TM 11-868

WAR DEPARTMENT TECHNICAL MANUAL

RADIO RECEIVER

128-AY

WAR DEPARTMENT *21 NOVEMBER 1942*

WAR DEPARTMENT TECHNICAL MANUAL
TM 11-868

RADIO RECEIVER

128-AY

WAR DEPARTMENT • 21 NOVEMBER 1942

United States Government Printing Office
Washington : 1945

WAR DEPARTMENT,
WASHINGTON 25, D. C., 21 November 1942.

TM 11–868, Radio Receiver 128–AY, is published for the information and guidance of all concerned.

[A. G. 062.11 (20 Oct 42).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

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

DISTRIBUTION:

SAFETY NOTICE.—WHEN THE RADIO RECEIVER 128–AY IS USED ON A D-C LINE, THE LEADS TO THE PRIMARY WINDING OF THE TRANSFORMER (T1) MUST FIRST BE DISCONNECTED AND THE END OF EACH LEAD CAREFULLY TAPED. (SEE PARAGRAPH 5 *d* (2) (*b*) (*1*).)

TABLE OF CONTENTS

	Paragraph
Section I Description	
General	1
Power Sources	2
Mechanical Construction	3
Section II Installation and Operation	
Initial Procedure	4
Installation	5
Preparation for Use	6
Operation	7
Field Upkeep	8
Section III Functioning of Parts	
General	9
Detailed Description	10
Section IV Servicing and Repair	
General	11
Routine Checks for Normal Operation	12
Trouble Location	13
Voltage and Current Measurements	14
Resistance Measurements	15
Sensitivity Measurements	16
Selectivity Measurements	17
RF Alignment Procedure	18
Removal of Parts	19
Section V Table of Replaceable Parts	20

LIST OF ILLUSTRATIONS

Figure		Page
1	Radio Receiver 128-AY	4
2	Radio Receiver 128-AY, Outline Dimensional Drawing	6
3	Radio Receiver 128-AY, Cabinet Interior	8
4	Radio Receiver 128-AY, Panel Layout	10
5	Radio Receiver 128-AY, Simplified Schematic Diagram of RF Section for Bands A and B	13
6	Radio Receiver 128-AY, Simplified Schematic Diagram of RF Section for Bands C and D	14
7	Radio Receiver 128-AY, Simplified Schematic Diagram of Power Switching	15
8	Radio Receiver 128-AY, Tube Socket Location Diagram	20
9	Radio Receiver 128-AY, Chassis Location Diagram	24
10	Radio Receiver 128-AY, Top View of Chassis	32
11	Radio Receiver 128-AY, Bottom Right Oblique View of Chassis	34
12	Radio Receiver 128-AY, Bottom Left Oblique View of Chassis	35
13	Radio Receiver 128-AY, Resistor-Capacitor Assemblies	36
14	Radio Receiver 128-AY, Schematic Diagram	43
15	Radio Receiver 128-AY, Wiring Diagram	44

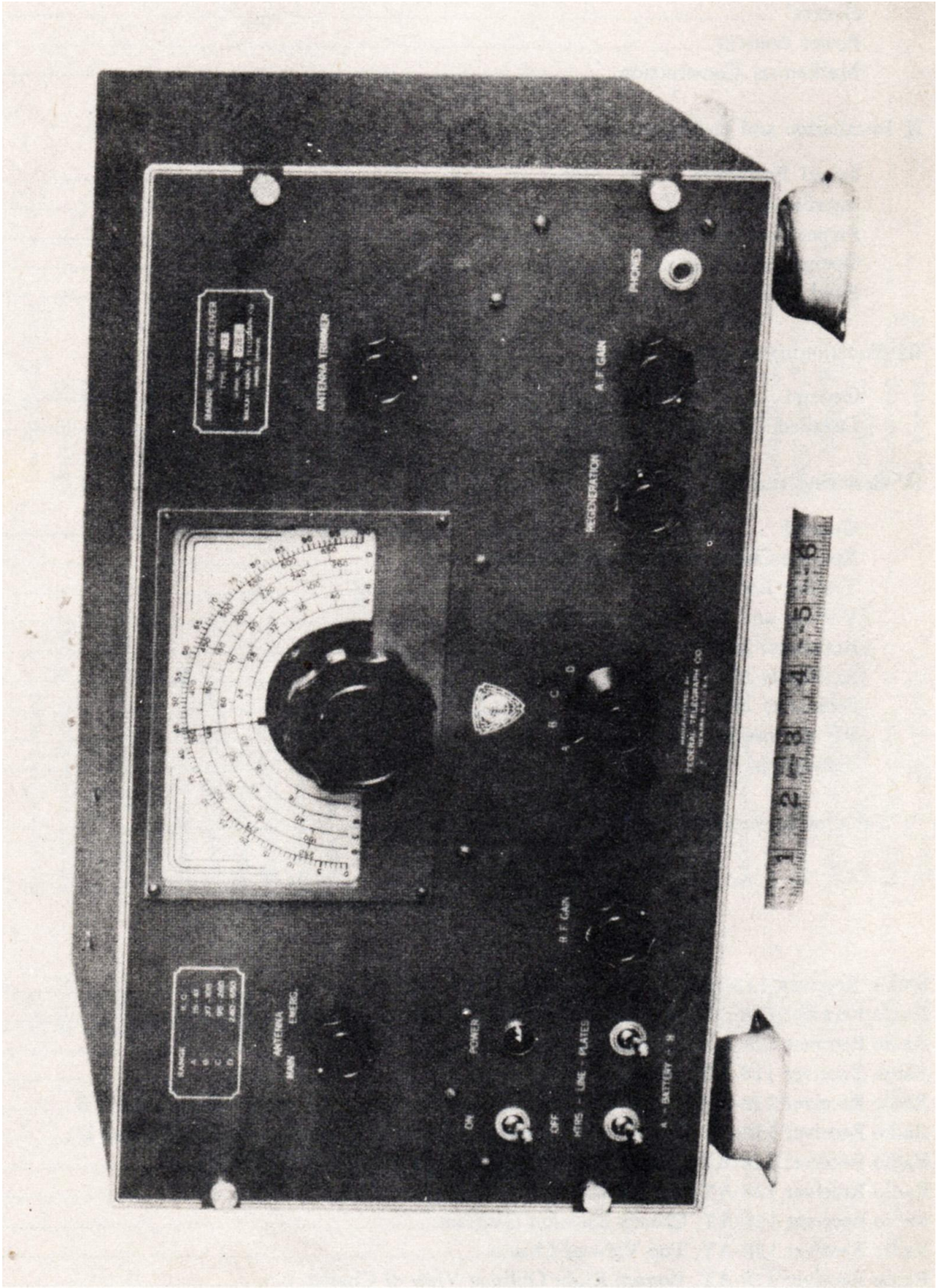


Figure 1—Radio Receiver 128-AY.

Section I
DESCRIPTION

	Paragraph
General	1
Power Sources	2
Mechanical Construction	3

1. General.—*a.* The 128-AY Receiver (figure 1) is a radio-telegraph receiver designed for use on ships and also at fixed stations.

b. This receiver is of the tuned radio-frequency type having one stage of radio-frequency amplification, a regenerative detector, and two stages of audio frequency amplification. It is designed to cover the intermediate and low frequency bands and can be used for the reception of both code (CW or ICW) and modulated (MCW) signals. The complete frequency coverage is 15 to 650 kc divided into four overlapping bands, calibrated in kilocycles on a full vision tuning scale:

Band	*Frequency Range*
A	15 – 41 kc
B	37 – 105 kc
C	95 – 260 kc
D	240 – 650 kc

c. The output circuit is designed for a load impedance of 10,000 to 20,000 ohms. The maximum output attainable with low distortion is 100 milliwatts, while the maximum output that may be obtained without regard to distortion is approximately 150 milliwatts.

d. The receiver is intended to be used with a single-wire antenna and ground. Provision has also been made for connecting an emergency antenna which can be quickly selected by means of a change-over switch on the panel.

e. The tube complement of the receiver is as follows:

Circuit Symbol	*Type*	*Function*
V1	6SK7	RF Amplifier
V2	6J5	Regenerator
V3	6SJ7	Detector
V4	6SJ7	First AF Amplifier
V5	6K6-G	Second AF Amplifier
V6	35Z5-GT	Rectifier

2. Power Sources.—*a.* The receiver is designed for operation from any one of three power sources: (1) a-c line, (2) d-c line in conjunction with an A battery, and (3) batteries. Switches on the panel enable the operator to change immediately to batteries in case of line supply failure.

b. The power or current required from each of the three power sources is as follows:

AC LINE

Voltage	115 Volts, 60 Cycles
Power	36 Watts

DC LINE WITH A BATTERY

Line Voltage	115 Volts
Line Current	.17 Amperes
A Battery Voltage	6.3 Volts
A Battery Current	1.9 Amperes

BATTERIES

B Battery Voltage	90 Volts
B Battery Current	7-12 Milliamperes
A Battery Voltage	6.3 Volts
A Battery Current	1.9 Amperes

3. Mechanical Construction.—*a.* The receiver components are mounted on a rigid panel and chassis assembly. The panel dimensions are 17 inches wide by 9-½ inches high, and the receiver mounts in a cabinet 12-½ inches deep. The receiver panel chassis assembly is secured in the cabinet by means of four captive screws at the edges of the panel. Terminal boards are provided within the cabinet for antenna, line, battery, and external phone connections. These circuits are connected from the terminal boards to the chassis by means of three flexible cables and separable plugs, one part of the plug being on the cable and the other part mounted on the chassis. The receiver is readily removed from the cabinet by loosening the four panel captive screws. The cables are sufficiently long so that the receiver may be operated when removed from the cabinet for servicing.

b. All of the r-f coils and the range selector switch are assembled on a bracket as a single unit.

c. In order to minimize microphonic response, the detector and regenerator tube sockets are mounted on a small sub-panel which is suspended from the chassis by means of rubber mountings.

d. All resistors, mica capacitors, and tubular paper capacitors are mounted on three terminal board assemblies, except where circuit conditions require special

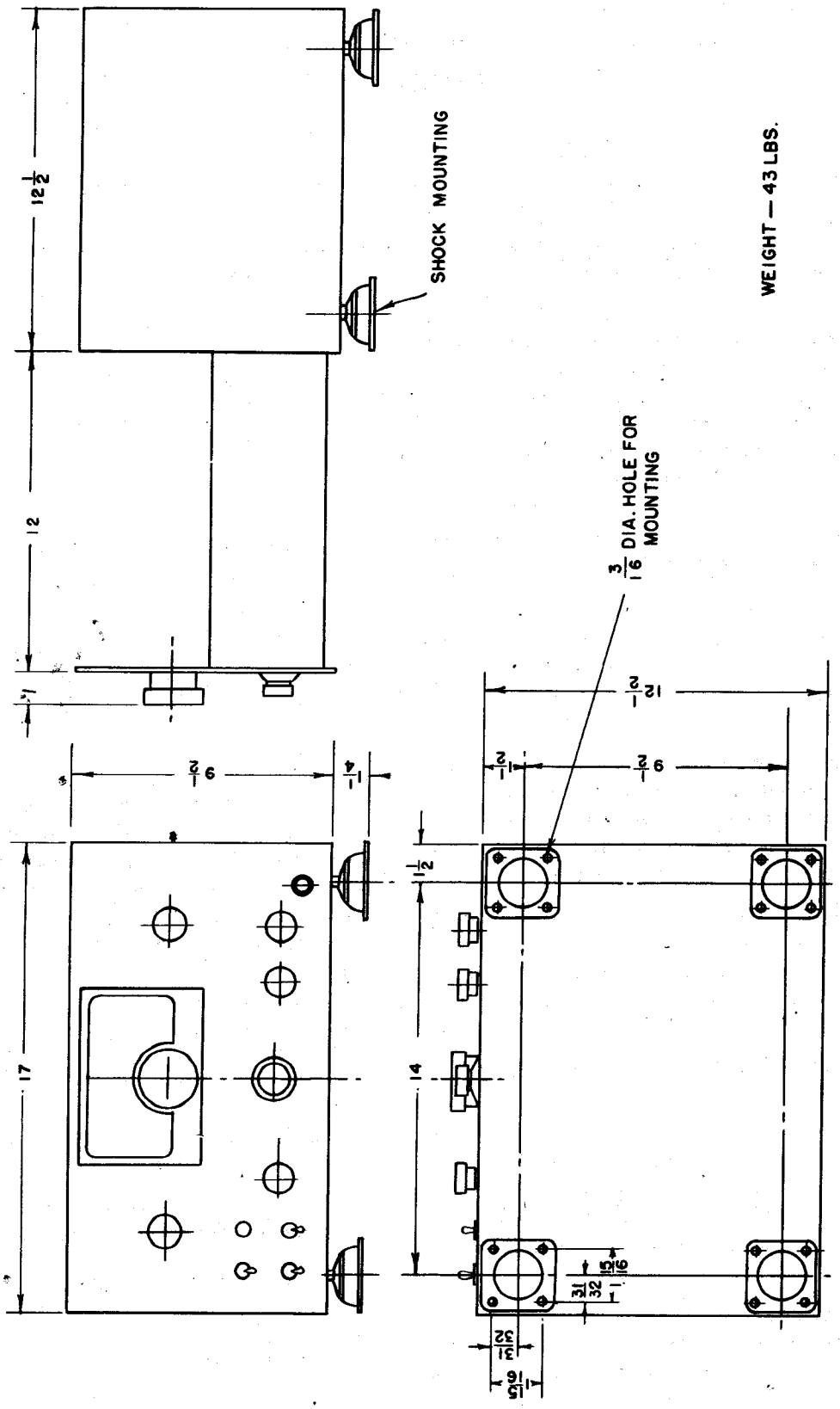


Figure 2—Radio Receiver 128-AY, Outline Dimensional Drawing.

mounting. This arrangement facilitates testing and servicing and gives the interior of the receiver a neat appearance.

e. Four protective extractor-type fuses in holders are mounted in the upper rear corner of the cabinet. One is connected in each side of the line circuit, one in the positive side of the A battery circuit, and one in the positive side of the B battery circuit.

f. The front panel controls are as follows:

Main Tuning Control
Range Selector Switch
ANTENNA Switch
ANTENNA TRIMMER
RF GAIN
REGENERATION
AF GAIN
Power Switches
Phone Jack

Section II

INSTALLATION AND OPERATION

	Paragraph
Initial Procedure	4
Installation	5
Preparation for Use	6
Operation	7
Field Upkeep	8

4. Initial Procedure.—The 128-AY Receiver and a complete set of tubes are packed together in one box for shipment. To open, place the box with the painted arrows pointing upward and pry off the top boards. Remove the carton of tubes and the receiver from the box. If the receiver is to be installed immediately, remove the corrugated and moisture-proof paper wrappings.

5. Installation.—*a. Vacuum Tube Installation.*—(1) To install the tubes, loosen the four captive screws on the front panel and remove the receiver from the cabinet. Disconnect the three cables connecting the receiver to the cabinet by pulling out the plugs on the receiver chassis. Remove the tubes from their cartons and insert in their proper sockets. The type of tube to be inserted in each socket is stamped on the chassis beside the socket. There are two 6SJ7 tubes but they are interchangeable.

(2) After the tubes have been inserted, set the receiver aside until the installation of the cabinet as described in the following paragraph has been completed. When the receiver is finally replaced in the cabinet, be sure that the three cable plugs are reconnected in their proper sockets.

b. Cabinet Mounting.—(1) The receiver is shipped with shock mounts attached to the base of the cabinet. Where the receiver will be subjected to shock and vibration or when a fixed position is desired, fasten the shock mounts directly to the operating table by means of standard size 10 bolts or screws, the length of which will depend upon the thickness of the table top. The relative location of the mounting holes is shown on the Outline Dimensional Drawing, figure 2. If wood screws, or bolts longer than 1-¼ inches, are used in fastening the shock mounts to the table, it will be necessary to unfasten the mounts from the cabinet by removing the four nuts on the inside. After securing the shock mounts to the table top, replace the cabinet on the mounts and secure with the four nuts.

(2) If space limitations make it desirable to mount the receiver cabinet directly to the table, remove the shock mounts, drill four $^{9}/_{32}$ inch holes in the table top, and mount the cabinet to it with ¼ inch bolts. The relative location of these holes can be obtained from the Outline Dimensional Drawing, figure 2.

c. Antenna and Ground Connections.—Two holes are provided in the rear of the cabinet above the antenna terminal board (TB2) for antenna and ground leads. (See figure 3.) Connect the main antenna to the terminal marked M and the ground wire to the terminal marked G. If an emergency antenna is to be used, connect it to the terminal marked E. In the event that the receiver is to be used in conjunction with a high frequency receiver, the high frequency antenna may be used as the emergency antenna. To do this, connect the high frequency antenna directly to terminal E and run an extension lead to the antenna post of the high frequency receiver from the terminal marked EXT.

d. Power Connections.—(1) Knockout holes are provided in the rear and bottom of the receiver cabinet for power, battery, and phone cables. To obtain the holes desired, knock out the plugs with a large screw driver and hammer. The holes are ⅞ inch in diameter and are suitable for connecting ½ inch pipe or armored cable.

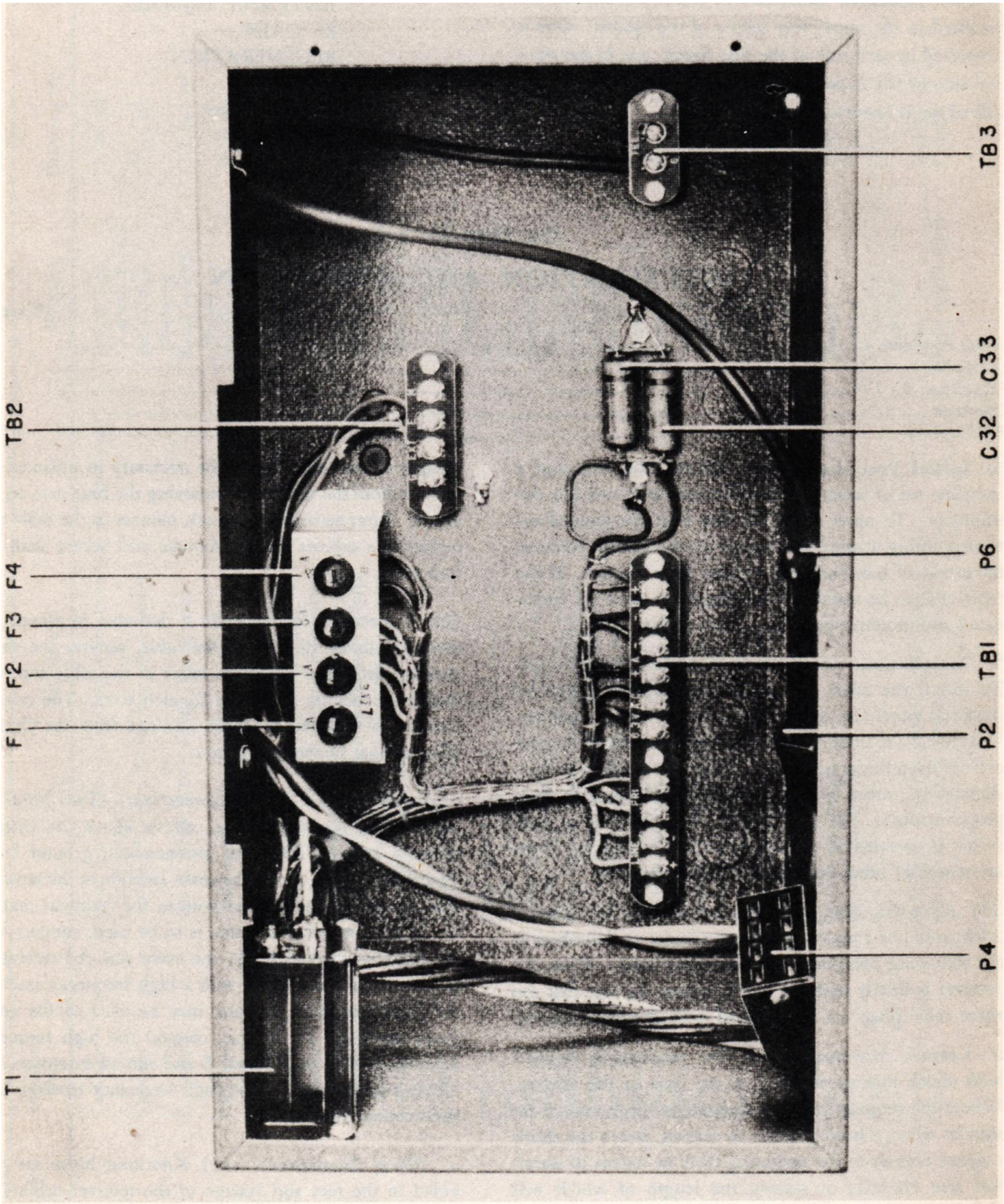


Figure 3—Radio Receiver 128-AY, Cabinet Interior.

(2) The power connections for the three types of operation are as follows:

(a) AC Line Operation.—(1) When the receiver is to be operated from a 115-volt a-c line, connect the side of the line nearer ground potential to the LINE terminal marked (—) on terminal board (TB1). The side of the line nearer ground should be determined by connecting an a-c voltmeter between each side and ground. (Use 150-volt range.) The side showing the least voltage indication is the proper one to connect to the (—) terminal. If neither side is near ground potential, excessive a-c hum may interfere with reception. If this is found to be so, it will be necessary to connect a two-winding transformer between the a-c line and the receiver LINE terminals, and to ground the side of the secondary that is connected to the LINE terminal marked (—).

(2) The line voltage should be within the range of 95 to 130 volts. For higher or lower a-c line voltages, it is recommended that an externally mounted step-down or step-up transformer be used. If one side of the line is grounded, an auto transformer will be satisfactory; otherwise the transformer should have two separate windings. This latter type of transformer will also satisfy the two-winding transformer requirements described in the preceding paragraph.

(3) If batteries are to be used as an emergency source of power, connect a 6-volt storage battery to the A terminals on the terminal board (TB1) and a 90-volt battery to the B terminals. (See figure 3.) Care must be taken to connect the positive lead to the positive terminal and the negative lead to the negative terminal in both cases.

(4) In some installations, the a-c supply may have poor wave form and will introduce appreciable hum into the output of the receiver. To reduce this hum, connect first one and then the other of the terminals marked 6.3 V. AC to the cabinet, listening to determine which produces the more quiet operation. The proper terminal can then be permanently connected to the cabinet by connecting a wire between this terminal and the ground lug directly below the terminal marked G on terminal board (TB2).

(b) DC Line Operation.—(1) For d-c line operation, disconnect the two transformer primary leads from the terminals marked 115 on the heater transformer (T1) in the cabinet and tape the end of each lead separately. Connect the d-c line to the LINE terminals, observing the polarity engraved on the terminal board (TB1). Connect a 6-volt storage battery to the terminals +A and —A, observing polarity.

(2) The line voltage should be within the range of 95 to 130 volts. For higher d-c voltages, an external series dropping resistor will be required. The value of this resistor can be determined from the expression $R = E_d/I$, and the power that will be dissipated by the resistor can be determined from the expression $P = E_dI$, where E_d in both cases is the voltage drop across the resistor. The d-c line current (I) is approximately .17 amperes at 115 volts.

(3) If a B battery is to be used as an emergency source of plate voltage, connect a 90-volt battery to the B terminals on the terminal board (TB1), observing polarity.

(c) Battery Operation.—For battery operation, connect a 6-volt storage battery to the A terminals on the terminal board (TB1) and a 90-volt battery to the B terminals, observing polarity in both cases.

e. Power Line RF Filter.—In certain installations, noise may appear in the output of the receiver at one or more frequency regions due to disturbances coming in over the a-c or d-c line. This condition can be corrected by inserting a noise filter in the line to the receiver, the filter being located external to the receiver. A suitable filter consists of an r-f choke of ½ to 1 millihenry in series with the ungrounded side of the line and a 1 microfarad capacitor from the choke to ground. The capacitor should be connected to the side of the choke which goes to the receiver, and not to the line side. The capacitor should be rated at 200 volts or more d-c working voltage. It is important to make the ground wire from the capacitor as short as possible and entirely independent of the ground wire from the receiver. In the event that this filter does not satisfactorily reduce the noise, a similar one should also be inserted in the other side of the line. If the noise appears on Bands B, C, and D only and not on Band A, it will usually be found sufficient to use a 0.1 microfarad capacitor rather than a 1 microfarad capacitor. The choke should have a current carrying capacity of at least 0.4 amperes for a-c line operation. Two National Type R-300 chokes in parallel will fulfill this requirement. For d-c line operation, the choke must have a current carrying capacity of only 0.2 amperes. A single R-300 choke will serve this purpose. The reason for the higher current carrying capacity of the a-c line choke is that the line in this case supplies both the plate and heater power, whereas for d-c line operation, only the plate power is supplied by the line.

f. Extension Phone Jack.—When it is desired to locate an additional phone jack at some other listening position, connect an extension shielded cable from the terminals marked TEL on terminal board (TB3) to the remote phone jack. Connect the shield of the cable to the terminal marked G.

6. Preparation for Use.—*a.* Before placing the receiver into operation, make the following routine checks:

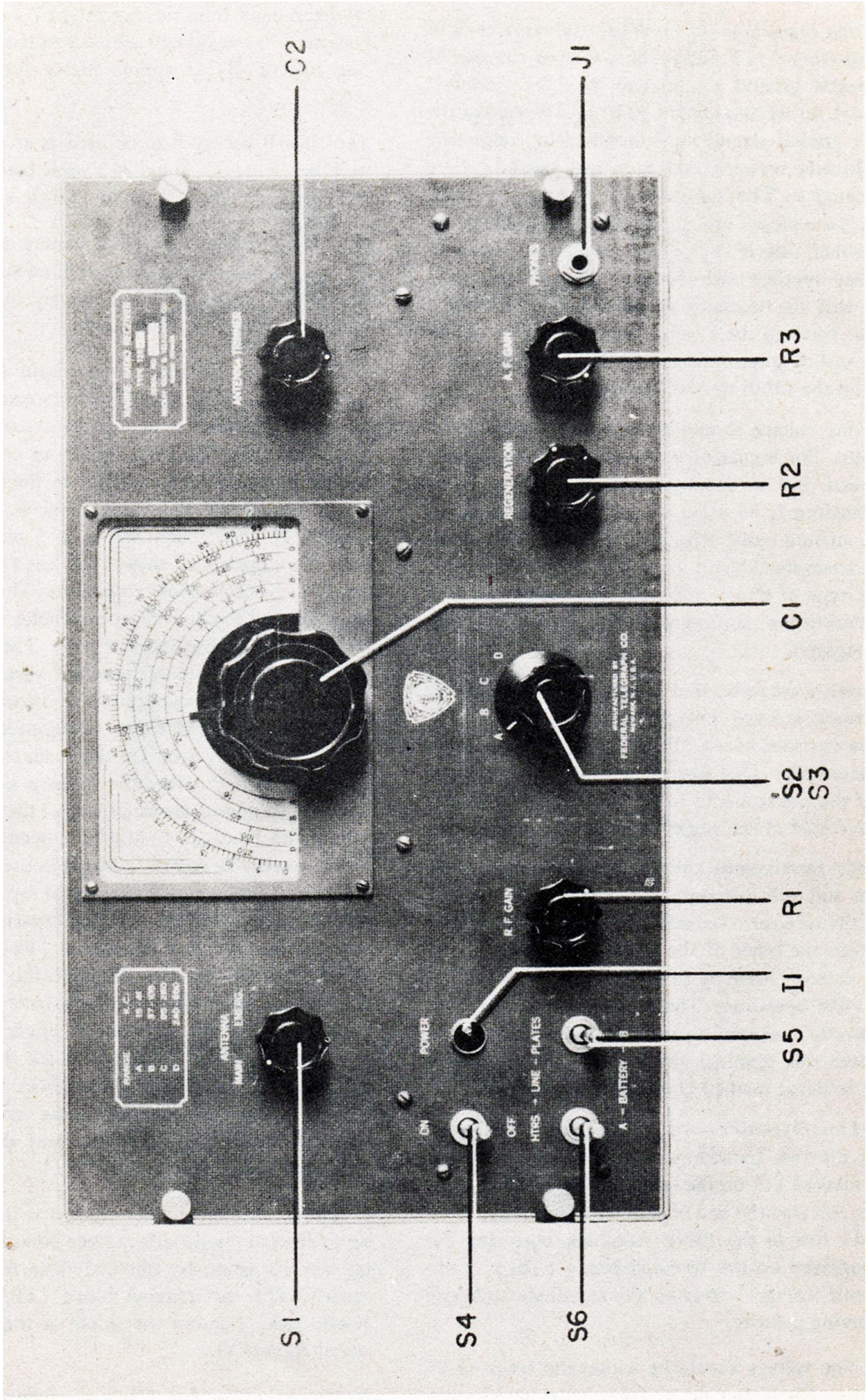


Figure 4—Radio Receiver 128-AY, Panel Layout.

(1) Check that the line input voltage is between 95 and 130 volts.

(2) If d-c line operation is used, check that the leads to the primary of the heater transformer (T1) have been disconnected as described in paragraph 5 *d* (2) *(b) (1)*, page 9.

(3) Check that the tubes have been inserted in the proper sockets and that all the cables from the cabinet have been properly connected to the receiver.

(4) Check that the antenna and ground connections to the cabinet have been properly made.

b. Finally plug a pair of high-impedance headphones into the panel jack marked PHONES.

7. Operation.—*a.* Preliminary Procedure—(1) *AC Operation.—(a)* Throw the power switch at the left of the pilot lamp up to the ON position. The pilot lamp should light.

(b) Throw the toggle switch marked HTRS up to the LINE position. The two dial lamps should light.

(c) Throw the toggle switch marked PLATES up to the LINE position.

(2) *DC Line Operation With A Battery.—(a)* Throw the power switch at the left of the pilot lamp up to the ON position. The pilot lamp should light.

(b) Throw the toggle switch marked HTRS down to the BATTERY position. The two dial lamps should light.

(c) Throw the toggle switch marked PLATES up to the LINE position.

(3) *Battery Operation.—(a)* Throw the power switch at the left of the pilot lamp down to the OFF position. The pilot lamp will not light on battery operation.

(b) Throw the toggle switch marked HTRS down to the BATTERY position. The two dial lamps should light.

(c) Throw the toggle switch marked PLATES down to the BATTERY position.

b. Operating Procedure.—(1) Turn the ANTENNA switch to MAIN.

(2) Set the RF GAIN to about three-quarters maximum clockwise rotation.

(3) Set the AF GAIN control near maximum clockwise rotation.

(4) Set the band switch to the desired frequency band.

(5) Set the main tuning control to the desired frequency.

(6) Turn the REGENERATION control to just above the oscillation point. A slight thump can be heard in the headphones at the point where the receiver goes into oscillation as the control is rotated clockwise.

(7) Turn the main tuning control slowly until the signal is located.

(8) If the signal is unmodulated, vary the tuning control to give the desired pitch of the beat note. If the signal is modulated, set the REGENERATION control just below the point of oscillation, and tune the main tuning control to give maximum output.

(9) Adjust the ANTENNA TRIMMER control to give maximum output.

(10) Readjust the RF GAIN and AF GAIN controls to produce the desired output.

(11) To turn the receiver off, proceed as follows:

(a) AC Line Operation.—Throw the power switch down to the OFF position.

(b) DC Line Operation With A Battery.—Throw the power switch down to the OFF position and the HTRS switch up to the LINE position.

(c) Battery Operation.—Throw the HTRS switch and the PLATES switch up to the LINE position.

c. Emergency Operating Procedure.—(1) *AC Line Failure.*—If the a-c line fails and emergency batteries have been connected to the receiver as described in paragraph 5 *d* (2) *(a) (3)*, page 9, throw the HTRS switch and the PLATES switch down to the BATTERY positions. Power failure will be indicated by the pilot and dial lamps going out. When the two switches are thrown to the BATTERY positions, only the dial lamps will light. The power switch is out of the circuit for battery operation and by leaving it in the ON position, the pilot lamp will light when the a-c line power is restored.

(2) *DC Line Failure.*—If the d-c line fails and emergency 90-volt battery has been connected to the receiver as described in paragraph 5 *d* (2) *(b) (3)*, page 9, throw the PLATES switch down to the BATTERY position. Power failure will be indicated by the pilot lamp going out, and when the PLATES switch is in the BATTERY position, this lamp will not light. The power switch is out of the circuit for battery operation and by leaving it in the ON position, the pilot lamp will light when the d-c line power is restored.

(3) *Main Antenna Failure.*—If the main antenna fails and an emergency antenna has been connected to the receiver as described in paragraph 5 *c*, page 7, throw the ANTENNA switch to the EMERG position. Retune the ANTENNA TRIMMER to produce maximum output.

Table 1

SUMMARY OF NORMAL OPERATING CONDITIONS

Power Source	Switch Positions: Power	Switch Positions: HTRS	Switch Positions: PLATES	Lamps: Pilot	Lamps: Dial	Active Fuses
AC Line	ON	LINE	LINE	ON	ON	F1, F2
DC Line with A battery	ON	BATTERY	LINE	ON	ON	F1, F2, F3
Batteries	OFF	BATTERY	BATTERY	OFF	ON	F3, F4

d. Summary.—(1) In table 1 are shown the correct position of the toggle switches, the condition of the pilot and dial lamps, and the active fuses for the various sources of power under normal operation conditions.

(2) This table will aid in determining whether the receiver is operating properly and also help in locating any fuse that may be defective. If either line fuse (F1) or (F2) is blown with a-c operation, none of the lamps will light. With d-c operation, using an A battery for the heater supply, a defective line fuse (F1) or (F2) will make the pilot lamp inoperative and the dial lamp will not light if the heater circuit fuse (F3) is defective. For battery operation, the pilot lamp is not in the circuit. If the heater fuse is burned out, the dial lamps will not light.

(3) A list of routine checks that may be made to determine if the receiver is operating normally is given in paragraph 12, page 16.

8. Field Upkeep.—*a. General.*—Upkeep of the receiver in the field may require the replacement of tubes, dial and pilot lamps, and fuses. To replace any of these, unscrew the four captive screws on the front panel, withdraw the receiver from the cabinet and proceed according to the instructions in one of the following appropriate paragraphs, 8 *b*, 8 *c*, or 8 *d*.

b. Tube Replacement.—All tubes are accessible from the top of the chassis. The type of tube in each socket is stamped on the chassis beside the socket. Either the metal types or their glass equivalents can be used. In an emergency, it is possible to use a 6J5 or its glass equivalent as a substitute for the 6K6G output tube (V5). When using this tube, no change will be required in the wiring of the tube socket but there will be a slight reduction in the gain of the receiver.

c. Dial and Pilot Lamp Replacement.—The two dial lamps are accessible from the top of the chassis and the pilot lamp from the bottom. When removing the pilot lamp, the receiver should be set on either end and not bottom side up as, otherwise, the output tube (V5) might be damaged. The lamps may be released from their sockets by pushing them firmly into the sockets and releasing with a counterclockwise motion.

d. Fuse Replacement.—The four fuses are located in holders in the upper rear corner of the cabinet. The current rating of each fuse is stamped on the metal mounting strip above the fuse and the circuit that it protects is stamped below. These fuses are extractor type and can be removed by unscrewing the center portion of the fuse post with a screw driver. Inspect the fuse visually to see if the fuse wire is broken. The 1/8 ampere fuse wire is quite thin and difficult to see, but holding the fuse against a white background will help to make the wire visible. If the wire is broken, pull the fuse out of the removable portion of the fuse holder and replace it with another of the same current rating.

Section III

FUNCTIONING OF PARTS

	Paragraph
General	9
Detailed Description	10

9. General.—The 128-AY Receiver is a tuned radio-frequency receiver with one stage of radio-frequency amplification and a separate stage of regeneration. This is followed by a detector and a two-stage audio amplifier, the output of which is impedance-coupled to a phone jack. The receiver is designed for the reception of both modulated and unmodulated signals. The schematic diagram of the receiver is shown in figure 14.

10. Detailed Description.—*a. Antenna and Radio-Frequency Circuits.*—(1) The 128-AY Receiver is intended to be used with a single-ended antenna from which the received energy is inductively coupled into the first tuned circuit by means of the antenna coil. Provision is also made for connecting an emergency antenna to the receiver and the desired antenna can be connected into the circuit by means of the ANTENNA switch on the panel.

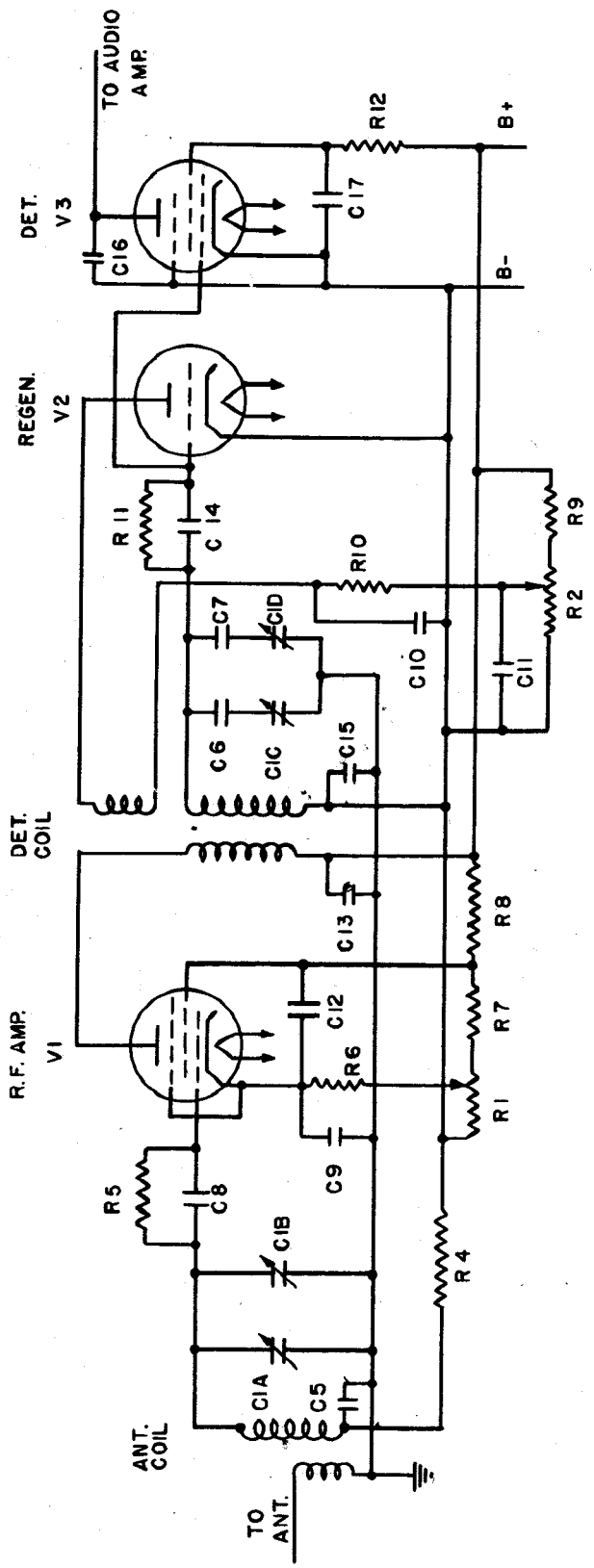


Figure 5—Radio Receiver 128-AY, Simplified Schematic Diagram of RF Section for Bands A and B.

When this switch is turned to MAIN, the main antenna is connected into the circuit and the terminals marked E and EXT on the terminal board (TB2) are connected together. Thus, if an emergency antenna were connected to E and a lead connected between EXT and another receiver, the emergency antenna would be connected to the other receiver through the 128-AY. When the antenna switch is turned to EMERG, the main antenna is grounded and the emergency antenna disconnected from EXT and connected into the circuit.

(2) The antenna trimmer (C2) is mounted on the panel and provides a means of adjusting the antenna tuned circuit for maximum output over the entire frequency range of the receiver.

(3) The lightning arrester (LA) is a neon lamp which is connected across the antenna input circuit. If the antenna input voltage rises above approximately 60 volts, the neon lamp ignites and becomes a very low resistance However, on ordinary radio signal voltages, the arrester presents negligible loading on the input circuit. In this way, the antenna coils are protected from lightning and also from high voltages induced in the antenna by local high-powered transmitters.

(4) The two ganged band switches, (S2) and (S3), connect the proper coils into the circuit and also make the necessary circuit changes for each band. For the purpose of explanation, assume that the band switches are on Band A. The circuit arrangement for Bands A and B are the same. A simplified schematic diagram of the r-f section for these two bands is shown in figure 5. Two sections of the tuning capacitor (C1A) and (C1B) are connected in parallel to form the capacitive portion of the antenna tuned circuit.

(5) The capacitor (C5) provides a low-impedance path to ground for the r-f current in the secondary of the antenna coil. This is required because the low potential end of the coil is connected to B— instead of ground and B— is not grounded except when operating from batteries.

(6) The resistor (R4) prevents the r-f current from entering the B supply circuit, but still provides a d-c path between the antenna coil and B—.

(7) The resistor-capacitor combination (R5-C8) is a protective device that prevents damage to the tube (V1) and its associated circuit if the tuning capacitor is accidentally shorted when the receiver is used on d-c line with the positive side grounded.

(8) The plate circuit of the r-f amplifier tube (V1) is untuned and inductively coupled to the detector and regenerator tuned grid circuit. The two capacitor combinations, (C1C) in series with (C6) and (C1D) in

series with (C7), are connected in parallel to form the capacitive portion of this tuned circuit. The purpose of these fixed capacitors, (C6) and (C7), is to protect the coil in the circuit if either (C1C) or (C1D) is shorted when the receiver is used on d-c line with the positive side grounded.

(9) When the band switch is on either Band C or D, the r-f circuit is slightly different. A simplified schematic diagram of the r-f section for Bands C and D is shown in figure 6. On these two bands, an additional coil is connected into the input circuit and, with the capacitor (C1B), forms a third tuned circuit. This tuned circuit is capacitively coupled to the antenna tuned circuit by means of the capacitor (C5). The circuits are coupled at their low-potential ends. Only one section of the main tuning capacitor is used in each tuned circuit on these two bands. This results in a better ratio of inductance to capacitance at the higher frequencies. The purpose of the extra tuned circuit is to provide the increased selectivity that is necessary at the higher frequencies. One section (C1C) of the tuning capacitor is disconnected from the detector and regenerator grid tuned circuit on Bands C and D, leaving only (C1D) in use.

b. Regeneration Circuit.—(1) The purpose of the regeneration circuit is to provide increased selectivity and sensitivity for modulated signals and also to act as the local oscillator for the reception of unmodulated signals. Feedback is accomplished by means of a tickler coil in the plate circuit of the regenerator tube which couples energy from the output circuit back into the input circuit. The feedback or regeneration control is a potentiometer (R2) which varies the plate voltage on the regenerator tube. This action varies the gain of the tube and, hence, the amount of feedback. The regeneration control is part of a voltage-divider circuit across the plate voltage supply.

(2) The resistor-capacitor combination (R10-C11) is a scratch filter which minimizes the noise in the output due to the sliding contact of the potentiometer.

(3) The bias for the regenerator tube is obtained from the voltage drop across the grid leak resistor (R11) due to the flow of grid current. Since the regenerator and detector grids are connected together, the regenerator bias will also be applied to the detector tube.

(4) When unmodulated (CW) signals are to be received, the regeneration control is advanced until the regenerator circuit goes into oscillation. The incoming signal then heterodynes or beats with the local oscillator and the difference frequency is produced in the detector and is subsequently amplified by the audio amplifier. The most stable condition of operation occurs at the setting of the regeneration control that causes the tube to *just* go into oscillation.

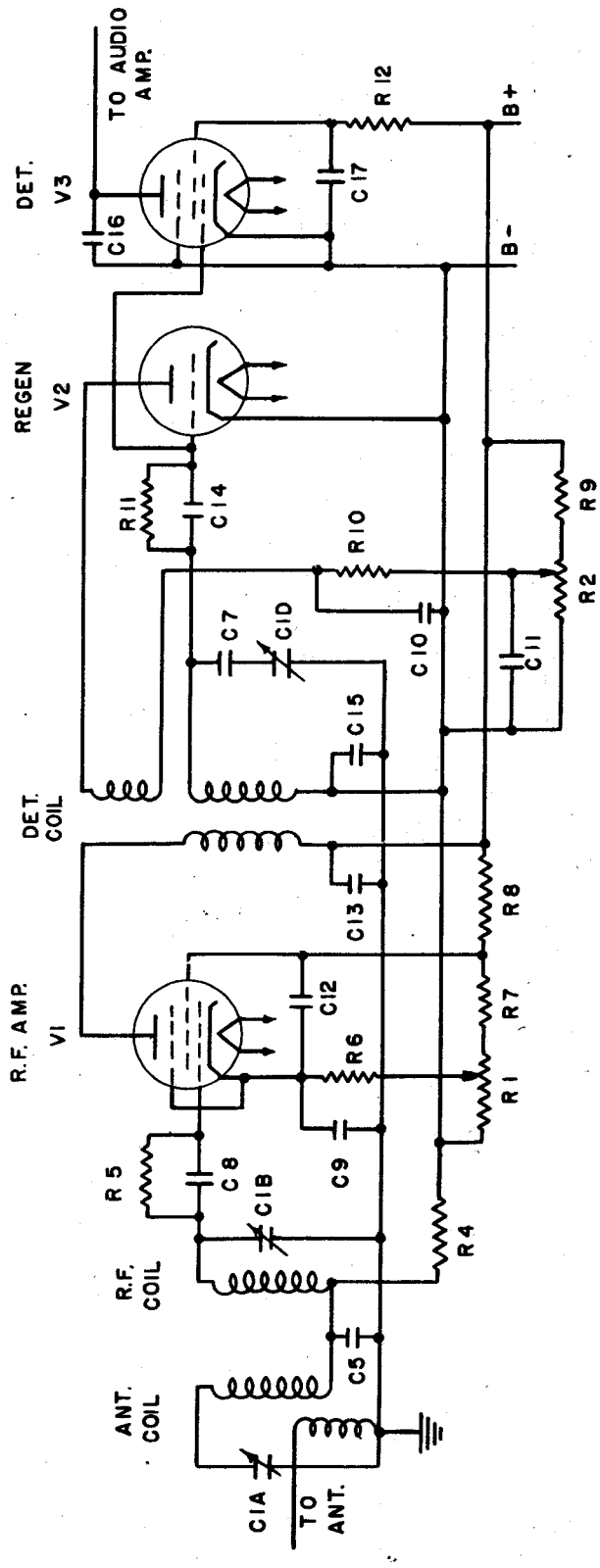


Figure 6—Radio Receiver 128-AY, Simplified Schematic Diagram of RF Section for Bands C and D.

(5) When receiving modulated (MCW or ICW) signals, the sensitivity and selectivity of the receiver may be increased by setting the regeneration control in the region below the point at which oscillation takes place. For maximum sensitivity and selectivity, the control should be set *just* below the point of oscillation.

c. RF Gain Control.—The r-f gain is controlled by the potentiometer (R1) which is part of a voltage divider across the plate voltage supply. By means of this potentiometer, a positive potential is applied to the cathode of the r-f amplifier tube (V1) through the series resistor (R6). The cathode current of the tube (V1) flows through the resistor (R6) and produces an additional bias on the tube. Hence, the tube will be biased even when the r-f gain control is at its maximum setting.

d. AF Amplifier.—(1) The a-f amplifier is a conventional resistance-coupled amplifier using impedance coupling in the output circuit. A blocking capacitor in the output circuit removes the plate voltage from the headphone jack (J1). Since the low limit of the radio-frequency range of the receiver is 15 kc, a large amount of r-f filtering has been incorporated in the audio amplifier to prevent the low radio frequencies from appearing in the output. The resistor (R15) and capacitor (C20) in the detector output circuit comprise a filter circuit for this purpose as also do the resistor and capacitor combination (R23-C34).

(2) The audio gain is controlled by the potentiometer (R3) in the grid circuit of the second audio amplifier tube (V5).

e. Plate Power Supply.—The plate voltage power supply consists of a half-wave rectifier (V6) and a capacitor input filter. Both sides of the supply are filtered in order that the receiver may operate from a d-c line having either the positive or negative side grounded. For normal operation from an a-c line, the plate supply circuit is isolated electrically from the chassis except for the connection through the by-pass capacitors (C30A) and (C30B). The purpose of the resistor (R22) is to drop the line voltage to the required voltage for the rectifier (V6) heater. The pilot lamp (I1) is connected across a portion of the rectifier heater and the circuit is so arranged that the plate current flows through this parallel combination.

f. Power Switching.—(1) By means of the three toggle switches, (S4), (S5), and (S6), the receiver may be connected for use with one of several combinations of heater and plate voltage supplies. A simplified schematic diagram of the power switching is shown in figure 7. Normally the receiver will be supplied by a-c power and both the PLATES and HTRS switches will be in the LINE position. In this case, only the power switch (S4) will be used to turn the receiver on and off. The switch positions for the other combinations of supply voltages are self-evident from figure 7.

(2) If the receiver is to be used on a d-c line, follow the instructions in paragraph 5 *d* (2) *(b) (1)*, page 9.

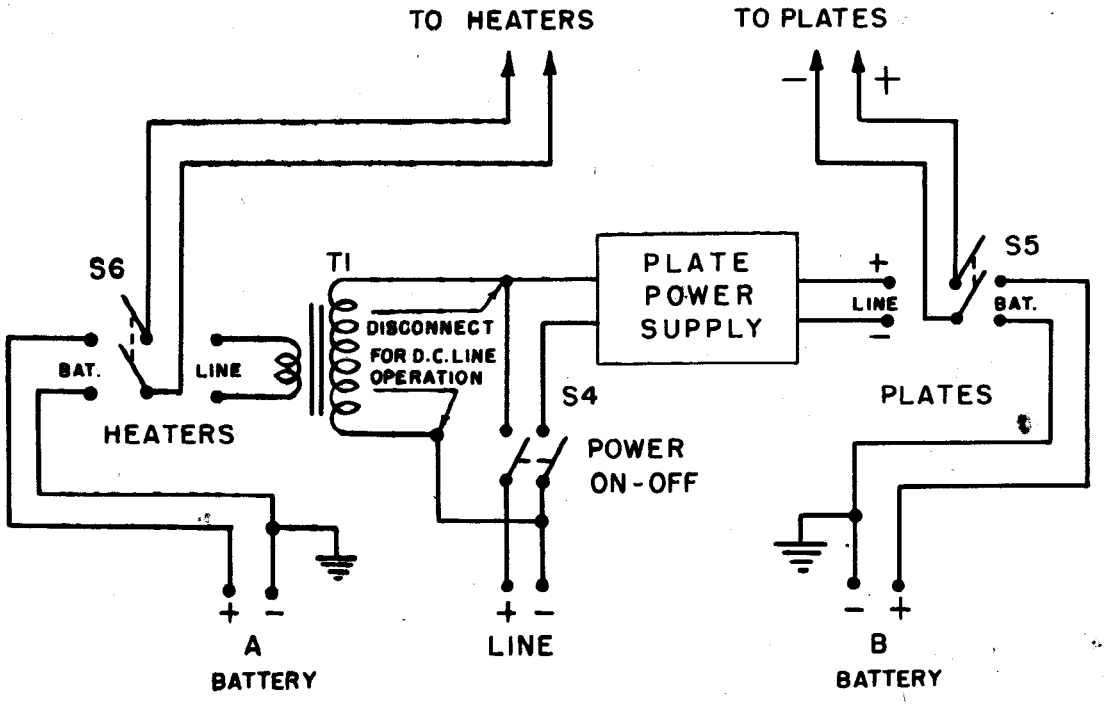


Figure 7—Radio Receiver 128-AY, Simplified Schematic Diagram of Power Switching.

Section IV

SERVICING AND REPAIR

	Paragraph
General	11
Routine Checks for Normal Operation	12
Trouble Location	13
Voltage and Current Measurements	14
Resistance Measurements	15
Sensitivity Measurements	16
Selectivity Measurements	17
RF Alignment Procedure	18
Removal of Parts	19

11. General.—The 128-AY Receiver is fundamentally simple both in design and operation. Very little servicing over long periods of time should be required. However, the vacuum tubes should be checked periodically to insure the continuance of the best possible performance.

12. Routine Checks for Normal Operation.—*a.* When it is desired to test the receiver for normal operation, the following checks will usually suffice. Operation from an a-c source of power is assumed. For other power sources, refer to the summary in paragraph 7 *d*, page 12, for the correct settings of the switches.

(1) Connect the receiver to a 115-volt, 60-cycle source of power and throw the power switch to ON. The pilot lamp should light.

(2) Throw the HTRS switch to LINE. The two dial lamps should light.

(3) Throw the PLATES switch to LINE.

(4) Plug a pair of high-impedance phones into the output jack and advance the AF GAIN control to its maximum position. If the audio amplifier is functioning properly, a small amount of hum should be heard. (AC line only.)

(5) Leave the AF GAIN control at maximum and advance the RF GAIN control to its maximum position. As the movable slider on the control passes over the last few wires, an audible output should be heard. Check this on all bands.

(6) Advance the REGENERATION control rapidly clockwise, starting from its minimum position. A definite thump should be heard in the phones when the receiver goes into oscillation. Check this on all bands.

(7) Finally, connect an antenna to the terminal marked M and a ground wire to the terminal marked G on the terminal board (TB2) in the cabinet. Check the reception on all bands.

b. If the receiver fails to meet any of these checks, refer to the Trouble Location Chart, table 2.

13. Trouble Location.—*a.* If the receiver fails to meet the tests given in the preceding paragraph 12, the trouble can usually be found in a short time by a systematic investigation. The first step is to localize the trouble and then trace it to a single source or component. For instance, if the trouble is confined to a single frequency band, it would tend to exempt from suspicion those radio-frequency components that are common to all bands, that is, the main tuning capacitor, tubes and their associated sockets and circuit components, the power supply, etc. Thus, one would suspect one of the parts selected by the switching operation, that is, a coil, trimmer capacitor, etc., or the switch itself.

b. To aid in the location of the more common troubles, a Trouble Location Chart is given in table 2. If the trouble cannot be located with the aid of this chart, detailed measurements of voltage and resistance will have to be made.

Table 2

TROUBLE LOCATION CHART

Power Source	*Trouble*	*Possible Cause*
AC line	Pilot lamp out	AC line failure. Power switch in OFF position. Fuse (F1) or (F2) defective. (See paragraph 8 *d*, page 12.) Pilot lamp (I1) defective. Heater of Rectifier (V6) open. Resistor (R22) open. AC line disconnected. Cable between cabinet and chassis disconnected.
AC line	Dial lamps out but pilot lamp on	HTRS switch in wrong position. (See paragraph 7 *d*, page 12.) Dial lamps (I2) and (I3) defective. Primary leads to (T1) disconnected.
AC line	No sound when AF GAIN control is at maximum	Defective headphones. PLATES switch in wrong position. (See paragraph 7 *d*, page 12.) Defective output tube (V5). Defective first a-f amplifier tube (V4).
DC line with A battery	Pilot lamp out	DC line failure. Power switch in OFF position. Fuse (F1) or (F2) defective. Resistor (R22) open. Heater of rectifier (V6) open. DC line disconnected. Cable between cabinet and chassis disconnected. Pilot lamp (I1) defective.
DC line with A battery	Dial lamps out but pilot lamp on	HTRS switch in wrong position. (See paragraph 7 *d*, page 12.) Dial lamps (I2) and (I3) defective. A battery not connected.
DC line with A battery	Pilot and dial lamps on but no output	Polarity of d-c line reversed.
Batteries	(Pilot lamp out)	(Normal)
Batteries	Dial lamps out	HTRS switch in wrong position. (See paragraph 7 *d*, page 12.) Dial lamps (I2) and (I3) defective. A battery not connected.

Table 2

TROUBLE LOCATION CHART (Concluded)

Power Source	*Trouble*	*Possible Cause*
Batteries	Dial lamp on but no output	Polarity of B battery reversed.
Any*	No regeneration on all bands	Regenerator tube (V2) or detector tube (V3) defective.
Any*	No signals or weak signals on all bands	Antenna shorted or disconnected. RF amplifier tube (V1) below normal. Antenna switch in wrong position. Antenna cable between cabinet and chassis disconnected. Tuned circuits misaligned excessively. (See paragraph **18**, page 31, for alignment instructions.) Band switch contact dirty. (Rotate switch several times.)
Any*	Noisy or intermittent operation	External noise being picked up by antenna. (Check by disconnecting antenna.) External noise being picked up by power lines. (See paragraph **5** *e*, page 9.) Antenna connection loose. Headset cord or plug defective. Poor contact between a vacuum tube and its socket. Broken wire in one of the cables between cabinet and chassis. (Check cable by bending at several points.) Poor contact between a cable plug and its socket.

* AC line, DC line with A battery, or batteries

14. Voltage and Current Measurements.—*a.* In some instances, a set of vacuum tube voltage and current measurements may be necessary in order to locate the trouble in a receiver. To aid in these measurements, typical values of tube voltages and currents are given in tables 3, 4, and 5. Table 3 is to be used when operating the receiver from an a-c line; table 4 when operating from a d-c line with an A battery; and table 5 when operating the receiver from batteries. The values given in the three tables were obtained with a Model 1183-SC Combination Tester which is a part of the Signal Corps Test Set I-56-C. The measurements should be made by inserting one of the vacuum tubes from the receiver into the proper socket on the tester and inserting the adapter unit of the tester into the corresponding tube socket in the receiver. Then the voltages between the various tube elements and the currents to any of the elements can be measured directly on the tester.

b. Certain voltages and currents, indicated in the tables, should be measured on all bands to check for possible open coils. The values given in the tables are for Band A. The values for other bands may differ somewhat.

c. In general, the voltage measurements should be made on the highest range of the tester that will give accurate readings. By doing this, the effect of the meter resistance on the cicruit will be minimized.

d. The data given in the tables are typical values of voltage and current and, with the exception of the heater voltages, variations in readings of $\pm 15\%$ from these values may be considered normal. The heater voltages (pin #7 to pin #2) should be within $\pm 10\%$ of the corresponding values in the tables.

Table 3

VACUUM TUBE VOLTAGE AND CURRENT MEASUREMENTS FOR AC LINE OPERATION

(All values d-c except where otherwise specified)

VOLTAGE READINGS (VOLTS) BETWEEN TERMINALS DESIGNATED

Terminal Number (+)	Terminal Number (−)	V1 (6SK7)	V2 (6J5)	V3 (6SJ7)	V4 (6SJ7)	V5 (6K6-G)	V6 (35Z5-GT)
3	5	....	....	....	....	115	....
4	5	....	....	....	....	117	....
5	(B−)	(a)	....	....	.80	....	....
6	5	(b)	....	28 (f)	20 (f)	....	....
8	5	(c)	.60	30 (f)	26 (f)	12	....
3	8	....	(d)	....	....	....	....
8	7	....	....	....	....	....	135
8	5*	....	....	....	....	....	155
7	2*	6.2	6.2	6.2	6.2	6.2	28
2	3*	....	....	....	....	....	3.2

CURRENT READINGS (MA) BETWEEN TERMINALS DESIGNATED

Terminal Number	Terminal Number	V1 (6SK7)	V2 (6J5)	V3 (6SJ7)	V4 (6SJ7)	V5 (6K6-G)	V6 (35Z5-GT)
3	3	....	(e)	....	....	5.3	....
4	4	....	....	....	....	.82	....
5	5	....	....	....	....	....	18
6	6	1.1	....	.20	.10	....	....
8	8	4.0	....	.66	.36	....	....

NOTES

Control	Position Min.	Position Max.
(a) RF GAIN	52	3.2
(b) RF GAIN	48	70
(c) RF GAIN	75 (g)	114 (g)
(d) REGENERATION	0	25 (g)
(e) REGENERATION	0	.26

(f) Use 250-volt meter range
(g) Check on all bands

NORMAL CONTROL SETTINGS

Power Switch	ON
PLATES Switch	LINE
HTRS Switch	LINE
Band Switch	A
RF GAIN	Maximum (clockwise)
AF GAIN	Minimum (counterclockwise)
REGENERATION	Minimum (counterclockwise)

* A-C Voltage.

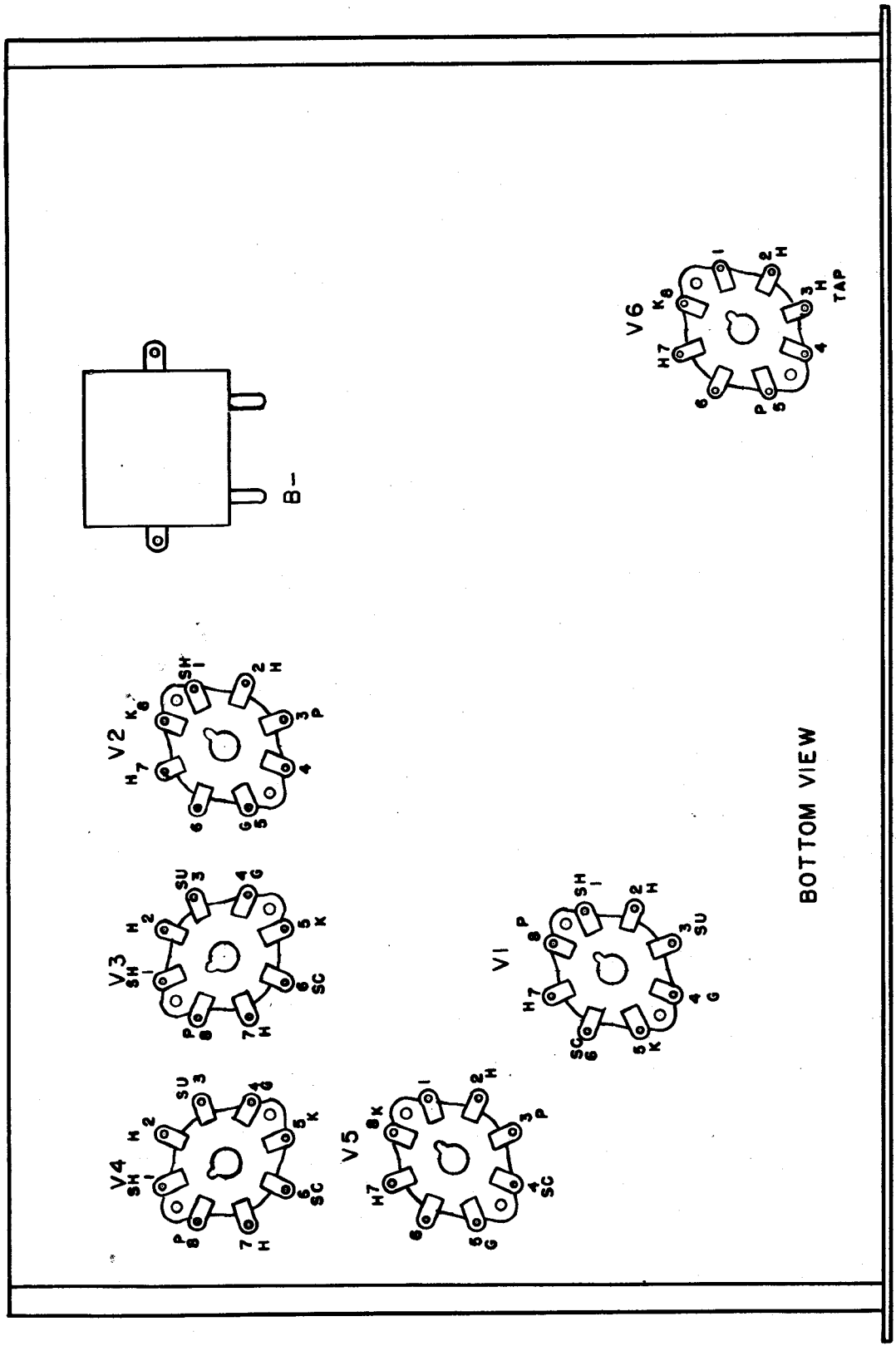


Figure 8—Radio Receiver 128-AY, Tube Socket Location Diagram.

Table 4

VACUUM TUBE VOLTAGE AND CURRENT MEASUREMENTS FOR DC LINE OPERATION

(All values d-c)

VOLTAGE READINGS (VOLTS) BETWEEN TERMINALS DESIGNATED

Terminal Number (+)	Terminal Number (−)	V1 (6SK7)	V2 (6J5)	V3 (6SJ7)	V4 (6SJ7)	V5 (6K6-G)	V6 (35Z5-GT)
3	5	....	....	....	....	100	....
4	5	....	....	....	....	102	....
5	(B−)	(a)	....	....	.72	....	....
6	5	(b)	....	25 (f)	19 (f)	....	....
8	5	(c)	.54	27 (f)	24 (f)	8.5	....
3	8	....	(d)	....	....	....	....
7	2	5.8	5.8	5.8	5.8	5.8	....
8	5	....	....	....	....	....	2.5
8	7	....	....	....	....	....	2.5
2	7	....	....	....	....	....	30
2	3	....	....	....	....	....	2.5

CURRENT READINGS (MA) BETWEEN TERMINALS DESIGNATED

Terminal Number	Terminal Number	V1 (6SK7)	V2 (6J5)	V3 (6SJ7)	V4 (6SJ7)	V5 (6K6-G)	V6 (35Z5-GT)
3	3	....	(e)	....	....	4.0	....
4	4	....	....	....	....	.63	....
5	5	....	....	....	....	....	13
6	6	.95	....	.15	.08	....	....
8	8	3.2	....	.52	.30	....	....

NOTES

Control	Position Min.	Position Max.
(a) RF GAIN	42	3.0
(b) RF GAIN	40	57
(c) RF GAIN	63 (g)	98 (g)
(d) REGENERATION	0	20 (g)
(e) REGENERATION	0	.20

(f) Use 250-volt meter range
(g) Check on all bands

NORMAL CONTROL SETTINGS

Power Switch	ON
PLATES Switch	LINE
HTRS Switch	BATTERY
Band Switch	A
RF GAIN	Maximum (clockwise)
AF GAIN	Minimum (counterclockwise)
REGENERATION	Minimum (counterclockwise)

Table 5

VACUUM TUBE VOLTAGE AND CURRENT MEASUREMENTS FOR BATTERY OPERATION

(All values d-c)

VOLTAGE READINGS (VOLTS) BETWEEN TERMINALS DESIGNATED

Terminal Number (+)	Terminal Number (−)	V1 (6SK7)	V2 (6J5)	V3 (6SJ7)	V4 (6SJ7)	V5 (6K6-G)	V6 (35Z5-GT)
3	5	....	....	....	....	88	....
4	5	....	....	....	....	90	....
5	(B−)	(a)	....	....	.63	....	....
6	5	(b)	....	22 (f)	17 (f)	....	....
8	5	(c)	.50	24 (f)	20 (f)	7.2	....
3	8	....	(d)	....	....	....	....
7	2	5.8	5.8	5.8	5.8	5.8	....

CURRENT READINGS (MA) BETWEEN TERMINALS DESIGNATED

Terminal Number	Terminal Number	V1 (6SK7)	V2 (6J5)	V3 (6SJ7)	V4 (6SJ7)	V5 (6K6-G)	V6 (35Z5-GT)
3	3	....	(e)	....	....	3.8	....
4	4	....	....	....	....	.58	....
6	6	.80	....	.14	.08	....	....
8	8	3.0	....	.46	.28	....	....

NOTES

Control	Position Min.	Position Max.
(a) RF GAIN	33	2.3
(b) RF GAIN	34	50
(c) RF GAIN	55 (g)	88 (g)
(d) REGENERATION	0	15 (g)
(e) REGENERATION	0	.17

(f) Use 250-volt meter range
(g) Check on all bands

NORMAL CONTROL SETTINGS

Power Switch	OFF
PLATES Switch	BATTERY
HTRS Switch	BATTERY
Band Switch	A
RF GAIN	Maximum (clockwise)
AF GAIN	Minimum (counterclockwise)
REGENERATION	Minimum (counterclockwise)

15. Resistance Measurements.—*a.* In the event that the trouble cannot be located by means of any of the preceding tests, it will be necessary to analyze the receiver by means of a series of resistance measurements. The resistance measurements are divided into three groups which are given in tables 6, 7, and 8. In table 6 the resistances from the tube socket terminals to the chassis of the receiver are given. Table 7 gives the resistances of the r-f coils, and table 8 gives various point-to-point resistances. A Tube Socket Location Diagram is shown in figure 8 and a Chassis Location Diagram in figure 9.

b. All resistance measurements in the three tables were made on a Model 1183-SC Combination Tester which is a unit of the Signal Corps Test Set I-56-C. Since it is possible in many instances to measure a resistance on one of several ranges, the greatest accuracy will be obtained if the range is chosen that gives a reading as near the center portion of the scale as possible.

c. The resistances given in the tables represent typical values and variations in readings of ±20% from these values may be considered normal.

d. CAUTION: Make certain that the receiver is disconnected from all sources of power before any resistance measurements are made.

Table 6

TUBE SOCKET TERMINAL RESISTANCE MEASUREMENTS

Pin No.	V1 (6SK7)	V2 (6J5)	V3 (6SJ7)	V4 (6SJ7)	V5 (6K6-G)	V6 (35Z5-GT)
1	0	0	0	0	Open	Open (d)
2	Open	Open	Open	Open	Open	980 (d)
3	(a)	(b)	0	1800	68 M	980 (d)
4	110 M	Open	1.0 Meg	470 M	68 M	Open (d)
5	(a)	1.0 Meg.	0	1800	(c)	980 (d)
6	63 M	Open	540 M	1.1 Meg.	Open	Open (d)
7	Open	Open	Open	Open	Open	950 (d)
8	68 M	0	215 M	340 M	1800	128 M (d)

NOTE 1: All measurements are between designated tube socket terminal and chassis unless otherwise specified.
NOTE 2: M designates thousands, for example 110 M is to be read 110,000.

NOTES

Control	Position Min.	Position Max.
(a) RF GAIN	40 M	680
(b) REGENERATION	47 M	88 M
(c) AF GAIN	0	500 M
(d) PLATES Switch (Measure between designated terminal and B−)	LINE	

NORMAL CONTROL SETTINGS

Power Switch	OFF
PLATES Switch	BATTERY
HTRS Switch	LINE
Band Switch	A
AF GAIN	Maximum (clockwise)
RF GAIN	Maximum (clockwise)
REGENERATION	Maximum (clockwise)

Table 7

RF COIL RESISTANCE MEASUREMENTS

Measure between Terminals (a) & (b)**	Band* A	B	C	D	Coils
(a) P1 Term. #1 (b) Chassis	29	4.0	2.8	0.85	L1, L2, L3, L4 (Prim.)
(a) C1A stator (b) Junction of R4 & C5	140	23.	13.5	5.5	L1, L2, L3, L4 (Sec.)
(a) C1B stator (b) Junction of R4 & C5	140	23.	14.0	5.5	L1, L2 (Sec.) L5, L6
(a) V1 plate (#8) (b) P4 Term. #8 (B+)	33	6.9	5.2	1.5	L7, L8, L9, L10 (Prim.)
(a) V2 plate (#3) (b) Junction of R10 & C10	9.8	1.5	0.9	0.47	L7, L8, L9, L10 (Ticklers)
(a) Junction of R11, C14 & C7 (b) Chassis	140	24.	14	5.7	L7, L8, L9, L10 (Sec.)

* Set band switch to corresponding band.
** Set PLATES switch to BATTERY.

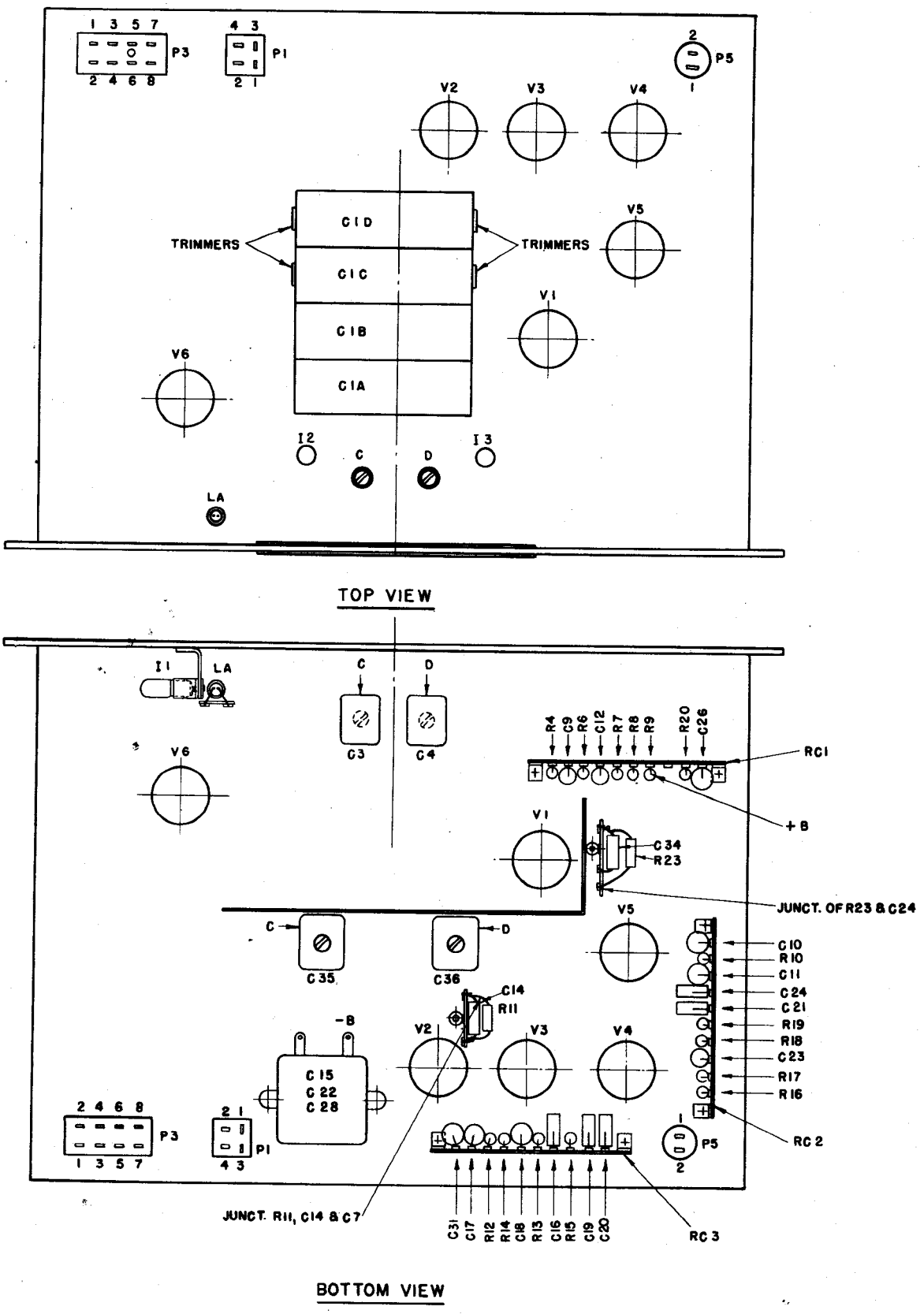


Figure 9—Radio Receiver 128-AY, Chassis Location Diagram.

Table 8

MISCELLANEOUS POINT-TO-POINT RESISTANCE MEASUREMENTS

Measure Between Terminals (a) & (b)	Principal Components	Resistance	Control Settings
(a) Junction R15 & C19 (b) V3 plate (#8)	R15	27 M	.....
(a) Junction R23 & C24 (b) V5 grid (#5)	R23	1 Meg.	AF GAIN control at max. (clockwise)
(a) Stator of C1B (b) Chassis	R4	10 M	Band switch to D PLATES switch to BATTERY
(a) V1 plate (#8) (b) V1 screen (#6)	R8	24 M	PLATES switch to BATTERY
(a) V3 plate (#8) (b) V3 screen (#6)	R12, R13 & R14	620 M	.....
(a) V4 plate (#8) (b) V4 screen (#6)	R18 & R10	1.3 Meg.	.....
(a) V5 plate (#3) (b) V5 screen (#4)	L12	405	.....
(a) V6 cathode (#8) (b) B+	L13	405	PLATES switch to LINE
(a) V3 plate (#8) (b) B+	R13 & R14	147 M	.....
(a) V2 plate (#3) (b) B+	R9 & R10	110 M	PLATES switch to BATTERY REGENERATION control at max. (clockwise)
(a) V1 screen (#6) (b) V1 cathode (#5)	R7	39 M	RF GAIN control at max. (clockwise)
(a) V3 plate (#8) (b) V4 grid (#4)	C19	680 M	PLATES switch to BATTERY
(a) V4 plate (#8) (b) V5 grid (#5)	C24	840 M	PLATES switch to BATTERY AF GAIN control at max. (clockwise)
(a) C1D stator (b) Chassis	....	Open	PLATES switch to BATTERY
(a) C1C stator (b) Chassis	....	Open	PLATES switch to BATTERY

NOTE: M designates thousands, for example 27 M is to be read 27,000.

Table 8 (Concluded)

MISCELLANEOUS POINT-TO-POINT RESISTANCE MEASUREMENTS

Measure Between Terminals (a) & (b)	Principal Components	Resistance	Control Settings
(a) B— (b) Chassis	....	Open*	PLATES switch to LINE
(a) P5 (*1) (b) P5 (*2)	....	Open	PLATES switch to BATTERY
(a) P4 (*6) (b) P4 (*7)	....	Open	Disconnect power cable
(a) P4 (*8) (b) P4 (*7)	....	Open	Disconnect power cable
(a) P4 (*1) (b) P4 (*4)	T1 (primary)	60	Disconnect power cable
(a) P4 (*3) (b) P4 (*5)	T1 (secondary)	.35	Disconnect power cable

* Disregard initial reading due to charging of capacitors.

16. Sensitivity Measurements.—*a. General.*—(1) The sensitivity measurements given in the accompanying tables are divided into CW sensitivities, table 9, MCW sensitivity with regeneration, table 10, and MCW sensitivities without regeneration, table 11. In all tables, both average and permissible values are given. The permissible values take into consideration variations in measuring equipment and technique, humidity, temperature, and, in the case of MCW sensitivities with regeneration, background noise.

(2) MCW sensitivity values with regeneration are given to indicate the actual operating performance of the receiver. MCW sensitivity values without regeneration are also given primarily for use in making test measurements. Data obtained under this condition are more easily duplicated.

(3) All measurements should be made in the absence of external interference such as man-made and natural static. This is particularly true of measurements made with regeneration because of the higher receiver sensitivity under this condition. Thus, in order to obtain data that can be duplicated, the measurements should be made in a shielded booth. MCW sensitivity measurements with regeneration eliminated, and consequently the effect of external noise minimized, are more useful in checking the performance of a receiver than are MCW sensitivity measurements with regeneration.

(4) The MCW sensitivity measurements without regeneration are really gain measurements because the gain controls are set at maximum rather than to give a specific noise output in the absence of a signal.

(5) Normally it will be necessary to check the receiver at only one frequency in each band.

(6) All of the sensitivity values given are based on a-c line operation. If the receiver is operated from a d-c line or from batteries, the required signal input, in general, will be somewhat greater, that is, the receiver will not be as sensitive.

b. Equipment.—To make sensitivity measurements, the following equipment is required:

(1) A signal generator with calibrated output, frequency range of 15-600 kc, and capable of being internally modulated.

(2) A constant-impedance output meter. (The sensitivity measurements given in these tables were made using a Model 650-SC Output Meter from a Signal Corps Test Set I-56-C. The impedance of this meter is 4000 ohms. Measurements made using a meter having a different impedance will differ somewhat from those given.)

(3) A pair of high-impedance headphones for monitoring purposes. Crystal phones or phones whose impedance is at least 20,000 ohms should be used.

(4) A .001 μf (1000$\mu\mu$f) capacitor to be used as a dummy antenna.

c. Connections and Preliminary Adjustments.—(1) Connect a pair of leads to the terminals marked M and G on the terminal board (TB2) in the cabinet and bring them out through one of the holes in the back.

(2) Connect the lead from the G terminal to the ground lead of the signal generator and insert the .001 μf capacitor between the lead from the M terminal and the ungrounded lead from the signal generator.

(3) Connect a pair of leads to the terminals marked TEL on terminal board (TB3) and bring out through a hole in the back of the cabinet. Connect these leads to the output meter.

(4) Plug the high-impedance phones into the jack marked PHONES on the front panel.

(5) Turn the ANTENNA switch to MAIN.

(6) Place the receiver in operation by setting the three toggle switches in their correct positions for the power source used as given in paragraph 7 *d*, page 12.

d. Procedure for Measuring CW Sensitivity.—(1) Make the connections and preliminary adjustments described in the preceding paragraph 16 *c*.

(2) Set the frequency of the signal generator to 400 kc, the output to 0, and the modulation to OFF.

(3) Set the receiver panel controls as follows:

(a) Band switch to D.

(b) Main tuning capacitor to 400 kc.

(c) AF GAIN at maximum.

(d) RF GAIN near maximum.

(e) REGENERATION to just above the point of oscillation as determined by use of the headphones.

(4) Set the output voltage of the signal generator to a value equal to the corresponding value given in table 9 and tune the receiver to produce maximum deflection on the output meter. The frequency of the output beat note will be approximately 400 cycles for this condition. Either the signal generator output or the GAIN controls of the receiver should be adjusted to keep the maximum output below five volts.

(5) Adjust the ANTENNA TRIMMER to give maximum output.

(6) Retune the receiver, as in step (4), for maximum output.

(7) Turn the signal generator output to zero and adjust the RF GAIN and AF GAIN controls to produce a reading of 0.2 volts on the lowest range of the output meter. This voltage is produced by the internal noise of the receiver.

(8) Increase the signal input until the receiver output is 4 volts. Vary the frequency of the signal generator slightly to make certain that it is adjusted properly. Readjust the signal generator output if necessary to obtain the 4 volt receiver output. The final reading of the signal generator is the CW sensitivity of the receiver and it should be equal to or less than the corresponding permissible value given in table 9.

(9) Repeat steps (2) to (8) for the other frequencies in table 9. In step (3) the band switch must be set to the proper band.

Table 9

CW SENSITIVITY

Band	Frequency (kc)	Sensitivity Average (μv)	Sensitivity Permissible (μv)
A	16	40	75
	24	15	25
	40	5	10
B	40	12	20
	60	8	15
	100	5	10
C	100	5	10
	150	5	10
	250	4	8
D	250	8	15
	400	8	15
	600	6	12

e. Procedure for Measuring MCW Sensitivity with Regeneration.—(1) Make the connections and preliminary adjustments as described in paragraph 16 *c*, page 27.

(2) Set the frequency of the signal generator to 400 kc, the output to 0, and the modulation to 30%.

(3) Set the receiver panel controls as follows:

(a) Band switch to D.

(b) Main tuning capacitor to 400 kc.

(c) AF GAIN at maximum.

(d) RF GAIN near maximum.

(e) REGENERATION to just below the point of oscillation as determined by use of the headphones.

(4) Set the output voltage of the signal generator to a value equal to the corresponding value given in table 10 and tune the receiver to produce maximum deflection on the output meter. Either the signal generator output or the receiver GAIN controls should be adjusted to keep the maximum output below five volts.

(5) Adjust the ANTENNA TRIMMER to give maximum output. If this causes the receiver to go into oscillation, reduce either the r-f gain or the regeneration. Check the main capacitor tuning.

(6) Readjust the REGENERATION control to produce the maximum output obtainable without the receiver breaking into oscillation. In doing this, it may be necessary to reduce the r-f gain of the receiver slightly to maintain stable operation.

(7) Turn the modulation of the signal generator off. Set the RF GAIN to give 0.2 volts on the 1.5 volt scale of the output meter. At some frequencies, the receiver will oscillate before the 0.2 volts can be obtained. In such cases, use the highest voltage that can be obtained without oscillation taking place.

(8) *(a)* Turn the generator modulation on and adjust the output of the signal generator to produce 4 volts on the receiver output meter.

(b) If it is necessary to change the generator output appreciably, steps (7) and (8) *(a)* must be repeated until the receiver output voltage readings with modulation off and with modulation on are 0.2 and 4 volts, respectively.

(c) The final reading of the signal generator is the MCW sensitivity of the receiver with regeneration for a 26 db (20 to 1) signal-to-noise ratio. This reading should be equal to or less than the corresponding permissible value given in table 10.

(9) Repeat steps (2) to (8) for the other frequencies in table 10. In step (3), the band switch must be set to the proper band.

Table 10

MCW SENSITIVITY WITH REGENERATION

Band	Frequency (kc)	Sensitivity	
		Average (μv)	Permissible (μv)
A	16	150	250
	24	50	80
	40	15	25
B	40	40	70
	60	25	40
	100	8	15
C	100	30	50
	150	10	18
	250	6	10
D	250	12	20
	400	15	25
	600	30	50

f. Procedure for Measuring MCW Sensitivity Without Regeneration.—(1) Make the connections and preliminary adjustments as described in paragraph 16 *c*, page 27.

(2) Set the frequency of the signal generator to 400 kc, the output to 0, and the Modulation to 30%.

(3) Set the receiver panel controls as follows:

(a) Band switch to D

(b) Main tuning capacitor to 400 kc.

(c) AF GAIN at maximum.

(d) RF GAIN at maximum.

(e) REGENERATION at minimum.

(4) Set the output voltage of the signal generator to a value equal to the corresponding value in table 11 and tune the receiver to produce maximum deflection on the output meter. The generator output should be adjusted to keep the maximum receiver output below five volts.

(5) Adjust the ANTENNA TRIMMER to give maximum output. Check the main capacitor tuning.

(6) Adjust the output of the signal generator to produce 4 volts on the receiver output meter. The generator reading is the MCW sensitivity of the receiver without regeneration. This reading should be equal to or less than the corresponding permissible value given in table 11.

(7) Repeat steps (2) to (6) for the other frequencies in table 11. In step (3), the band switch must be set to the proper band

17. Selectivity Measurements.—*a. General.*—(1) Usually it will be unnecessary to check the selectivity when servicing a receiver. However, if the selectivity is believed to be low due possibly to a high coil resistance or high switch contact resistance, it can be checked and compared with the values in table 12 or 13, whichever is applicable.

(2) Average values with regeneration are given in table 12 and without regeneration in table 13. While the selectivity measurements with regeneration are more representative of the actual operating condition of the receiver, measurements should be made without regeneration when servicing a receiver. This is due to the criticalness in the REGENERATION control setting in measurements made with regeneration. (See paragraph 16 *a*, page 26.)

(3) A list of the equipment that is required for selectivity measurements is given in paragraph 16 *b*, page 26.

(4) The selectivity of the receiver is substantially independent of the source of power used.

(5) Normally it will be necessary to check the selectivity of the receiver at only one frequency in each band.

Table 11

MCW SENSITIVITY WITHOUT REGENERATION

Band	Frequency (kc)	Sensitivity	
		Average (μv)	Permissible (μv)
A	16	500	800
	24	150	250
	40	25	40
B	40	200	400
	60	60	120
	100	20	40
C	100	100	200
	150	50	100
	250	20	40
D	250	150	250
	400	50	100
	600	50	100

b. Procedure for Measuring Selectivity With Regeneration.—(1) Make the necessary connections and preliminary adjustments as described in paragraph **16** *c*, page 27.

(2) Set the frequency of the signal generator to 400 kc, the output to 0, and the modulation to 30%.

(3) Set the receiver panel controls as follows:

(a) Band switch to D.

(b) Main tuning capacitor to 400 kc.

(c) AF GAIN at maximum.

(d) RF GAIN at about one-half rotation.

(e) REGENERATION to just below the point of oscillation as determined by use of the headphone.

(4) Set the output of the signal generator to 100 microvolts and tune the receiver to produce maximum deflection on the output meter. The RF GAIN or AF GAIN control should be adjusted to keep the maximum below five volts. (If, at some frequencies, the output meter reading is erratic due to a high receiver noise level, it will be necessary to increase the signal-to-noise ratio by using a larger signal generator output.)

(5) Adjust the ANTENNA TRIMMER to give maximum output.

(6) Readjust the REGENERATION control to produce maximum output obtainable without the receiver breaking into oscillation.

(7) Adjust the RF GAIN and AF GAIN controls to obtain one volt output.

(8) Detune the signal generator appreciably on the low-frequency side of resonance and increase the output of the generator by a factor of 10. Then adjust the signal generator frequency until the output is again one volt. Record the generator frequency as f_1. Repeat this procedure on the high frequency side of resonance and record the generator frequency as f_2. The band width of the receiver for a signal ratio of 10 is equal to $(f_2 - f_1)$. This value should be within $\pm 25\%$ of the corresponding value in table 12.

(9) Repeat step (8) for signal ratios of 100 and 1,000.

(10) Repeat steps (2) to (9) for the other frequencies in table 12. In step (3), the band switch must be set to the proper band.

c. Procedure for Measuring Selectivity Without Regeneration.—(1) Make the necessary connections and preliminary adjustments as described in paragraph **16** *c*, page 27.

(2) Set the frequency of the signal generator to 400 kc, the output to 0, and the modulation to 30%.

(3) Set the receiver panel controls as follows:

(a) Band switch to D.

(b) Main tuning capacitor to 400 kc.

(c) AF GAIN at maximum.

(d) RF GAIN at about one-half rotation.

(e) REGENERATION at minimum.

(4) Set the output of the signal generator to 100 microvolts and tune the receiver to produce maximum deflec-

Table 12

SELECTIVITY WITH REGENERATION

Band	Frequency (kc)	Total Band Width X10 (kc)	X100 (kc)	X1000 (kc)
A	16	1.8	4.8	
	24	2.0	5.2	
	40	2.5	7.5	
B	40	2.2	5.5	18
	60	2.4	6.2	20
	100	4.2	12.	
C	100	2.8	5.8	12
	150	4.0	8.0	20
	250	11.	20.	40
D	250	4.4	9.0	18
	400	5.0	14.	26
	600	11.	22.	50

tion on the output meter. The RF GAIN and AF GAIN controls should be adjusted to keep the maximum output below five volts. (If at some frequencies, the output meter reading is erratic due to a high receiver noise level, it will be necessary to increase the signal-to-noise ratio by using a larger signal generator output.)

(5) Adjust the ANTENNA TRIMMER to give maximum output.

(6) Adjust the RF GAIN or AF GAIN control to obtain a one volt output.

(7) Detune the signal generator appreciably on the low-frequency side of resonance and increase the output of the generator by a factor of 10. Then adjust the signal generator until the output is again one volt. Record the generator frequency as f_1. Repeat this procedure on the high-frequency side of resonance and record the generator frequency as f_2. The band width of the receiver for a signal ratio of 10 is equal to $(f_2 - f_1)$. This value should be within $\pm 15\%$ of the corresponding value in table 13.

(8) Repeat step (7) for signal ratios of 100 and 1,000.

(9) Repeat steps (2) to (8) for the other frequencies in table 13. In step (3), the band switch must be set to the proper band.

18. RF Alignment Procedure. — *a. General.* — If there appears to be appreciable frequency error in the calibration of the receiver, or if the gain of the receiver is low, the tuned circuits should be realigned. The equipment required for this operation is listed in paragraph 16 *b*, page 26.

b. Procedure.— (1) Remove the receiver chassis from its cabinet and set it on end, leaving the cables connected. Removing the chassis from the cabinet will have a negligible effect on the frequency calibration.

(2) Align the receiver as follows:

(a) Connect the signal generator to the receiver through the .001μf capacitor. Connection to the antenna terminal of the receiver should be made by bringing out a lead from the terminal marked M on the terminal board (TB2). Connection to ground may be made in the same manner, that is, by bringing out a lead from terminal G, or by connecting to any convenient ground point on the chassis. The series capacitor must be inserted in the antenna lead.

(b) Set the signal generator and the tuning capacitor of the receiver to 500 kc, the band switch to D, and the output of the generator to zero.

(c) Connect the output meter and the phones to the receiver output. The phones can be plugged into the phone jack and the leads brought out of the cabinet from terminal board (TB3) for the output meter. Switch the output meter to its highest range.

(d) Set the RF GAIN control to between ½ and ¾ full rotation and set the REGENERATION control to just above the point of oscillation.

(e) Adjust the signal generator output and the AF GAIN to give an audible output in the phones. Use the generator in the unmodulated position. If no beat note is heard, detune the signal generator slightly to ascertain whether or not the receiver is at zero beat with the generator. If it is, the oscillator circuit is properly aligned.

Table 13

SELECTIVITY WITHOUT REGENERATION

Band	Frequency (kc)	Total Band Width X10 (kc)	X100 (kc)	X1000 (kc)
A	16	3.0	10	
	24	3.5		
	40	6.5		
B	40	4.	12	
	60	5.	17	
	100	9.		
C	100	4.	8.5	20
	150	6.	13.	28
	250	14.	35.	80
D	250	8.	17.	35
	400	10.	23.	48
	600	19.	46.	100

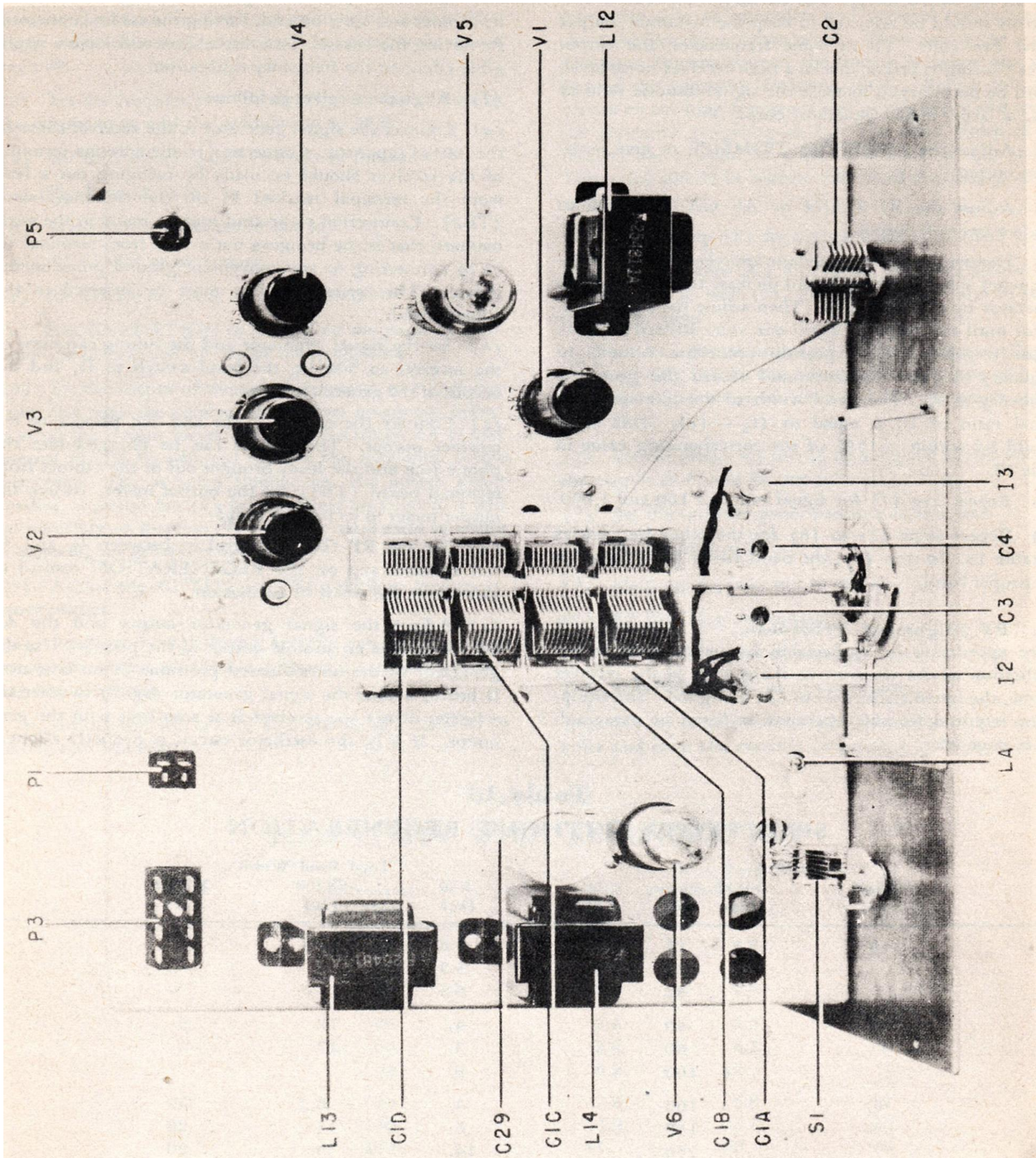


Figure 10—Radio Receiver 128-AY, Top View of Chassis.

Table 14
ALIGNMENT CHART

Band	Frequency (kc)	Tune to Zero Beat	Tune to Maximum Output
B	100	C10 (Trimmer)	-----
C	200	C35	C3
D	500	C36	C4

(f) Adjust the ANTENNA TRIMMER to give maximum output. It may be difficult to tune the antenna circuit because of a slight reaction between it and the oscillator. Therefore it should be tuned as well as possible by ear and not by the output meter as the reading of the meter will be affected by the frequency of the beat note. Furthermore, it is not necessary to tune this circuit accurately as its tuning will have a negligible effect on the frequency calibration of the receiver.

(g) By means of a screw driver adjust the trimmer capacitor (C36) to obtain zero beat as indicated by the phones. This capacitor is accessible from the bottom of the chassis on the rear surface of the coil bracket and is identified by the letter D stamped beside it on the bracket. The location of the capacitor is shown in the Chassis Location Diagram, figure 9.

(h) Set the REGENERATION control to a little below the point of oscillation and set the signal generator modulation to 30%.

(i) Adjust the AF GAIN control and the RF GAIN, if necessary, to produce a reading of about one volt on the output meter. Choose an appropriate range on the meter for this voltage.

(j) Tune the r-f trimmer capacitor (C4) to produce a maximum output as indicated on the meter. If the increase in output is enough to cause the meter needle to go off scale, reduce the output of the signal generator rather than switch the output meter to the next range. This will prevent overloading of the receiver. In any event, the phones should be used as a check on the action of the receiver.

(k) Switch the output meter to its highest range and set the signal generator and tuning capacitor of the receiver to 200 kc with the generator in the unmodulated position. Set the band switch to C.

(l) Repeat steps *(d)* to *(j)*, adjusting (C35) and (C3) instead of (C36) and (C4).

(m) Switch the output meter to its highest range and set the signal generator and tuning capacitor of the receiver to 100 kc. Set the band switch to B.

(n) Repeat steps *(d)* to *(g)*, adjusting one of the trimmers on either side of the rear section (C1C) of the tuning capacitor instead of (C36). The location of this capacitor and its trimmers is shown in figure 9. On Band B there is no r-f tuned circuit to be aligned.

(3) In table 14, the capacitors to be adjusted for each band are listed. It will be noticed that there is no adjustment for Band A. The reason for this is that the trimmer for Band B is common to Bands A and B and, if Band B is properly aligned, Band A will be also.

19. Removal of Parts.—*a.* Most of the electrical and mechanical components of the receiver are mounted in a simple manner and, if necessary, may be easily replaced. In replacing any electrical component requiring the disconnection of leads, always tag or otherwise identify the leads before removal.

b. The following instructions will aid in the replacement of some of the components more difficult to remove:

(1) *RF Coils.*—Each r-f coil can be removed from the coil shield assembly by unsoldering the leads connected to it and removing the screw holding the coil to the assembly. An off-set screw driver will be necessary to remove some of these coils. In removing either coil (L5) or (L6), it will be necessary to move either coil (L4) or (L3), respectively. This may be done by simply removing the mounting screw and swinging the coil to one side, which will leave sufficient space to remove the desired coil.

(2) *RF Trimmer Capacitors.*—To remove either of the two r-f capacitors (C3) or (C4), it will be necessary to move either coil (L4) or (L3), respectively, as described in the preceding paragraph, covering the removal of r-f coils.

(3) *Band Switches.*—The two band switches are connected together by a coupling. To remove either switch, one of the set screws in this coupling must be loosened and the taper pin on the same side removed so that the shafts may be separated. Care must be taken in removing the taper pin as it can be driven out in one direction only. If the rear switch (S3) is to be removed, it may be desirable to dismount the capacitor (C5) with its mounting strip from the coil shield. The capacitor can then be moved out of the way and the switch removed by unsoldering its leads and removing the nut securing it to the coil shield. In removing the front switch (S2), the rear switch must be dismounted from the coil shield and slid back out of the way. To do this, it will be necessary to unsolder two or three wires on the rear switch.

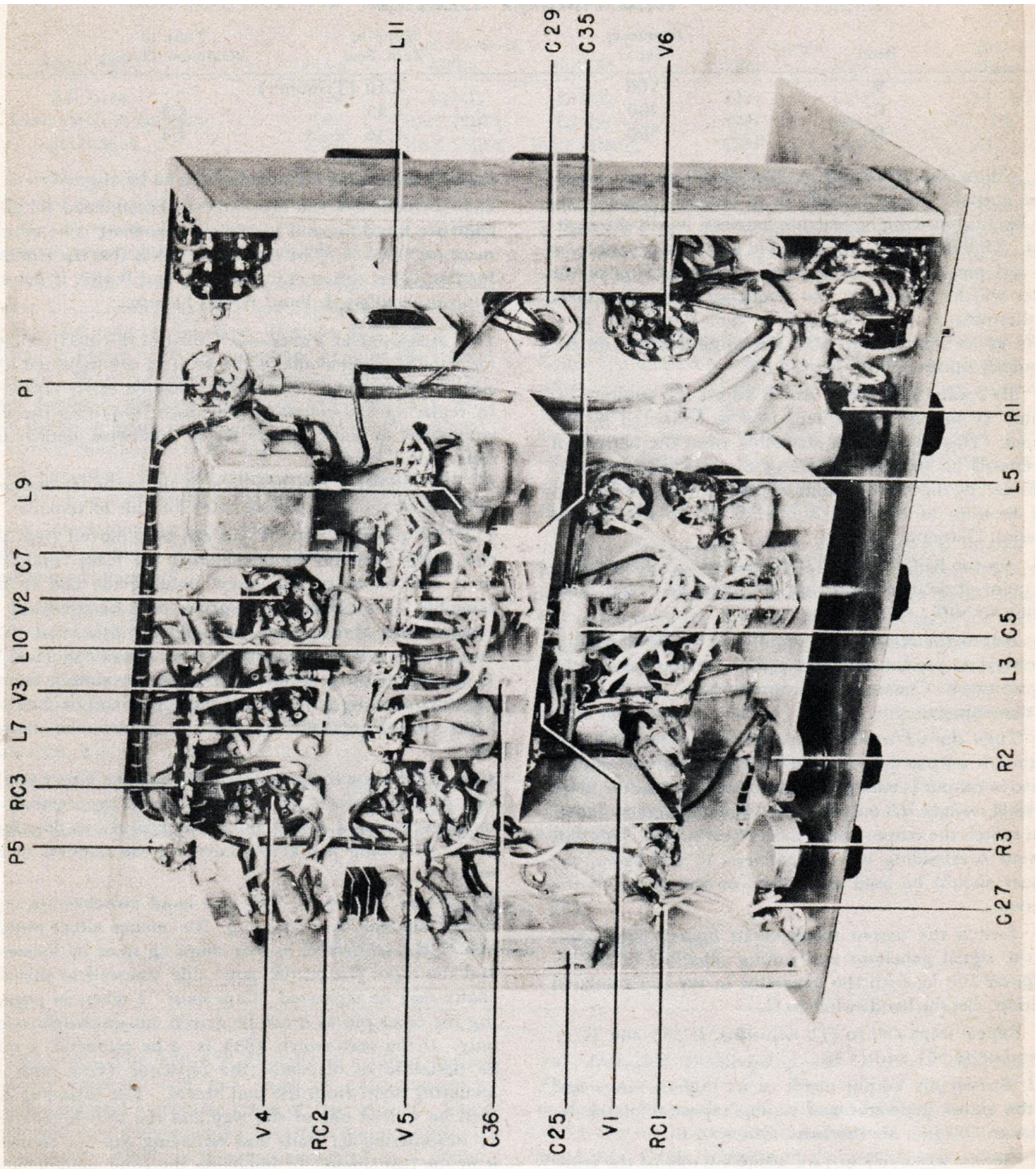


Figure 11—Radio Receiver 128-AY, Bottom Right Oblique View of Chassis.

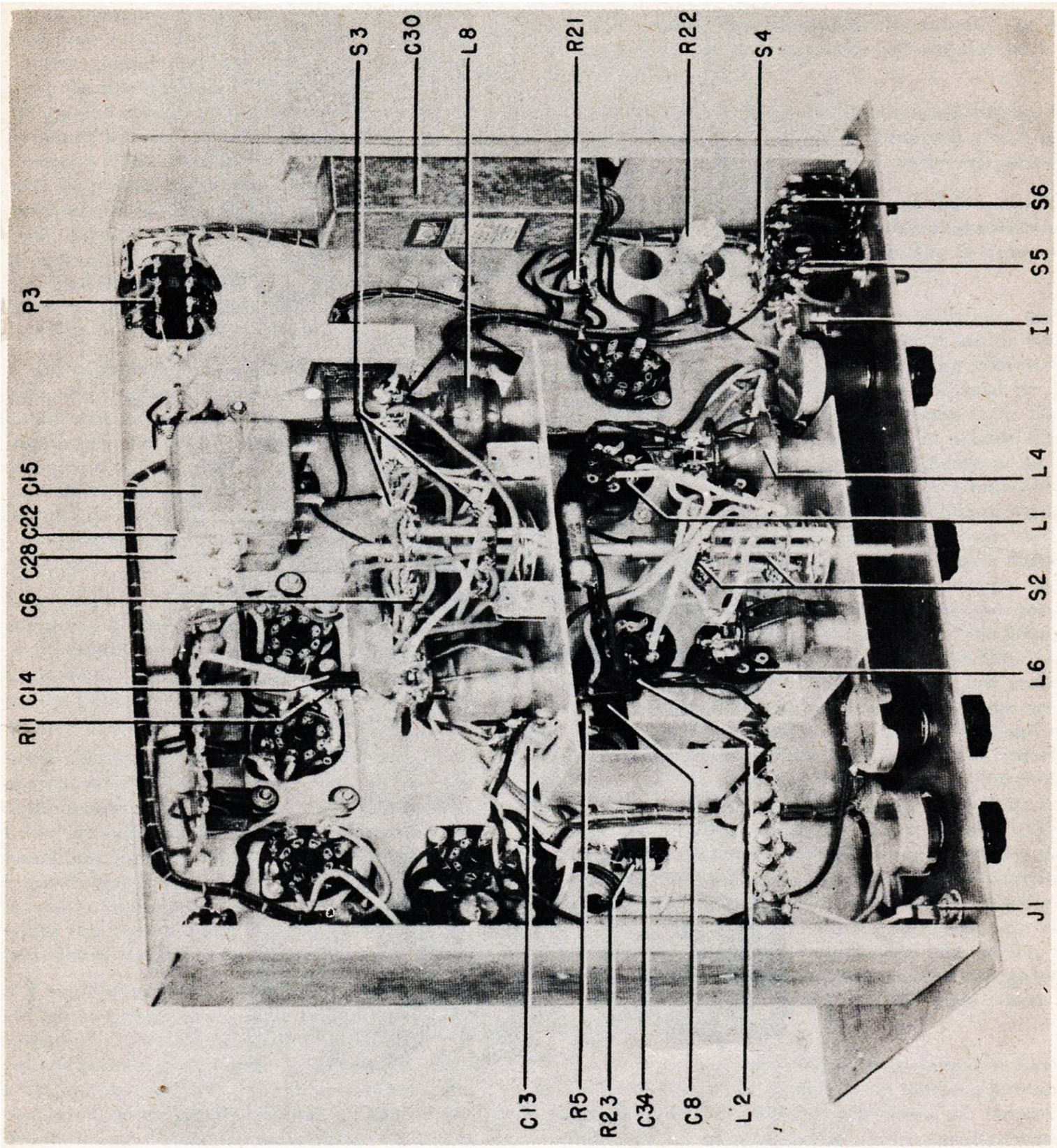


Figure 12—Radio Receiver 128-AY, Bottom Left Oblique View of Chassis.

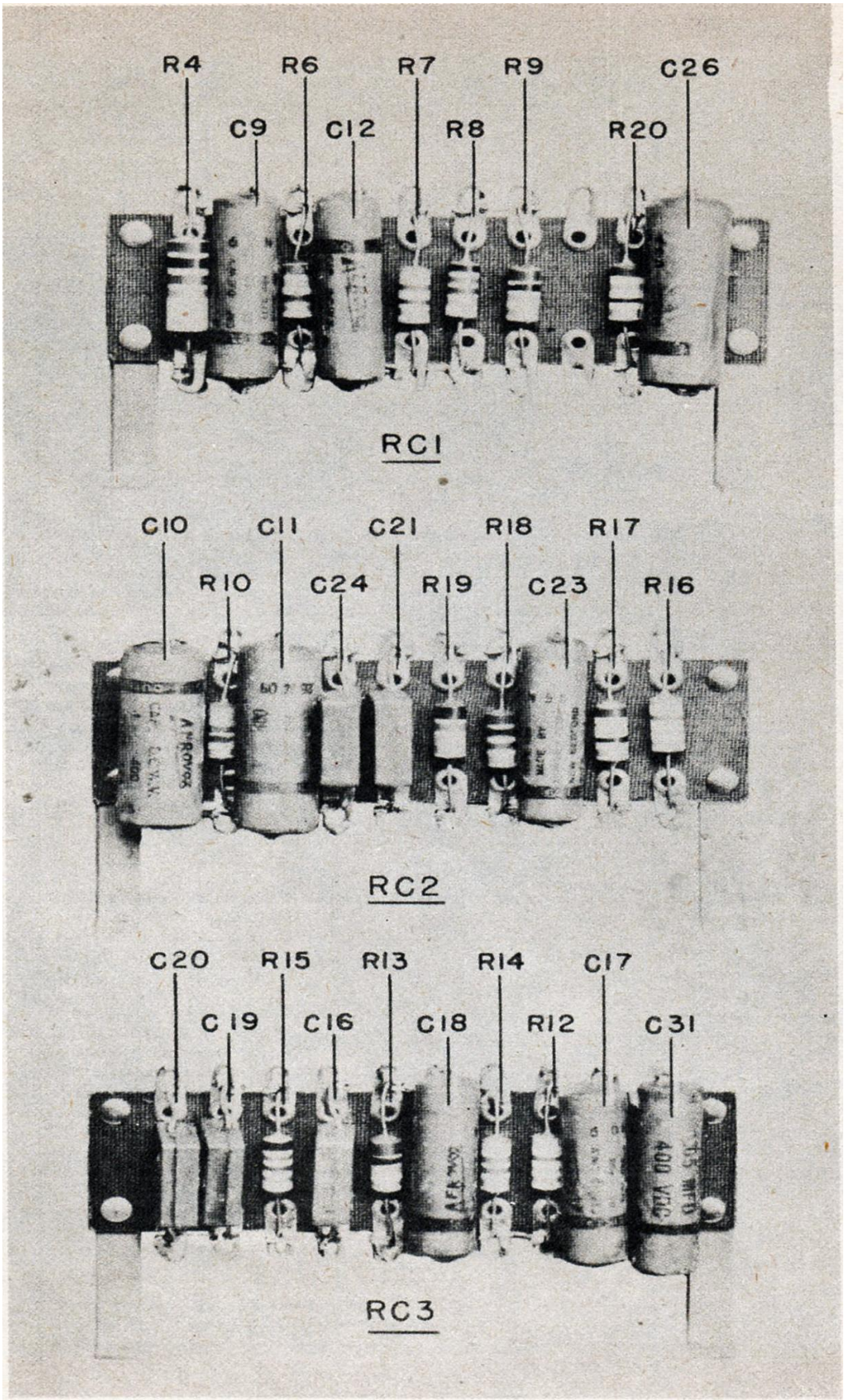


Figure 13—Radio Receiver 128-AY, Resistor-Capacitor Assemblies.

SECTION V

20. TABLE OF REPLACEABLE PARTS

Ref. No.	Stock No.	Name of Part	Description	Function	Drawing No.	Mfr.
C1		Capacitor	Four gang 402 $\mu\mu$f per section (modified per F-24859-1)	Tuning	Model 419	RC
C2		Capacitor	100 $\mu\mu$f straight line capacitance	Antenna Trimmer	SM-100	H
C3		Capacitor	30 $\mu\mu$f mica trimmer (solder lugs to be 90° to rear face of condenser base)	Band C RF Coil Trimmer	MEQ-30	H
C4		Capacitor	30 $\mu\mu$f mica trimmer (solder lugs to be 90° to rear face of condenser base)	Band D RF Coil Trimmer	MEQ-30	H
C5		Capacitor	.05 μf, ±10%, 400 v d-c working, paper tubular	Bypass and Coupling	Type 484	AER
C6		Capacitor	.05 μf, ±10%, 400 v d-c working, paper tubular	Det. Grid Coupling	Type 484	AER
C7		Capacitor	.05 μf, ±10%, 400 v d-c working, paper tubular	Det. Grid Coupling	Type 484	AER
C8		Capacitor	.001 μf, ±10%, 1000 v d-c test, molded mica	RF Amp. Bypass	F-9234-2-19*	SM**
C9		Capacitor	.05 μf, ±10%, 400 v d-c working, paper tubular	RF Amp. Cathode Bypass	Type 484	AER
C10		Capacitor	.1 μf, ±10%, 400 v d-c working, paper tubular	Regen. Plate Bypass	Type 484	AER
C11		Capacitor	.1 μf, ±10%, 400 v d-c working, paper tubular	Regen. Control Bypass	Type 484	AER
C12		Capacitor	.05 μf, ±10%, 400 v d-c working, paper tubular	RF Amp. Screen Bypass	Type 484	AER
C13		Capacitor	.05 μf, ±10%, 400 v d-c working, paper tubular	RF Amp. Plate Supply Bypass	Type 484	AER
C14		Capacitor	.00025 μf, ±10%, 1000 v d-c test, molded mica	Det. Grid Leak Bypass	F-9234-2-5*	SM**
C15		Capacitor	1.0 μf, ±10%, 200 v d-c working, paper metal case with terminals per F-5617-2-1	Det. Grid Bypass	Type 261	AER
C16		Capacitor	.001 μf, ±10%, 1000 v d-c test, molded mica	Det. Plate RF Bypass	F-9234-2-19*	SM**
C17		Capacitor	.05 μf, ±10%, 400 v d-c working, paper tubular	Det. Screen Bypass	Type 484	AER
C18		Capacitor	.05 μf, ±10%, 400 v d-c working, paper tubular	Det. Plate Supply Bypass	Type 484	AER
C19		Capacitor	.001 μf, ±10%, 1000 v d-c test, molded mica	1st AF Amp. Grid Coupling	F-9234-2-19*	SM**
C20		Capacitor	.001 μf, ±10%, 1000 v d-c test, molded mica	1st AF Amp. Grid RF Bypass	F-9234-2-19*	SM**
C21		Capacitor	.001 μf, ±10%, 1000 v d-c test, molded mica	1st AF Amp. Plate RF Bypass	F-9234-2-19*	SM**
C22		Capacitor	1.0 μf, ±10%, 200 v d-c working, paper, metal case with terminals per F-5617-2-1	1st AF Amp. Cathode Bypass	Type 261	AER
C23		Capacitor	.05 μf, ±10%, 400 v d-c working, paper tubular	1st AF Amp. Screen Bypass	Type 484	AER
C24		Capacitor	.001 μf, ±10%, 1000 v d-c test, molded mica	2nd AF Amp. Grid Coupling	F-9234-2-19*	SM**

*FTRC Drawing No.
**Or equal

20. TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	Drawing No.	Mfr.
C25		Capacitor	1.0 μf, ±10%, 200 v d-c working, paper, metal case with terminals per F-5617-2-1	2nd AF Amp. Cathode Bypass	Type 261	AER
C26		Capacitor	.1 μf, ±10%, 400 v d-c working, paper tubular	2nd AF Plate Coupling	Type 484	AER
C27		Capacitor	.004 μf, ±10%, 1000 v d-c test, molded mica	Phone Jack RF Bypass	F-9234-2-23*	SM**
C28		Capacitor	1.0 μf, ±10%, 200 v d-c working, paper, metal case with terminals per F-5617-2-1	2nd AF Amp. Screen Bypass	Type 261	AER
C29		Capacitor	8-8 μf, electrolytic, (can type), separate leads, 450 v d-c working	Power Supply Filter	KR 588A	CD
C30		Capacitor	8-8 μf, replacement paper (actually 3-3 μf), 450 v d-c working	Power Supply Filter	PE CH4808	CD
C31		Capacitor	.05 μf, ±10%, 400 v d-c working, paper tubular	Heater Bypass	Type 484	AER
C32		Capacitor	.1 μf, ±10%, 400 v d-c working, paper tubular	A Supply Bypass	Type 484	AER
C33		Capacitor	.1 μf, ±10%, 400 v d-c working, paper tubular	B Supply Bypass	Type 484	AER
C34		Capacitor	.00025 μf, ±10%, 1000 v d-c test, molded mica	2nd AF Amp. Bypass	F-9234-2-5*	SM**
C35		Capacitor	2-15 μμf, mica, Isolantite	Band C Det. Grid Trimmer	45-2P1	EMM**
C36		Capacitor	2-15 μμf, mica, Isolantite	Band D Det. Grid Trimmer	45-2P1	EMM**
F1		Fuse	1 amp, type 3AG	Line	Type 1040	LI
F2		Fuse	1 amp, type 3AG	Line	Type 1040	LI
F3		Fuse	5 amp, type 3AG	A Battery	Type 1080	LI
F4		Fuse	⅛ amp, type 3AG	B Battery	Type 1044	LI
I1		Pilot Lamp	6-8 v, .15 amp, bayonet base, brown bead	Pilot Lamp	Mazda 47	GE
I2		Dial Lamp	6-8 v, .15 amp, bayonet base, brown bead	Dial Lamp	Mazda 47	GE
I3		Dial Lamp	6-8 v, .15 amp, bayonet base, brown bead	Dial Lamp	Mazda 47	GE
J1		Jack	Midget open circuit	Phone	A1	MAL
L1		Coil	Antenna coil, Band A	Antenna	F-25325-2-1	F
L2		Coil	Antenna coil, Band B	Antenna	F-25325-2-3	F
L3		Coil	Antenna coil, Band C	Antenna	F-25326-2-1	F
L4		Coil	Antenna coil, Band D	Antenna	F-25326-2-4	F
L5		Coil	RF coil, Band C	RF Amplifier	F-25326-2-2	F
L6		Coil	RF coil, Band D	RF Amplifier	F-25326-2-5	F
L7		Coil	Detector coil, Band A	Detector	F-25325-2-2	F
L8		Coil	Detector coil, Band B	Detector	F-25325-2-4	F
L9		Coil	Detector coil, Band C	Detector	F-25326-2-3	F
L10		Coil	Detector coil, Band D	Detector	F-25326-2-6	F
L11		Choke	20 h, 200 ohm	AF Amplifier Isolating	F-7726-1	F
L12		Choke	22 h, 35 ma, 405 ohms (modified per F-25481-1)	Output	T 68C08	TH
L13		Choke	22 h, 35 ma, 405 ohms (modified per F-25481-1)	Power Supply Filter	T 68C08	TH

*FTRC Drawing No.
**Or equal

20. TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	Drawing No.	Mfr.
L14		Choke	22 h, 35 ma, 405 ohms (modified per F-25481-1)	Power Supply Filter	T 68C08	TH
LA		Lightning Arrester	Neon glow lamp T2, unbased	Lightning Arrester	NE-2	GE
P1		Plug	4 prong	Ant. Cable	P-304-AB	JO
P2		Socket	4 prong	Ant. Input	S-304-FHT	JO
P3		Plug	8 prong	Power Cable	P-408-AB 1/16	JO
P4		Socket	8 prong	Power Input	S-408 FHT	JO
P5		Plug	2 prong	Phone Cable	P-302-AB	JO
P6		Socket	2 prong	Phone Input	S-302-FHT	JO
R1		Potentiometer	50,000 ohms, wirewound, right hand taper	RF Gain	P10-50,000 v	CL
R2		Potentiometer	50,000 ohms, wirewound, linear taper	Regen.	P58-50,000	CL
R3		Potentiometer	500,000 ohms, carbon, audio taper	AF Gain	C501	STP
R4		Resistor	10,000 ohms, ±10%, insulated carbon, 1 w	Ant. Coil Decoupling		E**
R5		Resistor	100,000 ohms, ±10%, insulated carbon, ½ w	RF Amp. Limiting		E**
R6		Resistor	680 ohms, ±10%, insulated carbon, ½ w	RF Amp. Cathode		E**
R7		Resistor	47,000 ohms, ±10%, insulated carbon, ½ w	Gain Control Voltage Divider		E**
R8		Resistor	27,000 ohms, ±10%, insulated carbon, ½ w	RF Amp. Screen Dropping		E**
R9		Resistor	100,000 ohms, ±10%, insulated carbon, ½ w	Regen Control Voltage Divider		E**
R10		Resistor	47,000 ohms, ±10%, insulated carbon, ½ w	Regen Plate Supply Decoupling		E**
R11		Resistor	1.0 megohm, ±10%, insulated carbon, ½ w	Regen and Det. Grid Leak		E**
R12		Resistor	470,000 ohms, ±10%, insulated carbon, ½ w	Detector Screen Dropping		E**
R13		Resistor	100,000 ohms, ±10%, insulated carbon, ½ w	Det. Plate Load		E**
R14		Resistor	47,000 ohms, ±10%, insulated carbon, ½ w	Det. Plate Decoupling		E**
R15		Resistor	27,000 ohms, ±10%, insulated carbon, ½ w	Det. Plate RF Filter		E**
R16		Resistor	470,000 ohms, ±10%, insulated carbon, ½ w	1st AF Amp. Grid		E**
R17		Resistor	1,800 ohms, ±10%, insulated carbon, ½ w	1st AF Amp. Cathode		E**
R18		Resistor	1.0 megohm, ±10%, insulated carbon, ½ w	1st AF Amp. Screen Dropping		E**
R19		Resistor	270,000 ohms, ±10%, insulated carbon, ½ w	1st AF Amp. Plate Load		E**
R20		Resistor	1,800 ohms, ±10%, insulated carbon, ½ w	2nd AF Amp. Cathode		E**
R21		Resistor	47,000 ohms, ±10%, insulated carbon, ½ w	Power Supply Bleeder		E**
R22		Resistor	550 ohms, ±5%, 25 w, with terminals and mounting	Rect. Heater Dropping	Type 2A With Type 206 Terminals and Type 756 Mounting	WL
R23		Resistor	1.0 megohm, ±10%, insulated carbon, ½ w	2nd AF Amp. RF Filter		E**
S1		Switch	DPDT less knob, solid shaft with tapped holes omitted	Main-Emerg. Ant.	Type 760	MAL
S2		Switch	Rotary 2 plate, 4 circuit, 4 position, (per F-25462-2)	Ant. Band	Type H	OAK

**Or equal

20. TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	Drawing No.	Mfr.
S3		Switch	Rotary 2 plate, 4 circuit, 4 position (per F-25462-2)	Det. Band	Type H	OAK
S4		Switch	DPST "Bat" type toggle	Line	#81024-FA	H&H
S5		Switch	DPDT "Bat" type toggle	Plates	#81027-FA	H&H
S6		Switch	DPDT "Bat" type toggle	Heaters	#81027-FA	H&H
T1		Transformer	115/63 v, 2 amp, 50/60 cycles	Heater Supply	T388	KT
TB1		Terminal Board	10 terminals (modified per F-25302-1-1)	Line and Battery	Type 50	JO
TB2		Terminal Board	4 terminals (modified per F-25302-1-2)	Antenna	Type 50	JO
TB3		Terminal Board	2 terminals (modified per F-25302-1-3)	Phone	Type 50	JO
V1		Tube	6SK7 (or 6SK7-GT)	RF Amp.	Type 6SK7 (or 6SK7-GT)	RCA**
V2		Tube	6J5 (or 6J5-GT, or 6J5-G)	Regenerator	Type 6J5 (or 6J5-GT or 6J5-G)	RCA**
V3		Tube	6SJ7 (or 6SJ7-GT)	Detector	Type 6SJ7 (or 6SJ7-GT)	RCA**
V4		Tube	6SJ7 (or 6SJ7-GT)	1st AF Amp.	Type 6SJ7 (or 6SJ7-GT)	RCA**
V5		Tube	6K6-G (or 6K6-GT)	2nd AF Amp.	Type 6K6-G (or 6K6-GT)	RCA**
V6		Tube	35Z5-GT	Rectifier	Type 35Z5-GT	RCA**

Quantity	Stock No.	Name of Part	Description	Function	Drawing No.	Mfr.
5		Bushing	Insulating		F-9506-3-18	F
1		Cabinet	Grey wrinkle finish	Receiver Cabinet	F-25256-14-2	F
2		Cable	Single conductor #20 AWG, 3 ft	Phone and Ant.	#8421	BLD
1		Coupling	½" to 3/16" shaft coupling, (remove 5/16" insert and use with KK Knob S-310-S)	Band Switch	EC-240	MAL
1		Coupling		Tuning Capacitor Coupling	F-25303-1	F
1		Dial	Main dial	Tuning	F-25260-2*	CDA or C&C
1		Drive Unit	Drive unit of Type ACN Dial	Tuning Dial	F-25337-1*	N
3		Elastic Stop Nut	Cadmium plated	Tube Mounting Plate	99M62	ESN
4		Fuse Mounting	Extractor type	Fuse Holder	#1075	LI
6		Grommet	Rubber	Tube Mounting Plate	#1453	AIRW
2		Grommet	Rubber	Cabinet	#763	AIRW
1		Holder	Brass, cadmium plated	Lightning Arrester	F-25330-1	F
4		Insert	Bright nickel plated	Panel Mounting	F-20241-1-3	F

*FTRC Drawing No.
**Or equal

20. TABLE OF REPLACEABLE PARTS (Continued)

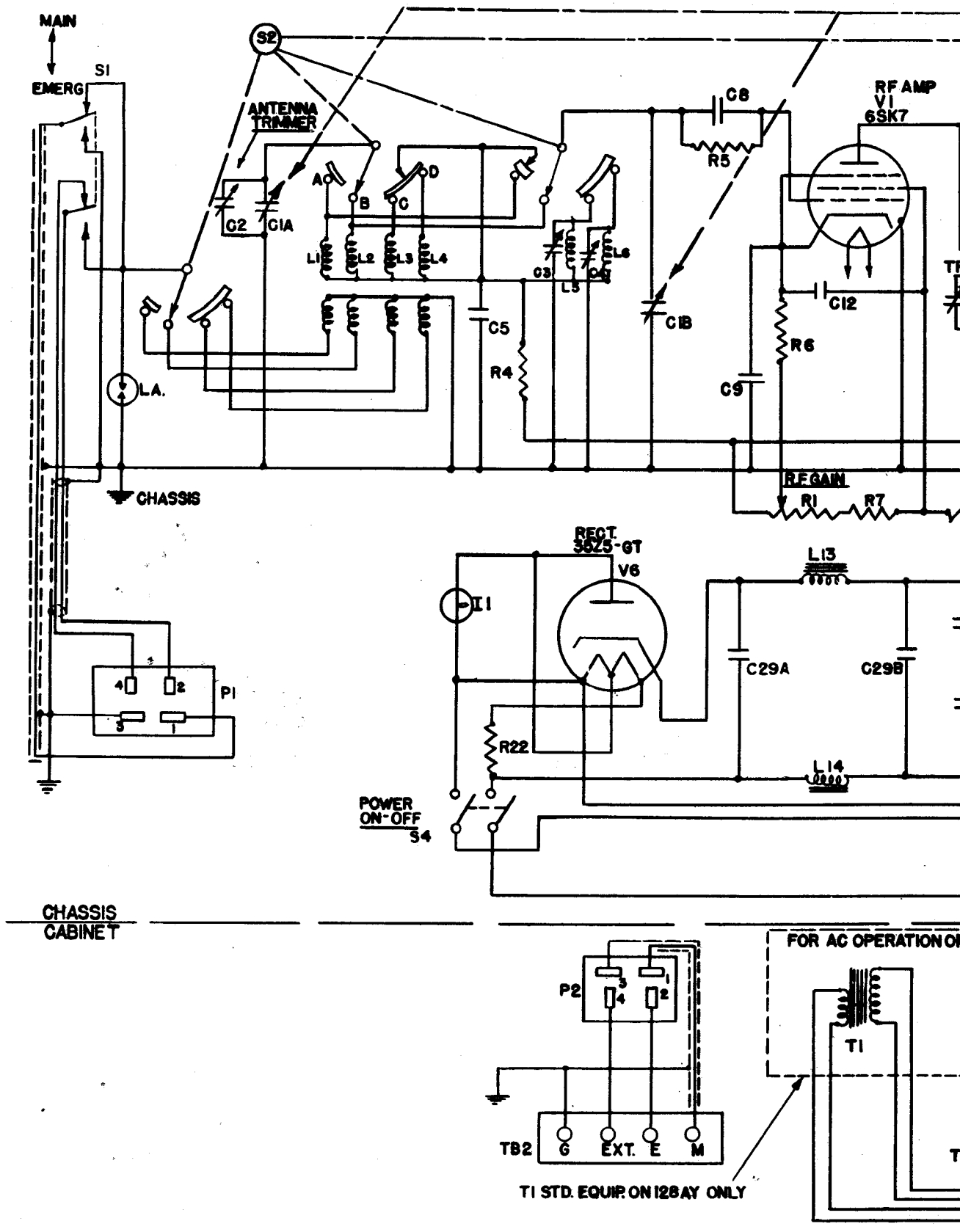
Quantity	Stock No.	Name of Part	Description	Function	Drawing No.	Mfr.
1		Knob	Insert turned flush	Band Switch	S-380-3L	KK
1		Knob	Insert turned flush	Tuning Capacitor	S-310-3	KK
5		Knob	(Modified per F-25322-1)	Panel Control	S-308-3	KK
1		Mounting Plate	Steel, copper and zinc plated	Tube Socket Mounting	F-25469-1	F
1		Panel	Front panel		F-31129-12	F
1		Pointer	(Modified per F-25329-1)	Frequency Indicator	#1464	WIN
3		Resistor Board	Natural canvas bakelite	Resistor and Capacitor Mounting	F-13549-2-3	F
4		Retainer Ring	Nickel flash	Panel Mounting	F-20242-1-2	F
4		Screw	Knurled head	Panel Mounting	F-20243-1-3	F
2		Set Screw	#6-32 headless, copper and cadmium plated	Capacitor Coupling		F
4		Shock Mounting	Plate form holder type per F-9731-1-2	Cabinet Support	150PH-12	L
6		Socket	Octal base per F-9203-12-47	Tube	39-1-E	FR
1		Socket Assembly	Bayonet base, ruby jewel	Pilot Lamp	#10-B	DMC
2		Socket	Bayonet base	Dial Lamp	#203-AH	DMC
1		Stop Bracket	Brass, zinc plated	Tuning Capacitor	F-26860-1	F
1		Window	Vinylite resin sheet, .020" thick	Main Dial	F-25258-1*	CDA or C&C

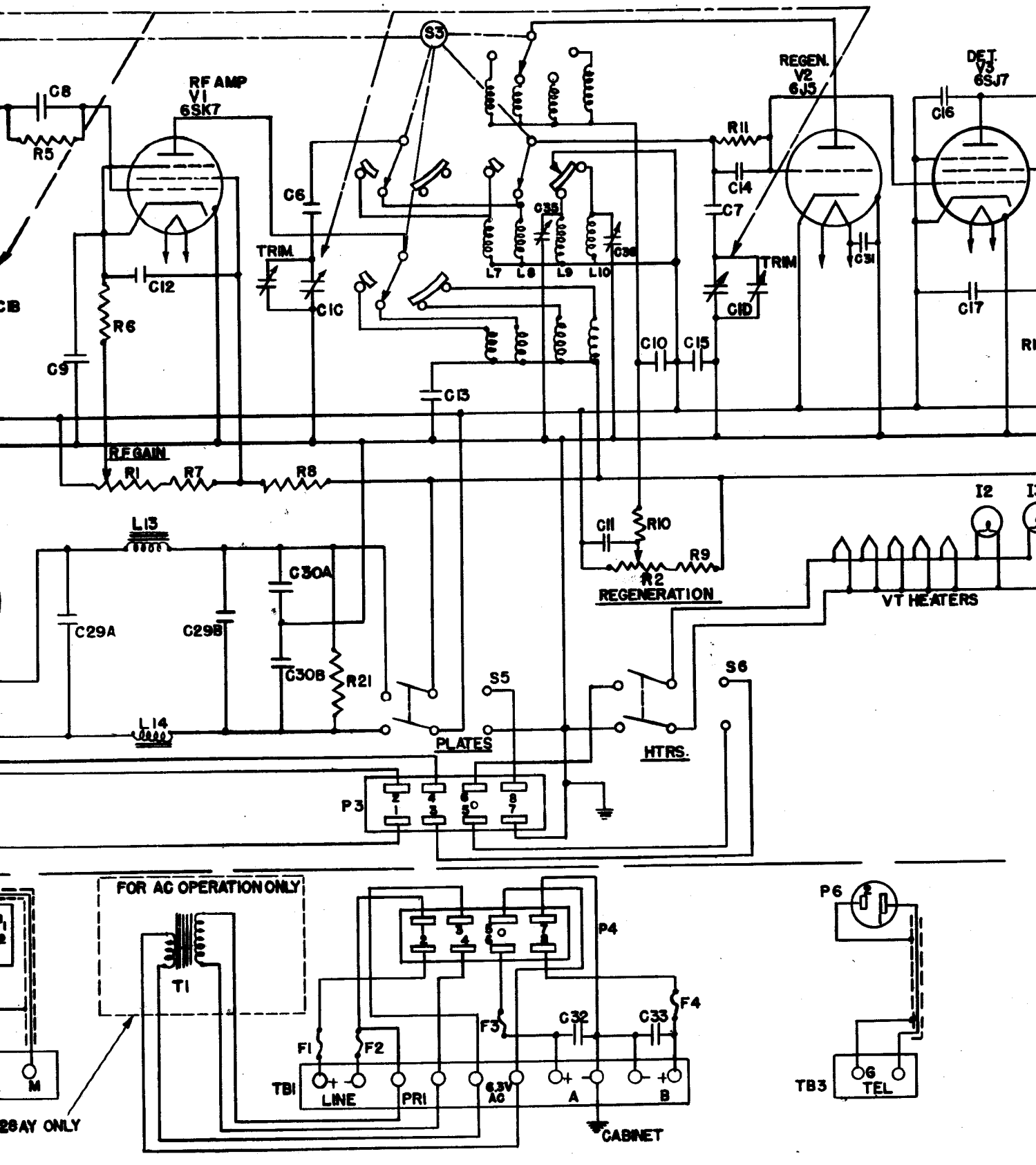
*FTRC Drawing No.

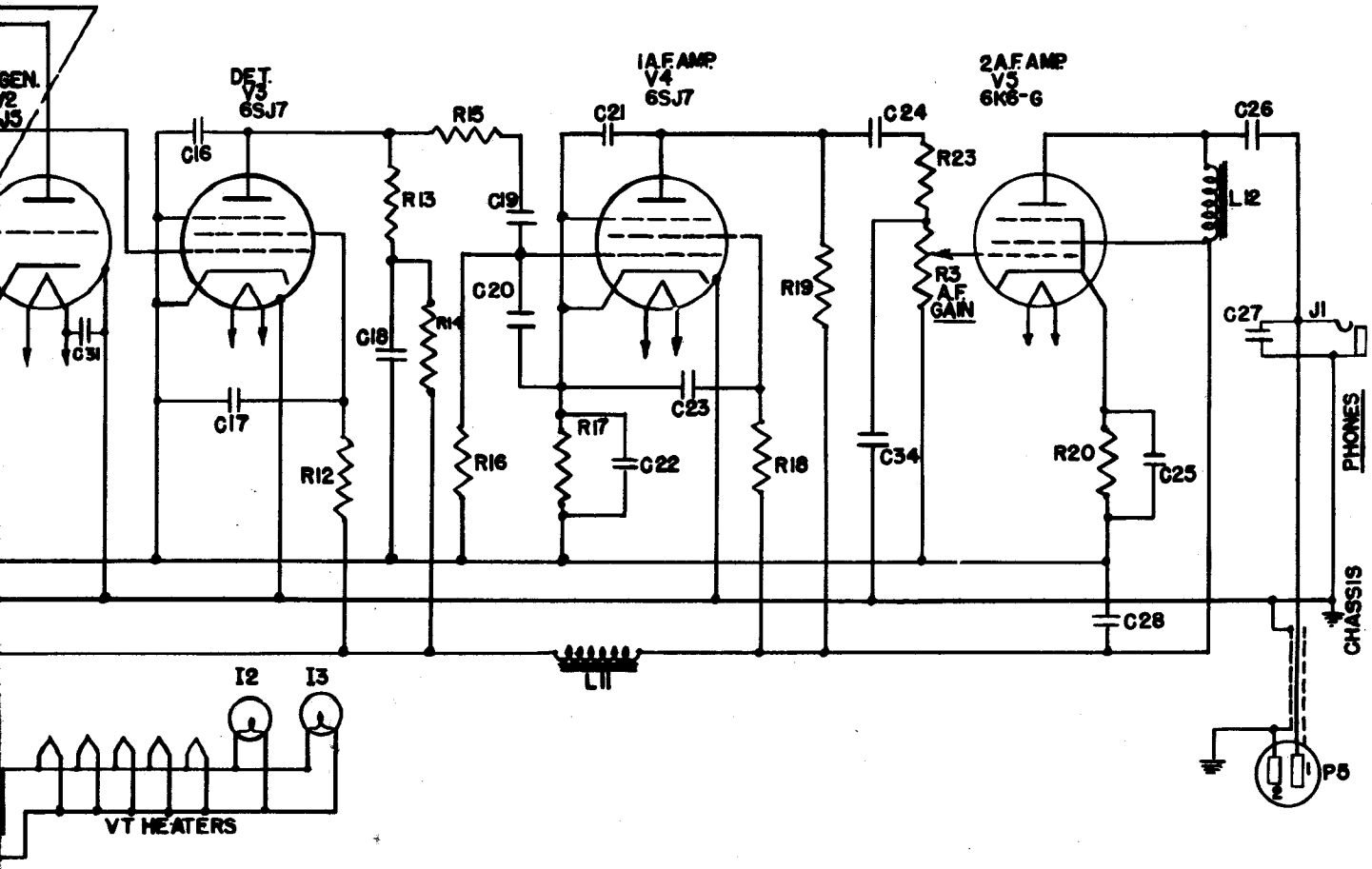
LIST OF MANUFACTURERS AND ADDRESSES

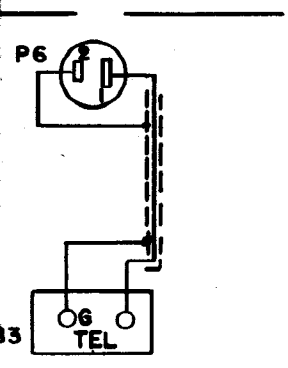
Symbol	Manufacturer	Address
AER	Aerovox Corporation	New Bedford, Mass.
AIRW	Atlantic India Rubber Works	Chicago, Ill.
BLD	Belden Mfg. Co.	Chicago, Ill.
C&C	Carbide & Carbon Chemical Corp.	New York, N. Y.
CD	Cornell-Dubilier Electric Corp.	S. Plainfield, N. J.
CDA	Croasdale & DeAngelis	Upper Darby, Pa.
CL	Clarostat Mfg. Co., Inc.	Brooklyn, N. Y.
DMC	Drake Mfg. Co.	Chicago, Ill.
E	Erie Resistor Corp.	Erie, Pa.
EMM	Electro-Motive Mfg. Co.	Willimantic, Conn.
ESN	Elastic Stop Nut Corp.	Union, N. J.
F	Federal Telephone & Radio Corp.	Newark, N. J.
FR	A. W. Franklin Mfg. Corp.	New York, N. Y.
GE	General Electric Co.	Schenectady, N. Y.
H	Hammarlund Mfg. Co., Inc.	New York, N. Y.
H&H	Hart & Hegeman Electric Co.	Hartford, Conn.
JO	Howard B. Jones Co.	Chicago, Ill.
KK	Kurz-Kasch, Inc.	New York, N. Y.
KT	Kenyon Transformer Co., Inc.	New York, N. Y.
L	Lord Mfg. Co.	New York, N. Y.
LI	Littelfuse Laboratories	Chicago, Ill.
MAL	P. R. Mallory & Co.	New York, N. Y.
N	National Co., Inc.	Malden, Mass.
OAK	Oak Mfg. Co.	Chicago, Ill.
RC	Radio Condenser Co.	Camden, N. J.
RCA	RCA Mfg. Co.	Harrison, N. J.
SM	Solar Mfg. Co.	New York, N. Y.
STP	Stackpole Carbon Co.	St. Marys, Pa.
TH	Thordarson Electric Mfg. Co.	Chicago, Ill.
WIN	J. H. Winn's Sons	Winchester, Mass.
WL	Ward Leonard Electric Co.	Mt. Vernon, N. Y.

U. S. GOVERNMENT PRINTING OFFICE : 0—1948


MAIN
EMERG
S1
S2
ANTENNA TRIMMER
C2
C1A
A
B
C
D
L1
L2
L3
L4
C3
L5
C4
L6
C8
R5
RF AMP
V1
6SK7
C1B
C12
R6
C9
C5
R4
L.A.
CHASSIS
R.F GAIN
R1
R7
RECT.
35Z5-GT
V6
I1
L13
C29A
C29B
R22
L14
POWER
ON-OFF
S4
P1
CHASSIS
CABINET
P2
TB2
G
EXT.
E
M
T1 STD. EQUIP. ON 128AY ONLY
FOR AC OPERATION
T1


S3
RF AMP
V1
6SK7
C8
R5
C6
TRIM
C1C
C12
R6
C9
C1B
L7
L8
L9
L10
C35
C36
REGEN.
V2
6J5
R11
C14
C7
TRIM
C1D
C31
DET.
V3
6SJ7
C16
C17
C10
C15
C13
R.F GAIN
R1
R7
R8
L13
L14
C29A
C29B
C30A
C30B
R21
C11
R10
R9
R2
REGENERATION
I2
VT HEATERS
S5
S6
PLATES
HTRS.
P3
FOR AC OPERATION ONLY
T1
P4
F1
F2
F3
F4
C32
C33
TB1
LINE
PRI
6.3V AC
A
B
CABINET
P6
TB3
TEL
M
26AY ONLY





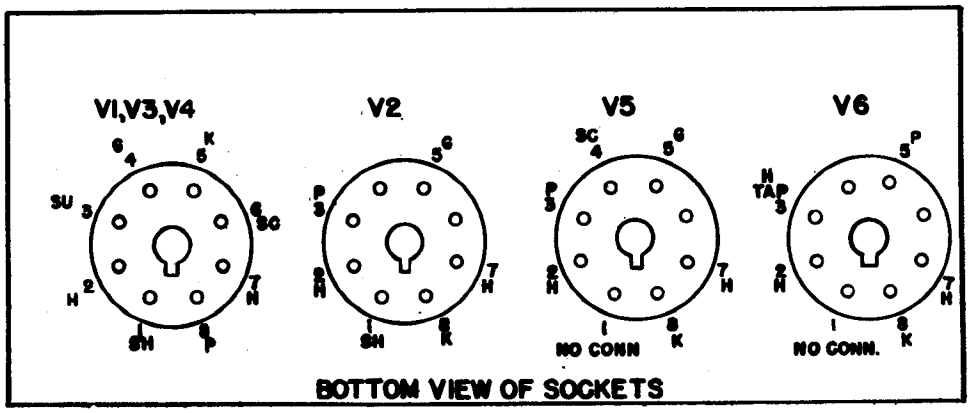
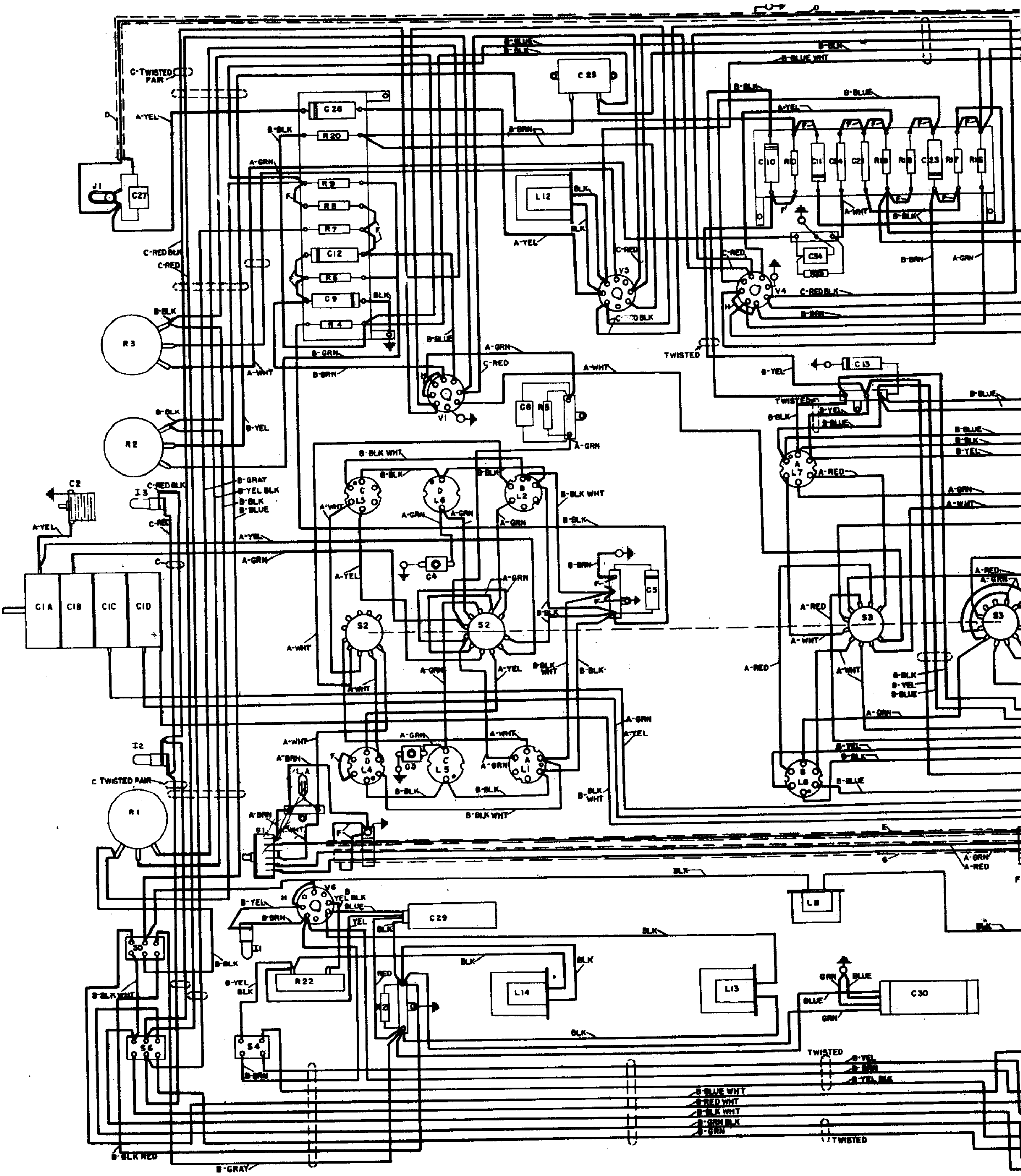


Figure 14—Radio Receiver 128-AY, Schematic Diagram.



C-TWISTED PAIR
A-YEL
D
J1
C27
C26
R20
R9
R8
R7
C12
R6
C9
R4
B-BLK
A-GRN
C-RED BLK
C-RED
R3
R2
R1
B-GRN
B-BRN
A-WHT
B-YEL
B-BLUE
V1
C25
B-BRN
L12
A-YEL
C-RED
V5
C-RED BLK
C10
C11
C23
C34
R16
R17
R18
R19
V4
B-BLUE WHT
TWISTED
C13
C8
R5
A-WHT
A-GRN
B-BLK WHT
L3
L6
L2
L7
A-RED
C2
I3
B-GRAY
B-YEL BLK
C1A
C1B
C1C
C1D
C4
C5
S2
S3
L4
L5
L1
L8
C3
I2
C TWISTED PAIR
S1
V6
C29
I1
R22
R21
L14
L13
L11
C30
S5
S4
S6
B-BLK RED
B-BLUE WHT
B-RED WHT
B-BLK WHT
B-GRN BLK
B-GRN
B-YEL BLK
B-BLK WHT
B-GRAY
GRN
BLUE
BLK
RED
YEL
E
6
A-GRN
A-RED

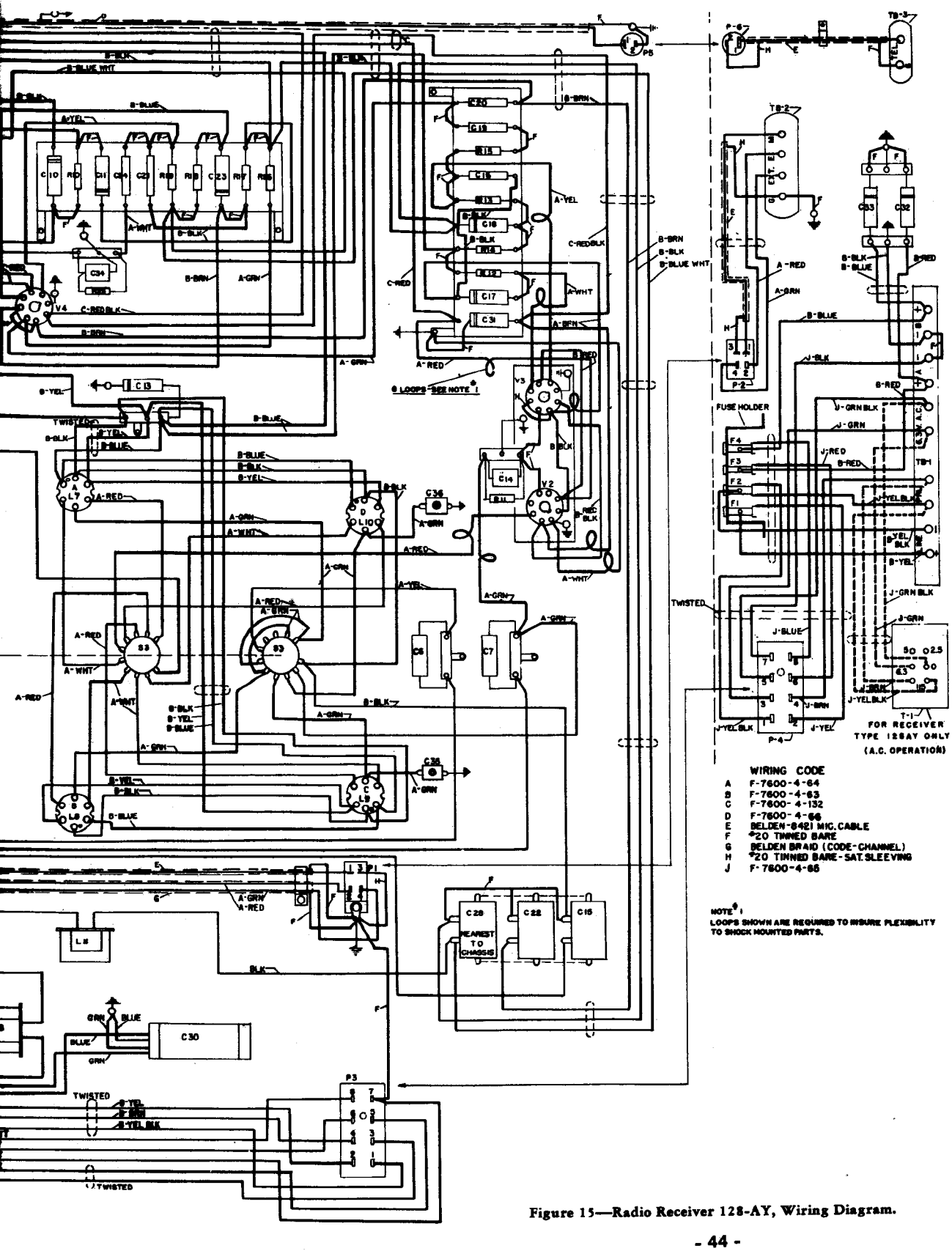


Figure 15—Radio Receiver 128-AY, Wiring Diagram.

Date Loaned