is a shorting bar, and on the side of the line nearest the filament window, a small screw runs into the shorting bar. With a screwdriver inserted through the filament window, loosen this screw, and then slide the shorting bar back or forth.

b. If the shorting bar is moved towards the back of the cabinet, that is, away from the operator, the frequency of the transmitter is made higher. Conversely, if the shorting bar is slid towards the operator, the frequency of the transmitter will be lowered.

c. Check the frequency by the procedure described in paragraph 32. Always be sure to tighten the screw on the filament tuning line before turning on the transmitter. This is important because considerable current flows through the shorting section of the filament line, and if the shorting bar is not tight, sparking occurs and the contacts become pitted.

34. SIMPLIFIED TUNING PROCEDURE. To compensate for drift in frequency during warm-up time, or as a general check, only a minor tuning procedure is necessary and may be done from the front of the console with the set operating. This simplified procedure is given below:

a. Step No. 1. With the set turned on, face the antenna in some direction from which permanent echoes are visible on the 20-mile range of the "A"-scope. Reduce the RECEIVER GAIN control until the height of one of the echoes is approximately ¾ inch or less. For tuning, it is best to select a single echo some distance from the set.

b. Step No. 2.

(1) Adjust controls in rotation (fig. 24) and peak this signal by tuning the:
- (*a*) OSC. TUNING control.
- (*b*) The 2nd R-F amplifier. (PLATE No. 2 control.)
- (*c*) The 1st R-F amplifier. (PLATE NO. 1 control.)
- (*d*) INPUT control.

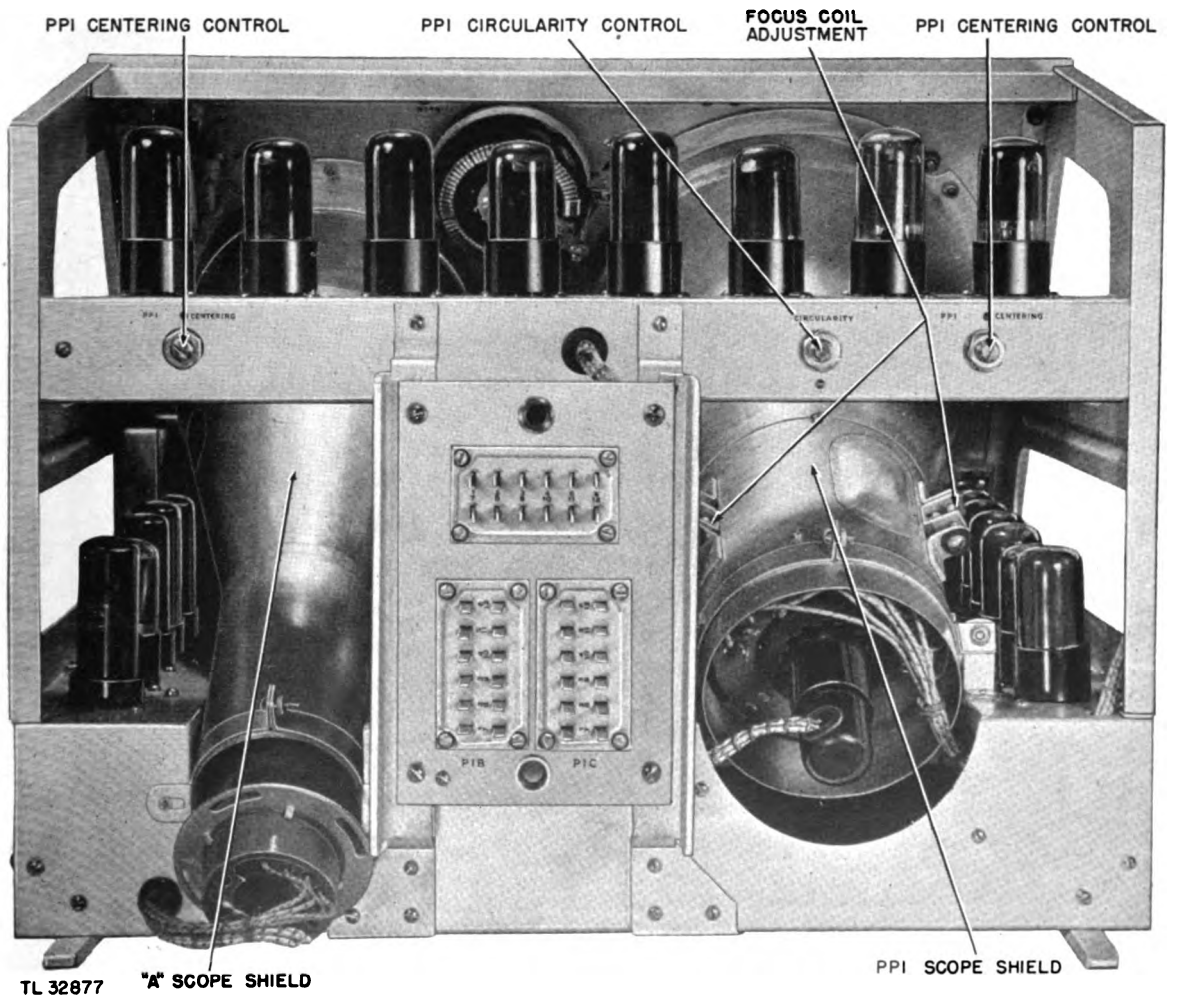


Figure 30. Indicator chassis, rear view.

(2) If the signal (echo) should reach the top edge on the scope, reduce the RECEIVER GAIN until the top of the pip is definitely visible. If the hissing of corona is heard in the transmitter, remove the lower front panel holding the air filter, and tune the stub tuners for maximum reading on the output meter and/or minimum noise in the transmitter.

WARNING: Dangerous voltages exist within these units. Use extreme care.

c. Step No. 3. While the cover is removed it is well to peak the T-R box of the duplexing assembly (fig. 27) on an echo by adjusting the resonant cavity. The mechanically adjusted gap (anti T-R spark gap) should be set to a gap-clearance of about $\frac{1}{16}$ inch. Too close a gap-clearance is dangerous since the gap may spark during the interval that the transmitter is off. This will effectively reduce the range of the set. If the anti T-R spark gap is not firing, the noise level (grass) along the horizontal sweep of the "A"-scope will not be uniform in height. When operating properly, the noise on the "A"-scope should be very fine in gradation and of uniform height for the entire range.

d. Step No. 4. After having tuned the set, reduce the RECEIVER GAIN control until the grass on the "A"-scope (fig. 7) is just barely visible along the horizontal sweep line. The "A" FOCUS and PPI FOCUS controls (fig. 26) should be adjusted until a fine, clearly defined line, or picture, is obtained on both scopes. The "A" and PPI INT controls should

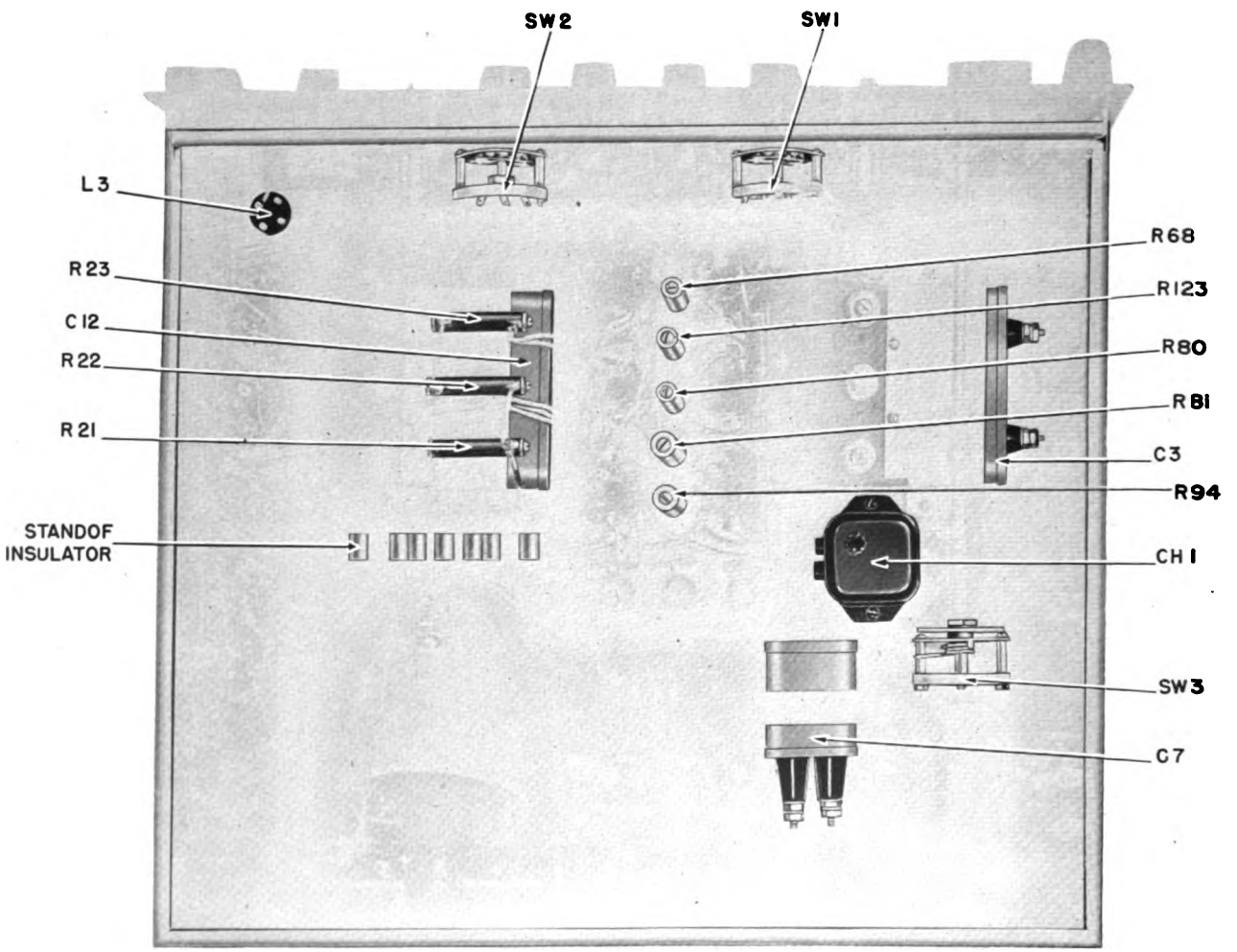


Figure 31. Underside of indicator chassis.

be set so as to have a fine, clear sweep line. Too high a setting on these controls produces a broad, blurred picture. The intensity on the PPI should only be bright enough to make the sweep line barely visible. The PPI GAIN control should be increased to a point where some noise appears along the PPI screen, while the antenna is rotating. If noise appears as large defocused spots on the screen, reduce the PPI CONTRAST control until echoes stand out brilliantly against the background.

SECTION III
OPERATION

35. TYPES OF OPERATION. This radio set is used primarily for early warning against aircraft. The manual does not describe the tactical employment of the set, but rather the types of operation and capabilities of the equipment. Radio Set AN/TPS-3 is capable of two types of operation, namely PPI scan or search and MANUAL tracking and searching. The components used for each type are primarily the same. The PPI-TRACK switch on the front panel of the indicator unit (fig. 23) determines which of these types of operation is produced.

a. With the switch in the PPI position, the antenna is rotated automatically up to a maximum speed of 5 rpm., and the sweep line revolves clockwise on the PPI scope as the antenna assembly rotates.

b. When the switch is in the TRACK position, the antenna is motionless. To operate the antenna, the TRACK LEFT-RIGHT switch, mounted next to the PPI-TRACK switch, is thrown from its neutral position, to move the antenna counter-clockwise. This switch is normally returned to the center or neutral position by spring contacts.

c. The speed of antenna assembly rotation both for PPI scanning and MANUAL tracking can be controlled by adjusting the ANT SPEED control, located at the top center of the indicator panel. A slower speed is desirable in tracking a target.

d. PPI searching is the type of operation used in early warning. The set is then fully automatic, since the persistence of the screen is great enough so that targets remain on the screen for several seconds. The drive-motor for the antenna should operate at full speed, about 5 rpm. The picture produced on the PPI scope is therefore similar to a map on which the radio set is the central point.

36. APPEARANCE OF TARGETS.

a. When viewed on the PPI screen, target echoes appear as short dashes of light or as bright, oval shaped spots. The size and shape of the echo patterns depends entirely upon the nature and number of targets causing the echoes. The ability to distinguish between stationary and moving targets is related to the fact that an echo from a moving target causes a moving echo whereas a stationary target causes an echo which remains fixed. A moving target is seen moving slowly in either azimuth or range, or both, depending entirely upon the direction of flight with respect to the equipment location. A target, which is traveling directly away from the equipment in a straight line, remains in the same azimuth position but will be seen to increase its range. On the other hand, a target moving straight toward the equipment causes an echo which remains the same in azimuth but decreases in range.

b. Increases and decreases in range are made evident by changes in the position of echoes with respect to the range-marker circles. This is indicated in figure 32 where A, B, and C are successive positions of an echo from a plane that is fixed in azimuth, but decreasing in range. Echo A would not be visible, of course, when echo B appeared. The distance in range between the two points on the screen is about 20 miles, and the time required for the target to travel this distance is greater than the persistence of the screen. Thus the bright spot at A would have faded out before the bright spot at B appeared. Similarly, echo C would not be visible along with either A or B.

c. In actual practice, the separation between successive echoes from the same plane is not so great as shown in figure 32. The speed of rotation of the sweep trace, the speed of the plane, and a number of other factors combine to produce bright spots which are much closer together. A plane approaching the set at 300 miles an hour in a straight line would be picked up four or five times during each minute of searching, so the successive echoes on the PPI scope would be about 1 mile apart. The antenna and the sweep trace on the PPI scope rotate at about 5 rpm.

d. Echoes from a plane flying in a straight line directly across the radio beam would appear on the PPI screen as a series of bright spots changing continuously in azimuth and first decreasing and then increasing in range. The indicated range would be a minimum when the radio beam from the antenna was at right angles to the target. This is shown in

simplified form in figure 33, where A is a first echo in point of time, B is a second echo picked up somewhat later when the range is shortest, and C is a third echo representing an increase in range. The actual separation between successive echoes would, of course, be very much less than that shown in the illustration.

e. As the reflector rotates, the number of echoes appearing on the PPI scope should agree with the number of targets within the effective range of the equipment. As stated above, moving targets are distinguished from fixed targets because echoes from the former change either in azimuth or range or both, and are fading slowly, while echoes from fixed targets remain stationary on the PPI screen. The pattern made on the screen by fixed echoes must be carefully observed since it is through the appearance of strange echoes that targets are detected.

f. Electrical noise or atmospheric disturbances also appear as bright spots and when first seen may be confused with echoes. These spots may be distinguished from true targets because they appear but once and then disappear. Moving targets produce a fairly persistent spot which moves slowly across the screen of the scope.

37. **MANUAL OPERATION.** Manual searching can be accomplished by throwing the PPI-TRACK switch to TRACK position. The antenna may now be rotated either clockwise or counter-clockwise by pressing the TRACK LEFT-RIGHT switch (fig. 23) left or right respectively. Complete 360° rotation can be performed in either case. A slower antenna speed is desirable in tracking a target. Through artful adjustment of the ANT. SPEED and TRACK LEFT-RIGHT controls, the sweep line can be made to stop directly on the target, and the target can be followed in.

38. **RANGE AND AZIMUTH DETERMINATION.**

a. Range Determination. The "A"-scope indicates range only and the scale reads from left to right. That is, the position of the radio set is represented at the extreme left of the trace line and distance from the set extends to the right. Range is represented along the sweep line and the echo extends upward. If the target is moving in on a direct azimuth toward the set, this pip on the "A"-scope will move from right to left, that is, the range will decrease. Conversely, the pip will move from left to right when the target is increasing its distance from the set. If the echo is moving across the path of the set, the echo on the "A"-scope will decrease in size as the target passes from the direct focal point of the antenna.

b. Azimuth Determination. Azimuth determination is made on the PPI scope. Near the lower right corner of the PPI escutcheon is a knurled azimuth pointer wheel (fig. 26). As this wheel is turned, a thin indicating line is rotated around the face of the PPI scope. When a target is located, this indicating line should be immediately aligned on the center of the arc representing the target. A pointer is aligned with the indicating line on the azimuth scale around the outer rim of the PPI scope. This pointer indicates the exact azimuth in number of degrees. Azimuth determination is made on the PPI scope. Range determination is best made on the "A"-scope.

39. **PPI GRID MAP.** If it is desirable to read target position in grid coordinates, a grid may be drawn on the spare, plastic azimuth discs supplied with the equipment. A chinagraph pencil is provided for this purpose. The disc assembly should be removed and the gridded, plastic disc substituted for the azimuth hair line disc. This disc can be revolved for orientation with the azimuth pointer wheel and can be locked after completing the orientation by inserting a matchstick wedge.

40. **STOPPING PROCEDURE.**

a. Step No. 1. Throw the TRACK-PPI switch on the indicator panel to the TRACK position. The TRACK LEFT-RIGHT switch should be in its center neutral position (fig. 23).

b. Step No. 2. Throw the TRANSMITTER switch on the receiver panel to the OFF position (fig. 24).

c. Step No. 3. Throw the MAIN POWER SUPPLY switch on the receiver panel to the OFF position.

d. Step No. 4. Throw the MODULATOR SWITCH on the generator control box to the OFF Position. See TM 11-933.

e. Step No. 5. After a 2 minute delay, stop the engine by holding down the stop button on the carburetor. A stop button for emergency stopping only is provided on the magneto.

f. Step No. 6. Allow for a cooling down period. Then cover the engine with the tarpaulin.

g. Step No. 7. If the unit is to be moved, close the shut-off valve on top of the fuel tank by turning it completely clockwise.

CHAPTER 4

EQUIPMENT PERFORMANCE

SECTION I

GENERAL INSTRUCTIONS FOR FILLING IN THE LOG SHEET

41. EQUIPMENT PERFORMANCE LOG.

a. General. An Equipment Performance Log has been developed to insure the most efficient technical operation of Radio Set AN/TPS-3. The front of the log sheet is shown in figure 34, and the reverse side is shown in figure 35. Regular and conscientious use of this *chart of technical operation* will assure the most efficient functioning of the radio set.

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

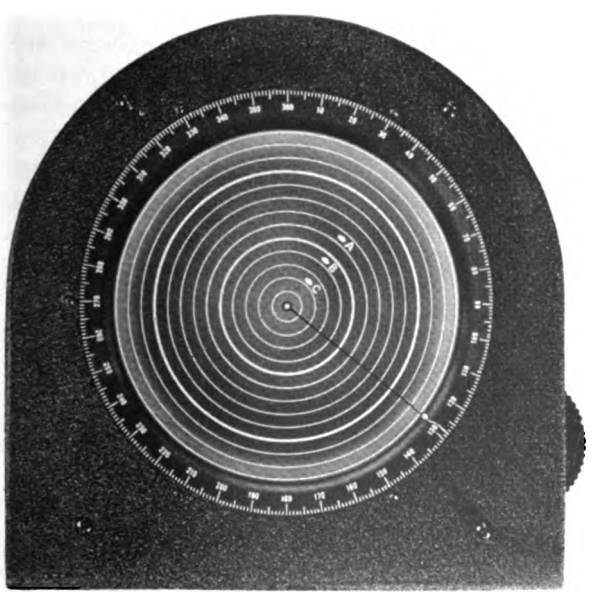
(1) It directs routine and systematic checks of the equipment while the set is on the air and eliminates careless and haphazard methods of technical operation.

(2) It presents the conditions of normal equipment performance and indicates the operating tolerances outside of which meter readings should not be permitted to go, except under circumstances of emergency.

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

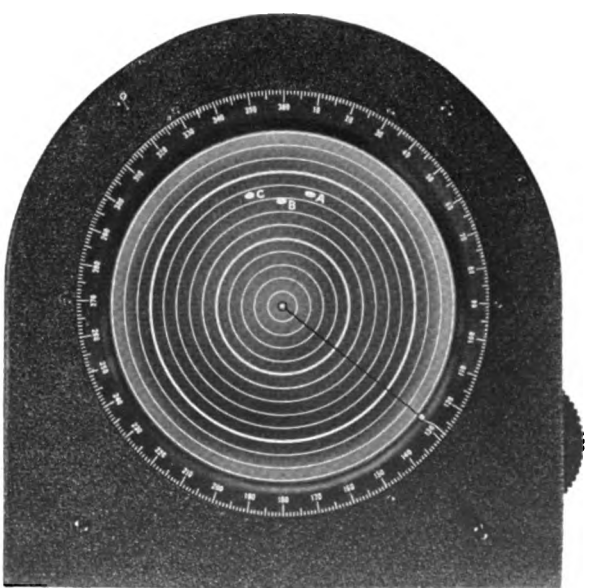
(4) It aids in the prevention of major breakdowns. When signs of irregular operation are discovered, total breakdown may often be avoided if the set is turned off immediately and the necessary repair is made.

(5) It provides complete records of equipment performance while the set is on the air 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. In addition, the log sheet fixes responsibility, provides information valuable for obtaining continuous performance of the radio set, and forms the basis for maintenance to be performed during shutdown periods. 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.



TL 32904

Figure 32. PPI scope, target moving toward set.



TL 32905

Figure 33. PPI scope, target moving across antenna beam.

42. DESCRIPTION OF THE LOG.

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 Equipment Performance Log is given in the front of each log pad.

b. Log Sheets. There are 73 regular log sheets, enough for ten weeks of operation, in each log pad. Each sheet is divided into sections. These sections are divided into items which appear on the front and back of the sheet.

(1) FRONT OF LOG SHEET. The front of the log sheet (fig. 34) contains section B, which forms the heading and consists of roman numeral items I through VII, and section C which forms the main part of the log sheet and consists of items 1 through 75. Items 1 through 75 may be grouped as indicated below:

(*a*) *Hourly Item.* Item 8 is filled in every hour.

(*b*) *Two-hourly Items.* Items 1 through 41, with exception of item 8, are filled in every 2 hours.

(*c*) *Twice-daily Items.* Items 42 through 54 are filled in twice daily.

(*d*) *Once-daily Items.* Items 57 through 64 are filled in once a day.

(*e*) *Operating Time.* Items 65 through 69 are filled in whenever the station goes on or off the air.

(*f*) *Signature of Person Keeping the Log.* Items 70 through 74 provide space for the technician to sign his name and log the time he comes on and goes off duty.

(*g*) *Numbering Log Sheets.* Item 75 provides a space for numbering the log sheets.

(2) BACK OF THE LOG SHEET. The back of the log sheet (fig. 35) is divided into the following five parts:

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

(*b*) *Section D.* 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 E and F.* This space is provided for a report on the components and the parts installed or removed from the set. Section E is labeled COMPONENT RECORD; section F is labeled PARTS RECORD.

(*d*) *Section G.* This space is provided on the back of the log sheet for the recording of any ideas, suggestions, recommendations, or remarks that the technician may have regarding the performance of the set.

43. GENERAL INSTRUCTIONS FOR FILLING IN THE LOG SHEET. Specific instructions for filling in the separate items and sections of the log sheet are given in section II of this chapter. However, the following general rules apply to filling in all items:

a. Location. The exact location of the component or the particular equipment is referred to in each item.

b. 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.

c. 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 24-hour period. The condition of the reading *seen* is the one to be recorded on the log sheet, regardless of whether the reading 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 the condition is likely to cause damage to equipment. On the reverse side of the log sheet in section D, explain the reason for the asterisk and 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 D, 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 D on the back of the log sheet.

d. 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. In section II of this chapter, examples of the log entry are given for each item.

e. 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 limits. By using specified corrective measures and adhering to the indicated tolerances, operators will be able to keep breakdowns at a minimum.

f. Optimum Values. Enter the optimum operating values,the meter indications that represent most efficient operation, to the right of the brackets in the column of empty parenthesis provided.

g. Units. Make all two-hourly, once-daily, and twice-daily entries in terms of the units (volts, degrees, hours, etc.) given in the last column of parenthesis to the right of the item titles.

h. Italicized Items. Check the items printed in *italics* more often than every two hours. 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 take 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 radio station's performance. If the operation is abnormal, make a note in section D, stating wherein the abnormality lies. Both technicians initial the entry in section D.

j. How to Obtain the Information. Instructions for securing the pertinent data from which the log entry is made are given for each item in section II of this chapter.

k. Remarks. Enter pertinent facts or miscellaneous information regarding an item under the REMARKS heading.

44. CORRECTIVE MEASURES. Specific Corrective Measures to be taken while the set is on the air are not described in the log pad. In section II of this chapter they are presented in detail with the discussions of specific procedures for each log item.

45. GENERAL CORRECTIVE STEPS. In contrast to specific corrective measures that are applied while the equipment is running, there are certain general corrective steps that should be followed. These general steps are as follows:

a. General Cleanliness. The routine cleaning of outside surfaces of the components of the set, including meter glasses, is covered in TM 11-1440, entitled Preventive Maintenance. Every operator of Radio Set AN/TPS-3 should take all necessary steps to keep the unit and its contents clean at all times. However, the process of making the log entries and performing specific corrective measures is not to be interrupted to permit cleaning.

b. Broken Meter Cover Glasses. The repair of cracked or broken meter-cover glasses is done in connection with routine preventive maintenance. However, if a meter glass becomes cracked or broken during operation, it is usually desirable to make temporary repair immediately. This can be done with adhesive tape or similar material, but care should be taken not to cover the meter scale with any opaque substance.

c. Pilot Lights. Pilot lights are often used in Radio Set AN/TPS-3 to indicate that certain elements in the system are operating as required. Consequently, if a pilot light is not glowing when it should be, an important fault may be present, or the pilot light bulb is burned out. If a light goes out during operation, replace the bulb with a new one as a first and immediate step. If the new bulb does not light, and if equipment performance seems satisfactory, simply make a note so that repair will be made during a shutdown period. If the new bulb does not light, and equipment performance is faulty, the person-in-charge should be informed immediately and asked for instructions relative to shutdown.

d. Cracked or Broken Knobs and Switch Buttons. Ordinarily, broken knobs and switch buttons are repaired during a period of routine preventive maintenance. However, if a knob or button is cracked or broken, temporary repair can sometimes be effected by using tape or a similar material. In some cases, it may be possible to replace a broken knob while the equipment is operating, but care must always be taken to avoid any changes in equipment operation.

46. READING METERS. Reading meters accurately is a matter of common sense plus carefulness (fig. 36). The following rules and cautions will help prevent errors:

a. Scale Numbering. In reading a meter, observe how the scale is numbered; that is, whether the numbering is 1-2-3, 2-4-6, 5-10-15, 10-20-30, 20-40-60, etc., or in some other sequence.

b. Obtaining Value of a Subdivision. Count the divisions of scale space between the two main-numbered graduations on each side of the needle. Divide the numerical difference between the two numbers by the number of divisions of scale space. This process gives the value of each subdivision, as illustrated in figure 36.

c. Scale Reading Accuracy. In general, the construction of the pointer and the graduation of the scale are such that, under steady conditions, the position of the pointer may be read by estimation to one-tenth of a scale division.

d. Avoiding Parallax Error. Guard against the error caused by parallax. To prevent this error, stand directly in line with the meter. If possible, have the eye on the same level as the meter; if this is impossible, be sure the eye is on the plane of the meter needle and the needle axis.

e. Linear Scales. In reading a meter, observe whether or not the scale is linear, that is, whether the needle deflection is directly proportional to the quantity being measured or not. A-c ammeters and voltmeters usually have scales on which the graduations are not directly proportional to the measured quantity. Linear scales are usually found on d-c instruments.

f. Nonlinear Scales. One meter using a nonlinear scale is known as the current-squared type. The needle deflection on this type of meter is proportional to the square of the current. This nonlinearity must be considered when estimating the reading on such a meter. For instance, when the needle is halfway between 2 and 3 on the meter, the reading is not 2.5, but 2.55. During operation of the unit some fluctuations in the readings may occur, but the readings usually can be averaged mentally.

47. ADJUSTING METERS.

a. Checking. Normally, both meters in the set should read zero when the unit is inoperative. Make an inspection of the zero setting of the meters during the shutdown period. The zero settings cannot be checked while the radio set is in operation.

b. Overcoming Starting Friction. Tap lightly on the meter case with tips of the fingers before deciding that a meter needs readjusting. This enables the needle to overcome the slight starting friction of the bearing which sometimes prevents an otherwise normal meter from resting at zero.

c. Zero Shift. Zero shift is caused by the gradual yielding of the spring when the instrument is kept at a large deflection for a considerable length of time. If on breaking the circuit, the pointer does not return at once to its original zero position, it will probably do so gradually. For this reason, it is most important that the zero settings of meters be checked and readjusted *only after the unit has been off the air for some time.*

d. Adjusting Screw. Adjust the zero setting of any meter only if it fails to return to its zero mark. Turn the adjusting screw on the front of the meter with a small screwdriver while tapping very lightly on the meter case with the tips of the fingers.

SECTION II

SPECIFIC LOG PROCEDURES AND SPECIFIC CORRECTIVE MEASURES

48. GENERAL.

a. As already indicated, an abridged form of the instructions for using the Equipment Performance Log is found in the front of each log pad. In the following paragraphs, a more complete discussion of procedures is given. Normal and abnormal conditions of operation, specific corrective measures, along with sample entries for each of the principal items on the front of the log sheet are discussed. In most cases, two sample entries are included; one is normal, and the other, which follows, is abnormal and shows an asterisk (*).

b. The log emphasizes normal operating conditions. It also stresses the use of corrective measures whenever they can be applied. Furthermore, the log provides for keeping a complete record of abnormal conditions. Whenever an abnormal condition is encountered, an asterisk (*) is to be entered on the

RESTRICTED WHEN BLANK
CONFIDENTIAL WHEN FILLED IN

I (a) Radio Set AN/TPS-3 _____ Ser. No. 4
(b) Radio Set AN/TPX-3 _____ Ser. No. 3

II (a) Assigned Frequency AN/TPS-3 — Mc.
(b) Assigned Frequency AN/TPX-3 — Mc.

III Organization 501st Squadron A.A.F — Section B

IV Address Revere Mass. — VI Date 27 March 1944

V Location Oak Island — VII Signature Kenneth B Wherry Jr

Section C — **EQUIPMENT PERFORMANCE LOG** — Section C

				0000-0200	0200-0400	0400-0600	0600-0800	0800-1000	1000-1200	1200-1400	1400-1600	1600-1800	1800-2000	2000-2200	2200-2400
1 Local Standard Time	[EWT]	( )	Hr.-Min.												
2 Log Starting Time	[ ]	( )	Hr.-Min.	0000	—	—	—	—	—	—	—	—	—	—	—
3 Weather Conditions	[ ]	( )	Symbols	○	○	○	○	○	○	●	●	○	○	○	○
4 Temperature Outside	[ ]	( )	°F	38°	37°	39°	42°	55°	63°	66°	65°	48°	44°	38°	35°
5 Temperature Inside	[ ]	( )	°F	65°	70°	72°	73°	75°	76°	76°	76°	73°	70°	65°	65°
6 Humidity	[Max. 50%]	( )	Symbols	30%	30%	32%	31%	33%	30%	31%	35%	35%	32%	32%	30%
7 Power Unit PU-6/TPS-1 (Ser.)	[Gen. Cond.]	( )	OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
8 *Fuel in tank (Hourly)*	[*Amt. Added*]	( )	*Qts.*	4/2	5/3	4/2	5/3	4/2	6/4	4/4	2/4	4/2	5/3	1/6	6/4
9 Gasoline in Reserve	[ ]	( )	*Gals.*	15	14	13	11	9	7	7	6½	6	5	4	4
10 Oil in Reserve	[ ]	( )	Qts.	5	4½	4	3¾	3	2½	2	2	2	2¾	2½	2
11 Generators	[ ]	( )	OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
12 Rotary Spark Gap	[Spark.Cond.]	( )	OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
13 A-C Output Freq. (Vibrating Reed)	[390-410]	( )	Freq.	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
14 A-C Output Voltage (Gen. Cont. Box)	[117-121]	( )	Voltage	118	119	118	118	117	120	120	120	119	118	117	117
15 *A-C Voltage (at Console)*	[*113-117 volts*]	( )	*Voltage*	115	116	116	115	116	117	117	117	115	114	114	114
16 *D-C Voltage (at Utility Outlet)*	[*22-28 volts*]	( )	*Voltage*	24	24	24	24	24	25	25	25	24	23	23	23
17 Transmitter Operation	[ ]	( )	OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
18 Ventilating System	[Gen. Cond.]	( )	OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
19 Anti-TR Spark Gap	[Spark Cond.]	( )	OK-N*	OK	OK	OK	OK	OK	N*	OK	OK	OK	OK	OK	OK
20 TR Spark Gap	[Tuning]	( )	OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
21 Frequency Check (AN/TPS-3)	[± 1 Mc.]	( )	Mc	—	—	—	—	—	—	—	—	—	—	—	—
22 R-F Output (Output Units)	[See Inst.]	( )	(Units-OK-N*)	5	6	5.5	6	6	6	5	4	4	5	5	5
23 Total B+ Current	[0.6 MA.]	( )	MA.	.6	.6	.6	.65	.7	.6	.6	.6	.55	.6	.5	.6
24 "A" Scan	[ ]	( )	OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
25 PPI Scan	[ ]	( )	OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
26 Range Markers	[ ]	( )	OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
27 1st R-F Amplifier Current	[9-11 MA.]	( )	MA	10	10	10	10	10	10	10	10	10	10	11	10
28 2nd R-F Amplifier Current	[9-11 MA.]	( )	MA.	10	10	10	10	10	9	10	10	10	10	10	10
29 Crystal Current (X-tal.)	[0.5-0.6]	( )	MA.	.5	.6	.5	.5	.5	.6	.6	.5	.6	.5	.6	.6
30 *Receiver Tuning*	[ ]	( )	*OK-N**	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
31 Blanking Circuit (AJ)	[ ]	( )	OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
32 Discriminating Circuit (AJ)	[ ]	( )	OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
33 Ant. Speed Control	[ ]	( )	OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
34 Track-Left-Right Control	[ ]	( )	OK-N*	OK	N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
35 IFF Control	[ ]	( )	OK-N*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
36 *AN/TPS-3 System Sensitivity*	[80%	( )	%	70%	70%	65%	70%	75%	75%	80%	80%	70%	65%	70%	70%
37 *AN/TPS-3 Signal-to-Noise Ratio*	[ ]	( )	*Ratio*	3/1	3/1	2/1	2/1	3/1	2/1	4/1	4/1	2/1	3/1	2/1	2/1
38 Az. & Max. Range AN/TPS-3	[ ]	( )	°/miles	160/40	160/40	160/40	160/40	160/40	160/40	160/40	160/40	160/40	160/40	160/40	160/40
39 Az. & Max. Range of IFF	[ ]	( )	°/miles	140/80	140/80	140/80	140/80	140/80	140/80	140/80	140/80	140/80	140/80	140/80	140/80
40 Type of IFF Target IN or OUT	[ ]	( )	type/1-0	—	Plane 1	—	—	Plane 1	Plane 1	—	—	Plane 1	—	—	—
41 Log Finishing Time	[ ]	( )	Hr.-Min.	—	—	—	—	—	—	—	—	—	—	—	2400

42 LogTime(Twice-daily items)(Hrs.-Min.)	0000	1200	47 Antenna System	(Gen. Cond.)	(OK-N*)	OK	OK	52 Cable Condition	(OK-N*)	OK	OK
43 Spare power unit Ser. No. (OK-N*)	OK	OK	48 Guys, Stakes, Deadmen	(Gen. Cond.)	(OK-N*)	OK	OK	53 Leveling	(OK-N*)	OK	OK
44 Modulator (Gen. Cond.) (OK-N*)	OK	OK	49 Transit Cases	(Gen. Cond.)	(OK-N*)	OK	OK	54 Tent	(OK-N)	OK	OK
45 Console (Gen. Cond.) (OK-N*)	OK	OK	50 Tools	(Gen. Cond.)	(OK-N*)	OK	OK	55			
46 Consoleairfilter(Gen. Cond.) (OK-N*)	OK	OK	51 Test Equipment	(Gen. Cond.)	(OK-N)	OK	OK	56	( )		

57 SUMMARY		TOTAL	65 OPERATING ANALYSIS			70 SIGNATURE OF PERSON KEEPING LOG			
58 Total Hours of Operation	(Hr.-Min.)	23:00	66 ON	67 OFF	68 TOTAL	69 DESCRIPTION	71 SIGNATURE	72 RANK	73 ON	74 OFF
59 Interruption Time	(Hr.-Min.)	—:—	Hr. Min.	Hr. Min.	Hr. Min.		Frank H Walton	Cpl.	0000	0600
60 Maintenance Time	(Hr.-Min.)	1:00	23:00	1:00	24:00	Maint. Period	James A Berry	Cpl.	06:00	13:00
61 Gasoline Consumed	(Gals.)	25	:	:	:		John Adams	Sgt.	13:00	19:00
62 Oil consumed	(Qts.)	6¼	:	:	:		Harold N Varney	Cpl.	19:00	24:00
63 Number of Targets Recorded	(Number)	18	:	:	:				:	:
64 Number of IFF Targets Recorded	(Number)	4	:	:	:				:	:
	( )		:	:	:				:	:
	( )		:	:	:				:	:
	( )		:	:	:				:	:
	( )		:	:	:				:	:

Make entries in ink or indelible pencil, if available. Do not erase. In case of error, strike out the mistake and make the correct entry. Place an asterisk (*) after an abnormal entry.

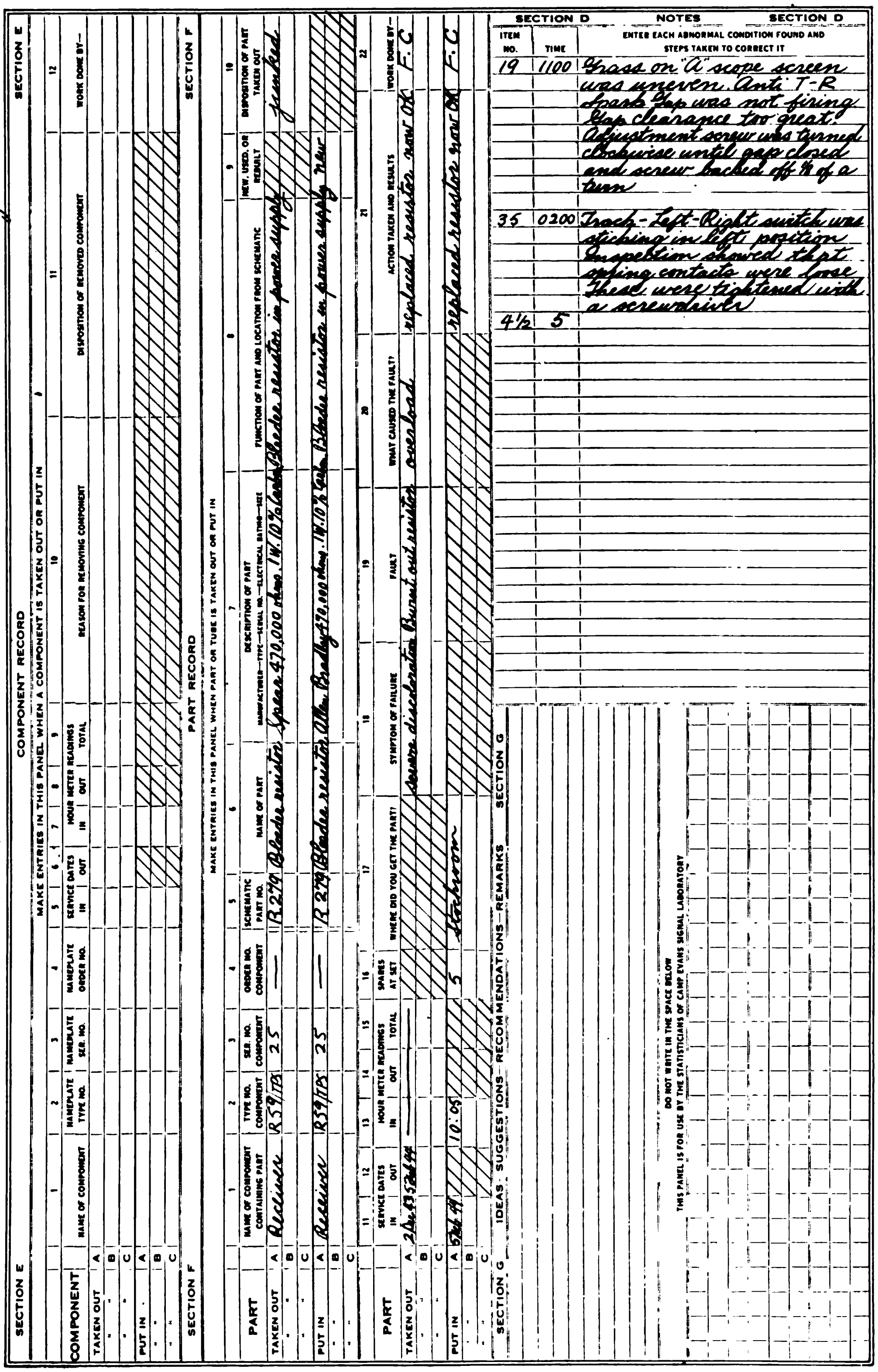
During the shut-down period reset all the meters requiring zero adjustment. Do not use ditto marks.

75. Sheet No. 1

Signal Corps Form No. 257
PART No. 208G200

TL33361

Figure 34. Front side of the log sheet.



I. Organization 501st. Squadron A.A.F.
II. Address Revere Mass
III. Location Oak Island
IV. (a) Radio Set AN/TPS-3 Ser. No. 4
(b) Radio Set AN/TPX-3 Ser. No.
V. Elevation 14 feet
VI. Distance from Sea 45 yards
Sections D, E, F, and G

SECTION E — COMPONENT RECORD — SECTION E

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												
" "	B												
" "	C												
PUT IN	A												
" "	B												
" "	C												

SECTION F — PART RECORD — SECTION F

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 Schematic part no.	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	Receiver	R59/TPS	25	—	R 279	Bleeder resistor	Spear 470,000 ohms. 1W. 10% Carbon	Bleeder resistor in power supply		junked
" "	B										
" "	C										
PUT IN	A	Receiver	R59/TPS	25	—	R 279	Bleeder resistor	Allen Bradley 470,000 ohms. 1W. 10% Carbon	Bleeder resistor in power supply	new	
" "	B										
" "	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	2 Dec 43	5 Feb 44						severe discoloration	Burnt out resistor	overload	replaced resistor now OK	F.C
" "	B												
" "	C												
PUT IN	A	5 Feb 44		10:05			5	Stockroom				replaced resistor now OK	F.C
" "	B												
" "	C												

SECTION G — IDEAS—SUGGESTIONS—RECOMMENDATIONS—REMARKS — SECTION G

DO NOT WRITE IN THE SPACE BELOW
THIS PANEL IS FOR USE BY THE STATISTICIANS OF CAMP EVANS SIGNAL LABORATORY

SECTION D — NOTES — SECTION D

Item no.	Time	Enter each abnormal condition found and steps taken to correct it
19	1100	Grass on "A" scope screen was uneven. Anti T-R Spark Gap was not firing. Gap clearance too great. Adjustment screw was turned clockwise until gap closed and screw backed off ¼ of a turn
35	0200	Track-Left-Right switch was sticking in left position. Inspection showed that spring contacts were loose. These were tightened with a screwdriver
4½	5	

SEE TM 11-1340 FOR SAMPLE AND FOR DETAILED EXPLANATION OF DATA WANTED.

ONCE A WEEK MAIL COMPLETED LOG SHEETS TO:
ELECTRONICS SECTION
Ground Signal Maintenance Branch
Quality Control Division Camp Evans, Belmar, N. J.

IF ADDITIONAL SPACE IS REQUIRED TEAR OUT ANOTHER LOG SHEET AND ATTACH TO THIS ONE.

SHEET No. 1

TL 33362

Figure 35. Rear side of the log sheet.

front of the log sheet, and a description of the condition is to be written in NOTES, Section D, on the back of the log sheet. In the itemized discussion which follows, the instruction to keep a record of abnormalities in Section D may sometimes not be specifically given, but entries in Section D should always be made when anything unusual concerning the equipment is observed.

49. **SECTION B, ITEMS I-VII.** Fill in items I-VI at the beginning of each 24-hour period. The person-in-charge examines the log sheet at the end of the period and signs his name in item VII.

50. **SECTION C, ITEMS 1-41.** These items are filled in every 2 hours, except item 8 which is filled in every hour.

NOTE: Items 1-11 are to be filled in every two hours whenever the power unit is in operation, whether the radio set is on the air or not. If the radio set is not on the air, items pertaining to it, of course, cannot be filled out.

1. Local Standard Time	[EWT] (Hr.-Min.)	0000-0200	0200-0400

Log Entry.

In the brackets to the right of the item title, record the abbreviation of the time used in the zone in which the station is located.

How to Obtain the Information.

The abbreviations of the time zone in which the radio station is located may be obtained from the person-in-charge. The following are examples:

ABBREVIATION	ZONE
EWT	Eastern War Time.
CWT	Central War Time.
MWT	Mountain War Time.
PWT	Pacific War Time.

The 12 spaces to the right of the title are labelled according to the 24-hour time system. Note the examples below.

Midnight	0000	2 P. M.	1400
2 A. M.	0200	10:30 P. M.	2230
12 Noon	1200	Midnight	2400

2. Log Starting Time	[ ] ( ) (Hr.-Min.)	0015	0215

Log Entry.

Enter the time in hours and minutes, using the 24-hour time system. Refer to figure 37 for a guide when converting ordinary time readings to their equivalents in the 24-hour system. Begin the log 15 minutes after the station goes on the air. Enter the time in the proper column. For instance, if the first set of readings is made at 0115, enter the readings in the column headed 0000-0200. Succeeding sets of entries are made at 2-hour intervals. If the 2-hour sequence is broken, place an asterisk (*) after that entry and make an explanation under NOTES on the back of the log sheet.

3. Weather Conditions	[ ] ( ) (Symbols)	C	O

Log Entry.

Observe the general condition of the weather. Notice the sky cover, precipitation, and visibility. Record any unusual conditions under NOTES on the back of the log sheet but use the following symbols for recording general weather data.

a. Sky Cover. Draw a symbol to indicate the degree of cloudiness as follows:

Clear sky.....○
Overcast sky.....●

b. Precipitation. Notice the type of precipitation and use one of the following abbreviations:

Rain	R	Sleet	E
Snow	S	Hail	AP
Freezing rain	ZR	Mist	M

c. Visibility. Use the following symbols and abbreviations to indicate the corresponding weather conditions:

Fog	F	Sand Storm	B
Hazy	H	Thunderstorm	↯
Smoky	K	Lightning visible	↘
		Dusty	D

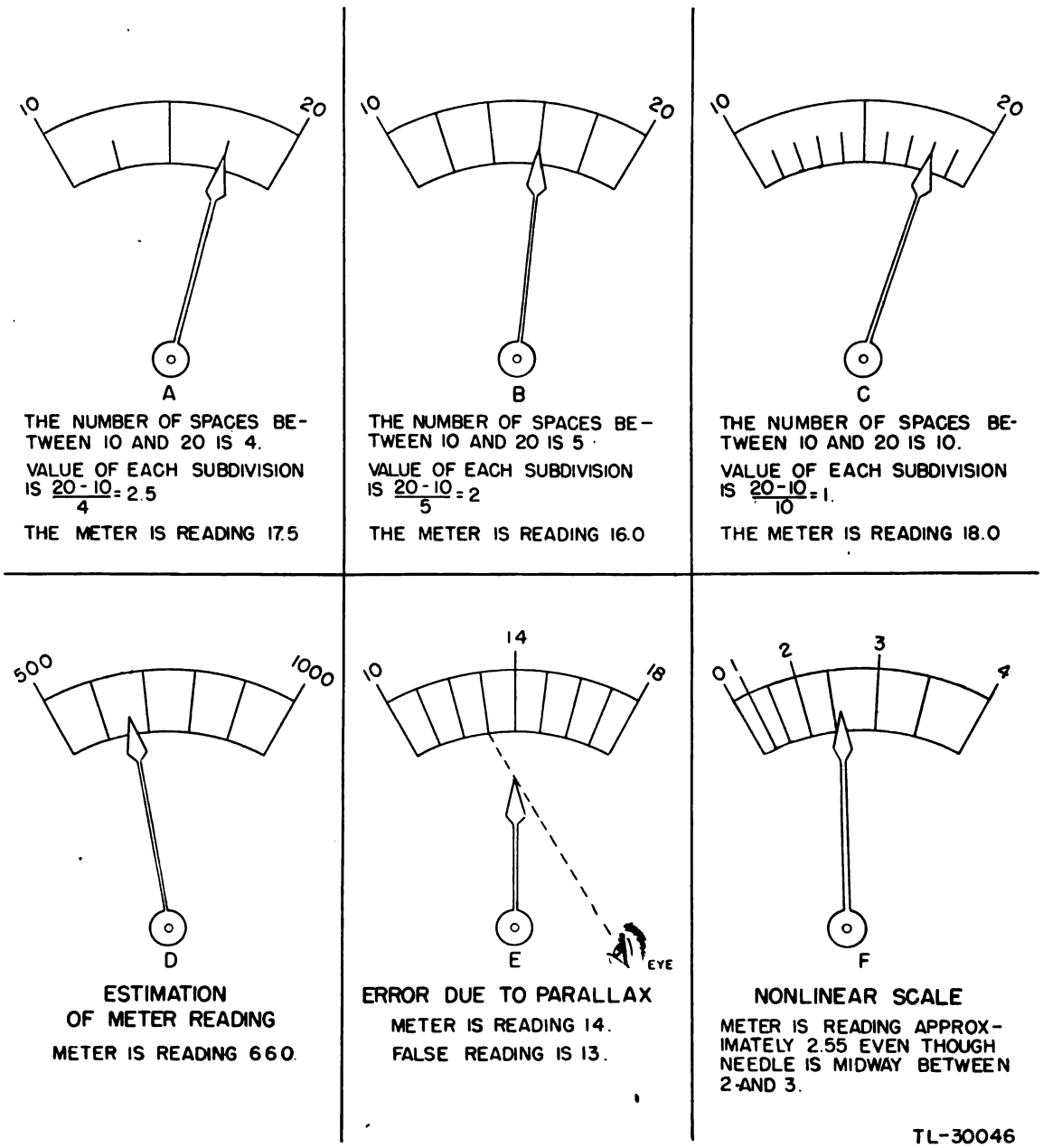
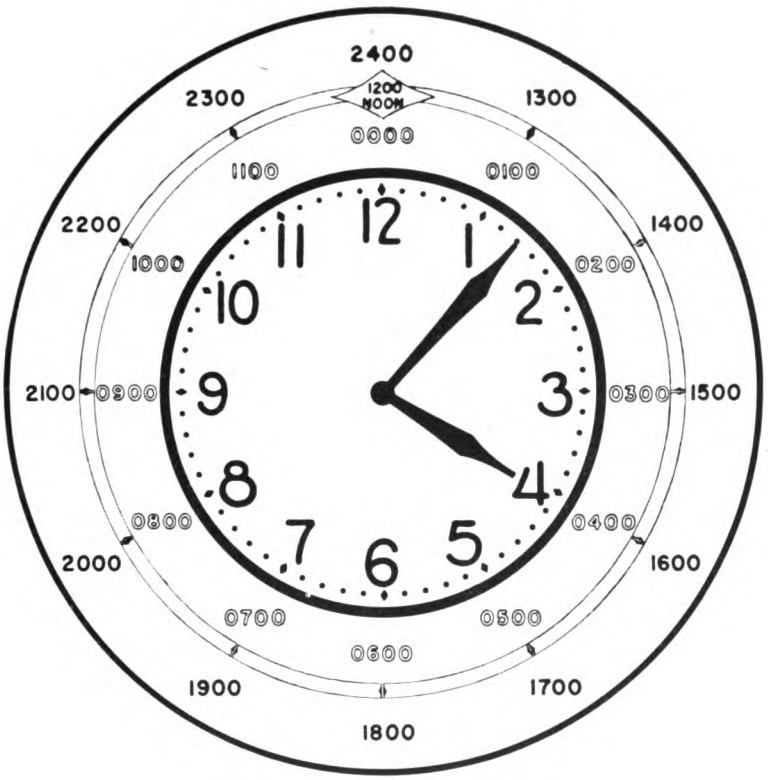


Figure 36. How to read meters.



24 HOUR TIME CLOCK

DESCRIPTION

THE INNER CIRCLE REPRESENTS A STANDARD 12 HOUR CLOCK.
THE MIDDLE SECTION (WHITE NUMERALS) COVERS THE A.M. PERIOD FROM MIDNIGHT (0000) TO NOON (1200)
THE OUTER SECTION (BLACK NUMERALS) COVERS THE P.M. PERIOD FROM NOON (1200) TO MIDNIGHT (2400).

INSTRUCTIONS

TIME READINGS ON THE 24-HOUR CLOCK ARE IDENTICAL TO THE STANDARD 12-HOUR CLOCK READINGS DURING THE FIRST TWELVE HOURS (A.M.) OF THE DAY, EXCEPT THAT THE RECORDING DOES NOT SHOW ANY MINUTE NOTATION.
EXAMPLES: AT 7:00 A.M. WRITE: 0700. AT 11:17 A.M. WRITE: 1117.
AFTERNOON (P.M.) READINGS ARE SHOWN IN THE OUTER SECTION THEY BEGIN WITH 1201 AND END WITH 2400 (MIDNIGHT) WHICH IS THE SAME AS 0000.
EXAMPLES: AT 3:26 P.M. WRITE: 1526. AT 9:02 P.M. WRITE 2102

CLOCK READING

IF A.M. THE FIGURE READS 0407 IF P.M. THE FIGURE READS 1607 TL 30528

Figure 37. 24 hour clock.

4. Temperature Outside	[ ] ( ) (°F.)	82	110*

Log Entry.

Enter the outside temperatures in degrees Fahrenheit.

Corrective Measure.

If the thermometer reading seems wrong, check the following possible causes:

a. The thermometer may be damaged. If it is, replace it with a new one as soon as possible.

b. The thermometer may be inaccurate. Check the readings against an accurate thermometer. Replace the thermometer if it is inaccurate.

c. Incorrect thermometer readings may be due to location in the direct rays of the sun or in the rain. If so, relocate the thermometer.

5. Temperature Inside	[ ] ( ) (°F.)	76	90*

Log Entry.

Enter the inside temperature in degrees Fahrenheit.

Corrective Measures.

If the thermometer reading seems incorrect, check for the following possible causes:

a. The thermometer may be damaged or inaccurate. Refer to corrective measures *a*, and *b*, under item 4.

b. An incorrect reading can be due to a location near hot equipment or near a ventilator. If this is the case, relocate the thermometer.

6. Humidity	[Max. 50%] ( ) (Symbols)	M	L

Log Entry.

Estimate the humidity, and make the entries in accordance with the following abbreviations:

Very low (air very dry).....VL
Low (air dry) L
Moderate .....M
High (air damp) .....H
Very high (air very damp) .....VH

Remarks.

The word "humidity" refers to the amount of water vapor in the air. At the low extreme of humidity, the air is very dry; at the high extreme, it is very damp or moist. In areas where there is very little rainfall, such as desert country, the humidity is almost always very low. The air as well as the ground is quite dry. In places where rainfall is heavy, the humidity is usually high. On a hot, very humid day, the air seems oppressive and heavy. On such a day the symbol VH would be entered in the log. In contrast, on a hot day in an arid region, even if a heavy rain has just stopped, the air seems fresh and light. The symbol L would be entered. Use care in making estimates.

7. Power Unit PU-6/TPS-1 (Ser)	[Gen. Cond.] ( ) (OK-N*)	OK	N*

Log Entry.

Record the type number of the power unit in the parenthesis to the right of the item title. If the general condition of the power unit is normal, enter OK in the log space; if not, enter N*.

8. *Fuel in Tank*	*(Hourly)*	*[Amt. Added]* ( ) *(Qts.)*	3/4	3/3½

Log Entry.

This item MUST be checked hourly as the unit will not run two hours on one filling. Fill the tank each hour and record the number of quarts of the gasoline-oil mixture that is added.

Remarks.

a. Filling Tank. If care is used, it is unnecessary to shut down the engine while filling the gasoline tank. Fill the tank as follows:

(1) Use a metal funnel, making sure it is grounded on the edge of the tank opening.

(2) Pour the gasoline-oil mixture from the container into the funnel. Make sure the can is grounded on the funnel. The funnel may be

held by one person while the other pours the mixture.

(3) Check frequently so the tank does not overflow. Make sure the gasoline does not spill on the hot engine.

b. Gasoline-Oil Mixture. One-half pint engine oil, specification 2-104-B (SAE 10), must be thoroughly mixed with each gallon of gasoline. Fill the fuel tank cap (capacity ⅛ pint) four times and pour into one gallon measure. Pour 1 or 2 quarts of gasoline into measure and stir with a clean stick until it foams. Then fill the measure with gasoline, stir again and pour into fuel tank. Since the entire engine is lubricated by oil mixed with gasoline, *it is extremely important that the oil and gasoline are completely mixed.*

CAUTION: Use SAE-30 or 50 oil when unit is operated in a confined area without adequate circulation of air or in extremely hot weather.

Corrective Measures.

If the reserve gasoline cans hold less than one day's operating requirement, notify the person-in-charge.

9. Gasoline in Reserve	[ ] ( ) (Gals.)	15	12

Log Entry.

Enter in the log the number of reserve gallons to the nearest ¼ gallon. If, at the beginning of the operational day, there are less than 6 gallons in the reserve gasoline cans, place an asterisk (*) after the log entry. If the gasoline reserve at any time of the day is less than the requirement for the balance of that operational day, place an asterisk (*) after the log entry.

10. Oil in Reserve	[ ] ( ) (Qts.)	5	4

Log Entry.

Record the number of quarts of oil available as a reserve.

11. Generator	[ ] ( ) (OK-N*)	OK	N*

Log Entry.

If the generator is normal, enter OK in the log space; if not, enter N*. The generators are normal if:

a. If not excessively hot to the touch, making due allowance for the weather.

b. The housing is free of excess dirt and grease.

c. No unusual noises are heard.

d. The brush inspection band is tight and properly installed.

e. The cable connections are secure.

Corrective Measures.

See TM 11-933 for possible troubles and corrections. Make entries in the Work-To-Be-Done Book for all corrections to be made during the shutdown period. Notify the person-in-charge of any abnormality that may cause an interruption of operations.

12. Rotary Spark Gap	[Spark. Cond.] ( ) (OK-N*)	OK	N*

Log Entry.

Enter OK if the rotary spark gap (fig. 3) is firing cleanly and regularly; if not, enter N* and explain under NOTES. The discharges need not be at one point on the stationary pin. They may be dispersed along its length.

Corrective Measures.

Make entries in the Work-To-Be-Done Book for all corrections to be made during the shutdown period. Notify the person-in-charge of any abnormality that may cause an interruption of operations. Refer to Service Manual TM 11-1540 for modulator spark-gap information.

13. A-C Output Freq. (Vibrating Reed) [390-410] ( ) (Freq.)	400	385*

Log Entry.

Enter the a-c output frequency to the nearest five cycles per second. If adjustment is required, enter under NOTES.

How to Obtain Information.

Using the vibrating reed frequency meter (fig. 29), measure the frequency of generator at the pin jack provided at the power unit.

Corrective Measures.

Adjust the frequency ± 5 cycles by adjusting the ratio of gas to air in the carburetor. If the necessary adjustments cannot be made, notify the person-in-charge. Make entries in the Work-To-Be-Done Book for all corrections to be made during the shutdown period.

14. A-C Output Voltage (Gen. Cont. Box) [117-121] ( ) (Volt)	119	124*

Log Entry.

Enter the reading to the nearest volt. If the reading is above or below normal, place an asterisk (*) after the number. If adjustment is required, enter under NOTES.

How to Obtain Information.

This measurement should be made with the MAIN POWER SUPPLY switch on the receiver in the ON position. Due to the drop in the power cable, the voltage at the generator control box should be approximately four volts greater than the voltage at the receiver.

Corrective Measures.

a. Check nature of load, whether IFF, etc., are ON.

b. Check Item 13, A-C Output Frequency.

c. Check Item 11, Generators.

d. Check Item 7, Power Unit PU-6/TPS-1.

e. Check voltages at receiver (meter may be defective).

f. Adjust the voltage control rheostat knob (fig. 3) to the correct voltage.

g. Make entries in the Work-To-Be-Done Book for all corrections to be made during the shutdown period. Report to the person-in-charge any abnormality that may cause an interruption in operations.

15. *A-C Voltage (at Console)* [*113-117 volts*] ( ) (*Voltage*)	115	121*

Log Entry.

Enter to the nearest volt the reading of the voltmeter on the receiver (fig. 24). If the reading is above or below normal, place an asterisk (*) after the number. If adjustment is required, enter under NOTES.

NOTE: Due to the drop in the power cable, this voltage should be approximately four volts less than the voltage measured at the generator control box.

Corrective Measures.

a. Check the nature of the load (whether IFF, etc., are ON).

b. Check Item 13, A-C Output Frequency.

c. Check Item 14, A-C Output Voltage.

d. Make entries in the Work-To-Be-Done Book of all corrections to be made during the shutdown period. Report to the person-in-charge any abormality that may cause an interruption in operations.

16. *D-C Voltage (at Utility Outlet)* [*22-28 volts*] ( ) (*Voltage*)	24	27

Log Entry.

Enter the reading to the nearest volt of the d-c voltmeter as measured at the outlet for the tent fan on the console.

Corrective Measures.

If the output is irregular or below 22 volts, immediately notify the person-in-charge and see TM 11-1540 for corrective measures.

No regulation is provided for this voltage.

Remarks.

This voltage, though small, is important since it supplies the entire ventilation system, including the console and transmitter blowers.

17. Transmitter Operation	[ ] ( ) (OK-N*)	OK	N*

Log Entry.

Enter OK if the transmitter operation is normal; otherwise enter N* and explain under NOTES in Section D on the back of the Log Sheet.

Normal Condition.

The transmitter operation is normal if:

a. The stub tuners are set for maximum r-f output (as indicated by the r-f output meter) consistent with minimum transmitter noise.

b. The transmitter shield case is in place.

How to Obtain Information.

This procedure is to be performed only when the equipment is not tracking or searching.

a. Position the antenna so that a fixed-target echo can be seen on the 50-mile range on the "A"-scope.

b. Adjust the RECEIVER GAIN control for a strong image below saturation (flat top).

c. Vary the stub tuners slightly and note whether the echo height was at its maximum. The stub tuners are on the base of the console (fig. 2).

Corrective Measures.

If the stub tuning is unsatisfactory, adjust the OSC TUNING control to provide maximum echo height. (Refer to Tuning Procedure section for further details.)

18. Ventilating Systems	[Gen. Cond.] ( ) (OK-N*)	OK	N*

Log Entry.

Enter OK if the general condition of the ventilating systems is normal; otherwise, enter N*, and explain under NOTES in Section D of the log sheet.

Location.

There are three ventilating systems to be checked; the console blower, the transmitter blower in the console (fig. 2), and the tent ventilating fan (fig. 21).

Normal Condition.

The condition of each ventilating system is normal if:

a. The flow of air from the exhaust vent at the top rear of the console for the console blower, and the exhaust vent at the lower rear of the console for the transmitter blower can be felt.

b. The tent ventilating fan is running in the proper direction for the convenience of the operator.

c. The temperature of the tent fan motor is normal.

d. The temperature of the console is normal.

e. The temperature of the transmitter and console blower motors is normal.

Corrective Measures.

a. Check Item 16 D-C Voltage (at utility outlet). See figure 8.

b. If the flow of air cannot be felt, immediately notify the person-in-charge.

c. See TM 11-1540 for corrective measures.

d. Make entries in the Work-To-Be-Done Book of all corrections to be made during the shutdown period. Report to the person-in-charge any abnormality that may cause an interruption in operations.

19. Anti T-R Spark Gap	[Spark. Cond.] ( ) (OK-N*)	OK	N*

Log Entry.

Enter OK if spark gap is normal. If not, enter N*.

Normal Condition.

a. Noise level is steady on the "A" scope (fig. 7).

b. See TM 11-1540 for details.

Corrective Measures.

a. Shut off transmitter and remove the lower panel from the console.

b. On the front of the anti T-R stub is a knurled screw adjustment. Turn this screw all the way clockwise until the contacts are touching.

c. Back off the screw ¼ turn in a counter-clockwise direction. This gives a gap clearance of 0.10 inch and should remedy the variation of the grass on the "A" scope. If this gap is shorted, the size of even a strong echo will be reduced considerably.

20. T-R Spark Gap	[Tuning] ( ) (OK-N*)	OK	N*

Log Entry.

Enter OK if T-R Box (fig. 27) is normal; if not, enter N*.

Normal Condition.

T-R Box tuned for maximum echoes.

Corrective Measures.

Check operation of T-R Box by tuning while observing the height of a fixed echo.

21. Frequency Check (AN/TPS-3)	[± 1 Mc] ( ) (Mc)		

Log Entry.

Enter to the nearest mc the reading on the frequency meter. If the frequency is more than 1 mc below or above the assigned frequency, place an asterisk (*) after the number and make a note of the condition in Section D under NOTES at the back of the log sheet.

How to Obtain the Information.

Use the frequency meter (fig. 29) by inserting it into the holes in the antenna shaft and tuning the meter for maximum bulb brightness. Read the calibrated scale for the frequency.

Corrective Measures.

If the frequency is off more than ± 1 mc from the assigned frequency, notify the person-in-charge.

22. R-F Output (Output Units)	[See Inst.] ( ) (Units OK-N*)	7/OK	3/N*

Log Entry.

Enter the output to the nearest unit as read on the output meter located on the receiver (fig. 24).

Normal Condition.

This reading should be within one output unit of that established by the person-in-charge when the transmitter was properly tuned. To simplify the recording of this entry, the person-in-charge should write the reference level in the parentheses provided with this item on the log.

Corrective Measures.

If the output falls off more than one unit, the person-in-charge should be notified, and a N* entry and explanation put in the log.

23. Total B+ Current	[0.6 MA.] ( ) (MA.)	0.6	0.6

Log Entry.

Measure the Total B+ current of the receiver and indicator by moving the meter switch on the receiver panel to the full clockwise position. Record to the nearest 0.1 milliampere.

24. "A" Scan	[ ] ( ) (OK-N*)	OK	N*

Log Entry.

If the display is steady on the screen (fig. 5), of proper intensity, properly focused and positioned, has the proper length on all ranges, and noise and signals have the proper amplitude, enter OK.

Corrective Measures.

When the above is not the case, the following measures may be used:

a. Reduce RECEIVER GAIN control to zero (extreme counter clockwise position).

b. The "A" INT control under hinged panel on front of the indicator unit adjusts the intensity on the "A"-scope. This should be set so as to give a clearly visible trace but not too intense or the flourescent screen of the scope may be damaged.

c. Adjust A POSITION control to center the trace on the face of the scope.

d. Adjust the three A SWEEP LENGTH controls on the front of the indicator chassis. These are located just below the "A"-scope.

e. Focusing the sweep to a sharp uniform line can be accomplished by the A FOCUS control.

f. RECEIVER GAIN control should then be advanced until ⅛ inch of grass appears on screen.

25. PPI Scan	[ ]	( ) (OK-N*)	OK	N*

Log Entry.

If the display on the PPI scope (fig. 6) is circular, steady, properly focused and centered, of the proper length on all ranges, of the proper intensity, and noise and signals are of proper amplitude, enter OK.

Corrective Measures.

Should the above not be true, the following measures should be taken:

a. Reduce RECEIVER GAIN control on receiver panel to zero. (Extreme counter-clockwise position.)

b. Adjust PPI INT control until a clearly visible trace occurs. This should not be too intense or the fluorescent material on the scope screen may be burned.

c. Adjust the PPI FOCUS control, under the hinged-panel on front of indicator unit, until trace is a sharp even line on the scope.

d. The centering of the trace makes it necessary to remove the indicator unit from the console. The extension cords must be employed to furnish the indicator with power. These CENTERING controls are screwdriver adjustments and are located on the elevated chassis directly behind the PPI scope. They should be set so as to have the trace start at the center and sweep to the outer edge of tube.

e. The three PPI SWEEP LENGTH controls for this scope are mounted directly below this tube on the front panel; one for each range. They will set the physical length of the sweep line on each range.

f. If the concentric circles produced by the rotation of the sweep are not exactly circular, an adjustment of the CIRCULARITY control, located at the rear of the indicator unit, will correct this condition.

g. Increase the RECEIVER GAIN control until grass on the "A"-scope is about ⅛ inch in height along the horizontal sweep line.

26. Range Markers	[ ]	( ) (OK-N*)	OK	N*

Log Entry.

If the calibration markers are steady, of normal amplitude, and properly synchronized, enter OK; if not, enter N* and explain under NOTES.

Corrective Measures.

If the above is not true, the following measures should be taken:

a. Adjust the 10 MI. SIZE control (fig. 26) under hinge-panel on the front of the indicator unit until small markers are approximately ⅛ inch below the sweep line on the "A"-scope.

b. Adjust 50 MI. SIZE control until the 50-100-mile markers are about twice the length of the 10-mile markers. On the 120-mile range, these long markers should occur on the fifth and tenth small markers.

c. If these long markers do not occur on the fifth and tenth markers, adjust the 50 MI. SYNC. control until they do.

27. 1st R-F Amplifier Current	[9-11 MA.]	( ) (MA.)	10	9

Log Entry.

Multiply the meter reading by 20 to obtain the actual current in milliamperes. Record to the nearest milliampere.

28. 2nd R-F Amplifier Current	[9-11 MA.]	( ) (MA.)	9	10

Log Entry.

Multiply the meter reading by 20 to obtain the actual current in milliamperes. Record to the nearest milliampere.

29. Current Crystal (X-tal)	[0.5 to 0.6 MA.]	( ) (MA.)	0.6	0.6

Log Entry.

Meter Switch (fig. 24) should be set in X-TAL position and current read to the nearest milliampere, and recorded.

30. *Receiver Tuning*	[ ]	(*OK-N**)	OK	N*

Log Entry.

Check the adjustment of all tuning controls by tuning on a fixed echo. If control adjustments are satisfactory, enter OK; if not, enter N* and explain under NOTES.

31. Blanking Circuit (AJ)	[ ]	( )	(OK-N*)	OK	N*

Log Entry.

This is filled in only to determine whether the circuit is generally operative. Switch in the blanking circuit. If circuit operation is satisfactory, enter OK.

32. Discriminating Circuit (AJ)	[ ]	( )	(OK-N*)	OK	N*

Log Entry.

Switch in the discriminator circuit. If the circuit operation is satisfactory, enter OK.

33. ANT. Speed Control	[ ]	( )	(OK-N*)	OK	N*

Log Entry.

Operate the ANT SPEED control (fig. 23). If the PPI rotation is satisfactory, enter OK; if not, enter N* and explain under NOTES.

34. TRACK-LEFT-RIGHT Control	[ ]	( )	(OK-N*)	N*	OK

Log Entry.

With the TRACK-PPI switch (fig. 23) in the TRACK position, operate the TRACK-LEFT-RIGHT switch and operate the ANT SPEED control. If operation is satisfactory, enter OK; if not, enter N* and explain under NOTES.

Remarks.

The rotation should be checked for general mechanical and electrical operating condition. The mechanical backlash should be checked by operating the TRACK-LEFT-RIGHT switch in the TRACK position. If reversing the direction of drive causes excessive jerking action, the chain drive should be examined and readjusted.

35. IFF Control	[ ]	( )	(OK-N*)	OK	N*

Log Entry.

No entry is to be made unless the IFF unit is incorporated with the set. Enter OK if the general operating condition of the IFF control is normal.

36. *AN/TPS-3 System Sensitivity*	[80%]	( ) %	72%	80%

Log Entry.

The system sensitivity is the most valuable means of checking the overall operation of the unit and is therefore the most important entry in the log. It should be made with great care in order to provide this information. In order to make this measurement, it is necessary that a reference target (usually a permanent echo) be checked at regular intervals to measure the system efficiency. Choose such an echo and use it for all tuning before the set is in tactical operation. When the unit is tuned to maximum, the height of the response should be noted. Make sure that the response is not saturated. Once this has been done, it is only necessary to check the response at two hour intervals using the same gain settings and reading the height of the response. A reduction in the height of the response to the extent of 20% can be tolerated, but any greater change should be investigated and corrected as soon as possible. It is important that the gain setting be the same for each reading.

37. *AN/TPS-3 Signal-to-Noise Ratio*	[75%]	(*Ratio*)	59%	75%

Log Entry.

Using a reference echo that is not saturated, determine the relative height of the signal referred to the height of the noise or grass, assuming that the noise is unity. For example, if a given reference response is five times higher than the grass, the signal-to-noise ratio should be recorded as 5/1. The ratio should always be taken using the same reference response. In some instances, there will be no change in system sensitivity, but there will be a reduction in the signal-to-noise ratio, meaning that the noise has increased in amplitude with no change in signal height. A reading of this sort will indicate that the receiver is functioning normally, and the noise is from some other source. In cases where the system sensitivity has decreased, the signal-to-noise ratio will normally be less, and the trouble may well be found in the receiver system. A reduction of 25% may be tolerated in this entry. For example, a reduction from 4/1 to 3/1 is tolerated but a greater reduction should be investigated.

38. Az and Max. Range AN/TPS-3	[ ] ( )	(°/miles)	100/100	350/90

Log Entry.

This entry is made in a split box. The entry above the line should record the azimuth in degrees, and the entry below the line should record the range in miles of the farthest target for the two-hour period. This can be determined from the Operations Log.

39. Az and Max. Range of IFF	[ ] ( )	(°/miles)	400/70	260/85

Log Entry.

This entry is made in a split box. The entry above the line should record the azimuth in degrees, and the entry below the line should record the range in miles of the farthest IFF target for the two-hour period. This can be determined from the Operations Log.

40. Type of IFF Target IN or OUT	[ ] ( )	(type/I-O)	/	/

Log Entry.

This entry is made in a split box. The entry above the line should record the type of aircraft when possible. This information may be obtained from the Radar Filter Officer, the ground observer, or perhaps from another set over which the plane may have passed. Below the line, the recorder should note whether the plane was approaching or leaving his set. This can be obtained from the Operations Log. It is important that this entry be made when the tactical situation permits as it provides an excellent check on the performance and installation of air-borne equipment.

41. Log Finishing Time	[ ] ( )	(Hrs.-Min.)	2315	1825

Log Entry.

Using the 24-hour time system enter the time that each set of log entries is finished, including the twice-daily items when they are made.

51. SECTION C, ITEMS 42-54. These items are filled in twice daily.

42. Log Time (Twice-daily items)	(Hrs.-Min.)	0100	1300

Log Entry.

Enter in the log the time at which the twice-daily items (42-54) are started. The first set of entries in the twice-daily section is to be made immediately following entries made in the two-hourly section. Twelve hours later, make the second set of twice-daily entries.

43. Spare Power Unit Ser. No.	(OK-N*)	OK	N*

Log Entry.

Record the serial number of the spare power unit to the right of the title in the space provided on the log. If the general conditions of the spare power unit are normal, enter OK in the log space; if not, enter N*.

How to Obtain Information.

Inspect the gas engine thoroughly. See TM 11-933 for details.

Corrective Measures.

Make notes in the Work-To-Be-Done Book for all work to be done during the regular maintenance period. See TM 11-1440.

44. Modulator	(Gen. Cond.)	(OK-N*)	OK	N*

Log Entry.

Enter OK if the general condition is normal; otherwise enter N*, and explain under NOTES in Section D.

Normal Condition.

The general condition of the Modulator Box (fig. 22) is normal if:

a. The box is clean, not overheating or leaking oil.

b. No signs of irregular operation are observed.

c. All cable connections are tight.

DANGER: Before working on the modulator, short the cable going to the spark gap to discharge the high-voltage capacitors.

Corrective Measures.

a. When necessary, clean the outside.

b. If there are signs of overheating or leaking of oil notify the person-in-charge.

c. If signs of irregular operation are observed, notify the person-in-charge.

d. When necessary, tighten all cable connections.

45. Console	(Gen. Cond.)	(OK-N*)	OK	N*

Log Entry.

Enter OK if the general condition of the console case and components is normal; otherwise, enter N* and explain under NOTES in Section D in the back of the log sheet.

Normal Conditions.

The condition of the console, including the components is normal if:

a. The outside is clean, all meter cover glasses are clean and not cracked, the pilot light shield is in place and not broken, the dial lights all operate properly, all control knobs and switch buttons are neither broken nor missing, none of the fuse holders on the indicator and receiving panels are cracked, and the bakelite screw-plugs are tight.

b. All pilot lights are glowing; the PPI dial glows when the DIAL LIGHT ON button is pushed.

c. All connections holding the different sections of the transmission line together are tight, the lines are not damaged, and the brackets that support the line are in place.

Corrective Measures.

a. When necessary, clean the outside of the unit and make temporary repairs on meter-cover glasses, pilot light shields, fuse caps, knobs, etc. Keep notes in the Work-To-Be-Done Book for all corrections to be made during the shutdown period. Notify the person-in-charge of any abnormality that may cause an interruption of operations.

b. If any connectors are loose or out of place, adjust and tighten them.

c. If the brackets are loose or out of place, adjust them.

46. Console Air Filter	(Gen. Cond.)	(OK-N*)	OK	N*

Log Entry.

Enter OK if the general condition of the console Air Filter (fig. 38) is normal; if not, enter N* and explain under NOTES in Section D of the log sheet.

Normal Condition.

a. The filter is free from excessive amounts of dirt. This filter may easily be removed for inspection.

b. The flow of air may be felt at the exhaust opening. See Item 18 Ventilating Systems.

Corrective Measures.

a. If the filter seems unusually dirty, it should be cleaned at the next shutdown period. Procedures for cleaning are given in TM 11-1440. The filter will be cleaned regularly as part of routine preventive maintenance, and will ordinarily be found in satisfactory condition. However, certain conditions such as heavy dust storms may cause excessive amounts of dirt to accumulate.

b. If the flow of air cannot be felt at the exhaust opening, check Item 18, Ventilating Systems, and immediately notify the Person-in-charge.

47. Antenna System	(Gen. Cond.)	(OK-N*)	OK	N*

Log Entry.

Enter OK if the general condition of the antenna system is normal; if not, enter N*.

Normal Condition.

The Antenna System (fig. 1), is normal if:

a. The guys have proper tension and security. The wind-balance should be examined for proper mounting and rigidity.

b. The dipole heads are not damaged.

c. The antenna is vertical and mounted securely.

d. The transmission lines and fittings are not damaged.

Corrective Measures.

Make notes in the Work-To-Be-Done Book for all corrections to be made during the shutdown period. Notify the person-in-charge of any abnormality that may cause an interruption of operations.

48. Guys, Stakes, Deadmen	(Gen. Cond.)	(OK-N*)	OK	N*

Log Entry.

If the general condition of the guys, stakes, and deadmen (fig. 1), is normal, enter OK in the log; if not, enter N*.

Normal Condition.

The guys, stakes, and deadmen are normal if:

a. The guys have the proper tension and security. Wind-balance should be examined for proper mounting and rigidity.

b. The stakes are secure and the soil around them is not too dry.

c. The deadmen should be as long as possible, since if they are stretched out to full length, maximum support for the set is obtained. They must always be 120° apart and be properly buried. Make sure that all nuts are tight, and the antenna mast is perpendicular to the ground.

Corrective Measures.

If the stakes are not firm, they should be made firm by pounding them deeper into the ground or by moving them to a better spot.

49. Transit Cases	(Gen. Cond.)	(OK-N*)	OK	N*

Log Entry.

If the general condition of the transit cases is normal, enter OK in the log; if not, enter N*.

Normal Condition.

The general condition of the transit cases is normal if:

a. The exterior is painted and the hardware is not rusty.

b. The wood is not warped, cracked, or broken.

c. The hinges are in working order and lubricated.

How to Obtain Information.

Inspect the case thoroughly.

Corrective Measures.

Make entries in the Work-To-Be-Done Book for all corrections to be made during the maintenance period. See TM 11-1440.

50. Tools	(Gen. Cond.)	(OK-N*)	OK	N*

Log Entry.

If the general condition of the tools is normal, enter OK in the log; if not, enter N*.

Normal Condition.

The general condition of the tools is normal if:

a. The tools operate properly when used during the day.

b. No tools are missing.

c. The tools are in their proper places.

Corrective Measures.

Make entries in the Work-To-Be-Done Book for all corrections to be made during the maintenance period. See TM 11-1440.

51. Test Equipment	(Gen. Cond.)	(OK-N*)	OK	N*

Log Entry.

This entry should record the condition of:

a. The frequency meter (vibrating reed). If the meter (fig. 29) is operative on the two-hour frequency checks, an OK entry may be made.

b. The frequency meter (r-f). If the meter (fig. 29) is operative on the two-hour frequency checks an OK entry is made.

c. The volt-ohmmeter (fig. 29). If it is operating normally on the two-hour current checks, an OK entry may be made.

d. Test leads and extensions. If they (fig. 29) are operating normally when used with the test instruments during the two-hour check period, and their insulation, clips, pins, or plugs are in good condition, enter OK in the log space.

e. If any one of the above checks is found abnormal, enter an N* and explain under NOTES in section D on the back of the log sheet.

Corrective Measures.

See TM 11-1440 for measures to be taken during the shutdown period. Make entries in the Work-To-Be-Done Book for all corrections to be made during the shutdown period. Report to the person-in-charge any abnormality that may cause an interruption in operations.

52. Cable Condition	(OK-N*)	OK	N*

Log Entry.

Twice a day, enter OK if the general condition is normal; otherwise enter N* and explain under NOTES in Section D of the log sheet.

Normal Condition.

Conditions are normal if on the Radio Set AN/TPS-3 and the IFF:

a. All connections are tight.

b. The cables (fig. 3) are free from oil and grease, are protected from sharp edges and points, sharp bends, undue play, and motion.

c. The insulation is not broken or cracked.

d. The cables are properly buried.

Corrective Measures.

a. Tighten any loose connections.

b. Remove all oil and grease from the cables; relocate them (without removing them from their plugs) if necessary, so that they do not touch sharp edges or points. If a sharp bend is found, carefully straighten the cable out and support properly.

c. If the insulation is cracked or broken, notify the person-in-charge.

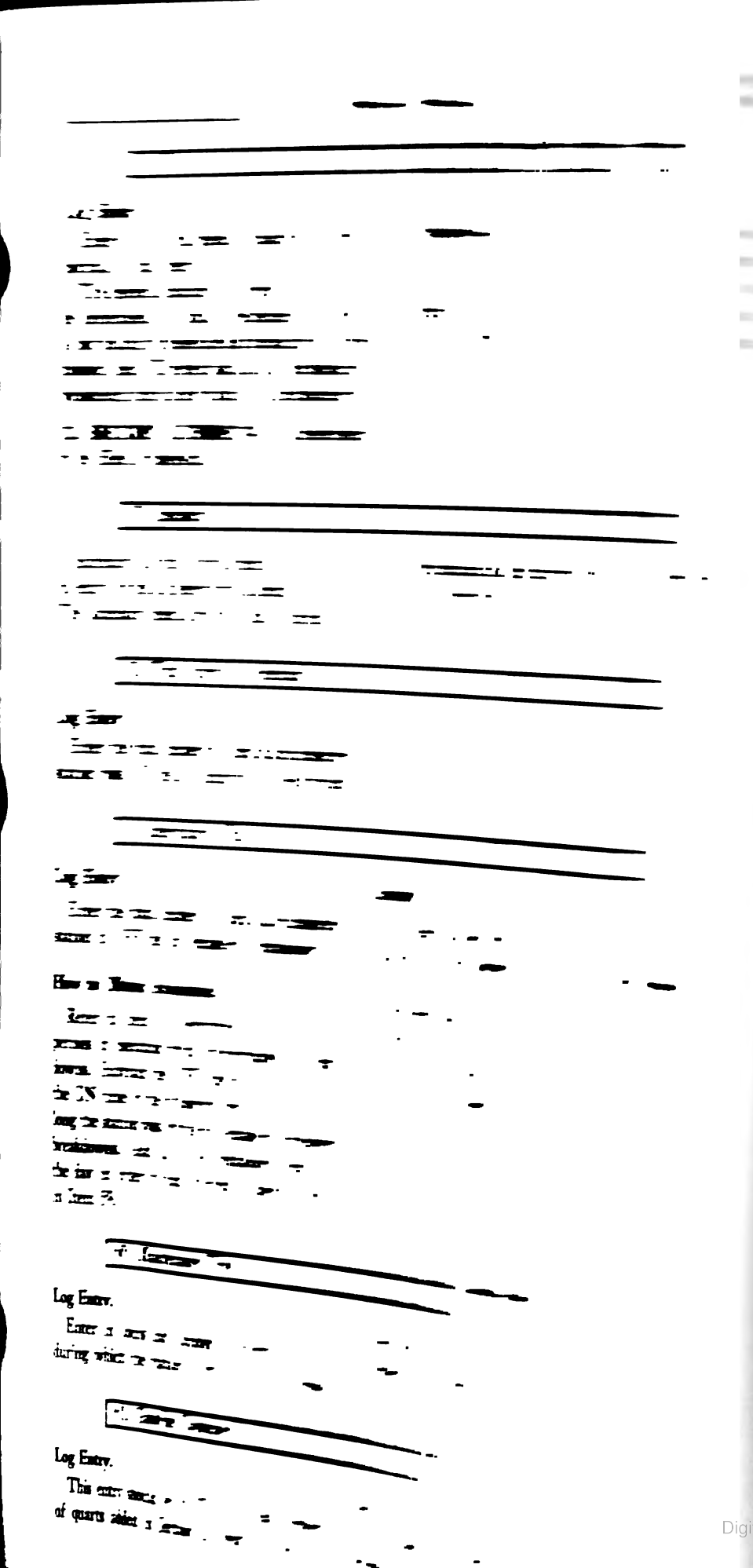
d. Bury the cables between modulator, generator, and console as required.

53. Leveling	[ ]	( )	(OK-N*)	OK	N*

Log Entry.

The antenna mast should be observed from two positions ninety degrees apart around the unit to determine whether or not the unit is vertical (fig. 8).

Any variation from the vertical should be corrected, as excessive strain caused by this condition may result in the failure of one of the deadmen supports.



50. Tools	(Gen. Cond.)	(OK-N*)	OK	N*

Log Entry.

If the general condition of the tools is normal, enter OK in the log; if not, enter N*.

Normal Condition.

The general condition of the tools is normal if:

a. The tools operate properly when used during the day.

b. No tools are missing.

c. The tools are in their proper places.

Corrective Measures.

Make entries in the Work-To-Be-Done Book for all corrections to be made during the maintenance period. See TM 11-1440.

51. Test Equipment	(Gen. Cond.)	(OK-N*)	OK	N*

Log Entry.

This entry should record the condition of:

a. The frequency meter (vibrating reed). If the meter (fig. 29) is operative on the two-hour frequency checks, an OK entry may be made.

b. The frequency meter (r-f). If the meter (fig. 29) is operative on the two-hour frequency checks an OK entry is made.

c. The volt-ohmmeter (fig. 29). If it is operating normally on the two-hour current checks, an OK entry may be made.

d. Test leads and extensions. If they (fig. 29) are operating normally when used with the test instruments during the two-hour check period, and their insulation, clips, pins, or plugs are in good condition, enter OK in the log space.

e. If any one of the above checks is found abnormal, enter an N* and explain under NOTES in section D on the back of the log sheet.

Corrective Measures.

See TM 11-1440 for measures to be taken during the shutdown period. Make entries in the Work-To-Be-Done Book for all corrections to be made during the shutdown period. Report to the person-in-charge any abnormality that may cause an interruption in operations.

52. Cable Condition	(OK-N*)	OK	N*

Log Entry.

Twice a day, enter OK if the general condition is normal; otherwise enter N* and explain under NOTES in Section D of the log sheet.

Normal Condition.

Conditions are normal if on the Radio Set AN/TPS-3 and the IFF:

a. All connections are tight.

b. The cables (fig. 3) are free from oil and grease, are protected from sharp edges and points, sharp bends, undue play, and motion.

c. The insulation is not broken or cracked.

d. The cables are properly buried.

Corrective Measures.

a. Tighten any loose connections.

b. Remove all oil and grease from the cables; relocate them (without removing them from their plugs) if necessary, so that they do not touch sharp edges or points. If a sharp bend is found, carefully straighten the cable out and support properly.

c. If the insulation is cracked or broken, notify the person-in-charge.

d. Bury the cables between modulator, generator, and console as required.

53. Leveling	[ ] ( )	(OK-N*)	OK	N*

Log Entry.

The antenna mast should be observed from two positions ninety degrees apart around the unit to determine whether or not the unit is vertical (fig. 8).

Any variation from the vertical should be corrected, as excessive strain caused by this condition may result in the failure of one of the deadmen supports.

54. Tent	[Gen. Cond.]	( )	(OK-N*)	OK	N*

Log Entry.

Enter OK if the general condition of the tent is normal, if not, enter N*.

The general condition of the tent (fig. 1) should be determined. It should be examined to be sure it is not pulling to one side and straining the r-f transmission line. The tent should also be examined for weakening fabric due to strain. The clearance of the transmission line support stub inside the tent should be checked as the stub will rapidly cause destruction of the tent if it is rubbing. The tent should also be examined to be sure that it is properly staked and that it is providing a light-tight seal with the ground.

52. **SECTION C, ITEMS 57-64.** These items are to be filled in once-daily.

57. Summary	Total

Summary is a title for the Items 57 to 64. Make no entry on the log sheet for this heading (Item 57). The summary items are to be filled in once a day. The technician-in-charge during the last watch of the 24-hour period fills in Items 58 to 64.

58. Total Hours of Operations	(Hr.-Min.)	22:45

Log Entry.

Enter the total number of hours and minutes the station was ON the air during the 24-hour period. Find this total by adding the entries in item 65. OPERATING ANALYSIS.

59. Interruption Time	(Hr.-Min.)	01:42

Log Entry.

Enter the total number of hours and minutes the station is OFF the air because of breakdowns.

How to Obtain Information.

Refer to Item 69, Description. Note all of the periods of operation which are terminated by breakdowns. Subtract the OFF time for that row from the ON time of the following row, to find out how long the station was off the air because of equipment breakdowns. Add all of the breakdown periods of the day in order to find the total. Enter this total in Item 59.

Example.

If the station went off the air at 1415 because of trouble in the transmitter and did not resume operation (go back on the air) until 1445, the interruption time was 1445 — 1415 = 0030. If the station broke down again at 1600 and went back on the air at 1712, the interruption time was 0112. The sum of the two breakdown periods is 0030 plus 0112, which equals 0142. In this case, 0142 will be the Item 59 entry.

60. Maintenance Time	(Hr.-Min.)	0130

Log Entry.

Enter in hours and minutes, the period of time during which the station is off the air for *routine* maintenance (Item 65). Note any period or periods designated *Maintenance.* In such instance, count only the time actually spent in maintenance.

61. Gasoline Consumed	(gals.)	16

Log Entry.

This entry should be 16/17 of the total number of quarts added in Section C, Item 8. The fuel added in Item 8 is a mixture of one-half pint of oil to one gallon of gasoline, therefore 1/16 of this mixture is oil, and 16/17 gasoline.

62. Oil Consumed .	(qts.)	4

Log Entry.

This entry is 1/17 of the total number of quarts added in Section C, Item 8.

63. Number of Targets Recorded	(number)	30

Log Entry.

Enter the total number of targets recorded during 24-hour period from midnight to midnight. Obtain this information from the tactical operations log.

64. Number of IFF Targets Recorded	(number)	10

Log Entry.

Enter the total number of IFF targets recorded during 24-hour period from midnight to midnight. Obtain this information from the tactical operations log.

53. **SECTION C, ITEMS 65-69.** These items are for operating analysis.

65. Operating Analysis

This is a heading for items 66 through 69 explaining the ON and OFF periods during the 24 hour interval.

66. ON

Enter in this column the time (24 hour time system) the set goes on the air after every shut down.

67. OFF

Enter in this column the time (24 hour time system) the set is shut down. The time of every shut down, whatever the cause, is to be recorded.

68. TOTAL

Enter in this column the total operating time between each ON and OFF. To get this figure, subtract the entry under ON from the entry under OFF in the same line of entries.

Example.

	Hr.	Min.
Entry under OFF in Item 78.....	18	00
Entry under ON in Item 77.....	10	00
Total time of operation between ON and OFF	8	00

65. OPERATING ANALYSIS			
66 ON	67 OFF	68 TOTAL	69 DESCRIPTION
00 00	09 00	09 00	Regular
		1 00	Maintenance
10 00	18 00	08 00	Regular
		30	Modulator
18 30	24 00	5 30	Regular

69. Description

Enter the reason for the shut-down in this column as outlined below:

a. Regular (no failure, regular operation).

b. Personnel (shut-down through error of operator).

c. Maintenance (shut-down for regular maintenance period).

d. Tactical (shut-down by special order).

e. Test (on the air for testing purposes).

f. Component breakdown. Enter the name of the component in which the breakdown occurred, such as the rectifier, transmitter, antenna, etc.

g. Special reasons, such as weather, fire, flood, combat damage, lightning, etc.

54. SECTION C, ITEMS 70-75. These items record signature, time data, and sheet numbers.

70. Signature of Person Keeping Log

This is a heading for items 71-75.

71. Signature

Enter the signature of the technician keeping the log. Signature to be entered when he reports for duty.

72. Rank

Enter the rank of the technician keeping the log.

73. ON

Enter the time (24 hour time system) the technician comes on duty.

74. OFF

Enter the time (24 hour time system) the technician goes off duty.

75. Sheet Number

55. HOW TO FILL IN THE BACK OF THE LOG.

a. Heading I-VI. Fill in the heading at the start of each new log sheet. (For details on how to fill in the heading, see figures 34 and 35.)

b. Section D NOTES. When an asterisk is used on the front of the log sheet to indicate an abnormal entry, give the following information under NOTES in Section D:

(1) The Item number.

(2) The time the abnormal condition was found.

(3) A description of the condition together with the cause.

(4) What was done about it.

(5) Your initials.

c. Section E COMPONENT RECORD.

(1) GENERAL. Fill in Section E whenever you remove a component and whenever you install a component. No entries need be made 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 example of components are: the Transmitter, Control Panel, Power Unit, Oscilloscope, etc.

(2) COLUMNS 1 TO 4. Record the name, type, serial, and order number of each component—the component "taken out" and the component "put in." You will find the name, type, serial, and order number on the name plate of the component.

(3) COLUMN 5. SERVICE DATE "In."—In column 5 enter the date that the component "taken out" was originally installed. You can find the date of the original installation in your station records. In the case of a component "put in," simply enter the date on which the installation is made.

(4) COLUMN 6. SERVICE DATE "Out." In this space record the date that the component is taken out.

(5) COLUMN 7. HOUR METER READING "In." In this space enter the hour meter reading at the time the component taken out was originally placed in service. You can get the information from your station records. In the case of a component being put in, simply write down the hour meter reading at the time you make the installation.

(6) COLUMN 8. HOUR METER READING "Out." In column 8 enter the 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 READING "Total." In column 9 you are to record 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. Write down the difference in column 9.

(8) COLUMN 10. REASON FOR REMOVING COMPONENT. In this space, you are to explain briefly why the component was removed. For example, it may have failed or it may have been running below optimum performance—or you may have been ordered to remove it for inspection or servicing purposes.

(9) COLUMN 11. DISPOSITION OF REMOVED COMPONENT. In this space you are to explain exactly what was done with the component after you removed it.

(10) COLUMN 12. WORK DONE BY. This space is provided for the signature of the technician who removed or installed the component.

d. Section F PART RECORD.

(1) GENERAL. Fill in Section F whenever you remove or install a part or tube. In addition enter all repairs made on spare equipment. No entries need be made 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) COLUMN 1 TO 4. Record the name, 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. You will find this information on the name plate of the component or in the Unit Component Record Book.

(3) COLUMN 5. SCHEMATIC PART NUMBER. In column 5 write down the schematic part number of the part or tube put in or taken out. You can find this number in the schematic drawing of the component concerned in the Service Manual TM 11-1540.

(4) COLUMN 6. NAME OF PART. In this space record the name of the part put in or taken out. You can find the name of the part on the schematic of the component concerned in the Service Manual TM 11-1540 or on the part itself.

(5) COLUMN 7. DESCRIPTION OF PART. In this space give a brief descrip-

tion of the part put in or taken out. Some of this information may be obtained from the parts list included in the Service Manual TM 11-1540. Additional information can be found on the part itself. In this description of the part it is important that you include the name of the manufacturer, the manufacturer's type and catalogue number, the electrical rating of the part, its size, etc. In order that the part may be positively identified, it is necessary that the part description be given as completely as possible.

(6) COLUMN 8. FUNCTION OF PART AND ITS LOCATION (from schematic). In this column you are to tell briefly what the part put in or taken out does and where it is located. In other words, give the function of the part or tube and its location in the schematic. 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 1st R.F., etc. You can get this information by consulting the Service Manual TM 11-1540.

(7) COLUMN 9. NEW, USED, OR REBUILT. Tell whether the part or tube which has been put in is a new, used, or rebuilt part or tube.

(8) COLUMN 10. DISPOSITION OF PART TAKEN OUT. Tell exactly what you did with the part or tube after you removed it. 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 installed. You can find the date of the original installation in your station records. In the case of a part or tube being put in, simply enter the date on which you make the installation.

(10) COLUMN 12. SERVICE DATE "OUT." In this space you are to record the date on which the part or tube is taken out.

(11) COLUMN 13. HOUR METER READING "IN." In this space enter the hour meter reading at the time the part or tube taken out was originally placed in service. You can find this reading in your station records. In the case of a part or tube being put in, simply record the hour meter reading at the time you make the installation.

(12) COLUMN 14. HOUR METER READING "OUT." In column 14 you are to write down the hour meter reading at the time the part or tube is taken out.

(13) COLUMN 15. HOUR METER READING "TOTAL." Under Total in column 15 you are to record the total time the part or tube taken out has been in use. To get this figure, subtract the time recorded in column 13 from the time recorded in column 14. Write the difference between these readings 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 you have 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 Lexington 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 indications which you had 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 oder of burning insulation, smoke, hissing noise of an arc, the heat of an overloaded part, etc.

(17) COLUMN 19. FAULT. In this space you are to describe exactly what happened to the part or tube that you removed. Merely describe in your own language what the trouble was. 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 breakdown, insulation breakdown,

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 in your own language what caused the fault to occur, using additional space in Section D if necessary. Describe any external condition which may have contributed to the fault. Indicate the first or primary cause insofar as you know it. Some examples of causes of faults are: Wear and tear in operation, shelf wear, excessive heat, excessive current (overload) due to resistor failure, high humidity, careless handling, lack of lubrication, improper operation, corrosion, excessive strain, improper adjustment, defective material, accidental damage, error in wiring, lack of proper ventilation, failure of some other part, loose connections, etc.

(19) COLUMN 21. ACTION TAKEN AND RESULTS. In this column briefly describe what you did about the fault. In addition, explain what results were obtained.

(20) COLUMN 22. WORK DONE BY. The name of the technician who performed the repair or replacement is to appear in this column. If you made the installation of the new part or tube, or if you took out the defective part or tube, sign your name in this column.

(21) SHEET NUMBERS. Enter the Sheet Numbers at the bottom right-hand corner. This number must be the same as the number on the front of the log.

e. Section G. IDEAS, SUGGESTIONS, RECOMMENDATIONS, REMARKS. Space is provided in Section G for suggestion and recommendations from men in the field relative to improvements in equipment, or more efficient technical operating procedures. These suggestions and recommendations are valuable and will be given careful consideration by proper authorities.

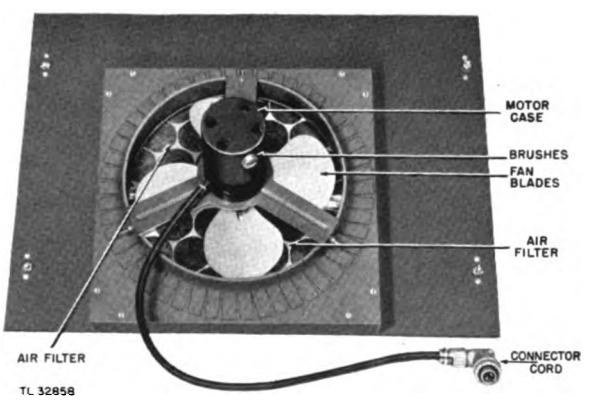


Figure 38. Console air filter.

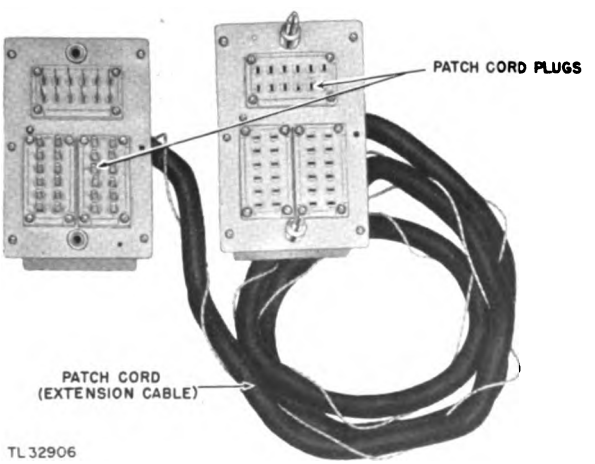


Figure 39. Extension cables.

CHAPTER 5

CHECKS MADE DURING STARTING

56. INTRODUCTION.

a. The starting procedure below repeats in detail the step by step procedure required to place Radio Set AN/TPS-3 in operation. Each step in the procedure requires the completion of a specific action or series of related actions. If the equipment is normal, each of the actions indicated in the step-by-step procedure should produce certain definite results. Most of these results can either be seen on scope screens or on meters, or heard as the procedure is followed step by step.

b. If the expected result of any given step is not obtained, it is evident that a defect exists. In each step of the procedure, the particular component or parts which may be the cause of this abnormality, is listed. By following this system throughout the start procedure, defects are readily located and simple faults may be remedied. Detailed information on how to perform some of the adjustments will be found in Complete Tuning Procedure in chapter 3, paragraph 32. If the fault cannot be eliminated by the procedures listed below, TM 11-1540 should be consulted.

57. STARTING STEPS.

a. STEP NO. 1.

(1) With the power unit in operation, check to make sure that the modulator switch (MODULATOR SWITCH ON POWER UNIT PU/TPS-1) is in the ON position.

(2) *If the overload relay falls out, shut off the power unit and short the high-voltage cable between the power unit and modulator, and check:*

(*a*) Power plug, connecting power unit to modulator, for shorts.

(*b*) Inside the accessible section of modulator at the power terminals for shorts.

(*c*) Power unit for shorts in wiring between plug outlet and overload relay. Refer to TM 11-933 for trouble shooting in the power unit.

b. STEP NO. 2.

(1) Check the tent fan, console ventilating fan, and transmitter blower for proper operation.

(2) *If fans are not operating, check:*

(*a*) For 24 volts d-c at plug board on lower left side of console. Use volt-ohmmeter to check this voltage, by simply plugging the test prods into the 24-volt outlets.

(*b*) *If the 24 volts d-c is not present, check:*

1. D-C overload relay in the power unit.
2. Power cables between the power unit and console and their corresponding plugs, for broken leads.

STEP NO. 3.

(1) Turn ANT. SPEED control half way up. Throw TRACK-PPI switch to the TRACK position and push TRACK LEFT-RIGHT switch first to the right and then to the left. Antenna should rotate clockwise and counterclockwise, respectively.

(2) *If antenna does not rotate, check:*

(*a*) Indicator unit. See that it is properly engaged with the plugboard at the rear of the console. It must be pushed all the way into the console.

(*b*) The drive-chain tension on the drive sprocket, with the receiver removed from the console. Also check for torque, or if there seems to be any slack in rotating the antenna from left to right.

(*c*) Continuity of motor field and armature windings.

(*d*) Wiring connecting the drive motor to its current source in the console.

NOTE: When the load on the motor is excessive, a loud clicking noise is heard. This is the ratchet clutch slipping. Look for something obstructing or arresting the rotation of the antenna.

d. STEP NO. 4.

(1) Check the antenna to see that it is not obstructed. *If antenna is obstructed by tent ridge-pole:*

(*a*) Raise the console by using leveling screws.

(*b*) And if ground is soft, additional support under leveling platform may be needed.

(*c*) Tent poles may be sunk deeper into the ground.

(*d*) Check leveling of console with carpenter's level.

e. STEP NO. 5.

(1) Set meter switch to the TOTAL B+ position. Throw MAIN POWER SUPPLY switch to the ON position and check to see that meter reads between 0.5 and 0.7 ma.

(2) If meter reads more than 0.7 ma, throw the main power supply switch to OFF position IMMEDIATELY.

(*a*) Excessive current drain may result from many sources in the receiver or indicator units. Refer to detailed trouble shooting procedure in TM 11-1540.

(*b*) If meter reads less than 0.5 ma, also refer to TM 11-1540.

f. STEP NO. 6.

(1) With MAIN POWER SUPPLY switch in the ON position, check the jewel pilot light on the indicator panel to see that it lights up.

(2) *If pilot light does not light up, check:*

(*a*) Control knob lights under hinge panel of indicator unit. *If these lights operate, check condition of pilot light bulb.*

(*b*) Overload relay in power unit if no lights are operating.

(*c*) That receiver and indicator are firmly seated in console.

(*d*) Condition of fuse on receiver panel.

(*e*) Presence of 115-volt a-c at plug board on left lower side of console by inserting trouble light, with extension, into a-c outlet. *If voltage is not present, check* plugs and cables between unit and console. *If a-c reaches console plug board, check* indicator and receiver power wiring, and wiring from plug board at lower left side of console to the console units.

g. STEP NO. 7.

(1) Remove the 4-inch cover plate from the front of the transmitter box at bottom of console and inspect the filaments visually to see that they are lit.

(2) *If they do not light, throw MAIN POWER SUPPLY switch to OFF position, and check:*

(*a*) Fuses, located at front of console terminal board (lower left side of console in a small, black shield box).

(*b*) *If fuses are OK,* refer to detailed trouble shooting procedure in section IV.

h. STEP NO. 8.

(1) Set meter switch (on receiver panel) to the R-F AMPL No. 1 position. Meter should read from 0.5 to 0.6 ma. If reading is off, adjust the BIAS No. 1 control until meter reads proper amount.

(2) *If reading cannot be changed by this adjustment, check:* BIAS No. 1 control for poor connections inside receiver or defective tube. Refer to TM 11-1540 for detailed trouble shooting procedure.

(3) Set the meter switch to the R-F AMPL No. 2 position. Meter should read from 0.5 to 0.6 ma. as in the case of R-F AMPL No. 1. If reading is off, adjust BIAS No. 2 control until the reading is the proper value.

(4) If reading cannot be changed by this adjustment, check the BIAS No. 2 control for poor connections.

(5) Set the meter switch to the X-TAL position. Meter should read from 0.4 to 0.9 ma.

(6) If meter reading is off adjust R-F PLATE No. 2 control (on front of receiver panel) until current rises to a peak. This is about the proper operating point and should be between 0.4 and 0.9 ma. If this adjustment has no effect on reading, trouble is indicated in the receiver and most likely in the r-f stages. Refer to detailed trouble shooting procedure in TM 11-1540.

i. STEP NO. 9.

(1) After a delay of not less than one minute after turning on MAIN POWER SUPPLY switch, throw the TRANSMITTER switch to the ON position. The screens of the "A" and PPI scopes should light up showing the two sweep lines.

(2) *If these sweep lines are not visible,* increase the "A" INT. control and the PPI INT. control, located under the hinge panel on the indicator unit. If adjustment of these controls does not light up the screens, refer to the detailed trouble shooting procedure in TM 11-1540.

j. STEP NO. 10.

(1) Check the sweep lines on the two scopes for erratic sweeps.

(2) *If no sweep lines appear on the scopes, or if the sweep is very erartic, the modulator and/or indicator may not be functioning properly. Check* the spark gap on the power unit through the circular peep-hole if sparking is normal.

(*a*) TURN OFF ALL POWER, including the power unit.

(*b*) Check the large high-voltage cable connecting the modulator to the console and the large (short) cable connecting the power unit to the modulator for proper connections.

(*c*) Remove lower panel on front of console and check wiring at terminals of pulse transformer. If wiring and cables are OK, refer to TM 11-1540 for corrective measures for transmitter, modulator, and the sweep circuits of the indicator unit.

k. STEP NO. 11.

(1) Check to see that horizonal sweep line on the "A"-scope is centered properly on the screen and that the line is nearly as long as the face of the scope.

(2) *If the sweep line is not centered:*

(*a*) Adjust the "A" POS. control under the hinge panel on the front of the indicator unit.

(*b*) *If this has no effect:*

Look for trouble in the "A" scope (sweep amplifier section) of the indicator unit. Poor connections at the control are a likely defect. Refer to detailed trouble shooting in TM 11-1540.

(3) *If the sweep is not focused to a sharp, narrow line:*

(*a*) Adjust the "A" FOCUS control hinge panel on indicator unit.

(*b*) *If this has no effect,* look for trouble in "A" scope section of the indicator unit.

Refer to detailed instructions in trouble shooting section VI TM11-1540.

(4) *If sweep line is not of proper length on any one range (determined by moving the A RANGE switch through the three positions):*

(*a*) Adjust the 20, 60 and 120 sweep length controls, located just below the "A"-scope on the indicator panel, on the corresponding ranges of the range switch.

(*b*) *If any one of these controls has no effect on the length of the sweep line,* refer to the detailed trouble shooting in TM 11-1540, as there is trouble in the "A" scope sweep circuits of the indicator unit.

l. STEP NO. 12.

(1) Check to see that the sweep line on the PPI scope is centered properly. See that it starts from the center of the face of the scope, and extends to the outer edge on each of the ranges. Check all three ranges by setting the PPI RANGE switch on the lower left of the indicator panel to the 20, 60 and 120 positions, respectively.

(2) *If on any one or all of these range settings, the sweep is not of proper length,* adjust the 20, 60, and 120 controls (screwdriver adjustments) just below the PPI scope, until the sweep length is correct. If these adjustments have no effect on the length of the sweep, refer to the detailed trouble shooting in TM 11-1540 for corrective measures. The trouble is probably in the PPI sweep circuits.

(3) *If the sweep is not centered properly:*

(*a*) Remove the indicator unit rrom the console (do not support weight of indicator by handles on panel) and connect the extension cable between the unit and the console plug board at upper rear of console, to supply the indicator unit with power.

(*b*) Center the sweep by means of the PPI CENTERING controls located on the sub-chassis at the rear of the indicator unit.

(*c*) *If these controls have no effect or insufficient effect on the centering of the sweep,* refer to the detailed trouble shooting procedure in TM 11-1540. After repair has been made, return the indicator unit to the console. Be sure that it is all the way in and properly engaging the plug board in the rear of the console.

(4) If the PPI sweep is not focused to a sharp, narrow line, adjust the PPI FOCUS CONTROL under the hinge panel on the indicator unit. If this has no effect on the focus of the sweep, there is trouble in the PPI focus coil or power supply circuits of the indicator unit. Refer to the detailed trouble shooting procedure Section TM 11-1540.

m. STEP NO. 13.

(1) With the sweeps visible, properly focused and centered on the scope screens, and the A RANGE and PPI RANGE switches in the 120 positions, 12 marker pips (the 5th and 10th of which are about twice as long as the others) should be seen along the horizontal sweep line on the "A"-scope. The twelve pips should point downward.

(2) On the PPI scope, these markers are represented as small brilliant dots along the sweep line. Two of these dots are heavier than the others (the 5th and 10th, counting from the center of the scope to the outer edge).

(3) *If these markers do not appear:*

(*a*) Adjust MARKER GAIN control on the front of the Indicator panel.

(*b*) Increase 10 MI SIZE and 50 MI SIZE controls.

(4) If markers do appear but the 50 and 100 mile markers do not occur as the 5th and 10th markers, adjust the 50 MI SYNC control until they do.

(5) *If no markers occur with any of these adjustments,* refer to TM 11-1540 for trouble shooting details on the marker pulse multivibrator section of the indicator unit.

n. STEP NO. 14.

(1) Rotate the antenna by throwing the TRACK LEFT-RIGHT switch on the indicator panel to either the right or left, making sure that the TRACK-PPI switch is in the TRACK position. As the antenna is rotating, view the PPI scope to see that the concentric circles, produced by the markers (dots) along the sweep line, are symmetrical.

(2) *If the pattern produced is not quite circular:*

(*a*) Shut off the TRANSMITTER switch and then the MAIN POWER SUPPLY switch.

(*b*) Remove the indicator from the console and attach the extension cable (patch cord) between it and the plug board at the upper rear of the console. This will supply the indicator unit with power.

(*c*) Turn on the MAIN POWER SUPPLY switch and allow one minute for the tube filaments to warm up, then throw the TRANSMITTER switch to the ON position.

(*d*) Start the antenna in rotation again and adjust the CIRCULARITY control, located on the elevated chassis at the rear of the indicator unit, until the marker circles become exactly symmetrical.

(3) *If adjustment of this control does not affect the shape of the marker circles, the trouble is apparently in the indicator unit.* Refer to the detailed trouble shooting procedure on the sweep amplifier section of the indicator unit in TM 11-1540. After repair of trouble, shut off the power, replace indicator unit in console, and turn on the power again.

o. STEP NO. 15.

(1) Increase the RECEIVER GAIN control until receiver noise (grass) is seen along the horizontal sweep of the "A"-scope. Also, be sure that the PPI GAIN control on the indicator panel is turned up to a point where noise just appears on the PPI scope. As the antenna is rotated, echoes (pips extending upward from the horizontal sweep line on the "A"-scope) should be seen. These echoes appear as arcs on the PPI screen.

(2) *If these indications do not occur,* check OUTPUT UNITS meter on the receiver panel to see that the transmitter is delivering power to the antenna.

CAUTION: Be careful of this meter and do not jar it against anything as it is very delicate. Never make a continuity check on it as the meter winding will burn out!

(3) *If OUTPUT UNITS meter reads zero and the transmitter is noisy* (hissing sound), remove the panel from the lower front of the console and adjust the capacity stub tuners on the floor of the console. Tune for maximum indication on the OUTPUT UNITS meter and/or minimum noise from the transmitter.

(4) If OUTPUT UNITS meter still reads zero, shut off *ALL* power and refer to the detailed trouble shooting procedure in TM 11-1540, under transmitter. It is possible that the high-voltage pulse from the modulator is not getting to the transmitter tube. Trouble may also be in the OUTPUT UNITS meter (on receiver panel) or its associated circuit.

(5) If OUTPUT UNITS meter is OK (about half scale) and no echoes can be seen, retune the receiver as described in paragraph 32.

(6) If no echoes are obtained while the antenna is rotated after retuning the receiver.

(*a*) Turn off all power at the console and remove the receiver from the console and attach extension cable.

(*b*) Refer to detailed trouble shooting procedure in TM 11-1540.

(7) After receiver trouble has been located and repaired, remove the extension cable and return receiver to console, making sure that the receiver securely engages the plug board at the rear of the console and is seated firmly.

p. STEP NO. 16.

(1) Check echoes on indicator screen.

(2) *If echoes appear on the screen but seem to be small compared to the grass along the sweep line on the "A"-scope:*

(*a*) Retune the receiver as described in paragraph 32, going over the controls several times to peak the echoes on the "A"-scope.

(*b*) If this does not improve echoes and/or any of the tuning controls on the receiver cause no effect on the size of the echo, see detailed trouble shooting in TM 11-1540, section V.

q. STEP NO. 17.

(1) Check the grass along the sweep on the "A"-scope.

(2) *If echoes can be seen on the scopes but the grass along the sweeps on the "A"-scope varies in height along the length of the sweep line, the anti T-R spark gap is not firing. To remedy this effect:*

(*a*) Shut off the TRANSMITTER switch and remove the lower panel from the console.

(*b*) Toward the back of the console, the anti T-R stub is pointing toward the operator. It is the lower of the two stubs mounted there. On the front of the anti T-R stub is a knurled screw adjustment.

(*c*) Turn this screw all the way clockwise until the contacts are touching.

(*d*) Back off the screw ¼ of a turn in a counter-clockwise direction. This gives a gap clearance of 0.10 inch and should remedy the variation of the grass on the "A"-scope. If this gap is shorted, the size of even a strong echo will be reduced considerably.

(*e*) Retune the T-R box (directly above the anti T-R stub) for maximum size of signal on the "A"-scope by moving the slider (along the top of the cylinder) in its slot.

(*f*) Replace lower front panel on the console.

APPENDIX I
FIRST-AID TREATMENT FOR ELECTRIC SHOCK

FIRST-AID TREATMENT FOR ELECTRIC SHOCK

Electric shock is caused by the passage of electric current through the body. If current of sufficient magnitude passes through the breathing center at the base of the brain, breathing stops and the victim loses consciousness. The pulse becomes very weak or ceases entirely and the body turns blue or very white. Occasionally the body becomes stiff. This condition is caused by the electricity and is not an indication of death.

In most cases of electric shock, the victim's life may be saved by the prompt and continued application of artificial respiration. By this means air is supplied to the body until the breathing center resumes its normal function. Resuscitation may take a long time; cases are recorded in which recovery occurred after eight hours of artificial respiration.

RESCUE

To rescue a person from a live source of electric current, first shut off the current if a switch can be reached without loss of time. If shutting off the current will cause delay, use a dry non-conductor, such as a rope, a board, or rubber gloves, to prevent contact, and free the victim or remove the live conductor. Do not use metal or any moist material. Should it be necessary to cut a live wire, use an axe or a hatchet with a dry wooden handle and turn away to avoid the resulting flash.

Never allow any part of your body to come into contact with the victim's body or the live conductor. Do not attempt a rescue at the hazard of your own life.

RESUSCITATION

Begin artificial respiration at once, as near the scene of the accident as possible. Every minute counts. Do not wait to loosen the patient's clothing, but do remove false teeth, chewing gum, or tobacco from his mouth, as any such obstruction interferes with the passage of air. Wrap the patient in a blanket, coat, or anything available, since warmth is very important. While one person starts artificial respiration, another should go at once for the nearest physician.

The procedure for artificial respiration follows:

1. Lay the patient face downward, with one arm bent at the elbow and placed so that the patient's cheek rests on the hand or forearm. The face is turned outward to leave the nose and mouth free for breathing. The other arm is extended overhead (fig. A).

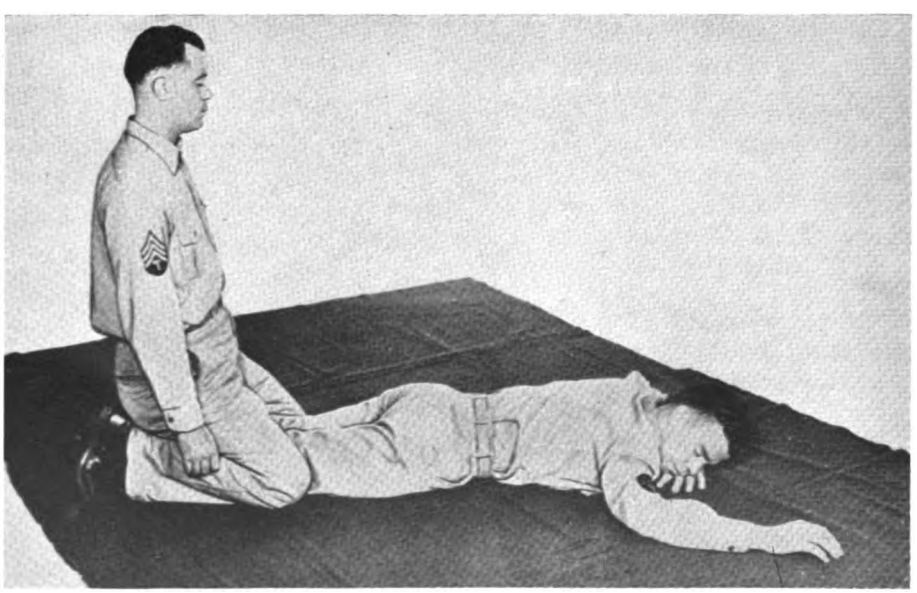


Figure A. Proper position.
TL-30041.

2. Kneel straddling the patient's thighs, with your knees placed far enough from the hip bones to allow you to assume the position shown in figure B. If the patient is a large, heavy person, it may be more convenient to straddle only one leg. Place the palms of your hands on the small of the patient's back, with the little fingers just touching the lowest ribs. The thumbs and fingers should be in a natural position as shown in figure B.

3. With arms held straight, swing forward slowly, so that a gradual pressure is brought to bear upon the patient. At the end of the forward swing, your shoulders should be directly over the heels of your hands (fig. C). Do not bend your elbows. The forward swing should take about two seconds.

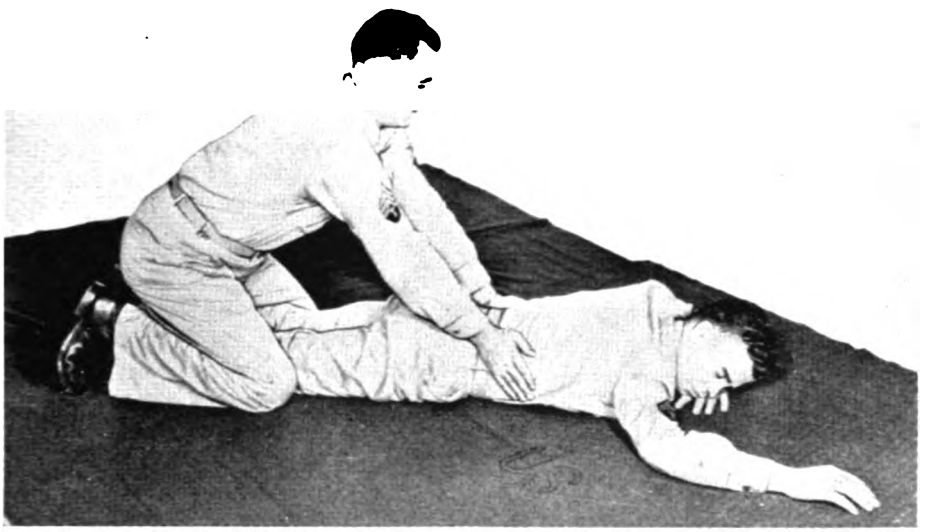


Figure B. Read to apply pressure.
TL-30042.

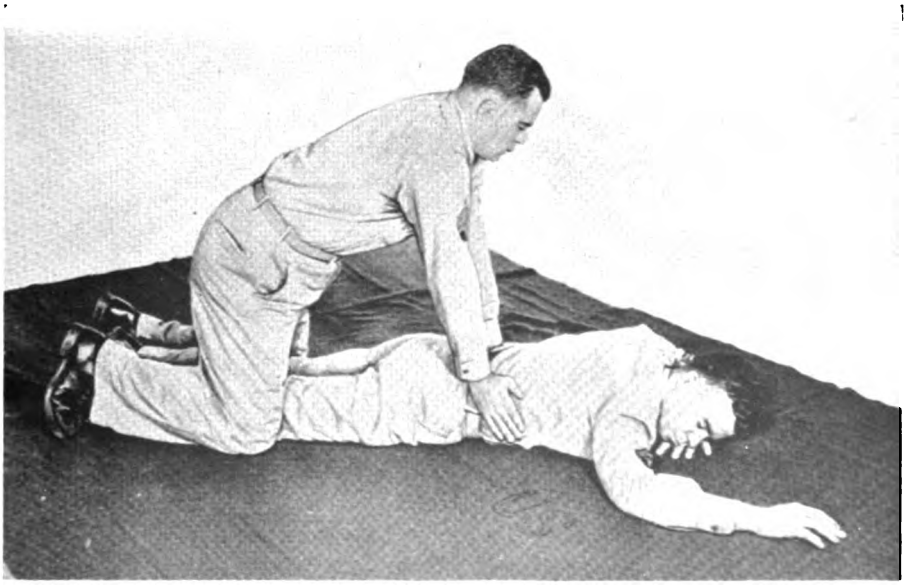


Figure C. Pressure applied.
TL-30043.

4. Immediately on completing the forward swing, release the pressure and swing backward to the position shown in figure D. Wait two seconds; then swing forward as before.

Repeat this cycle of pressure and release, which creates a complete respiration, 12 to 15 times a minute. Continue without interruption until natural breathing is restored or until a physician declares the patient dead. If no physician can be reached, continue until you are sure there is no chance of recovery. Remember that artificial respiration often has to be kept up for hours.

While artificial respiration is being given, some one other than the operator should loosen the clothing about the patient's neck, chest, and waist. Keep the patient warmly wrapped. Apply hot-water bottles, hot bricks or stones, if possible. Do not give the patient liquids until he is fully conscious.

The first attempt to breathe may be a gasp, a faint sigh, or a catch of the breath. Artificial respiration should be withheld when the first breathing begins. Be very careful not to exert pressure as the first spontaneous breath occurs. Continue to watch the patient carefully, as he may stop breathing again after a temporary recovery. In that case, artificial respiration must be resumed at once.

When the patient revives, he must be kept warm and quiet. Do not allow him to sit or stand. If no physician has arrived, give the patient a teaspoonful of aromatic spirits of ammonia in a small glass of water, or a drink of hot coffee or tea, as a stimulant.

If possible, avoid moving the patient until he is breathing normally. Even then, he should be moved only in a lying position. If extreme weather conditions or other hazards make it necessary to move a patient before normal breathing has been restored, continue artificial respiration while he is being moved.

It may be necessary to change operators while administering artificial respiration. The change must be made without interrupting the rhythm of respiration. The relief operator should kneel beside the person giving the artificial respiration. As the pressure is released, the operator falls aside, the relief operator takes his place, and the cycle of pressure and release continues without interruption.

—Adapted from The American Red Cross First-Aid Textbook.

RESUSCITATION DRILLS SHOULD BE HELD REGULARLY BY ALL OPERATING PERSONNEL.

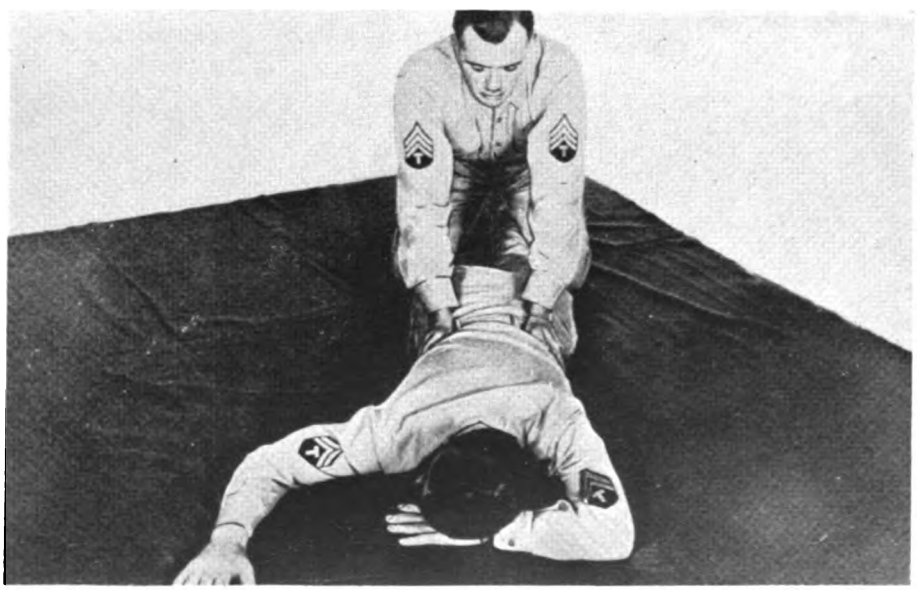


Figure D. Pressure released.
TL-30044.

8090 Copies, 23 August, 1944.