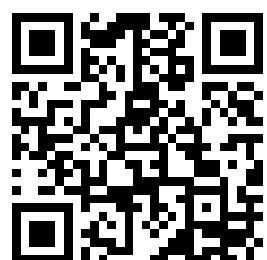

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D101-W111-1440



TM 11-1440

WAR DEPARTMENT TECHNICAL MANUAL

PREVENTIVE MAINTENANCE

RADIO SET
AN/TPS-3

NOTE. This is a reprint of TM11-1440, Radio Set AN/TPS-3, Preventive Maintenance, 1 March 1944. No distribution will be made to personnel possessing the original publication.

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No person is entitled solely by virtue of his grade or position to knowledge or possession of classified matter. Such matter is entrusted only to those individuals whose official duties require such knowledge or possession. (See also paragraph 23b, AR 380-5, 15 March 1944.)

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*United States Government Printing Office**Washington: 1945*

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

TM 11-1440, War Department Technical Manual, Radio Set AN/TPS-3 Preventive Maintenance, 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. ULIQ
Major General,
The Adjutant General.

DISTRIBUTION:

As prescribed in paragraph 9a, FM 21-6:

Armies (Sig) (5); Corps (Sig) (5); Def C (2); Depts (5); Sv C (Sig) (5); IBn 11 (4); IC 11 (4); Arm & Sv Boards (2); Sig C Rep Sh (2); ASF Dep (Sig Sec) (2); Sig Dep (Oversea) (10); Gen'l Dep (Sig Sec) (10); PE (2); Air Force Deps (Sig Sec) (5); Sig Corps Inspec Zones (2); Sig Corps Proc Dists (2).

IBn 11: T/O & E 11-400, (A) Sig AW Orgn Bn Hq.

IC 11: T/O 11-107; 11-237; 11-592; 11-587; 11-597; 11-617; 11-400, Sig AW Orgn Radar Rep Plat (U); 11-287; 11-500, Sig Sv Radar Maint Team (EC).

For explanation of symbols, see FM21-6.

**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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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**—Transmitter tube. Smash receiver and indicator units (units are readily removable from the 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, coaxial cable, and dipole.

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

4. **Bend**—Antenna shaft and transmission lines.

5. **Burn or scatter**—Scatter transmitter tube after smashing. Bury and scatter remains that do 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.

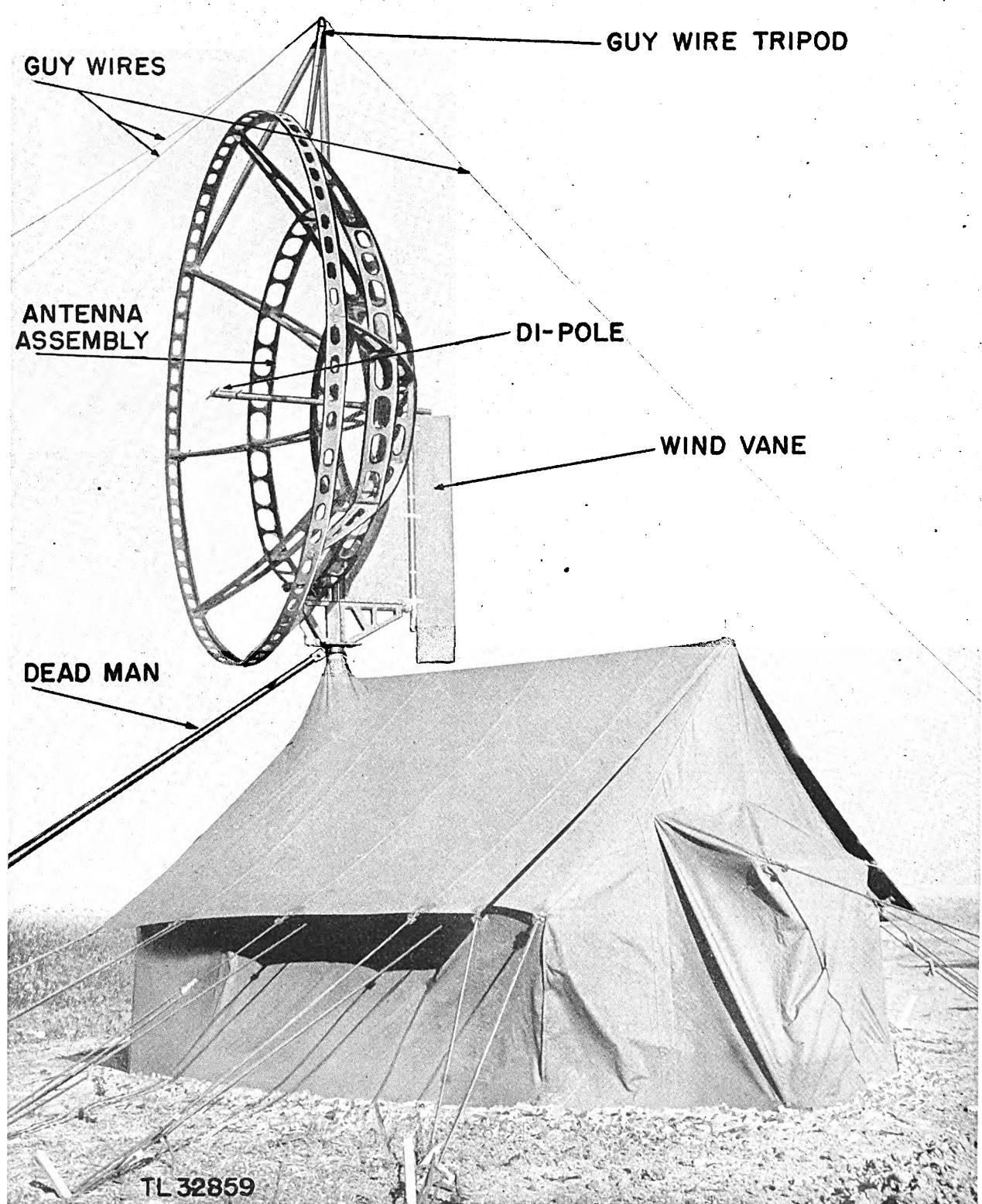


Figure 1. Radio Set AN/TPS-3.

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CHAPTER 1

GENERAL PREVENTIVE MAINTENANCE

TM 11-1440

Pars. 1-6

1. PURPOSE. This manual, TM 11-1440, describes the preventive maintenance procedures that are to be applied to Radio Set AN/TPS-3. It covers the maintenance of all electrical equipment comprising the radio set.

2. SCOPE. The manual is divided into four chapters, as follows:

- a. *General Preventive Maintenance.* (1) An explanation of the meaning and purpose of general preventive maintenance.
(2) A discussion of the precautions to be taken during the application of preventive maintenance procedures. These safety measures are designed to protect the personnel as well as the equipment.
(3) A description of the six basic maintenance operations: Feel, Inspect, Tighten, Clean, Adjust, and Lubricate.

b. *Handling of Service Tools Supplied with Radio Set AN/TPS-3.* (1) Identification of all tools supplied with Radio Set AN/TPS-3.

- (2) Care and handling of tools.

c. *Description of Maintenance Techniques.* (1) Detailed instructions on how to perform maintenance work on the major components and parts of the electrical and mechanical equipment.
(2) Information on the disassembly and reassembly of various units, on the adjustment and handling of special parts, and on procedures which have general applicability.

d. *Maintenance Items.* (1) The use of the Maintenance Schedule.
(2) Specific instructions, subdivided into sections and items.

3. PURPOSES OF PREVENTIVE MAINTENANCE. Preventive maintenance procedures are designed to:

- a. Combat the effect of weather on the equipment.
- b. Counteract the detrimental effects of dirt, dust, and water on the operation of the equipment.
- c. Keep the radio equipment in such condition as to insure uninterrupted operation.
- d. Maintain the equipment so that it always operates at maximum efficiency.
- e. Prolong the useful life of the equipment.

4. MEANING OF PREVENTIVE MAINTENANCE. To appreciate the meaning of the term preventive maintenance, it is necessary to distinguish between preventive maintenance on the one hand and trouble shooting and repair on the other. The primary function of preventive maintenance is to prevent breakdown and to avoid the necessity of repair. In sharp contrast, the primary function of trouble shooting and repair is to locate and correct existing defects. Trouble shooting and repair procedures are discussed in TM 11-1540. This manual, TM 11-1440, is limited to preventive maintenance techniques. It tells how to keep from having trouble. To summarize, preventive maintenance may be defined as a systematic series of operations performed periodically on the equipment and designed to maintain top efficiency in performance, to minimize unwanted interruptions in service, and to eliminate major breakdowns.

5. PROCEDURE DESCRIPTION. Preventive maintenance procedures consist of two general classes of items, as follows:

a. *Maintenance Items Performed While the Station Is on the Air.* A full discussion of the many checks that are made systematically while the equipment is operating is included in TM 11-1340, The Technical Operations Manual. Also included in that manual is a summary of the corrective measures that are to be taken to keep the equipment operating within tolerances. Checks and adjustments of this type are genuinely preventive in character.

b. *Maintenance Items Performed During Normal Shut-Down Periods.* The bulk of the work of maintaining the radio set and keeping it in the best possible condition must be done during regular shutdown periods. The numerous adjustments and minor repairs that can be made while the set is off the air all contribute toward preventing faults or toward eliminating them when they first appear.

6. SIGNIFICANCE OF PREVENTIVE MAINTENANCE.

a. Preventive maintenance acquires its proper significance when it is examined from the point of view of equipment utility. The equipment must be kept running, and running efficiently, if it is to serve its purpose. Nothing can obscure the basic fact that

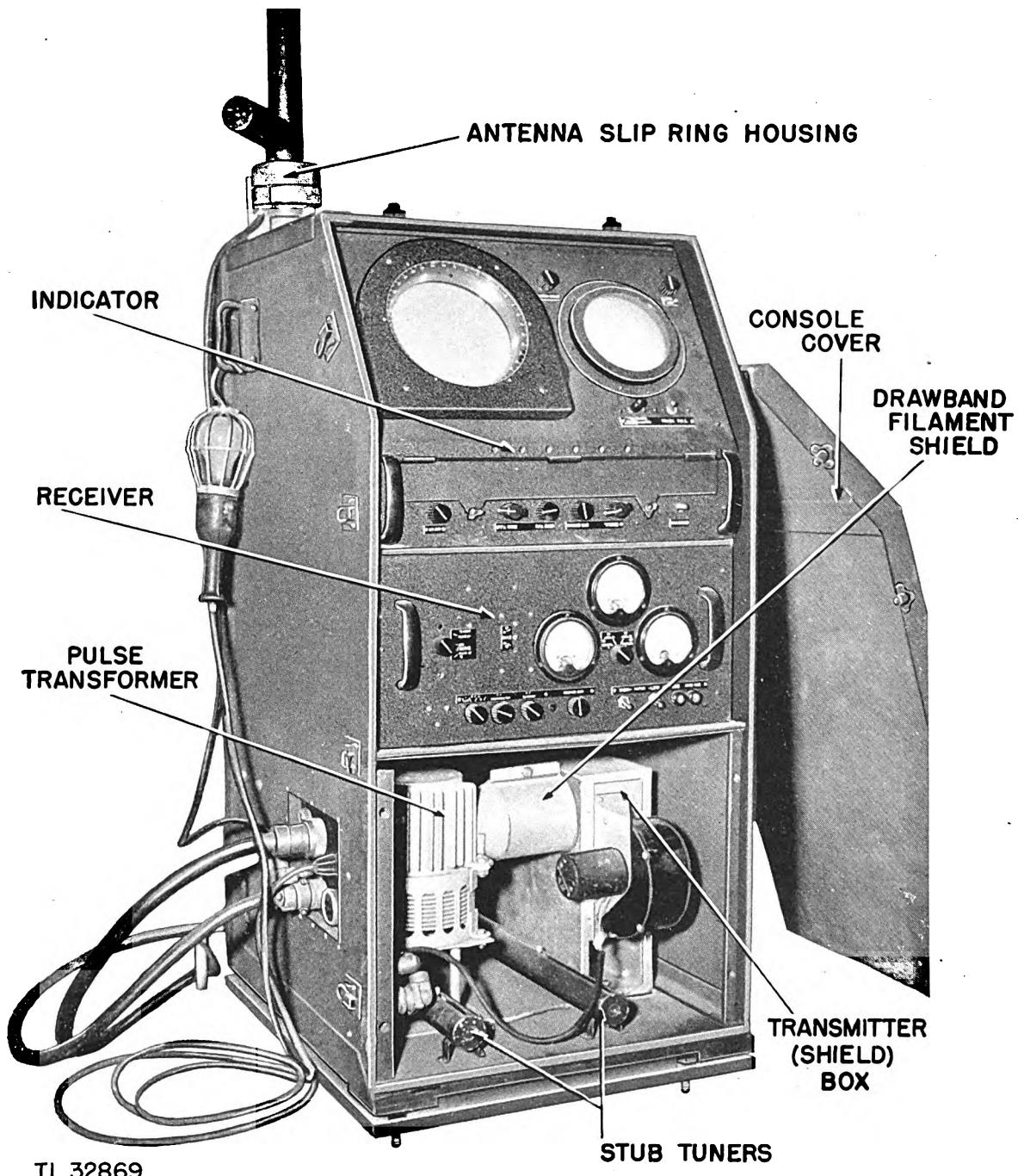


Figure 2. Console with lower panel removed.

equipment will rapidly become useless if it is not maintained.

b. The application of preventive maintenance to Radio Set AN/TPS-3 does more than prolong the useful life of the equipment; it contributes to the success of the entire aircraft warning service. In line with these thoughts, it must be recognized that the full benefits of preventive measures cannot be obtained merely by following the general directive ". . . shall be done." The personnel assigned to do the work must be imbued with the spirit and desire to perform their assignments well. They should have a keen appreciation of why the work is required. They should never think of their routine tasks as necessary evils.

c. Every soldier performs preventive maintenance on his pistol, rifle, or carbine, whichever he uses, and has a clear understanding of the part the work plays in his existence as a soldier. He knows that the periodic disassembly, cleaning, and reassembly are done for a definite reason—to keep the piece in working order—to minimize the chances of its jamming when the consequences are great. The weapon may mean the difference between life and death!

d. The same reasoning applies to the maintenance of Radio Set AN/TPS-3. The association between danger to personnel and failure of the apparatus may not be as clearly defined as in the case of the soldier and his gun, but the same implications are there. The enemy does not state his objective. It may be the immobilization of the station, bombardment of the area covered by the station, or the destruction of an important installation far behind the lines. No matter what the enemy's objective is, the efficient functioning of the radio set is paramount to the job of preventing the successful completion of his air-bound missions. Inoperative equipment endangers personnel, supplies, and the defense of vital zones. The radio set can serve its purpose only if it is ready at all times to provide continuous and accurate information on the location of enemy planes.

7. PREVENTIVE MAINTENANCE PROGRAM.

The program of preventive maintenance as applied to Radio Set AN/TPS-3 has the following basic features:

- a.* The complete equipment is divided into groups of components and miscellaneous accessories.
- b.* Each group of components and accessories is subdivided into a number of items. Each item consists of specific tasks to be performed.
- c.* The individual items are listed in the Maintenance Schedule. The scheduling is on a daily, weekly,

monthly, and quarterly basis. Groups of items are assigned to particular days of the week.

d. The schedule consists of seven sheets covering one year of operation. It is described fully in chapter 4, section I. The schedule tells what is to be done, and when. Instructions on *how* each item is performed are described in chapter 4, sections II-VIII.

8. PRECAUTIONS DURING MAINTENANCE.

Special safety precautions must be observed before and during the application of preventive maintenance procedures. These are discussed under two major headings:

- a.* Safety of personnel.
- b.* Damage to equipment.

9. SAFETY OF PERSONNEL.

a. General. Every effort must be made to avoid injury during maintenance work. Carelessness results in accidents for which there is no excuse. Aside from possible injury to personnel, damage to equipment may result. It is necessary to *pay strict attention to every safety measure.*

b. High Voltages—Danger. Numerous voltages used in the operation of Radio Set AN/TPS-3 are high and dangerous. DEATH by electrocution is an almost certain penalty for the operator or repairman who takes a chance with high-voltage circuits. The careful operator or repairman makes certain that every precaution is taken. He never trusts others to obey rules for him.

c. Safety Precautions. (1) Read the safety precautions given in the Preparatory Steps Item for each unit before performing any maintenance on the unit.

(2) The Preparatory Step Item is the first item for each component.

10. DAMAGE TO EQUIPMENT.

a. Numerous parts, such as tube envelopes and resistor bodies, particularly when they are located in the high-power components, remain very hot for several minutes after the power supply switches have been turned off. In fact, some units have a temperature so high that very painful burns will result if the bare skin touches them. A burn is bad enough; but it may lead to other serious consequences. Involuntary movements of an arm or the body, following a burn, may damage the equipment, especially the tubes. If work is started immediately after the power switches have been turned off, extreme care must be exercised.

b. The careful handling of equipment should become a regular habit. Space for working on units partially covered by other units should not be made by pushing and tugging and moving parts out of the way. Avoid causing unnecessary strain on wires, cables, connections, and couplings.

c. Tools that are used inside the components must be firmly grasped. Special care must be taken to prevent the dropping of pliers, screwdrivers, and similar repair tools on breakable parts. A heavy tool, if dropped, may readily fall on a tube and break the glass envelope or shift the position of the internal elements.

11. BASIC PREVENTIVE MAINTENANCE OPERATIONS.

The actual work of preventive maintenance consists of six basic operations. They are:

- a. Feel.
- b. Inspect.
- c. Tighten.
- d. Clean.
- e. Adjust.
- f. Lubricate.

12. NECESSITY FOR BASIC OPERATIONS.

a. The first two operations, "feel" and "inspect," serve to establish the need for applying the other four. The selection of particular operations is based on a general knowledge of field requirements. For example, the dust encountered on dirt roads during cross-country travel filters into the equipment, no matter how much care is taken to prevent it. Changes in climatic conditions such as heavy rains followed by blistering heat, excessive dampness, snow, ice, etc., all tend to cause deterioration of exposed surfaces and parts. Unless continuous inspection is the rule, and the necessary work of tightening, adjusting, cleaning, and lubricating is done, the equipment will soon become erratic in performance, undependable, and subject to breakdown when it is most needed.

b. Each of the basic operations listed in paragraph 11 will be described in two ways. The description given in this chapter states the general nature of the operation and the manner in which it is generally undertaken. The second description, given in chapter 3, states specifically how the operation is used in relation to particular parts and components.

13. MEANING OF FEEL OPERATION. The "feel" operation is used most often to check rotating machinery, such as blower motors, drive motors, or generators, and to detect overheated connections, resistors, bushings, etc. The aim is to evaluate the

temperature of the bearings, housings, connections, etc., and in this way to discover the existence of some defect which requires correction. Normal operating temperature of motors is described as that temperature which permits the hand to be held in contact with the motor or bearing case for a period of 5 seconds without discomfort. Many parts other than motors and generators may be felt for signs of overheating. Detailed instructions on these will be found in chapter 3 and in chapter 4 under the individual items.

14. MEANING OF INSPECT OPERATION.

a. Inspection is probably the most important operation in the preventive maintenance program. Careful observation is required. A careless observer overlooks the obscure evidences of defects and abnormalities. Many slight abnormalities may exist without interfering with equipment performance. These are the deviations from normal that should be discovered early. Valuable time and effort can be saved if defects are corrected before they lead to a major breakdown. The operating personnel must make every effort to become thoroughly familiar with the signs of normal functioning. In this way, they will be able to recognize the signs of malfunctioning.

b. Inspection consists of carefully surveying all parts of the equipment, observing color, placement, state of cleanliness, etc., and watching for the earmarks of possible trouble. Overheating is an undesirable condition that can often be detected; its signs are discoloration, blistering or bulging of the part or container, leakage of insulating compounds, and oxidation of contact surfaces. Dirt, corrosion, rust, mildew, fungus growth—all are sources of possible trouble, and all may be detected by diligent inspection. Careful search should be made for loose mounting bolts and screws, loose clamping rings, and loose connections. If a connection is believed to be loose, a test can be made by giving the wire a light pull or by feeling the lug or terminal screw, or by determining whether the connection can be tightened further by testing for tightness with a screwdriver or wrench. During inspection, wires and cables should be left in their original position. At least, they should be moved only slightly.

15. MEANING OF TIGHTEN OPERATION.

a. All mobile units while in transit are subject to vibration. As a result, loose connections, mounting strips, cables, tubes, etc., may be encountered. Every loose connection is a probable source of trouble and is apt to impair the operation of the set. All loose

parts, especially if they are large, are definite hazards to associated equipment. If they shift or fall out of place, nearby parts may be crushed.

b. Although the importance of firm mountings and connections cannot be over-emphasized, screws, bolts, and nuts *should not be tightened indiscriminately*. They should be tightened only when they are definitely known to be loose. If fittings are tightened beyond the pressure for which they were designed, they will be damaged or broken. Excessive force applied to a wrench or screwdriver will often snap off the head of a bolt or a screw. Tools of proper size must be used. Otherwise, fittings become damaged, and further adjustments will not be possible until replacement has been made.

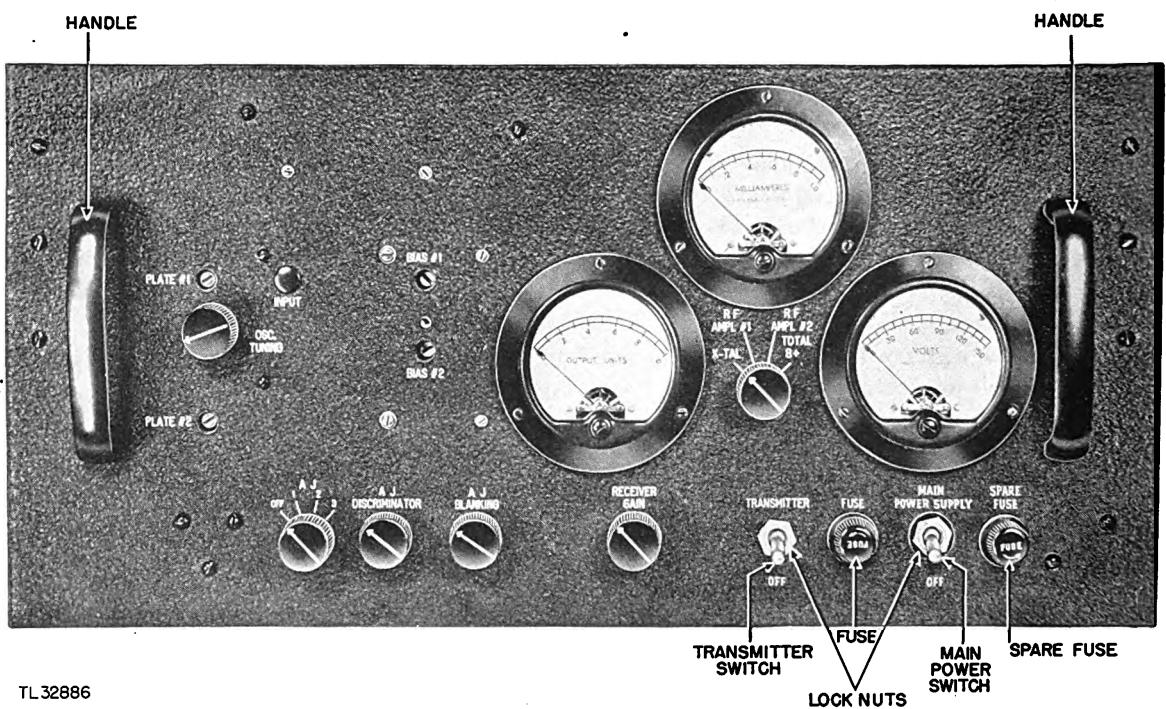
16. MEANING OF ADJUST OPERATION.

When the maintenance schedule says to "adjust" this part or that part, the instruction does not mean that adjustment must be made regardless of need. The correct interpretation is that an adjustment is made *only* when inspection indicates that it is required in order to maintain normal operating conditions. The required adjustments vary so greatly that complete instructions must be given in chapter 4, as a part of the discussion of specific items of maintenance.

17. MEANING OF CLEAN OPERATION. The maintenance schedule often calls for cleaning. The impression may be gained that a part or component must be cleaned each time it is inspected. The correct interpretation of the instruction "clean" is that the equipment is cleaned when it *needs* cleaning. However, this much must be said. As a result of normal usage over specified periods, sufficient dirt, dust, or other undesirable substances accumulate and necessitate regular cleaning. Naturally, such periodic cleanings are more frequent on exposed parts than on those contained within cabinets. Inspection may indicate the need for cleaning more frequently than is required by the schedule. If so, the work must be done in accordance with the specified cleaning instructions given in chapter 3 as a part of the discussion on the various parts and components.

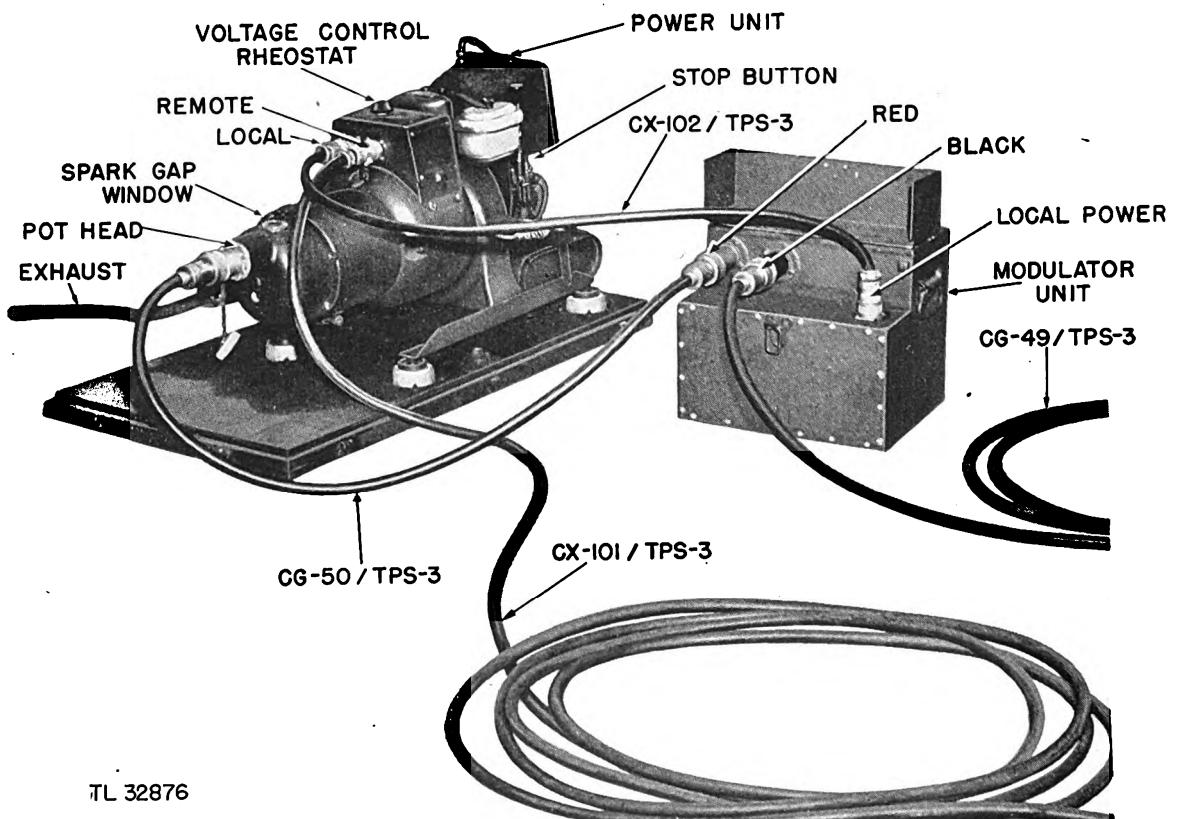
18. MEANING OF LUBRICATE OPERATION.

The word "lubricate," as used in the manual, refers to the application of grease to the bearings of motors and the bearings of the antenna system, as well as to the application of petroleum jelly to the hinges of the moveable panel on the indicator chassis. The small motors of this set are pre-lubricated at the factory and require no further lubrication.



TL 32886

Figure 3. Front panel of receiver.



TL 32876

Figure 4. Power unit and modulator.

CHAPTER 2

HANDLING OF SERVICE TOOLS SUPPLIED WITH RADIO SET AN/TPS-3

TM 11-1440
Pars. 19-20

19. TOOL LIST. The following list contains the tools which accompany Radio Set AN/TPS-3 and Power Unit PU-6/TPS-1:

Quantity	Description
1	Brush, wire.
1	Baffle reamer.
1	Carpenter's level.
1	Carbon scraper.
1	Cold chisel, $\frac{5}{8}$ " x $6\frac{1}{2}$ ".
1	Cutters.
1	Extension cable, indicator.
1	Extension cable, receiver.
1	File, triangular (and handle), 6".
1	File, half round (and handle), 10".
1	Funnel.
1	Gage, 0.020" thickness.
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 feet.
1	Lamp.
1	Lampcord and socket.
1	Mattock, trench.
1	Measure, quart.
1	Pliers, long nose.
1	Pliers, gas, 6".
1	Pliers, gas, 10".
1	Point dressing tool.
1	Rope, sisal, 15 ft.
4 sheets	Sandpaper, abrasive.
1	Screwdriver, small.
1	Screwdriver, large.
1	Screwdriver, $\frac{1}{8}$ " x 3".
1	Screwdriver, bakelite handle.
6	Screwdriver, $\frac{5}{16}$ " x 6".
1	Screwdriver, $\frac{1}{8}$ " x 10".
1	Screwdriver, $\frac{3}{16}$ " x 4".
1	Shovel.
1	Shorting wire clip lead for modulator.
1 lb	Solder, rosin-core.
1	Soldering-iron, 60 watt.
1	Tester, spark gap.
$\frac{1}{2}$ lb	Tape, friction.
1 roll	Tape, cellulose acetate.
1	Wrench, Allen head, $\frac{1}{8}$ ".

Quantity	Description
1	Wrench, box and open end, $\frac{7}{16}$ ".
1	Wrench, Bristol.
1	Wrench, combination.
1	Wrench, open end, $\frac{3}{8}$ " x $\frac{1}{2}$ ".
1	Wrench, open end, $\frac{9}{16}$ " x $1\frac{1}{16}$ ".
1	Wrench, open end, $\frac{3}{4}$ " x 1".
1	Wrench, open, $\frac{5}{8}$ " x $\frac{7}{8}$ ".
1	Wrench, Socket, $\frac{7}{8}$ " x $7\frac{1}{32}$ ".

20. PURPOSE, HANDLING, AND PACKING OF TOOLS. The importance of a well-kept tool kit cannot be over emphasized. Since the preventive maintenance program is a part of the daily schedule of operations, the required tools must not only be available, but should always be in proper working condition. Many of the tools provided with Radio Set AN/TPS-3 are of such a special type that numerous repairs cannot be accomplished without them. It is because of this that too much stress cannot be placed upon handling and storing of these maintenance devices. Missing or broken tools cause delays. The use of a substitute tool, not exactly suitable for the work to be done, but used nevertheless in place of a broken or lost tool, may cause unnecessary damage. Proper care of tools is just as much a responsibility as the proper care of the radio equipment. The following information on the use and care of tools is furnished for guidance.

a. Friction Tape. The friction tape is cloth, coated with an adhesive compound. It is used on joints and wires which require protection from contact with bare surfaces. It is also used as a cover on rubber tape wrappings since it has a more durable surface than rubber tape. When covering small joints or wrappings of rubber tape, it is advisable to split the tape down the center to form two $\frac{3}{8}$ -inch strips. Do not use friction tape alone on wires carrying high voltage. Always wrap the wire with rubber tape first. Do not expect friction tape to protect a joint from water. Wrap the joint with rubber tape first and then cover it with friction tape.

b. Pliers. (1) Several types of pliers are included in the tool kit and although they have different shapes and uses, all must be cared for in the same way. Pliers should be kept clean. They should be oiled occasionally to keep the joints free. Excess oil

should be removed with a cloth and the pliers properly stored in the tool box.

(2) Side cutters or lineman's pliers are used to cut all wires up to No. 6, to twist wire when making a connection, and for general use where heavy pliers are needed. The gas pliers are used to hold round tubing, round studs, any round metal object which does not have a screwdriver slot or flat sides for wrenches. Do not grip tubing too tightly because it may be crushed. Do not use the gas pliers on a nut or screw head. These pliers are designed for use on round pipe and will damage any soft metal or wrench-type fitting. Long-nose pliers are used to hold and bend small wires, and to grip very small parts. They are used generally around delicate apparatus. They should be cared for in exactly the same manner as other pliers.

c. *Screwdrivers.* Several screwdrivers of different sizes are furnished in the tool kit. These screwdrivers are important tools and must be kept in good condition. When selecting a screwdriver for a particular job, the following rules should guide choice and application.

- (1) The bit should be the same width as the head of the screw and should fit snugly in the slot.
- (2) The shank should be the right length and the handle should be large enough to afford proper leverage. Screws and bolts should be tightened, but excessive pressure, sufficient to break the fittings, should not be used.
- (3) Never force a screw. Examine the threads for crossed, bent, or otherwise damaged spots, and if necessary, replace the screw.

d. *Soldering Iron.* A soldering iron is an important piece of maintenance equipment and should be properly cared for. The tip must be clean and bright and properly tinned. The cord should be in good condition and carefully rolled when the iron is stored. The attachment plug must be solid and tightly fastened to the wire. A reasonable amount of care will keep the iron in good working condition. Whenever the tip of the iron becomes pitted and misshapen, it should be filed and retinned. The method is as follows:

- (1) File the tip until all pits are removed and the copper is smooth.
- (2) Connect the iron to an a-c 115-volt outlet and allow it to heat, testing the tip temperature with a piece of rosin core solder. When the solder melts, rub it all over the tip until the tip is completely coated. The iron is now ready for use.

(3) The tip should be removed from the heating element occasionally and the scale scraped from the shank of the tip and the threads with sandpaper. Remove all grains from the threads before reinserting the tip shank into the heating element.

e. *Soldering Hints.* Before soldering, a joint should be prepared in the following manner.

- (1) Clean the joint carefully, using sandpaper to remove corrosion.
- (2) Make the joint mechanically tight.
- (3) Apply the clean soldering iron to the joint and heat the joint until the solder flows when placed against the joint.
- (4) Flow in enough solder to completely fill the joint and apply the heat until the connection is smooth. Allow the joint to cool, then test it for tightness.
- (5) Do not use a dirty iron or expect solder to stick to a dirty joint.
- (6) Do not expect solder alone to make a joint tight. Always wrap the wire around the lug or connector so that it is mechanically tight.
- (7) Do not waste solder. Prepare the joint properly and little solder will be required.

f. *Allen Wrenches.* These wrenches are used to tighten or remove the set screws on fans, motor pulleys, etc. They are small wrenches and *must* be kept in the small cloth bag provided for that purpose. After use, they should be wiped off with an oily rag, replaced in the bag, and stored in the tool box.

g. *Bristol Wrenches.* These wrenches are similar to the Allen wrenches except for the added flanges at the hexagonal corners. They are used to tighten or remove the set screws on the dial knobs of the console. They require the same care as Allen wrenches.

h. *Open-End Wrenches.* Open-end wrenches are designed to remove or hold bolts, studs, and nuts of various sizes. These wrenches must be lightly oiled to prevent rusting and should be stored in the bottom of the tool box. Do not attempt to remove a nut or bolt with a wrench too large to fit the nut tightly. Use one with jaws that fit snugly against the flat sides of the bolt or nut.

i. *Packing of Tools.* The following "don'ts" are given for guidance in the storing of tools in the tool box provided for Radio Set AN/TPS-3.

- (1) Do not force tools into the box. If the tools are properly positioned, they will fit easily.

- (2) Do not place dirty tools in the box.
- (3) Do not place heavy tools atop light ones. Put the heavy tools in first, at the bottom of the box.
- (4) Do not place an open knife in the tool box.
- (5) Do not place the saw atop the soldering iron, because vibration may cause the saw to cut through the cord insulation.

CHAPTER 3

DESCRIPTION OF MAINTENANCE TECHNIQUES

21. GENERAL. Radio Set AN/TPS-3 employs many types of electrical devices and numerous varieties of any one type. Since preventive maintenance operations cannot be applied indiscriminately, the content of this section is for the guidance of personnel, assigned to carry out the six basic operations, namely, FEEL, INSPECT, TIGHTEN, CLEAN, ADJUST, and LUBRICATE. The instructions contained in this chapter state the exact procedures of applying these operations and the variations introduced by the differences in individual items. In this connection, *attention is called to the fact that the information presented in this section is not to be construed as indicating WHEN the operations are to be performed, but only HOW they are to be performed.* The schedule states the exact time when the various operations are to be performed. This schedule is discussed in chapter 4. Items in chapter 4 are often passed over with the statement, "Inspect for general condition." The maintenance man should then refer to chapter 3 for a detailed analysis of the operations included in the maintenance to be performed on the specific item scheduled. Such detailed analysis is presented below and throughout the rest of this chapter.

22. TUBES AND SOCKETS.

a. Preventive maintenance work on vacuum tubes includes inspection and cleaning. Work on tube sockets and mountings involves inspection, tightening, cleaning, and adjusting. Each of these operations is discussed in detail below.

NOTE: Avoid doing any work on the tubes immediately after shutdown while they are still hot. Severe burns may result from contact with the envelope of hot tubes.

(1) Both glass and metal-tube envelopes must be inspected for accumulation of dirt and for possible break-away of the envelopes from the tube bases. Examine the tube caps and tube connector clips for dirt, corrosion, and for possible break-away from the cement which holds them to the glass envelopes. When tubes with loose plate caps or envelopes are found, they should be replaced if suitable replacement is available. If re-

placement is not available, do not attempt repair. Record the condition on the Work-to-be-Done forms and make the replacement when possible.

- (2) The spring clips which make contact with the plate caps must be examined for possible corrosion or loss of tension and consequent loose connections. The condition of the wires soldered to these spring clips must also be checked. The wires should be free of frayed insulation or broken strands. Use care in removing a loose spring clip attached to a plate cap which has broken away from its glass envelope. Never turn the clip while it is on a loose cap. Be particularly careful when signs of corrosion exist, as the clip may be bound to the cap.
- (3) Firmness of tubes in sockets can be determined by inspection. This should be done by pressing the tubes down in the sockets. Do not partly withdraw the tube and then juggle it from side to side. Such movement tends to weaken the pins attached to the base and spreads the contacts on the socket.
- (4) The practice of inspecting tube sockets is discouraged, except as indicated in the schedule. The sockets for each tube can be conveniently examined whenever a tube is replaced. However, tubes should not be pulled out of the socket each time the tube is examined. If there is good reason to believe that the socket is faulty and responsible for improper operation, it becomes a servicing item and is discussed in TM 11-1540.
- (5) The modulator tubes are held in place by means of a clip and cap nut, which must be loosened one-quarter turn to remove the tube; and conversely, must be tightened, finger-tight, to hold the tube in proper position.
- (6) When inspection of the tube sockets is called for, look for dirt, corroded connections and contact springs, loose mountings, loss of tension in the contact springs, and cracked sockets.

(7) When a tube is removed from its socket, especially the high-power tubes, caution must be observed. When a warm tube is being removed from a socket, it should not be jarred. Never remove a tube from its socket without first removing the connection to the plate cap. It is equally important to sort tubes properly after they have been removed from the sockets. Tubes should not be placed on a flat surface without taking precautions to prevent their rolling off and falling to the floor or ground.

b. All loose connections at the tube sockets or the connections to the tubes must be tightened. However, if the contacts or connections are dirty or corroded, they should be cleaned first. When tightening locknuts which hold the socket base on the top of the insulated bushing, excessive pressure should not be applied. Too much pressure will crack the bushing. Socket mountings must be tight at all times. Otherwise, they may become loose during transit and the tubes contained within them will be damaged.

c. The tubes must be cleaned if inspection indicates the need. When judging this condition it is imperative to take into account the type of tube involved. Tubes operated at high voltages and with exposed plate connections and caps mounted on the envelopes should be kept free from dirt and dust because of possible leakage between the grid and plate terminals. However, tubes which do not operate at high voltages and do not have exposed plate caps are not subject to equally frequent cleaning. This does not mean that dirt should be permitted to accumulate upon the latter group of tubes, but a difference in the frequency of required cleaning does exist.

- (1) One precaution must always be observed in cleaning vacuum tubes. Tubes should not be removed from their sockets to be cleaned. The danger of breakage is extremely great when tubes are removed, and the scarcity of supplies makes it necessary to exercise every precaution. Be most careful when working with high-power tubes which have exposed plate caps.
- (2) Cleaning involves the removal of dust and dirt from the envelopes, using a clean, lint-free, dry rag which is free of substances that may scratch the glass. If proper care is exercised, plate caps may be cleaned by

using a piece of No. 0000 sandpaper. The paper should be wrapped around the cap and gently slid along the surfaces of the cap. Heavy pressure is unnecessary; neither is it necessary to grip the cap tightly.

- (3) When sockets are to be cleaned, and the contacts are accessible, fine sandpaper will remove corrosion, rust, or dirt.

23. CAPACITORS. The capacitors are mounted in various ways. One type of mounting uses clamps. Two metal clamps hook over the top of the capacitor case and are fastened to the chassis with screws. This type of mounting requires frequent inspection. Another type of mounting is the flange type. In this case, the capacitor has a flange on the mounting side with holes drilled in the flange and through the chassis. The capacitor is mounted on the chassis by means of bolts or studs.

CAUTION: Before maintenance work is begun, it is absolutely necessary, for safety of personnel, that all high-voltage capacitors be shorted with a well insulated screwdriver.

a. The terminals of the capacitor must be inspected for corrosion and loose connections. The mounting assemblies of the capacitors should be inspected for loose mounting screws, studs, or brackets. Inspect the leads to the capacitors for poor insulation, a condition characterized by cracks and dry rot. Connections at the terminals should be inspected for breakage and frayed insulation. Frayed insulation should be corrected by removing the loose strands. If too much base wire is exposed, cover it with friction tape.

b. The case of each oil-filled capacitor should be thoroughly inspected for leaks, particularly if there are signs of oil. Whenever a capacitor is found to be leaking oil, it should be removed and replaced, provided, of course, a replacement is available. Occasionally, a defective capacitor case with improperly soldered seams and leaking oil may be encountered. To retain such a capacitor in the circuit is not wise, but if a replacement is not available, there is no alternative but to locate the leak and resolder the seam. If the leak is resoldered from the outside before an appreciable amount of oil has leaked out, the capacitor may be as good as it was originally.

c. Loose terminals, mountings, and connections on all the capacitors must be tightened. Be careful

not to exert too much force in tightening. Avoid damaging bushings.

d. The capacitor, insulating bushings, and connections should be cleaned whenever they are found to be dirty, rusted, or corroded. The capacitor cases can usually be cleaned with a dry cloth, but if the deposit of dirt on these parts is hard to remove, the cloth may be moistened with solvent such as carbon tetrachloride. The bushings should be carefully wiped with a dry cloth after they are cleaned. Corroded connections should be rubbed with fine sandpaper and properly tightened. If necessary, repaint any exposed surfaces of the cases.

24. RESISTORS.

a. *Types of resistors.* Various types of resistors are used in the AN/TPS-3 equipment. One common type is the vitreous-enamelled resistor with a hard ceramic coating baked upon the resistance element. A popular type is the metalized resistor molded in plastic. They are widely used where the heat dissipation factor is not great.

b. *Connections.* Connections to the various resistors are made in two ways. One is the pigtail type in which the conducting lead enters the body of the resistor. The other is the vitreous type with connections bolted to metallic brackets.

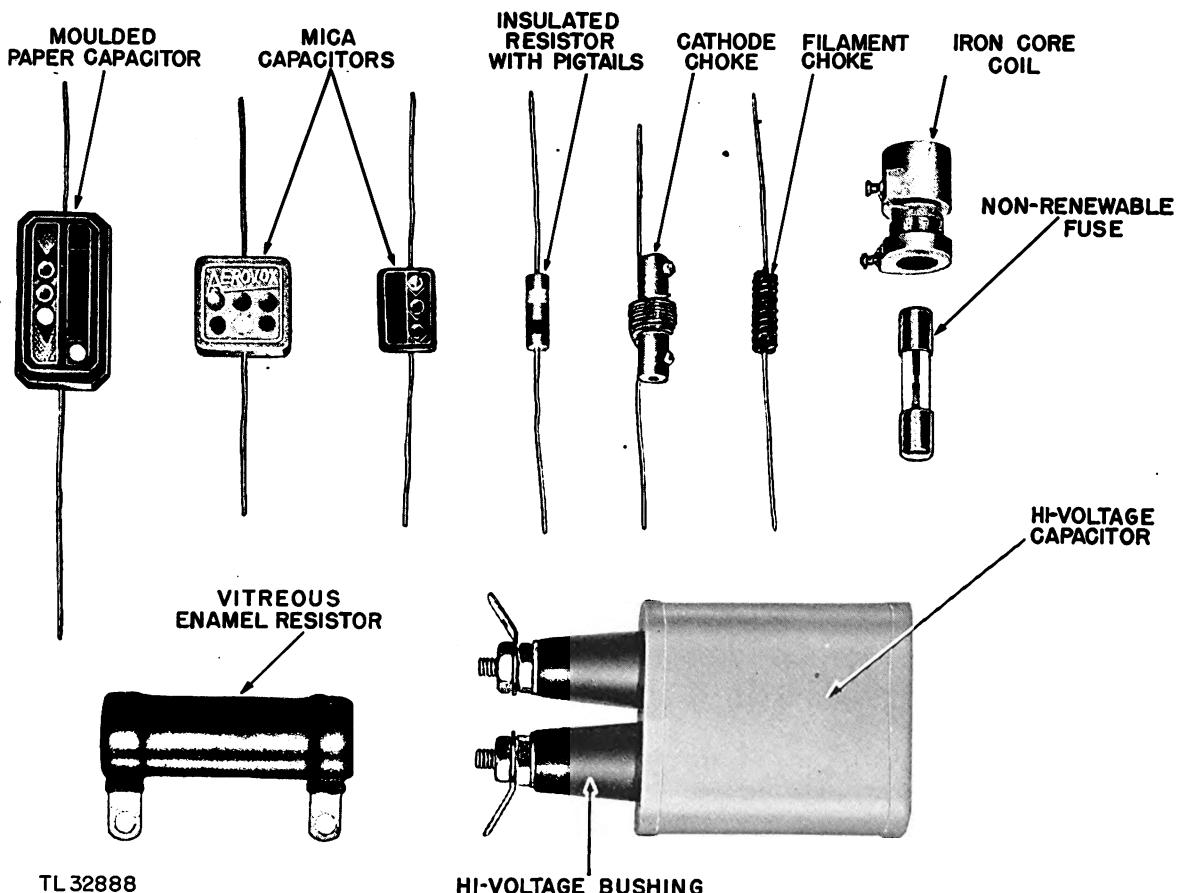


Figure 5. Common maintenance items.

c. Inspect. The coating of the vitreous resistors must be examined for cracks and chipping, especially at the ends (fig. 5). Look for blistering and discoloration which indicates overheating of all types of resistors. Look for arc pits. Inspect the leads, brackets, and all connections for corrosion, dirt, dust, and looseness. Look for broken strands in the connecting wire. Check for security of mountings. Do not attempt to move resistors with pigtail connections because there is danger of breaking the connection at the point where it enters the body of the resistor. Such defects cannot be repaired. Inspect the connections of the pigtail resistors for proper soldering.

d. Tighten. All resistor connections and mountings are to be tightened whenever they are found to be loose. If the resistor is allowed to remain loose, vibration may break the connection or damage the body.

e. Clean.

- (1) All dirty or corroded connections of resistors should be cleaned with a brush or cloth dipped in carbon tetrachloride. Vitreous resistors must be kept clean to avoid flash-over or leakage between the terminals. They should be wiped with a dry cloth, and if a dirt deposit is unusually hard to remove, try using carbon tetrachloride.
- (2) Discolored resistors cannot be cleaned. Slight discoloration of the resistor body at the center is normal. However, excessive discoloration is indicative of overloading at some time prior to the inspection. The overloading frequently is due to some circuit trouble which requires an analysis. Such analysis is detailed in the Service Manual TM 11-1540.
- (3) Resistors with pigtail connections should be cleaned with a small brush.

25. FUSES.

a. General.

- (1) Fuses are small strips of metal with a low melting point. They are inserted in series with an electrical circuit to open it when the amount of current exceeds a prescribed value (fig. 5). Fuses protect equipment against overload and damage. The type of fuse used in Radio Set AN/TPS-3 is nonrenewable, and when blown must be replaced. When a fuse blows, an effort should be made to discover the reason for the failure and to correct it before a new fuse is installed.

(2) Non-renewable or one-time fuses (fig. 5) are to be thrown away when blown and replaced with good fuses. The holder and fuse can be unscrewed from its socket. Care must be exercised to see that the contact surfaces of the fuse and socket are kept clean and tight.

b. Inspect. The fuse caps are to be examined for evidence of burning, charring, or corrosion. Examine the fuse clips for tension, dirt, or loose connections.

c. Tighten. All connections to the fuse clips must be tightened if they are found loose. The tension at the fuse clips may be increased by pressing the sides closer together.

d. Clean. All fuse ends and fuse block clips are to be cleaned, when necessary, with fine sandpaper, then wiped with a clean cloth. If a file is used to remove deep pits in the clips, fuse ends, or contacts, always polish afterwards with fine sandpaper in order to leave a smooth, contact surface. Finish by wiping with a clean cloth.

26. BUSHINGS AND INSULATORS.

a. General.

- (1) Insulator bushings are used in the high-voltage circuits, and are constructed of ceramic material with a glazed surface. Since an insulator is no better than its surface, deposits of fine substances upon the surface materially reduce the insulation value of the bushing. Therefore, it is important that bushings used in high-voltage circuits be inspected frequently (fig. 5).
- (2) Insulating bushings are employed in various ways. One application is the use of bushings as supports for high-voltage tube sockets; another, as supports for high-voltage leads, and a third, as supports for the voltage terminals of transformers and capacitors. Other applications are the use of bushings as mountings for resistors in high-voltage circuits and supports for panels which mount other parts (fig. 18).

b. Inspect. The physical condition of the insulator bushings should be inspected (fig. 18). Each should be clean and without cracks or chips. It is possible for a highly glazed insulator to develop fine, hairline, surface cracks where moisture and dust accumulate and eventually form a leakage path for a high-voltage flashover. Consequently, the surface of

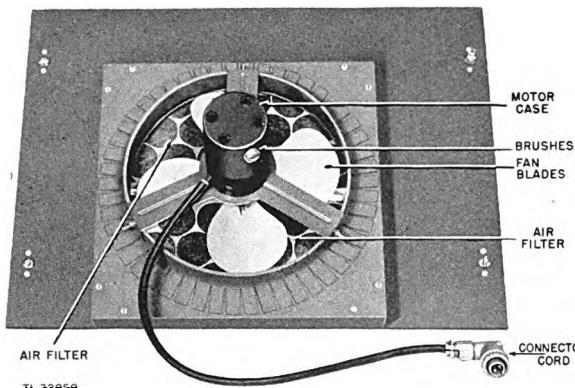


Figure 6. Console air filter and blower.

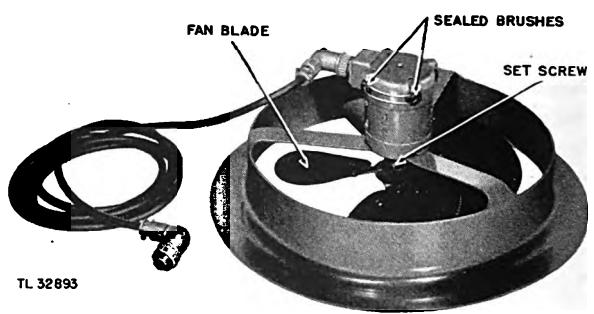


Figure 8. Tent fan.

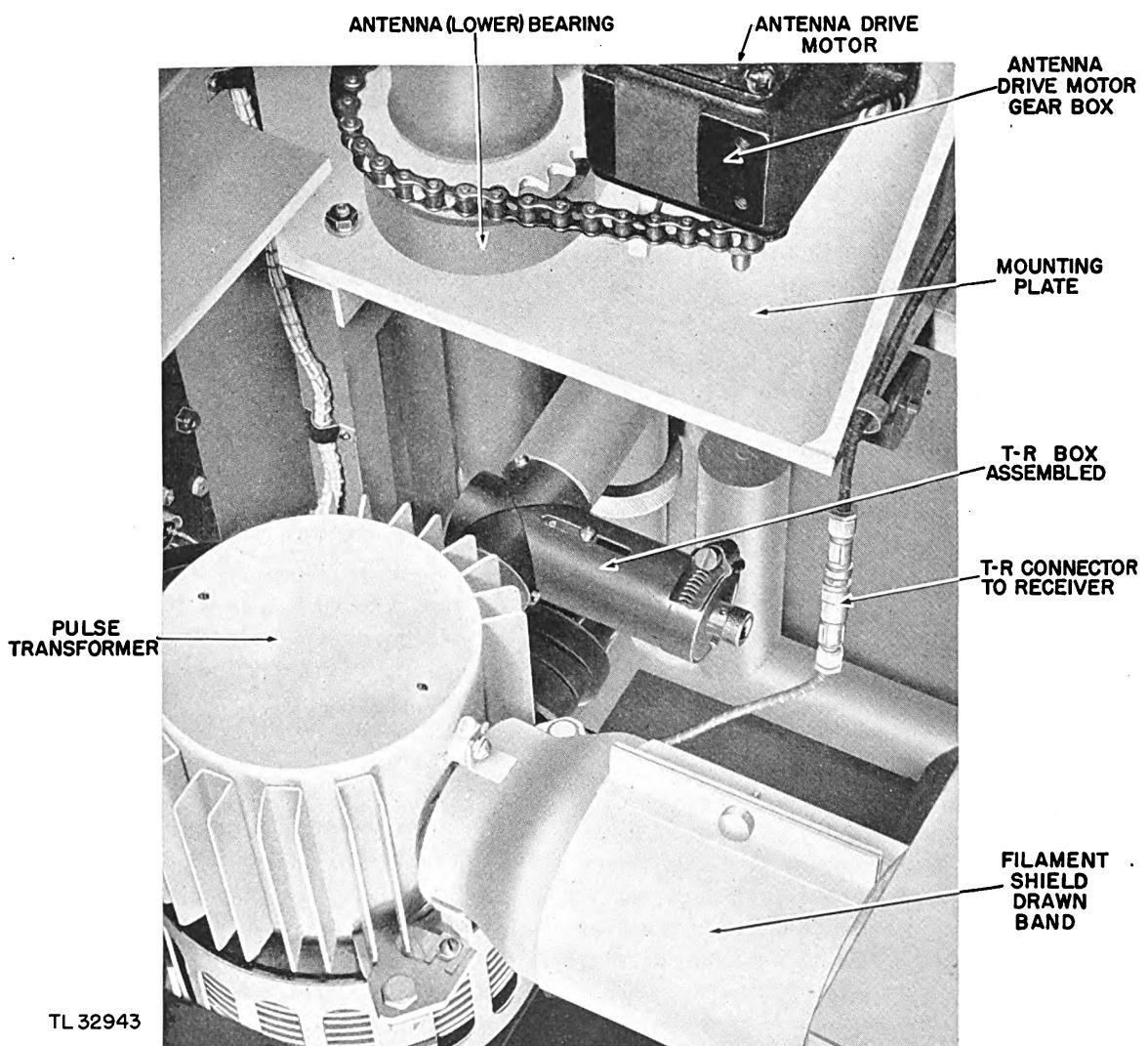


Figure 7. Lower corner of console.

the bushings must be inspected to detect such cracks. When a defective bushing is found, replacement is the only solution. As a rule, bushings are held in position with an hexagonal nut on a threaded conductor which passes through the bushing. They can be replaced easily. If replacement is impossible, the insulating bushings must be cleaned with carbon tetrachloride and inspected frequently. If it is difficult to see dust on a glazed surface, check by rubbing the finger across the bushing.

c. Tighten. All loose bushings must be tightened. The procedure used is self-evident. However, one precaution must be observed. Avoid forcing the nuts or screws. If too much pressure is exerted on the bushings, damage to the bushing is certain. Whenever a bushing with stud bolts screwed into threaded holes is found loose, and the defect lies in stripped threads in the bushing, replace the entire bushing.

d. Clean. Insulated bushings are easily cleaned, but to prevent destruction of the glazed finish, never use abrasive material. A clean, dry cloth is entirely satisfactory for the cleaning process. However, if a foreign deposit on the surface of the bushing is hard to remove, carbon tetrachloride may be used as a solvent. After the surface has been cleaned with the solvent, it should be carefully polished with a dry cloth; otherwise the solvent will leave a deposit on the surface of the bushing. This deposit impairs the effectiveness of the bushing as a high-voltage insulator.

NOTE: Insulator bushings used in high-voltage systems are always carefully constructed, but on rare occasions one may be found which has sharp points on the surface. This is a defective bushing and should be replaced as soon as practicable.

27. CIRCUIT BREAKERS AND SWITCHES.

a. General. A number of switches of various types are used in Radio Set AN/TPS-3. There are toggle switches, multiple position switches, and push button switches (fig. 18). Only certain switches require preventive maintenance. The location of each of these switches is given under the maintenance items detailed in chapter 4.

b. Inspect.

(1) The mechanical operation of each switch is to be inspected. While inspecting, look for signs of dirt or corrosion on whatever elements of the switch are exposed. In some cases the elements of the switch must be examined visually, whereas in other cases the action can be checked by flipping the control

knob or toggle, or pressing the switch button, and noting the freedom of movement and amount of spring tension.

(2) Examine the gang switches to see if they are properly lubricated and if the contacts are clean. The inspection is visual. Do not pry the leaves of the switch apart. The contacts are silver-plated and do not easily corrode. The rotary member should make good contact with the stationary member, and as the former slides into the latter, a spreading of the stationary contact leaves should be seen.

c. Tighten. Loose mountings and connections should be tightened. Increase the tension of springs only when inspection indicates that such treatment is necessary.

d. Clean. Dirty switches should be cleaned with a stiff brush moistened in carbon tetrachloride. Polish with a piece of cloth. Corroded connections may be cleaned with No. 0000 sandpaper.

e. Lubricate. The joints of all accessible switches are to be lubricated with petroleum jelly (vaseline or walscolube). Only lubricate when absolutely necessary.

28. MOTORS AND GENERATORS.

a. General. The motors and generators used in the AN/TPS-3 equipment serve several purposes and are of several types. No matter what their use or how prolonged or intermittent their operation, certain preventive maintenance procedures must be applied if proper functioning and dependable performance is to be obtained. See figures 4, 6, 7 and 8. Three causes contribute to faulty operation of such equipment:

- (1) Accumulation of dirt, dust, or other foreign matter on the moving part of the equipment.
- (2) Improper adjustment or imperfect condition of the moving part.
- (3) Lack of lubrication on the moving parts requiring lubrication.

b. Reasons for Maintenance. Given proper care, the motors and generators will give long service, but if neglected, they may fail when they are most needed. The instructions given below are intended to prevent or forestall such unexpected failures. However, it should be understood that the various maintenance techniques are not to be applied at random. They must be performed according to the schedules given, unless inspection indicates the necessity for certain routines before the scheduled time.

c. Feel. The motor bearings and the motor housing are felt to determine excessive rise in temperature. Normally the hand should be able to maintain contact with the motor (bearing end and motor housing) for a period of at least five seconds. Overheating of the housing generally indicates an overload of some type, and in most instances is due to lack of lubrication or mechanical binding. The motor should be examined to determine the cause, and if it cannot be remedied, replacement is the only alternative. Overheating of a bearing usually indicates the lack of proper lubrication, and if this condition has not existed for too long a period, it may be possible to save the bearing by proper lubrication. In any event, when such a condition is found, the person-in-charge should be notified so that the bearings can be lubricated immediately and a test run made to determine whether or not repair or replacement is necessary.

d. Inspect.

(1) The motor exterior and other visible parts must be inspected for dirt and signs of mechanical looseness or defects. Where wires are exposed, inspect to see if all connections are tight, in good condition, and that the insulation is not frayed. Inspect the mounting for loose bolts. Wherever possible, feel the coupling to see that it is tight on the shaft.

(2) Examine the brushes and the commutators of the generator at regular intervals. See TM 11-933. When the brushes are removed for inspection, be sure to replace the brush in exactly the same position as it was originally. Do not turn over or swap brushes. The brushes should be long enough to make firm contact with the commutator. The brush springs must have the proper tension and be in firm contact with the individual brush. The commutators must be clean and smooth. The brush caps must be tight and the covers and straps in place. If it is necessary to replace brushes or commutators, notify the person in charge.

e. Tighten. All loose connections or mountings must be tightened. If wires are out of place, return them to normal positions. If segments of the commutator appear loose, replacement of the device is the only remedy.

f. Clean.

(1) The exterior and the base of the motor with a clean cloth, or if necessary, with one

moistened in a solvent such as carbon tetrachloride.

(2) Clean all equipment coupled to the motor.

g. Lubricate.

(1) The motor in the power unit. All other motors are of the self-lubricating type. However, modifications in some of the sets may necessitate motor lubrication.

(2) Ball-bearing motors are usually lubricated with a hard oil. This oil is highly refined and its consistency is that of a thin jelly. Usually it is supplied in collapsible tubes. As a rule these motors are lubricated through a filler plug or a grease cup. In common with other motors these do not require much lubrication, but they must be checked at regular intervals. With reference to lubrication, a small amount is sufficient at any one time. If a motor is subject to prolonged use, lubrication should be done more often. At no time should an excessive amount of oil or grease be applied for over-lubrication is almost as bad as insufficient lubrication. The lubricant spreads and trouble will develop.

(3) Other types of ball bearing motors are packed with the proper lubricant and seals. The amount of lubricant inserted is intended to last for approximately a year, at which time it is recommended that the motor be returned to a base depot for cleaning and repacking of the bearing.

29. TRANSFORMERS AND FILTER CHOKES.

a. General. In virtually every case a defective transformer or choke must be replaced, but certain preventive maintenance operations are applicable as measures of protection against failure at inopportune times.

b. Inspect.

(1) All transformers and chokes for general cleanliness. Examine for tightness of connections, connecting lugs or terminals, mounting brackets, and rivets. Dust, dirt, or moisture present between the terminals of high-voltage transformers or chokes located at high-potential points in the circuit may cause flashover.

(2) Wax-impregnated transformers should be inspected for signs of overheating indicated by the presence of insulating compound (wax) on the outside of the seams of the

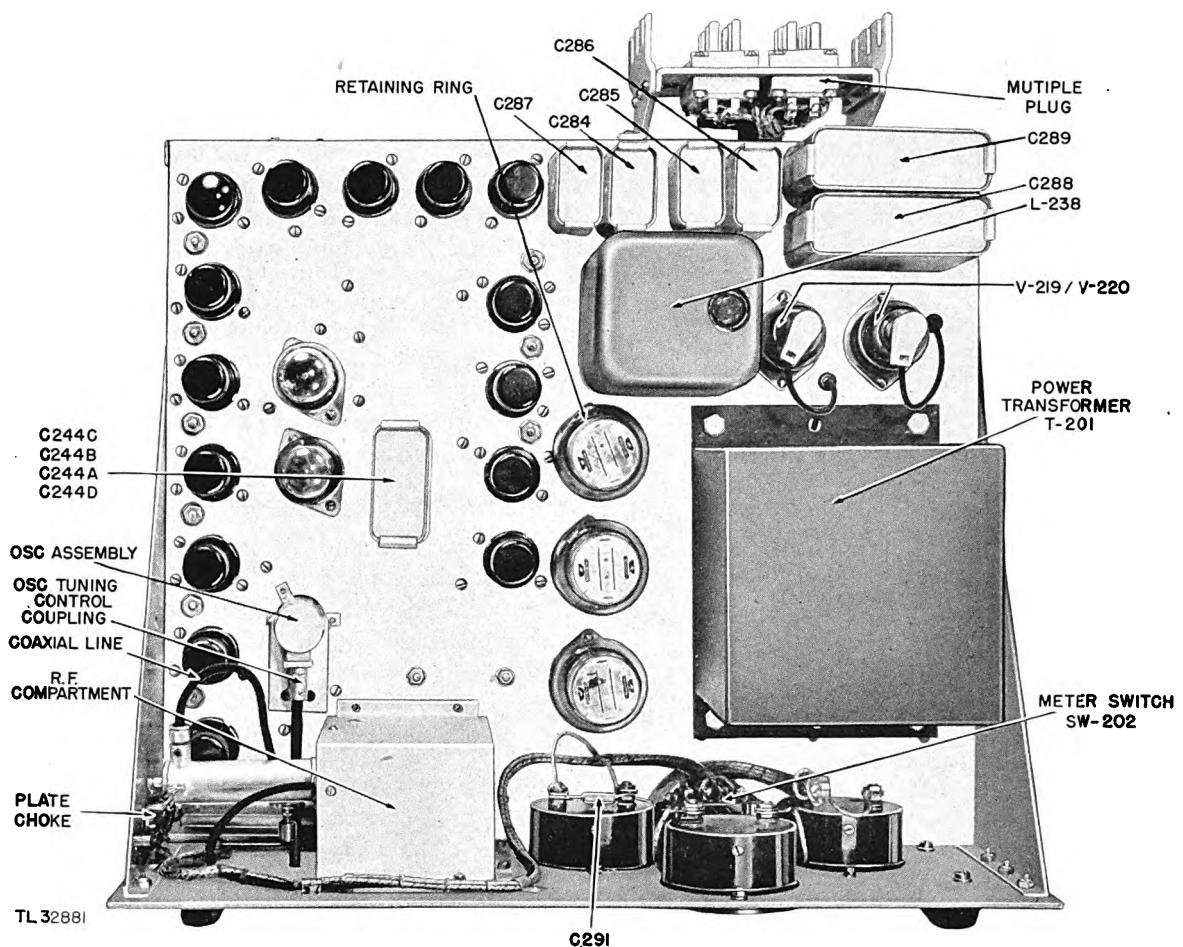


Figure 9. Receiver chassis, top view.

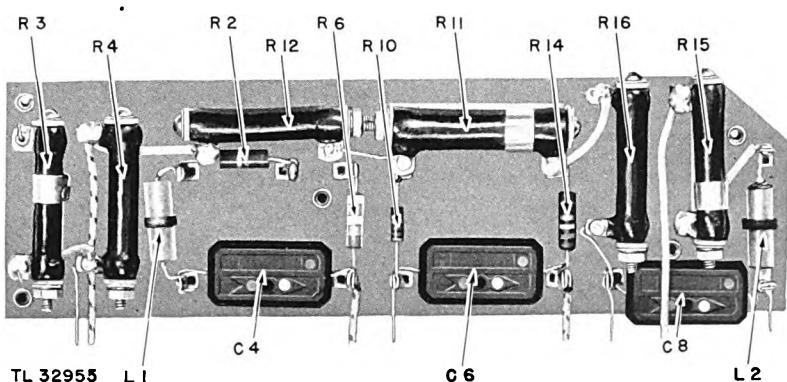


Figure 10. Terminal strip.

cases. Such evidence is an indication of trouble, and a system analysis must be made. See TM 11-1540.

c. *Clean.* Cases of transformers and chokes are cleaned with a dry cloth. In some instances, it may be necessary to use carbon tetrachloride as a solvent to remove foreign matter. Corroded contacts or connections can be sandpapered and wiped clean. Corrosion at ground contacts must be removed and the connection resoldered. The transformer and chokes are inclosed, and the connections are made on the underside of the chassis. Inspecting and cleaning the connections on these transformers and chokes need not be done frequently.

d. *Tighten.* All loose mounting screws or connections are to be tightened. The placement of the wires in these units is critical. They must *not* be disturbed. If it is necessary to remove wires to tighten the mountings of parts, the positions of the wires must be noted on a tag before they are unsoldered, and wires must be restored to their original places.

30. RHEOSTATS AND POTENTIOMETERS.

a. *Inspect.* The mechanical operation of the rheostats and potentiometers must be checked. The arm should be keyed tightly to the shaft, and the shaft should turn easily in the bushing which supports it. If the arm is loose on the shaft, inspect the ceramic bushing (in some types of rheostats) which holds the arm on the shaft. See if it is cracked or broken. Poor contact between the arm and the resistor winding is caused by insufficient tension in the arm. If the shaft is positioned by means of a compression spring, the spring should be inspected for breakage. Inspect the assembly and mounting screws, set screws, and nuts. The insulating body of the rheostat should be examined for the presence of dirt, dust, cracks, or chipped places. All metallic parts should be inspected for dust, dirt, and corrosion.

b. *Tighten.* All loose assembly or mounting screws are to be tightened. If the ceramic bushing is broken, the rheostat should be replaced. Make sure the adjustment is reset to its original position.

c. *Clean.* The contact surface of wire wound resistance windings, the sliding contact, the body of the rheostat or potentiometer, and the connections, are to be cleaned when found in a dirty or corroded condition. Remove the lubricant and dirt from the rheostat or potentiometer parts with carbon tetrachloride. Clean corroded surfaces of contacts with crocus cloth. Do this by inserting a strip of crocus

cloth between the arm and the winding and drawing the cloth back and forth.

d. *Adjust.* The contact arm should be adjusted if it does not have sufficient tension to insure positive contact. Use a pair of long-nose pliers to spring it slightly at the center in the direction in which increased tension is desired. Do not make a sharp bend at any one place. Work the pliers along the length of the contact arm and put a slight bow in its adjustment. Be careful not to damage the winding in the process.

e. *Lubricate.* If it is difficult to turn the shaft in its bushing, place a drop or two of light machine oil on the shaft at each end of the bushing. Make sure that the surrounding surfaces are cleaned with a dry cloth after lubrication.

31. TERMINAL STRIPS.

a. *General.* Terminal strips are used as distribution and connecting points for electrical circuits (fig. 10). Construction is simple, consisting of a strip of insulation with screw type or soldered connections mounted on it.

b. *Inspect.* The terminal strips must be examined for cracks, breakage, dirt, and loose connector or mounting screws. Carefully examine the connections for mechanical defects, dirt, or corrosion.

c. *Tighten.* All loose screws, lugs, and mounting bolts must be tightened. When tightening screws, be sure to select the proper screwdriver. Do not exert too much pressure. Do not remove loose connections and clean them unless they are found to be dirty or corroded.

d. *Clean.* The terminal strips must be cleaned with a dry brush when they are dirty. Accumulation of dust should not be permitted. In extreme cases, use a cloth moistened with carbon tetrachloride or some other solvent. Following such an operation, the board must be thoroughly wiped with a cloth and then brushed to remove the lint.

32. METERS.

a. *General.* Meters are delicate instruments and must be handled with extreme care (fig. 3). They usually require little maintenance. They are precision instruments and cannot be repaired in the field. A damaged meter should be replaced with a spare and returned to the depot for repair.

b. *Inspect.* The leads and connections to the meters should be examined. Look for loose, dirty, or corroded connections. The cover glass and the case should be kept clean. Since the movement of a

meter is extremely delicate, its accuracy will be seriously affected if the glass is broken. If the climate is damp it will only be a matter of time until moisture ruins the meter movement. Broken glass can be taped with transparent tape until replacement is possible.

c. *Tighten.* All loose connections or mountings must be tightened. The tightening of meter connections requires special technique, as careless handling can easily crack a meter case. To prevent such an occurrence, the proper wrench or some other appropriate tool should be used to hold the hexagonal retaining nut which makes contact with the metal case, while the outside nut is being tightened with another tool. This permits the tightening of the connection without increasing the pressure of the head of the stud against the inside of the meter case.

d. *Clean.* The meter cases, usually made of hard, highly polished bakelite, are to be cleaned with a dry cloth. If necessary, dampen the cloth in carbon tetrachloride. Dirty connections may be cleaned with a small stiff brush or a small piece of cloth dipped in carbon tetrachloride. It should be emphasized that solvents do not entirely remove dirt from the surface. Some of the dirt will be left in a softened state and must be removed by polishing with a clean cloth. Corroded connections are cleaned by sanding them lightly with a fine grade of sandpaper. After cleaning, the connections should be wiped carefully with a clean cloth.

e. *Adjust.* All meters in the set which should, but don't, indicate zero after the unit is inoperative for a period of at least 10 minutes are to be adjusted. The procedure used to set a meter to zero is not difficult. Before deciding that a meter needs readjusting, tap the meter case lightly with the tip of one finger. This enables the needle to overcome the slight friction which sometimes develops at the bearings and prevents an otherwise normal meter from coming to rest at zero. If adjustment is needed, insert the bit of a screwdriver into the slotted screwheads located below the meter glass, and slowly turn the adjusting screw until the meter point is set at

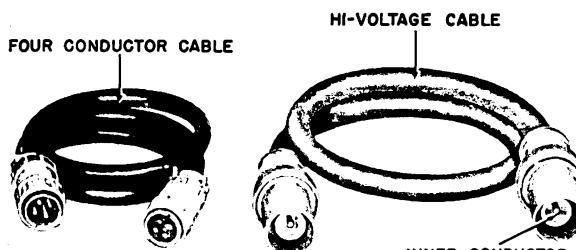


Figure 11. Cables.

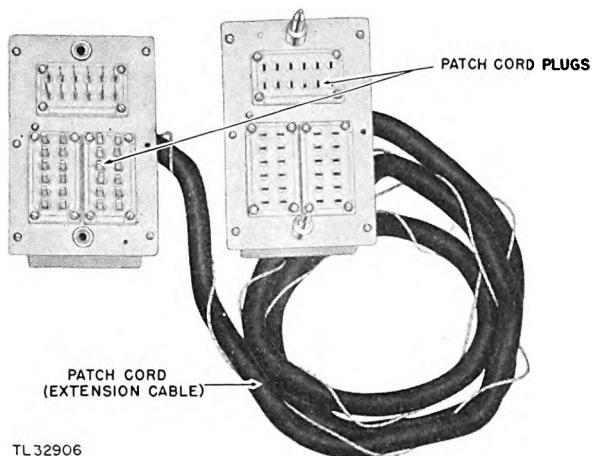


Figure 12. Extension cables.

zero. The following precaution must be exercised when positioning the meter indicator. View the meter face and pointer full-on and not from either side. That is, stand directly before the face of the meter to avoid any errors which may be caused by parallax. (See How to Read and Adjust Meters, TM 11-1340, chapter 4.) Avoid turning the screw too far; or the needle may be bent or the hair springs damaged.

33. CABLES AND PLUGS.

a. *General.* The cables in the AN/TPS-3 equipment may be regarded as the life lines of the equipment. The condition of the cabling must be closely observed. See figures 11 and 12.

b. *Inspect.*

(1) The cables are to be inspected for cracked or deteriorated insulation, frayed or cut insulation at the connections or support points, and improper placement which may subject the cables or connections to undue strain. Note the support of the cable. Make sure the cable is not kinked. Do not make sharp bends in the high-voltage cables when they are cold below zero, °F.). Where grounding clamps are employed, it is important to keep these clean and tight. If one or more of these grounded points is open or makes poor electrical contact, it may interfere with the operation of the equipment.

(2) It is recommended that the following check on the cabling system be made periodically. Clamps or brackets that hold or support cables should be inspected for tightness. If they are firm and solid and cannot be moved, no further attention is required. Also inspect the condition of conductors at the terminals.

Examine the cables to make sure the lacing which supports the cables is not broken.

(3) Inspect the rigid coaxial lines used for r-f transmission to see that they are properly mounted.

(4) Flexible coaxial lines should be inspected only for loose coupling rings and/or deteriorated insulation (fig. 9). They should be handled as little as possible, and unless repairs are indicated by a visual inspection, the connections should not be removed from the associated couplings.

(5) Examine plugs and contact surfaces for cleanliness. Make sure the plugs, particularly the high-voltage types, are properly assembled and seated.

c. Tighten. All loose cable clamps, coupling rings, and cable connections.

d. Clean. All dirty or corroded connections must be cleaned. The easiest way to clean dirty connections is to remove the connection and clean it with a brush dipped in carbon tetrachloride. Make sure that the connection is thoroughly dried with a dry cloth. Corroded connections are cleaned with No.

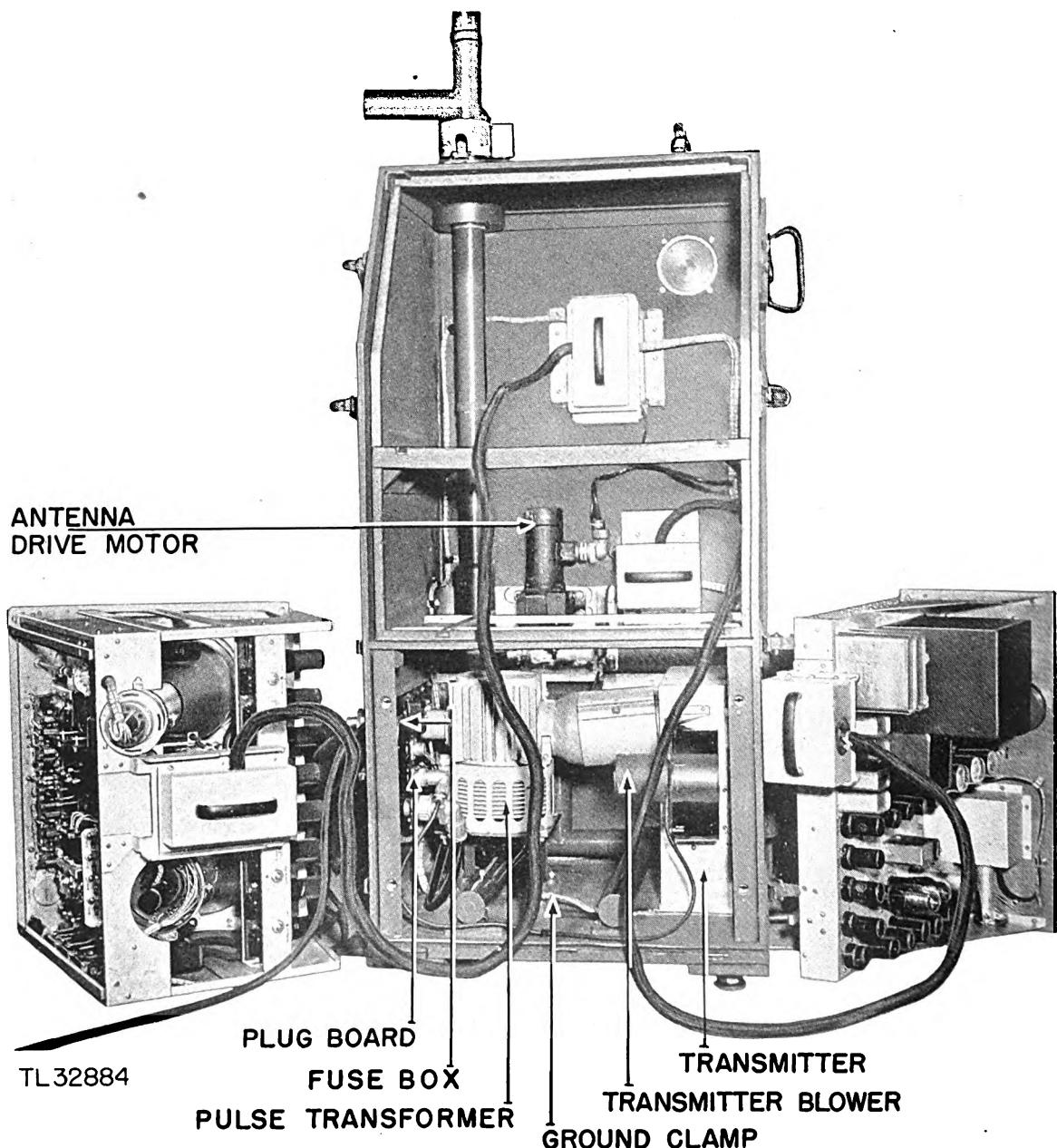


Figure 13. Console with chassis removed.

0000 sandpaper. It is important that the entire surface of the connections be clean. No attempt should be made to remove individual prongs from cable plugs.

34. PILOT LIGHTS.

a. General. Pilot lights are miniature lights used to indicate the application of power to a circuit or to indicate that a circuit is ready for power to be applied. The construction of pilot lights is simple, and they can be removed or replaced easily. The bulb is an ordinary 6 to 8 volt miniature lamp. The maintenance of pilot lights presents no special difficulty but the following general notes are given for guidance.

b. Inspect. The pilot light assemblies are examined for broken or cracked pilot light shields, loose bulbs, bulbs with loose bases, loose mounting screws, and loose, dirty, or corroded connections.

c. Tighten. Loose mounting screws and loose connections must be tightened and resoldered. If the connections are dirty or corroded, they should be cleaned before soldering. Loose bulbs should be screwed tightly into their base, but they should not be twisted hard enough to break the glass bulb loose from the base. Broken or burned out pilot light bulbs must be replaced as soon as possible, and while it may appear difficult to remove the bulb, the process is simple. A small piece of friction tape is folded over the top of the bulb and pressed against the two sides. After the tape is attached, the bulb is unscrewed and removed from the socket. Socket connections should be inspected while the bulb is out. A new bulb can be replaced with the fingers but if difficulty is experienced, the above procedure may be used to replace it.

d. Clean. The pilot light shields, the base assembly, and the glass of the bulb, where accessible, should be cleaned with a dry cloth. If the interior of the

base has accumulated dust or dirt, it can usually be removed with a small brush. Corroded sockets or corroded connections are cleaned with a piece of cloth. Films of foreign material on the connections or the socket contacts may be removed with a piece of cloth, or a small brush dipped in carbon tetrachloride, after which the clean surfaces should be polished with a dry cloth. Clean contacts and connections are important in pilot lights because of the low voltage at which they operate.

35. CHASSIS AND COMPARTMENT.

The cabinet which houses the various units of the equipment is constructed of plywood (fig. 2).

a. Inspect. The outside and inside of the cabinet should be examined thoroughly, paying strict attention to every detail associated with or mounted upon the cabinet or chassis. Check the panel and door hinges, the ventilator mountings, and all mounting screws. Make sure that the meter settings are all at zero. Occasionally examine the fit of the pilot light bulb in its socket. Check the pilot light covers for cracks and breaks. Inspect the panels for loose mounts or switches. Inspect the guide rails for dents, rust, or corrosion.

b. Clean. The cabinet, outside and inside, should be cleaned with a clean, dry cloth (fig. 13). Clean the glass of the meters and the control mounts with a clean cloth.

c. Adjust. The zero setting of all meters found to be inaccurate. Always stand exactly in front of the meter when doing this to avoid any error caused by parallax. See How to Read and Adjust Meters, TM 11-1340, chapter 4.

d. Lubricate. The hinges and latches (fig. 2) if inspection indicates the need for lubrication. Use a small amount of light oil. All excess oil should be removed with a dry cloth.

CHAPTER 4

MAINTENANCE ITEMS

SECTION I

MAINTENANCE SCHEDULE

Pars. 36-38
TM 11-1440

36. GENERAL. Chapter 4 of the manual describes the maintenance schedule and presents detailed instructions on the maintenance items. Basically, the maintenance schedule indicates the when and the what of the maintenance program; the item instructions state the where and the how; the assignment sheets show who does the work.

37. THE MAINTENANCE SCHEDULE.

a. The information given in the maintenance schedule is as follows:

- (1) The specific item in the designated component on which work is to be done.
- (2) The day of the week when the job is to be done.
- (3) The number of times the work is done each month.
- (4) Code letters (F, I, T, C, A, L) which specify the particular maintenance operations to be performed. F = Feel; I = Inspect; T = Tighten; C = Clean; A = Adjust; L = Lubricate.

b. Item numbers on the schedule correspond to the item numbers in this chapter. Maintenance men may refer to the specific item for instructions when doing the particular job called for. The complete maintenance schedule for a year's work is given on seven scheduled sheets—one sheet for each day in the week. Each schedule sheet consists of eight vertical columns. The first column in the schedule for each day gives the item number. The second column gives the code letter (F, I, T, C, A, L) of the maintenance operation to be performed; the third, the item title. Columns 4, 5, 6, 7, and 8 indicate the frequency at which the items are to be performed. For example, blank spaces across all five columns indicate that the particular item is to be performed once a week. Shaded spaces indicate that the item is not performed during the week shaded. See sample sheet on page 23.

NOTE: Operating conditions, as shown by the Equipment Performance Log or other records, might indicate that certain maintenance operations should be performed more often than specified in the schedule. More frequent scheduling of items is left to the discretion of the person-in-charge.

38. THE ASSIGNMENT SHEET.

a. The assignment sheet is used in conjunction with the schedule. Seven assignment sheets combine with seven maintenance schedule sheets. In other words, there is a Monday assignment sheet for the Monday schedule sheet, a Tuesday assignment sheet for the Tuesday maintenance sheet, a Wednesday for the Wednesday, etc. Used together, the schedule and the assignment sheet enable the scheduling of all maintenance jobs to be performed during the course of a year. See sample sheet on page 23.

b. The assignment sheet is divided into twelve main blocks, each block representing one month. Months are divided into weeks by means of the numbers under column 14. In other words, on the Monday sheet these figures indicate the first, second, third, fourth, and fifth Mondays of a month. On the Tuesday sheet, they represent the first, second, third, fourth, and fifth Tuesdays of the month, etc.

c. The assignment of specific men on the crew to particular items of maintenance can be made in columns 9, 10, and 11. As shown in the sample, the upper spaces under ASSIGNMENTS are used for entering the initials of the men assigned to the various jobs. The lower spaces under assignments are used for entering the numbers of the items to be performed by each man.

d. Column 12, DISPOSITION, is used to record any jobs that have not been completed or that have been performed unsatisfactorily. The item number and initials of the maintenance man are to be recorded here in case of an incompletely job. Column 13 is for the approval of the person-in-charge of the station.

SAMPLE MAINTENANCE SCHEDULE AND ASSIGNMENT SHEET

SCHEDULE FOR SUNDAY

		F FEEL	I INSPECT	T TIGHTEN	C CLEAN	A ADJUST	L LUBRICATE					
1	2	3						4	5	6	7	8
ITEM NO.	OPERATIONS	DESCRIPTION OF ITEMS						WORK TO BE DONE				
20	FI	TENT AND ACCESSORIES						FIRST SUN.	SECOND SUN.	THIRD SUN.	FOURTH SUN.	FIFTH SUN.
21		PREPARATORY STEPS—MODULATOR										
22	IC	MODULATOR										
23	I	ANTENNA ASSEMBLY						//////	//////	//////	//////	//////
25	L	POWER UNIT: SEE TM11-933										
26	L	LUBRICATION										

ASSIGNMENTS FOR SUNDAY

9	10	11	12	13	14	9	10	11	12	13	
ASSIGNMENTS			DISPOSITION	CHECKED BY		ASSIGNMENTS			DISPOSITION	CHECKED BY	
A. F.	J. B.	R. G.	J. B.-22 INCOMPLETE	A. Z.	FIRST SUN.						
20	21, 22	25		A. Z.	SECOND SUN.						
R. G.	J. B.	A. F.		A. Z.	THIRD SUN.						
20	21, 22	25		A. Z.	FOURTH SUN.						
A. F.	J. B.	R. G.		A. Z.	FIFTH SUN.						
20	21, 22	23, 25									
R. G.	A. F.	J. B.									
20	21, 22	25									
A. F.	J. B.	R. G.									
20	21, 22	25									

EXPLANATION:

a. In the sample Maintenance Schedule above, six items are scheduled for maintenance on Sunday. The antenna assembly work is to be done *only* once monthly, that is, on every third Sunday of the month. The tent and accessories item includes both the FEEL and INSPECT operations as indicated by the code letters F and I in column 2 of that item. Maintenance on the modulator calls for the completion of the INSPECT and CLEAN operations.

b. The Assignment Sheet illustrated above indicates the following:

- (1) During the first Sunday of the month, Private A. F. performs maintenance on Item 20.
- (2) Corporal J. B. performs maintenance on Items 21 and 22. He did not complete Item 22 and noted the fact in the DISPOSITION column.
- (3) During the third Sunday of the month, Item 23 was performed by Corporal R. G.
- (4) Corporal J. B. performs maintenance on Items 21 and 22.
- (5) Private A. F. completed Item 20.
- (6) Sergeant A. Z., the person-in-charge, signed in column 13, after the maintenance period.

SCHEDULE FOR MONDAY

F	I	T	C	A	L	FEEL	INSPECT	TIGHTEN	CLEAN	ADJUST	LUBRICATE	1	2	3	4	5	6	7	8
ITEM NO.	OPERATIONS	DESCRIPTION OF ITEMS										WORK TO BE DONE							
												FIRST MON.	SECOND MON.	THIRD MON.	FOURTH MON.	FIFTH MON.			
1		PREPARATORY STEPS—INDICATOR																	
2	I	TOP-SIDE OF INDICATOR CHASSIS																	
3	I	UNDERSIDE OF INDICATOR TUBE SHELF																	
25	I	POWER UNIT: SEE TM11-933																	
26	L	LUBRICATION																	

ASSIGNMENTS FOR MONDAY

JANUARY	9	10	11	12	13	14	9	10	11	12	13
	ASSIGNMENTS			DISPOSITION	CHECKED BY		ASSIGNMENTS			DISPOSITION	CHECKED BY
						FIRST MON.					
						SECOND MON.					
						THIRD MON.					
						FOURTH MON.					
						FIFTH MON.					
						FIRST MON.					
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						THIRD MON.					
						FOURTH MON.					
						FIFTH MON.					

SCHEDULE FOR TUESDAY

F FEEL	I INSPECT	T TIGHTEN	C CLEAN	A ADJUST	L LUBRICATE	4	5	6	7	8	
1	2	3									
ITEM NO.	OPER- ATIONS	DESCRIPTION OF ITEMS					WORK TO BE DONE				
1		PREPARATORY STEPS—INDICATOR					FIRST TUES.	SECOND TUES.	THIRD TUES.	FOURTH TUES.	FIFTH TUES.
4	I	UNDERSIDE OF INDICATOR CHASSIS									
5	I	FRONT PANEL OF INDICATOR									
6	I	CHASSIS OF INDICATOR									
25	I	POWER UNIT: SEE TM11-933									
26	L	LUBRICATION									

ASSIGNMENTS FOR TUESDAY

	9	10	11	12	13	14	9	10	11	12	13	
	ASSIGNMENTS			DISPOSITION	CHECKED BY		ASSIGNMENTS			DISPOSITION	CHECKED BY	
JANUARY						FIRST TUE.						JULY
						SECOND TUE.						
						THIRD TUE.						
						FOURTH TUE.						
						FIFTH TUE.						
FEBRUARY						FIRST TUE.						AUGUST
						SECOND TUE.						
						THIRD TUE.						
						FOURTH TUE.						
						FIFTH TUE.						
MARCH						FIRST TUE.						SEPTEMBER
						SECOND TUE.						
						THIRD TUE.						
						FOURTH TUE.						
						FIFTH TUE.						
APRIL						FIRST TUE.						OCTOBER
						SECOND TUE.						
						THIRD TUE.						
						FOURTH TUE.						
						FIFTH TUE.						
MAY						FIRST TUE.						NOVEMBER
						SECOND TUE.						
						THIRD TUE.						
						FOURTH TUE.						
						FIFTH TUE.						
JUNE						FIRST TUE.						DECEMBER
						SECOND TUE.						
						THIRD TUE.						
						FOURTH TUE.						
						FIFTH TUE.						

SCHEDULE FOR WEDNESDAY

F FEEL **I** INSPECT **T** TIGHTEN **C** CLEAN **A** ADJUST **L** LUBRICATE

1	2	3	4	5	6	7	8
ITEM NO.	OPER-ATIONS	DESCRIPTION OF ITEMS	FIRST WED.	SECOND WED.	THIRD WED.	FOURTH WED.	FIFTH WED.
7		PREPARATORY STEPS—RECEIVER					
8	FI	TOP-SIDE OF RECEIVER					
9	I	UNDERSIDE OF RECEIVER CHASSIS					
10	I	FRONT PANEL OF RECEIVER					
11	I	CHASSIS OF RECEIVER					
25	I	POWER UNIT: SEE TM11-933					
26	L	LUBRICATION					

ASSIGNMENTS FOR WEDNESDAY

	9	10	11	12	13	14	9	10	11	12	13	
	ASSIGNMENTS	DISPOSITION	CHECKED BY				ASSIGNMENTS	DISPOSITION	CHECKED BY			
JANUARY						FIRST WED.						JULY
						SECOND WED.						
						THIRD WED.						
						FOURTH WED.						
						FIFTH WED.						
FEBRUARY						FIRST WED.						AUGUST
						SECOND WED.						
						THIRD WED.						
						FOURTH WED.						
						FIFTH WED.						
MARCH						FIRST WED.						SEPTEMBER
						SECOND WED.						
						THIRD WED.						
						FOURTH WED.						
						FIFTH WED.						
APRIL						FIRST WED.						OCTOBER
						SECOND WED.						
						THIRD WED.						
						FOURTH WED.						
						FIFTH WED.						
MAY						FIRST WED.						NOVEMBER
						SECOND WED.						
						THIRD WED.						
						FOURTH WED.						
						FIFTH WED.						
JUNE						FIRST WED.						DECEMBER
						SECOND WED.						
						THIRD WED.						
						FOURTH WED.						
						FIFTH WED.						

SCHEDULE FOR THURSDAY

F I T C A L

FEEL INSPECT TIGHTEN CLEAN ADJUST LUBRICATE

1	2	3	4	5	6	7	8
ITEM- NO.	OPER- ATIONS	DESCRIPTION OF ITEMS	FIRST THURS.	SECOND THURS.	THIRD THURS.	FOURTH THURS.	FIFTH THURS.
24	I	TEST EQUIPMENT TRANSMITTER: SEE TM11-1540 T-R BOX AND SPARK GAP ELECTRODES: SEE TM11-1540 ANTENNA SLIP RINGS: SEE TM11-1540					
25	I	POWER UNIT: SEE TM11-933					
26	L	LUBRICATION					

ASSIGNMENTS FOR THURSDAY

	9	10	11	12	13	14	9	10	11	12	13	
	ASSIGNMENTS			DISPOSITION	CHECKED BY		ASSIGNMENTS			DISPOSITION	CHECKED BY	
JANUARY						FIRST THU.						JULY
						SECOND THU.						
						THIRD THU.						
						FOURTH THU.						
						FIFTH THU.						
FEBRUARY						FIRST THU.						AUGUST
						SECOND THU.						
						THIRD THU.						
						FOURTH THU.						
						FIFTH THU.						
MARCH						FIRST THU.						SEPTEMBER
						SECOND THU.						
						THIRD THU.						
						FOURTH THU.						
						FIFTH THU.						
APRIL						FIRST THU.						OCTOBER
						SECOND THU.						
						THIRD THU.						
						FOURTH THU.						
						FIFTH THU.						
MAY						FIRST THU.						NOVEMBER
						SECOND THU.						
						THIRD THU.						
						FOURTH THU.						
						FIFTH THU.						
JUNE						FIRST THU.						DECEMBER
						SECOND THU.						
						THIRD THU.						
						FOURTH THU.						
						FIFTH THU.						

SCHEDULE FOR FRIDAY

F I T C A L
FEEL INSPECT TIGHTEN CLEAN ADJUST LUBRICATE

1	2	3	4	5	6	7	8
ITEM NO.	OPERATIONS	DESCRIPTION OF ITEMS	WORK TO BE DONE				
			FIRST FRI.	SECOND FRI.	THIRD FRI.	FOURTH FRI.	FIFTH FRI.
12		PREPARATORY STEPS—CONSOLE					
13	I	PLUG BOARD					
14	FI	PULSE TRANSFORMER					
15	FI	TRANSMITTER					
16	I	SELSYN MOTOR					
25	I	POWER UNIT: SEE TM11-933					
26	L	LUBRICATION					

ASSIGNMENTS FOR FRIDAY

	9	10	11	12	13	14	9	10	11	12	13	
	ASSIGNMENTS	DISPOSITION	CHECKED BY				ASSIGNMENTS	DISPOSITION	CHECKED BY			
JANUARY						FIRST FRI.						JULY
						SECOND FRI.						
						THIRD FRI.						
						FOURTH FRI.						
						FIFTH FRI.						
FEBRUARY						FIRST FRI.						AUGUST
						SECOND FRI.						
						THIRD FRI.						
						FOURTH FRI.						
						FIFTH FRI.						
MARCH						FIRST FRI.						SEPTEMBER
						SECOND FRI.						
						THIRD FRI.						
						FOURTH FRI.						
						FIFTH FRI.						
APRIL						FIRST FRI.						OCTOBER
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MAY						FIRST FRI.						NOVEMBER
						SECOND FRI.						
						THIRD FRI.						
						FOURTH FRI.						
						FIFTH FRI.						
JUNE						FIRST FRI.						DECEMBER
						SECOND FRI.						
						THIRD FRI.						
						FOURTH FRI.						
						FIFTH FRI.						

SCHEDULE FOR SATURDAY

F	I	T	C	A	L
FEEL	INSPECT	TIGHTEN	CLEAN	ADJUST	LUBRICATE

1	2	3	4	5	6	7	8
ITEM NO.	OPER- ACTIONS	DESCRIPTION OF ITEMS	FIRST SAT.	SECOND SAT.	THIRD SAT.	FOURTH SAT.	FIFTH SAT.
12.		PREPARATORY STEPS—CONSOLE					
17	FI	ANTENNA DRIVE MOTOR					
18	FI	FILTER UNIT AND FAN					
19	I	CHASSIS OF CONSOLE					
25	I	POWER UNIT: SEE TM11-933					
26	L	LUBRICATION					

ASSIGNMENTS FOR SATURDAY

	9	10	11	12	13	14	9	10	11	12	13	
	ASSIGNMENTS			DISPOSITION	CHECKED BY		ASSIGNMENTS			DISPOSITION	CHECKED BY	
JANUARY						FIRST SAT.						JULY
						SECOND SAT.						
						THIRD SAT.						
						FOURTH SAT.						
						FIFTH SAT.						
FEBRUARY						FIRST SAT.						AUGUST
						SECOND SAT.						
						THIRD SAT.						
						FOURTH SAT.						
						FIFTH SAT.						
MARCH						FIRST SAT.						SEPTEMBER
						SECOND SAT.						
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APRIL						FIRST SAT.						OCTOBER
						SECOND SAT.						
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MAY						FIRST SAT.						NOVEMBER
						SECOND SAT.						
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						FIFTH SAT.						
JUNE						FIRST SAT.						DECEMBER
						SECOND SAT.						
						THIRD SAT.						
						FOURTH SAT.						
						FIFTH SAT.						

SCHEDULE FOR SUNDAY

F FEEL	I INSPECT	T TIGHTEN	C CLEAN	A ADJUST	L LUBRICATE	4	5	6	7	8
1	2	3								
ITEM NO.	OPERATIONS	DESCRIPTION OF ITEMS				WORK TO BE DONE				
20	FI	TENT AND ACCESSORIES				FIRST SUN.	SECOND SUN.	THIRD SUN.	FOURTH SUN.	FIFTH SUN.
21		PREPARATORY STEPS - MODULATOR								
22	IC	MODULATOR								
23	I	ANTENNA ASSEMBLY								
25	I	POWER UNIT: SEE TM11-933								
26	L	LUBRICATION								

ASSIGNMENTS FOR SUNDAY

	9	10	11	12	13	14	9	10	11	12	13
	ASSIGNMENTS			DISPOSITION	CHECKED BY		ASSIGNMENTS			DISPOSITION	CHECKED BY
JANUARY						FIRST SUN.					
						SECOND SUN.					
						THIRD SUN.					
						FOURTH SUN.					
						FIFTH SUN.					
FEBRUARY						FIRST SUN.					
						SECOND SUN.					
						THIRD SUN.					
						FOURTH SUN.					
						FIFTH SUN.					
MARCH						FIRST SUN.					
						SECOND SUN.					
						THIRD SUN.					
						FOURTH SUN.					
						FIFTH SUN.					
APRIL						FIRST SUN.					
						SECOND SUN.					
						THIRD SUN.					
						FOURTH SUN.					
						FIFTH SUN.					
MAY						FIRST SUN.					
						SECOND SUN.					
						THIRD SUN.					
						FOURTH SUN.					
						FIFTH SUN.					
JUNE						FIRST SUN.					
						SECOND SUN.					
						THIRD SUN.					
						FOURTH SUN.					
						FIFTH SUN.					

SECTION II

INDICATOR

39. ITEM 1. PREPARATORY STEPS.

a. Tools and Materials Needed.

- (1) Cleaning fluid, carbon tetrachloride.
- (2) Cloth, dry-clean.
- (3) Lamp and extension cord.
- (4) Pliers.
- (5) Sandpaper.
- (6) Screwdriver.
- (7) Soldering iron and solder.
- (8) Wrench, Allen.
- (9) Wrench, Bristol.
- (10) Wrench, open-end.
- (11) Wrench, socket.

b. Safety Precautions. FAILURE TO OBSERVE THE FOLLOWING WARNINGS MAY RESULT IN SERIOUS INJURY OR DEATH.

- (1) Be sure that all power is removed from the indicator by throwing the TRANSMITTER and MAIN POWER SUPPLY toggle switches to their OFF positions (fig. 3).
- (2) After the indicator chassis has been removed to the work bench, short circuit *all* capacitors whose terminals are mounted on insulated bushings. Use an insulated screwdriver.
- (3) Be careful not to strike the cathode-ray tubes. These highly evacuated vacuum tubes will shatter easily and may shower glass dangerously.
- (4) Avoid contact with the hot glass of the tubes for at least 10 minutes after the power has been turned OFF.

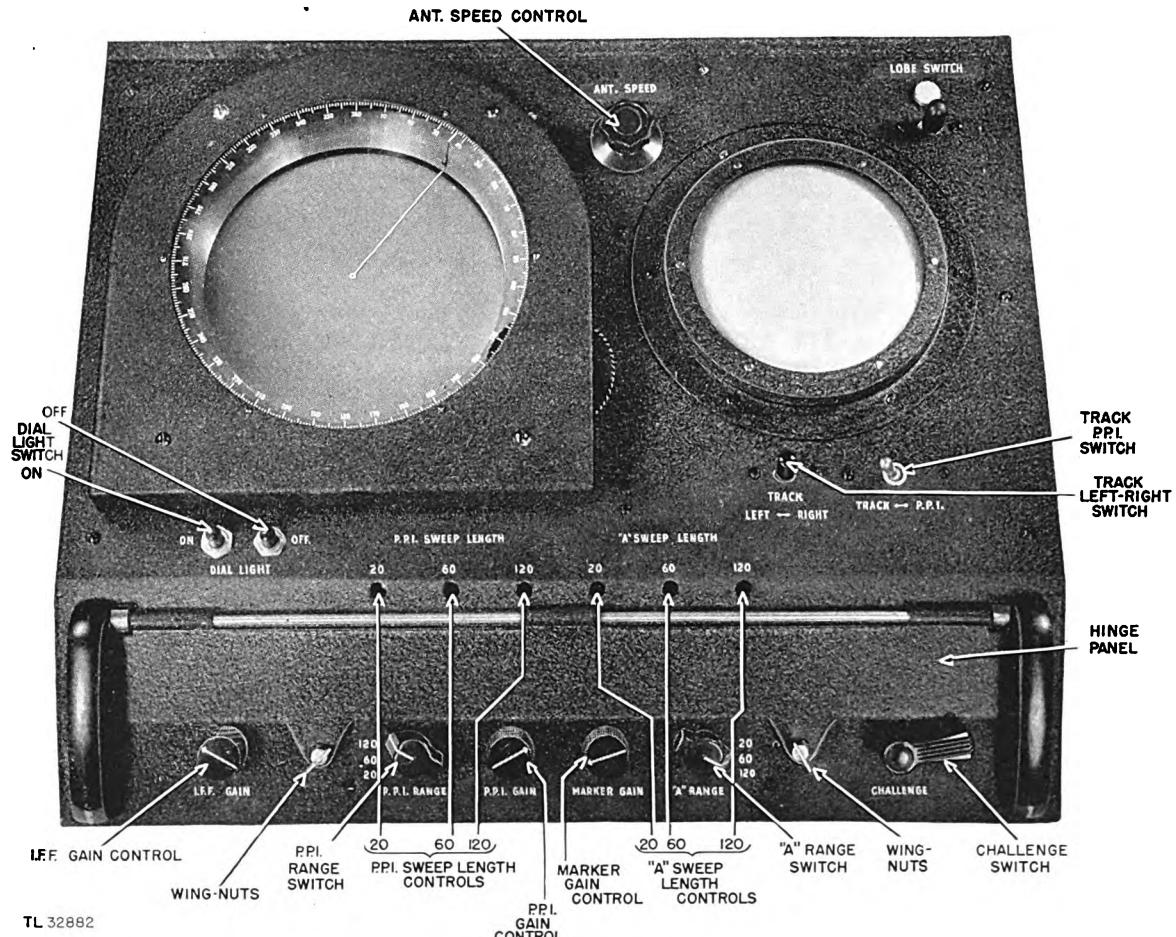


Figure 14. Indicator chassis, panel closed.

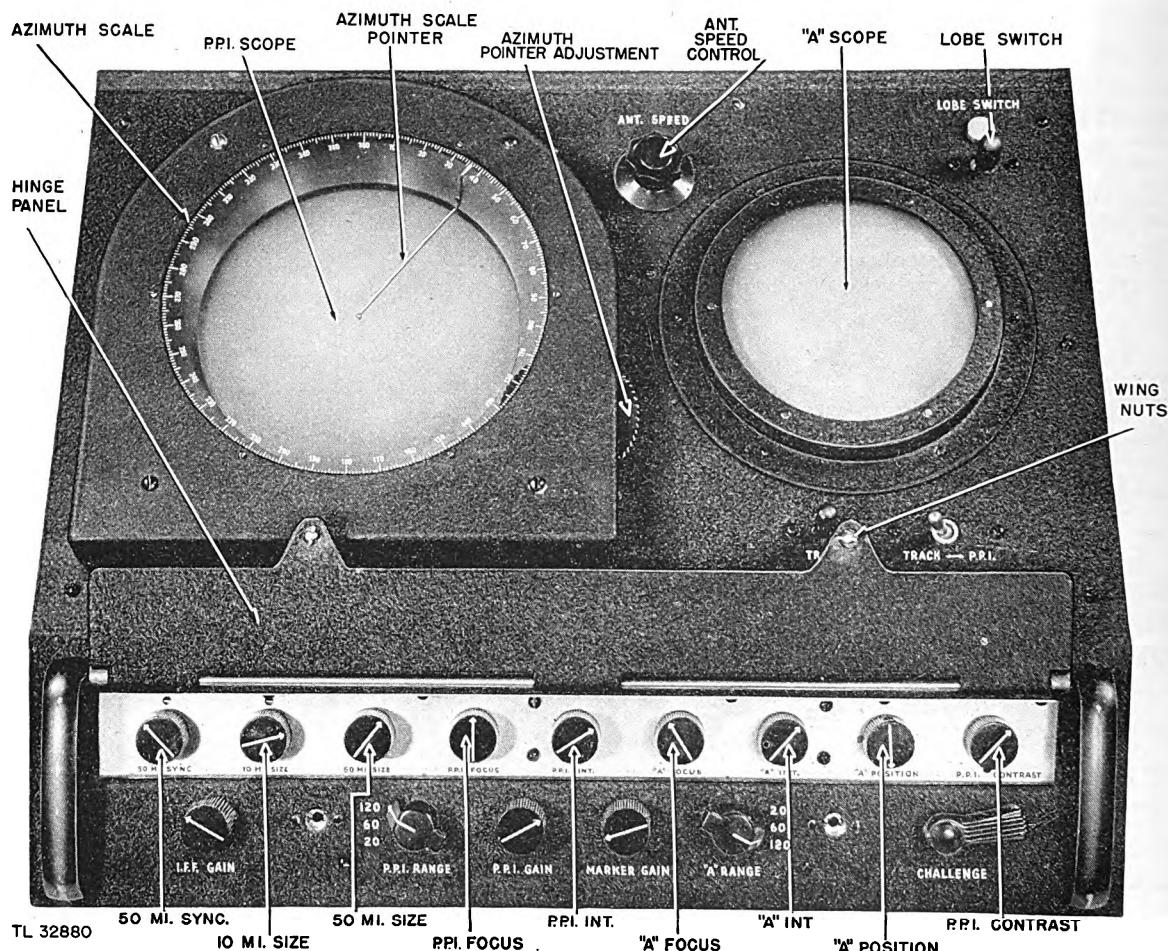


Figure 15. Indicator chassis, panel open.

(5) Avoid contact with the hot surface of the high wattage resistors R18, R24, R150, and R158, for at least 10 minutes after the power has been turned OFF.

c. Equipment Cautions.

(1) Handle the vacuum tubes carefully.

(2) Use the proper tools. The use of the proper tool for each operation will insure optimum results from the tools involved and the parts concerned.

(3) Tag all terminals when removing a part for cleaning, adjustment, repair, or replacement. Tag the terminals of the part as well as each of the cables or wires removed. This operation requires but little time, and serious trouble caused by incorrect reconnections is avoided.

(4) When removing parts, place every screw, washer, bolt, or small part into a container. This avoids possible loss or misplacement of these small parts.

(5) Employ care in handling the tools and parts in the unit. Be careful not to drop any part in the unit.

(6) Never use water for cleaning anything within the unit. The only cleaning agent to be used is carbon tetrachloride.

(7) Make sure that every terminal disconnected for inspection is properly and carefully reconnected. Tighten all nuts and screws securely. Be careful, however, not to exert too much force and strip threads or ruin connections.

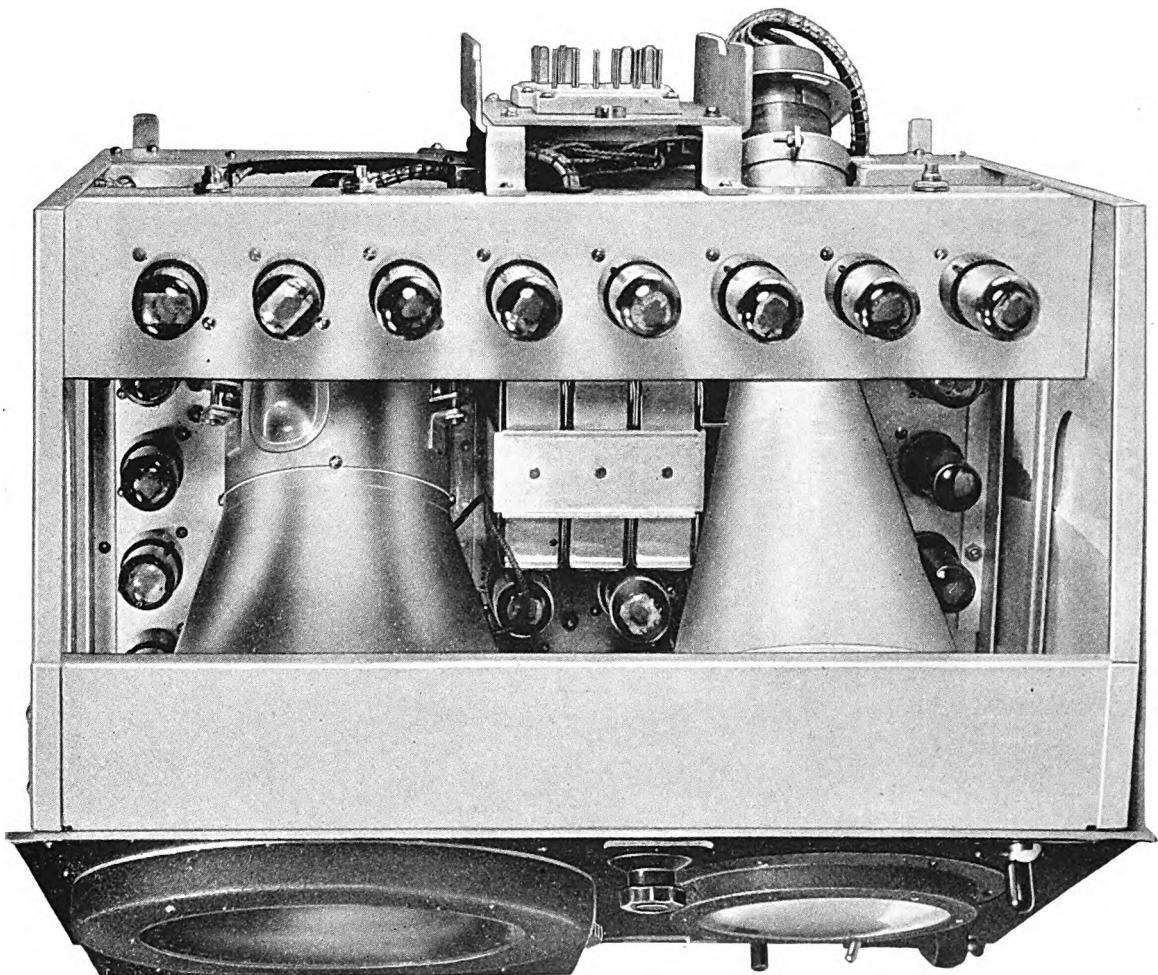
(8) Handle resistors and capacitors with pigtail connections carefully to avoid breaking off the fragile connections.

d. Location. See figures 2, 14, and 15.

e. Maintenance Procedure.

(1) To permit access to the indicator chassis:

- Grasp the handles.
- Pull the chassis out by sliding it carefully along its guide rails.



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Figure 16. Indicator chassis, top view.

(c) Place unit on work-bench.

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. The unit weighs 50 lbs. Be careful to hold it firmly.

WARNING: Avoid contact with the high-voltage capacitors within the unit until their terminals have been properly short-circuited.

(2) The various parts within the chassis of the indicator unit are now accessible for maintenance.

40. ITEM 2. TOP SIDE OF INDICATOR CHASSIS.

a. *Location.* See figure 16.

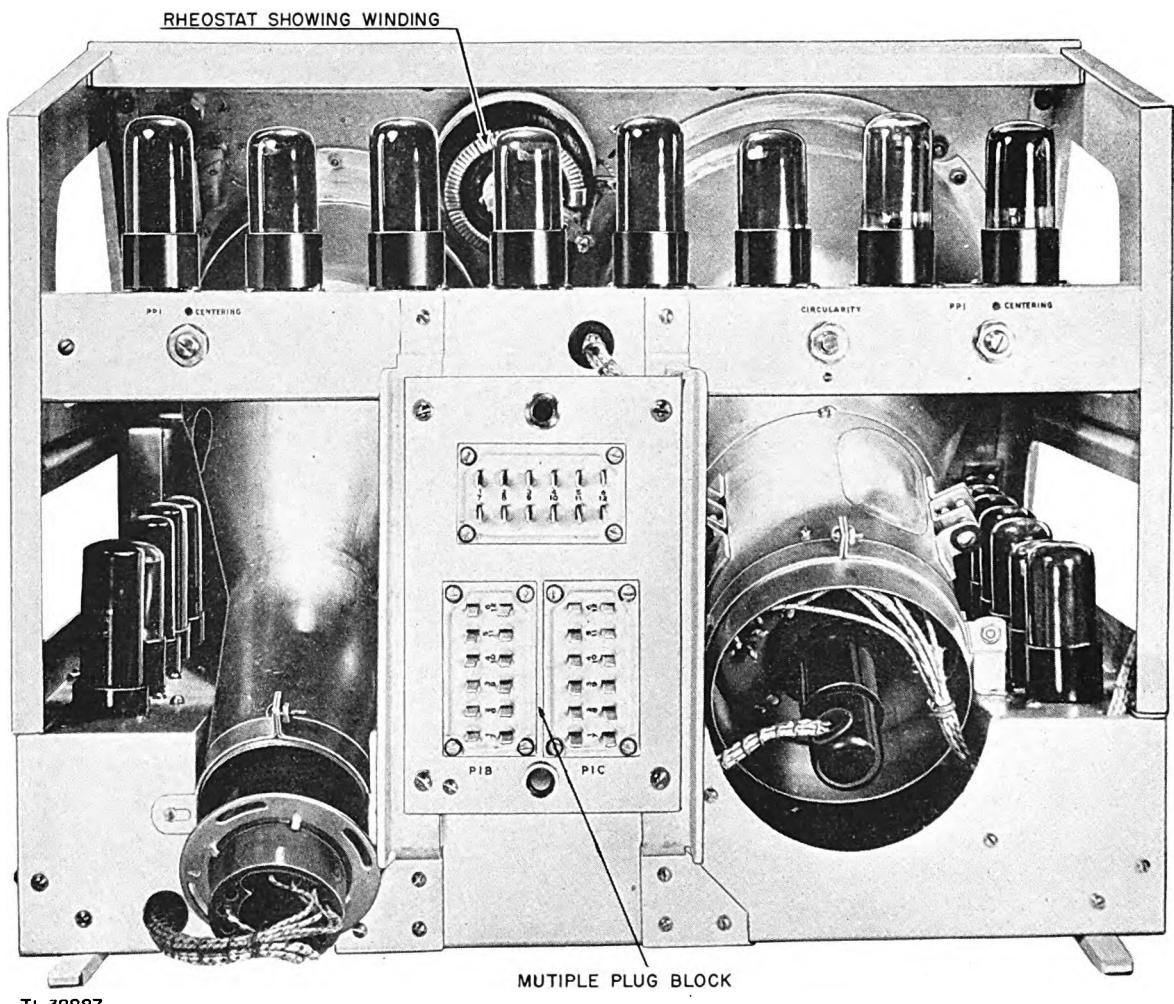
b. *Maintenance Procedure.*

INSPECT:

- (a) The tube envelopes for cleanliness.
- (b) The socket mounting screws for tightness.
- (c) The cathode ray tubes for:
 - 1. Cleanliness of shields.
 - 2. Tightness of shield mountings.
 - 3. Tightness of retaining ring screws.

NOTE: Do not disturb the setting of the "PPI" coil adjustment screws.

- (d) The "PPI" and "A" scope high-voltage anode leads for secure fastening.
- (e) The "PPI" and "A" scope sockets for tightness of mounting.
- (f) The connecting leads to the sockets of the "PPI" scope for proper soldering.
- (g) The cases of the capacitors for general condition.



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Figure 17. Indicator chassis, rear view.

- (h) The mounting clamp between capacitors C33 and C51 for tightness.
- (i) The capacitor C59 for:
 - 1. Cleanliness of case.
 - 2. Proper soldering of connecting leads. If access is difficult, examine visually.
- (j) The high-wattage resistors R18, R24, R150, and R158 for:
 - 1. General condition of coating. Examine for cracks, excessive discoloration, and excessive chipping. Make sure that the windings of the resistors are not exposed.
 - 2. Tightness of mounting bolts.
 - 3. Proper soldering of connecting leads.
- (k) The LOBE SWITCH (fig. 15) for:
 - 1. Mechanical operation.
 - 2. Condition of pilot light and socket.
 - 3. Condition of plastic insulating material.
 - 4. Proper soldering of connecting leads.
- (l) The TRACK LEFT-RIGHT switch (fig. 14) for:
 - 1. Mechanical operation.
 - 2. Proper soldering of connecting leads. If access is difficult, examine visually.
- (m) The "PPI"-TRACK switch (fig. 15) for:
 - 1. Mechanical operation.
 - 2. Proper soldering of connecting leads. If access is difficult, examine them visually.
- (n) The DIAL LIGHT OFF-ON switches for:
 - 1. Condition of insulating material.
 - 2. Proper soldering of connecting leads.
- (o) The case of coil L3 for cleanliness. Do not disturb the setting of the adjustment.
- (p) All potentiometers for:
 - 1. Cleanliness of case.
 - 2. Proper soldering of connecting leads.

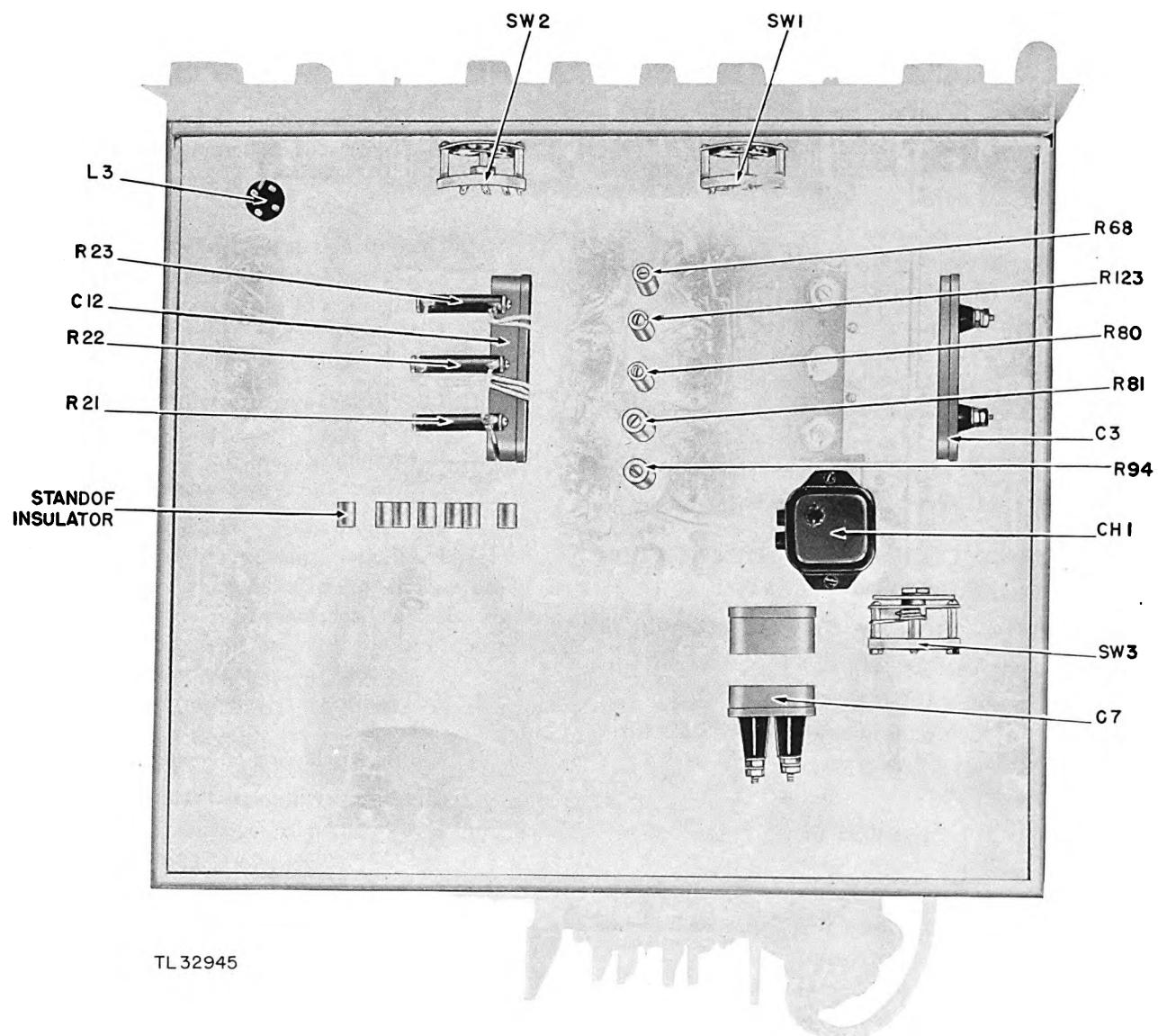


Figure 18. Underside of indicator chassis.

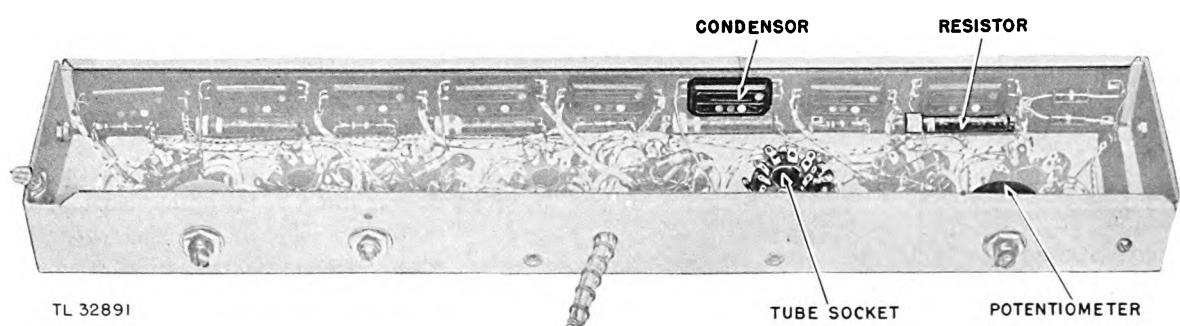


Figure 19. Indicator tube shelf, underside view.

- (q) The ANT. SPEED potentiometer (fig. 14) for:
 - 1. Mechanical operation.
 - 2. Cleanliness of windings and contacts.
 - 3. Adequate tension of movable contact.
 - 4. Proper soldering of connecting leads.
 - 5. General condition of insulating material.
- (r) The lock nuts of the "PPI" CENTER-ING and CIRCULARITY controls for tightness.
- (s) The multiple plug block for:
 - 1. Cleanliness of contacts.
 - 2. Tightness of mounting.
 - 3. General condition of insulating material.
 - 4. Proper soldering of connecting leads.
- (t) All cables and leads for general condition.

41. ITEM 3. UNDER SIDE OF INDICATOR TUBE SHELF.

a. *Location.* See figure 19.

b. *Maintenance Procedure.*

- (1) PREPARATORY STEPS. Access is permitted when the indicator chassis is placed on its side.
- (2) INSPECT:
 - (a) The tube sockets for:
 - 1. General condition.
 - 2. Proper soldering of connecting leads.
 - (b) The resistors and capacitors with pigtail connections for:
 - 1. Cleanliness.
 - 2. Proper soldering of connections.
 - (c) The potentiometers for:
 - 1. Cleanliness of cases.
 - 2. Proper soldering of connecting leads.
 - (d) The terminal strips for:
 - 1. General condition.
 - 2. Secure mounting of parts.
 - (e) The cables and leads for general condition.

42. ITEM 4. UNDER SIDE OF INDICATOR CHASSIS.

a. *Location.* See figure 18.

b. *Maintenance Procedure.*

INSPECT:

- (a) The tube sockets for:
 - 1. General condition.

- 2. Proper soldering of connecting leads.
- 3. Tightness of mountings.
- (b) Capacitors C3, C7, and C12 for:
 - 1. Cleanliness of case.
 - 2. Tightness of mounting clamps.
 - 3. Tightness of connections.
 - 4. Proper soldering of connecting leads to capacitor lugs.
- (c) The terminals of the capacitors for:
 - 1. Tightness of mountings.
 - 2. Tightness of connections.
 - 3. Proper soldering of connecting leads to capacitor lugs.
- (d) The resistors and capacitors with pigtail connections for:
 - 1. Cleanliness.
 - 2. Proper soldering of connections.
- (e) The high-wattage resistors for:
 - 1. General condition of coating. Examine for cracks, excessive discoloration, and excessive chipping. Make sure that the windings of the resistors are not exposed.
 - 2. Tightness of mounting screws and brackets.
 - 3. Proper soldering of connecting leads.
- (f) All resistors with pigtail connection for:
 - 1. Cleanliness.
 - 2. Proper soldering of connections.
- (g) The insulated capacitor bushings for general condition.
- (h) All stand-off insulators for general condition. Make sure the mountings are secure.
- (i) The rubber insulation of all the high-voltage leads for general condition.
- (j) The stand-off insulator clamp for tightness of mounting.
- (k) The "PPI" RANGE switch SW1 and "A" RANGE switch SW2 (fig. 18) for:
 - 1. Mechanical operation.
 - 2. Condition of insulating material.
 - 3. Tightness of mounting locknuts.
 - 4. Proper soldering of connecting leads.
- (l) The CHALLENGE switch SW3 (fig. 18) for:
 - 1. Mechanical operation. Be sure switch has sufficient tension to return to original position.

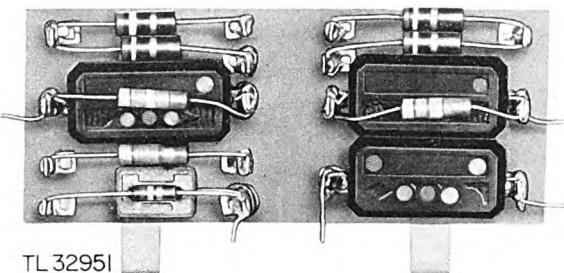


Figure 20. Indicator chassis terminal strip.

2. Cleanliness of connecting rod.
3. Tightness of mounting locknuts.
4. Tightness of coupling setscrews.
5. Tension of contact spring.
6. Condition of insulating material.
7. Proper soldering of connecting leads.

(m) Coils L1 and L2 for:

1. Cleanliness of windings.
2. Proper soldering of connecting leads. Avoid damaging the fragile windings.

(n) Coil L3 (fig. 18) for:

1. Tightness of mounting.
2. Proper soldering of connecting leads.

(o) The coil CH1 (fig. 18) for:

1. Cleanliness of case.
2. Tightness of mounting.
3. Proper soldering of connecting leads.

(p) Potentiometers R150, R153, R151, R152, R154 and R155 for tightness of locknut. Do not disturb the setting of the adjustments. The potentiometers R147 (I.F.F. GAIN), R8 ("PPI" GAIN), R40 (MARKER GAIN), R13 ("PPI" CONTRAST), R92 ("A" POSITION), R58 ("A" INT.), R60 ("A" FOCUS), R111 (PII INT.), R117 ("PPI" FOCUS), R42 (50 MI SIZE), R38 (10 MI SIZE) and R49 (50 MI SYNC) should be inspected for:

1. Mechanical operation.
2. Cleanliness of cases.
3. Tightness of mounting locknuts.
4. Proper soldering of connecting leads.

(q) The terminal strips (figs. 10 and 20) for:

1. General condition.
2. Secure mounting of parts.

(r) The cables and leads for general condition.

- (s) The shock absorbers for:
1. Tightness of mounting.
2. Evidence of excessive wear.

(t) The pilot lights PL1 and PL2 for:

1. General condition.
2. Tightness of sockets and mounting clamps.
3. Proper soldering of connecting leads.

(u) The guide rails for tightness of mounting.

43. ITEM 5. FRONT PANEL OF INDICATOR.

- a. Location. See figures 14 and 15.
- b. Maintenance Procedure.

INSPECT:

- (a) The plastic crystal faces of the "PPI" and "A" scopes for cleanliness.
- (b) The azimuth pointer rotating knob for mechanical operation.
- (c) The set screws of the potentiometer and switch knobs for tightness.
- (d) The assembly screws for tightness.
- (e) The rod of the control panel hinge for cleanliness. Open the panel and make sure that the hinges move freely.
- (f) The panel wing nuts for condition of pins.
- (g) The DIAL LIGHT OFF-ON switches for mechanical operation and tightness of locknut.

44. ITEM 6. CHASSIS OF INDICATOR.

- a. Location. See figures 16 and 17.
- b. Maintenance Procedure.

(1) INSPECT:

- (a) The assembly bolts for tightness.
- (b) The frame and floor of the chassis for cleanliness.

(2) FINAL WORK. Replace the indicator chassis. This completes the maintenance of the indicator unit.

SECTION III
RECEIVER

45. ITEM 7. PREPARATORY STEPS.

a. Tools and Materials Needed.

- (1) Cleaning fluid (carbon tetrachloride).
- (2) Cloth, dry-clean.
- (3) Lamp and extension cord.
- (4) Pliers.
- (5) Sandpaper, No. 0000.
- (6) Screwdriver.
- (7) Soldering iron and solder.
- (8) Wrench, Allen.
- (9) Wrench, Bristol.
- (10) Wrench, open-end.
- (11) Wrench, socket.

b. Safety Precautions. FAILURE TO OBSERVE THE FOLLOWING WARNINGS MAY RESULT IN SERIOUS INJURY OR DEATH.

- (1) Be sure that all power is removed from the receiver by throwing the TRANSMITTER and MAIN POWER SUPPLY toggle switches to their OFF positions. See figure 3.
- (2) After the receiver chassis has been removed to the work bench, short circuit *all* capacitors whose terminals are mounted on insulated bushings. Use an insulated screwdriver.
- (3) Avoid contact with the hot glass of the tubes for at least 10 minutes after the power has been turned OFF.
- (4) Avoid contact with the hot surface of the high-wattage resistors R265, R284, R286, and R285 for at least 10 minutes after the power has been turned off (fig. 21).

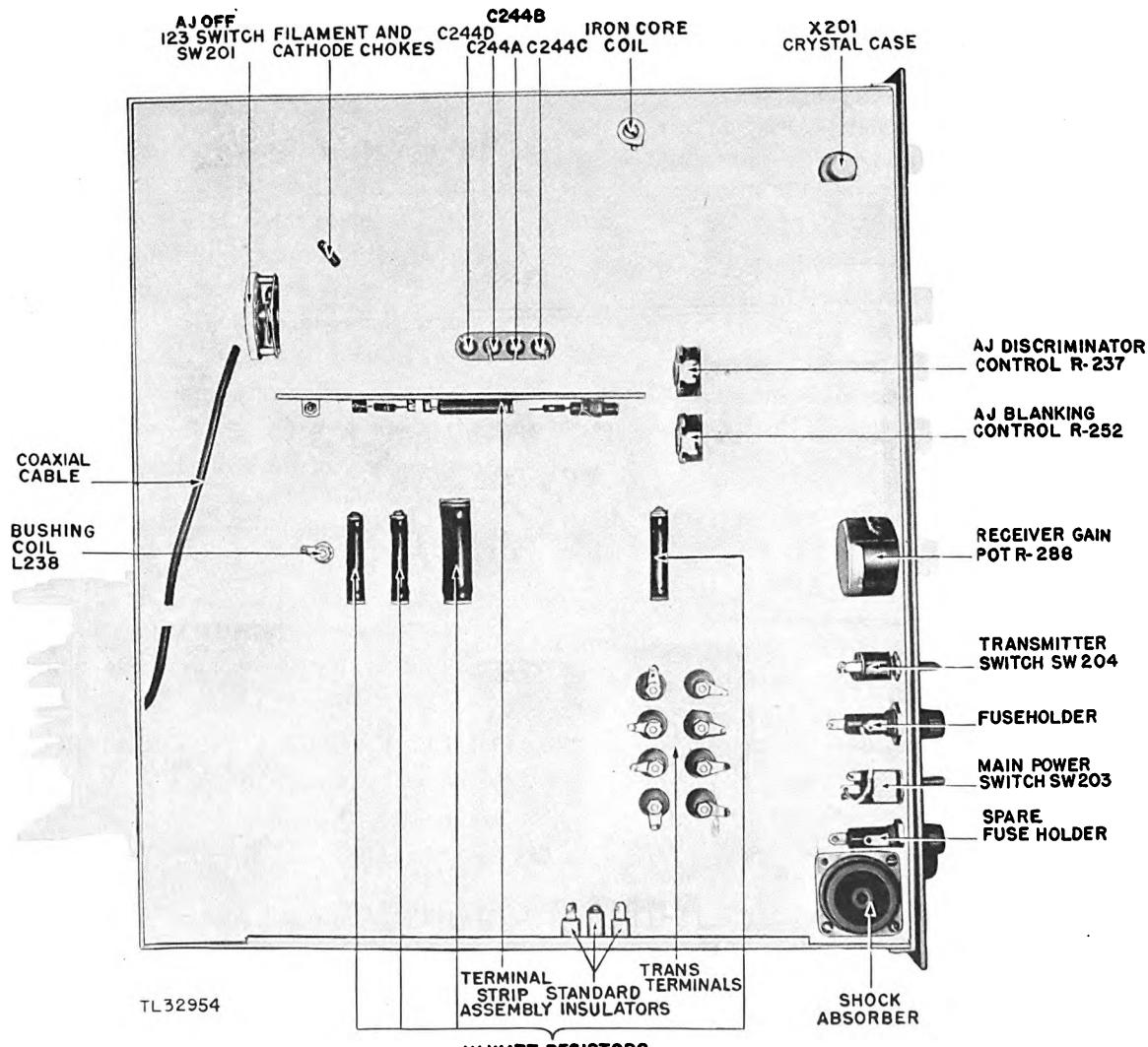


Figure 21. Underside of receiver chassis.

c. Equipment Cautions.

- (1) Handle the vacuum tubes carefully.
- (2) Use the proper tools. The use of the proper tools for each operation will insure optimum results from the tools involved and the parts concerned.
- (3) Tag all terminals when removing a part for cleaning, adjustment, repair, or replacement. Tag the terminals of the part as well as each of the cables or wires removed. This operation requires but little time, and serious trouble caused by incorrect reconnections is avoided.
- (4) When removing parts, place every screw, washer, bolt, or small part into a container. In this way possible loss or misplacement of small parts can be avoided.
- (5) Employ care in handling the tools and parts within the unit. Be careful not to drop any part in the unit.
- (6) Never use water for cleaning anything within the unit. The only cleaning agent which may be used is carbon tetrachloride.
- (7) Make sure that every terminal disconnected for inspection is properly and carefully reconnected. Tighten all nuts and screws securely. Be careful, however, not to exert too much force and strip threads or ruin the connections.
- (8) Handle resistors and capacitors with pigtail connections carefully to avoid breaking off the fragile connections.

d. Location. See figures 2 and 3.*e. Maintenance Procedure.*

PREPARATORY STEPS.

- (a) To permit access to the receiver chassis:
 1. Grasp the handles provided.
 2. Pull the chassis out by sliding it carefully along its guide rails.

NOTE: The unit is 50 lbs in weight. Be careful to hold it firmly.

3. Place unit on work-bench.

WARNING: Avoid contact with the high-voltage capacitors within the unit until their terminals have been properly short-circuited.

- (b) The various parts within the chassis of the receiver unit are now accessible for maintenance.

46. ITEM 8. TOP SIDE OF RECEIVER CHASSIS.

a. Location. See figure 9.*b. Maintenance Procedure.*

(1) FEEL:

- (a) The case of transformer T201 for evidence of overheating.
- (b) The case of coil L238 for evidence of overheating.

(2) INSPECT:

- (a) The tube envelopes for cleanliness.
- (b) The retaining rings of the glass tubes for tightness of mounting.
- (c) The tubes V219 and V220 for:
 1. Condition of caps and clips.
 2. Condition of insulation of cap.
 3. Proper soldering of connections within the tube clips.
 4. Condition of rubber lead.
 5. Cleanliness.
- (d) The cases of the capacitors for general condition.
- (e) The mica capacitor C291 (located across the terminals of the output meter M202) for:
 1. Cleanliness.
 2. Proper soldering of connecting leads.
- (f) The resistors with pigtail connections for:
 1. Cleanliness.
 2. Proper soldering of connections.
- (g) The Meter switch SW202 (fig. 9) for:
 1. Mechanical operation.
 2. Condition of insulating material.
 3. Cleanliness of contacts.
 4. Proper soldering of connecting leads.
- (h) The case of the r-f compartment and assembly (fig. 9) for:
 1. Cleanliness.
 2. Tightness of assembly bolts. Do not perform maintenance within the unit.
- (i) The small plate choke coils for:
 1. Cleanliness.
 2. Proper soldering of connecting leads.
- (j) The cases of transformer T201 and coil L238 for general condition (fig. 9).
- (k) The oscillator assembly and shield of tube V203 for:
 1. Cleanliness of case.
 2. Tightness of assembly screws.

NOTE: Do not perform maintenance within the unit.

- (l) The OSC. TUNING control shaft for:
 - 1. Mechanical operation.
 - 2. Condition of insulated rod.
 - 3. Tightness of coupling. Also make sure the case enclosing the oscillator tube is tight.
- (m) The terminals strips for:
 - 1. General condition.
 - 2. Secure mounting of parts.
- (n) The multiple plug block (fig. 9) for:
 - 1. Cleanliness of contacts.
 - 2. Tightness of mounting.
 - 3. General condition of insulating material.
 - 4. Proper soldering of connecting leads.
 - 5. Condition of connecting plug.
- (o) The three meters for:
 - 1. Condition of cases.
 - 2. Tightness of connecting leads.
 - 3. Proper soldering of connecting leads to lugs.
- (p) The cables and leads for general condition.

47. ITEM 9. UNDER SIDE OF RECEIVER CHASSIS.

a. *Location.* See figure 21.

b. *Maintenance Procedure.*

INSPECT:

- (a) The tube sockets for:
 - 1. General condition.
 - 2. Proper soldering of connecting leads.
 - 3. Tightness of mountings.
- (b) The capacitors for:
 - 1. Condition of insulated bushings.
 - 2. Tightness of mounting.
 - 3. Tightness of connections.
 - 4. Proper soldering of connecting leads to capacitor lugs.
- (c) The leads of capacitor C244 (A, B, C, and D) (fig. 21) for proper soldering.
- (d) The resistors and capacitors with pigtail connections (fig. 5) for:
 - 1. Cleanliness.
 - 2. Proper soldering of connections.
- (e) The high-wattage resistors R265, R284, R285, and R286 for:
 - 1. General condition of coating (fig. 21). Make sure that the windings of the resistors are not exposed. Ex-

- amine for cracks, excessive discoloration, and excessive chipping.
- 2. Tightness of mounting screws.
- 3. Proper soldering of connecting leads.
- (f) The fuse holders (fig. 21) for:
 - 1. Cleanliness.
 - 2. Tightness of locknut mounting.
 - 3. Proper soldering of connections.
- (g) All standoff insulators for general condition (fig. 21). Make sure the mountings are secure.
- (h) The bushings of coil L238 (fig. 21) for:
 - 1. Tightness of mounting nuts.
 - 2. Tightness of connecting leads.
 - 3. Proper soldering of connecting leads to the lugs.
- (i) The TRANSMITTER SW204 and the MAIN POWER SUPPLY SW203 toggle switches (fig. 21) for:
 - 1. Mechanical operation.
 - 2. Cleanliness of case.
 - 3. Proper soldering of connections.
- (j) The AJ OFF, 1-2-3 switch SW201 (fig. 21) for:
 - 1. Mechanical operation.
 - 2. Cleanliness of connecting rod.
 - 3. Tightness of coupling set screws.
 - 4. Condition of insulating material.
 - 5. Proper soldering of connections.
- (k) The lower side of the oscillator assembly (fig. 21) for cleanliness. Do not disturb the setting of the adjustments.
- (l) The case of crystal X201 (fig. 21) for cleanliness.
- (m) The transformer terminals (fig. 21) for:
 - 1. Condition of insulated bushings.
 - 2. Tightness of mounting.
 - 3. Tightness of connections.
 - 4. Proper soldering of connecting leads to lugs.
- (n) All the iron-core coils (fig. 21) for:
 - 1. General condition of insulation.
 - 2. Cleanliness of windings.
 - 3. Do not disturb the setting of the adjustments.
- (o) All small filament and cathode choke coils for:
 - 1. Cleanliness of winding.
 - 2. Proper soldering of connecting leads.
 - 3. Handle the fragile coil windings most carefully.

- (p) The AJ DISCRIMINATOR R252 and the AJ BLANKING R237 controls (fig. 21) for:
 1. Mechanical operation.
 2. Cleanliness of connecting rods.
 3. Tightness of locknuts.
 4. Cleanliness of cases.
 5. Proper soldering of connecting leads.
 6. Tightness of mounting bracket.
- (q) The RECEIVER GAIN potentiometer R288 (fig. 21) for:
 1. Mechanical operation.
 2. Cleanliness of case.
 3. Proper soldering of connecting leads.
- (r) The terminal strips (fig. 21) for:
 1. Tightness of mounting.
 2. Proper soldering of connections.
- (s) The cables and leads for general condition.
- (t) The ground connections for security of fastening to chassis.
- (u) All connecting leads to the ground connections for proper soldering.
- (v) The shock absorbers (fig. 21) for:
 1. Tightness of mounting.
 2. Evidence of excessive wear.
- (w) The guide rails for tightness of mounting.

48. ITEM 10. FRONT PANEL OF RECEIVER.*a. Location.* See figure 3.*b. Maintenance Procedure.***INSPECT:**

- (a) The fuses for general condition.
- (b) The lock nuts of the toggle switches for tightness.
- (c) The set screws of the potentiometer knobs for tightness.
- (d) The assembly screws for tightness.
- (e) The meters for accuracy of zero setting.

49. ITEM 11. CHASSIS OF RECEIVER.*a. Location.* See figure 9.*b. Maintenance Procedure.***(1) INSPECT:**

- (a) The assembly bolts for tightness.
- (b) The frame and floor of the chassis for cleanliness.

(2) FINAL WORK. Replace the receiver chassis. This completes the maintenance on the receiver unit.

SECTION IV
CONSOLE

50. ITEM 12. PREPARATORY STEPS.

a. Tools and Materials Needed (fig. 13).

- (1) Cleaning fluid, carbon tetrachloride.
- (2) Cloth, dry-clean.
- (3) Flashlight.
- (4) Pliers.
- (5) Sandpaper.
- (6) Screwdriver.
- (7) Soldering iron and solder.
- (8) Wrench, Allen.
- (9) Wrench, Bristol.
- (10) Wrench, open-end.
- (11) Wrench, socket.
- (12) Vaseline.

b. Safety Precautions. FAILURE TO OBSERVE THE FOLLOWING WARNINGS MAY RESULT IN SERIOUS INJURY OR DEATH.

- (1) Throw the TRANSMITTER and MAIN POWER SUPPLY toggle switches to their OFF (fig. 13) positions.
- (2) Be sure that all power is removed from the equipment by shutting off the power unit. Hold down the stop-button on the carburetor until the engine stops (fig. 4).
- (3) Remove the short modulator cable from the generator head (fig. 4). Carefully short-circuit the inner and outer conductors of the cable.
- (4) Avoid contact with the high-voltage capacitors within the indicator and receiver chassis (figs. 18 and 21).

c. Equipment Cautions.

- (1) Use the proper tools. The use of the proper tools for each operation will insure optimum results from the tools involved and the parts concerned.
- (2) Tag all terminals when removing a part for cleaning, adjustment, repair, or replacement. Tag the terminals of the part as well as each of the cables or wires removed. This operation requires but little time and serious trouble caused by incorrect reconnections is avoided.
- (3) When removing parts, place every screw, washer, bolt, or small part into a container. Possible loss or misplacement of these small parts is thus avoided.

- (4) Employ care in handling the tools and parts within the unit. Be careful not to drop any part into the unit. Avoid possible short circuits and other difficulties.
- (5) Never use water for cleaning anything within the unit. The only cleaning agent which may be used is carbon tetrachloride.
- (6) Make sure that every terminal disconnected for inspection is properly and carefully reconnected. Tighten all nuts and screws securely, but be careful not to exert too much force. Avoid stripping threads or ruining the connections.
- (7) Handle resistors and capacitors with pigtail connections carefully to avoid breaking off the fragile connections.

d. Location. See figure 13.

e. Maintenance Procedure.

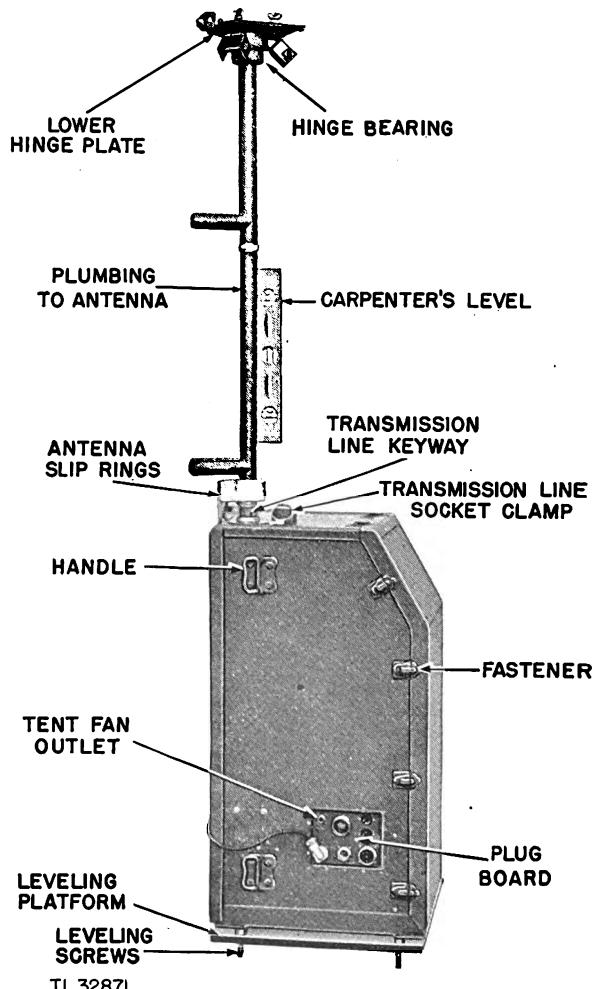


Figure 22. Console in the leveling position.

PREPARATORY STEPS

(a) To permit access to the various parts within the chassis.

1. Remove the indicator chassis by grasping the handles (fig. 14) provided and pulling the chassis out carefully by sliding it along the guide rails.

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.

2. Remove the receiver chassis in similar fashion (fig. 3). These units are each 50 lb in weight. Be careful!

WARNING: Avoid contact with the high-voltage capacitors within these units.

3. Remove the filter plate by loosening the four fasteners.

- (b) The various parts within the chassis of the console are now accessible for maintenance.

51. ITEM 13. PLUG BOARD.

a. *Location.* See figures 13 and 22.

b. *Maintenance Procedure.*

INSPECT

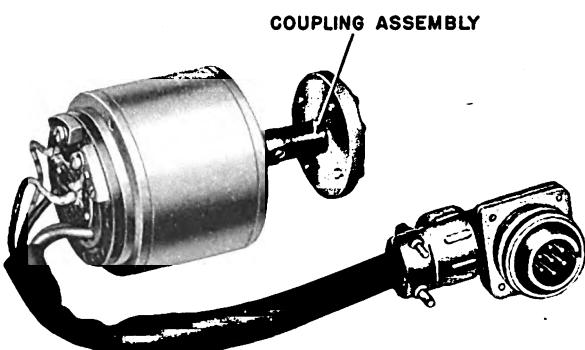
- (a) The plug board (fig. 22) for:

1. Tightness of plug mountings.
2. Proper soldering of connecting leads.
3. Tightness of mounting.

- (b) The fuse box for:

1. Cleanliness.
2. Condition of fuses. Make sure that the clips are secure. Make sure that cover is replaced in position, and that the locking clip is closed.

- (c) Make sure that all plugs are securely in position.



TL32861

Figure 23. Selsyn transformer.

52. ITEM 14. PULSE TRANSFORMER.

a. *Location.* See figure 13.

b. *Maintenance Procedure.*

- (1) FEEL: The case of the transformer for evidence of overheating.

(2) INSPECT:

- (a) The transformer for:

1. Cleanliness of case.
2. Tightness of mounting.
3. Proper soldering of connecting leads.
4. Tightness of assembly bolts.
5. Tightness of connecting cable.

53. ITEM 15. TRANSMITTER.

a. *Location.* See figure 13.

b. *Maintenance Procedure.*

- (1) FEEL: The transmitter blower motor (fig. 13) for evidence of overheating.

(2) INSPECT:

- (a) The transmitter (fig. 13) for:

1. Cleanliness of case.
2. Cleanliness of coupling between pulse transformer and transmitter.
3. Tightness of assembly screw.
4. Tightness of mounting.
5. Tightness of thumb screw in coupling between pulse transformer and transmitter.

- (b) The fan assembly (fig. 13) for:

1. Cleanliness of case.
2. Tightness of assembly bolts.

- (c) The transmitter blower motor for:

1. Cleanliness of case.
2. Tightness of assembly bolts.
3. Condition of brushes. Brushes are to be replaced when worn down to less than $\frac{1}{16}$ of an inch in length. Generally, brushes should be replaced every 1000 operating hours.

54. ITEM 16. SELSYN TRANSFORMER.

a. *Location.* See figures 23 and 24.

b. *Maintenance Procedure.*

INSPECT: The selsyn transformer for:

- (a) Tightness of retaining mounting ring.
- (b) Cleanliness of case.

55. ITEM 17. ANTENNA DRIVE MOTOR.

a. *Location.* See figs. 7 and 13.

b. *Maintenance Procedure.*

- (1) FEEL: The case of the antenna drive motor for evidence of overheating.

(2) INSPECT:

- (a) The antenna drive motor for:
 - 1. Cleanliness of case.
 - 2. Tightness of mounting bracket.
 - 3. Tightness of cable connecting plug.
 - 4. Condition of gear teeth.
- 5. Condition of brushes. Brushes are to be replaced when worn down to less than $\frac{3}{16}$ of an inch in length. Generally brushes should be replaced every 1000 hours of operation.
- (b) The gear train for condition of the links. Make sure that the chain is adequately taut. To tighten the chain, loosen the three nuts which hold the gear box and motor to the bearing plate, and move motor and gear box assembly to the right. Tighten the three nuts. Two men are necessary for this operation. Lubricate the chain with vaseline.
- (c) The gear coupling of antenna for condition of teeth.
- (3) REMARKS. Some of the types of drive motors used require special lubrication. These require filling of oil holes with special lubricant provided.

56. ITEM 18. FILTER UNIT AND FAN.

a. *Location.* See figure 6.b. *Maintenance Procedure.*

- (1) PREPARATORY STEPS. To permit access to the filter, remove the screws which hold the filter to the wooden mounting of the fan assembly.
- (2) FEEL: The case of the console blower motor for evidence of overheating.
- (3) INSPECT:
 - (a) The fan blades for mechanical operation.
 - (b) The fan blades for cleanliness.
 - (c) The filter unit. Note whether or not light can be seen through the filter. If not, replacement is necessary. If old filter unit is replaced, place cleaner side closest to fan.
 - (d) The case of the blower motor for cleanliness.
 - (e) The coupling screw between the fan and motor for tightness.
 - (f) The motor mounting is the bracket for tightness.
- (g) The condition of the brushes. Brushes are to be replaced if they are worn to a length of $\frac{3}{16}$ of an inch. Generally brushes should be replaced every 1000 hours of operation.

57. ITEM 19. CHASSIS OF CONSOLE.

a. *Location.* See figure 13.b. *Maintenance Procedure.*

(1) INSPECT:

- (a) The plumbing within the console (fig. 24) for cleanliness.
- (b) The plumbing within the console for tightness of mounting. Do not disturb the setting of any adjustments.
- (c) All plugs for general condition. Make sure the mountings are tight.
- (d) All cables and leads for general condition.
- (e) The cables for condition of rubber insulation.
- (f) The guide rails for cleanliness. Make sure the mountings are tight.
- (g) The ground clamp located between the pulse transformer and transmitter for tightness. Note the condition of the braid (fig. 13).
- (h) All assembly bolts for tightness.
- (i) The handle hinges and fasteners of the console for cleanliness. Make sure the handle hinges and fasteners are properly lubricated with vaseline (fig. 22).
- (j) The framework of the console for cleanliness.
- (k) The dust covers of the console for cleanliness.
- (l) The interconnecting cables between console, generator, and modulator for general condition (fig. 4).
- (m) The console for leveling (fig. 22).

(2) FINAL WORK:

- (a) Replace the cable between the modulator and generator (fig. 4).
- (b) Replace the receiver and indicator chassis.
- (c) Replace the filter unit.
- (d) This completes the maintenance on the console.

**58. ITEM 20. TENT AND ACCESSORIES
(Fig. 1).**

a. Tools and Materials Needed.

- (a) Cloth, dry and clean.
- (b) Hammer.
- (c) Screwdriver.
- (d) Wrench, Allen.

b. Safety Precaution. Be sure that the tent fan power plug is disconnected from the console (fig. 22).

c. Location. See figure 1.

d. Maintenance Procedure.

(1) **FEEL:** The case of the tent blower motor for evidence of overheating.

(2) **INSPECT:**

- (a) The tent blower motor (fig. 8) for:
 1. Mechanical operation of fan blades.
 2. Tightness of coupling screw between fan and motor.
 3. Cleanliness of fan blades.
 4. Cleanliness of the motor case.
 5. Condition of the motor brushes.

- (b) The canvas shelter for cleanliness.
- (c) The stakes, ropes, and poles for security of fastening.
- (d) The condition of the drainage trench around the tent.
- (e) The deadmen for security of support.
- (f) The guy wires for cleanliness and tautness. Make sure no undue stress is put on the antenna assembly.

**59. ITEM 21. PREPARATORY STEPS—
MODULATOR.**

a. Tools and Materials Needed.

- (1) Cleaning fluid, carbon tetrachloride.
- (2) Cloth, dry and clean.
- (3) Crocus cloth.
- (4) Pliers.
- (5) Sandpaper, No. 0000.
- (6) Screwdriver.
- (7) Soldering iron and solder.
- (8) Wrench, open-end.
- (9) Wrench, socket.

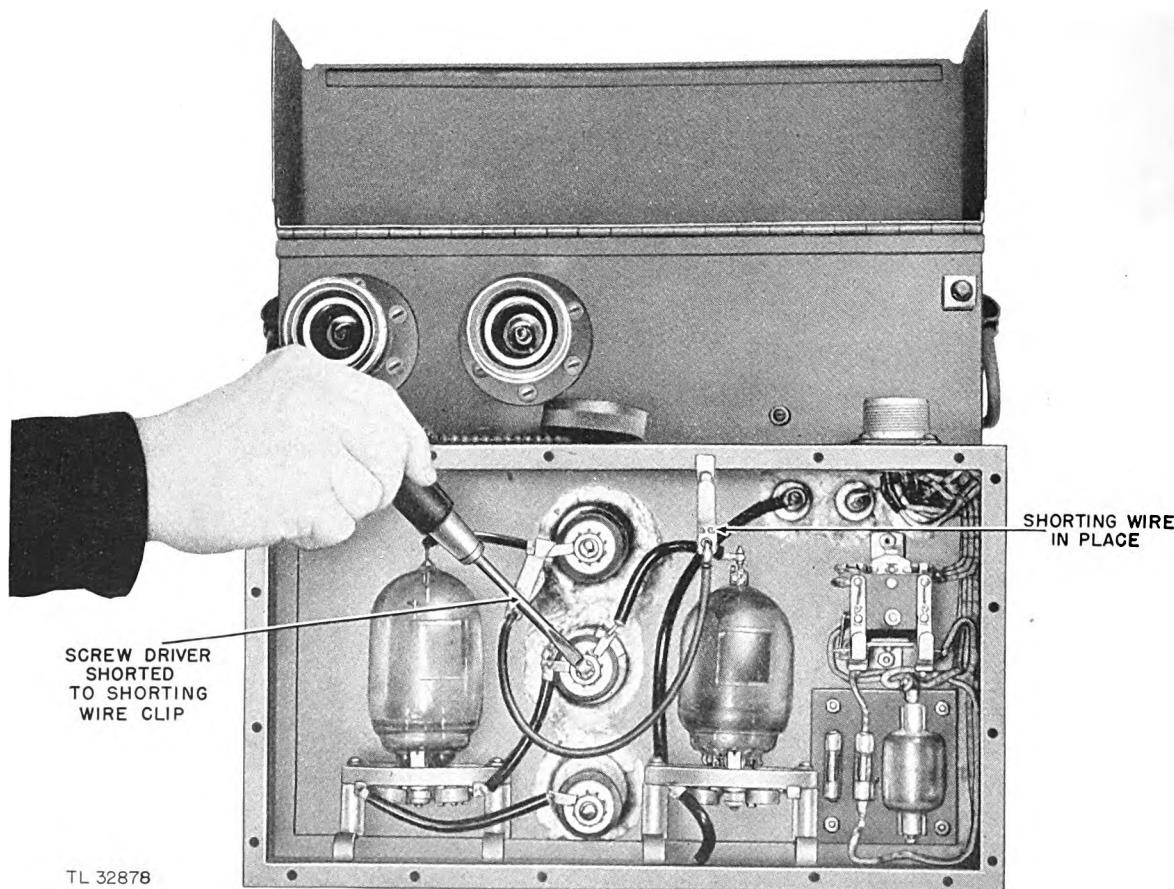


Figure 25. Method of discharging modulator capacitors.

b. Safety Precautions. FAILURE TO OBSERVE THE FOLLOWING WARNINGS MAY RESULT IN SERIOUS INJURY OR DEATH.

- (1) Be sure that all power is removed from the equipment by shutting off the power unit. Hold down the stop button on the carburetor head until the engine stops (fig. 4).
- (2) Remove the short modulator cable from the generator head (fig. 4). Carefully short circuit the inner and outer conductors of the cable. After the modulator plate is removed, connect the shorting clip *first* to ground and then connect the clip to the plate of one of the tubes. Then short the filament terminals of the rectifier tubes to ground with an insulated screwdriver. Be careful to hold the screwdriver only by the insulated handle (fig. 25).

c. Equipment Cautions.

- (1) Handle the vacuum tubes carefully.

- (2) Use the proper tools. The use of the proper tool for each operation will insure optimum results from the tools involved and the parts concerned.
- (3) Tag all terminals when removing a part for cleaning, adjusting, repair, or replacement. Tag the terminals of the parts as well as each of the cables or wires removed. This operation requires but little time and serious trouble caused by incorrect reconnections is avoided.
- (4) When removing parts, place every screw, washer, bolt, or small part into a container. Possible loss or misplacement of these small parts is thus avoided.
- (5) Employ care in handling the tools and parts within the unit. Be careful not to drop any part into the unit. Avoid possible short circuits and other difficulties.
- (6) Never use water for cleaning anything within the unit. The only cleaning agent which may be used is carbon tetrachloride.

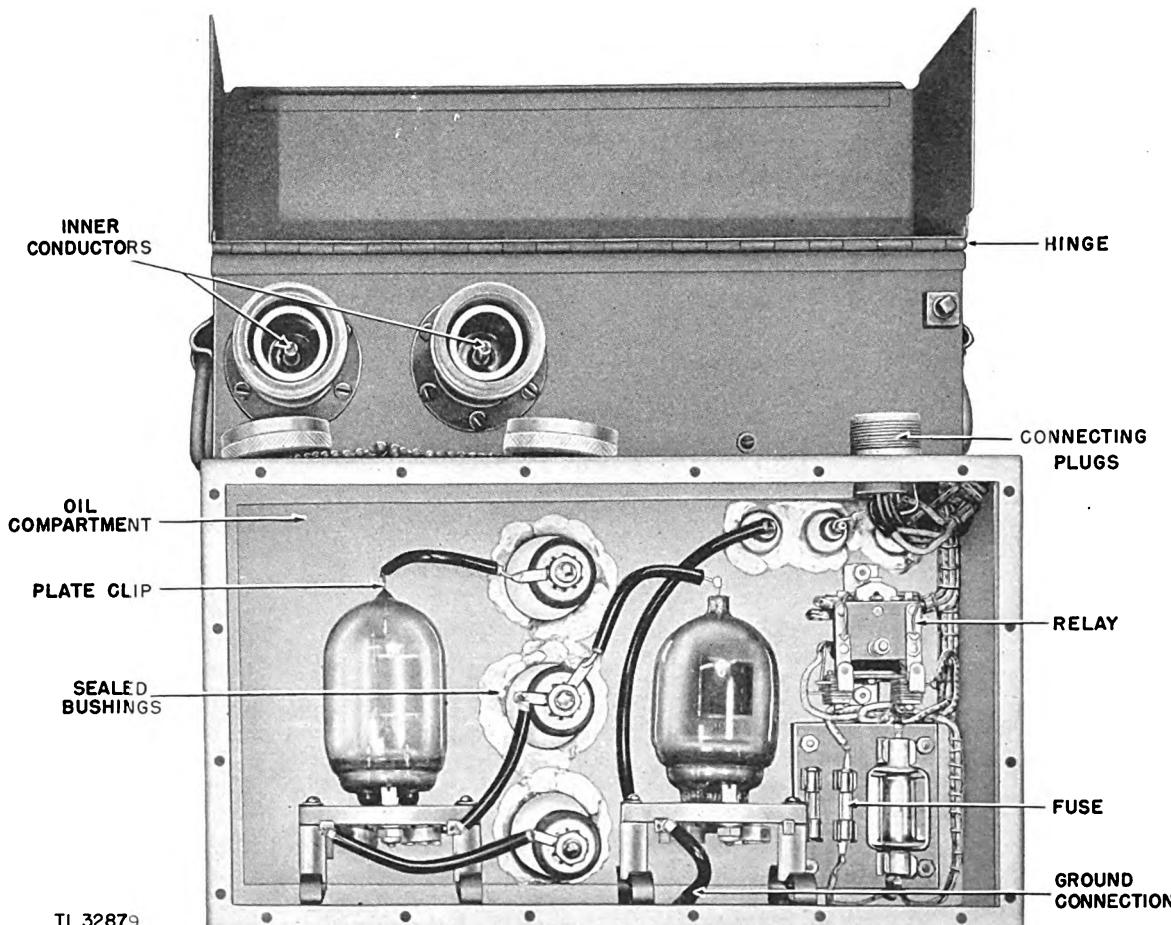


Figure 26. Modulator box with front cover removed.

- (7) Make sure that every terminal disconnected for inspection is properly and carefully reconnected. Tighten all nuts and screws securely, but be careful not to exert too much pressure. Avoid stripping the threads or ruining the connections.
- (8) Do not perform maintenance within the oil-filled chamber of the modulator. Do not disturb the oil-filler plug provided.

d. Location. See figure 4.

e. Maintenance Procedure. To permit access to the air-tight, water-tight, modulator compartment, carefully remove the cover plate. Avoid damaging the cork gasket. Maintenance within the modulator air compartment is now permitted.

60. ITEM 22. MODULATOR.

a. Location. See figure 4.

b. Maintenance Procedure.

(1) **INSPECT:**

- (a) The tube envelopes for cleanliness.
- (b) The tube sockets for tightness of mounting.
- (c) The tube plate grids for security of fastening.
- (d) The sealed bushings for proper soldering (fig. 26). Examine insulation for general condition.

NOTE: If soldering is necessary, notify the person-in-charge.

- (e) The ground connection for tightness.
- (f) The assembly bolts for tightness.

- (g) The relay (fig. 26) for:
 - 1. Freedom from dirt or dust.
 - 2. Cleanliness of contacts.
 - 3. Proper tension of springs.
 - 4. Mechanical operation.
 - 5. Proper soldering of connecting leads
 - 6. Security of assembly mounting.

(h) The fuses and clips for general condition (fig. 26).

(i) The exterior of the case for:

- 1. Cleanliness.
- 2. Tightness of connecting plugs.
- 3. Mechanical operation of hinges on plug covers.
- 4. Possible oil leaks from oil compartment.

(2) **CLEAN:**

(a) The relay contacts if they show signs of pitting or corrosion. Use a crocus cloth if necessary. Remove all dirt particles with a small brush. Exercise extreme care to avoid bending the contacts or breaking the connections.

(b) The exterior of the relay with a dry cloth (fig. 26). If necessary, dip cloth in carbon tetrachloride. Make sure surface is wiped clean and dry.

NOTE: Avoid adjusting or changing the settings of the relay (fig. 26).

(3) **FINAL WORK.** Carefully replace gasket and modulator cover. This completes the maintenance on the modulator unit.

SECTION V

ANTENNA ASSEMBLY

61. ITEM 23. ANTENNA ASSEMBLY.

a. Tools and Materials Needed.

- (1) Cleaning fluid, carbon tetrachloride.
- (2) Cloth, dry and clean.
- (3) Ladder.
- (4) Pliers.
- (5) Sandpaper.
- (6) Screwdriver.

b. Safety Precautions.

(1) Be sure that all power is removed from the antenna assembly by throwing the TRANSMITTER and MAIN POWER SUPPLY toggle switches to their OFF position (fig. 3).

(2) Exercise due caution when performing maintenance above the ground level. Make sure that the ladder used is secure.

c. Equipment Cautions. Handle the inner conductors of the coaxial transmission line most carefully (fig. 11).

d. Location. See figure 1.

e. Maintenance Procedure.

INSPECT:

- (a) The plumbing between the antenna assembly and the console for cleanliness (fig. 22).
- (b) The guy wires for security of fastening (fig. 1).
- (c) The assembly bolts and screws for tightness.

(d) The mountings for tightness.

• (e) The reflector wire of the parabola for cleanliness (fig. 1).

(f) The dipole for cleanliness. Make sure that the knurled knobs which hold the dipole secure to the antenna assembly are tight.

(g) The paraboloid bracing wires for tightness.

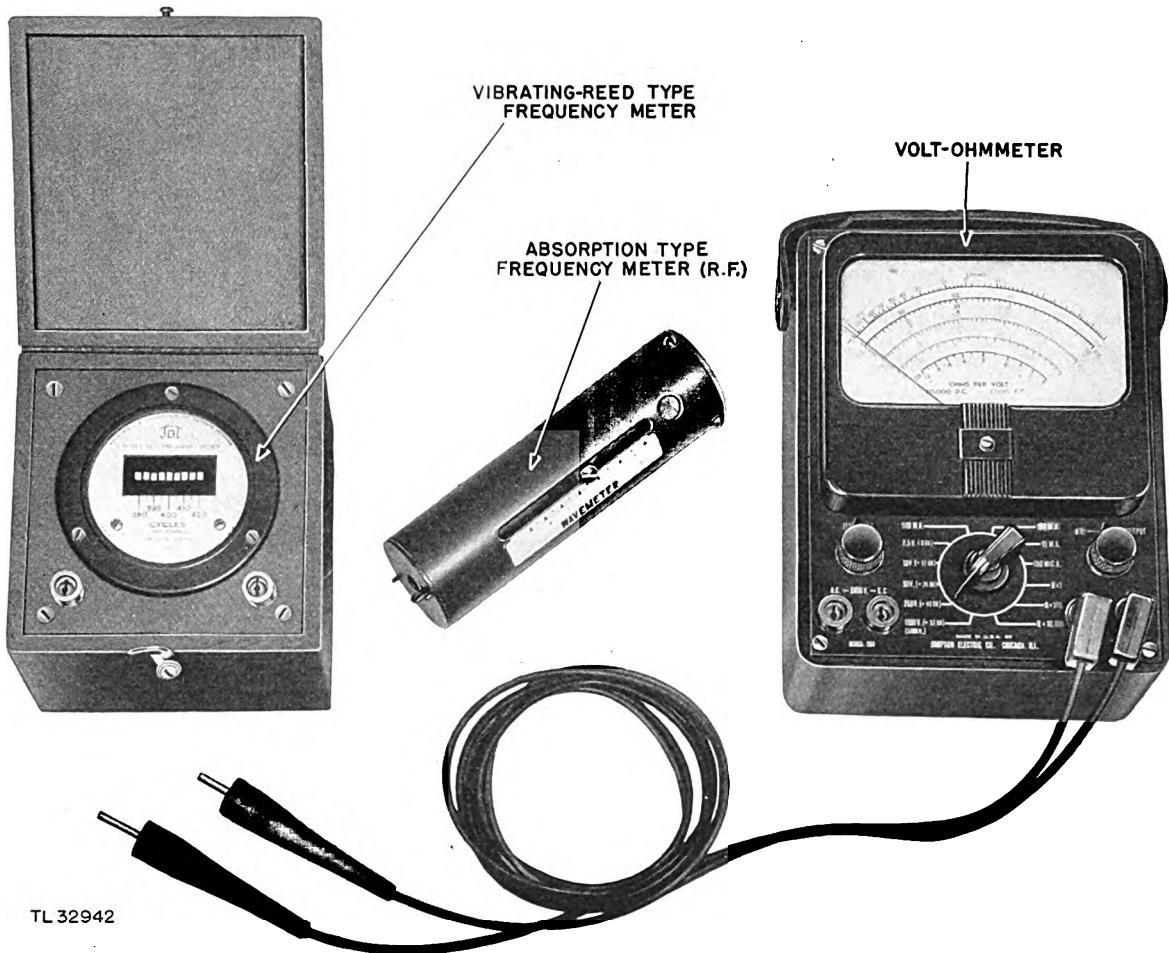


Figure 27. Test equipment.

SECTION VI TEST EQUIPMENT

62. ITEM 24. TEST EQUIPMENT.

a. Tools and Materials Needed.

- (1) Soldering iron and solder.
- (2) Tape, friction.

b. *Equipment Cautions.* Maintenance is not to be performed within the test equipment meter cases.

c. Location. See figure 27.

d. Maintenance Procedure.

INSPECT:

- (a) The test instrument leads (fig. 27) for:
 - 1. Condition of insulation.
 - 2. Cleanliness of clips.
- (b) The test instruments (fig. 27) for:
 - 1. Cleanliness of case.
 - 2. Tightness of assembly.
- (c) The supplementary patch cords (fig. 12) for:
 - 1. Condition of insulation of cable and plugs.
 - 2. Cleanliness of clips.

SECTION VII POWER UNIT PU-6/TPS-1

63. ITEM 25. POWER UNIT.

a. The details for the maintenance of Power Unit PU-6/TPS-1 are described in TM 11-933. The frequency at which these inspections are to be made depends on the location and the number of hours of operation of the power unit. The inspection schedule is divided into periods of: Daily, 100 hours, 150

hours, 200 hours, 350 hours, 500 hours, 700 hours, and 1500 hours.

b. Lubrication for the entire unit is furnished through oil mixed with gasoline. The cam wiper is oiled externally.

c. The spark plug and adapter are to be cleaned every day and whenever the engine does not start or perform properly. See TM 11-933 for details.

SECTION VIII LUBRICATION

64. ITEM 26. LUBRICATION.

a. Tools and Materials Needed.

- (1) Brush.
- (2) Cleaning fluid, carbon tetrachloride.
- (3) Cloth, dry and clean.
- (4) Cloth, oily.
- (5) Grease, general purpose No. 0 or No. 1.
- (6) Grease, general purpose No. 2.
- (7) Grease, lubricating No. AXS-637.
- (8) Oil, engine, SAE 10 to 30.
- (9) Oil, lubricating (special preservative) No. AXS-777.

b. *Safety Precaution.* Make sure that all power is removed from the equipment.

c. Location. See figures 1, 22, and 24.

d. Maintenance Procedure.

NOTE: Lubrication of the antenna drive system is a most important operation. A schedule for lubrication of the system is indicated below. The antenna drive system consists of a motor, a rotation gear box, a sprocket and chain and the antenna mast. The mast is held in position by three sets of ball bearings, one of which is exposed. Lubrication of these three sets of ball bearings involves considerable dismantling of the antenna and mast. The job should be done only by skilled personnel. See TM 11-1540.

LUBRICATE:

(a) The drive chain and sprockets every 64 operating hours (fig. 24). Apply SAE 10 to 30 engine oil or wipe with an oily cloth. If engine oil is not available use a light grease such as general purpose grease No. 0 or No. 1.

(b) The ball bearing under the antenna hinge plate every 128 hours (fig. 22). Repack with general purpose grease No. 2. See TM 11-1540 for details of disassembly.

(c) The ball bearings of the upper guy wire mast mechanism every 128 hours (fig. 1). Repack with general purpose No. 2 grease. See TM 11-1540 for details of disassembly.

(d) The reduction gear box every 500 hours with AXS-637 lubricating grease. The gear box (fig. 24) is packed with grease at the factory and does not have to be lubricated unless a leak develops or the box is taken apart for repairs. See TM 11-1540.

(e) The two mast bearings (fig. 24) in the console every 520 hours with general purpose No. 2 grease (fig. 24). See TM 11-1540 for details of assembly.

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