TM 11-853

WAR DEPARTMENT TECHNICAL MANUAL

RADIO RECEIVERS
(WILCOX ELECTRIC TYPES CW3 AND F3) AND RECEIVER BAY (WILCOX ELECTRIC TYPE 113A)

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TM 11-853, Radio Receivers (Wilcox Electric types CW3 and F3) and Receiver Bay (Wilcox Electric type 113A) is published for the information and guidance of all concerned.

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Refer to FM 21-6 for explanation of distribution formula.

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DESTRUCTION NOTICE

WHY — To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN— When ordered by your commander.

HOW — 1. Smash — Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.

2. Cut — Use axes, handaxes, matchetes.

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 — Cabinet, tubes, relays, connectors, coils, transformers, chokes, capacitors, resistors, meters, etc.

2. Cut — All wiring and cables.

3. Burn — All technical manuals, diagrams, capacitors, cable, cords, and all papers.

4. Bend — Chassis, panels, covers.

5. Bury or scatter — Any or all of above pieces after breaking.

DESTROY EVERYTHING

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Figure 1. Receiver bay type 113A, operation.

PART ONE

INTRODUCTION

SECTION I. DESCRIPTION OF RECEIVER BAY (WILCOX ELECTRIC TYPE 113A)

1. GENERAL.

a. Receiver bay (Wilcox Electric type 113A) consists of eight fixed-frequency communications receivers mounted in a ventilated cabinet type relay rack (fig. 2). The receiver bay is designed for use in ground station installations for point-to-point communications or for the reception of signals from aircraft to ground. Two types of receivers may be used with the receiver bay: Radio receiver (Wilcox Electric type CW3) for the reception of continuous-wave (c-w) signal, or radio receiver (Wilcox Electric type F3) for the reception of amplitude-modulated (a-m) voice signals. The eight receivers included with the receiver bay may consist of either type or a combination of both types.

b. Each radio receiver may be controlled independently, either locally or from a remote control point. The receivers may be preset to operate on any frequency within the range of 1,950 to 16,500 kilocycles (kc). When remotely controlled operation is desired, the receiver bay may be used in conjunction with Remote Control Console CY-161/FRC (Wilcox Electric type CS212) or an equivalent control equipment.

2. TECHNICAL CHARACTERISTICS.

a. Radio Receiver Type CW3.

Frequency range (fixed-frequency) 1,950 to 16,500 kc
Receiver type crystal-controlled superheterodyne
Type of signal which can be received ..... c-w
Number of tubes (including rectifier) 7
Intermediate frequency ..... 455 kc
Power input ..... 64.5 watts
Power supply ..... 110 volts, 60 cycles alternating current
Weight ..... 20.6 lb

b. Radio Receiver Type F3.

Frequency range (fixed-frequency) 1,950 to 16,500 kc
Receiver type crystal-controlled superheterodyne
Type of signals which can be received voice (a-m)
Number of tubes (including rectifier) 6
Intermediate frequency ..... 455 kc
Power input ..... 62.0 watts
Power supply ..... 110 volts, 60 cycles
Weight ..... 20.0 lb

3. TABLE OF COMPONENTS.

COMPONENT	REQD NO.	HEIGHT (in.)	DEPTH (in.)	LENGTH (in.)	WEIGHT (lb)	VOLUME (cu ft)
Radio receiver type CW3.	1 to 8	3 15/32	12½	19	20.6	0.477
Radio receiver type F3.	1 to 8	3 15/32	12¼	19	20.0	0.467
Relay-rack type 115A.	1	72	17	24	177	17.0
Coil set, radio-frequency.	8 sets	....	....	....	1.0 (per set)	....
Cable, type CS390-13.1, (relay rack interconnecting).	1	....	....	21	1.1	....
Cable, type CS390-15.1, (terminal box).	1	....	....	144	2.0	....
Wall terminal box type 118A.	1	22	3¾	8⅜	8.7	0.499
Quartz crystal unit type 80A.	8	1 5/16	1½	2 9/16	0.2 ea	0.0025

NOTE: This list is for general information only. See appropriate publication pertaining to requisition of spare parts.

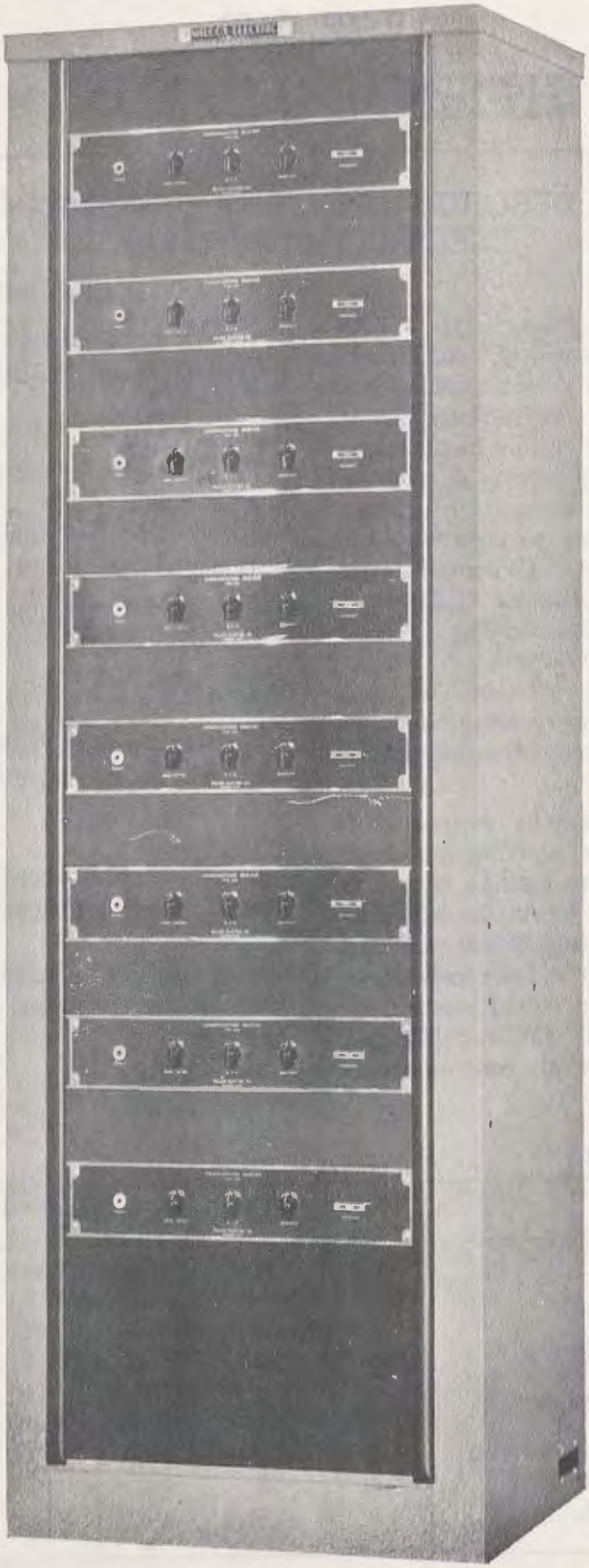

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Figure 2. Receiver bay type 113A, front view.

4. PACKAGING DATA.

Receiver bay type 113A is packed for export in nine separate wooden containers as follows:

a. Package No. 1. Package No. 1 is a wooden box 21 by 27 by 76 inches in size (24.9 cu ft) and weighing 325 pounds. The box contains relay-rack type 115A, wall terminal box type 118A, cable type CS390-13.1, and cable type CS390-15.1.

b. Packages No. 2 through 9. Packages No. 2 through 9 are identical, each containing a radio receiver unit. Each radio receiver is encased in a wooden box 27 by 17½ by 8¾ inches in size (2.39 cu ft) and weighs 50 pounds completely packed.

5. RADIO RECEIVER TYPE CW3.

Radio receiver type CW3 is a highly selective crystal-controlled superheterodyne receiver designed for the reception of c-w signals (fig. 3). The receiver may be operated at any frequency within the band of 1,950 to 16,500 kc. The total band is covered by four groups of plug-in coils. The receiver circuit is mounted on a 19-inch panel for rack mounting. It consists of a radio-frequency (r-f) amplifier stage, a mixer and high-frequency (h-f) oscillator stage, an intermediate-frequency (i-f) amplifier stage, a detector and beat-frequency oscillator (bfo) control tube, and an audio-output and output limiter stage. In addition, the receiver contains a rectifier circuit for converting the alternating-current (a-c) input to the proper direct-current (d-c) operating voltages. Three controls and a phone jack are mounted on the front panel of the receiver along with a nameplate giving the frequency to which the receiver is tuned. The tubes, coils, and crystal project from the rear of the panel and are covered by a removable dust cover. Connections to the receiver are made through a Jones plug and antenna connector also mounted at the rear of the unit.

6. RADIO RECEIVER TYPE F3.

Radio receiver type F3 (fig. 4) is similar in appearance and functioning to radio receiver type CW3 with the exception that this receiver circuit consists of an r-f amplifier stage, a mixer and h-f oscillator stage, an i-f amplifier stage, detector and automatic-volume-control (a-v-c) stage, and an output and noise suppressor stage. This receiver also contains its own power supply circuit. Three controls and a phone jack are mounted on the receiver front panel and connections to the unit are made through a Jones plug and antenna connector mounted on the rear panel.

7. RELAY-RACK TYPE 115A.

Relay-rack type 115A is a sheet-metal cabinet designed to mount standard 19-inch relay-rack panels between two vertical mounting strips. The relay rack contains eight blank panels for spacing the receiver units, an access door at the rear of the cabinet and a fan type blower for ventilation. The rack is completely wired to connect the power input, remote control circuit, and the antennas to the eight individual receivers. The power input leads pass through a master switch and fuse box before being connected to the receivers. A relay-rack interconnecting cable type CS390-13.1 is provided with the rack for connecting two relay racks together. The cable is complete with a 33-contact connector on each end.

8. WALL TERMINAL BOX TYPE 118A.

All connections from the remote control point are terminated in wall terminal box type 118A. The box is provided with brackets for wall mounting and is equipped with cable type CS390-15.1 for connection to the relay rack. A hinged lid is provided to cover the front of the terminal box.

9. R-F COIL SET.

Each receiver unit uses a set of three plug-in coils which must cover the frequency marked on the receiver front panel. Four sets of coils are available to cover the required frequency range:

Set 1 .....1,950 to 3,600 kc
Set II .....3,500 to 6,100 kc
Set III .....5,600 to 10,000 kc
Set IV .....9,400 to 16,500 kc

Each coil set contains an antenna-input coil, an r-f amplifier plate coil, and a mixer grid coil (fig. 5). Each coil is inclosed in an aluminum shield can and is provided with pins which fit standard octal tube sockets mounted on the receiver.

10. QUARTZ CRYSTAL UNIT TYPE 80A.

The crystal unit is a small rectangular case containing a quartz crystal and connecting pins (fig. 5) which fit into a special socket on

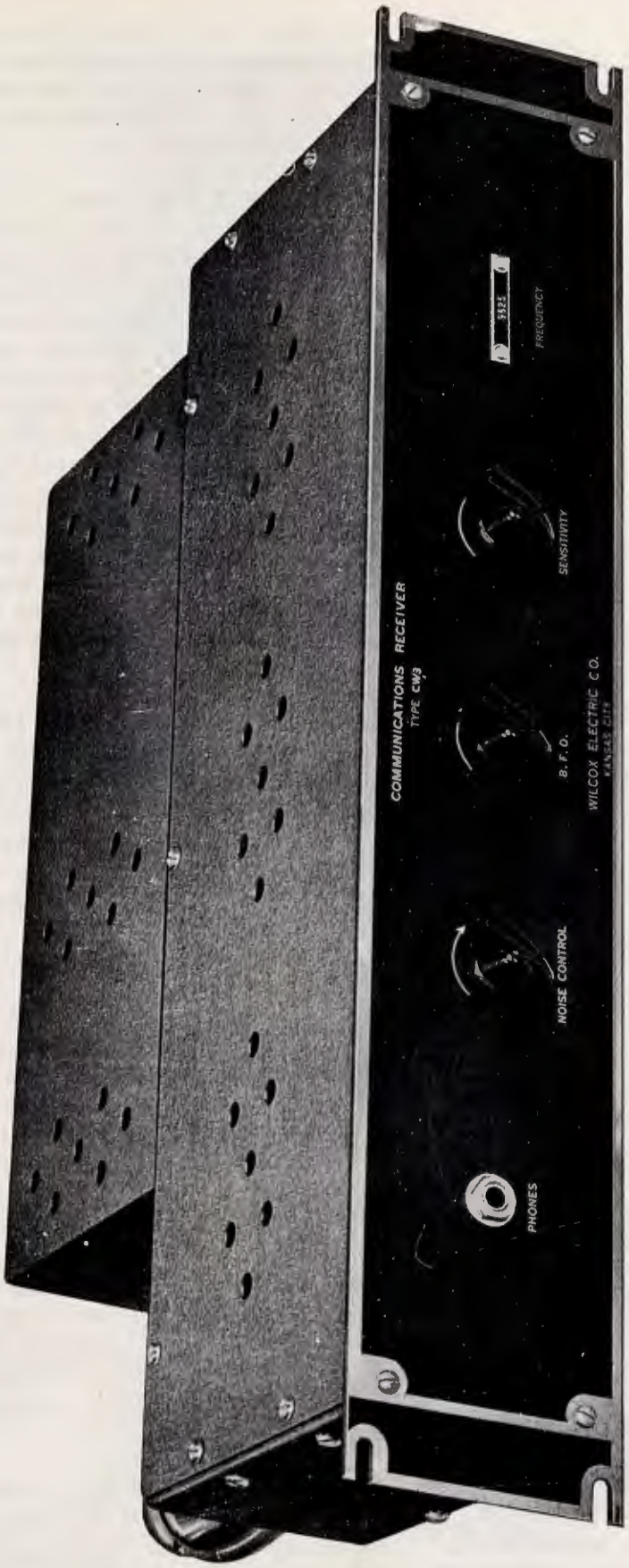

Figure 3. Radio receiver type CW3, front view.

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Figure 4. Radio receiver type F3, front view.

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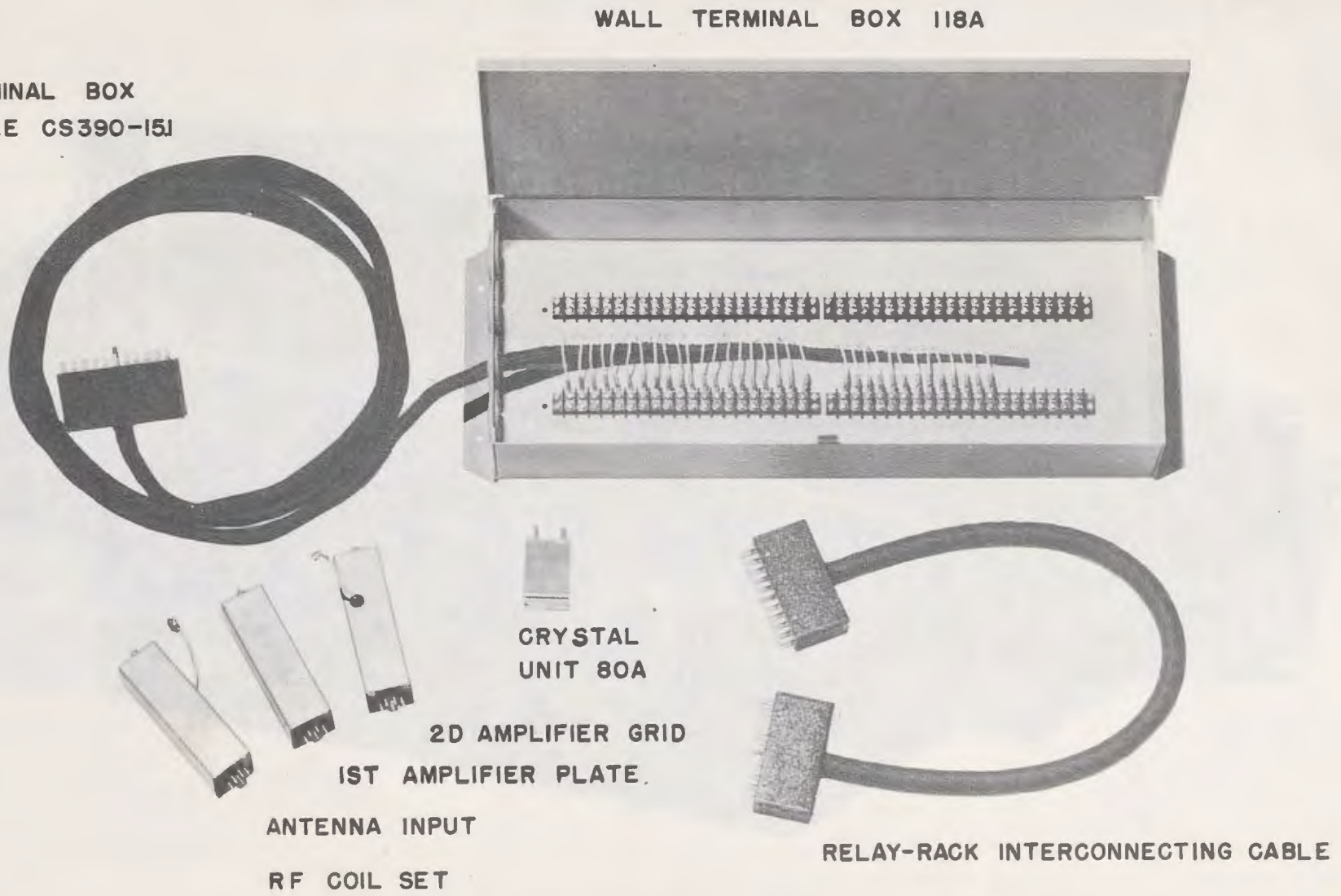

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Figure 5. Receiver bay accessories.

the receiver chassis. A nameplate on the end of the case lists the frequency to which the crystal is ground, the operating frequency of the receiver in which it is to be used, and the manufacturer's type number. The crystal unit is sealed and should not be disturbed.

SECTION II. INSTALLATION OF RECEIVER BAY (WILCOX ELECTRIC TYPE 113A)

11. SITING.

Receiver bay type 113A should be installed indoors, with sufficient space around it to permit access to all parts. Allow room at the rear for the access door to swing open. The equipment should be as close as possible to the receiver antennas so that the antenna leads may be short and all approximately the same length. Receiver antennas should be installed several miles from any transmitter antenna, but must not be closer than ten wavelengths in any installation.

12. UNPACKING, UNCRATING, CHECKING, AND REPACKING.

a. Cabinet Relay-rack Type 115A. Place the crates on the floor close to the proposed installation site, making sure that all components are present (par. 4). Cut the bands around the large crate. Pull the nails with a nail puller and remove the box tops. Tear or slit open the wrappings, being careful not to damage the equipment inside. Untie and unwrap the parts inside relay-rack type 115A. Check the components of the crate against the packing slip to determine if any equipment is missing. Inspect the relay rack and blower motor for any damage incurred during transit.

b. Receivers. Unpack the eight receivers following the procedure given above and check the components against the packing slips. Unwrap the tubes and crystal shield taking care to handle the tubes carefully to prevent breakage.

c. Repacking the Receivers. Remove the receivers from the relay rack. Remove the dust cover from each receiver and take out the tubes, coil, and crystal. Replace the dust covers on the receivers and repack the tubes, coils, and crystals in their original cartons. Pack the eight receivers in the crate in which they were furnished.

d. Repacking the Relay Rack. Remove the wall terminal box from the wall and detach all cables and wires from the relay rack. Unbolt the blower box from outside the access door and rebolt it to the inside of the access door. Repack the relay rack in the crate in which it was received.

13. INSTALLATION.

a. Relay Rack and Wall Terminal Box. Unbolt the blower box from inside the access door of the relay rack and rebolt it to the outside of the door. Feed the power cord through the door and connect it to the plug provided. Connect the 33-contact plug on the terminal box cable type CS390-15.1 to either of the remote control connectors on the sides of the relay rack. Insert the other end of this cable through one of the two center holes in the bottom of the wall terminal box type 118A and screw the terminal lugs to the nearer terminal strip. Fasten the lug on the end wire of the cable to terminal No. 33, the next lug to No. 32, etc., until all terminals from 1 to 33 are filled. Make all connections from the remote control point to this group of terminals. Screw the terminal box to a near-by wall to keep it away from moisture and dirt. Push the a-c power line through the porcelain bushing at the rear of the relay rack and up through the holes in the bottom of the safety switch (fig. 7). Ground the relay rack by fastening a wire under one of the screws holding the remote control circuit connectors and attaching the other end to a metal rod driven at least eight feet into the ground or connect to a cold-water pipe.

b. Receivers.

(*1*) Remove the tubes from their cartons, making certain that all tubes are in good physical condition. Remove the dust cover from the receiver and insert the tubes into their corresponding sockets as marked on the chassis serial plate, making sure that the guide key is

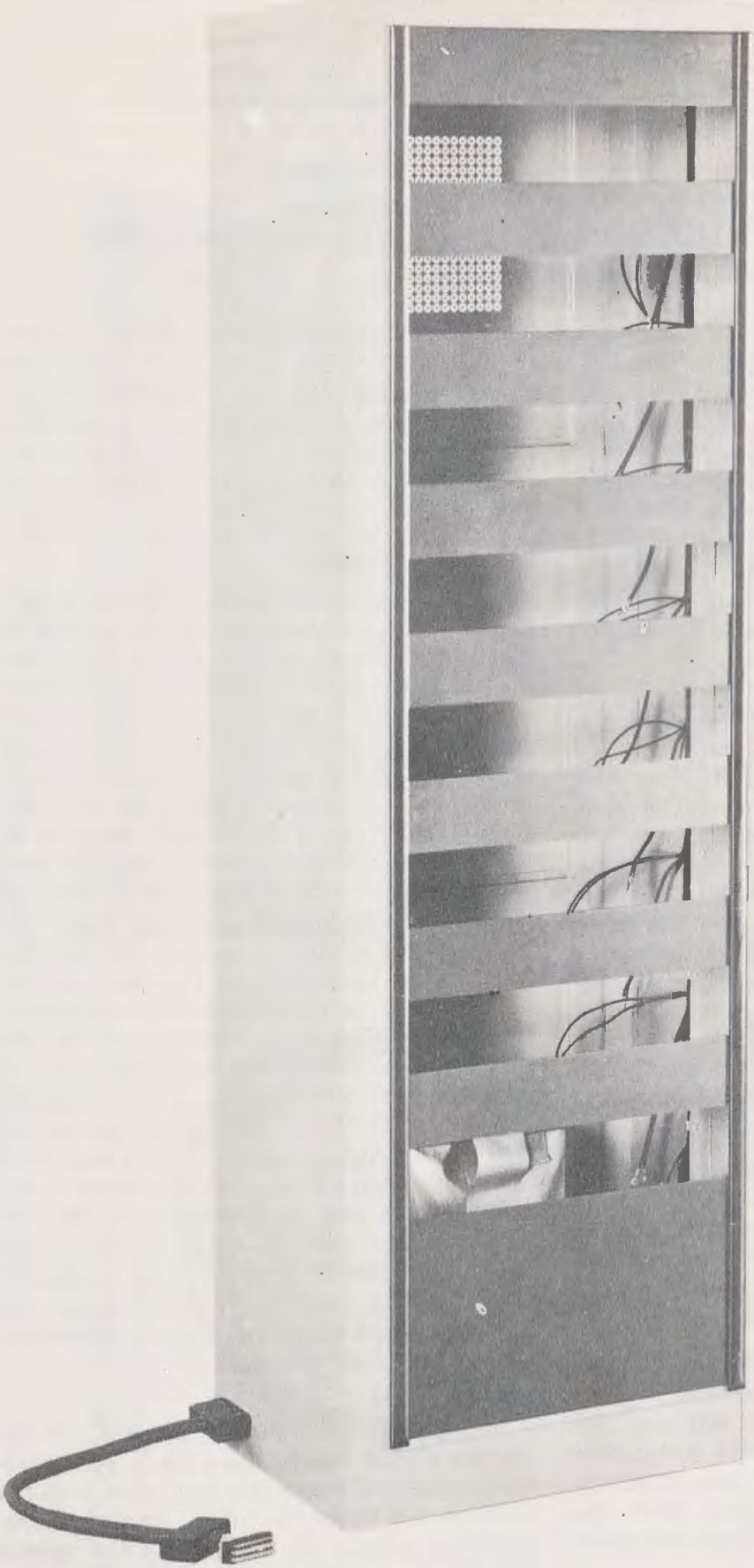

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Figure 6. Relay-rack type 115A, front view, partially unpacked.

properly aligned with the slot in each socket. Insert crystal unit type 80A into the three-hole socket and cover with the crystal shield.

(*2*) Select a set of r-f coils to cover the frequency shown on the receiver nameplate, using chart below. Plug them into the sockets provided. Refer to figure 33 or figure 37 for location.

NOTE: Each set of coils will operate in either receiver type CW3 or F3. Refer to section XIV for tuning procedure.

(*3*) Replace the dust cover and repeat the above procedure for all eight receivers.

(*4*) Pry the trim strips off the front of the relay rack and remove screws at each side of open spaces. Fasten the eight receivers to the rack and replace the trim strips. Connect each 10-contact connector on the left side of the relay rack to the adjacent receiver. Fasten the lugs at right side of cabinet to the three-point terminal board on the right end of each receiver. Connect with the black ground wires under the middle screw, and the rubber-covered antenna wires under the outside screws.

R-F COIL DATA CHART

FREQUENCY BANDS (KC)	COIL PART NO.		
	ANT. INPUT (L1)	R-F AMP. PLATE (L2)	MIXER GRID (L3)
Set I (1,950-3,600)	41,518	41,524	41,528
Set II (3,500-6,100)	41,521	41,525	41,529
Set III (5,600-10,000)	41,522	41,526	41,530
Set IV (9,400-16,500)	41,523	41,527	41,531

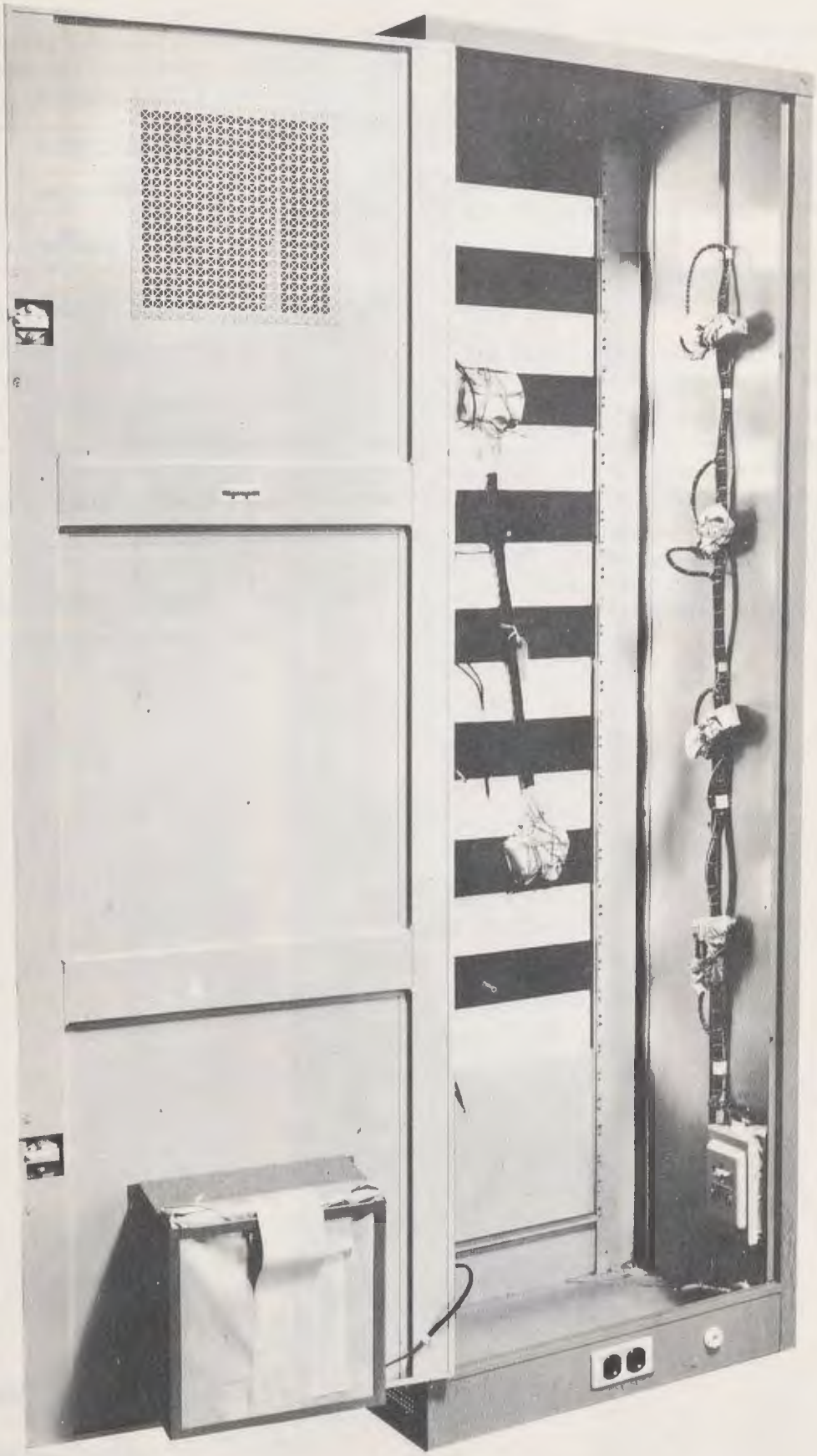

Figure 7. Relay-rack type 115A, rear view, partially unpacked.

PART TWO

OPERATING INSTRUCTIONS

NOTE: For information on destroying the equipment to prevent enemy use, refer to the destruction notice at the front of the manual.

SECTION III. CONTROLS AND THEIR USE

14. MAIN POWER SWITCH.

This switch is located low on the left inside relay-rack type 115A. All 110-volt, 60-cycle alternating current to receivers and blower is controlled by the lever on this box. Pull it toward the rear of the cabinet to turn equipment ON. The blower should start immediately.

15. CONTROLS ON RADIO RECEIVER TYPE CW3 (fig. 3).

a. SENSITIVITY Control. This control is found on the right side of the front panel with SENSITIVITY printed under it. It includes an ON-OFF switch for 110-volt power. Full counterclockwise rotation of the knob turns the receiver off. Clockwise rotation first turns the receiver on, then gradually increases its sensitivity to a maximum.

b. B.F.O. Controls.

(*1*) *Oscillator Trimmer Control* (*C22*). This control is at the rear of the receiver projecting from the dust cover. It is used as a trimmer control for setting the bfo frequency during alignment (par. 87).

(*2*) *B.F.O. Control.* A control at the center of the front panel is used to vary the pitch of the sound in the operator's headset from 0 to 1,750 cycles. This is to relieve ear fatigue caused by extended listening to one pitch, and to make it easier to copy through interference.

c. NOISE CONTROL. This is a control on the left side of the front panel which regulates the input signal strength needed to start the receiver operating. Maximum clockwise rotation causes the receiver to be inoperative except when a strong input signal is present, thereby reducing the amount of noise received between signals. Full counterclockwise rotation makes the receiver operate with a weak input signal.

16. CONTROLS ON RADIO RECEIVER TYPE F3 (fig. 4).

a. SENSITIVITY Control. This control is found on the right side of the front panel with SENSITIVITY printed under it. It includes an ON-OFF switch for 110-volt power. Full counterclockwise rotation of the knob turns the receiver off. Clockwise rotation first turns the receiver on, then gradually increases its sensitivity to a maximum.

b. AUDIO GAIN Control. At the center of the front panel is a control knob with AUDIO GAIN printed below it. This varies the volume of the sound heard in the operator's headset. Maximum clockwise rotation produces maximum volume.

c. NOISE CONTROL. This is a control on the left side of the front panel which regulates the input signal strength needed to start the receiver operating. Maximum clockwise rotation causes the receiver to be inoperative except when a strong input signal is present, thereby reducing the amount of noise received between signals. Full counterclockwise rotation makes the receiver operate with a weak input signal.

SECTION IV. OPERATION

17. STARTING.

This procedure must be performed at the radio receiver bay and not at the remote control point.

a. Relay-rack Type 115A. Throw main power switch to ON.

b. Radio Receiver Type CW3.

(*1*) Turn SENSITIVITY control to maximum clockwise rotation.

(*2*) Set B.F.O. control at middle of its rotation (approximately).

(*3*) Turn NOISE CONTROL to maximum counterclockwise rotation.

(*4*) Wait one minute for receiver to reach proper operating temperature.

(*5*) Readjust SENSITIVITY control to comfortable volume level.

(*6*) If background noise is objectionably loud, turn NOISE CONTROL clockwise to reduce it. Use SENSITIVITY control to restore volume if necessary.

c. Radio Receiver Type F3.

(*1*) Turn SENSITIVITY control to maximum clockwise rotation.

(*2*) Turn AUDIO GAIN control to maximum clockwise rotation.

(*3*) Turn NOISE CONTROL to maximum counterclockwise rotation.

(*4*) Wait one minute for receiver to reach proper operating temperature.

(*5*) Readjust AUDIO GAIN control to comfortable volume level.

(*6*) If noise between signals is objectionably loud turn NOISE CONTROL clockwise until it disappears.

18. STOPPING.

a. Stopping Equipment. Push the MAIN POWER SWITCH to OFF. This stops all receivers and the blower.

b. Stopping Individual Receivers. Turn SENSITIVITY control counterclockwise until it clicks.

SECTION V. EQUIPMENT PERFORMANCE CHECK LIST

19. PURPOSE AND USE OF CHECK LIST.

a. General. The equipment performance check list (par. 20) will help the operator to determine whether radio receivers types CW3 and F3 are functioning properly. The check list gives the item to be checked, the conditions under which the item is checked, the normal indications and tolerances of correct operation, and the corrective measures that the operator can take. Items 1 to 3 are checked before starting, items 4 and 5 when starting, items 6 to 10 during operation, and items 11 and 12 when stopping. Items 6 to 10 on this check list should be checked at least once during a normal operating period.

b. Action or Condition. For some items the information given in the action or condition column consists of the settings of various switches and controls under which the item is to be checked. For other items it represents an action that must be taken in order to check the normal indication given in the normal indication column.

c. Normal Indications. The normal indications listed include the visible and audible signs that the operator will perceive when he checks the items. If the indications are not normal, the operator should apply the recommended corrective measures.

d. Corrective Measures. The corrective measures listed are those that the operator can make without turning the equipment in for repairs. Reference in the table to part five in the manual indicates that the correction of the trouble cannot be effected during operation and that trouble shooting by an experienced repairman is called for. If the set is completely inoperative or if the recommended corrective measures do not yield results, trouble shooting is necessary. However, if the tactical situation requires that communication be maintained and if the set is not completely inoperative, the operator must maintain the set in operation as long as it is possible to do so.

e. Items 1 to 5. Items 1 to 5 should be checked each time the equipment is put into operation.

f. Items 6 to 10. The operator should familiarize himself with the operation of the receivers so that he knows the characteristics of reception of normal signals. By becoming familiar

with the operation of the receiver, the operator will know the normal position of the sensitivity control. This will aid in determining the sensitivity and amplification of the receiver.

g. **Items 11 and 12.** Items 11 and 12 are checked whenever the station is taken out of operation. Any abnormal indications at this time are probably caused by trouble in the set and should be corrected before the next expected period of operation.

20. EQUIPMENT PERFORMANCE CHECK LIST.

	ITEM NO.	ITEM	ACTION OR CONDITION	NORMAL INDICATIONS	CORRECTIVE MEASURES
PREPARATORY	1	Headset.	Headset plugged into PHONES jack on receiver.		
	2	Antenna and ground.	Antenna lead-in and ground wire connected to antenna connector on rear of receiver.		
	3	Crystal and plug-in coils.	Correct crystal and plug-in coils inserted in receiver.		
START	4	Radio receiver bay OFF-ON switch.	Turn to ON position.	Blower motor can be heard.	Replace line fuses in fuse box.
	5	SENSITIVITY switch on individual receivers.	Turn fully clockwise.	Switch can be heard to click. Tube filaments light.	
EQUIPMENT PERFORMANCE	6	AUDIO GAIN control on radio receiver type F3.	Rotate control in a clockwise direction.	Increased output is heard in headset.	Refer to paragraph 75, part five.
	7	B.F.O. control on radio receiver type CW3.	Rotate control in a clockwise direction.	Signal pitch will decrease to zero and then increase with continued rotation. Leave control in extreme counterclockwise position when remote control is used.	Adjust C23 control on back of receiver to zero beat, B.F.O. control at center position. Refer to paragraph 87, part five.
	8	SENSITIVITY control on individual receivers.	Rotate control in a clockwise direction.	Increased output is heard in headset.	Refer to paragraph 75, part five.
	9	NOISE CONTROL on radio receiver type F3.	Rotate control fully clockwise and then gradually turn control counterclockwise.	With no signal present, noise will suddenly disappear.	Refer to paragraph 75, part five.
	10	NOISE CONTROL on radio receiver type CW3.	Rotate control fully clockwise and then gradually turn control counterclockwise.	With signal present, noise will gradually be reduced and signal volume will remain unchanged. Continued counterclockwise rotation will also reduce signal volume.	Refer to paragraph 75, part five.
STOP	11	SENSITIVITY switch on individual receivers.	Turn to extreme counterclockwise position.	No noise or signal heard in headset.	
	12	Radio receiver bay OFF-ON switch.	Turn to OFF position.	Blower motor stops.	

PART THREE

MAINTENANCE INSTRUCTIONS

SECTION VI. PREVENTIVE MAINTENANCE TECHNIQUES

21. MEANING OF PREVENTIVE MAINTENANCE.

Preventive maintenance is a systematic series of operations performed at regular intervals on equipment, when turned off, to eliminate major break-downs and unwanted interruptions in service, and to keep the equipment operating at top efficiency. To understand what is meant by preventive maintenance, it is necessary to distinguish between preventive maintenance, trouble shooting, and repair. The prime function of preventive maintenance is to *prevent* break-downs and, therefore, the need for repair. On the other hand, the prime function of trouble shooting and repair is to locate and correct *existing* defects. The importance of preventive maintenance cannot be overemphasized. The entire system of radio communication depends upon each set's being *on the air* when it is needed and upon its *operating efficiency*. It is vitally important that radio operators and repairmen maintain their radio sets properly. See TB Sig 123, Preventive Maintenance Practices for Ground Signal Equipment.

NOTE: The operations in sections VI and VII are first and second echelon (organization operators and repairmen) maintenance. Some operations in section IX are higher echelon maintenance.

22. DESCRIPTION OF PREVENTIVE MAINTENANCE TECHNIQUES.

a. General. Most of the electrical parts used in receiver bay type 113A require routine preventive maintenance. Those requiring maintenance differ in the amount and kind required. Because hit-or-miss maintenance techniques cannot be applied, definite and specific instructions are needed. This section of the manual contains these specific instructions and serves as a guide for personnel assigned to perform the six basic maintenance operations, namely: Feel, Inspect, Tighten, Clean, Adjust, and Lubricate. Throughout this manual the lettering system for the six operations will be as follows:

F—Feel
I—Inspect
T—Tighten
C—Clean
A—Adjust
L—Lubricate

The first two operations establish the need for the other four. The selection of operations is based on a general knowledge of field needs. For example, the dust encountered on dirt roads during cross-country travel filters into the equipment no matter how much care is taken to prevent it. Rapid changes in weather (such as heavy rain followed by blistering heat), excessive dampness, snow, and ice tend to cause corrosion of exposed surfaces and parts. Without frequent inspections and the necessary performance of tightening, cleaning and lubricating operations, equipment becomes undependable and subject to break-downs when it is most needed.

b. Feel. The feel operation is used most often to check rotating machinery, such as blower motors, drive motors, etc., and to determine if electrical connections, bushings, etc., are overheated. Feeling indicates the need for lubrication or the existence of similar types of defects requiring correction. The maintenance man must become familiar with the normal operating temperatures of motors, etc., in order to recognize signs of overheating.

NOTE: It is important that the feel operation be performed as soon as possible after shut-down and always before any other maintenance is done.

c. Inspect. Inspection is the most important operation in the preventive maintenance program. A careless observer will overlook the evidences of minor trouble. Although these defects

may not interfere with the performance of the equipment, valuable time and effort can be saved if they are corrected before they lead to major break-down. Make every effort to become thoroughly familiar with the indications of normal functioning, in order to be able to recognize the signs of a defective set. Inspection consists of carefully observing all parts of the equipment, noticing their color, placement, state of cleanliness, etc. Inspect for the following conditions:

(*1*) Overheating, as indicated by discoloration, blistering, or bulging of the parts or surface of the container; leakage of insulating compounds; and oxidation of metal contact surfaces.

(*2*) Placement, by observing that all leads and cabling are in their original positions.

(*3*) Cleanliness, by carefully examining all recesses in the units for accumulation of dust, especially between connecting terminals. Parts, connections, and joints should be free of dust, corrosion, and other foreign matter. In tropical and high-humidity locations, look for fungus growth and mildew.

(*4*) Tightness, by testing any connection or mounting which appears to be loose.

d. Tighten, Clean, and Adjust.* These operations are self-explanatory. Specific procedures to be followed in performing them are given wherever necessary throughout part three.

CAUTION: Screws, bolts, and nuts should not be tightened carelessly. Fittings tightened beyond the pressure for which they are designed will be damaged or broken.

When a loose connection is tightened, it should be moistureproofed and fungiproofed again by applying the varnish with a small brush.

e. Lubricate. Lubrication refers to the application of grease or oil to the bearings of motors or other rotating shafts. It may also mean the application of a light oil to door hinges or other sliding surfaces on the equipment.

23. VACUUM TUBES (fig. 9).

a. Inspect (I).

(*1*) Inspect glass tube envelopes, tube caps, and tube cap connector clips for accumulation of dirt and for corrosion. When tubes with loose plate or grid caps or envelopes are found, replace if possible.

(*2*) The spring clips that make contact with the grid caps must be examined for corrosion and for loss of tension with resulting looseness. Check also the condition of the wires soldered to the spring clips. The wires should be free of frayed insulation or broken strands.

(*3*) Inspect the firmness of tubes in their sockets. Make the inspection by pressing the tubes down in the sockets and testing them for tightness by pulling them straight up, not by partially withdrawing the tubes and jiggling them from side to side. Lateral movement of a tube tends to weaken the pins in the base and unnecessarily to spread the contacts in the socket. It is desirable to inspect the tube sockets at the time the tubes are removed.

b. Tighten (T). If the connections to the tube sockets are dirty or corroded, clean before tightening. Tighten loose tube cap connector clips. Do not flatten tube connector clips during adjustment. Flattened clips do not make adequate contact with the surface of the tube cap.

c. Clean (C).

(*1*) Clean the tubes if inspection shows cleaning to be necessary.

(*2*) Remove dust or dirt from the glass envelopes with a clean, lint-free, dry cloth. If tube caps are corroded and if proper care is exercised, the tube caps may be cleaned with a piece of #0000 sandpaper. Wrap the paper around the cap and *gently* run along the surface. Wipe with a clean dry cloth.

24. CAPACITORS (fig. 10).

a. Inspect (I).

(*1*) Inspect the leads for poor insulation, cracks, and evidences of dry rot. Do not move capacitors with pig tail connections, because there is danger of breaking the connections at the point where they enter the body of the capacitor.

(*2*) Inspect the plates of variable capacitors for dirt, dust, or lint. Examine the movable set of plates for signs of damage or misalignment that would cause them to touch the fixed plates during tuning.

*The Adjust operation is not applicable to this equipment.

Figure 8. Radio receiver type CW3, front view.

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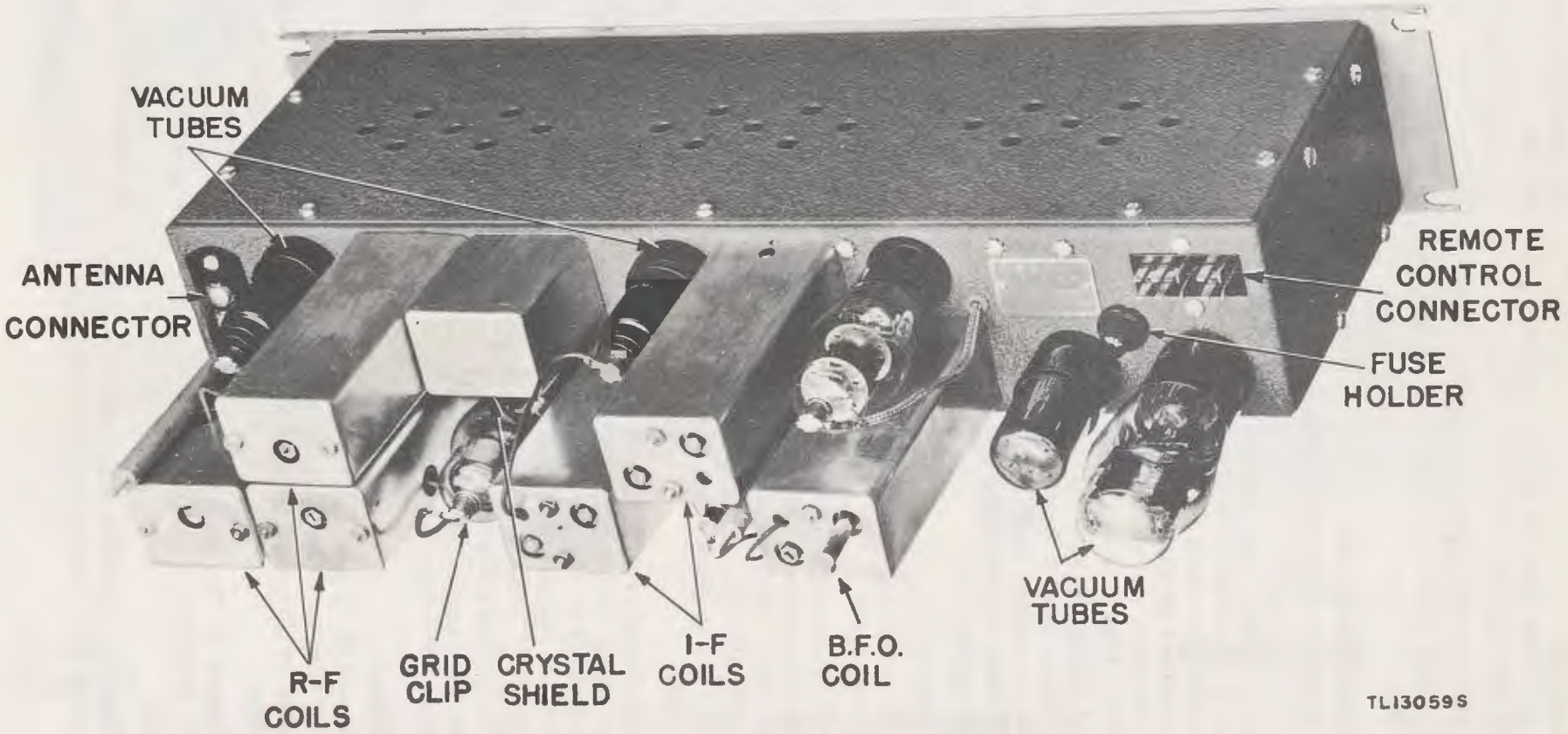

Figure 9. Radio receiver type CW3, rear view without cover.

b. Clean (C).

(*1*) Clean the case of fixed capacitors and connections that are dirty or corroded.

(*2*) Clean the plates of variable capacitors with a small brush or blower, removing all dust and lint.

25. RESISTORS (fig. 10).

a. Inspect (I). Inspect the coating of the vitreous-enameled resistors for signs of cracks and chipping, especially at the ends. Examine the bodies of all resistors for blistering, discoloration, and other signs of overheating. Inspect leads and all connections for corrosion, dirt, dust, looseness, and broken strands in connecting wires. Check the security of all mountings. Do not attempt to move resistors with pig tail connections, because there is danger of breaking the connections at the point where they enter the body of the resistor. Such defects cannot be repaired.

b. Clean (C).

(*1*) Clean all carbon resistors with a small, soft brush.

(*2*) The vitreous-enameled resistors must be kept clean to avoid leakage between the terminals. They will ordinarily be wiped with a dry cloth. However, if the dirt deposit is unusually hard to remove, use dry-cleaning solvent (SD).

(*3*) Resistors with discolored bodies cannot be cleaned. Discoloration is often indicative of overloading or of overheating at some time prior to the inspection. If the discoloratin is due to circuit trouble, refer to part five for trouble-shooting procedures.

NOTE: When fungiproofed resistors are heated a harmless brown stain may appear.

26. FUSES.

a. Inspect (I). Inspect the fuse caps for evidence of burning, charring, and corrosion; the fuse clips for dirt, loose connections, and proper tension.

b. Tighten (T). The tension of the fuse clips may be increased by pressing the sides closer together.

c. Clean (C) Clean fuse ends and fuse clips with crocus cloth; then wipe them with a clean cloth.

27. RHEOSTATS AND POTENTIOMETERS (fig. 10).

a. Inspect (I). Inspect the mechanical condition of the rheostats and potentiometers. The arm should be keyed tightly to the shaft, and the shaft should turn easily in the bushing which supports it. Examine the insulating body of the rheostat for dust, dirt, cracks, and chipped places.

b. Tighten (T). Tighten loose assembly or mounting screws.

c. Clean (C).

(*1*) Clean the exposed surfaces of the rheostat or potentiometer and the connections, whenever they are found in a dirty or corroded condition.

(*2*) Remove grease and dirt from the rheostat parts with dry-cleaning solvent.

(*3*) If the contact surfaces are corroded, clean them *gently*, rubbing with crocus cloth.

(*4*) Clean the contact surfaces of the arm by inserting a strip of crocus cloth between the arm and the winding and drawing the cloth back and forth.

(*5*) Clean the body of the rheostat or potentiometer with a brush or cloth.

28. MULTIPLE CONNECTORS.

a. Inspect (I). Inspect the female ends of the connectors for corrosion and collected dust. Inspect the mountings for cracks and loose connections. Inspect the male ends for loose and broken pins and for clean contact surfaces.

b. Clean (C). Clean the male and female ends of the connectors with a brush moistened in dry-cleaning solvent (SD). Remove corrosion with crocus cloth, then wipe with a clean cloth.

29. CABLES.

a. Inspect (I). Inspect the cables for cracked or deteriorated insulation, frayed or cut insulation at the connecting and supporting points, and improper placement which places the cables or connectors under strain.

b. Tighten (T). Tighten loose cable clamps.

c. Clean (C). Cable connections (including ground wire).

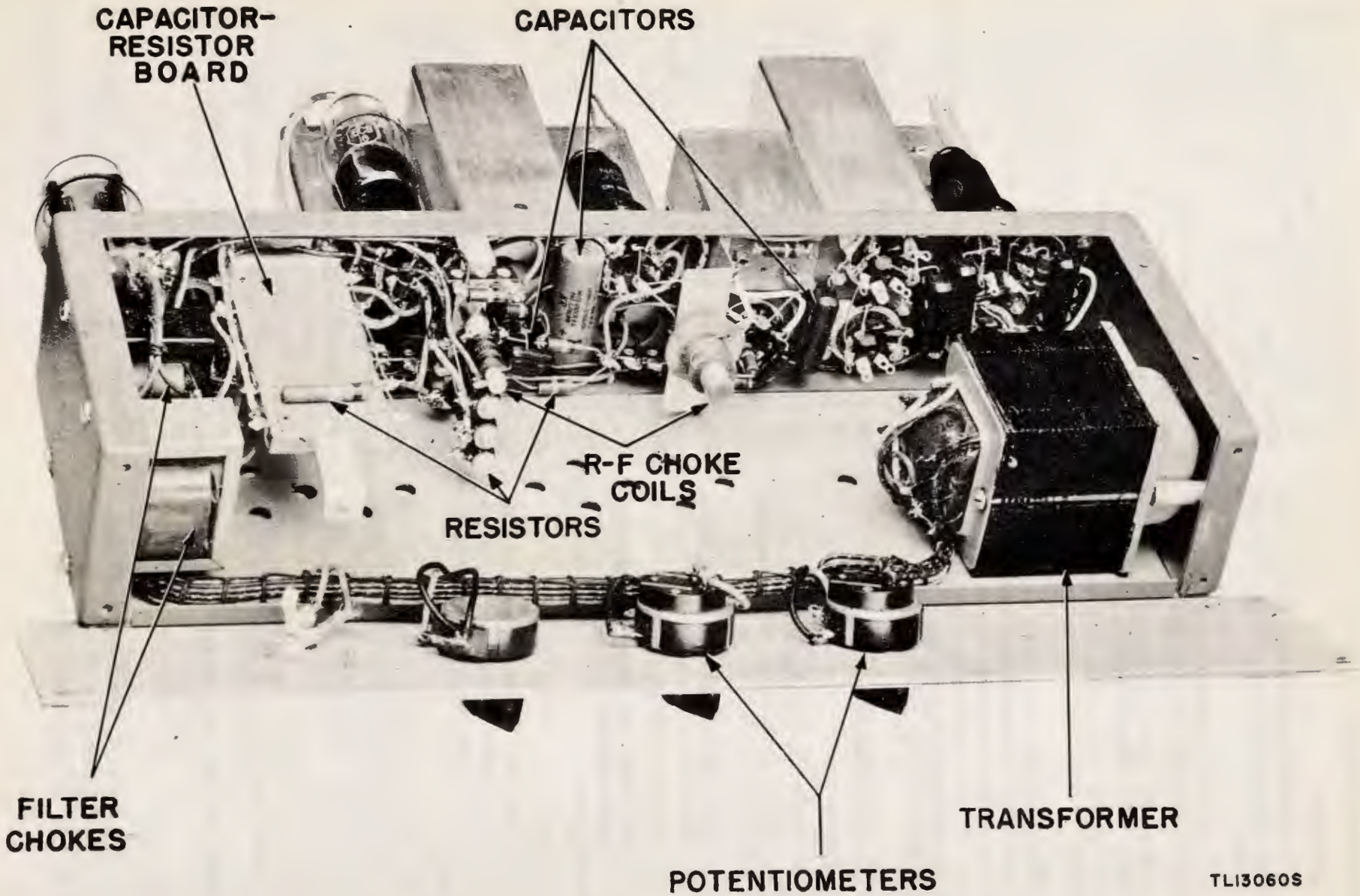

Figure 10. Radio receiver type CW3, interior view.

30 TERMINAL STRIPS.

a. Inspect (I).

(*1*) Inspect the terminal strips for cracks, breakage, dirt and loose connections or mounting screws.

(*2*) Carefully examine the connections for mechanical defects, dirt, and corrosion.

b. Tighten (T). Tighten loose screws, lugs, and mounting bolts. Remove loose lugs and clean them with crocus cloth when they are dirty or corroded.

c. Clean (C). Clean the terminal blocks, when they require it, with a dry brush. When necessary, use a cloth moistened with dry-cleaning solvent (SD). If a solvent is used, the block must be thoroughly wiped with a cloth, then brushed to remove lint.

31. RACK AND CHASSIS.

a. Inspect (I).

(*1*) Inspect the outside and inside of the rack thoroughly. Check the air filter mountings and the panel screws.

(*2*) Inspect the panels for loose knobs, switches, and jacks.

(*3*) Examine air filters for dirt.

CAUTION: Handle air filters carefully to prevent small splinters of glass from entering the fingers.

b. Clean (C).

(*1*) Clean each chassis, outside and in, with a clean dry cloth. Use dry, compressed air at low pressure to blow out all accumulated dirt and dust.

(*2*) If air filters cannot be cleaned with compressed air, replace them with clean filters.

(*3*) Repaint any surface that is found scratched, rusted, or chipped.

c. Tighten (T). Tighten all mounting bolts, panel screws, and control knobs found loose.

32. TRANSFORMERS AND FILTER CHOKES (fig. 10).

a. Inspect (I).

(*1*) Inspect all transformers and chokes for evidence of overheating. This usually will be accompanied by the melting of the tar compound with which these components are sealed. If evidence of overheating is found, make circuit checks in accordance with procedure outlined in part five for location of a defective component.

(*2*) Inspect for loose core plates which will cause excessive mechanical noise in the set and rapid deterioration of the windings.

(*3*) Inspect terminals for corrosion and leads for frayed insulation.

b. Tighten (T). If core plates are loose, tighten the screws which hold them together. Tighten the bolts with which they are mounted to the chassis.

c. Clean (C). Wipe surfaces of transformers and chokes with a clean dry cloth.

33. COILS AND AIR CORE TRANSFORMERS (fig. 9).

a. Inspect (I). Remove shield cans from coils L1, L2, L3, L5, and L6 and inspect windings for dirt, dust, and lint. Inspect coil L4 (under the chassis) for accumulated dirt and dust. Inspect all coils for corroded contacts.

b. Tighten (T). Tighen any loose coil mountings or connections by resoldering wires or tightening screws.

c. Clean (C). Clean coil form and coil with a soft brush. Clean points where coil shield can contacts the chassis and replace shield cans over the coils.

34. CRYSTAL HOLDERS (fig. 9).

a. Inspect (I). Remove shield can from around crystal holder and remove crystal holder from socket. Inspect for accumulation of dirt and dust and for evidence of corrosion on crystal holder contact pins.

b. Tighten (T). If the contact pins are dirty or corroded, clean before tightening. Otherwise, tighten loose socket clips by gently squeezing together with a pair of long-nose pliers.

c. Clean (C). Clean corroded contact pins by *gently* rubbing with crocus cloth.

35. CONTROL KNOBS (fig. 8).

a. Inspect (I). Inspect all control knobs for tightness on shafts.

b. Tighten (T). Tighten all loose control knobs

with a small screwdriver.

36. JACKS (fig. 8).

a. Inspect (I). Inspect jacks for tightness of mounting and for cleanliness and tightness of contacts.

b. Tighten (T).

(*1*) Tighten the mounting nuts, when loose.

(*2*) Increase spring tension by *gently* bending contacts with long-nose pliers.

c. Clean (C). Clean contacts with knob dipped in dry-cleaning solvent (SD). If corroded, rub gently with crocus cloth.

37. BLOWER.

a. Feel (F). Feel the bearings of the motor immediately after turning it off. They should not be too hot to touch.

b. Inspect (I). Inspect for accumulation of dirt, dust, or lint. See if mounting screws are tight.

c. Tighten (T). Tighten any loose mounting screws.

d. Clean (C). Clean the surface of the motor with a clean cloth.

e. Lubricate (L). Refer to section VIII.

SECTION VII. ITEMIZED PREVENTIVE MAINTENANCE

38. INTRODUCTON.

For ease and efficiency of performance, preventive maintenance on radio receivers types CW3 and F3 will be broken down into operations that can be performed at different time intervals. In this section the preventive maintenance work to be performed on the receivers at the specified time intervals is broken down into units of work called items. The general techniques involved and the application of the FITCAL operations in performing preventive maintenance on individual parts are discussed in section VI. These general instructions are not repeated in this section. When performing preventive maintenance, refer to section VI if more information is required for the following items. All work is to be performed with the power removed from the equipment. After preventive maintenance has been performed on a given day, the equipment should be put into operation and checked for satisfactory performance. (See par. 20, Equipment Performance Check List.)

39. COMMON MATERIALS NEEDED.

The following materials will be needed in performing preventive maintenance:

Common hand tools (screwdriver, knife, pliers).
Clean cloth.
#0000 sandpaper.
Crocus cloth.
Dry-cleaning solvent (SD).

NOTE: Gasoline will not be used as a cleaning fluid for any purpose. Solvent, Dry-cleaning, is available as a cleaning fluid through established supply channels. Oil, Fuel, Diesel, may be used for cleaning purposes when dry-cleaning solvent (SD) is not at hand. Carbon tetlachloride will be used as a cleaning fluid only in the following cases: where inflammable solvents cannot be used because of the fire hazard and for cleaning electrical contacts including relay contacts, plugs, commutators, etc.

40. ITEM 1, EXTERIOR OF RACK AND CHASSIS.

Operations.

ITC Rack and chassis.

41. ITEM 2, CABLES.

Operations.

ITC Cable clamps and connections.

42. ITEM 3, RECEIVER EXTERIORS.

Preliminary Steps. Remove the receivers from the rack and dust cover from rear of receiver chassis.

Operations.

IC Multiple connectors.
ITC Fuses.
ITC Vacuum tubes.
ITC Terminal blocks.

43. ITEM 4, BLOWER.

Operations.

FITCL Blower motor.

44. ITEM 5, RECEIVER INTERIORS.

Preliminary Steps. Remove shields from r-f coils and from crystal holder.

Operations.

IC Capacitors.
IC Resistors.
ITC Rheostats and potentiometers.
ITC Transformers and filter chokes.
ITC Coils and air core transformers.
ITC Crystal holders.

45. ITEM 6, JACKS.

Operations.

ITC Jacks.

46. ITEM 7, CONTROL KNOBS.

Operations.

ITC Control knobs.

47. PREVENTIVE MAINTENANCE CHECK LIST.

The following check list is a summary of the preventive maintenance operations to be performed on radio receivers types CW3 and F3. The time intervals shown on the check list may be reduced at any time by the local commander. For best performance of the equipment, perform operations at least as frequently as called for in the check list. The echelon column indicates which operations are first echelon maintenance and which operations are second echelon maintenance. Operations are indicated by the letters of the word FITCAL. For example, if the letters ITC appear in the "Operations" column, the items to be treated must be inspected (I), tightened (T), and cleaned (C).

ITEM NO.	OPERATIONS	ITEM	WHEN PERFORMED			
			Daily	Weekly	Monthly	Echelon
1	ITC	Exterior of rack and chassis	x			1st
2	ITC	Cable clamps and connections			x	2d
3	ITC	Receiver exteriors		x		2d
4	FITCL	Blower			x	2d
5	ITC	Receiver interiors			x	2d
6	ITC	Jacks		x		2d
7	ITC	Control knobs			x	2d

NOTE: X indicates when operations are to be performed.

F I T C A* L
Feel Inspect Tighten Clean Adjust Lubricate

*The Adjust operation is not applicable to this equipment.

SECTION VIII. LUBRICATION

48. LUBRICATION.

a. Radio Receivers Types CW3 and F3. Periodic lubrication instructions are not required.

b. Receiver Bay Type 113A. Clean and lubricate every 256 operating hours as follows:

(*1*) Inspect the air filter, remove, and clean by tapping out dust or replace when sufficient dust and dirt content requires a new filter. At this time, the entire equipment should be cleaned, using applicable brush, air pressure, or vacuum suction device.

(*2*) Apply 2 to 4 drops of engine oil (OE 10) through the oil holes to the blower motor bearings.

SYMBOL	STANDARD NOMENCLATURE	SPECIFICATION	ISSUING SERVICE	GRADE	CONTAINER SIZE	ASF SUPPLY CATALOG NO.
OE 10	Oil, engine	U.S. Army 2-104B (Amend. 2)	QMC	SAE 10	Non-refill can Non-refill can	14-0-2150-10 14-0-2150-20

SECTION IX. MOISTUREPROOFING AND FUNGIPROOFING

49. GENERAL.

a. Excessive failure of parts and loss of operating efficiency are usually caused, not by inferior parts or equipment, but by the accumu-

lated effects of moisture in high-humidity areas. Rapid temperature changes coupled with conditions of fog, rain and dew or high humidity promote such failures.

b. The effects of moisture (and fungus growth) on resistors, capacitors, coils, chokes, transformer windings, terminal boards, and insulating strips can be recognized in the form of corrosion, low insulation resistance, flash-overs, and crosstalk.

50. TREATMENT TO REDUCE FAILURES.

a. To reduce the above failures, a moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. The treatment consists of applying a film of moisture- and fungi-resistant varnish to all susceptible parts of the equipment. This film provides a nonwetting surface which forms a moisture barrier. Fungus growth is prevented by a fungicide in the varnish. Equipments which have been so treated are marked "MFP" and dated. Equipments not so marked should be examined and if it is obvious that the treatment has not been applied, the equipment should be returned at the first opportunity to third or higher echelon maintenance units for treatment.

b. Re-treatment may be required after a period of use. The need for this re-treatment will be indicated by excessive failures or the effects outlined above (par. 49b).

51. MOISTUREPROOFING AND FUNGIPROOFING PROCEDURE.

For a detailed description of the varnish-spray method of moistureproofing and fungiproofing, refer to TB SIG 13, Moistureproofing and Fungiproofing Signal Corps Equipment. TB SIG 13 with Changes thereto gives the necessary procedure for treating equipment.

52. MOISTUREPROOFING AND FUNGIPROOFING AFTER REPAIRS.

If, during repair, the coating of protective varnish has been punctured or broken, and if complete treatment is not needed to reseal the equipment, apply a brush coat to the affected part. Be sure the break is completely sealed.

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PART FOUR

AUXILIARY EQUIPMENT

(NOT USED)

PART FIVE

REPAIR INSTRUCTIONS

NOTE: Failure or unsatisfactory performance of equipment used by Army Ground Forces and Army Service Forces will be reported on W. D., A.G.O. Form No. 468 (Unsatisfactory Equipment Report); by Army Air Forces, on Army Air Forces Form No. 54 (Unsatisfactory Report). If either is not available, prepare the data according to the sample form reproduced in figure 40.

SECTION X. THEORY OF RADIO RECEIVER TYPE CW3

53. BLOCK DIAGRAM OF RECEIVER BAY TYPE 113A (fig. 11).

The incoming signal is received by the antenna corresponding to the proper frequency receiver, passes through the r-f antenna input coil primary of the receiver, and is returned to ground. The power enters the switch and fuse box in relay-rack type 115A and is fed to the various receivers as well as to a pair of service outlets. Remote control functions from the remote control point enter the wall terminal box type 118A, pass through the terminal box cable type CS390-15.1 to the 33-contact connector on either side of the relay rack, and thence to the various receivers. The connectors on each side of the relay rack are wired together in parallel so that an additional receiver bay type 113A may be connected, by means of relay-rack interconnecting cable type CS390-13.1, and controlled through wall terminal box type 118A.

54. CIRCUIT ANALYSIS OF RECEIVER BAY TYPE 113A.

Figure 12 is a schematic diagram of the wiring in the receiver bay with all pin numbers shown. Output connector numbers correspond to numbers in wall terminal box type 118A. Receiver connectors are inclosed by dotted lines and designated one to eight.

55. BLOCK DIAGRAM OF RADIO RECEIVER TYPE CW3 (fig. 15).

The received c-w signal is picked up by the antenna and is applied to the r-f amplifier stage V1. The signal is amplified by this stage and is then fed to the mixer stage, V2, where the received signal is beat with an h-f signal generated in the oscillator section of this tube. The resulting difference frequency of 455 kc is applied to the i-f amplifier stage, V3, where it is amplified before being fed to the detector stage, V4. Tube V4 also contains a bfo circuit whose output is beat against the i-f signal in the detector stage to produce an audio tone which may be heard in the headset. The audio output of the detector stage is amplified by tube V5 before application to the headset. This stage also functions as an output limiter to limit the audio signals to a predetermined level. The bfo control tube, V7, allows control of the pitch of the audio signal from a remote point. A rectifier circuit, V6, is included in the receiver to provide d-c plate voltages to the receiver tubes.

56. CIRCUIT ANALYSIS OF RADIO RECEIVER TYPE CW3 (fig. 16).

Radio receiver type CW3 is a crystal-controlled superheterodyne receiver designed for the reception of c-w signals. Plug-in coils are provided to cover a frequency band of 1,950 to 16,500 kc. Continuous tuning is not provided, the receiver being preset to a desired frequency within the frequency band. The receiver circuit incorporates an r-f amplifier stage, a mixer-oscillator stage, an i-f amplifier stage, a detector bfo stage, and an audio-amplifier peak

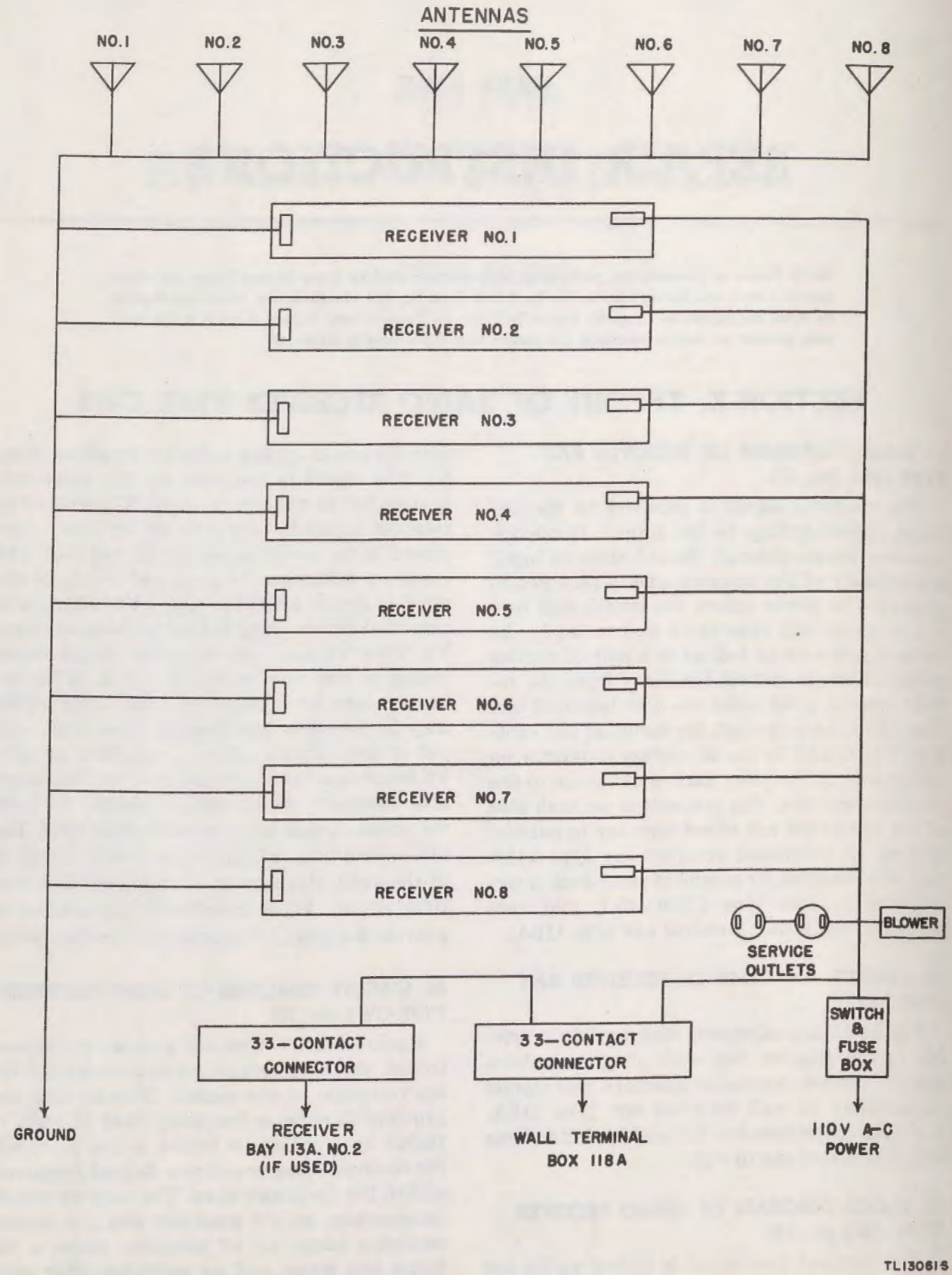

Figure 11. Receiver bay type 113A, block diagram.

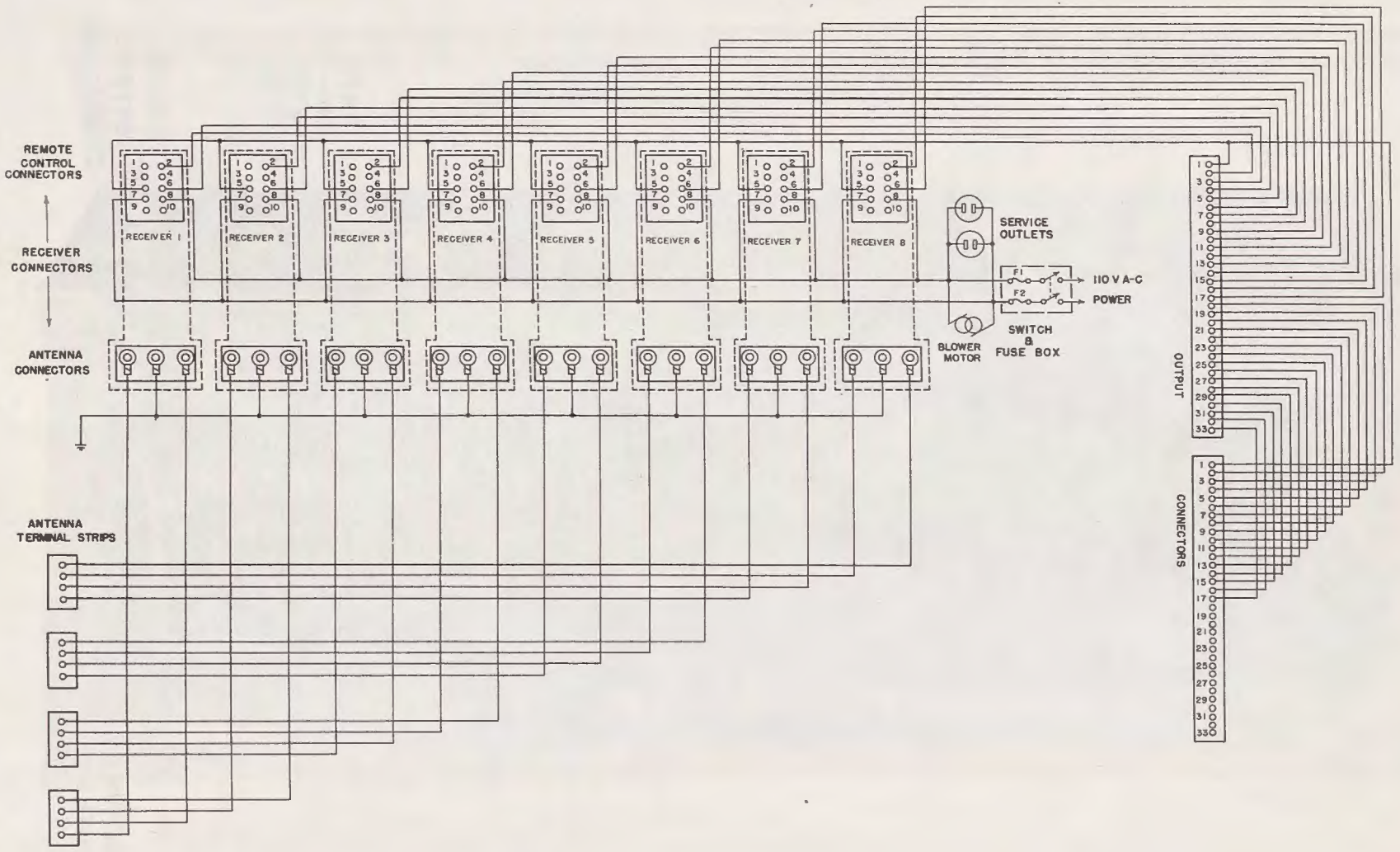

Figure 12. Receiver bay type 113A, schematic diagram.

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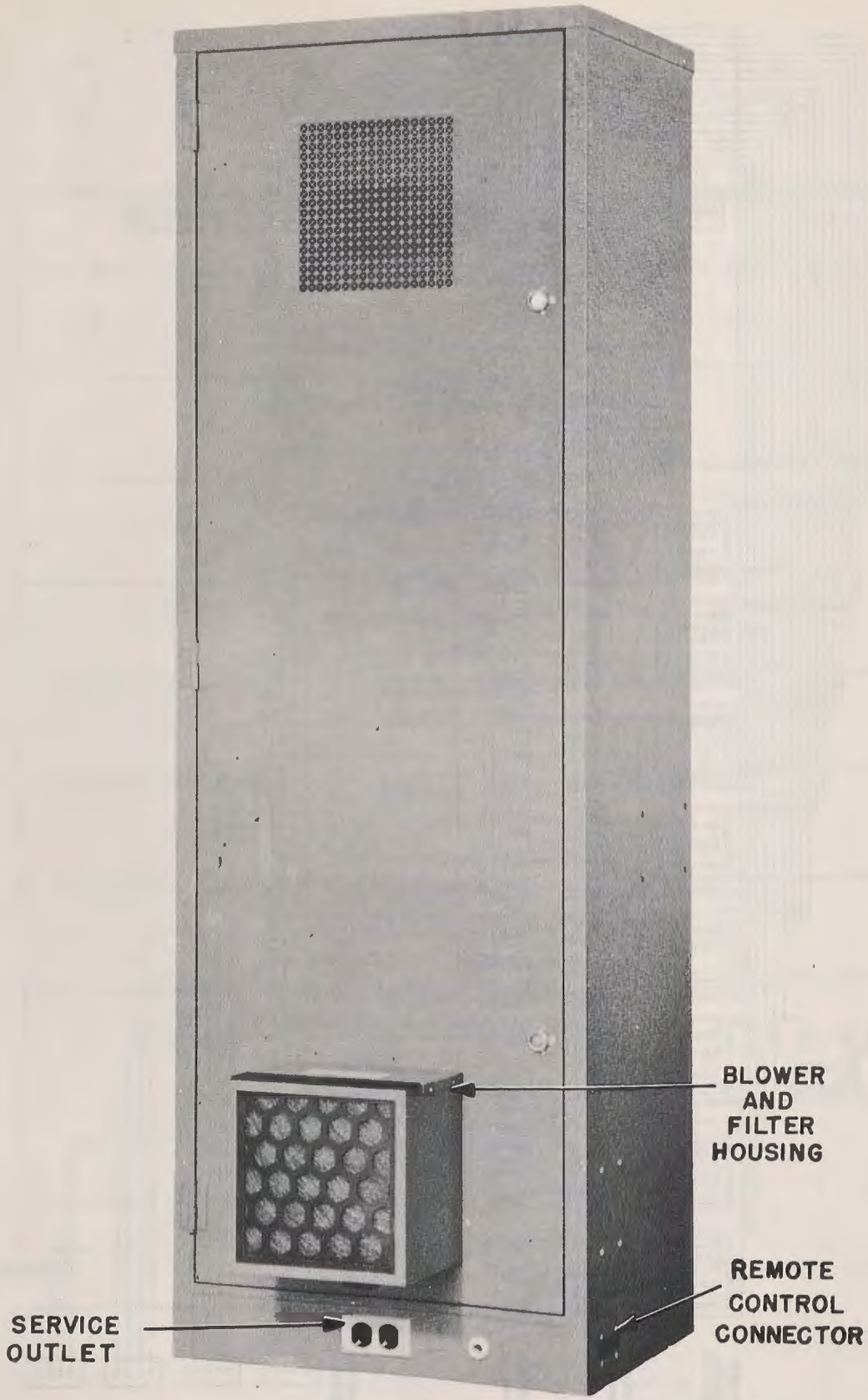
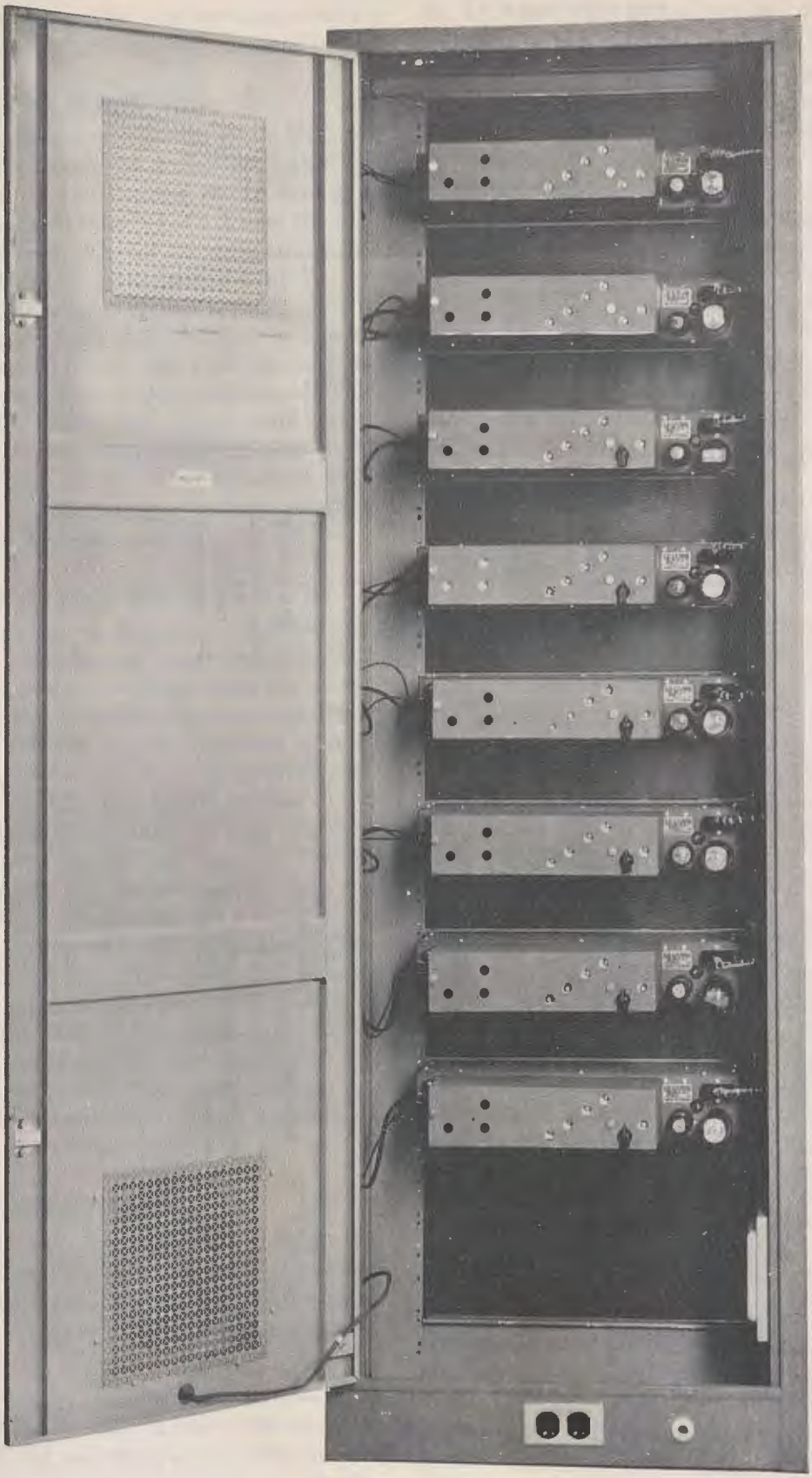
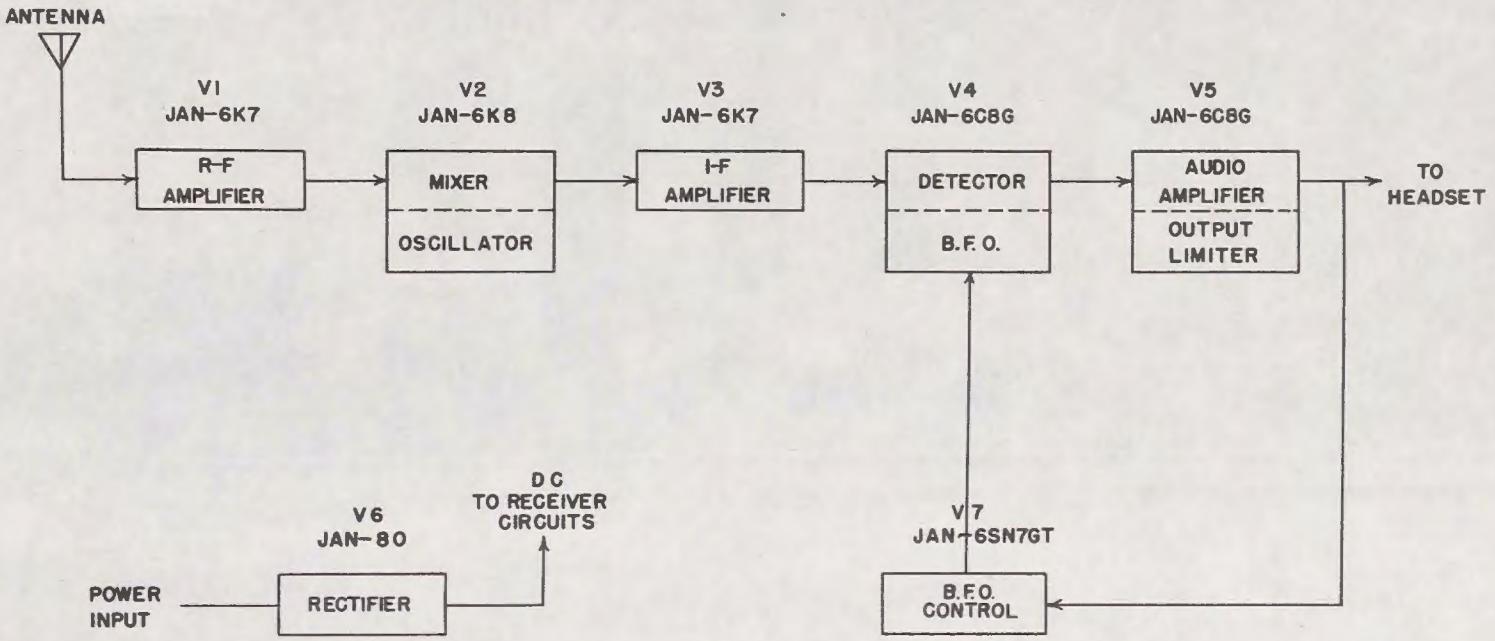


Figure 13. Receiver bay type 113A, rear view.



TL 13064 S

Figure 14. Receiver bay type 113A, interior view.



TL 13065S

Figure 15. Radio receiver type CW3, block daigram.

output limiter stage. The receiver also contains its own power supply and a bfo control tube.

57. R-F AMPLIFIER STAGE VI (fig. 17).

J2 is the antenna connector, on which the center terminal should be grounded. L1 is the antenna input r-f coil feeding the control grid of the r-f amplifier tube V1. C1 tunes the secondary of the coil. R1 and C2 are cathode resistor and cathode bypass capacitor of V1, respectively. R16 is a variable resistor in the cathode circuit of V1 and V3, by means of which the sensitivity of the receiver may be controlled (par. 15a) at the front panel. This circuit also appears at pin 1 of the remote control connector P1, for controlling the sensitivity at a remote point. L2 is the r-f amplifier plate coil, tuned by C3 across its primary winding. C2 is a screen bypass capacitor for V1.

58. MIXER-OSCILLATOR STAGE V2 (fig. 18).

L2 is link-coupled to the mixer-amplifier grid coil L3 whose secondary is tuned with capacitor C5. This coil injects its voltage onto the screen in the hexode mixer section of mixer-oscillator tube V2. R2 and C6 are the common cathode resistor and bypass capacitor, respectively, for both sections of V2. The triode section of V2 is used in a crystal-oscillator circuit, which is internally coupled to the first grid of V2. R-f choke L4 protects the power supply from r-f currents and C7 bypasses r-f currents to ground. The crystal is connected between the triode grid and triode plate, with R3 as grid resistor. The suppressor grids of the hexode section are internally connected and derive their voltage from the bleeder system of the power supply (par. 64). The plate lead of V2, mixer section, is connected to the primary of the input i-f transformer L5.

59. CRYSTAL FREQUENCIES.

The intermediate frequency is 455 kc in the receiver. Frequencies falling within the range of the Set I coils (par. 9) use the fundamental or first harmonic of the crystal, which must be 455 kc above the receiver frequency. Coils in Set II also use the fundamental crystal frequency which in this case is below the receiver frequency. Set III and Set IV coils use the second and third crystal harmonics respectively, both being below the receiver frequency.

60. I-F AMPLIFIER STAGE V3 (fig. 19).

This stage consists of two double-tuned circuits, L5 and L6, coupled by an amplifier tube V3 to form a band-pass filter permitting only a 455-kc frequency to pass. The primary of L5 is resonated by capacitor C9 and trimmed by capacitor C8. The secondary is resonated by capacitor C10 and trimmed by capacitor C11. C12 and R5 are cathode bypass capacitor and resistor respectively for V3. This cathode is connected to the sensitivity control R16 in the same manner as V1 above. The plate of V3 connects to a tap on the primary of the output i-f transformer L6. C14 and C15 are trimming and resonating capacitors respectively, for this primary, and C13 bypasses any remaining r-f current.

61. DETECTOR BFO STAGE V4 (fig. 20).

This stage includes a modified plate detector circuit using one triode section of twin triode tube V4. The secondary of output i-f transformer L6 is resonated by C17, trimmed by C16, and fed into the detector grid. Resistor R7, bypassed by C20, produces bias to operate the tube as a plate detector. Capacitor C19 bypasses the radio frequency from this plate circuit. A resistor R6 is inserted in the grid return as an additional output limiter when excessively high voltages appear at the detector circuit. The output of the detector is resistance-capacity coupled to the input of the audio-amplifier stage following. The second triode section of V4 is part of a bfo using a modified Hartley oscillator circuit coupled by C18 to the secondary of L6. The tuned circuit portion of the oscillator includes C21, C22, C23, and C24. Resistor R8 produces grid bias and C25 passes r-f currents around it. The frequency of the bfo is preset by adjusting C22 and C23. C22 is a very coarse adjustment, C23 being used as a trimming capacitor (par. 87). This frequency may then be changed either by variable resistor R15 or by control tube V7. Resistor R15 operates in series with a switch in the cathode return circuit of the bfo section of V4. Controlling the bias of the bfo tube by R15 varies the frequency within a limited range. This resistor is available by an adjustment knob at the front panel of the receiver. Switch S2 removes R15 from the circuit when the knob on R15 is rotated counterclockwise until it clicks. This allows remote bfo control through tube V7.

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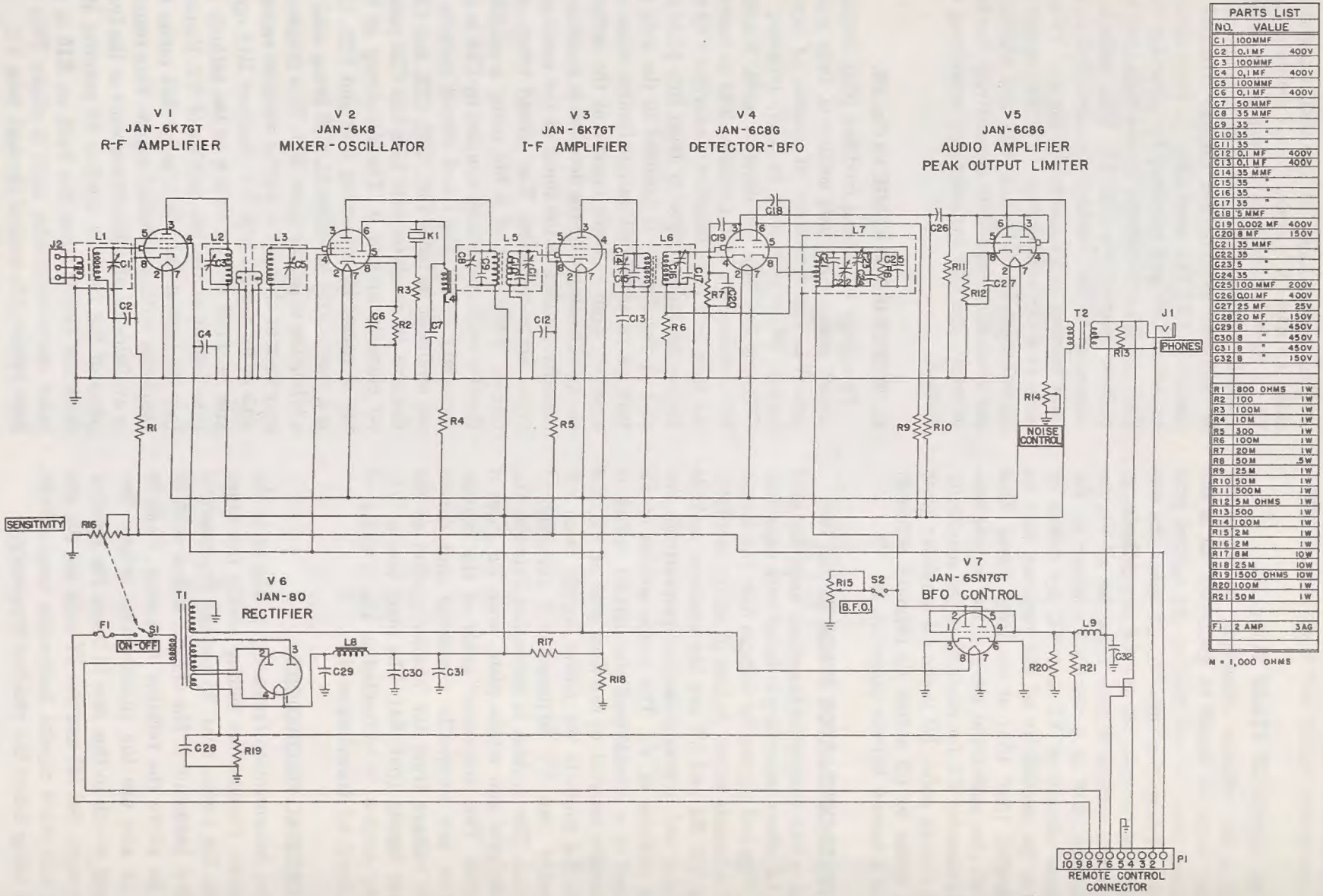


PARTS LIST		
NO.	VALUE	
C1	100MMF	
C2	0.1 MF	400V
C3	100MMF	
C4	0.1 MF	400V
C5	100MMF	
C6	0.1 MF	400V
C7	50 MMF	
C8	35 MMF	
C9	35 "	
C10	35 "	
C11	35 "	
C12	0.1 MF	400V
C13	0.1 MF	400V
C14	35 MMF	
C15	35 "	
C16	35 "	
C17	35 "	
C18	5 MMF	
C19	0.002 MF	400V
C20	8 MF	150V
C21	35 MMF	
C22	35 "	
C23	5 "	
C24	35 "	
C25	100 MMF	200V
C26	0.01 MF	400V
C27	25 MF	25V
C28	20 MF	150V
C29	8 "	450V
C30	8 "	450V
C31	8 "	450V
C32	8 "	150V
R1	800 OHMS	1W
R2	100	1W
R3	1.00M	1W
R4	1.0M	1W
R5	300	1W
R6	1.00M	1W
R7	20M	1W
R8	50M	.5W
R9	25M	1W
R10	50M	1W
R11	500M	1W
R12	5M OHMS	1W
R13	500	1W
R14	100M	1W
R15	2M	1W
R16	2M	1W
R17	8M	10W
R18	25M	10W
R19	1500 OHMS	10W
R20	100M	1W
R21	50M	1W
F1	2 AMP	3AG

M = 1,000 OHMS

TL 130665

Figure 16. Radio receiver type CWS, schematic diagram.

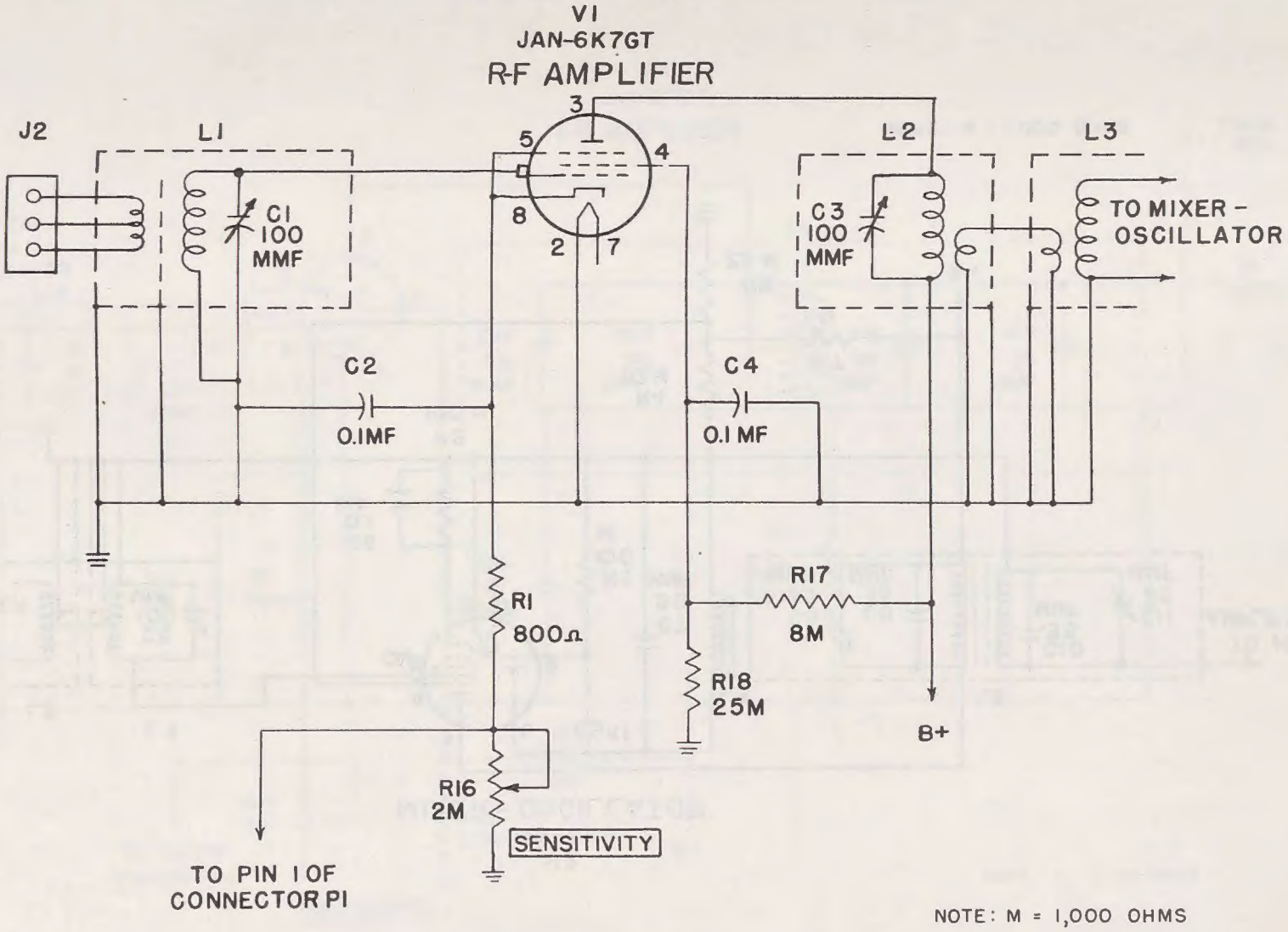
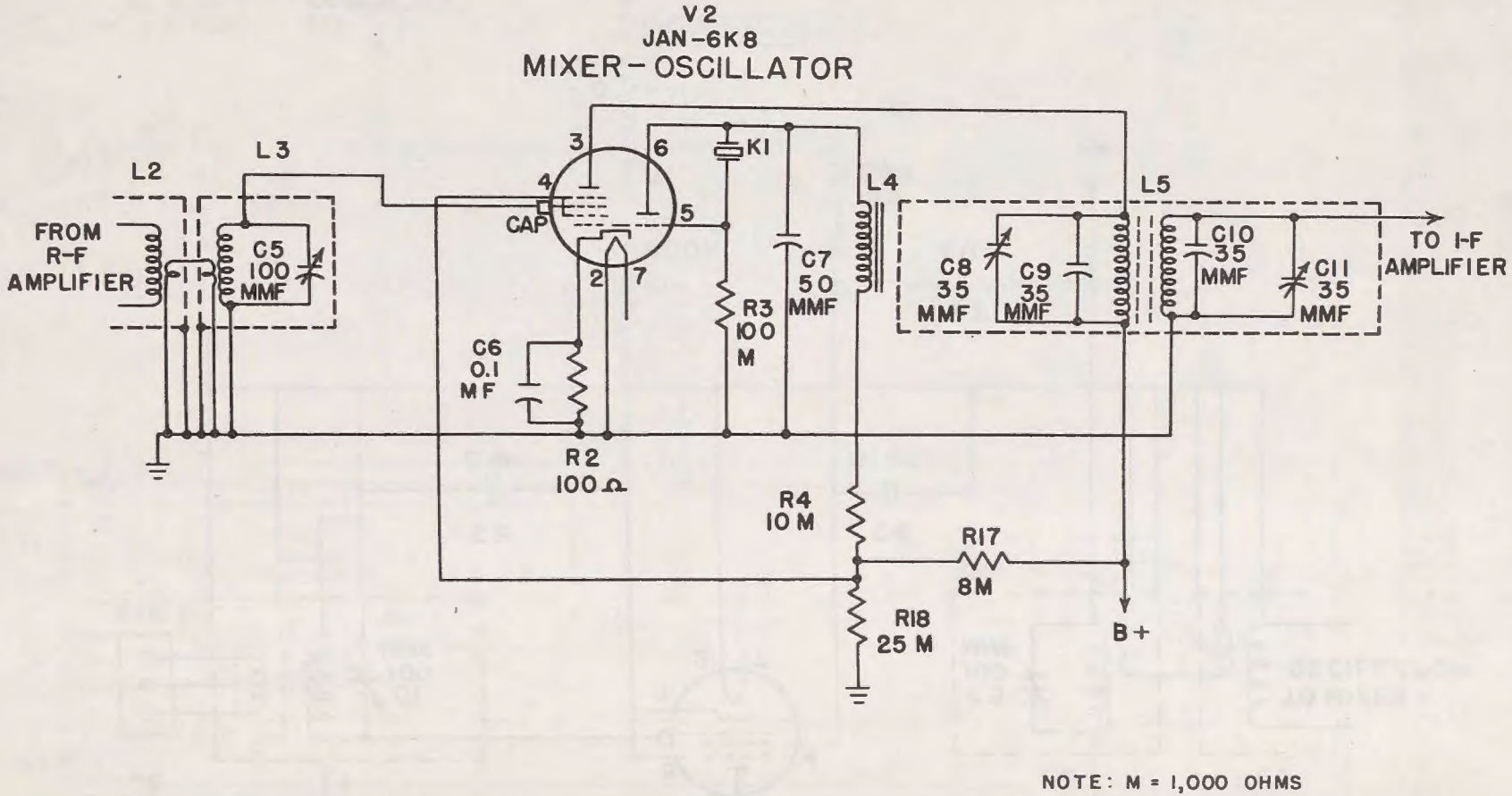


Figure 17. Radio receiver type CW3, functional diagram of r-f amplifier stage.

TL 13067 S



TL 13068 S

Figure 18. Radio receiver type CWS, functional diagram of mixer-oscillator stage.

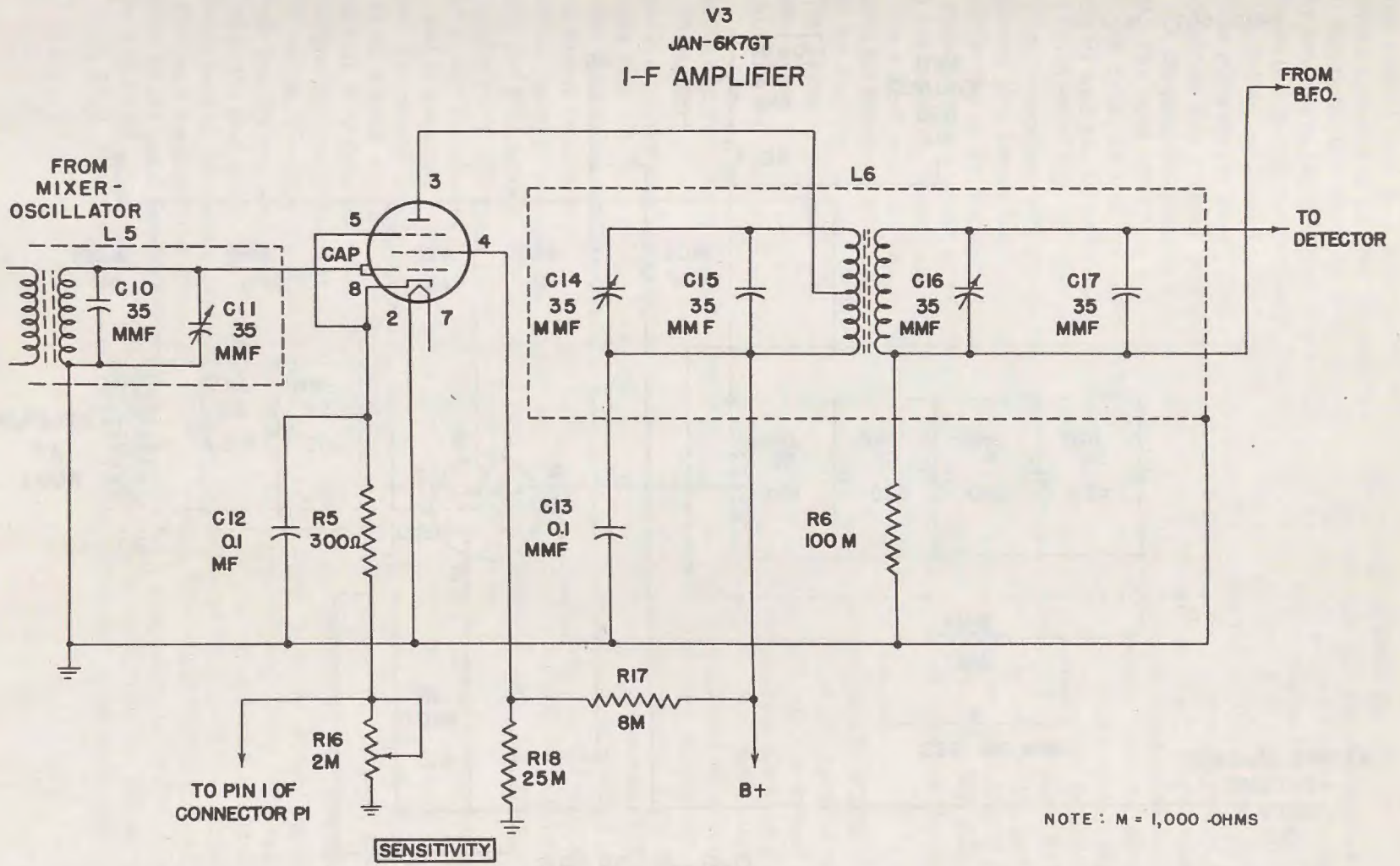


Figure 19. Radio receiver type CW3, functional diagram of i-f amplifier stage.

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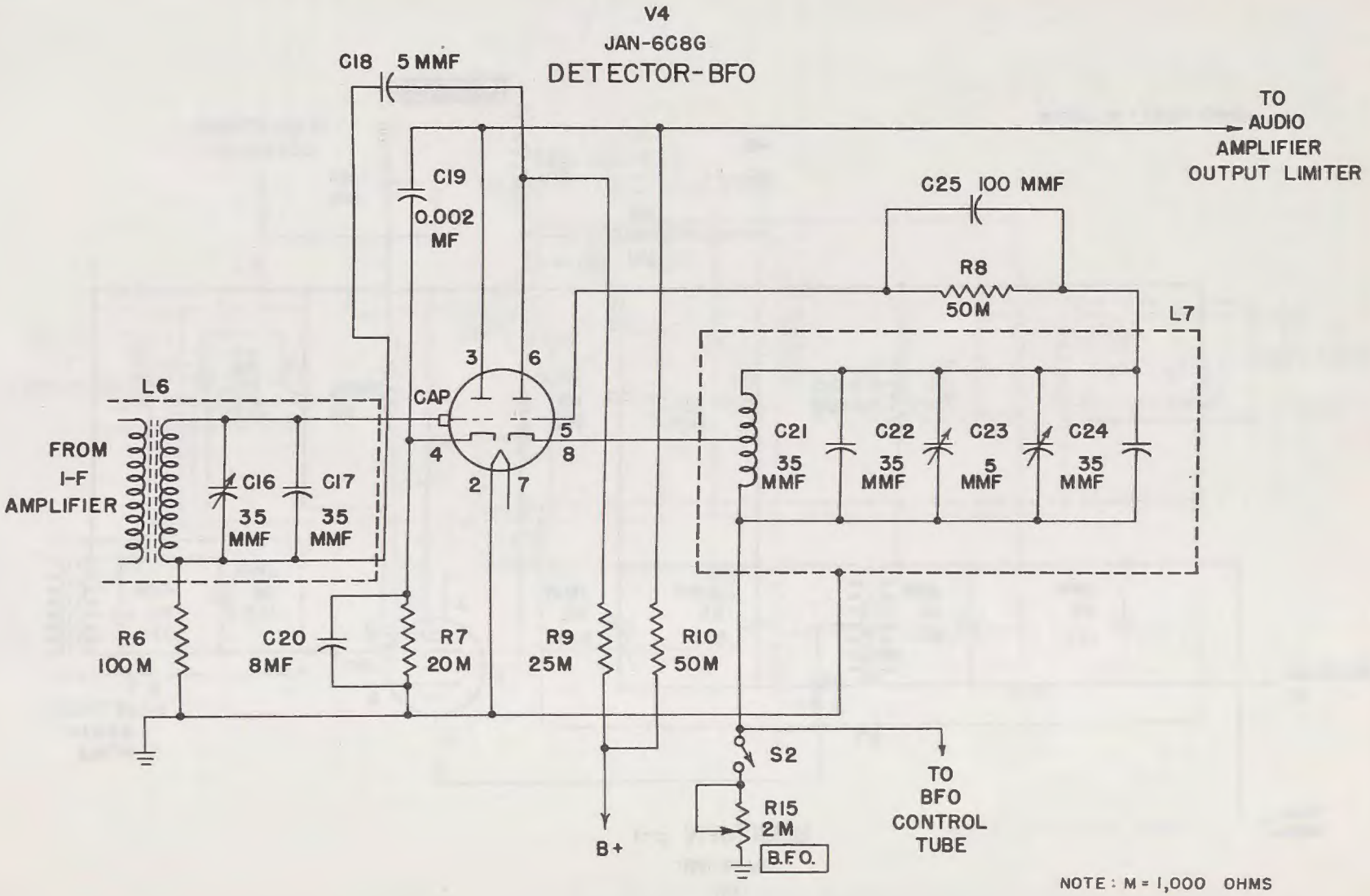


Figure 20. Radio receiver type CWS, functional diagram of detector BFO stage.

62. BFO CONTROL TUBE V7 (fig. 21).

The bfo control tube is a twin triode with both sections operated in parallel. The plate resistance functions the same as R15 and is varied by controlling the grid bias. Voltage for this purpose is obtained from dropping resistor R19 in the center tap ground return circuit of the rectifier plate supply transformer. The voltage drop across this resistor is applied to the grid of V7 through the resistor network R20 and R21. The grid of V7 is also connected through the filter, L9-C32, to remote control connector P1 and to the center tap of audio-output transformer T2. To operate the bfo from a remote location, the remote line must be terminated in a line-to-headset transformer with a center tap in the line side. A remote bfo control resistor with a series switch should be inserted between this center tap and ground. Closing the switch and varying the resistance will control the frequency of the audio beat note produced by the bfo. A beat frequency from 0 to 1,750 cycles is obtained when using remote control, and from 0 to 3,000 cycles with local control at the receiver front panel.

63. AUDIO-AMPLIFIER PEAK OUTPUT LIMITER STAGE V5 (fig. 22).

The audio amplifier consists of one section of twin triode tube V5. This section operates between the resistance-capacity network, R11-C26, and output transformer T2. R12 and C27 are cathode resistor and cathode bypass respectively for this section. The secondary of T2 is terminated in 500 ohms (R13), in order to obtain proper functioning of the peak output limiter, and is designed to operate into a 500-ohm load. The second triode section of V5 is employed as a peak output limiter across the output circuit. It rectifies the peaks of the audio voltage appearing across the grid of the audio-amplifier section. The grid and plate of the second triode section are wired in parallel, and connected to the grid of the first triode section. The cathode lead of the second section contains a variable load resistor R14 which provides adjustment of the noise limiting action. It appears on the front panel as a NOISE CONTROL (par. 15c). Full clockwise rotation of the knob provides maximum limiting.

64. POWER SUPPLY (fig. 23).

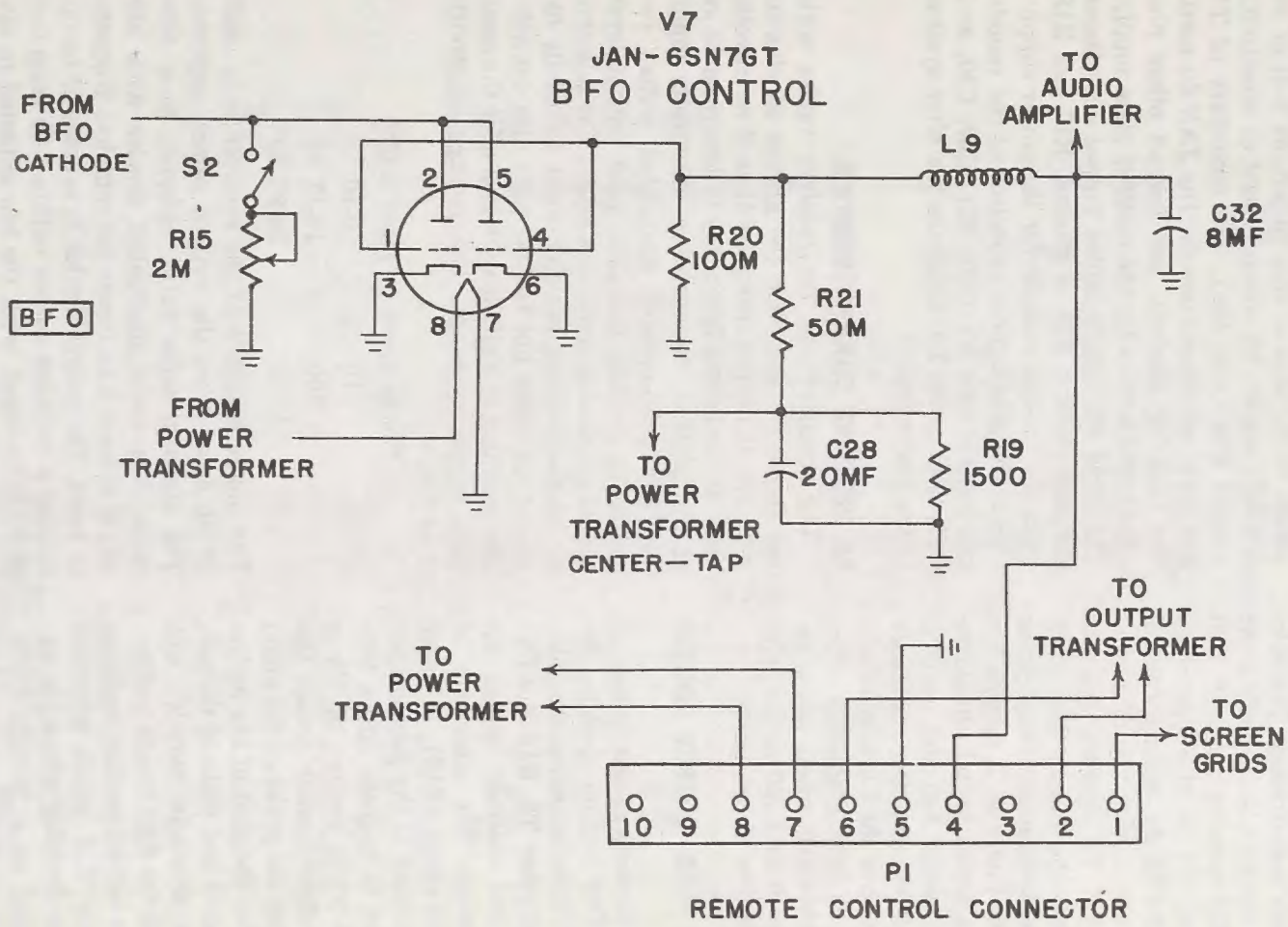
The 110-volt 60-cycle single-phase a-c power input connects to pins 7 and 8 of connector P1, and from there goes to the primary of power transformer T1. A 2-ampere fuse F1 is inserted in one side of this circuit, as well as an ON-OFF switch S1 which is part of sensitivity control R16 (par. 15a). The secondary of T1 has three windings; one for the JAN-80 rectifier tube V6 filament, one for all other filaments, and a third for the rectifier plate supply. The third winding is center tapped and passes through resistor R19 to ground. R17 and R18 form the bleeder resistor for the power supply. C28 is the grid bypass capacitor of the remote bfo control tube V7 (par. 62). C29, C30, and C31, with choke L8, comprise the filter system of the power supply.

65. RECEIVER CHARACTERISTICS.

The sensitivity of the receiver varies with the frequency and with the groups of plug-in r-f coils. It ranges from less than 2 microvolts (μv) at the lowest frequency to less than 20 μv at the highest, measured in microvolts input (400-cycle, 30-percent modulated signal, required to produce 0-decibel (db) output level across a 500-ohm resistance load). The selectivity of the receiver is determined primarily by the i-f amplifier but the r-f coils also contribute resulting in a slight variation over the complete frequency range. The average selectivity is as follows:

Times down	*Band width*
10	6-10 kc
100	12-17 kc
1,000	24-34 kc

The image response of the receiver is at least 60 db down from the desired signal response. The signal-to-noise ratio, referred to a 400-cycle, 30-percent modulated carrier with bfo off, is at least 3 to 1 over the complete frequency band. The output limiter is capable of maintaining a constant output within 4 db from 5μv to 20 volts input, with the bfo adjusted to approximately 800 cycles audio-output tone.



NOTE: M = 1,000 OHMS

TL 13072 S

Figure 21. Radio receiver type CW3, functional diagram of BFO control stage.

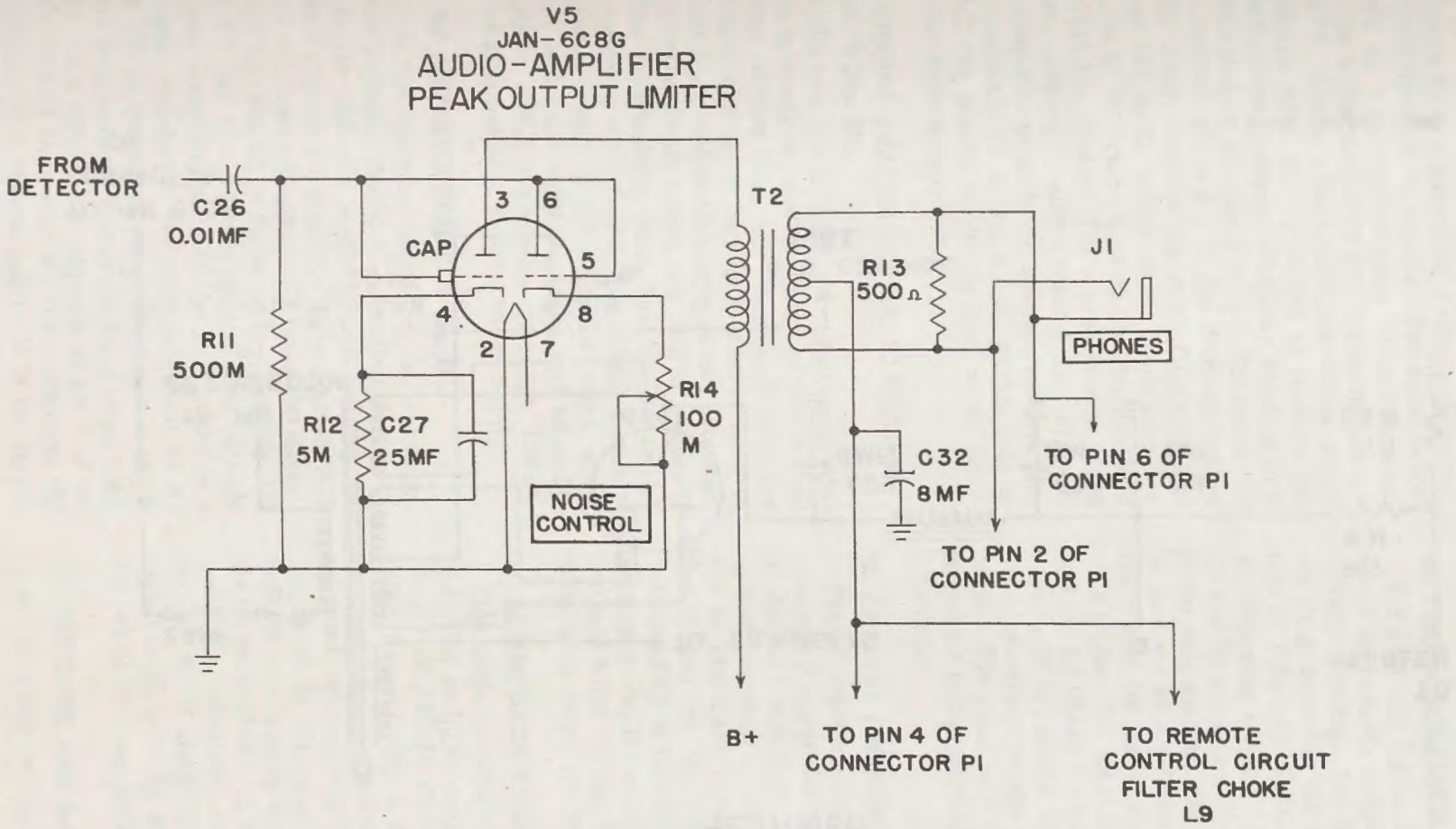


Figure 22. Radio receiver type CW3, functional diagram of audio-amplifier peak output limiter stage.

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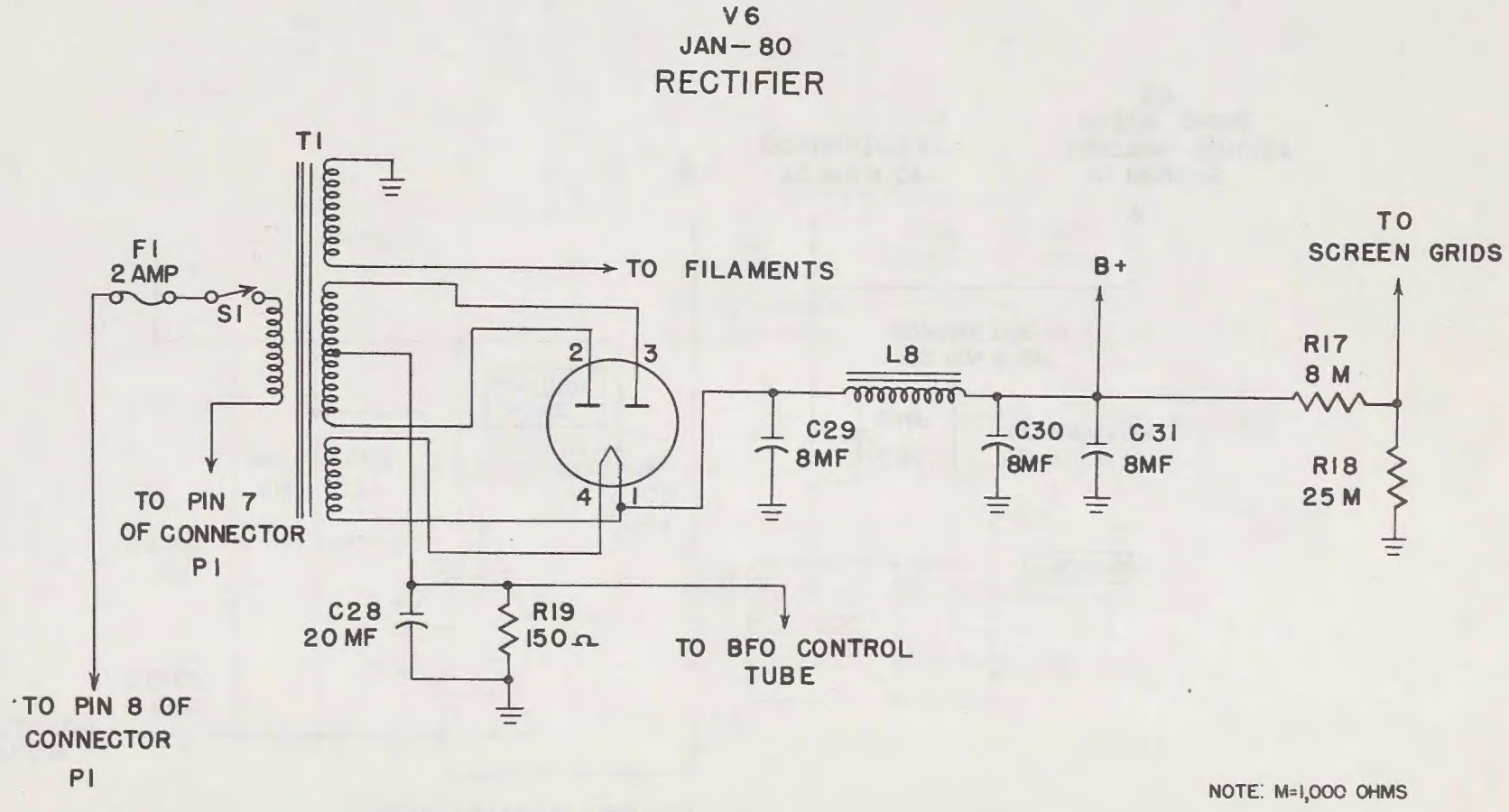

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Figure 23. Radio receiver type CW3, functional diagram of rectifier stage.

SECTION XI. THEORY OF RADIO RECEIVER TYPE F3

66. BLOCK DIAGRAM OF RADIO RECEIVER TYPE F3.

Figure 24 is a simplified diagram of the signal path through the receiver. The signal is amplified by r-f amplifier tube V1 and injected into the mixer section of V2. The second section of V2 is used as a local oscillator whose output combines with the r-f signal to produce the intermediate frequency of 455 kc which in turn is amplified by vacuum tube V3. The output of i-f amplifier V3 is fed to the detector section of V4 which removes the radio frequency and passes the audio signal to the audio-amplifier section of V5 where it is again amplified and fed into the headset. The second section of V4 is an automatic-volume-control (a-v-c) voltage amplifier provided to hold the receiver output constant. V5 is also a dual section tube in which the second section is used as an intercarrier noise suppressor.

67. CIRCUIT ANALYSIS OF RADIO RECEIVER TYPE F3 (fig. 25).

Radio receiver type F3 is a crystal-controlled superheterodyne receiver designed for the reception of a-m voice signals. Plug-in coils are provided to cover a frequency band of 1,950 to 16,500 kc. Continuous tuning is not provided, the receiver being preset to a desired frequency within the frequency band. The receiver circuit incorporates an r-f amplifier stage, a mixer-oscillator stage, an i-f amplifier stage, a detector and a-v-c amplifier stage, and an audio-amplifier and noise suppressor stage. The receiver also contains its own power supply.

68. R-F AMPLIFIER STAGE V1 (fig. 26).

J1 is the antenna connector, on which the center terminal should be connected to ground. L1 is the antenna input r-f coil feeding the control grid of r-f amplifier Tube JAN-6K7GT (V1). C1 is an r-f bypass. C2 tunes the secondary of L1, and R1 is the a-v-c bias resistor. R2 and C3 are the cathode resistor and cathode bypass capacitor respectively of V1. R20 is a variable resistor in the cathode circuit of V1 and V3, by means of which the receiver sensitivity may be controlled at the front panel (par. 16a). This circuit also appears at pin 1 of remote control connector P1 for controlling the sensitivity at a remote point. C4 is the screen bypass capacitor for V1. L2 is the r-f amplifier plate coil, tuned by C5.

69. MIXER-OSCILLATOR STAGE V2 (fig. 27).

R-f grid coil, L3, is link-coupled to L2, and tuned by variable capacitor C7 across the secondary winding. C6 is the signal grid decoupling capacitor for the hexode mixer section of Tube JAN-6K8GT (V2). R3 is the voltage-dropping resistor for bias on this section. C8 and R4 are cathode bypass capacitor and resistor respectively. The second section of V2 is used as an oscillator internally coupled to the mixer. Its frequency is controlled by crystal K1 (par. 70). R5 is the grid resistor for this section. L4 blocks r-f currents from the power supply, C9 bypassing them to ground. R6 provides operating voltage for the oscillator plate of V2. The plate lead of the mixer section is connected to the primary of the input i-f transformer L5.

70. CRYSTAL FREQUENCIES.

The intermediate frequency is 455 kc in this receiver. Frequencies falling within the range of the Set I coils (par. 9) use the fundamental or first harmonic of the crystal, which must be 455 kc above the receiver frequency. Coils in Set II also use the fundamental crystal frequency which in this case is below the receiver frequency. Set III and Set IV coils use the second and third crystal harmonics respectively, both being below the receiver frequency.

71. I-F AMPLIFIER STAGE V3 (fig. 28).

This stage consists of two double-tuned circuits, L5 and L6, coupled with i-f amplifier Tube JAN-6K7GT (V3), to form a band-pass filter, passing only a 455-kc signal. The primary of L5 is resonated by capacitor C12 and trimmed by capacitor C11. The secondary is resonated by C14 and trimmed by C15. C16 and R9 are cathode bypass capacitor and resistor, respectively, of V3. This cathode is connected to sensitivity control R20 in the same manner as V1 above. The plate of V3 feeds the signal to the primary of output i-f transformer L6, which is tuned by C18 and C17.

72. DETECTOR AND A-V-C STAGE V4 (fig. 29).

a. The triode section of Tube JAN-6F7 (V4)

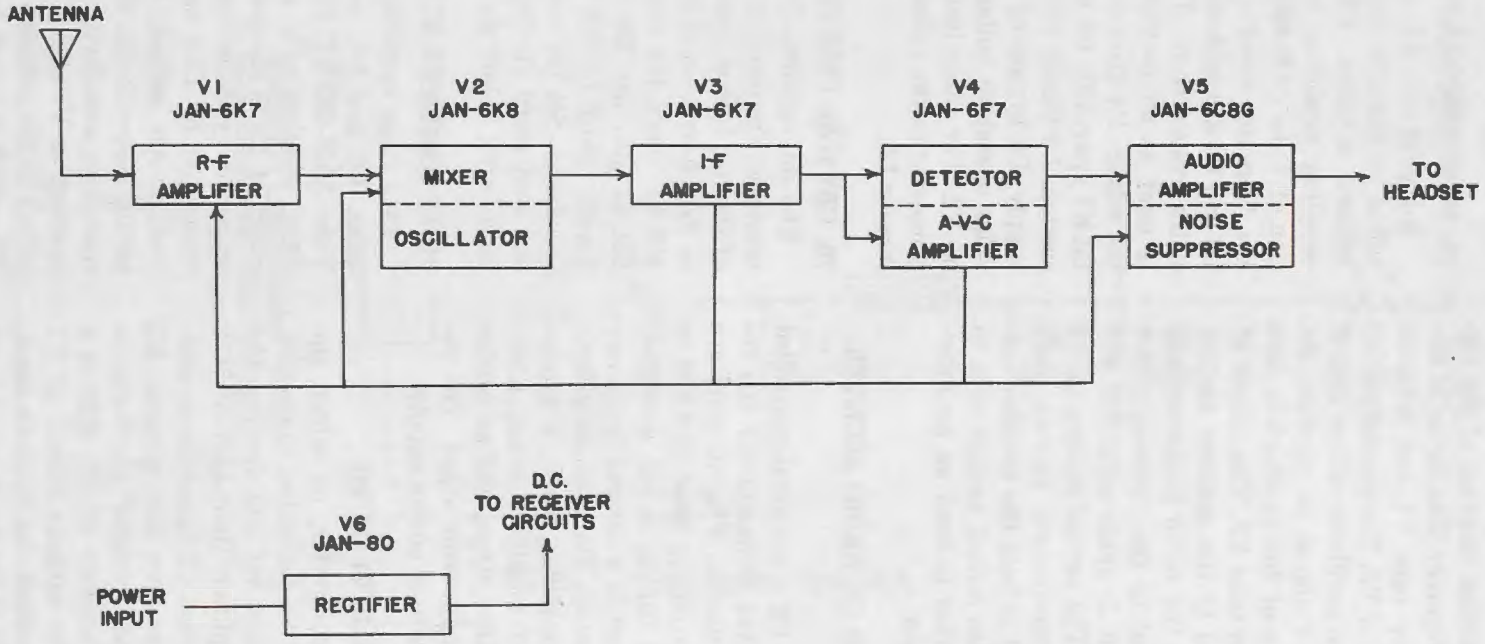

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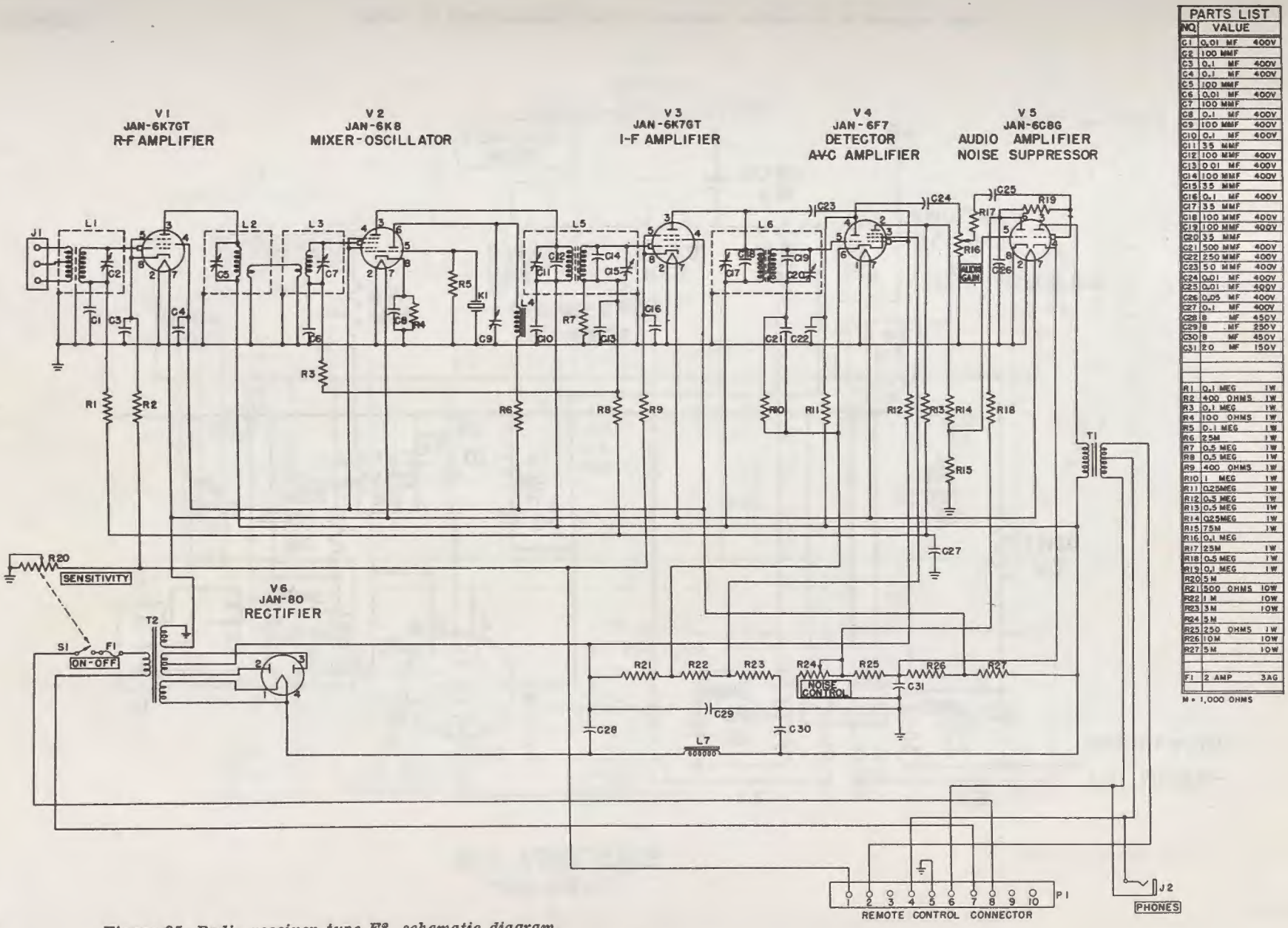
Figure 24. Radio receiver type F3, block diagram.

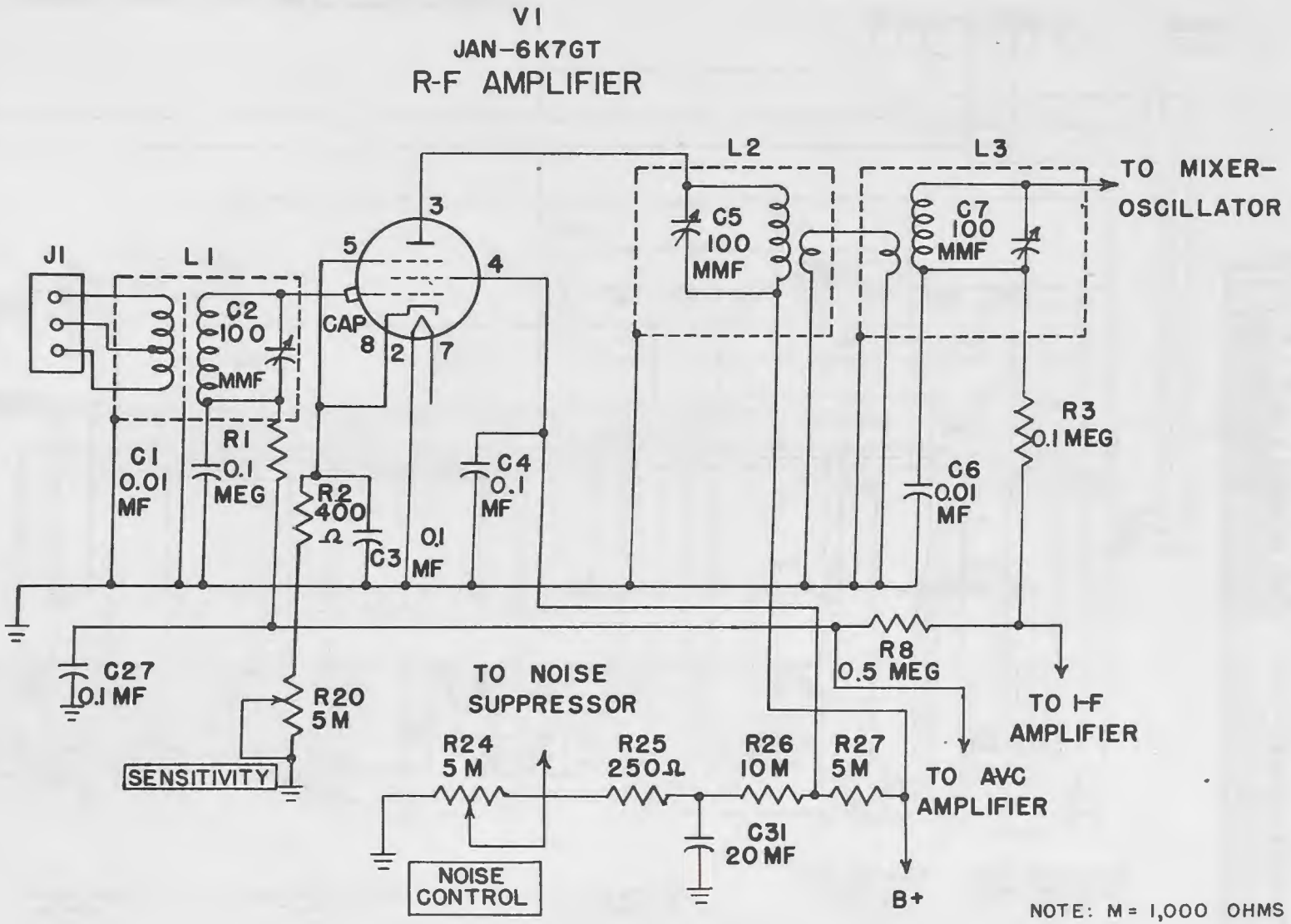


PARTS LIST		
NO.	VALUE	
C1	0.01 MF	400V
C2	100 MMF	
C3	0.1 MF	400V
C4	0.1 MF	400V
C5	100 MMF	
C6	0.01 MF	400V
C7	100 MMF	
C8	0.1 MF	400V
C9	100 MMF	400V
C10	0.1 MF	400V
C11	35 MMF	
C12	100 MMF	400V
C13	0.01 MF	400V
C14	100 MMF	400V
C15	35 MMF	
C16	0.1 MF	400V
C17	35 MMF	
C18	100 MMF	400V
C19	100 MMF	400V
C20	35 MMF	
C21	500 MMF	400V
C22	250 MMF	400V
C23	50 MMF	400V
C24	0.01 MF	400V
C25	0.01 MF	400V
C26	0.05 MF	400V
C27	0.1 MF	400V
C28	8 MF	450V
C29	8 MF	250V
C30	8 MF	450V
C31	20 MF	150V
R1	0.1 MEG	1W
R2	400 OHMS	1W
R3	0.1 MEG	1W
R4	100 OHMS	1W
R5	0.1 MEG	1W
R6	25M	1W
R7	0.5 MEG	1W
R8	0.5 MEG	1W
R9	400 OHMS	1W
R10	1 MEG	1W
R11	0.25MEG	1W
R12	0.5 MEG	1W
R13	0.5 MEG	1W
R14	0.25MEG	1W
R15	75M	1W
R16	0.1 MEG	
R17	25M	1W
R18	0.5 MEG	1W
R19	0.1 MEG	1W
R20	5 M	
R21	500 OHMS	10W
R22	1 M	10W
R23	3 M	10W
R24	5 M	
R25	250 OHMS	1W
R26	10 M	10W
R27	5 M	10W
F1	2 AMP	3AG

M = 1,000 OHMS

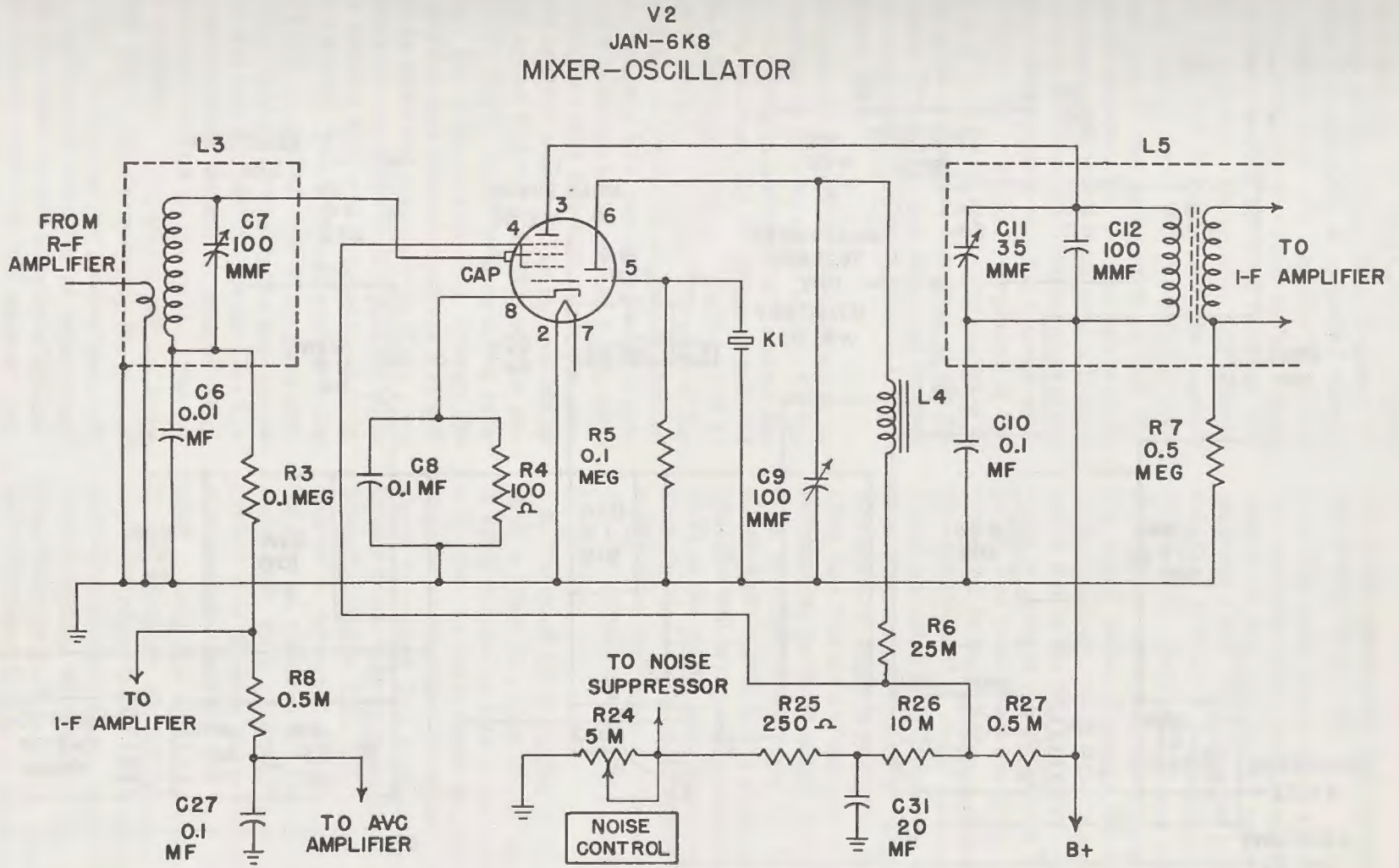
Figure 25. Radio receiver type F3, schematic diagram.

TL 130795



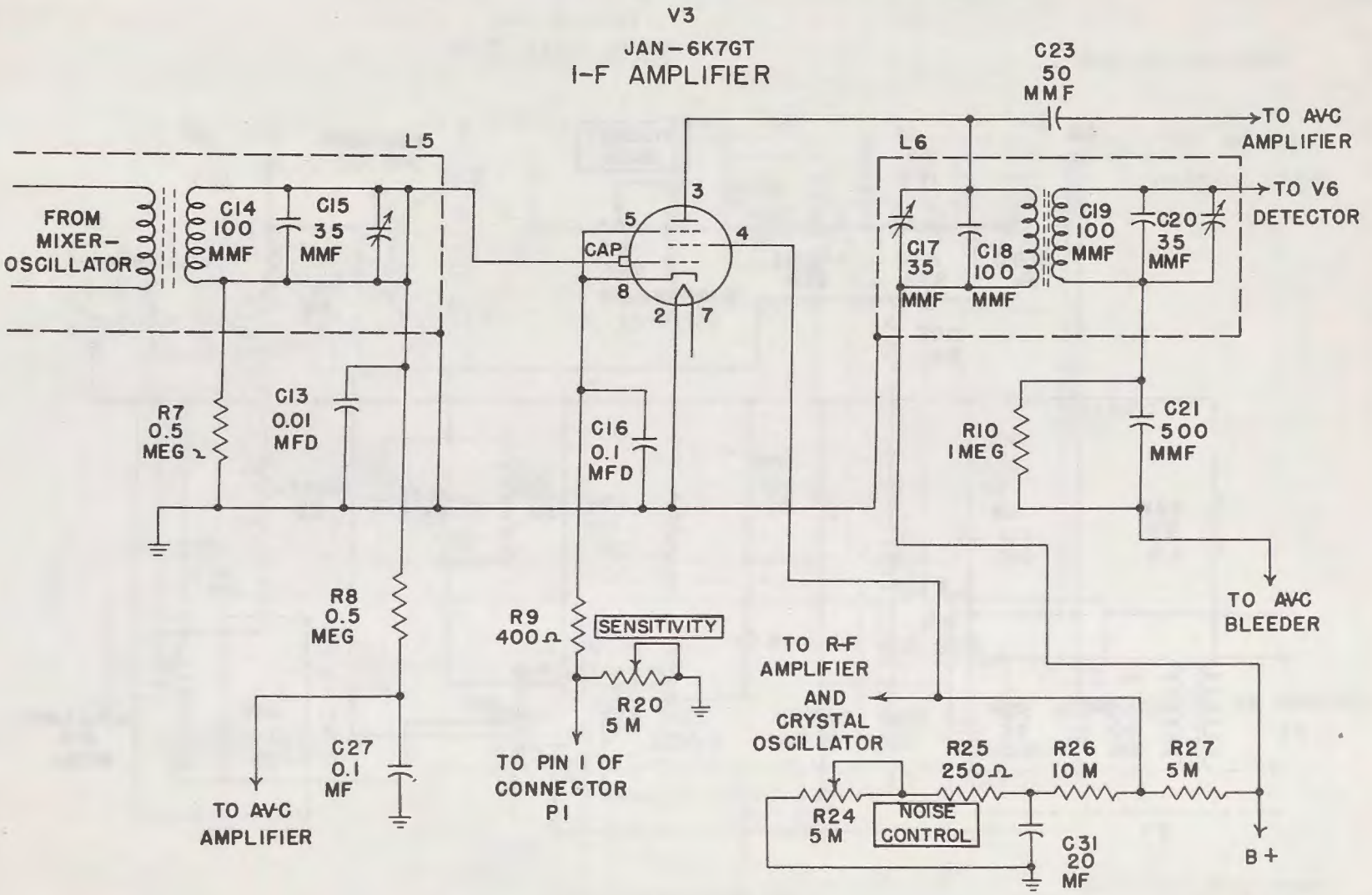
TL 130805

Figure 26. Radio receiver type F3, functional diagram of r-f amplifier stage.



TL 13081S

Figure 27. Radio receiver type F3, functional diagram of mixer-oscillator stage.



TL 13082S

Figure 28. Radio receiver type F3, functional diagram of i-f amplifier stage.

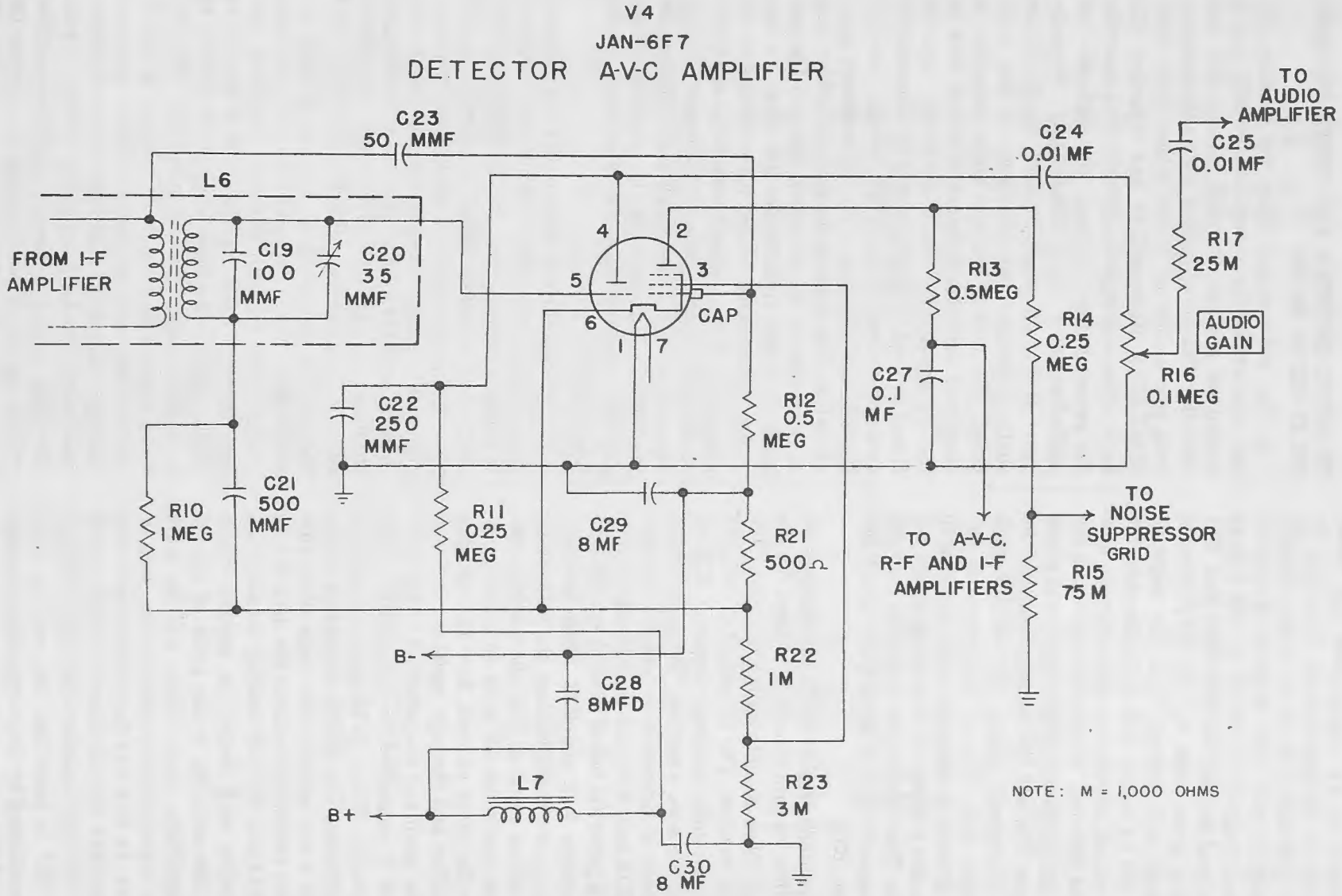
is used in a modified grid-leak detector circuit. The secondary of i-f transformer L6, tuned to resonance at the intermediate frequency by capacitors C19 and C20, is connected directly to the detector grid. The detector is cathode biased approximately to cut-off by the voltage drop developed across resistors R23 and R22 connected in series with resistor R21 between the B+ lead and ground. Thus the negative halves of the i-f signal will drive the detector grid past cut-off causing no plate current flow through the detector. The positive halves of the i-f signal applied to the detector grid will cause plate current flow and the audio envelope of the i-f signal will appear across the detector plate load resistor, R11. The i-f component is bypassed to ground by capacitor C22 resulting in only the audio component appearing at the detector plate. The audio signal is applied through coupling capacitor C24 to the AUDIO GAIN potentiometer, R16.

b. The pentode section of V4 functions as an a-v-c amplifier to provide a bias voltage for the r-f and i-f tubes to automatically control the gain of the receiver. The i-f output of tube V3 is applied through coupling capacitor C23 to the grid of the a-v-c amplifier. The plate of the a-v-c pentode is connected to ground through resistors R14 and R15, and the cathode is connected to a potential below ground by the drop across resistors R22 and R23. Since the pentode grid is more negative than the cathode by the drop across resistor R21, the pentode section will be nearly cut off with no signal present. Thus the plate current flow through the a-v-c amplifier and through resistors R15 and R14 will be small and the potential of the a-v-c line, which is connected to the pentode plate through resistor R13, will be approximately at ground potential. The i-f signal applied to the grid of the a-v-c pentode will cause plate current to flow, thereby increasing the drop across resistors R14 and R15 and making the a-v-c line more negative with respect to ground. Since the a-v-c line connects to the grids of the r-f and i-f amplifiers, these stages will be more negatively biased thereby reducing the gain of the receiver. In this way the receiver gain will remain constant for variation in input signal strength. The time constant of resistor R13 and capacitor C27 is such that the receiver gain will not be affected by the comparatively rapid variations of the audio signal, but will only respond to the average signal strength.

73. AUDIO-AMPLIFIER AND NOISE SUPPRESSOR STAGE V5 (fig. 30).

a. The audio output from the detector circuit appears across potentiometer R16 and is tapped off and fed through resistor R17 and capacitor C25 to the grid of the audio-amplifier tube, one section of double triode Tube JAN-6C8G (V5). Resistor R17 and capacitor C25 form a tone compensating network to maintain the proper balance between the high and low audio-frequency (a-f) components. Potentiometer R16 is the AUDIO GAIN control whose shaft is brought out to a knob in the front panel. The cathode of the audio amplifier is connected between resistors R25 and R26 in the voltage-divider chain connected between B and ground. The amplifier grid is connected to a more negative potential through resistors R19 and R18, which provide the necessary operating bias. The plate of the audio-amplifier tube is connected to the B supply through the primary of output transformer T1. Thus the amplified audio signal in the plate circuit of the amplifier will be coupled through the secondary of T1 to the output jack. Transformer T1 provides the proper impedance match between the high output impedance of the amplifier triode and the comparatively low impedance of the headphones.

b. The other triode section of V5 is connected as a noise suppressor circuit and functions to apply a negative bias to the audio-amplifier grid when no input signal is present. In this way the audio output is suppressed when no signal is present. The plate of the noise suppressor triode is connected to the amplifier grid through resistor R19. The noise suppressor cathode is connected directly to ground and the grid is connected to ground through resistor R15. With no signal present the plate current flow through the a-v-c amplifier tube and through resistors R14 and R15 will be small, causing the noise suppressor grid to be at approximately ground potential. Thus the noise suppressor triode will conduct, which effectively connects the audio amplifier to ground through resistor R19 and the noise suppressor tube. Since the audio-amplifier cathode is positive with respect to ground, the audio amplifier will be cut off. When a signal is received the a-v-c amplifier tube will conduct causing a neg-



TL 13083S

Figure 29. Radio receiver type F3, functional diagram of detector a-v-c amplifier stage.

ative potential to appear across resistor R15. This negative potential will cut off the noise suppressor triode thereby restoring the normal bias to the audio amplifier and allowing it to pass the audio signal. Resistor R24, the NOISE CONTROL, adjusts the bias on the audio amplifier and determines the strength of the carrier required to operate the noise suppressor circuit.

74. POWER SUPPLY (fig. 31).

The 110-volt, 60-cycle, single-phase a-c power input connects to pins 7 and 8 of connector P1, and from there goes to the primary of power transformer T1. A 2-ampere fuse F1 is inserted in one side of this circuit, as well as an on-off switch S1 which is part of the sensitivity control R20 (par. 16a). The secondary of T1 has three windings; one for rectifier Tube JAN-80 (V6) filament, one for all other filaments, and a third for the rectifier plate supply. This third winding is center-tapped and furnishes a return circuit for the a-v-c bias supply. Resistors R21 through R27 inclusive form the power supply bleeder resistor system. R21, R22, and R23 operate at a negative potential to furnish voltages for the a-v-c system. Choke L7 and capacitors C28, C29, and C30 are the filter system for the power supply.

SECTION XII. TROUBLE SHOOTING

75. GENERAL TROUBLE-SHOOTING INFORMATION.

No matter how well equipment is designed and manufactured, faults occur in service. When such faults 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.

a. Trouble-shooting Data. Take advantage of the material supplied in this manual to help in the rapid location of faults. Consult the following trouble-shooting data when necessary:

(*1*) Block diagrams of radio receivers types CW3 and F3 (figs. 15 and 24).

(*2*) Complete schematic diagrams (figs. 16 and 25).

(*3*) Partial schematic diagrams. These diagrams are particularly useful in trouble shooting, because the repairman can follow the electrical functioning of the circuits more easily than on the regular schematics, thus speeding trouble location.

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

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

(*6*) 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 key is the No. 1 pin.

(*b*) Plugs and receptables are numbered on the side to which the associated connector is attached.

b. Trouble-shooting Steps. The first step in servicing a defective receiver is to sectionalize the fault. Sectionalization means tracing the fault to the stage or circuit 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. Some faults such as burned-out resistors and shorted transformers can be located by sight, smell, and hearing. The majority of faults, however, must be located by checking voltage and resistance.

c. Sectionalization. Careful observation of the performance of the receiver while turning the front panel controls often sectionalizes the fault to a receiver stage or circuit at fault. Additional sectionalizing of the fault will be discussed in paragraphs 78 and 80.

d. Localization. Paragraphs 79 and 81 describe the methods of localizing faults within the individual stages. These paragraphs contain trouble-shooting charts which list abnormal symptoms and their probable causes. The

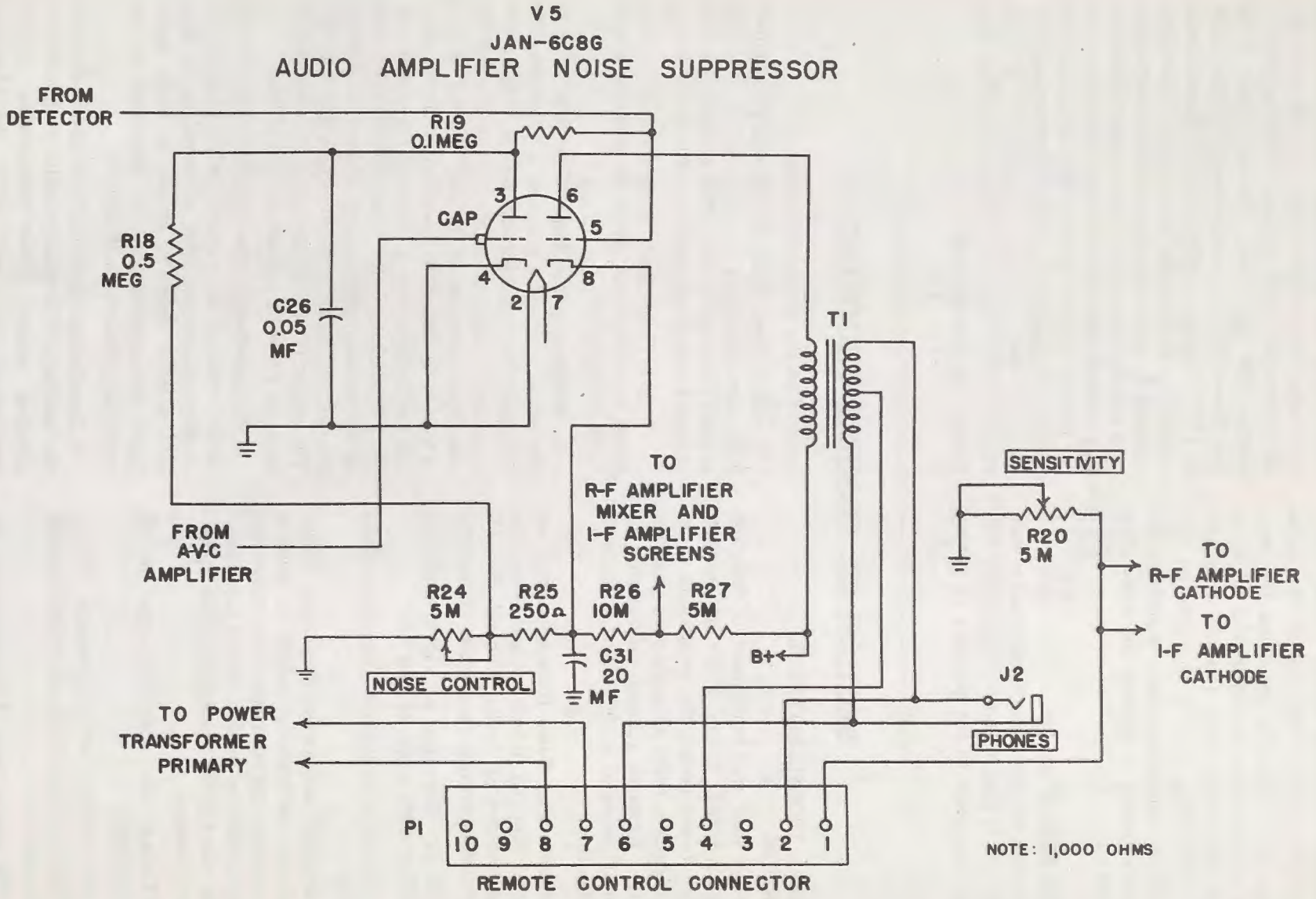


Figure 30 . Radio receiver type F3, functional diagram of audio-amplifier noise suppressor stage.

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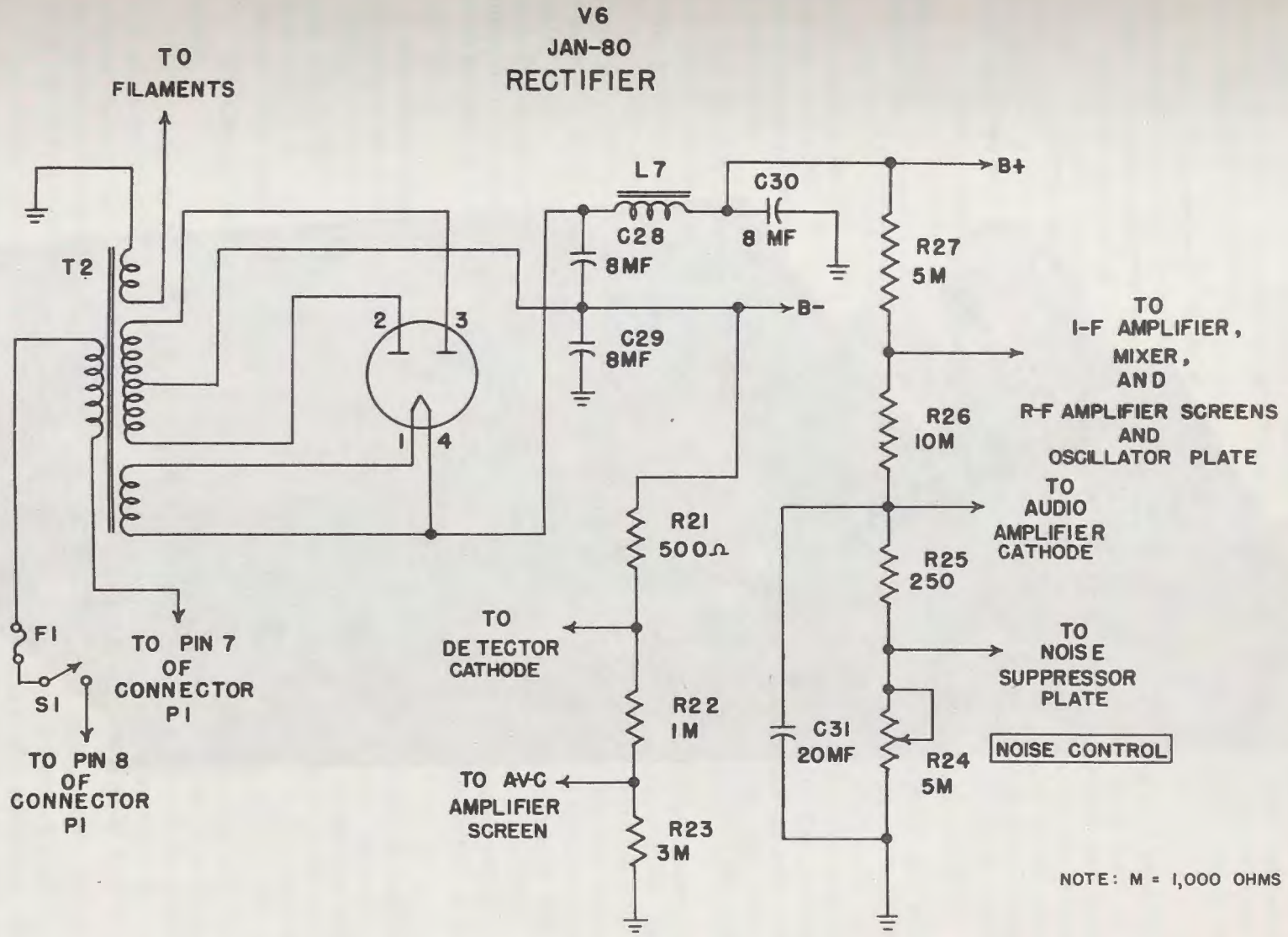

Figure 31. Radio receiver type F3, functional diagram of rectifier stage.

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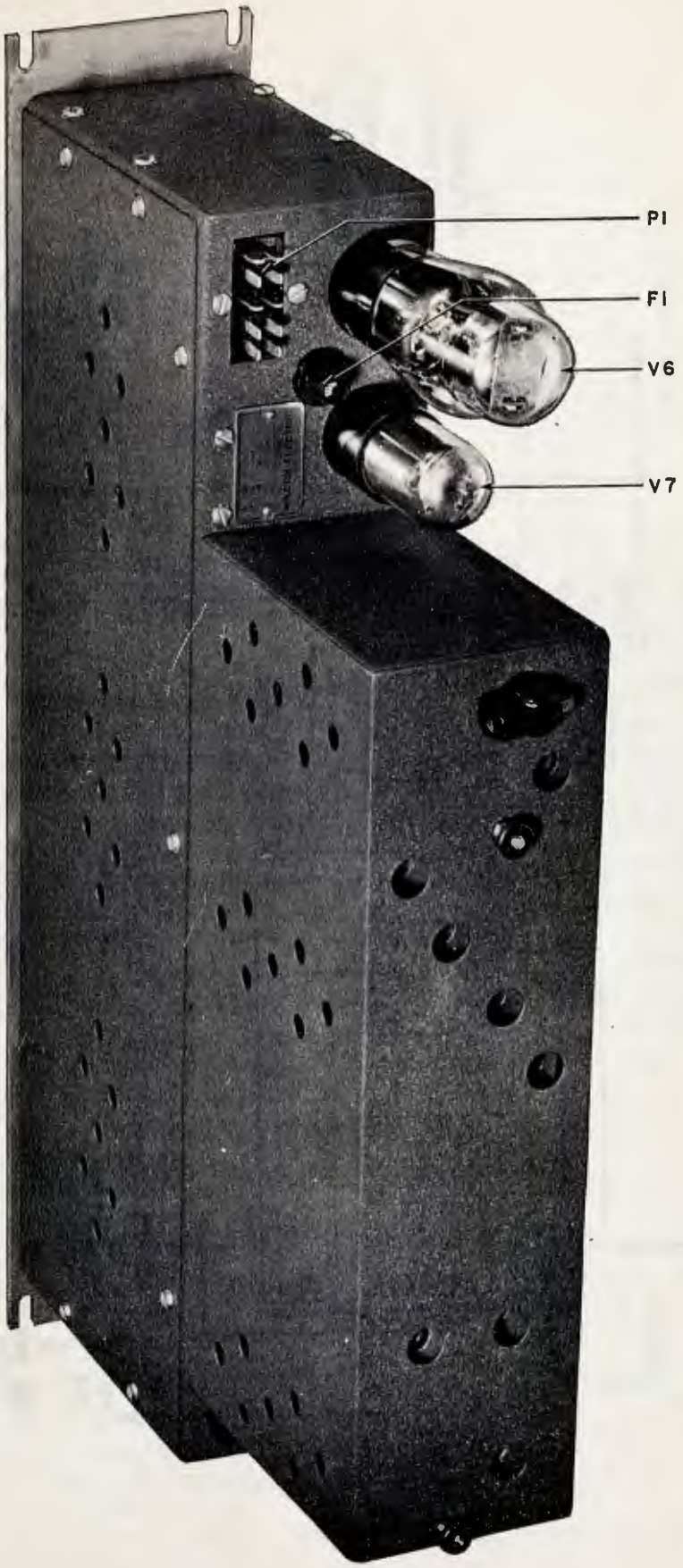

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Figure 32. Radio receiver type CW3, rear view with parts referenced.

charts also give the procedure for determining which of the probable locations of the fault is the exact one. In addition, there are a number of charts which show the resistance and voltage at every socket pin connection.

e. Voltage Measurements. 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 taken easily, because they are always made between two points in a circuit and the circuit need not be interrupted.

(*1*) Unless otherwise specified, the voltages listed on the voltage charts are measured between the indicated points and ground.

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

(*3*) In checking cathode voltage, remember that a reading can be obtained when the cathode resistor is actually open. The resistance of the meter may act as a cathode resistor. Thus, the cathode voltage may be approximately normal only as long as the voltmeter is connected between cathode and ground. Before the cathode voltage is measured, make a resistance check with the power to the component turned off to determine whether the cathode resistor is normal.

f. 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. This will eliminate possibility of making accidental contact with either ground or another part of the circuit and causing the electricity to travel from one hand to the other.

(*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 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 which are above ground.

g. 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 voltage lower 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 the voltmeter equals its ohms-per-volt value multiplied by the full-scale range in volts. For example: The resistance of a 1,000-ohm-per-volt meter on the 300-volt range is 300,000 ohms (R=1,000 ohms per volt times 300 volts=300,000 ohms).

(*2*) To minimize the 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 readings on two successive ranges. If the voltage readings on the two ranges do not agree, voltmeter loading is excessive. The readings (not the deflection) on the highest range will be greater than that 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 ohm-per-volt sensitivity of the voltmeter used to obtain the readings recorded on the voltage and resistance charts in the manual is printed on each chart. Use a meter having the same ohm-per-volt sensitivity; otherwise it will be necessary to consider the effect of loading.

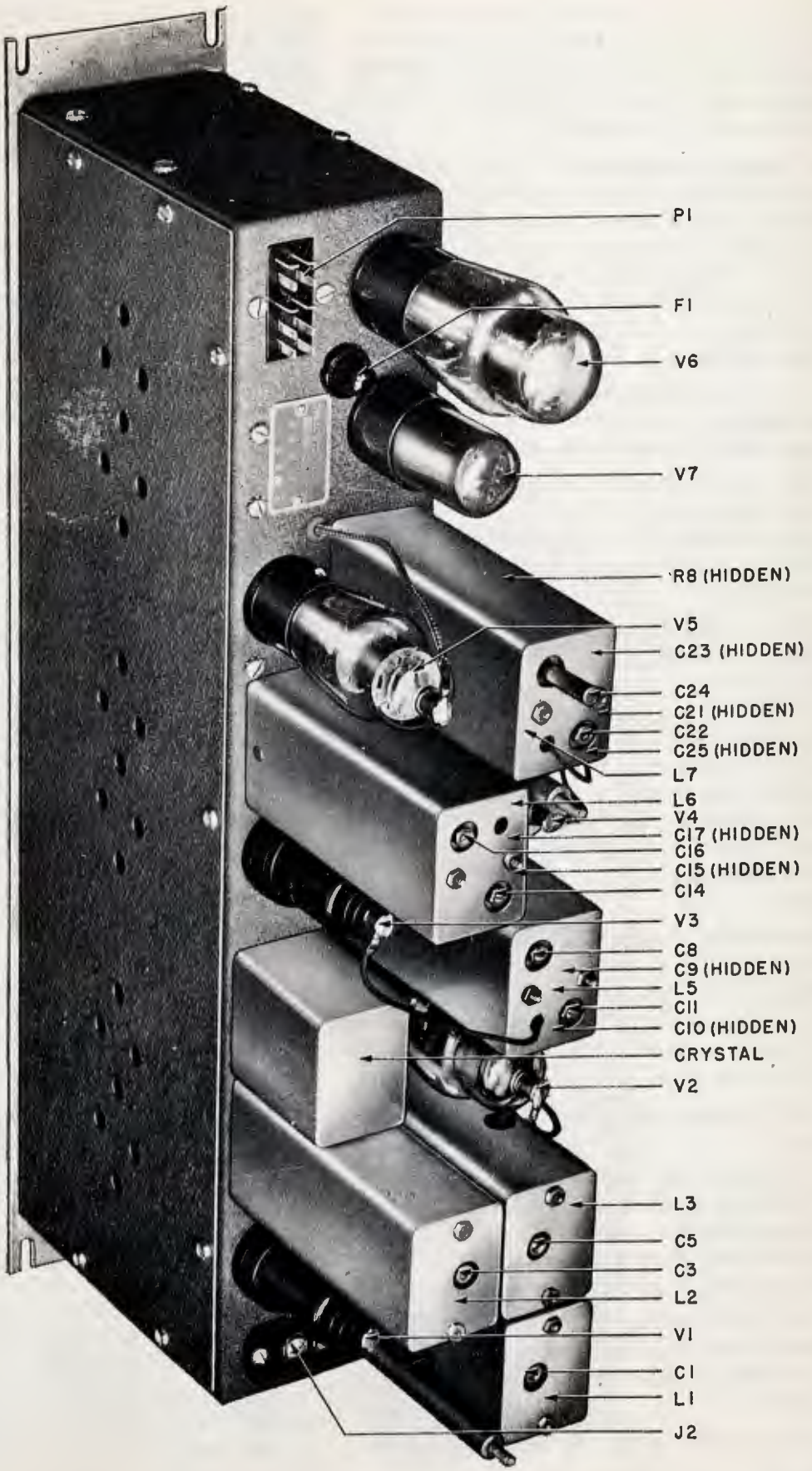

Figure 33. Radio receiver type CW3, rear view, less cover, with parts referenced.

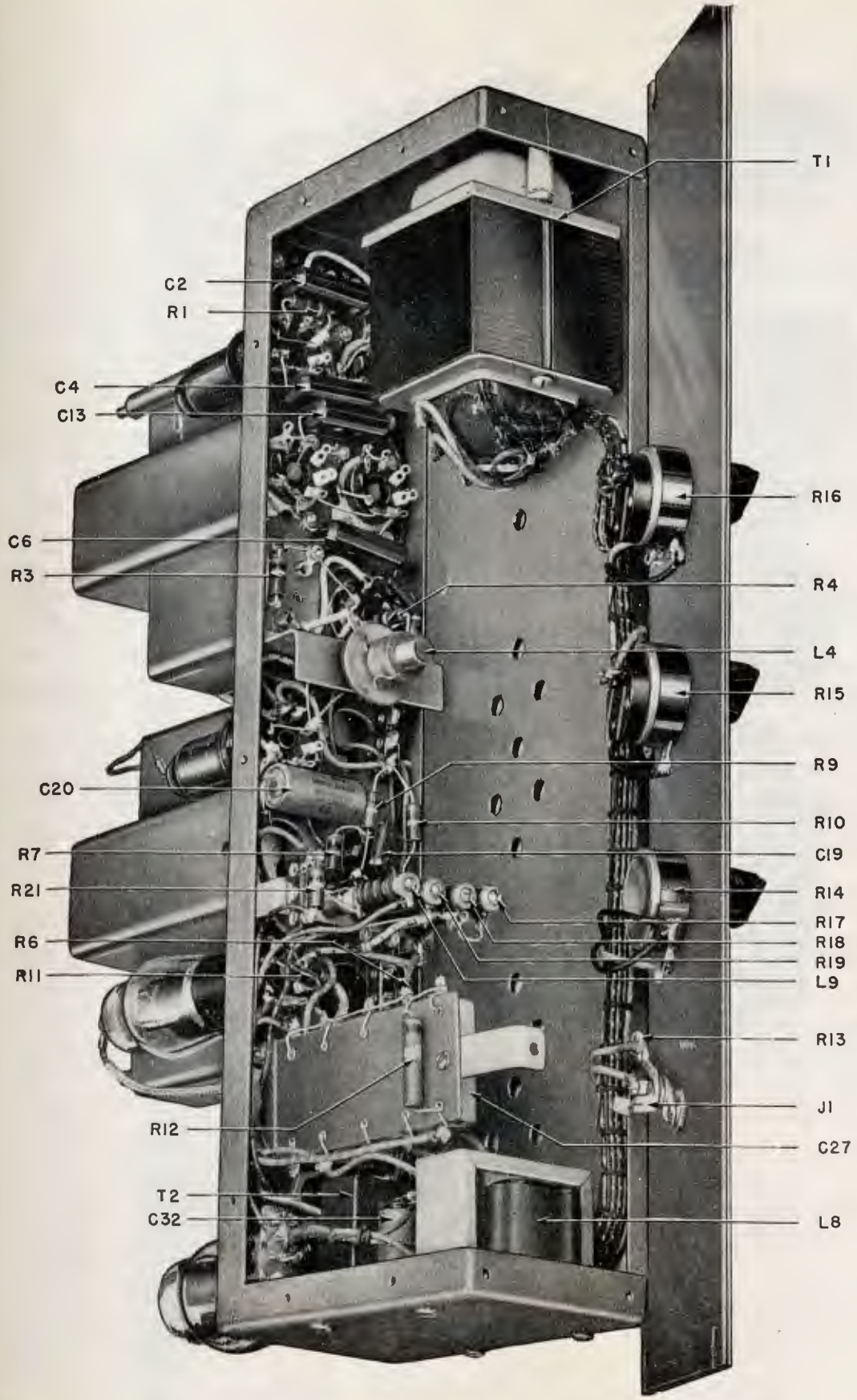

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Figure 34. Radio receiver type CW3, top interior view with parts referenced.

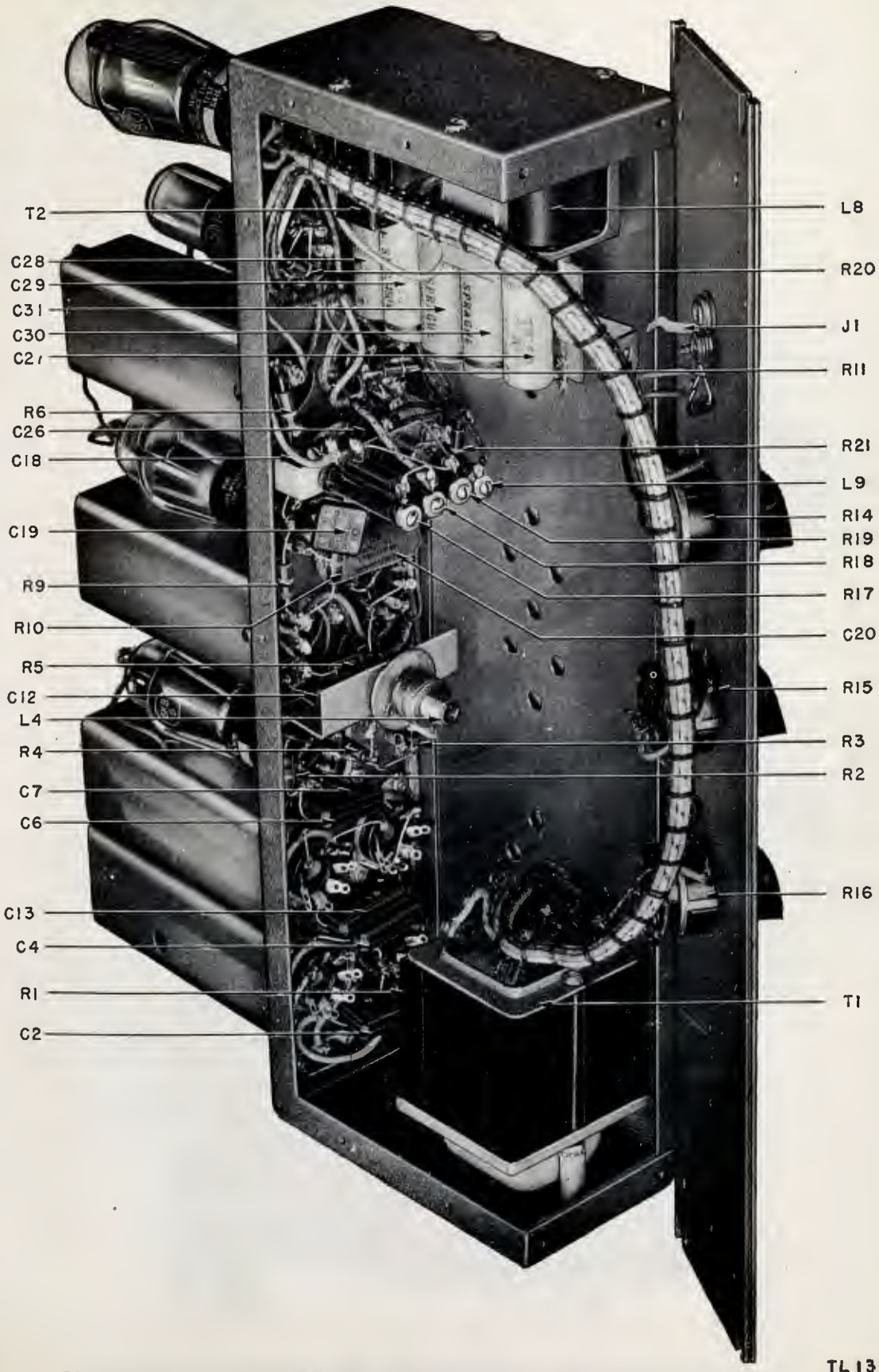

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Figure 35. Radio receiver type CWS, bottom interior view with parts referenced.

76. TROUBLE-SHOOTING PROCEDURES.

The accompanying trouble-shooting charts, if properly used, simplify trouble shooting. The charts are arranged in five groups. The first chart covers the sectionalization of trouble in receiver bay type 113A. This chart lists the various symptoms which may be recognized easily by the operator, and gives the probable location of the existing trouble as well as the recommended correction. They tell the operator whether the trouble is in the receivers, the antenna, or the relay rack. By the proper use of this chart, the operator can isolate the trouble to one particular component of the equipment, thus saving time that might otherwise be lost in checking components that are free of trouble. The second chart shows the sectionalization of the trouble in radio receiver type CW3. This chart will aid in determining which stage in the receiver is at fault. The third chart is to be used to localize the trouble in the receiver to the individual part in the circuit which is causing the abnormal condition. The fourth chart is similar to the second, except that it deals with sectionalizing the trouble in radio receiver type F3. The fifth chart localizes the trouble in this receiver to the individual part within the circuit. Therefore, the first chart will be used mainly by the operator, whereas the last four, covering trouble shooting within the various components, will be used by repairmen.

77. SECTIONALIZING TROUBLE IN RECEIVER BAY TYPE 113A (figs. 32 and 33).

SYMPTOMS	PROBABLE TROUBLE	CORRECTIONS
1. Blower does not run; receivers will not operate.	1. A-c switch not turned on in cabinet. Line fuse blown.	1. Turn on. Replace fuse.
2. Receiver will not operate; blower runs.	2. Remote control connectors not plugged into receptacles. Antennas not connected. Switch on SENSITIVITY control not turned on.	2. Plug in; see paragraph 13b (3). Connect; see paragraph 13b (3). Turn on.
3. Blower will not run; receivers operate.	3. Blower not connected. Blower motor dry.	3. Connect plug to receptable. Oil motor.

78. SECTIONALIZING TROUBLE IN RADIO RECEIVER TYPE CW3.

SYMPTOMS	PROBABLE TROUBLE	CORRECTIONS
1. Weak reception with antenna connected; strong signal with signal generator connected to antenna post.	1. Faulty antenna lead.	1. Repair or replace.
2. Weak signal heard with signal generator connected to antenna post; strong signal with signal generator connected to grid cap of VI.	2. R-f amplifier misaligned. R-f amplifier defective.	2. Realign; see paragraph 85. See paragraph 79.
3. Weak signal heard with signal generator connected to grid cap of V1; strong signal when connected to grid cap of V2.	3. Misaligned mixer stage. Defective mixer stage. Defective tube V2.	3. Realign; see paragraph 85. See paragraph 79. Replace V2.
4. Noise heard in output, no signal heard.	4. Crystal not plugged in. Oscillator tube V2 defective. Oscillator circuit defective.	4. Plug in. Replace V2. See paragraph 79.
5. Weak signal heard with signal generator connected to mixer plate (pin 3) of V2; strong signal generator connected to grid of V4.	5. I-f amplifier stage misaligned. I-f amplifier stage defective. I-f amplifier tube V3 defective.	5. Realign; see paragraph 86. See paragraph 79. Replace V3.
6. Hissing sound heard with signal generator connected to grid cap of V4; no c-w tone heard.	6. Bfo misaligned. Bfo coil defective. Bfo tube V4 defective.	6. Realign; see paragraph 87. See paragraph 79. Replace V4.

78. SECTIONALIZING TROUBLE IN RADIO RECEIVER TYPE CW3 (contd).

SYMPTOMS	PROBABLE TROUBLE	CORRECTIONS
7. No buzzing sound heard when touching grid cap of V5 with finger.	7. Defective tube V5.	7. Replace V5.
8. No change in amount of background noise heard when NOISE CONTROL is rotated.	9. B.F.O. control R15 defective. fective. Peak output limiter tube V5 defective.	8. Replace R14. Replace V5.
9. No change in pitch of tone heard when B.F.O. control on receiver is rotated.	9. B.F.O. control R15 defective.	9. Replace R15.
10. No change in pitch of tone heard when B.F.O. control at remote control point rotated.	10. B.F.O. control tube V7 defective. B.F.O. control at remote control point defective.	10. Replace V7. See TM on remote control equipment.
11. Filaments of tubes not lit.	11. Filament winding on T1 defective. Remote control connector not plugged in.	11. See paragraph 79. Plug in.

79. LOCALIZING TROUBLE IN RADIO RECEIVER TYPE CW3 (figs. 34 and 35).

a. Localizing Chart.

SYMPTOMS	PROBABLE TROUBLE	CORRECTIONS
1. Voltages at all pins of tube V1 normal except:		
a. No voltage at pin 3.	a. Shorted resistor R17. Shorted resistor R18.	a. Replace R17. Replace R18.
b. No voltage at pin 4.	b. Shorted capacitor C4. Shorted resistor R18.	b. Replace C4. Replace R18.
c. No voltage at pin 5 or pin 8.	c. Shorted capacitor C5. Shorted resistor R1.	c. Replace C5. Replace R1.
2. Voltages at all pins of tube V2 normal except:		
a. No voltage at pin 3.	a. Same as 1a above. Same as 1b above.	
b. No voltage at pin 4.	b. Open resistor R18. Shorted capacitor C7.	b. Replace R18. Replace C7.
c. No voltage at pin 6.	c. Open choke L4 or resistor R4.	c. Replace L4 or R4.
d. No voltage at pin 8.	d. Shorted capacitor C6. Open resistor R2.	d. Replace C6. Replace R2.
3. Voltages at all pins of tube V3 normal except:		
a. No voltage at pin 3.	a. Open primary of coil L6.	a. Replace L6.
b. No voltage at pin 4.	b. Open resistors R17 and R18.	b. Replace R17 & R18.
c. No voltage at pin 5 or pin 8.	c. Shorted capacitor C12. Open resistor R5. Shorted resistor R16. Poor connection to pin 1 of P1.	c. Replace C12. Replace R5. Replace R16. Clean or repair connection.
4. Voltages at all pins of tube V4 normal except:		
a. No voltage at pin 3.	a. Open resistor R10.	a. Replace R10.
b. No voltage at pin 6.	b. Open resistor R9.	b. Replace R9.
c. No voltage at pin 8.	c. Shorted resistor R15. Remote B.F.O. control defective.	c. Replace R15. See TM on remote control equipment.
5. Voltages at all pins of tube V5 normal except:		
a. No voltage at pin 3, 5, or grid cap.	a. Open resistor R11.	a. Replace R11.
b. No voltage at pin 4.	b. Open resistor R14.	b. Replace R14.
c. No voltage at pin 6.	c. Open primary of transformer T2.	c. Replace T2.
d. No voltage at pin 8.	d. Shorted capacitor C27. Open resistor R12.	d. Replace C27. Replace R12.
6. Voltages at all pins of tube V6 normal except for no voltage at pin 1 or 4.	a. Blown fuse F1. Open rectifier filament winding of T1.	a. Replace F1. Replace T1.

79. LOCALIZING TROUBLE IN RADIO RECEIVER TYPE CW3. (contd).

b. Resistances at Tube Sockets.

PIN	V1	V2	V3	V4	V5	V6	V7
1	0	0	0	0	0	30,000	0
2	0	0	0	0	0	1,500	0
3	30,000	25,000	30,000	50,000	375,000	1,500	38,000
4	22,000	18,000	22,000	2	160	30,000	0
5	900	46,000	800	80,000	375,000		0
6	0.5	30,000	30,000	75,000	25,000		0
7	0	0	0	0	0		0
8	900	100	800	17,000	4,000		38,000
Cap	0	0	6.5	50,000	38,000		0

(1) All controls turned fully clockwise.

(2) All tubes in sockets.

(3) Set III coils in place.

(4) No crystal.

(5) Receiver disconnected at P1.

(6) All d-c resistances to chassis ground, using 1,000-ohm-per-volt meter.

c. Voltages at Tube Sockets.

PIN	V1	V2	V3	V4	V5	V6	V7
1	0	0	0	0	0	280	0
2	a-c	a-c	a-c	a-c	a-c	a-c	0
3	260	260	250	140	0.5	a-c	0
4	115	115	115	0	0	280	0
5	5	0	5	0	0.5		0
6	0	85	250	185	260		0
7	a-c	a-c	a-c	a-c	a-c		a-c
8	5	2	5	15	4.5		a-c
Cap	0	0	0	0	0.5		

(1) All controls turned full clockwise.

(2) All tubes in sockets.

(3) Set III coils in place.

(4) No crystal.

(5) Receiver full on, no signal.

(6) All d-c voltages, using 1,000-ohm-per-volt meter.

80. SECTIONALIZING TROUBLE IN RADIO RECEIVER TYPE F3 (figs. 36 and 37).

SYMPTOMS	PROBABLE TROUBLE	CORRECTIONS
1. Weak reception with antenna connected; strong reception with signal generator connected to antenna post.	1. Faulty antenna lead.	1. Repair or replace.
2. Weak signal heard with signal generator connected to antenna post, strong signal with signal generator connected to grid cap of V1.	2. R-f amplifier misaligned. R-f amplifier defective.	2. Realign; see paragraph 89. See paragraph 81.

80. SECTIONALIZING TROUBLE IN RADIO RECEIVER TYPE F3 (figs. 36 and 37) (contd).

SYMPTOMS	PROBABLE TROUBLE	CORRECTIONS
3. Weak signal heard with signal generator connected to grid cap of V1, strong signal when connected to grid cap of V2.	3. Misaligned mixer stage. Defective mixer stage. Defective tube V2.	3. Realign; see paragraph 89. See paragraph 81. Replace V2.
4. Noise heard in output; no signal heard.	4. Crystal not plugged in. Oscillator tube V2 defective. Oscillator circuit misaligned.	4. Plug in. Replace V2. See paragraph 83.
5. Weak signal heard with signal generator connected to mixer plate (pin 3) of V2; strong signal with signal generator connected to pin 4 and V4.	5. I-f amplifier stage misaligned. I-f amplifier stage defective. I-f amplifier tube V3 defective.	5. Realign; see paragraph 89. See paragraph 81. Replace V3.
6. Connect jumper wire to V4 filament (pin 7) and touch other end to signal grid of V4, then to grid cap of V5. Same hum heard both times.	6. Defective stage. Defective tube V4.	6. See paragraph 81. Replace V4.
7. Touch one finger to grid cap of V5; no hum heard.	7. Audio-amplifier stage defective. Defective tube V5.	7. See paragraph 81. Replace V5.

81. LOCALIZING TROUBLE IN RADIO RECEIVER TYPE F3 (figs. 38 and 39).

a. Localizing Chart.

SYMPTOMS	PROBABLE TROUBLE	CORRECTIONS
1. Voltages at all pins of tube V1 normal except:		
a. No voltage at pin 3.	a. Shorted capacitor C30. Open primary in coil L2.	a. Replace C30. Replace L2.
b. No voltage on pin 4.	b. Shorted capacitor C4. Open resistor R27.	b. Replace C4. Replace R27.
c. No voltage on pin 5 or 8.	c. Shorted capacitor C3. Shorted or open resistor R2.	c. Replace C3. Replace R2.
2. Voltages at all pins of tube V2 normal except:		
a. No voltage at pin 3.	a. Same as 1a above.	
b. No voltage at pin 4.	b. Same as 1b above.	
c. No voltage at pin 6.	c. Open resistor R27. Shorted capacitor C9. Open choke L4 or resistor R6.	c. Replace R27. Replace C9. Replace L4 or R6.
d. No voltage at pin 8.	d. Shorted capacitor C8. Open resistor R4.	d. Replace C8. Replace R4.
3. Voltages at all pins of tube V3 normal except:		
a. No voltage at pin 3.	a. Same as 1a above.	
b. No voltage at pin 4.	b. Same as 1b above.	
c. No voltage at pin 5 or 8.	c. Shorted capacitor C16. Open resistor R9.	c. Replace C16. Replace R9.
4. Voltages at all pins of tube V4 normal except:		
a. No voltage at pin 3.	a. Shorted resistor R23.	a. Replace R23.
b. No voltage at pin 4.	b. Shorted capacitor C22. Open resistor R11.	b. Replace C22. Replace R11.
c. No voltage at pin 5.	c. Open secondary winding in coil L6. Open resistor R10.	c. Replace L6. Replace R10.
d. No voltage at pin 6.	d. Open resistor R22.	d. Replace R22.
e. No voltage at grid cap.	e. Shorted capacitor C29. Open resistor R12.	e. Replace C29. Replace R12.
5. Voltages at all pins of tube V5 normal except:		
a. No voltage at pin 3.	a. Open primary of transformer T1.	a. Replace T1.
b. No voltage at pin 4.	b. Shorted capacitor C30. Open resistor R26.	b. Replace C30. Replace R26.
c. No voltage at pin 5.	c. Open resistor R14.	c. Replace R14.

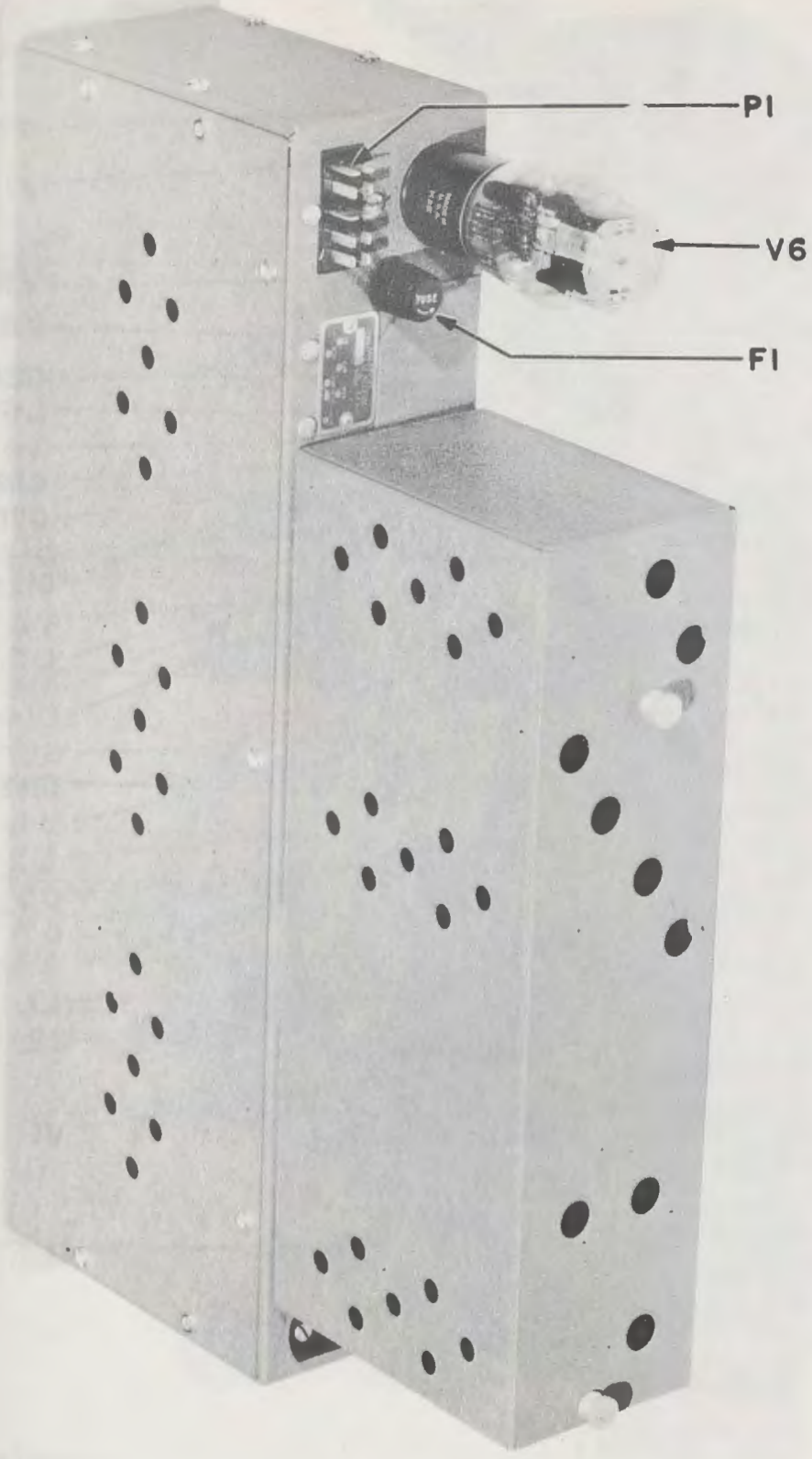

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Figure 36. Radio receiver type F3, rear view with parts referenced.

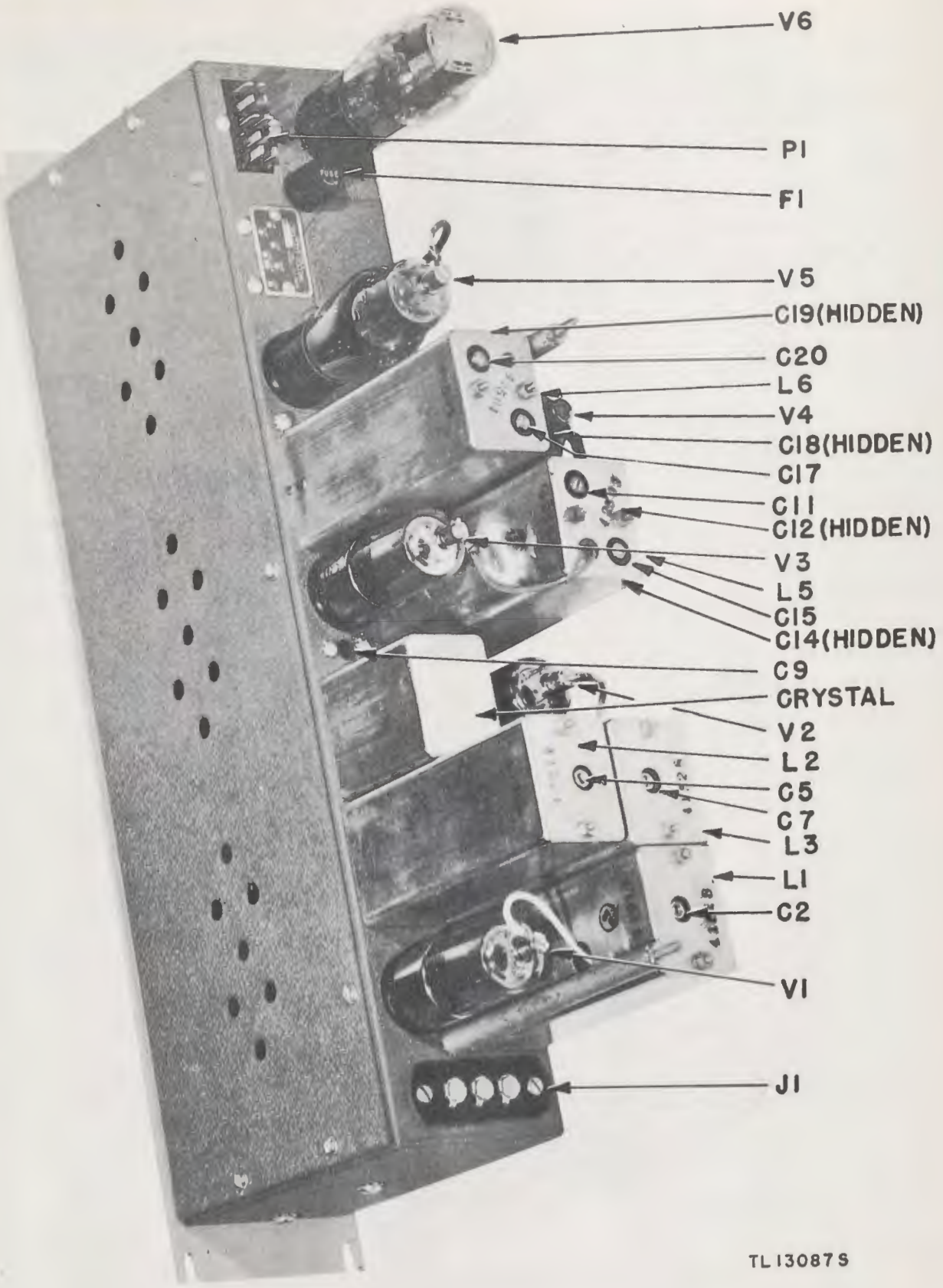

Figure 37. Radio receiver type F3, rear view, less cover, with parts referenced.

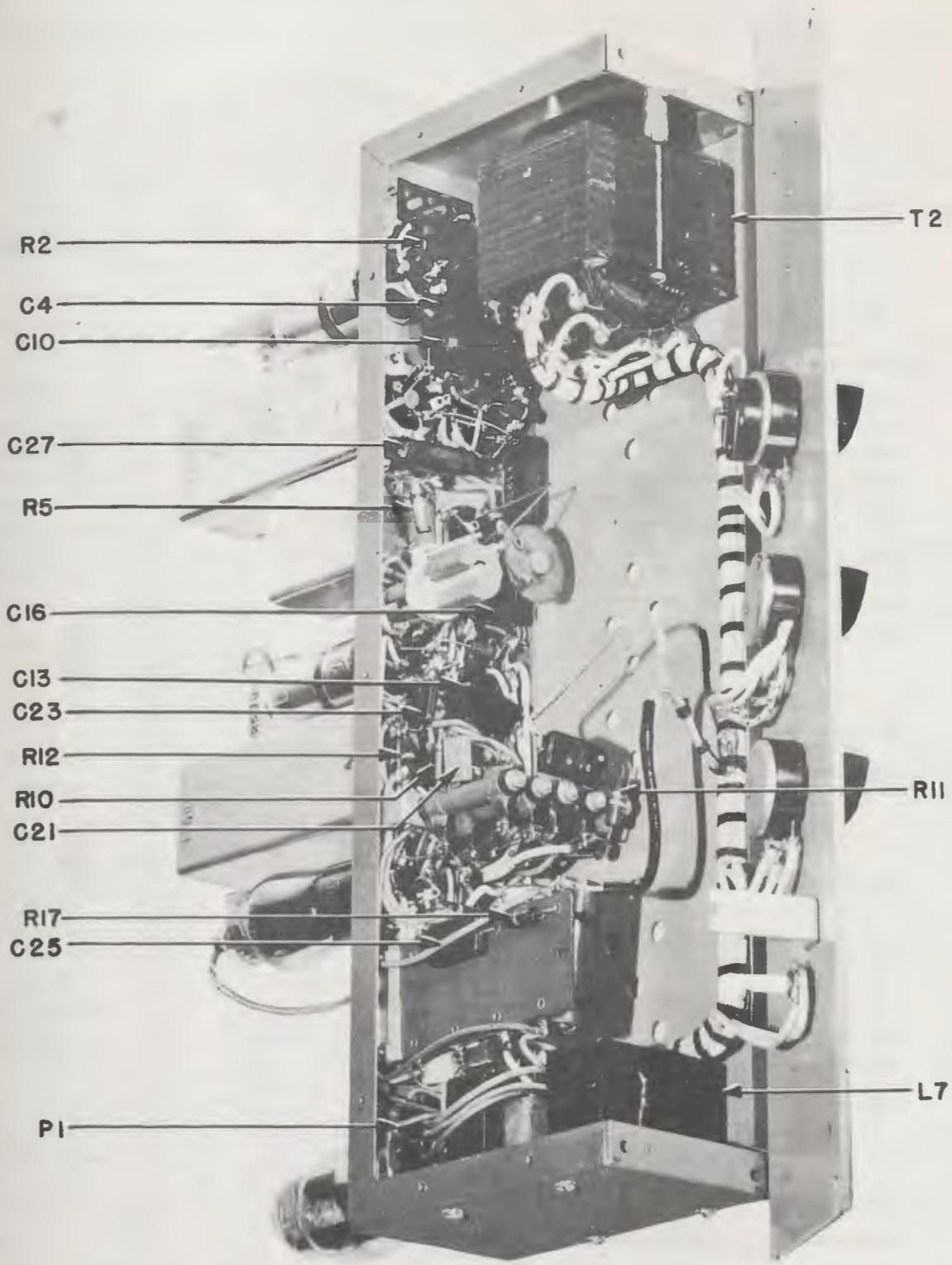

Figure 38. Radio receiver type F3, top interior view with parts referenced.

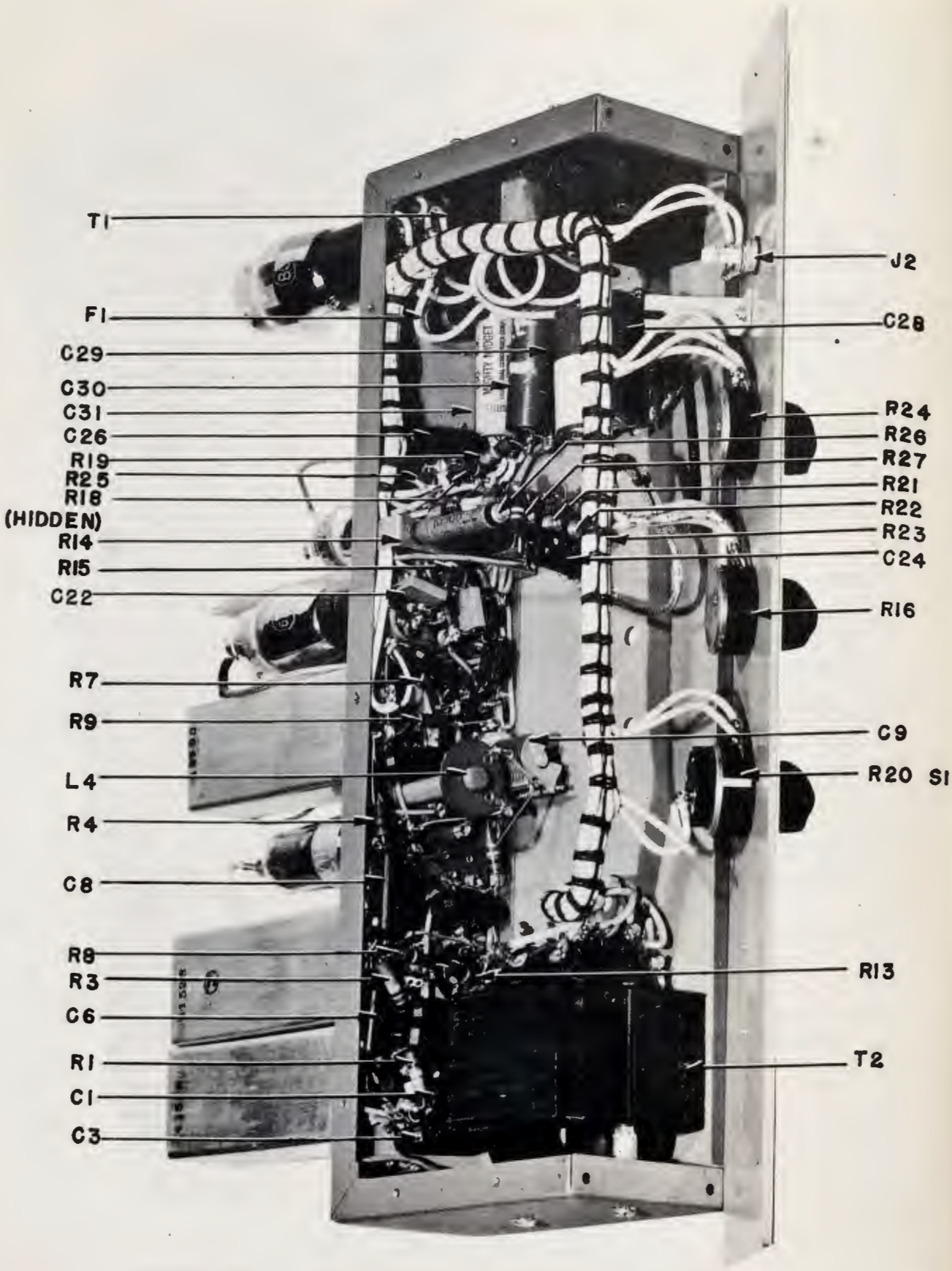

Figure 39. Radio receiver type F3, bottom interior view with parts referenced.

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81. LOCALIZING TROUBLE IN RADIO RECEIVERTYPE F3 (contd).

b. Voltages at Tube Sockets.

Pin	V1	V2	V3	V4	V5	V6
1	0	0	0	a-c	0	225
2	a-c	a-c	a-c	0	a-c	a-c
3	210	210	210	100	210	a-c
4	95	95	95	85	3	225
5	2.7	0	2.8	125	0.2	
6	0	95	210	130	0	
7	a-c	a-c	a-c	a-c	a-c	
8	2.7	0.9	2.8		0	
Cap	0	0	0	115	0	

(1) SENSITIVITY and AUDIO GAIN control turned full clockwise.
(2) NOISE CONTROL turned full counterclockwise.
(3) All tubes in sockets.
(4) Set III coils in place.
(5) No crystal.
(6) Receiver full on, no signal.
(7) All d-c voltages to chassis ground, using 1,000 ohm-per-volt meter.

c. Resistance at Tube Sockets.

Pin	V1	V2	V3	V4	V5	V6
1	0	0	0	0	0	15,000
2	0	0	0	250,000	0	4,500
3	15,000	15,000	15,000	3,000	16,000	4,500
4	10,000	10,000	10,000	240,000	270	15,000
5	400	90,000	400	1,000,000	65,000	
6	0	10,000	15,000	4,000	400,000	
7	0	0	0	0	0	
8	400	100	400		0	
Cap	500,000	400,000	300,000		500,000	

(1) SENSITIVITY and AUDIO GAIN controls turned full clockwise.
(2) NOISE CONTROL counterclockwise.
(3) All tubes in sockets.
(4) Set III coils in place.
(5) No crystal.
(6) Receiver disconnected at P1.
(7) All d-c resistances to chassis ground, using 1,000-ohm-per-volt meter.

SECTION XIII. REPAIRS

82. REPLACEMENT OF PARTS.

a. Most of the parts in radio receivers types CW3 and F3 are readily accessible and easily replaced if they are found to be faulty. Access to the tubes, crystal, and plug-in coils can be obtained by removing the two thumbnuts on the rear of the receiver dust cover and pulling the cover straight back. When removing the dust cover from radio receiver type CW3 the bfo adjustment control knob on the back of the dust cover must first be removed.

b. To obtain access to the majority of component parts of the receiver and to check the tube socket voltage readings it is necessary to remove either the top or bottom receiver panels, or both. These panels are held to the chassis by means of seven screws which must be removed to take off a panel. It may also be desirable to remove the front rack panel when replacing certain of the receiver parts. This panel is held to the receiver chassis by four mounting screws through the front panel and by a capacitor mounting board within the chassis. Remove the receiver top panel and the screw holding the front panel mounting bracket to the fiber capacitor board. Remove the four panel screws and swing the front panel down so that access to the receiver can be obtained.

83. RUSTPROOFING AND REPAINTING.

When the finish on the receiver panels or on the receiver bay has been badly scarred or damaged, rust and corrosion can be prevented by touching up bared surfaces as follows:

a. Use #00 or #000 sandpaper to clean the surface down to the bare metal. Obtain a bright smooth surface.

CAUTION: The use of steel wool, although permitting rapid removal of rust, is not recommended. Minute particles of steel wool frequently enter the case and cause harmful internal shorting or grounding of circuits.

b. When a touch-up job is necessary, apply paint with a small brush. When numerous scars and scratches warrant complete repainting, remove and spray paint over all panels and the dust cover. Remove rust from the panels by

cleaning corroded metal with dry-cleaning solvent (SD). In severe cases it may be necessary to use dry-cleaning solvent (SD) to soften the rust and sandpaper to complete the preparation for painting. Paint used will be authorized and consistent with existing regulations.

84. UNSATISFACTORY EQUIPMENT REPORT.

a. When trouble in equipment used by Army Ground Forces or Army Service Forces occurs more often than repair personnel feel is normal, War Department Unsatisfactory Equipment Report, W.D., A.G.O. Form No. 468, should be filled out and forwarded through channels to the Office of the Chief Signal Officer, Washington 25, D. C.

b. When trouble in equipment used by Army Air Forces occurs more often than repair personnel feel is normal, Army Air Forces Form No. 54 should be filled out and forwarded through channels.

c. If either form is not available, prepare the data according to the sample form reproduced in figure 40.

SECTION XIV. ALIGNMENT AND ADJUSTMENT

85. TEST INSTRUMENTS USED FOR ALIGNMENT AND ADJUSTMENT.

The following test equipment should be used for alignment and adjustment of radio receivers (Wilcox Electric types CW3 and F3) and receiver bay (Wilcox Electric type 113A).

a. Signal generator, Hickok No. 188X or Hickok No. 18X, or equivalent.

b. Test lead set, ICA No. 1005.

c. Vacuum tube voltmeter, Precision Apparatus No. EV-10-MCP, or equivalent.

d. Oscilloscope, Dumont No. 164E, or equivalent.

86. RADIO RECEIVER TYPE CW3, R-F ALIGNMENT.

Radio receiver type CW3 has been completely tested and tuned to the frequency indicated on the front panel by the manufacturer. Under ordinary conditions the only adjustments required are a check on the r-f amplifier and mixer tuning capacitors. These screwdriver adjustments, along with the i-f amplifier adjustment controls, are accessible through holes provided in the back of the receiver dust cover (fig. 41). The adjustment of the receiver r-f circuits is as follows:

a. Remove the dust cover from the receiver and make certain that the proper coils and crystal are inserted in the receiver. Connect a signal generator capable of producing the desired frequency to the grid cap of tube V1, after first removing the grid lead. The signal generator should contain internal modulation adjusted to 30 percent at 400 cycles. With a signal generator of this type the B.F.O. control is turned off (fully counterclockwise).

b. Set the signal generator to the desired frequency and adjust the output to a maximum. Plug a headset into the PHONES jack on the receiver front panel. Turn the SENSITIVITY control and the NOISE CONTROL fully clockwise.

c. Adjust the mixer grid stage by means of capacitor C5 (fig. 41) until the modulated tone is heard in the headset. Continue adjustment of this control until maximum signal is heard, reducing the signal generator output as necessary to keep from overloading the receiver circuits.

> **NOTE:** To prevent overloading, connect an output meter or a-c voltmeter across the receiver output circuit. Readjust the signal generator output during alignment to keep the receiver output below 1.73 volts or zero level output.

d. After peaking the mixer input stage the r-f amplifier plate circuit is adjusted by means of capacitor C3 whose slotted shaft is accessible through the L2 coil shield (fig. 41). Rotate the capacitor shaft until a maximum signal is heard in the headset. Take care to reduce the signal generator output below zero level to prevent overloading of the receiver.

e. Remove the signal generator output from the grid of V1 and connect it to the antenna input connection after removing the antenna transmission line. Replace the receiver dust

WAR DEPARTMENT
UNSATISFACTORY EQUIPMENT REPORT

FOR	TECHNICAL SERVICE: Signal Corps — MATERIEL		DATE: 1 Feb 45
FROM	ORGANIZATION: 175 Signal Repair Co		STATION: APO 102
TO	NEXT SUPERIOR HEADQUARTERS: Supply Sec, Hq Fourth Army Sig Sv	STATION: APO 110	TECHNICAL SERVICE: Signal Corps

COMPLETE MAJOR ITEM

NOMENCLATURE	TYPE	MODEL	
Radio Transmitter BC-123-A	Ground, vehicular	A	
MANUFACTURER	**U. S. A. REG. No.**	**SERIAL No.**	**DATE RECEIVED**
American Radio Corp	Order No 1234-Phila-45	12345	5 Jan 45

EQUIPMENT WITH WHICH USED (*If applicable*): Radio Set SCR-456-A in Tank, Medium, M4

DEFECTIVE COMPONENT—DESCRIPTION AND CAUSE OF TROUBLE

PART No.	TYPE	MANUFACTURER	DATE INSTALLED
Sig C Stk No. 3E47-2	Capacitor C20; fixed; 1-mf; 500 vdcw	American Radio Corp	When manufactured

DESCRIPTION OF FAILURE AND PROBABLE CAUSE (*If additional space is required, use back of form*)

Capacitor C20 shorts out due to humid operating conditions

DATE OF INITIAL TROUBLE	TOTAL TIME INSTALLED			TOTAL PERIOD OF OPERATION BEFORE FAILURE					
	YEARS	MONTHS	DAYS	YEARS	MONTHS	DAYS	HOURS	MILES	ROUNDS
15 Jan 45	-	-	-	0	0	5		-	-

BRIEF DESCRIPTION OF UNUSUAL SERVICE CONDITIONS AND ANY REMEDIAL ACTION TAKEN

Operation in tropics; heavy rainfall. Was replaced and set given moistureproofing and fungiproofing treatment, 20 Jan 45.

TRAINING OR SKILL OF USING PERSONNEL			RECOMMENDATIONS (*If additional space is required, use back of form*)
POOR	FAIR	GOOD	
		X	Substitute capacitor designed for tropical operation

ORIGINATING OFFICER

TYPED NAME, GRADE, AND ORGANIZATION	SIGNATURE
E.A.Wilson, 1st Lt, Sig C 175 Signal Repair Co	E. A. Wilson

FIRST ENDORSEMENT

TO CHIEF	TECHNICAL SERVICE	OFFICE	
NAME, GRADE, AND STATION		STATION	DATE

Instructions

1. It is imperative that the chief of technical service concerned be advised at the earliest practical moment of any constructional, design, or operational defect in matériel. This form is designed to facilitate such reports and to provide a uniform method of submitting the required data.
2. This form will be used for reporting manufacturing, design, or operational defects in matériel, petroleum fuels, lubricants, and preserving materials with a view to improving and correcting such defects, and for use in recommending modifications of matériel.
3. This form will not be used for reporting failures, isolated material defects or malfunctions of matériel resulting from fair-wear-and-tear or accidental damage nor for the replacement, repair or the issue of parts and equipment. It does not replace currently authorized operational or performance records.
4. Reports of malfunctions and accidents involving ammunition will continue to be submitted as directed in the manner described in AR 750-10 (change No. 2).
5. It will not be practicable or desirable in all cases to fill all blank spaces of the report. However, the report should be as complete as possible in order to expedite necessary corrective action. Additional pertinent information not provided for in the blank spaces should be submitted as inclosures to the form. Photographs, sketches, or other illustrative material are highly desirable.
6. When cases arise where it is necessary to communicate with a chief of service in order to assure safety to personnel, more expeditious means of communication are authorized. This form should be used to confirm reports made by more expeditious means.
7. This form will be made out in triplicate by using or service organization. Two copies will be forwarded direct to the technical service; one copy will be forwarded through command channels.
8. Necessity for using this form will be determined by the using or service troops.

W. D., A. G. O. Form No. 468
20 August 1944

This form supersedes W. D., A. G. O. Form No. 468, 1 December 1943, which may be used until existing stocks are exhausted.

U. S. GOVERNMENT PRINTING OFFICE 16—41840-1

TL19589C

cover and adjust the r-f amplifier input stage by means of capacitor C1 accessible through the opening in the back of the dust cover. Adjust C1 for maximum signal, again being careful to limit the receiver output by reducing the signal generator output.

f. After these adjustments have been completed, recheck the settings of C5, C3, and C1 with the signal generator connected as in subparagraph e above. Repeat this final adjustment several times to insure that the r-f circuits are properly aligned.

g. Remove the signal generator from the receiver and reconnect the antenna transmission line. Capacitor C1 may require a slight readjustment because of the difference of impedance between the signal generator and the transmission line. This adjustment may be made when monitoring a remote station or by using the signal generator in the field with an antenna to radiate the signal.

87. RADIO RECEIVER TYPE CW3, I-F ALIGNMENT.

With normal usage it should not be necessary to adjust the i-f amplifier stage. However, should it be necessary to completely retune the receiver, the i-f alignment is made as follows:

a. Remove the dust cover from the receiver and the grid lead from tube V3. Connect a signal generator capable of producing a modulated signal at 455 kc to the grid of tube V3. Connect a headset to the PHONES jack and an output meter or a-c voltmeter across the receiver output (par. 86c).

b. With the B.F.O. control turned fully counterclockwise and the NOISE CONTROL turned fully clockwise, adjust the signal generator to give maximum output without overloading the receiver circuits (par. 86c).

c. Adjust capacitor C16 in the detector grid circuit for maximum receiver output. Then adjust capacitor C14 in the i-f amplifier plate circuit for maximum output. After adjusting C14, recheck the adjustment of capacitor C16.

d. Remove the grid lead from tube V2 and connect the signal generator to the grid of this tube. Replace the grid lead from L5 to the grid of tube V3. Reduce the signal generator output for maximum signal without overloading the receiver.

e. Adjust capacitor C8 in the mixer plate circuit and capacitor C11 in the i-f amplifier grid circuit for maximum output as was done in subparagraph c above for capacitor C14 and C16.

f. Check the tuning of the r-f amplifier stages as outlined in paragraph 86 above. Replace the receiver dust cover.

88. RADIO RECEIVER TYPE CW3, B.F.O. ADJUSTMENT.

a. Connect the signal generator to the antenna connector and set it to the receiver frequency. Turn off the interval modulation and rotate the B.F.O. control on the receiver front panel to its approximate midposition.

b. Remove the remote connections from pins 2, 4, and 6 of connector P1. Adjust the knob on the back of the receiver dust cover (capacitor C23) to produce zero beat in the receiver output. If zero beat cannot be obtained by means of this control, adjust the screwdriver control, C22 (fig. 42) to obtain zero beat with capacitor C23 at midposition.

c. Adjust the front panel B.F.O. control to obtain an output signal of from 800 to 1,000 cycles and readjust capacitor C16 to produce maximum receiver output.

d. If remote control operation is desired, reconnect the remote leads and turn the B.F.O. control fully counterclockwise.

89. RADIO RECEIVER TYPE F3, R-F ALIGNMENT.

The r-f alignment of radio receiver type F3 is the same as the alignment procedure given in paragraph 86 for radio receiver type CW3 with the following exceptions:

a. The AUDIO GAIN control is turned fully clockwise.

b. The mixer grid input stage is tuned by capacitor C7 in place of C3 (fig. 42).

c. The r-f amplifier plate circuit is tuned by capacitor C5 in place of C3 (fig. 42).

d. The r-f amplifier grid circuit is tuned by capacitor C2 in place of capacitor C1 (fig. 42).

90. RADIO RECEIVER TYPE F3, I-F ALIGNMENT.

The i-f alignment of radio receiver type F3

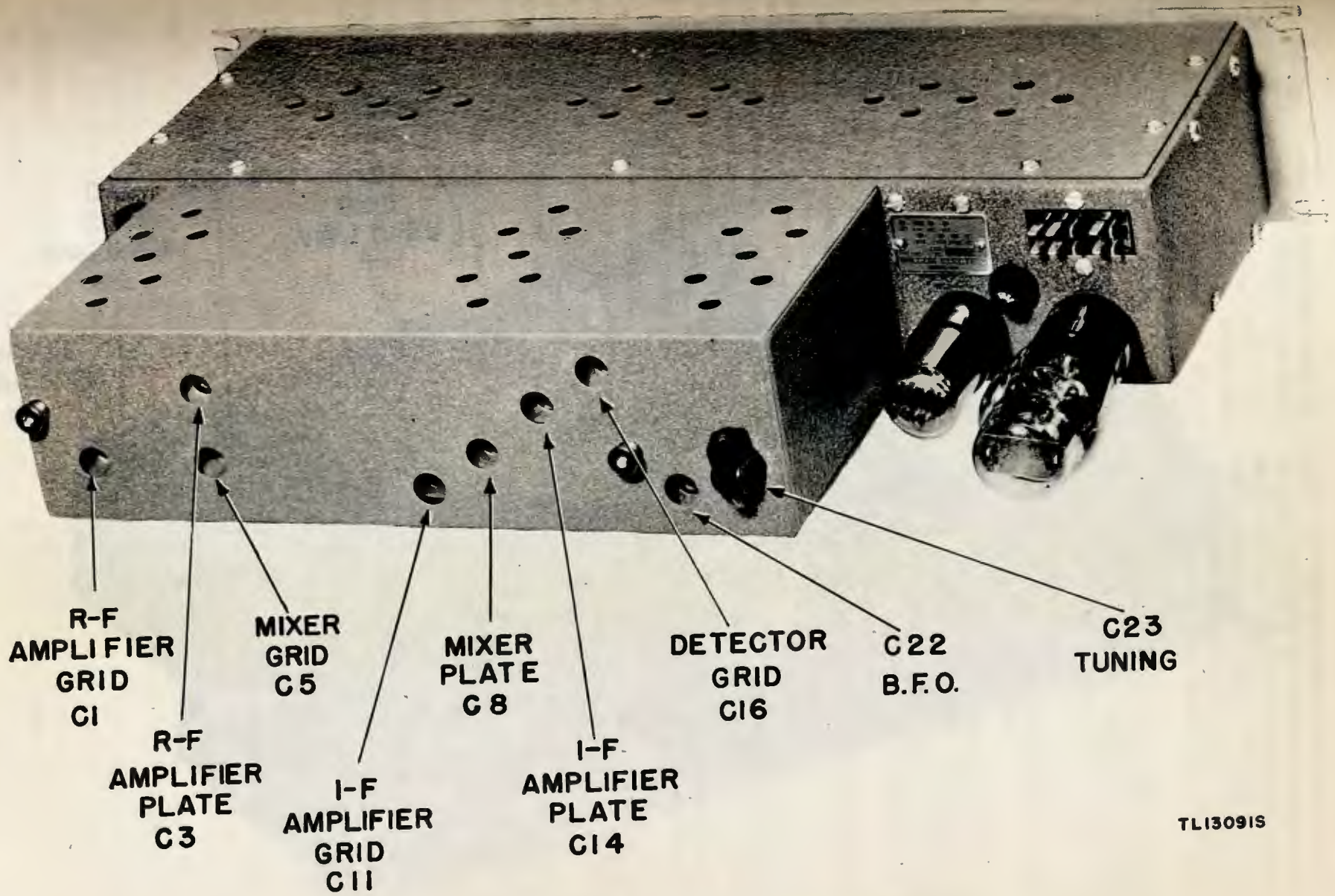


Figure 41. Radio receiver type CW3, alignment controls.

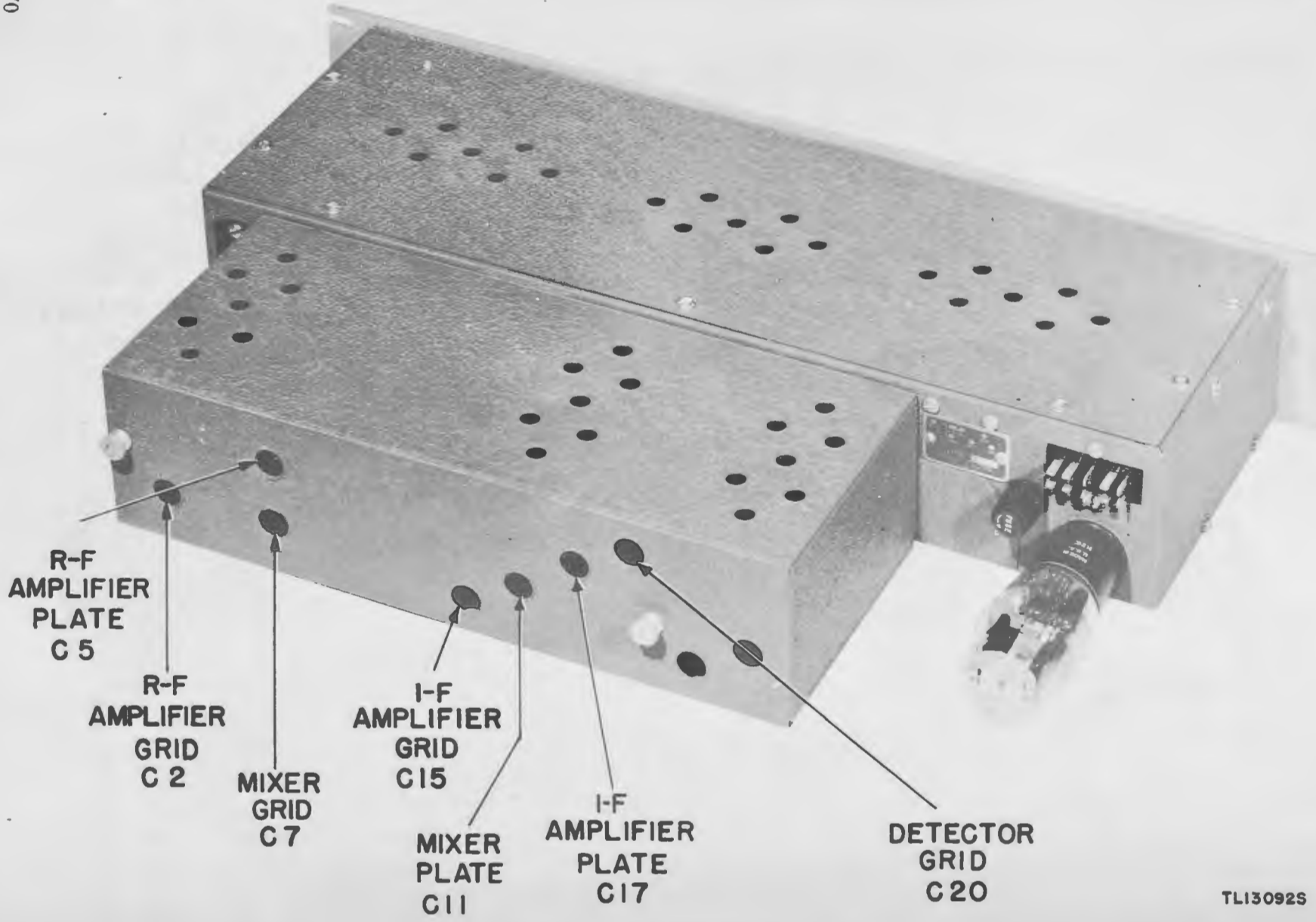


Figure 42. Radio receiver type F3. alignment controls.

is the same as the alignment procedure given in paragraph 87 for radio receiver type CW3 with the following exceptions:

a. The AUDIO GAIN control is turned fully clockwise.

b. The detector grid circuit is tuned by capacitor C20 in place of C16 (fig. 42).

c. The i-f amplifier plate circuit is tuned by capacitor C17 in place of C14 (fig. 42).

d. The mixer plate circuit is tuned by capacitor C11 in place of C8 (fig. 42).

e. The i-f amplifier grid circuit is tuned by capacitor C15 in place of C11 (fig. 42).

f. If it is necessary to change the receiver frequency the crystal oscillator circuit may require adjustment. This is accomplished by adjusting capacitor C9 in the crystal-oscillator plate circuit for maximum crystal output. Access to capacitor C9 is obtained by removing the receiver dust cover. The screw driver adjustment is located next to the crystal shield. Turn the adjustment screw until maximum signal is heard in the headset.

91. MINIMUM TEST REQUIREMENTS.

a. General. This paragraph is intended for use by Signal Corps radio repair organizations in determining the quality of a repaired radio receiver type CW3 or F3. Radio equipment which passes the tests outlined below is suitable for field operation.

b. Test Equipment Required. The following test equipment is required to make the tests outlined in Table I.

(*1*) *R-f Signal Generator with Metered Output.* The signal generator must cover the frequency range of 1,950 to 16,500 kc. It should have provisions for modulating the output signal at audio frequencies ranging from 200 to 3,000 cycles. If the r-f generator does not have internal modulation capabilities, a separate a-f generator may be used to modulate the r-f signal externally.

(*2*) *Output Meter or A-c Voltmeter.* The meter must have an a-c sensitivity of 20,000 ohms-per-volt and ranges of 0-1 volt and 0-10 volts.

(*3*) *Output Load Resistor.* 500-ohm, 1-watt, noninductive resistor.

c. Moving Parts and Finish. In addition to making the electrical tests described in the chart (table I), check the receiver for smoothness of operation in moving or rotating parts and for condition of finish.

(*1*) Check the receiver for cleanliness, inside and outside.

(*2*) Rotate all controls; operation across the arc of rotation should be smooth. There should be no backlash or slipping of controls.

(*3*) Insert the appropriate plugs into the proper jacks. The plugs should seat firmly and make good contact.

(*4*) Check fuse holders to see that fuses may be removed easily but will lock tightly when inserted.

(*5*) Observe the condition of the finish and painting. Both paint and plating should be free from corrosion, blisters, flaking, bare and worn spots, or deep scratches.

d. Electrical Check. Check radio receiver types CW3 and F3 electrically, using the chart shown in table I as a guide.

TABLE I—SIGNAL GENERATOR CONTROL SETTINGS

Test	Attenuator Setting (microvolts)	Frequency (kc)	Modulation Frequency (cycles per sec)	Modulation Percentage	Output meter reading
1. SENSITIVITY.					
a. Radio receiver type F3.	0.1	3,105	400	30	1.73 v (maximum gain).
	0.55	4,495	400	30	
	1.0	8,535	400	30	
	4.0	12,575	400	30	
b. Radio receiver type CW3.	0.2	3,417.5	None		1.73 v (maximum gain).
	0.3	5,292.5	None		
	0.55	8,535	None		
	4.0	12,575	None		
	7.0	16,700	None		
2. NOISE RATIO.					
a. Signal modulated.	2.0*	1,950 to 16,500	400	30	1.73 v (adjust gain to this value).
b. Signal unmodulated.	2.0*		None		0.57 v (noise ratio 3:1 or higher).
3. SELECTIVITY.					
a. Radio receiver type F3.	4.0	fr**	400	30	1.73 v.
	40.0	fr+8.5kc	400	30	1.73 v or less.
	40.0	fr−8.5kc	400	30	1.73 v or less.
b. Radio receiver type CW3.	4.0	fr**	None		1.73 v.
	40.0	fr+3kc	None		1.73 v or less.
	40.0	fr−3kc	None		1.73 v or less.
4. OUTPUT.					
a. Radio receiver type F3.	Sufficient to give output.	1,950 to 16,500	400	30	7.5 v.
b. Radio receiver type CW3.	Sufficient to give output.				4.6 v.
5. AUTOMATIC VOLUME CONTROL.	10	1,950 to 16,500	400	30	X volts.
	100,000		400	30	Y volts. (Y volts to be 1.78 times X or less).

LEGEND

1 SENSITIVITY.

a. Radio Receiver Type F3.

(*1*) Connect signal generator to antenna connector on receiver.

(*2*) Set receiver SENSITIVITY, AUDIO GAIN, and NOISE CONTROL fully clockwise.

(*3*)) Connect in parallel 500-ohm output load resistor and 20,000-ohm-per-volt a-c voltmeter to output of receiver.

(*4*) Tune signal generator to receiver frequency.

(*5*) Sensitivity should compare favorably with nearest corresponding value given in chart.

b. Radio Receiver Type CW3.

(*1*) Use same conditions as in subparagraph a above.

(*2*) Adjust B.F.O. control for a 400-cycle tone, approximately.

(*3*) Sensitivity should compare favorably with nearest corresponding value given in chart.

2. NOISE RATIO.

Use same conditions as in paragraph 1 above. Proceed in accordance with noise ratio tests as shown on chart.

3. SELECTIVITY.

Use same conditions as in paragraph 1 above. Proceed in accordance with selectivity test on chart.

4. OUTPUT.

Use same conditions as in paragraph 1 above. Increase signal generator output until no further increase in receiver output is noted. Proceed in accordance with output test on chart.

5. AUTOMATIC VOLUME CONTROL.

Use same conditions as in paragraph 1 above. Proceed in accordance with a-v-c test on chart.

6. MECHANICAL NOISE.

a. Place the receiver on a soft rubber or felt pad or on a padded bench.

b. Use the same conditions as in paragraph 1 above but replace 500-ohm load resistor with a headset.

c. Tap receiver repeatedly in various places with a padded mallet, listening for extraneous noise indicative of loose contacts or faulty microphonic condition. (Tapping is to simulate a vibration. Do not strike receiver hard enough to damage it.)

*Increase signal generator output if 1.73-volt output or 2.0μv input cannot be obtained.
**Receiver frequency.

APPENDIX

SECTION XV. REFERENCES

92. SUPPLY PUBLICATIONS.

SIG 1	Introduction to ASF Signal Supply Catalog.
SIG 2	Complete Index to ASF Signal Supply Catalog.
SIG 4-1	Allowances of Expendable Supplies.
SIG 4-2	Allowances of Expendable Supplies for Schools, Training Centers, and Boards.
SIG 5	Stock List of All Items.
SB 11-17	Electron Tube Supply Data.

93. TECHNICAL MANUALS ON AUXILIARY EQUIPMENT AND TEST EQUIPMENT.

TM 11-300	Frequency Meter Sets SCR-211-( ).
TM 11-303	Test Sets I-56-C, I-56-D, I-56-H, and I-56-J.
TM 11-321	Test Set I-56-E.
TM 11-472	Repair and Calibration of Electrical Measuring Instruments.
TM 11-2613	Voltohmeter I-166.
TM 11-2626	Test Unit I-176.
TM 11-2627	Tube Tester I-177.

94. PAINTING, PRESERVING, AND LUBRICATION.

TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment.
TB SIG 69	Lubrication of Ground Signal Equipment.
SB 11-10	Signal Corps Kit and Materials for Moisture- and Fungi-resistant Treatment.

95. CAMOUFLAGE.

FM 5-20	Camouflage, Basic Principles.

96. SHIPPING INSTRUCTIONS.

U.S. Army Spec No. 100-14A.	Army-Navy General Specification for Packaging and Packing for Overseas Shipment.

97. DECONTAMINATION.

TM 3-220	Decontamination.

98. DEMOLITION.

FM 5-25	Explosives and Demolitions.

99. OTHER PUBLICATIONS.

FM 21-6*	List of Publications for Training.
FM 24-18	Radio Communication.
TB SIG 5	Defense Against Radio Jamming.
TB SIG 25	Preventive Maintenance of Power Cords.
TB SIG 66	Winter Maintenance of Ground Signal Equipment.
TB SIG 72	Tropical Maintenance of Ground Signal Equipment.

*Refer to for applicable technical bulletins, modification work orders, and latest changes to TM 11-853.

TB SIG 75	Desert Maintenance of Ground Signal Equipment.
TB SIG 123	Preventive Maintenance Practices for Ground Signal Equipment.
TM 1-455	Electrical Fundamentals.
TM 11-227	Signal Communication Equipment Directory, Radio Communication Equipment.
TM 11-310	Schematic Diagrams for Maintenance of Ground Radio Communication Sets.
TM 11-314	Antennas and Antenna Systems.
TM 11-453	Shop Work.
TM 11-455	Radio Fundamentals.
TM 11-462	Reference Data.
TM 11-483	Suppression of Radio Noises.
TM 11-499	Radio Propagation.
TM 37-250	Basic Maintenance Manual.

100. FORMS.

W.D., A.G.O. Form No. 468 (Unsatisfactory Equipment Report).

Army Air Forces Form No. 54 (Unsatisfactory Report).

101. ABBREVIATIONS.

a-c	alternating current
a-f	audio frequency
a-m	amplitude-modulated
a-v-c	automatic volume control
bfo	beat frequency oscillator
c-w	continuous wave
db	decibel
d-c	direct current
h-f	high frequency
i-f	intermediate frequency
kc	kilocycle
mc	megacycle
mf	microfarad
mmf	micromicrofarad
r-f	radio frequency
μv	microvolt

SECTION XVI. MAINTENANCE PARTS

102. MAINTENANCE PARTS FOR RADIO RECEIVER (WILCOX ELECTRIC TYPE CW3) AND RECEIVER BAY (WILCOX ELECTRIC TYPE 113A).

The following information was compiled on 8 May 1945. The appropriate pamphlets of the ASF Signal Supply Catalog for radio receiver (Wilcox Electric type CW3), radio receiver, (Wilcox Electric type F3), and receiver bay (Wilcox Electric type 113A) are:

Fixed plant maintenance list

SIG 10-302, Radio Receiver CW3.

SIG 10-309.1, Radio Receiver F3.

For an index of available catalog pamphlets, see the latest issue of ASF Signal Supply Catalog SIG 2.

102. MAINTENANCE PARTS FOR RADIO RECEIV ER (WILCOX ELECTRIC TYPE CW3) AND RECEIVER BAY (WILCOX ELECTRIC TYPE 113A) (contd).

Ref. symbol	Signal Corps stock No.	NAME OF PART AND DESCRIPTION	MFR'S PART AND CODE NO.
	2C5403	RADIO RECEIVING EQUIPMENT: consisting of:.....	113A (W9)
	2Z7370-2	RELAY RACK ASSEMBLY.....	115A (W9)
	2C4547-2	RECEIVER, RADIO, xtal controlled, 4 band, freq range 2-18 mc, input 115 v, 50/60 cps a-c power supply.	CW3 (W9)
	3G1250-13.3	BUSHING, insulating: porcelain, 13/16" lg, 1⅛" OD, ½" hole, ⅞" mtg hole.	148 (E5) 27764 (W9)
	6Z7783-1	CONNECTOR, male cont: 2 flat parallel blades.....	8341 (A17)
	3E7205	CORD: 33-cond, 12' lg, with plug & type term at ends.....	DWG. E144 (W9)
	6Z3856-10	FILTER, air: Dustop, 10" x 10" x 2".....	2 (F31)
	3Z2610.15	FUSE, plug: 10 amp, 125 v.....	810 (B9)
	3H3000-105	MOTOR, blower: a-c, induction, 1/500 hp, 120 v, 60 cps, single-phase.	JS3-73 (S4) DWG BA16 45502 (W9)
	3H370.2-1	BLADE ASSEMBLY: fan, 4-blade.....	256 (S4) 73002 (W9)
	2Z3045-21	PLUG, male: 33-prong.....	P-333-FHT (J5)
	6Z7783-3	RECEPTACLE: 2-cont, female, 10 amp, 125/250 v.....	8339 (A17)
	6Z7786-1	RECEPTACLE, duplex: 125/250 v, bakelite.....	1913 (A17)
	2Z8680-2	SOCKET, receptacle: 10-cont, female.....	S-310-FHT (J5)
	2Z8699-4	SOCKET, receptacle: female, 33-cont.....	S-333-AB (J5)
	3Z9503-20	SWITCH, safety: tumbler type, 2 pole, 30 amp, 125/230 v, with fuse block.	93211 (S9)
	2Z9404.200	TERMINAL STRIP, ant: 4-term.....	4-136A (J5)
	2C4547-2	RADIO RECEIVER	CW-3 (W9)
	2Z1609-2	CAP, grid: for tube.....	194 (Z1)
C1	NSNR	CAPACITOR: part of L1.....	
C2, 4, 6, 12, 13	3DA100-112.1	CAPACITOR, paper: 0.1 mf, 400 vdcw.....	345-21 (M2)
C3	NSNR	CAPACITOR: part of L2.....	
C5	NSNR	CAPACITOR: part of L3.....	
C7	3K2051012	CAPACITOR, mica: 0.00005 mf, 500 vdcw.....	CM20A510J
C8, 9, 10, 11	NSNR	CAPACITOR, dual: part of L5.....	
C14, 15, 16, 17	NSNR	CAPACITOR, dual: part of L6.....	
C18	3K2005014	CAPACITOR: mica: 0.000005 mf, 500 vdcw.....	CM20A050M
C19	3K3020212	CAPACITOR, mica: 0.000005 mf, 500 vdcw.....	CM30A202J
C20, 32	3DB8-59	CAPACITOR, electrolytic: 8 mf, 150 vdcw.....	MM (I8)
C21, 22, 23, 24, 25	NSNR	CAPACITOR, dual: part of L7.	
C26	3DA10-140.2	CAPACITOR, paper: 0.01 mf, 400 vdcw.....	340-21 (M2)
C27	3DB25-11	CAPACITOR, electrolytic: 25 mf, 25 vdcw.....	MM (I8)
C28	3DB20-22	CAPACITOR, electrolytic: 20 mf, 150 vdcw.....	MM (I8)
C29, 30, 31	3DB8-31	CAPACITOR, electrolytic: 8 mf, 450 vdcw.....	M408 (S5)
L1	3C4005	COIL ASSEMBLY: ant; plug-in, band #1, 2-3.5 mc, includes trimmer.	41518 (W9)
L2	2C4547-2/C10	COIL ASSEMBLY: plate, plug-in, band #1, 2-3.5 mc, includes trimmer.	41524 (W9)
L3	2C4547-2/C14	COIL ASSEMBLY: grid, plug-in, band #1, 2-3.5 mc, includes trimmer.	41528 (W9)
L1	2C4547-2/C22	COIL ASSEMBLY: ant, plug-in, band #2, 3.4-5.8 mc, includes trimmer.	41521 (W9)
L2	2C4547-2/C11	COIL ASSEMBLY: plate, plug-in, band #2, 3.4-5.8 mc, includes trimmer.	41525 (W9)

102. MAINTENANCE PARTS FOR RADIO RECEIVER (WILCOX ELECTRIC TYPE CW3) AND RECEIVER BAY (WILCOX ELECTRIC TYPE 113A) (contd).

Ref. symbol	Signal Corps stock No.	NAME OF PART AND DESCRIPTION	MFR'S PART AND CODE NO.
L3	2C4547-2/C15	COIL ASSEMBLY: grid, plug-in, band #2, 3.4-5.8 mc, includes trimmer.	41529 (W9)
L1	2C4547-2/C21	COIL ASSEMBLY: ant, plug-in, band #3, 5.7-9.8 mc, includes trimmer.	41522 (W9)
L2	2C4547-2/C12	COIL ASSEMBLY: plate, plug-in, band #3, 5.7-9.8 mc, includes trimmer.	41526 (W9)
L3	3C4005-1	COIL ASSEMBLY: grid, plug-in, band #3, 5.7-9.8 mc, includes trimmer.	41530 (W9)
L1	2C4547-2/C23	COIL ASSEMBLY: ant, plug-in, band #4, 9.7-18 mc, includes trimmer.	41523 (W9)
L2	2C4547-2/C13	COIL ASSEMBLY: plate, plug-in, band #4, 9.7-18 mc, includes trimmer.	41527 (W9)
L3	2C4547-2/C16	COIL ASSEMBLY: grid, plug-in, band #4, 9.7-18 mc, includes trimmer.	41531 (W9)
L1	2C4547-2/C27	COIL ASSEMBLY: ant, plug-in, band #5, 15.2-22.0 mc, includes trimmer.	41544 (W9)
L2	2C4547-2/C17	COIL ASSEMBLY: plate, plug-in, band #5, 15.2-22.0 mc, includes trimmer.	41545 (W9)
L3	2C4547-2/C18	COIL ASSEMBLY: grid, plug-in, band #5, 15.2-22.0 mc, includes trimmer.	41546 (W9)
L1	2C4547-2/C25	COIL ASSEMBLY: ant, plug-in, band #6, 19-25.5 mc, includes trimmer.	41547 (W9)
L2	2C4547-2/C19	COIL ASSEMBLY: plate, plug-in, band #6, 19-25.5 mc, includes trimmer.	41548 (W9)
L3	2C4547-2/C20	COIL ASSEMBLY: grid, plug-in, band #6, 19-25.5 mc, includes trimmer.	41549 (W9)
L4	3C323-10E	COIL, choke: rf, xtal osc plate	95069 (W9)
L8	3C316-28	COIL, choke: filter, 10 h @ 100 ma	T45692 (T4)
L9	3C341-3	COIL, choke: keyer grid, 2.5 mh	34102 (M4)
P1	2Z7120.12	CONNECTOR, male: 10-prong	P-310-AB (J5)
K	2Z3535-(Freq.)	CRYSTAL HOLDER W/CRYSTAL: (freq. as specified)	80A (W9)
F1	3Z1927	FUSE: 2 amp, 250 v, type 3AG	1042 (L3)
	3Z3275-1	FUSE POST: extractor	1075A (L3)
J1	2Z5581-3	JACK, phone: single ckt, open	A1 (M1)
L1, 2, 3	2Z5729	KIT, coil: consisting of coil forms, capacitors, wire, sockets, instructions, etc., to wind 12 coils in the field.	Dwgs. (W9) B251-1 thru B262-1
	2Z5821-7	KNOB: bakelite	2300 (D26)
R1, 5	3RC30BE821K	RESISTOR, carbon: 800 ohm, 1 w	RC30BE821K
R2	3RC30BE101M	RESISTOR, carbon: 100 ohm, 1 w	RC30BE101M
R3, 6, 20, 21	3RC31AE104M	RESISTOR, carbon: 100,000 ohm, 1 w	RC31AE104M
R4	3RC31AE103M	RESISTOR, carbon: 10,000 ohm, 1 w	RC31AE103M
R7	3Z6620-36	RESISTOR, carbon: 20,000 ohm, 1 w	MB-1 (S24)
R8	NSNR	RESISTOR: part of L7	
R9	3RC31BE243J	RESISTOR, carbon: 25,000 ohm, 1 w	RC31BE243J
R10	3RC30BE473M	RESISTOR, carbon: 50,000 ohm, 1 w	RC30BE473M
R11	3RC31BE514J	RESISTOR, carbon: 500,000 ohm, 1 w	RC31BE514J (S24)
R12	3RC31BF472K	RESISTOR, carbon: 5,000 ohm, 1 w	RC31BF472K
R13	3RC31BE471M	RESISTOR, carbon: 500 ohm, 1 w	MB-1 (S24)
R14	2Z7271-149	RESISTOR, pot: carbon, 100,000 ohm, 1 w	1-010-1626 (C4)
R15, 16	2Z7279-24	RESISTOR, pot: WW, 2,000 ohm, with SPST sw	22011006 (C4)
R17	3Z6580-11	RESISTOR, WW: 8,000 ohm, 10 w	BD (02)

102. MAINTENANCE PARTS FOR RADIO RECEIVER (WILCOX ELECTRIC TYPE CW3) AND RECEIVER BAY (WILCOX ELECTRIC TYPE 113A) (contd).

Ref. symbol	Signal Corps stock No.	NAME OF PART AND DESCRIPTION	MFR'S PART AND CODE NO.
R18	3Z6625-59	RESISTOR, WW: 25,000 ohm, 10 w.	A-10-F (C10)
R19	3ZK5415.4	RESISTOR, WW: 1,500 ohm, 10 w.	A-10-F (C10)
	2Z8799-137	SOCKET, tube: octal, bakelite	S8 (A13)
	2Z8674.8	SOCKET, tube: 4-cont, bakelite	S4 (A13)
	2Z8650.5	SOCKET, tube: octal, (for coils L1, L2, L3)	9950 (C66)
	2Z8673.24	SOCKET, xtal: holder, 3-cont.	29525 (W9)
J2	2Z9403.31	TERMINAL STRIP: ant, 3-term.	1506 (A14)
L5, 6	2Z9641.34	TRANSFORMER ASSEMBLY: if, 455 kc, (L5 includes C8, 9, 10, 11), (L6 includes C14, 15, 16, 17).	54659 (S3)
T1	2Z9632.58	TRANSFORMER, audio output: 6C8G plate to 500 ohm ct line	T-43970 (T4)
T2	2Z9613.60	TRANSFORMER, power: pri 115 v, 60 cps, sec #1, 6.3 v @ 2.5 amp, sec #2, 5 v @ 2 amp, sec #3, 720 v ct @ 50 ma.	T-45942 (T4)
L7	2Z9644.4	TRANSFORMER ASSEMBLY: B.F.O., 455 kc, (includes R8, C21, 22, 23, 24, 25).	55251 (S3)
V1, 3	2J6K7	TUBE: type JAN-6K7	JAN6K7
V2	2J6K8G	TUBE: type JAN-6K8G	JAN6K8G
V4, 5	2J6C8G	TUBE: type JAN-6C8G	JAN6C8G
V6	2J80	TUBE: type JAN-80	JAN80
V7	2J6SN7GT	TUBE: type JAN-6SN7GT	JAN6SN7GT
		MISCELLANEOUS HARDWARE.	
	6Z4914	GROMMET, rubber: 1 1/32" O D x 3/16" thk, for 1/4" hole	1114G (A14)
	6LK3106-32SC	NUT, hex: steel, 1/4" w across flats, 7/64" thk, 6-32" thd	100,005 (W9)
	6L3604-32	NUT, hex: steel, 1/4" w across flats, 3/32" thk, 4-32" thd	100,002 (W9)
	3Z12059-52	TERMINAL, lug: for #4 screw	2101-4 (S15)
	3Z12059	TERMINAL, lug: for #6 screw	2101-6 (S15)
	3Z12072-47	TERMINAL, lug: brass	173 (Z1)
	6L72104Z	WASHER, lock: steel, for #4 screw, 9/32" OD, 0.016" thk.	1104 (S15)
	6L72106N	WASHER, lock: steel, ext. teeth, for #6 screw, 5/16" OD x 0.018" thk.	1106 (S15)
	6L72108Z	WASHER, lock: steel, for #8 s screw, ext. teeth, 3/8" OD x 0.020 thk.	1108 (S15)
	6L72204	WASHER, lock: steel, int teeth, for #4 screw, 17/64" OD, 0.016" thk.	1204 (S15)
	6L70004-2	WASHER, lock: steel, (for #4 screw 9/64" x 1/32")	76012 (W9)
	6L58014	WASHER, flat: steel, for #4 screw	76017 (W9)

103. MAINTENANCE PARTS FOR RADIO RECEIVER (WILCOX ELECTRIC TYPE F3).

Ref. symbol	Signal Corps stock No.	NAME OF PART AND DESCRIPTION	MFR'S PART AND CODE NO.
Dwg. E-146	2C4547-1	RADIO RECEIVER, xtal controlled: 4-band, freq range, 2 to 18 meg, 110 v, 60 cps a-c power supply.	F3 (W9)
	2Z1609-2	CAP, grid: for tubes	194 (Z1)
C1, 6, 13, 24, 25	3DA10-140.2	CACAPITOR, paper: 0.01 mf, 400 vdcw	340-21 (M2)
C2	NSNR	CAPACITOR: (part of L1)	
C3, 4, 8, 10,16, 27	3DA100-112.1	CAPACITOR, paper: 0.1 mf, 400 vdcw	345-21 (M2)
C5	NSNR	CAPACITOR: (part of L2)	
C7	NSNR	CAPACITOR: (part of L3)	

103. MAINTENANCE PARTS FOR RADIO RECEIVER (WILCOX ELECTRIC TYPE F3) (contd).

Ref. symbol	Signal Corps stock No.	NAME OF PART AND DESCRIPTION	MFR'S PART AND CODE NO.
C9	3D9100V-33	CAPACITOR, variable: 100 mmf	ASP-100-G (A34)
C11,12, 14, 15	NSNR	CAPACITOR: (part of L5)	
C17, 18, 19, 20	NSNR	CAPACITOR: (part of L6)	
C21	3K2047121	CAPACITOR, mica: 0.0005 mf, 500 vdcw	0 (M2)
C22	3D9250-27	CAPACITOR, mica: 0.00025 mf, 500 vdcw	1468 (A1)
C23	3K2051012	CAPACITOR, mica: 0.00005 mf, 500 vdcw	CN20A510J(S5)
C26	3DA50-42.1	CAPACITOR, paper: 0.05 mf, 400 vdcw	342-33 (M2)
C28, 30	3DB8-66.1	CAPACITOR, electrolytic: 8 mf, 450 vdcw	UT8 (S8)
C29	3DB8-18	CAPACITOR, electrolytic: 8 mf, 250 vdcw	BR-825 (C15)
C31	3DB20-22	CAPACITOR, electrolytic: 20 mf, 150 vdcw	MM-362 (I8)
L1	3C4005	COIL ASSEMBLY: ant, band #1, 2-3.5 mc, plug-in, includes trimmer.	41518 (W9)
L2	2C4547-2/C10	COIL ASSEMBLY: plate, band #1, 2-3.5 mc, plug-in, includes trimmer.	41524 (W9)
L3	2C4547-2/C14	COIL ASSEMBLY: grid, band #1, 2-3.5 mc, plug-in, includes trimmer.	41528 (W9)
L1	2C4547-2/C22	COIL ASSEMBLY: ant, band #2, 3.4-5.8 mc, plug-in, includes trimmer.	41521 (W9)
L2	2C4547-2/C15	COIL ASSEMBLY: plate, band #2, 3.4-5.8 mc, plug-in, includes trimmer.	41525 (W9)
L3	2C4547-2/C11	COIL ASSEMBLY: grid, band #2, 3.4-5.8 mc, plug-in, includes trimmer.	41529 (W9)
L1	2C4547-2/C21	COIL ASSEMBLY: ant, band #3, 5.7-9.8 mc, plug-in, includes trimmer.	41522 (W9)
L3	3C4005-1	COIL ASSEMBLY: grid, band #3, 5.7-9.8 mc, plug-in, includes trimmer.	41530 (W9)
L1	2C4547-2/C23	COIL ASSEMBLY: ant, band #4, 9.7-18 mc, plug-in, includes trimmer	41523 (W9)
L2	2C4547-2/C13	COIL ASSEMBLY: plate, band #4, 9.7-18 mc, plug-in, includes trimmer.	41527 (W9)
L3	2C4547-2/C16	COIL ASSEMBLY: grid, band #4, 9.7-18 mc, plug-in, includes trimmer.	41531 (W9)
L4	3C323-10E	COIL, RF xtal choke: osc, 50 turns, 15/44 LITZ, 28 mh	95069 (W9)
L7	3C316-28	COIL, filter choke: 10 @ 100 ma	T-45692 (T4)
P1	2Z7120.12	CONNECTOR, male: 10-prong	P-310-AB (J5)
K	2Z3535-(Freq)	CRYSTAL HOLDER: w/xtal (freq as specified)	80A (W9)
F1	3Z1927	FUSE: 2 amp, 250 v, type 3AG	1042 (L3)
	3Z3275-1	FUSE POST: extractor	1075A (L3)
J2	2Z5581-3	JACK, phone: single, open ckt	A1 (M1)
L1, 2, 3	2Z5729	KIT, coil: r-f, consists of coil forms, capacitors, wire, sockets, etc., necessary to wind 12 coils in the field, for 4 bands.	DWG. B251-1 thru B262-1 (W9)
	2Z5821-7	KNOB: bakelite	2300 (D26)
R1, 3, 5, 19	3RC31BE104M	RESISTOR, carbon: 100,000 ohm, 1 w	RC31BE104M
R2, 9	3RC31BE391J	RESISTOR, carbon: 400 ohm, 1 w	RC31BE391J
R4	3RC31BE101M	RESISTOR, carbon: 100 ohm, 1 w	RC31BE101M
R6, 17	3RC31BE243J	RESISTOR, carbon: 25,000 ohm, 1 w	RC31BE243J
R7, 8, 12, 13, 18	3RC31BE514J	RESISTOR, carbon: 500,000 ohm, 1 w	RC31BE514J
R10	3RC31BE105M	RESISTOR, carbon: 1 meg, 1 w	RC31BE105M
R11, 14	3RC31BE244J	RESISTOR, carbon: 250,000 ohm, 1 w	RC31BE244J
R15	3RC31BE753J	RESISTOR, carbon: 75,000 ohm, 1 w	RC31BE753J
R16	2Z7271-149	RESISTOR, pot: carbon, 100,000 ohm, 1 w	10-10 1-626 (C4)

103. MAINTENANCE PARTS FOR RADIO RECEIVER (WILCOX ELECTRIC TYPE F3) (contd).

Ref. symbol	Signal Corps stock No.	NAME OF PART AND DESCRIPTION	MFR'S PART AND CODE NO.
R20	2Z7280-29	RESISTOR, pot: WW, 5,000 ohm, 3 w, with SPST sw.....	22-011-004 (G15)
R21	3Z6050-102	RESISTOR, WW: 500 ohm, 10 w.....	1-3/4G2 (H3)
R22	3Z5410.10	RESISTOR, WW: 1,000 ohm, 10 w.....	1-3/4G2 (H3)
R23	3Z5430.8	RESISTOR, WW: 3,000 ohm, 10 w.....	1-3/4G2 (H3)
R24	2Z7280-30	RESISTOR, pot: WW, 5,000 ohm, 3 w.....	21-010-028 (G15)
R25	3RC31BE241J	RESISTOR, carbon: 240 ohm, 1 w.....	RC31BE241J
R26	3Z6610-173	RESISTOR, WW: 10,000 ohm, 10 w.....	A10C (C10)
R27	3Z5450.14	RESISTOR, WW: 5,000 ohm, 10 w.....	1-3/4G2 (H3)
	2Z8799-137	SOCKET, tube: bakelite, octal.....	S8 (A13)
	2Z8674.8	SOCKET, tube: bakelite, 4-cont.....	S4 (A13)
	2Z8690-1	SOCKET, tube: bakelite, 7-cont.....	S7S (A13)
	2Z8650.5	SOCKET, tube: bakelite, 8-cont for coils.....	9950 (C6)
	2Z8673.24	SOCKET, xtal holder: 3-cont.....	29525 (W9)
J1	2Z9403.31	TERMINAL STRIP: 3-term.....	1506 (A14)
L5	2Z9641.35	TRANSFORMER ASSEMBLY: if, input 455 kc, includes C11, 12, 14, 15.	42503 (W9)
L6	2Z9641.36	TRANSFORMER ASSEMBLY: if, output 455 kc, includes C17, 18, 19, 20.	42504 (W9)
T1	2Z9632.58	TRANSFORMER, audio output: 6C8G plate to 500 ohm ct line.	T-4390 (T4)
T2	2Z9613.60	TRANSFORMER, power: pri 115 v, 60 cps, sec #1, 6.3 v @ 2.5 amp sec #2, 5 v @ 2 amp, sec #3, 720v, ct @ 50 ma.	T-45942 (T4)
V1, 3	2J6K7	TUBE: type JAN-6K7.....	JAN 6K7
V2	2J6K8G	TUBE: type JAN-6K8G.....	JAN6K8G
V4	2J6F7	TUBE: type JAN-6F7.....	JAN6F7
V5	2J6C8G	TUBE: type JAN-6C8G.....	JAN6C8G
V6	2J80	TUBE: type JAN-80.....	JAN80

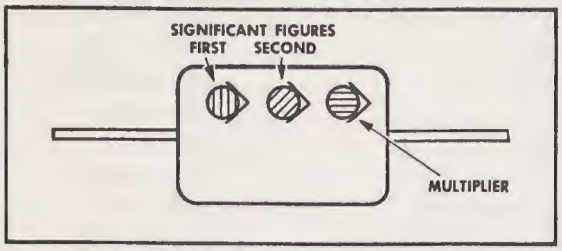
104. LIST OF MANUFACTURERS.

CODE	MANUFACTURER'S NAME
A1	Aerovox Corp.
A13	American Phenolic Corp.
A14	American Radio Hardware Co.
A17	Arrow, Hart & Hegeman Electric Co.
A34	American Steel Packages Co.
B9	Bussman Mfg. Co.
C4	Globe Union, Inc.
C6	Cinch Mfg. Corp.
C10	Clarostat Mfg. Co.
C15	Cornell-Dubilier Electric Corp.
D26	Davies-Wayne Packaging, Inc.
E5	Eagle Electric Mfg. Co.
F31	Fibreglass Corp.
G15	Globe Union, Inc.
H3	Hardwick-Hindle, Inc.
I8	Industrial Condenser Corp.
J5	Jones, Howard B.
L3	Littlefuse, Inc.
L4	Langevin Co., Inc.
M1	Mallory, P. K., & Co.
M2	Micamold Radio Corp.
M4	Millen, James, Mfg. Co.
02	Ohmite Mfg. Co.
S3	Sickles, F. W., Co.
S4	Signal Electric Mfg. Co.
S5	Solar Mfg. Corp.
S8	Sprague Specialties Co.
S9	Square D Mfg. Co.
S15	Shakeproof, Inc.
S24	Stackpole Carbon Co.
T4	Thordarson Electric Co.
W9	Wilcox Electric Co.
Z1	Zierich Mfg. Co.

Order No. 290-P-46-04. 1200 copies November, 1945

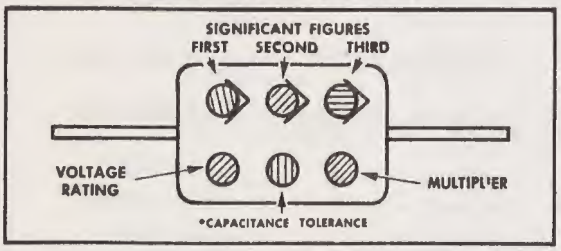
CAPACITOR COLOR CODES

RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

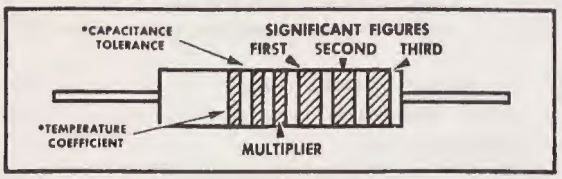


Capacitors marked with this code have a voltage rating of 500 volts.

RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS



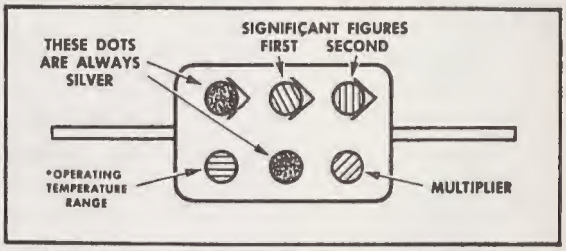
Capacitors marked with this code have a voltage rating of 500 volts.

RMA Radio Manufacturers Association JAN Joint Army-Navy

Note These color codes give all capacitances in micromicrofarads.

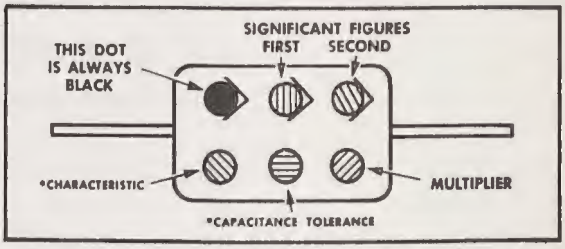
*Items marked with an asterisk are of interest primarily to depot and higher echelon repair personnel

JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



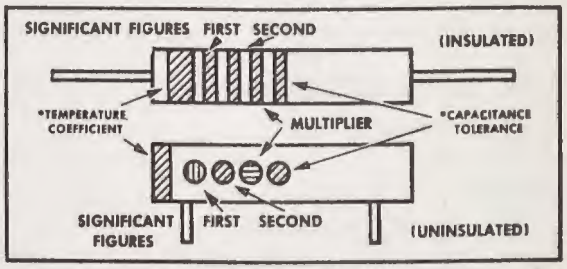
The silver dots serve to identify this marking. For working voltages see JAN type designation code.

JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



The black dot serves to identify this code. For working voltages see JAN type designation code.

JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS



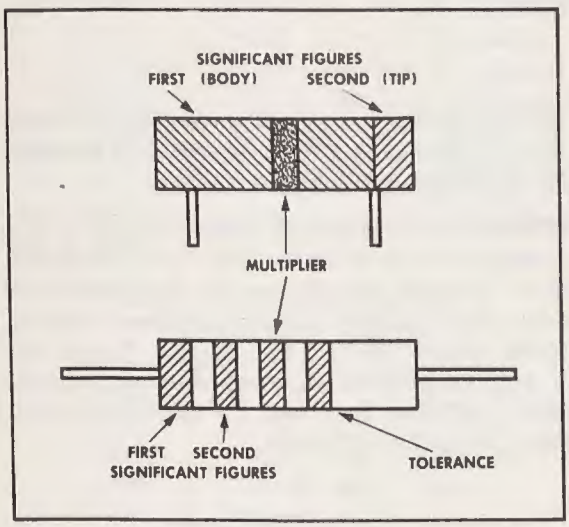
Capacitors marked with this code have a voltage rating of 500 volts. Either the band or dot code may be used.

COLOR	SIGNIFICANT FIGURE	MULTIPLIER			RMA VOLTAGE RATING
		RMA MICA-AND CERAMIC-DIELECTRIC	JAN MICA-AND PAPER-DIELECTRIC	JAN CERAMIC-DIELECTRIC	
BLACK	0	1	1	1	
BROWN	1	10	10	10	100
RED	2	100	100	100	200
ORANGE	3	1,000	1,000	1,000	300
YELLOW	4	10,000			400
GREEN	5	100,000			500
BLUE	6	1,000,000			600
VIOLET	7	10,000,000			700
GRAY	8	100,000,000		0.01	800
WHITE	9	1,000,000,000		0.1	900
GOLD		0.1	0.1		1,000
SILVER		0.01	0.01		2,000
NO COLOR					500

TL 13417 A

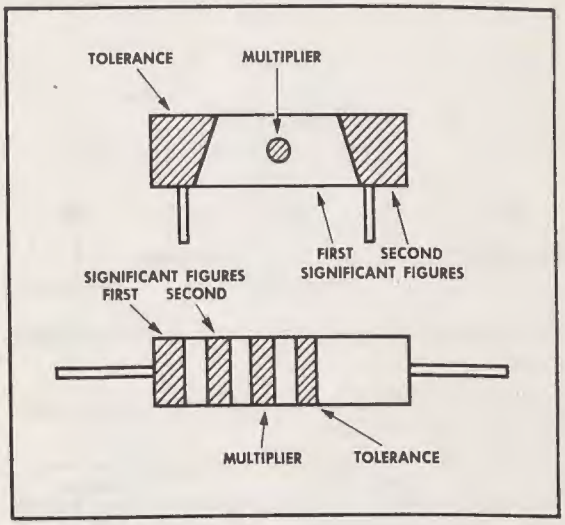
RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS



Insulated fixed composition resistors with axial leads are designated by a natural tan background color. Non-insulated fixed composition resistors with axial leads are designated by a black background color.

JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS



Resistors with axial leads are insulated. Resistors with radial leads are uninsulated.

COLOR	SIGNIFICANT FIGURE	MULTIPLIER	TOLERANCE (PERCENT)
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

*JAN ONLY

Example: A 50,000-ohm resistor with a standard tolerance of 20 percent (no color) would be indicated by a green ring (5), a black ring (0), and an orange ring (000)

RMA: Radio Manufacturers Association
JAN: Joint Army-Navy

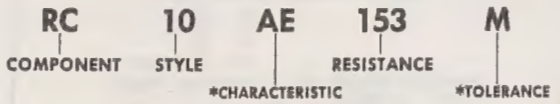
TL 13418 A

JOINT ARMY-NAVY TYPE DESIGNATION CODES FOR ELECTRICAL COMPONENTS

INTRODUCTION: Fixed and variable resistors and fixed capacitors manufactured under JAN specifications may be labeled with a *type designation code* instead of a color code or actual electrical value. For resistors and capacitors marked with the JAN type designation code, electrical values and other data can be determined by consulting the following information.

RESISTORS

FIXED, COMPOSITION



COMPONENT: RC signifies *fixed, composition resistor.*

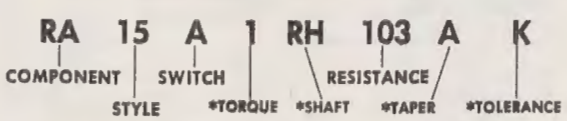
STYLE: A two-digit symbol indicates power rating and physical size.

Resistor style	Wattage
RC10, RC15, RC16	¼ WATT
RC20, RC21, RC25	½ WATT
RC30, RC31, RC35, RC38	1 WATT
RC40, RC41, RC45	2 WATTS
RC65	4 WATTS
RC75, RC76	5 WATTS

RESISTANCE: A three-digit symbol indicates the resistance value in ohms. The first two digits give the first two figures of the resistance value; the third digit gives the number of zeros which follow the first two figures.

RESISTORS

VARIABLE, WIRE-WOUND



COMPONENT: RA signifies *variable, wire-wound resistor.*

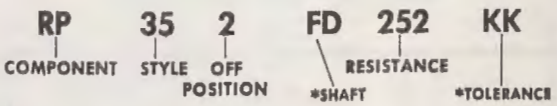
STYLE: A two-digit symbol indicates power rating and physical size and shape.

SWITCH: Symbol A indicates no switch. Symbol B indicates a switch turned ON at start of clockwise rotation.

RESISTANCE: A three-digit symbol indicates the resistance value in ohms. The first two digits give the first two figures of the resistance value; the final digit gives the number of zeros which follow the first two figures. The letter *R* may be substituted to represent a decimal point; but when *R* is used, the last digit of the group becomes significant.

RHEOSTATS

WIRE-WOUND POWER-TYPE



COMPONENT: RP signifies all *rheostats.*

STYLE: Same as for variable, wire-wound resistors.

OFF POSITION:

Numeral	OFF position
1	None.
2	At end of counterclockwise rotation.
3	At end of clockwise rotation.

RESISTANCE: Same as for variable, wire-wound resistors.

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*Items starred are of interest primarily to depot and higher echelon repair personnel.

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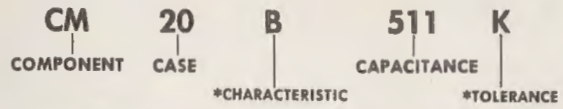
CAPACITORS

FIXED, MICA-DIELECTRIC



COMPONENT: CM signifies *fixed, mica-dielectric capacitor.*

CASE: A two-digit symbol identifies a physical case size and shape.

CAPACITANCE: A three-digit symbol indicates the capacitance value in micromicrofarads. The first two digits give the first two figures of the capacitance value; the final digit gives the number of zeros which follow the first two figures. When more than two significant figures are required, additional digits may be used, the last digit always indicating the number of zeros.

D-C WORKING VOLTAGE FOR CAPACITANCE RANGE

Case	Capacitance range	Vdcw
CM20	5-510 mmf	500
CM25	5-1,000 mmf	500
CM30	470-3,300 mmf	500
CM35	470-6,200 mmf	500
	6,800-10,000 mmf	500
CM40	3,300-8,200 mmf	500
	9,100-10,000 mmf	300

NOTE: Working voltages for capacitors above CM40 are stamped on the case.

The d-c working voltage of a capacitor can be determined from the above table when the case size and value of capacitance are known.

CAPACITORS

FIXED, MOLDED, PAPER-DIELECTRIC†

COMPONENT: CN signifies *fixed, molded, paper-dielectric capacitor.*

CASE: Same as for fixed, mica-dielectric capacitors.

CAPACITANCE: A three-digit symbol indicates the capacitance value in micromicrofarads. The first two digits give the first two figures of the capacitance value; the third digit gives the number of zeros which follow the first two figures.

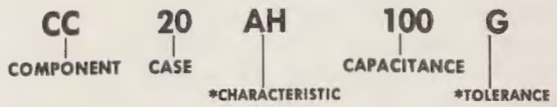
D-C WORKING VOLTAGE FOR CAPACITANCE RANGE

Case	Capacitance	Vdcw
CN35	3,000 mmf	800
	6,000 mmf	600
	10,000 mmf	400
CN36	3,000 mmf	400
	6,000 mmf	400
	10,000 mmf	300
CN40	3,000 mmf	400
	6,000 mmf	300
	10,000 mmf	300
CN41	3,000 mmf	600
	6,000 mmf	600
	10,000 mmf	400

The d-c working voltage of a capacitor can be determined from the above table when the case size and value of capacitance are known.

CAPACITORS

FIXED, CERAMIC-DIELECTRIC



COMPONENT: CC signifies *fixed, ceramic-dielectric capacitor.*

CASE: Same as for fixed, mica-dielectric capacitors.

CAPACITANCE: Same as for fixed, molded, paper-dielectric capacitors.

NOTE: All fixed, ceramic-dielectric capacitors have a working voltage of 500 volts, d-c.

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*Items starred are of interest primarily to depot and higher echelon repair personnel.

†This is not a JAN specification. These capacitors are covered by AWS C75/221.

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