TM 11-1531

WAR DEPARTMENT TECHNICAL MANUAL

SERVICE MANUAL
FOR
RADIO EQUIPMENT RC-145-A
THEORY, TROUBLE SHOOTING, AND REPAIR

CONFIDENTIAL

WAR DEPARTMENT 26 AUGUST 1944

WAR DEPARTMENT TECHNICAL MANUAL

TM 11-15[redacted]

This manual, together with TM 11-1331 and 11-1431, supersedes TM 11-1131, 26 July 1943, 6 September 1943, and 1 December 1943.

SERVICE MANUAL
FOR
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WAR DEPARTMENT   26 AUGUST 1944

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BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

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

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IC 44: T/O 44-16; 44-17; 44-116; 44-117.

For explanation of symbols, see FM21-6.

QUICK INDEX

CONTENTS

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—All tubes, taking special care to destroy completely the 2C26 tubes in the transmitter oscillator. All coil forms, transformers, selsyn motors, and all chassis.

2. Cut—All cables and coil windings.
3. Burn—All parts of the equipment that cannot be completely demolished by other means.
4. Bend—The dipoles and inductor bars in the transmitter oscillator circuit.
5. Bury or scatter—Nameplates, smashed tubes, and all other parts of the equipment.

DESTROY EVERYTHING

REFERENCE NOTICE

This is one of three Technical Manuals on Radio Equipment RC–145–A. The other two are: TM 11–1331 Radio Equipment RC–145–A, Technical Operation Manual. (General description, operating instructions, and Equipment Performance log) and TM 11–1431 Radio Equipment RC–145–A, Preventive Maintenance Manual.

WARNING

HIGH VOLTAGE

is used in the operation
of this equipment.

DEATH ON CONTACT

may result if personnel fail
to observe safety precautions.

Be careful not to contact high-voltage plate circuits or 115-volt a-c input connections while checking or servicing the equipment. Make certain that the power is turned off before disassembling any part of the equipment.

Dangerously high voltages are present in the power supplies of this equipment. High-voltage capacitors in these power supplies must be discharged manually when service checks are made after the a-c power has been removed from the components.

EXTREMELY DANGEROUS POTENTIALS

exist in the following units:

Power Supply RA–105–A.
Control Unit BC–1266–A.
Radio Receiver and Transmitter BC–1267–A.
Indicator I–221–A.

FIRST AID TREATMENT FOR ELECTRIC SHOCK

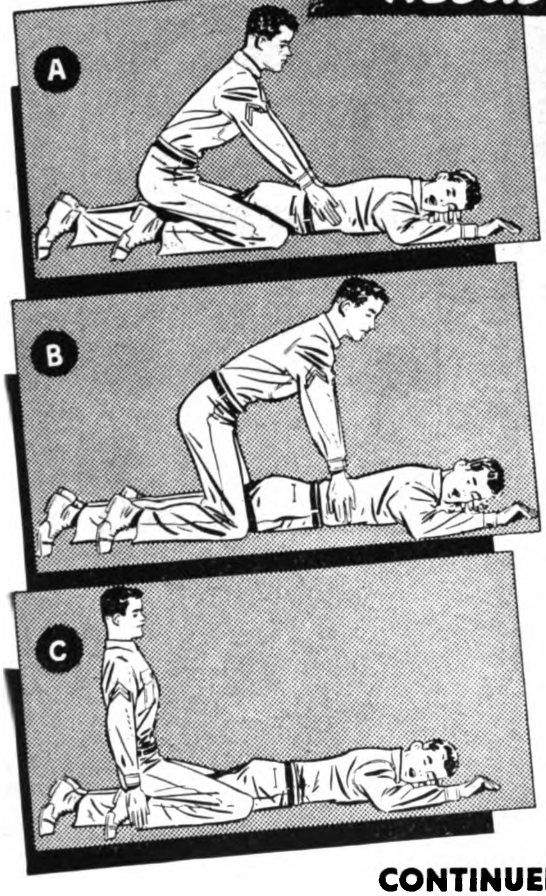
I. FREE THE VICTIM FROM THE CIRCUIT IMMEDIATELY.

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

II. ATTEND INSTANTLY TO THE VICTIM'S BREATHING.

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

RESUSCITATION



POSITION

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

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

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

FIRST MOVEMENT

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

SECOND MOVEMENT

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

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

CONTINUED TREATMENT

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

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

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

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

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

HOLD RESUSCITATION DRILLS REGULARLY

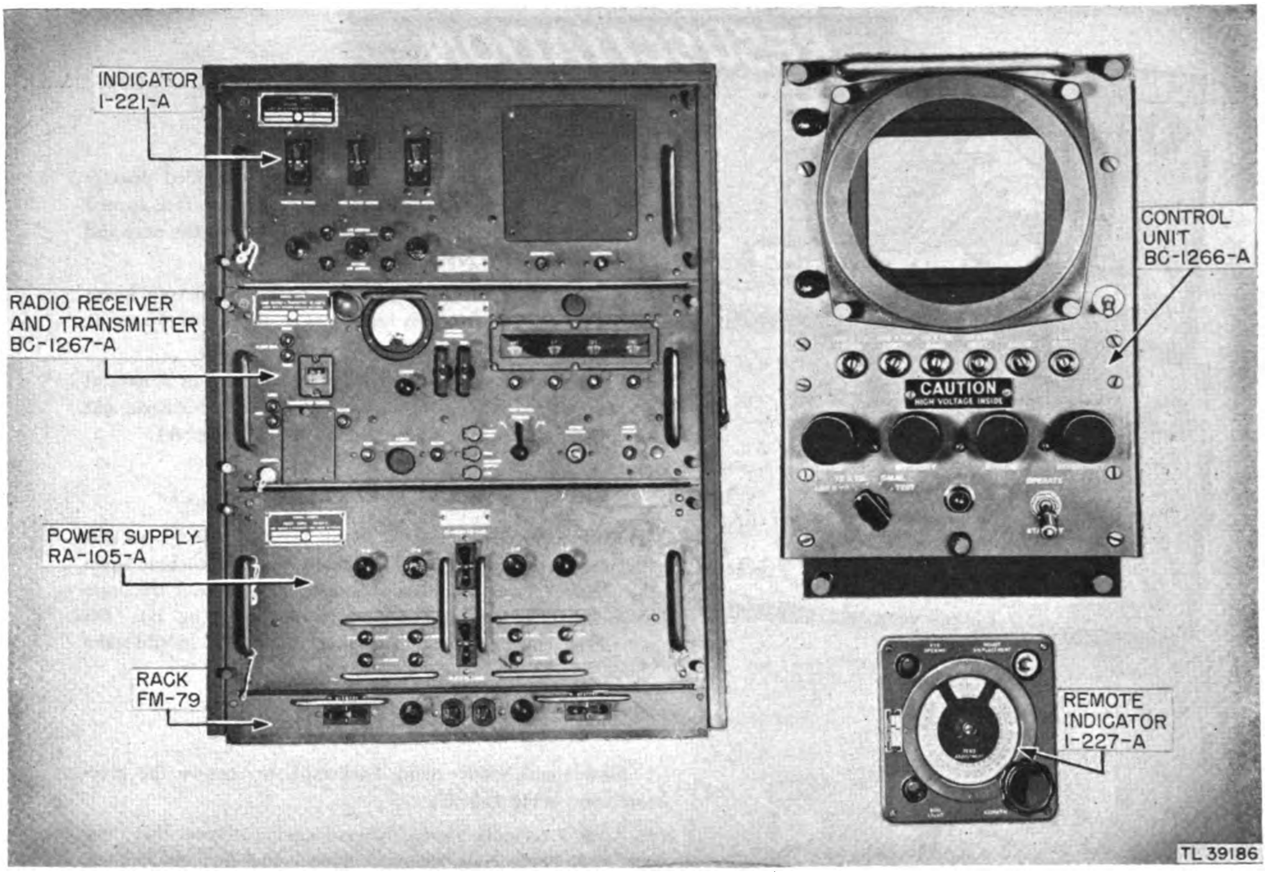


Figure 1. Rack FM-79 with components installed, Control Unit BC-1266-A, and Remote Indicator I-227-A.

[redacted]

This manual, together with TM 11-1331 and 11-1431, supersedes TM 11-1131, 26 July 1943, 6 September 1943, and 1 December 1943.

CHAPTER I

THEORY OF RADIO EQUIPMENT RC-145-A

Section I. ELEMENTARY PRINCIPLES OF IFF AND RADIO EQUIPMENT RC-145-A

1. Introduction

The primary aim of this technical manual is to present the electrical and mechanical theory of Radio Equipment RC-145-A and to aid the repairman in the maintenance, repair, and most efficient operation of the equipment.

2. Contents of Manual

This manual is divided into four chapters as follows:

Chapter 1. Theory of Radio Equipment RC-145-A.
Chapter 2. Trouble shooting and repair of Radio Equipment RC-145-A.
Chapter 3. Assembly and disassembly of antenna and tower.
Chapter 4. Maintenance Parts List for Radio Equipment RC-145-A.

a. CHAPTER 1. THEORY OF RADIO EQUIPMENT RC-145-A. This chapter contains a brief summary of the purpose and fundamentals of IFF and both a general and detailed description of the function and operation of the components of Radio Equipment RC-145-A. The detailed theory of the systems in the equipment is given in sections II through VIII and a discussion of the complete block diagram is given in section IX. The theory sections are:

(1) Section II, Transmitting system.
(2) Section III, Radio-frequency system.
(3) Section IV, Receiving system.
(4) Section V, Range and timing system.
(5) Section VI, Azimuth control system.
(6) Section VII, Power-supply system.
(7) Section VIII, Signal generator.
(8) Section IX, Complete block diagram of Radio Equipment RC-145-A.

b. CHAPTER 2. TROUBLE SHOOTING AND REPAIR OF RADIO EQUIPMENT RC-145-A. This chapter deals with the technique and methods of finding trouble in Radio Equipment RC-145-A. Chapter 2 includes the use of the starting procedure in trouble shooting, the significance of abnormal indications while the set is in operation, voltage and resistance measurements of the specific stages and circuit components, waveforms, the methods of signal tracing and signal substitution where applicable, and any other practicable technique. It also includes information on the replacement of defective electrical parts.

c. CHAPTER 3. ASSEMBLY AND DISASSEMBLY OF ANTENNA AND TOWER. This chapter contains information necessary for removal and replacement of all parts of antenna AN-154-A and Tower TR-24-A.

d. CHAPTER 4. MAINTENANCE PARTS LIST FOR RADIO EQUIPMENT RC-145-A. This is a complete list of all replaceable parts of the radio equipment. It includes reference symbols, Signal Corps stock numbers, name of part and description, quantity per equipment and indicates where parts are available.

3. Fundamentals of IFF

a. NEED FOR IFF. When the presence of an aircraft or surface vessel is detected by radar or other means, it is necessary to determine whether the target is friendly or hostile. This may be accomplished either by *recognition,* which implies that the target is established as friendly or hostile by visual observation, or by *identification.* The latter implies that the friendliness or hostility of the target is determined by means other than visual.

b. NONRADAR METHODS. Three nonradar methods of recognition are now in use. One method involves the coordination of reports from radar equipment and from distant observers who have been able to

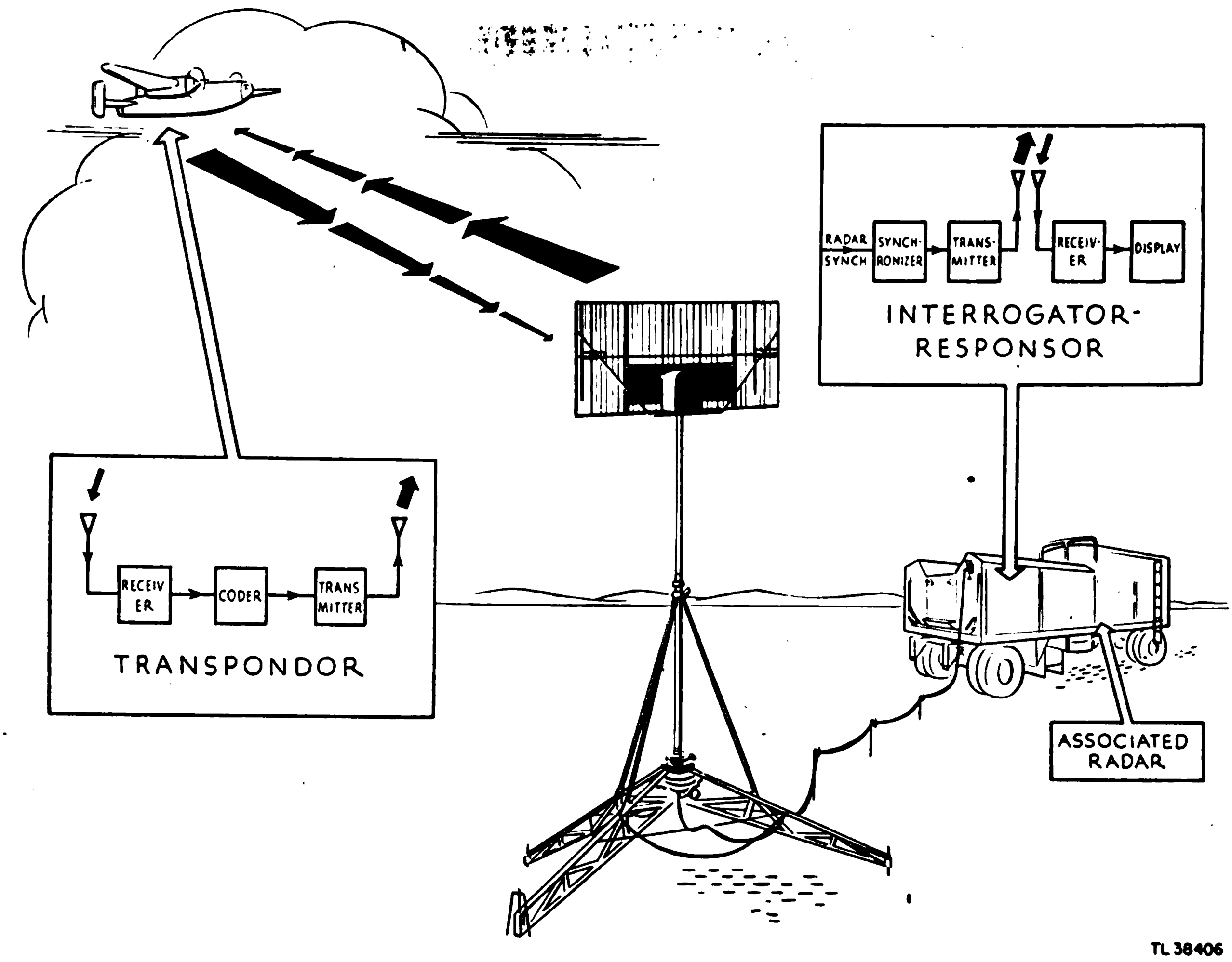


Figure 2. IFF, block diagram.

recognize the target. Another method is by a process of elimination, based on the knowledge of the movements of friendly aircraft and surface vessels. In the third method a craft identifies itself to a direction-finding system of radio telegraphy usually in a simple code.

c. Radar System, IFF. All such methods involve considerable coordination and consequent time delay, and it has been found essential to avoid this by providing means of direct identification at the point where the target is detected by radar. Radar sets are not, in themselves, capable of determining whether a target is friendly or hostile, and various systems have been developed whereby aircraft and surface vessels are provided with equipment which allows them to establish their friendly character, either directly to the primary radar set or to additional apparatus associated with the radar set. Such systems of identification are known as Identification Friend or Foe (IFF).

d. Development of IFF. Early types of IFF equipment made use of the radar signal but this was soon found to be inadequate. Radar sets now operate on such a large number of widely separated frequencies that it has become impracticable to produce a single IFF set capable of tuning and responding to all of them. To provide an adequate identification service operating in this manner it would, therefore, be necessary for aircraft and ships to carry several different types of IFF equipments. Furthermore, it would be necessary to introduce additions and modifications to this equipment each time radar equipment on a new frequency was introduced. Such increases in the amount of equipment carried, particularly in aircraft, would not be feasible. This difficulty, however, has been overcome by the introduction of a universal frequency band for IFF, separate from that of the radar sets. In this manner, though the need for extra equipment still exists, it is possible to save installation of several IFF sets in each aircraft and ship at the expense of fitting auxiliary apparatus to the radar set, where considerations of space and weight are, in general, of less critical importance.

4. Mark III IFF

a. Description. The complete Mark III IFF system consists of two separate units (fig. 2): the ground unit, called the interrogator-responsor, which is located near the radar set; and the airborne equipment called the transpondor, which is located in the friendly plane. The radar operator challenges the unidentified plane by operating the interrogator-responsor. As shown in figure 2, pulses of r-f energy are radiated toward the plane. These pulses are very weak (1 kw), as compared with the power of the radar pulses (100 kw), and consequently, the signal reflected from the plane is too small to be detected. If, however, the plane is friendly, it will contain a transpondor. The interrogation pulses are received by the transpondor and are then amplified, altered, and retransmitted with sufficient power to present an intelligible signal at the interrogator-responsor. Here the pulses are detected, amplified, and presented on the cathode-ray tube display. The necessary identification information is obtained from the coding of the altered retransmitted pulses. The following subparagraphs describe the system components and coding.

b. Interrogator-responsor. The ground equipment consists of transmitter and modulator units (interrogator), receiver and display units (responsor), and associated antenna and power units. A signal from the radar unit controls the circuits which supply pulses to operate the transmitter and display unit. The r-f pulses from the transmitter are fed to a directional antenna. By rotating this antenna, the operator is able to examine space with radio waves in the same manner as any radar set and thus interrogate the unidentified plane. The returned coded pulses are detected and amplified by the receiver circuits and then supplied to the display unit. Since there is little delay in the transpondor, the time lapse between the transmitted interrogation pulse and the received coded pulse can be used accurately to measure the range.

c. Transpondor. The airborne equipment consists of receiver, coding unit, transmitter unit, antenna, and power supply. The very sensitive receiver detects the interrogation pulses and passes them to be amplified in the coding unit. Here the pulse width is varied, but the repetition rate is maintained. These coded pulses are used to actuate the transmitter which retransmits the altered interrogation pulses. It is because of this additional *push* given to the original pulses that the IFF equipment with its very low power will have the same range as the larger and more powerful radar set. The transpondor normally uses one antenna for both receiving and transmitting.

d. Allocation of IFF Frequencies. The tuning of the transpondor receiver and transmitter is swept periodically through a band of frequencies (157 to 187 mc) and spot frequencies are allocated to the interrogator-responsor equipments associated with the various types of radar sets. Use of a frequency band in this manner has important advantages over the use of a single frequency for IFF purposes, including a reduction in the amount of mutual interference and the risk of *over-interrogation* (swamping) of the transpondor in operational areas having a high density of radar interrogation requirements. The wide band pass of the receiver (4 mc) insures adequate time during the transpondor sweep to permit easy identification of the pulse coding. As the transpondor is actuated ordinarily by the interrogator transmission and not as in early types of interrogation by the main radar transmission, the system permits additional security in that the interrogator need only be switched on when desired, thus avoiding continuous transmissions from the transpondor.

e. Display Systems. The identification signals received by the responsor may be displayed either on the display unit of the radar set or on a separate display unit. In Radio Equipment RC–145–A, the identification signals are displayed on the display oscilloscope of Control Unit BC–1266–A. In this way, the identification signal is promptly correlated with the correct target.

f. Coding. (1) The transpondor sweeps the frequency band in approximately 2½ seconds; hence, sweeps through any interrogator frequency at intervals of 2½ seconds. Coding is accomplished by arranging the transpondor so that during consecutive sweeps it may return to the interrogator-responsor equipment either:

(*a*) No reply.

(*b*) A narrow pulse.

(*c*) A wide pulse.

(2) The basic coding cycle consists of four sweeps after which all codes are repetitive. In this way six distinct codes have been provided which are selected by a switch on the transpondor control unit. It is apparent that the minimum time required to establish which code is in use is about 10 seconds.

(3) The various codes provide either a means of

discriminating between different types of friendly craft or a means of gaining additional security. In addition to the six codes described above, a further code is available in which a very wide pulse is returned each sweep. This code is the most easily distinguished and is intended as a universal distress code.

Table I. Coding positions, sequences, and pulse durations.

Coding Position	1st sweep	2d sweep	3d sweep	4th sweep
1	N	N	N	N
2	N	–	N	–
3	N	N	N	–
4	N	N	W	W
5	N	–	W	–
6	N	N	W	–
Emergency	VW	VW	VW	VW

N=Narrow transmitted pulses, from 5 to 12 microseconds.

W=Wide transmitted pulses, from 17 to 30 microseconds.

VW=Very wide transmitted pulses, from 60 to 100 microseconds (used when the friendly aircraft is in distress).

– =No transmission.

Ratio of wide pulse to narrow pulse (W/N) must be 2.5 or larger.

5. Radio Equipment RC–145–A

a. Description. Radio Equipment RC–145–A is a mobile IFF unit. It is designed for installation in the trailer which houses Radio Set SCR–545–A. A transport trailer is used for shipment of the antenna of Radio Equipment RC–145–A; and consequently the equipment and its associated radar unit can be moved together as required. The function of the RC–145–A is identification of friend or foe. In common with other IFF equipments Radio Equipment RC–145–A is capable of identifying, within certain limits, the particular aircraft which has been detected by the associate radar unit. The factor which enables the IFF unit to establish the identity of a particular plane is its ability to make use of the information supplied by the radar unit. In this way the IFF and radar units operate as one to supply the

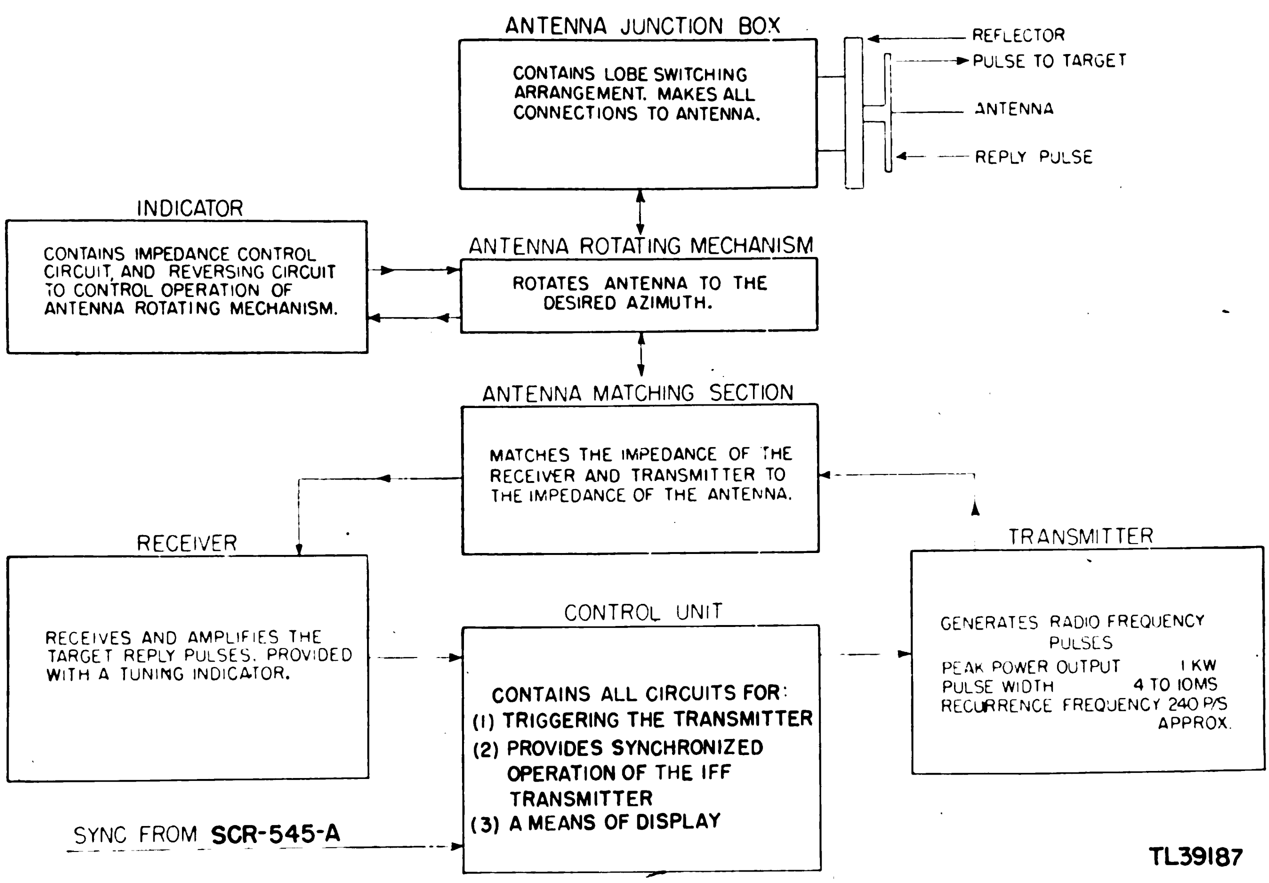


Figure 3. Radio Equipment RC–145–A, simplified block diagram.

operator with the necessary information. The maximum effective range of Radio Equipment RC–145–A is approximately 100,000 yards.

b. BLOCK DIAGRAM OF RADIO EQUIPMENT RC–145–A. (1) Figure 3 shows the complete block diagram of Radio Equipment RC–145–A. The RC–145–A has essentially the same fundamental components as the basic IFF equipment described in paragraph 4. The transmitter is triggered by the synchronizing voltage of the associated radar unit and processed through the control unit which establishes the recurrence rate of the transmission. The transmitter generates pulses of r-f energy which are fed to a directional antenna and radiated into space. The radiated pulses reaching a friendly aircraft are detected, amplified, coded, and retransmitted by its transpondor. The transpondor pulses are picked up by the RC–145–A antenna and fed into the receiver where they are detected and amplified. The output of the receiver is fed into the control unit (display oscilloscope). The control unit is the master unit; it supplies all the necessary trigger pulses, sweep voltages, and range-measuring circuits. The RC–145–A provides a means of establishing the azimuth of the interrogated target. This is accomplished by a rotating antenna with a lobe switching arrangement. The purpose of the azimuth determination is not to establish the direction of the target, but rather, to be used in conjunction with the radar equipment to determine identity of a particular target.

(2) Figure 3 shows the basic aspects of the RC–145–A and the main principles of its functioning. The details of the circuits used in the equipment are described in succeeding sections of this chapter. Study the block diagram before and during the reading of the following paragraphs, which give additional facts of general interest on the different units.

c. TRANSMITTER UNIT. The transmitter unit consists of several separate circuits: an amplifier and blocking oscillator, which shapes the pulses; a modulator, which is triggered by the blocking oscillator and acts as an electronic switch to turn the high voltage to the oscillator tubes on and off; and an r-f oscillator, which produces the r-f energy. The transmitter receives a trigger pulse from the control unit about 240 times a second (dependent upon the radar sync voltage). The transmitter contains circuits for shaping and amplifying the trigger pulse to a value of 3,000 volts, which is applied to the plates of the transmitter oscillator tubes for a period of 4 to 10 microseconds.

d. RECEIVER UNIT. The receiver of the RC–145–A receives and amplifies the transpondor's return pulse. The receiver is a conventional superheterodyne using a video amplifier as the output stage. The receiver has a double channel detector to supply the video amplifier and the tuning indicator with a portion of the i-f output signal.

e. CONTROL UNIT. The control unit contains all the essential trigger circuits and a display oscilloscope. This unit can be called the *timer* of the complete equipment because it produces all of the trigger pulses and provides the ranging circuits for the proper display of the received signals. The operation of the control unit is actuated by the synchronizing voltage from the associated radar unit. This, together with the functions of the control unit, enables the operation of the IFF and radar equipments to be coordinated.

f. INDICATOR AND REMOTE INDICATOR UNITS. The indicator units contain all circuits and devices for controlling the operation of the antenna lobe switching and tower rotation. The indicator units are composed of the following circuits: a control-impedance amplifier, which is actuated by displacement of selsyn transformers and which controls the impedance in the antenna drive-motor circuit; a reversing circuit, which is controlled by the displacement of the selsyn transformers and which switches the capacity of the drive-motor circuit to determine the direction of rotation; and an indicator circuit, which utilizes a tuning eye to indicate the displacement of the selsyn transformers, thus indicating when the antenna has reached the proper azimuth setting.

g. ANTENNA UNIT. The antenna is composed of three dipoles and a reflector. The antenna is used for both the receiver and transmitter. A lobe-switching assembly is used to permit the use of the directional characteristics of the antenna. The lobe switching is accomplished by a cam arrangement driven by a motor which runs at a constant rate. The antenna unit contains three dipoles mounted in front of a reflector, and a lobe switching arrangement which controls the horizontal lobe pattern of the dipoles.

6. Technical Characteristics of Set

The principal technical characteristics of the RC–145–A are as follows:

Characteristic	*Value*
Frequency	157 to 187 mc
Peak power output	1 kw
Pulse width	4 to 10 μsec
Recurrence frequency	240 cps

Characteristic	*Value*
Maximum range	100,000 yds
Azimuth coverage	360°
Range accuracy	± 500 yds
Power requirements	115-v, 60 cps, single phase; 1,560 watts

7. Major Components of Radio Equipment RC–145–A

Radio Equipment RC–145–A consists of several separate components listed below:

a. Radio Receiver and Transmitter BC–1267–A
b. Control Unit BC–1266–A
c. Indicator I–221–A
d. Remote Indicator I–227–A
e. Power Supply RA–105–A
f. Switch SW–220–A
g. Antenna AN–154–A
h. Tower TR–24–A
i. Signal Generator I–222–A

Section II. TRANSMITTING SYSTEM

8. Introduction

The transmitter section of Radio Receiver and Transmitter BC–1267–A contains all the circuits necessary to produce the desired pulses of r-f energy. The operation of the transmitter is synchronized with the other components of the equipment by a synchronizing voltage supplied by the control unit. The input circuits of the transmitter process the synchronizing pulse to produce a final output pulse of the proper width and amplitude.

9. Block Diagram

The diagram in figure 5 shows the basic circuits of the transmitting system. Each of the circuits is described briefly in the following paragraphs.

a. SYNCH[1] AMPLIFIER. The synch amplifier contains two stages of amplification and a cathode follower. The second stage operates as a limiter amplifier to produce a constant output for triggering the blocking oscillator.

b. BLOCKING OSCILLATOR. The blocking oscillator is triggered by the pulse from the cathode follower in the synchronizing amplifier. The oscillator produces a rectangular pulse which can be varied in width from 5 to 8 microseconds. This pulse is applied to the grids of the modulator tube.

c. MODULATOR. The modulator operates with a grid voltage which holds it beyond cut-off. The modulator is connected in the plate circuit of the r-f oscillator and acts as an electronic switch (the

[1] Throughout this manual the words "sync" and "synch" are used interchangeably. Synch is the word which appears on the manufacturer's equipment.

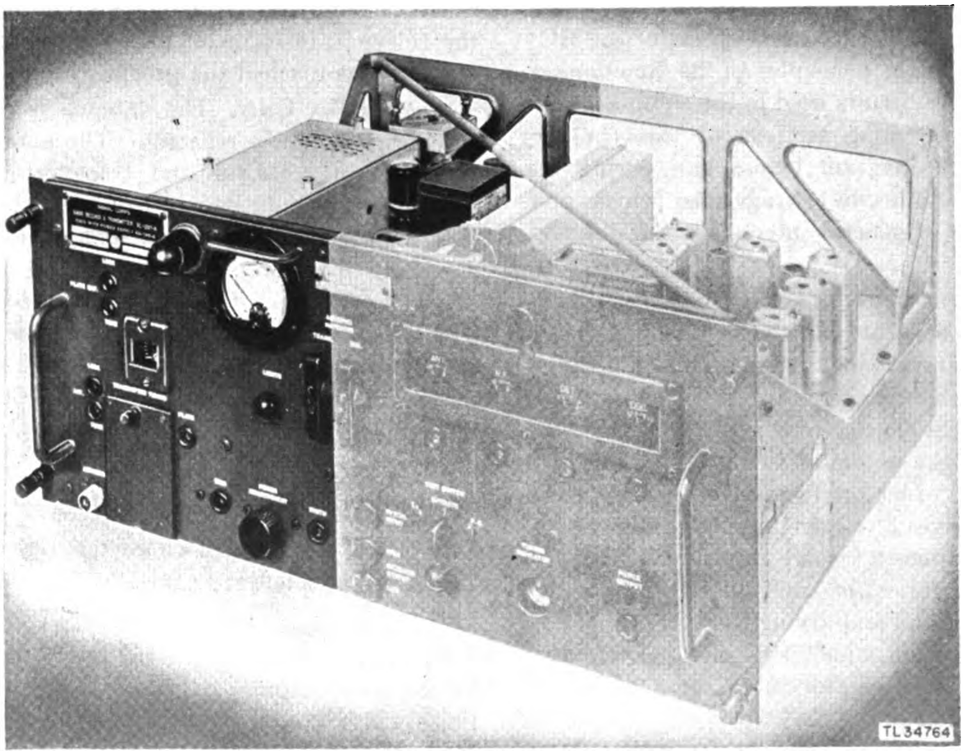


Figure 4. Radio Receiver and Transmitter BC–1267–A, front oblique transmitter section.

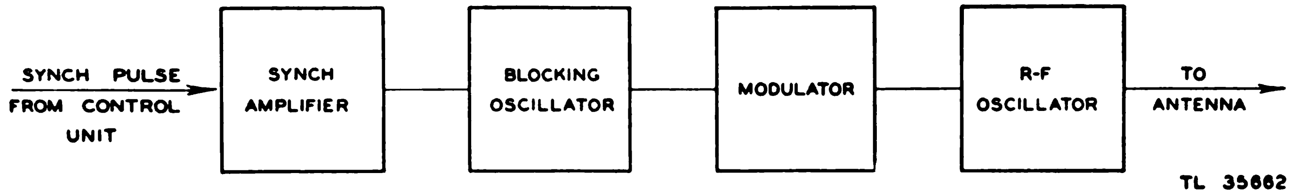


Figure 5. Transmitter, block diagram.

modulator applies plate voltage to the r-f oscillator when a synchronizing pulse is applied to its grids).

d. R-F OSCILLATOR. The r-f oscillator produces the r-f signal pulses. The oscillator is quiescent until plate voltage is applied by the modulator. The oscillator generates for the period of time the sync pulse is present at the grids of the modulator.

10. Functioning of Parts

a. SYNCH AMPLIFIER. The transmitter trigger pulse is obtained from the control unit. The pulse is applied to the grid of pulse-amplifier tube 16 through pin 3 of the interconnecting plug and capacitor 19–2. (See fig. 6.) Jack 150–1, SYNCH INPUT

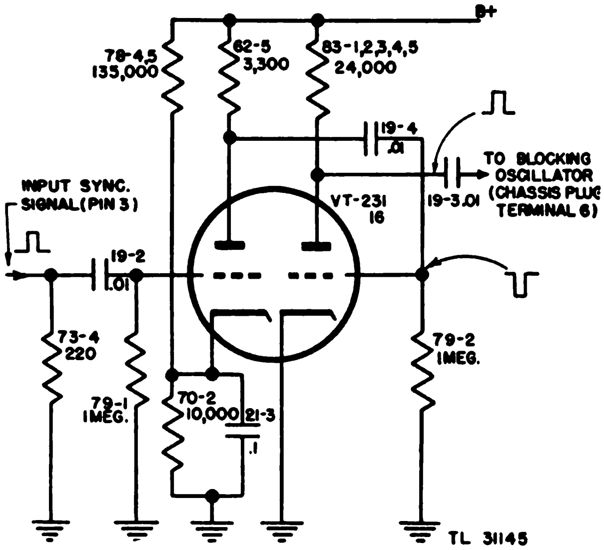


Figure 6. Transmitter, sync-amplified circuit.

(fig. 19), is shunted across the input to provide a means for observing the synchronizing trigger pulse. The coaxial line carrying this pulse from the control unit to the transmitter is loaded by resistor 73–4. The first section of tube 16 functions as an amplifier. The positive trigger pulse applied to the grid produces an amplified pulse in the plate circuit. This pulse is coupled to the grid of the second section of tube 16, which functions as a limiter amplifier. This section operates with zero bias and will saturate when a pulse exceeding 10 volts is applied to the amplifier section. The limiter produces a constant output for any input to the first section which exceeds 10 volts. The output from the pulse amplifier is fed to the grid of a conventional cathode follower (tube 18) through capacitor 19–3 and terminal 6 of the chassis plug. The output from the cathode follower is coupled to the blocking oscillator tube (19).

b. BLOCKING OSCILLATOR (fig. 7). The blocking oscillator is triggered by the positive pulse from the cathode follower. The cathode of the blocking oscillator has a fixed bias supplied by a divider network consisting of resistors 95–3, 78–2, and 78–3, connected between the 300-volt supply and ground. This bias is approximately 40 volts and is sufficient to cut off the tube when a trigger pulse is not present on the grid. The action of the blocking oscillator is as follows: the grid voltage of the blocking oscillator is negative with respect to the cathode because of fixed bias. When a positive trigger pulse is applied to the grid, the grid becomes positive with respect to the cathode. This positive voltage causes plate current to flow. The flow of this current through the primary windings of blocking oscillator transformer 118 induces into the secondary a voltage of such a polarity that the grid becomes more positive. This effect causes a greater plate current to flow. Because of this regenerative action, the plate current rises rapidly to a point of saturation. This condition is unstable and the process reverses. The plate current decreases, causing a negative voltage to be applied to the grid. This causes the plate current to decrease more rapidly, resulting in a more negative grid, until the tube current is off. Thus, the blocking oscillator completes one cycle and then is quiescent until the arrival of the next trigger pulse which initiates another cycle. The width of the pulse produced by the blocking oscillator is determined by the constants of the transformer and the time constant in the grid circuit. Therefore, capacitors 30–1 and 30–2 and resistors 52–3 and 89–1 also determine the width of the pulse produced. Resistor 89–1 is variable, making it possible to vary the width of the pulse over a range of approximately 5 to 8

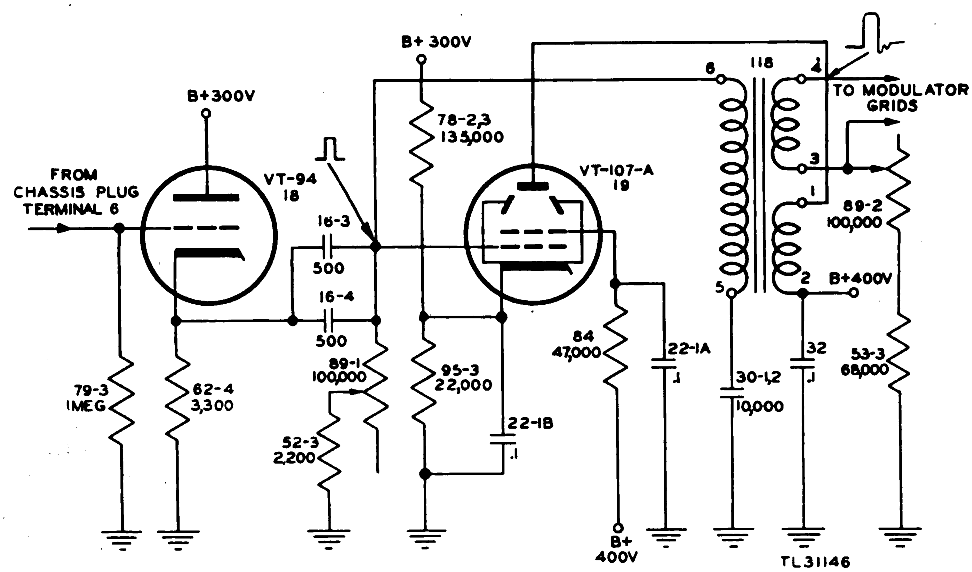


Figure 7. Transmitter, blocking-oscillator circuit.

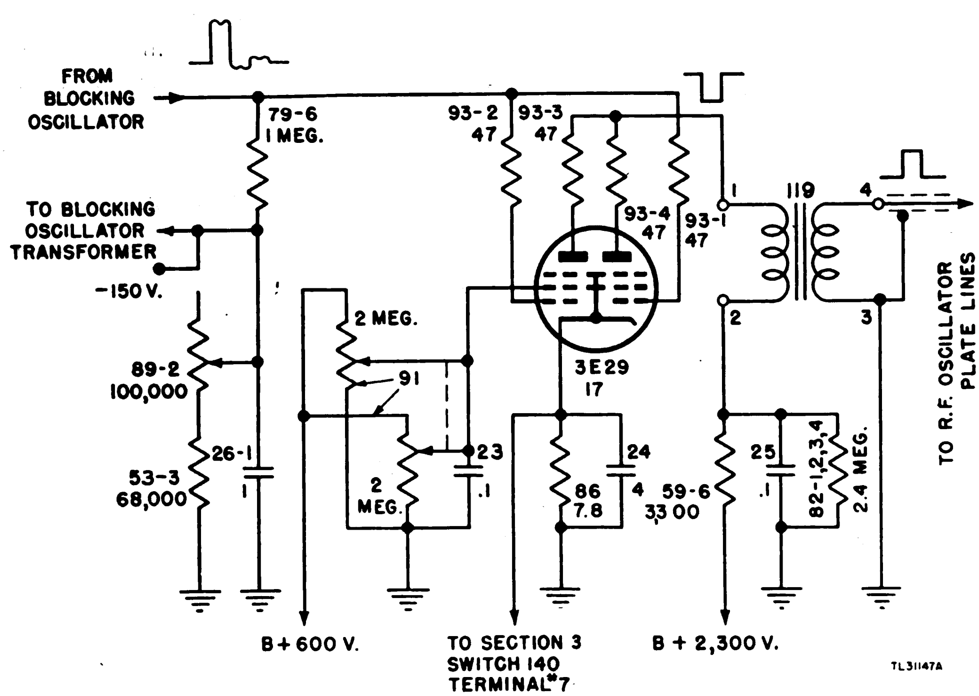


Figure 8. Transmitter, modulator circuit.

microseconds. Capacitors 22–1B, 22–1A, and 32 are used to filter the circuit. The output pulse of the blocking oscillator appears across the winding of transformer 118 which terminates at 3 and 4. This is a positive pulse approximately rectangular in shape and has a width of between 5 and 8 microseconds.

c. MODULATOR. The modulator stage utilizes a 3E29 tube, 17 (fig. 8), which is a double pentode connected in parallel. The output of the blocking oscillator is applied to the grids of tube 17. The grid bias for this tube is obtained from a negative 150-volt source, applied through the output winding of the blocking oscillator transformer 118. Variable resistor 89–2 and resistor 53–3 are connected across the 150-volt supply to ground. This makes it possible to vary the bias voltage from —90 to —140 volts. Plate voltage of 2,300 volts is applied to the plate of tube 17 through the primary of transformer 119. Screen voltage is obtained from a 600-volt source. The dual variable control 91, connected to the supply, makes it possible to vary the screen voltage from zero to 600 volts. The screen is bypassed at the socket by capacitor 23. The positive voltage applied to the grid produces a negative pulse in the plate circuit across the primary windings of transformer 119. This produces a positive pulse of approximately 3,000 volts across the secondary winding. The energy to produce this pulse is obtained from capacitor 25, which is discharged by bleeder resistors 82–1, 82–2, 82–3, and 82–4. Cathode-bypass capacitor 24 serves to bypass the pulse to ground. The d-c return is through resistor 86, which acts as a shunt for the 0–1 milliameter 160. This meter can be connected into the cathode circuit by means of switch 140 to measure the modulator current. Choke 120 and resistor 59–6 as well as the shield from terminal 4 on the transformer are necessary to keep the strong audio pulse from getting into the receiver circuits.

d. R-F OSCILLATOR. The r-f oscillator uses two 2C26 tubes (20 and 21) connected as a push-pull plate circuit. (See fig. 9.) Transmission lines are used for the circuit elements instead of lumped constants. The plate line is tuned by means of an adjustable shorting bar. By adjustment of this shorting bar the transmitter frequency may be varied from 157 megacycles to 187 megacycles. The plate-grid capacity of the 2C26 tubes serves to tune the plate line. Since this capacity will vary with individual tubes, it is possible to compensate for these variations by means of the variable capacitor 29. The grid line is untuned and is broadly resonant. The cathodes of the tubes are connected to one side of the heater, and the heater return to ground is through r-f chokes 114–2 and 114–4. The oscillator is grid-leak biased by resistor 62–1. The oscillator plate voltage is obtained from the modulator transformer 119. There is no d-c voltage on the plates of the 2C26 tubes until the modulator pulse is applied. This causes these tubes to oscillate at an r-f frequency for the duration of the pulse after which it is quiescent until the next pulse appears. The antenna line is about ⅛ wavelength long, inductively coupled to the plate line and tuned by

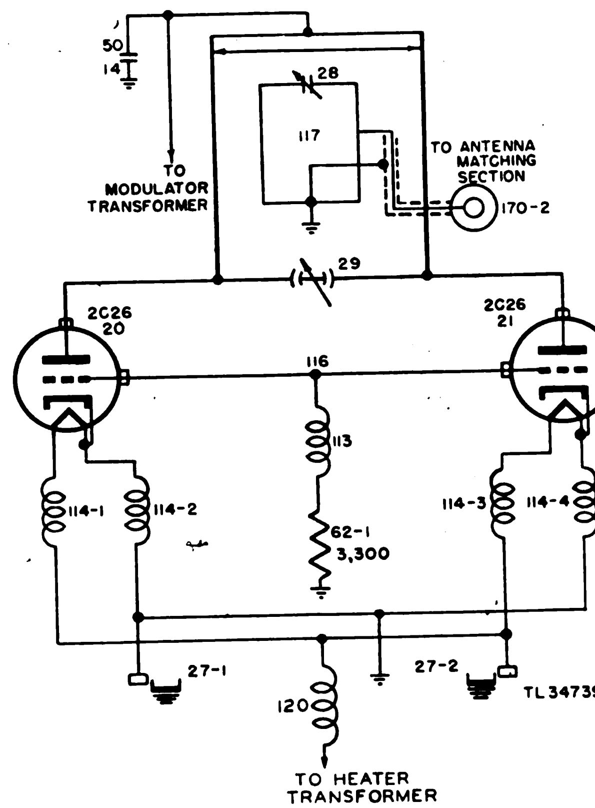


Figure 9. Transmitter, r-f oscillator circuit.

variable capacitor 28. The output of the oscillator is taken from a tap on the antenna line and is conveyed by means of a coaxial line to connector 170–2. This connector applies the output to the antenna matching section. The output of the matching section is connected to the diode measurement circuit and to antenna receptacle 170–1.

e. DIODE MEASUREMENTS. (1) The diode tube 9006 (14) is used to measure the power output and pulse shape of the transmitter. (See fig. 10.) The plate of this diode is connected to the antenna transmission line. Two cathode resistors 79–5 and 85

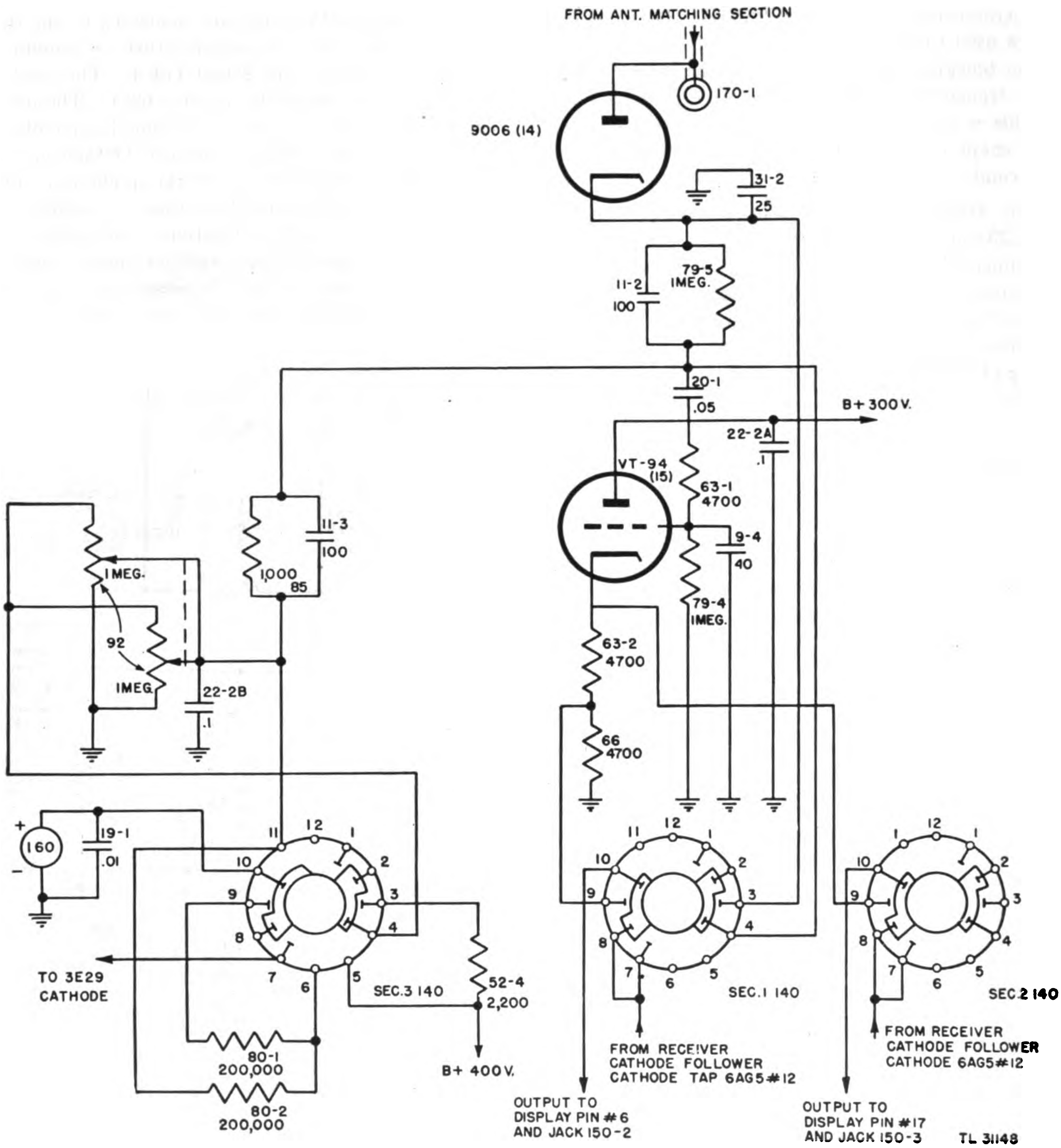


Figure 10. Transmitter, diode measurement circuit.

are connected from cathode to ground. Capacitor 22–2B can be considered a short circuit at pulse frequencies. A test switch provides a means for measuring the power output of the transmitter. This switch has three positions and is spring loaded so that it remains in the OPERATE position. When thrown to the left, the switch connects meter 160 in the cathode circuit of tube 3E29 as previously described in *c* above. When thrown to the right, the switch performs the following functions, in order to measure transmitter power: it shorts resistor 79–5 in the cathode circuit of tube 14, thus leaving a low-value resistor 85 in the circuit; it connects a 400–volt supply to the bottom of resistor 85 (potentiometer 92 varies this voltage from zero to 400 volts); and it disconnects the low receiver output from pin No. 6 on the plug which leads to the cathode-ray tube of the control unit and connects the low output of the cathode-follower tube VT-94 (15) in its place.

(2) The rectified pulse from tube 14 is applied to the grid of the cathode-follower tube (15) through coupling capacitor 20-1. (See fig. 10.) The output of the cathode follower is applied to the cathode-ray tube of the control unit through pin No. 6 on the plug. Thus, it is possible to see the width of the transmitted r-f pulse directly on the screen. This pulse can be decreased in magnitude and eliminated completely from the screen by applying voltage from potentiometer 92. The amount of voltage necessary to wipe out the pulse can be read on meter 160. However, since the load resistance of 50 ohms is known, this voltage appears in terms of power output. When it is in the normal position, the receiver low output is connected to pin No. 6 on the plug and resistor 79-5 is again in the circuit. This resistor has a very high value and is used to prevent tube 14 from loading the antenna.

(3) Jack 150-2, LOW (fig. 19), provides a means for testing the receiver low-impedance output pulse which is taken from the junction of resistors 94 and 59-5 in the cathode follower output circuit. It also monitors the low-impedance output transmitter pulse from the diode-measuring circuit when the test switch is thrown to the right. This connects the jack with the junction of resistors 66 and 63-2. Jack 150-3, HIGH (fig. 19), provides a means for testing the high-impedance receiver-output pulse which is taken directly from the cathode follower (12). When test switch 140 is thrown to the right, jack 150-3 also monitors the high-impedance output of the transmitter diode-measuring circuit (cathode of 15). Pin No. 17 on the plug provides for connecting these two outputs to the display tube in the control unit.

Section III. RADIO-FREQUENCY SYSTEM

11. Introduction

The radio-frequency system is the part of the equipment which carries the outgoing pulses from the transmitter to the antenna and also carries back from the antenna to the receiving system any return pulses picked up by the antenna. The basic

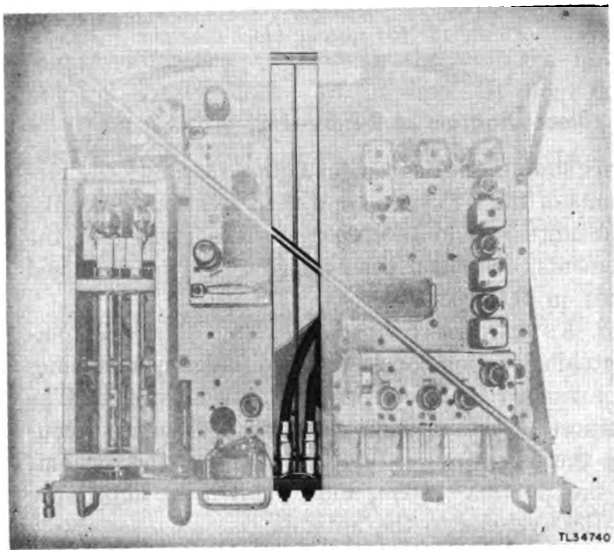


Figure 11. Radio Receiver and Transmitter BC-1267-A, top view, antenna-matching section.

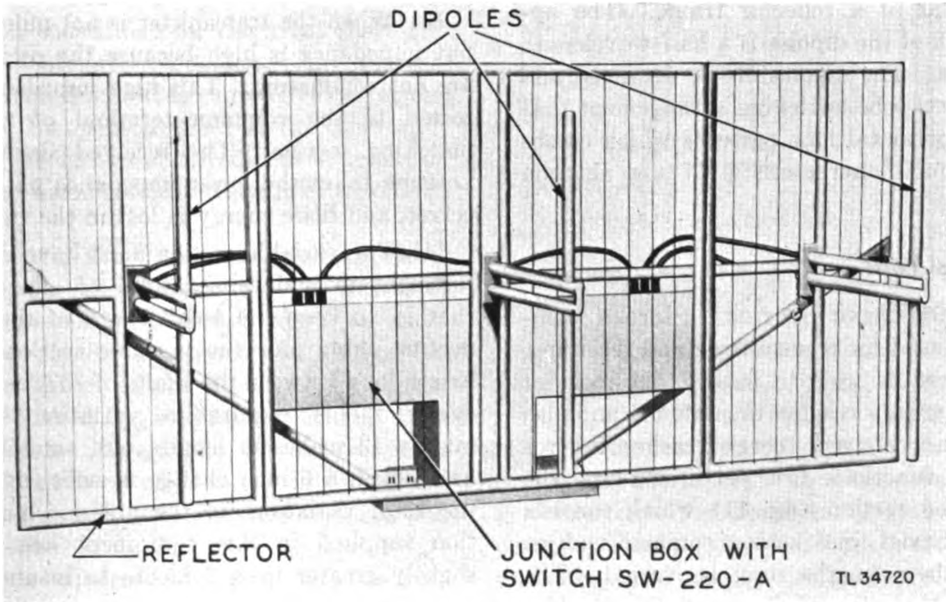


Figure 12. Antenna AN-154-A.

ideas involved in using a single antenna for transmitting and receiving will be discussed in paragraph 13*a*. The components of the r-f system are shown in figures 11 and 12.

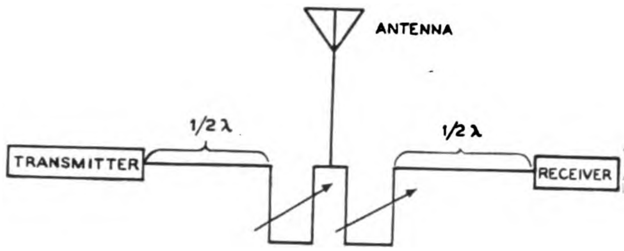


Figure 13. R-f system, block diagram.

12. Block Diagram of R-F System

This simplified diagram in figure 13 shows the elements of the r-f system and their relationship to the transmitting and receiving systems. Each of the elements, described briefly below, will be discussed later in this section.

a. ANTENNA-MATCHING SECTION. The antenna-matching section consists of two folded coaxial lines so arranged that their lengths may be varied. The purpose of the antenna-matching section is to couple the receiving system and transmitting systems to the antenna system, and to match the impedance of the systems to the antenna.

b. ANTENNA. The antenna connects to the antenna-matching section through the tower-junction box. The antenna is composed of three dipoles mounted in front of a reflector frame. The approximate length of the dipoles is a half-wavelength of the r-f waves. The dipoles are so arranged and so controlled by a lobe-switching arrangement that they produce horizontal lobe patterns which establish the directional characteristic of the antenna system.

13. Functioning of Parts

a. ANTENNA-MATCHING SECTION. Since a common antenna is used for transmitting and receiving, some means must be used to insure that most of the transmitted energy reaches the antenna and also that most of the received energy reaches the receiver. These functions are performed by the antenna-matching section (fig. 11) which consists of two folded coaxial lines with a common end, so arranged that their lengths may be varied. The common end of these lines is connected to the antenna transmission line forming a branched line from the antenna. The open ends of these branches are connected to the receiver and transmitter respectively, by suitable lengths of coaxial cable.

(1) The input impedance of the antenna is the same as the characteristic impedance of the coaxial antenna transmission line. This is the impedance appearing at the common end of the antenna-matching section, looking toward the antenna. If the length of the matching section is adjusted so that the total length of line between the common terminal and the transmitter is one wavelength, the transmitter impedance will appear at the common terminal. A similar condition exists in the receiver branch of the section.

(2) When the transmitter pulses, the output impedance is low because the oscillator tubes are conducting. This low impedance is transferred to the common terminal of the matching section and matches the impedance of the transmission line. A portion of the r-f pulse also takes the path to the receiver from the common terminal of the antenna-matching section. This voltage appears at the grid of the first r-f amplifier and causes grid current to flow. This flow of grid current charges grid capacitor 2 through the low grid-cathode resistance. The time constant of the charging circuit is so short that the capacitor charges on the first positive half-cycle and cuts the tube off. Current flow then ceases and no further loss takes place in the receiver. When the pulse ends, the charge on capacitor 2 leaks off through resistor 50–1, and the receiver is ready to receive the return signal from the antenna.

(3) When the transmitter is not pulsing, its output impedance is high because the oscillator tubes are not conducting. This high impedance is transferred to the common terminal of the antenna matching section. The received signal from the antenna takes the lower impedance path to the receiver, and little energy is lost in the transmitter.

(4) The variable section must have sufficient adjustment to maintain a total of one wavelength; that is, to keep the total length of the fixed connecting cable plus the variable section one wavelength long between the limits of 157 and 187 megacycles. This requires a variation of approximately 12 inches in length, but, since the sections are folded, a 6-inch change is sufficient. Actually, the total variation on the antenna-matching section supplied in this equipment has been made slightly greater than 7 inches to insure ample adjustment range.

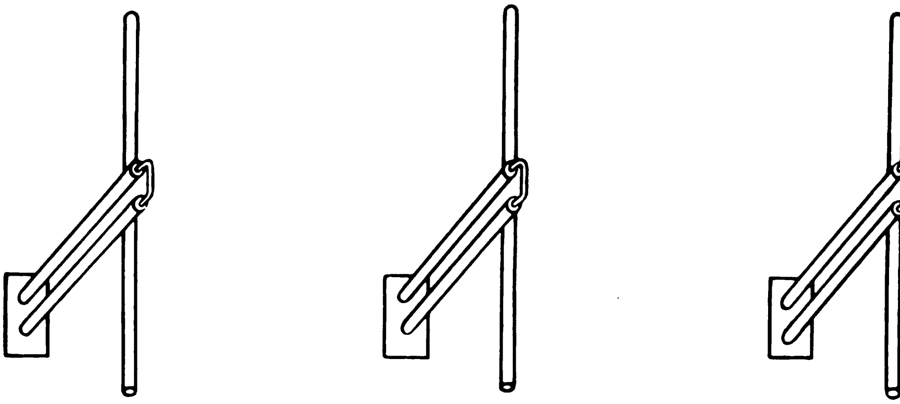


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Figure 14. Antenna AN-154-A, diagrammatic representation.

b. Antenna. (1) *Structural design.* (*a*) Figure 14 is a diagrammatic representation of the antenna, which consists of three half-wavelength dipole radiators supported on a reflecting frame. This frame is a tubular structure, 90 inches wide and 40 inches high; it constitutes the mechanical support and part of the reflecting surface. The balance of the reflection comes from vertical wires, spaced 2½ inches apart, attached to the top and bottom members of the frame.

(*b*) The dipoles and all resonant lines in the energy-feeding system are designed for correct electrical length at 172 megacycles or a wavelength of 1.74 meters.

(2) *Dipoles.* (*a*) Each dipole illustrated in figure 14 is supported by two metal tubular supports which act as a transmission line. The supports are ¼ wavelength long at 172 megacycles. These two supporting members are rigidly fastened to a plate (fig. 14) which constitutes an electrical short circuit for the two supporting members. Any quarter-wave transmission line that is short-circuited at one end appears to be open-circuited at the other end; therefore, the two halves of any dipole mounted on the supporting members are essentially insulated from each other.

(*b*) A schematic diagram of a single dipole is shown in figure 15 ①. Because the two halves of the dipole are essentially insulated from each other, the voltage feeding the dipoles may be applied between the two halves of the dipole at its center. This is accomplished by leading the coaxial lines feeding the dipole through the tubular supports. The center conductors of the coaxial lines are brought out at the ends of the tubular supports and connected together while the outer conductors are connected to the dipoles. Line 2 (fig. 14) is one-half wavelength longer than line 1 which results in a phase difference of 180° in the voltages impressed on the two halves of the dipole at point *B*. The action may be better understood by referring to figure 15 ②. The arrows show the directions of current flow in the dipole at one particular instant. The input resistance of the dipole is represented by a resistance, *B*. The inner and outer conductors are connected together through resistance *B* and all power lost in the resonant section from *A* to *B*

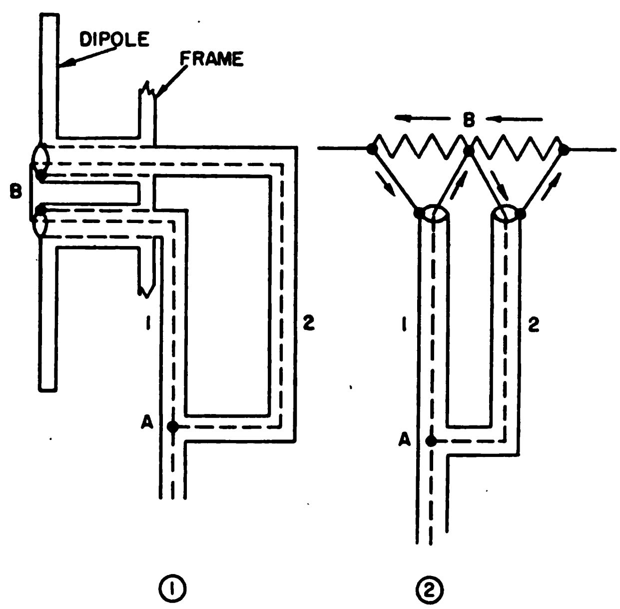

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Figure 15. Antenna AN-154-A, single dipole.

is lost in the resistance *B* which is the radiation resistance of the dipole. Thus the power in the line is delivered to the dipole and radiated there as r-f energy. The impedance of lines 1 and 2 is 50 ohms and since they are in series at the feedpoint, *B*, the impedance of the dipole is adjusted to 100 ohms

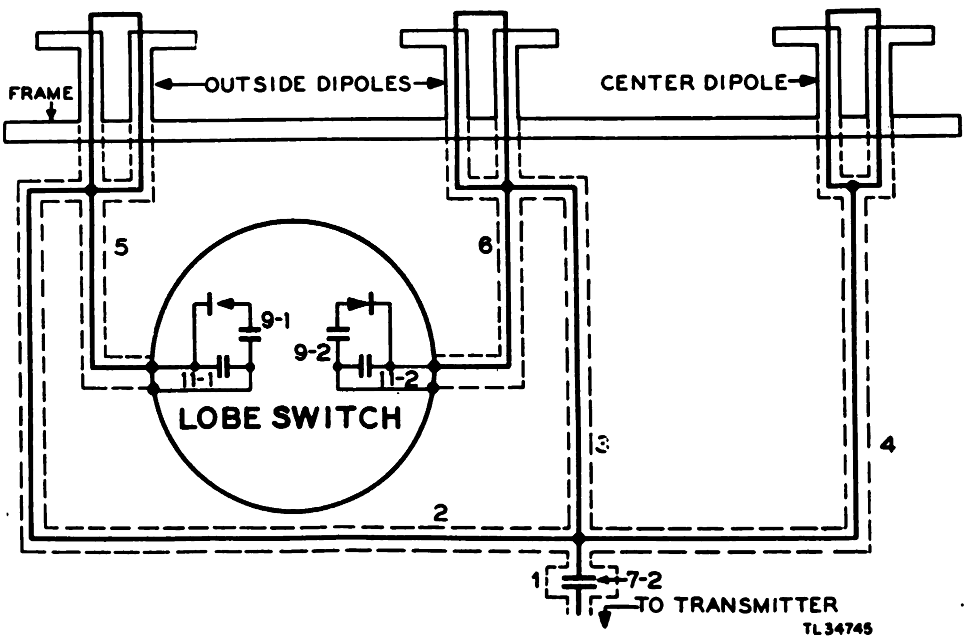


Figure 16. Antenna AN–154–A, schematic diagram.

in order to achieve maximum power transfer and maximum radiation.

(*c*) Figure 16 shows a schematic diagram of the r-f portion of the antenna. The signal from the transmitter is fed to the antenna through transmission line 1. Capacitor 7–2 allows the r-f signal to reach the antenna but isolates the center conductor of the transmission line from the low-frequency currents and direct current in the antenna lobe switch circuit. After passing through capacitor 7–2, the transmission line branches out into three separate lines (2, 3, and 4). These three lines carry the signal to each of the three dipoles. The lengths of the three lines are all equal, and the dipoles would all be fed in phase if it were not for the connection of the lobe switch to the outer dipoles through transmission lines 5 and 6.

(4) *Lobe switch.* (*a*) The lobe switch causes transmission lines 5 and 6 alternately to shunt the outer dipole feed lines with inductive and capacitive reactances, thus shifting the direction of maximum radiation of the antenna. It also provides switching in synchronization with the main r-f pattern switching for the purpose of providing *blanking* and *spread* pulses in the control unit. (See fig. 16.)

(*b*) Transmission lines 5 and 6 are identical and of such length that when one end is short-circuited, the other end, which is connected across its respective outer dipole feed lines, presents an inductive reactance. At the same time that one of the two lines (5 and 6) is short-circuited, the other line is terminated by capacitor 11–1 or 11–2. This line then presents a capacitive reactance across its outer dipole feed line. Because of the inherent inductance of the contacts of the lobe switch, it is impossible to get a perfect short circuit at the frequencies used. For this reason, capacitors 9–1 and 9–2 are connected in series with the contacts of the switch. These capacitors have reactances equal in magni-

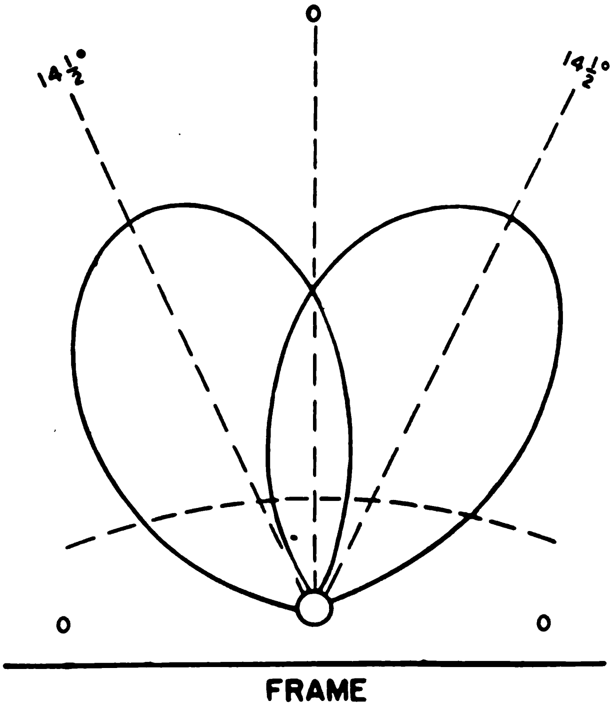


Figure 17. Antenna AN–154–A, lobe pattern.

tude but opposite in sign to the inductive reactances of the contacts themselves; consequently, the resultant circuit is series resonant and forms a good short circuit to the end of lines 5 and 6 when their respective contacts are closed. The purposes of the blanking and spread pulses are explained under the theory of operation of the control unit described in paragraph 19. Figure 16 shows a simplified schematic diagram of the lobe switch contacts to illustrate the formation of these pulses. The complete switch schematic is shown in figure 18 in which it can be seen that when the left contact of the lobe switch is closed, there is a d-c path from spread terminal *A* of plug 4 to ground; and that when this left contact is open, the d-c path is broken. Tracing this circuit, it can be seen that the current flows from terminal *A* of plug 4 through choke 8–1 and through the center conductor of the transmission line to receptacle 3–9 on the lobe switch. From here it goes through the left contact of the lobe switch and choke 8–2 to ground. In traversing the blanking circuit, the current leaves terminal *F* of plug 4, goes through resistor 15 and choke 8–3 in the switch, through the right-hand contact of the lobe switch to the center conductor of the transmission line; through this conductor to the left-hand contact of the lobe switch, and through this contact and choke 8–2 to ground. The purpose of chokes 8–1, 8–2, and 8–3 is to isolate the r-f circuits of the lobe switch from spread and blanking circuits. It is possible for transients in the blanking circuit of the lobe switch to trigger off the horizontal sweep of the control unit. Capacitor 7–1 and resistor 15 are used to suppress any such transients.

(5) *Antenna pattern.* Figure 17 is a representation of the horizontal directivity of Antenna AN–154–A for both positions of the lobe switch, which alternately selects the pattern shown. Figure 17 shows how the two patterns cross the zero axis with equal amplitude. The signals received from each position of the lobe switch are balanced by rotating the antenna mast in the proper direction. When the signals are of equal amplitude, the correct azimuth of the signal source is attained.

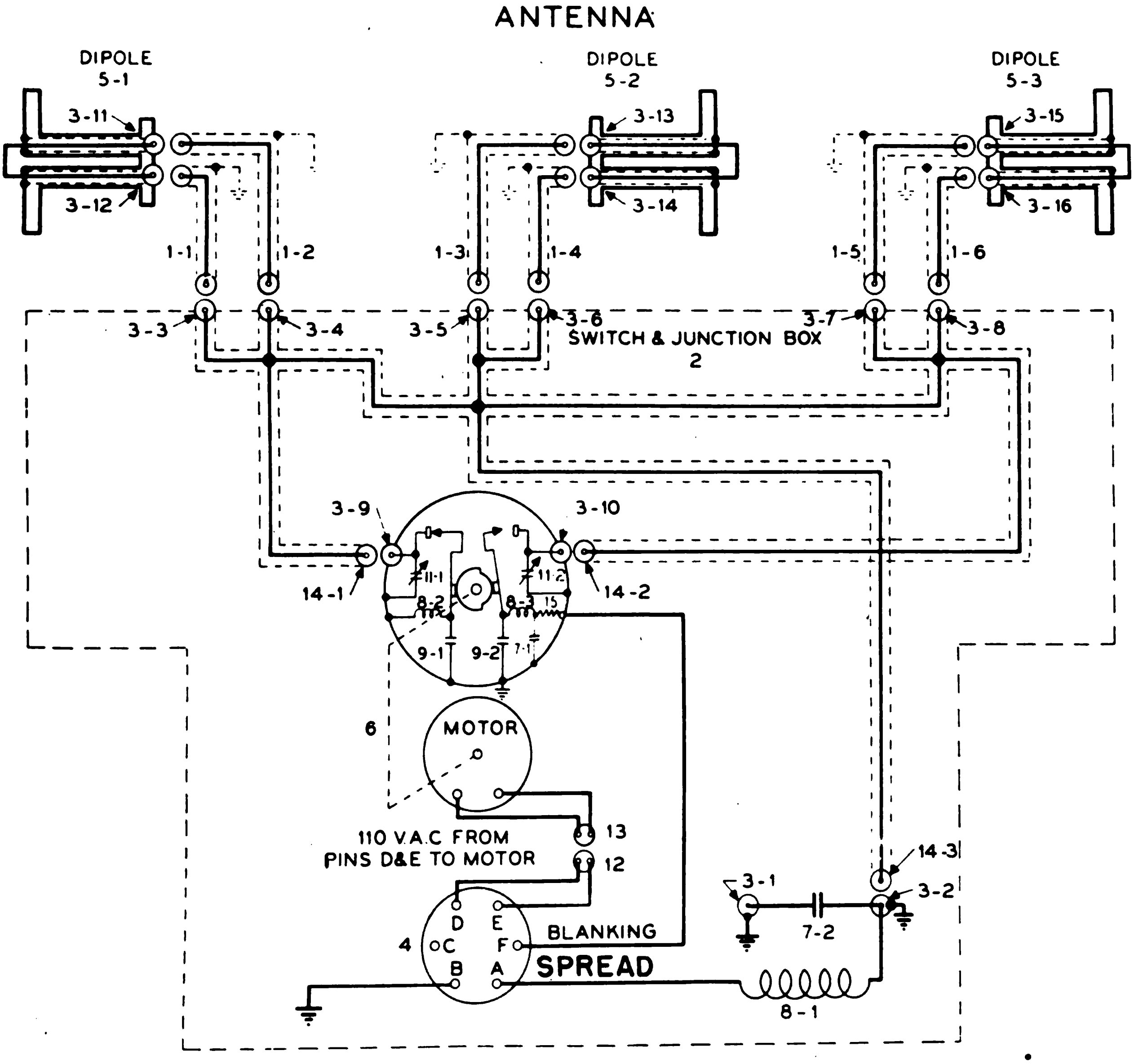


Figure 18. Antenna AN-154-A, and Switch SW-220-A, schematic diagram.

Reference No.	Qty	Name of Part	Manufacturer
1-1 to 1-6	6	Cable	Snyder Manufacturing Co.
2	1	Junction Box	Snyder Manufacturing Co.
3-1 to 3-16	16	Receptacle, Coaxial Female	American Phenolic Corp.
4	1	Receptacle, Male, 6 Pin	American Phenolic Corp.
5-1 to 5-3	3	Dipoles	Snyder Manufacturing Co.
6	1	Switch, Rotary	Russel Electric Co.
7-1 to 7-2	2	Capacitor Mica .01 MFD ± 10% 500 Volts DC	Micamold Radio Corp.
8-1 to 8-3	3	Choke Coil 2.5 Microhenries	Belmont Radio Corp.
9-1 to 9-2	2	Capacitor Ceramicon 35 MMF ± 10% 500 Volts DC	Erie Resistor Corp.
11-1 to 11-2	2	Capacitor Cer Trimmer 3 to 12 MMF ± 10% 500 Volts DC	Centralab.
12	1	Receptacle, Female	American Phenolic Corp.
13	1	Plug, Male	American Phenolic Corp.
14-1 to 14-3	3	Plug, Male	American Phenolic Corp.
15	1	Resistor, 470 Ohms, ± 10%, ½ Watt	Allen-Bradley Co.

Section IV. RECEIVING SYSTEM

14. Introduction

The function of the receiving system is to amplify and process the signals picked up by the antenna and apply them to the display unit. The receiver system utilizes a superheterodyne circuit. A discussion of the block diagram follows.

15. Block Diagram of Receiving System

A block diagram of the receiver is shown in figure 20. The reply pulses are picked up by the antenna and fed through the antenna-matching section to the r-f section of the receiver. The two stages of r-f amplification comprise a conventional r-f amplifier. The output of the r-f amplifier is fed into the mixer stage together with the signal from the

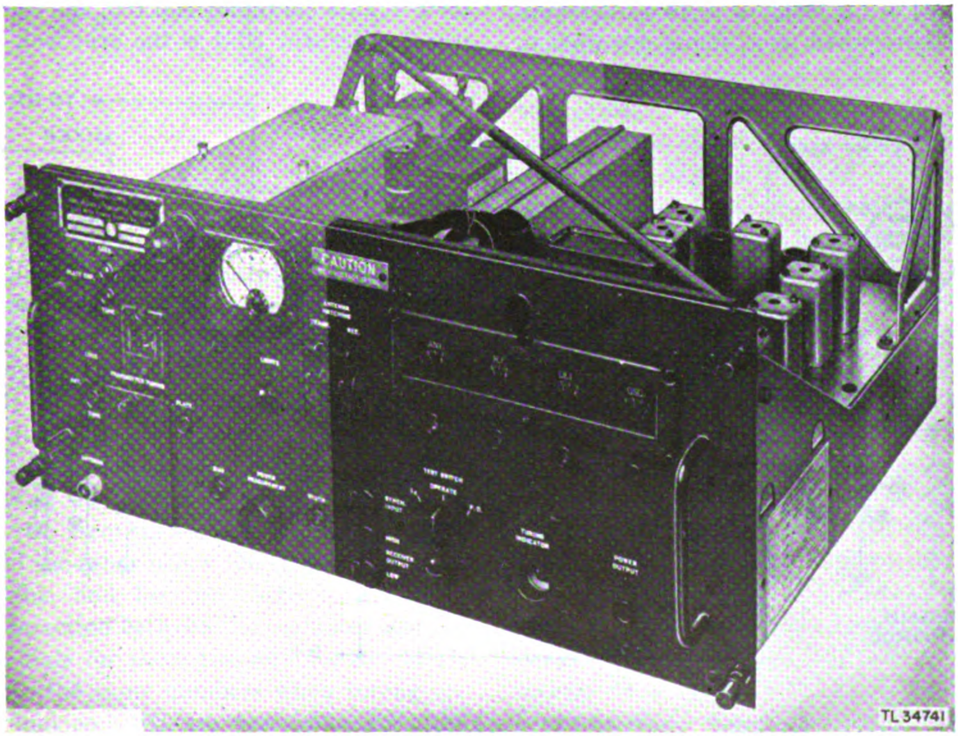


Figure 19. Radio Receiver and Transmitter BC-1267-A, front oblique receiver section.

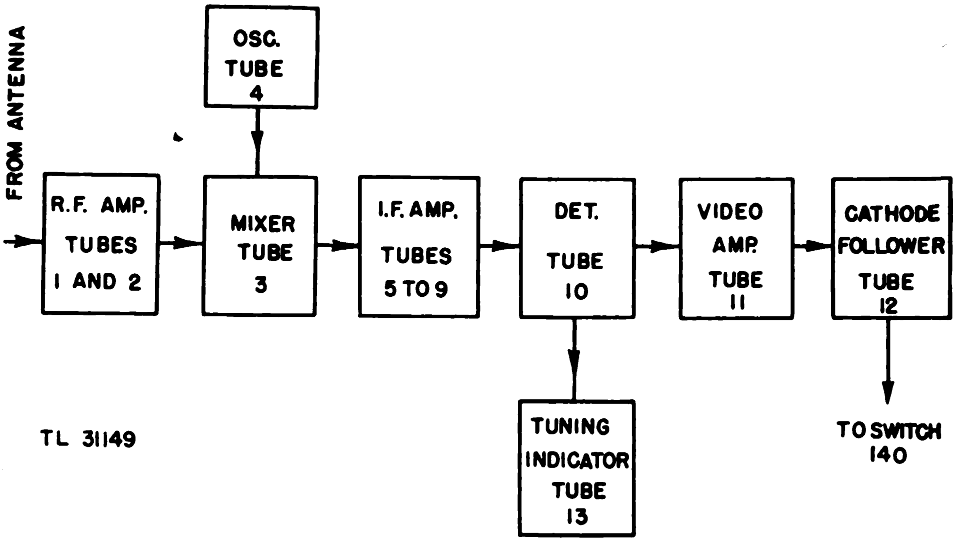


Figure 20. Receiving system, block diagram.

local oscillator, which is a modified Colpitts type operating over the range from 146 to 176 megacycles. The two r-f signals are fed to the grid of the mixer tube. The input signal and the oscillator signal are heterodyned within the mixer to produce an i-f signal of 11 megacycles. The i-f amplifier is a conventional five-stage amplifier. Each stage is tuned individually by varying the permeability of the tuning coil. Stagger tuning is used to produce a band width of 4 megacycles. The output of the i-f amplifier is fed to a double detector. The output of the first section of the detector is used to operate the tuning indicator, which is a tuning eye used to indicate the proper tuning of the receiver. The output of the second section is fed to the video-amplifier stage of the receiver. The video amplifier is conventional and is followed by a cathode follower. All d-c and filament voltages for the receiver are supplied by the RC–145–A power supply.

16. Functioning of Parts

a. R-F SECTION. (1) *R-f amplifier* (fig. 21). The signal is impressed on the grid of the first r-f amplifier, tube 1, through antenna-coupling capacitor 1–1, antenna tuning coil 100, and coupling capacitor 2. Resistor 50–1 is the grid leak for the first

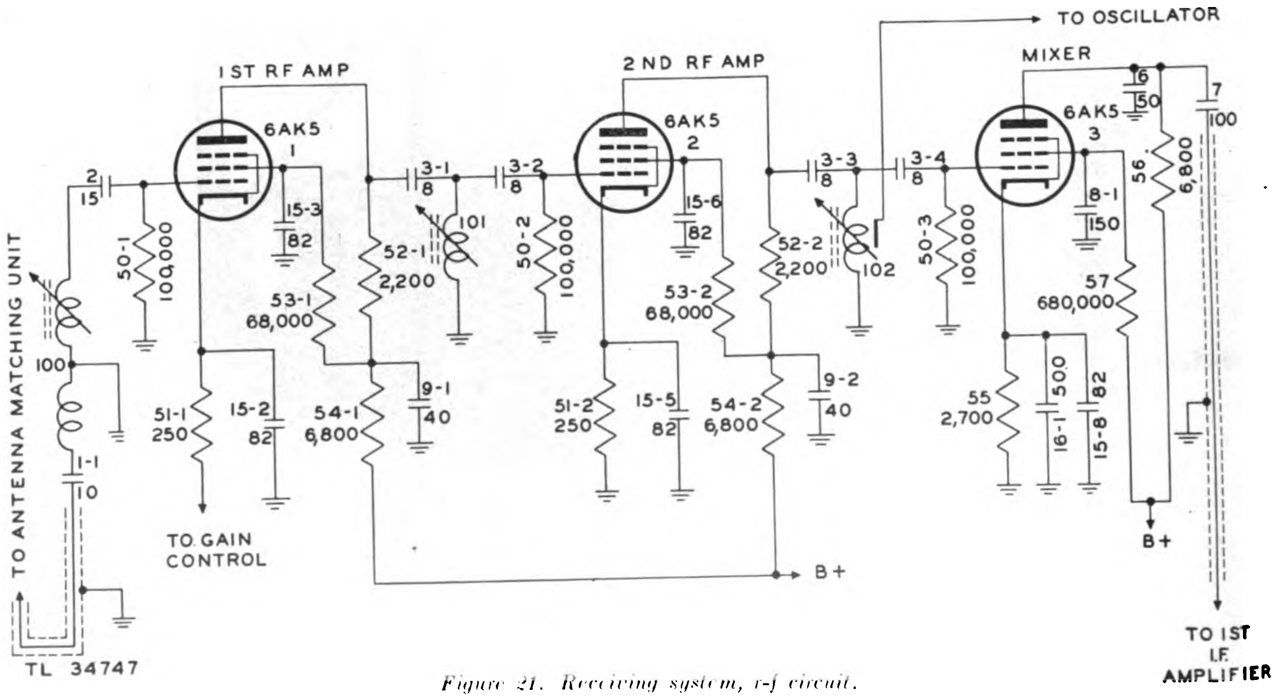


Figure 21. Receiving system, r-f circuit.

r-f amplifier. The output is fed to the grid of the second r-f amplifier, tube 2, through coupling capacitors 3–1 and 3–2. Coil 101 is used to tune the output of the first r-f amplifier. Resistor 50–2 is the grid leak for the second r-f amplifier. The three r-f circuits and the oscillator circuit are permeability tuned. An adjustable, powdered iron core inside the windings of coils 100, 101, and 102 vary their inductance, thus providing a means for tuning the individual circuits. Since there are no capacitors across the coils, the capacity of the tuned circuits is dependent upon the distributed capacities of the coil windings and the interelectrode capacities of the tubes. The method of coupling the antenna to the r-f section is shown in figure 21. The coupling coil consists of a half turn of silver wire placed around the first r-f amplifier tuning coil 100. One end of coil 100 is grounded and resonates with capacitor 2 approximately in the middle of the band. The coaxial line from the antenna-matching section is soldered directly to capacitor 1–1. The input impedance is approximately 50 ohms.

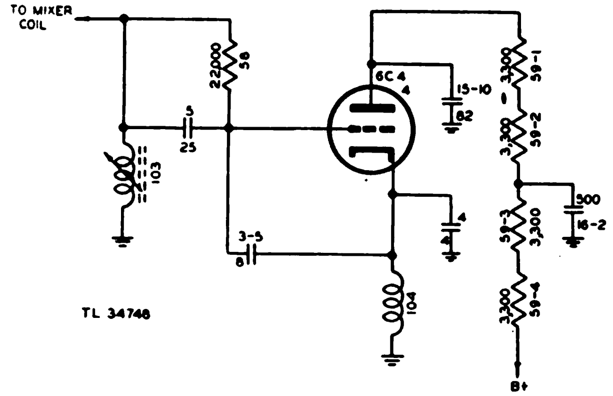


Figure 22. Receiving system, local oscillator circuit.

(2) *Oscillator.* The oscillator is a modified Colpitts type. (See fig. 22.) The plate capacitor is replaced by coil 104, which is resonant below the lowest operating frequency of the oscillator, making the coil appear as a capacitive reactance. The frequency of the oscillator is determined by capacitor 3–5 and coil 104 connected in series, acting as a capacitor in resonance with coil 103. At the low-frequency end of the band it is possible to tune the oscillator to two frequencies, one above the signal frequency and the other below the signal frequency. Because of this and because there is a certain amount of interaction between the oscillator and the detector, the dials for these two circuits should always be set to the same numbers when tuning up. Capacitor 4 and coil 103 are used to control the frequency of the oscillator. Coil 103 is permeability tuned in the same manner as the tuning coils in the r-f amplifier. Resistors 59–1, 59–2, 59–3, and 59–4 are voltage-dropping resistors for the oscillator plate. Capacitor 15–9 is the heater bypass capacitor; capacitor 15–10 is the oscillator plate bypass capacitor. Resistor 58 and capacitor 5 are the grid-leak resistor and capacitor for the oscillator.

(3) *Mixer.* The output from the plate of the second r-f amplifier is fed to the grid of mixer tube 3 through coupling capacitors 3–3 and 3–4. Resistor 50–3 is the grid leak for the mixer tube which is a 6AK5 pentode tube (fig. 21) used for mixing the incoming radio frequency with the output of the local oscillator. The oscillator is capacity coupled to mixer coil 102. The two signals are heterodyned within the mixer tube to produce the i-f signal in the plate circuit. The output of the mixer tube is connected to the grid of the first i-f amplifier tube 5 through a shielded cable.

b. I-F SECTION. The schematic for the i-f amplifier section is shown in figure 23. Each of the five stages are individually tuned by means of coils 106, 107, 108, 109, 110, and 111 which are permeability tuned. Capacitance for the tuned circuits is obtained from capacitors 1–2, 1–3, 10–1, 10–2, and 10–3 across the coils working in conjunction with the stray capacity of the circuit. The i-f signal is coupled to the grid of the first i-f amplifier through filter choke 121, where it is amplified and fed successively to the four succeeding stages for further amplification. The i-f transformers are stagger tuned to produce a band width of approximately 4 megacycles. The receiver has no automatic gain control, but a manual gain control is provided which controls the bias on the first r-f tube and the first three i-f tubes. This gain control is a special taper variable resistor and is not shown on the schematic because it is mounted in the control unit. Pin No. 22 of the interconnector plug of Radio Receiver and Transmitter BC–1267–A is connected to Control Unit BC–1266–A by a shielded wire. The gain control is connected between pin No. 22 and ground. Increasing the value of this resistance increases the bias on the tubes, which lowers the transconductance and decreases the gain. With the exception of the gain-control circuits, all the i-f stages are similar in their cathode, screen, and plate supply circuits. (See fig. 23.) R-f chokes 105–3 and 105–5, in series with the filament supply, filter the filament circuit. Closed circuit jack 151–1, in series with resistor 61 in the grid circuit of the first i-f amplifier, provides a means of testing and aligning the i-f amplifier section separately.

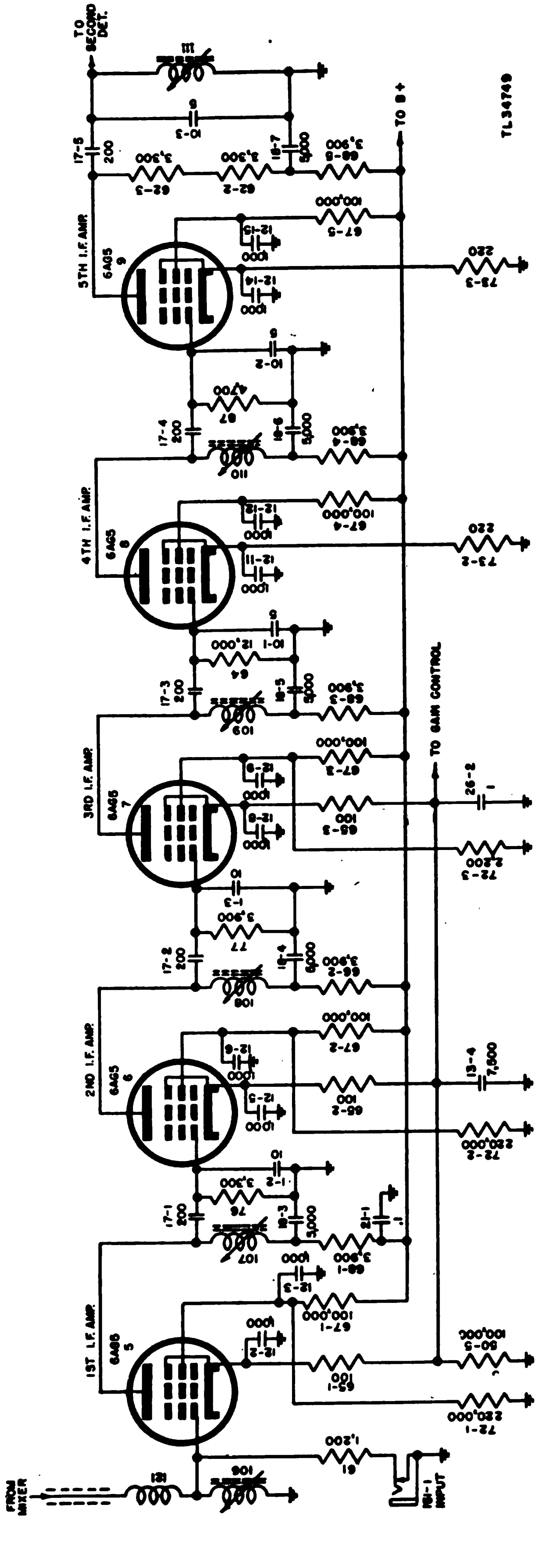


Figure 23. Receiving system, i-f circuit.

c. Detector. A 6H6 (10) double-diode tube is used as the detector. (See fig. 24.) One of the diodes functions as a detector for the signal output to be further amplified by the video stage. The other diode is used to detect a part of the signal to operate the tuning indicator. The input to the double diode consists of pulses of i-f signal, which are applied through capacitor 17–5 directly to the

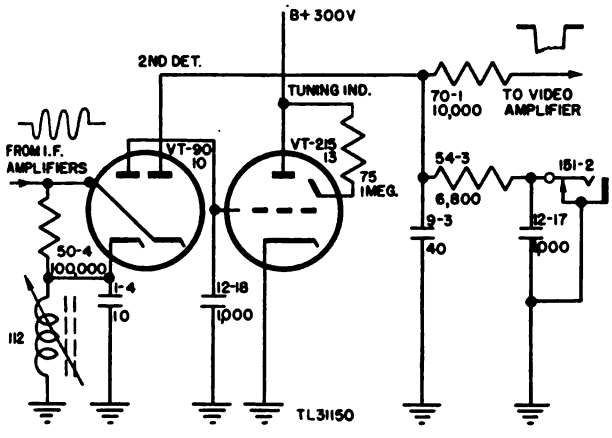


Figure 24. Receiving system, detector and tuning-indicator circuit.

cathode of the right-hand diode (pin No. 8) and through a dropping resistor 50–4 to the other cathode (pin No. 4). The cathode (pin No. 8) and the plate (pin No. 5) of the right-hand diode form the detector for the signal circuit. The input circuit for these elements is tuned by variable inductance 111. (See fig. 23.) A closed circuit jack 151–2, in series with the plate load resistor 54–3 and bypassed by capacitor 12–17, provides a means for measuring the rectified current. This jack is used to align the i-f amplifier. Resistor 70–1 damps out parasitic oscillations in the diode output to the video amplifier. The cathode (pin No. 4) and the plate (pin No. 3) of the left-hand diode form the detector for the tuning indicator signal and this detector is sharply tuned by the variable inductance 112 and capacitor 1–4. This permits accurate manual tuning of r-f and local oscillator circuits to the center frequency of the i-f stage. A long time constant circuit, resistor 69 and capacitor 13–5, is provided in the tuning indicator circuit so that it will respond to pulse signals. The accuracy of tuning is observed on the tuning indicator tube 13. Capacitor 9–3 and resistor 54–3 provide the filtering for the output of one diode, and capacitor 13–5 and resistor 69 provide the filtering for the other. The output delivered to the tuning indicator consists essentially of a direct current of negative polarity. The output from the plate of the right-hand diode (pin No. 5) consists of sharp pulses of negative

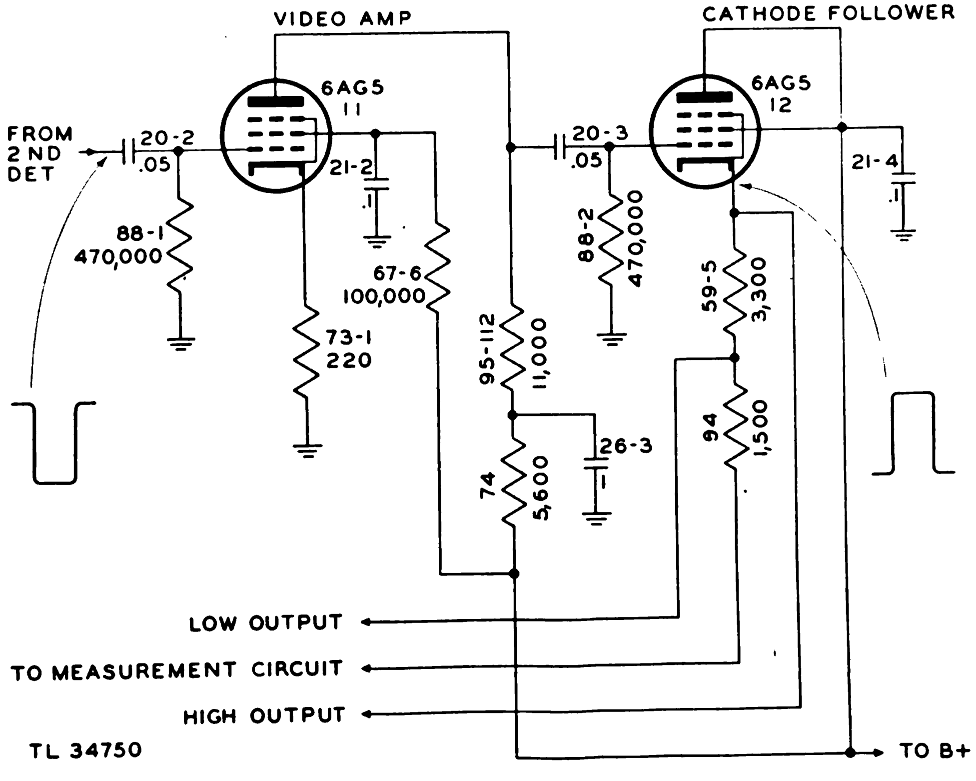


Figure 25. Receiving system, video circuit.

polarity. (See fig. 24.) This negative pulse is applied to the grid of the video amplifier.

d. Tuning Indicator. The connections to the tuning-indicator tube 6E5 (13) are conventional. (See fig. 24.) The negative input to the grid of tube 13 causes the control grid to become negative with respect to the cathode. When the signal becomes stronger, the control grid becomes more negative, causing the dark arc of the indicator tube to become narrower. Tuning adjustments, therefore, are made to get as narrow a shadow as possible.

e. Video Amplifier and Cathode Follower. The sharp negative pulse from one plate of the second detector is impressed on the grid of the video amplifier tube 6AG5(11) through coupling capacitor 20–2. (See fig. 25.) The leading and trailing edges of the pulse amplified by this video amplifier are very sharp. Consequently, the frequency response of the amplifier must be approximately 100 to 250,000 cycles per second. The amplified positive pulse from the plate of the video amplifier is coupled to the control grid of the cathode follower tube 6AG5 (12) through coupling capacitor 20–3. Since a low output impedance is desired, the last stage of the receiver operates as a cathode follower. The cathode load consists of two resistors, 94 and 59–5, so that two values of output impedance are available. The high output impedance signal is taken directly from the cathode of the cathode-follower tube, and the low output impedance signal is taken from the junction of resistor 94 and 59–5. (See fig. 25.) The output of the receiver consists of pulses of positive polarity.

Section V. RANGE AND TIMING SYSTEM

17. Introduction

The control unit of the RC–145–A contains all the range and trigger circuits necessary to make it possible for the unit to receive a synchronizing pulse from the radar equipment, delay the pulse $3\frac{1}{4}$ microseconds, then use the delayed pulse to trigger the IFF transmitter. The circuits provide a means for determining the correctness of the azimuth setting of the antenna, for calibrating the unit and for viewing the test patterns. The control unit also contains an oscilloscope for viewing, simultaneously, the main pulse of the identification transmitter and the pulse from the interrogated friendly target when the range switch is in the 100K YD. position. When the range switch is in the 10K YD. position, the sweep is expanded so that any 10K-yard portion of the total range, as determined by Radio Set SCR–

Figure 26. Control Unit BC–1266–A.

545–A ranging equipment, can be viewed. The control unit contains 15 tubes which perform 21 separate functions. The various stages of the control unit are shown in the block diagram. (See fig. 27.)

18. Block Diagram of Range and Timing System

The diagram in figure 27 shows the basic elements in the operation of the range and timing system. Each of these elements is described briefly in the following paragraphs:

a. Sync Amplifiers. The sync voltage supplied by Radio Set SCR–545–A is applied to the receptacle marked SYNCH IN. This receptacle is located at the rear of the control unit. This sync signal is a negative pulse 1 microsecond in duration having an amplitude of 30 volts. The sync signal of 480 pulses per second is fed directly to tube 1A which inverts the polarity of the sync pulses and isolates them from any other signals present in the control unit. The output of tube 1A is coupled to tube 1B which is a cathode follower. The cathode follower minimizes intercoupling between stages. The output of the sync amplifiers initiates the operation of the divider multivibrator. With the range

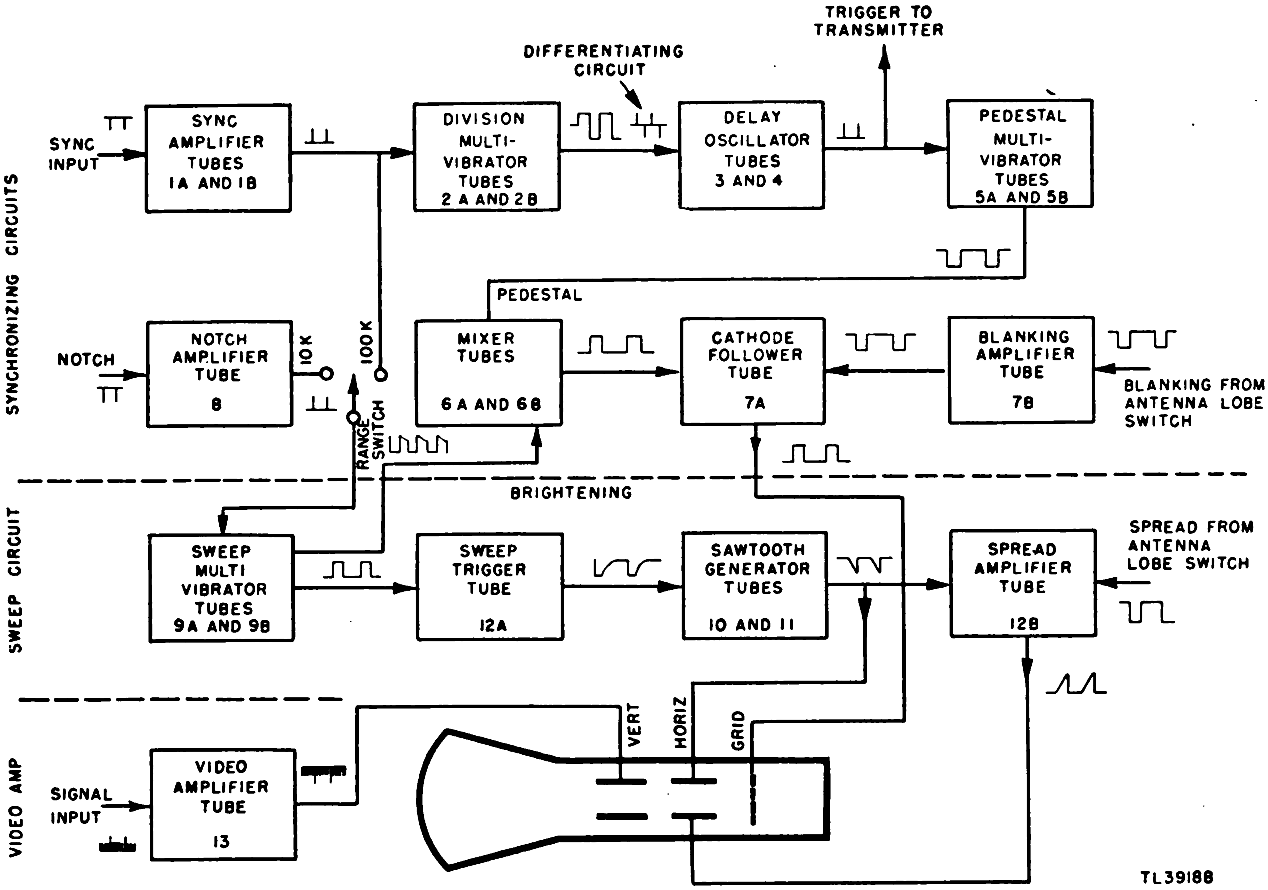


Figure 27. Block diagram of range and timing system.

switch in the 100K YD. position, the output of tube 1B also triggers the sweep multivibrators.

b. Divider Multivibrator. Tubes 2A and 2B are used in a conventional multivibrator circuit. The operation of the multivibrator is controlled so that its output is either a 1:1 or a 1:2 ratio with respect to the sync signal input to the control unit. The output of tube 2B is differentiated and applied to tube 3.

c. Pulse Shaper. Tube 3 serves as a pulse amplifier and shaper. The tube is operated so as to clip the negative input pulses. The output of tube 3 consists of negative pulses which are applied to the tuned circuit in the grid circuit of the delay oscillator.

d. Delay Oscillator. The voltages applied to the grid of tube 4 are obtained from the ringing circuit. The ringing circuit is shocked into oscillation by the output of tube 3. The oscillations begin in a negative direction and the normal operation of tube 4 is not changed until the first positive oscillation triggers it. The time lapse between the beginning of the oscillations and the first positive voltage swing produces the desired delay in circuit operation. The oscillations are very heavily damped so that only the first cycle is of importance. The output of tube 4 is the transmitter sync voltage which is applied to the STANDBY–OPERATE switch and also to the pedestal multivibrator. When the switch is in the OPERATE position, the signal is applied to the SYNCH OUT receptacle located at the rear of the control unit. When the switch is in the STANDBY position the transmitter sync signal is grounded through a resistor which is equivalent to the impedance of the transmitter.

e. Pedestal Multivibrator. The pedestal multivibrator consists of tubes 5A and 5B. The multivibrator produces 240 square waves per second which are later mixed with two other signals to make up a signal for brightening the trace on the screen of the cathode-ray tube at the proper times. The output of tube 5B is fed to tube 6A.

f. Mixer. Tubes 6A and 6B form a parallel plate mixer. Tube 6A receives its signal from tube 5B and tube 6B receives its signal from the sweep multivibrator tube 9B. Tube 9B supplies a pulse of the same duration as the sweep to be viewed on the cathode-ray tube at a frequency of 480 cycles per second. Therefore voltage addition in the common plate circuit occurs only at every other pulse from the sweep multivibrator.

g. Blanking Amplifier. The operation of this tube is controlled by the action of the lobe switch. Normally, tube 7B is biased beyond cut-off and consequently its plate voltage is almost at B+ potential. When the cams of the lobe switch short the cathode of tube 7B to ground, the tube conducts and its negative pulse output is fed to tube 7A. This blanking voltage is mixed with the brightening voltage from tubes 6A and 6B to prevent the application at the same time of both lobe outputs to the receiver and cathode-ray tube.

h. Cathode Follower. The mixed voltages from tubes 6A, 6B, and 7B are applied to tube 7A. Tube 7A is operated as a cathode follower and clipper. The negative portions of the voltages input are clipped and the output at the cathode is a pulse which lasts for the same length of time as the sweep and occurs once for every two sweeps. The brightening voltage output from tube 7A is applied to the control grid of the cathode-ray tube. When the range switch is in the TEST position, tubes 6A and 6B are made inoperative, thereby removing the brightening voltage.

i. Notch Amplifier. The notch sync voltage from Radio Set SCR–545–A enters at the receptacle marked NOTCH. This receptacle is located at the rear of the control unit, and is directly connected to tube 8. Tube 8 inverts the notch voltage and its amplified output synchronizes the sweep multivibrator when the range switch is in the 10K YD, or CALIB. positions.

j. Sweep Multivibrator. The sweep multivibrator consists of tubes 9A and 9B. The synchronizing voltage from tube 1B triggers the sweep multivibrator when the range switch is in the 100K YD. position, and the sync voltage from tube 8 triggers the sweep multivibrator when the range switch is in the 10K YD. or CALIB. positions. When the range switch is in the TEST position, the sweep multivibrator is inoperative. The output from the cathode of tube 9B is fed to the mixer tube 6B, and the output from the plate of tube 9B starts the operation of the sweep trigger tube.

k. Sweep Trigger. The sweep trigger is tube 12A. This stage amplifies the sweep trigger voltage in all positions of the range switch. However, when the range switch is in the TEST position, the input to tube 12A is taken from the divider multivibrator and not from the sweep multivibrator as in the other three positions. The output of the sweep trigger tube is fed to the saw-tooth generator tube.

l. Saw-tooth Generator. Tubes 10 and 11 connected in series and their associated integrating capacitors make up the saw-tooth generator. The plate of tube 11 is directly connected to the cathode of tube 10 and this common connection is also connected to the integrating capacitors. Tube 10 is normally conducting and its plate current is held at a constant value determined by the constant current pentode, tube 11. A negative pulse from the sweep trigger tube is applied to tube 10 and renders it nonconducting. When tube 10 is nonconducting, the integrating capacitor charges through tube 11 which produces a linear charging voltage. This linear voltage is fed to the grid of tube 12B and also to one of the horizontal deflection plates of the cathode-ray tube.

m. Sweep Amplifier. The signal from the saw-tooth generator is amplified by tube 12B and also mixed with the spread voltage from the lobe switch. The saw-tooth and spread signals are mixed in the grid circuit of tube 12B and the output of the sweep amplifier is then fed to the other horizontal deflection plate of the cathode-ray tube. With the sweep and spread voltages applied to the horizontal deflection plates in this manner, the procedure of pip-matching is made possible.

n. Video Amplifier. The output of the receiver is fed to the video amplifier, tube 13. Tube 13 inverts and amplifies the signals and sends them to one of the vertical deflection plates of the cathode-ray tube.

o. Cathode-ray Tube. The cathode-ray tube used is the type 5CP1 which is an electrostatic type of cathode-ray tube. Two centering controls are provided to properly position the patterns on the screen of the cathode-ray tube, and intensity and focus controls provide means for adjusting the focus and brilliance of the pattern. The control grid is modulated by the brightening voltage.

p. Rectifier. Tube 14 is a half-wave rectifier. The rectifier circuit is so designed that it delivers both positive and negative high potential for the operation of the cathode-ray tube.

19. Functioning of Parts

The simplified schematic diagrams given within the text show the circuits in simplified form accompanied by parts values and approximate waveforms. For a complete schematic refer to figure 133. Exact

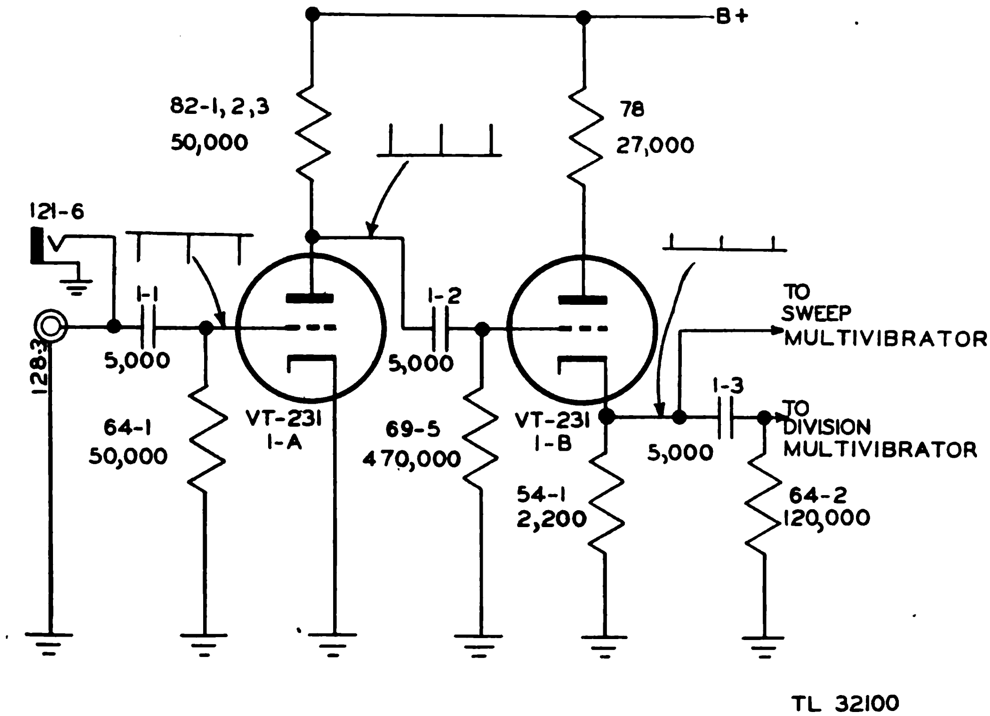


Figure 28. Control unit, sync-amplifiers circuit.

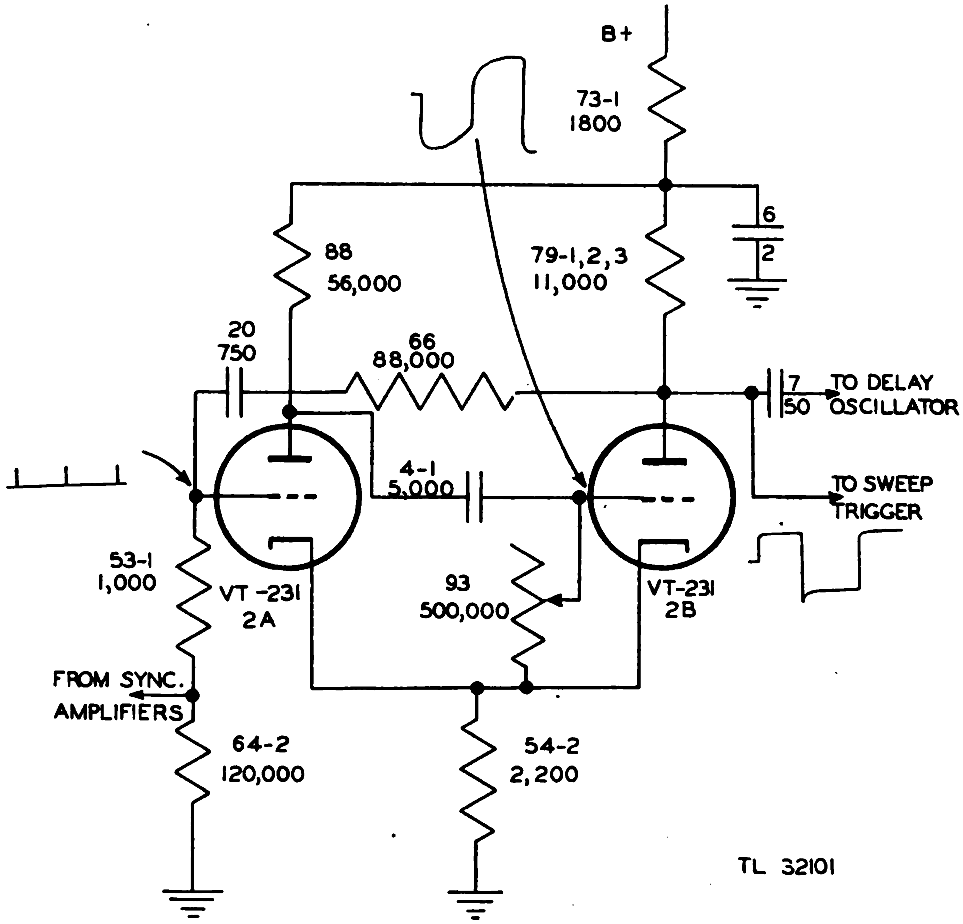


Figure 29. Control unit, divider multivibrator circuit.

waveforms are shown graphically at the end of the section and may be referred to by tube number. A detailed discussion of all circuits used is given in the following paragraphs.

a. Sync Amplifiers (fig. 28). The radar sync signal, which consists of 1 microsecond pulses of negative polarity and 30 volts in amplitude at a repetition frequency of 480 pulses per second, is fed to the control unit through fitting 128–3. This same signal is available for observation or test purposes at jack 121–6 on the side of the control unit. This sync signal, shown in figure 35 (A), is coupled to the grid of tube 1A which inverts the polarity as shown in figure 35 (B). The resulting positive signal is fed to the grid of tube 1B. Since this tube is used as a cathode follower it provides a low output impedance which minimizes common impedance coupling between the divider multivibrator and the sweep multivibrator described below. The output of tube 1B appears in figure 35 (C).

b. Divider Multivibrator (fig. 29). (1) Tubes 2A and 2B constitute the divider multivibrator. Since the grid of 2B is returned through control 93 directly to its cathode, it is normally unbiased and the tube is fully conducting. The resulting voltage drop across resistor 54–2 biases tube 2A beyond cut-off. The plate of 2A is normally at B+ potential except for the small drop across resistor 73–1. Resistor 73–1 and capacitor 6 are used as a decoupling filter. When tube 2A receives a positive sync pulse from tube 1B it begins to conduct. Since the plate of 2A is coupled to the grid of 2B and the cathode of 2B is coupled to the cathode of 2A, the circuit constitutes a regenerative loop. Additional coupling from 2B to 2A is provided by resistor 66 and capacitor 20.

(2) The process started by the sync pulse develops into a strong transient which results in complete cut-off of 2B and leaves 2A fully conducting. After the transient, the plate of 2A is at a relatively low voltage because of the drop across load resistor 88 while the plate of 2B is nearly at B+ potential as shown in the figures 35 (D) and 35 (F) respectively. The transient also leaves the grid of 2B with a high negative bias which immediately begins to leak off at a rate depending on the time constant of capacitor 4–1 and control 93, the latter providing an adjustment of this rate. In the course of time this negative bias drops to the cut-off value, allowing tube 2B to become conducting. The plate voltage of 2B begins to fall and the cathode voltage begins to rise. Both of these effects apply negative bias to 2A, causing the plate current of 2A to drop. As before, the system is regenerative and a second

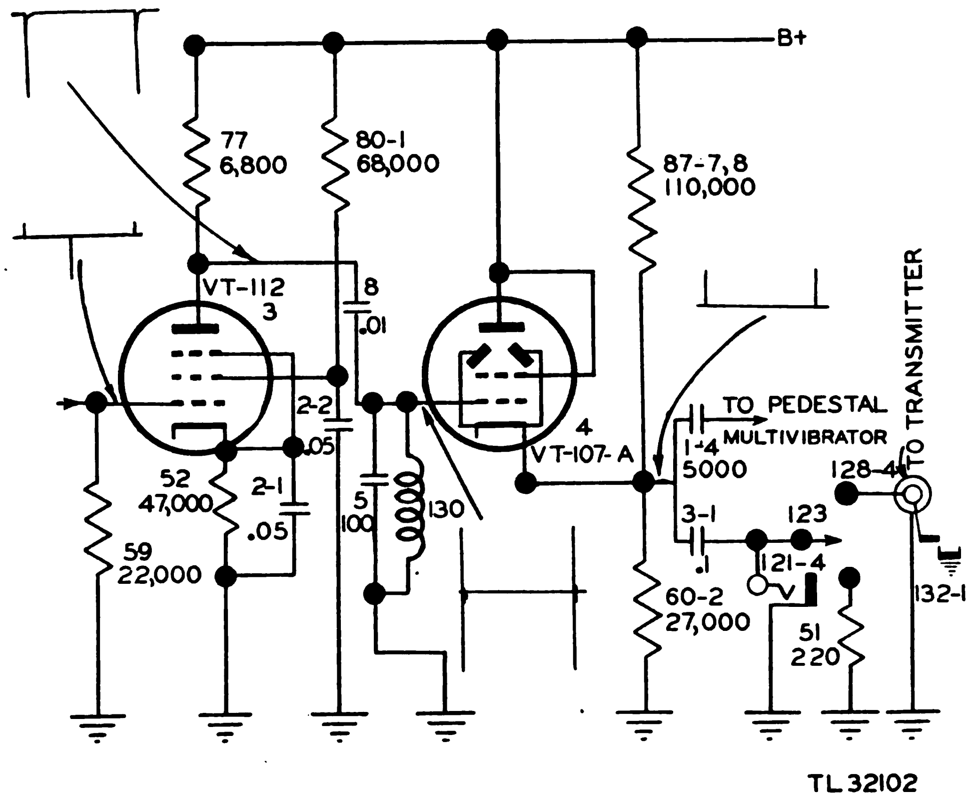


Figure 30. Control unit, delay oscillator circuit.

strong transient occurs which causes 2B to conduct heavily and drives 2A to cut-off. This leaves the multivibrator in its original condition. When it receives the next sync pulse the cycle is repeated. If, however, a sync pulse occurs before the second transient, it has no effect upon the multivibrator since it cannot initiate a new cycle until the cycle started is complete. This means that the multivibrator can be used as a divider, the repetition frequency being a sub-harmonic of the frequency of the sync signal. This division is adjustable by means of control 93. With an input frequency of 480 pulses per second, this control provides a choice of 1:1 or 2:1 division.

(3) Figures 35 (D) and 35 (F) show division of 1:1 while figures 35 (E) and 35 (G) indicate a division of 2:1. At the first transient of each cycle, which occurs at the time a sync pulse is received, the plate voltage of 2B is a positive step. This results in a positive pulse when the plate voltage of 2B is differentiated by capacitor 7 and resistor 59. This is shown in figure 35 (H). The second transient of each cycle results in a negative pulse.

c. Pulse Shaper (fig. 30). This voltage output from 2B is applied to the control grid of tube 3. A combination of grid leak bias developed across resistor 59 and cathode bias across resistor 52 produces clipping of the negative pulses. Only the positive pulses are amplified. They appear at the plate of tube 3 as shown in figure 35 (I).

d. Delay Oscillator (fig. 30). (1) The signal output from tube 3, applied to a tuned circuit consisting of coil 130 and capacitor 5, results in a ringing action which produces the voltage shown in figure 35 (J). Although figure 35 (J) does not show this waveform in detail, it consists of a rapidly damped sine wave. The first ½ cycle is negative; the waveform crosses the a-c axis and goes positive to a positive voltage of about 120 volts. This positive swing is clearly delayed by ½ cycle at the axis.

(2) The signal shown in figure 35 (J) is applied to the control grid of tube 4. This tube is used as a cathode follower and the cathode is biased by resistors 87–7, 87–8, and 60–2 to about +50 volts. Hence tube 4 does not begin to conduct until the grid voltage swings positive approximately 20 volts.

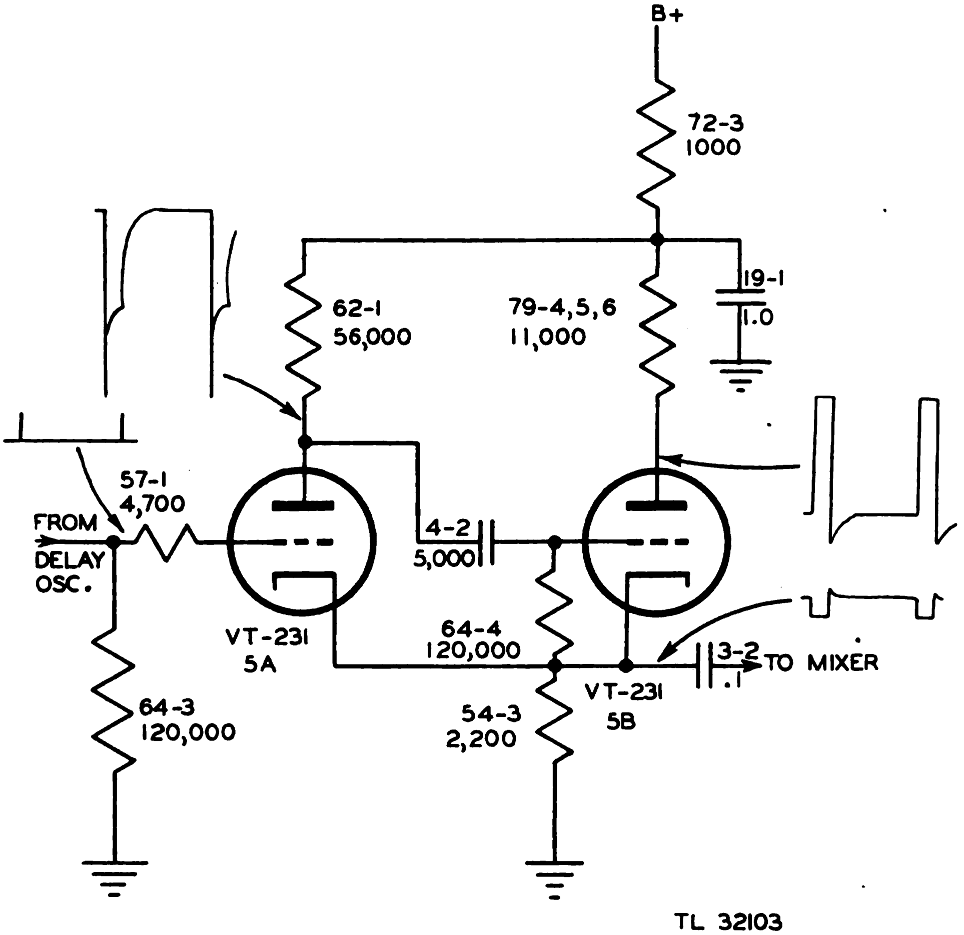


Figure 31. Control unit, pedestal multivibrator circuit.

The output at the cathode of tube 4 consists of a positive pulse which is delayed with respect to the original radar sync signal by ½ cycle of the tuned circuit plus the time taken for the upward swing to reach the point when tube 4 starts to operate. This tuned circuit is resonant at 200 kc, making the total delay 3¼ microseconds.

(3) The output of tube 4 is fed through capacitor 3–1 to jack 121–4 for test purposes and through switch 123 (the STANDBY OPERATE switch) and fitting 128–4. This fitting feeds the sync signal to the IFF transmitter. The spark plate 132–1 constitutes a bypass capacitor having extremely low series inductance. Spark plates are used on this and several other circuits to avoid pick-up of the high power pulses from the radar transmitter. In the STANDBY position, switch 123 grounds the sync signal lead of the transmitter and replaces the transmitter load by resistor 51. The output of tube 4 is also fed through capacitor 1–4 to the grid of tube 5A.

e. Pedestal Multivibrator (fig. 31). (1) Tubes 5A and 5B constitute the pedestal multivibrator which is used to control the brightening signal applied to the grid of the cathode-ray tube. The pedestal multivibrator operates in a manner similar to that of the divider multivibrator with the exception that the second transient of each cycle occurs long before the next sync pulse so that there is no dividing action. The voltage on the plate of 5A appears in figure 35 (L) while the plate voltage of 5B is shown in figure 35 (M).

(2) Figure 35 (N) illustrates common cathode voltage of tubes 5A and 5B. As in the case of the divider multivibrator, capacitor 4–2 and resistor 64–4 determine the time interval between the two transients of each cycle and, therefore, the width of the pulse appearing in figure 35 (N). The values are chosen for a pulse width of approximately 900 microseconds. This is longer than any of the brightening voltages to be used.

f. Mixer (fig. 32). Tubes 6A and 6B form a parallel plate mixer. The voltage of figure 35 (N) is coupled to the grid of tube 6A and either the voltage of figure 35 (R) or (Q) is coupled to the grid of tube 6B. The output of the mixer is shown in figure 35 (O) for the long range position and for the short range in figure 35 (P). When the range

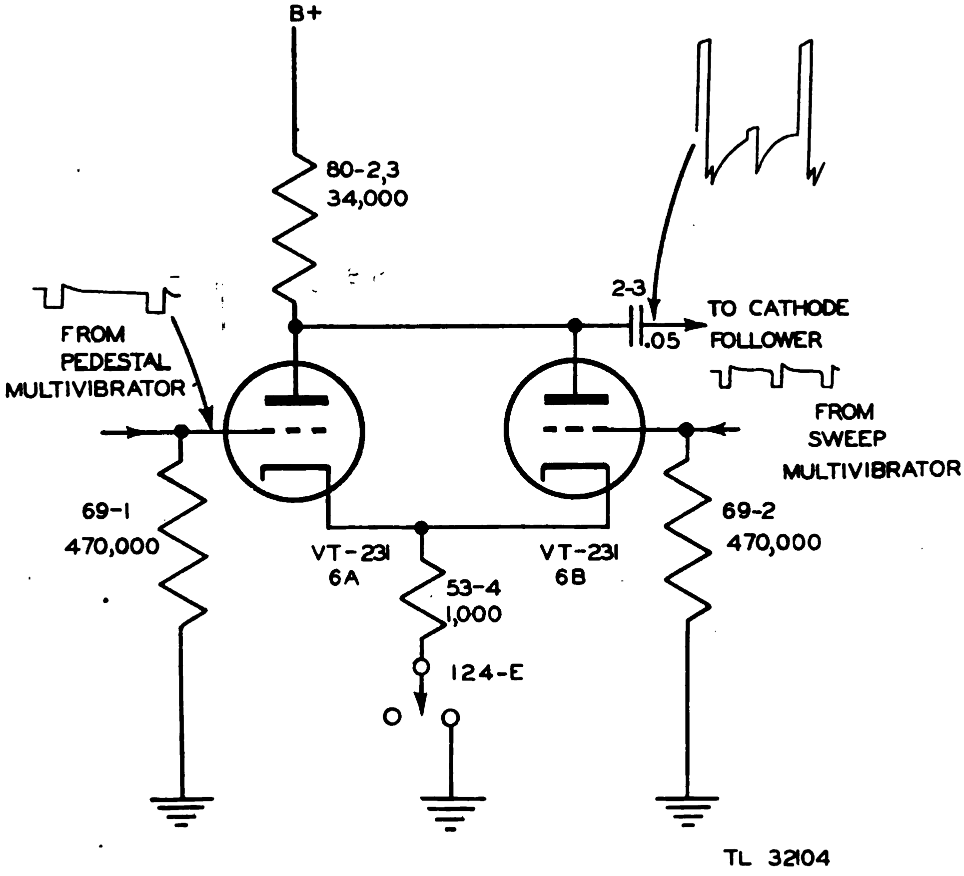


Figure 32. Control unit, mixer circuit.

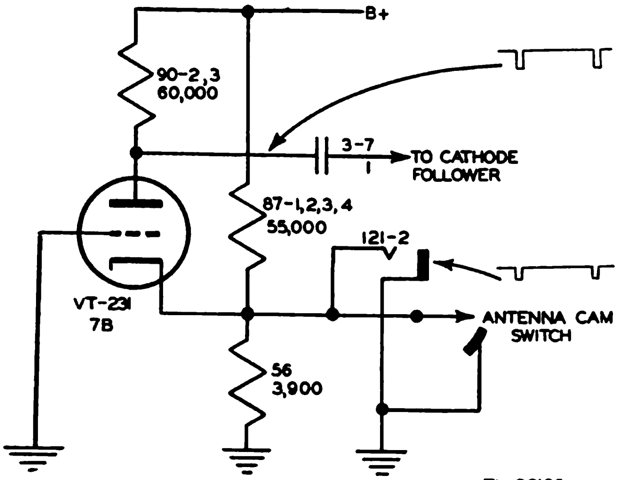


Figure 33. Control unit, blanking amplifier circuit.

switch is in the TEST position the common cathode bias resistor 53–4 of tubes 6A and 6B is disconnected from ground and the pedestal brightening signals are stopped. Control 96 will have to be advanced to compensate for the lack of brightening voltage to be able to see the test patterns on the screen of the cathode-ray tube.

g. Blanking Amplifier (fig. 33). The blanking voltage is produced at tube 7B. The grid of tube 7B is grounded and the cathode is biased to cut-off by resistors 87–1 to 87–4 inclusive and 56. This point is connected to jack 121–2 for test purposes and to the blanking cam of the lobe switch through pin G of plug 127. When the cam is grounded, tube 7B conducts because the biasing voltage is removed. Its plate voltage drops and when the blanking cam is opened the tube is once again cut-off, allowing the plate voltage to rise to B+ potential, thus producing a square wave. The output of tube 7B is coupled to the grid circuit of tube 7A through capacitor 3–7 and resistor 55.

h. Cathode Follower (fig. 34). (1) The blanking and mixer output signals are fed to the grid of tube 7A through capacitor 2–3. Tube 7A is a cathode follower whose output is available at jack 121–1 for test purposes and is coupled through capacitor 13 to the grid of the cathode-ray tube. The grid circuit of tube 7A is designed to clip the negative portions of the brightening signal.

(2) The output of tube 7A when the range switch is in the 100K position is shown in figure 35 (S). Figure 35 (T) shows the output for the short range. When the switch is in the TEST position, there is no brightening voltage output from tube 7A because the mixer tubes 6A and 6B are inoperative.

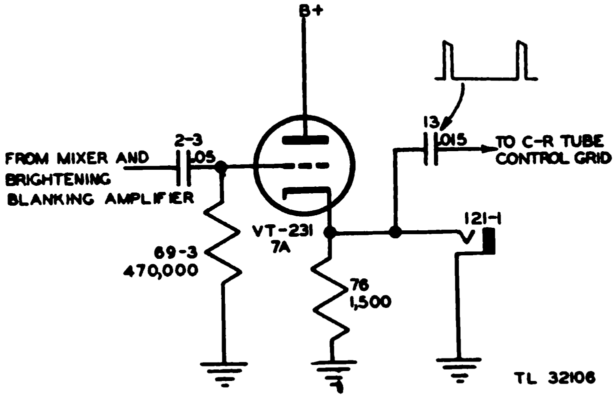


Figure 34. Control unit, cathode follower circuit.

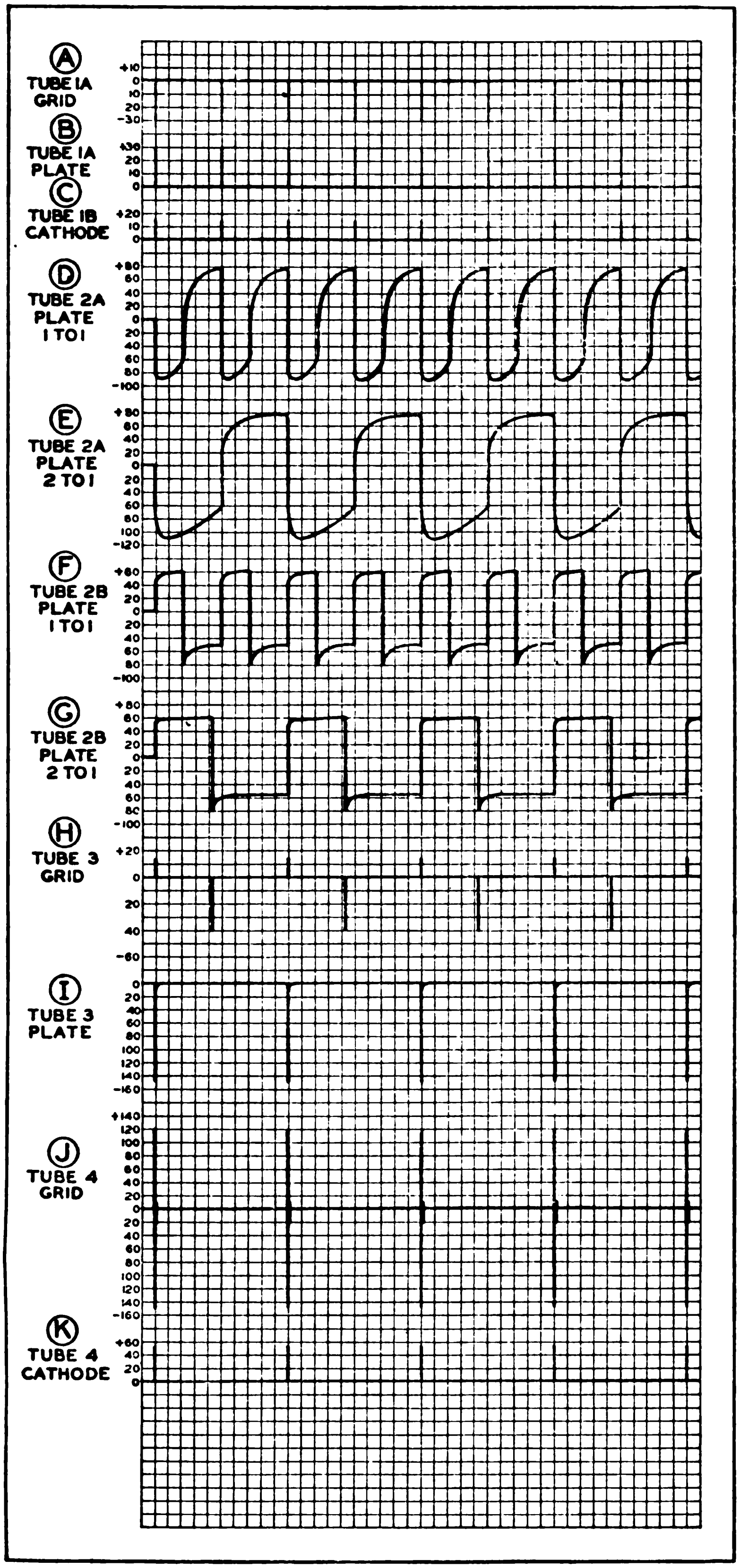


Figure 35. Control

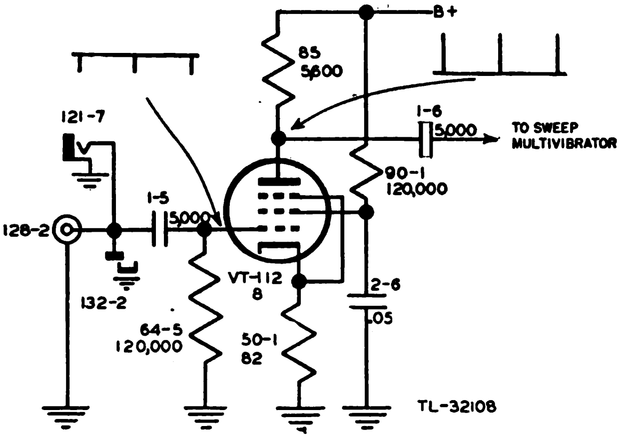


Figure 36. Control unit, notch amplifier circuit.

i. NOTCH AMPLIFIER (fig. 36). The radar notch voltage (fig. 41 (A)), a 1½-volt, 7½-microseconds wide pulse is fed to fitting 128–2. This signal is available for test purposes at jack 121–7 which also connects to spark plate 132–2 and to input coupling capacitor 1–5. Tube 8 is a high gain pentode and has the radar notch signal applied to its control grid. Figure 41 (B) shows this signal as it appears at the plate. The range switch selects either the output of tube 1B which is the radar sync signal for the long range, or the radar notch signal for the short range and calibrating positions and feeds this signal to the grid of tube 9A. The output of the notch amplifier is used only in the 10K YD. and CALIB. switch positions.

j. SWEEP MULTIVIBRATOR (fig. 37). This multivibrator (tubes 9A and 9B) operates in the same manner as the divider and pedestal multivibrators. The time interval between the two transients is fixed for the long range position at 600 microseconds by resistor 63–1, and it is adjustable to 60 microseconds in the short range and calibrating positions by means of control 92, the calibrating control. The voltage at the plate of tube 9A is shown in figure 41 (C) in the long range and in figure 41 (D) for the short range. The voltage at the plate of 9B is shown in figures 41 (E) and 41 (F) for the long and short ranges, respectively. The output of the sweep

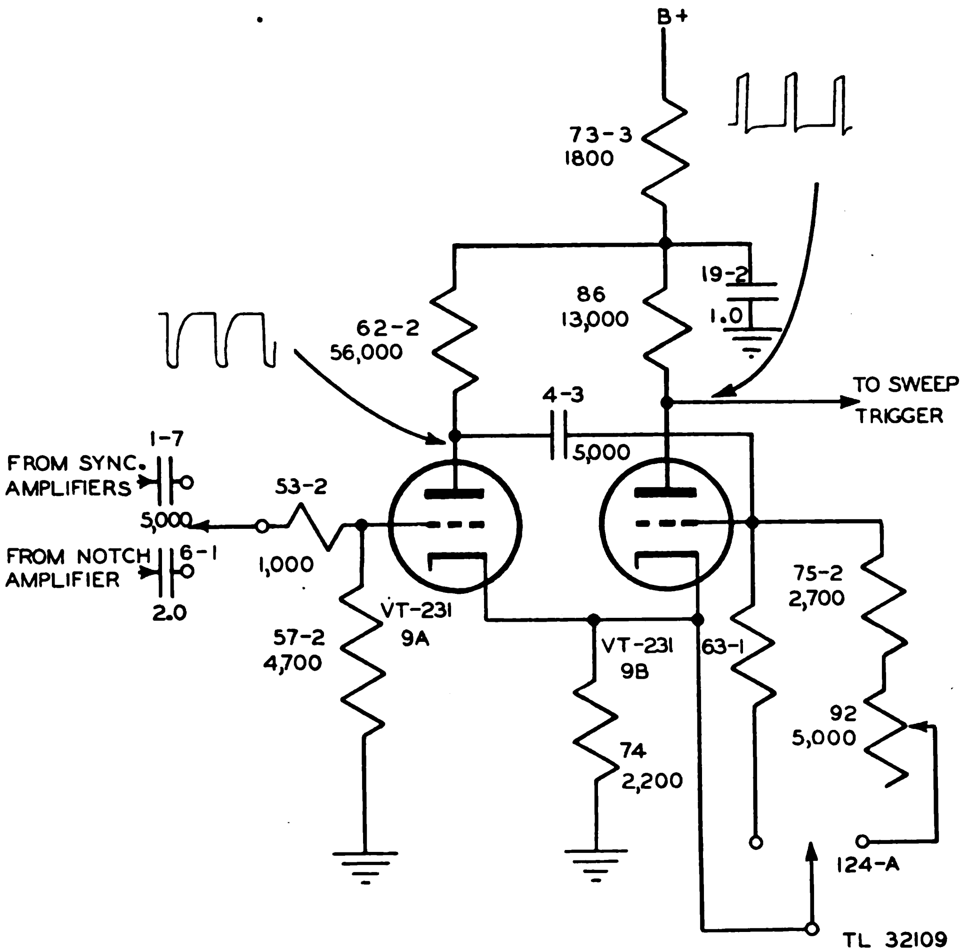


Figure 37. Control unit, sweep multivibrator circuit.

multivibrator is taken at the plate of 9B and fed to the grid of tube 12A through the range switch for all positions except the TEST position. In the TEST position the output of the divider multivibrator is fed through the same wafer of the switch and into the grid of tube 12A. A second output is taken from tube 9B at its cathode. The cathode voltage variations are coupled to the grid of tube 6B and become part of the output of the mixer tubes.

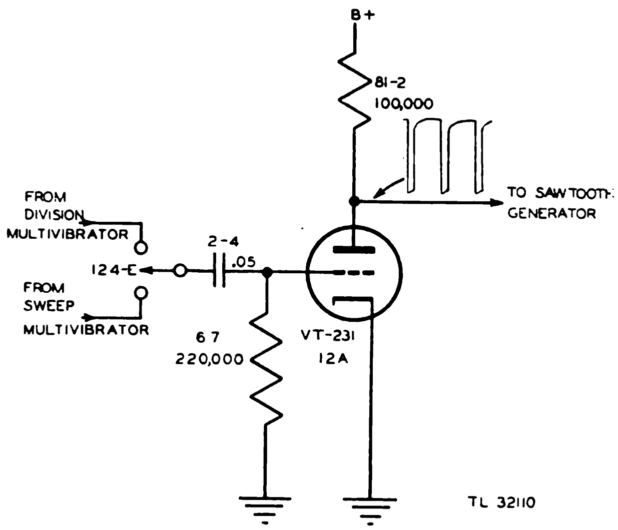


Figure 38. Control unit, sweep trigger circuit.

k. Sweep Trigger (fig. 38). Tube 12A serves to amplify the output of the sweep multivibrator. The output of tube 12A is shown in figures 41 (G) and 41 (H) for long and short ranges, respectively. The plate of 12A is connected directly to the control grid of tube 10.

l. Saw-tooth Generator (fig. 39). (1) Both tubes 10 and 11 are used in the generation of the saw-tooth sweep voltage. Tube 10 is connected in series with the constant current pentode, tube 11. Tube 11 gets its screen voltage from divider 60–1, 82–4, and 82–5. Its control and suppressor grids are grounded and its cathode is switched by the range switch to control 94–1 for the long range and TEST

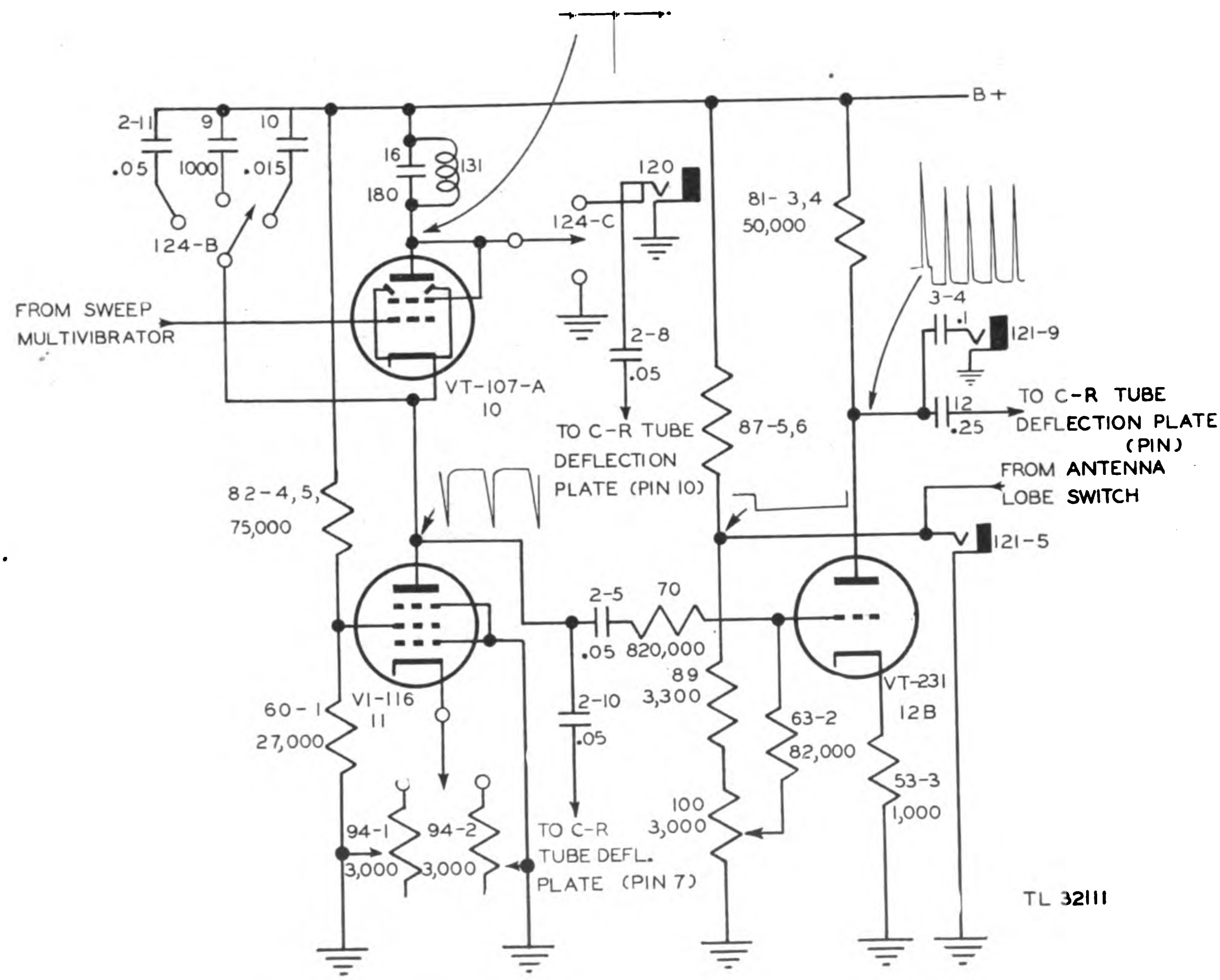


Figure 39. Control unit, saw-tooth generator and spread amplifier circuits.

positions, and to control 94–2 for the short range and calibrating positions. These controls vary the gain of the sweep produced at the common connection of the cathode of tube 10 and plate of tube 11.

(2) Normally both tubes are conducting. The abnormal condition exists when a strong negative pulse from tube 12A hits the control grid of tube 10, making tube 10 inoperative. Tube 10 being cut-off allows any one of the capacitors 2–11, 9, or 10 to charge through constant current tube 11 depending upon the position of the range switch. The capacitor selected for the particular range of operation is thrown between B+ and the plate of tube 11, which is conducting, and will allow the capacitor to charge gradually, its rate depending upon the capacity and the setting of either 94–1 or 94–2. When the negative pulse is removed from the grid of tube 10, it will start to conduct again and the capacitor that was being charged will be shorted by tube 10. The abnormal condition lasts as long as the pulse is applied to the control grid of tube 10.

(3) The voltage available at the common connection, cathode of tube 10 and plate of tube 11, to ground is dependant on the rate of charge of capacitor 10 for the long range (fig. 41 (J)). Voltages shown are for full coverage of the sweep on the screen of the cathode-ray tube. This also applies for the short range, as shown in figure 41 (K). The long range sweep lasts for 600 microseconds. The short range sweep lasts for 60 microseconds and the test sweep will be about 4,000 microseconds duration.

(4) The ringing circuit at the plate of tube 10 rings in much the same manner as coil 130 and capacitor 5 discussed before in conjunction with the delay oscillator. This tuned circuit (coil 131 and capacitor 16) has a resonant frequency of approximately 200 kc and, therefore, each cycle has a duration of 5 microseconds. This voltage is available at the plate of tube 10 as shown in figure 41 (I), and is brought to the range switch to be applied to one of the vertical deflecting plates of the cathode-ray tube to be observed on the screen. This voltage will appear as a succession of waves of 5 microseconds duration per each cycle. To calibrate the sweep to 60 microseconds the calibration control 92 is rotated until 12 complete cycles appear on the screen. The sweep voltage taken from the plate of tube 11 is brought to two coupling capacitors, 2–5 and 2–10. Capacitor 2–5 connects to the grid of tube 12B and 2–10 connects to the horizontal deflection plate of the cathode-ray tube. This sweep voltage is available through capacitor 3–6 at jack 121–8 for test purposes.

m. Spread Amplifier (fig. 39). (1) Capacitor 2–5 couples the sweep voltage output from tube 10 to the grid of tube 12B. This voltage is divided by the combination of resistors 70, 63–2, and control 100. Tube 12B amplifies the sweep voltage and also introduces a spread voltage into the sweep as shown in figure 41 (N) for the long range position of the range switch. When control 100 is set at its operational position, a spread of about ½ inch is produced. With control 100 in its maximum clockwise position there is a positive bias voltage applied to the grid of tube 12B of about 10 volts. This voltage is taken from the divider 87–5, 87–6, 89, and 100. The movable arm of the spread control serves as a return for the grid of 12B.

(2) The spread cam of the lobe switch is connected to pin J on plug 127. This voltage is available for test at jack 121–5 (fig. 41 (O)), and connects to the upper section of the divider just described. When the cam is closed there will be zero voltage across control 100 and when it is open there is about 10 volts across the control. This voltage is made adjustable by the control and introduces a square wave into the grid return of tube 12B; therefore, the sweep is shifted accordingly. The waveform at the plate of tube 12B is shown in figures 41 (L) and 41 (M) for the long and short ranges respectively, spread voltage off. The voltages shown are for full coverage of the sweep on the screen.

(3) The plate of tube 12B is tied to capacitor 12. The other horizontal deflection plate of the cathode-ray tube is connected to capacitor 12 and to loading resistor 71–3. Resistors 71–3 and 71–4 are connected to the range switch which selects two horizontal centering controls, one for each range.

n. Video Amplifier (fig. 40). (1) The video output of the receiver is brought to fitting 128–1 and coupled to tube 13 through capacitor 3–5. Figure 41 (Q) shows the signal at this point. Resistor 72 and capacitor 19–3 constitute a decoupling network for the purpose of isolating the video stage from signals present on B+ and vice versa. The video amplifier is connected to one of the vertical deflecting plates of the cathode-ray tube through capacitor 2–7. The signal at this point is illustrated in figure 41 (R).

(2) Fitting 128–1 is also connected to spark plate 132–4 and to jack 121–3 for test purposes. Control 98, which is the sensitivity control, connects to spark plate 132–3 and connector 127 pin K. This goes to the receiver and thus the gain of the receiver is controlled at the control unit.

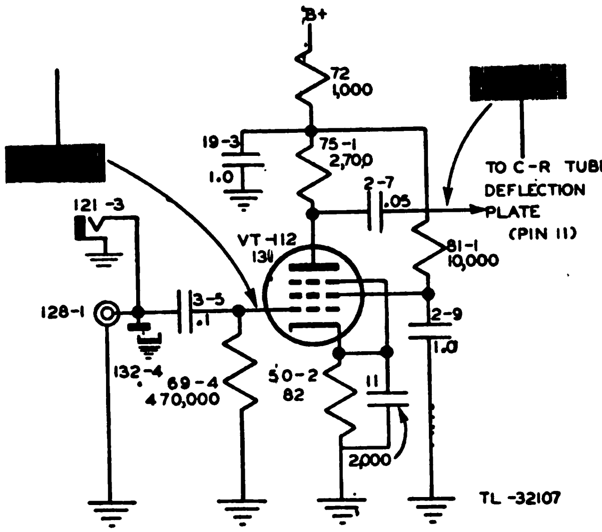


Figure 40. Control unit, video amplifier circuit.

o. Cathode-ray Tube (fig. 133). The cathode-ray tube is a 5CP1 tube used in a conventional manner. The signals input to the tube have been discussed in the analysis of the various associated stages. Some important circuits used with the cathode-ray tube which have not been discussed are the centering circuits. Resistor 71–2 is the loading resistor for the deflecting plate and control 95–3 is the vertical centering control. Resistor 71–1 is the loading resistor for the other vertical deflecting plate and 2–8 is the coupling capacitor to jack 120. This jack is connected to ground through the range switch for the long, short, and TEST positions and to the calibrating voltage developed at the plate of tube 10 for the calibrating position of the range switch. This circuit can be broken by inserting a plug in jack 120. Signals to be viewed on the screen of the cathode-ray tube can be fed into this jack. Loading resistors 71–2 and 71–1 are returned to the two movable arms of control 95–3. This control is so wired that by turning the shaft counterclockwise the pattern moves down, as one arm of the control moves toward a divider composed of resistors 68 and 65 which provides about +125 volts of centering voltage. Since the electron beam is of negative polarity it will be directed toward the bottom of the screen. At this point, the rear section of the centering control has moved its arm to the extreme counterclockwise position and a negative voltage, about —125 volts will be impressed on the other deflecting plate which lies on the top of the 5CP1 and will further tend to throw the electron beam to the bottom of the screen. A similar arrangement is provided for the horizontal deflecting plates of the cathode-ray tube. Two different controls, 95–1 and 95–2, are used for centering purposes in view of the fact that the signals applied to the horizontal plate have different a-c axis.

p. Rectifier (fig. 133). The rectifier, tube 14, supplies the d-c operating voltages for the cathode-ray tube. The power supply furnishes a negative voltage of approximately 1,900 volts to the cathode of the cathode-ray tube and a positive voltage of approximately 2,200 volts to the cathode-ray tube accelerating anode.

20. Simplified Functional Block Diagrams of Control Unit

The block diagrams in figures 42 to 45 inclusive are for the purpose of pointing out the important signal channels when the range switch is in each of its four positions, namely, the 100K YD., 10K YD., CALIB., and TEST positions. The object of the diagrams in each case is to show the paths of the sync, notch, brightening, blanking, spread, and sweep voltages. The input points of each voltage, whether or not the voltage is used, and the effect of each voltage upon the operation of the cathode-ray tube can be readily seen.

21. Spread and Blanking Amplifiers and Lobe Switch

a. The spread amplifier tube 12B and blanking amplifier, tube 7B, make it possible to view separately the signals received from either of the antenna patterns. A lobe switch, mounted in the antenna housing, alternately selects either of two antenna patterns displaced from the normal with respect to the reflector by approximately 14°. (See fig. 46.)

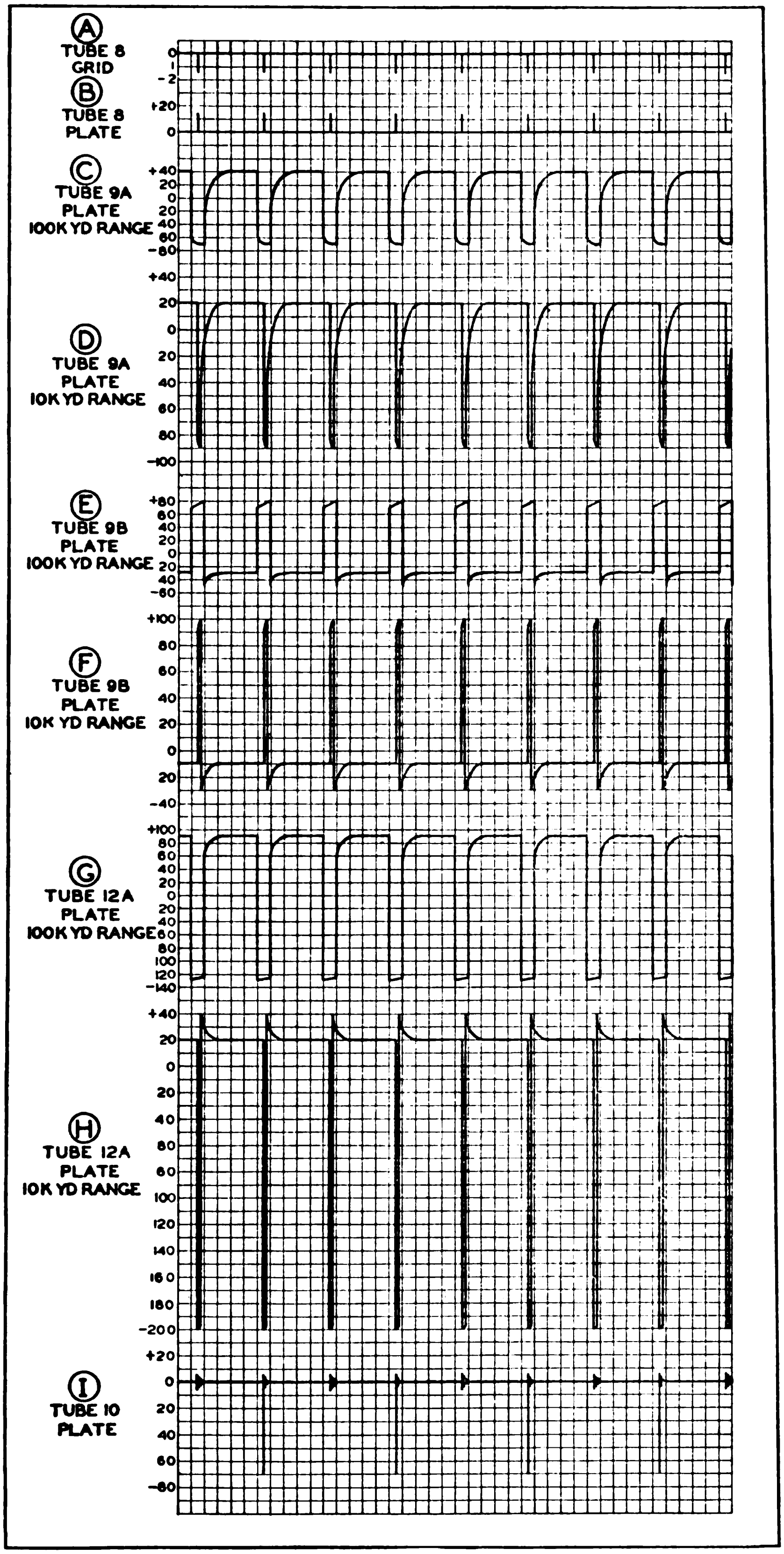
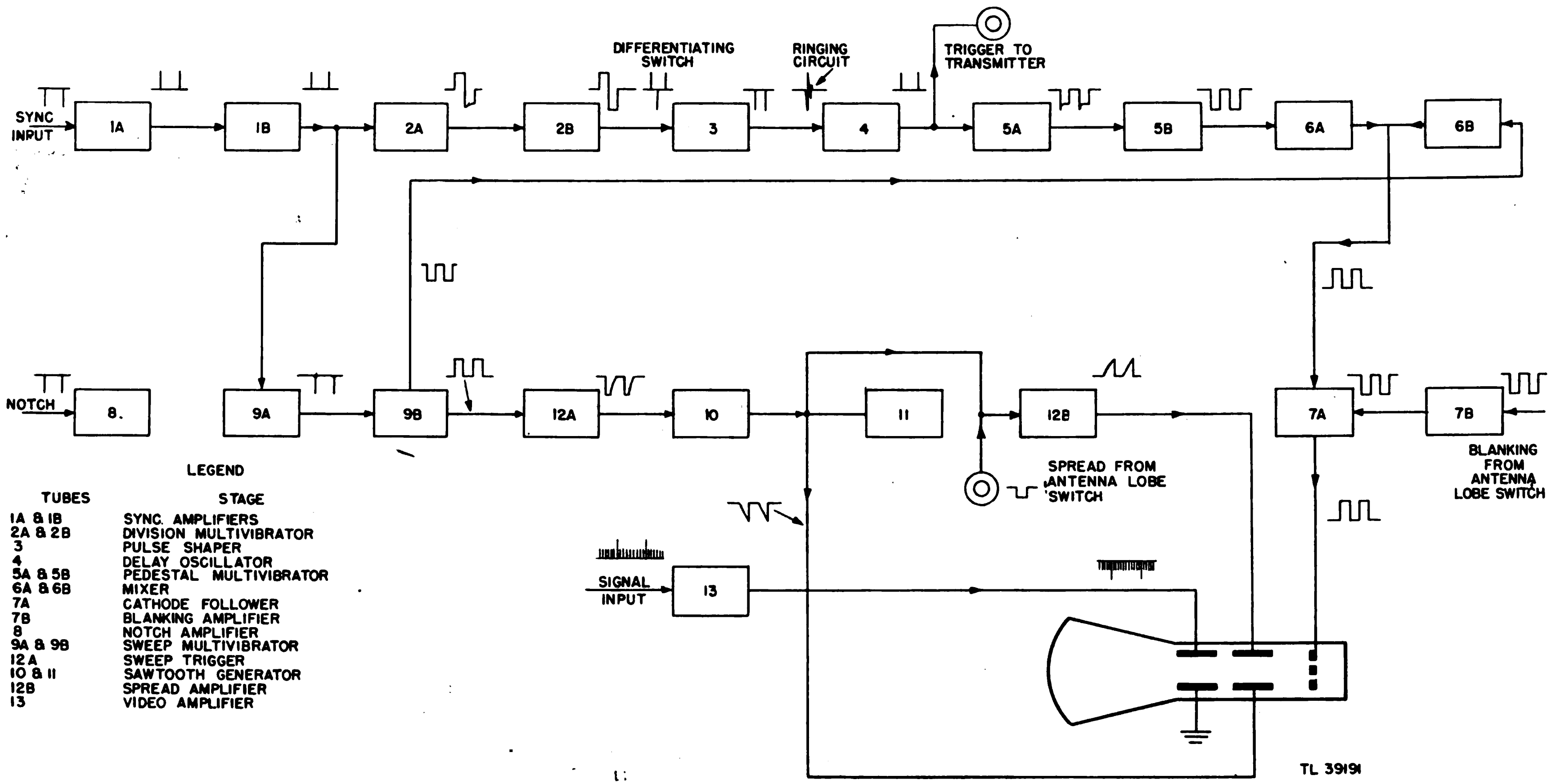


Figure 41. Con



LEGEND

TUBES	STAGE
1A & 1B	SYNC. AMPLIFIERS
2A & 2B	DIVISION MULTIVIBRATOR
3	PULSE SHAPER
4	DELAY OSCILLATOR
5A & 5B	PEDESTAL MULTIVIBRATOR
6A & 6B	MIXER
7A	CATHODE FOLLOWER
7B	BLANKING AMPLIFIER
8	NOTCH AMPLIFIER
9A & 9B	SWEEP MULTIVIBRATOR
12A	SWEEP TRIGGER
10 & 11	SAWTOOTH GENERATOR
12B	SPREAD AMPLIFIER
13	VIDEO AMPLIFIER

Figure 42. Control unit, block diagram with range switch in 100K YD. position.

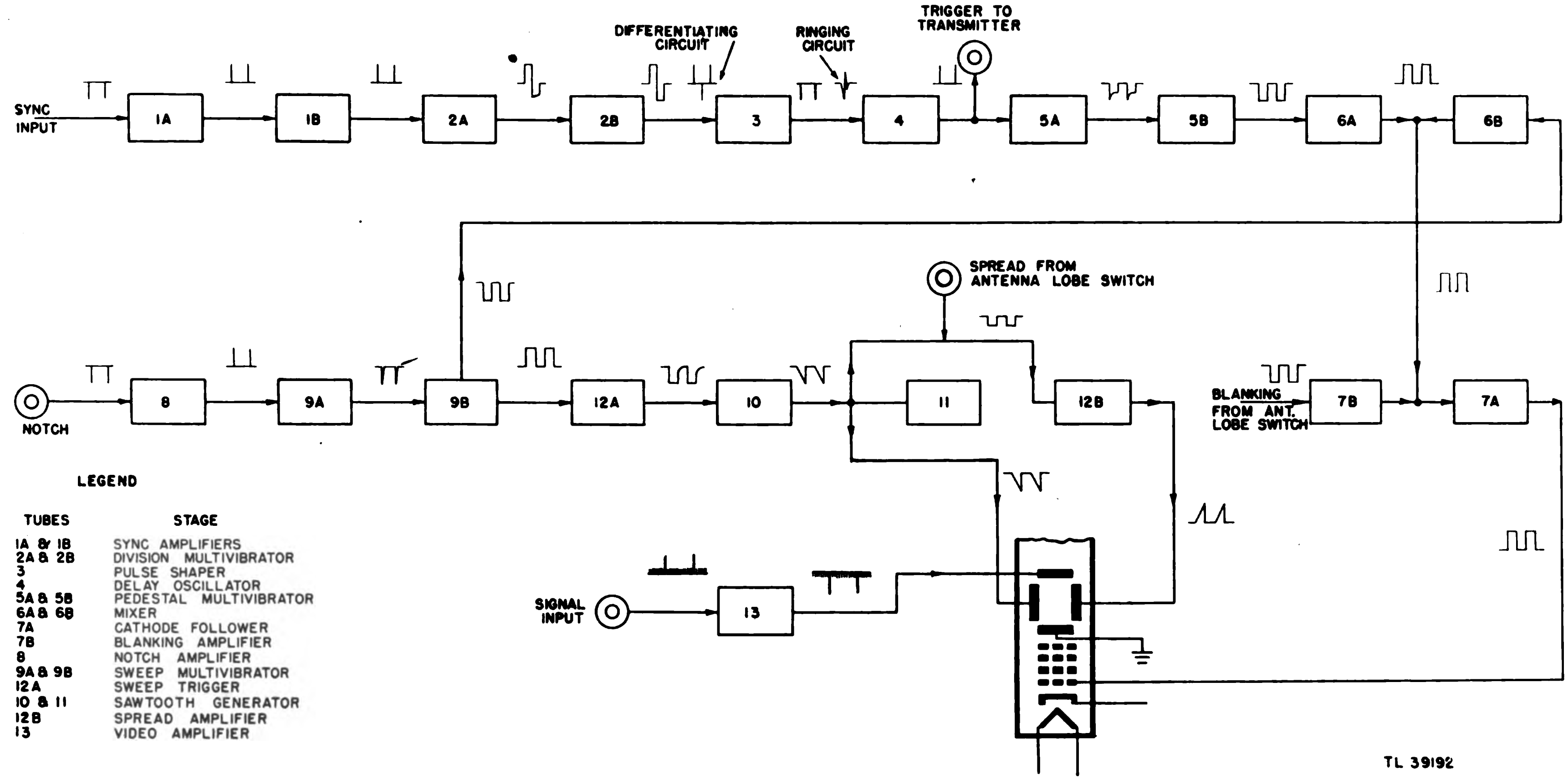


Figure 43. Control unit, block diagram with range switch in 10K YD. position.

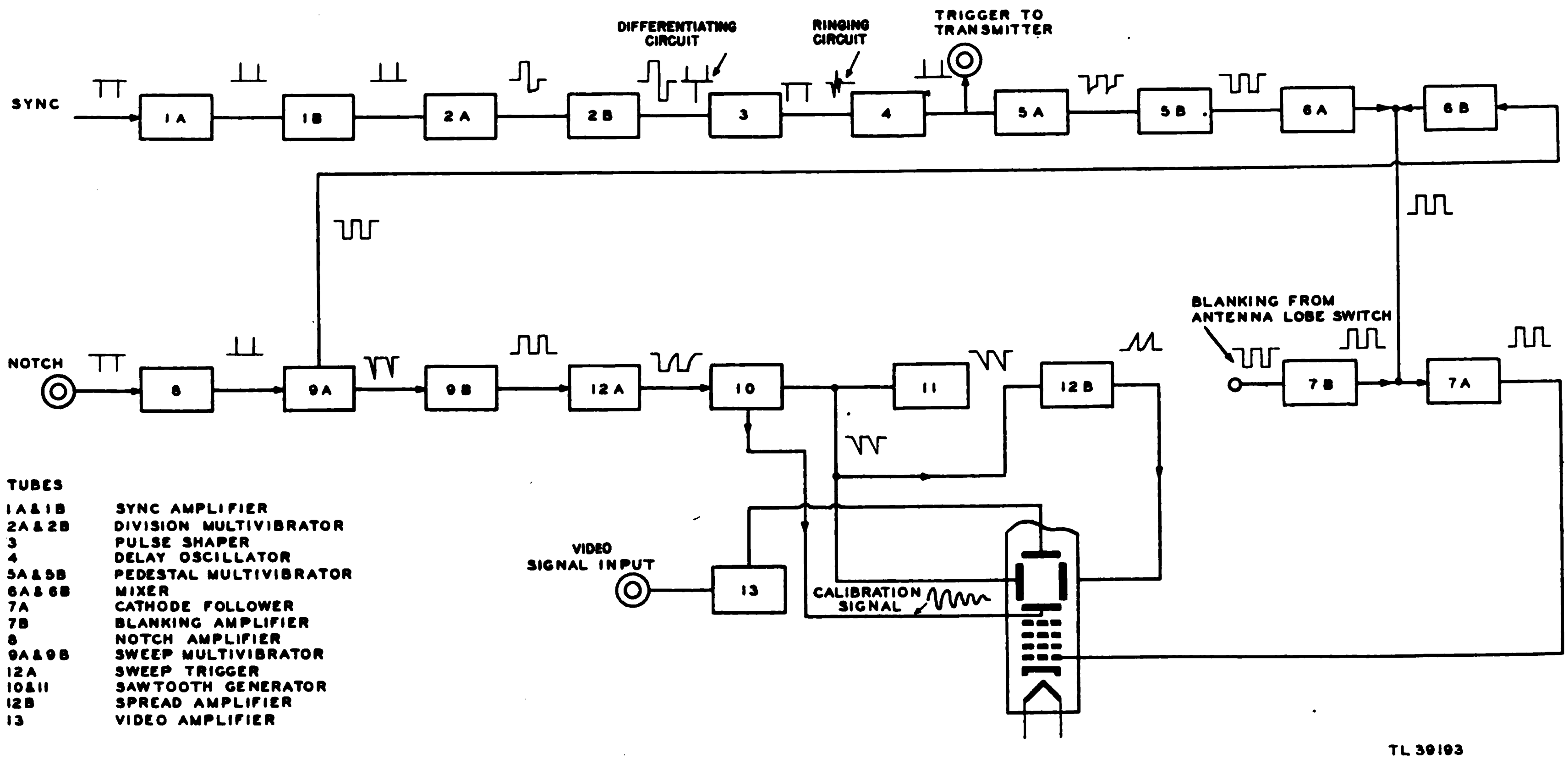


Figure 44. Control unit, block diagram with range switch in CALIB. position.

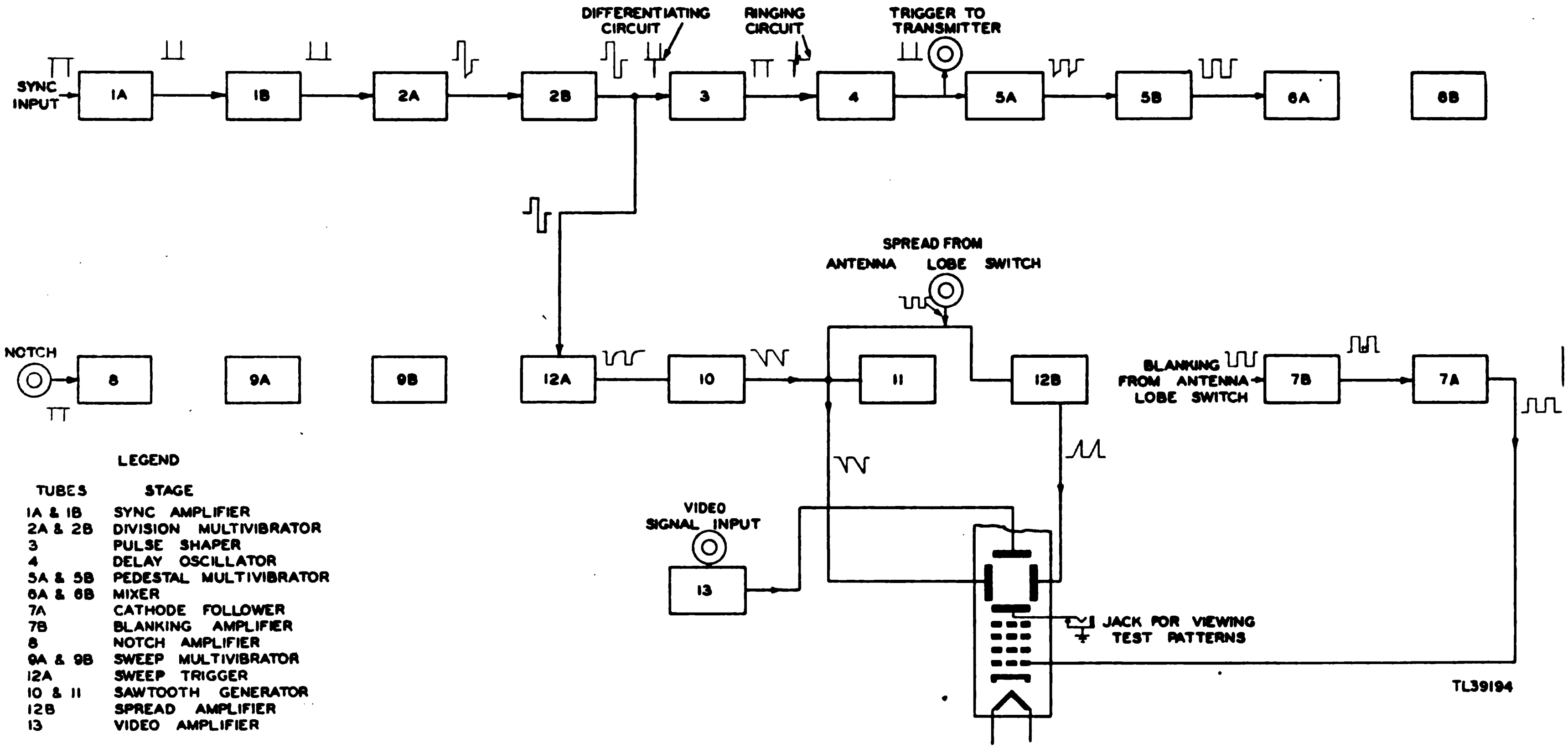


Figure 45. Control unit, block diagram with range switch in TEST position.

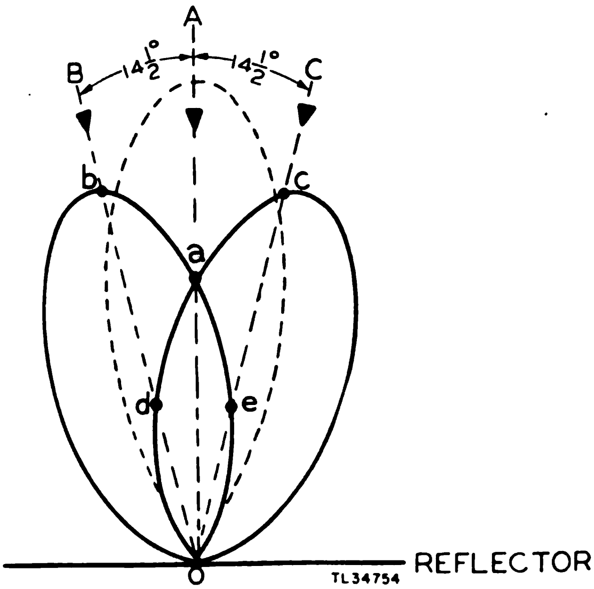


Figure 46. Antenna AN–154–A, lobe displacement.

Direction *a* to *o* is at 90° to the reflector, or *a* to *o* may be stated to be normal to the reflector. If a signal is received from a direction such as *b* to *o* and the left-hand lobe is switched to the input of the receiver, the intensity of the received signal is proportional to the distance *b* to *o*. With the right-hand lobe connected to the receiver input, the signal is proportional to distance *d* to *o*. Similarly, when a signal is coming in from a point *C*, the right and left lobe signal intensities are proportional to distances *c* to *o* and *e* to *o*, respectively. A signal coming in from a position perpendicular to the reflector (as at *A*) would intercept both lobes at equal amplitudes. To determine the direction from which a signal is coming, the receiver input is alternately switched from one lobe to the other. Simultaneously the sweep on the control unit cathode-ray tube screen is made to start from two different points. The lobe motor turns at a speed that is synchronous with the line frequency and switches from one lobe to the other at the rate of 30 cycles per second.

b. The transmitter repetition rate is adjusted to a frequency of 240 cycles per second, in order to keep the patterns stationary at the 30-cycle sweep. For every ½ cycle of lobe switch operation, the transmitter operates four times and four complete sweeps

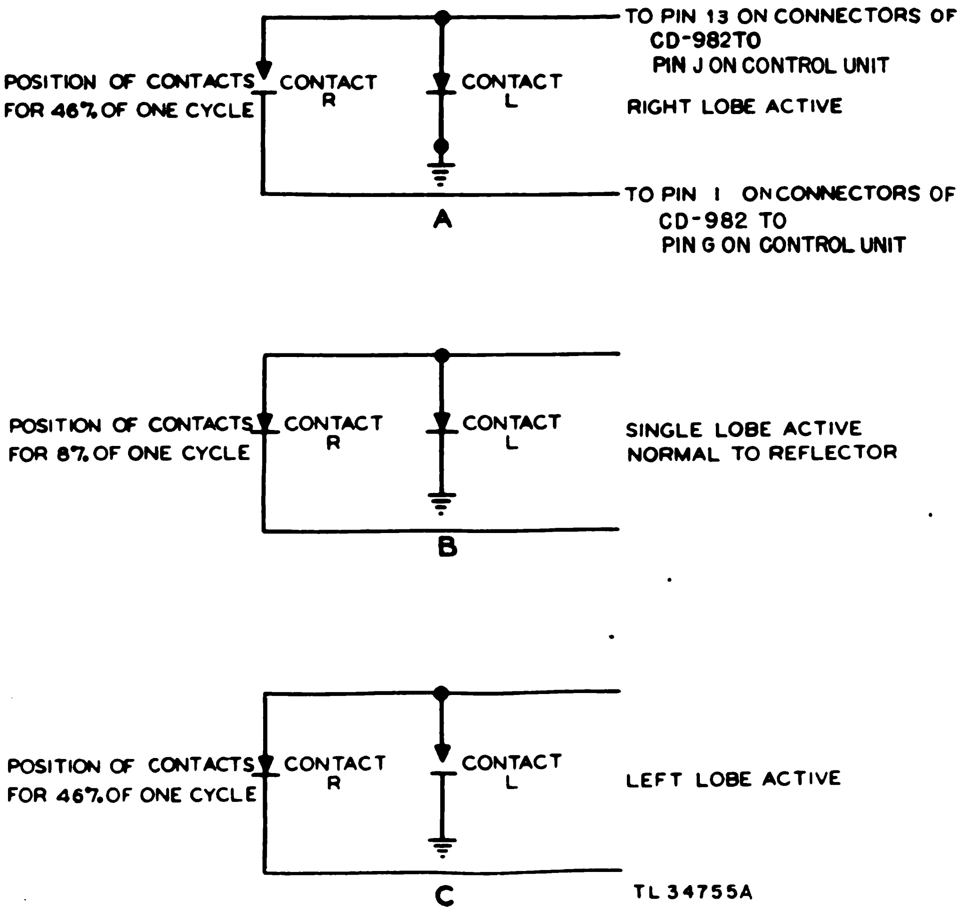


Figure 47. Antenna AN–154–A, cam-switch operation.

occur on the screen of the cathode-ray tube. As the lobe switch rotates, one of the lobes is connected to the receiver input every ½ cycle. Thus, the input from either lobe is displayed for a duration of four sweeps on the cathode-ray tube. The mechanism for producing a displaced pattern for either lobe is a combination of mechanical switching in the lobe switch and a process of mixing in the control unit. Figure 47 shows the d-c connections in the lobe switch for three possible combinations of cam contacts during any cycle.

c. Pin J of multiple receptacle 127 is connected to the junction of resistors 87–5 and 87–6 in parallel and resistor 89. These resistors, together with control 100, form a voltage divider. During that part of the cycle when the right lobe of the antenna is used, the junction point of resistors 89 and the parallel combination 87–5 and 87–6 is returned to ground; consequently, there is no voltage across the spread control 100. (Figure 47A shows the conditions schematically.) During the transition from the right to the left lobe (fig. 47B) both cam contacts are closed and the resultant antenna pattern is a single lobe normal to the reflector, but of an increased amplitude. If a signal were to be received at this time, it would appear with increased deflection, making it difficult to judge correct azimuth setting. Therefore, tube 7B is used to provide a blanking signal during this interval of time.

d. The blanking signal prevents the cathode-ray tube from becoming active during the time that the transition period of the lobe switch occurs. Connections shown in figure 47C are for that period of 1 lobe-switch cycle during which the left lobe is connected to the receiver and to the junction of resistors 89 and 87–5 through pin J, and to resistors 56 and 87–3 through pin G of plug 127. The voltage at these two junction points is the same, so resistors 56 and 87–3 can be disregarded, and it can be assumed that the junction between resistors 89 and 87–5 is no longer shorted. When the short is removed, the voltage at the junction rises and the voltage across control 100 becomes approximately 10 volts. Control 100 couples any selected amount of this square wave of voltage to the grid of tube 12B through grid resistor 63–2. The spread voltage wave applied to tube 12B is shown in figure 41 (o). Four sweeps occur for each ½ cycle of the square-wave spread voltage, and the alternate ½ cycles of spread voltage start the sweep from two different reference points. The amount of spread voltage available makes it possible to displace the two sets of sweeps by about 12 microseconds. During the transition time, when the lobe switch is passing from the right to the left lobe and the input to the receiver is a single lobe normal to the reflector, the cathode of tube 7B is returned to ground through the lobe-switch cam. (See fig. 47B.) If the cathode of tube 7B is not shorted, resistors 87–3 and 87–4 in parallel and resistor 56 form a voltage divider which biases tube 7B to cut-off. The plate voltage will then be at B+ potential. When the cathode is shorted, tube 7B is made conducting and the plate voltage drops. This negative pulse is coupled to the tube 7A through capacitors 3–7 and 2–3, and resistor 55. The output of tube 7A is coupled to the grid of the cathode-ray tube by means of capacitor 13. The brightening voltage, as previously described, is developed across resistor 76 by tube 7A. This voltage appears simultaneously with the blanking voltage developed in the plate of tube 7B. However, the blanking voltage is sufficient to produce complete visual cut-off during the lobe switch transition period. If the repetition frequency of the transmitter synchronizing signal is not an integral harmonic of the lobe-switching frequency, the positive brightening pulses will be constantly moving with respect to the negative blanking pulses. Consequently, the blanked sweep will vary from a condition of complete blanking to a condition of complete unblanking.

Figure 48. Indicator I-221-A.

Section VI. AZIMUTH-CONTROL SYSTEM

22. Introduction

All circuits and devices for controlling the azimuth of the antenna are contained in or controlled by the indicator units of the RC-145-A. The primary function of the units is to set the IFF antenna to the desired azimuth. This purpose is accomplished by two selsyn motors, one located in the remote indicator unit and the other connected mechanically to the rotating section of the tower.

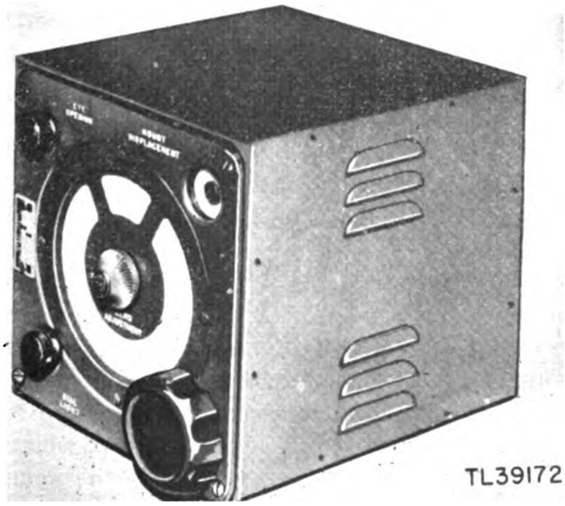


Figure 49. Remote Indicator I-227-A.

23. Block Diagram of Azimuth-Control System

a. A block diagram showing the basic elements of the azimuth-control system is shown in figure 50. Each of the elements is discussed briefly in the following paragraph.

b. The dial on the control panel is turned to a desired azimuth. The selsyn in the remote indicator unit generates the voltage, which, after being amplified, causes the antenna motor to rotate the antenna mount. As the mount rotates toward the null position, the voltage applied to the drive motor decreases rapidly and is removed before the mount stops. If the mount stops before it has reached the correct azimuth, voltage is again applied to the drive motor. If it moves through the null point, an extra pair of contacts on the reversing relay operate and cause the mount to move again toward the null point. If the mount stops at the null point, all voltage is removed and the mount remains at rest, with the antenna pointing in the same azimuth as indicated by the dial on the remote control unit, until the dial is turned to a new direction.

24. Functioning of Parts

a. Protective Devices. Three circuit breakers are provided on the indicator panel which controls the operation of the indicator and associated circuits. Each of these breakers contains a current coil in addition to contacts. In each of the breaker

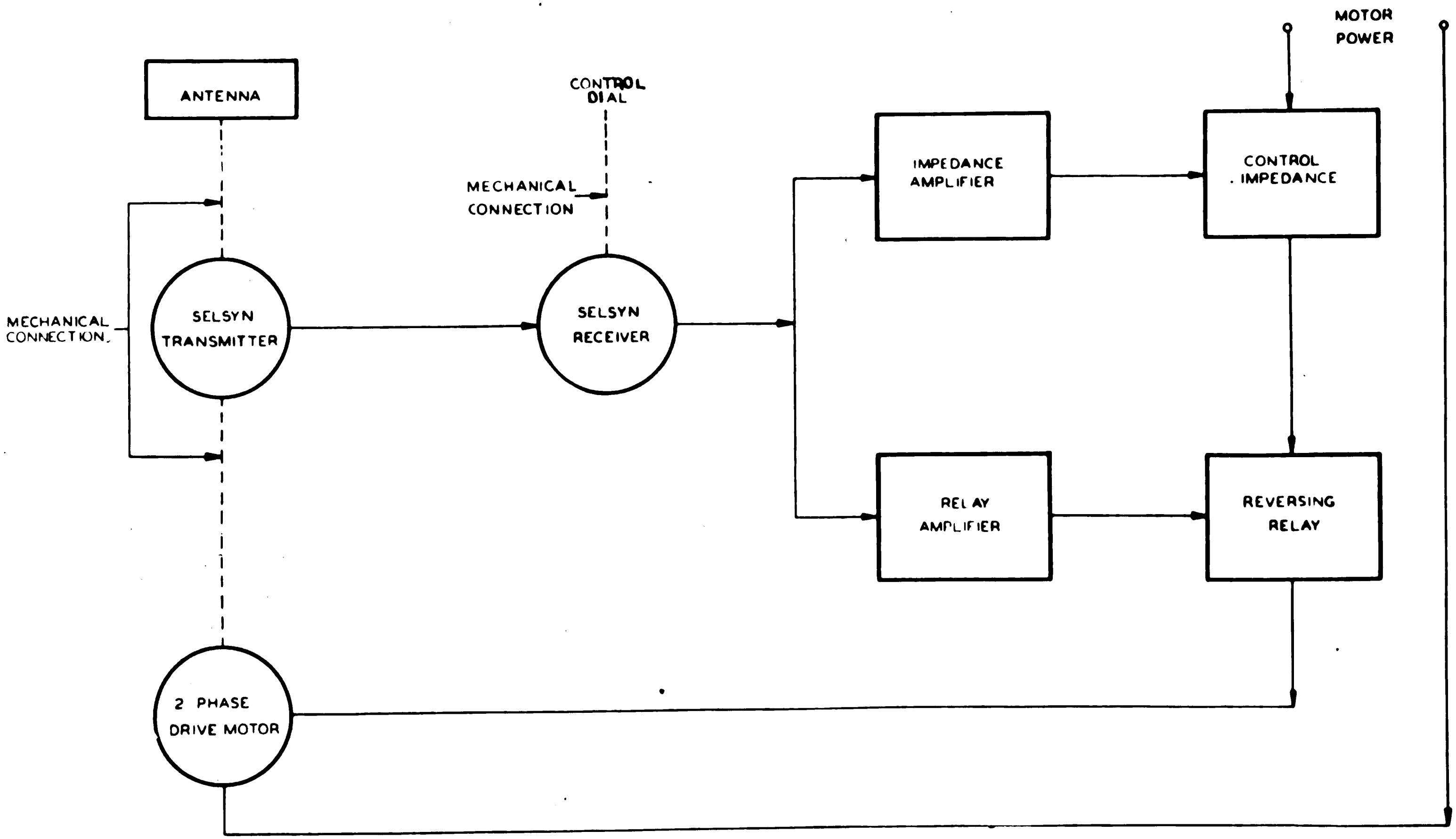


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Figure 50. Indicator, block diagram.

circuits a pilot lamp will light when the circuit is energized. There are also two fuses to protect the selsyn motor fields. Indicator panel breaker 118 is a 1¼-ampere instantaneous breaker; it is so constructed that any current greater than 1¼ amperes will trip it instantly. This breaker is wired in the circuit in such a manner that when it is in the OFF position, circuit breaker 116 cannot apply power to the antenna motor, because if power were applied to the antenna motor while the breaker 118 was off, a high voltage would be applied to Tube VT–218 (7) while the filament is cold. Thus the tube would be damaged. Antenna motor breaker 116 is a 4-ampere breaker and can stand a continuous flow of 4 amperes without tripping. If a current slightly greater than 4 amperes flows through the breaker, it will trip in approximately 20 seconds. A very large current would trip the breaker instantly. Lobe switch motor breaker 117 is a 3-ampere breaker and has the same general characteristics as breaker 116. Pilot lamp 119–1, located on the indicator panel below circuit breaker 116, lights when the antenna motor circuit is energized. Pilot lamp 119–3, located below circuit breaker 117 on the indicator panel, lights when the lobe switch motor circuit is energized. Pilot lamp 119–2, located below circuit breaker 118 on the indicator panel, lights when the indicator panel circuit is energized. Fuses 121–1 and 121–2 are ⅛-ampere fuses connected in series with two of the three selsyn leads. These fuses are contained in a housing located on the front panel. Spare fuses are located below the ones in the circuit.

b. Selsyn Motor. The selsyns operate as follows: if the stators of the transmitting selsyn are connected to the corresponding stators of the receiving selsyn and the rotor of one is connected to a single-phase source of alternating current, a voltage will appear between the rotor terminals of the other. Figure 51 shows this type of connection. The voltage indicated at E is a single-phase alternating voltage of the same frequency as the voltage applied to the rotor of the selsyn transmitter. The average value of this alternating voltage depends on the relative angular positions of the rotors of the two selsyns. When the rotor positions of both selsyns are the same with respect to their stators, the output voltage is maximum. This voltage decreases as one rotor is displaced in either direction and it reaches a minimum when the displacement is 90°. If the angular displacement exceeds 90°, the voltage undergoes a 180° phase shift and increases to maximum at 180°. The voltage decreases as the angular displacement exceeds 180°. It reaches a minimum and undergoes 180° phase shift at 270°. As the displacement again approaches zero degrees the voltage increases to maximum. The selsyn transmitter is geared to the antenna mount at a ratio of 1:1. The azimuth dial on the indicator unit reads the same as the dial on the antenna mount when the selsyns are displaced 90°.

c. Antenna Motor. This two-phase, squirrel-cage induction motor is geared to the antenna mast. It is constructed with a high resistance rotor to provide maximum starting torque. The motor is totally enclosed to prevent the entrance of dirt and moisture, and it is provided with a thermal cut-out, located within the motor housing, which opens the circuit if the motor overheats. The temperature inside the motor housing must decrease to a value determined by the setting of the cut-out before the cut-out closes again. In order to operate the motor from a single-phase source, a capacitor is connected in series with one of the phase windings. The direction of rotation of the motor is reversed by switching the capacitor from one phase winding to the other by means of the reversing relay.

d. Impedance Amplifier. (1) When the two selsyns have an angular displacement with respect to each other, a voltage is generated in the receiving selsyn. The magnitude of this voltage depends on the angle of the displacement; the phase is dependent on the direction of the displacement. The output of the selsyn receiver is amplified by two independent amplifiers. The impedance amplifier output controls the impedance which is connected in series with the antenna motor, and, consequently, controls the voltage across the motor. The impedance amplifier consists of Tube VT–229 (1), connected as full-wave rectifier followed by a four-stage amplifier, Tubes VT–229 (2B), VT–229 (3A), VT–229 (2A), and VT–231 (5B).

(2) The purpose of the amplifier is to provide a variable bias for the control impedance. Any displacement of the antenna mast causes an alternating voltage to be generated in the selsyn 115; this voltage appears between the terminals marked 1 and 2 of transformer 101. (See fig. 52.) Since the phase of the selsyn voltage depends on which side of the rest position the antenna is turned and it is desired that the antenna mast rotate at the same speed, no matter from which side of the rest position it approaches, it is necessary that the distinction between directions of displacement be eliminated. This purpose is accomplished by passing the selsyn output voltage through a full-wave rectifier.

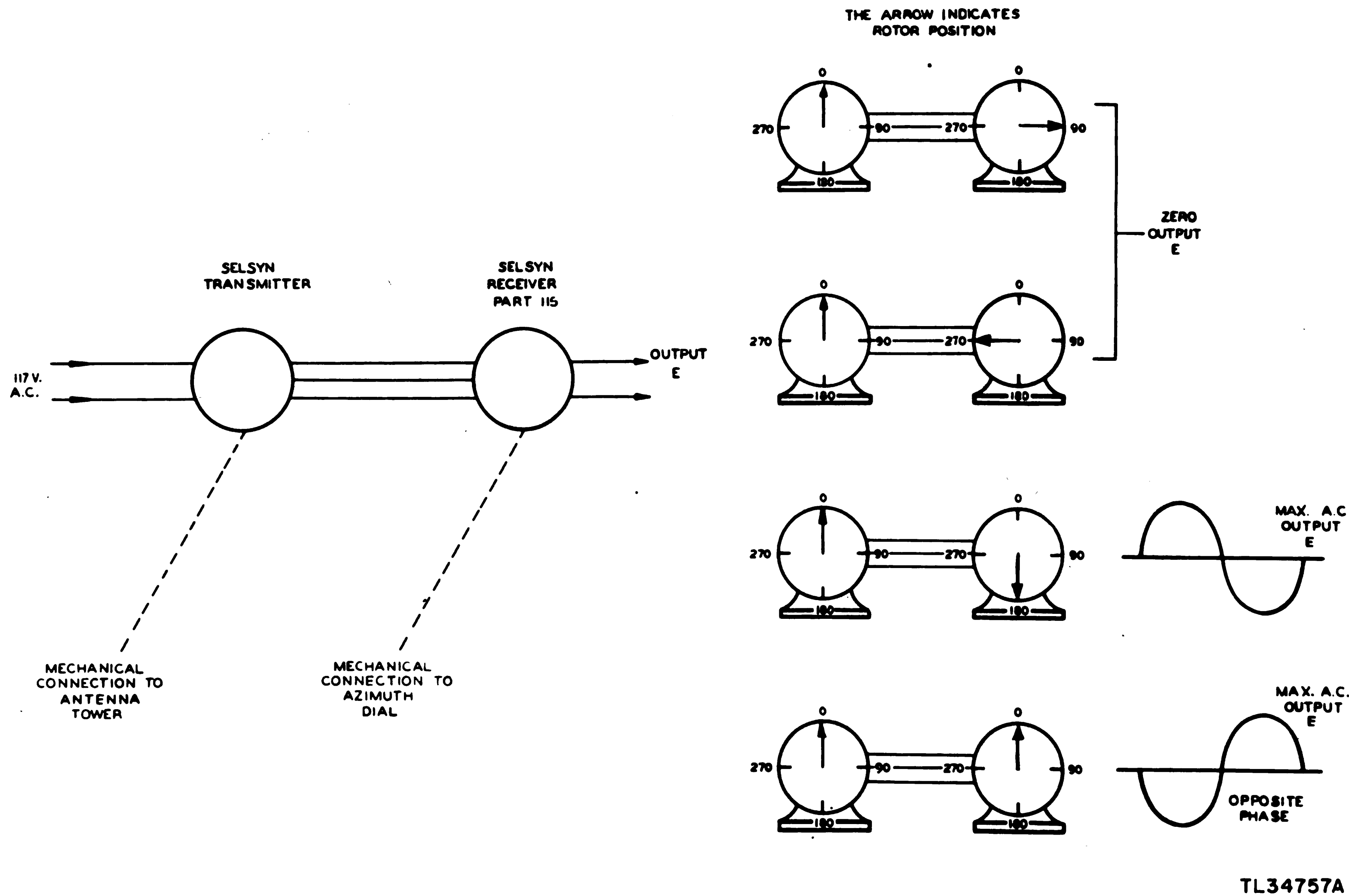


Figure 51. Indicator, selsyn circuit.

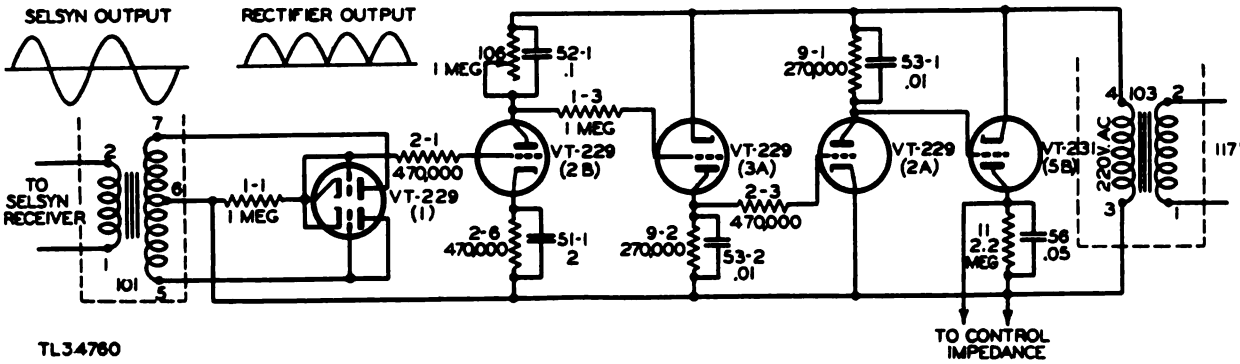


Figure 52. Indicator, impedance amplifier.

The output of the rectifier, appearing across resistor 1–1, contains a direct current and a 120-cycle a-c component. The output is applied to the grid of tube 2B. If the antenna is displaced, the output from the rectifier causes a positive voltage to be applied to tube 2B, resulting in an increase of plate current. This increase in plate current causes the voltage across resistance 106 and capacitor 52–1 to increase, with the result that tube 3A is biased to cut-off. Because the decrease of plate current in tube 3A removes the bias from tube 2A, this tube starts to draw current. A voltage then appears across resistor 9–1 and capacitor 53–1 which produces a biasing voltage for tube 5B. This bias is high enough to cut off the plate current and eliminate the voltage drop in the plate circuit of tube 7. This voltage drop is the voltage operating the control impedance.

(3) From the above explanation, it is apparent that any displacement of the antennas causes the control impedance bias to be removed and thus reduces the control impedance and increases the voltage applied to the antenna motor. In order to prevent the antenna mast from oscillating about the rest position, it is necessary to remove the power from the antenna motor before it arrives at the rest position, because the antenna mast has no brakes and must rely on its inherent friction to stop. The power is prematurely removed by resistor 2–6 and capacitor 51–1, connected in the cathode circuit of tube 2B. (See fig. 52.) The operation of this resistor-capacitor combination is as follows: when the antenna motor is turning the antenna toward the rest position, the output of selsyn 115 is decreasing. The positive voltage on the grid of tube 2B is decreasing, causing the plate current to decrease. The voltage across resistor 2–6 does not immediately decrease because capacitor 51–1 must first discharge. This capacitor holds the cathode of tube 2B positive long enough for the grid voltage to decrease below the cathode voltage and thus cut off the tube. This tube can then be cut off even though the selsyn voltage is not zero. The voltage is thus removed from the antenna motor before the antenna mast has reached the position of rest; the antenna mast then coasts to the rest position. Variable resistor 106 is the SENSITIVITY control. It is a screwdriver control located on the front panel of the indicator. When the value of resistor 106 is too large, the antenna motor will have power applied to it all the time, and the antenna mast will oscillate about the rest position. If the value is too small, the antenna motor will not operate, regardless of the displacement of the selsyn connected to the AZIMUTH dial. Resistor 2–1, connected in the grid circuit of tube 2B, limits the flow of grid current. Resistors 1–3 and 2–3 prevent the amplifier from *motor boating* or oscillating at a very low frequency. The plate-supply voltage of the amplifier is the 220-volt, a-c transformer 103. The filament supply for these tubes is taken from two separate windings of transformer 103, to keep the filament-to-cathode difference of potential in all tubes to a minimum.

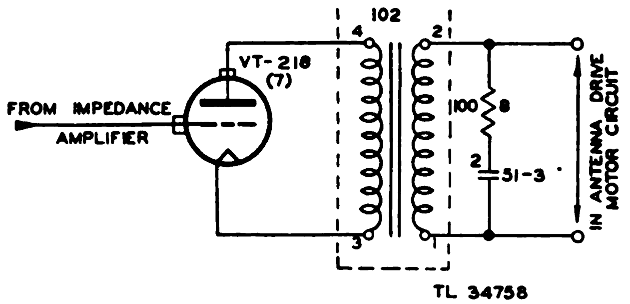


Figure 53. Indicator, control-impedance circuit.

c. CONTROL IMPEDANCE. The output of the impedance amplifier is applied to the grid of Tube VT–218 (7). (See fig. 53.) The control impedance consists of the plate circuit of tube 7. This impedance is too high to be connected in series with the motor; therefore, it is matched to the motor by means of transformer 102. When the tube has zero bias and is conducting, its plate circuit has an impedance of several thousand ohms. The turns ratio of transformer 102 is 71:1 so that the impedance ratio is $71^2:1 = 5041:1$. The impedance looking into the primary of the transformer (terminals 1 and 2), is therefore just a few ohms when tube 7 is conducting. When tube 7 is biased to cut-off, there can be no conductance reflected into the primary of transformer 102. For this reason the impedance is large. The voltage on the secondary (terminals 3 and 4) of transformer 102 is only a few hundred volts. When this tube is not conducting, the impedance is high and reaches a maximum voltage across it. Because the tube has low voltage across it when it is conducting, the power dissipated in the tube is low both for the conditions of maximum and of minimum bias. Therefore, the tube dissipates low power when the motor is not running and also when it is running at full speed. The peak power that the tube must dissipate occurs only for an instant when the motor starts and at the instant it stops. This peak power is below the rating of the tube.

f. Relay Amplifier. (1) The relay-amplifier circuit consists of three tubes: VT–229 (3B), VT–231 (5A), and VT–168A (6) (fig. 54). This amplifier causes the reversing relay to take one of two positions, depending on which direction the motor should rotate to bring the antenna mast to the correct azimuth.

(2) The voltage generated by the selsyn motor is applied across the primary of transformer 101. This voltage is the same that is applied to the impedance amplifier circuit. The plate voltage on the tubes of both amplifiers is a-c voltage. Figure 54 is a diagram of the relay-amplifier circuit, whose operation is as follows: when there is an antenna mast displacement, selsyn 115 generates a voltage which appears between terminals 1 and 2 on transformer 101. This voltage is stepped up to twice its value by the transformer and applied to the grid of tube 3B. The plate voltage of this tube is 220 volts alternating current and is supplied by transformer 103. This a-c grid voltage of the tube is either in phase or 180° out of phase with the plate voltage, depending on which side of the rest position the antenna mast lies. When the grid and plate voltages of tube 3B are in phase, the tube becomes conducting. When the grid and plate voltages are 180° out of phase, tube 3B is biased to cut-off. When tube 3B is conducting, a voltage appears across resistor 10–2 and capacitor 52–3. The voltage stored in this resistor-capacitor combination is applied to the grid of tube 5A and thus controls its plate current.

(3) When tube 5A is conducting, a voltage appears across resistor 10–1; capacitor 52–2 holds this voltage when tube 5A is not conducting. This voltage is applied to the grid of tube 6. The plate circuit of this tube contains the current coil of reversing relay 110. Capacitor 54 is connected across the relay to prevent the half-wave pulses from flowing through the relay and, consequently, keeps it from

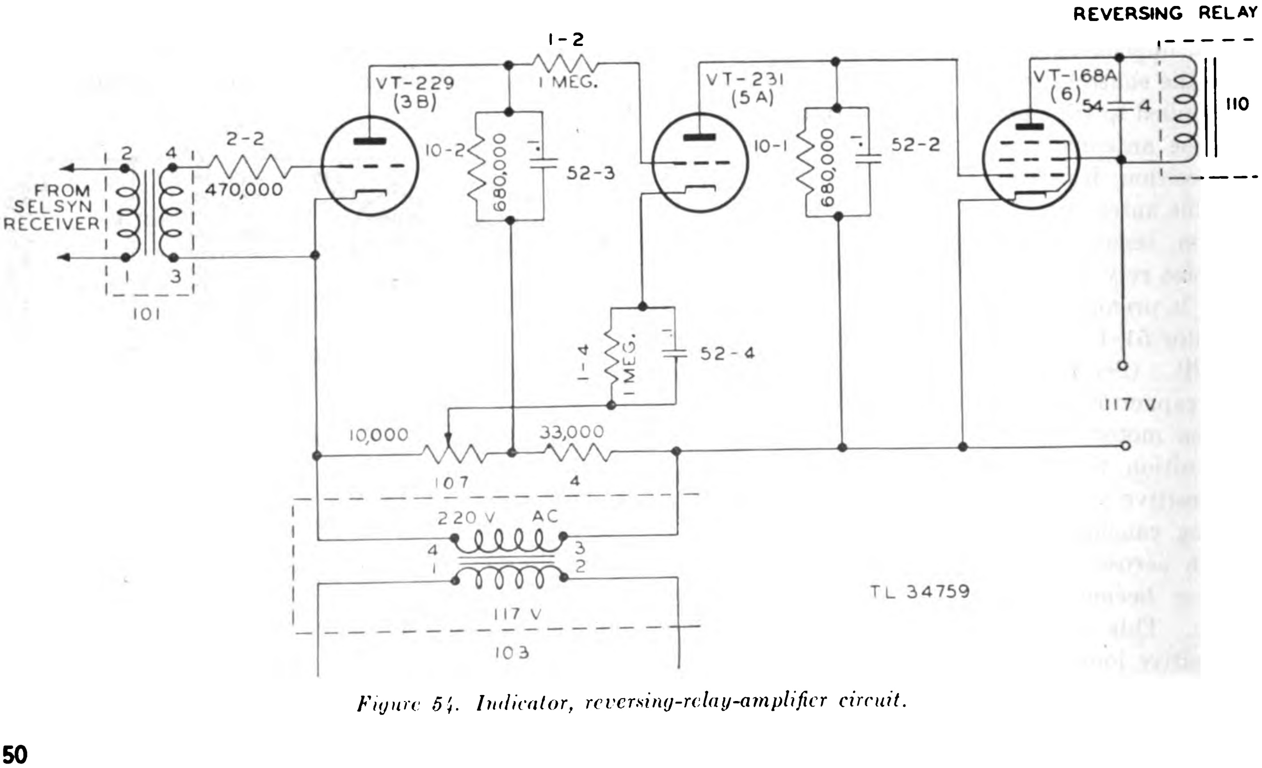


Figure 54. Indicator, reversing-relay-amplifier circuit.

chattering. Resistor 2–2 prevents the grid of tube 3B from drawing excessive grid current. Resistor 4, together with variable resistor 107, forms a voltage divider which is used to place the proper bias on tube 5A. Variable resistor 107 is the CENTERING control and controls the initial bias on tube 5A. This control is located on the front panel of the indicator and is adjusted by means of a screwdriver. Resistor 1–4 and capacitor 52–4 provide a delayed bias for 5A which causes the reversing relay to close slightly before the antenna crosses the rest position. The action of this resistor-capacitor combination is the same as that of the resistor-capacitor combination in the cathode circuit of the first impedance amplifier already discussed in c above. Resistor 1–2 is a decoupling resistor which prevents tube 5A from oscillating.

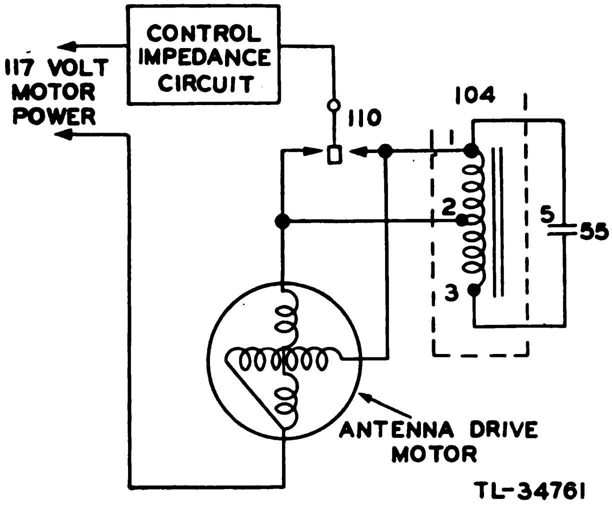


Figure 55. Indicator, motor-reversing circuit.

g. Motor-reversing Circuit (fig. 55). Relay 110 is a single-pole double-throw switch. It has two different positions: one when the coil has current flowing through it and one when the coil has no current flowing through it. When the relay is in one position, the motor supply voltage, appearing between points 1 and 2, is connected directly across one phase of the motor and also across the series combination of the other motor phase and the primary of transformer 104. When the relay is in the other position, the phases of the motor are reversed with respect to each other and the motor revolves in the opposite direction. Because the only load on the secondary of transformer 104 is capacitor 55, the primary current of the transformer is largely leading. For this reason, the impedance looking into terminals 1 and 2 is capacitive. The transformer is an autotransformer with a turns ratio of such a value that the reactance of 5 microfarad capacitor 55 reflects into the primary of the transformer as the reactance of a 50-microfarad capacitor. This is the capacitance needed for proper operation of the motor. Figure 56 shows an extra set of contacts on relay 110. These contacts form a

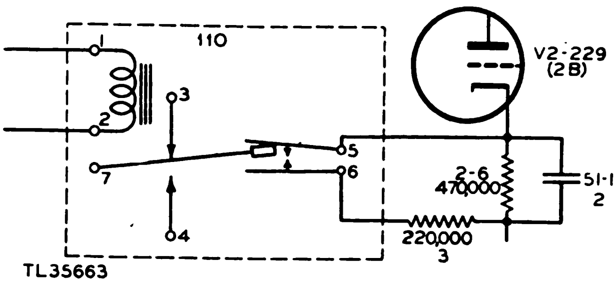


Figure 56. Indicator, capacitor discharging circuit.

single-pole single-throw switch which is closed only while the reversing relay is in motion. When the reversing relay is at rest in either position, these extra contacts are open. These contacts are connected across capacitor 51–1 through resistor 3, and their purpose is to discharge partially capacitor 51–1 each time the antenna passes through the rest position. When this occurs, the antenna mast emerges from the rest position with full voltage on the antenna motor and does not have to be stalled on one side of the rest position while waiting for capacitor 51–1 to be discharged through resistor 2–6. A double-pole, double-throw switch, 122, is located in the back of the indicator panel; it effectively interchanges the connections of two of the three selsyn leads, numbers 1 and 2 in figure 56, and thus provides a means of reversing the direction of rotation of the antenna motor. If the antenna mast turns in a direction opposite to the direction in which the azimuth dial is turned, switch 122 is operated. If the antenna mast turns in the same direction that the azimuth dial is turned, switch 122 is left in that position. This adjustment is made only when the equipment is assembled the first time.

h. Remote Indicator I–227–A. The receiving selsyn 115 is mounted on the remote indicator which is mounted in the cab of Trailer K–75–A. This indicator also contains Tubes VT-215 (8) and VT-229 (4), transformer 105, receptacle 112, controls 108 and 109, and dial lights 120–1 and 120–2. (See fig. 57.) The plate voltage for the tuning eye null-point indicator (tube 8) is obtained from the rectified 117-volt alternating current which is applied to the plate of the second section of tube 4. Capacitor 51–2 and the plate resistance of tube 4 provide the means for filtering this rectified voltage. The first

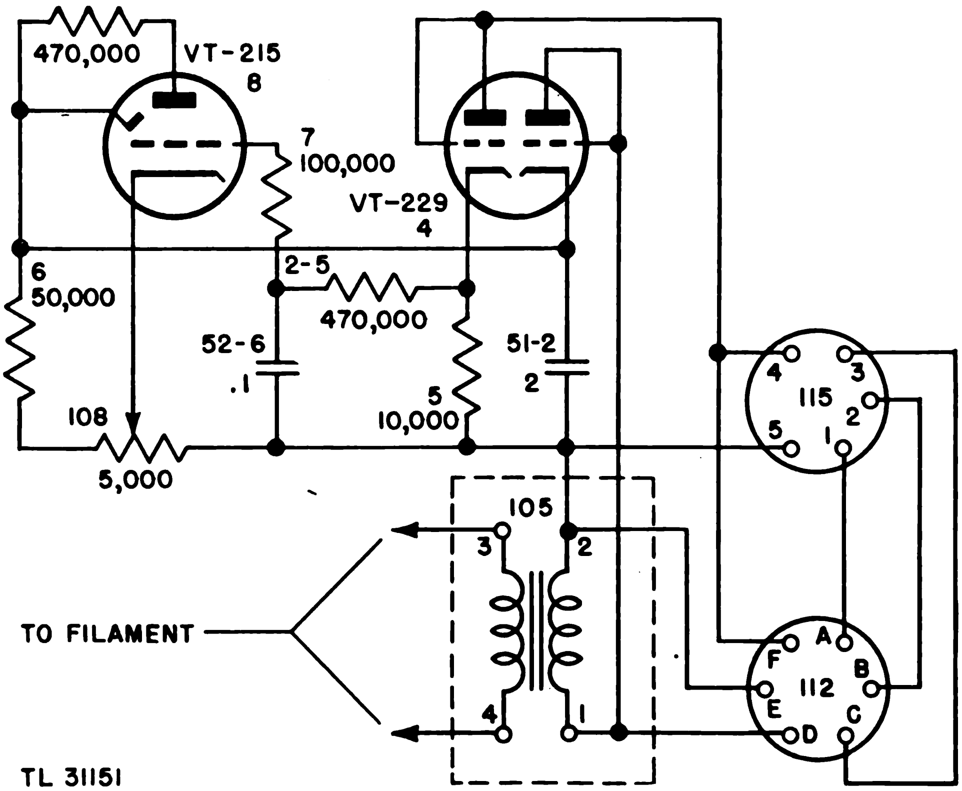


Figure 57. Remote Indicator I-227-A, schematic diagram.

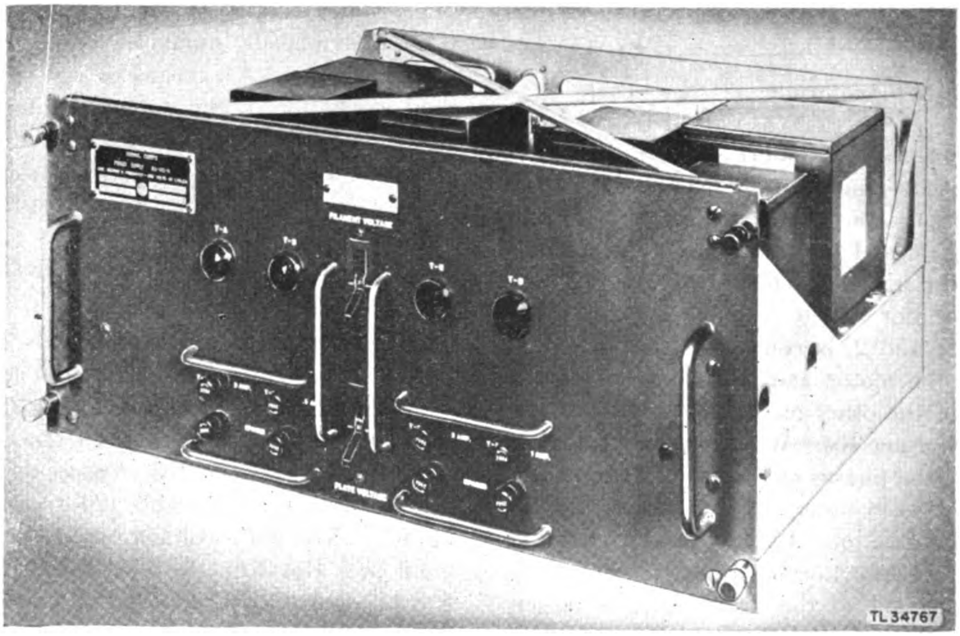


Figure 58. Power Supply RA-105-A—front oblique view.

section of tube 4 is used as a diode to rectify part of the output of the selsyn. The d-c output of this rectifier is filtered by means of resistor 2–5 and capacitor 52–6, and this output is applied to the grid of the indicator tube through decoupling resistor 7. Resistor 6 and variable resistor 108 form a voltage divider which is used to bias indication-eye tube 8. The EYE OPENING control, variable resistor 108, may be adjusted from the front of the remote indicator. Variable resistor 109 is a rheostat used to control the brightness of pilot lights 120–1 and 120–2. Transformer 105 is the filament transformer of the two tubes in the remote indicator.

Section VII. POWER-SUPPLY SYSTEM

25. Introduction

All of the operating voltages for Radio Receiver and Transmitter BC–1267–A are supplied by Power Supply RA–105–A. This power-supply system consists of seven rectifier tubes and associated filter circuits, transformers, circuit breakers, pilot lamps, fuses, and an interlock switch. A detailed discussion of the circuit elements is given in the following paragraphs.

26. Functioning of Parts (fig. 77)

a. PROTECTIVE DEVICES. (1) Circuit breaker 44 is a 10-ampere 117.5-volt magnetic breaker, containing a current coil which opens the circuit if a current greater than 10 amperes flows through the primary windings of transformers 56 or 57. Circuit breaker 44 is also connected in the circuit so that circuit breaker 43 cannot supply power to transformers 58 and 59 unless it is closed. This fact prevents the application of plate voltage to the rectifier tubes until after the filament voltage has been applied and, consequently, prevents injury to the plates of these tubes. The primaries of transformers 56 and 57 are further protected by fuses 70–1 and 72, respectively. Circuit breaker 43 controls the two plate voltage transformers 58 and 59. This circuit breaker contains a current coil in series with the secondary of transformer 58. If the current supplied by the two high-voltage rectifiers becomes excessive, circuit breaker 43 opens the primary circuits of transformers 58 and 59, which are further protected by fuses 70–2 and 71, respectively. Pilot lamps 35–3 and 35–4 light when transformers 59 and 58 are energized.

(2) Radio Receiver and Transmitter BC–1267–A and interlock switch 40 are in series with the primary winding of transformer 58. Therefore, if the radio receiver and transmitter unit is removed from the rack or if interlock switch 40 is open, power is removed from transformer 58 and, consequently, the high voltage is removed from tubes 6 and 7.

b. FILAMENT TRANSFORMERS. A-c power enters the power supply through pins 17 and 23 of the multiple receptacle 30; this power is applied to transformers 56 and 57 through circuit breaker 44. Transformer 56 has six secondary windings which supply the filament voltage for the five low-voltage rectifier tubes. The winding terminated at 5 and 6 supplies filament voltage to the radio receiver and transmitter. The winding terminating at 3 and 4 supplies filament voltage to rectifier Tube VT–126–B (1). Transformer 57 has three secondary windings which supply the filament voltage for the two high-voltage rectifier tubes.

c. PLATE TRANSFORMERS. (1) When circuit breakers 44 and 43 are closed, power is applied to transformers 59 and 58. The tapped secondary of transformer 59 supplies plate voltage for the five low-voltage rectifiers. Rectifier tube 1 is a VT–126–B and is used as a half-wave rectifier. The output of this tube supplies approximately —150 volts for biasing the modulator tube located in the transmitter of the radio receiver and transmitter. The a-c plate voltage is supplied from terminal 3 of transformer 59 and is applied to the voltage divider, which consists of resistors 22–1 and 22–2 in parallel and resistor 25. The output filter consists of capacitor 7 and resistor 21.

(2) Rectifier tube 2 (VT–244) is a full-wave rectifier. The a-c voltage is applied to the two plates from terminals 3 and 5 of transformer 59. The output of the rectifier is filtered by a conventional dual choke and capacity filter. The filtering is accomplished by the dual choke 62 and capacitors 2–3 and 3–1. Resistor 21 is the bleeder resistor. The positive 300-volt d-c output is supplied to the control unit.

(3) Rectifier tube 3 (VT–244) is a full-wave rectifier. The a-c voltage is applied to the two plates from terminals 5 and 3 of transformer 59. Because the requirement of this output is mainly voltage rather than current, a resistance and capacity type of filter is used. Resistors 18 and 23, together with capacitors 1 and 2–2, provide the filtering; resistors 19–2 and 19–3 in parallel are the bleeder resistors. The positive 400-volt direct current output is supplied to the radio receiver.

(4) Rectifier tube 4 is a full-wave rectifier supplied with a-c voltage from terminals 3 and 5 of

transformer 59. A choke and capacity type of filter is used, and resistor 19–1 is a bleeder resistor. The positive 300-volt d-c output is supplied to the radio receiver and transmitter. Tube 5 (VT–119) is a half-wave rectifier. The a-c plate voltage is supplied from terminal 6 of transformer 59. Because the output of this rectifier is primarily a voltage source, the filter circuit is a resistance and capacity type. The filter consists of resistor 15 and capacitor 4; resistor 15 also serves as the bleeder resistor. The positive 600-volt d-c output is supplied to the screen grid of the modulator tube in the radio receiver and transmitter.

(5) Tube 6 (VT–119) is a half-wave rectifier. The plate is supplied with a-c voltage from terminal 4 of transformer 58. The filter circuit for this rectifier tube, consisting of capacitor 25 and resistor 59–6, is located in the radio receiver and transmitter. The bleeder network consists of resistors 82–1, 82–2, 82–3, and 82–4. The positive 2,300-volt d-c output is applied to the plate of the modulator in the transmitter.

(6) Tube 7 (VT–119) is a half-wave rectifier. The a-c voltage is applied to the cathode from terminal 4 of transformer 58. The filter consists of resistor 17 and capacitors 6–1 and 6–2. The bleeder network consists of resistors 16–1, 16–2, 16–3, and 16–4. The circuit here described is not used in Radio Equipment RC–145–A, but since the power supply is an interchangeable component it is used with other equipments.

Section VIII. SIGNAL GENERATOR

27. Introduction

Signal Generator I–222–A is test equipment supplied with Radio Equipment RC–145–A. This signal generator provides a means for measuring the frequency setting of the receiving section, a means

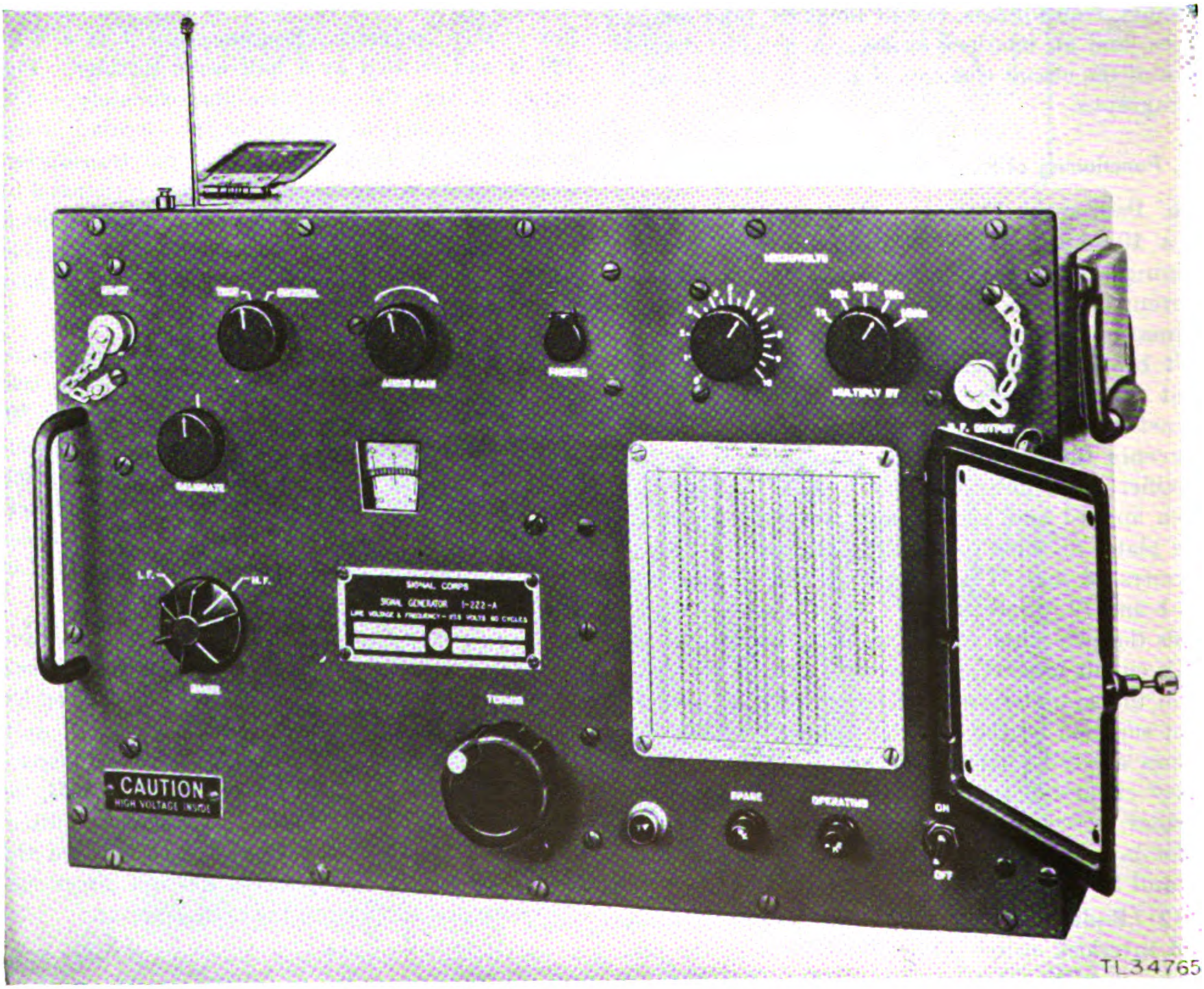


Figure 59. Signal Generator I–222–A.

for aligning the i-f amplifier of the receiver with an approximate r-f attenuator for measuring the gain of the i-f system, and a means for setting the operating frequency of the transmitter.

28. Block Diagram of Signal Generator

a. Figure 60 is a block diagram of the signal generator showing all circuit elements. These elements will be described in the following paragraphs.

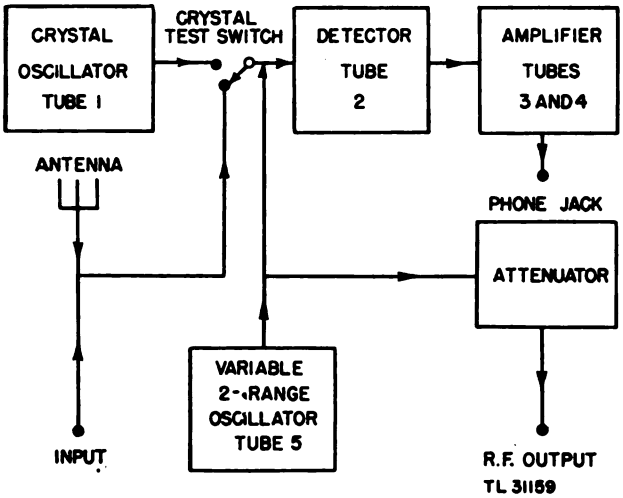


Figure 60. Signal generator, block diagram.

b. The signal generator is a combination signal generator and heterodyne-type wavemeter. A conventional two-range oscillator is used as a signal generator, to produce the required r-f signals. A rough attenuator is incorporated for use with the signal generator. As a wavemeter, the signal generator utilizes a crystal oscillator together with a detector and an audio amplifier. The basic function of the heterodyne wavemeter is to produce a frequency which is heterodyned with an incoming signal and fed through a detector to an amplifier. The source of the incoming signal must be tuned for the null of the wavemeter. In this manner it is possible to use the signal generator to set the transmitter to a desired frequency. A detailed discussion of the signal generator circuits will be given in the remainder of this section.

29. Functioning of Parts

a. CRYSTAL OSCILLATOR. The crystal oscillator uses a Tube VT–94 as a triode, crystal-controlled, self-excited oscillator with a frequency-discriminating plate tank consisting of coil 115, variable capacitor 61, and capacitor 59–1. (See fig. 61.) The output from the crystal oscillator is fed to the diode detector from the plate tank through d-c blocking capacitor 51–1 and resistor 20. When switch 106 is in the CRYSTAL position, the output of the crystal oscillator is applied to the diode detector (tube 2) through contacts 1 and 2. When the switch is in the TEST position, the grid circuit of the oscillator is grounded and the diode input is switched to the antenna by contacts 1 and 12.

b. DETECTOR AND AUDIO AMPLIFIER (fig. 62). (1) The input signal to the diode detector is supplied either from the variable two-range oscillator and the crystal oscillator or from the antenna and the variable two-range oscillator, depending upon the position of the CRYSTAL-TEST switch. The output from the detector, which is a mixture of the

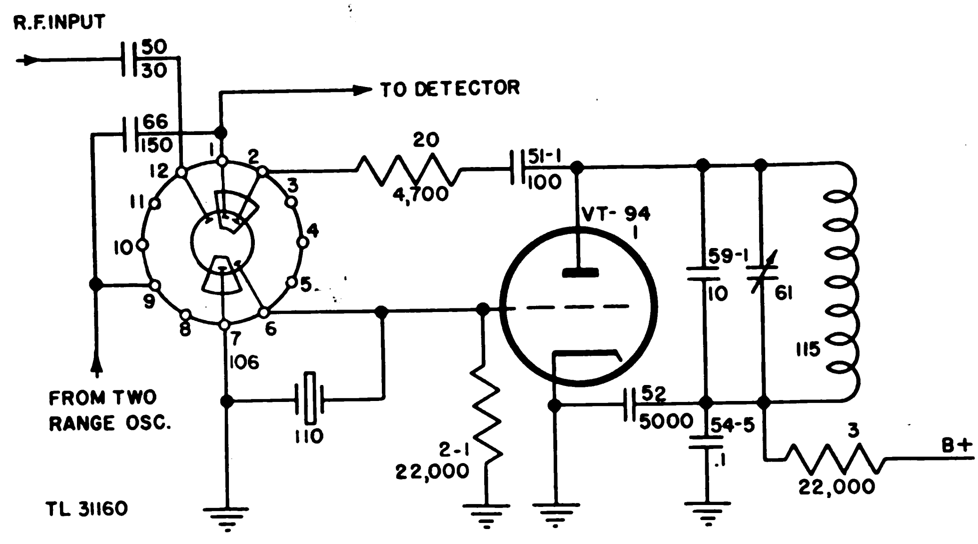


Figure 61. Signal generator, crystal-oscillator circuit.

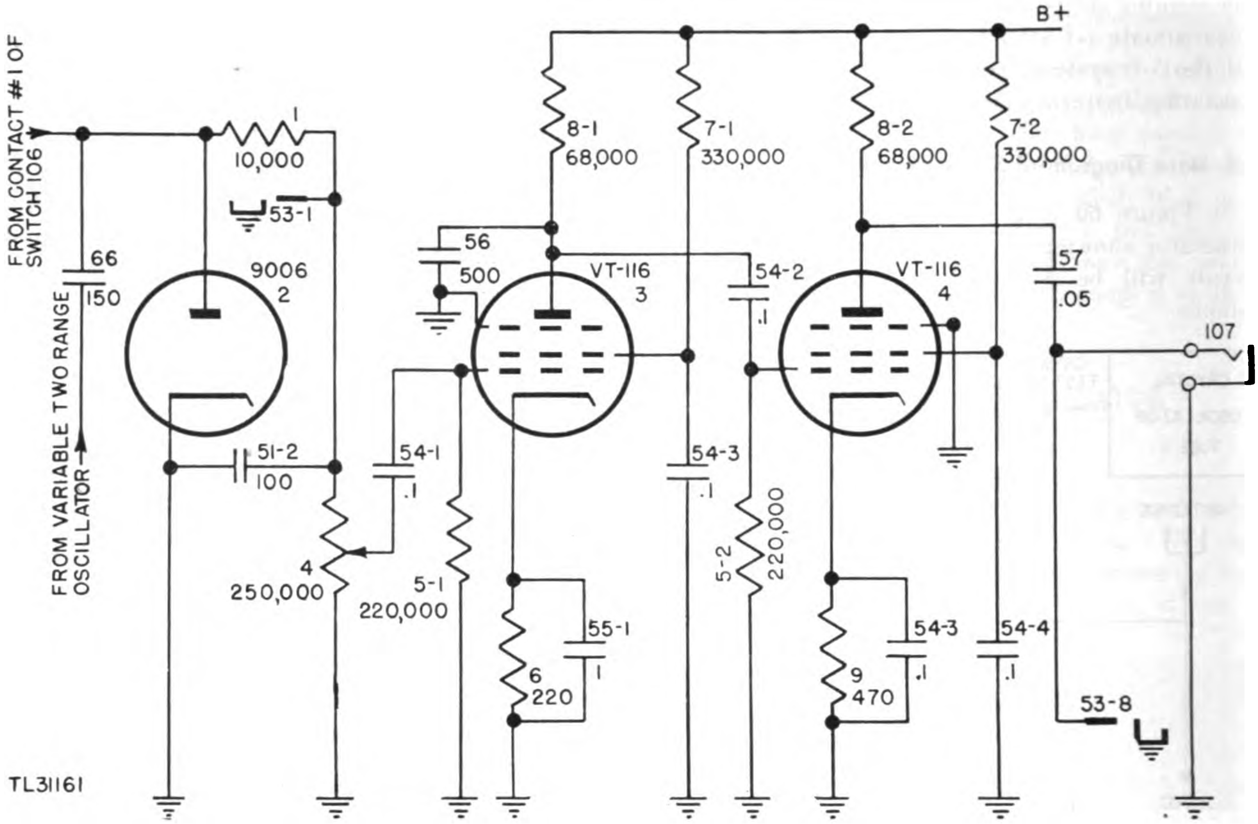


Figure 62. Signal generator, detector and amplifier circuit.

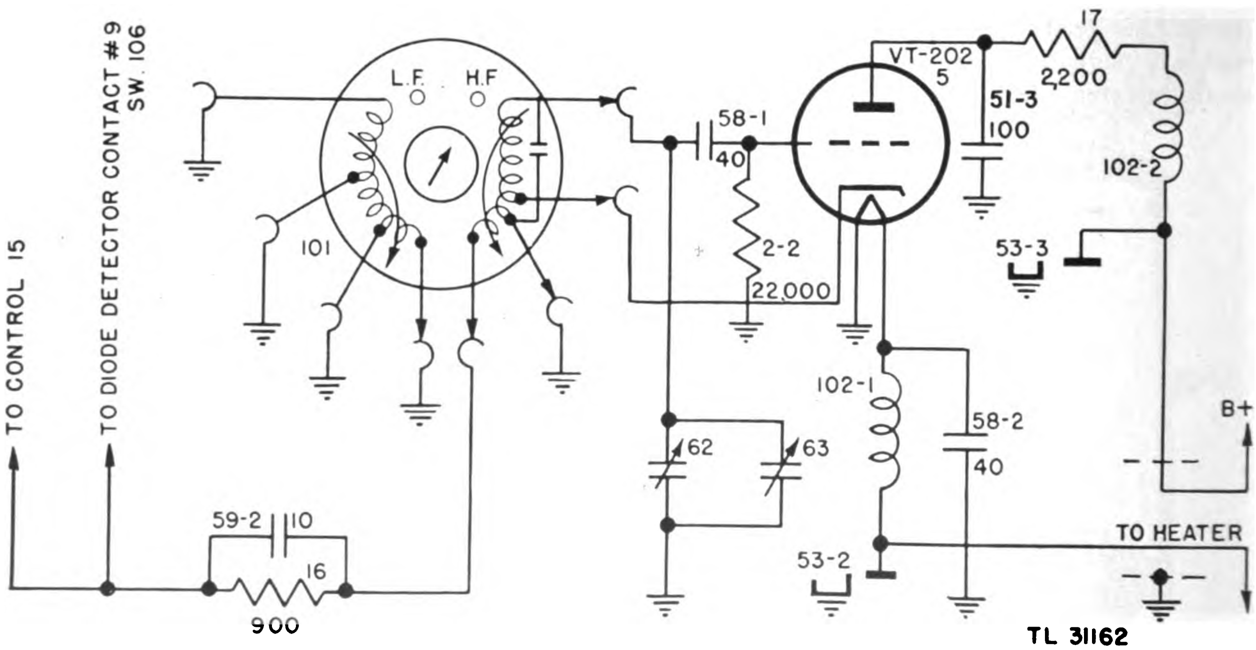


Figure 63. Signal generator, two-range oscillator circuit.

two r-f input signals, appears across load resistor 1. Capacitors 51–2 and 53–1 form the r-f return circuit. Spark gap 53–1 is shunted across the output to prevent r-f leakage.

(2) The output of the detector is applied to the grid of the first audio amplifier (tube 3) through potentiometer 4 and capacitor 54–1. Potentiometer 4 acts as the gain control by varying the amount of signal applied to the grid of tube 3. Resistor 5–1 is the grid resistor for tube 3. Resistor 6 and capacitor 55–1 produce the bias voltage. The screen-and-plate supply circuits are filtered by resistor 7–1 and capacitor 54–3, and resistor 8–1 and capacitor 56, respectively. The output of the first amplifier is coupled to the second amplifier (tube 4) through capacitor 54–2. Resistor 5–2 is the grid resistor for the second amplifier. The second amplifier circuit is similar to that of the first amplifier. The output of the second amplifier is coupled to jack 107 through capacitor 57. Spark plate 53–8 is connected across the output as a precautionary measure to prevent r-f leakage.

c. Variable Two-range Oscillator. This r-f oscillator uses a Tube VT–202 in a Hartley type circuit. (See fig. 63.) A turret, housing both h-f coil 100 and l-f coil 101, rotates to make contact with associated circuit elements. Capacitor 58–1 serves as a grid blocking capacitor, and resistor 2–2 is the grid leak. Variable capacitor 63 is the main tuning capacitor. A small variable capacitor 62, in parallel with capacitor 63, serves as a vernier capacity for restoring the calibration of the main tuning capacitor. Output voltage from this oscillator is developed across a low impedance inductance that is mutually coupled to the oscillator tank inductance. Resistor 17 is the plate dropping resistor. Capacitor 51–3 bypasses the r-f plate current to ground. Chokes 102–1 and 102–2, together with spark plates 53–2 and 53–3 and capacitor 58–2, are used as r-f filters. The shunt impedance, consisting of resistor 16 and capacitor 59–2, serves as a frequency discriminating network and also as a divider for the attenuator system and diode detector. In the l-f band, the discriminating network impedance is approximately equivalent to the value of resistor 16. In the h-f band, the capacity of 59–2 lowers the equivalent impedance to about one-tenth of the value of resistor 16 and, therefore, provides more voltage to the diode detector. This is necessary to bring up the level of its harmonic content.

d. R-f Attentuator (fig. 64). The r-f attenuator is of the constant impedance, π structure type, with a total attenuation of 100,000 to 1. This attenuator is divided up into five fixed steps of 10 to 1 per step with the last step having continuously variable output from zero to maximum. The input impedance of the network looks like 100 ohms for all positions of the multiplier. Voltage from the oscillator is divided to approximately 0.1 of its maximum value by the divider network, which consists of resistor 16, capacitor 59–2, and variable resistor 15. The divider has a 10:1 division on the l-f band and 2:1 on the h-f band. Input voltage is applied across variable resistor 15. By use of this resistor, any portion of the oscillator output may be fed to the variable, fixed-step divider network. The

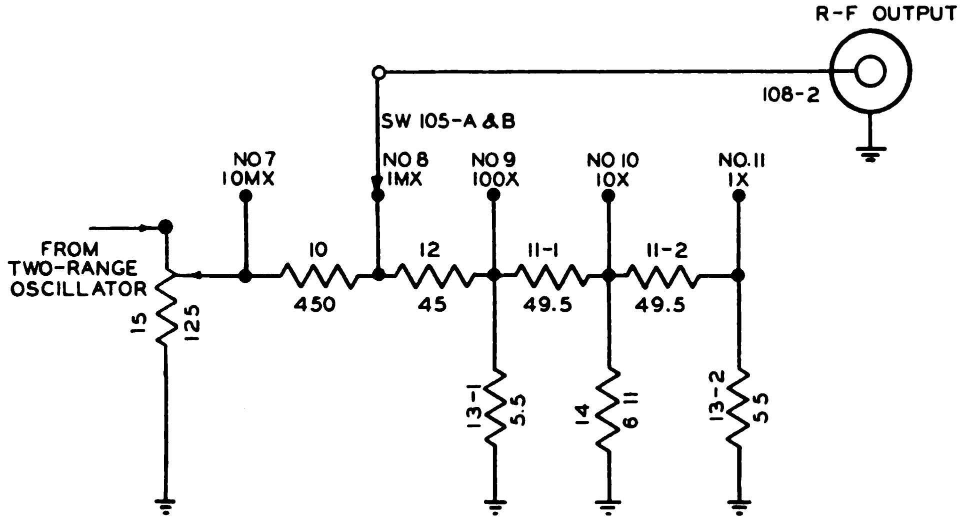


Figure 64. Signal generator, attenuator circuit.

control is approximately calibrated from 0–10 with 0.5 division marks between the whole numbers to indicate voltage division. With two-deck switch 105A–B in position 7 (10MX), maximum voltage is available when the arm of control 15 is in the maximum position. (Figure 64 is a simplified diagram of switch 105 A–B.) Positions 8 (1MX), 9 (100X), 10 (10X), and 11 (1X) give corresponding attenuation of 10 to 1 per switch setting. The impedance of the multiplier, when measured from the output side (108–2) to ground, is 100 ohms with the switch in position 7. When switch 105A–B is in position 9, 10, and 11, the impedance is equal to 5 ohms for each position.

e. Power Supply. The power supply uses a high-vacuum full-wave rectifier Tube VT–197–A (6). The 117-volt a-c power is applied to the primary of transformer 104 through receptacle 111, switch 112, and fuse 113. R-f chokes 102–3 and 102–4, together with spark plates 53–4, 53–5, 53–6, and 53–7, filter the a-c input circuit. Power transformer 104 provides three separate filament-voltage windings and one high-voltage winding for the plates of tube 6. Pilot lights 114–1 and 114–2 are connected across the filament winding supplying tubes 1, 2, 3, and 4. The rectifier circuit uses a capacitor input type of filter, which consists of dual chokes 103–A and 103–B and of capacitors 60–A, 60–B, and 60–C. The voltage divider consists of parallel resistors 18–1 and 18–2 in series with resistor 19. B+ voltage is supplied to terminal B of plug 117, and filament voltage is supplied to terminal A of plug 117.

Section IX. COMPLETE BLOCK DIAGRAM OF RADIO EQUIPMENT RC–145–A

30. Purpose of Diagram

a. The block diagram of Radio Equipment RC–145–A (fig. 65) is a complete functional presentation of the electrical circuits of the equipment. The discussion of the diagram follows the separate descriptions of the circuits given in preceding sections of this chapter. The diagram shows the relationship of these circuits and their individual functions in the over-all operation of the equipment.

b. The block diagram is excellent to use while making a quick review of the operation of the equipment or when instructing others in the broad details of its performance. While trouble shooting, the radar officer or technician can follow the course of a signal from circuit to circuit without the detailed circuit tracing encountered with schematics. When trouble is suspected in an individual circuit, reference can be made to the proper schematic and trouble-shooting data to locate accurately the source of trouble.

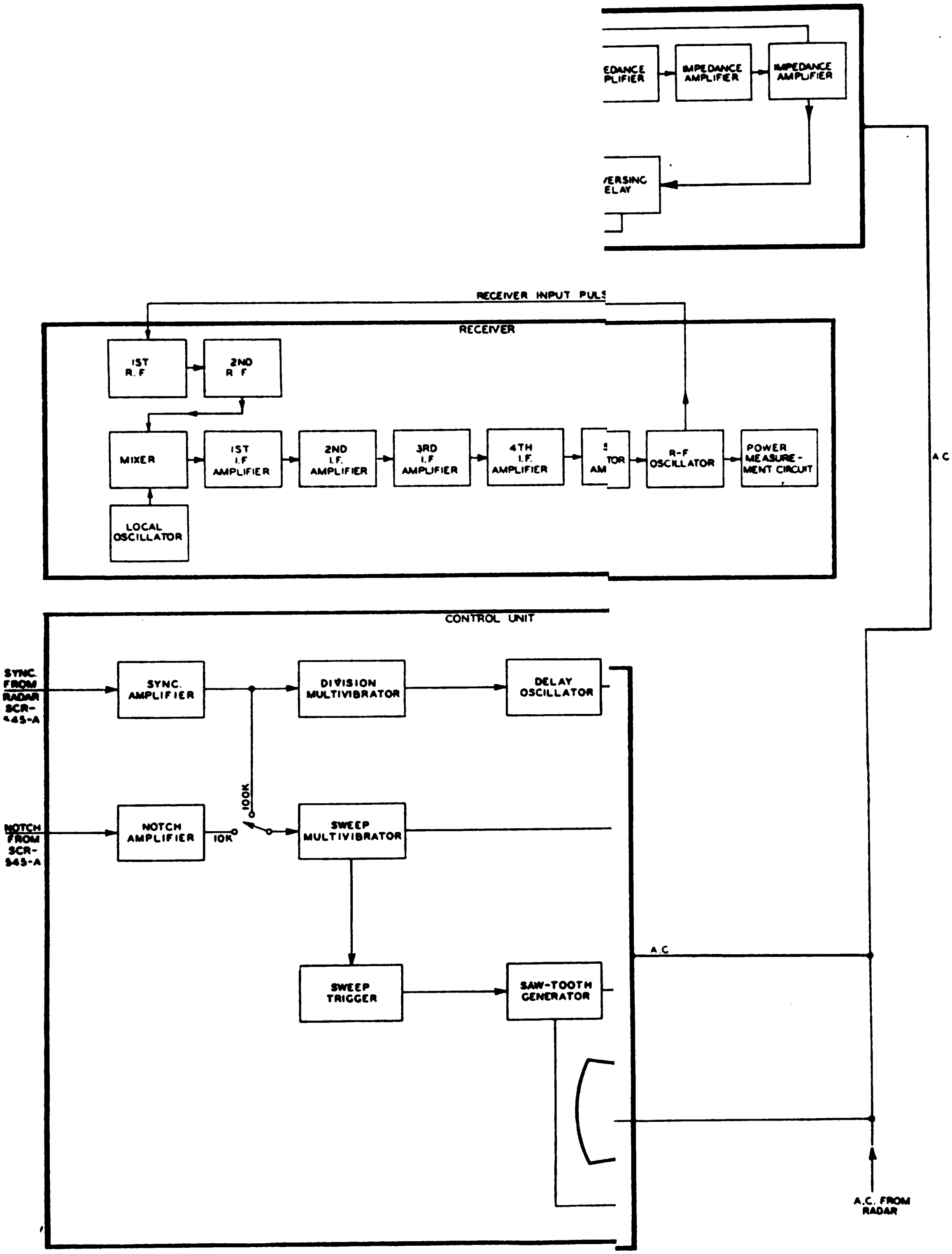
31. Reading Diagram

a. Figure 65 represents the various circuits of the equipment as blocks marked with the name of the circuit. A chassis or major component is represented by a large block, and the circuits within it are indicated by smaller blocks. Interconnections have been simplified and are indicated by solid lines with arrow heads pointing in the direction in which the signal is progressing. The various blocks representing major components have been arranged in groups so that each group represents a system.

b. A signal leaving a major component opposite one of the smaller blocks within it indicates that the signal leaves the component from the circuit identified by the smaller block. A signal shown entering a major component opposite a smaller block indicates that the signal is applied to the circuit represented by this block. The a-c distribution system has been omitted from the block diagram in order to simplify it. Filament connections and d-c connections within the various units also have been left out for the same reason. These latter voltages are shown applied to the entire major components, and their distribution within the component is to be assumed. Because the purpose of the diagram is to emphasize the functional or signal-carrying connections, it does not include any other connections which might confuse the diagram and defeat its main purpose.

32. Review of Theory with Block Diagram

Radio Equipment RC–145–A, in common with other IFF equipments, has the following primary functions: the transmission of a short pulse of radio frequency energy; the reception of *identification signals* transmitted by the challenged aircraft; the measurement of time intervals between the transmission of the pulse and the reception of the identification pulse; and the presentation of this time factor as linear distance between the radio set and the target. In addition to these basic functions, Radio Equipment RC–145–A presents a visual indication of the azimuth based upon the position of the antenna when it is pointed towards the target. The following summary of these actions, with reference to the block diagram (fig. 65) will show how the equipment operates.


EDANCE PLIFIER
IMPEDANCE AMPLIFIER
IMPEDANCE AMPLIFIER
/ERSING ELAY
RECEIVER INPUT PUL
RECEIVER
1ST R.F
2ND R F
MIXER
1ST I.F AMPLIFIER
2ND I.F. AMPLIFIER
3RD I.F AMPLIFIER
4TH I.F. AMPLIFIER
TOR
AM
R-F OSCILLATOR
POWER MEASURE-MENT CIRCUIT
LOCAL OSCILLATOR
A C
CONTROL UNIT
SYNC. FROM RADAR SCR-545-A
SYNC. AMPLIFIER
DIVISION MULTIVIBRATOR
DELAY OSCILLATOR
100K
NOTCH FROM SCR-545-A
NOTCH AMPLIFIER
10K
SWEEP MULTIVIBRATOR
A.C
SWEEP TRIGGER
SAW-TOOTH GENERATOR
A.C. FROM RADAR

TL30939A

a. TRANSMITTING SYSTEM. (1) The transmitting system shown in the transmitter section of the block diagram consists of the following components: the sync amplifier, clipper amplifier, blocking oscillator, cathode-follower, modulator, r-f oscillator, and power-measurement circuit. The main power supply furnishes both a-c and d-c power for the transmitter. A positive trigger pulse is supplied by the control unit to the transmitter along the line marked "sync." This pulse, which is repeated 240 times a second, causes the transmitting system to transmit a 4-to-9 microsecond r-f pulse of voltage approximately 240 times per second and to remain inactive during the period between these pulses.

(2) The sync amplifier amplifies and inverts the trigger pulse. The negative pulse output of the sync amplifier is amplified, clipped, and inverted by the clipper amplifier. The cathode follower takes the positive pulse output of the clipper amplifier and applies it to the grid of the blocking oscillator, which is triggered by this positive sync pulse, and supplies a positive pulse to the grid of the modulator. The modulator delivers a positive high-voltage pulse to the plates of the transmitting oscillator. Upon application of this pulse, the transmitter breaks into oscillation and emits a pulse of r-f energy, which has the same duration as the modulator pulse (4 to 10 μsec). The r-f energy developed by the oscillator is fed through a transmission line to the antenna. A portion of this r-f energy is fed to the diode-measuring circuit to provide means of determining power output.

b. RADIO-FREQUENCY SYSTEM. The r-f system is composed of the antenna-matching section, r-f lines, and the antenna. The rotating joint in the base of the antenna mast, which houses the line-coupling plug, is included in the line. However, it is not shown in the block because its function is primarily mechanical. The r-f line is fed from the antenna-matching section, which is fed by the transmitting oscillator, and conveys the signal to the antenna; this line also carries the input signal from the antenna to the receiver. The antenna radiates the signal from the transmitter and receives the identification pulses transmitted by the challenged target. The antenna-matching section serves two purposes: it provides a means for proper impedance-matching of the line when receiving and transmitting; and it isolates the transmitter and identification pulses to their own particular circuits.

c. RECEIVING SYSTEM. (1) The receiving system is comprised of the components necessary to receive the incoming *identification* signals from the antenna-matching section and to convert them into video signals for application to the display oscilloscope. These components are the r-f preamplifier stages, mixer, local oscillator, i-f amplifiers, detector, and video amplifier.

(2) The receiver is a conventional superheterodyne. Two stages of r-f amplification are used before the mixer. The local oscillator is of the Colpitts type and can be varied over a range of 146 to 176 megacycles. The mixer stage produces an intermediate frequency of 11 megacycles, which is amplified by five stages of stagger-tuned i-f amplification. A diode-type detector is used to demodulate the incoming signal. A double diode is used as the detector to develop the input to the video amplifier and also to supply the signal which operates the tuning indicator. The video amplifier inverts and amplifies the signal taken from the detector. The positive pulse output of the video amplifier is applied to the grid of a cathode follower which is used to provide a low impedance output to the display oscilloscope in the control unit. The power used in the receiver is supplied from the main power supply.

d. CONTROL UNIT. (1) The control unit is comprised of the component necessary to perform the following functions: to develop a synchronizing pulse for the identification transmitter; roughly measure the distance between the identification equipment and the interrogated target; determine the correctness of the azimuth setting of the antenna; and display simultaneously the main pulse of the identification transmitter and the pulse from the interrogated target.

(2) The sync voltage from the radar set is amplified and inverted within the sync amplifier stage. The next stage is the divider multivibrator which divides the incoming signal to the desired pulse-recurrence frequency. The pulse-shaper triggers the delay oscillator; this oscillator delays the starting time of the transmitter-trigger pulse with respect to the starting time of the ranging circuits.

(3) The output of the delay oscillator is also fed to the pedestal multivibrator which develops a square wave to be used as part of the final brightening voltage. The output of the pedestal multivibrator is coupled to one tube of the mixer stage, and the output of the sweep multivibrator is coupled to the other tube of the mixer stage. The pulse from the sweep multivibrator determines the duration of the brightening pulse produced by the mixer stage. The output of the mixer stage is the brightening voltage for the cathode-ray tube and is coupled to the grid of the cathode-ray tube through the cathode-fol-

lower. The cathode-follower normally passes the brightening voltage except when the brightening voltage is canceled by the blanking voltage. The blanking voltage is developed by the blanking amplifier and the lobe switch, and is coupled to the grid of the cathode-follower along with the brightening voltage. The net output of the cathode-follower modulates the grid of the cathode-ray tube in synchronism with the operation of the remainder of the IFF equipment, making the transmitter and interrogation pulses visible on the cathode-ray tube screen at the proper times. The output of the sweep multivibrator is applied to the grid of the sweep trigger tube. A negative pulse from the output of the sweep trigger tube is used to cut off the current flow in part of the saw-tooth generator and to allow an integrating capacitor in the plate circuit to begin charging. The time of the saw tooth produced across this capacitor is equal to the duration of the cut-off pulse determined by the sweep trigger. The amplitude of the saw-tooth voltage is determined by the size of the integrating capacitor, which is selected by the range switch so as to maintain approximately the same amplitude of the three sweep voltages. Sweep-gain controls are used to adjust the amplitudes to the required level for correct sweep of the cathode-ray display tube. The pulse from the sweep multivibrator also determines the duration of the brightening pulse produced by the mixer stage. The output of the saw-tooth generator is fed both to the spread amplifier and to one of the horizontal deflection plates of the cathode-ray tube.

(4) The notch amplifier receives the notch voltage from the radar set, and the output of the notch amplifier triggers the operation of the sweep multivibrator when the range switch is in either the 10K YD. or CALIB. positions. When the range switch is in the 100K YD. position, the sweep multivibrator is triggered by the output of the sync amplifier. In the TEST position the sweep multivibrator is triggered by the output of the divider multivibrator.

(5) The input to the spread amplifier consists of the output of the saw-tooth generator and the spread voltage. The spread voltage is controlled by the operation of the lobe switch, which causes the output of the spread amplifier to increase as one antenna lobe is selected separately. The output of the spread amplifier is variable and determines whether or not an IFF signal reply will appear as one or two pips on the screen of the cathode-ray tube. It must be remembered, however, that the separate viewing of either of the antenna lobe signals (pip-matching) requires the use of the blanking amplifier. The blanking amplifier is used to blank the sweep during the short interval of time when both lobes of the antenna are connected simultaneously to the receiver. This is accomplished by biasing the blanking amplifier to cut-off during the time when blanking does not occur and by removing this bias by shorting the cathode-resistor during the blanking interval. With the bias removed the plate voltage drops, producing a negative pulse of the same duration as the application of both lobe outputs to the receiver. The range-monitor stage is a cathode-follower, making it possible to check visually the functions of the ranging circuits. The purpose of the cathode-ray tube is to display the receiver and transmitter output signals in the desired form.

(6) The video stage amplifies the signals fed from the receiver, and the video output is coupled to one of the vertical deflection plates of the cathode-ray tube.

(7) When the range switch is in the CALIB. position, the voltage across the tuned circuit in the saw-tooth generator stage is coupled to the cathode-ray tube and appears as a damped sine wave. This sine-wave voltage is used to calibrate the long range sweep. The TEST position of the range switch provides the cathode-ray tube with a relatively slow sweep to be used when viewing test patterns. The test patterns may be fed to the cathode-ray tube through the jack connected to one of the vertical deflection plates.

CHAPTER 2

TROUBLE-SHOOTING PROCEDURES

Section I. GENERAL INFORMATION

33. Introduction

No matter how well equipment is designed and manufactured, faults are bound to occur in service. When such faults do occur, the repairman must locate and correct them as rapidly as possible. This section contains general information to aid personnel engaged in the important duty of trouble shooting. Remember, however, that preventive maintenance minimizes the necessity of trouble shooting.

a. TROUBLE-SHOOTING DATA. Take advantage of the material supplied in this manual to help in rapidly locating faults. Consult the following trouble-shooting data when necessary:

(1) *Block diagram of system.*

(2) *Complete schematic diagrams.* These diagrams include all components and show all the connections (power, input, and output) to the other units.

(3) *Simplified and partial schematics.* These diagrams are particularly useful in trouble shooting, because they enable the electrical functioning of circuits to be followed more clearly than on the regular schematics and thus speed trouble location.

(4) *Voltage and resistance data at all socket connections.*

(5) *Voltage, resistance, and waveform data at test jacks.* Blocking capacitors are omitted from most leads to the test jacks, to enable measurement of the d-c voltage at the plate or other points to which the test jacks connect. For this reason, be careful not to touch the measuring instruments which carry high voltage when connected to the test jacks.

(6) *Illustrations of components.* Front, top, and bottom views aid in locating and identifying parts.

(7) *Pin connections.* Pin connections on sockets, plugs, and receptacles are numbered or lettered on the various diagrams.

(*a*) Seen from the bottom, pin connections are numbered in a clockwise direction around the sockets. On octal sockets the first pin clockwise from the keyway is pin No. 1. Pin numbers appear both on the schematic diagrams and on the wiring diagrams, so that any tube element can be readily located.

(*b*) Plugs and receptacles are numbered on the side to which the associated connector is attached. To avoid confusion, some individual pins are identified by letters which appear directly on the connector.

b. TROUBLE-SHOOTING STEPS. The first step in servicing a defective radar set is to sectionalize the fault. Sectionalization means tracing the fault to the component responsible for the abnormal operation of the set. The second step is to localize the fault. Localization means tracing the fault to the defective part responsible for the abnormal condition.

(1) Use of the Equipment Performance Log (EPL) and of the Starting Procedure aids in tracing the fault to the defective component. The procedures to be followed are explained in *c* and *d* below.

(2) Some faults such as burned-out resistors, r-f arcing, etc., can be located by sight, smell, and hearing. The majority of faults, however, must be located by checking voltages, resistances, and waveforms.

c. EQUIPMENT PERFORMANCE LOG SECTIONALIZATION. The Equipment Performance Log Sheet is a record of the normal and abnormal operation of the station. In the event of station failure or abnormal operation, reference to the Equipment Performance Log usually will aid in sectionalizing the defect. When a station failure occurs, refer to the log sheet and note the operation of the station for the past 24 hours. The failure may be the result of a previous abnormal condition not serious enough in itself to have caused the station to go off the air at the time it occurred. The abnormal condition will have been entered in the station log. Check the log entry to obtain direct information leading to the cause of the failure.

d. STARTING-PROCEDURE SECTIONALIZATION. The starting procedure is the systematic method used to put the station on the air. This procedure is used in sectionalization when the cause of the station failure is not known. In most cases, it will trace the defect to a particular component. The steps of the starting procedure are performed in sequence until an abnormal result is obtained. As each step it performed, the visible and audible results of the action are noted. The use of the starting procedure is described in detail in section II of this chapter.

e. LOCALIZATION. Localization is the tracing of the fault to a particular part of the component. Sections III through IX of this chapter describe the method of localizing faults within the individual components. These sections contain trouble-shooting charts which list abnormal symptoms and their causes. The charts also give the procedure for finding out which of the probable locations of the fault is the exact one. The sections also tell what waveforms should be obtained at the test points. In addition, there is a drawing which shows the resistance and the voltage at every socket-pin connection. The method of using the voltage and resistance data in checking a circuit is described in detail in paragraphs 34d and 35c.

34. Voltage Measurements

a. GENERAL. Voltage measurements are an almost indispensable aid to the repairman, because most troubles either result from abnormal voltages or produce abnormal voltages. Voltage measurements are made easily, because they are always made between two points in a circuit and therefore the circuit need not be interrupted.

(1) Complete information on normal operating voltages is given in the trouble-shooting section. Unless otherwise specified, these voltages are measured between the indicated points and ground.

(2) Always begin by setting the voltmeter on the highest range, so that the voltmeter will not be overloaded. Then, if it is necessary to obtain increased accuracy, set the voltmeter to a lower range.

(3) In checking cathode voltage, remember that a reading can be obtained when the cathode resistor is actually open. The resistance of the meter may act as a cathode resistor. Thus, the cathode voltage may be approximately normal only as long as the voltmeter is connected between cathode and ground. Before the cathode voltage is measured, a resistance check should be made with the circuit cold to determine if the cathode resistor is normal.

b. PRECAUTIONS AGAINST HIGH VOLTAGE. Certain precautions must be followed when measuring voltages above a few hundred volts. High voltages are dangerous and can be fatal. When it is necessary to measure high voltages, observe the following rules:

(1) Connect the ground lead to the voltmeter.

(2) Place one hand in your pocket.

(3) If the voltage is less than 300 volts, connect the test lead to the hot terminal (which may be either positive or negative with respect to ground).

(4) If the voltage is greater than 300 volts, shut off the power, connect the hot test lead, step away from the voltmeter, turn on the power, and note the reading on the voltmeter. Do not touch any part of the voltmeter, particularly when it is necessary to measure the voltage between two points, both of which are above ground.

c. VOLTMETER LOADING. It is essential that the voltmeter resistance be at least 10 times as large as the resistance of the circuit across which the voltage is measured. If the voltmeter resistance is comparable to the circuit resistance, the voltmeter will indicate a lower voltage than the actual voltage present when the voltmeter is removed from the circuit.

(1) The resistance of the voltmeter on any range can always be calculated by the following simple rule: resistance of voltmeter equals the ohms-per-volt multiplied by the full-scale range in volts. Two examples are shown below:

(*a*) What is the resistance of a 1,000 ohms-per-volt voltmeter on the 300-volt range?

$$R = 1{,}000 \text{ ohms-per-volt} \times 300 \text{ volts} = 300{,}000 \text{ ohms}$$

(*b*) What is the resistance of a 20,000 ohms-per-volt voltmeter on the 300-volt range?

$$R = 20{,}000 \text{ ohms-per-volt} \times 300 \text{ volts} = 6 \text{ megohms}$$

(2) To minimize voltmeter loading in high-resistance circuits, use the highest voltmeter range. Although only a small deflection will be obtained (possibly only 5 divisions on a 100-division scale), the accuracy of the voltage measurement will be increased. The decreased loading of the voltmeter will more than compensate for the inaccuracy which results from reading only a small deflection on the scale of the voltmeter.

(3) When a voltmeter is loading a circuit, the effect can always be noted by comparing the voltage reading on two successive ranges. If the voltage readings on the two ranges do not agree, voltmeter loading is excessive. The reading (not the deflection) on the highest range will be greater than on the lowest range. If the voltmeter is loading the circuit heavily, the deflection of the pointer will remain nearly the same when the voltmeter is shifted from one range to another.

(4) The voltage and resistance drawings used in

this manual are based on readings taken with an actual meter. The ohms-per-volt sensitivity of the meter which was used is printed on the drawing. The trouble-shooter should use a meter having the same ohms-per-volt sensitivity. Because the meter used in testing for the voltage will produce the same amount of loading as the meter used in measuring the voltage, it is unnecessary to consider the effect of loading.

d. PRACTICAL EXAMPLE OF VOLTAGE ANALYSIS. Figure 66 illustrates a typical amplifier stage. The values of the various parts are labeled as well as the input voltages. The normal voltages at the V3 tube socket pins are:

Pin No.	1	2	3	4	5	6	7	8
Voltage:	7.2	6.3 ac	0	0	7.2	195	0	185

Note. All voltages are d-c unless otherwise specified. The d-c readings were taken with a 1,000 ohms-per-volt voltmeter. Drawings for each component, giving the voltage at each socket connection, can be found in the section on trouble shooting in the component.

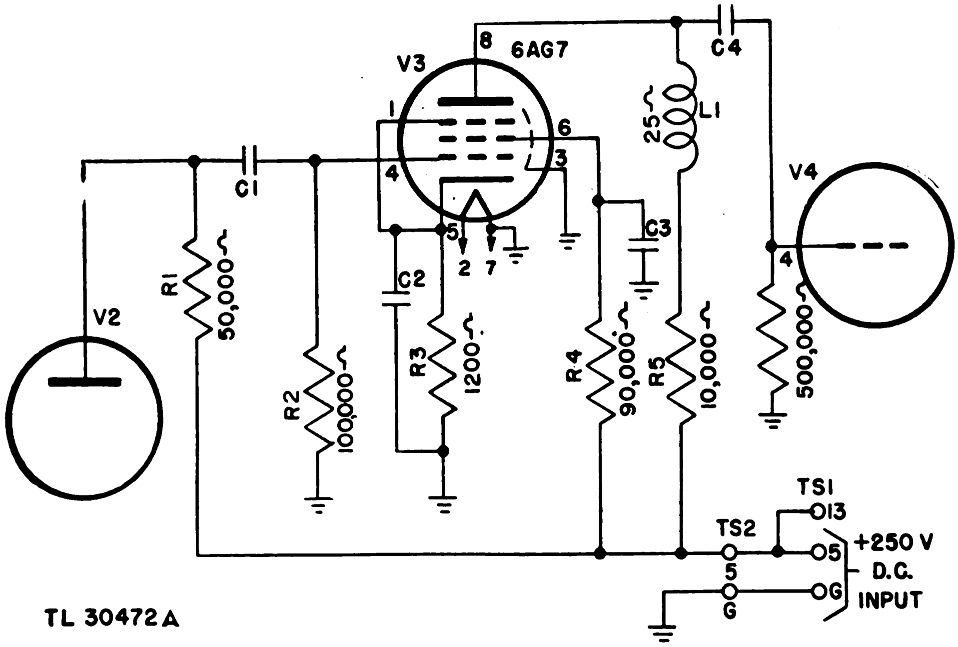


Figure 66. Schematic diagram for voltage analysis.

To check the stage shown in figure 66 for an abnormal voltage measurement, measure the voltages between the socket contacts and the chassis.

(1) The voltage between contact 1 and the chassis is normally 7.2 volts (see above chart). This voltage should be the same as that between socket contact 5 and the chassis, since they are directly connected, (5) below.

(2) The voltage between contact 2 and the chassis should be 6.3 a-c volts, because contact 2 is one side of the filament. On the diagram, no connections are shown because the filament of amplifier tubes are always connected to a low-voltage a-c source. If this voltage is abnormal, check the voltage across the winding of the transformer which supplies the voltage.

(*a*) If the voltage of the transformer is normal, the trouble is a broken connection between the transformer and the contact.

(*b*) If the voltage of the transformer winding is abnormal, measure the voltage of the transformer primary winding.

(*c*) If the primary voltage is normal and the voltage on the winding that delivers the filament voltage is abnormal, either the transformer is defective or an abnormally high drain is being placed on the filament winding. This condition can be checked by removing one of the wires from the filament winding and by testing again the voltage across this winding. If the transformer is defective, the voltage reading will still be abnormal. If the transformer is normal, the voltage will be a little higher than usual. If, however, the voltage on the transformer primary is abnormal, the source of this voltage must be checked.

(3) The voltage between contact 3 and the chassis should be zero, since this contact is directly connected to the chassis.

(4) The voltage between contact 4 and the chassis should be zero, because this is a class A amplifier and normally no grid current flows through resistor R2. If capacitor C1 should short-circuit, however, the high positive voltage on the plate of tube V2 would be delivered to contact 4 and a d-c positive-voltage reading would be obtained. It is also possible for a short circuit inside the tube to cause a reading on this contact.

(5) The voltage on contacts 1 and 5 should be 7.2 volts. (An important consideration in measuring cathode voltage is explained in paragraph 34a (3).) The plate cathode voltage and the grid cathode voltage normally cause a current to flow through the cathode resistor R3. This current is normally 0.006 ampere, since the resistor is rated at 1,200 ohms and the voltage across it is 7.2 volts.

$$I = \frac{E}{R} = \frac{7.2}{1{,}200} = 0.006 \text{ ampere}$$

(*a*) If no voltage is obtained, the trouble may be due to a lack of plate-supply voltage, a burned-out tube V3, a shorted resistor R3, a shorted capacitor C2, (this capacitor, if shorted, would connect the cathode to the chassis), or a broken connection.

(*b*) If the voltage is found to be low, the trouble may be a tube V3 with low emission, a leaky capacitor C2, an open-circuited resistor R4 or R5, a shorted capacitor C3 or C4, low plate-supply voltage, an open-circuited coil L1, a poor connection, or a change in the resistance value of any of the resistors.

(*c*) If the voltage is found to be too high, the trouble may be a gassy tube, a short-circuited resistor, too high an applied voltage, or a connection in either the plate-cathode or screen grid-cathode circuits shorted by an external circuit.

(6) The screen voltage is checked as follows:

(*a*) The voltage on contact 6 is normally 195 volts. The voltage drop across the resistor is normally 55 volts, since the voltage on one side of the resistor is 195 volts and 250 volts on the other side. The normal current through this resistor would be 0.0006 ampere.

$$I = \frac{E}{R} = \frac{55}{90{,}000} = 0.0006 \text{ ampere}$$

(*b*) If no voltage is obtained on contact 6, the trouble may be lack of applied voltage, an open-circuited resistor R4, a broken connection, or a shorted capacitor C3.

(*c*) If the voltage on contact 6 is too low, the trouble may be a gassy tube, a leaky capacitor C3, too low an applied voltage, or too low a bias voltage on the grid of tube V3 (grid is biased by the 7.2 volts on the cathode).

Note. A gassy tube, or lowering of the grid bias of tube V3, will increase the screen grid current. Increasing this current will increase the voltage drop across resistor R4. If capacitor C3 is leaky or shorted, the screen grid of tube V3 will be connected near or at ground potential and will lower the voltage on contact 6. The current through resistor R4 rises if capacitor C3 is shorted. Resistor R4 is the only resistance between the applied voltage and the chassis ground. Resistor R4 probably will burn out because of the high current flow unless the resistor has a high power rating. Any fault that will make high current flow through the screen grid-cathode circuit may burn out either resistor R3 or R4.

(7) The voltage between contact 7 and ground normally should be zero, according to the chart above, since this contact is connected directly to the chassis ground.

(8) The plate voltage is checked as follows:

(*a*) The voltage between contact 8 and the chassis normally should be 185 volts. This voltage is at one of the points in the plate-cathode circuit which comprises resistor R5, coil L1, the plate resistance of tube V3, and resistor R3. The applied voltage in this circuit is +250 volts. The voltage drop across resistor R5 and coil L1 in series is 65 volts (250 volts — 185 volts). The current through resistor R5 and coil L1 is 0.0064 ampere.

$$I = \frac{E}{R} = \frac{65}{10{,}025} = 0.0064 \text{ ampere}$$

(*b*) If no voltage is obtained on contact 8, the trouble may be a lack of applied voltage, an open-circuited resistor R5 or coil L1, or a broken connection between terminal 5 on terminal strip TS1 and contact 8.

(*c*) If the voltage on contact 8 is too low, the trouble may be a gassy tube V3, too low an applied voltage, a shorted or leaky capacitor C2, or a shorted resistor R3. A gassy tube V3, shorted or leaky capacitor C2, or a shorted resistor R3, will cause the current through the plate-cathode circuit to rise and thus increase the voltage drop across resistor R5 and coil L1. This would lower the voltage on contact 8. Increased current through this circuit may also burn out resistor R3 or resistor R5, unless its power rating is ample.

(*d*) If the voltage is too high, the trouble may be a burned-out tube V3, low emission in tube V3, a burned-out resistor R3, a shorted resistor R5, too high an applied voltage, or a burned-out resistor R4. If the tube is burned out or resistor R3 is open, no current will flow through the plate-cathode circuit, and there will be no voltage drop between the applied voltage and the plate of the tube.

(9) Capacitor C4, a coupling capacitor to the grid of tube V4, can be checked for a shorted or leaky condition by measuring the voltage between contact 4 on tube V4 and the chassis ground. If the positive d-c voltage is higher than normal when measured on contact 4 of tube V4, the capacitor is leaky or shorted.

35. Resistance Measurements

a. General. (1) *Normal resistance values.* When a fault develops in a circuit, its effect will very often show up as a change in the resistance values. To assist in the localization of such faults, troubleshooting data includes the normal resistance values, as measured at the tube sockets and at the test jacks. These values are measured between the indicated points and ground, unless otherwise stated. Often it is desirable to measure the resistance from other points in the circuit in order to determine whether the particular points in the circuit are normal. The normal resistance values at any point can be determined by referring to the resistance values shown in the schematic diagram.

(2) *Precautions.* (*a*) Before making any resistance measurements, turn off the power. An ohmmeter is essentially a low-range voltmeter and battery. If the ohmmeter is connected to a circuit which already has voltages in it, the needle will be knocked off scale and the voltmeter movement may be burned out.

(*b*) Capacitors must always be discharged before resistance measurements are made. To do this is very important when checking power supplies that are disconnected from their load. The discharge of the capacitor through the meter will burn out its movement and in some cases may endanger life.

(3) *Correct use of low and high ranges.* It is important to know when to use the low-resistance range and when to use the high-resistance range of an ohmmeter. When checking the circuit continuity, set the ohmmeter on the lowest range. If a medium or high range is used, the pointer may indicate zero ohms, even if the resistance is as high as 500 ohms. When checking high resistances or measuring the leakage resistance of capacitors or cables, use the highest range. If a low range is used, the pointer will indicate *infinite* ohms, even though the actual resistance is less than a megohm.

(4) *Parallel resistance connections.* In a parallel circuit the total resistance is less than the smallest resistance in the circuit. This fact is important to remember when shooting trouble with the aid of a schematic diagram.

(*a*) When a resistance is measured and the value is found to be less than expected, make a careful study of the schematic to be certain that there are no resistances in parallel with the one that has been measured. Before replacing a resistor because its resistance measures too low, disconnect one terminal from the circuit and again measure its resistance to make sure that the low reading was not caused by some part of the circuit being in parallel with the resistor.

(*b*) In some cases, it will be impossible to check a resistor because it has a low-voltage transformer winding connected across it. If the resistor must be checked, disconnect one terminal from the circuit before measuring its resistance.

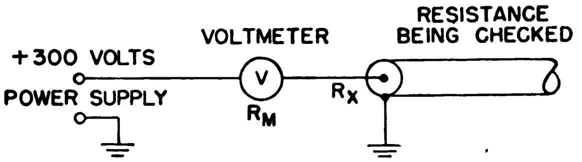
(5) *Checking grid resistance.* When checking grid resistance, a false reading may be obtained if the tube is still warm and the cathode is emitting electrons. Allow the tube to cool, or reverse the ohmmeter test leads so that the negative ohmmeter test lead is applied to the grid.

(6) *Tolerance values for resistance measurements.* Tolerance means the normal difference that is expected between the rated value of the resistor and its actual value.

(*a*) Most resistors that are used in radar circuits have a tolerance of at least 10 percent. For example, the grid resistor of a stage might have a rated value of 1 megohm. If the resistor were measured and found to have a value between 0.9 megohm and 1.1 megohms, it would be considered normal. As a rule, the ordinary resistors used in circuits are not replaced unless their values are off more than 20 percent. Some precision resistors and potentiometers are used. When a resistor is used whose value must be very close to its rated value, the tolerance is usually stated on the diagram.

(*b*) The tolerance values for transformer windings is generally between 1 and 5 percent. As a rule, suspect a transformer which shows a resistance deviating more than 5 percent from its rated values. Allow the transformer to cool off before the resistance test is made.

b. High-resistance Measurements. Many leakages will not show up when measured at low voltages. Most ohmmeters use a maximum test voltage of 15 volts on the highest resistance range. Where it is necessary to measure resistance above a few megohms or the leakage resistance between conductors of a cable, the test should be made by using an applied voltage of 100 volts or more. Where it is possible to ground one end of the resistance being checked, one of the low-voltage power supplies in the equipment can be used to provide about 300 volts for making these high-resistance measurements. The manner in which such measurements are made is indicated in figure 67. This method should be used only when the resistance being measured is very high. Be careful not to handle the meter after the circuit has been completed. The meter used should have an ohms-per-volt sensitivity



$$R_X = \frac{300}{V} R_M \text{ (APPROX.)}$$

EXAMPLE

V=5 VOLTS. THE METER IS USED ON ITS 300 VOLT RANGE AND HAS A RESISTANCE OF 1,000 OHMS-PER-VOLT.

$$R_M = 300 \times 1{,}000 = 300{,}000 \text{ OHMS.}$$

$$R_X = \frac{300}{5} \times 300{,}000 = 18 \text{ MEGOHMS.}$$

TL 35530

Figure 67. Measurement of high resistance.

of 1,000 ohms or more. The resistance of the meter is equal to the ohms-per-volt sensitivity multiplied by the range to which the meter is set. The derivation of the formula $R_x = \frac{300R_m}{V}$ is shown below. R_x is the unknown resistance, R_m is the meter resistance, and V is the voltmeter reading.

$$\frac{R_x}{R_m} = \frac{300\text{-}V}{V}$$

If R_x is very large, V will be small in comparison to 300. Assuming that 300-V can be replaced by 300, the formula $\frac{R_x}{R_m} = \frac{300}{V}$ is obtained. When solved for R_x, this gives $R_x = \frac{300R_m}{V}$. When making the measurement, first put the meter on the 300-volt scale to protect it in case R_x is very low. If the voltage used is not 300 volts, the correct value should be inserted in the formula in place of 300.

c. Practical Example of Resistance Analysis. The low-voltage power supply shown in figure 68 will be used in this sample analysis. Suppose that a fuse in the primary circuit of the power transformer has blown out. The cause is obviously an overload. The overload may be a short circuit in the unit to which the power supply furnishes power, a short circuit in the power supply, or a short circuit in the primary circuit of the power transformer.

(1) Points 1, 2, 3, 4, 5, and 6 represent connections to a plug which takes power away from the power supply. Disconnect the plug and replace the blown fuse. (Since this is a low-voltage circuit, it is not likely that any damage will be done by blowing another fuse.) Turn the power on. If the fuse blows again, the trouble was not in the unit to which power is supplied.

(2) If the fuse blew the second time, the resistance between point 2 and ground should be checked. If this resistance is within 10 percent of 12,400 ohms (the sum of the resistances in the bleeder chain equals 12,400 ohms), the trouble is in the secondary or primary of the transformer. For this analysis, it will be assumed that the resistance was found to be much less than 12,400 ohms.

(3) If the resistance between point 2 and ground is found to be zero, capacitor C3 must be shorted. In order to test the capacitor, disconnect its lead from point *M*. The actual resistance of the capacitor can then be measured.

(4) A resistance between point 2 and ground of 550 ohms indicates that capacitor C2 is shorted, since coil L1 has a resistance of 550 ohms. Test capacitor C2 by disconnecting it from ground and measuring its resistance.

(5) A resistance between point 2 and ground of 850 ohms indicates a short circuit in the rectifier tube, the filament winding, or capacitor *C*. To discover which one is shorted, remove the tube from its socket and again measure the resistance between point 2 and ground. If the fault is still present, it is either in capacitor *C* or in the filament winding. If the fault disappears when the tube is removed, the fault is in the tube.

(6) If the resistance between point 2 and ground is about 1,000 ohms, the trouble is in the circuit either to the right or to the left of point *M*. To isolate the trouble, disconnect the circuit at *M*. If the resistance between point 2 and ground is still much less than 12,400 ohms, the fault is in the bleeder chain. To check the chain, proceed as follows:

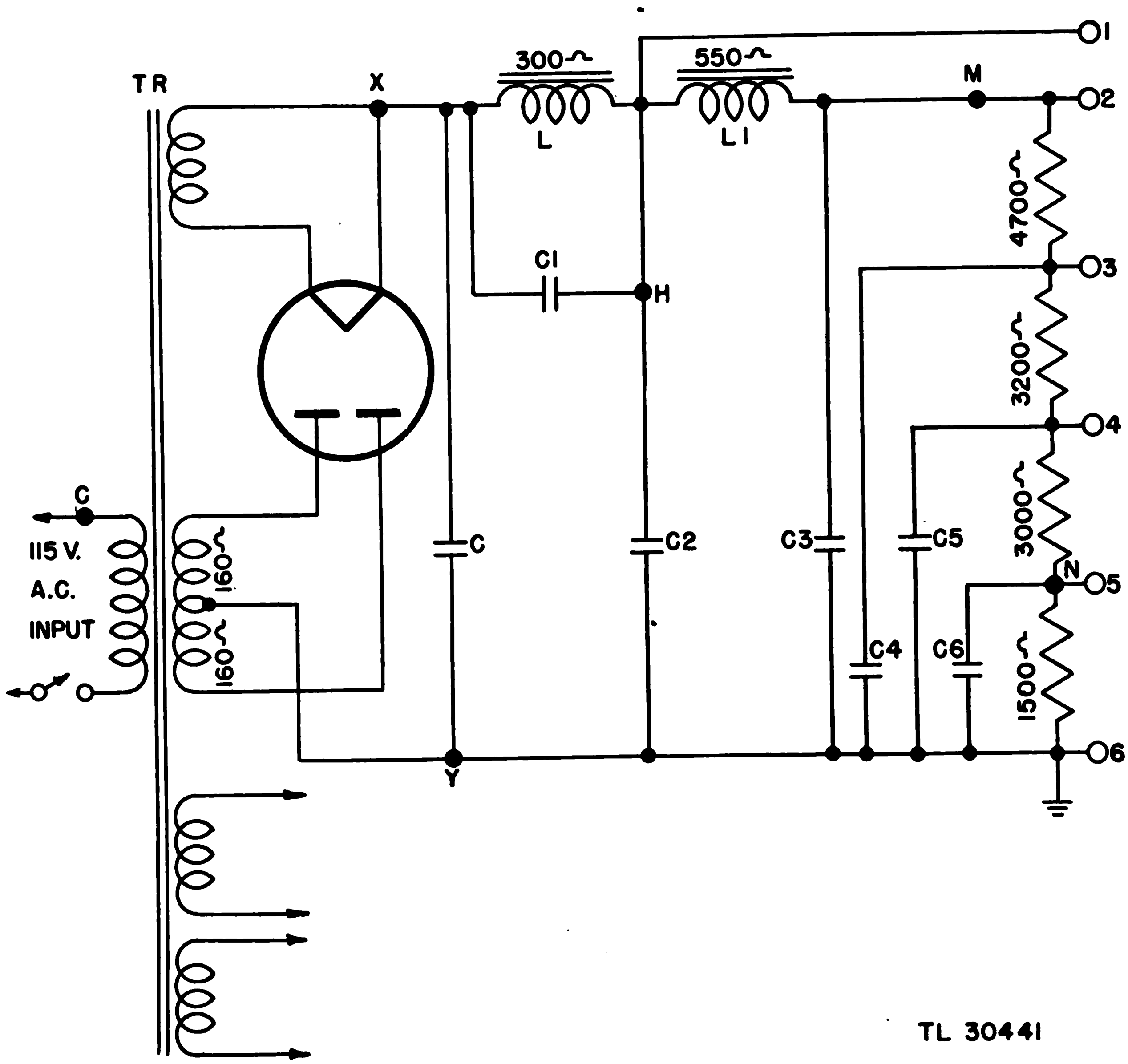


Figure 68. Schematic diagram for resistance analysis.

(*a*) Measure the resistance between points 2 and 3. If it is not close to 4,700 ohms, the resistor between these points should be replaced.

(*b*) If the above check was satisfactory, the resistance between point 3 and ground should be checked. From figure 68 it is seen that the reading should be 7,700 ohms. If the reading is zero, first disconnect capacitor C4 and check it. If capacitor C4 is normal, check the 3,200-ohm resistor. If the resistance between point 3 and ground is greater than zero but much less than 7,700 ohms, disconnect capacitors C4, C5, and C6 from the circuit. Then check the capacitors as well as the 1,500-ohm and the 3,000-ohm resistors individually.

36. Capacitor Tests

Capacitors which are leaky or shorted can be found by resistance checks of the stage. A capacitor which is suspected of being open can best be checked by shunting a good capacitor across it. In r-f circuits, keep the lead to the capacitor as short as the original capacitor leads. In video and low-frequency circuits (less than 1 megacycle), the test capacitor leads may be several inches long.

37. Current Measurements

Current measurements, other than those indicated by the panel meters, are not ordinarily required in trouble shooting in the radar set. Under special circumstances where the voltage and resistance measurements by themselves are not sufficient to localize the trouble, a current measurement can be made by opening the circuit and connecting an ammeter to measure the current. This procedure is not recommended except in very difficult cases.

a. When the meter is inserted in a circuit to measure current, it always should be inserted away from the r-f end of the resistance. For example, when measuring PLATE current, do not insert the meter next to the plate of a tube, but insert it next to the end of the resistor which connects with the power. This precaution is necessary to keep the meter from upsetting the r-f voltages.

Caution: A meter has least protection against damage when it is used to measure current. Always set the current range to the highest value. Then, if necessary, decrease the range to give a more accurate reading. Avoid working close to full-scale reading because this increases the danger of overload.

b. In most cases, the current to be measured flows through a resistance which is either known or can be measured with an ohmmeter. The current flowing in the circuit can be determined by dividing the voltage drop across the resistor by its resistance value. The drop across the cathode resistor is a convenient method of determining the cathode current. For example, see paragraph 34d.

38. Tubes

a. Tube Failures. Tube failures are responsible for a large percentage of the faults which occur in radar sets. There are, however, too many tubes in a radar set for a trouble-shooter to attempt to find a fault by indiscriminate tube changing. Do not resort to tube changing until the fault has been traced to a particular stage.

(1) When putting a new tube into a circuit, note the position of all controls before making any changes. If retuning the controls with the new tube in the circuit does not correct the abnormal condition, return the controls to their original position and put the old tube back in the circuit, unless a tube test shows the tube to be definitely bad.

Caution: In many radar circuits the interelectrode capacitance of a tube is a part of a tuned circuit. When tubes are switched, the tuning of the circuits is upset. If too many tube substitutions are made, the set may become seriously misaligned as a result of the tube changes.

(2) When replacing a tube in a circuit, decide at once whether or not to keep the old tube. Do not change the tubes indiscriminately, or the spares box will become full of tubes whose exact age and condition is uncertain.

b. Tube Checking. Tube checkers are used to check the emission of electrons from the cathode and to test for shorted elements. Tube checkers will not test the performance of high-voltage tubes and rectifiers and some special tubes in the modulator and rectifier. Tube checkers are useful, however, for checking receiving-type tubes used in the various components.

(1) Results obtained from a tube checker are not always conclusive, because the conditions are not the same as those under which the tube operates in the set. For this reason, the final test of a tube must be its replacement with a tube which is known to be good. In many cases it is quicker and more reliable to replace a suspected tube with a good one than to check it with the tube checker.

(2) An operating chart and an instruction book are provided with the tube checker. This chart indicates the setting of the tube checker for each tube type. The number of controls, their arrangement, and settings vary with different types of tube checkers.

39. Checking Waveforms

a. Signal Tracing. Basically, signal tracing means following the progress of a signal through a circuit. By *signal* is meant a video signal, a sweep voltage, a wide-gate voltage, or any other waveform which appears in the various parts of the equipment. A departure from the normal waveform indicates a fault located between the point where the waveform is last normal and the point where it is observed to be abnormal. For example, if a waveform is observed to be normal at the grid of a stage and abnormal at the plate of the same stage, this condition indicates that the trouble lies in that stage.

(1) When the waveform of a multivibrator, a blocking oscillator tube, or a similar circuit is found to be abnormal, replace the tube before making any further tests. If replacing the tube does not correct the waveform of the original tube, place it back in the socket.

(2) When a component does not give the expected waveform, the fault is not necessarily in the component. The abnormal waveform may be due to the absence of a synchronizing or triggering pulse from another component. The point at which to start signal-tracing a component is at the input trigger plug.

(3) It is sometimes desirable to know definitely whether a signal voltage (used in the broad sense) is getting to the grid of the first tube in a channel. To determine this when a test jack is not provided, remove the first tube in the channel involved so as to make the grid connection of the tube available from the top of the chassis. Then insert the test lead of the oscilloscope in the grid connection of the tube socket in order to see the waveform.

b. Use of Test Oscilloscope. Waveforms are the basis of radar operation. The outstanding advantage of the oscilloscope is that it can be used to observe and to measure waveforms at the various test jacks and other points in the equipment. By comparing the observed waveform with the actual reference waveform shown in the data, the fault can be rapidly localized. If, however, waveforms are measured at random, without a logical procedure, such as that originating with the starting procedure, the result may be a loss of time in finding the fault. The measurement of the waveforms with the test oscilloscope involves several essential points.

(1) *Initial adjustments.* The oscilloscope must be set up in accordance with the manufacturer's instructions.

(2) *Sweep frequency.* Adjust the sweep frequency to a frequency lower than the repetition frequency of the waveform being observed. For ordinary measurements, adjust the sweep frequency so that two or three cycles of the waveform appear on the screen. If more detail is desired, increase the sweep amplitude to spread the waveform.

(3) *Sixty-cycle waveforms.* Some of the waveforms have a fundamental or repetition frequency of 60 cycles. In observing these waveforms the sweep frequency can be set so that two cycles of the waveform are observed.

(4) *Synchronization.* Avoid excessive synchronizing voltage. If the SYNC control is advanced too far, the sweep will become nonlinear, with the result that the waveform will be distorted. Be sure that the fine frequency control on the oscilloscope is properly set so as to obtain a nearly stationary image. Then, advance the SYNC control only far enough to make the trace stationary.

(5) *Sixty-cycle pickup.* If some fault is present, it may be impossible to obtain a stationary pattern, even though the oscilloscope frequency control is properly adjusted. This effect usually is due to the presence of 60-cycle modulation or 60-cycle pickup combined with the observed waveform. To check this condition, turn the oscilloscope sweep frequency to 30 cycles. If the effect is due to line pickup, a stationary pattern will be observed. The inside of this pattern will, of course, be more or less *filled,* because of the much higher frequency of the waveform being observed.

(6) *Reactions of oscilloscope on waveform.* Remember that the oscilloscope, because it shunts capacitance and resistance across the circuit, modifies the actual operating waveforms present in the circuit. This fact does not affect the usefulness of waveform measurements. The reference waveforms shown in this manual were taken with a typical oscilloscope under the same conditions as the repairman takes the waveforms.

(7) *Test leads.* Avoid the use of a shielded test lead or twisted leads when taking waveforms. Each of these leads shunts a capacitance across the circuit under test and causes the waveform to be distorted and therefore different from that shown in the data. The waveforms shown in the test data were taken by using an unshielded lead. The ground lead should be connected at all times.

(*a*) Keep the ungrounded oscilloscope test lead away from other circuits to avoid introducing feedback. The test leads should be brought from the test points in a way which introduces the minimum amount of coupling to other stages.

(*b*) The leads to the oscilloscopes must be kept short when measuring grid voltages from circuits where the grid capacitors are small. The smallest reaction on the waveform is introduced when measuring the voltage across the output (cathode) of a cathode follower or of any low-impedance circuit.

(*c*) In measuring waveforms in high-impedance circuits, do not handle the *hot* test lead. If this precaution is not observed, the waveform will be distorted as a result of loading the circuit and picking up 60-cycle voltage.

(*d*) If a signal voltage is picked up on the test leads, the oscilloscope indication may be misleading. For example, a signal may appear on the oscilloscope even when a plate-to-grid coupling capacitor is open. This effect occurs most often in circuits carrying narrow-pulse waveforms. It can be recognized by the fact that the waveform will be reduced in amplitude below the normal and will be distorted because the high-frequency components are overemphasized.

(8) *R-f and i-f circuits.* Do not attempt to measure voltages or waveforms in any of the r-f or i-f circuits. These frequencies are beyond the range of ordinary test oscilloscopes and no indications useful in trouble shooting can be obtained.

(9) *Reversing line plug.* In some instances, a

more stable pattern may be obtained by reversing the a-c line plug of the oscilloscope circuit. Doing this may reduce the amount of 60-cycle pickups, if they happen to be troublesome.

(10) *Relative amplitude.* In following the path of the signal through a component, the amplitude of the waveform will usually increase as the checking point is advanced from the input stage toward the output stage. As the reference waveforms show, however, this is not always true. For example, when going from the grid to the cathode of the cathode-follower stage, there is a loss in signal amplitude of about 10 percent. This condition is normal. Another example is in connection with waveshaping circuits, where a decrease in the width of a signal is sometimes accompanied by a decrease in amplitude (as in differentiating circuits).

(11) *Calibration.* If it is necessary to measure the actual voltage of the waveform, the oscilloscope must be calibrated. Calibrate the oscilloscope by finding how many volts correspond to a 1-inch deflection on the screen. This deflection indicates the sensitivity of the scope.

(12) *High-voltage measurements.* When voltages above a few hundred volts are measured, connect the test lead with the power turned off.

Caution: Some test jacks do not have blocking capacitors. The capacitors are left out so that d-c voltages can be measured at the test jacks.

c. COMPARISON OF WAVEFORMS. If there is no fault in the circuit or equipment, an actual waveform taken at a point in the equipment should closely resemble the reference waveform. In some cases, however, differences in shape may occur for the following reasons:

(1) The test leads to the oscilloscope may not be placed in the same manner.

(2) A different oscilloscope may be used, having values of input resistance and capacitance which differ from those of the oscilloscope used in taking the reference waveforms.

(3) The various controls in the equipment may not be in the same position as they were when the reference waveforms were taken. Note the conditions specified in the reference waveform.

(4) The same number of cycles may not be present.

(5) The vertical or horizontal amplitudes of the reference and the test patterns may not be proportional. This condition will produce apparent differences in the shape of the two waveforms, when there is actually no real difference.

(6) Whether or not a waveform is regarded as abnormal will depend upon the symptom accompanying the fault which is being traced. The discrepancy should be considered significant if the fault could be caused by a minor difference in waveform at the point under test. Otherwise, time should not be spent in hunting down the cause of relatively minor differences between the shape of the reference waveforms and of the test waveforms.

40. Use of Signal Generator

Signal generators are used to locate defective stages in radar receivers and to align the i-f amplifiers.

a. SIGNAL TRACING. The signal generator output is fed to the first i-f stage, and the progress of the signal is then traced through the receiver. The procedure is as follows:

(1) The signal generator frequency should be set to the i-f frequency of the radar receiver. The output of the signal generator should be amplitude modulated at an audio-frequency rate of between 400 and 10,000 cycles per second. For information concerning the setting up of the signal generator, refer to the manufacturer's handbook accompanying the signal generator.

(2) Make the leads from the signal generator to the receiver as short as possible. Insert a coupling capacitor in the hot lead. For frequencies above 20 megacycles, the capacitance of the coupling capacitor should be around 0.005 microfarads.

(3) The i-f signal should be coupled by means of the coupling capacitor to the grid of the first i-f stage. If no output is shown on the radar oscilloscopes, connect a test oscilloscope to the plate of the detector. If no output is seen on the oscilloscope, the fault lies in or between the first i-f amplifier and the detector, (*a*) below. If a sinusoidal waveform having the same frequency as the chosen modulating frequency is seen, the i-f stages and the detector are operating. In that case, the test oscilloscope should be connected to the plate of the output stage of the receiver. If no output is seen there, the fault lies in or between the first video amplifier and the output stage, (*b*) below.

(*a*) If the fault is found to be in the i-f stages or in the detector, connect the signal generator to the grid of the middle stage of the i-f amplifier. If there is a normal output from the detector, the fault is in one of the first i-f stages. If the detector has no output, the fault is in or between the middle stage and the detector. By moving the signal generator output either forward or backward, stage by stage, the faulty stage can be located rapidly. In order to locate the defective part in the stage, change the tube. If replacing the tube does not clear up the fault, make resistance and voltage checks of the stage.

(b) If the fault is found to be in the video amplifiers, leave the signal generator connected to the first i-f stage and move the test oscilloscope from the grid to the plate of each video stage until the defective stage is located. If changing the tube does not correct the fault, make resistance and voltage checks to locate the defective part.

b. I-F ALIGNMENT. A signal generator is used in aligning i-f stages. The modulated output is fed to the grid of the stage preceding the stage being aligned. This is done to prevent the shunting effect of the signal generator from upsetting the circuit being aligned. The stage closest to the detector is aligned first. By working backward through the i-f stages, bring them all into alignment. Each stage is adjusted to produce maximum indication on the oscilloscope. Adjust the stages with a nonmetallic aligning tool. If no tool is available, one can be made from a dry wooden rod. At all times, use the minimum signal generator output that will produce a satisfactory indication.

41. Replacing Parts

Careless replacement of parts often makes new faults inevitable. Note the following points:

a. Before a part is unsoldered, note the position of the leads. If the part, such as a transformer, has a number of connections to it, tag each of the leads.

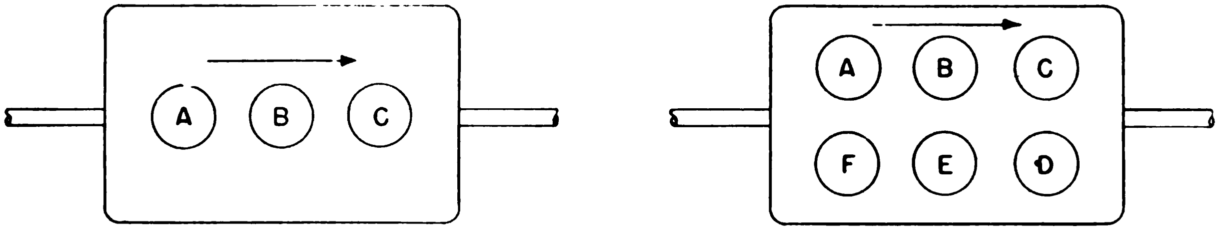
b. Be careful not to damage other leads by pulling or pushing them out of the way.

c. Do not allow drops of solder to fall into the set, because they may cause short circuits.

d. A carelessly soldered connection may create a new fault. It is very important to make well-soldered joints, because a poorly soldered joint is one of the most difficult faults to find.

e. When a part is replaced in r-f or i-f circuits, it must be placed exactly as the original one was. A part which has the same electrical value, but different physical size, may cause trouble in high-frequency circuits. Give particular attention to proper grounding when replacing a part. Use the same ground point as in the original wiring. Failure to observe these precautions may result in decreased gain or possibly in oscillation of the circuit.

CAPACITOR COLOR CODE



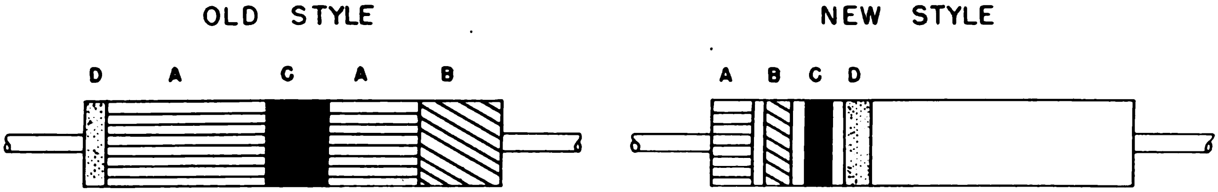
ONE ROW DOTS	COLOR	TWO ROWS OF DOTS
DOT A	INDICATES FIRST SIGNIFICANT FIGURE OF CAPACITANCE VALUE IN MICROMICROFARADS	DOT A
DOT B	INDICATES SECOND SIGNIFICANT FIGURE	DOT B
	INDICATES THIRD SIGNIFICANT FIGURE	DOT C
DOT C	INDICATES MULTIPLIER	DOT D
USUAL TOLERANCE ±20%	INDICATES TOLERANCE IN PER CENT OF THE NOMINAL CAPACITANCE VALUE. IF NO COLOR APPEARS TOLERANCE IS 20%	DOT E
RATED VOLTAGE USUALLY 500 VOLTS	INDICATES THE RATED VOLTAGE	DOT F

COLOR	SIGNIFICANT FIGURE	MULTIPLIER	TOLERANCE PER CENT (IF GIVEN)	RATED VOLTAGE (IF GIVEN)
BLACK	0	1		
BROWN	1	10	1	100
RED	2	100	2	200
ORANGE	3	1000	3	300
YELLOW	4	10,000	4	400
GREEN	5	100,000	5	500
BLUE	6	1,000,000	6	600
VIOLET	7	10,000,000	7	700
GRAY	8	100,000,000	8	800
WHITE	9	1,000,000,000	9	900
GOLD		0.1	5	1,000
SILVER		0.01	10	2,000
NO COLOR			20	500

TL 35619

Figure 69. Capacitor color code.

RESISTOR COLOR CODE



OLD STYLE	COLOR	NEW STYLE
BODY A	INDICATES FIRST SIGNIFICANT FIGURE OF RESISTANCE IN OHMS	BAND A
END B	INDICATES SECOND SIGNIFICANT FIGURE	BAND B
BAND OR DOT C	INDICATES MULTIPLIER	BAND C
END D	IF ANY, INDICATES TOLERANCE IN PER CENT OF THE NOMINAL RESISTANCE VALUE IF NO COLOR APPEARS TOLERANCE IS ± 20%	BAND D

COLOR	SIGNIFICANT FIGURE	MULTIPLIER	TOLERANCE PER CENT (IF GIVEN)
BLACK	0	1	
BROWN	1	10	
RED	2	100	
ORANGE	3	1,000	
YELLOW	4	10,000	
GREEN	5	100,000	
BLUE	6	1,000,000	
VIOLET	7	10,000,000	
GRAY	8	100,000,000	
WHITE	9	1,000,000,000	
GOLD		0.1	5
SILVER		0.01	10
NO COLOR			20

TL 35620

Figure 70. Resistor color code.

Section II. TROUBLE SHOOTING BASED ON STARTING PROCEDURE

42. Introduction

a. Radio Equipment RC–145–A has been designed to give trouble-free operation; but, as in all apparatus, faults will occur. The analysis of symptoms and the trouble-shooting information which follows have been prepared to aid the repairman in isolating such troubles as may occur, so that the equipment may be put in operation again as quickly as possible.

b. The best procedure for discovering and isolating trouble is to start the equipment in logical steps and to observe carefully the result of each step until an improper indication appears. When starting the equipment, follow the starting procedure described in TM 11–1331. The information in this chapter is presented as a sequel to the steps of the starting procedure. Proper indications are given, as well as most of the improper indications which would indicate trouble occurring at each particular step of the starting procedure. The explanations of the improper indications are such that, in most cases, the improper indications will enable the operator to determine quickly in which component the trouble has occurred and to hasten the replacement of the faulty component if a spare component is available. The operation therefore can be continued with minimum delay. If a replacement component is not available, refer to the following sections of this chapter, where more detailed tests and procedures and all reference data are collected by components.

c. The following tabulations of normal and abnormal conditions are based on the 13 steps of the starting procedure described in TM 11–1331.

43. Trouble-shooting Chart Based on Starting Procedure

STEP 1. Set the switch marked "IFF," located on Radio Set SCR–545–A power panel to the ON position.
NORMAL INDICATION: None. This switch controls the power to Rack FM–79.

STEP 2. Set the ON–OFF switch located on Control Unit BC–1266–A to the ON position.
NORMAL INDICATION: The pilot light, located in the lower center portion of the control unit panel, should light.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
Pilot lamp does not light.	1. Blown fuse. 2. Defective lamp. 3. Open filament circuit. 4. Input-power circuit open.

STEP 3. Set the BLOWER switch (circuit breaker) located on Rack FM–79 to the ON position.
NORMAL INDICATION: The pilot light beside the switch should light.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
Pilot lamp does not light.	1. Defective lamp. 2. Open filament circuit. 3. Input-power circuit open.
Blower circuit breaker will not remain closed.	1. Shorted blower circuit.

STEP 4. Set the filament circuit breaker on the power supply to the ON position.

NORMAL INDICATION: Pilot lamps T–A and T–B light.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
Pilot lamp T–A or pilot lamp T–B does not light.	1. Blown fuse. 2. Defective lamp. 3. Open filament circuit.
Neither of the pilot lamps light.	1. Bad fuses T–A and T–B. 2. Input-power circuit open. 3. Filament circuit open.
Filament circuit breaker will not remain closed.	1. Shorted filament circuit.

STEP 5. *Wait 45 seconds* and then set the plate voltage switch (circuit breaker) on the power supply to the ON position.

NORMAL INDICATION: Pilot lamps T–C and T–D light.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
Pilot lamp T–C or pilot lamp T–D does not light.	1. Blown fuse. 2. Defective lamp. 3. Open plate circuit.
Neither of the pilot lamps light.	1. Blown fuse T–C or T–D.
Plate circuit breaker will not remain closed.	1. Shorted plate-supply circuit.

STEP 6. Set the INDICATOR PANEL circuit breaker of the indicator to the ON position.

STEP 7. Set the LOBE SWITCH MOTOR circuit breaker to the ON position. (This switch can be turned ON or OFF at any time.)

STEP 8. Set the ANTENNA MOTOR circuit breaker to the ON position.

Note. The INDICATOR PANEL and ANTENNA MOTOR breakers are interlocked, and the failure of one will render the other circuit breaker inoperative.

NORMAL INDICATION: The pilot lamp below each switch should be lighted.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
Pilot lamps do not light.	1. Component loose in the rack. 2. Open circuit in the indicator unit. 3. Defective pilot lamp.
Only the indicator panel lamp lights.	1. Defective pilot lamp. 2. Open antenna-motor circuit. 3. Open lobe-switch motor circuit.
Lobe-switch motor pilot lamp does not light.	1. Defective pilot lamp. 2. Open lobe-switch motor circuit.
One of the circuit breakers will not remain closed.	1. A short in the respective circuit.

STEP 9. Adjust the INTENSITY control on the control unit until a clearly visible but not bright line appears on the screen of the cathode-ray tube.

STEP 10. Adjust the FOCUS control until sharp line trace appears on the cathode-ray tube screen. NORMAL INDICATION: The trace appears as a thin clear line.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
No trace or dot on the display tube.	1. Improper adjustment of the INTENSITY control. 2. No sync voltage. 3. Defective circuit within the control unit. 4. Faulty negative high-voltage circuit in the power supply.
Only a dot appears on the display tube.	1. Faulty circuit following the sweep oscillator.

Note. When this condition exists reduce the intensity control to prevent damage to the cathode-ray tube.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
Trace present but not clear and sharp.	1. Improper adjustment of the FOCUS control. 2. Faulty focusing circuit. 3. Improper cathode-ray tube potentials.

STEP 11. Check the azimuth indicator eye.

NORMAL INDICATIONS: 1. The eye remains closed.
2. The eyes closes within a few seconds after the AZIMUTH dial is rotated.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
The eye continuously opens and closes.	1. Improper adjustment of the SENSITIVITY control. 2. Open circuit in the SENSITIVITY control stage.
Eye does not close completely.	1. Improper adjustment of the SENSITIVITY control. 2. Faulty circuit in the impedance amplifier. 3. A short in the SENSITIVITY control circuit.
Eye remains open.	1. Incorrect adjustment of the SENSITIVITY control. 2. Indicator eye circuit defective. 3. Blown fuse in the selsyn transformer circuit. 4. Defective cording to the antenna tower. 5. Faulty impedance-amplifier circuit.
Eye closes at regular intervals.	1. Faulty circuit in the reversing-amplifier circuit. 2. Defective reversing relay.

STEP 12. Set the STANDBY-OPERATE switch to the OPERATE position. Rotate the SENSITIVITY control clockwise until "grass" appears on the cathode-ray screen.

NORMAL INDICATIONS: 1. "Grass" appears on the display tube as the SENSITIVITY control is advanced, and the "grass" increases in amplitude until the control is rotated to the maximum clockwise position.

2. The "grass" decreases in amplitude and disappears as the control is decreased.

3. Transmitted pulse appears on the extreme left end of the trace.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
No "grass" with the SENSITIVITY control set at maximum.	1. Defective control. 2. No output from the receiver. 3. Faulty cording from the receiver.
The "grass" does not disappear with the control set in the maximum counterclockwise position.	1. Faulty control circuit.
Pulse does not appear.	1. No transmitter output. 2. Faulty vertical amplifier circuit.

STEP 13. Rotate the SPREAD control to its maximum clockwise position.

NORMAL INDICATION: A split pattern should appear on the cathode-ray tube screen.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
Failure of the transmitted and received pulses to split.	1. Defective spread control. 2. Defective spread amplifier tube. 3. Defective spread amplifier circuit. 4. Defective blanking amplifier tube. 5. Defective blanking amplifier circuit. 6. Defective lobe motor switch assembly. 7. Defective cordage.

Section III. POWER SUPPLY

44. Introduction

a. Usually the main troubles encountered in the power supply are blown fuses and defective tubes. A blown fuse should never be replaced until the associated circuit is checked for shorts. Never replace a blown fuse by a fuse which has a higher rating.

b. When the unit is suspected of being faulty, the first step toward maintenance should be a check of all tubes. However, in some cases a shorted circuit will be indicated by a circuit breaker which will not remain closed.

45. Removal of Unit

The unit must be removed from the rack in order to replace the tubes or to perform other maintenance within the unit. The power supply is removed by loosening the four thumbscrews on the front panel (these screws are captive and should not be completely removed). After loosening the four screws, grasp the unit by the handles on the front panel and give a quick, firm pull. This action will disengage the interconnector plug at the rear of the chassis and will allow the unit to be removed. Two men will be required to remove the unit. Never place the unit on a work bench with the back of the chassis down; such a position will damage the acetate schematic diagrams.

46. Tube Replacement

All tubes employed in the power supply are easily accessable when the unit is removed from the rack. All of the tubes, with the exception of tubes 2, 3, and 4, are removed in the usual manner. Tubes 2, 3, and 4, have retaining clamps which must be pressed down before they can be removed or replaced.

47. Power Supply Trouble-shooting Chart

A. SYMPTOM: Either lamp T–A or lamp T–B does not light.

PROBABLE LOCATION OF FAULT	PROCEDURE
Pilot lamp.	1. Replace the pilot which does not light. 2. If trouble is not cleared, see item below.
Fuse.	1. Check the fuse in the faulty circuit and replace if necessary.

B. SYMPTOM: Pilot lamps T–A and T–B do not light.

PROBABLE LOCATION OF FAULT	PROCEDURE
No line voltage.	1. Turn blowers on. If the blowers operate, the presence of line voltage is indicated. 2. If trouble is not cleared, see item below.
Fuses.	1. Check fuses and replace if necessary. 2. If trouble is not cleared, see item below.
Pilot lamps.	1. Replace the pilot lamps. 2. If trouble is not cleared, see item below.
Circuit breaker.	1. Check the circuit breaker for mechanical operation and proper connections.

C. SYMPTOM: Either pilot lamp T–C or lamp T–D does not light.

PROBABLE LOCATION OF FAULT	PROCEDURE
Pilot lamp.	1. Replace the pilot lamp which does not light. 2. If trouble is not cleared, see item below.
Fuse.	1. Check the fuse in the circuit of the lamp that does not light.

D. SYMPTOM: Pilot lamp T–C and pilot lamp T–D do not light.

PROBABLE LOCATION OF FAULT	PROCEDURE
Pilot lamps.	1. Replace the pilot lamps. 2. If the trouble is not cleared, see item below.
Fuses.	1. Replace the fuses. 2. If the trouble is not cleared, see item below.
Circuit breaker.	1. Check the circuit breaker for mechanical operation and proper connections.

E. SYMPTOM: Circuit breaker will not remain closed.

PROBABLE LOCATION OF FAULT	PROCEDURE
Fuse holders.	1. Check fuse holders for shorts; repair if necessary. 2. If the trouble is not cleared, see item below.
Circuit wiring.	1. Check the wiring for shorts.

48. Replacement of Parts

a. The replacement of capacitors, transformers, chokes, and switches involves only the removal of connecting leads to the part and the removal of the screws which hold it in place. The new part is installed in reverse order. The cross bar from the front panel of the power supply to the back fence must be removed before removing certain parts.

b. The fuses and pilot lamps used in the power supply can be removed from the front panel of the unit without taking it from the rack. The fuses and pilot lamps are removed in the usual manner.

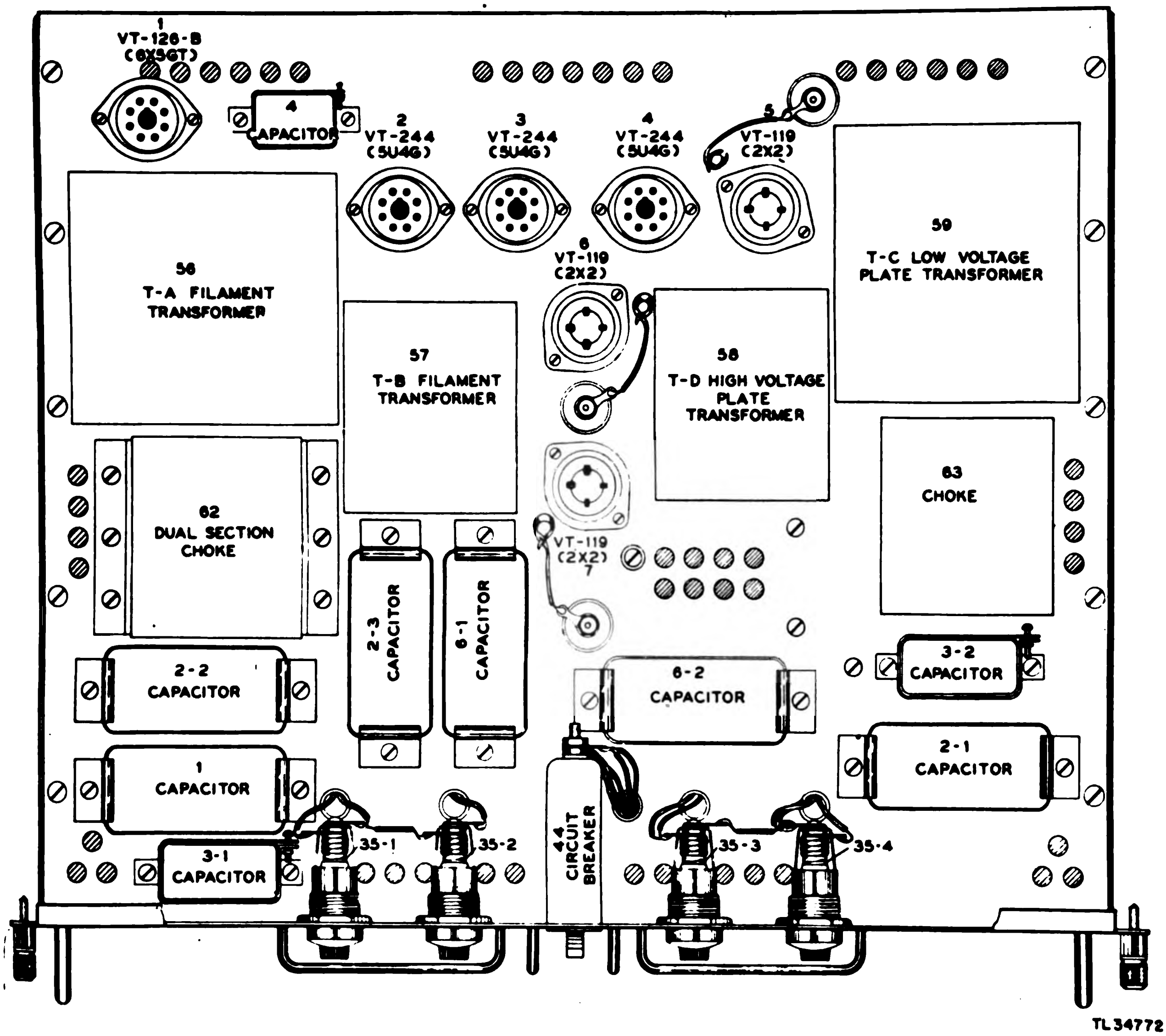


Figure 71. Power Supply RA-105-A, top view showing location of parts.

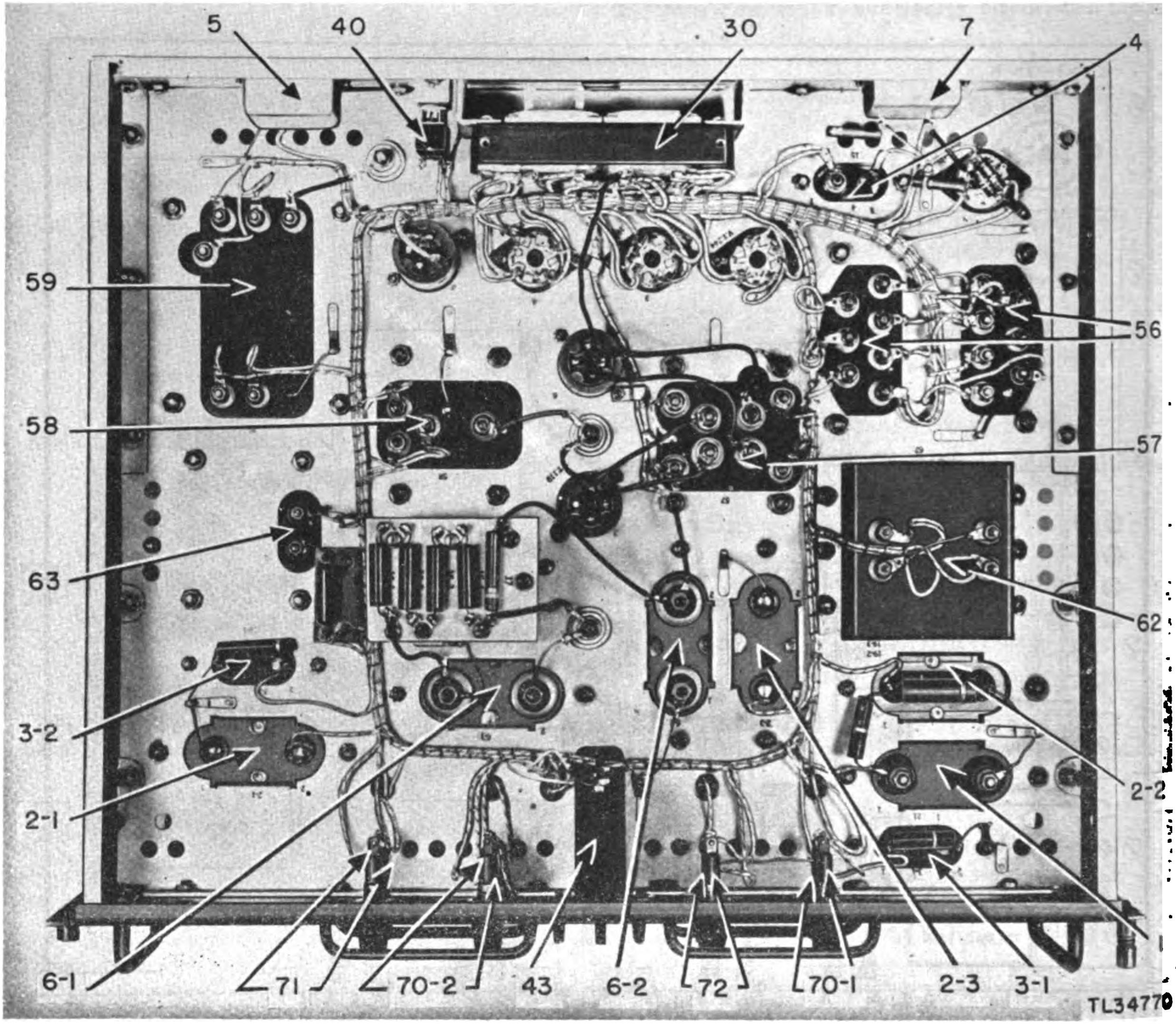


Figure 72. Power Supply RA-105-A, bottom view showing location of parts.

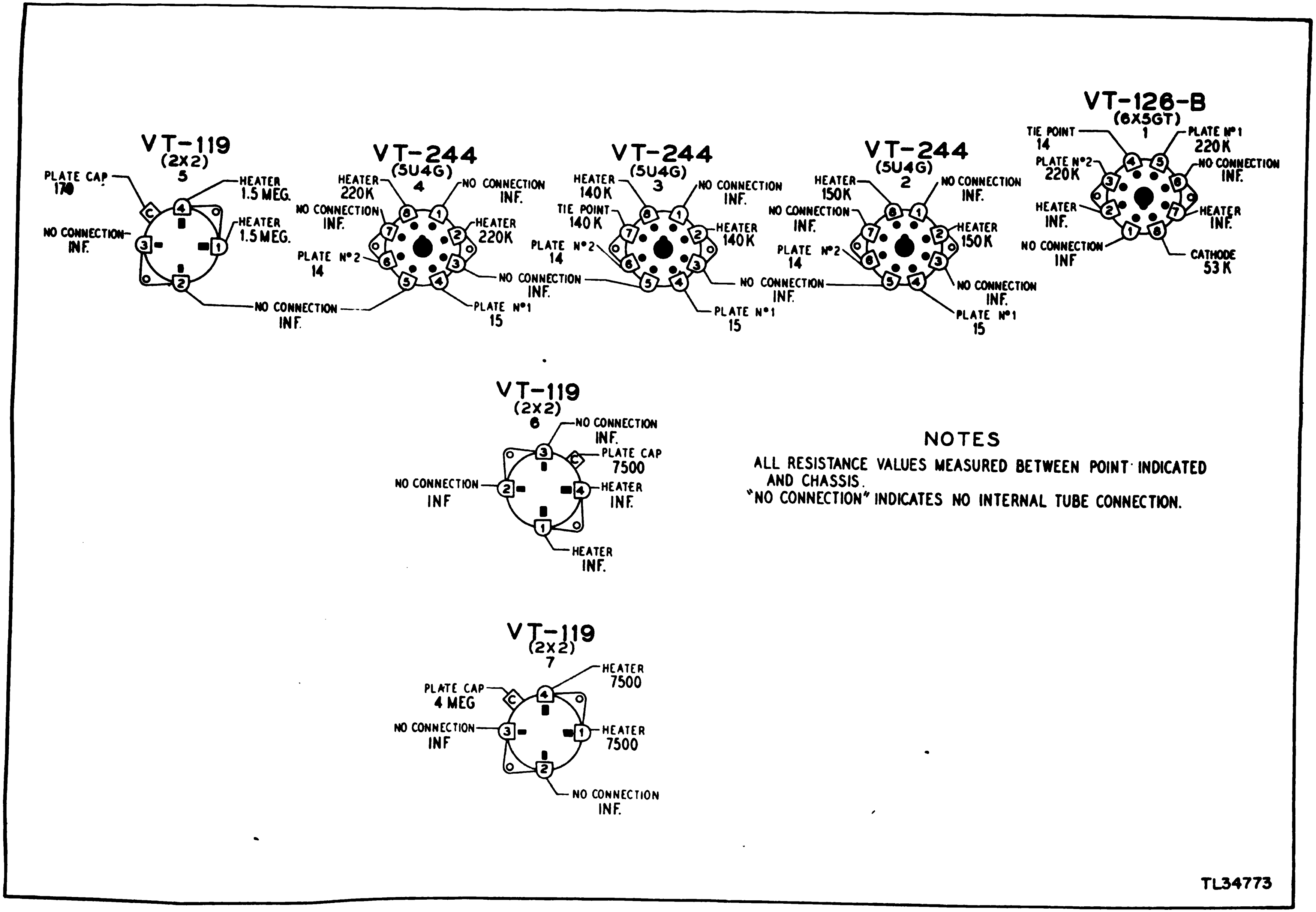


Figure 73. Power Supply RA-105-A, resistance chart.

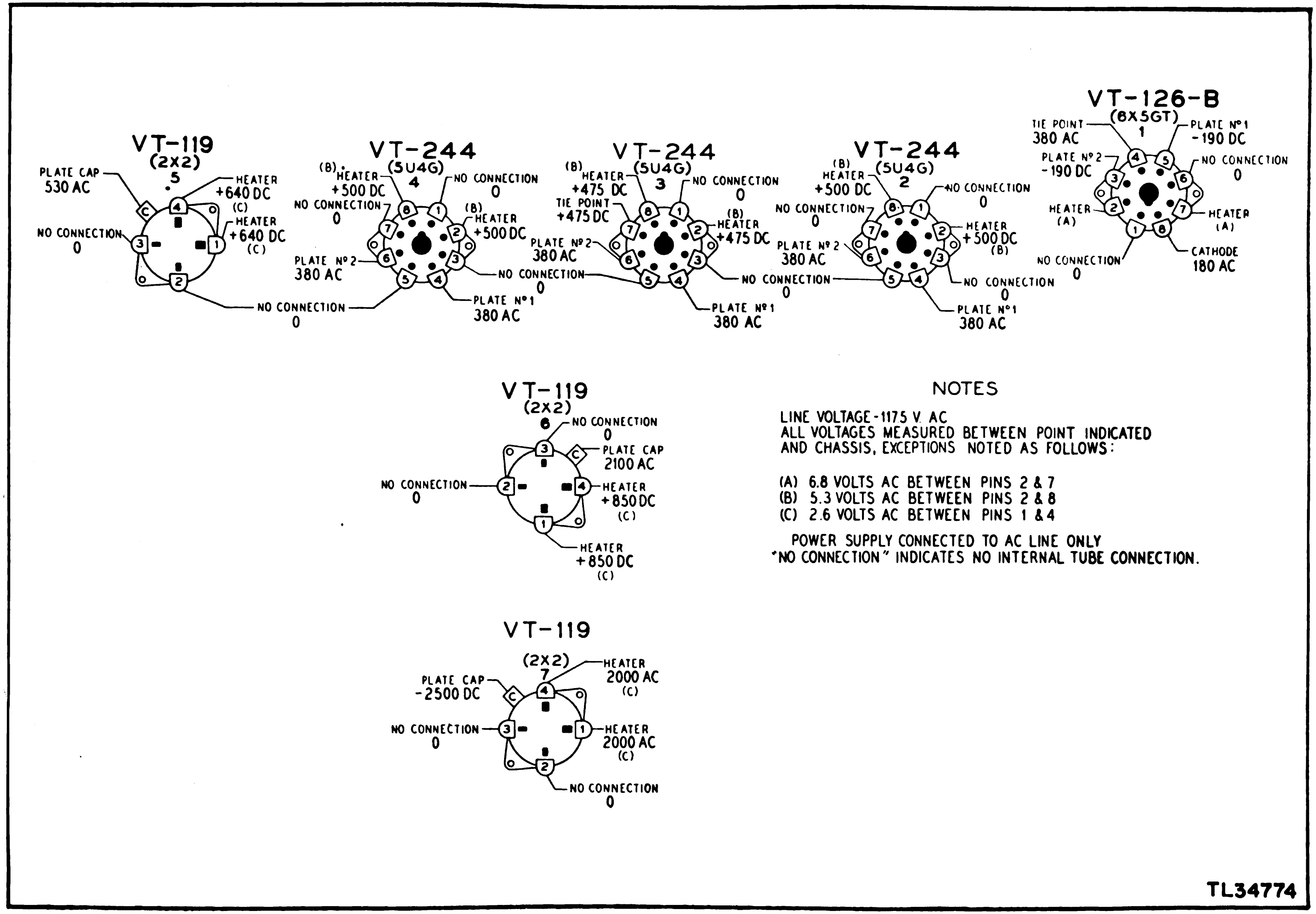


Figure 74. Power Supply RA-106-A, voltage chart.

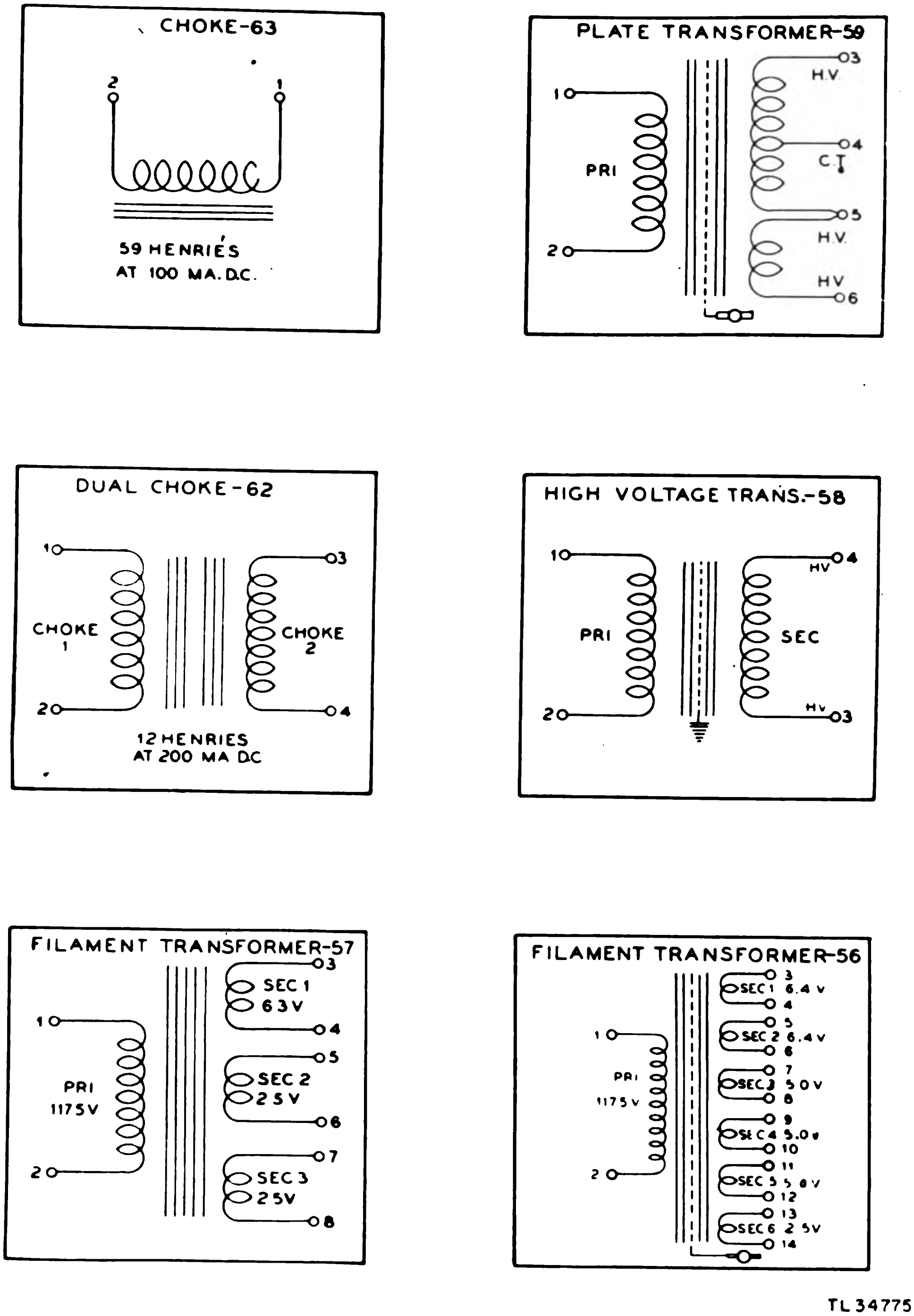
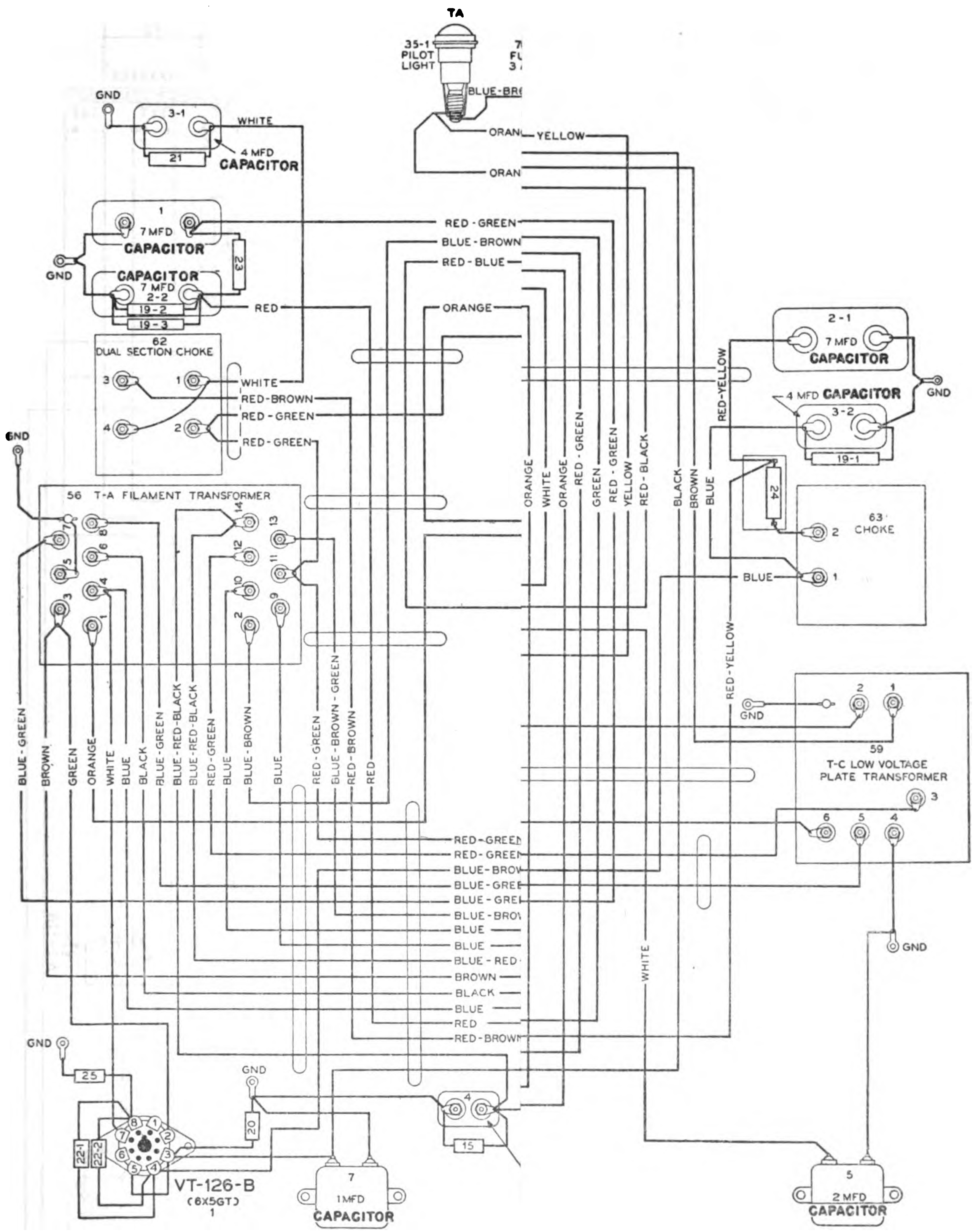
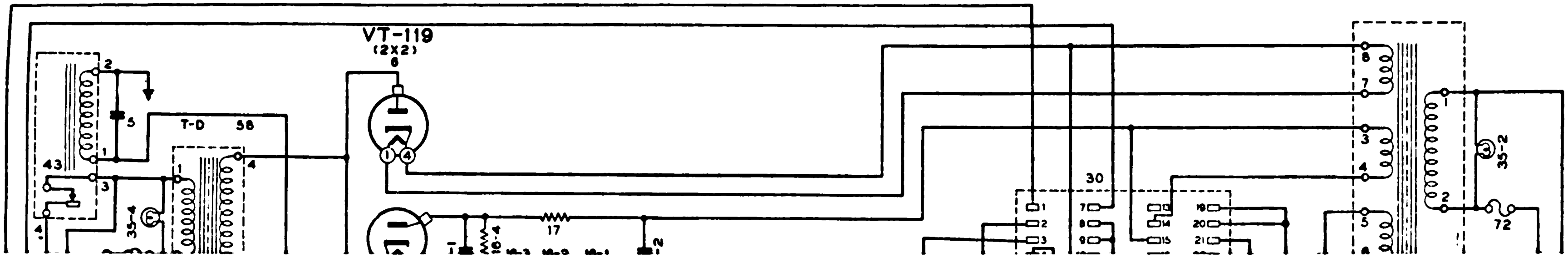


Figure 75. Power Supply RA-105-A, transformer schematic diagrams.


TA
35-1
PILOT
LIGHT
BLUE-BR
ORAN
YELLOW
GND
3-1
WHITE
21
4 MFD
CAPACITOR
1
7 MFD
CAPACITOR
23
GND
CAPACITOR
7 MFD
2-2
19-2
19-3
RED
RED-GREEN
BLUE-BROWN
RED-BLUE
ORANGE
62
DUAL SECTION CHOKE
WHITE
RED-BROWN
RED-GREEN
RED-GREEN
GND
56 T-A FILAMENT TRANSFORMER
2-1
7 MFD
CAPACITOR
GND
4 MFD CAPACITOR
3-2
19-1
RED-YELLOW
24
63
CHOKE
BLUE
ORANGE
WHITE
ORANGE
RED-GREEN
GREEN
RED-GREEN
YELLOW
RED-BLACK
BLACK
BROWN
BLUE
RED-YELLOW
GND
59
T-C LOW VOLTAGE
PLATE TRANSFORMER
BLUE-GREEN
BROWN
GREEN
ORANGE
WHITE
BLUE
BLACK
BLUE-GREEN
BLUE-RED-BLACK
BLUE-RED-BLACK
RED-GREEN
BLUE
BLUE-BROWN
BLUE
RED-GREEN
BLUE-BROWN-GREEN
RED-BROWN
RED
RED-GREEN
RED-GREEN
BLUE-BROW
BLUE-GREE
BLUE-GREE
BLUE-BROW
BLUE
BLUE
BLUE-RED
BROWN
BLACK
BLUE
RED
RED-BROWN
WHITE
GND
GND
25
GND
20
4
15
VT-126-B
(6X5GT)
1
7
1 MFD
CAPACITOR
5
2 MFD
CAPACITOR

TL34776


VT-119
(2X2)
6
T-D
58
43
35-4
17
10-4
30
35-2
72

Section IV. RADIO RECEIVER AND TRANSMITTER BC–1267–A

49. General

a. Field maintenance for Radio Receiver and Transmitter BC–1267–A requires regular adjustment of the following tuning controls for maximum response: PULSE WIDTH; ANT. TUNE; PLATE; ANTENNA MATCHING; POWER OUTPUT; and the four tuning adjustments on the receiver panel (ANT., R.F., DET., and OSC.). The PLATE control is used for tuning the transmitter to the desired frequency. The PULSE WIDTH control is adjusted for a pulse width of 4 to 10 microseconds. as measured on the display tube. The BIAS control is adjusted for a reading of 1 milliampere on the test meter with the TEST SWITCH in the Ic position and the STANDBY–OPERATE switch in the STANDBY position.

b. The blocking-oscillator transformer employed in the transmitter circuit can be used as a means of isolating trouble within the transmitter circuit. The transformer will buzz when it is functioning properly. Remember this fact when trouble shooting, to determine whether the trouble precedes or follows the blocking-oscillator transformer.

c. The controls of the receiver and transmitter should never be adjusted at random. Such adjustment will result in improper alignment of the equipment. The POWER OUTPUT and BIAS controls are the only exceptions, and they should not be adjusted without good reason. If the controls are turned and the equipment is thrown out of alignment, it will be very difficult to tell when the fault has been cleared.

d. A great number of the faults encountered within the receiver and transmitter unit are indicated by the test meter and the tuning eye. The test meter utilizes a measurement circuit within the transmitter; the tuning eye is operated by an independent circuit in the receiver. In most cases the trouble will be indicated by these two test points. However, it is well to remember the possibility of failure of the measurement circuits.

e. The r-f circuits of the receiver and transmitter are closely related because of their connection to the antenna-matching section. For this reason, a fault in the circuit of one may be reflected in the other. Trouble can be isolated by turning the receiver gain control completely on and by observing the display oscilloscope. If the display on the oscilloscope is the normal band of hash, it indicates that the receiver is functioning properly. The trouble is therefore known to exist in the transmitter circuit. However, if the display on the oscilloscope is not normal, the trouble is likely to be in the receiver circuits. If the fault is found to be in the receiver and it is of such a type that there is no receiver output, do not adjust the i-f transformers at random. Such an adjustment will only aggravate the condition and necessitate the realignment of the receiver. Because the receiver utilizes a stagger-tuned i-f amplifier, considerable time is required to align the stages properly. Time and effort can be saved if the above procedure is followed. The absence of the transmitter pulse on the display oscilloscope may be due to the SENSITIVITY control being set too far counterclockwise. Trouble shooting should not be attempted until this possibility has been checked. Because high voltage is employed in the transmitter, "flash over" will be a common cause of trouble. In such cases the trouble often may be found more easily by close visual inspection.

50. Tube Replacement

a. A defective tube frequently is the cause of faulty operation. After deciding which tube is most likely the cause of the trouble, replace it with a new tube and adjust only those controls which are directly associated with the circuit in which the tube has been replaced. If the trouble is not remedied, return the controls to their original positions so that further complications are not introduced.

b. All tubes in the receiver and transmitter are easily removed, except the two 2C26 tubes in the transmitter. The top cover must be removed from the r-f oscillator case to obtain access to the two 2C26's; after the case cover has been removed, use the normal procedure for the removal of this type of tube.

51. Removal of Unit

Remove the antenna line from the front panel of the receiver and transmitter before attempting removal of the unit. Loosen the four captive screws. Grasp the handles of the front panel of the unit and give a sharp pull to disengage the interconnector plug at the rear of the chassis. Then remove the unit from the rack. When placing the unit on the workbench, do not allow it to rest on the back of the chassis or the acetate diagrams will be damaged. Use the patch cord when the unit is removed, in order to place the equipment in normal operating condition.

52. Transmitter Trouble-shooting Chart

A. SYMPTOMS:

1. No transmitter pulse on the display oscilloscope.
2. No cathode current indication on the test meter.

PROBABLE LOCATION OF FAULT	PROCEDURE
No d-c voltage.	1. This condition is indicated by the tuning eye remaining dark. 2. Replace tube 4 in the power supply. 3. Make a continuity check of the rack wiring. 4. If the trouble is not cleared, see item below.
No sync pulse.	1. Check the sync signal at the transmitter-sync jack on the control unit. If signal is not present, the fault lies within the control unit. 2. If the sync signal is present at the control unit jack, check the rack wiring. 3. If trouble is not cleared, see item below.
Defective transmitter circuit.	1. Isolate the trouble in the transmitter by listening for a low buzzing sound in the blocking-oscillator transformer (118). 2. If the buzzing noise is heard, replace tube 17. 3. If the fault is not cleared, make a voltage and resistance check of the circuit of tube 17. 4. If the blocking-oscillator transformer is not buzzing, replace tubes 16, 18, and 19. 5. Trace the input sync signal through the blocking-oscillator circuit. 6. Make a voltage and resistance check of the input circuits (tubes 16, 18, and 19).

B. SYMPTOM:

Low power output indication.

PROBABLE LOCATION OF FAULT	PROCEDURE
Improper alignment.	1. Tune the transmitter for maximum power output, as described in paragraph 54*g*. 2. If fault is not cleared, see item below.
Improper adjustment of POWER OUTPUT control.	1. Turn the POWER OUTPUT fully clockwise. 2. If the adjustment does not affect the power output indication, check the POWER OUTPUT control circuit for a short. 3. If fault is not cleared, see item below.
Defective modulator tube (17).	1. Defective modulator tube (17) is indicated by a low current reading on the test meter. 2. Replace tube 17 and check output. 3. Make a voltage and resistance check of the modulator circuit.

4. If the modulator tube has no screen voltage, replace tube 5 in the power supply.
5. Check potentiometer 91 for an open or short.
6. If the modulator tube has no plate voltage, replace tube 6 in the power supply.
7. Make a voltage and resistance check of the power supply circuit and the rack wiring.
8. If fault is not cleared, see item below.

Defective r-f oscillator (tubes 20 and 21).

1. Replace tubes 20 and 21.
2. If fault is not cleared, make a voltage and resistance check of the circuit.
3. Check the filament chokes for shorted turns.
4. Check the oscillator-tank assembly for bad contacts.

C. SYMPTOM:

The output pulse viewed on the display oscilloscope is not steady as the transmitter is adjusted.

PROBABLE LOCATION OF FAULT	PROCEDURE
The mechanical contacts in the oscillator tank are not making good electrical contact.	1. Inspect the contacts and clean with a cloth if necessary.

D. SYMPTOM:

Abnormal modulator cathode current.

PROBABLE LOCATION OF FAULT	PROCEDURE
BIAS control.	1. Check for defective resistor 53–3 or control 89–2. 2. Replace tube 17. 3. Make a voltage and resistance check of the circuit of tube 17. 4. If bias is still incorrect, check capacitor 24 and resistor 86. 5. If fault is not cleared, see item below.
Low cathode current.	1. Replace tube 17. 2. If fault is not cleared, make a voltage and resistance check of the modulator circuit. 3. Check frequency of the sync signal. 4. Check control 91 for defect or improper adjustment. 5. If fault is not cleared, see item below.
High cathode current.	1. Check the frequency of the sync signal. If the frequency is incorrect check the control unit. 2. Replace tube 17. 3. Make a voltage and resistance check of the circuit of tube 17. 4. Check test-meter shunt for an open circuit. 5. Check the blocking oscillator to be certain it is triggered by the sync signal and not running free

E. SYMPTOMS:

1. Intermittent operation of the transmitter.
2. PULSE WIDTH control at maximum position.

PROBABLE LOCATION OF FAULT	PROCEDURE
Blocking oscillator.	1. Replace tube 19. 2. If trouble is not cleared, make a voltage and resistance check of the blocking-oscillator circuit.

F. SYMPTOMS:

1. Transmitter pulse does not appear on the display oscilloscope.
2. TEST SWITCH in the P.O. position.

PROBABLE LOCATION OF FAULT	PROCEDURE
Improper adjustment of the POWER MEASUREMENT control.	1. Set the POWER MEASUREMENT control to the maximum counterclockwise position. 2. If fault is not cleared, see item below.
TEST SWITCH.	1. Make a continuity check of the TEST SWITCH circuit. 2. If fault is not cleared, see item below.
Measurement circuit.	1. Replace tubes 14 and 15. 2. Make a voltage and resistance check on the measurement circuit.

G. SYMPTOMS:

1. Test meter fails to read with the POWER MEASUREMENT control in any position.
2. Transmitter operating.

PROBABLE LOCATION OF FAULT	PROCEDURE
Test meter.	1. Check the voltage across the meter. 2. If no voltage appears across the meter, check capacitor 19–1. 3. If voltage is present across the meter, a defective meter is indicated. 4. If trouble is not cleared, see item below.
Defective meter circuit.	1. Check the continuity of the TEST SWITCH circuit. 2. Check the continuity of resistors 80–1 and 80–2, and control 92.

H. SYMPTOM:

Power output not variable.

PROBABLE LOCATION OF FAULT	PROCEDURE
POWER OUTPUT control.	1. If the transmitter output is always at minimum, a shorted POWER OUTPUT control (91) is indicated. 2. If the transmitter output is always at maximum, an open POWER OUTPUT control is indicated.

53. Receiver Trouble-shooting Chart

I. SYMPTOM:

Low receiver gain.

PROBABLE LOCATION OF FAULT	PROCEDURE
Improper tuning	1. Tune the receiver as described in paragraph 54*f*. 2. If fault is not cleared, see item below.
Incorrect i-f alignment.	1. Align the i-f stages as described in paragraph 54*i*.

J. SYMPTOM:

Low output.

PROBABLE LOCATION OF FAULT	PROCEDURE
Video circuit.	1. Replace tubes 11 and 12. 2. If fault is not cleared, make a voltage and resistance check of the video circuit.

K. SYMPTOM:

Tuning eye gives no indication.

PROBABLE LOCATION OF FAULT	PROCEDURE
Tuning eye.	1. Replace the tuning eye (tube 13). 2. If the fault is not cleared, make a voltage and resistance check of the circuit.

L. SYMPTOM:

Tuning eye does not close properly.

PROBABLE LOCATION OF FAULT	PROCEDURE
Improper adjustment of the eye transformer (112).	1. Adjust the eye transformer as described in paragraph 54*i*(4).

M. SYMPTOMS:

1. "Flash over" from first r-f amplifier to ground.
2. Transmitter output maximum.

PROBABLE LOCATION OF FAULT	PROCEDURE
Improper adjustment of the antenna-matching section.	1. Adjust the antenna-matching section as described in paragraph 54*c*.

N. SYMPTOM:

R-f, mixer, and oscillator stages will not tune.

PROBABLE LOCATION OF FAULT	PROCEDURE
Defective tube.	1. Replace tubes 1, 2, 3, and 4. 2. If the fault is not cleared, trace the signal through to the first i-f amplifier. 3. Make a voltage and resistance check on the circuits. 4. If fault is not cleared, see item below.
Cores of coils.	1. Check operation of the core adjustment. The construction of the tuning assembly should cause the cores to move in and out smoothly if it is operating properly. 2. If fault is not cleared, see item below.
Capacitor 5.	1. Check capacitor 5 for a short.

54. Alignment

Improper alignment usually will be indicated by low transmitter output and low receiver sensitivity. The symptoms of improper alignment are quite limited; therefore, it is impossible to obtain an indication which will point directly to the improper adjustment of a particular control. Consequently, it is necessary to follow the complete alignment procedure with the exception of the i-f amplifier stage. The procedure described below includes the alignment of the transmitter and receiver for initial installation and for changing the frequency of operation. A short procedure can be followed when adjusting for maximum output and sensitivity, if the frequency is known to be correct. Such steps as adjustment of controls to a given position before application of plate voltage may be omitted. With the equipment operating, the only procedure necessary is to adjust the transmitted for maximum output indication and the receiver for maximum eye closure.

Note. The transmitter frequency, when set properly, should not be further adjusted because all adjustments are directly dependent upon the correct transmitter frequency.

a. TRANSMITTER AND RECEIVER ALIGNMENT. (1) Disconnect the PT–5 cable and the right-angle connector from the ANTENNA connector. Connect the T-connector to the ANTENNA connector. (See fig. 78.) Connect the short test antenna, which is mounted on a right-angle connector, to the upper branch of the T-connector. Connect the dummy antenna to the lower branch of the T-connector. Snap on the FILAMENT VOLTAGE circuit breaker. Set the STANDBY-OPERATE switch in the STANDBY position.

Note. The following controls should be adjusted with the knurled handle screwdriver which is screwed into the panel above the receiver tuning dials. (See fig. 79.)

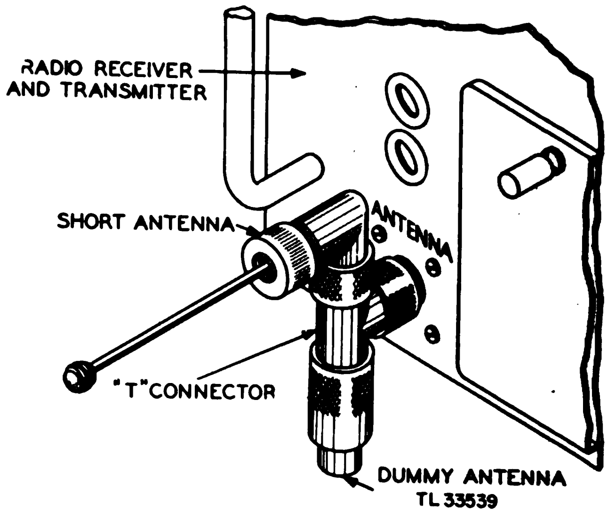


Figure 78. Radio Receiver and Transmitter BC–1267–A, showing antenna test installation.

Caution: Loosen LOCK screws above the PLATE CAP and the ANT. TUNE adjustments before attempting to adjust them.

(2) Set the WIDTH control, POWER MEASUREMENT control, and BIAS control at their extreme counterclockwise positions. Set the POWER OUTPUT control to its extreme clockwise position and the LIGHTS control to any position to give proper illumination of dials and meters. Open the door below the TRANSMITTER TUNING dial and find the desired frequency on the calibration chart. Set the TRANSMITTER TUNING dial, the receiver ANT., R. F., DET., and OSC. tuning dials to the settings given on the calibration chart

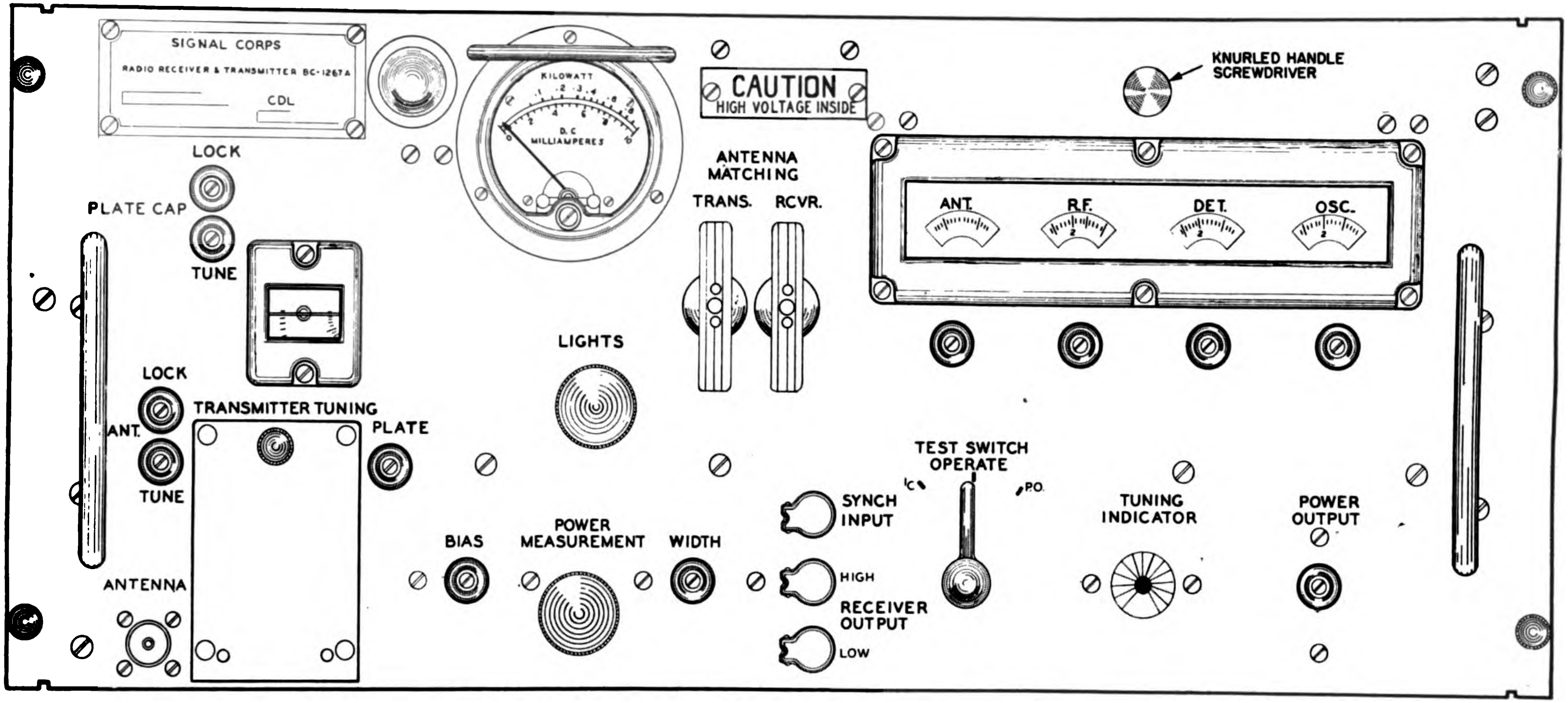


Figure 79. Radio Receiver and Transmitter BC-1267-A, front panel view.

TL33940

for the desired frequency. The TRANSMITTER TUNING dial is set by adjusting the PLATE control which is located to the lower right of the dial.

(3) Set up a test oscilloscope next to the RC-145-A rack. Connect the X INPUT terminals to the SWEEP jack on the Search Receiver Test Panel of Radio Set SCR-545-A. If the test oscilloscope has provisions for use of intensity modulation, connect the UNBLANK jack on the test panel to the appropriate posts on the test oscilloscope. Turn the test panel on by means of the toggle type power switch mounted on its left side. Connect the LOW RECEIVER OUTPUT jack of Radio Receiver and Transmitter BC-1267-A to the VERT. INPUT posts of the oscilloscope. Adjust the FOCUS and INTENSITY controls for a suitable picture. Rotate the SWEEP switch on the Search Receiver Test Panel to position No. 3. The sweep length of the test oscilloscope is now set to 55 microseconds.

b. Modulator-cathode Current. Set the PLATE VOLTAGE circuit breaker of the power supply on the ON position. With the TEST SWITCH in the Ic position, adjust the BIAS control until the test meter reads 1 ma. Place the STANDBY-OPERATE switch in the OPERATE position; the test meter should read between 4 to 7 ma in the Ic position.

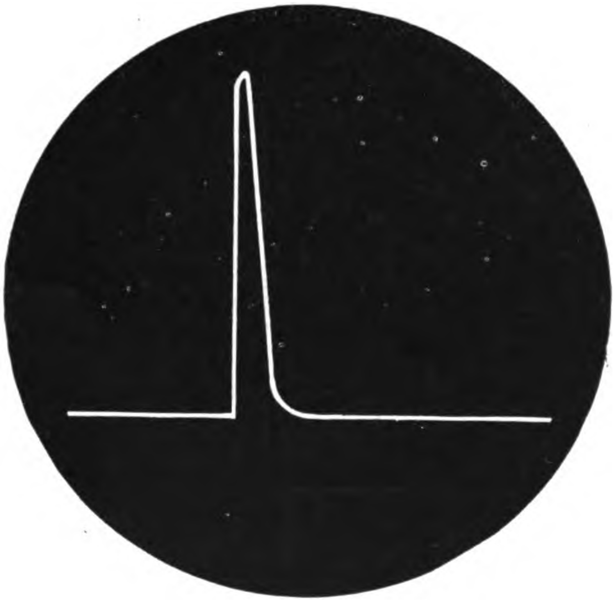


Figure 80. Control unit display tube pattern.

c. Antenna Matching. Place the TEST SWITCH in the P.O. position and the STANDBY-OPERATE switch in the OPERATE position. A picture of the envelope of the r-f pulse (similar to fig. 80) should appear on the screen of the cathode-ray tube. Adjust antenna tuning (ANT.) and the TRANS. and RCVR. portions of antenna-matching section to maximum pulse amplitude as indicated on the display oscilloscope on the control unit. The TRANS. RCVR. portions of the antenna matching section are adjusted by sliding their respective rods in and out to the desired position. (See fig. 81.) When this position is obtained, press the button in the center of the rod handle and push the rod in as far as it will go.

Note. If the pulse reaches the top of the cathode-ray tubes in the process of making these adjustments, it should be decreased by reducing the SENSITIVITY control on the control unit. The adjustments should then be continued for maximum pulse amplitude.

d. Pulse Width. Set the SWEEP switch on the Search Receiver Test Panel of Radio Set SCR-545-A to position number 2, which gives a sweep duration of 18 microseconds. Adjust the X GAIN control until the length of the baseline is equal to a multiple of 18 divisions on the screen. Hold the TEST SWITCH in the P.O. position. Adjust the width control until the width of the pulse, measured half-way from the baseline to the top of the pulse, is approximately 7 microseconds. The measurement of the width is made by comparison with the length of the baseline. Do not operate the equipment with a pulse width that will cause the cathode current of the 3E29 tube to exceed 7.5 milliamperes.

e. Transmitter Frequency. (1) Set the signal generator tuning dial to the correct calibration for the desired frequency by use of the calibration chart. Adjust the transmitter-frequency control (PLATE) until the note of the repetition rate heard in the headphones is interrupted. Make sure that the interruption is sharp and can be approached from both directions of rotation of the transmitter-frequency control.

(2) Retune the antenna tuning control (ANT.) and the ANTENNA-MATCHING sections as described in paragraph 54*c*.

f. Receiver Frequency. (1) The signal generator should be turned to the same frequency as it was when used with the transmitter.

(2) Turn the SENSITIVITY control on the control unit to its maximum clockwise position. Connect the r-f output of the signal generator to either branch of the T-connector on the transmitter antenna connection by using Cord CD-1104. Set the attenuator dial on the signal generator (marked "Multiply by") to the 1Mx position and adjust the receiver dials for maximum eye closure. If the eye closes completely, open it by turning the sensitivity

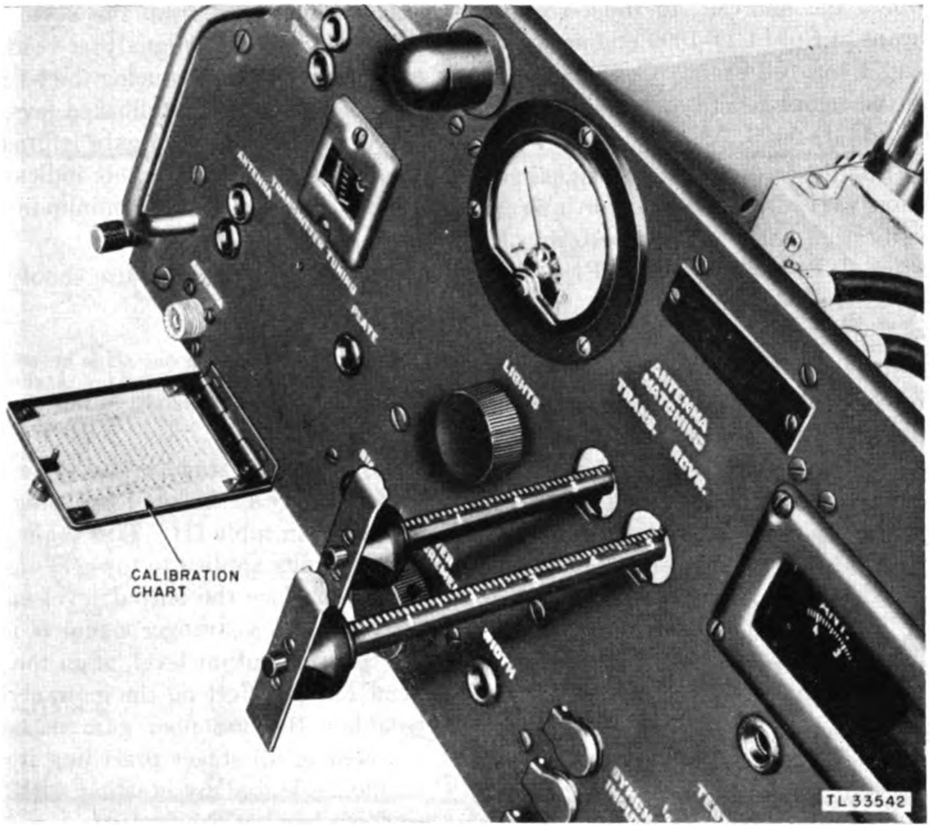


Figure 81. Radio Receiver and Transmitter BC–1267–A, chart showing antenna-matching adjustments and calibration.

control counterclockwise to reduce the gain of the receiver. Continue repeating this process until maximum eye closure is obtained.

Note. The right-hand control of the attenuator is used for course adjustment; the left-hand control is for fine adjustment. The 1Mx position of the attenuator is used because it gives the desired impedance of 50 ohms.

(3) Disconnect the signal generator from the transmitter and connect the test and dummy antennas to the T-connector.

(4) With the STANDBY-OPERATE switch in the OPERATE position and the TEST SWITCH in the P.O. position, again adjust the antenna-matching sections for maximum pulse amplitude on the scope screen.

(5) The above tuning adjustment should be rechecked several times because of the interaction of the antenna circuits.

g. Power Output. (1) Place the STANDBY-OPERATE switch in the OPERATE position and the TEST SWITCH in the P.O. position. While observing the pulse on the screen of the control unit, the POWER MEASUREMENT control should be rotated clockwise until the pulse fails to decrease in amplitude. The power output can then be read directly on the test meter. One kilowatt is the maximum power output. However, because of error in the measuring circuit, 0.750 kilowatts may be considered sufficient.

Note. If POWER MEASUREMENT control is rotated past the point where the pulse fails to decrease, a very inaccurate reading will be obtained.

(2) Remove the T-connector and connect the right-angle connector in its place. Connect the PT–5 cable to the right-angle connector.

h. Final Adjustments. (1) Slight readjustments of the antenna-tuning controls (ANT.) and the antenna-matching sections may be necessary. These are again adjusted for maximum pulse amplitude on the screen of the control unit with the TEST SWITCH in the P.O. position. Adjust the plate capacity (TUNE) to maximum pulse amplitude on the screen of the control unit. These final adjustments should be gone over several times to insure peak adjustment of these controls.

(2) Upon completion of all adjustments, tighten the LOCK screws on the ANT. TUNE and PLATE CAP. TUNE.

i. Alignment of I-f Coils. (1) Place the STANDBY-OPERATE switch in the STANDBY position. Connect the analyzer to the i-f output test jack by means of Cord CD–1099 and adjust the analyzer to read 1 ma full scale. Connect the r-f output jack on the signal generator to the i-f input by the use of Cord CD–1103.

(2) When setting the frequency of the signal generator, see section VIII of this chapter for information on the calibration chart and on restoring the calibration switch L.F.–H.F. to the L.F. position when setting up for i-f frequency.

(3) A reference level of 0.750 ma on the analyzer is used in aligning the i-f stages; all the sensitivities are referred to this level. If the indication goes off scale when making adjustments, it should be brought back by adjusting the output of the signal generator. Because the analyzer can be kept on its 1 ma scale throughout the alignment procedure when this system is used, its indication can be maintained very sensitive to small changes in output at all times.

(4) The tuning eye may be used for indications of changes in output with respect to the established level by adjusting the tuning-eye coil to maximum closure when the analyzer reads 0.750 ma. The closed eye now represents the level of 0.750 ma. The input should then be decreased to allow the eye to open so that an increase in output can be indicated by the eye when adjustments are being made. Alignment is easier with the eye, but it does not permit so great a degree of accuracy as does the meter.

(5) Set the dial on the signal generator to 11 mc and adjust the two microvolt controls to 300 microvolts. Set the sensitivity control on the control unit to maximum. If the analyzer does not read 0.750 ma, improper alignment is indicated. A reading of 0.750 ma indicates proper gain in the i-f section but does not necessarily indicate proper alignment because of the stagger tuning. This stagger tuning feature makes it possible for the i-f stages to be so tuned that the proper gain may be obtained at one frequency while the gain throughout the desired band width is inadequate.

(6) When i-f coils are stagger-tuned, each one is tuned to a different frequency to give a wide bandwidth. Therefore each transformer must be aligned to its frequency (table II gives the frequency for each of the 6 i-f stages). To do this aligning, look up the frequency for the stage to be aligned on the calibration chart. Set the tuning dial on the signal generator to the desired frequency obtained from the reading on the calibration chart. Use the alignment tool to adjust the i-f coil on the stage being tuned from the bottom of the chassis. Adjust for maximum analyzer reading or maximum eye closure. Keep reducing the i-f input as the output goes above the established level. Continue this process until maximum gain is produced. A condition of correct alignment is indicated by obtaining maximum output with a minimum microvolt input from the signal generator.

(7) The above procedure should be repeated for each i-f stage.

Note. When aligning one stage *never* go back to a previously aligned stage and tune for maximum gain. Although greater gain will be obtained in this way, it will reduce the bandwidth.

(8) If an i-f stage is defective or out of alignment, it may be isolated by using the information contained in table III. This table gives the number of microvolts applied to the grid of each stage which should produce the output level and the frequency for each. If a stronger signal is necessary to give the required output level, align the stage. If alignment has no effect on the gain, check the stage for trouble. Because poor gain in one stage will be reflected in all stages preceding it, the gain checks should be traced by starting with the last i-f and working back to the first i-f.

Table II. Alignment frequencies for i-f amplifier.

Stage No.	Alignment frequency (mc)
6	9.5
5	8.8
4	13.2
3	8.8
2	12.5
1	11.0

Table III. Average i-f grid sensitivities.
(For 5 volts output across diode load)

I-f tube grid No.	Frequency (mc)	Sensitivity (mv)
I.F. INPUT jack	11	300
1	11	280*
2	11	2,500
3	11	15,000
4	11	100,000
5	9.5	500,000

* The first sensitivity reading is greater than the second because the I.F. INPUT jack is connected in series with resistor 61.

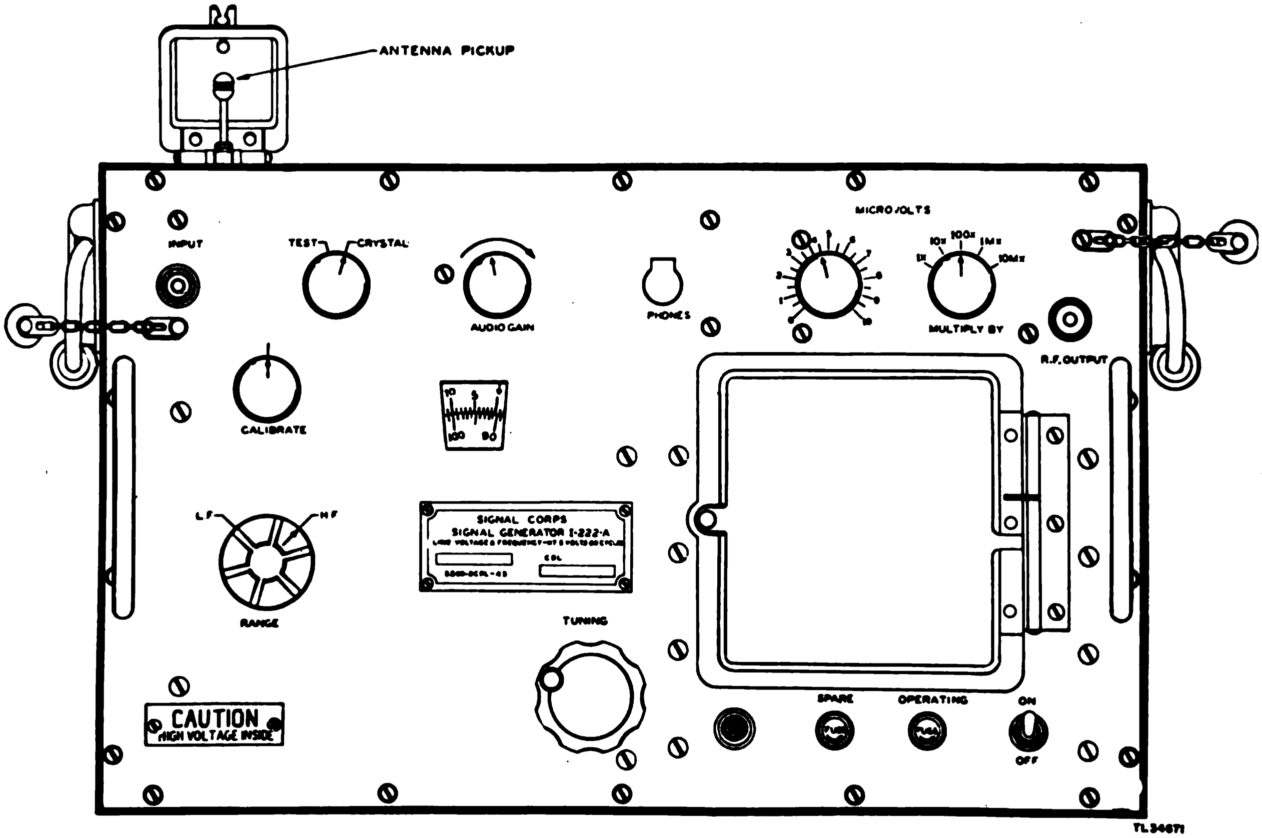


Figure 82. Signal Generator I-222-A—front panel.

j. Alignment of Receiver R-f Calibration Dials with the Calibration Chart. This alignment usually will not be necessary unless an r-f coil is replaced.

(1) The alignment procedure is written for all four r-f stages; however, it may be used to align just one without aligning the others.

(2) Place the STANDBY-OPERATE switch in the STANDBY position. Disconnect the coaxial cable from the antenna receptacle on the transmitter. Use Cord CD–1104 to connect the r-f output of the signal generator to the antenna receptacle. Use the tuning eye for a resonance indicator. Set the signal generator to the transmitter frequency and tune for resonance. If the dial readings on all the r-f stages of the receiver, with the exception of the ANT., read within one division of the reading on the calibration chart for the frequency being used, the dial alignment may be considered normal. Because of the great deviations in antenna characteristics, a much greater tolerance is allowed for the ANT. tuning dial. If the dials do not read correctly, follow the procedure below.

(3) Turn each tuning shaft to its maximum clockwise position and check the zero position of each dial. If the dial does not read zero in this position, loosen the dial setscrew and rotate the dial until the zero coincides with the hairline. (See fig. 83.)

(4) Loosen the setscrew on the slug-driver assembly (fig. 84) and adjust the tuning cores until their shafts extend 1/16 inch out from the tuner front plate. (See fig. 84.) For this operation the tuner must be removed from the chassis. Set the

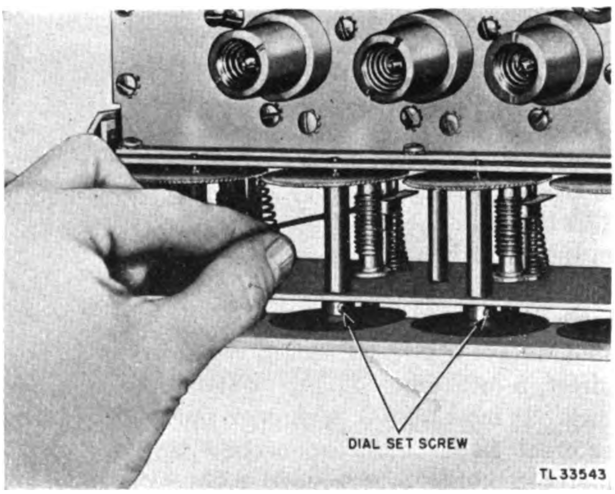


Figure 83. Radio Receiver and Transmitter BC–1267–A, r-f tuning section.

signal generator at 156 mc and tune the OSC. dial to maximum eye closure.

Note. In this receiver the desired response occurs with the heterodyning oscillator tuned below the incoming signal. This may be checked by noting what two frequencies of the signal generator give proper response and aligning to the higher response. A moderate signal input should be used to avoid high order image responses.

If the OSC. dial fails to check against the calibration point for 156 mc, adjust the outside turn and the center turn on the OSC. coil until the correct dial setting is obtained. (See fig. 84.) (The outside turn is next to the rear of the tuner.) The spacing should be adjusted by bending the outside turn away from or toward the center turn.

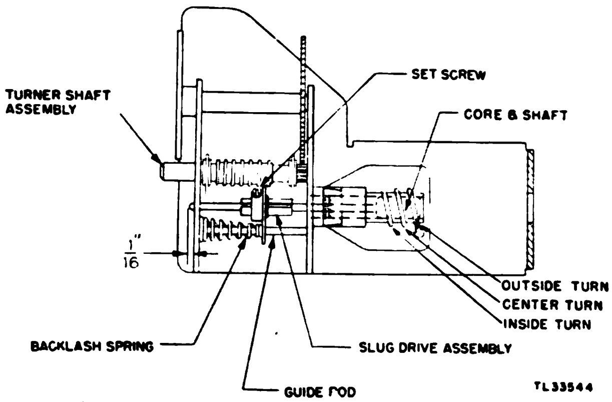


Figure 84. Radio Receiver and Transmitter BC–1267–A, r-f tuner assembly.

(5) Repeat the above procedure for the DET., R.F., and ANT. stages.

(6) Set the signal generator at 186 mc and tune the OSC. dial to resonance, as indicated by maximum eye closure. If the OSC. dial fails to check with the calibration chart, adjust the spacing between the inside turn and the center turn until the correct dial reading is obtained. (See fig. 84.) (The inside turn is next to the front panel.)

(7) Repeat this process for the DET., R.F., and ANT. stages.

k. Supplementary Data. (1) *Test equipment.* The tests discussed in this section require equipment which is not supplied with Radio Equipment RC–145–A. The equipment required is described in the paragraphs below.

(*a*) *Oscilloscope.* A DuMont model 241 oscilloscope or a similar instrument will be suitable. It should have a vertical deflection sensitivity (plates direct, 5-inch tube) of approximately 45 volts per inch. It must also be capable of operating with an external sweep. The connection to the vertical plates should be in series with a capacitor having a capacity of at least 0.5 mfd.

(*b*) *Low-capacity cable.* This cable is used to connect the vertical plates of the oscilloscope to the point under test. It should be about 3 feet long and its total capacity must not be greater than 50 mmfd.

(*c*) *Sweep and pulse generator.* This generator should produce a sweep voltage for the oscilloscope about 10 or 20 microseconds in length. A 100-microsecond sweep is also useful. The transmitter may be triggered by the control unit, or by a pulse from the sweep generator, if it has the same characteristics as the control unit trigger pulse. The phase relation between the trigger pulse and the sweep voltage must be variable.

(*d*) *Timing calibrator.* This unit is used to calibrate the sweep time on the oscilloscope. It should produce a 200-kc wave which will give 5 microsecond timing waves.

(*e*) *Capacity voltage divider.* This divider should have a division ratio of about 20:1 and should be capable of withstanding a peak voltage of 5,000 volts or more. The output capacity should be as low as possible. (See figs. 85 and 86.)

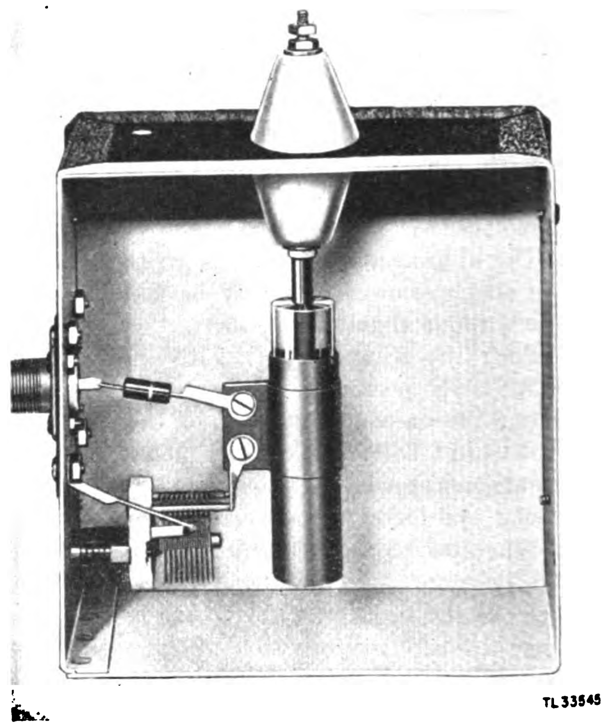
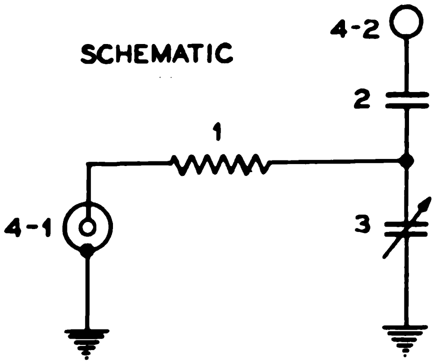


Figure 85. Capacity voltage divider, cover removed.

(*f*) *Power-measurement unit.* This unit should consist of a 50-ohm resistive load and a diode rectifier, preferably with a cathode-follower output stage. The diode load resistance shall be capable



LEGEND FOR CAPACITY VOLTAGE DIVIDER	
REF. NO.	DESCRIPTION
1	RESISTOR 75 OHMS
2	HIGH VOLTAGE CONDENSER 10 MMFD
3	VARIABLE CONDENSER 0-100 MMFD
4-1	RECEPTACLE SO-239
4-2	INPUT TERMINAL (CERAMIC FEED THROUGH INSULATOR)

TL33546

Figure 86. Capacity voltage divider, schematic diagram.

of being switched to either of two values; a high value to show the integrated pulse and a low value to reproduce the envelope of the r-f wave. Figure 89 shows the schematic of such a unit and figure 88 is a photograph showing typical construction.

(2) *Test connections.* The actual connection of the test equipment will depend on the type of equipment available. (It must be assumed that the operator is reasonably familiar with the use of such equipment.) The procedure described below gives the basic principles for checking the transmitter. A block diagram is given in figure 90.

(*a*) The transmitter may be triggered by the control unit if the SCR–545–A is operating, or by an external pulse and sweep generator. The transmitter should be removed from the rack and connected electrically to the rack by means of patch

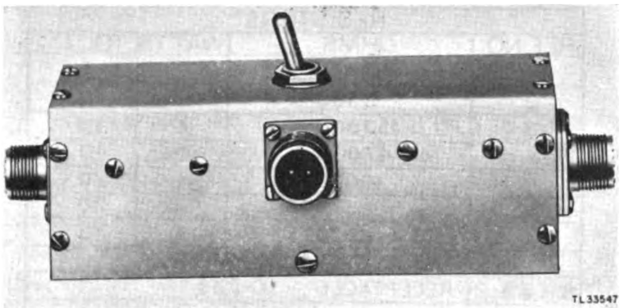


Figure 87. High-frequency diode head.

Cord CD–1106. The power supply unit must be in place in the rack. It is not necessary that the indicator be in place. If the trigger pulse is to come from the control unit, it is necessary that the control unit be properly adjusted for normal operation. To operate the transmitter from an external source, remove tube (4) from the control unit; throw the

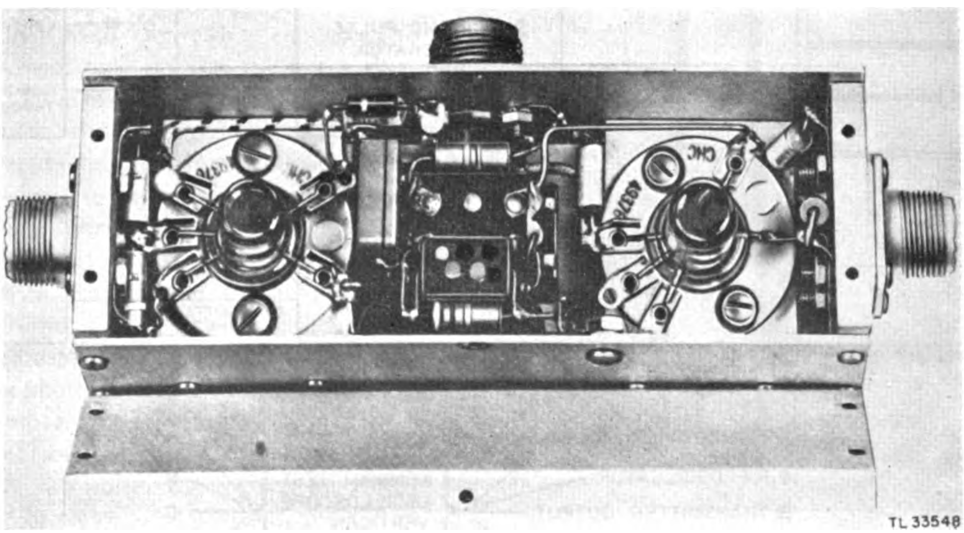
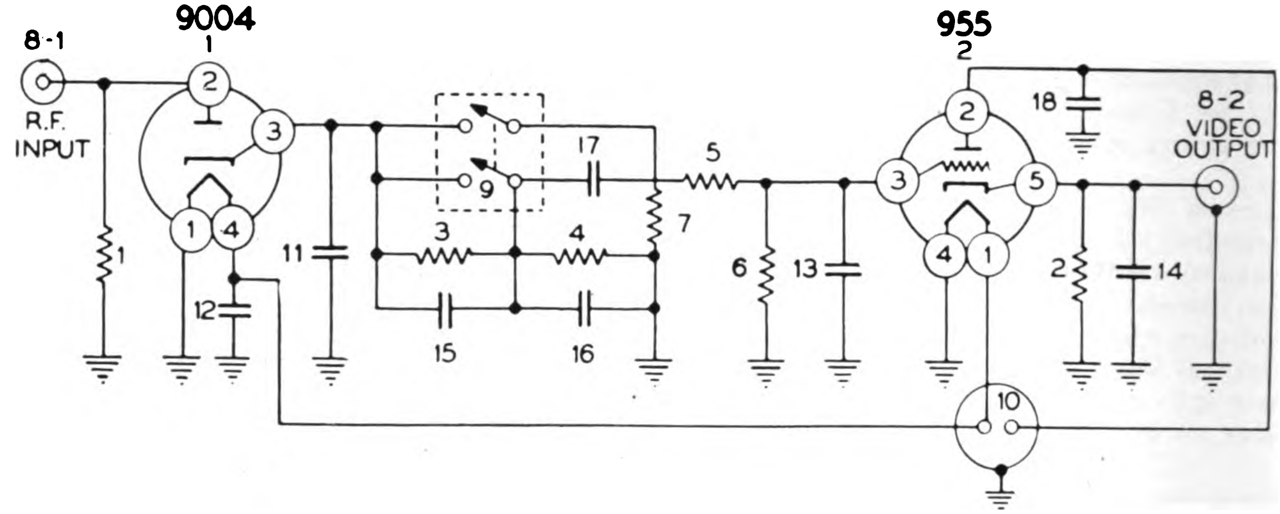


Figure 88. High-frequency diode head, cover removed.



RESISTORS			
REF. NO.	OHMS	WATTS	TOL ±%
1	50	1	1
2	3,300	1	10
3	150,000	1	10
4	47,000	1	10
5	10,000	½	20
6	1 MEG.	½	20
7	1,000	1	10
MISCELLANEOUS PARTS			
8-1 & 8-2	RECEPTACLE SO-239		
9	D.P.S.T. SWITCH		
10	2 PRONG PLUG		

CAPACITORS		
REF. NO.	CAPACITY	TYPE
11, 12	40 MMFD	CERAMIC
13	5 MMFD	CERAMIC
14	47 MMFD	CERAMIC
15	100 MMFD	SILVER MICA
16	300 MMFD	SILVER MICA
17	.006 MFD	MICA
18	.05 MFD	PAPER

Figure 89. High-frequency diode head, schematic diagram. TL 33549

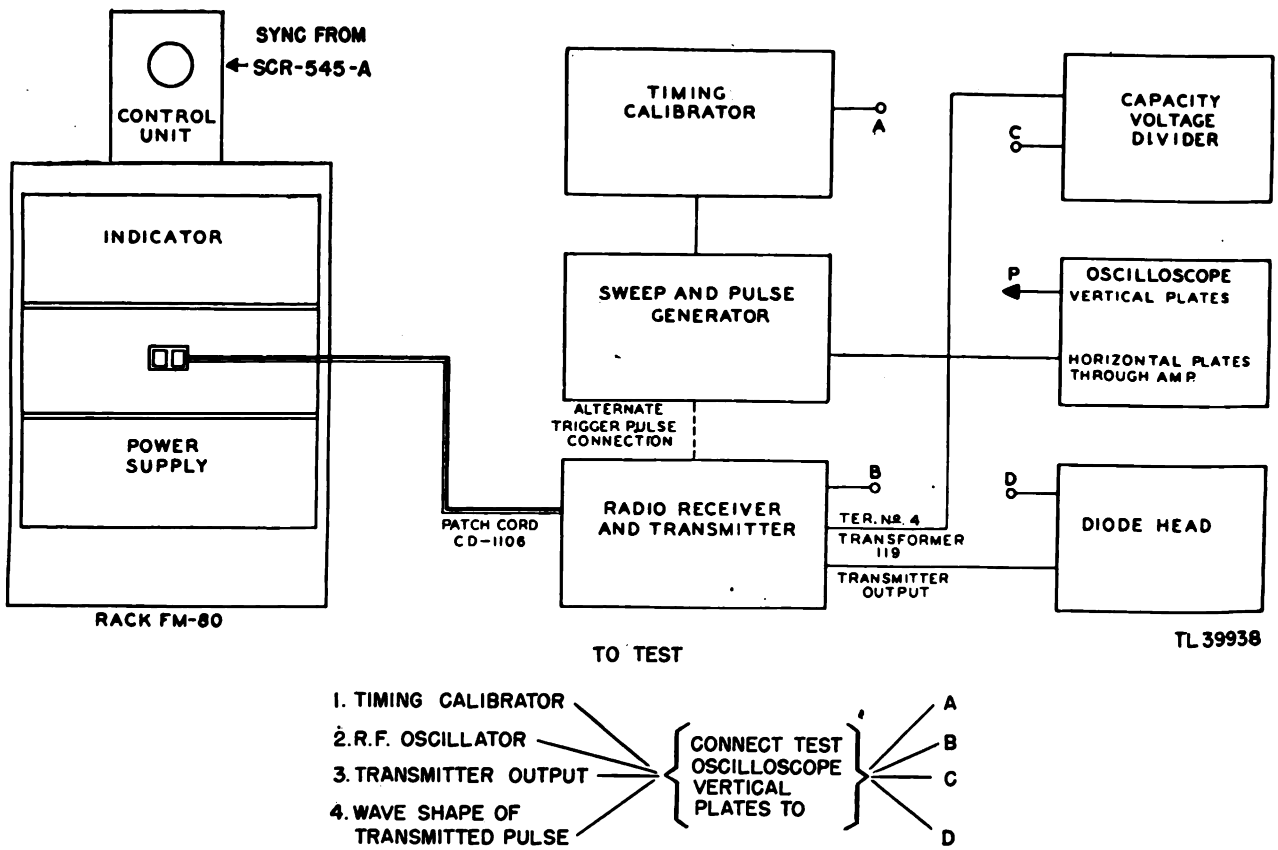


Figure 90. Radio Equipment RC-145-A, block diagram of test equipment connections.

STANDBY-OPERATE switch to the OPERATE position; then plug the external trigger voltage into the SYNC. INPUT jack on the transmitter.

(*b*) The sweep generator of the test oscilloscope must be synchronized with the trigger pulse. If the control unit is used, this sync pulse may be obtained from the jack marked SYNC INPUT located on the front panel of the receiver and transmitter unit. If the separate sweep and pulse generator is used, it must be synchronized with a separate audio oscillator, set to 240 cps.

(*c*) The sweep generator should be connected to the horizontal plates of the oscilloscope through the amplifier. The gain control on the test oscilloscope will provide an adjustable length of sweep on the oscilloscope screen.

(*d*) The timing calibrator is used to calibrate the sweep. It must be synchronized from the source which initiates the sweep. The output of the calibrator, which is damped sine wave, is connected to the vertical plates of the oscilloscope. The length of the sweep is adjusted until two cycles of the timing wave occupy 1 inch of length on the screen. The timing wave is 200 kc; therefore, 1 inch on the screen equals 10 microseconds. Other convenient units may be used.

(*e*) The capacity voltage divider is required when observing the 3,500-volt pulse output of the modulation transformer (119). The divider may be calibrated by impressing a known pulse voltage across the input terminal and ground. Measure the output pulse voltage with the oscilloscope. Adjust the capacitor in the lower section of the divider until the ratio is 20:1. The divider should be calibrated with a particular cable and oscilloscope. If either the cable or the oscilloscope is changed, the divider should be recalibrated.

(*f*) The diode head (fig. 89) is connected to the ANTENNA receptacle on the radio receiver and transmitter. To measure the power of the oscillator directly, remove the coaxial cable which is connected to receptacle 170–2 and connect the diode head in its place, using a short length of 50-ohm Copolene cable. When the switch on the diode unit is open, the circuit produces an integrated pulse whose height is proportional to the peak voltage across the 50-ohm load. The diode head must be calibrated against a known source of power such as a lamp and a photometer. If this equipment is not available, comparative measurements may be made against an arbitrary standard. To observe the envelope of the r-f pulse, the switch on the diode unit must be in the closed position, placing a low resistance load in the cathode circuit of the diode.

(3) *Test procedure.* The controls should be set at normal operating position. Be sure that plate voltage is applied by depressing the patch cord push-button switch when adjusting for cathode current cut-off.

(*a*) Connect the low-capacity test cable (which is connected to the vertical plates of the oscilloscope) to the high side of resistor 73–4. The pulse shape shown in figure 91 should appear across this resistor. If this pulse is not normal, check the control unit which produces this pulse, the rack wiring, and resistor 73–4.

Caution: Most of the following measurements involve high voltages. Exercise extreme care when making connections.

Note. The abbreviation μsec means microseconds.

(*b*) Connect the test cable to pin 5 of tube 16. The waveform shown in figure 92 should be obtained. This is the input wave after it has been amplified and inverted. The time constant in the plate circuit has been made as low as possible. If the voltage has a greater delay time than that shown in figure 92, the resistance or capacity has probably increased. Be sure that the wiring is dressed away

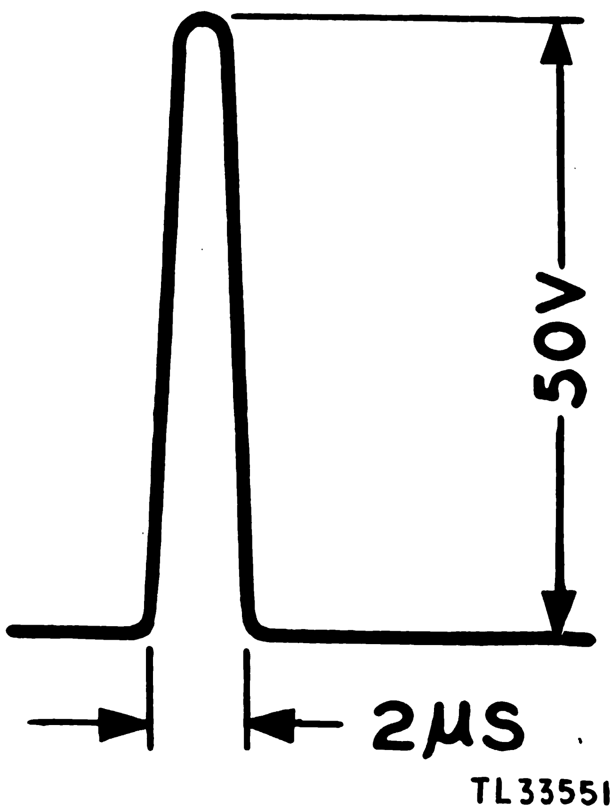


Figure 91. Test oscilloscope pattern.

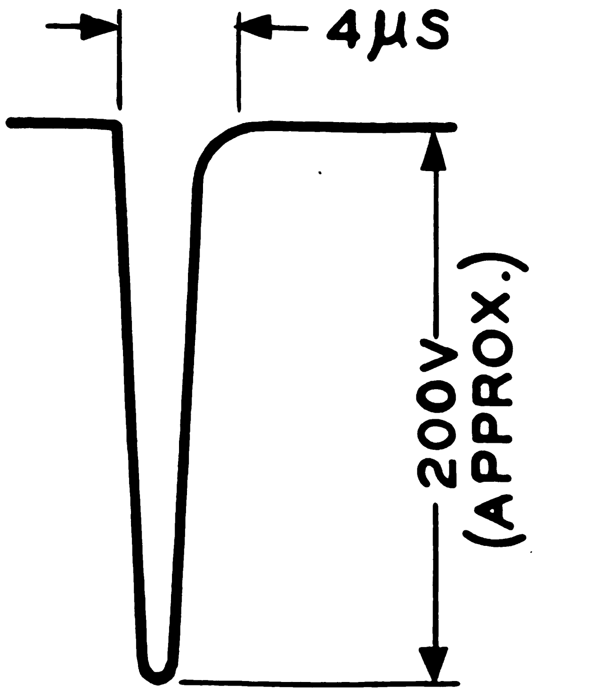


Figure 92. Test oscilloscope pattern.

from the chassis. Check resistor 62–5 and tube 16. The same waveform will also appear on pin 1 of tube 16.

(*c*) Connect the test cable to pin 2 of tube 16. The waveform shown in figure 93 should be obtained. The small step is the result of the reactions of the blocking oscillator on the preceding circuits. This wave, in common with the two previous waves, must have a steep rise, in order that the delay time be kept to a minimum. Any excess shunt capacity

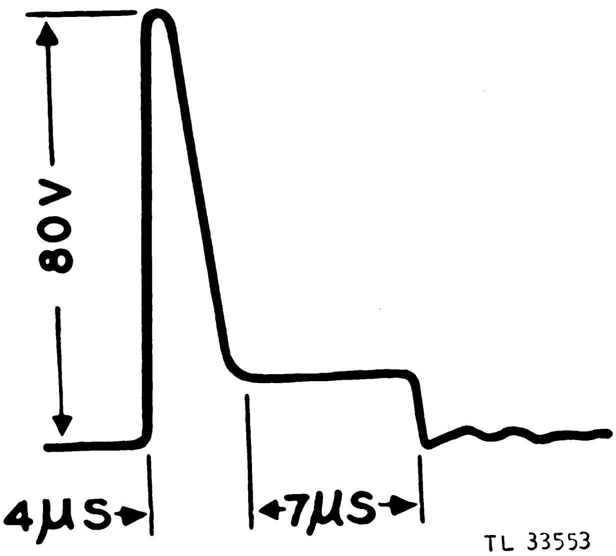


Figure 93. Test oscilloscope pattern.

in the circuit will increase the rise and delay time. An increase in the plate load resistance (83–1 to 83–5 in parallel) will also increase the delay time.

(*d*) Connect the test cable to the junction point of resistors 93–1 and 93–2, which are connected to the grid of tube 17. The waveform shown in figure 94 should be obtained. Plate voltage must be applied to tube 17 when this measurement is made because tube 17 is the load for the blocking-oscillator transformer. This is the output voltage of the tertiary winding on the blocking oscillator transformer. The characteristics of this wave are dependent on transformer 118, capacitors 30–1 and 30–2, and variable resistor 89–1. If this output pulse is too nar-

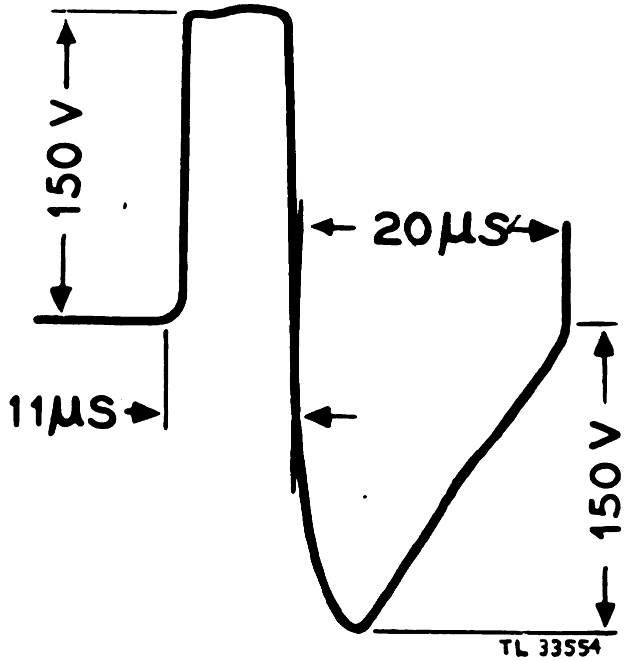
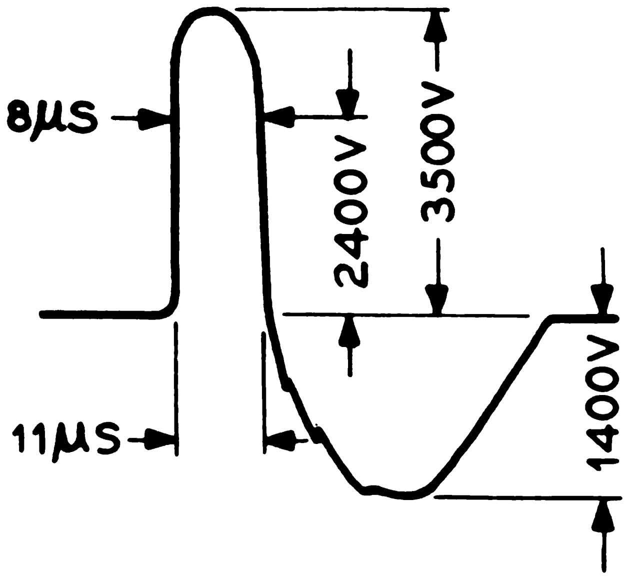


Figure 94. Test oscilloscope pattern.

row, either capacitors 30–1 or 30–2 or control 89–1 is defective. A distortion in the top of the pulse will be present if capacitor 22–1B or 21–5 is open. If capacitors 16–3 or 16–4 are defective, the blocking oscillator may not trigger. If resistor 95–3 is defective or if the bias is low, the blocking oscillator may run free. No waveform is shown for tube 18 since it is not normally accessible. However, this tube is a cathode-follower, and the waveform at its cathode is similar to that shown in figure 93, except that it has less amplitude.

(*e*) Connect the test cable to the low side of the capacity voltage divider. The high side of the divider should be connected to terminal 4 of transformer 119. Depress the push-button switch to apply plate voltage to tube 17. The waveform

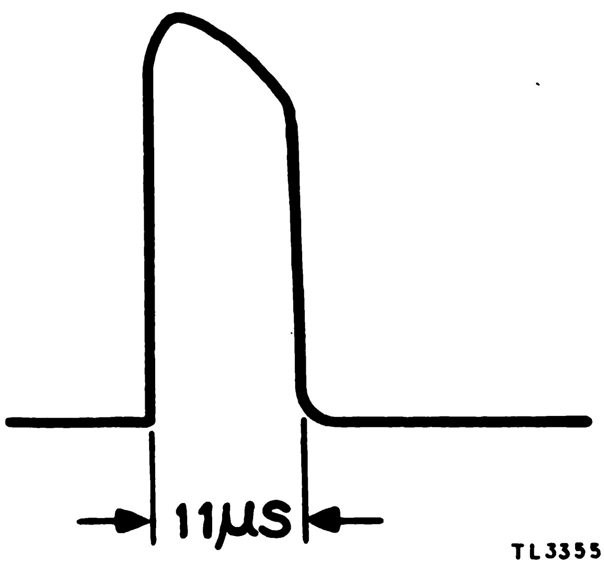


TL33555

Figure 95. Test oscilloscope pattern.

shown in figure 95 should be obtained. This waveform will depend on the load. A 2,000-ohm, 25-watt resistor may be used as a load on the secondary of the modulation transformer in place of the r-f oscillator tubes for preliminary measurements. Low output voltage may be due to a defective modulation transformer (119), a defective modulator tube (19), or low plate voltage.

(*f*) Connect the test cable to the diode head; then close the switch on the diode head. Close the push-button switch on the patch-cord box No. 2. A waveform similar to that shown in figure 96 should be obtained. This is the envelope of the r-f wave



TL33556

Figure 96. Test oscilloscope pattern.

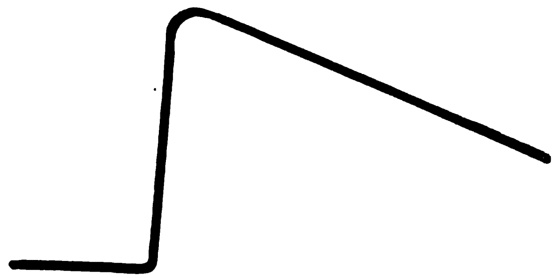
and is similar to the modulating-pulse envelope. This pulse will show any irregularities in the r-f output of the transmitter. Open the switch on the diode head. The waveform shown in figure 97 should be obtained. The height of this integrated pulse is proportional to the peak voltage of the output wave. The power output may be calculated from the formula:

$$P = E^2/2R$$

where E is the peak voltage across the load resistance R. In this case the load resistance is 50 ohms; thus the formula becomes:

$$P = E^2/100$$

The diode head affords a quick, accurate method of checking power. As adjustments are made, the height of the pulse on the oscilloscope screen can be observed. To observe whether the r-f oscillator is



TL35569

Figure 97. Test oscilloscope pattern.

working properly, connect the diode head to the receptacle (170–2) on the side of the oscillator box. The difference in the power measured here and the power measured at the ANTENNA receptacle should be about 20 percent when the radio receiver and transmitter is properly tuned.

55. Removal and Replacement of Parts

a. PULSE-GENERATOR CHASSIS. To remove the plug-in pulse-generator chassis, remove the two screws which hold it on the main chassis. Grasp the pulse-generator chassis by the two handles and pull firmly upward to disengage the connector on the plug-in pulse generator from the main chassis receptacle.

b. ADJUSTING RODS. To replace an adjusting rod of the antenna-matching section, engage the rod

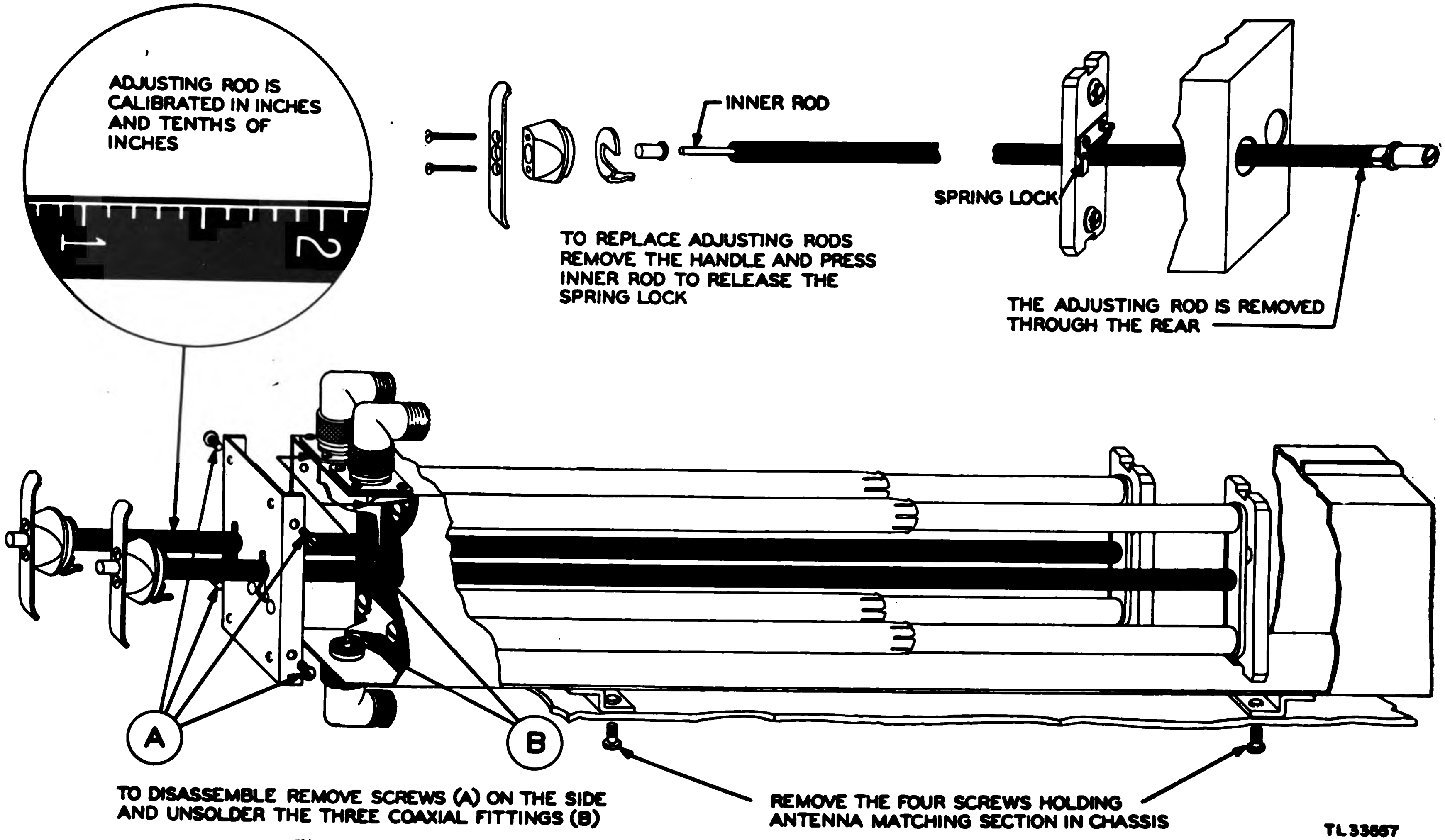


Figure 98. Radio Receiver and Transmitter BC-1267-A, disassembly of antenna-matching section.

and set it to zero on the calibrated scale; remove the handle; press the inner rod to release the spring lock; and remove the adjusting rod through the hole in the rear of the case which houses the antenna-matching section. (See fig. 98.) Assemble in reverse order.

c. ANTENNA-MATCHING SECTION. To remove the antenna-matching section, disconnect the three cables from their right angle fittings; set the adjusting rods to zero; remove the handles and center rods; remove the four screws which hold the case to the chassis; and then remove the crossbar brace which is mounted from the front panel to the rear fence. The antenna-matching section can now be removed. (See fig. 99.) To disassemble the antenna-matching section, remove the four screws which hold the front of the case to the case itself. Unsolder the three coaxial fittings. The entire assembly may now be slid out of the case. (See fig. 98.) To reassemble, reverse the above procedure.

d. POWER-MEASUREMENT CIRCUIT. To gain access to the wiring of the power-measurement circuit tubes, remove the eight screws which hold the cover of the shield box in place. (See fig. 100.) To remove the shield box, unsolder the wire at terminal 1 of tube 9006 and disconnect the two leads to capacitor 20–1. Remove the eight screws which hold the shield box to the chassis. To assemble, reverse the above order.

e. R-F OSCILLATOR BOX. To gain access to the r-f oscillator unit box loosen the four captive screws which hold the cover in place; then remove the cover. If further access is required, the side of the r-f oscillator unit box may be taken off. Remove the

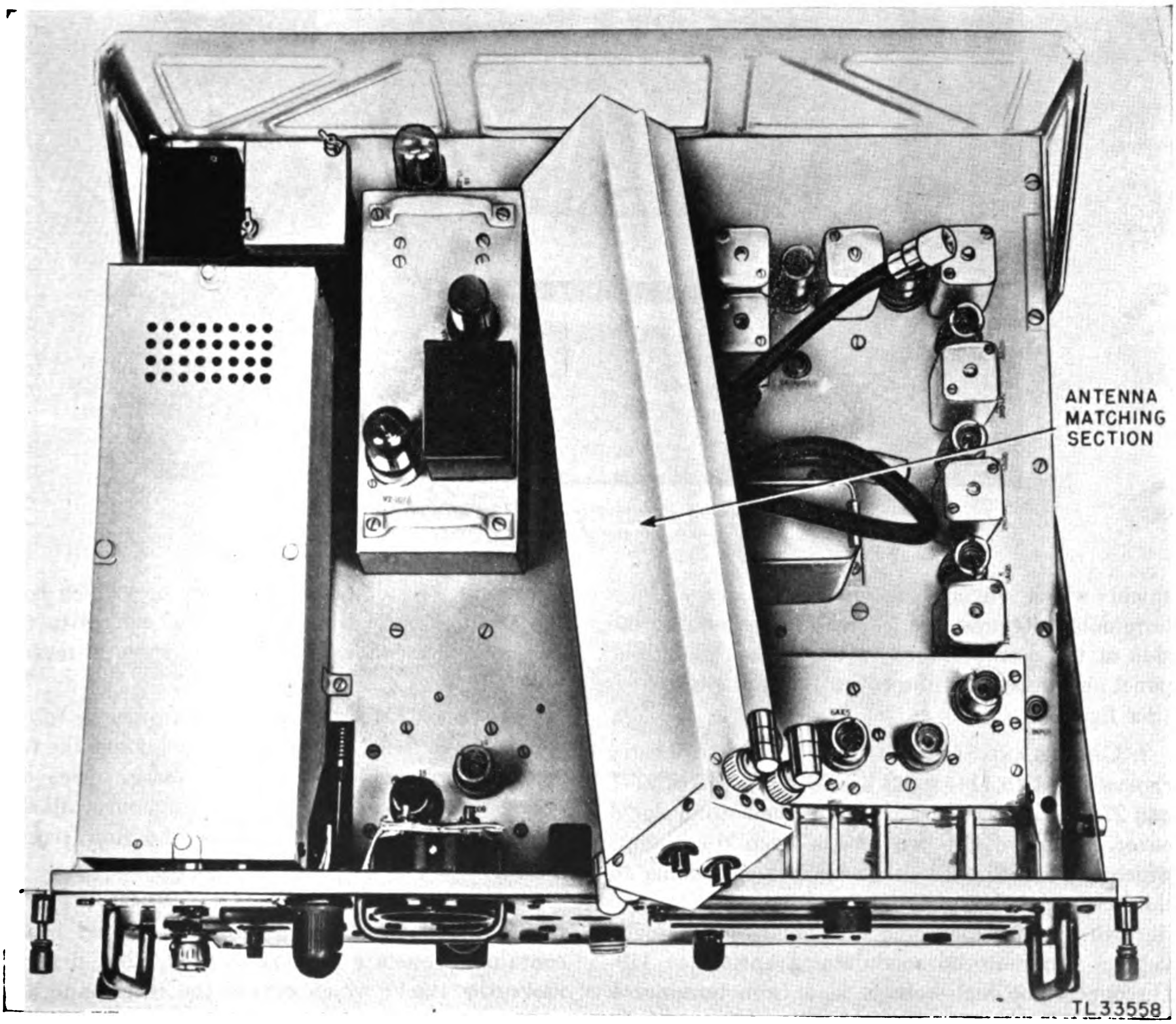


Figure 99. Radio Receiver and Transmitter BC-1267-A, removal of antenna-matching section.

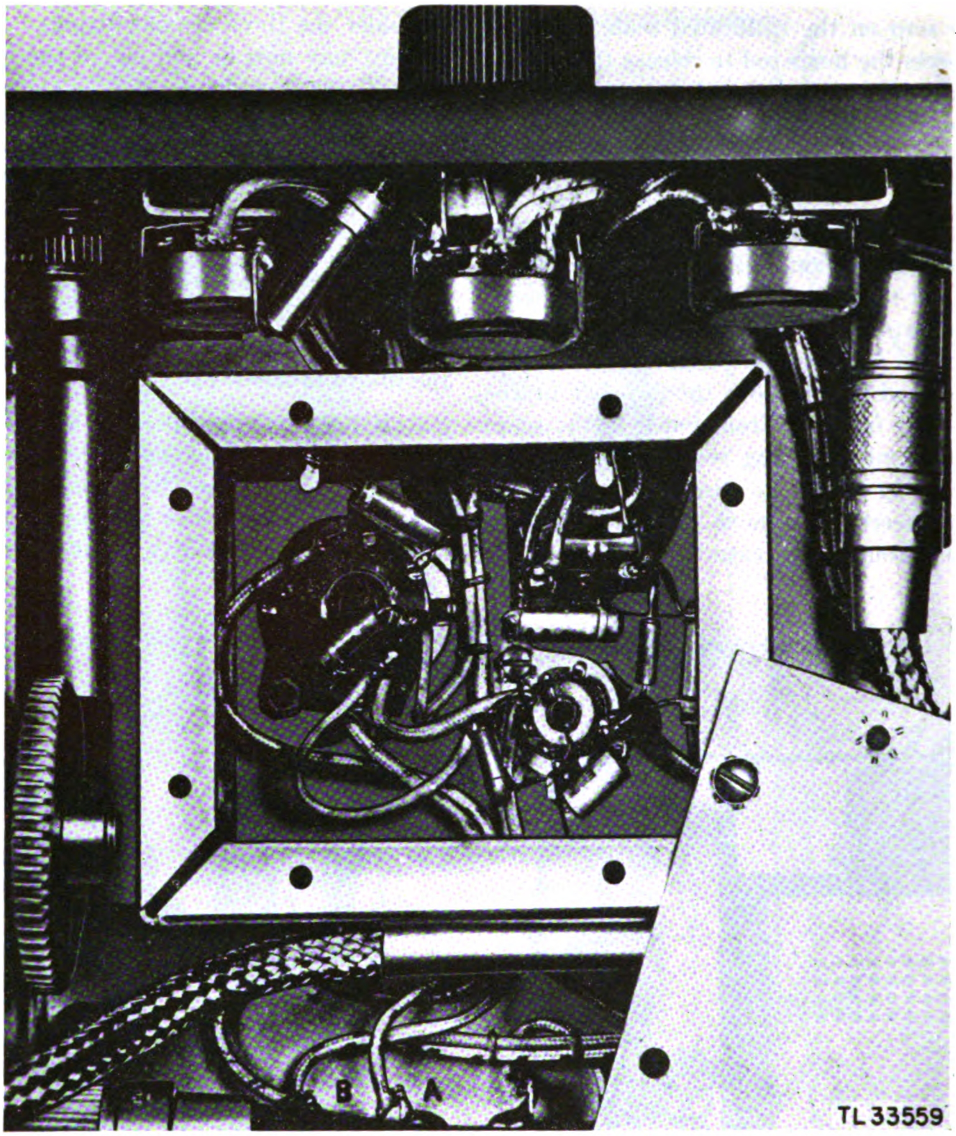


Figure 100. Radio Receiver and Transmitter BC-1267-A, power-measurement shield, cover removed.

shield which covers the modulator transformer terminals. Remove the sixteen screws holding the side of the oscillator box to the chassis and front panel and thus allow the entire side to be removed. (See fig. 101.)

f. Chokes and Spark Plates. To replace heater chokes 114-1 to 114-4 and heater spark plates 27-1 and 27-2, it is necessary to remove the bottom shield cover. Remove the two screws from the clamps which hold the high-voltage lead shield tubing to the bottom of the r-f oscillator unit box. Remove the two screws which hold the shield for the high-voltage terminals on modulator transformer 119. Disconnect the high-voltage lead from terminal 4 on modulator transformer 119. Remove the three screws on the side of the oscillator box which hold the shield for the tube sockets and chokes to the oscillator box. (See fig. 102.) Assemble in reverse order.

g. Interconnector Plug. To gain access to the connector on the rear of the chassis, remove the two screws which hold the shield in place. (See fig. 103.) To remove the connector, disconnect all the wires to its terminals. Remove the four screws which hold it to the frame of the chassis.

h. Capacitor 25 and Terminal Board. To replace capacitor 25 or the ceramic terminal board containing resistors 82-1, 82-2, 82-3, 82-4, first remove the shield which covers the board and the positive terminal of capacitor 25. This shield is

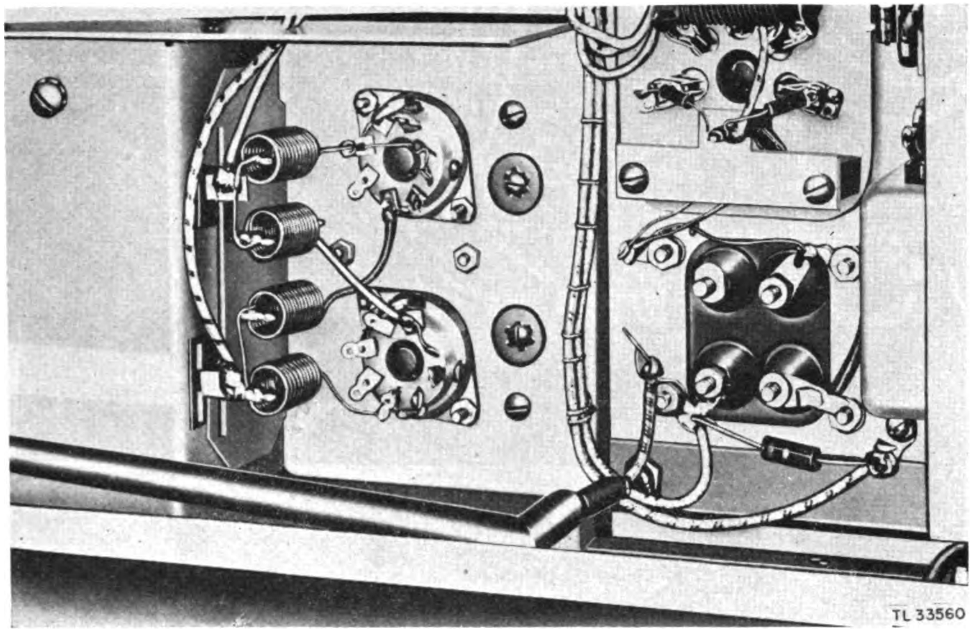


Figure 101. Radio Receiver and Transmitter BC-1267-A, transmitter-oscillator tube, shield removed.

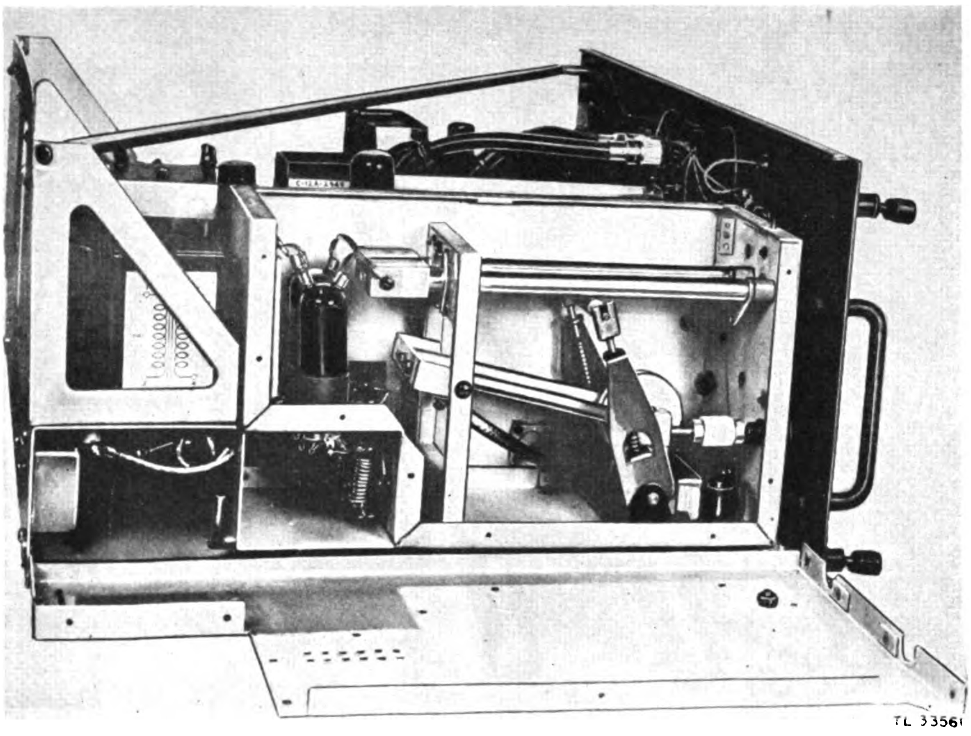


Figure 102. Radio Receiver and Transmitter BC-1267-A, side of oscillator box removed.

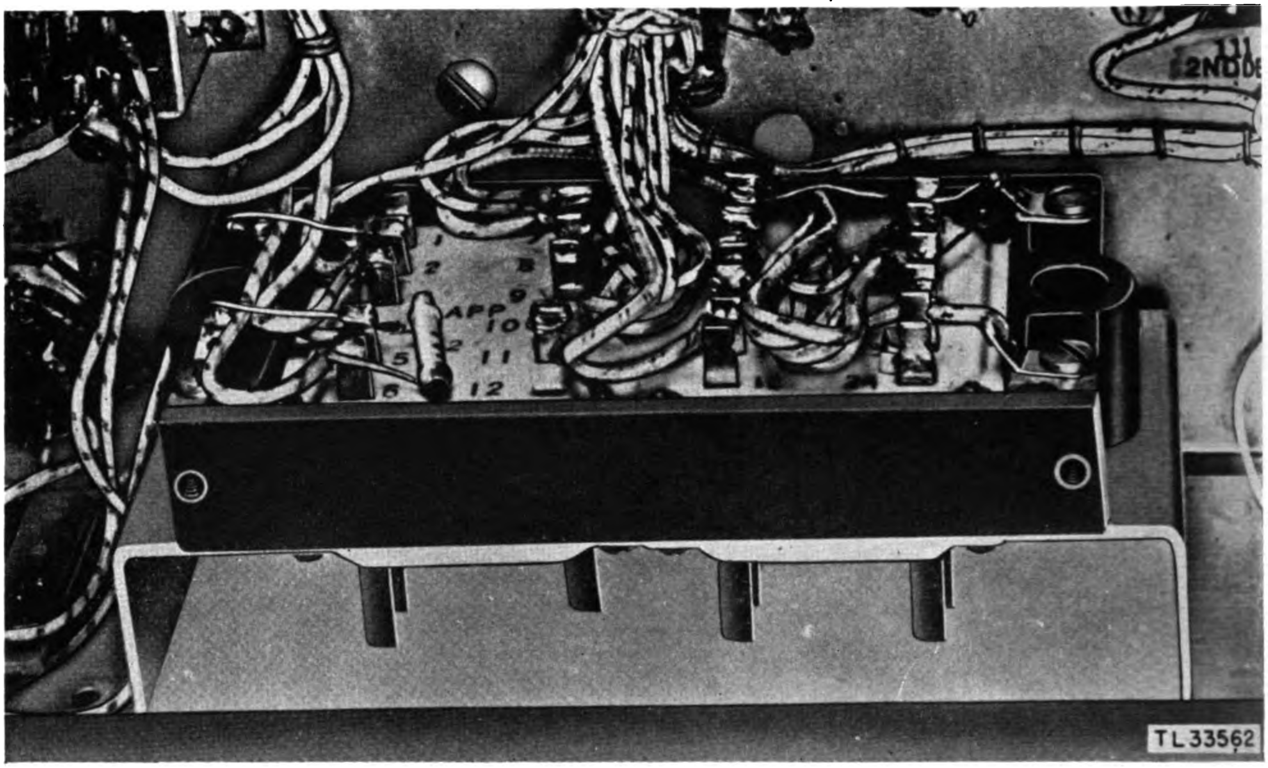


Figure 103. Radio Receiver and Transmitter BC-1267-A, plug shield removed.

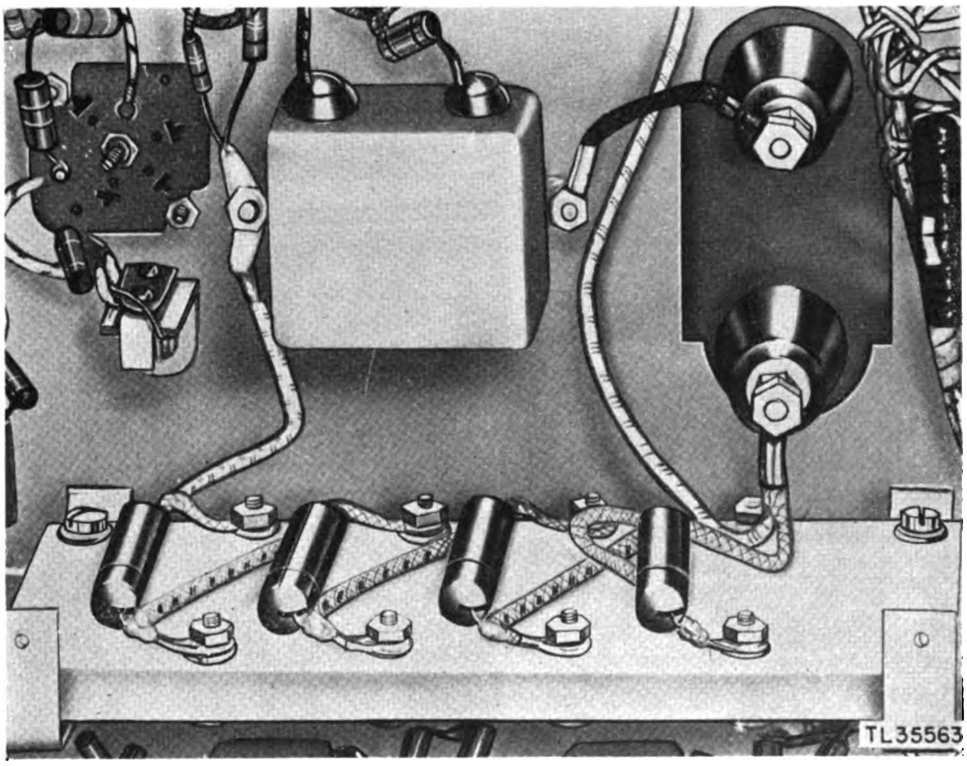
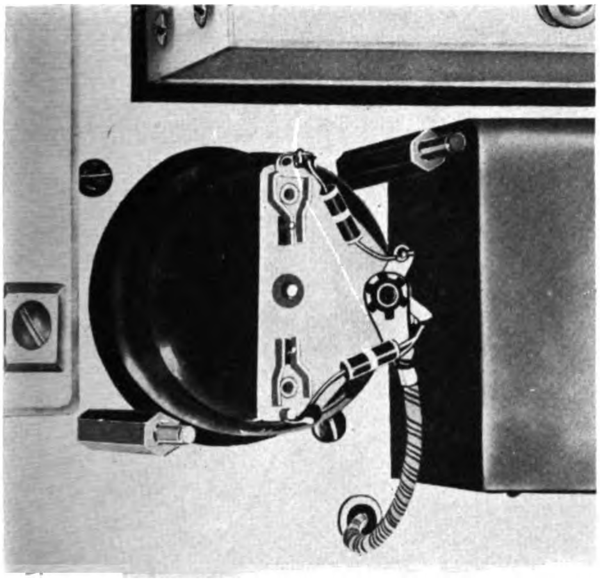


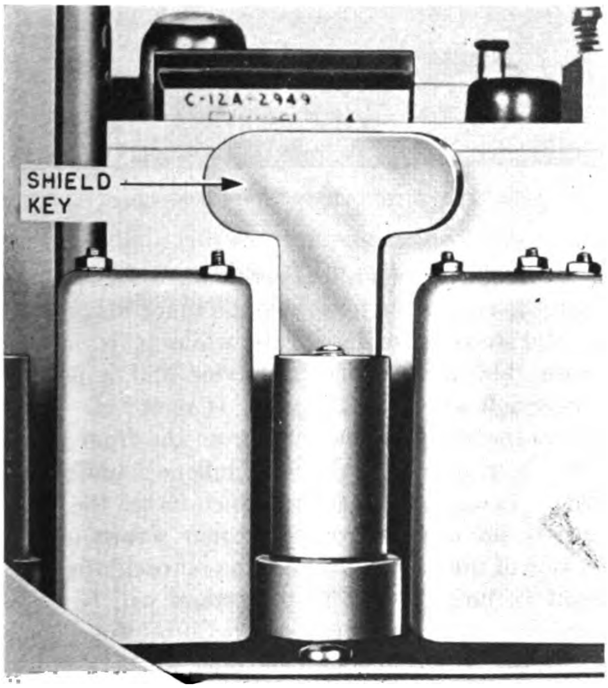
Figure 104. Radio Receiver and Transmitter BC-1267-A, high-voltage shield removed.



TL 35564

Figure 105. Radio Receiver and Transmitter BC-1267-A, modulator tube shield removed.

fastened to the chassis with two screws and to the ceramic terminal board supports with two screws. Remove these four screws and lift the shield off. (See fig. 104.) Ground the capacitor with a screw-



TL35565

Figure 106. Radio Receiver and Transmitter BC-1267-A, tube shield key.

driver. Remove the capacitor or the terminal board. Assemble in reverse order.

i. 2C26 TUBES. To replace the 2C26 tubes, remove the cover of the r-f oscillator unit. Remove the plate and grid caps. Remove the tubes by rocking them gently sideways and pulling upward.

j. TUBE 17. To remove tube 17 (3E29) it is necessary to remove the shield which covers it. Remove the crossbar brace which is mounted between the front panel and the rear fence. Remove the wingnuts and springs which hold the cover in place. These springs are under considerable tension; be

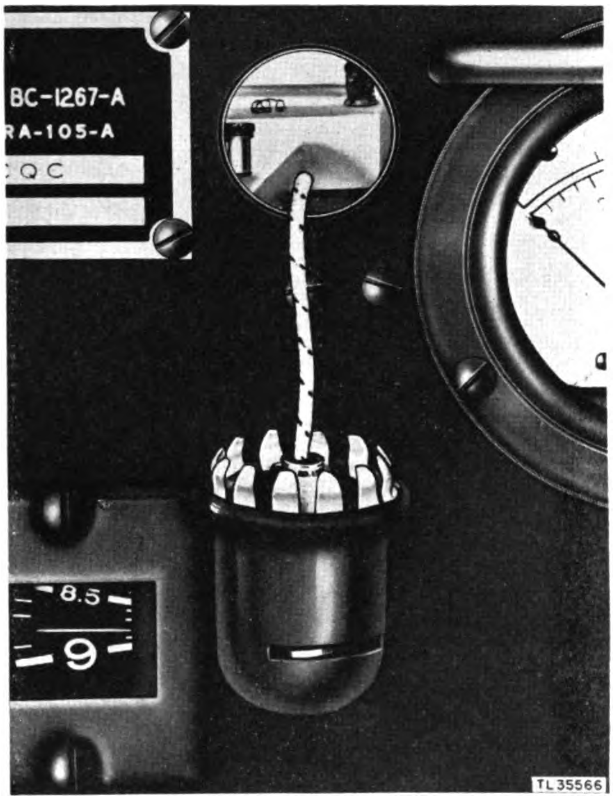


Figure 107. Radio Receiver and Transmitter BC-1267-A, meter-light housing removed from panel.

careful to prevent them from flying off when the nuts are removed. Remove the shield and the ceramic terminal board which is the plate connector for the 3E29 tube. (See fig. 105.) The tube can now be removed by pulling upward. Because this tube has no base, be careful when handling it not to break the seals where the pins leave the glass envelope. Replace in reverse order.

k. TUBE 14. Tube 14 has a shield over it which must be removed. Use the key which is fastened to the chassis next to tube 1 on the receiver section to turn this shield in a counterclockwise direction.

Figure 108. Radio Receiver and Transmitter BC–1267–A, meter pilot lamp removed from housing.

(See fig. 106.) After the shield has been taken off, the tube can be removed without difficulty.

l. METER PILOT LIGHT. The meter pilot light is in a special housing which is fastened to the front panel. Press down on the housing to remove it from the panel. (See fig. 107.) Grasp the wire lead in one hand and the housing in the other. (See fig. 108.) Exert a strong, steady pull which will separate the external housing into the pilot light socket. Push the pilot light into the socket slightly and turn it counterclockwise until it releases. Assemble in reverse order.

m. TRANSMITTER DIAL LIGHT. The transmitter dial light is mounted in a standard bayonet socket. Push the dial light in and turn it counterclockwise until it releases.

n. R-F COILS. (1) In order to replace an r-f coil or core in the r-f tuner, it is necessary to remove the tuner. It is possible to service the tuner for capacitor and resistor replacements while it is in the chassis, but it is easier to service and a neater, quicker job results if the tuner is removed. First remove the crossbar that runs from the front panel to the rear fence. Pull the trombone handles out 1 inch. Loosen all the screws which fasten the front panel to the chassis, except the four screws on the left side of the panel that hold the r-f oscillator box. About 1/8 inch of play in the screws will be sufficient; this play is necessary because the tuning screws on the tuner fit into shoulder washers on the front panel. Remove the tuning-eye tube from its bracket and remove the plate which covers the r-f tuning head. The eye tube is held to the bracket with a thumbnut which must be turned counter-

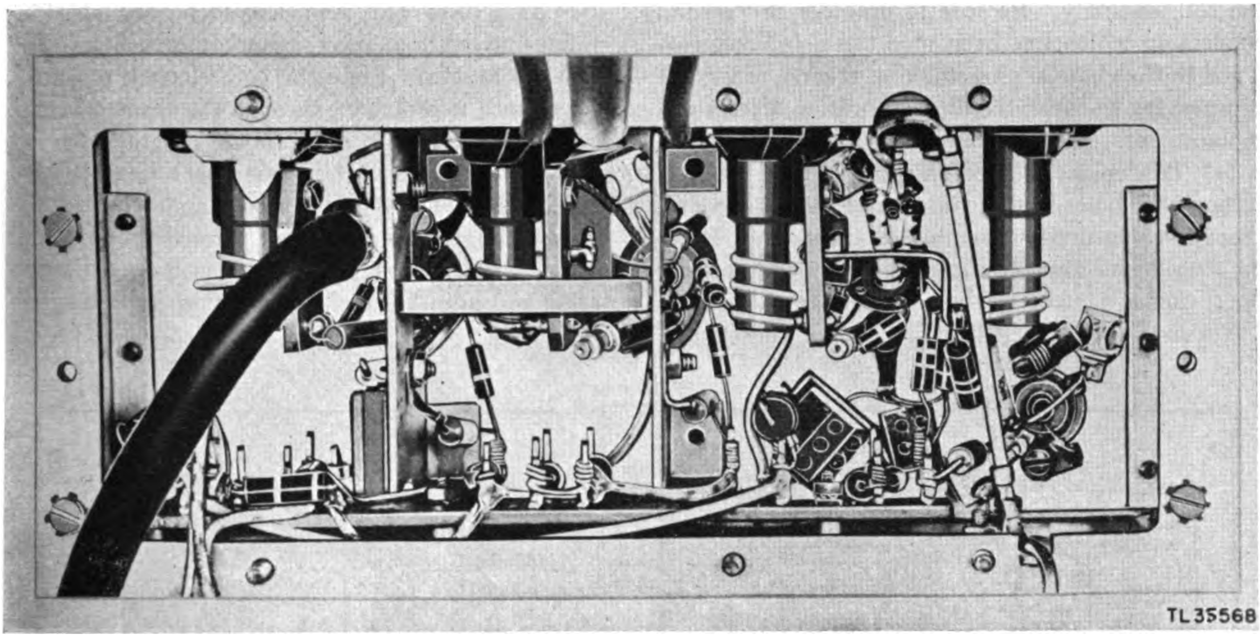


Figure 109. Radio Receiver and Transmitter BC-1267-A, r-f tuner plate removed.

clockwise to loosen. The cover plate can be taken off when the six nuts on the spade lugs are removed. (See fig. 109.) Unsolder the coaxial cable which is connected to capacitor 1–1. Unsolder the three wires which are connected to terminals 1, 2, and 3 on the terminal board on the edge of the tuner cut-out. Unsolder the shielded lead from terminal 5 of i-f transformer 106. Remove the four screws which hold the r-f tuner to the main chassis. Pull the front panel forward 1/8 inch to clear the screwdriver tuning rods and lift the tuner upward until it is clear. Be careful not to break the shielded i-f lead.

(2) After the tuner has been removed, the cores can be taken out. Turn the tuning screw clockwise until the dial reads zero. Measure the distance that the core shaft protrudes through the front panel. This distance should be 1/16 of an inch. (See fig. 110.) When the core is replaced, it must be set to the same distance. Insert a No. 6 Allen wrench in the setscrew which holds the core shaft. (See fig. 111.) Turn the setscrew counterclockwise until the core shaft slides freely.

(3) Slide the core through the holes in the terminal board and the rear of the tuner chassis. When removing the oscillator stage core, it is necessary to unsolder capacitor 5 and bend choke coil 104 downward to provide an unobstructed path for the core. After the core has been removed, the coil assembly may be removed. Unsolder the leads which are connected to the coil assembly; remove the two screws which fasten it to the tuner; then remove

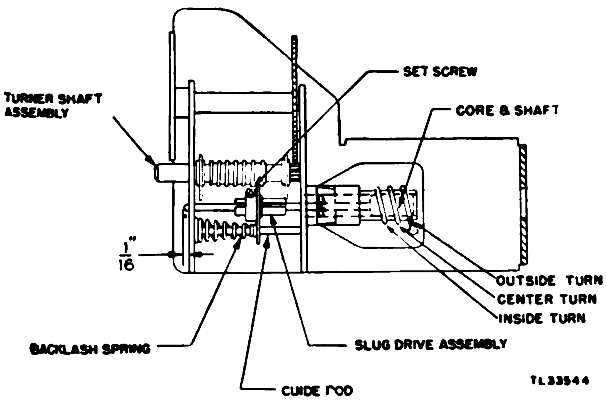


Figure 110. Tuning core measurement adjustment.

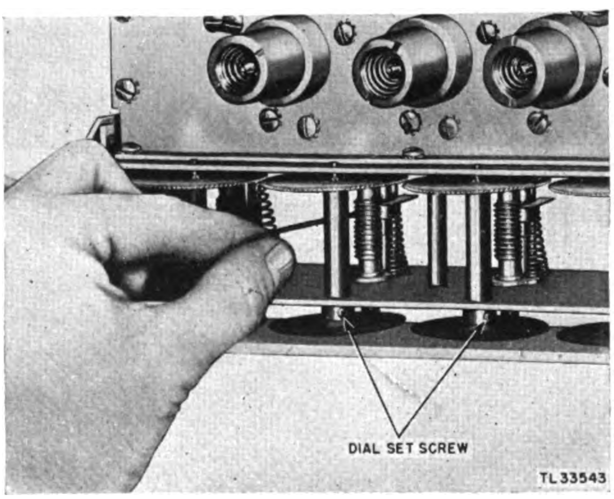


Figure 111. Loosening tuning core with wrench.

the coil assembly. Be sure to unsolder the ground connection which has been made to a bracket fastened to the chassis. Assemble in reverse order. It is necessary to check the dial calibration after a coil replacement. (See par. 54*j*.)

(4) To replace the core, slide it into the coil through the holes in the chassis and terminal board. Place the slug-driver assembly on the sleeve. Place the slug-driver assembly in position by compressing the spring and engaging the bottom edge of the slug-driver assembly with the screw thread tuning rod. (See fig. 110.) This item should be assembled by comparing with another assembly which has also been set at zero. Slide the core shaft through the sleeve until it protrudes through the front panel the distance measured in *n*(2) above. Tighten the setscrew. When the unit is assembled correctly, the stops will engage at exactly zero and 9 on the dial when tuning screw is rotated throughout its entire range. If the stops are not correct, loosen the setscrew and adjust the sleeve position until they are correct.

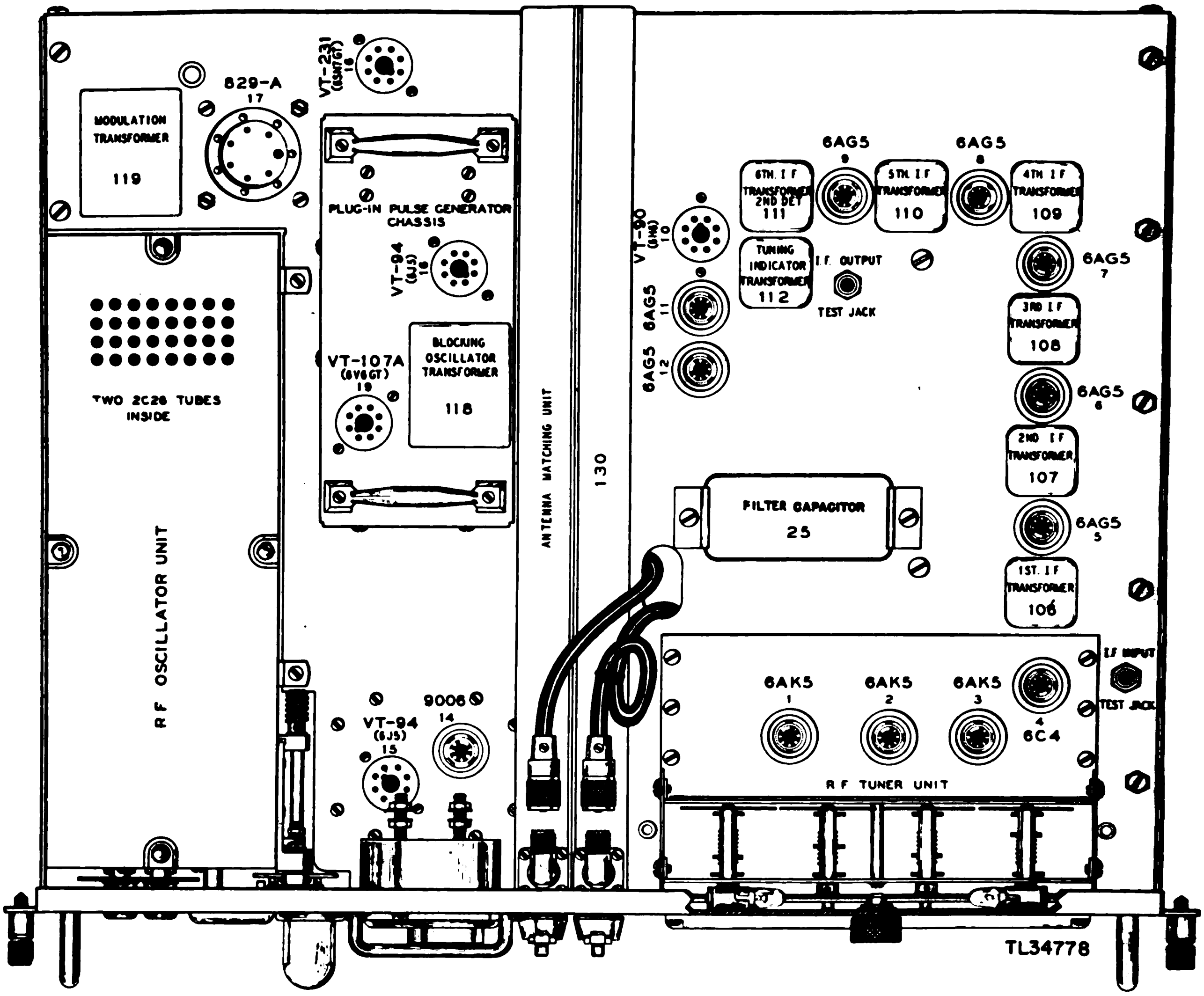


Figure 112. Radio Receiver and Transmitter BC-1267-A, top view showing location of parts.

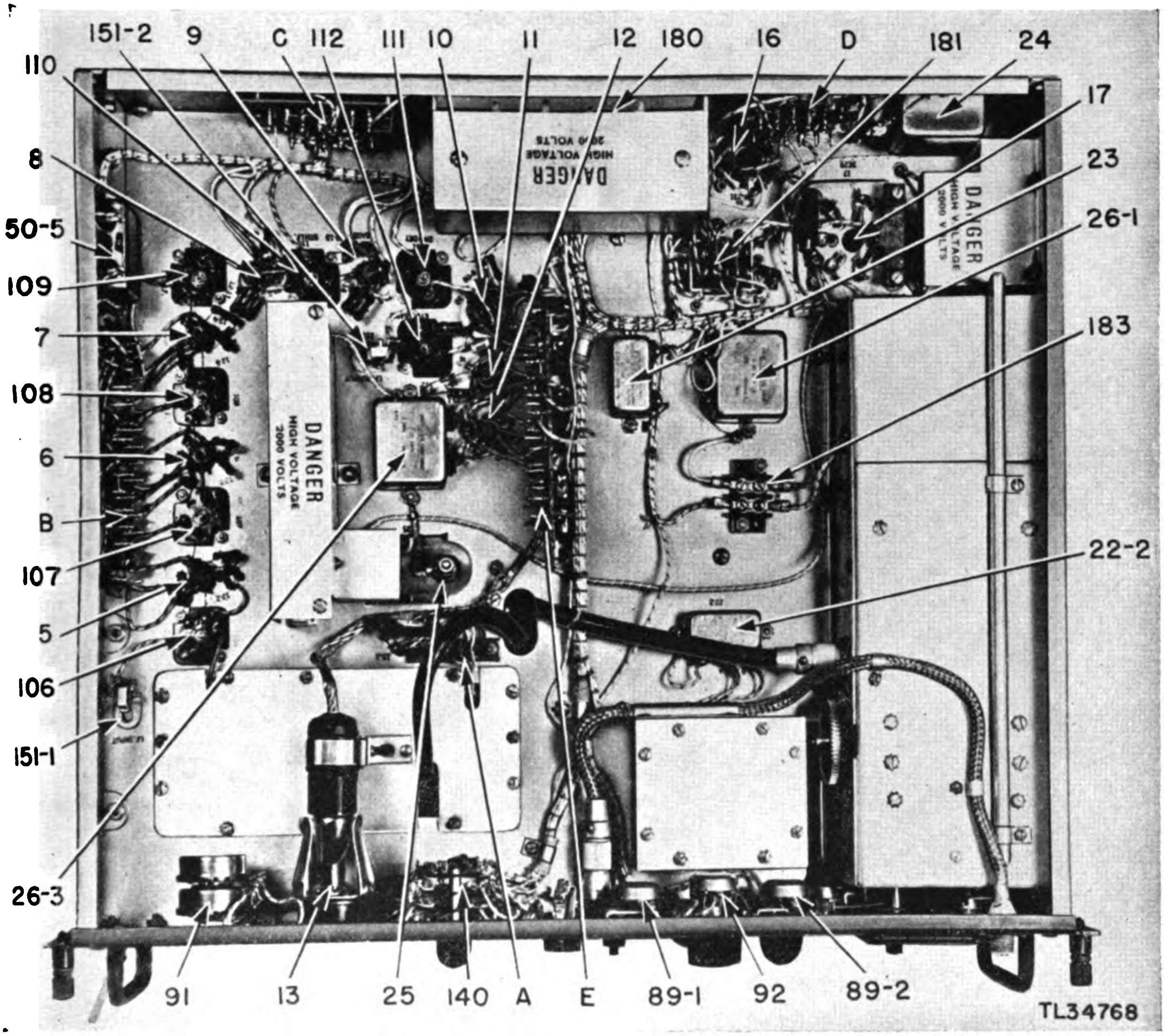
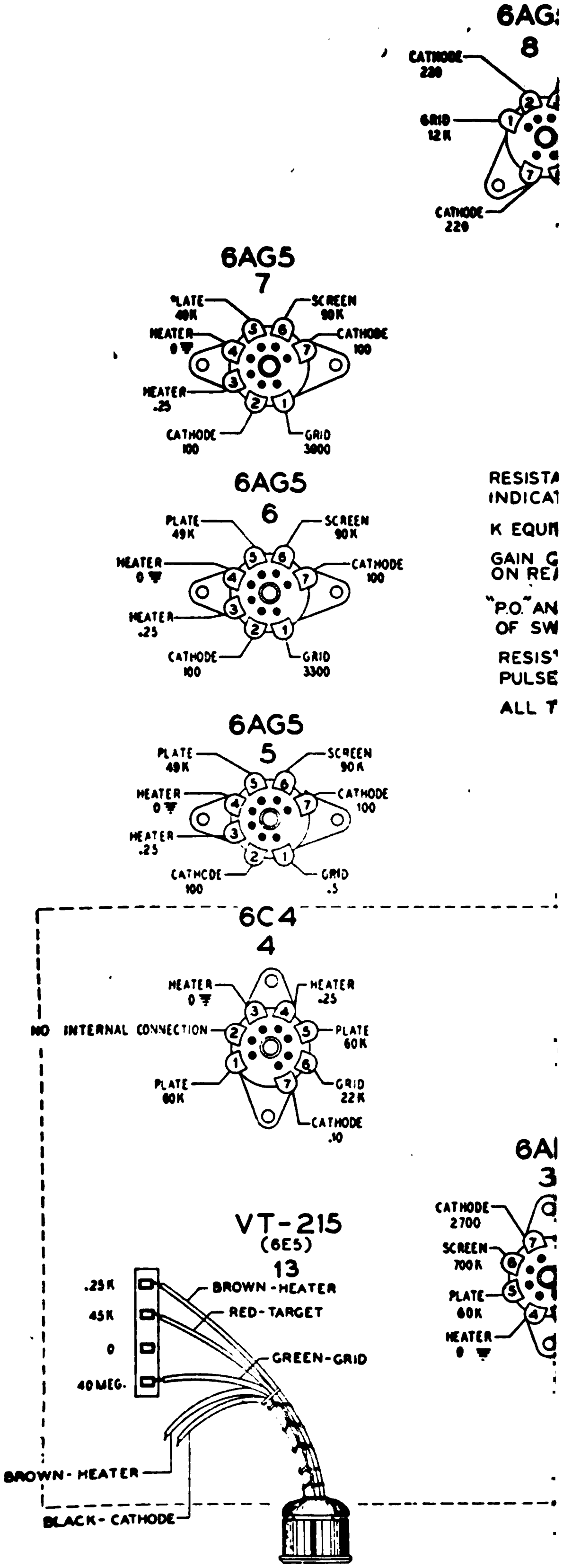


Figure 113. Radio Receiver and Transmitter BC-1267-A, bottom view showing location of parts.


6AG5
8
CATHODE 220
GRID 12 K
CATHODE 220
6AG5
7
PLATE 49K
SCREEN 90K
HEATER 0
CATHODE 100
HEATER .25
CATHODE 100
GRID 3300
6AG5
6
PLATE 49K
SCREEN 90K
HEATER 0
CATHODE 100
HEATER .25
CATHODE 100
GRID 3300
6AG5
5
PLATE 49K
SCREEN 90K
HEATER 0
CATHODE 100
HEATER .25
CATHODE 100
GRID .5
6C4
4
HEATER 0
HEATER .25
NO INTERNAL CONNECTION
PLATE 60K
PLATE 60K
GRID 22K
CATHODE .10
VT-215
(6E5)
13
.25K
45K
0
40 MEG.
BROWN-HEATER
RED-TARGET
GREEN-GRID
BROWN-HEATER
BLACK-CATHODE
CATHODE 2700
SCREEN 700K
PLATE 60K
HEATER 0
RESISTA
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K EQUI
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"P.O." AN
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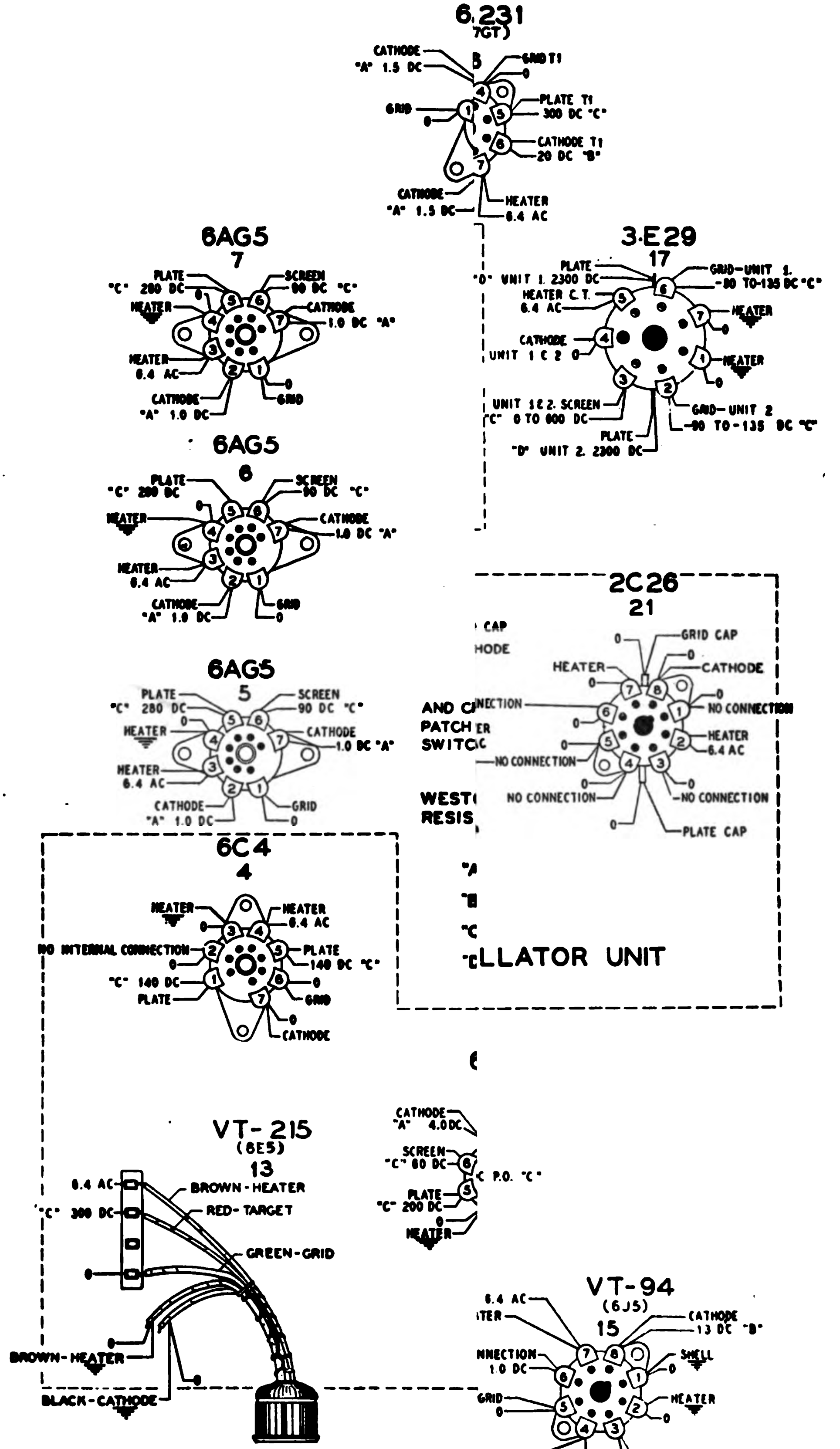
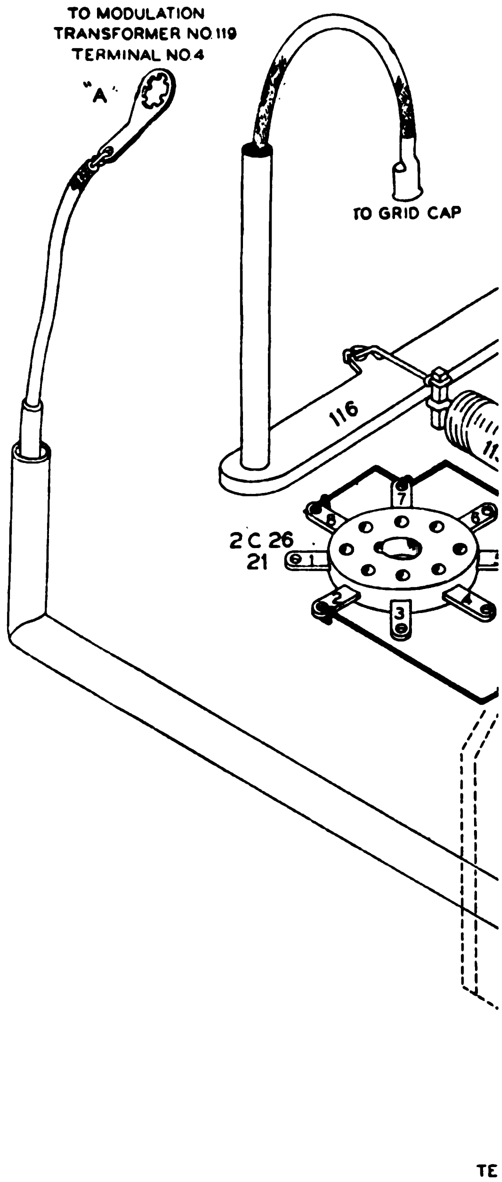

6.231
7GT)
CATHODE "A" 1.5 DC
GRID T1
GRID
PLATE T1 300 DC "C"
CATHODE T1 20 DC "B"
HEATER 6.4 AC
6AG5
7
PLATE "C" 280 DC
SCREEN 90 DC "C"
HEATER
CATHODE 1.0 DC "A"
HEATER 6.4 AC
CATHODE "A" 1.0 DC
GRID
3-E29
17
PLATE "D" UNIT 1. 2300 DC
GRID-UNIT 1. -80 TO-135 DC "C"
HEATER C.T. 6.4 AC
CATHODE UNIT 1 C 2
UNIT 1 & 2. SCREEN "C" 0 TO 600 DC
GRID-UNIT 2 -80 TO-135 DC "C"
PLATE "D" UNIT 2. 2300 DC
6AG5
6
6AG5
5
2C26
21
GRID CAP
HEATER
CATHODE
NO CONNECTION
HEATER 6.4 AC
PLATE CAP
AND C
PATCH
SWITC
WEST
RESIS
LLATOR UNIT
6C4
4
HEATER
HEATER 6.4 AC
NO INTERNAL CONNECTION
PLATE 140 DC "C"
"C" 140 DC PLATE
GRID
CATHODE
CATHODE "A" 4.0 DC
SCREEN "C" 80 DC
P.O. "C"
PLATE "C" 200 DC
VT-215
(6E5)
13
6.4 AC
"C" 300 DC
BROWN-HEATER
RED-TARGET
GREEN-GRID
BLACK-CATHODE
VT-94
(6J5)
15
6.4 AC
CATHODE 13 DC "B"
SHELL
1.0 DC
GRID
HEATER
PLATE 300 DC "C"

TL34780


TO MODULATION
TRANSFORMER NO.119
TERMINAL NO.4
"A"
TO GRID CAP
116
2C26
21
TE

VOLTAGE AND RESISTANCE OF R-F TUNER UNIT TERMINAL BOARD (fig. 117).

Terminal	Volts	Ohms (M = 1,000)
1	180.0 dc	56.0 M
2	250.0 dc	49.0 M
3	6.3 ac	0.2
4	230.0 dc	52.0 M
5	230.0 dc	52.0 M
6	290.0 dc	45.5 M
7	290.0 dc	45.5 M
8	230.0 dc	52.0 M
9	300.0 dc	45.0 M
10	6.3 ac	0.2
11	215.0 dc	53.0 M
12	290.0 dc	45.5 M
13	6.3 ac	0.2
14	230.0 dc	52.0 M
15	290.0 dc	45.5 M
16	100.0 dc	120.0 M
17	230.0 dc	52.0 M
18	0	0
19	100.0 dc	120.0 M
20	6.3 ac	0.2

TEST CONDITIONS

Voltage Measurements:

1. Measurements made between points indicated and chassis.
2. Chassis connected to rack with Cord CD-1106.
3. Line voltage 117.5 volts alternating current.
4. SENSITIVITY control on control unit in extreme clockwise position.

Resistance Measurements:

1. Measurements made between points indicated and chassis.
2. Chassis disconnected from rack.
3. Pins No. 20 and 22 on rear plug grounded.

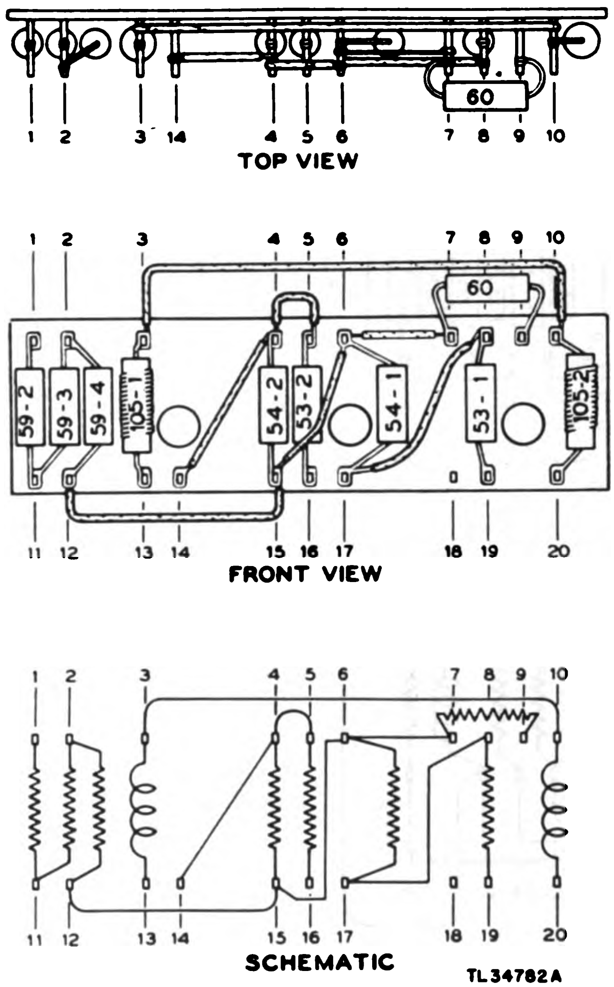


Figure 117. Radio Receiver and Transmitter BC-1267-A, r-f tuner unit terminal board (A).

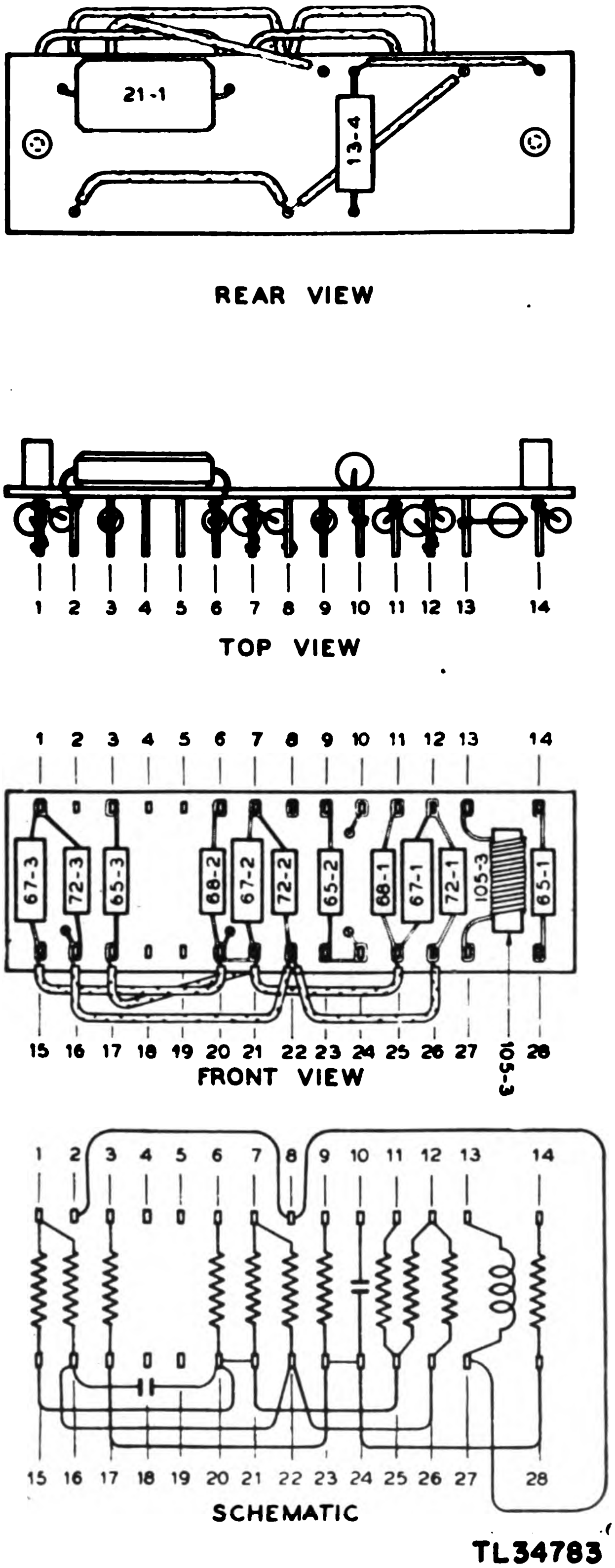


Figure 118. Radio Receiver and Transmitter BC-1267-A, first i-f terminal board (B).

VOLTAGE AND RESISTANCE OF FIRST I-F TERMINAL BOARD (fig. 118).

Terminal	Volts	Ohms (M = 1,000)
1	90.0 dc	90 M
2	6.3 ac	0.2
3	1.0 dc	100.0
4	0	Infinite
5	0	Infinite
6	280.0 dc	49 M
7	90.0 dc	90 M
8	6.3 ac	0.2
9	1.0 dc	100.0
10	0	0
11	280.0 dc	49 M
12	90.0 dc	90 M
13	6.3 ac	0.2
14	1.0 dc	100.0
15	300.0 dc	45 M
16	0	0
17	0	0
18	0	Infinite
19	0	Infinite
20	300.0 dc	45 M
21	300.0 dc	45 M
22	0	0
23	0	0
24	0	0
25	300.0 dc	45 M
26	0	0
27	6.3 ac	0.2
28	0	0

TEST CONDITIONS

Voltage Measurements:

1. Measurements made between points indicated and chassis.
2. Chassis connected to rack with Cord CD-1106.
3. Line voltage 117.5 volts alternating current.
4. SENSITIVITY control on control unit in extreme clockwise position.

Resistance Measurements:

1. Measurements made between points indicated and chassis.
2. Chassis disconnected from rack.
3. Pins No. 20 and 22 on rear plug grounded.

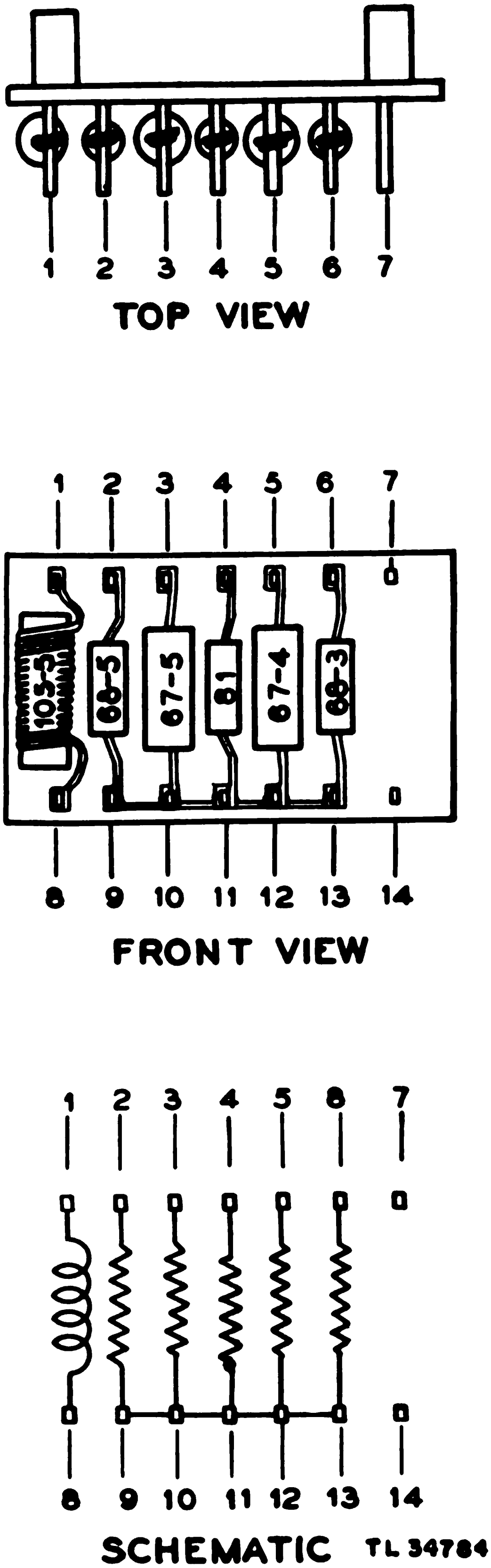


Figure 119. Radio Receiver and Transmitter BC-1267-A, cable terminal board (C).

VOLTAGE AND RESISTANCE OF CABLE TERMINAL BOARD (fig. 119).

Terminal	Volts	Ohms (M = 1,000)
1	6.3 ac	0.2
2	280.0 dc	49 M
3	120.0 dc	145 M
4	280.0 dc	49 M
5	140.0 dc	145 M
6	280.0 dc	49 M
7	0	Infinite
8	6.3 ac	0.2
9	300.0 dc	45 M
10	300.0 dc	45 M
11	300.0 dc	45 M
12	300.0 dc	45 M
13	300.0 dc	45 M
14	0	Infinite

TEST CONDITIONS

Voltage Measurements:

1. Measurements made between points indicated and chassis.
2. Chassis connected to rack with Cord CD-1106.
3. Line voltage 117.5 volts alternating current.
4. SENSITIVITY control on control unit in extreme clockwise position.

Resistance Measurements:

1. Measurements made between points indicated and chassis.
2. Chassis disconnected from rack.
3. Pins No. 20 and 22 on rear plug grounded.

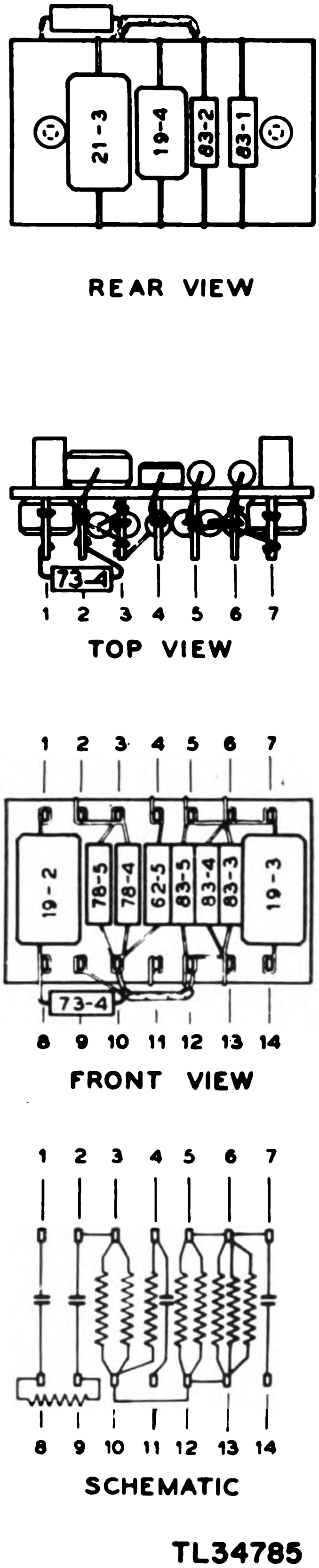


Figure 120. Radio Receiver and Transmitter BC-1267-A, pulse-amplifier terminal board (D).

VOLTAGE AND RESISTANCE OF PULSE-AMPLIFIER TERMINAL BOARD (fig. 120).

Terminal	Volts	Ohms (M = 1,000) (Meg = 1,000,000)
1	0	1 Meg
2	20 dc	10 M
3	20 dc	10 M
4	300 dc	48.3 M
5	75 dc	69 M
6	75 dc	69 M
7	75 dc	69 M
8	0	220
9	0	0
10	300 dc	45 M
11	0	1 Meg
12	300 dc	45 M
13	300 dc	45 M
14	0	1 Meg

TEST CONDITIONS

Voltage Measurements:

1. Measurements made between points indicated and chassis.
2. Chassis connected to rack with Cord CD-1106.
3. Line voltage 117.5 volts alternating current.
4. SENSITIVITY control on control unit in extreme clockwise position.

Resistance Measurements:

1. Measurements made between points indicated and chassis.
2. Chassis disconnected from rack.
3. Pins No. 20 and 22 on rear plug grounded.

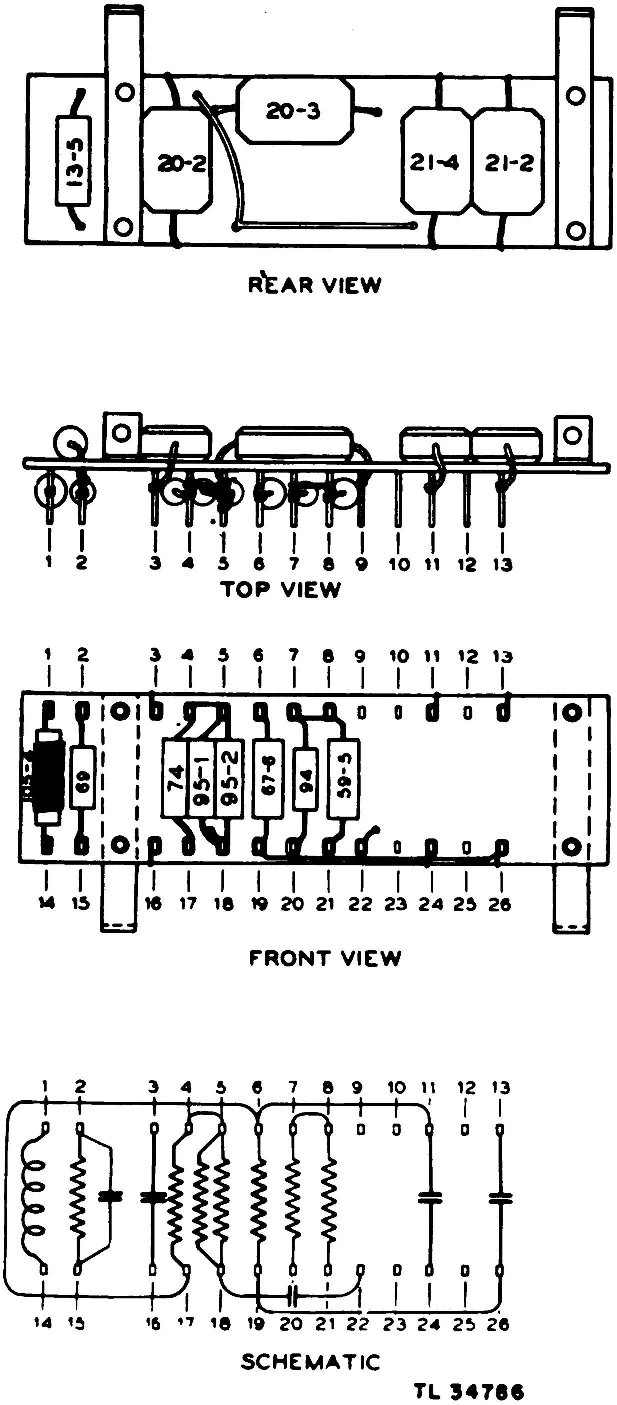


Figure 121. Radio Receiver and Transmitter BC-1267-A. second detector terminal board (E).

VOLTAGE AND RESISTANCE OF SECOND DETECTOR TERMINAL BOARD (fig. 121).

Terminal	Volts	Ohms (M = 1,000) (Meg = 1,000,000)
1	6.3 ac	0.1
2	0	0
3	0	470 M
4	270.0 dc	50 M
5	270.0 dc	50 M
6	300.0 dc	45 M
7	3.3 dc	1500
8	3.3 dc	1500
9	0	Infinite
10	0	Infinite
11	300.0 dc	45 M
12	0	Infinite
13	0	0
14	6.3 ac	0.2
15	0	40 Meg
16	0	17 M
17	300.0 dc	45 M
18	220.0 dc	60 M
19	140.0 dc	145 M
20	0	0
21	10.0 dc	4800 M
22	0	470 M
23	6.3 ac	0.1
24	0	0
25	0	Infinite
26	140.0 dc	145 M

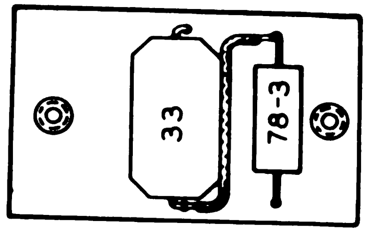
TEST CONDITIONS

Voltage Measurements:

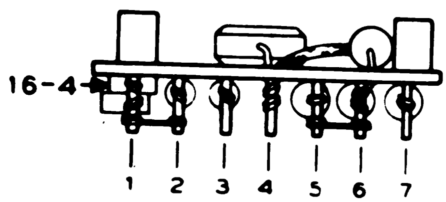
1. Measurements made between points indicated and chassis.
2. Chassis connected to rack with Cord CD-1106.
3. Line voltage 117.5 volts alternating current.
4. SENSITIVITY control on control unit in extreme clockwise position.

Resistance Measurements:

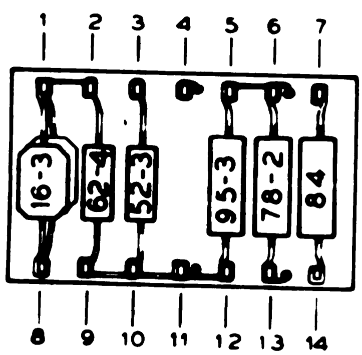
1. Measurements made between points indicated and chassis.
2. Chassis disconnected from rack.
3. Pins No. 20 and 22 on rear plug grounded.



REAR VIEW



TOP VIEW



FRONT VIEW

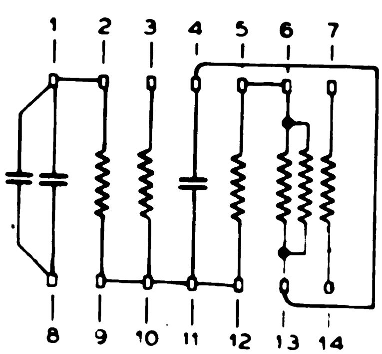


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Figure 122. Radio Receiver and Transmitter BC-1267-A, blocking-oscillator terminal board.

VOLTAGE AND RESISTANCE OF BLOCKING-OSCILLATOR TERMINAL BOARD (fig. 122).

Terminal	Ohms (M = 1,000)
1	3.3 M
2	3.3 M
3	2.2 M
4	135.0 M
5	10.0 M
6	10.0 M
7	Infinite
8	Infinite
9	0
10	0
11	0
12	0
13	135.0 M
14	Infinite

TEST CONDITIONS

1. Measurements made between points indicated and chassis.
2. Blocking oscillator sub-chassis removed from transmitter chassis.

Section V. CONTROL UNIT BC–1266–A

56. General

a. Field maintenance for Control Unit BC–1266–A requires only occasional adjustment of the sweep. The controls labeled 10K YD. GAIN, and 10K YD. CENT., listed under 10K YD., control the 10,000-yard sweep. The controls labeled 100K YD. GAIN, and 100K YD. CENT., listed under 100K YD., control the 100,000 yard sweep. The controls labeled CALIB. and VERT. CENT. are adjustments for calibrating the sweep circuit and positioning the sweep trace. If a fault is indicated, *do not* adjust the controls at random. To do this will aggravate the condition and make it very difficult to readjust the unit if a trouble exists.

b. If a sweep trace does not appear on the display tube, adjust ONLY the INTENSITY and VERT. CENT. controls. Because the sweep voltage is developed by one of the last circuits in the control unit, no sweep will be a common symptom indicating trouble. It is well to remember when isolating a fault that the sweep circuit is triggered by two sources dependent upon the position of the sweep range switch. Many of the faults encountered within the control unit can be isolated to a particular circuit by means of the sweep range and STANDBY-OPERATE switches. When using the switch positions in trouble shooting, remember that there may be a fault in the switch itself.

c. If the headset supplied with a Plug PL–55 is available, it can be used for determining whether a signal is present at the test jacks of the control unit. Only a steady tone will be heard in the headset; this tone will not be adequate to determine whether or not an abnormal signal exists.

d. The position of the gain and spread controls should always be checked before attempting to trouble shoot a faulty circuit. If any of the controls are in the extreme counterclockwise position, no sweep trace will appear on the display oscilloscope.

57. Tube Replacement

A defective tube is often the cause of faulty operation. If the symptoms indicate that a certain tube is probably defective, replace the tube and adjust only those controls directly associated with the circuit in which the replacement was made. If the fault is not cleared, return the controls to their original settings, so that additional complications are not introduced. All tubes employed in the control unit are easily accessible when the cover is removed from the unit. The usual procedure is followed when removing the tubes.

58. Removal of Unit

a. Before attempting to remove the control unit from the rack, loosen the two captive screws in the lower corners of the panel. Grasp the handles on the front panel and pull forward. Disconnect connecting cables and slip the chassis from the rack.

b. The chart in paragraph 59 indicates the symptoms, probable location of faults, and procedure for locating the faulty part.

59. Control Unit Trouble-shooting Chart

A. SYMPTOMS:

1. No 100K YD. sweep.
2. No 10K YD. sweep.
3. No spot on the display tube.

PROBABLE LOCATION OF FAULT	PROCEDURE
Improper adjustment of controls.	1. Adjust INTENSITY control. 2. If fault is not cleared, leave the INTENSITY at maximum and adjust the VERT. CENT. control. 3. If fault is not cleared, return the VERT. CENT. control to its original position and see item below.
No sync voltage.	1. Check cable connection at SYNC IN connection. 2. Plug a test oscilloscope into jack 121–6. 3. If no sync input voltage is present, check the input cording and the sync source in Radio Set SCR–545–A. 4. If fault is not cleared, see item below.

PROBABLE LOCATION OF FAULT	PROCEDURE
Faulty circuit between input and delay oscillator.	1. Place the STANDBY-OPERATE switch in the OPERATE position. 2. Plug a test oscilloscope jack 121–4, located in the *jack panel* on the side of the control unit. 3. If the oscilloscope indicates poor waveform or if no waveform can be detected, remove the control unit. 4. Trace the sync voltage signal from the input through to the delay oscillator. 5. Replace the tube in the suspected circuit. 6. If the fault is not cleared, make a voltage and resistance check of the faulty circuit. 7. If the fault is not cleared, see item below.
Sweep multivibrator.	1. Plug a test scope into SWEEP jack 121–9. 2. If the sweep voltage is present at the test jack, circuit is normal. 3. If sweep voltage does not appear at the test jack, replace the sweep-multivibrator tube (9). 4. If the fault is not cleared, make a voltage and resistance check of the sweep-multivibrator circuit. 5. If fault is not cleared, see item below.
Pedestal multivibrator and mixer circuit.	1. Plug test scope into jack 121–1. 2. If an incorrect waveform is observed or if no waveform is present, replace tubes 5 and 6. 3. If fault is not cleared, plug test scope into jack 121–4. 4. If waveform observed is normal, the input voltage to the pedestal multivibrator is normal. 5. Plug test scope into jack 121–9. 6. If sweep voltage is observed, the sweep multivibrator is functioning and feeding a signal to the mixer circuit. 7. Make a voltage and resistance check of the circuit. 8. If fault is not cleared, see item below.
Cathode-follower.	1. Plug test scope into jack 121–1. 2. If correct waveform is not present or if no waveform is shown, replace tube 7. 3. If the fault is not cleared, make a voltage and resistance check of the circuit. 4. If fault is not cleared, see item below.
Cathode-ray tube circuit	1. Check the filament voltage. 2. If there is no filament voltage, check the filament circuit back through to the filament supply. 3. If the fault is not cleared, make a continuity check on the filament of the cathode-ray tube. Replace tube if open. 4. Check the cathode voltage of the cathode-ray tube. 5. If there is no cathode voltage, replace tube 14 in the power supply. 6. Check the power supply circuit.

B. SYMPTOMS:

1. 100K YD. sweep normal.
2. No 10K YD. sweep.

PROBABLE LOCATION OF FAULT	PROCEDURE
Sweep range switch.	1. Check the sweep range switch and associated circuit. 2. If fault is not cleared, see item below.
Defective circuit between sweep-multivibrator (tubes 9–A and 9–B) and the sweep-trigger circuit (tube 12–A).	1. If there is no sweep voltage at the test jack 121–9, trace the signal through from tubes 9–A and 9–B to tube 12–A. 2. Replace the tube in the suspected stage. 3. If the fault is not cleared, make a voltage and resistance check on the defective circuit.

C. SYMPTOMS:

1. No sweep in 10K YD. position or in both positions.
2. Bright spot on the display tube.

Warning: When this condition exists, reduce the INTENSITY control, or damage to the cathode-ray tube will result.

PROBABLE LOCATION OF FAULT	PROCEDURE
Range circuits.	1. If sweep appears in the 100K YD. position, trace the signal from the sweep multivibrator (tubes 9–A and 9–B) through to the spread amplifier (tube 12–B). 2. Replace the tube in suspected circuit. 3. If the fault is not cleared, make a voltage and resistance check on the defective circuit. 4. If the fault is not cleared, see item below.
Sweep circuit.	1. If the sweep does not appear in either position, the trouble lies between the sweep multivibrator and the display tube. 2. Trace the sweep signal from the sweep multivibrator through to the display tube. 3. Replace the tube in the suspected circuit. 4. If the fault is not cleared, make a voltage and resistance check on the defective circuit.

D. SYMPTOM:

Extremely bright and badly focused display.

PROBABLE LOCATION OF FAULT	PROCEDURE
High-voltage supply.	1. Check the grid voltage of the cathode-ray tube. 2. If there is no grid voltage, check the continuity of resistor 61. 3. If fault is not cleared, see item below.

PROBABLE LOCATION OF FAULT	PROCEDURE
Abnormal grid bias on the cathode-ray tube.	1. If there is no potential difference between the grid and cathode, make a continuity check on capacitor 18 or resistor 83–1. 2. Check for a short in the cathode-ray tube from grid to cathode. 3. If the fault is not cleared, see item below.
Capacitor 13.	1. This is indicated by intermittent flashes on the screen of the display tube. 2. Check capacitor 13 for leakage.

E. SYMPTOM:

Astigmatism.

Note. This is indicated by the failure of the sweep to focus properly at all points.

PROBABLE LOCATION OF FAULT	PROCEDURE
Cathode-ray tube.	1. Adjust the FOCUS control. If a portion of the sweep trace goes out of focus as another portion is brought into focus, a faulty cathode-ray tube is indicated. *Note.* If the FOCUS control does not operate, the cathode ray tube should not be suspected.

F. SYMPTOM:

FOCUS control does not affect the sweep trace.

PROBABLE LOCATION OF FAULT	PROCEDURE
High-voltage supply.	1. Check the negative high voltage to the cathode-ray tube. 2. Check for defective potentiometer 97 or capacitor 17. 3. If fault is not cleared, see item below.
Cathode-ray tube.	1. Check the cathode-ray tube for shorted elements. 2. Replace the cathode-ray tube. 3. If the fault is not cleared, see item below.

G. SYMPTOM:

INTENSITY control does not affect the display.

PROBABLE LOCATION OF FAULT	PROCEDURE
Potentiometer 96.	1. Check the continuity of potentiometer 96, and replace if defective.

H. SYMPTOM:

Incorrect action of the 100K CENT. and 10K CENT. controls.

PROBABLE LOCATION OF FAULT	PROCEDURE
No voltage to controls 95–1 and 95–2 and section 3 of the sweep range switch.	1. Make a voltage check on the circuit. 2. Trace the voltage supply circuit through to the power supply.

PROBABLE LOCATION OF FAULT	PROCEDURE
	3. Check the continuity of the sweep-range circuit. 4. If fault is not cleared, see item below.
Resistors 65, 68, 84, 71–3, or 71–4.	1. Check the continuity of resistors 65, 68, 84, 71–3 and 71–4. 2. If fault is not cleared, see item below.
Plate-coupling capacitor.	1. Make a continuity check of the coupling capacitors. 2. If a capacitor is suspected, replace it.

I. SYMPTOM:

Incorrect action of the 100K GAIN and 10K GAIN controls.

PROBABLE LOCATION OF FAULT	PROCEDURE
Defective circuit between saw-tooth generator (tubes 10 and 11) and the cathode-ray tube.	1. This is indicated by the 100K and 10K GAIN controls operating but not producing sufficient display amplitude. 2. To trouble shoot the circuit, follow the procedure described in H. Symptom. 3. If fault is not cleared, see item below.
100K and 10K GAIN controls.	1. If the 100K and 10K GAIN controls have no effect on the display when it is rotated, a defective control is indicated. 2. Make a continuity check of potentiometer 94–2 in the 10K YD. position and potentiometer 94–1 in the 100K YD. position. 3. Replace either of the potentiometers that appears to be defective.

J. SYMPTOM:

Horizontal instability.

PROBABLE LOCATION OF FAULT	PROCEDURE
Improper adjustment of the DIVISION control.	1. Adjust the DIVISION control. 2. If fault is not cleared, replace tube 2. 3. Make a voltage and resistance check on the divider multivibrator circuit. 4. Check potentiometer 93.

K. SYMPTOMS:

1. STANDBY-OPERATE switch in the STANDBY position.
2. Transmitter pulse still appears on the display tube.

PROBABLE LOCATION OF FAULT	PROCEDURE
STANDBY-OPERATE switch (123).	1. Check the STANDBY-OPERATE switch for mechanical operation and possible shorted or open circuit.

L. SYMPTOMS:

1. STANDBY-OPERATE switch in the OPERATE position.
2. Transmitter pulse does not appear on the display tube.

PROBABLE LOCATION OF FAULT	PROCEDURE
SENSITIVITY control (98).	1. Rotate the SENSITIVITY control to maximum. 2. If no "grass" appears on the display tube, check the continuity of potentiometer 98. 3. If fault is not cleared, see item below.
No sync signal to transmitter.	1. Check the sync signal at jack 121–4 on the control unit. 2. If the sync signal does not appear at the test jack 121–4, trace the signal through from the delay oscillator. 3. Replace any suspected tubes. 4. If fault is not cleared, make a voltage and resistance check on the defective circuit. 5. If fault is not cleared, see item below.
Vertical-deflection amplifier circuit.	1. Check the signal at the VERT. INPUT jack 121–3. 2. If the signal is present at the test jack, replace tube 13. 3. If fault is not cleared, make a voltage and resistance check on the circuit. 4. If the signal is not present at the test jack, the trouble lies in the receiver.

M. SYMPTOM:

The SENSITIVITY control on the control unit has no effect on the gain of the equipment.

PROBABLE LOCATION OF FAULT	PROCEDURE
SENSITIVITY control (98) open.	1. A defective SENSITIVITY control is indicated if no "grass" appears on the sweep trace of the display tube. 2. Check the continuity of control 98. 3. If the fault is not cleared, see item below.
SENSITIVITY control (98) shorted.	1. This is indicated by a band of "grass" on the display tube, which has a constant amplitude. 2. Check the continuity of control 98 and associated circuit.

N. SYMPTOM:

No spread action.

PROBABLE LOCATION OF FAULT	PROCEDURE
Defective circuit (tube 12).	1. Replace tube 12. 2. If fault is not cleared, make a voltage and resistance check on the spread circuit.

PROBABLE LOCATION OF FAULT	PROCEDURE
	3. If spread voltage is not present, it is probable that the lobe switch or the cording to the lobe switch is defective.
	4. If fault is not cleared, see item below.
SPREAD control (100).	1. Check the continuity of potentiometer 100.
	2. If fault is not cleared, make a continuity check on resistors 63–2, 70, 89, and capacitor 2–5.

O. SYMPTOM:

Spread voltage present at all times, regardless of the position of the SPREAD control.

PROBABLE LOCATION OF FAULT	PROCEDURE
SPREAD control (100).	1. Check the continuity of the SPREAD control (100).
	2. If fault is not cleared, make a continuity check on the associated circuits.

P. SYMPTOM:

The reply pulses occasionally appear greater in amplitude.

PROBABLE LOCATION OF FAULT	PROCEDURE
Blanking amplifier circuit (tube 7B).	1. Replace tube 7.
	2. If the fault is not cleared, make a voltage and resistance check on the blanking-amplifier circuit.
	3. Check lobe switch and wiring.

Q. SYMPTOMS:

1. SENSITIVITY control set at maximum.
2. Excessive noise and extremely wide pulses.

PROBABLE LOCATION OF FAULT	PROCEDURE
Receiver output circuit.	1. Check the cathode circuit of the cathode-follower tube (12).

60. Removal and Replacement of Cathode-ray Tube

a. To remove the cathode-ray tube, loosen the four captive screws which hold the escutcheon, and at the same time push the escutcheon against the panel. (Spring pressure on the cathode-ray tube tends to push the escutcheon forward.) When the captive screws have been completely disengaged from the panel, (but not removed from the escutcheon) allow the escutcheon to come forward and remove it. The tube extends forward enough to allow it to be pulled from its socket. If it is difficult to get sufficient hold on the rim of the tube, a rocking motion of the cathode-ray tube socket will help to loosen it. When the tube has been disengaged from the socket, it should be carefully brought forward until the high-voltage clip lead attached to the side of the tube can be reached. Pull the rubber-covered clip off the terminal and remove the tube. Do this carefully to avoid unnecessary jarring of the tube.

Caution: The high-voltage lead attached to the side of the cathode-ray tube carries very dangerous potentials when the equipment is operating. Do not attempt to remove or replace the cathode-ray tube without first removing the control unit from the rack. When handling cathode-ray tubes, protect eyes and hands adequately. Wear goggles and an overcoat to protect the chest and abdomen.

b. To install a cathode-ray tube, first pull out the high-voltage clip lead until the slack is taken up, and insert the tube far enough to allow the connection to be made. Snap the metal clip over the pin in the center of the side terminal of the cathode-ray tube. Rotate the tube so that this connection is at the bottom (nearest the chassis) and push the tube back to the socket. Further slight rotation of the tube will allow the key on the large center pin of the tube to engage the keyway in the socket. Push the tube firmly into the socket. If the tube needs alignment, make this adjustment as described below. Replace the escutcheon, making sure that the hole in the rim, which holds the light shield in place, is at the top. Push the escutcheon back to the panel and tighten the captive screws. When a new cathode-ray tube is installed, it will usually be necessary to align it so that the sweep is horizontal. With the escutcheon removed, loosen the four screws around the rim of the cathode-ray tube socket and thus allow the tube and socket to be rotated together. To make the adjustment have the unit operating. Turn the sweep range switch to the 10K position and the STANDBY-OPERATE switch to the STANDBY position. Turn the SENSITIVITY control to its extreme counterclockwise position. Rotate the tube and socket to line up the pattern with the top and bottom of the panel. Turn unit off. Carefuly avoid further rotation of the tube, and tighten the four screws on the socket rim. Replace the escutcheon as described above.

61. Alignment

Note. Allow at least one minute for the equipment to warm up before making the following adjustments.

a. PRELIMINARY. (1) If no image appears on the screen of the control unit, slowly turn the INTENSITY control clockwise until a line appears.

(2) Adjust the FOCUS control by turning the control in one direction and then in the opposite direction until a sharply defined line is obtained.

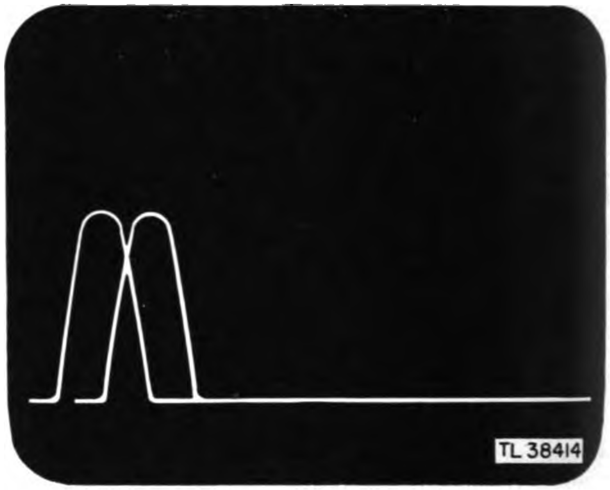


Figure 125. Control unit display tube pattern.

(3) Readjust the INTENSITY control until a visible, but not bright, line is obtained.

(4) Turn the sweep range switch to the 100K YD. position and adjust the 100K YD. CENT. control until the left end of the line is one-eighth of

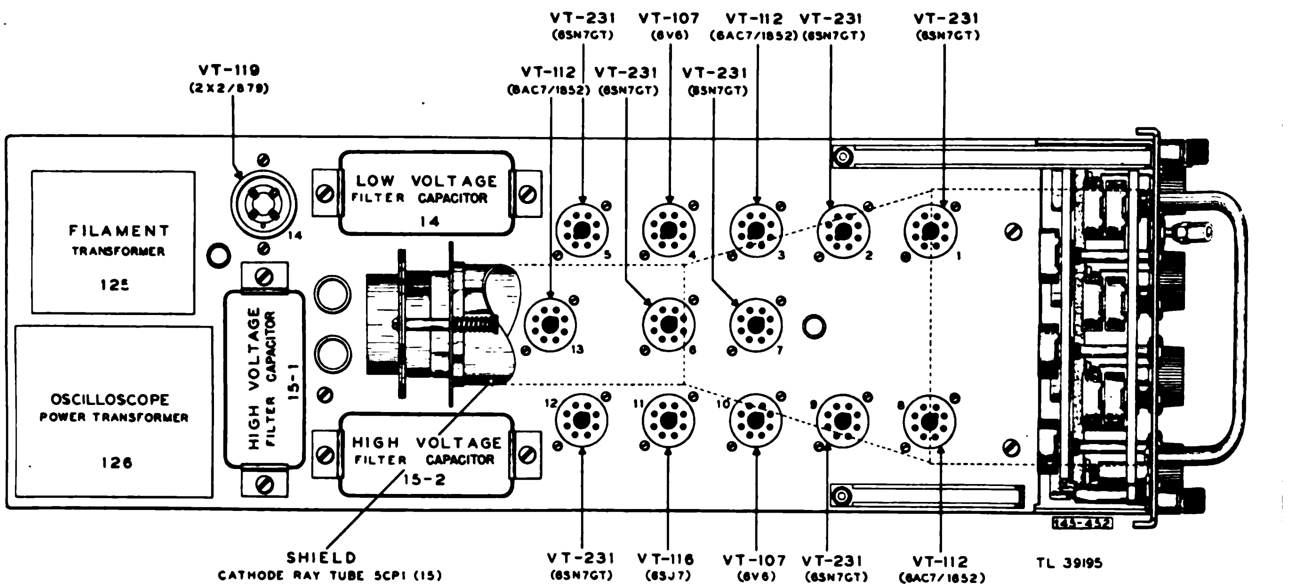


Figure 126. Control Unit BC-1266-A, top view showing location of parts.

an inch from the left edge of the visible portion of the screen.

(5) Adjust the 100K YD. GAIN control until the right end of the line is one-eighth of an inch from the right edge of the visible portion of the screen. It may now be necessary to readjust the 100K YD. CENT. control.

(6) Turn the range switch to the CALIB. position. A series of waves will appear on the screen.

(7) Turn the CALIB. control in a counterclockwise direction until 12 complete cycles are visible.

(8) Turn the range switch back to the 10K YD. position. Follow the same procedure for adjusting the 10K YD. GAIN control as was used for adjusting the 100K YD. GAIN control.

(9) With the sweep range switch in the 10K YD. position, the STANDBY-OPERATE switch in the STANDBY position, and the SENSITIVITY control retarded, rotate the SPREAD control to the right. The pattern should split (fig. 125) if the lobe switch is operating.

b. Division. (1) Turn the range switch to the TEST position.

(2) Turn the INTENSITY control in a clockwise direction until a line is plainly visible on the screen.

(3) Plug one end of Cord CD–1105 to jack 120 and the other end to jack 121–6 on the side of the control unit. For this operation the control unit is drawn forward a short distance and the plate covering the jacks removed.

Caution: Make sure that the control unit is not pulled out far enough to tip forward.

(4) Adjust potentiometer 93 (fig. 41) until a distinctive sharp pulse appears on each extremity of the baseline.

(5) Pull out the test cable plugs.

(6) Turn the range switch to the 100K YD. position.

(7) Turn the INTENSITY control in a counterclockwise direction until the line is plainly visible but not bright.

(8) Adjust the VERT. CENT. control until the pattern is ½ inch above the bottom of the visible portion of the screen.

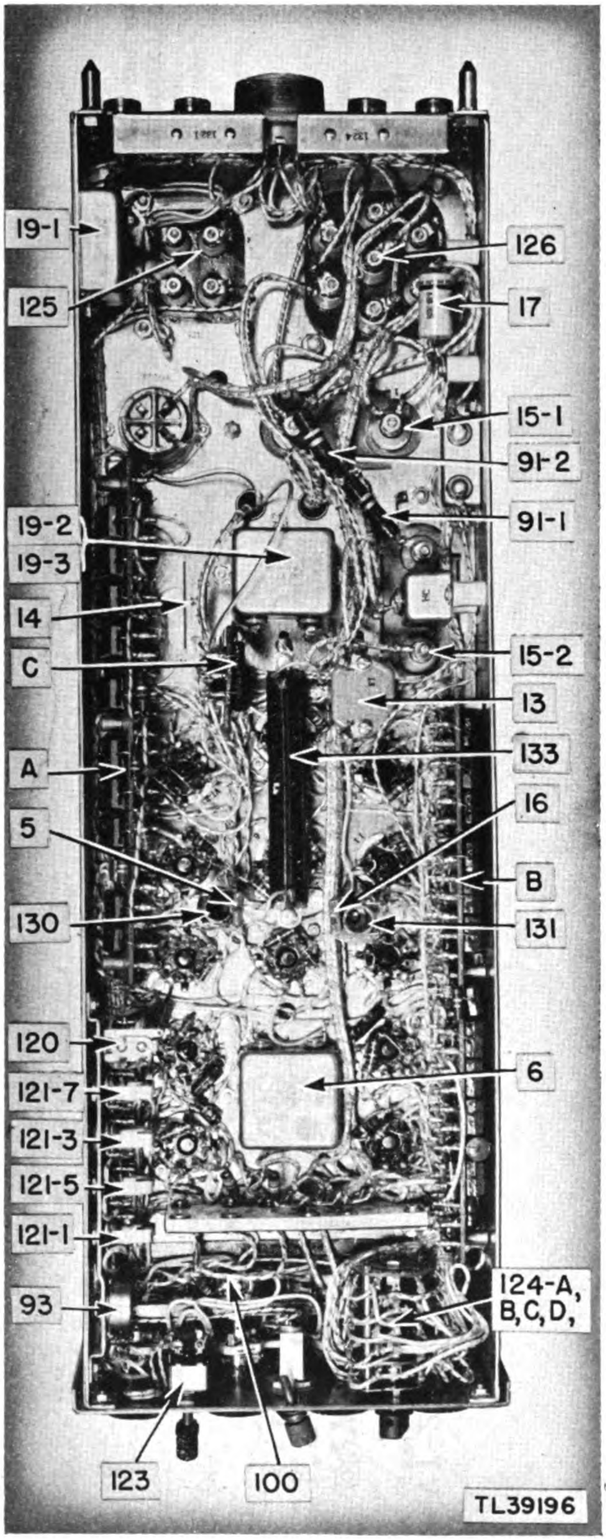


Figure 127. Control Unit BC–1266–A, bottom view showing location of parts.

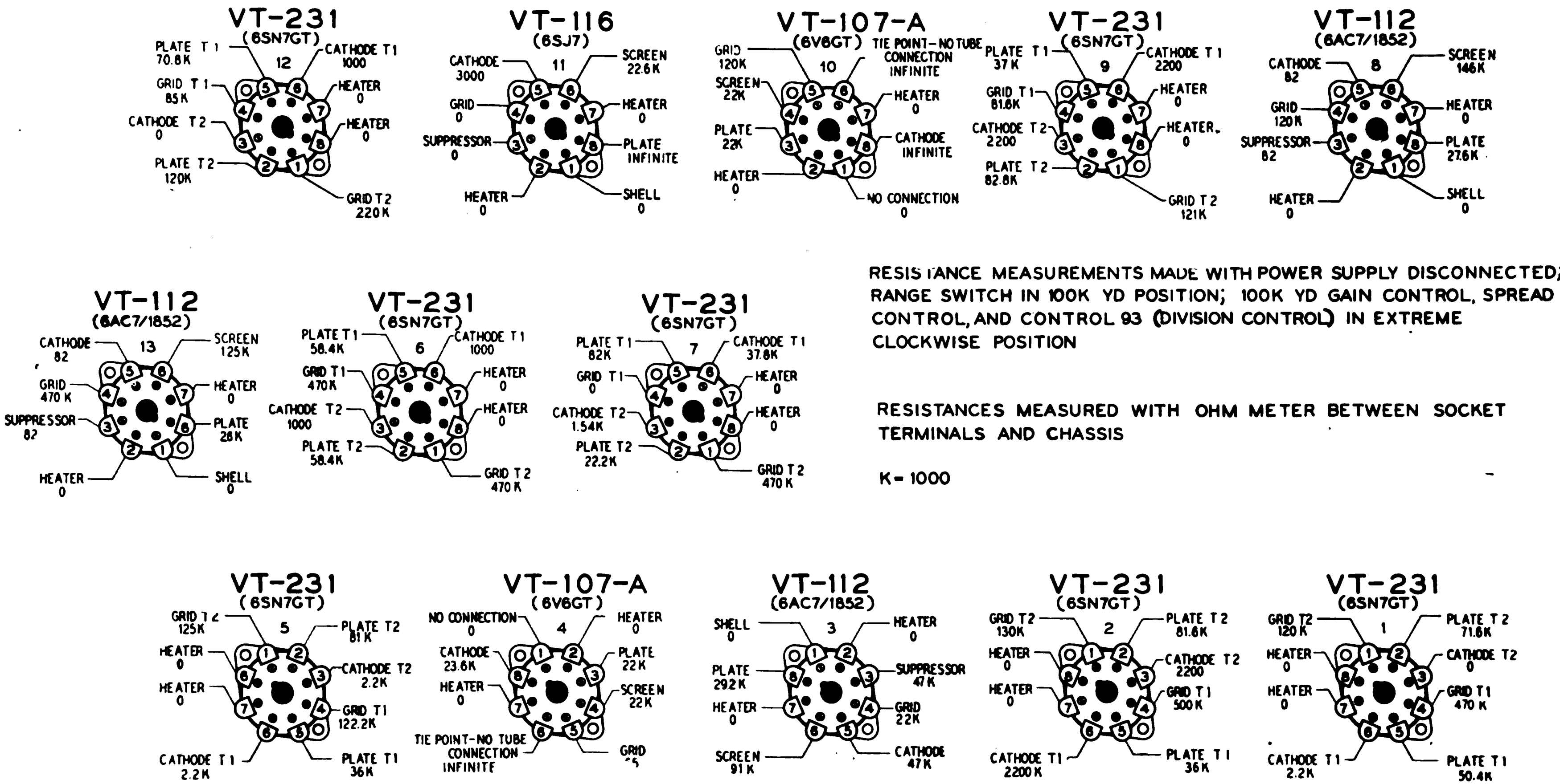
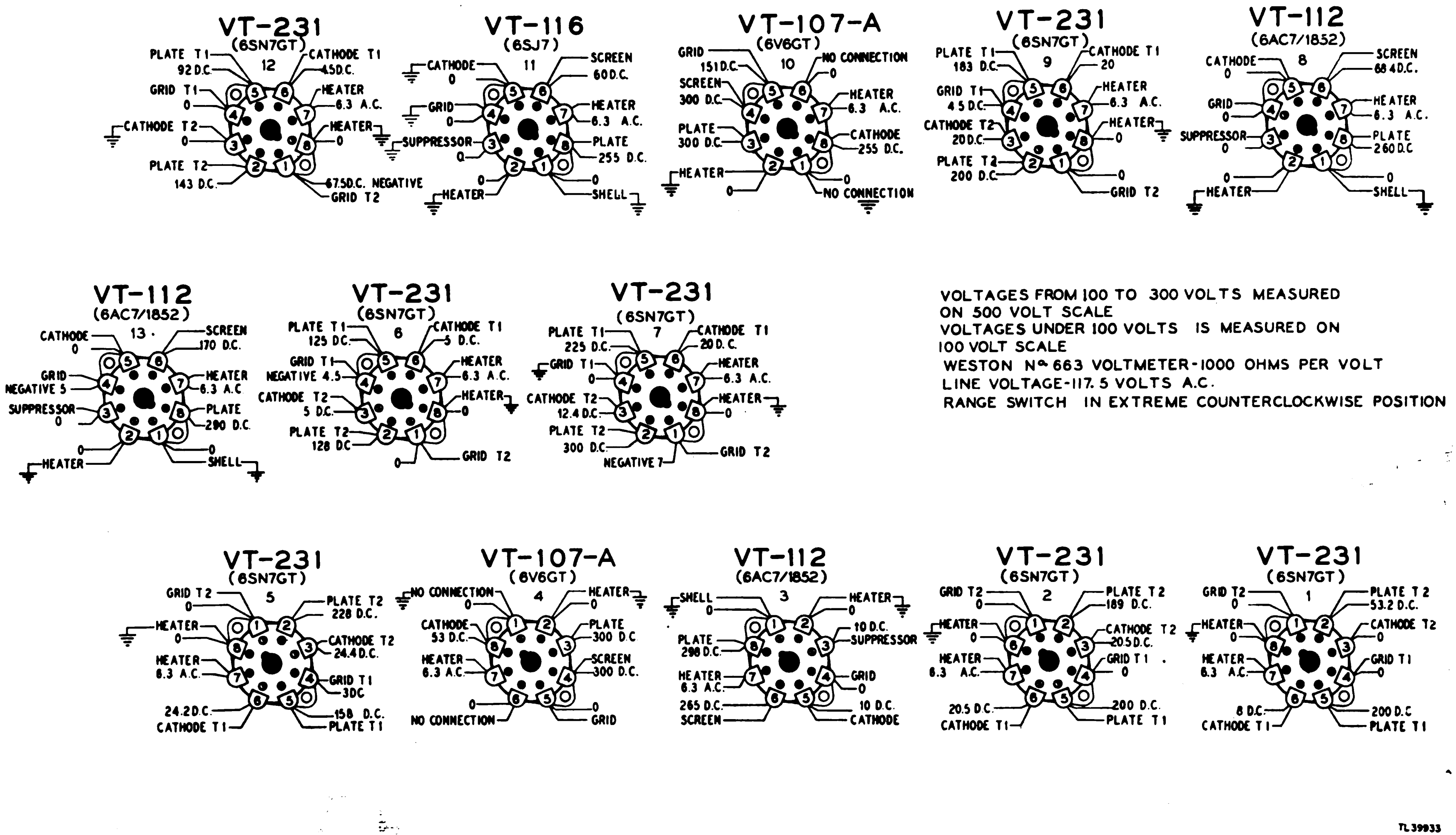
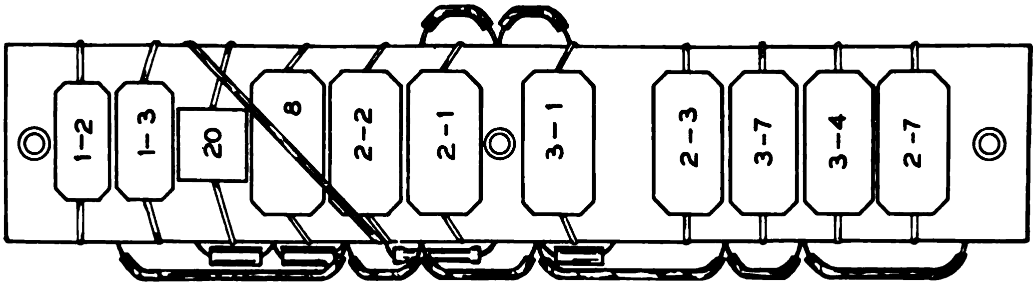


Figure 128. Control Unit BC-1266-A, resistance chart.

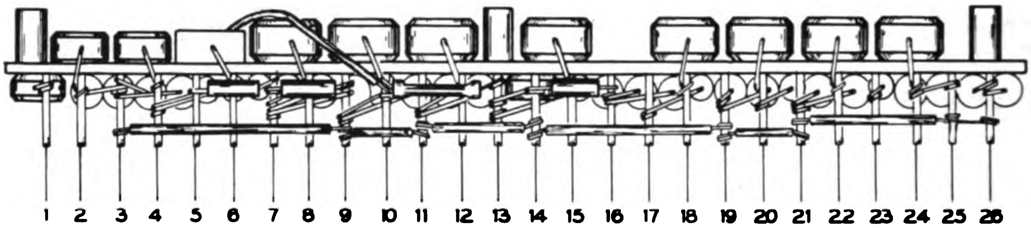


VOLTAGES FROM 100 TO 300 VOLTS MEASURED ON 500 VOLT SCALE
VOLTAGES UNDER 100 VOLTS IS MEASURED ON 100 VOLT SCALE
WESTON No 663 VOLTMETER-1000 OHMS PER VOLT
LINE VOLTAGE-117.5 VOLTS A.C.
RANGE SWITCH IN EXTREME COUNTERCLOCKWISE POSITION

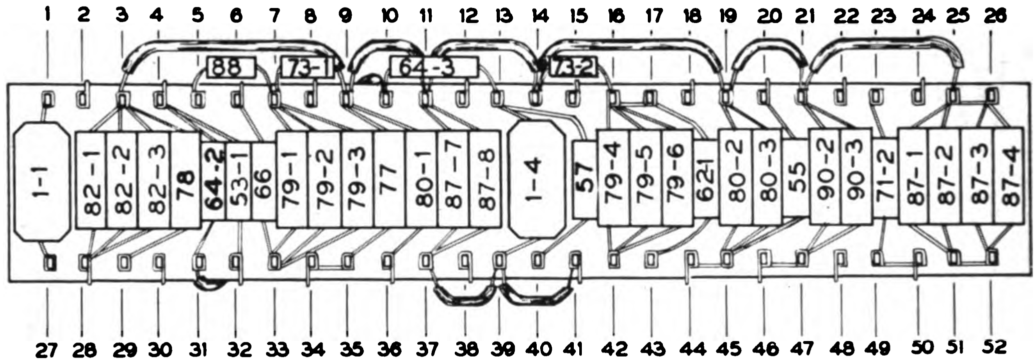
Figure 129. Control Unit BC-1266-A, voltage chart.



REAR VIEW



TOP VIEW



FRONT VIEW

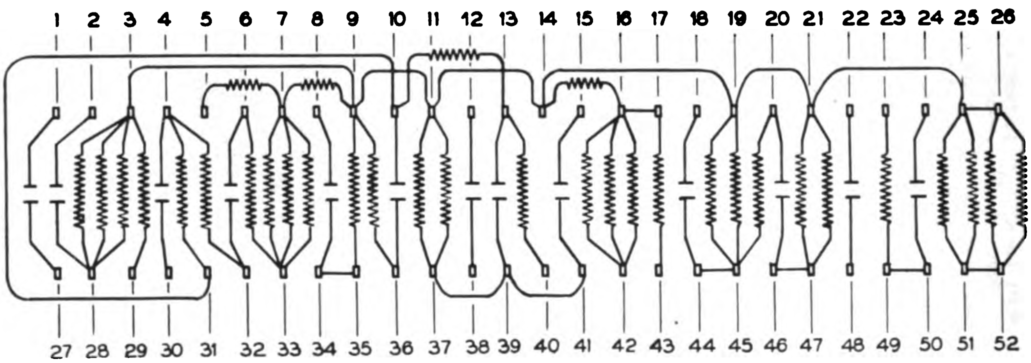


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Figure 130. Control Unit BC-1266-A, synchronizing terminal board (A).

VOLTAGE AND RESISTANCE OF SYNCHRONIZING TERMINAL BOARD (fig. 130).

Terminal	Volts	Ohms M = 1,000	Terminal	Volts	Ohms Meg = 1,000,000
1	56	2.0 M	27	0	100.0 M
2	0	450.0 M	28	58	57.0 M
3	300	21.0 M	29	200	47.0 M
4	0	120.0 M	30	0	2.2 M
5	175	85.0 M	31	0	0
6	155	210.0 M	32	0	120.0 M
7	285	24.0 M	33	210	33.0 M
8	0	6.8	34	300	28.0 M
9	300	21.0 M	35	300	28.0 M
10	0	0	36	265	80.0 M
11	300	21.0 M	37	44	21.0 M
12	0	0	38	0	43.0 M
13	0	125.0 M	39	44	21.0 M
14	300	21.0 M	40	0	130.0 M
15	0	210.0 M	41	44	21.0 M
16	280	24.0 M	42	135	33.0 M
17	280	24.0 M	43	255	80.0 M
18	0	470.0 M	44	120	5.3 M
19	300	21.0 M	45	120	5.3 M
20	110	88.0 M	46	270	85.0 M
21	300	21.0 M	47	270	85.0 M
22	0	Infinite	48	72	74.0 M
23	0	580.0 M	49	0	2.9 Meg
24	290	25.0 M	50	0	2.9 Meg
25	300	21.0 M	51	7	3.6 M
26	300	21.0 M	52	7	3.6 M

TEST CONDITIONS

Voltage Measurements:

1. Measurements made between terminals indicated and chassis.
2. Line voltage of 117.5 volts a-c.
3. Voltage measurements made with a meter having a resistance of 1,000 ohms per volt.
4. Voltages measured as follows:

   0 to 30 volts on 30-volt scale.
   30 to 50 volts on 150-volt scale.
   150 volts and over on 300-volt scale.

Resistance Measurements:

1. Measurements made between points indicated and chassis.
2. Resistance measurements made with power turned off.

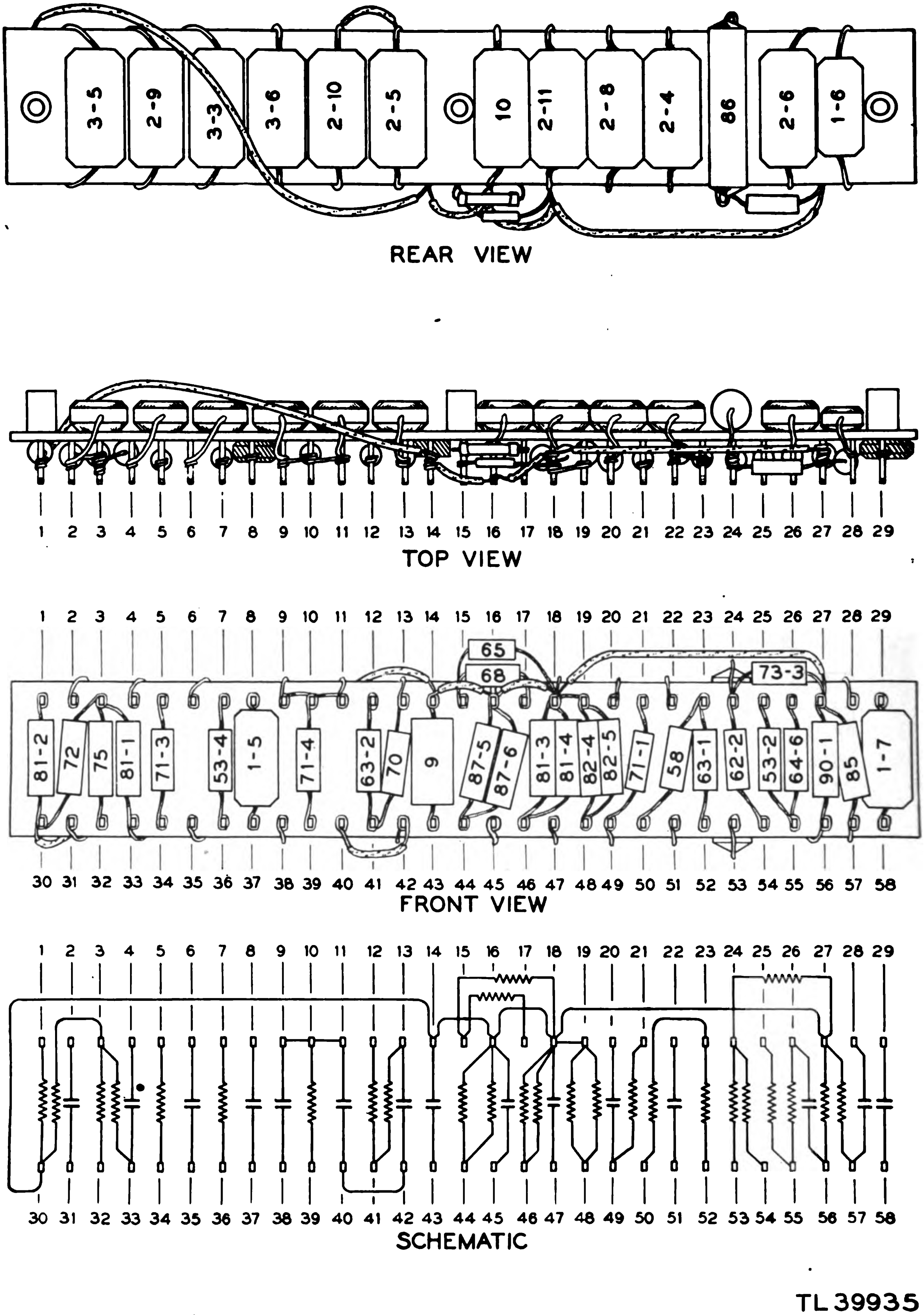


Figure 131. Control Unit BC-1266-A, notch terminal board (B).

VOLTAGE AND RESISTANCE OF NOTCH TERMINAL BOARD (fig. 131).

Terminal	Volts	Ohms M = 1,000	Terminal	Volts	Ohms Meg = 1,000,000
1	160	130.0 M	30	300	21.0 M
2	0	Infinite	31	0	470.0 M
3	298	22.0 M	32	290	26.0 M
4	0	0	33	200	132.0 M
5	0	1.0 Meg	34	0	3.0 Meg
6	19	2.2 M	35	0	470.0 M
7	0	0	36	4	1.0 M
8	0	121.0 M	37	0	Infinite
9	0	3.3 Meg	38	0	Infinite
10	0	3.3 Meg	39	4	1.0 Meg
11	0	3.3 Meg	40	232	Infinite
12	6	3.0 M	41	2	85.0 M
13	0	800.0 M	42	232	Infinite
14	300	21.0 M	43	0	Infinite
15	125	105.0 M	44	6	3.0 M
16	300	21.0 M	45	232	Infinite
17	0	0	46	72	75.0 M
18	300	21.0 M	47	0	0
19	300	21.0 M	48	47	20.0 M
20	0	0	49	0	3.0 M
21	4	600.0 M	50	3	920.0 M
22	0	250.0 M	51	172	36.0 M
23	3	88.0 M	52	9	2.2 M
24	285	23.0 M	53	172	370.0 M
25	0	125.0 M	54	215	77.0 M
26	0	0	55	0	121.0 M
27	300	21.0 M	56	65	150.0 M
28	0	Infinite	57	260	27.0 M
29	0	120.0 M	58	7	2.3 M

TEST CONDITIONS

Voltage Measurements:

1. Measurements made between terminals indicated and chassis.
2. Line voltage of 117.5 volts a-c.
3. Voltages measured as follows:

   1 to 100 volts on 100-volt scale.
   100 to 300 volts on 500-volt scale.

Resistance Measurements:

1. Measurements made between points indicated and chassis.
2. Resistance measurements made with power turned off.

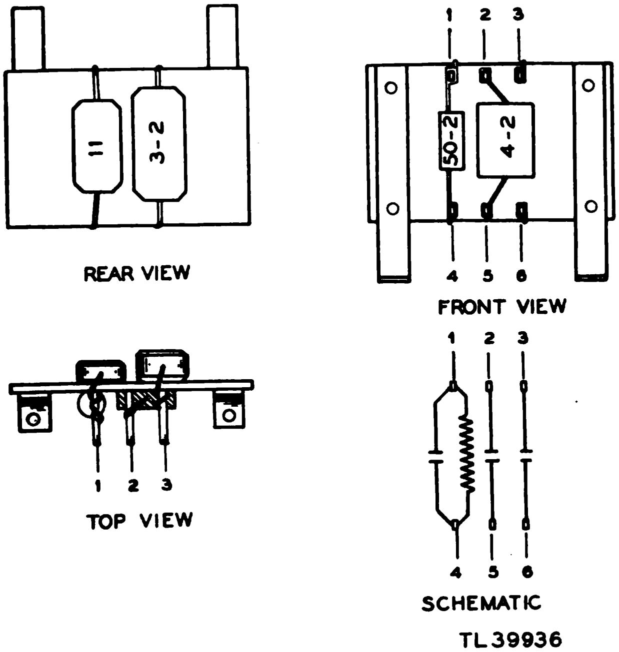


Figure 132. Control Unit BC-1266-A, video terminal board (C).

VOLTAGE RESISTANCE OF VIDEO TERMINAL BOARD (fig. 132).

Terminal	Volts	Ohms M=1,000
1	0	82.0
2	250	80.0 M
3	0	470.0 M
4	0	0
5	0	124.0 M
6	25	2.2 M

TEST CONDITIONS

Voltage Measurements:

1. Measurements made between terminals indicated and chassis.
2. Line voltage of 117.5 volts.
3. Voltage measurements made with a 1,000 ohm-per-volt voltmeter:

1 to 100 volts on 100-volt scale.
100 to 300 volts on 500-volt scale.

Resistance Measurements:

1. Measurements made between points indicated and chassis.
2. Resistance measured with power turned off.

[illegible]	[illegible]	[illegible]	[illegible]
66	1	180,000	10
67	1	220,000	10
68	1	390,000	10
69-1 to 69-5	5	470,000	10
70	1	820,000	10
71-1 to 71-4	4	2.2 Meg.	10
72	1	1,000	10
73-1 to 73-3	3	1,800	10
74	1	2,200	10
75-1 to 75-2	2	2,700	10

....	Jefferson Electric Co.	[illegible]	[illegible]
....	American Phenolic Corp.	AN-3102-28-8P.	A-55A-3495.
....	Howard B. Jones Co.	S-201-3/8	A-55A-3493.
....	Littelfuse, Inc.	3AG	A-46B-2717.
....	Belmont Radio Corp.	BRC	B-207-898.
....	Belmont Radio Corp.	BRC	B-204-382.
....	Belmont Radio Corp.	BRC	A-2D-1283.
....	Muter Co.	Candohm-FH.	A-9D-4185.
....	General Electric Co.	T-44	A-46A-1621.

Section VI. INDICATOR I-221-A

62. General

a. Field maintenance for Indicator I-221-A requires only occasional adjustment of the SENSITIVITY and CENTERING controls. The signals present in the indicator circuits have a duration of several seconds. For this reason a signal cannot be traced through the circuits with an oscilloscope in the usual manner. However, an indication of the signal can be obtained with a voltmeter. The voltmeter will show when a voltage drop occurs in a plate circuit; this voltage drop shows that a signal is passed. A steady signal is applied to the indicator circuits by continuously rotating the AZIMUTH dial through the eye closure with the ANTENNA MOTOR switch in the OFF position.

b. The gain of the individual stages is indicated by the voltage variation across the plate-load resistor as the AZIMUTH dial is rotated. A list of the voltage variation for the reversing relay amplifier is listed below according to the plate-load resistor.

Stage	Load Resistor	Minimum voltage	Maximum voltage
Transformer 101	Terminals 3 and 4	0	120 ac
3–B	10–2	0	60 dc
5–A	10–1	10	30 dc
6	Terminals 1 and 2, relay 110	0	60 dc

c. The gain indications or voltage variations of the impedance amplifiers are dependent upon the setting of the SENSITIVITY control. These voltage variations, which are obtained by varying the SENSITIVITY control from minimum to maximum, are listed in the chart below. The measurements were made across the plate-load resistors of the individual stages and are listed accordingly. The voltage across tube 7 should read between 10 and 200 volts. However, this voltage will appear at only one position of the SENSITIVITY control. This measurement should be taken with the indicator unit properly aligned.

Stage	Load resistor	Minimum voltage	Maximum voltage
1	1–1	0	120
2–B	Potentiometer 106	1	175
3–A	9	0	115
2–A	12	0	100
5–B	11	10	200

63. Tube Replacement

Tubes are often the cause of trouble; therefore, they should be replaced when they are suspected of causing faulty operation. All tubes employed in the indicator, except the 100th (tube 7), are easily accessible when the unit is removed from the rack. To remove the 100th tube, first remove the captive shield and plate cap. Press down on the top of the tube and turn counterclockwise until it stops. Lift the tube from the socket and tilt the top of the tube toward the rear of the chassis until the socket clears the mounting in the floor of the chassis. This operation will allow the grid clip on the side of the tube to be removed. Lift the tube completely out of the unit.

64. Removal of Unit

To remove the indicator unit from the rack, loosen the four captive screws on the front panel. Grasp the unit by the handles on the front panel and give a sharp pull to disengage the interconnector plug at the rear of the chassis. The unit is now free to slide from the shelf in the rack. When placing the unit on the workbench, do not allow it to rest on the back of the chassis so that damage to the acetate schematic diagram will not result. After removing the indicator from the rack, use the patch cord to resume normal operation, which will aid in trouble shooting.

65. Indicator Trouble-shooting Chart

A. SYMPTOMS:

1. Movement of the AZIMUTH dial does not rotate the antenna.
2. No eye indication.

PROBABLE LOCATION OF FAULT	PROCEDURE
No supply voltage.	1. Check the supply voltage wiring back through the rack.

B. SYMPTOM:

1. Rotation of the AZIMUTH dial is not indicated by the EYE.

PROBABLE LOCATION OF FAULT	PROCEDURE
Blown fuse in the selsyn circuit.	1. Check the fuses. 2. Make a continuity check on the selsyn circuit. *Note.* The d-c resistance of the selsyn transformer is very low. For this reason, remove the selsyn cable before making a continuity check on the circuit. 3. If fault is not cleared, see item below.
Cording and connectors.	1. Check the connectors of the power cables. 2. Check contacts of connectors on the ends of Cords CD-1004 and CD-1005. 3. If fault is not cleared, see item below.
Stage 4 or 8. This fault will apply only when the antenna rotates and the eye does not close.	1. Replace tubes 4 and 8. 2. If fault is not cleared, make a voltage and resistance check on the circuits. 3. If a fault is indicated in stage 4 and the indicator eye glows, the trouble is likely to be in the grid circuit.

C. SYMPTOMS:

1. Mast rotates continuously.
2. Mast hesitates at the desired AZIMUTH.

PROBABLE LOCATION OF FAULT	PROCEDURE
Adjustment of CENTERING control.	1. Adjust the CENTERING control as described in paragraph 66*b*. 2. If the fault is not cleared, see item below.
Reversing relay amplifier (tubes 3B, 5A, and 6).	1. Replace tubes 3, 5, and 6. 2. If fault is not cleared, make a voltage and resistance check on the circuit. 3. If fault is not cleared, see item below.
Relay 110.	1. Check the continuity of relay 110.

D. SYMPTOMS:

1. Eye indications are normal, and the reversing relay clicks as the AZIMUTH dial is rotated through the rest position.
2. Antenna mast does not move.

PROBABLE LOCATION OF FAULT	PROCEDURE
Adjustment of SENSITIVITY control.	1. Adjust the SENSITIVITY control as described in paragraph 66*c*. 2. If fault is not cleared, see item below.
Impedance amplifier (tubes 2B, 3A, 2A, 5B and 7).	1. Trace the signal through the impedance amplifier circuit. 2. Replace any suspected tubes. 3. If fault is not cleared, make a voltage and resistance check on the defective circuit. 4. If fault is not cleared, see item below.
Tube 7.	1. Replace tube 7. 2. If fault is not cleared, make voltage and resistance check on the circuit. 3. If fault is not cleared, see item below.
Switch on antenna tower.	1. Turn the AZIMUTH dial until the indicator eye opens. 2. Throw the switch on the tower to the other position. 3. If the tower does not rotate, return the switch to the original position, and see item below.
No voltage to the antenna drive.	1. Check the voltage at the connector on the indicator chassis. 2. If no voltage is present, check relay 110, transformer 104, and their associated circuits. 3. If voltage is present, check the cording to the antenna drive motor.

E. SYMPTOM:

1. Antenna oscillates about the rest position.

PROBABLE LOCATION OF FAULT	PROCEDURE
Adjustment of SENSITIVITY control.	1. Adjust the SENSITIVITY control as described in paragraph 66*c*. 2. If fault is not cleared, see item below.
Impedance amplifier.	1. Check for a gassy tube. 2. Replace the tubes in the impedance amplifier, starting with tube 7 and working back to the input stage. 3. Check the operation of the unit after each replacement.

F. SYMPTOM:

1. Antenna rotates more rapidly in one direction than in the other.

PROBABLE LOCATION OF FAULT	PROCEDURE
Adjustment of CENTERING control.	1. Adjust the CENTERING control as described in paragraph 66*b*. 2. If fault is not cleared, see item below.
Tube 1.	1. Replace tube 1. 2. If fault is not cleared, make a voltage and resistance check on the circuit.

66. Alignment

Improper alignment of any section of the indicator will render the unit inoperative. The individual steps necessary to align the unit are described in detail in the following subparagraphs.

a. Eye Opening. The proper adjustment of the indicator eye must be obtained before attempting any further adjustments. This adjustment is necessary because the eye indications aid in proper adjustment of the remaining stages. To adjust the eye, turn the AZIMUTH dial until maximum closure of the eye is obtained Adjust the EYE OPENING control until the eye just closes but does not overlap. Any opening of the eye now indicates that the antenna is displaced from the desired position of rest.

b. Centering Control. Rotate the azimuth dial until the eye closes. Turn the CENTERING control until the reversing relay clicks and observe the position of the control. Rotate the control in the opposite direction until the relay clicks and observe the position of the control. Set the control halfway between the observed points to split the difference in positions at which the relay clicks. If conditions prevent hearing the relay click, the centering can be adjusted by the eye opening. To center, snap the ANTENNA MOTOR circuit breaker ON and turn the SENSITIVITY control clockwise until the indicator starts to oscillate about its rest position. Improper setting of the CENTERING control will be indicated by a difference in size of alternate eye openings. Adjust the CENTERING control to the point where the alternate eye openings are equal. If the centering is far enough off its correct setting, it will cause the antenna to rotate in one direction only, pausing at its rest position. A rough adjustment of the CENTERING control will stop the antenna from rotating and make it oscillate. The centering may now be adjusted to its correct position as described above.

c. Sensitivity Control. If the antenna oscillates, slowly turn the SENSITIVITY control counterclockwise to the point where the reversing relay stops clicking. If the eye does not close after rotating the AZIMUTH dial a few degrees, turn the SENSITIVITY control clockwise until the antenna starts to oscillate. Slowly reduce the SENSITIVITY control to the point where the reversing relay ceases clicking.

d. Antenna. The IFF antenna must point in the same direction as the radar antenna before the correct AZIMUTH dial setting can be obtained. Place on the radar antenna an observer who looks through the telescope at the IFF antenna tower. Using the hand crank on the tower, rotate the antenna until the center dipole of the IFF antenna lines up directly between the two center vertical supporting bars. The two antennas are now facing each other. The correct setting for the IFF antenna will be the back azimuth of its present position. Observe the azimuth reading of the radar antenna. If the reading is less than 180°, add 180° to find the back azimuth; if the reading is more than 180°, subtract 180°. The azimuth indicator ring on the base of the tower is set to this reading. Loosen the long hexagonal bolt projecting from the ring. Rotate the ring until the proper reading of the azimuth is obtained, and tighten the hexagonal bolt.

e. Azmuth Dial. Snap the INDICATOR PANEL and ANTENNA MOTOR circuit breakers to the ON position. After the antenna comes to rest, snap the ANTENNA MOTOR circuit breaker OFF. Adjust the AZIMUTH dial for minimum eye opening. Observe the azimuth reading on the indicator ring at the base of the tower. Set the AZIMUTH dial to the same reading by holding the AZIMUTH knob and turning the center dial knob until the azimuth calibration corresponds to that of the antenna. Because of the possibility of error, snap on the ANTENNA MOTOR breaker and compare the two readings to see that they read the same with minimum eye opening.

67. Removal and Replacement of Parts

To remove a transformer, circuit breaker, relay, or capacitor, except those mounted on a terminal board, first unsolder the leads to the particular component. Remove the mounting screws and then remove the component.

a. Remote Indicator I–227–A. To remove the Remote Indicator I–227–A from the front panel, disconnect plug 111 from receptacle 112 and insert plug 111 in the dummy receptacle. (See fig. 134.) Next remove the four mounting screws in the corners of the remote indicator. (See fig. 134.) Remove the four mounting screws, A in figure 134, holding the remote indicator chassis to the indicator chassis. Remove the remote indicator from the front panel.

b. Selsyn Motor. To remove the selsyn motor, first remove the remote indicator from the front panel, as described above. Next, unsolder the five leads to the selsyn from their their connections to receptacle 112, which is located on the remote indicator chassis. (See fig. 134.) Using an Allen wrench, loosen the setscrew on the EYE OPENING,

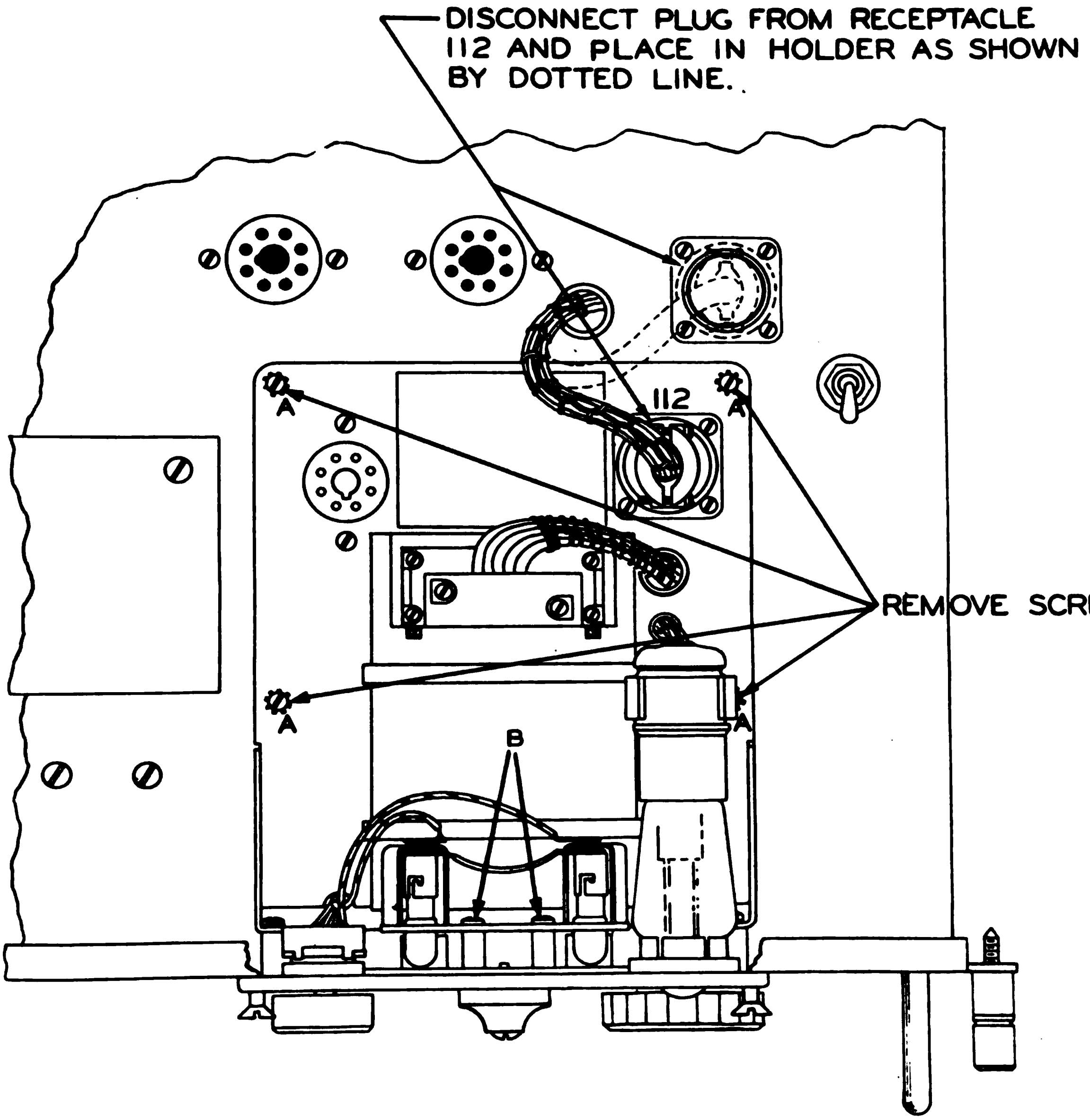


Figure 134. Indicator I-221-A, removal of Remote Indicator I-227-A.

DIAL LIGHT, and AZIMUTH knobs. Remove the knobs from the shafts. Unscrew and remove the screw in the center of the ZERO ADJUSTMENT knob. Remove this knob. Unscrew and remove the four screws from the frame which holds the dial glass in place. (See fig. 135.) Remove the frame and the dial glass. Remove the two pilot lamp bracket mounting screws. (See fig. 134.) Remove the pilot lamp bracket from the remote indicator. Insert an Allen wrench through the square hole in the die-cast front panel of the remote indicator under the right pilot lamp. Loosen the two setscrews from the coupling which connects the rotating portion of the dial to the selsyn motor shaft. Remove the dial. Remove the five selsyn motor mounting screws, three in the front panel and two in the chassis. Remove the selsyn motor from the remote chassis.

c. Dial Lamp Control. To remove DIAL LAMP rheostat 109, unsolder the two connections to the rheostat. Remove the two mounting screws holding the selsyn motors to the remote indicator chassis. Remove the five screws that hold the chassis of the remote indicator to the die-cast front panel of the remote indicator to provide ample room for removing the rheostat. Using an Allen wrench, loosen the setscrew in the knob and remove the knob from the shaft.

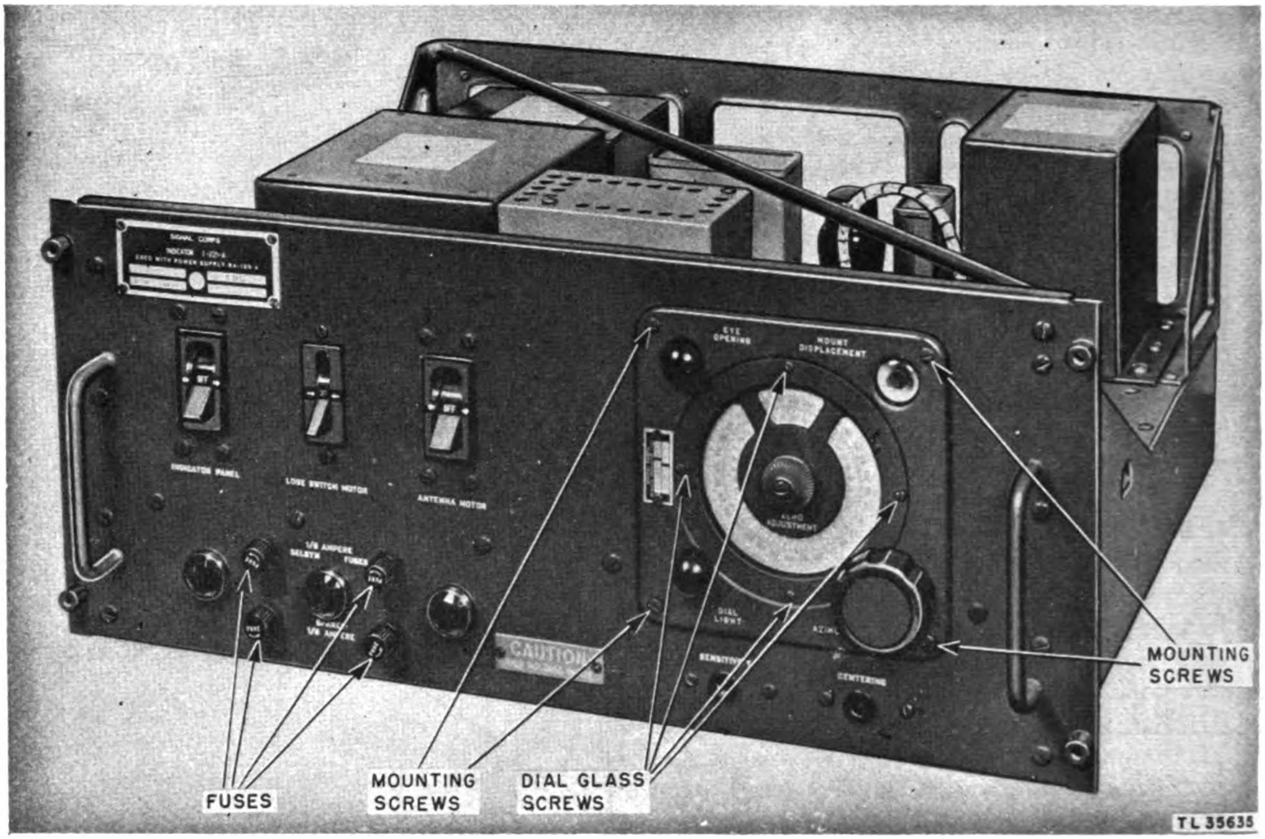


Figure 135. Indicator I-221-A, front panel view.

d. Controls. All variable controls, except the DIAL LAMP rheostat, may be removed merely by unsoldering the connections to the particular control. Loosen the setscrew in the knob and remove the knob from the shaft or take out the mounting bracket screws and remove the bracket. Remove the nut from the control shaft and take out the control.

e. Resistors and Capacitors. The resistors and capacitors mounted on the large terminal board are made accessible first by removing the terminal board from its mounting. Unsolder the connections to the terminals and remove the resistor or capacitor. The resistors and capacitors mounted on the small terminal board may be taken out by unsoldering the connections at the terminal board without first removing the terminal board from its mounting.

f. Pilot Lamps. To remove the large pilot lamps, 119–1, 119–2 or 119–3, pull the metal glass jewel container from its socket in the front panel. Unscrew the lamp from its socket. To remove the small pilot lights from the remote indicator, press the sides of the socket clip together (fig. 135), and remove it from the bracket. Press in on the lamp and turn counterclockwise simultaneously until the lamp springs from the socket.

g. Fuses. To replace fuse 121–1 or 121–2 push the head of the fuse holder in and turn it counterclockwise until it releases. (See fig. 135.) The fuse may now be pulled from the head of the fuse holder.

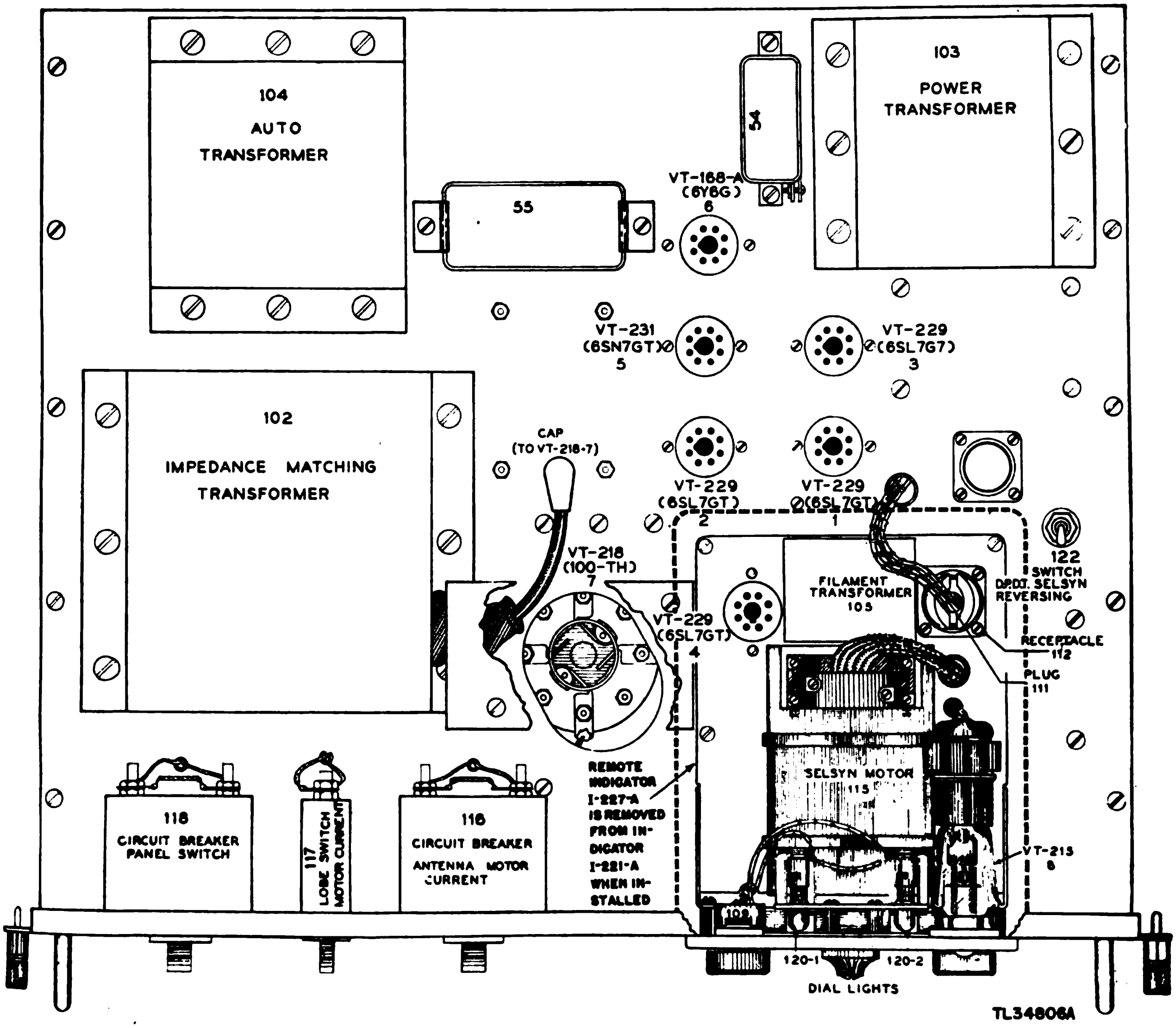


Figure 136. Indicator I-221-A, top view showing location of parts.

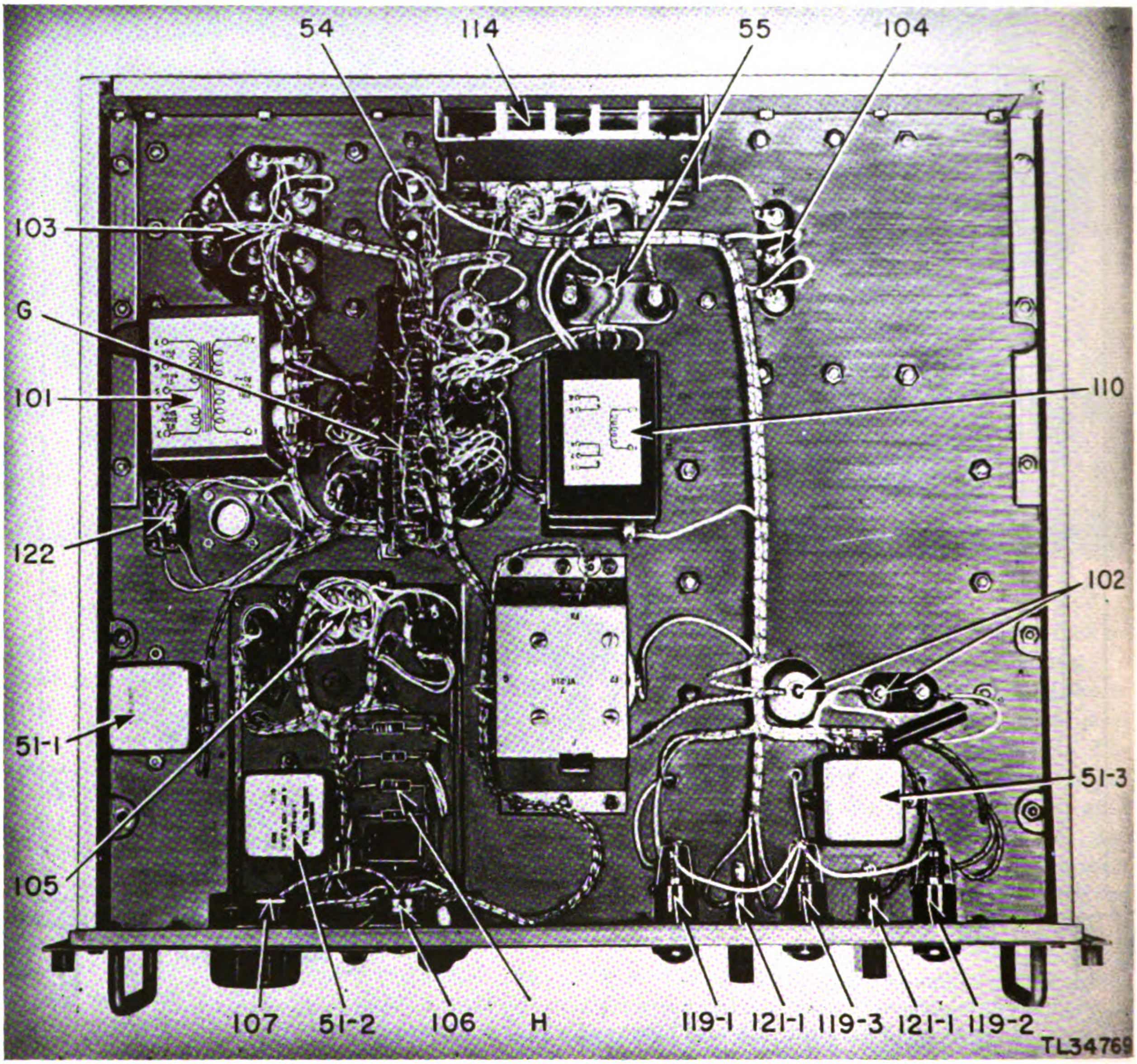


Figure 137. Indicator I–221–A, bottom view showing location of parts.

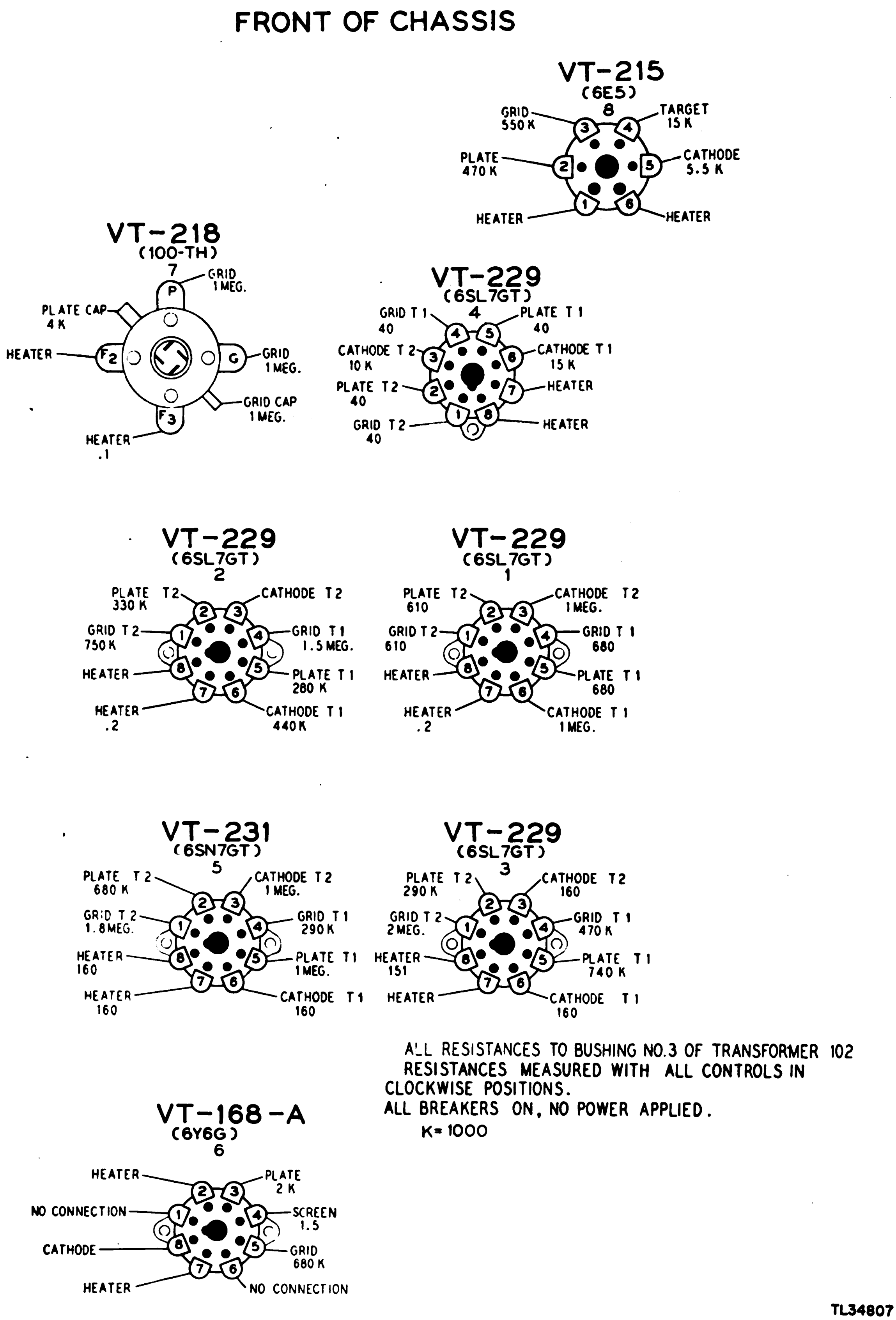


Figure 138. Indicator I-221-A, resistance chart.

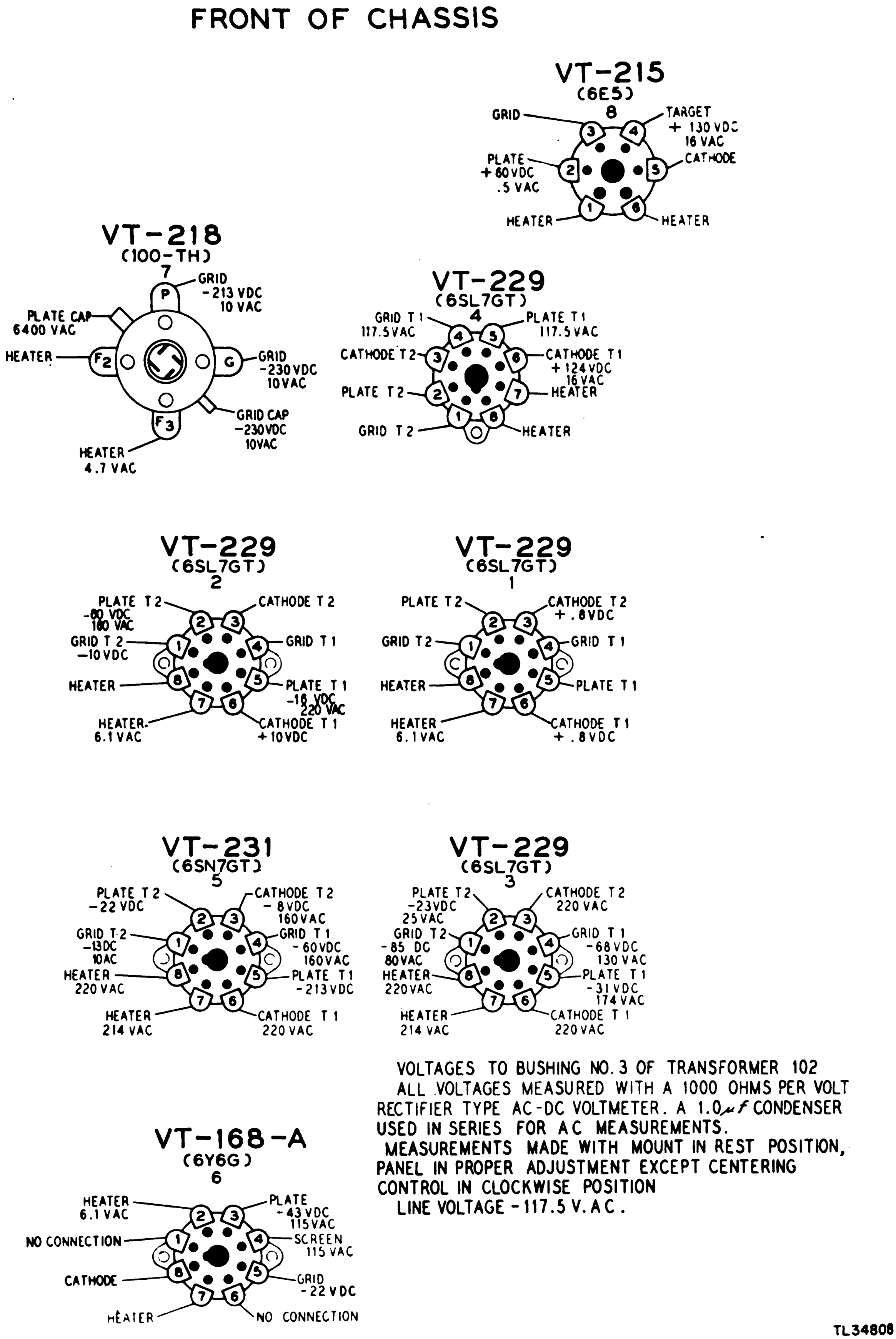


Figure 139. Indicator I-221-A, voltage chart.

VOLTAGE AND RESISTANCE OF INDICATOR TERMINAL BOARD (fig. 140).

Terminal	Volts D-c	Volts A-c	Ohms (M = 1,000)
1	15	220	160
2	0	0	1500 M
3	0	0	0
4	— 85	80	1200 M
5	— 16	220	160
6	— 10	0	750 M
7	0	0	0
8	— 68	130	470 M
9	— 8	160	7500
10	— 13	11	1750 M
11	0	0	0
12	0	0	0
13	— 8	160	2600
14	0	0	0
15	0	220	280 M
16	0.8	0	1000 M
17	— 22	0	680 M
18	— 16	220	220 M
19	— 60	160	330 M
20	— 23	25	290 M
21	— 23	25	290 M
22	— 15	220	890
23	— 31	174	740 M
24	— 31	174	740 M
25	—230	10	2200 M
26	0	0	220 M
27	— 8	160	1000 M
28	— 8	160	7500

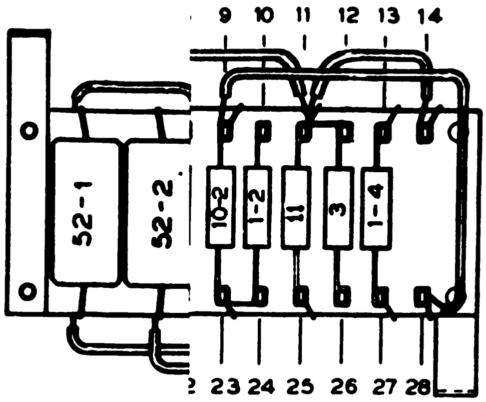
TEST CONDITIONS

Voltage Measurements:

1. Measurements made between points indicated and bushing No. 3 of transformer 102.
2. Measurements made with 1,000-ohm-per-volt rectifier type ac-dc voltmeter; a 1.0 microfarad capacitor used in series for a-c measurements.
3. Tower in rest position.
4. Unit in proper adjustment, except CENTERING control in maximum clockwise position.
5. Line voltage of 117.5 volts alternating current.

Resistance Measurements:

1. Measurements made between points indicated and bushing No. 3 of transformer 102.
2. All controls in clockwise position.
3. All circuit breakers ON.
4. No power applied.



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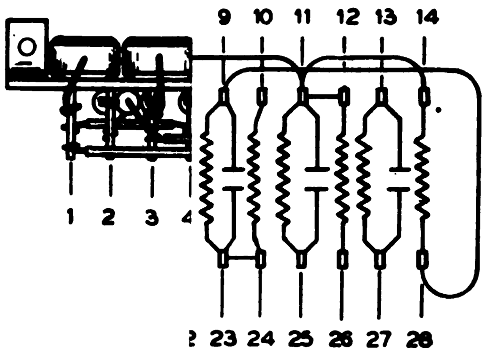

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VOLTAGE AND RESISTANCE OF AZIMUTH INDICATOR DIAL CONTROL TERMINAL BOARD (fig. 141).

	Volts		
Terminal	D-c	A-c	Ohms (M = 1,000)
1	32	0.4	500 M
2	0	0	0
3	0	0	500 M
4	0	0	500 M
5	0	0	500 M
6	8	0.6	5.4 M
7	70	7.3	50 M
8	0	0	10 M
9	0	0	10 M
10	0	0	550 M
11	0	0	0
12	70	7.3	50 M

TEST CONDITIONS

Voltage Measurements:

1. Measurements made between points indicated and bushing No. 3 of transformer 102.
2. Measurements made with 1,000-ohm-per-volt rectifier type ac-dc voltmeter; a 1.0 microfarad capacitor used in a series for a-c measurements.
3. Tower in rest position.
4. Unit in proper adjustment except CENTERING control in maximum clockwise position.
5. Line voltage 117.5 volts alternating current.

Resistance Measurements:

1. Measurements made between points indicated and bushing No. 3 of transformer 102.
2. All controls in clockwise position.
3. All circuit breakers ON.
4. No power applied.

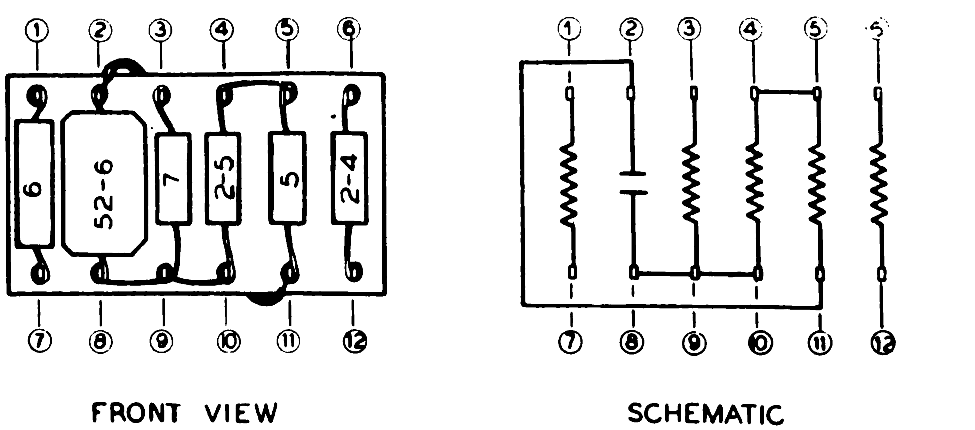
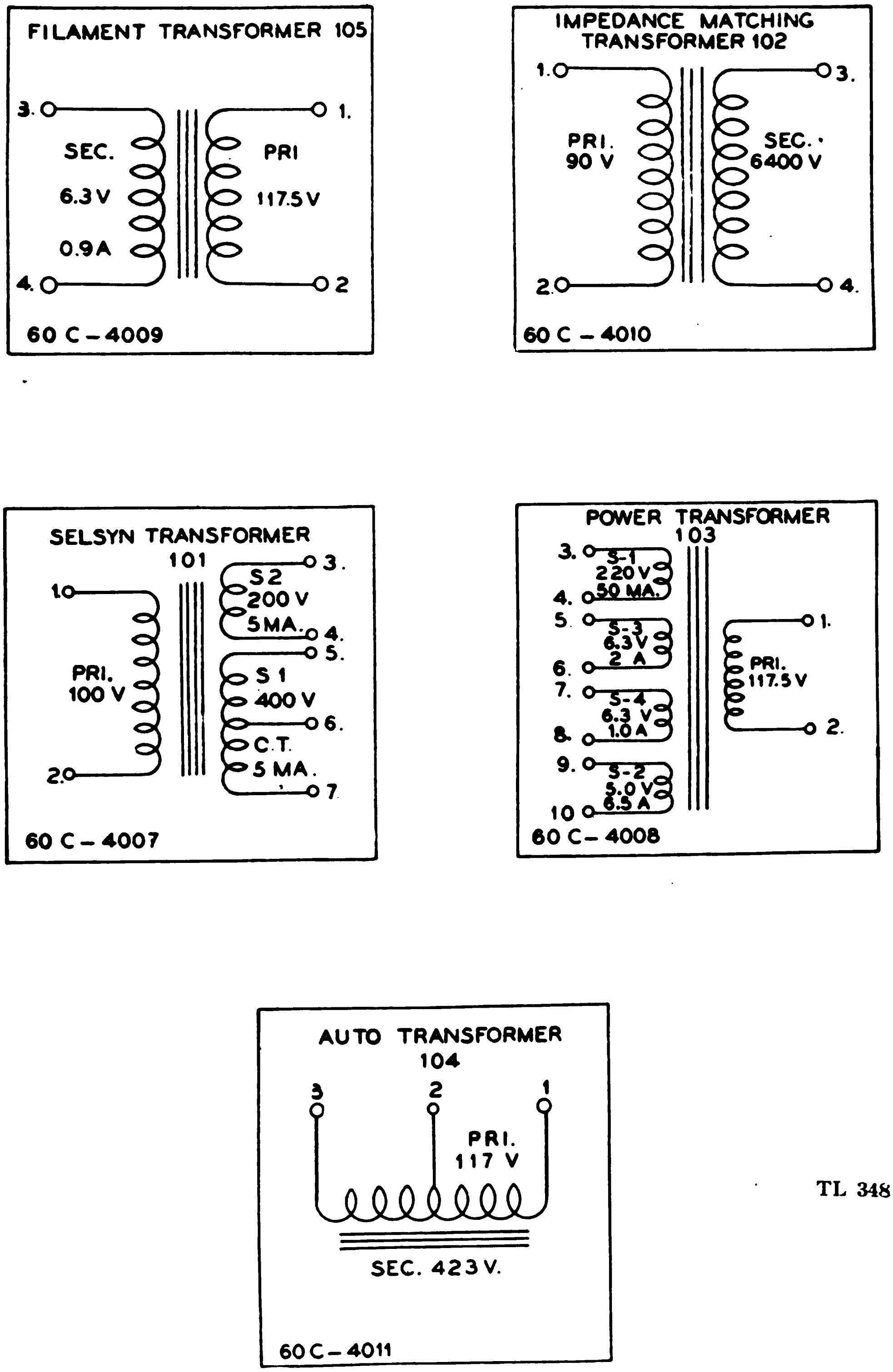
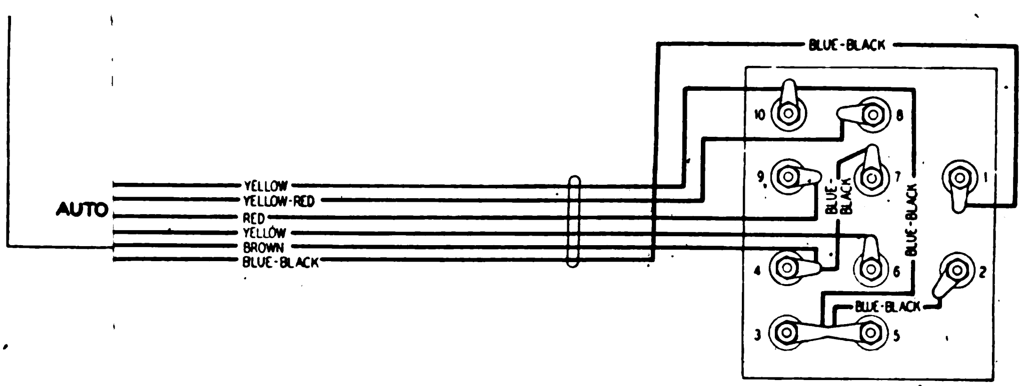


Figure 141. Indicator I-221-A, dial terminal board (H).



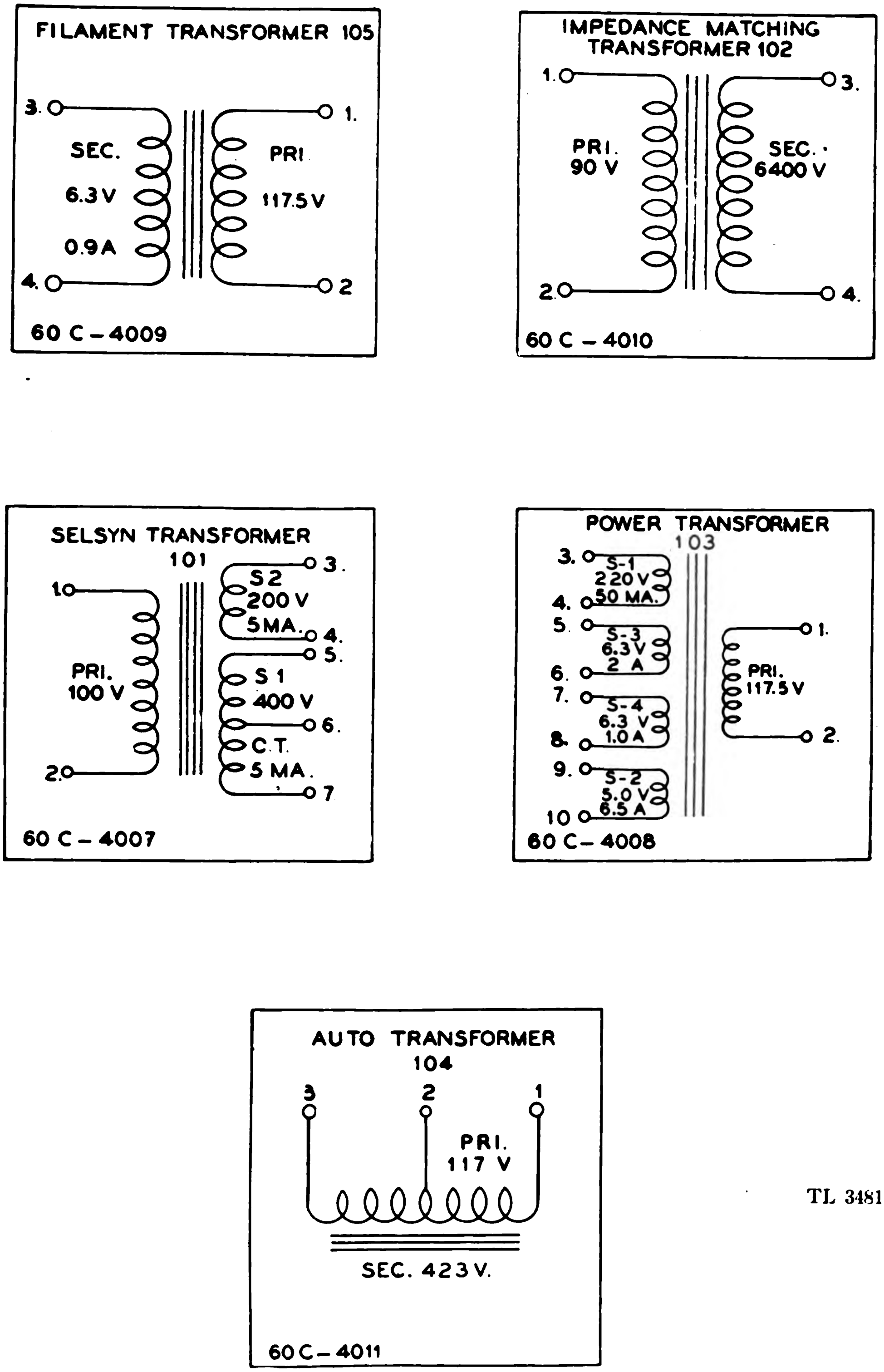
TL 34811

Figure 142. Indicator I-221-A, transformer schematics.



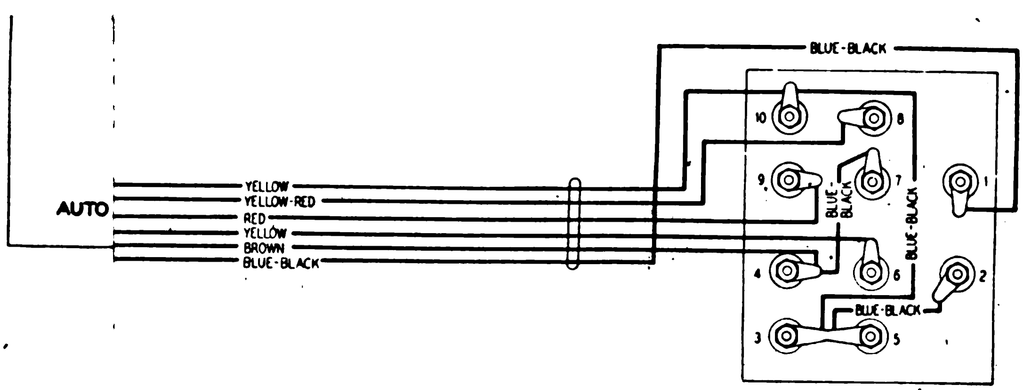
POWER TRANSFORMER 103.

TL-34812



TL 34811

Figure 142. Indicator I-221-A, transformer schematics.



POWER TRANSFORMER 103.

TL 34812

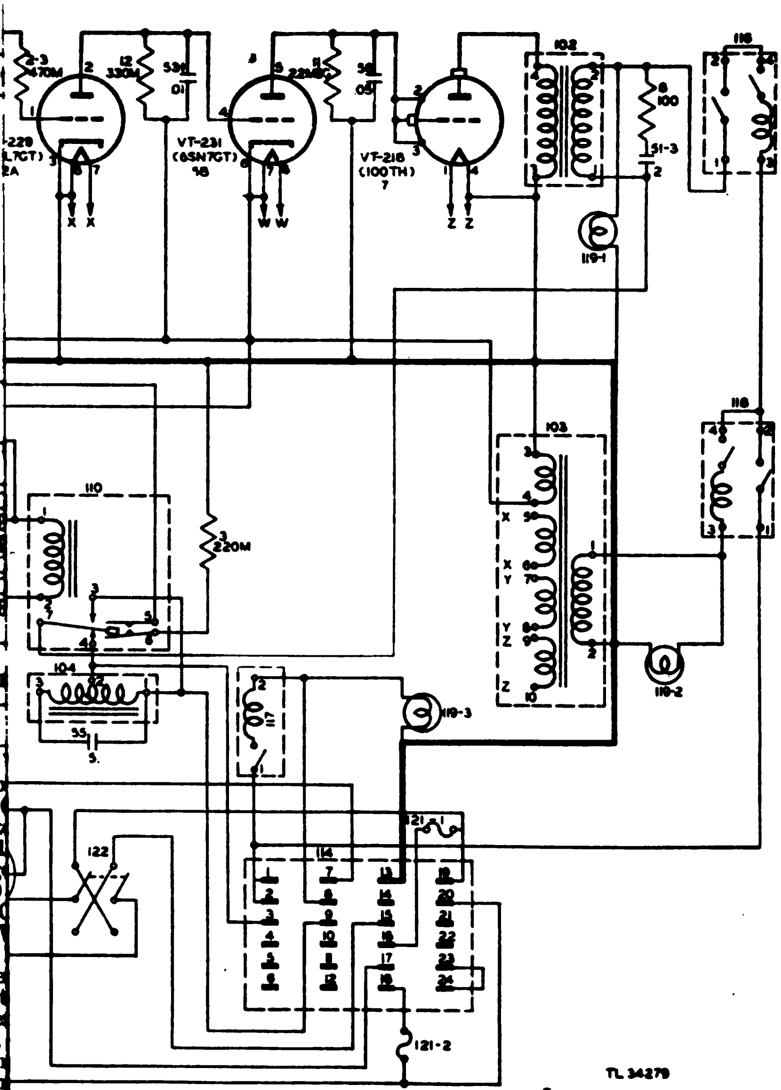
Legend for Indica

Reference No.	Quantity	Ohms
1-1 to 1-4	5	1 Meg.
2-1 to 2-6	6	470,000
3	1	220,000
4	1	33,000
5	1	10,000
6	1	50,000
7	1	100,000
8	1	100
9	1	270,000
10-1 to 10-2	2	680,000
11	1	2.2 Meg.
12	1	330,000

Reference No.	Quantity	Capacity	
51-1 to 51-3	3	2 MFD	C
52-1 to 52-4, 52-6	5	.1 MFD	P
53-1 to 53-2	2	.01 MFD	P
54	1	4 MFD	C
55	1	5 MFD	C
56	1	.05 MFD	P

MI

Reference No.	Quantity	
101	1	Transformer, Pri.-100
102	1	Transformer, 90 V. to
103	1	Transformer, 220 V.;
104	1	Transformer, 117 V. t
105	1	Transformer, 6.3 V.; 1
106	1	Potentiometer, 1 Meg
107	1	Potentiometer, 10,000
108	1	Potentiometer, 5,000 O
109	1	Rheostat, 75 Ohm, 3
110	1	Relay, SPDT; SPST;
111	1	Plug, 6-Conductor, Fe
112	1	Receptacle, 6-Conduct
114	1	Plug, 24-Terminal, Fe
115	1	Selsyn Motor, 115 V.,
116	1	Circuit Breaker, 4 Am
117	1	Circuit Breaker, 3 Am
118	1	Circuit Breaker, 1¼ A
119-1 to 119-3	3	Lamp, Pilot Light, 6 Watt, 117 Volts.
120-1 to 120-2	2	Lamp, 6.3 Volt, 150 M
121-1 to 121-2	2	Fuse, ⅛ Amp.............
122	1	Switch, D. P. D. T......



921-A, *schematic diagram.*

Section VII. RACK FM-79

68. General

a. Field maintenance of the rack will require only occasional replacement of pilot lamps and a check of the wiring. The troubles encountered within the rack will be treated generally in the following paragraphs.

b. If the heaters and blowers operate normally but no power is supplied to the units, check the interlock switch in the wiring channel for mechanical operation and proper connections.

c. If the pilot lamps do not light, check the blowers for proper operation by checking the air flow through the ventilator panel at the bottom of the rack. If the blowers are normal, the pilot lamp is probably defective.

d. If either of the circuit breakers fails to remain closed, check the rack wiring for a possible short circuit.

e. If power is not supplied to the units, check the units for firmness of mounting and the rack wiring for proper connections.

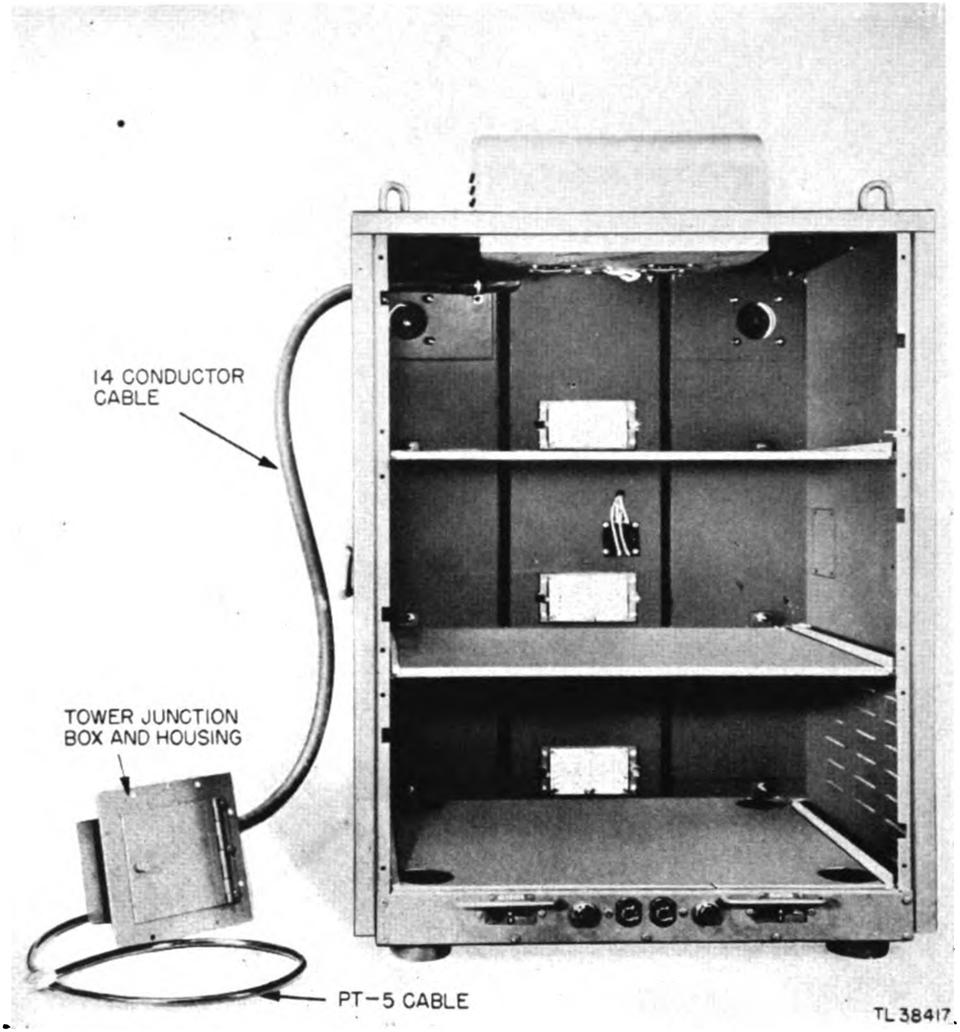
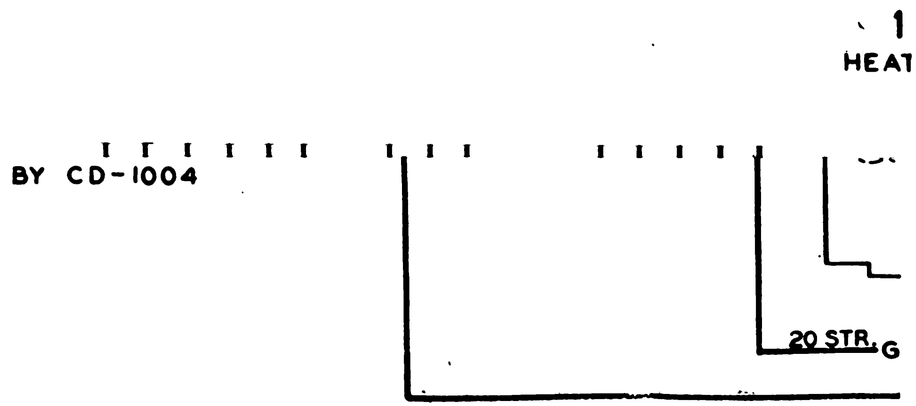


Figure 145. Rack FM-79, showing tower junction box.



Legend for Rack FM-79

Reference No.	Quantity	Name of Part	Manufacturer
*1	1	Heater, 150 W., 117.5-Volt Heating Element	Belmont Radio Corp.
*2	1	Heater, 150 W., 117.5-Volt Heating Element	Belmont Radio Corp.
*3	1	Blower, 117.5-Volts, 60 cycles Blower and Motor Unit.	A. G. Redmond Co.
(*)		Heater and Blower Assembly	A. G. Redmond Co.
4	1	Plug, 3-Prong Polarized	American Phenolic Cor
5	1	Receptacle, 3-Prong Base Type	American Phenolic Cor
6	1	Receptacle, 19-Pin Female	Pyle-National Co.
7-1 to 7-2	2	Receptacle	Lapp Insulator Co.
8	1	Receptacle	Lapp Insulator Co.
9	1	Switch, D.P.S.T., 10 Amp., 125 Volts, Interlock.	Cutler Hammer, Inc.
10	1	Connector, Right Angle 9-Pin Female	American Phenolic Cor
11	1	Connector, Right Angle 9-Pin Male	American Phenolic Cor

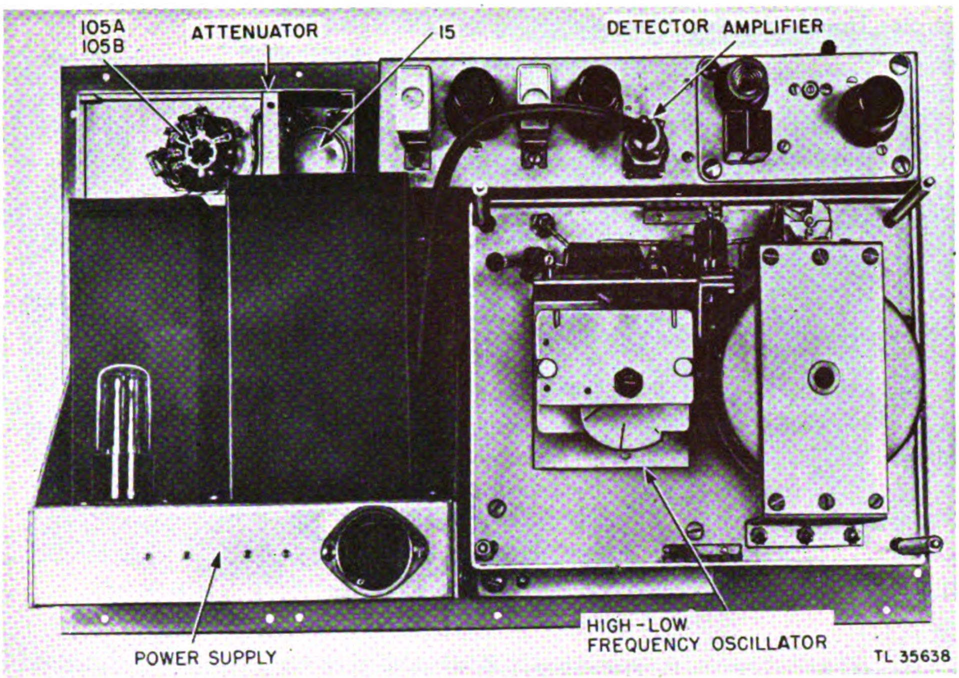


Figure 147. Signal Generator I-222-A, rear view.

Section VIII. SIGNAL GENERATOR I-222-A

69. General

It is impossible to anticipate all the circumstances which will cause faulty operation of the signal generator. However, some tests may help to isolate the circuit that is causing the trouble.

70. Removal of Unit

In order to replace tubes or make repairs on the unit, it is necessary to remove the unit from its case. To remove the unit, first unplug the a-c cord at the rear of the case. Close and latch the receptacle cover. Open the antenna rod cover and push the antenna rod down as far as it will go. Place the generator on its back with two strips of wood under it. Remove the screws from around the border of the panel and slip the unit from the case. (See fig. 148.)

71. Tube Replacement

a. A defective tube is frequently the cause of faulty operation. After deciding which tube is most likely the cause of the fault, replace it with a new tube and adjust only those controls which are directly associated with that tube. If the situation is not remedied, return the controls to their original position to obtain the original defective condition and not introduce any new faults.

b. All the tubes in the signal generator are easily removed except tube 2 (9006) and tube 5 (VT-202). (See fig. 154.)

(1) To remove tube 2 (9006), unscrew the heavy metal shield. A tube shield key for this purpose is mounted on the radio receiver and transmitter chassis. Remove the metal shield and the spring shield. Grasp the tube near the base and pull upward.

Caution: This tube is very fragile. Be careful when removing and replacing this tube because the seal, where the pins leave the glass envelope, is easily broken.

(2) To remove tube 5 (VT-202), it is necessary to remove the high-low frequency oscillator assembly cover. Remove the four knurled thumbnuts. Grasp the cover by the handles and with a rocking motion pull the cover from the assembly. Remove the tube by pulling upward.

72. Signal Generator Trouble-shooting Chart

A. SYMPTOMS:

1. No tone in headset (switch in TEST position).
2. Tone heard in CRYSTAL position.

PROBABLE LOCATION OF FAULT	PROCEDURE
Oscillator tube.	1. Replace oscillator tube. 2. If fault is not cleared, see item below.
Variable high-low frequency oscillator circuit.	1. Make voltage and resistance check of the oscillator assembly.

B. SYMPTOMS:

1. No tone in headset (switch in CRYSTAL position).
2. Tone heard in TEST position.

PROBABLE LOCATION OF FAULT	PROCEDURE
Crystal.	1. Replace with new crystal. 2. If fault is not cleared, see item below.
Oscillator tube.	1. Replace oscillator tube. 2. If fault is not cleared, see item below.
Oscillator circuit.	1. Make voltage and resistance check.

C. SYMPTOM:

Pilot and dial lights do not burn when set is turned on.

PROBABLE LOCATION OF FAULT	PROCEDURE
No a-c input.	1. Check voltage at source of power. Check fuse. 2. If fault is not cleared, see item below.
Lamps.	1. Check and replace if defective.

73. Alignment

a. Snap the signal generator ON and allow it to warm up for fifteen minutes before calibrating it. A chart, giving calibration points for both the high- and low-frequency bands will be found underneath the hinged cover on the right side of the signal generator panel. The figures in *red* indicate the crystal check points for restoring calibration at different portions of the band. To restore calibration, place the TEST-CRYSTAL switch in the CRYSTAL position and the L.F.–H.F. RANGE switch in the H.F. position; plug the headphones in the PHONES jack. Set the TUNING dial at the calibrated setting for the crystal check point (the red number) which is the closest to the desired frequency. If the frequency to be checked is unknown, set the calibration at the center of the band or 180 megacycles, as given by the chart. Adjust the CALIBRATE knob until *zero beat* is obtained in the headphones. Open the antenna door on top of the signal generator and pull out the pickup rod. Switch the TEST-CRYSTAL switch to the TEST position and place the signal generator near the short antenna on the T-connector on the transmitter. The signal generator is now accurately calibrated to read frequencies within range of this crystal check point, and the transmitter frequency can now be checked.

b. It is important that the unknown signal is adjusted to the correct monitoring level. Make this adjustment by rotating the audio gain control to its extreme clockwise position and sliding the pickup rod in and out of the case until a very weak signal is obtained.

Note. Because the detector is untuned, the repetition rate will be heard when monitoring a pulse-modulated signal, and an audio note will be heard when monitoring a sine-wave-modulated signal.

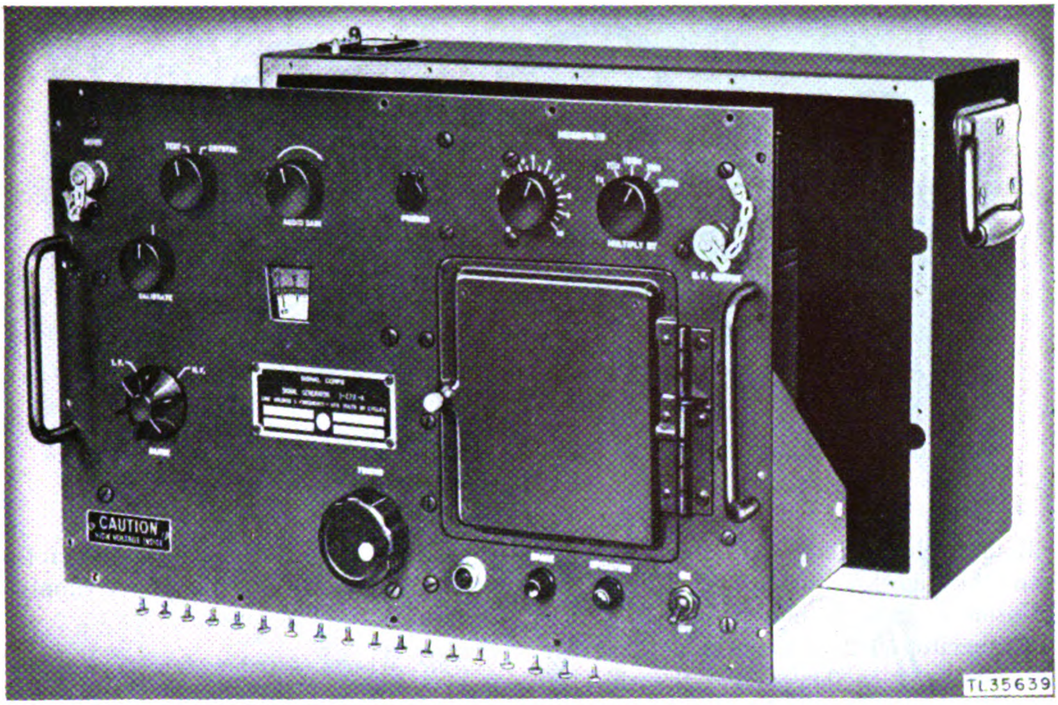


Figure 148. Signal Generator I-222-A, removed from case.

74. Removal of Subassemblies

The unit is composed of four subassemblies: power supply, attenuator, detector-amplifier, and high-low frequency oscillator. (See fig. **147**.)

a. To remove the attenuator assembly, remove the two screws from the attenuator assembly and slip the cover from the case. Unsolder the wire coming from the metal tubing at the terminal on control **15**. Unscrew the hex. nut at the end of the metal tubing. Remove the protective cap on the receptacle marked R.F. OUTPUT. With a No. **8** Allen wrench, loosen the setscrew on each of the two knobs just below MICROVOLTS on the front panel. (See fig. **148**.) Remove the two knobs from the shafts. Remove the four mounting screws; then take the assembly from the panel.

b. To remove the detector-amplifier assembly, remove the eight detector-amplifier cover mounting screws and slip the cover from the case. Disconnect the rubber-covered cable, provided with an Amphenol fitting, from the detector-amplifier case. Remove the four knurled thumbnuts from the high-low frequency oscillator assembly and remove the cover from the case. Unsolder the terminal of capacitor **59–2** from the white-blue tracer wire. Unsolder the wire between jack **107** and spark plate **53–8**. (See fig. **149**.) Remove the screw which fastens the braided ground strap to the detector-amplifier case. Remove the protective cap from the receptacle marked INPUT. With a No. **8** Allen wrench, loosen the setscrew on the TEST-CRYSTAL and AUDIO GAIN control knobs and remove them. Remove the five mounting screws; then take the case from the panel.

Caution: Be sure that the white-blue tracer wire slips through the hole in the high-low frequency oscillator case as the detector-amplifier is removed from the panel.

c. To remove the high-low frequency oscillator assembly, turn the unit over so that it rests on the

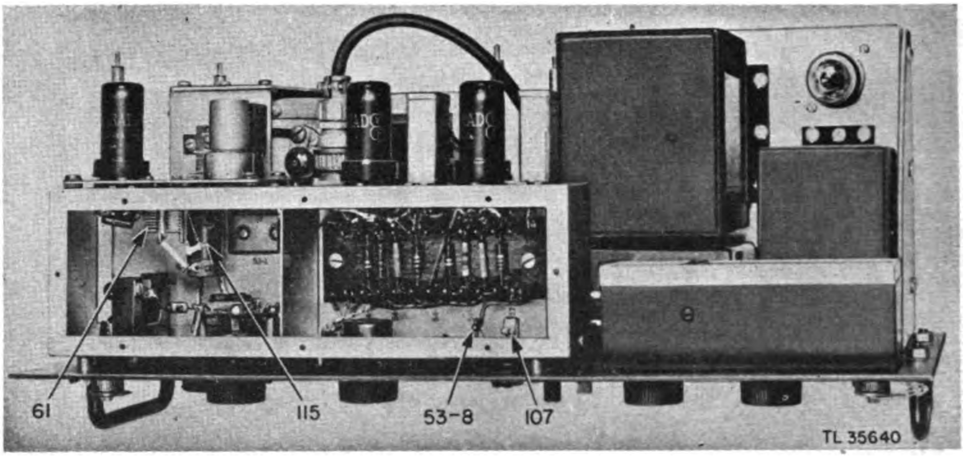


Figure 149. Signal Generator I-222-A, detector-amplifier cover removed.

handles. Remove the four knurled thumbnuts from the cover of the high-low frequency oscillator assembly. Unsolder the white-blue tracer wire at the terminal of capacitor 59–2. Unsolder the white and black rubber-covered conductor and the shielded braid of the rubber-covered cable. Unsolder the white-black tracer wire from terminal 7 of transformer 104. Remove the clamp holding the black rubber-covered cable to the power supply chassis. (See fig. 150.) Turn the unit up so that it is resting on the power supply chassis. Remove the cover from the attenuator assembly case. Unsolder the wire, encased in the metal tube, at the terminal on control 15. Remove the nut and washer from the tubing. Using a No. 8 Allen wrench, loosen the knobs and remove them.

Caution: The tuning knob is provided with two setscrews. Be sure that both of these screws are loosened before removing this knob from the shaft. Remove the high-low frequency oscillator assembly from the panel. Be sure that the rubber-covered cable and the white-black tracer wire follow through the hole in the side of the power supply chassis as the assembly is removed.

Note. When disassembly of the signal generator is necessary, the lubrication point should be checked against information supplied in TM 11–1431.

75. Replacement of Circuit Elements

The fuse and pilot lamp may be replaced without removing the unit from the case. In order to replace the other elements, it is necessary to remove the unit from the case.

a. To replace fuse 113, turn the bakelite button marked "Operating" counterclockwise. (See fig. 148.) Remove the fuse holder and fuse. Replace the fuse in reverse order.

b. To replace the pilot lamp, unscrew the metal collar. Remove the collar and glass jewel. Remove the lamp by pressing in and turning counterclockwise, simultaneously, until the lamp is released from the socket. Replace in reverse order.

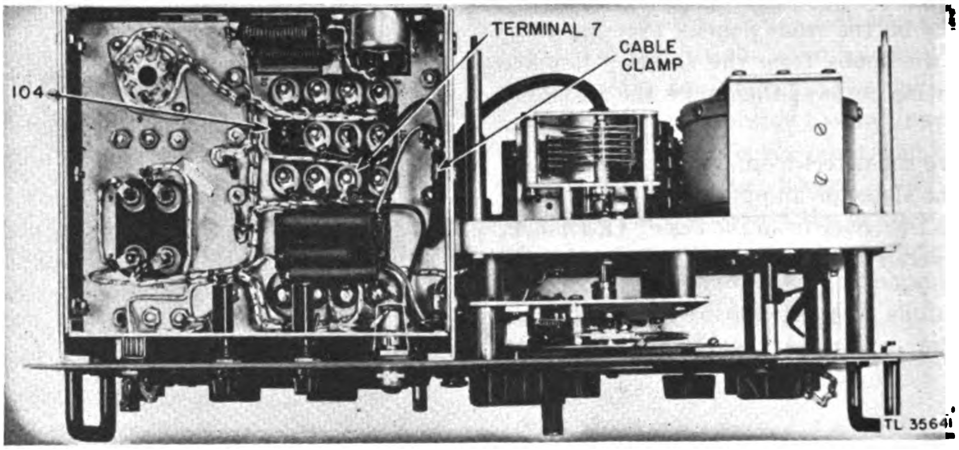


Figure 150. Signal Generator I-222-A, bottom view.

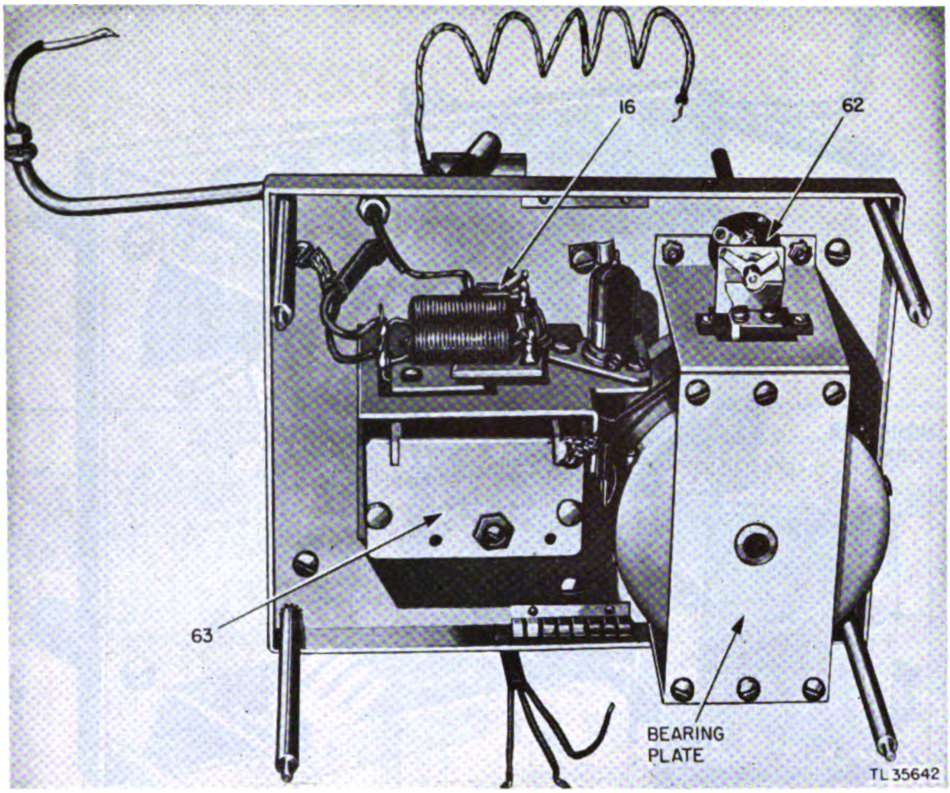


Figure 151. Signal Generator I-222-A, rear view of dial panel.

c. To replace the dial lamp, it is necessary to remove the detector-amplifier assembly. Remove the detector-amplifier assembly as described in paragraph 74*b*. Press in on the lamp while turning counterclockwise until the lamp is released from the socket.

d. To replace air-trimmer capacitor 61, remove the detector-amplifier cover. Unsolder the connections to the capacitor. Remove the two small screws located between tubes No. 1 and No. 2 and remove the capacitor. (See fig. 149.) Replace in reverse order.

e. To replace variable capacitor 63, remove the high-low frequency oscillator assembly from the panel, as described in paragraph 74*c*. Remove the four dial mechanism mounting screws. With a No. 8 Allen wrench, remove the two setscrews, which connect the dial shaft with the capacitor rotor shaft, at the dial shaft universal joint. Remove the dial mechanism from the high-low frequency-oscillator assembly mounting plate. Remove tube 5. Unsolder the wire, encased in the metal tubing, at the terminal of resistor 16. (See fig. 151.) Unsolder the wire connected to the terminal of capacitor 62. (See fig. 151.) Remove the three capacitor-support mounting screws and the clamp which holds the rubber-covered cable in place. Remove the capacitor-support assembly mounting plate. Unsolder the connection to the stator of capacitor 63. Remove the three capacitor mounting screws which fasten the capacitor to the capacitor-support mounting plate. Remove the capacitor. Replace in reverse order.

f. To replace l-f band coil 101 or h-f band coil 100, remove the high-low frequency oscillator assembly as described in paragraph 74. Remove the six bearing-plate mounting screws. Remove the bearing plate and the coil turret. (See fig. 151.) Remove the eight screws that mount the end of the coil turret to the turret housing. (See fig. 152.) Remove the screw which holds the other end of the bakelite strip, on which the coil is mounted, to the turret housing. (See fig. 153.) Remove the coil assembly. Assemble in reverse order.

g. To remove tank coil 115, remove the cover of the detector-amplifier assembly. (See fig. 149.) Remove the screw which fastens the coil to the case. Unsolder the wire at the coil terminal. Remove the coil. Assemble in reverse order.

h. To replace switch 106, remove the detector-amplifier assembly, as described in paragraph 74*b*. Remove the nut and washer which fastens the

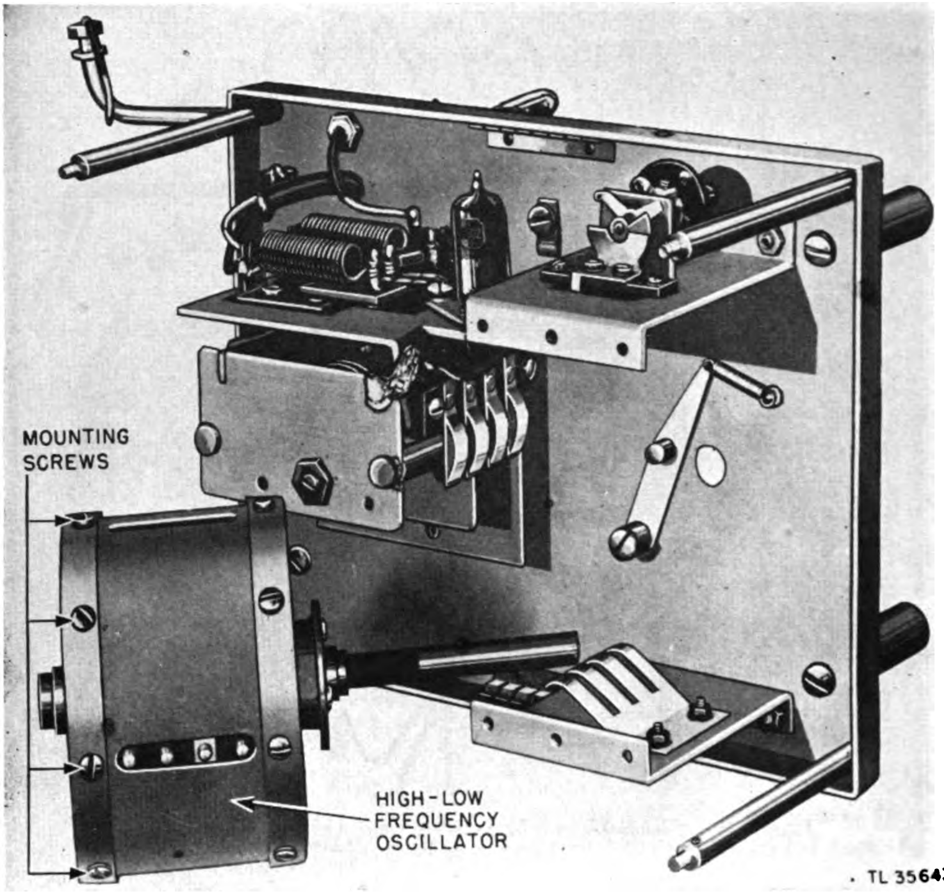


Figure 152. Signal Generator I-222-A, high-low frequency oscillator.

switch to the case. Unsolder the wires connected to the switch terminals and remove the switch. Assemble in reverse order.

i. To remove the antenna-support assembly, remove the detector-amplified assembly from the panel, as described in paragraph 74*b*. Remove the three antenna-support mounting screws. Unsolder the wires at the terminals. Remove the support from the case. Assemble in reverse order.

j. To replace switch 105–A and B (fig. 147), remove the attenuator assembly case from the front panel, as described in paragraph 74*a*. Remove the two screws on the side of the case. Lift the attenuator assembly from the case. Remove the two screws that hold the switch support plate to the mounting plate. Remove the nut and washer from the switch shaft. Unsolder the wires and remove the switch. Assemble in reverse order.

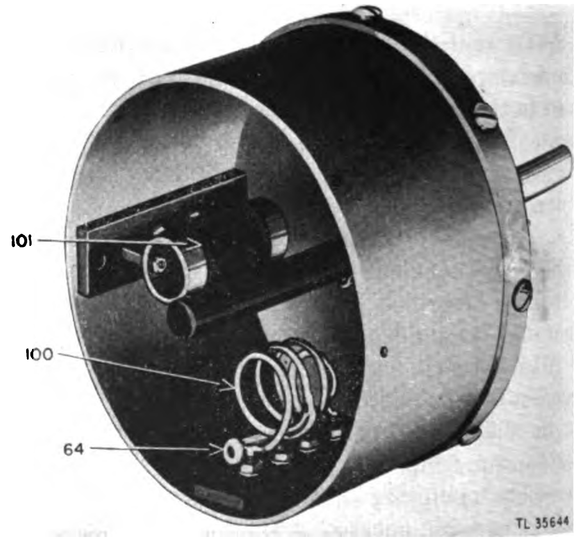


Figure 153. Signal Generator I-222-A, coil turret assembly.

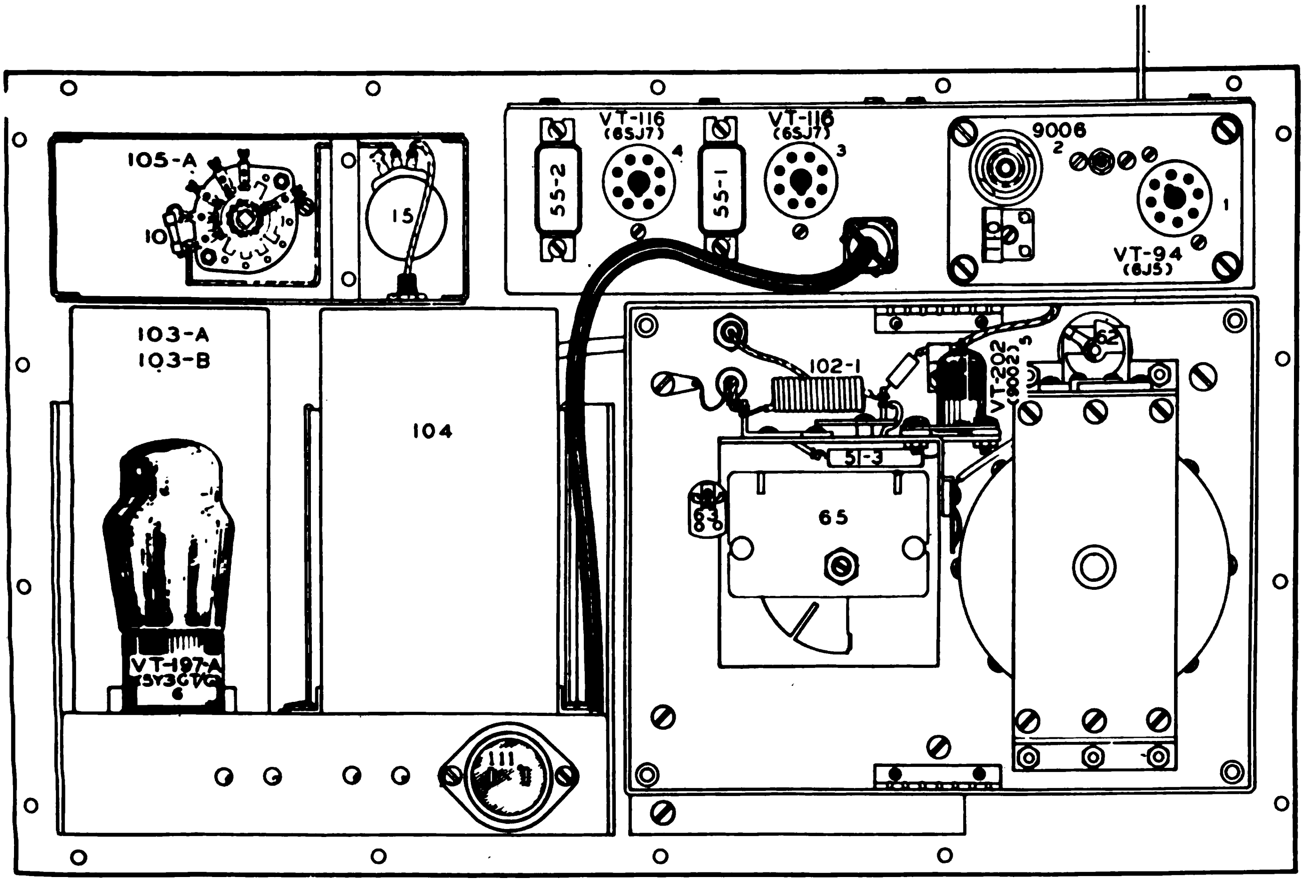


Figure 154. Signal Generator I-222-A, rear view showing location of parts.

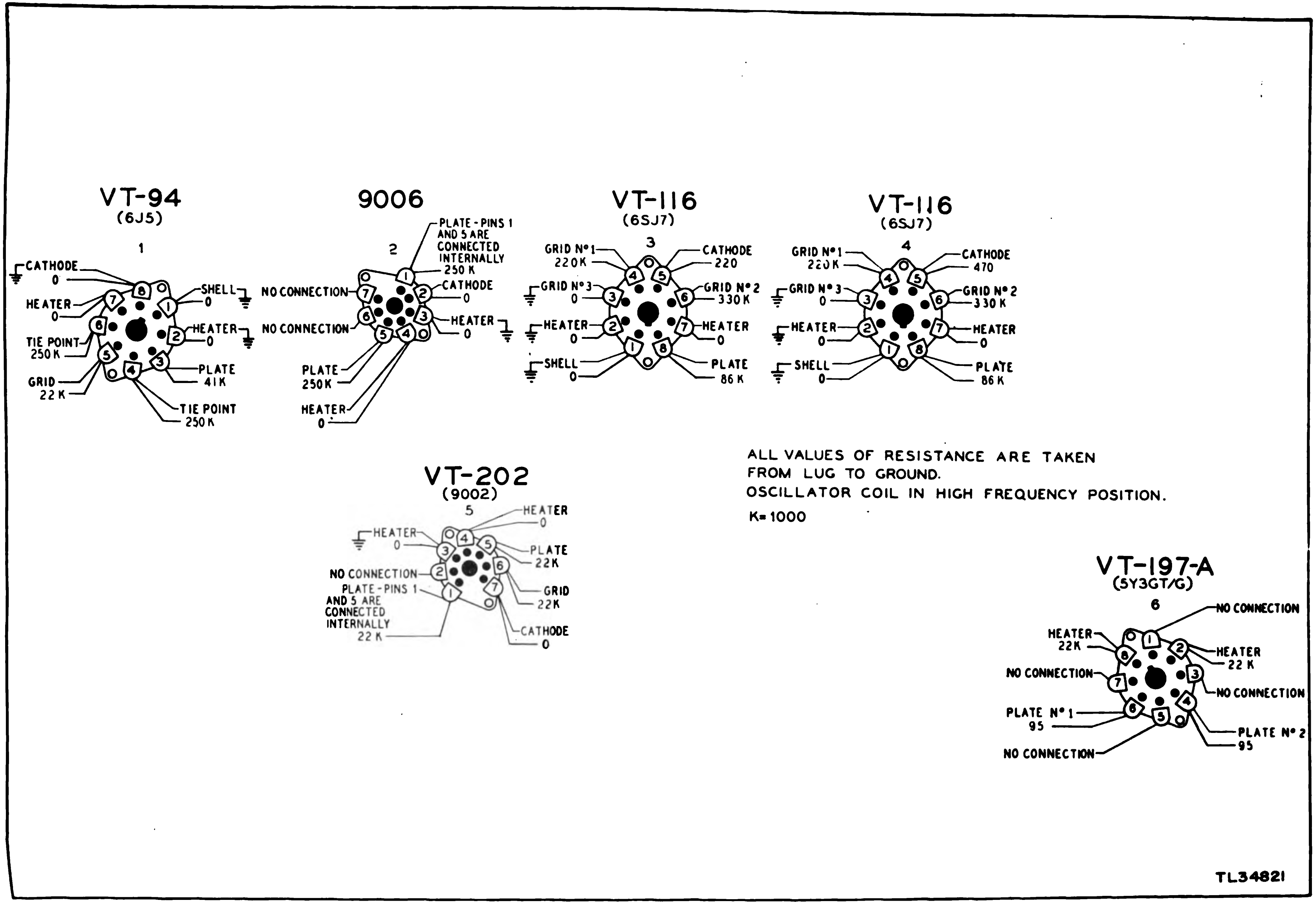


Figure 166. Signal Generator I-222-A, resistance chart.

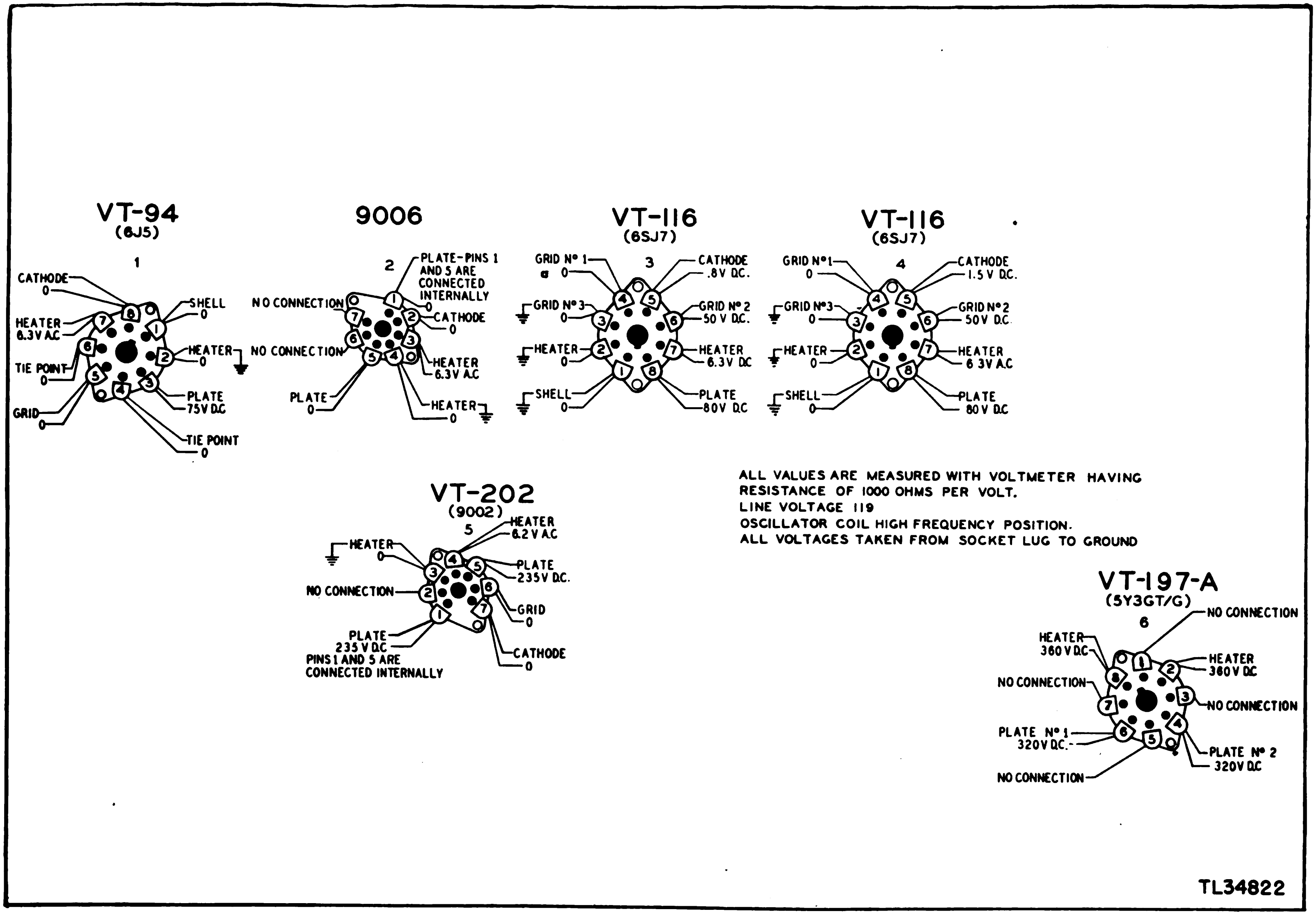


Figure 156. Signal Generator I-222-A, voltage chart.

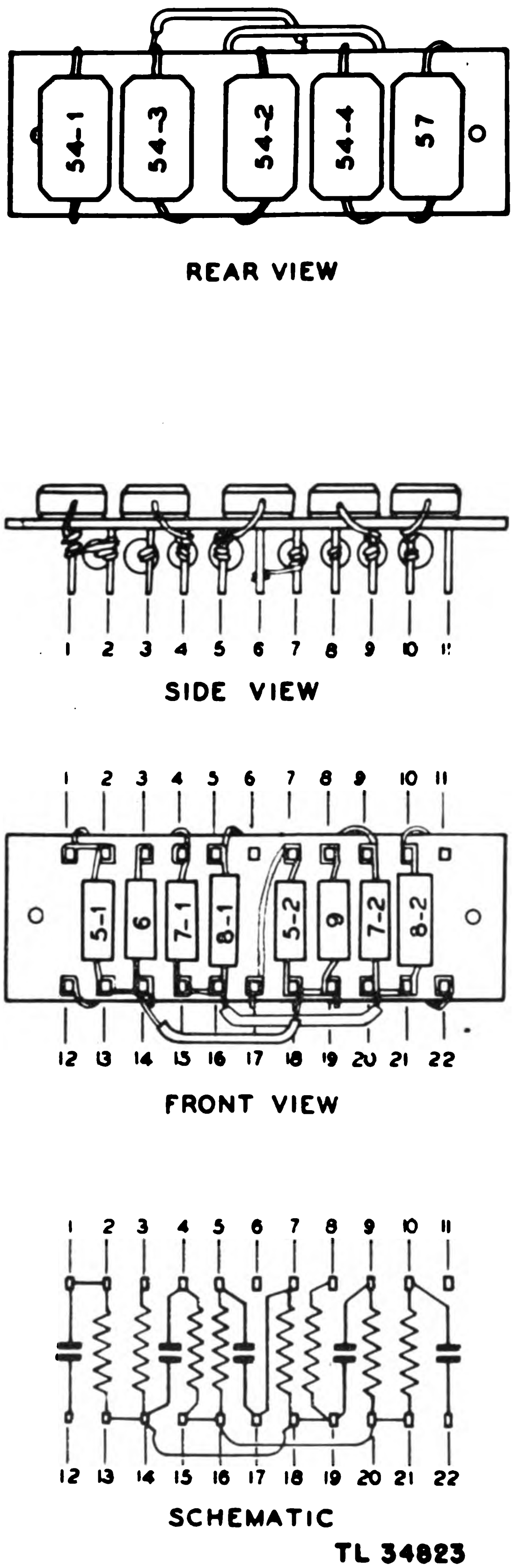


Figure 157. Signal Generator I-222-A, detector and audio-amplifier terminal board.

VOLTAGE AND RESISTANCE CHART OF DETECTOR AND AUDIO-AMPLIFIER TERMINAL BOARD (fig. 157).

Terminal	Volts	Ohms (M=1,000)
1	0	220 M
2	0	220 M
3	0.6	220
4	55	350 M
5	100	88 M
6	0	Infinite
7	0	220 M
8	1.2	470
9	50.	350 M
10	100	88 M
11	0	Infinite
12	0	250 M
13	0	0
14	0	0
15	250	20 M
16	250	20 M
17	0	220 M
18	0	0
19	0	0
20	250	20 M
21	250	20 M
22	0	Infinite

TEST CONDITIONS

1. All measurements made between points indicated and ground.
2. Voltage measurements made with voltmeter having resistance of 500 ohms per volt.
3. RANGE switch in either l-f or h-f position.
4. TEST-CRYSTAL switch in TEST position.
5. R-f attenuator controls in extreme counterclockwise position.
6. Head phones not plugged in.
7. AUDIO GAIN control in extreme clockwise position.

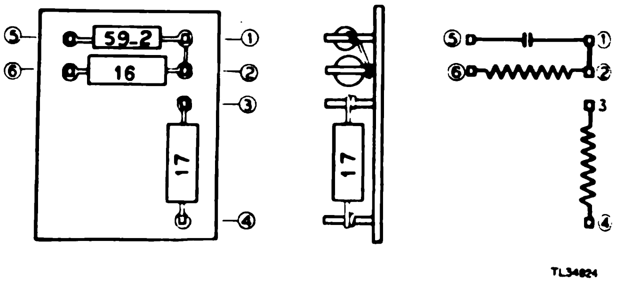


Figure 158. Signal Generator I-222-A, variable-frequency-oscillator terminal board.

VOLTAGE AND RESISTANCE CHART OF VARIABLE-FREQUENCY-OSCILLATOR TERMINAL BOARD (fig. 158).

Terminal	Volts	Ohms (M=1,000)
1	0	0
2	0	0
3	220	22.2 M
4	250	20 M
5	0	0
6	0	110

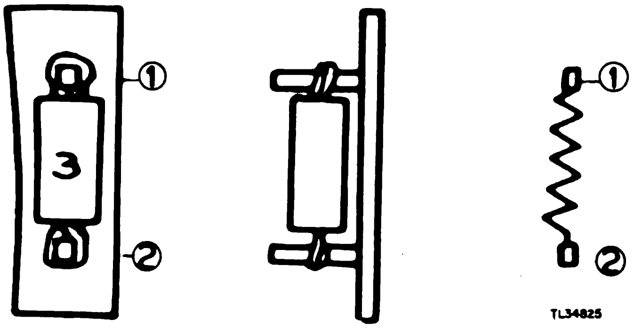


Figure 159. Signal Generator I-222-A, detector terminal board.

VOLTAGE AND RESISTANCE CHART OF DETECTOR TERMINAL BOARD (fig. 159).

Terminal	Volt	Ohm (M=1,000)
1	75	42 M
2	250	20 M

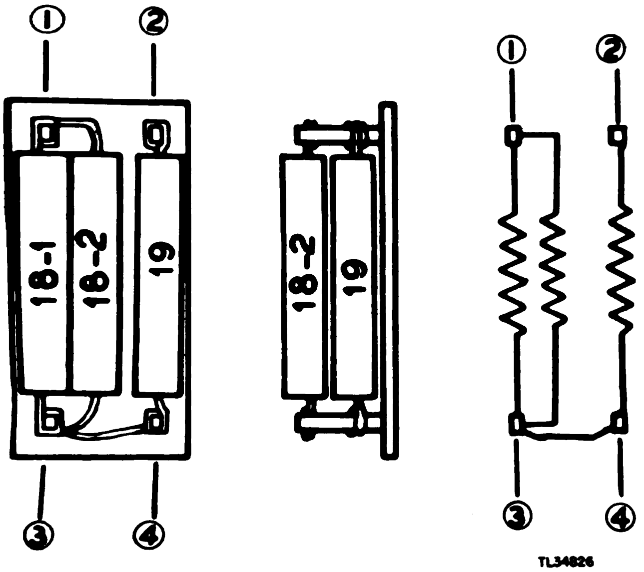


Figure 160. Signal Generator I-222-A, power-supply terminal board.

VOLTAGE AND RESISTANCE CHART OF POWER-SUPPLY TERMINAL BOARD (fig. 160).

Terminal	Volts	Ohms (M=1,000)
1	320	22 M
2	0	0
3	250	20 M
4	250	20 M

TEST CONDITIONS

1. All measurements made between points indicated and ground.
2. Voltage measurements made with voltmeter having resistance of 500 ohms per volt.
3. RANGE switch in either l-f or h-f position.
4. TEST-CRYSTAL switch in TEST position.
5. R-f attenuator controls in extreme counterclockwise position.
6. Headphones not plugged in.
7. AUDIO GAIN control in extreme clockwise position.

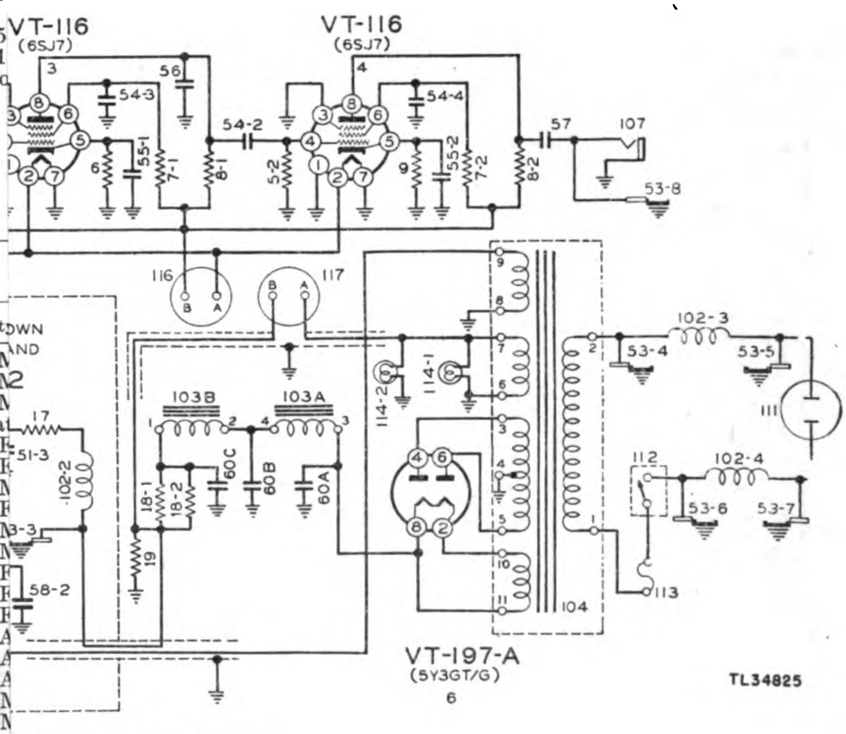
SPARK PLATE

PLY ASSEMBLY

TL 34827

Reference No.	Quantity	Ohms
1	1	10,000
2–1 to 2–3	3	22,000
3	1	22,000 Variable Cc
4	1	250,000
5–1 to 5–2	2	220,000
6	1	220
7–1 to 7–2	2	330,000
8–1 to 8–2	2	68,000
9	1	470
10	1	450
11–1 to 11–2	2	49.5
12	1	45
13–1 to 13–2	2	5.5
14	1	6.1 Variable Co
15	1	125
16	1	900
17	1	2,200
18–1 to 18–2	2	4,000
19	1	20,000
20	1	4,700

Reference No.	Quantity	Capacit
50	1	30 MM
51–1 to 51–3	3	100 MM
52	1	5000 MM
53–1 to 53–8	8	Spark Plat
54–1 to 54–5	5	.1 MF
55–1 to 55–2	2	1 MF
56	1	500 MM
57	1	.05 MF
58–1 to 58–2	2	40 MM
59–1 to 59–2	2	10 MM
60A	1	2.5 MF
60B	1	2.5 MF
60C	1	5.0 MF
61	1	Variable A
62	1	Variable A
63	1	Variable A
64	1	5 MM
66	1	150 MM



222-A, schematic diagram.

Reference No.	Quantity	
100	1	Inductanc
101	1	Inductanc
102–1 to 102–4	4	Inductanc
103A, 103B	1	Choke Du
104	1	Transform
105A, 105B	1	Switch, 5-
106	1	Switch, 2-
107	1	Jack, Phon
108–1 to 108–2	2	Receptacle
109	1	Antenna,
110	1	Crystal, 5
111	1	Receptacle
112	1	Switch, Tc
113	1	Fuse, 3 Ar
114–1 to 114–2	2	Lamp, 6-8
115	1	Inductanc
116	1	Receptacle
117	1	Plug, Fem

CHAPTER 3

ASSEMBLY AND DISASSEMBLY OF TOWER TR-24-A

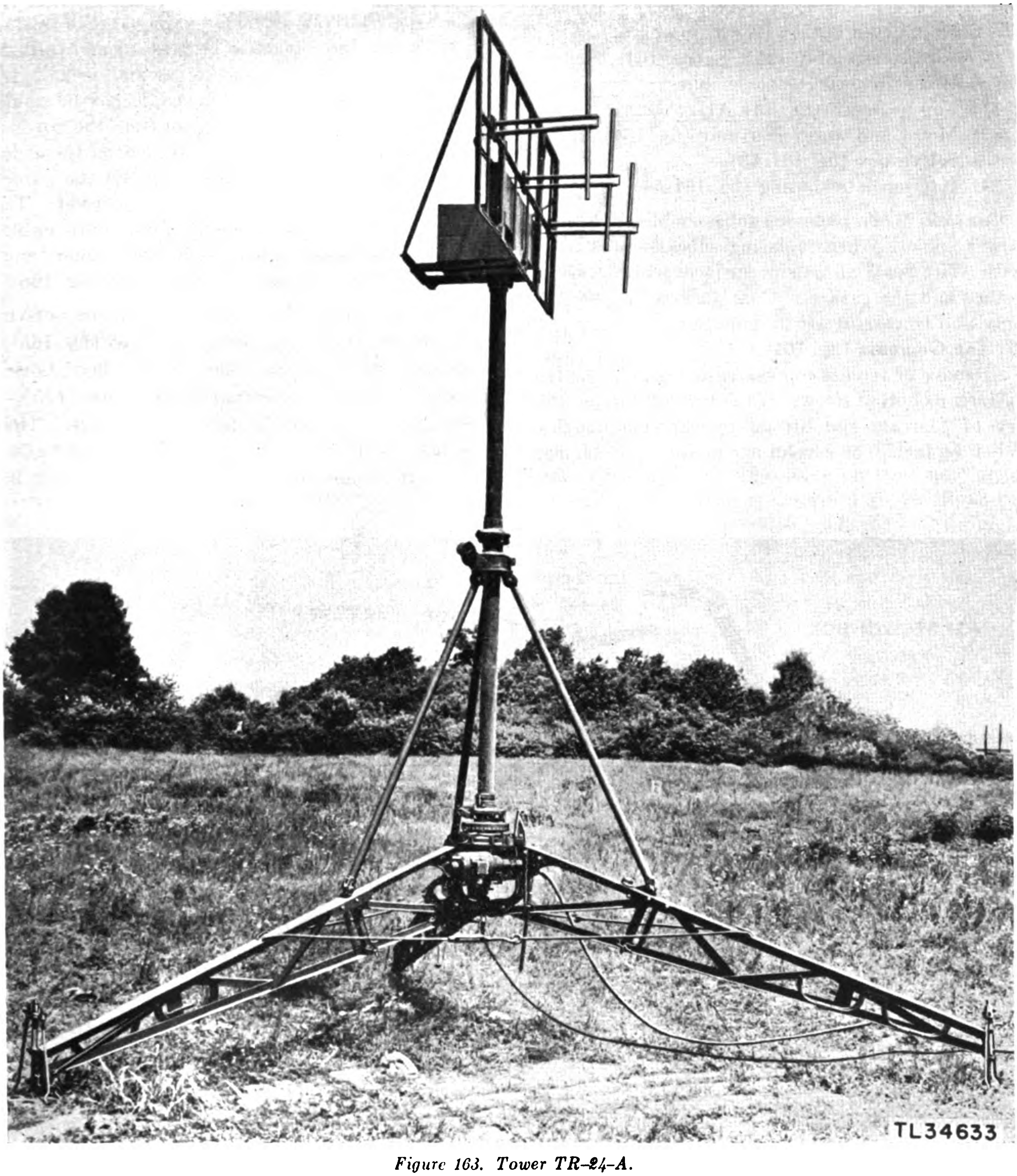


Figure 163. Tower TR-24-A.

76. General

a. Tower TR–24–A is a mast supported by a tripod. The tower supports Antenna AN–154–A together with the cabling and lobe-switching assembly associated with the antenna. The tower also has a drive motor and gearcase assembly which is used for rotating the antenna. The main assemblies are broken down into subassemblies, and the removal and replacement of the individual parts are described in detail in the following paragraphs.

b. Gearcase assembly 125X-E (fig. 164), is composed of the following subassemblies:

(1) Top gearcase (fig. 164 A1).
(2) Motor and worm gear unit (fig. 164 A2).
(3) Selsyn box (fig. 164 A3).
(4) Intermediate housing (fig. 164 A4).

Caution: When removing subassemblies, uncouple power cable. When replacing subassemblies, coat with "Tite Seal" all outside surfaces which bolt together and the gaskets. Coat gaskets on one side only and be careful not to damage them.

77. Top Gearcase (fig. 164)

To remove or replace top gearcase, take out the ten 3/8-inch mounting screws, 125X–1070 on top periphery of gearcase and lift off by carrying handles. When replacing, be careful not to deface or damage gears.

a. Slip Ring Jack Cables. The slip ring jack cables 125X–576 (fig. 165) are the six small cables used as intermediate connectors between the slip rings and the spring plunger contacts of the terminal plug at the bottom of the flexible coaxial line. To remove the slip ring jack cables, remove the small screws 125X–475 in bakelite core of beveled selsyn driving gear. Work the cables slightly upward until the buttons, fastened to the tops of the jacks, are pushed out of the large top bakelite bushing 125X–368 far enough to be grasped and pulled out, carrying with them the cables and jacks. If only a single cable is to be removed, it may be done without removing the top gearcase from the tower. Merely remove handhole cover located on the side of the intermediate housing and take out the cable by using a small pair of pliers and screwdriver. To make up a new cable assembly from spare cable stock, cut 7 1/8 inches of wire, strip back armor, and bare wires; then solder ends in place. (See fig. 166.)

b. Selsyn Gear. To remove or replace selsyn gear 125X–99 and driving flange 125X–95 (fig. 165), remove the slip ring jack cables, as described above. Remove the three 1/4-inch mounting screws 125X–1060 from underneath the face of the flange. The gear is pressed, keyed, and setscrewed to the bakelite hub 125X–60 which is attached to the flange in

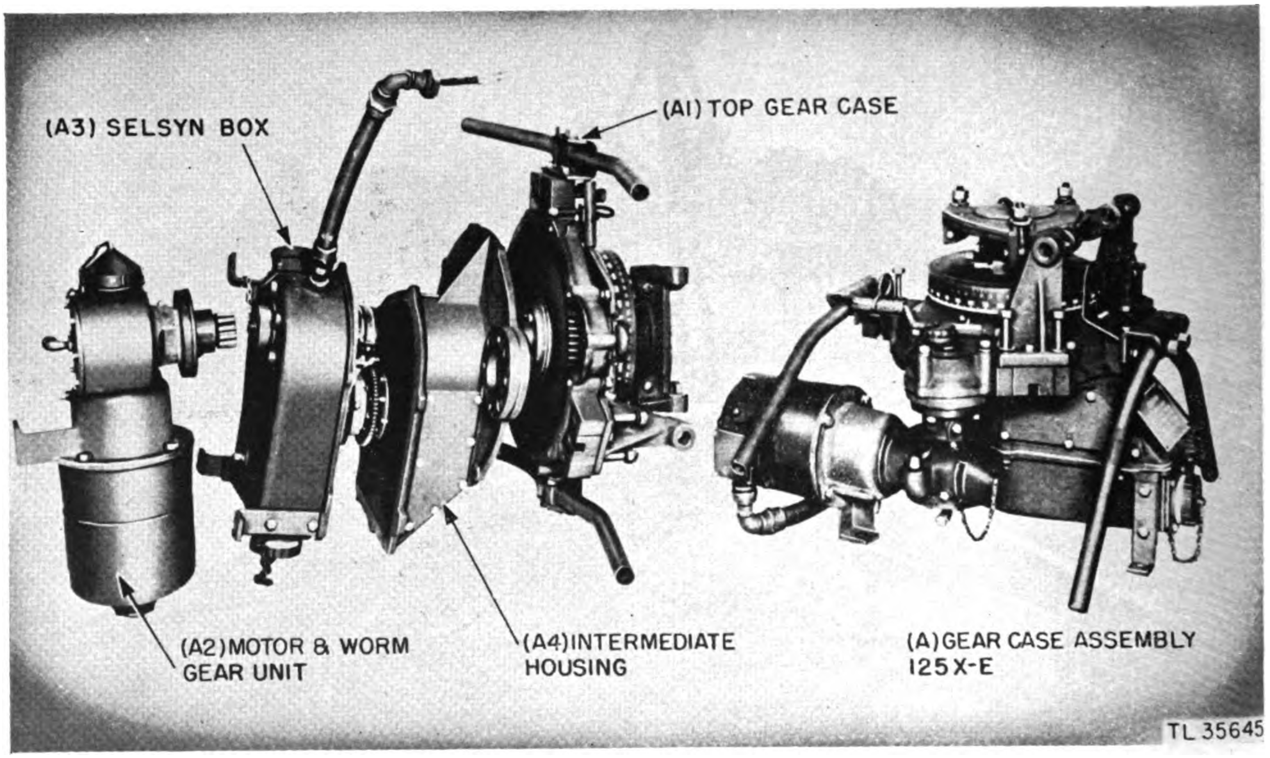


Figure 164. Tower TR–24–A, gearcase assembly 125X–E.

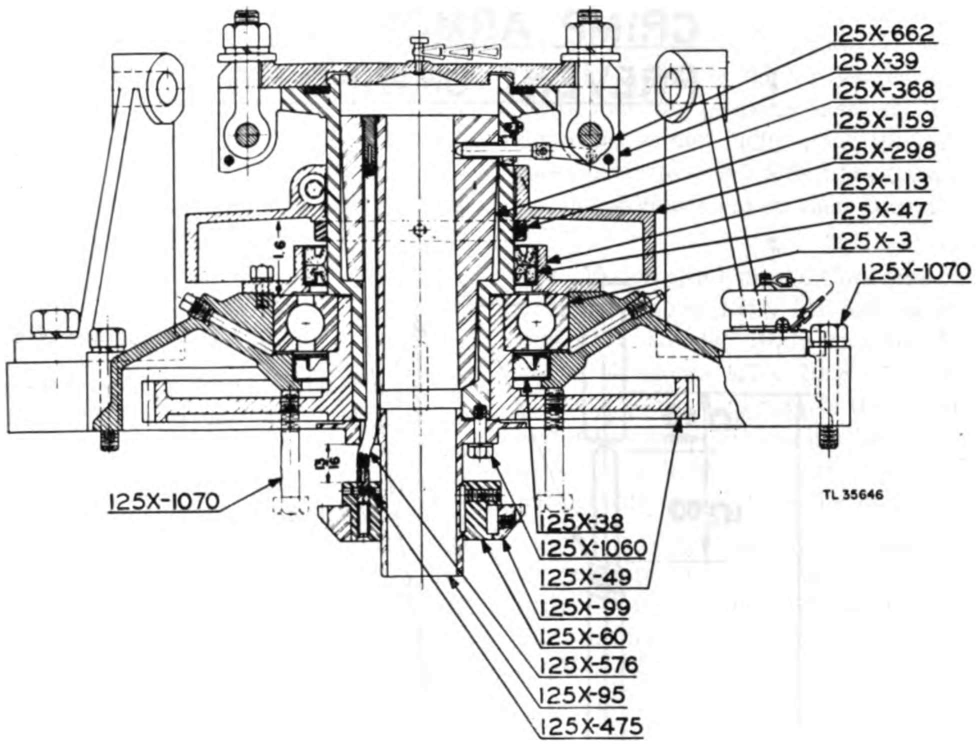


Figure 165. Tower TR-24-A, top gearcase.

the same manner. To remove the gear, loosen setscrew and carefully drive or press off. When replacing, drive or press on carefully to 13/16-inch dimension. (See fig. 165.)

c. Spur Gear. (1) To remove or replace spur gear **125X–49** and hinged mast flange 125X–39 (fig. 165), take out the selsyn gear and driving flange as described above. Next, remove aximuth-dial indicator or pointer. Also remove the bakelite bushing **125X–368** to prevent damaging it. When removing, it is necessary to disassemble and pull out interlocking or detecting pin 125X–662. Start the gear off its flange hub by using two of the top gearcase ⅜-inch fastening screws 125X–1070 as jacks. (See fig. 165.) Be careful to turn both screws at the same time so as not to cramp. After the gear is started off about ½-inch, drive out the central hub over which it is pressed by using a wodden plug to strike against so as not to damage the flange hub. The gear can then be pulled out of the inner ball-bearing race.

(2) To replace the spur gear, turn hinged flange upside down and drop the gearcase over it, with ball bearing and oil seals in place. Be careful not to damage oil seals. Rub a film of grease around inner face of oil seals and keep seals free from dirt. Drive gear over hub of flange, and be careful to line it up with the inner race of oil seal and ball bearing.

d. Azimuth Band. To remove or replace azimuth band 125X–298 (fig. 165) take out the spur gear and hinge mast flange as described above. Remove the seal retaining clip which holds the seal through which interlock pin 125X–662 protrudes. Loosen the azimuth-band adjusting lock and raise the ring to get at the two setscrews in collar 125X–159 located under the band. Loosen the setscrews in the collar and remove the collar and band. When replacing the collar, be sure it is located to 1.6-inch dimension as shown in figure 165.

e. Ball Bearing and Oil Seals. (1) To remove or replace ball bearing 125X–3 and oil seals 125X–47 and 125X–38 (fig. 165), take out the azimuth band as described above. Next, remove flange retainer 125X–113, carrying with it the top double-oil seals 125X–47. The ball bearing may then be lifted out and the bottom oil seal driven out.

(2) When replacing the ball bearing and the oil seal, coat the flange retainer with "Tite Seal." Be sure to keep all parts clean and free from dirt. Coat the inner race of oil seals with a film of grease. Oil seals are very easily damaged; be careful not to damage or deform them when pressing them in or out. Be careful not to scratch or deface the surfaces with which the oil seals come in contact on gear case assembly 125X–E, because the tightness of the seal depends on good contact with the casing as well as

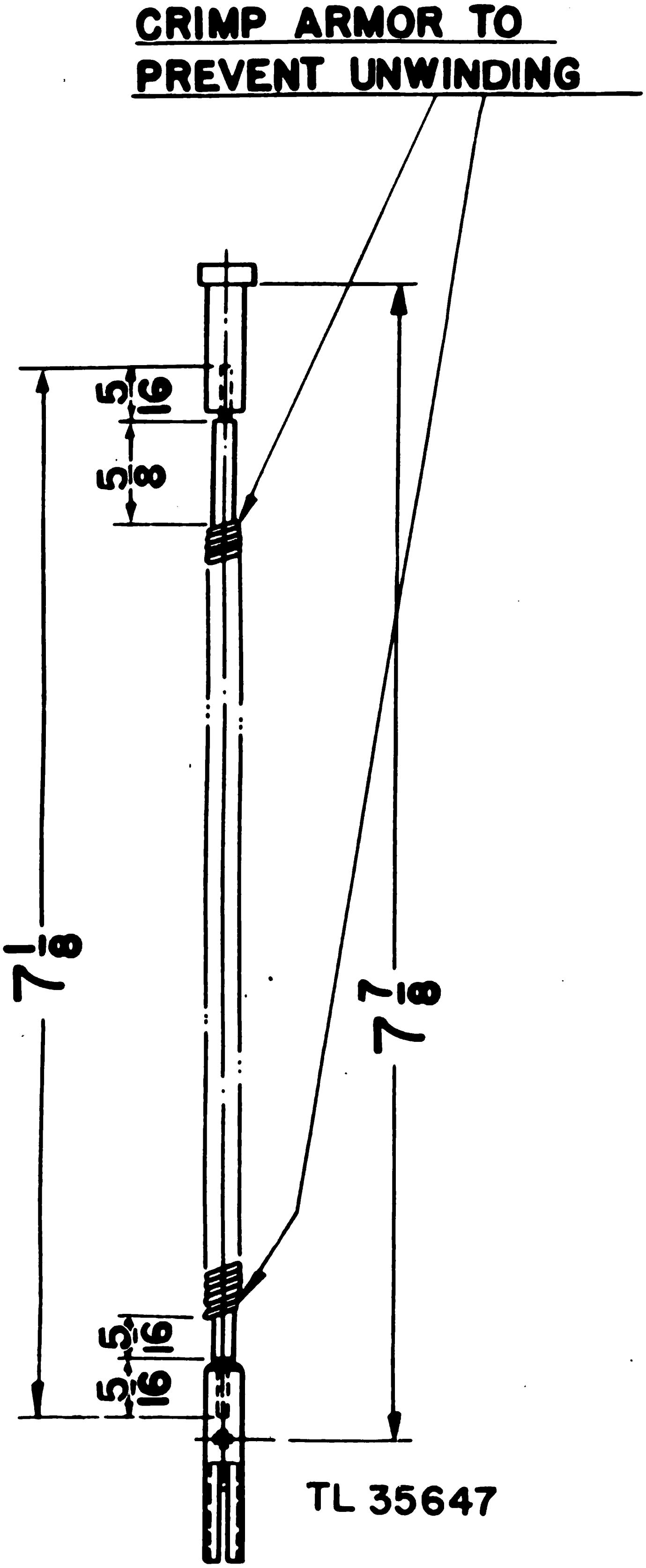


Figure 166. Tower TR-24-A, slip-ring jack cable.

with the flexible sealing member itself. (See fig. 165.) If oil seals are carelessly applied or damaged, dirt and moisture will enter the gearcase; the lubricant will leak out and cause serious damage to the parts. Handle oil seals carefully. To insure a leak-proof seal, oil seals must be installed so that the side with the serrated spring is next to the ball bearing. Be sure that the ball bearings are filled with grease and are kept free from dirt or grit.

78. Motor and Worm-gear Unit (fig. 164)

To remove or replace motor and the worm-gear unit subassembly (figs. 164 and 167), take off the cover of the terminal box on side of motor; disconnect the three wires from the terminals; unscrew the union; and disconnect the flexible condulet. Remove four 3/8-inch mounting screws 125X–1069 from the 4 1/4-inch flange which is attached underneath the face of the flange of the intermediate housing. Then remove motor and worm unit from the top of the gearcase. When replacing the motor and worm-gear unit, be sure the motor wires code-marked T–1, T–2, and T–3 are connected to terminals marked correspondingly. When bolting the assembled unit to the top gearcase (fig. 164), spur gears must be properly meshed. Tighten the four mounting screws lightly; tap the unit to adjust the mesh until there is a slight backlash of not over 1/2° on the azimuth band; then turn the screws down tight.

a. MOTOR AND DRIVING COUPLING. (1) To remove or replace motor 125X–516 and motor driving coupling 125X–55 (fig. 167), take out the four 3/8-inch mounting screws 125X–1068 in the flange to which motor is bolted, and remove the motor. If the motor and worm gear-unit has not been removed from the tower, it will be necessary first to disconnect the wiring before detaching the motor.

(2) To remove motor coupling 125X–55, loosen the setscrew in the hub and drive or press off carefully. If it is desired to remove the other half of the coupling attached to the worm shaft, take out the worm shaft.

(3) When replacing the motor coupling, be sure

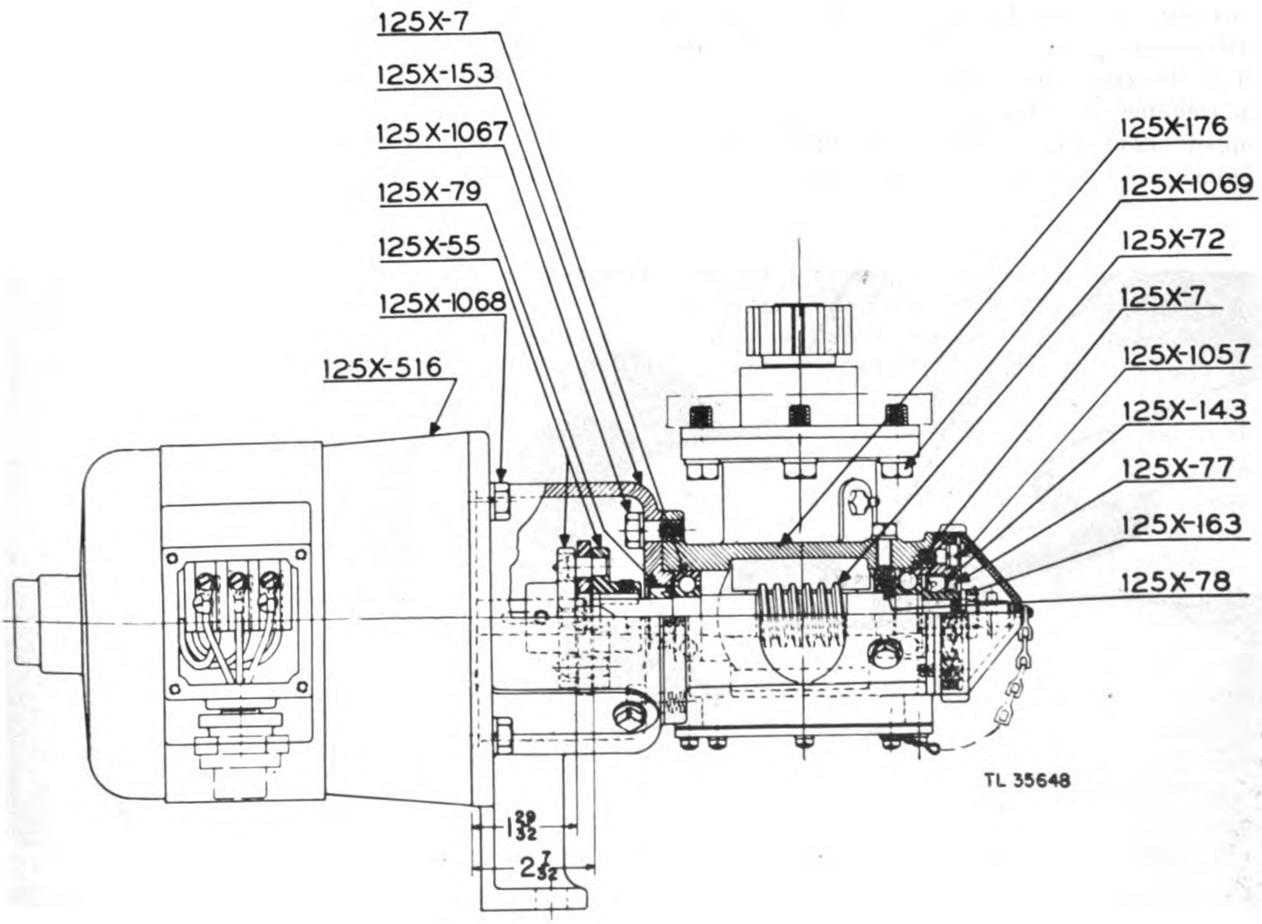


Figure 167. Tower TR-24-A, motor and worm-gear unit.

it is driven on to the 1 29/32-inch dimension shown in figure 167. Then tighten the setscrew in the hub coupling.

(4) To replace the motor, coat the flange to which it is bolted with "Tite Seal" and then bolt the motor securely to the flange with four ⅜-inch mounting screws 125X–1068 and reconnect the wiring.

b. Worm and Shaft. (1) To remove worm and shaft 125X–72 and coupling 125X–55 (fig. 167), take out the motor and worm-gear unit and the motor and coupling as described above. Unscrew the cap which covers the end of worm shaft to which the hand crank is attached and drive out the cross pin which engages the hand crank. Remove the retaining nut; then detach retaining cover 125X–77 by taking out the four ¼-inch slotted head-screws 125X–1057 with a screwdriver. Tap the cover lightly to loosen up the "Tite Seal" between the adhering surfaces. Remove the small retaining collar 125X–163 around the shaft which retains the ball bearing so that the outside oil seal will come off when the retaining cover is removed. Take off the four ⅜-inch mounting screws 125X–1067 on the inside periphery of the motor support or flange 125X–153. Carefully drive off this support. The worm and shaft, coupling, oil seal, and ball bearing will come off at the same time. Next, loosen the setscrew in the coupling hub. The plug in the bottom of motor support 125X–153 is removed to provide a hole through which the setscrew wrench can be inserted. Drive the worm shaft from the coupling (fig. 168) by using the ½-inch diameter bronze drift pin supplied with tool kit. When the shaft is driven from the coupling, it will carry the ball bearing with it. The oil seal in the motor support will probably be damaged, and therefore it is essential that a new one be installed each time the shaft is removed.

(2) To reassemble worm and shaft, fit coupling to worm shaft and then remove it together with key. Fit ball bearing 125X–7 on coupling end of the shaft. Drive its inner race against shoulder of shaft. Fit the other ball bearing, which is a duplicate, on the other end of the shaft; it should not fit too snugly. Remove the bearing from the shaft, fit retaining collar 125X–163 to shaft and remove it from shaft. Next insert the worm shaft into its housing 125X–176 and install the other ball bearing 125X–7 over the shaft and into the housing against the locating collar 125X–78. Place the retaining collar 125X–163 with flanged end against inner race of the ball bearing, and put the retaining cover 125X–77 with oil seal in place so that the side of the seal with the serrated spring is next to the ball bearing. Be sure to coat the joint surface of the retaining cover with "Tite Seal" and to tighten the mounting screws. Place the lockwasher on the shaft and tighten the retaining nut on the end of the shaft. Drive the hand-crank pin into the shaft. Place a new oil seal, keeping the serrated spring side

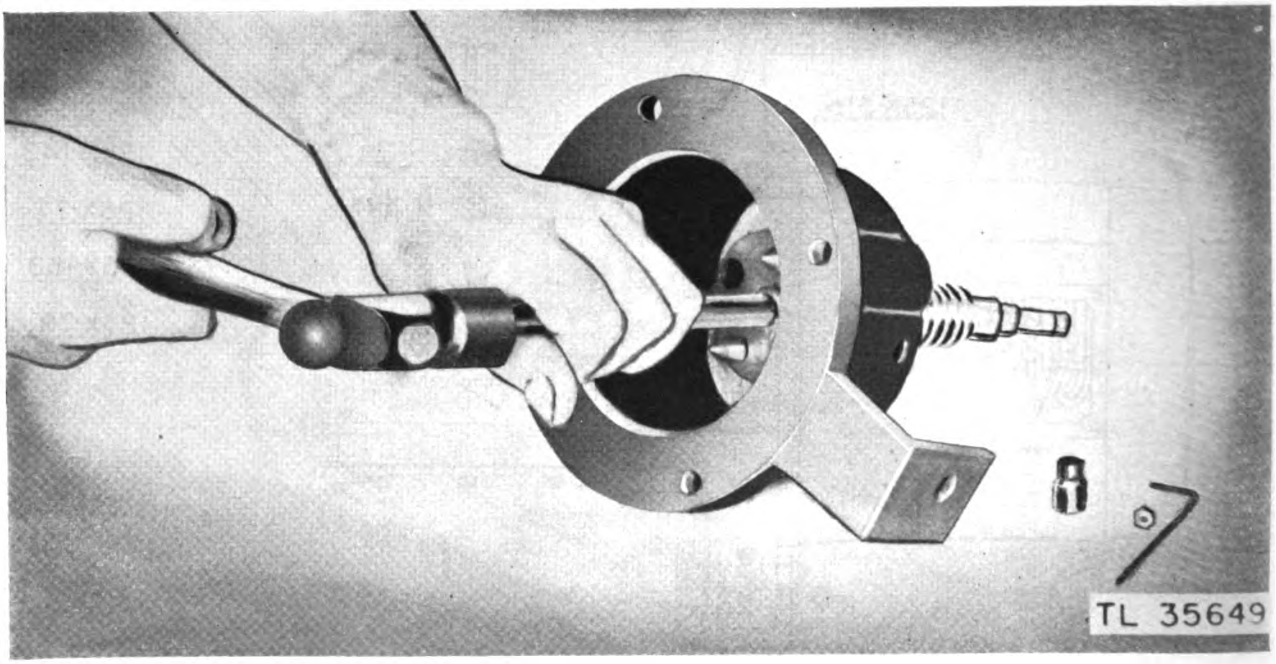


Figure 168. Tower TR-24-A, removal of worm shaft.

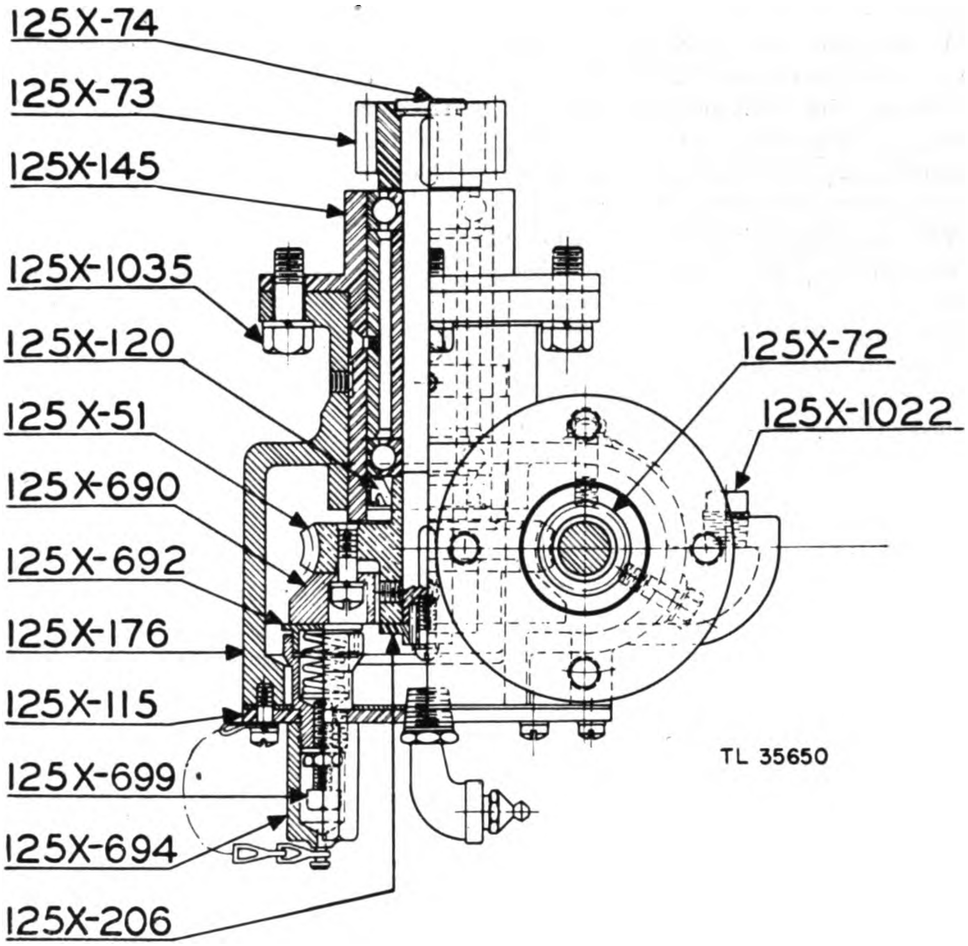


Figure 169. Tower TR–24–A, worm-gear vertical shaft mechanism.

of the seal next to the ball bearing on the motor support 125X–153 surface. Coat the surfaces with "Tite Seal" and bolt it to the housing. Place the coupling key on the shaft inside the motor support. Drive the coupling on to the 2 7/32-inch dimension as shown in figure 167. Tighten the setscrew, and screw in the plug to close setscrew wrench hole.

Caution: Do not loosen screws which hold locating collar 125X–78 or try to remove collar. This collar provides correct end-wise location of worm shaft without excessive end-play or backlash which would produce inaccurate tower performance. Be sure couplings are driven on to dimensions as shown in figure 167; otherwise, when motor is bolted on, the coupling faces may jam together and put excessive end pressure on motor and worm shafts.

c. Adjustment of Gear Mesh of Worm 125X–72 and Worm Wheel 125X–51 (fig. 169). (1) Remove the motor and worm-gear unit as described above. Adjustment must be made if gears are worn, if new gears are installed, or if gears have been taken out. The worm wheel, shaft, and spur gear, together with their ball bearings and oil seals, are supported as a unit by eccentric sleeve 125X–145. By rotating this sleeve, the meshing of the worm wheel with the worm is adjusted. To adjust, first remove cap 125X–694 and loosen friction adjusting screw 125X–699 so that there is no pressure from the friction spring against the worm wheel shaft. Next, loosen eccentric sleeve setscrew (fig. 169) in the housing hub 125X–176. Rotate the sleeve until gears mesh together with very little blacklash and still run perfectly free. Counterclockwise rotation tightens gear mesh.

(2) Excessive backlash makes the tower inaccurate. Meshing that is too tight makes the tower turn hard and perform erratically. When adjusting, test the proper gear mesh all the way around the worm wheel by turning the worm wheel until the tower has made one complete revolution. Tighten locking setscrews when adjustment is completed.

d. Worm Wheel, Vertical Shaft, and Spur Gear. (1) Never try to remove the wheel without first removing the worm and shaft as described above. To remove worm wheel 125X–51, vertical shaft 125X–74, and spur gear 125X–73 (fig. 169) first remove the round cover plate 125X–115.

Caution: Friction plug 125X–692 probably will stick to the flange 125X–690 therefore it must be picked out immediately or it will get lost in the grease. Remove grease; then take out the friction flange 125X–690 and retaining washer 125X–206. Loosen setscrews in hub of bronze worm wheel 125X–51; then loosen eccentric sleeve setscrew 125X–1035. (See fig. 169.) Carefully drive the shaft from the worm wheel, carrying the eccentric bushing along with it. Use ½-inch x 6-inch bronze drift pin supplied with tool kit to drive the shaft out. To remove spur gear 125X–73 drive the shaft through the gear.

(2) Parts that are replaced should be fitted before reassembly. Replace the ball bearing 125X–7 and oil seal 125X–120. Place the spur gear 125X–73 on shaft 125X–74 and push the shaft through ball bearings and oil seal in the eccentric sleeve. Put worm gear key in shaft and insert eccentric sleeve in housing 125X–176. Carefully drive or press bronze worm gear on shaft and tighten setscrew. Replace retaining washer 125X–206 and friction flange 125X–690, and tighten all setscrews securely.

(3) If worm and shaft have been removed, replace as described above. Pack gear housing with lubricating grease; make sure it is pressed into all pockets and areas. Replace the circular cover 125X–115, being sure that friction plug and spring are first properly assembled and the sealing gasket is properly placed. Do not withdraw the cover after friction plug has made contact with grease because the plug will stick to the grease, pull out of its holder, and probably get lost in the grease.

(4) The spring loaded friction plug 125X–692 engages the worm gear friction flange 125X–690, and its contact pressure and resulting friction are adjustable by means of the worm-gear brake screw 125X–699 (fig. 169) which projects through the cover plate 125X–115. This screw is inclosed by an oil-tight retaining cap 125X–694. To adjust the worm gear brake screw, remove the oil-tight retain-

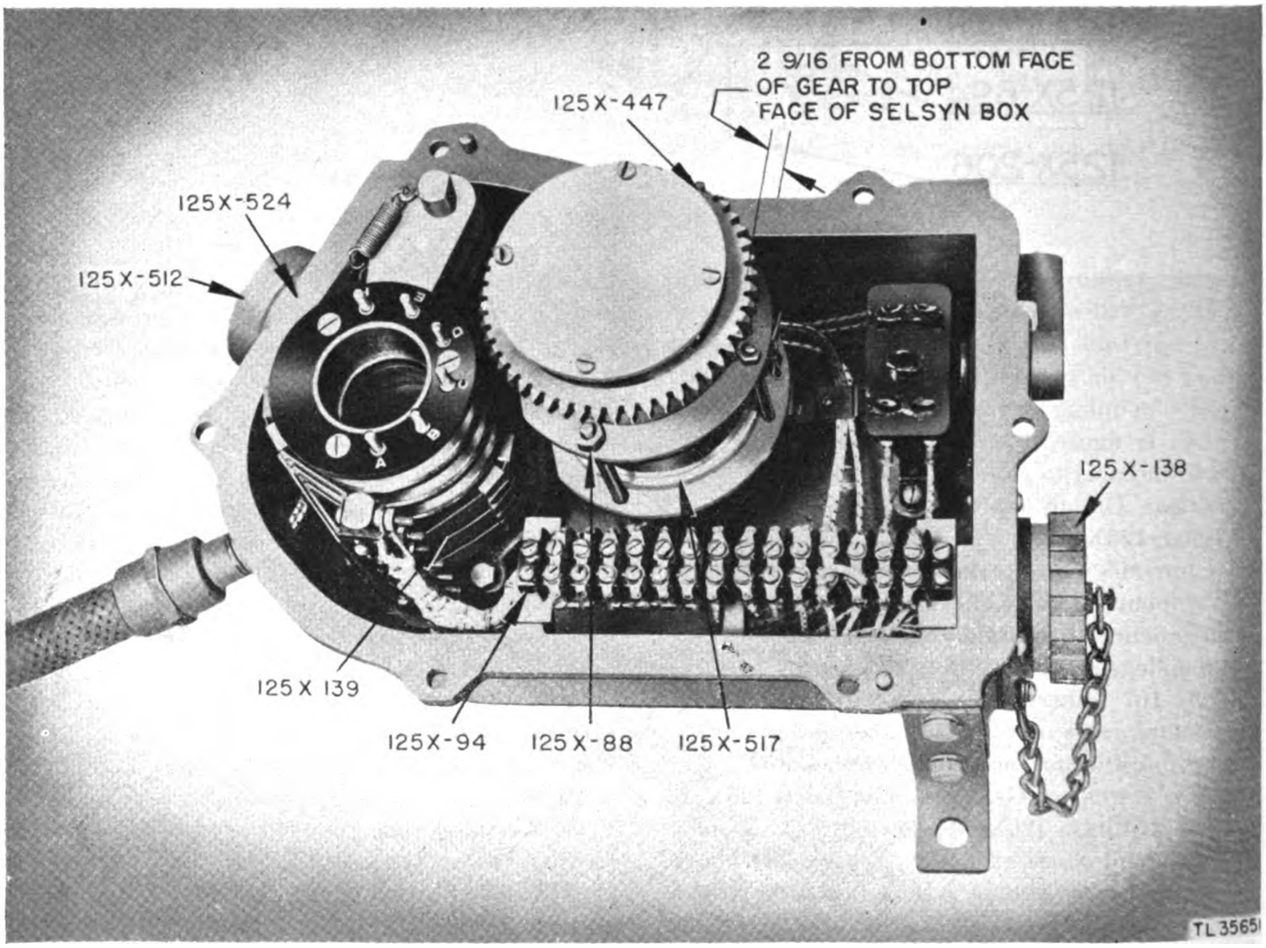
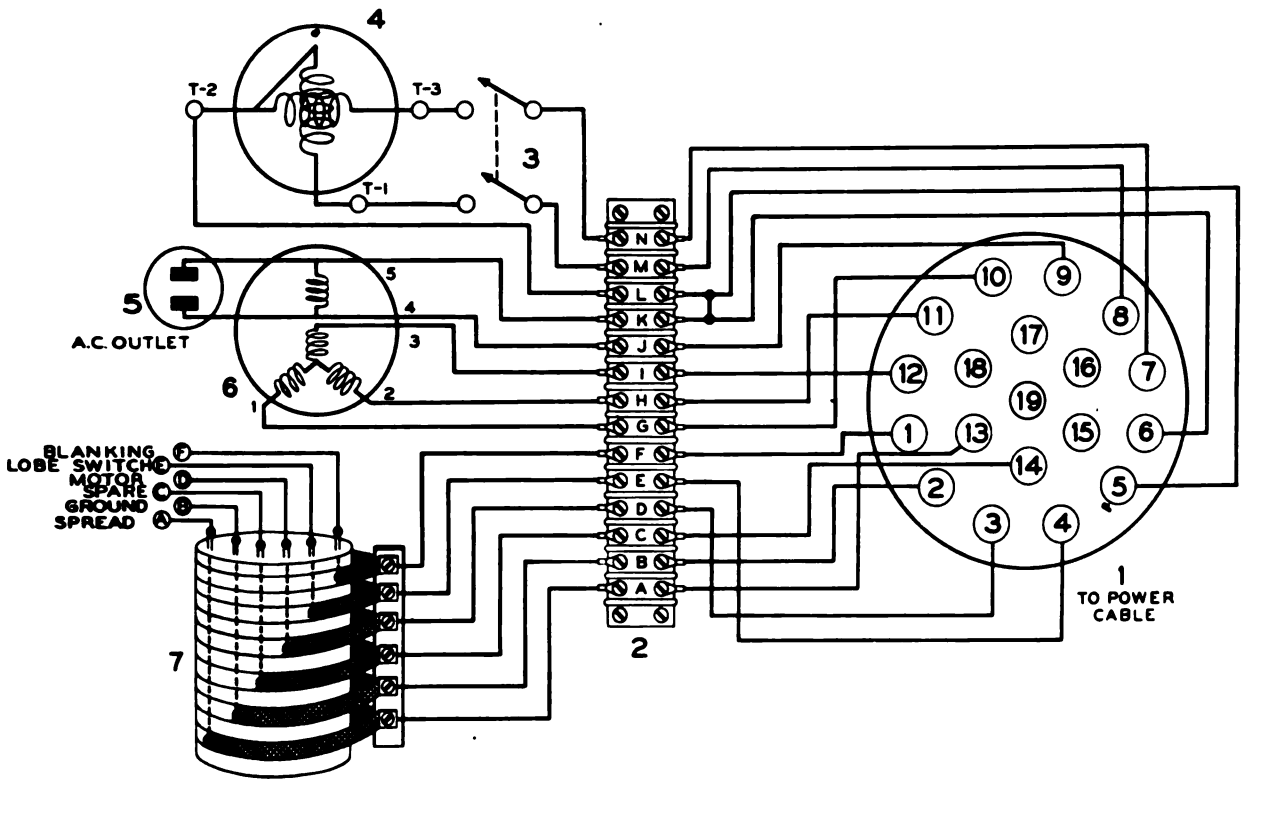


Figure 170. Tower TR-24-A, selsyn box subassembly.



PART NO.	S.C. TYPE	QTY.	PART	MANUFACTURERS TYPE OR CATALOG NO. AS SPECIFIED OR EQUIVALENT	
1		1	RECEPTACLE	PYLE-NATIONAL X100PEP	
2		1	TERMINAL STRIP	HOWARD B. JONES 14-141	
3		1	SWITCH	ARROW HART & HEGEMAN 6808-U	
4		1	MOTOR	GENERAL ELECTRIC KCP45	
5		1	RECEPTACLE	CROUSE-HINDS GS581	
6		1	SELSYN	BENDIX IV	
7		1	SLIP RING ASSEM.	LAPP INSULATOR PER. PNEUMATIC SCALE CO DWG. NO. 125X-524	

TL34602B

Figure 171. Tower TR-24-A, schematic diagram and legend of drive unit.

ing cap and loosen the locknut; then slowly turn the adjusting screw until the plug contacts the flange. Turn the adjustment plug three complete turns in from this point. Tighten locknut and replace the oil-retaining cap. This is an average adjustment. In setting for cold climate conditions in cases where the inherent friction of the tower is great, it may be necessary to break off this screw. On towers where excessive hunting persists, it is necessary to turn the adjustment screw to increase friction. Do not apply any more friction than necessary, because too stiff a tower may leave excessive voltage on the motor when it comes to rest.

79. Selsyn Box

Caution: All wires and terminals are marked or coded with letters or numbers. In making connections be sure terminal markings correspond. If markings are not readable, consult figure 171.

a. Selsyn Box Subassembly (fig. 170). (1) To remove selsyn box subassembly (figs. 165 and 170), remove solid coaxial line (fig. 175) and disconnect power cable. Disconnect wiring and flexible condulet at the motor, leaving wiring and condulet attached to selsyn box. Remove the six 5/16-inch fastening screws which bolt selsyn box to underneath face of intermediate housing, and lower the selsyn box. When lowering this box, be sure to keep it on a horizontol plane to prevent damage to the slip ring unit.

(2) To replace this box, remove inspection cover on side of intermediate housing. Check fits to insure that six prongs in top of slip ring unit properly engage their respective jacks. Lift the selsyn box up

to the intermediate housing, making sure that the dowels are matched with their respective holes. Bolt the two units together before replacing the inspection cover plate. Check to see that there is no backlash between selsyn gears.

Note. When removing motor and worm-gear unit and the selsyn box, turn the gear case assembly upside down for the sake of convenience. These units may, however, be removed without detaching the gearcase assembly from the tower.

Caution: Whenever the top gear case or the selsyn box is removed, the two selsyn gears are thrown out of mesh and the correct orientation of the tower with respect to the indicator azimuth dial is destroyed. Therefore, after reassembling the selsyn box, orientation must be re-established. Orientation is accomplished as follows: Apply power to the tower and allow the tower to come to rest. Read the azimuth of the tower on the azimuth band. Slip the indicator azimuth dial to the same reading and lock the dial in position. If, however, the tower azimuth dial was moved while the gear case and the selsyn box were removed, it is then necessary to reorient the whole tower in the same manner as when originally setting it up. Also, this latter procedure must be followed if the supporting legs of the tower have been moved from their original setting.

b. SLIP RING ASSEMBLY. (1) To remove or replace slip ring assembly 125X–524, disconnect the six-wire harness from terminal strip 125X–94. Remove the three ¼-inch screws which fasten the supporting bearing to the bottom of the selsyn box. The slip ring assembly can then be lifted off, together with the six-wire harness, brush assembly, and supporting bearing.

(2) To take off the slip rings, first remove brushes, then loosen setscrews and take off collar in recess under supporting bearing. The slip ring is made up of six independent rings mounted on a central sleeve and fastened together with the three long flathead screws. To remove these rings, remove the flathead screws. In reassembling, be sure to start with the ring having the long jack pin and place it at the bottom. To remove or replace slip ring brushes 125X–139 (fig. 170), take off the slip ring assembly as described above. Unhook brush springs and detach the bronze ribbon, which carries two carbon brush shoes, from its brass binding screw. In replacing the ribbons, the bottom three brush ribbons must be applied on the side opposite the ⅛-inch-thick bakelite baffle or shield so that the carbon shoes will not interfere with the baffle. It is best to place the top three brush ribbons on the side opposite the bottom three so as to balance the reaction of the brush spring pressure in the slip ring assembly.

c. SELSYN TRANSMITTER. (1) To remove selsyn transmitter 125X–517, (see fig. 170), disconnect the five selsyn lead wires from terminal strip 125X–94. There are four nuts which clamp the two flanges of the selsyn together. Remove the two larger nuts 125X–88. Take out the cotter pin from top of spring stud projecting through lower selsyn flange and lift the selsyn out.

(2) To remove and adjust selsyn gear 125X–447, remove circular wiring diagram. Take out the supporting disk. Unscrew the retaining nut and carefully pry off the gear. Do not lose the small key. Be careful not to move or unscrew the swiveled screws which support the selsyn because this will disturb the proper meshing of the gears.

(3) Proper height of the selsyn can be obtained by adjusting the supporting swivel screws and spring stud. The distance from underneath face of selsyn gear to finished top of selsyn box must be 2 9/16 inches. The selsyn must not be tipped at an angle. When the selsyn gear is meshed with its driving gear at the base of the mast, there must be no backlash. To mesh gears closer, unscrew supporting spring and stud, which allow the selsyn to pivot on the two swivel screws.

(4) The gear mesh must be checked and adjusted when mounting the completely assembled selsyn box on the tower. Check by means of the hand hole on the side of intermediate housing to see if there is backlash, drop the selsyn box, and adjust the gears.

d. POWER CABLE ORDNANCE RECEPTACLE. (1) To remove or replace power cable ordnance receptacle 125X–138 (fig. 172), disconnect outside wires from terminal strip 125X–94; then remove the four 3/16-inch screws from the rim of the receptacle on the outside of the selsyn box. Terminal strip 125X–94 can be removed with cable receptacle by disconnecting inside row of wires. When replacing this receptacle, make certain that the marked wires are connected to the terminals marked correspondingly.

(2) In assembling ordnance receptacle 125X–138, determine if the terminals have been attached to the wires. Insert ends of wires through the proper pin hole in bakelite disk A-41134. (See figure 171, for pin numbers corresponding to lettered terminals.) When inserting wires in this disk, have the raised part numbered A-41134 toward the terminals. (See fig. 172.) Solder pins to these wires and assemble into the disk. Place one pin in each of the holes numbered 15, 16, 17, 18, and 19 of bakelite disk A-46599 so that points of the pins project through the side having the pin numbers. With semicircular keyways

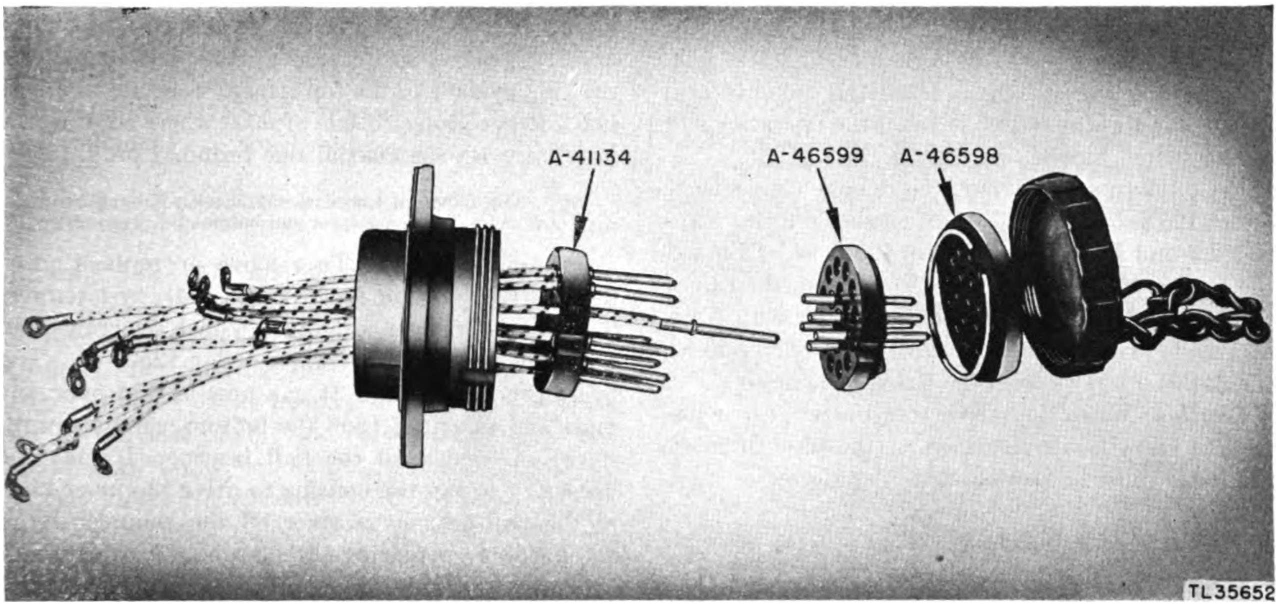


Figure 172. Tower TR-24-A, power cable and ordnance receptacle disassembled.

in line, assemble disk A–46599 with five loose pins onto the pins in disk A–41134. Enter terminal ends of wire through receptacle housing from the threaded end. With keyways in line, assemble bakelite disks with pins into the housing until the disks seat against the shoulder in the bottom of the housing. Snap the bronze split ring into small groove *X* (fig. 173) directly over the bakelite disk. Assemble soft rubber sealing disk A–46598 over pins. Make sure that pin numbers match those in disk, and press sealing disk into position so that it snaps exactly into large groove *Y* (fig. 173) directly above the bronze snap ring. Reconnect the wires to terminal strip 125X–94 and jumper wire from *K* to *L*. (See fig. 171.)

e. Power Switch. To remove or replace switch 125X–513 (fig. 170), disconnect the two wires at terminal strip 125X–94. Take out the switch mount-

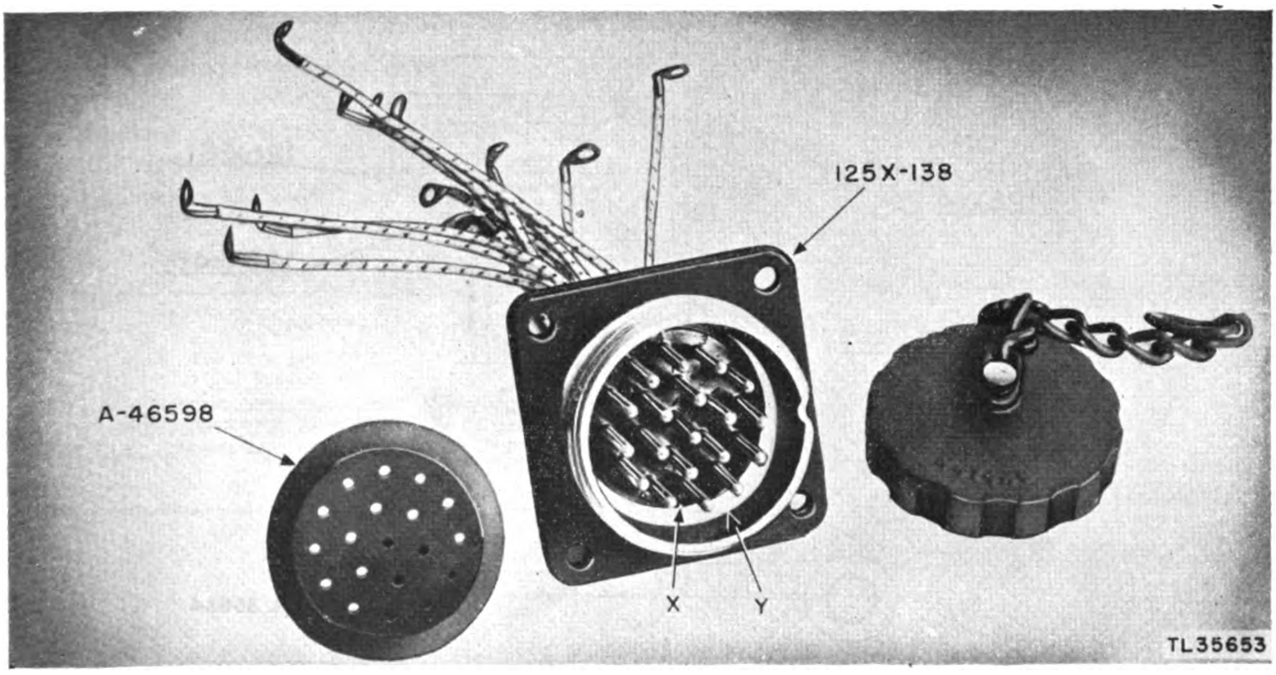


Figure 173. Tower TR-24-A, power cable and ordnance receptacle partially assembled.

ing screws; remove the switch and disconnect the two selsyn motor wires at terminals under switch. In replacing the switch, be sure the bakelite arm which operates the switch engages the operating slot of the switch handle.

f. CONVENIENCE OUTLET. To remove convenience outlet 125X–512 (fig. 170), disconnect the two wires coded *J* and *K* at terminal strip 125X–94. Take out the four 3/16-inch fastening screws from the rim of the outlet casing and remove it together with wires attached. To disassemble the receptacle, remove the flathead screws from the base of the outlet.

Caution: When the selsyn transmitter gear is unmeshed from its driving gear at the base of mast, the tower must be reoriented.

80. Lower Mast Assembly (fig. 174)

a. HINGED FLANGE. To remove or replace hinged flange 125X–24, remove the four hex. bolts in the flange and drive the flange off. In replacing the flange, be sure the flange is located with its hinge holes on the opposite side of the mast from the erecting eyebolt in the top flange. See that the hex. bolts do not project inside of mast where they would interfere with the coaxial line terminal plug.

Note. Top flange of lower mast and both flanges of upper mast are welded to mast tube and cannot be removed.

b. MAST BEARING. To remove or replace mast bearing 125X–653 or 125X–4 (fig. 174), first remove the hinged flange. Loosen two ¼-inch setscrews and withdraw shouldered retainer collar 125X–46. The bearing housing 125X–21 can now be slid over the mast and taken off from the bottom, carrying with it the oil seals and the ball bearing. It may be necessary to tap the housing to drive the inner race of the ball-bearing retainer off the shoulder from the mast. In replacing the housing, be careful not to damage oil seals. Coat oil seals with grease and keep seals and ball bearing free from dirt and grit. To remove or replace ball bearing 125X–4 or roller

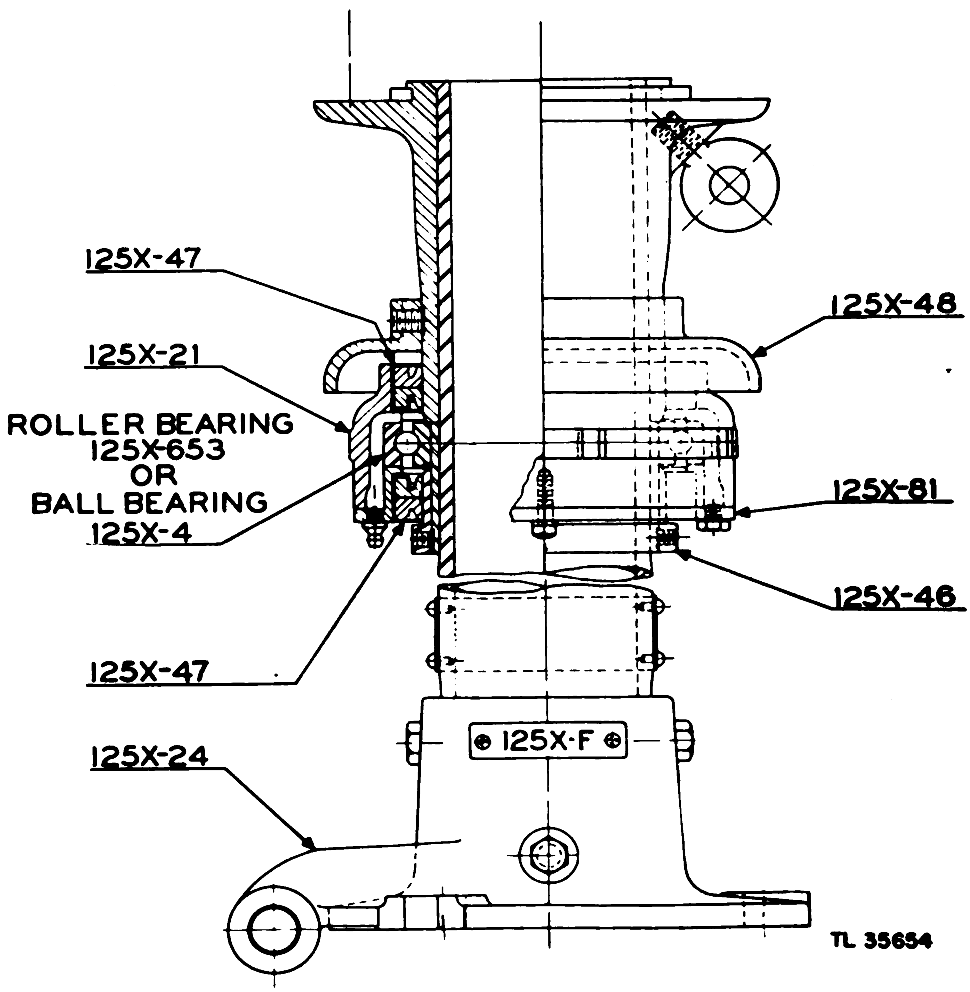


Figure 174. Tower TR-24-A, lower mast assembly.

bearing 125C–653 and oil seals 125X–47 (fig. 174), remove the mast bearing, the retainer flange 125X–81, and the six ¼-inch slot-head mounting screws. The bearing seal 125X–47 comes off with the retainer flange. Bearing can now be pushed out.

Note. Some towers have a ball bearing and others have a roller bearing. The two types are used interchangeably.

Oil seals 125X–47 can be driven out of retainer flange 125X–81 and bearing housing 125X–21. It is not necessary to remove them unless they become damaged. In replacing the seals, keep them parallel to the plane of the bearing surface. Be sure the side of the seal having the serrated flat spring is placed next to the ball bearing. Because the seal fits very close, it is necessary to drive the seals very hard to get them in place.

Note. Curved flange 125X–48 is merely a shield to protect top of bearing against weather and need not be removed.

81. Solid Coaxial Line Assembly (fig. 175)

Caution: Handle the polystyrene beads carefully to prevent breaking them, and keep them free from grease, oil, or dirt.

a. RIGHT-ANGLE CONNECTOR. (1) To remove or replace right-angle connector 125X–642, unscrew locking ring 125X–651; then pull right-angle connector from end of coaxial line. In replacing, insert the rubber packing ring 125X–657 with the spring end first to be sure of electrical contact between seat of connector and end of coaxial line. Good electrical contact must be obtained also on the inner line. If prongs on split inner-connector have not been spread sufficiently, they can be readily expanded with a knife. Locking ring must be tightened securely. To remove or replace inner line 125X–647 from right-angle connector 125X–642, remove locking ring 125X–645 and withdraw insulating bead 125X–644. Unscrew cap and adapter from the opposite end of right-angle coupling; then the inner line may be worked out. To remove polystyrene bead 125X–650 from inner line, unscrew retaining nut, then press the polystyrene bead off. When replacing parts, be sure not to crack polystyrene beads and keep electrical connections clean.

(2) To remove or replace inner coaxial line 125X–220, first remove the right-angle connector as described above. Remove coupling 125X–183 and back off setscrew in hexagonal collar 125X–188 until inner coaxial line is free to be withdrawn from the right-angle connector end. When replacing inner coaxial line, free all the polystyrene beads. The end of the coaxial line which has the bead closest to its extremity should enter the outer coaxial line first. When replacing coupling 125X–183, use care in inserting the tube through rubber gasket 125X–189.

b. LOCKING TUBE. To remove or replace locking tube 125X–210, first remove the inner line as described above. Unsolder hexagonal collar 125X–188 and slip it off over end of tube. Locking tube 125X–210 is now free to be withdrawn. When replacing the locking tube, be sure hexagonal collar 125X–188 is located to dimension 18⅝ inches from end of tube. (See fig. 175.)

82. Flexible Coaxial Line Assembly (fig. 176)

Caution: All connectors and cables must be handled carefully. Do not kink or coil these cables sharply. Keep them free from dirt. In temperatures of less than 5° above zero, cables must be warmed before handling to avoid breaking the insulation.

a. TERMINAL PLUG. To remove or replace the terminal plug, unscrew the three nuts on top of metal cover 125X–234. Pry the cover loose and slide it up onto the cables. Loosen the nuts that hold the clamp

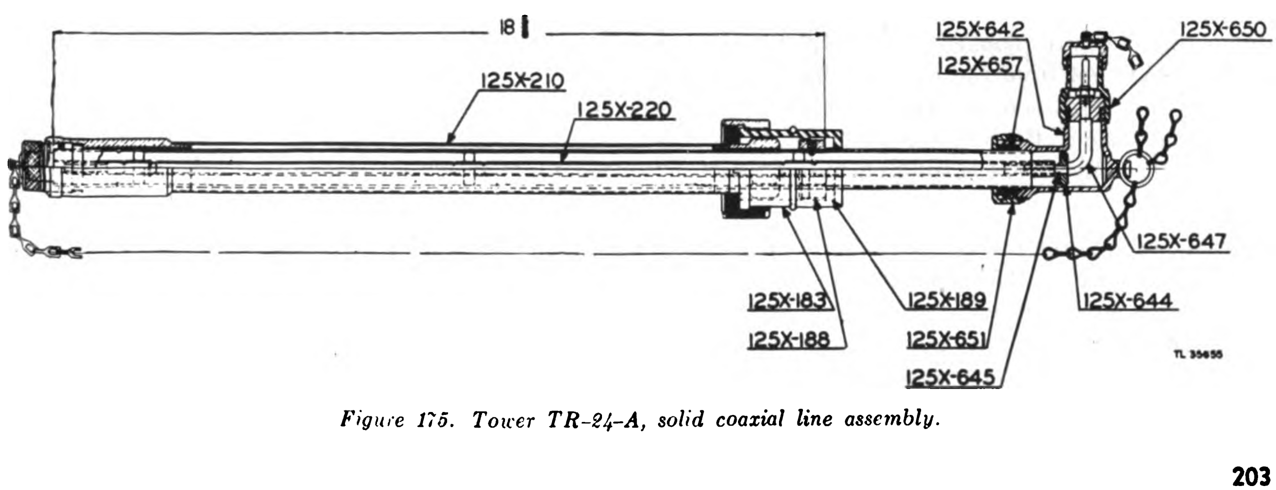


Figure 175. Tower TR-24-A, solid coaxial line assembly.

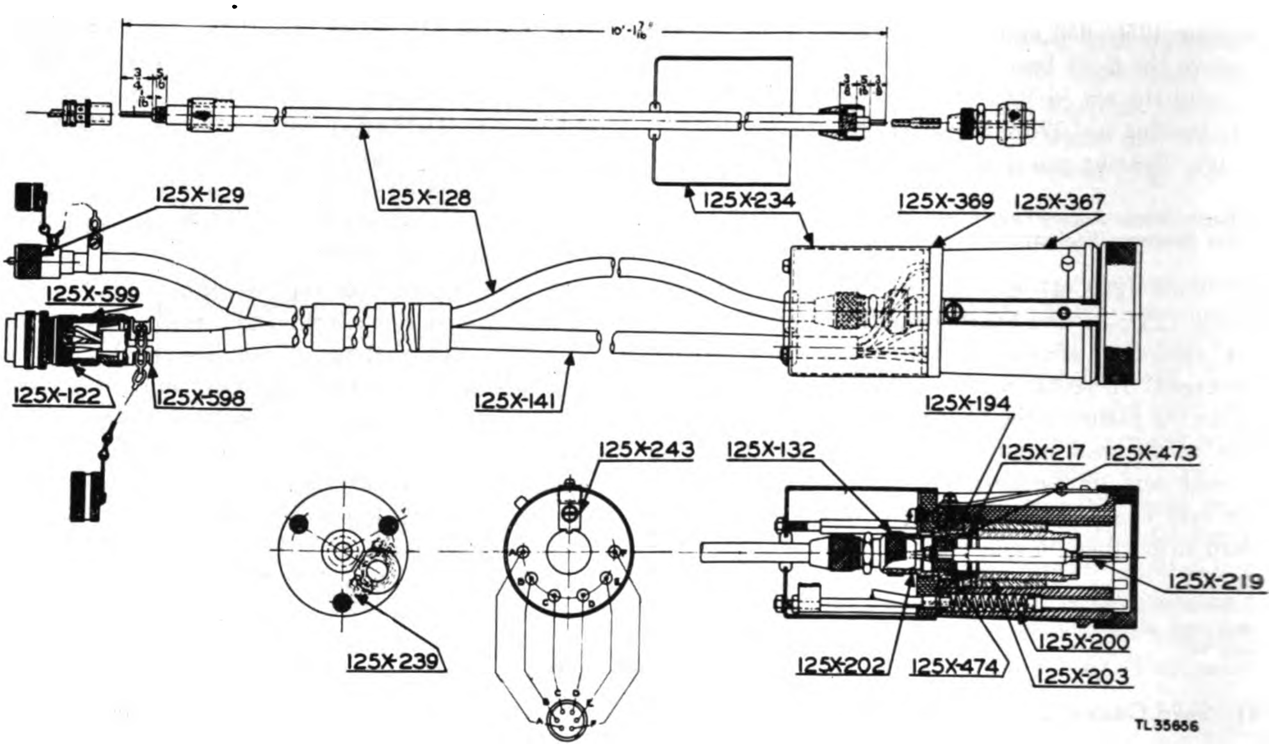


Figure 176. Tower TR-24-A, flexible coaxial line assembly.

for the 6-wire cable and unscrew the three cover supporting studs. The terminal plug may now be removed from the cables. The thrust washer 125X-217 and flanged sleeve 125X-203 may be removed from the terminal plug. (See fig. 177). When replacing these items, see that the surface of the thrust washer and the top surfaces of both the flanged sleeves are kept clean to insure good electrical contact. Be sure key 125X-243 is inserted in keyway of sleeve 125X-202 before tightening cover supporting studs.

b. Split Pin Connector. To remove or replace split pin connector 125X-219 and polystyrene insulating bushing 125X-474, first remove the terminal plug as described above. Uncouple coaxial line; then remove flanged sleeve 125X-202 and spring 125X-194 from the bakelite disk 125X-369. Unscrew nut from split pin connector and press the pin connector off. Remove threaded ring 125X-473 so that the polystyrene insulating bushing may be taken out.

c. Six-conductor Cable. To remove and replace six-conductor cable 125X-141, first remove the terminal plugs as described above. Compress springs 125X-200 and bind into position by using short pieces of wire and cotter pins as illustrated in figure 178. Unsolder contact pins and brass sleeves from the end of the six-conductor cable. Release clamp 125X-239 and pull cable through metal cover. The amphenol six-conductor plug may be removed by relieving and unscrewing clamp nut 125X-598; then unscrew nut 125X-599 and nut on plug of 125X-122. Slide all these nuts back over cable, exposing leads to plug. Plug may be removed by unsoldering these leads. When replacing the plug, be sure that wires are properly soldered and that they are connecting their proper terminals. See diagram on figure 176.

d. Coaxial Cable. To remove and replace flexible coaxial cable 125X-128, unscrew the three nuts on top of metal cover 125X-234. Pry the cover loose and slide it up onto the cables. Uncouple the cable by unscrewing the knurled nut that fastens cable to coupling. This will allow coupling 125X-132 to separate from the connector. Remove knurled nut from flexible coaxial cable; then pull cable through metal cover. The female connector may be removed by unsoldering. To remove amphenol connector 125X-129, unscrew coupling ring and slide it back over cable. Unsolder plug from braid and inner lead simultaneously. When replacing cable, ends must be stripped to the dimensions shown on the detail drawing of this cable on figure 176.

Caution: Do not apply excessive heat to flexible coaxial cable when soldering or unsoldering.

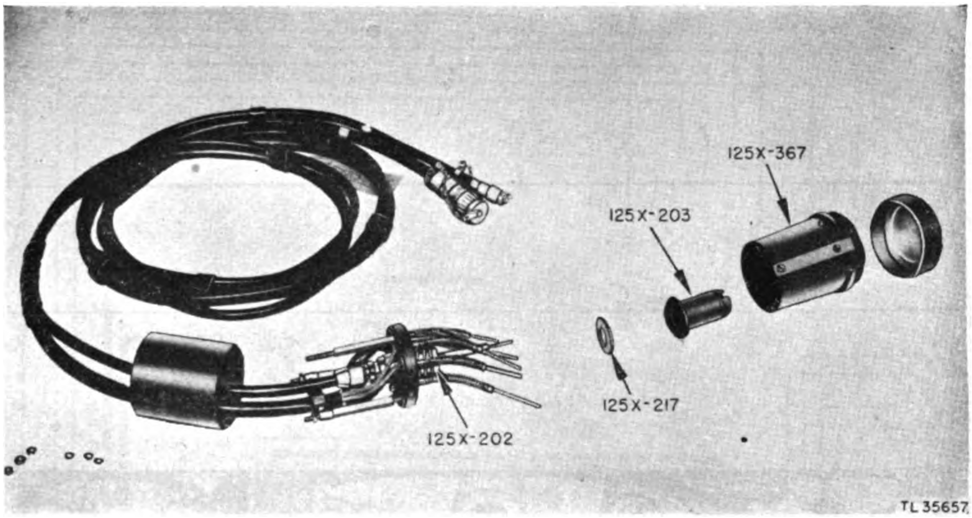


Figure 177. Tower TR-24-A, terminal plug dismantled.

83. Lobe Switch (fig. 179)

If for any reason the lobe switch fails to function properly, it can be removed from the antenna circuit; the antenna can then still be used, but in a limited way, for the identification of challenged aircraft. The switch can be removed from the circuit in the following manner:

a. Turn the ANTENNA MOTOR circuit breaker of Indicator I-221-A to the OFF position.

b. Open the door of the junction box at the rear of the antenna. (See fig. 179.)

c. Disconnect the two PL-259 connectors from the right-angle connectors at the sides of the switch.

d. Place the PL-259 connectors in such a position that the center conductor does not come in contact with any metal part of the chassis.

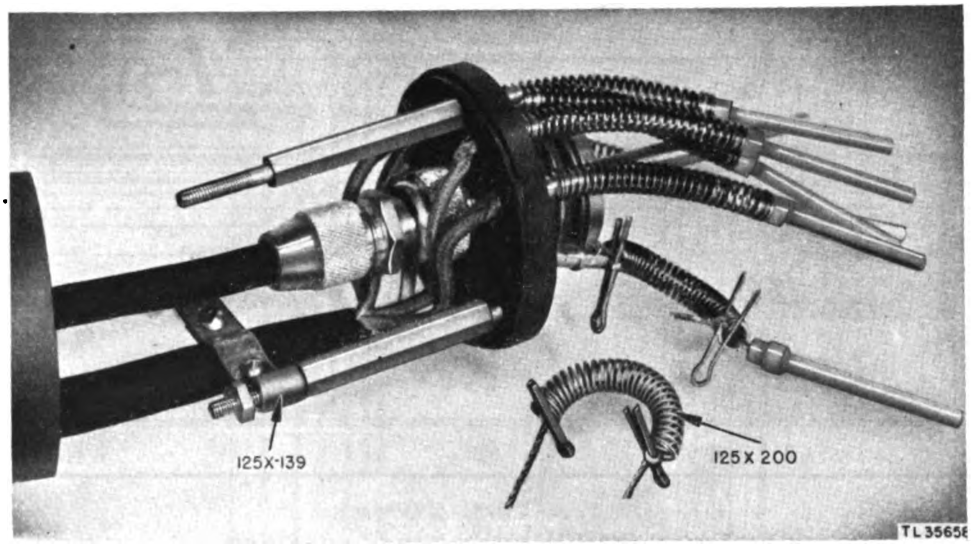


Figure 178. Tower TR-24-A, terminal plug, showing method of compressing springs.

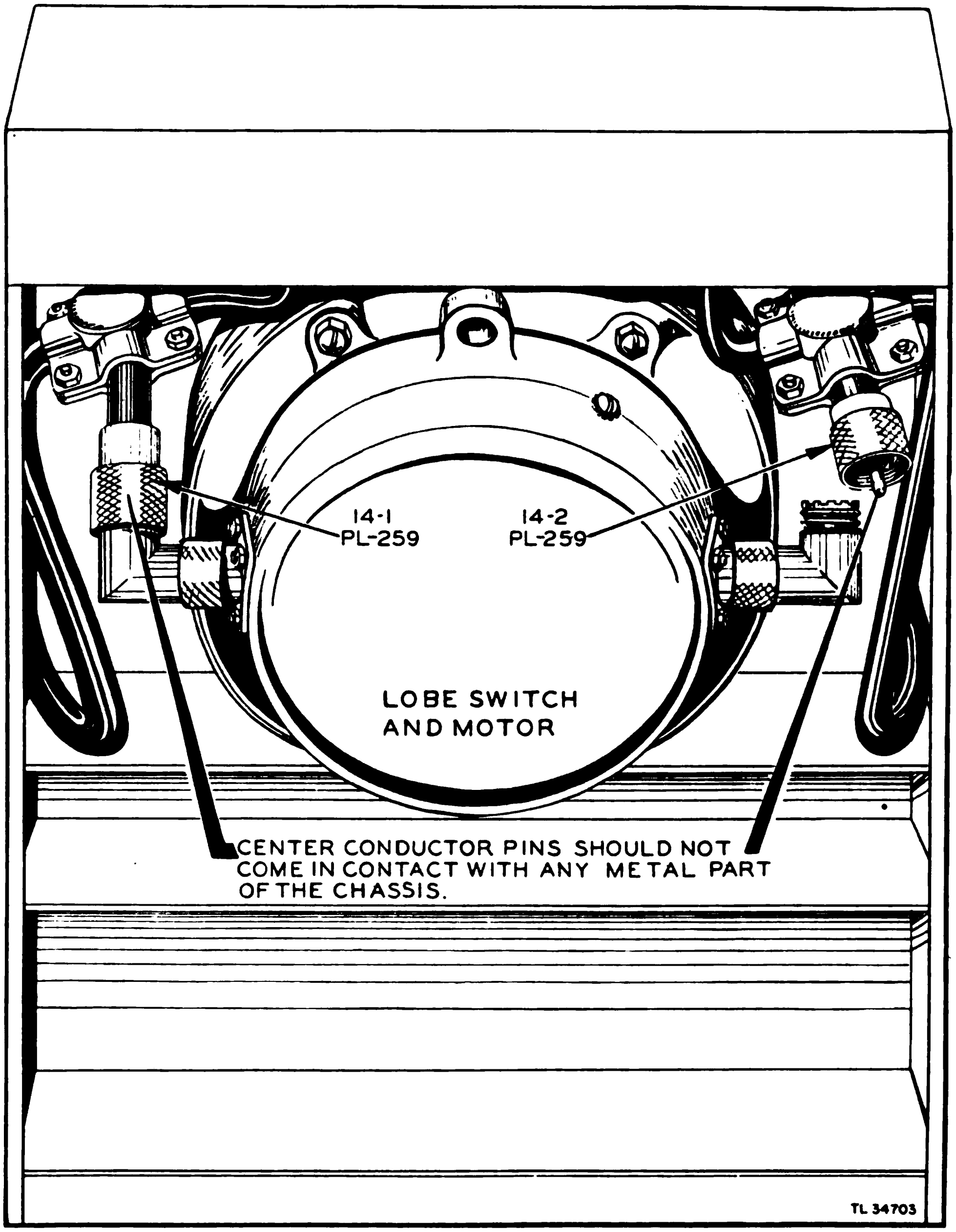


Figure 179. Tower TR-24-A, lobe switch box.

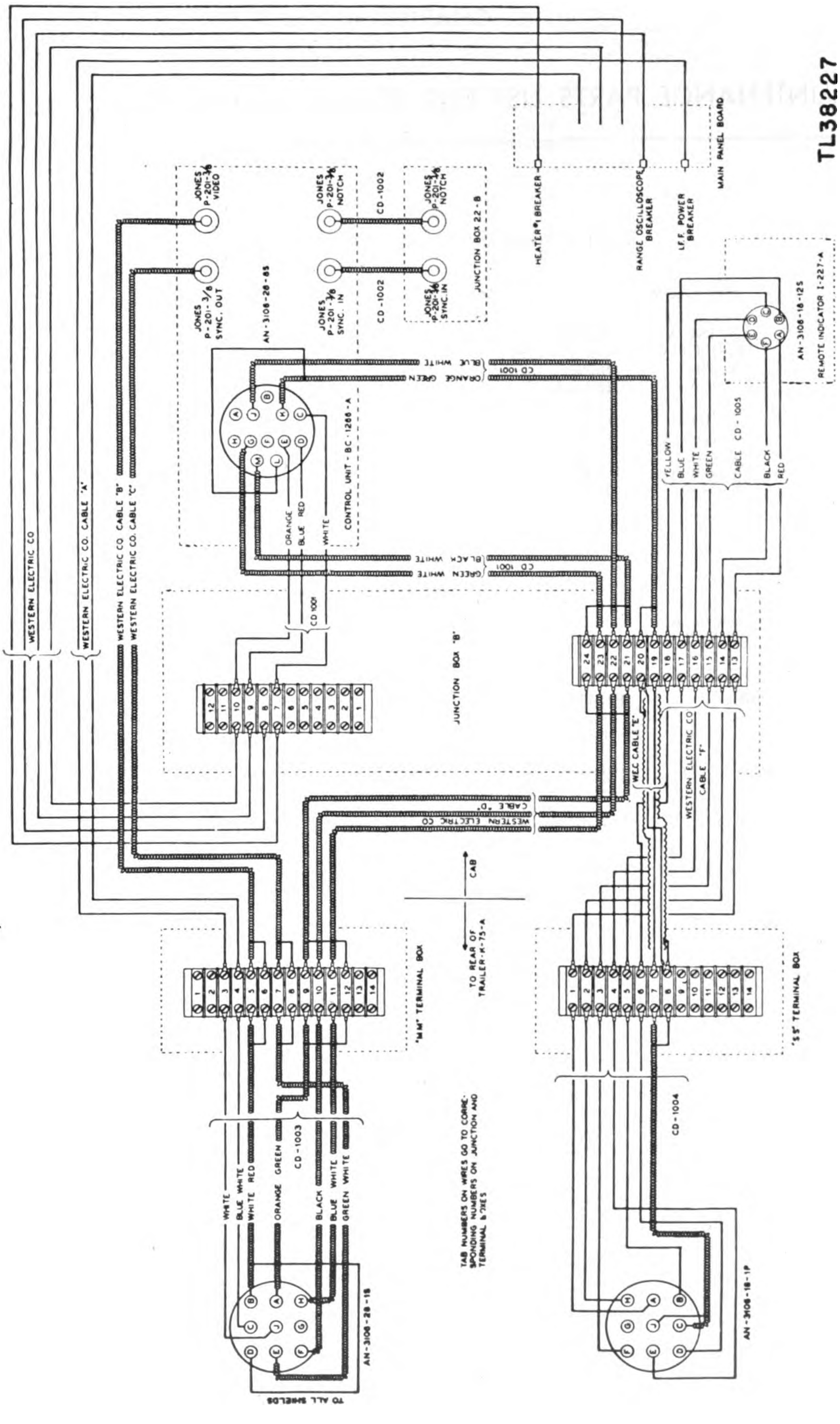


Figure 189. Trailer K–75–A, wiring diagram.

CHAPTER 4

MAINTENANCE PARTS LIST FOR RADIO EQUIPMENT RC-145-A

INDEX TO MAJOR COMPONENT SYMBOLS

Army type No.	Major component	Major component symbol
AN-154-A	Antenna	AN
BC-1266-A	Control Unit	CU
FM-79	Rack	FM
I-221-A	Indicator	I
	Miscellaneous	M
RA-105-A	Power Supply	PS
BC-1267-A	Receiver and Transmitter	RT
I-222-A	Signal Generator	SG
SW-220-A	Switch	SW
TR-24-A	Tower	T

Major Com-ponent	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock		3rd ech	4th ech	Depot stock
						1st ech	2nd ech			
M		1F6B1-3	BRAID, 1/8" wide, tinned copper, 64 strand, #34 B & S gauge, T. C. W., 25' long coil.	Feet			*			*
M		1F6C1-8.25	BRAID, 1/2" wide, tinned copper, T. C. W., 25' long coil (240X #30) stranded.	Feet			*			*
AN		1F-4B8-2	CABLE ASSEMBLY, special for antenna. (Dwg. No. 0-202-711).	Each	1		*			*
AN		1F4B8-4.22.25	CABLE ASSEMBLY, coaxial, 22 1/4" length. (Dwg. No. A-202-710).	Each	6		*			*
T		1F4B8-3.129	CABLE ASSEMBLY, coaxial flexible type BRC spec. (Dwg. No. 125X-605).	Each	1		*			*
FM-79		1F4B8-6.54	CABLE ASSEMBLY, single conductor PT-5 coaxial, transceiver to junction box of trailer. 54" long. (Dwg. No. B-201-860).	Each	1		*			*
FM-79		3E7144-10	CABLE ASSEMBLY, 14 conductor, IFF rack FM79 to junction box of trailer. 70" long. (Dwg. No. C-201-861).	Each	1		*			*
T		1F4B8-1.21.5	CABLE, coaxial solid assembly, 21 1/2" overall length. (Dwg. No. 125X-619).	Each	1		*			*
T		1D-716	CABLE, #16 AWG. (Dwg. No. 125X-140).	Each	1		*			*
		3E1999-99	CABLE, microphone 6' long	Each	1					*
		3E1999-105	CABLE, patch assembly, control unit. (Dwg. No. B-201-869).	Each	1		*			*
		1F432-981	CORD, CD-981, single conductor, 110' long, R. F. cable with tower Tr-24, both ends. Plug pl-259, connects Radio Sets RC-145-A or 184-A. (Dwg. No. B-201-810).	Each	1		*			*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
	....	3E1982	CORD, CD-982, single conductor, 110′ long, power with tower Tr-24, both ends NOX-1114, red connectors. (Dwg. No. D-201-848).	Each	1	....	*	....	....	*
	....	3E1999-01	CORD, CD-1001, 8 conductor, 6′ long, AN-3106-28-8S connector, other end terminal lugs, connects BC-1266 and junction box 48-B. (Dwg. No. C-201-845).	Each	1	....	*	....	....	*
	....	3E1999-02	CORD, CD-1002, coaxial cable, 4′ long both ends, Jones connector #P-201-3/8, connects unit BC-1266 and junction box 22-B. (Dwg. No. B-201-794-1).	Each	1	....	*	....	....	*
	....	3E1999-02	CORD, CD-1002, coaxial 4′ long, both ends Jones connector No. P-2013/8, connects unit BC-1266 and junction box 22-B. (Dwg. No. B-201-794-2).	Each	1	....	*	....	....	*
	....	3E1999-03	CORD, CD-1003, 10 conductor, 5′ long, 1 end AN-3106-28-8S connector, other end terminal lugs connect rack M-79 and junction box. (Dwg. No. C-201-892).	Each	1	....	*	....	....	*
	....	3E1999-04	CORD, CD-1004, 6 conductor, 5′ long, one end AN-3106-28-1P connector, other end terminal lugs connect rack M-79 and junction box. (Dwg. No. C-201-855).	Each	1	....	*	....	....	*
	....	3E1999-05	CORD, CD-1005, 6 conductor, 2′ long, one end AN-3106-18-128 connector, other end terminal lugs, connect I-221 to Selsyn junction box. (Dwg. No. C-201-852).	Each	1	....	*	....	....	*
	....	3E1999-09	CORD, CD-1009, standard heavy duty rubber covered, Type S, 6 conductor portable cable, 10′ 6″ long. (Dwg. No. 125X-141).	Each	0	*	*	....	....	*
AN	....	1F432-1071	CORD, CD-1071, 2′ long, 2 plugs PL-259, connects dipoles of Antenna AN-154-A and junction box of switch SW-220-A. (Dwg. No. A-201-880).	Each	6	....	*	....	....	*
	....	3E1999-103	CORD, CD-1103, single conductor, 33″ long, one end plug, PL-259, end plug PL-55, test cable with signal generator. (Dwg. No. B-201-857).	Each	1	....	*	....	....	*
	....	3E1999-104	CORD, CD-1104, single conductor, 34″ long, both ends plug PL-259 used for testing signal generator I-222-A. (Dwg. No. B-201-856).	Each	1	....	*	....	....	*
	....	3E1999-106	CORD, CD-1106, 21 conductor, 6′ long, one end special Belmont male plug, used to connect rack to unit removed during testing. (Dwg. No. D-201-729).	Each	1	....	*	....	....	*
	....	3E1999-141	CORD, CD-1141, 2 conductor, 6′ long, one end male plug, other end special jack assembly used for making voltage checks on power supply RA-105-A. (Dwg. No. B-201-865).	Each	1	....	*	....	....	*
T	....	3E7144-4	CORD, #16 armored, stranded copper wire, 7 3/16″ long, 8′. (Dwg. No. 125X-576).	Each	6	....	*	....	....	*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
SG		3E7144-2	CORD, Det. and Amp. power with connector at one end, 2 conductor #20 gauge, 21⅝" overall length. (Dwg. No. B-201-793).	Each	1		*			*
		3E7144-5	CORD, CD, line cord assembly one plug, 2-pole male, one plug, 2 poles, female 8′ long. (Dwg. No. B-201-728).	Each	1		*			*
SG		3E7144-3	CORD, OSC., 2 conductors, #20 gauge, 16⅞" long. (Dwg. No. B-14B-3675).	Each	1		*			*
M		1B1114.3	WIRE, #14 (41 x #30) aeroglas, 25′ long coil, black tracer.	Feet			*			*
M		1B1114.4	WIRE, #14 (41 x #30) aeroglas, 25′ long, blue tracer.	Feet						*
M		1B1114.2	WIRE, #14 (41 x #30) aeroglas, brown tracer.	Feet						*
M		1B1114.1	WIRE, #14 (41 x #30) aeroglas, 25′ long, white tracer.	Feet						*
M		1B1114.5	WIRE, (41 x #30) aeroglas, 25′ long, red tracer.	Feet						*
M		1B1116.6	WIRE, #16 (26 x #30) aeroglas, 25′ long coil, black tracer.	Feet						*
M		1B1116.8	WIRE, #16 (26 x #30) aeroglas, 25′ long coil, brown-blue tracer.	Feet						*
M		1B1116.3	WIRE, #16 (26 x #30) aeroglas, 25′ long coil, green tracer.	Feet						*
M		1B1116.7	WIRE, #16 (26 x #30) aeroglas, 25′ long coil, green-brown-blue tracer.	Feet						*
M		1B1116.2	WIRE, #16 (26 x #30) aeroglas, 25′ long, red tracer.	Feet			*			*
M		1B1116.5	WIRE, #16 (26 x #30) aeroglas, 25′ long, red-black-blue tracer.	Feet						*
M		1B1116.9	WIRE, #16 (26 x #30) aeroglas, 25′ long, red-brown-orange tracer.	Feet						*
M		1B1116.4	WIRE, #16 (26 x #30) aeroglas, 25′ long coil, red-green-yellow tracer.	Feet						*
M		1B1116.1	WIRE, #16 (26 x #30) aeroglas, 25′ long coil, white tracer.	Feet						*
M		1B1116.10	WIRE, #16 (26 x #30) aeroglas, 25′ long, yellow tracer.	Feet						*
M		1B1120.27	WIRE, #20 (10 x #30) aeroglas, 25′long, black-yellow tracer.	Feet						*
M		1B1120.28	WIRE, #20 (10 x #30) aeroglas, 25′ long, blue tracer.	Feet						*
M		1B1120.26	WIRE, #20 (10 x #30) aeroglas, 25′ long, blue-orange tracer.	Feet						*
M		1B1120.22	WIRE, #20 (10 x #30) aeroglas, 25′ long coil, green-black tracer.	Feet						*
M		1B1120.29	WIRE, #20 (10 x #30) aeroglas, 25′ long coil, green-orange tracer.	Feet						*
M		1B1120.21	WIRE, #20 (10 x #30) aeroglas, 25′ long coil, orange-black tracer.	Feet						*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
M		1B1120.17	WIRE, #20 (10 x #30) aeroglas, 25′ long coil, red-black tracer.	Feet						*
M		1B1120.30	WIRE, #20 (10 x #30) aeroglas, 25′ long coil, red-blue tracer.	Feet						*
M		1B1120.32	WIRE, #20 (10 x #30) aeroglas, 25′ long coil, red-yellow tracer.	Feet						*
M		1B1120.31	WIRE, #20 (10 x #30) aeroglas, 25′ long coil, yellow tracer.	Feet						*
M		6L58038-2	WIRE, 19 strands, #29 rubber shielded, T.C.W. No. 5-902-Y 25′ long.	Feet						*
M		1A814.5	WIRE, #14 solid tinned copper wire, 25′ long coil, bare.	Feet						*
M		1A72	WIRE, #16 solid tinned copper wire, 25′ long coil, bare.	Feet						*
M		1B1116.11	WIRE, #16 solid aeroglas, 25′ long coil, green-orange tracer.	Feet						*
M		1A107	WIRE, #20 solid tinned copper wire, 25′ long.	Feet						*
M		1B1120.35	WIRE, #20 solid aeroglas, 25′ long, black tracer.	Feet			*			*
M		1B1120.23	WIRE, #20 solid aeroglas, 25′ long coil, blue tracer.	Feet						*
M		1B1120.33	WIRE, #20 solid aeroglas, 25′ long coil, blue-black tracer.	Feet						*
M		1B1120.9	WIRE, #20 solid aeroglas wire, 25′ long coil, blue-brown tracer.	Feet						*
M		1B1120.8	WIRE, #20 solid aeroglas, 25′ coil, blue-green tracer.	Feet						*
M		1B1120.34	WIRE, #20 solid aeroglas, 25′ long, blue-yellow tracer.	Feet						*
M		1B1120.37	WIRE, #20 solid aeroglas, 25′ long, brown tracer.	Feet						*
M		1B1120.15	WIRE, #20 solid aeroglas, 25′ long, green tracer.	Feet						*
M		1B1120.14	WIRE, #20 solid aeroglas, 25′ long, orange tracer.	Feet						*
M		1B1120.25	WIRE, #20 solid aeroglas, 25′ long, red tracer.	Feet			*			*
M		1B1120.13	WIRE, #20 solid aeroglas, 25′ long, red-black tracer.	Feet						*
M		1B1120.36	WIRE, #20 solid aeroglas, 25′ long, red-blue tracer.	Feet						*
M		1B1120.10	WIRE, #20 solid aeroglas, 25′ coil, red-brown tracer.	Feet						*
M		1B1120.7	WIRE, #20 solid aeroglas, 25′ long, red-green tracer.	Feet						*
M		1B1120.12	WIRE, #20 solid aeroglas, 25′ long coil, red-yellow tracer.	Feet						*
M		1B1120.3	WIRE, #20 solid aeroglas, 25′ long, white tracer.	Feet						*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock		3rd ech	4th ech	Depot stock
						1st ech	2nd ech			
M		1B1120.24	WIRE, #20 solid aeroglas, 25′ long, yellow tracer.	Feet						*
M		1F549E	WIRE, Amphenol cable, #21B-290, 7/21 –6′ long.	Feet			*			*
T		1B1316.97	WIRE, 50′ long. (Dwg. No. 125X-507).	Feet			*			*
RT	4	3D9004-3	CAPACITOR, 4 mmf, ±12.5%, 500 volts, ceramic, type D, 7/32″ dia. x 7/16″ long. (Dwg. No. A-8G-2712).	Each	1		*	*	*	*
SG	64	3D9005-24.1	CAPACITOR, 5 mmf, ±5%, 500 volts, ceramic, type N-750-K-5. (Dwg. No. A-8G-3682).	Each	1		*	*	*	*
RT	10-1 to 10-3	3D9005-24	CAPACITOR, 5 mmf, ±20%, 500 volts, type MPOK-5. (Dwg. No. A-8G-2303).	Each	3		*	*	*	*
RT	3-1 to 3-5	3D9008-5.1	CAPACITOR, 8 mmf, ±6%, 500 volts, ceramic, type D. (Dwg. No. A-8G-2711).	Each	5		*	*	*	*
SG	59-1 to 59-2	3D9010-15	CAPACITOR, 10 mmf, ±5%, 500 volts, ceramic, type NPOK-10. (Dwg. No. A-8G-1830).	Each	2		*	*	*	*
RT	1-1 to 1-4	3D9010-26	CAPACITOR, 10 mmf, ±10%, 500 volts, ceramic, type NPOK-10. (Dwg. No. A-8G-2658).	Each	4		*	*	*	*
RT	2	3D9015-7	CAPACITOR, 15 mmf, ±10%, 500 volts, ceramic, type D. (Dwg. No. A-8G-2710).	Each	1		*	*	*	*
RT	31-1 to 31-2	3D9025-39	CAPACITOR, 25 mmf, ±10%, 500 volts, ceramic, type D. (Dwg. No. A-8G-3081).	Each	2		*	*	*	*
RT	5	3D9025-33.1	CAPACITOR, 25 mmf, ±10%, 500 volts, ceramic, type NPOL-25. (Dwg. No. A-8G-2659).	Each	1		*	*	*	*
SG	50	3D9030-15	CAPACITOR, 30 mmf, ±10%, 500 volts, ceramic, type N-75-OK. (Dwg. No. A-8G-3422).	Each	1		*	*	*	*
AN	9-1 to 9-2	3D9035-6	CAPACITOR, 35 mmf, ±10%, 500 volts, ceramic, type N-75-OK-35. (Dwg. No. A-8G-1559).	Each	2		*	*	*	*
SG	58-1 to 58-2	3D9040-21	CAPACITOR, 40 mmf, ±10%, 500 volts, ceramic, type NPOC-40. (Dwg. No. A-8G-2305).	Each	2		*	*	*	*
RT	9-1 to 9-4	3D9040-14	CAPACITOR, 40 mmf, ±10%, 500 volts, type N-750-K-40, mica. (Dwg. No. A-8G-2657).	Each	4		*	*	*	*
CU	7	3K2051012	CAPACITOR, .00005 mfd, ±10%, 500 volts, type PO, mica. (Dwg. No. B-8F-1554).	Each	1		*	*	*	*
RT	6	3D9050-70	CAPACITOR, 50 mmf, ±10%, 500 volts, ceramic, type D. (Dwg. No. A-8G-2714).	Each	1		*	*	*	*
RT	14	3D9050-94	CAPACITOR, 50 mmf, ±20%, 5000 volts, ceramic, type 850. (Dwg. No. A-8M-3185).	Each	1		*	*	*	*
RT	15-1 to 15-10	3D9082-3	CAPACITOR, 82 mmf, ±10%, 300 volts, mica, type A-7614. (Dwg. No. A-8M-2662).	Each	10		*	*	*	*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
CU	5	3K2010122	CAPACITOR, 100 mmf, ±5%, 500 volts D. C., mica, type 5R. (Dwg. No. B-8F-1938).	Each	1	....	*	*	*	*
RT	11-2 to 11-3	3D9100-118	CAPACITOR, 100 mmf, ±10%, 500 volts, ceramic, type D. (Dwg. No. A-8G-3402).	Each	2	....	*	*	*	*
RT	7	3D9100-57	CAPACITOR, 100 mmf, ±10%, 500 volts, ceramic, type C. (Dwg. No. A-8G-2306).	Each	1	....	*	*	*	*
SG	51-1 to 51-3	3D9100-95.1	CAPACITOR, 100 mmf, ±10%, 500 volts, mica, type O. (Dwg. No. B-8F-1556).	Each	3	....	*	*	*	*
RT	8-1 to 8-2	3D9150-23.1	CAPACITOR, 150 mmf, ±10%, 500 volts, ceramic, type C. (Dwg. No. A-8G-2713).	Each	2	....	*	*	*	*
SG	66	3DK9150-22	CAPACITOR, 150 mmf, ±10%, 500 volts D. C., mica, type O. (Dwg. No. B-8F-3681).	Each	1	....	*	*	*	*
CU	16	3D9180-1	CAPACITOR, .00018 mfd, ±3%, 500 volts, ceramic, type O. (Dwg. No. B-8F-1850).	Each	1	....	*	*	*	*
RT	17-1 to 17-5	3D9200-31.1	CAPACITOR, 200 mmf, ±10%, 500 volts D. C., mica, type O. (Dwg. No. B-8F-4363).	Each	5	....	*	*	*	*
RT SG	16-1 to 16-3, 56	3DK9500-99	CAPACITOR, 500 mmf, ±10%, 500 volts, mica, type O. (Dwg. No. B-8F-2715).	Each	4	....	*	*	*	*
CU	20	3K3075132	CAPACITOR, .00075 mfd, ±5%, 500 volts, type 816. (Dwg. No. B-8F-742).	Each	1	....	*	*	*	*
RT	12-1 to 12-19	3DA1-116	CAPACITOR, 1000 mmf, ±20%, 400 volts, ceramic, type 3165. (Dwg. No. A-8G-3264).	Each	19	....	*	*	*	*
CU	9	3DA1-142	CAPACITOR, .001 mfd, ±20%, 600 volts, paper, type 340-16. (Dwg. No. A-8J-3981).	Each	1	....	*	*	*	*
CU	11	3DA2-116	CAPACITOR, .002 mfd, ±20%, 600 volts, paper, type 340-17. (Dwg. No. A-8J-3980).	Each	1	....	*	*	*	*
CU RT	4-1 to 4-3 30-1 to 30-2	3DA5-9	CAPACITOR, .005 mfd, ±5%, 500 volts, mica, type W. (Dwg. No. B-8F-3779).	Each	5	....	*	*	*	*
SG RT	52 18-1 to 18-7	3DA5-32	CAPACITOR, .5000 mmf, ±10%, 500 volts, mica, type W. (Dwg. No. B-8F-512).	Each	8	....	*	*	*	*
CU	1-1 to 1-7	3DA5-73	CAPACITOR, .005 mfd, ±20%, 600 volts, paper, type 340-25. (Dwg. No. A-8J-3654).	Each	7	....	*	*	*	*
RT	13-3 to 13-5	3DA7.500-3	CAPACITOR, 7500 mmf, ±20%, 400 volts, ceramic, type 3167. (Dwg. No. A-8G-3265).	Each	3	....	*	*	*	*
AN	7-1 7-2	3DA10-53	CAPACITOR, 10,000 mmf, ±10%, 300 volts, mica, type W. (Dwg. No. B-8F-760).	Each	2	.....	*	*	*	*
I	53-1 53-2	3DA10-125	CAPACITOR, 10,000 mmf, ±10%, 400 W. V. molded case, type 340-21 paper. (Dwg. No. A-8J-3559).	Each	2	....	*	*	*	*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
RT	33	3DA10-140.2	CAPACITOR, .01 mfd, ±20%, 400 volts, molded case, type 340-21, paper. (Dwg. No. A-8J-1627).	Each	1	....	*	*	*	*
CU	8	3DA10-124.1	CAPACITOR, .01 mfd, ±20%, 600 volts, molded case, type 342-17, paper. (Dwg. No. A-8J-3424).	Each	1	....	*	*	*	*
CU	17	3DA100-111	CAPACITOR, .01 mfd, −20% +30%, 1000 volts, oil, type B. R. C. (Dwg. No. A-8B-3628).	Each	1	....	*	*	*	*
RT	19-1 to 19-4	3DA10-140	CAPACITOR, .01 mfd, +20% −10%, 400 volts, molded case, type 340-21, paper. (Dwg. No. A-8J-696).	Each	4	....	*	*	*	*
CU	10	3DA15-22	CAPACITOR, .015 mfd, ±20%, 600 volts, paper, type 345-35. (Dwg. No. A-8J-3982).	Each	1	....	*	*	*	*
CU	13	3K6015364	CAPACITOR, .015 mfd, ±20%, 2500 volts, mica, type XM. (Dwg. No. A-8L-3678).	Each	1	....	*	*	*	*
CU RT	2-1 to 2-11 20-1 thru 20-3	3DA50-57.1	CAPACITOR, 0.05 mfd, ±20%, 600 volts, molded case, type 345-22, paper. (Dwg. No. A-8J-1995).	Each	14	....	*	*	*	*
I	52-1 to 52-4 52-6	3DA100-113	CAPACITOR, .1 mfd, ±10%, 400 W. volts, molded case, type 345-21, fixed paper. (Dwg. No. A-8J-909).	Each	5	....	*	*	*	*
CU RT SG	3-1 to 3-7 21-1 thru 21-4 54-1 to 54-5	3DA100-112.1	CAPACITOR, 0.1 mfd, ±20%, 400 volts, molded case, type 345-21, paper. (Dwg. No. A-8J-1626).	Each	16	....	*	*	*	*
RT	32	3DA100-182	CAPACITOR, .1 mfd, +30% −10%, 600 volts, type 2528-1, paper. (Dwg. No. A-8B-3730).	Each	1	....	*	*	*	*
RT	23	3DA100-184	CAPACITOR, .1 mfd, ±30% −10%, 1000 volts, oil filled, paper type 8405BA. (Dwg. No. A-8B-3269).	Each	1	....	*	*	*	*
RT	22-1A 22-2A 22-1B 22-2B	3DA100-183	CAPACITOR, .1-.1 mfd, ±20%, −10%, 600 volts, oil, paper filled, type 8416 BR. (Dwg. No. A-8B-3268).	Each	2	....	*	*	*	*
CU	12	3DA-250-21.3	CAPACITOR, .25 mfd, ±20%, 600 volts, oil, type 6BA-25. (Dwg. No. A-8B-3512).	Each	1	....	*	*	*	*
CU PS	15-1 15-2 6-1 thru 6-2	3DA200-14	CAPACITOR, .2 mfd, +20% −10%, 5000 volts, oil filled, type Z-1416, paper. (Dwg. No. C-8B-2784).	Each	4	....	*	*	*	*
CU	18	3DA500-133	CAPACITOR, .5 mfd, +40% −10%, 200 volts, oil filled, type BMM-360-170, paper. (Dwg. No. A-8B-3191).	Each	1	....	*	*	*	*
SG	55-1 55-2	3DB1.2946	CAPACITOR, 1.0 mfd, ±20%, 400 volts, oil filled, type xx DM4-1, paper. (Dwg. No. A-8B-2946).	Each	2	....	*	*	*	*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
RT PS	26-1 to 26-3 7	3DB1.1104	CAPACITOR, 1 mfd, +20% −10%, 400 volts, oil filled, type BM-306-78, paper. (Dwg. No. A-8B-1104).	Each	4	....	*	*	*	*
CU	19-2 to 19-3	3DB1.1988	CAPACITOR, 1 mfd, ±20%, 600 volts, oil, type 6-BA-100. (Dwg. No. A-8B-1988).	Each	2	....	*	*	*	*
CU	19-1	3DB1.34	CAPACITOR, 1 mfd, +40% −10%, 600 volts, oil, type BMM-306-204. (Dwg. No. A-8B-3770).	Each	1	....	*	*	*	*
RT	25	3DB1.3062	CAPACITOR, 1 mfd, ±40% −10%, 3,600 volts, oil-filled, type 8412-SAL, paper. (Dwg. No. C-8B-3062).	Each	1	....	*	*	*	*
I PS	51-1 to 51-3 5	3DKB2-19	CAPACITOR, 2 mfd, +20% −10%, 400 volts, oil filled, type P-3044, paper. (Dwg. No. A-8B-1254).	Each	4	....	*	*	*	*
CU	6	3DB2-23	CAPACITOR, 2 mfd, +40% −10%, 600 volts, oil, type 6-BA-200. (Dwg. No. A-8B-3513).	Each	1	....	*	*	*	*
PS	4	3DB2.3042	CAPACITOR, 2 mfd, +20% −10%, 1,000 W. volts, oil-filled, type P-3042, paper. (Dwg. No. B-8B-1252-1).	Each	1	....	*	*	*	*
SG	60A 60B 60C	3DB5-26	CAPACITOR, 2.5 mfd—2.5 mfd, 5.0 mfd, +20% −10%, 600 volts, oil filled, type BMM-324-46, paper. (Dwg. No. C-8B-3740).	Each	1	....	*	*	*	*
I	54	3DB4-92	CAPACITOR, 4 mfd, +20% −10%, 400 volts, oil filled, type P-8432, paper. (Dwg. No. B-8B-3548).	Each	1	....	*	*	*	*
PS	3-1 3-2	3DB8-87	CAPACITOR, 4 mfd, +20% −10%, W.V., 600 volts, D.C., oil filled, type P-3040, paper. (Dwg. No. B-8B-1253-1).	Each	2	....	*	*	*	*
RT	24	3DB4-93	CAPACITOR, 4 mfd, +30% − 10%, 100 volts, oil filled, type 8413BA, paper. (Dwg. No. A-8B-3267).	Each	1	....	*	*	*	*
I	55	3DB5-60	CAPACITOR, 5 mfd, ±10%, W.V., 660 volts, oil filled, type ACC-5660, paper. (Dwg. No. C-8B-3549).	Each	1	....	*	*	*	*
PS	1	3DB7-3	CAPACITOR, 7 mfd, +20% −10%, W.V., 800 volts, D.C., oil filled, type 6848, paper. (Dwg. No. C-8B-2842).	Each	1	....	*	*	*	*
CU PS	14 2-1 thru 2-3	3DB7-2	CAPACITOR, 7 mfd, +30% −10%, W.V., 600 volts, D.C., oil filled, type BM-324-19, paper. (Dwg. No. B-8C-1139).	Each	4	....	*	*	*	*
SG	61	3D9003V-9	CAPACITOR, 3.9 to 50 mmf, air trimmer, type APC, variable. (Dwg. No. A-8H-3089).	Each	1	....	*	*	*	*
SG	63	3D9067VE8	CAPACITOR, 67.8 ±1%, min. less than 10.3 mmf, 500 volts, D.C., variable, type S-3090, air. (Dwg. No. B-8A-2942).	Each	1	....	*	*	*	*
AN	11-1 11-2	3DK9012V-2	CAPACITOR, 15 mmf, ±10%, 500 volts, D.C., ceramic, type 822, variable. (Dwg. No. A-8G-4223).	Each	2	....	*	*	*	*
CU	....	2C680-266A/C1	CAPACITOR, assembly, 750 mmf, ±5%, 500 volts, silver mica, type MOSW. (Dwg. No. A-201-830).	Each	1	....	*	*	*	*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
RT	28	Deleted	CAPACITOR, variable. (Dwg. No. A-202-741).	Each	1					*
RT	29	Deleted	CAPACITOR, variable. (Dwg. No. A-202-742).	Each	1					*
RT	100	3C-302-R	COIL, assembly, antenna tuning, type B. R. C. (Dwg. No. B-204-530).	Each	1		*		*	*
CU	130	2C680-266A/C2	COIL, assembly, delay line. (Dwg. No. B-207-898).	Each			*		*	*
SG	100	3C4081	COIL, assembly, IND HF osc., #12, type B. R. C. (Dwg. No. A-204-591).	Each	1		*		*	*
RT	102	3C392	COIL, assembly, mixer, tuning, type B. R. C. (Dwg. No. B-204-535) Detector.	Each	1		*		*	*
RT	101	3C-1084-N	COIL, assembly, RF tuning, type B. R. C. (Dwg. No. B-204-534).	Each	1		*		*	*
CU	131	2C680-266A/C3	COIL, assembly, timer, type B. R. C. (Dwg. No. B-204-382).	Each	1		*		*	*
SG	103A 103B	3C323-4K	COIL, choke, dual, type 466-001-095 (Dwg. No. C-16B-1317).	Each	1		*			*
PS	62	3C323-4J	COIL, choke, dual, type 466-001-117 (Dwg. No. D-17A-2785).	Each	1		*		*	*
RT	113	3C323-4F	COIL, choke, grid, type B. R. C. (Dwg. A-17A-3566).	Each	1		*		*	*
RT	114-1 to 114-4	3C323-4E	COIL, choke, heater, type B. R. C. (Dwg. No. A-17A-3565).	Each	4		*			*
RT	120	3C323-4G	COIL, choke, R. F. heater, bakelite, type B. R. C. (Dwg. No. A-204-812).	Each	1		*		*	*
RT AN	105-1 to 105-5	3C323-4B	COIL, choke, R. F. heater, type B. R. C. (Dwg. No. A-17A-1195).	Each	5		*			*
RT	104	3C323-4C	COIL, choke, oscillator, bakelite, type B. R. C. (Dwg. No. A-17A-1194).	Each	1		*		*	*
PS	63	3C323-4H	COIL, choke, type 466-001-143. (Dwg. No. C-17A-2841).	Each	1		*		*	*
SG	101	3C1081-12D	COIL, IND., oscillator, IF band, type B. R. C., 4 contacts. (Dwg. No. A-204-613).	Each	1		*		*	*
SG	102-1 to 102-4	3C323-4L	COIL, IND R. F. choke, cotton covered wire, type B. R. C. (Dwg. No. A-130-1542).	Each	4		*			*
SG	115	3C1081-12C	COIL, IND, oscillator tank, type B. R. C. (Dwg. No. A-204-641).	Each	1		*		*	*
RT	103	3C1081-12B	COIL, oscillator tuning, type B. R. C. (Dwg. No. B-204-543)	Each	1		*		*	*
AN RT		2Z299-359	ADAPTER, M-359, right angle, type #83-1 AP. (Dwg. No. A-55A-3367).	Each	5		*	*	*	*
M		2Z299-358	ADAPTER, M-258, type #83-IT. (Dwg. No. A-55A-4041).	Each	1		*	*	*	*
M		2Z3014-10	CONNECTOR, Barco coupling #26243. (Dwg. No. A-55A-2591).	Each	1		*	*	*	*
T		2Z3020-7	CONNECTOR, brush, braided copper wire, .040" dia. 3" long, type #27913. (Dwg. No. 125X-201).	Each	6		*			*

Major Com-ponent	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
PS I		2Z3095-5	CONNECTOR, V shaped, formed .375" centers, .312" high, 125" wide, .008" spring temp., phosphor bronze, B. R. C. part No. (Dwg. No. A26D-3597).	Each	5		*			*
FM	11	2Z7119.14	CONNECTOR, right angle, 9 pins, male, type #97-5109-28-1P. (Dwg. No. B-55A-4181).	Each	1		*	*	*	*
FM	10	2Z8679.8	CONNECTOR, right angle. (Dwg. No. B-55A-4163).	Each	1		*	*	*	*
M		2Z8679.9	CONNECTOR, type #AN-3106-28-1S. (Dwg. No. B-55A-4067).	Each						*
M		2Z7119.13	CONNECTOR, type #AN-3106-28-1P. (Dwg. No. B-55A-4066).	Each						*
M		2Z7122.27	CONNECTOR, type #AN-3106-28-83. (Dwg. No. B-55A-4068).	Each						*
RT	151-1 151-2	2Z5540.1	JACK, closed-circuit, type #J-307. (Dwg. No. A-44B-2850).	Each	2		*	*	*	*
RT	150-1 to 150-3	4C4312-5	JACK, phone, open-circuit, type #J-300. (Dwg. No. A-44A-2960).	Each	3		*	*	*	*
SG	107	2Z-5534	JACK, telephone, open-circuit, type #JK-34-A1. (Dwg. No. A-44A-300).	Each	1		*	*	*	*
T		2Z5584	JACK, phosphor bronze, type #28100. (Dwg. No. 125X-501).	Each	6		*	*	*	*
I RT	114 180	2Z7131.6	PLUG ASSEMBLY, 21 contacts, male, type B. R. C. (Dwg. No. C-201-546-4).	Each	2		*	*	*	*
RT	181	2Z7120.8	PLUG ASSEMBLY, 10 contacts, male, type B. R. C. (Dwg. No. A-201-579).	Each	1		*	*	*	*
M		2Z7129.3	PLUG ASSEMBLY, 19 contacts, male, Catalog #X-1114 ped. (Dwg. No. C-55A-2953).	Each	1		*	*	*	*
M		2Z7111.102	PLUG, coaxial. (Dwg. No. A-55A-3494).	Each						*
RT	171-1 to 171-4	2Z7111.60	PLUG, coaxial, straight, 2 contacts, type #83-1SP. (Dwg. No. B-55A-2162).	Each	4		*	*	*	*
M		6Z7567-1	PLUG, female, 2 poles, type #61-F11. (Dwg. No. A-19B-3671).	Each	1		*	*	*	*
SG RT	108-1 108-2 170-1 thru 170-5	2Z7111.61	PLUG, Flange, female contact, type 851-R. (Dwg. No. 55A-2071).	Each	7		*	*	*	*
I	112	2Z7116.27	PLUG, Flange, male contacts, type AN-3102-18-12P. (Dwg. No. A-55A-3373).	Each	1		*	*	*	*
SG	111	2Z7138.1	PLUG, male (2 contacts), Catalog No. 61-M10; type 61-M10. (Dwg. No. A-55A-3583).	Each	1		*	*	*	*
SG	116	2Z7112.22	PLUG (2 contacts), (Receptacle), male flange type; type AN-3102G-12S-3P. (Dwg. No. A-55A-1750).	Each	1		*	*	*	*
FM M	19	2Z7226-259	PLUG, (PL-259) male, type 83-1SP, single contact. (Dwg. No. B-55A-2244).	Each	4		*	*	*	*
T		2Z7226-259	PLUG, (PL-259) male, connector, Catalog No. 83-1SP, single contact. (Dwg. No. 125X-129).	Each	1		*	*	*	*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
M	....	6Z7592	PLUG (2 poles), male, 250 volts, type 2721. (Dwg. No. A-19A-2347).	Each	1	....	*	*	*	*
SW	....	6Z7567-5	PLUG (2 pole), male, type 61-M11. (Dwg. No. A-19A-4207).	Each	1	....	*	*	*	*
FM	4	2Z7113.8	PLUG (3 prongs), male polarized, type 60-M11. (Dwg. No. A-19A-4085).	Each	1	....	*	*	*	*
T	....	2Z71293	PLUG, ordnance, pep. male; receptacle with chain cap and gaskets type X-1100. (Dwg. No. 125X-138).	Each	1	....	*	*	*	*
FM	8	2Z7134.5	PLUG (24 contacts), type B. R. C. (Dwg. No. C-201-545-1).	Each	1	....	*	*	*	*
M RT	171-1 thru 171-4	2Z711.60	PLUG, selector, copper alloy, No. CSX-49195. (Dwg. No. B-55A-2162).	Each	6	....	*	*	*	*
M	....	2Z7155	PLUG, straight, male, type PL-55. (Dwg. No. A-19A-3304).	Each	1	....	*	*	*	*
CU	....	2Z8671.62	RECEPTACLE, coaxial, type S-2015-3/8. (Dwg. No. A-55A-3493).	Each	4	....	*	*	*	*
FM	16	6Z7809-5	RECEPTACLE, dual, convenience, type 92001, 125 volts. (Dwg. No. A-5E-3868).	Each	1	....	*	*	*	*
CU	127	2Z7122.2	RECEPTACLE, 1210 male, type AN-31-2-28-8T. (Dwg. No. A-55A-3495).	Each	1	....	*	*	*	*
FM	5	6Z7784.2	RECEPTACLE, 3 prongs, type 60-F18. (Dwg. No. A-19B-4086).	Each	1	....	*	*	*	*
T	....	6Z7804-2	RECEPTACLE, with fastening, Catalog No. C-146, 2-pole. (Dwg. No. 125X-135).	Each	1	....	*	*	*	*
SW	....	6Z8367-2	SOCKET, A. C., 2-pole, bakelite. (Dwg. No. A-19B-4206).	Each	1	....	*	*	*	*
FM M	6	2Z8689-5	SOCKET ASSEMBLY, female, type X-1100 rep., 19 contacts. (Dwg. No. C-55A-2951).	Each	2	....	*	*	*	*
RT	182	2Z8680-6	SOCKET ASSEMBLY, 10 contacts, type B. R. C., female. (Dwg. No. B-201-578).	Each	1	....	*	*	*	*
PS	P30	2Z8690-7	SOCKET ASSEMBLY, female, 20 contact, type B. R. C. (Dwg. No. C-201-546-1).	Each	1	....	*	*	*	*
FM	7-1 7-2	2Z8694.2	SOCKET ASSEMBLY, 21 contacts, type B. R. C. (Dwg. No. C-201-545-4).	Each	2	....	*	*	*	*
M	....	2Z8671.41	SOCKET, bakelite, 29/64" O.D. x 5/16" I.D., 1/8" thick, 1 contact. (Dwg. No. A-3B-3972).	Each	3	....	....	....	....	*
T	....	2Z8676.35	SOCKET, 6 contact, Catalog No. 3106-19-12F. (Dwg. No. 125X-122).	Each	1	....	*	*	*	*
I	111	2Z8676.37	SOCKET, 6 contacts, straight, type AN-3106W-18-125. (Dwg. No. C-55A-3563).	Each	1	....	*	*	*	*
M	....	2Z8689-3	SOCKET, female, Catalog No. X-1114 Red, 19 contact. (Dwg. No. C-55A-2954).	Each	1	....	*	*	*	*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
I	121-1 121-2	3Z2585	FUSE, 1/8 amperes, cartridge type, Catalog No. 3AG, 1/8, 250 volts. (Dwg. No. A-46B-3672).	Each	2	*	*	*	*	*
PS	71	3Z9126	FUSE, 1 ampere, 250 volts, cartridge type, Catalog No. 3-AG. (Dwg. No. A-46B-2718).	Each	1	*	*	*	*	*
CU		3Z1927	FUSE, 2 amperes, 250 volts, cartridge type, Catalog No. 3-AG. (Dwg. No. A-46B-2717).	Each	1	*	*	*	*	*
SG PS	113 70-1 70-2	3Z1950	FUSE, 3 amperes, 250 volts, cartridge type, Catalog No. 3-AG. (Dwg. No. A-46B-1109).	Each	3	*	*	*	*	*
PS	72	3Z1946	FUSE, 5 amperes, 250 volts, 1/2 amp., cartridge type, Catalog No. 3-AG. (Dwg. No. A-46B-2719).	Each	1	*	*	*	*	*
CU I PS		3Z3275-1	FUSE, holder type, post, Catalog No. 3-AG. (Dwg. No. A-55A-2716).		10		*			*
FM		6Z4876-12	GROMMET, black rubber, 1/2" ID x 1 1/16" OD x 1/2" hole x 5/16" long, type No. 2283. (Dwg. No. A-25A-4162).	Each			*			*
FM		6Z4856-23	GROMMET, black rubber, 1 3/4" OD x 7/16" thick x 1" dia. hole, type No. 2277. (Dwg. No. A-25A-3748).	Each			*	*	*	*
M		6Z4856-22	GROMMET, rubber, 1 5/8" OD x 61/64" ID, .359" thick. (Dwg. No. A-25A-3411).	Each	1		*	*	*	*
T		6Z4858	GROMMET, rubber, 1" dia. HD, 3/4" dia. body, 1/2" dia. hole, 7/16" long. (Dwg. No. 125X-603).	Each	1		*	*	*	*
SG		6Z4858-4	GROMMET, rubber, 7/16" OD x 3/16" ID x 7/32" thick. (Dwg. No. A-25A-3580).	Each	7		*			*
AN		6Z4858-3	GROMMET, rubber, 27/32" OD x 9/16" ID x 9/32" thick, type Buna S-K801. (Dwg. No. A-25A-4413).	Each	6		*			*
AN		6Z4858-2	GROMMET, rubber, 27/32" OD x 9/16" ID x 9/32" thick, type Buna S-K801. (Dwg. No. A-25A-4414).	Each	6		*			*
SG		3G1838-27.4	INSULATOR, bakelite, .015 XXXP, 7/8" x 1 11/16". (Dwg. No. A-7A-1188).	Each	3		*			*
PS		3G1250-24.10	INSULATOR, ceramic, 1/2" OD x 1 1/2" long, standoff. (Dwg. No. A-5G-2777).	Each	1		*			*
M		3G1100-101	INSULATOR, ceramic. (Dwg. No. C-5H-3139).	Each	1		*	*	*	*
AN		3G1250-13.2	INSULATOR, "Dipole". (Dwg. No. A-7A-3124).	Each	6		*			*
RT		3G1100-54.1	INSULATOR, grid line, micalex, 1/2" x 3 3/8" x 1/4"; strip has 4 holes, two holes are .147" dia., and two are .128" dia.; type B. R. C. (Dwg. No. A-7A-3163).	Each	1		*	*	*	*
RT		3G1838-10.5	INSULATOR, laminated phenolic, 3/8" x 5/8" x 1/32", has a .144" dia. hole; type B. R. C. (Dwg. No. A-74-4145).	Each	1		*	*	*	*
T		3G1839-21	INSULATOR, polystrene, .935" dia. HD, .779" dia. body, 9/16" long, #10 (1935) hole .375" dia., C bore 1/8" deep at head end. (Dwg. No. 125X-474).	Each	1		*	*	*	*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
RT		3G1100-110.2	INSULATOR, porcelain, 6 7/8" x 2 5/8" x 7/16", strip has 12 5/32" dia. holes, type B. R. C., standoff. (Dwg. No. A-7A-4108).	Each	1		*	*	*	*
AN		3G1795-3	INSULATOR, boot, rubber. (Dwg. No. A-25H-3723).	Each			*			
SG		3G1837-32.10	INSULATOR, standoff, bakelite, 5/8" dia. x 1" long, with #10-24 tapped hole. (Dwg. No. A-5G-3012).	Each	4		*			*
SG		3G1837-75	INSULATOR, standoff, bakelite, 5/8" dia. x 2 11/16" long, both ends tapped #10-24. (Dwg. No. A-5G-3028).	Each	2		*			*
M		3G1250-8.15	INSULATOR, standoff, ceramic. (Dwg. No. A-5F-3296).	Each	3		*			*
RT PS		3G1300-46	INSULATOR, steatite, 1/2" OD x 1/2" long tapped hole in each end, #6-32 tap x 3/16" deep, type 1158-04. (Dwg. No. A-55E-2778).	Each	6		*			*
RT		3G1838-26.3	INSULATOR, strip, polystrene, 1 5/8" x 1 1/8" x 1/8"; strip has three holes, two holes are 5/32" dia., one hole is .035" dia., type B. R. C. (Dwg. No. A-7A-3439).	Each	1		*	*	*	*
T		3G1838-20.10	INSULATOR, terminal block, bakelite, 1 1/4" x 1 7/8" x 3/4", three 3/8" wide grooves at top, 1 5/8" wide grooves at bottom. (Dwg. No. 125X-532).	Each	1					*
T		3G1838-20.11	INSULATOR, terminal block, bakelite, 1 1/4" x 1 7/8" x 3/8", two #6-32 tap holes. (Dwg. No. 125X-533).	Each	1					*
PS		3G1100-62	INSULATOR, terminal board, ceramic, 3 7/8" long x 2 3/4" wide x 3/8" thick, 7 holes, .187" dia. (Dwg. No. A-7A-3618).	Each	1		*			*
CU RT		3G1250-10.4	INSULATOR, ultra steatite, or equal, 1/2" OD x 5/8" long, #6-32 tapped both ends 3/16" deep, type B. R. C. (Dwg. No. A-5F-1120).	Each	2		*			*
PS		3G1625-6	INSULATOR, washer, vellutex, .171" ID x .375" OD x .031" thick. (Dwg. No. B-29G-3659).	Each	11		*			*
RT		3G1621-6.1	INSULATOR, washer, vellutex, .147" ID x .375" OD x 1/32" thick. (Dwg. No. B-29G-3217).	Each	36		*			*
I		3G1625-6.2	INSULATOR, washer, vellutex, .218" ID x .375" OD x .031" thick. (Dwg. No. B-29G-3502).	Each	8		*			*
RT		3G1625-8.1	INSULATOR, washer, vellutex, .173" ID x .500" OD x 1/32" thick. (Dwg. No. B-29G-3390).	Each	2		*			*
PS		3G1625-8.2	INSULATOR, washer, vellutex, .169" ID x .500" OD x .050" thick. (Dwg. No. A-41A-2592).	Each	7		*			*
CU RT		3G1625-8.3	INSULATOR, washer, vellutex, 1/2" x .147" x .500" OD x .031" thick. (Dwg. No. B-29G-3236).	Each	33		*			*
SW		3G1625-8	INSULATOR, washer, vellutex, .250" ID x .500" x .031" thick. (Dwg. No. B-29G-3460).	Each	1		*			*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
PS		2Z5988-21	LAMP ASSEMBLY, jewel and brkt. (2 filament transformers), amber, 1.250" dia., Catalog No. 75. (Dwg. No. A-55A-1267-2).	Each	2		*		*	*
I PS		2Z5884-3	LAMP ASSEMBLY, jewel and brkt., indication 3 different circuit breakers red, 1.250" dia., Catalog No. 75. (Dwg. No. A-55A-1267-1).	Each	5	*	*		*	*
CU I		2Z5991	LAMP ASSEMBLY, red, jewel, type 50. (Dwg. No. A-55A-1526).	Each	1		*		*	*
I	120-1 120-2	2Z5952	LAMP, bayonet base, 6.3 volts, .15 amps., type T-47. (Dwg. No. A-46A-3560).	Each	2	*	*	*	*	*
I PS	119-1 to 119-3 35-1 to 35-4	2Z5886	LAMP, candelabra base, 115 volts, 6 watt, type S-6. (Dwg. No. A-46A-4189).	Each	7	*	*	*	*	*
CU RT	134 190-1 to 190-4	2Z5927	LAMP, pilot light, 6.3 volts, 4 watt, type No. 44. (Dwg. No. A-46A-1621).	Each	4	*	*	*	*	*
RT		2Z5883-44	SOCKET, pilot light. (Dwg. No. A-55A-1115-2).	Each	1		*			*
RT		2Z5883-49	SOCKET, pilot light. (Dwg. No. A-47A-3220).	Each	2		*			*
RT		2Z5883-54	SOCKET, pilot light, meter. (Dwg. No. A-47A-3539).	Each	1		*			*
RT	160	3E25025	WATTMETER AMMETER, head dimensions, 3½" dia. x 19/64", body dimension 23/16" dia. x 1½" with two ¼" x 28 studs protruding out 1" bakelite case, scale limit are 0-10 ma., and 0-1KW, type DO41-44-46.(Dwg. No. 55A-3530).	Each	1		*			*
AN	46	3Z9903A-12/1	BUTTON, switch, bakelite, black, 23/32" OD x ½", counterboard .350, 1/32" deep ID x ½" long. (Dwg. No. A-5A-4082).	Each	1		*			*
FM	13	3H900-1.5-1	CIRCUIT BREAKER, "Blower" S. P., 117.5 volts, 1.5 amp., type Pam-1515-CS-1. (Dwg. No. B-20C-3590).	Each	1		*			*
I	116	3H900-4-1	CIRCUIT BREAKER, D. P., 117.5 volts, 4 amps., type 2163-4. (Dwg. No. C-20C-3534).	Each	1		*			*
I	118	3H900-1.25	CIRCUIT BREAKER, D. P., 117.5 volts, 1.25 amps., type 2163-1.25. (Dwg. No. C-20C-3558).	Each	1		*			*
FM	12	3H900-7-1	CIRCUIT BREAKER, "Heater" S. P., 117.5 volts, 7 amps., type Pam-1515-7. (Dwg. No. B-20C-2783).	Each	1		*			*
I	117	3H900-3-2	CIRCUIT BREAKER, S. P., 117.5 volts, 3 amps., type AM-1515-3. (Dwg. No. B-20C-3557).	Each	1		*			*
PS	43	3H900-0.04	CIRCUIT BREAKER, S.P.S.T., 117.5 volts, .040 to .050 amps., curve special, type AM-1515-RS-01. (Dwg. No. B-20C-2826).	Each	1		*			*
PS	44	3H900-10-4	CIRCUIT BREAKER, S.P.S.T., 117.5 volts, 10 amps., curve #1, type AM-1515-10. (Dwg. No. B-20C-3591).	Each	1		*			*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
AN	....	2Z3194-11	CONTACT, used on lobe switch, Russell Elec. Assem. No. X794-B. (Dwg. No. A-26C-4230).	Each	2			*	*	*
I	110	2Z7590-53	RELAY, used for motor reversing, D. P. 100 W. V., type B. R. C., part No. (Dwg. No. B-45A-3508).	Each	1		*			*
SG	105-A 105-B	3Z9825-60.5	SWITCH, attenuator rotary, 2-section, 5-position, type H. (Dwg. No. B-20A-2862).	Each	1		*	*		*
PS	40	3Z9824-275.2	SWITCH, interlock, 250 volts, 3 amps. or 125 volts, 5 amps., push button, type CH-7190. (Dwg. No. A-20F-2776).	Each	1		*	*		*
FM	9	3Z9824-275.3	SWITCH, interlock, D.P.S.T., 115 volts, 7 amps., push button, type M-75957-W3. (Dwg. No. A-20F-3866).	Each	1		*	*		*
M	....	3Z8220A/S1	SWITCH, lobe antenna, type X-902-A, S. C. type SW-220-A. (Dwg. No. 206-730).	Each	1		*	*	*	*
SG	106	3Z9825-60.4	SWITCH, mixer, crystal to Var-Osc., rotary, 2-position, type H. (Dwg. No. B-20A-3193).	Each	1		*			*
AN	46	3Z9824-250	SWITCH, push button, 125 volts, 1 amp., S. P. type 3391. (Dwg. No. A-20F-4098).	Each	1		*	*		*
CU	124	3Z9825-62.108	SWITCH, "Range Selector," 4-position, 10-pole, type 4BH x 6832X. (Dwg. No. B-20A-3669).	Each	1		*			*
RT	140	3Z9825-60.2	SWITCH, rotary, test, 3-position, 3-wafer, type QH3. (Dwg. No. B-20D-3260).	Each	1			*	*	
CU	123	3Z9849.22	SWITCH, "Toggle", D.P.D.T., 30 volts, .15 amps., antenna reversing, type 8825K4. (Dwg. No. A-20C-3100-1).	Each	1		*	*	*	*
CU	122	3Z9849.39	SWITCH, "Toggle," on-off, S.P.S.T., 117 volts, 1 amp., type No. 8803-K5. (Dwg. No. A-20C-3663).	Each	1		*			*
SG	112	3Z9849.10	SWITCH, "Toggle," power, S.P.S.T., 250 volts, 3 amps., type 8909-K119. (Dwg. No. A-20C-1263).	Each	1		*	*	*	*
T	....	3Z9864.2	SWITCH, "Toggle," type "NF", tumbler, Catalog No. 6808. (Dwg. No. 125X-93).	Each	1		*	*	*	*
I	107	2Z7269.47	POTENTIOMETER, 4 ohms, ±20%, 1 watt, type No. S1-010-1667, carbon. (Dwg. No. A-10A-3371).	Each	1		*	*	*	*
SG	15	2Z7267.12	POTENTIOMETER, 125 ohms, ±20%, 1 watt, type J, carbon linear. (Dwg. No. GA-10B-2863).	Each	1		*	*	*	*
CU	100	2Z7269.100	POTENTIOMETER, 3000 ohms, ±20%, ½ watt, type 35. (Dwg. No. A-10B-3096).	Each	1		*	*	*	*
CU	94-1 94-2	2Z7269.84	POTENTIOMETER, 3000 ohms, ±20%, ½ watt, type 35. (Dwg. No. A-10B-3095).	Each	2		*	*	*	*
CU	98	2Z7269.110	POTENTIOMETER, 3500 ohms, ±20%, ½ watt, type 35. (Dwg. No. A-10B-3098).	Each	1		*	*	*	*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
I	108	2Z7269.48	POTENTIOMETER, 5000 ohms, ±10%, ½ watt, type No. S33-010-338, carbon linear. (Dwg. No. B-10A-3540).	Each	1	....	*	*	*	*
CU	92	2Z7269.86	POTENTIOMETER, 5000 ohms, ±20%, ½ watt, type No. 35. (Dwg. No. A-10B-3094).	Each	1	....	*	*	*	*
RT	89-1 to 89-2	2Z7271-43	POTENTIOMETER, 100,000 ohms, ±10%, ½ watt, type 35, carbon linear. (Dwg. No. A-10A-3147).	Each	2	....	*	*	*	*
CU	96	2Z7271-101	POTENTIOMETER, intensity control, 160,000 ohms, ±20%, 2 watt, type J. (Dwg. No. A-10B-3099).	Each Each	1 1	....	* *	* *	* *	* *
SG	4	2Z7272-13	POTENTIOMETER, audio, 250,000 ohms, ±10%, 2 watts, type J. ±20% carbon. (Dwg. No. A-10B-3085).	Each	1	....	*	*	*	*
CU	97	2Z7272-88	POTENTIOMETER, "Focus," 360,000 ohms, ±20%, 2 watts, type J. (Dwg. No. A-10B-3097).	Each	1	....	*	*	*	*
CU	93	2Z7272-50	POTENTIOMETER, 500,000 ohms, ±2%, ½ watt, type No. 35. (Dwg. No. A-10B-3093).	Each	1	....	*	*	*	*
I	106	2Z7273-30	POTENTIOMETER, "sensitivity" control, 1 megohm, ±20%, 4 watts, type C, carbon. (Dwg. No. A-10A-3556).	Each	1	....	*	*	*	*
RT	92	2Z7284.61	POTENTIOMETER, dual, 1 megohm, ±10%, 1¼ watt, type J, carbon. (Dwg. No. B-10A-3172).	Each	1	....	*	*	*	*
RT	91	2Z7284.62	POTENTIOMETER, dual, 2 megohms, ±10%, 1¼ watt, type C, carbon. (Dwg. No. B-10A-3108).	Each	1	....	*	*	*	*
CU	95-1 95-3	2Z7284.60	POTENTIOMETER, dual, 2 megohms, each section, ±20%, ½ watt, type 35. (Dwg. No. A-10B-2767).	Each	3	....	*	*	*	*
RT	90	3Z7006-3	RHEOSTAT, 6 ohms, ±10%, 25 watt, wire-wound, type H. (Dwg. No. B-10A-3109).	Each	1	....	*	*	*	*
I	109	3Z7075-5	RHEOSTAT, 75 ohms, ±10%, 3 watt, wire-wound, type B. R. C. (Dwg. No. G-B-9A-3538).	Each	1	....	*	*	*	*
SG	13-1 13-2	3Z5995-20	RESISTOR, 5.5 ohms, ±5%, 1/10 watt, carbon, type MB-1/3. (Dwg. No. C-9B6-3379).	Each	2	....	*	*	*	*
SG	14	3Z5996-12	RESISTOR, 6 ohms, ±5%, 1/10 watt, carbon, type MB-1/3. (Dwg. No. C-9B6-3380).	Each	1	....	*	*	*	*
RT	86	3Z5997-9	RESISTOR, 7.8 ohms, ±2%, ½ watt, wire-wound, type W-W-7. (Dwg. No. A-9C3-532).	Each	1	....	*	*	*	*
SG	12	3Z6004E5-5	RESISTOR, 45 ohms, ±5%, 1/10 watt, carbon, type EB. (Dwg. No. C-9B6-3382).	Each	1	....	*	*	*	*
RT	93-1 to 93-4	3Z6004A7	RESISTOR, 47 ohms, ±10%, ½ watt, carbon, type EB. (Dwg. No. A-9B1-46).	Each	4	....	*	*	*	*
SG	11-1 11-2	3Z6005-53	RESISTOR, 49.5 ohms, ±5%, ½ watt, carbon, type MB-1/3. (Dwg. No. C-9B6-3381).	Each	2	....	*	*	*	*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
CU	50-1 to 50-2	3Z6008B2-6	RESISTOR, 82 ohms, ±10%, ½ watt, type EB. (Dwg. No. A-9B1-49).	Each	2	....	*	*	*	*
RT	65-1 to 65-3	3Z6010-36	RESISTOR, 100 ohms, ±10%, ½ watt, carbon, type EB. (Dwg. No. A-9B1-50).	Each	3	....	*	*	*	*
I	8	3Z6010-117	RESISTOR, 100 ohms, ±10%, 10 watt, wire-wound, type KOOLOHM-10K. (Dwg. No. A-9C-3904).	Each	1	....	*	*	*	*
CU RT	51 73-1 73-4	3Z6022-9	RESISTOR, 220 ohms, ±10%, ½ watt, carbon, bakelite insulation, type EB. (Dwg. No. A-9B1-54).	Each	5	....	*	*	*	*
RT	51-1 51-2	3Z6028-63	RESISTOR, 250 ohms, ±10%, ½ watt, carbon, type EB. (Dwg. No. A-9B1-2709).	Each	2	....	*	*	*	*
PS	24	3Z6033-20	RESISTOR, 330 ohms, ±10%, 5 watt, wire-wound, type KOOLOHM-5K. (Dwg. No. A-9C-3668).	Each	1	....	*	*	*	*
SG	10	3Z6045-15	RESISTOR, 450 ohms, ±5%, ½ watt, carbon, type EB. (Dwg. No. C-9B6-3383).	Each	1	....	*	*	*	*
RT SG	66 9	3Z6047-5	RESISTOR, 470 ohms, ±10%, ½ watt, carbon, type EB. (Dwg. No. A-9B1-58).	Each	2	....	*	*	*	*
RT	60	3ZK6047-12	RESISTOR, 470 ohms, ±10%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-58).	Each	1	....	*	*	*	*
CU	....	3Z6070-18	RESISTOR (heater). 700 ohms, ±10%, 20 watt, type CANDOHN-FM. (Dwg. No. A-9D-4185).	Each	1	....	*	*	*	*
SG	16	3RC20BE911J	RESISTOR, 900 ohms, ±5%, ½ watt, carbon, type EB. (Dwg. No. A-9B3-3535).	Each	1	....	*	*	*	*
CU	53-1 to 53-4	3Z4567	RESISTOR, 1000 ohms, ±10%, ½ watt, carbon, bakelite insulation, type EB. (Dwg. No. A-9B1-62).	Each	4	....	*	*	*	*
CU RT	72 85	3Z6100-80	RESISTOR, 1000 ohms, ±10%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-62).	Each	2	....	*	*	*	*
FM	17	3Z6120-25	RESISTOR, 1200 ohms, ±10%, 25 watt, wire-wound, type KOOLOHM-25K. (Dwg. No. A-9C-4084).	Each	1	....	*	*	*	*
CU, RT PS	76 94 18	3Z6150-79	RESISTOR, 1500 ohms, ±10%, ½ watt, fixed, carbon, type EB. (Dwg. No. A-9B1-64).	Each	3	....	*	*	*	*
CU	73-1 to 73-3	3Z6180-8	RESISTOR, 1800 ohms, ±10%, 1 watt, type GB. (Dwg. No. A-9B2-65).	Each	3	....	*	*	*	*
CU RT SC	54-1 to 54-3 52-1 to 52-4 17	3Z6220-3	RESISTOR, 2200 ohms, ±10%, ½ watt, fixed, carbon, type EB. (Dwg. No. A-9B1-66).	Each	8	....	*	*	*	*
CU	74	3Z6220-12	RESISTOR, 220 ohms, ±10%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-66).	Each	1	....	*	*	*	*
RT	55	3Z6270-19	RESISTOR, 2700 ohms, ±10%, ½ watt, carbon, type EB. (Dwg. No. A-9B1-67).	Each	1	....	*	*	*	*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
CU	75	3Z6270-6	RESISTOR, 2700 ohms, ±10%, 1 watt, type GB. (Dwg. No. A-9B2-67).	Each	1	....	*	*	*	*
CU RT	89 62-1 to 62-5	3Z6330-23	RESISTOR, 3300 ohms, ±10%, ½ watt, fixed, carbon, type EB. (Dwg. No. A-9B1-68).	Each	6	....	*	*	*	*
RT	59-1 to 59-6	3Z6330-13	RESISTOR, 3300 ohms, ±10%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-68).	Each	6	....	*	*	*	*
CU RT	56 68-1 to 68-4	3Z6390-3	RESISTOR, 3900 ohms, ±10%, ½ watt, carbon, type EB. (Dwg. No. A-9B1-69).	Each	5	....	*	*	*	*
RT	81	3Z6380	RESISTOR, 3900 ohms, ±10%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-69).	Each	1	....	*	*	*	*
SG	18-1 18-2	3Z6400-23	RESISTOR, 4000 ohms, ±5%, 10 watt, wire-wound, type KOOLOHM-10K. (Dwg. No. A-9C-3860).	Each	2	....	*	*	*	*
SG RT	20 87	3Z6470-27	RESISTOR, 4700 ohms, ±5%, ½ watt, fixed, carbon, type EB. (Dwg. No. A-9B1-175).	Each	2	....	*	*	*	*
CU RT	57 63-1 to 63-2	3Z6470-8	RESISTOR, 4700 ohms, ±10%, ½ watt, carbon, type EB. (Dwg. No. A-9B1-70).	Each	3	....	*	*	*	*
CU	58	3RC20BE672K	RESISTOR, 5600 ohms, ±10%, ½ watt, type EB. (Dwg. No. A-9B1-71).	Each	1	....	*	*	*	*
CU RT	85 74	3RC30BE562K	RESISTOR, 5600 ohms, ±10%, 1 watt, fixed, carbon, type GB. (Dwg. No. A-9B2-71).	Each	2	....	*	*	*	*
RT	56	3Z6568-5	RESISTOR, 6800 ohms, ±10%, ½ watt, carbon, type EB. (Dwg. No. A-9B1-72).	Each	1	....	*	*	*	*
CU RT	77 54-1 to 54-3	3Z6568-10	RESISTOR, 6800 ohms, ±10%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-72).	Each	4	....	*	*	*	*
PS	23	3Z6568-24	RESISTOR, 6800 ohms, ±10%, 2 watt, fixed, carbon, type S2. (Dwg. No. A-9B4-72).	Each	1	....	*	*	*	*
RT SG	70-1 to 70-3 1	3Z6610-57	RESISTOR, 10,000 ohms, ±10%, ½ watt, carbon, type EB. (Dwg. No. A-9B1-74).	Each	4	....	*	*	*	*
I	5	3Z6610-59	RESISTOR, 10,000 ohms, ±10%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-74).	Each	1	....	*	*	*	*
CU	86	3Z6613-6	RESISTOR, 13,000 ohms, ±5%, 10 watt, type KOOLHOM-10K. (Dwg. No. A-9C-3736).	Each	1	....	*	*	*	*
SG	19	3Z6620-106	RESISTOR, 20,000 ohms, ±5%, 10 watt, wire-wound, type KOOLOHM-10K. (Dwg. No. A-9C-3246).	Each	1	....	*	*	*	*
CU RT SG	59 58 2-1 to 2-3	3Z6622-10	RESISTOR, 22,000 ohms, ±10%, ½ watt, carbon, type EB. (Dwg. No. A-9B1-78).	Each	5	....	*	*	*	*
RT SG	95-1 to 95-3 3	3Z6622-11	RESISTOR, 22,000 ohms, ±10%, 1 watt, fixed, carbon, type GB. (Dwg. No. A-9B2-78).	Each	4	....	*	*	*	*
CU	78	3Z6627-8	RESISTOR, 27,000 ohms, ±10%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-79).	Each	1	....	*	*	*	*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
CU	55	3ZK6633-20	RESISTOR, 33,000 ohms, ±10%, ½ watt, fixed, carbon, type EB. (Dwg. No. A-9B1-80).	Each	1	....	*	*	*	*
CU	79-1 to 79-6	3Z6633-1	RESISTOR, 33,000 ohms, ±10%, 1 watt, type GB. (Dwg. No. A-9B2-80).	Each	6	....	*	*	*	*
I	4	3Z6633-19	RESISTOR, 33,000 ohms, ±10%, 2 watt, fixed, carbon, type S2. (Dwg. No. A-9B4-80).	Each	1	....	*	*	*	*
CU	52	3Z6647-5	RESISTOR, 47,000 ohms, ±10%, ½ watt, type EB. (Dwg. No. A-9B1-82).	Each	1	....	*	*	*	*
RT	84	3Z6647-19	RESISTOR, 47,000 ohms, ±10%, 1 watt, fixed, carbon, type GB. (Dwg. No. A-9B2).	Each	1	....	*	*	*	*
I	6	3Z6650-116	RESISTOR, 50,000 ohms, 10%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-3544).	Each	1	....	*	*	*	*
CU	62-1 to 62-2	3Z6656-18	RESISTOR, 56,000 ohms, ±10%, ½ watt, type EB. (Dwg. No. A-9B1-83).	Each	2	....	*	*	*	*
CU	88	3Z6656-12	RESISTOR, 56,000 ohms, ±10%, 1 watt, type GB. (Dwg. No. A-9B2-83).	Each	1	....	*	*	*	*
CU RT SG	80-1 to 80-3 53-1 to 53-4 8-1 to 8-2	3ZK6668-14	RESISTOR, 68,000 ohms, ±10%, 1 watt, fixed, carbon, type GB. (Dwg. No. A-9B2-84).	Each	9	....	*	*	*	*
CU	63-1 to 63-2	3RC20BE823K	RESISTOR, 82,000 ohms, ±10%, ½ watt, type EB. (Dwg. No. A-9B1-85).	Each	2	....	*	*	*	*
RT	50-1 to 50-5	3Z6700-61	RESISTOR, 100,000 ohms, ±10%, ½ watt, carbon, type EB. (Dwg. No. A-9B1-86).	Each	5	....	*	*	*	*
CU RT I	81-1 to 81-4 67-1 to 67-6 7	3RC30BE104K	RESISTOR, 100,000 ohms, ±10%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-86).	Each	11	....	*	*	*	*
CU	64-1 to 64-6	3Z6712-2	RESISTOR, 120,000 ohms, ±10%, ½ watt, carbon, type EB. (Dwg. No. A-9B1-87).	Each	6	....	*	*	*	*
CU RT PS	90-1 to 90-3 83-1 to 83-5 22-1 to 22-2	3RC30BE124K	RESISTOR, 120,000 ohms, ±10%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-87).	Each	10	....	*	*	*	*
CU	65	3Z6715-24	RESISTOR, 150,000 ohms, ±10%, ½ watt, carbon, type EB. (Dwg. No. A-9B1-88).	Each	1	....	*	*	*	*
CU	82-1 to 82-5	3RC30BE154K	RESISTOR, 150,000 ohms, ±10%, 1 watt, fixed, carbon, type GB. (Dwg. No. A-9B2-88).	....	....	....	....	....	....	....
PS	21	3RC40AE154M	RESISTOR, 150,000 ohms, ±20%, 2 watt, carbon, type S2. (Dwg. No. A-9B4-26).	Each	1	....	*	*	*	*
CU	66	3Z6718-3	RESISTOR, 180,000 ohms, ±1%, ½ watt, type EB. (Dwg. No. A-9B1-89).	Each	1	....	*	*	*	*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
PS	25	3Z6718-7	RESISTOR, 180,000 ohms, ±10%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-89).	Each	1	....	*	*	*	*
RT	80-1 80-2	3RC30BE204J	RESISTOR, 200,000 ohms, ±5%, 1 watt, fixed, carbon, type GB. (Dwg. No. A-9B2-3755).	Each	2	....	*	*	*	*
CU RT SG	67 72-1 to 72-3 5-1 to 5-2	3Z6722-5	RESISTOR, 220,000 ohms, ±10%, ½ watt, carbon, type EB. (Dwg. No. A-9B1-90).	Each	6	....	*	*	*	*
CU I PS	87-1 to 87-8 3 20	3Z6722-15	RESISTOR, 220,000 ohms, ±10%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-90).	Each	10	....	*	*	*	*
PS	19-1 to 19-3	3RC40AE224M	RESISTOR, 220,000 ohms, ±20%, 2 watt, carbon, type S2. (Dwg. No. A-9B4-27).	Each	3	....	*	*	*	*
CU	60-1 to 60-2	3Z6727-9	RESISTOR, 270,000 ohms, ±10%, ½ watt, carbon, type EB. (Dwg. No. A-9B1-79).	Each	2	....	*	*	*	*
RT I	78-1 to 78-4 9	3RC30BE274K	RESISTOR, 270,000 ohms, ±10%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-91).	Each	5	....	*	*	*	*
SG	71-1 71-2	3Z6733-17	RESISTOR, 330,000 ohms, ±10%, ½ watt, carbon, type EB. (Dwg. No. A-9B1-92).	Each	2	....	*	*	*	*
CU I	83-1 to 83-4 12	3RC30BE334K	RESISTOR, 330,000 ohms, ±10%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-92).	Each	5	....	*	*	*	*
CU	68	3Z6739-5	RESISTOR, 390,000 ohms, ±10%, ½ watt, fixed, carbon, type EB. (Dwg. No. A-9B1-93).	Each	1	....	*	*	*	*
CU	84	3Z6739-4	RESISTOR, 390,000 ohms, ±10%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-93).	Each	1	....	*	*	*	*
CU RT	69-1 to 69-5 88-1 to 88-2	3Z6747-6	RESISTOR, 470,000 ohms, ±10%, ½ watt, fixed, carbon, type EB. (Dwg. No. A-9B1-94).	Each	7	....	*	*	*	*
I	2-1 to 2-6	3RC30BE474K	RESISTOR, 470,000 ohms, ±10%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-94).	Each	6	....	*	*	*	*
CU	91-1 to 91-2	3RC41BE564K	RESISTOR, 560,000 ohms, ±10%, 2 watt, type B-2. (Dwg. No. A-9B4-95).	Each	2	....	*	*	*	*
RT	82-1 to 82-4	3Z6768-14	RESISTOR, 600,000 ohms, ±20%, 2 watt, fixed, carbon, type S-2. (Dwg. No. A-9B4-3219).	Each	4	....	*	*	*	*
RT	57	3Z6768-6	RESISTOR, 680,000 ohms, ±10%, ½ watt, carbon, type EB. (Dwg. No. A-9B1-96).	Each	1	....	*	*	*	*
I	10-1 10-2	3RC30BE684K	RESISTOR, 680,000 ohms, ±10%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-96).	Each	2	....	*	*	*	*
PS	17	3RC40AE684K	RESISTOR, 680,000 ohms, ±10%, 2 watt, carbon, type S-2. (Dwg. No. A-9B4-96).	Each	1	....	*	*	*	*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
CU	70	3Z6782	RESISTOR, 820,000 ohms, ±10%, ½ watt, type EB. (Dwg. No. A-9B1-97).	Each	1		*	*	*	*
RT	79-1 to 79-6	3Z6801-43	RESISTOR, 1 megohm, ±20%, ½ watt, fixed, carbon, type EB. (Dwg. No. A-9B1-31).	Each	6		*	*	*	*
I	1-1 to 1-4	3RC30BE105K	RESISTOR, 1 megohm, ±10%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-98).	Each	4		*	*	*	*
PS	16-1 to 16-4	3Z6801-78	RESISTOR, 1 megohm, ±20%, 2 watt, fixed, carbon, type S-2. (Dwg. No. A-9B4-31).	Each	4		*	*	*	*
CU	61	3Z6801A5-7	RESISTOR, 1-5 megohm, ±10%, ½ watt, type EB. (Dwg. No. A-9B1-100).	Each	1		*	*	*	*
PS	15	3RC30BE155M	RESISTOR, 1-5 megohms, ±20%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-32).	Each	1		*	*	*	*
CU	71-1 to 71-4	3Z6802A2-5	RESISTOR, 2.2 megohms, ±10%, ½ watt, fixed, carbon, type EB. (Dwg. No. A-9B1-102).	Each	4		*	*	*	*
I	11	3RC30BE225K	RESISTOR, 2.2 megohms, ±10%, 1 watt, carbon, type GB. (Dwg. No. A-9B2-102).	Each	1		*	*	*	*
RT	69	3Z6840	RESISTOR, 40 megohms, ±20%, ½ watt, fixed, carbon, type EB. (Dwg. No. A-9B1(3253).	Each	1		*	*	*	*
CU RT I		2Z8650.5	SOCKET, bakelite, for mounting standard octal tubes, type 9950, 8 contacts. (Dwg. No. A-15B-1462).	Each	6		*			*
CU		2ZK8684-5	SOCKET, bakelite, 10 contacts, for cathode Ray tube, type 9450. (Dwg. No. B-15B-3864).	Each	1		*			*
RT		2Z8663-1	SOCKET, ceramic, 7 contacts, type 247. (Dwg. No. A-15A-1123).	Each	1		*			*
RT		2Z8678.92	SOCKET, ceramic, 8 contacts, octal. (Dwg. No. A-15A-3750).	Each	2		*			*
SG		2Z8761-14	SOCKET, mica-filled bakelite, 4 prong, for mounting crystal, type 98. (Dwg. No. A-15B-3090).	Each	1		*			*
RT		2Z8677.30	SOCKET, mica-filled bakelite, midget type, 7 contacts. (Dwg. No. A-15C-3746).	Each	1		*			*
SG RT		2Z8677.5	SOCKET, mica-filled bakelite, 7 prong, midget, type 78-7P. (Dwg. No. A-15C-1041).	Each	13		*			*
RT		2Z8678.93	SOCKET, mica-filled bakelite, for mounting standard octal tubes, 8 prongs. (Dwg. No. A-15B-1142).	Each	3		*			*
CU PS		2Z8674.15	SOCKET, molded, for high voltage rectifiers, type 77A4T, 4 contacts. (Dwg. No. A-15B-2779).	Each	3		*			*
PS		2Z8678.91	SOCKET, tube ceramic for mounting standard octal tubes, type 40C-V1E, 8 prong. (Dwg. No. A-15A-2739).	Each	4		*			*
I SG		2Z8795.1	SOCKET, tube, steatite, for mounting standard octal tubes, type #40C-1EU, 8 prong. (Dwg. No. A-15A-1651-1).	Each	2		*			*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
I		2Z8759.4	SOCKET, tube, white porcelain, 4 contacts, type 209. (Dwg. No. B-15A-3376).	Each	1		*			*
RT	119	2Z9634.35	TRANSFORMER, AF modulator, primary, sec ndary ratio, type 467-011-211. (Dwg. No. C-12D-2935).	Each	1		*			*
RT	118	2Z9638-14	TRANSFORMER, blocking oscillator, tertiary winding, type 467-001-210. (Dwg. No. C-12A-2949).	Each	1		*			*
RT	112	2Z9643.44	TRANSFORMER, eye tuning, permeability tuned. (Dwg. No. B-13H-3133).	Each	1		*			*
PS	57	2Z9611.127	TRANSFORMER, filament, type 464-001-111. (Dwg. No. D-12A-2792), Pri. 117.5 V., 60 C. P. S.	Each	1		*			*
PS	56	2Z9611.126	TRANSFORMER, filament, type 464-001-110. (Dwg. No. D-12A-2838). Pri. 117.5 V., 60 C. P. S.	Each	1		*			*
CU	125	2Z9613.118	TRANSFORMER, filament, type #463-001-118. (Dwg. No. C-12A-3155).	Each	1		*			*
I	105	2Z9611.132	TRANSFORMER, filament, single, type #464-001-130. (Dwg. No. C-12D-3554). Pri. 117.5 V.	Each	1		*			*
CU	126	2Z9613.198	TRANSFORMER, high voltage, and filament, type #463-001-210. (Dwg. No. D-12A-3527).	Each	1		*			*
RT	106	2Z9643.37	TRANSFORMER, 1st I. F. permeability tuned. (Dwg. No. B-13A-3132).	Each	1		*			*
RT	107	2Z9643.41	TRANSFORMER, 2nd I. F. permeability tuned. (Dwg. No. B-13H-3131).	Each	1		*			*
RT	108	2Z9643.40	TRANSFORMER, 3rd I. F. permeability tuned. (Dwg. No. B-13H-3134).	Each	1		*			*
RT	109	2Z9643.39	TRANSFORMER, 4th I. F. permeability tuned. (Dwg. No. B-13H-3129).	Each	1		*			*
RT	110	2Z9643.38	TRANSFORMER, 5th I. F. permeability tuned. (Dwg. No. B-13B-3128).	Each	1		*			*
I	102	2Z9612.65	TRANSFORMER, plate, impedance matching, high voltage, single, type 2P82. (Dwg. No. D-12B-3553).	Each	1		*			*
PS	58	2Z9612.64	TRANSFORMER, plate, high voltage, type #465-001-142. (Dwg. No. D-12A-2786).	Each	1		*			*
PS	59	2Z9612.61	TRANSFORMER, plate, low voltage, iron core, type #465-001-141. (Dwg. No. D-12A-2811).	Each	1		*			*
SG	104	2Z9613.133	TRANSFORMER, power and filament and high voltage, type #463-001-126. (Dwg. No. D-12A-1319).	Each	1		*			*
I	103	2Z9613.132	TRANSFORMER, power, multiple winding, type 2P84. (Dwg. No. D-12A-3551). Pri. 117.5 V., C. P. S.	Each	1		*			*
RT	111	2Z9643.43	TRANSFORMER, 2nd detector, permeability tuned. (Dwg. No. B-13H-3130).	Each	1		*			*
I	101	2Z9612.60	TRANSFORMER, plate, selsyn, input, type 2P83. (Dwg. No. C-12C-3550).	Each	1		*			*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
I	104	2Z9957-28	TRANSTAT, auto, type 2P81. (Dwg. No. D-12A-3552).	Each	1		*			*
RT		2J6H6	TUBE, VT-90 type, (6H6), 6.3 volts, 0.3 ampere.	Each	1	*	*			*
RT SG		2J6J5	TUBE, VT-94 type, (6J5), 6.3 volts, 0.3 ampere.	Each	3	*	*			*
RT CU		2J6V6GT	TUBE, VT-107-A type, (6V6GT), 6.3 volts, 0.45 ampere.	Each	1	*	*			*
CU		2J6AC7	TUBE, VT-112 type, (6AC7)	Each	3	*	*			*
SG CU		2J6SJ7	TUBE, VT-116 type, (6SJ7)	Each	3	*	*			*
PS		2J2X2	TUBE, VT-119 type, (2X2), 2.5 volts, 1.75 amperes.	Each	3	*	*			*
PS		2J6X5GT	TUBE, VT-126B type, (6X5GT)	Each	1	*	*			*
I		2J6X6G	TUBE, VT-168A type, (6Y6G), beam power amplifier.	Each	1	*	*			*
SG		2J5X3-G	TUBE, VT-197A type, (5Y3-G), full wave high-vacuum rectifier.	Each	1		*			*
SG		2J9002	TUBE, VT-202 type, (9002)	Each	1		*			*
RT I		2J6E5	TUBE, VT-215 type, (6E5), electron ray-tube.	Each	2	*	*			*
I		2J100TH	TUBE, VT-218 type, (100TH)	Each	1	*	*			*
I		2J6SL7-GT	TUBE, VT-229 type, (6SL7-GT)	Each	4	*	*			*
RT I CU		2J6SN7-GT	TUBE, VT-231 type, (6SN7-GT), twin triode ampere.	Each	2	*	*			*
PS		2J5V4G	TUBE, VT-244 type, (5U4G)	Each	3	*	*			*
RT		2V2C26	TUBE, VT-( ) type, (2C26)	Each	3	*	*			*
RT		2V3E29	TUBE, VT-( ) type, (3E29)	Each	1	*	*			*
CU		2J5CP1	TUBE, VT-( ) type, (5CP1)	Each	1	*	*			*
RT		2V6C4	TUBE, VT-( ) type, (6C4)	Each	1	*	*			*
RT		2V6AG5	TUBE, VT-( ) type, (6AG5)	Each	7	*	*			*
RT		2V6AK5	TUBE, VT-( ) type, (6AK5)	Each	3	*	*			*
RT SG		2V9006	TUBE, VT-( ) type, (9006)	Each	2	*	*			*
SG M		3Z12059-14	TERMINAL, locking, phosphor, bronze, hot tin dipped, type #2104-4. (Dwg. No. A-26D-3242).	Each						*
CU SG RT		3Z12059-7	TERMINAL, locking, phosphor, bronze, hot tin dipped, type #2104-6. (Dwg. No. A-26D-3235).	Each						*
M		3Z12059-4	TERMINAL, locking, phosphor, bronze, hot tin dipped, #8 type #2104. (Dwg. No. A-26A-1773).	Each						*
M		3Z12059-4	TERMINAL, locking, phosphor, bronze, hot tin dipped, #8 type #2104. (Dwg. No. A-26D-3241).	Each						*
M		3Z12050-5.6	TERMINAL, lug, type #2067. (Dwg. No. A-26D-1826).	Each						*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
M		3Z12050-5.8	TERMINAL, lug, bronze, phosphor, type #2052. (Dwg. No. A-26D-3721).	Each						*
M		3Z12059-40.1	TERMINAL, lug, bronze, H. T. type #2124-6. (Dwg. No. A-26D-3514).	Each						*
FM M		3Z12025-9.15	TERMINAL, lug, phosphor, bronze, type #98. (Dwg. No. A-26D-2861).	Each						*
SG		3Z12059.37	TERMINAL, lug, ring-type, H. T. brass, type #2528-8. (Dwg. No. A-26D-697).	Each						*
SW		3Z12060-21.1	TERMINAL, lug, solder, assembly, 3-way. (Dwg. No. A-202-888).	Each	1		*			*
SW		3Z12060-21	TERMINAL, lug, solder, assembly, 4-way. (Dwg. No. A-202-887).	Each	3		*			*
M		3Z12050-3	TERMINAL, lug, soldering, brass. (Dwg. No. A-26D-366).	Each			*			*
M		3Z12059-31	TERMINAL, lug, spade-type, type #2103-4. (Dwg. No. A-26A-1457).	Each						*
M		3Z12031-12.3	TERMINAL, lug, spade-type, brass. (Dwg. No. A-26B-4184).	Each			*			*
SG		3Z12059-12	TERMINAL, sheet, type #2103-10. (Dwg. No. A-26A-3357).	Each						*
FM RT		3Z12059-21	TERMINAL, single-pole, type #2103-G, locking. (Dwg. No. A-26A-5).	Each						*
M		3Z12025-9.14	TERMINAL, spade, brass, 13/32" wide x 1 1/32" long x 3/32" high, type #1 lug. (Dwg. No. A-26D-3936).	Each	6		*			*
FM		3Z12031-11.2	TERMINAL, Stewart, type #302-8. (Dwg. No. A-26D-2841).	Each						*
M		2Z9402.44	TERMINAL, strip, 2 contacts. (Dwg. No. A-7A-3506).	Each	1					*
CU		2Z9440-38	TERMINAL BOARD Assembly, bakelite, 1 7/8" x 10 1/8" x 3/32", 52 terminals. (Dwg. No. B-201-642).	Each						*
CU		2Z9440-39	TERMINAL BOARD Assembly, bakelite, 1 7/8" x 11 3/16" x 3/32", 58 terminals. (Dwg. No. B-210-822).	Each						*
RT			TERMINAL BOARD Assembly. (Dwg. No. A-201-802).	Each						*
M		2Z9401.25	TERMINAL BOARD Assembly, bakelite, .312" x .82" x 3/32", 1 contact. (Dwg. No. A-201-439).	Each	1					*
M		2Z9420.8	TERMINAL BOARD, bakelite, 1 1/2", 20 contacts. (Dwg. No. A-201-540).	Each	1					*
M		2Z9403.42	TERMINAL BOARD, bakelite, 1 5/8" x 2 1/8" x 1/8", 3 contacts. (Dwg. No. A-201-896).	Each	1					*
M		2Z9404.45	TERMINAL BOARD, bakelite, 1/2" x 2 1/4" x 3/32", 4 contacts. (Dwg. No. A-201-687).	Each	1					*
M		2Z9402.75	TERMINAL BOARD, bakelite, 3/4" x 2 1/8" x 3/32", 2 contacts. (Dwg. No. A-201-743).	Each	1					*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
T		3Z12050-10	TERMINAL, brass, 3/8" x 13/32" x 1/4", #8-32 th'd 3/16" deep, #40 (.098) drill and C' sink both sides. (Dwg. No. 125X-534).	Each	3					*
SG		3Z12056/1	TERMINAL, phosphor, bronze. (Dwg. No. A-26A-2035).	Each						*
RT		3Z12031-12.1	TERMINAL, locking, phosphor, bronze, hot tin dipped, type #907, lug. (Dwg. No. A-26C-1670).	Each	4					*
M		3Z12056/2	TERMINAL, locking, phosphor, bronze, hot tin dipped, type #2108-8. (Dwg. No. A-26A-4057).	Each						*
M		3Z12059-22	TERMINAL, locking, phosphor, bronze, hot tin dipped, type #2101-10. (Dwg. No. A-26A-2462).	Each						*
SG		2Z9422.6	TERMINAL BOARD Assembly, 22 terminals. (Dwg. No. A-201-639).	Each	1					*
SG		3Z9402.64	TERMINAL BOARD Assembly, 2 lugs. (Dwg. No. A-201-89).	Each	1					*
SG		2Z9407.9	TERMINAL BOARD Assembly, 7 terminals. (Dwg. No. A-201-871).	Each	1					*
SG		2Z9404.47	TERMINAL BOARD Assembly, 4 terminals. (Dwg. No. A-201-608).	Each	1					*
M		2Z9412.32	TERMINAL BOARD Assembly, 12 terminals. (Dwg. No. B-201-653).	Each	1					*
M		2Z9428-5	TERMINAL BOARD Assembly, 28 contacts. (Dwg. No. B-201-656).	Each	1					*
RT		2Z9408.27	TERMINAL BOARD Assembly, bakelite, 1 1/4" x 3 3/4" x 3/32", 8 contacts. (Dwg. No. A-201-657).	Each	1					*
M		2Z9401.27	TERMINAL BOARD Assembly, bakelite, 7/8" x 2 1/4" x 3/32", 1 contact. (Dwg. No. A-201-803).	Each	1					*
FM		2Z9404.79	TERMINAL BOARD Assembly, bakelite, 1 7/8" x 3/4" x 1/16", 4 terminals, type B. R. C. (Dwg. No. A-201-1013).	Each	1					*
CU		2Z9406.60	TERMINAL BOARD Assembly, bakelite, 1 7/8" x 2" x 3/32", 6 terminals. (Dwg. No. A-201-833).	Each	1					*
CU		2Z9411.12	TERMINAL BOARD Assembly, 1 7/8" x 2" x .093", type #17-P5. (Dwg. No. A-201-831).	Each	1					*
M		2Z9414.15	TERMINAL BOARD Assembly, bakelite, 1 7/8" x 3 1/2" x 3/32", 14 contacts. (Dwg. No. A-201-718).	Each	1					*
RT		2Z9428.4	TERMINAL BOARD Assembly, bakelite, 1/2" x 2 1/4" x 3/32", 28 contacts. (Dwg. No. A-201-697).	Each	1					*
M		2Z9426-1	TERMINAL BOARD Assembly, bakelite, 1 7/8" x 6 3/8" x 3/32", 26 terminals. (Dwg. No. B-201-801).	Each	1					*
M		2Z9402.73	TERMINAL BOARD Assembly, bakelite, 1 7/8" x 3" x 3/32", 14 contacts. (Dwg. No. A-201-823).	Each	1					*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
M		2Z9409.12	TERMINAL BOARD Assembly, bakelite, 1½" x 2" x ⅛", 9 contacts. (Dwg. No. A-201-850).	Each	1					*
M		2Z9414.13	TERMINAL BOARD Assembly, bakelite, 1⅞" x 3" x 3/32", 14 contacts. (Dwg. No. A-201-580).	Each	1					*
M		2Z9402.64	TERMINAL BOARD Assembly, bakelite, ½" x 1⅞" x 3/32", 2 lugs. (Dwg. No. A-201-89).	Each	1					*
M		2Z9401.26	TERMINAL BOARD Assembly, bakelite, ¾" x 1¼" x 5/16", 1 contact. (Dwg. No. A-201-556).	Each	1					*
T		2Z9414.14	TERMINAL Strip, bakelite and brass, nickel-plated strips, 14 terminals, #145 terminal strip, 6 27/32" long. (Dwg. No. 125X-94).	Each	1		*			*
M		2Z9402.25	TERMINAL Strip, bakelite, ½" x 2⅞" x 3/32", 2 contacts. (Dwg. No. A-201-101).	Each	1					*
T		3Z12060-20.7	TERMINAL, stud hole, .170", #16 and #14 A. W. G., Catalog "Sta-Kon" #B-86 lug, solderless. (Dwg. No. 125X-142).	Each	45		*			*
SG		2A276-11	ANTENNA, assembly, antenna, consisting of antenna support, block springs, terminals, type B. R. C. (Dwg. No. B-201-745).	Each	1		*			*
M		2A271-4	ANTENNA, dummy simulates the antenna for adjusting the transmitter, consisting of connector end, connector front, connector plug and resistor, 47 ohms, 1 watt, ±10%, type B. R. C. (Dwg. No. A-201-886).	Each	1		*			*
AN		2Z275-154A/A1	ARM, assembly, breaker. (Dwg. No. A-201-1069).	Each					*	*
T		3H4575A/199	BEARING, ball, 1.5748" OD x .6693" ID x .4724" long, type #3203. (Dwg. No. 125X-7).	Each	4					*
T		3H305-7	BEARING, ball, steel, 6.299" OD x 3.5433" ID x 1.1811" long, type #1-SE-1626A. (Dwg. No. 125X-3).	Each	1					*
T		3H322	BEARING, ball, steel, 6.299" OD x 3.5433" ID x 1.1811" long, type #3218. (Dwg. No. 125X-653).	Each	1					*
M		2Z606-1	BLANK, wiring, (in envelope), diagram, acetate. (Dwg. No. A-6D-4629).				*	*		*
AN		3G1795-3	BOOT, rubber. (Dwg. No. A-25H-3723).	Each			*			*
T		2Z1172.4	BOX, gear unit completely assembled with carrying handles. (Dwg. No. 125X-E).	Each	1					*
T		2Z1295	BRAID, contact, #10 braid copper cable. (Dwg. No. 125X-139).	Each	6		*			*
RC		2Z1409-11	BUSHING, handle, Zamak, 1" OD x .390"-.343" ID x ⅝" long, type B.R.C. (Dwg. No. A-3B-2817).	Each	2					*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
RT		2Z1409-12	BUSHING, steel-headed, bushing head dimen. 5/16" dia. x 3/32" long, shank dimen. .216" dia. x 11/16" long, .147" dia. thru hole, type B. R. C. (Dwg. No. A-3B-4165).	Each	2		*			*
RT		2Z1480.6	BUTTON, release, steel-headed bushing, head dimen. .320" dia. x 3/64", shank dimen. .245" dia. x .328" long, blind hole in head end to be .147" dia. x 3/16" deep, type B. R. C. (Dwg. No. A-3B-2820).	Each	2					*
AN		2A275-154A/C1	CAM. (Dwg. No. A-2C-4233)	Each	1					*
T		2Z1616	CAP, aluminum, 2 1/4" OD x 11/16" long, 2-16 thd., on inside, #000 sash chain and stud, steel, 6 1/8" long, hot gal. (Dwg. No. 125X-518).	Each	1					*
SG		2Z1612.1	CAP AND CHAIN, aluminum, 3/4" dia. x 7/16", 5/8-24 threads, type #9760-10. (Dwg. No. B-55A-2546).	Each	3					*
RT		2Z1612.1	CAP AND CHAIN ASSEMBLY. (Dwg. No. A-202-885).	Each	1					*
AN		2Z1612.16	CAP AND CHAIN, aluminum, cap internal thread. (Dwg. No. B-55A-3724).	Each	2					*
FM		2Z1612.21	CAP AND CHAIN, type #AN-9760-28. (Dwg. No. B-55A-4198).	Each						*
T		6Z1809-1	CHAIN, sash, 2 1/2 feet long. (Dwg. No. 125X-251).	Each	1		*			*
T		6Z1809	CHAIN, sash, 60 feet long. (Dwg. No. 125X-232).	Each	1		*			*
T		2A3459-24A/C1	CLAMP, arm, steel, casting, 9 1/4" long, inside radius 3 13/16", outside radius of rib 4 7/16", reamed hole one end 5/8". (Dwg. No. 125X-17).	Each	1					*
I		2ZK2636-2	CLAMP, cable, 1 1/8" long x 1 3/16", max. OD cable 3/4", type #AN-3057-10. (Dwg. No. B-55A-3564).	Each	1					*
M		2ZK2636-15	CLAMP, cable, (B. R. C.). (Dwg. No. B-55A-4173).	Each						*
T		3A3459-24A/C2	CLAMP, dial, consisting of brass nut, 3/8"-24 (R. H.) thds., brass nut 3/8"-24 (L. H.) thds., brass studs 3/8" dia. x 4 5/8" long, both ends .3135" dia., 7/8" long, 3/8"-24 (R. H.) thds., one end 3/8"-24 (L. H.) thds., other end and steel stud 9/16" hex. x 7/8" long, 5/16" reamed hole. (Dwg. No. 125X-430).	Each	1					*
M		2ZK2636-27	CLAMP, type #AN-3057-20. (Dwg. No. B-55A-4069).	Each						*
I		3Z1371	CLIP, brass, .015" material, 7/32" stock x 11/16" long, type #15. (Dwg. No. A-26D-4439).	Each	1		*			*
PS		2Z2708	CLIP, grid, brass, .375" wide stock, .875" long, National #8. (Dwg. No. A-26D-757-2).	Each	3		*			*
I		2Z2725.4	CLIP, grid, ceramic, 5/8" high x 5/8" wide x 1 1/8" long, used on 100th tube, Catalog #36002. (Dwg. No. A-26D-3773).	Each	1		*			*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
T		2Z2935-3	COLLAR, steek, $1\frac{1}{16}$" OD x 1" ID x $\frac{5}{8}$" long, with $\frac{1}{4}$"-20 x $\frac{1}{8}$" hollow hd. set-screw. (Dwg. No. 125X-465).	Each	3					*
T		6G238	COMPOUND, 1-lb. can, medium weight, Tite-Seal. (Dwg. No. 125X-597).	Each	1		*			*
T		6Z3144	CONDULET UNION, $\frac{1}{2}$" pipe thread, male and female, type U. N. N. Y. #105. (Dwg. No. 125X-525).	Each	1	*				*
T		2Z3196-13	CONTACT, brass, $\frac{5}{16}$" dia. HD, .187" dia. body, $2\frac{3}{8}$" long, type #27957. (Dwg. No. 125X-199).	Each	6		*			*
T		6Z3423	COUPLING, flexible, $13\frac{1}{2}$" long, type #ECG-110. (Dwg. No. 125X-527).	Each	1					*
T		2Z3291-7	COUPLING, $2\frac{7}{16}$" long, type #26243. (Dwg. No. 125X-132).	Each	1					*
SG		2Z3354-18	COVER, jack, steel, $\frac{27}{32}$" x $4\frac{5}{16}$" x $\frac{9}{32}$", type #1601, style "D". (Dwg. No. A-23A-3656).	Each	1		*			*
SG		2X15-5000	CRYSTAL, 5 mo., $1\frac{1}{8}$" x $\frac{13}{16}$" x $\frac{13}{32}$", .484" plug in centers, type ft. 243 and holder 5000KC. (Dwg. No. A-8K-2848).	Each	1		*	*	*	*
I		2Z3719-16	DIAL, Assembly, 4.000" O. Dia. x .500" wide, used on indicator for indicating number of degrees of azimuth. (Dwg. No. A-200-780).	Each	1		*			*
I PS		2Z3775	DIAPHRAGM, jewel light, formica XXB, $\frac{1}{32}$" stock, .830"-.835" OD. (Dwg. No. A-7A-4588).	Each	7		*			*
M		6Z3832-1	FERRULE, soldering CRS, .921" OD x .531" ID x .046" thick, opening width .437". (Dwg. No. A-2D-4040).	Each						
M		6Z3832	FERRULE, soldering, 1.656" OD x 1.00" ID x .062" thick, opening width .937". (Dwg. No. A-2D-4038).	Each						*
T		6Z3859	FITTING, Alemite, $\frac{1}{8}$" pipe thread, type Alemite #1610. (Dwg. No. 125X-255).	Each	2		*			*
T		6Z3859-5	FITTING, Alemite, $\frac{1}{4}$"-32 thread, hydraulic fitting, Catalog #1681. (Dwg. No. 125X-114).	Each	1		*			*
T		6Z3859-6	FITTING, Alemite, $\frac{5}{16}$"-32 thread, type #1762A, hydraulic. (Dwg. No. 125X-366).	Each	1		*			*
M		2Z2635.55	FILLER, clamp. (Dwg. No. A-2M-4096).	Each						*
FM		6Z3856-43	FILTER, fibre glass, $4\frac{1}{8}$" x $4\frac{1}{2}$" x 1". (Dwg. No. A-55A-4061).	Each	1		*			*
T		2Z4867.17	GASKET, asbestos, #104. (Dwg. No. 125X-658).	Each	1		*			*
T		2Z4868.30	GASKET, compressed, asbestos. (Dwg. No. 125X-675).	Each	1		*			*
T		2Z4868.14	GASKET, composition, asbestos, $\frac{1}{16}$" x $10\frac{3}{8}$" x $14\frac{1}{2}$" long, center cut out leaving $\frac{5}{8}$" wide strip. (Dwg. No. 125X-162).	Each	1		*			*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
T	....	2Z4868.16	GASKET, composition asbestos sheet, similar to symbol 2150, 3¼" x 3⅝" x 1/16" thick, 9/32" hole in each corner. Spec. No. 33P #13b. (Dwg. No. 125X-196).	Each	1	....	*	....	....	*
T	....	2Z4868.20	GASKET, composition asbestos sheet, similar to symbol 2150, ⅛" x 3¼" x 7-15/16", one corner cut off, seven 9/32" holes. Spec. No. 33P #13b. (Dwg. No. 125X-198).	Each	1	....	*	....	....	*
T	....	2Z4868.19	GASKET, black compound, #38941,45-50 Durometer, 2-11/16" x 2-11/16 x 1/16". (Dwg. No. 125X-442).	Each	1	....	*	....	....	*
T	....	2Z4868.22	GASKET, black compound, #3894, 45-50 Durometer, 1/15" x 2-53/64" x 2-53/64". (Dwg. No. 125X-411).	Each	1	....	*	....	....	*
T	....	2Z4868.17	GASKET, black rubber compound, #3894, 45-50 Durometer, 3¾" OD x 3" ID x 3/16" thick. (Dwg. No. 125X-193).	Each	1	....	*	....	....	*
T	....	2Z4868.18	GASKET, black rubber compound, #3894, 45-50 Durometer, 4" OD x 3¼" ID x 3/16" thick. (Dwg. No. 125X-192).	Each	2	....	*	....	....	*
T	....	2Z4869.21	GASKET, rubber, 31/32" OD x 45/64" ID x —— thick, Durometer 35. (Dwg. No. 125X-351).	Each	1	....	*	....	....	*
M AN	....	2Z4868-15	GASKET, Vellutex, 1" sq. x 11/16" ID with four .128" dia. mounting holes .031" thick. (Dwg. No. A-41C-3238).	Each	1	....	*	....	....	*
T	....	2Z4872-2	GEAR, C. M. S., 8-pitch, 13-teeth, 1.625" pitch diam., 1-1/16" long, ¾" dia. holes, 3/16" x 3/32" keyway. (Dwg. No. 125X-73).	Each	1	....	....	....	....	*
T	....	2Z4871-21	GEAR, spur, bronze, 51-teeth, 12-pitch, 4.250" OD, .2503" hole, 1/16" keyway. (Dwg. No. 125X-447).	Each	1	....	....	....	....	*
T	....	2Z4872-1	GEAR, steel, 51-teeth, 4.250" pitch dia., special teeth as per B. R. C. (Dwg. No. 125X-99).	Each	1	....	....	....	....	*
T	....	2Z4872-3	GEAR, worm, bronze, 35-teeth, 12" pitch, 2.917 PD ⅝" face, hubs over-all length 1.813", ⅝" dia. hole, 3/16" x 3/32" keyway with ¼"-20 x ⅜" hole, H. D. set screw. (Dwg. No. 125X-51).	Each	1	....	....	....	....	*
T	....	2Z4872-5	GEAR, worm and shaft, steel, S.A.E. x 1315, 12" pitch, single thread, R. H. worm, 1⅝" long in center of shaft, over-all length 7½", 3/16" x 3/32" keyway one end, other end ½"-20 thread x ½" long. (Dwg. No. 125X-72).	Each	1	....	....	....	....	*
I	....	2Z4880-22	GLASS, dial, 4-31/64" OLD. x 15/16" ins. dia. x 3/32" thick, Catalog #G4826. (Dwg. No. A-55F-3243).	Each	1	....	*	....	....	*
RT	....	2Z4880-18	GLASS, dial, 7⅞" x 1½" x ⅛", clear. (Dwg. No. A-55A-3065).	Each	1	....	*	....	....	*
CU	....	2Z4880-21	GLASS, dial, duplex safety glass, 5-13/64" dia. x ¼" thick. (Dwg. No. A-55F-2837).	Each	....	....	*	....	....	*
RT	....	2Z4880-20	GLASS, dial, glass is opaque, 4 dial openings which have hairline indicators 1-55/64" x 9⅛" x ⅛", type B. R. C. (Dwg. No. A-55A-1055).	Each	1	....	*	....	....	*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
SG		3F2829	GLASS, dial, shatter proof, 3/32" thick x 1 3/4" long x 1 13/32" wide. (Dwg. No. A-55A-3118).	Each	1		*			*
RT		2Z4880-19	GLASS, dial; this glass has the inner surface olive drab for a portion of its length on both ends, 1 1/2" x 1 1/8" x 1/8", type B. R. C. (Dwg. No. A-55A-3066).	Each	1		*			*
T		6G673.1	GREASE, one 16 cam. (Dwg. No. 125X-452).	Each						*
T		2Z4883-1	GUARD, baffle, bakelite, 1/8" thick x 2" wide x 3" long. (Dwg. No. 125X-420).	Each	1					*
T		2Z4885-1	GUIDE, terminal, bakelite, 1/8" x 3/4" x 3 5/8", six 1/8" rad. notches in one side, 5/8" on center. (Dwg. No. 125X-421).	Each	1					*
RT		2Z4828-8	HANDLE, tuning, .083" col rolled steel 1/2" wide x 2 1/2" long, type B. R. C. (Dwg. No. A-23A-2821).	Each	2					*
M		2B935	HEADSET, max. voltage 500 volts D. C., complete with cord, headband, plug, and rubber cushion, ±10%. (Dwg. No. 44C-3545).	Each	1					*
FM		3H3000-50	HEATER, blower and motor units, type B. R. C. (Dwg. No. D-55A-4083).	Each						*
FM RT M AN		2Z5040-360	HOOD, connector, .020" brass, the piece is funnel shaped, base is 1" x 1", base dia. is 11/32", overall length 3/4", type #AN-M-360. (Dwg. No. A-55A-3519).	Each	5		*			*
M		2Z1859-9	INDICATOR CASE, assembly. (Dwg. No. D-202-895).	Each						*
M		2Z3552.29	INDICATOR, cover plate. (Dwg. No. D-2F-3772).	Each						*
M		2Z5652-124	JUNCTION BOX ASSEMBLY. (Dwg. No. C-201-879).	Each						*
CU RI I		2Z5821-16	KNOB, black molded bakelite, 27/32" OD x 17/32" long, .254" or .252" dia. shaft hole. (Dwg. No. A-5B-3986).	Each	2		*			*
I		2Z5788-20	KNOB, dial, Zamak No. 5, 1 1/8" OD x .500" long, special hole size. (Dwg. No. B-4B-3275).	Each	1		*			*
RT		2Z5821-13	KNOB, screwdriver type, steel, knurled, OD is 1" length. (Dwg. No. B-3F-2849).	Each	1		*			*
SG		2Z5848.16	KNOB, tuning, assembly, #5. (Dwg. No. A-200-835).	Each	1		*			*
CU		2Z5821-9	KNOB, Zamak #3, 1" x 3/4" rd., .468" long. (Dwg. No. A-4B-1489).	Each			*			*
CU RT SG		2Z5821-15	KNOB, #5 Zamak, 1 1/4" OD x 9/16", shaft hole .251". (Dwg. No. A-4B-1110).	Each	6		*			*
SG		2Z5821-18	KNOB, Zamak #5, 1 3/4" OD x 11/16", shaft hole .375". (Dwg. No. A-4B-3485).	Each	1		*			*
RT		2Z5821-14	KNOB, Zamak, knob has arm projecting from 3/4" dia. hub, shaft hole is .251". (Dwg. No. A-4B-1553).	Each	1		*			*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
I		2Z5821-19	KNOB, Zamak, 2-1/8" OD x 3/4" long, .243"-.248" dia. shaft hole. (Dwg. No. B-4B-4188).	Each	2		*			*
M		6G1005-3	LACQUER, purple, 2-oz. bottle	Each						*
T		6Z6918-4	LATCH, steel 3/8" x 1/2" x 2-1/2" long, chamfered at one end, 3/16" pin. (Dwg. No. 125X-362).	Each	3			*		*
T		2A3459-24A/L3	LEG, center section structure assembly with center bracket 125 x 354, consists of two fastening pins, one coaxial line assembly, one coupling unit. (Dwg. No. 125X-D).	Each	1					*
T		2A3459-24A/L2	LEG, center section with fastening pin, one chained to each leg. (125X-261). (Dwg. No. 125X-C).	Each	1					*
T		2A3459-24A/L1	LEG, outer extension structure consists of two sandbag holders, one fastening pin, 6 ft. long. (Dwg. No. 125X-B).	Each	3					*
T		6Q63006	LEVEL, spirit 1" OD flange, .687" OD body 1/16" long. (Dwg. No. 125X-350).	Each	1					*
T		2A3459-24A/M1	MAST, lower, with ball-bearing housing and rubber gasket, consists of two folding tie rods, 5'2" long, flange to flange. (Dwg. No. 125X-F).	Each	1					*
T		2A3459-24A/M2	MAST, upper, with four screw and rubber gasket attached to one end only, 4'10-1/2" long flange to flange. (Dwg. No. 125X-G).	Each	1					*
T		2A3459-24A/P3	PLATE, spring, blue ribbon spring steel, 1/16" x 1/2" x 3-11/16" long, six drill holes in one end, stud in other end, type #27931. (Dwg. No. 125X-244).	Each	1		*			*
T		2Z7111.68	PLUG, brass, type #27942. (Dwg. No. 125X-209).	Each	6		*	*	*	*
T		6Z7586-2.4	PLUG, 1/8" pipe, steel, square head. (Dwg. No. 125X-1020).	Each	2		*	*	*	*
T		6Z7586-1.2	PLUG, 1/4" pipe, steel, square head. (Dwg. No. 125X-1021).	Each	2		*	*	*	*
T		6Z7586-3.5	PLUG, 3/8" pipe, steel. (Dwg. No. 125X-1022).	Each	1		*	*	*	*
T		2Z3459-24A/P5	POST, bakelite, .625" dia. x 5-1/16" long, flated one side to 17/32" dim. (Dwg. No. 125X-151).	Each	1					*
T		2A3459-24A/P4	POST, bakelite, .625" dia. 5/16" from end. (Dwg. No. 125X-150).	Each	1					*
M		2Z7385	RADIATOR, assembly transceiver, consisting of connector, cap and radiator, type B. R. C. (Dwg. No. A-201-868).	Each	3		*			*
T		2Z7857-13	RING, retaining, 47/64" OD x 37/64" ID x 5/64" thick, closed type, code word "school" series 2. (Dwg. No. 125X-80).	Each	2		*			*
T		2A3459-24A/R7	RING, sealing, .754" OD for 3/8" shaft, 1/4" long felt, "Klozure," Catalog No. 13. (Dwg. No. 125X-71).	Each	1					*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
T		2A3459-24A/R1	RING, slip, assembly, consisting of 6 collector rings and 6 contact plugs, F.H. M.S. steel tubing, bakelite washers, type B. R. C.-Spec. (Dwg. No. 125X-524).	Each	1					*
RT		2Z8050-6	ROD, adjustment, assembly used in antenna matching section, size 18 5/8" long x 3/8" dia., type B. R. C. (Dwg. No. A-202-552).	Each	2		*			*
M		2Z8050-2	ROD, cable, steel, 3/8" dia. x 28" long with point at one end and "S" shaped at other. (Dwg. No. A-3P-3880).	Each	10					*
T		2A3459-24A/R5	ROD, end, steel, 1/2" dia. shank with 1/2"-13 thread 1 3/8" long. (Dwg. No. 125X-40).	Each	3		*			*
T		2A3459-24A/R2	ROD, tie, steel, 1/4" dia. with 1/4"-28 thread 7/8" long on one end, other end turned down to 3/8" dia. x 1/4" long, 2 13/16" long. (Dwg. No. 125X-587).	Each	1		*			*
T		2Z8050-4	ROD, tie, steel, 3/16" dia. x 3 1/16" long, #10-32 thread 5/16" long on each end. (Dwg. No. 125X-91).	Each	2		*			*
RT		2Z8050-5	ROD, release, black linen bakelite, .140" dia. x 18.323" long. (Dwg. No. A-3P-2819).	Each	10					*
T		2Z8050-3	ROD, tie, steel, 1/2" dia. x 17 1/16" long, one end threaded 1/2"-13, other end hooked 3/4" OD collar 3 5/8" from threaded end. (Dwg. No. 125X-377).	Each	2					*
T		2A3459-24A/S11	SEAL, felt, oil; 1.29" OD for .625" dia. shaft, 3/8" long, type Klozure #88. (Dwg. No. 125X-79).	Each	1					*
T		2A3459-24A/S8	SEAL, felt, oil; 1.379" OD for 3/4" dia. shaft 3/8" long, type Klozure #142. (Dwg. No. 125X-143).	Each	1					*
T		2A3459-24A/S7	SEAL, felt, oil; 1.579" OD for 31/32" dia. shaft 3/8" long, type Klozure #272. (Dwg. No. 125X-120).	Each	1					*
T		2A3459-24A/S10	SEAL, felt, oil; 5.005" OD for 4" dia. shaft 23/32" long, double garlock, Klozure type V-1. (Dwg. No. 125X-47).	Each	1					*
T		2A3459-24A/S9	SEAL, oil. (Dwg. No. 125X-661)	Each						*
T		2A3459-24A/S1	SEAL, oil, 5.506" OD for 4.00" dia. shaft 27/32" long, cadmium plate case, Klozure type #2532. (Dwg. No. 125X-38).	Each	1					*
M		2Z8078	SEPARATOR, bakelite, 1/32" x 1 11/16" x 2 5/16", 5/8" x 11/16" hole. (Dwg. No. 125X-149).	Each	6		*			*
T		2A3459-24A/S3	SHAFT, eccentric, steel, 13/16" dia. x 6 7/16" long, 1/2"-13 thread on one end 1" long, 7/8" hex. head on other end. (Dwg. No. 125X-264).	Each	3		*			*
SG		2Z8203-14	SHAFT, extension, bakelite, .250" dia. x 3.625" long, trimmer. (Dwg. No. A-56-2890).	Each	1		*			*
T		2A3459-24A/S2	SHAFT, drive, C. M. S., stepped—.626" dia., .6692" dia., .751" dia.; 7/8" dia. head, overall length 6 13/32", two 3/16" x 3/32" keyway. (Dwg. No. 125X-74).	Each	1					*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
M		2Z8303-1	SHIELD, rain, rubber, funnel-shaped, 2" long x 1¾" dia. one end, other end 1 1/16", type #1695. (Dwg. A-25A-2464).	Each	1					*
T		2A3459-24A/S12	SLEEVE, connecting, assembly. (Dwg. No. 125X-607).	Each						*
T		2Z8877.25	SPRING, blue tempered spring, steel, 1/16" thick x ¾" wide x 3 7/16" long, type #25. (Dwg. No. 125X-363).	Each	3		*			*
T		2Z8878-23	SPRING, #13 (.031) stainless steel, 21/64" ID x 2⅛" long, wind 8 coils per inch. (Dwg. No. 125X-148).	Each	6		*			*
I PS		2Z8878-26	SPRING, #19A (.0418) music wire, used on jewel indicator and bracket assembly, 13/16" ID x ⅛" overlap, retaining spring part. (Dwg. No. A-49A-4587).	Each	7		*			*
T		2Z8878-17	SPRING, #21 (.047) music wire, 7/16" OD x 1⅝" long, 13 turns, steel. (Dwg. No. 125X-471).	Each	1		*			*
T		2Z8878-16	SPRING, #27 (.067) stainless steel, spring wire, 21/64" ID x 2⅛" long, wind 8 coils per inch, motor support. (Dwg. No. 125X-85).	Each	1		*			*
T		2Z8878-22	SPRING, #30 (.080) music wire, 1½" long x ⅝" dia. (Dwg. No. 125X-409).	Each	3		*			*
T		2Z8878-21	SPRING, #35 (.106) dia., music wire, 1 7/16" OD x ¾" long, ¼" pitch, square ends, type #27905. (Dwg. No. 125X-194).	Each	1		*			*
I		2Z8878-25	SPRING, for dial knob, (.035) music wire, 7/16" long x 11/32" dia. x 5 turn part. (Dwg. No. A-49A-3351).	Each	1		*			*
SG RT		2Z8877.11	SPRING, music wire, 11" long. (Dwg. No. A-49A-1269).	Each	1		*			*
RT PS		2Z8878-24	SPRING, music wire, compression, .292" dia. x ⅞" long. (Dwg. No. A-49A-4166).	Each	2		*			*
CU		2Z8878-18	SPRING, music wire, governor, ⅜" dia. x 2⅝" long, compression type B. R. C. (Dwg. No. A-49A-2975).	Each			*			*
T		2Z8878-20	SPRING, (.040" dia.) stainless steel, spring wire ¼" ID x 3" long, 30 coils, square ends, type #27906. (Dwg. No. 125X-200).	Each	6		*			*
T		2A3459-24A/S4	STRAP, eccentric, steel, ⅜" x 2" x 11" long, one end chamfered with .688" wide x 1 1/16" deep cut-out. (Dwg. No. 125X-266).	Each	6		*			*
PS		2Z9010-3	STRAP, ground, brass, .093" thick x ⅜" x 2 1/16". (Dwg. No. A-2L-2748).	Each						*
T		6L31156-1	STUD, fork, steel, 9/16" dia. head, ¼" dia. body, ¼" dia. body, ¼"-28 thread 7/16" from end 3 13/16". (Dwg. No. 125X-590).	Each	2		*			*
T		6L31107	STUD, spring, steel, #10-32 thread, 11/16" overall length. (Dwg. No. 125X-147).	Each	6		*			*
T		2A3459-24A/S6	SUPPORT, BEARING, steel, one pad with four ½"-13 tapped holes, and 2 bosses 13/16" dia. holes with steel pin ½" dia. x 1 13/32" long. (Dwg. No. 125X-354).	Each	1					*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
T		2A3459-24A/S5	SUPPORT, steel, 1" x $1\frac{5}{8}$" x $3\frac{13}{16}$" long with word "loosen", and arrow. (Dwg. No. 125X-349).	Each	2					*
T		6Z8589	SWIVEL, steel, $\frac{1}{4}$" x $\frac{1}{2}$" x $\frac{5}{8}$" long, head body with $\frac{1}{4}$"-28 thread $\frac{7}{8}$" long. (Dwg. No. 125X-589).	Each	2		*			*
T		2A3459-24A/T1	TRIPOD, consisting of 3 struts assembly, support for mast bearing, three fastening pins, attached with chain, one leg, outer extension, two sandbag holders with nuts and washers attached, type B. R. C. (Dwg. No. 125X-H).	Each	1					*
M		3G2425-1	TUBING, #14 Hyflex, 25' long, coil, .064" ID x .172" OD.	Each						*
SW	6	3H3001-1	MOTOR, 117.5 volts, A. C., lobe switch. (Dwg. No. C-21D-4139).	Each	1					*
T	4	3H3000A16-6	MOTOR, (without wire), 115 volts, A. C., 1/6 H. P. (Dwg. No. 125X-516).	Each	1					*
I	115	3H3016-5	MOTOR, selsyn, A. C., synchronous, 115 volts, 60 cycle, 1942, C78386, Ser. #SP-23, cal. 11900, transformer, type XV. (Dwg. No. C-21D-3555).	Each	1					*
T	6	3H3016-6	MOTOR, selsyn, transmitter type IV, 115 volts, 60-cycle, single-phase. (Dwg. No. 125X-517).	Each	1					*
AN		2A275-154A	ANTENNA ASSEMBLY, #AN-154-A, including switch 220-A, lobe switch, right and left brace, 3 dipoles, and 6 cable assemblies with connectors on each end. (Dwg. No. 205-902).	Each	1	*				*
CU		2C680-266A	CONTROL UNIT BC-1266-A, including shock mounting assembly (D-202-841), in Depot 1. (Dwg. No. 205-787).	Each	1	*				*
I		2C1592	INDICATOR PANEL I-221-A. (Dwg. No. 205-719).	Each	1	*				*
PS		3H4496-105A	POWER SUPPLY, RA-105-A. (Dwg. No. 205-573).	Each	1	*				*
RT		2C5395-1267A	RADIO RECEIVER AND TRANSMITTER BC-1267-A. (Dwg. No. 205-674).	Each	1	*				*
SG		3F3900-222A	SIGNAL GENERATOR, I-22-A. (Dwg. No. 205-680).	Each	1					*
T		2A3459-24A	TOWER TR-24-A, maintenance parts, listed in miscellaneous section.	Each	1					*
M		6L606-2Z-2	BOLT, hex. head $\frac{3}{8}$"-16 thread x $1\frac{3}{4}$", Irodite finish. (Dwg. No. A-3F-4094).	Each			*			*
M		6L607-1.7HZ-2	BOLT, steel, hex. head, $\frac{7}{16}$"-14 thread x $3\frac{3}{4}$", Irodite finish. (Dwg. No. A-3F-3939).	Each			*			*
M		6L606-25Z-2	BOLT, steel, square head, $\frac{3}{8}$"-16 thread x $2\frac{1}{2}$", Irodite finish. (Dwg. No. A-3F-4176).	Each	2		*			*
T		6Z3773-1	EYELET, brass, .010" thick x $\frac{3}{8}$" dia., type #1, telescope eyelet. (Dwg. No. 125X-144).	Each	14		*			*
T		6L996-16	KEY, steel, square, drill rod. (Dwg. No. 125X-451).	Each	2					*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
T		6L996-31	KEY, tool, steel, .188" x .188" x $\frac{31}{32}$" long rounded ends used in drive shaft #125X-74. (Dwg. No. 125X-171).	Each	1		*			*
T		6L996-47	KEY, tool, steel, .313" x .313" x $1\frac{15}{32}$" long rounded ends, used in lower hinged flange. (Dwg. No.125X-254).	Each	1		*			*
T		2A3459-24A/K2	KEY, tool, steel, .126" x .126" x $\frac{31}{32}$" long rounded ends. (Dwg. No. 125X-96).	Each	1		*			*
T		6L996-21	KEY, tool, steel, .188" x .188" x $\frac{21}{32}$" long rounded ends used in worm and shaft. (Dwg. No. 125X-169).	Each	1		*			*
T		6L996-25	KEY, tool, steel, .188" x .188" x $\frac{25}{32}$" long rounded ends used in drive shaft. (Dwg. No. 125X-170).	Each	1		*			*
T		2A3459-24A/K1	KEY, tool, steel, .2505" x .2505" x $\frac{19}{32}$" long rounded ends used in connecting sleeve part #125X-60. (Dwg. No. 125X-97).	Each	1		*			*
RT		2Z5698	KEY, tube shield, steel, key is T-shaped, arm of "T" is $\frac{3}{4}$" x $2\frac{1}{4}$", stem is $\frac{7}{8}$" x 1", material is .059", type B. R. C. (Dwg. No. A-2H-4236).	Each	1		*			*
SG		6L3408-32.2B	NUT, brass, .0002" black nickel, round knurled, #8-32 tap, class 2 fit, $\frac{7}{16}$" dia. x $\frac{5}{16}$" thick. (Dwg. No. A-43E-3586).	Each	4		*			*
T		6L3101-20.5	NUT, brass, 1"-20 threads on OD $\frac{25}{32}$", dia. hole $\frac{9}{32}$", L. G. $\frac{1}{16}$" slot on one end type #28078. (Dwg. No. 125X-473).	Each	1		*			*
T		6L3004CE1	NUT, castellated, steel, $\frac{1}{4}$"-28 thread, finished, electro-galvanized, with cronak treatment. (Dwg. No.125X-86).	Each	1		*			*
T		6L3006CE1	NUT, castellated, steel, $\frac{3}{8}$"-16 thread. (Dwg. No. 125X-1018).	Each	3		*			*
T		6L3106-3211E1	NUT, hex., brass, #6-32 threads. (Dwg. No. 125X-1014).	Each	14		*			*
T		6L3110-32	NUT, hex., brass, #10-32. (Dwg. No. 125X-502).	Each			*			*
T		6LK3508-20-16	NUT, hex., lock, oil relief valve, $\frac{1}{4}$"-20. (Dwg. No. 125X-164).	Each	[illegible]		*			*
RT I PS		6L3604-40E-A4	NUT, hex., steel, #4-40, $\frac{3}{32}$" across flats, $\frac{1}{4}$" thick, finish zinc plate with cronak treatment. (Dwg. No. 43A-267).	Each	52		*			*
T		6L3606-32E1	NUT, hex., steel, #6-32 thread, $\frac{7}{64}$" thick. (Dwg. No. 125X-1013).	Each	8		*			*
RT I PS		6L3606-32E-A4	NUT, hex., steel, #6-32, $\frac{1}{4}$" thick, finish zinc plate with cronak treatment. (Dwg. No. 43A-27).	Each	48		*			*
RT FM I		6L3606-32E-A5	NUT, hex., steel, #6-32, $\frac{5}{16}$" across flats, $\frac{7}{64}$" thick, finish zinc plate with cronak treatment. (Dwg. No. 43A-1331).	Each	6		*			*
RT		6L3608-32E-A5	NUT, hex., steel, #8-32, $\frac{5}{16}$" across flats, $\frac{1}{8}$" thick, finish zinc plate with cronak treatment. (Dwg. No. 43A-3249).	Each	18		*			*
RT PS I CU		6L3608-32E-A5	NUT, hex., steel, #8-32, $\frac{5}{16}$" across flats, $\frac{1}{8}$" thick, finish zinc plate with cronak treatment, class 1. (Dwg. No. 43A-2730).	Each	66		*			*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
FM		6L3608-32Z-B5-1	NUT, hex., steel, #8-32 thread x 11/32" long, finish zinc plate with cronak treatment. (Dwg. No. 43A-3575).	Each			*			*
T		6L3610-32E1	NUT, hex., steel, #10-32 thread, 1/8" (Dwg. No. 125X-1015).	Each	4		*			*
C RT PS I		6L3610-32E-A6	NUT, hex., steel, #10-32, 3/8" across flats, 1/8" thick, finish zinc plate with cronak treatment. (Dwg. No. 43A-1326).	Each	108		*			*
I		6L3612-24E-A7	NUT, hex., steel, #12-24, 7/16" across flats, 5/32" thick, finish zinc plate with cronak treatment. (Dwg. No. 43A-1652).	Each	4		*			*
M		6L3504-28E-A7	NUT, hex., steel, #14-28, 7/16" across flats, 3/16" thick, Irodite finish. (Dwg. No. 43A-3141).	Each			*			*
RT PS I		6L3504-28E-A7	NUT, hex., steel, #1/4"-20, 7/16" across flats, 3/16" thick, finish zinc plate with cronak treatment. (Dwg. No. 43A-3141).	Each	5		*			*
I PS		6L3504-20E-A7	NUT, hex., steel, #1/4"-20, 7/16" across flats, 3/16" thick, finish with zinc plate cronak treatment. (Dwg. No. 43A-3140).	Each	24		*			*
PS I CU RT FM		6L3504-20E-A7	NUT, hex., steel, #1/4"-20, 7/16" across flats, 3/16" thick, finish zinc plate with cronak treatment. (Dwg. No. 43A-1330)	Each	32		*			*
T		6L3504-20E-A7	NUT, hex., steel, #1/4"-20 thread. (Dwg. No. 125X-1016).	Each	3		*			*
T		6L3504-285	NUT, hex., steel, clamp, #1/4"-28, 7/32" thick. (Dwg. No. 125X-88).	Each	5		*			*
T		6L3505-18E1	NUT, hex., steel, #5/16"-18 thread. (Dwg. No. 125X-1017).	Each	1		*			*
M		6L3506-16Z-B11	NUT, hex., steel, #3/8"-16 thread, 11/16" across flats, Irodite finish. (Dwg. No. 43A-1328).	Each	8		*			*
M		6L3507-14Z2	NUT, hex., steel, #7/16"-14 x thread 25/32", Irodite finish. (Dwg. No. 43A-3945).	Each			*			*
T		6L3508-13E1	NUT, hex., steel, #1/2"-13 thread. (Dwg. No. 125X-1019).	Each	4		*			*
T		6L3510-115	NUT, hex., 5/8"-11 thread, heavy steel, semi-finish, American standard. (Dwg. No. 125X-410).	Each	3		*			*
T		6L3658-13	NUT, steel, 3/4" x 17/32", with 1 1/4" dia. x 5/32" thick flange. (Dwg. No. 125X-260).	Each	3		*			*
M		6Z2385.2	NUT, lock. (Dwg. No. A-3G-4070)	Each						*
M		6L2382-1.1	NUT, lock, type #AN-3066-10. (Dwg. No. A-3G-4039).	Each						*
RT		6L3706-32E1	NUT, wing, steel, #6-32, 11/16" across wings, 11/32" high, finish zinc plate with cronak treatment. (Dwg. No. A-43E-3930).	Each	2		*			*
T		6L3808-13	NUT, wing, malleable iron, 1/2"-13 thread. (Dwg. No. 125X-379).	Each	6		*			*
T		6L974--32E1	PIN, cotter, steel, 1/16" dia. x 1/2" long. (Dwg. No. 125X-1029).	Each			*			*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock		3rd ech	4th ech	Depot stock
						1st ech	2nd ech			
T		6L974-6-48E1	PIN, cotter, steel, 3/32" dia. x 3/4" long. (Dwg. No. 125X-1030).	Each	1		*			*
T		6L974-6-64E1	PIN, cotter, steel, 3/32" dia. x 1" long. (Dwg. No. 125X-1031).	Each	3		*			*
T		6L974-8-64	PIN, cotter, steel, 1/8" dia. x 1" long. (Dwg. No. 125X-459).	Each	4		*			*
T		6L974-12-80	PIN, cotter, stainless steel, 3/16" dia. x 1 1/4" long. (Dwg. No. 125X-467).	Each	4		*			*
T		6L3928-96	PIN, detecting, 6" long x 1/2" dia. (Dwg. No. 125X-662).	Each						*
T		6L3923-12	PIN, drill rod, .188" dia. x 3/4" long. (Dwg. No. 125X-161).	Each	1		*			*
T		2A3459-24A/P1	PIN, eccentric, steel, 4 13/16" long, 7/8" hex. head, 7/8" long, 11/16" small dia., 13/16" long, dia. 1/16" eccentricity. (Dwg. No. 125X-355).	Each	2		*			*
T		6Z7545-1	PIN, hinge, steel, 5/8" dia. x 2" long, 3/32" groove, 1/8" from each end, 60° chamfer on each end. (Dwg. No. 125X-82).	Each	1		*			*
T		6Z7056-3	PIN, leg extension, steel, 7/8" dia., head 25/32" dia., shank 5 1/8" long with steel chain, 8 3/8" long, and cotter pin 1" x 1/8" (stainless steel). (Dwg. No. 125X-261).	Each	3		*			*
T		6L3928-21-1	PIN, locating, steel, 1/2" dia. x 1 11/32" long, shank 7/16" dia. x 25/32" long, 60° cone top. (Dwg. No. 125X-26).	Each	3		*			*
T		6L3928-17.7	PIN, locating, steel, 1/2" dia. x 1 15/32" long, shank 7/16" dia. x 5/8" long, top tapped. (Dwg. No. 125X-30).	Each	1		*			*
T		2Z7056-4	PIN, lower strut, steel, 7/8" dia., head 47/64" dia., shank 40° tapered end, overall length 3 5/16" with steel chain and cotter pin. (Dwg. No. 125X-111).	Each	3		*			*
T		6L3946-9-1	PIN, slotted head, S.A.E. 2330 heat-treated steel, 3/8"-24 thread, 3/8" dia. x 19/32" long. (Dwg. No. 125X-596).	Each	3		*			*
T		6L3945-11-1	PIN, steel, 5/16" dia., head .246" dia., body 23/32" long, #46 drill 1/8" from end. (Dwg. No. 125X-588).	Each	2		*			*
T		6L3950-30-1	PIN, steel, 5/8" dia., head 5/32" dia., shank 60° taper, 1/16" groove at end 1 29/32" long. (Dwg. No. 125X-41).	Each	1		*			*
T		6L3943-8P	PIN, steel, dowel, 3/16" x 1/2". (Dwg. No. 125X-1032).	Each			*			*
T		6L3943-12P	PIN, steel, 3/16" x 3/4". (Dwg. No. 125X-1033).	Each			*			*
T		6L3948-22-1	PIN, steel, hardened, 1/2" dia. x 1 13/32" long, 7/16" dia. shank 25/32" long. (Dwg. No. 125X-359).	Each	2		*			*
T		6L3912-20E1	PIN, steel, taper, 2/0 x 1/4". (Dwg. No. 125X-1026).	Each			*			*
T		6L3913-20E1	PIN, steel, taper, #3 x 1 1/4". (Dwg. No. 125X-1028).	Each	3		*			*
CU		3G1100-112	PLATE, mycalex, 1/4" x 1 1/4" x 7", type B. R. C. (Dwg. A-7A-3688).	Each						*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
M		2Z7093-6	PLATE, washer, steel, 1/16" (.062") x 3 3/4" x 2 3/4", two holes 1/2" apart. (Dwg. No. A-29H-4542).	Each	1		*			*
T		6L4044-1B	RIVET, bronze, round head, 1/4" x 1". (Dwg. No. 125X-1025).	Each	6		*			*
T		6L4355-5	RIVET, iron, round head, 1/4" x 1/2". (Dwg. No. 125X-1024).	Each	6		*			*
T		6L4043-6	RIVET, round head, bronze, 3/16" x 5/8". (Dwg. No. 125X-1023).	Each	6		*			*
M		2Z8807-56	SPACER, steel, 9/16" ID x 3/16" thick x 1 1/16" OD, Irodite finish. (Dwg. No. A-3C-2544).	Each	4		*			*
FM RT		6L7632-8.9SE-1	SCREW, B. H. M. steel, #6-32 thread x 1/2" long, finish zinc plate with cronak treatment. (Dwg. No. 32F6-3083).	Each	7		*			*
RT		6L6632-9.8Z-2	SCREW, B. H. M. steel, #6-32 thread x 9/16" long, Irodite finish. (Dwg. No. 32F6-3689).	Each	2		*			*
FM		6L6632-10.8SE-1	SCREW, B. H. M. steel, #6-32 thread x 5/8" long, finish zinc plate with cronak treatment. (Dwg. No. 32F6-3040).	Each	2		*			*
RT		6L6632-11.8SE-1	SCREW, B. H. M. steel, #6-32 thread x 11/16" long, finish zinc plate with cronak treatment. (Dwg. No. 32F6-2938).	Each	2		*			*
RT		6L6832-3-8SE-1	SCREW, B. H. M. steel, #8-32 thread x 3/16" long, finish zinc plate with cronak treatment. (Dwg. No. 32F8-1599).	Each	4		*			*
I RT		6L6832-4.8SE-1	SCREW, B. H. M. steel, #8-32 thread x 1/4" long, finish zinc plate with cronak treatment. (Dwg. No. 32F8-2655).	Each	6		*			*
M FM AN RT		6L6832-4.8Z-2	SCREW, B. H. M. steel, #8-32 thread x 1/4" long, Irodite finish. (Dwg. No. 32F8-2655).	Each	60		*			*
I		6L6832-5.8Z-2	SCREW, B. H. M. steel, #8-32 thread x 5/16" long, Irodite finish. (Dwg. No. 32F8-2726).	Each	8		*			*
I RT		6L6832-5.8SE-1	SCREW, B. H. M. steel, #8-32 thread x 5/16" long, finish zinc plate with cronak treatment. (Dwg. No. 32F8-2726).	Each	18		*			*
T		6L6832-2.8SE-1	SCREW, B. H. M. brass, #8-32 thread x 3/8" long. (Dwg. No. 125X-1039).	Each	1		*			*
CU I RT PS		6L6832-6.8SE-1	SCREW, B. H. M. steel, #8-32 thread x 3/8" long, finish zinc plate with cronak treatment. (Dwg. No. 32F8-2725).	Each	71		*			*
SG		6L6832-6.8Z-2	SCREW, B. H. M. steel, #8-32 thread x 3/8" long, Irodite finish. (Dwg. No. 32F8-2725).	Each	5		*			*
FM		6L6832-7.8SE-1	SCREW, B. H. M. steel, #8-32 thread x 7/16" long, Irodite finish. (Dwg. No. 32F8-2727).	Each	8		*			*
RT		6L6832-7.8SE-1	SCREW, B. H. M. steel, #8-32 thread x 7/16" long, finish zinc plate with cronak treatment. (Dwg. No. 32F8-2727).	Each	2		*			*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
T	....	6L6632-16SE1	SCREW, F. H. M. steel, #6-32 thread x 1" long. (Dwg. No. 125X-1040).	Each	4	....	*	....	....	*
CU	....	6L6832-4Z-2	SCREW, F. H. M. steel, #8-32 thread x ¼" long, Irodite finish. (Dwg. No. 32B8-3308).	Each	3	....	*	....	....	*
RT	....	6L6832-5SE-1	SCREW, F. H. M. steel, #8-32 thread x 5/16" long, finish zinc plate with cronak treatment. (Dwg. No. 32B8-3250).	Each	2	....	*	....	....	*
CU RT	....	6L6832-6.1SE-1	SCREW, F. H. M. steel, #8-32 thread x ⅜" long, finish zinc plate with cronak treatment. (Dwg. No. 32B8-2678).	Each	4	....	*	....	....	*
T	....	6L7032-6SE1	SCREW, F. H. M. steel, #10-32 thread x 7/16" long. (Dwg. No. 125X-1042).	Each	2	....	*	....	....	*
FM	....	6L6632.9Z2	SCREW, F. H. M. steel, #6-32 thread x 9/16" long, Irodite finish. (Dwg. No. 32B6-4168).	Each	8	....	*	....	....	*
SG	....	6L7224-14Z-1	SCREW, F. H. M. steel, #12-24 thread x ⅞" long, Irodite finish. (Dwg. No. 32B12-3576).	Each	4	....	....	....	....	*
T	....	6L7920-8-42.815	SCREW, ¾" hex. head, S.A.E. x 1315 (C.M.S.), ½"-20 thread, overall length 2⅝". (Dwg. No. 125X-464).	Each	4	....	*	....	....	*
RT	....	6L6440-13.2Z-2	SCREW, oval H. M. steel, #4-40 thread x 13/16" long, Irodite finish. (Dwg. No. 32D4-2831).	Each	4	....	*	....	....	*
I	....	6L6832-6.2Z-2	SCREW, oval, H. M. steel, #8-32 thread x ⅜" long, Irodite finish. (Dwg. No. 32D8-3431).	Each	4	....	*	....	....	*
PS	....	6L15008-12	SCREW, overall length ¾", .375" maximum dia., slotted head, #8-32 thread x 5/16" thread portion. (Dwg. No. A-30-3437).	Each	1	....	*	....	....	*
T	....	6L6632-8.1S	SCREW, R. H. M. steel, #6-32 thread x ½" long. (Dwg. No. 125X-1043).	Each	2	....	*	....	....	*
T	....	6L6632-10.18	SCREW, R. H. M. steel, #6-32 thread......	Each	1	....	*	....	....	*
CU RT	....	6L18504-3.42B	SCREW, set, Allen head, steel, #8-32 thread x 3/16" long, finish black oxidize. (Dwg. No. A-52A-463).	Each	6	....	*	....	....	*
I	....	6L18508-6.42B	SCREW, set, Allen head, steel, #8-32 thread x ⅜" long, finish black oxidize. (Dwg. No. A-52A-704).	Each	1	....	*	....	....	*
I RT	....	6L18508-4.42B	SCREW, set, Allen head, steel, #8-32 thread x ¼" long, finish black oxidize. (Dwg. No. A-52A-703).	Each	5	....	*	....	....	*
T	....	6L18604-4.81-HE1	SCREW, set, hollow points, steel, ¼"-20 thread x ¼" long. (Dwg. No. 125X-1034).	Each	4	....	*	....	....	*
T	....	6L18604-6.81-HE1	SCREW, set, hollow point, steel, ¼"-20 thread x ⅜" long. (Dwg. No. 125X-1035).	Each	2	....	*	....	....	*
T	....	6L18605-6.81-HE1	SCREW, set, hollow point, steel, 5/16"-18 thread x ⅜" long. (Dwg. No. 125X-1036).	Each	1	....	*	....	....	*
T	....	6L18606-8.81-HE1	SCREW, set, hollow point, steel, ⅜"-16 thread x ½" long. (Dwg. No. 125X-1037).	Each	1	....	*	....	....	*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
FM		6L18604-16.31SO	SCREW, headless, set, screwdriver slot, ¼"-20 thread x 1" long, Irodite finish. (Dwg. No. A-52A-3865).	Each	1		*			*
T		6L18604-6.9B-E1	SCREW, set, square head, steel, ¼"-20 thread x ⅜" long. (Dwg. No. 125X-1038).	Each	2		*			*
T		6L18604-10-1.95	SCREW, set, steel, ¼" square head, ¼"-20 thread, ½" dog point 21/32" long. (Dwg. No. 125X-121).	Each	1		*			*
T		6L15632-7	SCREW, shoulder, 5/16" dia. head, slotted, steel, #6-32 thread, 11/64" dia. shoulder, 7/16" long. (Dwg. No. 125X-528).	Each	4		*			*
T		6L1554-17.1S	SCREW, shoulder, ½" dia. head, slotted, steel, ¼"-20 thread, 5/16" dia. shoulder, 1 1/16" long. (Dwg. No. 125X-454).	Each	3		*			*
T		6L6637-8.1	SCREW, .138" dia. head, slotted, brass, #6-32 thread x ½" long. (Dwg. No. 125X-475).	Each	6		*			*
I		6L18506-6.3RZ2	SCREW, special, ⅜" long, cold drawn steel filister, #6-32 thread. (Dwg. No. A-3F-3314).	Each	1		*			*
T		6L7911.46.81S	SCREW, steel, S.A.E. x 1315 (C.M.X.), ⅝"-11 thread, ½" dia. shank, ⅞" hex. head, 2⅞" overall length. (Dwg. No. 125X-33).	Each	8		*			*
FM		6L18508-9-1.810	SCREW, 7/16" hex. head, steel, screwdriver slot shoulder under head, ¼" dia. x 3/32" long, Irodite finish, type B. R. C. (Dwg. No. A-3F-3612).	Each	16		*			*
CU		6L17112-22.3Z2	SCREW, "thumb", knurled head, .625" long, #12-24 x, .796" long. (Dwg. No. A-3F-1422).	Each	2		*			*
CU		6L17006-17	SCREW, "thumb", steel, overall length 1 1/16", head is knurled 7/16" dia. x ⅜" shank, threaded #6-32, shank has a .097" dia., type B. R. C. (Dwg. No. A-3F-2873).	Each	4		*			*
RT		6L4776-13-1N	SCREW, thumb, captive knurled, brass, overall length 27/32", head is knurled ⅜" dia. x 5/32" long; shank is ¾" long and has ¼" of its length threaded #6-32, shank has a .099" dia., type B. R. C. (Dwg. No. A-3C-554).	Each	4		*			*
I RT PS		6L17504-28Z2	SCREW, thumb, captive knurled, steel, overall length 1½", head is knurled, ½" dia. x ⅝", shank is ⅞" long, threaded ¼"-28, type B. R. C. (Dwg. No. A-31-2782).	Each	12		*			*
FM		6L6440-5.8Z2	SCREW, B. H. M. steel, #4-40 thread x 5/16" long, Irodite finish. (Dwg. No. 32F4-160).	Each	3		*			*
CU RT I		6L6440-5.85E-1	SCREW, B. H. M. steel, #4-40 thread x 5/16" long, finish zinc plate with cronak treatment. (Dwg. No. 32F4-1601).	Each	50		*			*
FM RT		6L6440-6.8SE-1	SCREW, B. H. M. steel, #4-40 thread x ⅜" long, Irodite finish. (Dwg. No. 32F4-1603).	Each	5		*			*
I RT PS		6L6440-6.8Z-2	SCREW, B. H. M. steel, #4-40 thread x ⅜" long, finish zinc plate with cronak treatment. (Dwg. No. 32F4-1603).	Each	28		*			*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
RT		6L6440-17.1Z-2	SCREW, B. H. M. steel, #4-40 thread x 1 1/16" long, Irodite finish. (Dwg. No. 32F4-3186).	Each	2		*			*
RT		6L6632-3.1SE-1	SCREW, B. H. M. steel, #6-32 thread x 3/16" long, finish zinc plate with cronak treatment. (Dwg. No. 32F6-2136).	Each	1		*			*
I RT		6L6632-4.8Z-2	SCREW, B. H. M. steel, #6-32 thread x 1/4" long, Irodite finish. (Dwg. No. 32F6-2649).	Each	21		*			*
I RT PS		6L6632-4.8SE-1	SCREW, B. H. M. steel, #6-32 thread x 1/4" long, finish zinc plate with cronak treatment. (Dwg. No. 32F6-2649).	Each	25		*			*
FM RT		6L6632-5.1Z-2	SCREW, B. H. M. steel, #6-32 thread x 5/16" long, Irodite finish. (Dwg. No. 32F6-2652).	Each	27		*			*
CU RT PS		6L6632-5.8SE-1	SCREW, B. H. M. steel, #6-32 thread x 5/16" long, finish zinc plate with cronak treatment. (Dwg. No. 32F6-2652).	Each	37		*			*
CU RT I		6L6632-6.8SE-1	SCREW, B. H. M. steel, #6-32 thread x 3/8" long, finish zinc plate with cronak treatment. (Dwg. No. 32F6-2654).	Each	18		*			*
I RT		6L6632-6.8Z-2	SCREW, B. H. M. steel, #6-32 thread x 3/8" long, Irodite finish. (Dwg. No. 32F6-2654).	Each	21		*			*
FM		6L6632-7.8SE-1	SCREW, B. H. M. steel, #6-32 thread x 7/16" long, Irodite finish. (Dwg. No. 32F6-2939).	Each	1		*			*
I		6L6632-7.8SE-1	SCREW, B. H. M. steel, #6-32 thread x 7/16" long, finish zinc plate with cronak treatment. (Dwg. No. 32F6-2939).	Each	9		*			*
I RT PS		6L6832-8.8SE-1	SCREW, B. H. M. steel, #8-32 thread x 1/2" long, finish zinc plate with cronak treatment. (Dwg. No. 32F8-3322).	Each	25		*			*
FM PS		6L6832-10.8SE-1	SCREW, B. H. M. steel, #8-32 thread x 5/8" long, finish zinc plate with cronak treatment. (Dwg. No. 32F8-3505).	Each	4		*			*
PS		6L6832-12.8SE-1	SCREW, B. H. M. steel, #8-32 thread x 3/4" long, finish zinc plate with cronak treatment. (Dwg. No. 32F8-3657).	Each	7		*			*
CU		6L6832-12.8SE-1	SCREW, B. H. M. steel, #8-32 thread x 1 1/4" long. (Dwg. No. 32F8-3919).	Each	2		*			*
CU		6L6832-32.8SE-1	SCREW, B. H. M. steel, #8-32 thread x 2" long, finish zinc plate with cronak treatment. (Dwg. No. 32F8-4128).	Each	2		*			*
FM SG		6L7032-5.8SE-1	SCREW, B. H. M. steel, #10-32 thread x 5/16" long, Irodite finish. (Dwg. No. 32F10-3046).	Each	18		*			*
RT		6L7032-5.8SE-1	SCREW, B. H. M. steel, #10-32 thread x 5/16" long, finish zinc plate with cronak treatment. (Dwg. No. 32F10-3046).	Each	1		*			*
FM I		6L7032-6.8Z-2	SCREW, B. H. M. steel, #10-32 thread x 3/8" long, Irodite finish. (Dwg. No. 32F10-2724).	Each	16		*			*
CU RT PS I		6L7032-6.8SE-1	SCREW, B. H. M. steel, #10-32 thread x 3/8" long, finish zinc plate with cronak treatment. (Dwg. No. 32F10-2724).	Each	38		*			*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
I		6L7032-7.8SE-1	SCREW, B. H. M. steel, #10-32 thread x 7/16" long, finish zinc plate with cronak treatment. (Dwg. No. 32F10-2728).	Each	4		*			*
I RT PS		6L7032-7.8Z-2	SCREW, B. H. M. steel, #10-32 thread x 7/16" long, Irodite finish. (Dwg. No. 32F10-2728).	Each	37		*			*
SG		6L7024-8.8Z-2	SCREW, B. H. M. steel, #10-24 thread x 1/2" long, Irodite finish. (Dwg. No. 32F10-3061).	Each	4		*			*
RT		6L7032-8.8Z-2	SCREW, B. H. M. steel, #10-32 thread x 1/2" long, Irodite finish. (Dwg. No. 32F10-3915).	Each	4		*			*
RT I PS M		6L7032-8.8SE-1	SCREW, B. H. M. steel, #10-32 thread x 1/2" long, finish zinc plate with cronak treatment. (Dwg. No. 32F10-3915).	Each	16		*			*
I		6L7032-18.8SE-1	SCREW, binder head, machine, steel, #10-32 thread x 1 1/8" long, finish zinc plate with cronak treatment. (Dwg. No. 32F10-3430).	Each	4		*			*
M		6L7224-10.8S	SCREW, binder head, machine, steel, #12-24 thread x 5/8" long, Irodite finish. (Dwg. No. 32A12-4174).	Each	2		*			*
SG		6L4768-17	SCREW, captive, steel, 1 1/16" knurled, #8-32 thread x 1 1/16" long. (Dwg. No. A-3F-3487).	Each	1		*			*
SW		6L4776-18-1E1	SCREW, captive, 3/8"-16 thread x 1 5/32" long. (Dwg. No. A-3F-3414).	Each	2		*			*
T		6L4768-46S	SCREW, captive, 3/4" hex. head, steel, 1/2"-13 thread, overall length 2 7/8". (Dwg. No. 125X-50).	Each	2		*			*
T		6L4778-54	SCREW, captive, 3/4" hex. head, steel, 1/2"-13 thread, .406" dia. shank, overall length 3 3/8". (Dwg. No. 125X-402).	Each	4		*			*
T		6L4904-7.32	SCREW, cap, 7/16" hex. head, steel, 1/4"-32 thread, overall length 7/16". (Dwg. No. 125X-477).	Each	1		*			*
T		6L4904-10E1	SCREW, cap, hex. head, steel, 1/4"-20 thread x 5/8" long. (Dwg. No. 125X-1059).	Each	15		*			*
T		6L4904-14E1	SCREW, cap, hex. head, steel, 1/4"-20 thread x 7/8" long. (Dwg. No. 125X-1060).	Each	5		*			*
T		6L4904-20E1	SCREW, cap, hex. head, steel, 1/4" long. (Dwg. No. 125X-1061).	Each	2		*			*
T		6L4904-24E1	SCREW, cap, hex. head, steel, 1/4"-20 thread, 1 1/2" long. (Dwg. No. 125X-1062).	Each	1		*			*
T		6L4905-12E1	SCREW, cap, hex. head, steel, 5/16"-18 thread x 3/4" long. (Dwg. No. 125X-1063).	Each	12		*			*
T		6L4905-14E1	SCREW, cap, hex, head, steel, 5/16"-18 thread x 7/8" long. (Dwg. No. 125X-1064).	Each	2		*			*
T		6L4905-32E1	SCREW, cap, hex. head, steel, 5/16"-18 thread x 2" long. (Dwg. No. 125X-1065).	Each	1		*			*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
T		6L4906-10E1	SCREW, cap, hex. head, steel, 3/8"-16 thread x 5/8" long. (Dwg. No. 125X-1066).	Each	4		*			*
T		6L4906-12E1	SCREW, cap, hex. head, steel, 3/8"-16 thread x 3/4" long. (Dwg. No. 125X-1067).	Each	6		*			*
T		6L7924-6.13.81S	SCREW, cap, 9/16" hex. head, steel, 3/8"-24 thread x 13/16" long. (Dwg. No. 125X-36).	Each	4		*			*
T		6L4906-14E1	SCREW, cap, hex. head, steel, 3/8"-16 thread x 7/8" long. (Dwg. No. 125X-1068).	Each	8		*			*
T		6L4906-16E1	SCREW, cap, hex. head, steel, 3/8"-16 thread x 1" long. (Dwg. No. 125X-1069).	Each	18		*			*
T		6L4906-36E1	SCREW, cap, hex. head, steel, 3/8"-16 thread x 2 1/4" long. (Dwg. No. 125X-1070).	Each	1		*			*
T		6L4908-20E1	SCREW, cap, hex. head, steel, 1/2"-13 thread x 1 1/4" long. (Dwg. No. 125X-1071).	Each	12		*			*
T		6L4910-11E1	SCREW, cap, hex. head, steel, 5/8"-11 thread x 2" long. (Dwg. No. 125X-1072).	Each	3		*			*
SG		6L4450-5.35E-1	SCREW, fil. head, machine, steel, #4-40 x 5/16" long, finish zinc plate with cronak treatment. (Dwg. No. 32C4-4661).	Each	2		*			*
T		6L7032-6.3SE1	SCREW, fil. head, machine, steel, #10-32 thread x 3/8" long. (Dwg. No. 125X-1055).	Each	2		*			*
T		6L7032-8.3SE1	SCREW, fil. H. M., steel, 1/4"-20 thread x 1/2" long. (Dwg. No. 125X-1057).	Each	4		*			*
T		6L7920-4-10.3E1	SCREW, fil., H. M. steel, 1/4"-20 thread x 5/8" long. (Dwg. No. 125X-1058).	Each	6		*			*
RT		6L6440-25E-1	SCREW, flat, H. M. steel, #4-40 thread x 1/8" long, finish zinc plate with cronak treatment. (Dwg. No. 32B4-2940).	Each	4		*			*
CU		6L6640-48Z-2	SCREW, flat, H. M. steel, #4-40 thread x 1/4" long, Irodite finish. (Dwg. No. 32B4-3307).	Each	2		*			*
RT		6L6440-3.8Z-2	SCREW, flat, H. M. steel, #4-40 thread x 3/16" long, Irodite finish. (Dwg. No. 32B4-3574).	Each	2		*			*
SG		6L6440-5SE-1	SCREW, flat, H. M. steel, #4-40 thread x 5/16" long, finish zinc plate with cronak treatment. (Dwg. No. 32B4-2878).	Each	4		*			*
CU		6L6440-8SE-1	SCREW, flat, H. M. steel, #4-40 thread x 1/2" long, finish zinc plate with cronak treatment. (Dwg. No. 32B4-4554).	Each	8		*			*
CU		6L6632-4.1SE-1	SCREW, F. H. M. steel, #6-32 thread x 1/4" long, finish zinc plate with cronak treatment. (Dwg. No. 32B6-3921).	Each	4		*			*
CU		6L6632-5Z-1	SCREW, F. H. M. steel, #6-32 thread x 5/16" long, finish zinc plate with cronak treatment. (Dwg. No. 32B6-3920).	Each	2		*			*
RT		6L6632-6SE-1	SCREW, F. H. M. steel, #6-32 thread x 3/8" long, finish zinc plate with cronak treatment. (Dwg. No. 32B6-3387).	Each	2		*			*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
T	....	6L6832-4.1S	SCREW, R. H. M. steel, #8-32 thread x ¼" long. (Dwg. No. 125X-1045).	Each	1	....	*	....	....	*
T	....	6L6832-6.1S	SCREW, R. H. M. steel, #8-32 thread x ⅜" long. (Dwg. No. 125X-1046).	Each	10	....	*	....	....	*
T	....	6L6832-8.1S	SCREW, R. H. M. steel, #8-32 thread x ½" long. (Dwg. No. 125X-1047).	Each	7	....	*	....	....	*
T	....	6L6832-10.1S	SCREW, R. H. M. steel, #8-32 thread x ⅝" long. (Dwg. No. 125X-1048).	Each	4	....	*	....	....	*
T	....	6L6832-18.1	SCREW, R. H. M. brass, #8-32 thread x 1⅛" long. (Dwg. No. 125X-1050).	Each	3	....	*	....	....	*
T	....	6L7032-6.1S	SCREW, R. H. M. steel, #10-32 thread x ⅜" long. (Dwg. No. 125X-1051).	Each	2	....	*	....	....	*
T	....	6L7032-8.1S	SCREW, R. H. M. steel, #10-32 thread x ½" long. (Dwg. No. 125X-1052).	Each	3	....	*	....	....	*
T	....	6L7032-10.1S	SCREW, R. H. M. steel, #10-32 thread x ⅝" long. (Dwg. No. 125X-1053).	Each	1	....	*	....	....	*
I	....	6L7224-7.1SE-1	SCREW, R. H. M. steel, #12-24 thread x 7/16" long, finish zinc plate with cronak treatment. (Dwg. No. 32A12-3877).	Each	4	....	*	....	....	*
T	....	6L7224-12.1S	SCREW, R. H. M. steel, #12-24 thread x ¾" long. (Dwg. No. 125X-1054).	Each	8	....	*	....	....	*
SW	....	6L7928-4-6.1SE1	SCREW, R. H. M. steel, ¼"-28 thread x ⅜" long, finish zinc plate with cronak treatment. (Dwg. No. 32A15-3861).	Each	6	....	*	....	....	*
I	....	6L7920-4-9.1SE1	SCREW, R. H. M. steel, ¼"-20 thread x 9/16" long, finish zinc plate with cronak treatment. (Dwg. No. 32A14-3429).	Each	18	....	*	....	....	*
FM M	....	6L7928-4-10.1Z2	SCREW, R. H. M. steel, ¼"-28 thread x ⅝" long, Irodite finish. (Dwg. No. 32A15-4170).	Each	7	....	*	....	....	*
FM	....	6L7928-4-12.8Z2	SCREW, R. H. M. steel, ¼"-28 thread x ¾" long, Irodite finish. (Dwg. No. 32A15-4171).	Each	1	....	*	....	....	*
SW	....	6L7918-5-16.1E1	SCREW, R. H. M. steel, 5/16"-18 thread x 1" long, finish zinc plate with cronak treatment. (Dwg. No. A-3F-42-09).	Each	2	....	*	....	....	*
M	....	6L72104Z2	WASHER, lock, external tooth, steel, 9/32" (.2816") OD for #4 screw, .016" thick, Irodite finish, type #1104. (Dwg. No. 28A-185).	Each	4	....	*	....	....	*
FM RI I PS	....	6L72104E1	WASHER, lock, external tooth, steel, 9/32" (.2816") OD for #4 screw, .016" thick, finish zinc plate with cronak treatment, type #1104. (Dwg. No. 28A-185).	Each	68	....	*	....	....	*
CU I PS RT	....	6L72106E1	WASHER, lock, external tooth, steel, 5/16" (.3125") OD for #6 screw, .018" thick, cronak treatment, type #1106. (Dwg. No. 28A-16).	Each	128	....	*	....	....	*
CU RT PS I	....	6L72108E1	WASHER, lock, external tooth, steel, ⅜" (.375") OD for #8 screw, .021" thick, finish zinc plate with cronak treatment, type #1108. (Dwg. No. 28A-116).	Each	162	....	*	....	....	*
CU I RT PS	....	6L72110E1	WASHER, lock, external tooth, steel, 13/32" (.4062") OD for #10 screw, .022" thick, finish zinc plate with cronak treatment, type #1110. (Dwg. No. 28A-347).	Each	140	....	*	....	....	*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
I		6L72112E1	WASHER, lock, external tooth, steel, 15/32" (.4687") OD for #12 screw, .022" thick, finish zinc plate with cronak treatment, Catalog #1112. (Dwg. No. 28A-3427).	Each	4		*			*
RT SG		6L72114E1	WASHER, lock, external tooth, steel, 1/2" (.500") OD for 1/4" screw, .025" thick, finish zinc plate with cronak treatment, type #1114. (Dwg. No. 28A-990).	Each	26		*			*
CU RT		6L72204Z2	WASHER, lock, internal tooth, steel, 17/64" (.2556") OD for #4 screw, .016" thick, finish Irodite finish, type #1204. (Dwg. No. 28B-476).	Each	16		*			*
CU RT PS I		6L72206Z2	WASHER, lock, internal tooth, steel 9/32" (.2816") OD for #6 screw, .018" thick, finish Irodite finish, type #1206. (Dwg. No. 28B-55).	Each	30		*			*
I PS M		6L72208Z2	WASHER, lock, internal tooth, steel, 21/64" (.3281") OD for #8 screw, .020" thick, Irodite finish, type #1208. (Dwg. No. 28B-643).	Each	9		*			*
RT I PS		6L72210Z2	WASHER, lock, internal tooth, steel, 3/8" OD for #10 screw, .021" thick, Irodite finish, type #1210. (Dwg. No. 28B-644).	Each	6		*			*
CU I RT		6L72214E1	WASHER, lock, internal tooth, steel, 1/2" (.500") OD for 1/4" screw, .024" thick, Irodite finish, type #1214. (Dwg. No. 28B-2302).	Each	8		*			*
RT PS		6L72114E1	WASHER, lock, internal tooth, steel, 1/2" (.500") OD for 1/4" screw, .024" thick, finish zinc plate with cronak treatment, type #1214. (Dwg. No. 28B-2302).	Each	8					*
FM RT I PS		6L71004E1	WASHER, lock, split, steel, 7/16" (.4375") OD for 1/4" screw, 1/16" thick, S.A.E. standard, finish zinc plate with cronak treatment. (Dwg. No. A-28C-323).	Each	27		*			*
T		6L70008P	WASHER, lock, steel, #8, (.164"). (Dwg. No. 125X-1001).	Each	29		*			*
M		6L70008-1	WASHER, lock, steel, S. T. #8, (.164"), 1/32" thick, 1/16" wall, Irodite finish. (Dwg. No. 28C-2599).	Each	10		*			*
T		6L70010P	WASHER, lock, steel, #10, .200" ID x .325" OD. (Dwg. No. 125X-1002).	Each	22		*			*
T		6L70012P	WASHER, lock, steel, #12, 7/32" ID x 11/32" OD. (Dwg. No. 125X-1003).	Each	8		*			*
M		6L71004	WASHER, lock, steel, S. T. 1/4" (.250"), 1/16" thick, 3/32" wall, Irodite finish. (Dwg. No. 28C-2107).	Each	4		*			*
T		6L71004	WASHER, lock, steel, 1/4" (.250"). (Dwg. No. 125X-1004).	Each	47		*			*
T		6L71005P	WASHER, lock, steel, 5/16", 37/64" OD x 5/64" thick. (Dwg. No. 125X-1005).	Each	13		*			*
T		6L71006P	WASHER, lock, steel, 3/8" (.375"). (Dwg. No. 125X-1006).	Each	46		*			*
M		6L71006Z-2	WASHER, lock, steel, S. T. 3/8" (.375"), 3/32" thick, wall 1/8", Irodite finish. (Dwg. No. A-28C-1327).	Each	8		*			*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
M		6L71008Z	WASHER, lock, steel, S. T. ½" (.515"), ⅛" thick, zinc plated. (Dwg. No. A-28C-2109).	Each	4		*			*
T		6L71008P	WASHER, lock, steel, ½" (.500"). (Dwg. No. 125X-1007).	Each	27		*			*
		6L71010P	WASHER, lock, steel, ⅝" (.655") ID. (Dwg. No. 125X-1008).	Each	4		*			*
T		6L70008-2B	WASHER, lock, phosphor bronze, #8, 3/64" thick. (Dwg. No. 125X-506).	Each	20		*			*
SW		6L71005E1	WASHER, lock, 5/16", zinc plate with cronak treatment. (Dwg. No. A-28C-1781).	Each	8		*			*
M		6L72112E1	WASHER, lock, (E. T. Irodite finish), type #1112. (Dwg. No. 28A-3427).	Each	5		*			*
M			WASHER, lock, split, ¼", Irodite finish. (Dwg. No. A-28C-323).	Each	9		*			*
M		6L71106	WASHER, lock, split, ⅜", Irodite finish. (Dwg. No. A-28C-1776).	Each	8		*			*
M		6L71007Z2	WASHER, lock, split, 7/16", Irodite finish. (Dwg. No. A-28C-3946).	Each	5		*			*
RT		6L58504	WASHER, locking, special, 13/16" OD, slot is .281" wide, washer has a projection 15/32" at right angle to its face, type B. R. C. (Dwg. No. A-29A-2822).	Each	2					*
T		2A3459-24A/W1	WASHER, retaining, steel, 1¼" dia. x ¼" thick, with pin .0937" dia. x ½" long. (Dwg. No. 125X-206).	Each	1		*			*
M		6L54024	WASHER, rubber. (Dwg. No. A-25G-4037).	Each	6		*			*
M		6L54007-2	WASHER, rubber. (Dwg. No. 25G-4036).	Each	2		*			*
M		2Z8807-64	WASHER, spacer, 11/16" x .453" x 5/32", Irodite finish. (Dwg. No. A-3C-3940).	Each	2		*			*
M		2Z8807-63	WASHER, spacer, 11/16" x ⅜" x .390" ID, Irodite finish. (Dwg. No. A-3C-3938).	Each	2		*			*
FM		6L71014B	WASHER, spring, .260" ID x 1/16" thick, phosphor bronze. 7/16" OD, type #3559. (Dwg. No. A-29E-466).	Each	16		*			*
T		6L58006E1	WASHER, steel, #6 (.138"), 5/32" ID x ⅜" OD. (Dwg. No. 125X-1009).	Each	2		*			*
T		6L58010E1	WASHER, steel, #10, .200" ID x .325" OD. (Dwg. No. 125X-1010).	Each	2		*			*
T		6L58012E1	WASHER, steel, #12, .226" ID x .351" OD. (Dwg. No. 125X-1011).	Each	1		*			*
T		6L58028E1	WASHER, steel, ⅜" (.375"). (Dwg. No. 125X-1012).	Each	3		*			*
SG		6L50102-4	WASHER, steel, .130" ID x 5/16" OD x .031" thick. (Dwg. No. B-29B-237).	Each	4		*			*
CU RT		6L58002-6E1	WASHER, steel, .147" ID x .375" OD x 1/32" thick, finish zinc plate with cronak treatment. (Dwg. No. B-29A-3216).	Each	4		*			*

Major Component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Organ Stock 1st ech	Organ Stock 2nd ech	3rd ech	4th ech	Depot stock
T		6L58027-1	WASHER, steel, 19/32" OD x 15/32" ID x 1/16" thick, close type, type "Schenectady", series 2. (Dwg. No. 125X-42).	Each	3		*			*
I PS RT		6L58023-3E1	WASHER, steel, .173" ID x .312" OD x .031" thick, finish zinc plate with cronak treatment. (Dwg. No. B-29A-3507).	Each	18		*			*
CU PS		6L58023-8E1	WASHER, steel, .173" ID x .375" OD x .031" thick, finish zinc plate with cronak treatment. (Dwg. No. B-29A-2165).	Each	11		*			*
M		6L58023-1Z-2	WASHER, steel, .173" ID x .500" OD x .050" thick, Irodite finish. (Dwg. No. B-29A-4169).	Each	13		*			*
I		6L58024E1-1	WASHER, steel, .218" ID x .375" OD x .031" thick, finish zinc plate with cronak treatment. (Dwg. No. B-29A-3501).	Each	4		*			*
RT		6L58024E1-2	WASHER, steel, 1/4" ID x .4375" OD x 1/16" thick, finish zinc plate with cronak treatment. (Dwg. No. B-29A-3776).	Each	2		*			*
T		6L58024-5	WASHER, steel, 17/64" ID x .4375" OD x 1/16" thick. (Dwg. No. 125X-591).	Each	1		*			*
SW		6L58026E1	WASHER, steel, 3/8" ID x 5/8" OD, finish zinc plate with cronak treatment. (Dwg. No. B-29A-3757).	Each	4		*			*
M		6L58026-4Z2	WASHER, steel, 25/64" ID x 2" OD x 5/64" thick, Irodite finish. (Dwg. No. B-29A-1025).	Each	2		*			*
I		6L58037E1	WASHER, steel, .437" ID x .687" OD x .025" thick, finish zinc plate with cronak treatment. (Dwg. No. B-29A-3251).	Each	2		*			*
M		6L58028-4Z-2	WASHER, steel, 7/16" ID x 1 1/8" OD x 5/64" thick, Irodite finish. (Dwg. No. B-29A-4172).	Each	6		*			*
M		6L58029-1Z-2	WASHER, steel, 9/16" ID x 3" OD x .093" thick, Irodite finish. (Dwg. No. B-29A-2105).	Each	7		*			*
M		6L58024-8	WASHER, steel, 3/4" x 1/4" x .062", Irodite finish. (Dwg. No. B-29A-4175).	Each	2		*			*
M		6L58026-5	WASHER, steel, 2 1/8" OD x .390" ID x .093" thick, Irodite finish. (Dwg. No. B-29A-3926).	Each	2					*
M		6L58038-2	WASHER, steel, 2 5/8" x .093", Irodite finish. (Dwg. No. B-29A-4076).	Each	2		*			*
M		6L58040	WASHER, steel. (Dwg. No. B-29A-4024).	Each	2					*
M		6L71016	WASHER, steel. (Dwg. No. B-29A-4167).	Each	8		*			*

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