TM 11-1517

WAR DEPARTMENT TECHNICAL MANUAL

SERVICE MANUAL
FOR
RADIO EQUIPMENTS
RC-150-B, RC-150-C, RC-150-D, RC-151, RC-151-A, RC-151-D

THEORY, TROUBLE SHOOTING, AND REPAIR

WAR DEPARTMENT *19 AUGUST 1944*

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TM 11-1517 Confidential

This manual, together with TM 11-1317 and TM 11-1417, supersedes TM 11-1117, 12 December 1942 and TM 11-1117, 15 September 1943.

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TM 11-1517, Radio Equipments RC-150-B, RC-150-C, RC-150-D, RC-151, RC-151-A, and RC-151-D, Service Manual, Theory, Trouble Shooting, and Repair, is published for the information and guidance of all concerned.

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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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For explanation of symbols, see FM 21-6.

QUICK INDEX

CONTENTS

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 110–120-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:
Transmitter BC–1160–A.
Test Oscilloscope I–134–B.

FIRST AID TREATMENT FOR ELECTRIC SHOCK

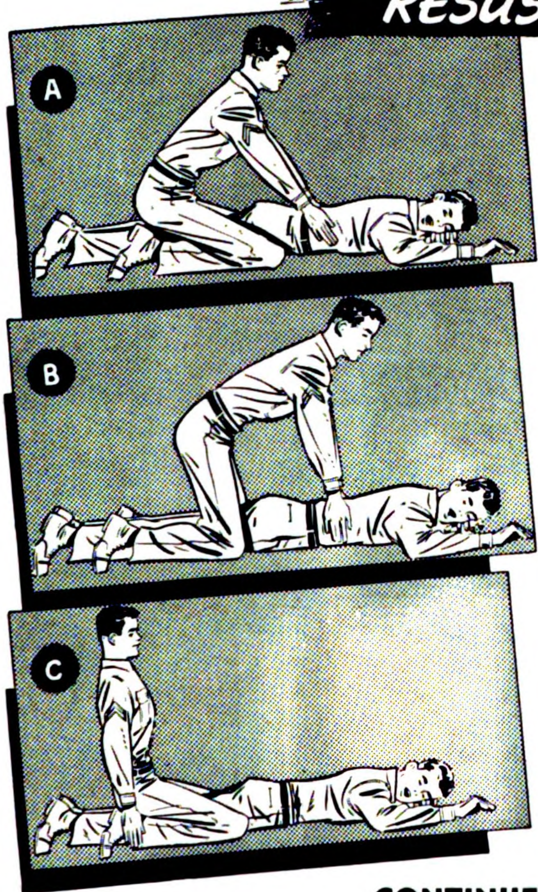
I. FREE THE VICTIM FROM THE CIRCUIT IMMEDIATELY.

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 **forhours**

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

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, meters, dials, connecting cables, and knobs. Take special care to destroy completely the oscillator tubes in the transmitter.

2. Cut—All connecting cables and wiring.
3. Burn—All literature and schematic diagrams.
4. Bend—The antenna matching section, antenna, and transmitter tuning rods.
5. Bury or scatter—All nameplates and other parts that cannot be destroyed otherwise.

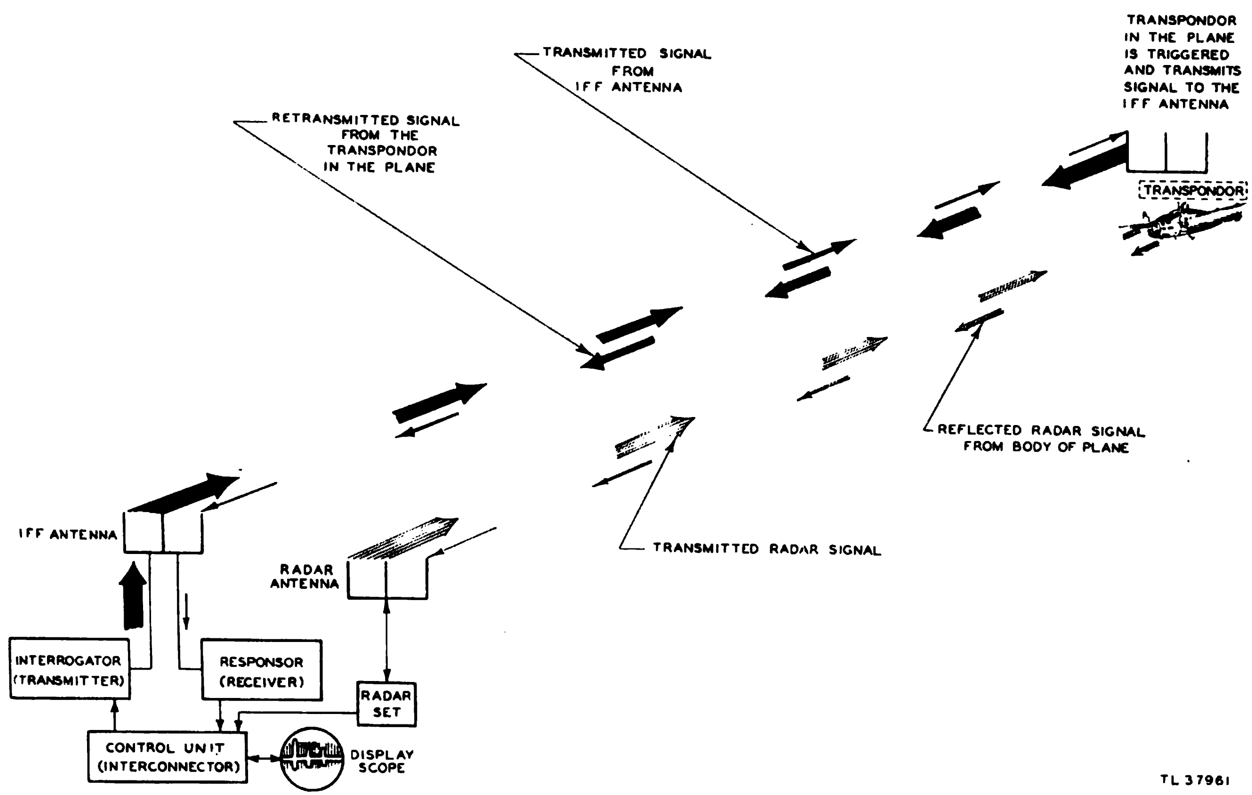
DESTROY EVERYTHING

REFERENCE NOTICE

This is one of three Technical Manuals on Radio Equipments RC–150–B, RC–150–C, RC–150–D, RC–151, RC–151–A, and RC–151–D. The other two are:

TM 11–1317, Radio Equipments RC–150–B, RC–150–C, RC–150–D, RC–151, RC–151–A, and RC–151–D, Technical Operation Manual (General Description, Operating Instructions, and Equipment Performance Log).

TM 11–1417, Radio Equipments RC–150–B, RC–150–C, RC–150–D, RC–151, RC–151–A, and RC–151–D, Preventive Maintenance Manual.



Frontispiece. Elements of Mark III IFF.

CONFIDENTIAL

This manual, together with TM 11-1317 and TM 11-1417, supersedes TM 11-1117, 12 December 1942 and TM 11-1117 15 September 1943.

CHAPTER 1

THEORY OF OPERATION

Section I. ELEMENTARY PRINCIPLES OF IFF AND RADIO EQUIPMENTS RC–150 AND RC–151

1. Introduction

The primary aim of this Technical Manual is to present the electrical and mechanical theory of the Radio Equipments RC–150 and RC–151, and to aid the repairman in the maintenance, repair, and most efficient operation of the equipment. It is the third and last book of a series on Radio Equipments RC–150 and RC–151. The two other manuals in this series are TM 11–1317, Technical Operation Manual, and TM 11–1417, Preventive Maintenance Manual. Hereafter, in this manual, reference to "Radio Equipment RC–150" will be made when all models of Radio Equipments RC–150 and RC–151 are meant and to "Radio Set SCR–270" when all models of Radio Sets SCR–270 and SCR–271 are meant, unless it is stated that only one model is intended.

2. Contents of Manual

This manual is divided into four chapters as follows:

Chapter 1, Theory of Operation.
Chapter 2, Trouble-shooting Procedures.
Chapter 3, Supplementary Mechanical Information.
Chapter 4, Maintenance Parts List.

a. CHAPTER 1, THEORY OF OPERATION. This chapter contains a brief summary of the purpose and fundamentals of Identification Friend or Foe (IFF) equipment and both a general and detailed description of the function and operation of the components of the Radio Equipments RC–150 and RC–151. These components, each treated in a separate section, are: transmitter, r-f system, receiver, interconnector, wavemeter, and signal generator.

b. CHAPTER 2, TROUBLE-SHOOTING PROCEDURES. This chapter deals with the technique and methods of finding trouble in Radio Equipment RC–150. 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 other suitable techniques. It also includes information on the replacement of defective electrical parts.

c. CHAPTER 3, SUPPLEMENTARY MECHANICAL INFORMATION. This chapter contains information necessary for the replacement of any defective mechanical parts of the Radio Equipment RC–150.

d. CHAPTER 4, MAINTENANCE PARTS LIST. This is a complete list of all replaceable parts of the radio equipment. It includes reference symbols, Signal Corps stock numbers, names of parts and descriptions, quantity per equipment, and 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 identification are now in use. One method involves the coordination of reports from radar equipment and from observers at a distance who have been able to recognize the target. Another method is by a process of elimination, based on the knowledge of the movements of friendly aircraft and surface

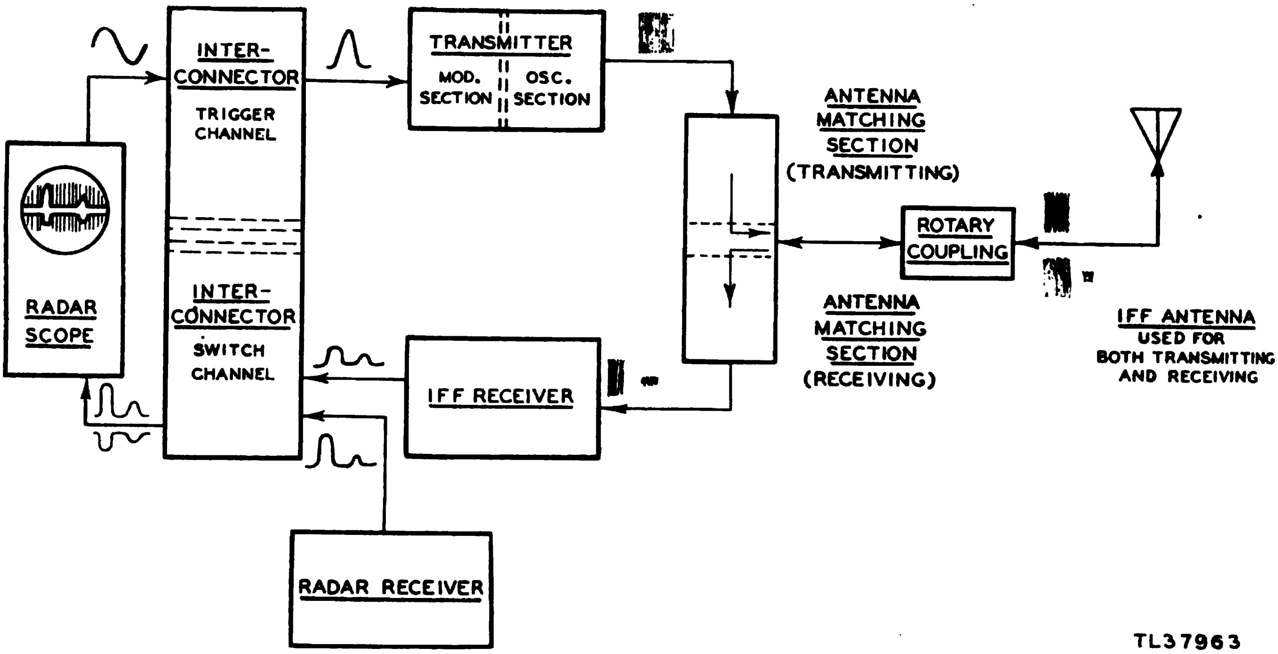


Figure 1. RC–150, components.

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 OF IFF. As all the foregoing methods involve considerable coordination and consequent time delay, it has been found essential to avoid this by providing 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 develop 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 importance.

4. Mark III IFF

a. DESCRIPTION. The complete MARK III IFF system consists of two separate units as shown in the frontispiece; namely the ground unit, located near the radar set, called the interrogator-responsor, and the airborne equipment, located in the friendly plane, called the transpondor. The radar operator challenges the unidentified plane by setting the interrogator-responsor into operation. As shown in the frontispiece, pulses of r-f energy are radiated toward the plane. These pulses are very weak (1 kw) as compared with the power in the radar pulses (100 kw); hence the signal reflected from the plane would be too small to be detected. If, however, the plane is friendly it contains a transpondor. The interrogation pulses are received by the transpondor and are 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 a cathode-ray display tube. 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 a 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 (157–187 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* (or 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-through 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 the RC–150, the identification signals are displayed on the radar oscilloscope below the normal echo. In this way, the identification signal is promptly correlated with the correct target. In some cases the IFF may be triggered into operation at ranges beyond the detection range of the radar in use. In these cases, the operator of the radar set will see the periodic IFF pulse without any associated echo.

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 that during consecutive sweeps the transpondor 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 discrimination between different types of

friendly craft or an additional security measure. In addition to the six codes just described, a further code is available in which a very wide pulse is returned each sweep. This code is most easily distinguished and is intended as a universal distress code.

Table 1.—Coding position, 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. Description of RC–150

a. General. The RC–150 is a typical example of the Mark III IFF interrogator-responsor equipment. In the next few paragraphs a general description of the components will be given and the part each one plays in the identification system (fig. 1).

b. Transmitter. The transmitter of the RC–150 is the interrogator. Its function is to generate the pulses of radio energy that are sent out into space to trigger the transpondor in the plane or ship that is to be identified. To accomplish this, the transmitter has a high-frequency oscillator section which oscillates at a frequency within the IFF band of 157 to 187 megacycles. To trigger this oscillator at the proper intervals, there is a built-in modulator section. This section receives a synchronizing voltage from the radar oscilloscope through the interconnector which is regulated so that the transmitter will send out its pulses 156 times per second. This is one-fourth the recurrence frequency of the radar set, 625 pulses per second.

c. R-F System. Associated with the interrogating function of the transmitter are the antenna matching section which is used to match the transmitter to the antenna, the rotary coupling coil which mechanically and electrically connects the rotating part of the transmission line to the fixed portion, and the antenna itself which radiates the energy into space in the direction of the target.

d. Receiver. The receiver of the RC–150 is the responsor. It is a superheterodyne type and with a few differences it is similar to most radio receivers. Two of these differences are the broad intermediate-frequency band-width of 3 megacycles which is obtained by staggered tuning and the high intermediate frequency of 11 megacycles. The function of the receiver is to receive the identification signal from the transpondor, amplify it, and detect or rectify it so that it can be sent to the radar oscilloscope together with a portion of the transmitted pulse for simultaneous presentation. The antenna, rotary coupling coil, and the antenna matching section, which is common to both the transmitting and receiving system, performs a similar function in both. In the latter case, however, the antenna receives the transpondor's signal.

e. Interconnector. The interconnector which is part of the control unit may be described as the heart of the set. Its synchronizing, switching, and testing functions will be described in detail in section V of this chapter.

f. Other Components. Although the radar receiver and the radar oscilloscope are not a part of the RC–150, they play an important part in the identification system. These components, together with the signal generator and the wavemeter will also be covered in this chapter.

g. Block Diagram. A functional block diagram of the entire equipment is given in figure 2. This figure shows in detail the interrelations of all the components of the equipment and serves as a master diagram for reference and review.

6. List of Components

Descriptive Name	*Signal Corps designation*
Rack	FM–71 or FM–72
Transmitter	BC–1160–A
Receiver	BC–1161–A
Control Unit	BC–1162–A

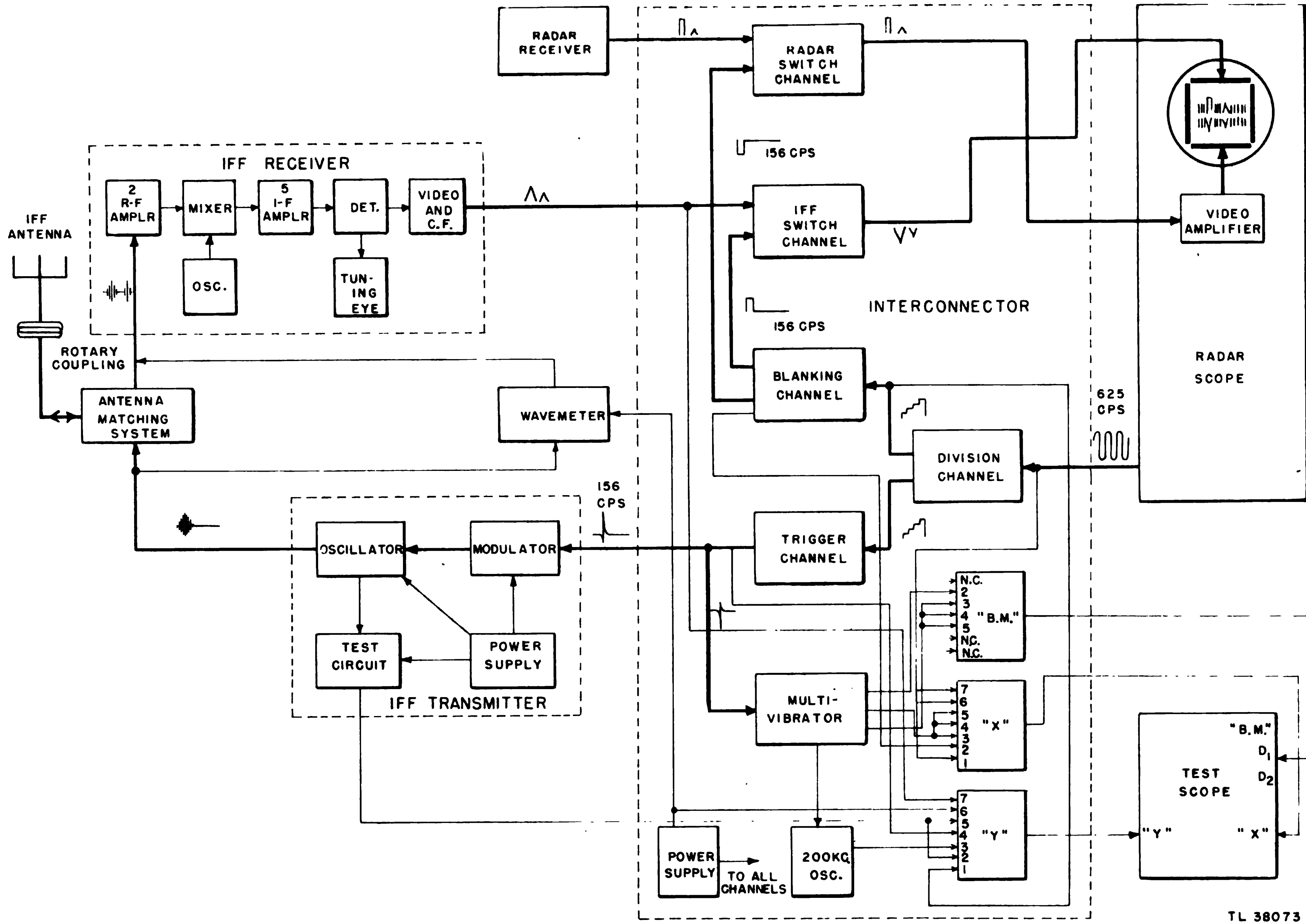


Figure 2. Radio Equipment RC-150 block diagram.

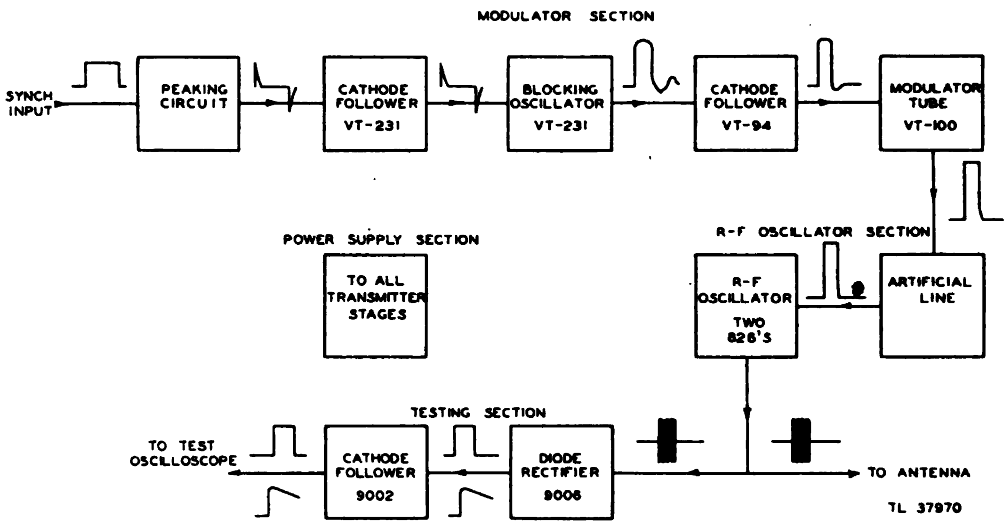


Figure 3. Transmitter, block diagram.

Antenna Matching Section	MC–414–A
Antenna	AN–125–A or AN–126–A
Signal Generator	I–198–A

7. Technical Characteristics

Wavelength	1.9 to 1.6 meters
Frequency	157 to 187 megacycles
Peak power output	1 kilowatt
Pulse width	5 to 7 microseconds
Recurrence frequency	156 cycles per second
Maximum range	150 miles (coincides with range of radar set)
Minimum range	2 miles
Azimuth coverage	360 degrees
Power requirements	275 watts 110–120 volts, 5 ampere, single phase, 60 cycles
Receiver i-f bandwidth	3 megacycles
Receiver intermediate frequency (central frequency)	11 megacycles

Section II. TRANSMITTER

8. Purpose

The function of the transmitter is to generate a radio-frequency interrogation pulse in proper synchronization with the radar transmitter pulse.

9. General Description

The transmitter consists of four sections: modulator section, r-f oscillator section, testing or monitor section, and power supply section (fig. 3). This paragraph contains a general description of the main sections of the transmitter. Paragraphs 10 through 18 contain a detailed description of the transmitter circuits.

a. MODULATOR SECTION. The modulator section includes five stages: the peaking circuit, input cathode follower, blocking oscillator, output cathode follower, and the modulator tube. The function of this section is to shape and amplify the pulse which keys the r-f oscillator. The input to the modulator is a 156 cycle-per-second pulse from the interconnector and the output is a sharp narrow pulse of large amplitude at the input recurrence frequency suitable for keying the r-f oscillator.

b. R-F OSCILLATOR SECTION. The r-f oscillator consists of the artificial line and the oscillator stage. This stage generates the r-f energy in the form of pulses which are radiated by the antenna.

c. TESTING SECTION. The testing section consists of two stages, a diode rectifier and a cathode follower. The function of this section is to provide a means of viewing the output pulse and checking the power output of the transmitter with the aid of the test oscilloscope. The input to this section is a portion of the output pulse of the r-f oscillator section. The output is the envelope of the r-f pulse.

d. POWER SUPPLY SECTION. The power supply section includes four transformers and three rectifier tubes. These circuits furnish the plate voltage and the bias voltage for the r-f oscillator section, the plate voltage for the modulator and testing sections, and the filament voltages.

10. Peaking Circuit

The input circuit of the transmitter is a peaking circuit, illustrated in figure 4. Resistor 55 is the load for the coaxial cable 101-B which

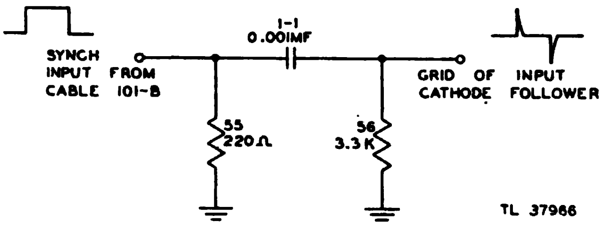


Figure 4. Peaking circuit, partial schematic.

carries the synchronizing signal from the interconnector to the transmitter. Approximately 20 volts of this synchronizing voltage is available across this resistor. Capacitor 1-1 and resistor 56 compose the peaking or RC circuit. The constants of this circuit are chosen so as to give a peaked-wave output. Therefore, a pulse of any width impressed across resistor 55 will appear as a peaked wave across resistor 56.

11. Cathode Follower VT-231

The cathode follower tube, ½ of VT-231, a 6SN7, is used to isolate the blocking oscillator from the input circuit (fig. 5). The voltage across the cathode resistor 57-1 is of the same shape as the input voltage, but it is of slightly less magnitude since the gain of a cathode follower is always less than unity. The capacitor 3A is the plate bypass capacitor. The voltage across the cathode resistor is applied to the grid circuit of the blocking oscillator.

12. Blocking Oscillator

a. GENERAL. The second half of the VT-231 is connected as a blocking oscillator (fig. 6). It is a triggered regenerative oscillator with a transformer supplying the required feedback from the plate to the grid. The oscillator, however, is arranged so that it will not operate continuously as other oscillators do, but will become blocked or inoperative after a definite length of time. With no synchronizing signal

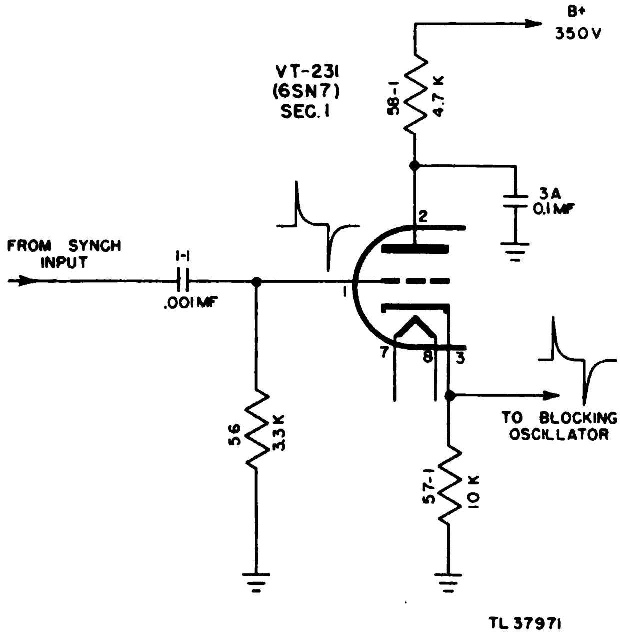


Figure 5. Cathode follower, VT-231, partial schematic.

impressed, the bias potentiometer is set to bias the tube just below cut-off. When the positive pulse from the interconnector is applied to the

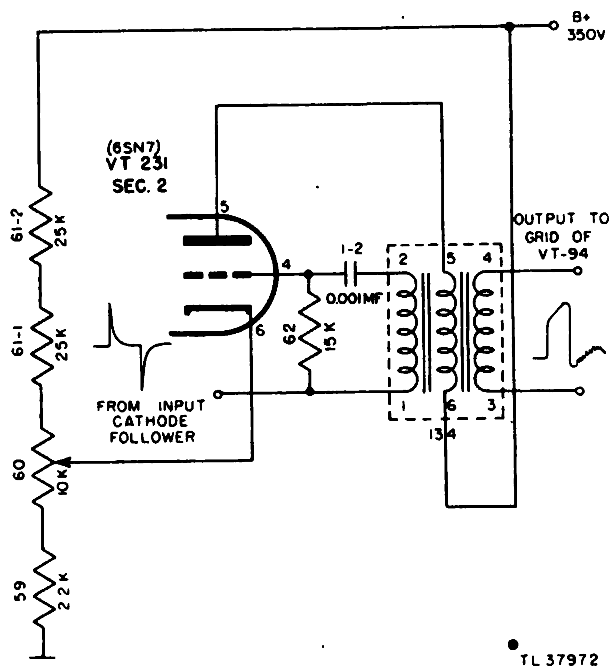


Figure 6. Blocking oscillator VT-231, partial schematic.

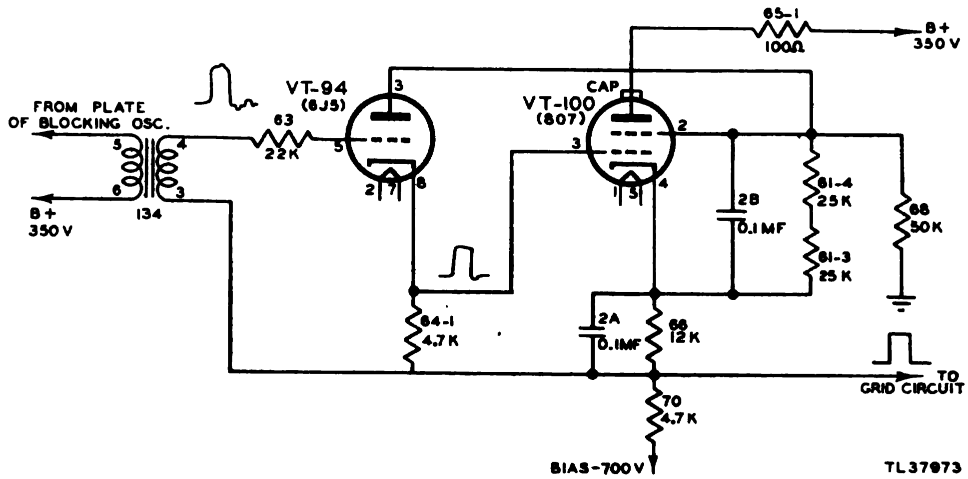


Figure 7. Cathode follower VT–94 and modulator VT–100, partial schematic.

blocking oscillator grid by way of the cathode follower, it triggers the blocking oscillator and sets it into oscillation. The oscillator generates one pulse and then stops until the next triggering pulse arrives. The details of this operation are explained in the following paragraphs.

b. Rise of Current. When the triggering pulse is impressed upon the grid of the blocking oscillator, it causes the grid to become more positive with respect to the cathode. This positive grid voltage causes an increase of plate current to flow through the plate winding of the blocking oscillator transformer which, in turn, induces a voltage in the grid winding of the transformer. Because of the polarity of the windings, the voltage causes the grid to become more positive and causes more plate current to flow. Because of this regenerative action, the plate current rises very rapidly to saturation. Although the plate voltage can change instantaneously, the current through the plate winding cannot. The plate voltage, therefore, drops to its minimum value very rapidly and remains there while the plate current is rising to saturation.

c. Fall of Current. At saturation, the field in the plate winding ceases to increase and for an instant there is no induced voltage in the grid winding. Immediately the grid capacitor 1–2 begins to discharge. This discharge causes the positive potential on the grid to become less positive, thereby causing a decrease in plate current in the plate winding and the field around the plate coil starts to collapse. This collapsing field, in turn, induces a voltage in the grid winding in the reverse direction, causing the grid to become more and more negative. This process continues until the grid is driven beyond cut-off, thus completing a cycle of operation.

d. Recurrence Frequency. Because of the action described in the above two paragraphs, sharp pulses are generated in the plate circuit. The rate of recurrence of the operating cycle depends only upon the synchronizing pulses from the interconnector when the bias potentiometer is set correctly. The fixed bias (resistor 59) also is used to prevent triggering of the blocking oscillator by stray coupling from the Radio Set SCR–270 transmitter.

e. Bias. The bias is obtained from a bleeder network connected between the plate supply and ground. This network is composed of fixed resistors 61–1, 61–2, 59, and the variable potentiometer 60. If the bias is too low, the blocking oscillator will oscillate freely at its natural frequency. If the bias is too high the blocking oscillator will always be cut off and will not oscillate even when the positive pulse is applied. The cathode bias voltage is variable between 20 and 60 volts. The bias control is adjusted by the use of a screw driver from the front panel of the transmitter.

f. Output Coupling. The output pulse of the blocking oscillator is coupled to the next stage by means of the third winding of the blocking oscillator transformer and appears as a narrow positive pulse. The 180° phase inversion is due to the polarity of the windings. This pulse is applied between the grid and cathode

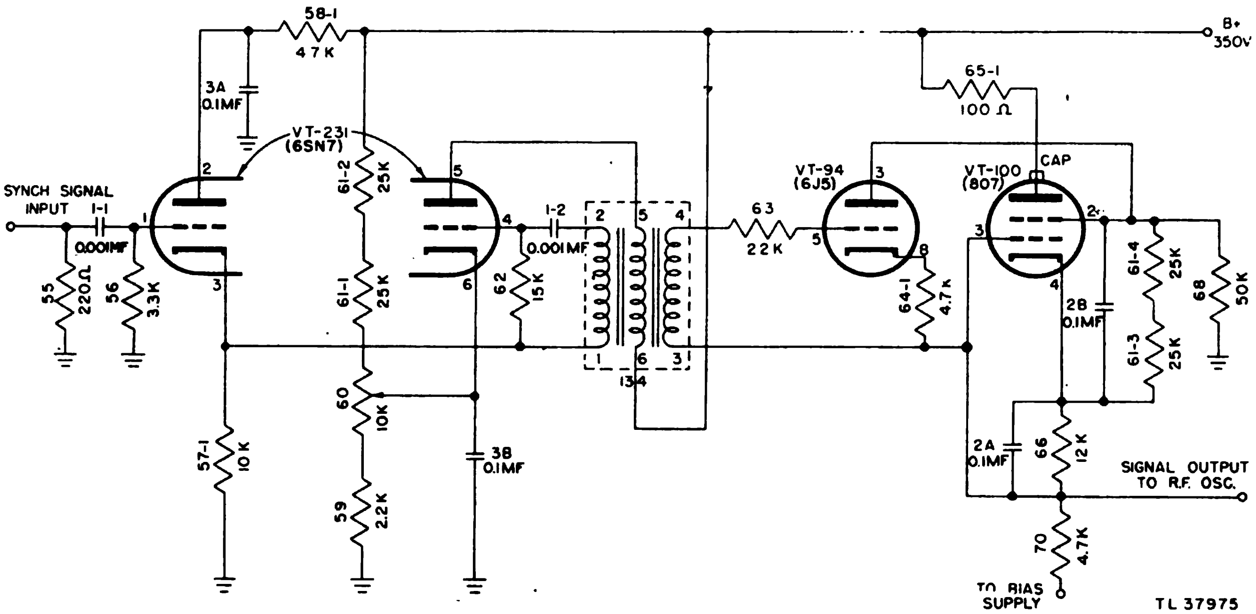


Figure 8. Modulator circuit, partial schematic.

of the second cathode follower VT–94. The use of a three winding transformer has a decided advantage in this circuit. It isolates the blocking-oscillator stage from the succeeding stage and permits a *floating* ground. This enables the cathode of the modulator to operate at a large negative voltage, so that the output of the low voltage positive and negative power supplies is in effect added together to produce a large drop across the tube.

13. Cathode Follower VT–94 (fig. 7)

The narrow positive pulse fed to the grid of the cathode follower is approximately 200 volts in amplitude. As the grid tends to go positive in relation to the cathode, grid current is drawn. The grid current causes a voltage drop across the series grid resistor 63. The magnitude of the grid current drawn is sufficient to prevent the grid from ever going more than slightly positive with respect to the cathode. Because of this, the voltage appearing across the cathode resistor 64–1, due to the flow of plate current, is a well-shaped square wave. However, some of the irregularities in the positive voltage input also appear across resistor 64–1, but these irregularities are considerably reduced across the cathode resistor. This is the purpose of positive clipping and the result is a well-shaped square-wave output from the cathode follower. The bias developed in the cathode is such that the tube is operated near cut-off; therefore, most of the negative portion of the oscillation does not appear in the output. The positive-pulse output is fed to the grid of the modulator, VT–100.

14. Modulator VT–100

a. GENERAL. A modulator, VT–100 (807) in a bootstrap circuit, is used to pulse the transmitter (fig. 8). The function of this circuit is to provide a large negative bias for the r-f oscillator grids and a high-voltage pulse of very short duration to trigger the r-f oscillator tubes.

b. BIAS CIRCUIT. During the period between pulses the modulator tube is biased beyond cut-off by the voltage developed across resistor 66. Resistor 66 is part of the voltage-divider network, consisting of resistors 70, 66, 61, (which is 61–3 and 61–4) and 68, across which the bias voltage of –700 volts is placed. The approximate voltages across this divider are given in figure 9. The cathode potential is –625 volts and the grid potential is –680 volts. Consequently, the tube is biased beyond cut-off. During this period, the VT–100 draws no current and the voltage on the plate is the supply voltage of 350 volts positive.

c. PULSE CIRCUIT. When the positive pulse from the cathode follower appears on the grid of the modulator tube, it causes the tube to draw current. The current flow now is through resistor 65–1, the resistance of the tube, capacitor 2A, and resistor 70 (fig. 10). Capacitor 2A bypasses resistor 66 for the duration of the pulse. There is a voltage drop in the tube, a small drop across the parasitic suppressing resistor 65–1, and a drop across the capacitor 2A. In this new voltage-divider circuit, the voltage drop across resistor 70 is approximately 850 volts. Since one end of resistor 70 is tied to –700 volts, the

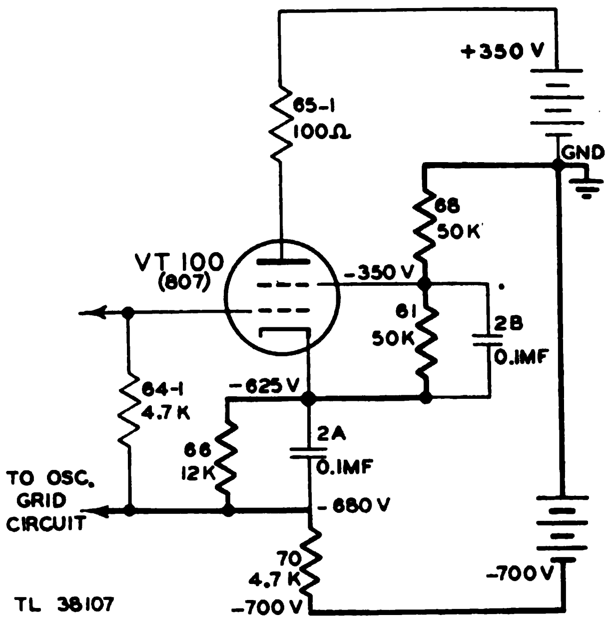


Figure 9. Bias circuit of modulator tube.

other will be at 150 volts positive with respect to ground. This high-voltage pulse is applied to the grid circuit of the r-f oscillator.

15. Artificial Line

a. GENERAL. An artificial line is used between the output of the modulator VT–100 and the grids of the r-f oscillator tubes in order to control the width of the r-f pulse emitted by the oscillator. The artificial line consists of a network of inductances and capacitors the electrical characteristics of which are so proportioned that the time of travel of a wave from the input of the line and back again is 6.66 microseconds. Its presence is necessary because the r-f oscillator has plate voltage on it at all times and if an ordinary pulse were supplied to its grid circuit, it would not stop oscillating promptly at the cessation of the pulse (fig. 11).

b. OPERATION. When the tubes are not con-

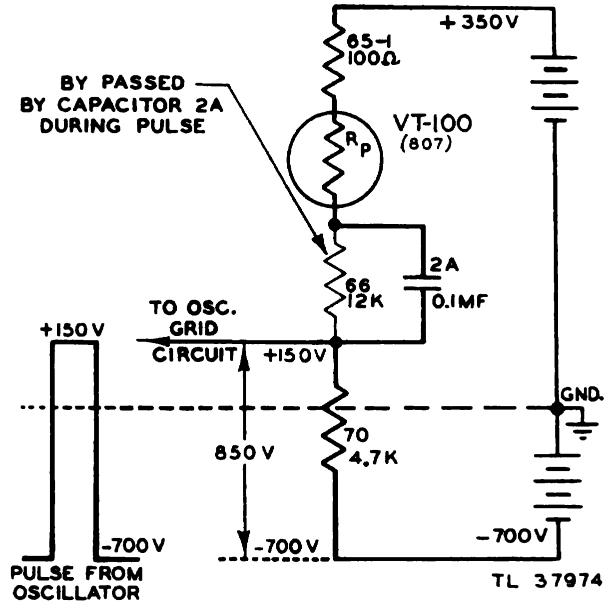


Figure 10. Pulse circuit of modulator tube.

ducting, the grid bias on the r-f oscillator is approximately –700 volts. When the modulator pulse of 150 volts positive is impressed upon the grid, the oscillator operates and grid current begins to flow. When grid current flows, the grid may be considered as practically at ground

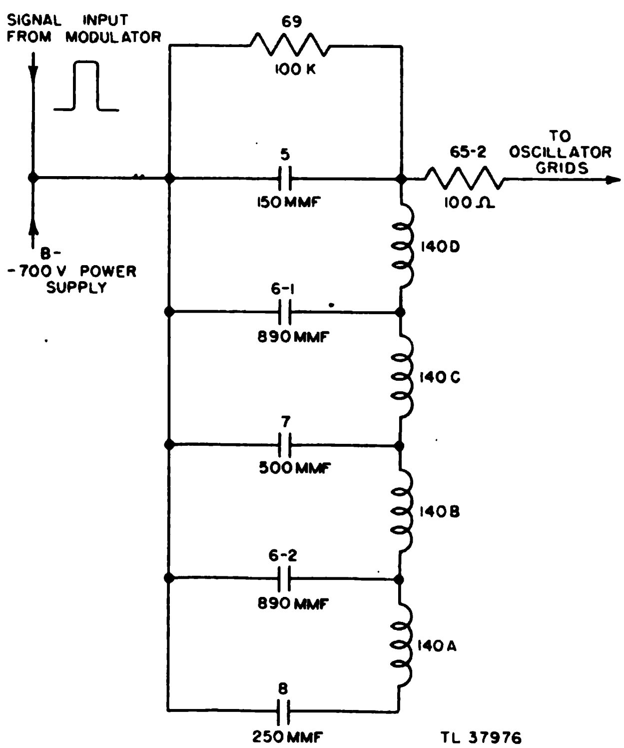


Figure 11. Artificial line, partial schematic.

because the cathode resistance is of negligible value (resistor 73, 7.8 ohms) and the grid to cathode internal resistance is low. Resistor 69, which is in the grid circuit, will consequently have a drop across it of almost the full 150 volts. This resistor is connected in parallel with the artificial line and the drop across it, therefore, is the input voltage to the artificial line network. The artificial line network has characteristics similar to an actual open-ended transmission line. The input voltage can be looked upon as a traveling wave of 150 volts charging the line as it travels toward the open end. On reaching the open end, the wave is reflected without change in polarity and thus charges the line another 150 volts or a total of 300 volts as it travels back toward resistor 69. The time required for the voltage wave to travel the length of the artificial line is 3.33 microseconds, or a total time of 6.66 microseconds is needed for the wave to travel back and forth along the line.

c. PULSE WIDTH. Between the time that the 150-volt potential across resistor 69 is put in to the artificial line and the time the reflected voltage appears across resistor 69, the grids of the oscillator tubes are held only slightly above cathode potential (ground). The amplitude of the reflected voltage on the line is approximately 150 volts and is of the same polarity as the input voltage. Consequently, the voltage across resistor 69 must be now the sum of the two voltages, that is, the source voltage of 150 volts and the 150-volt-reflected output of the artificial line, or a total of 300 volts. Since the 150-volt end of resistor 69 maintains this same potential until grid current ceases, the grid end of the resistor is driven 150 volts *negative* in order to satisfy the 300-volt drop across resistor 69. This negative potential on the grids causes the oscillating tube to stop oscillating promptly at the end of 6.66 microseconds. The pulse from the modulator, therefore, may be longer than 6.66 microseconds but the transmitter will still produce the proper width pulse by virtue of the action of the artificial line.

16. R-F Oscillator

a. GENERAL. The r-f oscillator uses two 826 tubes in a tuned-grid tuned-filament circuit operated in push-pull. At the frequency of operation, conventional inductors or capacitors would have to be so small in size that they would be impracticable. In addition, the skin effect in the coils introduces resistance which reduces the Q of the oscillator. To overcome these difficulties, the tuned circuits in the r-f oscillator are made of a quarter-wavelength transmission line. The inductance of the quarter-wavelength transmission line, shorted at the end away from the tube, together with its distributed capacity and the interelectrode capacitance of the tube, acts like a parallel resonant circuit. The Q of this tuned circuit is high because the resistance due to the skin effect is minimized by using large-diameter silver-plated rods for the quarter-wave line. The cathode line has been folded over in order to save space without affecting the electrical characteristic of the line (figs. 12, 13, and 14).

b. FILAMENT VOLTAGE. The filament current for the tube flows through the inner and outer conductors of the concentric line. Capacitors 4–1 and 4–2 are connected between the inner and outer conductors of the coaxial line so that each filament line acts only as a single conductor for r-f.

c. OPERATION. The operation of this oscillator is similar to that of any tuned-grid tuned-filament oscillator. The high voltage is applied directly to the plate circuit and the feedback necessary to maintain oscillations is obtained by the grid to cathode capacitance of the tube. The –700-volt bias keeps the tube cut off except when the positive pulse from the modulator section is applied to the shorted end of the grid line. It is operated with two tubes in push-pull in order to get a large power output. By connecting the tubes in push-pull rather than in parallel, the interelectrode capacitances of the tubes are not added. Resistor 65–2 in the grid circuit and 71 in the plate circuit are used to suppress parasitic oscillations.

d. TUNING. The tuning of the lines in the grid and filament circuits determines the frequency of oscillation (fig. 15).

(1) *Line tuning.* The electrical length of the filament line is adjusted by means of two shorting bars. Varying the distance of the shorting bars with respect to the end of the line varies the electrical length of the line and therefore the frequency of resonance. By means of the two shorting bars in the folded filament line

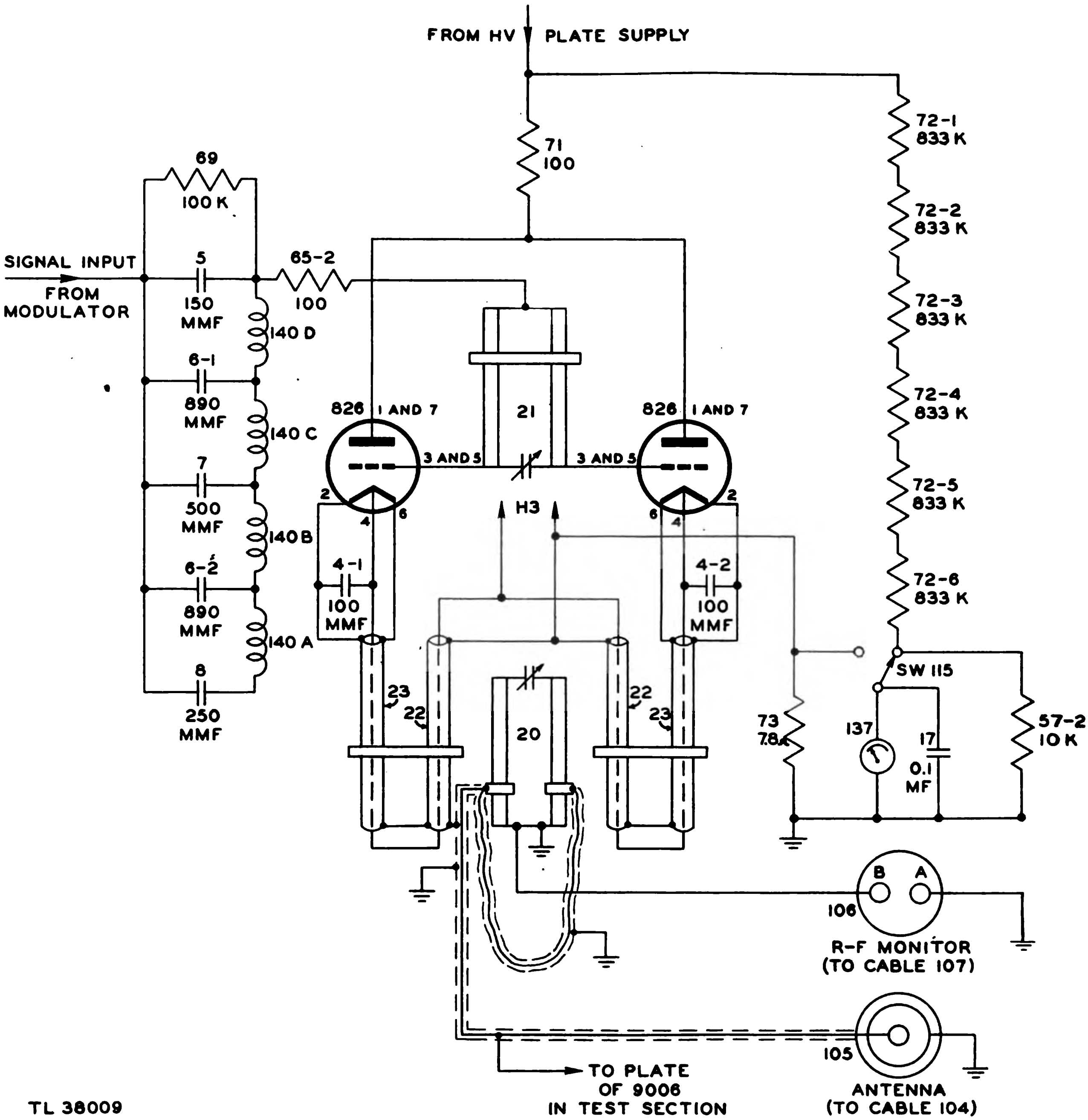


Figure 12. R-f oscillator section, partial schematic.

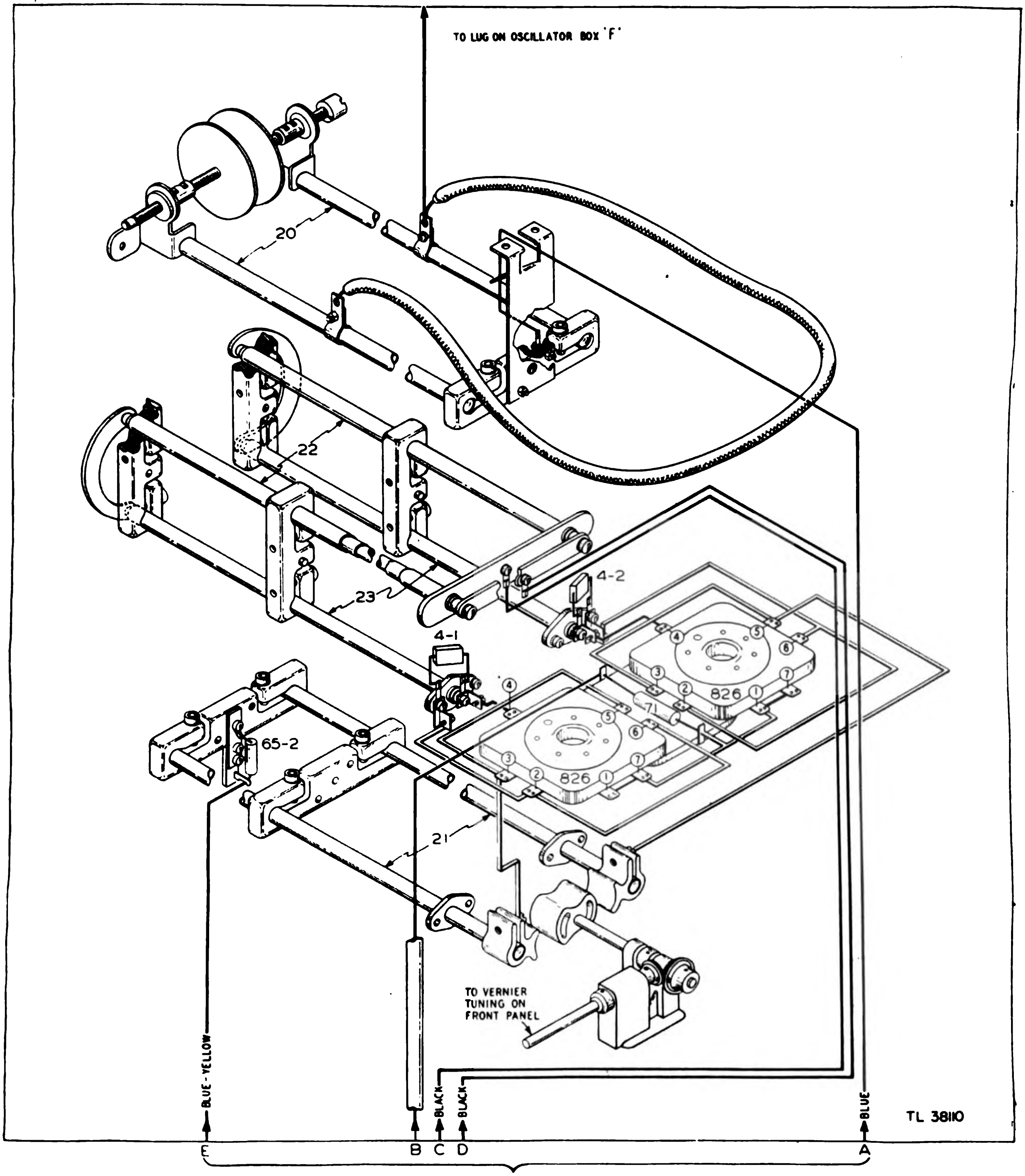


Figure 13. R-f oscillator section, pictorial diagram.

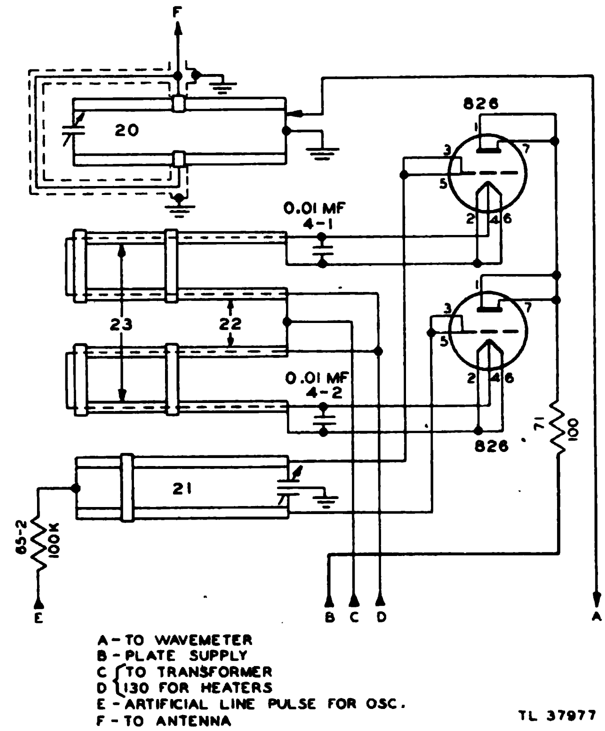


Figure 14. R-f oscillator section, simplified schematic.

and the shorting bar in the grid line, the frequency of the r-f oscillator can be varied over its entire range of 30 megacycles; that is, from 157 to 187 megacycles.

(2) *Vernier tuning.* In addition to the grid-line shorting bar there is a small butterfly capacitor installed across the grid line (21 in fig. 12) at the end nearer the tubes. This butterfly capacitor is connected by gears to the screw driver-adjustment knob labeled VERNIER TUNING on the front panel. Varying this capacitor varies the effective electrical length of the grid line and consequently the frequency of oscillation. By means of this adjustment the transmitter frequency may be varied from plus or minus ½ megacycle in some parts of the frequency range to plus or minus 3 megacycles in other parts of the frequency range from the frequency determined by the setting of the shorting bar.

e. OUTPUT COUPLING. The energy in the filament tank circuit is coupled to the r-f system by the tuned-antenna coupling line (fig. 16). The magnetic field that is set up by the r-f current in the filament tank circuit induces an r-f voltage in the coupling line. Thus, in effect, the coupling line is the tuned secondary of a transformer of which the filament tank circuit is the tuned primary. The capacitor placed across the open end of the coupling line is variable and permits the line to be adjusted to the transmitter frequency for maximum transfer of energy. This is a screw driver adjustment (antenna capacitor D) in the rear panel.

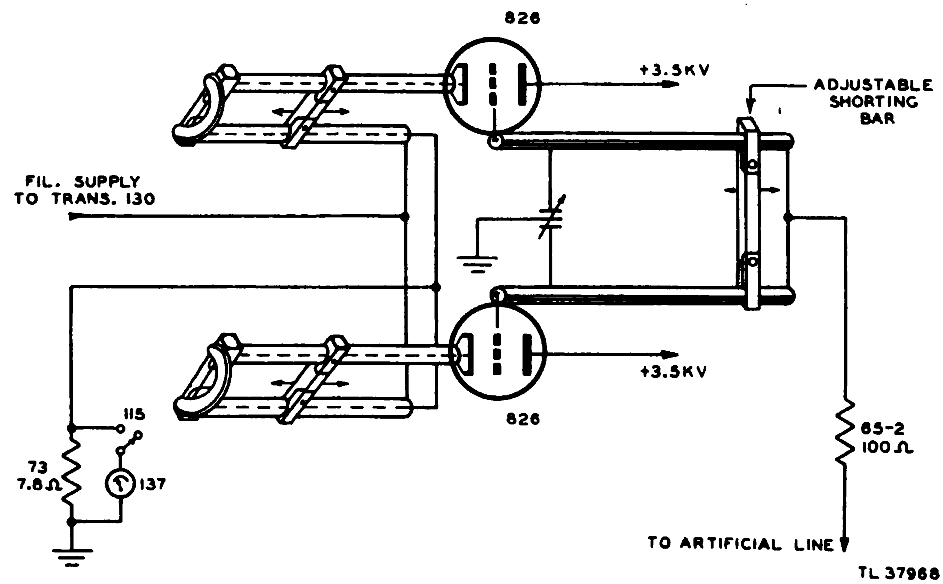


Figure 15. Grid and filament lines, r-f oscillator section.

f. COUPLING LOOP. Since the filament tuned circuit is a quarter-wave parallel wire transmission line, the voltages and currents on one of the lines will be 180° out of phase with those on the other line. Consequently, due to the placement of the coupling line, the voltages and currents on each half of it will also be 180° out of phase (fig. 16). In order to have the energy

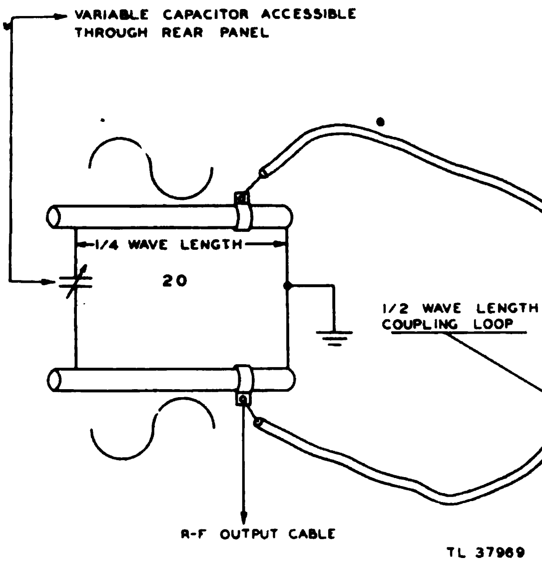


Figure 16. Antenna line.

from both sides of the coupling line in phase at the connection to the antenna transmission line, a half-wave section of coaxial cable (coupling loop) is connected across the antenna coupling line at points which represent approximately 50-ohms impedance, the characteristic impedance of the cable. When the energy on the side of the line opposite the r-f output-cable tap travels through the half-wave coupling loop, it will arrive in phase with the energy at the other side and add to it. Theoretically, this adjustment is exact for only one frequency, but in practice it works well over the entire range of the transmitter.

g. R-F OUTPUT CABLE. The r-f output cable is a coaxial cable tapped to the antenna coupling line at the same point as one end of the coupling loop (fig. 16). This point is chosen where the impedance is such as to match the impedance of the transmission line and thus obtain maximum transfer of energy. This tap is adjustable and the tap-off point is determined by the manufacturer for all frequencies and indicated on the calibration chart on the inside of the transmitter rear panel. There is another lead connected to a low-potential point on the antenna coupling line, which conveys energy to the wavemeter in order to determine the transmitter frequency. This lead goes to connector 106.

17. Test Circuit Section

a. DIODE RECTIFIER AND CATHODE FOLLOWER. A connection to the plate of the diode rectifier is tapped off the r-f cable as it goes to the antenna connector 105. This diode rectifier, a 9006 tube, rectifies a portion of the r-f pulse output of the oscillator and furnishes the envelope of the r-f pulse. The value of load resistors (fig. 17) in the cathode circuit of the diode can be varied by means of relay 139 so that the time constant of the circuit can be changed from a high to a low value. This stage is followed by a cathode follower.

b. POWER PULSE MEASUREMENT. Relay 139 is normally in the position that makes the value of the load-resistance (resistor 74 plus resistor 76) one million ohms. These resistors also act as a voltage divider and capacitors 13 and 14–1 are so proportioned as to make the divider accurate at the radio frequency used. The rectified output of the diode is connected to the grid of a cathode follower VT–202 through the r-f filter, composed of the resistor 58–2 and the capacitor 14–2. The voltage impressed upon the grid of the cathode follower is tapped down approximately one-fourth the way on the diode-load resistor in order to avoid overloading the grid of the cathode follower. The cathode-follower output, which is also tapped down about one-third the way, is applied to the test oscilloscope through connector 107. The picture on the oscilloscope for this condition of operation is a sawtooth wave. This wave is a measurement of the power output of the transmitter. A rough check on the power output can be made by use of the test positions 5 and 6. The height of the power pulse, as displayed by position 5, should be at least one-half the height of the calibration signal, position 6.

c. SIGNAL WIDTH MEASUREMENT. When the relay is thrown to the other position by means of the spring switch 115 on the interconnector, it places a very low value of load resistance, approximately 1,000 ohms, in the diode-load

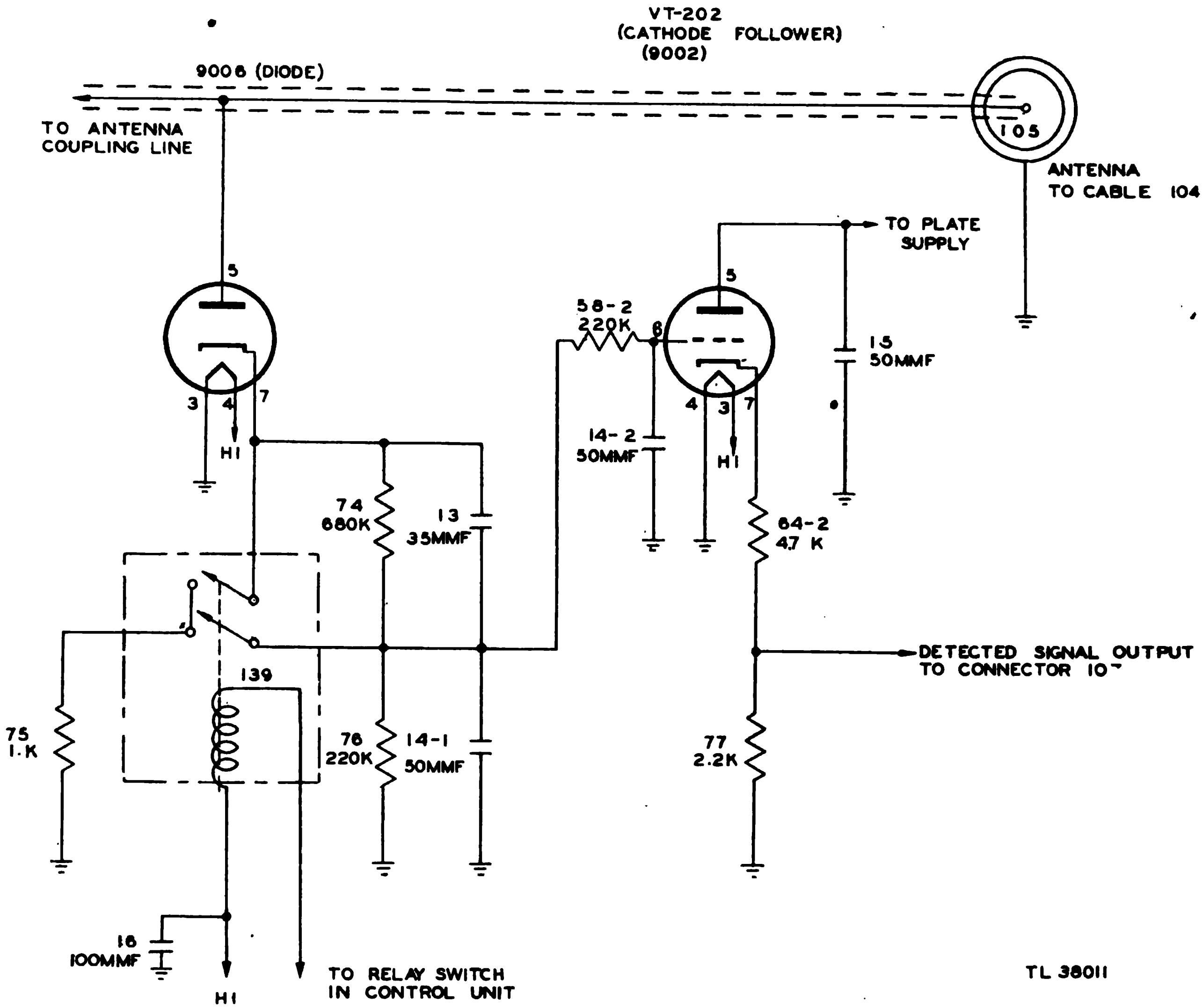


Figure 17. Test circuit section, partial schematic.

circuit (fig. 17). Since the time constant of the diode-load circuit is then low, the picture on the oscilloscope is a reproduction of the envelope of the r-f pulse. This pulse is not used to measure power because the low resistance is comparable to the diode resistance. This condition causes a drop across the diode and the efficiency of detection is not the same for all values of frequency and voltage. Also, there is a slight drop in transmitter power caused by the diode circuit. The cathode resistor of the VT–202 cathode follower is composed of two resistors, 64–2 and 77. Resistor 77 is of a low value in order to keep as small as possible the time constant of the line which is connected from connector 107 to the oscilloscope. This is necessary in order to avoid distortion in the appearance of the pulse on the test scope.

18. Power Supply Section

a. GENERAL. Four transformers and three rectifier tubes are used for furnishing the d-c and filament voltages required to operate the transmitter (fig. 18). The a-c voltage which supplies these transformers is brought into the transmitter through connection 108. One side of the a-c line goes through four interlock switches and a circuit breaker for the protection of both the operating personnel and the equipment. Both sides of the line are fused.

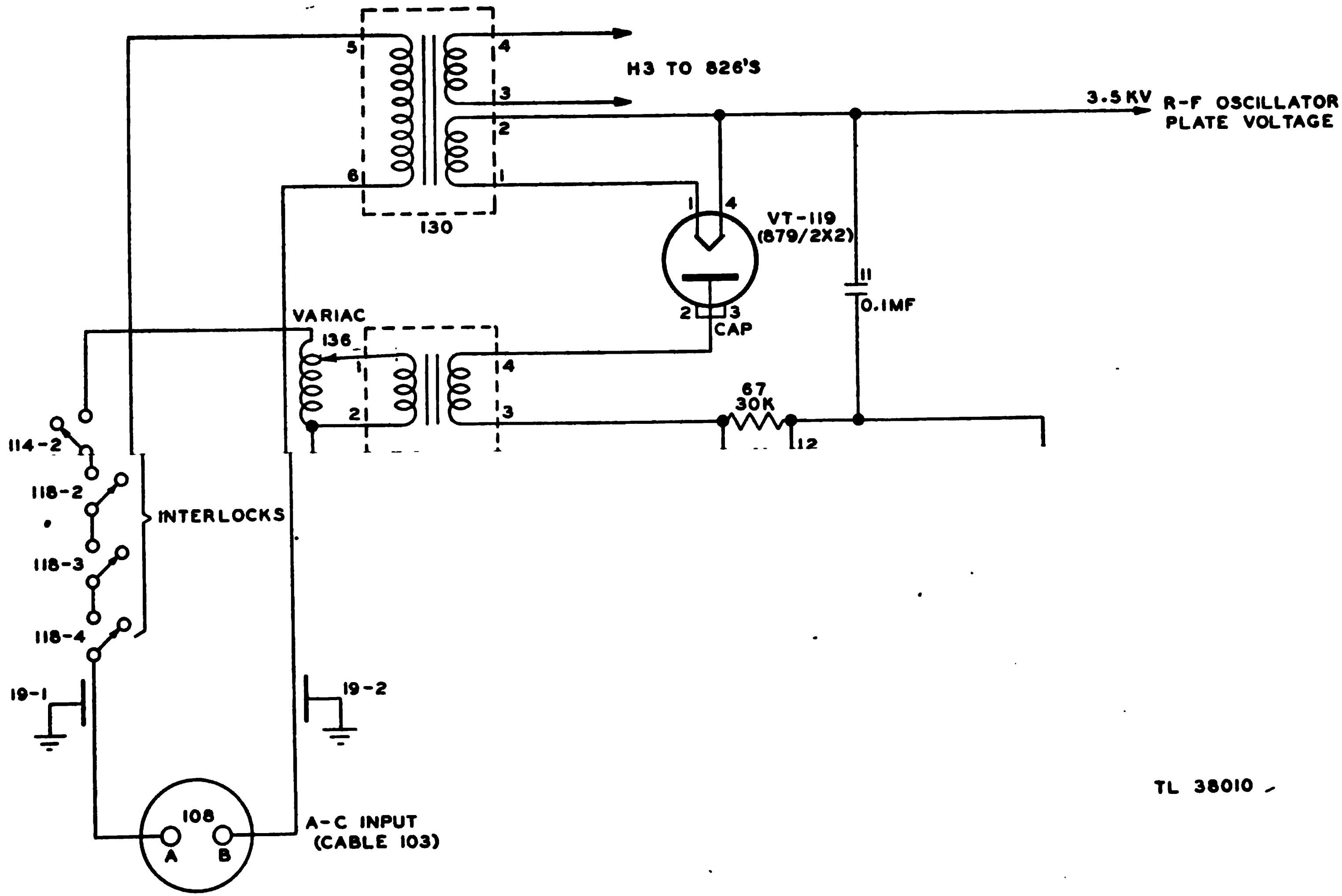


Figure 18. Power supply, partial schematic.

The 110–120-volt dial light 113 is connected so that it lights when the main circuit breaker is closed.

b. POSITIVE LOW-VOLTAGE POWER SUPPLY. The positive low-voltage power supply, transformer 132 and VT-244, is conventional. It supplies 350 volts d-c to the plates of the cathode followers VT-231 and VT-202, blocking oscillator tube VT-231, and modulator VT-100. Transformer 132 also supplies the filament voltage to tubes VT-244, VT-231, VT-202, 9006, and the meter light 112.

c. BIAS POWER SUPPLY. The bias or negative high-voltage power supply, transformer 133 and VT-244, is also a conventional full-wave rectifier except that the positive side is grounded. The output, –700 volts, is supplied to grids of the oscillator tubes and to the cathode of the modulator tube through resistor 70. Transformer 133 also supplies the filament voltage to tubes VT-94, VT-100, and VT-244 (H2 in fig. 18). The filament line is not grounded in order to avoid having a large difference in potential between the cathode and filament supply.

d. POSITIVE HIGH-VOLTAGE POWER SUPPLY. The positive high-voltage supply is composed of two transformers 130 and 131, and the half-wave high-voltage rectifier, VT-119. Transformer 130 supplies filament voltage for the r-f oscillator tubes and for the VT-119 rectifier. Variac 136 is provided in the primary of the high-voltage transformer 131 so that the output voltage of the power supply may be set at any value between 0 and 5,000 volts. The overload-relay circuit breaker 138 is provided to protect the high-voltage power supply in case of a serious overload or short circuit on the secondary side. Switch 116 is used to reset the overload relay from the front of the panel. Filter capacitor 11 has a capacity of 0.1 microfarad. The energy storage of this capacitor is sufficient to supply power to the r-f oscillator for the duration of the pulse without any appreciable drop in output voltage.

e. METER CIRCUIT. A meter is also provided in the transmitter high-voltage circuit and may be used to indicate either the voltage of the power supply or the current drawn by the r-f oscillator tubes (fig. 12). A spring switch 115 normally keeps the meter connected to read the power-supply voltage. In this normal position, the meter is shunted across one of the resistors (57–2) of the voltage-divider network which is connected in parallel with the output of the high-voltage supply. When the meter is used to indicate space current drawn by the transmitting tubes, it is shunted across resistor 73 in the cathode circuit of the transmitter tubes.

Section III. R-F SYSTEM

19. Purpose

The function of the r-f system is to conduct the r-f energy from the oscillator in the transmitter up to the radiating elements and radiate the energy into space. Between transmitted pulses the radiating elements become receiving elements which pick up the r-f energy from the transpondor and carry it down the transmission lines to the receiver.

20. General Description

The r-f system consists of an antenna, a coaxial transmission line, a rotary coupling box, an antenna matching section, and finally two separate coaxial cables. One carries the r-f energy from the matching section to the receiver and the other carries the r-f output of the transmitter to the matching section (fig. 19).

a. ANTENNA. The antenna is a vertically polarized broad-band directional array consisting of two dipoles, six reflectors, and a series of transmission lines used as matching transformers. Its functions are:

(1) To radiate the r-f output of the transmitter.

(2) To pick up the r-f signal generated by the transpondor in the interrogated aircraft.

b. ANTENNA ROTARY COUPLING. The antenna rotary coupling is a device through which the fixed portion of the transmission line is connected electrically and mechanically to the rotating portion. The details of the operation of this coupling device are given in chapter 3.

c. ANTENNA MATCHING SECTION. The antenna matching section is used to match the impedance of the transmission line to the impedance of the receiver and of the transmitter so that both components can use the same antenna and transmission line.

d. TRANSMISSION LINE. The transmission line and the cable connecting the antenna matching section to the receiver and transmitter are flexible coaxial cables with a characteristic impedance of approximately 50 ohms.

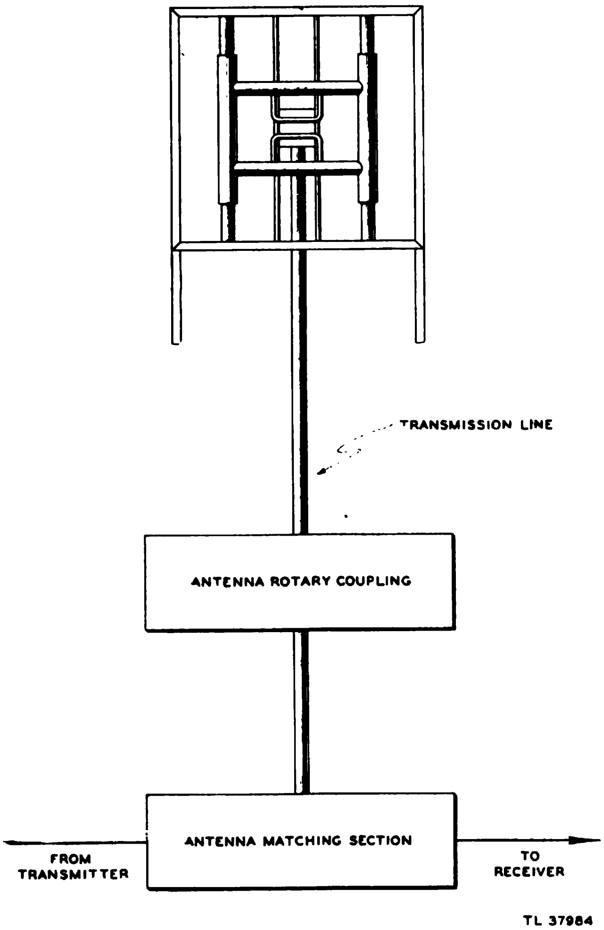


Figure 19. R-f system, block diagram.

21. Antenna

a. COMPONENTS OF ANTENNA ARRAY. The antenna consists of two vertical dipoles provided with reflectors, from which they are separated by ¼ wavelength metallic insulators (fig. 20). The physical spacing between dipoles is approximately 0.4 wavelength. Feeding the dipoles are two horizontal transmission lines in the form of metal tubes (B). Two Y-shaped impedance matching transformers (C) feed the transmission lines. The Y-shaped transformers are, in turn, fed by a quarter-wave section of transmission line (D), which is connected through coupling (E) to the transmission line from the transmitter.

b. CONSTRUCTION OF COMPONENTS. The dipoles, the Y-shaped matching transformers, and the horizontal transmission tubes are of large diameter. Construction of r-f conductors and radiators in this manner tends to lower their Q, makes their resonance curve less sharp, and allows them to operate in a uniform manner throughout a wide band of frequencies. Large diameters also make it possible to make the lengths of tuned elements somewhat shorter. The dipoles of this antenna are physically much less than ½ wavelength long.

c. FUNCTION OF MATCHING TRANSFORMERS. The transmitted pulse is conveyed through a series of matching transformers, which serve to match the impedance of the transmission line to that of the dipole and to feed the two dipoles in phase.

d. FUNCTION OF DIPOLES. The dipoles are vertically polarized. They are fed at two points approximately one-third from each end. This is a compromise between current and voltage feeding. They are designed to radiate effectively over a wide band of frequencies, 157 to 187 megacycles, without any marked discrimination between frequencies. Since the spacing between the dipoles is less than ½ wavelength (0.4 wavelength) there is some radiation to the side. Because of incomplete screening to the rear, there is considerable radiation in that direction also.

e. RECEPTION. Between transmitter pulses, the array acts as a receiving antenna. All frequencies within the transmitter range will resonate in the dipoles, and are conducted through the horizontal transmission tubes, the Y sections, the quarter-wave stub, and finally the coupling into the coaxial transmission cable.

22. 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 match-

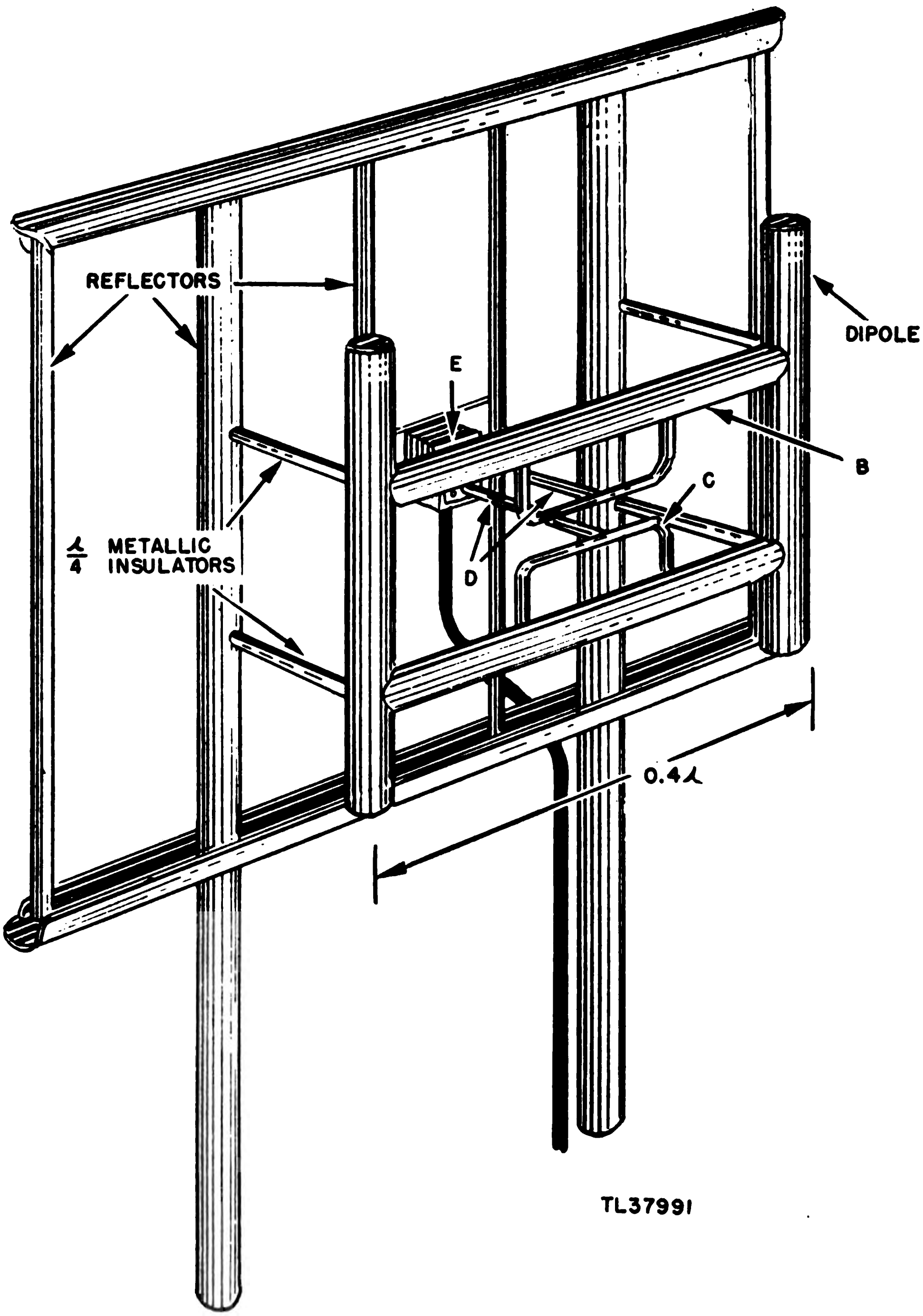


Figure 20. Antenna array.

ing section (fig. 21) which consists of two folded 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 (fig. 22).

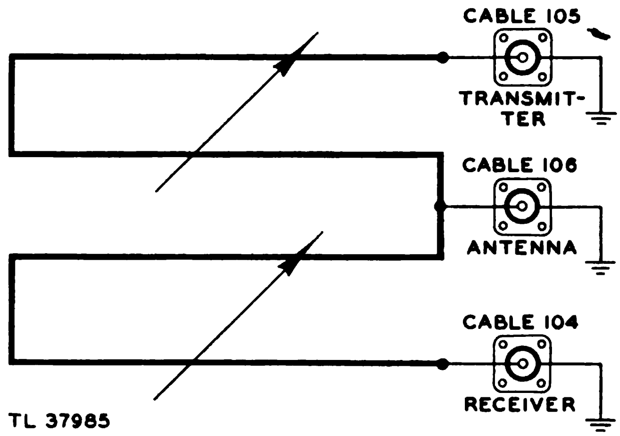


Figure 21. Antenna matching section, schematic.

a. 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 1 wavelength, the transmitter impedance will appear at the common terminal. A similar condition exists in the receiver branch of the section.

b. 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. The 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 66–1, and the receiver is ready to receive the return signal from the antenna.

c. 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.

d. The variable section must have sufficient adjustment to maintain a total of 1 wavelength; that is, to keep the total length of the fixed connecting cable plus the variable section 1 wavelength long between the limits of 157 and 187 megacycles. This requires a variation approximately 24 inches in length, but, since the sections are folded, a 12-inch change is sufficient. Actually, the total variation on the antenna matching section supplied in this equipment has been made slightly greater than 19 inches to insure ample adjustment range.

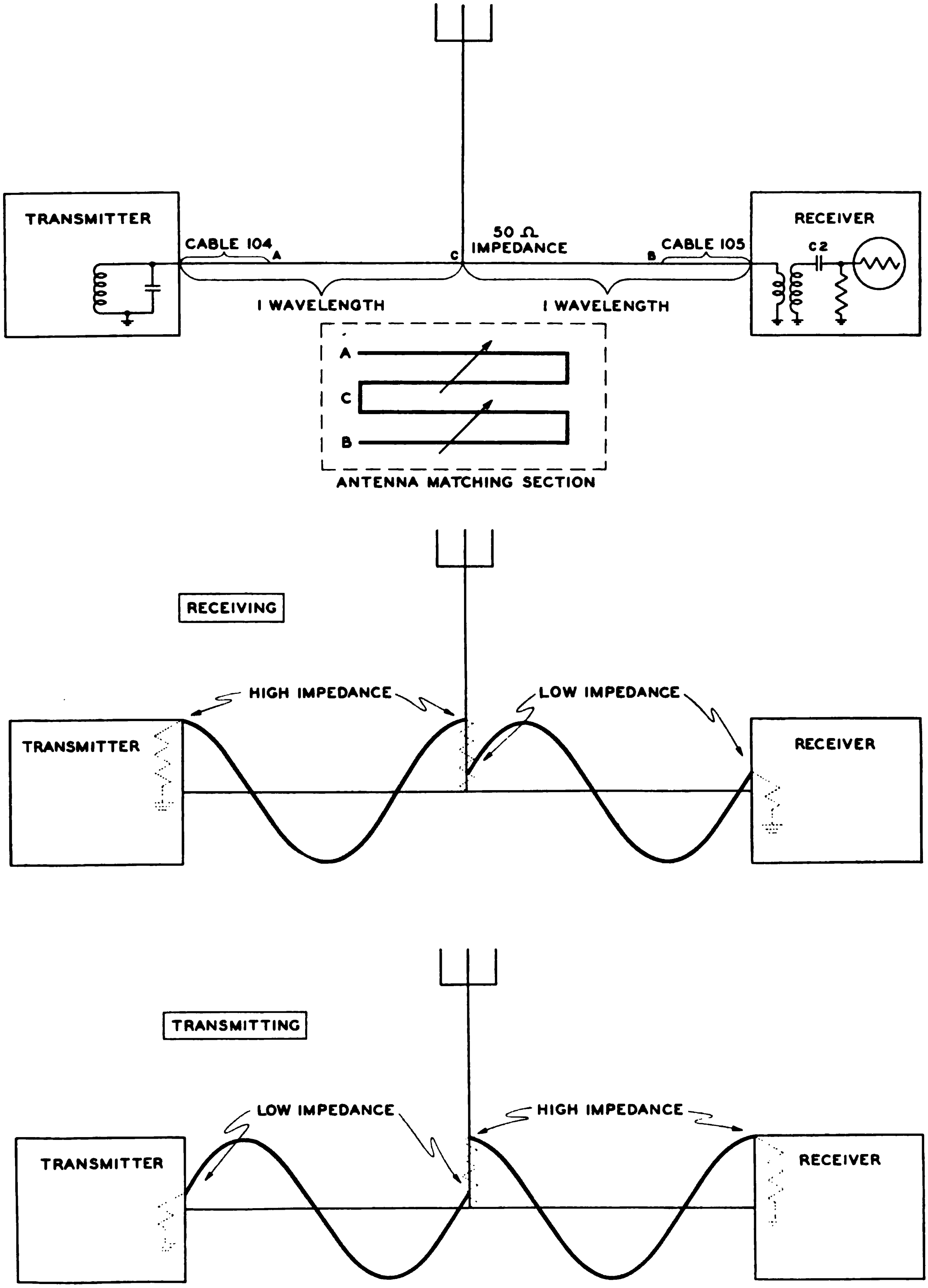


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Figure 22. T-R system.

Section IV. RECEIVER

23. Purpose

The function of the receiver is to detect and amplify the signals picked up by the antenna and to prepare them for presentation on the radar display oscilloscope.

24. General Description

This paragraph contains a general description of the main sections of the receiver. Paragraphs 25 through 36 contain a detailed description of the receiver circuits. The receiver is a 14-tube superheterodyne and consists of six sections: r-f section, i-f section, detector section, video section, tuning section, and power supply section (fig. 23).

a. R-F SECTION. The r-f section consists of two r-f amplifying stages, a local oscillator and a diode mixer. In this section, the r-f signal picked up by the antenna is amplified and mixed with the heterodyning frequency of the local oscillator to obtain the 11-megacycle intermediate frequency.

b. I-F SECTION. (1) This section consists of five i-f amplifiers which serve to amplify the 11-megacycle signal obtained from the mixer of the r-f section.

(2) The tuning of the i-f amplifiers is of the staggered type. That is, they are aligned or tuned to frequencies slightly above or below the center frequency, 11 megacycles, of the intermediate frequency band. This is done to achieve a wide band-pass amplification. The i-f amplifier section, when properly aligned, will pass a band of frequencies nearly 4 megacycles wide. In chapter 2 there will be a discussion of the alignment procedure.

c. DETECTOR SECTION. This section, consisting of one stage, is a diode detector. The input to the detector consists of pulses of the intermediate-frequency signal. The output signal consists of sharp pulses of negative polarity.

d. VIDEO SECTION. The video section consists of a video-amplifier stage and a cathode-follower stage. This section inverts and amplifies the signal from the detector.

e. TUNING SECTION. This section includes a diode stage and a tuning-eye indicator tube. The diode rectifies a small portion of the i-f signal and this voltage is used to actuate the tuning-eye indicator. The tuning-indicator tube is used to indicate when the r-f section is properly tuned and when the i-f stages are properly adjusted.

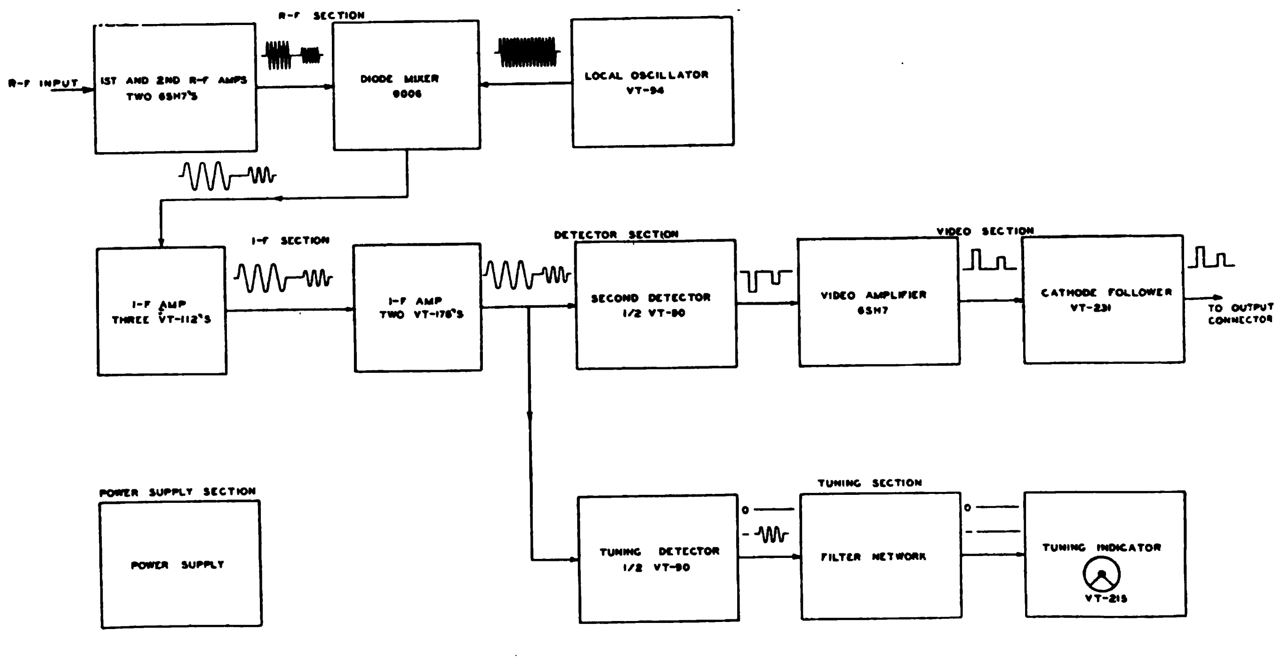


Figure 23. Receiver, block diagram.

f. POWER SUPPLY SECTION. The power supply section furnishes the voltages needed for all the various receiver stages.

25. First and Second R-F Stages

a. INPUT CIRCUIT. The radio energy which is picked up by the receiving antenna is fed to the receiver and is applied to the one-turn primary of the first r-f transformer. The method of coupling the antenna to the r-f section is shown in figure 24. The coupling coil consists of a half turn of silver-plated wire placed in axial symmetry with the first r-f amplifier tuning coil. The coupling coil is grounded at one end, and in series with it at the other end is capacitor 1 and the transmission line. The coupling coil and capacitor 1 are in series resonance at the middle frequency of the tuning range, allowing more current flow through the primary of the transformer and properly matching the input impedance to that of the transmission line. The lead from the coupling coil to the antenna-input connector on the rear channel of the receiver consists of a length of solid insulated wire inclosed in a hollow silver-plated brass tube used for shielding purposes. The impedance across the input terminals of the receiver is approximately 50 ohms over the tuning range.

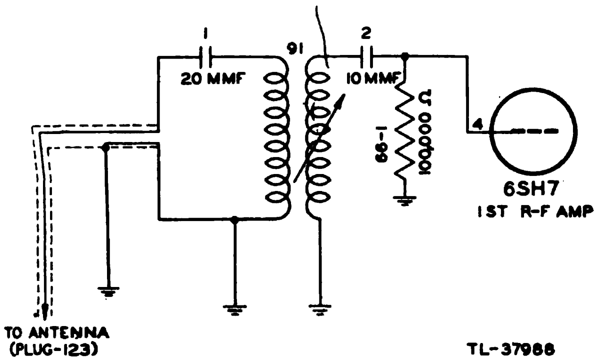


Figure 24. Coupling of antenna to r-f section.

b. PERMEABILITY OR REACTANCE TUNING. The secondary of this transformer, 91, which is made resonant to the received signal (157 to 187 mc), is tuned by means of an adjustable core, connected through a series of gears to a knob on the front panel of the receiver labelled ANT. This type of tuning is called reactance tuning. The inductance of the coil is decreased as the hollow silver plunger is inserted further in the coil windings. Since there are no capacitors across the coils, the capacity of the tuned circuits is dependent upon the distributed capacity of the coil windings and the interelectrode capacity of the tubes. The secondary of this transformer is resistance-capacitance coupled to the grid of the first r-f amplifier, a 6SH7 pentode. The usual precautions are taken to keep all interconnecting leads short; r-f bypass capacitors are extensively used.

c. OUTPUT CIRCUIT. The plate load 73–1 of the first r-f amplifier is a resistor and the output of this stage is coupled through capacitor 5–1 to another tuned circuit 92–1 (fig. 25). This second tuned circuit is adjusted by means of

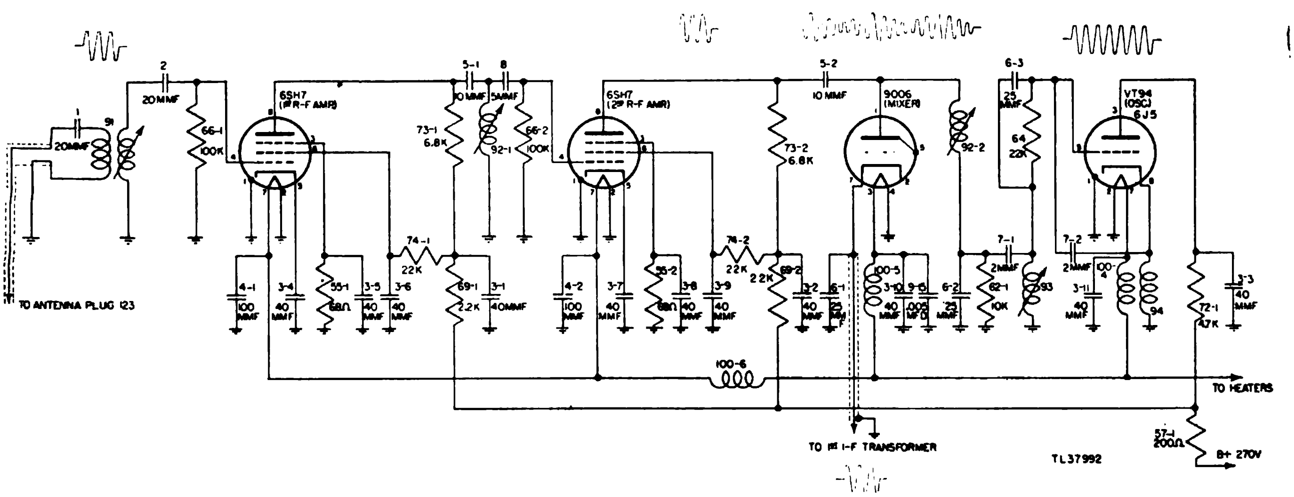


Figure 25. R-f section, partial schematic.

the knob on the front panel marked RF. The signal appearing across this tuned circuit is then RC coupled to the grid of the second r-f amplifier. The filament r-f choke 100–6 in the ungrounded side of the filament supply to these two tubes is used to prevent rf from breaking through to the filament supply. The plate load of the second r-f amplifier is a resistor 73–2. The output from this stage is coupled into the mixer by means of capacitor 5–2. The gain for the two r-f stages is approximately 2 per stage.

26. Local Oscillator

a. GENERAL. To generate the desired i-f signal of 11 megacycles, it is necessary to mix the r-f signal with the frequency of the local oscillator and tune the first i-f stage to the difference between the two frequencies. The local oscillator in this receiver (fig. 26), is a modification of the Colpitts type in which the plate capacitor is replaced by a coil 94. This coil is constructed to be resonant below the lowest operating frequency of the oscillator. There-

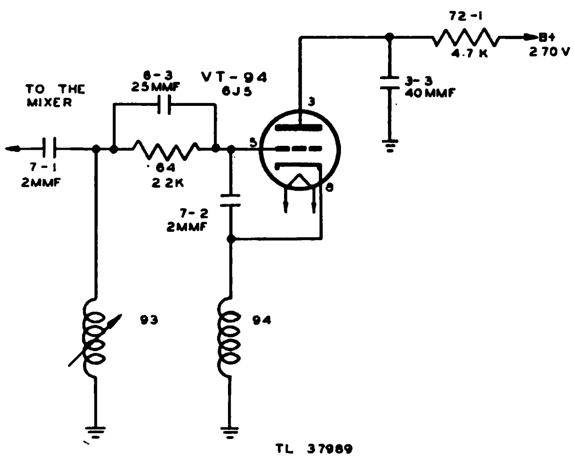


Figure 26. Local oscillator, partial schematic.

fore at the frequency of operation the coil functions as a capacitive reactance. The frequency of the oscillator is determined by capacitor 7–2 and the capacitive coil 94, in series, acting as a capacitor in resonance with coil 93 (fig. 27).

b. OPERATION. This circuit is tuned by varying the inductance of coil 93 in a manner similar to the permeability tuning of coils 91 and 92 in the r-f stages. The control, brought to the front of the panel by means of a gear arrangement, is labeled OSC. The oscillator is biased by the grid-leak capacitor combination 64 and 6–3. It will be found when tuning to the low end of the frequency range that two settings of the oscillator frequency can be used. One frequency is 11 megacycles above the signal and the other 11 megacycles below the signal. The latter one is the correct one to use. This circuit oscillates in the neighborhood of 60 megacycles, but the third harmonic of this frequency is used as the

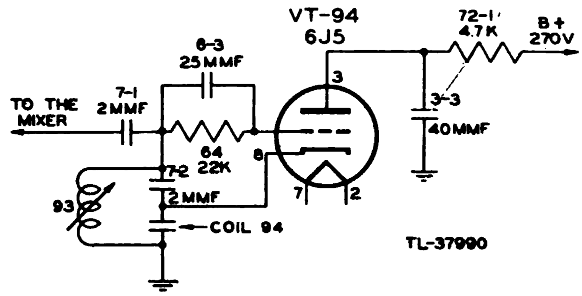


Figure 27. Local oscillator, equivalent circuit.

heterodyning frequency in the mixer stage. It is fed into the plate circuit of the mixer through the oscillator-coupling capacitor 7–1. A filament-choke 100–4 is used in this circuit as in the r-f and mixer circuits to prevent rf from leaking through to the filament supply.

27. Mixer Stage

a. GENERAL. The mixer stage in this receiver departs from the usual design practice in that a 9006 diode is used as the nonlinear device instead of the usual pentagrid converter. The advantage of this type of mixer circuit for an ultra-high-frequency receiver is that its output is delivered at a low noise level. The disadvantage is that a diode mixer produces no amplification. This, however, is compensated for in the high gain of the i-f stages.

b. OPERATION (fig. 28). The radio-frequency energy and the heterodyning frequency which is the output of the local oscillator are combined on the plate of the mixer tube. The r-f energy is passed to the mixer stage through capacitor 5–2 from the second r-f stage. The heterodyning frequency is passed to the plate of the mixer from the oscillator through capacitor 7–1. Inductance 92–2 acts as a parallel-tuned circuit, sharply tuned to 170 megacycles which will, therefore, offer maximum impedance to the 170 megacycles but will allow other frequencies to

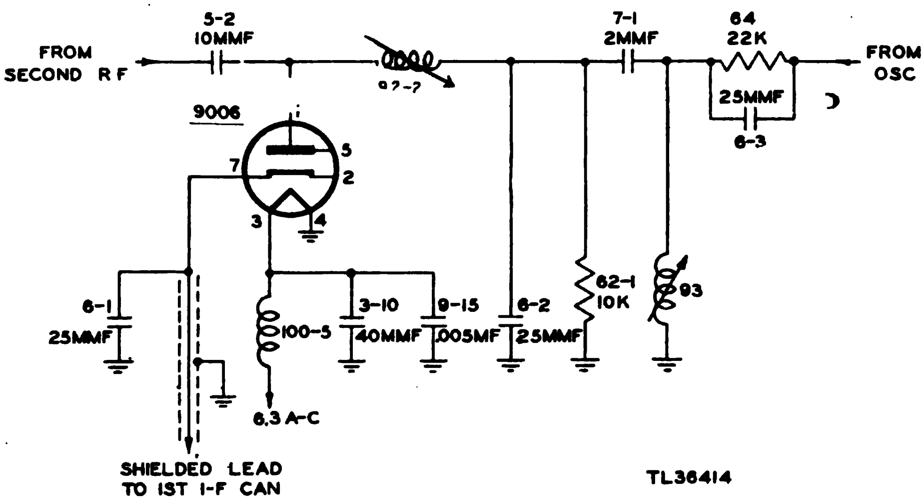


Figure 28. Mixer stage, partial schematic.

pass through. The purpose of this tuner circuit is to prevent the 170 megacycles in the r-f stages from going into the oscillator circuit. On the other hand this tuned circuit allows the frequencies generated by the oscillator to be applied through inductance 92–2 to the plate of the mixer. These frequencies are combined and give the sums, the differences, the original frequencies, and several harmonics on the plate of the mixer. All these frequencies are passed through the tube to the cathode and conducted through a shielded lead to the first i-f transformer. The i-f transformer is really a parallel-tuned inductance 101 in a shielded can and not the usual two-winding transformer (fig. 29). It is tuned to 11 megacycles and it will offer little resistance to all frequencies except 11 megacycles so that any other frequency will be shorted to ground and cause a negligible voltage drop across the tuned inductance. As this inductance offers maximum impedance to 11 megacycles, a voltage drop will develop across the circuit at this frequency and it is directly applied to the grid of the first i-f amplifier.

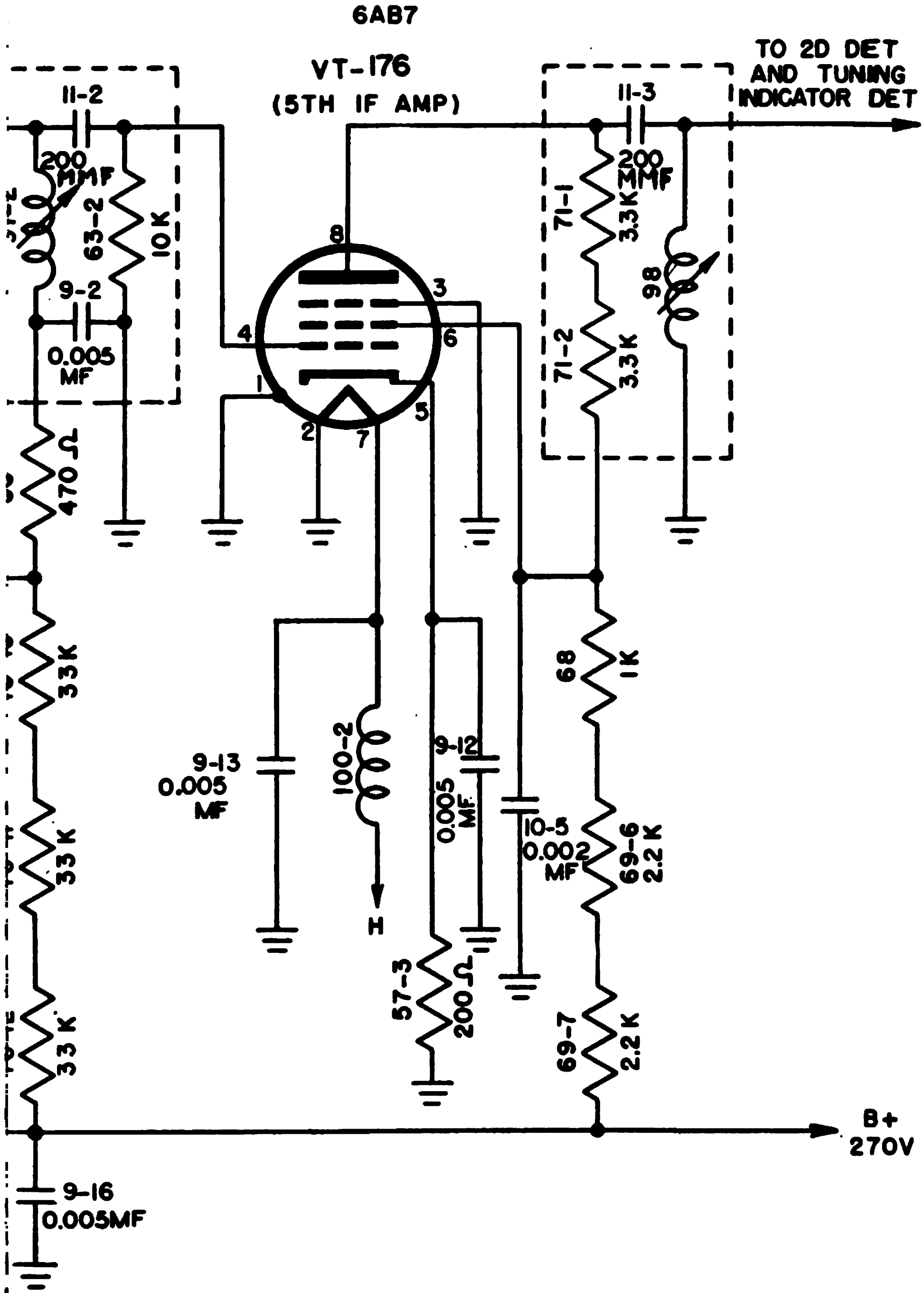
c. INTERMEDIATE FREQUENCY. This 11-megacycle i-f frequency is the difference frequency obtained by heterodyning the input signal in the r-f stages with the third harmonic of the oscillator. For example, if the incoming signal is 167 megacycles, the local oscillator is tuned to 52 megacycles so that its third harmonic, 156 megacycles, combines with the incoming r-f signal to give a difference frequency of 11 megacycles.

28. First, Second, and Third I-F Stages (fig. 29)

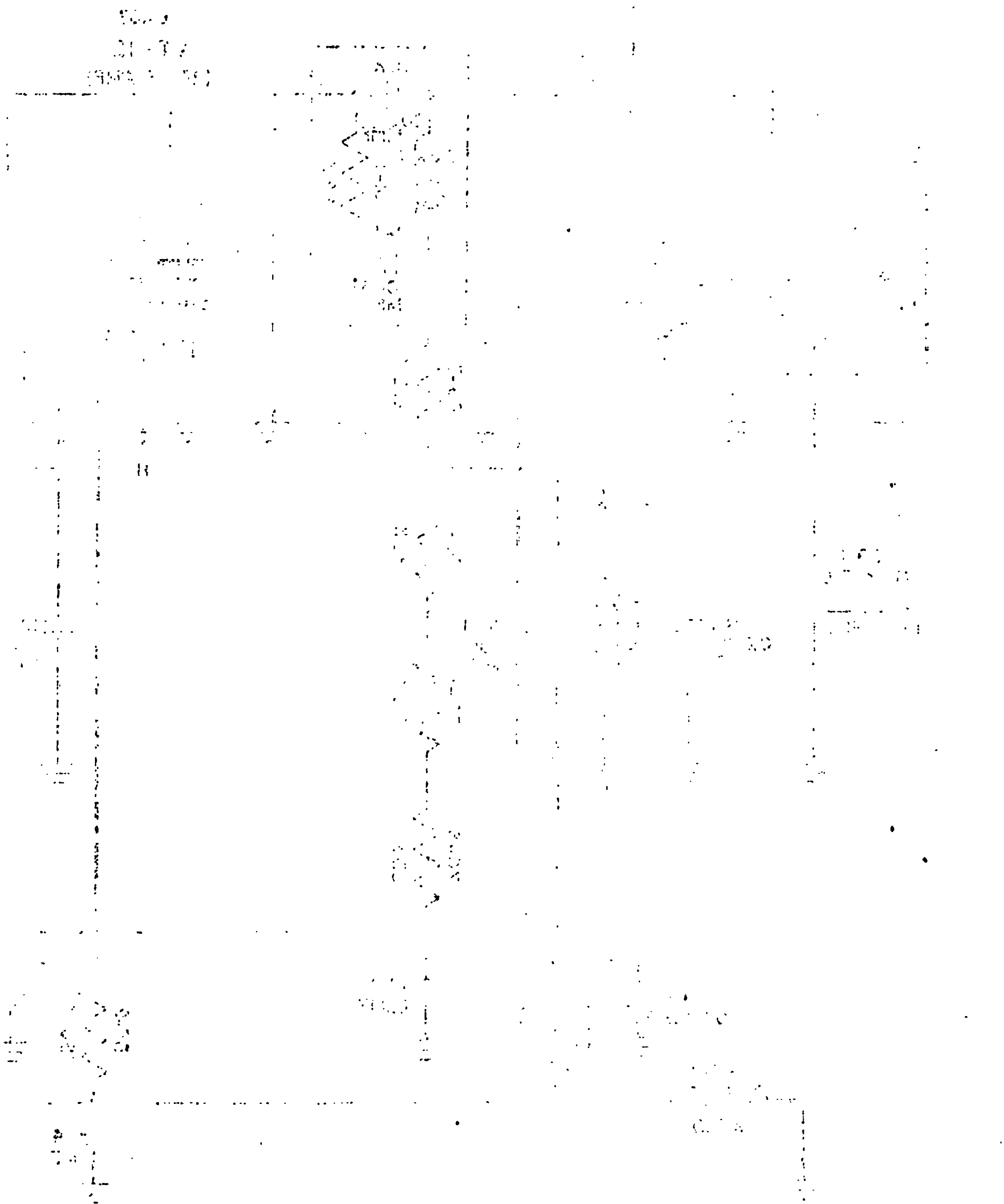
a. GENERAL. The first three i-f amplifier stages use 6AC7's and utilize a tuned inductance in the plate load (96–1, 97–1, 96–2). Each of these inductances is in resonance with the input capacitance of the associated tube, augmented by the stray circuit capacitance and the distributed capacitance of each coil, and acts as a tank circuit. The inductance of each coil is adjusted by means of a powdered iron core. The plate-load inductances in these stages are followed by networks consisting of two capacitors and a resistance for coupling the output to the following tube.

b. BROAD BAND PASS. The partial schematic of figure 30 shows the tuned inductance 96–1, the two capacitors 9–3 and 11–4, and the resistor 61–1 which are between the first and second i-f stages. Note that the grid resistor 61–1 is effectively in parallel with the tuned circuit since the coupling capacitor and bypass capacitor have a negligible reactance at the intermediate frequency and therefore act as low-resistance paths for the i-f signal. All these grid resistors are low in value and tend to damp or broaden the response of the tuned circuit and make it tune less sharply. This is desirable in order to achieve a broad band-pass response.

c. GAIN CONTROL. The gain-control provision in this receiver is in the first three i-f amplifiers and consists of a manual gain control which is physically located in the control unit. This is a variable resistor connected in the


6AB7
VT-176
(5TH IF AMP)
TO 2D DET
AND TUNING
INDICATOR DET
11-2
200
MMF
63-2
10K
9-2
0.005
MF
470 Ω
33K
33K
33K
9-16
0.005MF
8
3
4
6
1
2
7
5
11-3
200
MMF
71-1
3.3K
98
71-2
3.3K
68
1K
9-13
0.005
MF
100-2
H
9-12
0.005
MF
10-5
0.002
MF
69-6
2.2K
57-3
200 Ω
69-7
2.2K
B+
270V

TL 37993



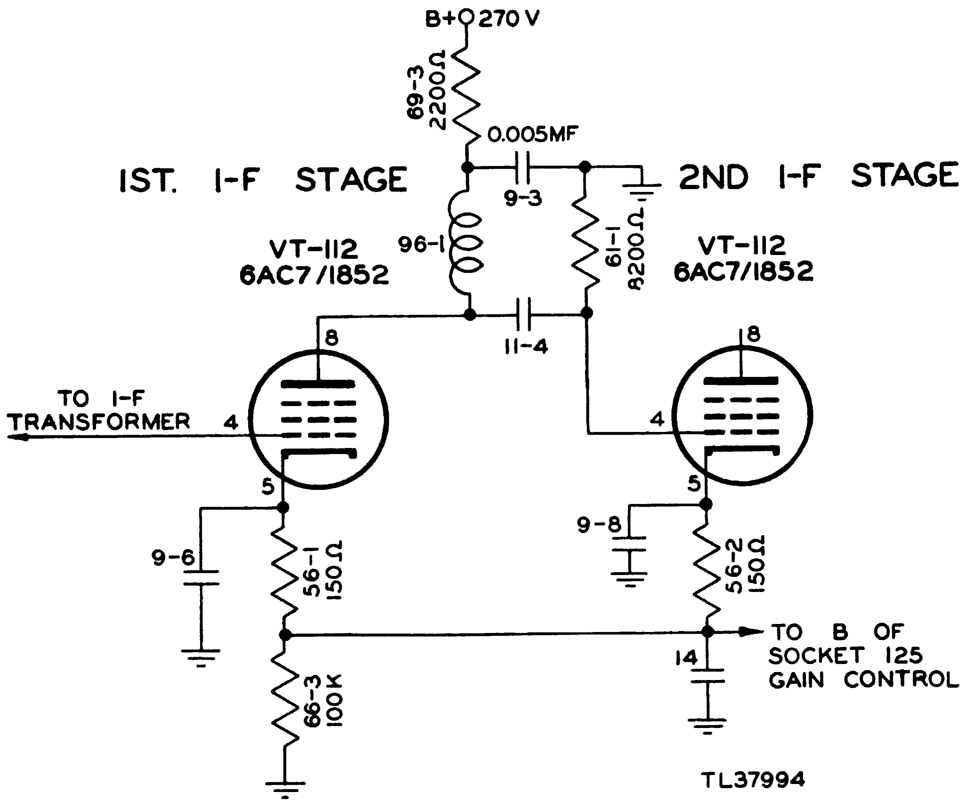


Figure 30. I-f transformer, partial schematic.

cathode-return circuit of these three amplifiers. Increasing the resistance in this circuit puts relatively large positive values of voltage on the cathodes of the first three tubes. This, in effect, puts negative voltage on the grids of the tubes, which reduces the amplification of the first three stages. Putting less resistance in the circuit reduces the negative voltage on the grids and increases the amplification of the first three i-f stages. The gain of each of these stages is approximately 12, but due to the staggered tuning the effective over-all gain of the individual stages is approximately 8 per stage.

29. Fourth and Fifth I-F Stages

a. GENERAL. These stages use 6AB7 tubes (VT-176). With the exception of the gain control connections, these intermediate stages are similar to the first three i-f amplifiers in their cathode, screen, and plate-supply circuits. A fixed resistor in the cathode of each stage provides proper bias. The plate load of the fifth i-f is a resistor, rather than a tuned inductance, and the tuned circuit is placed in the cathode of the diode detector. Both of these comprise the sixth i-f coupling circuit or tuning can.

b. DECOUPLING. The decoupling circuit for the filament power supply consists of coil 100–2 and an i-f bypass capacitor 9–13. Its purpose is to keep the i-f voltages out of the power supply by bypassing them to ground through the capacitor and by offering a high series impedance in the path to the power supply.

30. Second Detector

The second detector uses one-half of the double diode VT–90 and associated circuit components (fig. 31). The diode whose cathode is tied directly to the second detector-tuned circuit 98 is the detector diode. The incoming i.f. impresses a voltage across this tuned circuit which lies between the cathode and ground. The alternations of polarity of the i.f. make the cathode potential alternately positive and negative. On the positive half cycles, no conduction by the tube occurs since the diode will pass current in only one direction. On the negative half cycles, however, the cathode is negative with respect to the plate and current flows through the tube. The resistance-capacitor combination, resistor

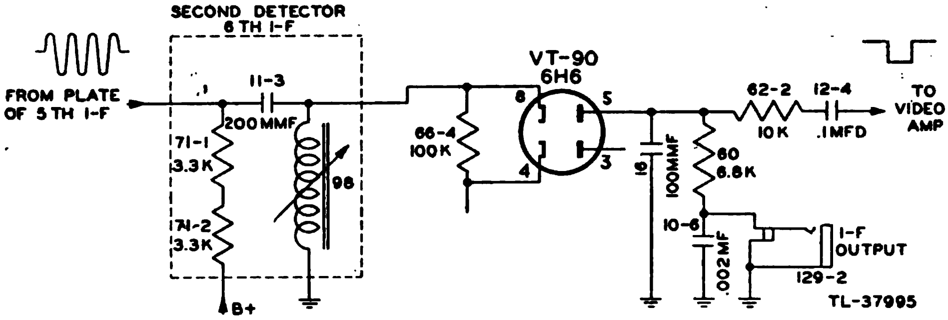


Figure 31. Second detector, partial schematic.

60 and capacitor 16, is the load across which the rectified output is developed. The capacitor is of such value as to short-circuit the i-f to ground but acts as a high impedance to the video-frequency components. Resistor 60 also acts as a dropping resistor when a plug is inserted in jack 129–2. This jack provides a means of measuring the rectified current and may be used in the alignment procedure. Inductances 100–3 and capacitor 9–5 are in the filament circuit to keep i.f. out of the filament supply (fig. 128).

31. Video Amplifier

The video amplifier or output amplifier consists of a 6SH7 pentode tube. Figure 32 is a schematic diagram of this section. The detector output, which consists of very sharp pulses, is fed into the video stage. The leading and trailing edges of these pulses require the transmission of all frequencies from the audio-frequency range to as high as 250 kilocycles. This is accomplished by the wide-frequency response of the stage due to the characteristics of the tube and the circuit elements. Low-frequency compensation is obtained by use of the capacitor 13–1 and resistor 72–2 network; high-frequency compensation is assured by the low internal capacitance of the tube. In addition, since no cathode bypass is used, negative feedback is introduced and the frequency response of the amplifier is improved. The input to this stage

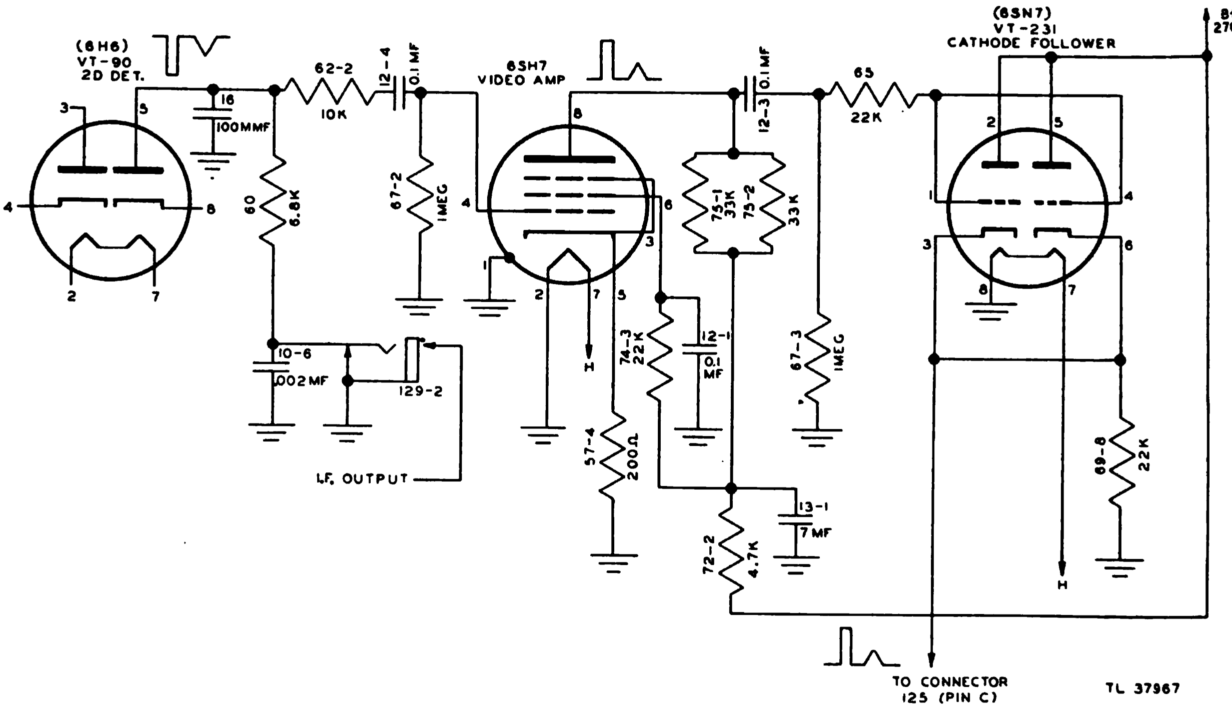


Figure 32. Video section, partial schematic.

is a negative pulse and the output, consequently, is a positive one.

32. Cathode Follower

The output of the video stage is coupled to another tube, a 6SN7 (VT-231), which is used as a cathode follower. This tube is a duo-triode and the two sections of the tube are connected in parallel. One of the advantages of a cathode follower is that it has a low-output impedance. The output impedance of this circuit is about 200 ohms which is fairly close to the impedance of the line which connects this tube with the IFF-switching channel of the interconnector. The advantage presented by a low-impedance line is that it will pick up less interference than one of high impedance. Since the RC-150 IFF equipment is located near the transmitter of Radio Set SCR–270, the problem of keeping the interference between these sets to a minimum is one which requires careful design and planning. Since the output is obtained from the cathode circuit, there is no phase inversion and the output signal remains a positive pulse.

33. Tuning Indicator Detector

The diode in VT-90 using pins 3 and 4 is the detector for the tuning indicator (fig. 33). A portion of the incoming intermediate frequency from the sixth i-f transformer is fed through resistor 66–4 to the tuned circuit in the cathode of the detector. The purpose of 66–4 is to make the diode appear to have a high-impedance input and so reduce the loading effects of the tuned circuit (L99 and 5–3) on the sixth i-f transformer. Because the tank circuit is tuned to 11 megacycles, it will cause a maximum impedance and voltage drop across the tank at this frequency. As a result, the cathode of the detector goes negative on each alternate half-cycle of the 11-megacycle voltage and causes the detector to conduct. To voltages of other frequencies, the tank is a low impedance and the cathode is practically shorted to ground. An increased flow through the tube causes an increased voltage drop across resistor 67–1, which is the load resistor for the diode, and makes the plate more negative. This results in a more negative voltage at the top of resistor 67–1 (load resistor) and, finally, on the grid of the tuning eye.

34. Filter Network

The rectified intermediate-frequency voltages travel from the plate of the detector to an RC network consisting of C12–2, R66–5, C9–17, R66–6. R67–1 is a load resistor for the diode and the rectified voltage is developed across it. The capacitors to ground will bypass both intermediate frequency and audio variations. Resistors 66–5 and 66–6 are attenuating resistors which bring down the value of the voltage on the grid of the tuning indicator and also help with the filtering action.

35. Tuning Indicator

The tuning indicator tube is essentially a triode (fig. 34). However, at the top of the tube the plate and grid are cut away and a round fluorescent target is placed around the cathode.

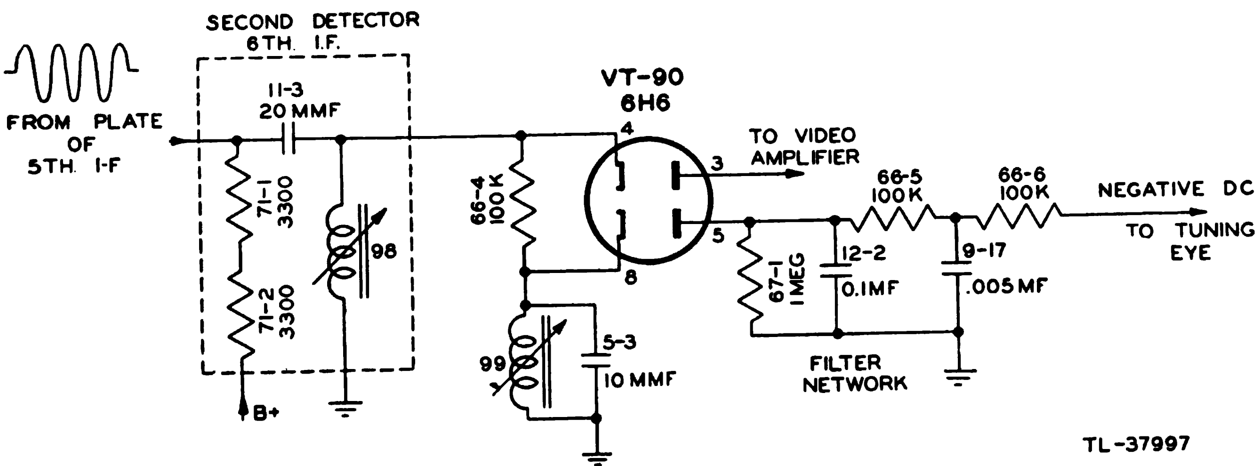


Figure 33. Tuning indicator detector, partial schematic.

When the cathode is emitting and the target is at a positive potential, it will draw electrons from the cathode and the target will glow with a green light. Between the cathode and the target is a small electrode which is connected

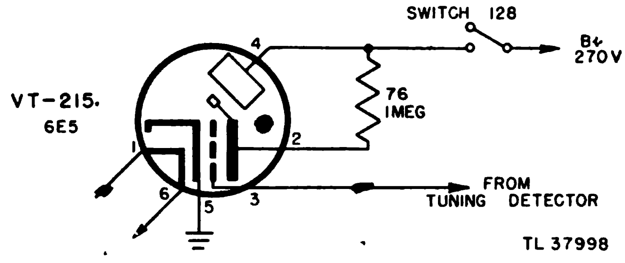


Figure 34. Tuning indicator, partial schematic.

to the plate and held at plate potential. The target is at B+ potential and the plate and its small electrode are connected to B+ through a 1-megohm resistor 76, in the tuning indicator socket. When a negative voltage applied to the grid of the indicator keeps plate current from flowing, no drop through R76 occurs. The target, plate, and small electrode are at the same potential and the small electrode offers no interference to the flow of electrons to the target which remains completely green. When a positive voltage is applied to the grid of the tuning indicator, a large current flow through the tube results. This brings about a large voltage drop through R76 and makes the plate and the small electrode much more negative than the target. Thus, it tends to repel electrons flowing from the cathode to the target. This repelling action causes the area of the target directly behind the small electrode to get no electrons and not to fluoresce. A shadow on the tuning-eye screen is the result. Thus, the more negative the voltage applied to the grid of the indicator, the smaller the shadow becomes. An increased signal to the detector gives an increased negative voltage on the indicator grid. Therefore an increased intermediate-frequency signal will result in a very small shadow or no shadow and the target will be completely green. Tuning adjustments are made to get as narrow a shadow as possible. The tuning-indicator stage has a switch in the plate-potential line which opens when the front panel of the receiver is closed, thus prolonging the life of the fluorescent surface in the tube.

36. Power Supply

The power supply receives its 110–120 volts a-c from the transmitter through cable 102 to the connector 124 (fig. 35). The power switch 127 is a double-pole single-throw switch; a fuse 135 in the primary circuit of the transformer protects the transformer and other elements in the circuit. There are three secondary windings in the transformer. One of these furnishes 6.3 volts alternating current to the heaters of the receiver tubes. The other two windings furnish filament and plate voltage for the rectifier tube. This rectifier is a full-wave rectifier with a filter

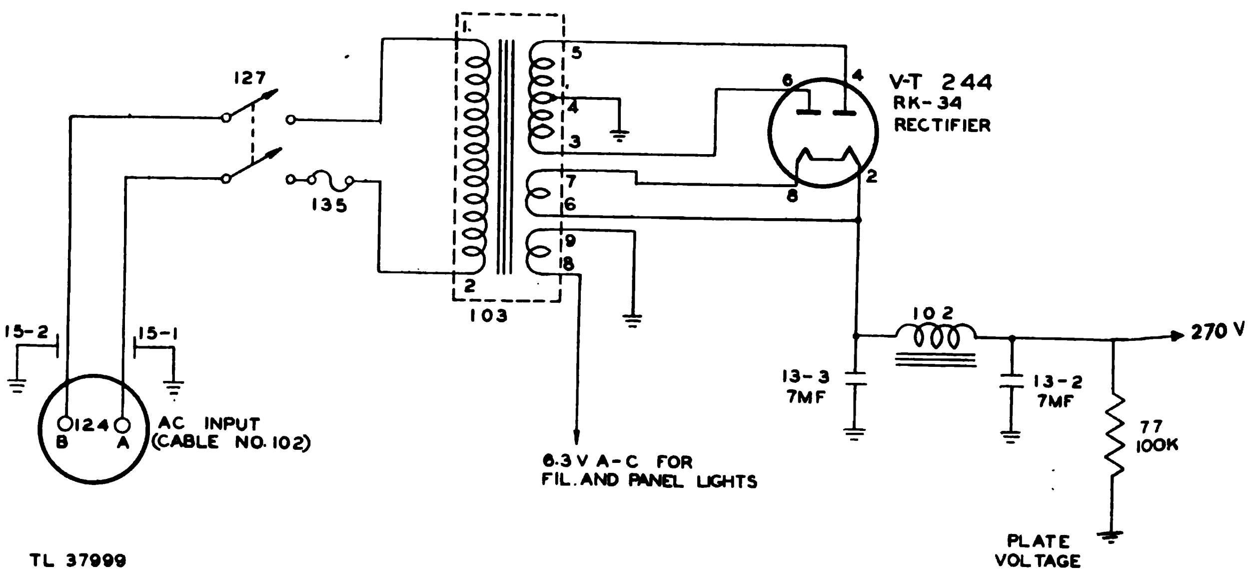


Figure 35. Power supply, partial schematic.

circuit composed of capacitor 13-3, inductance 102, and capacitor 13-2. The d-c output appears across the bleeder resistor 77 and is approximately 270 V.

Section V. INTERCONNECTOR

37. Purpose

The purpose of the interconnector is to coordinate the functions of the IFF transmitter and receiver with those of the radar set.

38. General Description

Figure 36 shows the relations of the interconnector within the radar set and identification equipment. The 625-cycle sine wave generated in the radar oscilloscope synchronizes the operation of the different components of the radar set; this same 625-cycle sine wave is fed to the interconnector and serves as the tie that binds the different components of the IFF equipment together with the radar set. It is from this voltage that the interconnector forms the pulse that triggers the IFF transmitter, which it synchronizes with the radar transmitter. This voltage is further used to time the action that places the radar and IFF received replies on the radar oscilloscope screen so that the two displays are seen together.

39. Specific Functions of Interconnector

The general purpose of the interconnector can be divided into several specific functions. The various functions are performed in different *channels* or groups of circuits. The detailed analysis of circuits will follow the arrangement of these channels. The channels and their corresponding functions are:

a. The division channel selects one out of every four cycles of the 625-cycle synchronizing signal.

b. The transmitter trigger channel forms the pulse that triggers the IFF transmitter.

c. The blanking channel provides voltages which are used to operate the switching channels.

d. The radar and IFF switching channels provide a switching arrangement which places the radar echo and the identification response alternately on the radar oscilloscope screen in such a way that they appear simultaneously.

e. The test channel provides test circuits that enable the operation at important points in the circuit to be monitored by using the test oscilloscope.

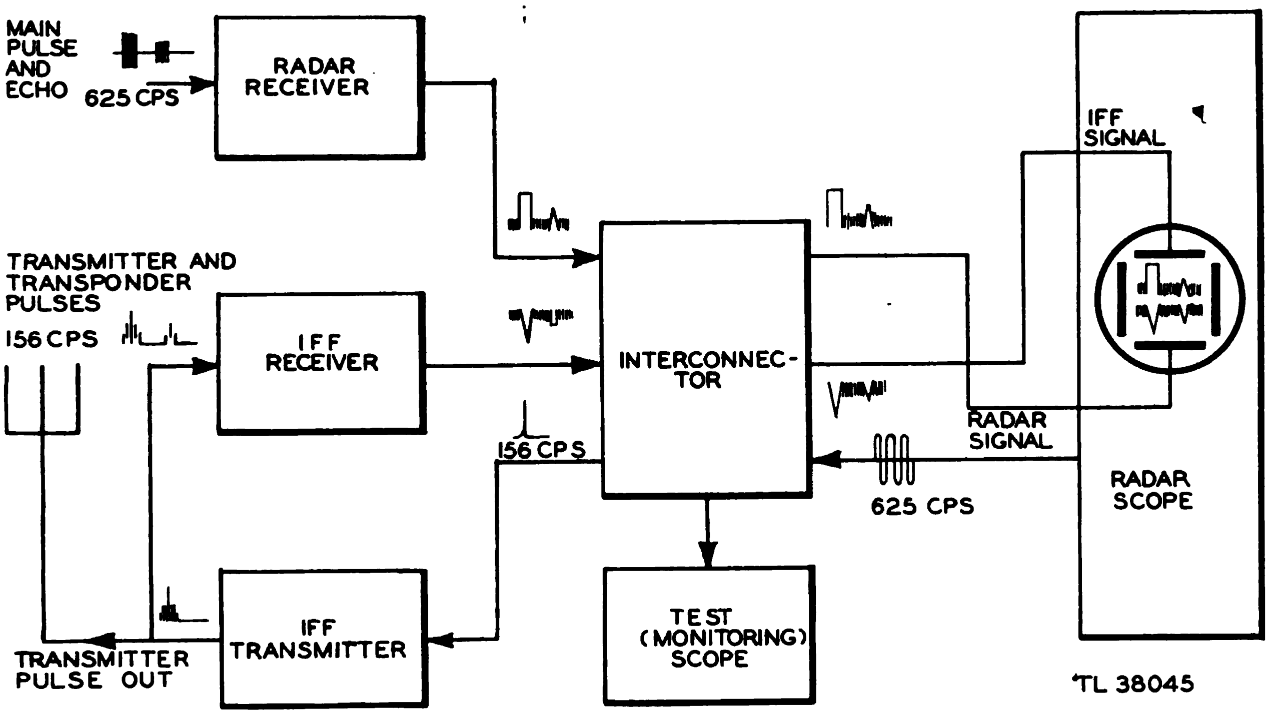


Figure 36. Relation of interconnector to identification system.

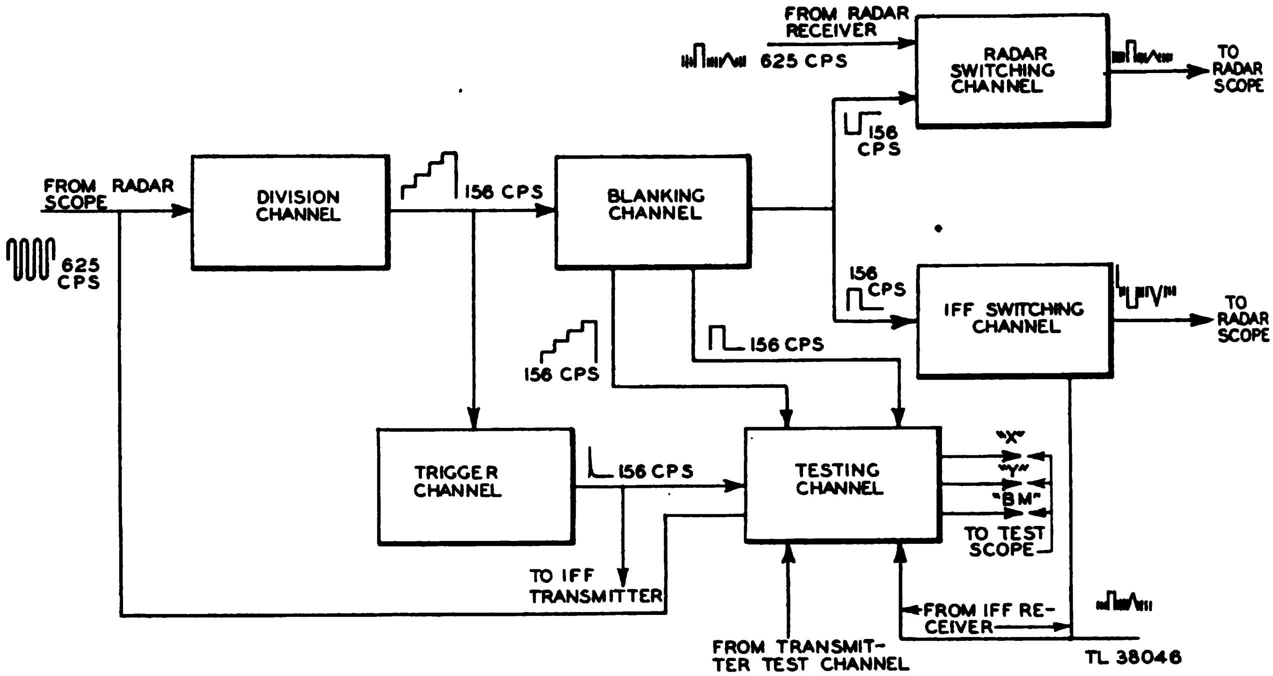


Figure 37. Interconnector, channel diagram.

40. Division and Trigger Channels

It is desirable to use a lower recurrence frequency in the IFF transmitter than the radar recurrence frequency of 625 cycles per second. First, a lower frequency will guard against *over-interrogation* of the transpondor, or triggering it so frequently in regions where there are many IFF sets that the transpondor cannot respond to all challenges. Further, a lower average power drain is required with the same peak power output. The recurrence frequency in this equipment is ¼ of 625 cycles, or 156 cycles per second. The division channel is so designed that only every fourth cycle of the 625 cycle input signal is accepted and shaped to form the pulse that is sent to trigger the transmitter. The division channel divides the frequency; the transmitter trigger channel shapes the trigger pulse from this divided frequency.

41. Blanking and Switching Channels

a. The radar and IFF replies appear to be present simultaneously on the radar oscilloscope. The radar signals are applied to the bottom vertical deflection plate of the radar oscilloscope as a negative voltage. The IFF signals are applied to the top plate also as a negative voltage. This plate is connected directly to ground when no IFF equipment is used with the radar. It is also grounded when the STANDBY-OPERATE switch of the IFF is in the STANDBY position. If both signals were applied at the same time, the voltages would tend to cancel each other and the image would be the resultant of the two applied voltages. It is impossible to put both sets of signals on the scope at the same time and have each clearly distinguished. In order to avoid this, the radar signal is applied to the vertical plates and the IFF signal is cut off during three out of every four sweeps of the electron beam across the scope screen. During the remaining sweep, the IFF signal is applied to the vertical plates and the radar signal is cut off. Because of the persistence of fluorescence of the screen and normal persistence of vision, the two signals appear to be on the screen all the time (fig. 38).

b. The division channel, when it divides the 625-cycle signal so that the pulse formed to trigger the IFF transmitter has a recurrence frequency of 156 cycles, it also initiates a 1,600-microsecond pulse in the blanking channel that starts at the same time as the transmitter pulse. This pulse synchronizes the switching operation in the radar and IFF channels through which the output of the radar and IFF receiver must

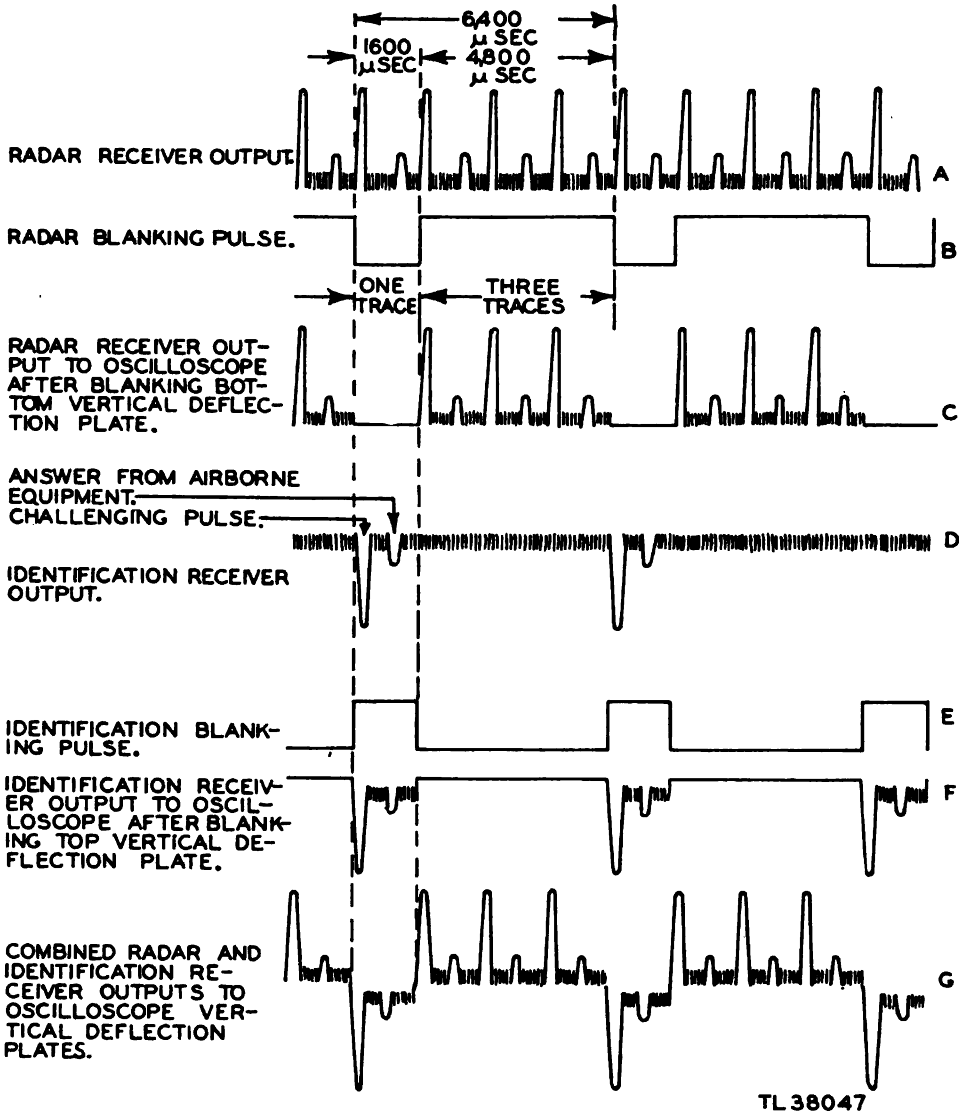


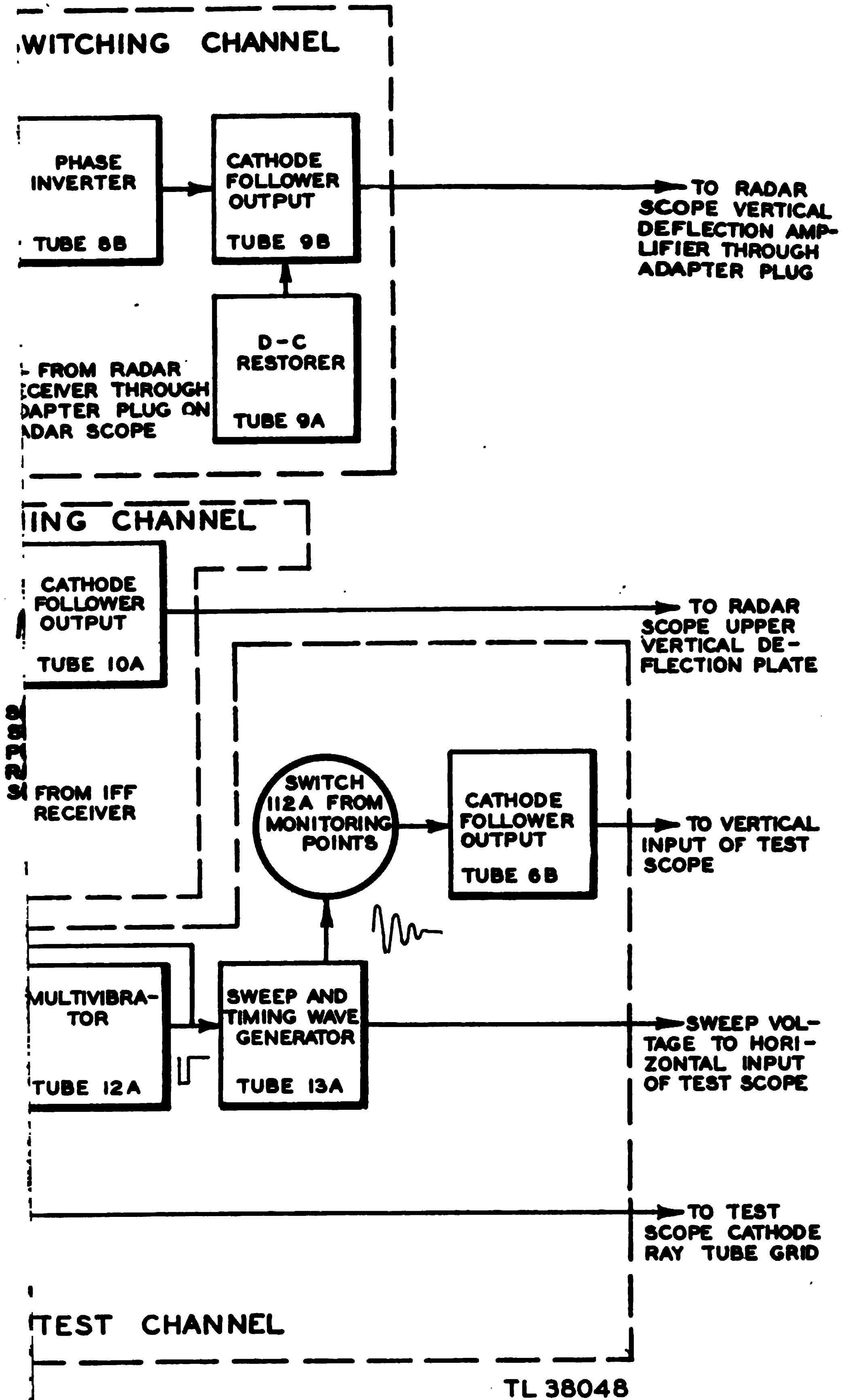
Figure 38. Oscilloscope time-sharing by radar and identification receivers.

pass before being placed on the scope. Taken off as a positive voltage from the blanking channel, it is sent to the IFF switch channel to make the channel operative for a 1,600-microsecond period, or one trace on the oscilloscope. Taken off as a negative voltage, it is sent to the radar switch channel as a blanking voltage to cut off the radar signal for the same 1,600-microsecond period. For the remaining three 1,600 microsecond periods or 4,800 microseconds, the IFF channel is inoperative and the radar signal is conducted through to the radar oscilloscope.

c. It is further necessary to separate the radar and IFF baselines on the scope, otherwise the echoes would extend above and below the same baseline and the two pictures would be confused. In the IFF switch channel a negative *pedestal* voltage is added to the IFF output voltage that displaces the IFF display a short distance below the radar baseline. This is called *baseline separation.*

42. Test Circuits

Test circuits are provided for use with the test oscilloscope. The operation of the transmitter, receiver, and various crucial points in the interconnector can be tested by using these circuits and the test scope.


WITCHING CHANNEL
PHASE INVERTER
TUBE 8B
CATHODE FOLLOWER OUTPUT
TUBE 9B
TO RADAR SCOPE VERTICAL DEFLECTION AMPLIFIER THROUGH ADAPTER PLUG
D-C RESTORER
TUBE 9A
FROM RADAR
CEIVER THROUGH
DAPTER PLUG ON
ADAR SCOPE
ING CHANNEL
CATHODE FOLLOWER OUTPUT
TUBE 10A
TO RADAR SCOPE UPPER VERTICAL DEFLECTION PLATE
FROM IFF RECEIVER
SWITCH 112A FROM MONITORING POINTS
CATHODE FOLLOWER OUTPUT
TUBE 6B
TO VERTICAL INPUT OF TEST SCOPE
MULTIVIBRATOR
TUBE 12A
SWEEP AND TIMING WAVE GENERATOR
TUBE 13A
SWEEP VOLTAGE TO HORIZONTAL INPUT OF TEST SCOPE
TO TEST SCOPE CATHODE RAY TUBE GRID
TEST CHANNEL
TL 38048

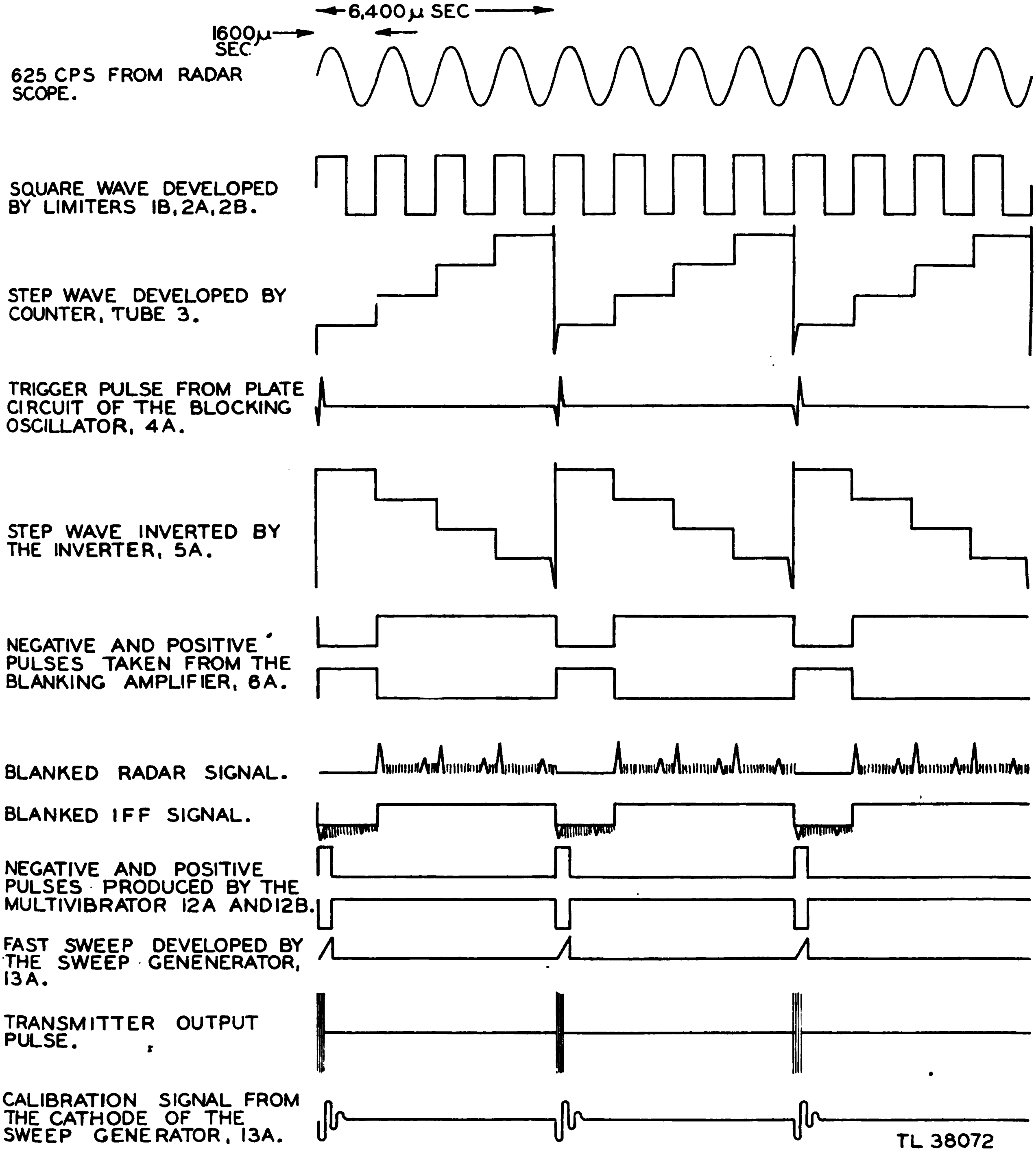


Figure 40. System waveforms.

43. Division Channel

As indicated in the block diagram of the interconnector (fig. 39), the division channel includes the following stages:

a. The phase shifter (tube 1A) shifts the phase of the 625-cycle sine wave input obtained from the radar oscilloscope. The main pulses from both the radar and IFF transmitters must be directly in line on the oscilloscope so that the replies will be beneath the corresponding echoes. However, the time delays and phase shifts

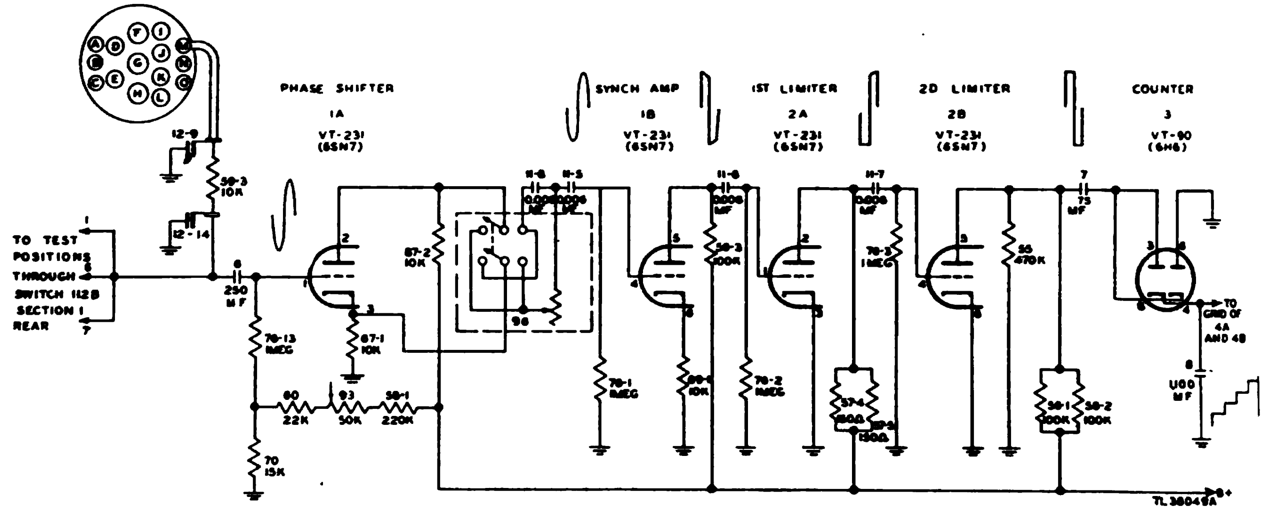


Figure 41. Division channel, partial schematic.

through the different circuits of the radar and IFF will probably be unequal. At some point in the circuit a corrective phase shift will have to be introduced. This is accomplished here by using a variable phase shifter (operated by the PHASE control) so that the phase and thus the position of the main IFF pulse can be varied from outside the set. This avoids the necessity of making elaborate calculations as to the phase shift in every stage, and the differences in phase shifts that would occur in different sets.

b. The sync amplifier (1B) amplifies and slightly flattens the signal output from the phase shifter network.

c. The first and second limiter (2A and 2B) are two similar stages which further square the sine wave output of the phase shifter. The output of the second limiter is a rectangular wave.

d. The counter, or stepping diode (3), forms a step waveform, one step for each cycle of the input square wave. Every fourth step is used to trigger the blocking oscillator and blanking channel circuits.

44. Input and Phase Shifter

The 625-cycle input synchronizing signal from the radar oscilloscope enters the interconnector through pin M of the large plug 105, where it is bypassed by spark-plate capacitors 12–9 and 12–14 to eliminate interference picked up by the connecting cable. The voltage is fed to section B of the TEST switch 112, where it is used for the horizontal sweep voltage in TEST positions 1, 6, and 7. The synchronizing voltage is also fed through coupling capacitor 6 to the grid of the phase shifter, tube 1A.

a. The circuit of the phase shifter is redrawn in figure 43. To make it more easily understood the d-c current path is omitted and only those components are shown that are necessary to the phase shifter operation. Capacitor 1C (fig. 61) effectively grounds one end of the plate load resistor 87–2 for alternating current and the end of the cathode resistor 87–1 is directly grounded and not bypassed. The result is that, neglecting capacitor 11–8 and variable control 96, the voltage drops across resistors 87–2 and 87–1 are in phase and approximately equal. When capacitor 11–8 and variable control 96 are connected across the plate and cathode of tube 1A, the potential of point A remains constant with respect to ground, but the phase of this voltage may be varied by means of control 96. The voltage drops across capacitor 11–8 and resistor 96 are 90° out of phase. The voltage between point A and ground is the difference between the voltage drops across resistor 87–2 and capacitor 11–8. This same voltage is the difference between the drops across resistor 87–1 and variable resistor 96. This difference is equal in magnitude to the drop from P to ground or K to ground, but the phase is dependent on the value of resistance in control 96. If the value of resistance in control 96 is large, the phase is almost the same as that of the voltage from P to K. If 96 is made small the voltage from A to ground is almost 180° out

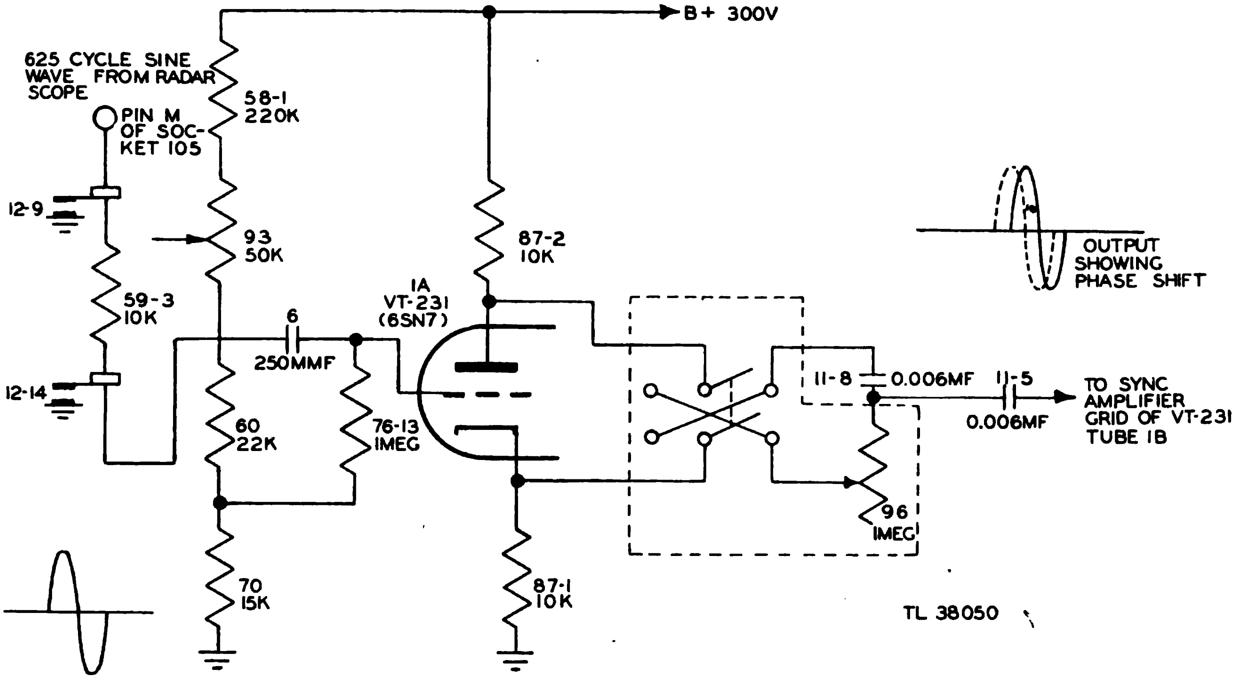


Figure 42. Input and phase shifter, partial schematic.

of phase with the voltage from P to K. Theoretically, as resistor 96 is varied from zero to maximum resistance, the phase of the voltage at A varies from zero to 180°. Actually, however, a range of only 160° is obtained. Another 160° shift is obtained by throwing the double-pole double-throw switch mounted with the PHASE control 96.

b. The phase relations existing in the circuit are shown in the vector diagram, figure 44. The voltage from K to G is represented by the vector V_R(87–1) and that from G to P by vector V_R(87–2). These voltages are in phase and added in series, while the midpoint is at ground potential. The output voltage is represented by the vector GA, which is the difference between V_R(96), voltage across control 96, and V_R(87–1). GA is also the difference between V_C(11–8), the voltage across capacitor 11–8, and V_R(87–2). V_R(96) and V_C(11–8) are 90° out of phase. Therefore as control 96 is varied V_R(96) varies and point A moves around the arc of the semicircle KAP.

45. Square Wave Generator

a. The sine wave output of the phase shifter is amplified and squared in the three stages, 1B, 2A, and 2B, so that a good rectangular wave results. Tube 1B is primarily an amplifier, and the input from the phase shifter is applied to

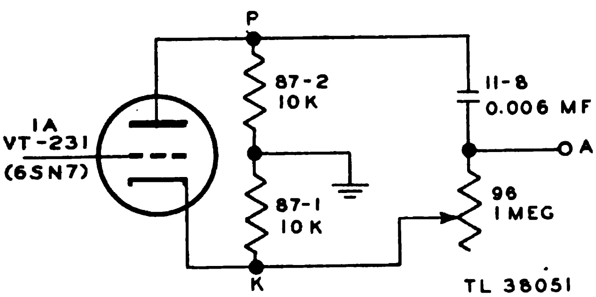


Figure 43. Phase shifter circuit, equivalent diagram.

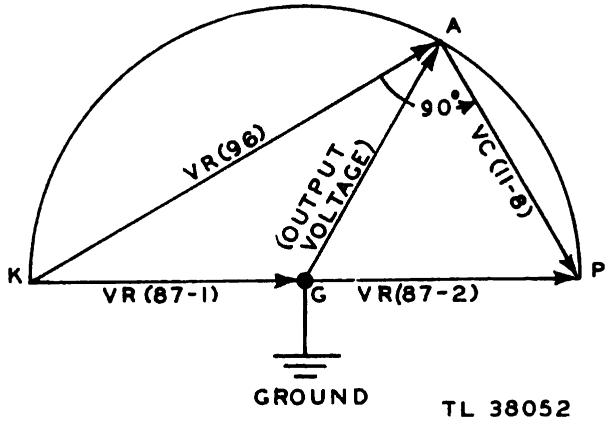


Figure 44. Phase shifter operation, vector diagram.

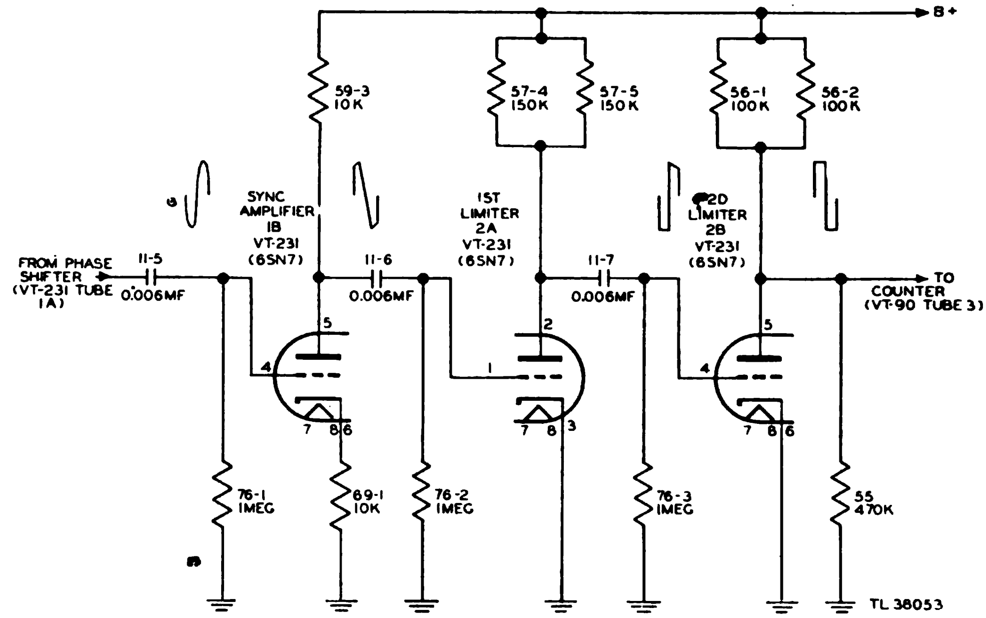


Figure 45. Square wave generator, partial schematic.

its grid through the coupling capacitor 11–5. This tube is self-biased by means of the cathode resistor 69–1.

b. The output from tube 1B is coupled through capacitor 11–6 to the grid of the first limiter tube, 2A. The limiter tubes are operated at zero fixed bias and are normally conducting heavily; they are overdriven amplifiers used as limiting tubes. During a portion of the positive peaks of the input voltage, tube 2A is driven to saturation, and during a portion of the negative peaks the tube is driven to cut-off. Thus, the positive and negative peaks are flattened. The output voltage of 2A is applied through capacitor 11–7 to tube 2B. Since this input voltage is considerably greater than the voltage input to the preceding tube, the tube will be operated at either saturation or cut-off during the entire cycle and the output of 2A will be further squared. The output of tube 2B is essentially a rectangular wave, figure 45.

46. Counter Circuit

The action of the circuit is such that capacitor 8 is charged in a series of steps, an additional step being added with every positive cycle of the square wave output from stage 2B. This capacitor is connected to the grid of the blocking oscillator which is normally biased to cut-off by a positive voltage on the cathode. As each step is added to capacitor 8, the positive voltage applied to the grid approaches nearer and nearer the positive bias on the cathode. Finally one more step is sufficient to overcome the bias and allow the oscillator to conduct, removing all charge on capacitor 8 and starting the step charging process all over again. This tube then actually divides the frequency of the input square wave; for, each cycle of the square wave adds one step to the step voltage, but only every fourth step allows the blocking oscillator to conduct and thus produce the trigger pulse. This action will now be described in detail.

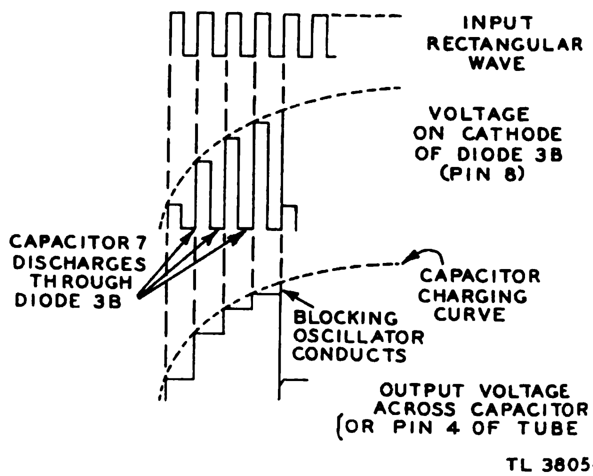


Figure 46. Counter circuit, waveform development.

a. The two diodes in tube 3, capacitor 7, and capacitor 8 are so arranged that when the high positive output of the square wave generator, (when tube 2B is not conducting) is applied to the input of the counter circuit, the two capacitors and the diode 3A (pins 3 and 4 of tube 3) charge in series. The essential fact to remember in understanding the action here is that in such a series circuit the same current will flow in all parts, the same charge will be left on each capacitor, but the voltage across the different capacitors will depend on their capacity. This can be compared to the action in a circuit with several resistors in series. The same current flows in all resistors, but the voltage across each depends directly upon its resistance. Thus, if one resistor is of 15,000 ohms and another 1,000 ohms, the voltage across the smaller resistor will be $1/16$ of the total across both, while $15/16$ will be across the large. However, with capacitors in series the voltage drop across each capacitor will be *inversely* proportional to its capacity. Capacitor 8 in this case is about 15 times larger than capacitor 7; but capacitor 8 will charge to only $1/16$ of the applied voltage, while the smaller capacitor (7) charges to $15/16$ of the applied voltage.

b. When the positive half cycle of the rectangular input wave occurs, capacitor 8 charges to about $1/16$ of this voltage and capacitor 7 to $15/16$. This voltage represents the first step (figs. 46 and 131E). On the next half cycle, when 2B conducts and the voltages of the rectangular wave drops sharply, the lower plate of capacitor 7 and the cathode (pin 8) of diode 3B become negative with respect to ground; and capacitor 7 discharges through the diode the charge it accumulated during the positive half-cycle. Capacitor 8, however, has no discharge path and retains its charge.

c. At the next positive half-cycle of the input signal, the two capacitors again charge in series. For the first step, no charge was on either capacitor, and together they charged to the total change in voltage, which was the value of the input voltage. For the second step, however, there is some charge on capacitor 8 and the total change in voltage across them is equal to the input voltage less the previous charge on capacitor 8. Again, $1/16$ of this change of voltage is added to the previous charge on capacitor 8 and $15/16$ is applied to capacitor 7. For example, if the positive input voltage is 160 volts, the first cycle will charge capacitor 8 to $1/16$ of that

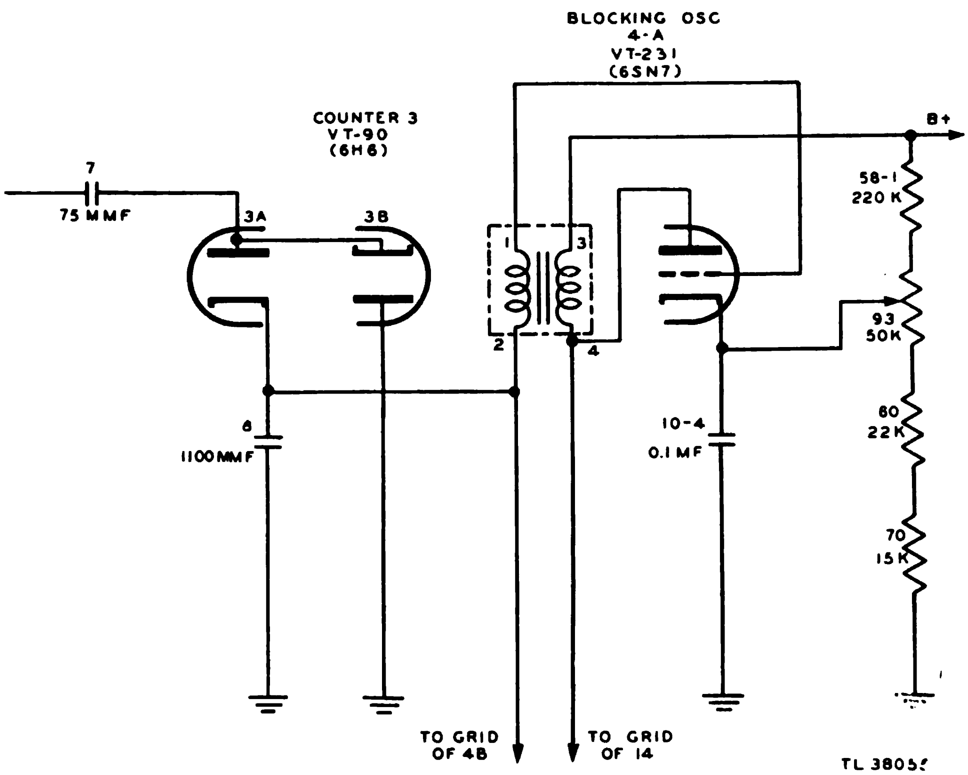


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Figure 47. Counter circuit and blocking oscillator, partial schematic.

voltage, or 10 volts. During the second cycle the positive voltage applied across the capacitors will be 160 minus 10 volts, or 150 volts. Capacitor 8 will charge an additional $^{150}/_{16}$, or 9.3 volts. When the positive input voltage is removed, capacitor 7 discharges to ground as in the first cycle, while capacitor 8 retains its charge.

d. This charging process will continue for as many cycles of the input voltage (or as many *steps*) as are required to increase the positive voltage on the grid of the blocking oscillator (4A), until it is sufficient to make that tube conduct and to allow capacitor 8 to discharge through the tube. This discharge point is determined by the setting of the DIVISION control, and can be anywhere from 3 to 7 steps of the step voltage on capacitor 8. Normally, the control is set so that four steps occur before the oscillator conducts. After capacitor 8 has discharged, the step charging process will begin again. Figure 46 illustrates that the outline of the steps resembles the regular charging curve for a capacitor.

47. Transmitter Trigger Channel

This channel has the following stages:

a. The blocking oscillator, tube 4A, is a conventional blocking oscillator that produces a sharp negative and positive pulse at a recurrence frequency which is variable, but normally is 156 cycles per second.

b. The pulse from the blocking oscillator is fed to tube 14, a cathode follower. This tube clips most of the negative pulse and passes the positive pulse to the transmitter.

48. Blocking Oscillator

Tube 4A is similar to the blocking oscillator previously explained in the transmitter section. Cathode bias is used to keep the tube in a normal non-oscillating condition. It is tapped

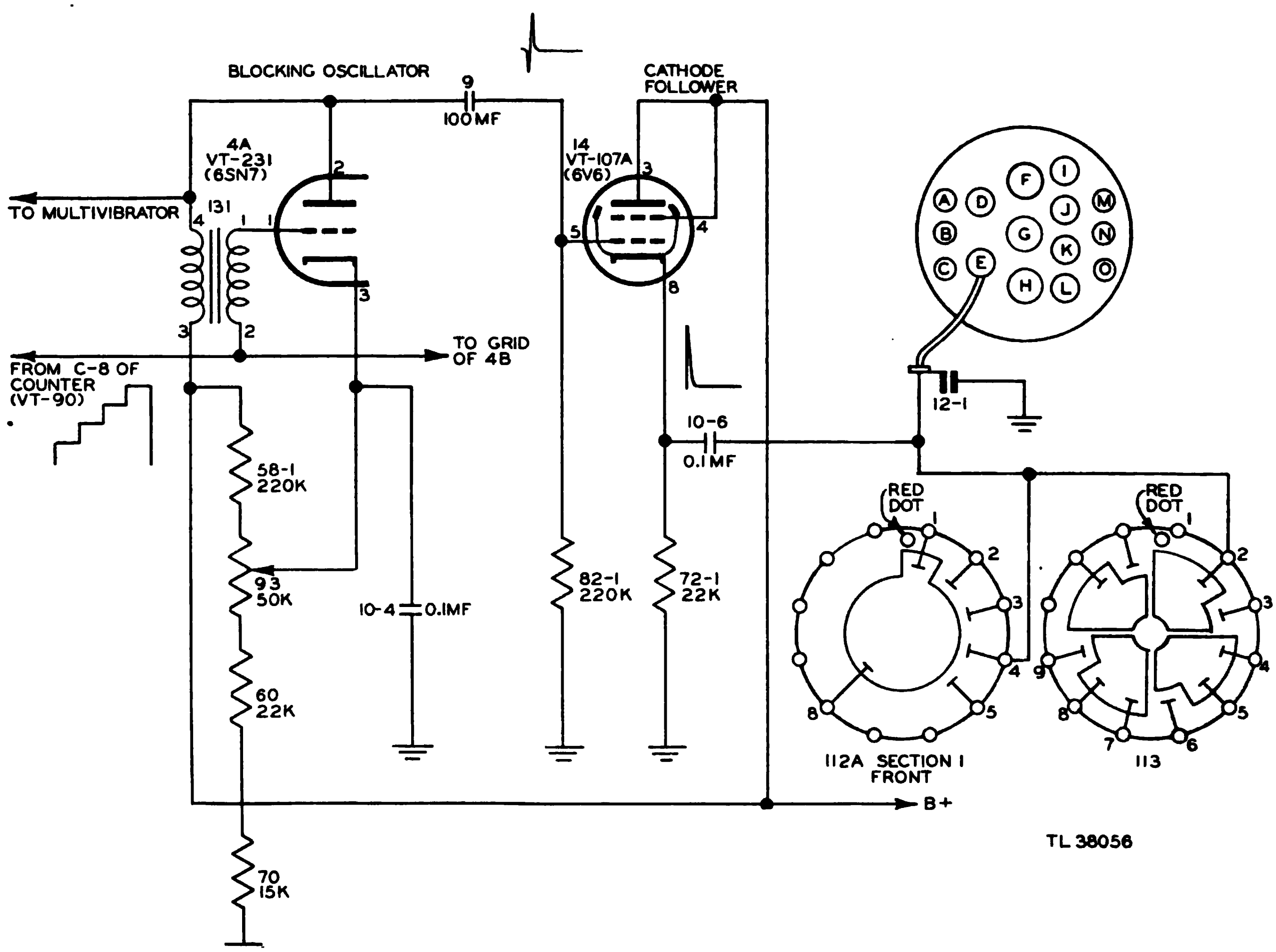


Figure 48. Trigger channel, partial schematic.

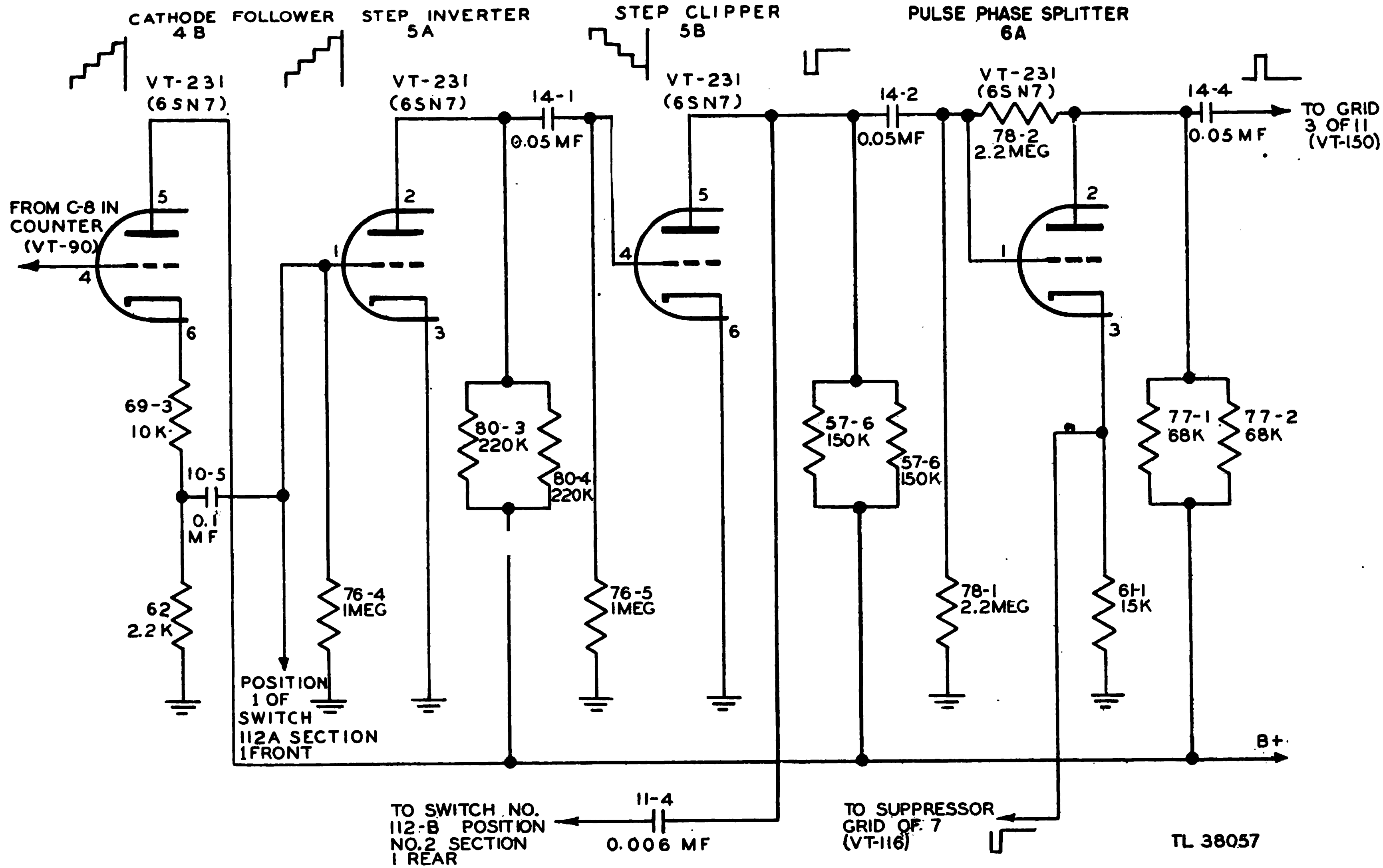


Figure 49. Blanking channel, partial schematic.

off variable resistor 93, one of a series of resistors, 58–1, 93, 60, and 70, connected between B+ and ground. This variable resistor is adjusted by the DIVISION control. The positive side of capacitor 8, connected to the grid of the oscillator, places a positive voltage on the grid as it charges. The effective bias on the tube is then the difference between the positive cathode voltage and the positive grid voltage from capacitor 8. As the charge on capacitor 8 increases, it will reach a point where it will be sufficient to overcome the cathode bias and allow the oscillator to conduct. Normally the DIVISION control should be set so that the oscillator is triggered as capacitor 8 starts to charge for a fifth step. As the oscillator conducts, grid current flows and discharges capacitor 8, and what was to be the fifth step becomes instead the first step of the next step charging cycle. The output from the plate is a sharp negative pulse followed immediately by a positive pulse, after which the oscillator is cut off until the next time capacitor 8 starts to charge for a fifth step. The oscillator oscillates then once every fourth cycle of the 625 cycle input, or at a frequency of 156 cycles corresponding to a time of 6,400 microseconds.

49. Cathode Follower, Tube 14

The output of the blocking oscillator is taken from the plate and fed through capacitor 9 to the cathode follower, tube 14 (6V6-GT). There is a high cathode bias on this tube which eliminates most of the negative pulse from the blocking oscillator. The positive pulse appears across the cathode resistor 72–1 and goes to the transmitter through coupling capacitor 10–6 and pin E of the large plug, 105. The output also goes to pin 2 on the STANDBY-OPERATE switch. While the switch is in OPERATE position this pin is an open circuit and has no effect on the output voltage, but in the STANDBY position, the switch gives a direct connection to ground, thus grounding the output to the transmitter. The output is also applied to pin 4 of the TEST switch, and then to the vertical deflection plates of the test scope in position 4 (par. 69).

50. Blanking Channel

The step voltage for capacitor 8 is also applied to tube 4B.

a. Tube 4B is a cathode follower. Only part of the output from this tube is applied to the next stage. This stage supplies the voltage on the vertical deflection plate.of the test scope in TEST position 1.

b. Tube 5A is an amplifier that amplifies and inverts the step voltage from tube 4B.

c. The step clipper, tube 5B, is operated so that only the first of the inverted steps makes the tube conduct, producing a negative 1,600 microsecond pulse at the plate.

d. The pulse phase splitter, 6A, is an amplifier with both a plate and cathode load. The negative pulse from 5B produces a positive pulse of 1,600 microseconds duration across the plate load and a negative pulse of the same duration in the cathode.

51. Cathode Follower, Tube 4B

a. The step voltage developed across capacitor 8 that is applied to the grid of the blocking oscillator is also applied to the grid of tube 4B. This tube is a cathode follower and the voltage on capacitor 8 is directly applied to the grid (note the absence of any grid resistor or coupling capacitor) since this cathode follower does not draw grid current. The direct connection to the grid isolates capacitor 8 from any effect of an additional discharge path that would be provided by a grid resistor. The output, as is usual with a cathode follower, will be a wave of the same shape and phase as the input. The output of a cathode follower is never larger than the input, and in this case it is reduced

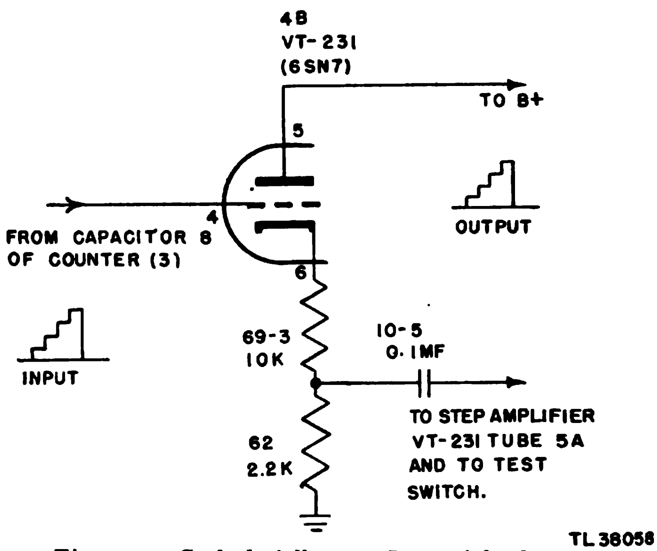


Figure 50. Cathode follower, 4B, partial schematic.

even further by using only part of the voltage developed across the total cathode resistance, resistors 62 and 69–3, or that part developed across resistor 62 as the output.

b. The output voltage of tube 4B is connected through coupling capacitor 10–5 to pin 1 of section A of the TEST switch. This is the voltage applied to the vertical deflection plate of the test scope for TEST position 1 (par. 69). The horizontal sweep voltage is the 625 cycles input voltage, each cycle having a duration of 1,600 microseconds, while the duration of each step is also 1,600 microseconds. As each step represents a higher voltage than the preceding one, the steps will appear as a series of successively higher lines on the screen. Since capacitor 8 does not charge instantaneously, the lines will appear to be connected by light, nearly vertical lines. The position of these nearly vertical lines will vary with the setting of the PHASE control, since this control varies the phase between the voltage synchronizing the control unit and the 625 cycle sine wave voltage from which the sweep voltage is derived.

52. Step Inverter

The voltage from the cathode follower tube 4B is also coupled to the grid of tube 5A through capacitor 10–5 and the small step voltage applied to the grid. This tube is an amplifier operating without fixed bias and the comparatively small input is amplified and inverted. The inverted step voltage is coupled to the grid of 5B through capacitor 14–1. The amplitude of this positive inverted step voltage is much higher than the input to the preceding tube with the result that a high grid-leak bias is built up. The first step is now the most positive (figs. 51 and 131G) and is high enough to make the tube conduct heavily for the duration of the step (1,600 microseconds) and to allow grid current to flow. The grid bias developed is sufficient to cut the tube off for the following three steps. The first step makes the tube conduct, the plate voltage drops, and a negative rectangular pulse of 1,600 microseconds duration is produced. At the end of this pulse, the tube stops conducting for the next three steps, or 4,800 microseconds, and the

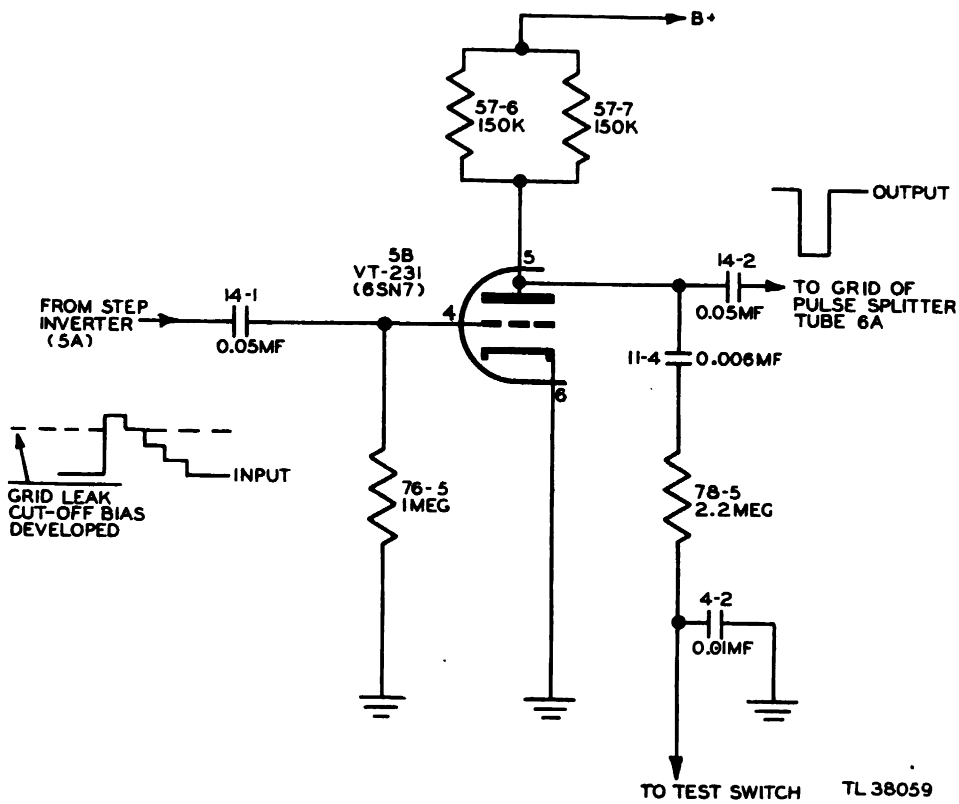


Figure 51. Step clipper, 5B, partial schematic.

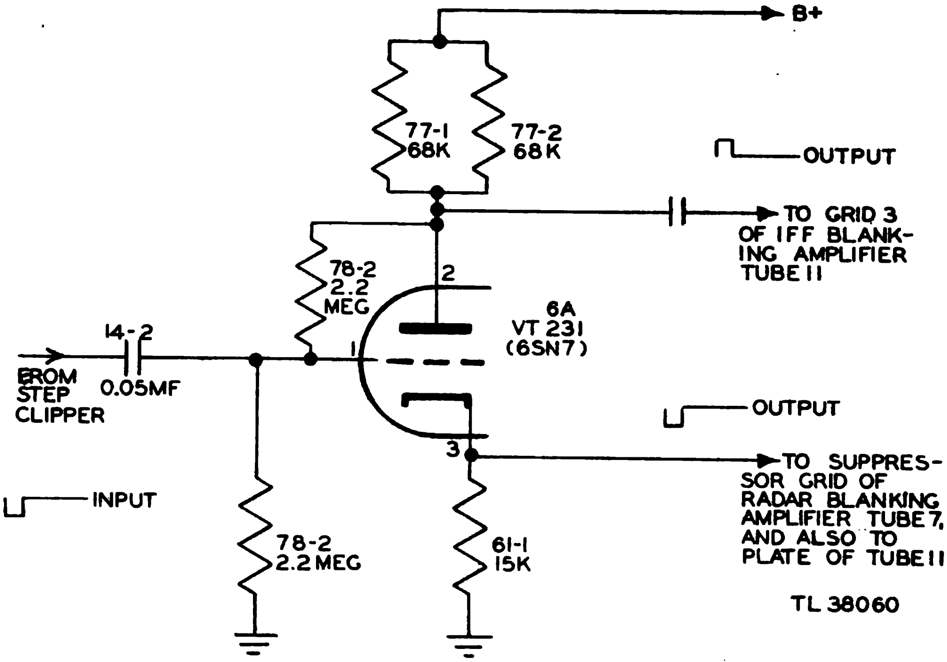


Figure 52. Pulse phase splitter, 6A, partial schematic.

plate voltage rises to the B+ potential. This blanking pulse occurs on the same step, which, as it begins, fires the blocking oscillator, discharging capacitor 8, and producing the transmitter trigger pulse. The output from this step clipper is fed to the test circuit section where it produces the slow sweep voltage for the test oscilloscope on TEST position 2. The output is also fed through coupling capacitor 14–2 to tube 6A, the pulse phase splitter.

53. Pulse Phase Splitter

The pulse phase splitter (tube 6A) like the phase shifter (tube 1A) has a load in both plate and cathode circuits. The output is taken off both the plate and the cathode. A negative rectangular pulse is taken from the cathode and a positive rectangular pulse is taken from the plate. The cathode resistor is not bypassed and follows the swings in input voltage in the same way as the cathode in a cathode follower. The negative input pulse decreases the plate current in the tube and the plate voltage rises, producing a positive pulse at the plate. Cathode bias is developed by current flowing through the cathode resistor. A positive potential is placed on the grid by connecting resistor 78–2 between the grid and plate. This holds the grid potential up and the tube normally conducts heavily, so that a negative pulse, cutting the tube off, will produce a large change in voltage. The two output pulses have the same width as the original input pulse, but the tube is sufficiently overdriven to square the pulse still further.

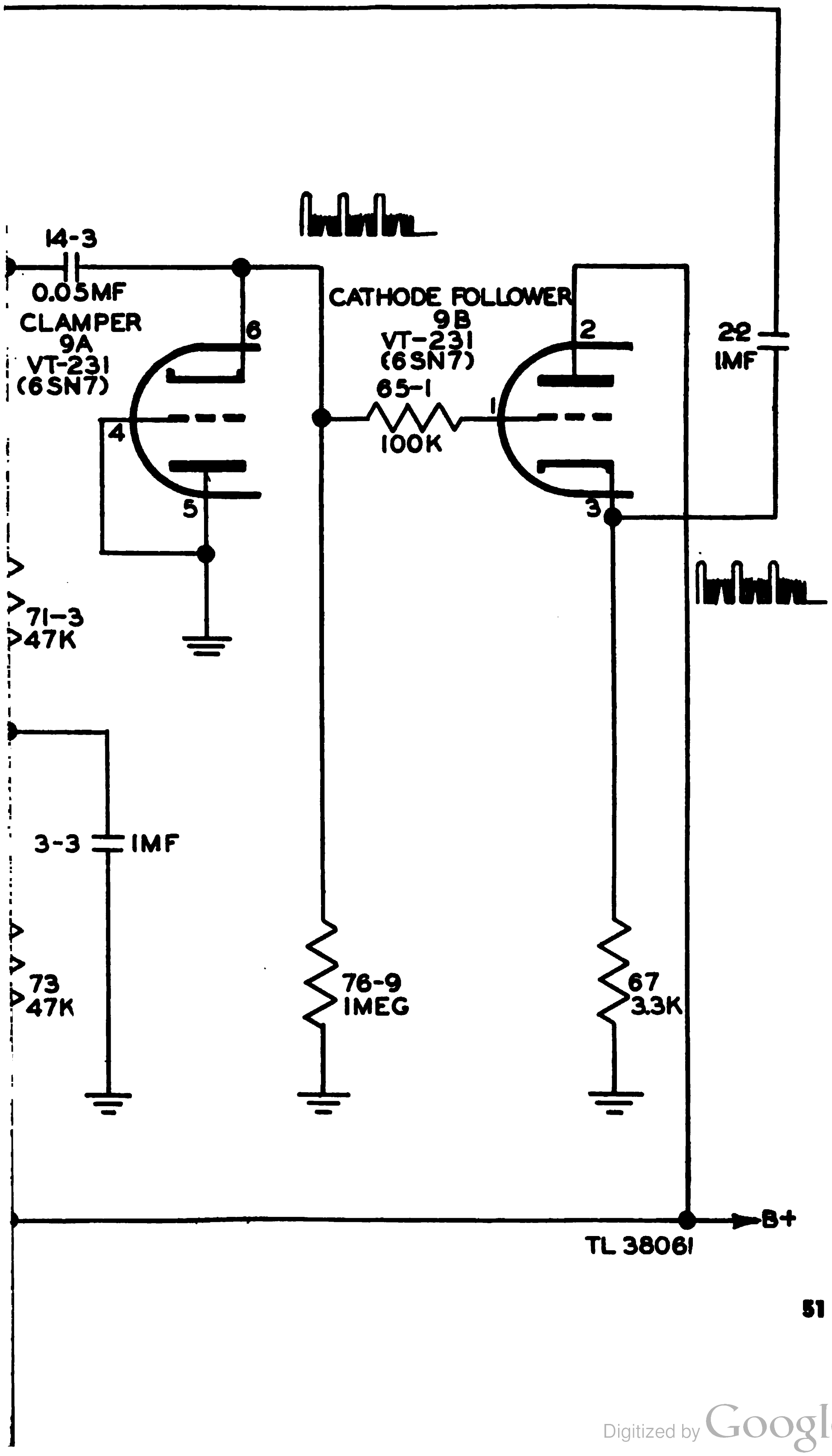
54. Radar Switching Channel

Tubes 8A, 7, 8B, 9A, and 9B compose the radar switching channel. Whenever both the radar and IFF information appear simultaneously on the radar oscilloscope the radar received signals must pass through this channel. This, together with the IFF switching channel, forms the electronic switch that alternately places the radar and IFF replies on the oscilloscope. The switching is timed by the output of the pulse phase splitter, tube 6A.

a. Tube 8A is connected as a diode, to act as a clamper, or d-c restorer.

b. Tube 7, the radar blanking amplifier, amplifies the radar signal for three out of four traces, but is cut off by the negative pulse from the pulse phase splitter for the remaining one trace.

c. The radar signal from tube 7 is passed through an amplifier that inverts it and restores the original positive input polarity.



14-3
0.05MF
CLAMPER
9A
VT-231
(6SN7)
6
4
5
71-3
47K
3-3
IMF
73
47K
CATHODE FOLLOWER
9B
VT-231
(6SN7)
65-1
100K
1
2
3
22
IMF
76-9
IMEG
67
3.3K
B+

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d. Tube 9A, like 8A, is connected as a clamping diode.

e. The output from the channel is fed through the cathode follower 9B.

55. Input to Radar Switching Channel

The output of the radar receiver goes through a coupling capacitor in the radar Receiver BC-404, out the output jack to the pulse jack on Oscilloscope BC-403, directly from that jack to pin 8 of the large plug on the rear of the oscilloscope, then to pin O on the large plug on the rear of the interconnector. The circuit from that point is shown in figure 53. This figure represents the circuit in the OPERATE position. In the STANDBY position, the radar pulse goes to pin 8 of the STANDBY-OPERATE switch and leaves at pin 9, going through resistor 83–2 to pin N of plug 105, thence to pin 9 of the plug in Oscilloscope BC-403 and to the video amplifier in the scope (fig. 54). When the RC–150 is not operating, it is necessary to leave the switch in STANDBY position if the radar signals are to be seen on the screen. The switch should never be left between positions. It should not be forgotten that even when the IFF is turned off, the received radar signals physically enter the interconnector.

56. Clamping Diodes

The output of both the IFF and radar receivers consists of a strong positive pulse followed by relatively weak echoes or answers. These occur on a baseline which is near zero potential with respect to ground. If these pulses are applied to an amplifier tube through a capacitor, (for the radar channel, the coupling capacitor in Receiver BC–404), the d-c level will be destroyed, because the capacitor cannot pass direct current. A new d-c average potential would then be established forming a new baseline.

a. Strong positive pulses will cause the grid to draw current and charge the coupling capacitor negatively. This charge cannot leak off rapidly and will establish a new baseline, resulting in an effective negative bias on the tube, forcing the original baseline below the bias. The strong main pulses will rise above the bias, but weak echoes may not be able to rise above the bias and will not be passed by the tube.

b. If the capacitor in the grid circuit acquires a negative charge because of the flow of grid current, a clamping diode in the grid circuit will conduct and the charge will flow to

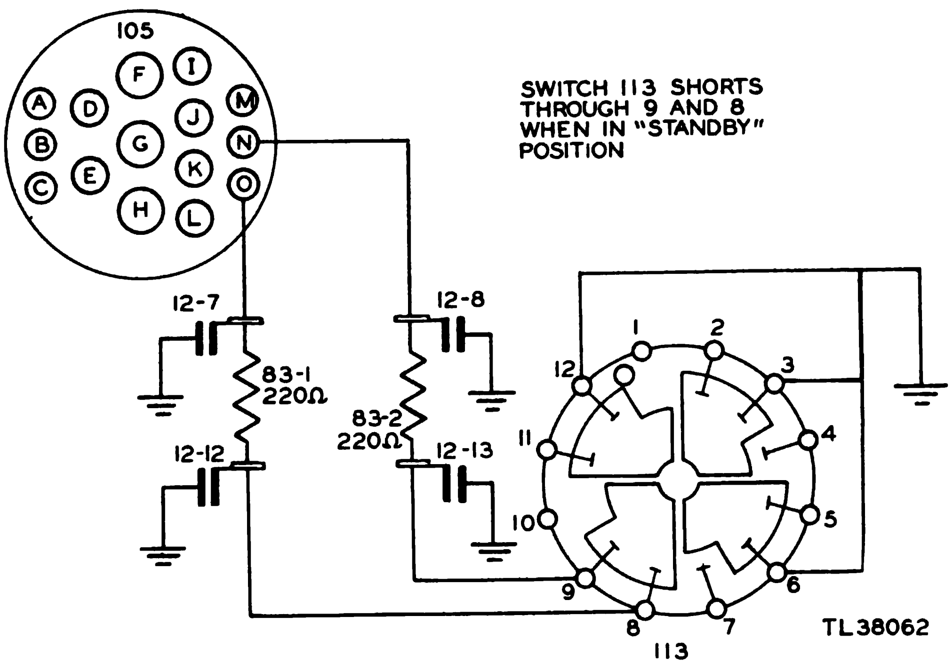


Figure 54. Input to radar channel, STANDBY position.

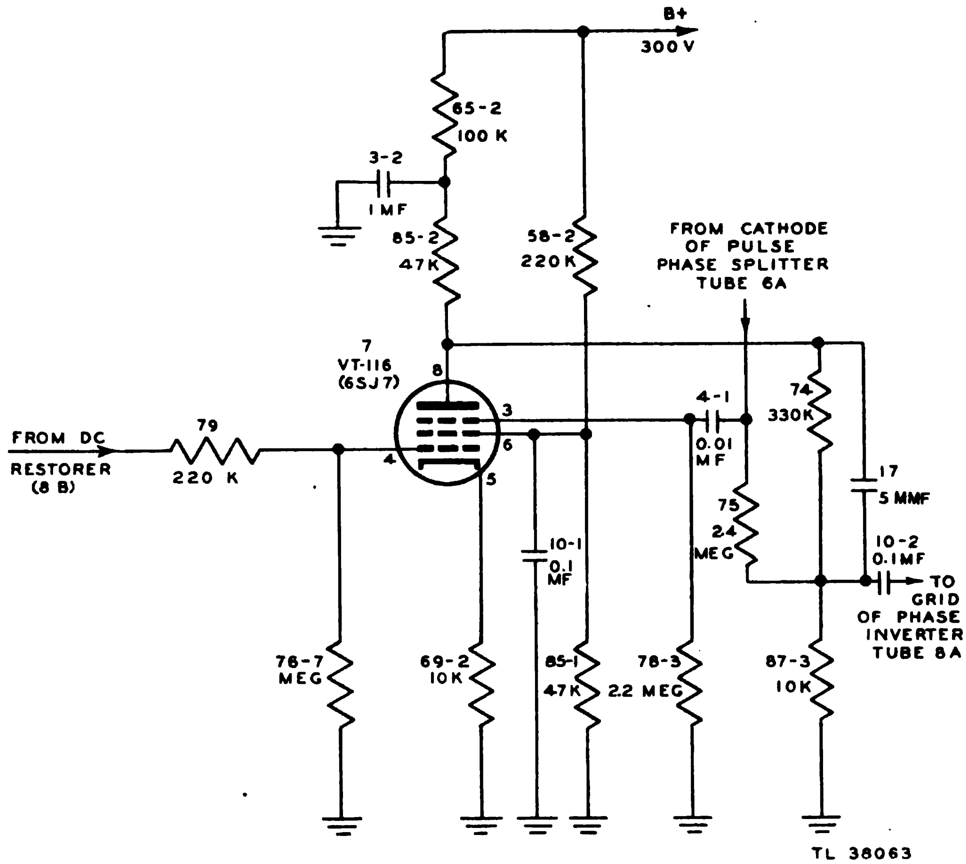


Figure 55. Radar blanking amplifier, partial schematic.

ground. The resut is that all positive signals will be applied to the grid of the amplifier and the averaging effect of capacitors will be eliminated.

57. Clamper, Tube 8A

The radar signal is applied to the grid of the blanking amplifier (tube 7) in parallel with which is a clamping diode, (fig. 53). This tube, a triode, is effectively a diode, since the plate and grid are tied together. It is an open circuit so far as positive signals are concerned and will have no effect on them, since a positive signal will make the cathode of the diode more positive than the grounded plate and the tube cannot conduct. A negative signal in the cathode, however, makes the cathode more negative than the plate and the tube will conduct most of the negative voltage to ground. The result is that only positive signals will be applied to the blanking amplifier, while negative signals and the negative voltage on the coupling capacitor will be grounded.

58. Radar Blanking Amplifier

a. The positive signals from the radar receiver are applied to the grid of the blanking amplifier, tube 7, through an attenuator, resistors 79 and 76–7. Resistor 79 also acts to limit any grid current drawn by this tube. There is no final loss in signal strength since there is sufficient amplification in the remainder of the channel to make up for this loss. It is desirable that the output signals of the radar channel have the same strength as the output of the radar receiver; otherwise the radar signal on the scope would change height as the STANDBY-OPERATE switch is changed from STANDBY to OPERATE position. This tube is connected as an ordinary pentode amplifier, except that the suppressor grid is connected to the cathode of the phase splitter 6A. It is biased so that normally it will act as an ordinary amplifier and will pass signals applied to its control grid. However, during the 1,600 microsecond period in which the negative pedestal was produced in the blanking channel, and during which the IFF transmitter sends out an interrogation pulse, the negative pedestal from the cathode of the pulse phase splitter is applied to the suppressor grid of the radar blanking amplifier and cuts off both the tube and the radar receiver channel. The negative pulse is taken off the cathode resistor, 61–1 of tube 6A, and coupled through capacitor 4–1 to the suppressor grid, pin 3, of tube 7, making that tube inoperative for the duration of the pulse.

b. The output of this tube, described so far, would be the radar main pulse and echoes for three-fourths of the time, and a long positive pulse for the remaining cycle. This pulse, however, would not be at the same level as the baseline while the amplifier was operating, since the negative pulse on the suppressor grid would cut the tube off and allow the plate voltage to rise. The result would be a positive pulse during the one trace when the radar signal was cut off. This would give an unstable baseline on the radar scope, since it would shift once every four traces.

c. This positive pulse is eliminated by connecting the suppressor grid of tube 7 to the plate of tube 7 at the junction of resistors 74 and 75, and so impressing a portion of the pulse from the cathode of tube 6A on the plate of tube 7 as well as on the suppressor grid. The negative pulse from the cathode of 6A and the positive pulse from the plate of 7 are approximately 180° out of phase, since the negative pulse on the suppressor becomes a positive output pulse on the plate. The voltage fed to the suppressor in this manner is of the proper magnitude to cancel the positive pulse output from the plate. The output from the plate is applied to the grid of 8B and attenuated across a voltage divider consisting of resistors 74 and 87–3, while capacitor 17 maintains the action of the voltage divider at high frequency. The output is taken off the top of resistor 87–3. Resistors 75 and 87–3 form a divider for the negative pulse applied to the plate, and this pulse is applied to the plate circuit at the top of resistor 87–3.

59. Phase Inverter and Cathode Follower

The blanking amplifier has inverted the radar pulses received from the radar receiver. In order to give them correct polarity to produce upward deflections on the radar scope, they must be inverted to become positive pulses once again. Tube 8B is an ordinary amplifier operated without fixed bias and normally conducting heavily, so that any negative pulse will decrease the plate current and produce a positive output pulse. The positive output of 8B is fed to a cathode follower, tube 9B, which has a clamping diode, tube 9A, in parallel with its input circuit. This operates in the same manner as the clamper 8A (fig. 53). The positive radar signals are passed through the cathode follower and the positive output is taken off the cathode resistor 67. Resistor 65–1 in the grid circuit of this tube will limit any grid current which might flow if the degenerative action provided by the cathode resistor is inadequate to develop sufficient voltage to prevent the grid from drawing current. The output taken from the cathode through coupling capacitor 2–2 goes to pin N of the large plug, and then to the video amplifier in the radar oscilloscope. In the STANDBY position the output lead is grounded through pin 6 on the STANDBY-OPERATE switch, thus preventing any interaction by the tube at that time.

60. IFF Switching Channel

Tubes 10B, 11, and 10A form the IFF switching channel. The output from the IFF receiver is fed to this channel and, in OPERATE position, is fed from this channel directly to the deflecting plate of the radar oscilloscope.

a. Tube 10B is a triode connected as a diode to act as a clamping tube.

b. Tube 11 is the IFF blanking amplifier which is operative for one cycle of 1,600 microseconds, and then cut off for 4,800 microseconds.

c. The output during the 1,600 microseconds that tube 11 conducts is passed through a cathode follower, tube 10A.

61. IFF Input

The output of the IFF receiver is taken off the cathode resistor of the cathode follower in the receiver, goes to pin I of plug 105 on the interconnector, bypassed by spark-plate 12–10. The input is coupled through capacitor 10–7 to the control grid of tube 11, the IFF blanking amplifier. A clamping diode, tube 10B, whose action is similar to the clamper tube, 8A, is in

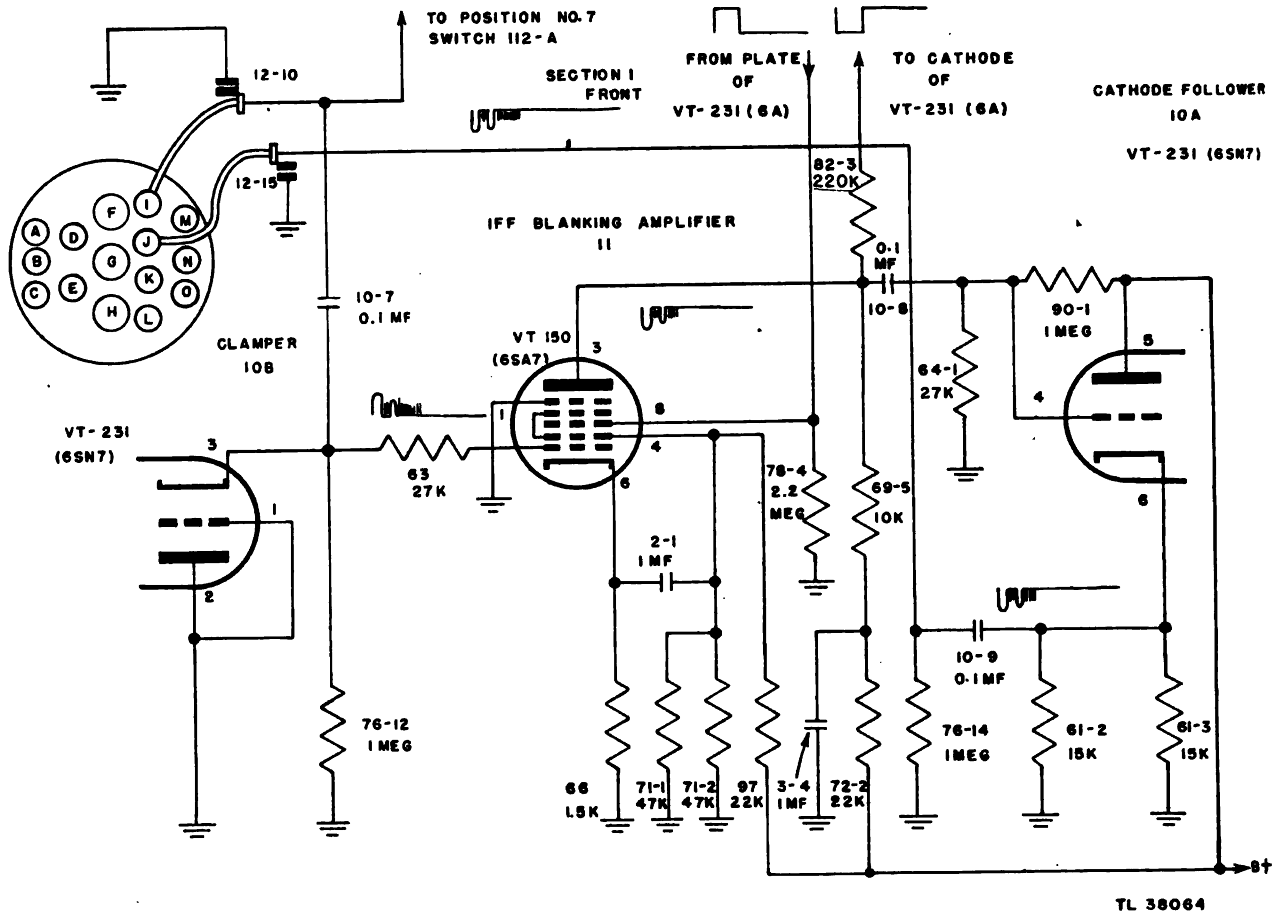


Figure 56. IFF switching channel, partial schematic.

parallel with the grid input. The input from the receiver is also fed directly to pin 7 of section A of TEST switch (112) and is applied to the vertical deflection plates of the test scope in position 7.

62. IFF Blanking Amplifier

a. Tube 11 is a pentagrid, so connected that input signals are applied to it on grids 1 (pin 5) and 3 (pin 8). The IFF received signals are applied to grid 1, the control grid, while the positive pulse from the plate of tube 6A is applied to grid 3, the suppressor. It is normally biased by resistor 66 so that no signals are passed through. For one trace out of each four, the positive pulse from the plate of the phase splitter 6A is applied to grid 3 making tube 11 conduct and amplifying the IFF receiver output. Thus, this tube operates one trace out of four and is inoperative for the remaining three traces. This tube, working with the radar blanking amplifier tube 7, will be amplifying IFF signals for the one trace that the radar amplifier is cut off, but will be cut off for the remaining three traces while the radar amplifier is operating. The positive pulse from the plate of 6A is coupled through capacitor 14–4 to grid 3 of tube 11. Resistor 78–4 connects the grid to ground in the same way as the ordinary control grid resistor.

b. The output from this tube is the negative main pulse and the replies from the IFF receiver (the positive pulses are inverted through the tube) placed on a negative pedestal. The negative pedestal is due to the drop in plate voltage as the current flow through the tube increases when the positive pulse is applied to grid 3. A still higher negative potential is added by coupling the negative pulse from the cathode of 6A to the plate output of 11 through resistor 82–3. Without this added negative potential, the radar and IFF echoes would fall close to-

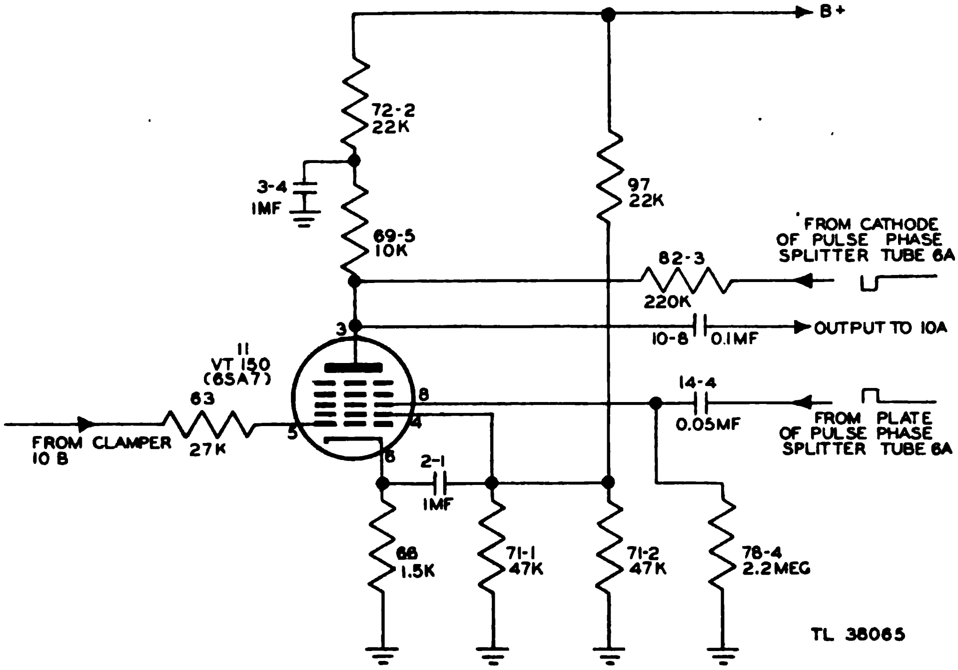


Figure 57. IFF blanking amplifier, partial schematic.

gether. To separate them further, the negative potential is inserted. By adding a constant negative voltage to the IFF output, the IFF baseline is depressed below the radar baseline.

63. Cathode Follower and Output

The output from the blanking amplifier is coupled through capacitor 10–8 to the cathode follower, tube 10A. Like tube 6A, the grid is connected to the plate through resistor 90–1, and a positive potential is placed on the grid. The output is taken across the cathode resistor 61–2 in parallel with 61–3. It is coupled through capacitor 10–9 and goes through spark-plate 12–15 to pin J of plug 105. The output also goes to pin 11 of the STANDBY-OPERATE switch (113) which is an open circuit when the switch is in OPERATE position. When the switch is in STANDBY position, however, the output is grounded directly through this switch (fig. 151). The IFF transmitter would not be operating with the switch in STANDBY position, but grounding the output provides a direct ground for the upper plate of the radar oscilloscope and prevents it from accumulating any charge. It also prevents any stray signal picked up by this channel in the STANDBY position from affecting the picture on the display scope. The output from pin J is put directly on the top vertical deflection plate of the oscilloscope. Thus the IFF signals do not go through the video channel in the oscilloscope (see schematic diagram of Oscilloscope BC–403) and it is unnecessary to invert the signals, as is done in the radar channel, to produce signals of proper polarity. Resistor 76–14 provides a high resistance path to ground for any charge left on the deflection plates.

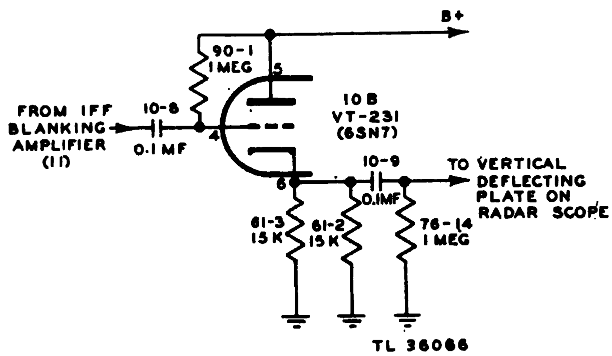


Figure 58. Cathode follower, 10B, partial schematic.

64. Test Channel

The test channel includes tubes 12A, 12B, 13A, the three sections of the TEST switch, and tubes 6B and 13B.

a. The multivibrator, tubes 12A and 12B, produces two 40 microsecond pulses, one positive and one negative, used for sweep voltages and brilliancy modulation voltages for the test scope.

b. The negative pulse from the multivibrator is applied to the grid of tube 13A, cutting it off. While it is cut off, the fast sweep voltage is produced in the plate circuit, and a series of damped oscillations at a frequency of 200 kilocycles is produced in the ringing circuit in the cathode.

c. The outputs to the vertical deflection plates, and the control grid of the cathode-ray tube in the test scope, are fed through cathode followers, tubes 6B and 13B.

65. Multivibrator

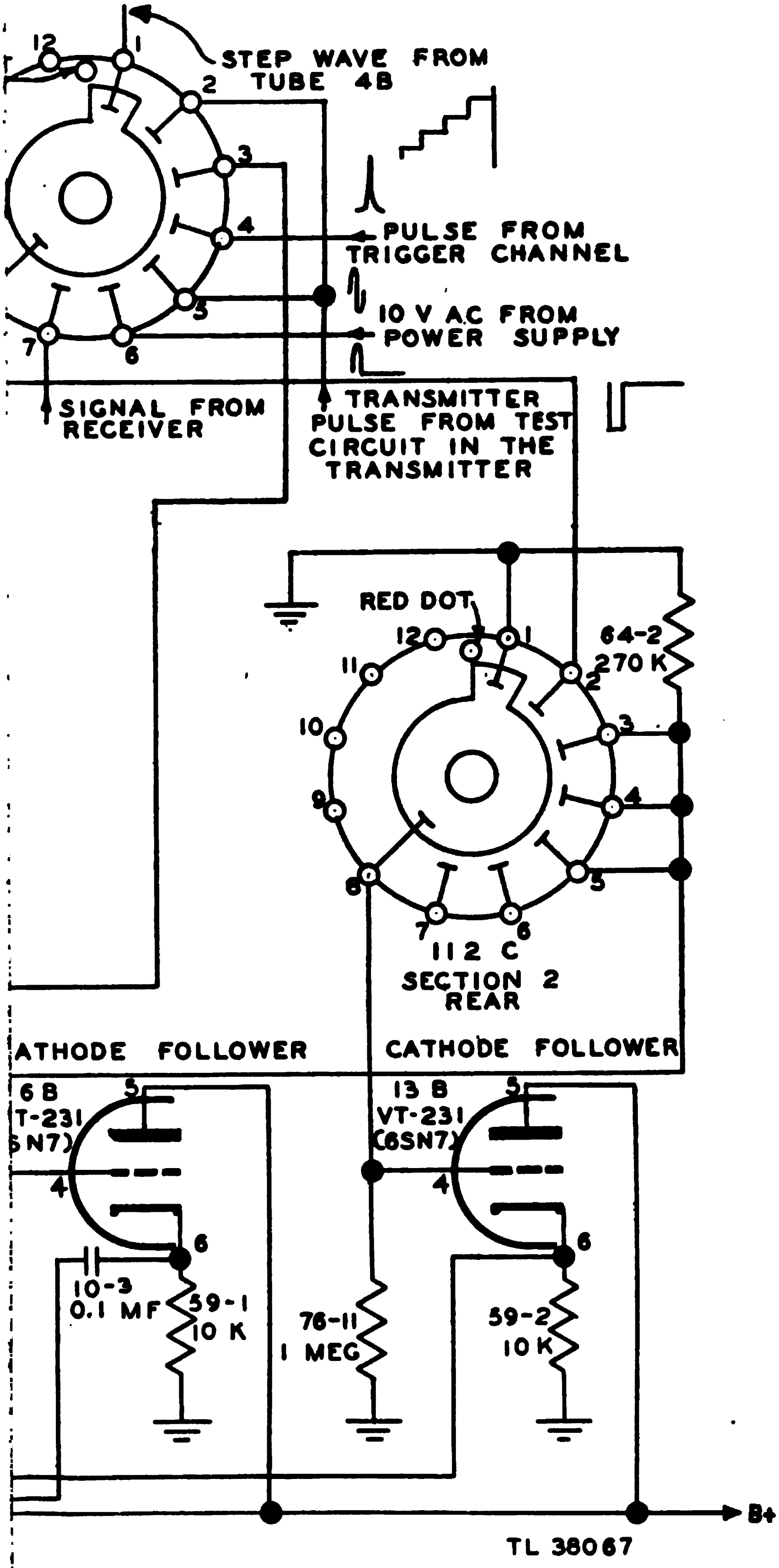
The two triodes of tube 12 are connected as a multivibrator. An ordinary multivibrator is a two stage amplifier in which the plate of the second tube is coupled to the grid of the first, so forming an oscillator. It produces a wave with many harmonics as the output, usually a rectangular wave. This multivibrator differs from the conventional type in having a common cathode resistor for both tubes, and in having the grid of 12B tied to B+. Normally it is in a non-oscillating condition, but when triggered by the negative output pulse from the blocking oscillator, tube 4A, it produces a pulse about 40 microseconds long. At the end of the pulse, the tube again is inoperative.

a. When the negative pulse is not applied, tube 12B will conduct heavily, since the grid is held positive by resistor 90–3 connected to its plate. The heavy flow of current through the tube develops sufficient voltage across the common cathode resistor 68 to bias tube 12A to cut-off. When a negative pulse from the blocking oscillator transformer is applied to the grid of 12B through resistor 57–1 and capacitor 16, the curent through tube 12B decreases, causing its plate voltage to rise. This rise is coupled to the grid of 12A through resistor 88 and capacitor 19. This positive voltage, applied to the grid of 12A, will cause the tube to conduct and produce a drop in voltage across the plate load resistor 69–4. This voltage in turn is coupled back to the grid of 12B through capacitor 16. The result of the original negative pulse on the grid of 12B and the feedback to that grid is a sudden drop in grid voltage that cuts tube 12B off, and a sudden rise in grid voltage on 12A that makes it conduct. For the next 40 microseconds tube 12B is cut off and tube 12A is conducting.

b. The negative charge on capacitor 16 accumulated during the conducting cycle will discharge in about 40 microseconds. As it discharges the grid voltage on 12B rises toward cut-off. At the end of 40 microseconds it will have discharged sufficiently to allow 12B to conduct. As it conducts, the drop in plate voltage is coupled back to the grid of 12A, lowering the grid voltage which increases the plate voltage, which in turn, raises the grid voltage of 12B. The result is to cut 12A off sharply and return to the original conditions existing when no pulse is present. The output of this circuit is then a positive pulse on the plate of tube 12B, and a negative pulse on the plate of 12A. These pulses are both of 40 microseconds duration, and both start at the same time, synchronized with the negative pulse from the blocking oscillator. Thus they will start a few microseconds before the positive transmitter trigger pulse, but compared to their 40 microseconds duration this short time is not important.

66. Slow and Fast Sweep

a. The negative pulse from the plate of 12A (pin 5 of tube 12) is used to initiate the fast sweep. The fast sweep is produced by tube 13A and its associated plate circuit components. This tube has no fixed bias, some small value of grid leak bias being produced across the grid resistor by the flow of grid current. Since the bias is small the tube conducts heavily; because of the drop across the large plate load resistors 80–1 and 80–2, the normal plate voltage is low, as is also the voltage across capacitor 15, which is connected between the plate and ground. The negative pulse from the multivibrator cuts off tube 13A; the plate voltage rises, charging capacitor 15 through resistors 80–1 and 80–2. The capacitor will charge slowly through this path and the charging curve will have an almost linear slope. The charging continues until the pulse is removed from the grid and the tube can conduct again, providing a low resistance path to ground through which capacitor 15 rapidly discharges. The sawtooth is produced similarly to the production of the sweep voltage in many radar oscilloscopes, including the Oscilloscope BC–403 series. Here the output is coupled



STEP WAVE FROM TUBE 4B
PULSE FROM TRIGGER CHANNEL
10 V AC FROM POWER SUPPLY
SIGNAL FROM RECEIVER
TRANSMITTER PULSE FROM TEST CIRCUIT IN THE TRANSMITTER
RED DOT
64-2 270 K
112 C SECTION 2 REAR
ATHODE FOLLOWER
CATHODE FOLLOWER
6 B T-231 N7)
13 B VT-231 (6SN7)
10-3 0.1 MF
59-1 10 K
76-11 1 MEG
59-2 10 K
B+
TL 38067

through capacitor 11–2 to pins 3, 4, 5, of the horizontal section (B) of the TEST switch. The sweep begins at the same time and has the same duration as the output pulse of the multivibrator.

b. A slow sweep is produced by applying the 1,600 microsecond negative pulse from the plate of the step clipper, tube 5B, through an integrating circuit consisting of resistor 78–5 and capacitor 4–2. The time constant of this circuit is exceptionally large, and results in a long sweep which is applied to the horizontal deflection plates of the test scope in position 2. The voltage giving the vertical deflection in this position is the transmitted pulse, and the sweep is of such a length that only one pulse should be seen if the pulse recurrence frequency is correct. If more than one pulse is seen, the recurrence frequency is too high, because either the blocking oscillator in the transmitter is running freely, or interference from the radar set may be triggering the oscillator.

67. Calibrating Signal

A damped sine wave of 200 kilocycle frequency is produced in the ringing circuit in the cathode of tube 13A. Each cycle of this sine wave will be 0.5 microseconds long, and can be

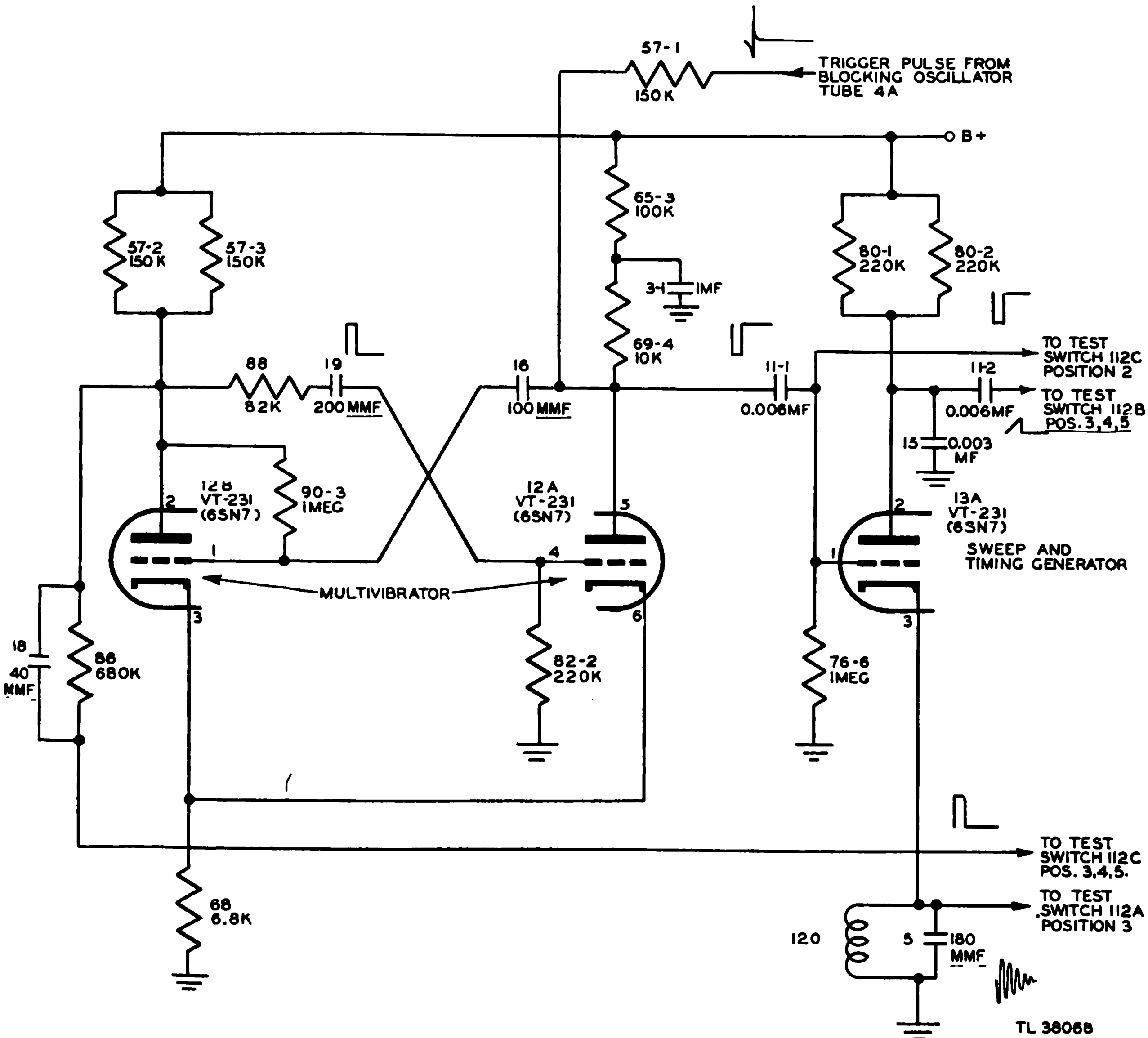


Figure 60. Multivibrator and sweep generator, partial schematic.

used to calibrate the test scope to determine the width of the transmitter trigger pulse and the transmitted pulse. The ringing circuit is a tank circuit of inductance (120) and capacitance (5) in parallel, of such values that they will oscillate at a frequency of 200 kc. The tube is normally conducting with current flowing through the inductance until the negative pulse from the multivibrator cuts off the tube. The current flow in the inductance will suddenly stop. When the current stops, the magnetic field built up around the coil by the flow of current will collapse, sending energy into the capacitor and charging it. The capacitor after absorbing all the energy from the coil will discharge back into the coil, storing energy in it which will again be used to charge the capacitor. Thus oscillations are started and continue until the negative pulse is removed from the grid and current again flows through the tube. The oscillations decrease in height (are *damped*) because of a small loss of energy in the resistance of the coil and wiring during each exchange of energy. The sine-wave output is coupled directly from the tank circuit to pin 3 of the vertical section (A) of the TEST switch.

68. Brilliancy Modulation

a. The extremely swift travel of the fast sweep in TEST position 3, 4, 5, with its slow recurrence rate, would cause it to be very dim, unless the brilliancy of the trace is intensified during the sweep. In these three test positions positive pulses are impressed on the control grid of the cathode-ray tube in the test scope and this increased positive grid voltage makes the scope picture clearly visible. This voltage is the positive 40 microsecond pulse from the plate of tube 12B. A voltage divider consisting of resistor 86, in parallel with capacitor 18, and resistor 64–2 is connected between the plate and ground. The voltage is applied to pins 3, 4, and 5 of section C of the TEST switch taken between resistors 86 and 64–2.

b. In TEST position 2, the negative pulse applied to the grid of 13A is also fed to the grid of the test scope cathode-ray tube, to decrease the intensity during a long return of the slow sweep. The negative pulse is taken directly from the grid (pin 1 of tube 13) and applied to pin 2 of section C of the TEST switch (112). Brilliancy modulation voltages are used in order to preserve the life of the cathode-ray tube screen. If the positive pulses are not applied to the grid of the cathode-ray tube, and the steady d-c voltage is increased by turning up the INTENSITY control until the fast vertical deflection is clearly visible, the baseline trace will be too bright and the screen will eventually burn out.

69. Test Switch, 112

The three-section test switch, 112, is used to select seven different test voltages (fig. 86) and apply them to the test oscilloscope. Those that originate in the interconnector have been described at the same time as the various circuits in the unit have been discussed. The test voltages applied to give the vertical deflection on the test oscilloscope are applied through section A of the switch, to pins 1 through 7. Pin 8 is the common connector through which the particular voltage selected is taken off. Section B selects the sweep voltage for the different test positions, pin 8 again being the common connector. It is connected through spark-plate 12–3 to pin B of the large plug, 105. Section C applies brilliancy modulation voltage to the control grid of the cathode-ray tube. These voltages have all been described in paragraph 68. Pin 8 is the common connector.

70. Cathode Follower and Output

The output (the vertical deflection voltages) taken from pin 8 of section A of the TEST switch, is coupled directly to the grid of tube 6B. Resistor 76–10 is the grid resistor. This tube is a cathode follower, the output being taken across cathode resistor 59–1, coupled through capacitor 10–3 and spark-plate 12–2 to pin C of plug 105. The output from the brilliancy modulation section C of the test switch is applied directly to tube 13B, a cathode follower, identical with 6B. The output, taken across the cathode resistor, 59–2, is coupled through spark-plate 12–4 and capacitor 4–3 to pin A of plug 105.

71. Power Supply

a. The power supply is of standard design. It uses a VT–197A double diode as a full-wave rectifier. The pulsating d-c output is filtered by a two section π type filter, with capacitor input. The power supply furnishes at the filter output

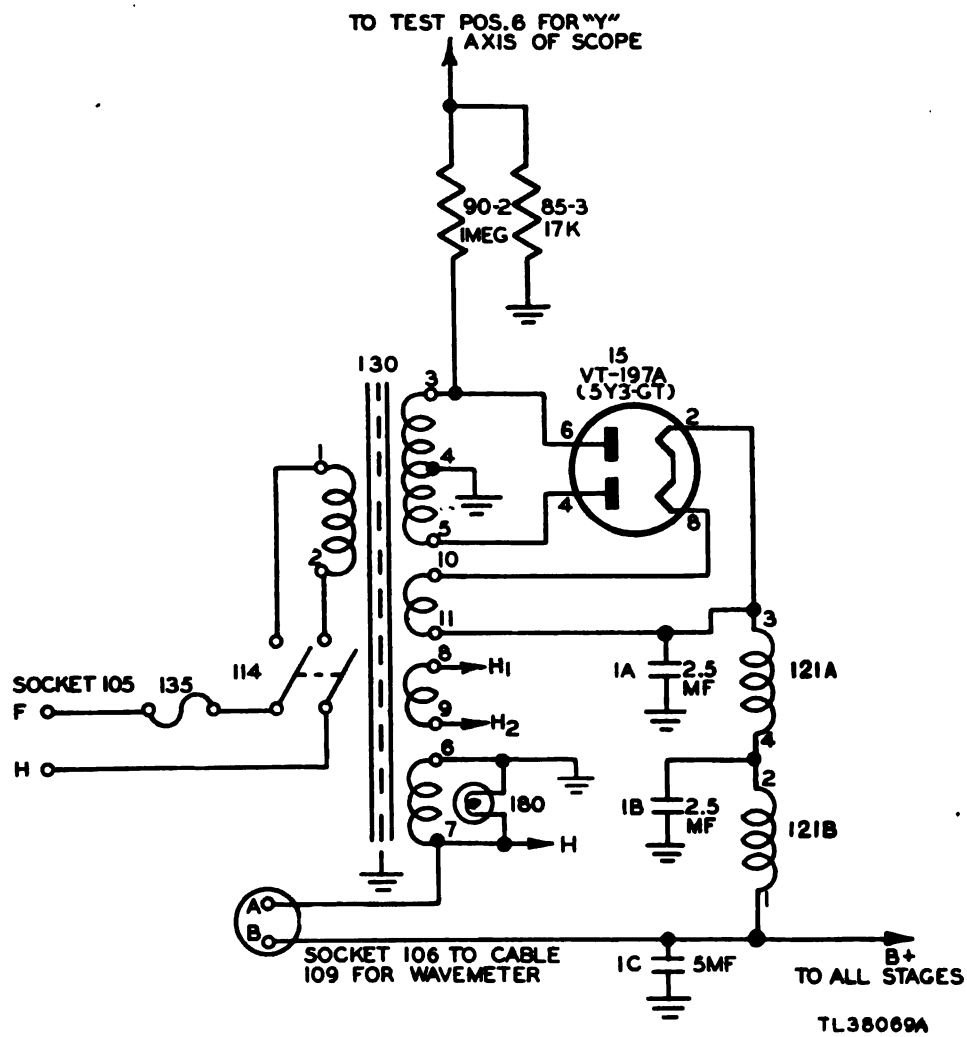


Figure 61. Power supply, partial schematic.

a steady d-c voltage in the neighborhood of 300 volts. This supplies the plates of the tubes both in the interconnector and in the wavemeter (through plug 106).

b. The power transformer receives its a-c supply from the transmitter through pins F and H of connector 105. It is equipped with 4 secondaries: a high-voltage secondary, a rectifier filament secondary, taps H_1 and H_2 which supply 6.3 volts to the VT–90 filaments, and tap H and ground which supply 6.3 volts to all other filaments in the interconnector and wavemeter. Switch 114 is located in the primary circuit and turns the interconnector on and off. Fuse 135 is also in the primary circuit and provides protection against current overloads. Light 108 is connected between H and ground, and filament voltage for the wavemeter is sent from H to plug 106. A 60-cycle voltage is taken from the high-voltage secondary and applied to pin 6 of section A (vertical deflecting voltage) of the TEST switch. This voltage is sent through a voltage divider composed of resistors 90–2 and 85–3 and the voltage across 85–3 is applied to the switch.

Section VI. WAVEMETER

72. Purpose

Because it is essential that the transmitter and receiver operate on the same frequency, a device for measuring the frequency of the transmitter and tuning the receiver to that frequency

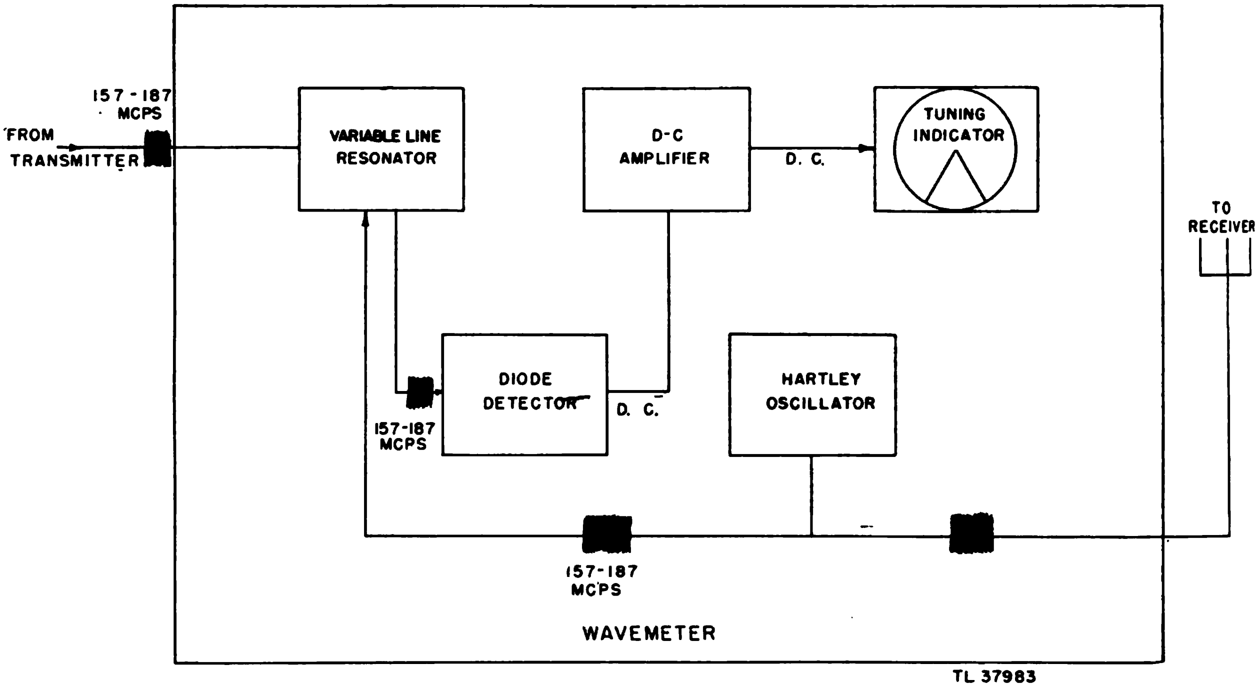


Figure 62. Wavemeter, block diagram.

is provided. This device is the wavemeter. When used with the transmitter, the wavemeter measures the frequency of the r-f output. When used with the receiver, the wavemeter radiates an r-f signal at the same frequency as the transmitter and the r-f sections of the receiver are then tuned to this frequency.

73. General Description

The wavemeter consists of five stages: the variable line resonator, diode detector, d-c amplifier, tuning indicator, and auxiliary oscillator (fig. 62). A detailed analysis of the circuits in the wavemeter is contained in paragraphs 74 to 78 which follow.

74. Variable Line Resonator

a. GENERAL. The variable line resonator, when tuned to the transmitter auxiliary-oscillator frequency, will permit maximum transfer of energy to the next stage.

b. OPERATION. The variable line resonator is essentially a parallel tuned circuit (fig. 63); that is, it is a coaxial line whose distributed capacitance (between conductors) and distributed inductance (along the length of each conductor) are of such quantity as to enable the resonator to be tuned to the frequency range of the transmitter. In a parallel tuned circuit, the resonant frequency is inversely proportional to the square root of the product of the inductance and capacitance in the circuit. Since these values are very small in the resonator, its resonant frequency will be high enough to be in the range of the transmitter frequency. It also follows that if these values of inductance and capacitance are reduced, the resonant frequency will rise. Thus, if a shorting end-plate is gradually moved from one end of the resonator to the other the dimensions of the line and, therefore, its capacitance and inductance will be reduced. This will result in a change in the resonant frequency of the resonator. The physical, and consequently, the electrical dimensions of the variable line resonator are controlled by a knob marked TUNING which is on the front of the wavemeter. This knob is geared to a calibrated dial so that the resonant frequency may be determined by using chart No. 3 mounted in the hinged panel on top of the wavemeter. When the resonator is in resonance with the transmitted frequency, which is coupled to it from the transmitter by means of a coupling link, it will absorb maximum power from the transmitted source and high radio-frequency currents will be set up in the resonator. These

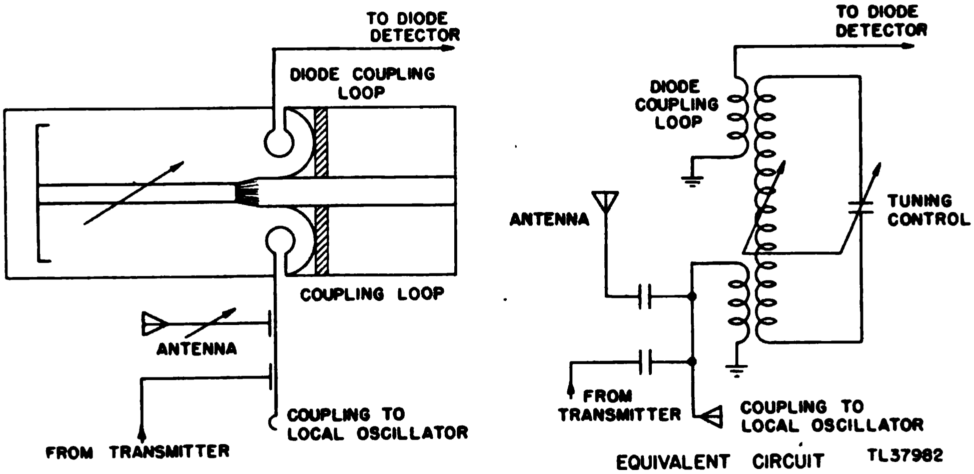


Figure 63. Variable line resonator, partial schematic, and equivalent circuit.

currents will induce voltages of the same frequency into the small diode coupling pick-up loop which is located inside the cavity. These r-f voltages are, in turn, carried by a short lead to the plate of the diode detector.

75. Detector (fig. 64)

Since the cavity resonator (tuned circuit) is in parallel with the diode, it will place a high voltage across the diode at resonance, due to its high impedance to the resonant frequency. This r-f voltage is rectified by the diode, a 9006 tube. The rectified current produces a voltage drop across the diode load resistor 57, a 1-megohm resistance. Due to the sharp resonance of the cavity resonator, any variation in the tuning will cause a decrease in voltage across this resistor. Capacitors 2–1 and 3–1 are high-frequency bypass capacitors to bypass the r-f to ground so that it will not cause any voltage drop across resistor 57. Capacitors 3–2, 5, and 2–2, in conjunction with resistance 58, form a filter network, which smoothes the detected r-f envelope and applies a fairly constant dc to the grid of the 6SF5, the d-c amplifier.

76. D-C Amplifier

The 6SF5 is a triode used as a d-c amplifier (fig. 65). This circuit is similar to a conventional audio amplifier except that there is no coupling capacitor in series with the output. The filtered, rectified, positive voltage from the diode is fed directly to the grid of the 6SF5. The greater the positive voltage on the grid, the greater will be the current flow through the tube. Consequently the plate voltage will be decreased. As the plate of the d-c amplifier is tied directly to the grid of the next stage, the potential on this grid will vary with the plate voltage of the d-c amplifier.

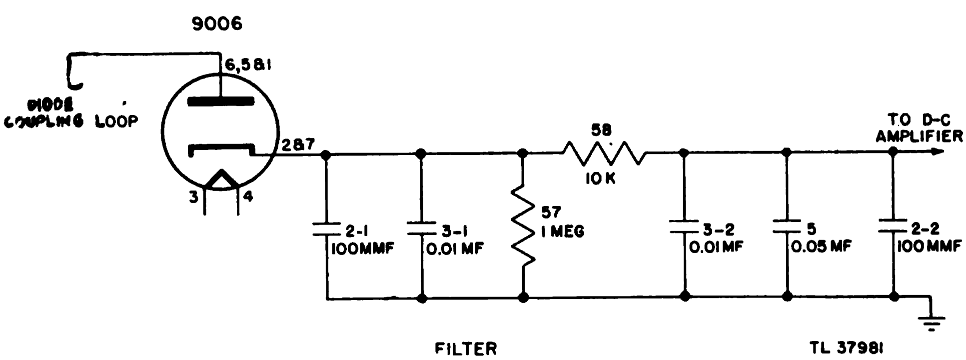


Figure 64. Diode detector and filter, partial schematic.

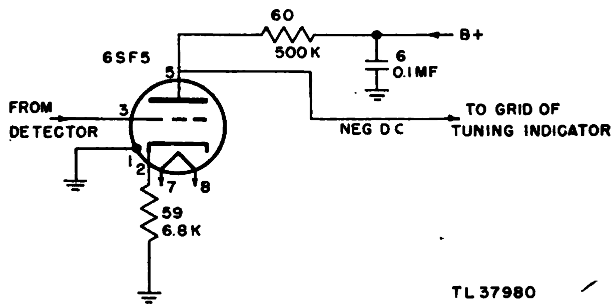


Figure 65. D-C amplifier, partial schematic.

77. Tuning Indicator

a. GENERAL. It has been pointed out that the plate voltage of the d-c amplifier is tied directly to the grid of the tuning indicator tube (6U5/6G5). This tube, however, is kept from drawing excessive current because the cathode is kept at a high positive potential. When the cavity resonator is at resonance a high current flows through the d-c amplifier. This causes a large drop across resistor 60 (the d-c amplifier load resistor), thus making the voltage on the plate less positive. This, in turn, makes the voltage on the grid of the tuning indicator less positive and tends to cut down the flow of current through the tuning indicator tube (fig. 66).

b. OPERATION. The tuning indicator tube is essentially a triode. However, at the top of the tube, the plate and grid are cut away and a round fluorescent target is placed around the cathode. When the cathode is emitting and the target is at a positive potential, it will draw electrons from the cathode and the target will glow with a green light. Between the cathode and the target is a small electrode which is connected to the plate and held at plate potential. The target is at B+ potential and the plate and its small electrode are connected to B+ through a 1-megohm resistor 61 in the tuning indicator socket. When a negative voltage applied to the grid of the indicator keeps plate current from flowing, no drop across resistor 61 occurs. The target, plate, and small electrode are at the same potential, and the small electrode offers no interference to the flow of electrons to the target. The target remains completely green. When a positive voltage (with respect to the cathode) is applied to the grid of the tuning indicator, a large current flow through the tube results. This brings about a large voltage drop across resistor 61 and makes the plate and the small electrode much more negative than the target. Thus, it tends to repel electrons flowing from the cathode to the target and this repelling action causes the area directly behind the small electrode to get no electrons and not fluoresce. A shadow on the tuning eye screen is the result. Thus, the more negative the voltage applied to the grid of the indicator, the smaller the shadow becomes.

c. EYE ADJ KNOB. By means of the EYE ADJ knob, potentiometer 63, it is possible to vary the potential on the cathode and thus control the current flow through the tube. To use it, first adjust the potentiometer until a shadow angle of about 30° is obtained. Then tune the resonator in either direction until shadow narrows. If shadow overlaps, readjust potentiometer for a 30° shadow and re-tune for minimum shadow. Continue this process until light on screen does not overlap at minimum shadow point. When this point has been reached, it is possible to find maximum tuning

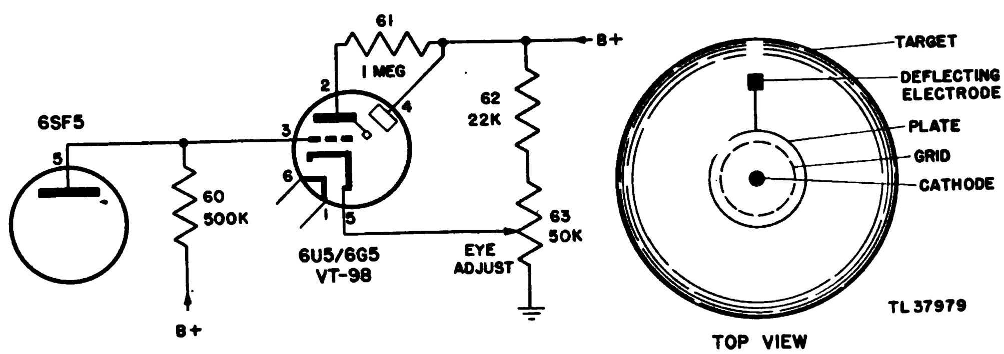


Figure 66. Tuning indicator, partial schematic.

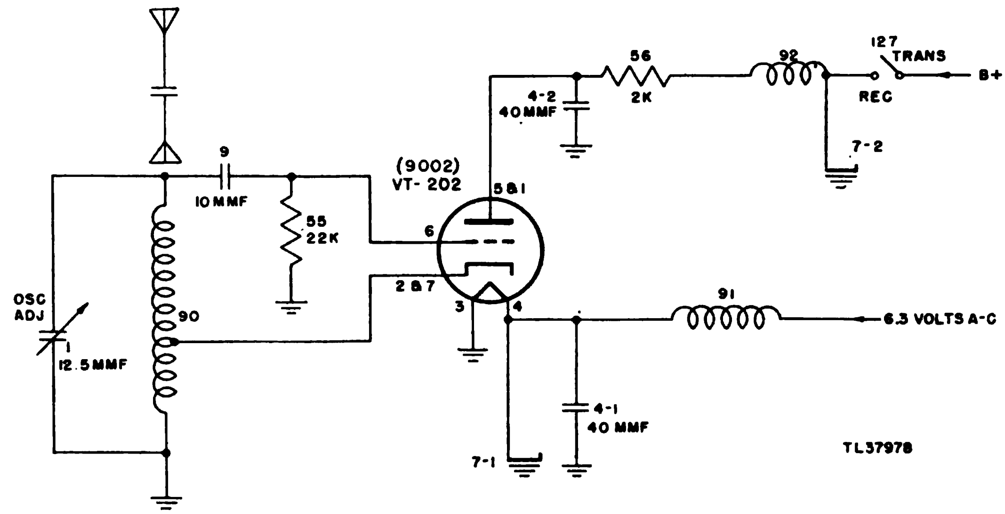


Figure 67. Auxiliary oscillator, partial schematic.

very accurately, since the eye is most sensitive when it is fluctuating between a closed condition and a 30°-shadow angle.

78. Auxiliary Oscillator

a. GENERAL. When it is desired to tune the receiver to the transmitter frequency, the use of the other stage in the wavemeter, the auxiliary oscillator, is needed (fig. 67). This is switched into the circuit by throwing switch 127 to REC position, which puts the proper voltage on the plate of the VT–202 (9002) and causes it to oscillate.

b. OPERATION. This stage is a triode tube in a Hartley oscillator circuit, whose frequency of oscillation is variable throughout the frequency range of the transmitter by the adjustment of a small r-f tuning capacitor 1 in its tank circuit (OSC ADJ control). This particular Hartley circuit is an r-f grounded-plate oscillator. That is, the plate is effectively grounded so far as r-f is concerned, due to the very small reactance of the capacitor 4–2 at the oscillator frequencies. This places the plate at one end of the tank circuit, the cathode at one tap on the coil, and the grid at the other end of the tank; the circuit thus assumes a conventional Hartley form. Resistor 55 and capacitor 9 furnish grid bias. Inductance 92 and capacitor 4–1 keep the r-f oscillations out of the power supply. The tuning capacitor is adjusted until the frequency of the auxiliary oscillator is equal to the resonant frequency of the variable line resonator and the tuning indicator eye has closed. In this manner the auxiliary oscillator can be tuned to exactly the same frequency as the transmitter. The auxiliary oscillator is coupled to the variable line resonator by the wavemeter coupling link. Once the auxiliary oscillator is tuned to the desired frequency, the resonator should be detuned about several turns so that it will not absorb too much energy from the output of the oscillator and interfere with its operation with the receiver. An antenna in a shielded sheath is also coupled to the input of the variable line resonator. This antenna will radiate when it is withdrawn from its shielding thus furnishing the radiations at the frequency desired to tune the receiver.

79. Power Supply

Both the plate voltage and 6.3 volts a-c for the filaments and pilot light are furnished by the interconnector power supply through cable 109. It is controlled by ON-OFF switch 128 which is a double throw toggle switch.

Section VII. SIGNAL GENERATOR

80. Purpose

Signal Generator I–198–A is designed to operate throughout the i-f band of receiver BC–1161–A. It is furnished to provide an i-f signal, modulated or unmodulated, for checking the i-f and video sections of the receiver. The fre-

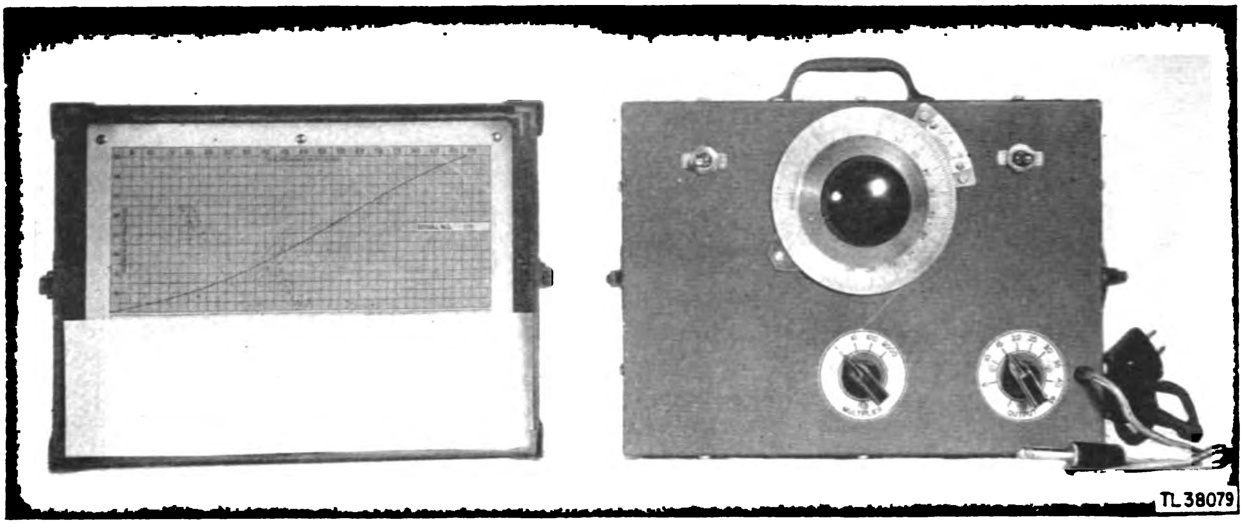


Figure 68. Signal generator I-198-A and cover.

quency of oscillation is determined by use of a calibrated dial and a calibration chart supplied on the inside of the front cover of the signal generator (fig. 68).

81. General Description

This paragraph contains a general description of the stages of the signal generator. Paragraphs 82 to 85 contain a detailed description of the signal generator circuits.

a. MODULATOR. A VT–37 triode is connected as a tuned plate oscillator to oscillate at 400 cps and provide a modulation voltage for use in checking audio and video systems.

b. R-F OSCILLATOR. A modified Hartley oscillator using a Tube VT–48 supplies r-f oscillations. This tube also acts as a mixer tube, mixing the r-f oscillations with the audio output of Tube VT–37.

c. ATTENUATOR. The output of the signal generator is taken across one of a series of resistors in the plate circuit of the oscillator. By varying the value of these resistors, the magnitude of the output voltage may be varied.

d. POWER SUPPLY. A double diode Tube VT–84 in a full-wave rectifier circuit supplies d-c voltage to the plates of the other stages and a-c voltage to their filaments.

e. FUSED PLUG. No provision for current overloads is made within the unit. Consequently, it is necessary to have fuses in series with both input leads from the 110–120 volt a-c source. These are placed in the male plug which connects to the a-c source.

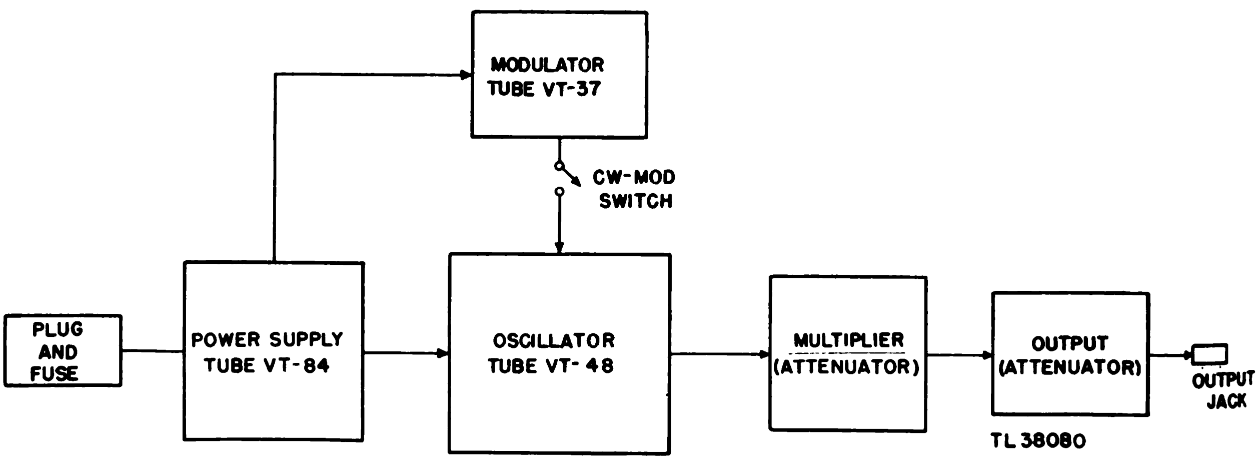


Figure 69. Signal generator, block diagram.

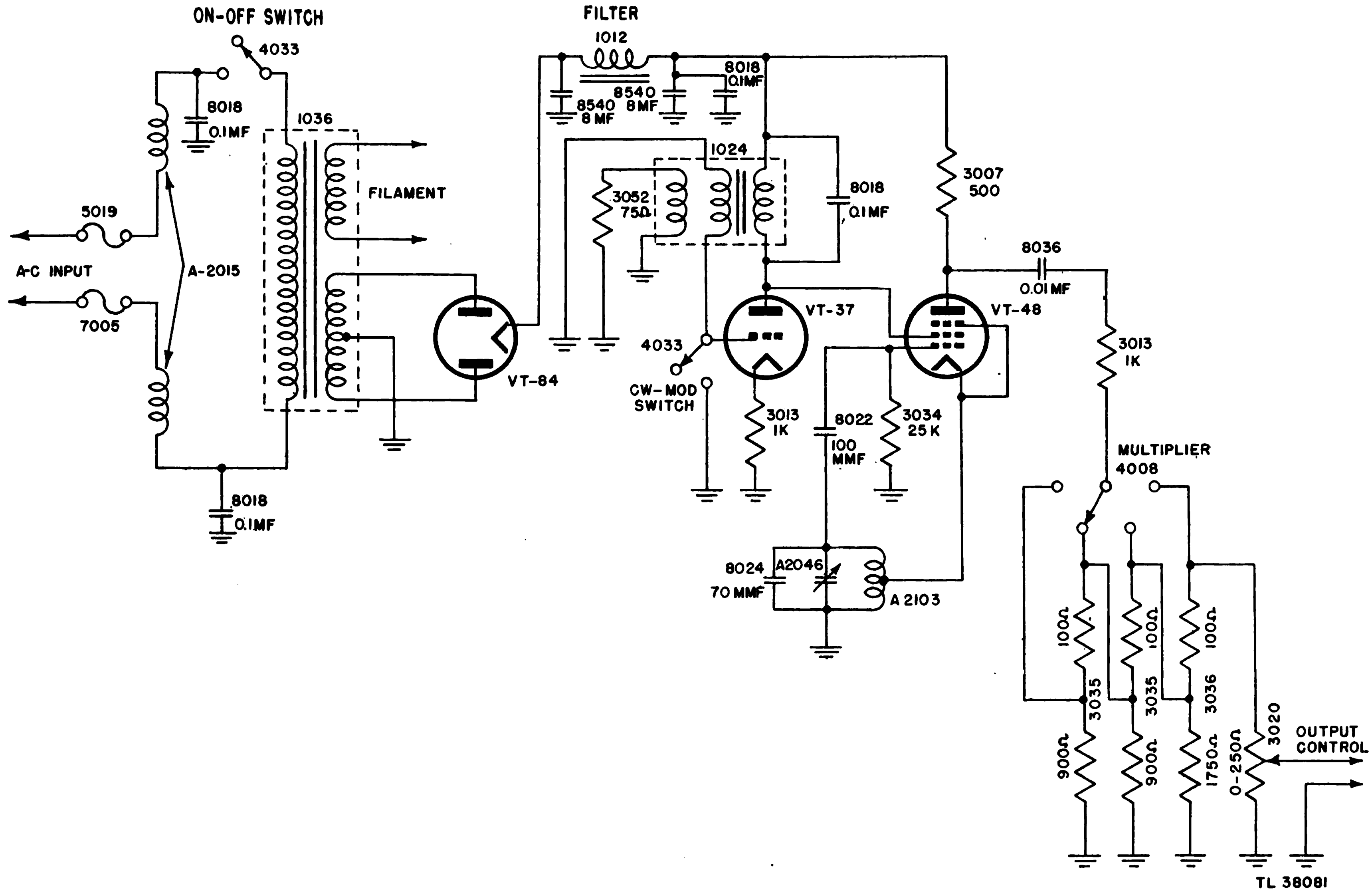


Figure 70. Signal generator, complete schematic.

82. Modulator Stage

If an audio-modulated output is desired from the signal generator, the modulator tube VT–37 is thrown into the circuit by snapping switch 4033, which removes the grounding connection to the grid of this tube (fig 78). This stage is essentially a tuned-plate tickler type of oscillator in which the resonant frequency of the plate tank circuit is induced into the grid circuit and sustains oscillations. Cathode bias is supplied by resistor 3013. Resistor 3052 is a loading resistor. The values in the tuned circuit in the plate are such as to make the oscillator resonate at 400 cycles.

83. R-f Oscillator

This stage is a Hartley oscillator, designed to oscillate between 7 and 15 megacycles. The control grid of the tube is connected to the top of a tank circuit (coil A–2103 and capacitors 8024 and A–2046), the cathode is tapped off part of the tank coil, and the plate is essentially grounded through capacitor 8036 and the low resistance of the attenuator network (fig. 70). When the modulator tube is operating, grid 2 is varying with the varying plate potential of the modulator tube. This variation affects the flow of plate current at an audio rate, and thus modulates the oscillator. When the modulator is inoperative, grid 2 is connected to the plate supply and acts as a screen grid. Capacitor 8018 (from B+ to ground) acts as a screen bypass capacitor, keeping the screen potential from fluctuating due to the r-f signals passing through it.

84. Attenuator and Output

In the plate circuit of the r-f oscillator, between the plate and ground, is a network of resistors which constitute an attenuation network (fig. 70). Its purpose is to allow variation in the voltage output of the oscillator so that a desired output voltage can be selected. A variation of the switch changes the resistance in the plate circuit slightly, but varies the distribution of current through the parallel branches of the network. In the 2000 position, the most current flows through potentiometer 3020 and thus causes the largest voltage drop across it and the maximum output. Multiple switch 4008 switches three banks of resistors in or out of the circuit. Resistor 3020 is a potentiometer. By varying it, the output voltage can be varied by small amounts. This is called the OUTPUT control, whereas the switch which snaps the resistors in and out is called the MULTIPLIER. The output is carried by a two-wire conductor to a plug. The outer conductor is a braided metal conductor which is grounded.

85. Power Supply

The power supply consists of a power transformer, full-wave rectifier, and filter. The circuit is a conventional full-wave rectifier circuit with a one-section capacitor input π-type filter at its output to smooth the d-c voltage. Switch 4033 (ON-OFF) is in series with the transformer primary and turns the power to the unit on and off. Capacitors 8018 and chokes A–2015 form a filter to keep the input voltage free from r-f pick-up.

CHAPTER 2

TROUBLE-SHOOTING PROCEDURES

Section I. GENERAL INFORMATION

86. 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 will minimize the necessity of trouble shooting.)

a. TROUBLE-SHOOTING DATA. Take advantage of the material supplied in this manual to help in locating faults rapidly. 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 other units.

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

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

(5) *Voltage and resistance data at terminal boards.*

(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 on both the schematic diagrams and 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 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 voltage, resistance, 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 will usually 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 is 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. Sections II to VII 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 and terminal board. The method of using the voltage and resistance data in checking a circuit is described in detail in paragraph 87*d* and 88*c* of this section.

87. 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 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 so 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?

$R = 1{,}000$ ohms-per-volt x 300 volts = 300,000 ohms.

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

$R = 20{,}000$ ohms-per-volt x 300 volts = 6 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 71 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 a-c	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.

To check the stage shown in figure 71 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].

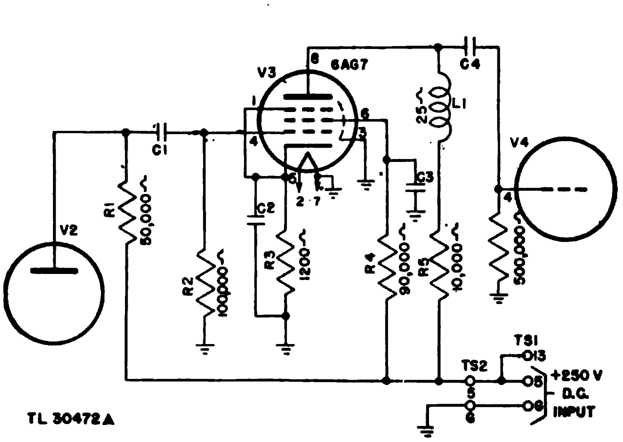


Figure 71. Schematic diagram for voltage analysis.

(2) The voltage between contact 2 and the chassis should be 6.3 a-c volts, since contact 2 is one side of the filament. On the diagram, no connections are shown because the filaments 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 can be checked by removing one of the wires from the filament winding and again testing 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, since 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 87*a*(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 a lack of the 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 was found to be low, the trouble could 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 was found to be too high, the trouble could 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 should normally be 195 volts. The voltage drop across the resistor normally would be 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 could 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 could 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, would increase the screen grid current. Increasing this current would increase the voltage drop across resistor R4. If capacitor C3 was leaky or shorted, the screen grid of tube V3 would be connected near or at ground potential, lowering the voltage on contact 6. The current through resistor R4 would rise if capacitor C3 was shorted. Resistor R4 would be the only resistance between the applied voltage and the chassis ground. Resistor R4 probably would burn out because of the high current flow unless the resistor had a high power rating. Any fault that would make high current flow through the screen grid-cathode circuit might 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 could 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 could 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, would cause the current through the plate-cathode circuit to rise, increasing 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 R5, unless their power rating is ample.

(*d*) If the voltage is too high, the trouble could 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 was burned out or resistor R3 was open, no current would flow through the plate-cathode circuit, and there would 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.

88. 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, trouble-shooting 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. 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, the ohmmeter should be set 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, the highest range should be used. 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 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 measure its resistance again, to make sure that the low reading was not because some part of the circuit was 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.

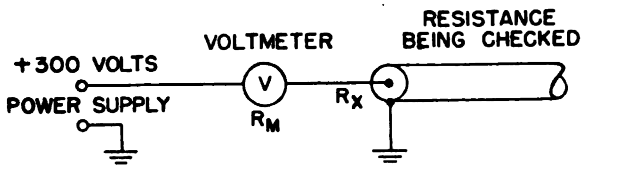
(5) *Checking grid resistance.* When checking grid resistance, a false reading may be obtained if the tube is still warm and the cathode is emitting electrons. Allow the tube to cool, or reverse the ohmmeter test leads so that the negative ohmmeter test lead is applied to the grid.

(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 are generally between 1 and 5 percent. As a rule, suspect a transformer which shows a resistance deviating more than 5 per cent from its rated values. Allow the transformer to cool off before the resistance test is made.



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

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 72. Measurement of high resistance.

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 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 72. 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 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 $Rx = \frac{300Rm}{V}$ is shown below. Rx is the unknown resistance, Rm is the meter resistance, and V is the voltmeter reading.

$$\frac{Rx}{Rm} = \frac{300-V}{V}$$

if Rx is very large, V will be small in comparison to 300. Assuming that 300-V can be replaced by 300, the formula $\frac{Rx}{Rm} = \frac{300}{V}$ is obtained. When solved for Rx this gives $Rx = \frac{300Rm.}{V}$

When making the measurement, the meter should first be put on the 300-volt scale to protect it in case Rx 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 73 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.

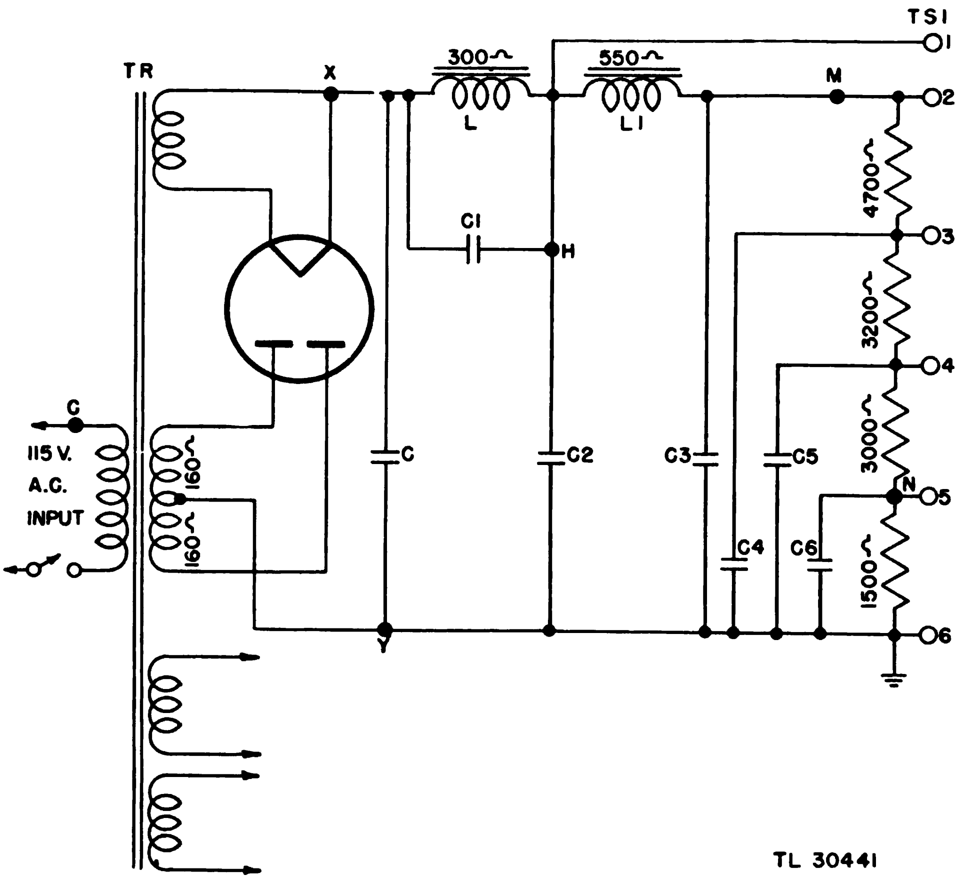


Figure 73. Schematic diagram for resistance analysis.

(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 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 either the circuit 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:

(*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 73, 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 was greater than zero but much less than 7,700 ohms, disconnect capacitors C4, C5, and C6 from the circuit. Then check the capacitors and the 1,500-ohm and the 3,000-ohm resistors individually.

89. 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 i-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.

90. 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 should always 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 to 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 an example, see paragraph 87*d*.

91. 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 returning 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.

92. 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

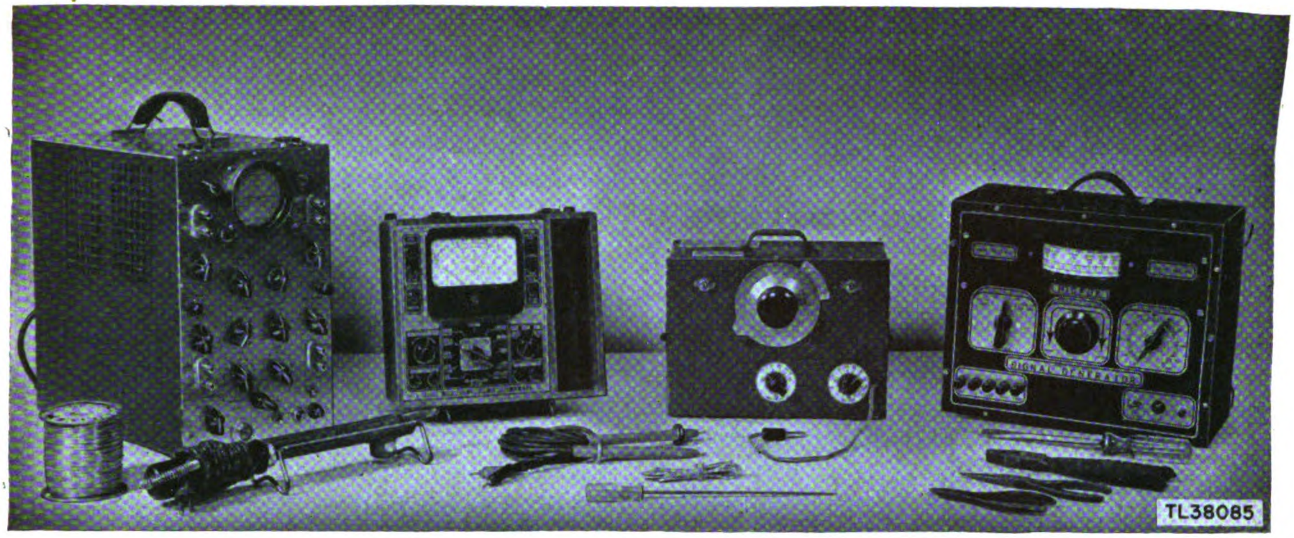


Figure 74. Test equipment used for trouble shooting RC–150.

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 measurements 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) *60-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 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) *60-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 is usually due to the presence of 60-cycle modulation or 60-cycle pickup combined with the observed waveform. To check turn the oscilloscope sweep frequency to 30 cycles. If the effect is due to lines 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 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 shunts a capacitance across the circuit under test, causing 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 oscilloscope 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. 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, 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 is a normal condition. 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 is 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 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 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 the test waveforms.

93. 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 microfarad.

(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 beween the middle stage and the detector. By moving the signal generator output either forward or backward, stage by stage, the faulty stage can be rapidly located. 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, they are all brought 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. Complete instructions for aligning the receiver are given in section IV of this chapter.

94. 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; they may cause short circuits.

d. A carelessly soldered connection may create a new fault. It is very important to make well-soldered joints, since 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.

Section II. TROUBLE SHOOTING BASED ON STARTING PROCEDURE AND SEVEN TEST POSITIONS

95. Introduction

Radio equipment RC–150 is designed to give trouble-free operation; but as in all precision apparatus, faults occur. The analysis of symptoms and trouble-shooting information which follows has been prepared to aid the repairman in isolating troubles as they occur, so that the set may be placed back in operation as quickly as possible.

a. In starting the set, the procedure in paragraph 66, TM 11–1317, Technical Operation Manual, should be followed. Proper indications are given, as well as most of the improper indications which indicate trouble occurring at a particular step of the starting procedure. The improper indications assist the operator in determining quickly where the trouble is. As soon as the faulty component is located replace it with the spare so that operations continue with minimum delay. After the replacement is made,

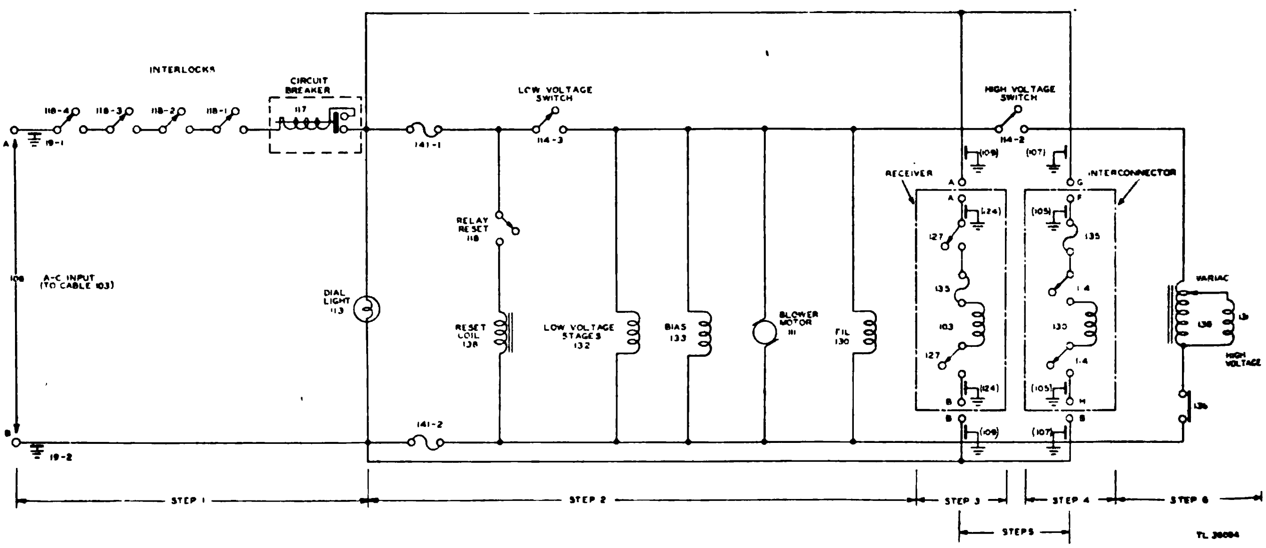


Figure 75. Schematic diagram of RC–150 control circuit.

refer to the other sections of this chapter, where detailed tests, procedures, and reference data for each component are given.

b. A trouble may be further isolated to a component by means of the seven test positions used in conjunction with the test scope. This procedure indicates operational faults which can be isolated to one component. After the defect is isolated the defective component can be quickly replaced and set up for trouble shooting. Refer to the other sections of this chapter, where detailed tests, procedures, and reference data for each component are given.

96. Trouble Shooting Based on Starting Procedure

The following tabulation of normal and abnormal conditions is based on the seven steps of the starting procedure, paragraph 66 of TM 11–1317. Figure 75 is a schematic diagram of the power supply of the transmitter and of the a-c input circuits to the receiver and the interconnector. These components are energized in the first five steps of the starting procedure. The diagram may be used to facilitate trouble shooting in these circuits.

STEP 1. Turn CIRCUIT BREAKER on transmitter ON.
NORMAL INDICATION: Red indicator light on transmitter panel lights.

Abnormal indications	*Probable location of fault*
Red indicator lamp, 113 fails to light.	1. Open in a-c circuit to connector 108. 2. Defective lamp. 3. Open in transmitter interlocks 118–1 to 118–4. 4. Defective circuit breaker, 117 (Transmitter, Symptom A).
CIRCUIT BREAKER 117 does not remain in ON position.	1. Short in a-c primary circuit in transmitter (Transmitter, Symptom B). 2. Short in a-c power supply from transmitter to interconnector. 3. Short in a-c power supply from transmitter to receiver. 4. Defective circuit breaker 117 (Transmitter, Symptom B).

STEP 2. Set the LOW VOLTAGE switch to the ON position.
NORMAL INDICATIONS: 1. Meter light on transmitter lights.
2. Blower motor in transmitter can be heard.

Abnormal indications	*Probable location of fault*
Blower motor cannot be heard. Meter lamp lights.	1. Defective blower motor (Transmitter, Symptom C).
Blower motor can be heard but meter lamp does not light.	1. Defective meter lamp 112. 2. Short or open in power supply of meter lamp 112 (Transmitter, Symptom D).
Circuit breaker *kicks out.* All indicator lamps go out.	1. (Transmitter, Symptom E).

STEP 3. Turn on receiver by switching receiver ON-OFF switch to ON position.
NORMAL INDICATIONS: 1. Panel lamps on receiver light.
2. Tuning indicator lights after a delay of a few seconds.

Abnormal indications	*Probable location of fault*
Panel lamps do not light and tuning indicator does not light.	1. A-c input circuit in receiver.

Abnormal indications	*Probable location of fault*
	2. A-c input circuit from transmitter socket 108 to receiver socket 124 (Receiver, Symptom A).
Panel lamps do not light. Tuning eye lights.	1. (Receiver, Symptom B.)
Tuning indicator does not light. Panel lamps light.	1. (Receiver, Symptom C.)
Circuit breaker on transmitter *kicks off*. All indicator lamps go out.	1. Short in receiver power supply (Receiver, Symptom D).

STEP 4. Turn on interconnector by switching interconnector ON-OFF to ON position.
NORMAL INDICATION: Red indicator lamp 108 on interconnector lights.

Abnormal indications	*Probable location of fault*
Red indicator lamp 108 does not light. All other indicator lamps are lighted.	1. A-c input circuit from transmitter socket 107 to interconnector socket 105. 2. A-c input circuit in interconnector (Interconnector, Symptom A). 3. Blown fuse 135 in interconnector. 4. Defective light bulb.

STEP 5. Making certain that at least 30 seconds have elapsed since transmitter LOW VOLTAGE switch was turned ON, and that HIGH VOLTAGE CONTROL is in extreme counterclockwise position, turn HIGH VOLTAGE toggle switch to ON position.

Abnormal indications	*Probable location of fault*
Blower motor stops operating. Meter light 112 goes out. Circuit breaker may *kick off*, turning all indicator lamps out.	1. (Transmitter, Symptom E.)

STEP 6. Place STANDBY OPERATE switch on OPERATE position. Then rotate HIGH VOLTAGE CONTROL in clockwise direction until meter reads 3.5 kilovolts. When normal indications below are observed, return STANDBY OPERATE switch to STANDBY position.
NORMAL INDICATIONS: 1. Meter reads 3.5 kilovolts with variac at normal setting.
2. Current reading, when VOLTAGE CURRENT toggle switch is pressed, is about 2 milliamperes with STANDBY OPERATE switch in OPERATE position.

Abnormal indications	*Probable location of fault*
Normal current and voltage reading cannot be obtained.	1. (Transmitter, Symptoms I, J, L, M, N, O, and P.)
Overload relay *kicks off*.	1. (Transmitter, Symptoms K, P, and Q.)
Variac smokes and fuse may blow as control knob is rotated.	1. (Transmitter, Symptom H.)

STEP 7. Set STANDBY OPERATE switch to OPERATE position.
NORMAL INDICATION: Normal IFF picture with main pulse should appear on display Oscilloscope BC-403 screen.

Abnormal indications	*Probable location of fault*
No picture on screen or distorted picture.	1. Radar scope (TM 11-1510, SCR-270-271). 2. (Interconnector, Symptoms B through K.)
No IFF picture on screen, radar picture normal.	1. (Receiver, Symptoms E through J.) 2. (Interconnector, Symptom E.)

97. Trouble Shooting Based on Seven Test Positions

The following tabulation of normal and abnormal conditions is based on the seven test positions, and is used to further isolate trouble after the starting procedure has been followed. It will sectionalize trouble to particular components and to channels of the interconnector. The correct settings for taking these positions are given in chapter 6, TM 11-1317, Technical Operation Manual.

POSITION 1: DIVISION.

Figure 76. Waveform position 1.

Abnormal conditions	*Probable location of fault*
1. Dot on screen.	1. Radar scope (TM 11-1510, SCR-270-271).
2. Horizontal sweep but no vertical deflection.	2. (Interconnector, Symptoms O through R.)

Note. If a dot appears on the test scope in positions 2 to 5 the trouble can only be in the radar scope or in input to interconnector. If the dot appears on only one of these positions additional probabilities are listed under those test position.

POSITION 2: TRANSMITTER REPETITION.

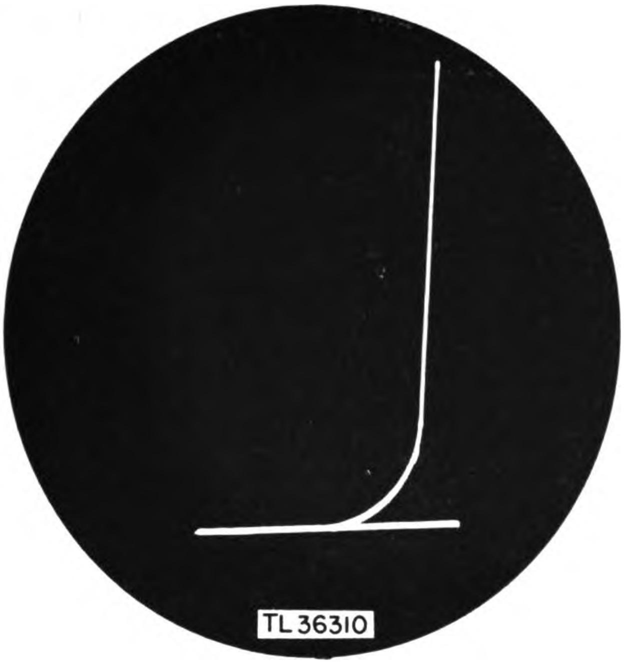


Figure 77. Waveform position 2.

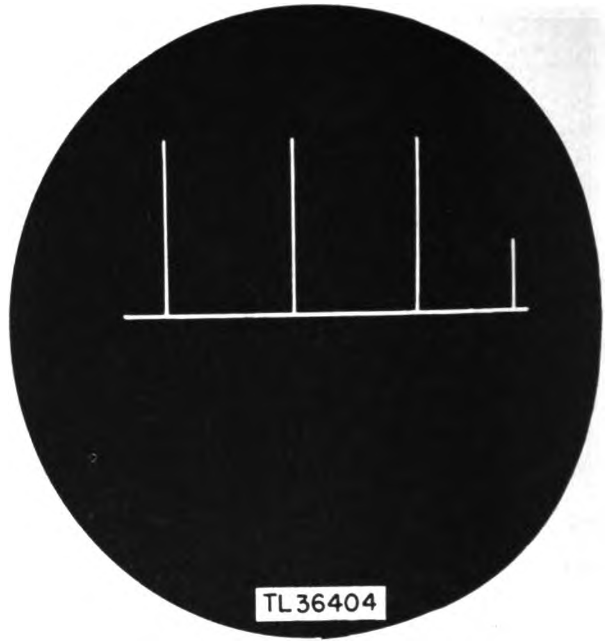


Figure 78. Waveform position 2, abnormal pattern.

Abnormal conditions	*Probable location of fault*
1. Dot on screen.	1. (Interconnector, Symptom M.)
2. Horizontal sweep but no vertical deflection.	2. See transmitter trouble-shooting chart, if position 4 is not normal.
3. Vertical deflection but no horizontal sweep.	3. (Interconnector, Symptom U.)

POSITION 3: TIMING.

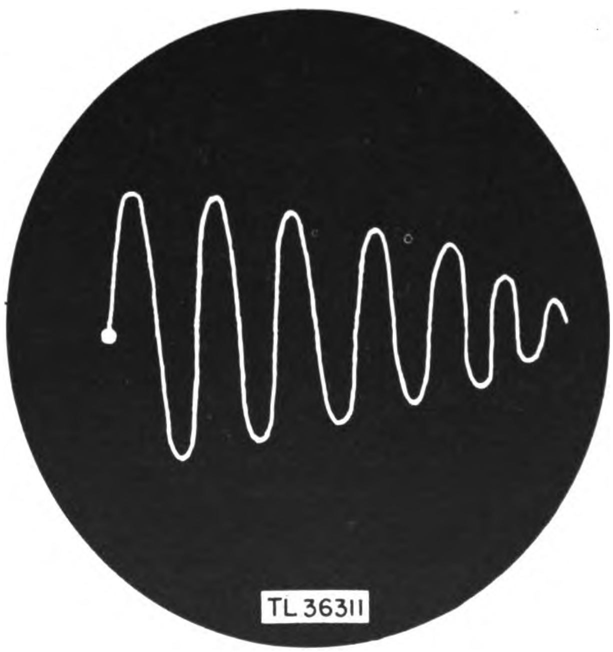


Figure 79. Waveform position 3.

Abnormal condition	*Probable location of fault*
1. Dot on screen.	1. (Interconnector, Symptoms M and C (1).)

POSITION 4: TRANSMITTER SYNC PATTERN.

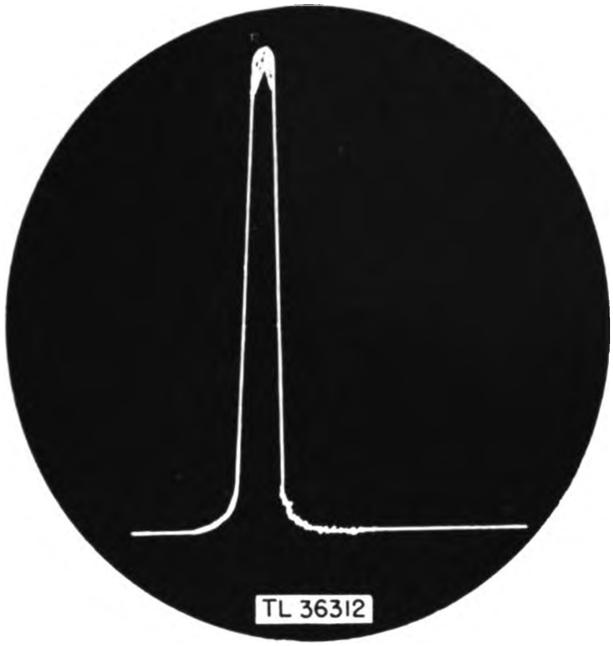


Figure 80. Waveform position 4.

Abnormal conditions	*Probable location of fault*
1. Dot on screen.	1. (Interconnector, Symptoms M, O, Q, R, and S.)
2. Horizontal sweep but no vertical deflection.	2. (Interconnector, Symptoms R and X.)
3. Vertical deflection but no horizontal sweep.	3. (Interconnector, Symptom C (1).)

POSITION 5A: MONITOR OUTPUT.

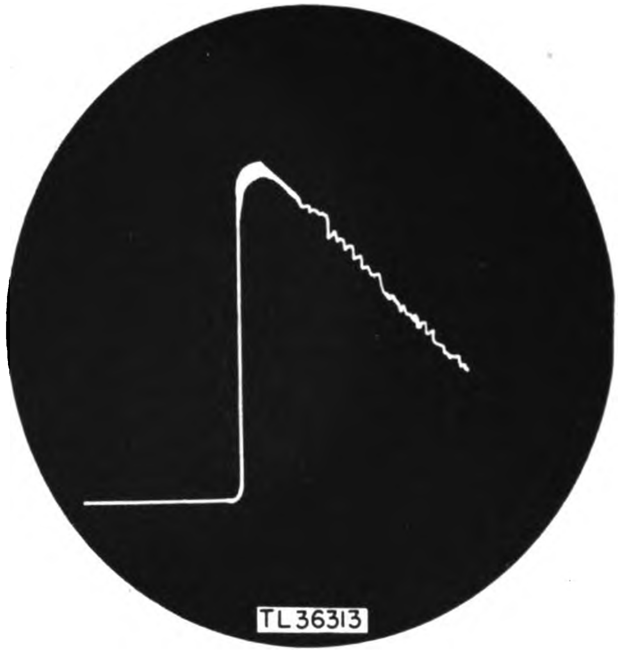


Figure 81. Waveform position 5A.

Abnormal conditions	*Probable location of fault*
1. Dot on screen.	1. (Interconnector, Symptoms M, O, Q, R, and S.)
2. Horizontal sweep but no vertical deflection.	2A. See transmitter trouble-shooting chart if position 4 is normal.
	2B. Interconnector, if position 4 is normal (Symptom R, and X).
3. Vertical deflection but no horizontal sweep.	3. (Interconnector, Symptom C (1).)

POSITION 5B: PULSE WIDTH (SIGNAL WIDTH-POWER switch pressed to SIGNAL WIDTH position)

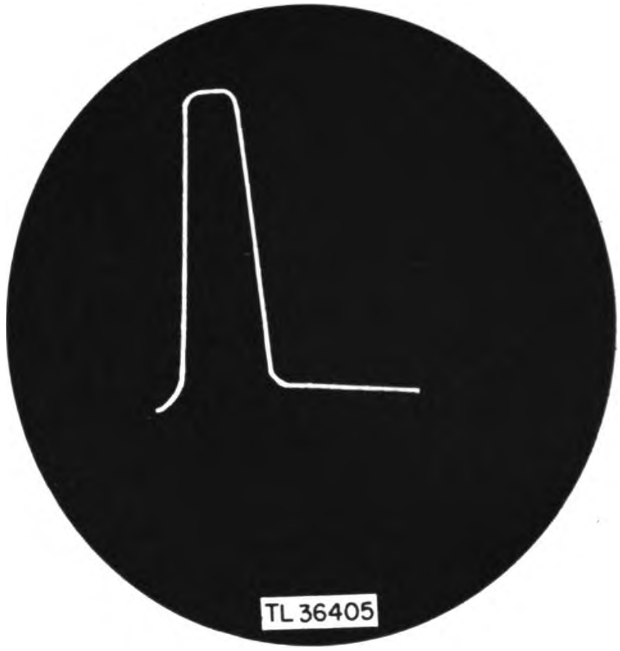


Figure 82. Waveform position 5B.

Abnormal conditions	*Probable location of fault*
1. Dot on screen.	1. (Interconnector Symptoms M, O, Q, R, and S.)
2. Horizontal sweep but no vertical deflection.	2A. See transmitter trouble-shooting chart, if position 4 is normal.
	2B. Interconnector, if position 4 is not normal (Symptom R, and X).
3. Vertical deflection but no horizontal sweep.	3. (Interconnector, Symptom C(1).)

POSITION 6: CALIBRATION SIGNAL

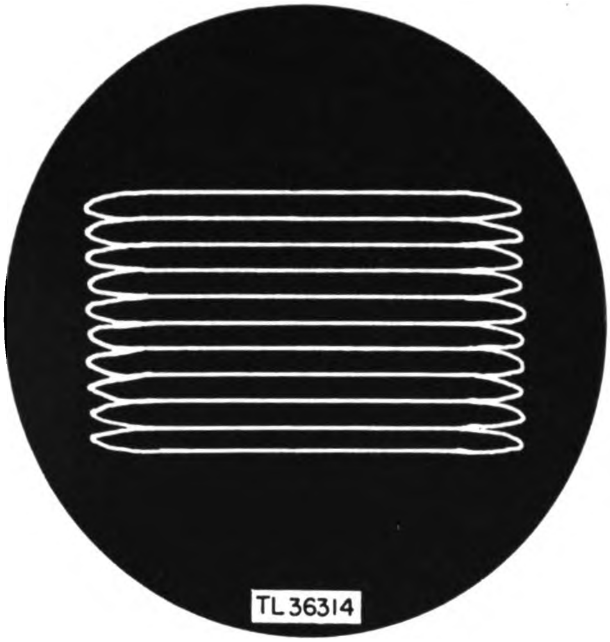


Figure 83. Waveform position 6.

Abnormal conditions	*Probable location of fault*
1. Dot on screen.	1. No power to either radar scope or interconnector (main power failure).
2. Horizontal sweep but no vertical deflection.	2. (Interconnector, Symptoms Q, and D(1).)
3. Vertical deflection but no horizontal sweep.	3. (Interconnector, Symptom M.)

POSITION 7: RECEIVER OUTPUT

Figure 84. Waveform position 7 showing receiver grass.

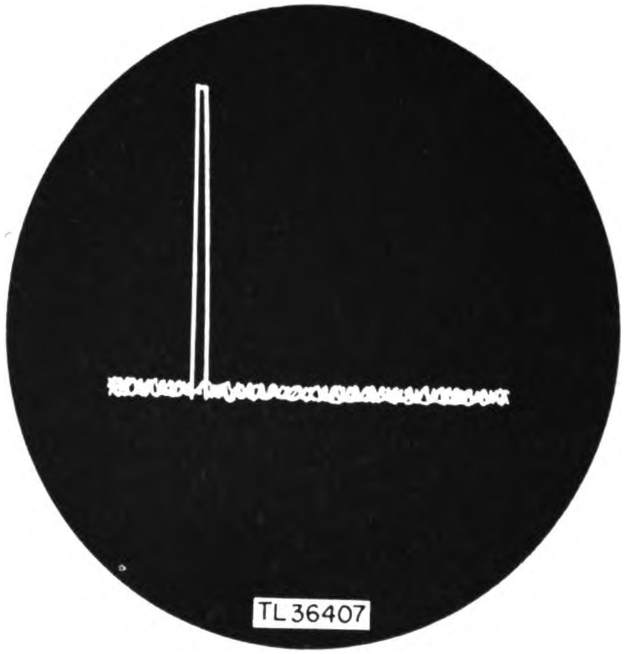


Figure 85. Waveform position 7 showing main pulse.

Abnormal conditions	*Probable location of fault*
1. Dot on screen.	1. Check power input to SCR–270 and RC–150.
2. Horizontal sweep but no vertical deflection.	2. See receiver trouble-shooting chart.
3. Horizontal sweep, vertical deflection shows *grass* but no transmitted pulse.	3A. Receiver not tuned to frequency of transmitter. 3B. See transmitter trouble-shooting chart.
4. Vertical deflection but no horizontal sweep.	4. (Interconnector, Symptom M.)

TESTS* 1 TO 7	DESCRIPTION	Y SIGNAL INPUT VERT AMP INPUT	X SIGNAL INPUT HOR AMP INPUT	D SIGNAL INPUT INTENSITY-GRID INPUT	WAVE FORM SEEN ON MONITORING OSCILLOSCOPE
1	DIVISIONS		625 CPS SINE-WAVE	NONE	
2	TRANSMITTER REPETITION	7 MICROSECONDS	6360 MICROSECONDS LONG SAW-TOOTH SWEEP	+ − 60 MICROSECONDS BLANKING WAVE	RADAR NOT KEYING THE IFF
3	TIMING	200 KILOCYCLES	40 MICROSECONDS FAST SAW-TOOTH SWEEP	+ − 40 MICROSECONDS	
4	TRANSMITTER SYNCH	1 TO 5 MICROSECONDS	40 MICROSECONDS FAST SAW-TOOTH SWEEP	+ − 40 MICROSECONDS	
5	TRANSMITTER PEAK POWER TRANSMITTER PULSE WIDTH	7 MICROSECONDS	40 MICROSECONDS FAST SAW-TOOTH SWEEP	+ − 40 MICROSECONDS	
6	CALIBRATION	60 CPS SINE-WAVE	625 CPS SINE-WAVE	NONE	
7	RECEIVER		625 CPS SINE-WAVE	NONE	

*SELECTOR SWITCH MUST BE IN THE "OPERATE" POSITION

TL38086

Figure 86. Test position input waveforms.

Section III. TRANSMITTER

> **Warning:** *Voltages sufficient to cause death on contact are exposed at many points on this unit. Do not place hands or arms within unit when the high voltage is on. Do not make any connection into the unit which will bring high voltages out to an exposed point. Make all tests with high voltages off. Always ground high-voltage capacitors before touching them or their associated circuits.*

98. Reference Data

To assist the maintenance personnel while trouble shooting on the transmitter, figures have been provided. In section II, chapter 1 there are partial schematics and block diagrams and at the end of this section there are groups of figures containing views of the transmitter, a complete schematic and wiring diagram, drawings of terminal boards, voltage and resistance measurements and waveforms.

99. Introduction

In section II, trouble shooting based on the starting procedure is discussed. On the basis of steps 1, 2, 5, 6, and 7 in the starting procedure, troubles in many of the circuits of the transmitter can be spotted. In the trouble-shooting chart in the following section, the first 16 symptoms can be observed while the equipment is being put into operation. Troubles which occur during the starting procedure, except for steps 3 and 4, will almost always indicate that the cause is in the transmitter. It is therefore very important to observe and record all the symptoms carefully, so that when the transmitter is removed from the rack there is no time wasted in determining the exact cause of the trouble. There are, however, many symptoms which are revealed after the starting procedure is accomplished and while the set is in operation. Troubles of this nature are also discussed in this section.

100. Localizing Trouble to Transmitter

If the IFF transmitter main pulse does not appear on the screen of the display oscilloscope when the SELECTOR switch is in the OPERATE position, the trouble may be in any of the three major components: receiver, transmitter, or interconnector. To determine which component is at fault the test oscilloscope should be used. Turn the test switch to position 4. If the proper pattern appears, then the control unit is not at fault, and it can be assumed that the transmitter is receiving its synchronizing pulse from the interconnector. Now turn to position 3. If the correct pattern is not observed, it can be concluded that the transmitter is at fault. Positions 4 and 5 together are usually a definite check on the operation of the transmitter, but it is always advisable to check position 7 also. In this position, the main transmitter pulse should be seen in the background of the receiver grass. This indicates that the transmitter is operating. As soon as the trouble has been localized to the transmitter, it is necessary to replace the faulty component with the spare; then consult the trouble-shooting chart. The first 12 symptoms do not require anything more than an ohmmeter and a tube checker. Some of the other troubles, however, call for signal tracing or voltage checks. Details which explain how to set up the equipment for a more exhaustive analysis follow.

101. Setting Up Transmitter for Trouble Shooting

a. The components and test equipment needed for trouble shooting the transmitter are:

(1) Interconnector (spare).

(2) Cable 101 (spare).

(3) Volt-ohmmeter.

(4) Signal Generator (audio) I–192–A.

(5) Modified test scope. A convenient arrangement of this equipment set up for trouble shooting may be seen in figure 87.

b. To prepare for trouble shooting the transmitter, make the following connections and checks:

(1) Connect cable 101 to the interconnector.

(2) Connect cable 101–B from the interconnector to the transmitter.

(3) Connect cable 101–D from the interconnector to the test scope.

(4) Check the test scope controls. The frequency range control should be set on X INPUT.

(5) Connect the signal generator output to terminal 6 of cable 101–E.

(6) Set the signal generator for an output frequency of 625 cps.

(7) Tape down the transmitter interlock switches.

(8) Place all power switches on the components in the OFF position.

(9) Connect the a-c power cords of the signal generator and the test scope, and cable 103 of the transmitter to the a-c supply.

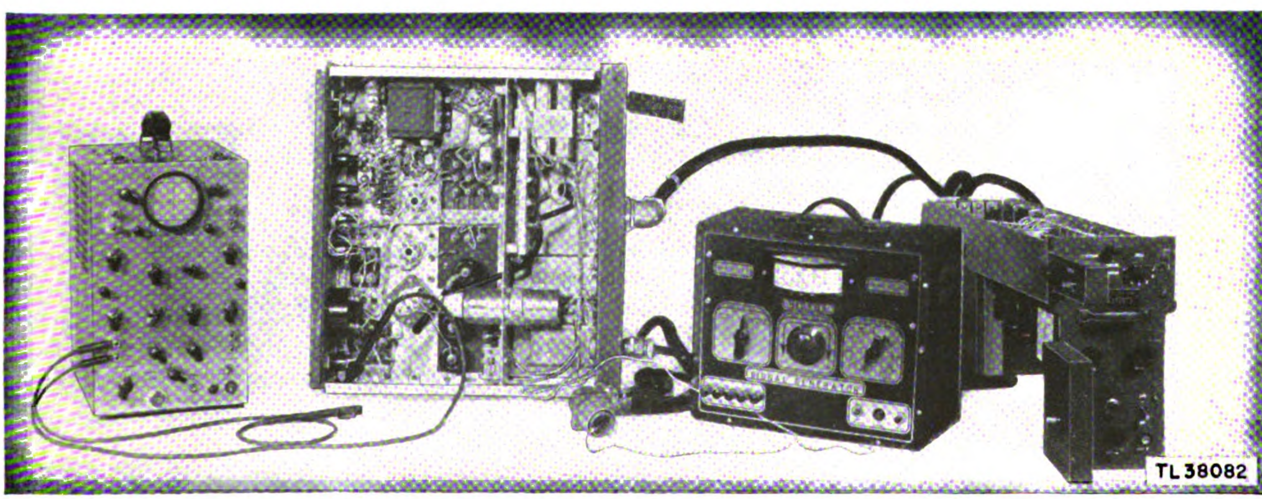


Figure 87. Transmitter set up for trouble shooting.

102. Signal Tracing Modulator Section

a. Signal tracing in the modulator section is complicated by the fact that the input and output waveforms of the various stages are of very short duration. However, this difficulty may be overcome by using the fast sweep and the brilliancy modulation obtainable from the interconnector.

b. Remove the Y-input leads of cable 101–D from the test scope, but leave the X-input and D1 — D2 leads connected. Connect the upper Y-input terminal to the signal probe and ground the lower Y-input terminal. Set the test position SELECTOR switch 112 on the interconnector positions 3, 4, or 5, and the range frequency control on the test scope to X. With this arrangement the fast sweep and brilliancy modulation is fed from the interconnector to the test scope as usual, but the Y-input signals may be taken from any terminal in the modulator section.

103. Accuracy Check of Meter 137

If a voltmeter having a 5,000-volt range is not available, use an ohmmeter to check the accuracy of the meter. Place the ohmmeter test leads across the meter terminals of a good meter. The ohmmeter range control may be turned to a higher or lower range setting, or the zero adjust control may be turned in order to obtain the most convenient meter indication. Then without further adjustment of the ohmmeter, place the ohmmeter test leads across the terminals of the suspected meter. If the reading of the suspected meter does not agree with the reading of the good meter, the suspected meter is defective.

104. Transmitter Trouble-shooting Chart

A. SYMPTOM: Red indicator lamp, 113, fails to light (step 1).

Probable location of fault	*Procedure*
Defective lamp.	1. Replace the lamp. 2. If trouble is not cleared, see item below (fig. 75).
Open in interlocks 118–1 to 118–4.	1. Check visually if cover of transmitter is properly placed on transmitter chassis. Readjust cover if necessary. 2. Check interlocks for continuity with ohmmeter. 3. If trouble is not cleared, see item below.
Defective circuit breaker 117.	1. Check circuit breaker and replace if necessary. 2. If trouble is not cleared, see item below.
Open in a-c supply circuit to connector 108.	1. Check a-c circuit through switch on operating van of SCR–270 or power panel of SCR–271 through unilet box to plug 108 on RC–150 transmitter, using test lamp or voltmeter.

B. SYMPTOM: Circuit breaker 117 does not remain in ON position (step 1).

Probable location of fault	*Procedure*
Defective circuit breaker 117.	1. Check circuit breaker and replace if necessary. 2. If trouble is not cleared, see item below (fig. 75).
Short in a-c input circuit in transmitter, receiver, or interconnector.	1. Remove cables to plugs 107 and 109. If circuit breaker opens, fault is in transmitter. Turn off power and use an ohmmeter to determine location of fault. 2. If trouble is not in transmitter, connect cables to plugs 107 and 109 in turn to determine in which component fault lies. 3. After determining in which component fault lies, use an ohmmeter to determine location of short.

C. SYMPTOMS: 1. Blower motor cannot be heard when LOW VOLTAGE switch 114-3 is put in ON position.
2. Meter lamp 112 lights (step 2).

Probable location of fault	*Procedure*
Defective wiring to blower motor.	1. Turn off power and check for continuity with an ohmmeter. 2. If trouble is not cleared, see item below.
Defective blower motor.	1. Check by replacing motor. See chapter 3, paragraph 143.

D. SYMPTOMS: 1. Meter lamp 112 does not light (step 2).
2. Blower motor operates (step 2).

Probable location of fault	*Procedure*
Defective meter lamp.	1. Replace the lamp. 2. If trouble is not cleared, see item below (fig. 18).
Short or open in power supply of meter lamp 112.	1. If filament of Tube VT–231 is glowing, turn off power and check meter light circuit for continuity from pin 7 of transformer 132 to lamp (figs. 18 and 96). 2. If filament of VT–231 is not glowing check for open in primary of transformer 132. Also check for open in filament secondary of transformer 132 (terminals 6 and 7).

E. SYMPTOMS: 1. Circuit breaker kicks out.
2. All indicator lamps go out (step 2).

Probable location of fault	*Procedure*
Short in primary of transformer 130, 132, or 133.	1. Isolate each transformer from the rest of the circuit and measure the resistance across the primary terminals. Values should be: Transformer 132, terminals 1 to 2, 20 ohms. Transformer 133, terminals 1 to 2, 16 ohms. Transformer 130, terminals 5 to 6, 9 ohms (figs. 18 and 96). 2. If trouble is not cleared, see item below.
Short in blower motor 111.	1. Check resistance of blower motor winding. It should be 100 ohms when measured at the male plug. 2. If trouble is not cleared, see item below.
Short in secondary of transformer 130.	1. Check oscillator tube filaments for glow. 2. If no glow is present, check for short in secondary windows (terminals 3 and 4 for filaments of oscillators, terminals 1 and 2 for filaments of h–v rectifier).

F. SYMPTOMS: 1. Meter lamp 112 does not light (step 2).
2. Blower motor cannot be heard (step 2).

Probable location of fault	*Procedure*
Fuse 141–1 or 141–2 open.	1. Check fuses for open. If fuses are open, there is a short in the power supply (figs. 18 and 96). 2. Isolate each transformer from the rest of the circuit and measure the resistance across the primary terminals. Values should be: Transformer 132, terminals 1 to 2, 20 ohms. Transformer 133, terminals 1 to 2, 16 ohms. Transformer 130, terminals 5 to 6, 9 ohms. 3. If trouble is not cleared check the resistance of the blower motor windings. It should be 100 ohms when measured at the male plug.
Defective low-voltage switch 114–3.	1. If fuses are not open, check switch for continuity.

G. SYMPTOMS: 1. Blower motor stops operating (step 5).
2. Meter lamp 112 goes out (step 5).
3. Circuit breaker may kick off, turning all indicator lamps out (step 5).

Probable location of fault	*Procedure*
Blown fuses 141–1 and 141–2.	1. Check fuses 141–1 and 141–2 for open. Fuses generally blow before circuit breaker *kicks out.* 2. Before throwing HIGH VOLTAGE toggle switch to ON position again, see item below (figs. 18 and 96).
Short in variable windings of variac 136.	1. To determine if short is in variac, measure resistance of parallel combination of variac winding 136 and the primary transformer 131, between terminals 1 and 2 (fig. 88) of the variac. This resistance should vary from zero to 5 ohms as variac control knob is rotated clockwise. 2. If above test is not conclusive, measure resistance of variac 136 alone when control knob is fully counterclockwise between terminals 1 and 3 (fig. 88). This resistance should be 15 ohms. 3. If trouble is not cleared see item below.
Short in the input of the high-voltage circuit beyond switch 114–2	1. Check for short to ground at switch 114–2. 2. Check for short to ground at terminals of variac 136. 3. Check for short to ground at contacts of overload relay 138.

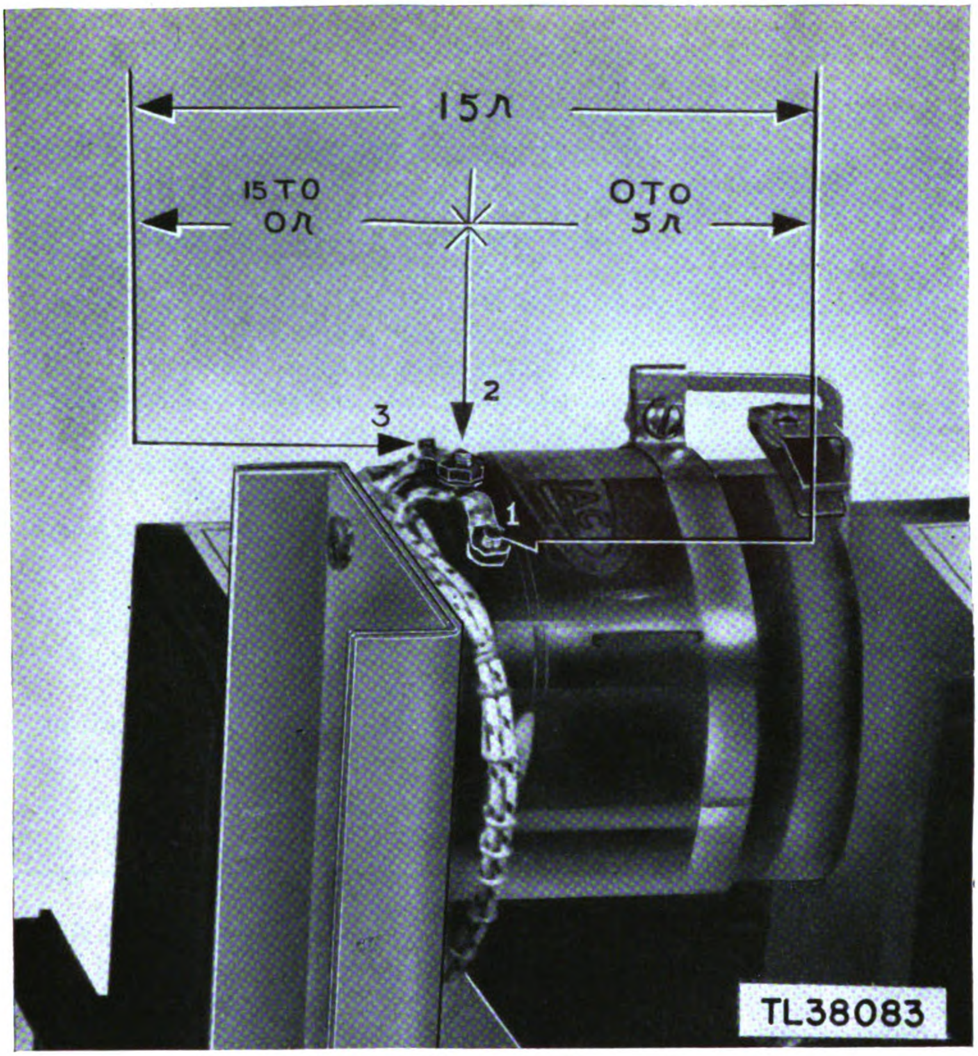


Figure 88. Variac measurements.

H. SYMPTOMS: 1. Variac 136 smokes as control knob is rotated clockwise (step 6).
2. Meter lamp 112 may go out (step 6).

Probable location of fault	*Procedure*
Short in primary of transformer 131 in transmitter.	1. Turn HIGH VOLTAGE toggle switch to OFF position immediately (fig. 18). Measure resistance of parallel combination of variac winding 136 and primary of transformer 131, between terminals 1 and 2 (fig. 88) of the variac. This resistance should vary from zero to 5 ohms as variac control knob is rotated clockwise.
	2. If above test is not conclusive, check primary resistance of transformer 131 (terminals 1 and 2 of transformer). This should be 6 ohms. *Note.* It is necessary to isolate transformer 131 from the variac 136 before making the measurement.
	3. If meter lamp 112 is out replace blown fuse 141–1 or 141–2 before turning the HIGH VOLTAGE switch to ON position.

I. SYMPTOMS: 1. No current or voltage indication on meter 137 as variac 136 control knob is rotated clockwise (step 6).
2. All other indications normal (step 6).

Probable location of fault	*Procedure*
Defective h-v power supply circuit.	1. Check by replacing Tube VT–119. 2. If trouble is not cleared measure resistance between VT–119 plate cap and chassis. Resistance should be 14,000 ohms (fig. 18). 3. Check filament supply of VT–119 for open or short if filament is not glowing. 4. Check for open in variac windings and in primary of transformer 131. 5. If trouble is not cleared, see item below.
Open bleeder network 72–1 through 72–6.	1. Make continuity test (fig. 104). 2. If trouble is not cleared, see item below.
Dirty contacts on overload relay 138 shorting bar.	1. Make continuity test (fig. 18). 2. If trouble is not cleared, see item below.
Defective meter circuit.	1. Check capacitor 17 for short (fig. 104). 2. Check toggle switch 115 for continuity. 3. Check meter (sec. I, ch. 2). 4. Make a complete check of meter circuit for short or open.

J. SYMPTOMS: 1. Meter reads 3.5 kilovolts but variac is not in normal position (step 6).
2. All other indications normal.

Probable location of fault	*Procedure*
Partial short of variac 136 or transformer 131.	1. Press VOLTAGE CURRENT toggle switch 115 to current position. If current reading is normal, fault is in the high-voltage power supply (fig. 18). 2. Check capacitor 11 for a leak. 3. Measure resistance of parallel combination of variac winding 136 and transformer primary 131 between terminals 1 and 2 (fig. 88) of the variac. This resistance should vary *evenly* from zero to 5 ohms as variac control knob is rotated clockwise. 4. If above test is not conclusive, check primary resistance of transformer 131 (terminals 1 and 2 of transformer 131). This should be 6 ohms. *Note.* It is necessary to isolate transformer 131 from the variac 136 before making the measurement. 5. Measure the secondary resistance of transformer 131 (terminals 3 and 4). Resistance should be 6 ohms.
Defective meter circuit.	1. If current reading is abnormal fault is in the meter circuit. 2. Check meter as indicated in paragraph 103, sec. III, ch. 2. 3. Check capacitor 17 for open or leak. 4. Measure resistance of resistor 57–2. Resistor should be 10,000 ohms.

K. SYMPTOMS: 1. Overload relay 138 *kicks off* as HIGH VOLTAGE CONTROL knob is turned up (step 6).
2. Meter reading returns to zero (step 6).
3. All other indications normal (step 6).

Probable location of fault	*Procedure*
Gassy oscillator tubes 826.	1. Substitute new tubes. 2. If trouble is not cleared, see item below.
Short in d-c high-voltage circuit.	1. Make a complete check for short in the high-voltage circuit (fig. 18). The resistance at capacitor 11 to ground should be about 5 megohms.

L. SYMPTOMS: 1. No voltage or current reading on meter 137 (step 6).
2. Meter light 112 goes out due to a blown fuse or circuit breaker 117 *kicking out* as variac control knob is turned clockwise (step 6).

Probable location of fault	*Procedure*
If the circuit breaker has not kicked off replace fuse 141–1 or 141–2.	
Shorted secondary of transformer 131.	1. Measure resistance of transformer secondary (terminals 3 and 4). This should be 12,000 ohms (fig. 18). 2. If trouble is not cleared, see item below.
Short in plate circuit of h-v rectifier Tube VT–119.	1. Check resistance between plate cap of VT–119 and ground. Resistance should be 14,000 ohms.

M. SYMPTOMS: 1. Voltage meter reading lags, then jumps suddenly to a high value, and finally increases normally as variac control is rotated (step 6).
2. Current shoots up to a high value and then drops back to zero as variac control is rotated (step 6).

Probable location of fault	*Procedure*
Open in grid circuit of oscillator tubes 826.	1. Check resistance of grid of tubes 826 to ground. Resistance should be 212K ohms.

N. SYMPTOMS: 1. Current reading on meter 137 is zero as variac control is turned up (step 6).
2. Voltage reading on meter 137 is normal as variac control is turned up (step 6).
3. All other indications normal (step 6).

Probable location of fault	*Procedure*
Improper adjustment of bias control.	1. Readjust bias control. 2. If trouble is not cleared, see item below.
Defective switch 115.	1. Check switch for continuity. 2. If trouble is not cleared, see item below.
Defective bias potentiometer or potentiometer circuit.	1. Check resistance of potentiometer 60 (fig. 8). Resistance should vary from zero to 10,000 ohms as control is varied. 2. If trouble is not cleared, see item below.
Defective positive low-voltage d-c power supply.	1. Check the plate voltage of the blocking oscillator VT–231. Plate voltage should be 350 volts (fig. 18). 2. If plate voltage is abnormal check l-v rectifier tube VT–244 and its associated circuit.

Probable location of fault	Procedure
Defective stage in modulator channel.	1. If plate voltage is normal, signal trace the modulator channel (fig. 18). 2. Check resistor 70. Its resistance should be approximately 4,700 ohms.

O. SYMPTOMS: 1. Current reading on meter 137 excessive (step 6).
2. Voltage reading on meter 137 normal (step 6).
3. All other indications normal (step 6).

Probable location of fault	Procedure
Improper bias adjustment.	1. Readjust bias control on front panel of transmitter.

P. SYMPTOMS: 1. Overload relay 138 *kicks off* when voltage reads about 250 volts on meter 137 (step 6).
2. Current reading on meter 137 is high (step 6).
3. All other indications normal (step 6).

Probable location of fault	Procedure
Open primary in transformer 133.	1. Check continuity (terminals 1 and 2). *Note.* It is necessary to isolate transformer primary from rest of circuit. 2. If trouble is not cleared, see item below (fig. 18).
Defective bias rectifier tube VT-244 or associated circuit.	1. Turn the h-v control completely clockwise and measure the voltage across resistor 68. Voltage should be 380 volts. 2. If voltage is abnormal, check bias rectifier tube VT-244. 3. Make a complete check of bias power supply.
Gassy oscillator tubes 826.	1. If voltage across resistor 68 is normal check for gassy oscillator tubes 826 by replacement.

Q. SYMPTOMS: 1. Overload relay 138 *kicks off* at about 1,750 volts (step 6).
2. Current surge is registered on meter 137 (step 6).
3. All other indications normal (step 6).

Probable location of fault	Procedure
Defective wiring to capacitor 11.	1. Make a continuity test from pin 4 of VT-119 to the capacitor (fig. 18). 2. If trouble is not cleared, see item below.
Capacitor 11 open.	1. Apply an ohmmeter across the two terminals of the capacitor. 2. If the meter needle does not deflect, capacitor is open. Replace capacitor.

R. SYMPTOMS: 1. Current reading of approximately 2 milliamperes on meter 137 when STANDBY OPERATE switch is in STANDBY position (step 6).
2. All other indications normal.

Probable location of fault	Procedure
Improper bias adjustment of blocking oscillator.	1. Readjust bias control for zero current in STANDBY position and approximately 2 milliamperes in OPERATE position (fig. 8).
Defective meter.	1. Turn off all power to the transmitter and zero meter (TM11-1317).

S. SYMPTOMS: 1. Pattern on test scope for position 5B (signal width) appears wider than normal.
2. All other indications normal.

Probable location of fault	*Procedure*
Defective artificial line.	1. Check for short in any of the capacitors 5, 6–1, 7, 6–2, or 8 (figs. 98 and 99). 2. If trouble is not cleared, check inductors 140 A, B, C, or D for open circuit.

T. SYMPTOMS: 1. Transmitter signal width waveform not obtainable on test position 5B.
2. All other indications normal.

Probable location of fault	*Procedure*
Defective relay 139 or a-c input circuit.	1. Check contacts of relay 139 for cleanliness (fig. 104). 2. Check voltage across coil of relay 139 when interconnector switch 115 is in SIGNAL WIDTH position. Voltage should be 6.3 volts. 3. If voltage is normal, replace the relay. If voltage is not normal, make a continuity test from switch 115 in interconnector to relay 139 in transmitter (figs. 151 and 152).

U. SYMPTOMS: 1. No picture on test scope in position 2 and 5.
2. Position 7 shows main IFF pulse with receiver grass.
3. All other indications normal.

Probable location of fault	*Procedure*
Defective monitoring section in transmitter.	1. Replace monitoring diode 9006. 2. Replace original diode, and insert new VT–202. 3. Make a voltage and resistance check of the two stages above (figs. 17, 92, 93, 97, 100). 4. If trouble is not cleared, see item below.
Defective cabling to interconnector.	1. Make a continuity test from the output of VT–202 through plug 107 (fig. 103) in transmitter, through plug 105 in interconnector, to test swich 112A, terminals 2 and 5 (figs. 135 and 138).

105. Procedure for Replacing Defective Electrical Parts in Transmitter

a. GENERAL. The information following is to assist the radar mechanic in replacing defective electrical parts in Transmitter BC–1160–A. Note that such replaceable items as small resistors, capacitors, tube sockets, and tubes are not covered in these procedures. Neither is a procedure given when the replacement for the part presents no special difficulties. The replacement procedures following have been worked out experimentally and represent the shortest and best method of accomplishing the work.

Cautions: 1. Before replacing a defective part, observe carefully its position, method of mounting, and wiring. This insures the correct installation of the replacement part.

2. When removing such parts as relays, switches, and terminal boards which have several wires attached to their terminals, be sure to tag the wires carefully so that they will be replaced in their proper position.

3. When disassembling a component, the screws, nuts, bolts, washers, and other small parts which are removed should be put in some small container to prevent their loss.

b. LIST OF ITEMS COVERED. (1) *Front panel of transmitter* (par. 106).

Meter light.
Meter light socket and bracket.
Meter.
Pilot light jewel.
Pilot light bulb.
Pilot light socket.
Pilot light jewel holder.
Circuit breaker.

(2) *Top of transmitter chassis* (par. 107).
Transformers and chokes.
Variac.
Blower outlet.
Overload relay 138.
Capacitor 12.
Artificial line.
Relay 139.
Power measurements unit.
Vernier tuning flexible shaft.

(3) *Lower part and side of transmitter chassis* (par. 108).
Connectors, Amphenol 108, 109, 107, and 106.
Connector, Amphenol 105.
Capacitor 11.
Resistor 68.
Capacitors 10–1, 10–2.
Capacitors 9–1, 9–2.
Antenna coaxial output line.

(4) *Oscillator compartment* (par. 109).
Antenna coaxial output line.
Cathode line porcelain stand-off insulator.
Antenna line porcelain stand-off insulator.
Antenna line ceramic support.
Cathode line ceramic support (upper line).
Cathode line ceramic support (lower line).
Grid line ceramic support (open end).
Grid line ceramic support (shorted end).
Porcelain tube sockets and porcelain tube socket stand-off insulators.
Resistor 71.
Capacitor 20 and antenna line.
Capacitor 21.
Resistor 71 mounting board.
Cathode line (upper line).
Cathode line (lower line).
Grid line.

106. Procedure for Replacing Items on Front Panel of Transmitter

a. METER LIGHT. (1) Remove the screws at the four corners of the meter light shield and remove the shield.

(2) The lamp is seated in a bayonet type socket. To remove, press down and turn a quarter turn.

(3) To install a new lamp, reverse removal procedure.

b. METER LIGHT SOCKET BRACKET. (1) Proceed as above in removing meter light. After lamp has been removed, unsolder the two connections to the socket.

(2) Remove the bracket and socket from the front panel by removing the one screw holding the bracket to the panel.

(3) To install a new bracket socket, reverse the removal procedure.

c. METER. (1) Remove the two bolted connections from the terminals of the meter.

(2) From the outside edge of the meter case on the front panel remove the three screws holding the meter to the panel and remove the meter.

(3) To install the new meter, reverse the removal procedure.

d. PILOT LIGHT JEWEL. (1) Grasp the metal rim of the jewel and turn it; at the same time pull outward. If it cannot be moved, insert a screw driver between the metal rim and the panel and gently pry the assembly away from the panel.

(2) To install the new jewel, simply push it into place in the holder.

e. PILOT LIGHT BULB. (1) This bulb can be removed and replaced without taking the transmitter from the rack. Simply remove the jewel, as described above, and unscrew the bulb from its socket.

(2) To install the new bulb reverse the removal procedure.

f. PILOT LIGHT SOCKET. (1) Unsolder the four connections to the socket.

(2) Compress the sides of the metal mounting clamp and unhook it from the pilot light jewel holder.

(3) To install the new socket, reverse removal procedure.

g. PILOT LIGHT JEWEL HOLDER. (1) Remove the pilot light socket as described above; it is not necessary to unsolder the connections to the pilot light socket terminals.

(2) From the back of the panel, remove the locknut which secures the holder to the panel.

(3) Remove the holder by pushing it out through the front panel.

(4) To install the new holder, reverse removal procedure.

h. CIRCUIT BREAKER. (1) Remove Tubes VT–231, VT–94, and VT–244, which are adjacent to the circuit breaker on the chassis.

(2) From the front panel remove the two screws which hold the circuit breaker in place.

(3) Withdraw the circuit breaker from the chassis as far as the wiring allows so that the terminal connections are accessible.

(4) Remove the connections from the terminals at each end of the circuit breaker by removing the two screws which hold them in place.

(5) To install the new circuit breaker, reverse removal procedure.

107. Top of Transmitter Chassis

a. TRANSFORMERS AND CHOKES. (1) Remove bolted connections from terminals.

(2) Remove the bolts from the mounting flanges on the chassis.

(3) To install new part, reverse removal procedure.

b. VARIAC. (1) Remove knob by loosening setscrew in center of knob with a screw driver.

(2) Remove the three nuts holding the terminal connections and remove the connections.

(3) Remove the two bolts immediately above, and the one below, the adjusting shaft on the front of the mounting bracket.

(4) To install new variac, reverse removal procedure.

c. BLOWER OUTLET. (1) Remove the entire blower outlet mounting bracket by removing the two screws holding it to the chassis.

(2) Turn the assembly over and remove the two bolted connections.

(3) Unscrew the two bolts from the top of the bracket and remove the defective outlet.

(4) To install new outlet, reverse removal procedure.

d. OVERLOAD RELAY 138. (1) Remove the four screws holding the cover on the relay and remove the cover.

(2) Unscrew the six slotted hexagonal nuts and remove the six connections to the relay.

(3) Remove the four bolts at the corners of the mounting board and lift off the defective relay.

(4) To install new relay, reverse removal procedure.

e. CAPACITOR 12. (1) Remove the three soldered connections and resistor 67 from the terminals of the capacitor.

(2) With an off-set screw driver, remove the two bolts holding the capacitor to the artificial line cover.

(3) To install a new capacitor, reverse the removal procedure.

f. ARTIFICIAL LINE. (1) Remove the cover from relay 139 by removing the four screws attaching it to the artificial line cover and power measurement unit subchassis.

(2) Remove the cover from the artificial line by removing the six bolts attaching the cover to the chassis.

(3) Lift the cover clear of the artificial line. Do not remove any of the connections to capacitor 12.

(4) Unscrew the four bolts holding the artificial line mounting board to the chassis and lift off the artificial line.

(5) To install the new artificial line, reverse removal procedure.

Note. One of the bolts which holds the cover of the artificial line to the chassis is also used to ground the shield of the r-f line inside the oscillator compartment. When replacing the artificial line cover, be certain to replace these two ground connections. There is also a ground from a common side of resistor 67 and capacitor 12 and this must be reconnected when the cover is replaced.

g. RELAY 139. (1) Remove the four screws which hold the cover of the relay, and remove the cover.

(2) Unsolder and remove the five connections to the relay.

(3) From the oscillator compartment remove the four screws which hold the small cover over the soldered connections to the tap on the antenna line.

(4) Unsolder the connections to the tap on the antenna lines.

(5) Unsolder and remove the four connections to the terminal strip on the power measurement subchassis.

(6) Remove the four screws at the four corners of the power measurement subchassis and lift it from the main chassis.

(7) From the under side of the power measurement subchassis, remove the terminal board by removing the two bolts at either end of the board.

(8) Lift the terminal board just enough to give access to the relay mounting screws and remove them. The relay may then be removed.

(9) Before installing the new relay, solder a jumper wire across the two inside terminals. Compare these connections with those on the old relay to be certain the work has been done correctly.

(10) To install the new relay, reverse the removal procedure.

h. POWER MEASUREMENT UNIT. (1) Remove the four screws which hold the cover of relay 139 and remove the cover.

(2) If it is required that the entire power measurement unit subchassis be removed, it is necessary to unsolder the four connections to terminal board on the subchassis.

(3) From the oscillator compartment, remove the four screws which hold the small cover over the soldered connections to the tap on the antenna line.

(4) Unsolder the connections to the tap on the antenna line.

(5) Remove the four screws at the four corners of the power measurement subchassis and lift it from the main chassis.

(6) To replace the power measurement unit subchassis, reverse the removal procedure.

i. VERNIER TUNING FLEXIBLE SHAFT. (1) With an Allen wrench loosen the two setscrews that hold the coupling to the vernier tuning control on the front panel and remove the coupling.

(2) Loosen the two setscrews on the phenolic coupling to the gear shaft and remove the coupling.

(3) To install a new vernier tuning flexible shaft, reverse the removal procedure.

108. Lower Part of Side and Bottom of Transmitter Chassis

a. CONNECTORS, AMPHENOL, 108, 109, 107, AND 106. (1) Unsolder the connections to the pins of the socket.

(2) Remove the screws from the four corners of the mounting plate and remove the connector.

(3) To install new connector, reverse the removal procedure.

b. CONNECTOR AMPHENOL, 105. (1) Unsolder the antenna connection and ground connection from the rear of the connector.

(2) From the outside of the transmitter case, remove the four screws within the circular cutout portion of the assembly and remove the connector.

(3) To install the new connector, reverse the removal procedure.

c. CAPACITOR 11. (1) Short terminal of capacitor to ground with capacitor safety shorting stick.

(2) Remove high-voltage lead by unscrewing nut and slipping connection off terminal.

(3) Loosen the bolt which holds the mounting clamp and slide the capacitor forward.

(4) To install new capacitor, reverse removal procedure.

d. RESISTOR 68. (1) Remove modulator tube 801.

(2) Remove nut from top of resistor.

(3) Remove fiber and mica washer under nut.

(4) Unsolder connection to resistor 61–4.

(5) Remove ground connection.

(6) Slide resistor off bolt.

(7) Slide new resistor on bolt and reverse removal procedure.

e. CAPACITORS 10–1, 10–2. (1) Remove two bolted connections to terminals.

(2) Remove four screws holding mounting bracket to chassis.

(3) Lift mounting bracket out and remove the defective capacitor.

(4) When installing the new capacitor, be sure that the fiber separators are included in the assembly.

(5) To install new capacitor, reverse removal procedure.

f. CAPACITORS 9–1, 9–2. (1) Remove capacitor 11. (See removal procedure listed above.)

(2) Unsolder the two connections to the terminals of capacitors 9–1, 9–2.

(3) Remove bolt holding mounting clamp around capacitor.

(4) Open the clamp sufficiently to allow the capacitor to be withdrawn.

(5) Withdraw the capacitor from the clamp.

(6) To install new capacitor, reverse removal procedure.

g. ANTENNA COAXIAL OUTPUT LINE. (1) From the back of connector 105, unsolder the antenna and ground connections.

(2) Remove the four mounting clamps which secure the line to the chassis.

(3) Remove the four screws which hold the

small metal cover inclosing the soldered tap connection to the power measurement unit and unsolder the connection.

(4) Unsolder the tap to the antenna line.

(5) The coaxial line may then be removed from the oscillator compartment.

(6) To install a new line, reverse the removal procedure.

109. Procedure for Replacing Items in Oscillator Compartment

To replace any of the parts listed below it is necessary to remove the case from the oscillator compartment. To accomplish this, perform the 23 basic steps, *a* to *w* as listed in paragraph 142, chapter 3. After the 23 basic steps are completed, refer to the following detailed description for the procedure for the replacement of each item.

a. CATHODE LINE PORCELAIN STAND-OFF INSULATOR. (1) Perform the 23 basic steps (par. 142 *a* to *w*, ch. 3).

(2) From the back of the insulator, remove the one screw which attaches it to the shorting bar.

(3) Remove the three bolts which attach the insulator to the panel, and slide the insulator out.

(4) To install a new insulator, reverse the removal procedure.

b. ANTENNA LINE PORCELAIN STAND-OFF INSULATOR. (1) Perform the 23 basic steps (par. 142 *a* to *w*, ch. 3).

(2) Remove the screw which attaches the insulator to the antenna line.

(3) Remove the screw which attaches the insulator to the panel and remove the insulator.

(4) To install a new insulator, reverse removal procedure.

c. ANTENNA LINE CERAMIC SUPPORT. (1) Perform the 23 basic steps (par. 142 *a* to *w*, ch. 3).

(2) With an Allen wrench, loosen the setscrews and remove the shorting bar at the end of the antenna line.

(3) Remove the two bolts from each end of the ceramic support and remove the support from the metal upright.

(4) To install a new ceramic support, reverse removal procedure.

d. CATHODE LINE CERAMIC SUPPORT (UPPER LINE). (1) Perform the 23 basic steps (par. 142 *a* to *w*, ch. 3).

(2) Remove the two bolts holding the metal bar on the outside of the ceramic support.

(3) With an Allen wrench loosen the four setscrews which hold the shorting bars in place on the upper cathode lines.

(4) Pull the metal bar forward which will remove the outside sheath of the lines.

(5) Remove the two bolts from either end of the support and remove the support from the metal uprights.

(6) To install new ceramic support, reverse the removal procedure.

e. CATHODE LINE CERAMIC SUPPORT (LOWER LINE). (1) Perform the 23 basic steps (par. 142 *a* to *w*, ch. 3).

(2) Drop the bottom plate by removing the six screws attaching it to the mounting panel, metal upright, and the tube socket mounting brackets.

(3) Remove the outer plate of capacitor 21 by entirely removing the setscrews which attach the grid leads (pins 3 and 5) to the capacitor.

(4) Remove the four screws holding the gear assembly mounting bracket to the tube socket mounting bracket.

(5) Remove the two screws holding the grid line brackets to the mounting panel.

(6) This exposes the under side of the tube sockets.

(7) Unsolder the cathode connections at lug attaching it to the cathode line.

(8) Unsolder pin 4 filament leads at the pin.

(9) Remove the four screws attaching the porcelain sockets to the tube socket porcelain stand-off insulator.

(10) Lift off the porcelain tube sockets, which make accessible the six screws holding the cathode line (lower line) to the cathode line ceramic support (lower line). Remove these six screws.

(11) Loosen four Allen setscrews on the shorting bars.

(12) The cathode line (lower line) may now be removed.

(13) Remove the two screws which hold the cathode line ceramic support (lower line) to the metal uprights.

(14) To replace, reverse procedure.

f. GRID LINE CERAMIC SUPPORT (OPEN END).

(1) Perform the 23 basic steps (par. 142 *a* to *w*, ch. 3).

(2) Perform steps 2 to 5 of the cathode line ceramic support (lower line) removal procedure.

(3) Remove the four screws holding the grid lines to the support.

(4) Remove the two screws attaching the support to the gear assembly mounting bracket.

(5) To replace, reverse removal procedure.

g. GRID LINE CERAMIC SUPPORT (SHORTED END). (1) Perform the 23 basic steps (par. 142, *a* to *w*, ch. 3).

(2) Perform steps 2 to 5 of the cathode line ceramic support (ower line) removal procedure.

(3) Remove the two screws holding the shorting bar to the support.

(4) Remove the two screws holding the support to the grid line brackets.

(5) To replace, reverse removal procedure.

h. PORCELAIN TUBE SOCKETS AND PORCELAIN TUBE SOCKET STAND-OFF INSULATOR. (1) Perform the 23 basic steps (par. 142 *a* to *w*, ch. 3).

(2) Perform steps 2 to 9 of the cathode line ceramic support (lower line) removal procedure.

(3) Tube sockets may now be lifted off.

i. RESISTOR 71. (1) Perform the 23 basic steps (par. 142 *a* to *w*, ch. 3).

(2) Drop the bottom plate by removing the six screws attaching it to the mounting panel, metal upright, and tube socket mounting bracket.

(3) To replace, reverse removal procedure.

j. CAPACITOR 20 AND ANTENNA LINE. (1) Capacitor 20 is an integral part of the antenna line. In order to replace capacitor 20, it is necessary to replace the entire antenna line assembly which includes capacitor 20.

(2) To begin this replacement perform the 23 basic steps (par. 142 *a* to *w*, ch. 3).

(3) With an Allen wrench loosen the two setscrews on the shorting bar and remove it from the antenna line.

(4) Remove the two screws which attach the antenna line to the stand-off insulators and remove line.

(5) To install the new antenna line and capacitor, reverse the removal procedure.

Caution: After the antenna line is installed, bring the capacitor plates together and make certain that they are parallel before tightening the stand-off insulator and the Allen setscrews. Then separate them at least 0.2 inch and have the entire capacitor approximately centered.

k. CAPACITOR 21. (1) Perform the 23 basic steps.

(2) Drop the bottom plate by removing the six screws attaching it to the mounting panel, metal uprights, and tube socket mounting bracket.

(3) The gear assembly may now be moved by unscrewing the three screws that have become accessible.

(4) With an Allen wrench remove the middle section of capacitor 21 and if either of the side sections needs replacing, unscrew and remove the tube grid pin lines and slide that section off.

(5) To install new capacitor, reverse removal procedure.

l. RESISTOR 71 MOUNTING BOARD. (1) Perform the 23 basic steps.

(2) Perform steps 2 to 6 of the cathode line ceramic support (lower line) removal procedure (*e* above).

(3) Unsolder the plate line at one end of resistor 71 and the black covered high-voltage line at the other end.

(4) Remove the four screws at the corner of the mounting board.

(5) To install new board, reverse removal procedure.

m. CATHODE LINE (UPPER LINE). (1) Perform the 23 basic steps.

(2) Perform steps 2, 3, and 4 of the cathode line ceramic support (upper line) removal procedure (*d* above).

(3) If it is desired to remove the inner cathode line, loosen the screws at the shorted end of the line and pull out.

Caution: When replacing, make certain that the fibre insulating tube has been placed in the outer line first.

n. CATHODE LINE (LOWER LINE). (1) Perform the 23 basic steps.

(2) Perform steps 2 to 12 of the cathode line ceramic support (lower line) removal procedure (*e* above).

(3) If it is desired to remove the inner cathode line, loosen the screws at the shorted end of the line and pull out.

Caution: When replacing, make sure that the fibre insulating tube has been placed in the outer line first.

o. GRID LINE. (1) Perform the 23 basic steps.

(2) Perform steps 2 to 5 of the cathode line ceramic support (lower line) removal procedure (*e* above).

(3) Remove the four screws holding the lines to the support.

(4) Loosen the Allen setscrews and pull grid line out.

(5) To replace, reverse removal procedure.

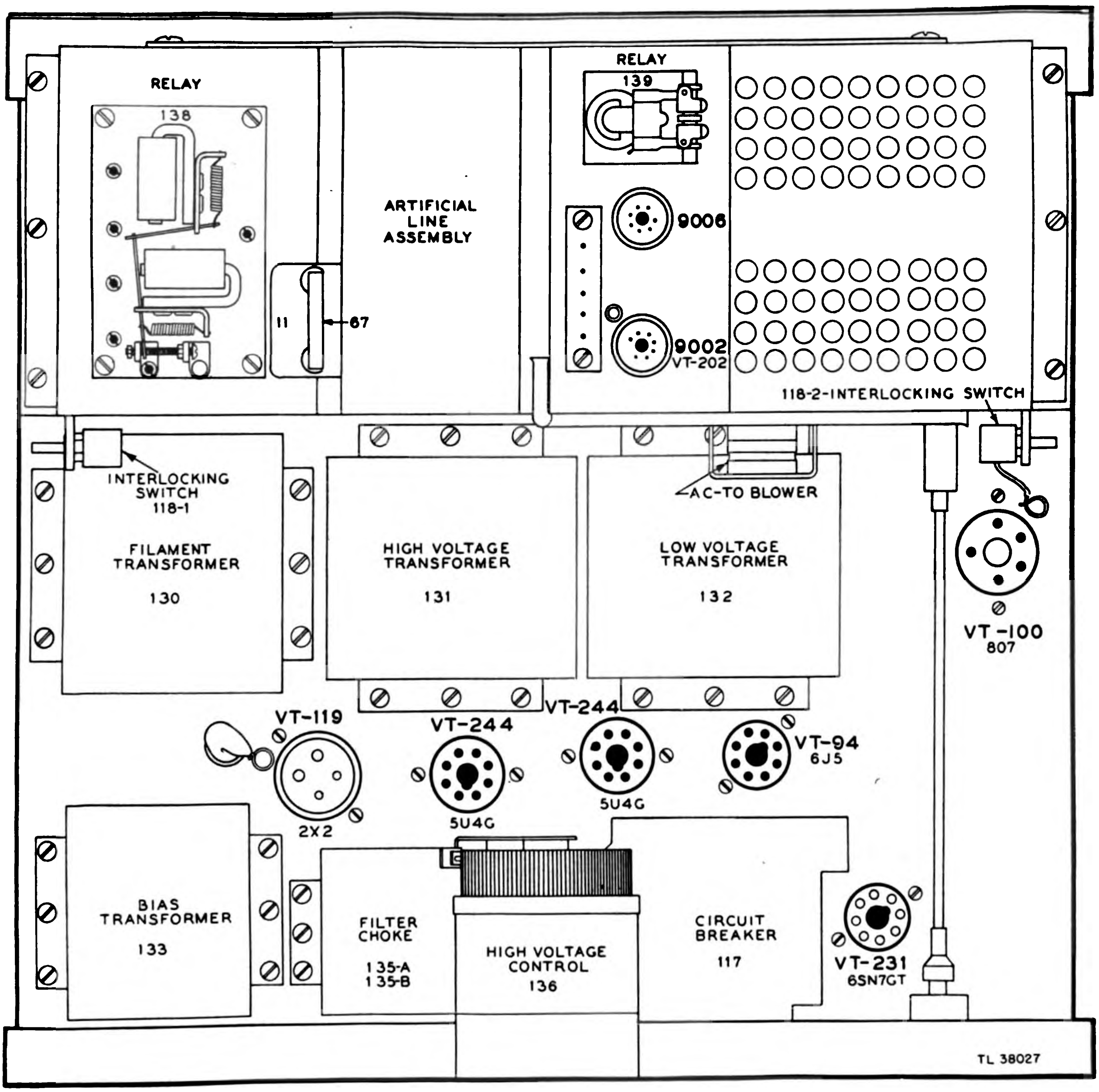


Figure 89. Transmitter, tube arrangement.

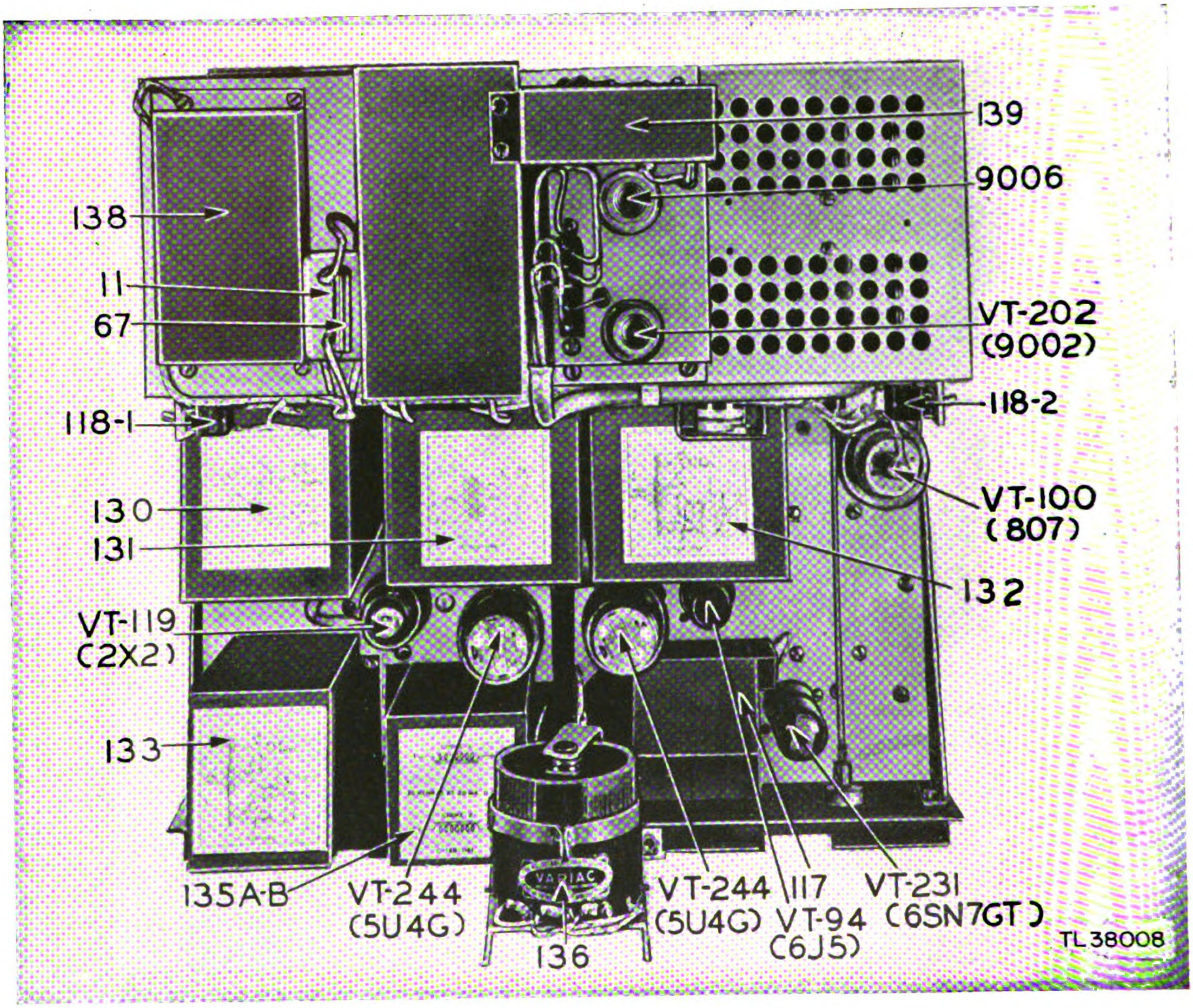


Figure 90. Top view of transmitter chassis.

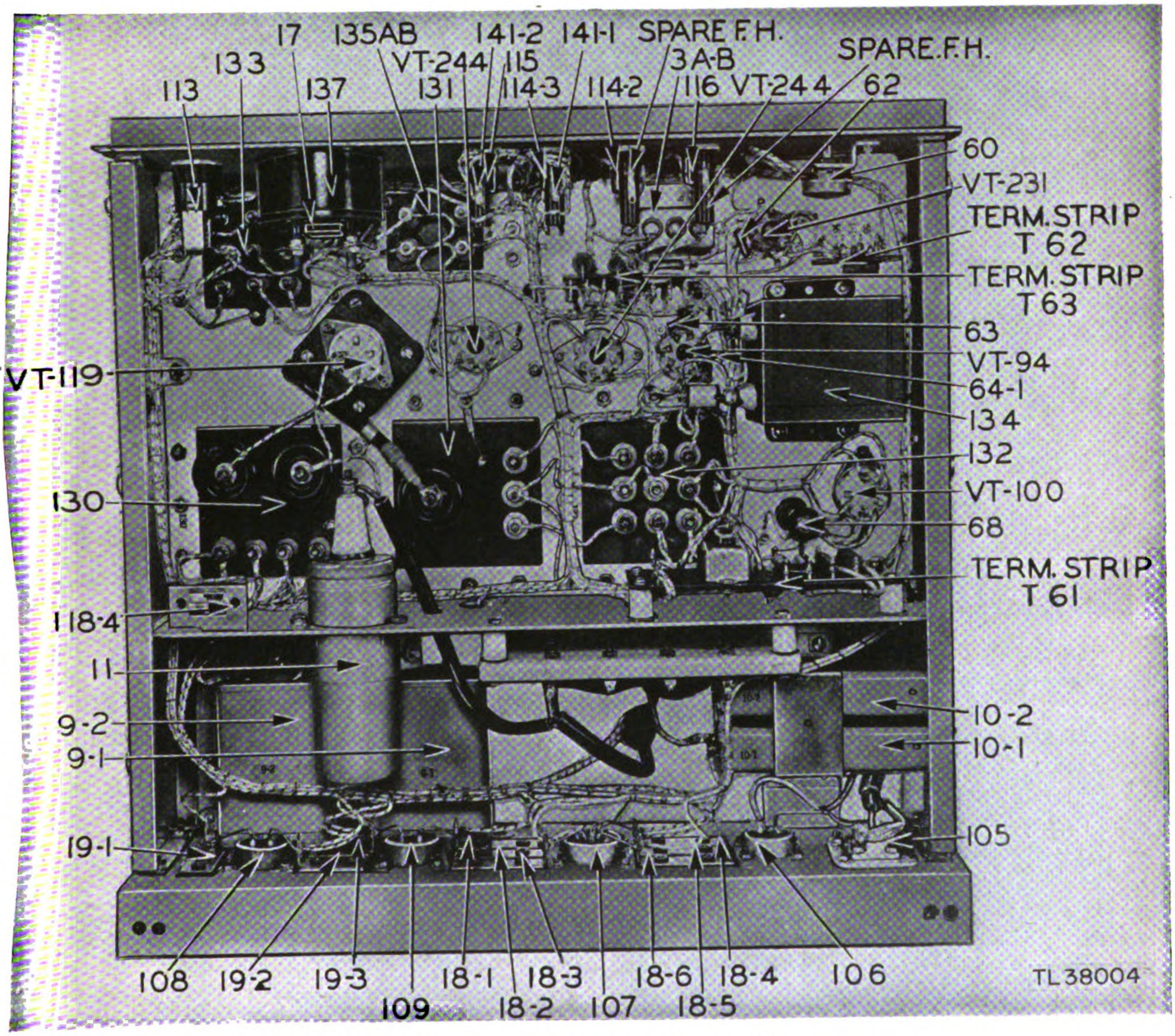


Figure 91. Bottom view of transmitter.

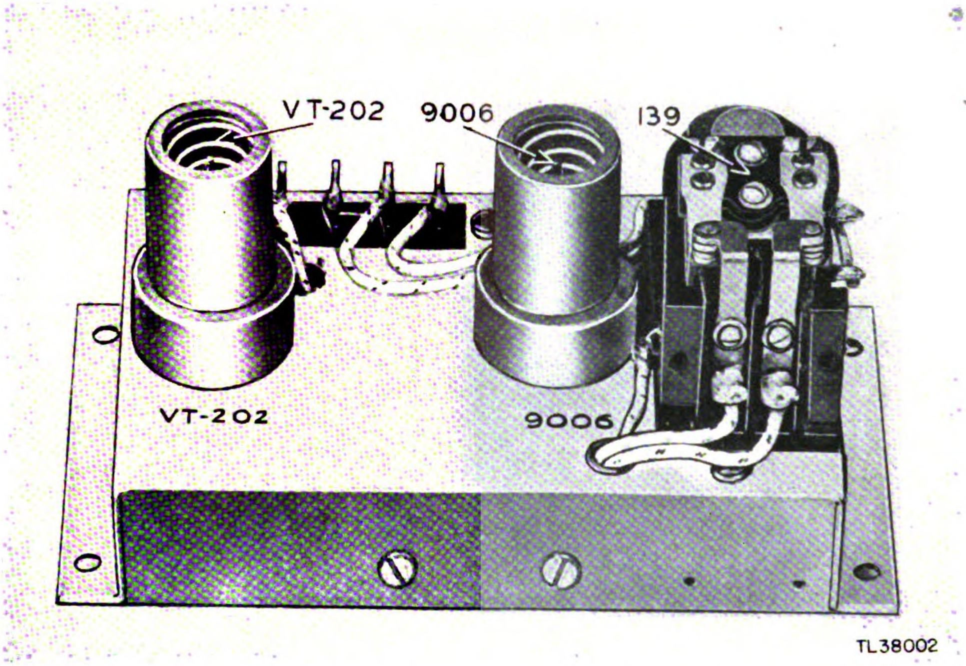


Figure 92. Power measurement unit of transmitter.

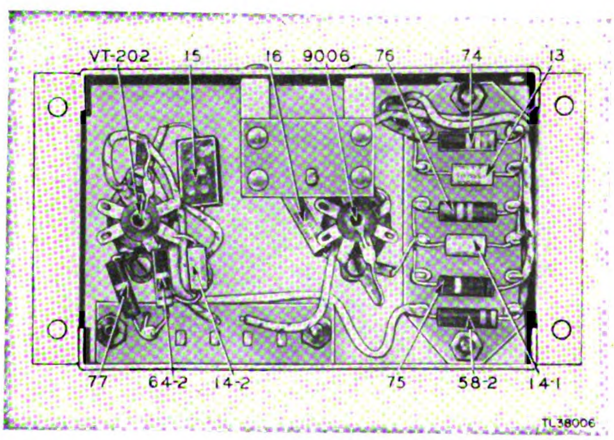


Figure 93. Bottom view of power measurment unit.

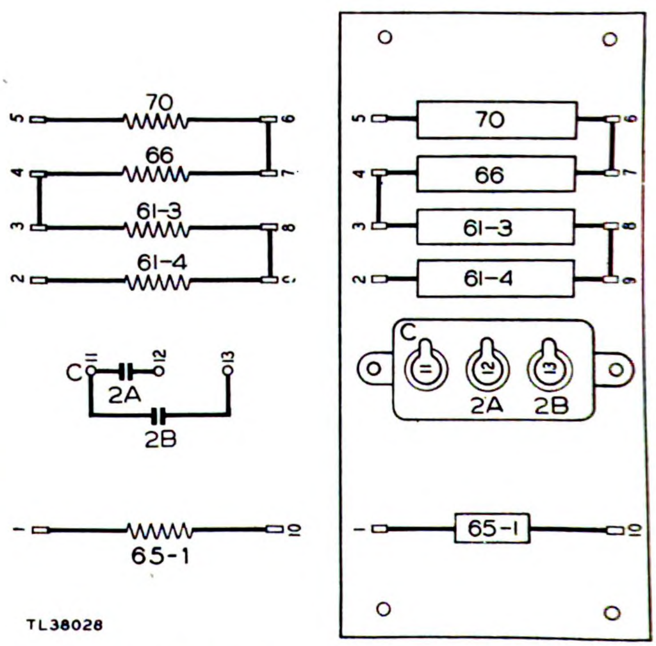


Figure 94. Wiring diagram of terminal board T 61.

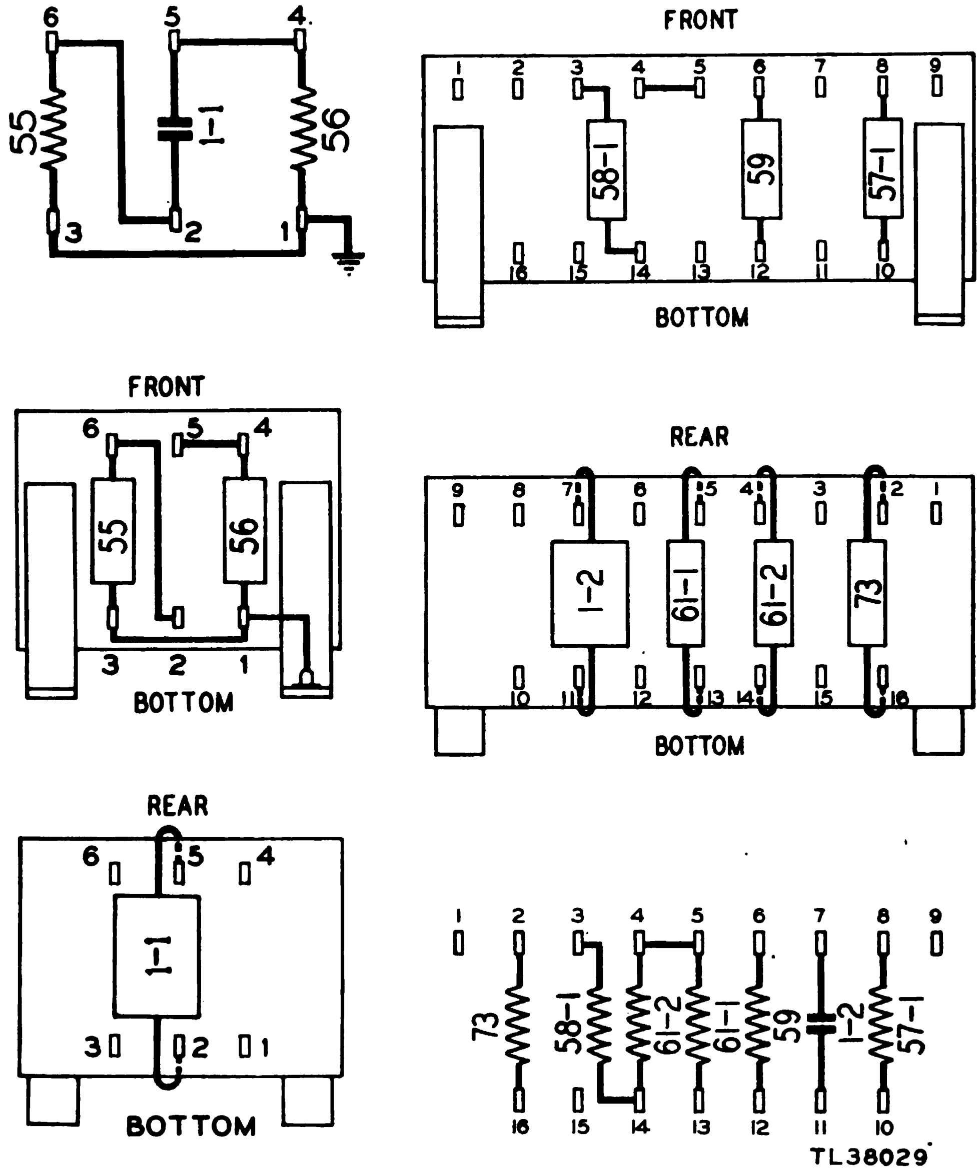
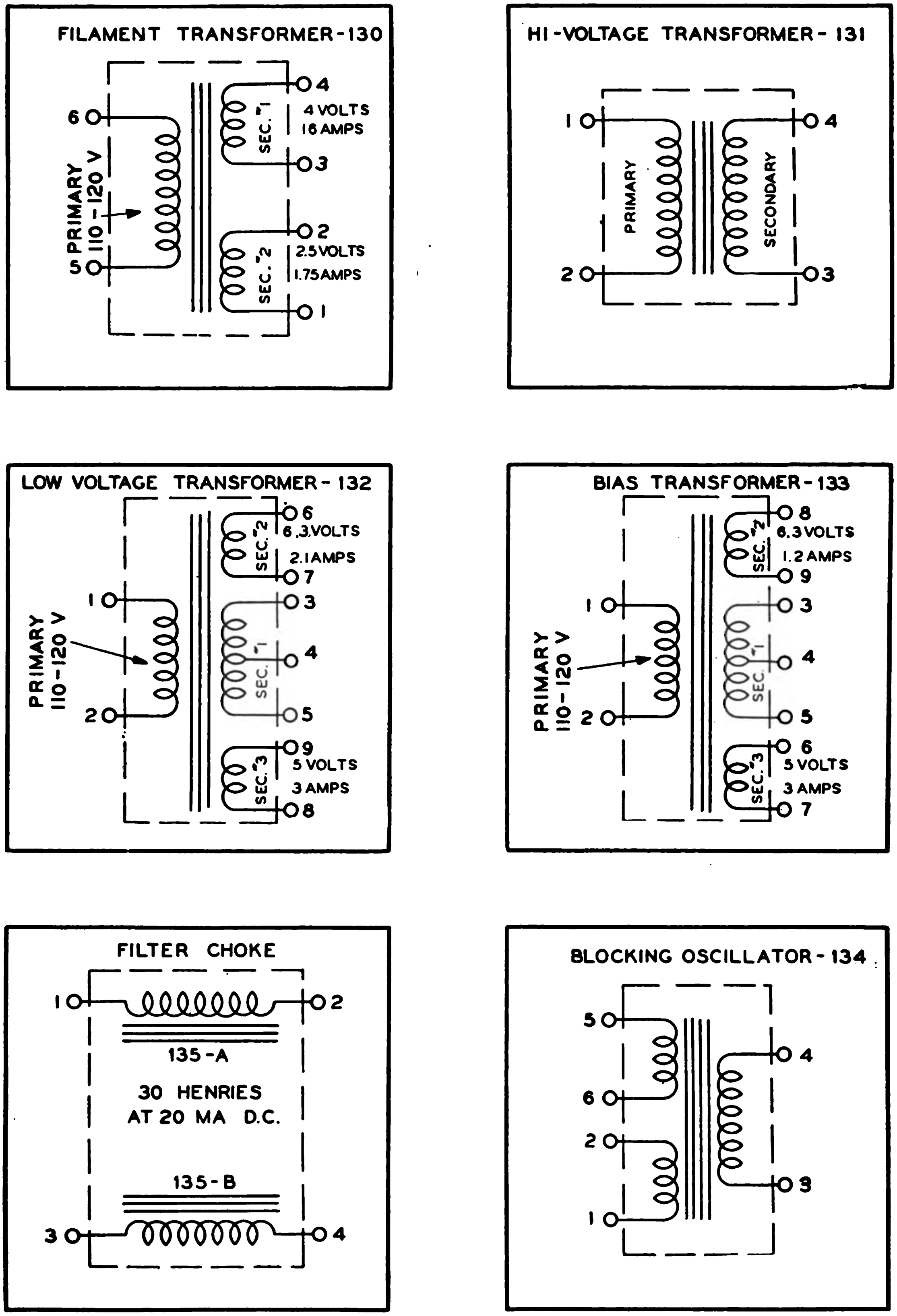


Figure 95. Wiring diagram of terminal boards T 62 and T 63.



TL38026

Figure 96. Transmitter schematic of individual transformers and chokes.

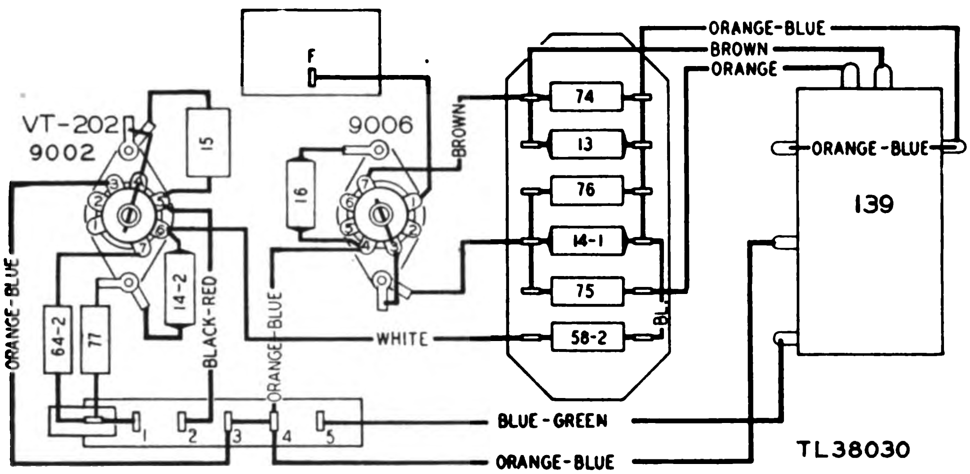


Figure 97. Transmitter, wiring diagram of test circuit section.

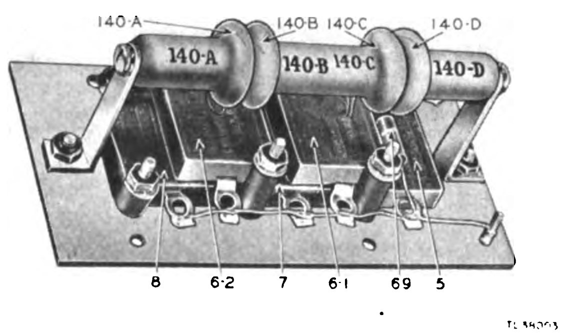


Figure 98. Transmitter, artificial line, pictorial view.

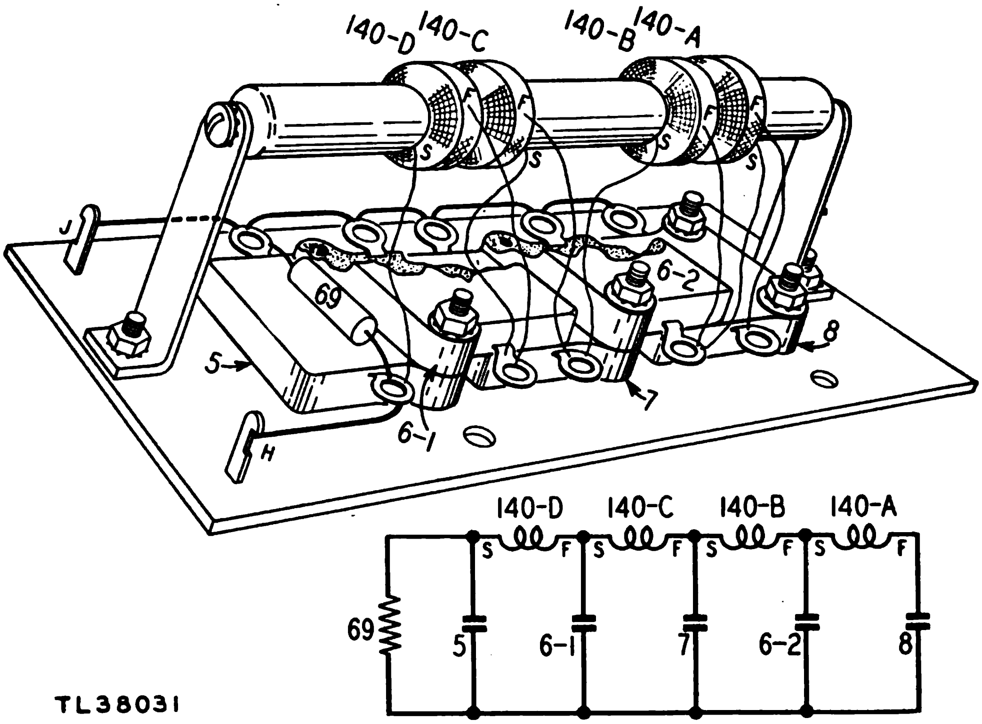


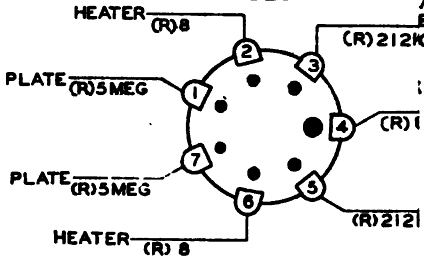
Figure 99. Transmitter, artificial line, wiring diagram.

...GE AND RESISTANCE MEASUREMENTS
...EST CONDITIONS

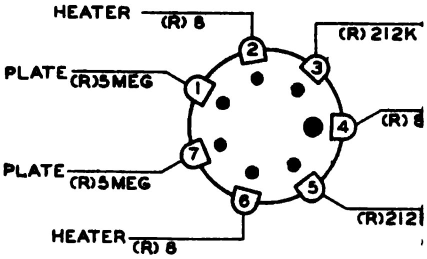
...N EXCEPT 826'S AND TEST CIRCUIT TUBES.
...MUM (EXTREME COUNTERCLOCKWISE POSITION).
...AS IS AT MINIMUM THERE IS A DROP OF 50
...E OUTPUT OF THE LOW VOLTAGE POWER
...ON ALL OF THE PLATES SUPPLIED BY THAT

...EN WITH 1,000 OHMS PER VOLT VOLTMETER.

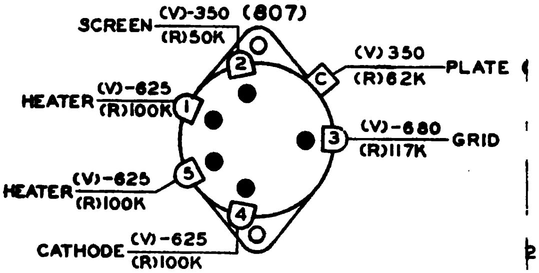
826

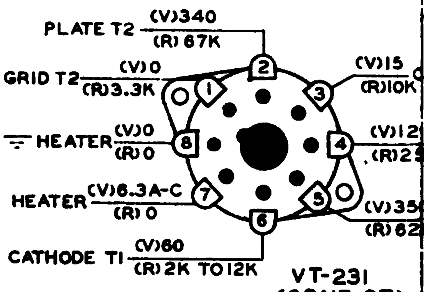


826

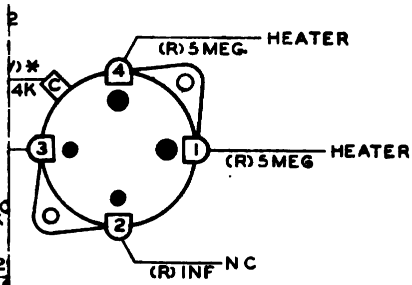


VT-100 (807)





VT-231
(6SN7-GT)



* VARIABLE HIGH VOLTAGE A-C
AT PLATE CAP

VT-119
(879, 2X2)

HIGH VOLTAGE RECTIFIER

TL38013

NOTE: SEE SOCKET VOLTAGE AND RESISTANCE CHART FOR CONDITIONS UNDER WHICH MEASUREMENTS WERE MADE.

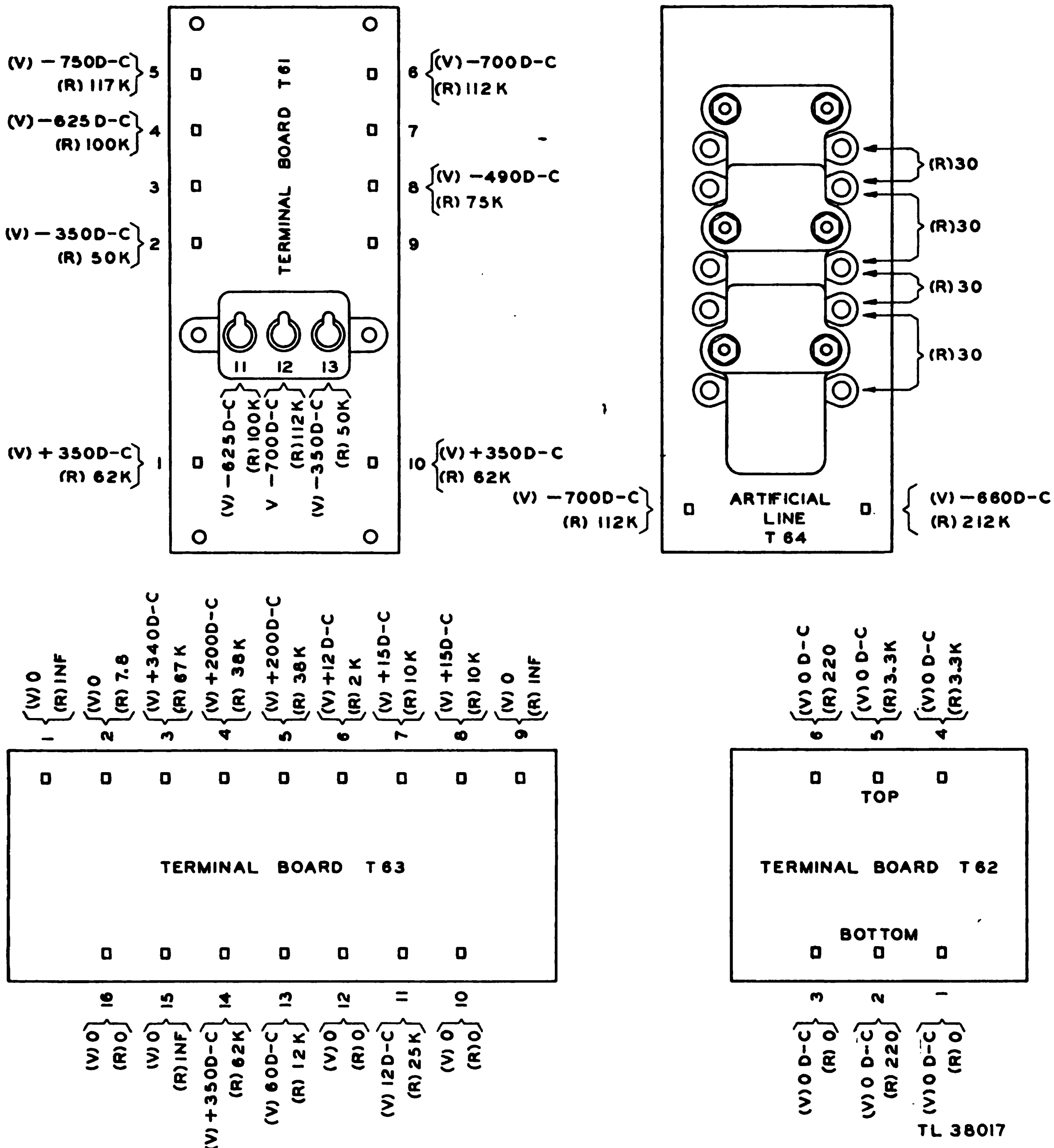
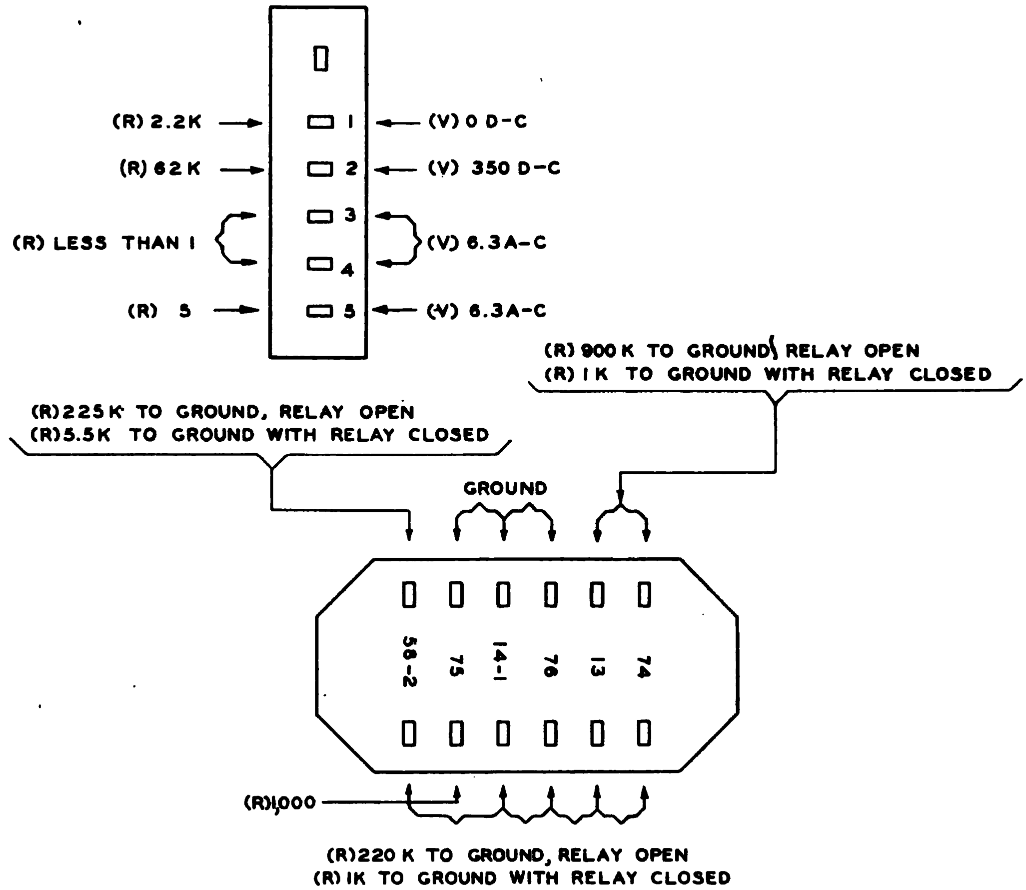


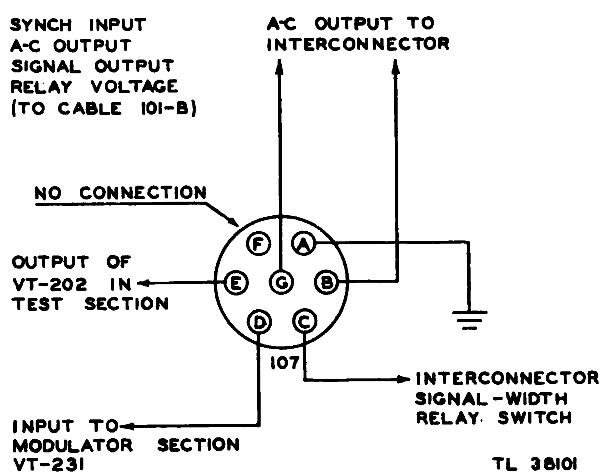
Figure 101. Transmitter terminal board, voltage and resistance measurement.



NOTE: SEE SOCKET VOLTAGE AND RESISTANCE CHART FOR CONDITIONS UNDER WHICH MEASUREMENTS WERE MADE

TL 38018

Figure 102. Terminal boards T 15, voltage and resistance measurement.



TL 38101

Figure 103. Transmitter, receptacle 107.

Capacitors

Part No.	Qty.	Capacity	Type	Tol. %	Volts DC
1-1	1	.001 MF	Mica	−10+10	500
1-2	1	.001 MF	Mica	−10+10	500
2-A		.1 MF	Oil	−10+20	600
2-B	1	.1 MF	Oil	−10+20	600
3-A		.1 MF	Oil	−10+20	600
3-B	1	.1 MF	Oil	−10+20	600
4-1 to 4-2	2	100 MMF	Silver Mica	±10	500
5	1	150 MMF	Mica	± 3-20	1,200
6-1 to 6-2	2	890 MMF	Mica	± 2	1,200
7	1	500 MMF	Mica	± 2	1,200
8	1	250 MMF	Mica	± 2	1,200
9-1 to 9-2	2	4.0 MF	Oil	−10+20	600
10-1 to 10-2	2	2.0 MF	Oil	−10+20	1,000
11	1	.1 MF	Oil	− 0+100	7,000
12	1	2.0 MF	Oil	−10+20	400
13	1	35 MMF	Ceramic	±10	500
14-1 to 14-2	2	50 MMF	Ceramic	±10	500
15	1	50 MMF	Silver Mica	±10	500
16	1	100 MMF	Ceramic	±10	500
17	1	.1 MF	Paper	±10	400
18-1 to 18-6	6	Spark Plate			
19-1 to 19-3	3	Spark Plate			
20	1	Antenna Line Assembly			
21	1	Grid Line			
22	1	Cathode Line Assembly No. 1			
23	1	Cathode Line Assembly No. 2			

Resistors

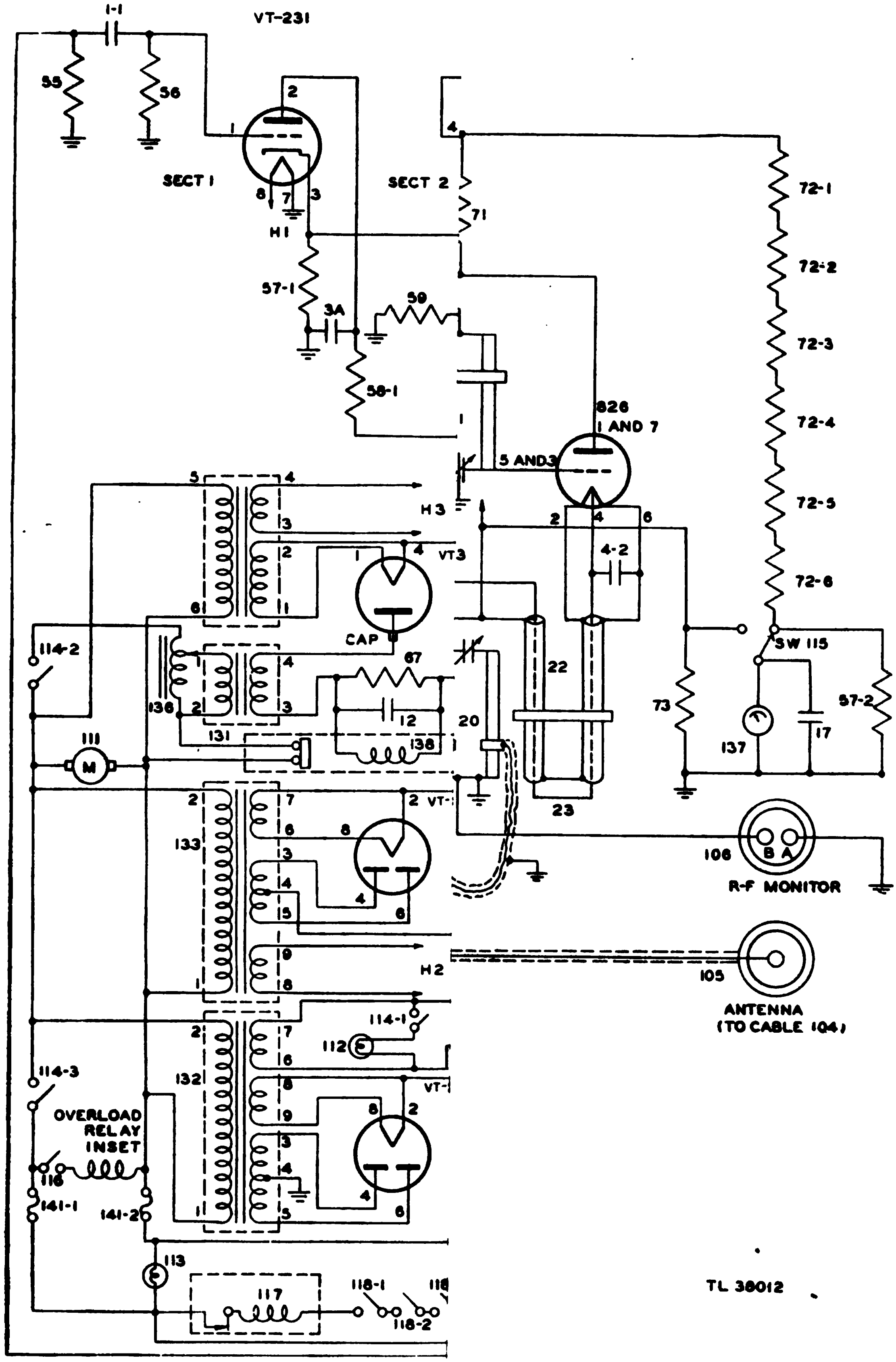
Part No.	Qty.	Ohms	Tol %.	Watts
55	1	220	10	½
56	1	3,300	20	½
57-1	1	10,000	20	½
57-2	1	10,000	20	½
58-1	1	4,700	20	½
58-2	1	4,700	20	½
59	1	2,200	20	½
60	1	10,000	Variable Control	2
61-1 to 61-2	2	25,000	10	2
61-3 to 61-4	2	25,000	10	2
62	1	15,000	20	½
63	1	22,000	20	½
64-1	1	4,700	10	½
64-2	1	4,700	10	½
65-1	1	100	20	½

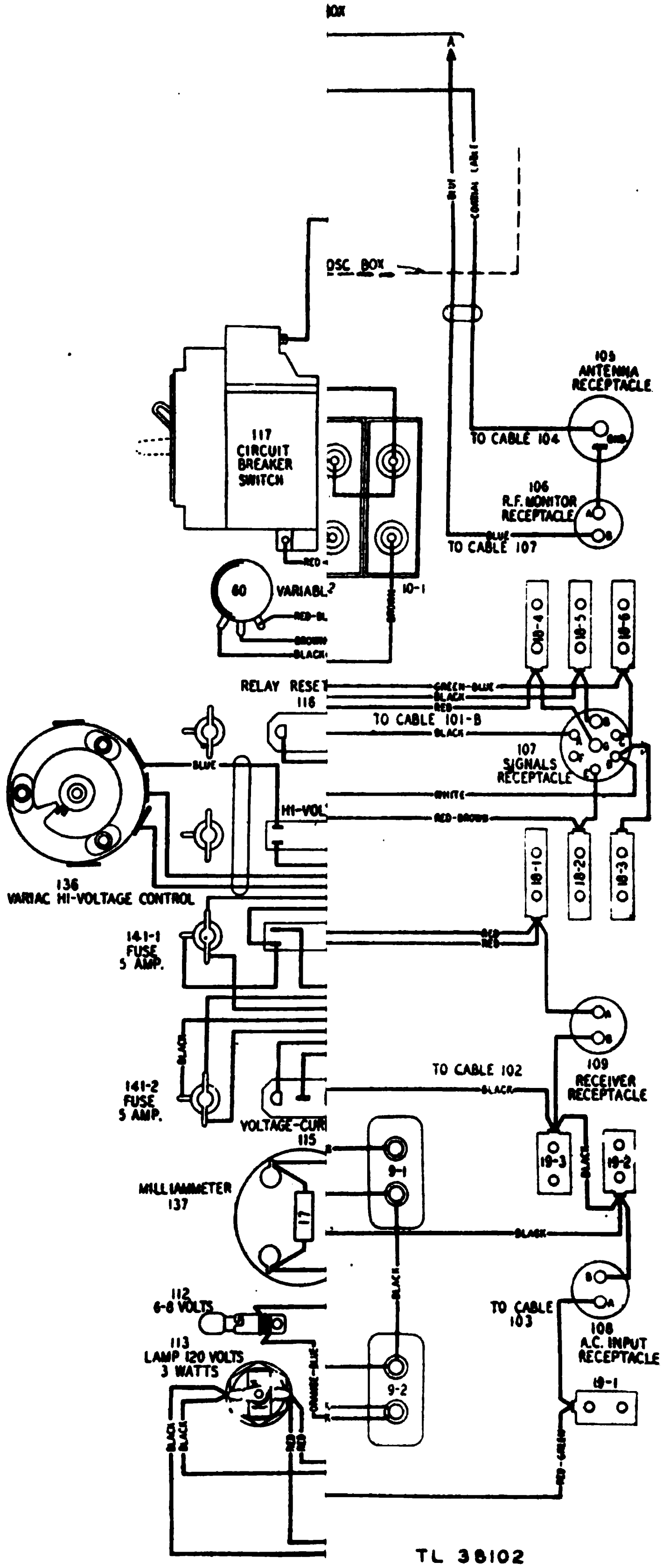
Resistors

Part No.	Qty.	Ohms	Tol. %	Watts
65-2	1	100	20	½
66	1	12,000	10	2
67	1	30,000	20	2
68	1	50,000	10	8
69	1	100,000	20	½
70	1	4,700	10	5
71	1	100	20	1
72-1 to 72-6	6	833,000	10	2
73	1	7.8	2	5
74	1	680,000	10	½
75	1	1,000	10	1
76	1	220,000	10	½
77	1	2,200	10	½

Miscellaneous Parts

Part No.	Qty.	Description
105	1	Receptacle Antenna
106	1	Receptacle RF-Monitor
107	1	Receptacle, Signals
108	1	Receptacle, AC Input
109	1	Receptacle, Receiver
111	1	Blower
112	1	Lamp—6-8 volts
113	1	Lamp—120 volts 3 watts
114-1	1	Switch—Meter Light
114-2	1	Switch—Hi-Voltage
114-3	1	Switch—Lo-Voltage
115	1	Switch—Voltage-Current
116	1	Switch—Relay Reset
117	1	Switch—Circuit Breaker
118-1 to 118-3	3	Switch—Interlock
118-4	1	Switch—Interlock
130	1	Transformer—Filament
131	1	Transformer—Hi-Voltage
132	1	Transformer—Lo-Voltage
133	1	Transformer—Bias
134	1	Transformer—Block Osc.
135-A		Filter Choke—30 Henries
135-B	1	Filter Choke—30 Henries
136	1	Variac Hi-Voltage Control
137	1	Milliammeter
138	1	Over Load Relay
139	1	Relay DP DT (Diode)
140-A		
140-B		
140-C		
140-D	1	Inductance—Artificial-Line
141-1 to 141-2	2	Fuses—5 Amp


1-1
VT-231
55
56
2
1
SECT 1
8
7
3
H1
SECT 2
4
71
72-1
72-2
72-3
72-4
72-5
72-6
57-1
3A
59
58-1
826
1 AND 7
5 AND 3
H3
2
4
6
4-2
VT3
CAP
114-2
67
12
138
20
22
73
SW 115
57-2
17
137
136
131
111
M
133
VT-
23
106
B A
R-F MONITOR
H2
105
ANTENNA
(TO CABLE 104)
114-1
112
132
114-3
OVERLOAD
RELAY
INSET
116
141-1
141-2
113
117
118-1
118-2
TL 38012



OSC BOX
105
ANTENNA
RECEPTACLE
TO CABLE 104
106
R.F. MONITOR
RECEPTACLE
TO CABLE 107
117
CIRCUIT
BREAKER
SWITCH
60
VARIABL
10-1
RELAY RESET
116
TO CABLE 101-B
107
SIGNALS
RECEPTACLE
HI-VOL
136
VARIAC HI-VOLTAGE CONTROL
141-1
FUSE
5 AMP.
141-2
FUSE
5 AMP.
TO CABLE 102
109
RECEIVER
RECEPTACLE
VOLTAGE-CUR
115
MILLIAMMETER
137
9-1
9-2
19-3
19-2
19-1
112
6-8 VOLTS
113
LAMP 120 VOLTS
3 WATTS
TO CABLE
103
108
A.C. INPUT
RECEPTACLE

TL 38102

Section IV. RECEIVER

110. Reference Data

To assist the maintenance man while trouble shooting on the receiver many figures have been provided. In section IV, chapter 1 there are partial schematics and block diagrams, and at the end of this section there are groups of figures containing views of the receiver, a complete schematic and wiring diagram, drawings of terminal boards, voltage and resistance measurements, and waveforms.

111. Introduction

In section II trouble shooting based on the starting procedure is discussed. On the basis of step 3 which involves switching the receiver ON-OFF switch to the ON position, troubles, chiefly in the a-c circuit of the receiving system, can be spotted. The first four symptoms listed on the trouble-shooting chart deal with troubles of this nature. There are, however, many symptoms which are revealed on the radar display oscilloscope while the set is in operation, or by means of test position number 7 and the test oscilloscope. Troubles of this nature in the receiving system will be discussed in this section.

112. Localizing Trouble to Receiver

a. If the IFF receiver grass and the transmitter pulse are not seen on the screen of the display oscilloscope when the STANDBY OPERATE switch is in the OPERATE position, but if the normal radar traces are present, the trouble may be isolated with the aid of the test switches to one of the major components. There are two possible reasons for this fault. Either the interconnector is faulty or the receiver is not operating. To determine which of these two is at fault, leave the STANDBY OPERATE switch on OPERATE and turn the TEST switch to position 7. If the receiver grass and transmitter pulse are now observed on the screen of the test oscilloscope when properly adjusted, the receiver is working properly and it can be concluded that the interconnector is not operating correctly (sec. V). If no grass is observed, the receiver is faulty. Test position 7 may always be used to check the operation of the receiver.

b. Trouble in the display oscilloscope is evidenced by the lack of any picture on the screen or the presence of a distorted one when the selector switch is on STANDBY. In this case, reference should be made to TM 11–1510 for trouble shooting in the SCR–270 display Oscilloscope BC–403.

c. If there is an abnormal picture on the display scope when the SELECTOR switch is on OPERATE, but a normal one when on STANDBY, trouble shoot the control system (sec. V).

113. Use of Trouble-shooting Chart

When the trouble has been localized to the receiver, careful attention should be paid to the tuning eye and the dial lights. The significance of any abnormal conditions is given in the trouble-shooting chart which follows. By means of the chart, troubles may be localized to a section in the receiver without removing the receiver from the rack. When the trouble-shooting chart is used, it is assumed that the transmitter has been checked and found to be in operation, the STANDBY OPERATE switch is in the OPERATE position, and the TEST switch on the interconnector in position 7.

114. Signal Substitution

a. GENERAL. When the trouble is localized to a section, such as Symptom H, where the trouble is within the i-f section, or Symptom I, where the trouble is in the r-f section, localization to a stage is possible by the method of signal substitution or by the use of voltage and resistance measurements. At this time, the receiver should be removed from its rack.

b. HOW TO SET UP RECEIVER FOR SIGNAL SUBSTITUTION. (1) *Description of equipment needed.* (*a*) *Test scope.* Any IFF test scope may be used; the one that is adapted for use with Radio Equipment RC–150 is suitable.

(*b*) *Signal generator* (*I–198–A*). This is an r-f generator with a range limited to the i-f frequency of the receiver. It has a graph on the inside of the front cover which furnishes the dial settings for the frequencies needed. There is a rough gain control called the MULTIPLIER and a fine gain control which is called the OUTPUT. There is a shielded lead from the signal generator near the OUTPUT control which is the output lead.

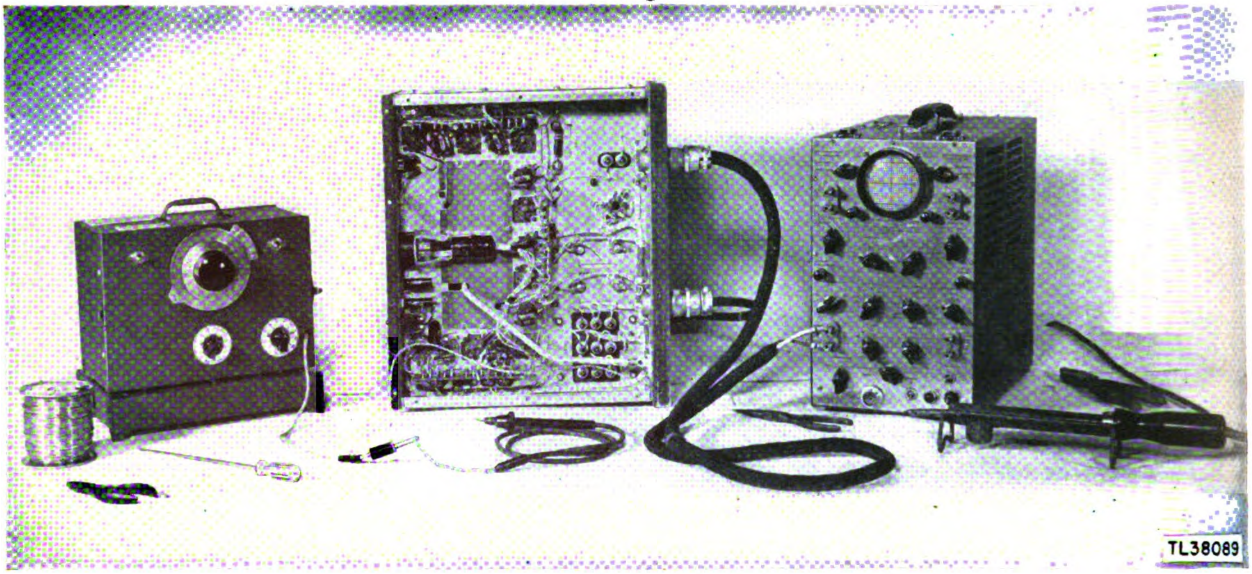


Figure 106. Receiver, set up for signal substitution.

(*c*) *Test Cable 110.* This is a special attachment between the receiver and scope to take the place of the GAIN CONTROL OUTPUT cable 101E. One end is a 3 prong Amphenol socket (female) and the other end has two spade lugs.

(*d*) *A-c input cable for receiver* (*Cable 103*). This is the spare transmitter power cable.

(2) *Connecting equipment for signal substitution.* (*a*) Plug the line cord from the signal generator into the 110–120 volt a-c outlet (fig. 106).

(*b*) Plug the line cord from the test scope into the 110–120 volt a-c outlet.

(*c*) Using the spare transmitter power cable 103 for receiver power, plug it into the 110–120 volt a-c outlet.

(*d*) Use test cable 110 to connect scope to receiver output connector 101E. Plug the 3 prong (female) Amphenol socket into receiver output and connect the spade lugs to the Y signal input terminals of the scope.

(*e*) On the connection from the signal generator to the receiver an adaptation must be made on the signal generator output plug to allow the high side of the generator output to be placed at various points for testing the receiver (fig. 107). Connect a wire lead to the negative part of the generator output plug by unscrewing the plastic portion a couple of turns and wrap one turn of wire around the threads and retighten. Connect an insulated lead around the portion of the plug on the outer side of the insulating washer. This lead should have an alligator clip (or probe) on it so that a good connection can be made on the various circuits

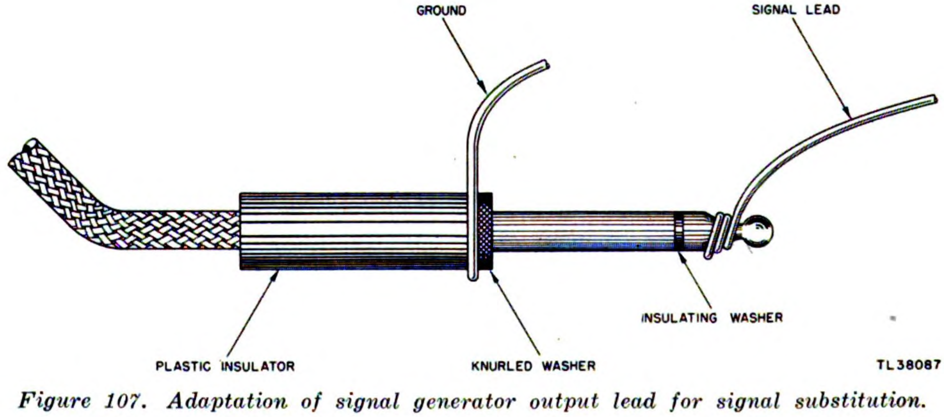


Figure 107. Adaptation of signal generator output lead for signal substitution.

being tested. The wire from the negative part of the generator output is grounded on the receiver chassis. The alligator clip (or probe) is used to apply the test signal to the various circuits being checked.

c. PRELIMINARY ADJUSTMENT OF EQUIPMENT. (1) *Signal generator.* (*a*) Put C.W.-MOD switch to MOD position.

(*b*) Put ON-OFF switch to the ON position.

(*c*) Turn MULTIPLIER and OUTPUT to the maximum range (clockwise).

(*d*) Using information on chart on inside of cover, adjust calibration dial for 11 megacycles.

(2) *Receiver.* Put ON-OFF switch to ON position and allow receiver a minute to warm up.

(3) *Test scope.* (*a*) Put ON-OFF switch to the ON position.

(*b*) Turn both horizontal and vertical deflection plate connections, by means of the TERMINALS-AMPLIFIER switch, to the AMPLIFIER position.

(*c*) Turn TERMINALS-PROBE switch to the TERMINALS position.

(*d*) Adjust ATTENUATION toggle switch and knob to observe desired picture. A suitable setting is 10:1.

(*e*) Place FREQUENCY RANGE control on the 220 scale.

(*f*) Be sure to connect all chassis together and ground them.

115. Method of Signal Substitution

a. The procedure of signal substitution consists of putting a signal into the grid of a tube and seeing if that signal, amplified, appears on the plate as evidence that the signal has passed through the tube. When the signal placed on the grid can be picked up on the plate it is assumed that the tube and its various circuit elements are working normally. On rare occasions a signal is passed through a circuit in a seemingly normal manner due to the capacitive action of the tube or circuit. The gain, however, of that stage is lost and there is no amplification. After very little experience with signal substitution this action is easily detected.

b. The signal from the signal generator should be applied to the grids and plates of the different stages, starting from the cathode follower and working back through the stages up to the mixer, making sure the signal is connected from the signal generator to the plate and then to the grid of each successive tube. While working back through the stages the gain of the signal generator should be cut down so as not to overdrive the stage. This reduction of generator output will show that gain is being obtained through the various amplifier stages. When a stage is bad, the signal will not get through or there will not be normal gain. The five i-f stages, the 2d detector, video amplifier, the cathode follower, and the mixer or modulator stages can be checked by this method. The two r-f stages and the local oscillator stage cannot be checked by the signal generator provided with the IFF test set.

c. When the signal is lost in any given stage, the trouble is isolated to that stage and the circuits directly connected to it. From this point on, the exact trouble should be located by means of voltage and resistance measurements (sec. I, ch. 2).

116. Checking Video Section

If the trouble appears to be in the video section of the receiver, as in Symptom E, the following method can be used as a quick and accurate check of the section.

a. Place a jumper from a 6.3 a-c voltage source, such as terminal 19 of terminal board R23, to the cathode of the cathode follower, pin 3 or 6 (VT–231). If a slightly distorted sine wave is seen on the radar scope, then the output circuit of the cathode follower is good. Place the jumper on the grid of the cathode follower (VT–231) (pin 1 or 4) and if a slightly distorted sine wave is seen on the scope, the cathode follower is known to be good. Place the jumper, from the 6.3 a-c voltage source, to the plate of the video (6SH7) to determine whether the coupling network is good. The same signal should be found on the scope as from the grid of the cathode follower. Next place the jumper from the a-c voltage source, to the grid of the video amplifier (6SH7) (pin 4). The scope picture should now be a sine wave distorted approximately to a square wave. Put the jumper on the plate of the second detector (VT–90) (pin 5) to determine whether the coupling network is good.

b. The a-c signal should be seen on the scope each time the jumper is placed on one of the above points. If the signal is lost, the trouble is in that stage and its connecting circuits. Voltage and resistance measurements should be made to determine the exact cause of the trouble.

117. Receiver Alignment Using Tuning Eye Indicator

a. EQUIPMENT NEEDED FOR RECEIVER ALIGNMENT. (1) Signal Generator I–198–A.

(2) Aligning screw driver.

(3) A-c input cable for receiver (103).

(4) Test cable 110.

b. CONNECTING THE EQUIPMENT FOR ALIGNMENT. (1) Plug the line cord from the signal generator into the 110–120 volt a-c outlet.

(2) Plug in the a-c input cable for the receiver into the 110–120 volt a-c outlet.

c. ALIGNMENT PROCEDURE. Alignment of the i-f stages of the receiver is carried out best with the receiver bottom plate fastened in place. This will help to prevent excessive regeneration. The alignment procedure is as follows:

(1) Remove the oscillator tube VT–94.

(2) Connect test cable 110 to receptacle 101E at the rear of the receiver. This insures maximum gain.

(3) Connect 110–120 volt a-c to the a-c input receptacle at the rear of the receiver.

(4) Snap the ON-OFF switch to the ON position.

(5) Connect the unmodulated signal from Signal Generator I–198–A to the I-F INPUT jack. To prevent the system from breaking into oscillation, alignment should first be made at reduced input.

(6) Set the generator to 11 megacycles.

(7) Adjust the eye transformer tuning slug for maximum closing of the tuning indicator eye. If the eye closes completely, reduce the output of the signal generator until maximum closure is clearly indicated.

(8) Set the generator to 10.5 megacycles.

(9) Adjust the second detector transformer tuning slug for maximum closing of the tuning indicator eye.

(10) Set the signal generator to 8.9 megacycles.

(11) Adjust the fifth i-f and third i-f transformer tuning slug, in order, for maximum closing of the tuning indicator eye.

(12) Set the signal generator to 13.1 megacycles.

(13) Adjust the fourth i-f and second i-f transformer tuning slugs, in that order, for maximum closing of the tuning indicator eye.

(14) Set the signal generator to 11 megacycles.

(15) Adjust the first i-f transformer tuning slug for maximum closing of the tuning eye.

d. OSCILLATION. If the system breaks into oscillation during adjustment, as evidenced by complete closure of the eye with no signal input, turn the slugs of the fifth and third i-f transformers all the way in. Then complete the adjustment of all the other transformers before returning to the fifth and third.

e. EXCESSIVE REGENERATION. To check for excessive regeneration in the i-f system, the signal generator should be adjusted to a frequency of 11 megacycles and the output adjusted to zero. A zero-to-one milliammeter plugged into the I.F. OUT jack should read less than 0.3 milliampere.

118. Additional Alignment Procedure Using Tuning Eye Indicator

a. To align the i-f system when considerable misalignment has been caused by accident or replacement of i-f transformers, the following procedure should be followed:

(1) Remove the oscillator Tube VT–94.

(2) Connect the unmodulated output of the Signal Generator I–198–A between the grid and ground of the fifth i-f amplifier Tube VT–176.

(3) Set the frequency at 11 megacycles.

(4) Adjust the eye transformer, 99, for maximum closing of the tuning indicator eye.

(5) Set the frequency at 10.5 megacycles.

(6) Adjust the second detector transformer, 98, for maximum closing of the tuning indicator eye.

(7) Shift the generator connections to grid and ground of the fourth i-f stage, VT–176.

(8) Set the frequency at 8.9 megacycles.

(9) Adjust the fifth i-f transformer, 97–2, for maximum closing of the tuning indicator eye.

Note. Care should be taken not to overload the tuning eye. This overload is indicated by an overlapping in the eye. To prevent this, reduce the signal generator input.

(10) Shift the generator connections to grid and ground of the third i-f stage, VT–112.

(11) Set the frequency at 13.1 megacycles.

(12) Resonate the fourth i-f transformer, 96–2, for maximum closing of the tuning indicator eye.

(13) Shift the generator connections to grid and ground of the second i-f stage, VT–112.

(14) Set the frequency at 8.9 megacycles.

(15) Resonate the third i-f transformer, 97–1, for maximum closing of the tuning indicator eye.

(16) Shift the generator connections to grid and ground of the first i-f stage, VT–112.

(17) Set the frequency at 13.1 megacycles.

(18) Resonate second i-f transformer, 96–1, for maximum closing of the tuning indicator eye.

(19) Shift the generator connections to the I.F. IN jack, 129–1.

(20) Resonate the first i-f transformer, 95, for maximum closing of the tuning eye.

b. If the i-f system breaks into oscillation at any time, turn the slugs of the fifth and third i-f transformers all the way in. Then complete the adjustment of all the other transformers before returning to the fifth and third.

119. Receiver Alignment Using Test Scope

a. The equipment needed to tune the i-f stages includes a signal generator, oscilloscope (or output meter), and a tuning screw driver. Since wave-shape and signal-to-noise ratio may be directly observed on an oscilloscope, the scope is to be preferred to the output meter.

b. A few precautionary measures to insure uniform results are necessary:

(1) Keep the equipment close together.

(2) Connect all chassis together with several short leads.

(3) Ground the chassis.

c. Preliminary to the alignment of the receiver, the following steps must be taken (fig. 108):

(1) Connect test cable 110 to receiver output socket and connect the spade lugs to the Y signal input terminals of scope. Use internal sweep.

(2) Connect the output of the signal generator to the I.F. IN jack, 129–1.

(3) Turn the equipment on and allow it to warm up for a few minutes.

d. After the equipment has reached its normal operating temperature, proceed as follows:

(1) Adjust the tuning dial of the signal generator for an output frequency of 11 mc/s.

(2) Increase the output level from zero until a picture is formed on the scope as shown in figure 109.

(3) Adjust the core of the i-f coils of first and sixth transformers for maximum deflection on the scope. When this adjustment is being made, decrease the signal output of the signal

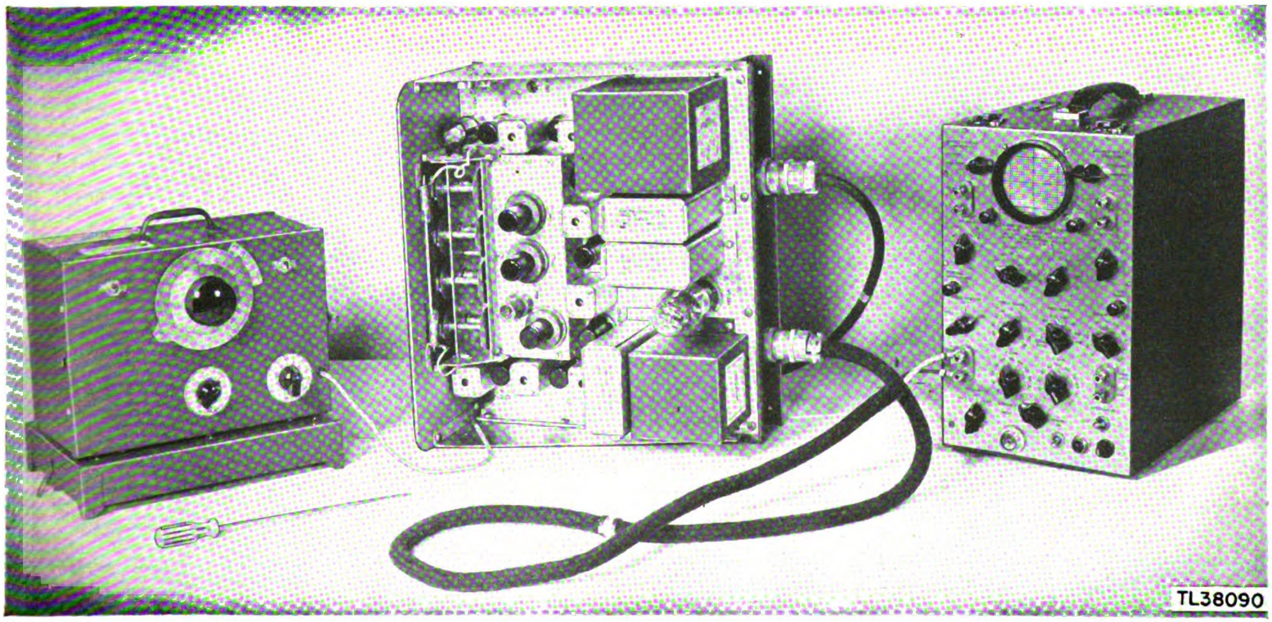


Figure 108. Receiver set up for alignment procedure.

generator to maintain the same deflection as in (*b*); otherwise distortion of the output due to overloading will cause misleading results. Observe this precaution each time an i-f stage is adjusted.

(4) Change the frequency of the signal generator to 13.1 mc/s and adjust i-f coils 2 and 4 for maximum deflection on the scope.

(5) Change the frequency of the signal generator to 8.9 mc/s and adjust i-f coils 3 and 5 the same way.

(6) Set the signal generator to 11 mc/s and adjust the tuning-eye tuned circuit (eye transformer) for maximum closure of the eye. (The signal level may have to be increased.)

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Figure 109. Scope pattern for alignment procedure.

120. Receiver Trouble-shooting Chart

A. SYMPTOMS:
1. Panel lamps, 126-1 and 126-2, do not light (step 3).
2. Tuning eye does not light (step 3).
3. All other indications normal (step 3).

Probable location of fault	*Procedure*
A-c input circuit in receiver.	1. Check fuse 135 for open. 2. If fault is not cleared, make a continuity test from plug 124 on receiver through receiver switch 127 (fig. 35). 3. Check primary of transformer 103 for open. 4. If fault is not cleared, see item below.
A-c input circuit from transmitter plug 109 to receiver plug 124.	1. Check the line voltage at plug 124. 2. If there is no voltage, make a continuity check from plug 108 in transmitter through plug 109 in transmitter to plug 124 in receiver.

B. SYMPTOMS:
1. Panel lamps do not light (step 3).
2. Tuning eye lights (step 3).
3. All other indications normal (step 3).

Probable location of fault	*Procedure*
Defective light bulbs.	1. Check by replacing light bulbs. 2. If fault is not cleared, see item below.
Defective switch 128.	1. Turn off receiver switch and make a continuity test across the switch. 2. If fault is not cleared, see item below.
Defective panel light circuit.	1. Make a continuity test from terminals 8 and 9 of transformer 103 to the terminals of the light bulbs (fig. 35).

C. SYMPTOMS:
1. Tuning eye does not light (step 3).
2. Panel lamps light (step 3).
3. All other indications normal (step 3).

Probable location of fault	*Procedure*
Defective tuning indicator tube.	1. Check tube by replacement. 2. If fault is not cleared, see item below.

Probable location of fault	*Procedure*
Defective power supply or wiring to tuning indicator tube.	1. Check for plate voltage at pins 2 and 4 of the tuning indicator tube. 2. If there is no voltage at the pins, turn the power off and make a continuity test from pin 6 of transformer 103 to pins 2 and 4 of the tuning indicator tube through switch 128 (figs. 128 and 129). 3. If fault is not in the wiring, make a complete check of the power supply. 4. If fault is not cleared, see item below.
Defective tuning indicator circuit.	1. If there is voltage at pins 2 and 4 of the tuning indicator tube check the voltage and resistance values at all the other pins of the tube.

D. SYMPTOMS: 1. Circuit breaker on transmitter kicks off (step 3).
2. All indicator lamps go out (step 3).

Probable location of fault	*Procedure*
Defective circuit breaker 117.	1. Measure voltage at junction of resistor 77 and choke 102. Voltage should be 270 volts. If voltage is normal trouble is in circuit breaker. Replace circuit breaker with a spare.
Short in receiver power supply.	1. If voltage is not normal at junction of resistor 77 and choke 102 check the power supply for a short (fig. 35).

E. SYMPTOMS: 1. Grass and main IFF pulse do not appear on radar scope.
2. Tuning eye VT–215, can be closed.
3. All other indications normal.

Probable location of fault	*Procedure*
Defective video or cathode follower stage in receiver.	1. Place test switch in position 7. 2. If pattern on test scope shows no grass and no main pulse, trouble is in receiver. 3. Check tube and associated circuit of video stage (fig. 32). 4. Check tube and associated circuit of cathode follower.
Defective IFF switching channel in interconnector.	1. If pattern on test scope for position 7 is normal, trouble is in interconnector. 2. See paragraph 127, section V, Symptom E.

F. SYMPTOMS: 1. Tuning eye VT–215, does not light.
2. Grass and main IFF pulse do not appear on radar scope.
3. Panel lamps 126–1 and 126–2 light.
4. All other indications normal.

Probable location of fault	*Procedure*
Defective power supply in receiver.	1. Check rectifier tube and associated circuit (fig. 35).

G. SYMPTOMS: 1. Tuning eye VT–215, does not light.
2. All other indications normal.

Probable location of fault	*Procedure*
Defective tuning indicator stage.	1. Check tube VT–215 by replacement. 2. If trouble is not cleared, replace tube and make a voltage and resistance check of the stage (fig. 115). Check switch 128 for continuity.

H. SYMPTOMS: 1. No grass or signal on radar scope.
2. Tuning eye VT–215, does not close.
3. All other indications normal.

Probable location of fault	*Procedure*
Defective stage from 2d i-f amplifier to 2d detector inclusive.	1. Isolate trouble to stage by signal substitution (fig. 29). 2. Make a resistance and voltage check of the suspected defective stage and the stage preceding it (fig. 115).

I. SYMPTOMS: 1. Main IFF pulse does not show through grass.
2. Grass appears normal.
3. Tuning eye will not close.
4. All other indications normal.

Probable location of fault	*Procedure*
Defective r-f tuning head.	1. Check gearing for proper mechanical connection. 2. Make a complete voltage and resistance check of the r-f stages (figs. 113 and 124).

J. SYMPTOMS: 1. Grass on radar scope barely perceptible.
2. Eye does not close.
3. All other indications normal.

Probable location of fault	*Procedure*
Defective first i-f stage.	1. Check tube and associated circuit of 1st i-f stage (fig. 29).

K. SYMPTOMS: 1. Tuning eye VT–215, does not light.
2. Panel lamps 126–1 and 126–2 do not light.
3. Grass on radar scope normal.

Probable location of fault	*Procedure*
Defective switch 128.	1. Check switch for continuity. Replace if defective.

121. Procedure for Replacing Defective Electrical Parts in Receiver

a. INTRODUCTION. The information following is to assist the radar mechanic in replacing defective major parts in the receiver. Note that such replaceable items as small resistors, capacitors, tube sockets, and tubes are not covered in these procedures. Neither is a procedure given when the replacement of the part presents no special difficulties. The procedures given in this section cover only items difficult to replace. These procedures have been worked out experimentally and represent the shortest and best method of accomplishing the work.

Cautions: 1. Before replacing a defective part, observe carefully its position, method of mounting, and wiring. This insures the correct installation of the replacement part.

2. When removing such parts as switches and terminal boards, which have several wires attached at their terminals, be sure to tag the wires carefully so that they will be replaced in their proper positions.

3. When disassembling a component, the screws, nuts, bolts, washers, and other

small parts which are removed, should be put in small container to prevent their loss.

b. LIST OF ITEMS COVERED. (1) *Front panel* (par. 122).

Fuses.
Toggle switch.
Interlock switch.
Window glass.

(2) *Under side* (par. 123).

R-f tuning head.
Antenna input conduit.
Tuning indicator tube clamp.
I-f transformers.
Transformers, chokes, and filter capacitors.
Jacks.
Capacitor No. 14.
Fuse holder.

122. Front Panel of Receiver

a. FUSES. See transmitter, front panel.

b. TOGGLE SWITCH. See transmitter, front panel.

c. INTERLOCK SWITCH. See transmitter, top side.

d. WINDOW GLASS. (1) Remove r-f tuning head. See procedure below.

(2) Remove brackets which hold glass and remove the glass.

(3) To install new glass, reverse removal procedure.

123. Under Side of Receiver

a. R-F TUNING HEAD. (1) With an Allen wrench, remove the tuning knobs from the front panel.

(2) Remove all screws shown in figure 164.

(3) Pull the front panel forward and drop it down to clear receiver chassis.

(4) Remove tuning indicator Tube VT–215 (6E5) and place it in back of chassis (fig. 165).

(5) Remove the metal plate on the bottom of the tuning head by taking off the nuts and screws indicated as A in figure 165.

(6) Unsolder wire in the i-f conduit from lug 5 of the first i-f transformer (fig. 165).

(7) Unsolder the i-f conduit from the lug adjacent to the Tube VT–112.

(8) Unsolder the capacitor at the end of the orange lead (the antenna conduit) from the antenna coil.

(9) Remove the clamp which holds the antenna conduit to the tuner case.

(10) Remove the red and yellow leads from terminals 25 and 28 respectively.

(11) Remove r-f tuner head from the receiver chassis by removing screws B (fig. 165) and lifting the tuner head free.

(12) To install the spare r-f tuner head, carefully place it in position in the receiver chassis and reverse the removal procedure.

b. ANTENNA INPUT CONDUIT (fig. 165). (1) Unsolder the capacitor at the end of the orange lead (which is the antenna conduit) from the antenna coil.

(2) Remove the four screws which hold the antenna conduit to connector 123.

(3) To install a new conduit, reverse the removal procedure.

c. TUNING INDICATOR TUBE CLAMP. (1) From the front panel remove two screws which attach the clamp and remove it.

(2) To install the new clamp, reverse removal procedure.

d. I-F TRANSFORMERS. (1) Unsolder the connections to the terminals of the transformers.

(2) Remove from the under side of the chassis two nuts which attach the transformer to the chassis and remove the transformer.

(3) To remove the case from the transformer, remove the two nuts on top of the case and slip it off.

(4) To install a new transformer, reverse the removal procedure.

e. TRANSFORMERS, CHOKES, AND FILTER CAPACITORS See transmitter, top side.

f. JACKS. (1) Remove the soldered connections from the terminals of the jacks.

(2) From the top side of the chassis, remove the locknut which secures the jack and push it out through the bottom of the chassis.

(3) To install a new jack, reverse the removal procedure.

g. CAPACITOR 14. (1) Unsolder the connections to terminals of the capacitor.

(2) From the side of the chassis remove the two screws which secure the capacitor.

(3) To install the new capacitor, reverse removal procedure.

h. FUSE HOLDER. See transmitter, bottom side.

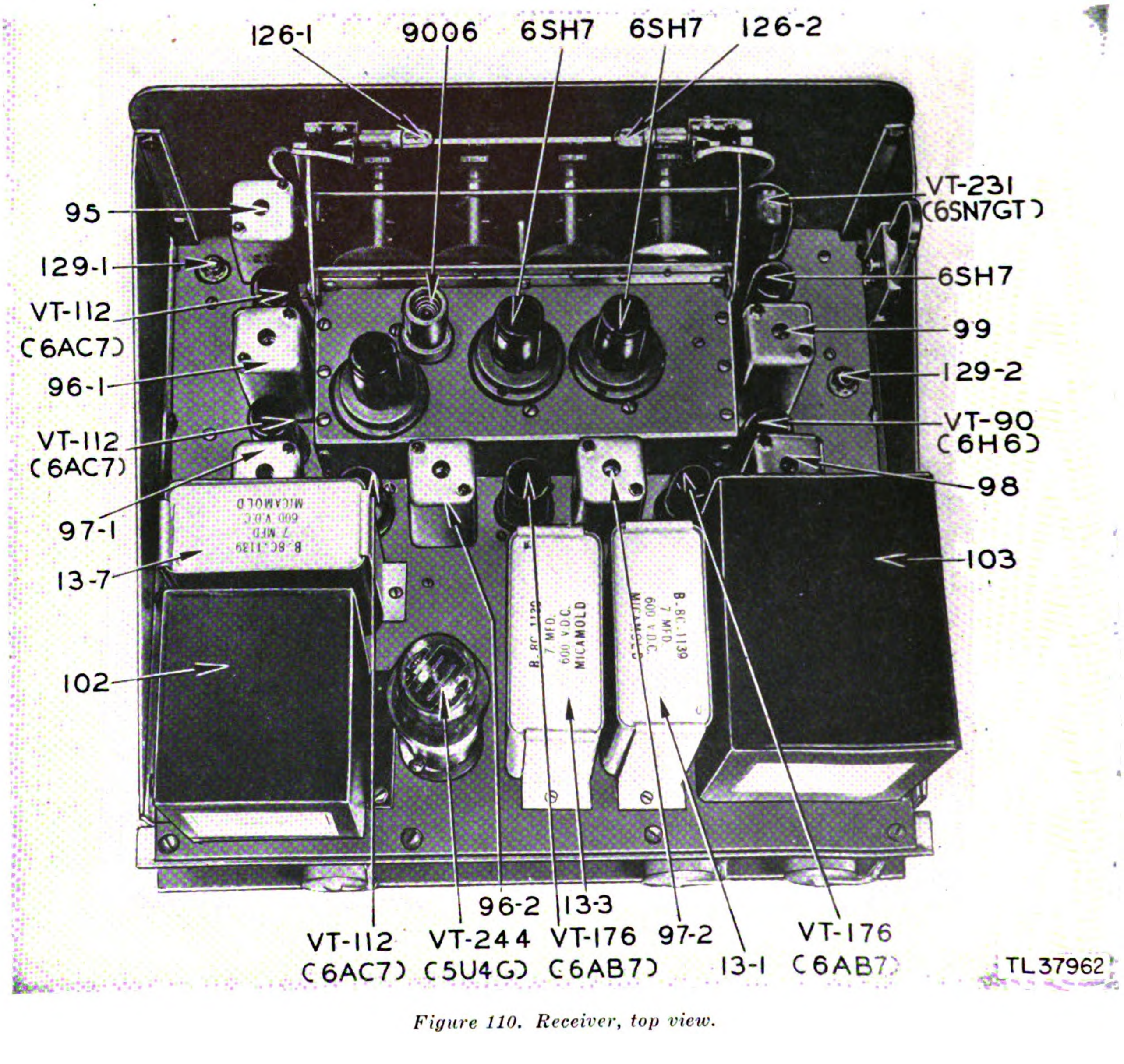


Figure 110. Receiver, top view.

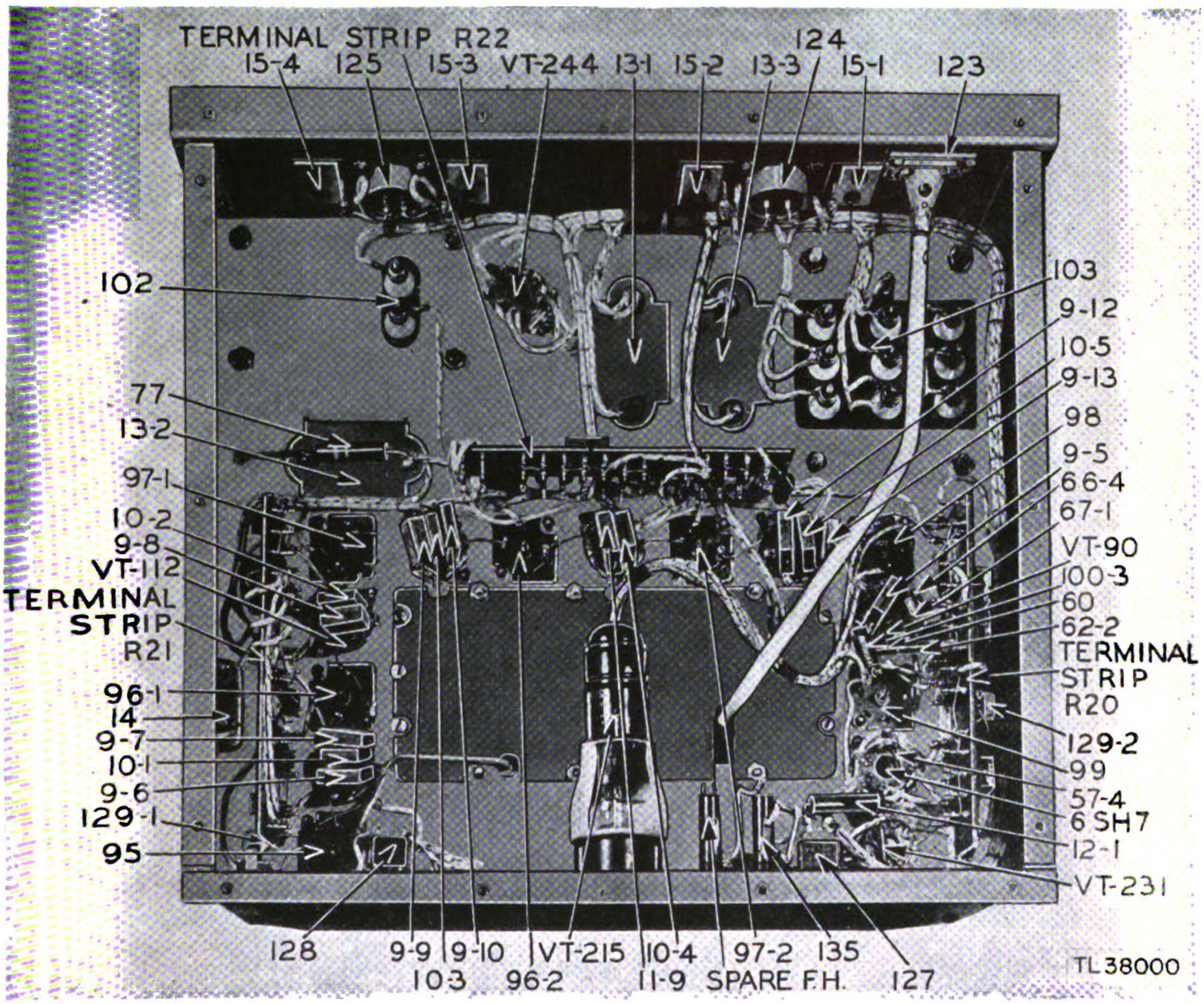


Figure 111. Receiver, bottom view.

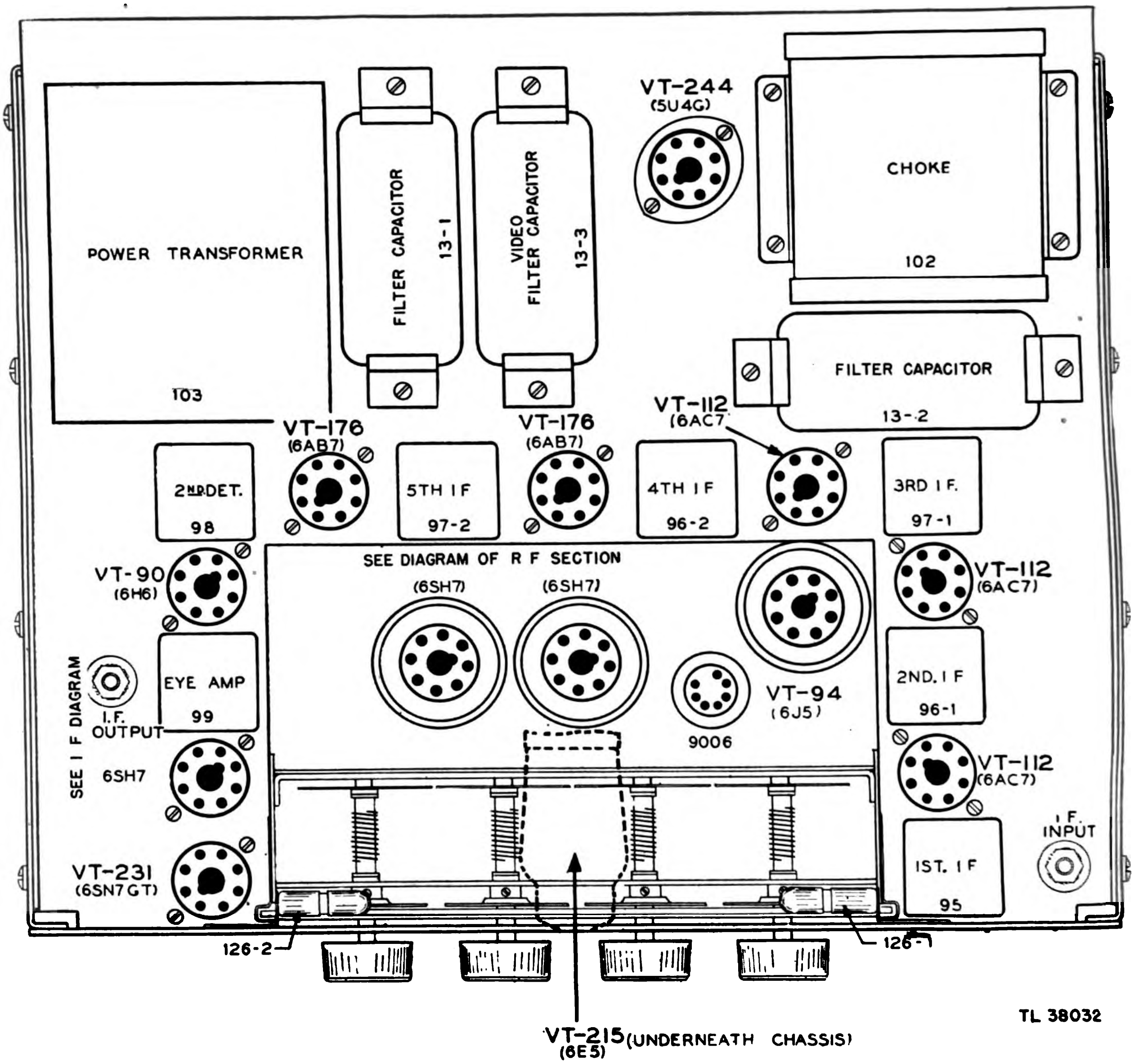


Figure 112. Receiver, tube arrangement.

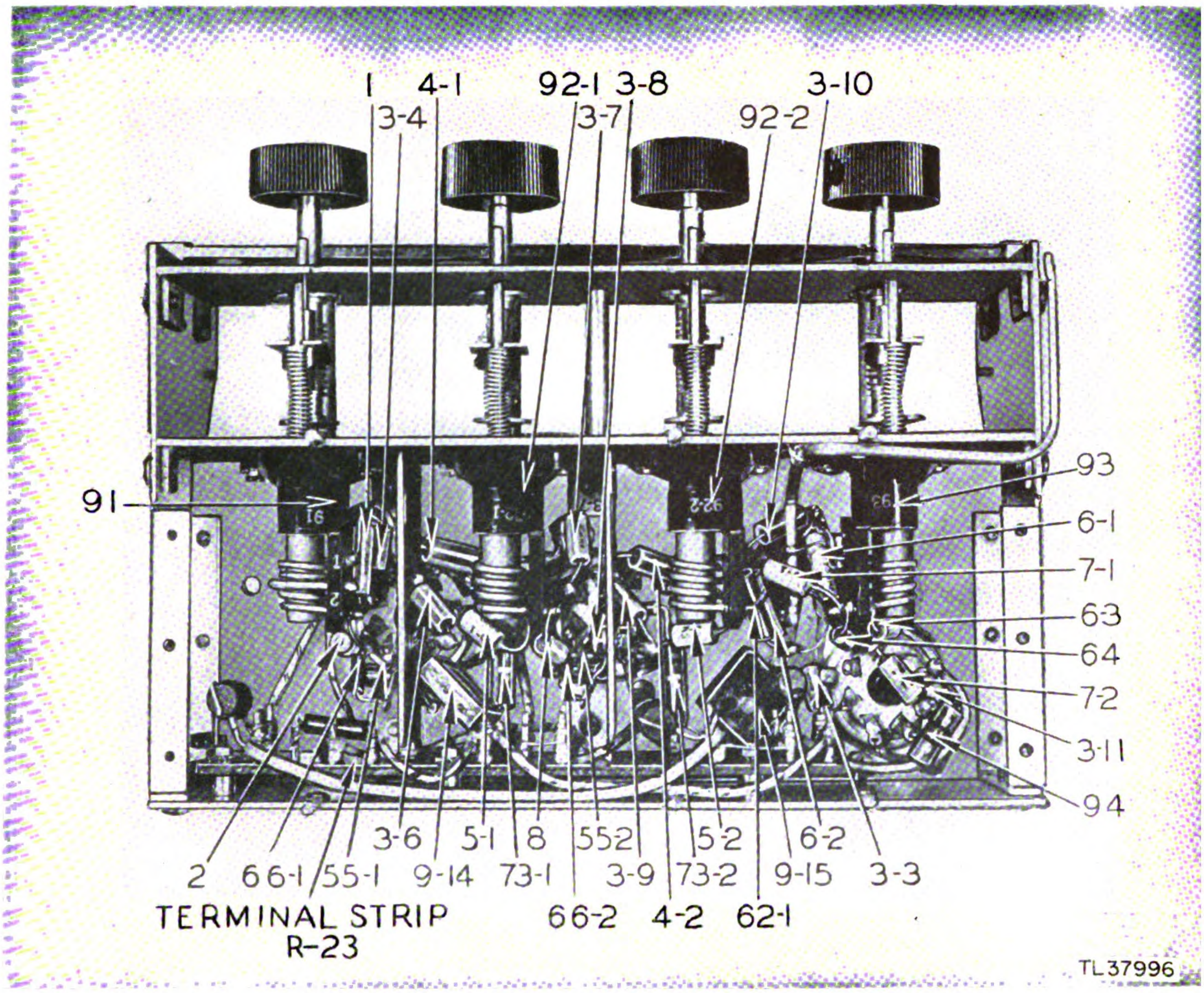
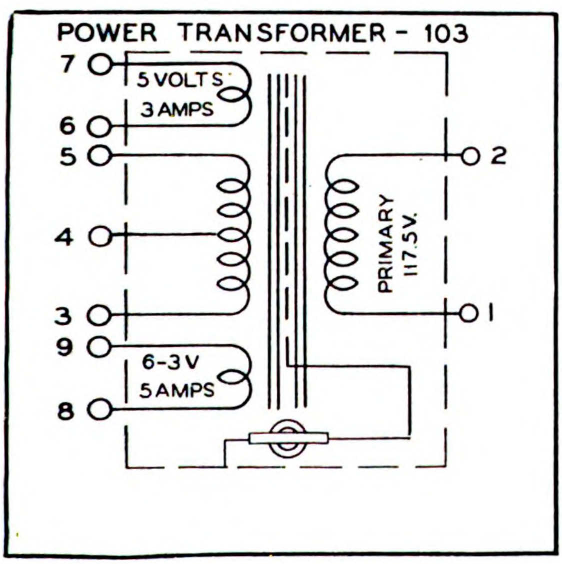


Figure 113. Receiver, bottom view of r-f tuner.



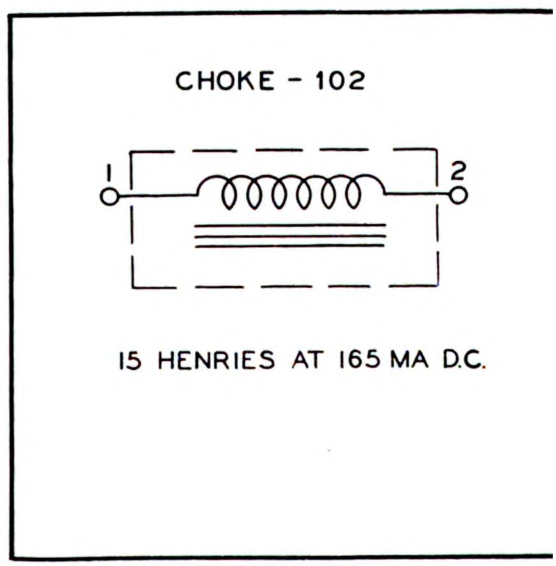


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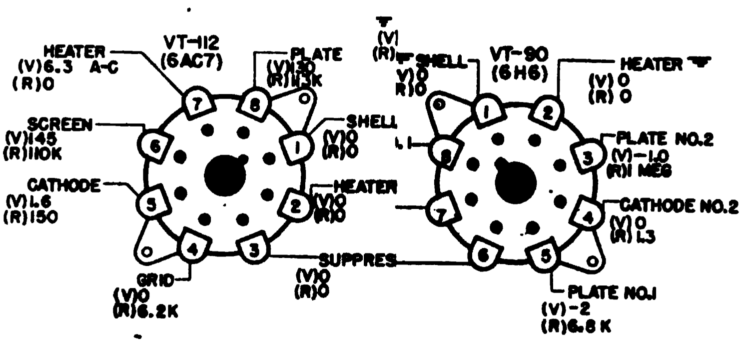
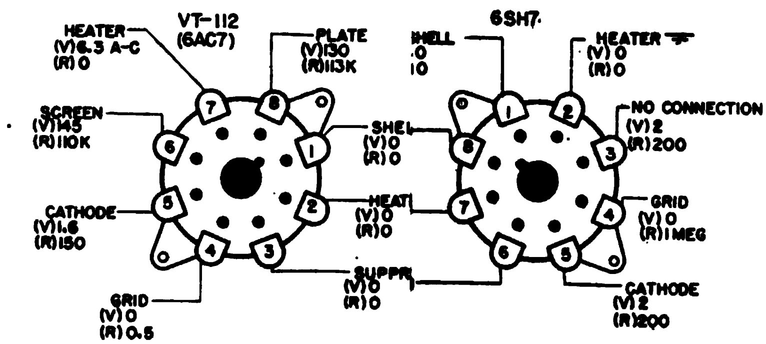
Figure 114. Receiver, schematic of power transformer 103 and choke 102.

SUREMENTS

RTED.

VOLT VOLTMETER.





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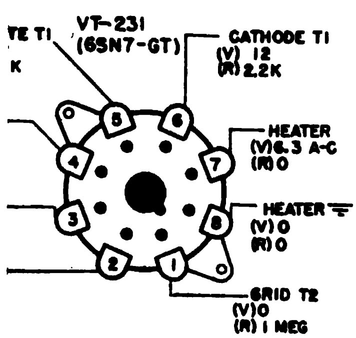


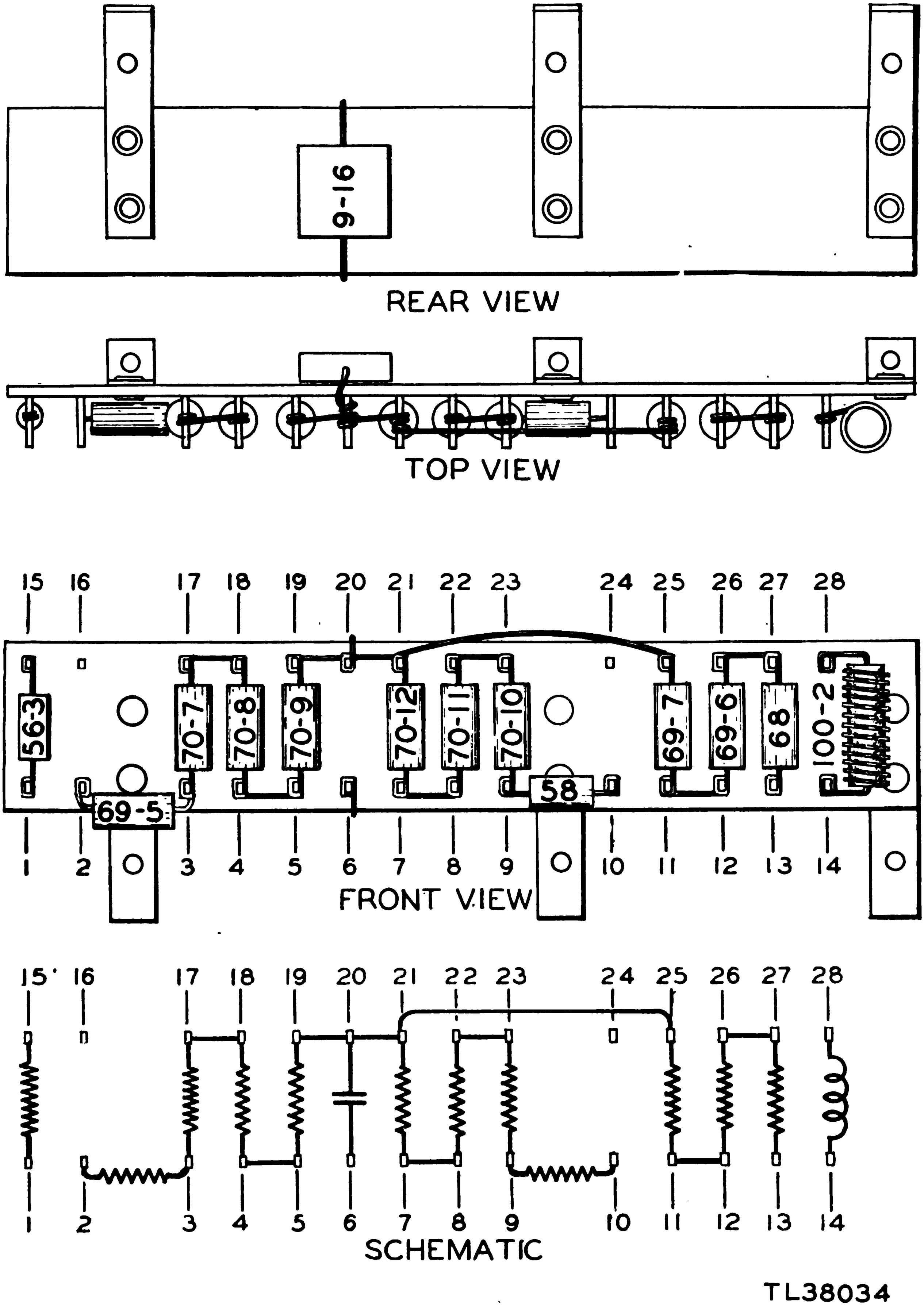
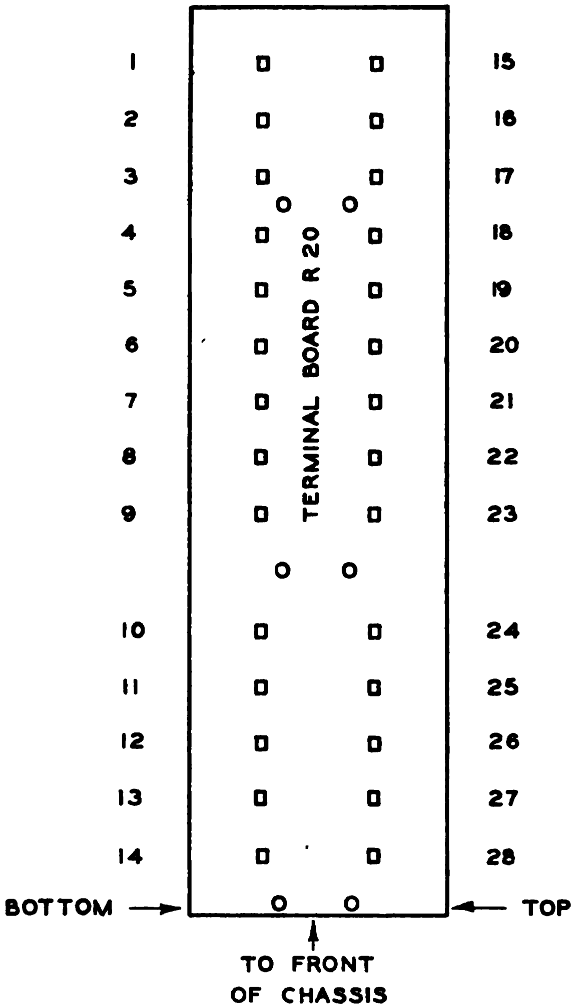


Figure 116. Schematic and wiring diagram of terminal board R20.

OHMS	VOLTS	TERMINAL NO.	TERMINAL NO.	VOLTS	OHMS
100K	270	1	15	0	INF
1.2 MEG	-0.5	2	16	-0.2	1.1 MEG
0	0	3	17	-0.2	1.1MEG
1 MEG	-1	4	18	-1	1 MEG
1 MEG	-1	5	19	-0.2	1.1 MEG
16.8K	-0.5	6	20	0	1 MEG
0	0	7	21	0	1 MEG
100 K	270	8	22	220	105K
127K	150	9	23	220	105K
121K	100	10	24	220	105K
121 K	100	11	25	220	105K
121 K	100	12	26	0	1 MEG
1 MEG	0	13	27	0	1 MEG
0	0	14	28	0	1 MEG



NOTE: SEE SOCKET VOLTAGE AND RESISTANCE CHART FOR CONDITIONS UNDER WHICH MEASUREMENTS WERE MADE.

TL 38019

Figure 117. Resistance and voltage chart for terminal board R20.

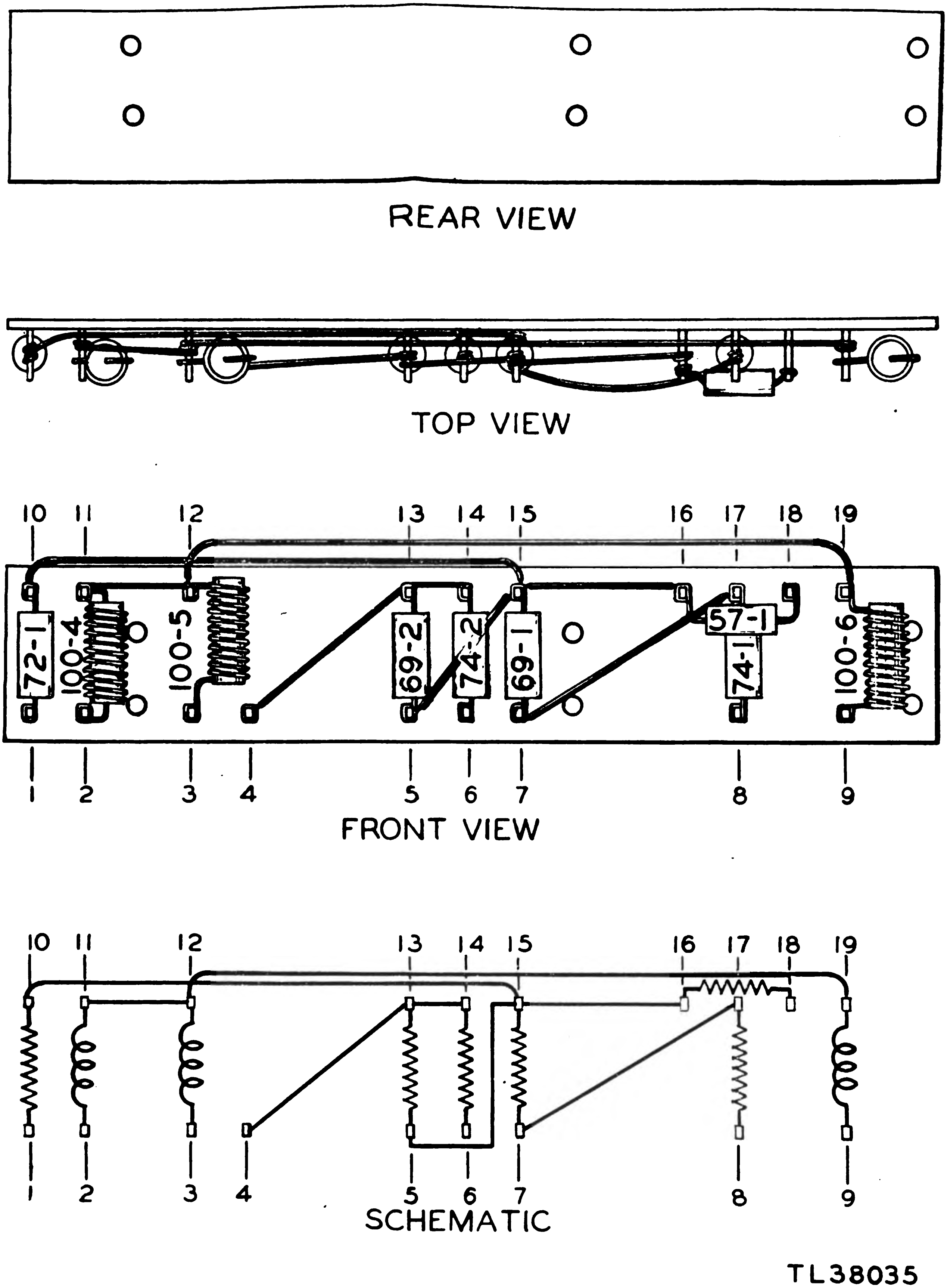


Figure 118. Schematic and wiring diagram of terminal board R21.

TERMINAL

OHMS	VOLTS	NO.	NO.	VOLTS	OHMS
150	1.6	1	14	0	0
104 K	235	2	15	270	100 K
104 K	235	3	16	200	107 K
110 K	145	4	17	200	107 K
110 K	145	5	18	130	113 K
0	6.3A-C	6	19	6.3A-C	0
INF	0	7	20	0	INF
150	1.6	8	21	0	0
0	0	9	22	0	0
104 K	235	10	23	270	100 K
104 K	235	11	24	200	107 K
110K	145	12	25	200	107K
110 K	145	13	26	130	113K

TERMINAL BOARD R21

BOTTOM → ← TOP

TO REAR OF CHASSIS

NOTE: SEE SOCKET VOLTAGE AND RESISTANCE CHART FOR CONDITIONS UNDER WHICH MEASUREMENTS WERE MADE

TL 38020

Figure 119. Resistance and voltage chart for terminal board R21.

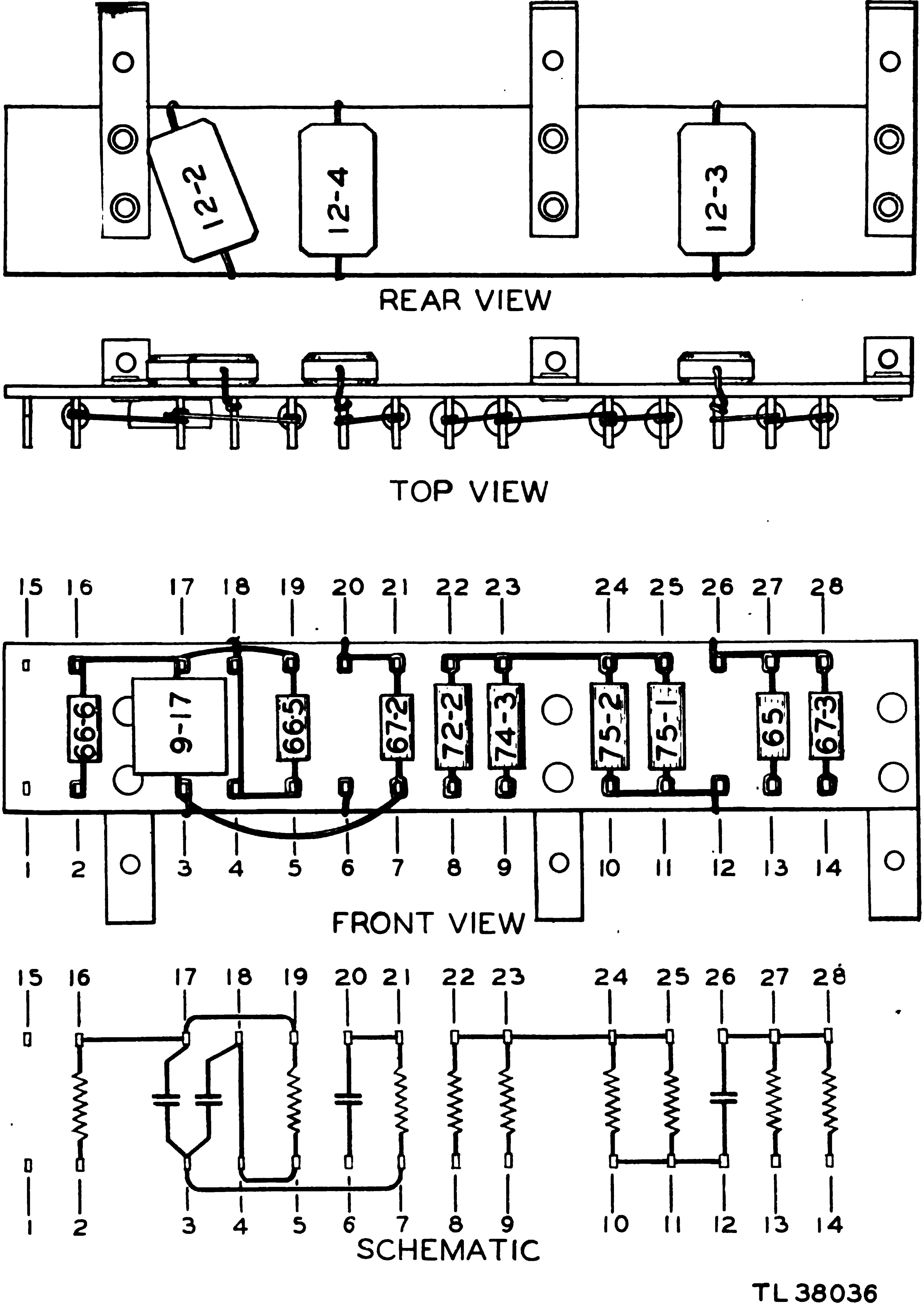


Figure 120. Schematic and wiring diagram of terminal board R22.

OHMS	VOLTS	NO.	TERMINAL NO.	VOLTS	OHMS
150	1.7	1	15	0	0
113 K	130	2	16	0	INF
110 K	145	3	17	200	107K
104 K	235	4	18	200	107K
104 K	235	5	19	270	100K
0	0	6	20	270	100K
104 K	235	7	21	270	100K
104 K	235	8	22	200	107K
110 K	150	9	23	200	107K
110 K	145	10	24	0	INF
103 K	240	11	25	270	100K
103 K	240	12	26	210	106K
106 K	175	13	27	210	106 K
0	6.3A-C	14	28	6.3 A-C	0

TERMINAL BOARD R22

BOTTOM → ← TOP

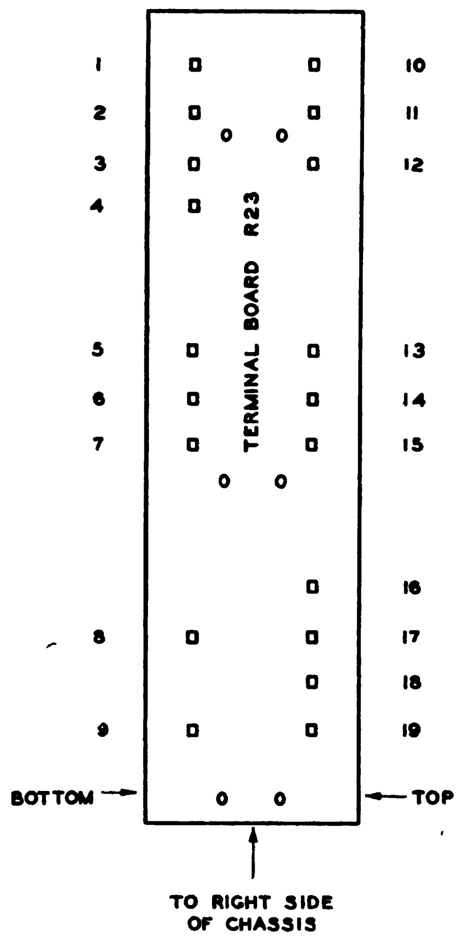
TO RIGHT SIDE OF CHASSIS

NOTE: SEE SOCKET VOLTAGE AND RESISTANCE CHART FOR CONDITIONS UNDER WHICH MEASUREMENTS WERE MADE

TL 38021

Figure 121. Resistance and voltage chart for terminal board R22.

OHMS	VOLTS	TERMINAL NO.	TERMINAL NO.	VOLTS	OHMS
106K	165	1	10	265	100K
0	6.3A-C	2	11	6.3A-C	0
0	6.3 A-C	3	12	6.3A-C	0
103K	240	4			
100 K	265	5	13	240	103K
125 K	140	6	14	240	103K
103 K	240	7	15	265	100K
			16	265	100 K
125 K	140	8	17	240	103K
			18	270	10K
0	6.3A-C	9	19	6.3A-C	0



NOTE: SEE SOCKET VOLTAGE AND RESISTANCE CHART FOR CONDITIONS UNDER WHICH MEASUREMENTS WERE MADE

TL 38022

Figure 122. Resistance and voltage chart for terminal board R23.

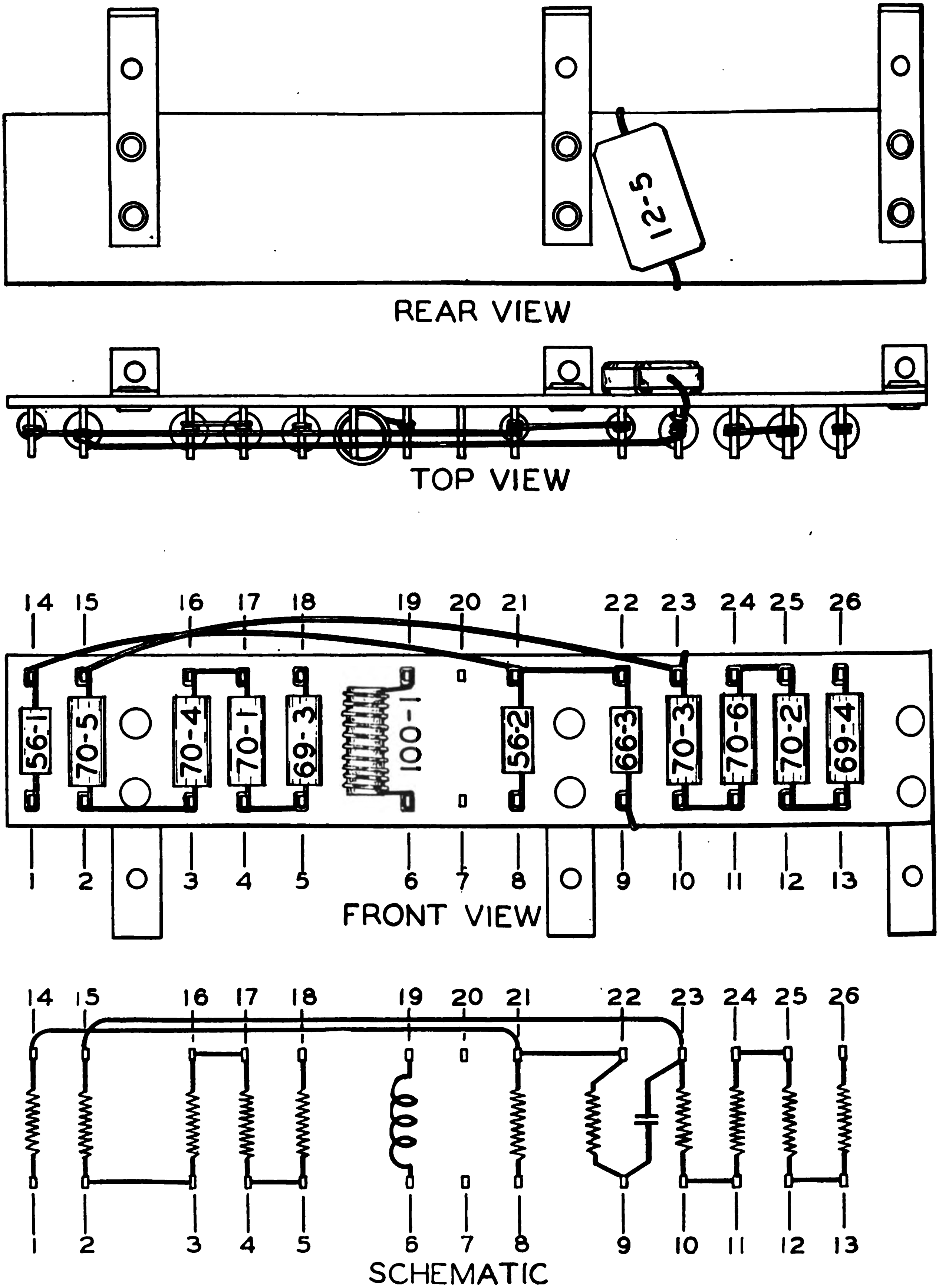


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Figure 123. Schematic and wiring diagram of terminal board R23.

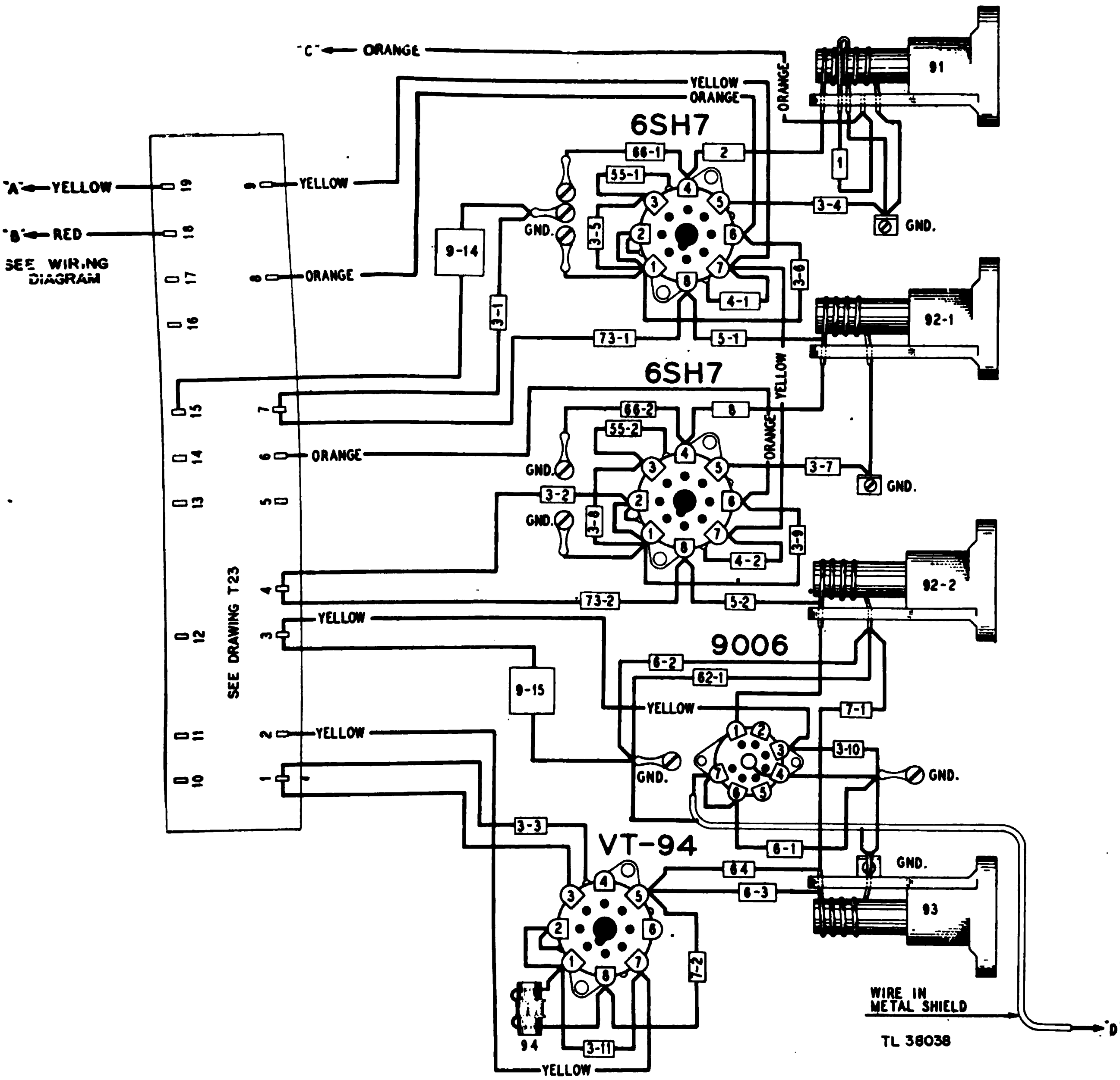


Figure 124. Wiring diagram of r-f tuner.

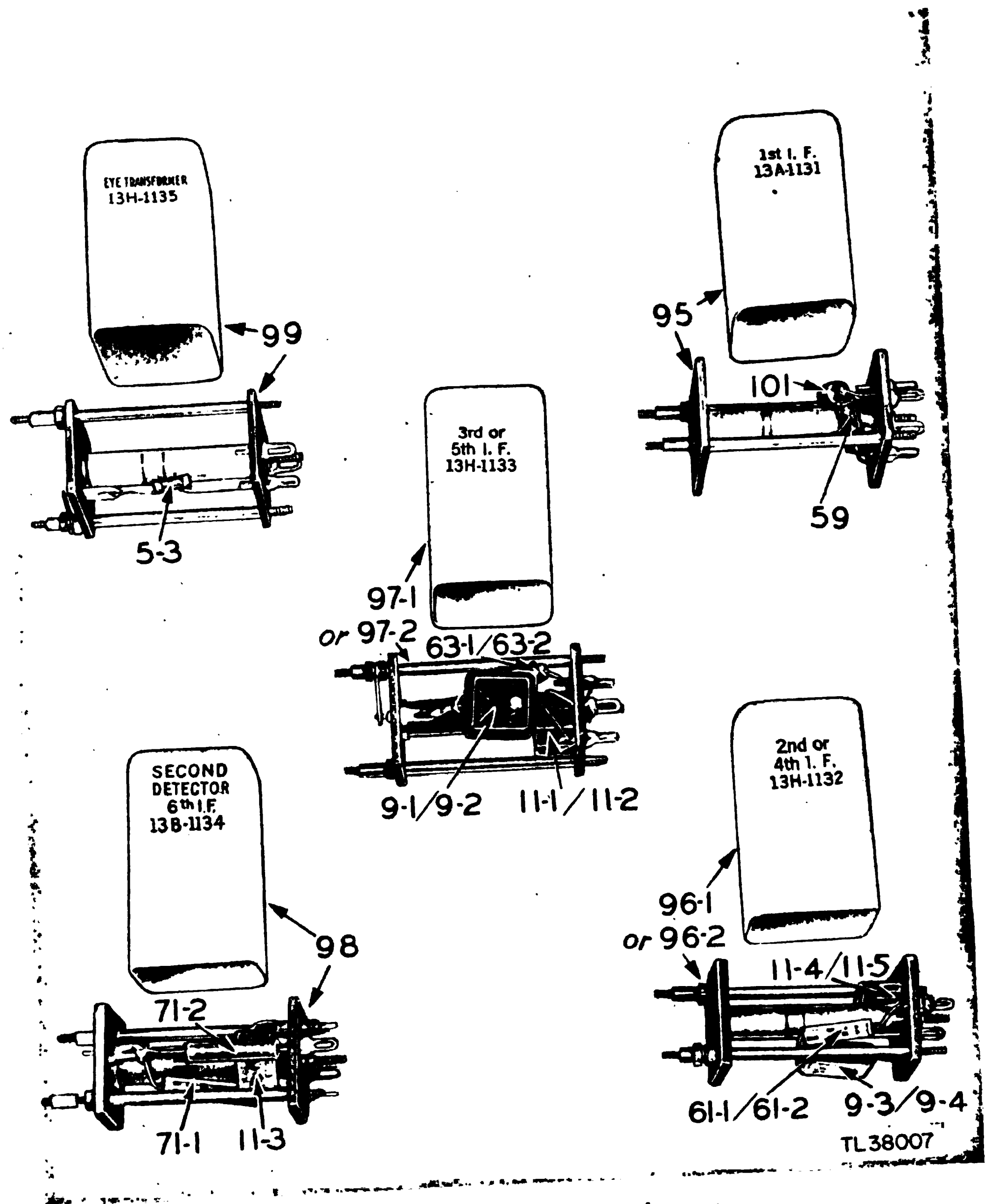


Figure 125. Receiver, i-f transformers.

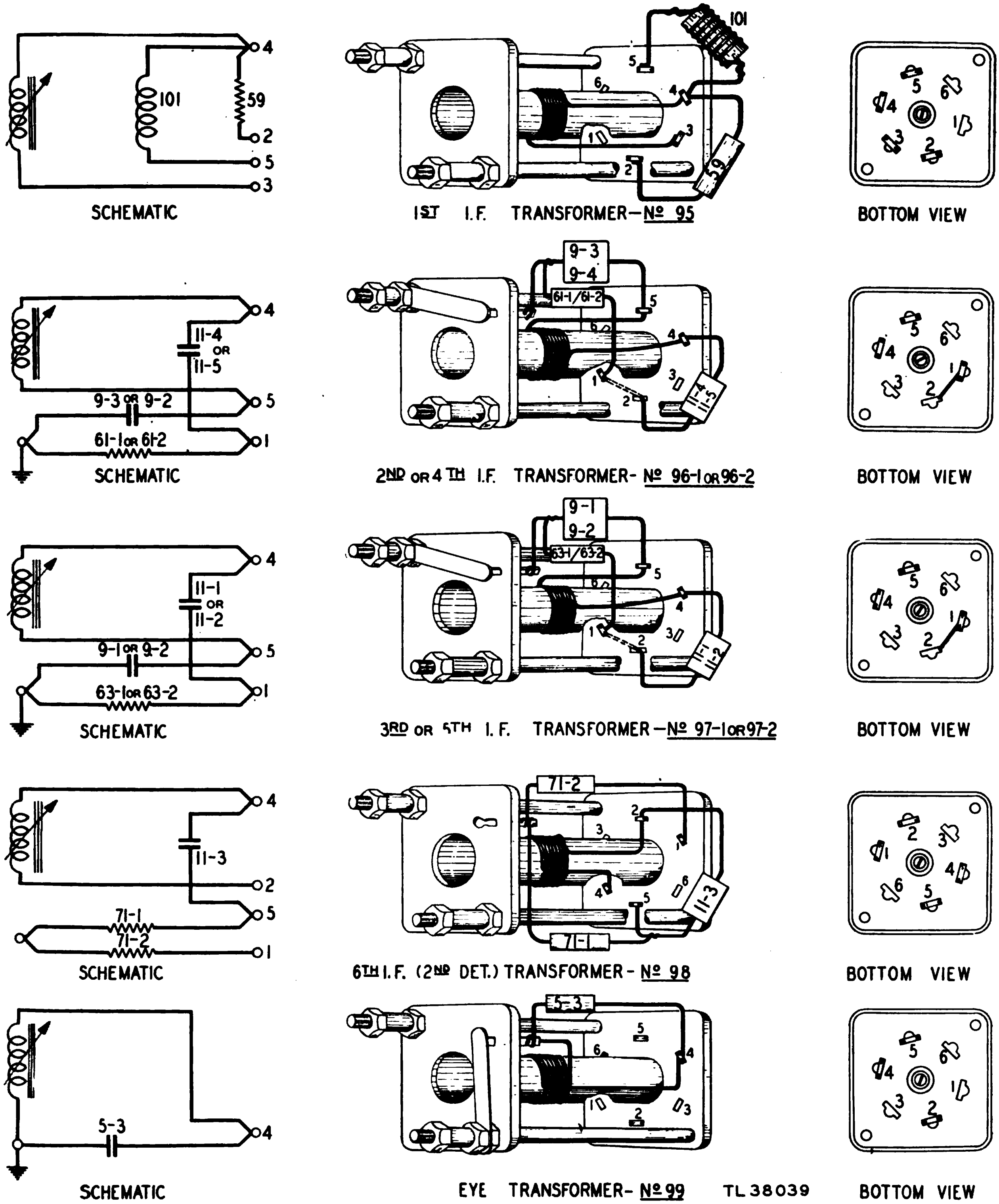


Figure 126. Wiring and schematic diagram i-f transformers.

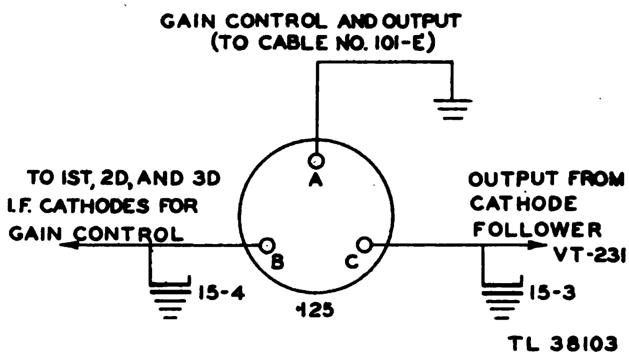


Figure 127. Receiver, receptacle 125.

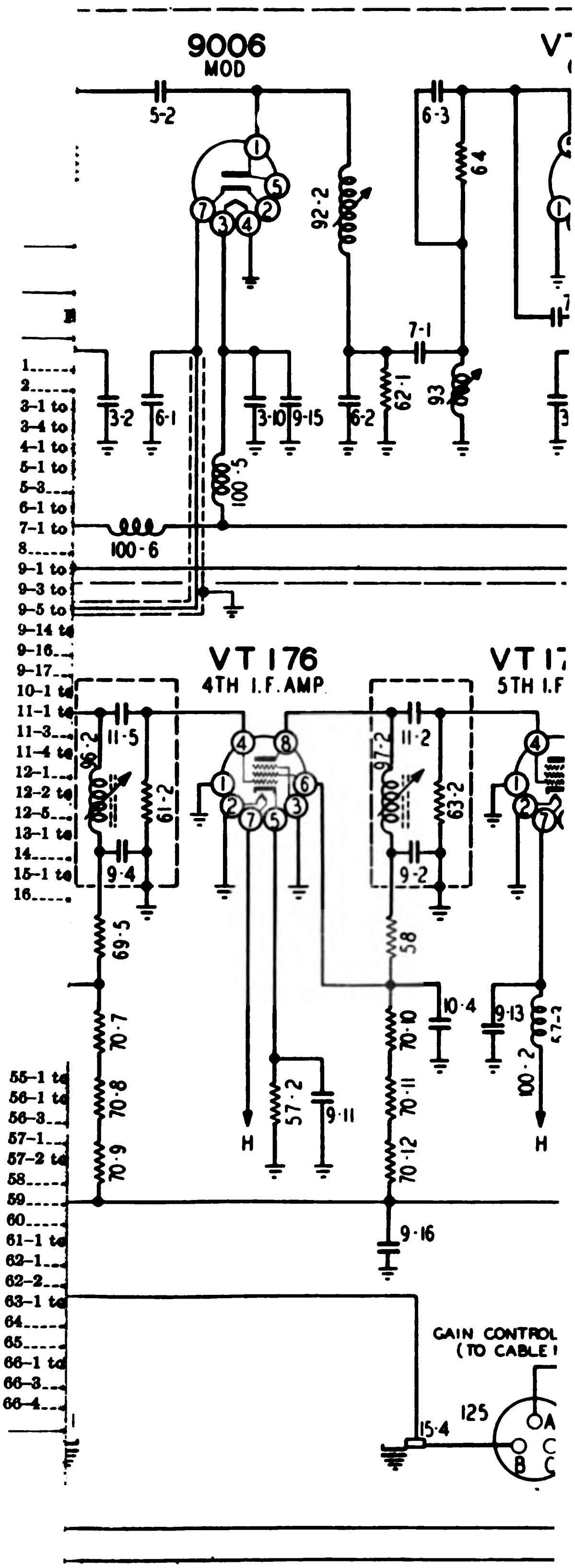
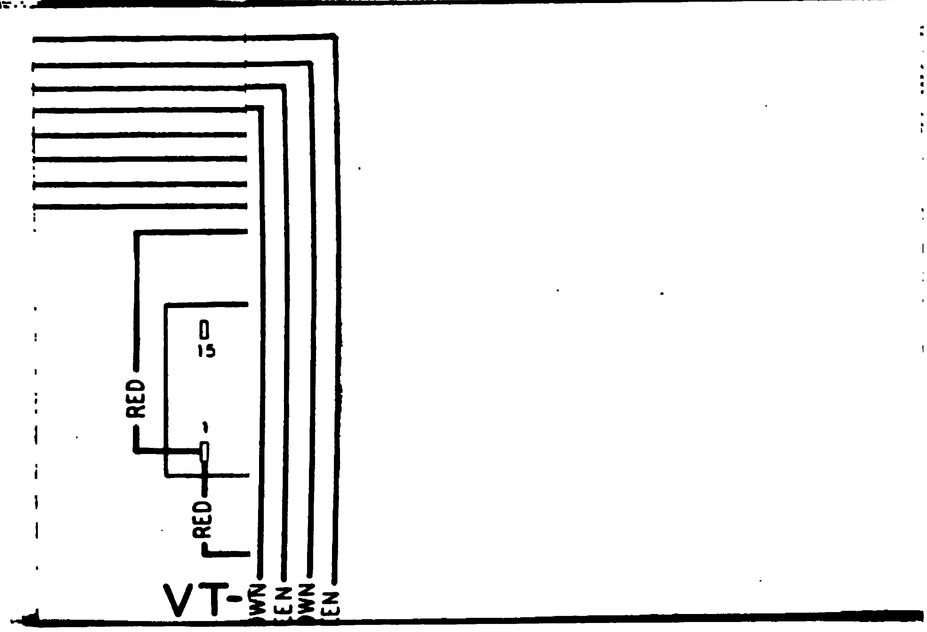


Figure 128. Receiver, complete schematic



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Section V. INTERCONNECTOR

124. Reference Data

To assist the maintenance personnel while trouble shooting on the interconnector, many figures have been provided. In section V, chapter 1, there are partial schematics and block diagrams, and at the end of this section there are groups of figures containing views of the interconnector, a complete schematic and wiring diagram, drawings of terminal boards, voltage and resistance measurements and waveforms, and block diagrams of the seven test positions.

125. Introduction

Inasmuch as both the radar receiver output and the IFF receiver output pass through the interconnector, if an abnormal pattern appears on the display scope at step No. 7 of the starting procedure, trouble in the interconnector must be suspected. Should trouble in the receiver be eliminated with the aid of test position 7 and in the transmitter with the aid of test positions 4 and 5, trouble may be assumed to exist in the switching or blanking channels of the interconnector. It is well to bear in mind, though, that the fault might be in the radar display scope. If any of the test voltages besides those that come from the receiver and transmitter are abnormal, the interconnector is at fault. Most of the troubles can be definitely localized to the control system by the use of the seven test positions. There are also troubles included in the trouble-shooting chart which do not affect any of the seven test positions.

126. Signal Tracing in Interconnector

After checking the seven test positions, if there is any doubt as to which stage is at fault in the interconnector, the interconnector may have to be signal traced. This is done by sending a 625-cycle signal from the audio signal generator supplied with Radio Set SCR–270, to terminal M of socket 105. The test scope is used as the output indicator for the signal tracing. See section I of this chapter for information on signal tracing. Place the probe of the scope at each point indicated on the waveform chart, figure 131. Start from the first stage of the channel involved and go through the interconnector until either no signal is found at a stage or a distorted signal is observed. When the trouble is isolated to a stage make a voltage and resistance check of that stage. For further reference, figures 134 to 140 will be helpful in determining the stages in the circuit for each of the seven test positions.

Note. Do not check stages 3 and 4A for waveforms because the test scope will discharge capacitor 8 and incorrect waveforms will be obtained. Instead, check the cathode of 4B. If a step wave is observed, then stages 3 and 4A are operating correctly.

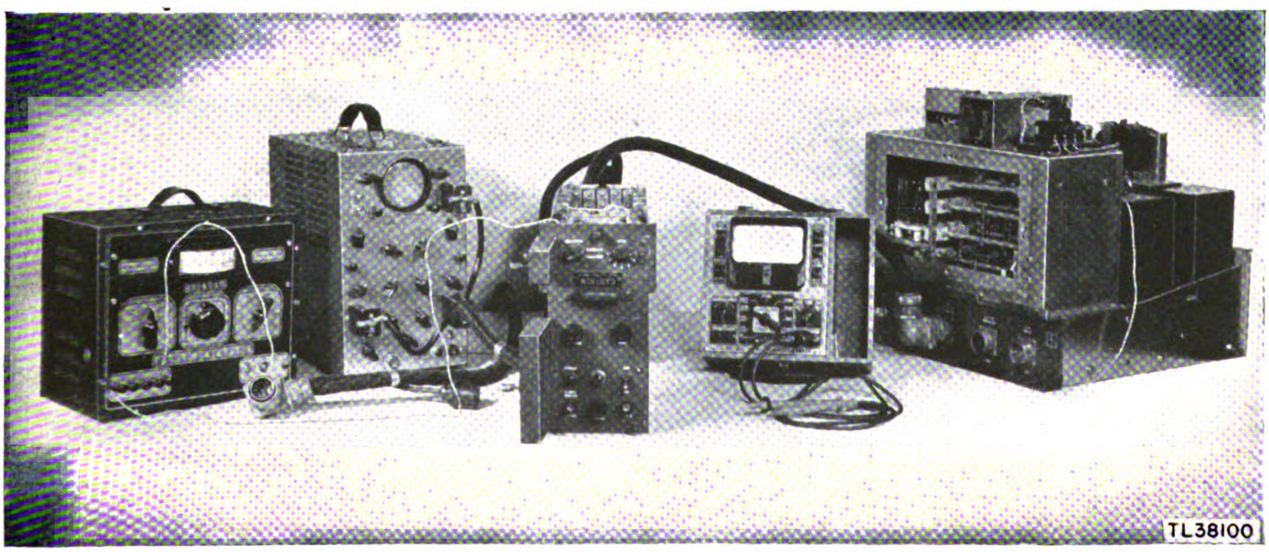

Figure 130. Interconnector, set up for trouble shooting.

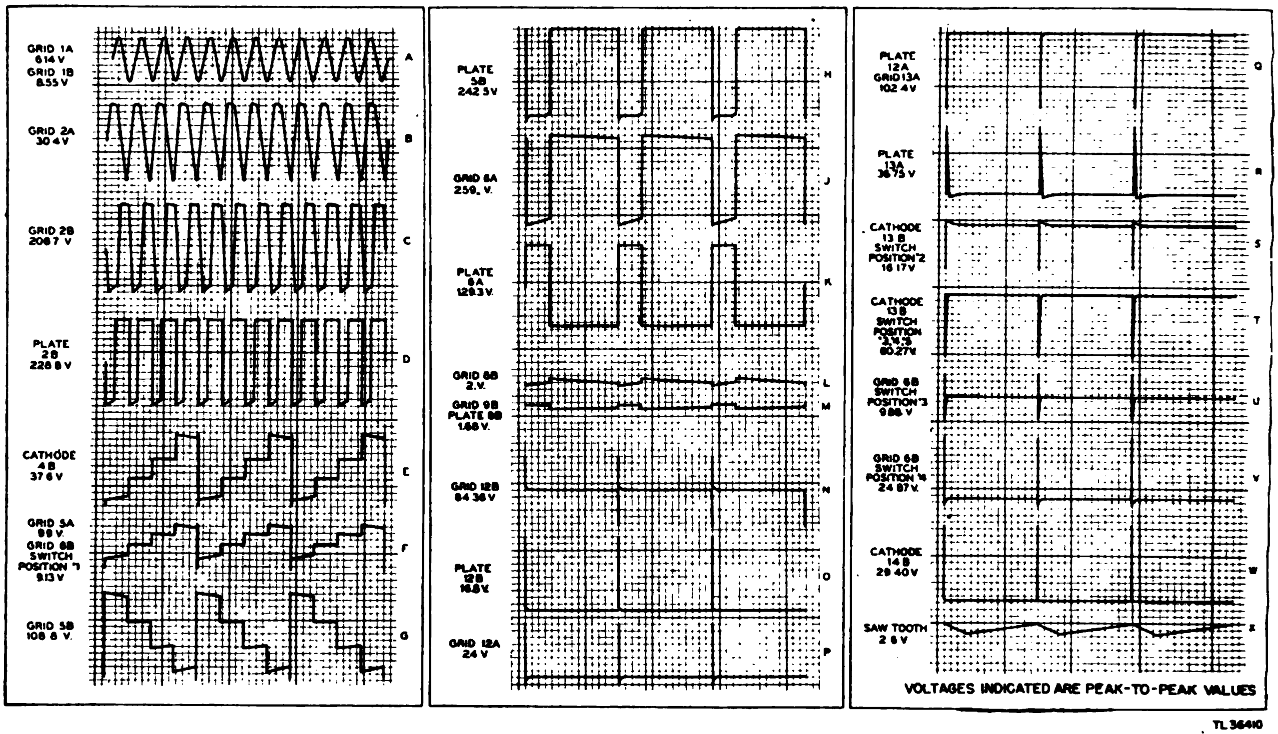

Figure 131. Interconnector waveforms.

127. Interconnector Trouble-shooting Chart

A. SYMPTOMS: 1. Red indicator lamp 108 on interconnector does not light (step 4).
2. All other indicator lamps are lighted (step 4).

Probable location of fault	*Procedure*
Open fuse 135 in interconnector.	1. Check the fuse and replace if necessary. 2. If trouble is not cleared, see item below.
Defective indicator lamp.	1. Check lamp by replacing it. 2. If trouble is not cleared replace original lamp and see item below.
Defective indicator lamp circuit.	1. Check the Tubes VT–231 for filament glow. 2. If the tubes are glowing make a continuity test from pins 6 and 7 of transformer 130 in interconnector to terminals of indicator lamp.
Defective a-c input circuit.	1. If the Tubes VT–231 are not glowing, check for line voltage between terminals 1 and 2 of transformer 130. 2. If there is no voltage make a continuity test from transmitter socket 107 through interconnector socket 105 to terminals 1 and 2 of transformer 130. Test for continuity between terminals 1 and 2.

B. SYMPTOMS: 1. Radar scope completely filled with hash.
2. All test positions normal.
3. All other indications normal.

Probable location of fault	*Procedure*
Defective pulse phase splitter, 6A.	1. Check tube and associated circuit, particularly output capacitor 14–4 and capacitor 4–1.

C. SYMPTOMS: 1. Radar signal does not appear on radar scope.
2. All other indications normal.

Probable location of fault	*Procedure*
Defective radar switching channel.	1. Make a resistance and voltage check of stages in channel. 2. If trouble is not cleared, see item below.
Open from output of radar switching channel to cathode-ray tube of radar scope.	1. Check continuity from output of radar switching channel through STANDBY OPERATE switch 113 to large plug on interconnector. 2. Check continuity from large plug 105 on interconnector to video stage and lower deflection plate on cathode-ray tube of radar scope.

D. SYMPTOMS: 1. Radar signal does not appear on radar scope.
2. Distorted base line on radar scope.
3. IFF signal appears on radar scope.

Probable location of fault	*Procedure*
Defective blanking amplifier, stage 7.	1. Make a voltage and resistance check of stage and compensating network.

E. SYMPTOMS: 1. No IFF signal on radar scope.
2. Radar signal normal.

Probable location of fault	*Procedure*
Defective IFF switching channel.	1. Make a voltage and resistance check of stages in channel. 2. If trouble is not cleared, see item below.
Open from output of IFF switching channel to cathode-ray tube of radar scope.	1. Check continuity from output of IFF channel through STANDBY OPERATE switch to large socket (105) on interconnector. 2. Check continuity from large plug (105) on interconnector to deflection plate (pin 6) of cathode-ray tube of radar scope.
Tube 6A defective.	1. Check stage.

F. SYMPTOMS: 1. Radar and IFF base lines are distorted.
2. All other indications normal.

Probable location of fault	*Procedure*
Defective compensating and separating networks.	1. Check resistance of networks.

G. SYMPTOMS: 1. Radar baseline appears below IFF baseline on radar scope.
2. All other indications normal.

Probable location of fault	*Procedure*
Defective clampers 9A, 10B, or 8A.	1. Make resistance and voltage check of clamper stages 9A, 10B and 8A (fig. 149).

H. SYMPTOMS: 1. Radar baseline appears below IFF baseline.
2. Radar baseline very jumpy.
3. Other indications normal.

Probable location of fault	*Procedure*
Defective baseline compensation network.	1. Check resistor 74 and network (figs. 145 and 146).

I. SYMPTOMS: 1. Baseline separation wider than normal.
2. Other indications normal.

Probable location of fault	*Procedure*
Defective baseline compensation and separation network.	1. Check capacitor 17 for short, resistor 75 for open, and remainder of networks (figs. 145 and 146).

J. SYMPTOMS: 1. No baseline separation.
2. All other indications normal.

Probable location of fault	*Procedure*
Defective IFF separation network.	1. Check resistor 82-3 for open.

K. SYMPTOMS: 1. Entire pattern on radar scope moves below bottom of screen.
2. When vertical positioning control on radar scope is rotated clockwise, pattern moves up, but baselines still cannot be seen.

Probable location of fault	*Procedure*
Defective output circuit of cathode follower 10A.	1. Check resistor 76-14 for open (fig. 56).

L. SYMPTOMS: 1. No phase control of IFF signal possible except through switch on phase control knob.
2. All other indications normal.

Probable location of fault	*Procedure*
Defective phase shifting network.	1. Check capacitor 11–8 (fig. 42). 2. Check resistor 96.

M. SYMPTOMS:
Position 1.
1. No vertical or horizontal deflection on test scope (dot on screen).
2. Positions 2, 3, 4, 5, no vertical or horizontal deflection.
3. Positions 6 and 7, no horizontal deflection.
4. Radar scope, radar receiver output on screen.
5. All other indications normal.

Probable location of fault	*Procedure*
Open in 625 cycle input from radar oscilloscope to input of division channel.	1. Check continuity of circuit from pin 6 of 12 pin plug on radar oscilloscope through large plug (105) on interconnector (pin M) to input of stage 1A (fig. 41).

N. SYMPTOMS:
Position 1.
1. Symptoms similar to symptom M.
2. Very slight control of IFF phase by phase control.
3. Rotation of phase control to clockwise position results in normal indications in all test positions; in counterclockwise position above abnormalities will return.
4. All other indications normal.

Probable location of fault	*Procedure*
Defective phase shifting circuit.	1. Check capacitor 11–8 for short (fig. 42).

O. SYMPTOMS:
Position 1.

1. No vertical voltage but normal horizontal voltage on test scope.
2. Positions 2, 3, 4, 5, no horizontal or vertical voltages.
3. Positions 6, 7, normal patterns.
4. Radar scope, no baseline separation; no IFF display; distorted baseline.
5. All other indications normal.

Probable location of fault	*Procedure*
Defective division channel.	1. Check voltages and resistances of stages 1A, 1B, 2A, 2B, and 3A (fig. 41). 2. Check resistors 60 and 70 in cathode circuit of 4A for open. 3. Check voltages and resistances of blocking oscillator 4A.

P. SYMPTOMS:
Position 1.

1. No vertical voltage, normal horizontal sweep on test scope.
2. Position 2, no horizontal sweep.
3. Positions 3, 4, 5, 6, 7, normal pattern.
4. Radar scope, no baseline separation, no IFF display.
5. All other indications normal.

Probable location of fault	*Procedure*
Defective cathode follower 4B.	1. Replace tube 4B and check patterns on test scope. 2. If patterns are not correct, make a voltage and resistance check of the cathode follower circuit (fig. 149).

Q. SYMPTOMS:
Position 1.

1. No vertical deflection, normal horizontal sweep on test scope.
2. Positions 2, 3, 4, 5, 7, no vertical or horizontal voltages.
3. Position 6, no vertical deflection.
4. Radar scope, baseline alone appears in OPERATE position; radar receiver signal appears in STANDBY position.
5. All other indications normal.

Probable location of fault	*Procedure*
Defective power supply.	1. Replace rectifier tube 15 and check patterns on test scope (fig. 61). 2. If patterns are not correct, make a voltage and resistance check of the power supply (fig. 149).

R. SYMPTOMS:
Position 1.

1. No vertical deflection; normal horizontal sweep, on test scope.
2. Positions 2, 3, 4, 5, 6, 7, no vertical deflection.
3. All other indications normal.

Probable location of fault	*Procedure*
Defective cathode follower stage (6B).	1. Replace tube 6B and check patterns on test scope. 2. If patterns are not normal, make a voltage and resistance check of the stage (fig. 149).

Probable location of fault	Procedure
	3. If trouble is not cleared, see item below.
Defective switch 112A and wiring.	1. Check switch 112A, especially contact 8. 2. Make continuity test from contact 8 to grid (pin 4) of cathode follower (6B).

S. SYMPTOMS:

Position 1.

1. One vertical division obtained on test scope, division control has no effect; horizontal sweep normal.
2. Positions 2, 3, 4, 5, no vertical or horizontal voltages.
3. Positions 6, 7, normal patterns.
4. Radar scope, no baseline separation; distorted baseline.
5. Test scope, no brilliancy modulation.
6. All other indications normal.

Probable location of fault	Procedure
Blocking oscillator (4A).	1. Replace tube 4A, and check patterns on test scope (fig. 48). 2. If patterns are not normal, make a voltage and resistance check of the stage (fig. 149).

T. SYMPTOMS:

Position 1.

1. Vertical voltage on test scope controllable only from two to five steps. Horizontal sweep normal.
2. All other indications normal.

Probable location of fault	Procedure
Defective second limiter stage (2B).	1. Check resistor 55 for open (fig. 45).

U. SYMPTOMS:

Position 2.

1. No horizontal deflection on test scope; vertical deflection normal.
2. Positions 1, 3, 4, 5, 6, 7, normal patterns on test scope.
3. Radar scope, baseline distorted.

Probable location of fault	Procedure
Defective step amplifier stage (5A).	1. Observe baseline separation on radar scope. 2. If separation is abnormal, replace tube 5A and check patterns on test scope (fig. 49). 3. If patterns are not normal, make a voltage and resistance check of the stage (fig. 149).
Defective clipper stage (5B).	1. If separation of baseline appears normal, replace tube 5B and check patterns on test scope. 2. If patterns are now not normal, make a voltage and resistance check of the stage (fig. 149).

V. SYMPTOMS:

Position 2.

1. Horizontal and vertical voltages on test scope normal but no brilliance modulation present.
2. Positions 1, 6, 7, normal patterns on test scope.
3. Position 3, negative pulse on short horizontal sweep.
4. Positions 4, 5, faint positive pulse which goes off the screen. Horizontal sweep very short.
5. All other indications normal.

Probable location of fault	*Procedure*
Defective multivibrator (12A and 12B).	1. Replace tubes 12A and 12B and check patterns on test scope (fig. 60). 2. If patterns are not normal, make a voltage and resistance check of the multivibrator (fig. 149).

W. SYMPTOMS:

Position 2.

1. Horizontal and vertical voltages normal on test scope. No brilliancy modulation.
2. Positions 3, 4, 5, no brilliancy modulation.
3. All other indications normal.

Probable location of fault	*Procedure*
Defective cathode follower stage (13B).	1. Replace tube 13B and check patterns on test scope (fig. 59). 2. If patterns are not normal, make a voltage and resistance check of the circuit (fig. 149). 3. If trouble is not cleared, see item below.
Defective switch 112C and wiring.	1. Check switch 112C, especially contact 8. 2. Make a continuity test from contact 8 to grid (pin 4) of cathode follower (13B).

X. SYMPTOMS:

Position 2.

1. No vertical deflection on test scope. Horizontal sweep normal.
2. Positions 1, 3, 6, 7, normal patterns on test scope.
3. Positions 4, 5, no vertical deflection.
4. Radar scope, no IFF pulse on cathode-ray tube.
5. All other indications normal.

Probable location of fault	*Procedure*
Defective cathode follower stage (14).	1. Replace tube 14 and check patterns on test scope (fig. 48). 2. If patterns are not normal, make a voltage and resistance check of the circuit (fig. 149).

Y. SYMPTOMS:

Position 2.

1. Horizontal sweep much longer than normal on test scope. Vertical voltage normal. (When interconnector is functioning properly, if sweep length of position 1 is set to equal 1 inch, then the normal sweep length in position 2 should equal 1/4 inch. This fault will cause sweep length in position 2 to be about 1 1/4 inches.
2. All other indications normal.

Probable location of fault	*Procedure*
Defective slow sweep circuit.	1. Check for open to capacitor 4–2 (figs. 145 and 146).

Z. SYMPTOMS:

Position 3.

1. Horizontal sweep much longer than normal on test scope. Vertical voltage normal.
2. Positions 4, 5, horizontal sweep longer than normal; vertical deflection normal.
3. All other indications normal.

Probable location of fault	*Procedure*
Defective fast sweep circuit.	1. Check for open to resistor 90–3 (fig. 60). 2. If trouble is not cleared, see item below. 3. Check for open to capacitor 15.

A(1) SYMPTOMS:

Position 3.

1. Pattern on test scope normal but unusually dim.
2. Positions 4, 5, patterns unusually dim.
3. All other indications normal.

Probable location of fault	*Procedure*
Defective fast sweep intensifying circuit.	1. Check resistor 86 for open (figs. 60, 145 and 146).

B(1) SYMPTOMS:

Position 3.

1. Pattern on test scope normal but unusually bright.
2. Positions 4, 5, patterns unusually bright.
3. All other indications normal.

Probable location of fault	*Procedure*
Defective fast sweep intensifying circuit.	1. Check capacitor 18 for short (fig. 60).

C(1) SYMPTOMS:

Position 3.

1. No vertical or horizontal sweep on test scope.
2. Positions 1, 2, 6, 7, normal patterns on test scope.
3. Positions 4, 5, no horizontal sweep.
4. All other indications normal.

Probable location of fault	*Procedure*
Defective test amplifier stage (13A).	1. Replace tube 13A and check patterns on test scope. 2. If patterns are not normal, make a voltage and resistance check of the circuit.

D(1) SYMPTOMS:

Position 6.

1. No vertical deflection on test scope. Horizontal deflection normal. (Also see Symptom Q.)
2. All other indications normal.

Probable location of fault	*Procedure*
Defective test power supply voltage divider.	1. Check resistor 90–2 for open (fig. 61).

128. Procedure for Replacing Defective Electrical Parts in Interconnector

a. INTRODUCTION. The information following is to assist the radar mechanic in replacing defective electrical parts in the interconnector section of Control Unit BC–1162–A. It will be noted that such replaceable items as small resistors and capacitors, tube sockets, and tubes are not covered in these procedures. Neither is a procedure given when the replacement of the part presents no special difficulty. These procedures have been worked out experimentally and represent the shortest and best method of accomplishing the work.

Cautions: 1. Before replacing a defective part, observe carefully its position, method of mounting, and wiring. This will insure the correct installation of the new part.

2. When removing such parts as switches, potentiometers, and tube sockets, which have several wires attached to their terminals, be sure to tag the wires so that they will be replaced in their proper positions.

3. When disassembling a component, the screws, nuts, bolts, washers, and other small parts which are removed, should be put in some small container to prevent loss.

b. INDEX TO ITEMS. The replacement of the following items is discussed in the next paragraph:

Pilot light jewel.
Pilot light bulb.
Potentiometers.
Transformers and chokes.
Filter capacitors.
Rotary gang switches.
Inductor 120.
Connector 106.
Connector 105.

129. Step-by-Step Procedure to Replace Items

a. PILOT LIGHT JEWEL. (1) Remove the jewel by unscrewing it in a counterclockwise direction from its socket.

(2) To install new jewel, reverse removal procedure.

b. PILOT LIGHT BULB. (1) Remove jewel as described above.

(2) Push bulb in, turn it counterclockwise, and remove it.

(3) To install new bulb, reverse removal procedure.

c. POTENTIOMETERS. (1) Unsolder the connection to the terminals of the defective potentiometer.

(2) With an Allen wrench loosen the setscrew on the knob and remove it.

(3) From the front panel remove the locknut which secures the potentiometer and remove it from the panel.

(4) To install the new potentiometer reverse the removal procedure.

d. TRANSFORMERS AND CHOKES. See replacement of electrical parts in transmitter.

e. FILTER CAPACITORS. (1) From the underside of the chassis remove the seven soldered connections to the capacitor (1A, B, C) terminals.

(2) From the top of the chassis, remove the two bolts which attach the mounting flange to the chassis, and remove the capacitor.

(3) To install the new capacitor, reverse the removal procedure.

f. ROTARY GANG SWITCHES. (1) With an Allen wrench remove the control knob from the front panel.

(2) With the tip of a screw driver, push out the small metal fastener in the slot on the extension shaft immediately back of the front panel.

(3) With an Allen wrench loosen the setscrew which holds the extension shaft coupling to the switch and move the extension shaft back out of the way.

(4) Unsolder the connections to the terminals of the switch.

(5) Remove the locknut which attaches the switch to the bracket and remove the switch.

(6) To install the new switch reverse the removal procedure.

g. INDUCTOR 120. (1) Unsolder the connections to the terminals of the inductor.

(2) From the topside of the chassis, remove the bolt which secures the inductor.

(3) To install the new inductor, reverse the removal procedure.

h. CONNECTOR 106. (1) Unsolder the two connections to the terminals of the connector.

(2) Remove the bolts at the four corners of the connector mounting and remove it from the chassis.

(3) To install the new connector, reverse the removal procedure.

i. CONNECTOR 105. (1) Remove the four bolts which attach the back panel to the main chassis and push the panel back as far as the wiring will allow.

(2) Unsolder the connections to the terminal of the connector.

(3) Remove the bolts at the four corners of the connector mounting and remove it from the chassis.

(4) To install the new connector reverse the removal procedure.

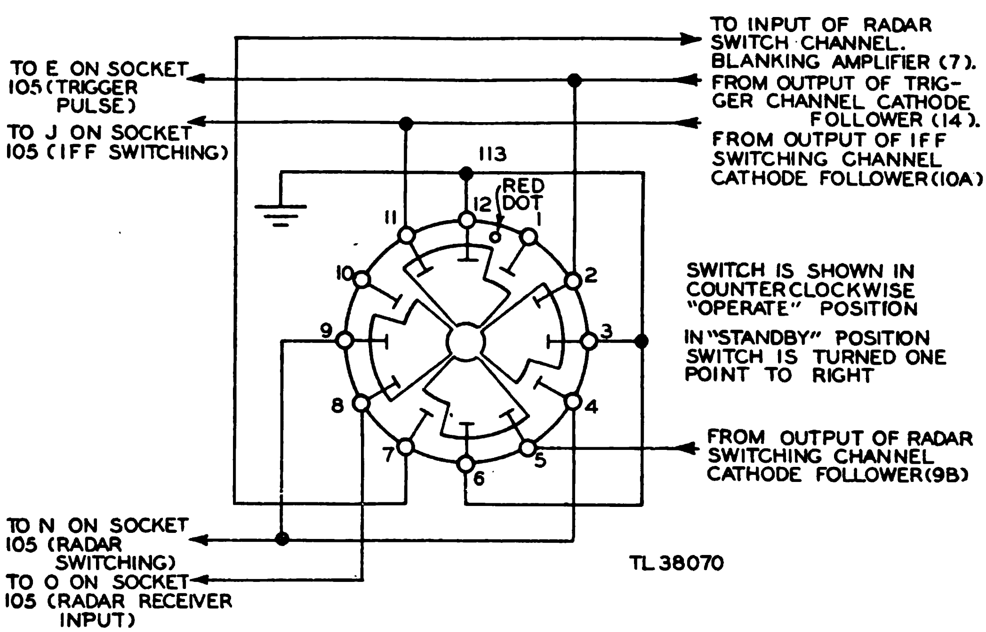

Figure 132. Action of STANDBY-OPERATE switch on radar switching channel.

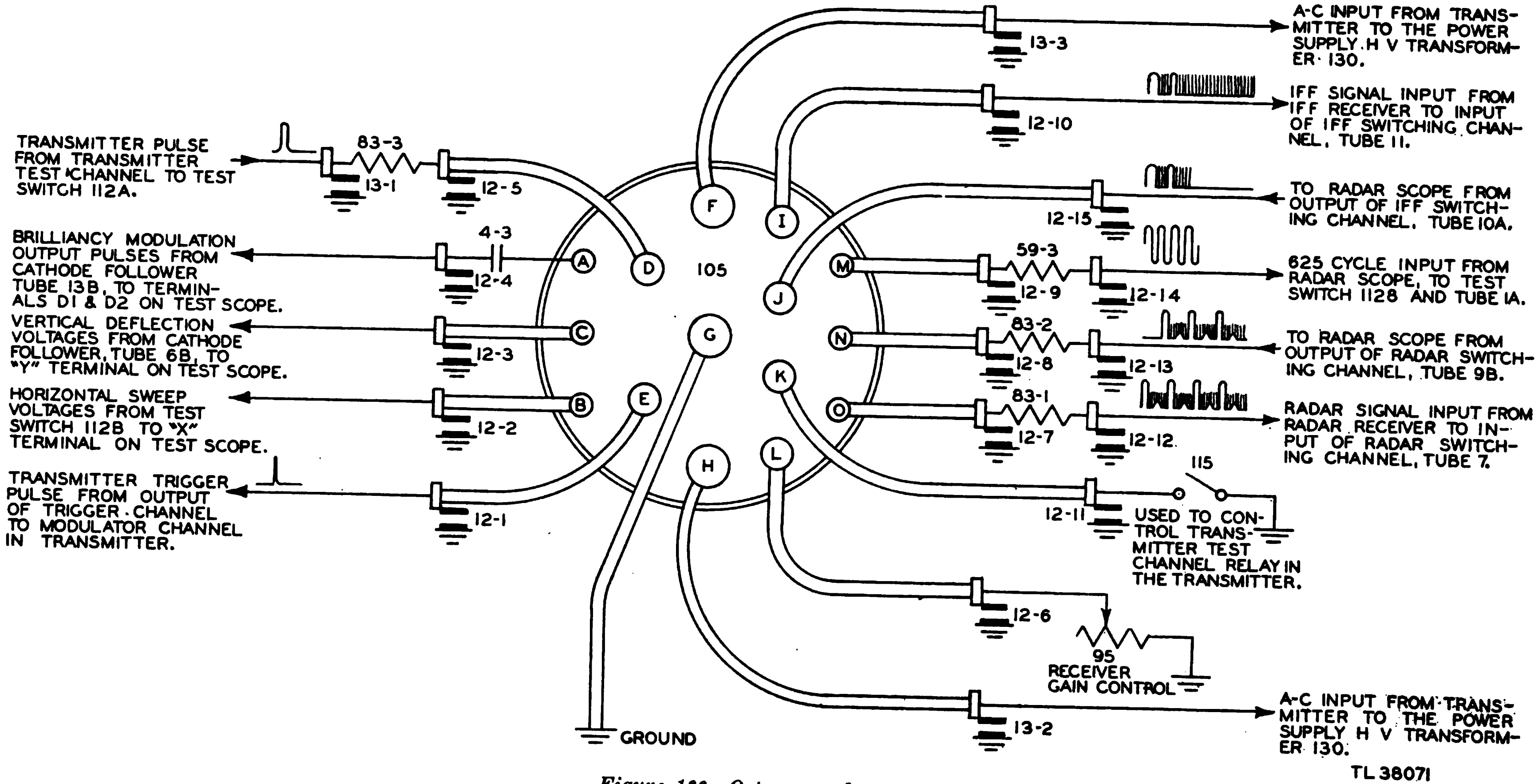

Figure 133. Octopus socket 105.

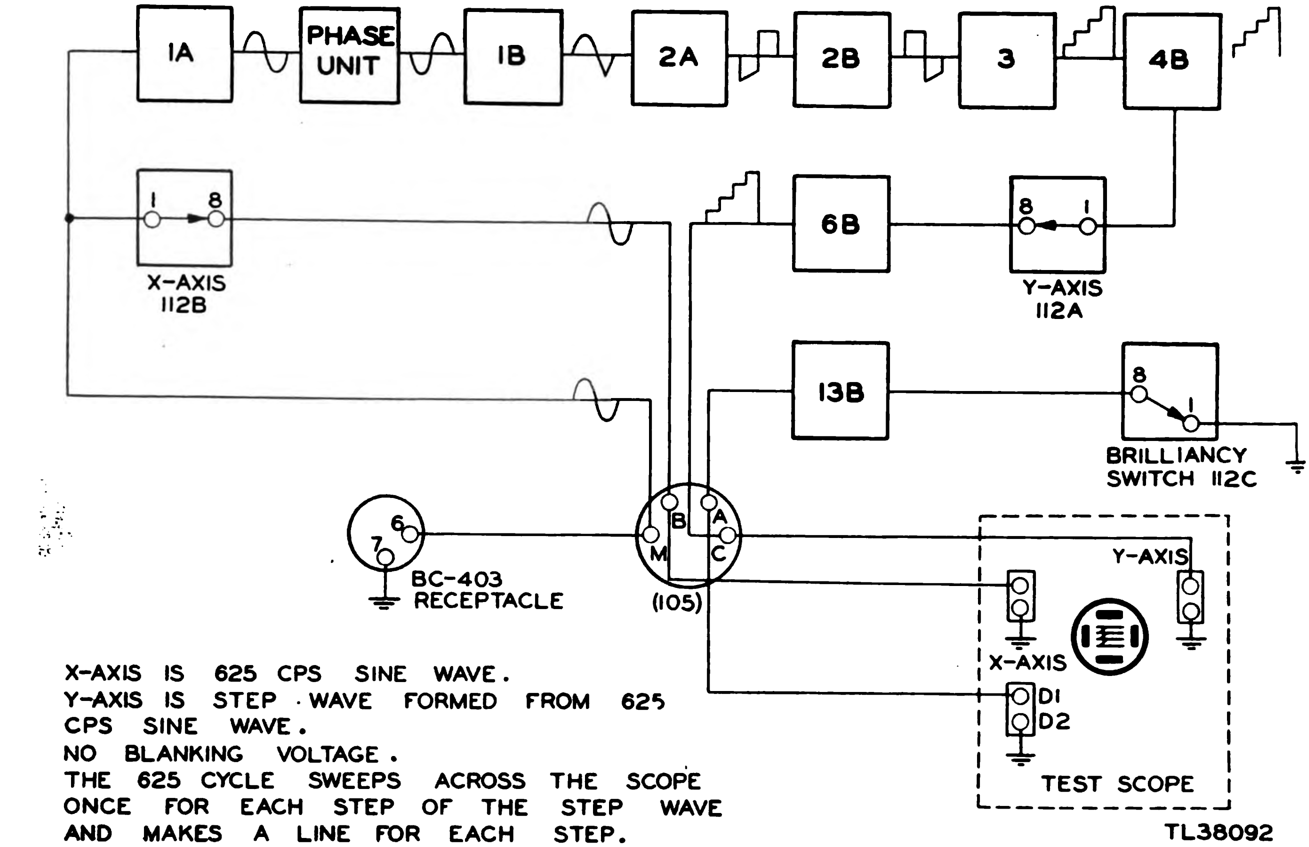

Figure 134. Block diagram of position 1.

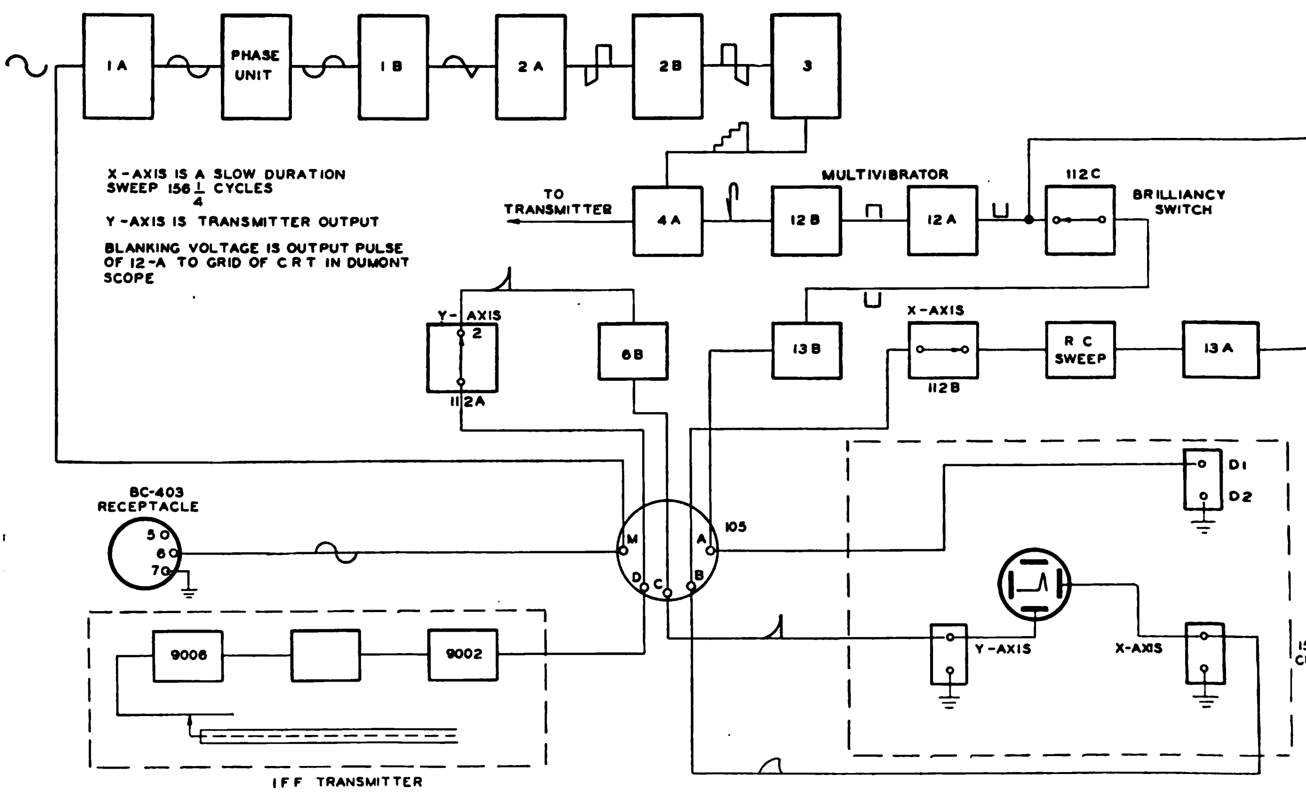

Figure 135. Block diagram of position 2.

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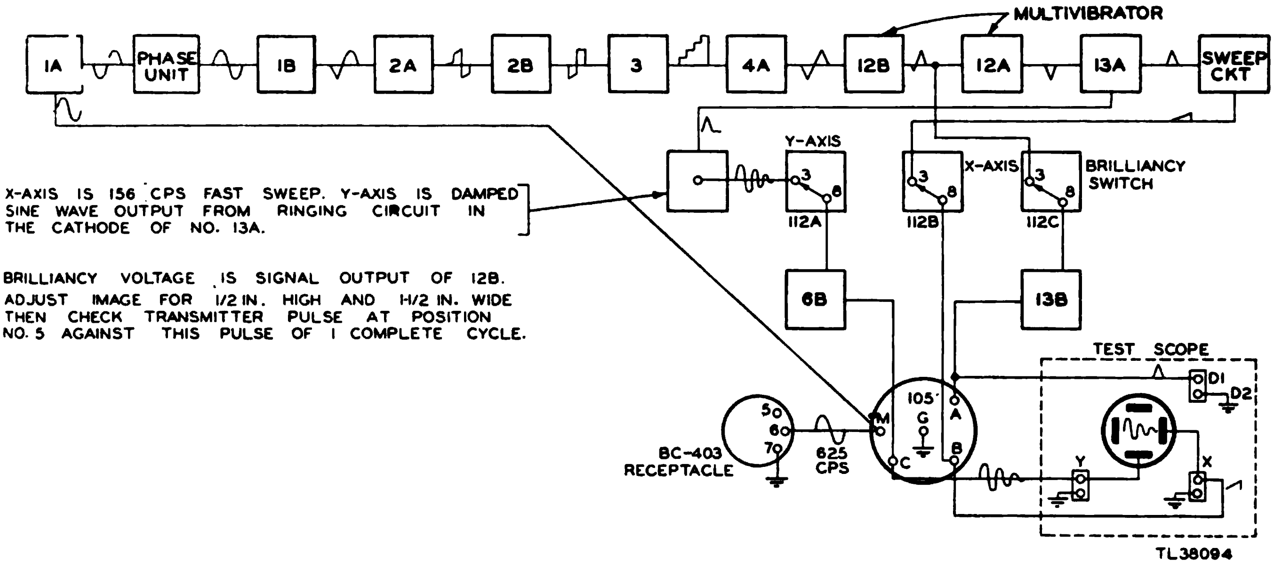

Figure 136. Block diagram of position 3.

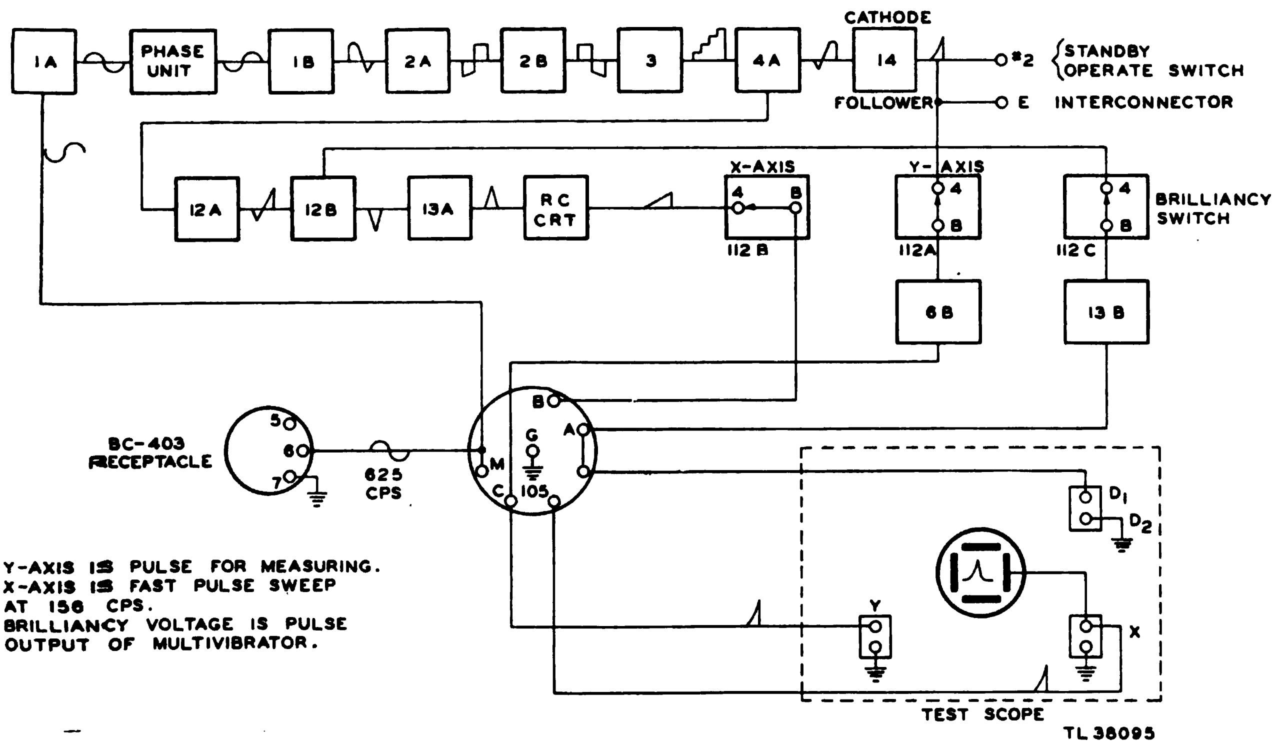

Figure 137. Block diagram of position 4.

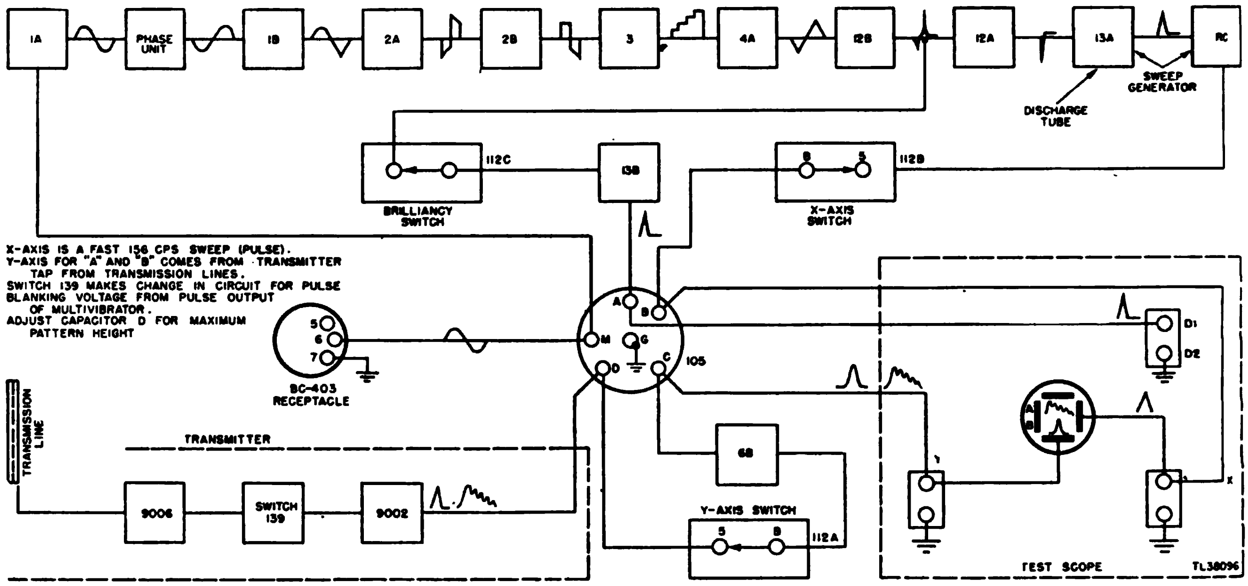

Figure 138. Block diagram of position 5.

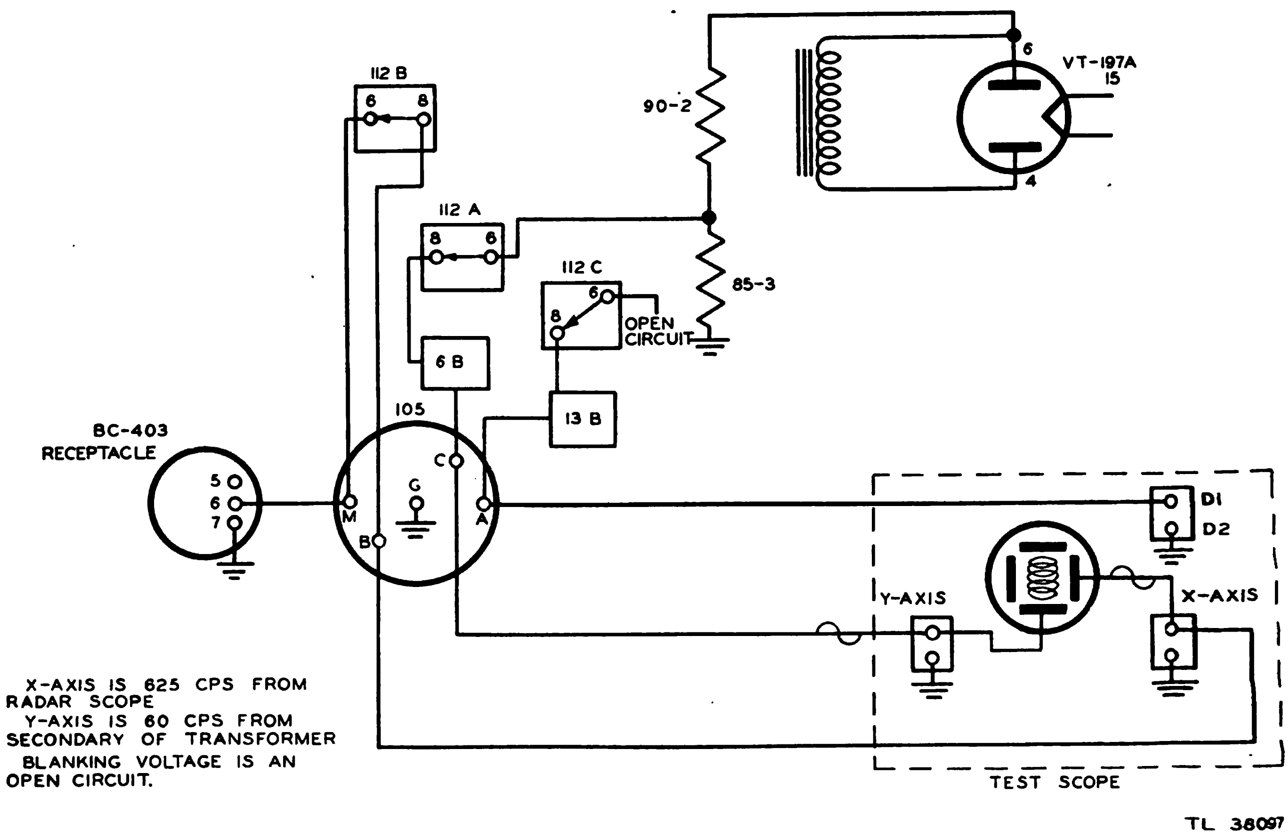

Figure 139. Block diagram of position 6.

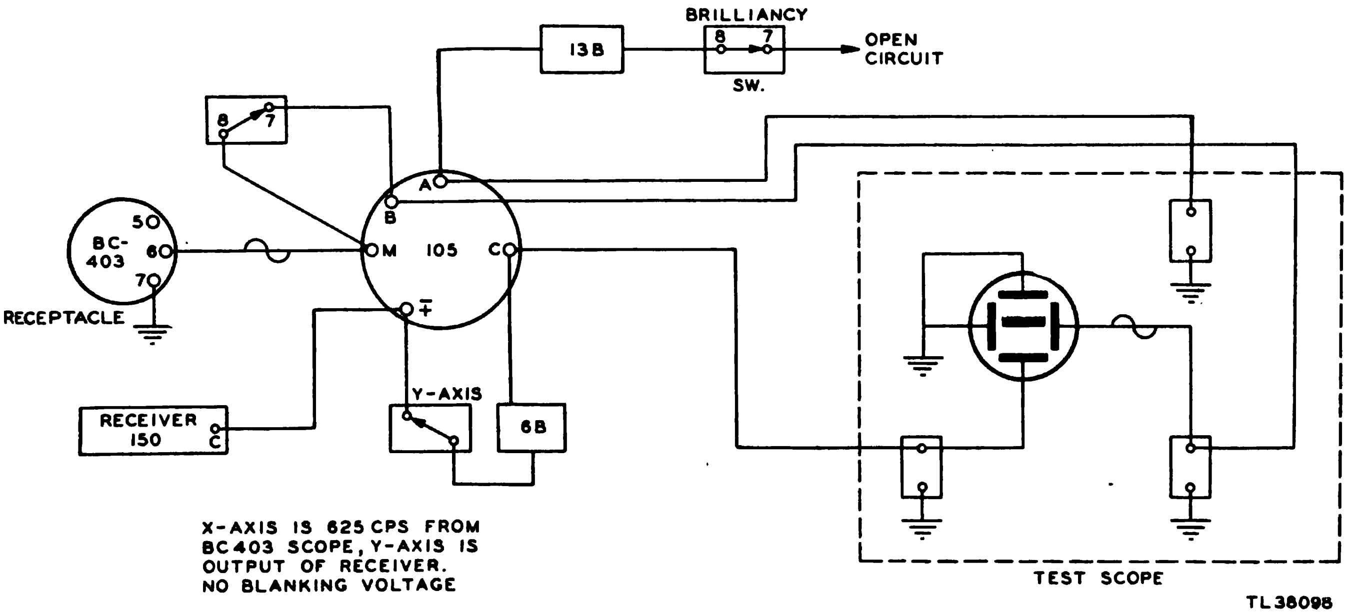

Figure 140. Block diagram of position 7.

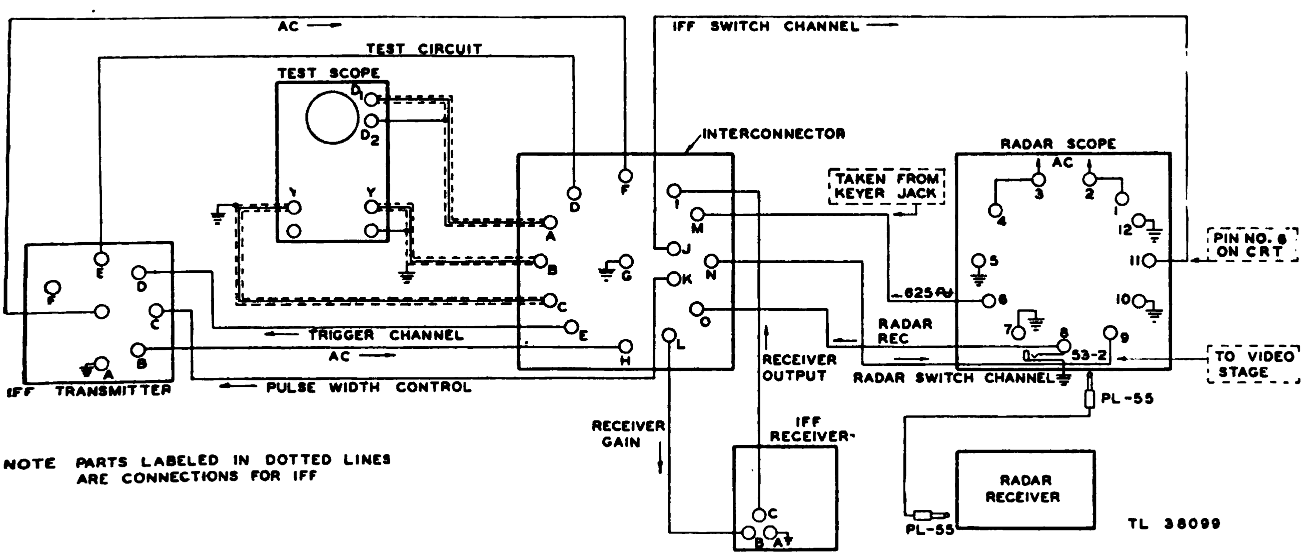

Figure 141. Cable connection of components of the control system.

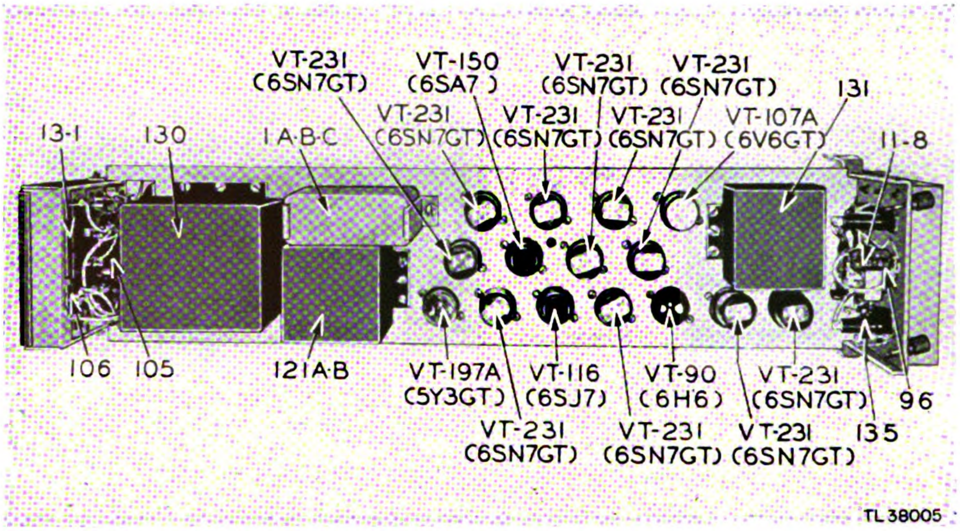

Figure 142. Interconnector, top view.

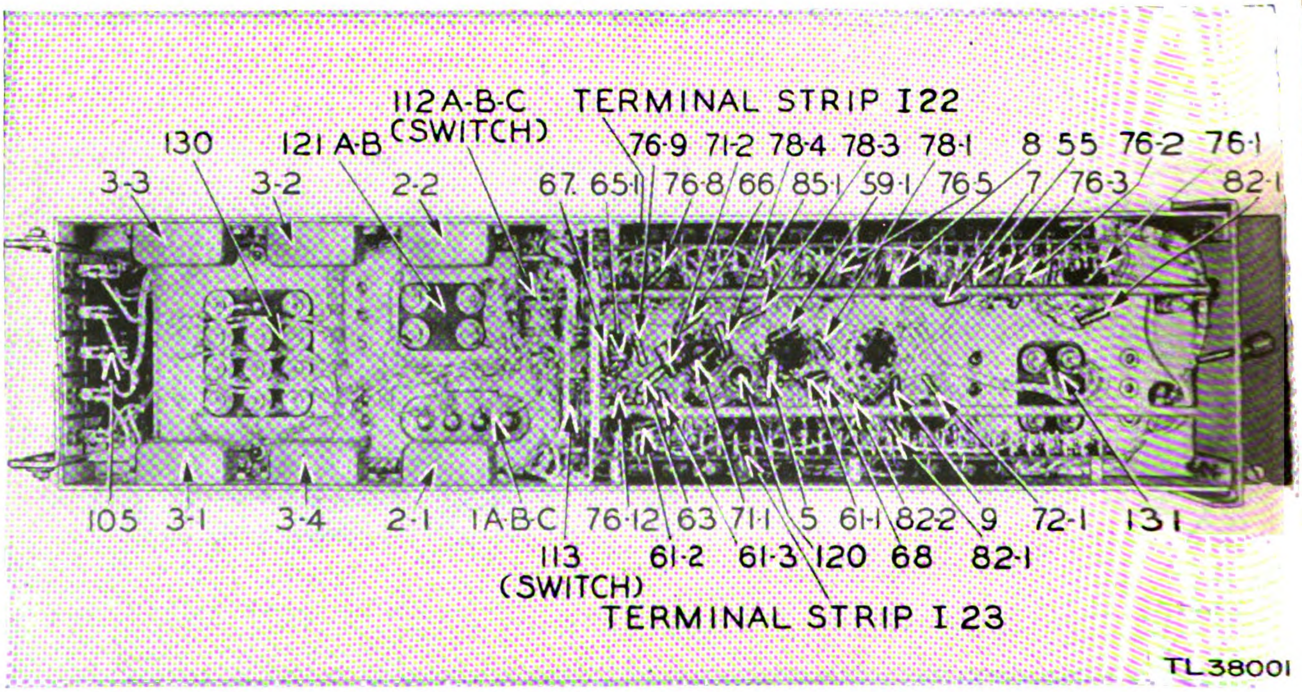

Figure 143. Interconnector, bottom view.

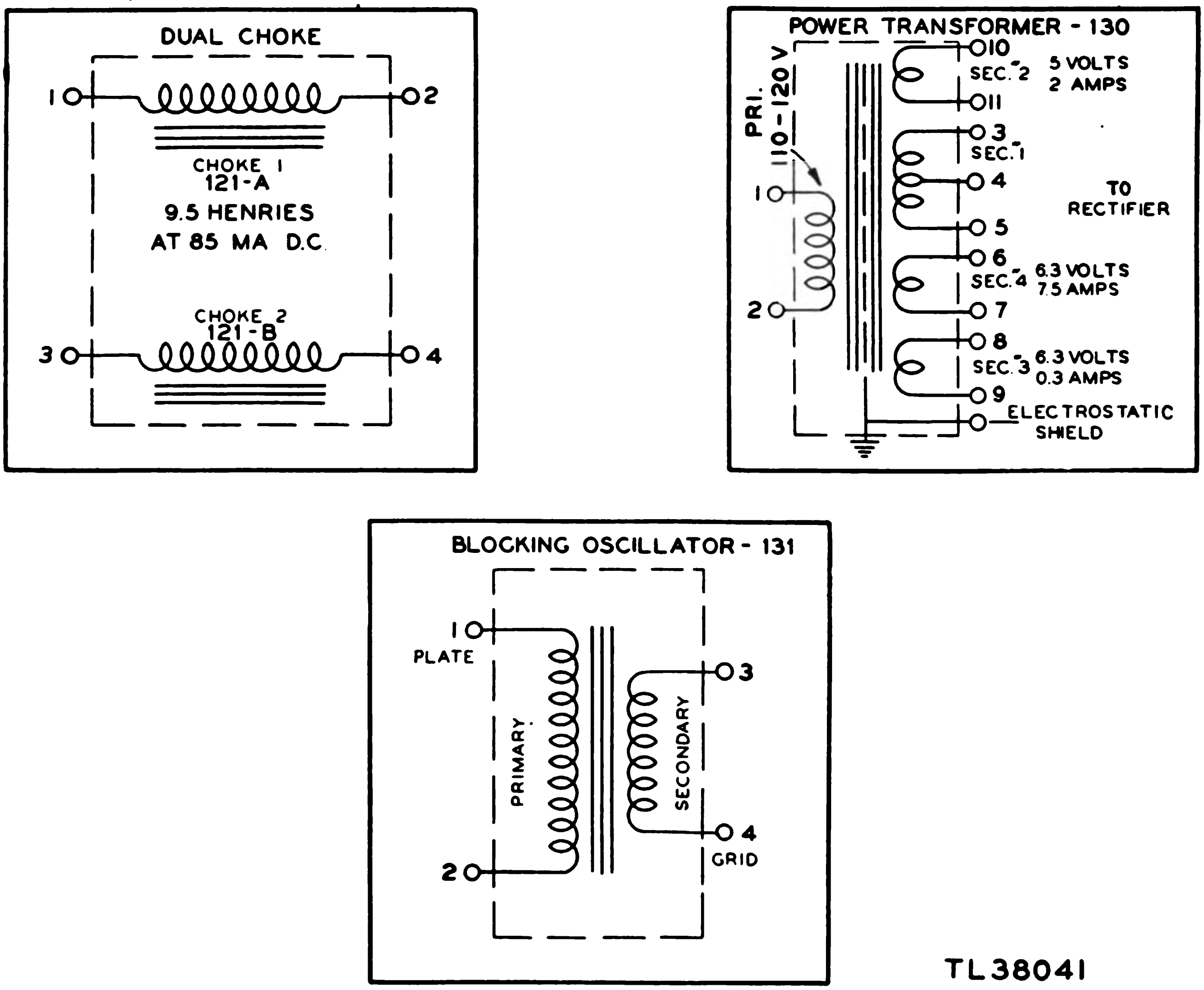

Figure 144. Interconnector, schematic diagram of chokes and transformers.

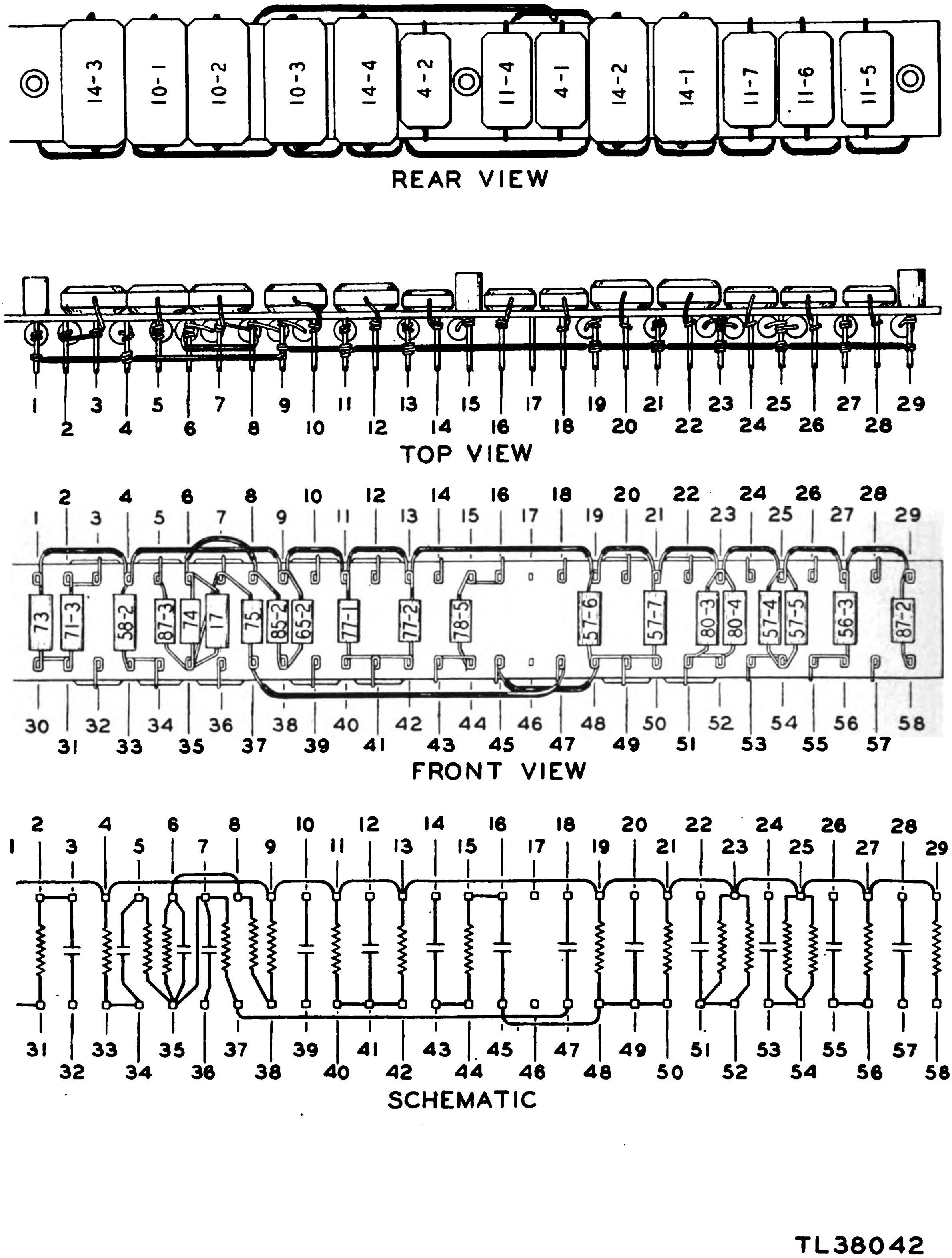

Figure 145. Schematic and wiring diagram of terminal board I 22.

TERMINAL

OHMS	VOLTS	NO.	NO.	VOLTS	OHMS
72K	170	30	1	300	25K
72K	170	31	2	35	119K
I MEG	0.2	32	3	35	119K
39K	36	33	4	300	25K
39K	36	34	5	0	0
10K	25	35	6	150	115K
I MEG	0	36	7	2 5	10K
12K	65	37	8	150	115K
95K	200	38	9	300	25K
10K	16	39	10	0	INF
60K	160	40	11	300	25K
60K	160	41	12	0	2.2 MEG
60K	160	42	13	300	25K
INF	0	43	14	0	0
INF	0	44	15	0	INF
100K	60	45	16	0	INF
BLANK	BLANK	46	17	BLANK	BLANK
12K	65	47	18	0	2.2 MEG
100K	60	48	19	300	25K
100K	60	49	20	0.5	1.1 MEG
100K	60	50	21	300	25K
135K	35	51	22	0.1 MEG	900K
135K	35	52	23	300	25K
100K	50	53	24	0.4MEG	I MEG
100K	50	54	25	300	25K
125K	172	55	26	0.4MEG	I MEG
125K	172	56	27	300	25K
I MEG	0	57	28	270	30K
35K	270	58	29	300	25K

TO REAR OF SET

TERMINAL BOARD I 22

TO FRONT OF SET

NOTE: SEE SOCKET VOLTAGE AND RESISTANCE CHART FOR CONDITIONS UNDER WHICH MEASUREMENTS WERE MADE.

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Figure 146. Voltage and resistance charts of terminal board I 22.

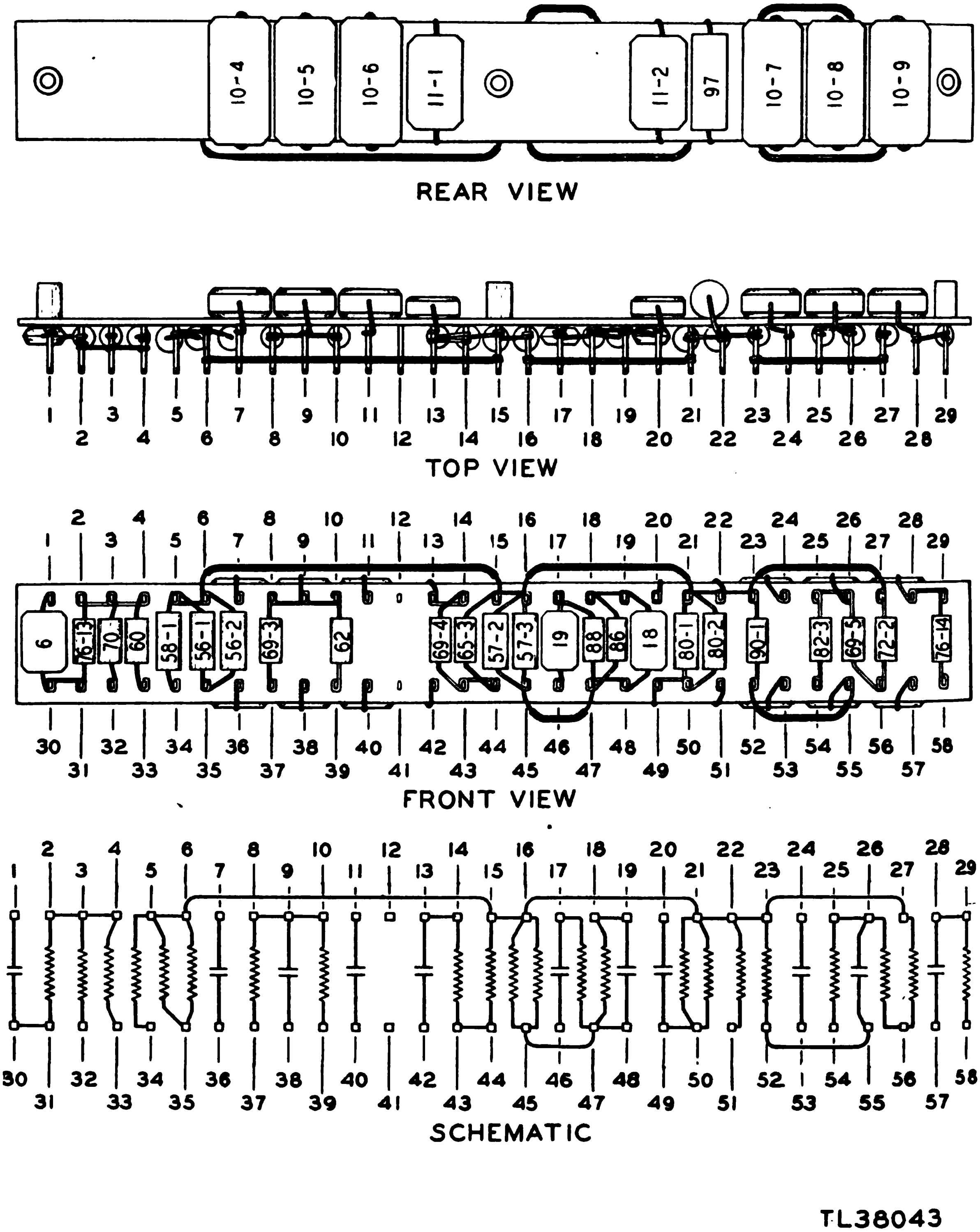
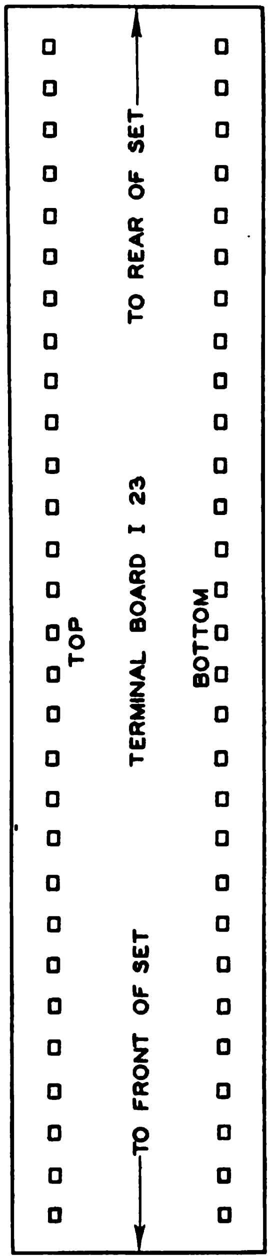


Figure 147. Schematic and wiring diagram of terminal board I 23.

TERMINAL

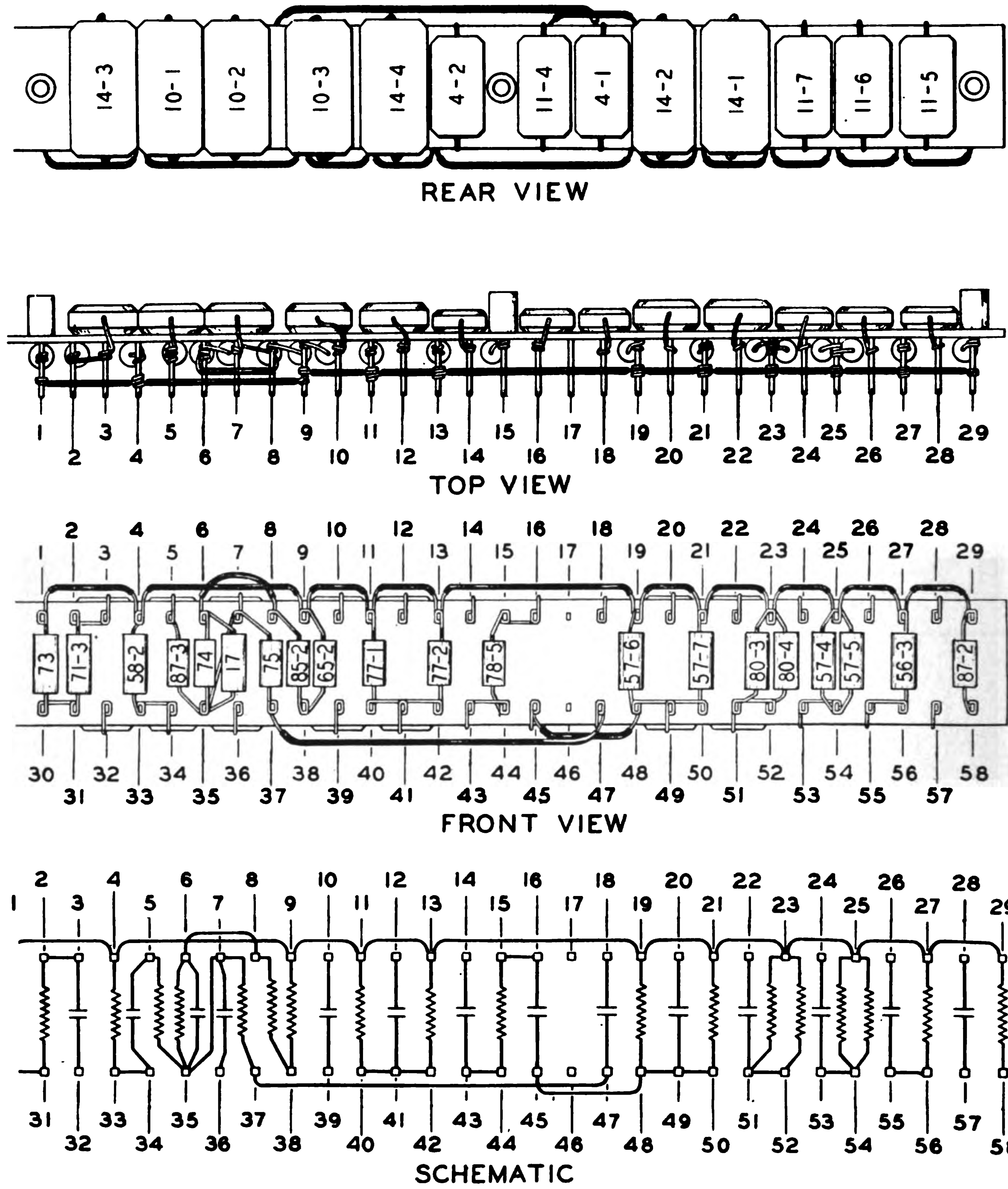
OHMS	VOLTS	NO.	NO.	VOLTS	OHMS
1 MEG	0	29	58	0	0
1 MEG	0	28	57	76	7.5K
25K	300	27	56	260	41K
48K	220	26	55	1.2	220K
48K	220	25	54	65	12K
INF	0	24	53	0.2	1 MEG
25K	300	23	52	1.2	220K
25K	300	22	51	103	18K
25K	300	21	50	30	135K
INF	0	20	49	30	135K
200K	0.4	19	48	58	85K
200K	0.4	18	47	58	85K
150K	1.7	17	46	0	220K
25K	300	16	45	55	85K
25K	300	15	44	225	85K
85K	250	14	43	225	85K
85K	250	13	42	0	1 MEG
BLANK	BLANK	12	41	BLANK	BLANK
INF	0	11	40	30	22K
2,200	5	10	39	0	0
2,200	5	9	38	0.1	500K
2,200	5	8	37	30	13K
0	0	7	36	45	32 TO 64
25K	300	6	35	60	65K
25K	300	5	34	75	65K
14K	10	4	33	35	32K
14K	10	3	32	0	0
14K	10	2	31	0	1 MEG
INF	0	1	30	0	1 MEG



NOTE: SEE SOCKET VOLTAGE AND RESISTANCE CHART FOR CONDITIONS UNDER WHICH MEASUREMENTS WERE MADE.

TL 38024

Figure 148. Voltage and resistance charts of terminal board I 23.



TL38042

Figure 145. Schematic and wiring diagram of terminal board I 22.

TERMINAL

OHMS	VOLTS	NO.	NO.	VOLTS	OHMS
72K	170	30	1	300	25K
72K	170	31	2	35	119K
I MEG	0.2	32	3	35	119K
39K	36	33	4	300	25K
39K	36	34	5	0	0
10K	25	35	6	150	115K
I MEG	0	36	7	25	10K
12K	65	37	8	150	115K
95K	200	38	9	300	25K
10K	16	39	10	0	INF
60K	160	40	11	300	25K
60K	160	41	12	0	2.2 MEG
60K	160	42	13	300	25K
INF	0	43	14	0	0
INF	0	44	15	0	INF
100K	60	45	16	0	INF
BLANK	BLANK	46	17	BLANK	BLANK
12K	65	47	18	0	2.2 MEG
100K	60	48	19	300	25K
100K	60	49	20	0.5	1.1 MEG
100K	60	50	21	300	25K
135K	35	51	22	0.1 MEG	900K
135K	35	52	23	300	25K
100K	50	53	24	0.4 MEG	I MEG
100K	50	54	25	300	25K
125K	172	55	26	0.4 MEG	I MEG
125K	172	56	27	300	25K
I MEG	0	57	28	270	30K
35K	270	58	29	300	25K

TO REAR OF SET — TERMINAL BOARD I 22 — TO FRONT OF SET

NOTE: SEE SOCKET VOLTAGE AND RESISTANCE CHART FOR CONDITIONS UNDER WHICH MEASUREMENTS WERE MADE.

TL 38023

Figure 146. Voltage and resistance charts of terminal board I 22.

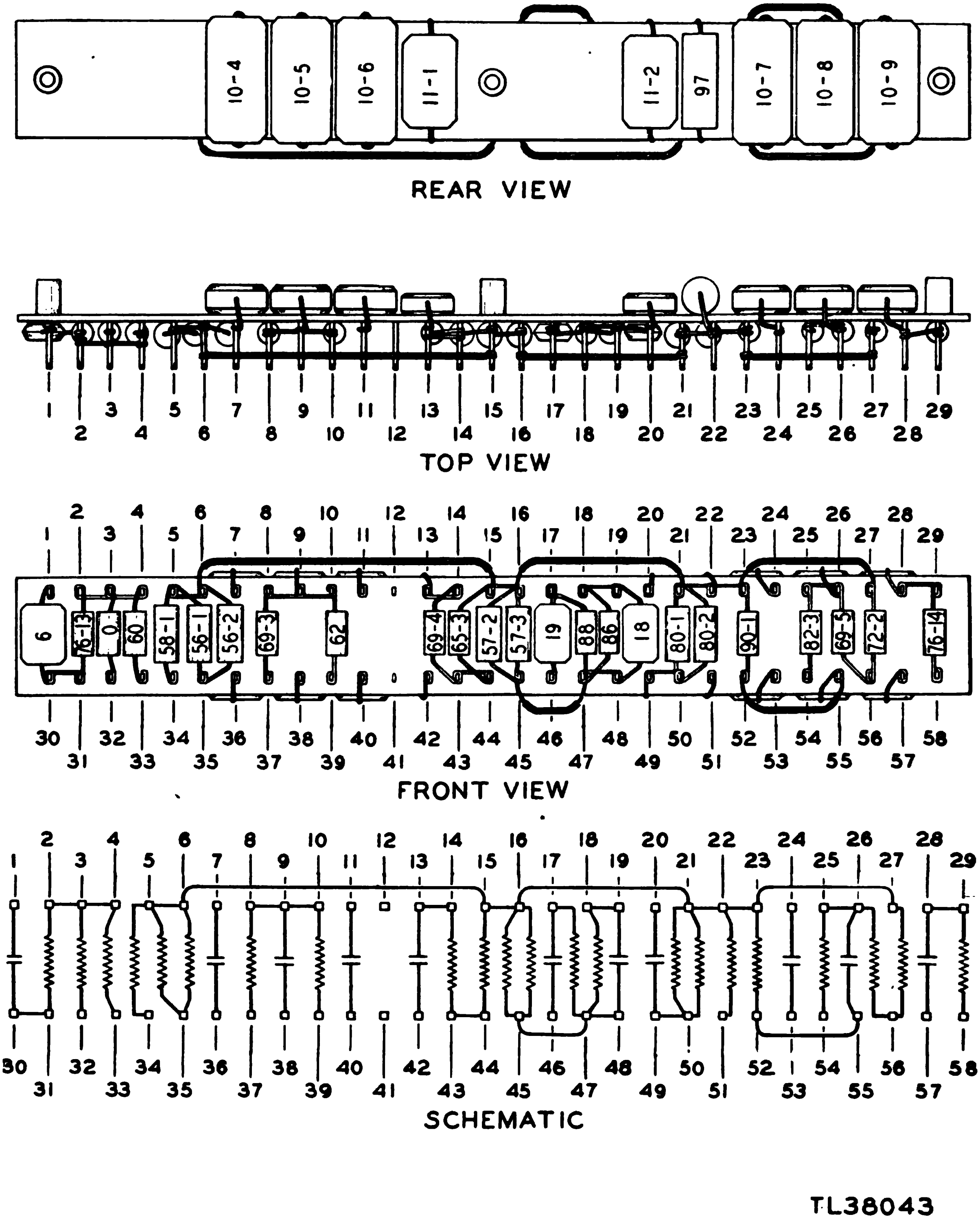


Figure 147. Schematic and wiring diagram of terminal board I 23.

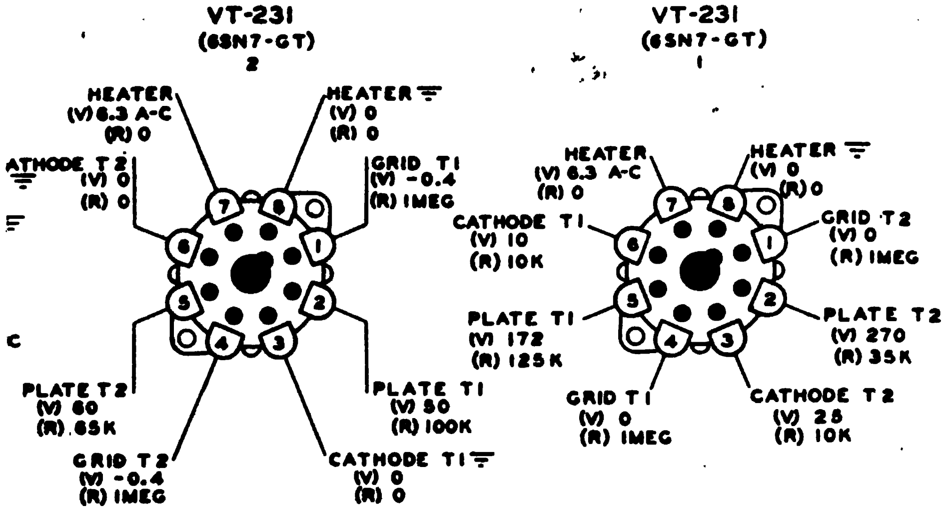
OHMS	VOLTS	TERMINAL NO.	TERMINAL NO.	VOLTS	OHMS
1 MEG	0	29	58	0	0
1 MEG	0	28	57	76	7.5K
25K	300	27	56	260	41K
48K	220	26	55	1.2	220K
48K	220	25	54	65	12K
INF	0	24	53	0.2	1 MEG
25K	300	23	52	1.2	220K
25K	300	22	51	103	18K
25K	300	21	50	30	135K
INF	0	20	49	30	135K
200K	0.4	19	48	58	85K
200K	0.4	18	47	58	85K
150K	1.7	17	46	0	220K
25K	300	16	45	55	85K
25K	300	15	44	225	85K
85K	250	14	43	225	85K
85K	250	13	42	0	1 MEG
BLANK	BLANK	12	41	BLANK	BLANK
INF	0	11	40	30	22K
2,200	5	10	39	0	0
2,200	5	9	38	0.1	500K
2,200	5	8	37	30	13K
0	0	7	36	45	32 TO 64
25K	300	6	35	60	65K
25K	300	5	34	75	65K
14K	10	4	33	35	32K
14K	10	3	32	0	0
14K	10	2	31	0	1 MEG
INF	0	1	30	0	1 MEG

TO REAR OF SET — TERMINAL BOARD I 23 — TOP — BOTTOM — TO FRONT OF SET

NOTE: SEE SOCKET VOLTAGE AND RESISTANCE CHART FOR CONDITIONS UNDER WHICH MEASUREMENTS WERE MADE.

TL 38024

Figure 148. Voltage and resistance charts of terminal board I 23.



NOTE: T1 IS FIRST SECTION OF TUBE VT-231.
T2 IS SECOND SECTION.

NOTE:
INTERCONNECTOR VOLTAGE AND RESISTANCE MEASUREMENTS
TEST CONDITIONS

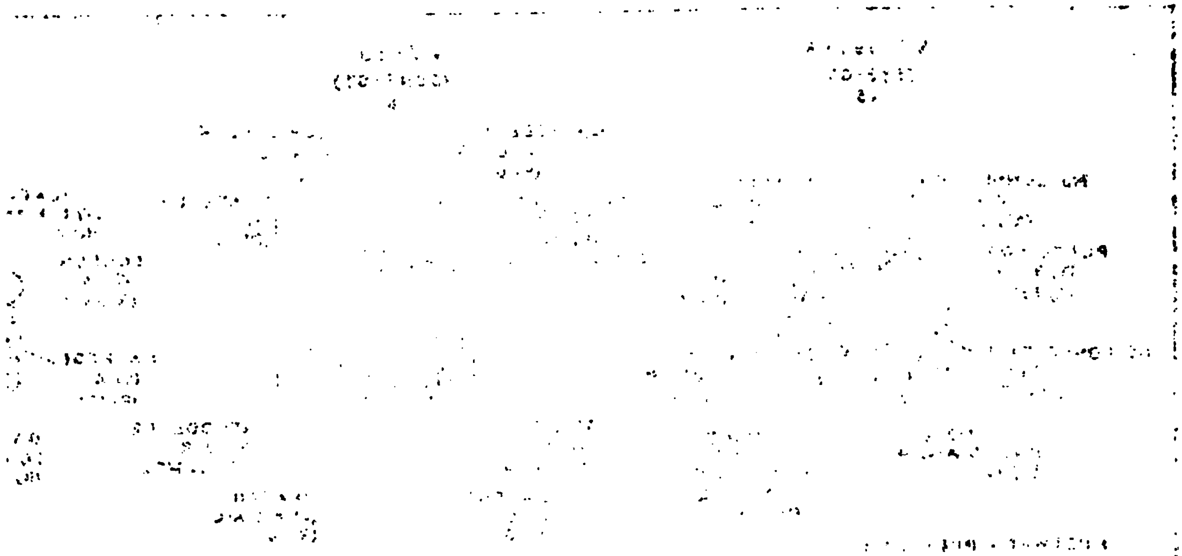
(1). NO SIGNAL.
(2). ALL TUBES IN.
(3). GAIN AND PHASE CONTROLS AT COMPLETE COUNTERCLOCKWISE POSITIONS.
(4). DIVISION CONTROL AT EXTREME CLOCKWISE POSITION. IN OTHER POSITIONS IT IS UNSTABLE, BLOCKING OSCILLATOR MAY BE FREE RUNNING OR TRIGGERED BY INTERFERENCE. TUBE CAN ALSO BE TAKEN OUT TO AVOID THIS CONDITION. POWER SUPPLY OUTPUT FALLS TEN VOLTS WHEN DIVISION IS ROTATED TO COUNTERCLOCKWISE POSITION, PLATE OF 2B (SECOND LIMITER) FALLS 100 VOLTS.
(5). TEST SWITCH IN POSITION 1. OPERATE STANDBY SWITCH IN OPERATE POSITION.
(6). READINGS TAKEN WITH 1,000 OHMS PER VOLT VOLTMETER; GRID READINGS GIVEN HERE ARE NOT ACCURATE AT ANY OTHER SCALE.

FRONT OF CHASSIS

SECTION

OF

TL 38015



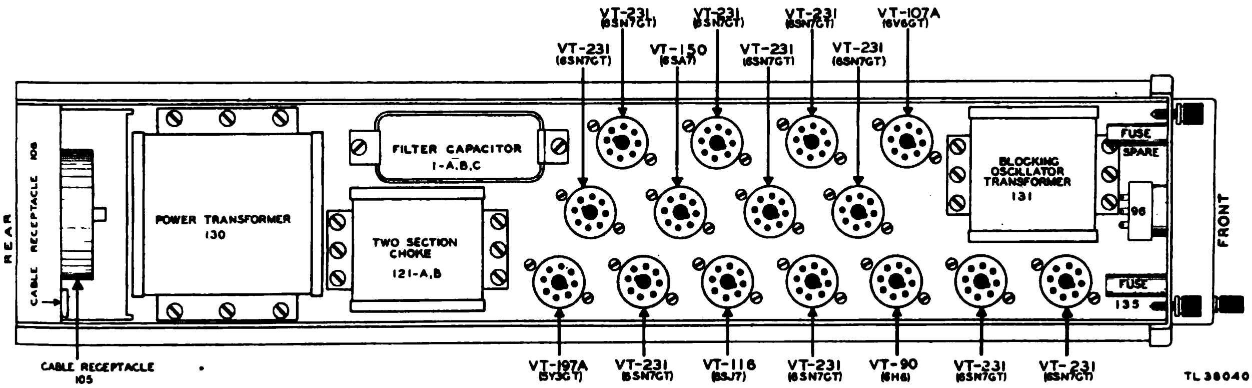


Figure 150. Interconnector, tube arrangement.

Legend for Interconnector section of Control Unit BC-1162-A

Capacitors

Part No.	Qty.	Capacity	Type	Tol. %	Volts DC
1A		2.5 MF	Oil		600
1B		2.5 MF	Oil		600
1C	1	5.0 MF	Oil		600
2-1 to 2-2	2	1.0 MF	Oil		400
3-1 to 3-4	4	1.0 MF	Oil		600
4-1 to 4-2	2	.01 MF	Paper	±20	400
4-3	1	.01 MF	Paper	±20	400
5	1	180 MMF	Mica	±3	500
6	1	250 MMF	Mica	−10±40	500
7	1	75 MMF	Mica	±5	500
8	1	1100 MMF	Mica	±8	500
9	1	100 MMF	Mica	−10±40	500
10-1 to 10-3	3	.1 MF	Paper	±20	400
10-4 to 10-9	6	.1 MF	Paper	±20	400
11-1 to 11-2	2	.006 MF	Paper	±20	600
11-4 to 11-7	4	.006 MF	Paper	±20	600
11-8	1	.006 MF	Paper	±20	600
12-1 to 12-15	15	Spark Plates			
13-1 to 13-3	3	Spark Plates			
14-1 to 14-4	4	.05 MF	Paper	±20	600
15	1	.003 MF	Mica	±20	500
16	1	100 MMF	Mica	±10	500
17	1	5 MMF	Ceramicon	±20	500
18	1	40 MMF	Mica	±10	500
19	1	200 MMF	Mica	−10±40	500

Resistors

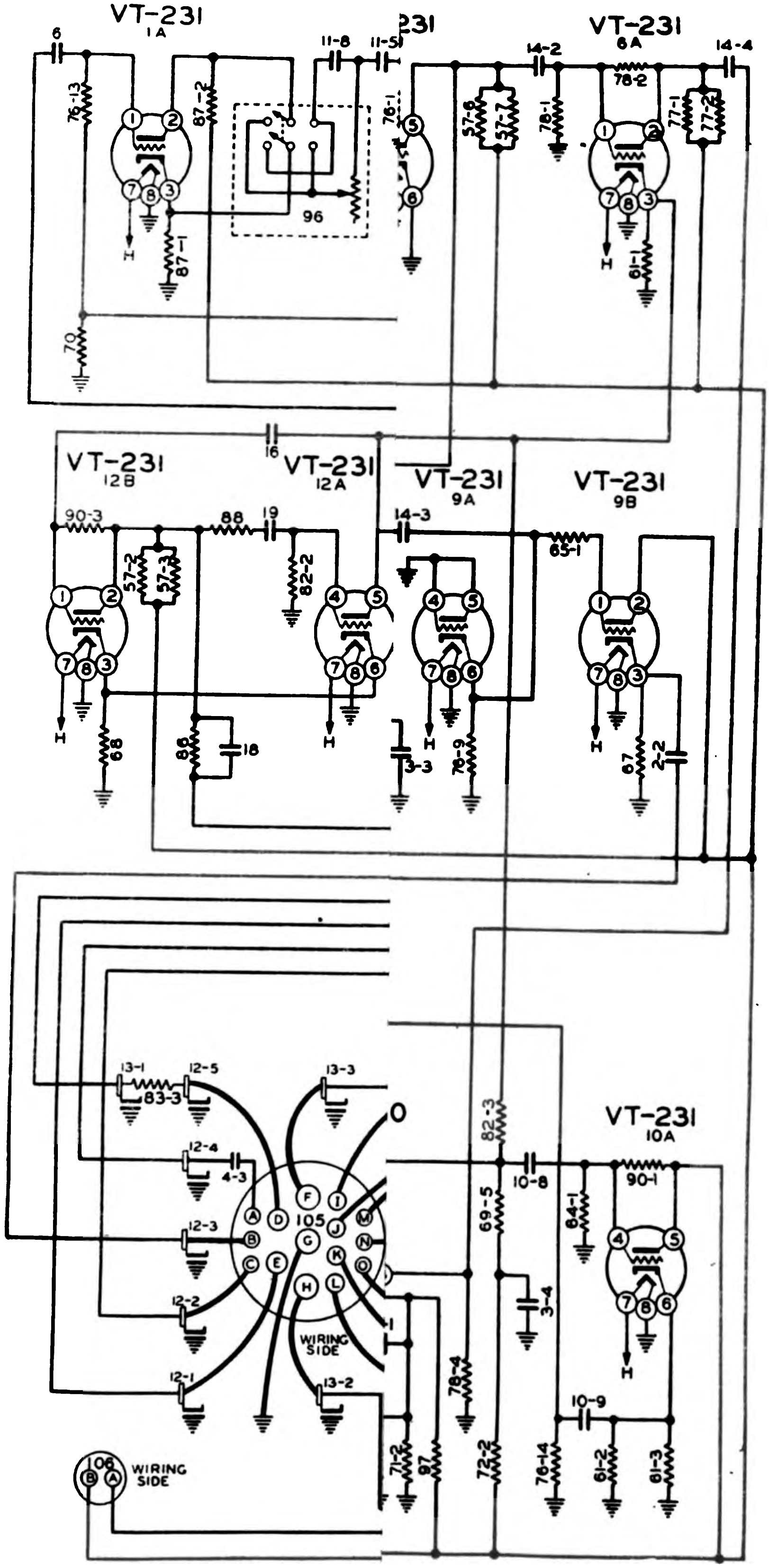
Part No.	Qty.	Ohms	Tol. +%	Watts
55	1	470,000	20	½
56-1 to 56-2	2	100,000	20	1
56-3	1	100,000	20	1
57-1	1	150,000	20	1
57-2 to 57-3	2	150,000	20	1
57-4 to 57-7	4	150,000	20	1
58-1	1	220,000	10	1
58-2	1	220,000	10	1
59-1 to 59-3	3	10,000	20	1
60	1	22,000	10	½
61-1 to 61-3	3	15,000	20	1
62	1	2,200	20	½
63	1	27,000	20	½
64-1 to 64-2	2	270,000	10	½
65-1	1	100,000	20	½
65-2	1	100,000	20	½
65-3	1	100,000	20	½
66	1	1,500	20	½
67	1	3,300	20	1
68	1	6,800	20	½

Resistors

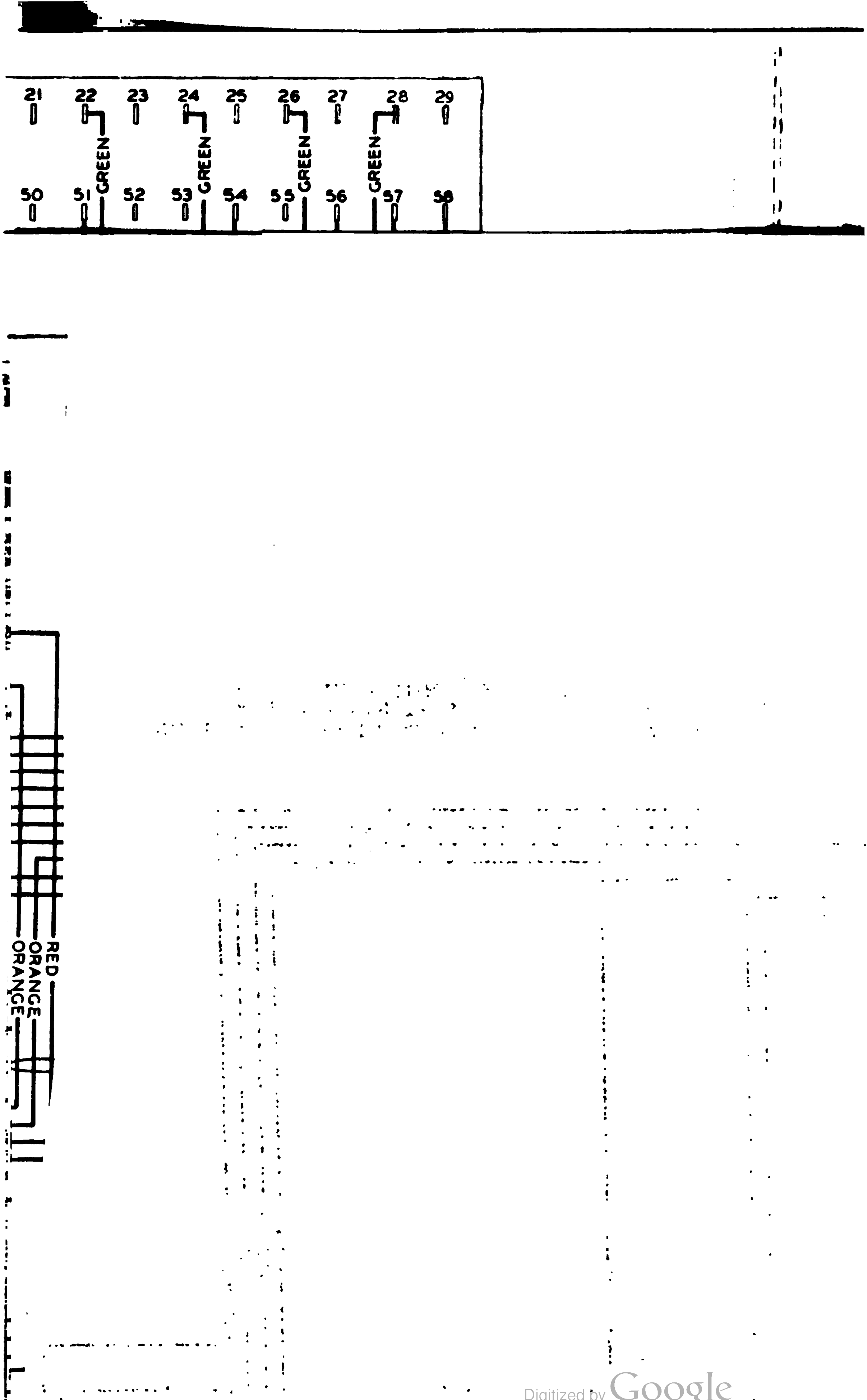
Part No.	Qty.	Ohms	Tol. %	Watts
69-1 to 69-2	2	10,000	20	½
69-3 to 69-5	3	10,000	20	½
70	1	15,000	10	½
71-1 to 71-2	2	47,000	10	1
71-3	1	47,000	10	1
72-1	1	22,000	20	½
72-2	1	22,000	20	½
73	1	47,000	20	1
74	1	330,000	10	½
75	1	2.4 MEG	5	½
76-1 to 76-12	12	1 MEG	20	½
76-13 to 76-14	2	1 MEG	20	½
77-1 to 77-2	2	68,000	20	1
78-1 to 78-4	4	22 MEG	20	½
78-5	1	2.2 MEG	20	½
79	1	220,000	10	½
80-1 to 80-2	2	220,000	20	1
80-3 to 80-4	2	220,000	20	1
82-1 to 82-2	2	220,000	20	½
82-3	1	220,000	20	½
83-1 to 83-3	3	220	20	1
85-1 to 85-3	2	47,000	10	½
85-2	1	47,000	10	½
86	1	680,000	10	½
87-1	1	10,000	10	½
87-2 to 87-3	2	10,000	10	½
88	1	82,000	20	½
90-1	1	1 MEG	10	½
90-2 to 90-3	2	1 MEG	10	½
93	1	50,000	Variable Control	
94				
95	1	3,500	Variable Control	
96	1	1 MEG	Variable Control and Switch DP DT	
97	1	22,000	5	5

Miscellaneous Parts

Part No.	Qty.	Description
105	1	Receptacle
106	1	Receptacle
108	1	Lamp, 6-8 volts
112-A		
112-B	1	Switch, Test
112-C		
113	1	Switch, Selector
114	1	Switch (A.C. Power)
115	1	Switch, relay
120	1	Inductance, timer
121-A		Filter choke, 9.5 henries
121-B	1	Filter choke, 9.5 henries
130	1	Transformer, power
131	1	Transformer, blocking osc.
135	1	Fuse 3 amp.


VT-231
1A
VT-231
8A
VT-231
12B
VT-231
12A
VT-231
9A
VT-231
9B
VT-231
10A
6
76-13
87-2
11-8
11-5
96
87-1
H
70
76-1
14-2
14-4
78-2
57-6
57-7
78-1
77-1
77-2
61-1
16
90-3
88
19
14-3
65-1
57-2
57-3
82-2
68
86
18
3-3
76-9
67
2-2
13-1
12-5
83-3
13-3
12-4
4-3
12-3
12-2
12-1
13-2
105
WIRING SIDE
82-3
10-8
90-1
69-5
64-1
3-4
78-4
10-9
71-2
97
72-2
76-14
61-2
61-3
106
WIRING SIDE

TL 38106


21
22
23
24
25
26
27
28
29
50
51
52
53
54
55
56
57
58
GREEN
GREEN
GREEN
GREEN
RED
ORANGE
ORANGE

Section VI. WAVEMETER

130. Reference Data

To assist the maintenance man while trouble shooting on the wavemeter many figures have been provided. In section VI, chapter 1, there are partial schematics and block diagrams, and at the end of this section there are groups of figures containing views of the wavemeter, a complete schematic and wiring diagram, drawings of terminal boards, voltage and resistance measurements and waveforms.

131. Introduction

a. Troubles that arise when setting the frequency of the receiver by means of the wavemeter may be sectionalized by making a simple check. Following the instructions given in paragraph 73, chapter 4, TM 11–1317, tune receiver OSC knob until receiver tuning eye closes. If eye fails to close, defect is either in the wavemeter oscillator or in the receiver. To determine which component is at fault do the following:

(1) Tune variable line resonator by means of the handwheel to the frequency of the wavemeter auxiliary oscillator.

(2) If proper deflection of wavemeter tuning eye is obtained, wavemeter oscillator is operating properly and fault is in the receiver. If no deflection of tuning eye is obtained, fault is in wavemeter.

b. Troubles that arise when determining the frequency of the transmitter may also be sectionalized easily. Following the instructions given in paragraph 120, chapter 6, TM 11–1317 tune the variable line resonator by means of the handwheel until the wavemeter tuning eye closes. If the eye does not close, either the transmitter or the wavemeter is defective. To determine which component is at fault, do the following:

(1) Switch the wavemeter to REC position.

(2) Tune wavemeter oscillator to frequency of variable line resonator.

(3) If proper deflection of tuning eye is obtained, wavemeter is normal and the transmitter is at fault.

(4) As a further check, check position four on the test scope. If a proper pulse appears, the transmitter is being triggered properly. Then check position 5A. If proper pattern is seen, transmitter power output is normal and the wavemeter is probably defective.

132. Wavemeter Trouble-shooting Chart

A. SYMPTOMS:
1. Tuning eye VT–98 and pilot lamp 126 do not light when power switch 128 is placed in ON position.
2. All other indications normal.

Probable location of fault	*Procedure*
Defective input power circuit.	1. Check switch 128 for continuity. 2. Make a continuity test from connector 124 on wavemeter through plug 106 on interconnector to interconnector power supply.

B. SYMPTOMS:
1. Pilot lamp 126 does not light when switch 128 is placed in ON position.
2. Tuning indicator lamp glows.
3. All other indications normal.

Probable location of fault	*Procedure*
Defective pilot lamp or connections.	1. Replace pilot lamp. 2. If trouble is not cleared, check circuit for short or open (fig. 157).

C. SYMPTOMS:
1. Tuning indicator VT-98 does not light when power switch 128 is placed in ON position.
2. Pilot lamp 126 glows.
3. All other indications normal.

Probable location of fault	*Procedure*
Defective tuning eye circuit.	1. Check potentiometer 63 for open. 2. Make a voltage and resistance check of the circuit (figs. 154 and 157). 3. Check by replacing tube. 4. If trouble is not cleared, see item below.
Defective power input circuit.	1. Inspect power switch 128. 2. Make a continuity test from connector 124 on wavemeter through connector 106 on interconnector to interconnector B+ power supply.

D. SYMPTOMS:
1. Rotation of EYE ADJ control fails to close tuning eye.
2. Rotation of TUNING CONTROL fails to close tuning eye (switch 127 on TRANS position).
3. Tuning indicator and pilot lamp glow.
4. All other indications normal.

Probable location of fault	*Procedure*
Open in grid circuit of VT-98.	1. Check continuity or resistance to ground (fig. 154).
Defective (6SF5) d-c amp.	1. Check tube and circuit.
Filtering network defective.	1. Check continuity for shorted capacitor or open resistors.
Defective (9006) detector.	1. Check tube and circuit.
Cavity resonator.	1. Make visual check of variable line resonator to make sure that sliding disk is connected to gears and tuning knob.
Defective r-f signal input circuit.	1. Check cable 107, socket 125, and antenna transmission line and wavemeter coupling link for continuity.

E. SYMPTOMS:
1. Rotation of EYE ADJ fails to close tuning eye.
2. Rotation of TUNING CONTROL fails to close tuning eye (switch 127 on REC position).
3. Tuning eye can be closed when switch is in TRANS position.
4. All other indications normal.

Probable location of fault	*Procedure*
Defective coupling.	1. Make visual check of coupling circuit between local oscillator and variable line resonator. 2. If trouble is not cleared, see item below.
Defective oscillator stage (VT-202).	1. Replace tube and check operation of tuning eye. 2. If tuning eye does not close, make voltage and resistance check of oscillator circuit (figs. 154, 155, and 157).

F. SYMPTOMS: 1. Tuning eye closes and opens slowly without any movement of EYE ADJ control (switch 127 in REC position).
2. All other indications normal.

Probable location of fault	*Procedure*
Oscillator VT–202 unstable.	1. Replace oscillator tube and retune circuit. 2. If tuning eye still is unstable, make a voltage and resistance check of the oscillator circuit (figs. 154, 155, and 157).

G. SYMPTOMS: 1. Impossible to close tuning eye on receiver when tuning receiver to wavemeter oscillator.
2. Tuning eye on wavemeter can be closed by oscillator in wavemeter.
3. All other indications normal.

Probable location of fault	*Procedure*
Defective coupling.	1. Inspect coupling between oscillator and antenna. 2. If trouble is not cleared, see item below.
Defective receiver.	1. See section IV, chapter 2.

133. Procedure for Replacing Defective Electrical Parts in Wavemeter

a. INTRODUCTION. The information contained in the following section is to assist the radar mechanic in replacing defective major parts in the wavemeter. Note that such replaceable items as small resistors, capacitors, tube sockets, and tubes are not covered in these procedures. Neither is a procedure given when the replacement for the part presents no special difficulty. The procedures have been worked out experimentally and represent the shortest and best method of accomplishing the work.

Cautions: 1. Before replacing a defective part, observe carefully its position, method of mounting, and wiring. This will insure the correct installation of the replacement part.

2. When removing such parts as switches, potentiometers and tube sockets, which have several wires attached to their terminals, be sure to tag the wires carefully so that they will be replaced in their proper positions.

3. When disassembling a component, the screws, nuts, bolts, washers, and other small parts which are removed, should be put in some small container to prevent their loss.

b. LIST OF ITEMS COVERED. (1) *Outside of wavemeter* (par. 134).
Antenna rod and sheath.
Tuning knob.
Pilot light socket and bracket.
Connectors 124 and 125.

(2) *Inside of wavemeter* (par. 135).
Eye adjustment potentiometer flexible shaft.
Tuning indicator tube (VT–98).
Wavemeter pick-up loop assembly.
Inductance loop 90.
Tube socket 9002.
Tube socket 6SF5.
Potentiometer 63.
Variable capacitor 1.

(3) *Parts requiring remodeling oscillator chassis* (par. 141).
Tuning indicator tube socket.
Resistor 61.
9006 tube socket.
Diode pick-up loop assembly.
Capacitor 2–1.

134. Placement of Items in Outside of Wavemeter

a. ANTENNA ROD AND SHEATH. (1) Remove the two lower mounting screws from the fiber insulators which attach the antenna sheath to the resonator.

(2) Unsolder the lug from the inside end of the antenna sheath.

(3) Loosen the two screws on the top of the fiber insulators.

(4) Slide the antenna assembly from be-

tween the two mounting insulators and out through the front of the panel.

(5) To install, reverse removal procedure.

b. TUNING KNOB. (1) With the long end of an Allen wrench loosen the setscrew which fastens the knob to the shaft and pull the knob off.

(2) To install the new knob, reverse removal procedure.

c. PILOT LIGHT SOCKET AND BRACKET. (1) Remove the screw which attaches the bracket to the black casting.

(2) Unsolder the connection to the socket.

(3) To install the new socket reverse removal procedure.

d. CONNECTORS 124 AND 125. (1) Unsolder the connections from the back of the connectors.

(2) Remove the screw at the four corners of the mounting plate and push the connectors out.

(3) To install the new connector, reverse removal procedure.

135. Placement of Items Inside Wavemeter

a. EYE ADJUSTMENT POTENTIOMETER FLEXIBLE SHAFT. (1) With an Allen wrench, remove the adjusting knob from the front panel.

(2) With an Allen wrench remove the connection to the potentiometer shaft. The flexible shaft can then be removed from the chassis.

(3) To install the new shaft, reverse removal procedure.

b. TUNING INDICATOR TUBE (VT–98). (1) Remove POWER ON-OFF switch from front panel by removing the locknut. Do not unsolder the connection to the switch.

(2) Turn the switch sideways and slip it out of the way underneath the tube.

(3) Loosen the knurled thumbscrew which holds the tube clamp to the bracket.

(4) Pull the tube and socket out of the side of the chassis as far as the wiring will allow.

(5) Grasp the socket in one hand and the tube in the other so as not to strain the wiring and rock the tube out of the socket.

(6) To install the new tube, reverse removal procedure.

c. WAVEMETER PICK-UP LOOP ASSEMBLY. Assembly is mounted on the resonator with a black insulated lead attached to it.

(1) Unsolder the connection to the assembly.

(2) Remove the two screws which hold the assembly to the resonator.

(3) To install the new assembly, reverse the removal procedure.

Note. To replace any of the parts listed below it will be necessary to remove the L-shaped top and front panel from the wavemeter.

Inductance loop 90
Resistor 55, 56, 57, 58, 59, 60, 62
Tube socket 9002
Tube socket 6SF5
Potentiometer 63
Variable capacitor 1
Resistor 61
Capacitor 2–1, 2–2, 3–1, 3–2, 4–1, 4–2, 5, 9
Inductors 91 and 92

To accomplish this, perform the nine steps listed in Removal Procedure for Top and Front Panels, *d* below. After these 9 steps are completed, refer to the detailed description of the procedure for the replacement of each item listed above. These procedures will be found at the end of the nine preliminary steps. Some of the items listed above do not have a detailed removal procedure written for them because their replacement after the nine preliminary steps are complete, requires no explanation.

d. REMOVAL PROCEDURE FOR TOP AND FRONT PANELS. (1) Remove the side panels of the oscillator compartment by turning shock-proof fasteners ¼ turn counterclockwise.

(2) Remove the two lower mounting screws from the fibre insulator which attaches the antenna sheath to the resonator.

(3) Unsolder the three wires that come out of the shielded tube at the rear of the wavemeter (black, white, and red wires).

(4) With an Allen wrench, remove the large tuning knob and the two smaller knobs, AUX OSC and EYE ADJ.

(5) Remove the ON-OFF and TRANS-REC switches by removing the locknuts and washers.

(6) Remove the four mounting screws on the front panel which attach it to the black metal casting.

(7) From the top panel, remove the three mounting screws located 4¼ inches from the end of the panel.

(8) Grasp handles on top panel and pull slightly forward and upward to lift completely off.

(9) Remove the top cover of the oscillator compartment by removing the six screws which attach it to the oscillator compartment chassis.

e. INDUCTANCE LOOP 90. (1) Perform the *removal procedure for top and front panels.*

(2) Remove the knurled screw holding the tuning eye socket in place.

(3) With an Allen wrench loosen the setscrews which hold the large oscillator tuning drive gear to its shaft and remove the gear.

(4) Unsolder the two connections to the variable capacitor.

(5) Remove the screw which attaches the loop to the side panel.

(6) To install the new loop, reverse removal procedure.

f. TUBE SOCKET 9002. (1) Perform the *removal procedure for top and front panels.*

(2) Remove the 9002 from the socket.

(3) Remove the two screws which hold the tube socket mounting bracket to the chassis.

(4) Slightly turn the whole assembly so that the soldered connections to the back of the tube socket are accessible and unsolder all the connections to the socket.

(5) Remove the two bolts that hold the socket in the bracket and remove the socket.

(6) To install the new socket, reverse the removal procedure.

g. TUBE SOCKET 6SF5. (1) Perform the *removal procedure for top and front panels.*

(2) Remove the 6SF5 tube from its socket.

(3) Unsolder the connection from the back of the tube socket.

(4) Remove the two bolts which hold the socket to the chassis and remove the socket.

(5) To install the new socket, reverse the removal procedure.

h. POTENTIOMETER 63. (1) Perform the *removal procedure for the top and front panels.*

(2) With an Allen wrench loosen the setscrew which holds the flexible shaft to the potentiometer shaft and remove this connection.

(3) Remove the setscrew which secures the potentiometer to the chassis. Pull the potentiometer clear of the chassis as far as the attached wiring will allow.

(4) Unsolder the connections to the three terminals of the potentiometer.

(5) To install the new potentiometer reverse the removal procedure.

i. VARIABLE CAPACITOR 1. (1) Perform the five steps necessary to remove inductance loop 90, listed above.

(2) Remove the two screws which attach the capacitor to the chassis and remove the capacitor.

(3) To install the new variable capacitor, reverse the removal procedure.

Note. Make certain that the capacitor plates are completely meshed and the reduction gear shaft turned clockwise as far as the lugs will allow. The large gear may now be engaged.

136. Items Requiring Removal of Oscillator Chassis

To replace any of the parts listed below, it is necessary to first perform the 9 steps listed in paragraph 140 *d, removal procedure for the top and front panels.* After this, it is necessary to remove the oscillator compartment from the resonator so that the bottom of the oscillator chassis is accessible.

a. PROCEDURE FOR REMOVING OSCILLATOR COMPARTMENT FROM RESONATOR. (1) Perform steps 1 to 9 in *top and front panel removal procedure.*

(2) Unsolder the black insulated wire at the lug attaching it to the resonator.

(3) Unsolder the wire from the base of tube 9006 at the lug attaching it to the resonator.

(4) Remove the screw which holds the mounting bracket of the pilot light to the black casting.

(5) Remove the screws holding the two fibre insulators, which carry the antenna input line, to the resonator.

(6) Unscrew clamp holding the shield to the top of the resonator.

(7) Remove the four mounting screws that hold the compartment to the resonator.

(8) Remove the four screws holding the end plate to the resonator.

(9) Lift compartment off carefully so as not to bend the antenna input line.

b. TUNING INDICATOR TUBE SOCKET. (1) Perform the *procedure for removing oscillator compartment from resonator.*

(2) Remove the tube VT–98 from the socket.

(3) Remove the knurled thumbscrew which attaches the tube socket clamp to the bracket.

(4) On the underside of the oscillator chassis, unsolder the two connections to the 9006 tube socket.

(5) Unsolder the four connections to the 6SF5 tube socket.

(6) Unsolder the two connections to the terminal board.

(7) From the under side of the oscillator chassis remove the clamp which secures the laced wiring to the chassis.

(8) Unsolder the lead to the center top of the potentiometer and pull the laced wiring up through the hole in the chassis.

(9) Remove the screw which attaches the short length of conduit to the chassis. The socket and its attached wiring is now free and can be removed from the chassis.

(10) The spare socket comes complete with all the necessary color-coded wiring attached. To install, reverse removal procedure.

c. RESISTOR 61. This resistor is located inside the tuning indicator tube socket. To replace this resistor it is necessary to replace the entire socket as explained in *b* above.

d. 9006 TUBE SOCKET. (1) Perform the *procedure for removing oscillator compartment from resonator.*

(2) Remove the 9006 tube from its socket.

(3) Remove the five connections from the bottom of the tube socket.

(4) Remove the two bolts which attach the tube socket to the bracket and remove the socket.

(5) To install the new socket, reverse removal procedure.

e. DIODE PICK-UP LOOP ASSEMBLY. (1) Perform the *procedure for removing oscillator compartment from resonator.*

(2) Remove the two screws which attach the assembly to the resonator.

(3) To install the new assembly, reverse removal procedure.

f. CAPACITOR 2–1. (1) Perform the *procedure for removing oscillator compartment from resonator.*

(2) Unsolder the two connections to the capacitor.

(3) To install new capacitor, reverse removal procedure.

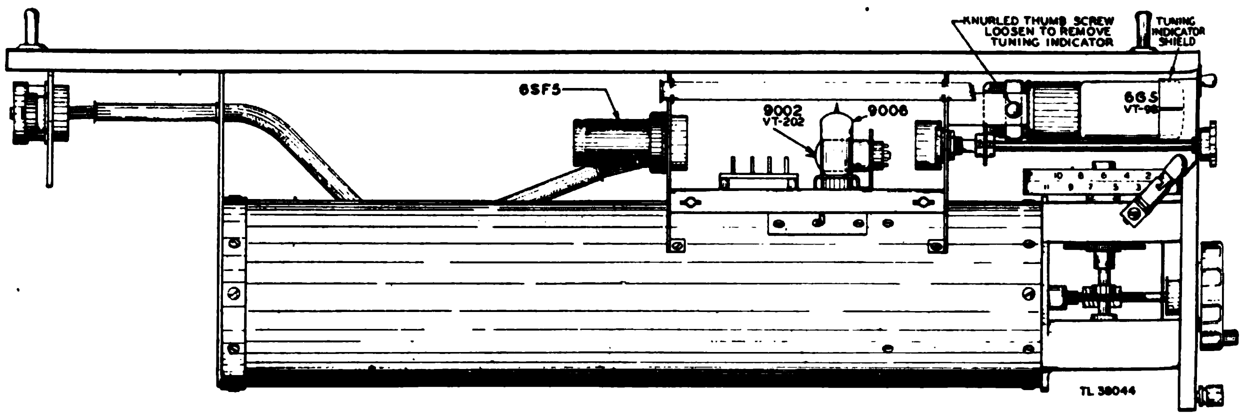


Figure 153. Wavemeter, side view showing tube arrangement.

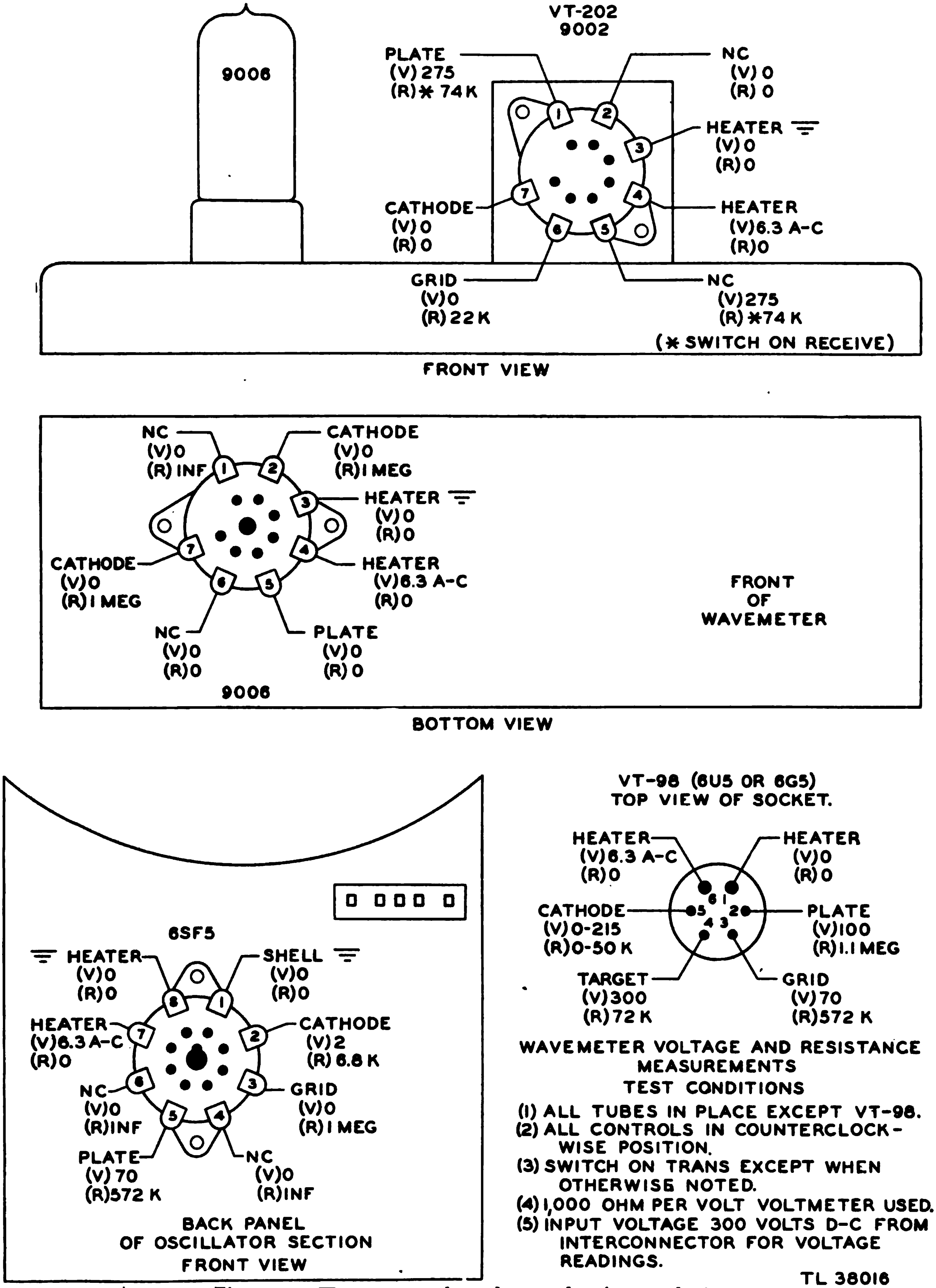
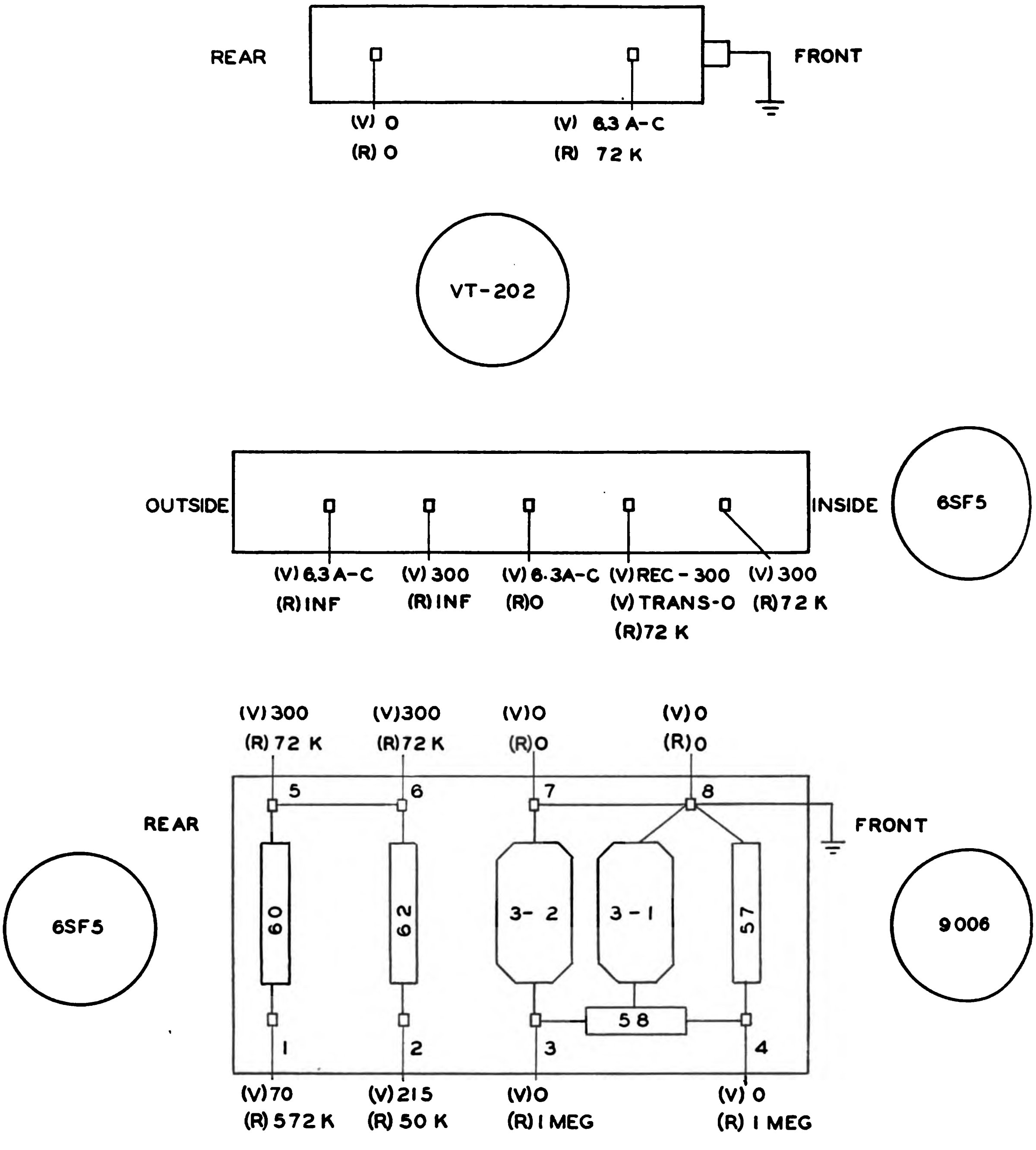


Figure 154. Wavemeter, socket voltage and resistance chart.



NOTE. SEE SOCKET VOLTAGE AND RESISTANCE CHART FOR CONDITIONS UNDER WHICH MEASUREMENTS WERE MADE.

TL 38025

Figure 155. Wavemeter, terminal boards voltage and resistance charts.

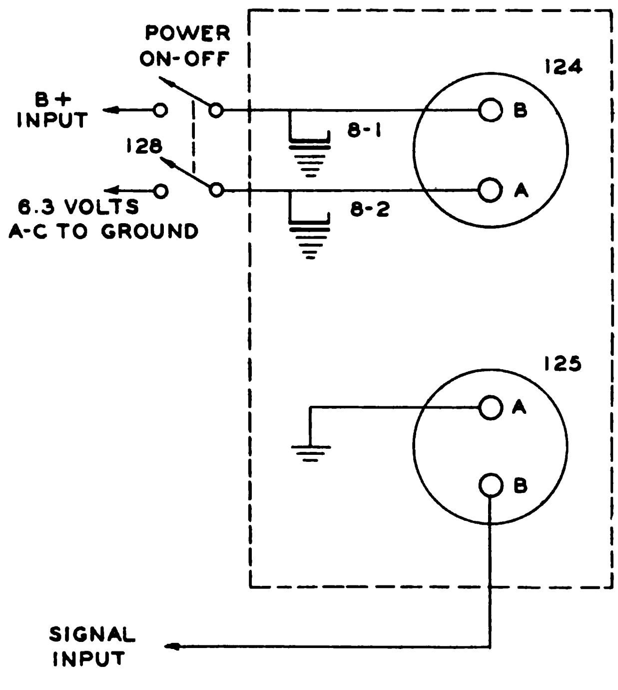


Figure 156. Wavemeter, receptacles 124 and 125.

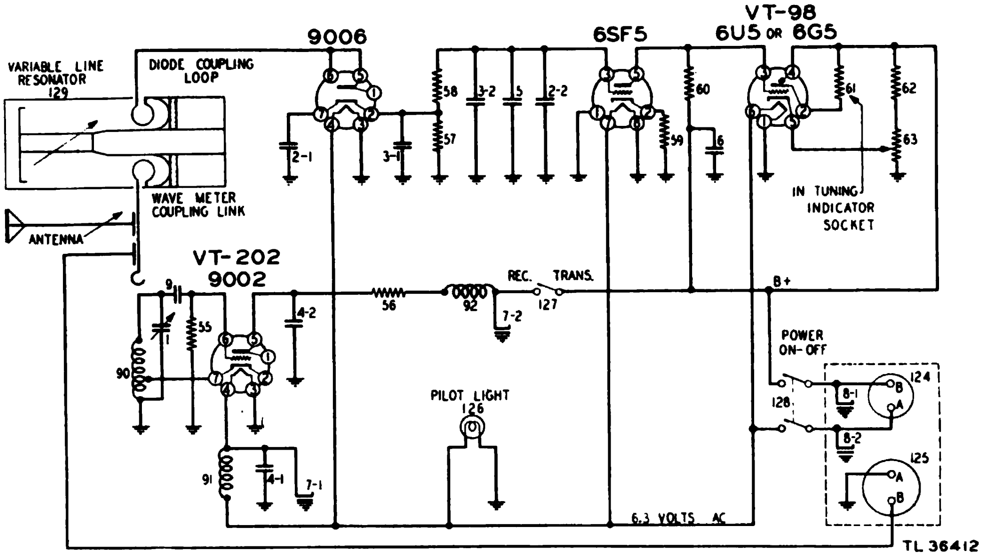
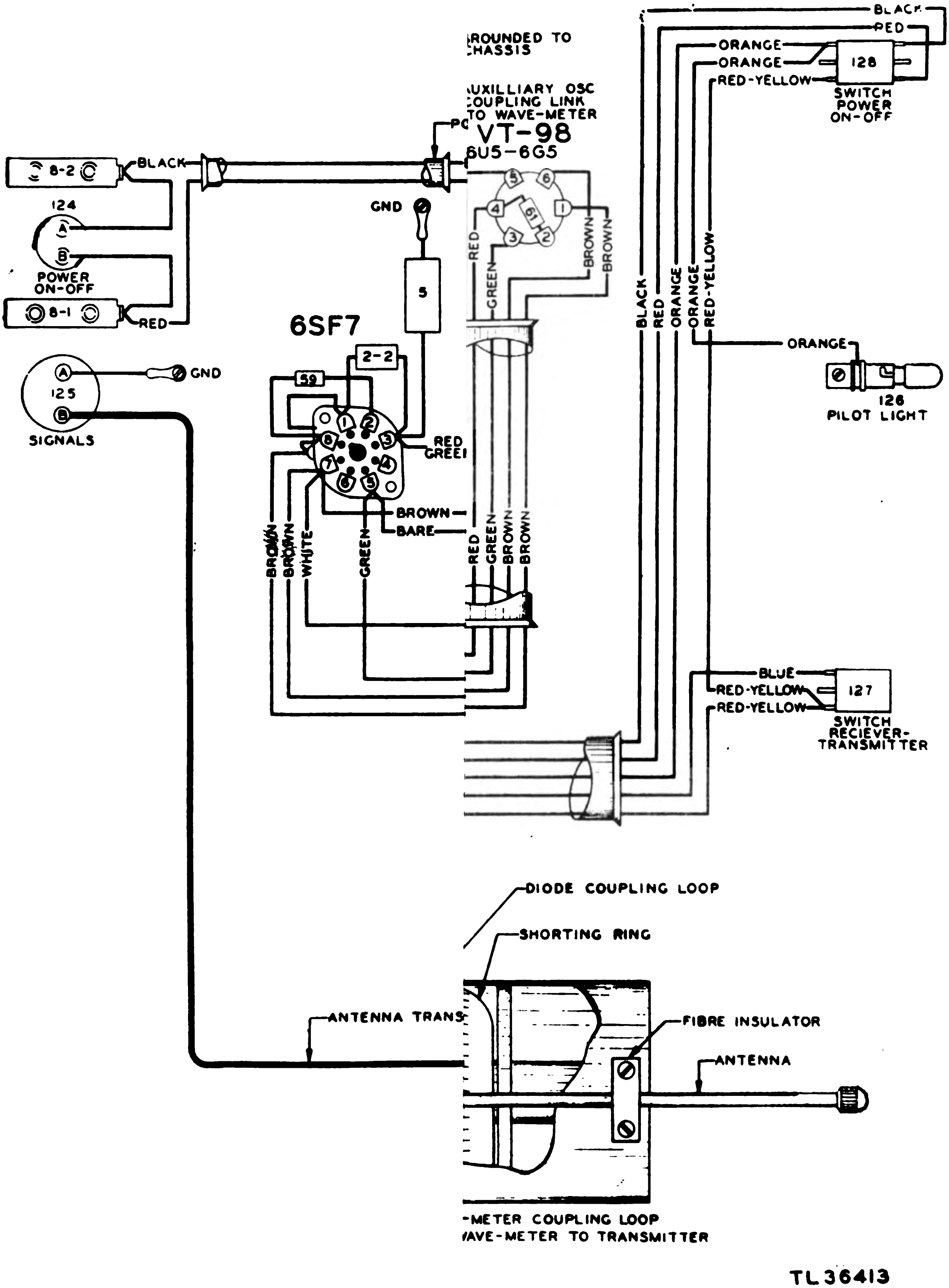


Figure 157. Schematic of wavemeter.

Legend for wavemeter section of Control Unit BC-1162-A

Part No.	Qty.	Description
1	1	Capacitor, Air Trimmer, Min. 2.5–Max. 12.5 MMF'S
2	2	Capacitor, 100 MMF ±10% Mica 500 volts
3	2	Capacitor, .01 MF ±30–10% Paper 400 volts
4	2	Capacitor, 40 MMF ±5% Ceramic 500 volts
5	1	Capacitor, .05 MF ±10% Paper 400 volts
6	1	Capacitor, .1 MF ±10% Paper 400 volts
7	2	Spark Plate
8	2	Spark Plate
9	1	Capacitor, 10 MMF ±10% Ceramic 500 volts
55	1	Resistor, 22,000 Ohms ±10% ½ watt
56	1	Resistor, 2,000 Ohms ± 5% ½ watt
57	1	Resistor, 1 Megohm ±10% ½ watt
58	1	Resistor, 10,000 Ohms ±20% ½ watt
59	1	Resistor, 6,800 Ohms ±10% ½ watt
60	1	Resistor, 500,000 Ohms ±10% ½ watt
61	1	Resistor, 1 Megohm ±20% 1/10 watt
62	1	Resistor, 22,000 Ohms ±10% 1 watt
63	1	Resistor, 55,000 Ohms Variable 2 watt
90	1	Inductance, Coil
91	1	Inductance, Coil
92	1	Inductance, Coil
124	1	Receptacle, "Power"
125	1	Receptacle, "Signals"
126	1	Pilot Light, 6–8 volts
127	1	Switch, SP–ST
128	1	Switch, DP–ST
129	1	Variable Line Resonator



ROUNDED TO
CHASSIS
UXILLIARY OSC
COUPLING LINK
TO WAVE-METER
VT-98
6U5-6G5
BLACK
RED
ORANGE
ORANGE
RED-YELLOW
128
SWITCH
POWER
ON-OFF
8-2
124
POWER
ON-OFF
8-1
GND
5
6SF7
2-2
59
125
SIGNALS
BROWN
BARE
WHITE
GREEN
126
PILOT LIGHT
BLUE
127
SWITCH
RECIEVER-
TRANSMITTER
DIODE COUPLING LOOP
SHORTING RING
ANTENNA TRANS
FIBRE INSULATOR
ANTENNA
-METER COUPLING LOOP
VAVE-METER TO TRANSMITTER
TL36413

Section VII. SIGNAL GENERATOR

137. Reference Data

As the signal generator is a comparatively simple component, the block diagram and complete schematic diagram in section VII, chapter 1, and the trouble-shooting chart below should be sufficient reference information.

138. Signal Generator Trouble-shooting Chart

A. SYMPTOM: Signal generator has zero output.

Probable location of fault	*Procedure*
Defective a-c input circuit.	1. Check filaments of rectifier Tube VT–84 for glow. 2. If filaments are not glowing, check fuses 5019 and 7005 for open. Make a continuity test from the a-c input terminals through switch 4033 to the terminals of the primary of 1036. 3. Replace rectifier Tube VT–84 and check for a filament glow.
Defective power supply.	1. If filaments are glowing check for an open in the secondary of transformer 1036. 2. Check for open in filter circuit.
Faulty oscillator stage, VT–48.	1. Check the grid voltage of the oscillator. Voltage should be from –0.2 to –1.2 volts if tube is ocsillating. 2. If grid voltage is abnormal, make a voltage and resistance check of the complete stage.
Defective attenuator circuit.	1. If grid voltage is normal, check the attenuator network for a short or open. 2. Check for open to output capacitor 8036.

B. SYMPTOM: Signal generator output cannot be modulated.

Probable location of fault	*Procedure*
Defective audio oscillator stage.	1. Replace Tube VT–37 and check output. 2. If trouble is not cleared, make a voltage and resistance check of the complete stage.

C. SYMPTOM: Signal generator output is weak.

Probable location of fault	*Procedure*
Low input voltage.	1. Check the input voltage. Voltage should be approximately 110- to 220-volts. 2. If trouble is not cleared, see item below.
Weak tubes.	1. Replace the r-f oscillator Tube VT–48 and check output. 2. If output has not increased, make a voltage and resistance check of the complete stage. 3. If trouble is not cleared, see item below.
Defective attenuator circuit.	1. Check the attenuator circuit and output plug for a faulty connection. 2. Check switch 4008 for a bad contact.

139. Removal of Signal Generator From Case

To remove this instrument from its case, it is not necessary to remove any dials or controls from the front panel.

a. Remove small screw holding grounding lug to rear panel of generator.

b. Remove 10 screws holding front panel to sides, top, and bottom panels.

c. Gently pull forward on the front panel, rocking slightly from side to side if necessary, and remove front panel and entire internal assembly from shell.

d. To replace, reverse removal procedure.

CHAPTER 3

SUPPLEMENTARY MECHANICAL INFORMATION

140. Introduction

The information contained in this chapter is to assist the radar mechanic in replacing defective mechanical parts in the RC–150 and to explain the mechanical operation of the IFF portion of the antenna rotary coupling. As the procedures are described, it will be noted that mechanical parts are taken down only so far as can readily be done with the tools on hand. Where gears and shafts are held together with peened pins rather than setscrews and Allen screws, no removal procedure is described because work of this nature is not usually done in the field. If, however, it does become necessary to replace these parts, the information given herein supplies the mechanic with at least the preliminary steps to accomplish the work.

141. Precautions

a. Before replacing a defective mechanical part, observe carefully its position, method of mounting, and proper mesh of gears. This will insure the correct installation of the part.

b. When disassembling a component, the screws, nuts, bolts, washers, and other small parts which are removed should be put in a small container to prevent their loss.

c. When removing parts such as switches and terminal boards, which have several wires attached to their terminals, be sure to tag the wires carefully so that they will be replaced in their proper positions (fig. 159).

Note. For removal of the transmitter, receiver, or wavemeter from the rack and their cases see TM 11–1417, Preventive Maintenance Manual.

142. Vernier Tuning Gear Assembly (Capacitor 21) of Transmitter

In order to replace a defective vernier tuning gear assembly, the following procedure is necessary (figs. 159 and 160):

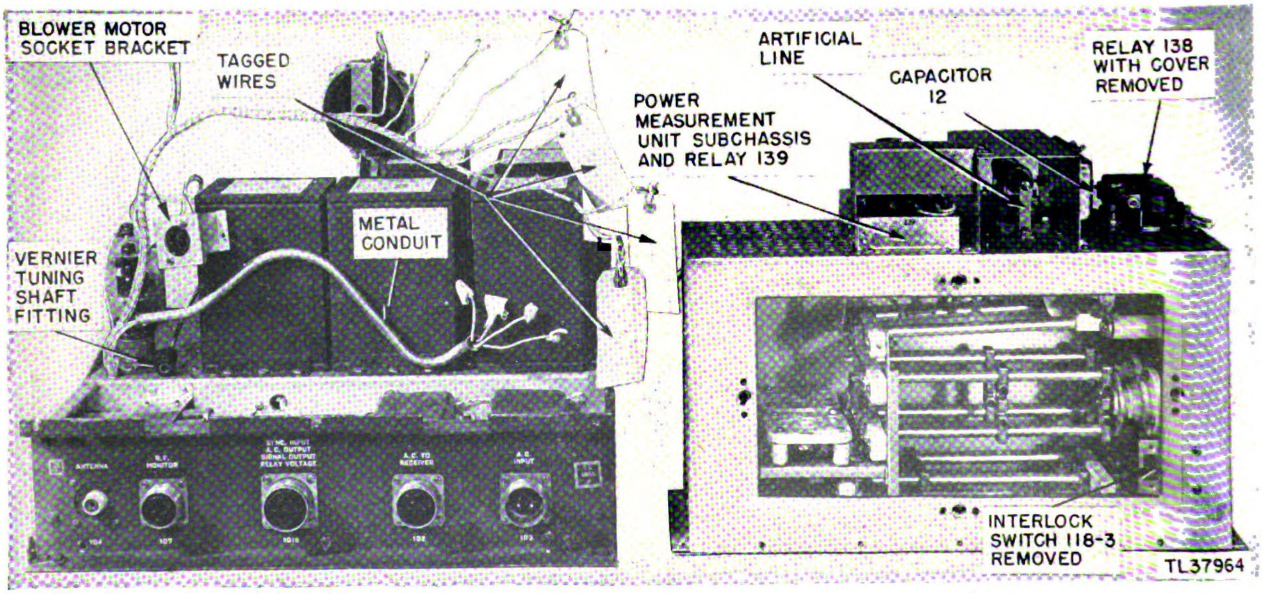


Figure 159. Transmitter, oscillator compartment removed.

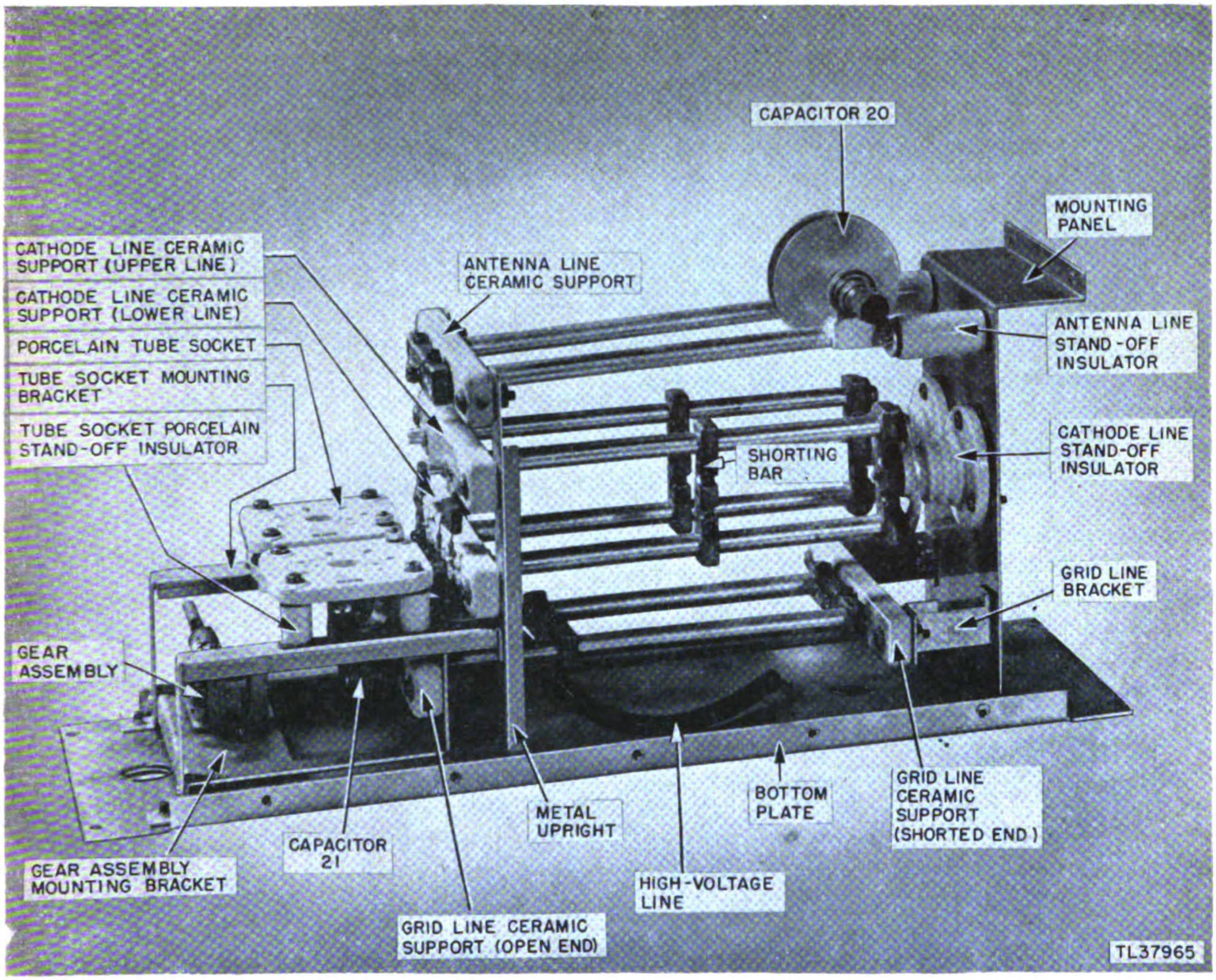


Figure 160. R-f oscillator assembly.

a. Take out screws at the four corners of the cover on relay 138, and remove the cover.

b. Take out slotted nuts from connections 2, 3, 5, and 6, on relay 138 and remove the connections.

c. From capacitor 12, attached to the side of the cover of the artificial line, unsolder the two connections to the outside terminal.

d. Unsolder the connections to the two terminals of the artificial line.

e. Unsolder the four connections to the terminal strip of the power measurement unit subchassis.

f. Unsolder the two connections to each of the interlock switches (118–1, 118–2).

g. Remove the blower motor socket bracket from the back of the oscillator compartment by taking out screws on each side of the bracket.

h. Remove the three clamps which hold the laced wiring to the interlock switches, artificial line, relays 138 and 139, to the oscillator compartment chassis.

i. Remove the two clamps which hold the metal conduit (containing the wiring to the power measurement unit) to the oscillator compartment chassis.

j. With an Allen wrench, loosen the two setscrews and remove the fitting on the vernier tuning shaft which goes to the gear assembly of capacitor 21.

k. Remove the two screws which hold the interlock switch 118–3 to the mounting bracket and pull switch out of compartment so that the connections may be unsoldered. Unsolder the two connections and remove the switch.

l. At the open end of the upper cathode line (marked 22), above the porcelain tube sockets, remove the black and white leads and pull them through the hole in the bottom of the compartment.

m. Unsolder the end of the heavy black high-voltage line from resistor 72–1, in the bottom of the chassis.

n. From antenna connector 105, unsolder the shielded antenna lead.

o. From R.F. MONITOR connector 106, unsolder the blue lead.

p. From the shorted end of the grid line, remove the screw holding the small terminal board to which resistor 65–2 is attached.

q. Pull through the hole, first the red and blue interlock leads and then the terminal strip with the resistor attached.

r. Remove the four large bolts that attach the oscillator compartment to the main chassis and lift off the entire oscillator compartment.

s. From the shorted end of the antenna line (marked 20), remove three screws holding the vertical bracket and pull the bracket clear of the shorting bar; also detach the blue striped R.F. MONITOR lead.

t. Remove the two clamps which attach the shielded leads to the antenna lines.

u. From the bottom edge of the compartment remove the ten screws which attach the bottom plate of the compartment to the upper case.

v. From the end panel, below relay 138, remove the two screws which hold the mounting panel to the case.

w. Lift the case from the oscillator section (fig. 161).

x. Drop the bottom plate by removing the six screws attaching it to the mounting panel metal upright and tube socket mounting bracket.

y. The gear assembly may now be removed by unscrewing the three screws that have become accessible (fig. 162).

z. To install the new gear assembly, reverse the removal procedure.

143. Blower Motor in Transmitter

In order to replace a defective blower motor the following procedure is necessary:

a. For description of removal of case from transmitter chassis, see TM 11–1417.

b. Remove four screws on top of case that hold motor bracket.

c. To replace, reverse removal procedure.

144. R-F Tuning Head Receiver

Should the gear assemblies in the receiver r-f tuning section become damaged, it will be necessary to replace the entire r-f tuning head because these gear assemblies are not removable for replacement. In order to do this, the following procedure is necessary:

a. With an Allen wrench, remove the tuning knobs from the front panel.

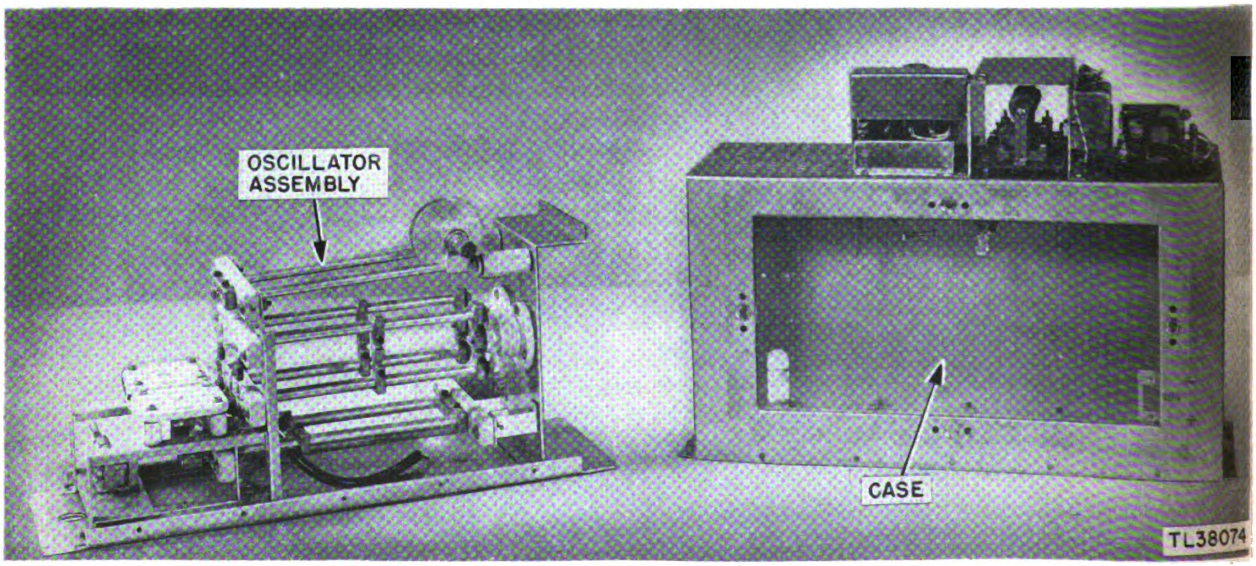


Figure 161. Oscillator compartment assembly and case.

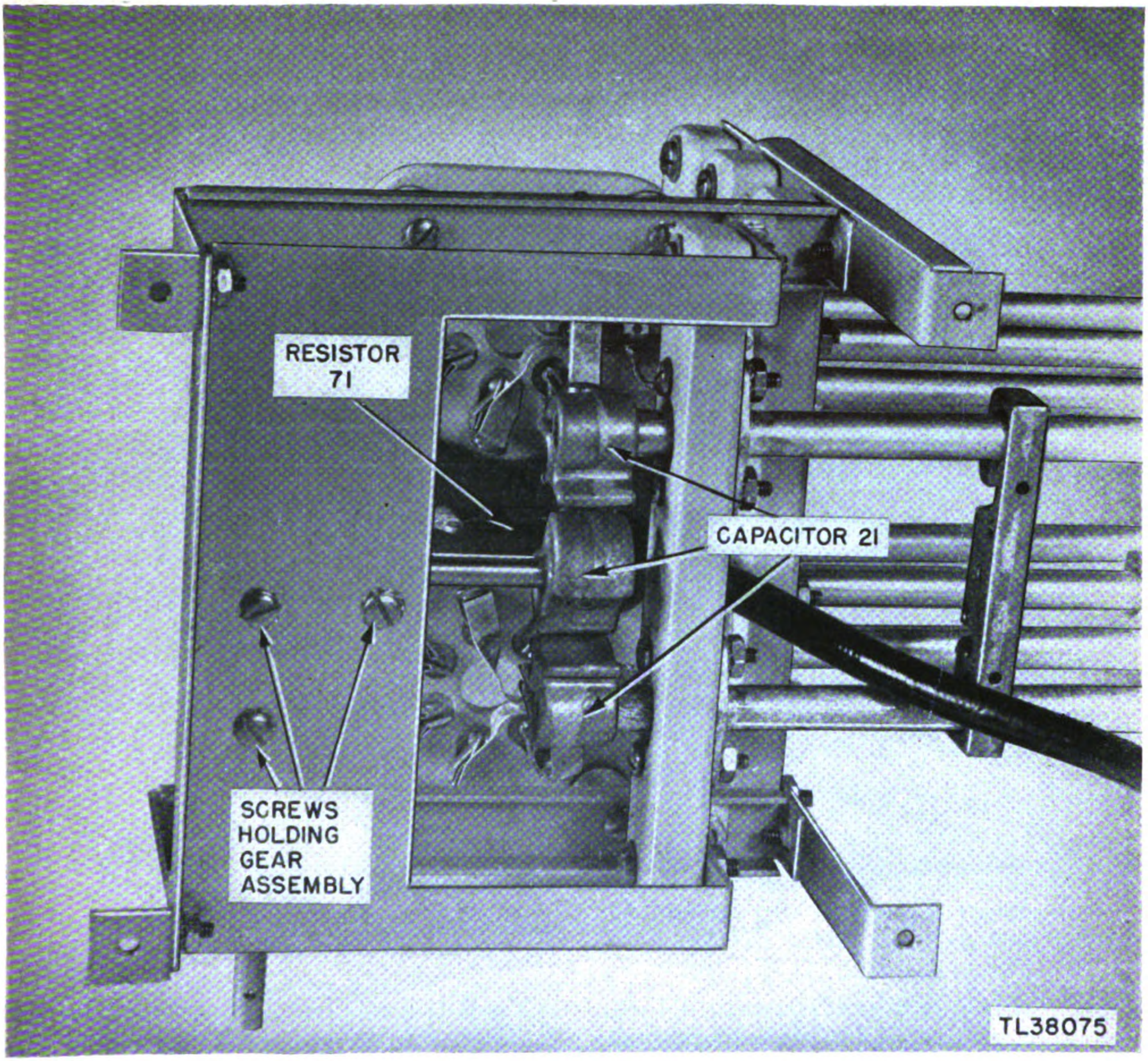


Figure 162. Oscillator assembly, underside, showing capacitor 21 and resistor 71.

b. Remove all screws shown in figure 164.

c. Pull the front panel forward and drop it down to clear receiver chassis.

d. Remove tuning indicator Tube VT–215, and place it to rear of chassis (fig. 165).

e. Remove the metal plate on the bottom of the tuner head by taking off the nuts and screws indicated as A in figure 165.

f. Unsolder wire in the i-f conduit from lug 5 of the first i-f transformer.

g. Unsolder the i-f conduit from the lug adjacent to Tube VT–112.

h. Unsolder the capacitor at the end of the orange lead (which is the antenna conduit) from the antenna coil.

i. Remove the clamp which holds the antenna conduit to the tuner case.

j. Remove the red and yellow leads from terminals 25 and 28 respectively.

k. Remove the r-f tuning head from the re-

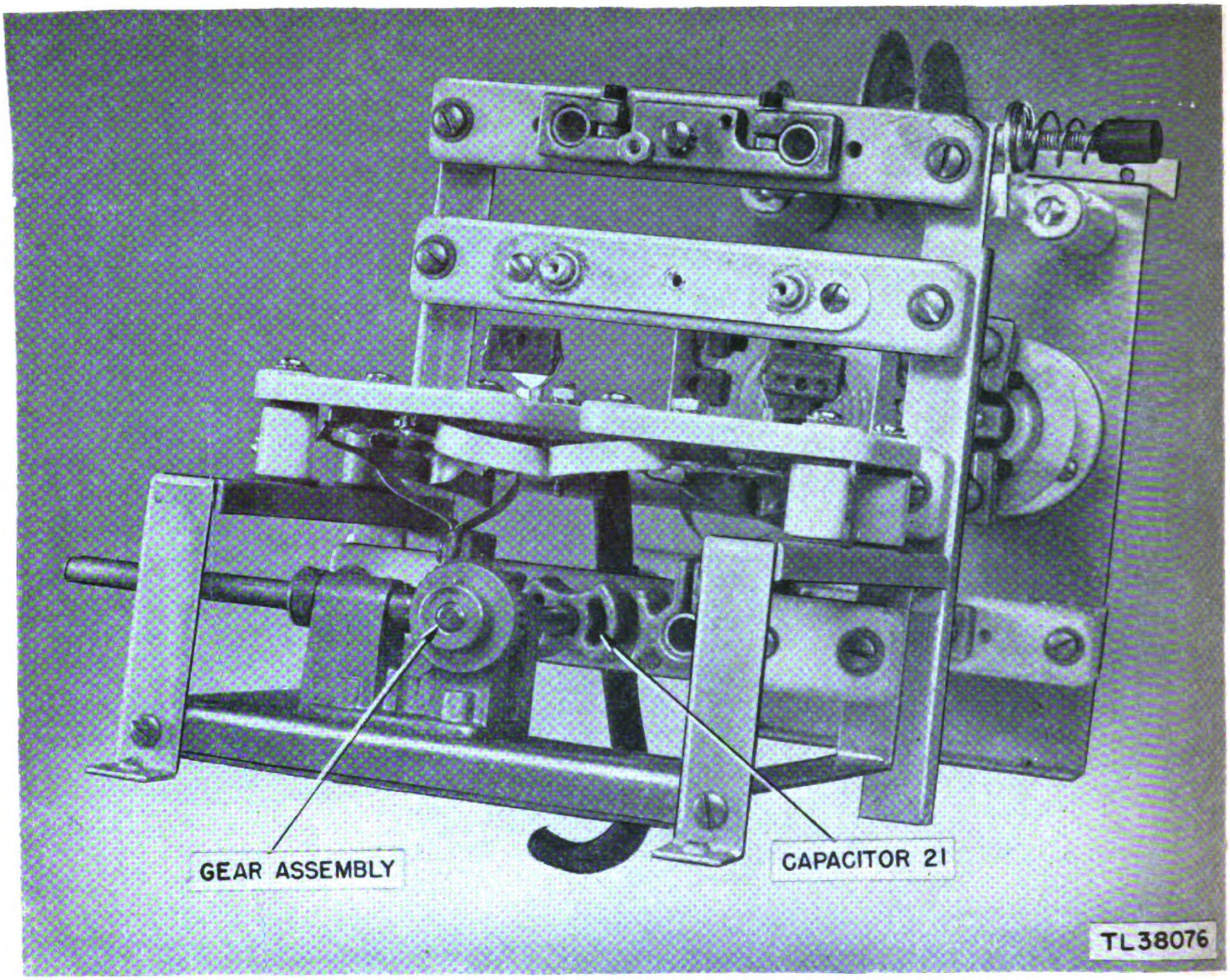


Figure 163. Oscillator assembly, end view.

ceiver chassis by taking out screws B (fig. 165) and lifting the receiver free of the tuning head.

l. To install the spare r-f tuning head, carefully place it in position in the receiver chassis and reverse the removal procedure.

145. Oscillator Tuning Drive Gear in Wavemeter

In order to replace the oscillator tuning drive gear (the drive assembly for variable capacitor 1) the following procedure is necessary:

a. Remove the side panels of the oscillator compartment by turning shock-proof fasteners ¼ turn counterclockwise.

b. Remove the lower mounting screws from the fibre insulators which attach the antenna sheath to the resonator.

c. Unsolder the three wires (black, white, and red) that come out of the shielded tube at the rear of the wavemeter.

d. With an Allen wrench, remove the large TUNING control knob and the two smaller knobs, AUX OSC and EYE ADJ.

e. Remove the ON-OFF and TRANS-REC switches by removing the locknuts and washers.

f. Remove the four mounting screws on the front panel which attach it to the black metal casting.

g. From the top panel, remove the three mounting screws located 4¼ inches from the rear end of the panel.

h. Grasp handles on top panel and pull slightly forward and upward and lift off completely.

i. Remove the top cover of the oscillator

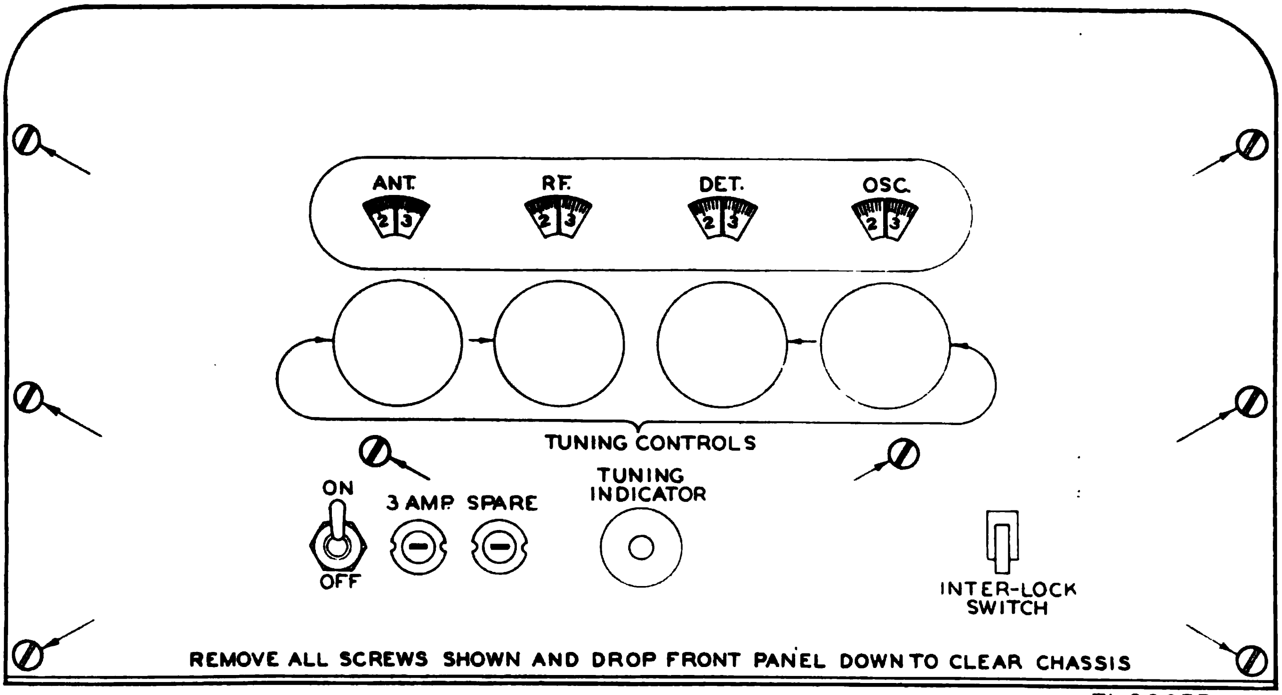


Figure 164. Removal of front panel of Receiver BC–1161–A.

compartment by removing the six screws which attach it to the oscillator compartment chassis.

j. Remove the knurled screw holding the tuning eye socket in place.

k. With an Allen wrench, loosen the setscrews which hold the large gear to the variable capacitor shaft, and remove the gear.

l. To install the new gear, reverse the removal procedure.

Note. Make certain that the capacitor plates are completely meshed and that the reduction gear shaft is turned counterclockwise as far as the lugs will allow. The large gear may now be engaged.

146. Carbon Brushes in Antenna Rotary Coupling

In order to replace the carbon brushes in the portion of the antenna rotary coupling used for IFF the following procedure is necessary (fig. 166):

a. Lift the rain cap clear of the connector assembly.

b. Unscrew connector assembly freeing coaxial line 111.

c. Unscrew small coupling assembly to which a brass cover is attached. Remove banana plug.

d. Remove six small bolts which hold the metal tube to the rotary joint assembly. Do not remove the six large screws at the base.

e. Lift off metal tube.

f. The six carbon brushes are now visible and may be removed by pulling out.

g. To replace, reverse procedure.

147. Mechanical Operation of Portion of Antenna Rotary Coupling Used for IFF (figs. 166 and 167).

a. The portion of the antenna rotary coupling used for IFF consists of two concentric tubes and a device for maintaining an electrical connection between the stationary and rotating coaxial cables. The inner tube is ¼ inch in diameter and 55 inches long while the outer tube is ¾ inch in diameter and 48 inches in length. They are held apart for their entire length by a number of polystyrene insulators or spacers that look like candy life savers. These polystyrene insulators are evenly distributed along the length of the two concentric tubes. The tubes, along with the IFF coupling device (rotary joint assembly on the top of the MC–398 coupling box), form the IFF coupling for the coaxial cables 106 and 111.

b. The inner tube has inserted in each end a

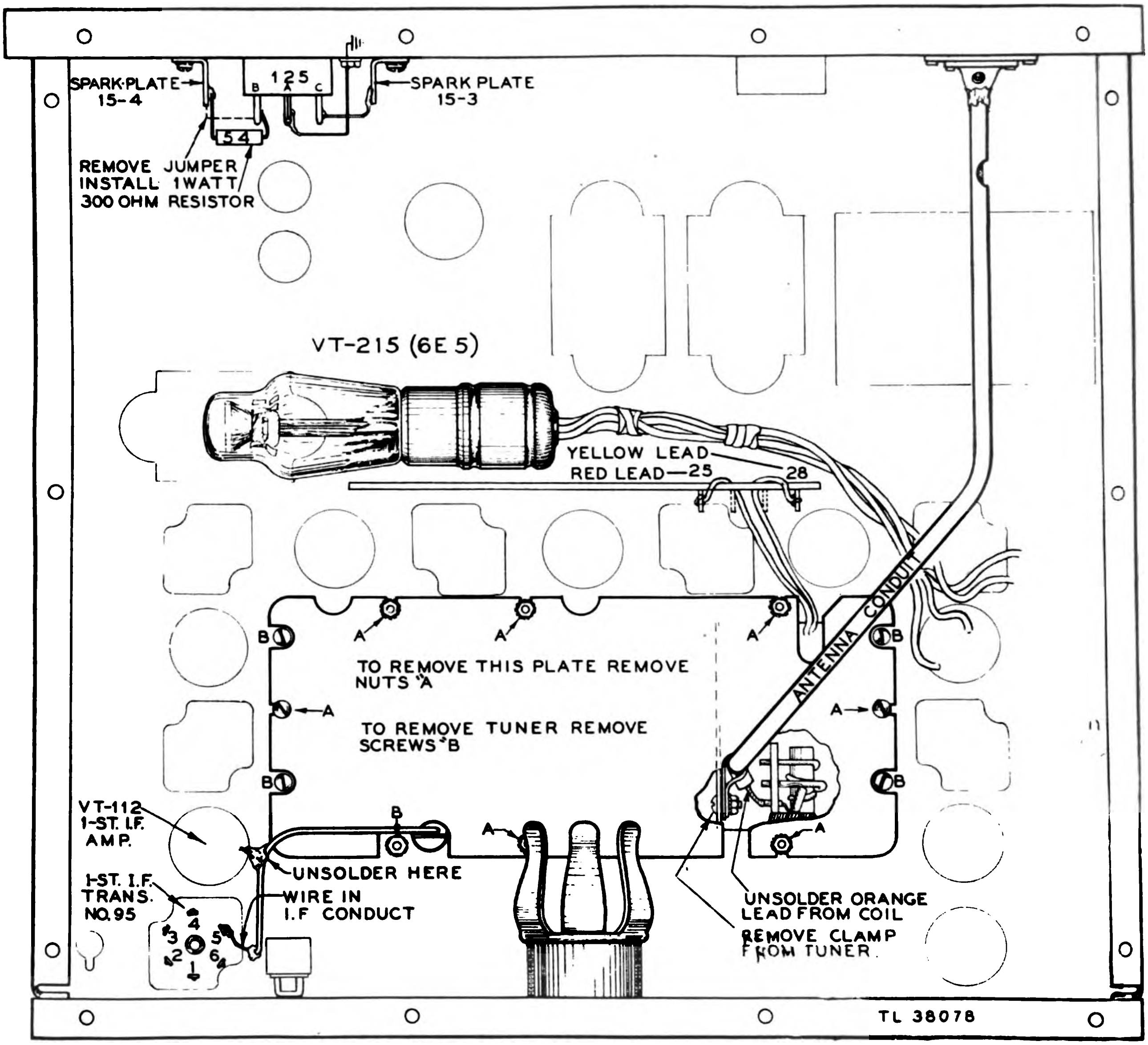


Figure 165. Diagram showing method of replacing r-f tuning head.

banana plug, which in turn is connected to the inner conductor of each cable. As the upper coaxial cable rotates with the antenna, the banana plug rotates in the inner tube, allowing the upper cable 111 to turn freely but constantly maintaining an electrical contact with the lower stationary cable 106. The outer conductors of cables 106 and 111 are connected to the outer concentric tube in the manner described in the chapter on installation of TM 11–1317. The outer conductors of cables 106 and 111 maintain their electrical contact with each other through the use of six small carbon brushes located in the metal tube which is joined to the rotary joint assembly on top of Coupling Box MC–398. The bottom of this tube has a flange with six round-head screws that fasten it to the rotary joint assembly (IFF coupling device). Do not confuse this flange with the one that fastens the rotary joint assembly to the top of the Coupling Box MC–398. On removing these screws the tube can slide free of the housing. There is a brass apron approximately 5/8 of an inch deep, on the bottom of this tube, that fits down into the housing. Set into the bottom of this apron are the six carbon brushes that rotate with the upper coaxial cable 111. These brushes can be removed very easily for replacement by grasp-

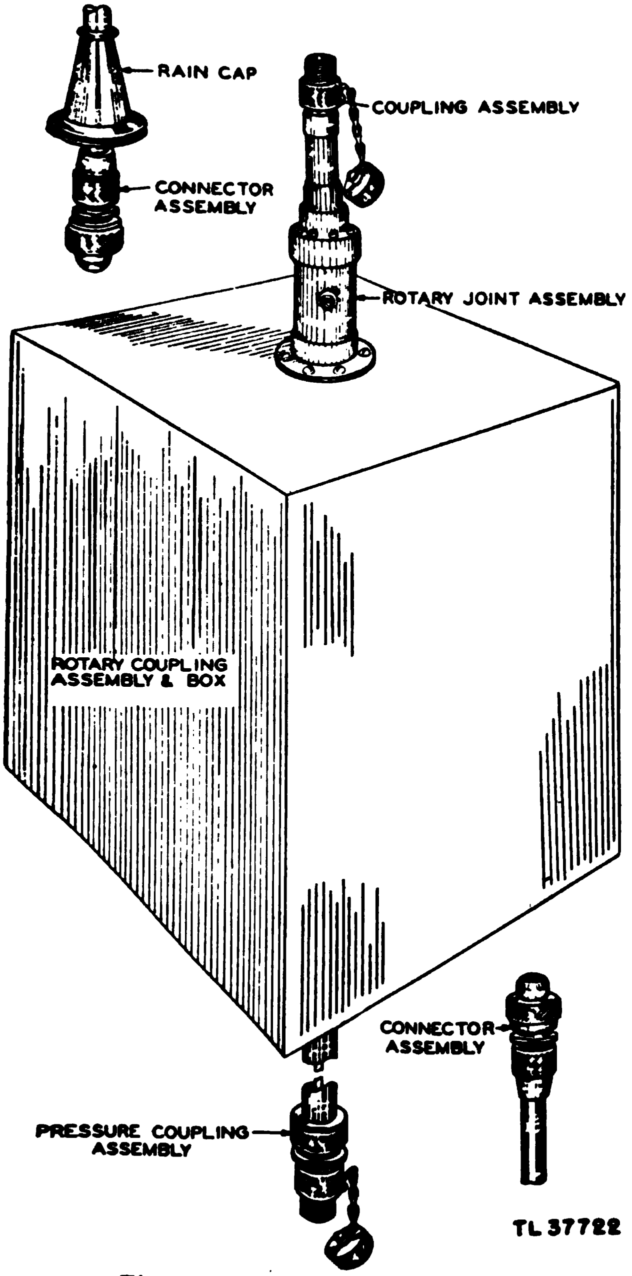


Figure 166. Coupling MC-398-B.

ing them with the fingers and pulling them free from their sockets. When putting in the new brushes, be careful not to bend or damage the small springs attached to the end of each brush for the purpose of keeping a firm contact.

c. To remove the rotary joint assembly housing loosen the small setscrew at the bottom. Turn the housing in a counterclockwise manner and it will lift up easily from the bearing case, brush contact, and ring arrangement. In lifting the housing care should be exercised so as not to damage the thin steel spring that sets down between the brush contact and the brush apron. The brush contact (top brass ring) is fastened to the lower outer tube and remains stationary. The bearing case contains small roller bearings which enable the housing and all the upper portions of this device to rotate freely around the stationary section. Great care should be taken to keep grit or sand from getting into or around the bearing case and its associated parts while it is open. If it becomes necessary to replace brushes, the rotary joint assembly need not be removed from the bearing case.

d. If this coupling device is kept properly lubricated through the zerk fitting and the brushes inspected according to schedule, it should give very efficient service. The lower section of the outer concentric tube, is held firmly in place and in a stationary position by the use of a spider mounted directly to the antenna trailer frame, under the turntable. A pressure coupling assembly is fastened to the outer concentric tube and it is at this point that cable 106 makes contact with the inner and outer concentric tubes by means of a coupling assembly and banana plug.

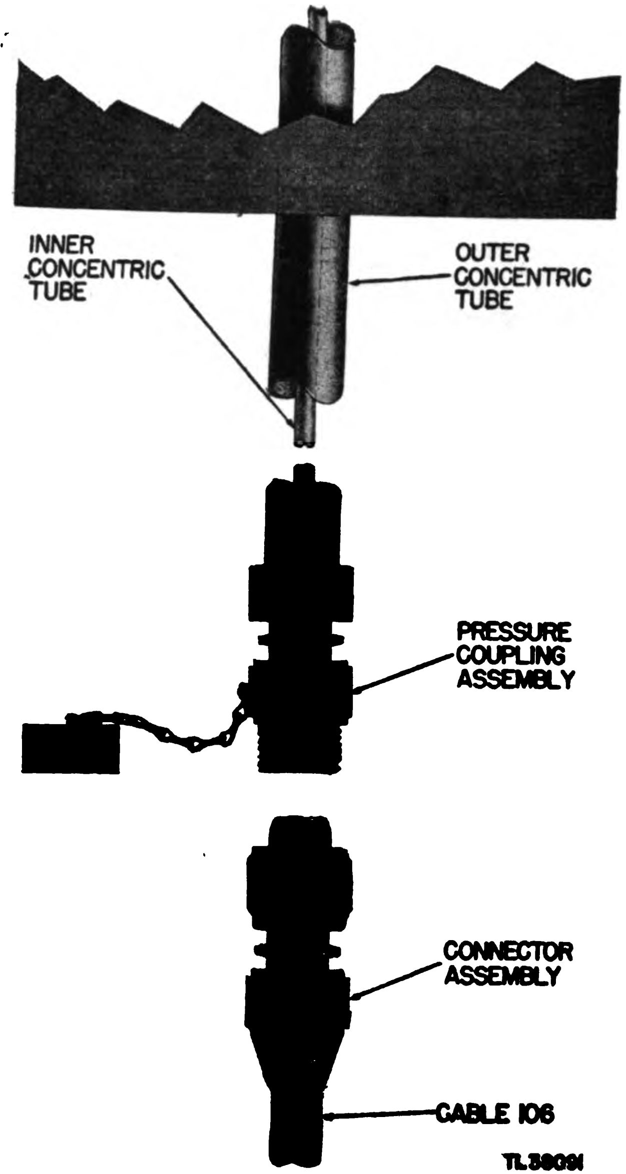
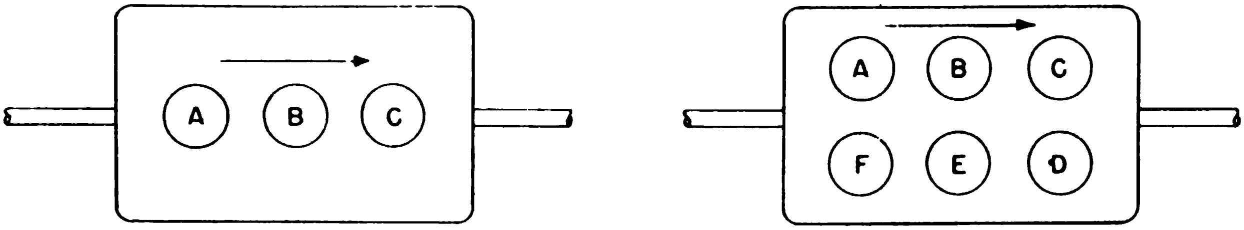


Figure 167. Detailed drawing of Coupling MC–398–B.

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

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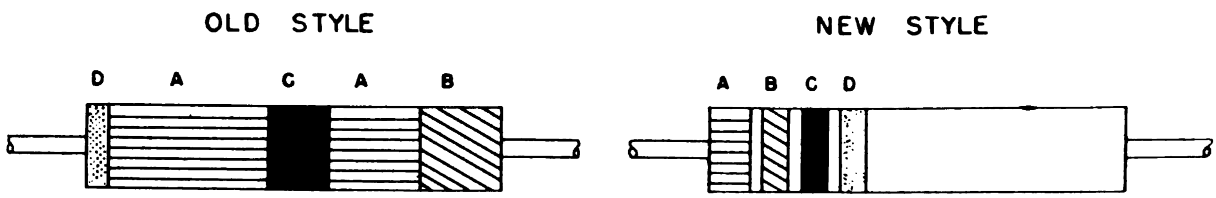
Figure 168. Color code, capacitor.

RESISTOR COLOR CODE

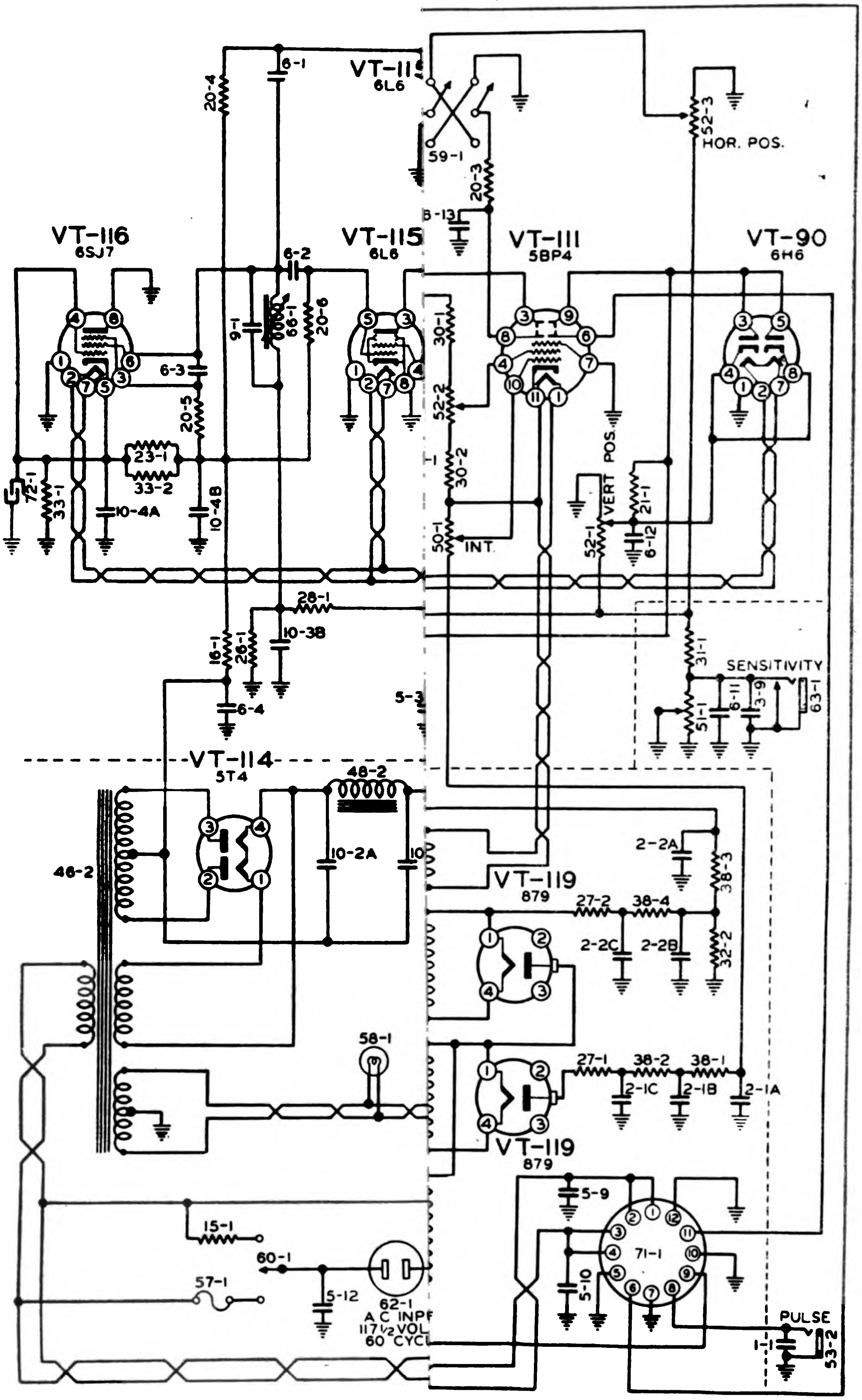


OLD STYLE	COLOR	NEW STYLE
BODY A	INDICATES FIRST SIGNIFICANT FIGURE OF RESISTANCE IN OHMS	BAND A
END B	INDICATES SECOND SIGNIFICANT FIGURE	BAND B
BAND OR DOT C	INDICATES MULTIPLIER	BAND C
END D	IF ANY, INDICATES TOLERANCE IN PER CENT OF THE NOMINAL RESISTANCE VALUE IF NO COLOR APPEARS TOLERANCE IS ±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

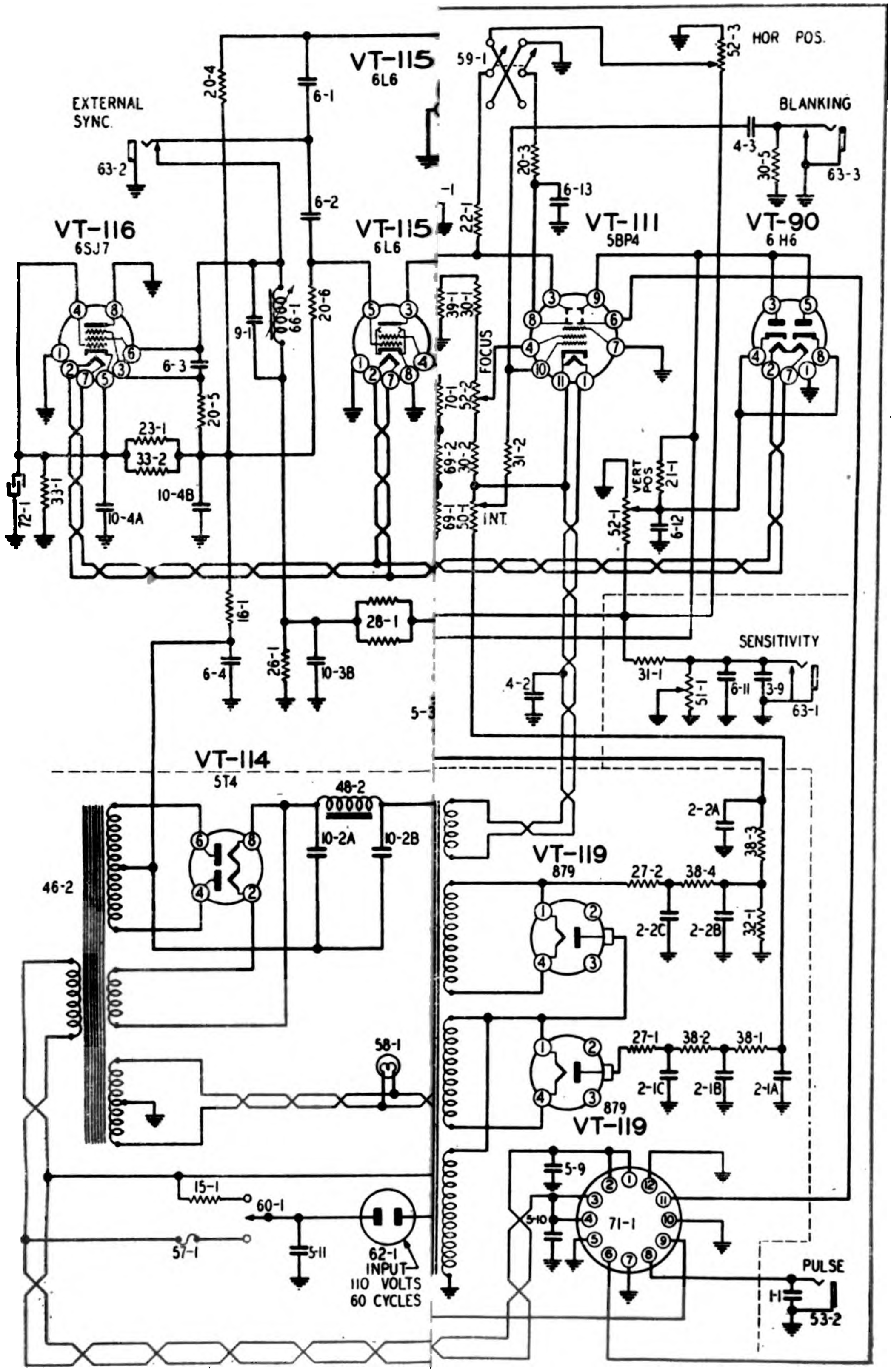
COLOR	SIGNIFICANT FIGURE	MULTIPLIER	TOLERANCE PER CENT (IF GIVEN)
BLACK	0	1	
BROWN	1	10	
RED	2	100	
ORANGE	3	1,000	
YELLOW	4	10,000	
GREEN	5	100,000	
BLUE	6	1,000,000	
VIOLET	7	10,000,000	
GRAY	8	100,000,000	
WHITE	9	1,000,000,000	
GOLD		0.1	5
SILVER		0.01	10
NO COLOR			20

TL 35620

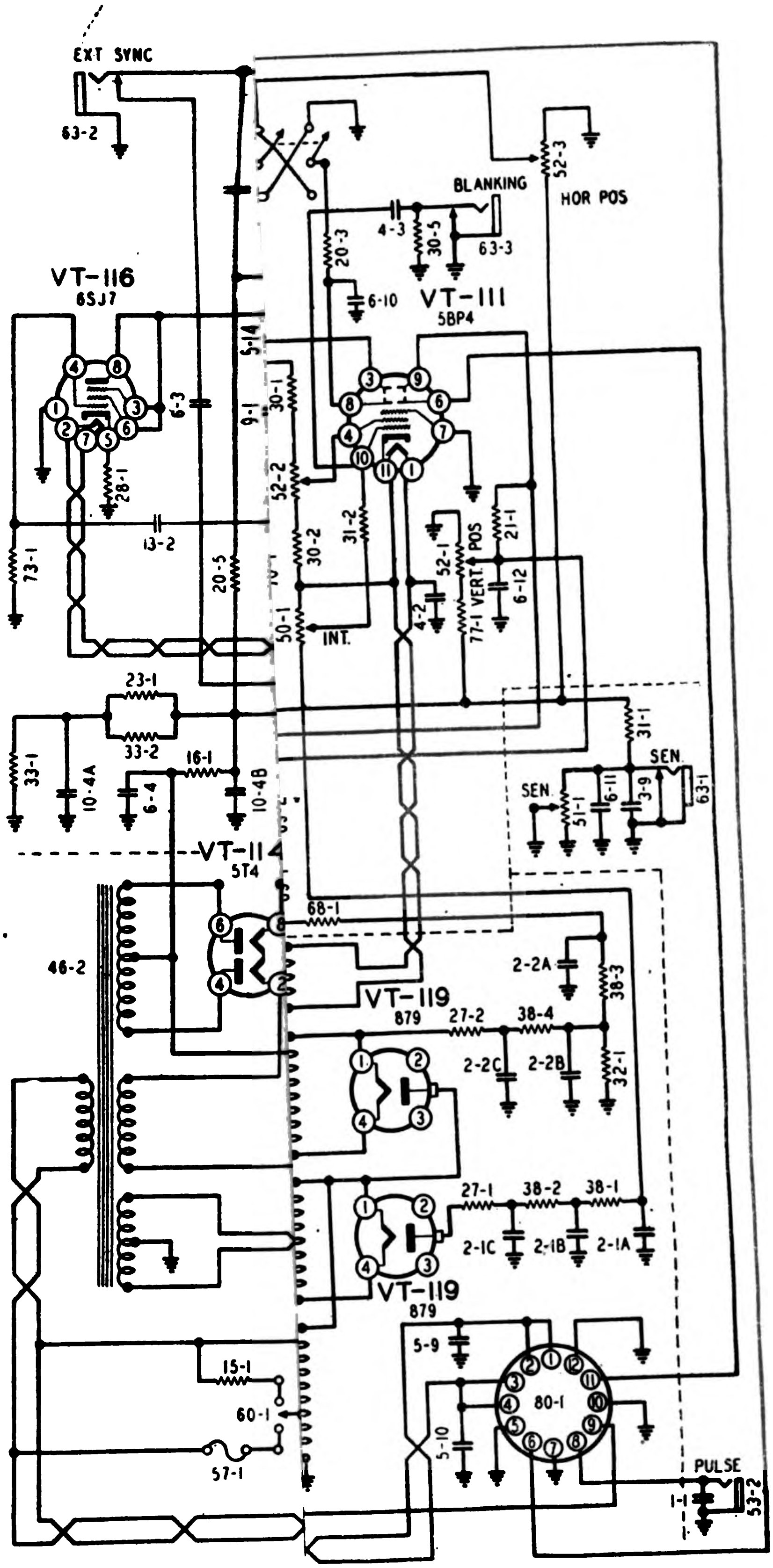
Figure 169. Color code, resistor.


VT-116
6SJ7
VT-115
6L6
VT-111
5BP4
VT-90
6H6
VT-114
5T4
VT-119
879
HOR. POS.
VERT POS.
INT.
SENSITIVITY
PULSE
48-2
46-2
59-1
71-1
62-1
A C INP
117½ VOL
60 CYC

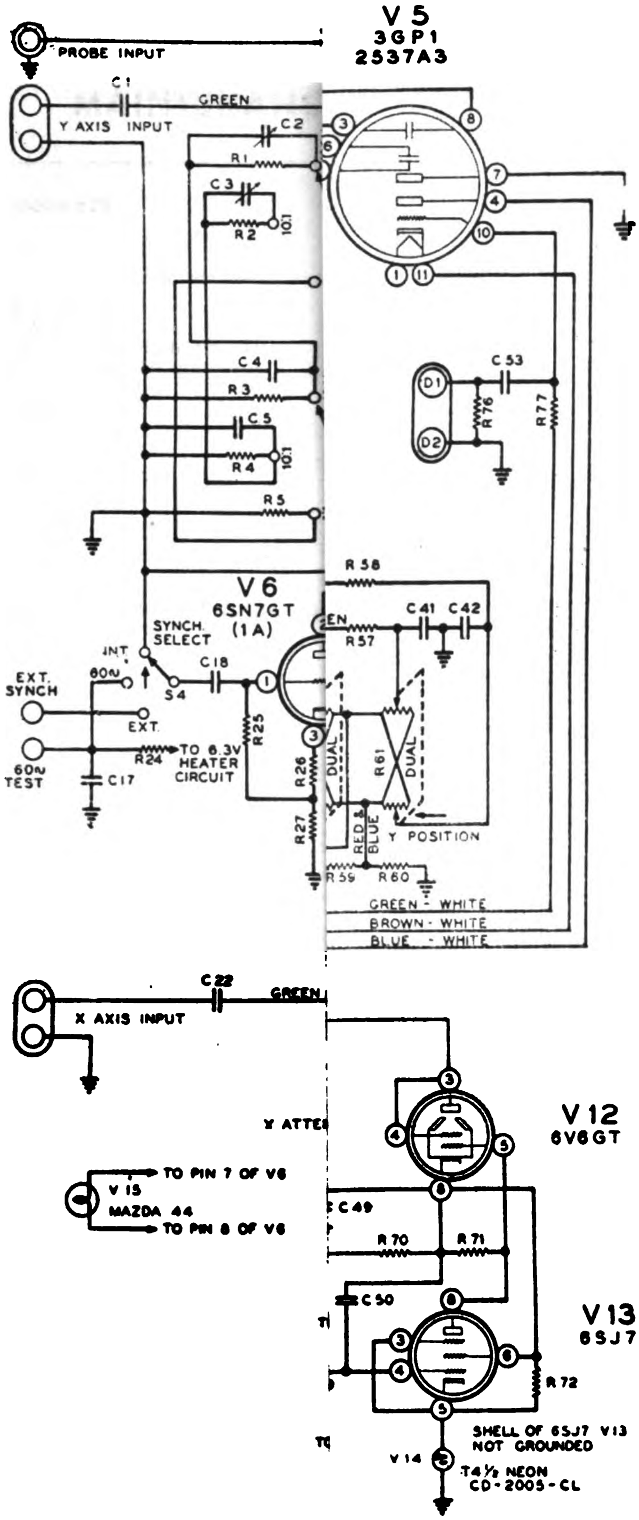
TL 36415


VT-115
6L6
EXTERNAL SYNC.
VT-116
6SJ7
VT-115
6L6
VT-111
5BP4
VT-90
6H6
HOR POS.
BLANKING
FOCUS
INT.
VERT POS
SENSITIVITY
VT-114
5T4
VT-119
879
VT-119
879
INPUT 110 VOLTS 60 CYCLES
PULSE

TL 36416


EXT SYNC
63-2
BLANKING
52-3
HOR POS
4-3
30-5
63-3
20-3
6-10
VT-111
5BP4
VT-116
6SJ7
6-3
5-14
9-1
30-1
52-2
28-1
13-2
73-1
20-5
30-2
31-2
52-1
POS
21-1
VERT
6-12
4-2
77-1
50-1
INT.
23-1
33-2
31-1
SEN.
16-1
33-1
10-4A
6-4
10-4B
SEN.
51-1
6-11
3-9
63-1
VT-114
5T4
46-2
68-1
2-2A
38-3
VT-119
879
27-2
38-4
2-2C
2-2B
32-1
27-1
38-2
38-1
2-1C
2-1B
2-1A
VT-119
879
5-9
80-1
15-1
60-1
5-10
57-1
PULSE
1-1
53-2

TL 36417


V 5
3GP1
2537A3
PROBE INPUT
C1
GREEN
Y AXIS INPUT
C2
R1
C3
R2
10:1
C4
R3
C5
R4
10:1
R5
C53
R76
R77
R58
V6
6SN7GT
(1A)
SYNCH. SELECT
INT.
60∿
EXT. SYNCH
S4
C18
C41 C42
R57
EXT.
R25
60∿ TEST
C17
R24
TO 6.3V HEATER CIRCUIT
R26
DUAL
R61
DUAL
R27
RED & BLUE
Y POSITION
R59
R60
GREEN - WHITE
BROWN - WHITE
BLUE - WHITE
C22
GREEN
X AXIS INPUT
V12
6V6GT
TO PIN 7 OF V6
V15
MAZDA 44
TO PIN 8 OF V6
C49
R70
R71
C50
V13
6SJ7
R72
SHELL OF 6SJ7 V13 NOT GROUNDED
V14
T4½ NEON CD-2005-CL

TL 36418

CHAPTER 4

MAINTENANCE PARTS LIST

148. Index to Major Components

Major components	*Reference symbol*
Antenna AN-125-A	A2A275-125A
Antenna AN-126-A	A2A275-126A
Antenna Matching Section MC-414-A	AMS
Cable and Connector Assemblies	C&C
Control Unit BC-1162-A	
Interconnector Section	CU
Wavemeter Section	WM
Dummy Antenna	DA
Mounting Accessories	MA
Oscilloscope BC-403-( )	O4G1668
Receiver BC-1161-A	R
Transmitter BC-1160-A	T

149. Maintenance Parts List for Radio Equipments RC-150 and RC-151

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock		3d ech	4th ech	Depot stock
						1st ech	2d ech			
T		1F6C1-8.25	BRAID, tinned, copper	ft	1			*		*
CU		1F6B1-3	BRAID, 1/8" flat rolled	ft	3 1/8			*		*
C&C		1F425-8	CABLE RG-8/U, 50 ohms impedance, Amphenol PT-5, (used with connector RC150/4 to make up cables #106 and #111). RC-150-B RC-150-D RC-150-C RC-151 RC-151-A RC-151-D	ft ft ft ft ft ft	120 120 210 71 155 205					* * * * * *
C&C		1A507	WIRE, messenger, 7 strand .080 steel wire (RC-150-B, RC-150-C, RC-150-D) (Belmont Radio Corp., Dwg. #B-14B-2218) (75 ft).	ea	1					*
C&C		1A507	WIRE, messenger, 7 strand .080 steel wire (RC-151-A) (Belmont Radio Corp., Dwg. #B-14B-2218-1) (35 ft).	ea	1					*
C&C		1A507	WIRE, messenger, 7 strand .080 steel wire (RC-151-D) (Belmont Radio Corp., Dwg. #B-14B-2218-2) (90 ft).	ea	1					*
C&C		3E1846	CABLE CD-846, (Belmont Radio Corp. Dwg. #D-201-410) cable #101.	ea	1					*
C&C		3E1847	CABLE CD-847, (Belmont Radio Corp., Dwg. #C-201-415) cable #102.	ea	1					*
C&C		3E1848	CABLE CD-848, (Belmont Radio Corp., Dwg. C-201-412) cable #103.	ea	1					*
C&C		1F432-849	CABLE CD-849, (Belmont Radio Corp., Dwg. #C-201-416) cable #104.	ea	1					*
C&C		1F432-850	CABLE CD-850, (Belmont Radio Corp., Dwg. #C-201-411) cable #105.	ea	1					*
C&C		3E1851	CABLE CD-851, (Belmont Radio Corp., Dwg. #C-201-413) cable #107.	ea	1					*
C&C		3E1852	CABLE CD-852, (Belmont Radio Corp., Dwg. #C-201-414) cable #108.	ea	1					*

* Indicates stock available.

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
C&C		3E1679	CABLE CD-679, (Belmont Radio Corp., Dwg. #C-201-272) cable #109.	ea	1					*
C&C		3E1661	CABLE CD-661, (Belmont Radio Corp., Dwg. #C-201-350) cable #110.	ea	1					*
T		3E7144-12	CABLE, plate assy. VT119, (Belmont Radio Corp., Dwg. #A-14B-2555).	ea	1					*
T		3E7144-11	CABLE, high voltage bleeder, (Belmont Radio Corp., Dwg. #A-14B-2556).	ea	1					*
WM		3E7144-13	CABLE ASSY, tuning eye, Special, (Belmont Radio Corp., Dwg. #B-208-328).	ea	1					*
AMS		1A812.12	WIRE, #12, solid, tinned, copper	ft	½					*
T		1A72	WIRE, #16, solid tin copper	ft	4					*
T		1B1116.6	WIRE, #16 strand, Aeroglass black, Lenz Electric Co.	ft	6					*
DA		1B1118.4	WIRE, #18 Aeroglass, 26 strand, Lenz Electric Co.	ft	¼					*
T, O, WM, CU		1A107	WIRE, #20 bare	ft	9¼					*
T, CU, R, WM		1B1120.25-1	WIRE, #20 solid Aeroglass red	ft	63					*
T		1B1120.4	WIRE, #20, solid, Aeroglass 5000 V test, brown, Lenz Electric Co.	ft	6					*
O		3E7144-6	WIRE, high voltage, Packard, (Belmont Radio Corp. Dwg. #A-55A-1803-4).	ft	20					*
T		1B1120.34	WIRE, #20, solid, Aeroglass 5000 V test, blue-yellow, Lenz Electric Co.	ft	4					*
T		1B1120.3-1	WIRE, #20, solid, Aeroglass 5000 V test, white, Lenz Electric Co.	ft	5½					*
DO		1B1120.16	WIRE, #20, solid, Aeroglass white-black, Lenz Electric Co.	ft	4					*
T		1B1120.6	WIRE, #20, solid, Aeroglass red-blue, Lenz Electric Co.	ft	3½					*
T		1B1120.10	WIRE, #20, solid, Aeroglass red-brown, Lenz Electric Co.	ft	4½					*
T		1B1120.9	WIRE, #20, solid, Aeroglass blue-brown, Lenz Electric Co.	ft	5½					*
T		1B1120.8	WIRE, #20, solid, Aeroglass blue-green, Lenz Electric Co.	ft	4½					*
T, R, CU, WM		1B1120.23-1	WIRE, #20, solid, Aeroglass blue, Lenz Electric Co.	ft	34½					*
T, R, CU, WM		1B1120.14-1	WIRE, #20, solid, Aeroglass orange, Lenz Electric Co.	ft	15					*
T, R, CU		1B1120.15-1	WIRE, #20, solid, Aeroglass green, Lenz Electric Co.	ft	32					*
T, R, CU, WM		1B1120.4-1	WIRE, #20, solid, Aeroglass brown, Lenz Electric Co.	ft	22					*
T, R, O, CU, WM		1B1120.3-2	WIRE, #20, solid, Aeroglass white, Lenz Electric Co.	ft	30					*
T, R, O, CU, WM		1B1120.35	WIRE, #20, solid, Aeroglass black, Lenz Electric Co.	ft	45					*
T, R, CU		1B1120.24-1	WIRE, #20, solid, Aeroglass yellow, Lenz Electric Co.	ft	29					*
T, CU		1B1120.16-1	WIRE, #20, solid, Aeroglass blue-orange, Lenz Electric Co.	ft	15					*
CU		1B1120.5-1	WIRE #20, solid, Aeroglass blue-yellow, Lenz Electric Co.	ft	6½					*
T, CU		1B1120.13-1	WIRE, #20, solid, Aeroglass red-black, Lenz Electric Co.	ft	22					*
T, CU, WM		1B1120.12-1	WIRE, #20, solid, Aeroglass red-yellow, Lenz Electric Co.	ft	26					*
T, WM		1B1120.7	WIRE, #20, solid, Aeroglass red-green, Lenz Electric Co.	ft	14					*
O		1B1120.38	WIRE, 10 x 30 strand, Aeroglass green, Lenz Electric Co.	ft	2					*
O		1B1120.11	WIRE, 10 x 30 strand, Aeroglass black, Lenz Electric Co.	ft	¾					*

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
O		1B1120.19-1	WIRE, 10 x 30 strand, Aeroglass orange.	ft	1					*
O		1B1120.20-1	WIRE, 10 x 30 strand, Aeroglass white, Lenz Electric Co.	ft	2					*
O		1B1120.22-1	WIRE, 10 x 30 strand, Aeroglass black-green, Lenz Electric Co.	ft	1					*
O		1B1120.21	WIRE, 10 x 30 strand, Aeroglass black-orange, Lenz Electric Co.	ft	1					*
O		1B1120.22-1	WIRE, 10 x 30 strand, Aeroglass black-green, Lenz Electric Co.	ft	4					*
O		1B1120.17-1	WIRE, 10 x 30 strand, Aeroglass red-black, Lenz Electric Co.	ft	½					*
R	7-1, 7-2	3D9002-8	CAPACITOR, ceramic, 2 mmf, ±12.5%, 500 VDCW, Erie Resistor Corp. type NPOK-2. (Belmont Radio Corp. Dwg. #A-8G-1311.)	ea	2		*	*	*	*
R	8	3D9005-20	CAPACITOR, ceramic, 5 mmf, ±0.5 mmf, 500 VDCW, Erie Resistor Corp. type NPOK-5. (Belmont Radio Corp. Dwg. #A-8G-2303.)	ea	1		*	*	*	*
CU	17	3D9005-24	CAPACITOR, ceramic, 5 mmf, ±20%, 500 VDCW, Erie Resistor Corp. type N-750K. (Belmont Radio Corp. Dwg. #A-8G-1312.)	ea	1		*	*	*	*
R	2	3D9010-40	CAPACITOR, ceramic, 10 mmf, ±5%, 500 VDCW, Central Radio Labs. type 8753. (Belmont Radio Corp. Dwg. #A-8G-1309.)	ea	1		*	*	*	*
R	5-1 thru 5-3	3D9010-15	CAPACITOR, ceramic, 10 mmf, ±5%, 500 VDCW, Erie Resistor Corp. type NPOK-10. (Belmont Radio Corp. Dwg. #A-8G-1830.) (This item also appears in RC150/3-15.)	ea	3		*	*	*	*
WM	9	3D9010-37	CAPACITOR, ceramic, 10 mmf, ±10%, 500 VDCW, Erie Resistor Corp. type NPOK-10. (Belmont Radio Corp. Dwg. #A-8G-2508.)	ea	1		*	*	*	*
R	1	3D9020-5.1	CAPACITOR, ceramic, 20 mmf, ±10%, 500 VDCW, Erie Resistor Corp. type NPOL-15. (Belmont Radio Corp. Dwg. #A-8G-2356.)	ea	1		*	*	*	*
R	6-1 thru 6-3	3D9025-33.1	CAPACITOR, ceramic, 25 mmf, ±0.5 mmf, 500 VDCW, Erie Resistor Corp. type NPOL-25. (Belmont Radio Corp. Dwg. #A-8G-1310.)	ea	3		*	*	*	*
T	13	3D9035-6	CAPACITOR, ceramic, 35 mmf, ±10%, 500 VDCW, Erie Resistor Corp. type N-750-K. (Belmont Radio Corp. Dwg. #A-8G-1559.)	ea	1		*	*	*	*
WM	4-1, 4-2	3D9040-9	CAPACITOR, ceramic, 40 mmf, ±5%, 500 VDCW, Erie Resistor Corp. type N750K. (Belmont Radio Corp. Dwg. #A-8G-752.)	ea	2		*	*	*	*
R	3-1 thru 3-11	3D9040-14	CAPACITOR, ceramic, 40 mmf, ±10%, 500 VDCW, Erie Resistor Corp. type N750K-40. (Belmont Radio Corp. Dwg. #A-8G-2305.)	ea	11		*	*	*	*
CU	18	3D9040-16	CAPACITOR, mica, 40 mmf, ±10%, 500 VDCW, Micamold Radio Corp. type O. (Dwg. #B-8F-1942. Belmont Radio Corp.)	ea	1		*	*	*	*

* Indicates stock available.

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
T	14-1, 14-2	3D9050-49	CAPACITOR, ceramic dielectric, moisture resistant, fixed, 50 mmf, ±10%, 500 VDCW, Erie Resistor Corp. type M750K. (Belmont Radio Corp. Dwg. #A-8G-1557.)	ea	2		*	*	*	*
T	15	3D9050-33	CAPACITOR, fixed, silver mica, 50 mmf, ±10%, 500 VDCW, Micamold Radio Corp. type PO. (Belmont Radio Corp. Dwg. #B-8F-1554.)	ea	1		*	*	*	*
CU	7	3K2075032	CAPACITOR, mica, 75 mmf, ±5%, 500 VDCW, Micamold Radio Corp. type O. (Belmont Radio Corp. Dwg. #B-8F-693.)	ea	1		*	*	*	*
R	4-1, 4-2	3D9100-65	CAPACITOR, ceramic, 100 mmf, ±10%, 500 VDCW, Erie Resistor Corp. type N750L-100. (Belmont Radio Corp. Dwg. #A-8G-2306.)	ea	2		*	*	*	*
T	16	3D9100-65	CAPACITOR, ceramic, 100 mmf, ±10%, 500 VDCW, Erie Resistor Corp. type N750L. WE Co. ESO-690310-17. (Belmont Radio Corp. Dwg. #A-8G-1558.)	ea	1		*	*	*	*
R	16	3K2010111	CAPACITOR, mica, 100 mmf, ±10%, 500 VDCW, Micamold Radio Corp. type O. (Belmont Radio Corp. Dwg. #B-8F-1556.)	ea	1		*	*	*	*
T, WM	4-1, 4-2, 2-1, 2-2	3K2010111	CAPACITOR, silver mica, 100 mmf, ±10%, 500 VDCW, Micamold Radio Corp. type O. (Belmont Radio Corp. Dwg. #B-8F-1560.)	ea	4		*	*	*	*
CU	9, 16	3D9100-95.1	CAPACITOR, mica, 100 mmf, +40-10%, 500 VDCW, Micamold Radio Corp. type O. (Belmont Radio Corp. Dwg. #B-8F-1548.)	ea	2		*	*	*	*
T	5	3D9150-13	CAPACITOR, mica, 150 mmf, +3-20%, 1200 VDCW, Micamold Radio Corp. type 5. (Belmont Radio Corp. Dwg. #A-8L-1490.)	ea	1		*	*	*	*
CU	5-1	3D9180-1	CAPACITOR, mica, 180 mmf, ±3%, 500 VDCW, Micamold Radio Corp. type O. (Belmont Radio Corp. Dwg. #B-8F-1850.)	ea	1		*	*	*	*
CU	19	3D9200-43	CAPACITOR, mica, 200 mmf, +40-10%, 500 VDCW, Micamold Radio Corp. type O. (Belmont Radio Corp. Dwg. #B-8F-1943.)	ea	1		*	*	*	*
T	8	3D9250-40	CAPACITOR, mica, 250 mmf, ±2%, 1,200 VDCW, Micamold Radio Corp. type 5. (Belmont Radio Corp. Dwg. #A-8L-1493.)	ea	1		*	*	*	*
CU	6-1	3D9250-42	CAPACITOR, mica, 250 mmf, +40-10%, 500 VDCW, Micamold Radio Corp. type O. (Belmont Radio Corp. Dwg. #B-8F-1546.)	ea	1		*	*	*	*
T	7	3D9500-79.1	CAPACITOR, mica, 500 mmf, ±2%, 1,200 VDCW, Micamold Radio Corp. type 5. (Belmont Radio Corp. Dwg. #A-8L-1492.)	ea	1		*	*	*	*

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech
T	6-1, 6-2	3D9890	CAPACITOR, mica, 890 mmf, ±2%, 1200 VDCW, Micamold Radio Corp. type 5. (Belmont Radio Corp. Dwg. #A-8L-1491.)	ea	2		*	*	*
T	1-1, 1-2	3DA1-70	CAPACITOR, mica, 1,000 mmf, ±10%, 500 VDCW, Micamold Radio Corp. type W. (Belmont Radio Corp. Dwg. #B-8F-985.)	ea	2		*	*	*
CU	8	3DA1-100-2	CAPACITOR, mica, 1,100 mmf, ±8%, 500 VDCW, Solar Mfg. Co. type MWW. (Belmont Radio Corp. Dwg. #B-8F-1594.)	ea	1		*	*	*
R	10-1 thru 10-6	3DA2-66	CAPACITOR, mica, 2,000 mmf, ±10%, 500 VDCW, Micamold Radio Corp. type W. (Belmont Radio Corp. Dwg. #B-8F-1308.)	ea	6		*	*	*
CU	15	3DA3-35	CAPACITOR, mica, 3,000 mmf, ±20%, 500 VDCW, Solar Mfg. Co. type MWW. (Belmont Radio Corp. Dwg. #B-8F-1941.)	ea	1		*	*	*
R	9-1 thru 9-17	3DA5-32	CAPACITOR, mica, 5,000 mmf, ±10%, 500 VDCW, Micamold Radio Corp. type W. (Belmont Radio Corp. Dwg. #B-8F-512.) (This item also appears in items RC150/13-2 and RC150/13-3.)	ea	17		*	*	*
CU	11-1 thru 11-8	3DA6-45	CAPACITOR, fixed, paper, 6,000 mmf, ±20%, 600 VDCW, Micamold Radio Corp. type 340-24. (Belmont Radio Corp. #A-8J-1851.)	ea	8		*	*	*
CU	4-1 thru 4-3, 5-9 thru 5-10	3DA10-140.2	CAPACITOR, paper, 10,000 mmf, ±20%, 400 VDCW, Micamold Radio Corp. type 340-21. (Belmont Radio Corp. Dwg. #A-8J-1627.)	ea	5		*	*	*
WM	3-1, 3-2	3DA10-140.1	CAPACITOR, molded paper, 10,000 mmf, +30-10%, 400 VDCW, Micamold Radio Corp. type 340-21. (Belmont Radio Corp. #A-8J-696.)	ea	2		*	*	*
DO	C-53	3DA10-186	CAPACITOR, paper, 10,000 mmf, ±20%, 1,600 VDCW, Solar Mfg. Co. type XT1M16-01. (Belmont Radio Corp. #A-8B-2172.)	ea	1			*	*
WM	5	3DA50-42.3	CAPACITOR, molded, 50,000 mmf, ±10%, 400 VDCW, Micamold Radio Corp. type 342-33. (Belmont Radio Corp. Dwg. #A-8J-1472.)	ea	1		*	*	*
CU	14-1 thru 14-4	3DA50-57.1	CAPACITOR, paper, 50,000 mmf, ±10%, 400 VDCW, Micamold Radio Corp. type 345-22. (Belmont Radio Corp. Dwg. #A-8J-1995.)	ea	4		*	*	*
T, WM	17, 6	3DA100-113	CAPACITOR, molded paper, 100,000 mmf, ±10%, 400 Micamold Radio Corp. type 345-21. (Belmont Radio Corp. Dwg. #A-8J-909.)	ea	2		*	*	*
R CU	12-1 thru 12-5 10-1 thru 10-9	3DA100-112.1	CAPACITOR, paper, 100,000 mmf, ±20%, 400 VDCW, Micamold Radio Corp. type 345-21. (Belmont Radio Corp. Dwg. #A-8J-1626.)	ea	14		*	*	*

* Indicates stock available.

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock		3d ech	4th ech	Depot stock
						1st ech	2d ech			
T	2A, 2B, 3A, 3B	3DA100-183.1	CAPACITOR, paper, 100,000-100,000 mmf, +20-10%, 600 VDCW, Sprague Specialty Co. type P-3043. (Belmont Dwg. #A-8B-1255.)	ea	2	----	*	*	*	*
T	11	3DA100-173	CAPACITOR, oil, 100,000 mmf, +100-0%, 7,000 VDCW, Sprague Specialty Co. type P-3041. (Belmont Radio Corp. Dwg. #B-8B-1170.)	ea	1	----	*	*	*	*
R, CU	14, 2-1, 2-2	3DB1.1104	CAPACITOR, paper, 1 mfd, +20-10%, 400 VDCW, oil, Solar Mfg. Co. type XDM-RAW4-1-1020. (Belmont Radio Corp. Dwg. #A-8B-1104.)	ea	3	----	*	*	*	*
CU	3-1 thru 3-4	3DB1.1988	CAPACITOR, oil, 1 mfd, +30-10%, 600 VDCW, Solar Mfg. Co. type XDMRAW. (Belmont Radio Corp. Dwg. #A-8B-1988.)	ea	4	----	*	*	*	*
T	12	3DKB2-19	CAPACITOR, paper, 2 mfd, +20-10%, 400 VDCW, Sprague Specialty Co. type P-3044. (Belmont Radio Corp. Dwg. #A-8B-1254.)	ea	1	----	*	*	*	*
T	10-1, 10-2	3DB2.3042	CAPACITOR, paper, 2 mfd, +20-10%, 1,000 VDCW, Sprague Specialty Co. type P-3042. (Belmont Radio Co. #B-8B-1252.)	ea	2	----	*	*	*	*
CU	1A, 1B, 1C	3DB5-26	CAPACITOR, 2.5-2.5-5.0 mfd, +20-10%, 600 VDCW, Micamold Radio Corp. type S-1481-P. (Belmont Radio Corp. Dwg. #C-8B-1256.)	ea	1	----	*	*	*	*
T	9-1, 9-2	3DB4-87	CAPACITOR, paper, 4 mfd, +20-10%, 600 VDCW, Sprague Specialty Co. type P-3040. (Belmont Radio Co. #B-8B-1253.)	ea	2	----	*	*	*	*
R	13-1 thru 13-3	3DB7-2	CAPACITOR, oil, 7 mfd, +30-10%, 600 VDCW, Micamold Radio Corp. type BM-324-19. (Belmont Radio Corp. Dwg. #B-8C-1139.)	ea	3	----	*	*	*	*
O	72	3DB2000-4.1	CAPACITOR, electrolytic, 2,000 mfd, 15 VDCW. (Belmont Radio Corp. Dwg. #A-8B-2184.)	ea	1	----	*	*	*	*
WM	1	3D9012VE5-1	CAPACITOR, air trimmer, 2.5-12.5 mmf, American Steel Package. (Belmont Radio Corp. Dwg. #A-8H-1475.)	ea	1	----	----	----	----	*
R	102	3C323-4A	COIL, choke, filter, Jefferson Electric Co. type 466-001-087. (Belmont Radio Corp. Dwg. #B-16B-1137.)	ea	1	----	----	----	*	*
T	135A, 135B	3C323-4N	COIL, choke, filter 30H, Jefferson Electric Co. type 466-001-085. (Belmont Radio Corp. Dwg. #C-16B-1161.)	ea	1	----	----	----	*	*
CU	121A, 121B	3C323-4K	COIL, choke, filter, 9.5H, Jefferson Electric Co. type 466-001-095. (Belmont Radio Corp. Dwg. #C-16B-1317.)	ea	1	----	----	----	*	*
R	94	3C323-4C	COIL, cathode, choke, special. (Belmont Radio Corp. Dwg. #A-17A-1194.)	ea	1	----	----	----	*	*
R	100-1 thru 100-6	3C323-4B	COIL, heater, choke, special. (Belmont Radio Corp. Dwg. #A-17A-1195.)	ea	6	----	----	----	*	*
R	93	2C5066-1161A/C3	COIL, oscillator, tuning. (Belmont Radio Corp. Dwg. #B-0204-213.)	ea	1	----	----	----	*	*

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech
WM	90	3C1081-12A	COIL, oscillator, special. (Belmont Radio Corp. Dwg. #B-3N-1482.)	ea	1				*
R	92-1, 92-2	2C5066-1161A/C2	COIL, RF and detector tuning special. (Belmont Radio Corp. Dwg. #B-204-212.)	ea	2				*
R	91	2C5066-1161A/C1	COIL, antenna tuning, special. (Belmont Radio Corp. Dwg. #B-204-214.)	ea	1				*
WM	91, 92	3C323-4M	COIL, choke Ass'y. (Belmont Radio Corp. Dwg. #A-201-329.)	ea	2				*
CU	120	3C1084N-2	COIL, timer, ass'y, special. (Belmont Radio Corp. Dwg. #B-204-382.)	ea	1				*
T	140-A, 140-B, 140-C, 140-D	2C6596-1160A/A1	OIL, inductance (artificial line). (Belmont Radio Corp. Dwg. #B-203-248.)	ea	1				*
R	99, 5-3	2Z9645	TRANSFORMER ASSEMBLY, tuning indicator, consists of an inductance Aladdin Radio Industries Cat. #41-356, and a capacitor, 10 mmf., ceramic, ±5%, 500 VDCW, Erie Resistor Corp. #NPOK-10. (Belmont Radio Corp. Dwg. #A-8G-1830.) (This capacitor also shown as Item #RC150/2-5.) Inclosed in a can. (Belmont Radio Corp. Dwg. #B-13H-1135.)	ea	1				*
C&C	CD-679	2Z7112.16	CONNECTOR, American Phenolic Corp. AN-3106-12S-3P. Belmont Radio Corp. Dwg. #C-55A-1678.)	ea	1				
C&C	CD-846	2Z7226-Q262	CONNECTOR, American Phenolic Corp. AN-3108W-24-3P. (Belmont Radio Corp. Dwg. #C-55A-1689.)	ea	1				
C&C	CD-851	2Z7112.39	CONNECTOR, American Phenolic Corp. AN-1308W-20-5P. (Belmont Radio Corp. Dwg. #C-55A-1699.)	ea	1				
WM	125	6Z7798-3	CONNECTOR, American Phenolic Corp. AN-3102G-20-5P. (Belmont Radio Corp. Dwg. #A-55A-1529.)	ea	1		*		
C&C	CD-661, CD-846	2Z7113.40	CONNECTOR, American Phenolic Corp. AN-3106W-20-6P. (Belmont Radio Corp. Dwg. #C-55A-1691.)	ea	2				
T	108	2Z7112.6	CONNECTOR, American Phenolic Corp. AN-3102-22-8P. (Belmont Radio Corp. Dwg. #A-55A-1275.)	ea	1		*		
C&C	CD-847	2Z7112.50	CONNECTOR, American Phenolic Corp. AN-3108W-22-11P. (Belmont Radio Corp. Dwg. #C-55A-1693.)	ea	1				
C&C	CD-846	2Z8685-5	CONNECTOR, American Phenolic Corp. AN-3108W-48-1S. (Belmont Radio Corp. Dwg. #C-55A-1686.)	ea	1				
T	107	2Z8799-242	CONNECTOR, 7 contact, Control Unit, American Phenolic Corp. AN-3102-24-3S. (Belmont Radio Corp. Dwg. #A-55A-1273.)	ea	1		*		
C&C	CD-679	2Z7226-175	CONNECTOR, American Phenolic Corp. AN-3106-12S-3S. (Belmont Radio Corp. Dwg. #C-55A-1675.)	ea	1				

* Indicates stock available.

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock		3d ech	4th ech	Depot stock
						1st ech	2d ech			
T	106	2Z8672.17	CONNECTOR, 2 contact, American Phenolic Corp. AN-3102-20-5S. (Belmont Radio Corp. Dwg. #A-55A-1272.)	ea	1		*			*
C&C	CD-851	2ZK7112.3	CONNECTOR, American Phenolic Corp. AN-3108W-20-5S. (Belmont Radio Corp. Dwg. #C-55A-1700.)	ea	1					*
C&C	CD-848	2Z8672.63	CONNECTOR, American Phenolic Corp. AN-3106W-22-8S. (Belmont Radio Corp. Dwg. #C-55A-2328.)	ea	1					*
T	109	2Z8672.15	CONNECTOR, American Phenolic Corp. AN-3102-22-11S. (Belmont Radio Corp. Dwg. (#A-55A-1274.)	ea	1		*			*
C&C	CD-847	2Z8672.56	CONNECTOR, American Phenolic Corp. AN-3106W-22-11S. (Belmont Radio Corp. Dwg. #C-55A-1692.)	ea	1					*
C&C	CD-848	6Z7592	CONNECTOR, General Electric Co. #2721. (Belmont Radio Corp. Dwg. #A-19A-2347.)	ea	1					*
T		6Z3151/1	CONNECTOR, Cord, Hubbel, Graybar #7465. (Belmont Radio Corp. Dwg. #A-55A-2301.)	ea	1		*			*
WM	124	2Z7112.22	CONNECTOR, American Phenolic Corp. ZB-3102G-12S-3P. (Belmont Radio Corp. Dwg. #A-55A-1750.)	ea	1		*			*
T	105	2Z7111.61	CONNECTOR, Coaxial Ant., American Phenolic Corp. AN-3102-22-2S. (Belmont Radio Corp. Dwg. #A-55A-2071.)	ea	1		*			*
DA		2Z7111.56	CONNECTOR, Insert. (Belmont Radio Corp. Dwg. #A-55A-2082.)	ea	1					*
O	80	2Z8682.16	CONNECTOR, American Phenolic Corp. Dwg. #AN-3102-24-684-S. (Belmont Radio Corp. Dwg. #A-55A-1808.)	ea	1		*			*
C&C		2Z7122.17	CONNECTOR. (Belmont Radio Corp. Dwg. #C-55A-2314.)	ea	1					*
R	129-1, 129-2	2Z5531.2	JACK, closed circuit, Chicago Telephone Co. type J-307. Belmont Radio Corp. Dwg. #A-44B-1314.)	ea	2		*			*
MA		6Z7809-1	OUTLET, Duplex, Convenience, Hubble #9575. (Belmont Radio Corp. Dwg. #A-5E-2178.)	ea	1		*			*
CU	105	2Z7125	PLUG, 15 contact; Amphenol #AN-3102-48-1P (Male receptacle, aluminum alloy). (Belmont Radio Corp. Dwg. #B-55A-1527.)	ea	1		*			*
C&C		2Z7110-8	PLUG, Male Assembly. (Belmont Dwg. #201-473.)	ea	1		*			*
T		6Z7813-3	RECEPTACLE, Hubble, #11616. (Belmont Radio Corp. Dwg. #A-55A-1288.)	ea	1		*			*
C&C	Cable #106 & #111	2Z7111.60	SELECTOR, male fitting. (Belmont Radio Corp. Dwg. #A-55A-2162 or B-55A-2244.)	ea	6					*
R	124	2Z8672.1	SOCKET, 2 contact, American Phenolic Corp. AN-3102-22-11P (cable connector, AC input, male). (Belmont Radio Radio Corp. Dwg. #A-55A-1108.)	ea	1		*			*

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
CU	106	2Z8672.10	SOCKET, 2 contact, Amphenol AN-3102G-12S-3S (female receptacle, aluminum alloy, Belmont Radio Corp. Dwg. #A-55A-1749.)	ea	1		*			*
R	125	2Z8673.2	SOCKET, 3 contact, cable connector, output gain, female, aluminum; mounting flange 1½″ square with 3 socket sheeve inserts for #16AWG wire; 4 mounting holes. 12″ dia., protruding length front 27/32″, coupling 1¼″, 18 thds. per inch; overall length 1¾″. (American Phenolic Corp. AN-3102-20-6S, Belmont Radio Corp. Dwg. #C-55A-1106.)	ea	1		*			*
CU, R	135, 135	3Z1950	FUSE, 3 amp., 250 V., Littlefuse type 3AG. (Dwg. #A-46B-1287.)	ea	2	*	*	*	*	*
T	141-1, 141-2	3Z1925	FUSE, 5 amp., Littlefuse type 3AG. (Dwg. #A-46B-1109.)	ea	2	*	*	*	*	*
T, R, CU		3Z3275	FUSE HOLDER, Littlefuse type 1075. (Dwg. #A-55A-1076.)	ea	4		*	*	*	*
AMS		3G1150-48	ASSEMBLY, Micalex Spacer. (Belmont Radio Corp. Dwg. #A-202-402.)	ea	1					*
AMS		3G1150-56	ASSEMBLY, Micalex, Spacer End. (Belmont Radio Corp. Dwg. #A-202-403.)	ea	1					*
T		2Z750-1	BOARD, X-L Spacer 4.187″ spec. (Belmont Radio Corp. Dwg. #A-6C-1847.)	ea	1					*
MA		3G1775-12	BUSHING, Fibre Insulating. (Belmont Dwg. #A-5D-2243.)	ea	4			*	*	*
T		3G1837-20.1	CAP, Insulating. (Belmont Dwg. #A-5G-1154.)	ea				*	*	*
WM		6Z4856	GROMMET, Black Rubber, 7/16″ O.D. Atlantic India Rubber Works. (Belmont Radio Corp. Dwg. #25A-1653.)	ea			*	*	*	*
O		3G1838-92.1	INSULATION, 4¾″ long. (Belmont Radio Corp. Dwg. #A-7A-2174.)	ea						*
CU		3G1838-70	INSULATOR, blk. bak. 1.625″ x 4.375″, 10 holes. (Belmont Radio Corp. Dwg. #A-7A-1432.)	ea						*
A		3G1550-28	INSULATOR. (Belmont Radio Corp. Dwg. #A-7A-2213.)	ea						*
T, WM		3G1838-27.4	INSULATOR, blk. bak., 1.687″ x .875″, 2 holes. (Belmont Radio Corp. Dwg. #A-7A-1188.)	ea						*
T, WM, CU		3G1838-36.4	INSULATOR, blk. bak., .625″ x 2.25″, 2 holes. (Belmont Radio Corp. Dwg. #A-7A-1282.)	ea						*
T		3G1250-10.4	INSULATOR, Steatite, ½″ dia. x ⅝″ long spec. (General Ceramic Co. Dwg. #A-5F-1120.)	ea			*			*
T		3G1250-16.13	INSULATOR, Ceramic, ¾″ dia. x 1½″ long, spec. (General Ceramic Co. Dwg. #A-5F-1121.)	ea			*			*
T		3G1000-11.1	INSULATOR, Standoff, Steatite. (General Ceramic Co. #1076-00, Belmont Radio Corp. Dwg. #A-5F-1122.)	ea			*			*
WM		3G1838-82	INSULATOR, Transmission Line, nat. bak., ⅜″ x ½″ x ½″. (Belmont Radio Corp. Dwg. #A-6C-1535.)	ea						*

* Indicates stock available.

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
C&C		3G1780-89	INSULATOR, Fish Paper. (Belmont Radio Corp. Dwg. #A-41C-2505.)	ea						*
T		3G1838-36.2	INSULATOR, Socket Support. (Belmont Radio Corp. Dwg. #A-7A-1844.)	ea						*
AMS		2Z8552-3	SLEEVE, Rubber, 5/8" O.D. x 5/8" Special. (Belmont Radio Corp Dwg. #A-25G-1671.)	ea						*
CU		3G2425-1	SPAGHETTI, 5/32" Hiflex	ft	3/4					*
T		3G1100-88	SUPPORT, Line Insulating ceramic 5½" long. (Belmont Radio Corp. Dwg. #A-5F-1124.)	ea			*			*
T		3G2300-126	TUBE, Insulating, 7.875" long. (Belmont Radio Corp. Dwg. #A-5G-1093.)	ea			*			*
T		6L50514.2	WASHER, Bakelite. (Belmont Radio Corp. Dwg. #A-29B-1178.)	ea			*	*	*	*
T		6L50204	WASHER, Bakelite. (Belmont Radio Corp. Dwg. #A-29B-1181.)	ea			*	*	*	*
T		6L50205	WASHER, Bakelite. (Belmont Dwg. #A-29B-1182.)	ea			*	*	*	*
T		6L50202	WASHER, Bakelite. (Belmont Dwg. #A-29B-1668.)	ea			*	*	*	*
T		6L50530-1	WASHER, Fibre. (Belmont Dwg. #A-29B-1174.)	ea			*	*	*	*
T		6L50523-3	WASHER, Fibre. (Belmont Dwg. #A-29B-1176.)	ea			*	*	*	*
T		6L50523-1	WASHER, Fibre. (Belmont Dwg. #A-29B-1177.)	ea			*	*	*	*
T		6L50523-1	WASHER, Fibre. (Belmont Dwg. #A-29B-1183.)	ea			*	*	*	*
T		6L50523-2	WASHER, Fibre. (Belmont Dwg. #A-29B-1250.)	ea			*	*	*	*
CU, WM		3G1838-5.6	WASHER, Fibre. (Belmont Dwg. #A-41A-1320.)	ea				*	*	*
T		3G1550-12.1	WASHER, Mica. (Belmont Radio Corp. Dwg. #A-29B-1667.)	ea			*	*	*	*
T, R	112, 126-1, 126-2	2Z5927	LAMP, 6-8 V. Tungsol type T-44. (Dwg. #A-46A-314.)	ea	5	*	*			*
CU, WM	108, 126									
T	113	6Z6820	LAMP, Dial Light, 120 V., 3 watt, GE type S-6. (Dwg. #A-46A-1622.)	ea	1		*			*
DA		2Z5884	LAMP, ¼ watt neon, candelabra, GE type T 3¼. (Dwg. #A-46A-1788.)	ea	1		*			*
T	137	3F6315	METER, milliammeter, 3½" GE type DO-41-44-46. (Dwg. #B-55A-1164.)	ea	1		*			*
T		2Z7588-28/3	CONTACT ASS'Y. (Belmont Radio Corp., Dwg. #A-208-508.)	ea	1		*	*	*	*
T		2Z3196-18	CONTACT ASS'Y. (Belmont Radio Corp., Dwg. #A-208-506.)	ea	1			*	*	*
T		2Z7588-28/1	CONTACT ASS'Y. (Belmont Radio Corp., Dwg. #A-208-507.)	ea	1			*	*	*
T	139	2Z7588-2G	RELAY, 2 contacts, No. 6.3 V., Potter & Brumfield type #SPA-5. (Belmont Radio Corp., Dwg. #B-45A-982.)	ea	1		*			*
T	138	2Z7599-40	RELAY, 10ma. overload, Dunco type RPXB579, Porter & Brumfield type B-4500. (Belmont Radio Corp., Dwg. #B-45A-1077.)	ea	1		*			*

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
T	117	3H900-15-20	SWITCH, circuit breaker 15A, Hineman #P-0311. (Belmont Radio Corp., Dwg. #B-20C-1094.)	ea	1		*			*
R	127	3Z9849.22	SWITCH, toggle, DPDT, Cutler Hammer Co. type #8825 (20 amp. at 24 volt, silver contacts, bat type lever with luminus end). (Belmont Radio Corp., Dwg. #A-206-1146.)	ea	1		*			*
T	114-1 thru 114-3	3Z9849.10	SWITCH, high voltage, low voltage meter light toggle Cutler Hammer Co. type 8280. (Belmont Radio Corp., Dwg. #A-20C-1263.)	ea	3		*			*
T	116	3Z9849.83	SWITCH, relay reset, SPST toggle, Cutler Hammer Co. type 8817. (Belmont Radio Corp., Dwg. #A-20C-1265.)	ea	1		*			*
T	118-1 thru 118-4	3Z9860-3Z	SWITCH, interlock SPST N.O. 2, Cutler Hammer type 8907-K-19. (Belmont Radio Corp., Dwg. #A-20C-1097.)	ea	5		*			*
T	115	3Z9849.53	SWITCH, meter, SPDT, toggle, spring tension, Cutler Hammer type #8802. (Belmont Radio Corp.,-Dwg. #A-20C-1266.)	ea	1		*			*
WM	128	3Z9858-7	SWITCH, toggle, DPST; 1 amp. at 250 volt, 3 amp. at 125 volt; Arrow-Hart & Hageman Co., #20902-EY (nonindicating, grade XXP bakelite insulation). (Belmont Radio Rorp., Dwg. #A-20C-303-1.)	ea	1		*			*
CU	115	3Z9849.34	SWITCH, toggle, SPST; Cutler Hammer 8817K2 (momentary nominal rating 20 amp., 24 volt). (Belmont Radio Corp., Dwg. #A-20C-1524.)	ea	1		*			*
CU	114	3Z9845-11.1	SWITCH, toggle, DPST; Cutler Hammer 8823K2 (nominal rating 20 amp., 24 volt). (Belmont Radio Corp., Dwg. #A-20C-1525.)	ea	1		*			*
WM	127	3Z9858-6	SWITCH, toggle, SPST; 3 amp. at 250 volt; Arrow-Hart & Hegeman Co., #20994-KD (nonindicating, grade P bakelite insulation). (Belmont Radio Corp., Dwg. #A-20C-1564.)	ea	1		*			*
CU	112A, 112B, 112C	3Z9825-62.24	SWITCH, selector, 7 position, 3 deck, Central Radio Labs., type H. (Belmont Radio Corp., Dwg. #B-20A-1993.)	ea	1		*			*
CU	113	3Z9825-58.30	SWITCH, test, 2 positions, Central Radio Labs., type H. (Belmont Radio Corp., Dwg. #B-20A-1994.)	ea	1		*			*
CU	95	2Z7299M3.5	POTENTIOMETER, Gain, 3500 ohms, Allen-Bradley Co. type J. (Belmont Radio Corp. Dwg. #A-10B-1356.)	ea	1		*	*	*	*
T	60	2Z7269.95	POTENTIOMETER, Variable Bias, 10,000 ohms, Allen-Bradley Co. type J. (Belmont Radio Corp. Dwg. #A-10A-1268.)	ea	1		*	*	*	*
CU	93	2Z7288-3	POTENTIOMETER, Base Line, 50,000 ohms, Allen-Bradley Co. type J. (Belmont Radio Corp. Dwg. #A-10B-1354.)	ea	1		*	*	*	*

* Indicates stock available.

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
WM	63	2Z7270.98	POTENTIOMETER, Eye adjustment, 50,000 ohms, Allen-Bradley Co. type J. (Belmont Radio Corp. Dwg. #A-10B-1353.)	ea	1		*	*	*	*
CU	96	2Z7273-50	POTENTIOMETER & SWITCH, 1 megohm, Stackpole Carbon Co. type LP-SS-3. (Belmont Radio Corp. Dwg. #B-10A-1357.)	ea	1		*	*	*	*
T	73	3Z5997-5	RESISTOR, 7.8 ohms, 5 watts, ±2%, Sprague Specialty Co. Type 5K. (Belmont Radio Corp. Dwg. #A-9C-1618.)	ea	1		*	*	*	*
R	55-1, 55-2	3RC20BE680K	RESISTOR, 68 ohms, ±10%, ½ watt, Allen Bradley Co. Type EB. (Belmont Radio Corp., Dwg. #A-9B1-48.)	ea	2		*	*	*	*
T	65-1, 65-2	3RC20AE101M	RESISTOR, 100 ohms, ±20%, ½ watt, Speer Resistor Corp. Type SCI-¼. (Belmont Radio Corp. Dwg. #A-9B1-7.)	ea	2		*	*	*	*
T, DA	71	3Z6010-81	RESISTOR, 100 ohms, ±20%, 1 watt, Speer Resistor Corp. Type SI-1. (Belmont Radio Corp. Dwg. #A-9B2-7.)	ea	2		*	*	*	*
O	78	3RC30BE101K	RESISTOR, 100 ohms, ±10%, 1 watt, Allen Bradley type GB. (Belmont Radio Corp. Dwg. #A-9B2-50.)	ea	1		*	*	*	*
R	56-1 thru 56-3	3RC20BE151K	RESISTOR, 150 ohms, ±10%, ½ watt, Allen Bradley Co. Type EB. (Belmont Radio Corp. Dwg. #A-9B1-52.)	ea	3		*	*	*	*
R	57-1 thru 57-4	3RC20BE201J	RESISTOR, 200 ohms, ±5%, ½ watt, Allen Bradley type EB. (Belmont Radio Corp. Dwg. #A-9B1-1931.)	ea	4		*	*	*	*
T	55	3RC20BE221K	RESISTOR, 220 ohms, ±10%, ½ watt, Speer Resistor Corp. type SCI-½ IRCBT ½. (Belmont Radio Corp. Dwg. #A-9B1-54.)	ea	1		*	*	*	*
CU	83-1 thru 83-3	3Z6020-30	RESISTOR, 220 ohms, ±20%, 1 watt, Allen Bradley Co., type GB. (Belmont Radio Corp. Dwg. #A-9B2-9.)	ea	3		*	*	*	*
R	58	3RC20BE471K	RESISTOR, 470 ohms, ±10%, ½ watt, Allen Bradley Type EB. (Belmont Radio Corp. Dwg. #A-9B1-58.)	ea	1		*	*	*	*
O	79	3Z6050-117	RESISTOR, 500 ohms, ±10%, 5 watts, WW.(Belmont Radio Corp. Dwg. #A-9B-2185.)	ea	1		*	*	*	*
R, T	68, 75	3RC30BE102K	RESISTOR, 1,000 ohms, ±10%, 1 watt, Allen Bradley type GB. (Belmont Radio Corp. Dwg. #A-9A2-62.)	ea	2		*	*	*	*
CU	66	3RC20BE152M	RESISTOR, carbon, 1,500 ohms, ±20%, ½ watt, Allen Bradley Co. type EB. (Belmont Radio Corp. Dwg. #A-9B1-14.)	ea	1		*	*	*	*
WM	56	3Z6200-1	RESISTOR, 2000 ohms, ±5%, ½ watt, Allen Bradley Co. type EB. (Belmont Radio Corp. Dwg. #A-9B1-166.)	ea	1		*	*	*	*
T	77	3RC20BE222K	RESISTOR, 2200 ohms, ±10%, ½ watt, Speer Resistor Corp. type SCI-½. (Belmont Radio Corp. Dwg. #A-9B1-66.)	ea	1		*	*	*	*
T, CU	59, 62	3Z6220-10	RESISTOR, 2200 ohms, ±20%, ½ watt, Speer Resistor Corp. type SCI-½. (Belmont Radio Corp. Dwg. #A-9B1-15.)	ea	2		*	*	*	*

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
R	69-1 thru 69-8	3RC30BE222K	RESISTOR, carbon, 2,200 ohms, ±10%, 1 watt, Allen Bradley Co., type GB. (Belmont Radio Corp. Dwg. #A-9B2-66.)	ea	8		*	*	*	*
T	56	3RC21AE3332M	RESISTOR, 3,300 ohms, ±20%, ½ watt, Speer Resistor Corp. type SCI-½. (Belmont Radio Corp. Dwg. #A-9B1-16.)	ea	1		*	*	*	*
R	70-1 thru 70-12, 71-1, 71-2.	3RC30BE332K	RESISTOR, carbon, 3,300 ohms, ±10%, 1 watt, Allen Bradley Co., type GB. (Belmont Radio Corp. Dwg. #A-9B2-68.)	ea	14		*	*	*	*
CU	67	3RC30BE332M	RESISTOR, 3,300 ohms, ±20%, 1 watt, Allen Bradley, type GB. (Belmont Radio Corp. Dwg. #A-9B2-16.)	ea	1		*	*	*	*
T	58-1, 58-2	3RC20BE472M	RESISTOR, 4,700 ohms, ±20%, ½ watt, Speer Resistor Co., type SCI-½. (Belmont Radio Corp. Dwg. #A-9B1-17.)	ea	2		*	*	*	*
T	64-1, 64-2	3RC20BE472K	RESISTOR, 4,700 ohms, ±10%, ½ watt, Speer Resistor Co., type SCI-½. (Belmont Radio Corp. Dwg. #A-9B1-70.)	ea	2		*	*	*	*
R	72-1, 72-2	3RC30BE472K	RESISTOR, 4,700 ohms, ±10%, Allen Bradley Co., type GB. (Belmont Radio Corp. Dwg. #A-9B2-70.)	ea	2		*	*	*	*
T	70	3Z6470-23	RESISTOR, 4,700 ohms, ±10%, 5 watts, Sprague Specialty Co., type N1. (Belmont Dwg. #A-9C-1680.)	ea	1		*	*	*	*
CU	68	3RC20BE682M	RESISTOR, carbon, 6,800 ohms, ±20%, ½ watt, Allen Bradley Co. type EB-6822. (Belmont Radio Corp. Dwg. #A-9B1-18.)	ea	1		*	*	*	*
WM	59	3RC20AE682K	RESISTOR, carbon, 6,800 ohms, ±10%, ½ watt, Allen Bradley Co. type EB. (Belmont Radio Dwg. #A-9B1-72.)	ea	1		*	*	*	*
R	60	3RC20BE682J	RESISTOR, carbon, 6,800 ohms, ±5%, ½ watt, Allen Bradley Co. type EB. (Belmont Radio Corp. Dwg. #A-9B1-179.)	ea	1		*	*	*	*
R	73-1, 73-2	3RC30BE682K	RESISTOR, carbon, 6,800 ohms, ±10%, 1 watt, Allen Bradley Co. type GB. (Belmont Radio Corp. Dwg. #A-9B2-72.)	ea	2		*	*	*	*
T CU WM	57-1, 57-2 69-1 thru 69-5 58	3RC21AE103M	RESISTOR, 10,000 ohms, ±20%, ½ watt, Speer Resistor Corp. type SCI-½. (Belmont Radio Corp. Dwg. #A-9B1-19.)	ea	8		*	*	*	*
R CU	62-1, 62-2 87-1 thru 87-3	3RC20BE103K	RESISTOR, carbon, 10,000 ohms, ±10%, ½ watt, Allen Bradley Co. type EB. (Belmont Radio Corp. #A-9B1-74.)	ea	5		*	*	*	*
CU	59-1 thru 59-3	3RC30BE103M	RESISTOR, 10,000 ohms, ±20%, 1 watt, Allen Bradley type GB. (Belmont Radio Corp. Dwg. #A-9B2-19.)	ea	3		*	*	*	*
T	66	3RC40AE122K	RESISTOR, 12,000 ohms, ±10%, 2 watt, Speer Resistor Corp. type SI-2. (Belmont Radio Corp. Dwg. #A-9B4-75.)	ea	1		*	*	*	*
T	62	3RC21BE153M	RESISTOR, 15,000 ohms, ±20%, ½ watt, Speer Resistor Corp. type SCI-½, IRC BT-½. (Belmont Radio Corp. Dwg. #A-9B1-20.)	ea	1		*	*	*	*

* Indicates stock available.

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
CU	70	3RC20BE153K	RESISTOR, 15,000 ohms, ±10%, ½ watt, Allen Bradley Co. type EB. (Belmont Radio Corp. Dwg. #A-9B1-76.)	ea	1		*	*	*	*
CU	61-1 thru 61-3	3RC30BE153M	RESISTOR, 15,000 ohms, ±20%, 1 watt, Allen Bradley type GB. (Belmont Radio Corp. Dwg. #A-9B2-20.)	ea	3		*	*	*	*
T, CU	63, 72-1, 72-2	3Z6622-13	RESISTOR, 22,000 ohms, ±20%, ½ watt, Speer Resistor Corp. SCI-½. (Belmont Radio Corp. Dwg. #A-9B1-21.)	ea	3		*	*	*	*
R, CU, WM	64, 60, 55	3RC20BE223K	RESISTOR, 22,000 ohms, ±10%, ½ watt, Allen Bradley Co. type EB. (Belmont Radio Corp. Dwg. #A-9B1-78.)	ea	3		*	*	*	*
R, WM	74-1 thru 74-3, 62	3RC30BE223K	RESISTOR, 22,000 ohms, ±10%, 1 watt, Allen Bradley Co. type GB. (Belmont Radio Corp. Dwg. #A-9B2-78.)	ea	4		*	*	*	*
CU	97	3Z6622-23	RESISTOR, 22,000 ohms, ±5%, 5 watt, WW, Sprague Specialty Co. type 5K. (Belmont Radio Corp. Dwg. #A-9B-1530.)	ea	1		*	*	*	*
T	61-1 thru 61-4	3Z6625-39	RESISTOR, carbon, 25,000 ohms, ±10%, 2 watts, Speer Resistor Corp. type SI-2. (Belmont Radio Corp. Dwg. #A-9B4-1846.)	ea	4		*	*	*	*
CU	63	3Z6627-14	RESISTOR, 27,000 ohms, ±20%, ½ watt, Allen Bradley Co. type EB. (Belmont Radio Corp. Dwg. #A-9B1-1987.)	ea	1		*	*	*	*
T	67	3Z6630-23	RESISTOR, carbon, 30,000 ohms, ±20%, 2 watts, Speer Resistor Corp. type SI-2. (Belmont Radio Corp. Dwg. #A-9B4-1845.)	ea	1		*	*	*	*
R	75-1, 75-2	3RC30BE333K	RESISTOR, carbon, 33,000 ohms, ±10%, 1 watt, Allen Bradley Co. type GB. (Belmont Radio Corp. Dwg. #A-9B2-80.)	ea	2		*	*	*	*
R, CU	65, 85-1 thru 85-3	3Z6647-5	RESISTOR, 47,000 ohms, ±10%, ½ watt, Allen Bradley Co. type EB. (Belmont Radio Corp. Dwg. #A-9B1-82.)	ea	4		*	*	*	*
CU	71-1 thru 71-3	3RC30BE473M	RESISTOR, 47,000 ohms, ±20%, 1 watt, Allen Bradley Co., GB. (Belmont Radio Corp. Dwg. #A-9B2-23.)	ea	3		*	*	*	*
CU	73	3Z6647-19	RESISTOR, 47,000 ohms, ±10%, 1 watt, Allen Bradley Co. type GB. (Belmont Radio Corp. Dwg. #A-9B2-82.)	ea	1		*	*	*	*
T	68	3Z6650-85	RESISTOR, WW, 50,000 ohms, ±10%, 8 watts. (Belmont Radio Corp. Dwg. #A-9C-1592.)	ea	1		*	*	*	*
CU	77-1, 77-2	3RC30BE683M	RESISTOR, 68,000 ohms, ±20%, 1 watt, Allen Bradley Co. type GB. (Belmont Radio Corp. Dwg. #A-9B2-24.)	ea	2		*	*	*	*
CU	88	3Z6682-9	RESISTOR, 82,000 ohms, ±20%, ½ watt, Allen Bradley Co. type EB. (Belmont Radio Corp. Dwg. #A-9B1-1986.)	ea	1		*	*	*	*

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
R	66-1 thru 66-6	3RC20BE104K	RESISTOR, 100,000 ohms, ½ watt, ±10%, Allen Bradley Co. type EB, ½. (Belmont Radio Corp. Dwg. *A-9B1-86.)	ea	6		*	*	*	*
CU	65-1 thru 65-3	3RC20BE104M	RESISTOR, 100,000 ohms, ±20%, ½ watt, Allen Bradley Co. type EB. (Belmont Radio Corp. Dwg. #A-9B1-25.)	ea	3		*	*	*	*
CU	56-1 thru 56-3	3RC30BE104M	RESISTOR, 100,000 ohms, ±20%, 1 watt, Allen Bradley type GB. (Belmont Radio Corp. Dwg. #A-9B2-25.)	ea	3		*	*	*	*
T	69	3RC21BE104M	RESISTOR, 100,000 ohms, ±20%, ½ watt, Speer Resistor Corp. type SCI-½. (Belmont Radio Corp. Dwg. #B-203-248.)	ea	1		*	*	*	*
R	77	3RC41BE104K	RESISTOR, 100,000 ohms, ±15%, 2 watt, Speer Resistor Corp. type SI-2 IRC. (Belmont Radio Corp. Dwg. #A-9B4-2304.)	ea	1		*	*	*	*
CU	57-1, 57-7	3RC30BE154M	RESISTOR, 150,000 ohms, ±20%, 1 watt, Allen Bradley Co. type GB. (Belmont Radio Corp. Dwg. #A-9B2-26.)	ea	7		*	*	*	*
CU	82-1 thru 82-3	3RC20BE224M	RESISTOR, 220,000 ohms, ±20%, ½ watt, Allen Bradley Co. type EB. (Dwg. #A-9B1-27, Belmont Radio Corp.)	ea	3		*	*	*	*
T, CU	76, 79	3RC21AE224K	RESISTOR, 220,000 ohms, ±10%, ½ watt, Allen Bradley Co. type EB. (Belmont Radio Corp. Dwg. #A-9B1-90.)	ea	2		*	*	*	*
CU	80-1, 80-4	3RL30BE224M	RESISTOR, 220,000 ohms, ±20%, 1 watt, Allen Bradley Co. type GB. (Belmont Radio Corp. Dwg. #A-9B2-27.)	ea	4		*	*	*	*
CU	58-1, 58-2	3Z6722-15	RESISTOR, 220,000 ohms, ±10%, 1 watt, Allen Bradley type GB. (Belmont Radio Corp. Dwg. #A-9B2-90.)	ea	2		*	*	*	*
CU	64-1, 64-2	3RC20BE274K	RESISTOR, 270,000 ohms, ±10%, ½ watt, Allen Bradley type EB. (Belmont Radio Corp. Dwg. #A-9B1-91.)	ea	2		*	*	*	*
CU	74	3RC20AE334K	RESISTOR, 330,000 ohms, ±10%, ½ watt, Allen Bradley Co. type EB. (Belmont Radio Corp. Dwg. #A-9B1-92.)	ea	1		*	*	*	*
CU, DO	55	3RC20BE474M	RESISTOR, 470,000 ohms, ½ watt, ±20%, Allen Bradley Co. type EB. (Belmont Radio Corp. Dwg. #A-9B1-29.)	ea	2		*	*	*	*
WM	60	3RC20BE514J	RESISTOR, 500,000 ohms, ±20%, ½ watt, Allen Bradley Co. type EB. (Belmont Radio Corp. Dwg. #A-9B1-1473.)	ea	1		*	*	*	*
T, CU	74, 86	3RC21AE684K	RESISTOR, 680,000 ohms, ±10%, ½ watt, Speer Resistor Corp. type SCI-½ or EB, IRC BT-½. (Belmont Radio Corp. Dwg. #A-9B1-96.)	ea	2		*	*	*	*
T	72-1 thru 72-6	3Z6783C3	RESISTOR, 833,000 ohms, ±10%, 2 watts, Speer Resistor Corp. type SI-2. (Belmont Radio Corp. Dwg. #A-9B4-1908.)	ea	6		*	*	*	*
WM	61	3Z6801-43	RESISTOR, 1 megohm, ±20%, 1/10 watt. (Tuning indicator plate load, Allen Bradley Co. type K, Belmont Radio Corp. Dwg. #B-208-328.)	ea	1		*	*	*	*

* Indicates stock available.

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
R, CU, WM	67–1 thru 67–3, 90–1 thru 90–3 57	3RC20AE105K	RESISTOR, carbon, 1 megohm, ±10%, ½ watt, Allen Bradley type EB, Stack Pole MB-½. (Belmont Radio Corp. Dwg. #A-9B1-98.)	ea	7		*	*	*	*
CU	76–1 thru 76–14	3RC20BE105M	RESISTOR, 1 megohm, ±20%, ½ watt, Allen Bradley Co. type EB. (Belmont Radio Corp. Dwg. #A-9B1-31.)	ea	14		*	*	*	*
CU DO	78–1 thru 78–5	3RC20BE225M	RESISTOR, carbon, 2.2 megohm, ½ watt, ±20%, Allen Bradley Co. type EB. (Belmont Radio Corp. Dwg. #A-9B1-33.)	ea	6		*	*	*	*
CU	75	3RC20BE245J	RESISTOR, 2.4 megohm, ±5%, ½ watt, Allen Bradley Co. type EB. (Belmont Radio Corp. Dwg. #A-9B1-240.)	ea	1		*	*	*	*
T		2Z8663-1	SOCKET, 7 prong, ceramic, Johnson type 247. (Belmont Radio Corp. Dwg. #A-15A-1123.)	ea	2			*	*	*
T		2Z8762.1	SOCKET, 4 prong, ceramic, American Phenolic Corp., type RSS4. (Belmont Radio Corp. Dwg. #A-15A-1848.)	ea	1			*	*	*
T		2Z8763.4	SOCKET, 5 prong, ceramic, American Phenolic Corp., type RSS5. (Belmont Radio Corp. Dwg. #A-15A-1166.)	ea	1			*	*	*
T		2Z8795.1	SOCKET, 8 prong, ceramic, American Phenolic Corp., type RSS8. (Belmont Radio Corp. Dwg. #A-15A-1651.)	ea	2			*	*	*
T, R		2Z8678.20	SOCKET, 8 prong, ceramic, Meissner Mfg. Co. (Belmont Radio Corp. Dwg. #A-15A-1040.)	ea	4			*	*	*
T, O, CU, WM		2Z8650.5	SOCKET, 8 prong, Cinch Mfg. Co. type 9950. (Belmont Radio Corp. Dwg. #A-15B-1462.)	ea	18			*	*	*
R		2Z8678.93	SOCKET, 8 prong, mica filled, bakelite, Meissner Mfg. Co. (Belmont Radio Corp. Dwg. #A-15B-1142.)	ea	9			*	*	*
R, WM, T		2Z8677.5	SOCKET, Button type, special, Cinch Mfg. Co. (Belmont Radio Corp. Dwg. #A-15C-1041.)	ea	5			*	*	*
T		2Z5883-10	SOCKET, pilot light, bayonet. (Belmont Radio Corp. Dwg. #A-47A-1623.)	ea	1			*	*	*
WM		2Z8648.2	SOCKET, pilot light, bracket, offset, bayonet. (Belmont Radio Corp. Dwg. #A-47A-1598.)	ea	1			*	*	*
R	59, 95, 101	2Z10001.13	TRANSFORMER ASS'Y, 1st I.F., consists of an inductance, Aladin Radio Industries Cat. #41-352, an inductance, R. F. choke, 0.2 uh, Aladdin Radio Industries Cat. #37-223, Resistor, 2,200 ohms, ±5%, ½ watt, Ohio Carbon type P. Inclosed in a can (Belmont Radio Corp. Dwg. #B-13A-1131.)	ea	1		*			*

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
R	96-1, 11-4, 61-1, 9-3, 96-2, 11-5, 61-2, 9-4	2Z9641.23	TRANSFORMER ASS'Y, 2nd, & 4th I.F., each consists of an inductance, Alladin Radio Industries Cat. #41-353, capacitor, 200 mmf, mica ±10%, 500 VDCW, Micamold Radio Corp. type O, capacitor, 5,000 mmf, mica ±10%, 500 VDCW, Micamold Radio Corp. type W. (This capacitor also shown as Item No. RC150/2-30), resistor, 8,200 ohms, ±5%, ½ watt, Centralab type 710. Inclosed in a can. (Belmont Radio Corp. Dwg. #B-13H-1132.)	ea	2		*			*
R	97-1, 11-1, 63-1, 9-1, 97-2, 11-2, 63-2, 9-2	2Z9643.38	TRANSFORMER ASS'Y, 3rd & 5th I.F., each consists of an inductance, Aladdin Radio Industries Cat. #41-354, capacitor, 200 mmf, mica, ±10%, 500 VDCW, Micamold Radio Corp. type O, capacitor, 5,000 mmf, mica, ±10%, 500 VDCW, Micamold Radio Corp. type W. (This capacitor also shown as Item No. RC150/2-30) resistor, 10,000 ohms, ±5%, ½ watt, Centralab type 710. Inclosed in a can. (Belmont Radio Corp. Dwg. #B-13B-1133.)	ea	2		*			*
R	98, 11-3, 71-1, 71-2.	2Z9641.20	TRANSFORMER ASS'Y, 6th I.F., consists of an inductance, Aladdin Radio Industries Cat. #41-356, capacitor, 200 mmf, mica, ±10%, 500 VDCW, Micamold Radio Corp. type O, two (2) resistors, 3,300 ±10%, 1 watt, Ohio Carbon type PB. Inclosed in a can. (Belmont Radio Corp. Dwg. #B-13B-1134.)	ea	1		*			*
T	134	2Z9638-16	TRANSFORMER, blocking Oscillator, Jefferson Electric Co. type 467-001-142 (Belmont Radio Corp. Dwg. #C-12A-1162.)	ea	1		*			*
CU	131	2Z9643.42	TRANSFORMER, blocking Oscillator, Jefferson Electric Co. type 467-001-137 (Belmont Radio Corp. Dwg. #C-12A-1318.)	ea	1		*			*
T	130	2Z9611.151	TRANSFORMER, filament, Jefferson Electric Co. type 464-000-071, (Belmont Radio Corp. Dwg. #C-12A-1157.)	ea	1		*			*
T	133	2Z9613.102	TRANSFORMER, Bias, Jefferson Electric Co. type 463-001-118 (Belmont Radio Corp. Dwg. #C-12A-1160.)	ea	1		*			*
T	132	2Z9611.39	TRANSFORMER, low voltage 6.3 V., 5.0 V. and 312 V. (Rectified DC4T.-02 amp.) Jefferson Electric Co. type 463-001-119 (Belmont Radio Corp. Dwg. #C-12A-1159.)	ea	1		*			*
T	131	2Z9612.52	TRANSFORMER, high voltage rectified output 4,000 V. DC at .01 amps. Jefferson Electric Co. type 465-000-106 (Belmont Radio Corp. #C-12A-1158.)	ea	1		*			*

* Indicates stock available.

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
R	103	2Z9613-23	TRANSFORMER, power, Jefferson Electric type 463-001-117 (Belmont Radio Corp. Dwg. #D-12A-1138.)	ea	1		*			*
CU	130	2Z9613.133	TRANSFORMER, power, Jefferson Electric type 463-001-126 (Belmont Radio Corp. Dwg. #D-12A-1319.)	ea	1		*			*
T	136	2Z9957-7	TRANSTAT, variac, 50 to 60 cycle (Pri. 1, 5, 4.) 115 V., (Secondary 3, 4), 0-115 V. or 0-130 V., Rated load 1A., Max. 1.5A., oscillator fil. regulator. General Radio #200B. (Belmont Radio Corp. Dwg. #B-12A-1163.)	ea	1		*			*
R, CU		2J6H6	TUBE, VT-90 (Comm. type 6H6)	ea	2	*	*			*
R, T		2J6J5	TUBE, VT-94 (Comm. type 6J5)	ea	2	*	*			*
CU		2J6U5/6G5	TUBE, VT-98 (Comm. type 6U5)	ea	1	*	*			*
T		2J807	TUBE, VT-100 (Comm. type 807)	ea	1	*	*			*
CU		2J6V6GT/G	TUBE, VT-107A (Comm. type 6V6GT.)	ea	1	*	*			*
R		2J6AC7	TUBE, VT-112 (Comm. type 6AC7.)	ea	4	*	*			*
CU		2J6SJ7	TUBE, VT-116 (Comm. type 6SJ7.)	ea	1	*	*			*
T		2J2X2	TUBE, VT-119 (Comm. type 2X2.)	ea	1	*	*			*
CU		2J6SA7	TUBE, VT-150 (Comm. type 6SA7.)	ea	1	*	*			*
R		2J6AB7	TUBE, VT-176 (Comm. type 6AB7.)	ea	2	*	*			*
CU		2J5Y3GT	TUBE, VT-197-A (Comm. type 5Y3GT.)	ea	1	*	*			*
T, CU		2J9002	TUBE, VT-202 (Comm. type 9002.)	ea	2	*	*			*
R		2J6E5	TUBE, VT-215 (Comm. type 6E5.)	ea	1	*	*			*
T, U		2J6SN7GT	TUBE, VT-231 (Comm. type 6SN7GT.)	ea	12	*	*			*
R, T		2J5U4G	TUBE, VT-244 (Comm. type 5U4G.)	ea	3	*	*			*
CU		2J6SF5	TUBE, (Comm. type 6SF5)	ea	1	*	*			*
R		2J6SH7	TUBE, (Comm. type 6SH7)	ea	3	*	*			*
T		2J826	TUBE, (Comm. type 826)	ea	2	*	*			*
T, R, CU		2J9006	TUBE, (Comm. type 9006)	ea	3	*	*			*
T, R		3Z12050-3	LUG, ground, Patton MacGuire Co., #999, (Belmont Radio Corp., Dwg. #A-26D-366.)	ea						*
T		2Z9417.3	TERMINAL BOARD, 1 row, 7 lugs, 1 row 15 lugs, special, (Belmont Radio Corp. Dwg. #A-201-59.)	ea						*
WM		2Z9402.64	TERMINAL BOARD, 2 lugs, special (Belmont Radio Corp. Dwg. #A-201-89.)	ea						*
R		2Z9419-2	TERMINAL STRIP, 19 lugs, special, (Belmont Radio Corp. Dwg. #A-201-206.)	ea						*
R		2Z9426-8	TERMINAL BOARD, 26 lugs, special (Belmont Radio Corp., Dwg. #A-201-218.)	ea						*
R		2Z9428-3	TERMINAL STRIP, 28 lugs, special (Belmont Radio Corp. Dwg. #A-201-219.)	ea						*
T		2Z9410.22	TERMINAL STRIP, 10 lugs, Anchor Tool & Die Co. (Belmont Radio Corp., Dwg. #A-201-256.)	ea						*
T		2Z9402.113	TERMINAL BOARD, Anchor Tool & Die Co. (Belmont Radio Corp. Dwg. #A-201-258.)	ea						*
T		2Z9405.27	TERMINAL STRIP (Belmont Radio Corp. Dwg. #A-201-259.)	ea						*

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
T		2Z9412.25	TERMINAL BOARD, (Belmont Radio Corp. Dwg. #A-201-260.)	ea						*
WM		2Z9405.26	TERMINAL BOARD, 5 lugs, special (Belmont Radio Corp. Dwg. #A-201-284.)	ea						*
WM		2Z9408.23	TERMINAL BOARD, 2 rows of 4 lugs each, special. (Belmont Radio Corp. Dwg. #A-201-285.)	ea						*
T		2Z9401.25	TERMINAL BOARD. (Belmont Radio Corp. Dwg. #A-201-439.)	ea						*
		2Z9408.66	TERMINAL BOARD, 1 lug, special. (Belmont Radio Corp. Dwg. #A-201-440.)	ea						*
T		2Z9401.45	TERMINAL BOARD. (Belmont Radio Corp. Dwg. #A-201-500.)	ea						*
CU		2Z9440-42	TERMINAL BOARD. (Belmont Radio Corp. Dwg. #A-201-175-2.)	ea						*
T		3G1100-10	TERMINAL BOARD, ceramic. (Belmont Radio Corp. Dwg. #A-7A-2300.)	ea			*			*
O		2Z9401.21	TERMINAL STRIP, Cinch Mfg. Co., type 1815. (Belmont Radio Corp. Dwg. #A-7A-1316.)	ea						*
T, R		3Z12031-5	TERMINAL, Stewart No. 308. (Belmont Radio Corp. Dwg. #A-26D-709.)	ea			*			*
WM, O		3Z12059-21	TERMINAL, Shakeproof Products No. 2103-6. (Belmont Radio Corp. Dwg. #A-26A-5.)	ea	1		*			*
CU		3Z12059-4	TERMINAL, Shakeproof Products No. 2104-8. (Belmont Radio Corp. Dwg. #A-26A-1773.)	ea						*
O		3Z12056	TERMINAL, Shakeproof Products No. 2018-4. (Belmont Radio Corp. Dwg. #A-26A-2354.)	ea						*
CU		3Z12059-14	TERMINAL, Shakeproof Products No. 2104-4. (Belmont Radio Corp. Dwg. #A-26A-1799.)	ea						*
CU		3Z12059-39	TERMINAL, Shakeproof Products No. 2118-8. (Belmont Radio Corp. Dwg. #A-26A-1838.)	ea						*
CU		3Z12059-37	TERMINAL, Shakeproof Products No. 2528-B. (Belmont Radio Corp. Dwg. #A-26A-697.)	ea						*
T		3Z12059-38	TERMINAL, Shakeproof Products No. 2528-10. (Belmont Radio Corp. Dwg. #A-26D-1540.)	ea						*
WM		3Z12059-36	TERMINAL, Shakeproof Products No. 6200-⅛. (Belmont Radio Corp. Dwg. #A-26A-1756.)	ea						*
T, O		3Z12056/1	TERMINAL, Shakeproof Products No. 2108-6. (Belmont Radio Corp. Dwg. #A-26A-2035.)	ea						*
WM		3Z12059-31	TERMINAL, special, Shakeproof Products No. 2103-4. (Belmont Radio Corp. Dwg. #A-26A-1457.)	ea						*
AMS		3Z12060-21.2	TERMINAL. (Belmont Radio Corp. Dwg. #A-26D-1579.)	ea						*
T		3Z12031-12.1	TERMINAL. (Belmont Radio Corp. Dwg. #A-26D-1670.)	ea						*

* Indicates stock available.

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
C&C		3Z12050-5.6	TERMINAL, Patton MacGuire Co., No. 2067. (Belmont Radio Corp. Dwg. #A-26D-1826.)							*
T		3Z12060-21.4	TERMINAL. (Belmont Radio Corp. Dwg. #A-26D-2034.)	ea						*
T		3Z12056/1	TERMINAL. (Belmont Radio Corp. Dwg. #A-26D-2035.)	ea						*
T		2Z272	TERMINAL, grid cap National No. 24. (Belmont Radio Corp. Dwg. #A-26D-757.)	ea			*			*
AMS		6R8970	ASSEMBLY, adjusting handle, (Belmont Radio Corp. Dwg. #B-202-398.)	ea	1					*
		2A275-125A/M1	ASSEMBLY, antenna matching stub. (Belmont Radio Corp. Dwg. #205-504.)	ea						*
T		2Z7093-5	ASSEMBLY, condenser plate. (Belmont Radio Corp. Dwg. #A-200-235.)	ea	1					*
T		2Z3351-14	ASSEMBLY, cover, rear. (Belmont Radio Corp. Dwg. #B-202-251.)	ea	1					*
T		2Z3351-15	ASSEMBLY, cover plate oscillator. (Belmont Radio Corp. Dwg. #B-202-254.)	ea	1					*
T		2Z7588-28/3	ASSEMBLY, leaf. (Belmont Radio Corp. Dwg. #A-208-505.)	ea	1					*
WM		2Z7857-12	ASSEMBLY, loop mtg., plate. (Belmont Radio Corp. Dwg. #A-201-283.)	ea			*			*
R		2Z11153	ASSEMBLY, slug driver. (Belmont Radio Corp. Dwg. #A-200-216.)	ea	4		*			*
R		2Z5636-10	ASSEMBLY, tuning eye. (Belmont Radio Corp. Dwg. #A-55A-1102.)	ea	1		*			*
R		2Z11052	ASSEMBLY, tuning slug. (Belmont Radio Corp. Dwg. #A-200-217.)	ea	4		*			*
WM		2Z5821-28	ASSEMBLY, tuning knob. (Belmont Radio Corp. Dwg. #A-200-301.)	ea	1		*			*
MA		2Z2309-2	ASSEMBLY, wing nut. (Belmont Radio Corp. Dwg. #A-201-484.)	ea	2		*			*
T		2Z5884-16	ASSEMBLY, jewel & bracket. (Belmont Radio Corp. Dwg. #A-55A-1267.)	ea	1		*			*
T	111	3H384	BLOWER UNIT, A. G. Redmond Co. type L. (Belmont Radio Corp. Dwg. #C-55A-1262.)	ea	1					*
MA		6L604-.5H	BOLT, hex, head, ¼"-20 x ½". (Belmont Radio Corp. Dwg. #3F-2148.)	ea	8					*
MA		6L608-5.5Z-2	BOLT, square, ½"-13 x 5½" long. (Belmont Radio Corp. Dwg. #A-3F-2103.)	ea (not	4 used)					*
MA		6L605-7H	BOLT, 5/16-18 x ¾. (Belmont Radio Corp. Dwg. #A-3F-2564.)	ea	8					*
R		2Z1243-1	BRACKET, pilot light, R.H. term. (Belmont Radio Corp. Dwg. #A-55A-115-1.)	ea	1		*			*
T		2Z1239.4	BRACKET, socket support. (Belmont Radio Corp. Dwg. #A-7A-1192.)	ea	1		*			*
R		2Z1243-2	BRACKET, pilot light, L.H. term. (Belmont Radio Corp. Dwg. #A-55A-1115-2.)	ea	1		*			*
T		2Z9957-7/1	BRUSH, variac for item 13-15. (Belmont Radio Corp. Dwg. #A-55A-1165.)	ea	1		*	*	*	*

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
A		2Z1612.1	CAP & CHAIN, American Phenolic Corp. AN-9760-10. (Belmont Radio Corp. Dwg. #B-55A-2546.)	ea	1		*			*
R		2Z2200-1	CHANNEL, rubber, Atlantic India Rubber Works #X-379. (Belmont Radio Corp. Dwg. #A-25E-1056.)	ea	2		*			*
T		2Z2200-5	CHANNEL, rubber. (Belmont Radio Corp. Dwg. #A-25E-1227.)	ea	2		*			*
T		2Z4866.30	CHANNEL, rubber. (Belmont Radio Corp. Dwg. #A-25E-1259.)	ea	2		*			*
CU		2Z2200-4	CHANNEL, rubber. (Belmont Radio Corp. Dwg. #A-25E-1531.)	ea	2		*			*
CU		2Z2200-3	CHANNEL, rubber. (Belmont Radio Corp. Dwg. #A-25E-1533.)	ea	1		*			*
C&C		2Z2636-2	CLAMP, American Phenolic Corp. AN-3057-16. (Belmont Radio Corp. Dwg. #B-55A-1709.)	ea	2					*
C&C		5B2800-289	CLAMP, American Phenolic Corp. AN-3057-16. (Belmont Radio Corp. Dwg. #B-55A-1709-2.)	ea	1					*
C&C		2Z2636-4	CLAMP, American Phenolic Corp. AN-3057-4. (Belmont Radio Corp. Dwg. #B-55A-1711.)	ea	2					*
C&C		2Z2642.23	CLAMP, American Phenolic Corp. AN-3057-12. (Belmont Radio Corp. Dwg. #B-55A-1708-1.)	ea	5					*
C&C		2Z2642.23	CLAMP, American Phenolic Corp. AN-3057-12. (Belmont Radio Corp. Dwg. #B-55A-1708-2.)	ea	2					*
C&C		2Z2636-27	CLAMP, American Phenolic Corp. AN-3057-40. (Belmont Radio Corp. Dwg. #B-55A-1710.)	ea	1					*
MA		2Z2635.23	CLAMP, cable. (Belmont Radio Corp. Dwg. #A-2M-2493.)	ea	9					*
C&C		6C272-1	CLAMP, cable. (Belmont Radio Corp. Dwg. #A-2M-2586.)	ea	10					*
MA		2Z2635.49	CLAMP, antenna mounting $1\frac{3}{16}$" inside radius, $\frac{13}{32}$" diam. hole $\frac{5}{8}$" from each end, $4\frac{3}{4}$" long, rounded ends, .196 diam. hole in center, $1\frac{1}{4}$" wide, $\frac{1}{8}$" thick. (Belmont Radio Corp. Dwg. #A-2M-2238 and Belmont Radio Corp. #G-5-5348).	ea	16		*			*
MA		2Z3095-4	CONNECTOR, $\frac{3}{8}$" x 90°, (Belmont Radio Corp. Dwg. #A-55A-2176.)	ea	1					*
MA		6Z3178	CONNECTOR, $\frac{1}{2}$" BX, (Belmont Radio Corp. Dwg. #A-55A-2177.)	ea	1					*
T		6Z3856-21	FILTER, fibre glass, $4\frac{5}{8}$" x 9 x 1, (Belmont Radio Corp. Dwg. #A-55A-1229.)	ea	2	*	*			*
A		2Z3014-10	FITTING, female rotary coupling. (Belmont Radio Corp. Dwg. #A-55A-2591.)	ea	1					*
R		2Z4880-20	GLASS, window, 4 clear (Belmont Radio Corp. Dwg. #A-55A-1055.)	ea	1		*			*
WM		6Z9462	GLASS, window, for dial (Belmont Radio Corp. Dwg. #A-55A-1405.)	ea	1		*			*

* Indicates stock available.

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
CU		2Z5991	INDICATOR, jewel & bracket, Drake type 50 (Belmont Radio Corp. Dwg. #A-55A-1526.)	ea	1		*			*
R		2Z5821-15	KNOB, 1¼" dia., #3 Zamak, Central Die Casting Co. (Belmont Radio Corp. Dwg. #A-4B-1110.)	ea	4		*			*
CU		2Z5821-21	KNOB, ¾" dia., Zamak Spec. (Belmont Radio Corp. Dwg. #A-4B-1407.)	ea	1		*			*
CU		2Z5821-9	KNOB, ¾" dia., Zamak, Spec. (Belmont Radio Corp. Dwg. #A-4B-1489.)	ea	1		*			*
CU		2Z5821-14	KNOB (Belmont Radio Corp. Dwg. #A-4B-1553.)	ea	1		*			*
CU		2Z5822-25	KNOB, bak., knurl, 1" dia. Kurtz-Kash Inc., (Belmont Radio Corp. Dwg. #A-4B-1783.)	ea	6		*			*
T		2Z5821-12	KNOB, variac, (Belmont Radio Corp. Dwg. #B-5B-1294.)	ea	1		*			*
MA		6L70012	LOCKWASHER, 12-24, (Belmont Radio Corp. Dwg. #A-28C-1775.)	ea	8					*
MA		6L71008Z	LOCKWASHER, ½"-13, Split, (Belmont Radio Corp. Dwg. #28C-2109.)	ea	4					*
MA		6L71004	LOCKWASHER, ¼-20 (Belmont Radio Corp. Dwg. #28C-2107.)	ea	32					*
MA		6L7100E1	LOCKWASHER, 5/16"-18 (Belmont Radio Corp. Dwg. #28C-2111.)	ea	8					*
MA		6L3504-20E-A7	NUT, hex. ¼-20 (Belmont Radio Corp. Dwg. #43A-1330.)	ea	8					*
MA		6L3505-18.1	NUT, Hex. 5/16"-18 (Belmont Radio Corp. Dwg. #43A-2112.)	ea	8					*
		6L3508-13Z-B8	NUT, Hex. ½"-13 x 31/64" (Belmont Radio Corp. Dwg. #43A-2562.)	ea	4					*
MA		6L3710-32S	NUT, wing 10-32 (Belmont Radio Corp. Dwg. #A-3F-3002.)	ea	2		*			*
CU, WM, T		2Z8809-2	PLATE, spark (Belmont Radio Corp. Dwg. #A-2D-1283.)	ea	11					*
T, CU, WM		2Z8809-3	PLATE, spark 1870 (Belmont Radio Corp. Dwg. #A-2D-1284.)	ea	15					*
WM		2A288A-3	ROD, antenna, telescopic (Belmont Radio Corp. Dwg. #B-55A-1448.)	ea	1		*			*
T		2Z8270-3	SCREW, 2.437" O.D. (Belmont Radio Corp. Dwg. #A-55A-1228.)	ea	1					*
CU		6L7955-2	SCREW, Set 6-32 x ⅛ Allen hd. (Belmont Radio Corp. Dwg. #A-52A-870.)	ea	9		*			*
T, R, WM, CU.		6L18508-3-42B	SCREW, Set 8-32 x ⅛" Allen hd. (Belmont Radio Corp. Dwg. #A-52A-463.)	ea	19		*			*
T		2Z3194-10	SCREW, 8-32 x ⅜" slotted hd., DOGP.S (Belmont Radio Corp. Dwg. #A-52A-3007.)	ea	1					*
MA		6L7032-24.7	SCREW, 10-32 x 1½" FHM (Belmont Radio Corp. Dwg. #34B10-2457.)	ea	2					*
C&C		6L7920-4-32.2S	SCREW, ¼"-20 FHM (Belmont Radio Corp. Dwg. #32C14-2506.)	ea	2					*
CU		6L17132-4K	SCREW, thumb, knurl, 18-12 x ¼" (Belmont Radio Corp. Dwg. #A-3F-1421.)	ea	1		*			*
CU		6L17112-12K	SCREW, thumb 12-24 x .796" (Belmont Radio Corp. Dwg. #A-3F-1422.)	ea	1		*			*

Major component	Ref symbol	Signal Corps stock No.	Name of part and description	Unit of meas	Quan per equip	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
WM		6L17132-17K	SCREW, thumb (Belmont Radio Corp. Dwg. #A-3F-1485.)	ea	1		*			*
MA		6L20132-16	Screw, wing, 10-32 x 1 (Belmont Radio Corp. Dwg. #A-3F-1785.)	ea	4					*
R		6L7955-3.39S	SCREW, Set, Allen head 6-32 x 5/16" (Belmont Radio Corp. Dwg. #A-52A-219.)	ea	8		*			*
T		2Z8203-12	SHAFT, Assy., flexible, (Belmont Radio Corp. Dwg. #A-201-239.)	ea	1		*			*
R		6R7443	PULLER, tube, Muter type 131257 (Belmont Radio Corp. Dwg. #A-55A-1930.)	ea	1	*	*			*
R		2Z8304.11	SHIELD, eye, blk. bak. tube (Belmont Radio Corp. Dwg. #A-55A-1335.)	ea	1		*			*
C&C		2Z8303-1	SHIELD, rain, rubber (Belmont Radio Corp. Dwg. #A-25A-2464.)	ea	1					*
T, R		2Z8304.9	SHIELD, tube #3 Zamak (Belmont Radio Corp. Dwg. #A-3D-1045.)	ea	3					*
WM		2Z8304.10	SHIELD, tuning eye, fibre, (Belmont Radio Corp. Dwg. #A-5G-1638.)	ea	1		*			*
R		6Z8163	SLEEVE (Belmont Radio Corp. Dwg. #A-3D-1299.)	ea	4		*			*
DA		2Z8551-2	SLEEVE, coupling, (Belmont Radio Corp. Dwg. #A-55A-2079.)	ea	1					*
T, R		2Z8879.11	SPRING, 5/8" long for tube shield, Cinch Mfg. Co. (Belmont Radio Corp. Dwg. #A-49A-1269.)	ea	4		*			*
T		2Z4880-6	WINDOW, (Belmont Radio Corp. Dwg. #A-55A-1230.)	ea	1					*
		2A275-125A	ANTENNA AN-125-A, (Belmont Radio Corp. Dwg. #D-205-436.)	ea	1					*
		2A275-126A	ANTENNA AN-126-A (Belmont Radio Corp. Dwg. #205-432.)	ea	1					*
		2A2517-414A	ANTENNA MATCHING SECTION MC-414-A. (Belmont Radio Corp. Dwg. #D-205-395.)	ea	1					*
		2C680-162A	CONTROL UNIT BC-1162-A. (Belmont Radio Corp. Dwg. #D-205-446.)	ea	1	*				*
		2C5066-1161A	RECEIVER BC-1161-A. (Belmont Radio Corp. Dwg. #D-205-221.)	ea	1	*				*
		2C6596-1160A	TRANSMITTER BC-1160-A. (Belmont Radio Corp. Dwg. #D-205-236.)	ea	1	*				*

* Indicates stock available.

☆ 601434—1944

TM 11-1518

WAR DEPARTMENT TECHNICAL MANUAL

RADIO EQUIPMENTS

RC-148, RC-148-B, RC-148-C

SERVICE MANUAL

THEORY, TROUBLE SHOOTING, AND REPAIR

[redacted]

Classification changed from CONFIDENTIAL
to RESTRICTED per WD Cir 335 dtd 3 Nov 45

[redacted]

WAR DEPARTMENT 20 OCTOBER 1944

WAR DEPARTMENT TECHNICAL MANUAL

TM 11-151 [redacted]

This manual, together with TM 11-1318 and TM 11-1418, supersedes TM 11-1118, 5 October 1942, 1 July 1943, and TM 11-1118C, 1 December 1943.

RADIO EQUIPMENTS RC-148, RC-148-B, RC-148-C

SERVICE MANUAL

THEORY, TROUBLE SHOOTING, AND REPAIR

WAR DEPARTMENT 20 OCTOBER 1944

United States Government Printing Office
Washington: 1944

WAR DEPARTMENT,
WASHINGTON 25, D.C., 20 October 1944.

TM 11-1518, Radio Equipments RC-148, RC-148-B, RC-148-C, Service Manual, is published for the information and guidance of all concerned.

[A.G. 300.7 (21 Jul 44).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

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

DISTRIBUTION:
As prescribed in paragraph 9a, FM 21-6:
Armies (5); Sv C (5); Depts (5); Def Cs (2); Arm & Sv Boards (2); IBn 11 (2); IC 4, 11, 44 (2); Sig C Rep Shs (2); Sig C Insp Zones (2); Sig C Proc Dist (2).
IBn 11: T/O & E 11-400 (A) Sig AW Orgn.
IC 4 : T/O & E 4-68.
IC 11 : T/O 11-107; 11-237; 11-287; 11-592; 11-587; 11-597; 11-617; 11-400 (C) Sig AW Orgn Radar Rep Plat: 11-500 (EC) Radar Maint Team.
IC 44 : T/O & E 44-16; 44-17; 44-116; 44-117; 44-136; 44-138.

For explanation of symbols, see FM 21-6.

QUICK INDEX

CONTENTS

LIST OF ILLUSTRATIONS

Fig. No.	Title	Page

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 110-120-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:

Transmitter BC-1072-A
Radio Receiver and Transmitter BC-1267-A
Power Supply RA-105-A

FIRST AID TREATMENT FOR ELECTRIC SHOCK

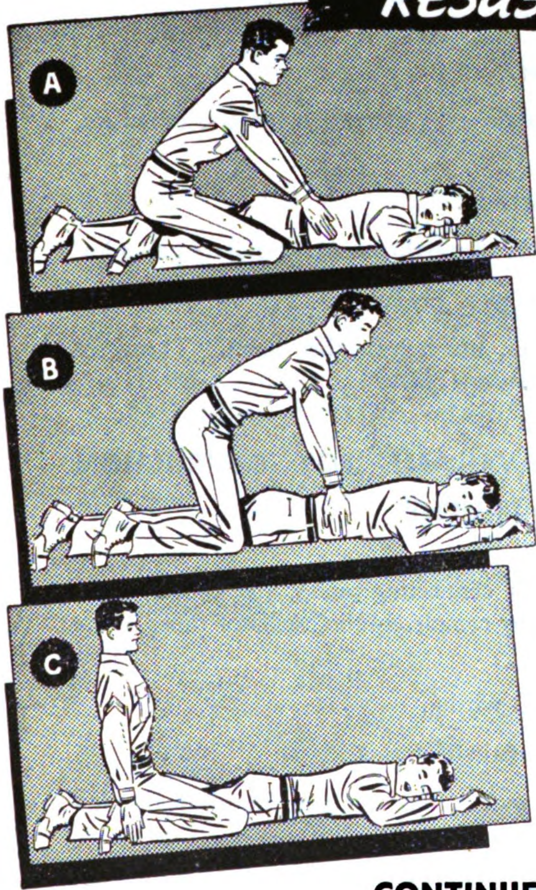
I. FREE THE VICTIM FROM THE CIRCUIT IMMEDIATELY.

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

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, meters, dials, connecting cables, and knobs. Take special care to destroy completely the oscillator tubes in the transmitter.

2. Cut—All connecting cables and wiring.

3. Burn—All literature and schematic diagrams.

4. Bend—The antenna matching section, antenna, and transmitter tuning rods.

5. Bury or scatter—All nameplates and other parts that cannot be destroyed otherwise.

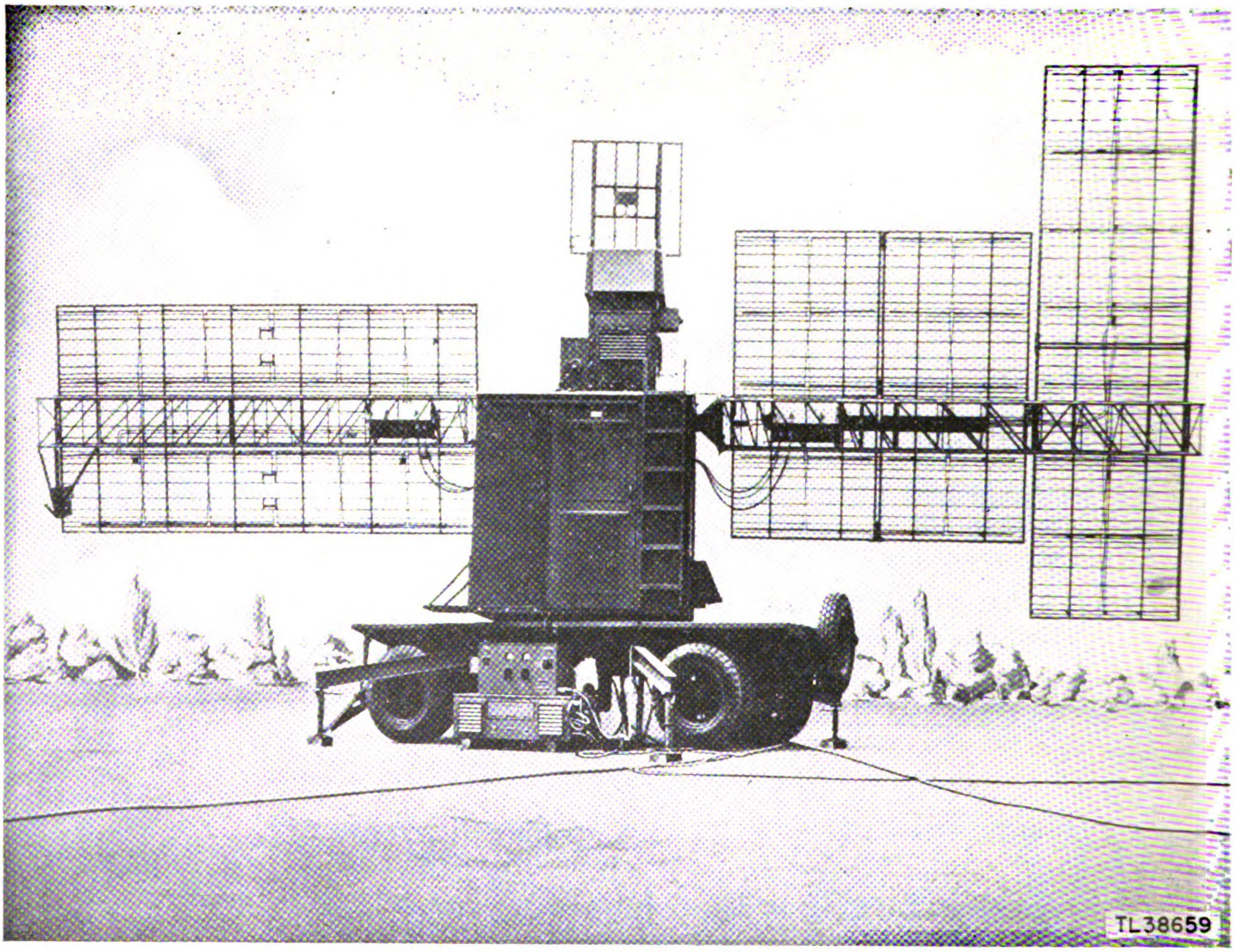
DESTROY EVERYTHING

REFERENCE NOTICE

This is one of three technical manuals on Radio Equipments RC–148, RC–148–B, and RC–148–C. The other two are:

TM 11–1318, Radio Equipments RC–148, RC–148–B, and RC–148–C, Technical Operation Manual (General Description, Operating Instructions, and Equipment Performance Log).

TM 11–1418, Radio Equipments RC–148, RC–148–B, and RC–148–C, Preventive Maintenance Manual.



Frontispiece. Radio Equipment RC–148–B mounted on Radio Set SCR–268–B.

CONFIDENTIAL

This manual, together with TM 11–1318 and TM 11–1418, supersedes TM 11–1118, 5 October 1942, 1 July 1943, and TM 11–1118C, 1 December 1943.

CHAPTER 1

THEORY OF OPERATION

Section I. ELEMENTARY PRINCIPLES OF IFF AND RADIO EQUIPMENTS RC–148, RC–148–B, AND RC–148–C

1. Introduction

The primary aim of this Technical Manual is to present the electrical and mechanical theory of Radio Equipments RC–148, RC–148–B, and RC–148–C, and to aid the repairman in the maintenance, repair, and most efficient operation of the equipment. It is the third book of a series on Radio Equipments RC–148, RC–148–B, and RC–148–C. The other two manuals in this series are TM 11–1318, Technical Operation Manual, and TM 11–1418, Preventive Maintenance Manual. Hereafter, in this manual, reference to Radio Equipment RC–148–(*) will be made when models of Radio Equipments RC–148, RC–148–B, and RC–148–C are meant and to Radio Set SCR–268–(*) when models of Radio Sets SCR–268, SCR–268–B, and SCR–268–C are meant, unless it is stated that only one model is intended.

2. Contents of Manual

This manual is divided into four chapters as follows:

Chapter 1. Theory of Operation.
Chapter 2. Trouble-shooting Procedures.
Chapter 3. Supplementary Mechanical Information.
Chapter 4. Maintenance Parts Lists.

a. CHAPTER 1. THEORY OF OPERATION. This chapter contains a brief summary of the purpose and fundamentals of Identification Friend or Foe (IFF) equipment and both a general and detailed description of the function and operation of the components of Radio Equipment RC–148–(*). These components, each treated in a separate section, are: transmitter, r-f system, receiver, interconnector, wavemeter, and signal generator of the RC–148 and RC–148–B; and transmitter section, r-f system, receiver section, interconnector, signal generator, and power supply of the RC–148–C.

b. CHAPTER 2. TROUBLE-SHOOTING PROCEDURES. This chapter deals with the technique and methods of finding trouble in Radio Equipment RC–148–(*). 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 other suitable techniques. It also includes information on the replacement of defective electrical parts.

c. CHAPTER 3. SUPPLEMENTARY MECHANICAL INFORMATION. This chapter contains information necessary for the replacement of defective mechanical parts of the Radio Equipment RC–148–(*).

d. CHAPTER 4. MAINTENANCE PARTS LISTS. These are complete lists of all replaceable parts of the radio equipments. It includes reference symbols, Signal Corps stock numbers, names of parts and descriptions, quantity per equipment, and 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 identification are now in use. One method involves the coordination of reports from radar equipment and from distant observers who have been able to recognize the target. Another method is by a process of elimination, based on the knowledge of the movements

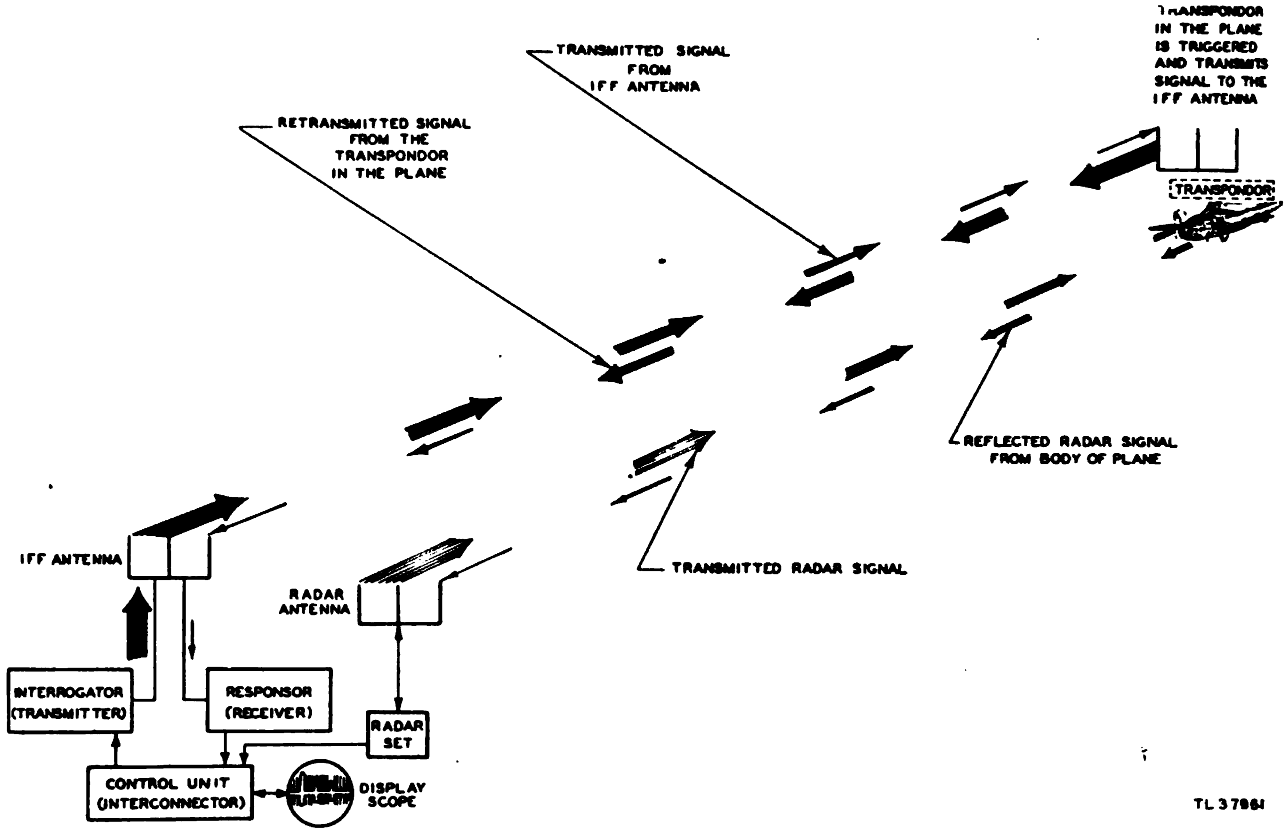


Figure 1. Elements of Mark III IFF.

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 of IFF. As all the foregoing methods involve considerable coordination and consequent time delay it has been found essential to avoid this by providing 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. 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 develop 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 weights are in general of less importance.

4. Mark III IFF

a. Description. The complete Mark III IFF system consists of two separate units as shown in figure 1; namely the ground unit, located near the radar set, called the interrogator-responsor, and the airborne equipment, located in the friendly plane, called the transpondor. The radar operator challenges the unidentified plane by setting the interrogator-responsor into operation. As shown in figure 1, pulses of r-f energy are radiated toward the plane. These pulses are very weak as compared with the power in the radar pulses hence the signal reflected from the plane would be 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 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 a 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 a 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 (157-187 mc) and spot frequencies are allocated to the interrogator-respondor 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* (or swamping) of the transponder 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-through 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 the RC–148–(*), the identification signals are displayed on the radar range oscilloscope below the normal echo. In this way, the identification signal is promptly correlated with the correct target. In some cases the IFF may be triggered into operation at ranges beyond the detection range of the radar in use. In these cases, the operator of the radar set will see the periodic IFF pulse without any associated echo.

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 during consecutive sweeps to have the transpondor 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 each code is repeated. 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 discrimination between different types of friendly craft or an additional security measure. In addition to the six codes just described, a further code is available in which a very wide pulse is returned each sweep. This code is most easily distinguished and is intended as a universal distress code.

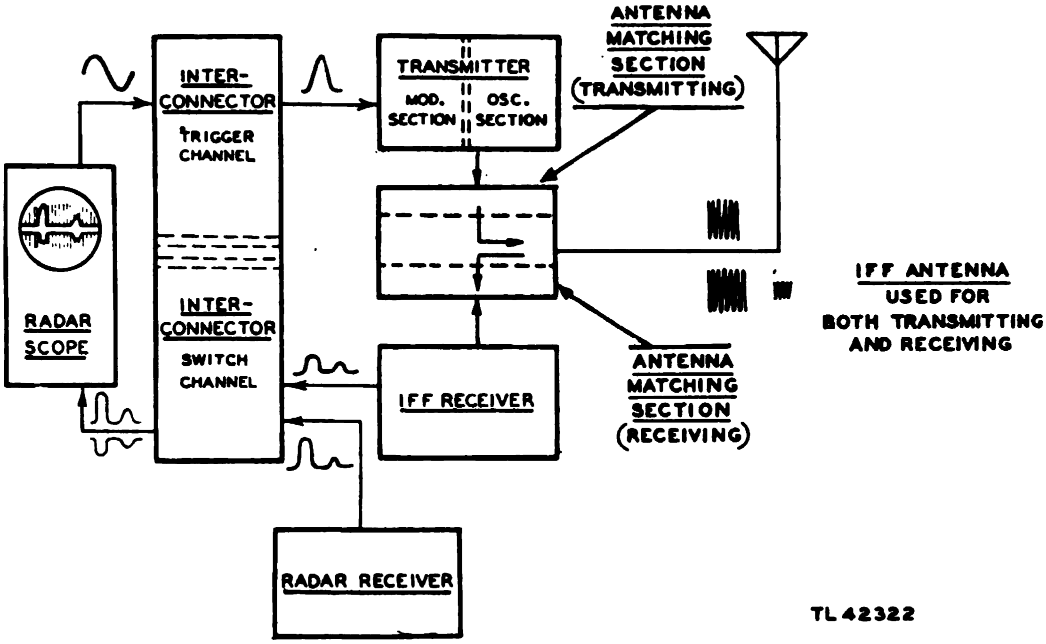


Figure 2. Radio Equipment RC–148–(*), components.

Table 1. Coding position, 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.

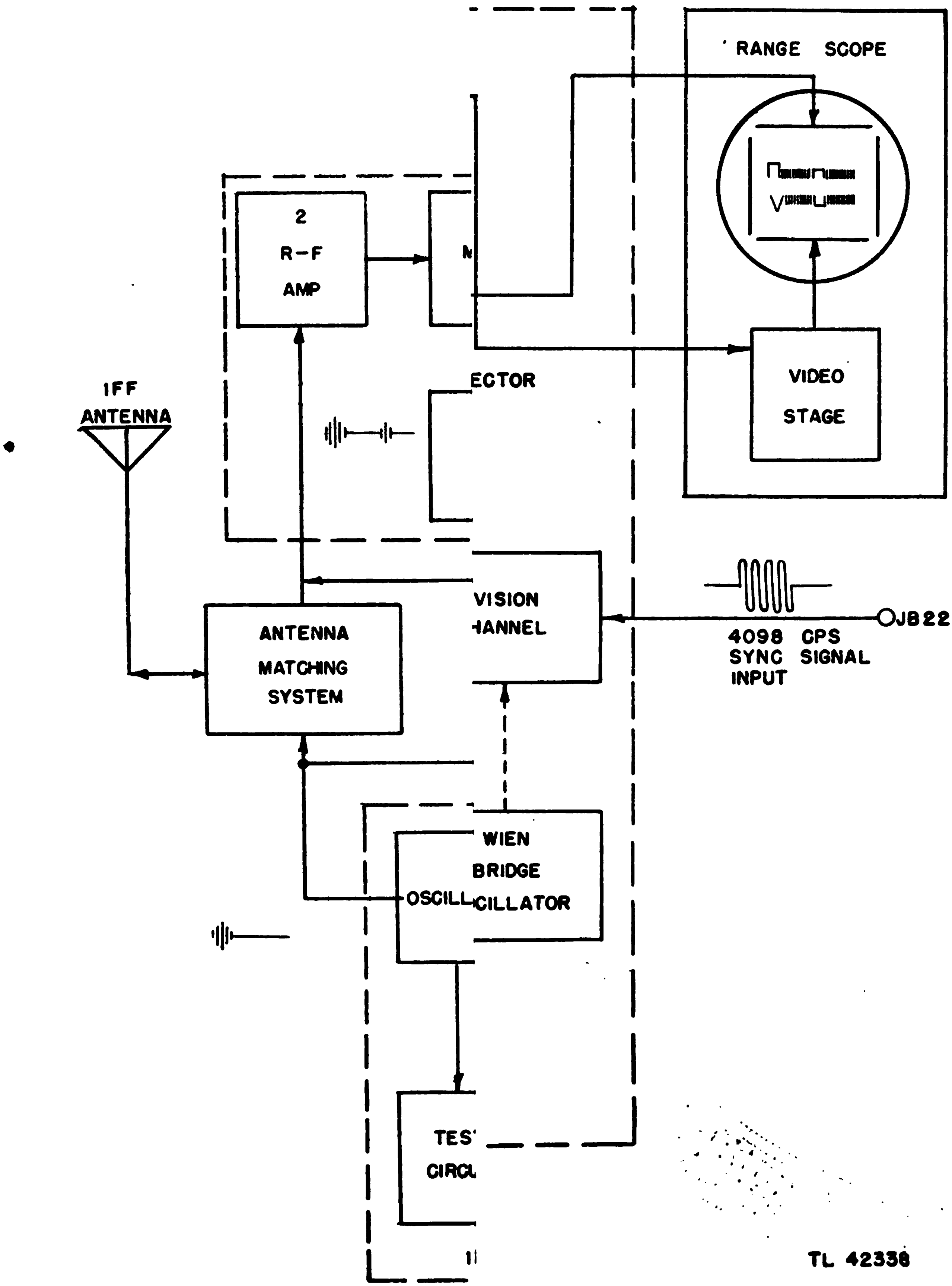
5. Description of RC–148–(*)

a. General. The RC–148–(*) is a typical example of the Mark III IFF interrogator-responsor equipment. In the next few paragraphs a general description of the components will be given and the part each one plays in the identification system. (See fig. 2). On the RC–148–C the transmitter, the receiver and the matching section are housed in one chassis, but are treated as though they were separate components. (See fig. 2.)

b. Transmitter. The transmitter of the RC–148–(*) is the interrogator. Its function is to generate the pulses of radio energy that are sent out into space to trigger the transpondor in the plane or ship that is to be identified. To accomplish this, the transmitter has a high-frequency oscillator section which oscillates at a frequency within the IFF band of 157 to 187 megacycles. To trigger this oscillator at the proper intervals, there is a built-in modulator section. This section receives a synchronizing voltage from the radar keying unit through the interconnector which is regulated so that the transmitter will send out its pulses 273 times per second. This is 1/15 the recurrence frequency of the radar set, 4098 pulses per second.

c. R-f System. Associated with the interrogating function of the transmitter are the antenna matching section which is used to match the transmitter to the antenna, and the antenna itself which radiates the energy into space in the direction of the target.

d. Receiver. The receiver of the RC–148–(*) is the responsor. It is a superheterodyne type and with a few differences it is similar to most radio receivers. Two of these differences are the broad intermediate-frequency bandwidth of four megacycles which is obtained by staggered tuning and the high intermediate frequency of 11 megacycles. The function of the receiver is to receive the identification signal from the transpondor, amplify it, and detect or rectify it so that it can be sent to the radar range oscilloscope together with a portion of the transmitted pulse for simultaneous presentation. The antenna and the antenna matching section, which are common to both the transmitting and receiving system, perform a similar function in both. In the latter case, however, the antenna receives the transpondor signal.


RANGE SCOPE
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R-F
AMP
ECTOR
VIDEO
STAGE
IFF
ANTENNA
VISION
HANNEL
4098 CPS
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SYSTEM
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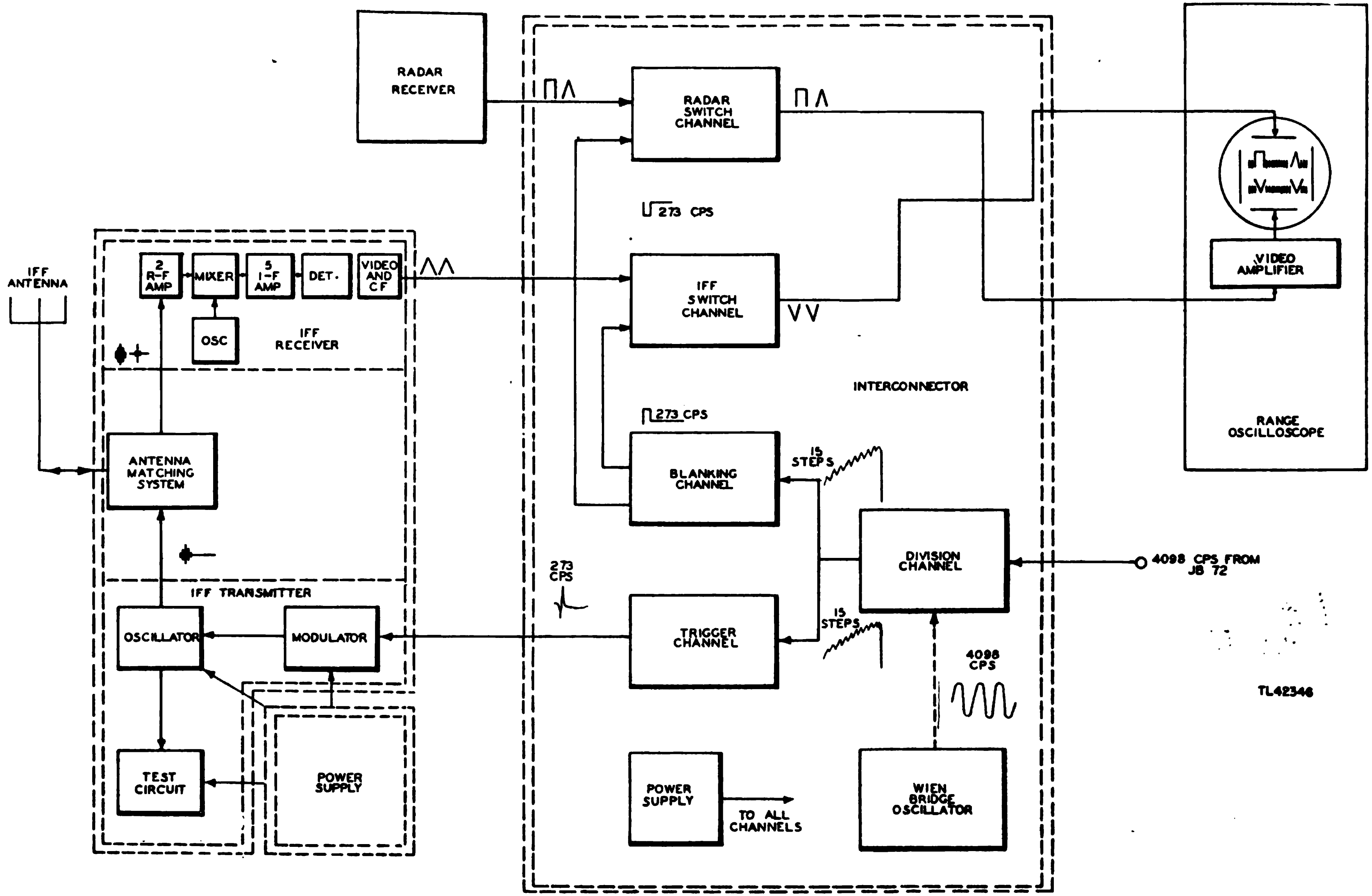

Figure 4. Radio Equipment RC–148–C, block diagram.

e. INTERCONNECTOR. The interconnector which is part of the control unit may be described as the heart of the set. Its synchronizing, switching, and testing functions are described in detail in section V.

f. OTHER COMPONENTS. Although the radar receiver and the radar range oscilloscope are not a part of the RC–148–(*), they play an important part in the identification system. These components, together with the signal generator and the wavemeter are also covered in this chapter. In the RC–148–C, the Signal Generator I–222–A performs the combined functions of the wavemeter section of the control unit and the Signal Generator I–198–A in the RC–148 and RC–148–B.

g. BLOCK DIAGRAM. A functional block diagram of the entire Radio Equipment RC–148 or RC–148–B is given in figure 3 and a functional block diagram of the RC–148–C is given in figure 4. These figures show in detail the interrelation of all the components of the equipment and serve as a master diagram for reference and review.

6. List of Components

a. RC–148 AND RC–148–B.

Descriptive name	*Signal Corps designation*
Transmitter	BC–1072–A
Receiver	BC–1068–A
Control Unit	BC–1073–A
Antenna Matching Section	MC–295–A
Antenna	AN–128–A
Signal Generator	I–198–A

b. RC–148–C.

Descriptive name	*Signal Corps designation*
Radio Receiver and Transmitter	BC–1267–A
Interconnector	BC–1298
Power Supply	RA–105–A
Rack	FM–82
Antenna	AN–128–A
Signal Generator	I–222–A

7. Technical Characteristics

a. RC–148 AND RC–148–B.

Wavelength ....1.9 to 1.6 meters
Frequency ....157 to 187 megacycles
Peak power output ....1 kilowatt
Pulse width ....5 to 7 microseconds
Recurrence frequency .....273 cycles per second
Maximum range ....40,000 yards or greater
Minimum range ....1 mile
Azimuth coverage ....360°
Power requirements ......275 watts
110-120 volts, 5 ampere, single phase 60 cycles
Receiver i-f band width ...4 megacycles
Receiver intermediate frequency (central frequency) ....11 megacycles

b. RC–148–C.

Wavelength ....1.9 to 1.6 meters
Frequency ....157 to 187 megacycles
Peak power output ....750 watts
Pulse width ....5 to 8 microseconds
Recurrence frequency .....273 cycles per second
Maximum range ....40,000 yards or greater
Minimum range ....1 mile
Azimuth coverage ....360°
Power requirements ......600 watts (approx.)
110-120 volts, 5 ampere, single phase 60 cycles
Receiver i-f bandwidth ...4 megacycles
Receiver intermediate frequency (central frequency) ....11 megacycles

Section II. TRANSMITTER OF RC–148 AND RC–148–B

8. Purpose

The function of the transmitter is to generate a radio-frequency interrogation pulse in proper synchronization with the radar transmitter pulse.

9. General Description

The transmitter consists of four sections: modulator section, r-f oscillator section, testing or monitor section, and power supply section. (See fig. 4.) This paragraph contains a general description of the main sections of the transmitter. Paragraphs 10 through 18 contain a detailed description of the transmitter circuits.

a. MODULATOR SECTION. The modulator section includes five stages: the peaking circuit, input cathode follower, blocking oscillator, output cathode follower, and the modulator tube. The function of this section is to shape and amplify the pulse which keys the r-f oscillator. The input to the modulator is a 273-cycles-per-second pulse from the interconnector and the output is a sharp narrow pulse of large

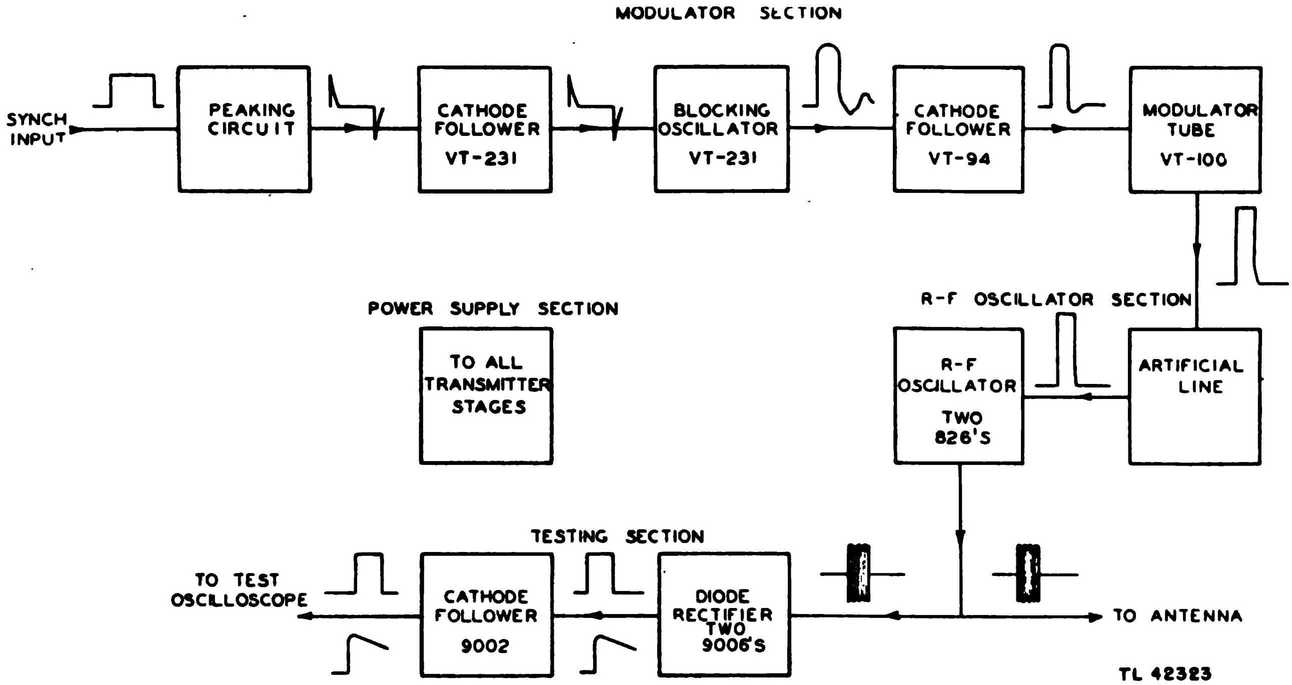

Figure 5. Transmitter, block diagram.

amplitude at the input recurrence frequency suitable for keying the r-f oscillator.

b. R-F OSCILLATOR SECTION. The r-f oscillator section consists of the artificial line and the oscillator stage. This stage generates the r-f energy, in the form of pulses, which is to be radiated by the antenna.

c. TESTING SECTION. The testing section consists of two stages, a diode rectifier, and a cathode follower. The function of this section is to provide a means of viewing the output pulse and checking the power output of the transmitter with the aid of the test oscilloscope. The input to this section is a portion of the output pulse of the r-f oscillator section. The output is the envelope of the r-f pulse.

d. POWER SUPPLY SECTION. The power supply section includes four transformers and three rectifier tubes. These circuits furnish the plate voltage and the bias voltage for the r-f oscillator section, the plate voltage for the modulator and testing sections, and the filament voltages.

10. Peaking Circuit

The input circuit of the transmitter is a peaking circuit, illustrated in figure 6. Resistor 55 is the load for the coaxial cable 101–B which carries the synchronizing signal from the interconnector to the transmitter. Approximately 20 volts of this synchronizing voltage is available across this resistor. Capacitor 1–1 and resistor 56 comprise the peaking or RC circuit. The constants of this circuit are chosen to give a peaked-wave output. Therefore, a pulse of any width impressed across resistor 55 will appear as a peaked wave across resistor 56.

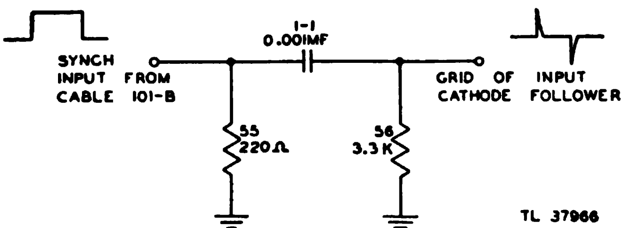

Figure 6. Peaking circuit, partial schematic.

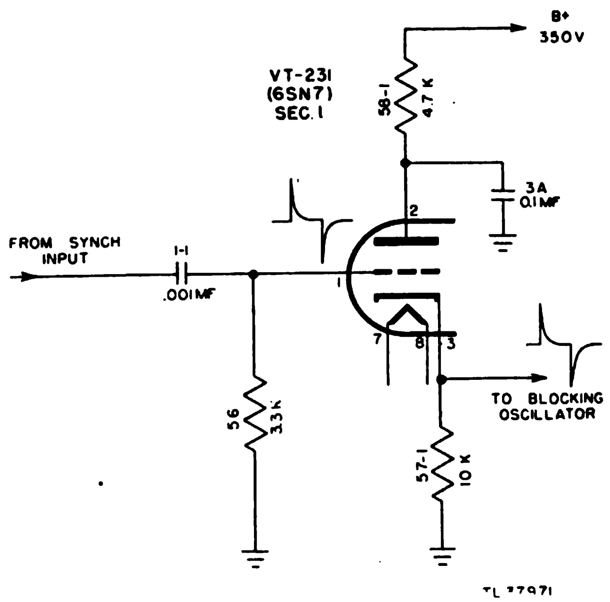

Figure 7. Cathode follower, VT–231, partial schematic.

e. INTERCONNECTOR. The interconnector which is part of the control unit may be described as the heart of the set. Its synchronizing, switching, and testing functions are described in detail in section V.

f. OTHER COMPONENTS. Although the radar receiver and the radar range oscilloscope are not a part of the RC–148–(*), they play an important part in the identification system. These components, together with the signal generator and the wavemeter are also covered in this chapter. In the RC–148–C, the Signal Generator I–222–A performs the combined functions of the wavemeter section of the control unit and the Signal Generator I–198–A in the RC–148 and RC–148–B.

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60 cycles
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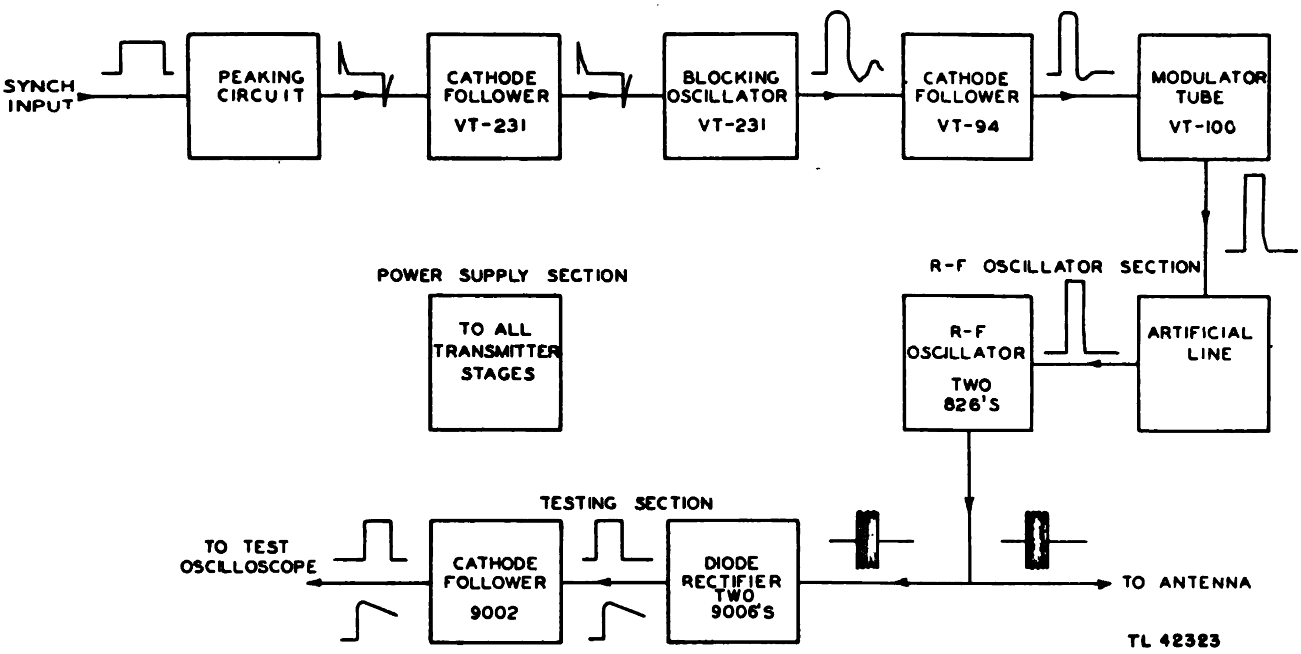

Figure 5. Transmitter, block diagram.

amplitude at the input recurrence frequency suitable for keying the r-f oscillator.

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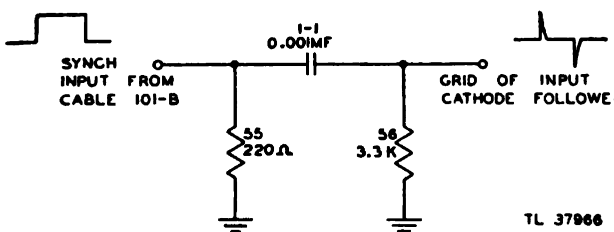


Figure 6. Peaking circuit, partial schematic.

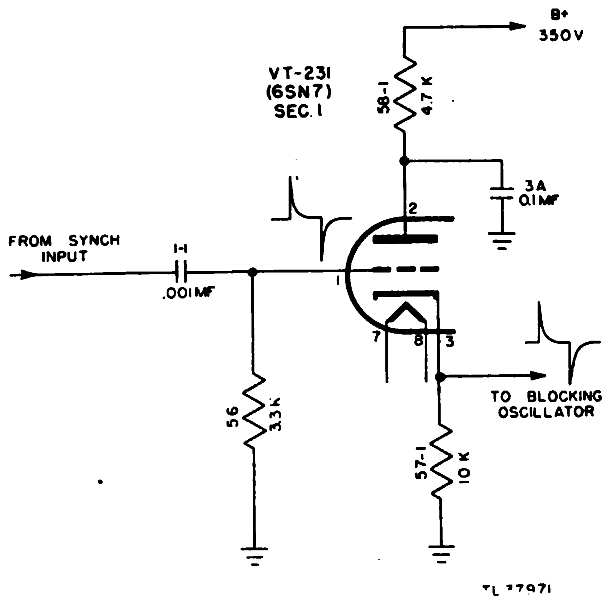


Figure 7. Cathode follower, VT-231, partial schematic.

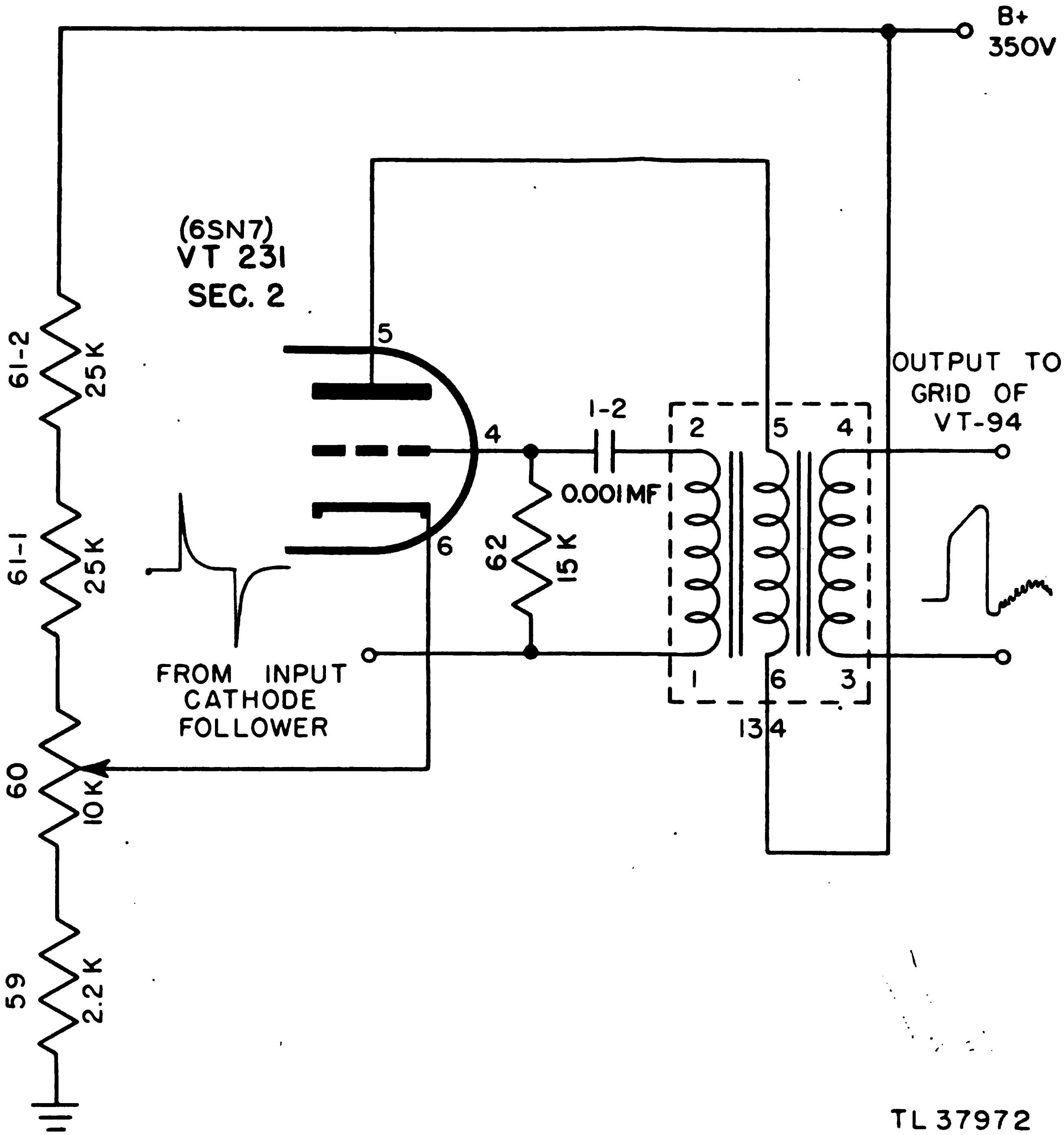


Figure 8. Blocking oscillator, VT-231, partial schematic.

11. Cathode Follower VT-231

The cathode follower tube, ½ of VT-231, a 6SN7, is used to isolate the blocking oscillator from the input circuit. (See fig. 7.) The voltage across the cathode resistor 57-1 is of the same shape as the input voltage, but it is of slightly less magnitude since the gain of a cathode follower is always less than unity. The capacitor 3A is the plate bypass capacitor. The voltage across the cathode resistor is applied to the grid circuit of the blocking oscillator.

12. Blocking Oscillator

a. General. The second half of the VT-231 is connected as a blocking oscillator. (See fig. 8.) It is a triggered regenerative oscillator with a transformer supplying the required feedback from the plate to the grid. The oscillator, however, is arranged so that it will not operate continuously as other oscillators do, but will become blocked or inoperative after a definite length of time. With no synchronizing signal impressed, the bias potentiometer is set to bias the tube just below cut-off. When the positive pulse from the interconnector is applied to the blocking oscillator grid by way of the cathode follower, it triggers the blocking oscillator and sets it into oscillation. The oscillator generates one pulse and then stops until the next triggering pulse arrives. The details of this operation are explained in the following paragraphs.

b. Rise of Current. When the triggering pulse is impressed upon the grid of the blocking oscillator, it causes the grid to become more positive with respect to the cathode. This positive grid voltage causes an increase of plate current to flow through the plate winding of the blocking oscillator transformer which, in turn, induces a voltage in the grid winding of the transformer. Because of the polarity of the windings, the voltage causes the grid to become more positive and causes more plate current to flow. Because of this regenerative action, the plate current rises very rapidly to saturation. Although the plate voltage can change instantaneously, the current through the plate winding cannot. The plate voltage, therefore, drops to its minimum value very rapidly and remains there while the plate current is rising to saturation.

c. Fall of Current. At saturation, the field in the plate winding ceases to increase, and for an instant there is no induced voltage in the grid winding. Immediately the grid capacitor 1–2 begins to discharge. This discharge causes the positive potential on the grid to become less positive, thereby causing a decrease in plate current in the plate winding and the field around the plate coil starts to collapse. This collapsing field, in turn, induces a voltage in the grid winding in the reverse direction, causing the grid to become more and more negative. This process continues until the grid is driven beyond cut-off, thus completing a cycle of operation.

d. Recurrence Frequency. Because of the action described in *b* and *c* above, sharp pulses are generated in the plate circuit. The rate of recurrence of the operating cycle depends only upon the synchronizing pulses from the interconnector when the bias potentiometer is set correctly. The fixed bias (resistor 59) also is used to prevent triggering of the blocking oscillator by stray coupling from Radio Set SCR–268–(*) transmitter.

e. Bias. The bias is obtained from a bleeder network connected between the plate supply and ground. This network is composed of fixed resistors 61–1, 61–2, 59, and the variable potentiometer 60. If the bias is too low, the blocking oscillator will oscillate freely at its natural frequency. If the bias is too high the blocking oscillator will always be cut off and will not oscillate even when the positive pulse is applied. The cathode bias voltage is variable between 20 and 60 volts. The bias control is adjusted by the use of a screw driver from the front panel of the transmitter.

f. Output Coupling. The output pulse of the blocking oscillator is coupled to the next stage by means of the third winding of the blocking oscillator transformer and appears as a narrow positive pulse. The 180° phase inversion is due to the polarity of the windings. This pulse is applied between the grid and cathode of the second cathode follower VT–94. The use of a three winding transformer has a decided advantage to this circuit. It isolates the blocking oscillator stage from the succeeding stage and permits a *floating* ground. This enables the cathode of the modulator to operate at a large negative voltage, so that the output of the low voltage positive and negative power supplies is added together to produce a large drop across the tube.

13. Cathode Follower VT–94 (fig. 9)

The narrow positive pulse fed to the grid of the cathode follower is approximately 200 volts in amplitude. As the grid tends to go positive in relation to the cathode, grid current is drawn. The grid current causes a voltage drop across the series grid resistor 63. The magnitude of the grid current drawn is sufficient to prevent the grid from ever going more than slightly positive with respect to the cathode. Because of this, the voltage appearing across the cathode resistor 64–1, due to the flow of plate current, is a well-shaped square wave. However, some of the irregularities in the positive voltage input also appear across resistor 64–1, but these irregularities are considerably reduced across the cathode resistor. This is the purpose of positive clipping and the result is a well-shaped square-wave from the cathode follower. The bias developed in the cathode is such that the tube is operated near cut-off; therefore, most of the negative portion of the oscillation does not appear in the output. The positive-pulse output is fed to the grid of the modulator, Tube VT–100.

14. Modulator Tube VT–100

a. General. A modulator Tube VT–100 (807) in a bootstrap circuit is used to pulse the transmitter.

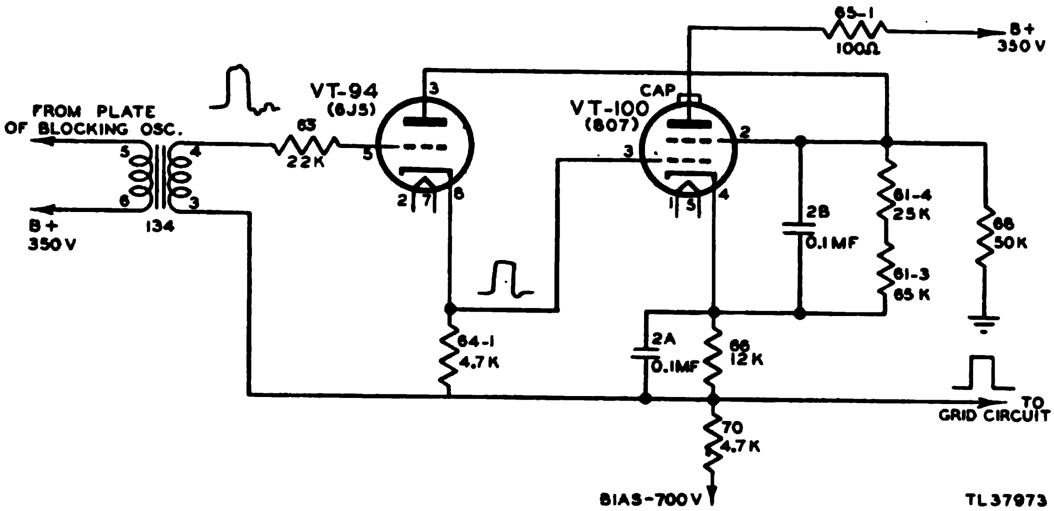


Figure 9. Cathode folllower, VT–94, and modulator, VT–100, partial schematic.

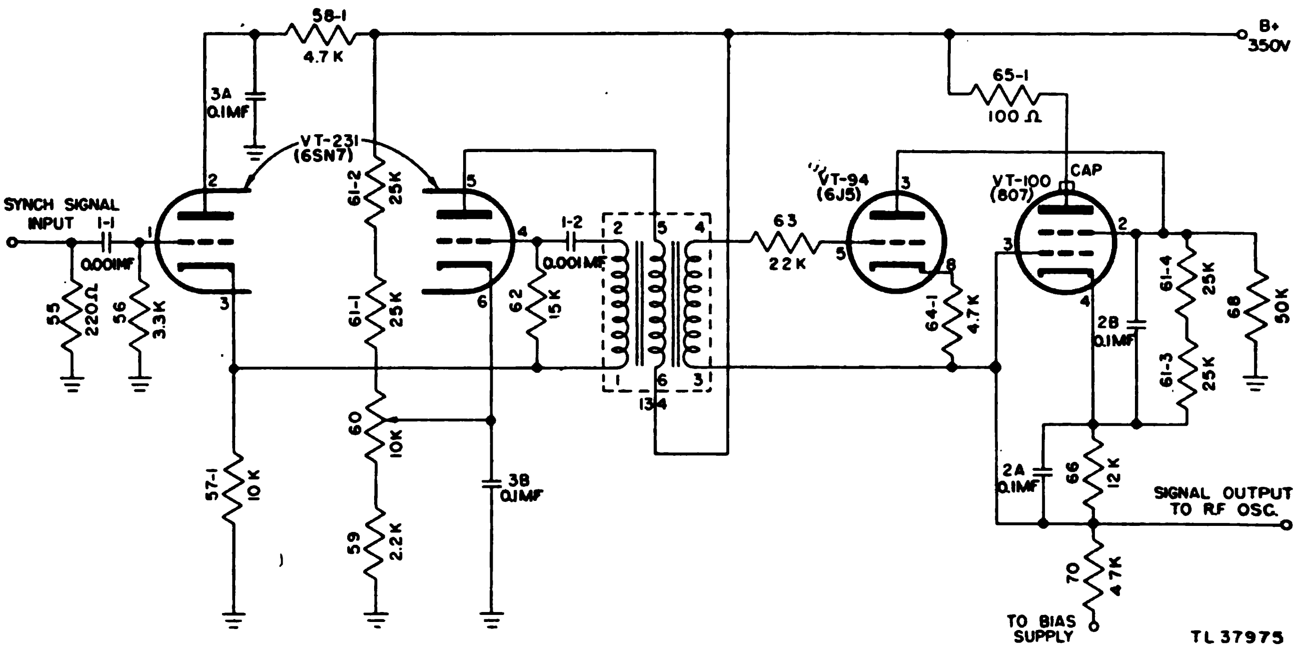


Figure 10. Modulator circuit, partial schematic.

(See fig. 10.) The function of this circuit is to provide a large negative bias for the r-f oscillator grids and a high-voltage pulse of very short duration to trigger the r-f oscillator tubes.

b. BIAS CIRCUIT. During the period between pulses the modulator tube is biased beyond cut-off by the voltage developed across resistor 66. Resistor 66 is part of the voltage-divider network, consisting of resistors 70, 66, 61, (which is 61–3 and 61–4) and 68, across which the bias voltage of —700 volts is placed. The approximate voltages across this divider are given in figure 11. The cathode potential is —625 volts and the grid potential is —680 volts. Consequently, the tube is biased beyond cut-off. During this period, the VT–100 draws no current and the voltage on the plate is the supply voltage of 360 volts positive.

c. PULSE CIRCUIT. When the positive pulse from the cathode follower appears on the grid of the modulator tube, it causes the tube to draw current. The current flow now is through resistor 65–1, the resistance of the tube, capacitor 2A, and resistor 70.

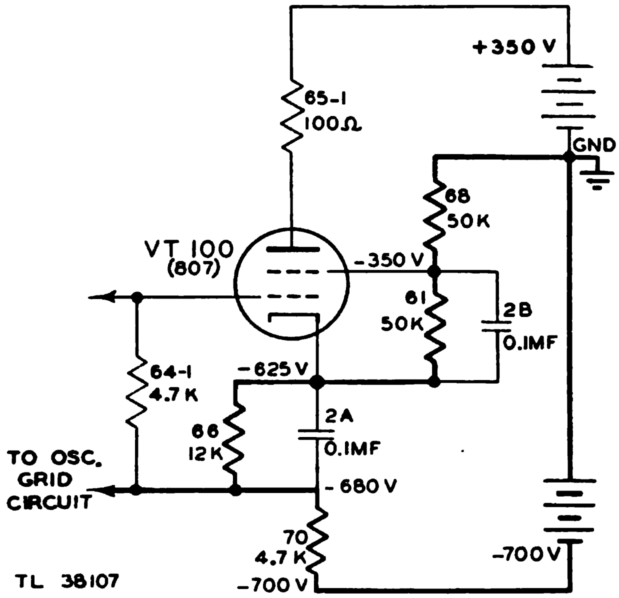


Figure 11. Bias circuit of modulator tube.

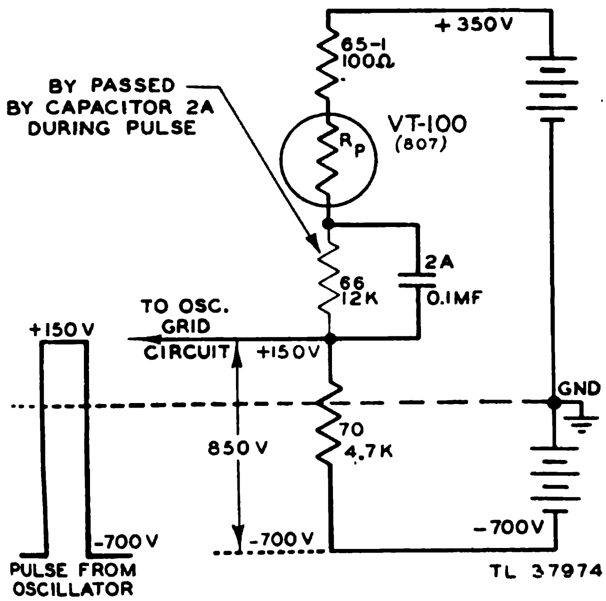


Figure 12. Pulse circuit of modulator tube.

(See fig. 12.) Capacitor 2A bypasses resistor 66 for the duration of the pulse. There is a voltage drop in the tube, a small drop across the parasitic suppressing resistor 65–1, and a drop across the capacitor 2A. In this new voltage-divider circuit, the voltage drop across resistor 70 is approximately 850 volts. Since one end of resistor 70 is tied to —700 volts, the other will be at 150 volts positive with respect to ground. This high-voltage pulse is applied to the grid circuit of the r-f oscillator.

15. Artificial Line

a. GENERAL. An artificial line is used between the output of the modulator VT–100 and the grids of the r-f oscillator tubes in order to control the width of the r-f pulse emitted by the oscillator. The artificial line consists of a network of inductances and capacitors the electrical characteristics of which are so proportioned that the travel time of a wave from the input of the line and back again is 6.66 microseconds. Its presence is necessary because the r-f oscillator has plate voltage on it at all times and if an ordinary pulse were supplied to its grid circuit it would not stop oscillating promptly at the cessation of the pulse. (See fig. 13.)

b. OPERATION. When the tubes are not conducting, the grid bias on the r-f oscillator is approximately —700 volts. When the modulator pulse of 150 volts positive is impressed upon the grid, the oscillator operates and grid current begins to flow. When grid current flows, the grid may be considered as practically at ground because the cathode resistance is of negligible value (resistor 73, 7.8 ohms) and the grid to cathode internal resistance is low. Resistor 69, which is in the grid circuit, will consequently have a drop across it of almost the full 150 volts. This resistor is connected in parallel with the artificial line, and the drop across it, therefore, is the input voltage to the artificial line network. The artificial line network has characteristics similar to an actual open-ended transmission line. The input voltage can be looked upon as a traveling wave of 150 volts charging the line as it travels toward the open end. On reaching the open end, the wave is reflected without change in polarity and thus charges the line another 150 volts or a total of 300 volts as it travels back toward resistor 69. The time required for the voltage wave to travel the length of the artificial line is 3.33 microseconds, or a total time of 6.66 microseconds is needed for the wave to travel back and forth along the line.

c. PULSE WIDTH. Between the time that the 150-volt potential pulse across resistor 69 is put in to the artificial line and the time the reflected voltage appears across resistor 69, the grids of the oscillator tubes are held only slightly above cathode potential (ground). The amplitude of the reflected voltage on the line is approximately 150 volts and is of the same polarity as the input voltage. Consequently, the voltage across resistor 69 must be now the sum of the two voltages, that is, the source voltage of 150 volts and the 150-volt-reflected output of the artificial line, or a total of 300 volts. Since the 150-volt end of resistor 69 maintains this same potential until grid current ceases, the grid end of the resistor is driven 150 volts *negative*

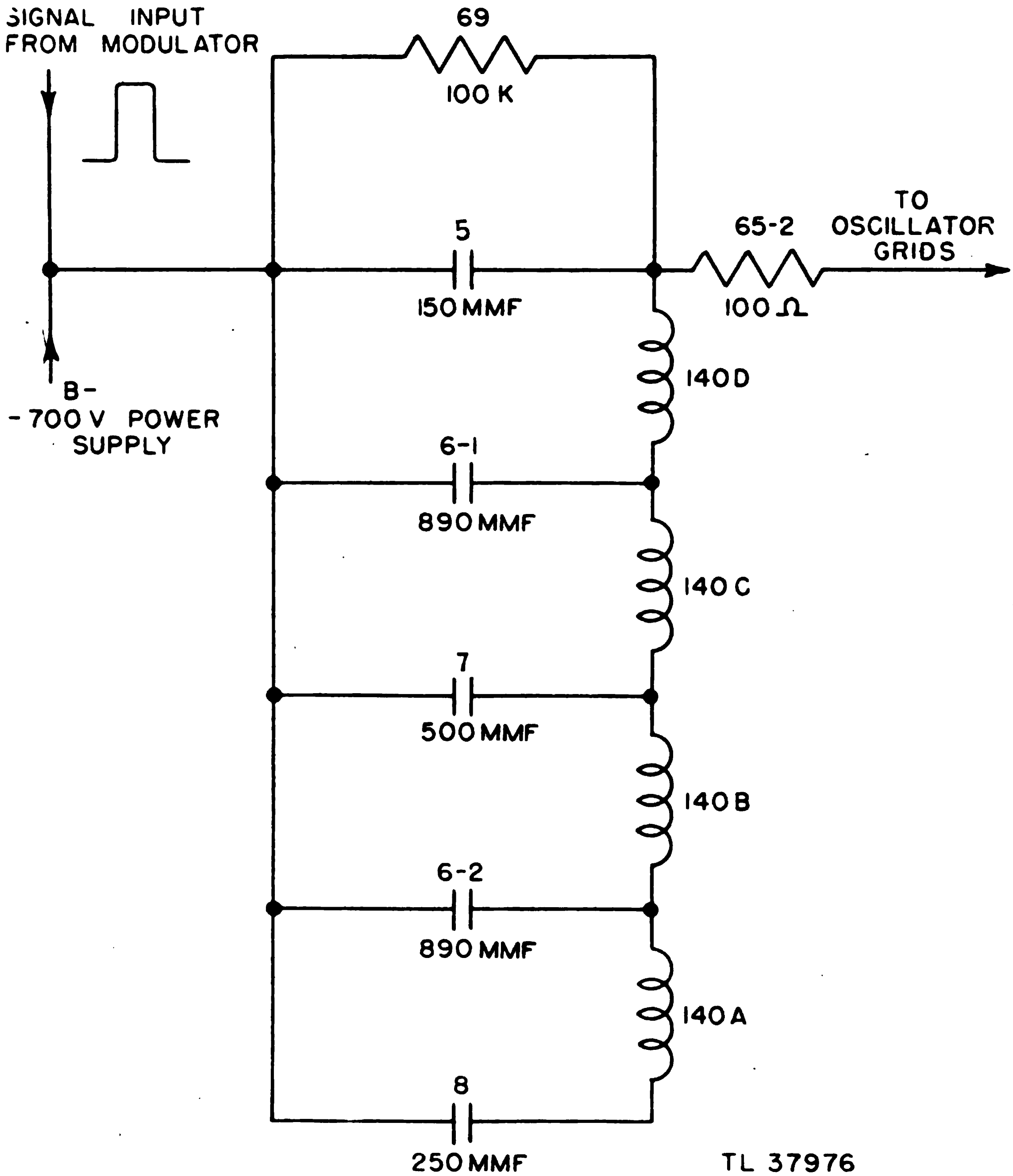


Figure 13. Artificial line, partial schematic.

in order to satisfy the 300-volt drop across resistor 69. This negative potential on the grids causes the oscillating tube to stop oscillating promptly at the end of 6.66 microseconds. The pulse from the modulator, therefore, may be longer than 6.66 microseconds but the transmitter will still produce the proper width pulse by virtue of the action of the artificial line.

16. R–f Oscillator

a. GENERAL. The r-f oscillator uses two 826 tubes in a tuned-grid tuned-filament circuit operated in push-pull. At the frequency of operation, conventional inductors or capacitors would have to be so small in size that they would be impracticable. In addition, the skin effect in the coils introduces resistance which reduces the Q of the oscillator. To overcome these difficulties, the tuned circuits in the r-f oscillator are made of a quarter-wavelength transmission line. The inductance of the quarter-wavelength transmission line, shorted at the end away from the tube, together with its distributed capacity and the interelectrode capacitance of the tube, acts like a

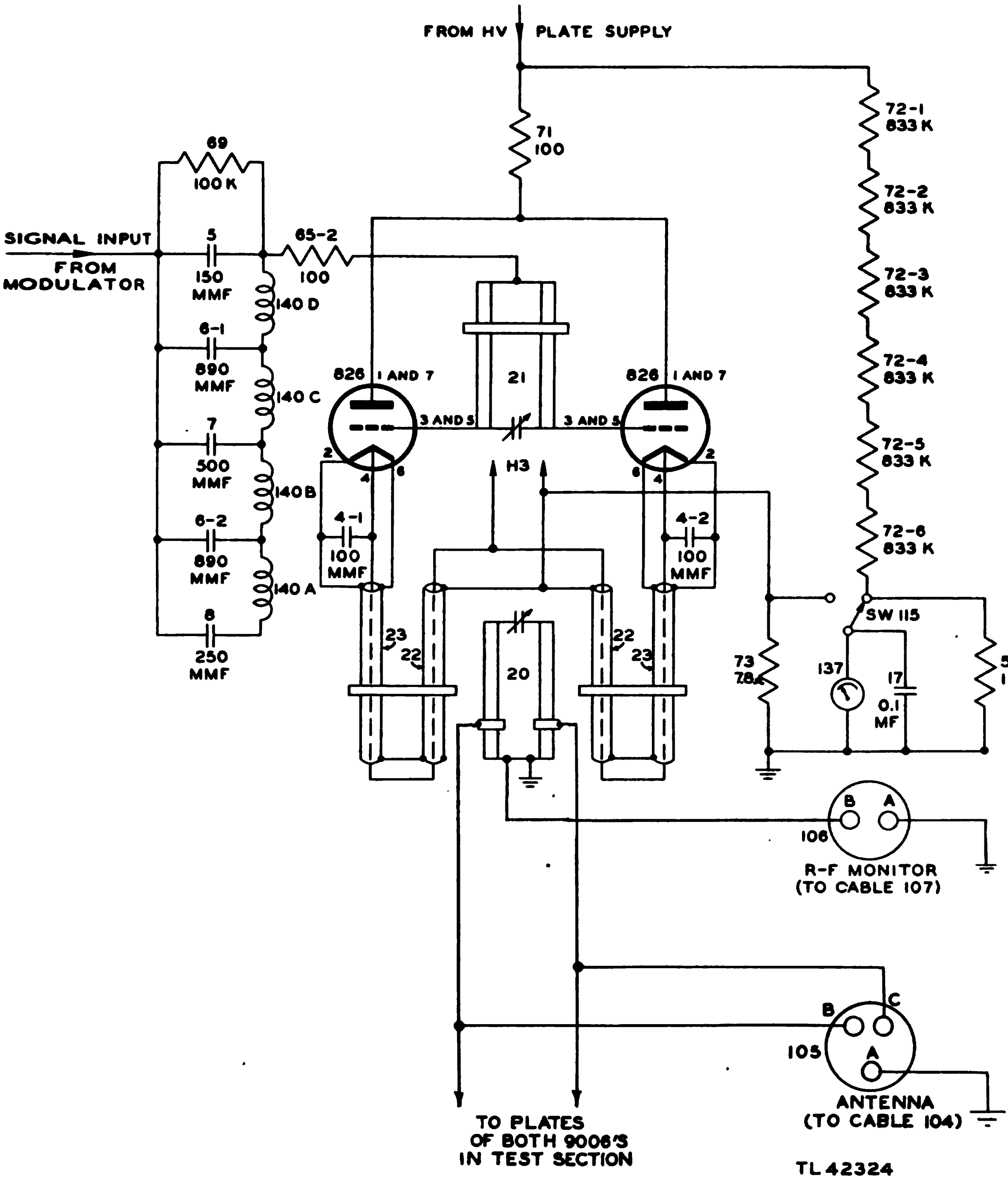


Figure 14. R-f oscillator section, partial schematic.

parallel resonant circuit. The *Q* of this tuned circuit is high because the resistance due to the skin effect is minimized by using large-diameter silver-plated rods for the quarter-wave line. The cathode line has been folded over in order to save space without affecting the electrical characteristics of the line. (See figs. 14, 15, and 16.)

b. Filament Voltage. The filament current for the tube flows through the inner and outer conductors of the concentric line. Capacitors 4–1 and 4–2 are connected between the inner and outer conductors of the coaxial line so that each filament line acts only as a single conductor for r-f.

c. Operation. The operation of this oscillator is

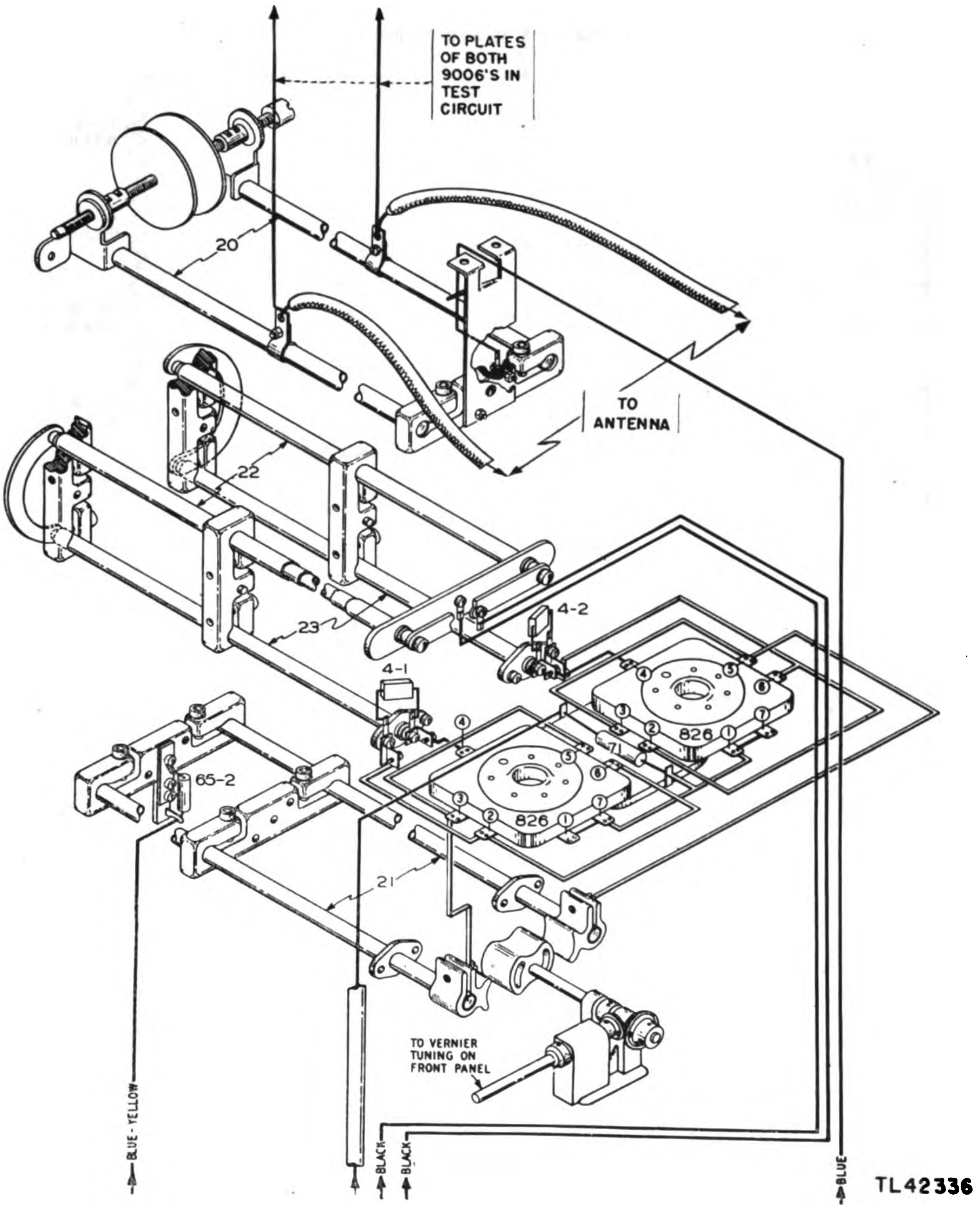
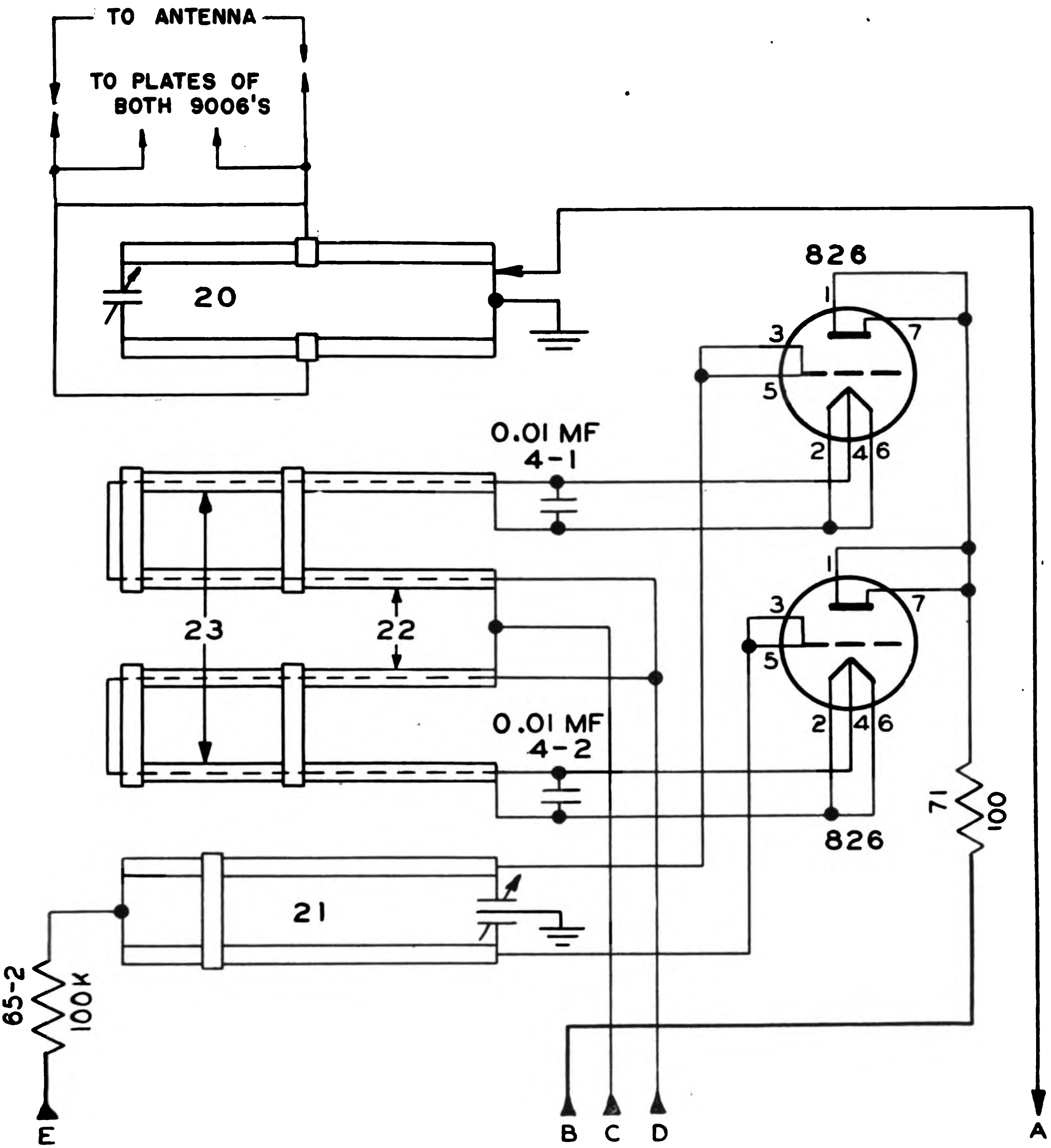


Figure 15. R-f oscillator section, pictorial diagram.

similar to that of any tuned-grid tuned-filament oscillator. The high voltage is applied directly to the plate circuit and the feedback necessary to maintain oscillations is obtained by the grid to cathode capacitance of the tube. The —700-volt bias keeps the tube cut off except when the positive pulse from the modulator section is applied to the shorted end of the grid line. It is operated with two tubes in push-pull in order to get a large power output. By connecting the tubes in push-pull rather than in parallel, the interelectrode capacitances of the tubes are not added. Resistor 65-2 in the grid circuit and 71 in the plate circuit are used to suppress parasitic oscillations.

d. TUNING. The tuning of the lines in the grid and filament circuits determines the frequency of oscillation. (See fig. 17.)

(1) *Line tuning.* The electrical length of the filament line is adjusted by means of two shorting bars. Varying the distance of the shorting bars with respect to the end of the line varies the electrical length of the



A – TO WAVEMETER
B – PLATE SUPPLY
C { TO TRANSFORMER
D { 130 FOR HEATERS
E – ARTIFICIAL LINE PULSE FOR OSC.

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Figure 16. R-f oscillator section, simplified schematic.

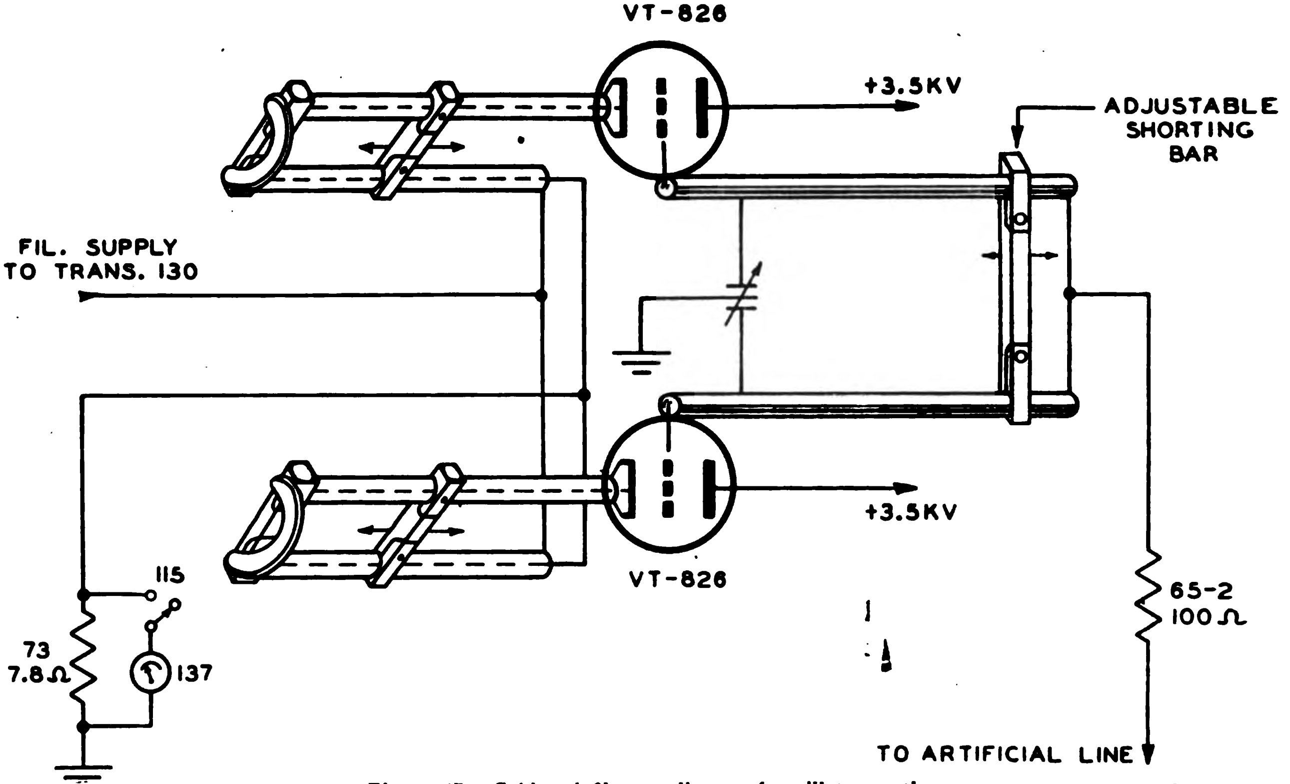

Figure 17. Grid and filament lines, r-f oscillator section. TL 3796C

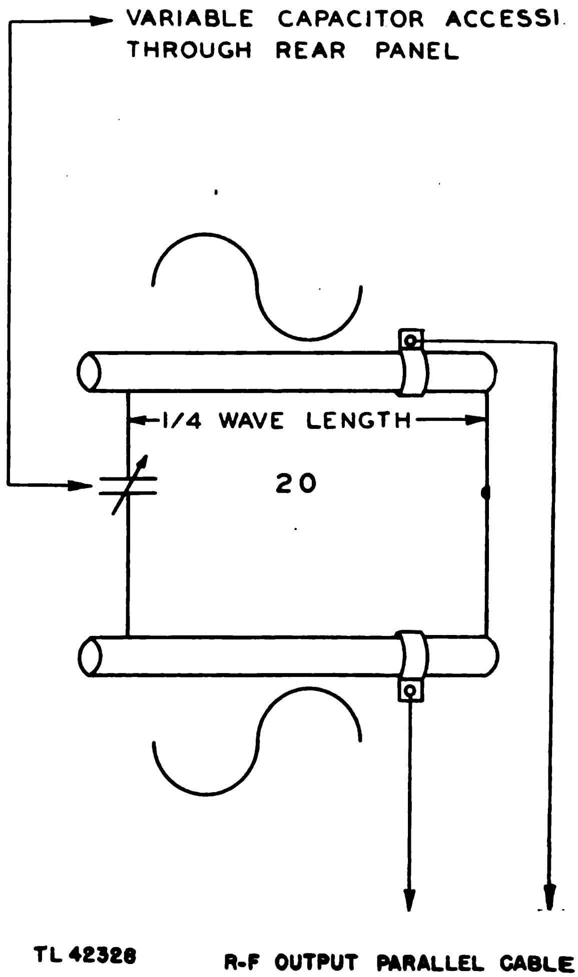

Figure 18. Antenna line.

line and therefore the frequency of resonance. By means of the two shorting bars in the folded filament line and the shorting bar in the grid line, the frequency of the r-f oscillator can be varied over its entire range of 30 megacycles; that is, from 157 to 187 megacycles.

(2) *Vernier tuning.* In addition to the grid-line shorting bar, there is a small butterfly capacitor installed across the grid line (21 in fig. 15) at the end nearer to the tubes. This butterfly capacitor is connected by gears to the screw driver-adjustment knob labeled VERNIER TUNING on the front panel. Changing this capacitance varies the effective electrical length of the grid line and consequently the frequency of oscillation. By means of this adjustment, the transmitter frequency may be varied from plus or minus ½ megacycle in some parts of the frequency range to plus or minus 3 megacycles in other parts of the frequency range from the frequency determined by the setting of the shorting bar.

e. Output Coupling. The energy in the filament tank circuit is coupled to the r-f system by the tuned-antenna coupling line. (See fig. 18.) The magnetic field that is set up by the r-f current in the filament tank circuit induces an r-f voltage in the coupling line. Thus, in effect, the coupling line is the tuned secondary of a transformer of which the filament tank circuit is the tuned primary. The capacitor placed across

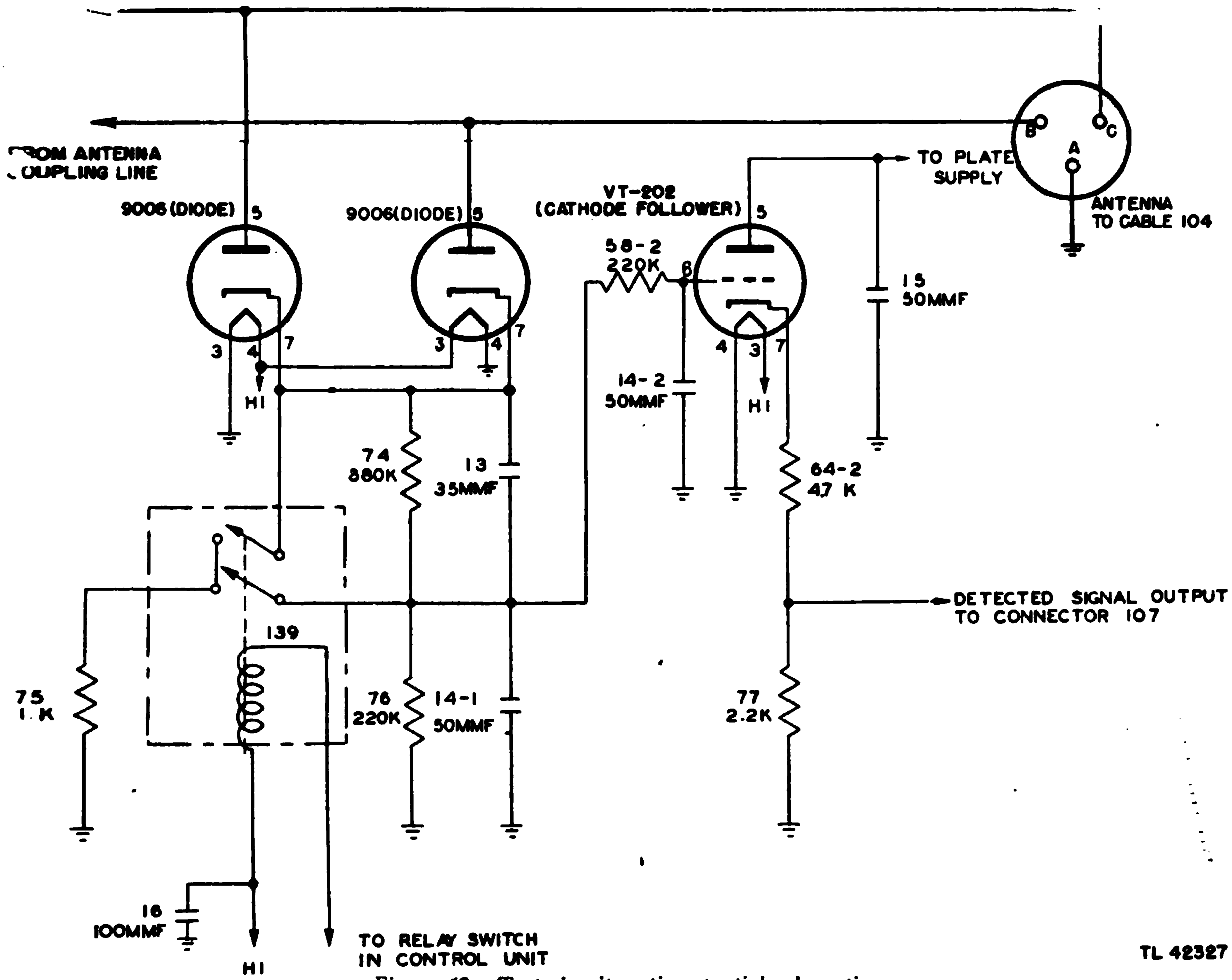

Figure 19. Test circuit section, partial schematic.

the open end of the coupling line is variable and permits the line to be adjusted to the transmitter frequency for maximum transfer of energy. This is a screw driver adjustment (antenna capacitor D on chart) in the rear panel.

f. R-F OUTPUT CABLE. The r-f output cable is a parallel wire line tapped to the antenna coupling line at opposite points. (See fig. 18.) These points in the line are chosen where the impedance is such as to match the impedance of the transmission line and thus obtain maximum transfer of energy. The taps are adjustable and the tap-off points are determined by the manufacturer for all frequencies and indicated on the calibration chart on the inside of the transmitter rear panel. There is another lead coupled to a low-potential point on the antenna coupling line, which conveys energy to the wavemeter in order to determine the transmitter frequency. This lead goes to connector 106.

17. Test Circuit Section

a. DIODE RECTIFIERS AND CATHODE FOLLOWER. A connection to the plate of each diode rectifier is tapped off the two lines of the r-f cable as they go to the antenna connector 105. These diode rectifiers, two 9006 tubes in parallel rectify a portion of the r-f pulse output of the oscillator and furnish the envelope of the r-f pulse. The value of load resistors (fig. 19) in the cathode circuit of the diodes can be varied by means of relay 139 so that the time constant of the circuit can be changed from a high to a low value. This stage is followed by a cathode follower.

b. POWER PULSE MEASUREMENT. Relay 139 is normally in the position that makes the value of the load-resistance (resistor 74 plus resistor 76) one million ohms. These resistors also act as a voltage divider and capacitors 13 and 14–1 are so proportioned as to make the divider accurate at the radio frequency used. The rectified output of the diode is connected to the grid of a cathode follower VT–202 through the r-f filter, composed of the resistor 58–2 and the capacitor 14–2. The voltage impressed upon the grid of the cathode follower is tapped down approximately one-fourth the way on the diode-load re-

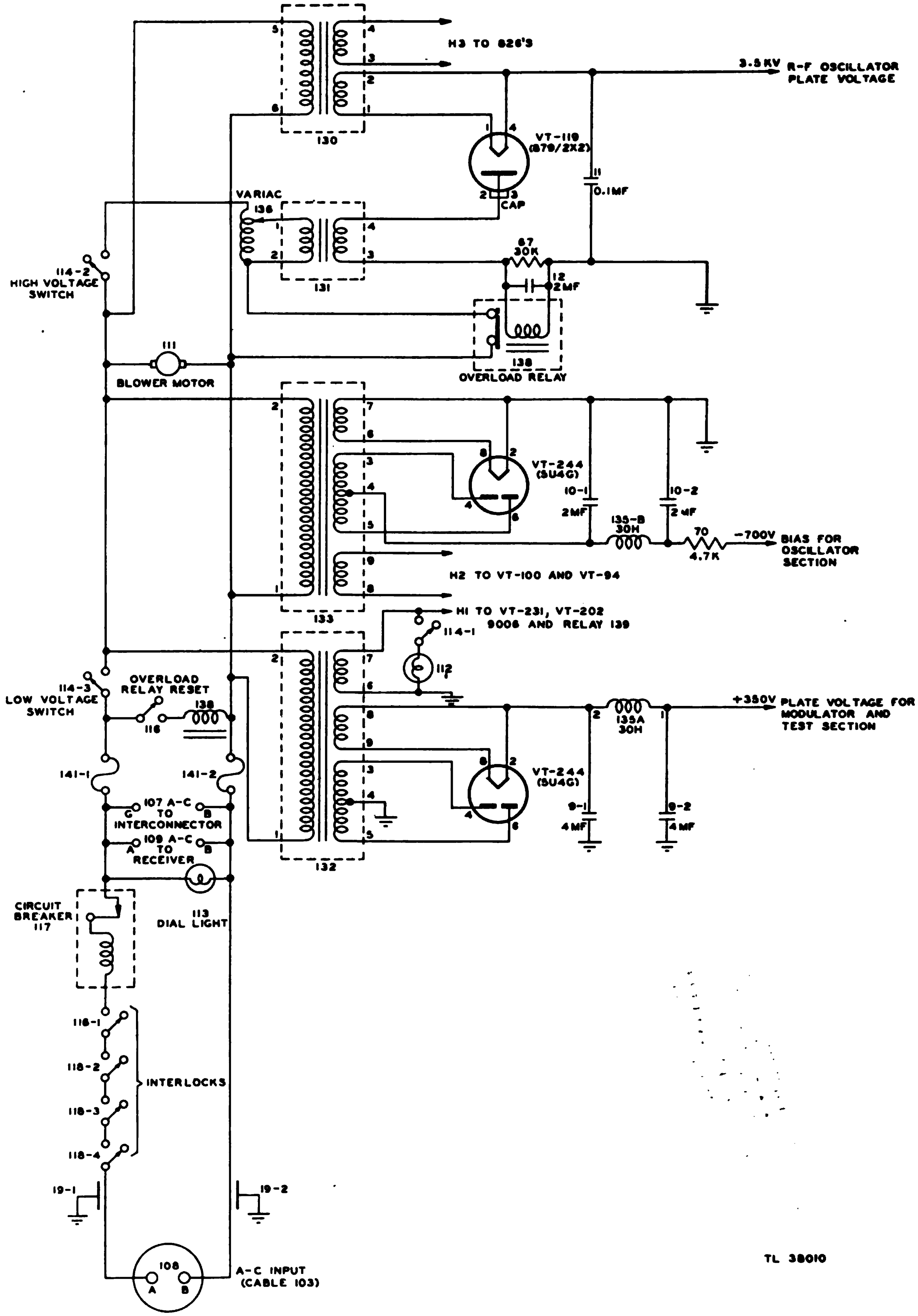

Figure 20. Power supply, partial schematic.

sistor in order to avoid overloading the grid of the cathode follower. The cathode-follower output, which is also tapped down about one-third the way, is applied to the upper deflection plate of the range oscilloscope through connector 107. The picture on the oscilloscope for this condition of operation is a sawtooth wave. This wave is a measurement of the power output of the transmitter. A rough check on the power output can be made by use of TEST positions 4 and 5 with the SELECTOR switch in either position 4 or 5. The height of the power pulse, as displayed by position 5, should be at least one-half the height of the calibration signal, position 4.

c. Signal Width Measurement. When the relay is thrown to the other position by means of the spring switch 115 on the interconnector, it places a very low value of load resistance, approximately 1,000 ohms, in the diode-load circuit. (See fig. 19.) Since the time constant of the diode-load circuit is then low, the picture on the oscilloscope is a reproduction of the envelope of the r-f pulse. This pulse is not used to measure power because the low resistance is comparable to the diode resistance. This condition causes a drop across the diode and the efficiency of detection is not the same for all values of frequency and voltage. Also, there is a slight drop in transmitter power caused by the diode circuit. The cathode resistor of the VT–202 cathode follower is composed of two resistors, 64–2 and 77. Resistor 77 is of a low value in order to keep as small as possible the time constant of the line which is connected from connector 107 to the oscilloscope. This is necessary in order to avoid distortion in the appearance of the pulse on the test scope.

18. Power Supply Section

a. General. Four transformers and three rectifier tubes are used for furnishing the d-c and filament voltages required to operate the transmitter. (See fig. 20.) The a-c voltage which supplies these transformers is brought into the transmitter through connection 108. One side of the a-c line goes through four interlock switches and a circuit breaker for the protection of both the operating personnel and the equipment. Both sides of the line are fused. The 110-120-volt dial light 113 is connected so that it lights when the main circuit breaker is closed.

b. Positive Low-voltage Power Supply. The positive low-voltage power supply, transformer 132 and VT–244, is conventional. It supplies approximately 350 volts d-c to the plates of the cathode followers VT–231 and VT–202, blocking oscillator tube VT–231, and modulator VT–100. Transformer 132 also supplies the filament voltage to the tubes VT–244, VT–231, VT–202, 9006 and the meter light 112.

c. Bias Power Supply. The bias or negative high-voltage power supply, transformer 133 and VT–244, is also a conventional full-wave rectifier except that the positive side is grounded. The output, approximately —700 volts, is supplied to the grids of the oscillator tubes and to the cathode of the modulator tube through resistor 70. Transformer 133 also supplies the filament voltage to the Tubes VT–94, VT–00, and VT–244 (H2 in fig. 20). The filament line is not grounded in order to avoid having a large difference in potential between the cathode and filament supply.

d. Positive High-voltage Power Supply. The positive high-voltage supply is composed of two transformers 130 and 131, and the half-wave high-voltage rectifier, VT–119. Transformer 130 supplies filament voltage for the r-f oscillator tubes and for the VT–119 rectifier. Variac 136 is provided in the primary of the high-voltage transformer 131 so that the output voltage of the power supply may be set at any value between zero and 5,000 volts. The overload-relay circuit breaker 138 is provided to protect the high-voltage power supply in case of a serious overload or short circuit on the secondary side. Switch 116 is used to reset the overload relay from the front of the panel. Filter capacitor 11 has a capacity of 0.1 microfarad. The energy storage of this capacitor is sufficient to supply power to the r-f oscillator for the duration of the pulse without any appreciable drop in output voltage.

e. Meter Circuit. A meter is also provided in the transmitter high-voltage circuit and may be used to indicate either the voltage of the power supply or the current drawn by the r-f oscillator tube. A spring switch 115 normally keeps the meter connected to read the power-supply voltage. In this normal position, the meter is shunted across one of the resistors (57–2) of the voltage-divider network which is connected in parallel with the output of the high-voltage supply. When the meter is used to indicate space current drawn by the transmitting tubes, it is shunted across resistor 73 in the cathode circuit of the transmitter tubes.

Section III. R–F SYSTEM OF THE RC–148 and RC–148–B

19. Purpose

The function of the r-f system is to conduct the r-f energy from the oscillator in the transmitter up to the

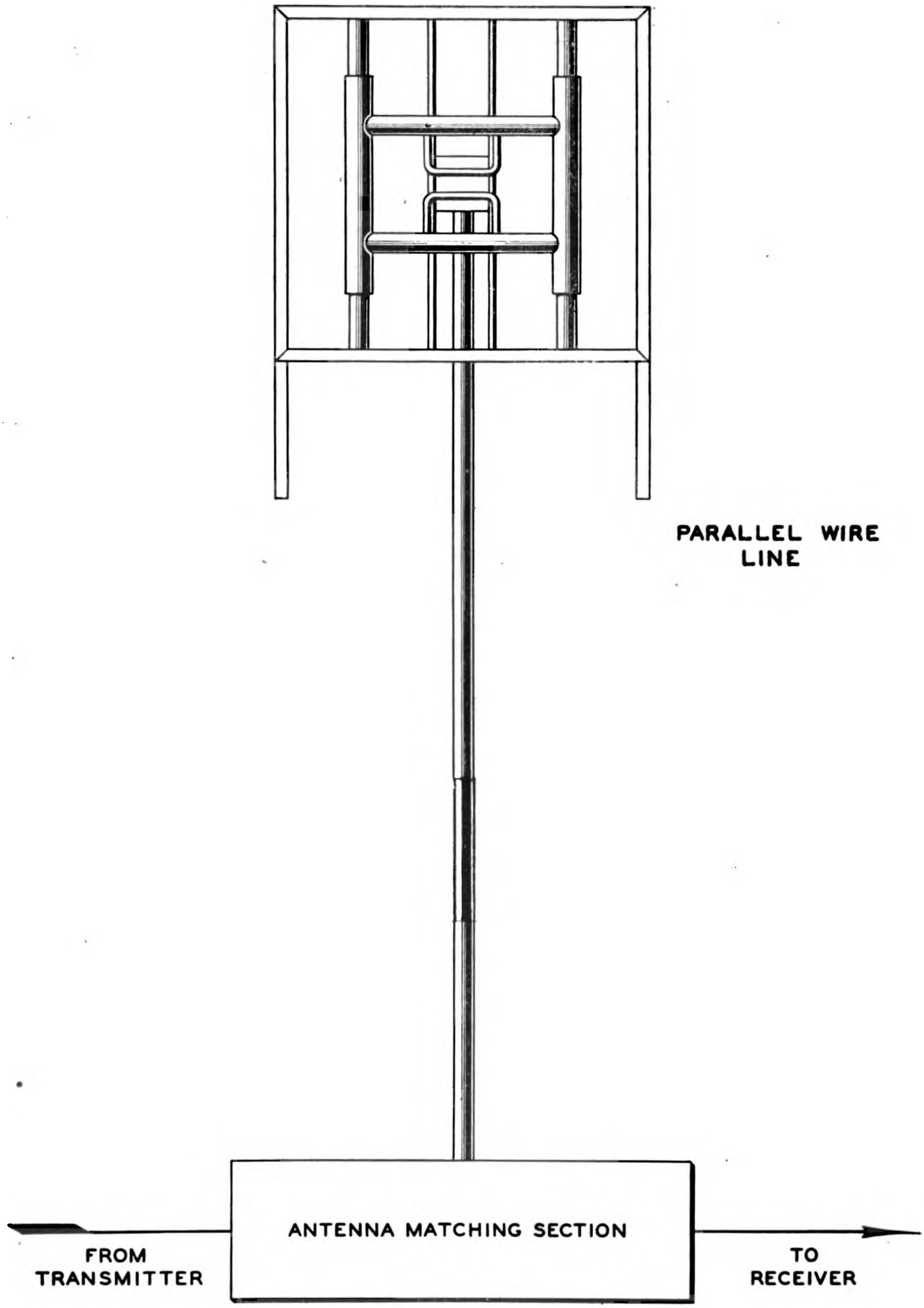

Figure 21. R-f system, block diagram.

radiating elements and radiate the energy into space. Between transmitted pulses the radiating elements become receiving elements which pick up the r-f energy from the transpondor and carry it down the transmission lines to the receiver.

20. General Description

The r-f system consists of an antenna, a transmission line, an antenna matching section, and two separate cables. One cable carries the r-f energy from the matching section to the receiver, and the other carries

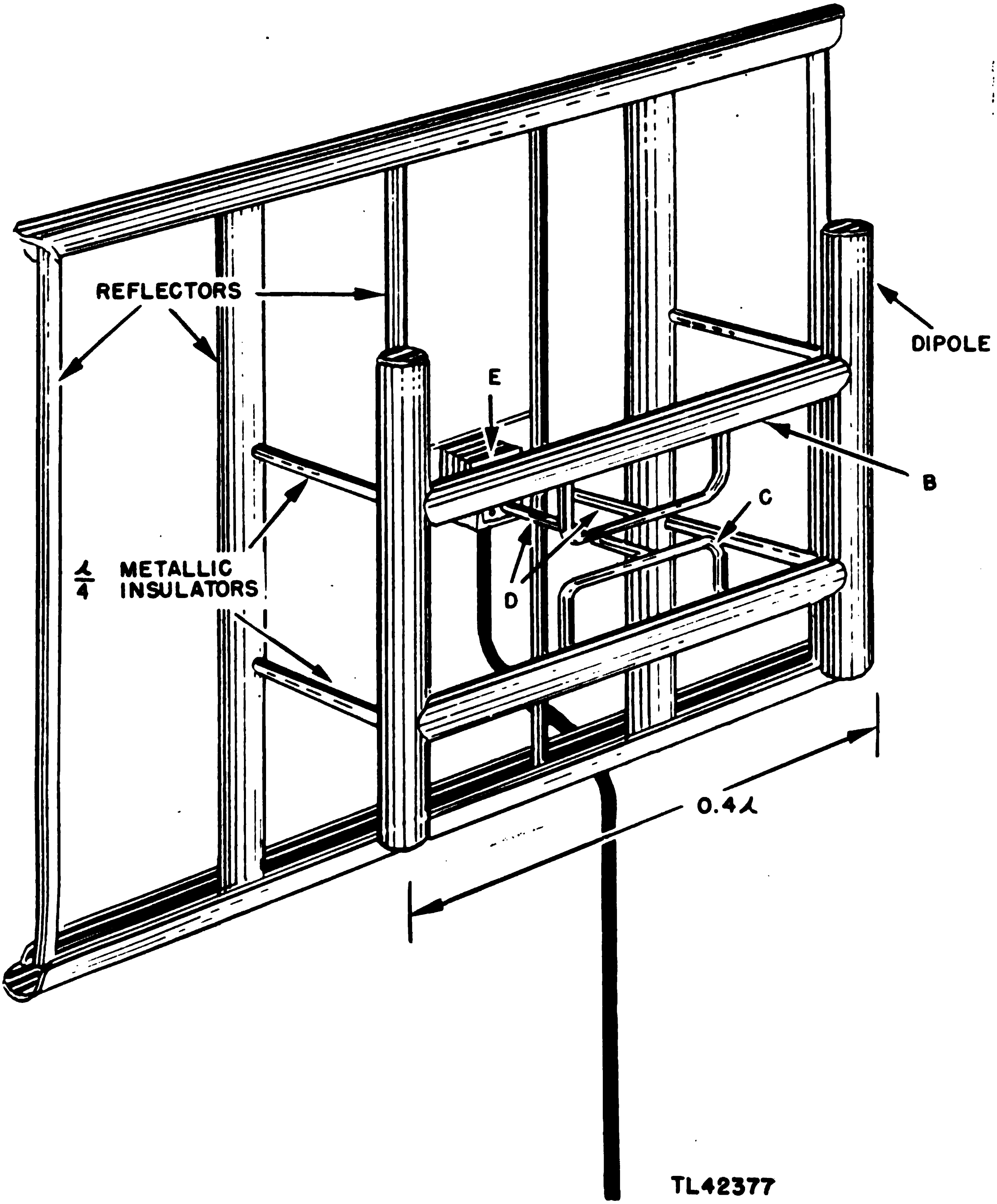

Figure 22. Antenna array.

the r-f output from the transmitter to the matching section. (See fig. 21.)

a. Antenna. The antenna is a vertically polarized broad-band directional array consisting of two dipoles, six reflectors, and a series of transmission lines used as matching transformers. Its functions are:

(1) To radiate the r-f output of the transmitter.

(2) To pick up the r-f signal generated by the transpondor in the interrogated aircraft.

b. Antenna Matching Section. The antenna matching section is used to match the impedance of the transmission line to the impedance of the receiver and of the transmitter so that both components can use the same antenna and transmission line.

c. Transmission Line. The transmission line and the cables connecting the antenna matching section to the receiver and transmitter are parallel stranded wires imbedded in a soft plastic insulating material covered with a metallic shielding braid and an outer layer of varnished cloth insulation.

21. Antenna

a. Components of Antenna Array. The antenna consists of two vertical dipoles provided with reflectors, from which they are separated by ¼ wavelength metallic insulators. (See fig. 22.) The physical spacing between dipoles is approximately 0.4 wavelength. Feeding the dipoles are two horizontal transmission lines in the form of metal tubes (B). Two Y-shaped impedance matching transformers (C) feed the transmission lines. The Y-shaped transformers are, in turn, fed by a quarter-wave section of transmission line (D), which is connected through coupling (E) to the transmission line from the transmitter.

b. Construction of Components. The dipoles, the Y-shaped matching transformers, and the horizontal transmission tubes are of large diameter. Construction of r-f conductors and radiators in this manner tends to lower their *Q*, makes their resonance curve less sharp, and allows them to operate in a uniform manner throughout a wide band of frequencies. Large diameters also make it possible to make the lengths of tuned elements somewhat shorter. The dipoles of this antenna are physically much less than half-wavelength long.

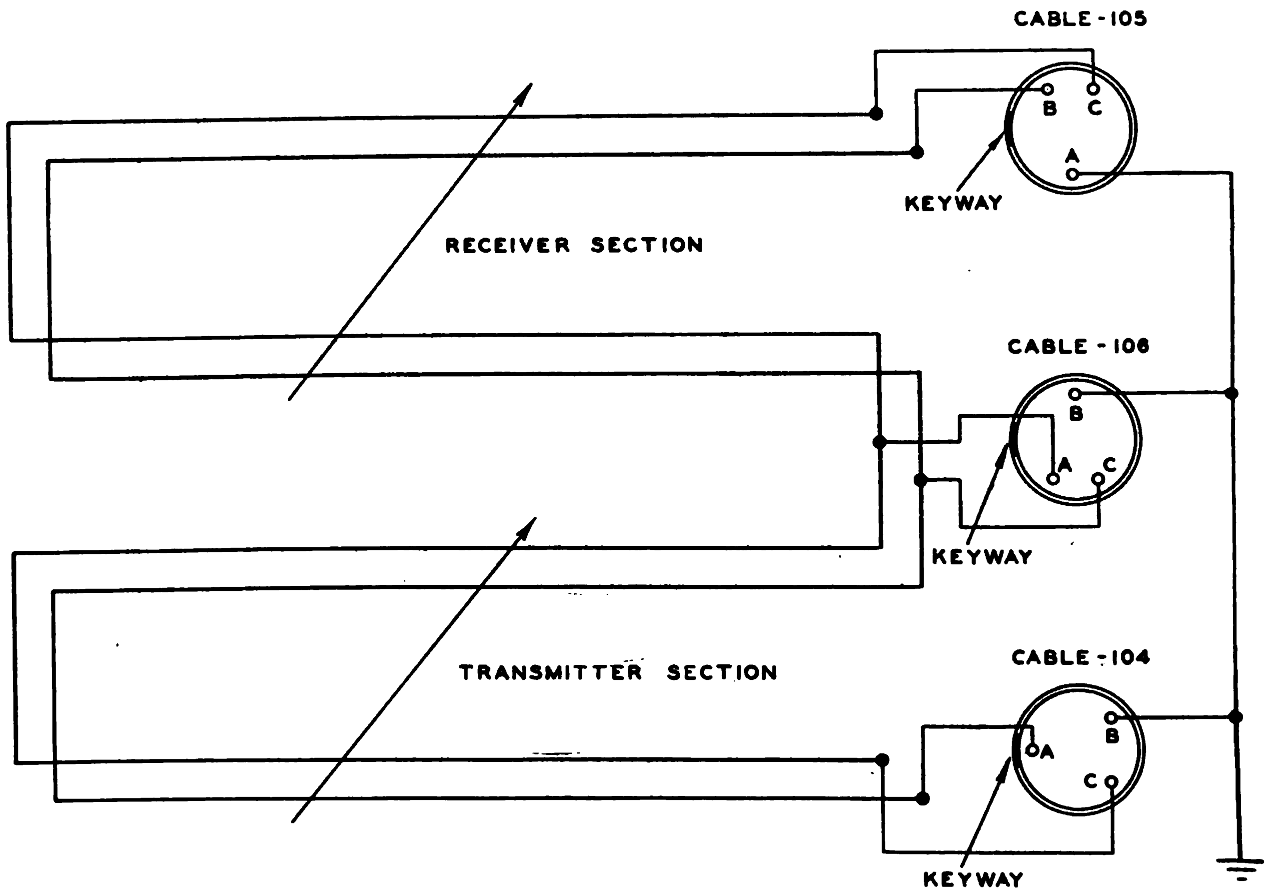

Figure 23. Antenna-matching section, schematic.

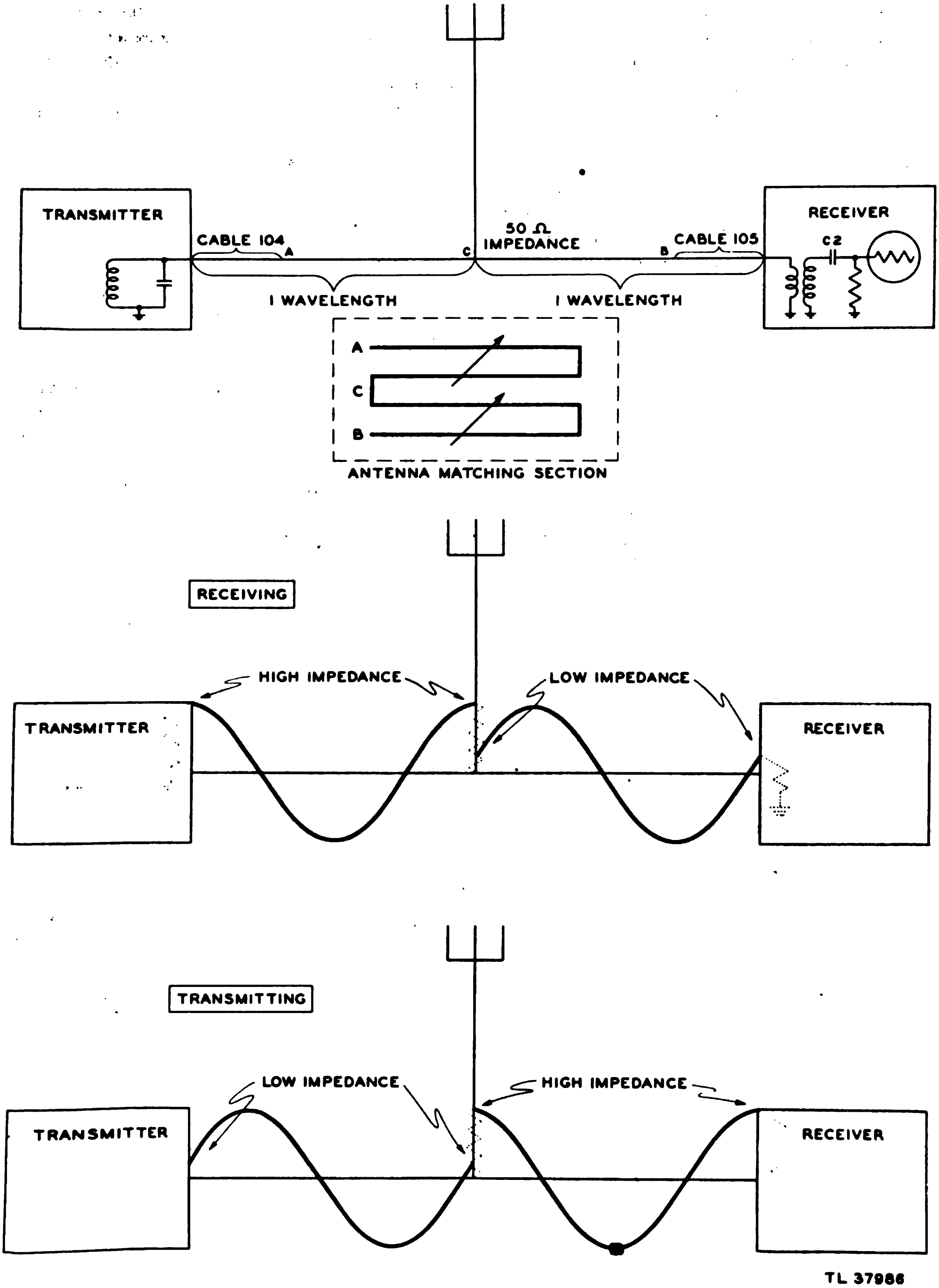

Figure 24. T-R system.

c. FUNCTION OF THE MATCHING TRANSFORMERS. The transmitted pulse is conveyed through a series of matching transformers, which serve to match the impedance of the transmission line to that of the dipole and to feed the two dipoles in phase.

d. FUNCTION OF THE DIPOLES. The dipoles are vertically polarized. They are fed at two points; each point is approximately one-third from the ends. This is a compromise between current and voltage feeding. They are designed to radiate effectively over a wide band of frequencies, 157 to 187 megacycles, without any marked discrimination between frequencies. Since the spacing between the dipoles is less than half-wavelength (0.4 wavelength) there is some radiation to the side. Because of incomplete screening to the rear, there is considerable radiation in that direction also.

e. RADIATION PATTERN. The radiation pattern of this array is such that its beam angle in the vertical plane is greater than its beam angle in the horizontal plane. Since the RC–148–(*) antenna follows the rotation of the antenna of the SCR–268–(*) in azimuth but not in elevation, it is tilted back at a fixed angle of 75° with the horizontal plane in order to obtain equal area coverage with both antennas.

f. RECEPTION. Between transmitter pulses, the array acts as a receiving antenna. All frequencies within the transmitter range will resonate in the dipoles, and are conducted through the horizontal transmission tubes, the *Y* sections, the quarter-wave stub, and finally the coupling into the coaxial transmission cable.

22. 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. 23) which consists of two folded 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 cable. (See fig. 24.)

a. The input impedance of the antenna is the same as the characteristic impedance of the 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 1 wavelength, the transmitter impedance will appear at the common terminal. A similar condition exists in the receiver branch of the section.

b. 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. The 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 66–1, and the receiver is ready to receive the return signal from the antenna.

c. 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.

d. The variable section must have sufficient adjustment to maintain a total of 1 wavelength; that is, to keep the total length of the fixed connecting cable plus the variable section 1 wavelength long between the limits of 157 and 187 megacycles. This requires a variation of approximately 24 inches in length, but, since the sections are folded, a 12-inch change is sufficient. The total variation on the antenna matching section supplied in this equipment has been made great enough to insure ample adjustment range.

Section IV. RECEIVER OF RC–148 AND RC–148–B

23. Purpose

The function of the receiver is to detect and amplify the signals picked up by the antenna and to prepare them for presentation on the radar display oscilloscope.

24. General Description

This paragraph contains a general description of the main sections of the receiver. Paragraphs 25 through 36 contain a detailed description of the receiver cir-

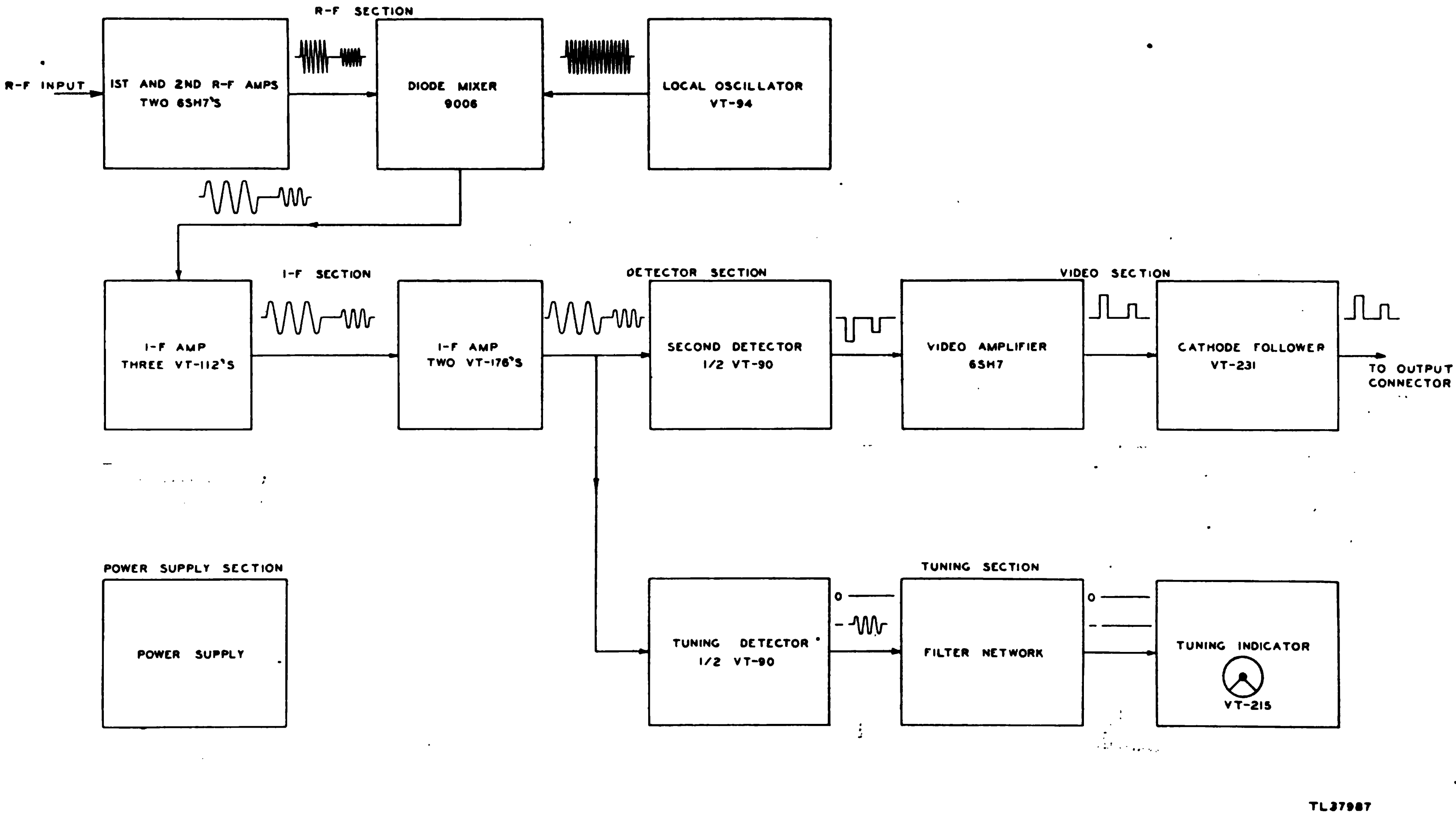

Figure 25. Receiver, block diagram.

cuits. The receiver is a 14-tube superheterodyne and consists of six sections: r-f section, i-f section, detector section, video section, tuning section, and power supply section. (See fig. 25.)

a. R-F SECTION. The r-f section consists of two r-f amplifying stages, a local oscillator and a diode mixer. In this section, the r-f signal picked up by the antenna is amplified and mixed with the heterodyning frequency of the local oscillator to obtain the 11-megacycle intermediate frequency.

b. I-F SECTION. (1) This section consists of five i-f amplifiers which serve to amplify the 11-megacycle signal obtained from the mixer of the r-f section.

(2) The tuning of the i-f amplifiers is of the staggered type. That is, they are aligned or tuned to frequencies slightly above or below the center frequency, 11 megacycles, of the intermediate frequency band. This is done to achieve a wide band-pass amplification. The i-f amplifier section, when properly aligned, will pass a band of frequencies nearly 4 megacycles wide. In chapter 2 there is a discussion of the alignment procedure.

c. DETECTOR SECTION. This section, consisting of one stage, is a diode detector. The input to the detector consists of pulses of the intermediate-frequency signal. The output signal consists of sharp pulses of negative polarity.

d. VIDEO SECTION. The video section consists of a video-amplifier stage and a cathode-follower stage. This section inverts and amplifies the signal from the detector.

e. TUNING SECTION. This section includes a diode stage and a tuning-eye indicator tube. The diode rectifies a small portion of the i-f signal and this voltage is used to actuate the tuning-eye indicator. The tuning-indicator tube is used to indicate when the r-f section is properly tuned and when the i-f stages are properly adjusted.

f. POWER SUPPLY SECTION. The power supply section furnishes the voltages needed for all the various receiver stages.

25. First and Second R-F Stages

a. INPUT CIRCUIT. The radio energy which is picked up by the receiving antenna is fed to the receiver and is applied to the one-turn primary of the first r-f transformer. The method of coupling the antenna to the r-f section is shown in figure 26. The coupling coil consists of a half turn of silver-plated wire placed in axial symmetry with the first r-f amplifier tuning coil. The coupling coil is grounded at its midpoint and in parallel with it is capacitor 1. The coupling coil and capacitor 1 are in parallel resonance at the middle frequency of the tuning range. The lead from the coupling coil to the antenna-input connector on the rear channel of the receiver consists of a pair of twisted lines enclosed in a hollow silver-plated brass tube used for shielding purposes.

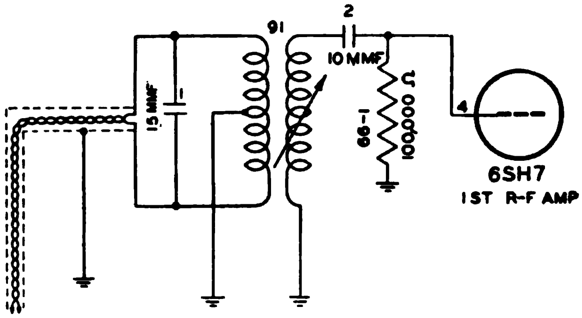

Figure 26. Coupling of antenna to r-f section.

b. PERMEABILITY TUNING. The secondary of transformer 91, which is made resonant to the received signal (157 to 187 mc), is tuned by means of an adjustable core, connected through a series of gears to a knob on the front panel of the receiver labeled "ANT." This type of tuning is called reactance tuning. The inductance of the coil is decreased as the hollow silver plunger is inserted further in the coil windings. Since there are no capacitors across the coils, the capacity of the tuned circuits is dependent upon the distributed capacity of the coil windings and the interelectrode capacity of the tubes. The secondary of this transformer is resistance—capacitance coupled to the grid of the first r-f amplifier, a 6SH7 pentode. The usual precautions are taken to keep all interconnecting leads short; r-f bypass capacitors are extensively used.

c. OUTPUT CIRCUIT. The plate load 73–1 of the first r-f amplifier is a resistor and the output of this stage is coupled through capacitor 5–1 to another tuned circuit 92–1. (See fig. 27.) This second tuned circuit is adjusted by means of the knob on the front panel marked "RF". The signal appearing across this tuned circuit is then *RC* coupled to the grid of the second r-f amplifier. The filament r-f choke 100–6 in the ungrounded side of the filament supply to these two tubes is used to prevent r-f from breaking through to the filament supply. The plate load of the second r-f amplifier is a resistor 73–2. The output from this stage is coupled into the mixer by means of capacitor 5–2. The gain for the two r-f stages is approximately two per stage.

26. Local Oscillator

a. General. To generate the desired i-f signal of 11 megacycles, it is necessary to mix the r-f signal with the frequency of the local oscillator and tune the first i-f stage to the difference between the two frequencies. The local oscillator in this receiver (fig. 28), is a modification of the Colpitts type in which the plate capacitor is replaced by a coil 94. This coil is constructed to be resonant below the lowest operating frequency of the oscillator. Therefore, at the frequency of operation the coil functions as a capacitive reactance. The frequency of the oscillator is determined by the capacitor 7–2 and the capacitive coil 94, in series, acting as a capacitor in resonance with coil 93. (See fig. 27.)

b. Operation. This circuit is tuned by varying the inductance of coil 93 in a manner similar to the permeability tuning of coils 91 and 92 in the r-f stages. The control, brought to the front of the panel by means of a gear arrangement, is labeled "OSC". The oscillator is biased by the grid leak-capacitor combination 64 and 6–3. It will be found when tuning to the low end of the frequency range that two settings of the oscillator frequency can be used. One frequency is 11 megacycles above the signal and the other 11 megacycles below the signal. The latter one is the correct one to use. This circuit oscillates in the neighborhood of 60 megacycles, but the third harmonic of this frequency is used as the heterodyning frequency in the mixer stage. It is fed into the plate circuit of the mixer through the oscillator-coupling capacitor 7–1. A filament-choke 100–4 is used in this circuit as in the r-f and mixer circuits to prevent r-f from leaking through to the filament supply.

27. Mixer Stage

a. General. The mixer stage in this receiver departs from the usual design practice in that a 9006 diode is used as the nonlinear device instead of the usual pentagrid converter. The advantage of this type of mixer circuit for an ultra-high-frequency receiver is that its output is delivered at a low-noise level. The disadvantage is that a diode mixer produces no amplification. This, however, is compensated for in the high gain of the i-f stages.

b. Operation (fig. 30). The radio-frequency energy and the heterodyning frequency which is the output of the local oscillator are combined on the plate of the mixer tube. The r-f energy is passed to the mixer stage through capacitor 5–2 from the second r-f stage. The heterodyning frequency is passed to the plate of the mixer from the oscillator through

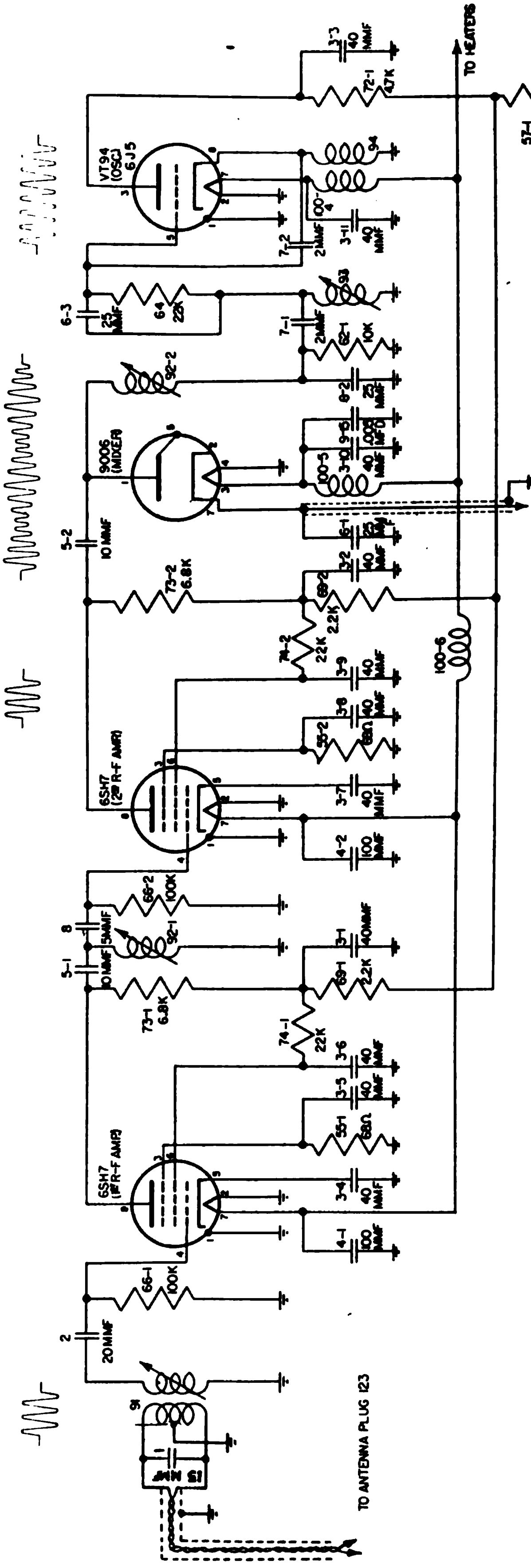

Figure 27. R-f section, partial schematic.

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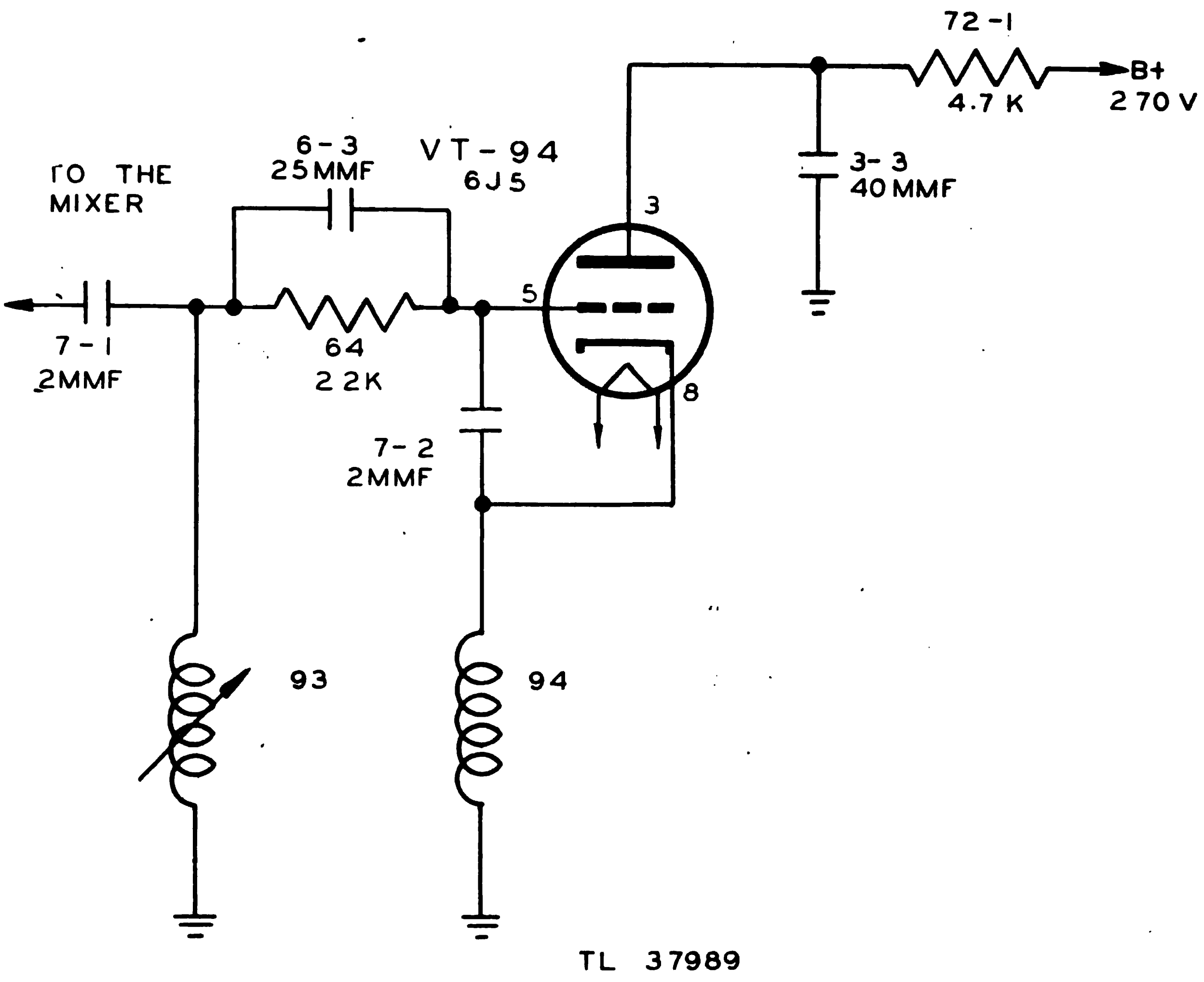

Figure 28. Local oscillator, partial schematic.

capacitor 7–1. Inductance 92–2 acts as a parallel-tuned circuit, sharply tuned to 170 megacycles which will, therefore, offer maximum impedance to the 170 megacycles but will allow other frequencies to pass through. The purpose of this tuner circuit is to prevent the 170 megacycles from the r-f stages from going into the oscillator circuit. On the other hand

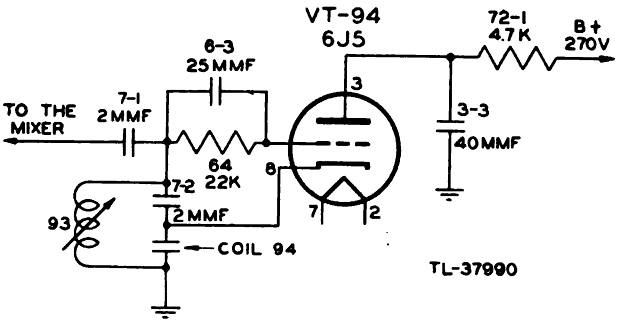

Figure 29. Local oscillator, equivalent circuit

this tuner circuit allows the frequencies generated by the oscillator to be applied through inductance 92–2 to the plate of the mixer. These frequencies are combined and give the sums, the differences, the original frequencies, and several harmonics on the plate of the mixer. All these frequencies are passed through the tube to the cathode and conducted through a shielded lead to the first i-f transformer. This i-f transformer is really a parallel-tuned inductance 101 in a shielded can and not the usual two-winding transformer. (See fig. 31.) It is tuned to 11 megacycles and it will offer little resistance to all frequencies except 11 megacycles so that any other frequency will be shorted to ground and cause a negligible voltage drop across the tuned inductance. As this inductance offers maximum impedance to 11 megacycles, a voltage drop will develop across the circuit at this frequency and it is directly applied to the grid of the first i-f amplifier.

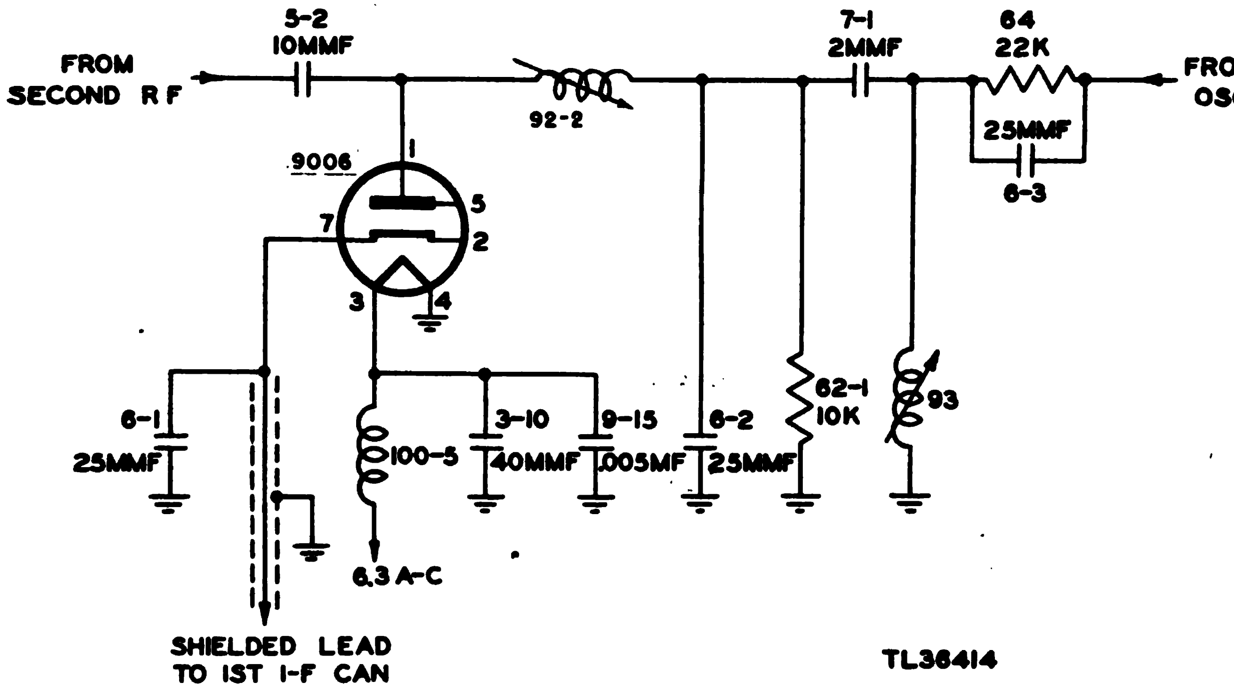

Figure 30. Mixer stage, partial schematic.

c. INTERMEDIATE FREQUENCY. This 11 megacycle i-f frequency is the difference frequency obtained by heterodyning the input signal in the r-f stages with the third harmonic of the oscillator. For example, if the incoming signal is 167 megacycles, the local oscillator is tuned to 52 megacycles so that its third harmonic, 156 megacycles, combines with the incoming r-f signal to give a difference frequency of 11 megacycles.

28. First, Second, and Third I-f Stages

a. GENERAL. The first three i-f amplifier stages use 6AC7's and utilize a tuned inductance in the plate load (96–1, 97–1, 96–2). Each of these inductances is in resonance with the input capacitance of the associated tube, augmented by the stray circuit capacitance and the distributed capacitance of each coil, and acts as a tank circuit. (See fig. 31.) The inductance of each coil is adjusted by means of a powdered iron core. The plate-load inductances in these stages are followed by networks consisting of two capacitors and a resistance for coupling the output to the following tube.

b. BROAD BAND PASS. The partial schematic of figure 32 shows the tuned inductance 96–1, the two capacitors 9–3 and 11–4, and the resistor 61–1 which are between the first and second i-f stages. Note that the grid resistor 61–1 is effectively in parallel with the tuned circuit since the coupling capacitor and bypass capacitor have a negligible reactance at the intermediate frequency and therefore act as low-resistance paths for the i-f signal. All these grid resistors are low in value and tend to damp or broaden the response of the tuned circuit and make it tune less sharply. This is desirable in order to achieve a broad band-pass response.

c. GAIN CONTROL. The gain-control provision in this receiver is in the first three i-f amplifiers and consists of a manual gain control which is physically located in the control unit. This is a variable resistor connected in the cathode-return circuit of these three amplifiers. Increasing the resistance in this circuit puts relatively large positive values of voltage on the cathodes of the first three tubes. This, in effect, puts negative voltage on the grids of the tubes, which reduces the amplification of the first three stages. Putting less resistance in the circuit reduces the negative voltage on the grids and increases the amplification of the first three i-f stages. The gain of each of these stages is approximately 12, but due to the staggered tuning the effective over-all gain of the individual stages is approximately 8 per stage.

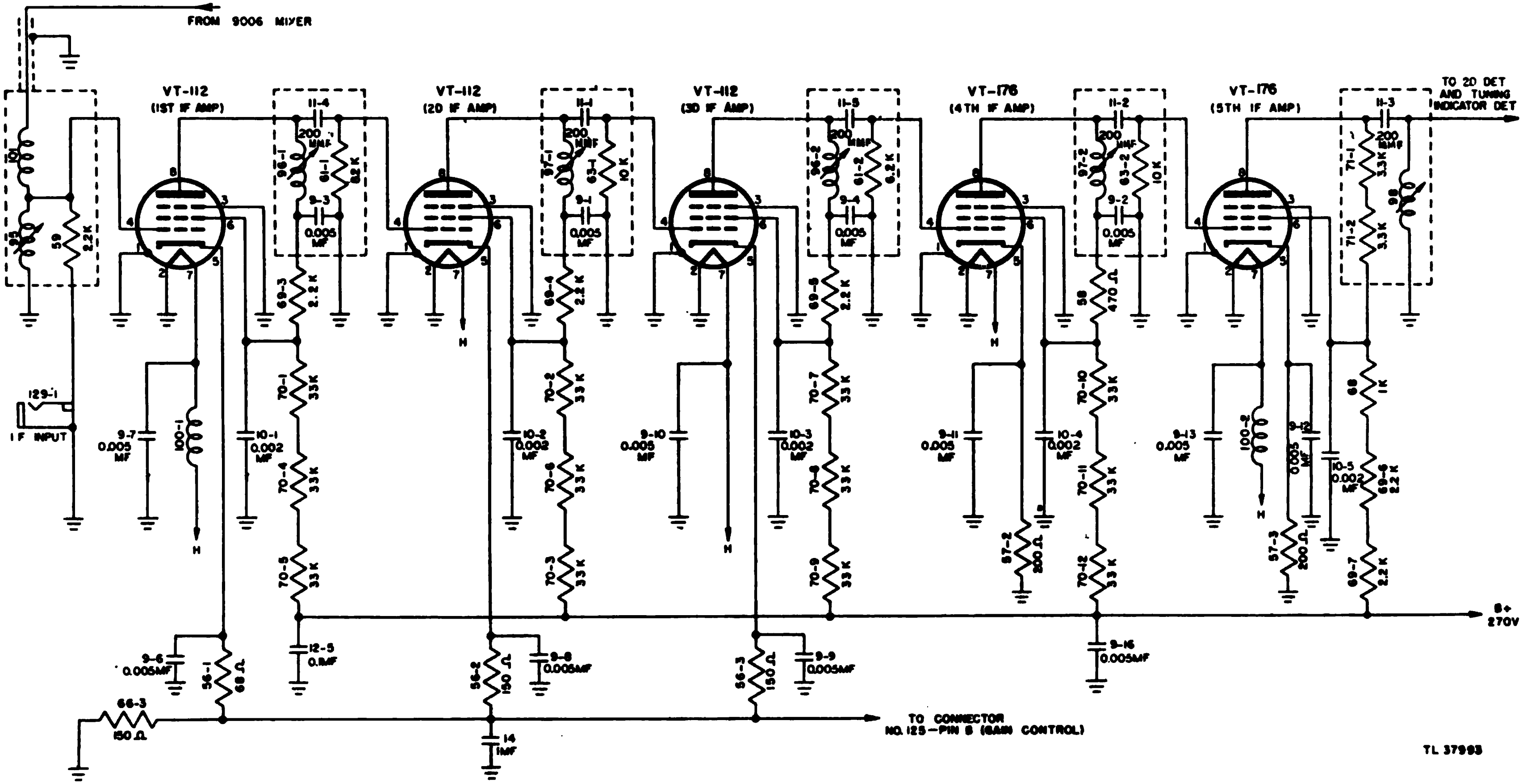

Figure 31. I-f amplifier section, partial schematic.

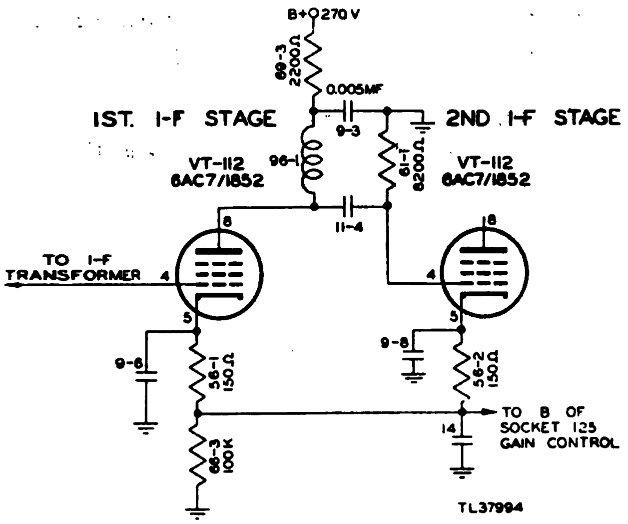

Figure 32. I-f transformer, partial schematic.

29. Fourth and Fifth I-f Stages

a. GENERAL. These stages use 6AB7 tubes (VT-176). With the exception of the gain control connections, these intermediate stages are similar to the first three i-f amplifiers in their cathode, screen, and plate-supply circuits. A fixed resistor in the cathode of each stage provides proper bias. The plate load of the fifth i-f is a resistor, rather than a tuned inductance, and the tuned circuit is placed in the cathode of the diode detector. Both of these comprise the sixth i-f coupling circuit or tuning can.

b. DECOUPLING. The decoupling circuit for the filament power supply consists of coil 100–2 and an i-f bypass capacitor 9–13. Its purpose is to keep the i-f voltages out of the power supply by bypassing them to ground through the capacitor and by offering a high series impedance in the path to the power supply.

30. Second Detector

The second detector uses one-half of the double diode VT–90 and associated circuit components. (See fig. 33.) The diode whose cathode is tied directly to the second detector-tuned circuit 98 is the detector diode. The incoming i-f impresses a voltage across this tuned circuit which lies between the cathode and ground. The alternations of polarity of the i-f make the cathode potential alternately positive and negative. On the positive half cycles, no conduction by the tube occurs since the diode will pass current in only one direction. On the negative half cycles, however, the cathode is negative with respect to the plate and current flows through the tube. The resistance-capacitor combination, resistor 60, and capacitor 16 is the load across which the rectified output is developed. The capacitor is of such value as to short circuit the i-f to ground but acts as a high impedance to the video-frequency components. Resistor 60 also acts as a dropping resistor when a plug is inserted in jack 129–2. This jack provides a means of measuring the rectified current and may be used in the alignment procedure. Inductance 100–3 and capacitor 9–5 are in the filament circuit to keep r-f voltage out of the filament supply.

31. Video Amplifier

The video amplifier or output amplifier consists of a 6SH7 pentode tube. Figure 34 is a schematic diagram of this section. The detector output, which consists of very sharp pulses, is fed into the video stage. The leading and trailing edges of these pulses require the transmission of all frequencies from the audio-frequency range to as high as 250 kilocycles. This is accomplished by the wide-frequency response of the stage due to the characteristics of the tube and the circuit elements. Low-frequency compensation is

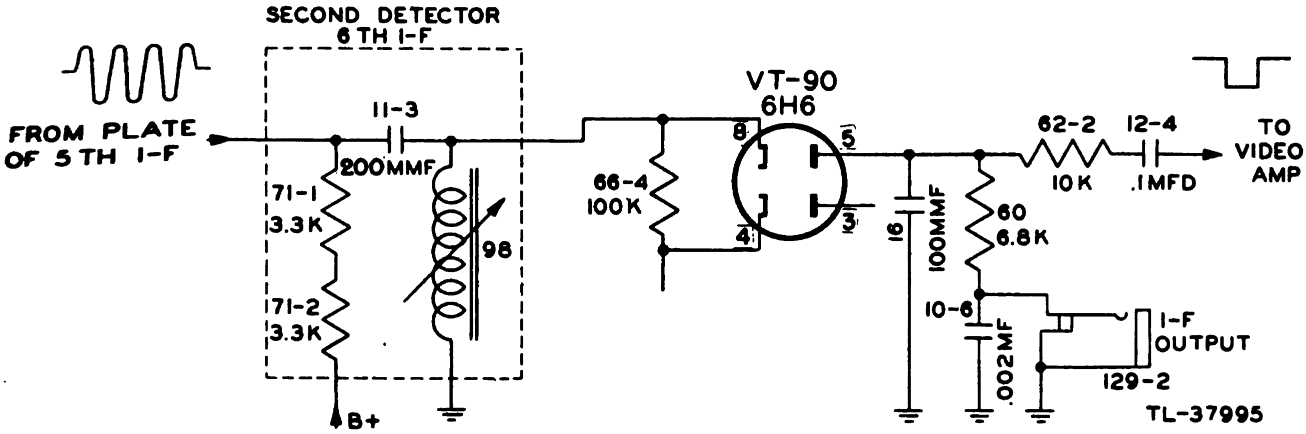

Figure 33. Second detector, partial schematic.

obtained by the use of the capacitor 13–1 and resistor 72–2 network; high-frequency compensation is assured by the low internal capacitance of the tube. In addition, since no cathode bypass is used, negative feedback is introduced and the frequency response of the amplifier is improved. The input to this stage is a negative pulse and the output, consequently, is a positive one.

the cathode circuit, there is no phase inversion and the output signal remains a positive pulse.

33. Tuning Indicator Detector

The diode in VT–90 using pins 3 and 4 is the detector for the tuning indicator. (See fig. 35.) A portion of the incoming intermediate frequency from the sixth i-f transformer is fed through resistor 66–4

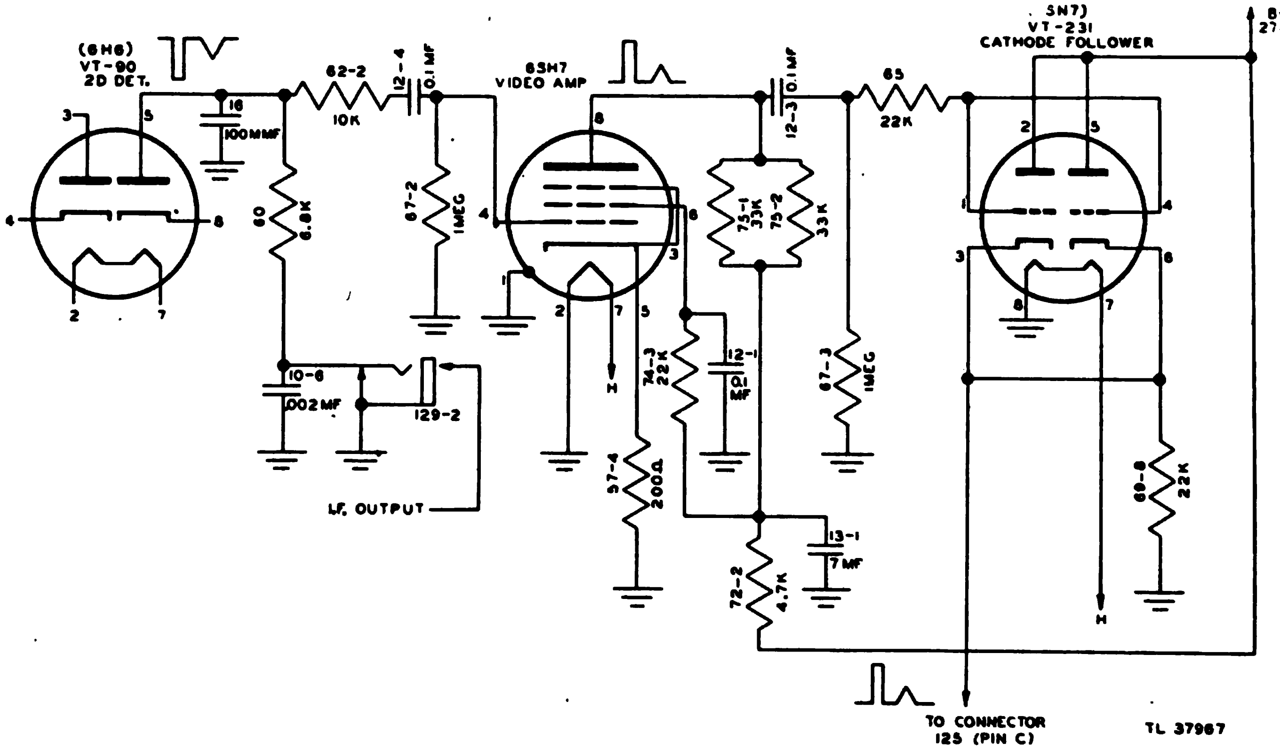

Figure 34. Video section, partial schematic

32. Cathode Follower

The output of the video stage is coupled to another tube, a 6SN7 (VT 231), which is used as a cathode follower. This tube is a duo-triode and the two sections of the tube are connected in parallel. One of the advantages of a cathode follower is that it has a low-output impedance. The output impedance of this circuit is about 200 ohms which is fairly close to the impedance of the line which connects this tube with the IFF-switching channel of the interconnector. The advantage presented by a low-impedance line is that it will pick up less interference than one of high impedance. Since the RC–148–(*) IFF equipment is located near Radio Set SCR–268–(*), the problem of keeping the interference between these sets to a minimum is one which requires careful design and planning. Since the output is obtained from

to the tuned circuit in the cathode of the detector. The purpose of 66–4 is to make the diode appear to have a high-impedance input and so reduce the loading effects of the tuned circuit (99 and 5–3) on the sixth i-f transformer. Because the tank circuit is tuned to 11 megacycles, it will cause a maximum impedance and voltage drop across the tank at this frequency. As a result, the cathode of the detector goes negative on each alternate half-cycle of the 11 megacycle voltage and causes the detector to conduct. To voltages of other frequencies, the tank is a low impedance and the cathode is practically shorted to ground. An increased flow through the tube causes an increased voltage drop across resistor 67–1, which is the load resistor for the diode, and makes the plate more negative. This results in a more negative voltage at the top of resistor 67–1 (load resistor) and, finally, on the grid of the tuning eye.

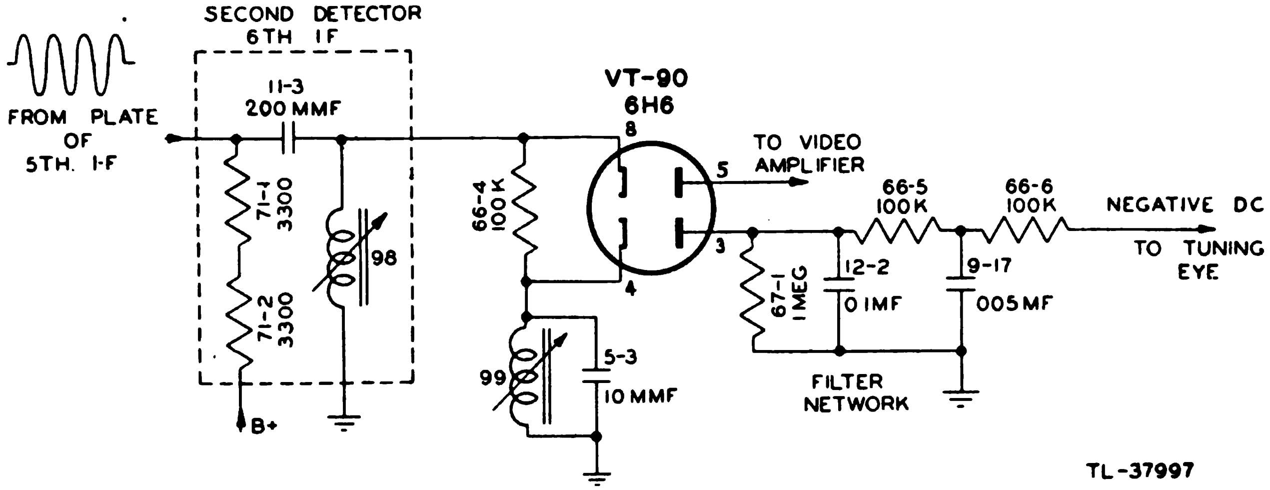

Figure 35. Tuning indicator detector, partial schematic.

34. Filter Network

The rectified intermediate-frequency voltages travel from the plate of the detector to an *RC* network consisting of C12–2, R66–5, C9–17, R66–6. R67–1 is a load resistor for the diode and the rectified voltage is developed across it. The capacitors to ground will bypass both intermediate frequency and audio variations. Resistors 66–5 and 66–6 are attenuating resistors which bring down the value of the voltage on the grid of the tuning indicator and also help with the filtering action.

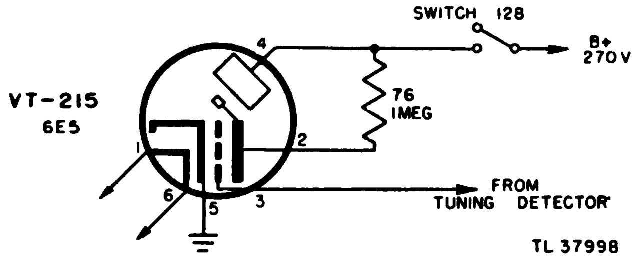

Figure 36. Tuning indicator, partial schematic.

35. Tuning Indicator

The tuning indicator tube is essentially a triode (See fig. 36.) However, at the top of the tube the plate and grid are cut away and a round fluorescent target is placed around the cathode. When the cathode is emitting and the target is at a positive potential, it will draw electrons from the cathode and the target will glow with a green light. Between the cathode and the target is a small electrode which is connected to the plate and held at plate potential. The target is at B+ potential and the plate and its small electrode are connected to B+ through a 1-megohm resistor 76, in the tuning indicator socket. *When a negative voltage applied to the grid of the indicator keeps plate current from flowing, no drop through R76 occurs. The target, plate, and small electrode are at the same potential and the small electrode offers no interference to the flow of electrons to the target which remains completely green.* When a positive voltage is applied to the grid of the tuning indicator, a large current flow through the tube results. This brings about a large voltage drop through R76 and makes the plate and the small electrode much more negative than the target. Thus, it tends to repel electrons flowing from the cathode to the target. This repelling action causes the area of the target directly behind the small electrode to get no electrons and not to fluoresce. A shadow on the tuning-eye screen is the result. Thus, the more negative the voltage applied to the grid of the indicator, the smaller the shadow becomes. An increased signal tö the detector gives an increased negative voltage on the indicator grid. Therefore an increased intermediate-frequency signal will result in a very small shadow or no shadow and the target will be completely green. Tuning adjustments are made to get as narrow a shadow as possible. The tuning-indicator stage has a switch in the plate-potential line which opens when the front panel of the receiver is closed, thus prolonging the life of the fluorescent surface in the tube.

36. Power Supply

The power supply receives its 110–120 volts a-c from the transmitter through cable 102 to the connector 124.

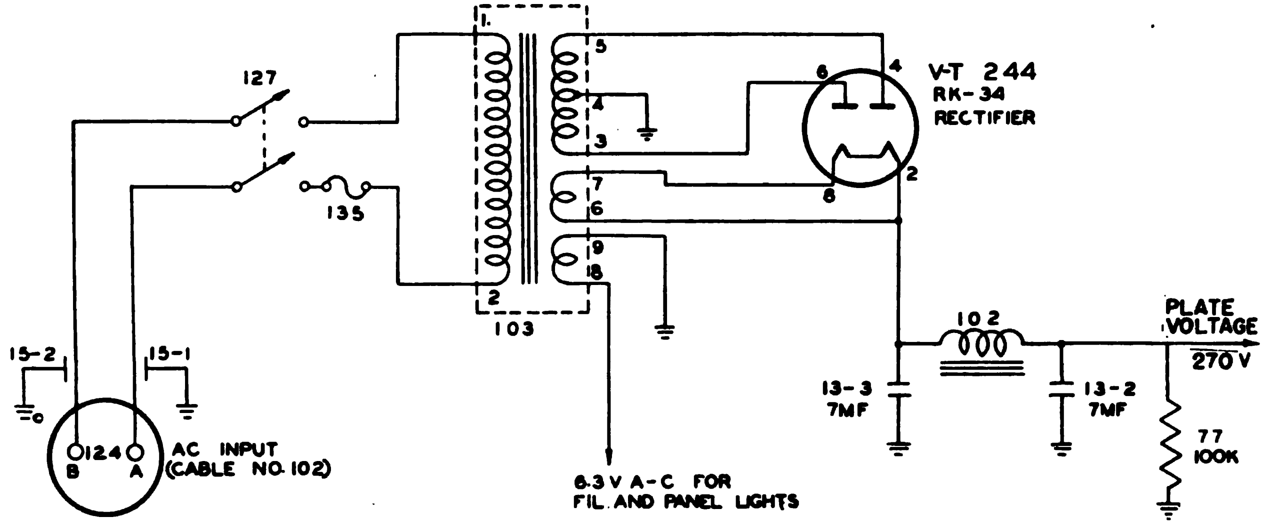

Figure 37. Receiver power supply, partial schematic.

(See fig. 37.) The power switch 127 is a double-pole single-throw switch; fuse 135 in the primary circuit of the transformer protects the transformer and other elements in the circuit. There are three secondary windings in the transformer. One of these furnishes 6.3 volts ac to the heaters of the receiver tubes. The other two windings furnish filament and plate voltage for the rectifier tube. This rectifier is a full-wave rectifier with a filter circuit composed of capacitor 13–3, inductance 102, and capacitor 13–2. The d-c output appears across the bleeder resistor 77 and is approximately 270 volts.

Section V. INTERCONNECTOR OF RC–148 AND RC–148–B

37. Purpose

The purpose of the interconnector is to coordinate the functions of the IFF transmitter and receiver with those of the radar set.

38. General Description

Figure 38 shows the relations of the interconnector to the radar set and identification equipment. The 4098-cycle sine wave generated in the radar keying unit synchronizes the operation of the different components of the radar set; this same 4098-cycle sine wave is fed to the interconnector and serves as the tie that binds the different components of the IFF equipment together with the radar set. From this voltage the interconnector forms the pulse that triggers the IFF transmitter, and synchronizes the IFF transmitter with the radar transmitter. This voltage is further used to time the action that places the radar and IFF received replies on the radar oscilloscope screen so that the two displays are seen together. The interconnector also includes a master oscillator (called a Wien bridge oscillator) which provides a 4098 cps signal for synchronization of the RC–148 independently of the SCR–268.

39. Specific Functions of Interconnector

The general purpose of the interconnector can be divided into several specific functions. The various functions are performed in different *channels* or groups of circuits. (See fig. 39.) The detailed analysis of circuits will follow the arrangement of these channels. The channels and their corresponding functions are:

a. The division channel selects one out of every 15 cycles of the 4,098-cycle synchronizing signal.

b. The transmitter trigger channel forms the pulse that triggers the IFF transmitter.

c. The blanking channel provides voltages which are used to operate the switching channels.

d. The radar and IFF switching channels provide a switching arrangement which places the radar echo and the identification response alternately on the radar range oscilloscope screen in such a way that they appear simultaneously.

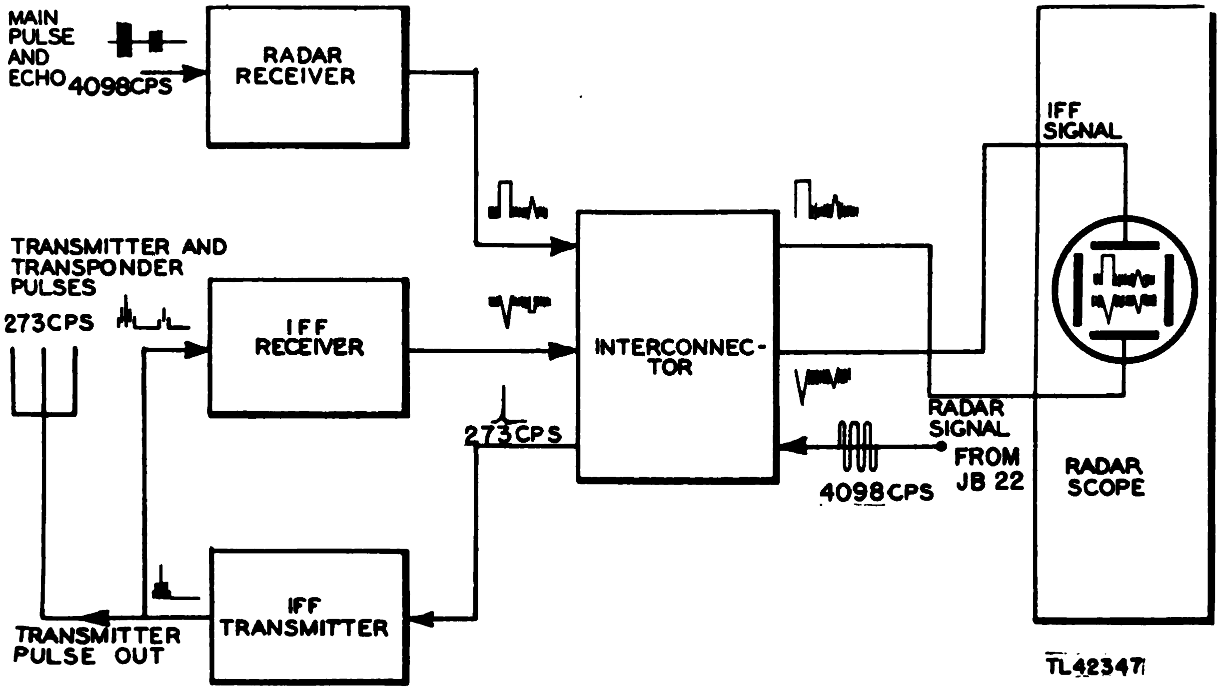

Figure 38. Relation of interconnector to identification system.

e. The brightness correction channel provides a positive voltage that is applied to the control grid of the cathode-ray tube to increase the brightness of the IFF trace.

f. The Wien bridge oscillator channel is used to develop a 4098 cps signal to be used for test purposes or to provide a synchronizing voltage if the equipment is used independently of the SCR–268.

g. The test channel provides various signals that enable the operation at important points in the circuit to be monitored by using the range oscilloscope as a test scope.

40. Division and Trigger Channels

It is desirable to use a lower recurrence frequency than the radar recurrence frequency of 4,098 cycles per second in the IFF transmitter. First, a lower frequency guards against *over-interrogation* of the transpondor, that is triggering it so frequently in regions where there are many IFF sets that the transpondor cannot respond to all challenges. Further, a lower average power drain is required with the same peak power output. The recurrence frequency in this equipment is $1/15$ of 4,098 cycles per second or 273 cycles per second. The division channel is so designed that only every fifteenth cycle of the 4,098 cycle input signal is accepted and shaped to form the pulse that is sent to trigger the transmitter. The division channel divides the frequency; the transmitter trigger channel shapes the trigger pulse from this divided frequency.

41. Blanking, Switching, and Brightness Correction Channels

a. The radar and IFF replies appear to be present simultaneously on the radar range oscilloscope. The radar signals are applied to the bottom vertical deflection plate of the radar oscilloscope as a negative voltage. The IFF signals are applied to the top plate also as a negative voltage. This plate is connected directly to ground when no IFF equipment is used with the radar. It is also grounded when the SELECTOR switch of the IFF is in the STANDBY position. If both signals are applied at the same time, the voltages tend to cancel each other and the image is the resultant of the two applied voltages. It is impossible to put both sets of signals on the scope at the same time and have each clearly distinguished. In order to avoid this the radar signal is applied to the vertical plates and the IFF signal is cut off during 14 out of every 15 sweeps of the electron beam across the scope screen. During the remaining sweep, the IFF signal is applied to the vertical plates and the radar signal is cut off. (See fig. 40.)

b. The division channel, which divides the 4,098-cycle signal so that the pulse that is formed to trigger the IFF transmitter has a recurrence frequency of

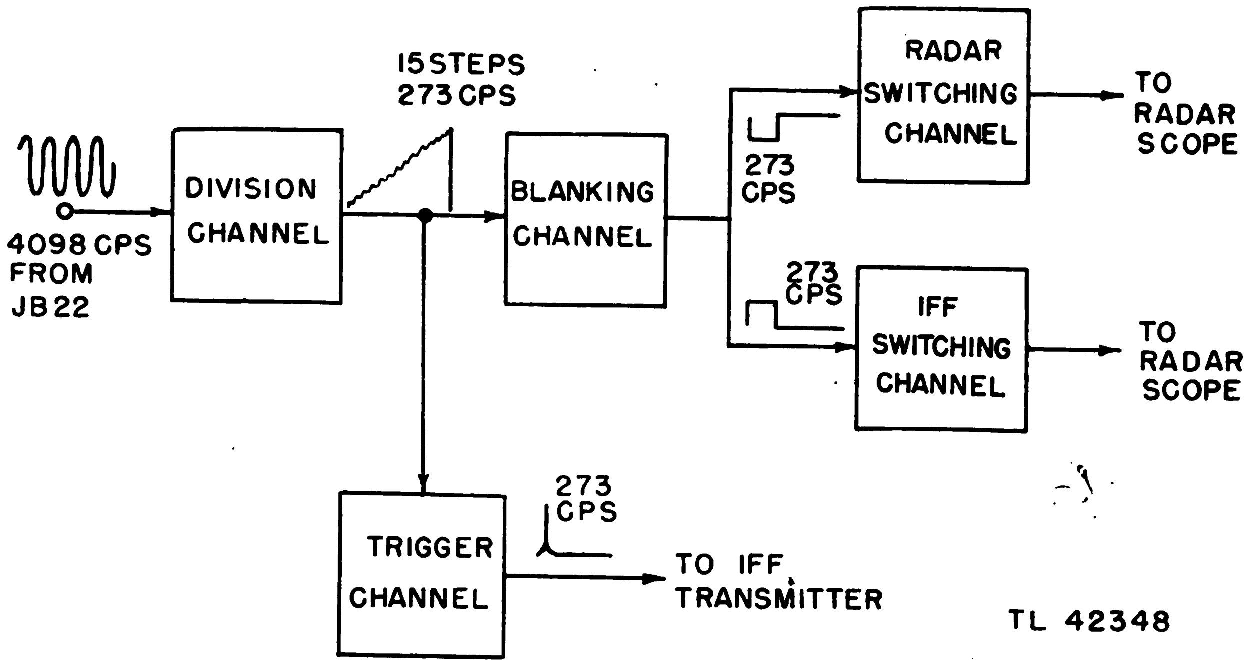

Figure 39. Interconnector, channel diagram.

273 cycles, also initiates a 244-microsecond pulse in the blanking channel. This pulse in the blanking channel starts at the same time as the transmitter pulse. This pulse synchronizes the switching operation in the radar and IFF channels through which the output of the radar elevation receiver and the IFF receiver must pass before being placed on the scope. Taken off as a positive voltage from the blanking channel, the pulse is sent to the IFF switch channel to make the channel operative for a 244-microsecond period, or one trace on the oscilloscope. Taken off as negative voltage, it is sent to the radar switch channel as a blanking voltage to cut off the radar signal for the same 244-microsecond period. As the IFF switching channel is ordinarily cut off while the radar switching channel offers a free path to signals, the radar signal will appear on the screen for the remaining fourteen 244-microsecond periods, while the IFF signal will not appear on the screen. The above discussion is based on a switching ratio of 1 to 15 which is the normal procedure for operation. However, it is possible to control the output of the blanking channel so that a positive pulse for three periods of 244-microseconds may be obtained and the IFF signals placed on the oscilloscope for those three periods.

c. It is further necessary to separate the radar and IFF baselines on the scope, otherwise the echoes would extend above and below the same baseline and the two pictures would be confused. In the IFF switch channel a negative *pedestal* voltage is added to the IFF output voltage that displaces the IFF display a short distance below the radar baseline. This is called baseline separation.

d. The IFF and radar signals are switched alternately on the radar oscilloscope, but appear to be on the screen together because of the persistence of fluorescence of the screen and the normal persistence of vision. However, the IFF signal, which is on the screen only 1/15 of the time that the radar signal is displayed, would be much fainter in appearance than the radar signal. To make both signals appear with equal brightness, the brightness correction amplifier inserts a positive pulse on the grid of the cathode-ray tube in the range oscilloscope during the time the IFF signal is displayed. This increases the intensity of the trace as long as the IFF signal is on the screen and makes it appear as bright as the radar signal.

42. Test Circuits

Test signals are provided for use with the TEST switch. The operation of the transmitter, receiver, and various crucial points in the interconnector can be tested by using these signals and the range scope.

43. Division Channel

As indicated in the block diagram of the intercon-

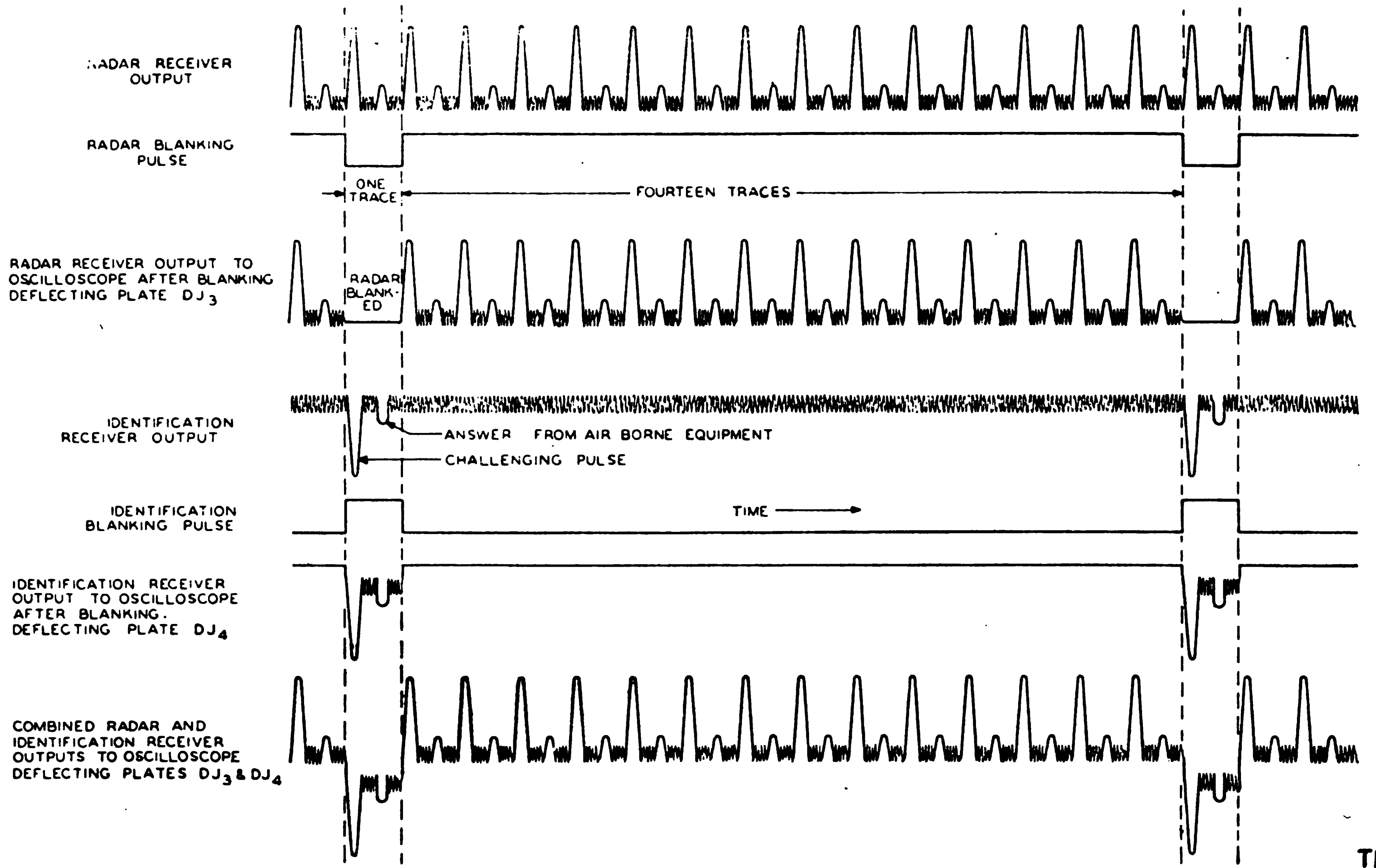

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Figure 40. Oscilloscope time sharing by radar and identification receivers.

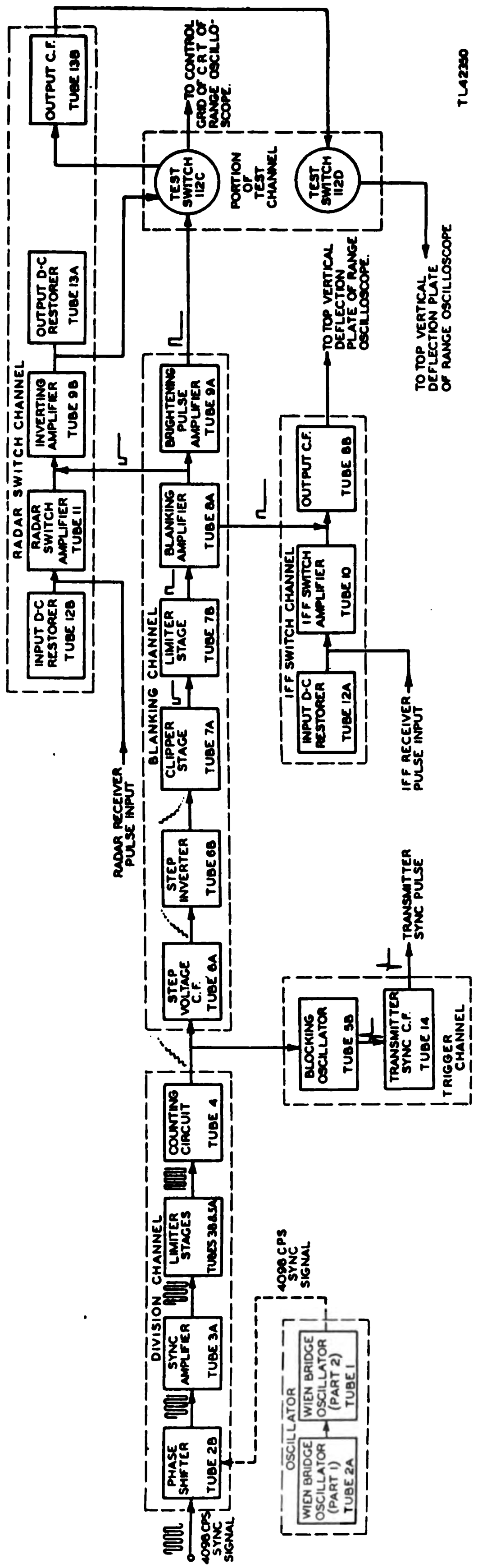


Figure 41. Interconnector, block diagram.

nector (fig. 41), the division channel includes the following stages:

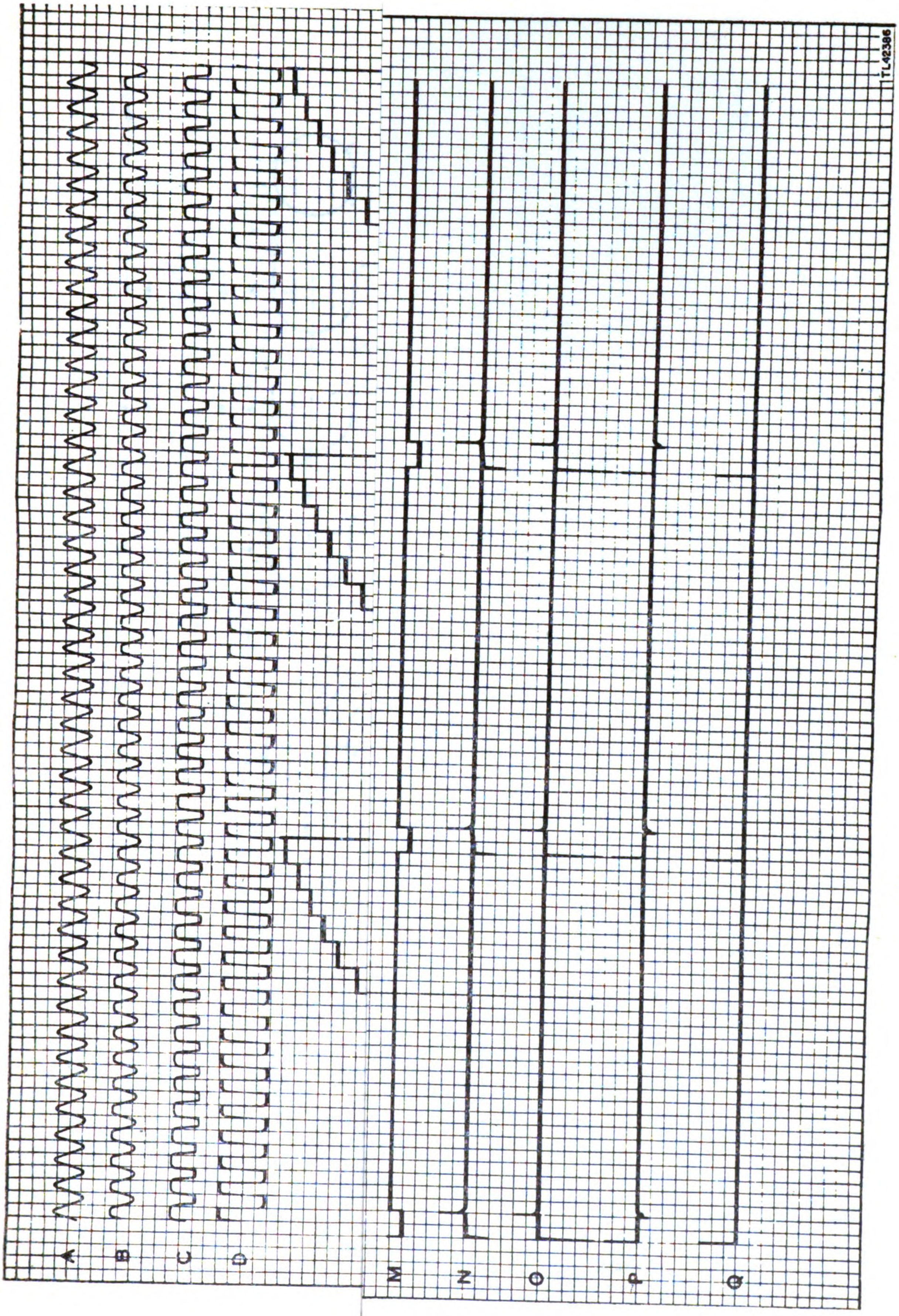
a. The phase shifter (tube 2B) shifts the phase of the 4,098-cycle sine wave input obtained from Junction Box JB-22 (terminal SYNC IN of the terminal strip). The main pulses from both the radar and IFF transmitters must be directly in line on the oscilloscope so that the replies will be beneath the corresponding echoes. However, the time delays and phase shifts through the different circuits of the radar and IFF will probably be unequal. At some point in the circuit a corrective phase shift will have to be introduced. This is accomplished here by using a variable phase shifter (operated by the PHASE control) so that the phase and, as a result, the position of the main IFF pulse can be varied from outside the set. This avoids the necessity of making elaborate calculations as to the phase shift in every stage, and the differences in phase shifts that would occur in different sets.

b. The sync amplifier 3A amplifies and slightly flattens the signal output from the phase shifter network.

c. The first and second limiter (3B and 5A) are two similar stages which further square the sine wave output of the phase shifter. The output of the second limiter is a rectangular wave.

Table II.

Tube No.	Element	Pin	Wave shape
1	Plate	3	A
2B	Grid	4	A
2B	Plate	5	A
3A	Grid	1	A
3A	Plate	2	B
3B	Grid	4	B
3B	Plate	5	C
5A	Grid	1	C
5A	Plate	2	D
6A	Cath	6	E
6B	Grid	1	F
6B	Plate	2	G
7A	Plate	5	H
7B	Grid	1	H
7B	Plate	2	J
8A	Plate	2	K
8A	Cath	3	L
9A	Grid	1	M
9A	Plate	2	L
11	Plate	8	N
9B	Plate	5	N
9B	Grid	4	O
13B	Cath	6	P
10	Plate	3	K
8B	Cath	6	M
14	Cath	8	Q


A
B
C
D
M
N
O
P
Q
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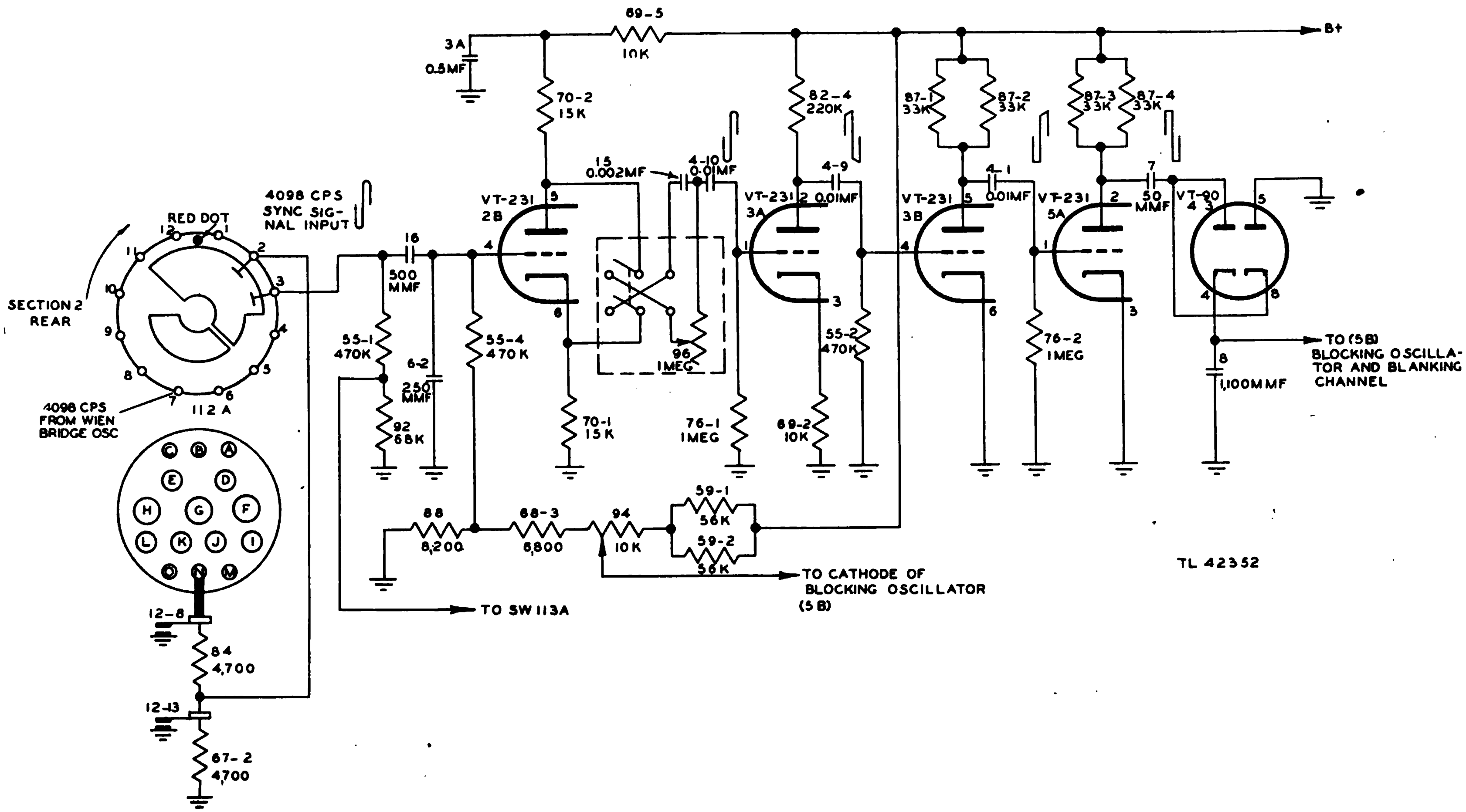


Figure 43. Division channel, partial schematic.

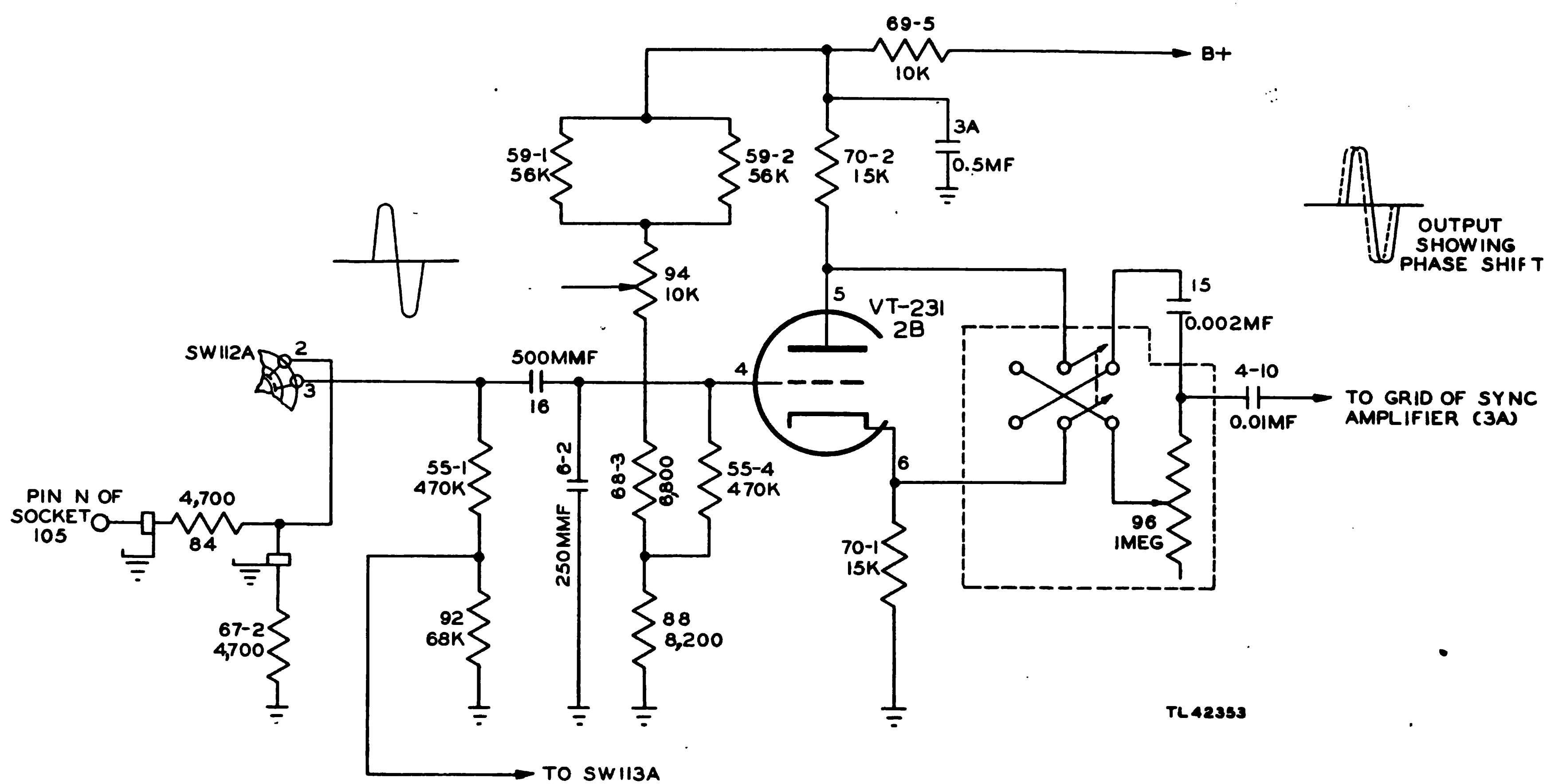


Figure 44. Input and phase shifter, partial schematic.

d. The counter, or stepping diode (4), forms a step waveform, one step for each cycle of the input square wave. Every fifteenth step is used to trigger the blocking oscillator and blanking channel circuits.

44. Input and Phase Shifter

a. The 4,098-cycle input synchronizing signal generated in the radar keying unit and distributed through Junction Box JB-22 enters the interconnector through pin *N* of the large socket 105. It is applied across a voltage divider consisting of resistors 84 and 67–2, bypassed by spark-plate capacitors 12–8 and 12–13 to eliminate interference picked up by the connecting cable. The synchronizing voltage developed across resistor 67–2 is fed to pin 2 of section *A* of the SELECTOR switch 112, and in the first four positions of that switch (OPERATE, STANDBY, 3, and 4) passes directly through and out pin 3 to tube 2B. In position 5 of the SELECTOR switch, the connection between pins 2 and 3 is opened, and the synchronizing voltage applied to tube 2B is taken from the Wien bridge oscillator, through pin 7 of switch 112-A.

b. There are two 4,098 inputs to the interconnector, the one just described that enters on pin *N* and another that comes from the range oscilloscope that has first passed through the radar range unit and is used to form the sweep voltage in the oscilloscope. This enters the interconnector at pin *K* of socket 105, goes to pin 8 of switch 112-A. In the first four positions of the SELECTOR switch (OPERATE, STANDBY, 3 and 4) it leaves directly by pin 9, returning to the range oscilloscope through pin 0 on socket 105.

c. The synchronizing voltage is applied to the grid of the phase shifter, tube 2B, through capacitor 16. A voltage divider (resistors 55–1 and 92) is placed across this input and the voltage developed across 92 is applied to pin 6 of section *A* of the TEST switch 113. In TEST position 6 (position 4 for the RC–148–C) (SELECTOR switch position 4 and 5) this voltage is applied to the lower deflecting plate of the range oscilloscope. (See par. 69.)

d. The circuit of the phase shifter is redrawn in figure 45. To make it more easily understood, the d-c current path is omitted and only those components are shown that are necessary to the phase shifter operation. Capacitor 3A effectively grounds one end of the plate load resistor 70–2 for alternating current and the end of the cathode resistor 70–1 is directly grounded and not bypassed. The result is that, neglecting capacitor 15 and variable control 96, the voltage drops across resistors 70–2 and 70–1 are in phase and approximately equal. When capacitor 15 and variable control 96 are connected across the plate and cathode of tube 2B, the potential of point *A* remains constant with respect to ground, but the phase of this voltage may be varied by means of control 96. The voltage drops across capacitor 15 and resistor 96 are 90° out of phase. The voltage between point *A* and ground is the difference between the voltage drops across resistor 70–2 and capacitor 15. This same voltage is the difference between the drops across resistor 70–1 and variable resistor 96. This difference is equal in magnitude to the drop from *P* to ground or *K* to ground, but the phase is dependent on the value of resistance in control 96. If the value of resistance in control 96 is large, the phase is almost the same as that of the voltage from *P* to *K*. If 96 is made small the voltage from *A* to ground is almost 180° out of phase with the voltage from *P* to *K*. Theoretically, as resistor 96 is varied from zero to maximum resistance, the phase of the voltage at *A* varies from zero to 180°. Actually, however, a range of only 160° is obtained. Another 160° shift is obtained by throwing the double-pole double-throw switch mounted with the PHASE control 96.

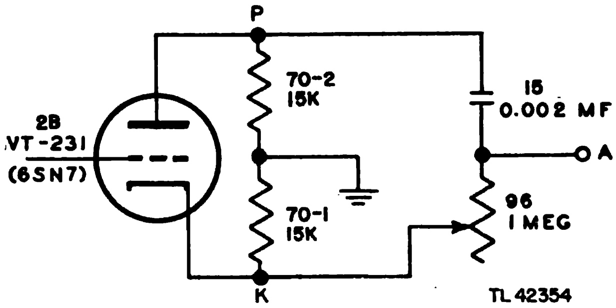


Figure 45. Phase shifter circuit, equivalent diagram.

e. The phase relations existing in the circuit are shown in the vector diagram figure 46. The voltage from *K* to *G* is represented by the vector $V_R(70\text{–}1)$ and that from *G* to *P* by vector $V_R(70\text{–}2)$. These voltages are in phase and added in series, while the midpoint is at ground potential. The output voltage is represented by the vector *GA*, which is the difference between $V_R(96)$, the voltage across control 96, and $V_R(70\text{–}1)$. *GA* is also the difference between $V_C(15)$, the voltage across capacitor 15, and $V_R(70\text{–}2)$. $V_R(96)$ and $V_C(15)$ are 90° out of phase. Therefore, as control 96 is varied, $V_R(96)$ varies and point *A* moves around the arc of the semicircle *KAP*.

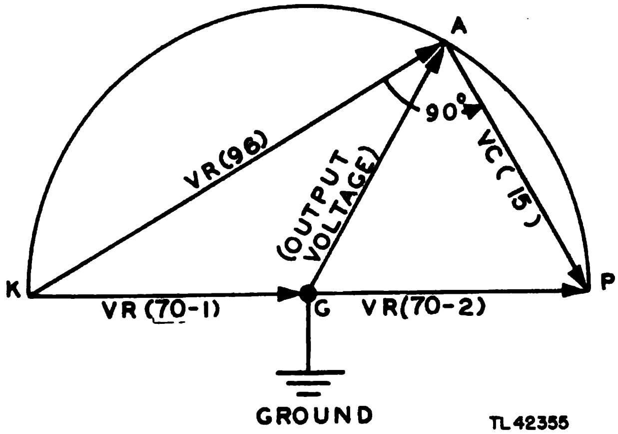


Figure 46. Phase shifter operation, vector diagram.

45. Square Wave Generator

a. The sine wave output of the phase shifter is amplified and squared in the three stages, 3A, 3B, and 5A, so that a good rectangular wave results. Tube 3A is primarily an amplifier, and the input from the phase shifter is applied to its grid through the coupling capacitor 4–10. This tube is self-biased by means of the cathode resistor 69–2.

b. The output from tube 3A is coupled through capacitor 4–9 to the grid of the first limiter tube, 3B. The limiter tubes are operated at zero fixed bias and are normally conducting heavily; they are overdriven amplifiers used as limiting tubes. During a portion of the positive peaks of the input voltage, tube 3B is driven to saturation, and during a portion of the negative peaks the tube is driven to cut-off. Thus, the positive and negative peaks are flattened. The output voltage of 3B is applied through capacitor 4–1 to tube 5A. Since this input voltage is considerably greater than the voltage input to the preceding tube, the tube will be operated at either saturation or cut-off during the entire cycle and the output of 3B will be further squared. The output of tube 5A is essentially a rectangular wave. (See fig. 47.)

46. Counter Circuit

The action of this circuit is such that capacitor 8 is charged in a series of steps, an additional step being added with every positive cycle of the square wave output from stage 5A. This capacitor is connected to the grid of the blocking oscillator which is normally biased to cut-off by a positive voltage on the cathode. As each step is added on capacitor 8, the positive voltage applied to the grid approaches nearer and nearer the positive bias on the cathode. Finally, one more step is sufficient to overcome the bias and allow the oscillator to conduct, removing all charge on capacitor 8 and starting the step charging process all over again. This tube then actually divides the frequency of the input square wave; for each cycle of the square wave adds one step to the step voltage, but only every fifteenth step allows the blocking oscillator to conduct and thus produce the trigger pulse. This action will now be described in detail.

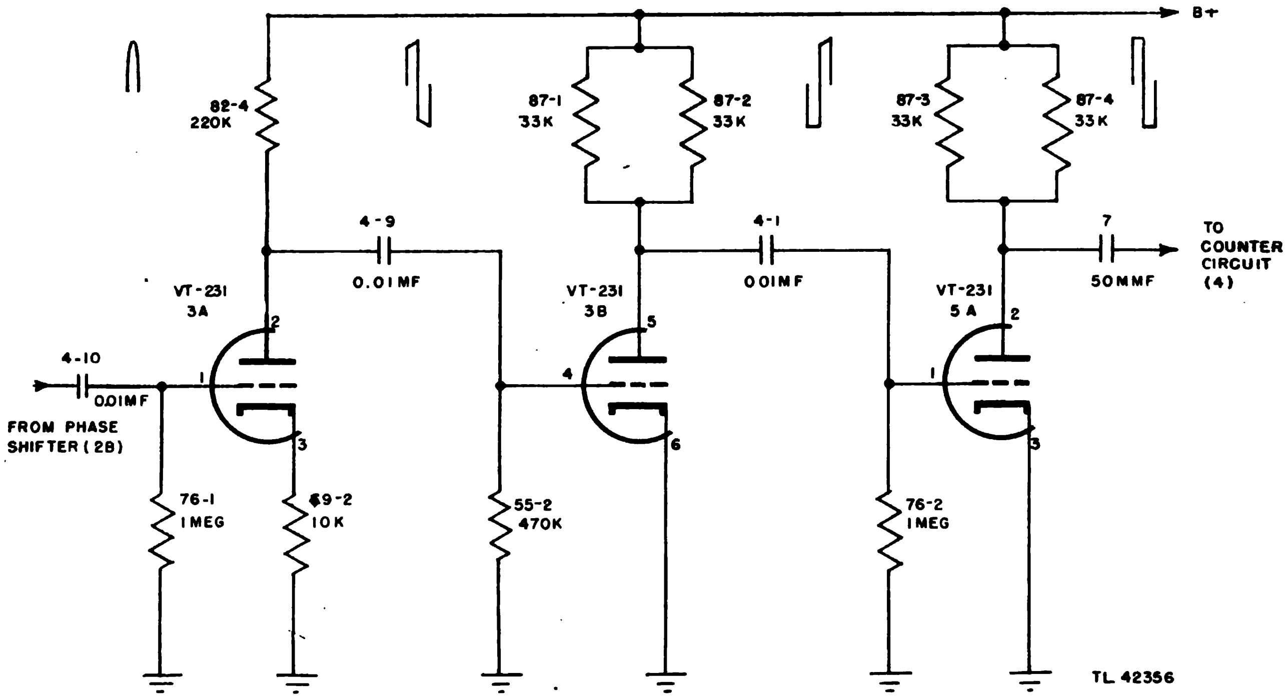


Figure 47. Square wave generator, partial schematic.

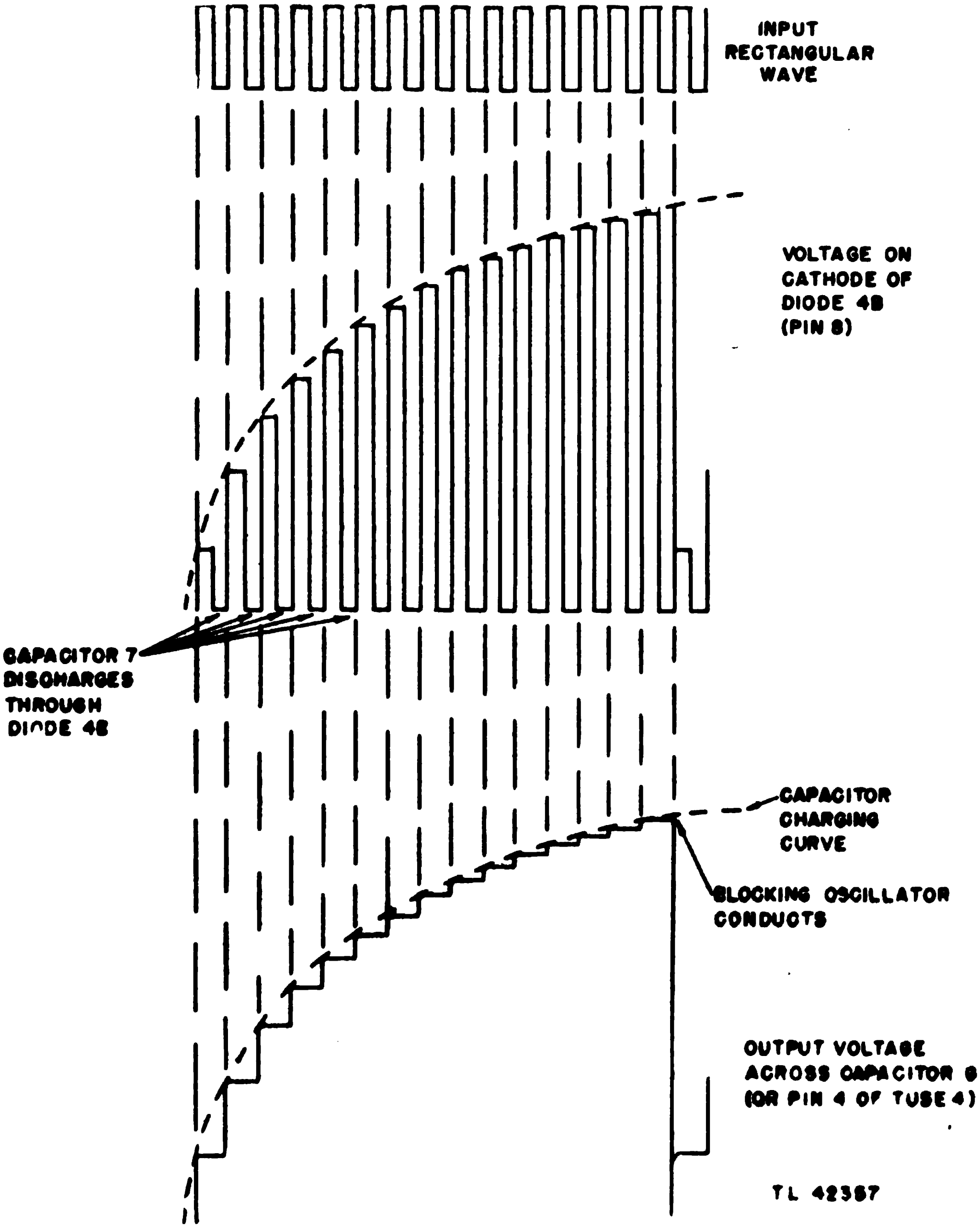


Figure 48. Counter circuit, waveform development.

a. The two diodes in tube 4, capacitor 7, and capacitor 8 are so arranged that when the high positive output of the square wave generator, (when tube 5A is not conducting) is applied to the input of the counter circuit, the two capacitors and the diode 4A (pins 3 and 4 of tube 4) charge in series. The essential fact to remember in understanding the action here is that in such a series circuit the same current will flow in all parts, and the same charge will be left on each capacitor, but the voltage across the different capacitors will depend on their capacity. This can be compared to the action in a circuit with several resistors in series. The same current flows in all resistors, but the voltage across each depends directly upon its resistance. Thus, if one resistor is of 22,000 ohms and another 1,000 ohms, the voltage across the smaller resistor will be $1/23$ of the total across both, while $22/23$ will be across the larger. However, with capacitors in series the voltage drop across each capacitor will be *inversely* proportional to its capacity. Capacitor 8 in this case is 22 times larger than capacitor 7; but capacitor 8 will charge

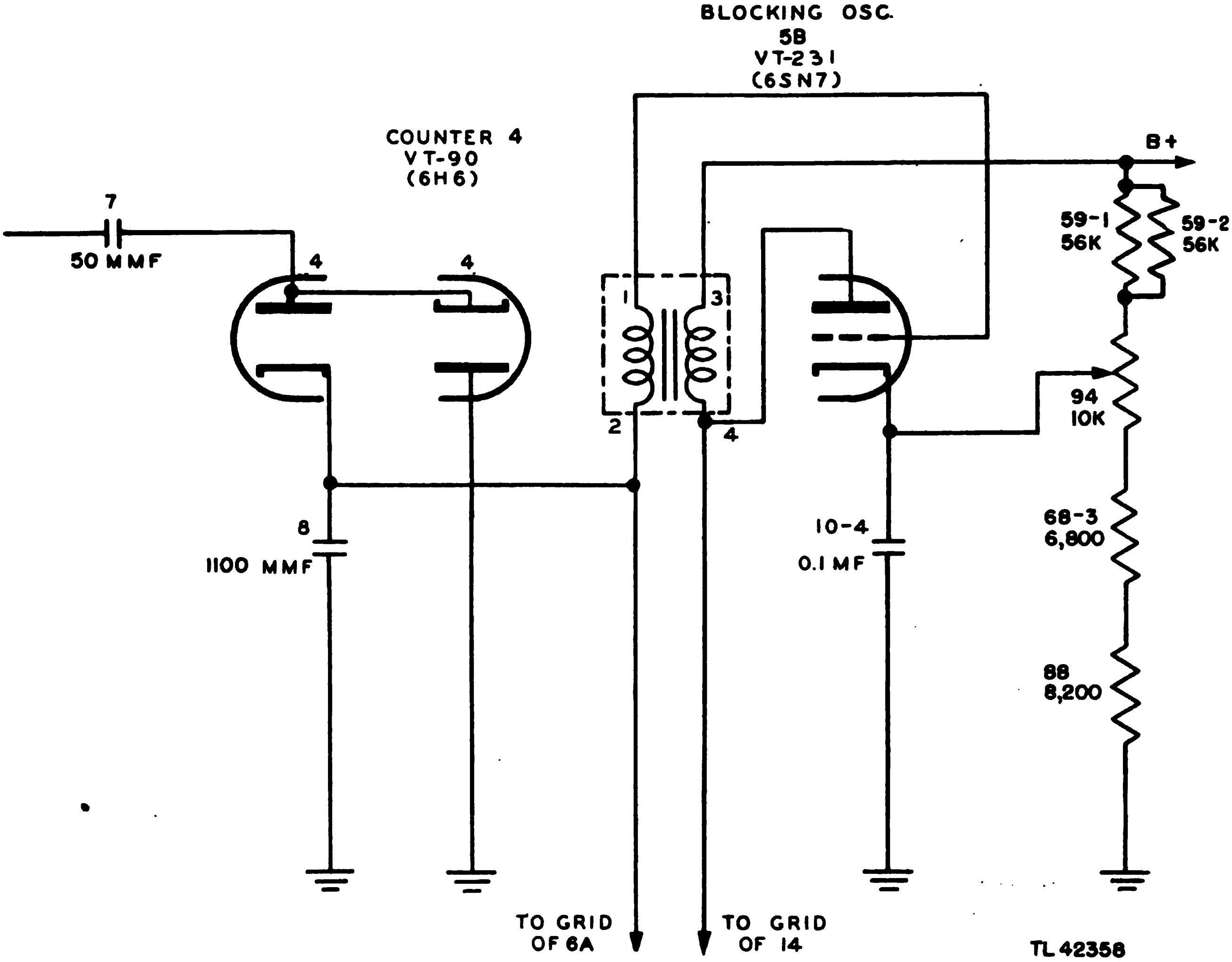


Figure 49. Counter circuit and blocking oscillator, partial schematic.

to only $1/23$ of the applied voltage, while the smaller capacitor (7) charges to $22/23$ of the applied voltage.

b. When the positive half-cycle of the rectangular input wave occurs, capacitor 8 charges to about $1/23$ of this voltage and capacitor 7 to $22/23$. This voltage represents the first step. (See fig. 48.) On the next half-cycle, when 5A conducts and the voltage of the rectangular wave drops sharply, the lower plate of capacitor 7 and the cathode (pin 8) of diode 4B become negative with respect to ground; and capacitor 7 discharges through the diode the charge it accumulated during the positive half-cycle. Capacitor 8, however, has no discharge path and retains its charge.

c. At the next positive half-cycle of the input signal, the two capacitors again charge in series. For the first step, no charge was on either capacitor, and together they charged to the total change in voltage, which was the value of the input voltage. For the second step, however, there is some charge on capacitor 8 and the total change in voltage across them is equal to the input voltage less the previous charge on capacitor 8. Again, $1/23$ of this change of voltage is added to the previous charge on capacitor 8 and $22/23$ is applied to capacitor 7. For example, if the positive input voltage is 230 volts, the first cycle will charge capacitor 8 to $1/23$ of that voltage, or 10 volts. During the second cycle the positive voltage applied across the capacitors will be 230 minus 10 volts, or 220 volts. Capacitor 8 will charge an additional $22/23$, or 9.5 volts. When the positive input voltage is removed, capacitor 7 discharges to ground as in the first cycle, while capacitor 8 retains its charge.

d. This charging process will continue for as many cycles of the input voltage, or as many ***steps,*** as are required to increase the positive voltage on the grid of the blocking oscillator (5B) until it is

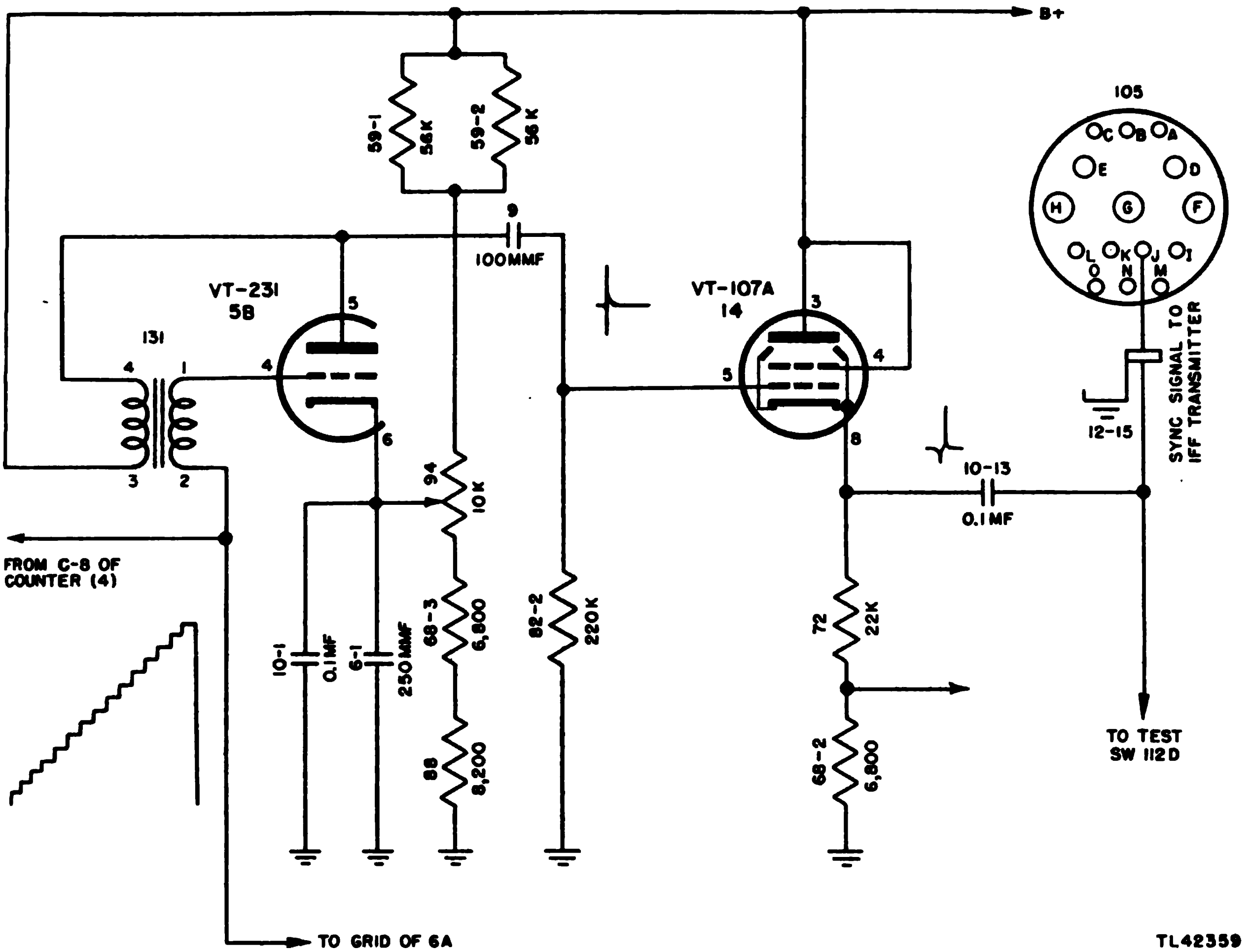


Figure 50. Trigger channel, partial schematic.

sufficient to make that tube conduct and to allow capacitor 8 to discharge through the tube. This discharge point is determined by the setting of the DIVISION control, and can be anywhere from 11 to 30 steps of the step voltage on capacitor 8. Normally, the control is set so that 15 steps occur before the oscillator conducts. After capacitor 8 has discharged, the step charging process will begin again. From figure 48 it can be seen that the outline of the steps resembles the regular charging curve for a capacitor.

47. Transmitter Trigger Channel

This channel has the following stages:

a. The blocking oscillator, tube 5B, is a conventional blocking oscillator that produces a sharp negative and positive pulse at a recurrence frequency which is variable, but normally is 273 cycles per second.

b. The pulse from the blocking oscillator is fed to tube 14, a cathode follower. This tube clips most of the negative pulse and passes the positive pulse to the transmitter.

48. Blocking Oscillator

Tube 5B is similar to the blocking oscillator previously explained in the transmitter section. Cathode bias is used to keep the tube in a normal nonoscillating condition. It is tapped off variable resistor 94, one of a series of resistors, 59–1 and 59–2 in parallel, 94, 68–3, and 88 connected between B+ and ground. This variable resistor is adjusted by the DIVISION control. The positive side of capacitor 8, connected to the grid of the oscillator, places a positive voltage on the grid as it is charged. The effective bias on the tube is then the difference between the positive cathode voltage and the positive grid voltage from capacitor 8. As the charge on capacitor 8 increases, it will reach a point where it will be sufficient to overcome the cathode bias and allow the oscillator to conduct. Normally, the DIVISION control should be set so that the oscillator is

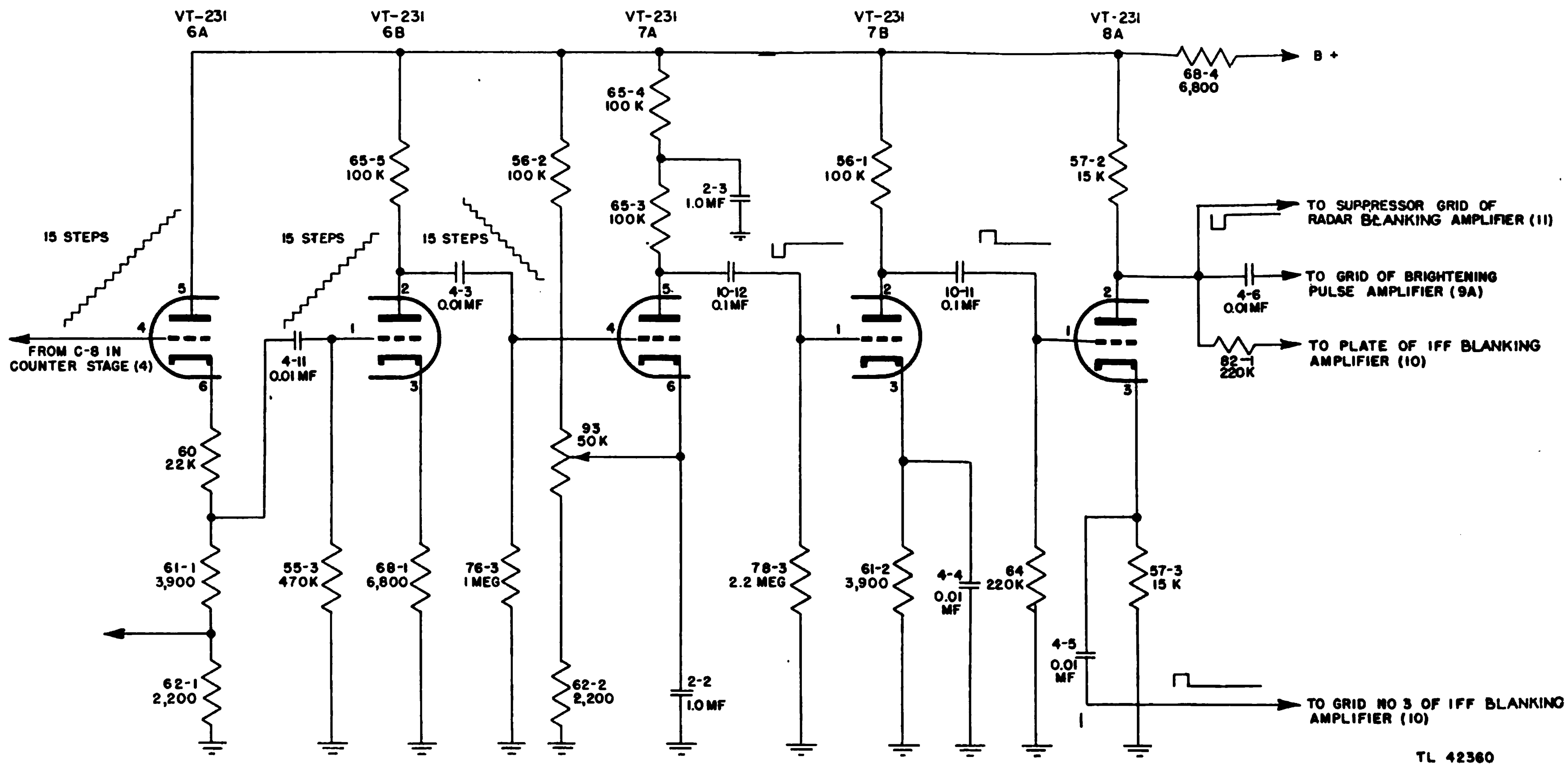


Figure 51. Blanking channel, partial schematic.

triggered as capacitor 8 starts to charge for a sixteenth step. As the oscillator conducts, grid current flows and discharges capacitor 8, and what was to have been the sixteenth step becomes instead the first step of the next step charging cycle. The output from the plate is a sharp negative pulse followed immediately by a positive pulse, after which the oscillator is cut off until the next time capacitor 8 starts to charge for a sixteenth step. The oscillator oscillates then once every fifteenth cycle of the 4,098-cycle input, or at a frequency of 273 cycles corresponding to a time of 3,660 microseconds.

49. Cathode Follower, Tube 14

The output of the blocking oscillator is taken from the plate and fed through capacitor 9 and resistor 82–2 to a cathode follower, tube 14 (6V6–GT). (See fig. 50.) There is a high cathode bias on this tube which eliminates most of the negative pulse from the blocking oscillator. The positive pulse appears across the cathode resistors 72 and 68–2 and goes to the transmitter through coupling capacitor 10–13 and pin *J* of the large connector, 105. The output also goes to pin 9 and 10 of section *D* of the SELECTOR switch 112. While the switch is on OPERATE position, this pin is an open circuit and has no effect on the output voltage, but in the STANDBY position, and position No. 3, the switch gives a direct connection to ground, thus grounding the output to the transmitter. The output is also tapped off from the junction point of resistors 72 and 68–2 and applied to pin 3 of section 113A of the TEST switch, and then to the lower vertical deflection plates of the range oscilloscope in TEST position 3 (par. 69), through the vertical amplifier in the scope.

50. Blanking Channel

The step voltage on capacitor 8 is also applied to tube 6A.

a. Tube 6A is a cathode follower. Only part of the output from this tube is applied to the next stage. This stage also supplies the voltage on the lower vertical deflection plate of the range oscilloscope in TEST position 2.

b. Tube 6B is an amplifier that amplifies and inverts the step voltage from tube 6A.

c. The step clipper, tube 7A, is operated so that only from one to three of the inverted steps make the tube conduct, producing a negative pulse from one to three steps wide. The width of the pulse is determined by the setting of the BASELINE control.

d. The limiter, tube 7B, is used to produce a squared, sharp-sided pulse from the pulse applied to its grid by the clipper stage.

e. The pulse phase splitter, 8A, is an amplifier with both a plate and cathode load. The positive pulse from 7B produces a negative pulse of from 244 to 732 microseconds across the plate load and a positive pulse of the same duration in the cathode.

51. Cathode Follower, Tube 6A

a. The step voltage developed across capacitor 8 and applied to the grid of the blocking oscillator is also applied to the grid of tube 6A. This tube is a cathode follower and the voltage on capacitor 8 is directly applied to the grid (note the absence of any grid resistor or coupling capacitor) since this cathode follower does not draw grid current. The direct connection to the grid isolates capacitor 8 from any effect of an additional discharge path that would be provided by a grid resistor. The output, as is usual with a cathode follower, will be a wave of the same shape and phase as the input. The output of a cathode follower is never larger than the input, and in this case it is reduced even further by using only part of the voltage developed across the total cathode resistance, resistors 60, 61–1, and 62–1, or that part developed across resistors 61–1 and 62–1 as the output.

b. The output voltage of tube 6A developed across resistor 62–1 is connected to pin 2 of section *A* of the *TEST* switch (113). This is the voltage applied to the lower deflection plate of the range oscilloscope

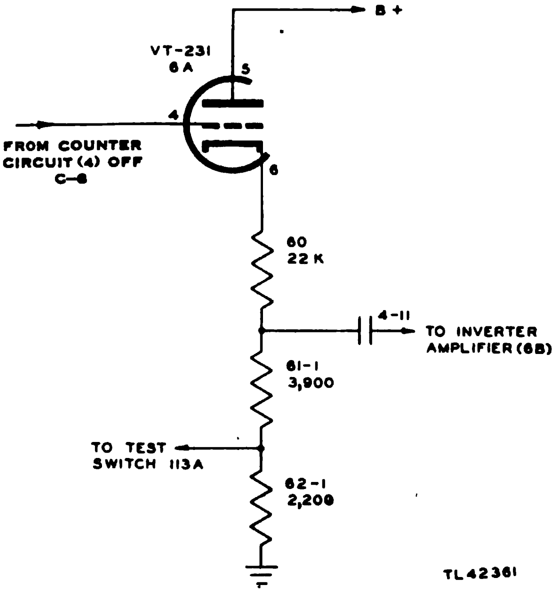


Figure 52. Cathode follower, 6A, partial schematic.

for *TEST* position 2 (par. 69) through the vertical amplifier in the scope. The horizontal sweep voltage has a duration of 244 microseconds, while the duration of each step is also 244 microseconds. As each step represents a higher voltage than the preceding one, the steps will appear as a series of successively higher lines on the screen. Since capacitor 8 does not charge instantaneously, the lines will appear to be connected by light, nearly vertical lines. The position of these nearly vertical lines will vary with the PHASE control, since this control varies the phase between the voltage synchronizing the control unit and the 4,098-cycle sine wave voltage from which the sweep voltage is derived.

52. Step Inverter, Clipper, and Limiter

a. The voltage from the cathode follower tube 6A (fig. 52) is coupled to the grid of tube 6B through capacitor 4–11 and the small step voltage applied to the grid. This tube is an amplifier operating without fixed bias and the comparatively small input is amplified and inverted.

b. Tubes 7A and 7B and their associated circuit elements make up the step clipper and limiter stages. (See fig. 53.) Both stages operate as conventional resistance coupled amplifiers and produce a blanking pulse of the desired width to be used in the blanking circuits. This is made possible by the baseline control in the cathode circuit of tube 7A. The cathode of tube 7A is connected to a voltage divider (composed of resistor 56–2, variable resistor 93, and resistor 62–2) connected from B+ to ground. The cathode resistors are bypassed by capacitor 2–2. This is the equivalent of a high negative bias on the grid of 7A. By means of resistor 93 the pulse width of the output can be varied from one to three steps of the applied signal. The applied signal is the step voltage inverted in 6B, a series of positive decreasing steps. When applied to the grid of 7A the most positive of the steps will overcome the bias and allow the tube to conduct. When potentiometer 93 is in its extreme counterclockwise position the identification signals are blanked completely; when in its extreme clockwise position a pulse three steps wide is produced. In normal operation the control is set to pass one step. The width of the output pulse of the blanking channel determines the length of time the IFF signal can be observed on the oscilloscope. If the blanking pulse were only one step wide, the recognition signal from a target at a range of more than 40,000 yards (the maximum calibrated range on the scope) could not be seen. The IFF transmitter sends out its pulse 273 times a second, and ordinarily the received pulse would have to be received within the next 244 micro-

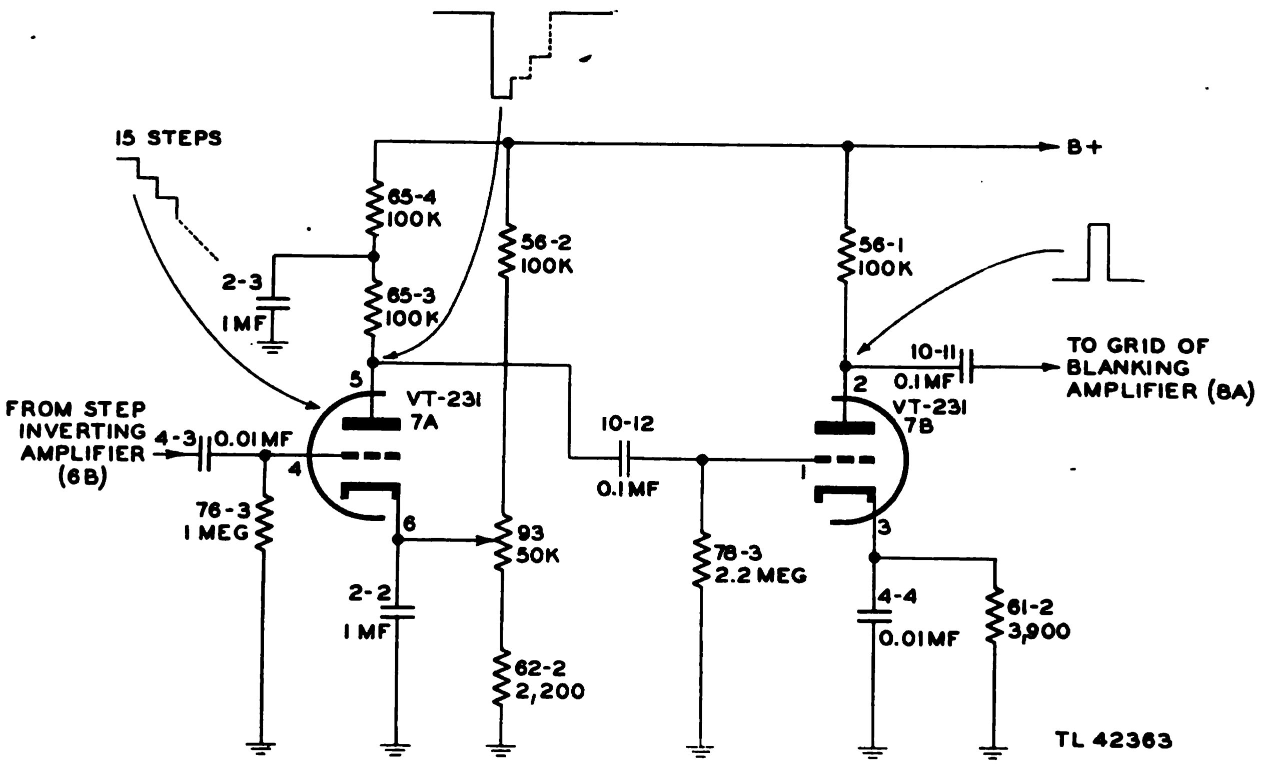


Figure 53. Step clipper, 7A, and limiter, 7B, partial schematic.

seconds to be seen on the display oscilloscope. However, the BASELINE control can be adjusted so that the clipper will pass up to three steps, and the result is that any IFF replies received up to three times 244 microseconds can be displayed on the scope. For example, a target at a distance of 60,000 yards would not have its identification reply appear on the scope for a blanking pulse of one step; but if the blanking pulse were two steps, its identification signal would appear on the scope at an apparent range of 20,000 yards.

c. The output of the clipper stage is applied to the grid of tube 7B through capacitor 10–12. Bias voltage for the stage is developed in the cathode circuit by resistor 61–2, which is bypassed by capacitor 4–4. The bias voltage developed in the cathode circuit will effectively bias the tube near enough to cut-off to allow the negative pulses to drive the tube to cut-off. By driving tube 7B to cut-off, a squared pulse will be developed across load resistor 56–1 which will have the same pulse width as the applied signal.

53. Pulse Phase Splitter

The pulse phase splitter (tube 8A) like the phase *shifter* (tube 2B) has a load in both plate and cathode circuits. The output is taken off both the plate and the cathode. A negative rectangular pulse is taken from the plate and a positive rectangular pulse is taken from the cathode. The cathode resistor is not bypassed and follows the swings in input voltage in the same way as the cathode in a cathode follower. The positive input pulse increases the plate current in the tube and the plate voltage decreases, producing a negative pulse at the plate. Cathode bias is developed by current flowing through the cathode resistor and grid-leak bias is developed because of the high positive voltage impressed on the grid. The two output pulses have the same width as the original input pulse, but the tube is sufficiently overdriven to square the pulse still further.

54. Radar Switching Channel

Tubes 12B, 11, 9B, and 13A compose the radar switching channel. Whenever both the radar and IFF information simultaneously appear on the radar range oscilloscope, the radar received signals must pass through this channel. This, together with the IFF switching channel, forms the electronic switch that alternately places the radar and IFF replies on the oscilloscopes. The switching is timed by the output of the pulse phase splitter, tube 8A.

a. Tube 12B is a diode, acting as a clamper, or d-c restorer.

b. Tube 11, the radar blanking amplifier, amplifies and passes the radar signal for 14 out of 15 traces,

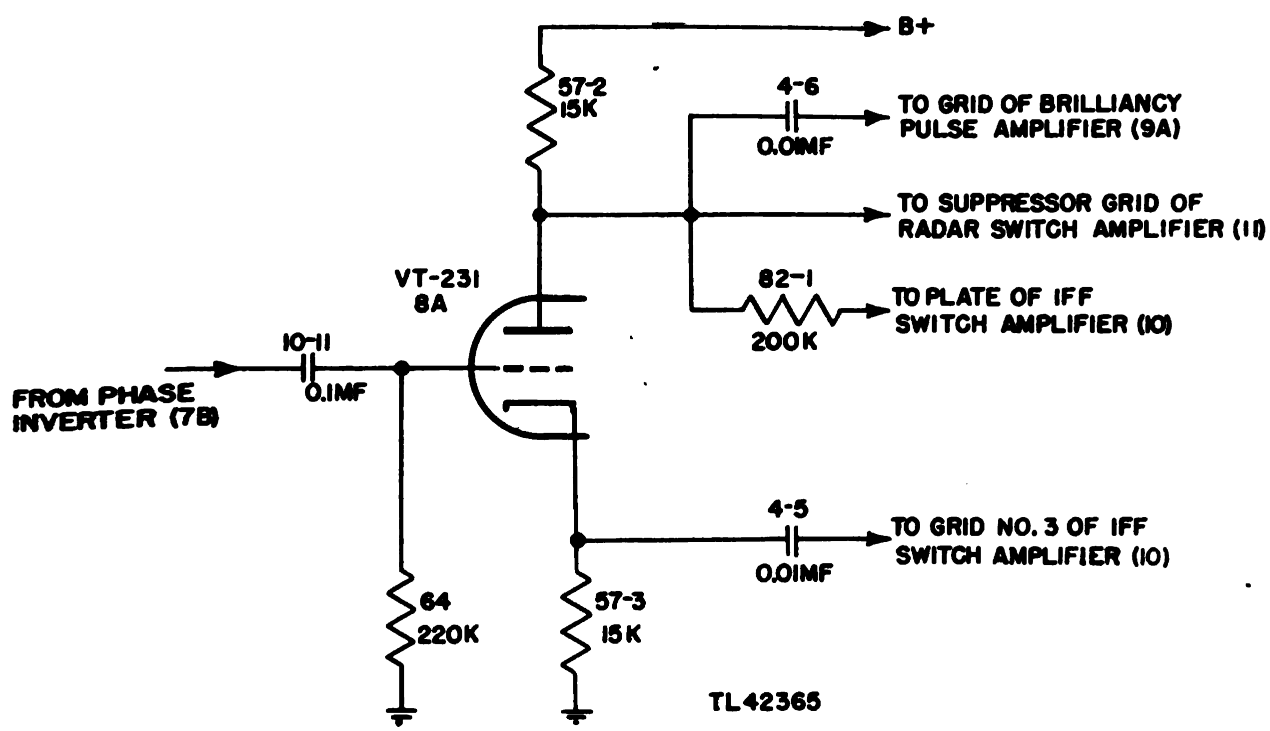


Figure 54. Pulse phase splitter, 8A, partial schematic.

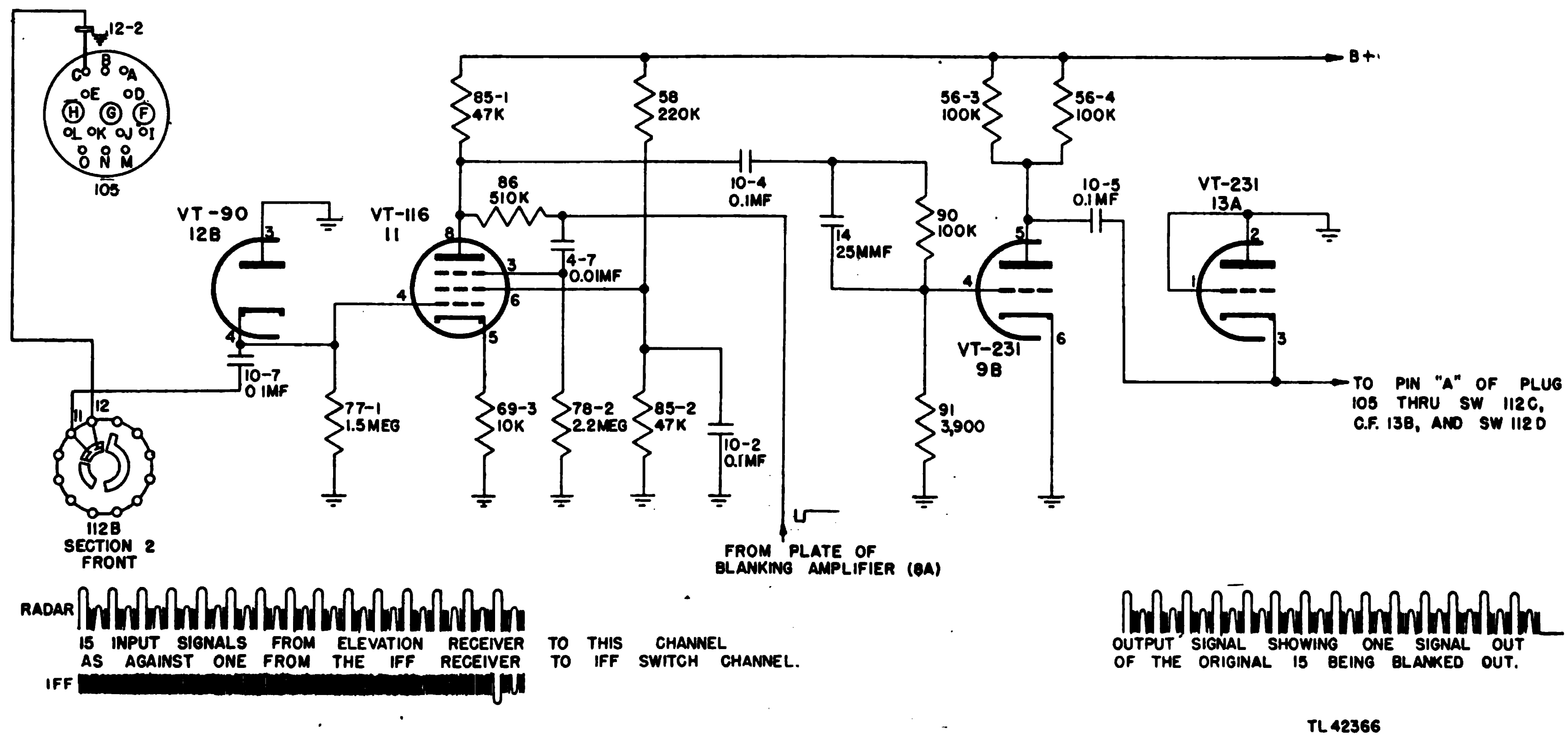


Figure 55. Radar channel, partial schematic.

but is cut off by the negative pulse from the pulse phase splitter for the remaining one trace.

c. The radar signal from tube 11 is passed through an amplifier, 9B, that inverts it and restores the original positive input polarity.

d. Tube 13A, a triode, is connected as a diode, and used as a clamping tube.

55. Input to Radar Switching Channel

The output of the radar elevation receiver goes through a coupling capacitor in the radar elevation receiver BC–406, then to the range oscilloscope, directly from the scope to pin *C* on the large plug on the rear of the interconnector. The circuit from that point is shown in figure 55. This figure represents the circuit in the OPERATE position. In the STANDBY position, the radar pulse goes to pin 2, section *D*, of the SELECTOR switch and leaves at pin 6, then to pin *A* of connector 105, thence to pin 11 of the plug in the range oscilloscope, and to the video amplifier in the scope. (See fig. 56.) When the RC–148 is not in operation, it is necessary to leave the SELECTOR switch in STANDBY position if the radar signals are to be seen on the screen. The switch should never be left between positions. It should not be forgotten that even when the IFF is turned off, the received radar signals physically enter the interconnector.

56. Clamping Diodes

The output of both the IFF and radar receivers consists of a strong positive pulse followed by relatively weak echoes or answers. These occur on a baseline which is near zero potential with respect to ground. If these pulses are applied to an amplifier tube through a capacitor (for the radar channel, the coupling capacitor in the radar receiver), the d-c level will be destroyed, because the capacitor cannot pass direct current. A new d-c average potential would then be established forming a new baseline.

a. Strong positive pulses will cause the grid to draw current and charge the coupling capacitor negatively. This charge cannot leak off rapidly and will establish a new baseline, resulting in an effective negative bias on the tube, forcing the original baseline below the bias. The strong main pulses will rise above the bias, but weak echoes may not be able to rise above the bias and will be cut off by the tube.

b. If the capacitor in the grid circuit acquires a negative charge because of the flow of grid current, a clamping diode in the grid circuit will conduct and the charge will flow to ground. The result is that all positive signals will be applied to the grid of the amplifier, and the averaging effect of the capacitor will be eliminated.

57. Clamper, Tube 12B

The radar signal is applied to the grid of the blanking amplifier (tube 11) in parallel with which is a clamping diode. (See fig. 55.) This tube is an open circuit so far as positive signals are concerned and will have no effect on them, since a positive signal will make the cathode of the diode more positive than the grounded plate and the tube cannot conduct. A negative signal in the cathode, however, makes the cathode more negative than the plate and the tube will conduct most of the negative voltage to ground. The result is that only positive signals will be applied to the blanking amplifier, while negative signals and the negative voltage on the coupling capacitor will be grounded.

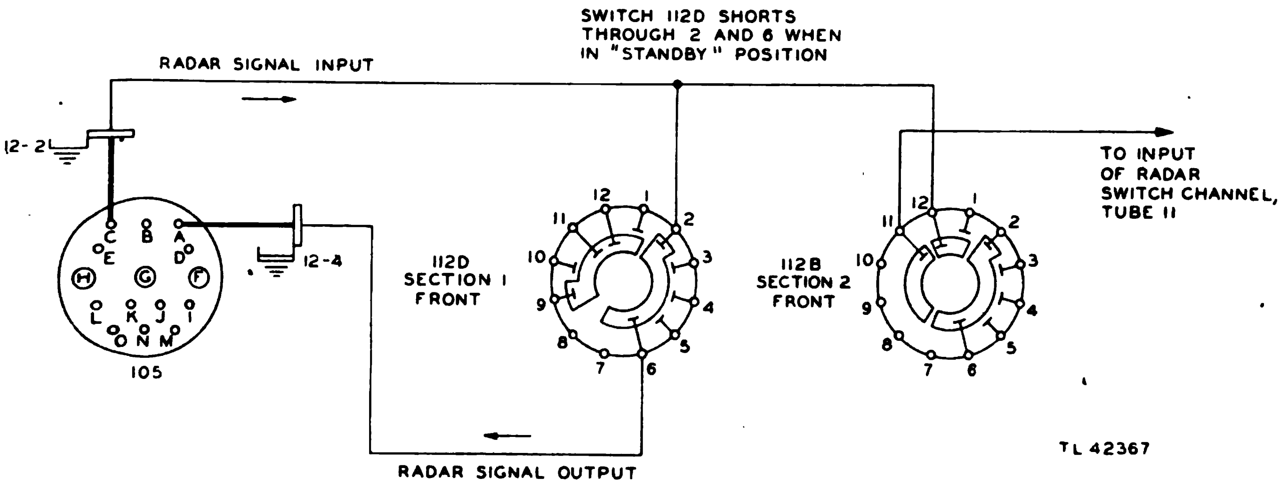


Figure 56. Input to radar channel, STANDBY position.

58. Radar Blanking Amplifier

a. The positive signals from the radar receiver are applied to the grid of the blanking amplifier, tube 11. This tube is connected as an ordinary pentode amplifier, except that the suppressor grid is connected to the plate of the phase splitter 8A. It is biased so that normally it will act as an ordinary amplifier and will pass signals applied to its control grid. However, during the 244-microsecond period in which the negative pulse was produced in the blanking channel, and during which the IFF transmitter sends out an interrogation pulse, tube 11 and the radar receiver channel are cut off by the negative pulse from the plate of the pulse phase splitter applied to the suppressor grid. The negative pulse is taken off the plate of tube 8A; the voltage from the plate is coupled through capacitor 4–7 to the suppressor grid, pin 3, of tube 11, making that tube inoperative for the duration of the pulse.

b. The output of this tube, described so far, would be the radar main pulse and echoes for 14/15 of the time, and a long straight positive pulse for the remaining cycle. This pulse, however, would not be at the same level as the baseline while the amplifier was operating, since the negative pulse on the suppressor grid would cut the tube off and allow the plate voltage to rise. The result would be a positive pulse during the one trace when the radar signal was cut off. This would give an unstable baseline on the radar range scope, since it would shift once every 15 traces.

c. This positive pulse is eliminated by connecting resistor 86 between the suppressor grid circuit of tube 11 and the plate of tube 11 and so impressing a portion of the pulse from the plate of tube 8A on the plate of tube 7 as well as on the suppressor grid of tube 7. The negative pulse from the plate of tube 8A and the positive pulse from the plate of tube 11 are approximately 180° out of phase, since the negative pulse on the suppressor becomes a positive output pulse on the plate. The voltage fed to the suppressor in this manner will tend to cancel the positive

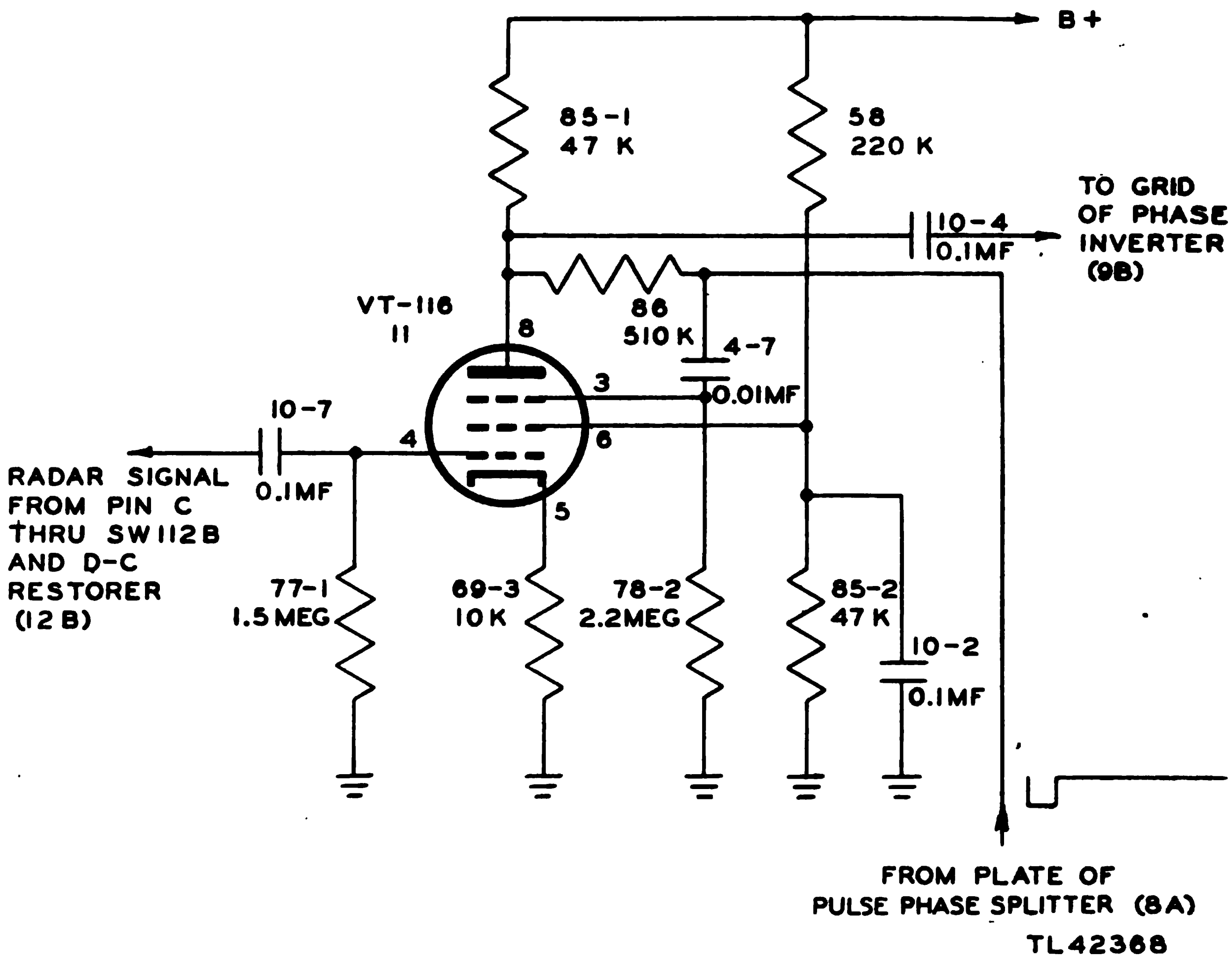


Figure 57. Radar blanking amplifier, partial schematic.

pulse output from the plate. The value of resistor

through capacitor 10–8 and resistor 65–1 to the con-

52. Radar Blanking Amplifier

time, and a long straight positive pulse for the repulse output from the plate. The value of resistor 86 is so chosen (510,000 ohms) that the negative signal coupled from the suppressor circuit and the positive signal due to the tube action will be equal and so cancel one another.

59. Phase Inverter and Clamping Diode

a. The blanking amplifier has inverted the radar pulses received from the radar receiver. In order to give them correct polarity to produce upward deflections on the radar scope, they must be inverted to become positive pulses once again. Tube 9B is an ordinary amplifier operated without fixed bias and normally conducting heavily, so that any negative pulse will decrease the plate current and produce a positive output pulse. The input is fed through an attenuator, resistors 90 and 91, the voltage across 91 applied to the grid. Capacitor 14 maintains the action of this voltage divider at high frequency. There is no final loss in signal strength since there is sufficient amplification in the remainder of the channel to make up for this loss. It is desirable that the output signals of the radar channel have the same strength as the output of the radar elevation receiver; otherwise, the picture on the oscilloscope would change height as the SELECTOR switch is changed from STANDBY to OPERATE position.

b. A clamping diode, tube 13A, is in parallel with the output circuit of the phase inverter. This tube, 13A, a triode, is effectively a diode, since the plate and grid are tied together. It operates in the same manner as the clamper 12B. The path of the radar signal from this point is traced in the discussion of the test channel.

60. IFF Switching Channel

Tubes 12A, 10, and 8B form the IFF switching channel. The output from the IFF receiver is fed to this channel and, in OPERATE position, is fed from this channel directly to the radar range oscilloscope.

a. Tube 12A is a diode acting as a clamping tube.

b. Tube 10 is the IFF amplifier which is operative for one cycle of 244 microseconds, and then inoperative for 3,416 microseconds.

c. The output during the 244 microseconds that tube 10 conducts is passed through a cathode follower, tube 8B.

61. IFF Input

The output of the IFF receiver is taken off the cathode resistor of the cathode follower in the receiver, goes to pin *B* of plug 105 on the interconnector which is bypassed by spark-plate 12–3. The input is coupled through capacitor 10–8 and resistor 65–1 to the control grid of tube 10, the IFF blanking amplifier. A clamping diode, tube 12A, whose action is similar to the clamper tube, 12B, is in parallel with the grid input. In the RC–148 and RC–148–B the input from the receiver is also fed directly to pin *7* of section *C* of the TEST switch (113) and is applied to the upper deflection plates of the range oscilloscope through section *B* of the SELECTOR switch (112) when the TEST switch is in position 7 and the SELECTOR switch is in position 4 or 5.

62. IFF Blanking Amplifier

a. Tube 10 is a pentagrid, so connected that input signals are applied to it on grids 1 (pin 5) and 3 (pin 8). The IFF received signals are applied to grid 1, the control grid, while the positive pulse from the cathode of tube 8A is applied to grid 3, the suppressor. The tube is normally biased by resistor 66 so that no signals are passed through. For one trace out of each 15, the positive pulse from the cathode of the phase splitter 8A is applied to grid 3 making tube 10 conduct and amplifying the IFF receiver output. Thus, this tube operates one trace out of each 15 and is inoperative for the remaining 14 traces. This tube, working with the radar blanking amplifier tube 11, will amplify IFF signals for the one trace that the radar amplifier is cut off, but will be cut off for the remaining 14 traces while the radar amplifier is operating. The positive pulse from the cathode of 8A is coupled through capacitor 4–5 to grid 3 of tube 10. Resistor 78–1 connects the grid to ground, in the same way as the ordinary control grid resistor.

b. The output from this tube is the negative main pulse and replies from the IFF receiver (the positive pulses are inverted through the tube) placed on a negative pedestal. The negative pedestal is caused by the drop in plate voltage as the current flow through the tube increases when the positive pulse is applied to grid 3. A still higher negative potential is added by coupling the negative pulse from the plate of tube 8A to the plate output of tube 10 through resistor 82–1. Without this added negative potential, the radar and IFF baselines would be close together. To separate them further, the negative potential is inserted. By adding a constant negative voltage to the IFF output, the IFF baseline is depressed below the radar baseline.

63. Cathode Follower and Output

a. The output from the blanking amplifier is coupled through capacitor 10–10 to the cathode follower,

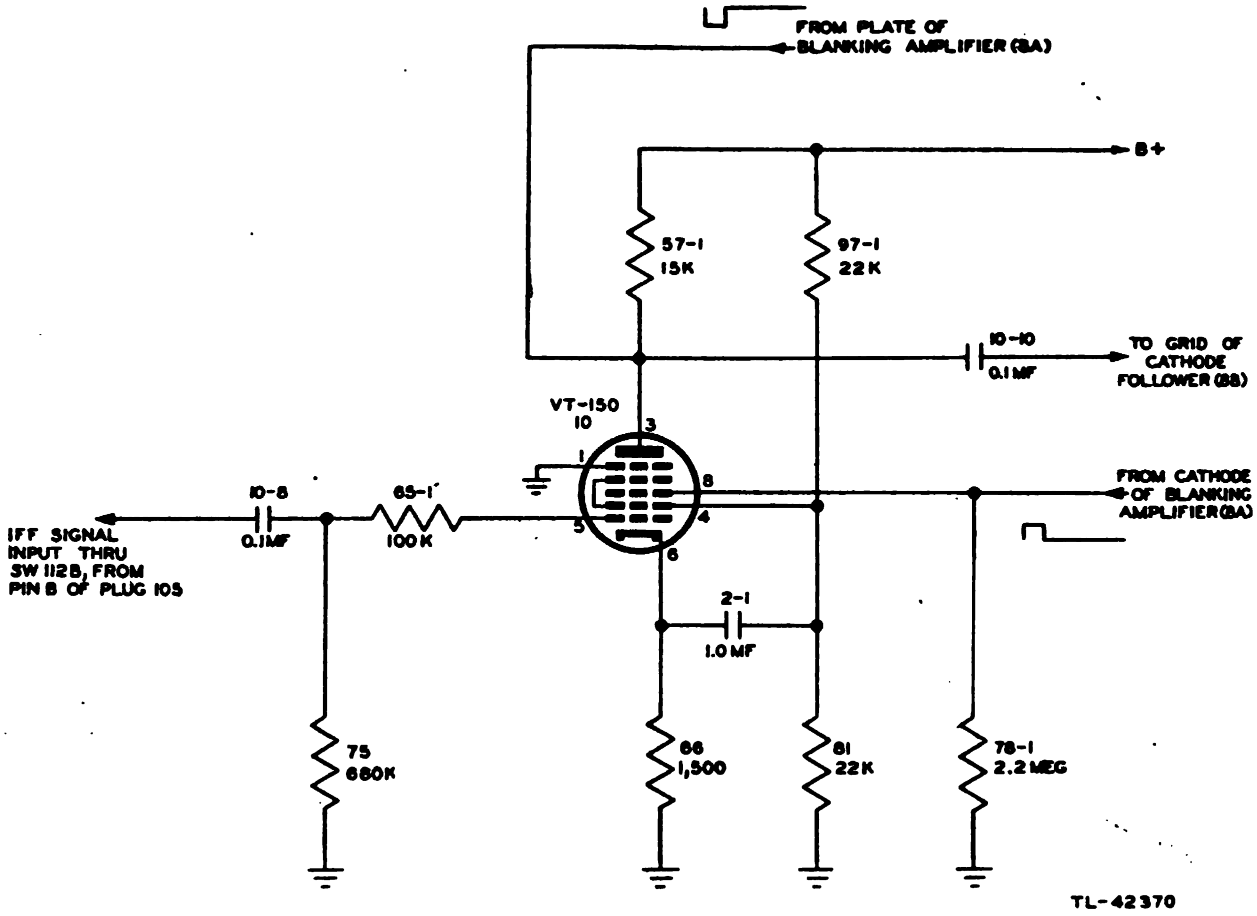


Figure 59. IFF blanking amplifier, partial schematic.

tube 8B. The output is taken across the cathode resistor 71–1 in parallel with 71–2. This tube has the advantage of an ordinary cathode in giving a low impedance output, but it is unlike most cathode followers in having the input applied between grid and cathode rather than grid and ground. This prevents the usual degenerative feedback in a cathode follower so that gain can be obtained from the stage. Thus, tube 8B has the advantage of an amplifier in providing gain, and the advantage of a cathode follower in giving a low impedance output with no phase inversion.

b. The output is coupled through capacitor 10–9 and goes to pins 1 and 3 of section *B* of the SELECTOR switch 112 and out the common pin 6 through spark-plate 12–1 to pin *E* of connector 105. The output is also tied directly to pin 1 of section *C* of the TEST switch 113 and then out the common pin 8 to pins 4 and 5 of section *B* of switch 112, and appears on the oscilloscope in TEST position 1. With the SELECTOR switch in the OPERATE position, the IFF output is fed from pin *E* to the upper vertical deflection plate of the range oscilloscope. When in the STANDBY position, the pins to which the output of the cathode follower are tied are allowed to float. However, the upper vertical deflection plate is grounded through switch 112B to prevent the accumulation of any charge on the deflection plate. With the SELECTOR switch in position 3, the output of the IFF channel will also be fed to the upper vertical deflection plate through pin *E* of connector 105. Thus the IFF signals do not go through the video channel in the oscilloscope (see schematic diagram of Oscilloscope BC–412) and it is unnecessary to invert the signals, as is done in the radar channel, to produce signals of proper polarity.

64. Brightness Correction Amplifier

a. Since the IFF trace is shown only 1/15 of the display time, the brightness of the trace must be increased during its time of display, so that the IFF and radar pictures will have the same degree of brightness. To increase the brightness of the IFF trace, a positive signal is applied to the control grid of the cathode-ray tube of the range oscilloscope. This positive signal is obtained from the output of the brightness correction amplifier, tube 9A.

b. The brightness correction amplifier tube 9A, is a conventional resistance-capacitance coupled amplifier. (See fig. 61.) Since the increase in brightness must be for the same period of time as the IFF signal is fed to the range oscilloscope, the negative

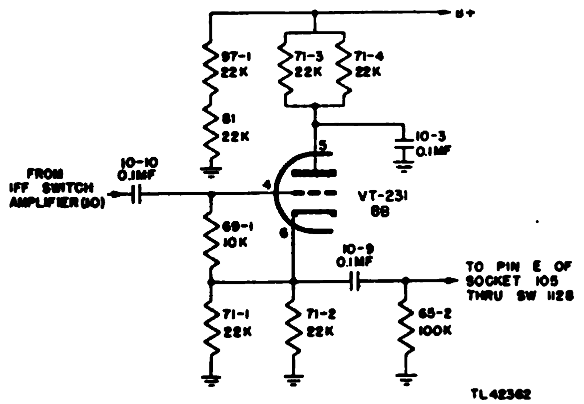


Figure 60. Cathode follower, 8B, partial schematic.

pulse from the plate of the blanking amplifier, tube 8A, that turns off the radar switch channel is used also as the input signal to the brightness correction amplifier. Since this amplifier circuit is conventional, the input pulse will be inverted producing a positive output pulse. The positive output pulse is coupled through capacitor 4–8 to pin *I* of connector 105. From the connector it is fed to the control grid of the cathode-ray tube of the range oscilloscope.

65. Wien Bridge Oscillator

Tubes 1 and 2A, in conjunction with their associated circuits, make up the Wien bridge test oscillator. (See fig. 62.) The purpose of this oscillator is to provide a means of obtaining sync voltage for the IFF equipment for test purposes or for operation of the equipment independent of the SCR–268. The oscillator, with the exception of the bridge circuit used to control the frequency and the amplitude of the output signal, is a conventional multivibrator circuit. The feedback circuit of tube 2A can be broken down into an equivalent Wien bridge circuit. (See fig. 63.) In the diagram, lamp 109 is represented as a resistance. The feedback signal is applied from the plate of tube 1 through capacitor 10–14. By selecting resistors and capacitors of the proper values it is possible to take off a voltage from points *A* and *B* that are in phase with that applied at point *C* and ground. This voltage taken from points *A* to *B* is of the proper phase to produce positive feedback to the grid of 2A to sustain oscillation. Oscillations within a very limited range of frequencies can be obtained from this type of feedback circuit as the frequency that will produce positive feedback will give the maximum amount of positive feedback only

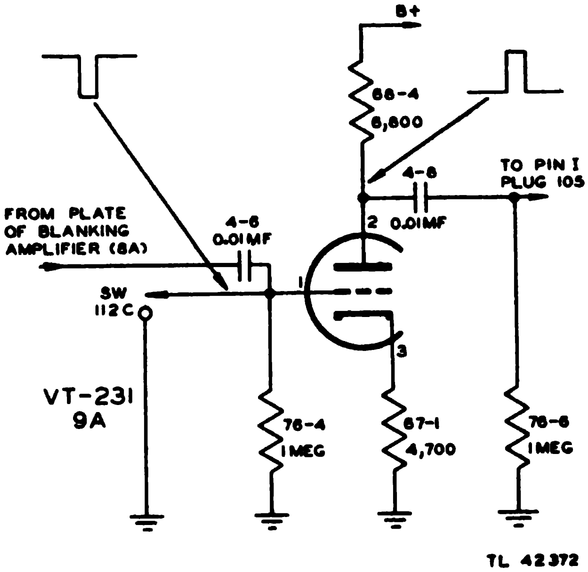


Figure 61. Brightness correction amplifier, 9A, partial schematic.

at that frequency. In this manner the frequency will be held within very close limits. In order to have a stable output the amount of voltage fed back must be held at a constant value. This is obtained by the use of a tungsten filament type lamp, 109. As the current through the lamp increases, the resistance of the filament of the lamp will increase and reduce the amount of positive feedback to the grid of tube 2A. As the current drops due to an insufficient amount of feedback voltage the resistance of the filament of 109 will decrease and cause an increase in feedback voltage. This will hold the amplitude of the output of the oscillator at a steady value. The output of the oscillator is a sine wave and is taken off the plate of tube 1 and applied to the grid of tube 2B through capacitor 4–12 and switch 112A when it is in position 5. In the other four positions it is made inoperative by grounding the grid of tube 1 through switch 112D.

66. Test Channel

The test channel includes tube 13B, four sections of the SELECTOR switch, and three sections of the TEST switch. The RC–148 and the RC–148–B TEST switch has seven test positions while the RC–148–C has five.

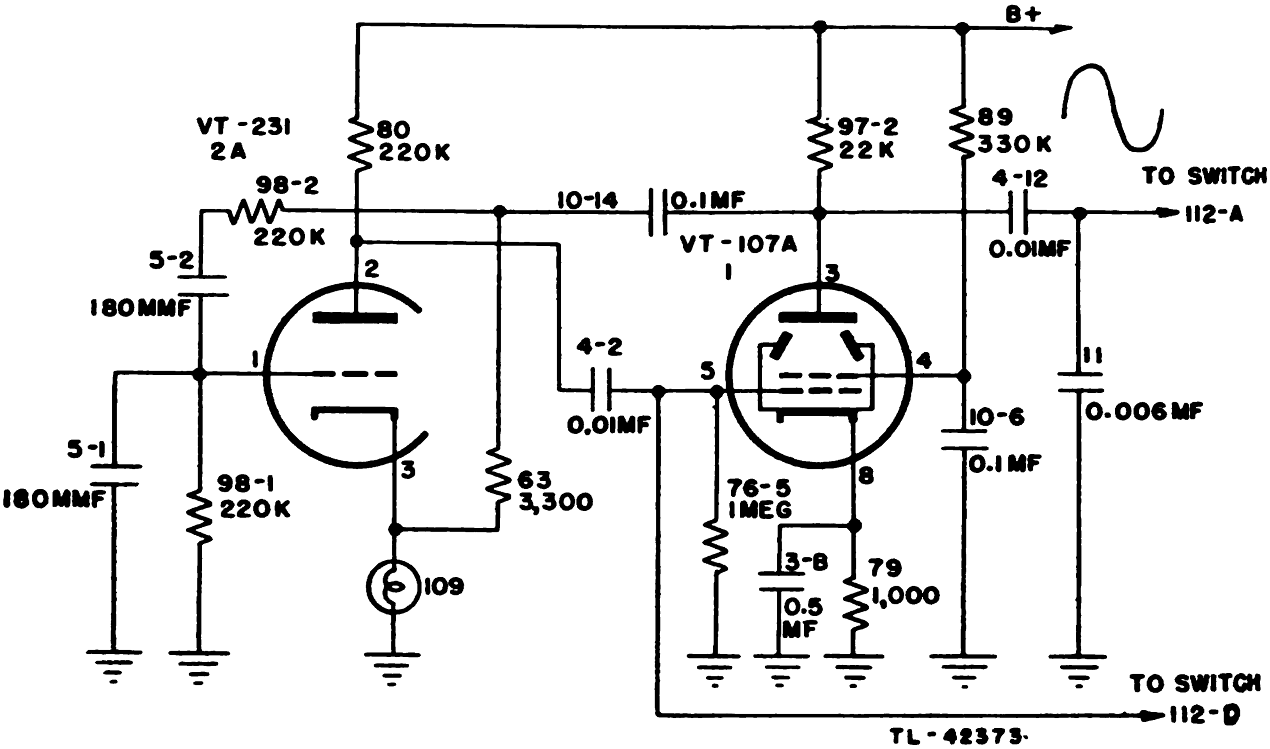


Figure 62. Wien bridge oscillator, partial schematic.

a. The cathode follower, tube 13B, is inserted in the circuit connecting the output of the interconnector control unit to the lower deflection plate amplifier of the range oscilloscope.

b. The SELECTOR switch 113, produces the desired operating condition of the RC–148 equipment.

c. The TEST switch is used to select signals from various parts of the interconnector, the transmitter monitor circuit, or the receiver output, so that these signals may be observed on the range oscilloscope to check the functioning of the RC–148.

67. Output Cathode Follower

Tube 13B is a conventional cathode follower. (See fig. 64.) Its input lead is connected to the common terminal of section 112C of the SELECTOR switch. In positions 1 (OPERATE) and 3 of the SELECTOR switch, the output of the radar switching channel is fed to tube 13B by means of this common terminal. In STANDBY position of the SELECTOR switch the input to the tube is grounded, and the elevation receiver output is connected through switch 112 to the lower vertical deflection plate amplifier rather than to the input of the radar switching channel. In position 4 or 5 of the SELECTOR switch, the test signals for positions 1, 2, 3, 6, are fed to tube 13B by means of the common pin. In position 4 or 5 of the SELECTOR switch, the input to tube 13B, by means of the common pin, is grounded for TEST positions 4, 5, and 7. The output taken off the cathode resistance 69–4 is tied to pins 1, 3, 4, and 5 of section 112D of the SELECTOR switch. In all positions of the SELECTOR switch except the STANDBY position the common pin of section 112D feeds the output through pin *A*

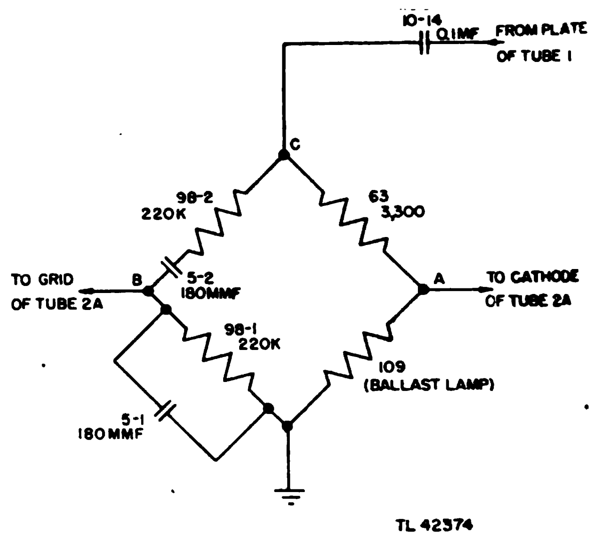


Figure 63. Wien bridge oscillator, equivalent circuit.

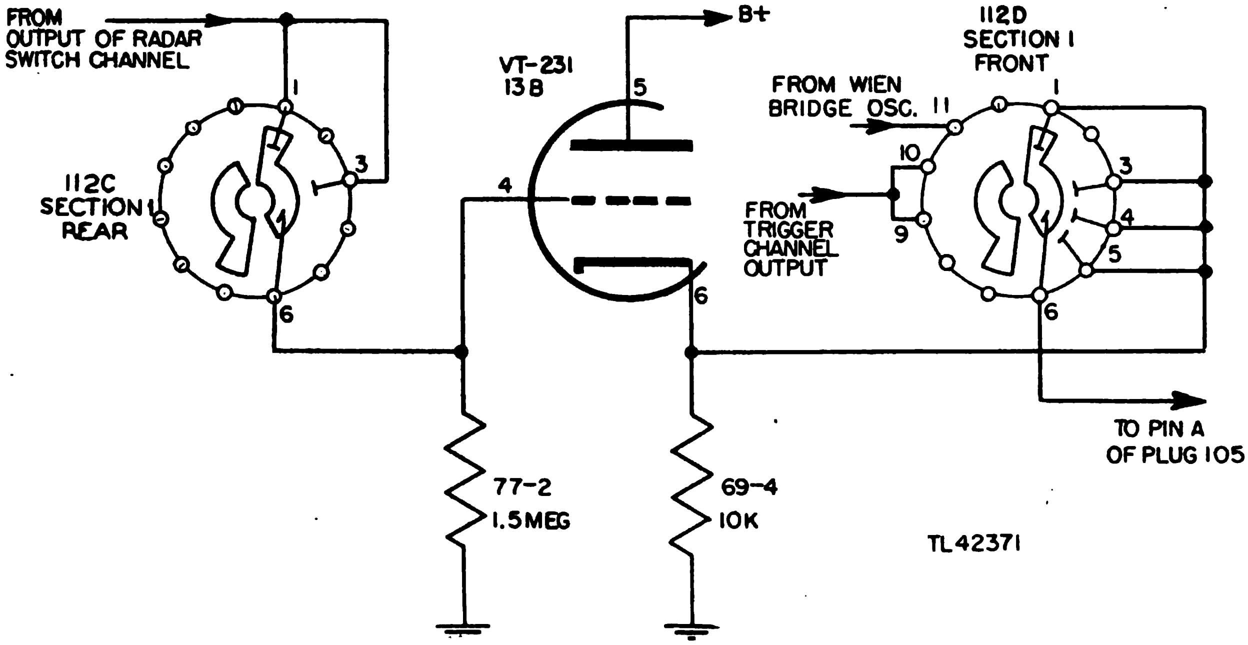


Figure 64. Cathode follower, 13B, and output circuit.

of connector 105 to the lower vertical deflection plate amplifier of the range oscilloscope.

68. Selector Switch

There are five operating conditions of the RC–148 which are chosen by the five positions of the SELECTOR switch 112.

a. Position 1 (OPERATE). This position of the switch is used to permit normal operation of the RC–148. In this position it is presumed that all necessary adjustments have been made and the RC–148 is operating normally in conjunction with the SCR–268.

b. Position 2 (STANDBY). This position of the switch stops operation of the RC–148, but permits operation of the SCR–268 in the usual manner. This position is used when identification is not necessary. It is to be noted that several signal circuits are grounded. Power, however, is fed to the various components; thus all the tubes are heated and have the proper plate voltage. It is only necessary to throw the switch back to the OPERATE position to have the RC–148 instantly in normal operation.

c. Position 3. This position stops the operation of the RC–148 transmitter by grounding the transmitter triggering pulse from the interconnector to the transmitter. This position will allow identification of spurious signals, jamming, or interfering identification signals due to a source other than the transmitter.

d. Position 4. This position is used with the TEST switch to permit observations of signals from various sections of the RC–148 selected by the TEST switch. The synchronizing signal used in this position is from the SCR–268.

e. Position 5. This position has the same function as position 4, but the source of the synchronizing signal is the Wien bridge oscillator in the RC–148 interconnector. This permits operation of RC–148 independently of SCR–268.

69. Test Switch

The TEST switch 113 is used only with the SELECTOR switch in position 4 or 5 when checking or adjusting the RC–148. On the test bench, position 5 must be used exclusively. The range oscilloscope with its normal sweep of 244 microseconds (40,000 yards) is used for a test scope.

a. Position 1. This position applies only to the output of the radar switch channel and the IFF switch channel to the deflection plates of the range oscilloscope. If the receivers in both the SCR–268 and the RC–148 are turned off, or the gain turned to minimum, the pattern on figure 100 will be obtained. The cross-over roughly represents the letter *X* and is due to the slope of the blanking pulses from the blanking amplifier. The BASELINE control may be adjusted while observing this pattern.

b. Position 2. This position selects a signal from the division channel which shows the number of steps in the step wave. To prevent discharge of capacitor 8, the signal is taken off the cathode of tube 6A. The pattern shown in figure 101 has one broken horizontal line for each step in the step wave.

c. Position 3. This position selects a signal from the sync pulse output stage, thus showing the pulse being fed to the transmitter. The signal is taken from the cathode of tube 14, the output cathode follower of the transmitter sync channel, and fed through switches 113A, 112C, and the output cathode follower 13B, to the lower vertical deflection plate of the range oscilloscope. The pattern, figure 102, may be used to check the output of the transmitter trigger channel.

d. Position 4. This position is used to select a calibrating voltage from the 60 cycle a-c power of the power supply in the interconnector. The pattern produced is shown in figure 103 and is used as a comparison with the transmitter power pattern to show proper output of the RC–148 transmitter.

e. Position 5A. This position is obtained with the TEST switch in position 5 and the POWER SIGNAL WIDTH switch in the POWER position. The signal is selected from the transmitter monitor circuit and fed to pin *M* of connector 105 on the interconnector. The signal is taken off resistor 82–3, a part of the voltage divider made up by resistor 82–3 and r-f choke 120–2. The signal is fed to the upper deflection plate by way of switch 113C. The pattern obtained is shown in figure 104.

f. Position 5B. This position is obtained with the TEST switch in position 5, and the POWER SIGNAL WIDTH switch in the SIGNAL WIDTH position. In this position a signal is selected from the transmitter. (See fig. 105.) This position is used to observe the pulse width of the transmitted pulse in order to see if it is within the necessary width limit.

g. Position 6. This position selects a signal from the input to the division channel, whether this signal is from the SCR–268 or the Wien bridge oscillator. The signal is taken across resistor 92 of the input network to tube 2B and fed to the lower vertical plate by means of switch 113A. The pattern normally seen (fig. 106) is an overdriven sine wave. This position of the switch may be used in trouble shooting to determine the input to the interconnector division channel.

h. Position 7. This position selects the output of the IFF receiver and applies it directly to the range oscilloscope, so that the receiver output may be observed independently of the interconnector. The pattern seen is that of the receiver output. (See fig. 107.)

70. Power Supply (fig. 65)

a. The power supply is of standard design. It uses a VT–197A double diode as a full-wave rectifier. The pulsating d-c output is filtered by a two section π type filter, with capacitor input. The power supply furnishes, at the filter output, a steady d-c voltage in the neighborhood of 300 volts. This supplies the plates of the tubes both in the interconnector and in the wavemeter (through plug 106).

b. The power transformer receives its a-c supply from the transmitter through pins *F* and *H* of connector 105. It is equipped with 4 secondaries: a high-voltage secondary, a rectifier filament secondary, taps H_1 and H_2 which supply 6.3 volts to the VT–90 filaments, and tap *H* and ground which supply 6.3 volts to all other filaments in the interconnector and wavemeter. Switch 114 is located in the primary circuit and turns the interconnector on and off. Fuse 135 is also in the primary circuit and provides protection against current overloads. Light 108 is connected between *H* and ground, and filament voltage for the wavemeter is sent from *H* to plug 106. A 60-cycle voltage is taken from the primary and applied to pin 4 of section 113C of the SELECTOR switch. This voltage is sent through a voltage divider composed of resistors 74 and 73 and the voltage across 73 is applied to the switch.

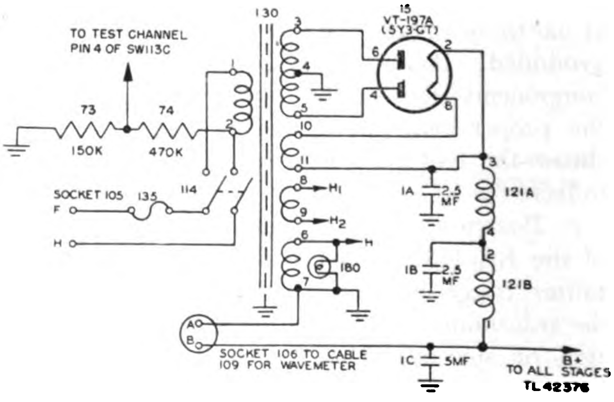


Figure 65. Power supply, partial schematic.

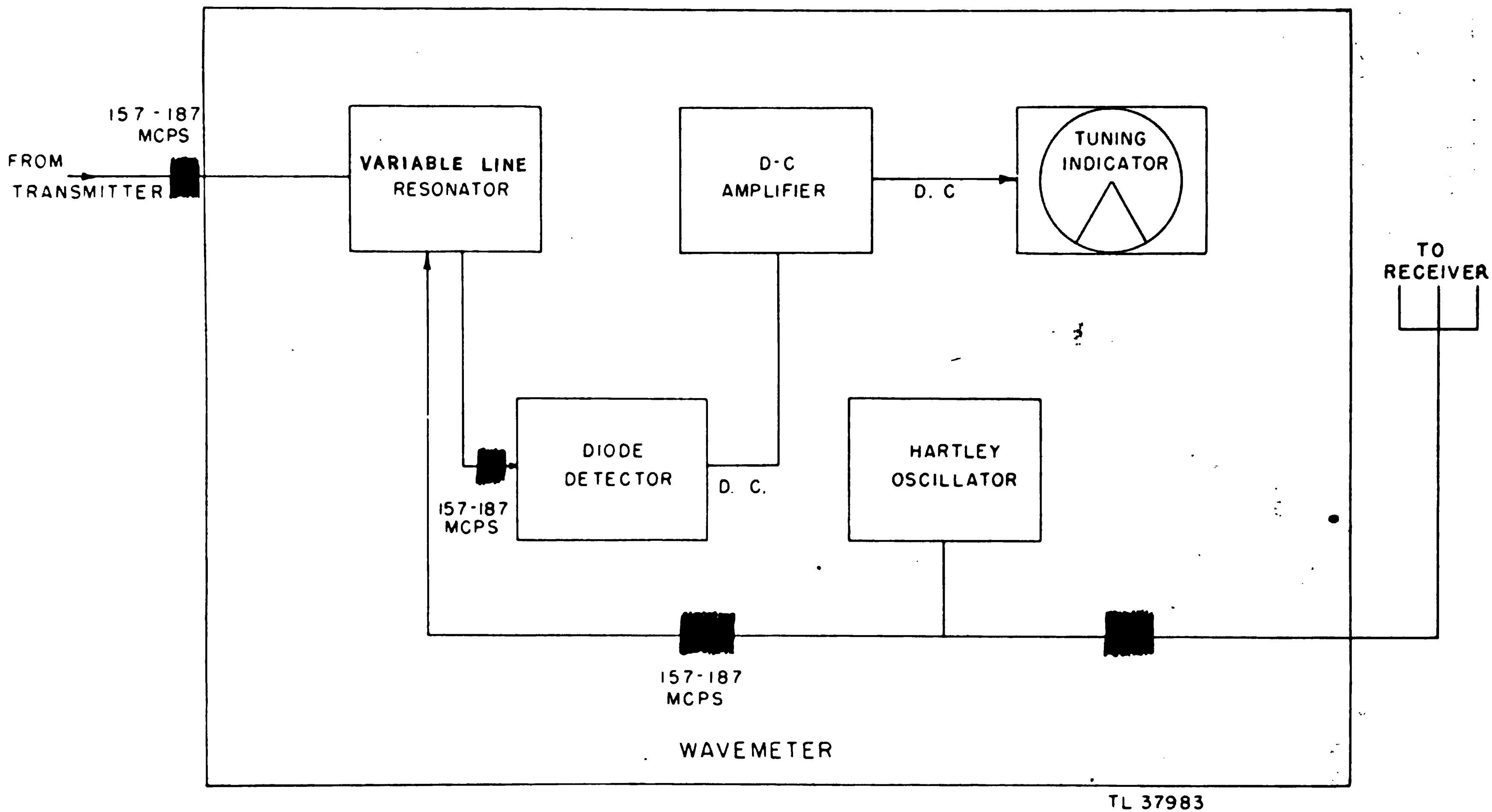


Figure 66. Wavemeter, block diagram.

Section VI. WAVEMETER OF RC-148 AND RC-148-B

71. Purpose

Because it is essential that the transmitter and receiver operate on the same frequency, a device for measuring the frequency of the transmitter and tuning the receiver to that frequency is provided. This device is the wavemeter. When used with the transmitter, the wavemeter measures the frequency of the r-f output. When used with the receiver, the wavemeter radiates an r-f signal at the same frequency as the transmitter and the r-f sections of the receiver are then tuned to this frequency.

72. General Description

The wavemeter consists of five stages: the variable line resonator, diode detector, d-c amplifier, tuning indicator, and auxiliary oscillator. (See fig. 66.) A detailed analysis of the circuits in the wavemeter is contained in paragraphs 73 through 77.

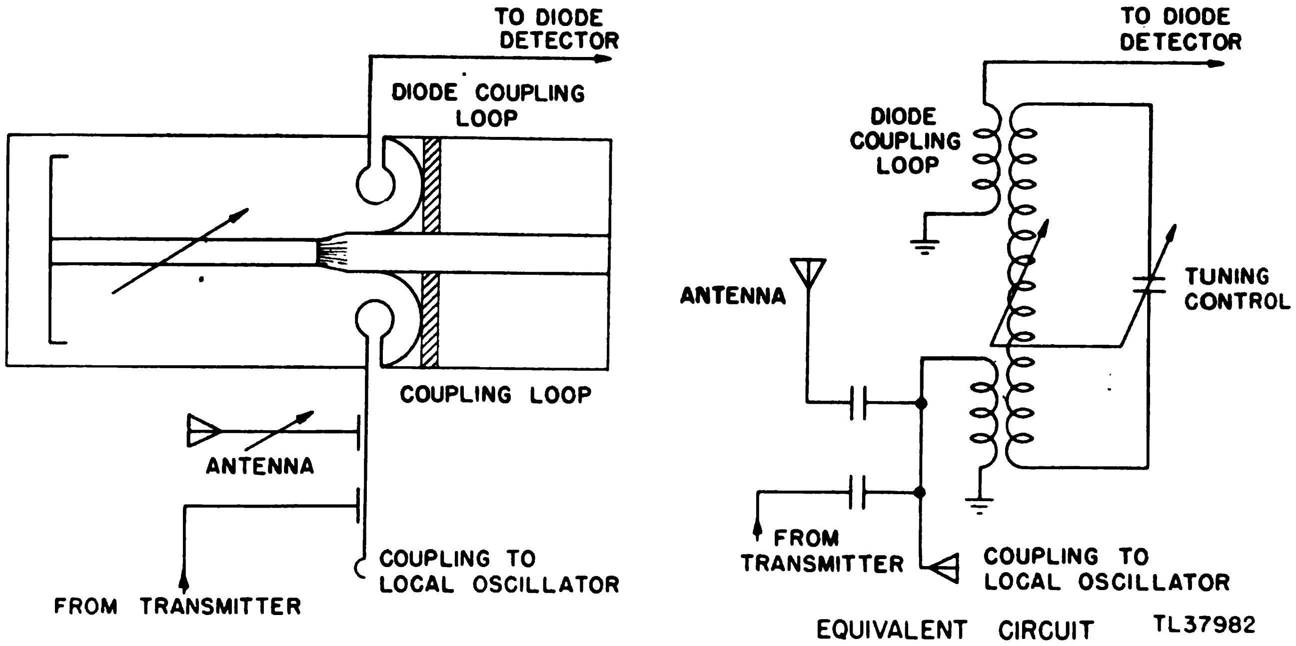


Figure 67. Variable line resonator, partial schematic and equivalent circuit.

73. Variable Line Resonator

a. General. The variable line resonator, when tuned to the transmitter auxiliary-oscillator frequency, will permit maximum transfer of energy to the next stage.

b. Operation. The variable line resonator is essentially a parallel tuned circuit (fig. 67); that is, it is a coaxial line whose distributed capacitance (between conductors) and distributed inductance (along the length of each conductor) are of such quantity as to enable the resonator to be tuned to the frequency range of the transmitter. In a parallel tuned circuit, the resonant frequency is inversely proportional to the square root of the product of the inductance and capacitance in the circuit. Since these values are very small in the resonator, its resonant frequency will be high enough to be in the range of the transmitter frequency. It also follows that if these values of inductance and capacitance are reduced, the resonant frequency will rise. Thus, if a shorting end plate is gradually moved from one end of the resonator to the other, the dimensions of the line and, therefore, its capacitance and inductance will be reduced. This will result in a change in the resonant frequency of the resonator. The physical, and consequently, the electrical dimensions of the variable line resonator are controlled by a knob marked "TUNING" which is on the front of the wavemeter. This knob is geared to a calibrated dial so that the resonant frequency may be determined by using chart No. 3 mounted in the hinged panel on top of the wavemeter. When the resonator is in resonance with the transmitted frequency, which is coupled to it from the transmitter by means of a coupling link, it will absorb maximum power from the transmitted source and high radio-frequency currents will be set up in the resonator. These currents will induce voltages of the same frequency into the small diode coupling pick-up loop which is located inside the cavity. These r-f voltages are, in turn, carried by a short lead to the plate of the diode detector.

74. Detector (fig. 68)
Since the variable line resonator (tuned circuit) is in parallel with the diode, it will place a high voltage across the diode at resonance, due to its high impedance to the resonant frequency. This r-f voltage is rectified by the diode, a 9006 tube. The rectified current produces a voltage drop across the diode load resistor 57, a 1-megohm resistance. Due to the sharp resonance of the cavity resonator, any variation in the tuning will cause a decrease in voltage across this resistor. Capacitors 2–1 and 3–1 are high-frequency bypass capacitors to bypass the r-f to ground so that it will not cause any voltage drop across resistor 57. Capacitors 3–2, 5, and 2–2, in conjunction with resistance 58, form a filter network, which smoothes the detected r-f envelope and applies a fairly constant dc to the grid of the 6SF5, the d-c amplifier.

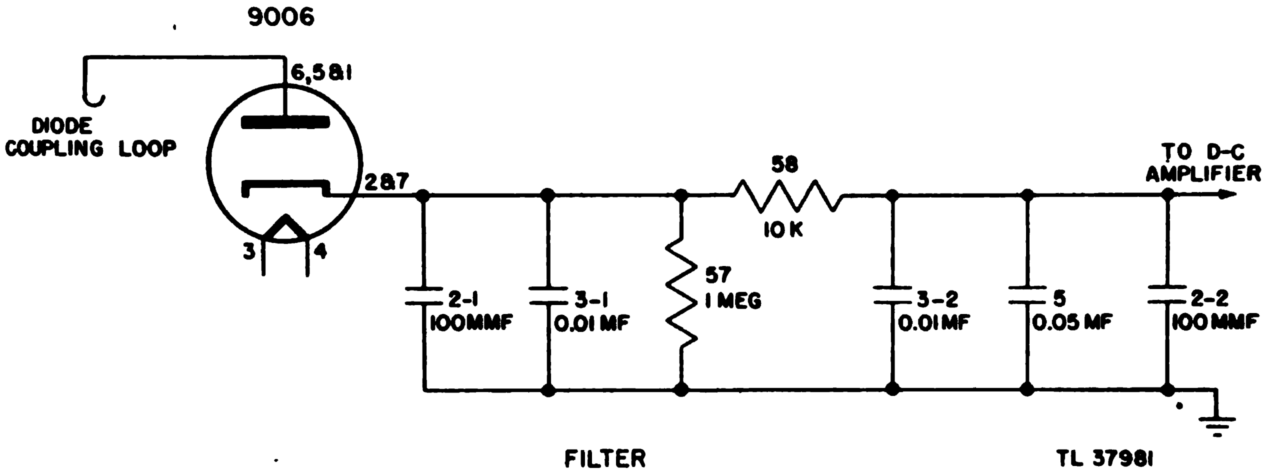


Figure 68. Diode detector and filter, partial schematic.

75. D-c Amplifier
The 6SF5 is a triode used as a d-c amplifier. (See fig. 69.) This circuit is similar to a conventional audio amplifier except that there is no coupling capacitor in series with the output. The filtered, rectified, positive voltage from the diode is fed directly to the grid of the 6SF5. The greater the positive voltage on the grid, the greater will be the current flow through the tube. Consequently the plate voltage will be decreased. As the plate of the d-c amplifier is tied directly to the grid of the next stage, the potential on this grid will vary with the plate voltage of the d-c amplifier.

76. Tuning Indicator
a. General. It has been pointed out that the plate voltage of the d-c amplifier is tied directly to the grid of the tuning indicator tube (6U5/6G5). This tube, however, is kept from drawing excessive current because the cathode is kept at a high positive potential. When the cavity resonator is at resonance a high current flows through the d-c amplifier. This causes a large drop across resistor 60 (the d-c amplifier load resistor), thus making the voltage on the plate less positive. This, in turn, makes the voltage on the grid of the tuning indicator less positive and tends to cut down the flow of current through the tuning indicator tube. (See fig. 70.)

b. Operation. The tuning indicator tube is essentially a triode. However, at the top of the tube, the plate and grid are cut away and a round fluorescent target is placed around the cathode. When the cathode is emitting and the target is at a positive potential, it will draw electrons from the cathode and the target will glow with a green light. Between the cathode and the target is a small electrode which is

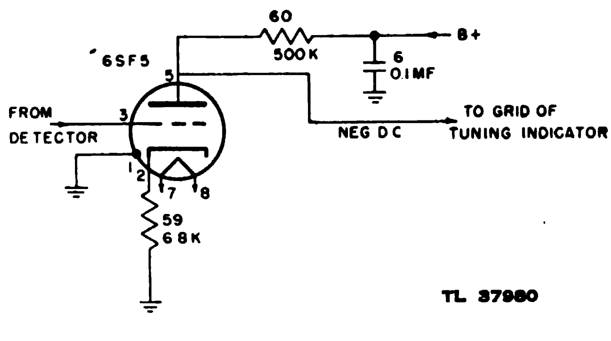


Figure 69. D-c amplifier, partial schematic.

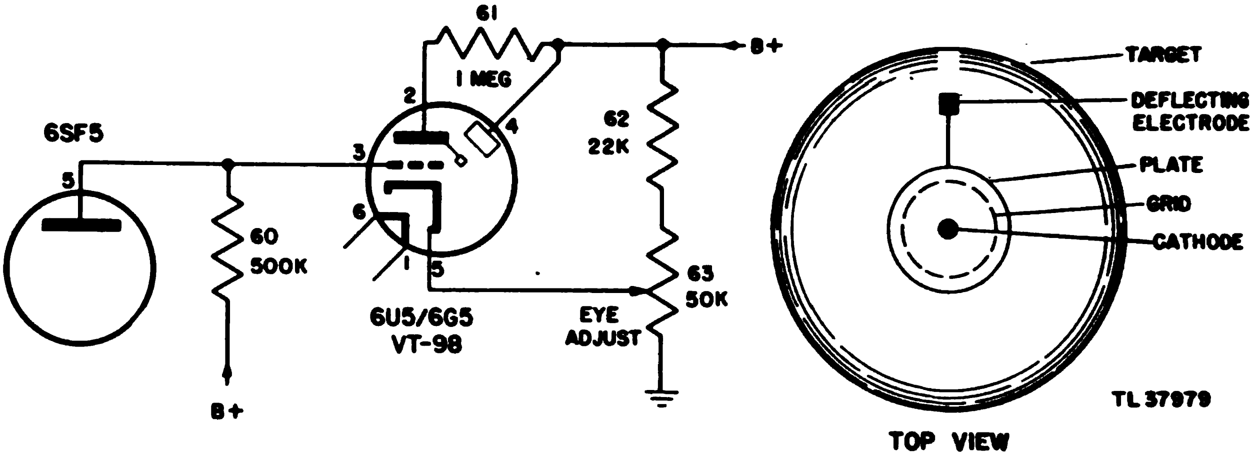


Figure 70. Tuning indicator, partial schematic.

connected to the plate and held at plate potential. The target is at B+ potential and the plate and its small electrode are connected to B+ through a 1-megohm resistor 61 in the tuning indicator socket. When a negative voltage applied to the grid of the indicator keeps plate current from flowing, no drop across resistor 61 occurs. The target, plate, and small electrode are at the same potential, and the small electrode offers no interference to the flow of electrons to the target. The target remains completely green. When a positive voltage (with respect to the cathode) is applied to the grid of the tuning indicator, a large current flow through the tube results. This brings about a large voltage drop across resistor 61 and makes the plate and the small electrode much more negative than the target. Thus, it tends to repel electrons flowing from the cathode to the target and this repelling action causes the area directly behind the small electrode to get no electrons and not fluoresce. A shadow on the tuning eye screen is the result. Thus, the more negative the voltage applied to the grid of the indicator, the smaller the shadow becomes.

c. EYE ADJ KNOB. By means of the EYE ADJ knob, potentiometer 63, it is possible to vary the potential on the cathode and thus control the current flow through the tube. To use it, first adjust the potentiometer until a shadow angle of about 30° is obtained. Then tune the resonator in either direction until shadow narrows. If shadow overlaps, readjust potentiometer for a 30° shadow and re-tune for mini-

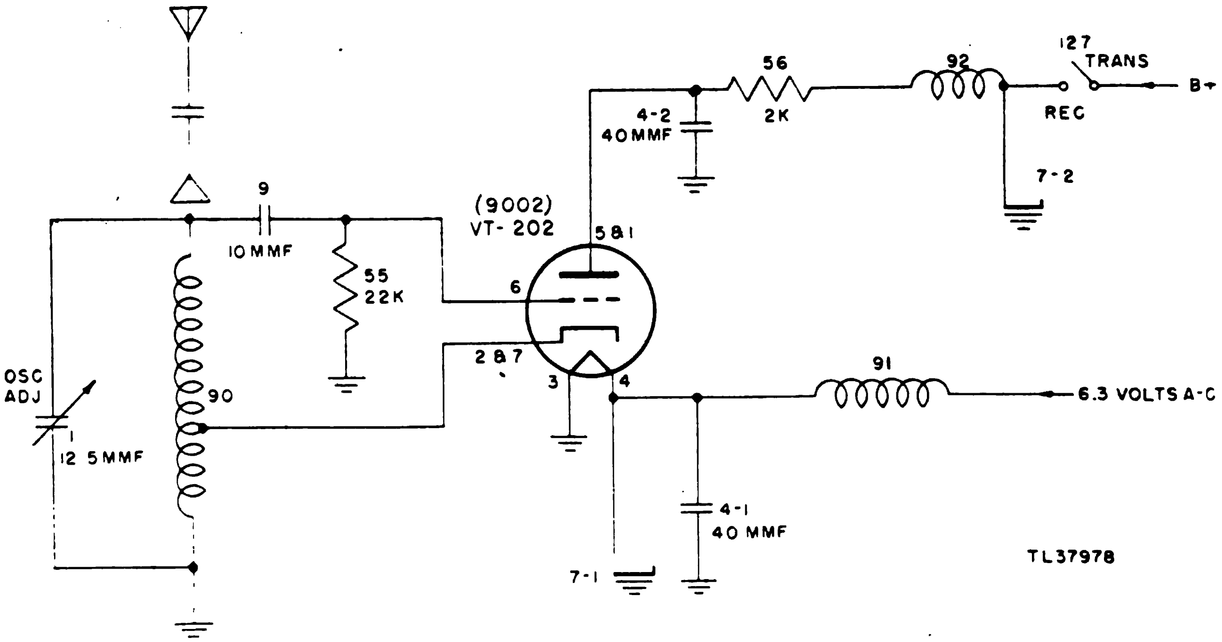


Figure 71. Auxiliary oscillator, partial schematic.

mum shadow. Continue this process until light on screen does not overlap at minimum shadow point. When this point has been reached, it is possible to find maximum tuning very accurately, since the eye is most sensitive when it is fluctuating between a closed condition and a 30°-shadow angle.

77. Auxiliary Oscillator

a. General. To tune the receiver to the transmitter frequency, the use of the other stage in the wavemeter, the auxiliary oscillator, is needed. (See fig. 71.) This is switched into the circuit by throwing switch 127 to REC position, which puts the proper voltage on the plate of the VT–202 (9002) and causes it to oscillate.

b. Operation. This stage is a triode tube in a Hartley oscillator circuit, whose frequency of oscillation is variable throughout the frequency range of the transmitter by the adjustment of a small r-f tuning capacitor in its tank circuit (OSC ADJ control). This particular Hartley circuit is an r-f grounded-plate oscillator. That is, the plate is effectively grounded so far as r-f is concerned, due to the very small reactance of the capacitor 4–2 at the oscillator frequencies. This places the plate at one end of the tank circuit, the cathode at one tap on the coil, and the grid at the other end of the tank; the circuit thus assumes a conventional Hartley form. Resistor 55 and capacitor 9 furnish grid bias. Inductance 92 and capacitor 4–1 keep the r-f oscillations out of the power supply. The tuning capacitor is adjusted until the frequency of the auxiliary oscillator is equal to the resonant frequency of the variable line resonator and the tuning indicator eye has closed. In this manner the auxiliary oscillator can be tuned to exactly the same frequency as the transmitter. The auxiliary oscillator is coupled to the variable line resonator by the wavemeter coupling link. Once the auxiliary oscillator is tuned to the desired frequency, the cavity resonator should be detuned several turns so that it will not absorb too much energy from the output of the oscillator and interfere with its operation with the receiver. An antenna in a shielded sheath is also coupled to the input of the variable line resonator. This antenna will radiate when it is withdrawn from its shielding thus furnishing the radiations at the frequency desired to tune the receiver.

78. Power Supply

Both the plate voltage and 6.3 volts a-c for the filaments and pilot light are furnished by the interconnector power supply through cable 109. It is controlled by ON-OFF switch 128 which is a double throw toggle switch.

Section VII. SIGNAL GENERATOR OF RC–148 AND RC–148–B

79. Purpose

Signal Generator I–198–A is designed to operate throughout the i-f band of Receiver BC–1068–A. It is furnished to provide an i-f signal, modulated or unmodulated for checking the i-f and video sections of the receiver. The frequency of oscillation is determined by use of a calibrated dial and a calibration chart supplied on the inside of the front cover of the signal generator. (See fig. 72.)

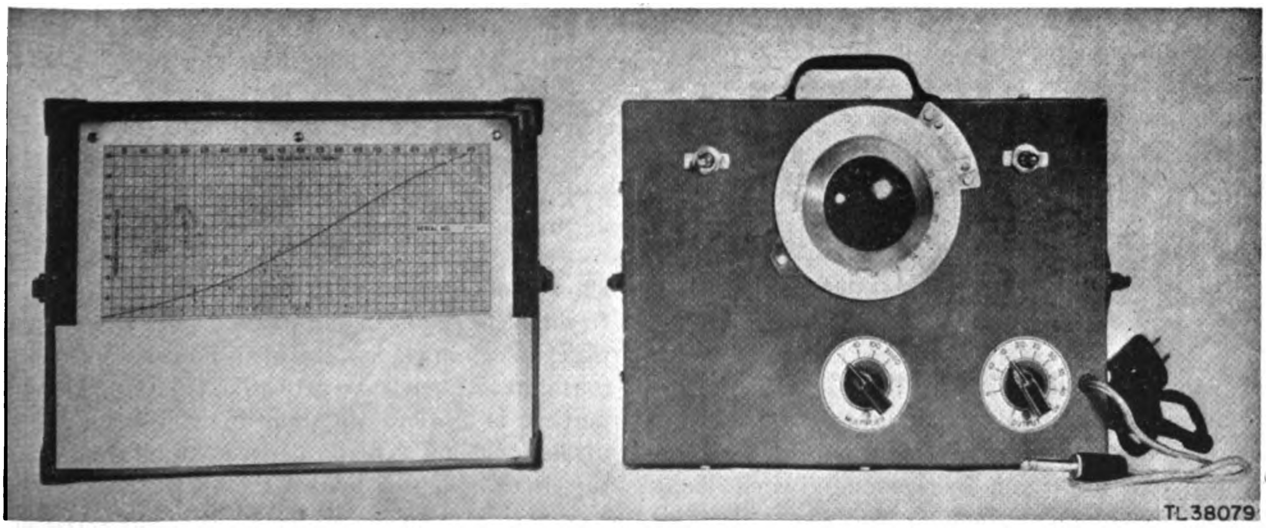


Figure 72. Signal Generator I–198–A and cover.

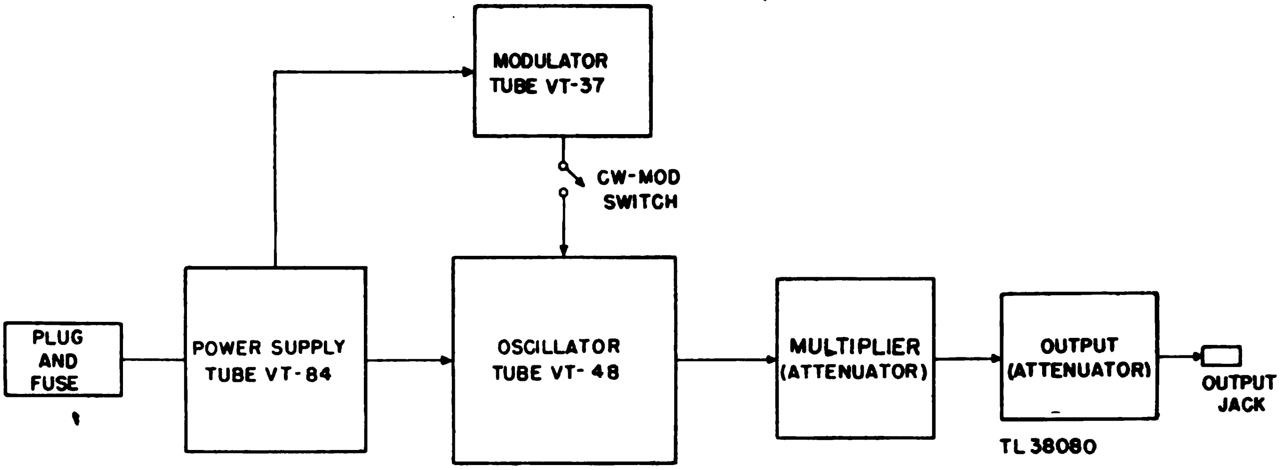


Figure 73. Signal generator, block diagram.

80. General Description

This paragraph contains a general description of the stages of the signal generator. Paragraphs 81 to 84 contain a detailed description of the signal generator circuits.

a. MODULATOR. Triode VT–37 is connected as a tuned plate oscillator to oscillate at 400 cps and provide a modulation voltage for use in checking audio and video systems. (See fig. 73.)

b. R-F OSCILLATOR. A modified Hartley oscillator, using Tube VT–48, supplies r-f oscillations. This tube also acts as a mixer tube, mixing the r-f oscillations with the audio output of Tube VT–37.

c. ATTENUATOR. The output of the signal generator is taken across one of a series of resistors in the plate circuit of the oscillator. By varying the value of these resistors, the magnitude of the output voltage may be controlled.

d. POWER SUPPLY. A double diode Tube VT–84 in a full-wave rectifier circuit supplies d-c voltage to the plates of the other stages and a-c voltage to their filaments.

e. FUSED PLUG. No provision for current overloads is made within the unit. Consequently, it is necessary to have fuses in series with both input leads from the 110-120 volt a-c source. These are placed in the male plug which connects to the a-c source.

81. Modulator Stage

If an audio-modulated output is desired from the signal generator, the modulator Tube VT–37 is thrown into the circuit by snapping switch 4033, which removes the grounding connection to the grid of this tube. (See fig. 74.) This stage is essentially a tuned-plate tickler type of oscillator in which the resonant frequency of the plate tank circuit is induced into the grid circuit and sustains oscillations. Cathode bias is supplied by resistor 3013. Resistor 3052 is a loading resistor. The values in the tuned circuit in the plate are such as to make the oscillator resonate at 400 cycles.

82. R-f Oscillator

This stage is a Hartley oscillator, designed to oscillate between 7 and 15 megacycles. The control grid of the tube is connected to the top of a tank circuit (coil A–2103 and capacitors 8024 and A–2046), the cathode is tapped off part of the tank coil, and the plate is essentially grounded through capacitor 8036 and the low resistance of the attenuator network. (See fig. 74.) When the modulator tube is operating, grid 2 is varying with the varying plate potential of the modulator tube. This variation affects the flow of plate current at an audio rate, and thus modulates the oscillator. When the modulator is inoperative, grid 2 is connected to the plate supply and acts as a screen grid. Capacitor 8018 (from B+ to ground) acts as a screen bypass capacitor, keeping the screen potential from fluctuating due to the r-f signals passing through it.

83. Attenuator and Output

In the plate circuit of the r-f oscillator, between the plate and ground, is a network of resistors which constitute an attenuation network. (See fig. 74.) Its purpose is to allow variation in the voltage output of the oscillator so that a desired output voltage can be selected. A variation of the switch changes the resistance in the plate circuit slightly, but varies the distribution of current through the parallel branches

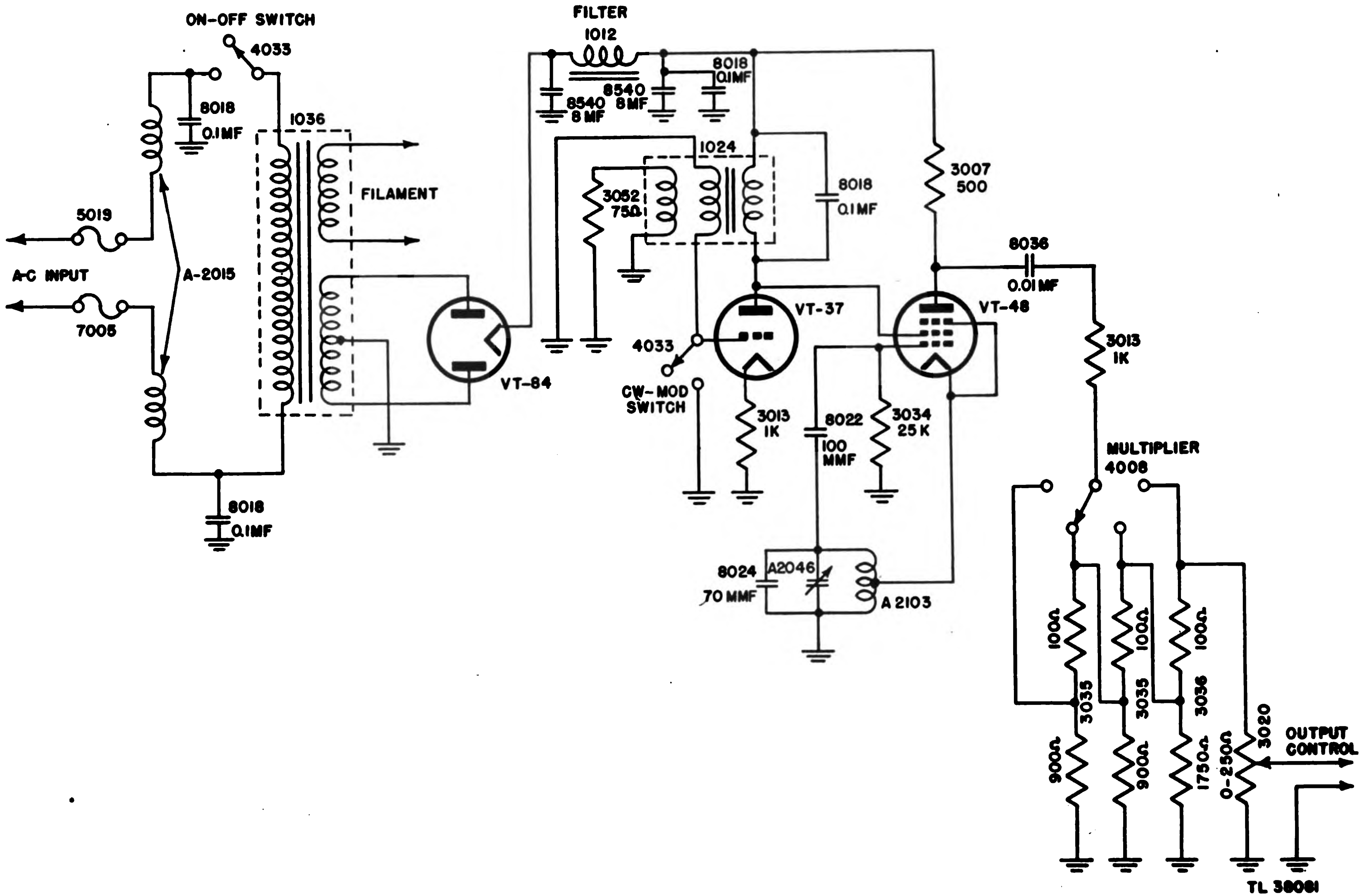


Figure 74. Signal generator, complete schematic.

of the network. In the 2000 position, most current flows through potentiometer 3020 and thus causes the largest voltage drop across it and the maximum output. Multiple switch 4008 switches three banks of resistors in or out of the circuit. Resistor 3020 is a potentiometer. By varying it, the output voltage can be varied by small amounts. This is called the "Output" control, whereas the switch which snaps the resistors in and out is called the "Multiplier." The output is carried by a two-wire conductor to a plug. The outer conductor is a braided metal conductor which is grounded.

84. Power Supply

The power supply consists of a power transformer, full-wave rectifier, and filter. The circuit is a conventional full-wave rectifier circuit with a one-section capacitor input π-type filter at its output to smooth the d-c voltage. Switch 4033 (ON-OFF) is in series with the transformer primary and turns the power to the unit on and off. Capacitors 8018 and chokes A–2015 form a filter to keep the input voltage free from r-f pick-up.

Section VIII. TRANSMITTER SECTION OF RC–148–C

85. Purpose

The transmitter is a section of the receiver-transmitter component of Radio Equipment RC–148–C. Operationally, the receiver and transmitter may be treated as though each were in a separate chassis. The transmitter is discussed in this section, and the receiver in section X. 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

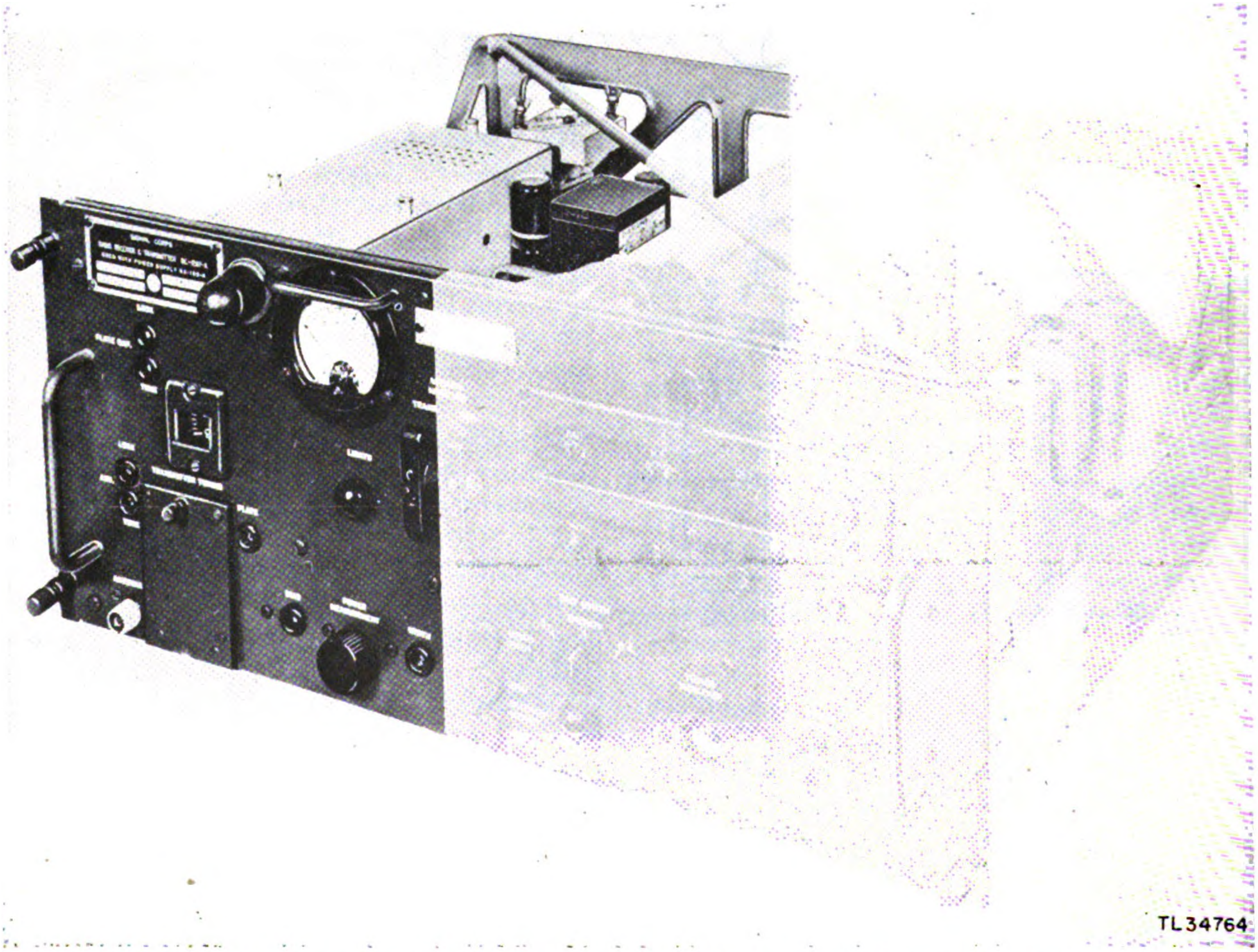


Figure 75. Radio Receiver and Transmitter BC–1267–A, front oblique transmitter section.

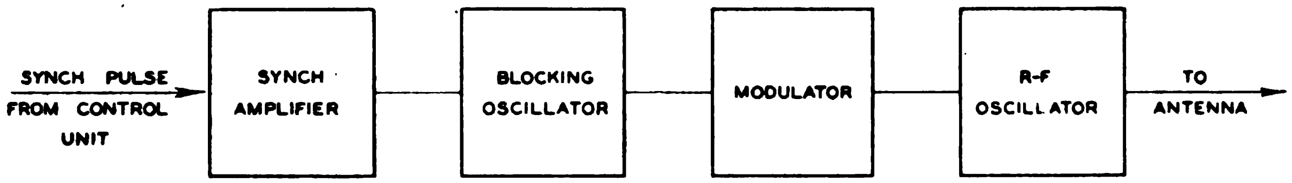


Figure 76. Transmitter, block diagram. TL 35062

by the interconnector. The input circuits of the transmitter process the synchronizing pulse to produce a final output pulse of the proper width and amplitude.

86. General Description

This paragraph contains a general description of the main stages of the transmitter. Paragraphs 87 through 91 contain a detailed description of the circuits in the transmitter section. The general description of the circuits follows. (See fig. 76.)

a. SYNCH 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 4 to 10 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 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 synch pulse is present at the grids of the modulator.

87. Synch Amplifier

a. The transmitter trigger pulse is obtained from the interconnector. 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. 77.) Jack 150–1 is shunted across the input to provide a means for observing the synchronizing trigger pulse. The coaxial line carrying this pulse from the interconnector 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.

b. 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.

c. The output from the pulse amplifier is fed to the grid of a conventional cathode follower (tube 18) (fig. 78), 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).

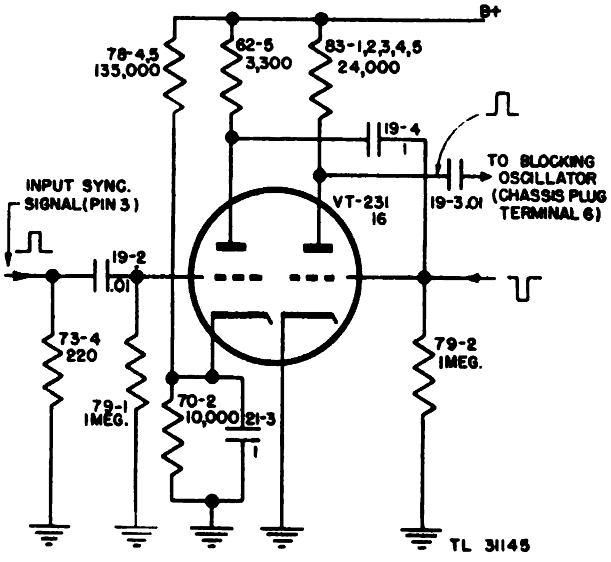


Figure 77. Transmitter, synch-amplifier, partial schematic.

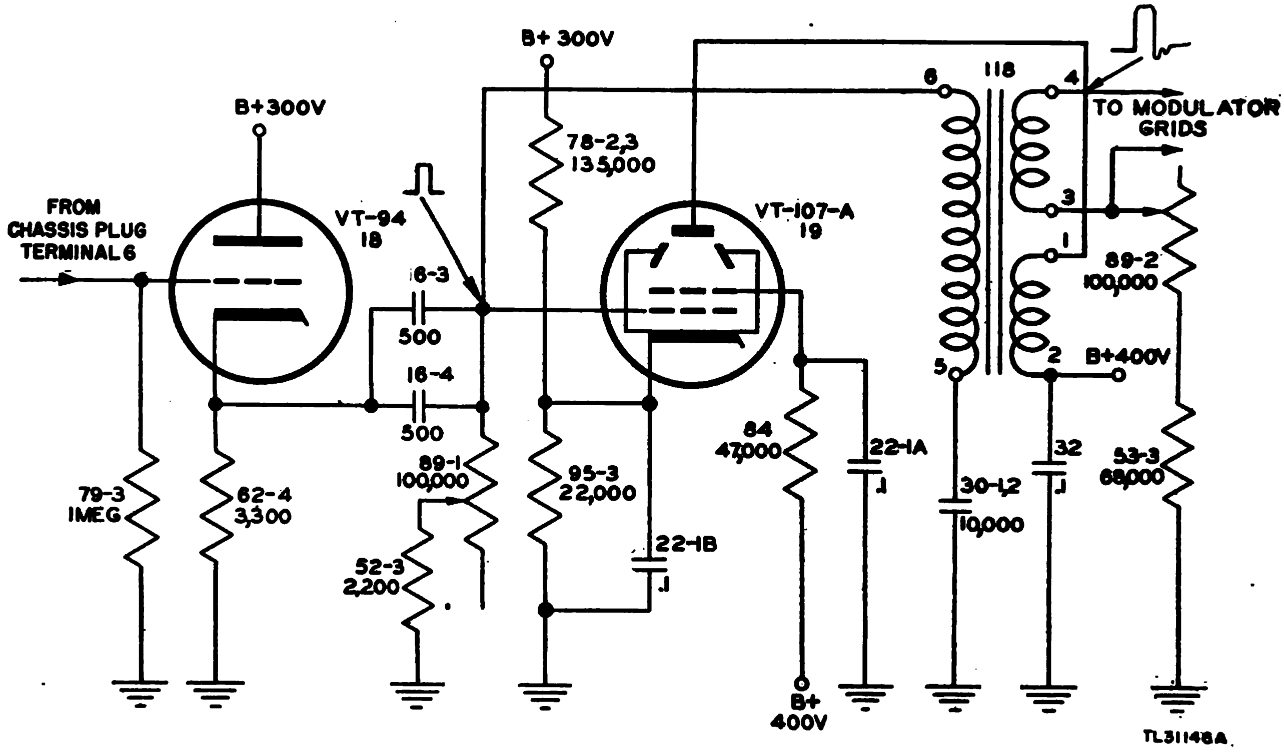


Figure 78. Transmitter, blocking oscillator, partial schematic.

88. Blocking Oscillator

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 resistor 95–3, 78–2, and 78–3, connected between the 300-volt supply and ground (fig. 78). This bias is approximately 40 volts and is sufficient to cut off the tube when a trigger pulse is not present on the grid. For a detailed discussion of the operation of a blocking oscillator see paragraph 12. 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 is possible to vary the width of the pulse over a range of approximately 4 to 10 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 4 and 10 microseconds.

89. Modulator

The modulator stage utilizes a 3E29 tube, 17. (See fig. 79.) 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 pro-

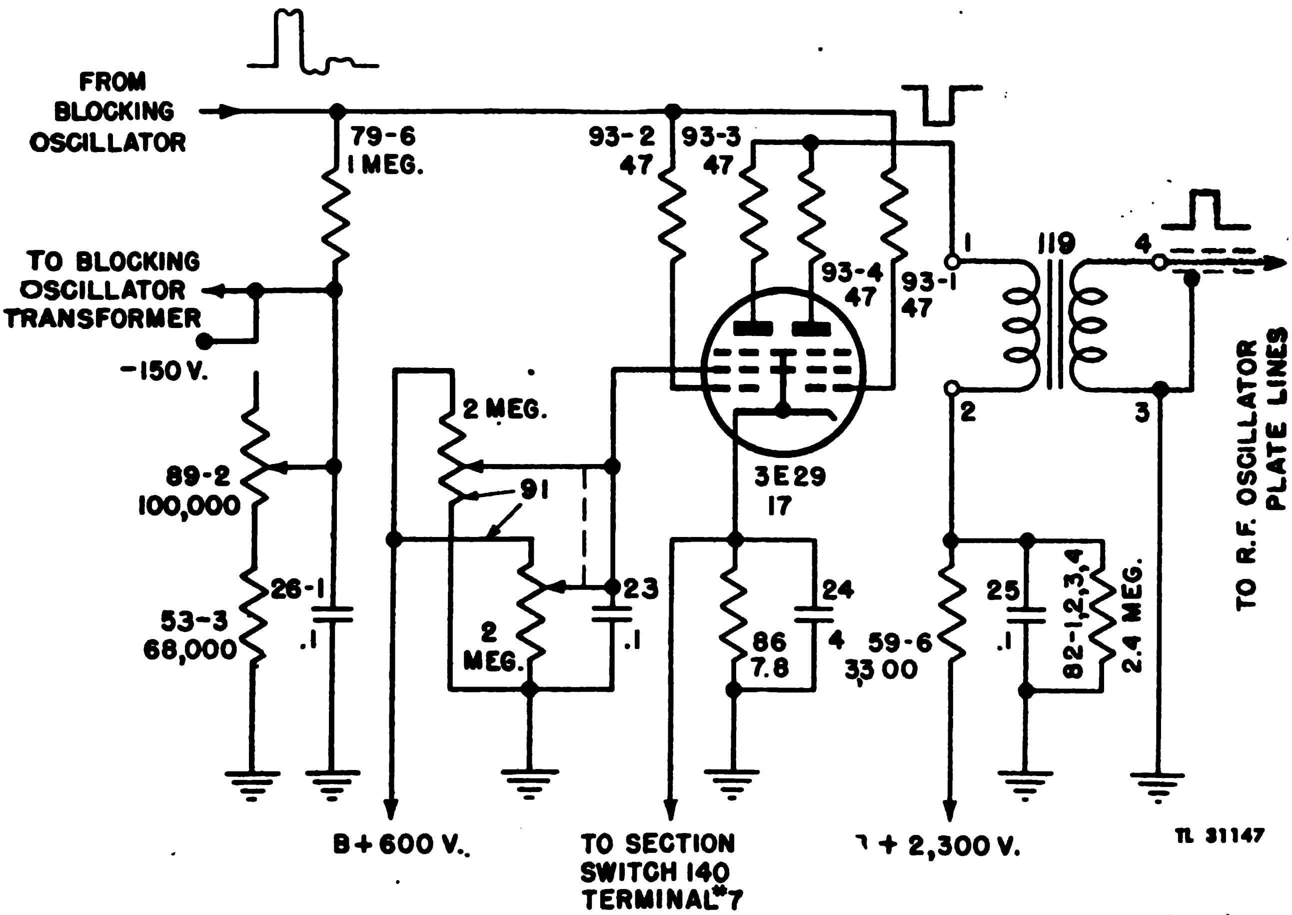


Figure 79. Transmitter, modulator, partial schematic.

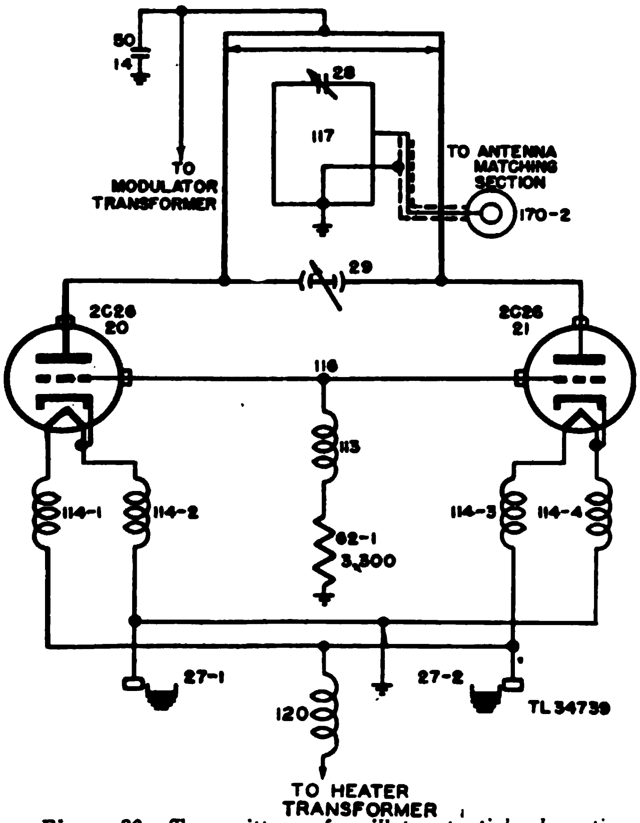


Figure 80. Transmitter, r-f oscillator, partial schematic.

duces 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 when power is removed from the component. 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 0-10 milliameter 160. This meter can be connected into the cathode circuit by means of switch 140 to measure the modulator current. Choke 120 in the filament supply and resistor 59–6 as well as the shield from terminal 4 (fig. 221) on the transformer are necessary to keep the strong audio pulse from getting into the receiver circuits.

90. R-f Oscillator

The r-f oscillator uses two 2C26 tubes (20 and 21) connected in a push-pull tuned-plate circuit. (See fig. 80.) Transmission lines are used for 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

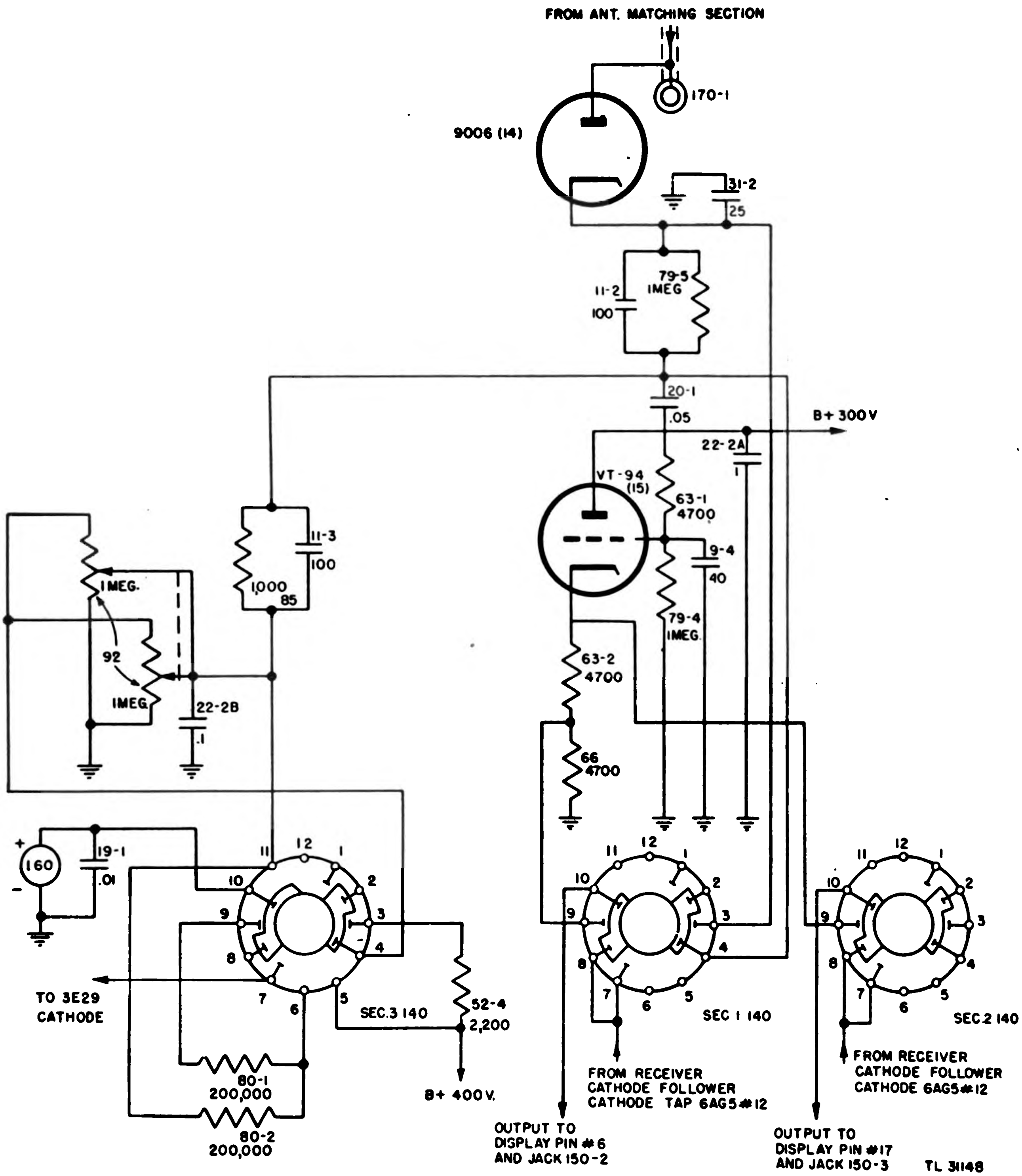


Figure 81. Transmitter, diode measurement circuit, partial schematic.

modulator pulse is applied. This causes these tubes to oscillate at an r-f frequency for the duration of the pulse after which they are quiescent until the next pulse appears. The antenna line is about ⅜ wavelength long, inductively coupled to the plate line and tuned by 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.

91. Diode Measurements

a. The diode tube 9006 (14) is used to measure the power output and pulse shape of the transmitter. (See fig. 81.) The plate of this diode is connected to the antenna transmission line. Two cathode resistors 79–5 and 85 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 paragraph 89. When thrown to the right the switch performs the following functions, in order to measure transmitter power:

(1) It shorts resistor 79–5 in the cathode circuit of tube 14, thus leaving a low value resistor 85 in the circuit.

(2) It connects a 400-volt supply to the bottom of resistor 85 (potentiometer 92 varies this voltage from zero to 400 volts).

(3) It disconnects the high-receiver output and connects in its place the high output of the cathode follower Tube VT–94 (15) to pin 17 on the plug of the rear of the receiver-transmitter. Pin 17 of this plug is connected to connector 5 on Rack FM–82 and from there is cabled to pin *B* of connector 105 on the interconnector.

(4) It disconnects the low receiver output and connects in its place the low output of the cathode follower Tube VT–94 (15) to pin 6 on the plug at the rear of the receiver-transmitter. These signals however are not used. This condition arises because the transmitter-receiver was originally designed for use with a slightly different radio equipment.

b. The rectified pulse from tube 14 is applied to the grid of the cathode-follower tube (15) through coupling capacitor 20–1. (See fig. 81.) The output of the cathode follower is applied to the range scope through pin No. 17 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 high output is connected to pin No. 17 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.

c. Jack 150–2 (LOW) provides a means for testing the receiver low output pulse which is taken from the junction of resistors 94 and 59–5 in the cathode follower output circuit. (See fig. 221.) It also monitors the low 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.

d. Jack 150–3 (HIGH) provides a means for testing the high 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 output of the transmitter and provides for these two outputs to the display tube in the range scope.

Section IX. R-F SYSTEM OF RC–148–C

92. Introduction

The r-f system is essentially the same electrically as that of Radio Equipments RC–148 and RC–148–B. The differences are those of construction and location.

93. Antenna Matching Section

The antenna matching section of the RC–148–C is inclosed in the receiver-transmitter chassis. As a consequence of this—

a. The cables from the transmitter and receiver sections of the receiver-transmitter to the open ends of the antenna matching section are much shorter in the RC–148–C.

b. The common end of the antenna matching section is brought to a connector (ANTENNA) on the front panel of the transmitter.

c. The lengths of the lines in the antenna matching section are varied by rods brought to the front panel.

94. Operation

Resistor 66–1 in the receiver of RC–148 and RC–148–B serves the same purpose as resistor 50–1 in RC–148–C and if this distinction is remembered, the operation and function of its antennas and antenna matching section is the same as the antenna and antenna matching section of the RC–148 and RC–148–B as described in paragraphs 21 and 22.

Section X. RECEIVER SECTION OF RC–148–C

95. Purpose

The function of the receiver is to detect and amplify the signals picked up by the antenna and to prepare them for presentation on the radar display oscilloscope.

96. General Description

This paragraph contains a general description of the main sections of the receiver. Paragraphs 97 through 101 contain a detailed description of the receiver circuits. The receiver is a 14-tube superheterodyne (fig. 83) and consists of five sections: r-f section, i-f section, detector section, video section, and tuning section.

a. R-F SECTION. The r-f section consists of two r-f amplifying stages, a local oscillator and a diode mixer. In this section, the r-f signal picked up by the antenna is amplified and mixed with the heterodyning frequency of the local oscillator to obtain the 11-megacycle intermediate frequency.

b. I-F SECTION. (1) This section consists of five i-f amplifiers which serve to amplify the 11-megacycle signal obtained from the mixer of the r-f section.

(2) The tuning of the i-f amplifiers is of the staggered type. That is, they are aligned or tuned to frequencies slightly above or below the center fre-

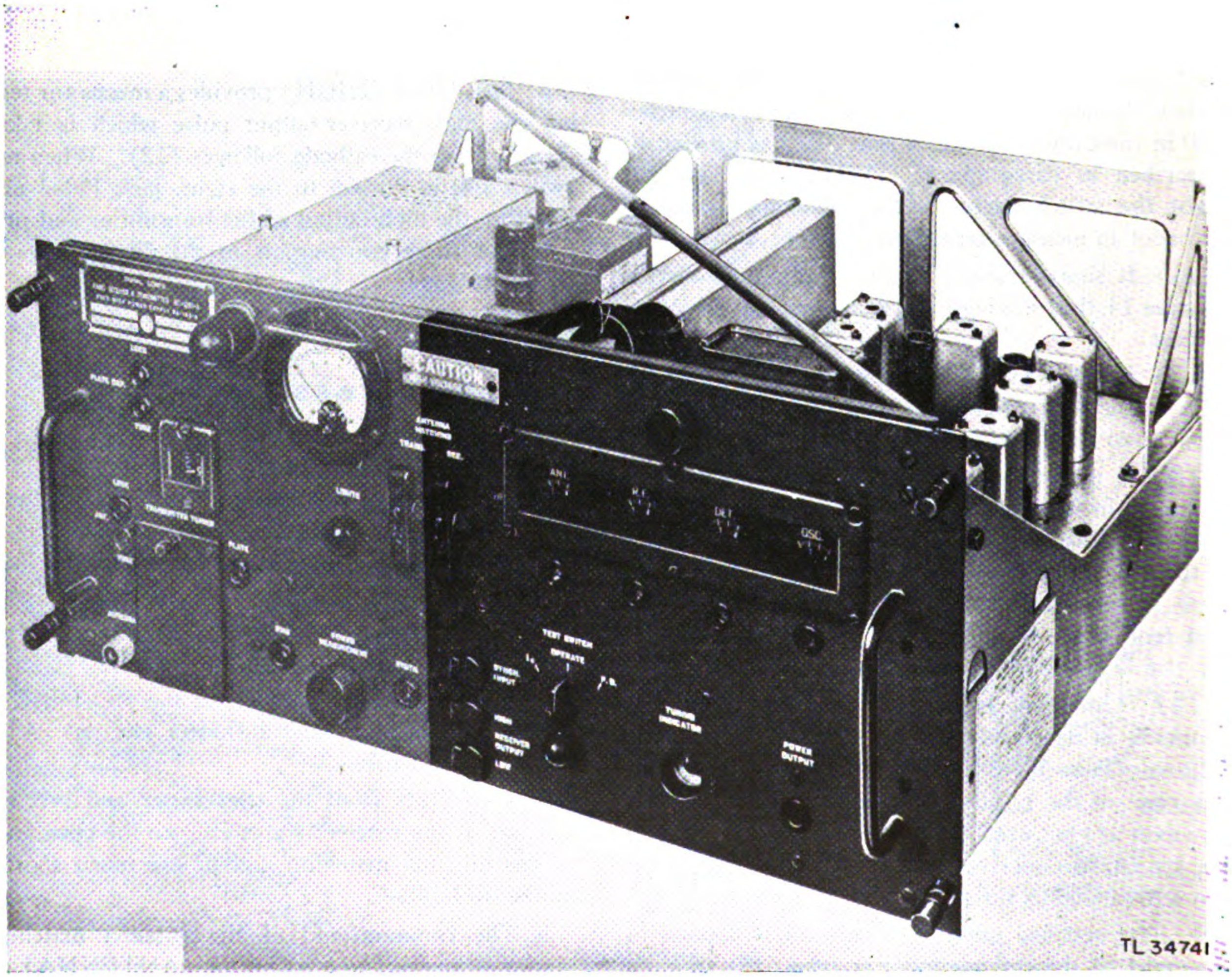


Figure 82. Radio Receiver and Transmitter BC–1267–A, front oblique view of receiver section.

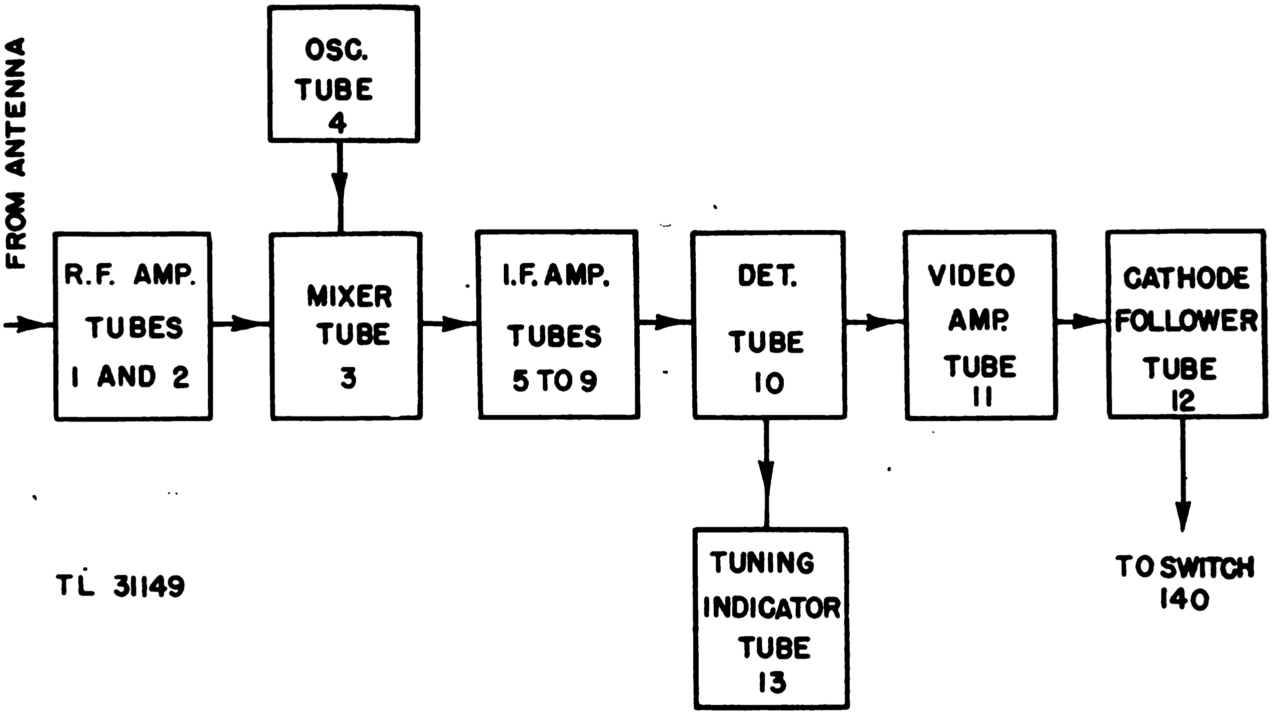


Figure 83. Radio receiver, block diagram.

quency, 11 megacycles, of the intermediate-frequency band. This is done to achieve a wide band-pass amplification. The i-f amplifier section, when properly aligned, will pass a band of frequencies nearly 4 megacycles wide. In chapter 2 the alignment procedure will be discussed.

c. Detector Section. This section, consisting of one stage, is a diode detector. The input to the detector consists of pulses of the intermediate-frequency signal. The output signal consists of sharp pulses of negative polarity.

d. Video Section. The video section consists of a

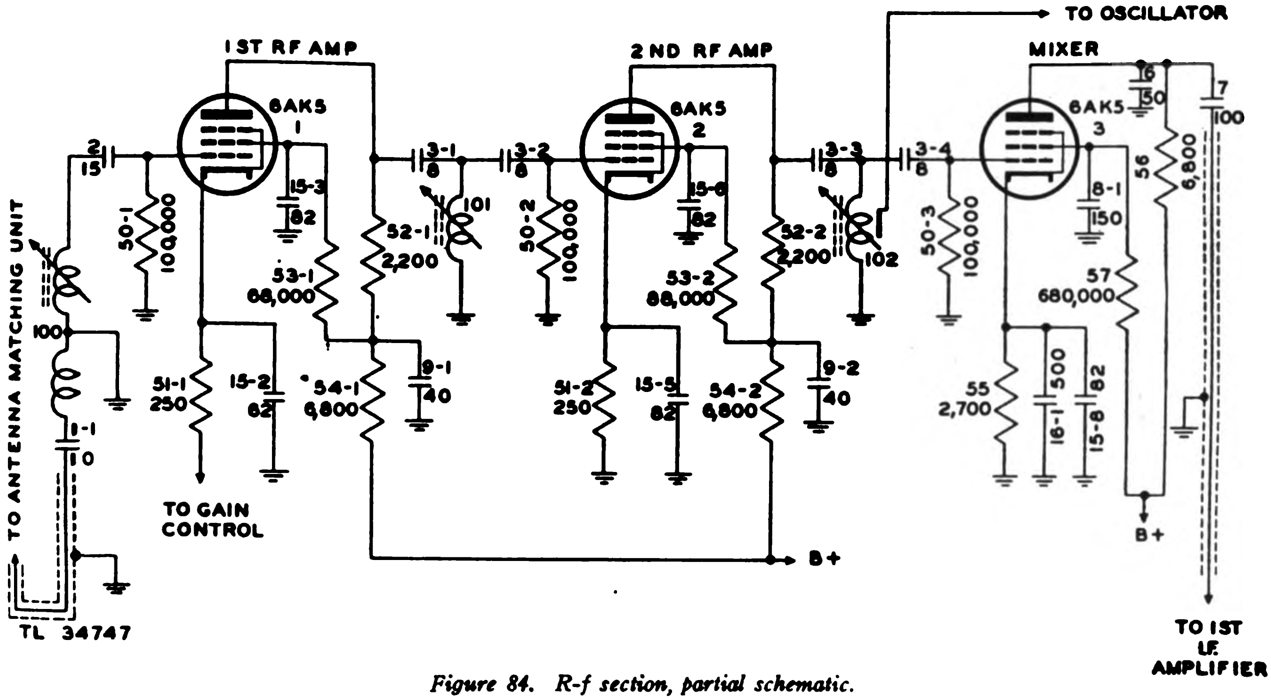


Figure 84. R-f section, partial schematic.

video-amplifier stage and a cathode-follower stage. This section inverts and amplifies the signal from the detector.

e. Tuning Section. This section includes a diode stage and a tuning-eye indicator tube. The diode rectifies a small portion of the i-f signal and this voltage is used to actuate the tuning-eye indicator. The tuning-indicator tube is used to indicate when the r-f section is properly tuned and when the i-f stages are properly adjusted.

97. R–f Section

a. R-f Amplifiers (fig. 84). 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 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 varies 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 84. 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.

b. Oscillator. The oscillator is a modified Colpitts type. (See fig. 85.) 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 mixer the dials (OSC. and DET.) for these two circuits should always be set

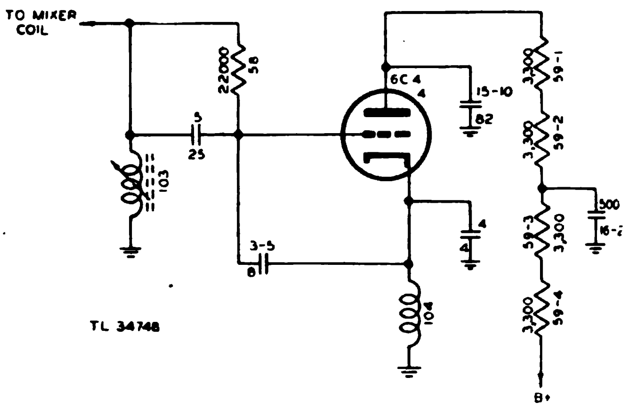


Figure 85. Local oscillator, partial schematic.

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, shown in the complete schematic diagram of this component, 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.

c. 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. 84) 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 an 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.

98. I–f Section

The schematic for the i-f amplifier section is shown in figure 86. Each of the five stages is 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

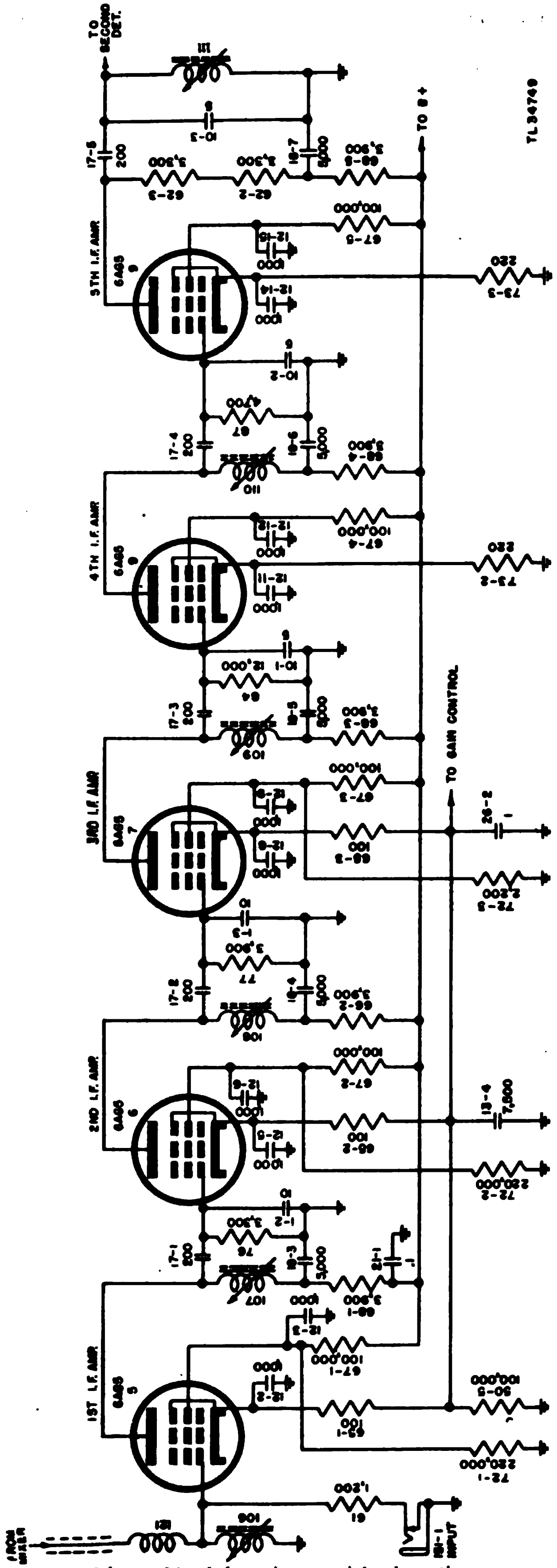


Figure 86. I-f section, partial schematic.

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 interconnector. Pin No. 22 of the interconnector plug of Radio Receiver and Transmitter BC–1267–A is connected to Rack FM–82 by a shielded wire in the rear of the rack. From the rack it is connected to pin *D* of connector 105 on Interconnector BC–1298. 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. 86.) R-f chokes 105–3 and 105–5, in series with the filament supply as shown in the complete schematic diagram of this component, 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 for testing and aligning the i-f amplifier section separately.

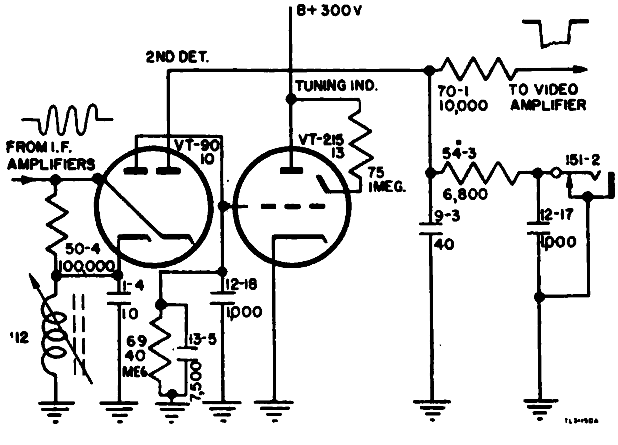


Figure 87. Detector and tuning indicator, partial schematic.

99. Detector

A 6H6 (10) double-diode tube is used as the detector. (See fig. 87.) One of the diodes functions as a detector for the signal output which is 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 (fig. 86) directly to the cathode of the right-hand diode and through a dropping resistor 50–4 to the other cathode. The cathode and the plate 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. 86.) 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 and the plate 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 very high 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 consists of sharp pulses of negative polarity. (See fig. 87.) This negative pulse is applied to the grid of the video amplifier.

100. Tuning Indicator

The connections to the tuning-indicator tube 6E5 (13) are conventional. (See fig. 87.) 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 obtain as narrow a shadow as possible.

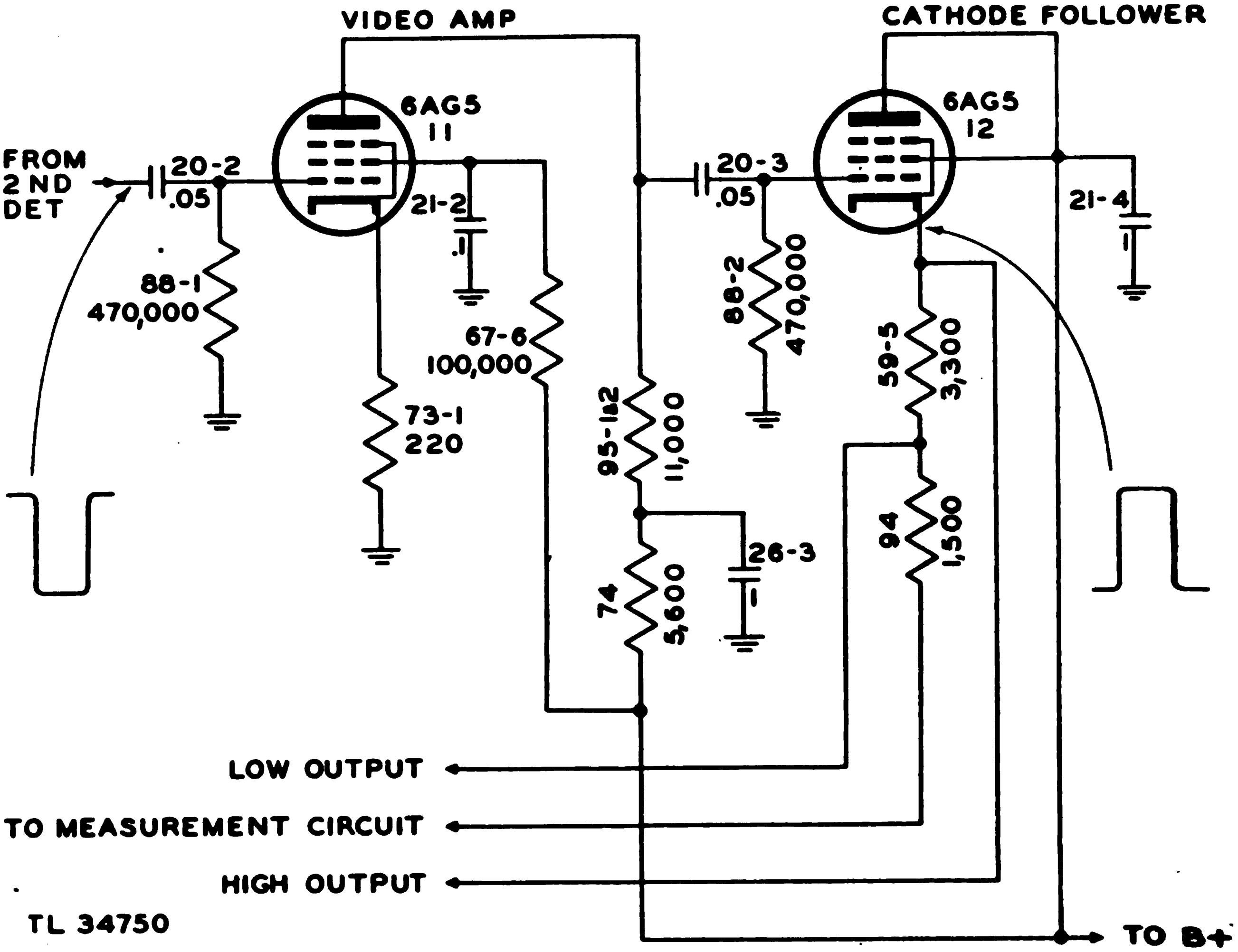


Figure 88. Video section, partial schematic.

101. Video Section

a. The sharp negative pulse from one plate of the 2d detector is impressed on the grid of the video amplifier tube 6AG5(11) through coupling capacitor 20–2. (See fig. 88.) 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 aproximately 100 to 250,000 cycles per second.

b. 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. 88.) The output of the receiver consists of pulses of positive polarity.

Section XI. INTERCONNECTOR OF THE RC–148–C

102. Introduction

Interconnector BC–1298 of the RC–148–C is essentially the same as that of the RC–148 and RC–148–B. The major differences of the two components are the elimination of two test positions that are in the RC–148 and RC–148–B. These two test positions are the calibrating voltage (position 4) from the 60 cps a-c power of the power supply in the interconnector and the r-f pulse width (position 5B). As a consequence of this elimination both the TEST and SELECTOR switches are wired differently. For ease in reference, the test positions are given below and the changes in wiring between the RC–148 and RC–148–B interconnector with that of the RC–148–C are noted.

103. Test Switch

The TEST switch 113 is used only with the SELECTOR switch in position 4 or 5 when checking or adjusting the RC–148. On the test bench, position 5 must be used exclusively. The range oscilloscope with its normal sweep of 244 microseconds (40,000 yards) is used for a test scope.

a. Position 1. (1) This position applies only the output of the radar switch channel and the IFF switch channel to the deflection plates of the range oscilloscope. If the receivers in both the SCR–268–C and the RC–148–C are turned off or the gain turned to minimum the pattern on figure 169 will be obtained. The cross-over roughly represents the letter *X* and is due to the slope of the blanking pulses from the blanking amplifier. The BASELINE control may be adjusted while observing this pattern.

(2) The output of the IFF switching channel is applied to pin 1 of section *C* of the TEST switch and taken off the common pin in all cases. However, for the RC–148–C interconnector, the common pin is 6 instead of 8, as for the RC–148–B.

b. Position 2. This position selects a signal from the division channel that shows the number of steps in the step wave. To prevent discharge of capacitor 8, the signal is taken off the cathode of tube 6A. The pattern shown in figure 170 has one broken horizontal line for each step in the step wave.

c. Position 3. This position selects a signal from the sync pulse output stage, thus showing the pulse fed to the transmitter. The signal is taken from the cathode of tube 14, the output cathode follower of the transmitter sync channel, and fed through switch 113A, 112C, and the output cathode follower 13B to the lower vertical deflection plate. The pattern may be used to check the output of the transmitter trigger channel. (See fig. 171.)

d. Position 4. This position selects a signal from the input to the division channel, whether this signal is from the SCR–268–C Keyer, or the Wien bridge oscillator in the interconnector. The signal is taken across resistor 92 of the input network to tube 2B and fed to the lower vertical plate by means of switch 113A. The pattern normally seen (fig. 172) is an overdriven sine wave. This position of the switch may be used in trouble shooting to determine the input to the interconnector division channel. The 4098 cps signal developed across resistor 92 in the input circuit to stage 2B is fed to pin 4 instead of to pin 6 of section *A* of the TEST switch 113.

e. Position 5A. (1) This position selects the output of the IFF receiver and applies it directly to the range oscilloscope, so that the receiver output may be observed independent of the interconnector. The pattern seen is that of the receiver which may be seen in figure 173. This position is obtained with the TEST SWITCH on the receiver-transmitter in the OPERATE position.

(2) The input to the interconnector from the IFF receiver is fed directly to pin 5 (instead of pin 7 on the RC–148 and RC–148–B) of section *C* of the TEST switch. It is then applied to section *B* of TEST switch 112. Thus the TEST switch is in

position 5 instead of position *7* as in the RC–148 and RC–148–B when the receiver output is checked.

f. Position 5B. (1) This position presents the envelope of the output r-f pulse of the receiver-transmitter (fig. 174). It may be used to monitor the output power as explained in the section on the transmitter. It is obtained with the TEST SWITCH on the receiver-transmitter in the P.O. position.

(2) The r-f pulse enters the interconnector at the same pin of the connector 105 as the IFF receiver output, pin *B*. Either one of these two inputs is chosen by the TEST SWITCH on the receiver-transmitter. Inasmuch as the signal from the RC–148 and RC–148–B transmitters for test position 5B entered on pin *M* of connector 105, pin *M* on the RC–148–C now has no connection to it.

(3) Due to the circuit changes in the monitoring section of the transmitter, switch 115 on the interconnector is eliminated.

Section XII. SIGNAL GENERATOR OF RC–148–C

104. Purpose

Signal Generator I–222–A (fig. 89) is the test equipment supplied with the RC–148–C. Functionally it takes the place of both the wavemeter and signal generator which are supplied with Radio Equipments RC–148 and RC–148–B.

a. This signal generator, when serving as a wavemeter, is of the heterodyne type. The basic function of a heterodyne wavemeter is to produce an r-f signal frequency which is heterodyned with an incoming signal, detected and amplified. 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 of the RC–148–C to a desired frequency.

b. This signal generator also provides a means for measuring the frequency setting of the receiving

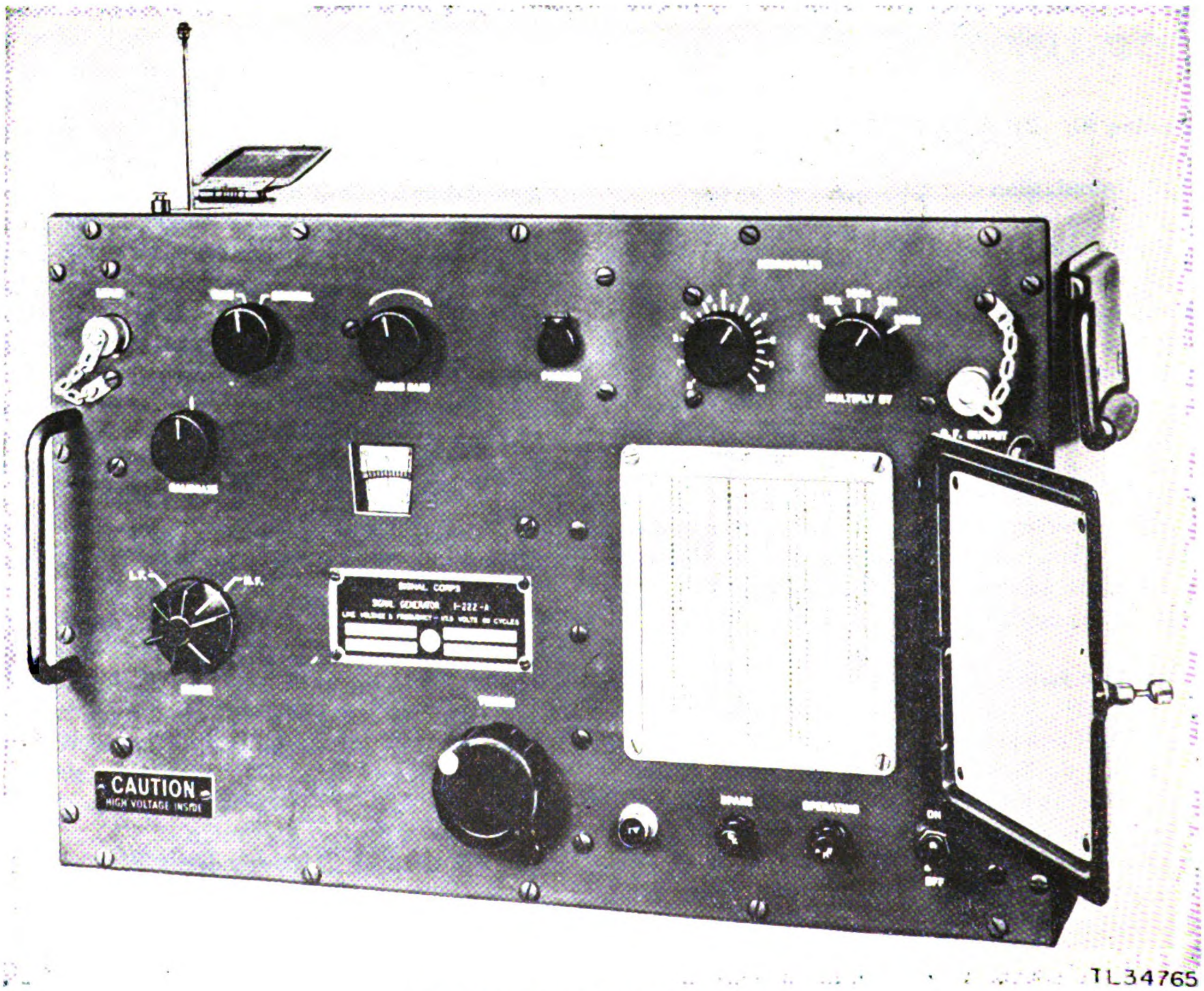


Figure 89. Signal Generator I–222–A.

section, and for aligning the i-f amplifier section of the receiver with an approximate r-f attenuator for measuring the gain of the i-f system.

105. General Description

The signal generator consists of five stages: the crystal oscillator, two-range oscillator, detector, amplifiers and attenuators (fig. 90). The general function of these stages will be discussed in this paragraph. A detailed analysis of the circuits in the signal generator is contained in paragraphs 106 through 110.

a. CRYSTAL OSCILLATOR. The crystal oscillator is a triode Tube VT–94 utilizing a crystal in its grid circuit to provide an r-f signal of known frequency. This signal may be compared with that of the two-range oscillator as a check on the frequency of the two-range oscillator-detector.

b. DETECTOR. This stage is used to mix two r-f signal inputs. The two input signals may be from either of two combinations: the crystal oscillator and the two-range oscillator, or the two-range oscillator and the antenna signal. When mixed and amplified the audio output can be heard in a set of headphones.

c. AUDIO AMPLIFIERS. Stages 3 and 4 are conventional audio amplifiers used to amplify the audio output of the detector. A jack is provided in the plate circuit for a set of headphones to listen for audio output.

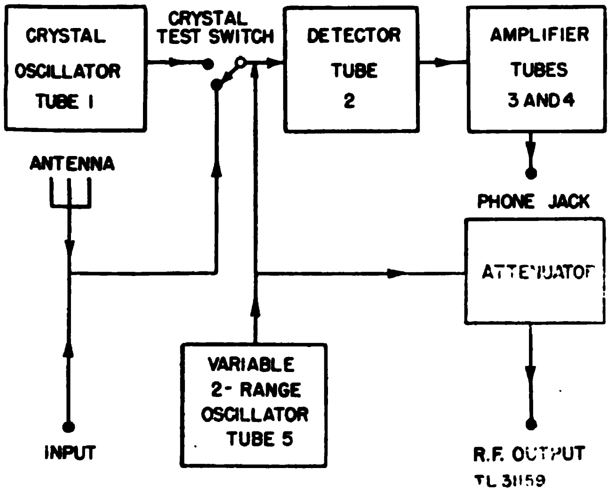


Figure 90. Signal generator, block diagram.

d. TWO-RANGE OSCILLATOR. (1) 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 its output circuit.

(2) When setting the frequency of the transmitter, the output of the oscillator is used as a known frequency source of r-f signal to compare with the frequency with the transmitter.

106. Crystal Oscillator

The crystal oscillator uses a Tube VT–94 as a triode, and a crystal controlled, self-excited oscillator with a frequency-discriminating plate tank consisting of coil 115, variable capacitor 61, and capacitor 59–1. (See fig. 91.) 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.

107. Detector and Audio Amplifier

a. The input signal to the diode detector is supplied from either the variable two-range oscillator and the crystal oscillator or the antenna and the variable two-range oscillator, depending upon the position of the CRYSTAL-TEST switch. (See fig. 92.) The output from the detector, which is a mixture of the two r-f input signals, appears across load resistor 1. Capacitors 51–2 and 53–1 form the r-f return circuit. Spark plate 53–1 is shunted across the output to prevent r-f leakage.

b. The output of the detector is applied to the grid of the 1st 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 1st amplifier is coupled to the 2d amplifier (tube 4) through capacitor 54–2. Resistor 5–2 is the grid resistor for the 2d amplifier. The 2d amplifier circuit is similar to that of the 1st amplifier. The output of the 2d 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.

108. Variable Two-Range Oscillator

This r-f oscillator uses a Tube VT–202 in a Hartley type circuit. (See fig. 93.) 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. Spark plate 53–3, choke 102–2, resistor 17, and capacitor 51–3 filter the plate supply circuit. Choke 102–1, spark plate 53–2, and capacitor 58–2 are used as r-f filters in the filament circuit. 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.

109. R–f Attenuator (fig. 94)

The r-f attenuator is of the constant impedance, π-structure type, with a total attenuation of 100,000 to 1. This is divided up into five fixed steps of 10 to 1 per step with the last step having a 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 resistors 16, 59–2 (fig. 93), 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 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 94 is a simplified diagram of switch 105A–B.) Positions 8 (1000X), 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.

110. Power Supply

The power supply uses a high-vacuum full-wave rectifier Tube VT–197–A (6). The 110-120-volt a-c power is applied to the primary of transformer 104 through receptacle 111, switch 112, and fuse 113. R-f

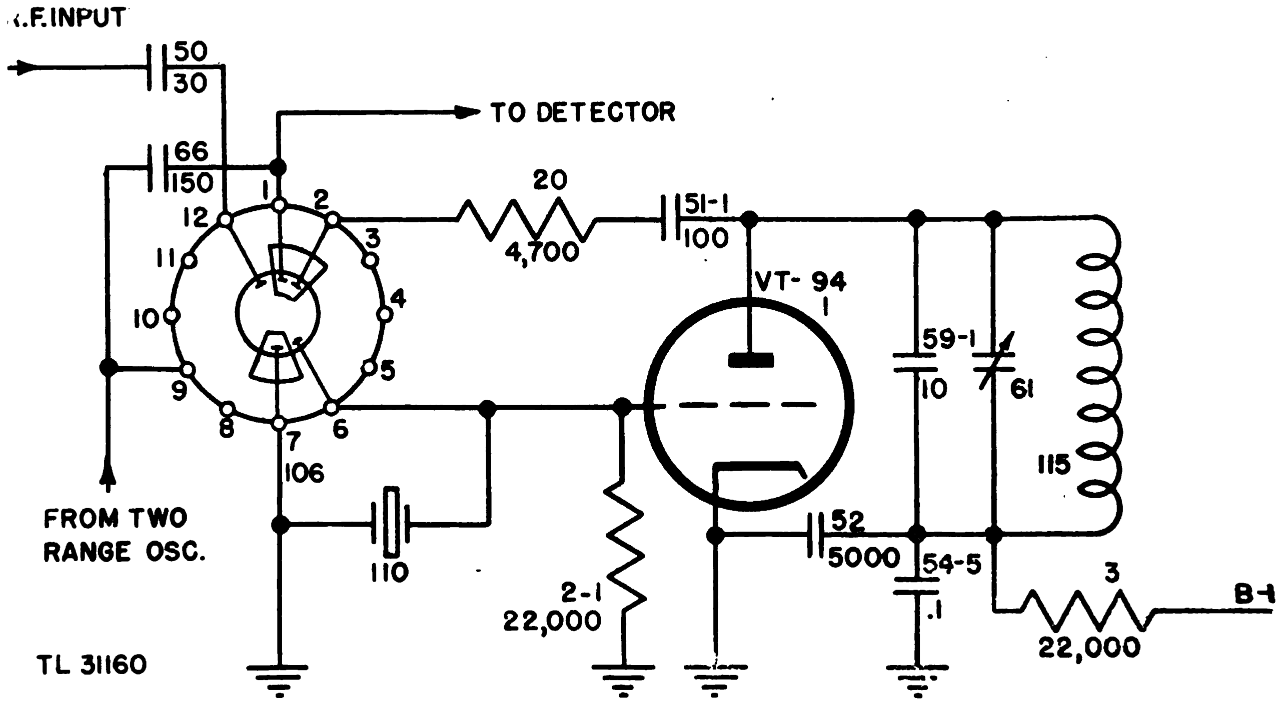


Figure 91. Signal generator, crystal oscillator, partial schematic.

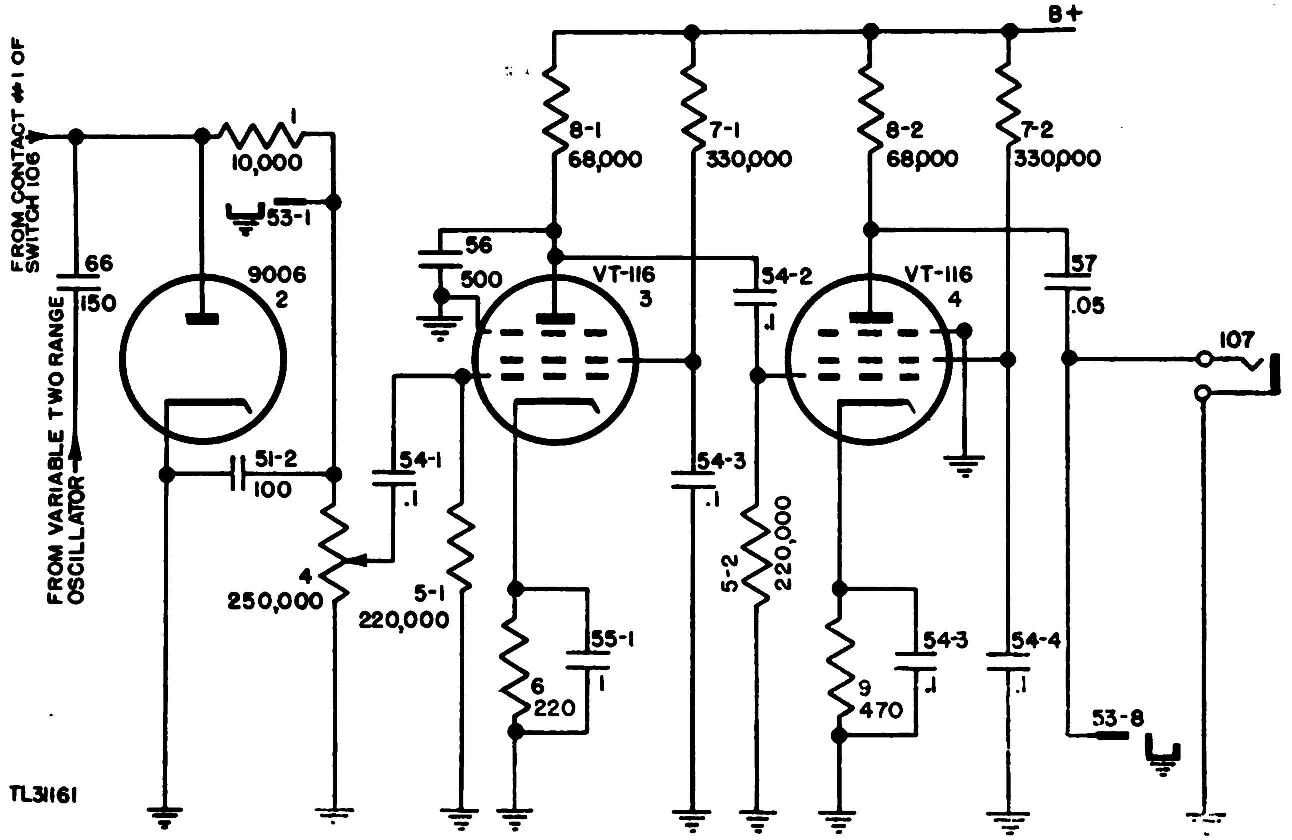


Figure 92. Signal generator, detector and amplifier, partial schematic.

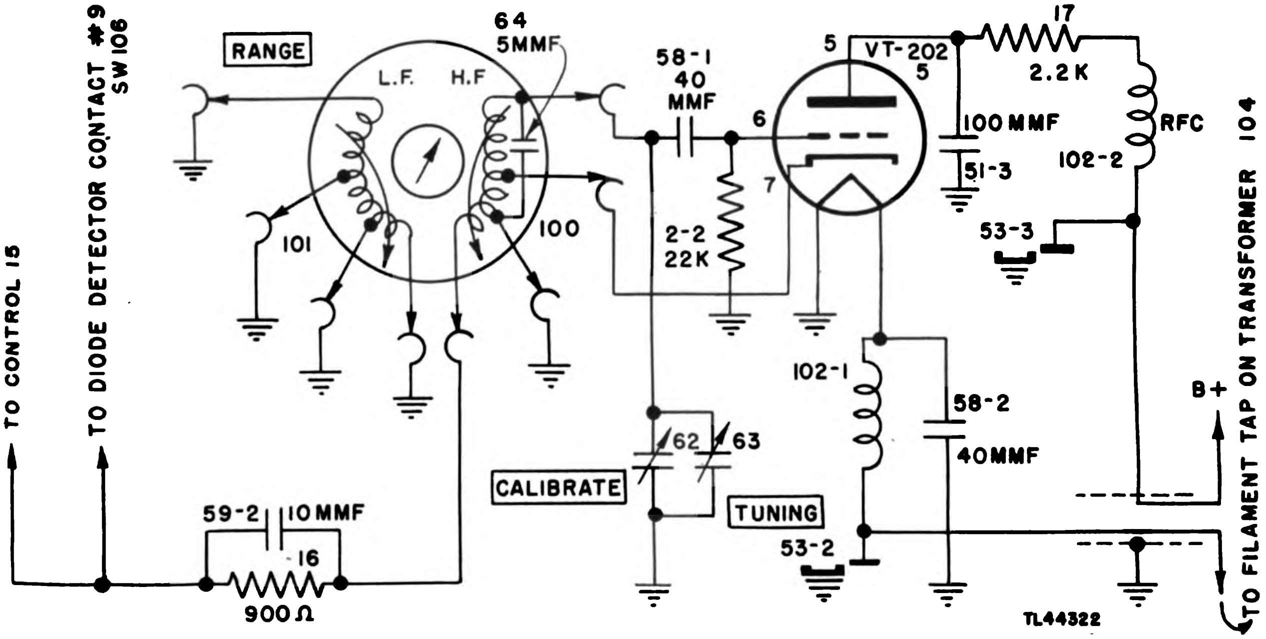


Figure 93. Signal generator, two-range oscillator, partial schematic.

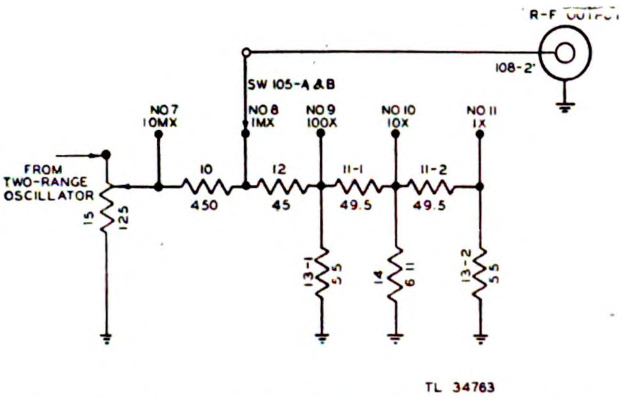


Figure 94. Signal generator, attenuator, partial schematic.

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 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 XIII. POWER SUPPLY OF RC–148–C

111. Purpose

The operating voltages for the receiver-transmitter are supplied by Power Supply RA–105–A. (See fig. 95.) 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. See complete schematic diagram in chapter 2.

112. Protective Devices

a. Circuit breaker 44 (FILAMENT) 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 connected also in the primary circuit of transformers 58 and 59 so that circuit breaker 43 (PLATE) cannot supply power to transformers 58 and 59 unless it is closed. This 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, re-

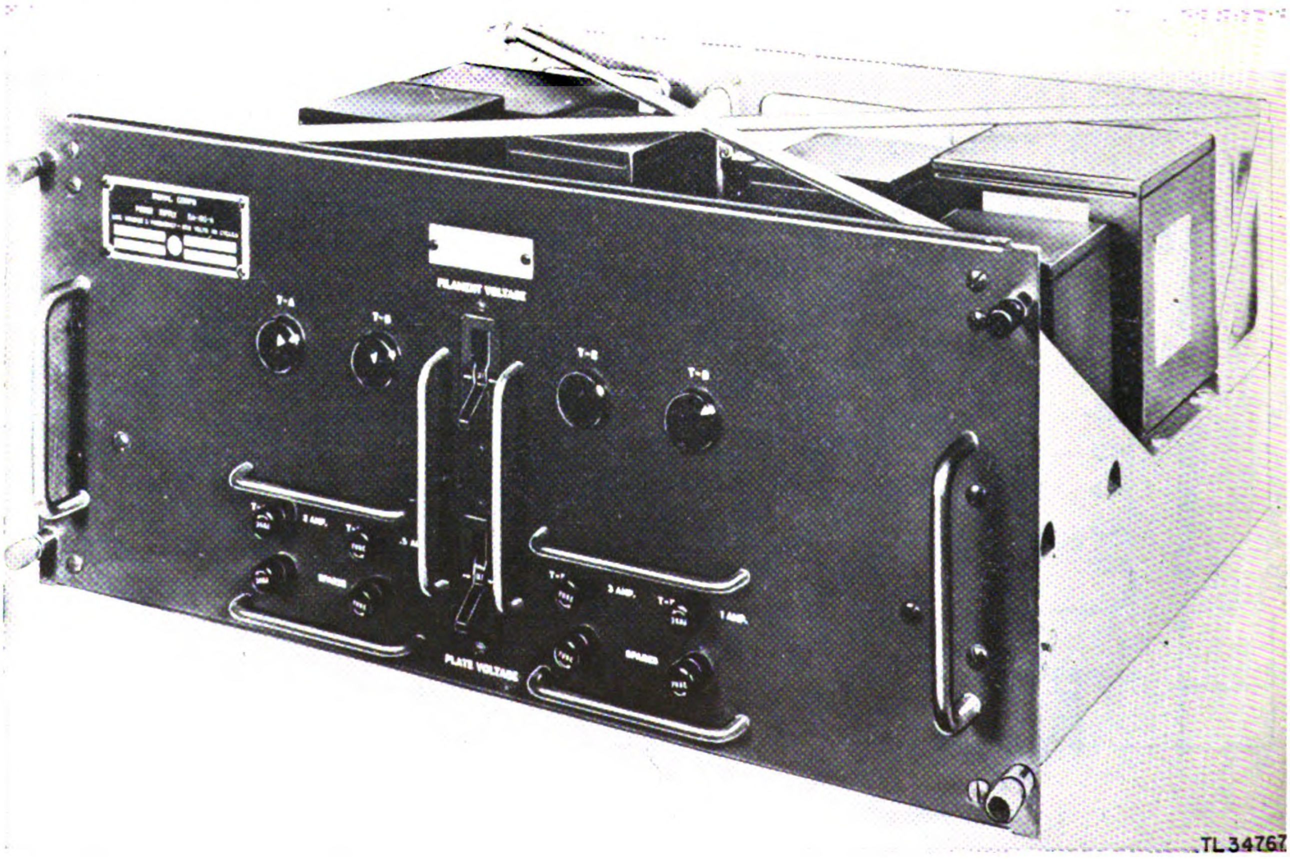


Figure 95. Power Supply RA–105–A—front oblique view.

spectively. 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.

b. 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 are 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.

113. 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. Transformer 57 has three secondary windings which supply the filament voltage for the two high-voltage rectifier tubes.

Note. It is to be noted that terminal 3 of one of the secondaries of transformer 56 runs to pins 21 and 22, and terminal 4 to pins 8 and 9 of the multiple receptacle 30. Terminal 6 of one of the secondaries of transformer 56 is also run to pins 19 and 20 of the multiple receptacle 30. The voltages provided at the above mentioned pins of multiple receptacle 30 are not used anywhere in the RC–148–C. This condition arises because the power supply was originally designed for another unit.

114. Plate Transformers

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.

a. Rectifier 1. 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 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 resistor 25. The output filter consists of capacitor 7 and resistor 20.

b. Rectifier 2. Rectifier tube No. 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 pin 6 of multiple receptacle 30. No use is made of this voltage. This condition arises because of the original design of the power supply for a unit other than the RC–148–C.

c. Rectifier 3. Rectifier tube No. 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. Since 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; and 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 for power output measurement.

d. Rectifier 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 3,000-volt d-c output is supplied to the radio receiver and transmitter.

e. Rectifier 5. Tube No. 5 (VT–119) is a half-wave rectifier. The a-c voltage is supplied from terminal 6 of transformer 59. The output of this rectifier is primarily a voltage source so 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.

f. Rectifier 6. Tube No. 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.

g. Rectifier 7. Tube No. 7 (VT–119) is a half-wave rectifier. Since a negative voltage is required, the a-c voltage is applied to the cathode from terminal 4 of transformer 58. The filter consists of resistor 17 and capacitor 6–1 and 6–2. The bleeder network consists of resistors 16–1, 16–2, 16–3, and 16–4. The negative 2,000-volt d-c output is supplied to pin 5 of the multiple receptacle 30. This voltage is not used in the RC–148–C. This condition arises because the power supply was originally designed for a unit other than the RC–148–C.

CHAPTER 2

TROUBLE-SHOOTING PROCEDURES

Section I. GENERAL INFORMATION

115. 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 will minimize the necessity of trouble shooting.

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

(1) *Block diagram of the system.*

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

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

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

(5) *Voltage and resistance data at terminal boards.*

(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 on both the schematic diagrams and 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 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, or hearing. The majority of faults, however, must be located by checking voltage, resistance, 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 will usually 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 sequency until an abnormal result is obtained. As each step is performed, the visible and audible results of the action are noted.

The use of the starting procedure is described in detail in section II.

e. LOCALIZATION. Localization is the tracing of the fault to a particular part. Sections II through VII 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 and terminal board. The method of using the voltage and resistance data in checking a circuit is described in detail in paragraphs 116*d* and 117*c* of this section.

116. 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 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. When, 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 so 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 LEADING. 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 leading in high-resistance circuits, use the highest voltmeter range. Although only a small deflection will be obtained (possible 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 volmeter 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.

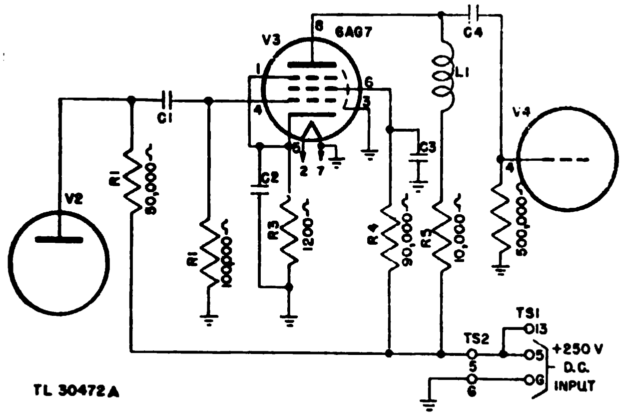


Figure 96. Schematic diagram for voltage analysis.

d. Practical Example of Voltage Analysis. Figure 71 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 dc 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.

To check the stage shown in figure 71 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 contract 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, since 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 can be checked by removing one of the wires from the filament winding and again testing 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, since 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 116*a*(3).) The plate cathode voltage and the grid cathode voltage normally causes 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 a lack of the plate-supply voltage, a burned-out tube V-3, 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 could 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 could 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 should normally be 195 volts. The voltage drop across the resistor normally would be 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 could 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 could 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, would increase the screen grid current. Increasing this current would increase the voltage drop across resistor R4. If capacitor C3 was leaky or shorted, the screen grid of tube V3 would be connected near or at ground potential, lowering the voltage on contact 6. The current through resistor R4 would rise if capacitor C3 was shorted. Resistor R4 would be the only resistance between the applied voltage and the chassis ground. Resistor R4 probably would burn out because of the high current flow unless the resistor had a high power rating. Any fault that would make high current flow through the screen grid-cathode circuit might 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 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 could 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 could 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, would cause the current through the plate-cathode circuit to rise, increasing 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 R5, unless their power rating is ample.

(d) If the voltage is too high, the trouble could 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 was burned out or resistor R3 was open, no current would flow through the plate-cathode circuit, and there would 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.

117. Resistance Measurements

a. GENERAL. (1) *Normal resistance values.* When a fault develops in a circuit, its effect will often show up as a change in the resistance values. To assist in the localization of such faults, trouble-shooting 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. 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 movements 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, the ohmmeter should be set 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, the highest range should be used. 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 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 measure its resistance again, to make sure that the low reading was not because some part of the circuit was in parallel with the resistor.

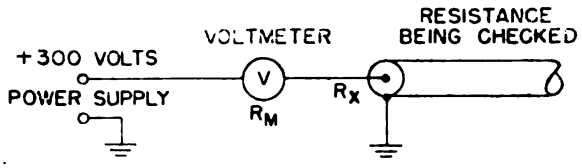
(*b*) In some cases, it will be impossible to check a resistor because it has a low-voltage transformer winding connected across it. If the resistor must be checked, disconnect one terminal from the circuit before measuring its resistance.

(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 s age might have a rated value of 1 megohm. If the resistor were measured and found to have a value between 0.9 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 are 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.



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

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 97. Measurement of high resistance.

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 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 72. 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 of 1,000 ohms or more. The resistance of the motor is equal to the ohms-per-volt sensitivity multiplied by the range to which the meter is set.

The derivation of the formula $Rx = \frac{300\ Rm}{V}$ shown below. Rx is the unknown resistance, Rm is the meter resistance, and V is the voltmeter reading.

$$\frac{Rx}{Rm} = \frac{300\text{-}V}{V}$$

If Rx is very large, V will be small in comparison to 300. Assuming that 300-V can be replaced by 300, the formula $\frac{Rx}{Rm} = \frac{300}{V}$ is obtained. When solved for RX this gives $Rx = \frac{300\ Rm}{V}$. When making the measurement, the meter should first be put on the 300-volt scale to protect it in case Rx 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 73 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.

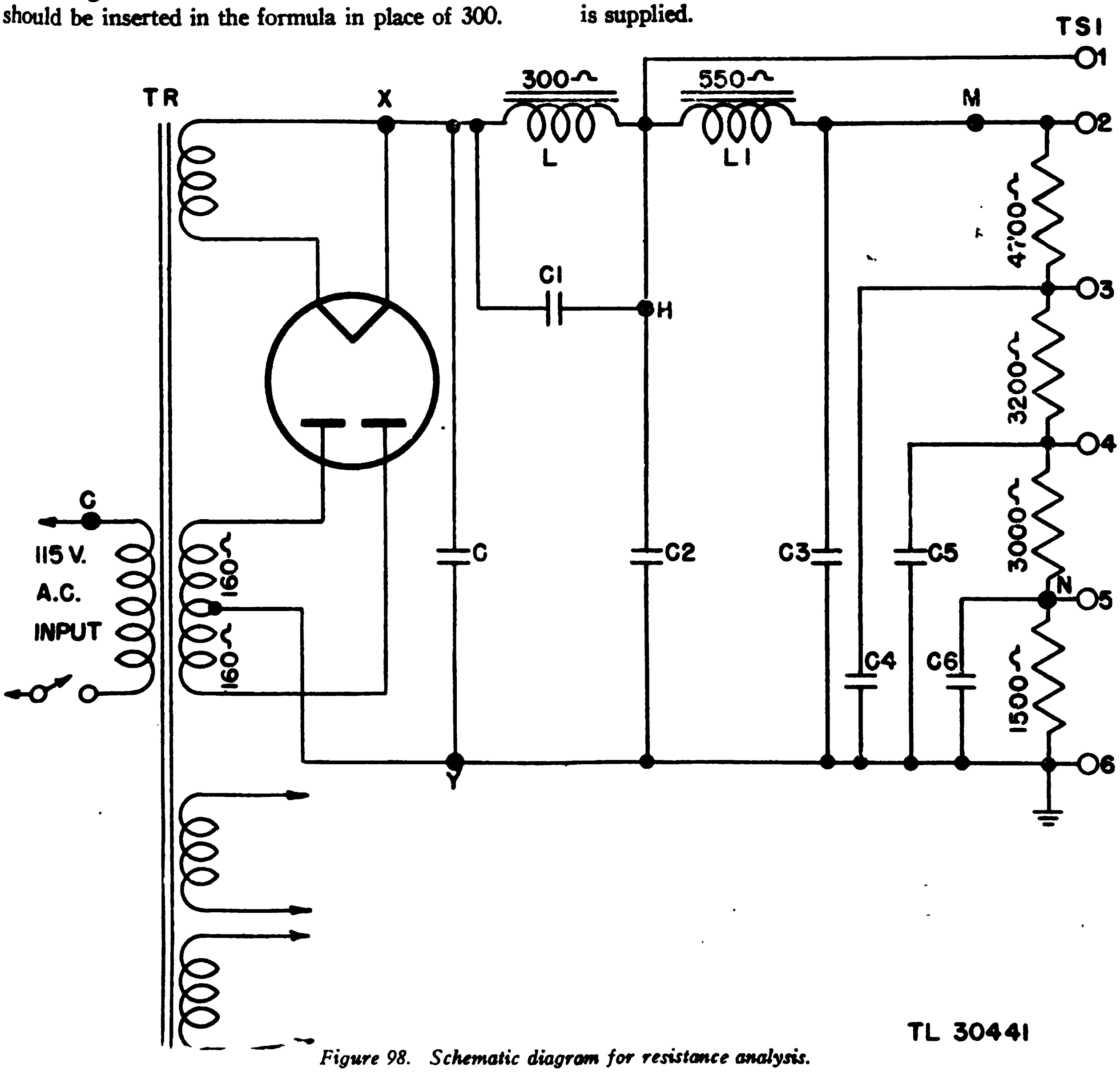


Figure 98. Schematic diagram for resistance analysis.

(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 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 either the circuit 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:

(*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 73, 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 was greater than zero but much less than 7,700 ohms, disconnect capacitors C4, C5, and C6 from the circuit. Then check the capacitors and the 1,500-ohm and the 3,000-ohm resistors individually.

118. 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 i-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.

119. Current Measurement

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 is should always 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 to 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 an example, see paragraph 116*d*.

120. 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.

121. 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 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 the original tube 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 measurements 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) *60-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 fine frequency control on the oscilloscope is properly set so as to obtain a nearly stationary image. Then, ad-

vance the SYNC control only far enough to make the trace stationary.

(5) *60-cycle pick-up.* 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 is usually due to the presence of 60-cycle modulation of 60-cycle pick-up combined with the observed waveform. To check, turn the oscilloscope sweep frequency to 30 cycles. If the effect is due to line pick-up, 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 does not affect the usefulness of waveform measurements. The reference waveform 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 shunts a capacitance across the circuit under test, causing 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 oscilloscope 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. This may reduce the amount of 60-cycle pick-ups, 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, 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 is a normal condition. 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 is 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 when the reference wave-

forms 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 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 the test waveforms.

122. 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, see 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. (See (*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. (See (*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 rapidly located. 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, they are all brought 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. Complete instructions for aligning the receiver are given in section IV.

123. 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; they may cause short circuits.

d. A carelessly soldered connection may create a new fault. It is very important to make well-soldered joints, since 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.

Section II. TROUBLE SHOOTING BASED ON STARTING PROCEDURE AND SEVEN TEST POSITIONS (RC–148 AND RC–148–B)

124. Introduction

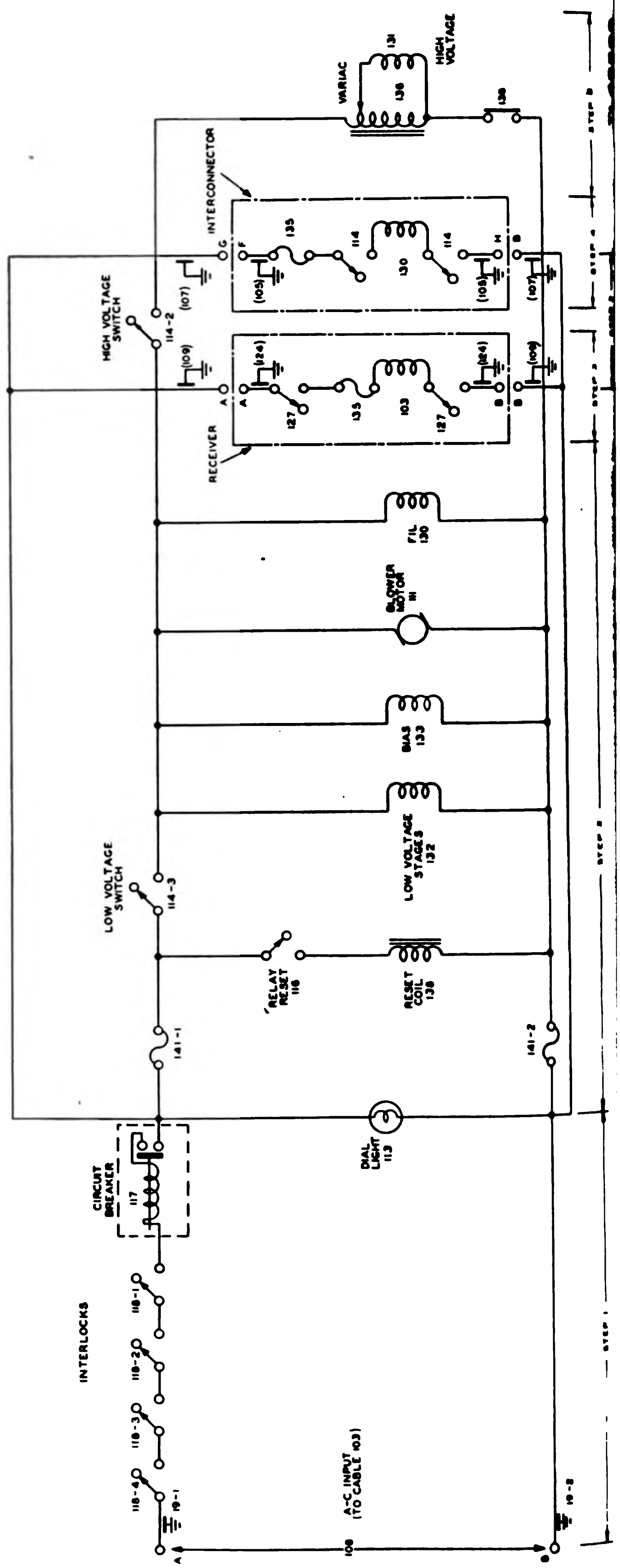
Radio Equipment RC–148 is designed to give trouble free operation; but as in all precision apparatus, faults occur. The analysis of symptoms and trouble-shooting information which follows has been prepared to aid the repairman in isolating troubles as they occur, so that the set may be placed back in operation as quickly as possible.

a. In starting the set, the procedure in paragraph 48, TM 11–1318, should be followed. Proper indications are given, as well as most of the improper indications which point to trouble occurring at a particular step of the starting procedure. The improper indications assist the operator in determining quickly where the trouble is. As soon as the faulty component is located replace it with the spare so that operations continue with minimum delay. After the replacement is made, refer to the other sections of this chapter, where detailed tests, procedures, and reference data for each component are given.

b. A trouble may be further isolated to a component by means of the seven test positions used in conjunction with the test (range) scope. This procedure indicates operational faults which can be isolated to one component. After the defect is isolated the defective component can be quickly replaced and set up for trouble shooting. Refer to the other sections of this chapter, where detailed tests, procedures, and reference data for each component are given.

125. Trouble Shooting Based on Starting Procedure

The following tabulation of normal and abnormal conditions is based on the nine steps of the starting procedure, paragraph 48, TM 11–1318. Figure 99 is a schematic diagram of the a-c input circuits to the transmitter, receiver, and interconnector. These components are energized in the nine steps of the starting procedure. The diagram may be used to facilitate trouble shooting in these circuits.



STEP 1. Turn CIRCUIT BREAKER on transmitter ON.

NORMAL INDICATION: Red indicator light on transmitter panel lights.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
1. Red indicator lamp 113 fails to light.	1*a*. Open in a-c circuit to connector 108. *b*. Defective lamp. *c*. Open in transmitter interlocks 118–1 to 118–4. *d*. Defective circuit breaker, 117 (transmitter, symptom A).
2. CIRCUIT BREAKER 117 does not remain in ON position.	2*a*. Short in a-c primary circuit in transmitter (transmitter, Symptom B). *b*. Short in a-c power supply from transmitter to interconnector. *c*. Short in a-c power supply from transmitter to receiver. *d*. Defective CIRCUIT BREAKER 117 (transmitter, Symptom B).

STEP 2. Set the LOW VOLTAGE switch to the ON position.

NORMAL INDICATIONS: 1. Meter light on transmitter lights.
2. Blower motor in transmitter can be heard.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
1. Blower motor cannot be heard. Meter lamp lights.	1. Defective blower motor (transmitter, Symptom C).
2. Blower motor can be heard but meter lamp does not light.	2*a*. Defective meter lamp 112. *b*. Short or open in power supply if meter lamp 112 (transmitter, Symptom D).
3. Circuit breaker *kicks out* and all indicator lamps go out.	3. (Transmitter, Symptom E).

STEP 3. Turn on receiver by switching receiver ON-OFF switch to ON position.

NORMAL INDICATIONS: 1. Panel lamps on receiver light.
2. Tuning indicator lights after a delay of a few seconds.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
1. Panel lamps do not light and tuning indicator does not light.	1*a*. A-c input circuit in receiver. *b*. A-c input circuit from transmitter socket 108 to receiver socket 124. *c*. (Receiver, Symptom A.)
2. Panel lamps do not light but tuning eye lights.	2. (Receiver, Symptom B.)
3. Tuning indicator does not light but panel lamps light.	3. (Receiver, Symptom C.)
4. Circuit breaker on transmitter *kicks off* and all indicator lamps go out.	4. Short in receiver power supply (receiver, Symptom D).

STEP 4. Turn on interconnector by switching interconnector ON-OFF switch to ON position.

NORMAL INDICATION: Red indicator lamp 108 on interconnector lights.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
1. Red indicator lamp 108 does not light. All other indicator lamps are lighted.	1*a*. A-c input circuit from transmitter socket 107 to interconnector socket 105. *b*. A-c input circuit in interconnector (interconnector, Symptom A). *c*. Blown fuse 135 in interconnector. *d*. Defective light bulb.
2. Circuit breaker on transmitter *kicks off* and all indicator lamps go out.	2. Short in primary of interconnector power supply.

STEP 5. Check DIVISION control.

NORMAL INDICATION: With SELECTOR switch in position 4 and TEST switch in position 2, 15 horizontal lines on range oscilloscope should be obtainable with the aid of DIVISION control.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
1. No horizontal lines obtainable as DIVISION control is adjusted.	1. Defective division channel (interconnector, Symptom N, O, P, T).
2. Impossible to obtain 15 lines with aid of DIVISION control.	2. Defective blocking oscillator, 5B (interconnector, Symptom Q).

STEP 6. Check BASELINE control.

NORMAL INDICATIONS:
1. With SELECTOR switch in position 4 and TEST switch in position 1, a double baseline is obtained on range oscilloscope.
2. As BASELINE control is rotated clockwise, it has the effect of peeling one line off the top trace and piling it up on the lower trace.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
1. Single baseline appears on range scope.	1. Interconnector (Symptoms N, O, P, Q, T).

STEP 7. Making sure that at least 30 seconds have elapsed since transmitter LOW VOLTAGE switch was turned ON, and that HIGH VOLTAGE CONTROL is in extreme counterclockwise position, turn HIGH VOLTAGE toggle switch to ON position.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
1. Blower motor stops operating and meter light 112 goes out. Circuit breaker may *kick off*, turning all indicator lamps out.	1. (Transmitter, Symptom G.)

STEP 8. Place SELECTOR switch on OPERATE position. Then rotate HIGH VOLTAGE CONTROL in clockwise direction until meter reads 3.5 kilovolts. When normal indications below are observed, return SELECTOR switch to STANDBY position.

NORMAL INDICATIONS:
1. Meter reads 3.5 kilovolts with variac at normal setting.
2. Current reading, when VOLTAGE CURRENT toggle switch is pressed, is about 2 milliamperes with STANDBY OPERATE switch in OPERATE position.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
1. Normal current and voltage reading cannot be obtained.	1. (Transmitter, Symptoms I, J, L, M, N, O, P.)
2. Overload relay *kicks off*.	2. (Transmitter, Symptoms E, K, P, Q.)
3. Variac smokes and fuse may blow as control knob is rotated.	3. (Transmitter, Symptom H.)

STEP 9. Set SELECTOR switch to OPERATE position.

NORMAL INDICATION: Normal IFF picture with main pulse should appear on display Oscilloscope BC-412 screen.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
1. No picture on screen or distorted picture.	1*a*. Radar range scope (TM 11-1506, SCR-268). *b*. (Interconnector, Symptoms B through K.)
2. No IFF picture on screen, radar picture normal.	2*a*. (Receiver, Symptoms E through J.) *b*. (Interconnector, Symptom E.)

126. Trouble Shooting Based on Seven Test Positions

The following tabulation of normal and abnormal conditions is based on the seven test positions, and is used to further isolate trouble after the starting procedure has been followed. It will sectionalize trouble to particular components and to channels of the interconnector. The correct settings for taking these positions are given in chapter 3, TM 11-1318.

POSITION 1: BASELINE.

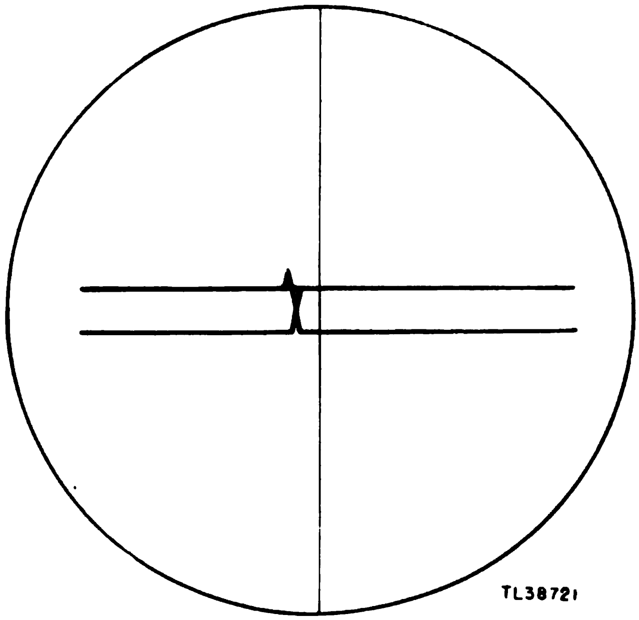


Figure 100. Baseline pattern.

ABNORMAL CONDITIONS — PROBABLE LOCATION OF FAULT

1. See Step No. 6 for abnormal conditions and probable location of fault.

POSITION 2: DIVISION.

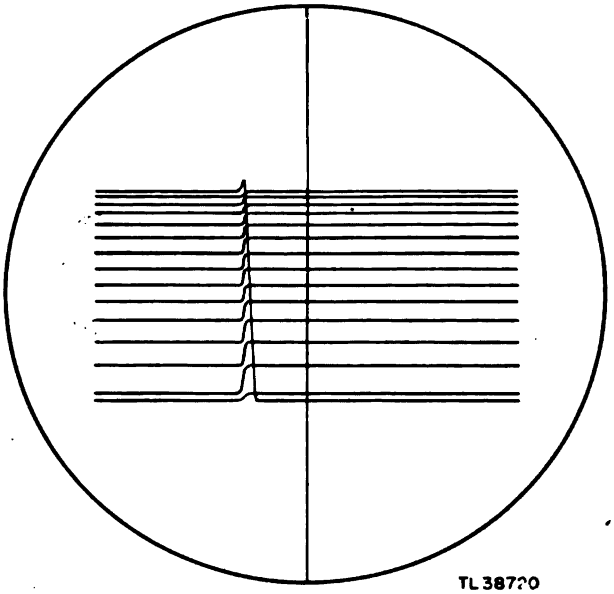


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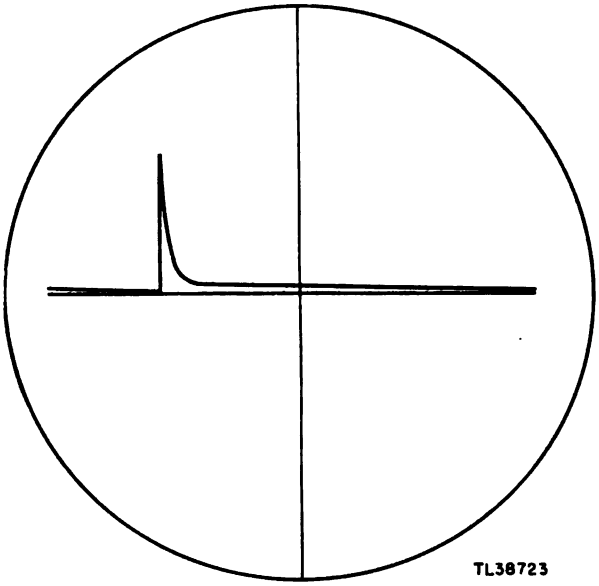
Figure 101. Division pattern.

ABNORMAL CONDITIONS — PROBABLE LOCATION OF FAULT

1 See Step No. 5 for abnormal conditions and probable location of fault.

POSITION 3: TRANSMITTER SYNC PATTERN.



TL38723

Figure 102. Transmitter synchronising signal pattern.

ABNORMAL CONDITIONS	PROBABLE LOCATION OF FAULT
1. Horizontal sweep but no vertical deflection.	1. (Interconnector, Symptom R.)

POSITION 4: CALIBRATION SIGNAL.

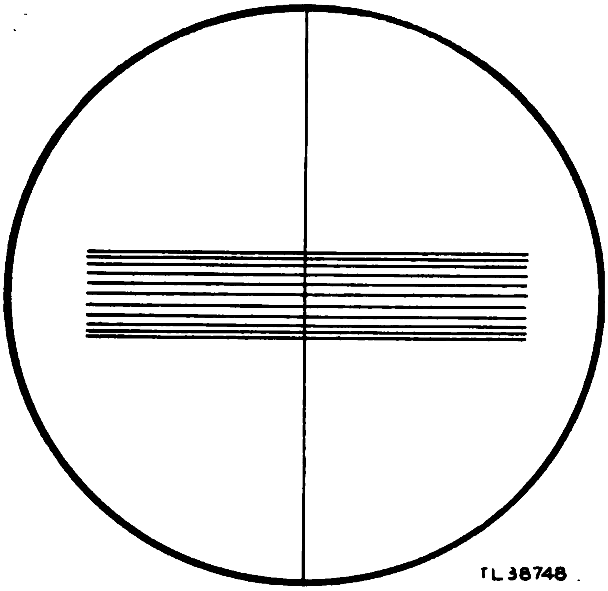


Figure 103. Calibration pattern.

ABNORMAL CONDITIONS	PROBABLE LOCATION OF FAULT
1. Horizontal sweep but no vertical deflection.	1. (Interconnector, Symptom S.)

POSITION 5A: MONITOR OUTPUT.

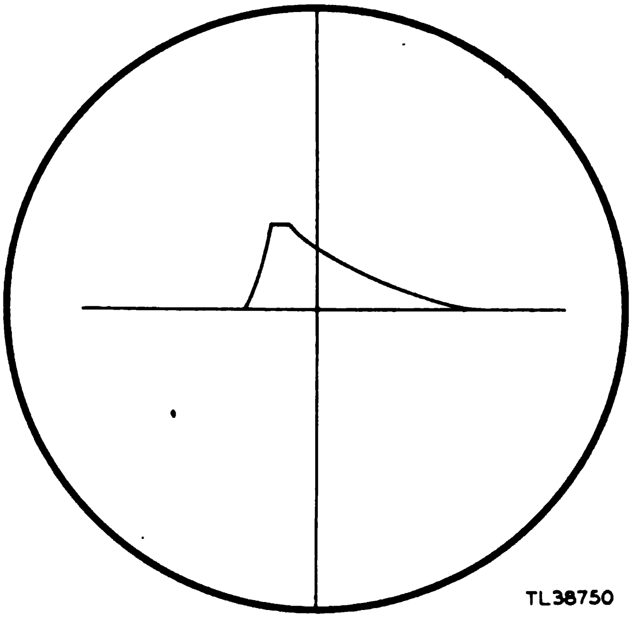


Figure 104. Monitor output.

ABNORMAL CONDITIONS	PROBABLE LOCATION OF FAULT
1. Horizontal sweep but no vertical deflection.	1*a*. Transmitter trouble-shooting chart if position 3 is normal. *b*. Interconnector, if position 3 is abnormal (Symptom R).

POSITION 5B: PULSE WIDTH (SIGNAL WIDTH POWER switch pressed to SIGNAL WIDTH position).

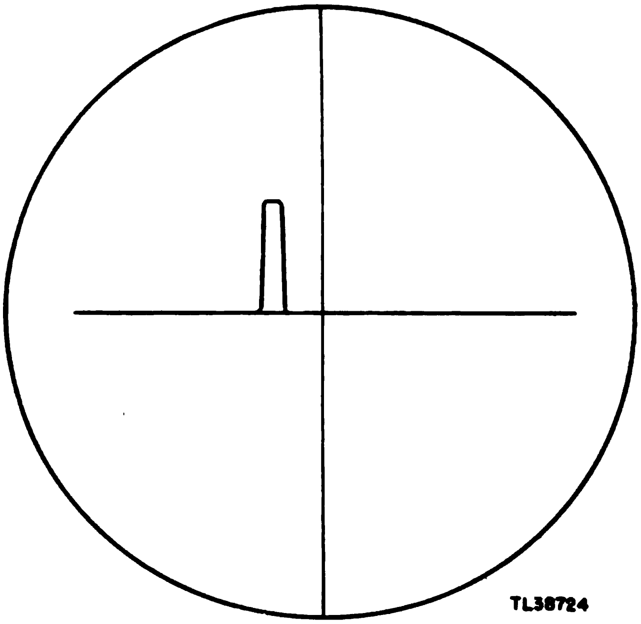


Figure 105. Pulse width.

ABNORMAL CONDITIONS	PROBABLE LOCATION OF FAULT
1. Horizontal sweep but no vertical deflection.	1*a*. Transmitter trouble-shooting chart, if position 3 is normal. *b*. Interconnector, if position 3 is abnormal (Symptom R).

POSITION 6: SYNCHRONIZING VOLTAGE PATTERN.

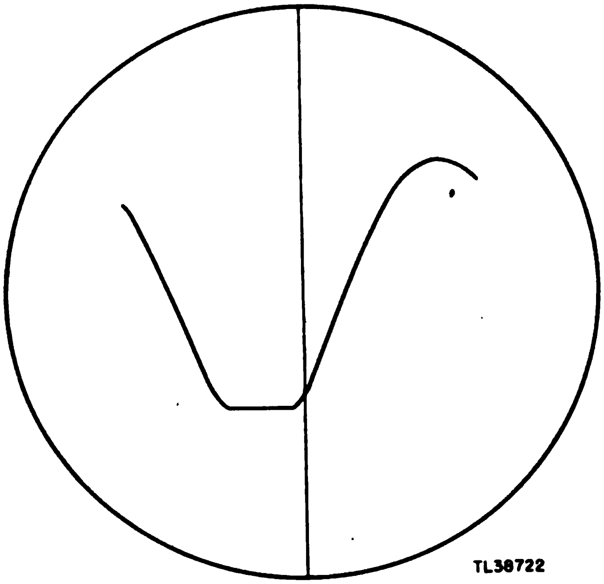


Figure 106. Synchronizing voltage pattern.

ABNORMAL CONDITIONS

1. Horizontal sweep but no vertical deflection.

PROBABLE LOCATION OF FAULT

1. (Interconnector, Symptoms T, U.)

POSITION 7: RECEIVER OUTPUT.

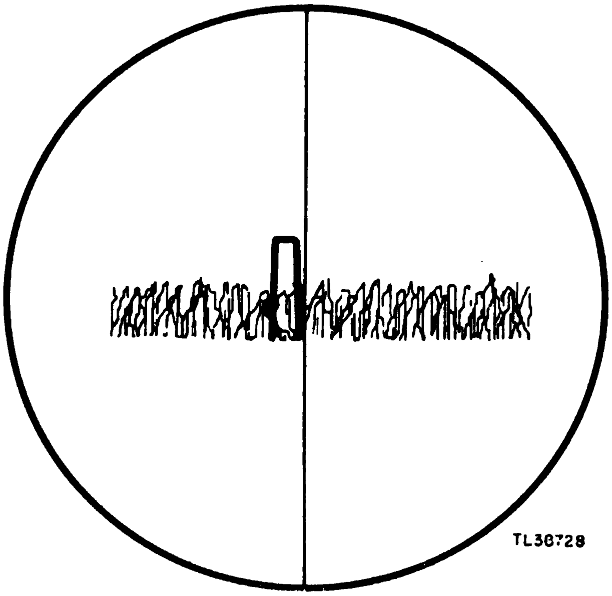


Figure 107. Receiver output.

ABNORMAL CONDITIONS

1. Horizontal sweep but no vertical deflection.
2. Horizontal sweep, vertical deflection shows *grass* but no transmitted pulse.

PROBABLE LOCATION OF FAULT

1. Receiver trouble-shooting chart.

2*a*. Receiver not tuned to frequency of transmitter.

b. Transmitter trouble-shooting chart.

Section III. TRANSMITTER OF THE RC–148 AND RC–148–B

> *Warning: Voltages sufficient to cause death on contact are exposed at many points on this unit. Do not place hands or arms within unit when the high voltage is on. Do not make any connection into the unit which will bring high voltages out to an exposed point. Make all tests with high voltages off. Always ground high-voltage capacitors before touching them or their associated circuits.*

127. Reference Data

To assist the maintenance personnel while trouble shooting on the transmitter, figures have been provided. In section II, chapter 1 there are partial schematics and block diagrams and at the end of this section there are groups of figures containing views of the transmitter, a complete schematic and wiring diagram, drawings of terminal boards, voltage and resistance measurements and waveforms.

128. Introduction

In section II, trouble shooting based on the starting procedure is discussed. On the basis of steps 1, 2, 7, 8, and 9 in the starting procedure, troubles in many of the circuits of the transmitter can be spotted. In the trouble-shooting chart in the following section, most of the symptoms can be observed while the equipment is being put into operation. Troubles which occur during the starting procedure, except for steps 3, 4, 5, and 6, will almost always indicate that the cause is in the transmitter. It is therefore very important to observe and record all the symptoms carefully, so that when the transmitter is removed from the rack there is no time wasted in determining the exact cause of the trouble. There are, however, many symptoms which are revealed after the starting procedure is accomplished and while the set is in operation. Troubles of this nature are also discussed in this section.

129. Localizing Trouble to Transmitter

If the IFF transmitter main pulse does not appear on the screen of the display oscilloscope when the SELECTOR switch is in the OPERATE position, the trouble may be in any of the three major components: receiver, transmitter, or interconnector. To determine which component is at fault the TEST switch should be used. Turn the test switch to position 3 and the SELECTOR switch to position 4 or 5. If the proper pattern appears, then the control unit is not at fault, and it can be assumed that the transmitter is receiving its synchronizing pulse from the interconnector. Now turn to position 5. If the correct pattern is not observed, it can be concluded that the transmitter is at fault. Positions 3 and 5 together are usually a definite check on the operation of the transmitter, but it is always advisable to check position 7 also. In this position, the main transmitter pulse should be seen in the background of the receiver grass. This indicates that the transmitter is operating. As soon as the trouble has been localized to the transmitter, it is necessary to replace the faulty component with the spare; then consult the trouble-shooting chart. The first 12 symptoms do not require anything more than an ohmmeter and a tube checker. Some of the other troubles, however, call for signal tracing or voltage checks. Details which explain how to set up the equipment for a more exhaustive analysis follow.

130. Setting Up Transmitter For Trouble Shooting

a. The components and test equipment needed for trouble shooting the transmitter are:

(1) Interconnector (spare).

(2) Cable 101 (spare).

(3) Cable 103 (spare).

(4) Volt-ohmmeter.

(5) Signal generator (audio).

(6) Test scope. A convenient arrangement of this equipment set up for trouble shooting may be seen in figure 108.

b. To prepare for trouble shooting the transmitter, make the following connections and checks:

(1) Connect cable 101 to the interconnector.

(2) Connect cable 101-B from the interconnector to the transmitter.

(3) Connect cable 103 from the transmitter to any a-c outlet. It will be necessary to make a few changes at one end of the cable to fit an ordinary outlet plug.

(4) Set the test scope controls for X input.

(5) Tape down the transmitter interlock switches.

(6) Place all power switches on the components in the OFF position.

(7) Connect the a-c power cord of the test scope to the a-c supply.

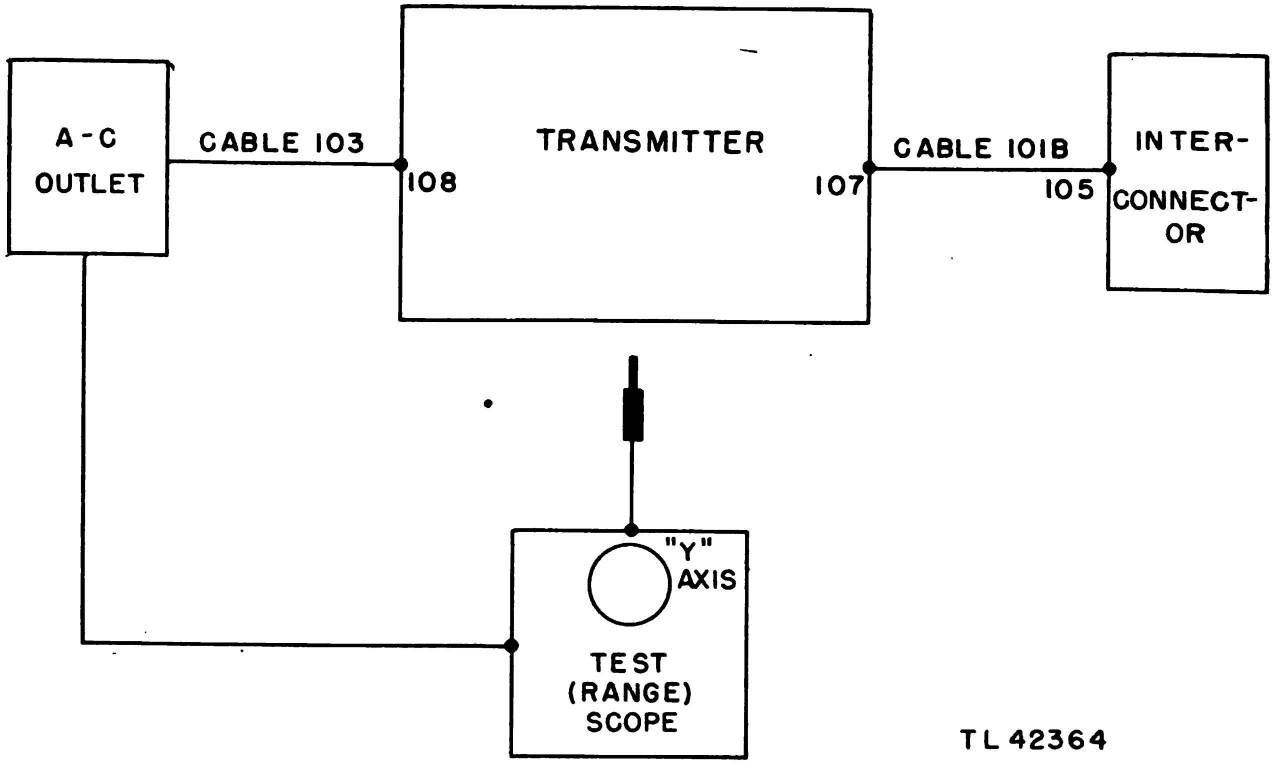


Figure 108. Transmitter, set up for trouble shooting, block diagram.

131. Signal Tracing Modulator Section

a. Signal tracing in the modulator section is complicated by the fact that the input and output waveforms of the various stages are of very short duration. However, this difficulty may be overcome partly by using a fast sweep on the test scope.

b. Set the SELECTOR switch on the interconnector to position 5 and the TEST switch to position 5. With this arrangement, the synch pulse from the interconnector is fed to the transmitter. The Y-input signals may be taken from any terminal in the modulator section of the transmitter. The frequency of the sweep of the test (range) scope should be set so that one to two cycles of the Y-input signal appear on the screen.

132. Accuracy Check of Meter 137

If a voltmeter having a 5,000-volt range is not available, use an ohmmeter to check the accuracy of the meter. Place the ohmmeter test leads across the meter terminals of a good meter. The ohmmeter range control may be turned to a higher or lower range setting, or the zero adjust control may be turned in order to obtain the most convenient meter indication. Then without further adjustment of the ohmmeter, place the ohmmeter test leads across the terminals of the suspected meter. If the reading of the suspected meter does not agree with the reading of the good meter, the suspected meter is defective.

133. Transmitter Trouble-shooting Chart

A. SYMPTOM:

Red indicator lamp, 113, fails to light (step 1).

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective lamp.	1*a*. Replace the lamp. *b*. If trouble is not cleared, see item below.
2. Open interlocks 118–1 to 118–4.	2*a*. Check visually if cover of transmitter is properly placed on transmitter chassis. Readjust cover if necessary. *b*. Check interlocks for continuity with ohmmeter. *c*. If trouble is not cleared, see item below.
3. Defective CIRCUIT BREAKER 117.	3*a*. Check circuit breaker and replace if necessary. *b*. If trouble is not cleared, see item below.
4. Open in a-c supply circuit to connector 108.	4*a*. Check a-c circuit from terminals 7 and V.M. on the terminal strip in Junction Box JB-22 to the connector 103 on JB-22. *b*. From connector 103 on JB-22 make continuity test to connector 108 on transmitter.

B. SYMPTOM:

CIRCUIT BREAKER 117 does not remain in ON position (step 1).

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective CIRCUIT BREAKER 117.	1*a*. Check circuit breaker and replace if necessary. *b*. If trouble is not cleared, see item below.
2. Short in a-c input circuit in transmitter, receiver, or interconnector.	2*a*. Remove cables to plugs 107 and 109. If circuit breaker opens, fault is in transmitter. Turn off power and use an ohmmeter to determine location of fault. *b*. If trouble is not in transmitter, connect cables to plugs 107 and 109, in turn, to determine in which component fault lies. *c*. After determining in which component fault lies, use an ohmmeter to determine location of short.

C. SYMPTOMS:

1. Blower motor cannot be heard when LOW VOLTAGE switch 114-3 is put in ON position.
2. Meter lamp 112 lights (step 2).

PROBABLE LOCATION OF FAULT / PROCEDURE

1. Defective wiring to blower motor.
   - 1a. Turn off power and check for continuity with an ohmmeter.
   - b. If trouble is not cleared, see item below.
2. Defective blower motor.
   - 2. Check by replacing motor. (See ch. 3.)

D. SYMPTOMS:

1. Meter lamp 112 does not light (step 2).
2. Blower motor operates (step 2).

PROBABLE LOCATION OF FAULT / PROCEDURE

1. Defective meter lamp.
   - 1a. Replace the lamp.
   - b. If trouble is not cleared, see item below.
2. Short or open in power supply of meter lamp 112.
   - 2a. If filament of VT-231 is glowing, turn off power and check meter light circuit for continuity from pin 7 of transformer 132 to lamp.
   - b. If filament of VT-231 is not glowing, check for open in primary of transformer 132. Also check for open in filament secondary of transformer 132 terminals (6 and 7).

E. SYMPTOMS:

1. Circuit breaker kicks out.
2. All indicator lamps go out (step 2).

PROBABLE LOCATION OF FAULT / PROCEDURE

1. Short in primary of transformer 130, 132, or 133.
   - 1a. Isolate each transformer from the rest of the circuit and measure the resistance across the primary terminals. Values should be:
     Transformer 132, terminals 1 to 2, 20 ohms.
     Transformer 133, terminals 1 to 2, 16 ohms.
     Transformer 130, terminals 5 to 6, 9 ohms.
   - b. If trouble is not cleared, see item below.
2. Short in blower motor 111.
   - 2a. Check resistance of blower motor winding. It should be 100 ohms when measured at the male plug.
   - b. If trouble is not cleared, see item below.
3. Short in secondary of transformer 130.
   - 3a. Check oscillator tube filaments for glow.
   - b. If no glow is present, check for short in secondary windows (terminals 3 and 4 for filaments of oscillators, terminals 1 and 2 for filaments of h-v rectifier).

F. SYMPTOMS:

1. Meter lamp 112 does not light (step 2).
2. Blower motor cannot be heard (step 2).

PROBABLE LOCATION OF FAULT

1. Fuse 141–1 or 141–2 open.

PROCEDURE

1a. Check fuses for open. If fuses are open, there is a short in the power supply.

b. Isolate each transformer from the rest of the circuit and measure the resistance across the primary terminals. Values should be:
Transformer 132, terminals 1 to 2, 20 ohms.
Transformer 133, terminals 1 to 2, 16 ohms.
Transformer 130, terminals 5 to 6, 9 ohms.

c. If trouble is not cleared check the resistance of the blower motor windings. It should be 100 ohms when measured at the male plug.

PROBABLE LOCATION OF FAULT

2. Defective low-voltage switch 114–3.

PROCEDURE

2. If fuses are not open, check switch for continuity.

G. SYMPTOMS:

1. Blower motor stops operating (step 7).
2. Meter lamp 112 goes out (step 7).
3. Circuit breaker may kick off, turning all indicator lamps out (step 7).

PROBABLE LOCATION OF FAULT

1. Blown fuses 141–1 and 141–2.

PROCEDURE

1a. Check fuses 141–1 and 141–2 for open. Fuses generally blow before circuit breaker *kicks out.*

b. Before throwing HIGH VOLTAGE toggle switch to ON position again, see item below.

PROBABLE LOCATION OF FAULT

2. Short in variable windings of variac 136.

PROCEDURE

2a. To determine if short is in variac, measure resistance of parallel combination of variac winding 136 and the primary transformer 131, between terminals 1 and 2 (fig. 123) of the variac. This resistance should vary from zero to 5 ohms as variac control knob is rotated clockwise.

b. If above test is not conclusive, measure resistance of variac 136 alone when control knob is fully counterclockwise between terminals 1 and 3. (See fig. 123.) This resistance should be 15 ohms.

c. If trouble is not cleared, see item below.

PROBABLE LOCATION OF FAULT

3. Short in the input of the high voltage circuit beyond switch 114–2.

PROCEDURE

3a. Check for short to ground at switch 114–2.

b. Check for short to ground at terminals of variac 136.

c. Check for short to ground at contacts of overload relay 138.

H. SYMPTOMS:

1. Variac 136 smokes as control knob is rotated clockwise (step 8).
2. Meter lamp 112 may go out (step 8).

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Short in primary of transformer 131 in transmitter.	1*a*. Turn HIGH VOLTAGE toggle switch to OFF position immediately. Measure resistance of parallel combination of variac winding 136 and primary of transformer 131, between terminals 1 and 2 (fig. 123) of the variac. This resistance should vary from zero to 5 ohms as variac control knob is rotated clockwise.
	b. If above test is not conclusive, check primary resistance of transformer 131 (terminals 1 and 2 of transformer). This should be 6 ohms.
	Note. It is necessary to isolate transformer 131 from the variac 136 before making the measurement.
	c. If meter lamp 112 is out replace blown fuse 141–1 or 141–2 before turning the HIGH-VOLTAGE switch to ON position.

I. SYMPTOMS:

1. No current or voltage indication on meter 137 as variac 136 control knob is rotated clockwise (step 8).
2. All other indications normal (step 8).

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective h-v power supply circuit.	1*a*. Check by replacing Tube VT-119.
	b. If trouble is not cleared measure resistance between VT-119 plate cap and chassis. Resistance should be 14,000 ohms.
	c. Check filament supply of VT-119 for open or short if filament is not glowing.
	d. Check for open in variac windings and in primary of transformer 131.
	e. If trouble is not cleared, see item below.
2. Open bleeder network 72–1 and 72–6.	2*a*. Make continuity test.
	b. If trouble is not cleared, see item below.
3. Dirty contacts on overload relay 138 shorting bar.	3*a*. Make continuity test.
	b. If trouble is not cleared, see item below.
4. Defective meter circuit.	4*a*. Check capacitor 17 for short.
	b. Check toggle switch 115 for continuity.
	c. Check meter. (See par. 132.)
	d. Make a complete check of meter circuit for short or open.

J. SYMPTOMS:

1. Meter reads 3.5 kilovolts but variac is not in normal position (step 8).
2. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Partial short of variac 136 or transformer 131.	1*a*. Press VOLTAGE CURRENT toggle switch 115 to current position. If current reading is normal, fault is in the high-voltage power supply. *b*. Check capacitor 11 for a leak. *c*. Measure resistance of parallel combination of variac winding 136 and transformer primary 131 between terminals 1 and 2 (fig. 123) of the variac. This resistance should vary ***evenly*** from zero to 5 ohms as variac control knob is rotated clockwise. *d*. If above test is not conclusive, check primary resistance of transformer 131 (terminals 1 and 2 of transformer 131). This should be 6 ohms. *Note.* It is necessary to isolate transformer 131 from the variac 136 before making the measurement. *e*. Measure the secondary resistance of transformer 131 (terminals 3 and 4). Resistance should be 6 ohms.
2. Defective meter circuit.	2*a*. If current reading is abnormal fault is in the meter circuit. *b*. Check meter as indicated in ch. 2, sec. III, paragraph 132. *c*. Check capacitor 17 for open or leak. *d*. Measure resistance of resistor 57–2. Resistor should be 10,000 ohms.

K. SYMPTOMS:

1. Overload relay 138 ***kicks off*** as HIGH VOLTAGE CONTROL knob is turned up (step 8).
2. Meter reading returns to zero (step 8).
3. All other indications normal (step 8).

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Gassy oscillator tubes, 826.	1*a*. Substitute new tubes. *b*. If trouble is not cleared, see item below.
2. Short in d-c high-voltage circuit.	2. Make a complete check for short in the high-voltage circuit. The resistance at capacitor 11 to ground should be about 8 megohms.

L. SYMPTOMS:

1. No voltage or current reading on meter 137 (step 8).
2. Meter light 112 goes out due to a blown fuse or CIRCUIT BREAKER 117 *kicking out* as variac control knob is turned clockwise (step 8).

PROBABLE LOCATION OF FAULT	PROCEDURE
Note. If the circuit breaker has not kicked off replace fuse 141-1 or 141-2.	
1. Shorted secondary of transformer 131.	1*a*. Measure resistance of transformer secondary (terminals 3 and 4). This should be 12,000 ohms.
2. Short in plate circuit of h-v rectifier Tube VT–119.	2. Check resistance between plate cap of VT–119 and ground. Resistance should be 14,000 ohms.

M. SYMPTOMS:

1. Voltage meter reading lags, then jumps suddenly to a high value, and finally increases normally as variac control is rotated (step 8).
2. Current shoots up to a high value and then drops back to zero as variac control is rotated (step 8).

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Open in grid circuit of oscillator tubes, 826.	1. Check resistance of grid of tubes 826 to ground. Resistance should be 212K ohms.

N. SYMPTOMS:

1. Current reading on meter 137 is zero as variac control is turned up (step 8).
2. Voltage reading on meter 137 is normal as variac control is turned up (step 8).
3. All other indications normal (step 8).

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Improper adjustment of bias control.	1*a*. Readjust bias control. *b*. If trouble is not cleared, see item below.
2. Defective switch 115.	2*a*. Check switch for continuity. *b*. If trouble is not cleared, see item below.
3. Defective bias potentiometer or potentiometer circuit.	3*a*. Check resistance of potentiometer 60. Resistance should vary from zero to 10,000 ohms as control is varied. *b*. If trouble is not cleared, see item below.
4. Defective positive low-voltage d-c power supply.	4*a*. Check the plate voltage of the blocking oscillator VT–231. Plate voltage should be 380 volts. *b*. If plate voltage is abnormal check 1-v rectifier tube VT–244 and its associated circuit.
5. Defective stage in modulator channel.	5*a*. If plate voltage is normal, signal trace the modulator channel. *b*. Check resistor 70. Its resistance should be approximately 4,700 ohms.

O. SYMPTOMS:

1. Current reading on meter 137 excessive (step 8).
2. Voltage reading on meter 137 normal (step 8).
3. All other indications normal (step 8).

PROBABLE LOCATION OF FAULT

1. Improper bias adjustment.

PROCEDURE

1. Readjust bias control on front panel of transmitter.

P. SYMPTOMS:

1. Overload relay 138 *kicks off* when voltage reads about 250 volts on meter 137 (step 8).
2. Current reading on meter 137 is high (step 8).
3. All other indications normal (step 8).

PROBABLE LOCATION OF FAULT

1. Open primary in transformer 133.
2. Defective bias rectifier Tube VT-244 or associated circuit.
3. Gassy oscillator tubes, 826.

PROCEDURE

1*a*. Check continuity (terminals 1 and 2).

Note. It is necessary to isolate transformer primary from rest of circuit.

b. If trouble is not cleared, see item below.

2*a*. Turn the h-v control completely clockwise and measure the voltage across resistor 68. Voltage should be 380 volts.

b. If voltage is abnormal, check bias rectifier Tube VT-244.

c. Make a complete check of bias power supply.

3. If voltage across resistor 68 is normal check for gassy oscillator tubes 826 by replacement.

Q. SYMPTOMS:

1. Overload relay 138 *kicks off* at about 1,750 volts (step 8).
2. Current surge is registered on meter 137 (step 8).
3. All other indications normal (step 8).

PROBABLE LOCATION OF FAULT

1. Defective wiring to capacitor 11.
2. Capacitor 11 open.

PROCEDURE

1*a*. Make a continuity test from pin 4 of VT-119 to the capacitor.

b. If trouble is not cleared, see item below.

2*a*. Apply an ohmmeter across the two terminals of the capacitor.

b. If the meter needle does not deflect, capacitor is open. Replace capacitor.

R. SYMPTOMS:

1. Current reading of approximately 2 milliamperes on meter 137 when STANDBY OPERATE switch is in STANDBY position (step 8).
2. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Improper bias adjustment of blocking oscillator.	1. Readjust bias control for zero current in STANDBY position and approximately 2 milliamperes in OPERATE position.
2. Defective meter.	2. Turn off all power to the transmitter and zero meter.

S. SYMPTOMS:

1. Pattern on test scope for position 5B (signal width) appears wider than normal.
2. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective artificial line.	1a. Check for short in any of the capacitors 5, 6–1, 7, 6–2, or 8. b. If trouble is not cleared, check inductors 140 A, B, C, or D for open circuit.

T. SYMPTOMS:

1. Transmitter signal width waveform not obtainable on test position 5B.
2. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective relay 139 or a-c input circuit.	1a. Check contacts of relay 139 for cleanliness. b. Check voltage across coil of relay 139 when interconnector switch 115 is in SIGNAL WIDTH position. Voltage should be 6.3 volts. c. If voltage is normal, replace the relay. If voltage is not normal, make a continuity test from switch 115 in interconnector to relay 139 in transmitter.

U. SYMPTOMS:

1. No picture on test scope in position 5.
2. Position 7 shows main IFF pulse with receiver grass.
3. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective monitoring section in transmitter.	1a. Replace monitoring diode 9006. b. Replace original diode, and insert new VT-202. c. Make a voltage and resistance check of the two stages above. d. If trouble is not cleared, see item below.
2. Defective cabling to interconnector.	2. Make a continuity test from the output of VT-202 through plug 107 in transmitter, through plug 105 in interconnector, to test switch 113C, terminal 5.

134. Procedure For Replacing Defective Electrical Parts In Transmitter

a. GENERAL. The information following is to assist the radar repairman in replacing defective electrical parts in Transmitter BC–1072–A. Note that such replaceable items as small resistors, capacitors, tube sockets, and tubes are not covered in these procedures. Neither is a procedure given when the replacement for the part presents no special difficulties. The replacement procedures following have been worked out experimentally and represent the shortest and best method of accomplishing the work.

Cautions: (1) Before replacing a defective part, observe carefully its position, method of mounting, and wiring. This insures the correct installation of the replacement part.

(2) When removing such parts as relays, switches, and terminal boards which have several wires attached to their terminals, be sure to tag the wires carefully so that they will be replaced in their proper position.

(3) When disassembling a component, the screws, nuts, bolts, washers, and other small parts which are removed should be put in some small container to prevent their loss.

b. LIST OF ITEMS COVERED.

(1) *Front panel of transmitter* (par. 135).
- Meter light.
- Meter light socket and bracket.
- Meter.
- Pilot light jewel.
- Pilot light bulb.
- Pilot light socket.
- Pilot light jewel holder.
- Circuit breaker.

(2) *Top of transmitter chassis* (par. 136).
- Transformers and chokes.
- Variac.
- Blower outlet.
- Overload relay 138.
- Capacitor 12.
- Artificial line.
- Relay 139.
- Power measurements unit.
- Vernier tuning flexible shaft.

(3) *Lower part and side of transmitter chassis* (par. 137).
- Connectors, Amphenol 108, 109, 107, and 106.
- Connector, Amphenol 105.
- Capacitor 11.
- Resistor 68.
- Capacitors 10–1, 10–2.
- Capacitors 9–1, 9–2.
- Antenna output line.

(4) *Oscillator compartment* (par. 138).
- Cathode line porcelain stand-off insulator.
- Antenna line porcelain stand-off insulator.
- Antenna line ceramic support.
- Cathode line ceramic support (upper line).
- Cathode line ceramic support (lower line).
- Grid line ceramic support (open end).
- Grid line ceramic support (shortened end).
- Porcelain tube sockets and porcelain tube socket stand-off insulators.
- Resistor 71.
- Capacitor 20 and antenna line.
- Capacitor 21.
- Resistor 71 mounting board.
- Cathode line (upper line).
- Cathode line (lower line).
- Grid line.

135. Procedure For Replacing Items On Front Panel of Transmitter

a. METER LIGHT. (1) Remove the screws at the four corners of the meter light shield and remove the shield.

(2) The lamp is seated in a bayonet type socket. To remove, press down and turn a quarter turn.

(3) To install a new lamp, reverse removal procedure.

b. METER LIGHT SOCKET BRACKET. (1) Proceed as above in removing meter light. After lamp has been removed, unsolder the two connections to the socket.

(2) Remove the bracket and socket from the front panel by removing the one screw holding the bracket to the panel.

(3) To install a new bracket socket, reverse the removal procedure.

c. METER. (1) Remove the two bolted connections from the terminals of the meter.

(2) From the outside edge of the meter case on the front panel remove the three screws holding the meter to the panel and remove the meter.

(3) To install the new meter, reverse the removal procedure.

d. PILOT LIGHT JEWEL. (1) Grasp the metal rim of the jewel and turn it; at the same time pull outward. If it cannot be moved, insert a screw driver between the metal rim and the panel and gently pry the assembly away from the panel.

(2) To install the new jewel, simply push it into place in the holder.

e. PILOT LIGHT BULB. (1) This bulb can be removed and replaced without taking the transmitter from the rack. Simply remove the jewel, as described above, and unscrew the bulb from its socket.

(2) To install the new bulb reverse the removal procedure.

f. Pilot Light Socket. (1) Unsolder the four connections to the socket.

(2) Compress the sides of the metal mounting clamp and unhook it from the pilot light jewel holder.

(3) To install the new socket, reverse removal procedure.

g. Pilot Light Jewel Holder. (1) Remove the pilot light socket as described above; it is not necessary to unsolder the connections to the pilot light socket terminals.

(2) From the back of the panel, remove the locknut which secures the holder to the panel.

(3) Remove the holder by pushing it out through the front panel.

(4) To install the new holder, reverse removal procedure.

h. Circuit Breaker. (1) Remove Tubes VT-231, VT-94, and VT-244 which are adjacent to the circuit breaker on the chassis.

(2) From the front panel remove the two screws which hold the circuit breaker in place.

(3) Withdraw the circuit breaker from the chassis as far as the wiring allows so that the terminal connections are accessible.

(4) Remove the connections from the terminals at each end of the circuit breaker by removing the two screws which hold them in place.

(5) To install the new circuit breaker, reverse removal procedure.

136. Top of Transmitter Chassis

a. Transformers and chokes. (1) Remove bolted connections from terminals.

(2) Remove the bolts from the mounting flanges on the chassis.

(3) To install new part, reverse removal procedure.

b. Variac. (1) Remove knob by loosening setscrew in center of knob with a screw driver.

(2) Remove the three nuts holding the terminal connections and remove the connections.

(3) Remove the two bolts immediately above, and the one below, the adjusting shaft on the front of the mounting bracket.

(4) To install new variac, reverse removal procedure.

c. Blower Outlet. (1) Remove the entire blower outlet mounting bracket by removing the two screws holding it to the chassis.

(2) Turn the assembly over and remove the two bolted connections.

(3) Unscrew the two bolts from the top of the bracket and remove the defective outlet.

(4) To install new outlet, reverse removal procedure.

d. Overload Relay 138. (1) Remove the four screws holding the cover on the relay and remove the cover.

(2) Unscrew the six slotted hexagonal nuts and remove the six connections to the relay.

(3) Remove the four bolts at the corners of the mounting board and lift off the defective relay.

(4) To install new relay, reverse removal procedure.

e. Capacitor 12. (1) Remove the three soldered connections and resistor 67 from the terminals of the capacitor.

(2) With an off-set screw driver, remove the two bolts holding the capacitor to the artificial line cover.

(3) To install a new capacitor, reverse the removal procedure.

f. Artificial Line. (1) Remove the cover from relay 139 by removing the four screws attaching it to the artificial line cover and power measurement unit subchassis.

(2) Remove the cover from the artificial line by removing the six bolts attaching the cover to the chassis.

(3) Lift the cover clear of the artificial line. Do not remove any of the connections to capacitor 12.

(4) Unscrew the four bolts holding the artificial line mounting board to the chassis and lift off the artificial line.

(5) To install the new artificial line, reverse removal procedure.

Note. One of the bolts which holds the cover of the artificial line to the chassis is also used to ground the shield of the r-f line inside the oscillator compartment. When replacing the artificial line cover, be certain to replace these two ground connections. There is also a ground from a common side of resistor 67 and capacitor 12 and this must be reconnected when the cover is replaced.

g. Relay 139. (1) Remove the four screws which hold the cover of the relay, and remove the cover.

(2) Unsolder and remove the five connections to the relay.

(3) From the oscillator compartment remove the four screws which hold the small cover over the soldered connections to the tap on the antenna line.

(4) Unsolder the connections to the tap on the antenna lines.

(5) Unsolder and remove the four connections to the terminal strip on the power measurement subchassis.

(6) Remove the four screws at the four corners of the power measurement subchassis and lift it from the main chassis.

(7) From the under side of the power measurement subchassis, remove the terminal board by removing the two bolts at either end of the board.

(8) Lift the terminal board just enough to give access to the relay mounting screws and remove them. The relay may then be removed.

(9) Before installing the new relay, solder a jumper wire across the two inside terminals. Compare these connections with those on the old relay to be certain the work has been done correctly.

(10) To install the new relay, reverse the removal procedure.

h. POWER MEASUREMENT UNIT. (1) Remove the four screws which hold the cover of the relay 139 and remove the cover.

(2) If it is required that the entire power measurement unit subchassis be removed, it is necessary to unsolder the four connections to terminal board on the subchassis.

(3) From the oscillator compartment, remove the four screws which hold the small cover over the soldered connections to the tap on the antenna line.

(4) Unsolder the connections to the tap on the antenna line.

(5) Remove the four screws at the four corners of the power measurement subchassis and lift it from the main chassis.

(6) To replace the power measurement unit subchassis, reverse the removal procedure.

i. VERNIER TUNING FLEXIBLE SHAFT. (1) With an Allen wrench loosen the two setscrews that hold the coupling to the vernier tuning control on the front panel and remove the coupling.

(2) Loosen the two setscrews on the phenolic coupling to the gear shaft and remove the coupling.

(3) To install a new vernier tuning flexible shaft, reverse the removal procedure.

137. Lower Part of Side and Bottom of Transmitter Chassis

a. CONNECTORS, AMPHENOL, 106, 107, 108, AND 109. (1) Unsolder the connections to the pins of the socket.

(2) Remove the screws from the four corners of the mounting plate and remove the connector.

(3) To install new connector, reverse the removal procedure.

b. CONNECTOR, AMPHENOL, 105. (1) Unsolder the antenna connection and ground connection from the rear of the connector.

(2) From the outside of the transmitter case, remove the four screws within the circular cut-out portion of the assembly and remove the connector.

(3) To install the new connector, reverse the removal procedure.

c. CAPACITOR 11. (1) Short terminal of capacitor to ground with capacity safety shorting stick.

(2) Remove high-voltage lead by unscrewing nut and slipping connection off terminal.

(3) Loosen the bolt which holds the mounting clamp and slide the capacitor forward.

(4) To install new capacitor, reverse removal procedure.

d. RESISTOR 68. (1) Remove modulator tube 801.

(2) Remove nut from top of resistor.

(3) Remove fiber and mica washer under nut.

(4) Unsolder connection to resistor 61–4.

(5) Remove ground connection.

(6) Slide resistor off bolt.

(7) Slide new resistor on bolt and reverse removal procedure.

e. CAPACITORS 10–1, 10–2. (1) Remove two bolted connections to terminals.

(2) Remove four screws holding mounting bracket to chassis.

(3) Lift mounting bracket out and remove the defective capacitor.

(4) When installing the new capacitor, be sure that the fiber separators are included in the assembly.

(5) To install new capacitor, reverse removal procedure.

f. CAPACITORS 9–1, 9–2. (1) Remove capacitor 11. (See removal procedure listed above.)

(2) Unsolder the two connections to the terminals of capacitors 9–1, 9–2.

(3) Remove bolt holding mounting clamp around capacitor.

(4) Open the clamp sufficiently to allow the capacitor to be withdrawn.

(5) Withdraw the capacitor from the clamp.

(6) To install new capacitor, reverse removal procedure.

g. ANTENNA OUTPUT LINE. (1) From the back of connector 105, unsolder the antenna and ground connections.

(2) Remove the four mounting clamps which secure the line to the chassis.

(3) Remove the four screws which hold the small metal cover inclosing the soldered tap connection to

..ic power measurement unit and unsolder the connection.

(4) Unsolder the tap to the antenna line.

(5) The line may then be removed from the oscillator compartment.

(6) To install a new line, reverse the removal procedure.

138. Procedure For Replacing Items in Oscillator Compartment

To replace any of the parts listed below it is necessary to remove the case from the oscillator compartment. To accomplish this, perform the 23 basic steps. (See par. 203*a* through *w*.) After the 23 basic steps are completed, refer to the following detailed description for the procedure for the replacement of each item:

a. Cathode Line Porcelain Stand-off Insulator. (1) Perform the 23 basic steps. (See par. 203*a* through *w*.)

(2) From the back of the insulator, remove the one screw which attaches it to the shorting bar.

(3) Remove the three bolts which attach the insulator to the panel, and slide the insulator out.

(4) To install a new insulator, reverse the removal procedure.

b. Antenna Line Porcelain Stand-off Insulator. (1) Perform the 23 basic steps. (See par. 203*a* through *w*.)

(2) Remove the screw which attaches the insulator to the antenna line.

(3) Remove the screw which attaches the insulator to the panel and remove the insulator.

(4) To install a new insulator, reverse procedure.

c. Antenna Line Ceramic Support. (1) Perform the 23 basic steps. (See par 203*a* through *w*.)

(2) With an Allen wrench, loosen the setscrews and remove the shorting bar at the end of the antenna line.

(3) Remove the two bolts from each end of the ceramic support and remove the support from the metal upright.

(4) To install a new ceramic support, reverse removal procedure.

d. Cathode Line Ceramic Support (Upper Line). (1) Perform the 23 basic steps. (See par. 203*a* through *w*.)

(2) Remove the two bolts holding the metal bar on the outside of the ceramic support.

(3) With an Allen wrench loosen the four setscrews which hold the shorting bars in place on the upper cathode lines.

(4) Pull the metal bar forward which will remove the outside sheath of the lines.

(5) Remove the two bolts from either end of the support and remove the support from the metal uprights.

(6) To install new ceramic support, reverse the removal procedure.

e. Cathode Line Ceramic Support (Lower Line). (1) Perform the 23 basic steps. (See par. 203*a* through *w*.)

(2) Drop the bottom plate by removing the six screws attaching it to the mounting panel, metal upright, and tube socket mounting brackets.

(3) Remove the outer plate of capacitor 21 by entirely removing the setscrews which attach the grid leads (pins 3 and 5) to the capacitor.

(4) Remove the four screws holding the gear assembly mounting bracket to the tube socket mounting bracket.

(5) Remove the two screws holding the grid line brackets to the mounting panel.

(6) This exposes the under side of the tube sockets.

(7) Unsolder the cathode connections at lug attaching it to the cathode line.

(8) Unsolder pin 4 filament leads at the pin.

(9) Remove the four screws attaching the porcelain sockets to the tube socket porcelain stand-off insulator.

(10) Lift off the porcelain tube sockets which make accessible the six screws holding the cathode line (lower line) to the cathode line ceramic support (lower line). Remove these six screws.

(11) Loosen four Allen setscrews on the shorting bars.

(12) The cathode line (lower line) may now be removed.

(13) Remove the two screws which hold the cathode line ceramic support (lower line) to the metal uprights.

(14) To replace, reverse procedure.

f. Grid Line Ceramic Support (Open End). (1) Perform the 23 basic steps. (See par. 203*a* through *w*.)

(2) Perform steps 2 to 5 of the cathode line ceramic support (lower line) removal procedure.

(3) Remove the four screws holding the grid lines to the support.

(4) Remove the two screws attaching the support to the gear assembly mounting bracket.

(5) To replace, reverse removal procedure.

g. Grid Line Ceramic Support (Shorted End). (1) Perform the 23 basic steps. (See par. 203*a* through *w*.)

(2) Perform steps 2 to 5 of the cathode line ceramic support (lower line) removal procedure.

(3) Remove the two screws holding the shorting bar to the support.

(4) Remove the two screws holding the support to the grid line brackets.

(5) To replace, reverse removal procedure.

h. Porcelain Tube Sockets and Porcelain Tube Socket Stand-off Insulator. (1) Perform the 23 basic steps (par. 203*a* through *w*).

(2) Perform steps 2 to 9 of the cathode line ceramic support (lower line) removal procedure.

(3) Tube sockets may now be lifted off.

i. Resistor 71. (1) Perform the 23 basic steps (par. 203*a* through *w*).

(2) Drop the bottom plate by removing the six screws attaching to it the mounting panel, metal upright, and tube socket mounting bracket.

(3) To replace, reverse removal procedure.

j. Capacitor 20 and Antenna Line. (1) Capacitor 20 is an integral part of the antenna line. In order to replace capacitor 20, it is necessary to replace the entire antenna line assembly which includes capacitor 20.

(2) To begin this replacement perform the 23 basic steps. (See par. 203*a* through *w*.)

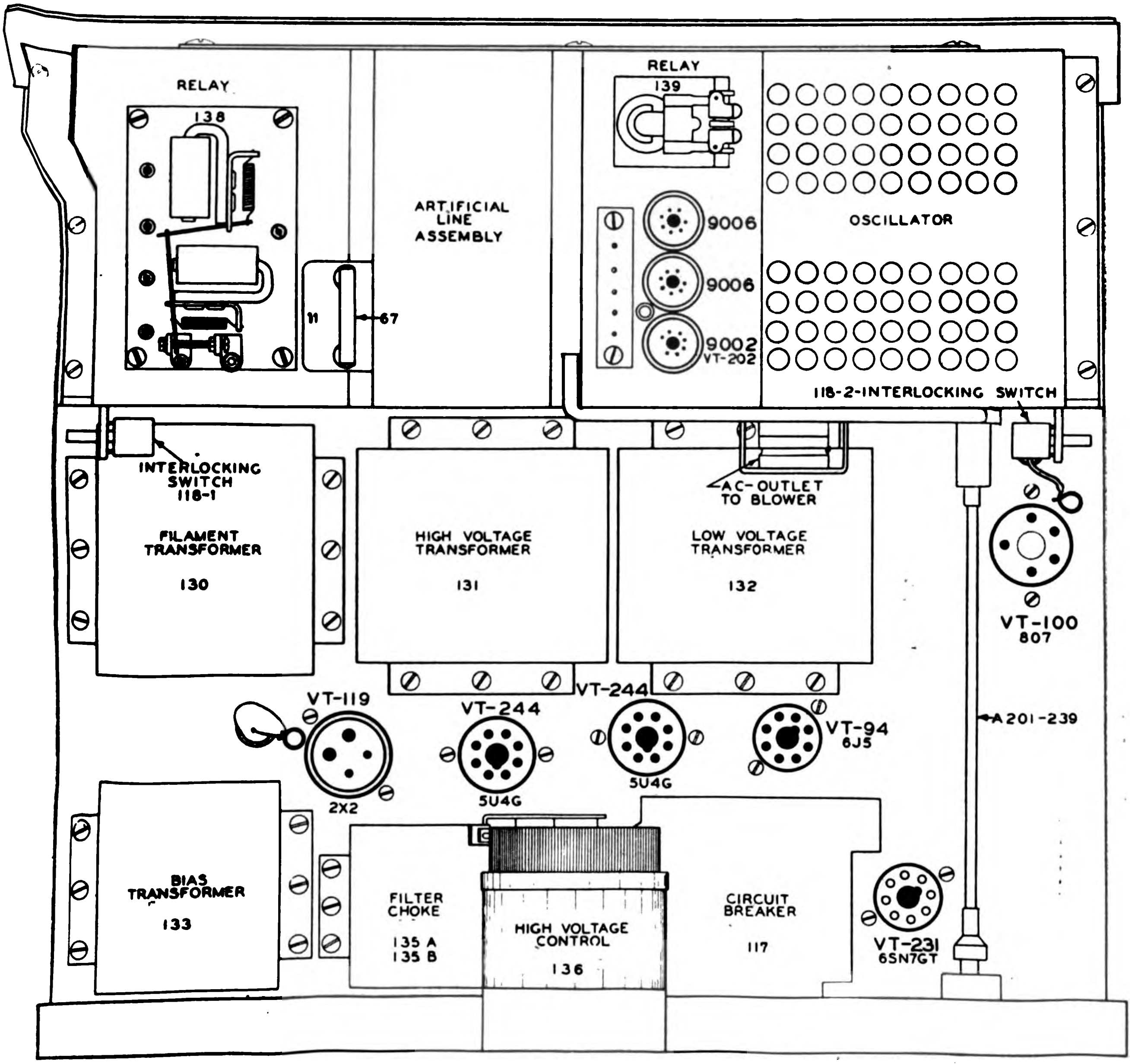


Figure 109. Transmitter, tube arrangement.

(3) With the Allen wrench loosen the two setscrews on the shorting bar and remove it from the antenna line.

(4) Remove the two screws which attach the antenna line to the stand-off insulators and remove line.

(5) To install the new antenna line and capacitor, reverse the removal procedure.

Caution: After the antenna line is installed, bring the capacitor plates together and make certain that they are parallel before tightening the stand-off insulator and the Allen setscrews. Then separate them at least 0.2 inches and have the entire capacitor approximately centered.

k. CAPACITOR 21. (1) Perform the 23 basic steps. (See par. 203*a* through *w*.)

(2) Drop the bottom plate by removing the six screws attaching it to the mounting panel, metal uprights, and tube socket mounting bracket.

(3) The gear assembly may now be moved by unscrewing the three screws that have become accessible.

(4) With an Allen wrench remove the middle section of capacitor 21 and if either of the side sections need replacing, unscrew and remove the tube grid pin lines and slide that section off.

(5) To install new capacitor, reverse removal procedure.

l. RESISTOR 71 MOUNTING BOARD. (1) Perform the 23 basic steps. (See par. 203*a* through *w*.)

(2) Perform steps 2 to 6 of the cathode line ceramic support (lower line) removal procedure, *e* above.

(3) Unsolder the plate line at one end of resistor 71 and the black covered high-voltage line at the other end.

(4) Remove the four screws at the corner of the mounting board.

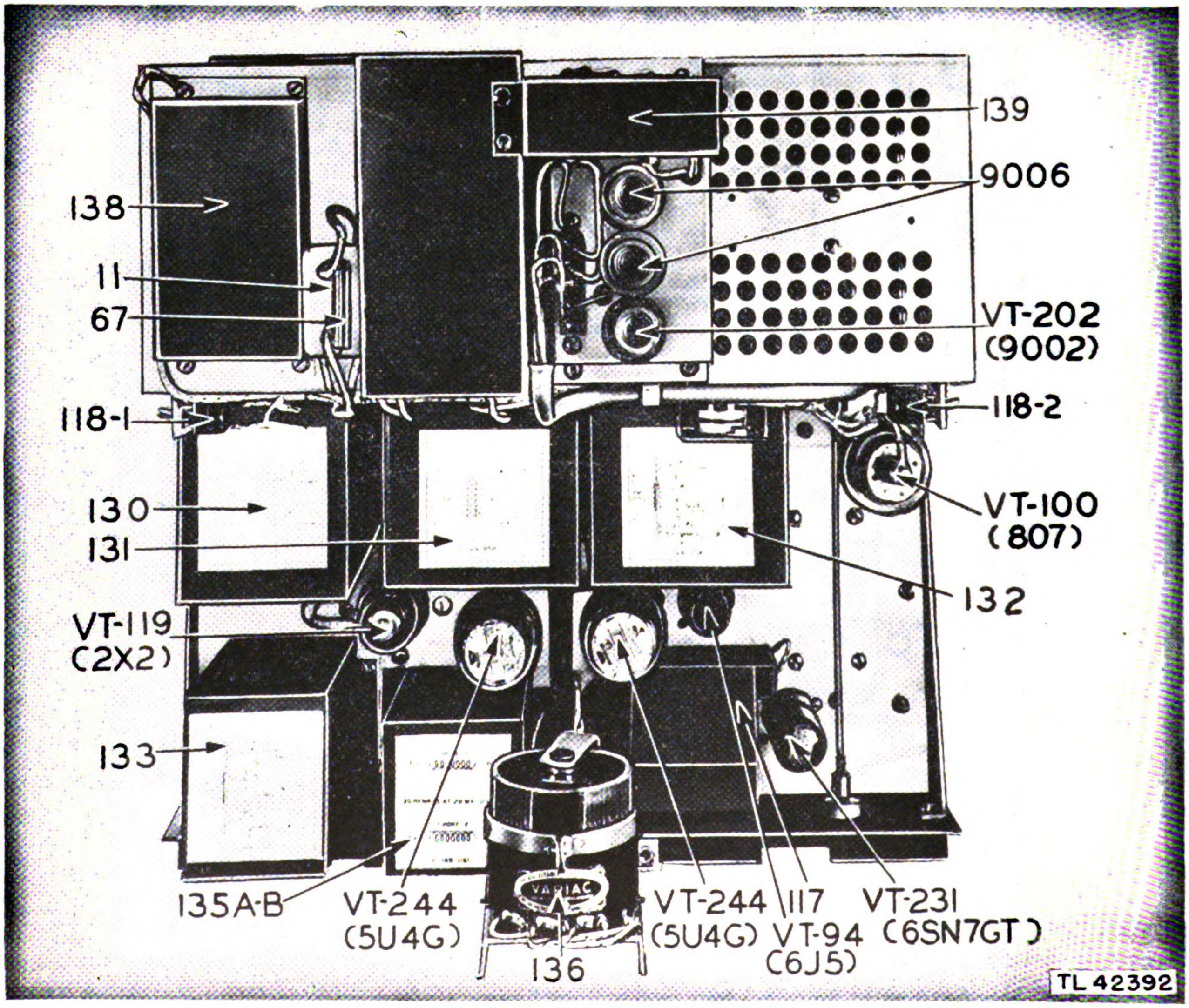


Figure 110. Top view of transmitter chassis.

(5) To install new board, reverse removal procedure.

m. CATHODE LINE (UPPER LINE). (1) Perform the 23 basic steps. (See par. 203*a* through *w*.)

(2) Perform steps 2, 3, and 4 of the cathode line ceramic support (upper line) removal procedure, *d* above.

(3) If it is desired to remove the inner cathode line, loosen the screws at the shorted end of the line and pull out.

Caution: When replacing, make certain that the fiber insulating tube has been placed in the outer line first.

n. CATHODE LINE (LOWER LINE). (1) Perform the 23 basic steps. (See par. 203*a* through *w*.)

(2) Perform steps 2 to 12 of the cathode line ceramic support (lower line) removal procedure, *e* above.

(3) If it is desired to remove the inner cathode line, loosen the screws at the shorted end of the line and pull out.

Caution: When replacing, make sure that the fiber insulating tube has been placed in the outer line first.

o. GRID LINE. (1) Perform the 23 basic steps. (See par. 203*a* through *w*.)

(2) Perform steps 2 to 5 of the cathode line ceramic support (lower line) removal procedure, *e* above.

(3) Remove the four screws holding the lines to the support.

(4) Loosen the Allen setscrews and pull grid line out.

(5) To replace, reverse removal procedure.

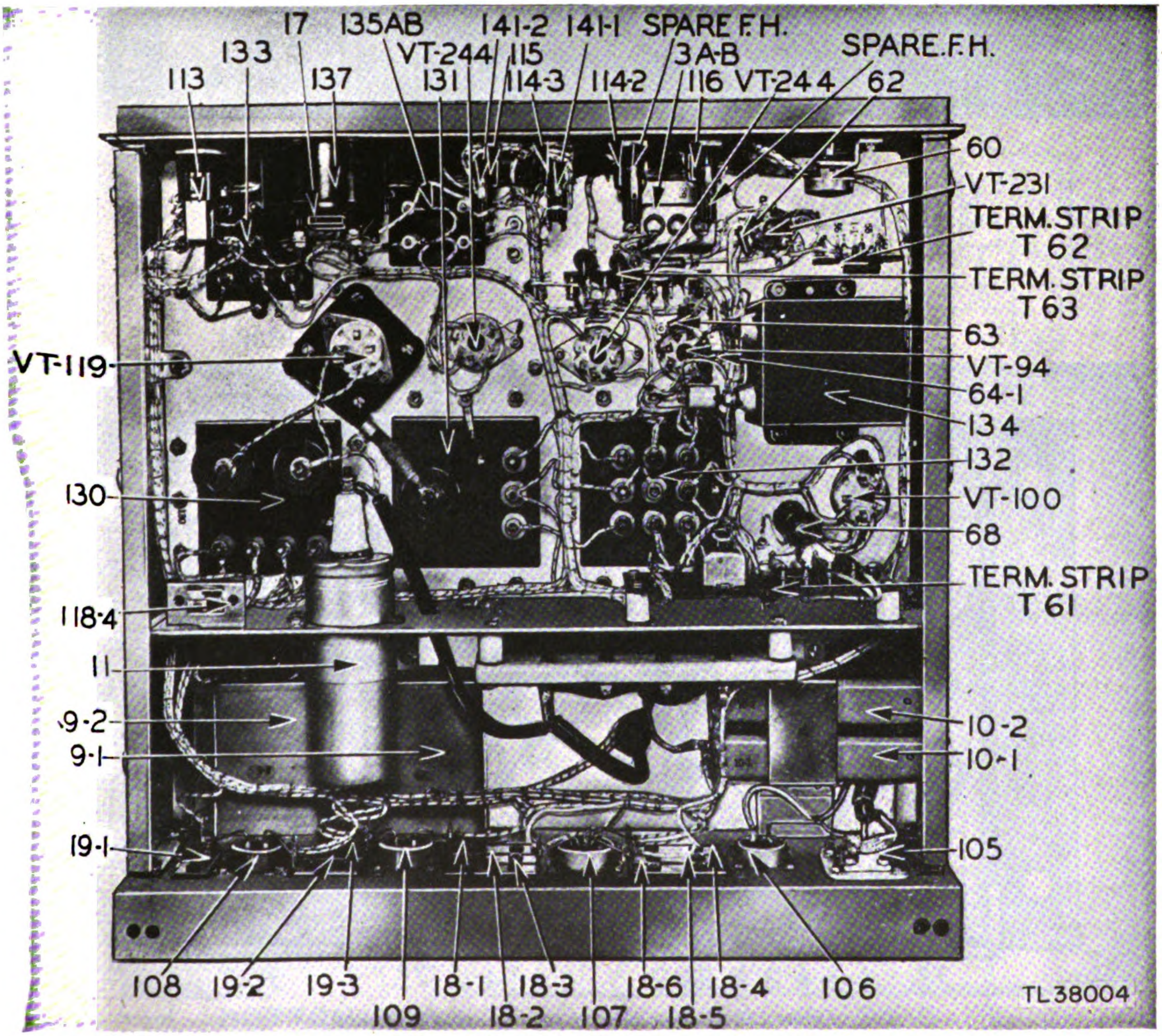


Figure 111. Bottom view of transmitter.

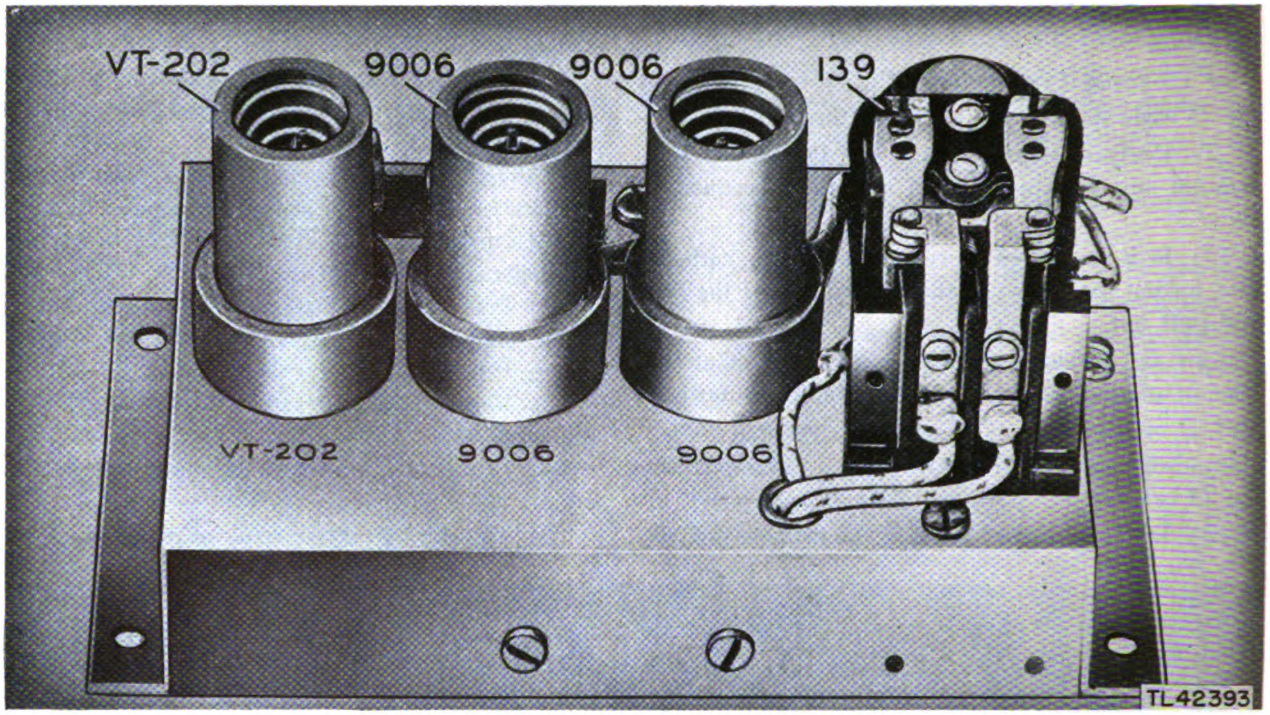


Figure 112. Power measurement unit of transmitter.

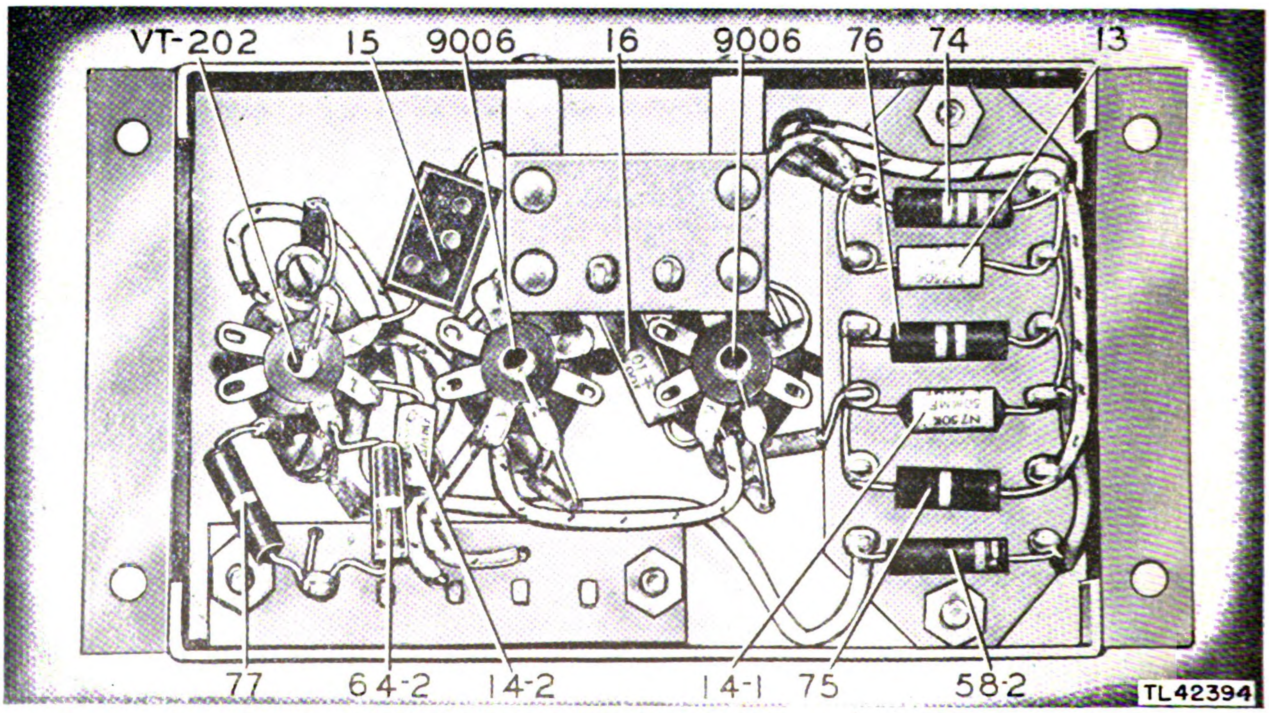


Figure 113. Bottom view of power measurement unit.

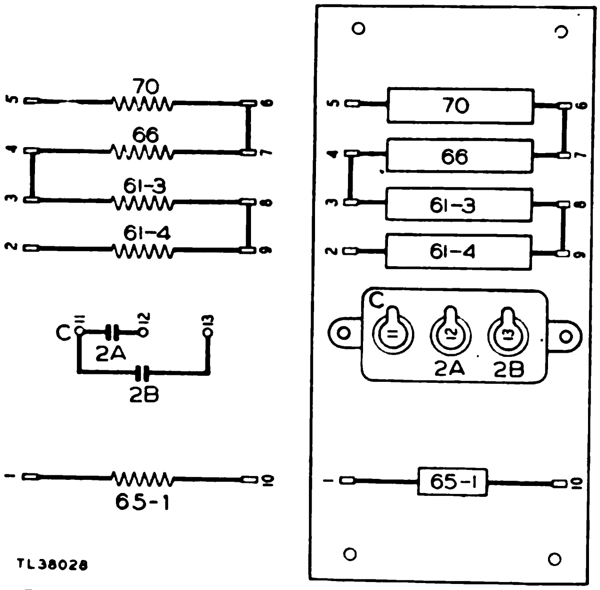


Figure 114. Wiring diagram of terminal board T61.

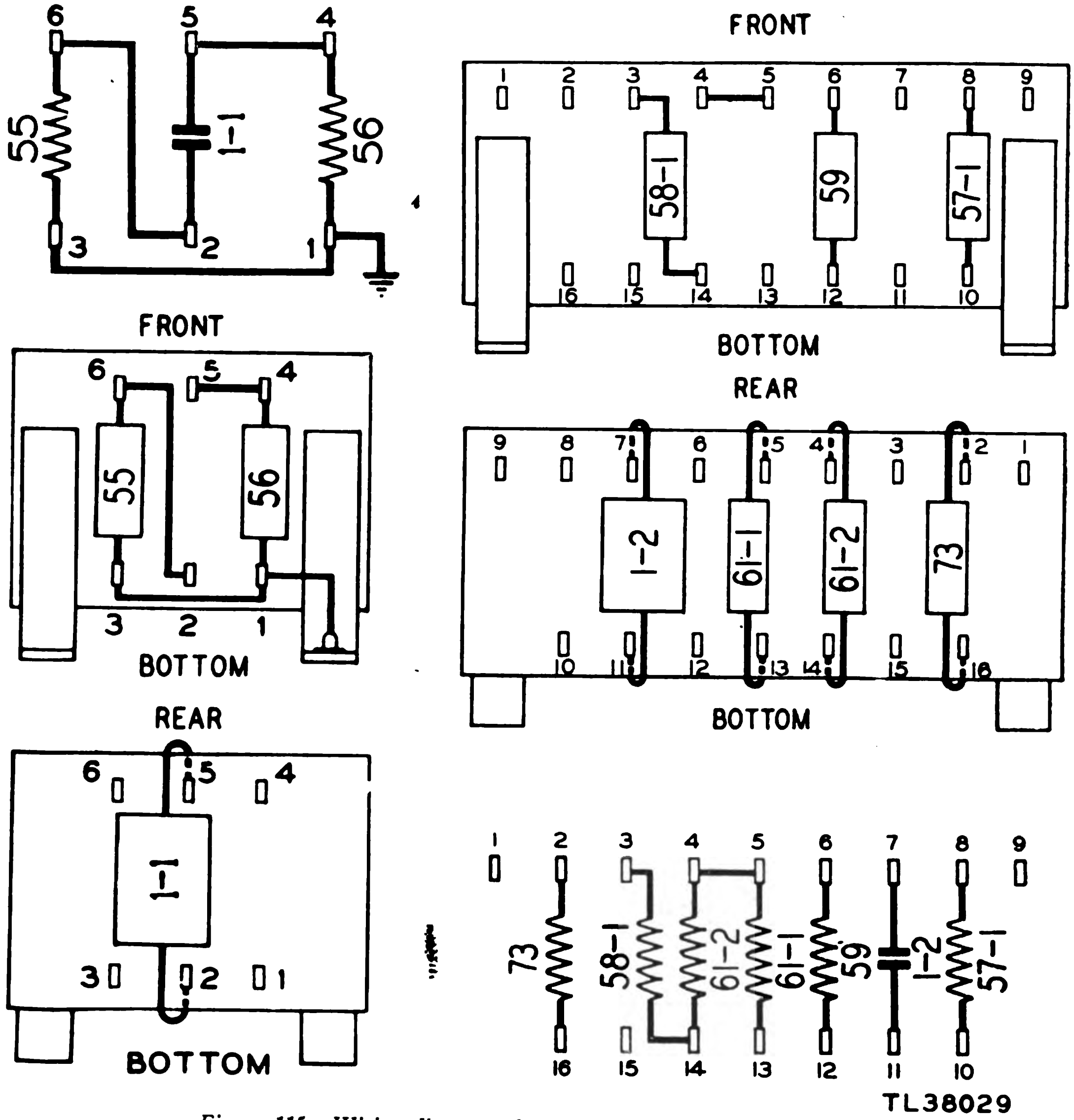


Figure 115. Wiring diagram of terminal boards T62 and T63.

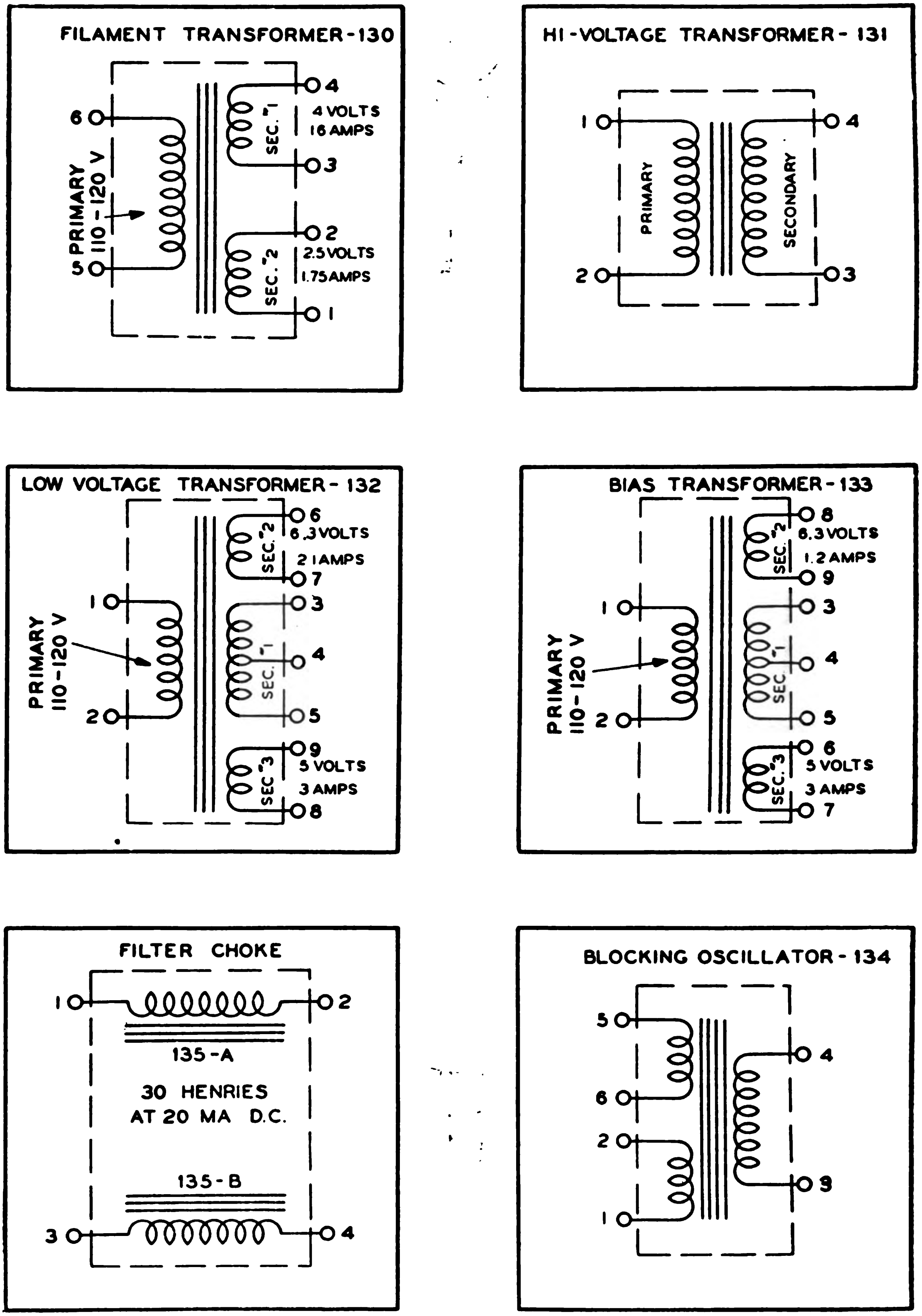


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Figure 116. Transmitter, schematic of individual transformers and chokes.

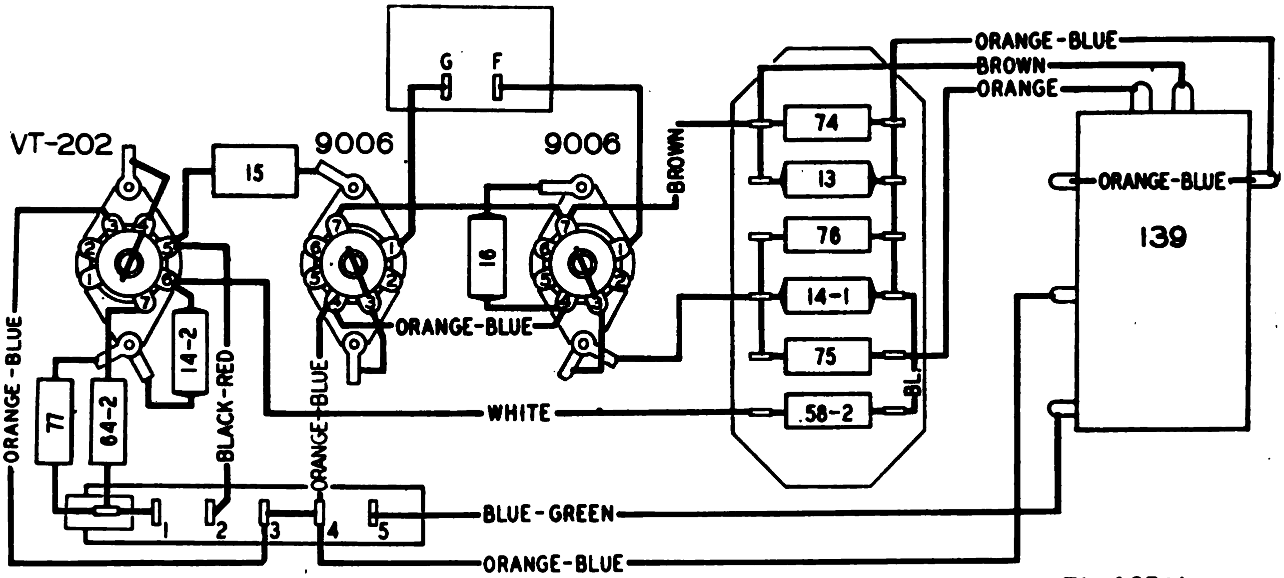


Figure 117. Wiring diagram of test circuit section.

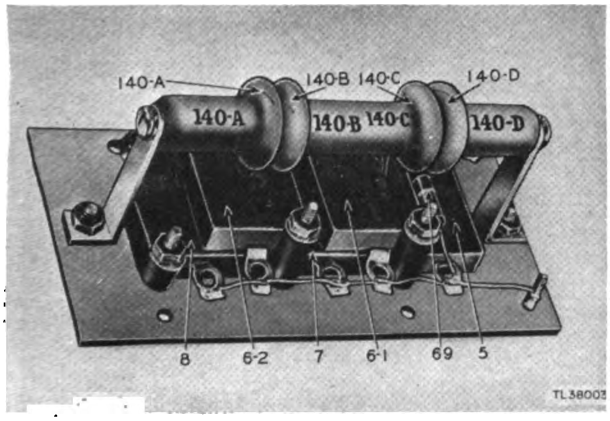


Figure 118. Transmitter, artificial line, pictorial diagram.

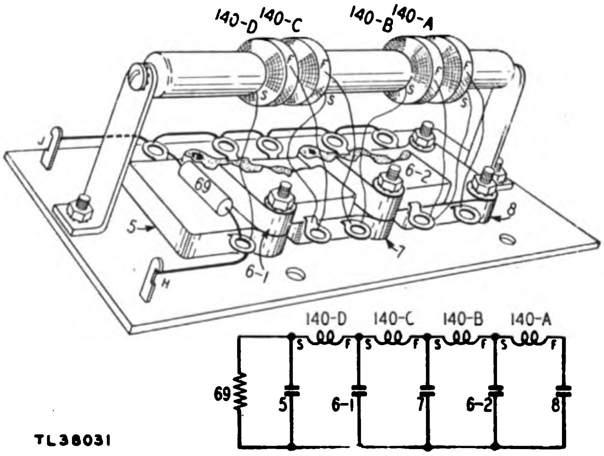
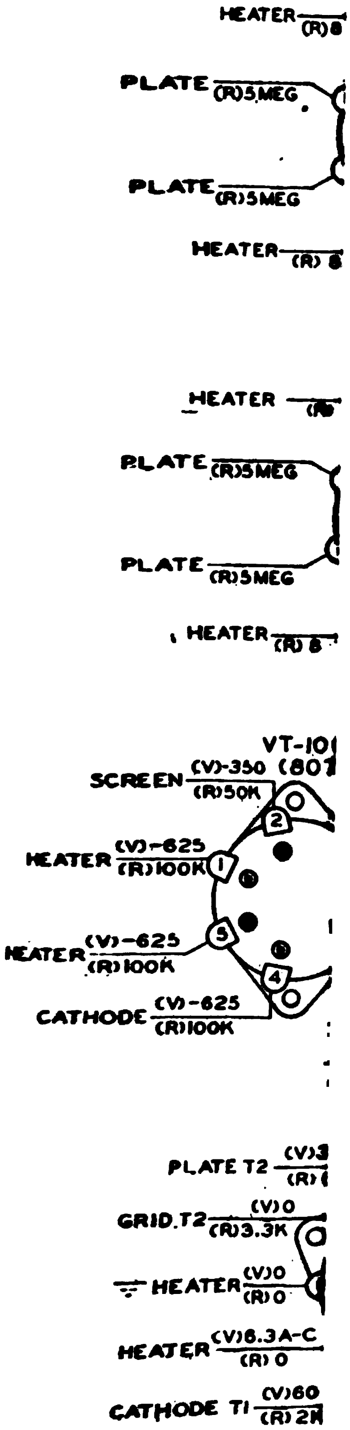


Figure 119. Transmitter, artificial line, wiring diagram.


HEATER (R) 8
PLATE (R) 5 MEG
PLATE (R) 5 MEG
HEATER (R) 8
HEATER
PLATE (R) 5 MEG
PLATE (R) 5 MEG
HEATER (R) 8
VT-10
(80
SCREEN (V)-350 (R) 50K
HEATER (V)-625 (R) 100K
HEATER (V)-625 (R) 100K
CATHODE (V)-625 (R) 100K
PLATE T2
GRID T2 (V) 0 (R) 3.3K
HEATER (V) 0 (R) 0
HEATER (V) 6.3 A-C (R) 0
CATHODE T1 (V) 60 (R) 2K

NOTE: SEE SOCKET VOLTAGE AND RESISTANCE CHART FOR CONDITIONS UNDER WHICH MEASUREMENTS WERE MADE.

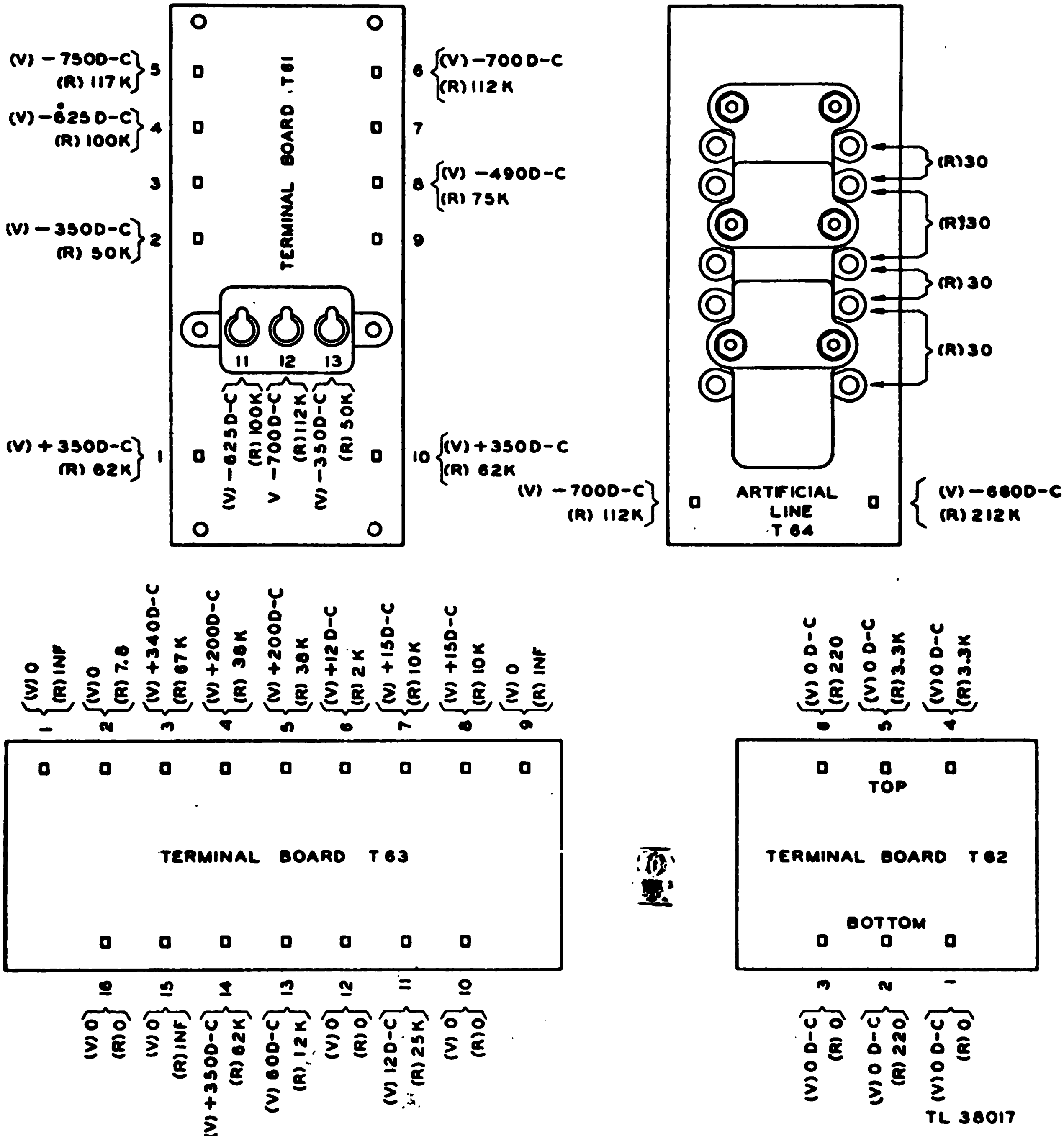
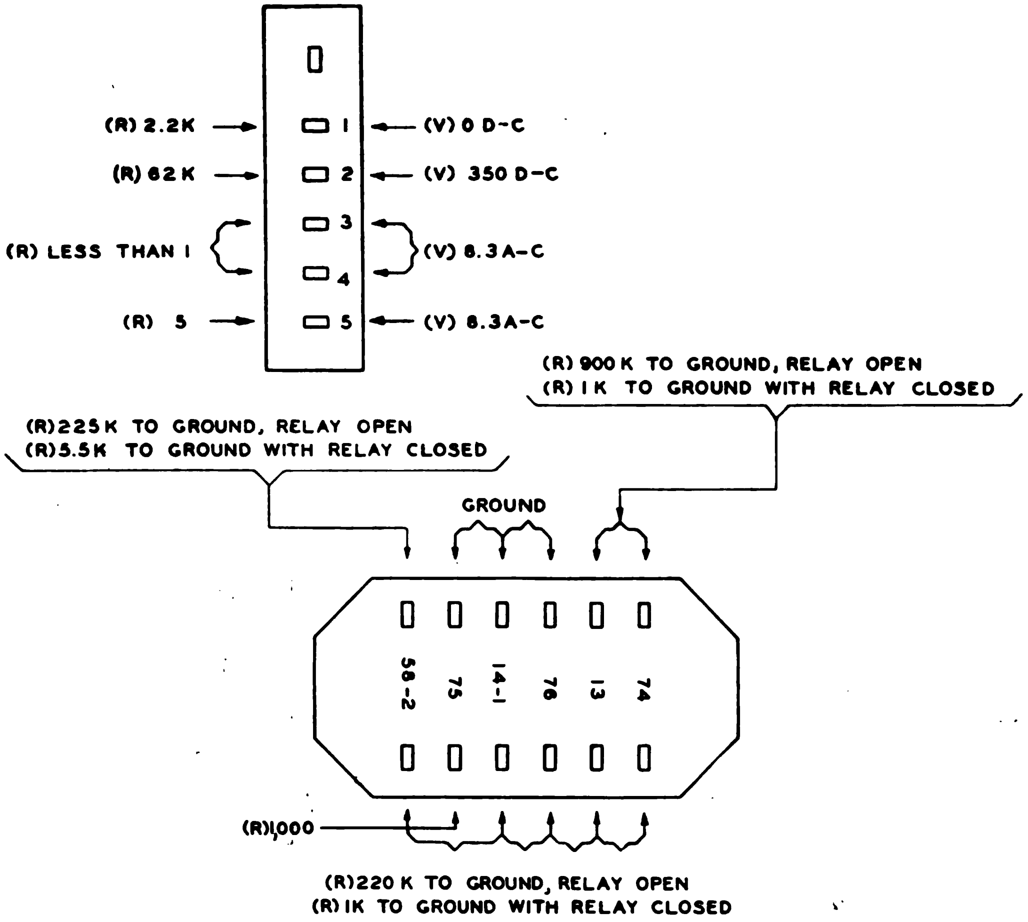


Figure 121. Transmitter terminal boards T61, T62, T63, and T64, voltage and resistance measurement.



NOTE: SEE SOCKET VOLTAGE AND RESISTANCE CHART FOR CONDITIONS UNDER WHICH MEASUREMENTS WERE MADE.

Figure 122. Transmitter, terminal board T15, voltage and resistance measurement.

TL 38018

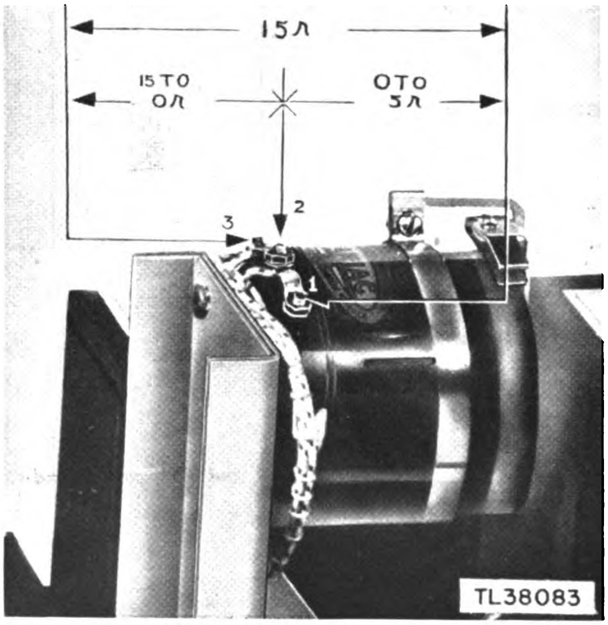
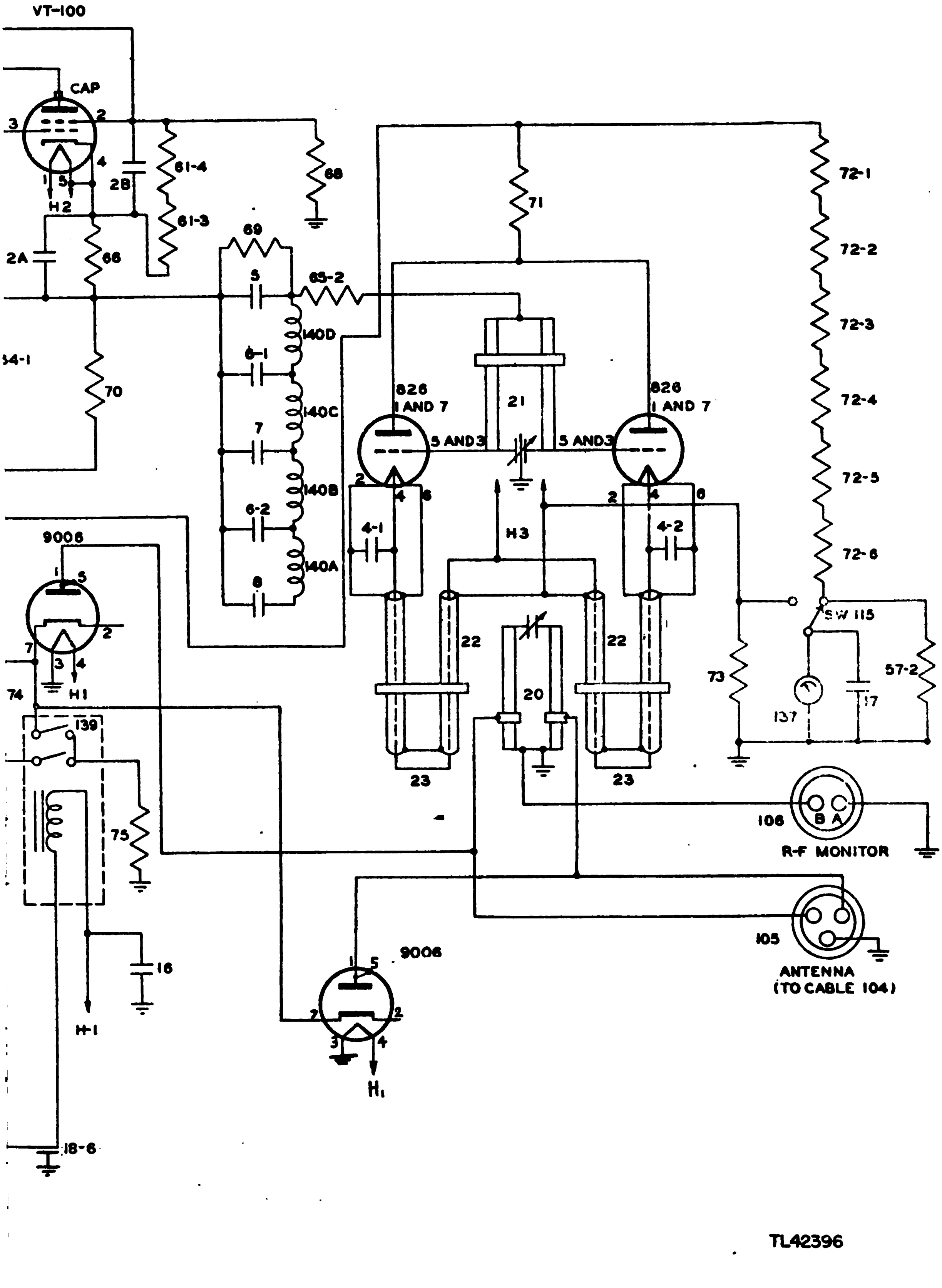
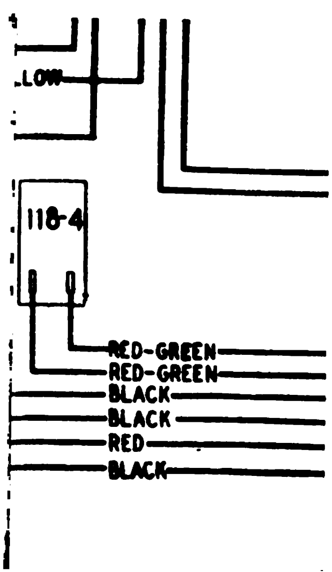


Figure 123. Transmitter, variac measurements.



omplete schematic diagram.



LOW
118-4
RED-GREEN
RED-GREEN
BLACK
BLACK
RED
BLACK

Section IV. RECEIVER OF RC–148 AND RC–148–B

139. Reference Data

To assist the maintenance man while trouble shooting on the receiver, figures are provided. In section IV, chapter 1 there are partial schematics and block diagrams, and at the end of this section there are groups of figures containing views of the receiver, a complete schematic and wiring diagram, drawings of terminal boards, voltage and resistance measurements, and waveforms.

140. Introduction

In section II trouble shooting based on the starting procedure is discussed. On the basis of step 3 which involves switching the receiver ON-OFF switch to the ON position, troubles, chiefly in the a-c circuit of the receiving system, can be spotted. The first four symptoms listed on the trouble-shooting chart deal with troubles of this nature. There are, however, many symptoms which are revealed on the radar display oscilloscope while the set is in operation, or by means of test positions and the range oscilloscope. Troubles of this nature in the receiving system are discussed in this section.

141. Localizing Trouble To Receiver

a. If the IFF receiver grass and the transmitter pulse are not seen on the screen of the display oscilloscope when the SELECTOR switch is in the OPERATE position, but if the normal radar traces are present, the trouble may be isolated with the aid of the test switches, to one of the major components. There are two possible reasons for this fault. Either the interconnector is faulty or the receiver is not operating. To determine which of these two is at fault, leave the SELECTOR switch on OPERATE and turn the TEST switch to position 7. If the receiver grass and transmitter pulse are now observed on screen of the test oscilloscope when properly adjusted, the receiver is working properly and it can be concluded that the interconnector is not operating correctly. (See sec. V.) If no grass is observed, the receiver is faulty. Test position 7 may always be used to check the operation of the receiver.

b. Trouble in the display oscilloscope is evidenced by the lack of any picture on the screen or the presence of a distorted one when the SELECTOR switch is on STANDBY. In this case, reference should be made to the technical manual on Radio Set SCR–268.

c. If there is an abnormal picture on the display scope when the SELECTOR switch is on OPERATE, but a normal one when on STANDBY, trouble shoot the interconnector. (See sec. V.)

142. Use of Trouble-Shooting Chart

When the trouble has been localized to the receiver, careful attention should be paid to the tuning eye and the dial lights. The significance of any abnormal conditions is given in the trouble-shooting chart which follows. By means of the chart, troubles may be localized to a section in the receiver without removing the receiver from the rack. When the trouble-shooting chart is used, it is assumed that the transmitter has been checked and found to be in operation, the SELECTOR switch is in position 4 or 5, and the TEST switch on the interconnector is in position 7.

143. Signal Substitution

a. General. When the trouble is localized to a section, such as Symptom H, where the trouble is within the i-f section, or Symptom I, where the trouble is in the r-f section, localization to a stage is possible by the method of signal substitution or by the use of voltage and resistance measurements. At this time, the receiver should be removed from its rack.

b. How to Set Up Receiver for Signal Substitution. (1) *Description of equipment needed.* (*a*) *Test scope.* Any test scope may be used.

(*b*) *Signal Generator* (*I–198–A*). This is an r-f generator with a range limited to the i-f frequency of the receiver. It has a graph on the inside of the front cover which furnishes the dial settings for the frequencies needed. There is a rough gain control called the "Multiplier" and a fine gain control which is called the "Output." There is a shielded lead from the signal generator near the OUTPUT control which is the output lead.

(*c*) *Gain box* (fig. 126). This is essentially a potentiometer inclosed in a shielded box to replace the GAIN potentiometer in the interconnector. This is easily constructed by soldering one end of an alligator clip lead to the variable tap of a 3,500-ohm potentiometer. The alligator clip should be clasped to pin *B* of connector 125 on receiver. One end of the potentiometer should be soldered to a terminal on the box inclosing the potentiometer. This terminal should be grounded by a lead run to the receiver chassis.

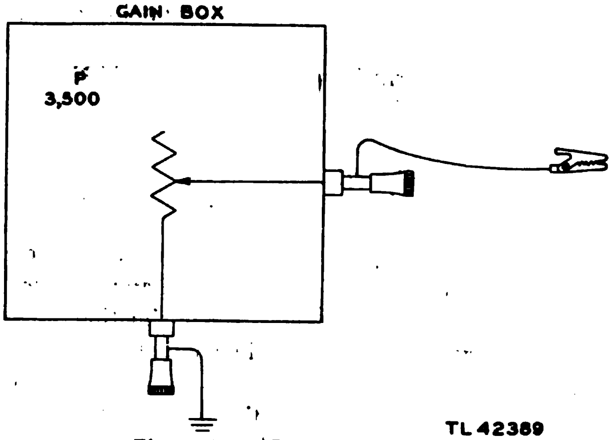


Figure 126. Gain box, schematic.

(*d*) *A-c input cable for receiver* (*cable 103*). This is the spare transmitter power cable.

(2) *Connecting equipment for signal substitution.* (*a*) Plug the line cord from the signal generator into the 110-120-volt a-c outlet. (See fig. 127.)

(*b*) Plug the line cord from the test scope into the 110-120-volt a-c outlet.

(*c*) Use the spare transmitter power cable 103 for receiver power, plug it into the 110-120-volt a-c outlet. It will be necessary to make a few changes at one end of the cable to make it fit an ordinary outlet plug.

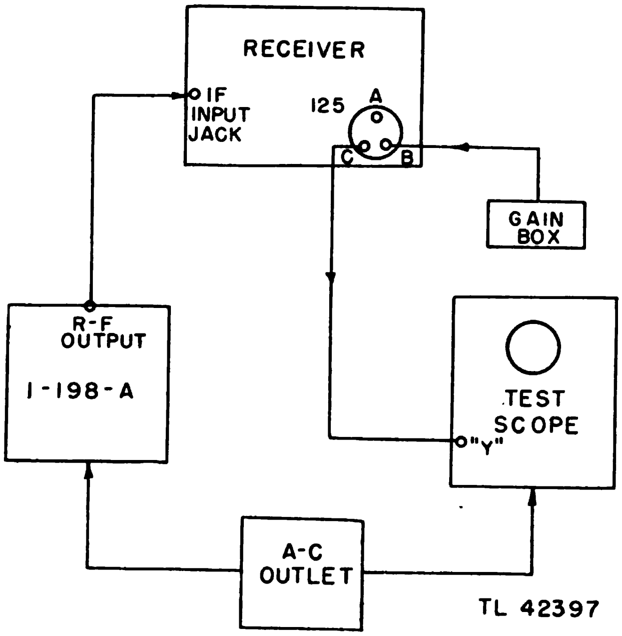


Figure 127. Receiver, set up for signal substitution, block diagram.

(*d*) Connect the Y-input lead of the test scope to pin *C* of connector 125 on the receiver.

(*e*) Connect the alligator clip of the gain box to pin *B* of connector 125 on the receiver.

(*f*) On the connection from the signal generator to the receiver an adaptation must be made on the signal generator output plug to allow the high side of the generator output to be placed at various points for testing the receiver. (See fig. 107.) Connect a wire lead to the negative part of the generator output plug by unscrewing the plastic portion a couple of turns and wrap one turn of wire around the threads and retighten. Connect an insulated lead around the portion of the plug on the outer side of the insulating washer. This lead should have an alligator clip (or probe) on it so that a good connection can be made on the various circuits being tested. The wire from the negative part of the generator output is grounded on the receiver chassis. The alligator clip (or probe) is used to apply the test signal to the various circuits being checked.

c. Preliminary Adjustment of Equipment. (1) *Signal generator.* (*a*) Put C.W.-MOD switch to MOD position.

(*b*) Put ON-OFF switch to the ON position.

(*c*) Turn MULTIPLIER and OUTPUT to the maximum range (clockwise).

(*d*) Using information on chart on inside of cover, adjust calibration dial for 11 megacycles.

(2) *Receiver.* Put ON-OFF switch to ON position and allow receiver 1 minute to warm up.

(3) *Gain box.* Place the variable tap of the potentiometer to approximately its midpoint.

(4) *Test scope.* (*a*) Put ON-OFF switch to the ON position.

(*b*) Adjust sweep frequency so that several cycles of output wave may be seen.

(*c*) Adjust Y-gain control to give a pattern of approximately 2 inches.

(*d*) Be sure to connect all chassis together and ground them.

144. Method of Signal Substitution

a. The procedure of signal substitution consists of putting a signal into the grid of a tube and seeing if that signal, amplified, appears on the plate as evidence that the signal has passed through the tube. When the signal placed on the grid can be pick up on the plate it is assumed that the tube and its various circuit elements are working normally. On rare occasions a signal is passed through a circuit in a seemingly normal manner due to the capacitive action of the tube or circuit. The gain, however, of that stage is lost and there is no amplification. After very little experience with signal substitution this action is easily detected.

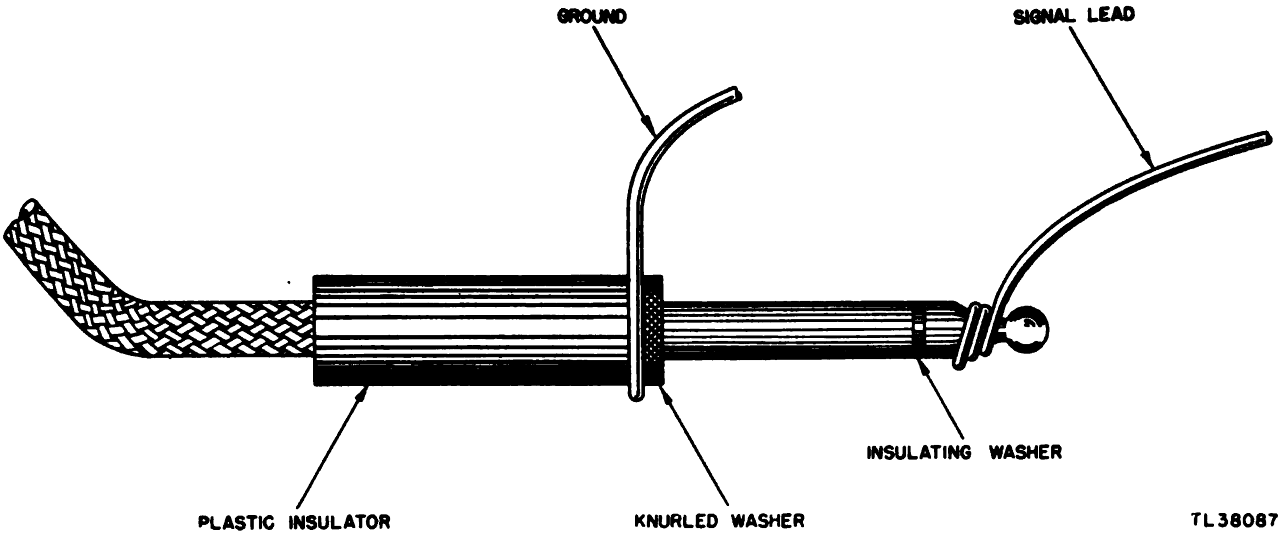


Figure 128. Adaptation of signal generator output lead for signal substitution.

b. The signal from the signal generator should be applied to the grids and plates of the different stages, starting from the cathode follower and working back through the stages up to the mixer, being sure the signal is connected from the signal generator to the plate and then to the grid of each successive tube. While working back through the stages the gain of the signal generator should be cut down so as not to overdrive the stage. This reduction of generator output will show that gain is being obtained through the various amplifier stages. When a stage is bad, the signal will not get through or there will not be normal gain. The five i-f stages, the 2d detector, video amplifier, the cathode follower, and the mixer or modulator stages can be checked by this method. The two r-f stages and the local oscillator stage cannot be checked by the signal generator provided with the IFF test set.

c. When the signal is lost in any given stage, the trouble is isolated to that stage and the circuits directly connected to it. From this point on, the exact trouble should be located by means of voltage and resistance measurements. (See sec. I, ch. 2.)

145. Checking Video Section

If the trouble appears to be in the video section of the receiver, as in Symptom E, the following method can be used as a quick and accurate check of the section.

a. Place a jumper from a 6.3 a-c voltage source, such as terminal 19 of terminal board R23, to the cathode of the cathode follower, pin 3 or 6 (VT–231). If a slightly distorted sine wave is seen on the radar scope, then the output circuit of the cathode follower is good. Place the jumper on the grid of the cathode follower (VT–231) (pin 1 or 4) and if a slightly distorted sine wave is seen on the scope, the cathode follower is known to be good. Place the jumper, from the 6.3 a-c voltage source, to the plate of the video (6SH7) to determine whether the coupling network is good. The same signal should be found on the scope as from the grid of the cathode follower. Next place the jumper from the a-c voltage source, to the grid of the video amplifier (6SH7) (pin 4). The scope picture should now be a sine wave distorted approximately to a square wave. Put the jumper on the plate of the second detector (VT–90) (pin 5) to determine whether the coupling network is good.

b. The a-c signal should be seen on the scope each time the jumper is placed on one of the above points. If the signal is lost, the trouble is in that stage and its connecting circuits. Voltage and resistance measurements should be made to determine the exact cause of the trouble.

146. Receiver Alignment Using Tuning Eye Indicator

a. Equipment Needed for Receiver Alignment.

(1) Signal Generator I–198–A.

(2) Aligning screw driver.

(3) A-c input cable for receiver (cable 103).

(4) Gain box.

b. Connecting the Equipment for Alignment.

(1) Plug the line cord from the signal generator into the 110-120-volt a-c outlet.

(2) Plug in the a-c input cable for the receiver into the 110-120-volt a-c outlet.

(3) Connect the alligator clip of the gain box to pin *B* of connector 125 on receiver.

c. Alignment Procedure. Alignment of the i-f stages of the receiver is carried out best with the receiver bottom plate fastened in place. This will help to prevent excessive regeneration. The alignment procedure is as follows:

(1) Remove oscillator Tube VT-94.

(2) Turn variable control of gain box completely counterclockwise. This insures maximum gain.

(3) Connect 110-120-volt ac to the a-c input receptacle at the rear of the receiver.

(4) Snap the ON-OFF switch to the ON position.

(5) Connect the unmodulated signal from Signal Generator I-198-A to the I.F. IN jack. To prevent the system from breaking into oscillation, alignment should first be made at reduced input.

(6) Set the generator to 11 megacycles.

(7) Adjust the eye transformer tuning slug for maximum closing of the tuning indicator eye. If the eye closes completely, reduce the output of the signal generator until maximum closure is clearly indicated.

(8) Set the generator to 10.5 megacycles.

(9) Adjust the second detector transformer tuning slug for maximum closing of the tuning indicator eye.

(10) Set the signal generator to 8.9 megacycles.

(11) Adjust the fifth i-f and third i-f transformer tuning slugs, in order, for maximum closing of the tuning indicator eye.

(12) Set the signal generator to 13.1 megacycles.

(13) Adjust the fourth i-f and second i-f transformer tuning slugs, in that order, for maximum closing of the tuning indicator eye.

(14) Set the signal generator to 11 megacycles.

(15) Adjust the first i-f transformer tuning slug for maximum closing of the tuning eye.

d. Oscillation. If the system breaks into oscillation during adjustment, as evidenced by complete closure of the eye with no signal input, turn the slugs of the fifth and third i-f transformers all the way in. Then complete the adjustment of all the other transformers before returning to the fifth and third.

e. Excessive Regeneration. To check for excessive regeneration in the i-f system, the signal generator should be adjusted to a frequency of 11 megacycles and the output adjusted to zero. A zero-to-1 milliammeter plugged into the I.F. OUT jack should read less than 0.3 milliamperes.

147. Additional Alignment Procedure Using Tuning Eye Indicator

a. To align the i-f system when considerable misalignment has been caused by accident or replacement of i-f transformers, the following procedure should be followed:

(1) Remove oscillator Tube VT-94.

(2) Connect the unmodulated output of the Signal Generator I-198-A between the grid and ground of the fifth i-f amplifier Tube VT-176.

(3) Set the frequency at 11 megacycles.

(4) Adjust the eye transformer, 99, for maximum closing of the tuning indicator eye.

(5) Set the frequency at 10.5 megacycles.

(6) Adjust the second detector transformer, 98, for maximum closing of the tuning indicator eye.

(7) Shift the generator connections to grid and ground of the fourth i-f stage, VT-176.

(8) Set the frequency at 8.9 megacycles.

(9) Adjust the fifth i-f transformer, 97-2, for maximum closing of the tuning indicator eye.

Note. Care should be taken not to overload the tuning eye. This overload is indicated by an overlapping in the eye. To prevent this, reduce the signal generator output.

(10) Shift the generator connections to grid and ground of the third i-f stage, VT-112.

(11) Set the frequency at 13.1 megacycles.

(12) Adjust the fourth i-f transformer, 96-2, for maximum closing of the tuning indicator eye.

(13) Shift the generator connections to grid and ground of the second i-f stage, VT-112.

(14) Set the frequency at 8.9 megacycles.

(15) Adjust the third i-f transformer, 97-1, for maximum closing of the tuning indicator eye.

(16) Shift the generator connections to grid and ground of the first i-f stage, VT-112.

(17) Set the frequency at 13.1 megacycles.

(18) Adjust second i-f transformer, 96-1, for maximum closing of the tuning indicator eye.

(19) Shift the generator connections to the I.F. IN jack, 129-1.

(20) Adjust the first i-f transformer, 95, for maximum closing of the tuning eye.

b. If the i-f system breaks into oscillation at any time, turn the slugs of the fifth and third i-f transformers all the way in. Then complete the adjustment of all the other transformers before returning to the fifth and third.

148. Receiver Alignment Using Test Scope

a. The equipment needed to tune the i-f stages includes a signal generator, oscilloscope (or output

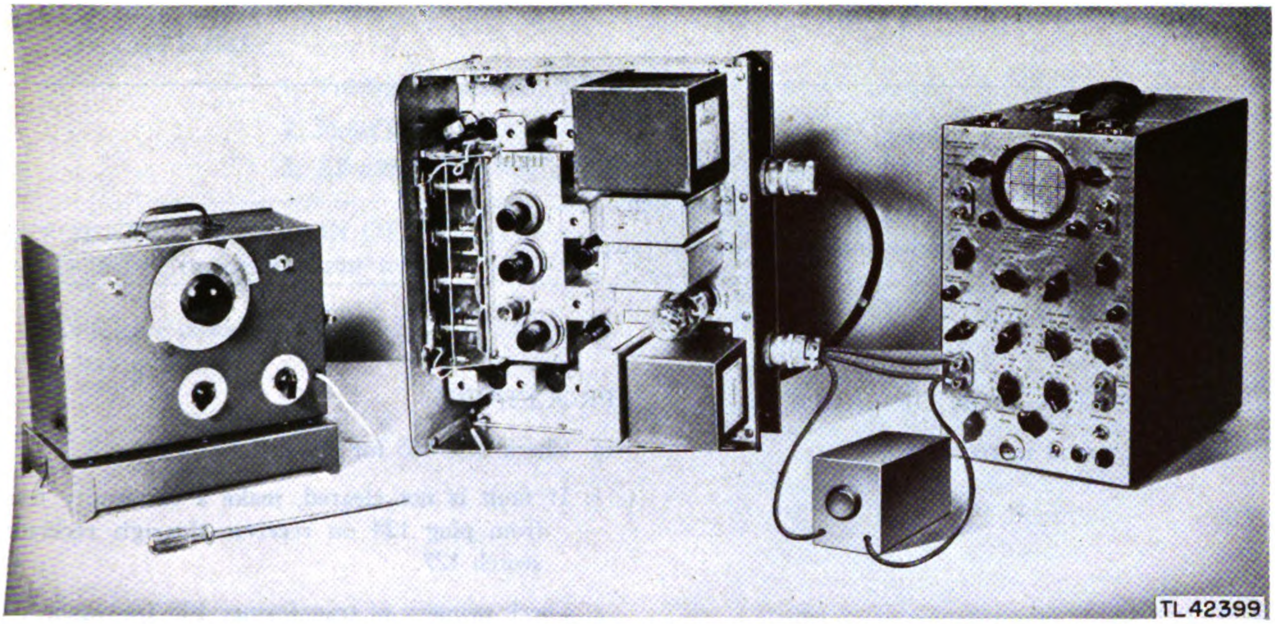


Figure 129. Receiver set up for alignment procedure.

meter), and a tuning screw driver. Since waveshape and signal-to-noise ratio may be directly observed on an oscilloscope, the scope is to be preferred to the output meter.

b. A few precautionary measures to insure uniform results are necessary:

(1) Keep the equipment close together.

(2) Connect all chassis together with several short leads.

(3) Ground the chassis.

c. Preliminary to the alignment of the receiver, the following steps must be taken (fig. 129):

(1) Connect alligator clip of gain box to pin B of connector 125 on receiver. Turn variable control of gain box completely counterclockwise. This insures maximum gain.

(2) Connect **Y**-input lead of test scope to pin *C* of connector 125 of receiver.

(3) Connect the output of signal generator to the I.F. IN jack 129-1.

(4) Turn the equipment on and allow it to warm up for a few minutes.

d. After the equipment has reached its normal operating temperature, proceed as follows:

(1) Adjust the tuning dial of the signal generator for an output frequency of 11 mc/s.

(2) Increase the output level from zero until a picture is formed on the scope as shown in figure 130.

(3) Adjust the core of the i-f coils of first and sixth transformers for maximum deflection on the scope. When this adjustment is being made, decrease the signal output of the signal generator to maintain the same deflection as in (2); otherwise distortion of the output due to overloading will cause misleading results. Observe this precaution each time an i-f stage is adjusted.

(4) Change the frequency of the signal generator to 13.1 mc/s and adjust i-f coils 2 and 4 for maximum deflection on the scope.

(5) Change the frequency of the signal generator to 8.9 mc/s and adjust i-f coils 3 and 5 the same way.

(6) Set the signal generator to 11 mc/s and adjust the tuning eye tuned circuit (eye transformer) for maximum closure of the eye. (The signal level may have to be increased.)

Figure 130. Scope pattern for alignment procedure.

A. SYMPTOMS:
1. Panel lamps, 126–1 and 126–2, do not light (step 3).
2. Tuning eye does not light (step 3).
3. All other indications normal (step 3).

PROBABLE LOCATION OF FAULT	PROCEDURE
1. A-c input circuit in receiver.	1*a*. Check fuse 135 for open. *b*. If fault is not cleared, make a continuity test from plug 124 on receiver through receiver switch 127. *c*. Check primary of transformer 103 for open. *d*. If fault is not cleared, see item below.
2. A-c input circuit from transmitter plug 109 to receiver plug 124.	2*a*. Check the line voltage at plug 124. *b*. If there is no voltage, make a continuity check from plug 108 in transmitter through plug 109 in transmitter to plug 124 in receiver.

B. SYMPTOMS:
1. Panel lamps do not light (step 3).
2. Tuning eye lights (step 3).
3. All other indications normal (step 3).

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective light bulbs.	1*a*. Check by replacing light bulbs. *b*. If fault is not cleared, see item below.
2. Defective switch 128.	2*a*. Turn off receiver switch and make a continuity test across the switch. *b*. If fault is not cleared, see item below.
3. Defective panel light circuit.	3. Make a continuity test from terminals 8 and 9 of transformer 103 to the terminals of the light bulbs.

C. SYMPTOMS:

1. Tuning eye does not light (step 3).
2. Panel lamps light (step 3).
3. All other indications normal (step 3).

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective tuning indicator tube.	1a. Check tube by replacement. b. If fault is not cleared, see item below.
2. Defective power supply or wiring to tuning indicator tube.	2a. Check for plate voltage at pins 2 and 4 of the tuning indicator tube. b. If there is no voltage at the pins, turn the power off and make a continuity test from pin 6 of transformer 103 to pins 2 and 4 of the tuning indicator tube through switch 128. c. If fault is not in the wiring, make a complete check of the power supply. d. If fault is not cleared, see item below.
3. Defective tuning indicator circuit.	3. If there is voltage at pins 2 and 4 of the tuning indicator tube check the voltage and resistance values at all the other pins of the tube.

D. SYMPTOMS:

1. Circuit breaker on transmitter kicks off (step 3).
2. All indicator lamps go out (step 3).

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective circuit breaker 117.	1. Measure voltage at junction of resistor 77 and choke 102. Voltage should be 270 volts. If voltage is normal, trouble is in circuit breaker. Replace circuit breaker with a spare.
2. Short in receiver power supply.	2. If voltage is not normal at junction of resistor 77 and choke 102 check the power supply for a short.

E. SYMPTOMS:

1. Grass and main IFF pulse do not appear on radar scope.
2. Tuning eye VT–215, can be closed.
3. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective video or cathode follower stage in receiver.	1a. Place test switch in position 7. b. If pattern on test scope shows no grass and no main pulse, trouble is in receiver. c. Check tube and associated circuit of video stage. d. Check tube and associated circuit of cathode follower.
2. Defective IFF switching channel in interconnector.	2a. If pattern on test scope for position 7 is normal, trouble is in interconnector. b. See paragraph 156, Symptom E.

F. SYMPTOMS:

1. Tuning eye VT–215, does not light.
2. Grass and main IFF pulse do not appear on radar scope.
3. Panel lamps 126–1 and 126–2 light.
4. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective power supply in receiver.	1. Check rectifier tube and associated circuit.

G. SYMPTOMS:

1. Tuning eye VT–215 does not light.
2. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective tuning indicator stage.	1*a*. Check tube VT-215 by replacement. *b*. If trouble is not cleared, replace tube and make a voltage and resistance check of the stage. Check switch 128 for continuity.

H. SYMPTOMS:

1. No grass or signal on radar scope.
2. Tuning eye VT–215 does not close.
3. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective stage from 2d i-f amplifier to 2d detector inclusive.	1*a*. Isolate trouble to stage by signal substitution. *b*. Make a resistance and voltage check of the suspected defective stage and the stage preceding it.

I. SYMPTOMS:

1. Main IFF pulse does not show through grass.
2. Grass appears normal.
3. Tuning eye will not close.
4. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective r-f tuning head.	1*a*. Check gearing for proper mechanical connection. *b*. Make a complete voltage and resistance check of the r-f stages.

J. SYMPTOMS:

1. Grass on radar scope barely perceptible.
2. Eye does not close.
3. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective first i-f stage.	1. Check tube and associated circuit of 1st i-f stage.

K. SYMPTOMS:

1. Tuning eye VT–215 does not light.
2. Panel lamps 126–1 and 126–2 do not light.
3. Grass on radar scope normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective switch 128.	1. Check switch for continuity. Replace if defective.

150. Procedure For Replacing Defective Electrical Parts in Receiver

a. INTRODUCTION. The information following is to assist the radar repairman in replacing defective major parts in the receiver. Note that such replaceable items as small resistors, capacitors, tube sockets, and tubes are not covered in these procedures. Neither is a procedure given when the replacement of the part presents no special difficulties. The procedures given in this section cover only items difficult to replace. These procedures have been worked out experimentally and represent the shortest and best method of accomplishing the work.

Cautions: (1) Before replacing a defective part, observe carefully its position, method of mounting, and wiring. This insures the correct installation of the replacement part.

(2) When removing such parts as switches and terminal boards, which have several wires attached to their terminals, be sure to tag the wires carefully so that they will be replaced in their proper positions.

(3) When disassembling a component, the screws, nuts, bolts, washers, and other small parts which are removed, should be put in a small container to prevent their loss.

b. LIST OF ITEMS COVERED.

(1) *Front panel* (par. 151).
Fuses.
Toggle switch.
Interlock switch.
Window glass.

(2) *Under side* (par. 152).
R-f tuning head.
Antenna input conduit.
Tuning indicator tube clamp.
I-f transformers.
Transformers, chokes, and filter capacitors.
Jacks.
Capacitor No. 14.
Fuse holder.

151. Front Panel of Receiver

a. FUSES. See transmitter, front panel.

b. TOGGLE SWITCH. See transmitter, front panel.

c. INTERLOCK SWITCH. See transmitter, top side.

d. WINDOW GLASS. (1) Remove r-f tuning head. See procedure in paragraph 152.

(2) Remove brackets which hold glass and remove the glass.

(3) To install new glass, reverse removal procedure.

152. Under Side of Receiver

a. R-F TUNING HEAD. (1) With an Allen wrerch, remove the tuning knobs from the front panel.

(2) Remove all screws shown in figure 255.

(3) Pull the front panel forward and drop it down to clear receiver chassis.

(4) Remove tuning indicator Tube VT–215 (6E5) and place it in back of chassis. (See fig. 256.)

(5) Remove the metal plate on the bottom of the tuning head by taking off the nuts and screws indicated as *A* in figure 256.

(6) Unsolder wire in the i-f conduit from lug 5 of the first i-f transformer. (See fig. 256.)

(7) Unsolder the i-f conduit from the lug adjacent to the Tube VT-112.

(8) Unsolder the capacitor at the end of the orange lead (the antenna conduit) from the antenna coil.

(9) Remove the clamp which holds the antenna conduit to the tuner case.

(10) Remove the red and yellow leads from terminals 25 and 28 respectively.

(11) Remove r-f tuner head from receiver chassis by removing screws *B* (fig. 256) and lifting tuner head free.

(12) To install spare r-f tuner head, carefully place it in position in receiver chassis and reverse removal procedure.

b. Antenna Input Conduit (fig. 256). (1) Unsolder capacitor at end of orange lead (the antenna conduit) from the antenna coil.

(2) Remove the four screws which hold antenna conduit to connector 123.

(3) To install a new conduit, reverse the removal procedure.

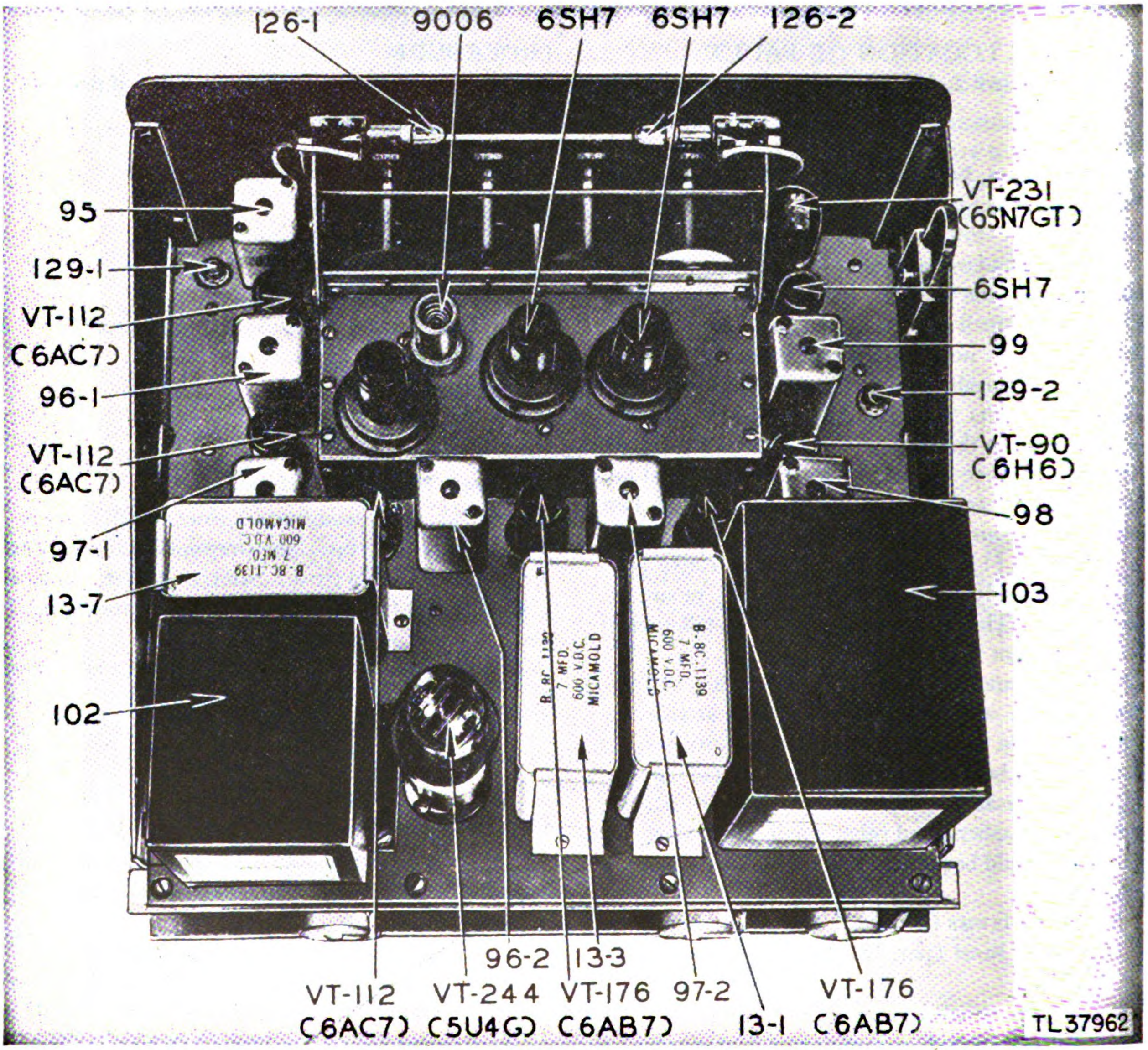


Figure 131. Receiver—top view.

c. TUNING INDICATOR TUBE CLAMP. (1) From front panel remove two screws which attach the clamp and remove it.

(2) To install the new clamp, reverse removal procedure.

d. I-F TRANSFORMERS. (1) Unsolder connections to terminals of transformers.

(2) Remove from the underside of chassis two nuts which attach transformer to chassis and remove the transformer.

(3) To remove the case from the transformer, remove the two nuts on top of the case and slip it off.

(4) To install a new transformer, reverse the removal procedure.

e. TRANSFORMERS, CHOKES, AND FILTER CAPACITORS. See transmitter, top side.

f. JACKS. (1) Remove the soldered connections from the terminals of the jacks.

(2) From the top side of the chassis, remove the locknut which secures the jack and push it out through the bottom of the chassis.

(3) To install a new jack, reverse the removal procedure.

g. CAPACITOR 14. (1) Unsolder the connections to terminals of the capacitor.

(2) From the side of the chassis remove the two screws which secure the capacitor.

(3) To install the new capacitor, reverse removal procedure.

h. FUSE HOLDER. See transmitter, bottom side.

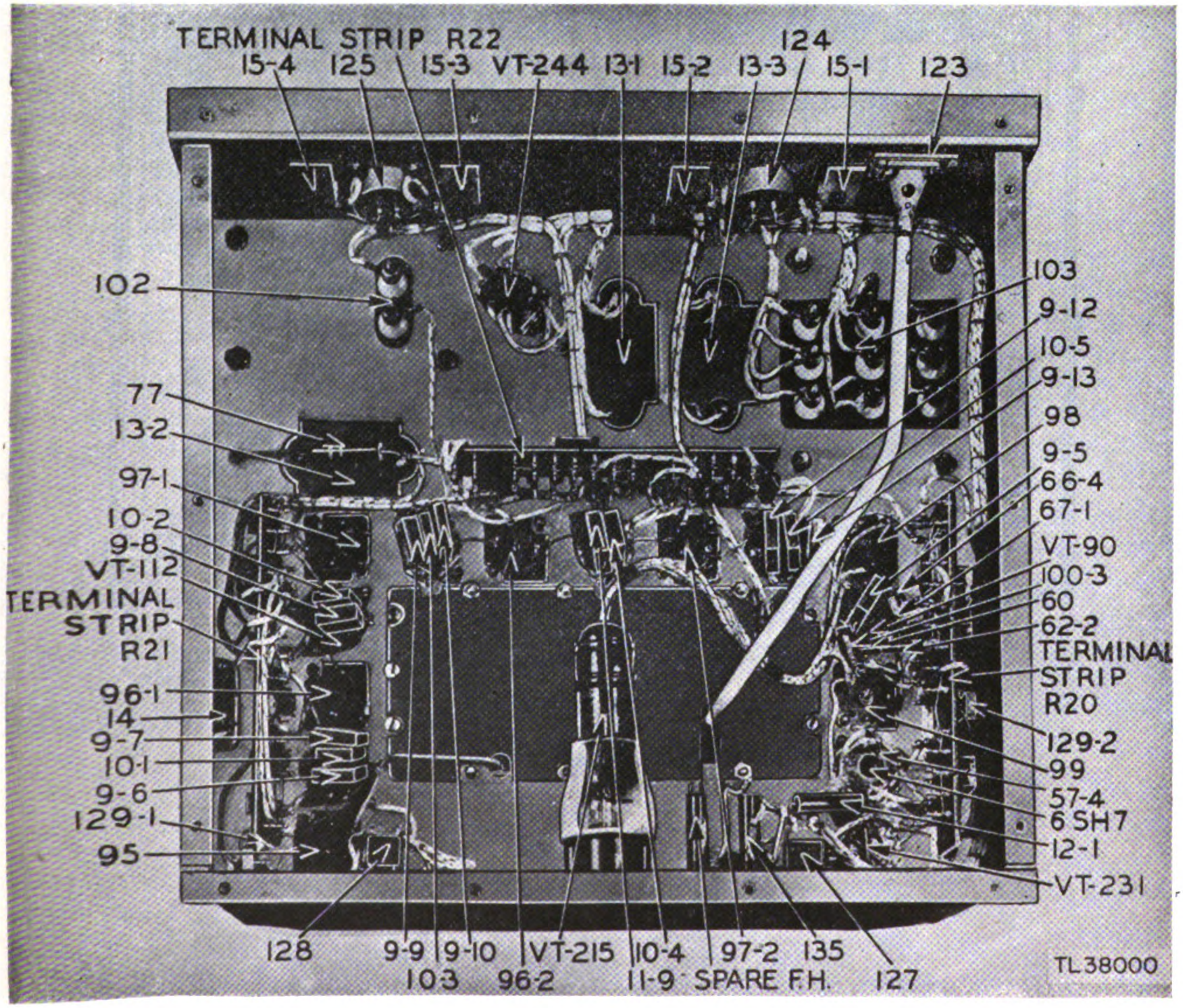


Figure 132. Receiver—bottom view.

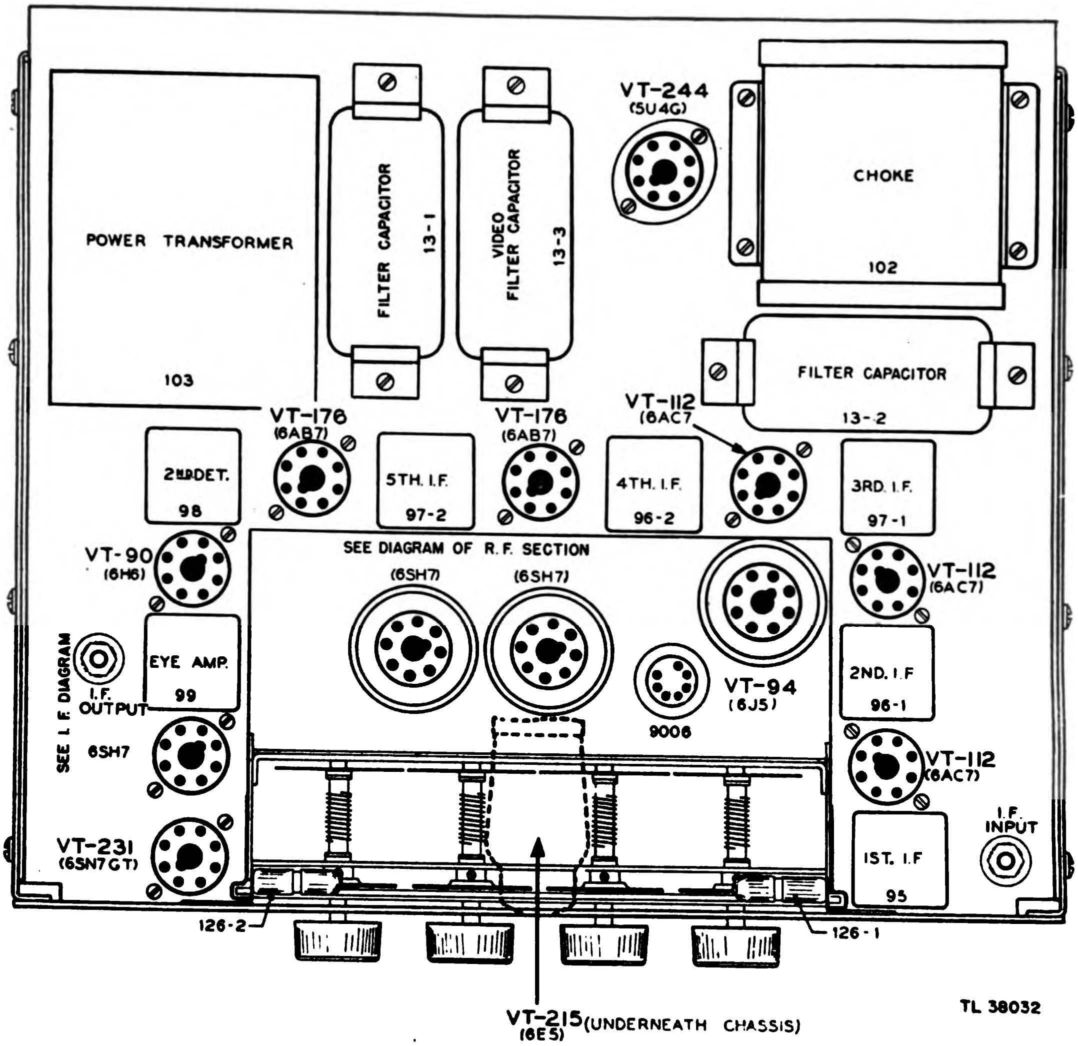


Figure 133. Receiver—tube arrangement.

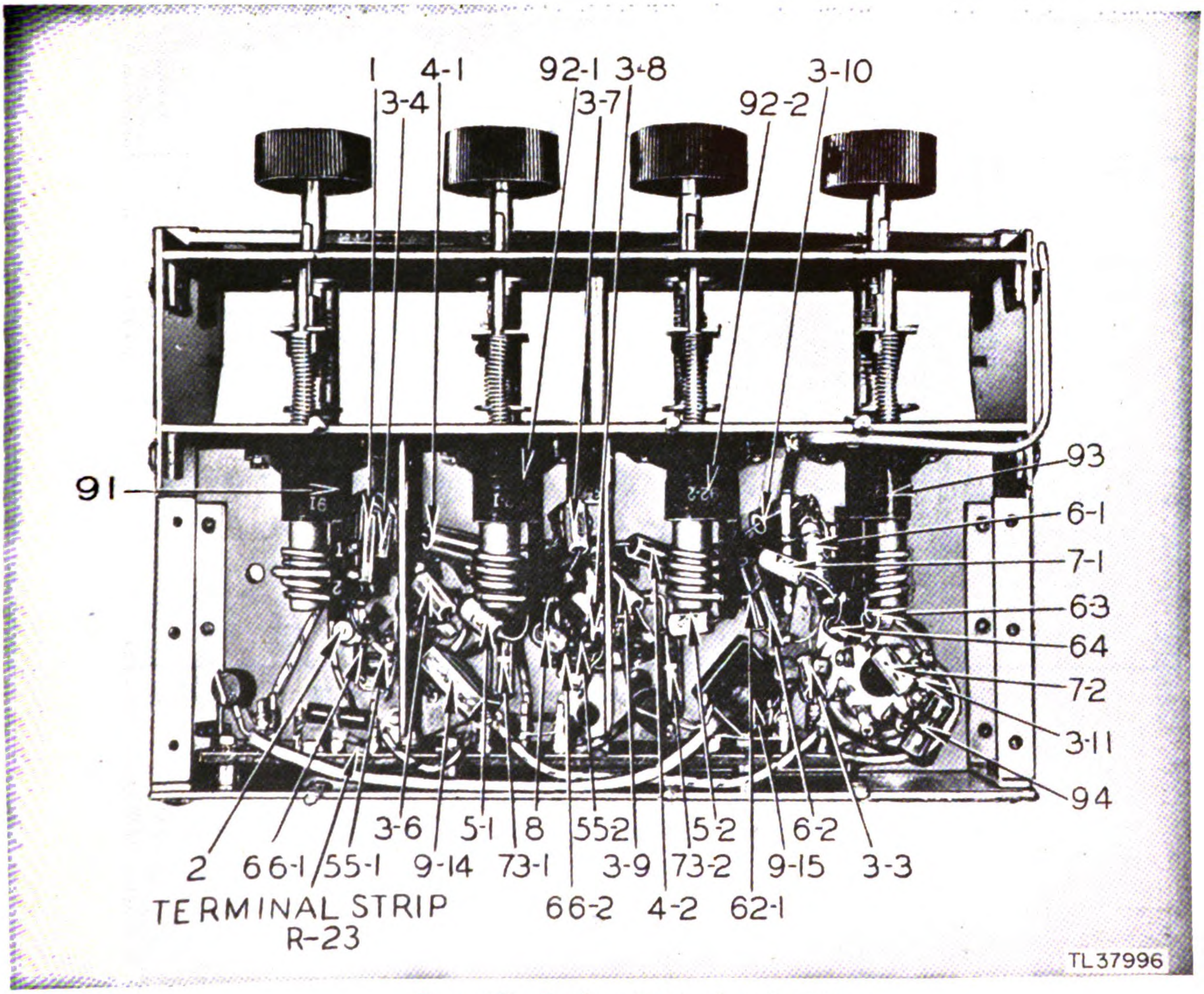


Figure 134. Receiver—bottom view of r-f tuner.

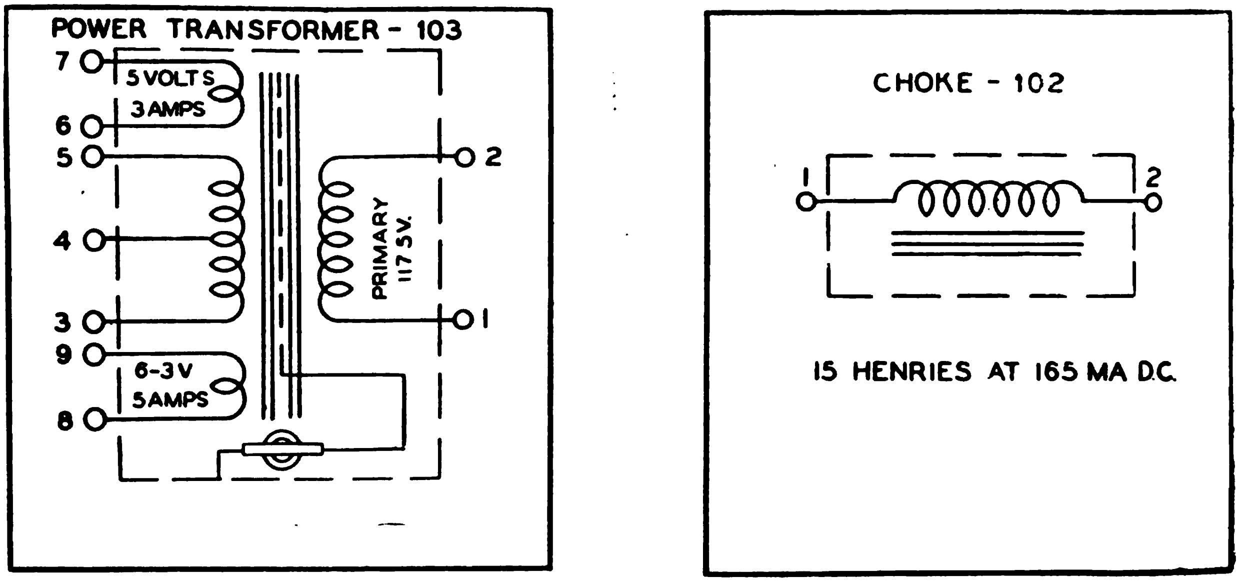


Figure 135. Receiver, schematic of power transformer 103 and choke 102. TL38033

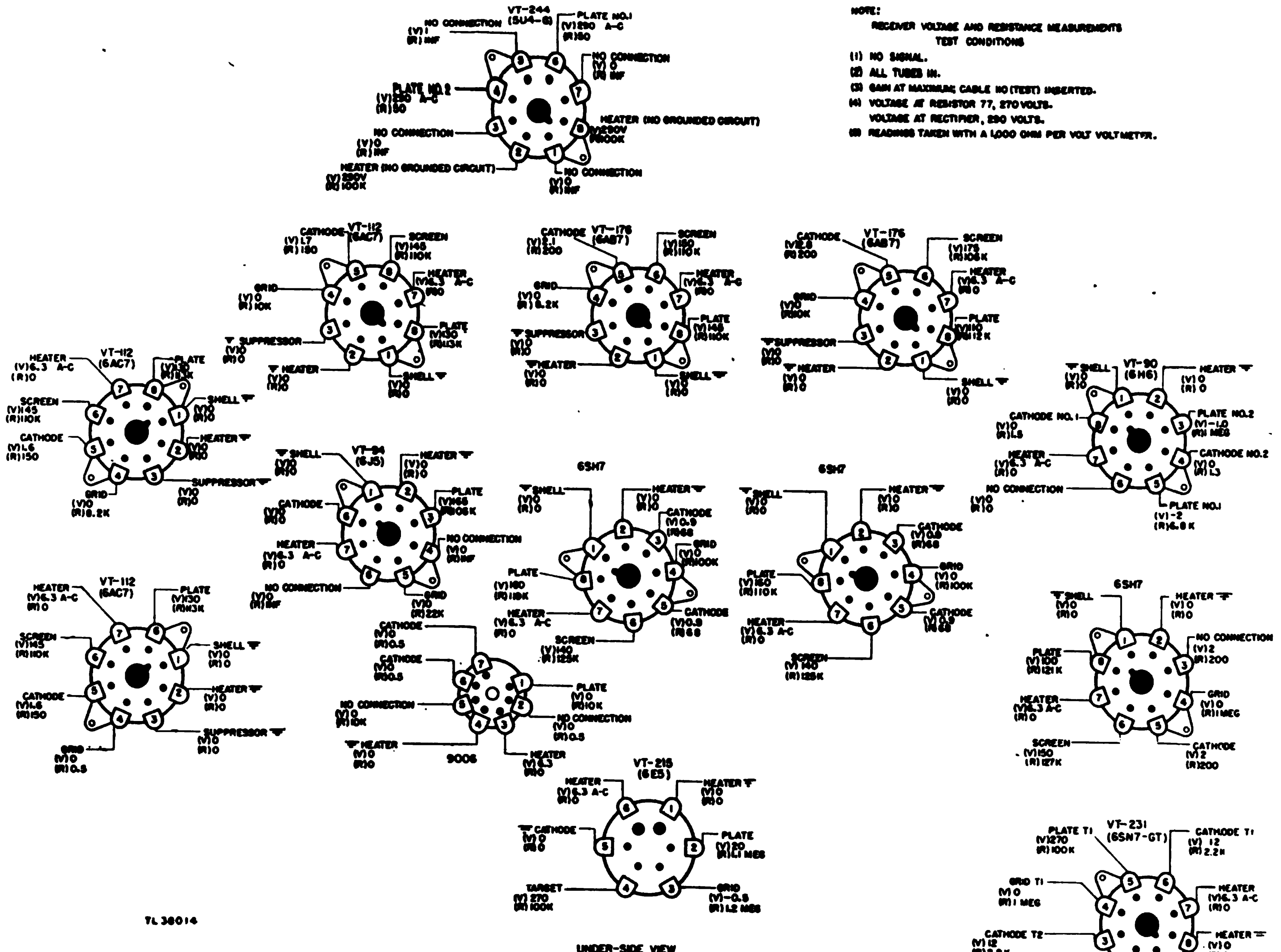


Figure 136. Receiver, socket voltage and resistance chart.

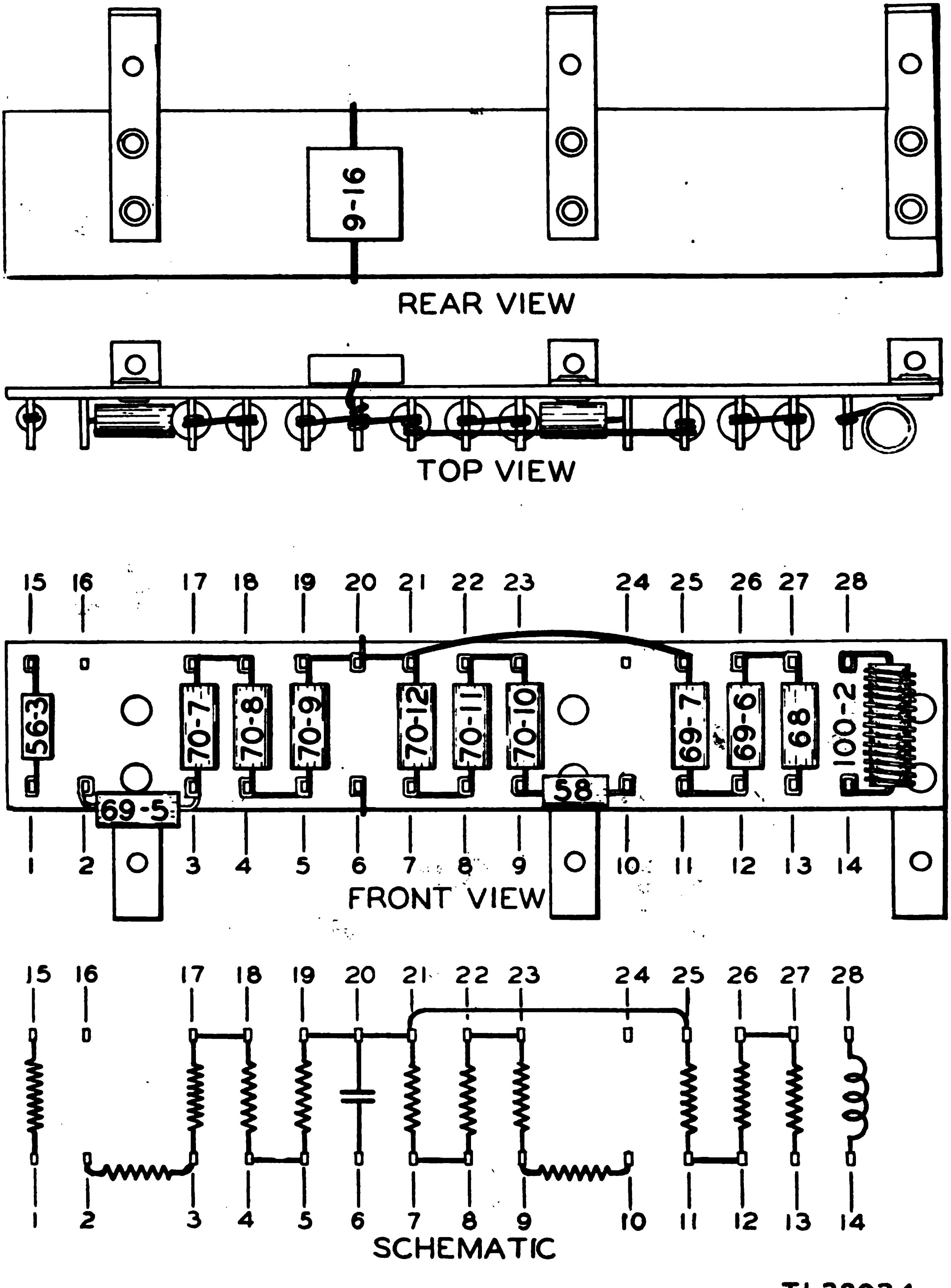
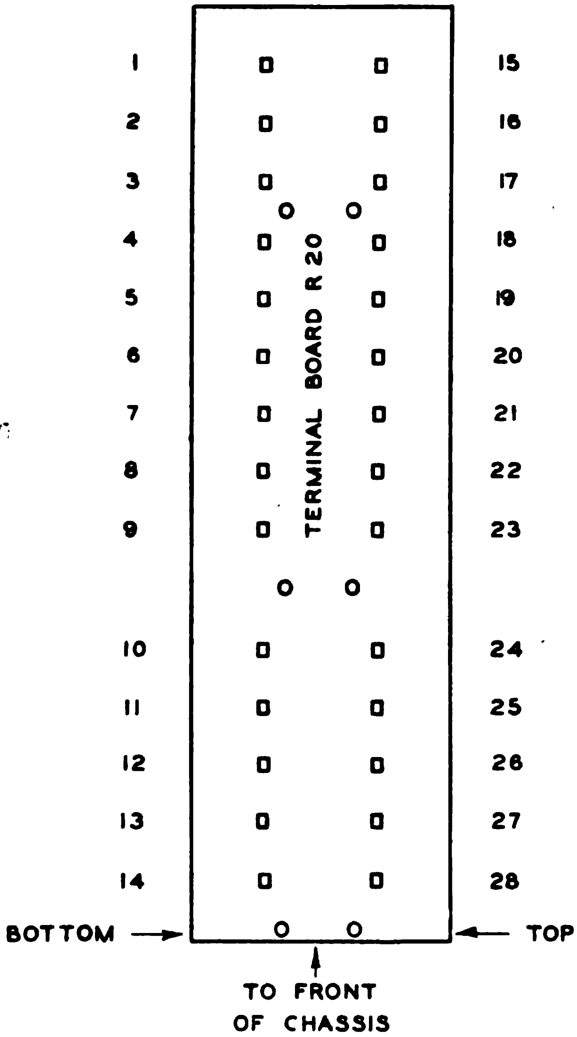


Figure 137. Schematic and wiring diagram of terminal board R20.

OHMS	VOLTS	TERMINAL NO.	TERMINAL NO.	VOLTS	OHMS
100K	270	1	15	0	INF
1.2 MEG	-0.5	2	16	-0.2	1.1 MEG
0	0	3	17	-0.2	1.1 MEG
1 MEG	-1	4	18	-1	1 MEG
1 MEG	-1	5	19	-0.2	1.1 MEG
16.8K	-0.5	6	20	0	1 MEG
0	0	7	21	0	1 MEG
100 K	270	8	22	220	105K
127K	150	9	23	220	105K
121K	100	10	24	220	105K
121 K	100	11	25	220	105K
121 K	100	12	26	0	1 MEG
1 MEG	0	13	27	0	1 MEG
0	0	14	28	0	1 MEG



NOTE: SEE SOCKET VOLTAGE AND RESISTANCE CHART FOR CONDITIONS UNDER WHICH MEASUREMENTS WERE MADE.

TL 38019

Figure 138. Resistance and voltage chart for terminal board R20.

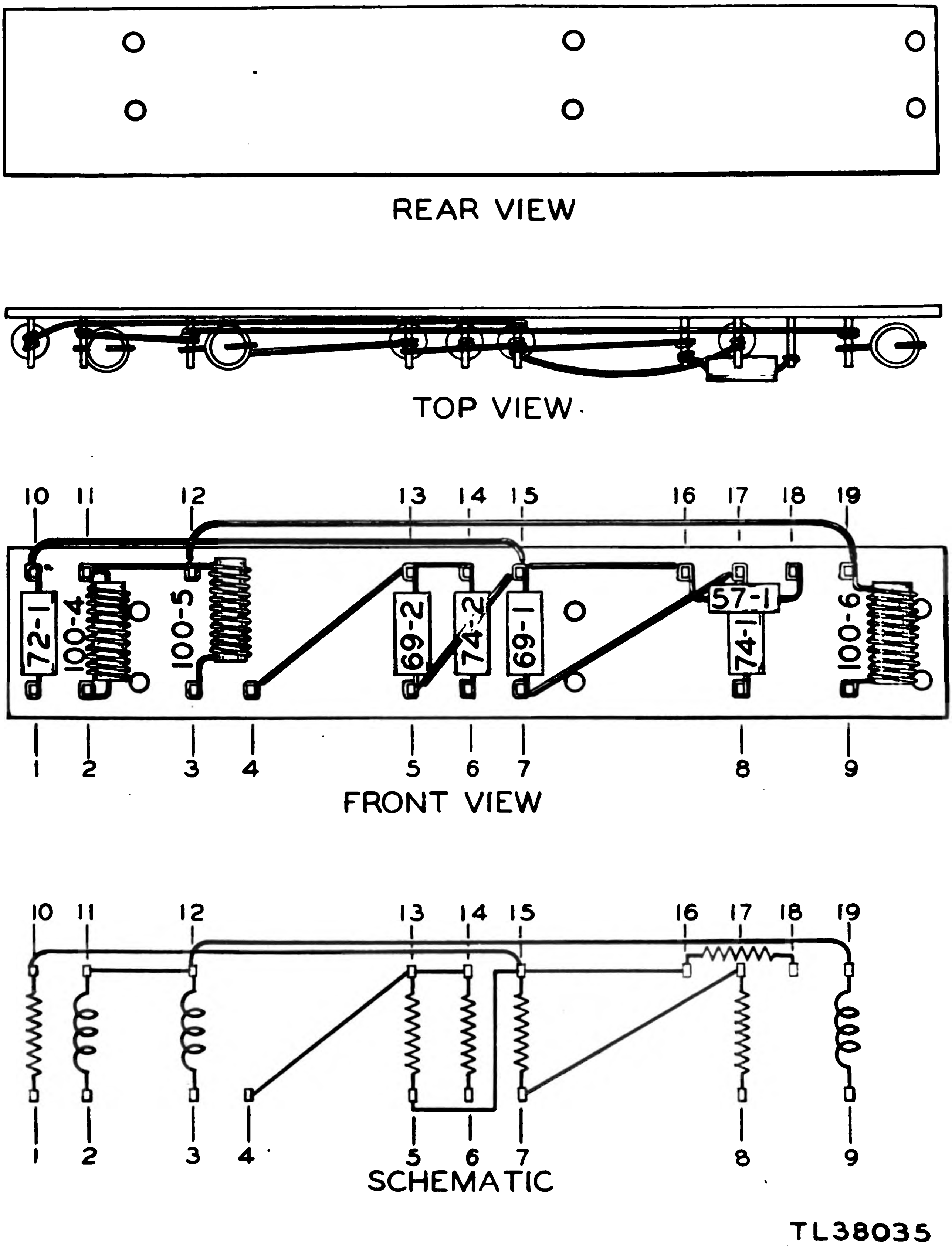
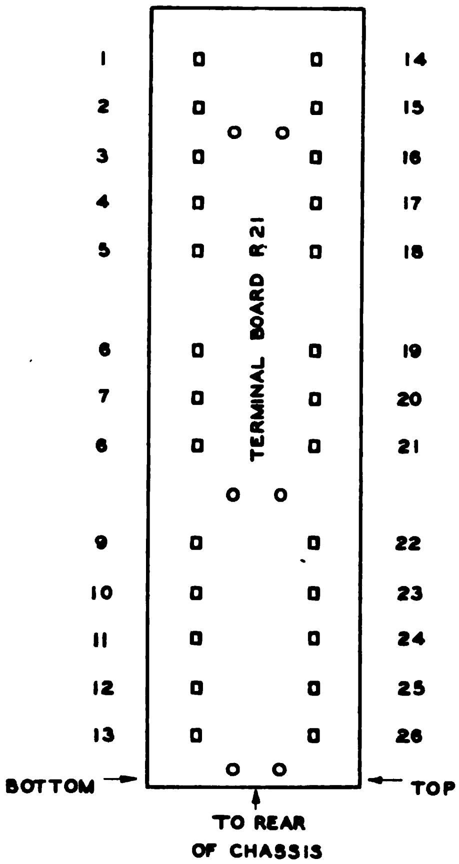


Figure 139. Schematic and wiring diagram of terminal board R21.

OHMS	VOLTS	TERMINAL NO.	TERMINAL NO.	VOLTS	OHMS
150	1.6	1	14	0	0
104 K	235	2	15	270	100 K
104 K	235	3	16	200	107 K
110 K	145	4	17	200	107 K
110 K	145	5	18	130	113 K
0	6.3A-C	6	19	6.3A-C	0
INF	0	7	20	0	INF
150	1.6	6	21	0	0
0	0	9	22	0	0
104 K	235	10	23	270	100 K
104 K	235	11	24	200	107 K
110 K	145	12	25	200	107 K
110 K	145	13	26	130	113 K



NOTE: SEE SOCKET VOLTAGE AND RESISTANCE CHART FOR CONDITIONS UNDER WHICH MEASUREMENTS WERE MADE

TL 38020

Figure 140. Resistance and voltage chart for terminal board R21.

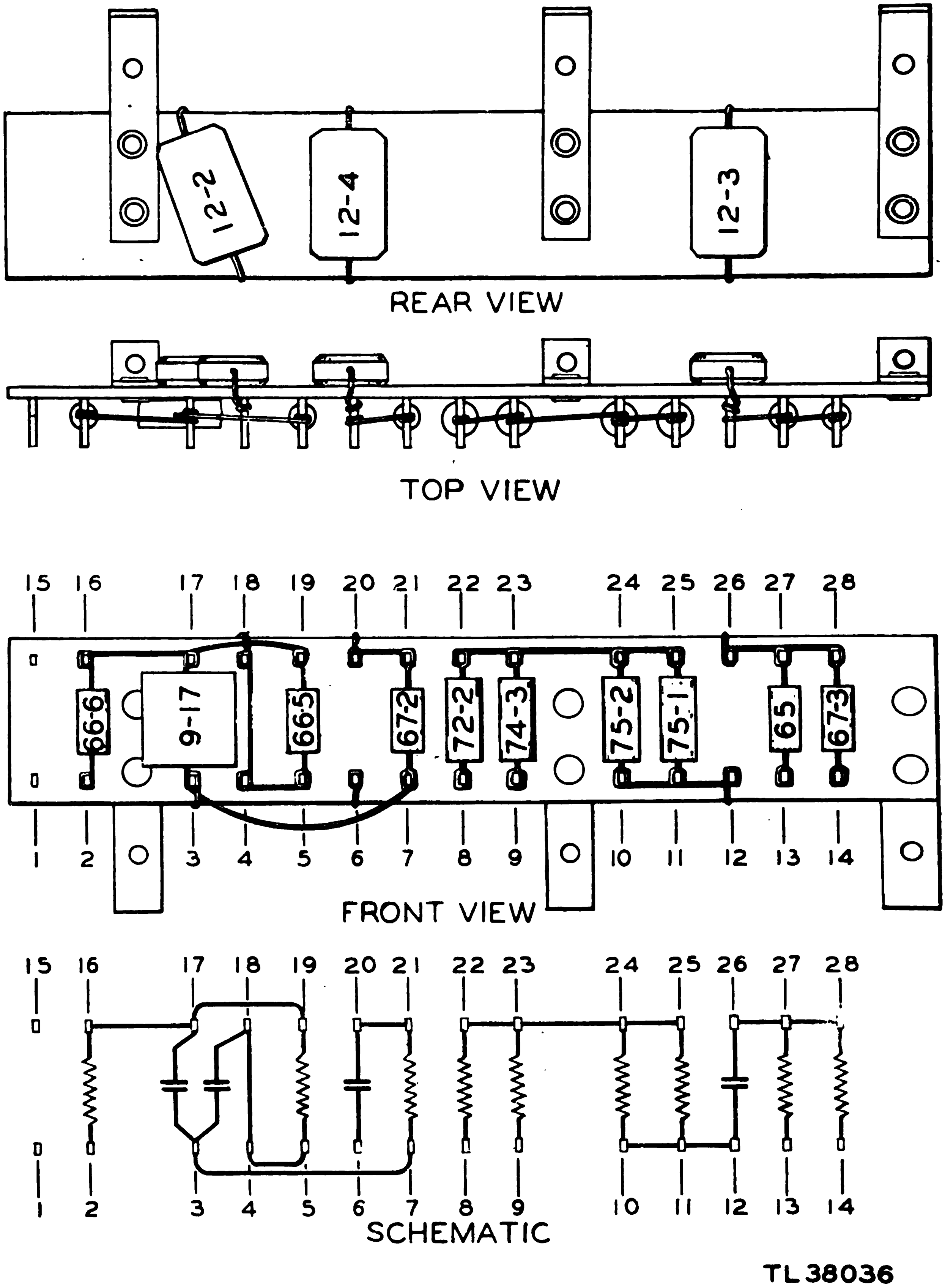
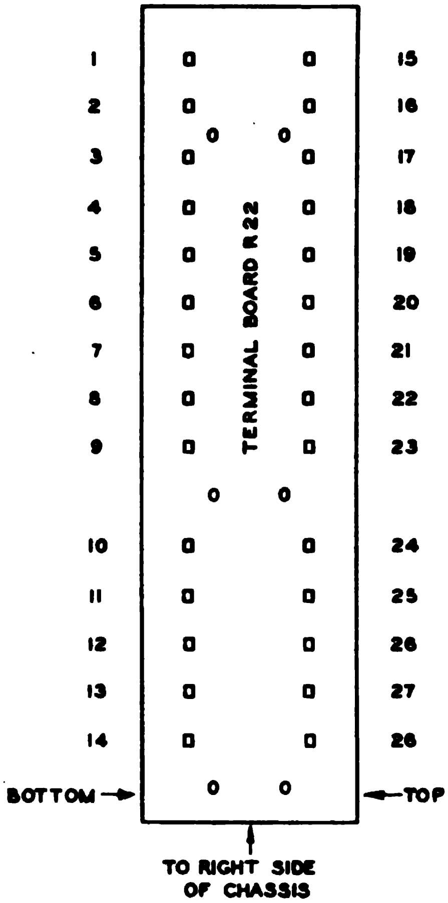


Figure 141. Schematic and wiring diagram of terminal board R22.

TERMINAL

OHMS	VOLTS	NO.	NO.	VOLTS	OHMS
150	1.7	1	15	0	0
113 K	130	2	16	0	INF
110K	145	3	17	200	107K
104 K	235	4	18	200	107K
104 K	235	5	19	270	100K
0	0	6	20	270	100K
104K	235	7	21	270	100K
104 K	235	8	22	200	107K
110K	150	9	23	200	107K
110K	145	10	24	0	INF
103K	240	11	25	270	100K
103 K	240	12	26	210	106K
106K	175	13	27	210	106K
0	6.3A-C	14	28	6.3A-C	0



NOTE: SEE SOCKET VOLTAGE AND RESISTANCE CHART FOR CONDITIONS UNDER WHICH MEASUREMENTS WERE MADE.

TL 38021

Figure 142. Resistance and voltage chart for terminal board R22.

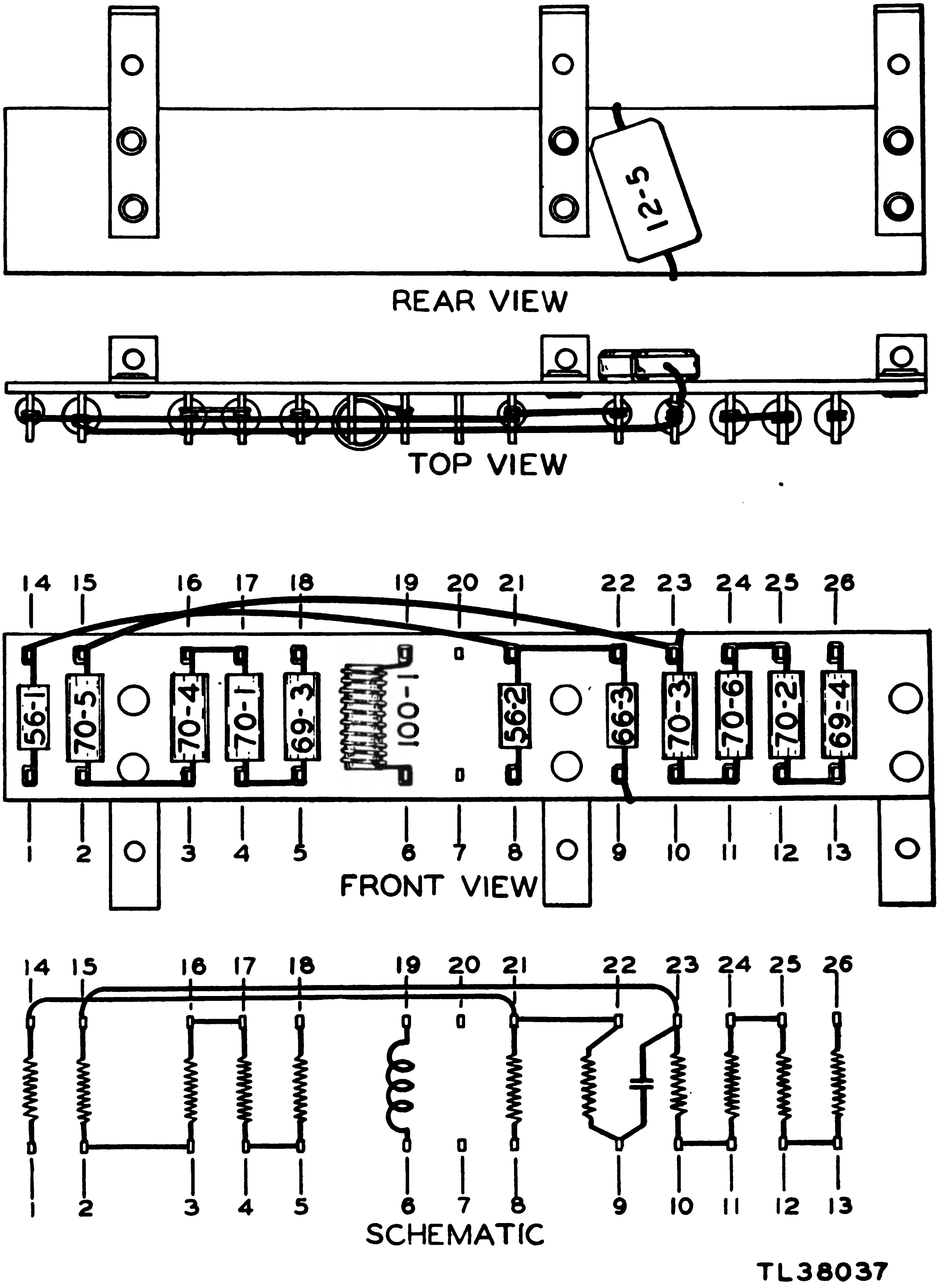
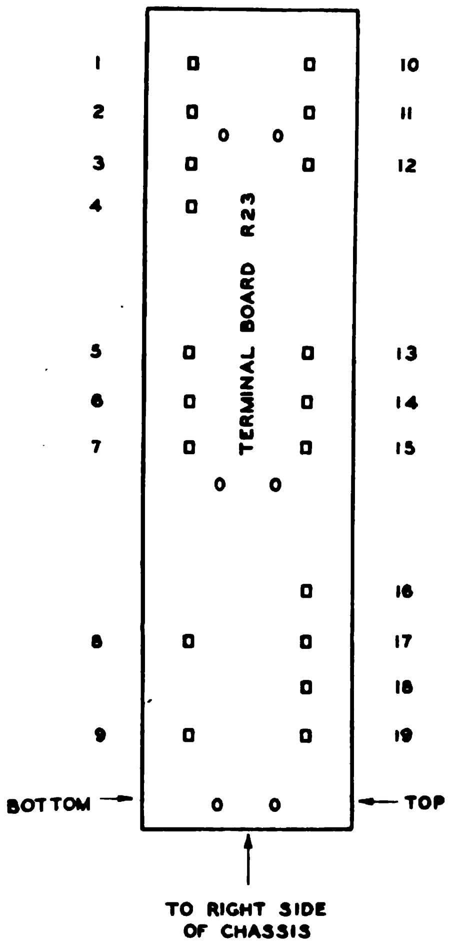


Figure 143. Schematic and wiring diagram of terminal board R23.

TERMINAL

OHMS	VOLTS	NO.
108 K	165	1
0	6.3A-C	2
0	6.3 A-C	3
103 K	240	4
100 K	265	5
125 K	140	6
103 K	240	7
125 K	140	8
0	6.3A-C	9

NO.	VOLTS	OHMS
10	265	100K
11	6.3A-C	0
12	6.3A-C	0
13	240	103K
14	240	103K
15	265	100K
16	265	100 K
17	240	103K
18	270	10K
19	6.3A-C	0



NOTE: SEE SOCKET VOLTAGE AND RESISTANCE CHART FOR CONDITIONS UNDER WHICH MEASUREMENTS WERE MADE.

TL 38022

Figure 144. Resistance and voltage chart for terminal board R23.

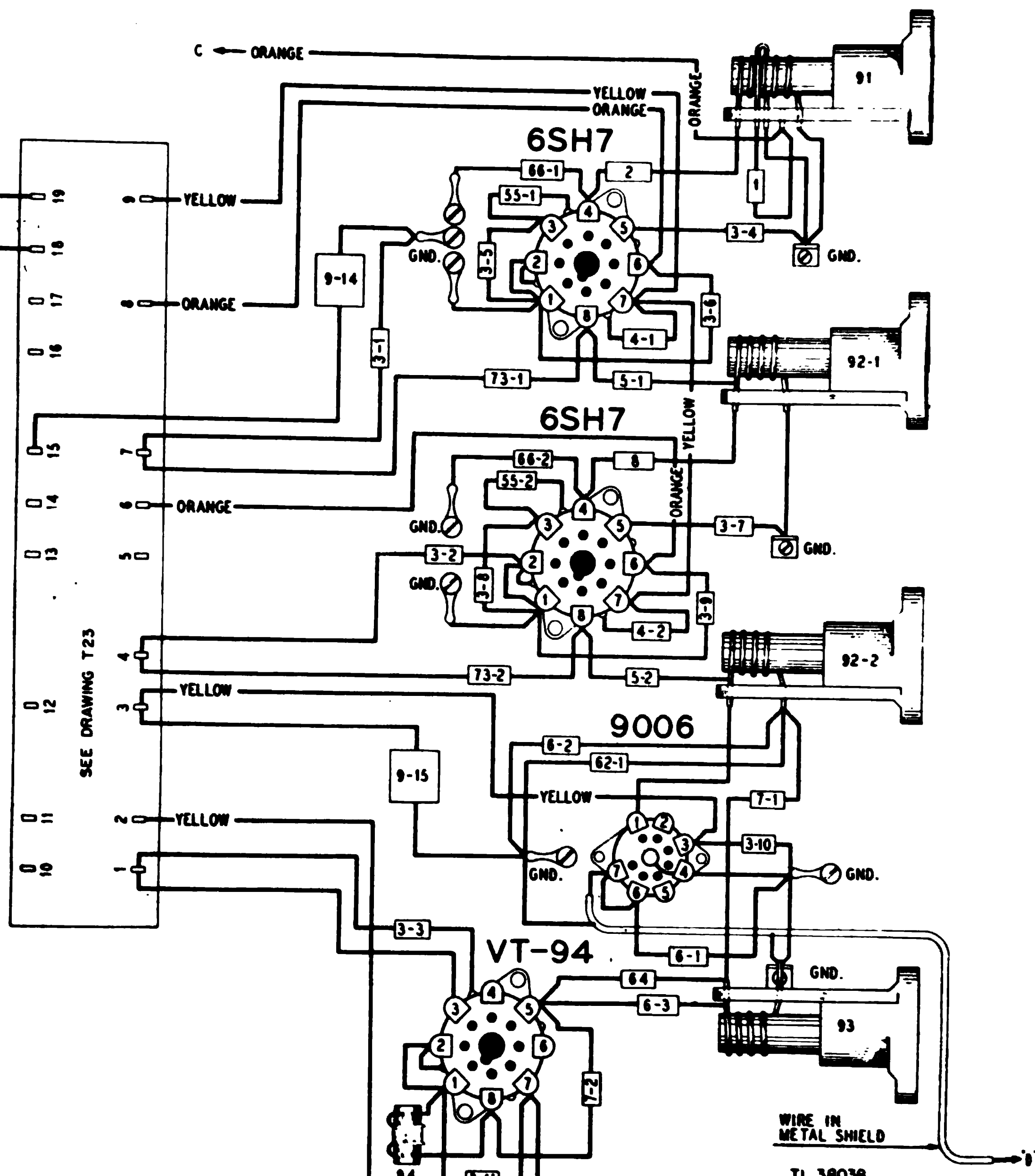


Figure 145. Wiring diagram of r-f tuner.

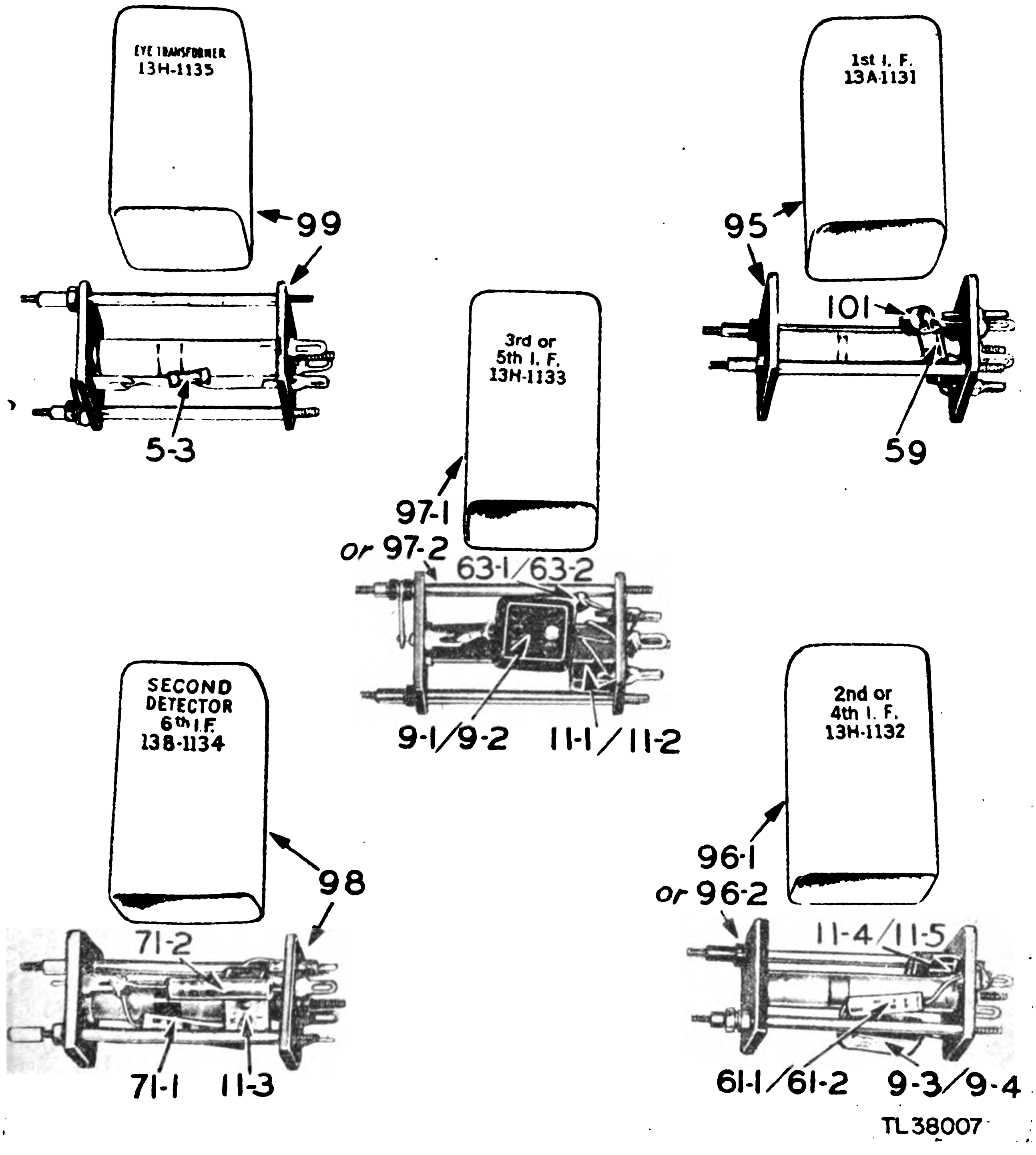


Figure 146. Receiver, i-f transformers.

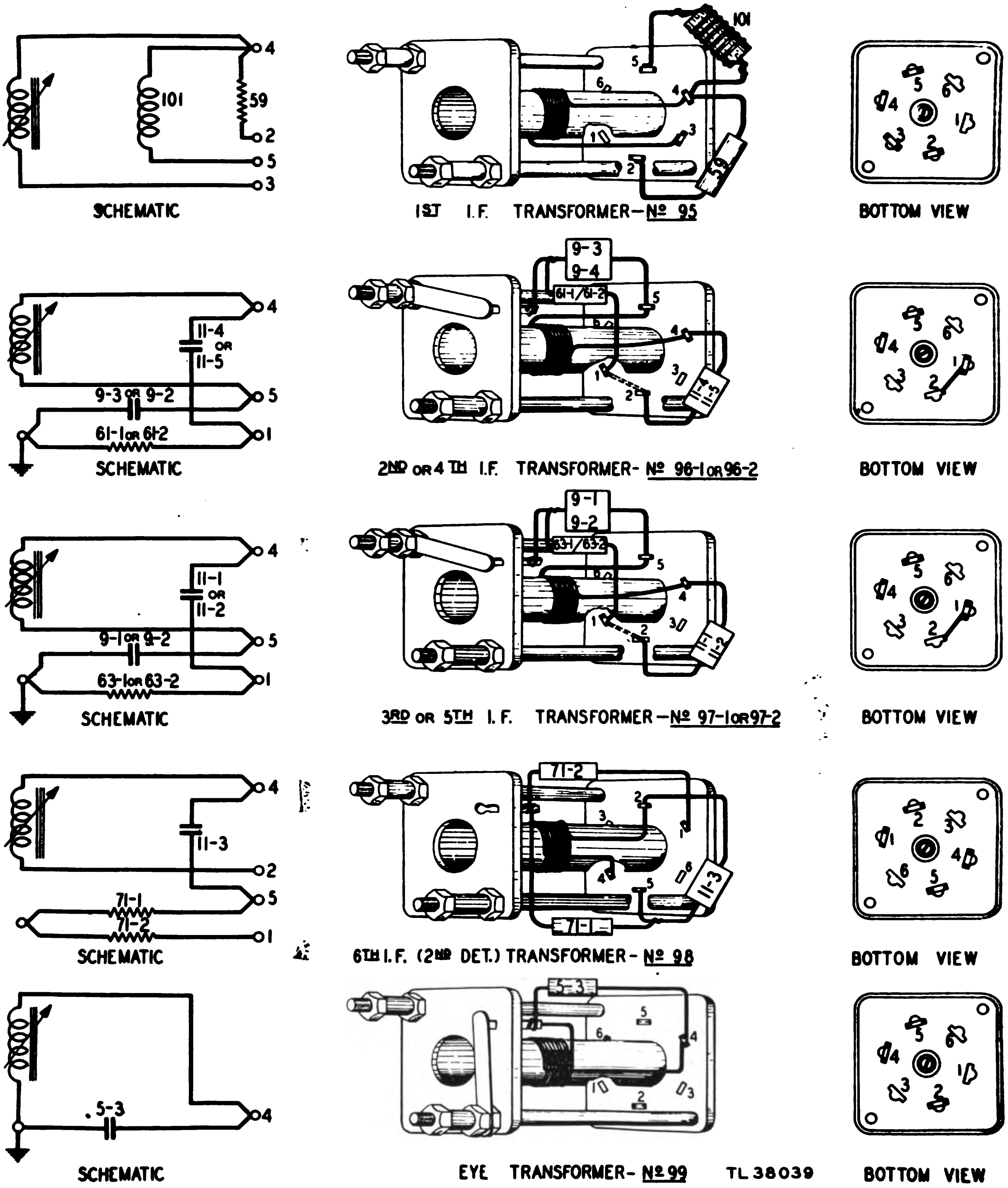


Figure 147. Wiring and schematic diagram of i–f transformers.

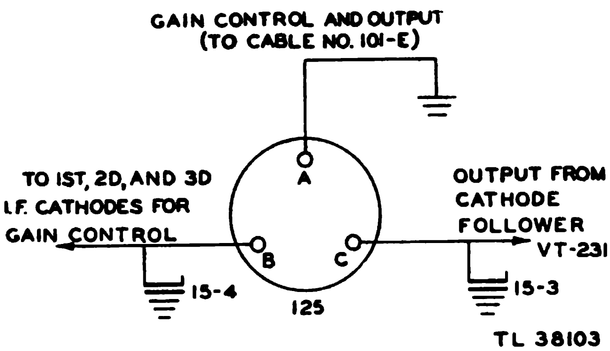


Figure 148. Receiver, receptacle 125.

CAPACITORS

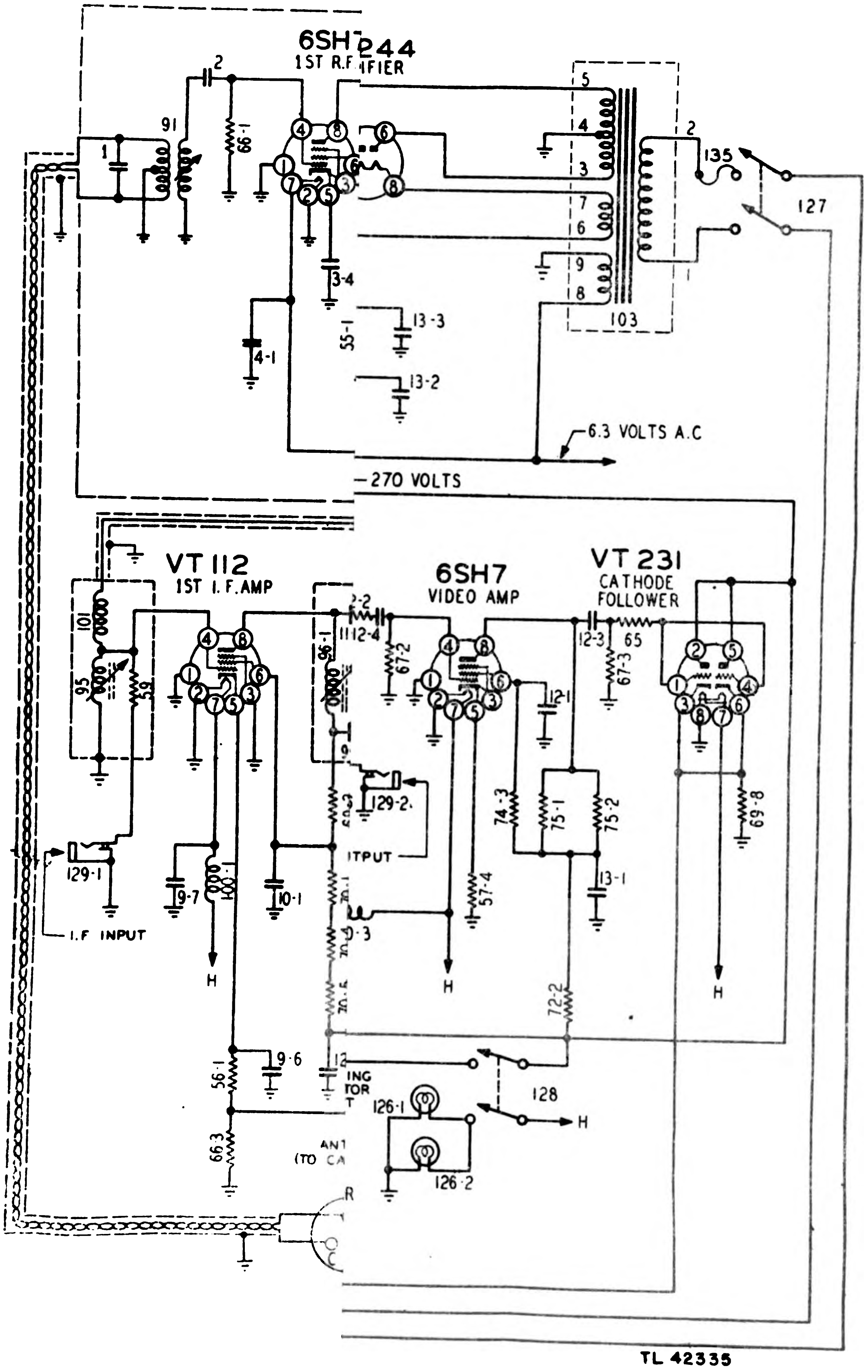
Part No.	Quantity	Capacity	Type	Tol. ±%	Volts d-c
1	1	15 MMF	Ceramic	10	500
2	1	10 MMF	Ceramic	5	500
3-1 to 3-3	3	40 MMF	Ceramic	10	500
3-4 to 3-11	8	40 MMF	Ceramic	10	500
4-1 to 4-2	2	100 MMF	Ceramic	10	500
5-1 to 5-2	2	10 MMF	Ceramic	5	500
5-3	1	10 MMF	Ceramic	5	500
6-1 to 6-3	3	25 MMF	Ceramic	10	500
7-1 to 7-2	2	2 MMF	Ceramic	12.5	500
8	1	5 MMF	Ceramic	10	500
9-1 to 9-2	2	.005 MF	Mica	10	500
9-3 to 9-4	2	.005 MF	Mica	10	500
9-5 to 9-13	9	.005 MF	Mica	10	500
9-14 to 9-15	2	.005 MF	Mica	10	500
9-16	1	.005 MF	Mica	10	500
9-17	1	.005 MF	Mica	10	500
10-1 to 10-6	6	.002 MF	Mica	10	500
11-1 to 11-2	2	200 MMF	Mica	10	500
11-3	1	200 MMF	Mica	10	500
11-4 to 11-5	2	200 MMF	Mica	10	500
12-1	1	.1 MF	Paper	10	400
12-2 to 12-4	3	.1 MF	Paper	10	400
12-5	1	.1 MF	Paper	10	400
13-1 to 13-3	3	7.0 MF	Oil	—10+30	600
14	1	1.0 MF	Oil	—10+20	400
15-1 to 15-4	4	Spark Plates			
16	1	100 MMF	Mica	10	500

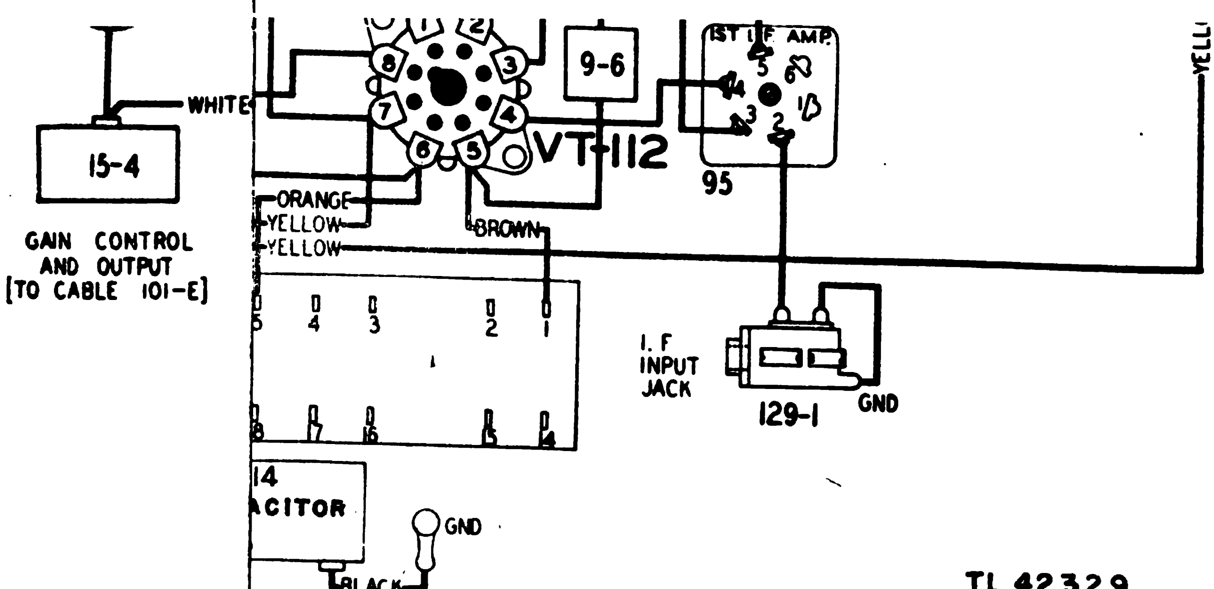
RESISTORS

Part No.	Quantity	Ohms	Tol. ± %	Watts
55-1 to 55-2	2	68	10	½
56-1 to 56-2	2	150	10	½
56-3	1	150	10	½
57-1	1	200	10	½
57-2 to 57-4	3	200	10	½
58	1	470	10	½
59	1	2200	5	½
60	1	6800	5	½
61-1 to 61-2	2	8200	5	½
62-1	1	10000	10	½
62-2	1	10000	10	½
63-1 to 63-2	2	10000	5	½
64	1	22000	10	½
65	1	47000	10	½
66-1 to 66-2	2	100000	10	½
56-3	1	100000	10	½
66-4	1	100000	10	½
66-5 to 66-6	2	100000	10	½
67-1	1	1 Megohm	10	½
57-2 to 67-3	2	1 Megohm	10	½
68	1	1000	10	1
69-1 to 69-2	2	2200	10	1
69-3 to 69-4	2	2200	10	1
69-5 to 69-7	3	2200	10	1
69-8	1	2200	10	1
70-1 to 70-6	6	3300	10	1
70-7 to 70-12	6	3300	10	1
71-1 to 71-2	2	3300	10	1
72-1	1	4700	10	1
72-2	1	4700	10	1
73-1 to 73-2	2	6800	10	1
74-1 to 74-2	2	22000	10	1
74-3	1	22000	10	1
75-1 to 75-2	2	33000	10	1
76	1	1 Megohm	20	¼
77	1	100000	15	2

MISCELLANEOUS PARTS

Part No.	Quantity	Description
91	1	Inductance—Antenna Tuning
92-1	1	Inductance—R.F. Tuning
92-2	1	Inductance—Detector Tuning
93	1	Inductance—Oscillator Tuning
94	1	Inductance—Osc. Cath. Choke 0.3 μh
95	1	Inductance—1st I.F.
96-1	1	Inductance—2nd I.F.
96-2	1	Inductance—4th I.F.
97-1	1	Inductance—3rd I.F.
97-2	1	Inductance—5th I.F.
98	1	Inductance—6th I.F.
99	1	Inductance—Tuning Indicator
100-1	1	Inductance—Heater Choke
100-2	1	Inductance—Heater Choke
100-3	1	Inductance—Heater Choke
100-4 to 100-6	3	Inductance—Heater Choke
101	1	Inductance—R.F. Choke 0.2 μh
102	1	Filter Choke
103	1	Transformer (Power)
123	1	Receptacle (Antenna)
124	1	Receptacle (A-C input)
125	1	Receptacle (Output gain)
126-1 to 126-2	2	Lamp 6-8 volts
127	1	Switch (On-OFF)
128	1	Switch (Tuning indicator and dial light)
129-1 to 129-2	2	Jack (Closed circuit)
135	1	Fuse (3 Amp. 250 volts)


6SH7
1ST R.F
244
IFIER
VT 112
1ST I. F. AMP
6SH7
VIDEO AMP
VT 231
CATHODE
FOLLOWER
6.3 VOLTS A.C
270 VOLTS
I.F INPUT
103
127
135
128
TL 42335



WHITE
15-4
GAIN CONTROL
AND OUTPUT
[TO CABLE 101-E]
ORANGE
YELLOW
YELLOW
BROWN
VT-112
9-6
1ST I.F. AMP.
95
YELL
I. F
INPUT
JACK
129-1
GND
14
ACITOR
GND
BLACK

TL 42329

Section V. INTERCONNECTOR OF RC-148 AND RC-148-B

153. Reference Data

To assist the maintenance personnel while trouble shooting on the interconnector, many figures have been provided. In section V, chapter 1 there are partial schematics and block diagrams, and at the end of this section there are groups of figures containing views of the interconnector, a complete schematic and wiring diagram, drawings of terminal boards, voltage and resistance measurements, for the RC-148 and RC-148-B.

154. Introduction

Inasmuch as both the radar elevation receiver output and the IFF receiver output pass through the interconnector, if an abnormal pattern appears on the display scope at step No. 9 of the starting procedure, trouble in the interconnector must be suspected. Should trouble in the receiver be eliminated with the aid of TEST position 7, and in the transmitter with the aid of TEST position 5, trouble may be assumed to exist in the switching or blanking channels of the interconnector. It is well to bear in mind, though, that the fault might be in the radar range display scope. If any of the test voltages besides those that come from the receiver and transmitter are abnormal the interconnector is at fault. Most of the troubles can be definitely localized to the control system by the use of the seven test positions. There are also troubles included in the trouble-shooting chart which do not affect any of the seven test positions.

155. Signal Tracing In Interconnector

After checking the seven test positions, if there is any doubt as to which stage is at fault in the interconnector, the interconnector may have to be signal traced. This is done by using SELECTOR position 5 as a source for the 4098-cycle signal. A test scope is used as the output indicator for the signal tracing. See section I for information on signal tracing. Place the probe of the test scope to the grid and plate of each stage starting from the input to the first stage of the channel involved and going through each channel until either no signal is found at a stage or a distorted signal is observed. When the trouble is isolated to a stage make a voltage and resistance check of that stage.

Note. Do not check stages 4 and 5B for waveforms because the test scope will discharge capacitor 8 and incorrect waveforms will be obtained. Instead, check the cathode of 6A. If a step waveform is observed, then stages 4 and 5B are operating correctly.

156. Interconnector Trouble-shooting Chart

A. SYMPTOMS:

1. Red indicator lamp 108 on interconnector does not light (step 4).
2. All other indicator lamps are lighted (step 4).

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Open fuse 135 in interconnector.	1*a*. Check the fuse and replace if necessary. *b*. If trouble is not cleared, see item below.
2. Defective indicator lamp.	2*a*. Check lamp by replacing it. *b*. If trouble is not cleared replace original lamp and see item below.
3. Defective indicator lamp circuit.	3*a*. Check the tubes VT-231 for filament glow. *b*. If the tubes are glowing make a continuity test from pins 6 and 7 of transformer 130 in interconnector to terminals of indicator lamp.
4. Defective a-c input circuit.	4*a*. If the tubes VT-231 are not glowing, check for line voltage between terminals 1 and 2 of transformer 130. *b*. If there is no voltage make a continuity test from transmitter socket 107 through interconnector socket 105 to terminals 1 and 2 of transformer 130. Test for continuity between terminals 1 and 2.

B. SYMPTOMS:

1. Radar scope completely filled with hash.
2. All test positions normal.
3. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective pulse phase splitter, stage 8A.	1. Check tube and associated circuit, particularly output capacitor 4-7 and capacitor 4-5.

C. SYMPTOMS:

1. Radar signal does not appear on radar scope.
2. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective receiver.	1. Place SELECTOR switch in STANDBY position. If radar signal does not appear, trouble is in elevation receiver.
2. Defective radar switching channel.	2*a*. If signal appears in STANDBY position, fault is in input circuit to radar switching channel or in channel itself.
	b. Check input circuit.
	c. Make a voltage and resistance check of radar switching channel.
	d. If fault is not cleared, check output circuit especially the output cathode follower, 13B.

D. SYMPTOMS:

1. Radar signal does not appear on radar scope.
2. Distorted base line on radar scope.
3. IFF signal appears on radar scope.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective blanking amplifier, stage 11.	1. Make a voltage and resistance check of stage, especially compensating network.

E. SYMPTOMS:

1. No IFF signal on radar scope.
2. Radar signal normal.

PROBABLE LOCATION OF FAULT

1. Defective IFF switching channel.
2. Open from output of IFF switching channel to cathode-ray tube of radar scope.
3. Tube 8A defective.

PROCEDURE

1*a*. Make a voltage and resistance check of stages in channel.
b. If trouble is not cleared, see item below.
2*a*. Check continuity from output of IFF channel through section *B* of SELECTOR switch 112 to large socket (105) on interconnector.
b. Check continuity from large plug (105) on interconnector to deflection plate (pin 6) of cathode-ray tube of radar scope.
3. Check stage.

F. SYMPTOMS:

1. Radar and IFF base lines are distorted.
2. All other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective compensating and separating networks.

PROCEDURE

1. Check resistance of networks.

G. SYMPTOMS:

1. Radar baseline appears below IFF baseline on radar scope.
2. All other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective clamper 13A, 12B, or 12A.

PROCEDURE

1. Make resistance and voltage check of clamper stages 13A, 12B, and 12A.

H. SYMPTOMS:

1. Radar baseline appears below IFF baseline.
2. Radar baseline very jumpy.
3. Other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective baseline compensation network.

PROCEDURE

1. Check resistor 86 and network.

I. SYMPTOMS:

1. Baseline separation wider than normal.
2. Other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective pulse phase splitter 8A.
2. Defective baseline compensation and separation network.

PROCEDURE

1. Check stage.
2. Check output network of stage 11 composed of resistors 86, 90, 91 and capacitors 10–4 and 14.

J. SYMPTOMS:

1. No baseline separation.
2. All other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective IFF separation network.

PROCEDURE

1. Check resistors 82–1 for open.

K. SYMPTOMS:

1. Entire pattern on radar scope moves below bottom of screen.
2. When vertical positioning control on radar scope is rotated clockwise, pattern moves up, but baselines still cannot be seen.

PROBABLE LOCATION OF FAULT

1. Defective output circuit of cathode follower 8B.

PROCEDURE

1. Check resistor 65–2 for open.

L. SYMPTOMS:

1. No phase control of IFF signal possible except through switch on phase control knob.
2. All other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective phase shifting network.

PROCEDURE

1*a*. Check capacitor 15 for open.
b. Check resistor 96 for open.

M. SYMPTOMS:

1. IFF trace unusually dim on radar scope.
2. All other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective brightness correction amplifier stage 9A.

PROCEDURE

1*a*. Make a voltage and resistance check of stage.
b. If trouble is not cleared, make a continuity test from output of amplifier to control grid of c-r tube.

N. SYMPTOMS:
(Position 1)

1. Single baseline appears on range scope.
2. Positions 2, 3, 5, no vertical voltage.
3. Positions 4, 6, 7, normal patterns.
4. All other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective division channel.

PROCEDURE

1a. Check voltages and resistances of stages 2B, 3A, 3B, 5A, and 4.
b. Check resistors 59–1, 59–2, and 88 in cathode circuit of 5B for open.
2. Check voltages and resistances of blocking oscillator 5B.

O. SYMPTOMS:
(Position 1)

1. Single baseline appears on range scope.
2. Position 2, no vertical voltage.
3. Positions 3, 4, 5, 6, 7, normal pattern.
4. Radar scope, no baseline separation.
5. All other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective cathode follower 6A.

PROCEDURE

1. Replace tube 6A and check patterns on scope.
2. If patterns are not correct, make a voltage and resistance check of the cathode follower circuit.

P. SYMPTOMS:
(Position 1)

1. No vertical deflection on range scope.
2. Positions 2, 3, 4, 5, 7, no vertical deflection.
3. Position 6, normal pattern.
4. Radar scope, baseline alone appears in OPERATE position; radar receiver signal appears in STANDBY position.
5. All other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective power supply.

PROCEDURE

1a. Replace rectifier tube 15 and check patterns on range scope.
b. If patterns are not correct, make a voltage and resistance check of the power supply.

Q. SYMPTOMS:
(Position 2)

1. One vertical division obtained on range scope; division control has no effect.
2. Positions 1, 3, 5, no vertical voltage.
3. Positions 4, 6, 7, normal patterns.
4. Radar scope, no baseline separation; distorted baseline.
5. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Blocking oscillator (5B).	1*a*. Replace tube 5B, and check patterns on scope. *b*. If patterns are not normal, make a voltage and resistance check of the stage.

R. SYMPTOMS:
(Position 3)

1. No vertical deflection on range scope.
2. Positions 1, 2, 4, 6, 7, normal patterns on scope.
3. Position 5, no vertical deflection.
4. Radar scope, no IFF pulse on cathode-ray tube.
5. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective cathode follower stage (14).	1*a*. Replace tube 14 and check patterns on range scope. *b*. If patterns are not normal, make a voltage and resistance check of the stage.

S. SYMPTOMS:
(Position 4)

1. No vertical deflection on range scope. (Also see symptom P.)
2. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective test power supply voltage divider.	1. Check resistor 74 for open.

T. SYMPTOMS:
(Position 6)

1. No vertical deflection on range oscilloscope (SELECTOR switch in position 4).
2. Positions 1, 2, 3, 5, no vertical deflection.
3. Positions 4 and 7, normal patterns.
4. All other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective 4098 signal input circuit.

PROCEDURE

1a. Put SELECTOR switch in position 5 and observe patterns.
b. If patterns are normal, check continuity from interconnector plug 105 through switch 112A to input of stage 2B.
c. If trouble is not in interconnector, check continuity from terminal SYNC IN on terminal strip of Junction Box JB–22 to connector 105.

U. SYMPTOMS:
(Position 6)

1. Symptoms similar to symptom T.
2. Very slight control of IFF phase by phase control.
3. Rotation of phase control to clockwise position results in normal indications in all test positions; in counterclockwise position, above abnormalities will return.
4. All other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective phase shifting circuit.

PROCEDURE

1. Check capacitor 15 for short.

V. SYMPTOMS:
(Position 6)

1. Positions 1, 2, 3, 5, 6, no vertical deflection with SELECTOR switch in position 5.
2. Positions 1, 2, 3, 5, 6, normal patterns with SELECTOR switch in position 4.
3. Positions 4 and 7, normal patterns with positions 4 and 5 of SELECTOR switch.
4. All other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective Wien bridge oscillator.
2. Defective switch 112A.

PROCEDURE

1a. Make a complete voltage and resistance check of the two stages 2A and 1.
b. If trouble is not cleared, see item below.
2. Check switch 112A, especially pin 7.

157. Procedure For Replacing Defective Electrical Parts in Interconnector

a. INTRODUCTION. The information following is to assist the radar repairman in replacing defective electrical parts in the interconnector section of Control Unit BC–1073–A. It will be noted that such replaceable items as small resistors and capacitors, tube sockets, and tubes are not covered in these procedures. Neither is a procedure given when the replacement of the part presents no special difficulty. These procedures have been worked out experimentally and represent the shortest and best method of accomplishing the work.

Cautions: (1) Before replacing a defective part, observe carefully its position, method of mounting, and wiring. This will insure the correct installation of the new part.

(2) When removing such parts as switches, potentiometers, and tube sockets, which have several wires attached to their terminals, be sure to tag the wires so that they will be replaced in their proper positions.

(3) When disassembling a component, the screws, nuts, bolts, washers, and other small parts which are removed, should be put in some small container to prevent loss.

b. INDEX TO ITEMS. The replacement of the following items is discussed in paragraph 158:

- Pilot light jewel.
- Pilot light bulb.
- Potentiometers.
- Transformers and chokes.
- Filter capacitor.
- Connector 106.
- Connector 105.

158. Step-By-Step Procedure to Replace Items

a. PILOT LIGHT JEWEL. (1) Remove the jewel by unscrewing it in a counterclockwise direction from its socket.

(2) To install new jewel, reverse removal procedure.

b. PILOT LIGHT BULB. (1) Remove jewel as described above.

(2) Push bulb in, turn it counterclockwise, and remove it.

(3) To install new bulb, reverse removal procedure.

c. POTENTIOMETERS. (1) Unsolder the connection to the terminals of the defective potentiometer.

(2) With an Allen wrench loosen the setscrew on the knob and remove it.

(3) From the front panel remove the locknut which secures the potentiometer and remove it from the panel.

(4) To install the new potentiometer reverse the removal procedure.

d. TRANSFORMERS AND CHOKES. See replacement of electrical parts in transmitter.

e. FILTER CAPACITORS. (1) From the underside of the chassis remove the seven soldered connections to the capacitor (1A, B, C) terminals.

(2) From the top of the chassis, remove the two bolts which attach the mounting flange to the chassis, and remove the capacitor.

(3) To install the new capacitor, reverse the removal procedure.

f. CONNECTOR 106. (1) Unsolder the two connections to the terminals of the connector.

(2) Remove the bolts at the four corners of the connector mounting and remove it from the chassis.

(3) To install the new connector, reverse the removal procedure.

g. CONNECTOR 105. (1) Remove the four bolts which attach the back panel to the main chassis and push the panel back as far as the wiring will allow.

(2) Unsolder the connections to the terminals of the connector.

(3) Remove the bolts at the four corners of the connector mounting and remove it from the chassis.

(4) To install the new connector reverse the removal procedure.

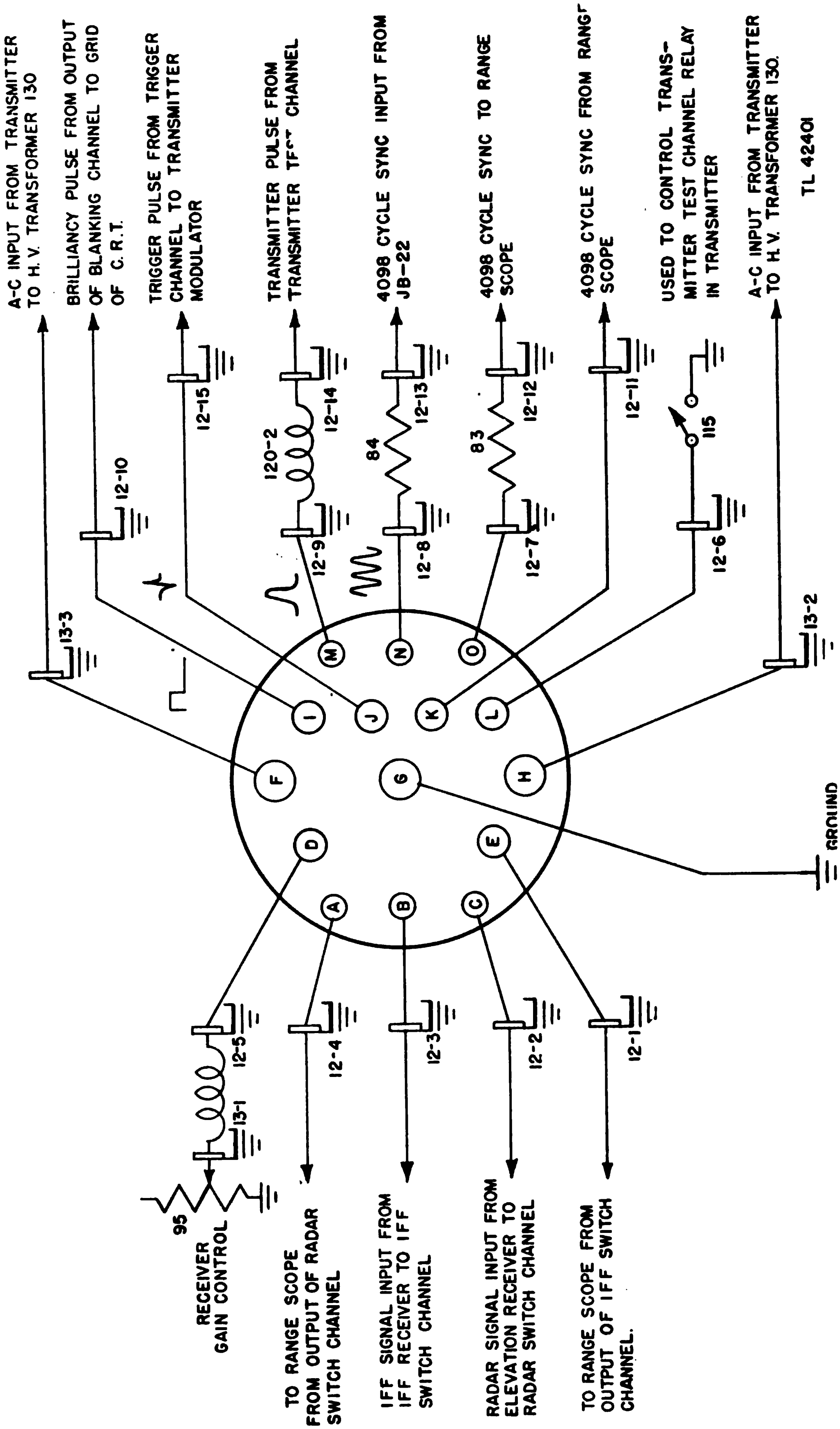


Figure 152. Octopus socket, 105.

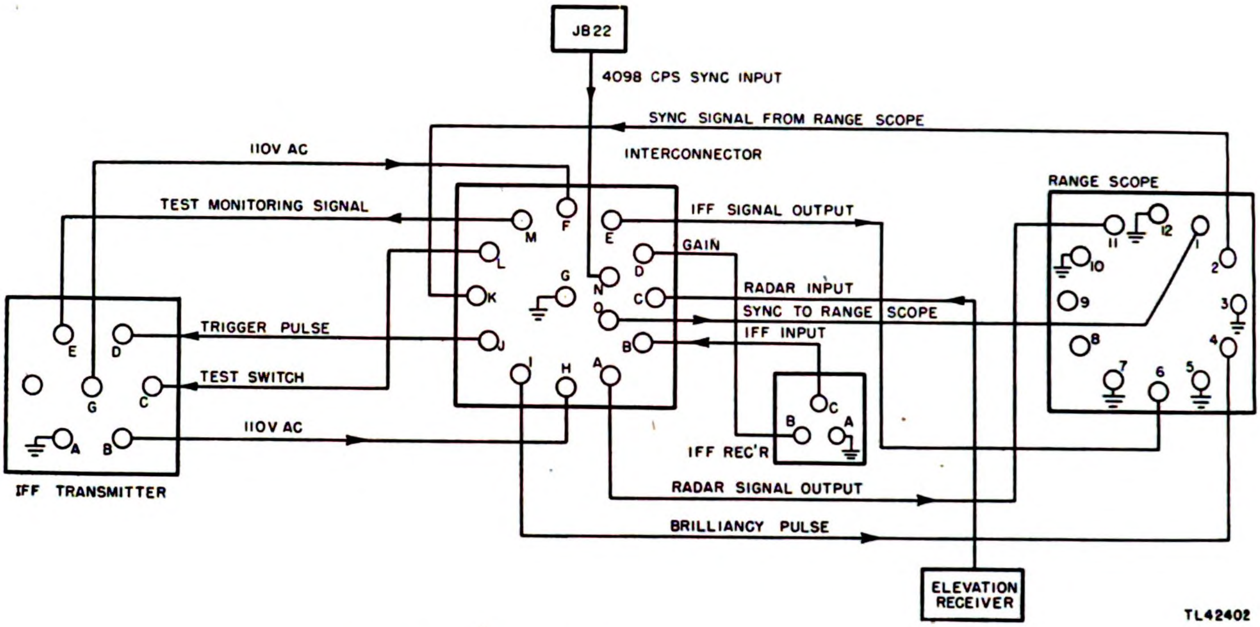


Figure 153. Cable connections of components of identification system.

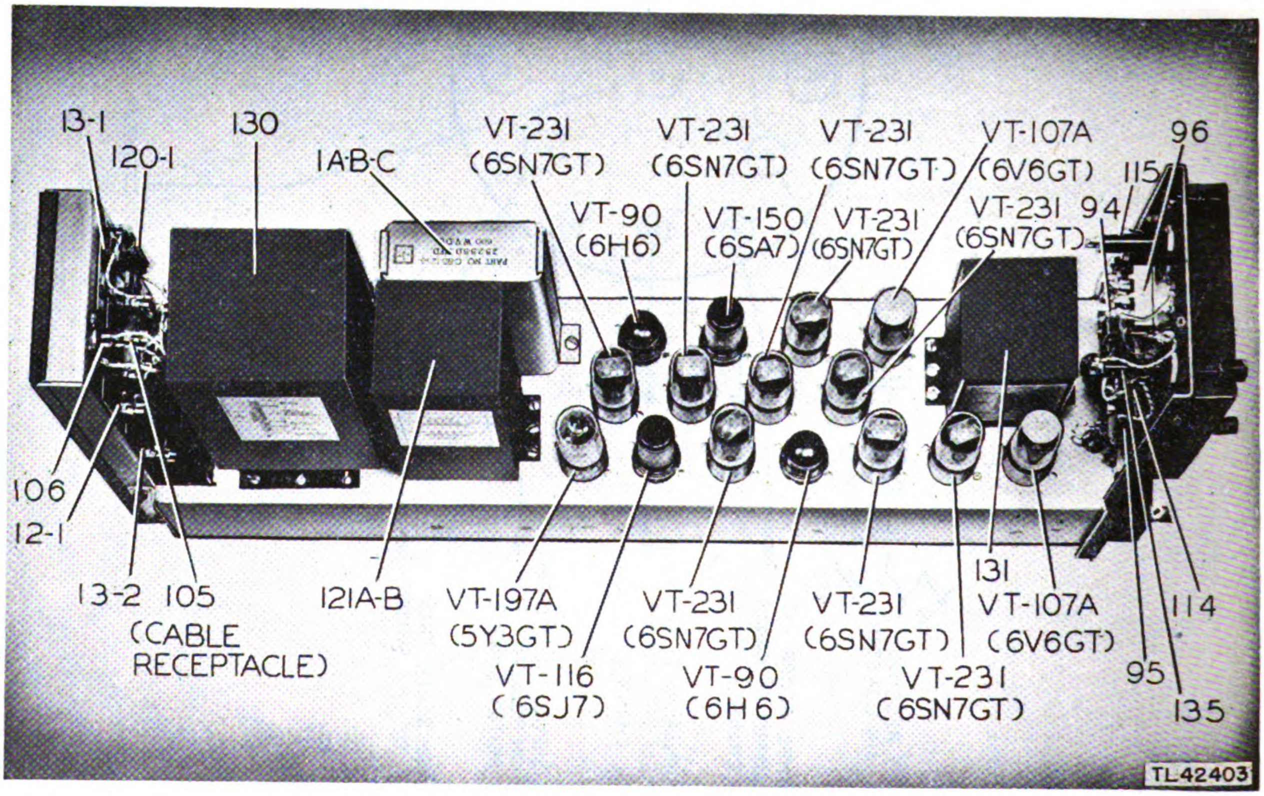


Figure 154. Interconnector—top view.

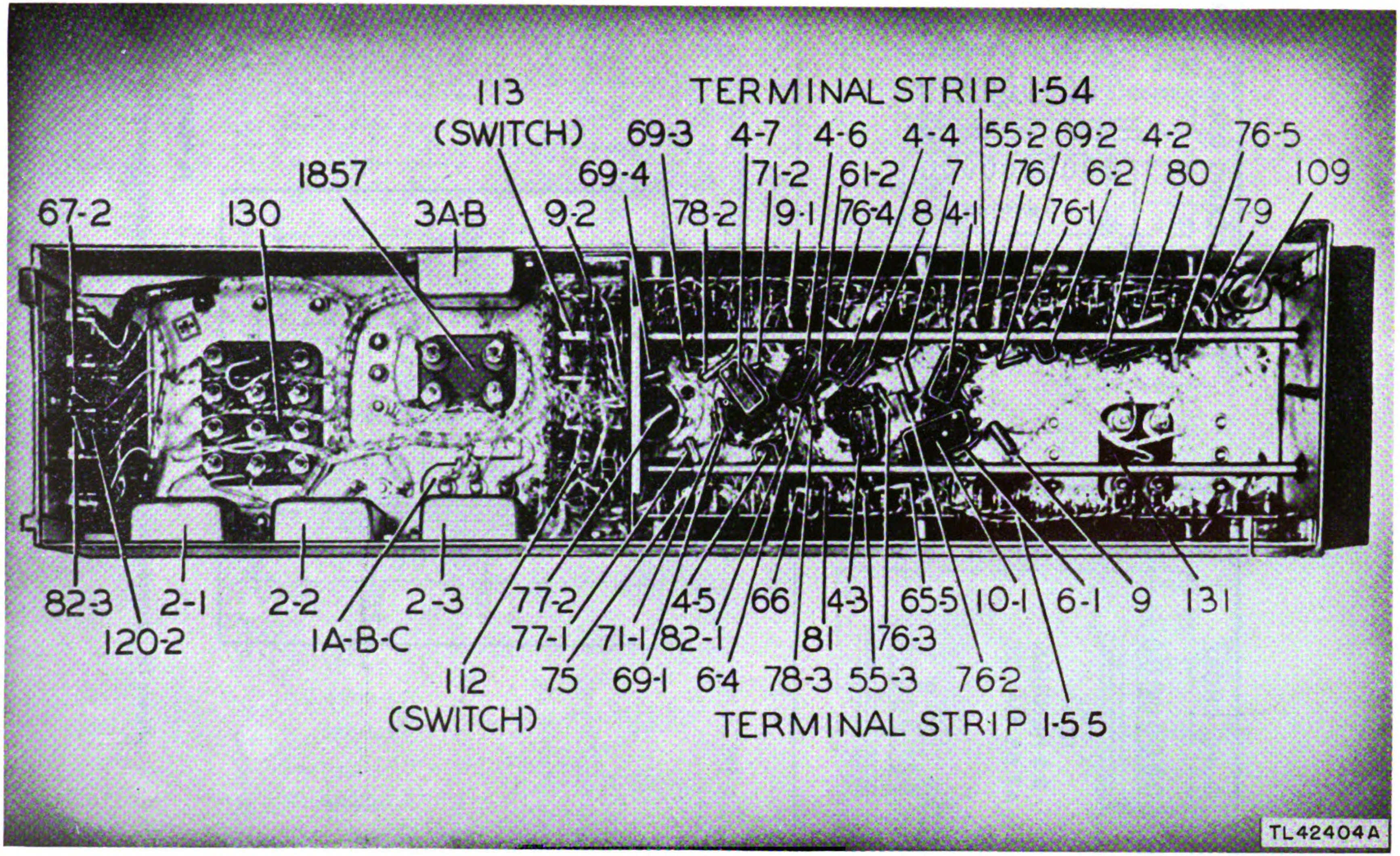


Figure 155. Interconnector—bottom view.

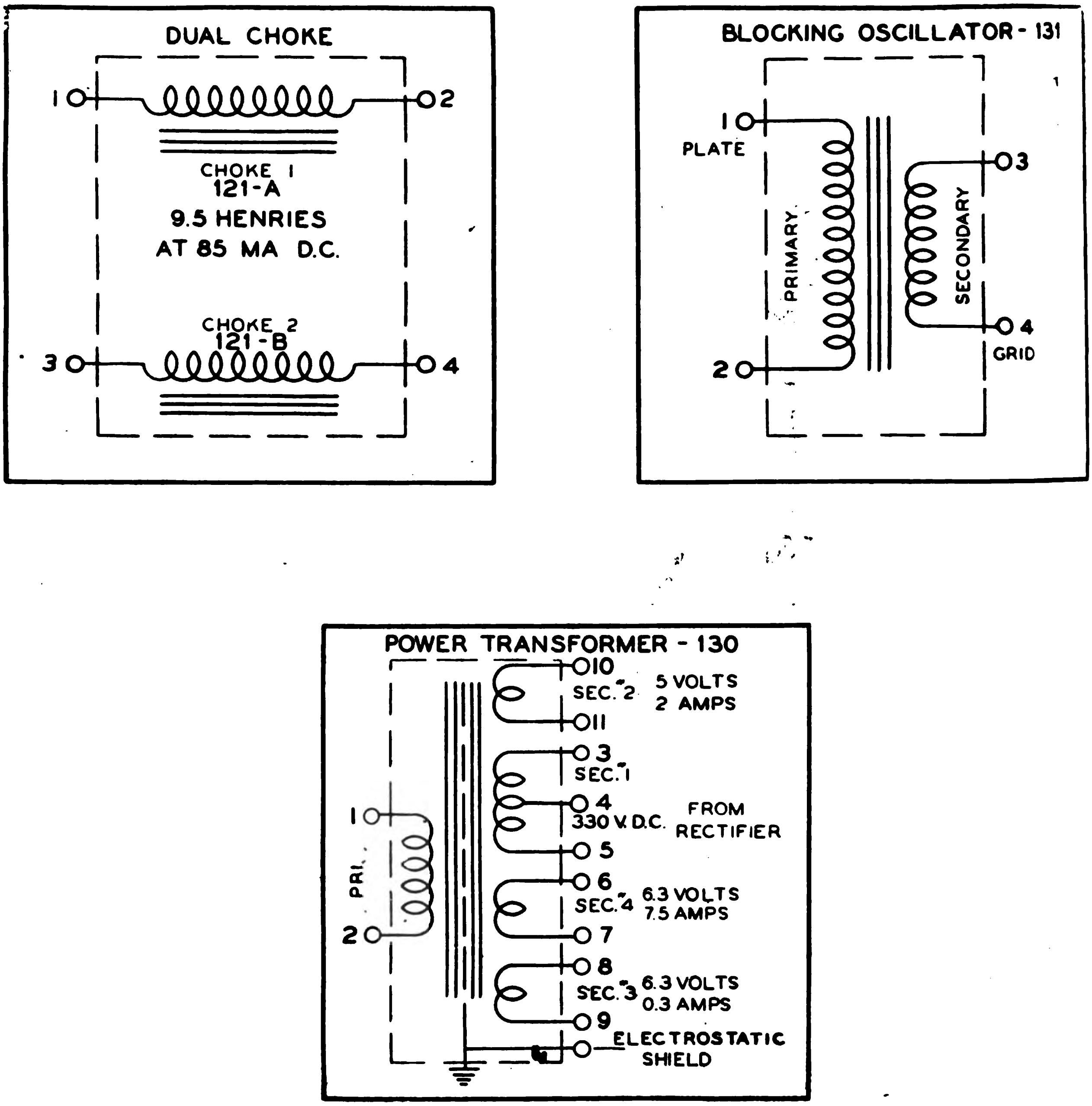


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Figure 156. Interconnector—schematic diagram of chokes and transformers.

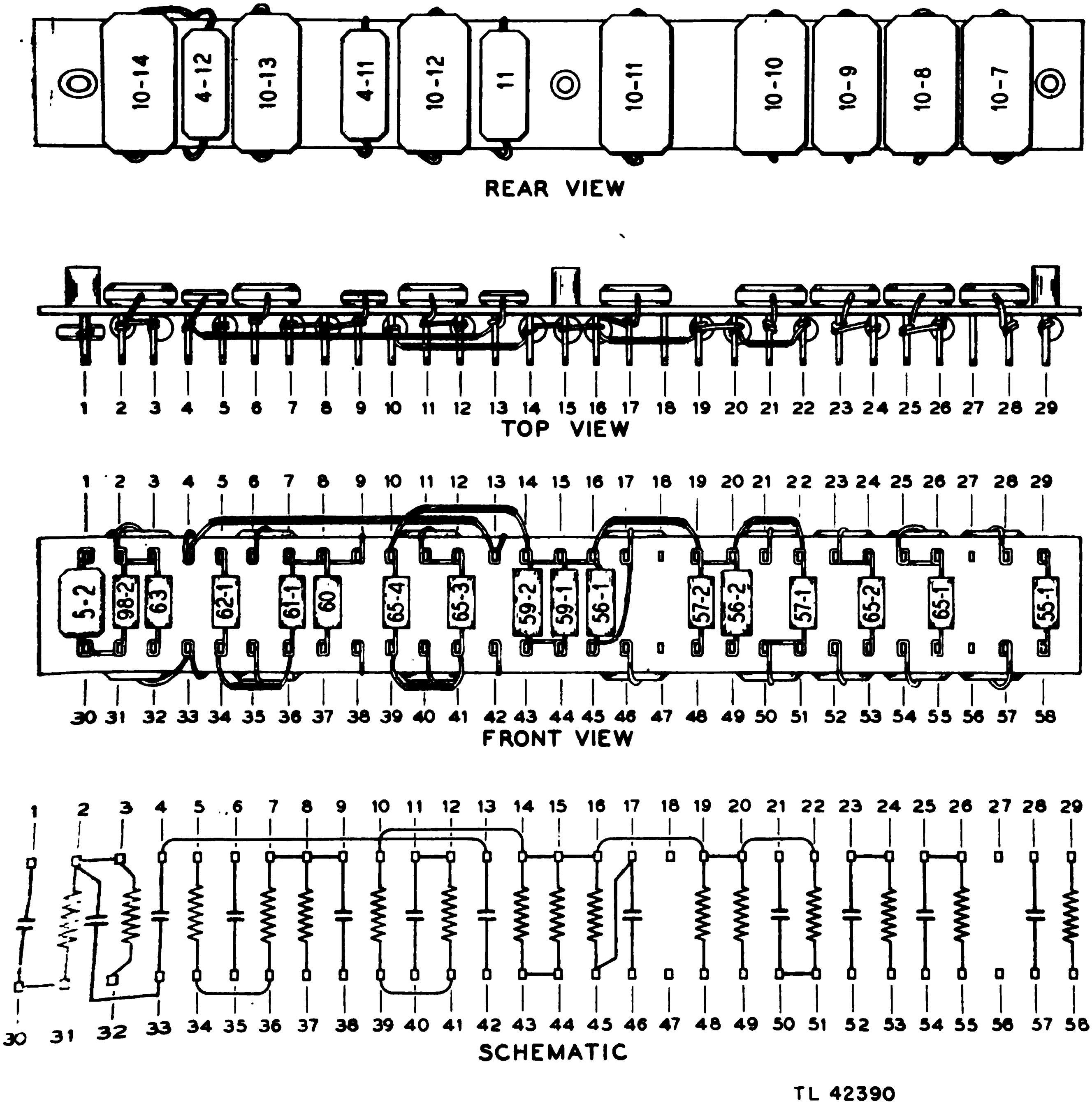


Figure 157. Schematic and wiring diagram of terminal board I54.

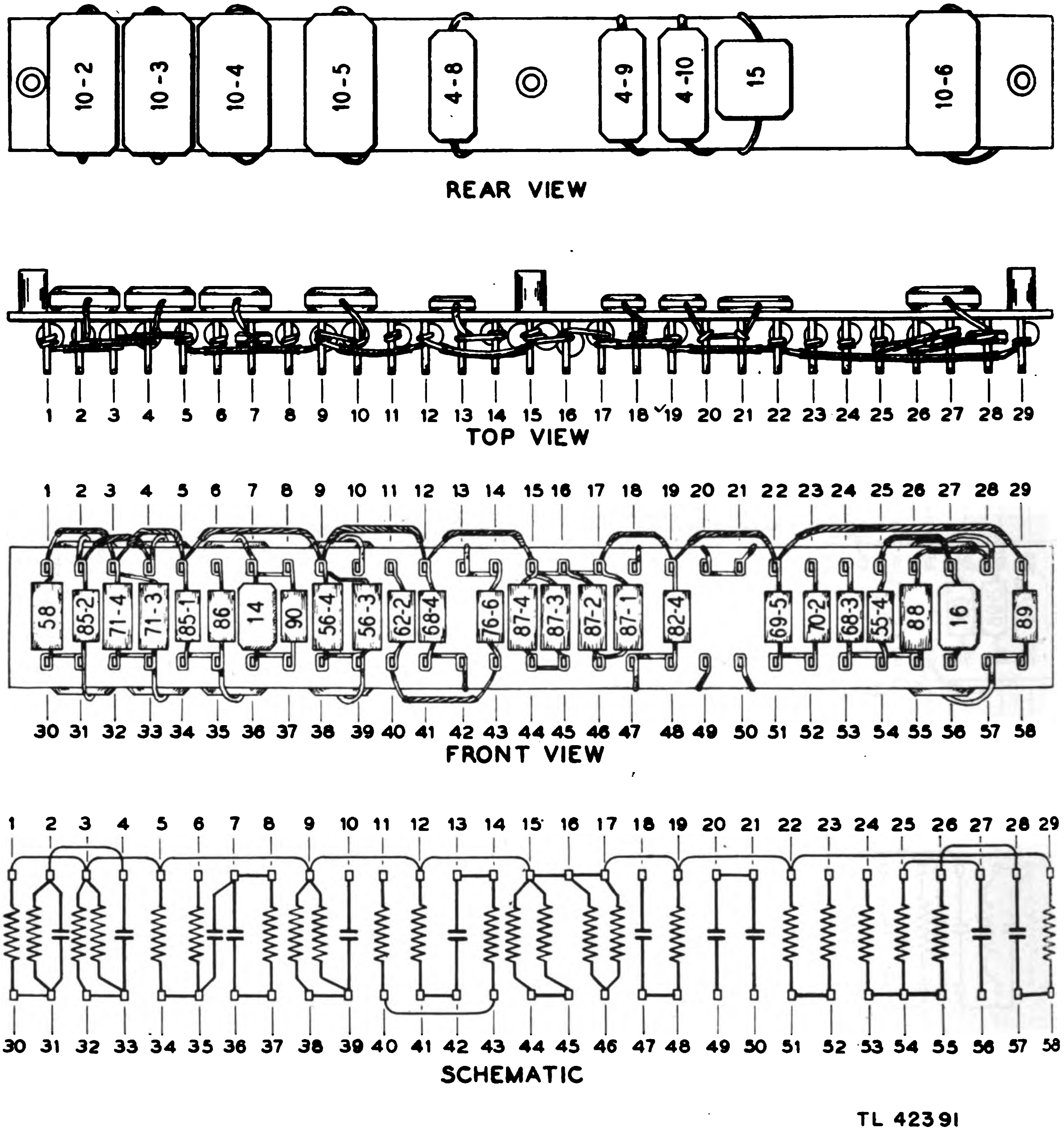


Figure 158. Schematic and wiring diagram of terminal board 155.

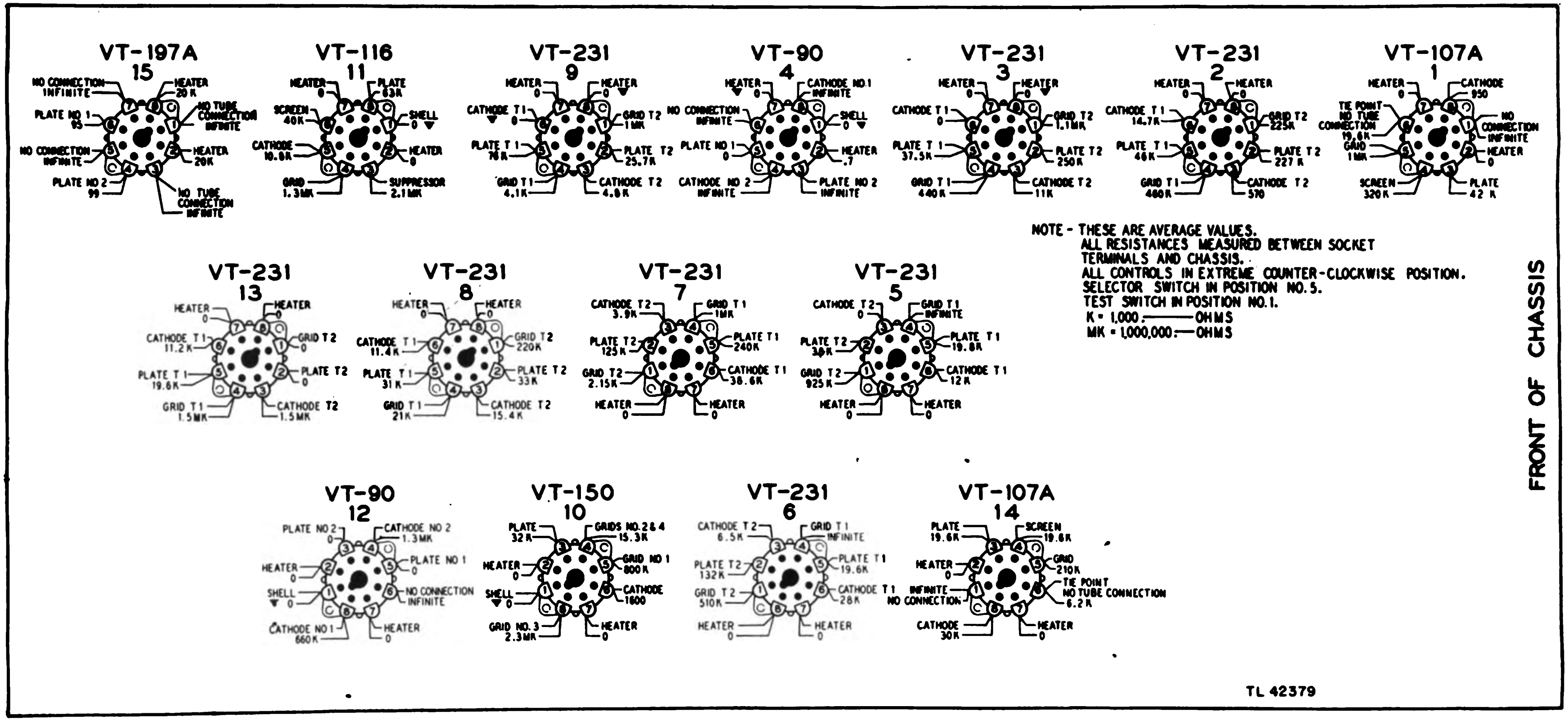
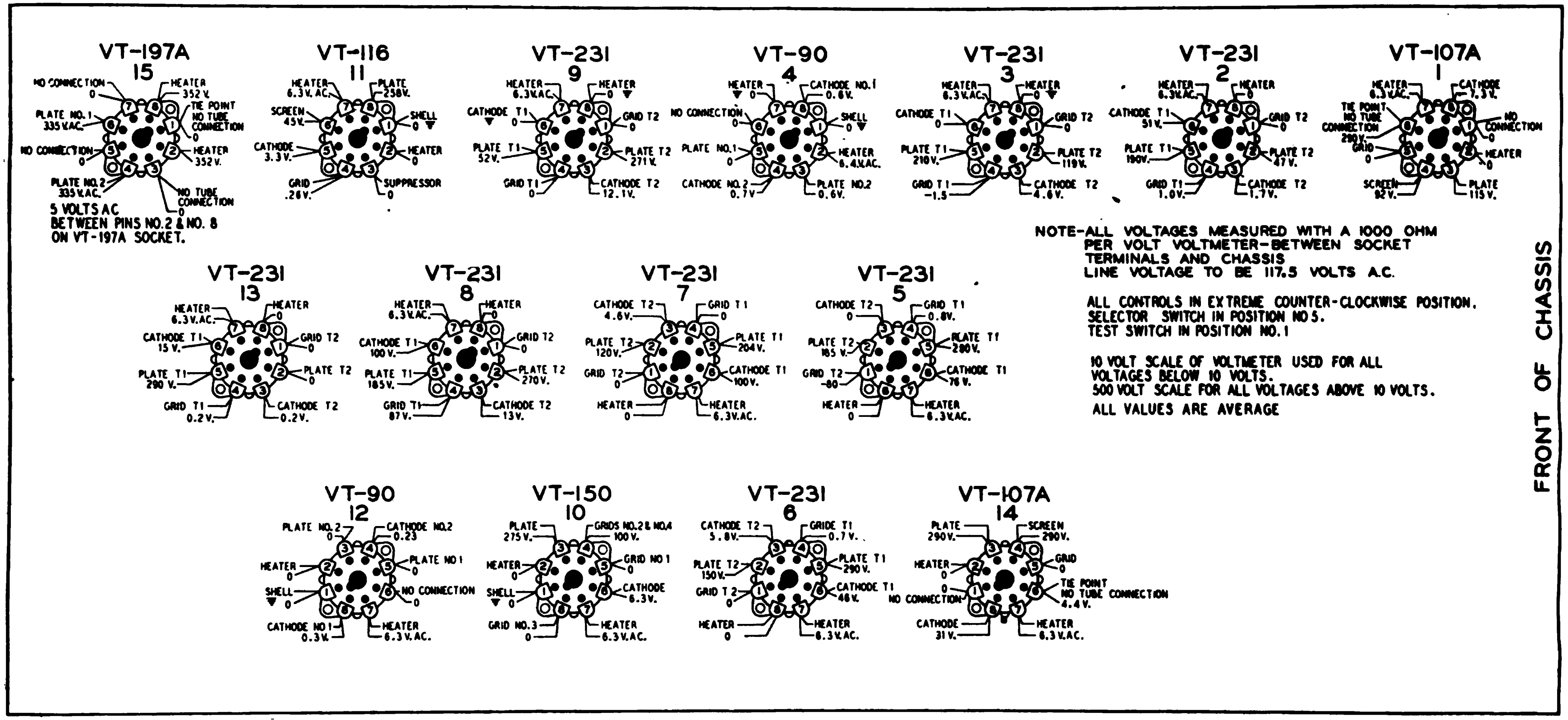


Figure 159. Socket resistance chart for interconnector.



TL 42383

Figure 160. Socket voltage chart for interconnector.

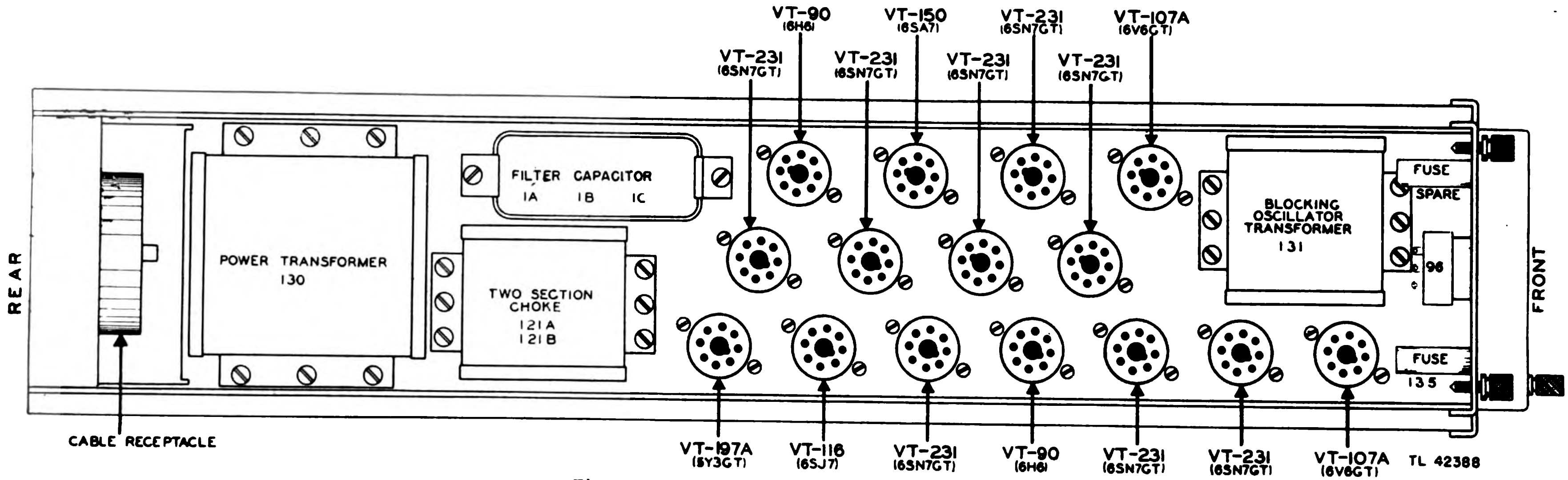
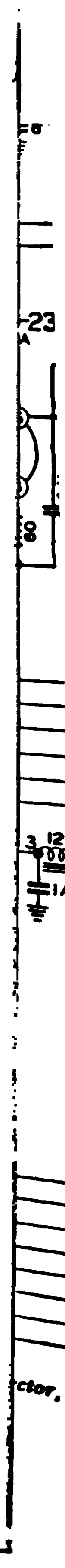
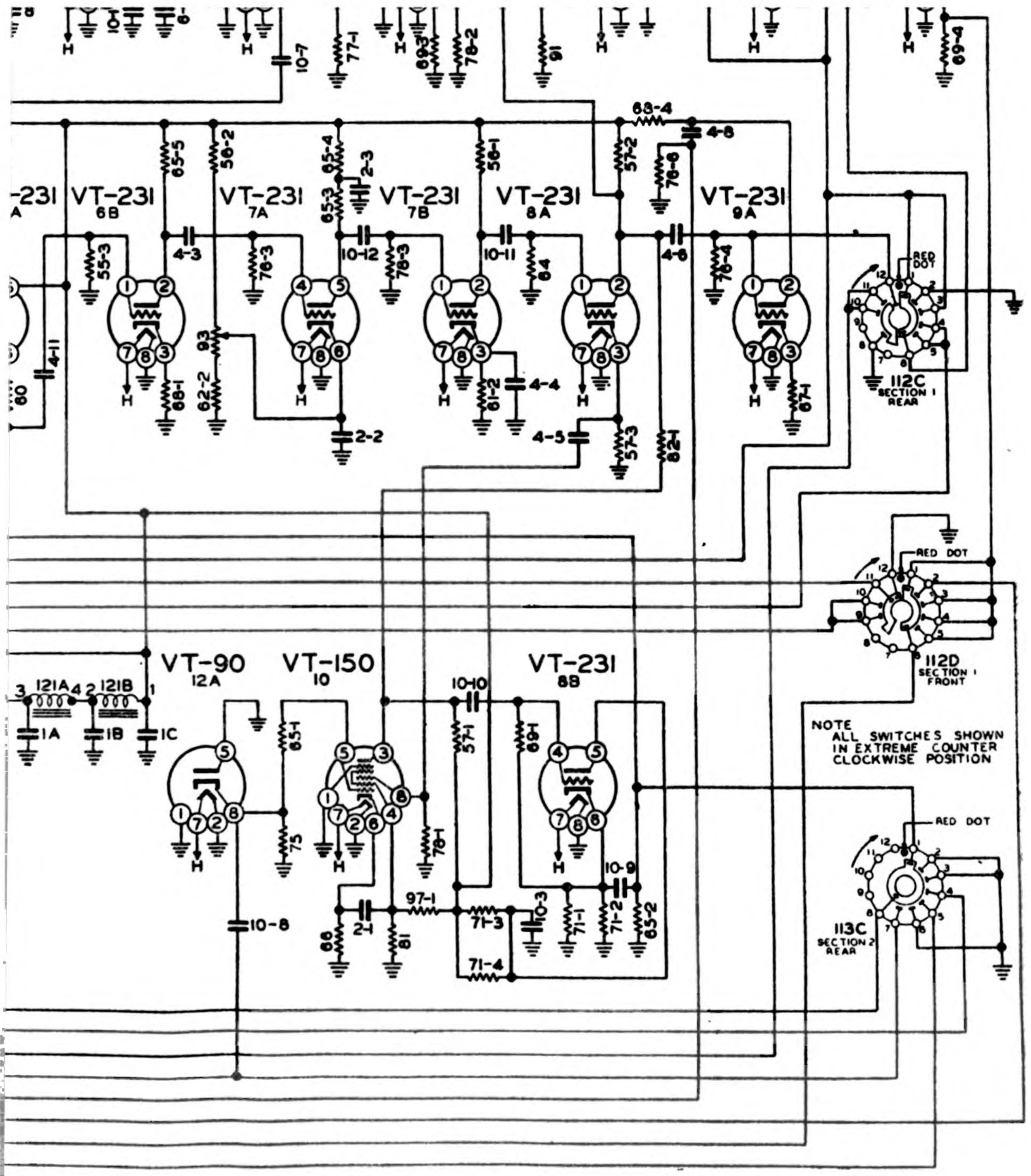
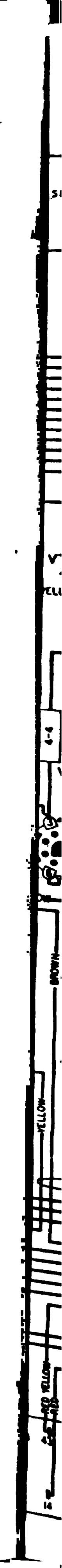


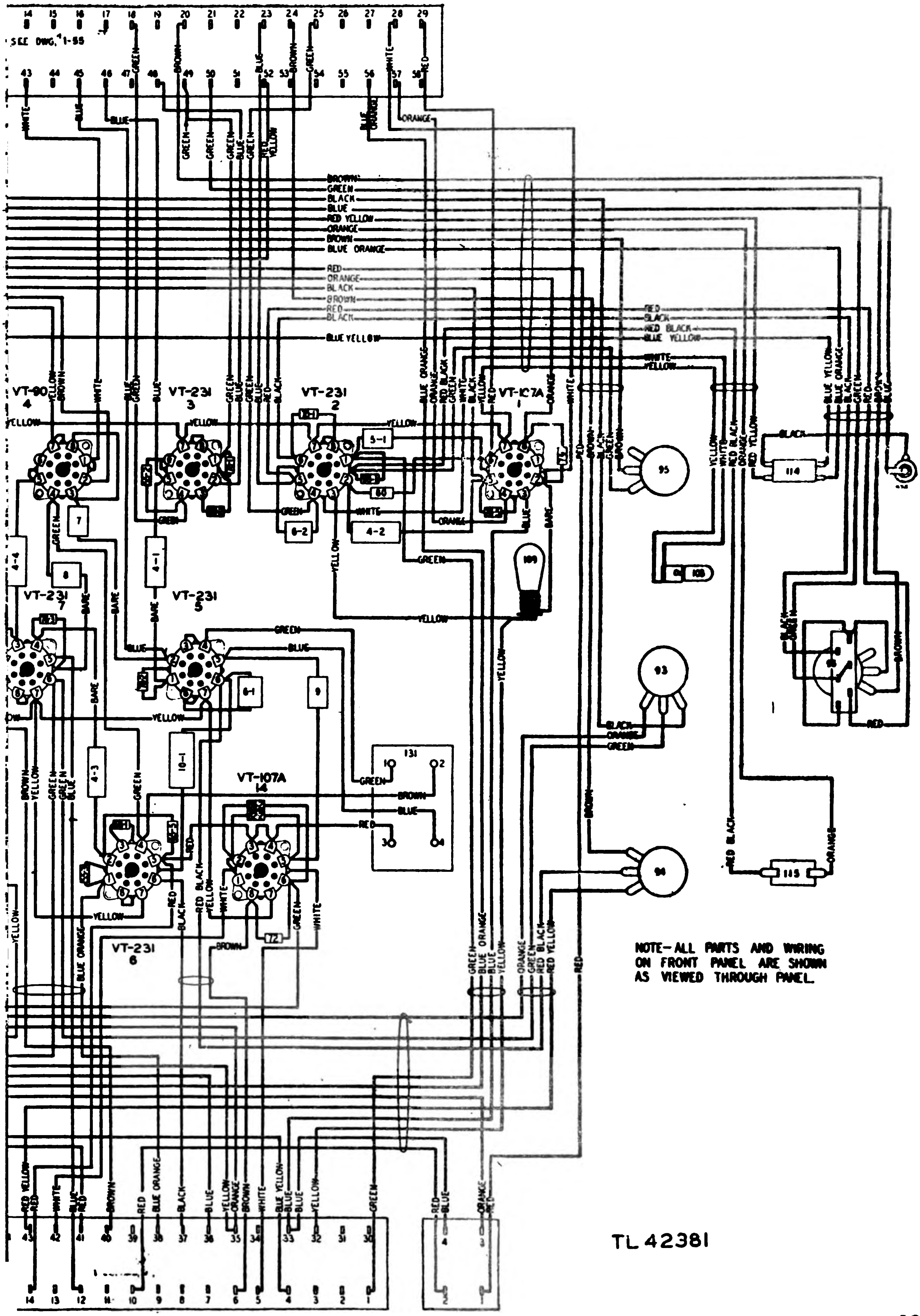
Figure 161. Interconnector, tube arrangement.


23
80



...ctor, complete schematic.


BROWN
YELLOW



NOTE—ALL PARTS AND WIRING ON FRONT PANEL ARE SHOWN AS VIEWED THROUGH PANEL.

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Table III. Pin connections of connector 105.

Pin	External connection	Internal connection
A	Range scope lower deflecting plate.	Contact 6 of 112D.
B	IFF receiver output.	IFF switch channel and 7 of 113C.
C	Radio Set SCR-268 elevation receiver output.	12 of 112B and 2 of 112D.
D	IFF receiver sensitivity.	Receiver "gain" control (R95).
E	Range scope upper deflecting plate.	Contact 6 of 112B.
F	120-v ac.	Power supply.
G	Ground.	Ground.
H	120-v ac.	Power supply.
I	Range scope c-r tube intensity grid.	Output of brightness correction amplifier.
J	To transmitter sync pulse input.	Output of sync pulse stage and contacts 9 and 10 of 112D.
K	4098-cps signal from range scope.	Contact 9 of 112A.
L	Monitor circuit relay in transmitter.	Signal width power switch.
M	Signal from transmitter monitor.	Contact 5 of 113C.
N	4098-cps sync signal from Junction Box JB-22.	Contact 2 of 112A.
O	Sync signal to range scope.	Contact 8 of 112A.

Table IV. Selector switch.

Position	Section	Function
Position 1 (OPERATE)	112A	(a) Connects sync signal from Junction Box JB-22 to division channel.
	112A	(b) Returns 4098-cps signal from range scope through 112A back to range scope.
	112B	(c) Connects IFF switch channel output to upper deflecting plate of range scope.
	112B	(d) Connects elevation receiver to radar switch channel input.
	112C	(e) Connects radar switch channel output to cathode follower 13B to lower deflecting plate of range scope.
	112D	(f) Shorts Wien bridge oscillator to ground.
Position 2 (STANDBY)	112A	(a) Connects sync signal from Junction Box JB-22 to division channel.
	112A	(b) Returns 4098-cps signal from range scope through 112A back to range scope.
	112B	(c) Shorts upper deflecting plate of range scope to ground.
	112C	(d) Shorts blanking channel negative pulse to ground.
	112C	(e) Shorts cathode follower 13B input to ground.
	112D	(f) Connects elevation receiver output directly to lower deflecting plate of range scope.
	112D	(g) Shorts transmitter sync pulse to ground.
	112D	(h) Shorts Wien bridge oscillator to ground.
Position 3	112D	Same as OPERATE except transmitter sync pulse is shorted to ground.
Position 4	112A	(a) Connects sync signal from Junction Box JB-22 to division channel.
	112A	(b) Returns 4098-cps signal from range scope through 112A to range scope.
	112B	(c) Connects common contact (8) of 113C to the upper deflecting plate of range scope.
	112B	(d) Connects elevation receiver to radar switch channel input.
	112B	(e) Connects common contact (8) of 113A to the cathode follower 13B input.
	112C	(f) Connects blanking channel negative pulse output to ground on contacts 2, 4, and 6 on 113B.
	112D	(g) Connects cathode follower 13B output to lower deflecting plate of range scope.
	112D	(h) Shorts Wien bridge oscillator to ground.
Position 5		Same as position 4 except:
	112A	(a) Wien bridge oscillator output is not grounded and supplies signal to the range scope.
	112D	(b) Wien bridge oscillator signal is substituted for sync signal from JB-22.

Table V. Test switch.

Position	Section	Function
1	113A	(a) Connects radar switch channel output through cathode follower 13B to lower deflecting plate of range scope.
	113C	(b) Connects IFF switch channel output to upper deflecting plate of range scope.
2	113A	(a) Connects division channel output through cathode follower 13B to lower deflecting plate of range scope.
	113C	(b) Shorts upper deflecting plate to ground.
	113B	(c) Shorts blanking channel negative pulse to ground.
3	113A	(a) Connects sync pulse output stage output through cathode follower 13B to lower deflecting plate of range scope.
	113C	(b) Shorts upper deflecting plate to ground.
4	113A	(a) Shorts cathode follower 13B input to ground.
	113B	(b) Shorts blanking channel negative pulse to ground.
	113C	(c) Connects 60-cps a-c from power supply to upper deflecting plate of range scope.
5	113A	(a) Shorts cathode follower 13B input to ground.
	113C	(b) Connects signal from transmitter monitor to upper deflecting plate of range scope.
6	113A	(a) Connects sync channel input signal to lower deflecting plate of range scope.
	113B	(b) Shorts blanking channel negative pulse to ground.
	113C	(c) Shorts upper deflecting plate to ground.
7	113A	(a) Shorts cathode follower 13B input to ground.
	113C	(b) Connects output of IFF receiver directly to upper deflecting plate to range scope.

The positions of the TEST switch apply only when the SELECTOR switch is in position 4 or 5.

Section VI. WAVEMETER OF RC-148 AND RC-148-B

159. Reference Data

To assist the maintenance man while trouble shooting on the wavemeter figures have been provided. In section VI, chapter 1, there are partial schematics and block diagrams, and at the end of this section there are groups of figures containing view of the wavemeter, a complete schematic and wiring diagram, drawings of terminal boards, voltage and resistance measurements and waveforms.

160. Introduction

a. Troubles that arise when setting the frequency of the receiver by means of the wavemeter may be sectionalized by making a simple check. Following the instructions given in paragraph 73, TM 11-1318, tune receiver OSC knob until receiver tuning eye closes. If eye fails to close, defect is either in the wavemeter oscillator or in the receiver. To determine which component is at fault do the following:

(1) Tune variable line resonator by means of the handwheel to the frequency of the wavemeter auxiliary oscillator.

(2) If proper deflection of wavemeter tuning eye is obtained, wavemeter oscillator is operating properly and fault is in the receiver. If no deflection of tuning eye is obtained, fault is in wavemeter.

b. Troubles that arise when determining the frequency of the transmitter may also be sectionalized easily. Following the instructions given in TM 11-1318, tune the variable line resonator by means of the handwheel until the wavemeter tuning eye closes. If the eye does not close, either the transmitter or the wavemeter is defective. To determine which component is at fault, do the following:

(1) Switch wavemeter to REC position.

(2) Tune wavemeter oscillator to frequency of variable line resonator.

(3) If proper deflection of tuning eye is obtained, wavemeter is normal and the transmitter is at fault.

(4) As a further check, check position 3 on the test scope. If a proper pulse appears, the transmitter is being triggered properly. Then check position 5A. If proper pattern is seen, transmitter power output is normal and the wavemeter is probably defective.

161. Wavemeter Trouble-shooting Chart

A. SYMPTOMS:

1. Tuning eye VT-98 and pilot lamp 126 do not light when power switch 128 is placed in ON position.
2. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective input power circuit.	1*a*. Check switch 128 for continuity. *b*. Make a continuity test from connector 124 on wavemeter through plug 106 on interconnector to interconnector power supply.

B. SYMPTOMS:

1. Pilot lamp 126 does not light when switch 128 placed in ON position.
2. Tuning indicator lamp glows.
3. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective pilot lamp or connections.	1*a*. Replace pilot lamp. *b*. If trouble is not cleared, check circuit for short or open.

C. SYMPTOMS:

1. Tuning indicator VT-98 does not light when power switch 128 is placed in ON position.
2. Pilot lamp 126 glows.
3. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective tuning eye circuit.	1*a*. Check potentiometer 63 for open. *b*. Make a voltage and resistance check of the circuit. *c*. Check by replacing tube. *d*. If trouble is not cleared, see item below.
2. Defective power input circuit.	2*a*. Inspect power switch 128. *b*. Make a continuity test from connector 124 on wavemeter through connector 106 on interconnector to interconnector B+ power supply.

D. SYMPTOMS:

1. Rotation of EYE ADJ control fails to close tuning eye.
2. Rotation of TUNING CONTROL fails to close tuning eye (switch 127 on TRANS position).
3. Tuning indicator and pilot lamp glow.
4. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Open in grid circuit of VT–98.	1. Check continuity or resistance to ground.
2. Defective (6SF5) d-c amp.	2. Check tube and circuit.
3. Filtering network defective.	3. Check continuity for shorted capacitor or open resistors.
4. Defective (9006) detector.	4. Check tube and circuit.
5. Cavity resonator.	5. Make visual check of variable line resonator to make sure that sliding disk is connected to gears and tuning knob.
6. Defective r-f signal input circuit.	6. Check cable 107, socket 125, and antenna transmission line and wavemeter coupling link for continuity.

E. SYMPTOMS:

1. Rotation of EYE ADJ fails to close tuning eye.
2. Rotation of TUNING CONTROL fails to close tuning eye (switch 127 on REC position).
3. Tuning eye can be closed when switch is in TRANS position.
4. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective coupling.	1*a*. Make visual check of coupling circuit between local oscillator and variable line resonator. *b*. If trouble is not cleared, see item below.
2. Defective oscillator stage (VT–202).	2*a*. Replace tube and check operation of tuning eye. *b*. If tuning eye does not close, make voltage and resistance check of oscillator circuit.

F. SYMPTOMS:

1. Tuning eye closes and opens slowly without any movement of EYE ADJ control (switch 127 in REC position).
2. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Oscillator VT–202 unstable.	1*a*. Replace oscillator tube and re-tune circuit. *b*. If tuning eye still is unstable, make a voltage and resistance check of the oscillator circuit.

G. SYMPTOMS:

1. Impossible to close tuning eye on receiver when tuning receiver to wavemeter oscillator.
2. Tuning eye on wavemeter can be closed by oscillator in wavemeter.
3. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective coupling.	1*a*. Inspect coupling between oscillator and antenna. *b*. If trouble is not cleared, see item below.
2. Defective receiver.	2. See section IV, chapter 2.

162. Procedure For Replacing Defective Electrical Parts in Wavemeter

a. INTRODUCTION. The information contained in the following section is to assist the radar repairman in replacing defective major parts in the wavemeter. Note that such replaceable items as small resistors, capacitors, tube sockets, and tubes are not covered in these procedures. Neither is a procedure given when the replacement for the part presents no special difficulty. The procedures have been worked out experimentally and represent the shortest and best method of accomplishing the work.

Caution: (1) Before replacing a defective part, observe carefully its position, method of mounting, and wiring. This will insure the correct installation of the replacement part.

(2) When removing such parts as switches, potentiometers, and tube sockets which have several wires attached to their terminals, be sure to tag the wires carefully so that they will be replaced in their proper positions.

(3) When disassembling a component, the screws, nuts, bolts, washers, and other small parts which are removed, should be put in some small container to prevent their loss.

b. A LIST OF ITEMS COVERED.

(1) *Outside of wavemeter* (par. 163).
- Antenna rod and sheath.
- Tuning knob.
- Pilot light socket and bracket.
- Connectors 124 and 125.

(2) *Inside of wavemeter* (par. 164).
- Eye adjustment potentiometer flexible shaft.
- Tuning indicator Tube VT–98.
- Wavemeter pick-up loop assembly.
- Inductance loop 90.
- Tube socket 9002.
- Tube socket 6SF5.
- Potentiometer 63.
- Variable capacitor 1.

(3) *Parts requiring remodeling oscillator chassis* (par. 141).
- Tuning indicator tube socket.
- Resistor 61.
- 9006 tube socket.
- Diode pick-up loop assembly.
- Capacitor 2–1.

163. Replacement of Items Outside of Wavemeter

a. ANTENNA ROD AND SHEATH. (1) Remove the two lower mounting screws from the fiber insulators which attach the antenna sheath to the resonator.

(2) Unsolder the lug from the inside of the antenna sheath.

(3) Loosen the two screws on the top of the fiber insulators.

(4) Slide the antenna assembly from between the two mounting insulators and out through the front of the panel.

(5) To install, reverse removal procedure.

b. TUNING KNOB. (1) With the long end of an Allen wrench loosen the setscrew which fastens the knob to the shaft and pull the knob off.

(2) To install the new knob, reverse removal procedure.

c. PILOT LIGHT SOCKET AND BRACKET. (1) Remove the screw which attaches the bracket to the black casting.

(2) Unsolder the connection to the socket.

(3) To install the new socket reverse removal procedure.

d. CONNECTORS 124 AND 125. (1) Unsolder the connections from the back of the connectors.

(2) Remove the screw at the four corners of the mounting plate and push the connectors out.

(3) To install the new connector, reverse removal procedure.

164. Replacement of Items Inside Wavemeters

a. EYE ADJUSTMENT POTENTIOMETER FLEXIBLE SHAFT. (1) With an Allen wrench, remove the adjusting knob from the front panel.

(2) With an Allen wrench remove the connection to the potentiometer shaft. The flexible shaft can then be removed from the chassis.

(3) To install the new shaft, reverse removal procedure.

b. TUNING INDICATOR TUBE VT–98 (fig. 166). (1) Remove POWER ON-OFF switch from front panel by removing the locknut. Do not unsolder the connection to the switch.

(2) Turn the switch sideways and slip it out of the way underneath the tube.

(3) Loosen the knurled thumbscrew which holds the tube clamp to the bracket.

(4) Pull the tube and socket out of the side of the chassis as far as the wiring will allow.

(5) Grasp the socket in one hand and the tube in the other so as not to strain the wiring and rock the tube out of the socket.

(6) To install the new tube, reverse removal procedure.

c. WAVEMETER PICK-UP LOOP ASSEMBLY. Assembly is mounted on the resonator with a black insulated lead attached to it.

(1) Unsolder the connection to the assembly.

(2) Remove the two screws which hold the assembly to the resonator.

(3) To install the new assembly, reverse the removal procedure.

Note. To replace any of the parts listed below it will be necessary to remove the L-shaped top and front panel from the wavemeter.

Inductance loop 90.
Resistor 55, 56, 57, 58, 59, 60, 62.
Tube socket 9002.
Tube socket 6SF5.
Potentiometer 63.
Variable capacitor 1.
Resistor 61.
Capacitor 2–1, 2–2, 3–1, 4–1, 4–2, 5, 9.
Inductors 91 and 92.

To accomplish this, perform the nine steps listed in removal procedure for top and front panels, *d* below. After these nine steps are completed, refer to the detailed description of the procedure for the replacement of each item listed above. These procedures will be found at the end of the nine preliminary steps. Some of the items listed above do not have a detailed removal procedure written for them because their replacement after the nine preliminary steps are complete, requires no explanation.

d. REMOVAL PROCEDURE FOR TOP AND FRONT PANELS. (1) Remove the side panels of the oscillator compartment by turning shockproof fasteners ¼ turn counterclockwise.

(2) Remove the two lower mounting screws from the fiber insulator which attaches the antenna sheath to the resonator.

(3) Unsolder the three wires that come out of the shielded tube at the rear of the wavemeter (black, white, and red wires).

(4) With an Allen wrench, remove the large tuning knob and the two smaller knobs, AUX OSC and EYE ADJ.

(5) Remove the ON-OFF and TRANS-REC switches by removing the locknuts and washers.

(6) Remove the four mounting screws on the front panel which attach it to the black metal casting.

(7) From the top panel, remove the three mounting screws located 4¼ inches from the end of the panel.

(8) Grasp handles on top panel and pull slightly forward and upward to lift completely off.

(9) Remove the top cover of the oscillator compartment by removing the six screws which attach it to the oscillator compartment chassis.

e. INDUCTANCE LOOP 90. (1) Perform the *removal procedure for top and front panels.*

(2) Remove the knurled screw holding the tuning eye socket in place.

(3) With an Allen wrench loosen the setscrews which hold the large oscillator tuning drive gear to its shaft and remove the gear.

(4) Unsolder the two connections to the variable capacitor.

(5) Remove the screw which attaches the loop to the side panel.

(6) To install the new loop, reverse removal procedure.

f. TUBE SOCKET 9002. (1) Perform the *removal procedure for top and front panels.*

(2) Remove the 9002 from the socket.

(3) Remove the two screws which hold the tube socket mounting bracket to the chassis.

(4) Slightly turn the whole assembly so that the soldered connections to the back of the tube socket are accessible and unsolder all the connections to the socket.

(5) Remove the two bolts that hold the socket in the bracket and remove the socket.

(6) To install the new socket, reverse the removal procedure.

g. TUBE SOCKET 6SF5. (1) Perform the *removal procedure for top and front panels.*

(2) Remove the 6SF5 tube from its socket.

(3) Unsolder the connection from the back of the tube socket.

(4) Remove the two bolts which hold the socket to the chassis and remove the socket.

(5) To install the new socket, reverse the removal procedure.

h. POTENTIOMETER 63. (1) Perform the *removal procedure for the top and front panels.*

(2) With an Allen wrench loosen the setscrew which holds the flexible shaft to the potentiometer shaft and remove this connection.

(3) Remove the setscrew which secures the potentiometer to the chassis. Pull the potentiometer clear of the chassis as far as the attached wiring will allow.

(4) Unsolder the connections to the three terminals of the potentiometer.

(5) To install the new potentiometer reverse the removal procedure.

i. VARIABLE CAPACITOR 1. (1) Perform the five steps necessary to remove inductance loop 90, listed above.

(2) Remove the two screws which attach the capacitor to the chassis and remove the capacitor.

(3) To install the new variable capacitor, reverse the removal procedure.

Note. Make certain that the capacitor plates are completely meshed and the reduction gear shaft turned clockwise as far as the lugs will allow. The large gear may now be engaged.

165. Items Requiring Removal of Oscillator Chassis

To replace any of the parts listed below, it is necessary to first perform the 9 steps listed in paragraph 200 *removal procedure for top and front panels.* After this, it is necessary to remove the oscillator compartment from the resonator so that the bottom of the oscillator chassis is accessible.

a. PROCEDURE FOR REMOVING OSCILLATOR COMPARTMENT FROM RESONATOR. (1) Perform steps 1 to 9 in *top and front panel removal procedure.*

(2) Unsolder the black insulated wire at the lug attaching it to the resonator.

(3) Unsolder the wire from the base of tube 9006 at the lug attaching it to the resonator.

(4) Remove the screw which holds the mounting bracket of the pilot light to the black casting.

(5) Remove the screws holding the two fiber insulators, which carry the antenna input line, to the resonator.

(6) Unscrew clamp holding the shield to the top of the resonator.

(7) Remove the four mounting screws that hold the compartment to the resonator.

(8) Remove the four screws holding the end plate to the resonator.

(9) Lift off carefully so as not to bend the antenna input line.

b. TUNING INDICATOR TUBE SOCKET. (1) Perform the *procedure for removing oscillator compartment from resonator.*

(2) Remove the tube VT–98 from the socket.

(3) Remove the knurled thumbscrew which attaches the tube socket clamp to the bracket.

(4) On the underside of the oscillator chassis, unsolder the two connections to the 9006 tube socket.

(5) Unsolder the four connections to the 6SF5 tube socket.

(6) Unsolder the two connections to the terminal board.

(7) From the underside of the oscillator chassis remove the clamp which secures the laced wiring to the chassis.

(8) Unsolder the lead to the center top of the potentiometer and pull the laced wiring up through the hole in the chassis.

(9) Remove the screw which attaches the short length of conduit to the chassis. The socket and its attached wiring is now free and can be removed from the chassis.

(10) The spare socket comes complete with all the necessary color-coded wiring attached. To install, reverse removal procedure.

c. RESISTOR 61. This resistor is located inside the tuning indicator tube socket. To replace this resistor it is necessary to replace the entire socket as explained in *b* above.

d. 9006 TUBE SOCKET. (1) Perform the *procedure for removing oscillator compartment from resonator.*

(2) Remove the 9006 tube from its socket.

(3) Remove the five connections from the bottom of the tube socket.

(4) Remove the two bolts which attach the tube socket to the bracket and remove the socket.

(5) To install the new socket, reverse removal procedure.

e. DIODE PICK-UP LOOP ASSEMBLY. (1) Perform the *procedure for removing oscillator compartment from resonator.*

(2) Remove the two screws which attach the assembly to the resonator.

(3) To install the new assembly, reverse removal procedure.

f. CAPACITOR 2–1. (1) Perform the *procedure for removing oscillator compartment from resonator.*

(2) Unsolder the two connections to the capacitor.

(3) To install new capacitor, reverse removal procedure.

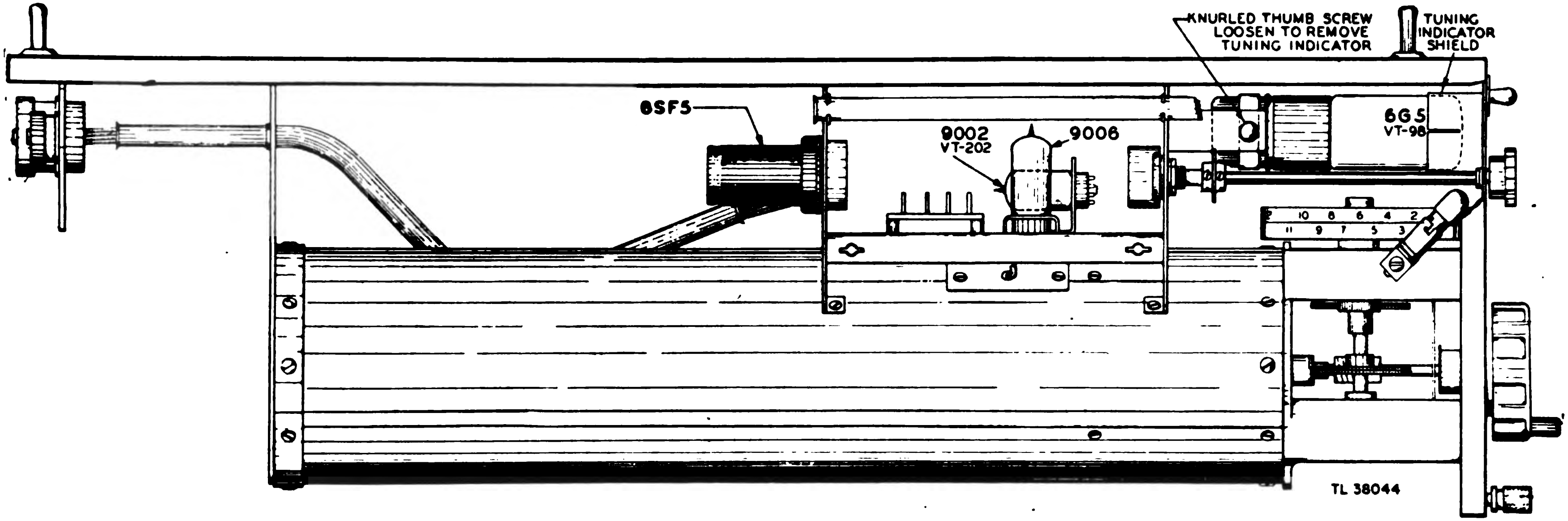

Figure 164. Wavemeter—side view showing tube arrangement.

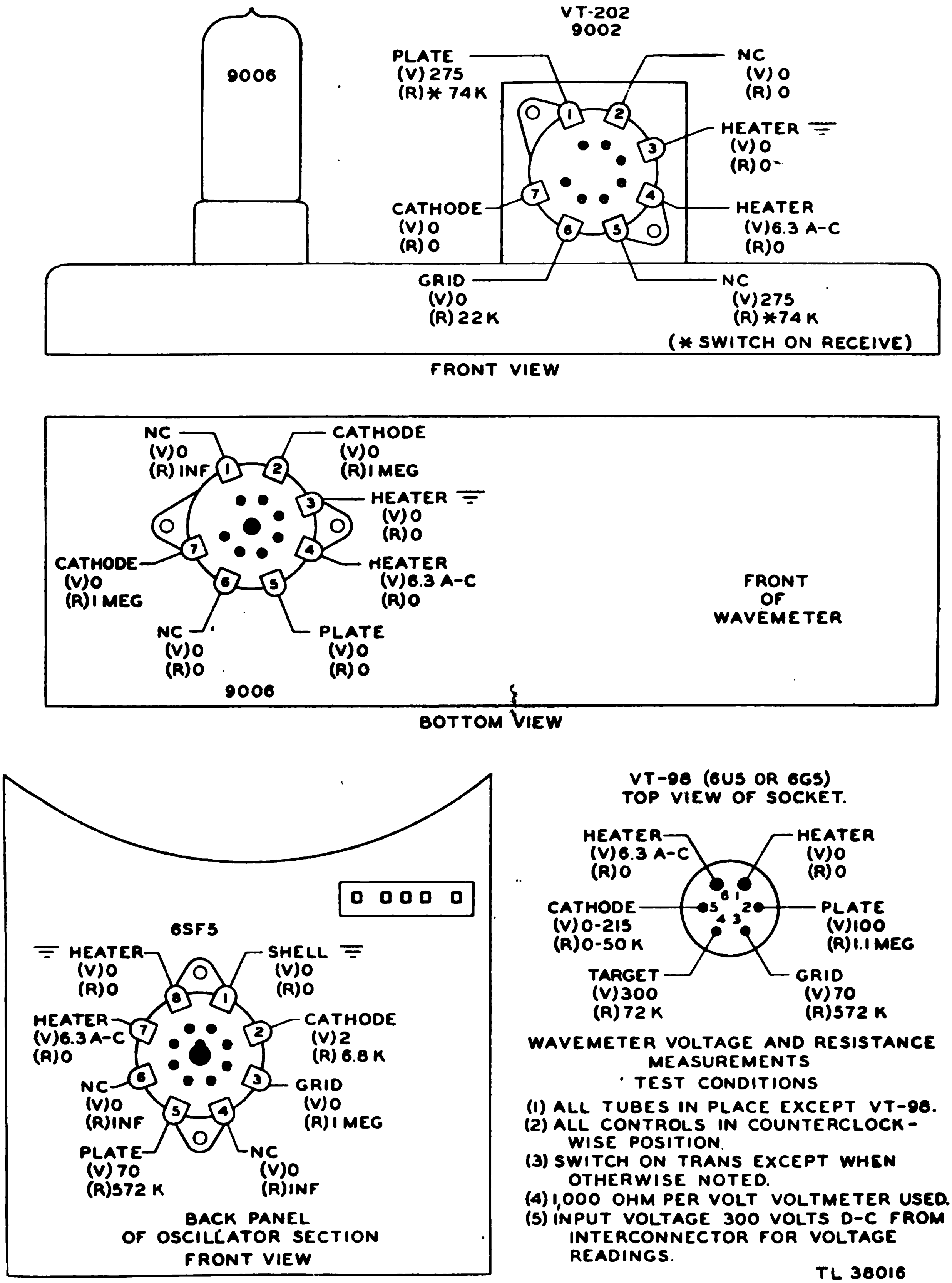

Figure 165. Wavemeter—socket voltage and resistance chart.

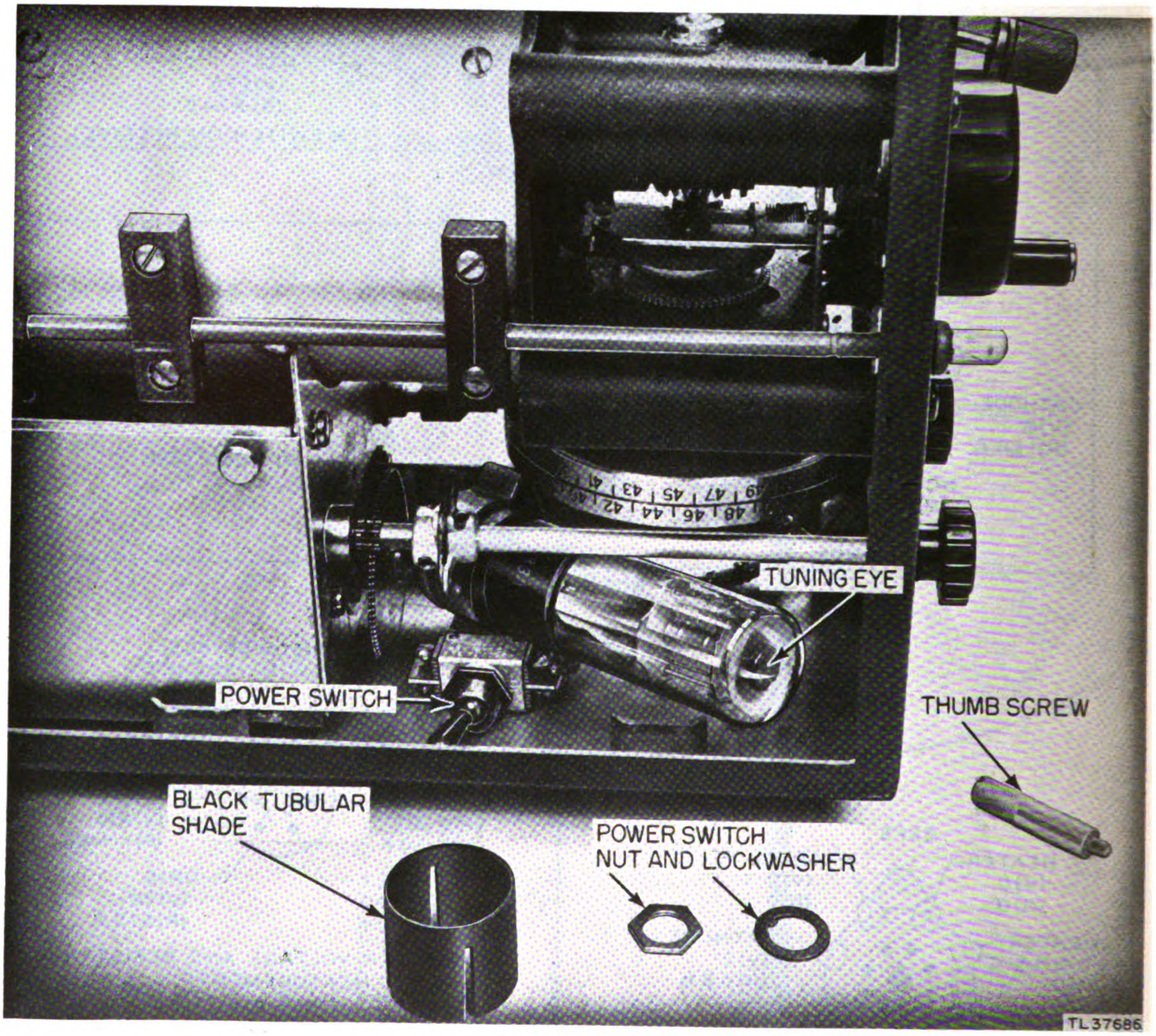

Figure 166. Wavemeter—removal of tuning indicator tube.

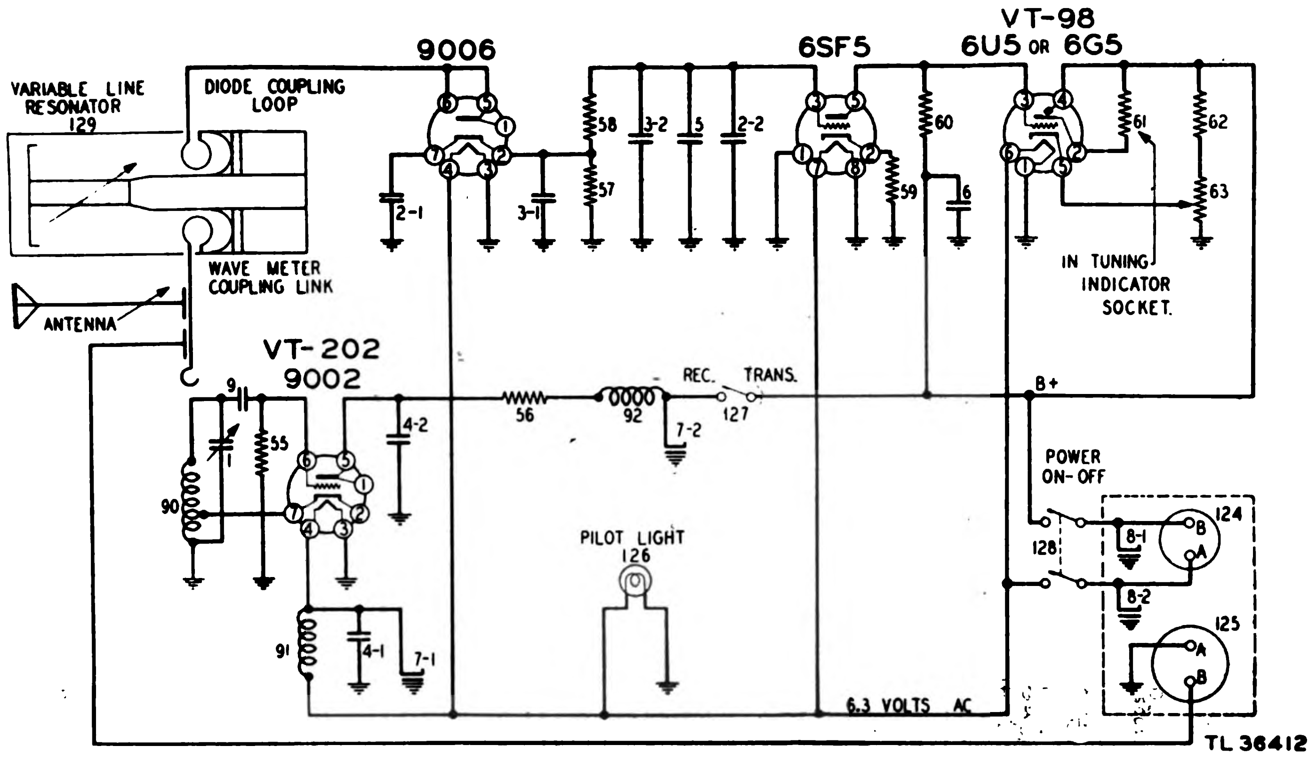

Figure 167. Wavemeter, complete schematic.

Part No.	Quantity	Description					
1	1	Capacitor	Air Trimmer Min. 2.5–Max. 12.5 MMF				
2	2	Capacitor	100 MMF	±10%	Mica	500	volts
3	2	Capacitor	.01 MF	+30–10%	Paper	400	volts
4	2	Capacitor	40 MMF	± 5%	Ceramic	500	volts
5	1	Capacitor	.05 MF	±10%	Paper	400	volts
6	1	Capacitor	.1 MF	±10%	Paper	400	volts
7	2	Spark plate					
8	2	Spark plate					
9	1	Capacitor	10 MMF	±10%	Ceramic	500	volts
55	1	Resistor	22,000 Ohms	±10%		½	watt
56	1	Resistor	2,000 Ohms	± 5%		½	watt
57	1	Resistor	1 Megohm	±10%		½	watt
58	1	Resistor	10,000 Ohms	±20%		½	watt
59	1	Resistor	6,800 Ohms	±10%		½	watt
60	1	Resistor	500,000 Ohms	±10%		½	watt
61	1	Resistor	1 Megohm	±20%		1/10	watt
62	1	Resistor	22,000 Ohms	±10%		1	watt
63	1	Resistor	55,000 Ohms	Variable		2	watt
90	1	Inductance	Coil				
91	1	Inductance	Coil				
92	1	Inductance	Coil				
124	1	Receptacle	"Power"				
125	1	Receptacle	"Signals"				
126	1	Pilot light	6–8 Volts				
127	1	Switch	SP–ST				
128	1	Switch	DP–ST				
129	1	Variable line resonator					

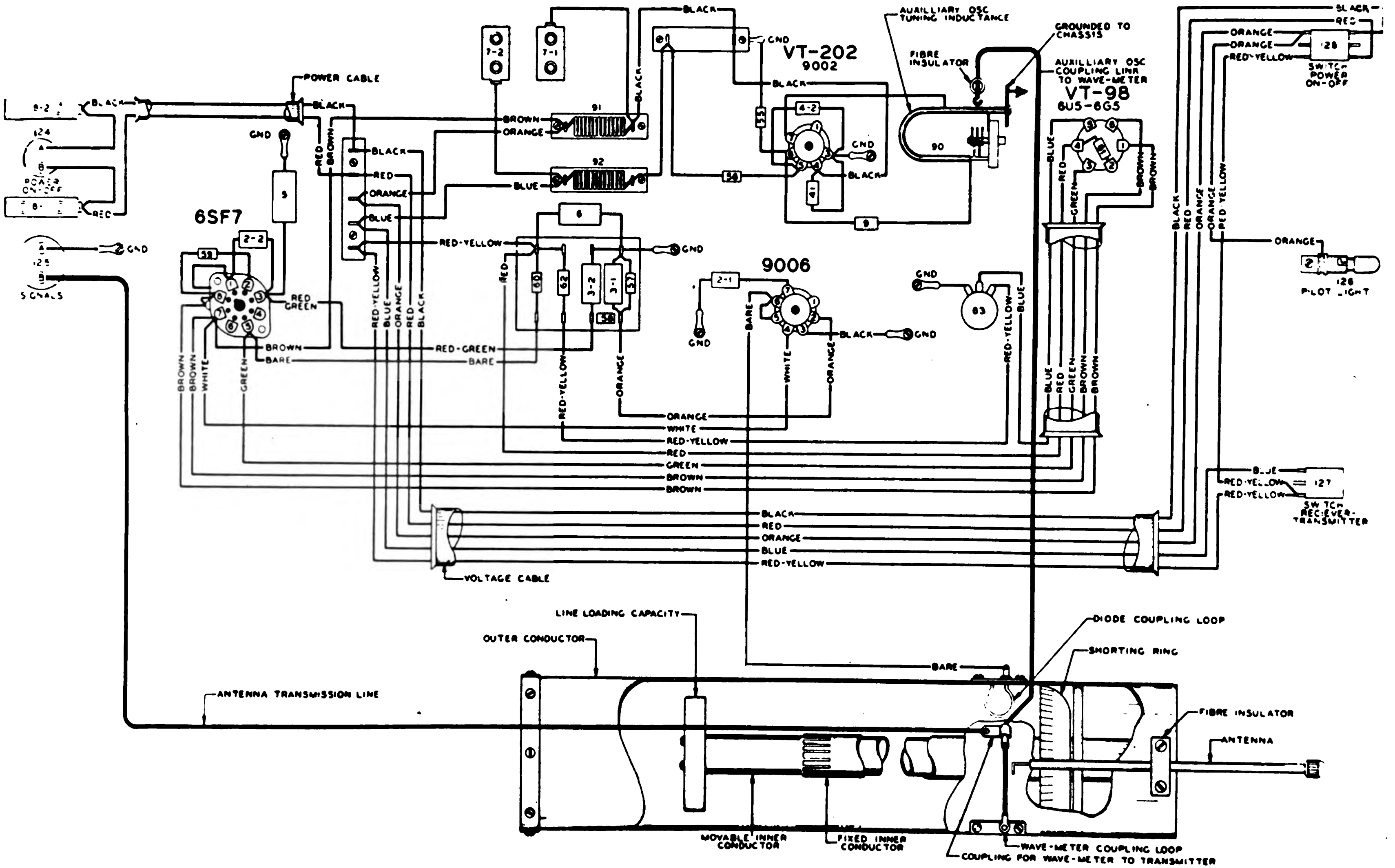

Figure 168. Wiring diagram of wavemeter.

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166. Reference Data

As the signal generator is a comparatively simple component, the block diagram and complete schematic diagram in chapter 1, section VII, and the trouble-shooting chart below should be sufficient reference information.

167. Signal Generator Trouble-shooting Chart

A. SYMPTOM:
Signal generator has zero output.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective a-c input circuit.	1*a*. Check filaments of rectifier, Tube VT–84, for glow. *b*. If filaments are not glowing, check fuses 5019 and 7005 for open. Make a continuity test from the a-c input terminals through switch 4033 to the terminals of the primary of 1036. *c*. Replace rectifier, Tube VT–84, and check for a filament glow.
2. Defective power supply.	2*a*. If filaments are glowing check for an open in the secondary of transformer 1036. *b*. Check for open in filter circuit.
3. Faulty oscillator stage, VT–48.	3*a*. Check the grid voltage of the oscillator. Voltage should be from —0.2 to —1.2 volts if tube is oscillating. *b*. If grid voltage is abnormal, make a voltage and resistance check of the complete stage.
4. Defective attenuator circuit.	4*a*. If grid voltage is normal, check the attenuator network for a short or open. *b*. Check for open to output capacitor 8036.

B. SYMPTOM:
Signal generator output cannot be modulated.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective audio oscillator stage.	1*a*. Replace Tube VT–37 and check output. *b*. If trouble is not cleared, make a voltage and resistance check of the complete stage.

C. SYMPTOM:
Signal generator output is weak.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Low input voltage.	1*a*. Check the input voltage. Voltage should be approximately 110-120 volts. *b*. If trouble is not cleared, see item below.
2. Weak tubes.	2*a*. Replace the r-f oscillator Tube VT–48 and check output. *b*. If output has not increased, make a voltage and resistance check of the complete stage. *c*. If trouble is not cleared, see item below.
3. Defective attenuator circuit.	3*a*. Check the attenuator circuit and output plug for a faulty connection. *b*. Check switch 4008 for a bad contact.

168. Removal of Signal Generator from Case

To remove this instrument from its case, it is not necessary to remove any dials or controls from the front panel.

a. Remove small screw holding grounding lug to rear panel of generator.

b. Remove 10 screws holding front panel to sides, top, and bottom panels.

c. Gently pull forward on the front panel, rocking slightly from side to side if necessary, and remove front panel and entire internal assembly from shell.

d. To replace, reverse removal procedure.

Section VIII. TROUBLE SHOOTING BASED ON STARTING PROCEDURE AND FIVE TEST POSITIONS (RC-148-C)

169. Introduction

Radio Equipment RC-148-C is designed to give trouble free operation; but as in all precision apparatus, faults occur. The analysis of symptoms and trouble-shooting information which follows has been prepared to aid the repairman in isolating troubles as they occur, so that the set may be placed back in operation as quickly as possible.

a. In starting the set, the procedure in TM 11-1318, Technical Operation Manual, paragraph 62 should be followed. Proper indications are given, as well as most of the improper indications, which point to trouble occurring at a particular step of the starting procedure. The improper indications assist the operator in determining quickly where the trouble is. As soon as the faulty component is located replace it with the spare so that operations may continue with minimum delay. After the replacement is made, refer to the other sections of this chapter, where detailed tests, procedures, and reference data for each component are given.

b. A trouble may be further isolated to a component by means of the five test positions used in conjunction with the test scope. This procedure indicates operational faults which can be isolated to one component. After the defect is isolated the defective component can be quickly replaced and set up for trouble shooting. Refer to the other sections of this chapter, where detailed tests, procedures, and reference data for each component are given.

170. Trouble Shooting Based on Starting Procedure

The following tabulation of normal and abnormal conditions is based on the nine steps of the starting procedure, paragraph 62 of TM 11-1318.

STEP 1. Place the STANDBY OPERATE switch in the STANDBY position.
Place FILAMENT VOLTAGE circuit braker of power supply in ON position.
NORMAL INDICATION: Pilot lamps T-A and T-B light.

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

STEP 2. Snap ON-OFF toggle switch on interconnector to ON position.
NORMAL INDICATION: Red indicator lamp 108 on interconnector lights.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
1. Red indicator lamp 108 does not light.	1*a.* A-c input circuit from connector 4 of Rack FM-82 to interconnector socket 105. *b.* A-c input circuit in interconnector (interconnector, Symptom A). *c.* Blown fuse 135 in interconnector. *d.* Defective light bulb.

STEP 3. Check DIVISION control.

NORMAL INDICATION: With SELECTOR switch in position 4 and TEST switch in position 2, 15 horizontal lines on range oscilloscope should be obtainable with the aid of DIVISION control.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
1. No horizontal lines obtainable as DIVISION control is adjusted.	1. Defective division channel (interconnector, Symptom N).
2. Impossible to obtain 15 lines with aid of DIVISION control.	2. Defective blocking oscillator, 5B (interconnector, Symptom Q).

STEP 4. Check BASELINE control.

NORMAL INDICATIONS:
1. With SELECTOR switch in position 4 and TEST switch in position 1, a double baseline is obtained on the range oscilloscope.
2. As BASELINE control is rotated clockwise, it has the effect of peeling one line off the top trace and piling it up on the lower trace.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
1. Single baseline appears on range scope.	1. Interconnector (Symptoms N, O, P, Q, T, U).

STEP 5. (Make sure 30 seconds have elapsed since STEP 1.) Turn PLATE VOLTAGE circuit breaker to ON position.

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

ABNORMAL INDICATION	PROBABLE LOCATION OF FAULT
1. Pilot lamp T-C or pilot lamp T-D does not light.	1*a*. Blown fuse. *b*. Defective lamp. *c*. Open plate circuit.
2. Neither of pilot lamps light.	2. Blown fuses T–C or T–D.
3. Place circuit breaker will not remain closed.	3. Shorted plate supply circuit.

STEP 6. Check transmitter modulator current.

NORMAL INDICATION: Test meter reads between 4 and 7.5 milliamperes with TEST SWITCH in Ic position and SELECTOR switch in OPERATE position, and 1 milliampere in STANDBY position.

ABNORMAL INDICATION	PROBABLE LOCATION OF FAULT
1. Meter reading incorrect.	1*a*. Improper adjustment of BIAS control. *b*. Defective modulator circuit. (See transmitter-receiver trouble-shooting chart.) *c*. Defective measurement circuit.
2. Meter reading same in both positions.	2*a*. No sync voltage to transmitter. *b*. Faulty sync input circuit in transmitter. *c*. Defective modulator circuit.

STEP 7. Turn SELECTOR switch to OPERATE position.

NORMAL INDICATION: Normal radar display with IFF display beneath it should appear on range oscilloscope. (Return switch to STANDBY position.)

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
1. No picture on screen or distorted picture.	1*a*. Radar range scope. *b*. (Interconnector, Symptoms B through K.)
2. No IFF picture on screen, radar picture normal.	2*a*. Receiver, trouble-shooting chart. *b*. (Interconnector, Symptom E.)

171. Trouble Shooting Based on Five Test Positions

The following tabulation of normal and abnormal conditions is based on the five test positions, and is used to isolate trouble after the starting procedure has been followed. It will sectionalize trouble to particular components and to channels of the interconnector. The correct settings for taking these positions are given in TM 11–1318, Technical Operation Manual, chapter 3.

POSITION 1: BASELINE

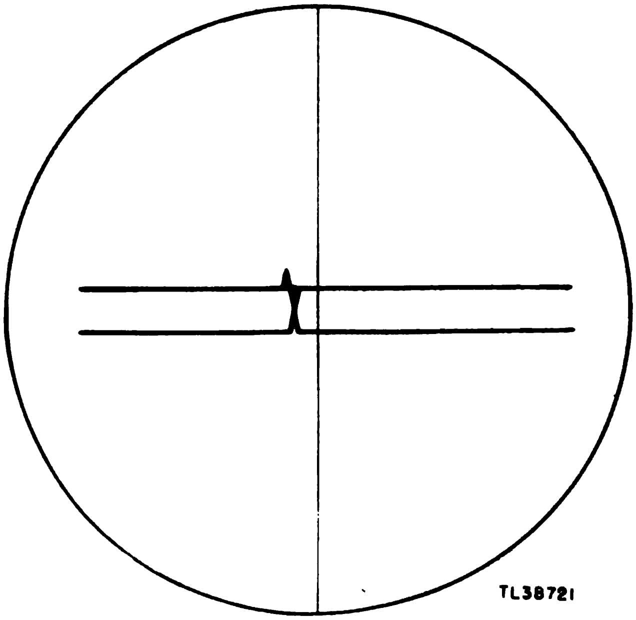

Figure 169. Baseline pattern.

ABNORMAL CONDITIONS	PROBABLE LOCATION OF FAULT
1. See step No. 4 for abnormal conditions and probable location of fault.	

POSITION 2: DIVISION.

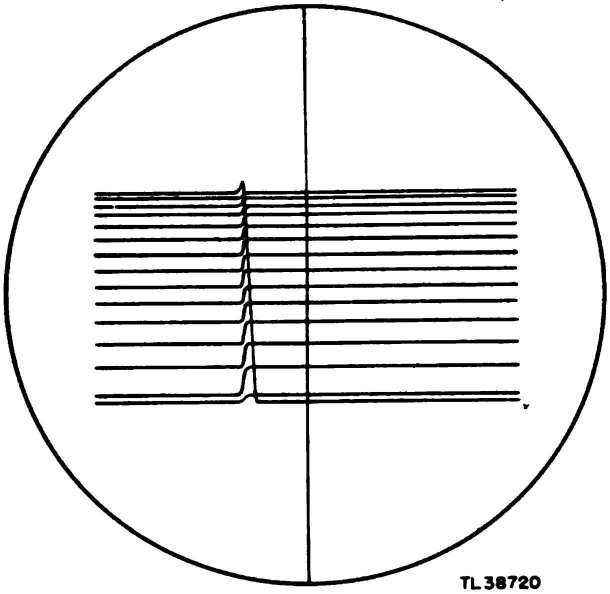

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Figure 170. Division pattern.

ABNORMAL CONDITIONS — PROBABLE LOCATION OF FAULT

1. See step No. 3 for abnormal conditions and probable location of fault.

POSITION 3: TRANSMITTER SYNC PATTERN.

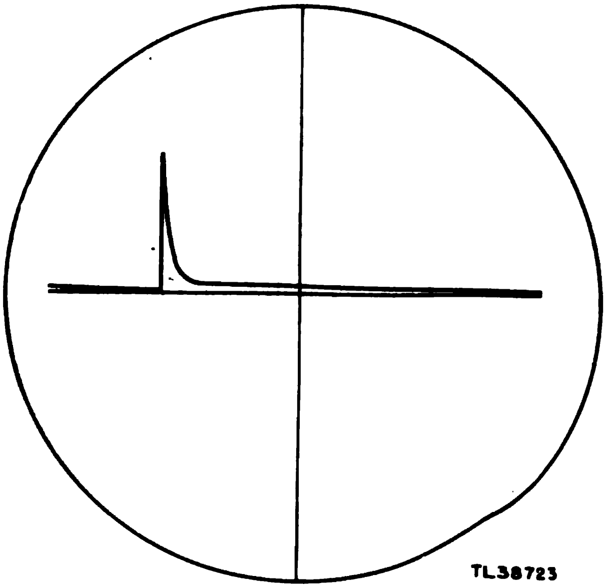

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Figure 171. Transmitter synchronizing signal pattern.

ABNORMAL CONDITIONS	PROBABLE LOCATION OF FAULT
1. Horizontal sweep but no vertical deflection.	1. (Interconnector, Symptom S).

POSITION 4: SYNCHRONIZING VOLTAGE PATTERN.

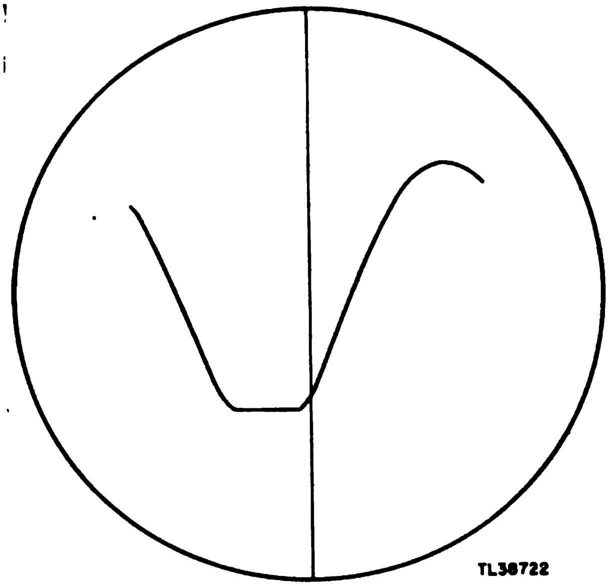


Figure 172. Synchronizing voltage pattern.

ABNORMAL CONDITIONS	PROBABLE LOCATION OF FAULT
1. Horizontal sweep, but no vertical deflection.	1. (Interconnector, Symptoms I, U, V).

POSITION 5A: RECEIVER OUTPUT.

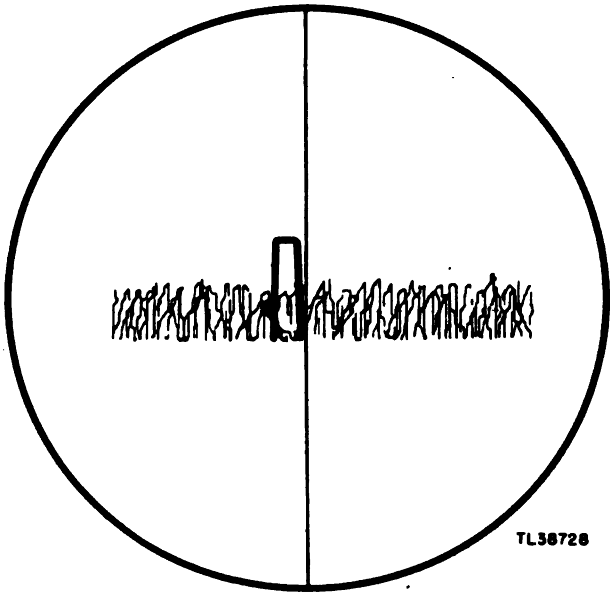


Figure 173. Receiver output pattern.

ABNORMAL CONDITIONS	PROBABLE LOCATION OF FAULT
1. Horizontal sweep but no vertical deflection.	1. Receiver trouble-shooting chart.
2. Horizontal sweep; vertical deflection shows *grass* but no transmitted pulse.	2*a*. Receiver not tuned to frequency of transmitter. *b*. Transmitter trouble-shooting chart.

POSITION 5B: MONITOR OUTPUT (TEST SWITCH pressed to P.O. position).

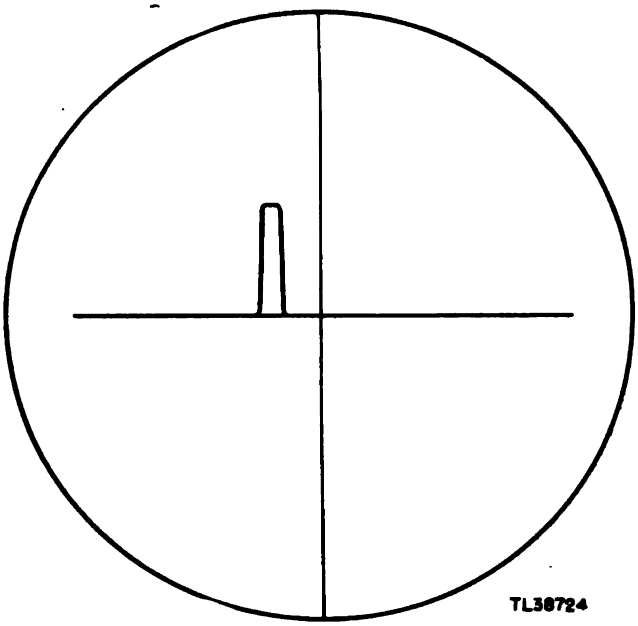


Figure 174. Pattern showing r–f envelope.

ABNORMAL INDICATIONS	PROBABLE LOCATION OF FAULT
1. Horizontal sweep but no vertical deflection.	1*a.* Transmitter trouble-shooting chart if position 3 is normal. *b.* Interconnector (Symptom S) if position 3 is abnormal.

Section IX. RECEIVER AND TRANSMITTER SECTIONS OF RC–148–C

> *Warning: Voltages sufficient to cause death on contact are exposed at many points in this unit. Do not place hands or arms within unit when the high voltage is on. Do not make any connection into the unit which will bring high voltages out to an exposed point. Make all tests with high voltages off. Always ground high-voltage capacitors before touching them or their associated circuits.*

172. Reference Data

To assist the maintenance personnel while trouble shooting on the receiver-transmitter, many figures have been provided. In chapter 1, sections VIII and X, there are partial schematics and block diagrams, and at the end of this section there are groups of figures containing views of the receiver-transmitter, a complete schematic and wiring diagram, drawings of terminal boards, voltage and resistance measurements.

173. Introduction

a. The blocking-oscillator transformer used 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.

b. 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.

c. 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, and 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.

d. 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 transmormers at random. This will only aggravate the condition and necessitate the realignment of the receiver. The receiver utilizes a stagger-tuned i-f amplifier, and therefore 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. High voltage is used in the transmitter, and for this reason flash-over will be a common cause of trouble. In such cases the trouble often may be found more easily by a close visual inspection.

174. Preparing Unit for Trouble Shooting

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.

175. Transmitter, Trouble-shooting Chart

A. SYMPTOMS:

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

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

B. SYMPTOM:

Low power output indication.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Improper alignment.	1*a*. Tune transmitter for maximum power output, as described in paragraph 177*g*. *b*. If fault is not cleared, see item below.
2. Improper adjustment of POWER OUTPUT control.	2*a*. Turn POWER OUTPUT to full ON position. *b*. If adjustment does not affect power output indication, check POWER OUTPUT control circuit for a short. *c*. If fault is not cleared, see item below.
3. Defective modulator tube (17).	3*a*. Defective modulator tube (17) is indicated by low current reading on test meter. *b*. Replace tube 17 and check output. *c*. Make voltage and resistance check of modulator circuit. *d*. If modulator tube has no screen voltage, replace tube 5 in power supply. *e*. Check potentiometer 91 for an open of short. *f*. If modulator tube has no plate voltage, replace tube 6 in power supply. *g*. Make a voltage and resistance check of power supply circuit and rack wiring. *h*. If fault is not cleared, see item below.
4. Defective r-f oscillator (tubes 20 and 21).	4*a*. Replace tubes 20 and 21. *b*. If fault is not cleared, make voltage and resistance check of circuit. *c*. Check filament chokes for shorted turns. *d*. Check oscillator-tank assembly for bad contacts.

C. SYMPTOM:

Output pulse viewed on range oscilloscope is not steady as transmitter is adjusted.

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

D. SYMPTOM:

Abnormal modulator cathode current.

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

E. SYMPTOMS:

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

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

F. SYMPTOMS:

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

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Improper adjustment of POWER MEASUREMENT control.	1*a*. Set POWER MEASUREMENT control to maximum counterclockwise position. *b*. If fault is not cleared, see item below.
2. TEST SWITCH.	2*a*. Make continuity check of TEST SWITCH circuit. *b*. If fault is not cleared, see item below.
3. Measurement circuit.	3*a*. Replace tubes 14 and 15. *b*. Make voltage and resistance check on measurement circuit.

G. SYMPTOMS:

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

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

H. SYMPTOM:

Power output not variable.

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

176. Receiver, Trouble-shooting Chart

A. SYMPTOM:

Low receiver gain.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Improper tuning.	1*a*. Tune receiver as described in paragraph 177*f*. *b*. If fault is not cleared, see item below.
2. Incorrect i-f alignment.	2. Align i-f stages as described in paragraph 178.

B. SYMPTOM:

Low output.

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

C. SYMPTOM:

Tuning eye gives no indication.

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

D. SYMPTOM:

Tuning eye does not close properly.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Improper adjustment of eye transformer (112).	1. Adjust eye transformer as described in paragraph 178*c*.

E. SYMPTOMS:

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

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Improper adjustment of antenna-matching section.	1. Adjust antenna-matching section as described in paragraph 177*c*.

F. SYMPTOM:

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

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

177. Alignment

Improper alignment will usually 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 transmitter for maximum output indication and the receiver for maximum eye closure.

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

a. Transmitter and Receiver Alignment. (1) Disconnect Cord CD–1098 and the right-angle connector from the ANTENNA connector. Connect the *T*-connector to the ANTENNA connector (fig. 175) and plug in the dummy antennas. Snap on the FILAMENT VOLTAGE circuit breaker. Set the SELECTOR switch in the STANDBY position.

Note. The following controls should be adjusted with the knurled handle screw driver which is screwed into the panel above the receiver tuning dials (see fig. 176).

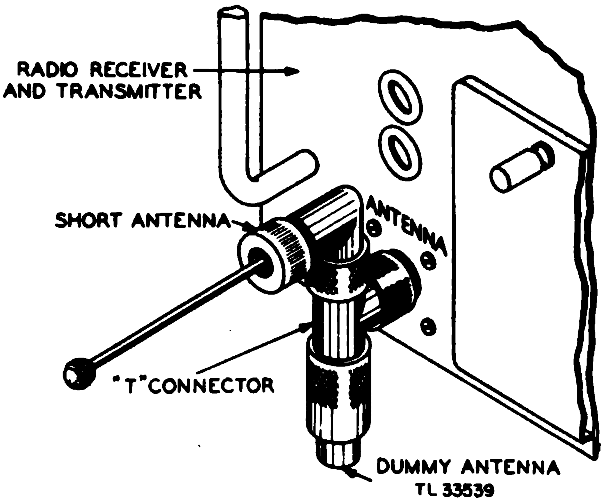


Figure 175. Radio Receiver and Transmitter BC–1267–A, showing antenna test installation.

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 for the

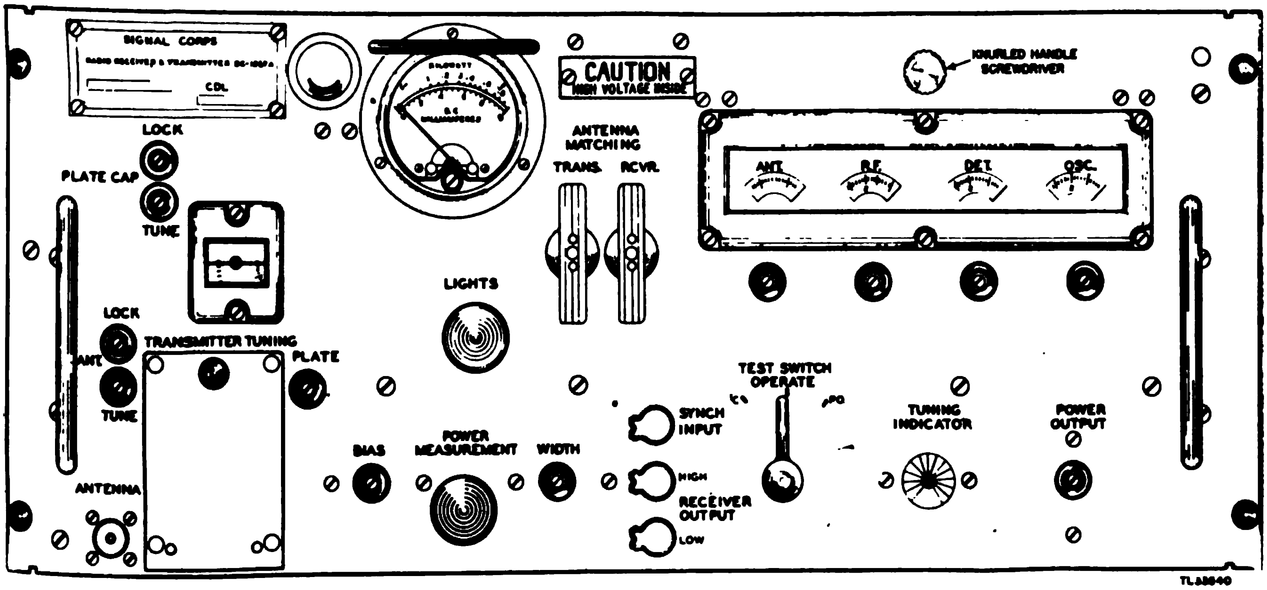


Figure 176. Radio Receiver and Transmitter BC–1267–A, front panel.

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

b. Modulator-cathode Current. With the TEST SWITCH in the Ic position, adjust the BIAS control until the test meter reads 1 ma. Place the SELECTOR switch in the OPERATE position; the test meter should read from 4 to 7 ma in the OPERATE position.

c. Antenna Matching. Place the TEST SWITCH in the P.O. position, the SELECTOR switch in position 4, and the TEST switch on the interconnector to position 5. A picture of the envelope of the r-f pulse should appear on the screen of the cathode-ray tube. Adjust the antenna tuning (ANT.) and the TRANS. and RCVR. portions of the 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. 177). 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.

d. Pulse Width. Place the TEST SWITCH in the P.O. position, the SELECTOR switch in position 4, and the TEST switch in position 5. Rotate the PHASE control on the interconnector until one edge of the pulse is on the zero line. Then rotate the

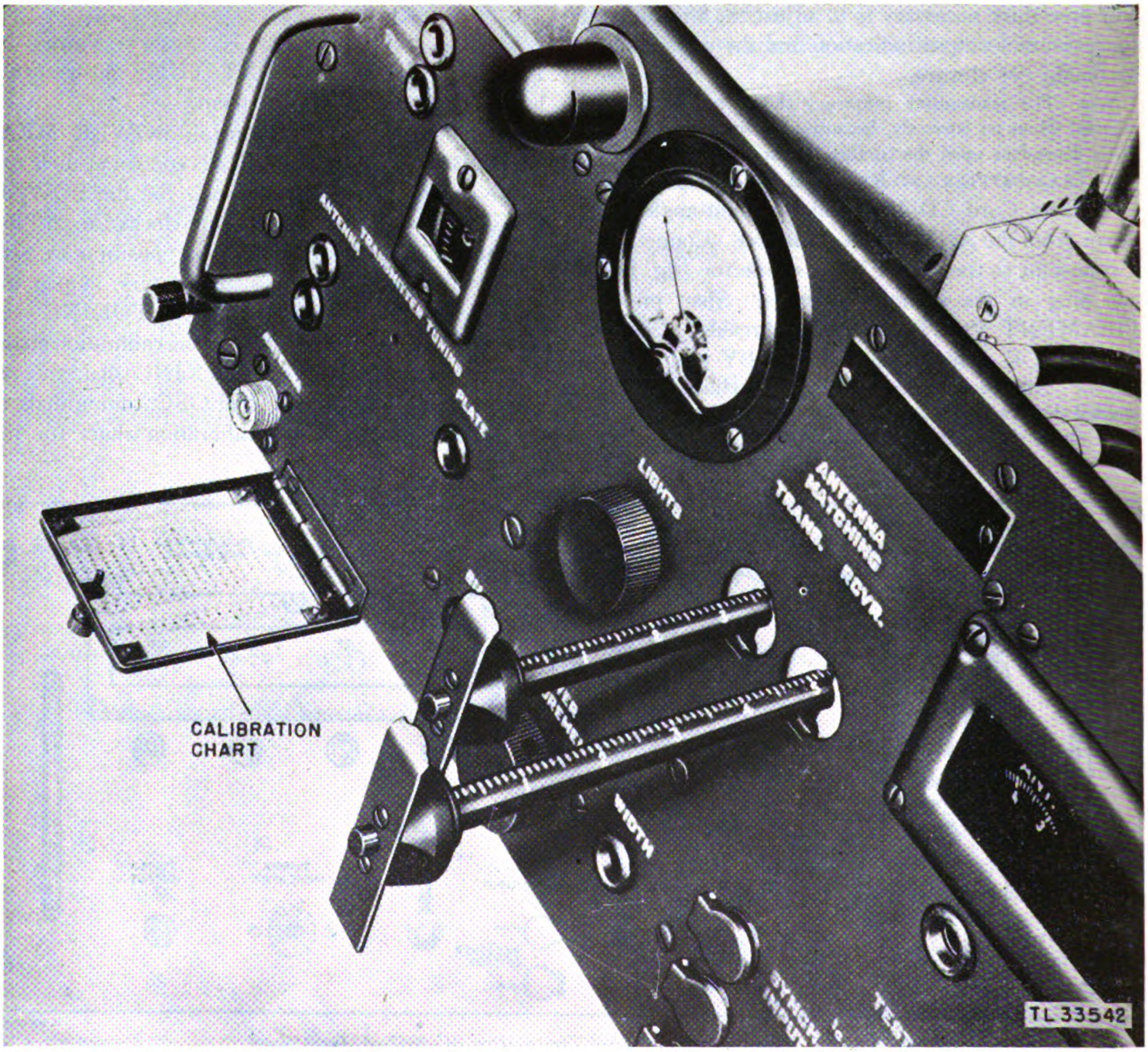


Figure 177. Radio Receiver and Transmitter BC-1267-A, chart showing antenna matching adjustments and calibration.

RANGE CONTROL on the range unit until the other edge of the pulse is on the zero line. The distance, measured in yards on the range dial, should be approximately 1,280 yards. If the pulse width is incorrect, adjust the WIDTH control on the transmitter and measure the width as before until the correct width is obtained.

e. TRANSMITTER FREQUENCY. (1) Set the signal generator to the TEST position. Rotate the TUNING control to the desired setting as read from the chart on the front panel of the signal generator. Insert the headphones in the PHONES jack provided for them. Pull the antenna rod up out of the case.

Note. It will be necessary to allow the signal generator to warm up for at least 15 minutes to prevent any frequency drift.

(2) Set the TRANSMITTER 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 (see par. 193). Make sure that the interruption is sharp and can be approached from both directions of rotation of the transmitter-frequency control.

(3) Retune the antenna-tuning control (ANT.) and the antenna-matching sections as described in paragraph 177*c*.

f. RECEIVER FREQUENCY.

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

(2) Turn the GAIN control on the interconnector 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 GAIN 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 coarse 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 SELECTOR switch on the interconnector in position 4, the TEST switch on the interconnector in position 5, and the TEST SWITCH in the P.O. position. While observing the pulse on the screen of the range scope, 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 kilowatt may be considered sufficient.

Note. If the 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 Cord CD–1098 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 range scope with the TEST SWITCH in the P.O. position. Adjust the PLATE CAP. 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.

178. Alignment of I-f coils

a. PREPARATION. Place the SELECTOR switch in the STANDBY position. Connect the ends of Cord CD–1103 to the R.F. OUTPUT receptacle of the signal generator and to the i-f input jack of the receiver.

b. CALIBRATION OF SIGNAL GENERATOR. When setting the frequency of the signal generator, refer to paragraph 193 of this chapter for information on the calibration chart and restoring the calibration L.F.-H.F. band switch to the L.F. position when setting up for the i-f frequency.

c. PROCEDURE. Use the alignment tool to adjust the i-f coil on the stage being tuned from the bottom of the chassis. The alignment procedure is as follows:

(1) Remove the local oscillator tube 6C4.

(2) Turn the GAIN control on the interconnector completely clockwise. This insures maximum gain.

(3) To prevent the system from breaking into os-

cillation, alignment should first be made at reduced signal generator input.

(4) Set the generator to 11 megacycles.

(5) Adjust the eye transformer tuning slug for maximum closing of the tuning indicator eye. If the eye closes completely, reduce the output of the signal generator until maximum closure is clearly indicated.

(6) Set the generator to 9.5 megacycles.

(7) Adjust the second detector transformer tuning slug for maximum closing of the tuning indicator eye.

(8) Set the signal generator to 8.8 megacycles.

(9) Adjust the fifth i-f and third i-f transformer tuning slug, in order, for maximum closing of the tuning indicator eye.

(10) Set the signal generator to 13.2 megacycles.

(11) Adjust the fourth i-f transformer tuning slug for maximum closing of the tuning indicator eye.

(12) Set the signal generator to 12.5 megacycles.

(13) Adjust the second i-f transformer tuning slug for maximum closing of the tuning indicator eye.

(14) Set the signal generator to 11 megacycles.

(15) Adjust the first i-f transformer tuning slug for maximum closing of the tuning eye.

d. Oscillation. If the system breaks into oscillation during adjustment, as evidenced by complete closure of the eye with no signal input, turn the slugs of the fifth and third i-f transformers all the way in. Then complete the adjustment of all the other transformers before returning to the fifth and third.

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

e. Trouble Shooting Defective I-f Stage. 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. Since poor gain in one stage will be reflected in all stages preceding it, the gain checks should be traced back by starting with the last i-f and working back to the first i-f.

Table VI. 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 VII. 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.

179. Additional Alignment Procedure using Tuning Eye Indicator

a. To align the i-f system when considerable misalignment has been caused by accident or replacement of i-f transformers, the following procedure should be followed:

(1) Remove the oscillator tube 6C4.

(2) Connect the unmodulated output of Signal Generator I–122–A between the grid and ground of the fifth i-f amplifier tube.

(3) Set the frequency at 11 megacycles.

(4) Resonate the eye transformer, 112, for maximum closing of the tuning indicator eye.

(5) Set the frequency at 9.5 megacycles.

(6) Resonate the second detector transformer, 111, for maximum closing of the tuning indicator eye.

(7) Shift the generator connections to grid and ground of the fourth i-f stage.

(8) Set the frequency at 8.8 megacycles.

(9) Resonate the fifth i-f transformer, 110, for maximum closing of the tuning indicator eye.

Note. Care should be taken not to overload the tuning eye. This overload is indicated by an overlapping in the eye. To prevent this, reduce the signal generator input.

(10) Shift the generator connections to grid and ground of the third i-f stage.

(11) Set the frequency at 13.2 megacycles.

(12) Resonate the fourth i-f transformer, 109, for maximum closing of the tuning indicator eye.

(13) Shift the generator connections to grid and ground of the second i-f stage.

(14) Set the frequency at 8.8 megacycles.

(15) Resonate the third i-f transformer, 108, for maximum closing of the tuning eye.

(16) Shift the generator connections to grid and ground of the first i-f stage.

(17) Set the frequency at 12.5 megacycles.

(18) Resonate second i-f transformer, 107, for maximum closing of the tuning indicator eye.

(19) Shift the generator connections to the i-f jack, 151–1.

(20) Resonate the first i-f transformer, 106, for maximum closing of the tuning eye.

b. If the i-f system breaks into oscillation at any time, turn the slugs of the fifth and third i-f transformers all the way in. Then complete the adjustment of all the other transformers before returning to the fifth and third.

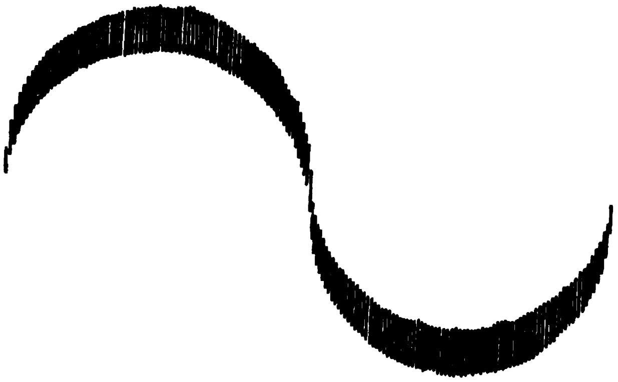


Figure 178. Scope pattern for alignment procedure.

180. Receiver Alignments using Test Scope

a. The equipment needed to tune the i-f stages includes a signal generator, oscilloscope (or output meter), gain box, and a tuning screw driver. Since waveshape and signal-to-noise ratio may be directly observed on an oscilloscope, the scope is to be preferred to the output meter.

b. A few precautionary measures to insure uniform results are necessary:

(1) Keep the equipment close together.

(2) Connect all chassis together with several short leads.

(3) Ground the chassis.

c. Preliminary to the alignment of the receiver, the following steps must be taken:

(1) Connect the alligator clip of the gain box to pin 22 of multiple receptacle 180 on the receiver. Turn the variable control of the gain box completely counterclockwise. This insures maximum gain.

(2) Connect the *Y*-input lead of the test scope to the HIGH jack 150–3 of the receiver.

(3) Connect the output of the signal generator to the I.F. IN jack, 151–1.

(4) Turn the equipment on and allow it to warm up for a few minutes.

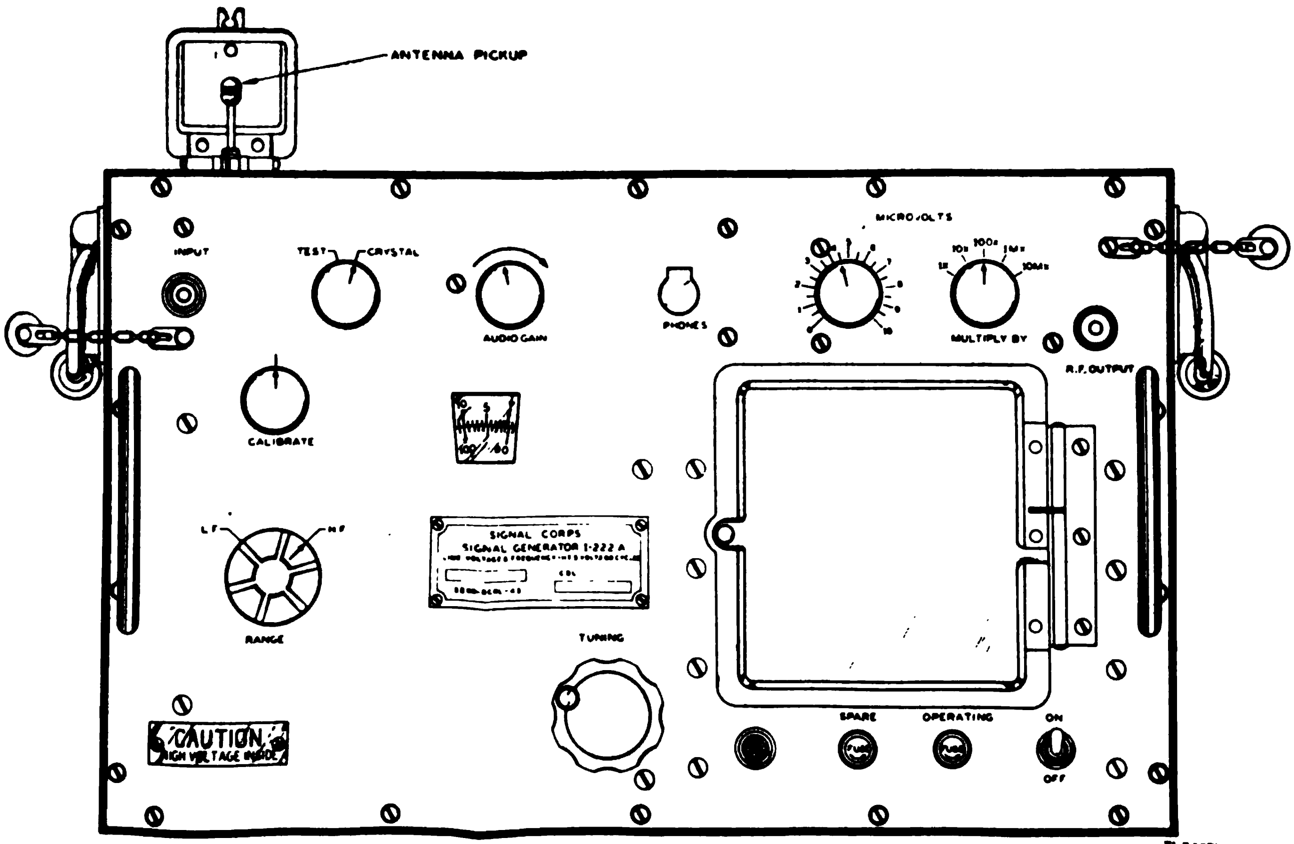


Figure 179. Signal Generator I–222–A, front panel.

d. After the equipment has reached its normal operating temperature, proceed as follows:

(1) Adjust the tuning dial of the signal generator for an output frequency of 11 mc.

(2) Increase the output level from zero until a picture is formed on the scope as shown in figure 178.

(3) Adjust the core of the i-f coils of first and sixth transformers for maximum deflection on the scope. When this adjustment is being made, decrease the signal output of the signal generator to maintain the same deflection as in (2) above; otherwise distortion of the output due to overloading will cause misleading results. Observe this precaution each time an i-f stage is adjusted.

(4) Change the frequency of the signal generator to 12.5 mc and adjust i-f coil 2 for maximum deflection on the scope.

(5) Change the frequency of the signal generator to 13.2 mc and adjust i-f coil 4 for maximum deflection on the scope.

(6) Change the frequency of the signal generator to 8.8 mc and adjust i-f coils 3 and 5 the same way.

(7) Set the signal generator to 11 mc and adjust the tuning-eye tuned circuit (eye transformer) for maximum closure of the eye. (The signal level may have to be increased.)

181. Alignment of Receiver R-f Calibration Dials with Calibration Chart

This alignment usually will not be necessary unless an r-f coil is replaced.

a. The alignment procedure is written for all four

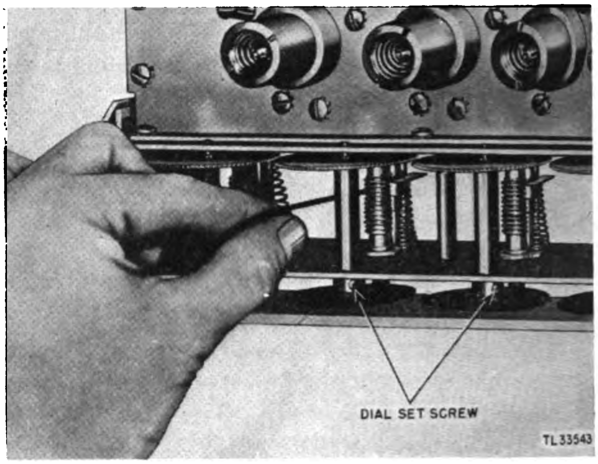


Figure 180. Radio Receiver and Transmitter BC-1267-A, r-f tuning section.

r-f stages; however, it may be used to align just one without aligning the others.

b. Place the SELECTOR switch in the STAND-BY position. Disconnect the cable from the antenna

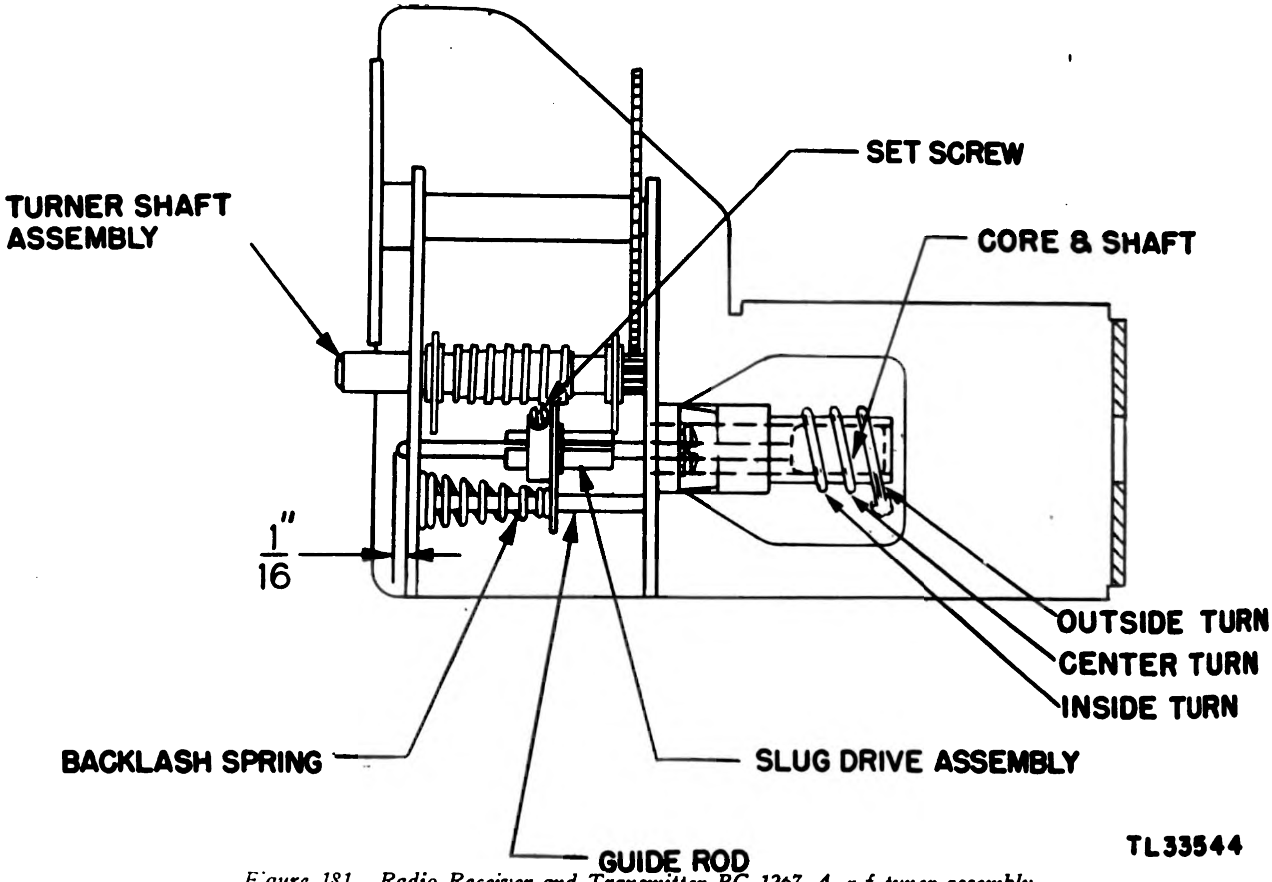


Figure 181. Radio Receiver and Transmitter BC-1267-A, r-f tuner assembly.

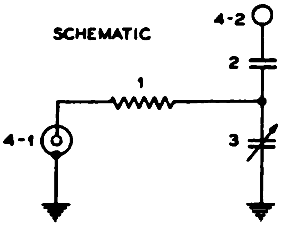
receptacle on the transmitter. Use Cord CD–1104 to connect the r-f output of the signal generator to the antenna receptacle. Use the tuning eye for a resonance indicator. Set the signal generator to the transmitter frequency and tune the r-f section controls for resonance. If the dial readings on all the r-f stages of the receiver, with the exception of the ANT., are 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 greater 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.

c. 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. 180).

d. Loosen the setscrew on the slug-driver assembly (fig. 181) and adjust the tuning cores until their shafts extend 1/16 inch out from the tuner front plate (see fig. 181). To do this the tuner must be removed from the chassis. (If the coil has been replaced, this has already been taken care of.) Set the signal generator at 156 mc and tune the OSC. dial to maximum eye closure.

Note. In this receiver the desired response occurs with the heterodyne 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. 181). (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.



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

TL33546

Figure 183. Capacity voltage divider, schematic diagram.

e. Repeat the above procedure for the DET., R.F., and ANT. stages.

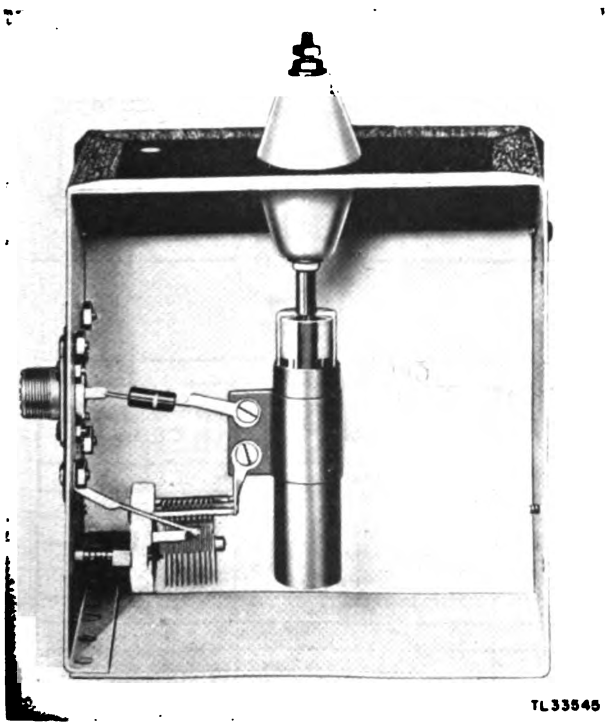
f. Set the signal generator at 186 mc and tune the OSC. dial to resonance, as indicated by maximum eye closure. If the OSC. dial fails to check with the calibration chart, adjust the spacing between the inside turn and the center turn until the correct dial reading is obtained (see fig. 181). (The inside turn is next to the front panel.)

g. Repeat this process for the DET., R.F., and ANT. stages.

182. Testing Transmitter

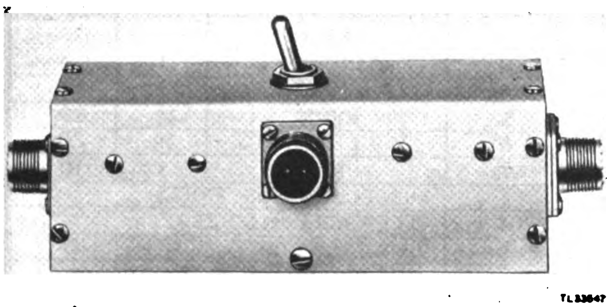
a. Test Equipment. The tests discussed in this paragraph require equipment which is not supplied with Radio Equipment RC–148–C. The equipment required is described in the paragraphs below.

(1) *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



TL33545

Figure 182. Capacity voltage divider, cover removed.



TL33547

Figure 184. High-frequency diode head.

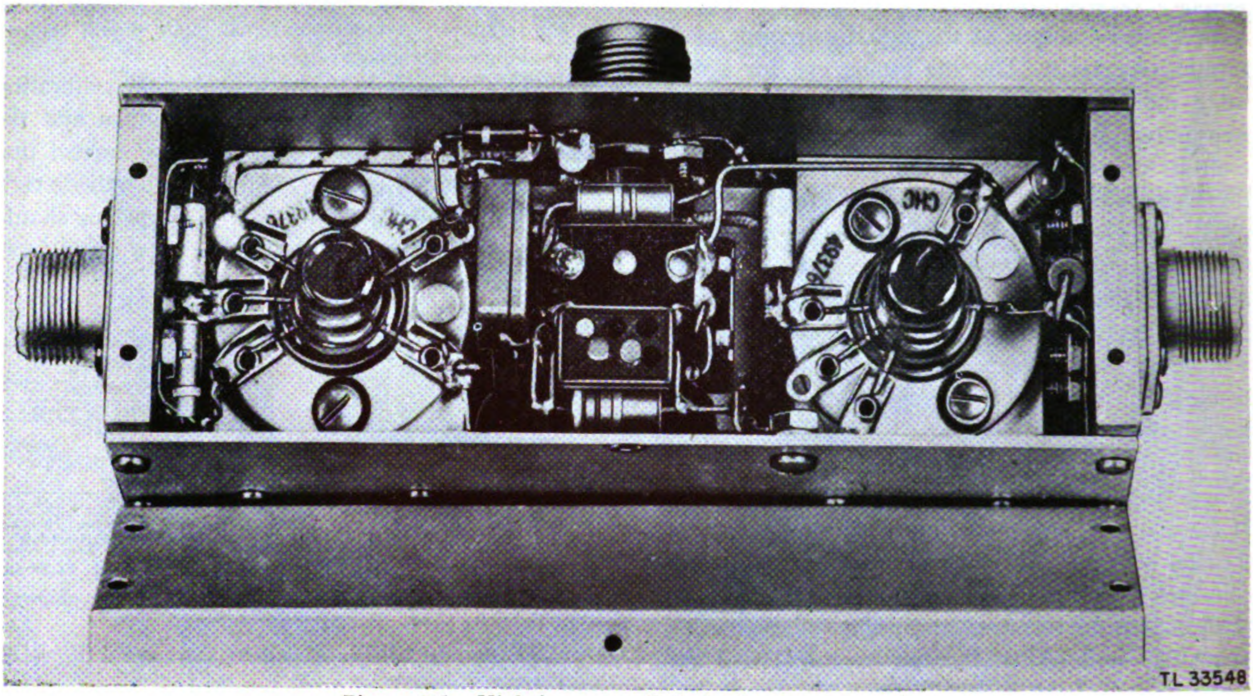
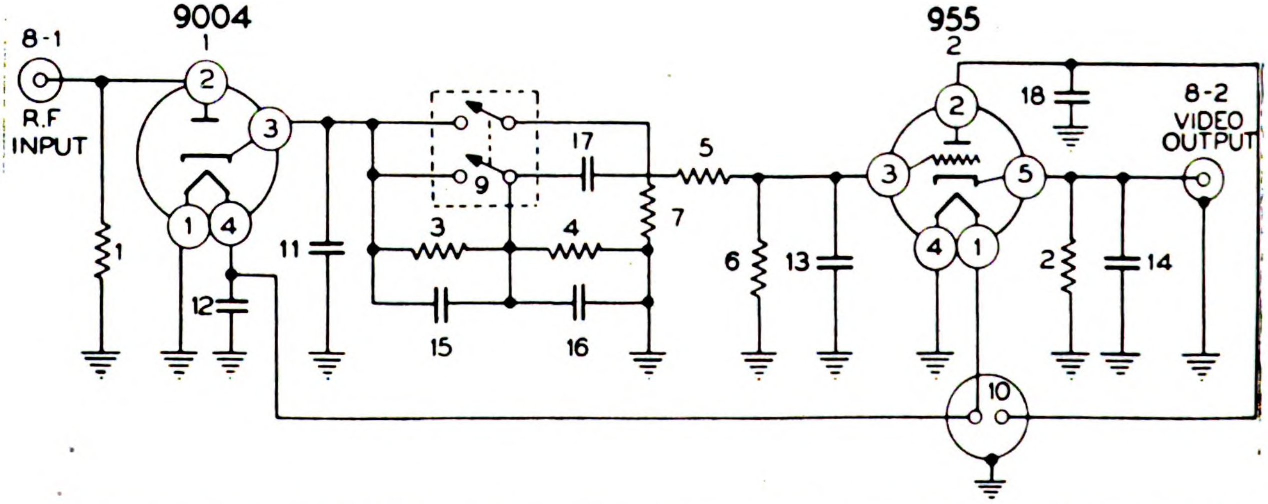


Figure 185. High-frequency diode head, cover removed.



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	} 40 MMFD	} CERAMIC
12		
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

TL 33549

Figure 186. High-frequency diode head, schematic diagram.

external sweep. The connection to the vertical plates should be in series with a capacitor having a capacity of at least 0.5 mf.

(2) *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 mmf.

(3) *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 interconnector, 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.

(4) *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.

(5) *Capacity voltage divider.* This divider should have a division ration 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. 182 and 183).

(6) *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 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 186 shows the schematic of such a unit, and figure 185 is a photograph showing typical construction.

b. 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 187.

(1) The transmitter may be triggered by the interconnector 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 Cord CD–1106. The power supply must be in place in the rack if the trigger pulse is to come from the interconnector, it is necessary that the interconnector be properly adjusted for normal operation. To operate the transmitter from an external source, plug the external trigger voltage into the SYNCH. INPUT jack on the transmitter.

(2) The sweep generator for the test oscilloscope must be synchronized with the trigger pulse.

(*a*) If the interconnector is used, this sync pulse may be obtained from the usual sync output channel. In order to vary the phase of the transmitter trigger pulse with respect to the leading edge of the

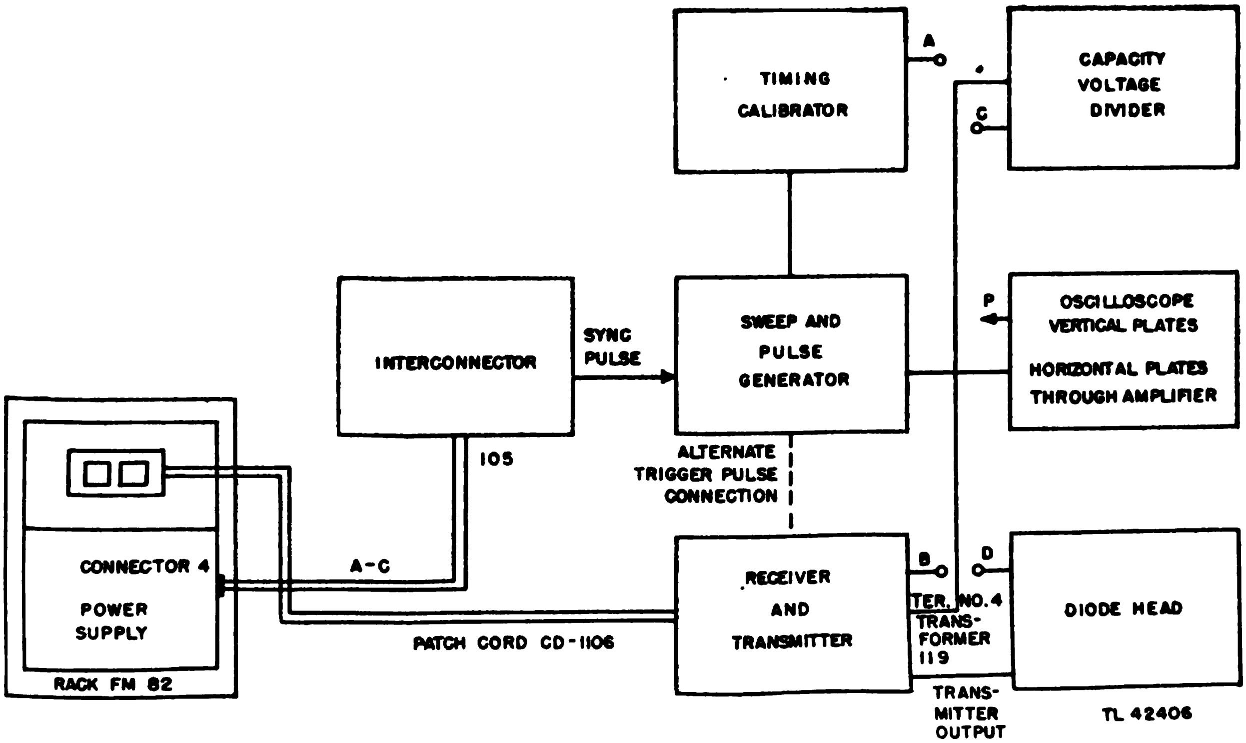


Figure 187. Radio Equipment RC–148–C, block diagram of test equipment connections.

sweep, it is necessary only to rotate the PHASE control. This will move the trigger pulse with respect to the sweep.

(*b*) If the separate sweep and pulse generator is used it may receive sync from a separate audio oscillator. A phase control must be incorporated into the sweep generator.

(3) 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.

(4) 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 a damped sine wave, is connected to the vertical plates of the oscilloscope. The length of the sweep is adjusted until 2 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.

(5) 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.

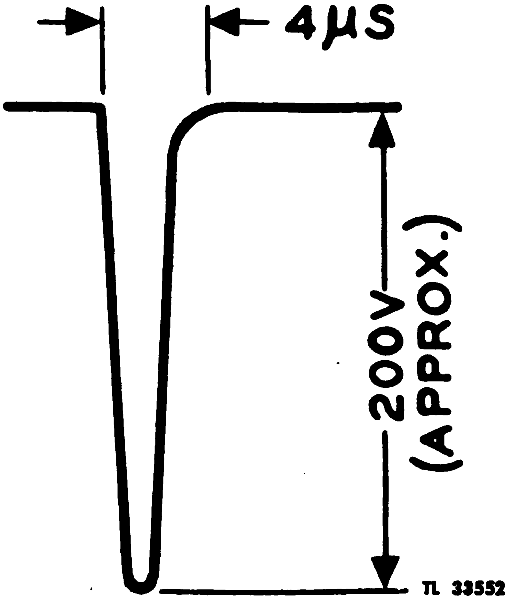


Figure 189. Test oscilloscope pattern.

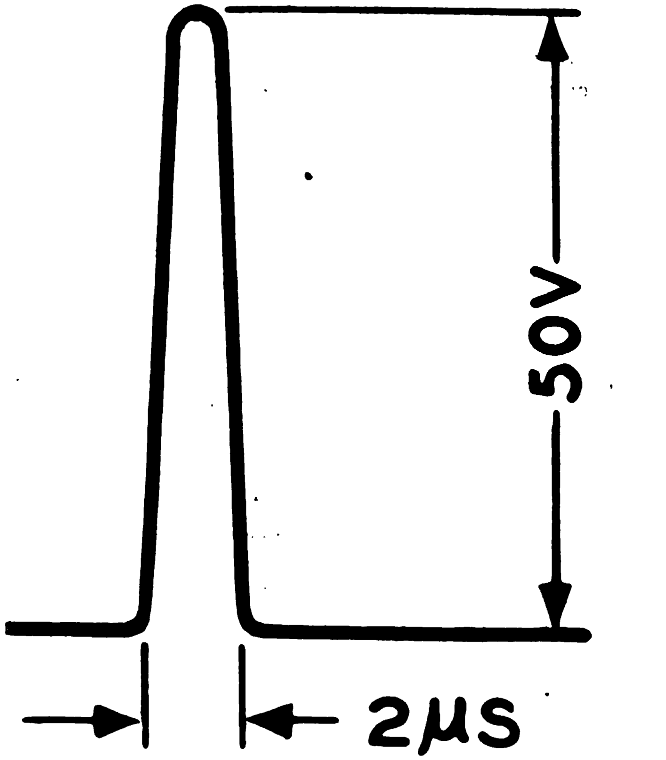


Figure 188. Test oscilloscope pattern.

(6) The diode head (fig. 186) is connected to the ANTENNA receptacle on the radio receiver and transmitter. To measure the power of the oscillator directly, remove the cable which is connected to receptacle 170–2 and connect the diode head in its place, using a short length of 50-ohm cable. To measure power, the switch on the diode unit must be in the open position. This 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. This puts a low resistance load in the diode cathode circuit.

(*c*) Test Procedure. The controls of the transmitter 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.

(1) 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 188 should appear across this re-

sistor. If this pulse is not normal, check the interconnector 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.***

(2) Connect the test cable to pin 5 of tube 16. The waveform shown in figure 189 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 decay time than that shown in figure 189, the resistance or capacity has probably increased. Be sure that the wiring is dressed away from the chassis. Check resistor 62–5 and tube 16. The same wave form will also appear on pin 1 of tube 16.

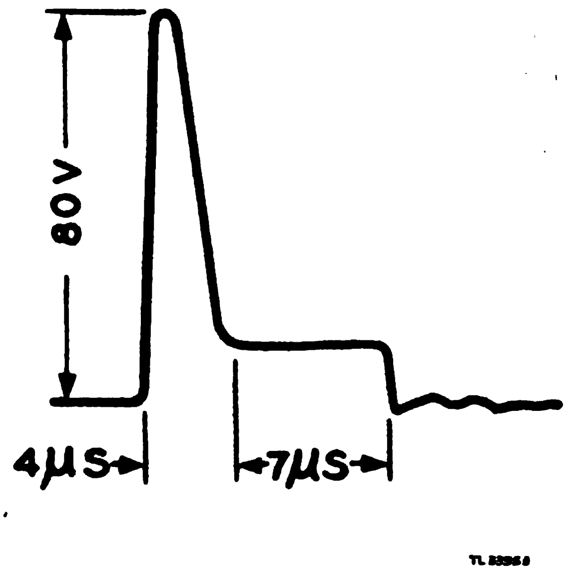


Figure 190. Test oscilloscope pattern.

(3) Connect the test cable to pin 2 of tube 16. The waveform shown in figure 190 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 in the circuit will increase the rise and decay time. An increase in the plate load resistance (83–1 to 83–5 in parallel) will also increase the decay time.

(4) 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 191 should be obtained. Plate voltage must be ap-

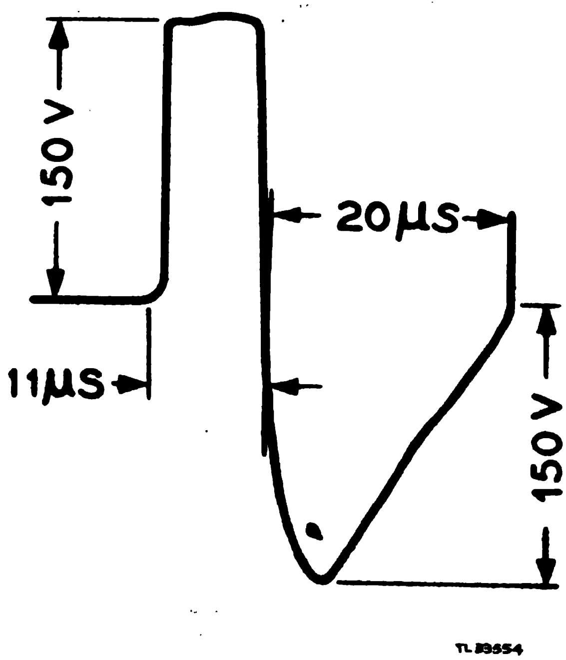


Figure 191. Test oscilloscope pattern.

plied 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 the output pulse is too narrow, capacitor 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 capacit...

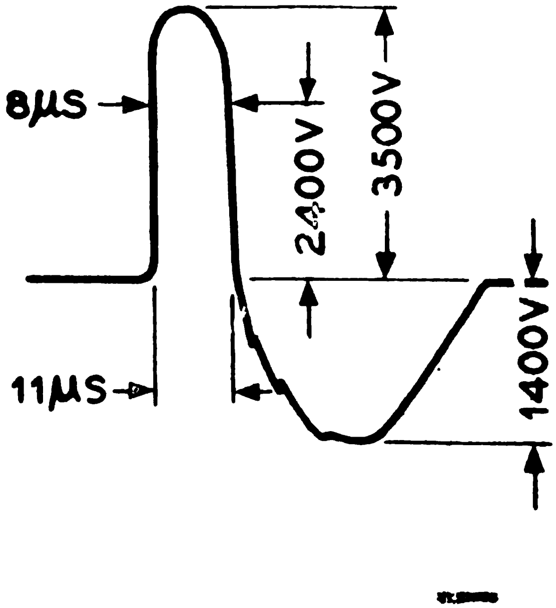


Figure 192. Test oscilloscope pattern.

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 190 except that it has less amplitude.

(5) 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 shown in figure 192 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 (17), or low plate voltage.

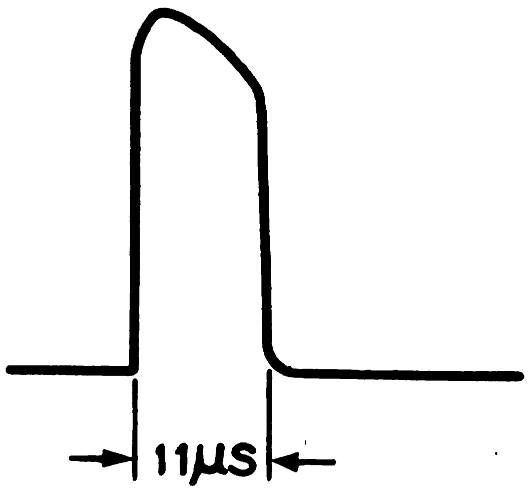


Figure 193. Test oscilloscope pattern.

(6) 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 193 should be obtained. This is the envelope of the r-f wave 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 194 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:

$$P = \frac{E^2}{2R},$$

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

$$P = \frac{E^2}{100}.$$

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 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.

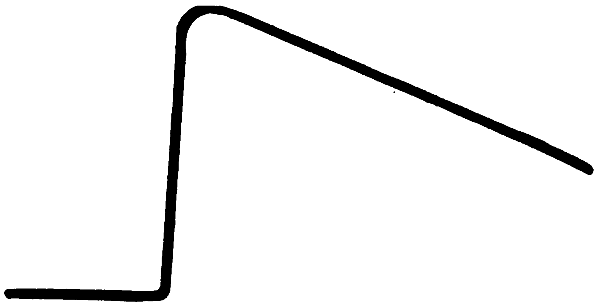


Figure 194. Test oscilloscope pattern.

183. 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.

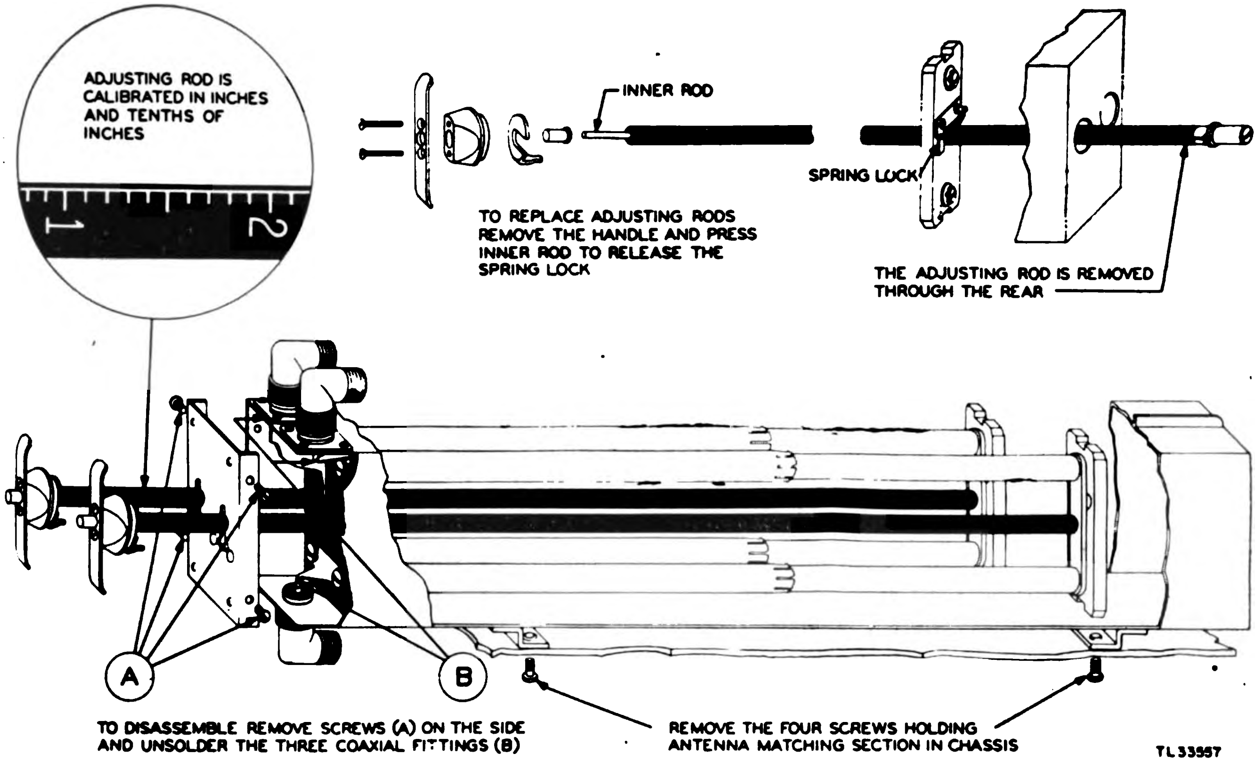


Figure 195. Radio Receiver and Transmitter BC-1267-A, disassembly of antenna-matching section.

b. Adjusting Rods. To replace an adjusting rod of the antenna-matching section, engage the rod 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. 195). 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. 196). 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. 195). 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. 197). 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 shield which covers the modulator transformer terminals. Remove the 16 screws which hold the side of the oscillator box to the chassis and front panel. This allows the entire side to be removed (see fig. 199).

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. 198). Assemble in reverse order.

g. Interconnector Plug. To gain access to the

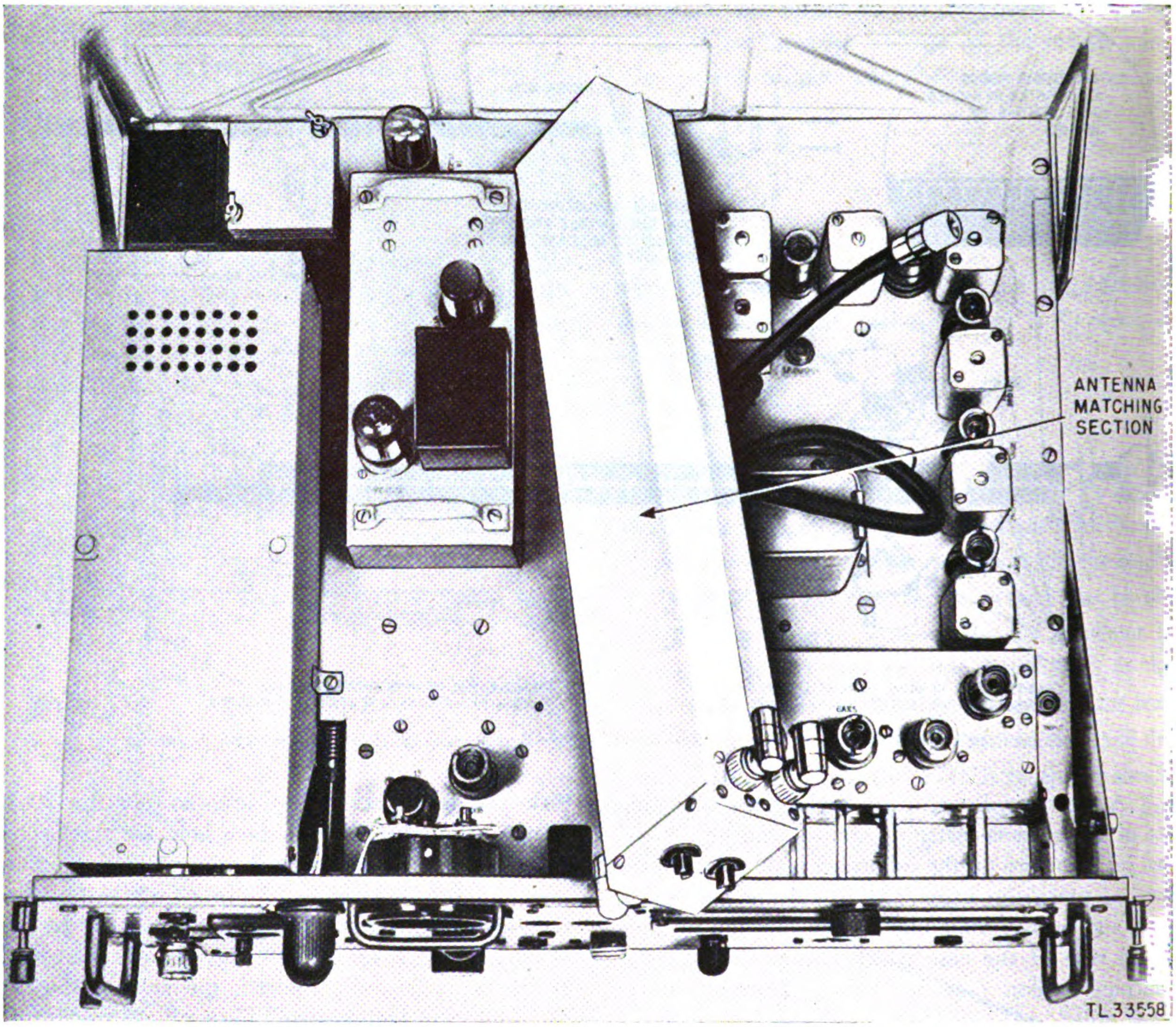


Figure 196. Radio Receiver and Transmitter BC–1267–A, removal of antenna-matching section.

connector on the rear of the chassis, remove the two screws which hold the shield in place (see fig. 200). 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, and 82–4, first remove the shield which covers the board and the positive terminal of capacitor 25. This shield is 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. 201). Ground the capacitor with a screw 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 from the front panel to the rear fence. Remove the wingnuts and springs which hold the cover in place. These springs are under considerable tension; be 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. 202). The tube can now be removed by pulling upward. This tube has no base. Be careful when handling it so as not to break the seals where the

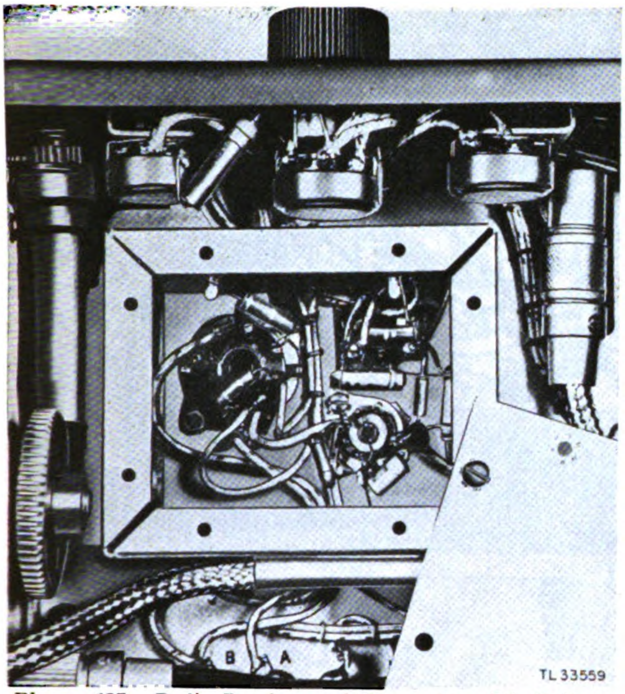


Figure 197. Radio Receiver and Transmitter BC-1267-A, power-measurement circuit, shield cover removed.

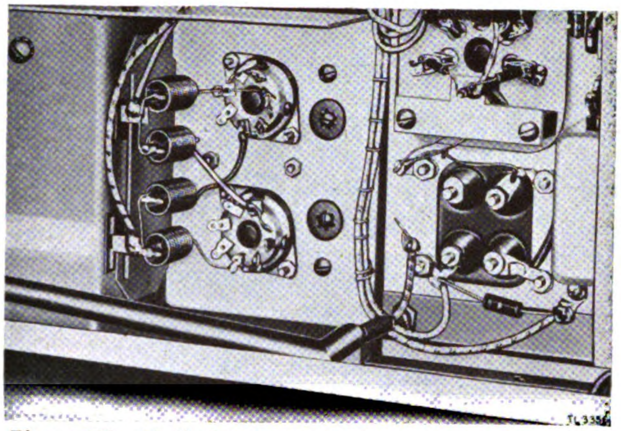


Figure 198. Radio Receiver and Transmitter BC-1267-A, transmitter-oscillator tube, shield removed.

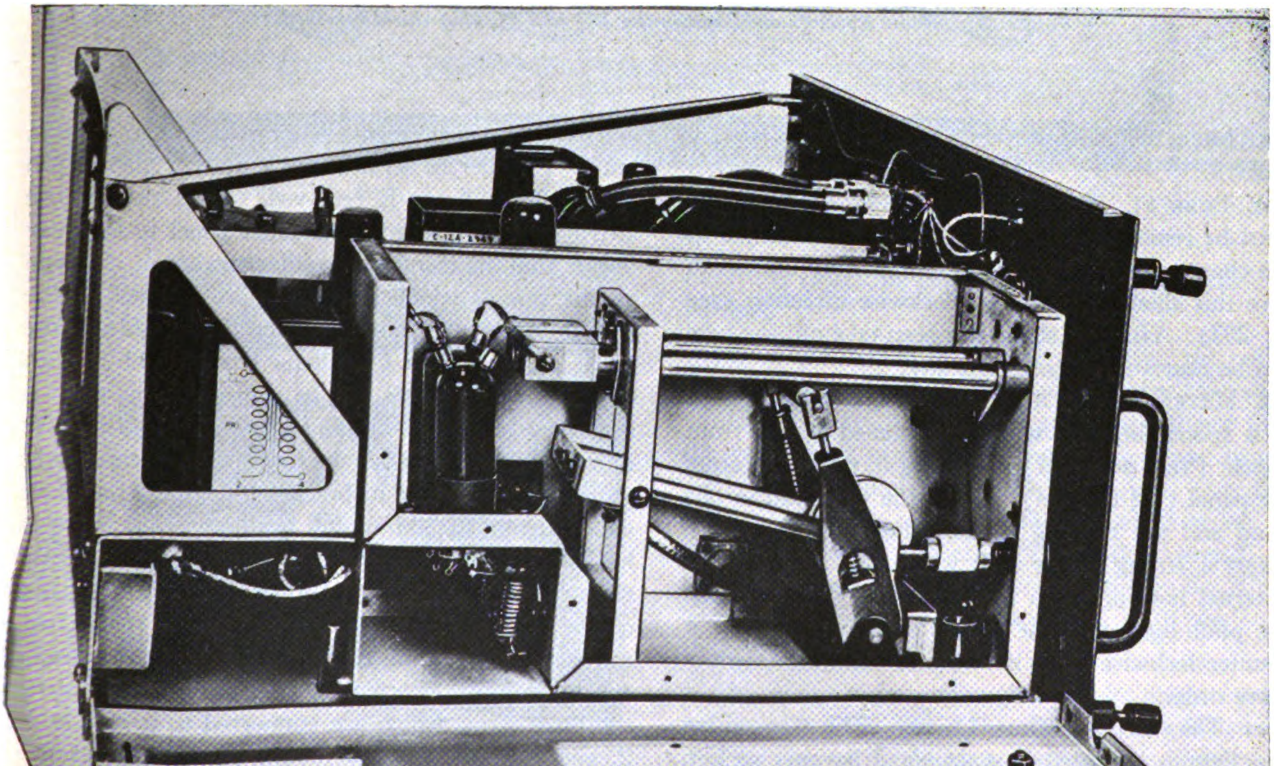


Figure 199. Radio Receiver and Transmitter BC-1267-A, side of oscillator box removed.

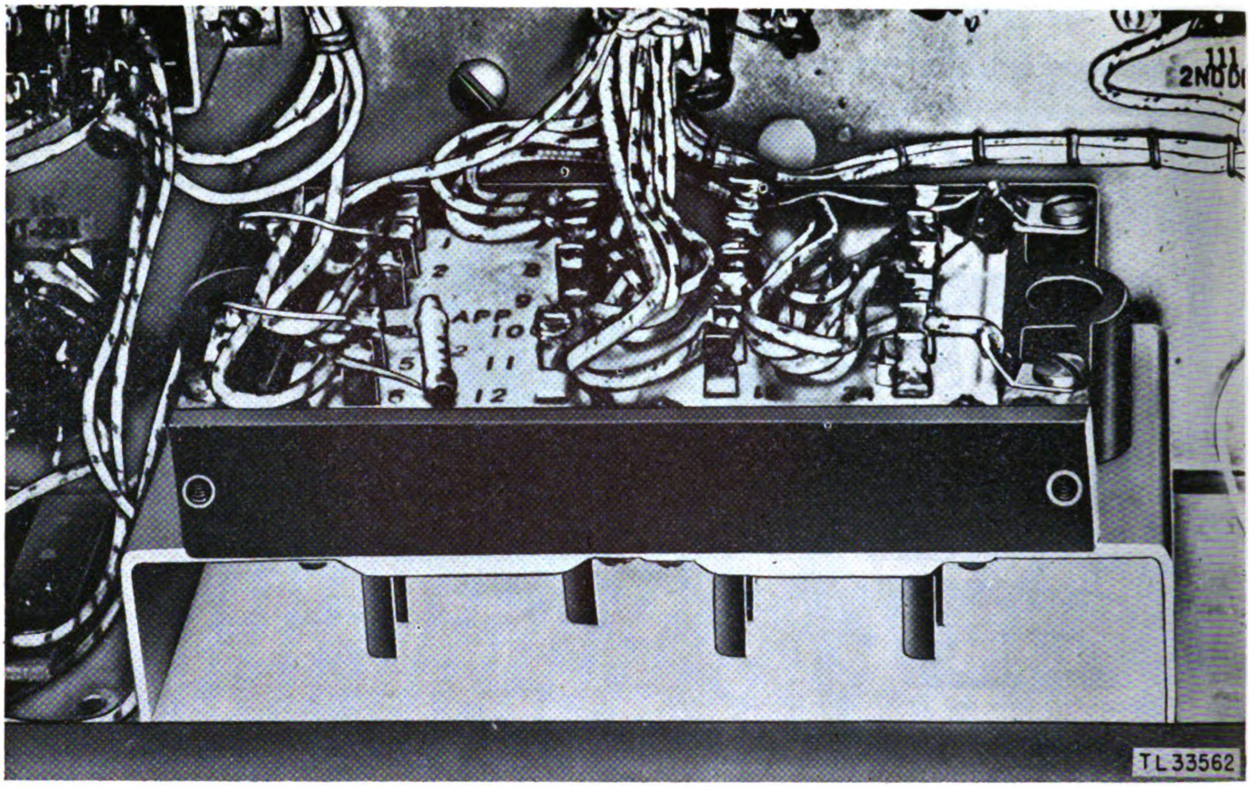


Figure 200. Radio Receiver and Transmitter BC–1267–A, plug shield removed.

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 (see fig. 203). After the shield has been take 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. 204). Grasp the wire lead in one hand and the housing in the other (see fig. 205). Exert a strong steady pull which will separate the external housing from 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 counterclockwise to loosen. The cover plate can be taken off when the six nuts on the spade lugs are removed (see fig. 206). 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 screw driver tuning rods and lift the tuner upward

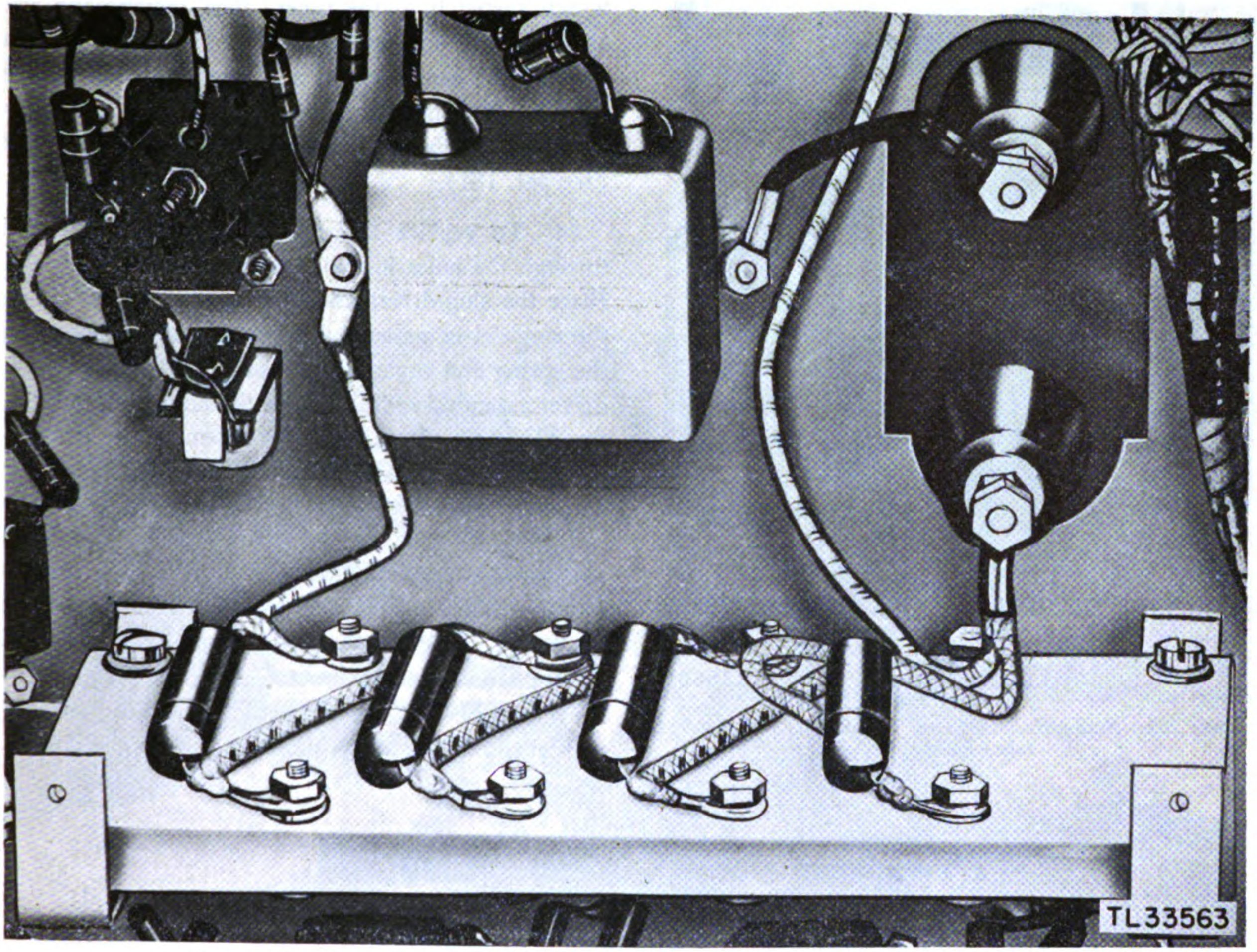


Figure 201. Radio Receiver and Transmitter BC-1267-A, high-voltage shield removed.

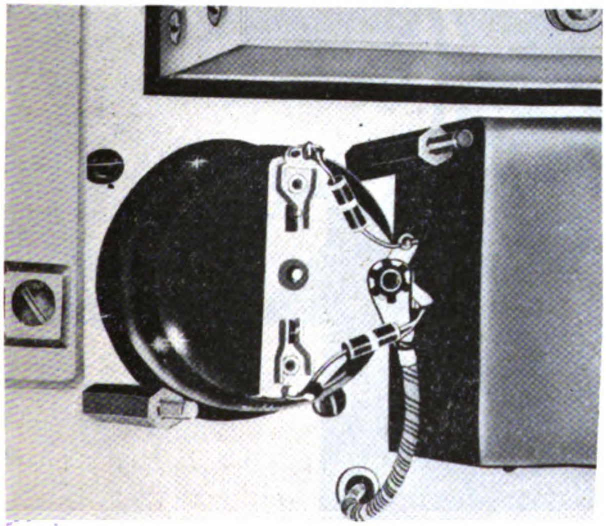


Figure 202. Radio Receiver and Transmitter BC-1267-A, modulator tube shield removed.

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. 207). 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. 208). 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

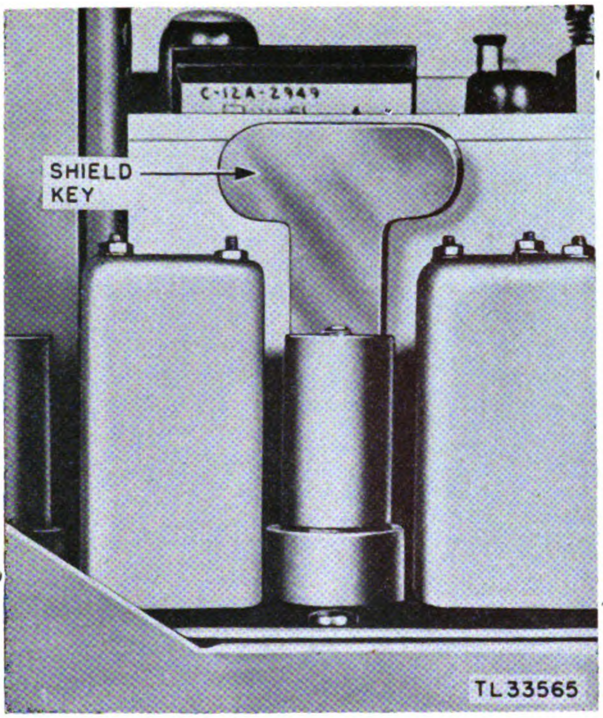


Figure 203. Radio Receiver and Transmitter BC–1267–A, tube shield key.

which fasten it to the tuner; then remove 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. 181).

(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. 207). 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 paragraph 183*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 the 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 204. Radio Receiver and Transmitter BC–1267–A, meter light housing removed from panel.

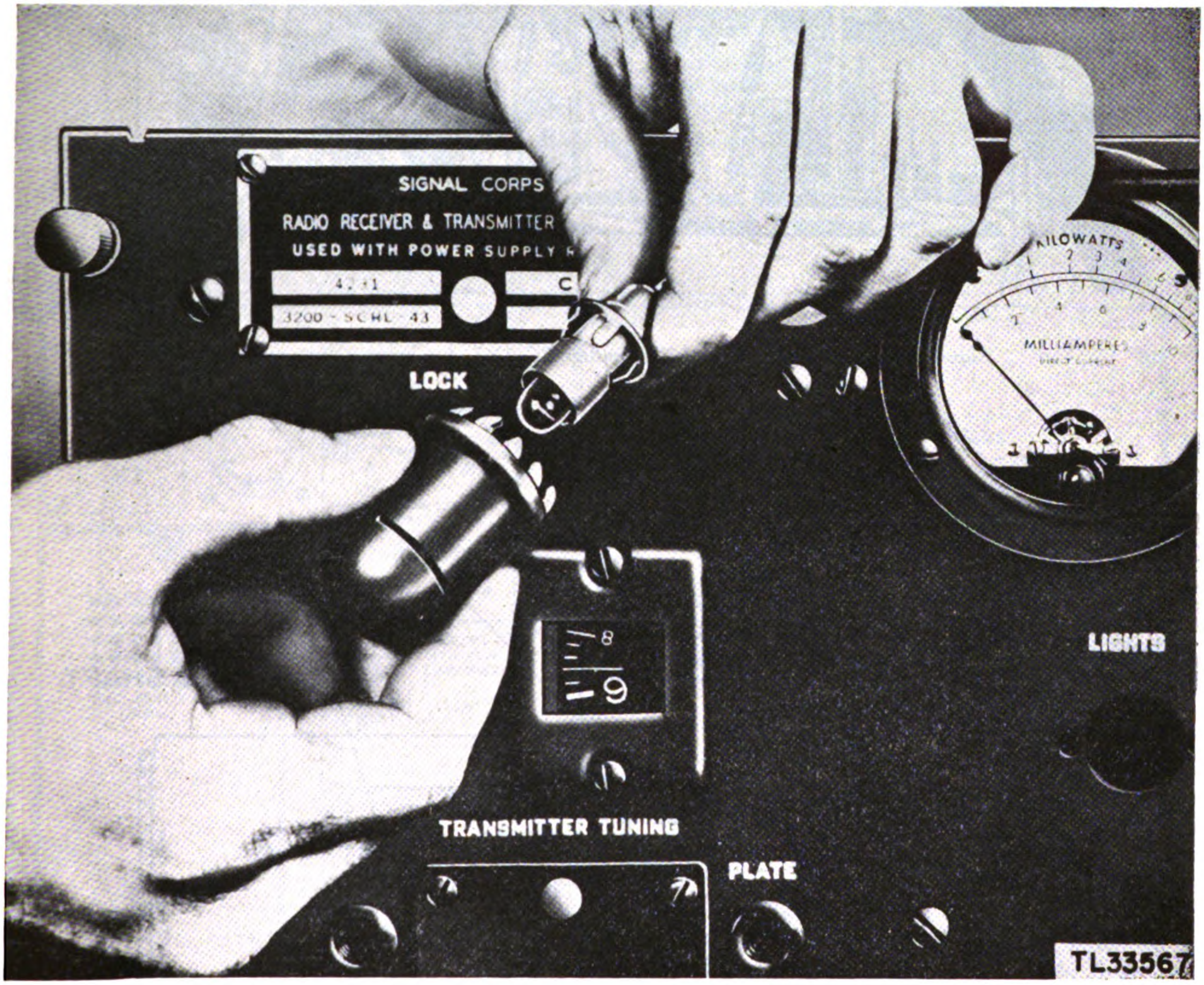


Figure 205. Radio Receiver and Transmitter BC–1267–A, meter pilot lamp removed from housing.

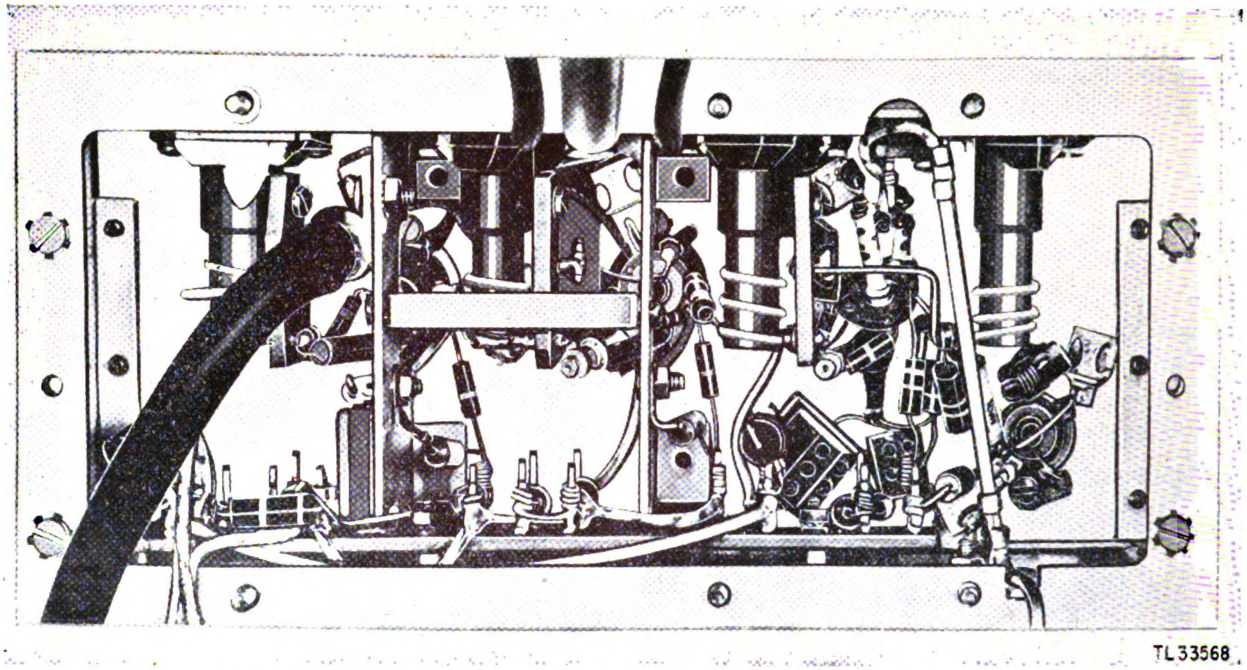


Figure 206. Radio Receiver and Transmitter BC-1267-A, r-f tuner plate removed.

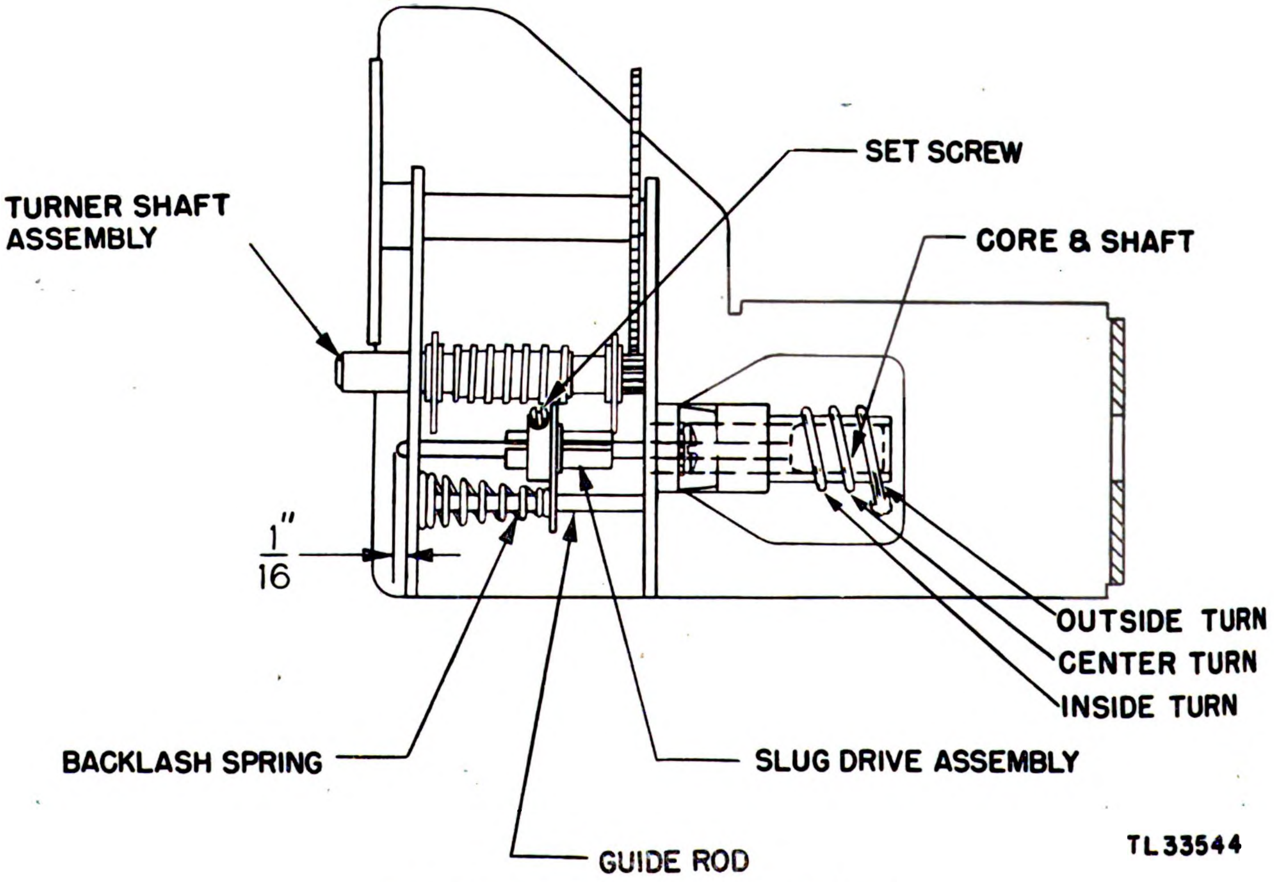


Figure 207. Tuning core measurement adjustment.

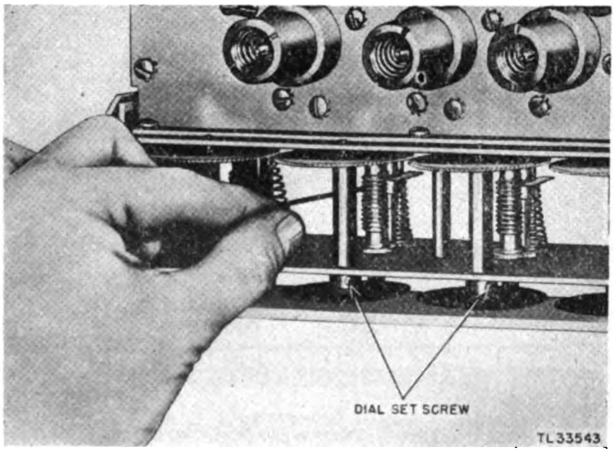


Figure 208. Loosening tuning core with wrench.

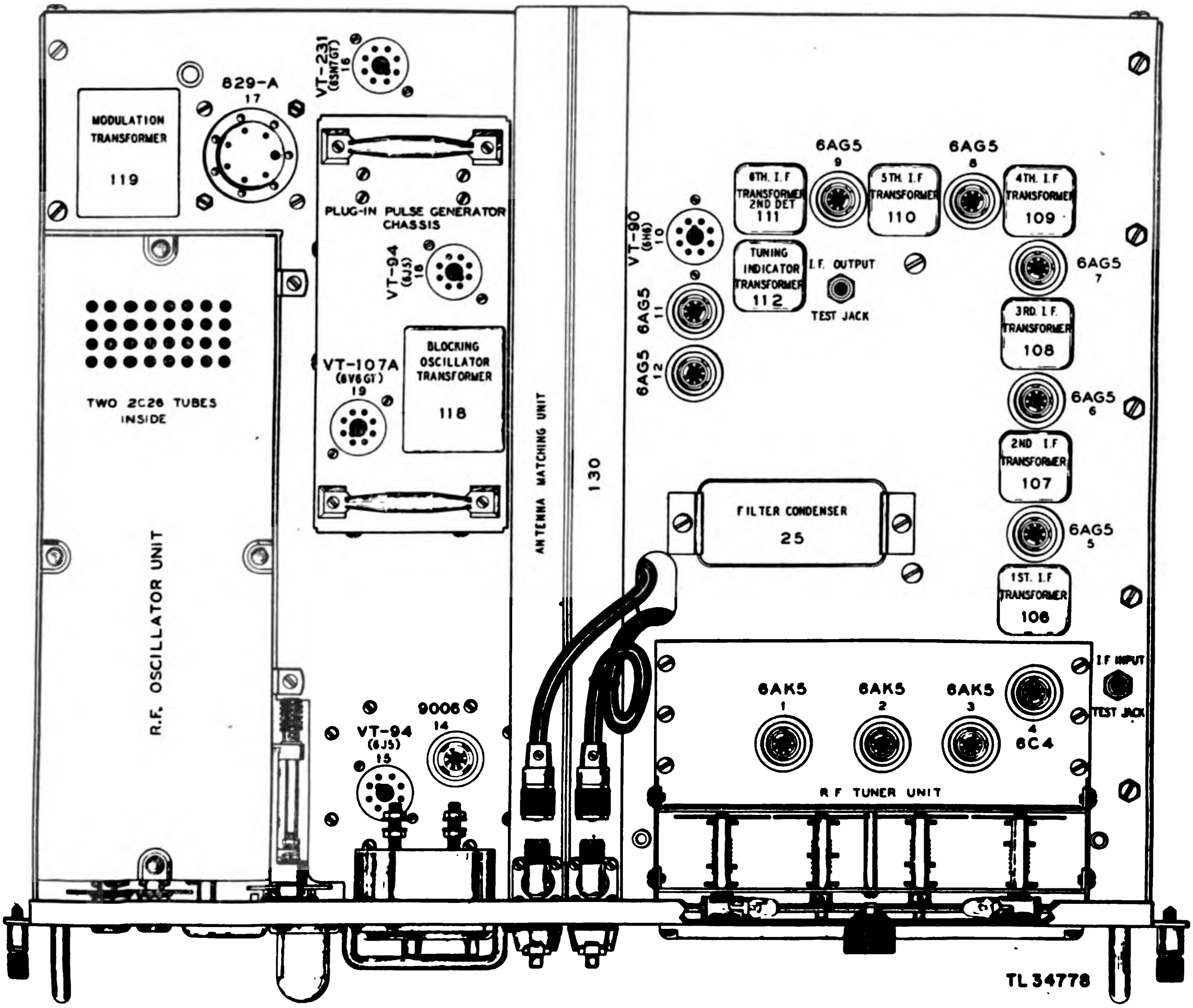


Figure 209. Radio Receiver and Transmitter BC–1267–A, top view showing location of parts.

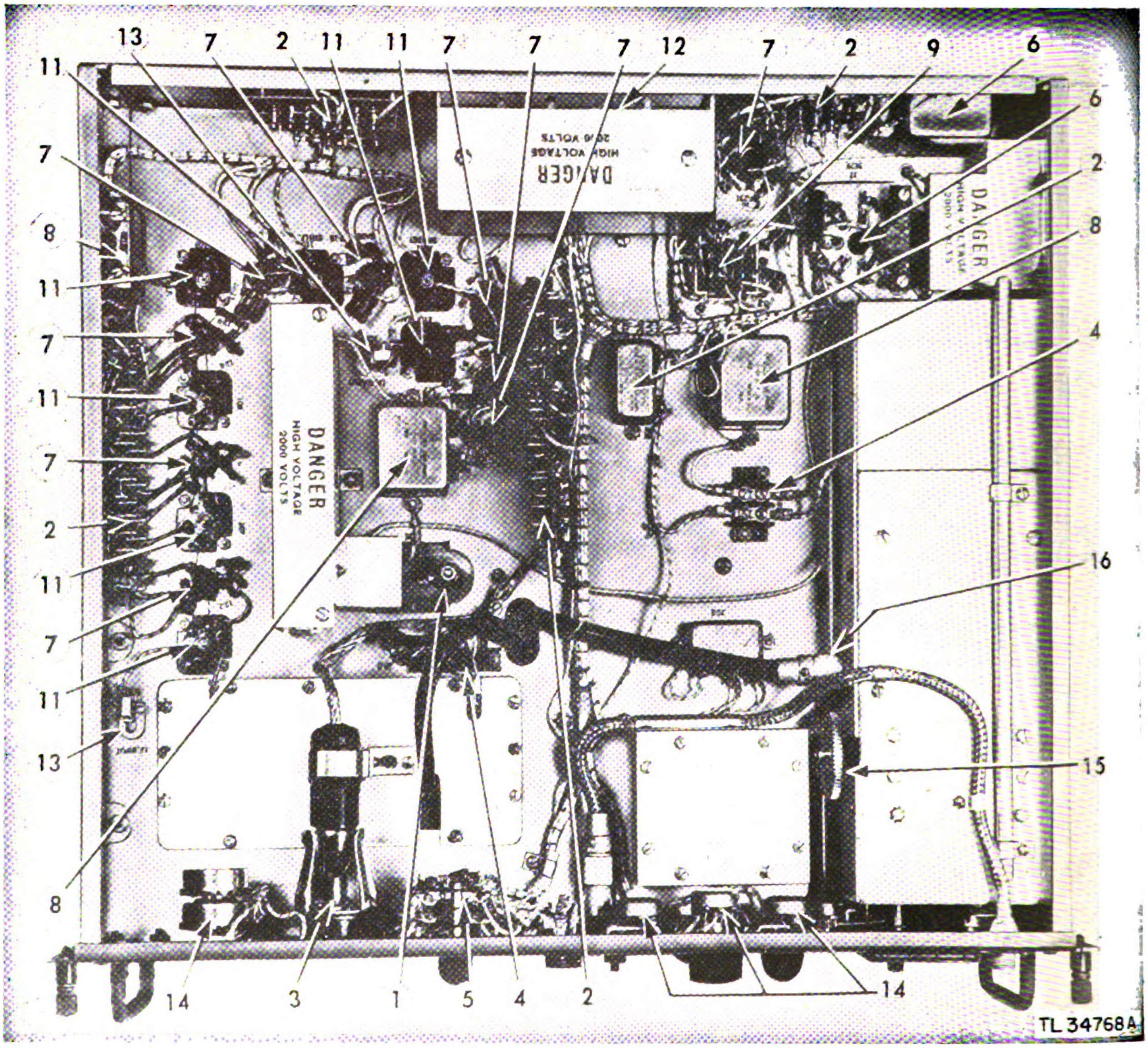


Figure 210. Radio Receiver and Transmitter BC–1267–A, bottom view showing location of parts.

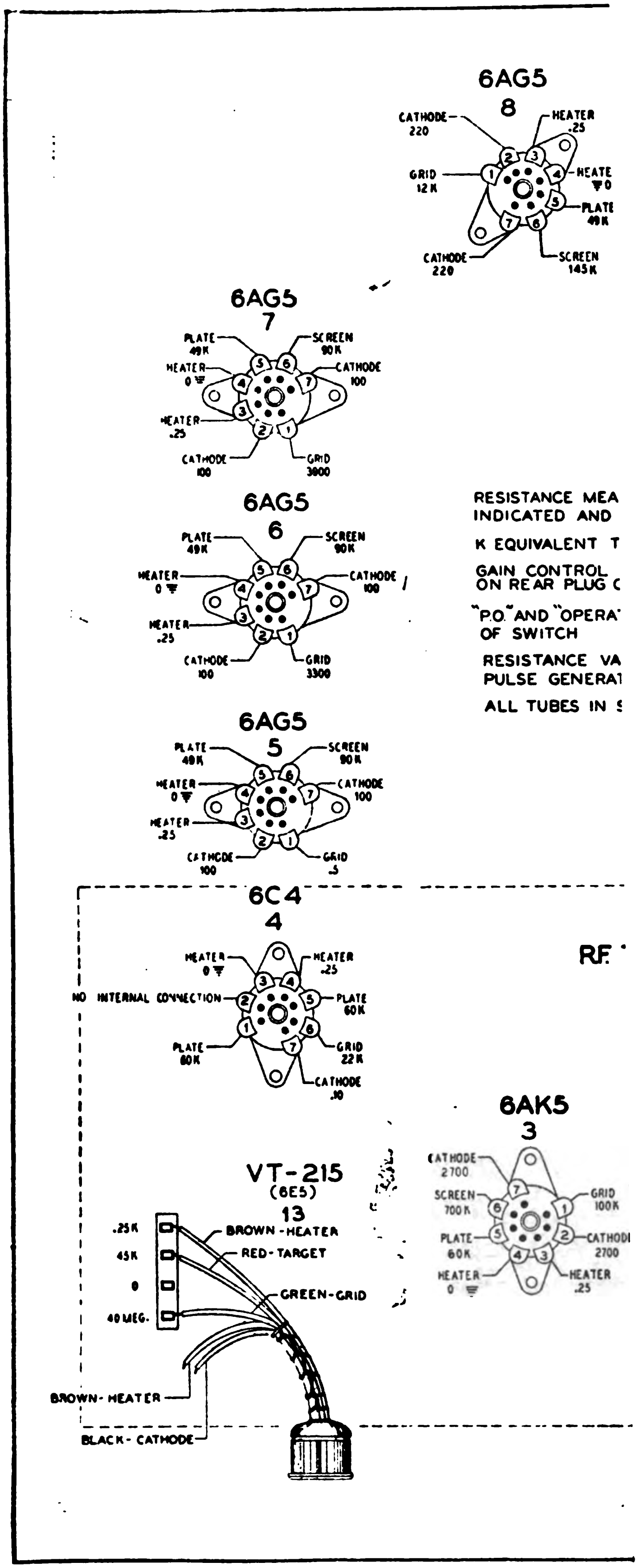

6AG5
8
CATHODE 220
HEATER .25
GRID 12 K
PLATE 49 K
CATHODE 220
SCREEN 145 K
6AG5
7
PLATE 49 K
SCREEN 90 K
HEATER 0
CATHODE 100
HEATER .25
CATHODE 100
GRID 3800
6AG5
6
PLATE 49 K
SCREEN 90 K
HEATER 0
CATHODE 100
HEATER .25
CATHODE 100
GRID 3300
6AG5
5
PLATE 49 K
SCREEN 90 K
HEATER 0
CATHODE 100
HEATER .25
CATHODE 100
GRID .5
RESISTANCE MEA
INDICATED AND
K EQUIVALENT T
GAIN CONTROL
ON REAR PLUG C
"P.O." AND "OPERA
OF SWITCH
RESISTANCE VA
PULSE GENERAT
ALL TUBES IN S
6C4
4
HEATER 0
HEATER .25
NO INTERNAL CONNECTION
PLATE 60K
PLATE 60K
GRID 22 K
CATHODE .10
RF
6AK5
3
CATHODE 2700
SCREEN 700 K
GRID 100 K
PLATE 60 K
CATHODE 2700
HEATER 0
HEATER .25
VT-215
(6E5)
13
.25 K
45 K
0
40 MEG.
BROWN-HEATER
RED-TARGET
GREEN-GRID
BROWN-HEATER
BLACK-CATHODE

Figure 2

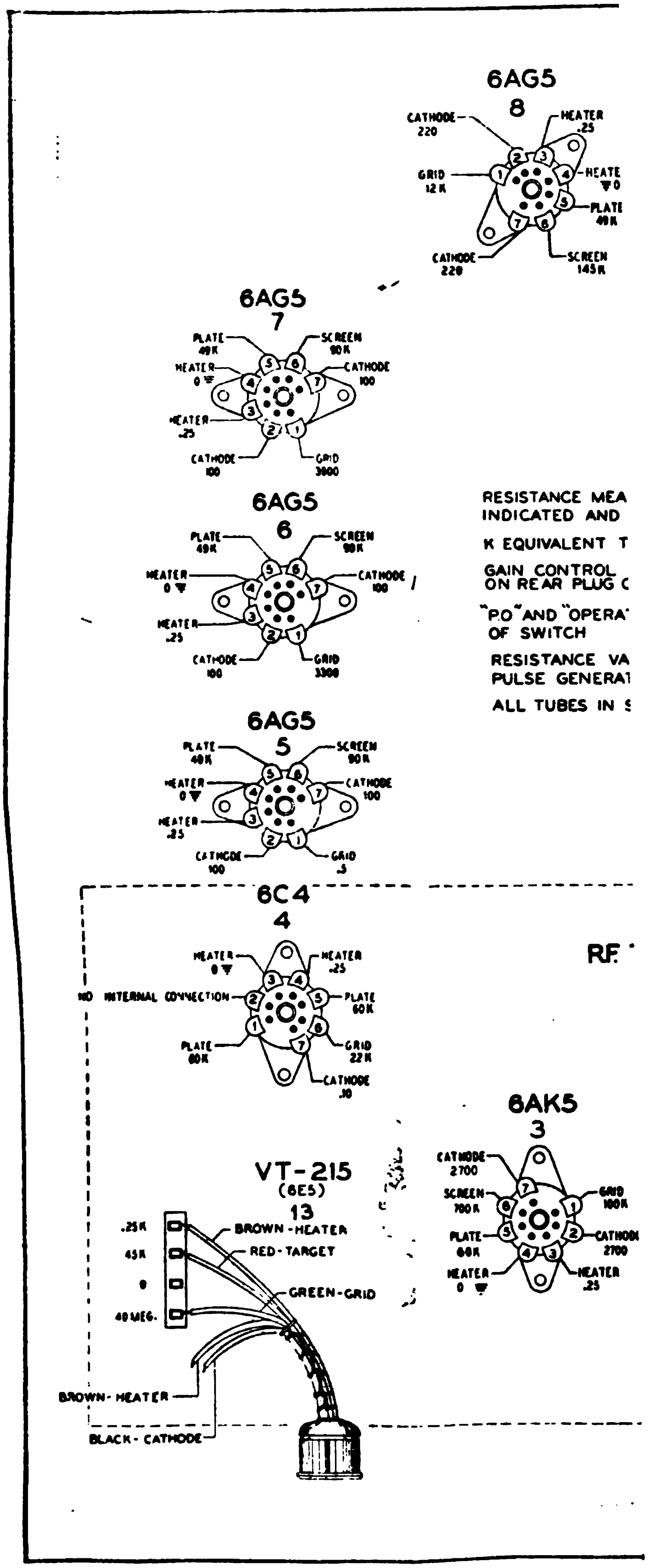

6AG5
8
CATHODE
220
HEATER
.25
GRID
12 K
PLATE
49K
CATHODE
220
SCREEN
145K
6AG5
7
PLATE
49K
SCREEN
90K
HEATER
CATHODE
100
HEATER
.25
CATHODE
100
GRID
3000
RESISTANCE MEA
INDICATED AND
K EQUIVALENT T
GAIN CONTROL
ON REAR PLUG C
"P.O" AND "OPERA'
OF SWITCH
RESISTANCE VA
PULSE GENERA1
ALL TUBES IN S
6AG5
6
PLATE
49K
SCREEN
90K
HEATER
CATHODE
100
HEATER
.25
CATHODE
100
GRID
3300
6AG5
5
PLATE
SCREEN
90K
HEATER
CATHODE
100
HEATER
.25
CATHODE
100
GRID
.5
6C4
4
HEATER
HEATER
.25
NO INTERNAL CONNECTION
PLATE
60K
PLATE
60K
GRID
22K
CATHODE
.10
RF
6AK5
3
CATHODE
2700
SCREEN
700K
GRID
100K
PLATE
60K
CATHODE
2700
HEATER
HEATER
.25
VT-215
(6E5)
13
.25K
45K
40 MEG.
BROWN-HEATER
RED-TARGET
GREEN-GRID
BROWN-HEATER
BLACK-CATHODE

Figure 2

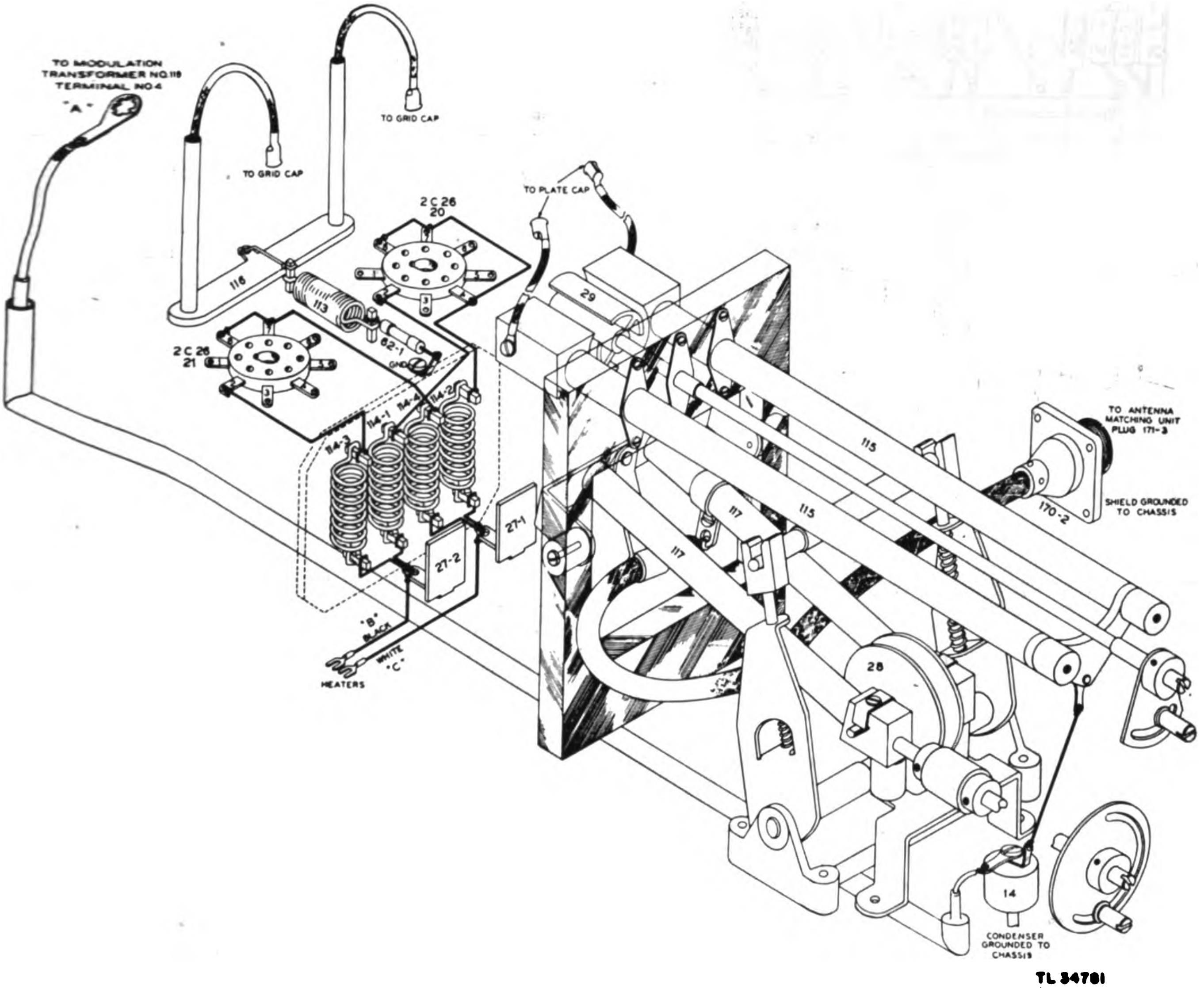


Figure 213. Radio Receiver and Transmitter BC-1267-A, wiring diagram of r-f oscillator.

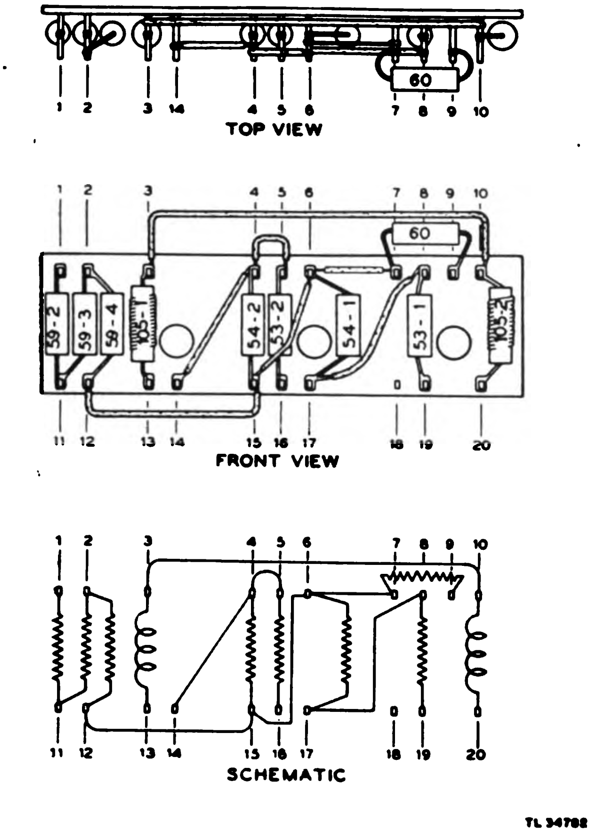


Figure 214. Radio Receiver and Transmitter BC–1267–A, r–f tuner unit terminal board.

VOLTAGE AND RESISTANCE OF R-F UNIT TERMINAL BOARD (fig. 214).

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

VOLTAGE AND RESISTANCE OF 1ST I-F TERMINAL BOARD (fig. 215).

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

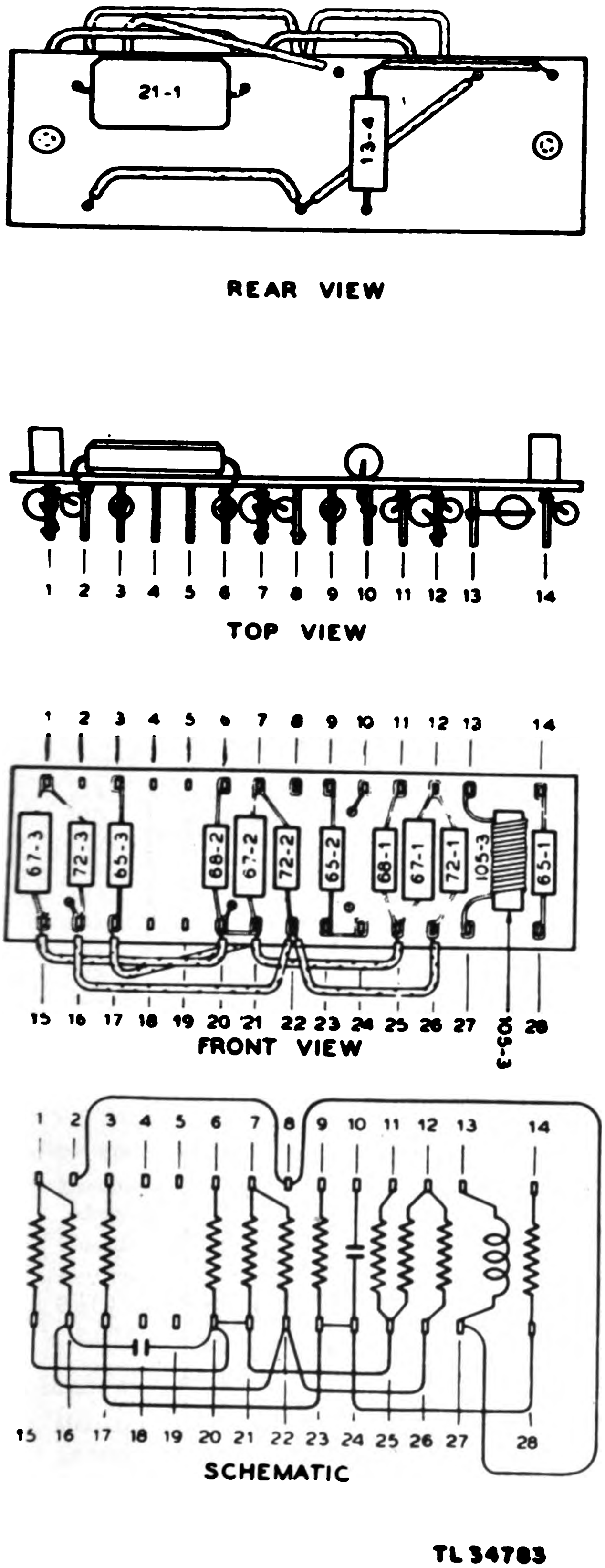


Figure 215. Radio Receiver and Transmitter BC-1267-A, 1st i-f terminal board.

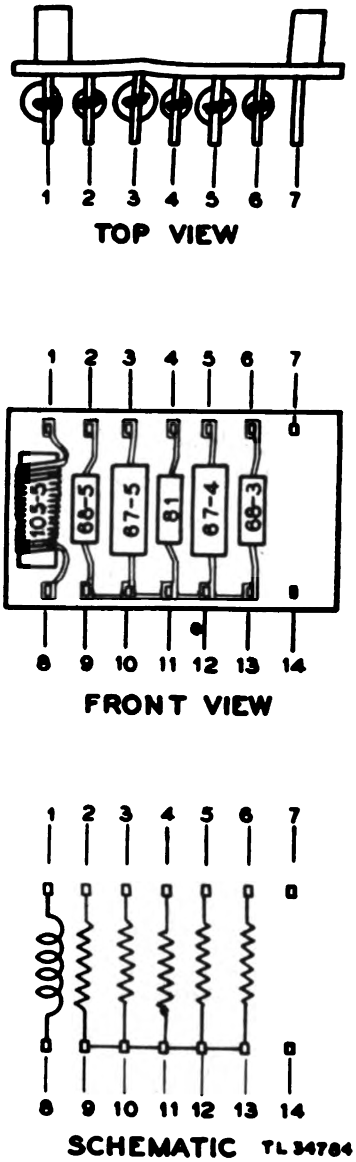


Figure 216. Radio Receiver and Transmitter BC-1267-A cable terminal board.

VOLTAGE AND RESISTANCE OF CABLE TERMINAL BOARD (fig. 216).

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

VOLTAGE AND RESISTANCE OF PULSE AMPLIFIER TERMINAL BOARD (fig. 217).

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

TEST CONDITIONS

Voltage Measurements:

1. Measurements made between points indicated and
2. Chassis connected to rack with Cord CD–1106.
chassis.
3. Line voltage 117.5 volts alternating current.
4. GAIN control on interconnector 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.

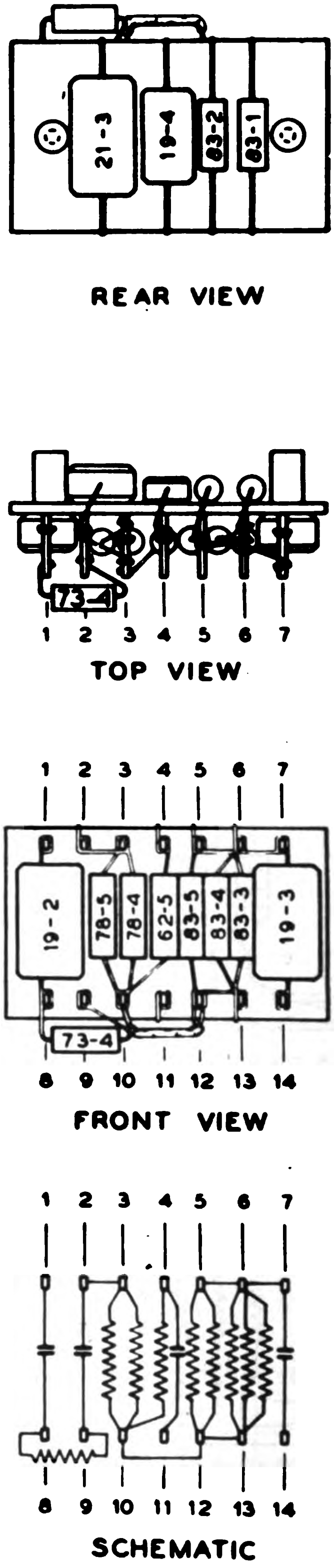


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Figure 217. Radio Receiver and Transmitter BC–1267–A, pulse-amplifier terminal board.

VOLTAGE AND RESISTANCE OF 2D DETECTOR TERMINAL BOARD (fig. 218).

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

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. GAIN control on interconnector 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.

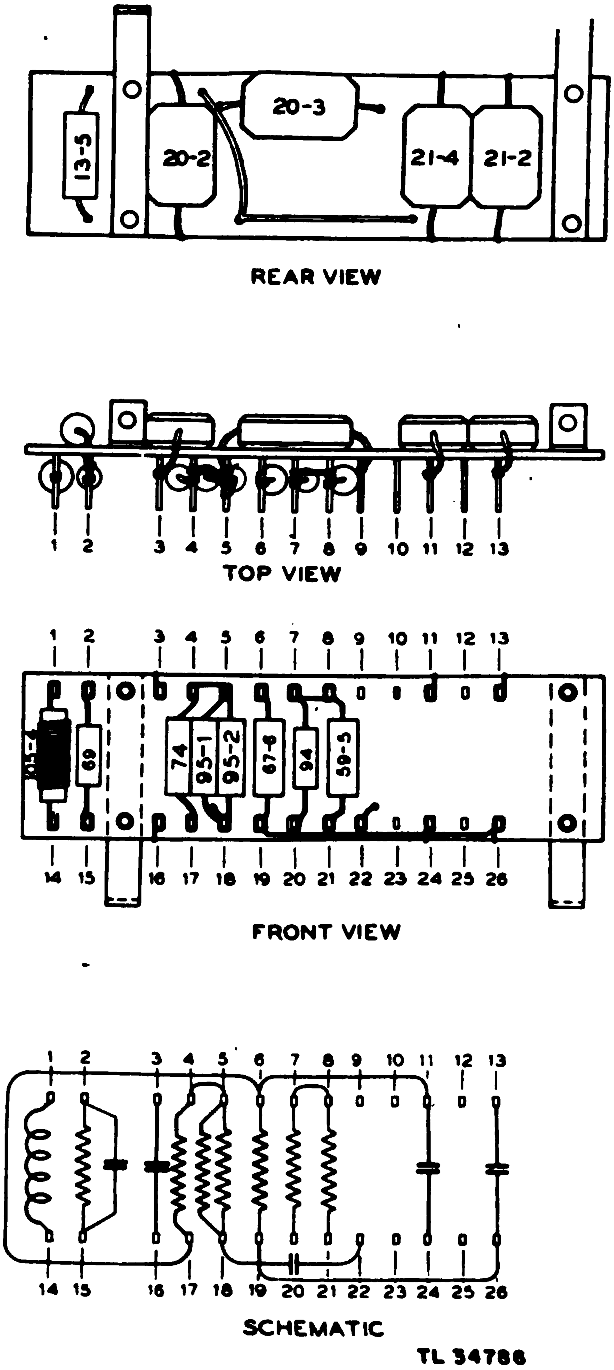


Figure 218. Radio Receiver and Transmitter BC–1267–A, 2d detector terminal board.

VOLTAGE AND RESISTANCE OF BLOCKING OSCILLATOR TERMINAL BOARD (fig. 219).

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

TEST CONDITIONS

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

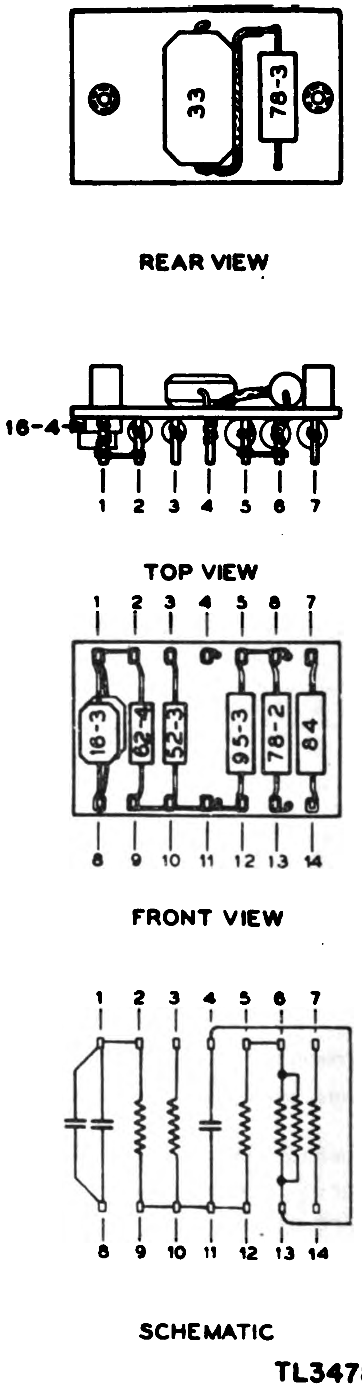
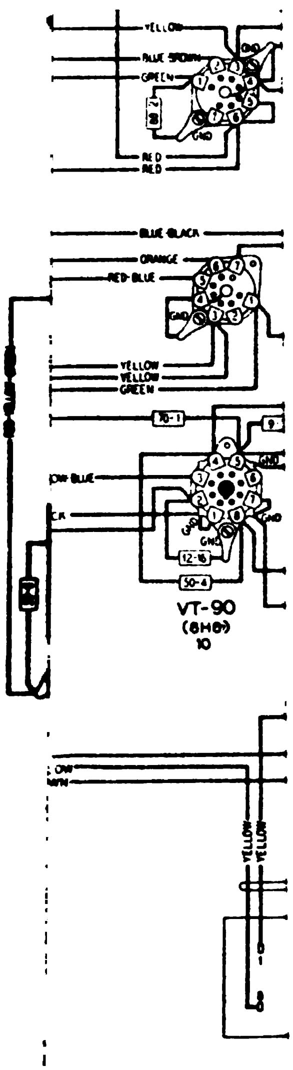


Figure 219. Radio Receiver and Transmitter BC-1267-A, blocking-oscillator terminal board.


YELLOW
BLUE BROWN
GREEN
RED
RED
BLUE-BLACK
ORANGE
RED-BLUE
YELLOW
YELLOW
GREEN
VT-90
(6H6)
10
YELLOW
YELLOW

184. Reference Data

To assist the maintenance personnel while trouble shooting on the interconnector, many figures have been provided. In chapter 1, section V, there are partial schematics and block diagrams, and at the end of section V, chapter 2, there are groups of figures containing views of the interconnector, a complete schematic and wiring diagram, drawings of terminal boards, voltage and resistance measurements for the RC–148–C and RC–148–B. These illustrations may be used in trouble shooting the RC–148–C interconnector with the exception of the complete schematic and wiring diagram, which are printed at the end of this section for the RC–148–C.

185. Introduction

Inasmuch as both the radar elevation receiver output and the IFF receiver output pass through the interconnector, if an abnormal pattern appears on the display at step No. 7 of the starting procedure, trouble in the interconnector must be suspected. Should trouble in the receiver be eliminated with the aid of test position 5A and the transmitter with the aid of test positions 3 and 5B, trouble may be assumed to exist in the switching or blanking channels of the interconnector. It is well to bear in mind, though, that the fault might be in the radar range display sc. pe. If any of the test voltages besides those that come from the receiver and transmitter are abnormal, the interconnector is at fault. Most of the troubles can be definitely localized to the control system by the use of five test positions. There are also troubles included in the trouble-shooting chart which do not affect any of the five test positions.

186. Signal Tracing in Interconnector

After checking the five test positions, if there is any doubt as to which stage is at fault in the interconnector, the interconnector may have to be signal traced. This is done using SELECTOR position 5 as a source for the 4098 cycle signal. A test scope is used as the output indicator for the signal tracing. See section I of this chapter for information on signal tracing. Place the probe of the scope to the grid and plate of each stage, starting from the input to the first stage of the channel involved and going through each channel until no signal is found at a stage or a distorted signal is observed. When the trouble is isolated to a stage make a voltage and resistance check of that stage.

Note. Do not check stages 4 and 5B for waveforms because the test scope will discharge capacitor 8 and incorrect waveforms will be obtained. Instead, check the cathode of 6A. If a step wave is observed, then stages 4 and 5B are operating correctly.

187. Interconnector Trouble-shooting Chart

A. SYMPTOMS:

1. Red indicator lamp 108 on interconnector does not light (step 2).
2. All other indicator lamps are lighted (step 2).

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Open fuse 135 in interconnector.	1*a*. Check the fuse and replace if necessary. *b*. If trouble is not cleared, see item below.
2. Defective indicator lamp.	2*a*. Check lamp by replacing it. *b*. If trouble is not cleared replace original lamp and see item below.
3. Defective indicator lamp circuit.	3*a*. Check the VT–231 tubes for filament glow. *b*. If the tubes are glowing make a continuity test from pins 6 and 7 of transformer 130 in interconnector to terminals of indicator lamp.
4. Defective a-c input circuit.	4*a*. If the VT–231 tubes are not glowing, check for line voltage between terminals 1 and 2 of transformer 130. *b*. If there is no voltage make a continuity test from Rack FM–82 socket 4 through indicator socket 105 to terminals 1 and 2 of transformer 130. Test for continuity between terminals 1 and 2. *c*. Check for defective wiring on rack.

B. SYMPTOMS:

1. Radar scope completely filled with hash.
2. All test positions normal.
3. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective pulse phase splitter, stage 8A.	1. Check tube and associated circuit, particularly output capacitor 4–7 and capacitor 4–5.

C. SYMPTOMS:

1. Radar signal does not appear on radar scope.
2. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective receiver.	1. Place SELECTOR switch in STANDBY position. If radar signal does not appear, trouble is in elevation receiver.
2. Defective radar switching channel.	2*a*. If radar signal appears in STANDBY position, fault is in input circuit to radar switching channel or in channel itself. *b*. Check input circuit. *c*. Make a voltage and resistance check of radar switching channel. *d*. If fault is not cleared, check output circuit especially the output cathode follower, 13B.

D. SYMPTOMS:

1. Radar signal does not appear on radar scope.
2. Distorted baseline on radar scope.
3. IFF signal appears on radar scope.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective blanking amplifier, stage 11.	1. Make a voltage and resistance check of stage, especially compensating network.

E. SYMPTOMS:

1. No IFF signal on radar scope.
2. Radar signal normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective IFF switching channel.	1*a*. Make a voltage and resistance check of stages in channel. *b*. If trouble is not cleared, see item below.
2. Open from output of IFF switching channel to cathode-ray tube of radar scope.	2*a*. Check continuity from output of IFF channel through section B of SELECTOR switch 112 to large socket (105) on interconnector. *b*. Check continuity from large plug (105) on interconnector to deflection plate (pin 6) of cathode-ray tube of radar scope.
3. Tube 8A defective.	3. Check stage.

F. SYMPTOMS:

1. Radar and IFF baselines are distorted.
2. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective compensating and separating networks.	1. Check resistance of networks.

G. SYMPTOMS:

1. Radar baseline appears below IFF baseline on radar scope.
2. All other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective clamper 13A, 12B, or 12A.

PROCEDURE

1. Make resistance and voltage check of clamper stage 13A, 12B, and 12A.

H. SYMPTOMS:

1. Radar baseline appears below IFF baseline.
2. Radar baseline very jumpy.
3. Other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective baseline compensation network.

PROCEDURE

1. Check resistor 86 and network.

I. SYMPTOMS:

1. Baseline separation wider than normal.
2. Other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective pulse phase splitter 8A.
2. Defective baseline compensation and separation network.

PROCEDURE

1. Check stage.
2. Check output network of stage 11 composed of resistors 86, 90, 91, and capacitors 10–4 and 14.

J. SYMPTOMS:

1. No baseline separation.
2. All other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective IFF separation network.

PROCEDURE

1. Check resistor 82–1 for open.

K. SYMPTOMS:

1. Entire pattern on radar scope moves below bottom of screen.
2. When vertical positioning control on radar scope is rotated clockwise, pattern moves up, but baseline still cannot be seen.

PROBABLE LOCATION OF FAULT

1. Defective output circuit of cathode follower 8B.

PROCEDURE

1. Check resistor 65–2 for open.

L. SYMPTOMS:

1. No phase control of IFF signal possible except through switch on phase control knob.
2. All other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective phase shifting network.

PROCEDURE

1a. Check capacitor 15 for open.
b. Check resistor 96 for open.

M. SYMPTOMS:

1. IFF trace unusually dim on radar scope.
2. All other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective brightness correction amplifier stage 9A.

PROCEDURE

1. Make a voltage and resistance check of stage.
2. If trouble is not cleared, make a continuity test from output of amplifier to control grid of c-r tube.

N. SYMPTOMS:
(Position 1)

1. Single baseline appears on range scope.
2. Positions 2, 3, 5B, no vertical voltage.
3. Positions 4, 5A, normal patterns.
4. All other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective division channel.

PROCEDURE

1a. Check voltages and resistances of stages 2B, 3A, 5A, and 4.
b. Check resistors 59–1, 59–2 and 88 in cathode circuit of 5B for open.
c. Check voltages and resistances of blocking oscillator 5B.

O. SYMPTOMS:
(Position 1)

1. Single baseline appears on range scope.
2. Position 2, no vertical voltage.
3. Positions 3, 4, 5A, and 5B, normal pattern.
4. Radar scope, no baseline separation.
5. All other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective cathode follower 6A.

PROCEDURE

1a. Replace tube 6A and check patterns on scope.
b. If patterns are not correct, make a voltage and resistance check of the cathode follower circuit.

P. SYMPTOMS:
(Position 1)

1. No vertical deflection on range scope.
2. Positions 2, 3, 4, 5B, no vertical deflection.
3. Position 5A, normal pattern.
4. Radar scope, baseline alone appears in OPERATE position; radar receiver signal appears in STANDBY position.
5. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective power supply.	1*a*. Replace rectifier tube 15 and check patterns on range scope. *b*. If patterns are not correct, make a voltage and resistance check of the power supply.

Q. SYMPTOMS:
(Position 2)

1. One vertical division obtained on range scope; division control has no effect.
2. Positions 1, 3, 5B, no vertical voltage.
3. Positions 4, 5A, normal patterns.
4. Radar scope, no baseline separation; distorted baseline.
5. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Blocking oscillator (5B).	1*a*. Replace tube 5B, and check patterns on range scope. *b*. If patterns are not normal, make a voltage and resistance check of the stage.

R. SYMPTOMS:
(Position 2)

1. Impossible to obtain 15 lines with aid of DIVISION control.
2. Positions 1, 3, 4, 5A, 5B, normal patterns.
3. Radar scope, IFF trace much brighter than usual.
4. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Blocking oscillator (5B).	1*a*. Replace tube 5B, and check patterns on range scope. *b*. If patterns are not normal, make a voltage and resistance check of the stage. *c*. If fault is not cleared, see item below.
2. External triggering.	2*a*. Blocking oscillator may be triggered by nearby radar set. Check radar scope for strong interfering signals on screen. *b*. Check for stray inductive coupling to blocking oscillator from within interconnector.

S. SYMPTOMS:
(Position 3)

1. No vertical deflection on range scope.
2. Positions 1, 2, 4, 5A, normal patterns on scope.
3. Position 5B, no vertical deflection.
4. Radar scope, no IFF pulse on cathode-ray tube.
5. All other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective cathode follower stage (14).

PROCEDURE

1*a*. Replace tube 14 and check patterns on scope.
b. If patterns are not normal, make a voltage and resistance check of the circuit.

T. SYMPTOMS:
(Position 4)

1. No vertical deflection on range oscilloscope (SELECTOR switch in position 4).
2. Positions 1, 2, 3, 5B, no vertical deflection.
3. Position 5A, normal pattern.
4. All other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective 4098 signal input circuit.

PROCEDURE

1*a*. Put SELECTOR switch in position 5 and observe patterns.
b. If patterns are normal, check continuity from interconnector plug 105 through switch 112A to input of stage 2B.
c. If trouble is not in interconnector, check continuity from terminal SYNC IN on terminal strip of Junction Box JB–22 to connector 105.

U. SYMPTOMS:
(Position 4)

1. Symptoms similar to symptom T.
2. Very slight control of IFF phase by phase control.
3. Rotation of phase control to clockwise position results in normal indications in all test positions; in counterclockwise position above abnormalities will return.
4. All other indications normal.

PROBABLE LOCATION OF FAULT

1. Defective phase shifting circuit.

PROCEDURE

1. Check capacitor 15 for short.

V. SYMPTOMS:
(Position 4)

1. Positions 1, 2, 3, 4, 5B, no vertical deflection with SELECTOR switch in position 5.
2. Positions 1, 2, 3, 4, 5B, normal patterns with SELECTOR switch in position 4.
3. Position 5A, normal pattern with positions 4 and 5 of SELECTOR switch.
4. All other indications normal.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Defective Wien bridge oscillator.	1. Make a complete voltage and resistance check of two stages 2A and 1.

188. Procedure for Replacing Defective Electrical Parts in Interconnector

a. INTRODUCTION. The information following is to assist the radar mechanic in replacing defective electrical parts in the Interconnector BC–1298. It will be noted that such replaceable items as small resistors and capacitors, tube sockets and tubes are not covered in these procedures. Neither is a procedure given when the replacement of the part presents no special difficulty. These procedures have been worked out experimentally and represent the shortest and best method of accomplishing the work.

Cautions: (1) Before replacing a defective part. observe carefully its position, method of mounting, and wiring. This will insure the correct installation of the new part.

(2) When removing such parts as switches, potentiometers, and tube sockets, which have several wires attached to their terminals, be sure to tag the wires so that they will be replaced in their proper positions. (3) When disassembling a component, the screws, nuts, bolts, washers, and other small parts are removed, and should be put in some small container to prevent loss.

b. INDEX TO ITEMS. The replacement of the following items is discussed in the next paragraph:

Pilot light jewel.
Pilot light bulb.
Potentiometers.
Transformers and chokes.
Filter capacitor.
Connector 105.

189. Step-by-Step Procedure to Replace Items

a. PILOT LIGHT JEWEL. (1) Remove the jewel by unscrewing it in a counterclockwise direction fr its socket.

(2) To install new jewel reverse procedure.

b. PILOT LIGHT BULB. (1) Remove jewel as scribed above.

(2) Push bulb in, turn it counterclockwise, a remove it.

(3) To install new bulb, reverse removal pro dure.

c. POTENTIOMETERS. (1) Unsolder the conn tion to the terminals of the defective potentiomet

(2) With an Allen wrench loosen the setscrew the knob and remove it.

(3) From the front panel remove the lock which secures the potentiometer and remove it fr the panel.

(4) To install the new potentiometer reverse removal procedure.

d. TRANSFORMERS AND CHOKES. See replacem of electrical parts in transmitter.

e. FILTER CAPACITORS. (1) From the unders of the chassis remove the seven soldered connecti to the capacitor (1A, B, C) terminals.

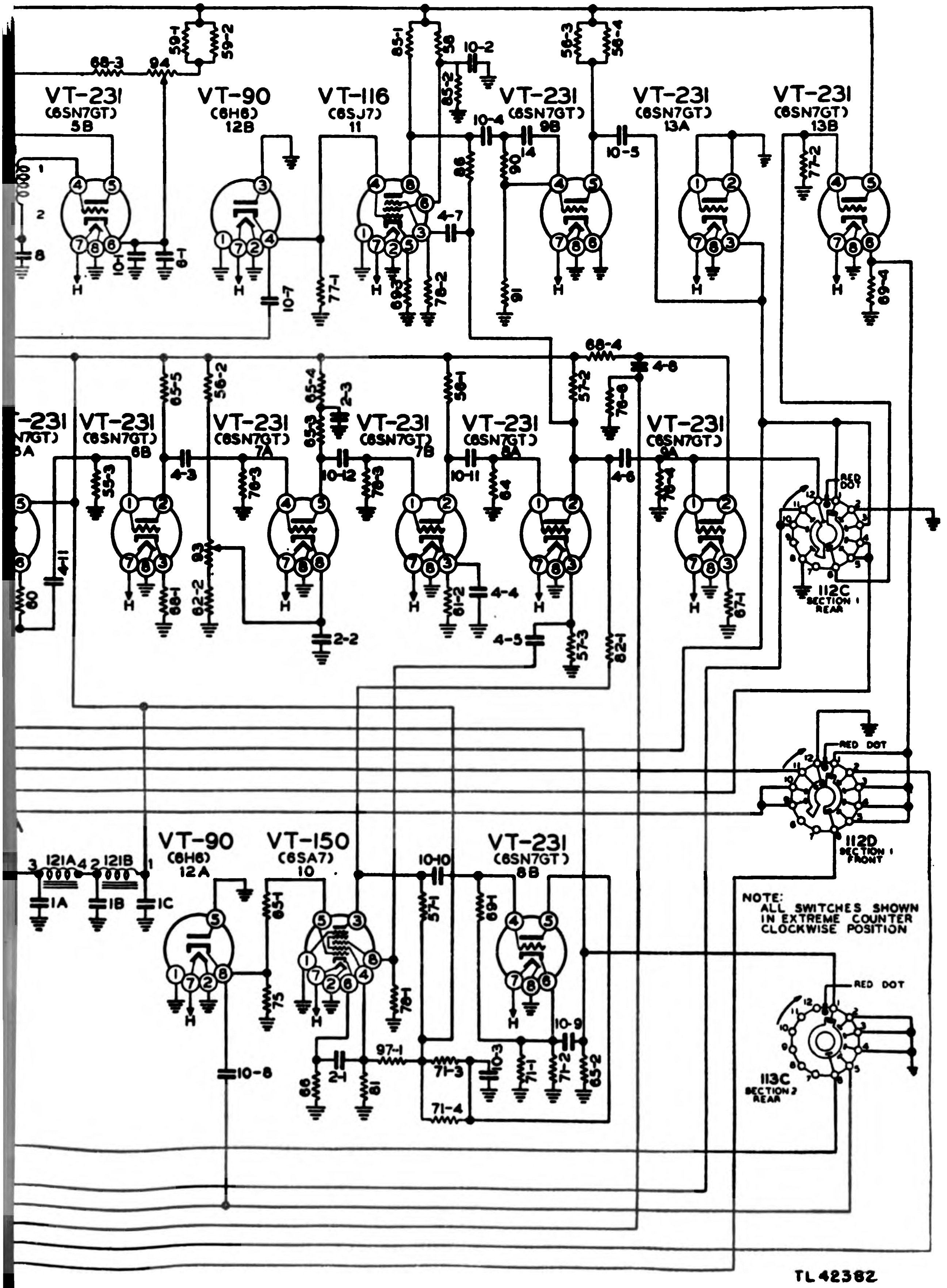
(2) From the top of the chassis, remove the t bolts which attach the mounting flange to the chas and remove the capacitor.

(3) To install the new capacitor, reverse the moval procedure.

f. CONNECTOR 105. (1) Remove the four b which attach the back panel to the main chassis a push the panel back as far as the wiring will allow.

(2) Unsolder the connections to the terminal the connector.

(3) Remove the bolts at the four corners of connector mounting and remove it from the chas



r BC-1298, complete schematic.

(4) To install the new connector reverse the removal procedure.

Section XI. SIGNAL GENERATOR OF RC–148–C

190. General

a. It is impossible to anticipate all the types and combinations of circumstances which will cause faulty operation of the signal generator. However some tests may help to isolate the circuit that is causing the trouble.

b. In order to replace tubes or make repairs on the unit it is necessary to remove it from the 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. 225).

191. 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).

(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 as 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.

192. 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
1. Oscillator tube.	1*a*. Replace oscillator tube. *b*. If fault is not cleared, see item below.
2. Variable high-low frequency oscillator circuit.	2. 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
1. Crystal.	1*a*. Replace with new crystal. *b*. If fault is not cleared, see item below.
2. Oscillator tube.	2*a*. Replace oscillator tube. *b*. If fault is not cleared, see item below.
3. Oscillator circuit.	3. Make voltage and resistance check.

C. SYMPTOM:

Pilot and dial lights do not burn when set is turned on.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. No a-c input.	1*a*. Check voltage at source of power. Check fuse. *b*. If fault is not cleared, see item below.
2. Lamps.	2. Check and replace if defective.

193. Alignment

a. Snap the signal generator on and allow it to warm up for 15 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, the L.F.-H.F. range switch in the H.F. position and plug the head phones 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 head phones. Open the antenna door on top of the signal generator and pull out the pick-up 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 to adjust the unknown signal

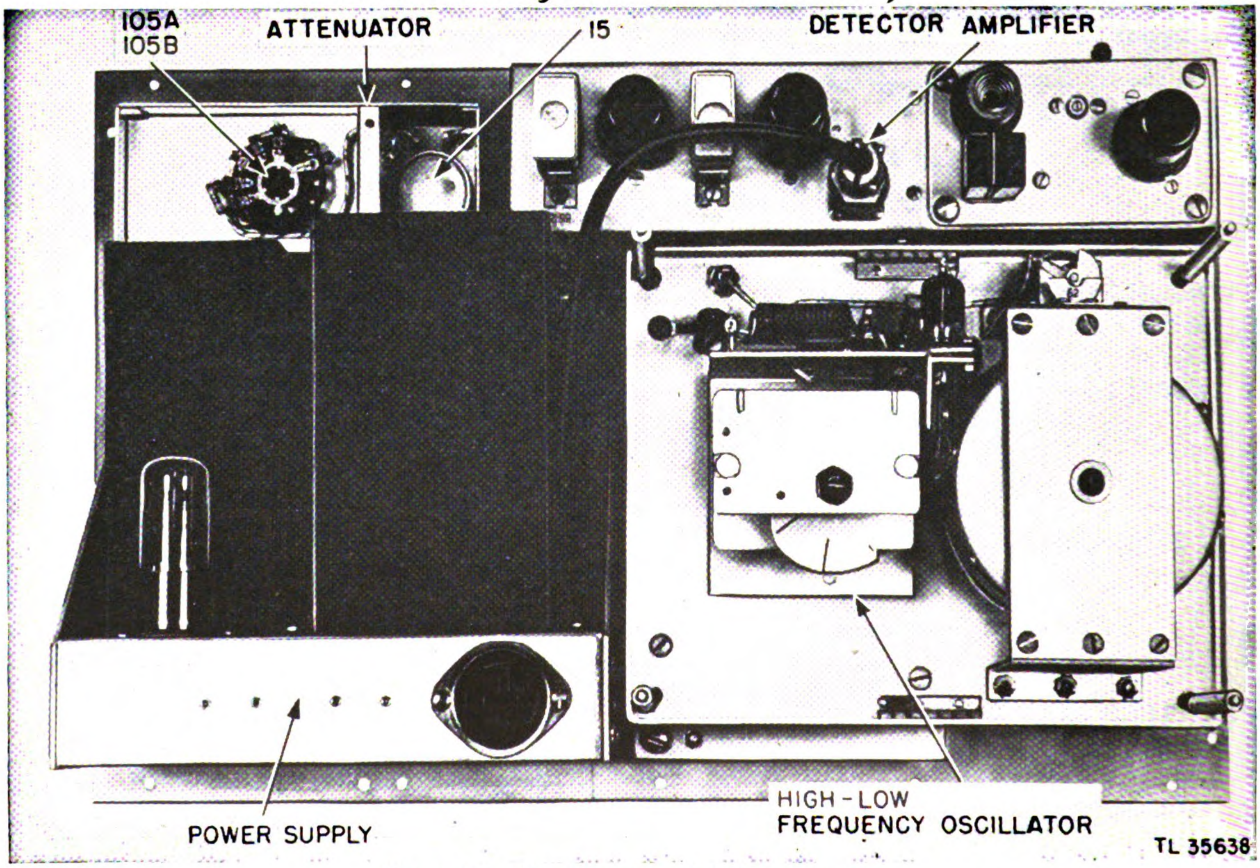


Figure 224. Signal Generator I-222-A, rear view.

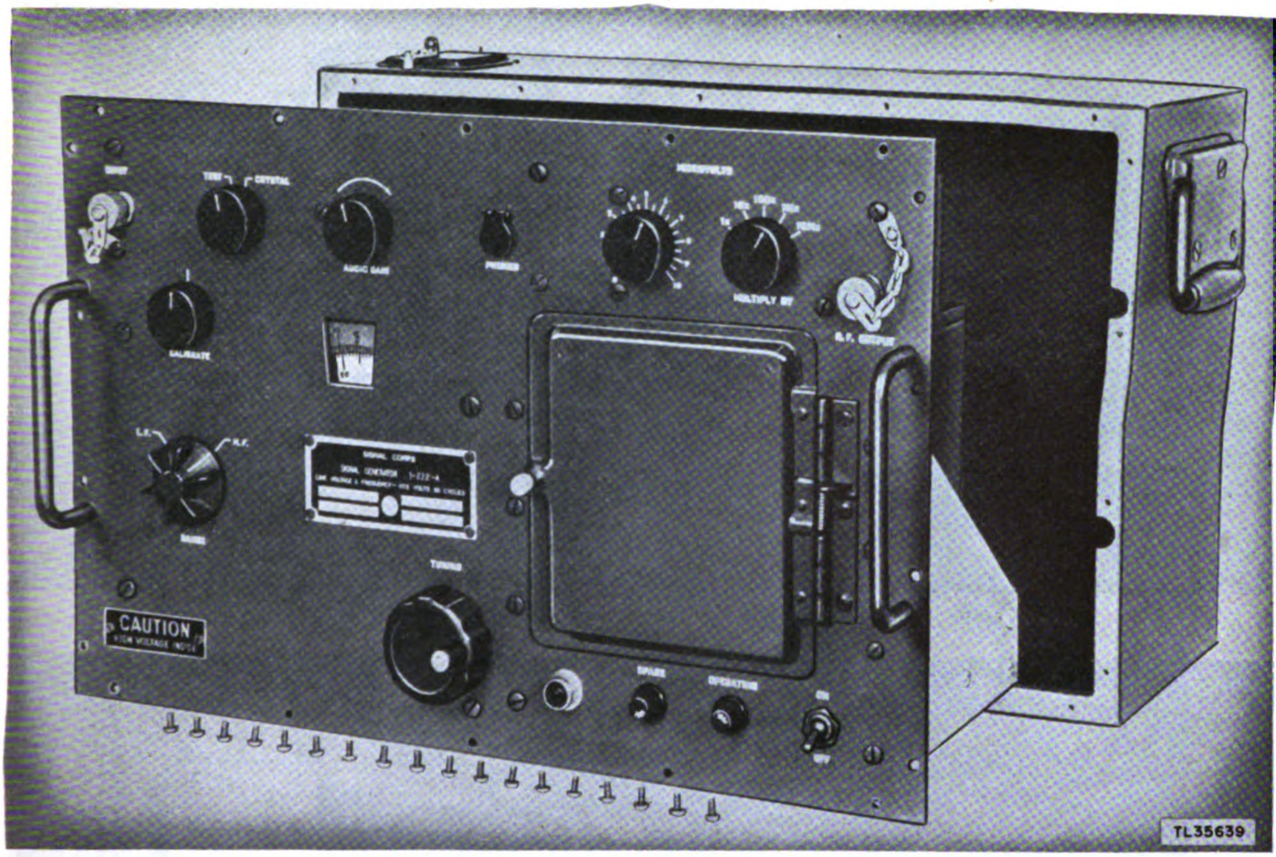


Figure 225. Signal Generator I–222–A, removed from case.

to the correct monitoring level. To do this rotate the audio gain control to its extreme clockwise position and slide the pick-up 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.

194. Removal of Subassemblies

The unit is composed of four subassemblies; power supply, attenuator, dectector-amplifier, and high-low frequency oscillator (see fig. 224).

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 head wrench, loosen the setscrew on each of the two knobs just below MICROVOLTS on the front panel (see fig. 225). 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. 226). 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: Make 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 handles. Remove the four knurled thumbnuts from the cover of the high-low frequency oscillator assembly. Unsolder the white-blue tracer wire at the ter-

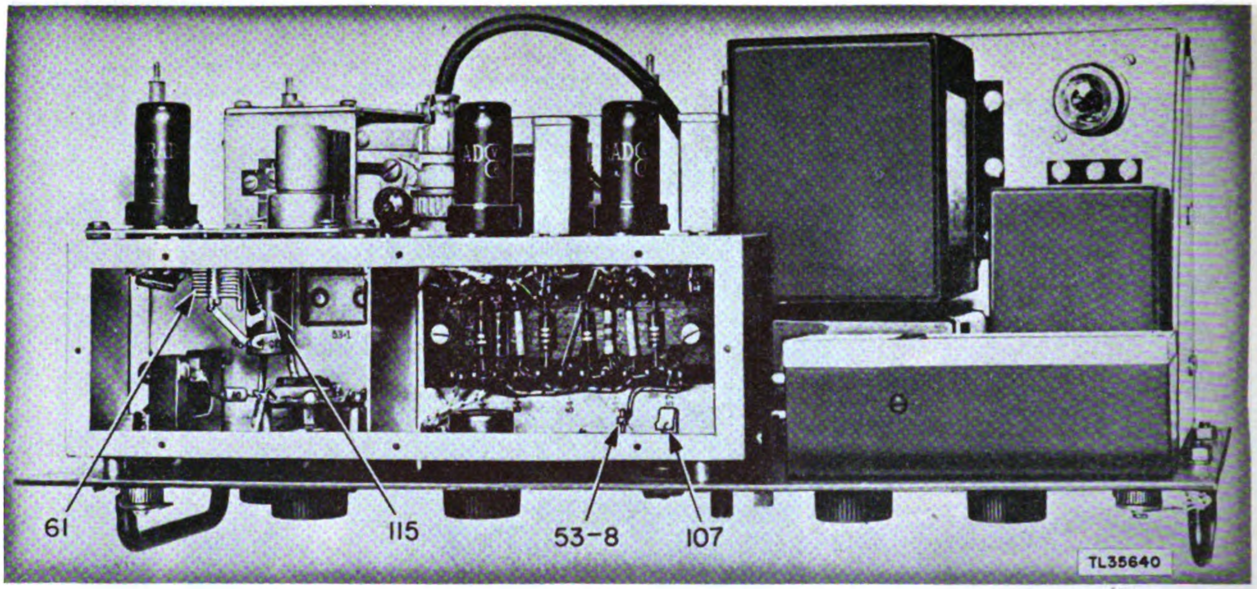


Figure 226. Signal Generator I–222–A, detector amplifier cover removed.

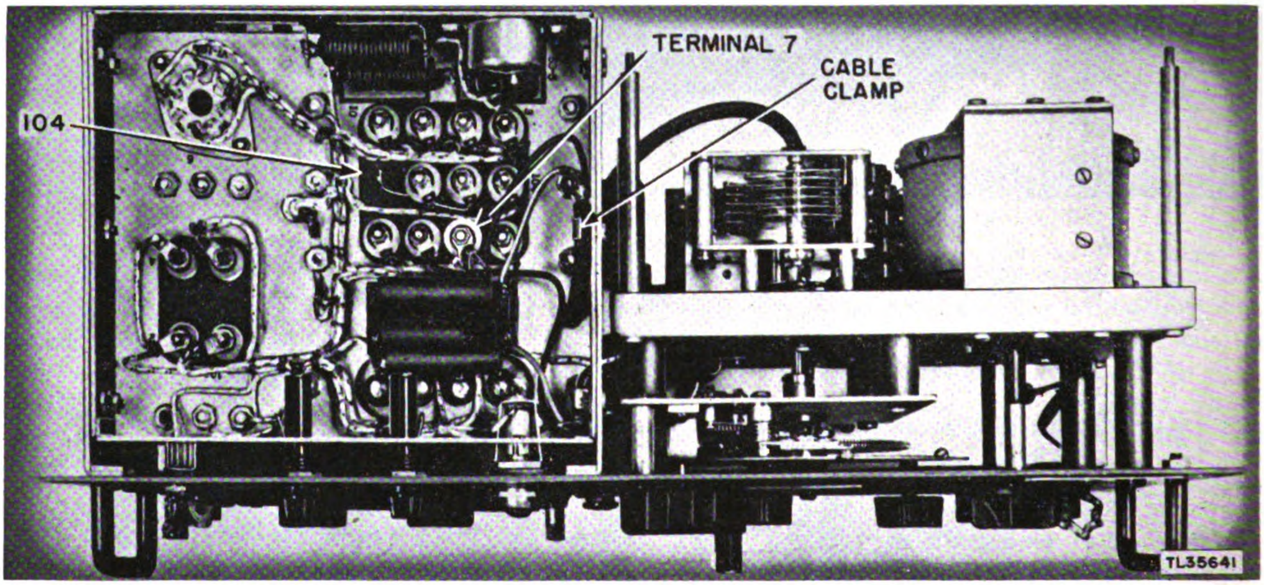


Figure 227. Signal Generator I–222–A, bottom view.

minal 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, terminal 7 of transformer 104. Remove the clamp holding the black rubber-covered cable to the power supply chassis (see fig. 227). 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 No. 8 Allen head wrench, loosen the knobs and remove them.

Caution: The tuning knob is provided with two setscrews. Make sure that both of these are loosened before removing this knob from the shaft. Remove the high-low frequency oscillator assembly from the panel. Make 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 11–1418.

195. Replacement of Circuit Elements

The fuse and pilot lamp may be replaced without removing the unit from the case. In order to replace

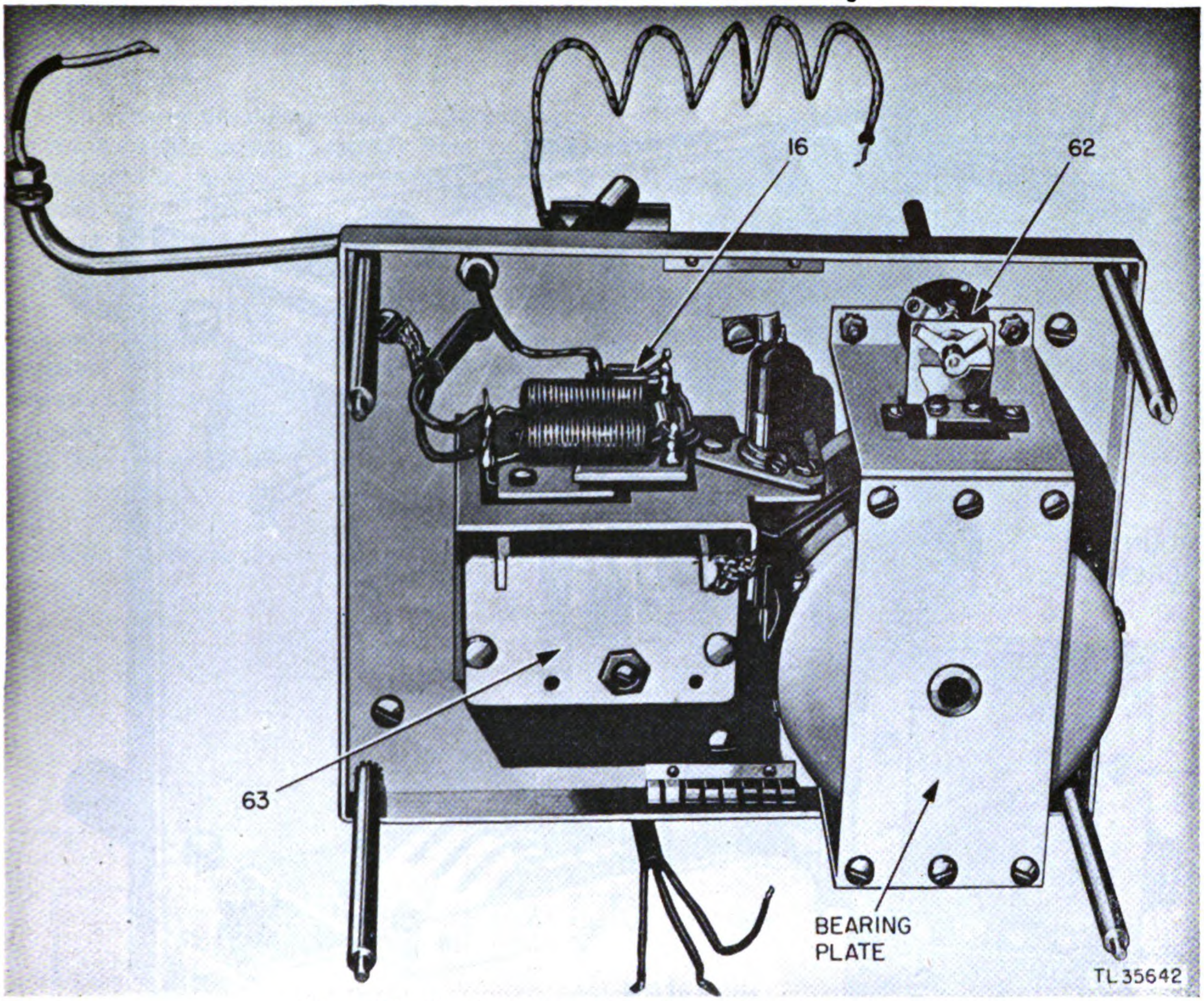


Figure 228. Signal Generator I–222–A, rear view of dial panel.

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. 225). 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.

c. To replace the dial lamp, it is necessary to remove the detector-amplifier assembly. Remove the detector-amplifier assembly as described in paragraph 194*b.* above. 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. 226). Replace in reverse order.

e. To replace variable capacitor 63, remove the high-low frequency oscillator assembly from the panel, as described in paragraph 194*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. 228). Unsolder the wire connected to the terminal of capacitor 62 (see fig. 228). Remove the three capacitor-support mounting screws

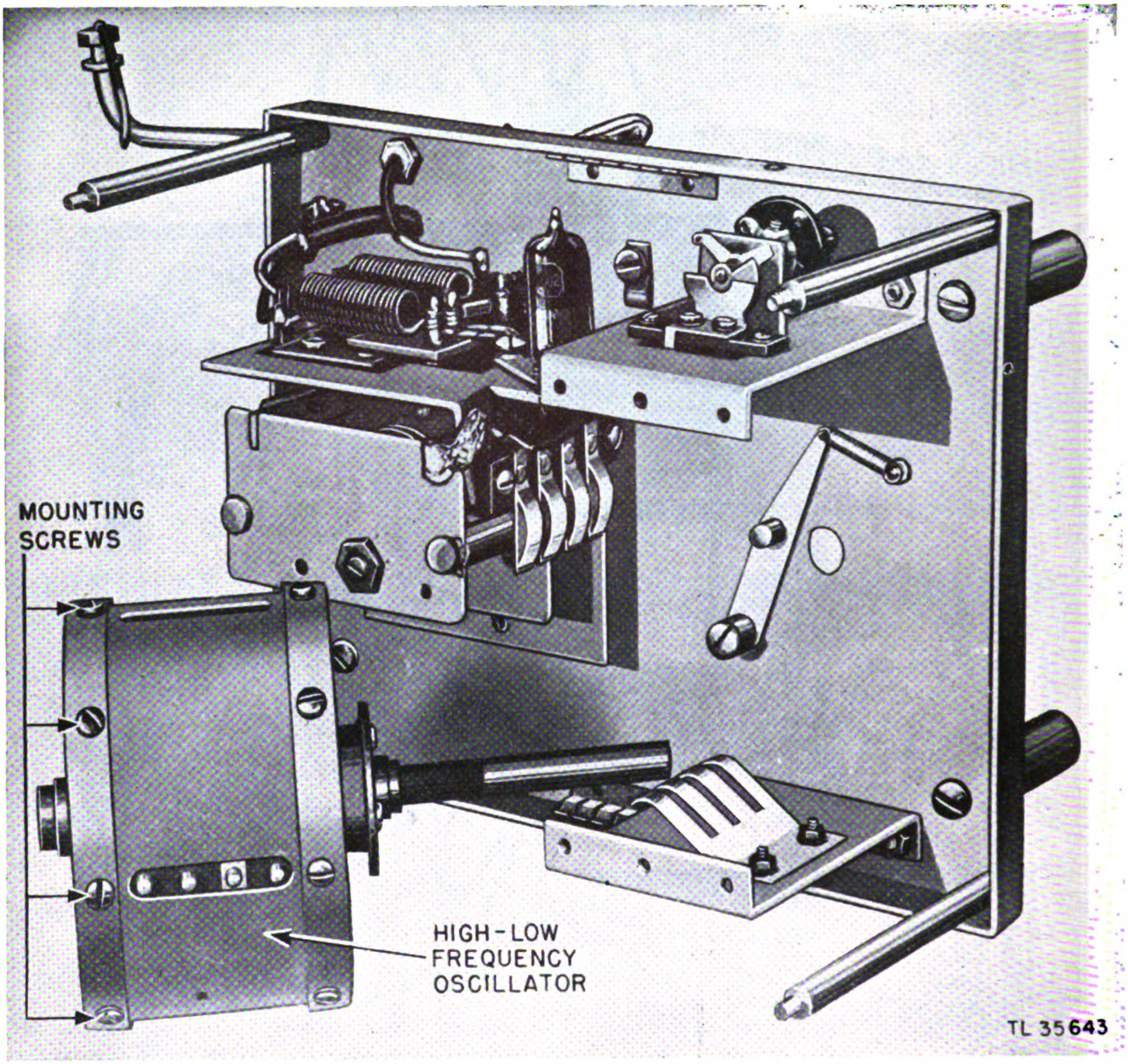


Figure 229. Signal Generator I-222-A, high-low frequency oscillator.

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 194*c*. Remove the six bearing plate mounting screws. Remove the bearing plate and the coil turret (see fig. 228). Remove the eight screws that mount the end of the coil turret to the turret housing (see fig. 229). Remove the screw which holds the other end of the bakelite strip, on which the coil is mounted, to the turret housing (see fig. 230). Remove the coil assembly. Assemble in reverse order.

g. To remove tank coil 115, remove the cover of the detector-amplifier assembly (see fig. 226). 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 swich 106, remove the detector-amplifier assembly, as described in paragraph 194*b*. Remove the nut and washer which fastens the 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-amplifier assembly from the panel, as described in paragraph 194*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, remove the attenuator assembly case from the front panel, as described in paragraph 194*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.

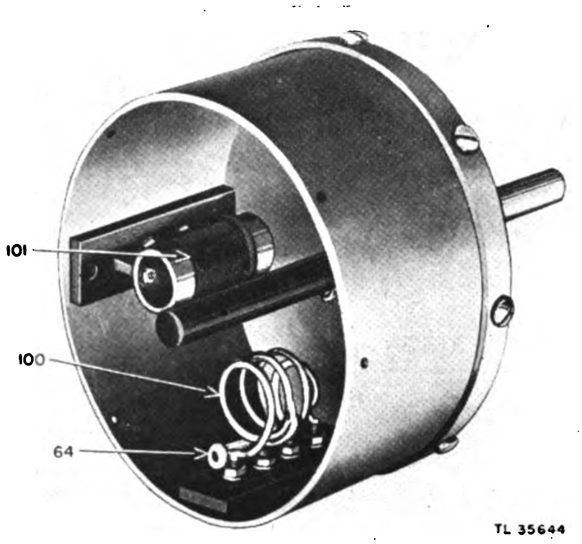


Figure 230. Signal Generator I–222–A, coil turret assembly.

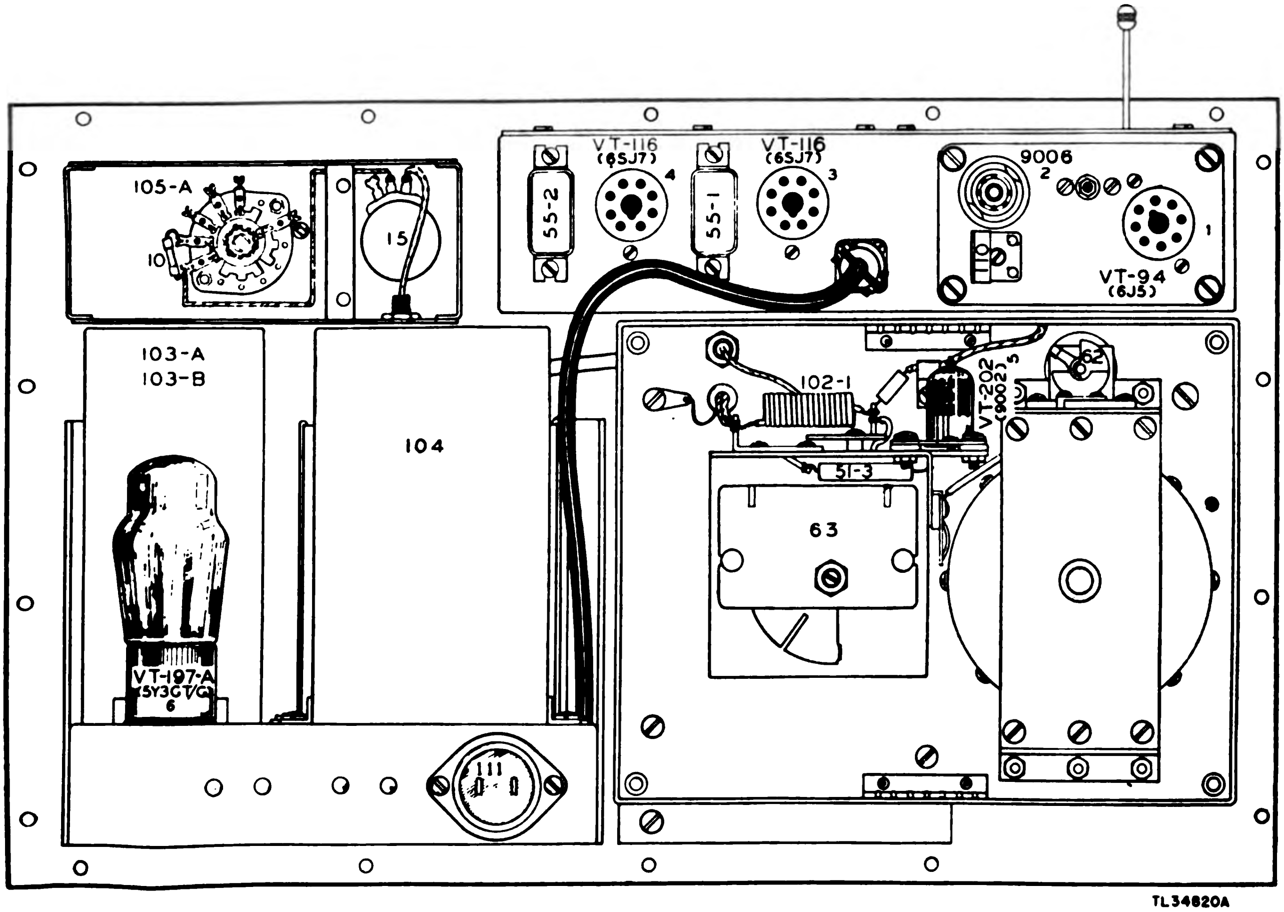


Figure 231. Signal Generator I–222–A, rear view showing location of parts.

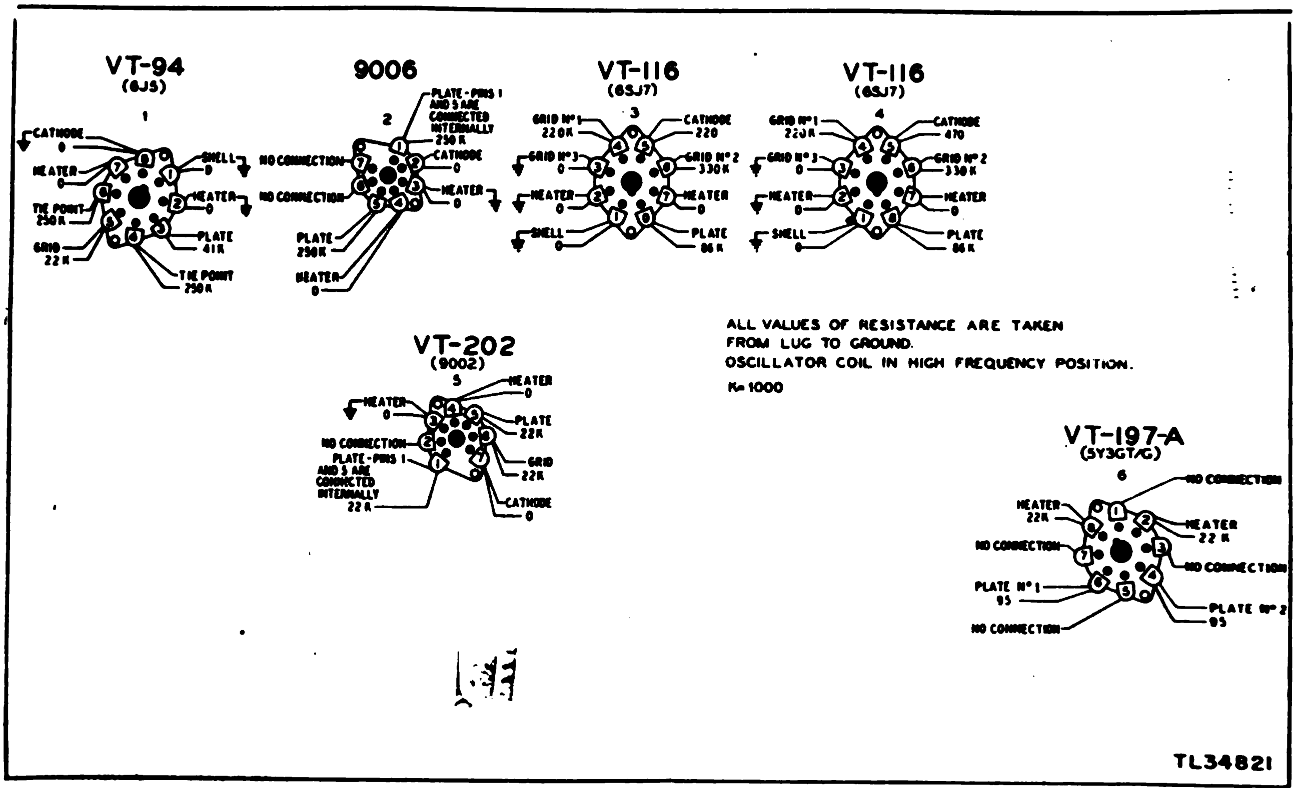


Figure 232. Signal Generator I–222–A, resistance chart.

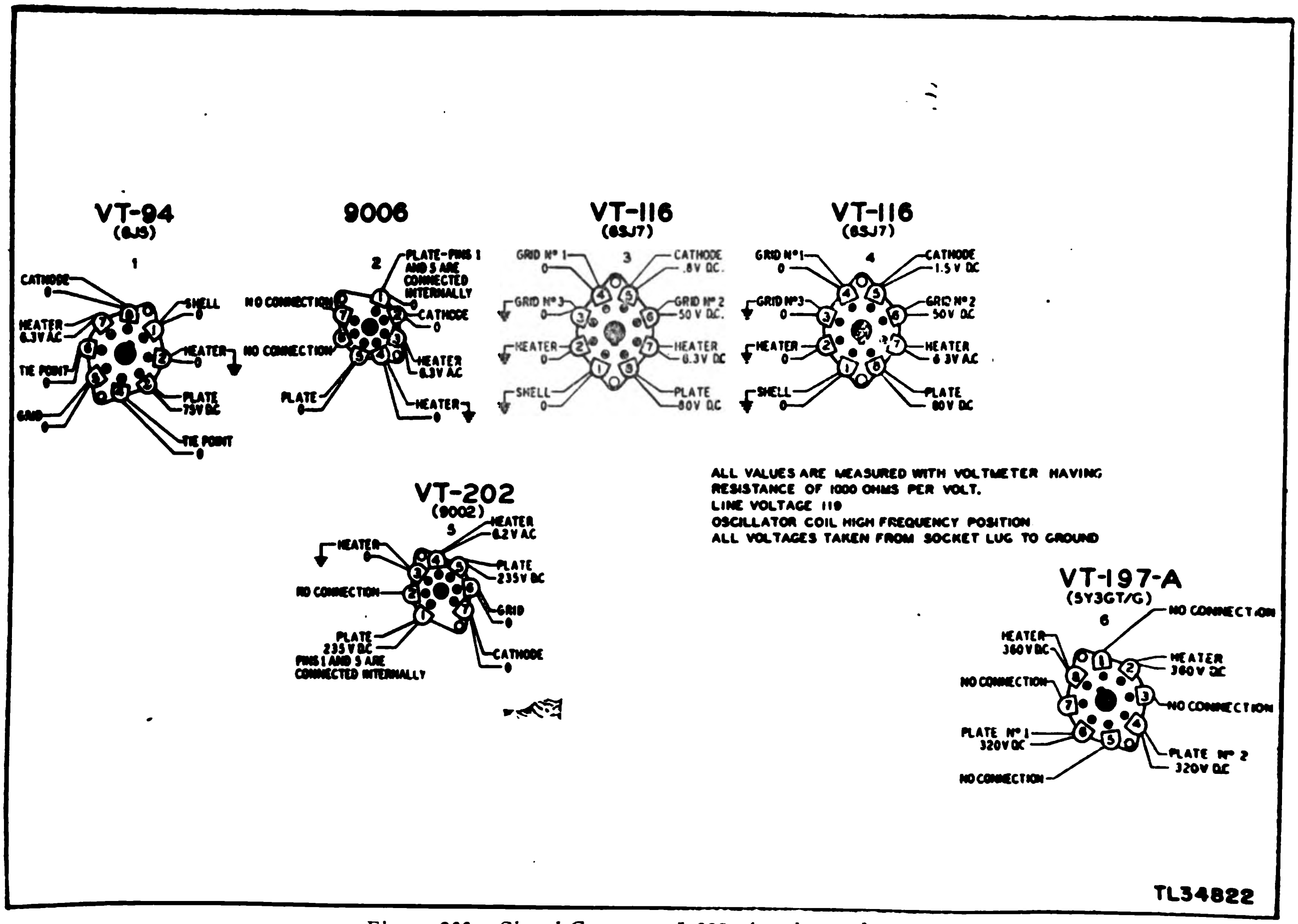


Figure 233. Signal Generator I–222–A, voltage chart.

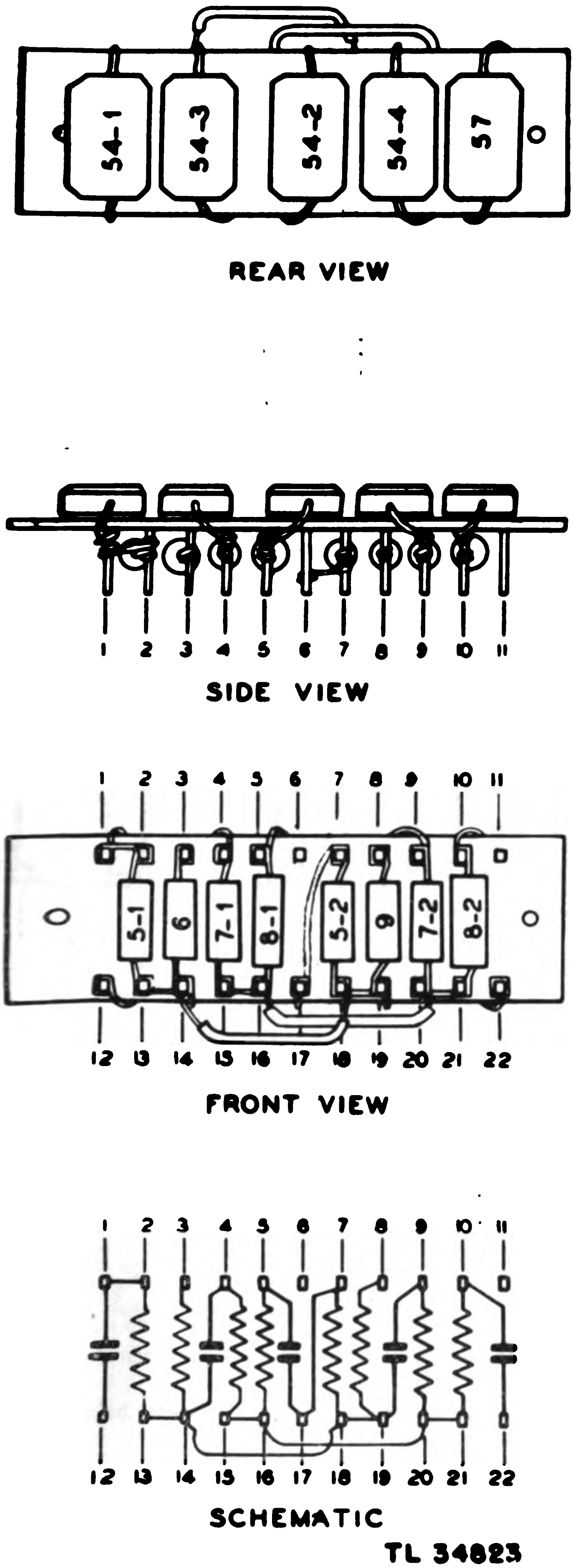


Figure 234. Signal Generator I-222-A, detector and audio-amplifier terminal board.

VOLTAGE AND RESISTANCE CHART OF DETECTOR AND AUDIO AMPLIFIER TERMINAL BOARD (fig. 234).

Terminal	Volts	Ohms (K = 1,000)
1	0	220 K
2	0	220 K
3	0.6	220
4	55	350 K
5	100	88 K
6	0	Infinite
7	0	220 K
8	1.2	470
9	50	350 K
10	100	88 K
11	0	Infinite
12	0	250 K
13	0	0
14	0	0
15	250	20 K
16	250	20 K
17	0	220 K
18	0	0
19	0	0
20	250	20 K
21	250	20 K
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.

VOLTAGE AND RESISTANCE CHART OF VARIABLE FREQUENCY OSCILLATOR TERMINAL BOARD (see fig. 235).

Terminal	Volts	Ohms (K = 1,000)
1	0	0
2	0	0
3	220	22.2 K
4	250	20 K
5	0	110
6	0	110

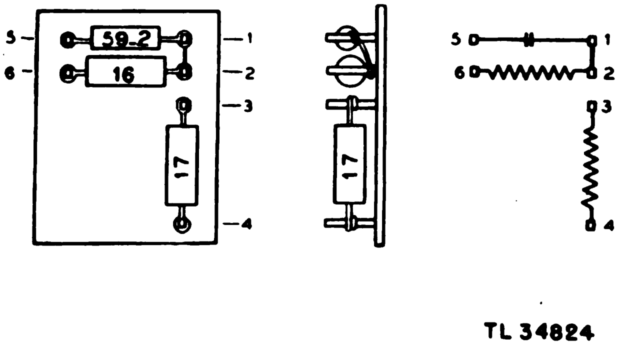


Figure 235. Signal Generator I–222–A, variable-frequency-oscillator terminal board.

VOLTAGE AND RESISTANCE CHART OF DETECTOR AND AUDIO AMPLIFIER TERMINAL BOARD (see fig. 236).

Terminal	Volts	Ohms (K = 1,000)
1	72	42 K
2	250	20 K

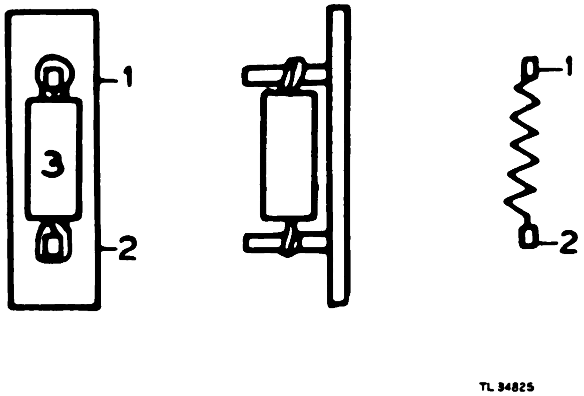


Figure 236. Signal Generator I–222–A, detector terminal board.

VOLTAGE AND RESISTANCE CHART OF POWER SUPPLY TERMINAL BOARD (see fig. 237).

Terminal	Volts	Ohms (K = 1,000)
1	320	22 K
2	0	0
3	250	20 K
4	250	20 K

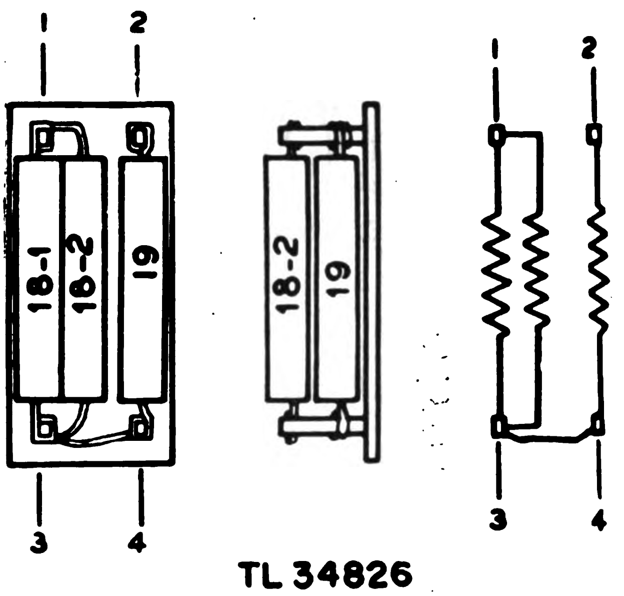
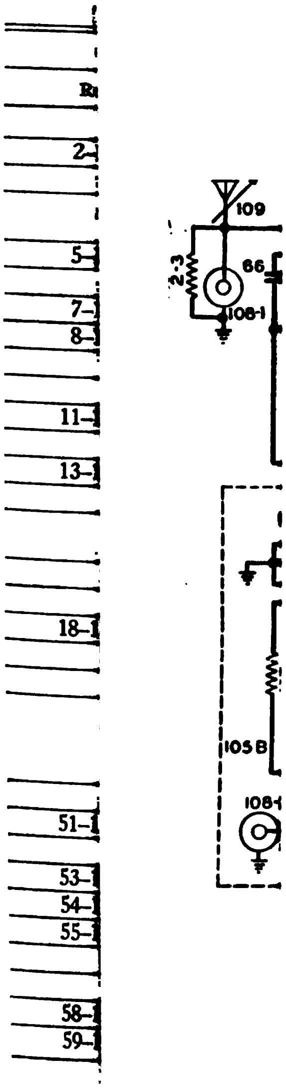


Figure 237. Signal Generator I–222–A, power-supply terminal board.

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.


109
2-3
66
108-1
105B
108-1
2-
5-
7-
8-
11-
13-
18-
51-
53-
54-
55-
58-
59-

Section XII. POWER SUPPLY AND RACK OF RC–148–C

> *Warning: Voltages sufficient to cause death on contact are exposed at many points in this unit. Do not place hands or arms within unit when the high voltage is on. Do not make any connection into the unit which will bring high voltage out to an exposed point. Make all tests with high voltages off. Always ground high-voltage capacitors before touching them or their associated circuits.*

196. Reference Data

To assist the maintenance personnel while trouble shooting on the power supply or the rack, many figures have been provided. At the end of this section there is a group of figures containing views of the rack and power supply, schematic and wiring diagrams, and voltage and resistance measurements.

197. Rack FM–82

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 operate normally but no power is supplied to the units, check the interlock switch 40 in the wiring channel for mechanical operation and proper connections.

c. If either of the circuit breakers fails to remain closed, check the rack wiring for a possible short circuit.

d. If power is not supplied to the units, check the units for firmness of mounting and the rack wiring for proper connections.

198. Power Supply RA–105–A

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 power supply is suspected of being faulty, the first step should be a check of all tubes. In some cases, however, a shorted circuit will be indicated by a circuit breaker which will not remain closed.

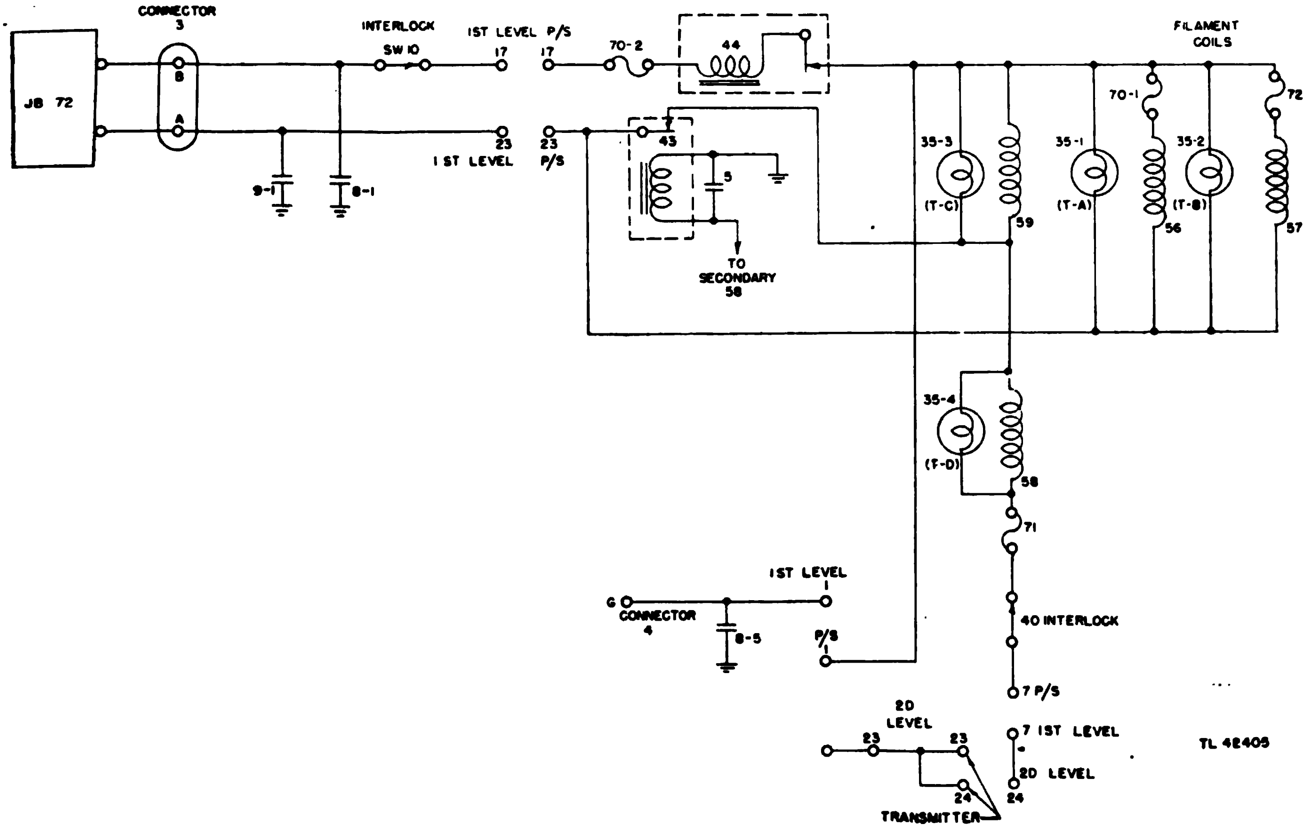


Figure 240. Power supply, a-c input circuit.

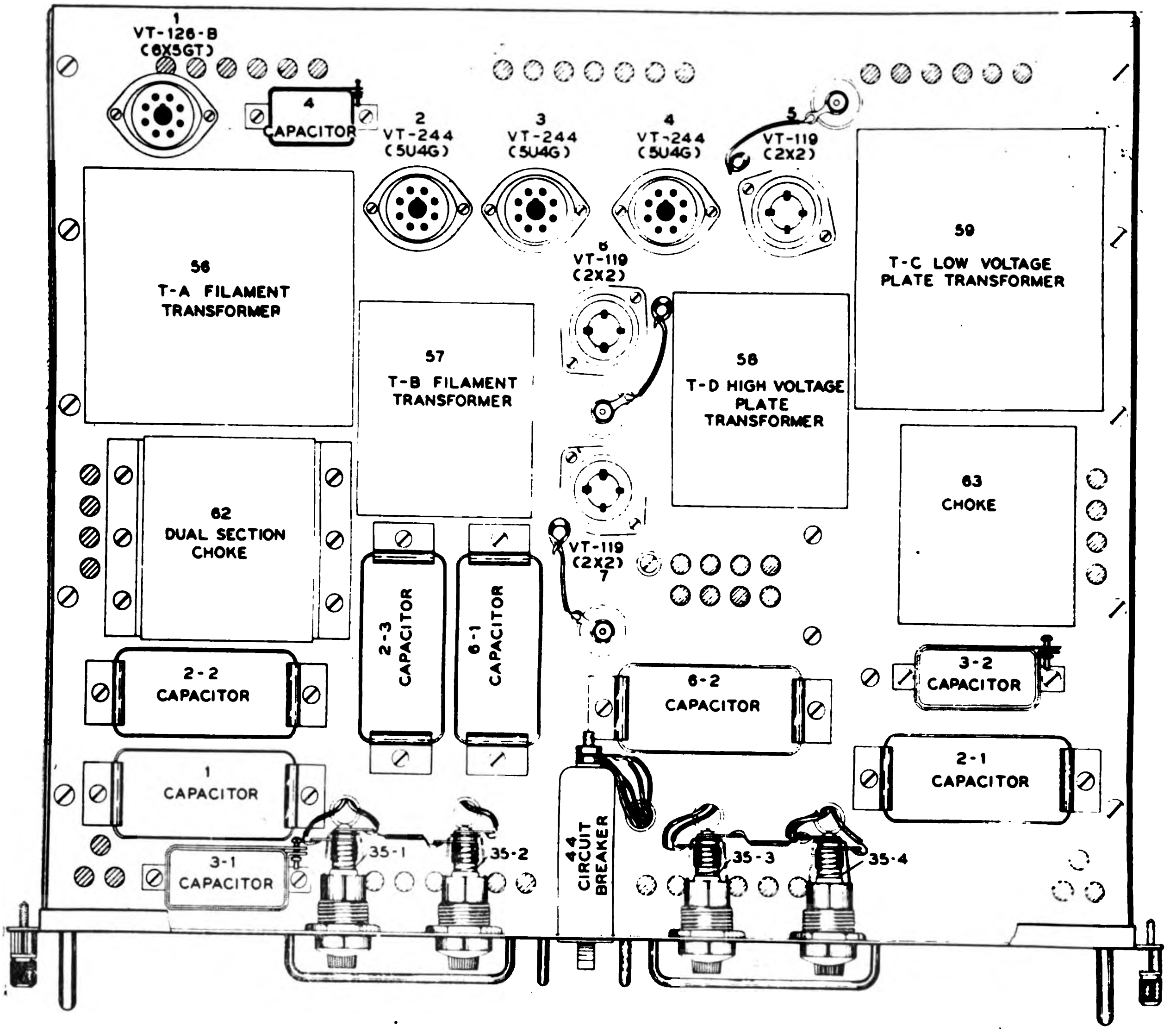


Figure 241. Power Supply RA-105-A, top view.

199. Power Supply Trouble-shooting Chart

A. SYMPTOM:

Either lamp T-A or lamp T-B does not light.

PROBABLE LOCATION OF FAULT	PROCEDURE
1. Pilot lamp.	1*a*. Replace the pilot which does not light. *b*. If trouble is not cleared, see item below.
2. Fuse.	2. 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
1. No line voltage.	1*a*. Turn blowers on. If the blowers operate, the presence of line voltage is indicated. *b*. If trouble is not cleared see item below.
2. Fuses.	2*a*. Check fuses and replace if necessary. *b*. If trouble is not cleared, see item below.
3. Pilot lamps.	3*a*. Replace the pilot lamps. *b*. If trouble is not cleared, see item below.
4. Circuit breaker.	4. 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
1. Pilot lamp.	1*a*. Replace the pilot lamp which does not light. *b*. If trouble is not cleared, see item below.
2. Fuse.	2. 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
1. Pilot lamps.	1*a*. Replace the pilot lamps. *b*. If the trouble is not cleared, see item below.
2. Fuses.	2*a*. Replace the fuses. *b*. If the trouble is not cleared, see item below.
3. Circuit breaker.	3. Check the circuit breaker for mechanical operation and proper connections.

E. SYMPTOM:

Circuit breaker will not remain closed.

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

200. Replacement of Parts

a. The replacement of capacitors, transformers, chokes, and switches involve 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.

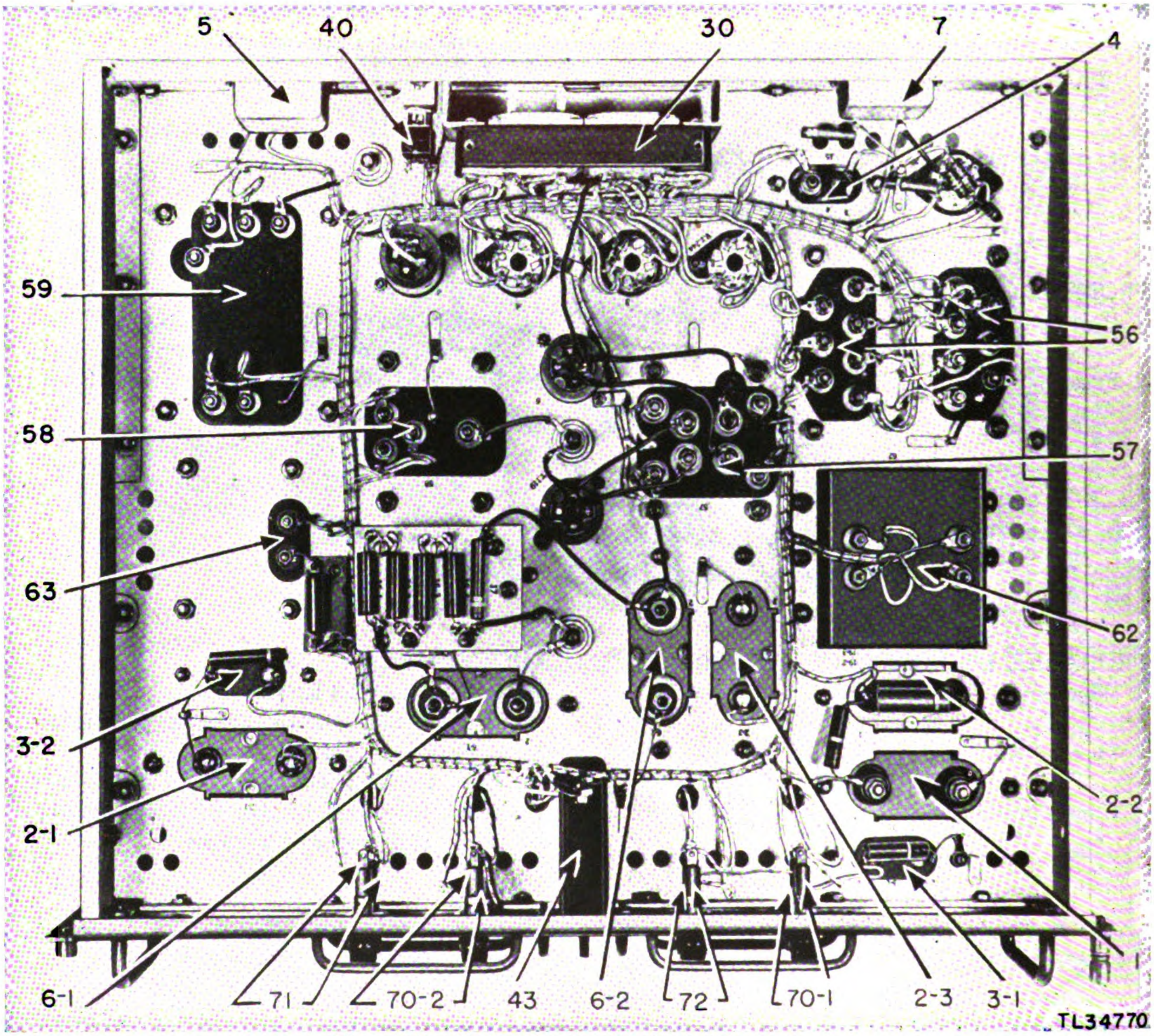


Figure 242. Power Supply RA-105-A, bottom view.

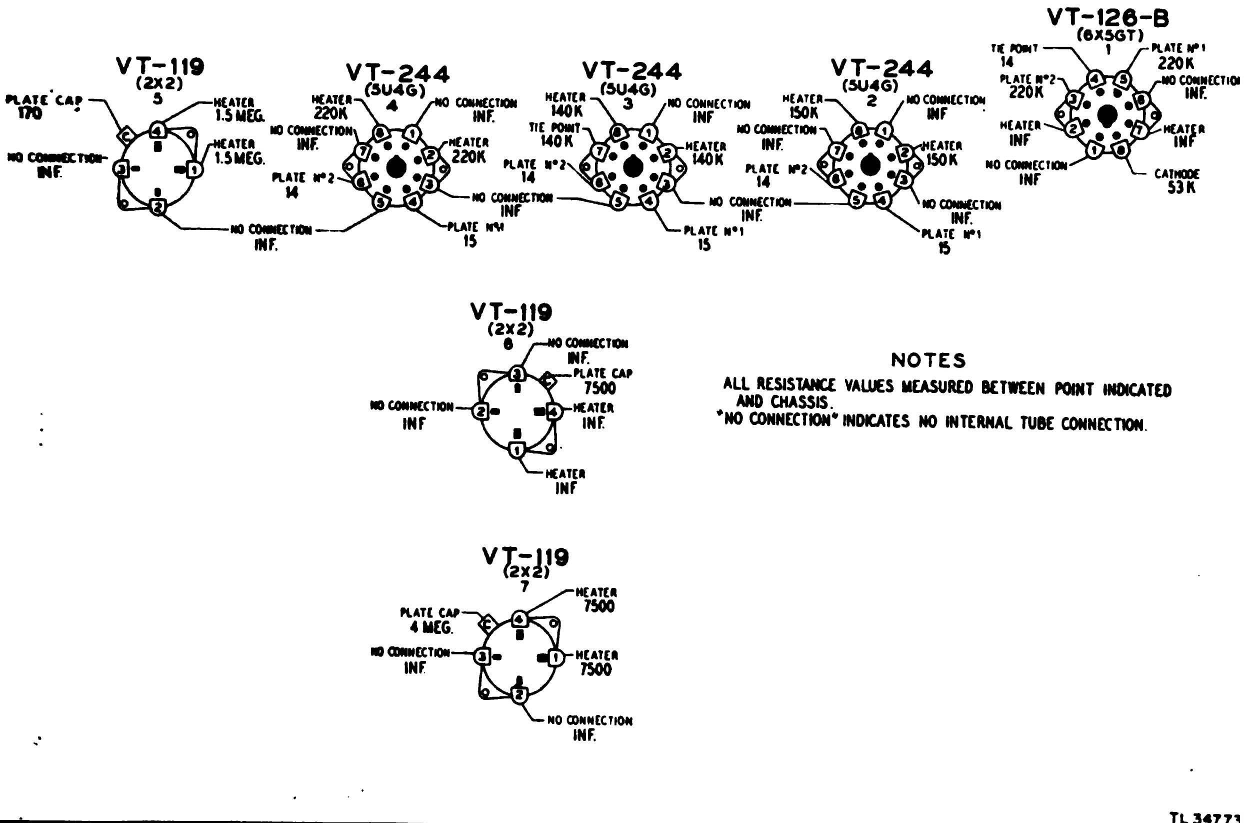


Figure 243. Power Supply RA-105-A, resistance chart.

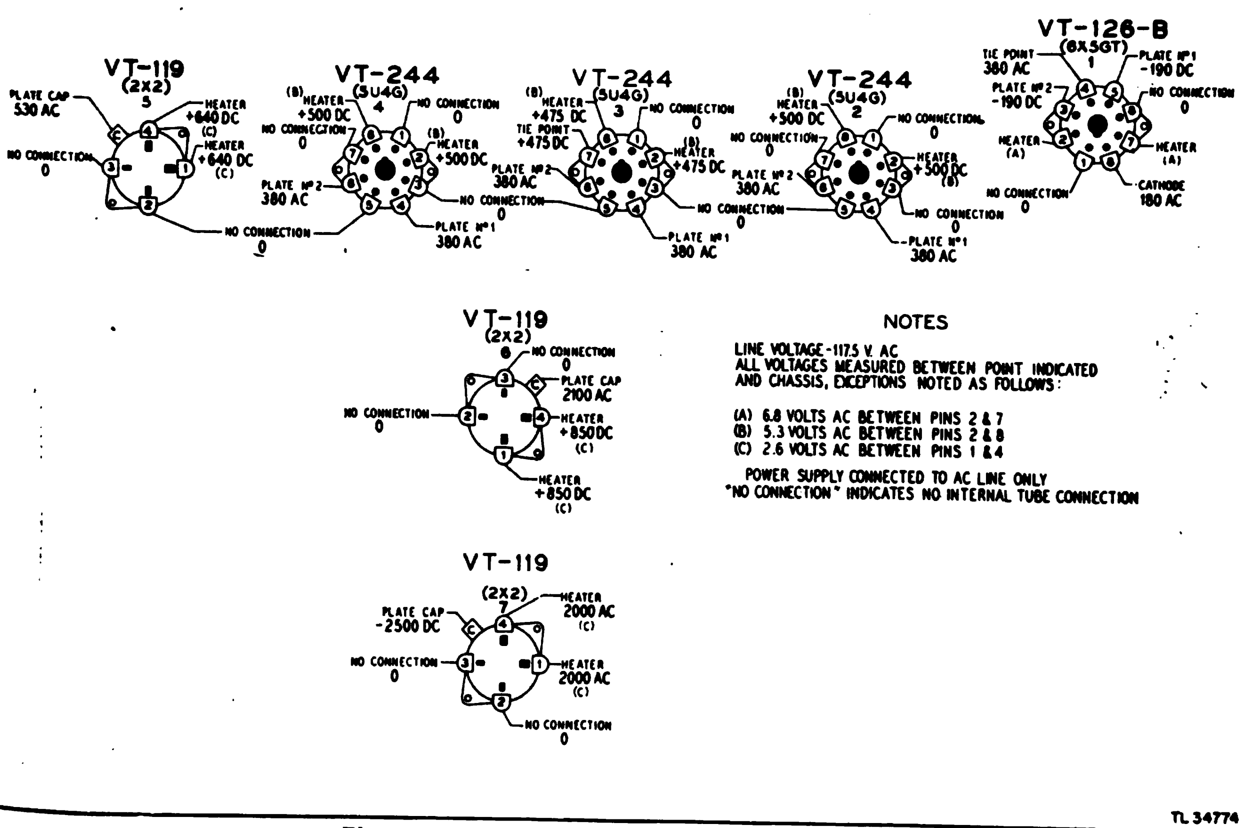
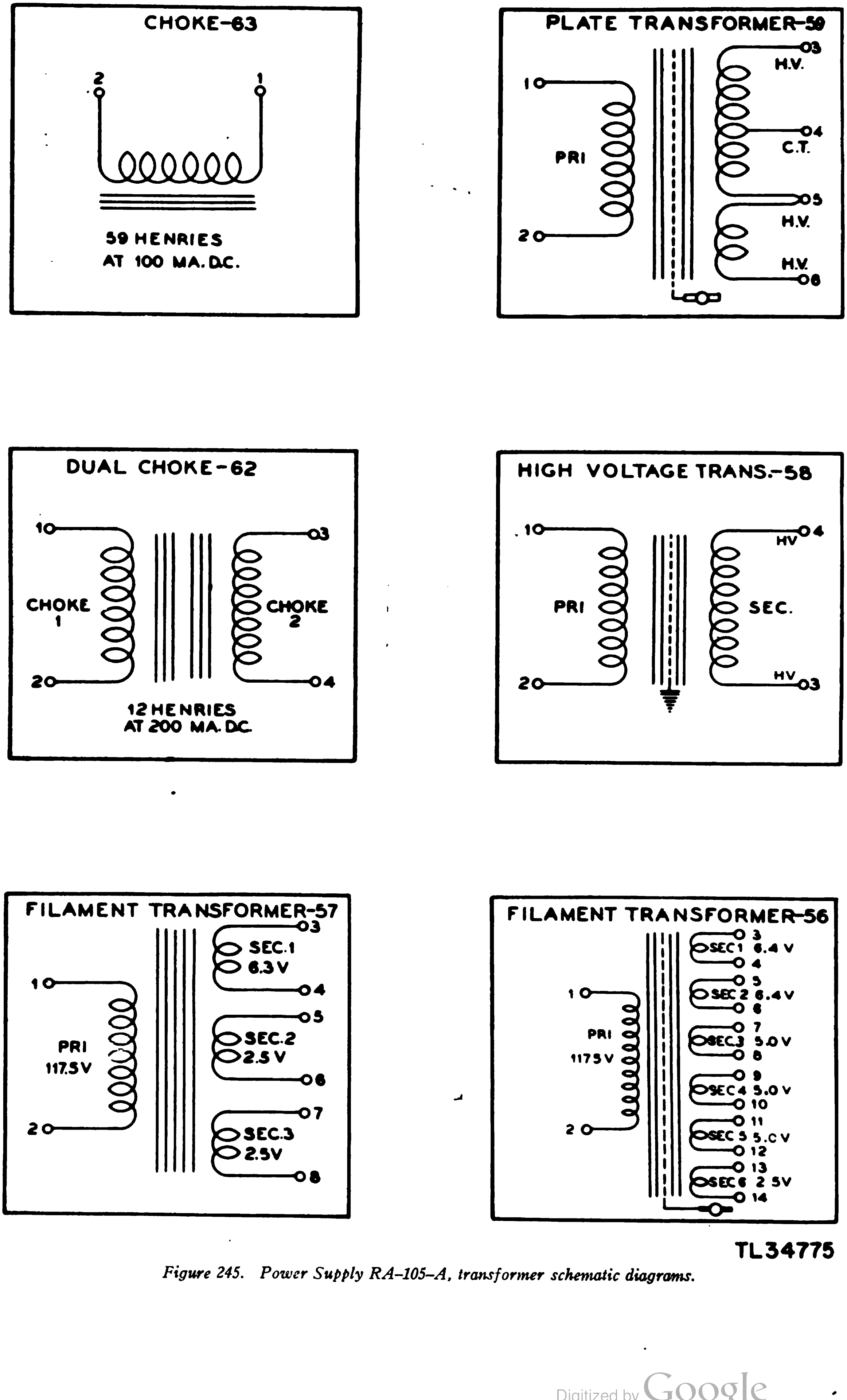
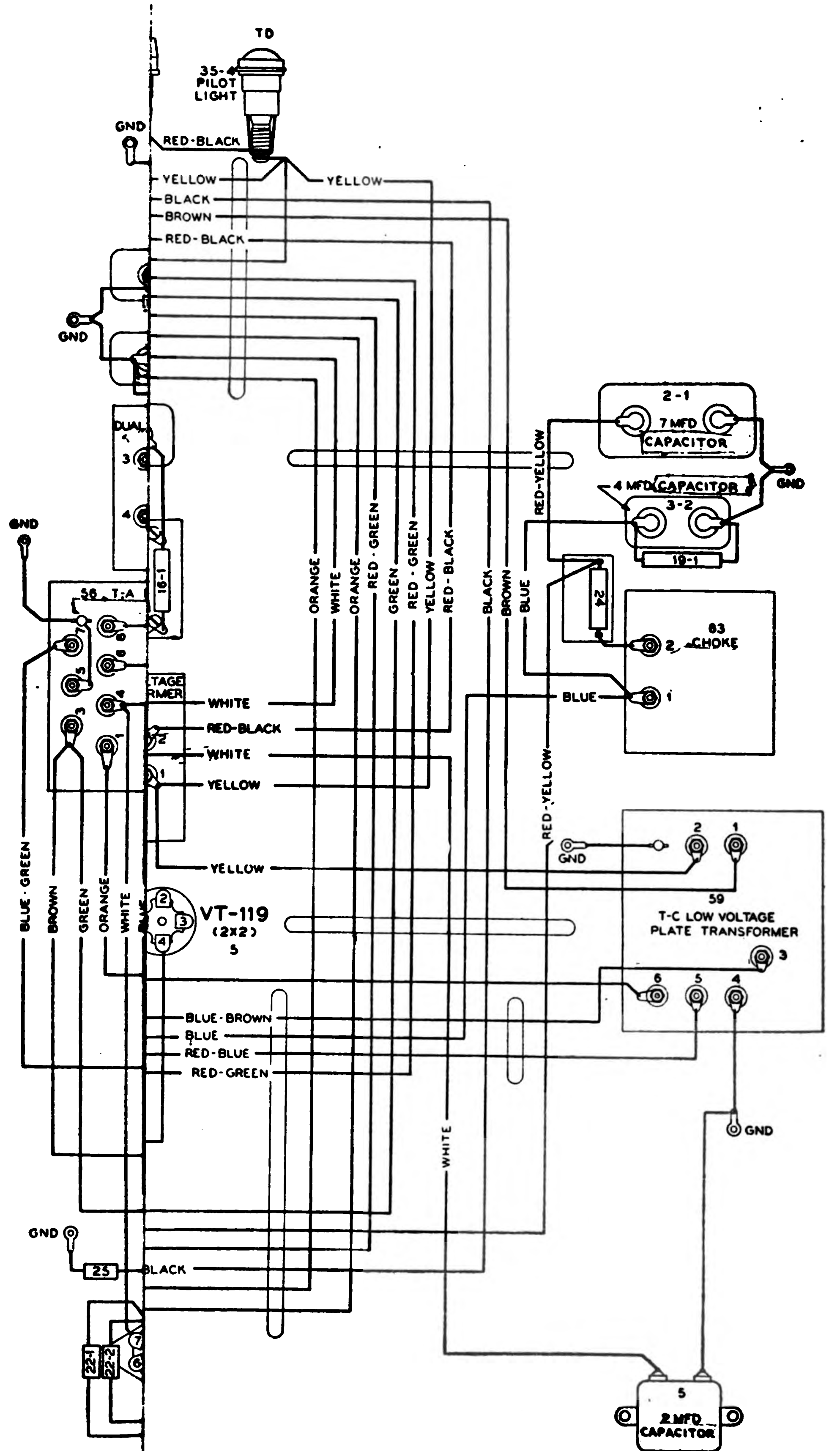


Figure 244. Power Supply RA-105-A, voltage chart.



TL34775

Figure 245. Power Supply RA-105-A, transformer schematic diagrams.


TD
35-4
PILOT
LIGHT
GND
RED-BLACK
YELLOW
YELLOW
BLACK
BROWN
RED-BLACK
GND
DUAL
2-1
7 MFD
CAPACITOR
4 MFD CAPACITOR
3-2
GND
19-1
RED-YELLOW
16-1
GND
56 T-A
24
63
CHOKE
ORANGE
WHITE
ORANGE
RED-GREEN
GREEN
RED-GREEN
YELLOW
RED-BLACK
BLACK
BROWN
BLUE
BLUE
WHITE
RED-BLACK
WHITE
YELLOW
RED-YELLOW
GND
YELLOW
59
T-C LOW VOLTAGE
PLATE TRANSFORMER
BLUE-GREEN
BROWN
GREEN
ORANGE
WHITE
BLUE
VT-119
(2X2)
5
BLUE-BROWN
BLUE
RED-BLUE
RED-GREEN
GND
WHITE
GND
25
BLACK
22-1
22-2
5
2 MFD
CAPACITOR

TL 42344

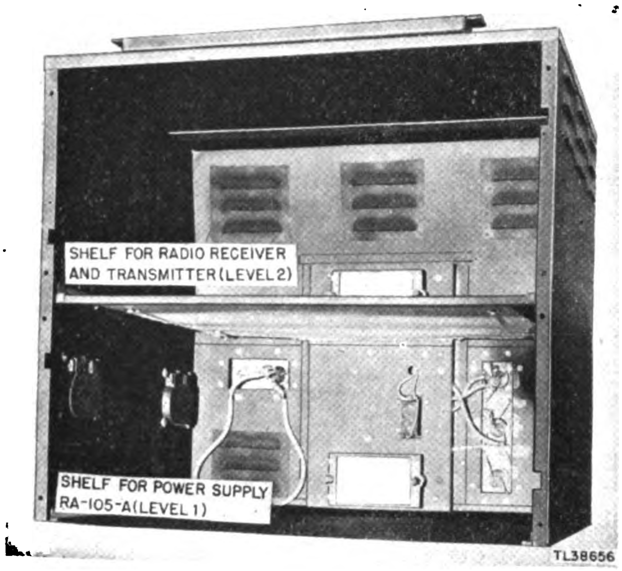


Figure 248. Rack FM-82 front view, with components removed.

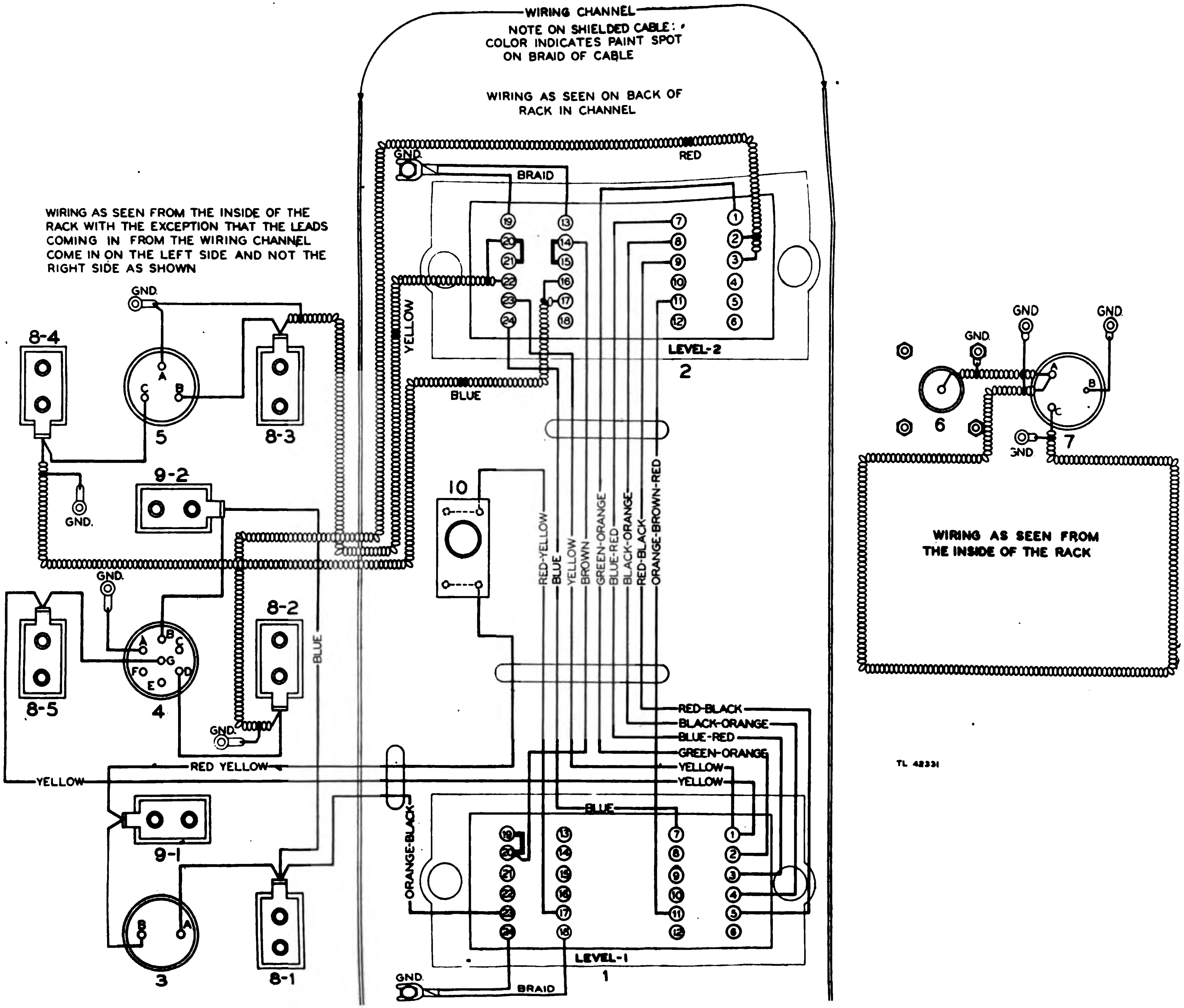


Figure 249. Rack FM-82, wiring diagram.

CHAPTER 3

SUPPLEMENTARY MECHANICAL INFORMATION

201. Introduction

The information contained in this chapter is to assist the radar mechanic in replacing defective mechanical parts in the RC–148, and RC–148–B. As the procedures are described, it will be noted that mechanical parts are taken down only so far as can readily be done with the tools on hand. Where gears and shafts are held together with peened pins rather than setscrews and Allen screws, no removal procedure is described because work of this nature is not usually done in the field. However, if it does become necessary to replace these parts, the information given herein supplies the mechanic with at least the preliminary steps to accomplish the work.

Note. For removal of the transmitter, receiver, or wavemeter from the rack and their cases see TM 11–1418, Preventive Maintenance Manual.

202. Precautions

a. Before replacing a defective mechanical part, observe carefully its position, method of mounting, and proper mesh of gears. This will insure the correct installation of the part.

b. When disassembling a component, the screws, nuts, bolts, washers, and other small parts which are removed should be put in a small container to prevent their loss.

c. When removing parts such as switches and terminal boards, which have several wires attached to their terminals, be sure to tag the wires carefully so that they will be replaced in their proper positions (see fig. 250).

203. Vernier Tuning Gear Assembly (Capacitor 21) of Transmitter of RC–148 and RC–148–B

In order to replace a defective vernier tuning gear assembly, the following procedure is necessary (see figs. 250 and 251):

a. Take out screws at the four corners of the cover on relay 138, and remove the cover.

b. Take out slotted nuts from connections 2, 3, 5, and 6, on relay 138 and remove the connections.

c. From capacitor 12, attached to the side of the cover of the artificial line, unsolder the two connections to the outside terminal.

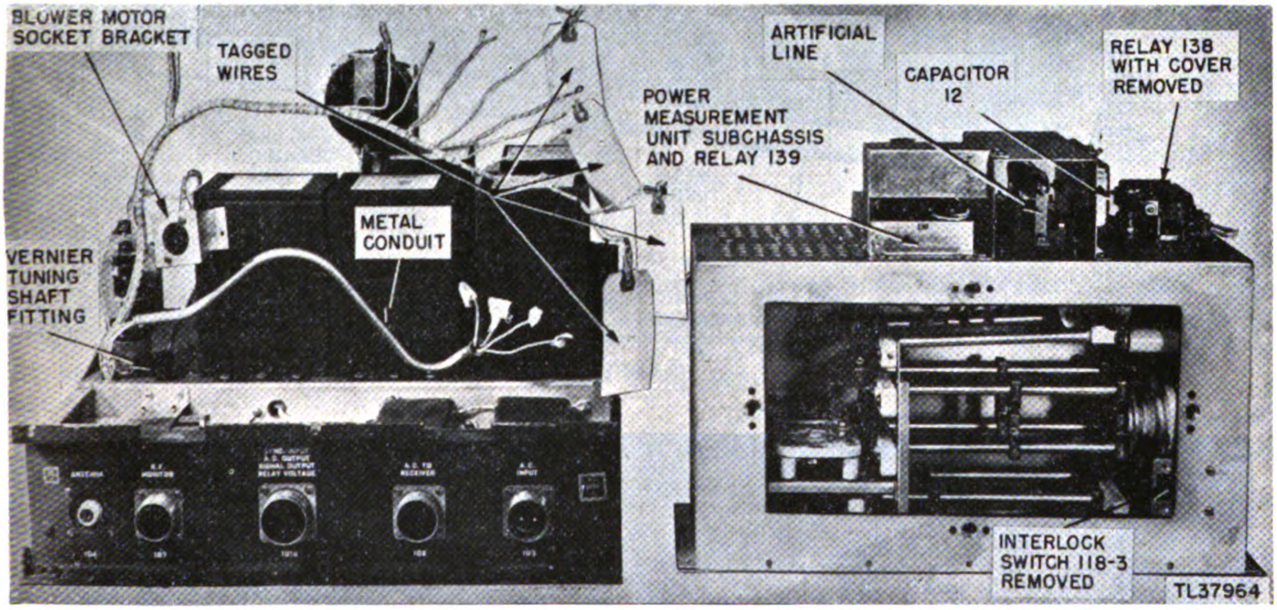


Figure 250. Transmitter, oscillator compartment removed.

d. Unsolder the connections to the two terminals of the artificial line.

e. Unsolder the four connections to the terminal strip of the power measurement unit subchassis.

f. Unsolder the two connections to each of the interlock switches (118–1, 118–2).

g. Remove the blower motor socket bracket from the back of the oscillator compartment by taking out screws on each side of the bracket.

h. Remove the three clamps which hold the laced wiring to the interlock switches, the artificial line,

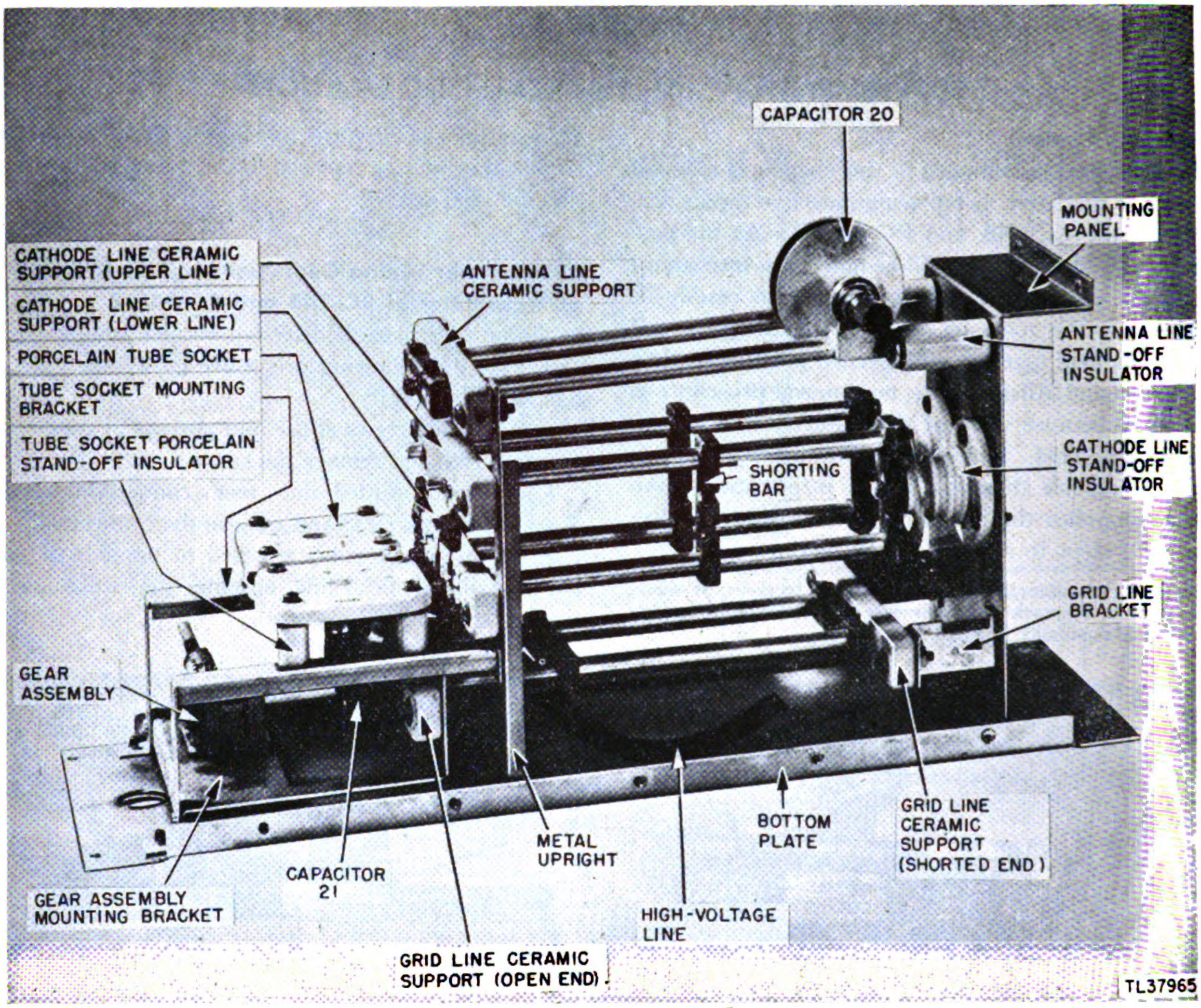


Figure 251. R-f oscillator assembly.

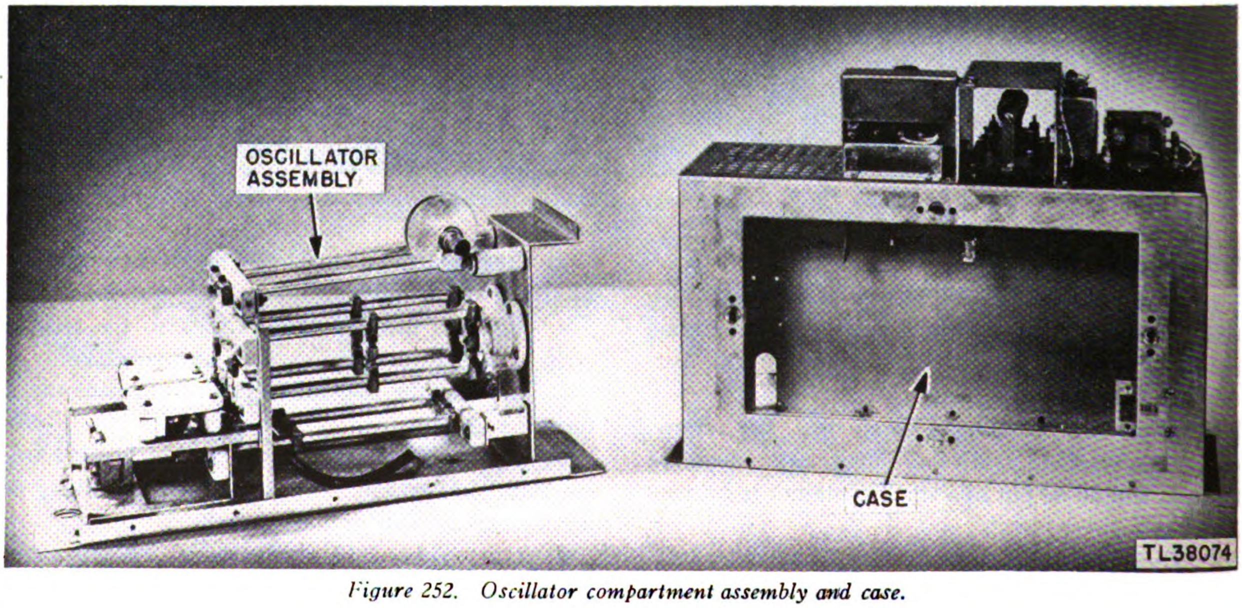


Figure 252. Oscillator compartment assembly and case.

and relaps 138 and 139 to the oscillator compartment chassis.

i. Remove the two clamps which hold the metal conduit (containing the wiring for the power measurement unit) to the oscillator compartment chassis.

j. With an Allen wrench, loosen the two setscrews and remove the fitting on the vernier tuning shaft which goes to the gear assembly of capacitor 21.

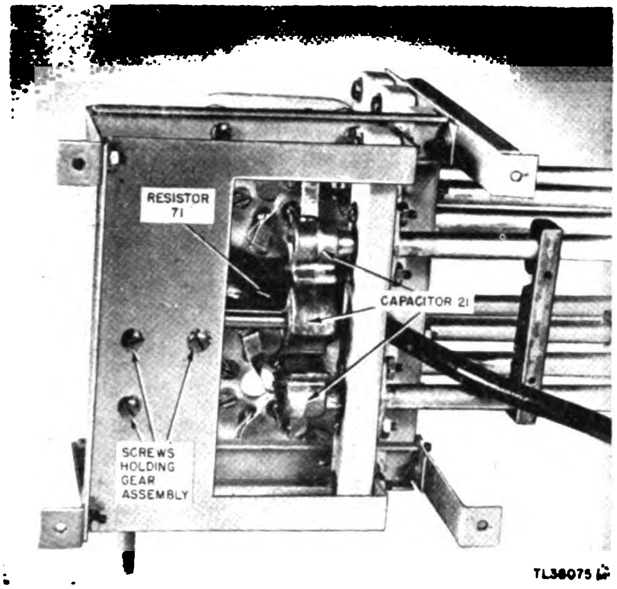


Figure 253. Oscillator assembly, under side, showing capacitor 21 and resistor 71.

k. Remove the two screws which hold the interlock switch 118–3 to the mounting bracket and pull switch out of compartment so that the connections may be unsoldered. Unsolder the two connections and remove the switch.

l. At the open end of the upper cathode line (marked 22), above the porcelain tube sockets, remove the black and white leads and pull them through the hole in the bottom of the compartment.

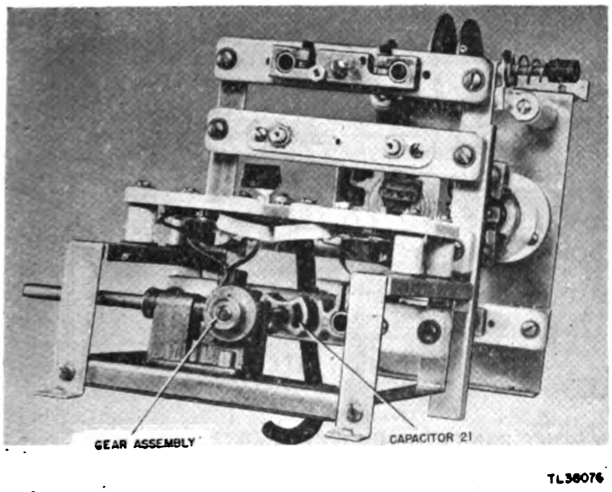


Figure 254. Oscillator assembly, end view.

m. Unsolder the end of the heavy black high-voltage line from resistor 72–1, in the bottom of the chassis.

n. From antenna connector 105, unsolder the shielded antenna lead.

o. From R.F. MONITOR connector 106, unsolder the blue lead.

p. From the shorted end of the grid line, remove the screw holding the small terminal board to which resistor 65–2 is attached.

q. Pull through the hole, first the red and blue interlock leads and then the terminal strip with the resistor attached.

r. Remove the four large bolts that attach the oscillator compartment to the main chassis and lift off the entire oscillator compartment.

s. From the shorted end of the antenna line (marked 20), remove three screws holding the vertical bracket and pull the bracket clear of the shorting bar; also detach the blue striped R.F. MONITOR lead.

t. Remove the two clamps which attach the shielded leads to the antenna lines.

u. From the bottom edge of the compartment remove the 10 screws which attach the bottom plate of the compartment to the upper case.

v. From the end panel, below relay 138, remove the two screws which hold the mounting panel to the case.

w. Lift the case from the oscillator section (see fig. 252).

x. Drop the bottom plate by removing the six screws attaching it to the mounting panel metal upright and tube socket mounting bracket.

y. The gear assembly may now be removed by unscrewing the three screws that have become accessible (see fig. 253).

z. To install the new gear assembly, reverse the removal procedure.

204. Blower Motor in Transmitter of RC–148 and RC–148–B

In order to replace a defective blower motor the following procedure is necessary:

a. For description of removal of case from transmitter chassis, see TM 11–1418.

b. Remove four screws on top of case that hold motor bracket.

c. To replace, reverse removal procedure.

205. R-f Tuning Head of Receiver of RC–148 and RC–148–B

Should the gear assemblies in the receiver r-f tuning section become damaged, it will be necessary to replace the entire r-f tuning head because these gear assemblies are not removable for replacement. In order to do this, the following procedure is necessary:

a. With an Allen wrench, remove the tuning knobs from the front panel.

b. Remove all screws shown in figure 255.

c. Pull the front panel forward and drop it down to clear receiver chassis.

d. Remove tuning indicator Tube VT–215, and place it to rear of chassis (see fig. 256).

e. Remove the metal plate on the bottom of the tuner head by taking off the nuts and screws indicated as A in figure 256.

f. Unsolder wire in the i-f conduit from lug 5 of the first i-f transformer.

g. Unsolder the i-f conduit from the lug adjacent to Tube VT–112.

h. Unsolder the capacitor at the end of the orange lead (which is the antenna conduit) from the antenna coil.

i. Remove the clamp which holds the antenna conduit to the tuner case.

j. Remove the red and yellow leads from terminals 25 and 28 respectively.

k. Remove the r-f tuning head from the receiver chassis by taking out screws B (fig. 256) and lifting the receiver free of the tuning head.

l. To install the spare r-f tuning head, carefully place it in position in the receiver chassis and reverse the removal procedure.

206. Oscillator Tuning Drive Gear in Wavemeter of RC–148 and RC–148–B

In order to replace the oscillator tuning drive gear, the drive assembly for variable capacitor 1, the following procedure is necessary:

a. Remove the side panels of the oscillator compartment by turning shock-proof fasteners one-quarter turn counterclockwise.

b. Remove the lower mounting screws from the fibre insulators which attach the antenna sheath to the resonator.

c. Unsolder the three wires (black, white, and red) that come out of the shielded tube at the rear of the wavemeter.

d. With an Allen wrench, remove the large TUNING control knob and the two smaller knobs, AUX, OSC and EYE ADJ.

e. Remove the ON-OFF and TRANS-REC switches by removing the locknuts and washers.

f. Remove the four mounting screws on the front panel which attach it to the black metal casting.

g. From the top panel, remove the three mounting

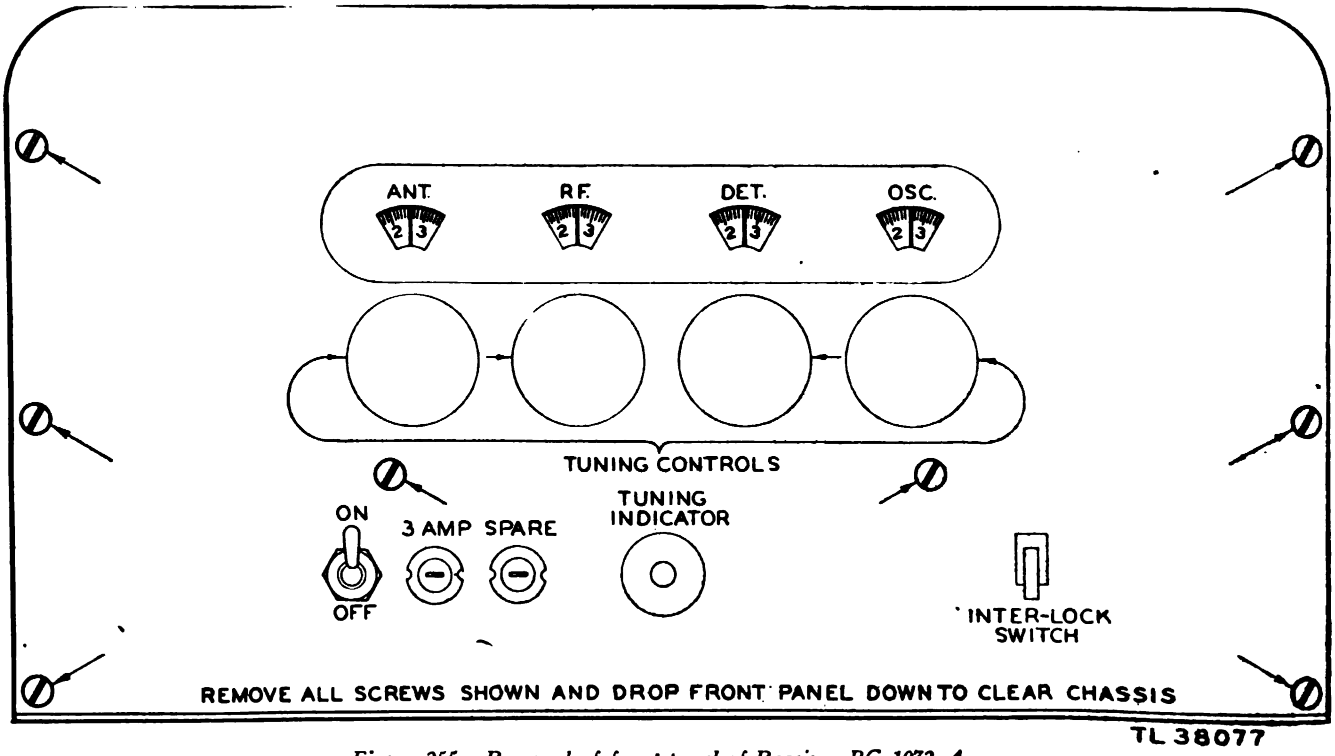


Figure 255. Removal of front panel of Receiver BC–1072–A.

screws located 4¼ inches from the rear end of the panel.

h. Grasp handles on top panel and pull slightly forward and upward and lift off completely.

i. Remove the top cover of the oscillator compartment by removing the six screws which attach it to the oscillator compartment chassis.

j. Remove the knurled screw holding the tuning eye socket in place.

k. With an Allen wrench, loosen the setscrews which hold the large gear to the variable capacitor shaft, and remove the gear.

l. To install the new gear, reverse the removal procedure.

Note. Make certain that the capacitor plates are completely meshed and that the reduction gear shaft is turned counterclockwise as far as the lugs will allow. The large gear may now be engaged.

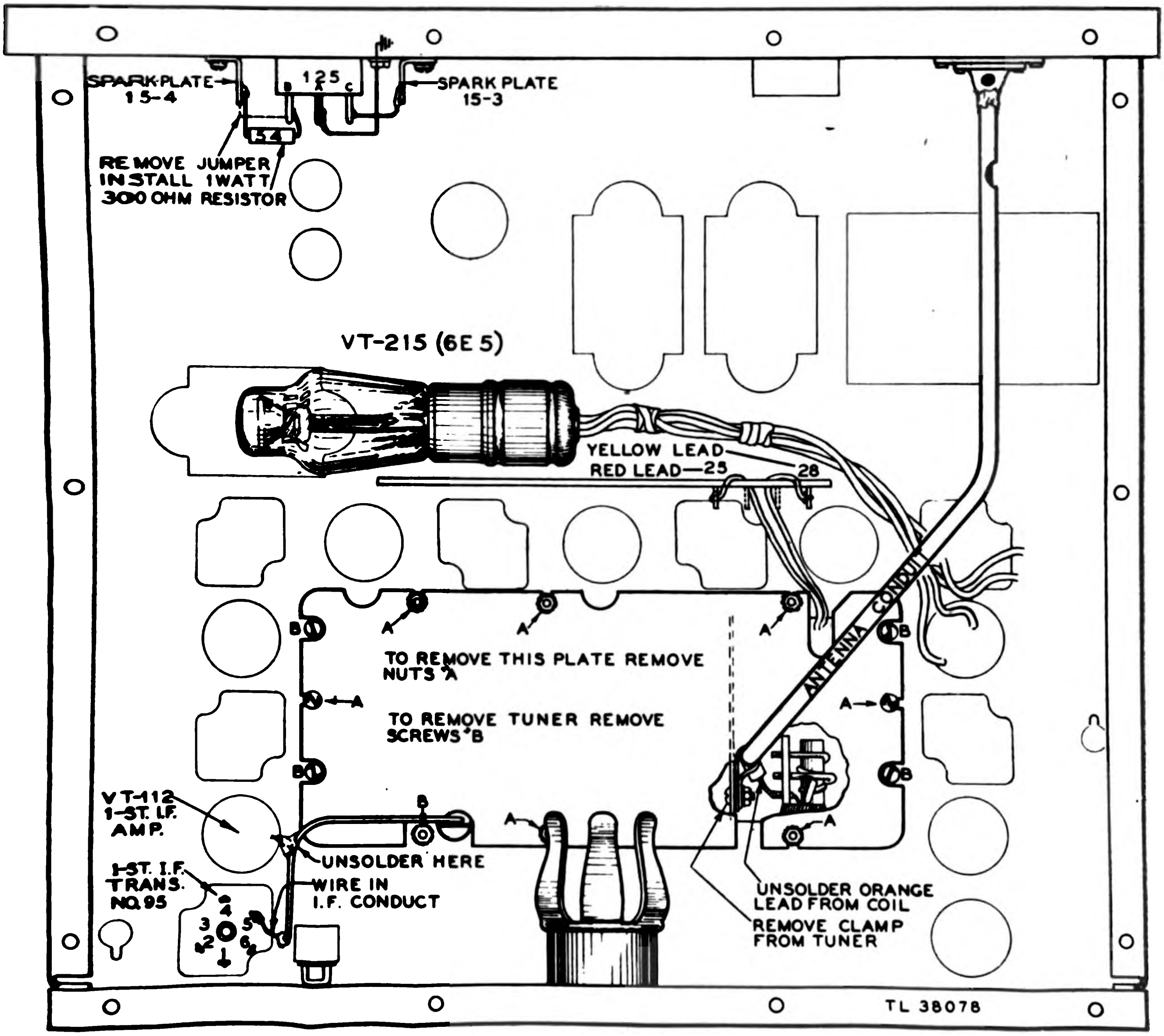
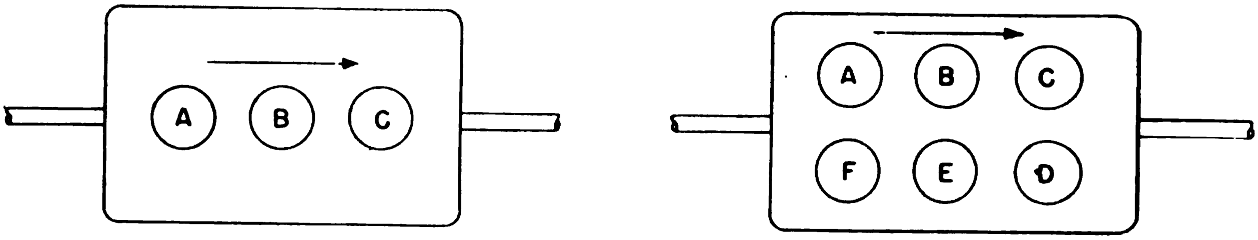


Figure 256. Method of replacing r-f tuning head.

CAPACITOR COLOR CODE



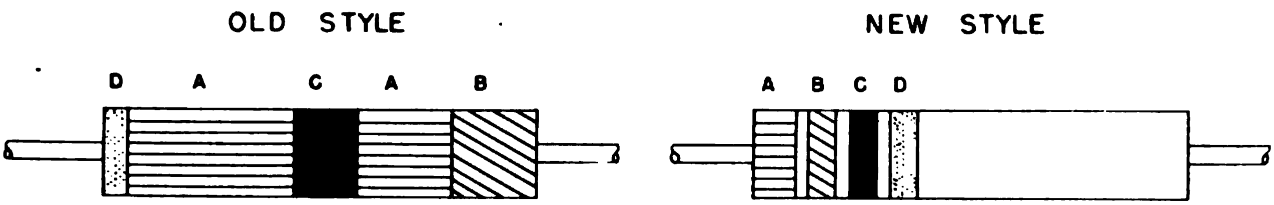
ONE ROW DOTS	COLOR	TWO ROWS OF DOTS
DOT A	INDICATES FIRST SIGNIFICANT FIGURE OF CAPACITANCE VALUE IN MICROMICROFARADS	DOT A
DOT B	INDICATES SECOND SIGNIFICANT FIGURE	DOT B
	INDICATES THIRD SIGNIFICANT FIGURE	DOT C
DOT C	INDICATES MULTIPLIER	DOT D
USUAL TOLERANCE ±20%	INDICATES TOLERANCE IN PER CENT OF 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 257. Color code, capacitor.

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 258. Color code, resistors.

PART Nº		QTY REQ'D	DESCRI	
1		9	CAPACITOR	10
2		1	CAPACITOR	56
3		1	CAPACITOR	35
4		1	CAPACITOR	.05
5		4	CAPACITOR	.05
6		1	CAPACITOR	.05
7		1	CAPACITOR	10
8		7	CAPACITOR	.1 MFD
9		2	CAPACITOR	.5 MFD
10		2	CAPACITOR A	.1
			B	.1
			C	.1
11		1	CAPACITOR A	.2
			B	.2
			C	.2
12		5	CAPACITOR A	8 MFD
			B	8 MFD
13		0	REPLACED IN CONVE	
14		1	RESISTOR	2
15-1		0	REPLACED IN CONVE	
15-2		1	RESISTOR	5
16		0	ELIMINATED IN CONVE	
17		1	RESISTOR	50
18		4	RESISTOR	10
19		5	RESISTOR	1
20		2	RESISTOR	5
21		2	RESISTOR	10
22		1	RESISTOR	15
23		2	RESISTOR	2
24		2	RESISTOR	4
25		1	RESISTOR	50
26		6	RESISTOR	10
27		2	RESISTOR	50
28		1	RESISTOR	1

MANUFACTURERS TYPE OR CATALOG Nº AS SPECIFIED BELOW OR EQUAL		ASSEMBLED AS DWG Nº	ITEM
INTERNATIONAL RESISTANCE CO.	TYPE BT-1	ES-D-8821	8
INTERNATIONAL RESISTANCE CO.	TYPE BT-2	ES-D-8811	60
INTERNATIONAL RESISTANCE CO.	TYPE BT-2	ES-D-8811	59
INTERNATIONAL RESISTANCE CO.	TYPE AB	ES-D-8811	58
INTERNATIONAL RESISTANCE CO.	TYPE AB	ES-D-8811	57
INTERNATIONAL RESISTANCE CO.	TYPE AB	ES-D-8811	56
CONTINENTAL CARBON CO.	TYPE H5	ES-D-8816	23
AS PER ES-D. 8821		ES-D-8821	5
INTERNATIONAL RESISTANCE CO.	TYPE 11-103	ES-D-8811	39
INTERNATIONAL RESISTANCE CO.	TYPE 11-129	ES-D-8816	14
INTERNATIONAL RESISTANCE CO.	TYPE 14-125	ES-D-8811	38
INTERNATIONAL RESISTANCE CO.	TYPE 11-120	ES-D-8816	15
ARROW HART & HEGEMAN CO.	TYPE 3392	ES-D-8816	16
KENYON TRANSFORMER CO.	TYPE S-13336	ES-D-8811	30
THORDARSON ELECTRIC MFG. CO.	TYPE 92-R-21	ES-D-8811	31
THORDARSON ELECTRIC MFG. CO.	TYPE 74-C-29	ES-D-8811	32
RUSSEL & STOLL CO.	TYPE 8141	ES-D-8811	36
RUSSEL & STOLL CO.	TYPE 8141	ES-D-8811	36
INTERNATIONAL RESISTANCE CO.	TYPE EP	ES-D-8811	55
AEROVOX CORP.	TYPE 1467	ES-D-8822	3
AS PER ES-D-8822		ES-D-8811	28
AS PER ES-D 8821		ES-D-8811	27
SOLAR MFG. CORP.			2
SOLAR MFG. CORP.		C-202-322	26
MICAMOLD		C-202-322	25
MICAMOLD		C-202-322	24
SOLAR MFG. CORP.	TYPE XS	C-202-322	12
ALLEN BRADLEY	TYPE GB		6
ALLEN BRADLEY	TYPE GB		5
ALLEN BRADLEY	TYPE GB		3
ALLEN BRADLEY	TYPE GB	C-202-322	23
ALLEN BRADLEY	TYPE GB	C-202-322	27
ALLEN BRADLEY	TYPE GB	C-202-322	22
AMERICAN PHENOLIC CORP.	TYPE AN-3102-24-684S	B-201-315	10
AS PER A-20-1283		B-201-315	7

TL42330

CHAPTER 4

MAINTENANCE PARTS LISTS

207. Index to Major Components of Radio Equipments RC–148 and RC–148–B

This index is a key to column 3 in the following pages.

Army type No.	Major item	Major item symbol
AN–128–A	Antenna	ANT
MC–295	Antenna Matching Section	AMS
	Cable & Connector Assembly	C&C
BC–1073–A	Interconnector Unit	CU
JB–22	Junction Box	JB–22
BC–412	Oscilloscope	O
BC–1068–A	Receiver	R
I–198–A	Signal Generator	SG
BC–1073–A	Wavemeter	WM

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
	1F6B1-3	CU	BRAID: flat rolled; 1/8"	0.8 ft	----	----	----	----	•
	1A1014	TR	BRAID: tinned copper	0.2 ft	----	----	----	----	•
	3E7144-11	TR	CABLE: high voltage bleeder; dwg No. A-14B-2556.	1	----	•	----	•	•
9006	3F3852H/C3	SG	CABLE: output; dwg No. 55A-213	1	----	----	----	----	•
Cable No. 106	3E1743	C&C	CABLE ASSEMBLY: antenna; dwg No. C-201-270.	1	----	•	----	•	•
Cable No. 110	3E1661	C&C	CABLE ASSEMBLY: auxiliary test; dwg No. C-201-350.	1	----	•	----	•	•
Cable No. 103	2F7091-21	C&C	CABLE ASSEMBLY: a-c power input; dwg No. C-201-265.	1	----	•	----	•	•
Cable No. 102	3E1744	C&C	CABLE ASSEMBLY: a-c to receiver; dwg No. C-201-266.	1	----	•	----	•	•
	3E7144-14	JB22	CABLE ASSEMBLY: junction box; dwg No. 205-354.	1	----	•	----	•	•
Cable No. 101	3E1720	C&C	CABLE ASSEMBLY: master; dwg No. D-201-263.	1	----	•	----	•	•
Cable No. 108	3E1680	C&C	CABLE ASSEMBLY: oscilloscope converter; dwg No. C-201-271.	1	----	•	----	•	•
Cable No. 109	3E1679	C&C	CABLE ASSEMBLY: power, frequency meter; dwg No. C-201-272.	1	----	•	----	•	•
	3E7144-12	TR	CABLE ASSEMBLY: plate, VT 119; dwg No. A-14B-2555.	1	----	•	----	•	•
Cable No. 107	3E1741	C&C	CABLE ASSEMBLY: r-f monitor; dwg No. C-201-267.	1	----	•	----	•	•
Cable No. 105	3E1748	C&C	CABLE ASSEMBLY: receiver antenna; dwg No. C-201-268.	1	----	•	----	•	•
Cable No. 104	3E1742	C&C	CABLE ASSEMBLY: transmitter antenna; dwg No. C-201-269.	1	----	•	----	•	•
	3E7144-13	WM	CABLE ASSEMBLY: "tuning eye"; dwg No. B-208-328.	1	----	•	----	•	•
	3E7144-15	SG	CORD: line; 6' shielded; dwg No. 14B-1900.	1	----	----	----	----	•
	3G2425-1	CU	WIRE: hyflex spaghetti; tubing; 5/32"		----	•	----	•	•
	1B1120.38	O	WIRE: stranded; 10 x 30; aeroglass; green.			•	----	----	•
	1B1120.11	O	WIRE: stranded; 10 x 30; aeroglass; black.		----	----	----	----	•
	1A812.12	ANT, AMS	WIRE: solid; tinned copper; No. 12	0.1 ft	----	----	----	----	•
	1A814.9	ANT	WIRE: solid; tinned copper; No. 14			----	----	----	•
	1A72	TR	WIRE: No. 16; solid; tinned copper	0.8 ft	----	----	----	----	•
	1B1116.6	TR	WIRE: stranded No. 16; aeroglass; black.	1.2 ft	----	----	----	----	•
	1A107	TR, R, CU, WM	WIRE: solid; tinned copper; No. 20	1.4 ft	----	----	----	----	•
	1B1120.24	TR, R, CU, O	WIRE: solid; No. 20; aeroglass; yellow.	2.88 ft	----	----	----	----	•
	1B1120.35	TR, R, CU, O	WIRE: solid; No. 20; aeroglass; black.	65 ft		•	----	----	•
	1B1120.3	TR, R, CU, WM	WIRE: solid; No. 20; aeroglass; white	4.66 ft	----	----	----	----	•
	1B1120.25	TR, RO, CU, WM	WIRE: solid; No. 20; aeroglass; red	8.6 ft	----	•	----	----	•
	1B1120.37	TR, RO, CU, WM	WIRE: solid; No. 20; aeroglass; brown.	5.7 ft	----	----	----	•	•
	1B1120.15	R, TR, CU, O	WIRE: solid; No. 20; aeroglass; green	3.35 ft	----	----	----	----	•
	1B1120.14	TR, RO, CU, WM	WIRE: solid; No. 20; aeroglass; orange	2.39 ft	----	----	----	----	•
	1B1120.23	TR, RO, CU, WM	WIRE: solid; No. 20; aeroglass; blue	4.56 ft	----	----	----	----	•
	1B1120.34	CU	WIRE: solid; No. 20; aeroglass; blue, yellow.			----	----	----	•
	1B1120.8	TR	WIRE: solid; No. 20; aeroglass; blue, green.	0.9 ft	----	----	----	----	•
	1B1120.16	TR, CU	WIRE: solid; No. 20; aeroglass; orange.	2.0 ft	----	•	----	•	•

• Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
	1B1120.9	TR, O	WIRE: solid; No. 20; aeroglass		----	----	----	----	*
	1B1120.10	TR	WIRE: solid; No. 20; aeroglass; red, brown.	0.90 ft	----	----	----	----	*
	1B1120.13	TR, CU	WIRE: solid; No. 20; aeroglass; red, black.	2.6 ft	----	*	----	*	*
	1B1120.6	TR	WIRE: solid; No. 20; aeroglass; red, blue.	0.7 ft	----	----	----	----	*
	1B1120.12	TR, CU, WM	WIRE: solid; No. 20; aeroglass; red, yellow.	1.3 ft	----	----	----	----	*
	1B1120.7	TR, O, WM	WIRE: solid; No. 20; aeroglass; red, green.	3.45 ft	----	*	----	*	*
	1B1120.39	TR	WIRE: solid; No. 20; aeroglass; 5,000-volt; test; white.			----	----	----	*
	1B1120.5	TR	WIRE: solid; No. 20; aeroglass; 5,000-volt; test; blue, yellow.	2 ft 10 in	----	*	----	*	*
	1B1120.4	TR	WIRE: solid; No. 20; aeroglass; 5,000-volt; test; brown.	1.2 ft	----	----	----	----	*
7–1, 7–2	3D9002–8	K	CAPACITOR: 2-mmf, ±12%; 500-volt; ceramic; dwg No. A–8G–1311.	2	----	*	*	*	*
8	3D9005–19.3	R	CAPACITOR: 5-mmf, ±10%, 500-volt; ceramic; dwg No. A–8G–23–3.	1	----	*	*	*	*
2	3D9010–40	R	CAPACITOR: 10-mmf, ±5%; 500-volt; ceramic; dwg No. A–8G–1309.	1	----	*	*	*	*
5–1, 5–2, 5–3	3D9010–15	R	CAPACITOR: 10-mmf, ±5%; 500-volt; ceramic; dwg No. A–8G–1830.	3	----	*	*	*	*
9	3D9010–37	WM	CAPACITOR: 10-mmf, ±10%; 500-volt; ceramic; dwg No. A–8G–2508.	1	----	*	*	*	*
1	3D9015–7	R	CAPACITOR: 15-mmf, ±10%; 500-volt; ceramic; dwg No. A–8G–2145.	1	----	*	*	*	*
6–1, 6–2, 6–3	3D9025–33	R	CAPACITOR: 25-mmf, ±10%; 500-volt; ceramic; dwg No. A–8G–1310.	3	----	*	*	*	*
51, 14	3D9025–24	O, CU	CAPACITOR: 25-mmf, ±40% –10%; 500-volt; mica; dwg No. B–8F–1551.	2	----	*	*	*	*
13	3D9035–6	TR	CAPACITOR: 35-mmf, ±10%; 500-volt; ceramic; dwg No. A–8G–1559.	1	----	*	*	*	*
4–1, 4–2	3D9040–13	WM	CAPACITOR: 40-mmf, ±5%; 500-volt; ceramic; dwg No. A–8G–752.	2	----	*	*	*	*
3–1 through 3–11	3D9040–14	R	CAPACITOR: 40-mmf, ±10%; 500-volt; ceramic; dwg No. A–8G–2305.	11	----	*	*	*	*
14–1, 14–2	3D9050–49	TR	CAPACITOR: 50-mmf, ±10%, 500-volt; ceramic; dwg No. A–8G–1557.	2	----	*	----	*	*
15	3D9050–33	TR	CAPACITOR: 50-mmf, ±10%; 500-volt; mica; dwg No. B–8F–1554.	1	----	*	*	*	*
7	3D9050–49.2	CU	CAPACITOR: 50-mmf, ±3%; 500-volt; mica; dwg No. B–8F–1593.	1	----	*	*	*	*
8024	3D9070–2	SG	CAPACITOR: 70-mmf, ±10%; 500-volt; mica; dwg No. B–8F–1877.	1	----	*	*	*	*
16	3D9100–65	TR	CAPACITOR: 100-mmf, ±10%; 500-volt; ceramic; dwg No. A–8G–1558.	1	----	*	*	*	*
9	3D9100–95.1	CU	CAPACITOR: 100-mmf, +40%, –10%; 500-volt; mica; dwg No. B–8F–1548.	1	----	*	*	*	*
16	3D9100–64	R	CAPACITOR: 100-mmf, ±10%; 500-volt; mica; dwg No. B–8F–1556.	1	----	*	*	*	*
4–1, 4–2	3D9100–65	R	CAPACITOR: 100-mmf, ±10%; ceramic; dwg No. A–86–2306.	2	----	*	*	*	*
2–1, 2–2 1–1 through 1–9	3D9100–63	WM O	CAPACITOR: 100-mmf, ±10%; 500-volt; mica; dwg No. B–8F–1560.	13	----	*	*	*	*
4–1, 4–2	TR								
8022	3D9100–45	SG	CAPACITOR: 100-mmf, ±20%; 500-volt; mica; dwg No. B–8F–1876.	1	----	*	*	*	*
5–1, 5–2	3D9180–1	CU	CAPACITOR: 180-mmf, ±3%; 500-volt; mica; dwg No. B–8F–1850.	2	----	*	*	*	*
6–1, 6–2 50	3D9250–27	CU O	CAPACITOR: 250-mmf, +40%, –10%; 500-volt; mica; dwg No. B–8F–1546.	3	----	*	*	*	*
16	3D9500–46	CU	CAPACITOR: 500-mmf, +40%, –10%; 500-volt; mica; dwg No. B–8F–1547.	1	----	*	*	*	*

*Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
1-1, 1-2	3DA1-50	TR	CAPACITOR: 1,000-mmf, ±10%; 500-volt; mica; dwg No. B-8F-985.	2	----	*	*	*	*
8	3DA1.100-2	CU	CAPACITOR: 1,100-mmf, ±8%; 500-volt; mica; dwg No. B-8F-1594.	1	----	*	*	*	*
10-1 through 10-6	3DA2-66	R	CAPACITOR: 2,000-mmf, ±10%; 500-volt; mica; dwg No. B-8F-1308.	6	----	*	*	*	*
15	3DA2-77	CU	CAPACITOR: 2,000-mmf, +40%, −10%; 500-volt; mica; dwg No. B-8F-1152.	1	----	*	*	*	*
54	3DA5-112	O	CAPACITOR: 5,000-mmf, ±10%; 500-volt; mica; dwg No. A-8L-1555.	1	----	*	*	*	*
9-1 through 9-17	3DA5-32	R	CAPACITOR: 5,000-mmf, ±10%; 500-volt; mica; dwg No. B-8F-512.	21	----	*	*	*	*
5-1 through 5-4		O							
11	3DA6-45	CU	CAPACITOR: 6,000-mmf, ±20%; 600-volt; paper; dwg No. A-8J-1851.	1	----	*	*	*	*
8036	3DA10-16	SG	CAPACITOR: 10,000-mmf, ±20%; 400-volt; paper; dwg No. 8D-1902.	1	----	*	*	*	*
4-1 through 4-12	3DA10-140	CU	CAPACITOR: 10,000-mmf, +30%, −10%; 400-volt; paper; dwg No. A-8J-1627.	13	----	*	*	*	*
52		O							
3-1, 3-2	3DA10-140	WM	CAPACITOR: 10,000-mmf, +30%, −10%; paper; dwg No. A-8J-696.	2	----	*	*	*	*
5	3DA50-42	WM	CAPACITOR: 50,000-mmf, ±10%; 400-volt; paper; dwg No. A-8J-1472.	1	----	*	*	*	*
8018	3DA100-274	SG	CAPACITOR: 100,000-mmf, ±20%; 200-volt; paper; dwg No. 8D-1903.	4	----	*	*	*	*
17, 53	3D277	TR, O	CAPACITOR: 100,000-mmf, ±10%; 400-volt; paper; dwg No. A-8J-909.	3	----	*	*	*	*
6		WM							
10-1 through 10-14, 12-1 through 12-5	3DA100-112	CU	CAPACITOR: 100,000-mmf, ±20%; 400-volt; paper; dwg No. A-8J-1626.	19	----	*	*	*	*
2A, 2B, 3A, 3B	3DA100-183.1	TR	CAPACITOR: 100,000-mmf, ±20%; 600-volt; paper; dwg No. A-8B-1255.	2	----	*	*	*	*
11	3DA100-173	TR	CAPACITOR: 100,000-mmf, +100%, −0%; 7,000-volt; paper; dwg No. B-8B-1170.	1	----	*	*	*	*
3A, 3B	3DA500-114.1	CU	CAPACITOR: 500,000 x 500,000-mmf, 400-volt; paper; dwg No. A-8B-1257.	1	----	*	*	*	*
2-1 through 2-3	3DB1.1104	CU	CAPACITOR: 1-mfd, +20%, −10%; 400-volt; paper; dwg No. A-8B-1104.	4	----	*	*	*	*
14		R							
12	3DB2.3044	TR	CAPACITOR: 2-mfd, +20%, −10%; 400-volt; paper; dwg No. A-8B-1254.	1	----	*	*	*	*
10-1 through 10-2	3DB2.3042	TR	CAPACITOR: 2-mfd, +20%, −10%; 1,000-volt; paper; dwg No. B-8B-1252.	2	----	*	*	*	*
1A, 1B, 1C	3DB5-26	CU	CAPACITOR: 2.5 x 2.5 x 5.0-mfd, +20%, −10%; 600-volt; paper; dwg No. C-8B-1256.	1	----	*	*	*	*
9-1 through 9-2	3DB4-87	TR	CAPACITOR: 4-mfd, +20%, −10%; 600-volt; paper; dwg No. B-8B-1253.	2	----	*	*	*	*
13-1 through 13-3	3DB7-2	R	CAPACITOR: 7-mfd, +30%, −10%; 600-volt; paper; dwg No. B-8C-1139.	3	----	*	*	*	*
8540	3DB8-18	SG	CAPACITOR: 8-mfd, 250-volt; electrolytic; dwg No. 8C-1882.	2	----	*	*	*	*
A-2046	3D9350V-6	SG	CAPACITOR: variable gang; dwg No. 8A-1891.	1	----	*	*	*	*
1	3D9012VE5-1	WM	CAPACITOR: 2.5-mmf, min, to 12.5-mmf, max; variable; dwg No. A-8H-1475.	1	----	*	----	*	*
91	3C302Q	R	COIL: antenna assembly; dwg No. B-204-214.	1	----	*	----	*	*
91, 92	3C323-4M	WM	COIL: assembly, choke; dwg No. A-201-329.	2	----	*	----	*	*
121A, 121B	3C323-4K	CU	COIL: choke; dwg No. C-16B-1317	1	----	*	----	*	*
94	3C323-4C	R	COIL: choke; cathode; dwg No. A-17A-1194.	1	----	*	----	*	*

*Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
102	3C323-4A	R	COIL: choke; filter; dwg No. B-16B-1137.	1		*		*	*
135A, 135B	3C323-4N	TR	COIL: choke; filter; dwg No. C-16B-1161.	1		*		*	*
1012	3C323-68A	SG	COIL: choke; filter; dwg No. 16B-1881.	1		*		*	*
100-1 through 100-6	3C323-4B	R	COIL: choke; heater; dwg No. A-17A-1195.	6		*		*	*
120-1, 120-2	3C323-4L	CU	COIL: R-f choke; dwg No. A-13C-1542.	2		*		*	*
93	3C1081-12E	R	COIL: oscillator; dwg No. B-204-213.	1		*		*	*
90	3C1081-12A	WM	COIL: oscillator; dwg No. B-3N-1482.	1		*		*	*
92-1, 92-2	2C3648B/C1	R	COIL: R-f and detector; dwg No. B-204-212.	2		*		*	*
1024	2C3648B/C3	SG	COIL: R-f oscillator; induc; dwg No. 13C-1899.	1		*		*	*
99	2Z9643	R	COIL: tuning indicator; dwg No. B-13H-1135.	1		*		*	*
A-2015	3Z1891-3	SG	FILTER: R-f line; dwg No. 13C-1887.	1		*		*	*
	6Z3151/1	TR	CONNECTOR: dwg No. A-55A-2301.	1		*			*
Cable No. 108	6Z7565F	C&C	CONNECTOR: bushing type; dwg No. A-55A-1514-1.	1					*
Cable No. 101D	6Z7565F	C&C	CONNECTOR: bushing type; dwg No. A-55A-1514-2.	1					*
	2Z8673.51	ANT, AMS	CONNECTOR: plug; type AN-3106W-22-6S; dwg No. A-55A-1630.	1		*			*
Cable No. 103	2Z7112.42	C&C	CONNECTOR: plug; type AN-3106W-22-8P; dwg No. A-55A-1695.	1					*
Cable No. 109	2Z7226-Q175	C&C	CONNECTOR: plug; type AN-3106-12S-3S; dwg No. C-55A-1675.	1					*
Cable No. 109	2Z7112-16	C&C	CONNECTOR: plug; type AN-3106-12S-3P; dwg No. C-55A-1678.	1					*
Cable No. 101	2Z8685-5	C&C	CONNECTOR: plug; type AN-3108W-48-1S; dwg No. C-55A-1686.	1					*
Cable No. 104 No. 101A	2Z7112.1/3	C&C	CONNECTOR: plug; type AN-3106W-22-1P; dwg No. C-55A-1688.	2					*
Cable No. 101B	2Z7226-Q262	C&C	CONNECTOR: plug; type AN-3108W-24-3P; dwg No. C-55A-1689.	1					*
Cable No. 108 No. 101C	2Z7122.25	C&C	CONNECTOR: plug; type AN-3106W-24-684P; dwg No. C-55A-1690.	2					*
Cable No. 101E	2ZK7113.10	C&C	CONNECTOR: plug; type AN-3106W-20-6P; dwg No. C-55A-1691.	1					*
Cable No. 102	2Z8672.56	C&C	CONNECTOR: plug; type AN-3106W-22-11S; dwg No. C-55A-1692.	1					*
Cable No. 102	2Z7112.49	C&C	CONNECTOR: plug; type AN-3108W-22-11P; dwg No. C-55A-1693.	1					*
Cable No. 103	2Z8672.59	C&C	CONNECTOR: plug; type AN-3108W-22-8S; dwg No. C-55A-1694.	1					*
Cable No. 105	2Z7115.13	C&C	CONNECTOR: plug; type AN-3106W-22-2P; dwg No. C-55A-1696.	2					*
Cable No. 6	2Z7113.40	C&C	CONNECTOR: plug; type AN-3106W-22-6P; dwg No. C-55A-1698.	2					*
	2Z7113.45	C&C	CONNECTOR: plug; type AN-3106W-22-2P; dwg No. C-55A-1697.	1					*
Cable No. 107	2Z7112.39	C&C	CONNECTOR: plug; type AN-3108W-20-5P; dwg No. C-55A-1699.	1					*
Cable No. 107	2ZK7112.3	C&C	CONNECTOR: plug; type AN-3108W-20-5S; dwg No. C-55A-1700.	1					*
106	2Z8672.10	CU	CONNECTOR: receptacle; type AN-3102G-12S-3S; dwg No. A-55A-1749.	1		*			*
124	2Z8799-155	WM	CONNECTOR: receptacle; type AN-3102-12S-3P; dwg No. A-55A-1750.	1		*			*
61	2Z8682.16	Scope	CONNECTOR: receptacle; type AN-3102-24-684S; dwg No. 12A-55A-1808.	1		*			*
107	2Z8799-242	TR	CONNECTOR: receptacle; type AN-3102-24-3S; dwg No. A-55A-1273.	1		*			*
109	2Z8672.15	TR	CONNECTOR: receptacle; type AN-3102-22-115; dwg No. A-55A-1274.	1		*			*

*Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
108	2Z7112.6	TR	CONNECTOR: receptacle; type AN-3102-22-8P; dwg No. A-55A-1275.	1		*			*
	6Z7798-2	CU	CONNECTOR: receptacle; type AN-3102-22-11P; dwg No. A-55A-1527.	1		*			*
125	6Z7798-3	WM	CONNECTOR: receptacle; type AN-3102G-20-5P; dwg No. A-55A-1529.	1		*		*	*
105	2Z8673.1	TR, AMS	CONNECTOR: receptacle; 1 11/16" long; type AN-3102-22-2S; dwg No. A-55A-1588.	1		*			*
125	2Z8673.2	R	CONNECTOR: receptacle; type AN-3102-20-6S; dwg No. A-55A-1106.	1		*			*
123	2Z8673-1	R, AMS	CONNECTOR: receptacle; type AN-3102-22-2S; 1¾" long; dwg No. A-55A-1107.	2		*			*
124	2Z8672.1	R	CONNECTOR: receptacle; type AN-3102-22-11P; dwg No. A-55A-1108.	1		*			*
106	2ZK8672.19	TR	CONNECTOR: receptacle; type AN-3102-20-5S; dwg No. A-55A-1272.	1		*			*
For Cable 101 A	2Z8672.20	JB22	CONNECTOR: receptacle; type AN-3102-22-1S; dwg No. A-55A-1704.	1		*			*
For Cable 103	2Z8672.11	JB22	CONNECTOR: receptacle; type AN-3102-22-8S; dwg No. A-55A-1703.	1		*			*
129-1, 129-2	2Z5531.2	R	JACK: "closed circuit"; type J307; dwg No. A-44B-1314.	2		*			*
5019	6F7574-4	SG	PLUG: 115-volt; fused; dwg No. 19A-1901.	1		*			*
5032	2Z7111.58	SG	PLUG: midget phone; dwg No. 19B-1884.	1		*			*
	6Z7813-3	TR	RECEPTACLE: dwg No. A-55A-1288.	1		*			*
	2A215A	AMS	ANTENNA: matching sec.; type MC-295-A.	1					*
	2C680-73A	CU	CONTROL UNIT BC-1073-A	1	*				*
	2C5066-1068A	R	RECEIVER BC-1068-A	1	*				*
	3F3900-198A	SG	SIGNAL GENERATOR I-198-A	1					*
	2C6596-1072A	TR	TRANSMITTER BC-1072-A	1	*				*
	3G1350-67	AMS	INSULATOR ASSEMBLY: micalex; 4 holes; dwg NoA. -208-313.			*	*	*	*
	3G1839-17	AMS	INSULATOR & STUD ASSEMBLY: dwg No. A-202-326.			*	*	*	*
	3G1838-36.4	TR, CU, WM	INSULATOR: 0.015" black bakelite; 2 holes; dwg No. A-7A-1282.			*	*	*	*
	3G1838-70	CU	INSULATOR: 0.015"; black bakelite; 10 holes; dwg No. A-7A-1432.			*	*	*	*
	3G1780-89	C&C	INSULATOR: fish paper; dwg No. A-41C-2505.			*	*	*	*
	3G1838-37.3	O	INSULATOR: spark plate; bakelite; dwg No. A-7A-1714.			*	*	*	*
	3G1838-36.2	TR	INSULATOR: socket support; 2.25" square; dwg No. A-7A-1844.	1		*	*	*	*
	3G1000-11.1	TR	INSULATOR: stand-off; ultra steatite; 3 holes; dwg No. A-5F-1122.	2		*	*	*	*
	3G1838-8.2	WM	INSULATOR: transmission line; dwg No. A-6C-1535.	10		*	*	*	*
	3G1838-27.4	TR, WM	INSULATOR: 0.015" thick; bakelite; 2 holes; dwg No. A-7A-1188.			*	*	*	*
	3G1250-10.4	TR	INSULATOR: ultra steatite; cylindrical piece; dwg No. A-5F-1120.	17		*	*	*	*
	3G1250-16.13	TR	INSULATOR: ultra steatite; cylindrical; dwg No. A-5F-1121.	2		*	*	*	*
	3G1837-20.1	TR	INSULATING CAP: dwg No. A-5G-1154.	1		*	*	*	*
	3G2300-126	TR	INSULATING TUBE: dwg No. A-5G-1093.	4		*	*	*	*
113, 109	6Z6820-3	TR, CU	BULB: dial-light; 120-volt; 3-watt; GE type S-6; dwg No. A-46A-1622.	2	*	*			*
126-1 to 126-2	2Z5927	R	BULB: meter-light; 6-8-volt; GE; dwg No. A-46A-1621.	2	*	*			*
	2Z5884	DA	BULB: neon; ¼-watt; 115-125-volt; GE type T3; dwg No. A-46A-1788.	1		*	*		*
108, 126, 112	2Z5927	CU, WM, TR	BULB: 6-8-volt; No. T-44; dwg No. A-46A-314; tungsol.	3	*	*			*

*Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
7005	3Z1926 or 3Z260113	SG	FUSE: 1-amp; Littel fuse type No. 3AG; dwg No. 46B–1897.	1	*	*	*	*	*
135, 135	3Z26032	R, CU	FUSE: 3-amp; 250-volt; Littel fuse type No. AG; dwg No. A–46B–1287.	2	*	*	*	*	*
141–1 to 141–2	3Z2605.2	TR	FUSE: 5-amp; 250-volt; Littel fuse type No. 3AG; dwg No. A–46B–1109.	2	*	*	*	*	*
	2Z5884–9	TR	JEWEL & BRACKET ASSEMBLY: dwg No. A–55A–1267.	1	----	*	----	----	*
	2Z5991	CU	JEWEL: indicator and bracket; dwg No. A–55A–1526; type No. 50.	1	----	*	----	----	*
1	2A275–128A	A	ANTENNA & JUNCTION BOX ASSEMBLY: Ant. AN–128–A.	----	----	----	----	----	*
1	2C6596–1160/A1	TR	ARTIFICIAL LINE ASSEMBLY: dwg No. B–203–248.	----	----	*	----	*	*
1	2Z3196–18	TR	CONTACT L H ASSEMBLY: stationary; dwg No. A–208–506.	----	----	*	*	*	*
1	2Z5821–28	WM	KNOB ASSEMBLY: tuning, knurled; dwg No. A–200–301.	----	----	*	----	----	*
1	2Z6726–12	TR	LEAF ASSEMBLY: dwg No. A–208–505.	----	----	*	*	*	*
	2Z7857–12	WM	LOOP MOUNTING PLATE ASSEMBLY: dwg No. A–201–283.	----	----	*	----	*	*
1	2Z1230–358	A	MOUNTING BRACKET L H ASSEMBLY: No. F T 358; dwg No. 202–315.	----	----	----	----	----	*
1	2Z1230–358	A	MOUNTING BRACKET R H ASSEMBLY: No. F T 358; dwg No. 202–316.	----	----	----	----	----	*
2	4G1670A/K1	O	SCOPE CONVERSION KIT: dwg No. 205–342.	1	----	----	----	----	*
	2Z8203–12	TR	SHAFT ASSEMBLY: flexible; dwg No. A–201–239.	----	----	*	----	*	*
	2Z11153	R	SLUG: driver assembly; dwg No. A–200–216.	----	----	*	----	*	*
1	2Z6721–348	TR	TRANSMITTER SHOCK MOUNTING ASSEMBLY: No. F T 348; dwg No. D–202–334.	----	----	*	----	----	*
1	2Z8636–10	R	TUNING EYE ASSEMBLY: dwg No. A–55A–1102.	----	----	*	----	----	*
	2Z11152	R	TUNING SLUG ASSEMBLY: dwg No. A–200–217.	----	----	*	----	*	*
138	2Z7599–50	TR	RELAY: complete; overload; No. B–4500; dwg No. B–45A–1077.	1	----	*	*	*	*
139	2Z7588–28	TR	RELAY: DPDT; diode; 6.3-volt; 1-amp; No. SPA–5; dwg No. B–45A–982.	1	----	*	*	*	*
114	3Z9845–11	CU	SWITCH: "AC"; dwg No. A–20C–1525.	1	----	*	*	*	*
127	3Z9858–6	WM	SWITCH: "Align"; SPST; No. 20994 KD; dwg No. A–20C–1564.	1	----	*	*	*	*
4008	3Z9903–10	SG	SWITCH: attenuator multi; No. 8910–H1; dwg No. 20A–1892.	1	----	*	*	*	*
117	3H900–15–13	TR	SWITCH: "Circuit Breaker"; SPST; 115-volt a-c; PO–311; dwg No. B–20C–1094.	1	----	*	*	*	*
114–1 through 114–3, 115	3Z9849.10	TR	SWITCH: CH–8280; dwg No. A–20C–1263.	4	----	*	*	*	*
128	3Z9812–5	R	SWITCH: dial-light; No. 8907K–19; dwg No. A–20C–1097.	1	----	*	*	*	*
118–1 through 118–4	3Z9825–68.5	TR	SWITCH: interlock; SPST; No. 8907K–19; dwg No. A–20C–1271.	4	----	*	*	*	*
	3Z9849.53	TR	SWITCH: "Meter"; toggle; SPDT; No. 8802; dwg No. A–20C–1266.	1	----	*	*	*	*
127	3Z9849.22	R	SWITCH: "On-off"; SPST; No. 8825; dwg No. A–20C–1146.	1	----	*	*	*	*
128	3Z9858–7	WM	SWITCH: "Power"; DPST; No. 20–902–EY; dwg No. A–20C–303–1.	1	----	*	*	*	*
116	3Z9849.52	TR	SWITCH: "Relay Reset"; No. 8905K–604; dwg No. A–20C–1265.	1	----	*	*	*	*
115	3Z9849.34	CU	SWITCH: relay; SPST; No. 8817K–2; dwg No. A–20C–1524.	1	----	*	*	*	*
112A, 112B, 112C, 112D	3Z9825–58.24	CU	SWITCH: selector; 5-position; 2-deck; type H; dwg No. G–20A–1289.	1	----	*	*	*	*

*Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
113A, 113B, 113C	3Z9825-58.25	CU	SWITCH: "Test"; 7-position; 2-deck; type H; dwg No. B-20A-1290.	1	----	*	*	*	*
4033	3Z9858-8.1	SG	SWITCH: toggle; SPST; No. 20994; dwg No. 20C-1896.	1	----	*	*	*	*
3020	2Z7267.18	SG	POTENTIOMETER: 250-ohm, ±10%; radiohm type CR; Belmont; dwg No. A-10B-1893.	1	----	*	----	----	*
95	2Z7299M3.5	CU	POTENTIOMETER: 3,500-ohm; carbon; 2-watt; type J; dwg No. A-10B-1356.	1	----	*	*	*	*
94	2Z7292-10M	CU	POTENTIOMETER: 10,000-ohm; carbon; 2-watt; type J; dwg No. A-10B-1355.	1	----	*	*	*	*
60	2Z7269.95	TR	POTENTIOMETER: 10,000-ohm; carbon; 2-watt; type J; dwg No. A-10A-1268.	1	----	*	*	*	*
93	2Z7288-3	CU	POTENTIOMETER: 50,000-ohm; carbon; 2-watt; type J; dwg No. A-10B-1354.	1	----	*	*	*	*
63	2Z7270.98	WM	POTENTIOMETER: 50,000-ohm; carbon; 2-watt; type J; dwg No. A-10B-1353.	1	----	*	*	*	*
96	2Z7273-50	CU	POTENTIOMETER: 1-megohm; with switch; DPDT stack-pole; type LP-SS-3; dwg No. B-10A-1357.	1	----	*	*	*	*
73	3Z5997-5	TR	RESISTOR: 7.8-ohm, ±2%; 5-watt; wire-wound; dwg No. A-9C-1618.	1	----	*	*	*	*
55-1, 55-2	3Z6006H4	R	RESISTOR: 68-ohm, ±10%; ½-watt; dwg No. A-9B1-48.	2	----	*	*	*	*
	3RC10AE750K	SG	RESISTOR: 75-ohm, ±10%; ¼-watt; dwg No. A-9B5-1907.	1	----	*	*	*	*
55	3Z6007E5-14	O	RESISTOR: 75-ohm, ±10%; 1-watt; dwg No. A-9B2-1800.	1	----	*	*	*	*
65-1, 65-2	3Z6010-57	TR	RESISTOR: 100-ohm, ±20%; ½-watt; dwg No. A-9B1-7.	2	----	*	*	*	*
71	3Z6010-88	TR	RESISTOR: 100-ohm, ±20%; 1-watt; dwg No. A-9B2-7.	1	----	*	*	*	*
3035	3Z6090-12	SG	RESISTOR: 100-900-ohm, ±10%; ¾-watt per inch; wire-wound; dwg No. 9D-1894.	2	----	*	*	*	*
3036	3Z6175-1	SG	RESISTOR: 100-1,750-ohm, ±10%; ¾-watt per inch; wire-wound; dwg No. 9D-1895.	1	----	*	*	*	*
56-1 through 56-3	3Z6015-11	R	RESISTOR: 150-ohm, ±10%; ½-watt; dwg No. A-9B1-52.	3	----	*	*	*	*
57-1 through 57-4	3Z6020-32	R	RESISTOR: 200-ohm, ±10%; ½-watt; dwg No. A-9B1-1931.	4	----	*	*	*	*
	3Z6020-67	DA	RESISTOR: 200-ohm, ±20%; 1-watt; dwg No. A-9B1-1780.	2	----	*	*	*	*
55	3Z6022-9	TR	RESISTOR: 220-ohm, ±10%; ½-watt; dwg No. A-9B1-54.	1	----	*	*	*	*
83	3Z6020-30	CU	RESISTOR: 220-ohm, ±20%; 1-watt; dwg No. A-9B2-9.	1	----	*	*	*	*
58	3Z6047-1	R	RESISTOR: 470-ohm, ±10%; ½-watt; dwg No. A-9B1-58.	1	----	*	*	*	*
56	3ZK6047-12	R, O	RESISTOR: 470-ohm, ±10%; 1-watt; dwg No. A-9B2-58.	1	----	*	*	*	*
3007	3Z6050-16	SG	RESISTOR: 500-ohm, ±10%; ¼-watt; dwg No. 9B5-1906.	1	----	*	*	*	*
3013	3Z6100-81	SG	RESISTOR: 1,000-ohm, ±10%; ½-watt; dwg No. 9B5-1905.	2	----	*	*	*	*
79	3Z6100-75	CU	RESISTOR: 1,000-ohm, ±20%; ½-watt; dwg No. A-9B1-13.	1	----	*	*	*	*
68 57-1, 57-2, 75	3Z6100-80	R O TR	RESISTOR: 1,000-ohm, ±10%; 1-watt; dwg No. A-9B2-62.	4	----	*	*	*	*
66	3Z6150-25	CU	RESISTOR: 1,500-ohm, ±20%; ½-watt; dwg No. A-9B1-14.	1	----	*	*	*	*
56	3Z6200-1	WM	RESISTOR: 2,000-ohm, ±5%; ½-watt; dwg No. A-9B1-166.	1	----	*	*	*	*
77	3Z6620-3	TR	RESISTOR: 2,200 ohm, ±10%; ½-watt; dwg No. A-9B1-66.	1	----	*	*	*	*

*Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depo stock
59 62-1, 62-2	3Z6220-10	TR CU	RESISTOR; 2,200-ohm, ±20% ½-watt; dwg No. A-9B1-15.	3	----	*	*	*	*
69-1 through 69-8, 58	3Z6220-12	R O	RESISTOR: 2,200-ohm, ±10%; 1-watt; dwg No. A-9B2-66.	9	----	*	*	*	*
63	3Z6330-11	CU	RESISTOR: 3,300-ohm, ±5%; ½-watt; dwg No. A-9B1-171.	1	----	*	*	*	*
56	3Z6330-12	TR	RESISTOR: 3,300-ohm, ±20%; ½-watt; dwg No. A-9B1-16.	1	----	*	*	*	*
70-1 through 70-12, 71-1 71-2	3Z6330-13 3Z6330-14	R	RESISTOR: 3,300-ohm, ±10%; 1-watt; dwg No. A9-B2-68.	14	----	*	*	*	*
91	3Z6390-3	CU	RESISTOR: 3,900-ohm, ±10%; ½-watt; dwg No. A-9B1-69.	1	----	*	*	*	*
61-1, 61-2	3Z6390-4	CU	RESISTOR: 3,900-ohm, ±20%; ½-watt; dwg No. A-9B1-1758.	2	----	*	*	*	*
67-1, 67-2 58-1, 58-2	3Z6470-14	CU TR	RESISTOR: 4,700-ohm, ±20%; ½-watt; dwg No. A-9B1-17.	4	----	*	*	*	*
64-1, 64-2	3Z6470-4	TR	RESISTOR: 4,700-ohm, ±10%; ½-watt; dwg No. A-9B1-70.	2	----	*	*	*	*
72-1, 72-2	3Z6470-17	R	RESISTOR: 4,700-ohm, ±10%; 1-watt; dwg No. A-9B2-70.	2	----	*	*	*	*
84	3Z6470-15	CU	RESISTOR: 4,700-ohm, ±20%; 1-watt; dwg No. A-9B2-17.	1	----	*	*	*	*
70	3Z6470-20	TR	RESISTOR: 4,700-ohm, ±10%; 5-watt; wire-wound; dwg No. A-9C-1680.	1	----	*	*	*	*
60	3Z6568-3	R	RESISTOR: 6,800-ohm, ±5%; ½-watt; dwg No. A-9B1-179.	1	----	*	*	*	*
59	3ZF4026	CU, WM	RESISTOR: 6,800-ohm, ±10%; ½-watt; dwg No. A-9B1-72	1	----	*	*	*	*
68-1 through 68-4	3Z6568-11	CU	RESISTOR: 6,800-ohm, ±20%; ½-watt; dwg No. A-9B1-18.	4	----	*	*	*	*
73-1, 73-2	3Z6568-10	R	RESISTOR: 6,800-ohm, ±10%; 1-watt; dwg No. A-9B2-72.	2	----	*	*	*	*
88	3Z6582-5	CU	RESISTOR: 8,200-ohm, ±20%; 1-watt dwg No. A-9B2-1759.	1	----	*	*	*	*
62-1, 62-2	3Z6610-57	R	RESISTOR: 10,000-ohm, ±10%; ½-watt; dwg No. A-9B1-74.	2	----	*	*	*	*
69-1 through 69-5 58 57-1, 57-2	3Z6610-73	CU WM TR	RESISTOR: 10,000-ohm, ±20%; ½-watt; dwg No. A-9B1-19.	8	----	*	*	*	*
59	3Z6610-11	O	RESISTOR: 10,000-ohm, ±10%; 1-watt; dwg No. A-9B2-74.	1	----	*	*	*	*
66	3Z6120-11	TR	RESISTOR: 12,000-ohm, ±10%; 2-watt; dwg No. A-9B4-75.	1	----	*	*	*	*
70-1, 70-2	3Z6615-26	CU	RESISTOR: 15,000-ohm, ±10%; ½-watt; dwg No. A-9B1-76.	2	----	*	*	*	*
57-1 through 57-3 62	3Z6615-41	CU TR	RESISTOR: 15,000-ohm, ±20%; ½-watt; dwg No. A-9B1-20.	4	----	*	*	*	*
60 55 64	3Z6622-10	CU WM R	RESISTOR: 22,000-ohm, ±10%; ½ watt; dwg No. A-9B1-78.	3	----	*	*	*	*
72 63	3Z6622-13	CU TR	RESISTOR: 22,000-ohm, ±20%; ½-watt; dwg No. A-9B1-21.	2	----	*	*	*	*
81 62 74-1 through 74-3	3Z6622-11	CU WM	RESISTOR: 22,000-ohm, ±10%; 1-watt; dwg No. A-9B2-78.	5	----	*	*	*	*
70-1 through 70-4	3Z6622-12	CU	RESISTOR: 22,000-ohm, ±20%; 1-watt; dwg No. A-9B2-21.	4	----	*	*	*	*
97-1, 97-2	3Z6622-23	CU	RESISTOR: 22,000-ohm, ±5%; 5-watt; wire-wound; dwg No. A-9B-1530.	2	----	*	*	*	*
	3Z4557	SG	RESISTOR: 25,000-ohm, ±10%; ½-watt; dwg No. 9C-1904.	1	----	*	*	*	*
61-1 through 61-4	3Z6625-39	TR	RESISTOR: 25,000-ohm, ±10%; 2-watt; dwg No. A-9B4-1846.	4	----	*	*	*	*
67	3Z6630-23	TR	RESISTOR: 30,000-ohm, ±20%; 2-watt; dwg No. A-9B4-1845.	1	----	*	*	*	*

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Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
75–1, 75–2	3Z6633–9	R	RESISTOR: 33,000-ohm, ±10%; 1-watt; dwg No. A–9B2–80.	2	----	*	*	*	*
87–1 through 87–4	3Z6633–8	CU WM	RESISTOR: 33,000-ohm, ±20%; 1-watt; dwg No. A–9B2–22.	4	----	*	*	*	*
65 85–1	3Z6647–5	R CU	RESISTOR: 47,000-ohm, ±10%; ½-watt; dwg No. A–9B1–82.	3	----	*	*	*	*
68	3Z6650–85	TR	RESISTOR: 50,000-ohm, ±10%; 8-watt, wire-wound; dwg No. A–9C–1592.	1	----	*	*	*	*
59–1, 59–2	3Z6656–7	CU	RESISTOR: 56,000-ohm, ±20%; 1-watt; dwg No. A–9B2–1760.	2	----	*	*	*	*
92	3Z6668–9	CU	RESISTOR: 68,000-ohm, ±20%; ½-watt; dwg No. A–9B1–24.	1	----	*	*	*	*
90 66–1 through 66–6	3Z6700–44	CU R	RESISTOR: 100,000-ohm, ±10%; ½-watt; dwg No. A–9B1–86.	7	----	*	*	*	*
65–1 through 65–5	3Z6700–71	CU	RESISTOR: 100,000-ohm, ±20%; ½-watt; dwg No. A–9B1–25.	5	----	*	*	*	*
56–1 through 56–4 60–1, 60–2	3Z6700–74	CU O	RESISTOR: 100,000-ohm, ±20%; 1-watt; dwg No. A–9B2–25.	6	----	*	*	*	*
77	3Z6700–79	R	RESISTOR: 100,000-ohm, ±15%; 2-watt; dwg No. A–9B4–2304.	1	----	*	*	*	*
73	3Z6715–24	CU	RESISTOR: 150,000-ohm, ±10%; ½-watt; dwg No. A–9B1–88.	1	----	*	*	*	*
98–1, 98–2	3Z6622–14	CU	RESISTOR: 220,000-ohm, ±5%; ½ watt; dwg No. A–9B1–215.	2	----	*	*	*	*
64 76	3Z6722–5	CU TR	RESISTOR: 220,000-ohm, ±10%; ½-watt; dwg No. A–9B1–90.	2	----	*	*	*	*
82–1 through 82–4	3Z6722–13	CU	RESISTOR: 220,000-ohm, ±20%; ½-watt; dwg No. A–9B1–27.	4	----	*	*	*	*
58	3Z6722–15 3Z6722–6	CU	RESISTOR: 220,000-ohm, ±10%; 1-watt; dwg No. A–9B2–90.	1	----	*	*	*	*
80	3Z6722–14	CU	RESISTOR: 220,000-ohm, ±20%; 1-watt; dwg No. A–9B2–27.	1	----	*	*	*	*
89	3Z6733–8	CU	RESISTOR: 330,000-ohm, ±20%; ½-watt; dwg No. A–9B1–28.	1	----	*	*	*	*
74	3Z6747–4	CU	RESISTOR: 470,000-ohm, ±10%; ½-watt; dwg No. A–9B1–94.	1	----	*	*	*	*
55–1 through 55–4	3Z6747–15	CU	RESISTOR: 470,000-ohm, ±20%; ½-watt; dwg No. A–9B1–29.	4	----	*	*	*	*
60	3RC20BE504K	WM	RESISTOR: 500,000-ohm, ±10%; ½-watt; dwg No. A–9B1–1473.	1	----	*	*	*	*
86	3RC20BE514J	CU	RESISTOR: 510,000-ohm, ±5%; ½-watt; dwg No. A–9B1–224.	1	----	*	*	*	*
74	3RC21AE684K	TR	RESISTOR: 680,000-ohm, ±10%; ½-watt; dwg No. A–9B1–96.	1	----	*	*	*	*
75	3RC20BE684M	CU	RESISTOR: 680,000-ohm, ±20%; ½-watt; dwg No. A–9B1–30.	1	----	*	*	*	*
72–1, 72–6	3RC40AE824K	TR	RESISTOR: 833,000-ohm, ±10%; 2-watt; dwg No. A–9B4–1908.	6	----	*	*	*	*
57, 67–1 through 67–3	3RC20AE105K	WM	RESISTOR: 1-megohm, ±10%; ½-watt; dwg No. A–9B1–98.	4	----	*	*	*	*
76–1 through 76–6	3RC20BE105M	CU	RESISTOR: 1-megohm, ±20%; ½-watt; dwg No. A–9B1–31.	6	----	*	*	*	*
77–1, 77–2	3RC20BE155M	CU	RESISTOR: 1.5-megohm, ±20%; ½-watt; dwg No. A–9B1–32.	2	----	*	*	*	*
78–1 through 78–3	3RC20BE225M	CU	RESISTOR: 2.2-megohm, ±20%; ½-watt; dwg No. A–9B1–33.	3	----	*	*	*	*
	2Z8762.1	TR	SOCKET: ceramic; 4-prong; RSS–4; dwg No. A–15A–1848.	----	----	*	*	*	*
	2Z8763.4	TR	SOCKET: ceramic; 5-prong; RSS–5; dwg No. A–15A–1166.	----	----	*	*	*	*
	2Z8676.71	SG	SOCKET: 5-prong; dwg No. 15B–1885	----	----	*	*	*	*
	2Z8687	SG	SOCKET: 6-prong; dwg No. 15B–1886	----	----	*	*	*	*
	2ZF4222	TR	SOCKET: ceramic; 7-prong; dwg No. A–15A–1123.	----	----	*	*	*	*
	2Z8677.5	TR, R, WM	SOCKET: 8 contacts; dwg No. A–15C–1041.	----	----	*	*	*	*
	2Z8678.20	TR, R	SOCKET: ceramic; 8-prong; dwg No. A–15A–1040.	----	----	*	*	*	*

*Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
	2Z8795.10	TR	SOCKET: ceramic; 8-prong; RSS-8; dwg No. A-15A-1651.			*	*	*	*
	2Z8678.93	R	SOCKET: 8-prong; mica-filled; dwg No. A-15B-1142.			*	*	*	*
	2Z8650.5	TR, CU, S, WM	SOCKET: 8-prong; dwg No. A-15B-1462.			*	*	*	*
	2Z5884-27	CU	SOCKET & BRACKET: ballast-light; dwg No. A-47A-1453.			*	*	*	*
	2Z8648.2	WM	SOCKET & BRACKET: pilot-light; dwg No. A-47A-1598.			*	*	*	*
	2Z5883-10	TR	SOCKET: pilot-light; dwg No. A-47A-1623.			*	*	*	*
95	2Z9642.28	R	TRANSFORMER: 1st i.f.; assembly; type 41-352; dwg No. B-13B-1131.	1		*			*
97-1 through 97-2	2Z9643.53	R	TRANSFORMER: 3d & 5th i.f.; assembly; type 41-354; dwg No. B-13B-1133.	2		*			*
98	2Z9641.20	R	TRANSFORMER: 6th i.f.; assembly; type 41-355; dwg No. B-13B-1134.	1		*			*
96-1 through 96-2	2Z9641.23	R	TRANSFORMER: 2d & 4th i.f.; assembly; type 41-353; dwg No. B-13H-1132.	2		*			*
133	2Z9613.102	TR	TRANSFORMER: bias; type 463-001-118; dwg No. C-12A-1160.	1		*			*
134	2Z9638-16	TR	TRANSFORMER: blocking osc; type 467-001-142; dwg No. C-12A-1162.	1		*			*
131	2Z9643.42	CU	TRANSFORMER: blocking osc; type 467-001-137; dwg No. C-12A-1318.	1		*			*
130	2Z9611.151	TR	TRANSFORMER: filament; type 464-000-071; dwg No. C-12A-1157.	1		*			*
131	2Z9612.51	TR	TRANSFORMER: high-voltage; type 465-00-106; dwg No. C-12A-1158.	1		*			*
132	2Z9611.39	TR	TRANSFORMER: low-voltage; type 463-001-119; dwg No. C-12A-1159.	1		*			*
1024	2Z9634.49	SG	TRANSFORMER: modulation osc; type T-46229; dwg No. 12A-1880.	1		*			*
1026	2Z9613.162	SG	TRANSFORMER: power; type 46460; dwg No. 12A-1879.	1		*			*
103	2Z9613.23	R	TRANSFORMER: power; type 467-001-117; dwg No. D-12A-1138.	1		*			
130	2Z9613.133	CU	TRANSFORMER: power; type 463-001-095; dwg No. D-12A-1319.	1		*			*
136	2Z9957-7	TR	VARIAC: 0-115-volt; 12-amp; type 200B; dwg No. B-12A-1163.	1		*			*
	2J37	SG	TUBE VT-37: type 37	1	*	*			*
	2J41	SG	TUBE VT-48: type 41	1	*	*			*
	2J84 or 2J6Z4	SG	TUBE VT-84: type 84 or 6Z4	1	*	*			*
	2J6H6	CU, R	TUBE VT-90: type 6H6	3	*	*			*
	2J6J5	R, TR	TUBE VT-94: type 6J5	2	*	*			*
	2J6U5/6G5	WM	TUBE VT-98: type 6U5-6G5	1	*	*			*
	2J807	TR	TUBE VT-100: type 807	1	*	*			*
	2J6V6GT	CU	TUBE VT-107A: type 6V6GT	2	*	*			*
	2J6AC7	R	TUBE VT-112: type 6AC7	3	*	*			*
	2J6SJ7	CU	TUBE VT-116: type 6SJ7	1	*	*			*
	2J2X2	TR	TUBE VT-119: type 2X2	2	*	*			*
	2J6SA7	CU	TUBE VT-150: type 6SA7	1	*	*			*
	2J6AB7	R	TUBE VT-176: type 6AB7	2	*	*			*
	2J5Y3GT	CU	TUBE VT-197A: type 5Y3GT	1	*	*			*
	2J9002	TR, WM	TUBE VT-202: type 9002	2	*	*			*
	2J6E5	R	TUBE VT-215: type 6E5	1	*	*			*
	2J6SN7G7	CU, R, TR	TUBE VT-231: type 6SN7GT	11	*	*			*
	2J504G	R, TR	TUBE VT-244: type 504G	3	*	*			*
	2V826	TR	TUBE: type 826	2	*	*			*
	2V9006	R, TR, WM	TUBE: type 9006	4	*	*			*
	2V6SF5	WM	TUBE: type 6SF5	1	*	*			*
	2V6SH7	R	TUBE: type 6SH7	3	*	*			*
	2Z9401.5	SG	MOUNTING STRIP: single lug; dwg No. 201-361.	2		*			*
	2Z9403.10	SG	MOUNTING STRIP: triple lug; dwg No. 201-360.	1		*			*

*Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
	2Z9406.73	S	TERMINAL: dwg No. A-201-319	2		*			*
	3Z12060-21.2	AMS	TERMINAL: dwg No. A-26D-1579	8		*			*
	3Z12060-21.4	TR	TERMINAL: dwg No. A-26D-2034	14		*			*
	3Z12056/1	TR	TERMINAL: dwg No. A-26A-2035	4		*			*
	3Z12031-11.2	ANT	TERMINAL: No. 302-B-Stewart; dwg No. A-26D-2481.	4		*			*
	3Z12031-5	TR, R	TERMINAL: Stewart No. 308; dwg No. A-26D-709.	94		*			*
	3Z12059-37	CU	TERMINAL: Shakeproof No. 2528-BSP; dwg No. A-26A-697.	4		*			*
	3Z12059-22	S	TERMINAL: Shakeproof No. 10; dwg No. A-26A-2462.	4		*			*
	3Z12031-11.1	ANT	TERMINAL: No. 2103-8SP; dwg No. A-26A-2480.	2		*			*
	3Z12050-3	R, TR, JB	TERMINAL: No. 2528-10SP; Patton MacQuire Co. No. 999; dwg No. A-26D-366.	24		*			*
	3Z12031-12.1	TR	TERMINAL: dwg No. A-26D-1670	8		*			*
	3Z12059-24	WM	TERMINAL: No. 6200-⅛; dwg No. A-26D-1756.	8		*			*
	3Z12050-5.6	C&C	TERMINAL: Patton MacQuire No. 2067; dwg No. A-26D-1826.	4		*			*
	2Z9408.66	TR	TERMINAL BD ASSEMBLY: dwg No. A-201-440.	2					*
	2Z9404.76	CU	TERMINAL BD ASSEMBLY: dwg No. B-201-178.	2					*
	2Z9403.79	S	TERMINAL BD ASSEMBLY: dwg No. A-201-321.	2					*
	2Z9401.25	TR	TERMINAL BD ASSEMBLY: dwg No. A-201-439.	2					*
	2Z9402-64	WM	TERMINAL BD ASSEMBLY: 2 mtg holes; 2 lugs; dwg No. A-201-89.	2					*
	2Z9408.23	WM	TERMINAL BD ASSEMBLY: 2 mtg holes; 8 lugs; dwg No. A-201-285.	2					*
	2Z9402.65	TR	TERMINAL BD ASSEMBLY: 2 holes; 2 lugs; dwg No. A-201-261.	2					*
	2Z9405.26	WM	TERMINAL BD ASSEMBLY: 2 holes; 5 lugs; dwg No. A-201-284.	2					*
	2Z7397	S	TERMINAL BD ASSEMBLY: 4 holes; J term; dwg No. A-201-323.	2					*
	2Z9405.27	TR	TERMINAL BD ASSEMBLY: 5 holes; 5 lugs; dwg No. A-201-259.	2					*
	2Z9402.113	TR	TERMINAL BD ASSEMBLY: 6 holes; 2 angle brackets; dwg No. A-201-258.	2					*
	2Z9426-8	R	TERMINAL BD ASSEMBLY: 6 holes; 2 angle brackets; 26 lugs; dwg No. A-201-218.	2					*
	2Z9428-3	R	TERMINAL BD ASSEMBLY: 6 holes; 3 angle brackets; 28 lugs; dwg No. A-201-219.	2					*
	2Z9410.22	TR	TERMINAL BD ASSEMBLY: 6 holes; 10 lugs; dwg No. A-201-256.	2					*
	2Z9419-2	R	TERMINAL BD ASSEMBLY: 6 holes; 19 lugs; dwg No. A-201-206.	2					*
	2Z9412.25	TR	TERMINAL BD ASSEMBLY: 12 lugs; dwg No. A-201-206.	2					*
	2Z9417.3	TR	TERMINAL BD ASSEMBLY: 16 lugs; 2 angle brackets; dwg No. A-201-59.	2					*
	2Z9401.20	S	TERMINAL BD ASSEMBLY: 1 terminal; dwg No. A-201-320.	2					*
	2Z9440-14	CU	TERMINAL BD ASSEMBLY: 58 terminals; dwg No. B-201-175-1.	2					*
	3G1100-110	TR	TERMINAL BOARD: ceramic; 12 holes; dwg No. A-7A-2300.	5			*		*
	3Z12060-21.3	AMS	TERMINAL: double; dwg No. A-26D-1580.	4		*			*

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	3Z12059-3	S, WM	TERMINAL: screw size #4; Shakeproof No. 2103-4SP; dwg No. A-26A-1457.	8		*			*
	3Z12059-14	CU	TERMINAL: screw size #4; Shakeproof No. 2104-4SP; dwg No. A-26A-1799.	4		*			*
	3Z12059-21	S, WM	TERMINAL: screw size #6; Shakeproof No. 2103-6; dwg No. A-26A-5.	4		*			*
	3Z12059-4	CU	TERMINAL: screw size #8; Shakeproof No. 2104-8; dwg No. A-26A-1773.	12		*			*
	3Z12059-40	JB	TERMINAL: screw size #8; Shakeproof No. 2159-B-SP; dwg No. A-26D-1832.	8		*			*
	3Z12059-34	CU	TERMINAL: screw size #8; Shakeproof No. 2116-8SP; dwg No. A-26A-1838.	2		*			*
	3Z12059-38	TR	TERMINAL: screw size #10; Shakeproof No. 2528-10-SP; dwg No. A-26D-1540.	30		*			*
	2A271-6	TR	ANTENNA: dummy; dwg No. A-205-324.	1	*	*			*
	2Z588-5	ANT	BAR: tie; dwg No. A-2M-1018	1		*			*
	3H384	TR	BLOWER UNIT: complete (1 motor, 1 blower); AG Redmond Co., type L; dwg No. C-55A-1262.	1		*			*
	6L606-1.5HZ	AN-128-A	BOLT: 65% thread; 3/8-16 x 1 1/2″			*			*
	6L606-1.5H-1	ANT	BOLT: 100% thread; 3/8-16 x 1 1/2″			*			*
	6L604-4.H	AMS	BOLT: hex hd; 1/4-20 x 1/16″; Belmont Radio; dwg No. A-3F-1234.	30		*			*
	6L606-1.7H16	MTG	BOLT: hex hd; 3/8-16 x 1 3/4″; Belmont Radio; dwg No. A-3F-1233.	20		*			*
	6L606-1.5H	ANT	BOLT: hex hd; 3/8-16 x 1 1/2″; Belmont Radio; dwg No. A-3F-1644.	10		*			*
	6L606-1.5HZ	ANT	BOLT: hex hd; 3/8-16 x 1 1/2″; Belmont Radio; dwg No. A-3F-1645.	20		*			*
	6M211-38		BOOK: log	1					*
	2C7709A/W1	ANT	BRACE: antenna, right			*			*
	2A275-128A/B1	ANT	BRACE: antenna, left			*			*
	2Z1230-38	ANT	BRACKET: mtg, right			*			*
		ANT	BRACKET: mtg, left			*			*
	2Z1243-1	R	BRACKET: pilot-light; 1-1/16″ x 7/16″ x 1/2″; 2 mtg holes; right-hand terminal; dwg No. A-55A-1115-1.	1		*			*
	2Z1243-2	R	BRACKET: pilot-light; 1/16″ x 7/16″ x 1/2″; 2 mtg holes; left-hand terminal; dwg No. A-55A-1115-2.	1		*			*
	2Z1239.4	TR	BRACKET: socket-support; 4 mtg holes; 2 lugs (anchor tool & die); dwg No. A-72A-1192.	1		*			*
	2Z9957-7/1	TR	BRUSH: variac, phosphor bronze; for variac No. 200 Gen. Radio; dwg No. A-55A-1165.	2			*		*
	2Z1409-10	AMS	BUSHING: rubber; black; 1/2″ ID, 5/8″ OD, 3/8″ width; Belmont Radio; dwg No. A-250-1671.			*			*
	2Z1612.10	C&C	CAP & CHAIN: thread 3/16″; Amer. Phen. type 9760-48P; dwg No. B-55A-1747.						*
	2Z1612.15	CU, WM	CAP & CHAIN: thread 3/4-20; Amer. Phen. type 9760-12; dwg No. B-55A-1742.	2		*			*
	2Z1612.12	C&C	CAP & CHAIN: thread 3/4-20; Amer. Phen. type 9760-12P; dwg No. B-55A-1745.						*
	2Z1612.11	C&C	CAP & CHAIN: thread 3/4-20; Amer. Phen. type 9760-20P; dwg No. B-55A-1746.						*
	2Z1612	TR, R, WM	CAP & CHAIN: thread 1 1/4-18; OD 1 3/8″ x 7/16″; Amer. Phen. type 9760-20; dwg No. A-55A-1277.	3		*			*

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	2Z1612.9	C&C	CAP & CHAIN: thread 1⅜–18; Amer. Phen. type 9760–22P; dwg No. B–55A–1743.			*			*
	2ZK1612–1	TR, R, ANT, AMS, JB	CAP & CHAIN: thread 1⅜ rubber gasket in cap; Amer. Phen. type 9760–22; dwg No. A–55A–1276.	11		*			*
	2Z1612.14	C&C	CAP & CHAIN: thread 1½–18; Amer. Phen. type 9760–24P; dwg No. B–55A–1744.						*
	2Z1612.8	TR	CAP & CHAIN: thread 1½–18 with rubber gasket; 1⅝ OD Amer. Phen. type 9760–24; dwg No. A–55A–1510.	1		*			*
	2Z2724	TR	CAP: grid; brass; cadmium plate; 0.875" long, 0.375" diam, 0.375" width; National type 24; dwg No. A–26D–757.			*			*
	2Z3352.23	C&C	CAP: rain; dwg No. B–25H–2527–1						*
	2Z3352.43	C&C	CAP: rain; dwg No. B–25H–2527–2			*			*
	2Z2200–1	R	CHANNEL: rubber; inside width 3/32", outside width 5/16", inside depth 17/64", wall 3/64" outside depth 5/16", length 1 27/32"; Atlantic India Rubber Wks. type x 379; dwg No. A–25E–1056.	2		*			*
	2Z2200–2	CU	CHANNEL: rubber stripping; inside width 3/32", outside width 7/32", inside depth ¼", wall 1/16", outside depth 5/16", length 4¾"; W. H. Salisbury type C–170; dwg No. A–25E–1849.	1					*
	2Z4866.30	TR	CHANNEL: rubber; inside width 13/64", outside width 21/64", inside depth ¼", outside depth 5/16", wall 1/16", length 2 9/16"; Walls Gardner type 8 x 138; dwg No. A–25E–1259.	2		*			*
	2Z2200–5	TR	CHANNEL: rubber; inside width 13/64", outside width 21/64", inside depth ¼", outside depth 5/16", wall 1/16", length.	2		*			*
	2Z2200–4	CU	CHANNEL: rubber stripping; inside width 7/32", inside depth ¼", wall 1/16", outside depth 5/16", length 9.625"; W. H. Salisbury type C–170; dwg A–25E–1531.	1		*			*
	2Z2200–3	CU	CHANNEL: rubber stripping; inside width 7/32", inside depth 5/16", wall 1/16", outside depth 5/16", length 4 5/16"; W. H. Salisbury type C–170; dwg No. A–25E–1533.	1		*			*
	2Z2639–15	C&C	CLAMP: cable antenna; 0.598"; cold rolled steel; Belmont Radio; dwg No. A–2D–1771.	5					*
	2Z2639–14	C&C	CLAMP: cable antenna; Belmont Radio; dwg No. A–2D–1772.	5					*
	2Z2636–3	C&C	CLAMP: gasket and ferrule; Amer. Phen. type AN–3057–12; dwg No. 3–55A–1708–(1–2).			*			*
	2Z2636–2	C&C	CLAMP: gaskets and ferrule for portable cord; adjustable; max ID 1"; Amer. Phen. type AN–3057–16; dwg No. B–55A–1709.			*			*
	2Z2636–27	C&C	CLAMP: gasket and ferrule; Amer. Phen. type AN–3057–40; dwg No. B–55A–1710–1.						*
	2Z2642.22	C&C	CLAMP: gasket and ferrule; adjustable; max ID ⅜"; Amer. Phen. type AN–3057–4; dwg No. B–55A–1711.						*
	2Z7093–5	TR	CAPACITOR PLATE ASSEMBLY: dwg No. A–200–235.						*
	6Z3856–21	TR	FILTER: fibre-glass; Owens Corning Fibre-Glass Co.; dwg No. A–55A–1229.	1		*			*
	2Z4384	C&C	FITTING: connector; Belmont Radio; dwg No. A–55A–1796.						*

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	2Z4396		FOOT REST: dwg No. A-2D-1595	1					*
	6Z4856-3	SG	GROMMET: 5/16"; black rubber; Atlan. India Rubber Wks.; dwg No. 25A-2141.	2		*			*
	6Z4856-1	SG	GROMMET: black rubber; 1/2"; Atlan. India Rubber Wks. type 1724; dwg No. 25A-2140.	1		*			*
	6Z4856-2	SG	GROMMET: 1/2"; pure gum rubber; Belmont Radio; dwg No. 25A-2139.	3		*			*
	6Z4856	WM	GROMMET: rubber; Atlan. India Rubber Wks; type 374; dwg No. A-25A-1654.			*			*
	3Z3275	TR, R, CU	HOLDER: fuse; extractor type; Littelfuse type 1075; dwg No. A-55A-1076.	8		*			*
	2Z8552-14	C&C	INSERT: sleeve; black fibre or bakelite; section of tube; Belmont Radio; dwg No. A-3C-1791.	60		*	*		*
	2Z5821-8	R	KNOB: Belmont Radio type ZAMAK: dwg No. A-4B-1110.	4		*			*
	2Z5821-14	CU	KNOB: bar type; Belmont Radio type No. 3, ZAMAK; dwg No. A-4B-1553.	1		*			*
	2Z5843.6	SG	KNOB: black bar; dwg No. 5B-1883.	2		*			*
	2Z5822-25	CU	KNOB & SET: screw; Kurz-Kasch, Inc.; dwg No. A-4B-1783.	2		*			*
	2Z5821-21	CU	KNOB: switch with bar; Belmont Radio; dwg No. A-4B-1407.	1		*			*
	2Z5821-9	CU	KNOB: switch with bar; Belmont Radio; dwg No. A-4B-1489.	1		*			*
	2Z5821-12	TR	KNOB: variac; Belmont Radio; dwg No. B-5B-1294.	1		*			*
	6L71005E1	ANT	LOCKWASHER: split; 5/16" x 3/32" x 1/16"; dwg No. A-28C-1781.			*			*
	6L71004-3N	ANT	LOCKWASHER: Split; 1/4" x 3/32" x 3/32" x 1/16"; dwg No. 28C-1329.			*			*
	6L71016	ANT	LOCKWASHER: Split; No. 3/8; dwg No. A-28C-1776.	6		*			*
	6L71006	ANT	LOCKWASHER: Split; No. 3/8			*			*
	6L71012.BN	ANT	LOCKWASHER: Split; No. 12; dwg No. 28C-1775.	1		*			*
	3F6315	TR	METER: milliameter; size 3 1/2"; Gen. Elec. type D-041-44-46; dwg No. B-55A-1164.	1		*			*
	6L3504-20Z-BZ		NUT: hex; 1/4"-20 x 7/16"; Mfg. Screw & Supply Co.; dwg No. 43A-1330.			*			*
	6L3112-24		NUT: hex; brass; 12-24 x 7/16"; Mfg. Screw & Supply Co.; dwg No. 43C-1602.			*			*
	6L3810-16	ANT	NUT: wing; 3/8-16; Mfg. Screw & Supply Co.; dwg No. A-3F-1764.			*			*
	2Z6961.6	ANT	PANEL: junction box; overall 4 1/4" x 2 3/4" x 1/8" thk; HP Snyden; dwg No. A-74-1647.	1					*
	6R7443	R	PULLER: tube; 0.050 x 1/4"; Muter Co. type 131257; dwg No. A-55A-1930.		*	*			*
	6R8980	ANT	ROD: adjustment; tool equip. 205-392; dwg No. A-5G-2531.	1	*	*	*	*	*
	2A288A-3	WM	ROD: antenna telescopic; brass; Belmont Radio; dwg No. B-55A-1448.	1		*			*
	2Z8270-3	TR	SCREEN: steel; 0.8" mesh; Belmont Radio; dwg No. A-55A-1228.	1		*			*
	6L4904-18P	ANT	SCREW CAP: 1/4"-20 x 1 1/8"; dwg No. A-3F-1234.			*			*
	6L4910-20.H	AMS	SCREW: captive; 5/16-18 x 1 1/4"; Ruylan Corp.; dwg No. A-3F-1028.	5					*
	2Z3194-10	TR	SCREW: DOGP.S, 8-32 x 3/8"; slotted hd; dwg No. A-52A-3007.			*			*
	6L7920-4-32.12S	C&C	SCREW: FHMS, 1/4"-20; dwg No. 32C14-2506.						*

* Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
	6L7224–20	ANT	SCREW: FHMS, 12–24 x 1 1/4"; dwg No. 33B12–1604.			•			•
	6L4910–20.18	ANT	SCREW: locking; dwg No. A–3F–1028.			•			•
	6L7224–12.1F	ANT	SCREW: RHMS, 12–24 x 3/4"			•			•
	6L7224–20	TR, R, CU, WM	SCREW: set; 8–32 x 5/16"; Allen hd; Mfg. Screw & Supply Co.; dwg No. A–52A–463.	19		•			•
	6L7955–2	CU, WM	SCREW: set; 6–32 x 1/8"; Allen hd; dwg No. A–52A–870.	4		•			•
	6L7955–3.39S	R	SCREW: set; 6–32 x 3/16"; Allen hd; dwg No. A–52A–219.	8		•			•
	6L17112–12K	CU	SCREW: thumb; dwg No. A–3F–1422.	5		•			•
	6L17132–17K	WM	SCREW: thumb; 8–32 x 3/16"; dwg No. A–3F–1485.	5		•			•
	6L17132–4K	CU	SCREW: thumb; 8–32 x 1/4"; dwg No. A–3F–1421.	5		•			•
	6L20132–8	C&C	SCREW: wing; 10–32 x 1/2"; dwg No. A–3F–1792.	5					•
	6L20132–12	C&C	SCREW: wing; 10–32 x 3/4"; dwg No. A–3F–1795.	5					•
	6L20132–16	C&C, MTG, ACCESS	SCREW: wing; 10–32 x 1"; dwg No. A–3F–1785.	5				•	•
	2Z8304–11	R	SHIELD: eye; black bakelite; OD, 1 3/8", ID 1 1/4" x 3/4" deep; dwg No. A–55A–1335.	1					•
	2Z8304.12	SG	SHIELD: tube; dwg No. 55A–2144	3		•			•
	2Z8304.9	R, TR	SHIELD: tube; No. 3 Zamac; 1 23/64" long, OD 7/8", ID 47/64", 7/8–14 thread type, 9,000 series; dwg No. A–3D–1045.	15		•			•
	3Z8304.10	WM	SHIELD: "tuning eye"; 4 slots; overall 1 x 1 1/8"; dwg No. A–5G–1638.	1		•			•
	2Z8552–57	ANT	SLEEVE: antenna reduction sleeve			•			•
	6Z8163	R	SLEEVE: brass; 0.796" long, OD 1/2", ID 0.128", slot 3/64" x 7/32" long; dwg No. A–3D–1299.	20		•			•
	2Z750–1	TR	SPACER BOARD: X–L; dwg No. A–6C–1847.	5		•			•
13–1 through 13–3 18–1 through 8–6 8–1 through 8–2	2Z8809–2	CU TR WM	SPARK PLATE: 0.043" C.R.S. angle, long leg 2" x 1/2" with 2 holes 0.234 diam, short leg 5/8" x 1/4" slot 3/8" deep, 3/32" wide; dwg No. A–2D–1283.	11		•	•		•
19–1 through 19–3 12–1 through 12–15 7–1 through 7–2	2Z8809–3	TR CU WM	SPARK PLATE: 0.043" C.R.S. angle, long leg 1 3/8" x 3/4" with 2 holes, 0.234 diam, short leg 5/8" x 1/4" slot 3/8" deep, 3/32" wide; dwg No. A–2D–1284.	20		•	•		•
	2Z8877.11	TR, R	SPRING: spiral; dwg No. A–49A–1269	4		•			•
	3G1100–88	TR	SUPPORT: line insulating; ceramic; width 0.875", length 5.5" x 1/2" TR., T holes; dwg No. A–5F–1124.	25					•
	6L60004		WASHER: 3/4" x 9/32" x 1/16"; dwg No. A–29B–1782.			•			•
	6L5514–2	TR	WASHER: bakelite; dwg No. A–29B–1178.	2		•			•
	6L40234	TR	WASHER: bakelite; dwg No. A–29B–1181.	2		•			•
	6L40235	TR	WASHER: bakelite; dwg No. A–29B–1182.	6		•			•
	6L40233	TR	WASHER: bakelite; dwg No. A–29B–1668.	1		•			•
	6L58424F	MTG, ACCESS	WASHER: extruded; C.R.S.; dwg No. A–41A–1793.						•
	6L50530–1	TR	WASHER: fibre; dwg No. A–29B–1174.	2		•			•
	6L50523–3	TR	WASHER: fibre; dwg No. A–29B–1176.	2		•			•
	6L50523–1	TR	WASHER: fibre; dwg No. A–29B–1177.	2		•			•

• Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
	6L5502-4	TR	WASHER: fibre; dwg No. A-29-B-1183.	8	----	*	----	----	*
	6L52523-2	TR	WASHER: fibre; dwg No. A-29B-1250.	28	----	*	----	----	*
	3G1836-5.6	CU, WM	WASHER: fibre; dwg No. A-41A-1320.	----	----	*	----	----	*
	3G1550-12.1	TR	WASHER: mica; dwg No. A-29B-1667.	2	----	*	----	----	*
	6L58004-9	ANT	WASHER: steel; ¾ x 17/64 x 0.062"	----	----	*	----	----	*
	6L58026.3	ANT	WASHER: steel; ¾" x 0.390 x 1/16"; dwg No. A-29A-1656.	2	----	*	----	----	*
	6L58028-3		WASHER: steel; ¾ x 0.390 x 1/16"			*	----	----	*
	2Z4880-6	TR	WINDOW: 5.75" x 2.812" x 13/64" tk; dwg No. A-55A-1230.	1	----	*	----	----	*
	6Z9462	WM	WINDOW: glass; for dial; 1¼" x 3¼" x 3/32" tk; dwg No. A-55A-1405.	1	----	*	----	----	*
	6Z9462-1	R	WINDOW: glass; 4 clear glasses, 9.125" x 1.859"; dwg No. A-55A-1055.	1	----	*	----	----	*
	6R57400-6		WRENCH: Allen No. 6; tool equip. 205-392; dwg No. A-55A-1951.	----	*	*	----	----	*
	6R7400		WRENCH: Allen No. 8; tool equip. 205-392; dwg No. A-55A-790.	----	*	*	----	----	*

*Indicates stock available.

209. Index to Major Components of Radio Equipment RC–148–C

This index is a key to column 3 in the following pages.

Army Type No.	Major Component	Major Component Symbol
RA–105–A	Power Supply	PS
BC–1267–A	Receiver-Transmitter	RT
I–222–A	Signal Generator	SG
AN–128–A	Antenna	AT
BC–1298	Interconnector Unit	IC
FN–82	Operating Console (Rack)	RK
BC–412–B	Oscilloscope	O

210. MAINTENANCE PARTS LIST FOR RADIO EQUIPMENT RC-148-C (USED WITH RADIO SET SCR-268-C)

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
	1F6B1-3	M	BRAID: tinned copper; ⅛" w; 64 strand; No. 34.						*
	1F6C1-8.25	M	BRAID: tinned copper; ½" w; 240 strand; No. 30.						*
	3E7144-7	RK	CABLE: dwg No. B-14B-4602	1		*			*
	3E7144-9	RK	CABLE: dwg No. B-14B-4601	1		*			*
	1F4A2.2	RK	CABLE: 3⅝" lg; dwg No. A-14B-4229	1		*			*
	3E7144-8	RK	CABLE: dwg No. B-14B-4600	1		*			*
	1F4A2.2	RK	CABLE: 24½" lg; dwg No. A-14B-4228	1		*			*
	3E7144-14	JB72	CABLE ASSEMBLY: master; JB72 internal connecting; dwg No. 205-354.	1		*			*
	3E7144-2	SG	CORD: 21" length; 2-conductor 20 gauge with connector at one end; 8 amp; dwg No. B-201-793.	1		*			*
	3E7144-5	SG	CORD: 8 ft; with one 2-pole male plug; 110 volts; G.E. No. 2721 (A-19A-2.347.1 BRC); and one female 2-pole plug, 110 volts; Phenolic No. F11-AM; dwg No. B-201-728.	1		*			*
	3E7144-3	SG	CORD: 2-conductor; No. 20; 16⅞" long; 500 volts; dwg No. B-14B-3675.	1		*			*
	3E1743	RK	CORD ASSEMBLY: Antenna CD-743; twin-X; 95-ohm; 187" long; 2 plugs AN-3106W-22-6P, one at each end; antenna to FM82; dwg No. C-201-270.	1		*			*
	1F432-1098	SG	CORD ASSEMBLY: CD-1098; 50-ohm; Pt-5; 46" long; Plug PL-259-B-55A-2244 at each end; connects from receiver and transmitter to rear of rack FM-82; dwg No. B-201-988.	1		*			*
	3E1999-103	SG	CORD ASSEMBLY: CD-1103; single stranded conductor; 33" long; Plug PL-259 one end, other end Plug PL-55; test cable with sig. gen.; dwg No. B-201-857.	1		*			*
	3E1999-104	SG	CORD ASSEMBLY: CD-1104; single conductor; Plug PL-259 at both ends; for testing sig. gen.; dwg No. B-201-856.	1		*			*
	3E1999-141	SG	CORD ASSEMBLY: CD-1141-2; 2 conductors, 6 ft long; one end male plug, part No. A-19A-2347, other end special jack assembly; used for making voltage check on power supply; dwg No. B-201-865.	1		*			*
	3E1999-187	RK	CORD ASSEMBLY: CD-1187; 2 conductors; Plug AN-3106W-22-8P connects to JB72; Plug AN-3108W-22-8S connects to FM-82; 108" lg; dwg No. C-201-992.	1		*			*
	3E1680	SG	CORD ASSEMBLY: CD-680; 4-conductor; 6" lg; Plug AN-3106W-24-684P one end; Russell-Stoll No. 8098 at other end; connects cable No. 16 and BC-412; dwg No. C-201-271.	1		*			*
	3E1999-106	SG	CORD ASSEMBLY: CD-1106; 21 conductors; special Belmont male plug C-201-546 one end; special Belmont plug, female, C-201-245 connects rack to unit; remove during testing; dwg No. D-201-729.	1		*			*

* Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
	3E1999–186	IC	CORD ASSEMBLY: master; CD–1186–5; multiple plug ZB–3108W–48–1S connects to BC–1298–A; Cable C–14B–1737 with 2 conductors, 97" long, with plug AN–3106W–22–1P connects to JB–72; Cable C–14B–1736, 6 conductors, 4" long, with plug AN–3108W–24–3P connects to FM–82; Cord C–148–1740, 6 conductors, 56" long, with plug 97–3106–24–68–4P connects to BC–412; Cable C–14B–1793, 2 condensers, 23" long, with plug A–55A–1514–2 connects to Cord No. 16. Cable C–14B–4608, 3 condensers, 32" long, with plug AN–3108W–20–6P connects to FM–82; dwg No. D–201–1008.	1		*			*
	1B1114.3	M	WIRE: No. 14 (41 x No. 30); aeroglas; white with black tracer.			*			*
	1B1114.4	M	WIRE: No. 14 (41 x No. 30); aeroglas; white with blue tracer.						*
	1B1114.2	M	WIRE: No. 14 (41 x No. 30); aeroglas; white with brown tracer.						*
	1B1114.1	M	WIRE: No. 14 (41 x No. 30); aeroglas; white.						*
	1B1116.6	M	WIRE: No. 16 (26 x No. 30); aeroglas; white with black tracer.						*
	1B116.7	M	WIRE: No. 16 (26 x No. 30); aeroglas; white with green, brown, and blue tracer.						*
	1B1116.2	M	WIRE: No. 16 (26 x No. 30); aeroglas; white with red tracer.			*			*
	1B1116.5	M	WIRE: No. 16 (26 x No. 30); aeroglas; white with red, black and blue tracer.						*
	1B1116.9	M	WIRE: No. 16 (26 x No. 30); aeroglas; white with red, brown and orange tracer.						*
	1B116.4	M	WIRE: No. 16 (26 x No. 30); aeroglas; white with red, green and yellow tracer.						*
	1B1120.29	M	WIRE: No. 20 (10 x No. 30); aeroglas; white with green and orange tracer.						*
	1B1120.21	M	WIRE: No. 20 (10 x No. 30); aeroglas; white with black and orange tracer.						*
	1B1120.17	M	WIRE: No. 20 (10 x No. 30); aeroglas; white with red and black tracer.						*
	1B1120.30	M	WIRE: No. 20 (10 x No. 30); aeroglas; white with blue and red tracer.						*
	1B1120.32	M	WIRE: No. 20 (10 x No. 30); aeroglas; white with red and yellow tracer.						*
	1B1120.31	M	WIRE: No. 20 (10 x No. 30); aeroglas; white with yellow tracer.						*
	1B1120.38	M	WIRE: No. 20 (10 x No. 30); aeroglas; white with green tracer.						*
	1B1120.11	M	WIRE: No. 20 (10 x No. 30); aeroglas; white with black tracer.						*
	1B1116.11	M	WIRE: No. 16; solid; aeroglas; white with green and orange tracer.						*
	1B1120.23	M	WIRE: No. 20; solid; aeroglas; white with blue tracer.						*
	1B1120.33	M	WIRE: No. 20; solid; aeroglas; white with blue and black tracer.						*
	1B1120.8	M	WIRE: No. 20; solid; aeroglas; white with blue and green tracer.						*
	1B1120.34	M	WIRE: No. 20; solid; aeroglas; white with blue and yellow tracer.						*
	1B1120.13	M	WIRE: No. 20; solid; aeroglas; white with red and black tracer.						*
	1B1120.36	M	WIRE: No. 20; solid; aeroglas; white with red and blue tracer.						*

*Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
	1B1120.10	M	WIRE: No. 20; solid; aeroglas; white with red and brown tracer.						*
	1B1120.7	M	WIRE: No. 20; solid; aeroglas; white with red and green tracer.						*
	1B1120.12	M	WIRE: No. 20; solid; aeroglas; white with red and yellow tracer.						*
	1B1120.3	M	WIRE: No. 20; solid; aeroglas; white						*
	1B1120.15	M	WIRE: No. 20; solid; aeroglas; white with green tracer.						*
	1B1120.24	M	WIRE: No. 20; solid; aeroglas; white with yellow tracer.						*
	1B1120.4	M	WIRE: No. 20; solid; aeroglas; white with brown tracer.						*
	1B1120.35	M	WIRE: No. 20; solid; aeroglas; white with black tracer.			*			*
	1B1120.25-1	M	WIRE: No. 20; solid; aeroglas; white with red tracer.			*			*
	1B1120.16	M	WIRE: No. 20; solid; aeroglas; white with blue and orange tracer.						*
	1B1120.14-2	M	WIRE: No. 20; solid; aeroglas; white with orange tracer.						*
	1A812.15	M	WIRE: No. 12; bare; T.C.W.						*
	1A814.5	M	WIRE: No. 14; bare; T.C.W.						*
	1A72	M	WIRE: No. 16; bare; T.C.W.						*
	1A107	M	WIRE: No. 20; bare; T.C.W.						*
	3E7144-6	SG	WIRE: packard; high-tension; dwg No. A-55A-1803.						*
4	3D9004-3	RT	CAPACITOR: 4 mmf ±12.5%; 500-volts; ceramic; dwg No. A-8G-2712.	1		*	*	*	*
64	3D9005-24.1	SG	CAPACITOR: 5 mmf ±5%; 500-volts; ceramic; dwg No. A-8G-3682.	1		*	*	*	*
3-1, 3-2, 3-3, 3-4, 3-5	3D9008-5.1	RT	CAPACITOR: 8 mmf ±6%; 500-volts; ceramic; dwg No. A-8G-2711.	5		*	*	*	*
59-1, 59-2	3D9010-15	SG	CAPACITOR: 10 mmf ±5%; 500-volts; ceramic; dwg No. A-8G-1830.	2		*	*	*	*
1-1, 1-2, 1-3, 1-4	3D9010-26	RT	CAPACITOR: 10 mmf ±10%; 500-volts; ceramic; dwg No. A-8G-2658.	4		*	*	*	*
2	3D9015-7	RT	CAPACITOR: 15 mmf ±1 mmf; 500-volts; ceramic; dwg No. A-8G-2710.	1		*	*	*	*
13-1, 13-2	3D9025-39	RT	CAPACITOR: 25 mmf ±10%; 500-volts; ceramic; dwg No. A-8G-3081.	2		*	*	*	*
5	3D9025-33.1	RT	CAPACITOR: 25 mmf ±10%; 500-volts; ceramic; dwg No. A-8G-2659.	1		*	*	*	*
14	3D9025-33	IC	CAPACITOR: 25 mmf ±20%; 500-volts; mica; dwg No. B-8F-4648.	1		*	*	*	*
50	3D9030-15	SG	CAPACITOR: 30 mmf ±10%; 500-volts; ceramic; dwg No. A-8G-3422.	1		*	*	*	*
58-1, 58-2	3D9040-21	SG	CAPACITOR: 40 mmf ±10%; 500-volts; ceramic; dwg No. A-8G-2657.	2		*	*	*	*
9-1, 9-2, 9-3, 9-4	3D9040-14	RT	CAPACITOR: 40 mmf ±10%; 500-volts; ceramic; dwg No. A-8G-2657.	4		*	*	*	*
7	3D9050-49.2	IC	CAPACITOR: 50 mmf ±5%; 500-volts; mica; dwg No. B-8F-1593.	1		*	*	*	*
6	3D9050-70	RT	CAPACITOR: 50 mmf ±10%; 500-volts; ceramic; dwg No. A-8G-2714.	1		*	*	*	*
14	3D9050-94	RT	CAPACITOR: 50 mmf ±20%; 500-volts; ceramic; dwg No. A-8M-3185.	1		*	*	*	*
15-1 to 15-10	3D9082-3	RT	CAPACITOR: 82 mmf ±10%; 300-volts; mica; dwg No. A-8M-2662.	10		*	*	*	*
11-2, 11-3	3D9100-118	RT	CAPACITOR: 100 mmf ±10%; 500-volts; ceramic; dwg No. B-8G-3402.	2		*	*	*	*
7	3D9100-57	RT	CAPACITOR: 100 mmf ±10%; 500-volts; ceramic; dwg No. A-8G-2306.	1		*	*	*	*
51-1, 51-2, 51-3	3D9100-95.1	SG	CAPACITOR: 100 mmf ±10%; 500-volts; mica; dwg No. A-8F-1556.	3		*	*	*	*
1-1 to 1-9	3D9100-63	O	CAPACITOR: 100 mmf ±10%; 500-volts; sil. mica; dwg No. B-8F-1560.	9		*	*	*	*
9	3D9100-45	IC	CAPACITOR: 100 mmf ±20%; 500-volts; mica; dwg No. B-8F-1876.	1		*	*	*	*
8-1, 8-2	3D9150-23.1	RT	CAPACITOR: 150 mmf ±10%; 500-volts; ceramic; dwg No. B-8G-2713.	2		*	*	*	*

*Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
66	3DK9150-22	SG	CAPACITOR: 150 mmf ±10%; 500-volts; mica; dwg No. A-8F-3681.	1	----	*	*	*	*
5-1, 5-2	3D9180-1	IC	CAPACITOR: 180 mmf ±3%; 500-volts; mica; dwg No. B-8F-1850.	2	----	*	*	*	*
15	3D9200-31	IC	CAPACITOR: 200 mmf ±20%; 500-volts; mica; dwg No. B-8F-4649.	1	----	*	*	*	*
6-1, 6-2	3D9250-27	IC	CAPACITOR: 250 mmf ±20%; 500-volts; mica; dwg No. B-8F-4647.	2	----	*	*	*	*
16-1, 16-2 16-3, 56	3DK9500-99	RT SG	CAPACITOR: 500 mmf ±10%; 500-volts; mica; dwg No. B-8F-2715.	4	----	*	*	*	*
16	3DK9500-106	IC	CAPACITOR: 500 mmf ±20%; 500-volts; mica; dwg No. B-8F-4214.	1	----	*	*	*	*
12-1 to 12-19	3DA1-116	RT	CAPACITOR: 1,000 mmf ±20%; 400-volts; ceramic; dwg No. A-8G-3264.	19	----	*	*	*	*
8	3DA1.100-2	IC	CAPACITOR: 1,100 mmf ±8%; 500-volts; mica; dwg No. B-8F-1594.	1	----	*	*	*	*
30-1, 30-2	3DA5-9	RT	CAPACITOR: 5,000 mmf ±5%; 300-volts; mica; dwg No. B-8F-3779.	2	----	*	*	*	*
18-1 to 18-7 52	3DA5-32	RT SG	CAPACITOR: 5,000 mmf ±10%; 500-volts; mica; dwg No. B-8F-512.	8	----	*	*	*	*
54	3DA5-112	O	CAPACITOR: 5,000 mmf ±20%; 3,000-volts; mica; dwg No. A-8L-1555.	1	----	*	*	*	*
11	3DA6-45	IC	CAPACITOR: 6,000 mmf ±20%; 600-volts; paper molded case; dwg No. A-8J-1851.	1	----	*	*	*	*
13-3 to 13-5	3DA7.500-3	RT	CAPACITOR: 7,500 mmf ±20%; 400 volts; ceramic; dwg No. A-8G-3265.	3	----	*	*	*	*
4-1 to 4-12 33	3DA10-140.2	IC RT	CAPACITOR: 10,000 mmf ±20%; 400 volts; paper molded case; dwg No. A-8J-1627.	13	----	*	*	*	*
19-1, 19-2, 19-3, 19-4	3DA10-140	RT	CAPACITOR: 10,000 mmf +20% −10%; 400 volts; paper molded case; dwg No. A-8J-696.	4	----	*	*	*	*
20-1, 20-2	3DA50-57.1	RT SG	CAPACITOR: 50,000 mmf ±20%; 600 volts; paper molded case; dwg No. A-8J-1995.	4	----	*	*	*	*
53	3DA100-113	O	CAPACITOR: 100,000 mmf ±10%; 400 volts; paper molded case; dwg No. A-8J-909.	1	----	*	*	*	*
12-1, 12-2, 12-4 10-1 to 10-14 54-1 to 54-5	3DA100-112.1	RT IC SG	CAPACITOR: 100,000 mmf ±20%; 400 volts; paper molded case; dwg No. A-8J-1626.	22	----	*	*	*	*
32	3DA100-182	RT	CAPACITOR: 100,000 mmf −10%, +30%; 600-volts; oil filled; dwg No. A-8B-3730.	1	----	*	*	*	*
32	3DA100-184	RT	CAPACITOR: 100,000 mmf +30% −10%; 1,000-volts; oil filled; dwg No. A-8B-3269.	1	----	*	*	*	*
22-1A, 22-2A, 22-1B, 22-2B	3DA100-183	RT	CAPACITOR: 0.1-0.1 mfd +20%, −10%; 600-volts; oil filled; dual; dwg No. A-8B-3268.	2	----	*	*	*	*
6-1, 6-2	3DA200-14	PS	CAPACITOR: 200,000 mmf +20%, −10%; 500-volts; oil filled; dwg No. C-8B-2784.	2	----	*	*	*	*
3-A, 3-B	3DA500-114.1	IC	CAPACITOR: 500,000 mmf −10% +30%; 400-volts; oil filled; dual; dwg No. A-8B-1257.	2	----	*	*	*	*
55-1, 55-2	3DB1.2946	SG	CAPACITOR: 1 mfd ±20%; 400 volts; oil filled; dwg No. A-8B-2946.	2	----	*	*	*	*
26-1, 26-2, 26-3 2-1, 2, 3 7	3DB1.1104	RT IC PS	CAPACITOR: 1 mfd +20% −10%; 400-volts; oil filled; dwg No. A-8B-1104.	10	----	*	*	*	*
25	3DB1.3062	RT	CAPACITOR: 1 mfd +40% −10%; 3,600-volts; oil; high voltage; with brackets; dwg No. C-8B-3062.	1	----	*	*	*	*

*Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
5	3DKB2-19	PS	CAPACITOR: 2 mfd +20% −10%; 400-volts; oil filled; dwg No. A-8B-1254.	1	----	*	*	*	*
4	3DB2.3042	PS	CAPACITOR: 2 mfd +20% −10%; 1,000-volts; oil filled; dwg No. B-8B-1252-1.	1	----	*	*	*	*
1A, 1B, 1C	3DB5-26	IC	CAPACITOR: 2.5 mfd, 2.5 mfd, 5 mfd, +20% −10%; 600-volts; oil filled; dwg No. C-8B-1256.	3	----	*	*	*	*
60A, 60B, 60C	3DB5-26	SG	CAPACITOR: 2.5 mfd, 2.5 mfd, 5 mfd +20% −10%; 600-volts; oil filled; dwg No. C-8B-3740.	3	----	*	*	*	*
3-1, 3-2	3DB4-87	PS	CAPACITOR: 4 mfd +20% −10%; 600-volts; oil filled; dwg No. B-8B-1253-1.	2	----	*	*	*	*
24	3DB4.93	RT	CAPACITOR: 4 mfd +30% −10%; 100-volts; oil filled; dwg No. A-8B-3267.	1	----	*	*	*	*
1	3DB7-3	PS	CAPACITOR: 7 mfd +20% −10%; 800-volts; oil filled; dwg No. C-8B-2842.	1	----	*	*	*	*
2-1, 2-2, 2-3	3DB7-2	PS	CAPACITOR: 7 mfd +30% −10%; 600-volts; oil filled; dwg No. B-8C-1139.	3	----	*	*	*	*
61	3D9050V-60.1	SG	CAPACITOR: 4.5 to 50 mmf; variable; ceramic; dwg No. A-8H-3089.	1	----	*	*	*	*
63	3D9067VE8	SG	CAPACITOR: variable; air max 67.8 ±1%, min less than 10.3 mmf; 500 volts; dwg No. B-8A-2942.	1	----	*	*	*	*
12-1 to 12-15 27-1, 27-2 9-1, 9-2	2Z8809-3	IC RT RK	CAPACITOR: spark plate; hot tin dip; dwg No. A-2D-1284.	18	----	*	*	*	*
13-1 to 13-3 8-1 to 8-5	2Z8809-2	IC RK	CAPACITOR: spark plate; hot tin dip; dwg No. A-2D-1283.	8	----	*	*	*	*
63	3C323-4H	PS	COIL: choke; 100 ma, 59 hy, 850-ohms; dwg No. C-17A-2841.	1	----	*	----	----	*
104	3C323-4C	RT	COIL: choke, cathode osc choke; dwg No. A-17A-1194.	1	----	*	----	*	*
	3C323-4K	IC, SG	COIL: choke, dual, 9.5 hy; dwg No. C-16B-1317.	2	----	*	----	----	*
62	3C323-4J	PS	COIL: choke, dual, each section 200 ma, 12 hy, 150-ohms; dwg No. D-17A-2785.	1	----	*	----	----	*
113	3C323-4F	RT	COIL: choke; 18 turns; grid; dwg No. A-17A-3566.	1	----	*	----	*	*
114-1 to 114-4	3C323-4E	RT	COIL: choke; 12 turns; heater; dwg No. A-17A-3565.	4	----	*	----	*	*
120-1 102-1 to 102-4	3C323-4L	IC SG	COIL: choke; inductance r-f; dwg No. A-13C-1542.	5	----	*	----	----	*
120	3C323-4G	RT	COIL: choke; "reheater"; dwg No. A-204-812.	1	----	*	----	----	*
105-1 to 105-5	3C323-4B	RT	COIL: r-f heater choke; dwg No. A-17-A-1195.	5	----	*	----	*	*
100	3C302R	RT	COIL ASSEMBLY: "antenna" tuning; dwg No. B-204-536.	1	----	*	----	----	*
102	3C392	RT	COIL ASSEMBLY: "detector" mixer tuning; dwg No. B-204-535.	1	----	*	----	----	*
100	3C4081	SG	COIL ASSEMBLY: "high-freq osc"; dwg No. A-204-591.	1	----	*	----	----	*
101	3C1081-12D	SG	COIL ASSEMBLY: lf band osc, inductance lf osc coil; dwg No. A-204-613.	1	----	*	----	----	*
115	3C1081-12C	SG	COIL ASSEMBLY: inductance tank; coil; dwg No. A-204-641.	1	----	*	----	----	*
103	3C1081-12B	RT	COIL ASSEMBLY: "oscillator" tuning; dwg No. B-204-543.	1	----	*	----	----	*
101	3C1084N	RT	COIL ASSEMBLY: r-f tuning; dwg No. B-204-534.	1	----	*	----	----	*
	2Z299-358	SG	ADAPTER: female; 2 contacts; SC No. M-358; dwg No. A-55A-4041.	2	----	*	----	----	*
	2Z299-359	RT, AT, M	ADAPTER: right angle; dwg No. A-55A-3367.	6	----	----	----	----	*

*Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
	2Z8682.16	O	CONNECTOR: dwg No. A-55A-1808.	1		*			*
	2C3648C/C1	M	CONNECTOR: dwg No. A-55A-1796.	2		*		*	*
	6Z7565F	M	CONNECTOR: female polarized; everlock; 3 wire, 4 pole; 20 amps; 125 volts; type No. 8098 Russell-Stoll; dwg No. A-55A-1514.	1		*			*
	2Z3095-5	PS, RT	CONNECTOR: formed 0.375″ centers; spring temp. phosphor bronze; dwg No. A-26D-3597.	5		*			*
151-1, 151-2	2Z5531.2	RT	JACK: closed circuit; with mtg hardware; dwg No. A-44B-2850-1.	2		*			*
107	2Z5534	SG	JACK: phone; open circuit; complete with hardware; dwg No. A-44A-300.	1		*			*
150-1 to 150-3	4C4312-5	IC	JACK: phone; open circuit; dwg No. A-44A-2960.	3		*			*
	6Z7567-1	M	PLUG: clamp; 2 pole; 110 volts ac; type; dwg No. A-19B-3671.	1		*			*
170-1 to 170-5 6, 108-1, 108-2	2Z7111.61	RT, RK, SG	PLUG: female; coaxial; 1 contact; type SC. No. SC-239; dwg No. 55A-2071.	8		*			*
	2Z8672.59	M	PLUG: female; 2 contacts; type No. AN-3108W-22-8S, American Phenolic Corp; dwg No. C-55A-1694.	1		*			*
	2Z8685-5	M	PLUG: female; 15 contacts; type Z8-3108-48-1S, American Phenolic Corp; dwg No. C-55A-1686.	1		*			*
	2Z7226-259	RK	PLUG: male; coaxial; 1 contact; type 83-1SP; dwg No. R-55A-2244.	2		*			*
171-1 to 171-4	2Z7111.27	RT	PLUG: male; coaxial; 1 contact; type SC No. PL259; dwg No. B-55A-2162.	6		*			*
	2Z7155	M	PLUG: male; "phone" type PL 55; dwg No. A-19A-3304.	1		*			*
	2Z7212.42	M	PLUG: male; 2 contacts; type No. AN-3106W-228-P; American Phenolic Corp; dwg No. C-55A-1695.	1		*			*
	2Z7112.43	M	PLUG: male; 2 contacts; type No. AN-3106W-22-1P, American Phenolic Corp; dwg No. C-55A-1688.	1		*			*
116	2Z7112.22	SG	PLUG: male; 2 contacts; flange; type No. AN-3102G-12-S-3P, American American Phenolic Corp; dwg No. A-55A-1750.	1		*			*
111	2Z7138.1	SG	PLUG: male; flush; motor; 2 pole; type 61-M10, American Phenolic Corp; dwg No. A-55A-3583.	1		*			*
	6Z7592	M	PLUG: male; 2 pole; 110-volts; type No. 2721; dwg No. A-19A-2347-1.	1		*			*
	2Z7113.40	M	PLUG: male; 3 contacts; type No. AN-3106W-22-P, American Phenolic Corp; dwg No. C-55A-1698.	1		*			*
	2Z3023	M	PLUG: male; 3 contacts; type No. AN-3108W-20-6P, American Phenolic Corp; dwg No. C-55A-4593.	1		*			*
	2Z7226-Q262	M	PLUG: male; 7 contacts; type No. AN-3108W-2A-3P, American Phenolic Corp; dwg No. C-55A-1689.	1		*			*
	2Z7122.25	M	PLUG: male; 12 contacts; type No. AN-3106-24-684P, American Phenolic Corp; dwg No. C-55A-1690.	1		*			*
	2Z7120.8	RT	PLUG ASSEMBLY: male; 10 contacts; pulse connector; dwg No. A-201-579.	1		*			*
180	2Z7131.6	RT	PLUG ASSEMBLY: male; type 21; contacts; dwg No. C-201-546-4.	1		*			*
1	2Z7134.5		PLUG ASSEMBLY: male; hv; 24 contacts; dwg No. C-2-1-1-545-1.	1		*			*
	2Z8672.20		RECEPTACLE: female; 2 contacts; type No. AN-3102-22-18; dwg No. A-55A-1704.	2		*			*

*Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	2d ech	3d ech	4th ech	Depot stock
	2Z8672.11		RECEPTACLE: female; 2 contacts; type No. AN-3102-22-8S, American Phenolic Corp; dwg No. A-55A-1703.	2		*			*
5	2Z8673.2	RK	RECEPTACLE: female; 3 contacts; type No. AN-3102-20-6S, American Phenolic Corp; dwg No. A-55A-1106.	2		*			*
4	2Z8799.242	RK	RECEPTACLE: female; 7 contacts; type No. AN-3102-24-3S; dwg No. A-55A-1273.	1		*			*
3	2Z7112.6	RK	RECEPTACLE: male; 2 contacts; type No. AN-3102-22-8P; dwg No. A-55A-1275.	1		*			*
7	2Z8673.51	RK	RECEPTACLE: male; 3 contacts; type No. AN-3102-22-6S; dwg No. A-55A-1630.	1		*			*
105	2Z7125	IC	RECEPTACLE: male; 15 contacts; type No. AN-3102-48-1P; dwg No. B-55A-1527.	1		*			*
182	2Z8680-6	PS	SOCKET ASSEMBLY: female; 10 contacts; dwg No. B-201-578.	1		*			*
30	2Z8690-7		SOCKET ASSEMBLY: female; 20 contacts; hv; dwg No. 201-546-1.	1		*			*
2	2Z8694.2	RK	SOCKET ASSEMBLY: female; 24 contacts; hv; dwg No. C-201-545-4.	1		*			*
72	3Z1946	PS	FUSE: cartridge; 0.5 amp, 250-volts; dwg No. A-46B-2719.	1	*	*	*	*	*
71	3Z1926	PS	FUSE: cartridge; 1 amp, 250-volts; dwg No. A-46B-2718.	1	*	*	*	*	*
113 70-1, 70-2	3Z1950	SG PS	FUSE: 3 amp, 250-volts; dwg No. A-46B-1109.	3	*	*	*	*	*
135	3Z2603.17	IC	FUSE: 3 amp, 250-volts; dwg No. A-46B-1287.	1	*	*	*	*	*
	3Z3275	IC	FUSE POST: extractor; dwg No. A-55A-1076.	2		*			*
	3Z3275-1	PS, SG	FUSE POST: Littelfuse; dwg No. A-55A-2716.	8		*			*
	6Z4858-4	SG	GROMMET: rubber; 7/16" OD x 3/16" ID x 1/2" thick; dwg No. A-25A-3580.	7		*			*
	3G1838-70	IC	INSULATOR: dwg No. A-7A-1432.	3		*			*
	3G1838-36.4	IC, RK	INSULATOR: dwg No. A-74A-1282.	8		*			*
	3G1838-27.4	RK, SG	INSULATOR: bakelite; dwg No. A-7A-1188.	5		*			*
	3G1100-101	RT	INSULATOR: ceramic; dwg No. D-5H-3139.	1		*			*
	3G1250-10.4	RT	INSULATOR: ceramic; 1/2" OD x 5/8" long; No. 6-32 tapped both ends 3/16" deep; dwg No. A-5F-1120.	2		*			*
	3G1100-110.2	RT	INSULATOR: ceramic; 6 7/8" x 2 5/8" x 7/16" strip has 12 5/32" diam holes; dwg No. A-7A-4108.	1		*			*
	3G1838-10.5	RT	INSULATOR: laminated; phenolic; 3/8" x 5/8" x 1/32"; has 0.144" diam hole; dwg No. A-7A-4145.	1		*			*
	3G1100-54.1	RT	INSULATOR: micalex; 1/2" x 3 3/8" x 1/4"; dwg No. A-7A-3163.	1		*			*
	3G1838-26.3	RT	INSULATOR: polystyrene; strip 1 5/8" x 1 1/8" x 1/8"; dwg No. A-7A-3439.	1		*			*
	3G1250-8.15	RT	INSULATOR: stand-off; ceramic; dwg No. A-5F-3296.	3		*			*
	3G1837-32.10	SG	INSULATOR: stand-off; bakelite; 5/8" diam, 1" long, with No. 10-24 tapped hole; dwg No. A-5G-3012.	4		*			*
	3G1837-75	SG	INSULATOR: stand-off; bakelite; 5/8" diam, 2 11/16" long, both ends tapped No. 10-24 hole; dwg No. A-5G-3028.	2		*			*
	3G1250-24.10	PS	INSULATOR: stand-off; ceramic; 1/2" OD x 1 1/2" long; dwg No. A-5G-2777.	4		*			*

* Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
	3G–1300–46	PS, RT	INSULATOR: steatite; feed thru; 1/2" OD x 1/2" long; tapped hole in each end, 6–32 tapped 3/16" deep; dwg No. A–55E–2788.	6		*			*
	3G1100–62	PS	INSULATOR: terminal board; ceramic; 3 7/8" long x 2 3/4" wide x 3/8" thick; 7 holes 0.187" diam; dwg No. A–7A–3618.	1		*			*
	3G1625–6.1	RT	INSULATOR: washer vellutex; 0.147 ID x 0.375 OD x 0.031 thick; dwg No. B–29G–3217.	36		*			*
	3G1625–8.3	RT	INSULATOR: washer vellutex; 0.147 ID x 0.500 OD x 0.031 thick; dwg No. B–29G–3236.	12		*			*
	3G1625–6	PS	INSULATOR: washer vellutex; 0.171 IDx0.375OD; dwg No. B–29G–3659.	11		*			*
	3G1625–8.1	RT	INSULATOR: washer vellutex; 0.173 ID x 0.500 OD x 0.031 thick; dwg No. B–29G–3390.	2		*			*
	3G1625–8.2	PS	INSULATOR: washer vellutex; 0.500 ODx0.169ID; dwg No. A–41A–2592.	8		*			*
190–1, 190–4, 108, 114–1, 114–2	2Z5927	RT, IC, SC	LAMP: bayonet base; 6.3 volts, 4 watts; type 44; dwg No. A–46A–1621.	7	*	*	*	*	*
109	6Z6820	IC	LAMP: ballast light; 120 volts; 3 watts; dwg No. A–46A–1622.	1	*	*			*
109	2Z5886	RT	LAMP: candelabra base; 115-volts, 6 watts; type S–6; dwg No. A–46A–4189.	1	*	*	*	*	*
	2Z5991	SC	LAMP ASSEMBLY: Drake, type No. 50; 1/2" red jewel; dwg No. A–55A–1526.	2		*			*
	2Z5884–9	PS	LAMP ASSEMBLY: Drake, type No. 75; 1" red jewel, 1.250" diam; dwg No. A–55A–1267–1.	2		*			*
	2Z5884–16	PS	LAMP ASSEMBLY: jewel and bracket indicating; amber 1.250" diam; cat. No. 75; dwg No. A–55A–1267–2.	1		*			*
	2Z5883–54	RT	LAMP SOCKET: bayonet; meter pilot light; base with hood covering; dwg No. A–47A–3539.	1		*			*
	2Z5883–44	RT	LAMP SOCKET ASSEMBLY: pilot light and bracket; bayonet base; dwg No. A–55A–1115–2.	1		*			*
	2Z5883–49	RT	LAMP SOCKET ASSEMBLY: pilot light; miniature bayonet base; dwg No. A–47A–3220.	2		*			*
160	3F25025	RT	METER: d-c; milliammeter; 0–10 ma and 0–1 kw; dwg No. B–55A–3530.	1					*
46	3Z9903A–12/1	SG	BUTTON: switch; bakelite (black); 23/32" OD x 1/8" counterbored, 350 7/32" deep ID x 1/2" long; dwg No. A5A–4082.	1					*
43	3H900–0.04	PS	CIRCUIT BREAKER: SPST; 0.040 to 0.050 amp, 117.5-volts; curve special; dwg No. 20C–2826.	1		*			*
44	3H900–10–4	PS	CIRCUIT BREAKER: SPST; 10 amp, 117.5-volts; curve No. 1; dwg No. B–20C–3591.	1		*			*
	3Z9824–250	SG	SWITCH: push button; 1 amp, 125-volts; a-c; single pole; dwg No. 20F–4098.	1					*
40	3Z9824–275.2	PS	SWITCH: push button; 5 amp; 125-volts; 3 amp, 250 volts; dwg No. A–20F–2776.	1		*			*
10	3Z9824–275.3	RK	SWITCH: push button; DPST; 7 amp, 115-volts; dwg No. A–20F–3866.	1		*			*
114	3Z9845–11.1	IC	SWITCH: relay; toggle; DPST; dwg No. A–20C–1525.	1		*			*
106	3Z9825–60.4	SG	SWITCH: rotary; single section; dwg No. B–20A–3193.	1		*			*

*Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
105-A, 105-B	3Z9825-60.5	SG	SWITCH: rotary; 2 section; 5 position; dwg No. 20A-2862.	1	----	*	----	----	*
140	3Z9825-60.2	RT	SWITCH: rotary; test; 3 position; 3 section; dwg No. B-20D-3260.	1	----	*	----	----	*
112-A, 112-B, 112-C, 112-D	3Z9825-58.24	IC	SWITCH: "Selector"; 7 position; 2 deck; dwg No. B-20A-1289.	1	----	*	----	----	*
113-A, 113-B, 113-C	3Z9825-62.105	IC	SWITCH: "Test"; 5 position; 2 section; dwg No. B-20A-4102.	1	----	*	----	----	*
112	3Z9849.10	SG	SWITCH: toggle; SPST; 3 amp, 250-volts; dwg No. A-20C-1263.	1	----	*	----	----	*
15	2Z7267.12	SG	POTENTIOMETER: 125 ohms, ±20%; carbon linear taper; dwg No. A-10B-2863.	1	----	*	----	----	*
95	2Z7269.45	IC	POTENTIOMETER: 3,500 ohms, ±20%; 1 watt; taper special wire-wound; dwg No. A-10B-3154.	1	----	*	----	----	*
94	2Z7292-10M	IC	POTENTIOMETER: 10,000 ohms, ±20%; "Control division"; dwg No. A-10B-1355.	1	----	*	----	----	*
93	2Z7288-3	IC	POTENTIOMETER: 50,000 ohms, ±20%; control clipper bias; dwg No. A-10B-1354.	1	----	*	----	----	*
89-1	2Z7271-43	RT	POTENTIOMETER: 100,000 ohms, ±10%; ½ watt; linear taper; pulse and bias; dwg No. A-10A-3147.	2	----	*	----	----	*
4	2Z7272-13	SG	POTENTIOMETER: 250,000 ohms, ±10%; 2 watts; linear type; dwg No. A-10B-3085.	1	----	*	----	----	*
92	2Z7284.61	RT	POTENTIOMETER: 1 megohm, ±10%; 1¼ watt; "dual"; linear taper; dwg No. B-10A-3172.	1	----	*	----	----	*
96	2Z7273-50	IC	POTENTIOMETER: 1 megohm, ±40% -0%; with DPDT switch; control "phase"; dwg No. B-10A-1357.	1	----	*	----	----	*
91	2Z7284.62	RT	POTENTIOMETER: 2 megohm, ±10%; 1¼ watt; "dual"; linear type; dwg No. B-10A-3108.	1	----	*	----	----	*
90	3Z7006-3	RT	RHEOSTAT: 6 ohms ±10%; 25 watts; wire-wound; linear type; dwg No. B-10A-3109.	1	----	*	----	----	*
13-1, 13-2	3Z5995-39	SG	RESISTOR: 5.5 ohms ±10%; 1/10 watt; carbon; dwg No. C-9B6-3379.	2	----	*	*	*	*
14	3Z5996-21	SG	RESISTOR: 6.11 ohms ±10%; 1/10 watt; carbon; dwg No. C-9B6-3380.	1	----	*	*	*	*
86	3Z5997-9	RT	RESISTOR: 7.8 ohms ±2%; ¼ watt; wire-wound; dwg No. A-9C-3532.	1	----	*	*	*	*
12	3RC20BE470J	SG	RESISTOR: 47 ohms ±5%; ⅓ watt; carbon; dwg No. C-9B6-3382.	1	----	*	*	*	*
93-1, 93-2, 93-3, 93-4	3Z6004A7	RT	RESISTOR: 47 ohms ±10%; ½ watt; carbon; dwg No. A-9B1-46.	4	----	*	*	*	*
11-1, 11-2	3Z6004A9-2	SG	RESISTOR: 49.5 ohms ±10%; 1/10 watt; carbon; dwg No. C-9B6-3381.	2	----	*	*	*	*
55	3Z6007E5-21	O	RESISTOR: 75 ohms ±10%; 1 watt; carbon; dwg No. A-9B2-1800.	1	----	*	*	*	*
65-1, 65-2, 65-3	3RC21BE101K	RT	RESISTOR: 100 ohms ±10%; ½ watt; carbon; dwg No. A-9B1-50.	3	----	*	*	*	*
73-1, 73-2, 73-3, 73-4, 6	3RC20BE221K	RT SG	RESISTOR: 220 ohms ±10%; ½ watt; carbon; dwg No. A-9B1-54.	5	----	*	*	*	*
83	3Z6020-30	IC	RESISTOR: 220 ohms ±20%; 1 watt; carbon; dwg No. A-9B2-9.	1	----	*	*	*	*
51-1, 51-2	3Z6025-63	RT	RESISTOR: 250 ohms ±10%; ⅓ watt; carbon; dwg No. A-9B1-2709.	2	----	*	*	*	*
24	3Z6033-20	PS	RESISTOR: 330 ohms ±10%; 5 watt; wire-wound; dwg No. A-9C-3668.	1	----	*	*	*	*
10	3RC20BE471J	SG	RESISTOR: 470 ohms ±5%; ⅓ watt; carbon; dwg No. C-9B6-3383.	1	----	*	*	*	*
66 9	3RC20BE471K	RT SG	RESISTOR: 470 ohms ±10%; ⅓ watt; carbon; dwg No. A-9B1-58.	2	----	*	*	*	*

*Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
56 60	3RC30BE471K	O RT	RESISTOR: 470 ohms ±10%; 1 watt; carbon; dwg No. A-9B2-58.	2	----	•	•	•	•
16	3Z6090-17	SG	RESISTOR: 910 ohms ±5%; ½ watt; carbon; dwg No. C-9B3-3535.	1	----	•	•	•	•
79	3Z6100-75	IC	RESISTOR: 1,000 ohms ±20%; ½ watt; carbon; dwg No. A-9B1-13.	1	----	•	•	•	•
85 57-1, 57-2	3RC30BE102K	RT O	RESISTOR: 1,000 ohms ±10%; 1 watt; carbon; dwg No. A-9B2-62.	3	----	•	•	•	•
18	3RC20BE152K	PS	RESISTOR: 1,500 ohms ±10%; ½ watt; carbon; dwg No. A-9B1-54.	2	----	•	•	•	•
66	3RC20BE152M	IC	RESISTOR: 1,500 ohms ±20%; ½ watt; carbon; dwg No. A-9B1-14.	1	----	•	•	•	•
52-1 52-2, 52-3, 52-4, 17	3RC20BE222K	RT SG	RESISTOR: 2,200 ohms ±10%; ½ watt; carbon; dwg No. A-9B1-66.	5	----	•	•	•	•
62-1, 62-2	3Z6220-10	IC	RESISTOR: 2,200 ohms ±20%; ½ watt; carbon; dwg No. A-9B1-15.	2	----	•	•	•	•
58	3RC30BE222K	O	RESISTOR: 2,200 ohms ±10%; 1 watt; carbon; dwg No. A-9B2-66.	1	----	•	•	•	•
55	3RC20BE272K	RT	RESISTOR: 2,700 ohms ±10%; ½ watt; carbon; dwg No. A-9B1-67.	1	----	•	•	•	•
63 76	3Z6630-11	IC RT	RESISTOR: 3,300 ohms ±5%; ½ watt; carbon; dwg No. A-9B1-171.	2	----	•	•	•	•
62-2, 62-3	3RC20BE332K	RT	RESISTOR: 3,300 ohms ±10%; ½ watt; carbon; dwg No. A-9B1-68.	3	----	•	•	•	•
59-1 through 59-6	3RC30BE332K	RT	RESISTOR: 3,300 ohms ±10%; 1 watt; carbon; dwg No. A-9B2-68.	6	----	•	•	•	•
68-1 68-3, 68-5, 91	3RC20BE392K	RT IC	RESISTOR: 3,900 ohms ±10%; ½ watt; carbon; dwg No. A-9B2-69.	5	----	•	•	•	•
61-1, 61-2	3Z6390-4	IC	RESISTOR: 3,900 ohms ±20%; ½ watt; carbon; dwg No. A-9B1-1758.	1	----	•	•	•	•
81	3RC30BE392J	RT	RESISTOR: 3,900 ohms ±5%; 1 watt; carbon; dwg No. A-9B1-69.	1	----	•	•	•	•
18-1, 18-2	3Z6400-23	SG	RESISTOR: 4,000 ohms ±5%; 10 watt; wire-wound; dwg No. A-9C-3860.	2	----	•	•	•	•
20 87	3Z6470-27	SG RT	RESISTOR: 4,700 ohms ±5%; ½ watt; carbon; dwg No. A-9B1-175.	2	----	•	•	•	•
63-1, 63-2	3Z6470-8	RT	RESISTOR: 4,700 ohms ±10%; ½ watt; carbon; dwg No. A-9B1-70.	2	----	•	•	•	•
67-1, 67-2	3RC20BE472M	IC	RESISTOR: 4,700 ohms ±20%; ½ watt; carbon; dwg No. A-9B1-17.	2	----	•	•	•	•
84	3Z6470-14	IC	RESISTOR: 4,700 ohms ±20%; 1 watt; carbon; dwg No. A-9B2-17.	1	----	•	•	•	•
74	3RC0BE562K	RT	RESISTOR: 5,600 ohms ±10%; 1 watt; carbon; dwg No. A-9B2-71.	1	----	•	•	•	•
56	3RC40AE682K	RT	RESISTOR: 6,800 ohms ±10%; 2 watts; carbon; dwg No. A-9B1-72.	1	----	•	•	•	•
68-1, 68-2, 68-3, 68-4	3RC20BE682M	IC	RESISTOR: 6,800 ohms ±20%; ½ watt; carbon; dwg No. A-9B1-18.	4	----	•	•	•	•
54-1, 54-2, 54-3	3RC30BE682K	RT	RESISTOR: 6,800 ohms ±10%; 1 watt; carbon; dwg No. A-9B2-72.	3	----	•	•	•	•
23	3RC40AE682K	PS	RESISTOR: 6,800 ohms ±10%; 2 watts; carbon; dwg No. A-9B4-72.	1	----	•	•	•	•
88	3Z6582-5	IC	RESISTOR: 8,200 ohms ±20%; 1 watt; carbon; dwg No. A-9B2-1759.	1	----	•	•	•	•
70-1 70-2, 70-3, 1	3RC20BE103K	RT SG	RESISTOR: 10,000 ohms ±10%; ½ watt; carbon; dwg No. A-9B1-74.	4	----	•	•	•	•
59	3RC30BE103K	O	RESISTOR: 10,000 ohms ±10%; 1 watt; carbon; dwg No. A-9B2-74.	1	----	•	•	•	•
69-1 through 69-5	3RC21AE103M	IC	RESISTOR: 10,000 ohms ±20%; ½ watt; carbon; dwg No. A-9B1-19.	5	----	•	•	•	•
70-1, 70-2	3RC20BE153K	IC	RESISTOR: 15,000 ohms ±10%; ½ watt; carbon; dwg No. A-9B1-76.	1	----	•	•	•	•
57-1, 57-2, 57-3	3RC21BE153M	IC	RESISTOR: 15,000 ohms ±20%; ½ watt; carbon; dwg No. A-9B1-20.	3	----	•	•	•	•
19	3Z6620-106	SG	RESISTOR: 20,000 ohms ±5%; 10 watts; wire-wound; dwg No. A-9C-3246.	1	----	•	•	•	•
58 2-1 to 2-3 60	3RC20BE223K	RT SG IC	RESISTOR: 22,000 ohms ±10%; ½ watt; carbon; dwg No. A-9B1-78.	5	----	•	•	•	•

* Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
95-1 to 95-3 81 3	3RC30BE223K	RT IC SG	RESISTOR: 22,000 ohms ±10%; 1 watt; carbon; dwg No. A-9B2-78.	5	----	*	*	*	*
72	3Z6622-13	IC	RESISTOR: 22,000 ohms ±20%; ½ watt; carbon; dwg No. A-9B1-21.	1	----	*	*	*	*
71-1, 71-2, 71-3, 71-4	3Z6622-12	IC	RESISTOR: 22,000 ohms ±20%; 1 watt; carbon; dwg No. A-9B2-21.	4	----	*	*	*	*
97-1, 97-2	3Z6622-23	IC	RESISTOR: 22,000 ohms ±5%; 5 watts; carbon; dwg No. A-9B-1530.	2	----	*	*	*	*
87-1, 87-2, 87-3, 87-4	3Z6633-8	IC	RESISTOR: 33,000 ohms ±20%; 1 watt; carbon; dwg No. A-9B2-22.	4	----	*	*	*	*
85-1, 85-2	3Z6647-5	IC	RESISTOR: 47,000 ohms ±10%; ½ watt; carbon; dwg No. A-9B1-82.	2	----	*	*	*	*
84	3RC30BE473K	RT	RESISTOR: 47,000 ohms ±10%; 1 watt; carbon; dwg No. A-9B2-82.	1	----	*	*	*	*
59-1, 59-2	3Z6656-7	IC	RESISTOR: 56,000 ohms ±20%; 1 watt; carbon; dwg No. A-9B2-1760.	2	----	*	*	*	*
92	3Z6668-9	IC	RESISTOR: 68,000 ohms ±20%; ½ watt; carbon; dwg No. A-9B1-24.	1	----	*	*	*	*
53-1, 53-2, 53-3, 8-1, 8-2	3ZK6668-14	RT SG	RESISTOR: 68,000 ohms ±10%; 1 watt; carbon; dwg No. A-9B2-84.	5	----	*	*	*	*
50-1 through 50-5, 90	3RC20BE104K	RT, IC	RESISTOR: 100,000 ohms ±10%; ½ watt; carbon; dwg No. A-9B1-86.	6	----	*	*	*	*
65-1 through 65-5	3Z6700-74	IC	RESISTOR: 100,000 ohms ±20%; ½ watt; carbon; dwg No. A-9B1-25.	5	----	*	*	*	*
67-1 through 67-6	3RC30BE104K	RT	RESISTOR: 100,000 ohms ±10%; 1 watt; carbon; dwg No. A-9B2-86.	6	----	*	*	*	*
56-1, 56-2, 56-3, 56-4	3RC30BE104M	IC	RESISTOR: 100,000 ohms ±20%; 1 watt; carbon; dwg No. B-9B2-25.	4	----	*	*	*	*
22-1, 22-2, 83-1 to 83-5	3RC30BE124K	PS RT	RESISTOR: 120,000 ohms ±10%; 1 watt; carbon; dwg No. A-9B2-87.	11	----	*	*	*	*
21	3RC40BE154M	PS	RESISTOR: 150,000 ohms +20%; 2 watts; carbon; dwg No. A-9B4-26.	1	----	*	*	*	*
25	3RC30BE184K	PS	RESISTOR: 180,000 ohms ±10%; 1 watt; carbon; dwg No. A-9B2-89.	1	----	*	*	*	*
80-1, 80-2	3RC30BE204J	RT	RESISTOR: 200,000 ohms ±5%; 1 watt; carbon; dwg No. A-9B2-3755.	2	----	*	*	*	*
98-1, 98-2	3Z6722-14	IC	RESISTOR: 220,000 ohms ±5%; ½ watt; carbon; dwg No. A-9B1-215.	2	----	*	*	*	*
72-1 to 72-3, 64, 5-1, 5-2	3RC20BE224K	RT, IC SG	RESISTOR: 220,000 ohms ±10%; ½ watt; carbon; dwg No. A-9B1-90.	6	----	*	*	*	*
82-1, 82-2, 82-4,	3RC40AE224M	IC	RESISTOR: 220,000 ohms ±20%; 2 watts; carbon; dwg No. A-9B1-27.	3	----	*	*	*	*
20, 58	3Z6722-15	PS, IC	RESISTOR: 220,000 ohms ±10%; 1 watt; carbon; dwg No. A-9B2-90.	2	----	*	*	*	*
80	3RC30BE224M	IC	RESISTOR: 220,000 ohms ±20%; 1 watt; carbon; dwg No. A-9B2-27.	1	----	*	*	*	*
19-1, 19-2, 19-3	3Z6722-13	PS	RESISTOR: 220,000 ohms ±20%; 2 watts; carbon; dwg No. A-9B4-27.	3	----	*	*	*	*
78-2 to 78-5	3RC30BE274K	RT	RESISTOR: 270,000 ohms ±10%; 1 watt; carbon; dwg No. A-9B2-91.	4	----	*	*	*	*
7-1, 7-2	3RC20BE334K	SG	RESISTOR: 330,000 ohms ±10%; ½ watt; carbon; dwg No. A-9B1-92.	2	----	*	*	*	*
89	3Z6733-8	IC	RESISTOR: 330,000 ohms ±20%; ½ watt; carbon; dwg No. A-9B1-28.	1	----	*	*	*	*
88-1, 88-2	3RC20BE474K	RT	RESISTOR: 470,000 ohms ±10%; ½ watt; carbon; dwg No. A-9B1-94.	2	----	*	*	*	*
55-1, 55-2, 55-3, 55-4	3RC20BE474M	IC	RESISTOR: 470,000 ohms ±20%; ½ watt; carbon; dwg No. A-9B1-29.	4	----	*	*	*	*
86	3Z6751-2	IC	RESISTOR: 510,000 ohms ±5%; ½ watt; carbon; dwg No. A-9B1-224.	1	----	*	*	*	*
82-1, 82-2, 82-3, 82-4	3Z6768-14	RT	RESISTOR: 600,000 ohms ±20%; 2 watts; carbon; dwg No. A-9B4-3219.	4	----	*	*	*	*
57	3RC20BE684K	RT	RESISTOR: 680,000 ohms ±10%; ½ watt; carbon; dwg No. A-9B1-96.	1	----	*	*	*	*
75	3Z6768-5	IC	RESISTOR: 680,000 ohms ±20%; ½ watt; carbon; dwg No. A-9B1-30.	1	----	*	*	*	*
17	3RC40AE684K	PS	RESISTOR: 680,000 ohms ±10%; 2 watts; carbon; dwg No. A-9B4-96.	1	----	*	*	*	*

*Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
76-1 through 76-6, 79-1 through 79-6	3RC20BE105M	RT, IC	RESISTOR: 1 megohm ±20%; ½ watt; carbon; dwg No. A-9B1-31.	12		*	*	*	*
16-1 to 16-4	3Z6801-78	IC	RESISTOR: 1 megohm ±20%; 2 watts; carbon; dwg No. A-9B4-31.	4		*	*	*	*
	2Z7385	SG	RADIATOR ASSEMBLY: transceiver; consisting of connector, cap, and radiator; dwg No. A-201-868.	1		*			*
	2Z8050-5	RT	ROD: release; black linen, bakelite; 0.140" diam x 18.323" lg; dwg No. A-3P-2819.	2					*
	2Z8050-6	RT	ROD ASSEMBLY: adjusting; used in antenna matching section; 18⅝" long x ⅜" diam; dwg No. A-202-552.	2					*
	2Z8203-14	SG	SHAFT: extension; bakelite; 0.250" diam, 3.625"; dwg No. A-5G-2890.	1					*
	2Z5698	RT	SHIELD: key; tube steel; T-shaped; dwg No. A-2H-4236.	1		*			*
	2Z8878-24	RT	SPRING: music wire; compression; 0.234" diam x ⅞" long; dwg No. A-49A-4166.	2		*			*
	2Z8878-26	PS	SPRING: retaining; No. 19GA (0.0418) music wire; used on jewel indicator and bracket assemblies; dwg No. A-49A-4587.	4		*			*
	2Z8877.11	RT, SG	SPRING: tube shield; dwg No. A-49A-1269.	3		*			*
	2Z9049.7	RT	STRAP: hanger tie; dwg No. B-2H-4575.	2					*
	3G2425-1	M	TUBING: hyflex; No. 14; 25' long; coil.						*
	3G2425-1	M	TUBING: 5/16 hyflex; 25' long; coil.						*
77-1, 77-2	3Z6801A5-10	IC	RESISTOR: 1.5 megohm ±20%; ½ watt; carbon; dwg No. A-9B1-32.	2		*	*	*	*
15	3RC30BE155M	PS	RESISTOR: 1.5 megohm ±20%; 1 watt; carbon; dwg No. A-9B2-32.	1		*	*	*	*
78-1, 78-2, 78-3	3RC20BE225M	IC	RESISTOR: 2.2 megohms ±20%; ½ watt; carbon; dwg No. A-9B1-33.	3		*	*	*	*
69	3Z6840	RT	RESISTOR: 40 megohms ±20%; ½ watt; carbon; dwg No. A-9B1-3253.	1		*	*	*	*
	2Z5884-27	IC	SOCKET: ballast light and bracket; dwg No. A-47A-1A53.	1		*			*
	2Z8761-14	SG	SOCKET: "crystal"; 4-prong; mica-filled bakelite; dwg No. A-15B-3090.	1		*			*
	2Z8678.92	RT	SOCKET: octal; 8-prong; ceramic; dwg No. A-15A-3750.	2		*			*
	2Z8678.91	PS	SOCKET: octal; 8-prong; ceramic; dwg No. A-15A-2739.	4		*			*
	2Z8678.93	RT	SOCKET: octal; 8-prong; mica-filled bakelite; dwg No. A-15B-1142.	3		*			*
	2Z8674.15	PS	SOCKET: tube; 4-contact; mica-filled bakelite; dwg No. A-15B-2779.	3		*			*
	2Z8677.30	RT	SOCKET: 7-prong; midget type; mica-filled bakelite; dwg No. A-15C-3746.	1		*			*
	2Z8677.5	RT, SG	SOCKET: tube; 7-prong; black bakelite; dwg No. A-15C-1041.	13		*			*
	2Z8663-1	RT	SOCKET: tube; 7-contract; steatite; dwg No. A-15A-1123.	1		*			*
	2Z8650.5	IC, RT, SG	SOCKET: tube; molded bakelite; 8-contact; dwg No. A-15B-1462.	20		*			*
	2Z8795.1	SG	SOCKET: tube; 8-prong; mica; dwg No. A-15A-1651.	1		*			*
131	2Z9643.42	IC	TRANSFORMER: blocking oscillator; turns ratio 2:1; dwg No. C-12A-1318.	1		*			*
118	2Z9638-14	RT	TRANSFORMER: blocking oscillator; tertiary winding; dwg No. C-12A-2949.	1		*			*
112	2Z9643.44	RT	TRANSFORMER: eye tuning; permeability tuned; dwg No. B-13H-3133.	1		*			*

* Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
56	2Z9611.126	PS	TRANSFORMER: filament; low voltage; six secondaries; dwg No. D-12A-2838.	1		*			*
57	2Z9611.127	PS	TRANSFORMER: filament; high voltage; three secondaries; dwg No. D-12A-2792.	1		*			*
119	2Z9634.35	RT	TRANSFORMER: modulator; step down, primary-secondary ratio; dwg No. C-12D-2935.	1		*			*
58	2Z9612.64	PS	TRANSFORMER: plate; high voltage; dwg No. D-12A-2786.	1		*			*
59	2Z9612.61	PS	TRANSFORMER: plate; low voltage; dwg No. D-12A-2811.	1		*			*
104, 130	2Z9613.133	SG, IC	TRANSFORMER: power filament and high-voltage supply; dwg No. D-12A-1319.	2		*			*
106	2Z9643.37	RT	TRANSFORMER: 1st i.f.; permeability tuned; dwg No. B-13A-3132.	1		*			*
107	2Z9643.41	RT	TRANSFORMER: 2d i.f.; permeability tuned; dwg No. B-13H-3131.	1		*			*
111	2Z9643.43	RT	TRANSFORMER: 2d detector; permeability tuned; dwg No. B-13H-3130.	1		*			*
108	2Z9643.40	RT	TRANSFORMER: 3d i.f.; permeability tuned; dwg No. B-13H-3134.	1		*			*
109	2Z9643.39	RT	TRANSFORMER: 4th i.f.; permeability tuned; dwg No. B-13H-3129.	1		*			*
110	2Z9643.38	RT	TRANSFORMER: 5th i.f.; permeability tuned; dwg No. B-13B-3128.	1		*			*
	2J6H6GT/G	IC, RT	TUBE: JAN, 6H6, VT-90-A	3	*	*			*
	2J6J5	RT, SG	TUBE: JAN, 6J5, VT-94	3	*	*			*
	2J6V6GT	IC, RT	TUBE: JAN, 6J6-GT, VT-107-A	3	*	*			*
	2J65J7	IC, SG	TUBE: JAN, 6SJ7, VT-116	3	*	*			*
	2J2X2	PS	TUBE: JAN, 2X2, VT-119	3	*	*			*
	2J6X5GT	PS	TUBE: JAN, 645GT, VT-126-B	1	*	*			*
	2J6SA7	IC	TUBE: JAN, 6SA7, VT-150	1	*	*			*
	2J5Y3G	IC, SG	TUBE: JAN, 5Y3G, VT-197-A	2	*	*			*
	2J9002	SG	TUBE: JAN, 9002, VT-202	1		*			*
	2J6E5	RT	TUBE: JAN, 6E5, VT-215	1	*	*			*
	2J6SN7GT	IC, RT	TUBE: JAN, 6SN7GT, VT-231	9	*	*			*
	2J5U4G	PS	TUBE: JAN, 5U4G, VT-244	3	*	*			*
	2J3E29	RT	TUBE: JAN, 3E29	1	*	*			*
	2J2C26	RT	TUBE: JAN, 2C26	2	*	*			*
	2J6C4	RT	TUBE: JAN, 6C4	1	*	*			*
	2J6AG5	RT	TUBE: JAN, 6AG5	7	*	*			*
	2J6AK5	RT	TUBE: JAN, 6AK5	3	*	*			*
	2J9006	RT, SG	TUBE: JAN, 9006	2	*	*			*
	3Z12059-22	RT	TERMINAL: locking; phosphor bronze; type Shakeproof No. 2101-10; dwg No. A-26A-2462.	8					*
	3Z12059-21	RT	TERMINAL: locking; phosphor bronze; for No. 6 machine screw; Shakeproof No. 2103-6; dwg No. A-26A-5.	8					*
	3Z12031-12.1	RT	TERMINAL: locking; phosphor bronze; hot tin dipped; type Stewart; No. 907; dwg No. A-26C-1670.	4					*
	3Z12059-4	PS	TERMINAL: No. 8 locking type; steel; Shakeproof No. 2101; dwg No. A26A-1773.	10					*
	3Z12059-4	SG, RT	TERMINAL: No. 8 locking type; steel; Shakeproof No. 2104; dwg No. A-260-3241.	22		*			*
	3Z12059-14	SC, RT	TERMINAL: phosphor bronze; Shakeproof No. 2104-4; dwg No. A-260-3242.	19		*			*
	3Z102056/2	RT	TERMINAL: SPL; phosphor bronze; hot tin dipped; type Shakeproof No. 2108-8; dwg No. A-26A-4057.	2		*			*
	3Z12059-7	SG, RT	TERMINAL: sheet; locking; for No. 6 screw; Shakeproof No. 2104-6; dwg No. A-260-3235.	14		*			*

*Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
	3Z12059-12	SG	TERMINAL: sheet; locking; for No. 10 screw; Shakeproof No. 2103-10; dwg No. A-26A-3357.	1					*
	3Z12056/1	SG	TERMINAL: SPL; phosphor bronze; No. 2108-6; dwg No. A-26A-2035.	1					*
	3Z12031-11.2	RK	TERMINAL: type Stewart; No. 302-8; dwg No. A-260-2481.	3					*
	3Z12059-41.1	SG	TERMINAL: type Shakeproof No. 2116-10; dwg No. A-26A-4199.	1					*
	3Z12031-11.1	AT	TERMINAL: type Stewart; No. 302-4; dwg No. A-26D-2480.	1					*
	3Z12059-14	IC	TERMINAL: type Shakeproof No. 2104-4; dwg No. A-26A-1799.	1					*
	2Z9401.27	RT	TERMINAL BOARD: 1-contact; phenolic; 2¼" long x ⅞" wide x 3/32" thick; dwg No. A-201-803.	1					*
	2Z9402.64	RT, SG	TERMINAL BOARD: 2 lugs ⅜" long; phenolic; 1½" x ½" x 3/32"; dwg No. A-201-89.	2					*
	2Z9402.75	PS	TERMINAL BOARD: 2 contacts; phenolic; 1½" long x 1" wide x 3/32" thick; 2 mtg holes; dwg No. A-201-743.	1					*
	2Z9403.42	RT	TERMINAL BOARD: 3 contacts; phenolic; 1 1/16" long x ¾" wide x 3/32" thick; 2 mtg holes; dwg No. A-201-896.	1					*
	2Z9404.45	RT	TERMINAL BOARD: 4 contacts; phenolic; 2¼" long x ½" wide x 3/32" thick; 2 mtg holes; dwg No. A-201-687.	1					*
	2Z9404.47	SG	TERMINAL BOARD: 4 terminals; bakelite; 2½" long x 1⅛" wide x 0.093" thick; dwg No. A-201-608.	1					*
	2Z9407.9	SG	TERMINAL BOARD: 7 terminals; bakelite; 2⅜" long x 1¼" wide x 0.093" thick; 2 mtg holes; dwg No. A-201-871.	1					*
	2Z9408.27	RT	TERMINAL BOARD: 8 terminals; bakelite; 1¼" x 3¾" x 3/32"; dwg No. A-201-657.	1					*
	2Z9409.12	RT	TERMINAL BOARD: 9 contacts; ceramic; 1¾" base, 1 5/32" high x 5/32" thick; dwg No. A-201-850.	1					*
	2Z9414.15	RT	TERMINAL BOARD: 14 contacts; bakelite; 3½" long x 1⅞" wide x 0.093" thick; dwg No. A-201-718.	1					*
	2Z9420.8	RT	TERMINAL BOARD: 20 contacts; bakelite; 6⅜" x 1⅜" x 3/32"; dwg No. A-201-540-1.	1					*
	2Z9440-36	IC	TERMINAL BOARD ASSEMBLY: dwg No. B-201-1009.	1					*
	2Z9401.20	O	TERMINAL BOARD ASSEMBLY: dwg No. A-201-320.	1					*
	2Z9440-36	IC	TERMINAL BOARD ASSEMBLY: dwg No. B-201-1010.	1					*
	2Z9403.79	O	TERMINAL BOARD ASSEMBLY: dwg No. A-201-321.	1					*
	2Z9406.73	O	TERMINAL BOARD ASSEMBLY: dwg No. A-201-319.	1					*
	2Z9404.76	IC	TERMINAL BOARD ASSEMBLY: dwg No. A-201-178.	1					*
	2Z9405.53	O	TERMINAL BOARD ASSEMBLY: dwg A-201-323.	1					*
	2Z9401.25	RT	TERMINAL BOARD ASSEMBLY: 1 terminal; bakelite; 0.812" long x 0.312" wide x 0.093" thick; dwg No. A-201-439.	1					*
	2Z9401.26	RT	TERMINAL BOARD ASSEMBLY: 1 terminal; bakelite; ⅝" long x ⅜" wide x 3/32" thick; dwg No. A-201-556.	1					*

* Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
	2Z9414.13	RT	TERMINAL BOARD ASSEMBLY: 14 contacts; bakelite; 3" long x 1⅛" wide x 0.093" thick; dwg No. A-201-580.	1					*
	2Z9402.73	RT	TERMINAL BOARD ASSEMBLY: 14 contacts; bakelite; 3" long x 1⅛" wide x 0.093" thick; dwg No. A-201-823.	1					*
	2Z9422.6	SG	TERMINAL BOARD ASSEMBLY: 22 male terminals; bakelite; 5" long x 1⅝" wide x 3/16" thick; dwg A-201-639.	1					*
	2Z9426-1	RT	TERMINAL BOARD ASSEMBLY: 26 male terminals; bakelite; 6⅜" long x 1⅞" wide x 3/16" thick; dwg No. B-201-801.	1					*
	2Z9428-4	RT	TERMINAL BOARD ASSEMBLY: 28 contacts, male; bakelite; 5.250" long x 1.500" wide x 3/16" thick; dwg No. A-201-697.	1					*
	3Z12059-31	SG, RT	TERMINAL LUG: brass; Shakeproof No. 2103-4; dwg No. A-26A-1457.	8					*
	3Z12059-40.1	RT	TERMINAL LUG: bronze; H.T.; Shakeproof No. 2124-6; flat rt angle type; dwg No. A-26D-3514.	5					*
	3Z12025-9.15	RK, PS	TERMINAL LUG: phosphor bronze; H.T.; Sherman 98; dwg No. A-26D-2861.	3					*
	3Z12050-5.8	RT	TERMINAL LUG: phosphor bronze; H.T.; Patten MacGuyer 2052-6; dwg No. A-26D-3721.	2					*
	3Z12059.37	SG	TERMINAL LUG: ring type; Shakeproof No. 2528-8; dwg No. A-26D-697.	1					*
	3Z12050-3	RT	TERMINAL LUG: soldering; brass; single ear; dwg No. A-26A-366.	1					*
	3Z12050-5.1	RT	TERMINAL LUG: soldering; Patton Mac Guyer No. 2045; dwg No. A-26D-1832.	3					*
	3Z12050-5.6	RT	TERMINAL LUG: spade type; H.T.; brass; Patton Mac Guyer 2067; one ear; dwg No. A-26D-1826.	2					*
183	2Z9402.44	RT	TERMINAL STRIP: 2 contact; bakelite; dwg No. A-7A-3506.	1					*
	2Z9402.25	RT	TERMINAL STRIP: 2 contact; phenolic; 2⅞" long x ½" wide x 3/16" thick; dwg No. A-201-101.	1					*
	2A271-4	SG	ANTENNA: dummy; dwg No. A-201-886.	1					*
	2A276-11	AT	ANTENNA ASSEMBLY: support; dwg No. B-201-745.	1					*
	2Z1409-11	RT	BUSHING: handle; samak; 1" OD x 0.390", 0.343 ID x ⅝" long; dwg No. A-3B-2817.	2		*			*
	2Z1409-12	RT	BUSHING: steel headed; head size, 5/16" diam x 3/32" long; shank, 0.216" diam x 11/16" long; 0.147" diam thru-hole; dwg No. A-3B-4165.	2		*			*
	2Z1480.6	RT	BUTTON: release; dwg No. A-3B-2820.	2		*			*
	3Z3352.23	M	CAP: rain; dwg No. B-25H-2527-1	1					*
	3Z7144-12	M	CAP: rain; dwg No. B-25H-2527-5	1					*
	2Z1612.10	M	CAP: rain; dwg No. B-25H-2527	1					*
	2Z1612.1	RT	CAP AND CHAIN: assembly; dwg No. A-202-885	1					*
	2Z1612.13	RT	CAP AND CHAIN: dwg No. A-55A-1276.	1					*
	2Z1612	RK	CAP AND CHAIN: dwg No. B-55A-1277.	1					*
	2Z1612.8	RK	CAP AND CHAIN: dwg No. B-55A-1510.	1					*

* Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	2d ech	3d ech	4th ech	Depot stock
	2Z1612.21	IC	CAP AND CHAIN: dwg No. A-55-A-1528.	1					*
	2Z1612.9	M	CAP AND CHAIN: dwg No. B-55A-1743.	2					*
	2Z1612.14	M	CAP AND CHAIN: dwg No. B-55A-1744; AN-9760-24P.	2					*
	2Z1612.11	M	CAP AND CHAIN: dwg No. B55A-1746.	1					*
	2Z1612.10	M	CAP AND CHAIN: dwg No. B-55A-1747.	1					*
	2Z1612.1	RK	CAP AND CHAIN: dwg No. B-55A-2546.	1					*
	2Z2708	PS	CLIP: grid; brass; 0.375 wide stock; 0.875 long; dwg No. A-26D-757-2.	3		*			*
	2Z3354-18	SG	COVER: jack; steel; 27/32" x 4 5/64" x 9/32"; dwg No. A23A-3656.	1		*			*
	2X15-5000	SG	CRYSTAL AND HOLDER: 5 mc; 1 1/8" x 13/16" x 13/32" 0.484" plug in centers; dwg No. A8K-2848.	1		*	*	*	*
	2Z3775	PS	DIAPHRAM: jewel light	4		*			*
	2Z4880-18	RT	GLASS: dial; 7 7/8" x 1 1/2" x 1/8"; dwg No. A-55A-3065.	1		*			*
	2Z4880-19	RT	GLASS: dial; glass has the inner surface olive drab for a portion of its length on both ends; 1 1/2" x 1 1/8"; dwg No. A-55A-3066.	1		*			*
	2Z4880-20	PS	GLASS: dial; glass is opaque except for four dial openings which have hair line indicators; 1 55/64" x 9 1/8" x 1/8"; dwg No. A-55A-1055.	1		*			*
	3F2829	SG	GLASS: dial; shatterproof; 3/32" thick, 1 3/4" long x 1 13/32" wide; dwg No. A-55A-3118.	1					*
	2Z9010-3	RT	GROUND STRAP: brass; dwg No. A-2L-2748.	1					*
	2Z4928-8	RT	HANDLE: tuning; 0.083" cold rolled steel, 1/2" wide, x 2 1/2" long; dwg No. A-23A-2821.	2					*
	2Z5040-360	RT	HOOD: connector; 0.020" brass; the piece is funnel-shaped, the base is 1" x 1", the base diam is 0.635", the tip diam is 11/32", over-all length 3/4"; dwg No. A-55A-3519.	2					*
	2Z5822-25	IC	KNOB: dwg No. A-4B-1783	4		*			*
	2Z5821-21	IC	KNOB: dwg No. A-4B-1407	1		*			*
	2Z5821-16	RT	KNOB: bakelite; dwg No. A-5B-3986	1		*			*
	2Z5821-15	SG, RT	KNOB: molded; No. 3 zamak; 1 1/4" OD x 9/16"; dwg No. A-4B-1110.	3		*			*
	2Z5821-13	RT	KNOB: screw driver tip; knurled; OD 1"; dwg No. B-3F-2849.	1		*			*
	2Z5848.16	SG	KNOB: tuning assembly; dwg No. A-200-835.	1		*			*
	2Z5821-9	IC	KNOB: zamak No. 3; 1" x 3/4" rd, 0.468" long; dwg No. A-4B-1489.	1		*			*
	2Z5821.14	RT	KNOB: zamak; with arm 1 7/8" x 3/4" x 5/8"; dwg No. A-4B-1553.	1		*			*
	2Z5821-18	SG	KNOB: zamak; range selector; dwg No. A-4B-3485.	1		*			*
	2Z6196-3	RK	LOCKING BAR ASSEMBLY: dwg No. B-202-989.	1		*			*
	2Z6820.5	RK	MOUNTING: hanger; left-hand rack; dwg No. C-2D-4577.	1					*
	2Z6820.6	RK	MOUNTING: hanger; right-hand rack; dwg No. C-2D-4578.	1					*
	2A275-128A	AT	ANTENNA AN-128-A: dwg No. C-205-304.	1					*
	2C1598-1298	IC	INTERCONNECTOR UNIT BC-1298: dwg No. 202-957.	1	*				*
	2Z7360-82	RIC	OPERATING CONSOLE RACK FM-82: dwg No. 202-905.	1					*
	3H4496-105-A	PS	POWER SUPPLY RA-105-A: dwg No. 205-573.	1	*				*

*Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
	2C5895-1267-A	RT	RADIO RECEIVER AND TRANSMITTER BC-1267-A: dwg No. 205-674.	1	*				*
	3F3900-122A	SG	SIGNAL GENERATOR I-222-A: dwg No. 205-680.	1					*
	6L4906-12	AT	BOLT: hex head; 3/8-16 x 3/4; dwg No. A-3F-4642.	4		*			*
	6L3408-32.2B	SG	NUT: brass; knurled; No. 8-32 tap; class 2 fit; 7/16" diam, 5/16" thick; finish, black nickel; dwg No. 43E-3586.	4		*			*
	6L3504-20Z-B7	RK	NUT: hex; No. 1/4-20 thd x 7/16"; steel; finish, irodite treatment, zinc plate; dwg No. 43A-1330.	5		*			*
	6L3504-20EA7	PS, SG	NUT: hex; No. 1/4-20 thd, 7/16" across flats, 3/16"; thick; class 1 fit; steel; finish, electrogalvanized with cronak treatment; dwg No. 43A-3140.	24		*			*
	6L3504-20E-A7	PS, RT	NUT: hex; No. 1/4-20 thd, 7/16" across flats, 3/16" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. 43A-1330.	8		*			*
	6L3504-28E-A7	PS, RT, SG	NUT: hex; No. 1/4-28 thd, 7/16" across flats, 3/16" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. 43A-3141.	6		*			*
	6L3604-40E-A4	PS, RT, IC	NUT: hex; No. 4-40 thd, 1/4" across flats, 3/32" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. 43A-267.	74		*			*
	6L3606-32E-A4	PS, RT	NUT: hex; No. 6-32 thd, 1/4" across flats, 3/32" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. 43A-27.	62		*			*
	6L3606-32E-A5	RT, IC	NUT: hex; No. 6-32 thd, 5/16" across flats, 7/64" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. 43A-1331.	16		*			*
	6L3608-32E-A5	RT	NUT: hex; No. 8-32 thd, 5/16" across flats, 1/8" thick; class 1 fit; steel; finish, electro-galvanized with cronak treatment; dwg No. 43A-3249.	4		*			*
	6L3608-32E-A5	PS, RT, IC	NUT: hex; No. 8-32 thd, 5/16" across flats, 1/8" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. 43A-2730.	92		*			*
	6L3608-32Z-B5-1	RK	NUT: hex; No. 8-32 thd, x 11/32" long; steel; finish, electro-galvanized with cronak treatment; dwg No. 43A-3575.	24		*			*
	6L3608-32-EA5	IC	NUT: hex; No. 8-32 thd x 3/8" long; finish, electro-galvanized with cronak treatment; dwg No. 43A-2167.	4		*			*
	6L3610-32E-A6	PS, RT, IC	NUT: hex; No. 10-32 thd, 3/8" across flats, 1/8" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. 43A-1326.	89		*			*
	6L3612-24E-A7	SG	NUT: hex; No. 12-24 thd, 7/16" across flats, 5/32" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. 43A-1652.	6		*			*
	6L3506-16Z-B11	AT	NUT: hex; No. 3/8-16 x 1/8"; dwg No. 43A-1328.	16		*			*
	6L3706-32E-1	RT	NUT: wing; No. 6-32 thd, 11/16" across wings, 11/32" high; steel; finish, electro-galvanized with cronak treatment; dwg No. A-43A-3930.	2		*			*
	6L6440-5.8SE-1	RT	SCREW: B.H.M.; No. 4-40 thd x 5/16" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F4-1601.	38		*			*

* Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
	6L6440-5.8SE-1	IC	SCREW: B.H.M.; No. 4-40 thd x 5/16"; steel; finish; Irodite treatment with zinc plate; dwg No. 32F4-1601.	3		*			*
	6L6440-6.8SE-1	PS, RT	SCREW: B.H.M.; No. 4-40 thd x 3/8" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F4-1603.	18		*			*
	6L6440-6.8Z-2	RT	SCREW: B.H.M.; No. 4-40 thd x 3/8" long; steel; finish, Irodite treatment with zinc plate; dwg No. 32F4-1603.	4		*			*
	6L6440-7.8E1	RT	SCREW: B.H.M.; No. 4-40 thd x 7/16"; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F4-3084.	1		*			*
	6L6440-17-1Z-2	RT	SCREW: B.H.M.; No. 4-40 thd x 1 1/16" long; steel; finish, Irodite treatment with zinc plate; dwg No. 32F4-3186.	2		*			*
	6L6440-17.8E1	RT	SCREW: B.H.M.; No. 4-40 thd x 1 1/16"; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F4-3186.	2		*			*
	6L6632-3.1SE-1	RT	SCREW: B.H.M.; No. 6-32 thd x 3/16" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F6-2136.	13		*			*
	6L6632-4.8Z-2	PS	SCREW: B.H.M.; No. 6-32 thd x 1/4" long; steel; finish, Irodite treatment with zinc plate; dwg No. 32F6-2649.	4		*			*
	6L6632-4.1SE-1	RT	SCREW: B.H.M.; No. 6-32 thd x 1/4" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F6-2649.	49		*			*
	6L6632-5.1Z-2	RT, RK	SCREW: B.H.M.; No. 6-32 thd x 5/16" long; steel; finish, Irodite treatment with zinc plate; dwg No. 32F6-2652.	15		*			*
	6L6632-5.8SE-1	PS, RT	SCREW: B.H.M.; No. 6-32 thd x 5/16" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F6-2652.	48		*			*
	6L6632-6.8SE-1	RT	SCREW: B.H.M.; No. 6-32 thd x 3/8" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F6-2654.	22		*			*
	6L6632-6.8Z-2	RT	SCREW: B.H.M.; No. 6-32 thd x 3/8" long; steel; finish, Irodite treatment with zinc plate; dwg No. 32F6-2654.	17		*			*
	6L6632-7.8SE-1	RT	SCREW: B.H.M.; No. 6-32 thd x 7/16" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F6-2939.	8		*			*
	6L7632-8.8SE-1	RT	SCREW: B.H.M.; No. 16-32 thd x 1/2" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F6-3083.	1					*
	6L6632-9.8Z-2	RT	SCREW: B.H.M.; No. 6-32 thd x 9/16" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F6-3689.	2		*			*
	6L6632-9.8Z-2	RT	SCREW: B.H.M.; No. 6-32 thd x 9/16" long; steel; finish, Irodite treatment with zinc plate; dwg No. 32F6-3689.	2					*
	6L6632-11.8SE-1	RT	SCREW: B.H.M.; No. 6-32 thd x 11/16" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F6-2938.	2					*
	6L6632-22.9A	AT	SCREW: B.H.M.; No. 6-32 thd x 1 3/8"; finish, dull white, nickel; dwg No. 33F6-1648.	4		*			*

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	6L6832-3.8SE-1	RT	SCREW: B.H.M ; No. 8-32 thd x 3/16" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F8-1599.	4		*			*
	6L6832-4.8SE-1	RT	SCREW: B.H.M.; No. 8-32 thd x 1/4" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F8-2655.	13		*			*
	6L6832-5.8Z-2	RK	SCREW: B.H.M.; No. 8-32 thd x 5/16" steel; finish, Irodite treatment with zinc plate; dwg No. 32F8-2726.	11		*			*
	6L6832-5.8SE-1	RT	SCREW: B.H.M.; No. 8-32 thd x 5/16" long; steel; finish electrogalvanized with cronak treatment; dwg No. 32F8-2726.	14		*			*
	6L6832-6.8Z-2	RK	SCREW: B.H.M.; No. 8-32 thd x 3/8"; steel; finish, Irodite treatment with zinc plate; dwg No. 32F8-2725.	23		*			*
	6L6832-6.8SE-1	PS, RT	SCREW: B.H.M.; No. 8-32 thd x 3/8" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F8-2725.	49		*			*
	6L6832-7.8SE-1	RT	SCREW: B.H.M.; No. 8-32 thd x 7/16" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F8-2727.	9		*			*
	6L6832-7.8Z-2	RT	SCREW: B.H.M.; No. 8-32 thd x 7/16" steel; finish, Irodite treatment with zinc plate; dwg No. 32F8-2727.	2					*
	6L6832-8.8SE-1	PS, RT	SCREW: B.H.M.; No. 8-32 thd x 1/2" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F8-3322.	10		*			*
	6L6832-9.8SE-1	RT	SCREW: B.H.M.; No. 8-32 thd x 9/16" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F8-3048.	4		*			*
	6L6832-10.8SE-1	RT	SCREW: B.H.M.; No. 8-32 thd x 5/8" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F8-3505.	2		*			*
	6L6832-12.8SE-1	PS	SCREW: B.H.M.; No. 8-32 thd x 3/4" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F8-3657.	7		*			*
	6L6832-14.8Z-2	IC	SCREW: B.H.M.; No. 8-32 thd x 7/8" long; steel; finish, Irodite treatment with zinc plate; dwg No. 32F8-4239.	2		*			*
	6L6832-16-19A	O	SCREW: B.H.M.; No. 8-32 thd x 1"; finish, dull white nickel; dwg No. 33F8-662.	2		*			*
	6L7032-4.8Z-2	IC	SCREW: B.H.M.; No. 10-32 thd x 1/4" long; steel; finish, Irodite treatment with zinc plate; dwg No. 32F10-3046.	3		*			*
	6L7032-5.8SE-1	RT	SCREW: B.H.M.; No. 10-32 thd x 5/16" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F10-3046.	4		*			*
	6L7032-6.8SE-1	PS, RT	SCREW: B.H.M.; No. 10-32 thd x 3/8" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F10-2724.	32		*			*
	6L7032-7.8SE-1	PS	SCREW: B.H.M.; No. 10-32 thd x 7/16"; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F10-2728.	10		*			*
	6L7032-7.8Z-2	RT	SCREW: B.H.M.; No. 10-32 thd x 7/16" long; steel; finish, Irodite treatment with zinc plate; dwg No. 32F10-2728.	13					*

* Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
	6L7032-8.8Z-2	PS	SCREW: B.H.M.; No. 10-32 thd x ½" long; steel; finish, Irodite treatment with zinc plate; dwg No. 32F10-3915.	2		*			*
	6L7032-8.8SE-1	PS, RT	SCREW: B.H.M.; No. 10-32 thd x ½" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32F10-3915.	8		*			*
	6L4766-13IN	RT	SCREW: captive; No. 6-32; dwg No. A-3C-554.	4		*			*
	6L4768-17	SG	SCREW: captive; knurled; No. 8-32 thd x 25/32" long; steel; finish, Irodite treatment with zinc plate; dwg No. A-3F-3487.	10		*			*
	6L4906-12	IC	SCREW: cap., ⅜" (0.375") 16 thd ¾" long; steel; dwg No. A-3F-4642.	20		*			*
	6L6440-5.3SE-1	SG	SCREW: fil; H.M.; No. 4-40 thd x 5/16" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32C4-4661.	4		*			*
	6L6440-2SE-1	RT	SCREW: F.H.M.; No. 4-40 thd x ⅛" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32B4-2940.	2		*			*
	6L6440-3Z-2	RT	SCREW: F.H.M.; No. 4-40 thd x 3/16" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32B4-3574.	2		*			*
	6L6440-3Z-2	RT	SCREW: F.H.M.; No. 4-40 thd x 3/16" steel; finish, Irodite treatment with zinc plate; dwg No. 32B4-3574.	2		*			*
	6L6440-5SE-1	SG	SCREW: F.H.M.; No. 4-40 thd x 5/16" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32B4-2878.	5		*			*
	6L6632-5Z-2	IC	SCREW: F.H.M.; No. 6-32 thd x 5/16" steel; finish, electrogalvanized with cronak treatment; dwg No. 32B6-3920.	2		*			*
	6L6632-6SE-1	RT	SCREW: F.H.M.; No. 6-32 thd x ⅜" long; steel; finish electrogalvanized with cronak treatment; dwg No. 32B6-3387.	10		*			*
	6L6832-4.8SE-1	IC	SCREW: F.H.M.; No. 8-32 thd x ¼" steel; finish, electrogalvanized with cronak treatment; dwg No. 32B8-3308.	8		*			*
	6L6832-5SE-1	RT	SCREW: F.H.M.; No. 8-32 thd x 5/16" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32B6-3250.	2		*			*
	6L6832-6.1SE-1	RT	SCREW: F.H.M.; No. 8-32 thd x ⅜" long; steel; finish, electrogalvanized with cronak treatment; dwg No. 32B8-2678.	4		*			*
	6L7224-14Z-1	SG	SCREW: F.H.M.; No. 12-20 thd x ⅞" long; steel; finish, Irodite treatment with zinc plate; dwg No. 32B12-3576.	6		*			*
	6L15008-12	PS	SCREW: stud; finish, galvanized with cronak treatment; dwg No. A-3C-3437.	1		*			*
	6L18604-16.31SO	RK	SCREW: headless set; screw-driver slot; ¼" 20 thd x 1" long; steel; finish, Irodite treatment with zinc plate; dwg No. A-52A-3865.	1		*			*
	6L18508-9-1.810	RK	SCREW: hex head; 7/16"; screw-driver slot; shoulder under head ¼" diam. x 3/32" long; No. 8-32 thd x ⅜" long; steel; finish, Irodite treatment with zinc plate; dwg No. A-3F-3612.	8		*			*

*Indicates stock available.

Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
	6L6440-13.2Z-2	RT	SCREW: O.H.M.; No. 4-40 thd x 1 3/16" long; steel; finish, Irodite treatment with zinc plate; dwg No. 32D4-2831.	4	----	*	----	----	*
	6L7224-12.1Z-2	AT	SCREW: R.H.M.; No. 12-24 thd x 3/4" long; steel; finish, Irodite treatment with zinc plate; dwg No. 30A12-1649.	4	----	*	----	----	*
	6L18508-3.42B	SG, RT	SCREW: set; Allen head; No. 8-32 thd x 3/16" long; steel; finish, black oxidize; dwg No. A-52A463.	2	----	*	----	----	*
	6L18508-4.42B	RT	SCREW: set; Allen head; No. 8-32 thd x 1/4" long; steel; finish, black oxidize; dwg No. A-52A-703.	3	----	*	----	----	*
	6L17504-28Z2	RT	SCREW: thumb; captive; knurled; over-all length 1 1/2"; head is knurled, 1/2" diam. x 5/8"; shank is 7/8" long; steel, and has 5/16" of length threaded 1/4"-28, shank has a 0.203 diam; dwg No. A-3F-2782.	4	----	*	----	----	*
	6L17112-12K	IC	SCREW: thumb; finish, Irodite treatment with zinc plate; dwg No. A-3F-1422.	73	----	*	----	----	*
	6L17132-4K	IC	SCREW: thumb; finish, Irodite treatment with zinc plate; dwg No. A-3F-1421.	1	----	*	----	----	*
	6L50102-4	SG	WASHER: 0.128" I.D. x 0.278" OD x 0.025"; steel; finish electrogalvanized with cronak treatment; dwg No. B29B237.	4	----	*	----	----	*
	6L58002-6E1	RT	WASHER: 0.147" ID x 0.375" OD x 1/32" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. B-29A-3216.	30	----	*	----	----	*
	6L58023-3E1	PS, RT	WASHER: 0.173" ID x 0.312" OD x 0.031" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. B-29A-3507.	16	----	*	----	----	*
	6L58023-8E1	PS	WASHER: 0.173" ID x 0.375" OD x 0.031" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. B-29A-2165.	11	----	*	----	----	*
	6L58024E1-2	RT	WASHER: 1/4" ID x 0.4375" OD x 1/16" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. B-28A-3776.	4	----	*	----	----	*
	3G1838-5.6	RK	WASHER: fibre; dwg No. A41-A-1320.	14	----	*	----	----	*
	6L72104Z2	PS, RT, O, RK, IC, SG	WASHER: lock; external; tooth; 9/32" for No. 4 screw 0.016" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. 28A-185.	157	----	*	----	----	*
	6L72106E1	PS, RT, IC, RK, SG	WASHER: lock; external; tooth; 5/16" OD for No. 6 screw; 0.018" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. 28A-16.	260	----	*	----	----	*
	6L72110E1	PS, RT, IC, SG	WASHER: lock; external; tooth; 13/32" OD for No. 10 screw; 0.022" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. 28A-347.	124	----	*	----	----	*
	6L72112E1	SG	WASHER: lock; external; tooth; 15/32" OD for No. 12 screw; 0.022" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. 28A-3427.	6	----	*	----	----	*
	6L72114E1	PS, SG, IC	WASHER: lock; external; tooth; 1/2" OD for 1/4" screw; 0.025" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. 28A-990.	30	----	*	----	----	*
	6L72204Z2	RT, RK, SG	WASHER: lock; internal; tooth; 17/64" OD for No. 4 screw; 0.016" thick; steel; finish, Irodite treatment with zinc plate; dwg No. 28B-476.	42	----	*	----	----	*

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Ref symbol	Signal Corps stock No.	Major component	Name of part and description	Quan per unit	Orgn Stock 1st ech	Orgn Stock 2d ech	3d ech	4th ech	Depot stock
	6L72204Z2	IC, SG	WASHER: lock; internal; tooth; 17/64" OD for No. 4 screw; 0.016" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. 28B-476.	21		*			*
	6L72206Z2	RT, RK, SG	WASHER: lock; internal; tooth; 9/32" OD for No. 6 screw; 0.018" thick; steel; finish, Irodite treatment with zinc plate; dwg No. 28B-55.	20		*			*
	6L72206Z2	IC, SG	WASHER: lock; internal; tooth 9/32" OD for No. 6 screw; 0.018" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. 28B-55.	58		*			*
	6L72208Z2	RT, PS, RK, SG	WASHER: lock; internal; tooth 21/64" OD for No. 8 screw; 0.020" thick; steel; finish; Irodite treatment with zinc plate; dwg No. 28B-643.	41		*			*
	6L72208Z2	SG, IC	WASHER: lock; internal; tooth 21/64" OD for No. 8 screw; 0.020" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. 28B-643.	28		*			*
	6L72210Z2	PS, RT, SG	WASHER: lock; internal; tooth 13/32" OD for No. 10 screw; 0.021" thick; steel; finish, Irodite treatment with zinc plate; dwg No. 28-B-644.	17		*			*
	6L72210Z2	IC, SG	WASHER: lock; internal; tooth; 13/32" OD for No. 10 screw; 0.021" thick; steel; finish, electrogalvanized with cronak treatment; dwg No. 28B-644.	10		*			*
	6L72214E1	PS, RT	WASHER: lock; internal; tooth; 1/2" OD for 1/4" screw; 0.024" thick; steel; finish, Irodite treatment with zinc plate; dwg No. 28-B-2302.	8		*			*
	6L72108E1	PS, RT, IC, RK, SG	WASHER: lock; No. 1108ET; steel; finish, electrogalvanized with cronak treatment; dwg No. 28A-116.	220		*			*
	6L70008E1	IC	WASHER: lock; No. 8 screw; split type; 1/32" thick, 1/16" wall; steel; finish, electrogalvanized with cronak treatment; dwg No. 28C-2599.	8		*			*
	6L71014B	RK	WASHER: lock; string; 0.260" ID x 0.6875" OD; concave bend 1/16" overall; 0.010 phosbronze; dwg No. A-29E-466.	3		*			*
	6L71004E1	PS, RT, RK, IC, SG	WASHER: lock; split; 7/16" OD for 1/4" screw; 1/16" thick; SAE standard; steel; finish, electrogalvanized with cronak treatment; dwg No. A28C-323.	19		*			*
	6L71016	AT	WASHER: lock; split type; 3/8" (0.375"); finish, electrogalvanized with cronak treatment; dwg No. 28C-1776.	2		*			*
	6L71309	RT	WASHER: locking; special; OD 13/16"; slot is 0.281" wide; washer has a projection 15/32" at right angle to its face, material 0.078"; dwg No. A-20A-2822.	2		*			*
	6L580263	AT	WASHER: steel; finish, electrogalvanized with cronak treatment; dwg No. B-29A-1656.	2		*			*
	6L71004E1	RT, PS	WASHER: steel; 7/16" x 1/4"; finish, electrogalvanized with cronak treatment; dwg No. B-29A-3528.	1		*			*

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