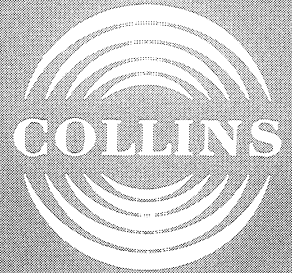


ARNOLD T. FERGUSON
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instruction book

Collins Radio Company of Canada Ltd., Toronto, Ontario, Canada

32RS-1C
Transceiver

GUARANTEE

The equipment described herein is sold under the following guarantee:

Collins agrees to repair or replace, without charge, any equipment, parts, or accessories which are defective as to design, workmanship or material, and which are returned to Collins at its factory, transportation prepaid, provided

- (a) Notice of the claimed defect is given Collins within one (1) year from date of delivery and goods are returned in accordance with Collins' instructions.
- (b) Equipment, accessories, tubes, and batteries not manufactured by Collins or from Collins' designs are subject to only such adjustments as Collins may obtain from the supplier thereof.
- (c) No equipment or accessory shall be deemed to be defective if, due to exposure or excessive moisture in the atmosphere or otherwise after delivery, it shall fail to operate in a normal or proper manner.

Collins further guarantees that any radio transmitter described herein will deliver full radio frequency power output at the antenna lead when connected to a suitable load, but such guarantee shall not be construed as a guarantee of any definite coverage or range of said apparatus.

The guarantee of these paragraphs is void if equipment is altered or repaired by others than Collins or its authorized service center.

No other warranties, expressed or implied, shall be applicable to any equipment sold hereunder, and the foregoing shall constitute the Buyer's sole right and remedy under the agreements in this paragraph contained. In no event shall Collins have any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with other equipment or materials, or from any other cause.

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Collins Radio Company of Canada Limited
150 Bartley Drive,
Toronto 16,
Ontario

INFORMATION NEEDED:

- (A) Type number, name, and serial number of equipment
- (B) Date of delivery of equipment
- (C) Date placed in service
- (D) Number of hours of service
- (E) Nature of trouble
- (F) Cause of trouble if known
- (G) Part number (9 or 10 digit number) and name of part thought to be causing trouble
- (H) Item or symbol number of same obtained from parts list or schematic
- (I) Collins number (and name) of unit sub-assemblies involved in trouble
- (J) Remarks

HOW TO ORDER REPLACEMENT PARTS.

When ordering replacement parts, you should direct your order as indicated below and furnish the following information insofar as applicable. To enable us to give you better replacement service, please be sure to give us complete information.

ADDRESS:

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150 Bartley Drive,
Toronto 16,
Ontario

INFORMATION NEEDED:

- (A) Quantity required
- (B) Collins' part number (9 or 10 digit number) and description
- (C) Item or symbol number obtained from parts list of schematic
- (D) Collins' type number, name, and serial number of principal equipment
- (E) Unit sub-assembly number (where applicable)



instruction book

32RS-1C Transceiver

• *Collins Radio Company of Canada Ltd. 1964*

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Figure 1-1. Transceiver 32RS-1C

SECTION I GENERAL DESCRIPTION

1.1 PURPOSE OF INSTRUCTION BOOK.

This instruction book provides information for installation, operation, and maintenance of Transceiver 32RS-1.

1.2 PURPOSE OF EQUIPMENT.

Transceiver 32RS-1 is a complete fixed station for single-sideband high-frequency radio communication in the range of 1.6 to 15 mc. It operates on the upper

sideband of any one of four channels as selected at the front panel.

1.3 EQUIPMENT SUPPLIED.

Transceiver Model 32RS-1C is shown in figure 1-1 and consists of a cabinet with the 32RS-1 chassis and power supply mounted in it. Table 1-1 lists equipment supplied.

TABLE 1-1. EQUIPMENT SUPPLIED

UNIT	COLLINS PART NUMBER	DIMENSIONS (in.)			WEIGHT (lb)
		DEPTH	WIDTH	HEIGHT	
Transceiver 32RS-1C	522-1189-00	14-3/4	22	24-1/2	97
Transceiver	543-7336-00	7	19	12-1/4	20
Power Supply	543-7335-00	7	19	7	35

1.4 EQUIPMENT REQUIRED BUT NOT SUPPLIED.

Equipment required but not supplied is listed in table 1-2.

TABLE 1-2
EQUIPMENT REQUIRED BUT NOT SUPPLIED

ITEM	QUANTITY PER TRANSCEIVER	DESCRIPTION
Antenna and antenna feed system	One required (separate antennas may be used for each channel if desired).	50-ohm characteristic impedance antenna and 50-ohm unbalanced feed system with swr not to exceed 2.5 to 1.
Power source	One	115 or 230 volts a-c. 50-60 cps. single phase. 350 watts.

TABLE 1-2 (Cont)

EQUIPMENT REQUIRED BUT NOT SUPPLIED

ITEM	QUANTITY PER TRANSCEIVER	DESCRIPTION
Crystals	One per channel.	CR-27/U, as required by frequency assignment.
Coil sets	One set of 6 each per channel.	As required by frequency assignment.
Crystal ovens	One oven for two channels.	As required by frequency, stability 1.5 parts in 10 ⁶ .

1.5 ACCESSORIES.

Accessories available for use with Transceiver 32RS-1 are listed in table 1-3.

SECTION I
General Description

TABLE 1-3

ACCESSORIES

ITEM	DESCRIPTION
Antenna Coupler 180V-1	Reversible L-network that matches the following antennas to a 52-ohm transmission line: 50-foot whip - 1.6 to 2.5 mc 30-foot whip - 2.5 to 12.0 mc 100-foot long wire - 1.6 to 12.0 mc
Phone Patch 152J-1	Allows operation into or out of a phone line.
Directional Wattmeter. 302E-2	0 to 200 watts, forward or reverse power indicator.

1.6 EQUIPMENT SPECIFICATIONS.

Frequency range 1.6-15 mc.
 Mode Single sideband, upper sideband only. (Crystals for lower sideband are available on special order.)
 Stability 1.5 parts per million.
 Transmit power output . . . 100 watts PEP.
 Transmit output impedance . 52 ohms with swr not to exceed 2.5 to 1.
 Harmonic and other spurious radiation
 Second harmonic At least 50 db down from peak signal.
 Carrier, static 50 db below peak output.
 dynamic 30 db below peak output.

Lower sideband At least 50 db below peak output.
 Spurious radiation 9-12 mc, 40 db down
 2-9 mc, 60 db down from peak signal.
 12-15 mc, 35 db below
 Distortion products At least 25 db down from peak signal (2-tone signal).
 Transmit audio input . . . - Telephone handset with provisions for external 4-wire telephone connection. Input range - .1 to 2 volts.
 Audio-frequency response . ±3 db, 500 to 3000 cps.
 Automatic load control . . . Capable of at least 6 db compression.
 Receiver selectivity 3 kc nominal.
 Receiver sensitivity Less than 1.0-microvolt input signal required for 10 db signal-to-noise ratio.
 Receiver image rejection . . 50 db from 1.6 to 12 mc.
 40 db from 12 to 13 mc.
 30 db 13 to 15 mc.
 Receiver audio output power 2.0 watts maximum.
 More than 50 mw with 1-microvolt input signal.
 Receive audio distortion . . Less than 10% harmonic.

1.7 TUBE, FUSE, AND SEMICONDUCTOR COMPLEMENT.

Table 1-4 lists tubes, fuses, and semiconductors of Transceiver 32RS-1.

TABLE 1-4. TUBE, FUSE, AND SEMICONDUCTOR COMPLEMENT

SYMBOL	TYPE	FUNCTION
TRANSCEIVER		
V1A	1/2 6CQ8	455-kc oscillator.
V1B	1/2 6CQ8	Isolation amplifier.
V2	12AT7	Transmit balanced mixer.

TABLE 1-4. TUBE, FUSE, AND SEMICONDUCTOR COMPLEMENT (Cont)

SYMBOL	TYPE	FUNCTION
TRANSCEIVER		
V3	6DC6	Transmit and receive r-f amplifier.
V4	6CL6	Driver.
V5	6146A	Power amplifier.
V6	6146A	Power amplifier.
V7A	1/2 6CQ8	First speech amplifier on OPERATE position. Tone oscillator on TUNE position.
V7B	1/2 6CQ8	Vox amplifier.
V8A	1/2 12AT7	Second speech amplifier.
V8B	1/2 12AT7	Vox relay control.
V9A	1/2 6AL5	ANTI-VOX rectifier.
V9B	1/2 6AL5	Vox rectifier.
V10A	1/2 6CQ8	Channel oscillator.
V10B	1/2 6CQ8	Phase inverter.
V11	6BA7	Receive mixer.
V12	6BA6	Receive first i-f amplifier.
V13	6BA6	Receive second i-f amplifier.
V14	12AT7	Product detector.
V15A	1/2 12AT7	First a-f amplifier.
V15B	1/2 12AT7	Second a-f amplifier.
V16	6AQ5	Receiver a-f power amplifier.
V17A	1/2 6AL5	Agc rectifier.
V17B	1/2 6AL5	R-f gain gating.
V18	6AL5	Alc rectifier.
CR1	1N270	Switching diode.
CR4, 5, 6, and 7	1N67's	Quaddiode ring balanced modulator.
Y1, Y2, Y3, Y4	CR-27/U	Channel crystals.
Y5		455 kc bfo crystal.

TABLE 1-4. TUBE, FUSE, AND SEMICONDUCTOR COMPLEMENT (Cont)

SYMBOL	TYPE	FUNCTION
POWER SUPPLY		
2V1	5U4GB	Rectifier L. V.
2V2	5R4G-YA	Rectifier H. V.
2F-1	1.5 or 3 amp slow blow	Primary power fuse.
2F-2	1.5 or 3 amp slow blow	Primary power fuse.
2F-3	1/16 amp, time-lag	PA screen fuse.
2CR-1	Selenium	Bias rectifier.

SECTION II INSTALLATION

2.1 UNPACKING AND INSPECTING EQUIPMENT.

Remove all packing material, and carefully lift the units from their crates. Be careful when uncrating; use a nail puller to open the crates. Check the equipment against the packing slips and list of equipment supplied (table 1-1 of this handbook). The CHANNEL SELECTOR knob and the handset cradle are packed in a separate carton in the rear of the equipment. Inspect each unit for physical damage. If damage exists, save packaging material and packing containers to substantiate claim with transportation agency.

2.2 INSTALLATION.

2.2.1 MOUNTING.

Transceiver 32RS-1C may be set on desk or bench as desired. To install the handset cradle, release panel fasteners and let front panel down. Reach in with the right hand, put thumb on panel and forefinger on the long leaf of the cradle switch and depress about one-fourth inch. Insert the handset cradle into the cradle switch from the front side of panel.

The blower for the 32RS-1C is removed for shipping and can be secured in place with four screws and lock washers (furnished).

2.2.2 WIRING CONNECTIONS.

Figure 2-1 shows interunit and external wiring connections. Transceiver 32RS-1C is shipped with all interunit connections made.

When shipped, the power supply is wired for 115-volt operation and with 3-ampere slow blow fuses in the fuse holders. For operation on a 230-volt primary, rewire jumpers in the power supply (three places) as illustrated on figure 7-2, and replace the 3-ampere slow blow fuses with 1.5-ampere slow blow fuses. The 1.5-ampere slow blow fuses are supplied in a spare fuse bag attached to the equipment.



Read the following paragraphs before applying power.

2.3 ANTENNA CONNECTIONS.

2.3.1 GENERAL.

There are four possible methods of coupling Transceiver 32RS-1 to the antenna feed-line system. Wiring connections are discussed for each method. Refer to figures 7-1 and 2-1.

2.3.2 DIRECT CONNECTION.

a. Obtain a BNC connector and enough cable (use RG-58/U) to reach from the 32RS-1 to the antenna or antenna coupler.

b. Connect the BNC connector to the cable, refer to figure 2-6, and connect the antenna cable directly to J5 on the jack panel on the rear of the 32RS-1 chassis.

2.3.3 DIRECT CONNECTION THROUGH WATTMETER.

Perform operations outlined in paragraph 2.5.1, steps a, b, and c.

2.3.4 MULTIPLE ANTENNA CONNECTIONS.

a. Refer to figure 2-1A. Use RG-58/U coax to run a lead from J5 on the jack panel on the 32RS-1 chassis to terminal B of switch S5.

b. Install one BNC connector, for each antenna used, in the extra holes provided in the jack panel on the 32RS-1 chassis.

c. Use RG-58/U coax to make connections from switch S5 to the newly installed BNC connectors as illustrated in figure 2-1A.

d. Obtain one mating BNC connector for each connector installed in the 32RS-1 jack panel and enough cable (RG-58/U) to reach to the antennas. Fabricate cables and connect from the jacks on the 32RS-1 chassis to the antennas. Make certain the proper switch terminal on S5 is coupled to the correct antenna.

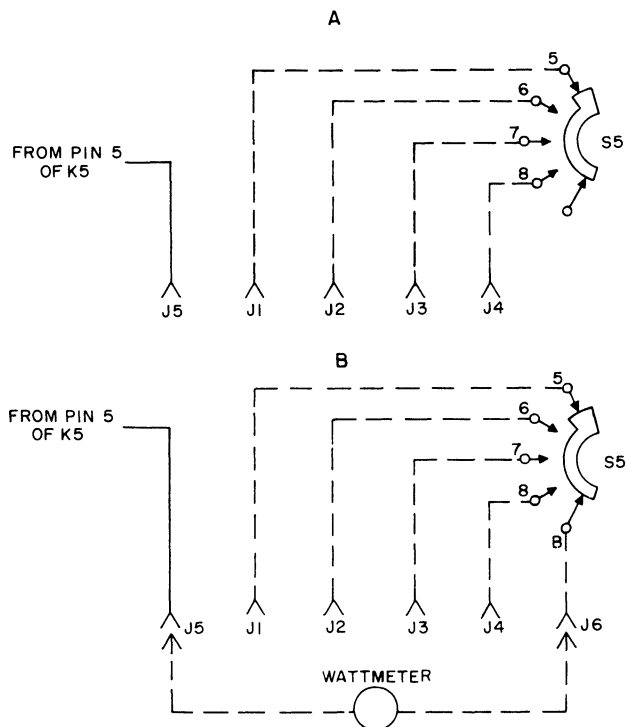


Figure 2-1. Transceiver 32RS-1 Antenna Connections

2.3.5 MULTIPLE ANTENNA CONNECTIONS THROUGH WATTMETER.

- a. Refer to figure 2-1B. Perform operations outlined in paragraph 2.5.1, steps a, b, and d.
- b. Obtain one BNC connector, for each antenna to be used, in the jack panel on the rear of the 32RS-1 chassis.
- c. Use RG-58/U coax to make a connection from J6 to terminal B of switch S5.
- d. Install one BNC connector, for each antenna used, in the extra holes provided in the jack panel on the 32RS-1 chassis.
- e. Use RG-58/U coax to make connections from switch S5 to the newly installed BNC connectors as illustrated in figure 2-1B.
- f. Obtain one mating BNC connector for each connector installed in the 32RS-1 jack panel and enough cable (RG-58/U) to reach to the antennas. Fabricate cables and connect from the jacks on the 32RS-1 chassis to the antennas. Make certain the proper switch terminal on S5 is coupled to the correct antenna.

2.4 TUNING PROCEDURE.

a. Insert desired channel crystals into channel-crystal ovens, HR2 and HR3. Figure 2-2 is a partial photograph of the 32RS-1 chassis indicating possible crystal positions. Channel crystals are located according to oven pins as follows:

CHANNEL	CRYSTAL LOCATION
1	Pins 3 and 4 of HR3
2	Pins 7 and 8 of HR3
3	Pins 3 and 4 of HR2
4	Pins 7 and 8 of HR2

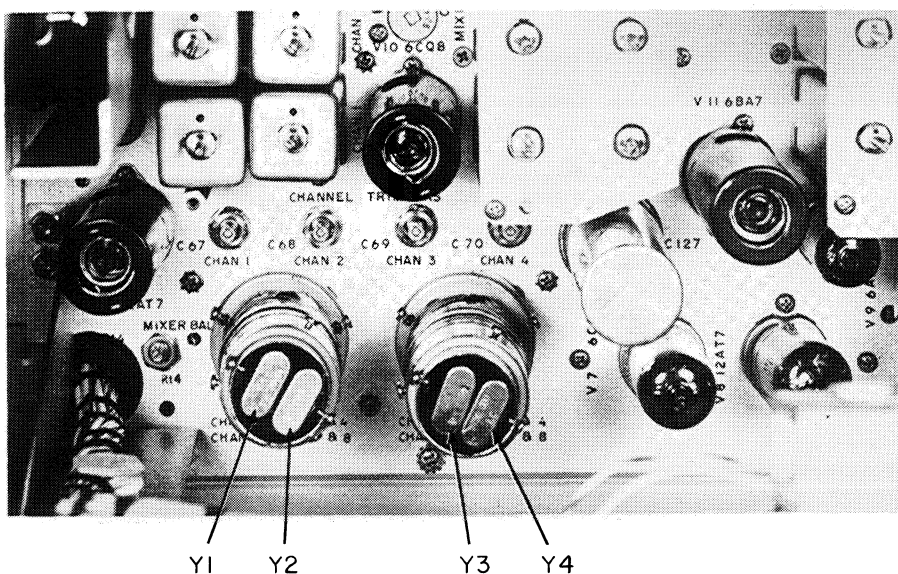


Figure 2-2. Channel Injection Crystal Positions

SECTION II
Installation

For upper sideband, these crystals should be type CR-27/U, ground to a frequency 455 kc higher than the desired channel frequency.

b. Refer to figure 2-3. Insert the appropriate antenna, r-f, and PA coils. Check location against silk screening on chassis. Table 2-1 identifies the coils according to frequency range and Collins part numbers.

NOTE

If trouble is experienced with one set of coils detuning the adjacent channel coils, separate the interfering channels on the chassis by putting the interfering channels on the extreme outside coil positions.

TABLE 2-1. COIL KIT AND COIL PART NUMBERS

FREQ RANGE (mc)	PLUG-IN COIL KIT (1 ANT. COIL, 4 R-F COILS, AND 1 PA COIL) COLLINS PART NO.	ANT. COIL COLLINS PART NO.	FIRST R-F COIL COLLINS PART NO.	R-F COIL COLLINS PART NO.	PA COIL COLLINS PART NO.
1.6-2.0	567-4662-00	544-6102-00	546-6035-00	544-6103-00	567-4652-00
2.0-3.3	567-4663-00	543-7735-00	546-6036-00	543-4346-00	567-4653-00
3.3-5.5	567-4664-00	543-7736-00	546-6037-00	543-4347-00	567-4654-00
5.5-9.0	567-4665-00	543-7737-00	546-6038-00	543-4348-00	567-4655-00
9.0-12.0	567-4666-00	543-7738-00	546-6039-00	543-4349-00	567-4656-00
12.0-15.0	567-4667-00	545-3237-00	546-6040-00	543-3238-00	567-4656-00

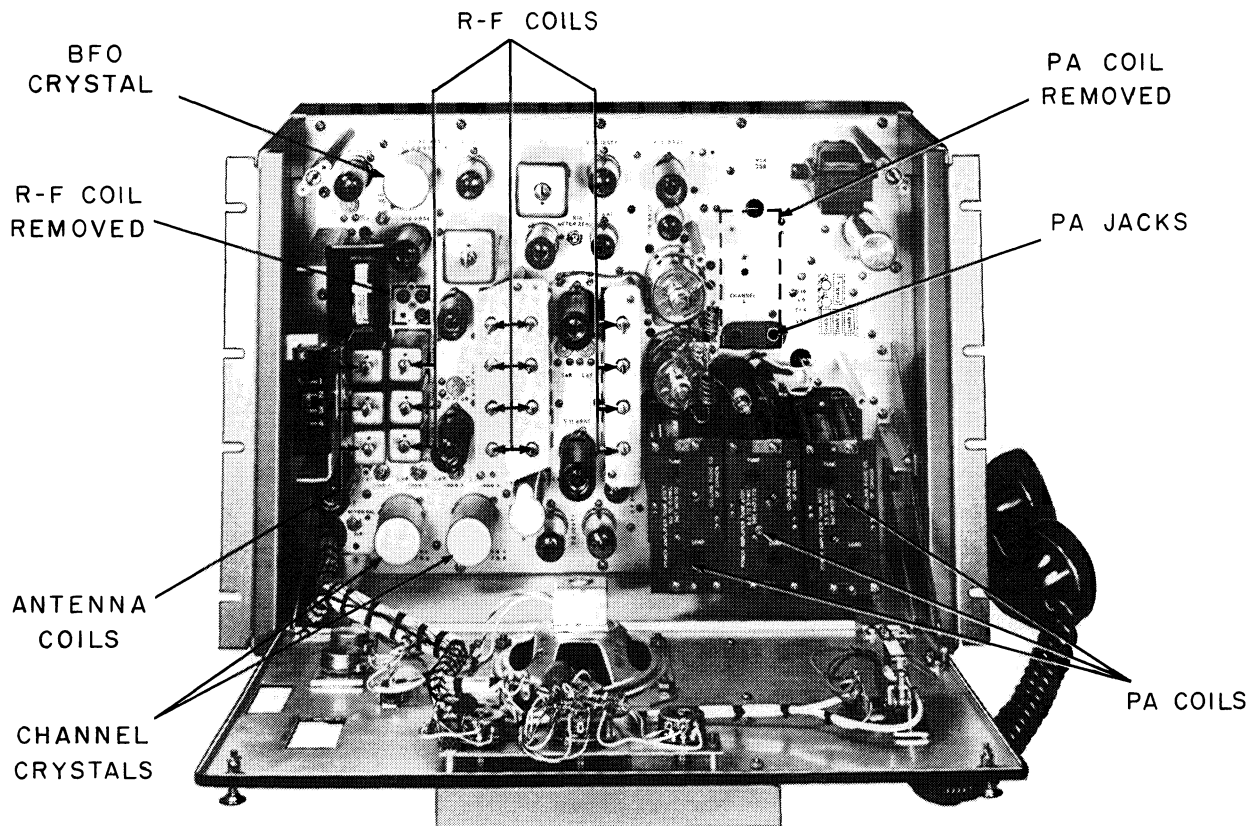


Figure 2-3. Coil Positions

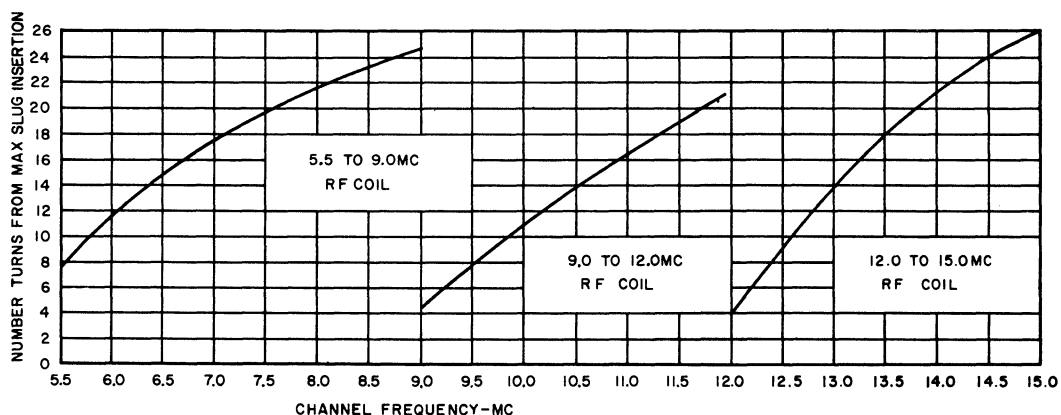
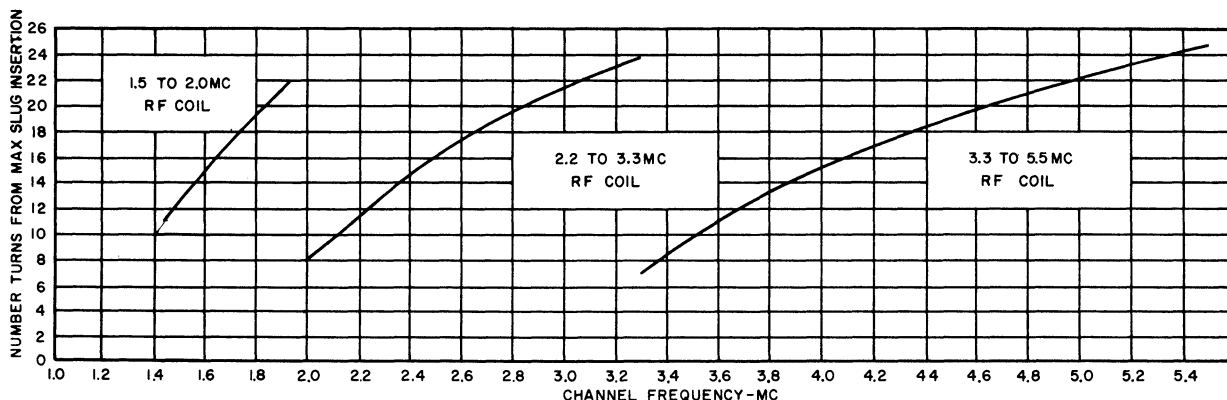


Figure 2-4. Calibration Curves for Antenna and R-F Coils

c. Secure the coils at the rear of the chassis with hardware supplied. The PA coils should be secured by the center bolt. Turn all slugs all the way in, and set the rollers on PA coils at maximum counterclockwise rotation. The rollers are then at the chassis end of the coil. Be careful not to run the roller off the coil.

d. Turn out the antenna and r-f coil slugs the number of turns indicated in figure 2-4.



Replace PA shields - 800 V. During tuneup, DO NOT run the 32RS-1 with a cathode current indication above S5 for more than 15 seconds at a time or the PA tubes and PA coils may be permanently damaged.

e. Turn the TRANSMIT AUDIO gain control fully counterclockwise. Place the TUNE-OPERATE switch in TUNE position and the meter switch to PA CATH MA position. Connect the antenna.

NOTE

The antenna-feed system should not have an swr greater than 2.5 to 1.

f. Set OVENS and L.V. switches to the ON position. Wait for tube filaments to heat, and set the H.V. switch to the ON position. Turn the VOX GAIN control clockwise until the vox relays operate. Check that the no-signal PA cathode current is between S-1 and S-2. If it is not, adjust the BIAS ADJ potentiometer on the power supply. Return the VOX GAIN control to the counterclockwise position so that the VOX relays will de-energize.

NOTE

Do not set the no-signal PA plate current too low; amplifier linearity will be degraded. Do not set too high; PA tube life will be shortened.

SECTION II Installation

g. For the following adjustments, it is suggested that the unit be keyed by the telephone handset so that the PA may be allowed to cool while not being adjusted. Advance the TRANSMIT AUDIO gain control until PA cathode current is slightly increased. Adjust the antenna and r-f coils for maximum PA cathode current, keeping the PA cathode current below S-5 by using the TRANSMIT AUDIO gain control to limit tube dissipation.

NOTE

If no increase in PA cathode current is found, unscrew each r-f coil of the channel slug one turn at a time, keeping all slugs at approximately the same position. The TRANSMIT AUDIO gain control should control the level of PA cathode current. If it does not, the transmitter has been tuned 455 kilocycles higher than the desired frequency, and the correct tuning point will be found with the slugs turned further in. Plate circuit of V4 must be tuned with the PA coil detuned.

h. Refer to figure 2-5 for approximate PA coil settings for a 52-ohm resistive antenna. Adjust the TUNE coil in the appropriate PA tank coil assembly in a clockwise direction until PA cathode current dips. Adjust for current minimum.

i. With the meter switch in the ALC-S position, adjust the TRANSMIT AUDIO gain control to the point where a slight alc voltage is indicated (S-3). Return the meter switch to PA CATH MA position.

j. Adjust the LOAD coil in the appropriate PA tank coil assembly in a clockwise direction until the meter indicates S-9. Redip cathode current by adjusting the TUNE coil. Check that alc is still driven.

k. Repeat steps h, i, and j until the meter reads S-9 with the PA TUNE coil adjusted for cathode current dip as the final adjustment. The transmitter is now delivering full power, and all transmit and receive circuits are ready for operation on the channel.

l. Repeat steps g through k for each channel. Be sure the CHANNEL SELECTOR is set to the channel being aligned.

m. Factory-installed crystals are trimmed to the correct frequencies. However, if crystals are purchased separately, it may be necessary to trim them to channel frequency. If no frequency standard is available, the appropriate channel trimmer can be adjusted until the received signal from a station on the desired channel is received satisfactorily.

n. Refer to paragraph 3.2, steps f and h for VOX GAIN and ANTI-TRIP gain control settings.

2.5 ACCESSORY INSTALLATION.

2.5.1 DIRECTIONAL WATTMETER 302E-2.

a. Install the 302E-2 in the accessory panel as indicated in figure 1-1, using the screws that hold the filler panel cover plate in place. There are three filler panels on the accessory panel; the accessories may be mounted in any of the three panels.

b. Fabricate a cable (use RG-58/U) to connect J5 on the rear panel of the 32RS-1 to the transmitter connection (TRANS.) on the 302E-2. Use one of the supplied right-angle BNC connectors for attachment to the 302E-2. Use a straight BNC connector for attachment to the 32RS-1. Refer to figure 2-6 for cable fabrication diagram.

c. Fabricate a cable (use RG-58/U) to connect the output of the 302E-2 to the antenna or an antenna coupler. Use the supplied right-angle BNC connector to make a connection from the ANT. jack, on the 302E-2, to the antenna or antenna coupler.

d. If separate antenna output voltages are required, fabricate a cable (use RG-58/U) to connect the output of the 302E-2 (ANT.) back to J6 on the filter panel of the 32RS-1. Use the supplied right-angle BNC connector for attachment to the 302E-2. Use a straight BNC connector for attachment to J6 on the 32RS-1.

2.5.2 PHONE PATCH 152J-1.

a. Install the 152J-1 on the accessory panel as illustrated in figure 1-1, using the screws that hold the filler panel in place.

b. Attach the 6-wire cable, furnished in the installation kit, from the 32RS-1 filter panel to TB1 on the 152J-1, as illustrated in figure 7-4.

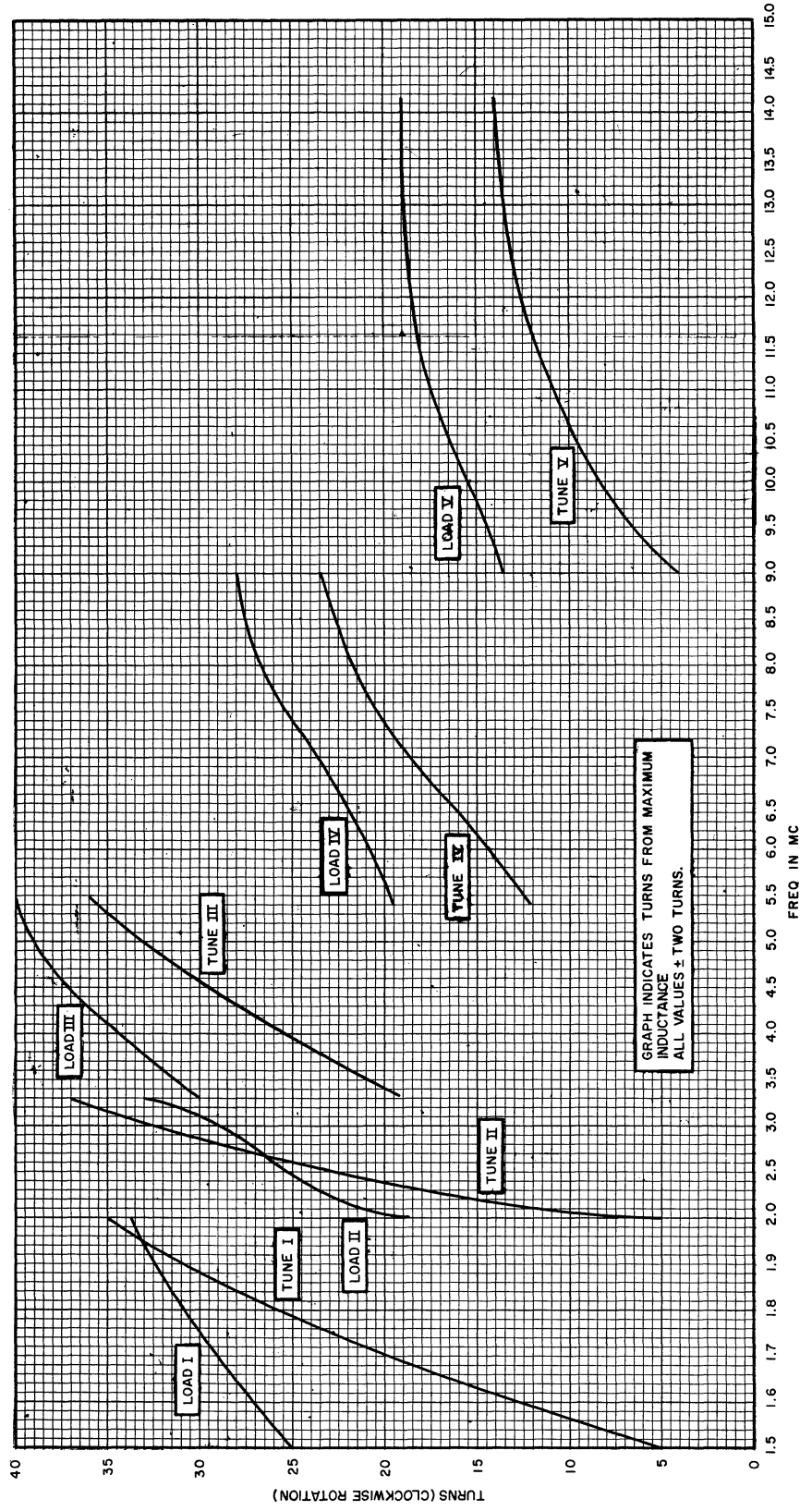


Figure 2-5. Calibration Curves for PA Coils

SECTION II
Installation

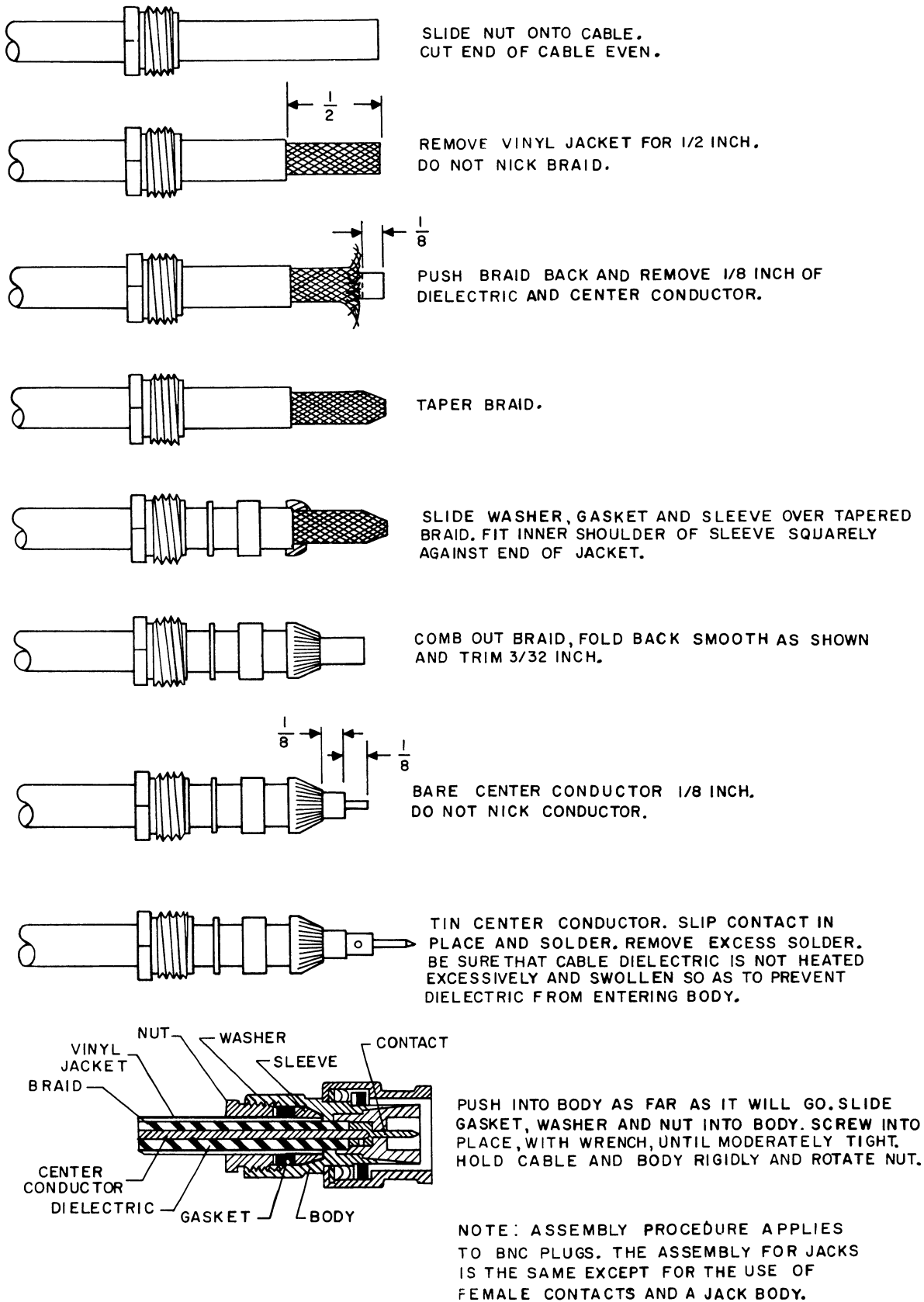


Figure 2-6. Cable Fabrication Diagram

SECTION III OPERATION

3.1 OPERATING CONTROLS.

Operating controls are identified in figure 3-1 and described below.

3.1.1 TRANSCEIVER FRONT-PANEL CONTROLS.

RECEIVE RF	Controls receiver sensitivity.
TRANSMIT AUDIO	Controls transmitter drive level.
SPEAKER ON-OFF	Disconnects speaker in the OFF position.
CHANNEL SELECTOR	Selects one of four pretuned channels of operation.

3.1.2 POWER SUPPLY FRONT-PANEL CONTROLS.

OVENS	Controls application of power to crystal ovens and other power supply switches.
L.V.	Controls application of power to low-voltage power supply and to H.V. switch.
H.V.	Controls application of power to high-voltage power supply and to PA screen grids.

3.1.3 CONTROLS UNDER TRANSCEIVER FRONT-PANEL COVER.

TUNE-OPERATE	Selects function of tube V7A. In TUNE position, V7A is a tone oscillator; in OPERATE position, V7A is the first speech amplifier.
RECEIVER AUDIO GAIN	Controls receive audio level.
VOX GAIN	Controls gain in voice-operate circuits.
ANTI-TRIP	Controls anti-vox voltage to set vox threshold and prevent loudspeaker output from keying transmitter.
Meter function switch	Selects meter function.
ALC-S position	Connects meter to indicate drive level in transmit and received signal strength in receive.
PA CATH MA position	Connects meter to indicate PA cathode current (S-9 = 250 ma).
+275 VDC	Connects meter to indicate low-voltage plate supply voltage (S-9 = 275 volts).
+800 VDC	Connects meter to indicate high-voltage plate (S-9 = 800 volts).
-75 VDC	Connects meter to indicate bias supply voltage (S-9 = 72 volts).

3.1.4 PHONE PATCH 152J-1 OPERATING CONTROLS.

PHONE PATCH	Controls off, on, and station mute operation of phone patch.
STATION CONTROL	Controls transmit-receive operation of transceiver.

3.1.5 DIRECTIONAL WATTMETER 302E-2 OPERATING CONTROL.

REVERSE-FORWARD	Controls direction of power indication.
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3.1.6 ADJUSTMENTS ON POWER SUPPLY CHASSIS.

BIAS ADJUSTMENT	Sets PA no-signal plate current.
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SECTION III
Operation

3.2 OPERATING PROCEDURES, TRANSCEIVER 32RS-1.

a. When using the 32RS-1 under normal day-to-day operating conditions, leave the OVENS switch in the ON position at all times.

b. Leave L.V. switch in ON position during standby periods. This allows receiver monitoring of the channel in use and keeps all filaments heated.

c. Leave H.V. switch in the ON position only during operating periods. Leaving this switch in the OFF position during standby periods conserves power.

d. For best receive operation, adjust RECEIVE RF gain to make the ALC-S meter rest at approximately the same level as the peak ALC-S meter indication on a received signal; then adjust RECEIVER AUDIO GAIN for a desirable output level. Thereafter when changing channels or when signal level varies, adjust RECEIVE RF gain for a desirable output level; do not change RECEIVER AUDIO GAIN. Normal RECEIVER AUDIO GAIN setting is approximately at nine o'clock position.

e. Key the transceiver with the handset switch, and talk in a normal voice. Advance the TRANSMIT AUDIO gain control until the ALC-S meter kicks slightly on voice peaks. Maximum power is being transmitted when the ALC-S meter kicks to approximately S-3 on normal voice peaks.

f. If voice operation (vox) is desired, set SPEAKER switch to OFF, and advance VOX GAIN control until speaking into the microphone keys the transmitter when the handset key is not pressed. Normal VOX GAIN setting is at approximately nine o'clock.

g. Set the SPEAKER switch to ON, and advance ANTI-TRIP control slightly if loudspeaker output trips the vox circuit. Normal ANTI-TRIP setting is at approximately three o'clock.

h. No further adjustment of VOX GAIN and ANTI-TRIP controls should be necessary for normal vox operation by the same operator. The vox operation may be overridden at any time by pressing the push-to-talk switch on the handset.

i. When the operating period is over, hang the handset on its cradle. With the handset in the cradle, the cradle switch disconnects the microphone circuit. The SPEAKER switch may be left in the ON position during standby, and the receiver will monitor the channel. The RECEIVE RF may be set to the weakest expected signal to quiet background noise.

3.3 OPERATING PROCEDURES, ACCESSORIES.

3.3.1 PHONE PATCH 152J-1.

a. Set TRANSMIT AUDIO for normal operation. Turn VOX GAIN and ANTI-TRIP fully counterclockwise. Turn RECEIVE RF fully clockwise. Leave RECEIVE AUDIO GAIN at normal position.

b. Set BALANCE resistor on rear of the 152J-1 fully counterclockwise, and turn BALANCE capacitor to the OUT position.

c. Lift telephone and dial one number to remove dial tone, then turn the PHONE PATCH switch on.

d. Cover phone input with hand during the following adjustments. Slowly advance VOX GAIN control on the

32RS-1 until the vox relays just start dropping in and out.

e. Carefully readjust BALANCE resistor until the vox relays drop out.

f. Repeat steps d and e until it is no longer possible to drop out vox relays with very small adjustments of the BALANCE resistor. It may be necessary to turn the BALANCE capacitor, on the 152J-1, to the IN position to achieve the proper balance conditions. Under rare conditions, more capacity may be required in parallel with C6 and C7.

NOTE

If there are extension phones on the same line, about 0.5 uf capacity in parallel with the BALANCE capacitor, C7, may be required for each additional phone.

g. Hang up phone, turn PHONE PATCH switch off, reset the 32RS-1 operating controls for normal operation. This includes the ANTI-TRIP control.

h. The phone patch is now ready for use. The normal operating procedure is to call the party on the telephone (PHONE PATCH switch in the STATION MUTE position); then switch the phone patch on. Adjust RECEIVE RF on the 32RS-1 for normal telephone line level as monitored using the station telephone. It is suggested that the SPEAKER be turned off, and that the 32RS-1 handset be on its cradle.

i. Depending upon telephone line characteristics and voice volume of the incoming telephone signal, it may be necessary to make slight adjustments of the TRANSMIT AUDIO and VOX GAIN controls. In case of weak signals from the telephone line, use the TRANSMIT and RECEIVE positions of the STATION CONTROL switch on the 152J-1.

3.3.2 DIRECTIONAL WATTMETER 302E-2.

a. Set power switch on the 302E-2 to FORWARD position.

b. Tune and load transmitter according to paragraph 2.4 of this handbook.

c. Note forward power reading on 302E-2 meter.

d. Set power switch to REVERSE position and note meter reading. Use forward and reflected readings with vswr chart, figure 3-2, to compute standing-wave ratio of antenna and feed-line system. If the vswr is 2.5 to 1 or less, the directional wattmeter indications may be used to calculate the power delivered to the feed line by subtracting reflected power from forward power.

e. If the vswr is greater than 2.5 to 1, use an antenna coupler or change the antenna. Adjust the antenna coupler or antenna for minimum reflected power.

NOTE

The procedure in step e provides optimum operating conditions for the transmitter. It will not correct standing-wave conditions on the feed line unless the antenna tuner is located at the junction of the feed line and the antenna.

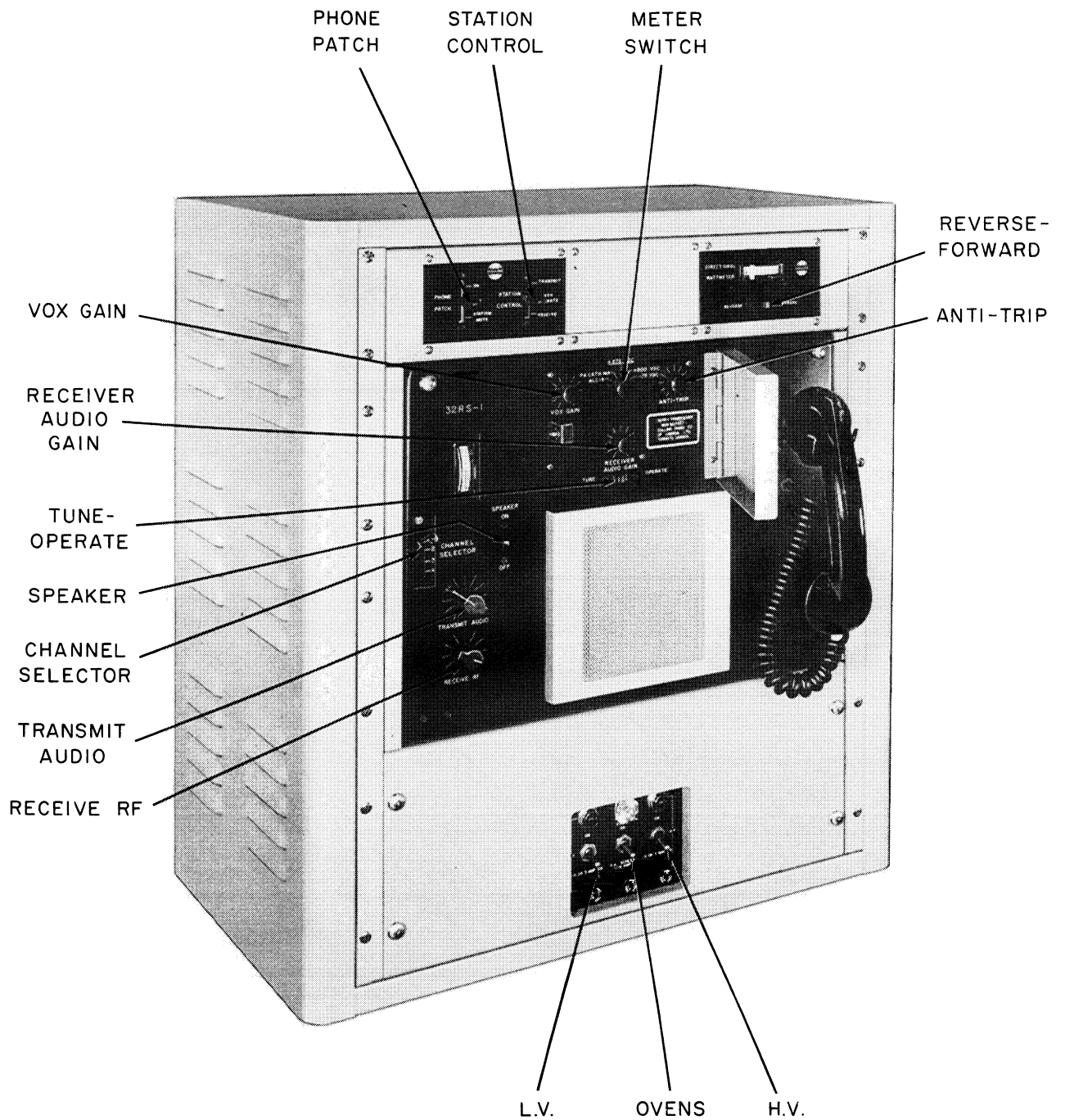


Figure 3-1. Transceiver 32RS-1, Operating Controls

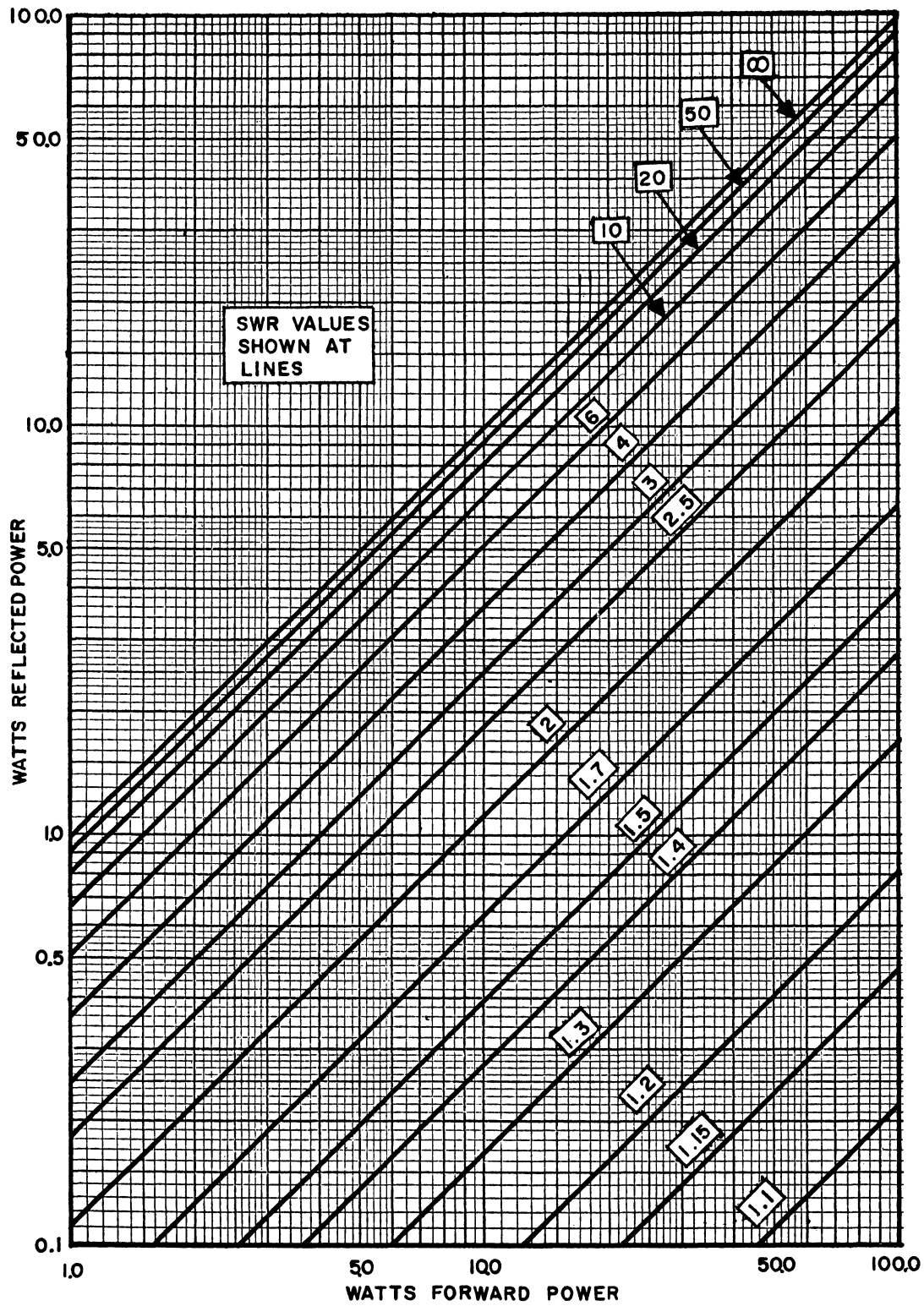


Figure 3-2. Voltage Standing-Wave Ratio Chart

SECTION IV PRINCIPLES OF OPERATION

4.1 GENERAL.

Transceiver 32RS-1 is a superheterodyne device using common oscillators, r-f amplifier, and tuned circuits for both transmit and receive functions. All tuned circuits are preset for appropriate channels and, together with channel crystal, are selected by the CHANNEL SELECTOR switch.

4.2 BLOCK DIAGRAM.

Figure 4-1 is a block diagram of the transceiver. The heavy, solid lines show transmit signal path, and the dashed lines show receive signal path. Other lines indicate controls and control voltages.

4.3 RECEIVE CIRCUITS.

Refer to figures 4-1 and 7-1. The receive signal from J5 or S5 is connected through normally closed contacts of K3 and K1, through S1 to the selected channel antenna coil. From the selected channel antenna coil, the signal is coupled through the selected channel r-f coil and channel switch, S11, to the grid of the r-f amplifier, V3. CHANNEL SELECTOR switch, S2, selects a channel r-f tuned circuit from which the amplified receive signal is coupled to the receive mixer, V11. The selected channel crystal oscillator signal is also coupled to the receive mixer. Since the channel crystal oscillator frequency is 455 kilocycles higher than the desired channel frequency and the mechanical filter FL1 selects the difference frequency, the sideband is inverted.

The single-sideband, 455-kilocycle signal from FL1 is amplified by two stages of i-f amplification, V12 and V13, and applied to the product detector, V14. In the product detector, the 455-kc lower sideband signal is beat with the 455-kc crystal oscillator (bfo) signal. The audible product is applied to the a-f amplifier, V15. Output from V15 is amplified by V16 for feeding the handset, speaker, or 600-ohm line.

4.4 TRANSMIT CIRCUITS.

Refer to figures 4-1 and 7-1. The handset-microphone signal modulates the cathode current of tube V7A. If a high-impedance microphone is used, the input is fed to the grid circuit of V7A. The amplified signal from V7A plate is connected to the grid of cathode follower, V8A, through TRANSMIT AUDIO gain control, R35, and coupling capacitor C62. Output from the cathode follower is applied to the diode-ring balanced modulator, CR4, CR5, CR6, and CR7. In the balanced modulator, the audio signal is switched at a 455-kc rate to produce both upper and lower sideband signals, but the

mechanical filter passes only the lower sideband signal to the transmit balanced mixer. In the transmit balanced mixer, the 455-kc signal is mixed with the selected channel oscillator signal which is 455 kilocycles higher than the desired signal. The difference, or desired signal frequency (with sideband "flipped" to upper), is selected by the mixer plate tuned circuits. This channel frequency is amplified by V3 and V4 and applied to the grids of the power amplified stage, V5 and V6, in parallel. Output from the power amplifier is tuned by a double pi section. These tuned circuits will match the power amplifier to the antenna if the antenna feed-line system presents an swr that does not exceed 2.5 to 1.

4.5 OSCILLATOR CIRCUITS.

Both the 455-kc oscillator and the channel oscillator operate continuously. The 455-kc oscillator provides carrier generation signal to the balanced modulator during transmit and beat-frequency oscillator injection to the product detector during receive. Oscillator feedback is from the plate through C1 and Y5 to the grid. No tuned circuit is necessary. Oven HR1 maintains nearly constant temperature to hold Y5 frequency constant to better than 5 parts per million. Tube section V1B serves as a 455-kc isolation amplifier during transmit and is unused during receive.

The channel oscillator, V10A, provides injection frequency to transmit mixer V2 and receive mixer V11. Section B of V10 (phase inverter) provides push-pull oscillator injection to the cathodes of the balanced mixer, V2. Switch S6 selects the desired channel crystal and connects it into the screen and grid circuits of V10A. Ovens HR2 and HR3 maintain the channel crystals at constant temperature to provide either one or five parts per million stability, depending upon which oven is selected. Trimmer capacitors C67, C68, C69, and C70 trim channel crystals Y1, Y2, Y3, and Y4, respectively, to the exact channel frequency desired. This compensates for crystal grinding tolerances and circuit stray capacitances as well as for crystal aging.

4.6 CONTROL CIRCUITS.

4.6.1 TRANSMIT-RECEIVE CONTROLS.

Refer to figures 4-1, 7-1, and 4-2. Figure 4-2 is a partial schematic showing voice-operated control (vox) circuits with all relays. When TUNE-OPERATE switch S9 is in TUNE position, tube section V7A is connected as a phase-shift audio oscillator operating at approximately 1.4 kc. When S9 is in OPERATE

SECTION IV

Principles of Operation

position. V7A is connected as a conventional microphone amplifier. The cathode current passes through R29 and the carbon microphone in handset HS1 when HS1 is off the cradle. The handset cradle switch, S10, shorts the microphone when HS1 is on the cradle. If a high-impedance microphone is used, it is connected to the grid of V7A through capacitor C57.

The output from V7B plate is rectified by the vox rectifier, V9B. The positive output of V9B is applied to the grid of the vox relay control tube, V8B, through resistor R44. Some of the receive audio output from V16 is coupled to the anti-vox rectifier, V9A. The negative output from V9A is connected through resistor R43 to the grid of vox-relay control tube V8B. The level of this negative voltage is set by ANTI-VOX control R88 and keeps the loudspeaker output from tripping the transmit circuits. When enough voice input is present at the handset or microphone, the positive vox voltage from V9B exceeds the negative anti-vox voltage from V9A at the grid of V8B. Application of positive voltage to the grid of V8B causes the tube to conduct current and therefore energize relay K1.

When relay K1 is energized, normally closed contacts 3 and 4 open and disconnect receive audio from the grid of V16. Normally open contacts 5 and 6 close to complete the coil circuit for relays K2 and K3, energizing both. Normally closed contacts 8 and 9 of K1 open to disconnect the antenna from the receive circuits. Contacts 7 and 8 close and short the receive input circuits to ground. Contacts 1, 2, and 3 of relays K2 and K3 select the proper timing capacitor for the alc/agg bus and discharge the one not in use. Contacts 4, 5, and 6 of K2 switch the driver and PA screen circuits from 0 to +275 volts d-c. Contacts 7, 8, and 9 of K2 open the cathode circuits of V11, V12, and V13 and remove cutoff bias from grid circuits of V1B and V2 by grounding the grid-circuit end of R105. Contacts 10, 11, and 12 of K2 remove the signal short from V8B by connecting R114 to ground. Contacts 4, 5, 6, 10, 11, and 12 of K3 are all used in switching antenna connections from receive to transmit function. Contacts 7, 8, and 9 remove the cathode circuit of switching diode CR1 from ground and apply it to a +250 volts d-c. This reverse-biases CR1 and thus removes the channel oscillator signal from the receiver mixer, V11.

4.6.2 OPERATING CONTROLS.

Normally used controls consist of power supply on-off switches, the meter switch, TUNE-OPERATE switch, and CHANNEL SELECTOR. The functions of these switches are described in section III. Switches S1, S2, S3, S4, S5, S6, and S11 are ganged to the CHANNEL SELECTOR control. All except S5 select channel crystals or channel tuned circuits. Switch S5A gives channel position information for remote switching or indication, such as to control Antenna Coupler 180V-1. Space and mounting holes are provided for

custom installation of four additional coaxial receptacles. These may be wired to S5B and connected to separate antenna so that the appropriate antenna is selected when the CHANNEL SELECTOR is set to the desired channel.

4.7 DIRECTIONAL WATTMETER 302E-2.

Refer to figure 7-3. Transmission line current flows through the line center conductor and through the center of a toroid coil. The conductor forms the primary, and the coil the secondary of a toroidal transformer, T1. Induced toroid current produces a voltage that divides equally across series resistors R1 and R2. Since the junction of R1-R2 is grounded, voltages across R1 and R2 are opposite in phase with respect to ground and proportional to line current. Line voltage is applied across two capacitive voltage dividers, C1-C3 and C2-C4, resulting in equal voltages of the same phase across C3 and C4.

When the transmission line is mismatched, the voltages across R1 and R2 represent the vector sum of two components, one proportional to the current in the forward wave and the other proportional to the current in the reflected wave. Similarly, the voltages across C3 and C4 represent the vector sum of forward and reflected voltage components. Capacitors C1 and C2 are factory adjusted so that the magnitudes of forward voltage and current components are equal; the reflected components are then equal. The settings of C1 and C2 are correct for a 52-ohm transmission line only.

The phase relationship between the various voltage components is such that the r-f voltage across diode CR1 is equal to the sum of the two forward voltage components. Also, the r-f voltage across diode CR2 is equal to the sum of the two reflected components.

When the transmission line is terminated in its own impedance, the voltage across C3 and R1 are equal in magnitude and opposite in phase. Being on opposite sides of CR1 with respect to ground, the voltages across C3 and R1 add to one another. Also, the voltages across C4 and R2 are equal in magnitude and of the same phase; being on opposite sides of CR2 with respect to ground, their voltages cancel. These relationships are used for adjusting C1 and C2 under laboratory conditions.

Derived r-f voltages are rectified and filtered by CR1-L1 and CR2-L2 to produce d-c currents through meter M1. Resistors R3 and R4 are meter calibrating resistors selected in factory tests to give accurate indications of forward and reverse power levels.

4.8 PHONE PATCH 152J-1.

Refer to figure 7-4. The operation of the 152J-1 is clarified by tracing the audio signal voltages from the transceiver to the telephone line and from the telephone line to the transceiver as follows: When the

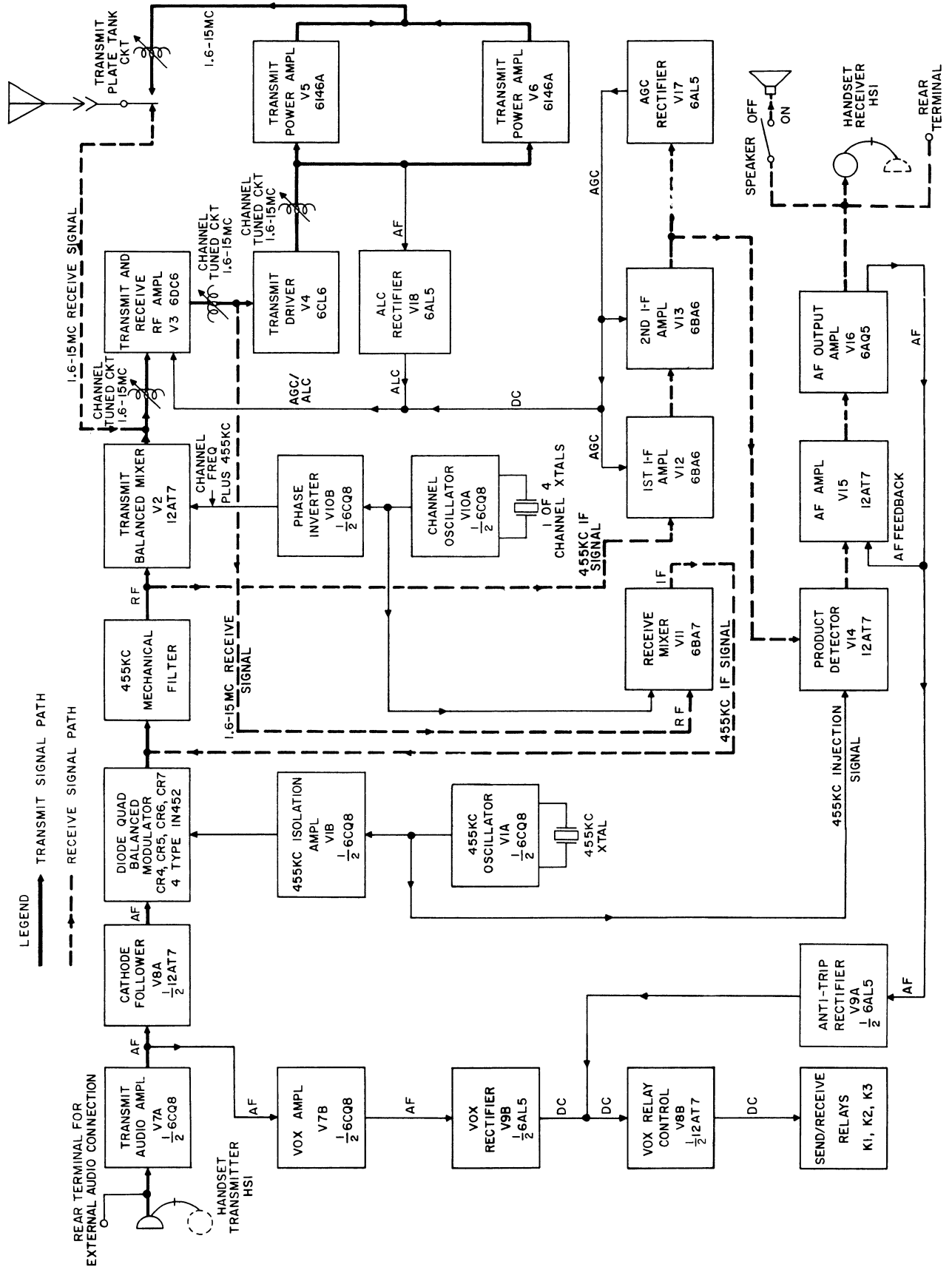


Figure 4-1. Transceiver 32RS-1, Block Diagram

SECTION IV
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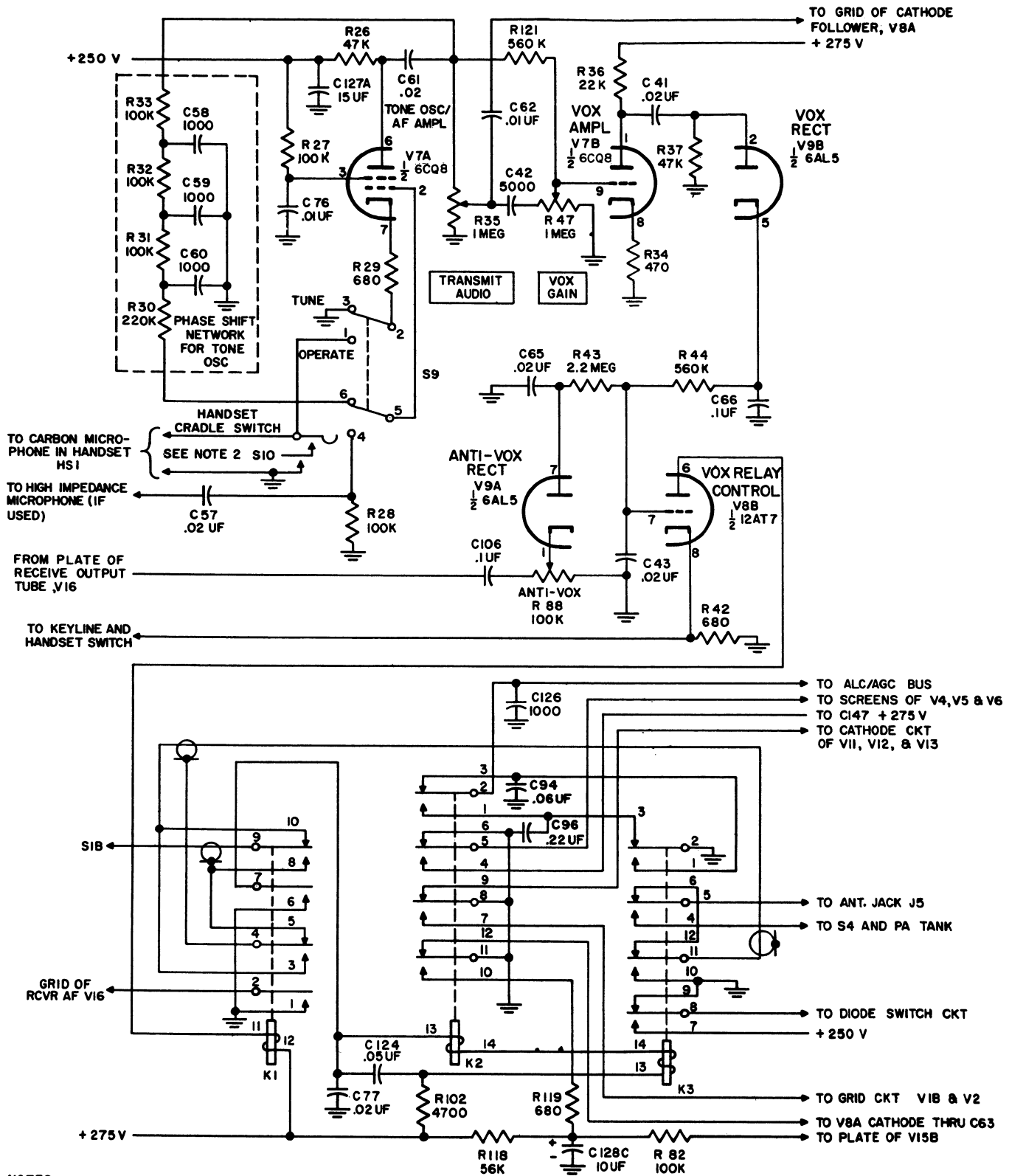


Figure 4-2. Partial Schematic, Vox Circuits

PHONE PATCH switch, S2, is set to ON and the STATION CONTROL switch, S1, is turned to VOX OPERATE, audio output voltage from the 32RS-1 passes through an attenuating pad (R13, R14, and R15) to the primary of T2. The secondary of T2 is connected across a bridge circuit. Output from the bridge circuit is passed through a resistive pad and an r-f filter to the telephone line. Audio input voltage from the telephone line is passed through an r-f filter and the resistive pad to the bridge circuit, impressed across T1, and coupled through the STATION CONTROL switch, S1, to the microphone input of the 32RS-1.

Resistors R6, R7, R8, R9, and R10 along with capacitors C6 and C7 form a balancing circuit that operates with the 32RS-1 VOX GAIN control to prevent transceiver audio output voltages from operating the transceiver audio input circuits. The VOX GAIN control on Transceiver 32RS-1 and the 152J-1 balance adjustments, C7 and R10, are adjusted so that with normal receiver output voltages, the voltage appearing across T2 secondary is not strong enough to couple to the microphone input and trip the vox relays in the 32RS-1.

The TRANSMIT and RECEIVE positions of the STATION CONTROL switch, S1, allow transceiver operation when telephone input voltages will not permit normal vox operation or when it is desired to override the vox circuits. The TRANSMIT position of S1 grounds the grid and cathode of vox amplifier V8 in the 32RS-1 and couples audio input signals from T1 of the 152J-1 bridge circuit to the microphone input of the 32RS-1. The RECEIVE position of S1 grounds the grid of vox amplifier V8 in the 32RS-1 and shorts microphone input signals from the 152J-1.

The STATION MUTE position of the PHONE PATCH switch, S2, grounds the 32RS-1 microphone input, disconnects the received input signals from the 32RS-1, and disconnects the phone line. The OFF position of the PHONE PATCH switch, S2, disconnects the phone line and returns a ground to the 32RS-1 speaker. The 32RS-1 may be keyed, however, by turning the STATION CONTROL switch to TRANSMIT. The 152J-1 exerts no control on the 32RS-1 when the STATION CONTROL switch is in VOX OPERATE position and the PHONE PATCH switch is in the OFF position.

SECTION V MAINTENANCE

5.1 GENERAL.

This section contains trouble-shooting procedures, alignment instructions, and performance tests for Transceiver 32RS-1.

5.1.1 TEST EQUIPMENT.

The following test equipment items (or equivalents) are suggested for testing Transceiver 32RS-1.

- a. R-f signal generator, capable of 1.0 volt output.
- b. Audio signal generator, Heathkit AG-9.
- c. Vacuum-tube voltmeter, Hewlett-Packard 410B.
- d. 52-ohm load, Bird Model 820.
- e. Communications receiver - general coverage with S-meter, 51J-4.
- f. One 600-ohm, 4-watt resistor (two 270-ohm, 2-watt resistors in series).

5.2 INSPECTION AND LUBRICATION.

5.2.1 GENERAL.

It is suggested that at the beginning of station operation that the operator make a log of meter readings and output power level and that the operator continue keeping this log up to date. A comparative check of meter indications and output power level over a period of time will give an indication of over-all transceiver operation. Also, trading log information with other stations within the radio net helps in determining over-all equipment operation.

5.2.2 VISUAL INSPECTION.

Remove the covers from the 32RS-1, and make a visual inspection of circuit components and relay and

switch contacts. Remove any dust or dirt that may have accumulated.

5.2.3 PA CATHODE CURRENT CHECK.

Check power amplifier cathode current periodically by turning the meter selector to PA CATH MA. The meter should indicate S-1.5 to S-2 when unit is keyed and kick up to S-9 when talking into the handset. Abnormal meter readings indicate aging PA tubes, incorrect bias or plate voltage, possible alc circuit malfunction, PA screen or high-voltage fuses blown, or antenna changes.

5.2.4 LUBRICATION.

Lubricate blower motor and band-switch bushings, link, and detent every 2,000 hours. Use any good quality of motor oil.

5.3 TROUBLE ANALYSIS.

5.3.1 GENERAL.

Trouble analysis of Transceiver 32RS-1 is accomplished easily by measuring stage gain, checking for normal voltage and resistance readings, and other common trouble-shooting methods. Stage gain and voltage and resistance readings are incorporated on the 32RS-1 schematic diagram, figure 7-1. The following text provides trouble-shooting procedures for faults that could be encountered in the 32RS-1. It should be noted that voltage and resistance readings given in this section are nominal and may vary slightly from equipment to equipment.

PHONE PATCH switch, S2, is set to ON and the STATION CONTROL switch, S1, is turned to VOX OPERATE, audio output voltage from the 32RS-1 passes through an attenuating pad (R13, R14, and R15) to the primary of T2. The secondary of T2 is connected across a bridge circuit. Output from the bridge circuit is passed through a resistive pad and an r-f filter to the telephone line. Audio input voltage from the telephone line is passed through an r-f filter and the resistive pad to the bridge circuit, impressed across T1, and coupled through the STATION CONTROL switch, S1, to the microphone input of the 32RS-1.

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5.3.2 WEAK TRANSMIT SIGNAL.

a. Attach a 52-ohm load (Bird model 820) to J5 of the 32RS-1, and check power output during transmit. If power output is near normal (100 watts PEP), check antenna feed-line system to see that an swr of 2.5 to 1 or less exists. If power output is less than normal, proceed to next step.

b. Key transmitter and measure the 455 kilocycles and channel injection oscillator voltages. Voltage at the wiper arm of R8 (455 kc) should be about 1.1 volts a-c. Voltage at either of the cathodes of V2 (channel injection) should be about 0.75 volt a-c. If either or both indications are abnormal, trouble-shoot oscillator circuits, and then proceed to paragraphs 5.4.9 and 5.4.10 for oscillator alignment procedures. If oscillator voltages are normal, proceed to next step.

c. Refer to paragraph 2.4, steps e through n, for tuning adjustments of the 32RS-1.

NOTE

Be careful that the transmitter is not tuned to the injection frequency. Transmitter is tuned to the injection frequency if the TRANSMIT AUDIO gain control has no effect on the amplitude of the output signal.

5.3.3 SPURIOUS SIGNAL RADIATION.

a. Spurious signal radiation may be caused by oscillations in the driver or power amplifier stages. Refer to paragraphs 5.4.2, 5.4.3, 5.4.4, and 5.4.5 for neutralization procedures.

b. Channel injection voltages will not hold when channels are changed. (These may vary over a 2-to-1 range due to normal crystal activity variations.)

c. If diode CR1 malfunctions, injection voltage for receive operation will not be at the proper level.

5.3.4 UNWANTED RECEIVER RESPONSE DURING TRANSMIT.

Any receiver response during transmit operation indicates that receive circuits are not being disabled. Check relay K2 and other vox circuits.

5.3.5 FREQUENCY DRIFTING.

- Check oven power circuits.
- Check ovens.

5.3.6 EQUIPMENT OFF FREQUENCY.

- Check oven circuits.

b. Check crystal trimmers according to tuning instructions given in paragraph 2.4. If the crystal is off trim on any one channel, check the channel trimmer. If this is all right, the crystal has probably aged beyond its frequency tolerances.

5.3.7 POOR TRANSMIT AUDIO QUALITY.

a. Turn the meter selector to the ALC-S position. Talk into handset while observing alc action. If alc action is abnormal, check V18 and associated alc circuits.

b. Key unit and check for an indication of S-1.5 to S-2 when the meter is in the PA CATH MA position. If the bias voltage is too low, the PA tubes will be

driven into nonlinear operation. If the PA bias is too high, the life of the PA tubes is impaired.

- Check r-f amplifier tubes.

d. Check crystal trim and tuning and loading adjustments on the driver and power amplifier according to instructions in paragraph 2.4.

5.3.8 SIGNAL DROPOUT DURING TRANSMIT.

a. Refer to paragraph 3.2, steps f and g for VOX GAIN and ANTI-TRIP adjustments.

b. Check vox circuits including V7B, V8B, V9, and relays K1, K2, and K3.

5.3.9 CONTINUAL RECEIVER SQUEAL.

a. Check filter components between the product detector, V14, and the audio amplifier, V15. Also check components between the product detector and V11 and V12.

- Check i-f amplifier circuits for oscillations.

5.3.10 RECEIVER WEAK.

- Check avc action according to paragraph 5.4.7.

b. If avc voltage is normal and signal is still weak, check the a-f stages and the product detector.

c. Check channel injection voltage at pin 2 of V11 for about 0.75 volt.

d. Check alignment of r-f stage according to paragraph 2.4.

NOTE

If it is noted that the receiver is weak immediately after tuning procedures have been completed, it is possible that the receiver is tuned to an image frequency. Repeat tuning adjustments. Be very careful that equipment is not tuned to the injection frequencies.

5.3.11 TRANSCEIVER 32RS-1 FAILS TO TUNE.

Check the physical alignment of switches S1 through S6 and S11 to see that one or more switches have not become misaligned.

WARNING

The plate amplifier shield should be securely in place for the following adjustments.

5.4 NEUTRALIZATION AND ALIGNMENT.

5.4.1 PRELIMINARY NEUTRALIZATION PROCEDURE.

Set the r-f driver and neutralizing capacitor (C47, figure 6-1) 45 degrees from minimum capacity, and set the feedback neutralizing capacitor (C48, figure 6-1) at one half capacity. Connect the 52-ohm load at antenna jack J1. Apply low and high voltage; then put the TUNE-OPERATE switch in the TUNE position and adjust the tuneup signal (transmit audio-gain control) for approximately five volts across this load, as read on a 410B or equivalent meter. Carefully peak all coils (antenna, r-f and PA tank) for maximum output, keeping the load power below five watts. If the equipment becomes unstable, as evidenced by a jump in

output voltage, adjust the feedback neutralizing capacitor slightly to re-establish stability.

5.4.2 R-F AMPLIFIER NEUTRALIZATION.

Open the feedback circuit by disconnecting the lead from the above chassis end of C50. Remove the plate and screen voltages from V3, and turn on the high and low voltages. With the 52-ohm load still in place, but with the 410B replaced by a 51J-4 or receiver of equivalent range, perform the following operations:

- a. Select a 12-mc channel using the tuneup oscillator for a forward signal.
- b. Using an insulated alignment tool, adjust C155 for a minimum S-meter reading.
- c. Repeak the r-f plate coil and repeat step b.

5.4.3 DRIVER NEUTRALIZATION.

a. Remove the plate and screen voltages from V4, apply plate and screen voltages to V3, and turn on the low and high voltages. The 52-ohm load and 51J-4 are connected as in paragraph 5.4.2. Again select a 12-mc channel.

- b. Using an insulated alignment tool, adjust C47 for a minimum S-meter indication.
- c. Repeak driver plate coil and repeat step b.

5.4.4 PA NEUTRALIZATION.

Remove plate and screen voltages from V5 and V6. Apply plate and screen voltages to both V3 and V4. The load and 51J-4 are connected as in paragraph 5.4.2. The transceiver is tuned to a 12-mc channel.

- a. Using an insulated alignment tool, adjust C114 (see figure 6-2) for a minimum S-meter indication.
- b. Repeak the PA tank circuit and repeat step a.
- c. Replace the 51J-4 with the 410B or equivalent. Apply high voltage, and set the tuneup signal for approximately five volts across the 52-ohm load. Repeak all coils for a maximum output indication.

5.4.5 FEEDBACK NEUTRALIZATION.

a. With the 32RS-1 tuned to the 12-mc channel, couple the antenna of a 51J-4 receiver to the plate of V3 through a 10-uuf capacitor. Connect a 22-uuf capacitor between the signal generator and the above chassis end of C50 (figure 6-1), the feedback-feedthrough capacitor. Leads should be short and the coax should be grounded securely.

- b. Key the transmitter. With the tuneup oscillator turned off and the channel crystal oven removed, tune the signal generator for a zero beat on the 51J-4 at 12 mc. Adjust the signal generator output until the 51J-4 S-meter rests at midscale or less. Using an insulated alignment tool, adjust C48 for a minimum change in S-meter indication as the driver grid coil is varied back and forth through resonance.
- c. Reconnect feedback lead to C50.

5.4.6 METER ADJUSTMENT.

- a. Turn OVENS and low-voltage (L.V.) switches on.
- b. After the warmup period, adjust the meter zero-adjust potentiometer (R16) for a zero reading on the meter, with the antenna shorted to ground.
- c. Turn the high-voltage (H.V.) switch on. Rotate the meter function selector through the +275 and -75 VDC positions. Meter should indicate S-9 $\pm 5\%$ on each position.
- d. Rotate the meter function selector to +800 VDC position. Meter should indicate between 59 and 20 db over S-9 when the 32RS-1 is unkeyed. Key the 32RS-1 and adjust the bias potentiometer (2R3) for a meter indication of between S-1.5 and S-2 when the meter selector is in the PA CATH MA position. The +800 VDC reading should then drop to near S-9 when the 32RS-1 is keyed.

5.4.7 RECEIVER I-F ALIGNMENT.

a. Inject a 453.5-kc unmodulated signal at the junction of C15-C16. This tie point is located just below pin 9 on V11.

b. Turn meter selector to the ALC-S position, and adjust T1 and both slugs of T2 for maximum indication on the meter.

c. Check gain through the receiver i-f stages by adjusting signal generator input until the meter indicates S-0. If signal generator input level is between 150 and 500 uv, the receiver i-f stages are operating properly. If an input signal of greater than 350 uv is required for S-0 indication, check V12, V13, and associated circuit components. The S-0 indication is at avc threshold.

d. Check avc action by adjusting signal generator input level until meter indicates S-9. If signal generator input level for S-9 indication is between 5000 and 35000 uv, the avc circuits are operating properly. If less than 5000 uv is required for an S-9 indication, avc circuits are malfunctioning; check V17 and associated circuit components.

e. Disconnect signal generator input, and check that the S-meter drops smoothly to zero with a time constant of about one-fifth second.

5.4.8 AUDIO AMPLIFIER AND 455-KC OSCILLATOR CHECKS.

a. With the signal generator still connected at the junction of C15-C16 and the injection level at avc threshold (S-0), turn up RECEIVER AUDIO GAIN, R84. A beat note between the 455-kc crystal oscillator and the 453.5-kc signal should be heard in the handset.

b. Turn SPEAKER on to check its operation.

c. Connect two 270-ohm, 2-watt resistors in series from C142 to ground. Connect a vtvm from C142 to ground. Capacitor C142 is located on the rear filter plate.

d. Sweep the signal generator across the "audio spectrum" (450 to 455 kc), then return the signal generator to the frequency setting that gives maximum output voltage.

e. With the SPEAKER off, increase the RECEIVER AUDIO GAIN to maximum. Output voltage should be not less than 27.4 volts. If the audio gain is low, check V14, V15, V16 and associated circuits.

5.4.9 CHANNEL INJECTION BALANCE.

a. Terminate the 32RS-1 with a 52-ohm load (Bird model 820). Remove the 455-kc crystal oven. Select the highest frequency channel being used. Turn the TRANSMIT AUDIO control to minimum, and select OPERATE at the TUNE-OPERATE switch.

b. Couple a general coverage communications receiver to the 32RS-1 output, and tune to the 32RS-1 frequency. Figure 5-1 is the suggested method of coupling the communications receiver to protect the receiver.

c. Adjust R14 and C25 for a minimum signal as heard on the communications receiver.

d. Select TUNE at the TUNE-OPERATE switch, and increase the TRANSMIT AUDIO control until 100 watts is indicated at the output load. When tuned to the channel frequency, the communications receiver S-meter should indicate an increased reading of at least 65 db over the transmitted signal level at the channel crystal frequency. If there is less than 65 db signal increase, channel injection balance adjustments should be repeated.



DO NOT run the 32RS-1 at full CW output power for more than 15 seconds at a time or the PA tubes may be damaged.

5.4.10 CARRIER BALANCE AND NOISE.

a. Terminate 32RS-1 with a 52-ohm load (Bird model 820). Couple the input of a communications receiver to the 32RS-1 output. Select a frequency on the communications receiver corresponding to the frequency selected at the CHANNEL SELECTOR. One channel is as good as another for this adjustment. Select OPERATE with the TUNE-OPERATE switch, and key transmitter by means of the handset push-button. Hold down the cradle switch, S10, to eliminate ambient noise pickup.

b. With no signal input and the TRANSMIT AUDIO control to minimum, balance R8 and C11 for minimum residual carrier.

c. Decrease coupling to the communications receiver until its S-meter indicates near the low end of the scale. Record S-meter indication.

d. Increase the gain setting of the TRANSMIT AUDIO control to maximum. Record communications receiver S-meter indication.

e. Return TRANSMIT AUDIO to minimum, and select TUNE at the TUNE-OPERATE switch.

f. Increase TRANSMIT AUDIO to a point where the 32RS-1 output is 100 watts PEP. Record communications receiver S-meter indication.

g. If residual carrier and noise levels (as measured in steps c and d) are not at least 50 db down from full power output operation (as measured in step f), repeat carrier balance adjustments, and check a-f input circuits for stray noise inputs.

5.4.11 TRANSMIT AUDIO AND VOX OPERATION.

a. Turn TRANSMIT AUDIO control to maximum (cw stop). Place TUNE-OPERATE switch in TUNE position.

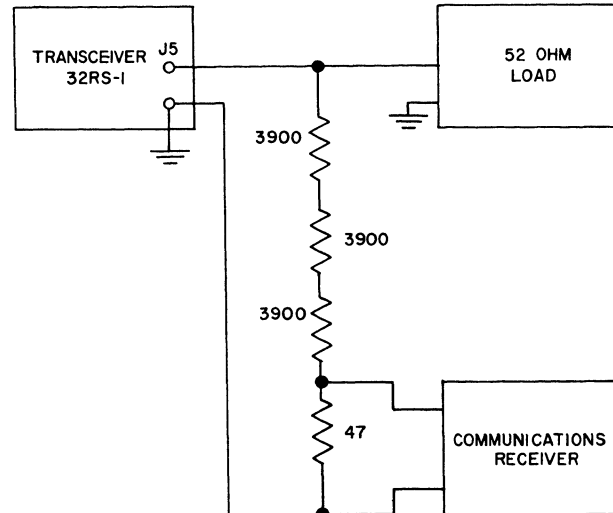


Figure 5-1. Test Equipment Connections During Balance Adjustments

b. Turn VOX GAIN clockwise, and check that vox relays operate before the knob pointer passes nine o'clock position. If operation is not normal, check V7, V8, and V9 tubes and circuitry.

5.5 PERFORMANCE TESTS AND ADJUSTMENTS.

5.5.1 GENERAL.

To determine that the 32RS-1 is operating properly, conduct the tests outlined in the following paragraphs. If test results indicate that corrective action is necessary, the last step of each test procedure gives instructions for corrective action or references this information elsewhere in this section. It is assumed that prior to testing, the tuning procedures outlined in paragraph 2.4 have been performed.

5.5.2 OVER-ALL GAIN, ALC, AND POWER OUTPUT CHECKS.

a. Terminate the 32RS-1 at J5 with a 52-ohm load. (Bird model 820). Select OPERATE at the TUNE-OPERATE switch. Attach an audio signal generator to the microphone input on the rear of the 32RS-1 (C146), and set frequency output to 1500 cps. Turn TRANSMIT AUDIO control, R35, to maximum.

b. Increase audio oscillator input until the meter reads S-3 in the ALC-S position.



DO NOT overheat the PA tubes.

c. Using an r-f voltmeter, measure the 32RS-1 output voltage. Output voltage should be not less than 72 volts. Input voltage required to produce 72 volts output should not exceed 0.1 volt.

d. Increase input voltage 6 db, and measure the 32RS-1 output voltage. Output voltage with the increased input level should not exceed two volts more than voltage measured in step c. The ALC-S meter reading for the increased signal level input should be between S-4 and S-8.

e. If power output does not meet specifications, proceed to paragraph 5.3.2 for trouble-analysis procedures.

5.5.3 RECEIVER OVER-ALL GAIN.

a. Turn RECEIVE RF gain R91 and RECEIVER AUDIO GAIN R83 to maximum. Turn SPEAKER to OFF. Terminate C142 with two 270-ohm, 2-watt resistors in series to ground.

b. For any channel selected, use a signal generator to inject a 1.0-uv signal at J5 of the 32RS-1. Vary the signal generator frequency to obtain maximum audio output voltage as measured with a vtvm at the load. Output voltage should be not less than 5.5 volts.



Be careful that the high-voltage switch is off while the signal generator is connected to J5 so that if the transmitter is keyed accidentally severe damage would not result to the signal generator.

c. If receiver gain is low, refer to paragraph 5.3.10 for trouble analysis.

5.5.4 RECEIVER SENSITIVITY.

a. TURN RECEIVE RF gain R91 and RECEIVER AUDIO GAIN R84 to maximum. Turn SPEAKER off. Terminate C142 with two 270-ohm, 2-watt resistors in series to ground.

b. For any channel selection, use a signal generator to inject a 1.0-uv signal at J5 of the 32RS-1. Vary the signal generator frequency to obtain maximum audio output voltage as measured with a vtvm across the load. Record this voltage.

c. Detune the signal generator input, and again measure the load voltage. The signal-plus-noise to noise ratio should be not less than 10 db. If the signal-plus-noise to noise ratio is too low, check alignment of r-f stages (refer to par. 2.4) or try changing r-f tubes.

5.5.5 MAXIMUM AUDIO POWER OUTPUT AND AVC ACTION.

a. Turn RECEIVE RF gain R91 and RECEIVER AUDIO GAIN R84 to maximum. Turn SPEAKER off. Terminate C142 with two 270-ohm, 2-watt resistors in series to ground.

b. For any channel selection, use a signal generator to inject a signal at J5 of the 32RS-1. Vary the signal generator frequency until output load voltage is maximum.

c. Increase signal generator input voltage until output load voltage is 13.8 volts. The ALC-S meter should read not more than S-6 and antenna input voltage should be from 1 to 7 uv.

d. If power output is low, refer to paragraph 5.3.10 for corrective action.

5.5.6 TALKOUT, VOX, ALC, AND ROUGH GAIN CHECKS.

a. Set the TUNE-OPERATE switch to OPERATE. Select any channel with the CHANNEL SELECTOR. Set the TRANSMIT AUDIO gain, R35, so alc kicks on voice peaks. Increase the VOX GAIN, R47, setting until normal vox operation is obtained, that is transmitter keys when operator speaks into handset.

b. Hold the handset about one foot in front of the speaker. Adjust the ANTI-TRIP control, R88, until no feedback occurs.

c. Speak into the handset, and check for normal vox operation. Repeat adjustments outlined in steps a and b.

d. Check that send-receive operation is smooth and quiet.

e. Check for alc action on all four channels, resetting the TRANSMIT AUDIO gain control as required. If no indication is obtained on a channel, repeat tuning procedures according to paragraph 2.4.

f. Listen to transmitter on a separate receiver.

5.6 TROUBLE ANALYSIS OF DIRECTIONAL WATT-METER 302E-2.

Unusual readings for forward and reflected power do not necessarily indicate a faulty instrument. The wattmeter may be reading the true conditions resulting from a faulty transmission line, antenna, or transmitter. If a fault in the instrument is suspected, connect the output to a nonreactive 52-ohm load such as a Bird model 820. When r-f energy is fed into the load from the 32RS-1, the forward power reading should be consistent with 32RS-1 power output (100 watts PEP) and the reflected power reading should be quite small or zero. Wattmeter calibration and accuracy can be checked by reversing the 302E-2 in the line and comparing the power readings on corresponding direction settings. The 302E-2 is reversed by switching the TRANS. and ANT. connectors. Under these conditions, forward power will be read when the switch is set to the REVERSE position and vice versa. Corresponding readings in the normal and reversed positions should be within $\pm 10\%$ of one another.

The value and placement of most of the parts in the coupler are critical. Replacement components must have the same tolerance, be of the same type, and be in exactly the same position as the original parts. Accuracy and calibration will be impaired if improper parts and placement are used. The types of parts and their tolerances are specified in section VI, Parts List. If any one of the selected resistors must be replaced, use the same value ($\pm 1\%$) of the original resistor. Faulty instruments can be returned to the factory for service, calibration, and adjustment at any time. If diodes are changed, rebalancing is necessary.



When packing the 302E-2 for shipment, pad the shipping container with abundant packing material to avoid shipping damage.

5.7 TROUBLE ANALYSIS OF PHONE PATCH 152J-1.

If the phone patch unit is not functioning properly, carefully check all adjustments as outlined in section III. Check all connections, plugs, etc., for open or shorted conditions. If the BALANCE controls, C7 and R10, do not yield sufficient isolation, check to make sure the telephone line is properly connected. Replacement components can be ordered from the factory by part number, as listed in section VI.

SECTION VI PARTS LIST

ITEM	DESCRIPTION	COLLINS PART NUMBER
TRANSCEIVER 32RS-1C (CABINET MOUNT)		522-1189-00
TRANSCEIVER 32RS-1		543-7336-00
B1	FAN, CENTRIFUGAL: direct connection forward curved blades, single phase 60 cps, 115 v ac, 0.30 amp, 23 w, 1550 rpm; Redmond Trailer Co. part no. L-3198	009-1394-00
C1	CAPACITOR, FIXED, CERAMIC: 1000 uuf ±20%, 500 v dc; MIL type CK60AW102M	913-1186-00
C2	CAPACITOR, FIXED, MICA: 100 uuf ±10%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5T1EK	912-0495-00
C3	CAPACITOR, FIXED, MICA: 10 uuf ±10%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5Q1CK	912-0432-00
C4	CAPACITOR, FIXED, MICA: 68 uuf ±10%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5Q68EK	912-0483-00
C5	CAPACITOR, FIXED, MICA: same as C3	912-0432-00
C6	CAPACITOR, FIXED, CERAMIC: same as C1	913-1186-00
C7	CAPACITOR, FIXED, CERAMIC: 4700 uuf ±20%, 500 v dc; MIL type CK62AW472M	913-1187-00
C8	CAPACITOR, FIXED, MICA: 510 uuf ±10%, 300 v dc; Cornell Dubilier Electric Corp. part no. 22R3T51EK	912-0546-00
C9	CAPACITOR, FIXED, CERAMIC: 0.02 uf -20% +100%, 500 v dc; Sprague Electric Co. part no. 33C2	913-2142-00
C10	CAPACITOR, FIXED, CERAMIC: 10,000 uuf ±20%, 500 v dc; MIL type CK63AW103M	913-1188-00
C11	CAPACITOR, VARIABLE, CERAMIC: 8.0 uuf min to 75.0 uuf max 350 v dc; Erie Resistor Corp. part no. 557018 U2PO 34R	917-1075-00
C12	CAPACITOR, FIXED, CERAMIC: same as C9	913-2142-00
C13	CAPACITOR, FIXED, CERAMIC: same as C9	913-2142-00
C14	CAPACITOR, FIXED, MICA: 150 uuf ±10%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5T15EK	912-0507-00
C15	CAPACITOR, FIXED, MICA: same as C14	912-0507-00
C16	CAPACITOR, FIXED, CERAMIC: same as C1	913-1186-00
C17	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C18	CAPACITOR, FIXED, CERAMIC: same as C9	913-2142-00
C19	CAPACITOR, FIXED, MICA: 51 uuf ±10%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5Q51EK	912-0474-00
C20	CAPACITOR, FIXED, CERAMIC: same as C7	913-1187-00
C21	CAPACITOR, FIXED, CERAMIC: same as C1	913-1186-00
C22	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C23	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C24	CAPACITOR, FIXED, CERAMIC: same as C7	913-1187-00
C25	CAPACITOR, VARIABLE, CERAMIC: 5.0 to 37.5 uuf, 350 v dc; Erie Resistor Corp. part no. 557018 COPO 39R	917-1073-00
C26	CAPACITOR, FIXED, MICA: same as C3	912-0432-00
C27	CAPACITOR, FIXED, MICA: same as C3	912-0432-00
C28	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C29	CAPACITOR, FIXED, MICA: same as C8	912-0546-00
C30	CAPACITOR, FIXED, MICA: 51 uuf ±2%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5Q51EG	912-0472-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
C31	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C32	CAPACITOR, FIXED, CERAMIC: same as C7	913-1187-00
C33	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C34	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C35	CAPACITOR, FIXED, MICA: 100 uuf ±2%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5T1EG	912-0493-00
C36	CAPACITOR, FIXED, MICA: 47 uuf ±2%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5Q47EG	912-0469-00
C37	CAPACITOR, FIXED, CERAMIC: same as C7	913-1187-00
C38	CAPACITOR, FIXED, CERAMIC: same as C7	913-1187-00
C39	CAPACITOR, FIXED, CERAMIC: same as C1	913-1186-00
C40	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C41	CAPACITOR, FIXED, CERAMIC: same as C9	913-2142-00
C42	CAPACITOR, FIXED, CERAMIC: same as C7	913-1187-00
C43	CAPACITOR, FIXED, CERAMIC: same as C9	913-2142-00
C44	CAPACITOR, FIXED, MICA: 68 uuf ±10%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5Q68EK	912-0483-00
C45	CAPACITOR, FIXED, MICA: same as C8	912-0546-00
C46	CAPACITOR, FIXED, CERAMIC: same as C9	913-2142-00
C47	CAPACITOR, VARIABLE, CERAMIC: same as C25	917-1073-00
C48	CAPACITOR, VARIABLE, CERAMIC: same as C11	917-1075-00
C49	CAPACITOR, FIXED, MICA: same as C30	912-0472-00
C50	CAPACITOR, FIXED, CERAMIC: 5000 uuf ±20%, 50 v dc; Erie Resistor Corp. part no. 357012 Y5U0 502M	913-3549-00
C51	CAPACITOR, FIXED, CERAMIC: 100 uuf ±20%, 50 v dc; Erie Resistor Corp. part no. 357012 Y5U0 101M	913-3550-00
C52	CAPACITOR, FIXED, MICA: same as C3	912-0432-00
C53	CAPACITOR, FIXED, CERAMIC: same as C7	913-1187-00
C54	CAPACITOR, FIXED, CERAMIC: same as C1	913-1186-00
C55	CAPACITOR, FIXED, CERAMIC: same as C7	913-1187-00
C56	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C57	CAPACITOR, FIXED, CERAMIC: same as C9	913-2142-00
C58	CAPACITOR, FIXED, MICA: 1800 uuf ±5%, 500 v dc; MIL type CM06F182J03	912-3019-00
C59	CAPACITOR, FIXED, MICA: same as C58	912-3019-00
C60	CAPACITOR, FIXED, MICA: same as C58	912-3019-00
C61	CAPACITOR, FIXED, CERAMIC: same as C9	913-2142-00
C62	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C63	CAPACITOR, FIXED, ELECTROLYTIC: 25 uf, -10% +100%, 25 v dc; Mallory, P. R. and Co., Inc. part no. TC26	183-1034-00
C64	CAPACITOR, FIXED, MICA: 47 uuf ±10%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5Q47EK	912-0471-00
C65	CAPACITOR, FIXED, CERAMIC: same as C9	913-2142-00
C66	CAPACITOR, FIXED, PAPER: 0.1 uf ±10%, 400 v dc; Sprague Electric part no. 160P10494	931-0299-00
C67	CAPACITOR, VARIABLE, AIR: midget, single section; 3.6 uuf to 30.0 uuf, 28 plates, 850 v peak ac, 60 cps; E. F. Johnson Co. part no. 160-130-3	922-0038-00
C68	CAPACITOR, VARIABLE, AIR: same as C67	922-0038-00
C69	CAPACITOR, VARIABLE, AIR: same as C67	922-0038-00
C70	CAPACITOR, VARIABLE, AIR: same as C67	922-0038-00
C71	CAPACITOR, FIXED, CERAMIC: same as C1	913-1186-00

SECTION VI
Parts List

ITEM	DESCRIPTION	COLLINS PART NUMBER
C72	CAPACITOR, FIXED, MICA: same as C35	912-0493-00
C73	CAPACITOR, FIXED, CERAMIC: 2000 uuf ±20%, 2000 v dc	913-3571-00
C74	CAPACITOR, FIXED, CERAMIC: same as C9	913-2142-00
C75	CAPACITOR, FIXED, CERAMIC: same as C1	913-1188-00
C76	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C77	CAPACITOR, FIXED, CERAMIC: same as C9	913-2142-00
C78	CAPACITOR, FIXED, CERAMIC: same as C9	913-2142-00
C79	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C80	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C81	CAPACITOR, FIXED, CERAMIC: same as C1	913-1188-00
C82	CAPACITOR, FIXED, CERAMIC: 50,000 uuf -20% +80%, 500 v dc; Sprague Electric Co. part no. 33C58	913-3153-00
C83	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C84	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C85	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C86	CAPACITOR, FIXED, MICA: same as C64	912-0471-00
C87	CAPACITOR, FIXED, MICA: same as C1	913-1188-00
C88	CAPACITOR, FIXED, CERAMIC: same as C82	913-3153-00
C89	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C92		
C93	CAPACITOR, FIXED, MICA: same as C8	912-0546-00
C94	CAPACITOR, FIXED, PAPER: 0.06 uf -10% +30%, 200 v dc	931-0164-00
C95	CAPACITOR, FIXED, CERAMIC: same as C1	913-1188-00
C96	CAPACITOR, FIXED PAPER: 0.22 uf ±10%, 400 v dc; Sprague Electric Co. part no. 160P22494	931-0303-00
C97	CAPACITOR, FIXED, CERAMIC: same as C9	913-2142-00
C98	CAPACITOR, FIXED, MICA: 220 uuf ±5%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5T22EJ	912-0518-00
C99	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C100	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C101	CAPACITOR, FIXED, MICA: 5 uuf ±10%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5V5CK	912-0429-00
C102	CAPACITOR, FIXED, MICA: 100 uuf ±10%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5T1EK	912-0495-00
C103	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C104	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C105	CAPACITOR, FIXED, ELECTROLYTIC: same as C63	183-1034-00
C106	CAPACITOR, FIXED, PAPER: same as C66	931-0299-00
C107	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C108	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C109	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C110	CAPACITOR, FIXED, CERAMIC: same as C1	913-1188-00
C111	CAPACITOR, FIXED, CERAMIC: same as C1	913-1188-00
C112	CAPACITOR, FIXED, CERAMIC: same as C73	913-3571-00
C113	CAPACITOR, FIXED, MICA: same as C8	912-0546-00
C114	CAPACITOR, VARIABLE, CERAMIC: same as C25	917-1073-00
C115	CAPACITOR, FIXED, PAPER: same as C96	931-0303-00
C116	CAPACITOR, FIXED, CERAMIC: 10 uuf ±10%, 5000 v dc; Centralab Division of Globe Union Inc. part no. DA855-035	913-0972-00
C117	CAPACITOR, FIXED, CERAMIC: same as C73	913-3571-00
C118	CAPACITOR, FIXED, CERAMIC: same as C116	913-0972-00
C119	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C120	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C121	NOT USED	
C122	CAPACITOR, FIXED, CERAMIC: same as C1	913-1188-00
C123	NOT USED	
C124	CAPACITOR, FIXED, PAPER: 0.047 uf -10% +30%, 600 v dc; Sangamo Electric Co. part no. 33-503P 30M10PCT600WV	931-5508-00
C125	CAPACITOR, FIXED, CERAMIC: same as C1	913-1188-00
C126	CAPACITOR, FIXED, CERAMIC: same as C1	913-1188-00
C127	CAPACITOR, FIXED, ELECTROLYTIC: three sections, 15, 15, 10 uf -10% +50%, 450 v dc; Sprague Electric Co. part no. D11635	183-1091-00
C128	CAPACITOR, FIXED, ELECTROLYTIC: same as C127	183-1091-00
C129 thru C134	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C135	CAPACITOR, FIXED, CERAMIC: 1000 uuf -20% +80%, 500 v dc; Erie Resistor Corp. part no. 327047 X5T0 102Z	913-1292-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
C136 thru C143	CAPACITOR, FIXED, CERAMIC: same as C135	913-1292-00
C144	CAPACITOR, FIXED, PAPER: 1000 uuf -10% -30%, 1000 v dc; Sprague Electric Co. part no. P12756	241-0011-00
C145 thru C150	CAPACITOR, FIXED, CERAMIC: same as C135	913-1292-00
C151	CAPACITOR, FIXED, MICA: 39 uuf ±5%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5Q39EJ	912-0464-00
C152	CAPACITOR, VARIABLE, CERAMIC: same as C11	917-1075-00
C153	CAPACITOR, FIXED, MICA: same as C101	912-0429-00
C154	CAPACITOR, FIXED, CERAMIC: same as C51	913-3550-00
C155	CAPACITOR, VARIABLE, CERAMIC: 3.0 uuf min to 18.0 uuf max, 350 v dc; Erie Resistor Corp. part no. 557018 COPO 17R	917-1072-00
C156	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C157	CAPACITOR, FIXED, CERAMIC: same as C1	913-1188-00
C158	CAPACITOR, FIXED, CERAMIC: same as C9	913-2142-00
*C159	CAPACITOR, FIXED, MICA: 20 uuf ±5%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5Q2CJ	912-0443-00
*C159	CAPACITOR, FIXED, MICA: 24 uuf ±5%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5Q24EJ	912-0449-00
*C159	CAPACITOR, FIXED, MICA: 27 uuf ±5%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5Q27EJ	912-0452-00
*C159	CAPACITOR, FIXED, MICA: 33 uuf ±5%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5Q33EJ	912-0458-00
*C159	CAPACITOR, FIXED, MICA: 36 uuf ±5%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5Q36EJ	912-0461-00
*C159	CAPACITOR, FIXED, MICA: 39 uuf ±5%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5Q39EJ	912-0464-00
*C159	CAPACITOR, FIXED, MICA: 43 uuf ±5%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5Q43EJ	912-0467-00
*C159	CAPACITOR, FIXED, MICA: 47 uuf ±5%, 500 v dc; Cornell Dubilier Electric Corp. part no. 22R5Q47EJ	912-0470-00
C160	CAPACITOR, FIXED, MICA: 5 uuf ±5%, 500 v dc; Electro Motive Mfg. Co. part no. DM15C050J01	912-2750-00
C161	CAPACITOR, FIXED, CERAMIC: 0.1 uf -30% +80%, 75 v dc; Centralab part no. DA150-001CB	913-3794-00
C162	CAPACITOR, FIXED, CERAMIC: same as C10	913-1188-00
C163	CAPACITOR, FIXED, CERAMIC: same as C9	913-2142-00
C164	NOT USED	
C165	NOT USED	
C166	CAPACITOR, FIXED, CERAMIC: 6.0 uuf +1/2 uuf, 500 v dc; MIL type CC20CH060D	916-0122-00
CR1	SEMICONDUCTOR DEVICE, DIODE: germanium, hermetically sealed; JEDEC type 1N270	353-2018-00
CR2	NOT USED	
CR3	NOT USED	
CR4	SEMICONDUCTOR DEVICE, SET: silicon, hermetically sealed	353-3460-00
CR5	SEMICONDUCTOR DEVICE SET: same as CR4	353-3460-00
CR6	SEMICONDUCTOR DEVICE SET: same as CR4	353-3460-00
CR7	SEMICONDUCTOR DEVICE SET: same as CR4	353-3460-00
CR8	SEMICONDUCTOR DEVICE, DIODE: silicon; Hughes Products Division of Hughes Aircraft Co. part no. 1N458	353-0205-00
FL1	FILTER, MECHANICAL: brass, nickel plate finish 7/16 in. dia by 2-3/4 in. lg	526-9365-00
H1	NUT, SLEEVE: bakelite; 3/8 in. dia by 1-1/2 in. lg	500-8927-001
H2	NOT USED	
H3	POST, SPACING: phenolic; 0.187 in. by 0.312 in. by 1.125 in.	543-7398-002
H4	POST, MTG, SHIELD: aluminum, chromate dip finish; 0.160 in. by 0.312 in. by 3.906 in.	543-7401-002
H5	POST, MOUNTING: aluminum, chromate dip finish; 0.234 in. by 0.312 in. by 4.968 in.	543-7396-002
H6	POST, FILTER PLATE: aluminum, chromate dip finish; 0.160 in. by 0.250 in. by 1.937 in.	543-7397-002

*Chosen per operational requirements.

SECTION VI
Parts List

ITEM	DESCRIPTION	COLLINS PART NUMBER
H7	POST, ELECTRICAL MECHANICAL EQUIPMENT: aluminum, chemical film finish; 4-40 UNC-2B thd, 0.125 in. by 0.187 in. by 1.375 in.	540-9059-003
H8	CABLE CLAMP: steel, cadmium plated finish; 0.375 in. by 0.472 in. by 1.222 in.	500-6208-001
H9	POST, ELECTRICAL MECHANICAL EQUIPMENT: aluminum, chemical film finish; 6-32 UNC-2B thd, 0.160 in. by 0.250 in. by 0.500 in.	540-9209-003
H10	SPACER, SLEEVE: aluminum, chromate dipped; 0.152 in. max id, 0.226 in. max od, 0.125 in. lg o/a	541-6000-002
HR1	OVEN, CRYSTAL: for two HC-6U crystal holders, 75° C oven temp, 115 v ac 10 w heater rating; James Knight Co. part no. 900-0069	292-0184-00
HR2 or HR3	OVEN, CRYSTAL: for two HC-6U crystal holders, 75°c oven temp, 115 v ac 15 w heater rating; Ovensaire Inc. part no. PSA-101-28	292-0301-00
HS1	HANDSET: receiver, magnetic, 130 ohms impedance, microphone carbon element, 40 ohms impedance; w/cord, 4 conductors, w/ switch; General Dynamics Corp. part no. 216827-000	977-0022-00
J1	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 female contact; 10 amps, 50 ohms; low loss plastic dielectric; straight shape; Communication Electronic Nomenclature Subpanel part no. UG-290A/U (not furnished with equipment)	357-9111-00
J2	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J1 (not furnished with equipment)	357-9111-00
J3	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J1 (not furnished with equipment)	357-9111-00
J4	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J1 (not furnished with equipment)	357-9111-00
J5	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 female contact teflon insulation; 1/2 in. w across flats by 1-1/16 in. lg; Communication Electronic Nomenclature Subpanel part no. UG1094U	357-9183-00
K1	RELAY, ARMATURE: 2C, 2A contact arrangement, 100 ma at 250 v dc or 300 ma at 115 v ac, 5 minutes on 5 minutes off duty cycle; C. P. Clare and Co. part no. A95183	972-1353-00
K2	RELAY, ARMATURE: 4C, 115 v dc nom coil, 10,000 ohms coil resistance, 3 amp at 30 v or 115 v ac noninductive load, continuous duty cycle; Aemco, Inc. part no. 45-2402	972-1346-00
K3	RELAY, ARMATURE: same as K2	972-1346-00
L1	COIL, RADIO FREQUENCY: single layer wound, 220 uh ±5%, 7.20 ohms max dc resistance, 210 ma dc current rating; James Millen Mfg. Co., Inc. part no. J301-220	240-2524-00
L2	NOT USED	
L3	NOT USED	
L4	COIL, RADIO FREQUENCY: same as L1	240-2524-00
L5	COIL, RADIO FREQUENCY: same as L1	240-2524-00
L6	COIL, RADIO FREQUENCY: same as L1	240-2524-00
L7	COIL, RADIO FREQUENCY: same as L1	240-2524-00
L8	RADIO FREQUENCY CHOKE: 6 millihenry inductance, 21 ohms dc resistance ±5% 5 sections, multiple-pi-duo lateral wound; National Coil Co. part no. C-0047690	240-5900-00
L9	COIL, RADIO FREQUENCY: same as L1	240-2524-00
L10	COIL, RADIO FREQUENCY: same as L1	240-2524-00
L11	COIL, RADIO FREQUENCY: same as L1	240-2524-00
L12	COIL, RADIO FREQUENCY: same as L1	240-2524-00
L13	NOT USED	
L14	COIL, RADIO FREQUENCY: same as L1	240-2524-00
L15	COIL, RADIO FREQUENCY: same as L1	240-2524-00
LS1	LOUDSPEAKER, PERMANENT MAGNET: 2 w nominal power, 3-4 ohms, voice coil impedance 4-1/8 in. by 6-1/8 in. overall; Jensen Mfg. Co. part no. 46K7	271-0216-00
M1	METER: dc millimeter, 0-1 milliampere dc, 17 ohms ±20%	458-0447-00
MP1	BUSHING, FIDUCIAL DRIVE: brass, bright alloy plate finish; 0.3125 in. by 0.260 in. by 0.500 in.	542-5375-002
MP2	BEARING, SLEEVE: porous bronze, 0.2515 in. id, 0.3155 in. od, 1/4 in. lg; Amplex Division of Chrysler Corp. part no. AA347-2MILL6085A	309-0422-00
MP3	CRANK, SWITCH: brass hub and arm, cres pin; 0.439 in. by 0.625 in. by 1.109 in. o/a dim.	543-7390-002

ITEM	DESCRIPTION	COLLINS PART NUMBER
MP4	CRANK, SWITCH: brass stud, arm and hub, cres pin; no. 6(0.138 in.)-32 thd stud; 0.439 in. by 1.468 in. by 1.985 in. o/a dim.	543-7391-002
MP5	LINK, CHANNEL SELECTOR: CRES, passivate finish; 0.062 in. by 0.188 in. by 0.375 in.	543-7344-002
MP6	SHAFT, SWITCH: ceramic; 0.186 in. by 0.250 in. by 15.750 in.	543-7399-002
O1	KNOB: setscrew type, black phenolic, brass insert for 1/4 in. shaft, 13/32 in. by 1 in. dia, 8-32NC-2 setscrew supplied; Harry Davies Moulding Co. part no. 1400	281-0069-00
O2	KNOB: same as O1	281-0069-00
O3	KNOB: same as O1	281-0069-00
O4	KNOB: same as O1	281-0069-00
O5	KNOB BAR: bakelite; 5/8 in. by 11/16 in. by 1-1/8 in.	508-1103-00
P1 thru P5	NOT USED	
R1	CONNECTOR, PLUG, ELECTRICAL: BNC cable mounting plug connector with "V" groove cable clamp for use with RG-55, 58, 223/U or similar coaxial; teflon insulation; Communication Electronic Nomenclature Subpanel part no. UG-88C/U (used in accessory only)	357-9292-00
R1	RESISTOR, FIXED, COMPOSITION: 0.15 meg-ohm ±10%, 1/2 w; MIL type RC20GF154K	745-1443-00
R2	RESISTOR, FIXED, COMPOSITION: 22,000 ohms ±10%, 1 w; MIL type RC32GF223K	745-3408-00
R3	RESISTOR, FIXED, COMPOSITION: 0.10 meg-ohm ±10%, 1/2 w; MIL type RC20GF104K	745-1436-00
R4	RESISTOR, FIXED, COMPOSITION: 0.56 meg-ohm ±10%, 1/2 w; MIL type RC20GF564K	745-1468-00
R5	RESISTOR, FIXED, COMPOSITION: same as R4	745-1468-00
R6	RESISTOR, FIXED, COMPOSITION: 68 ohms ±10%, 1/2 w MIL type RC20GF680K	745-1303-00
R7	RESISTOR, FIXED, COMPOSITION: same as R6	745-1303-00
R8	RESISTOR, VARIABLE, COMPOSITION: 250 ohms ±30% 0.2 w	376-4602-00
R9	RESISTOR, FIXED, COMPOSITION: 470 ohms ±10%, 1 w; MIL type RC32GF471K	745-3338-00
R10	RESISTOR, FIXED, COMPOSITION: same as R6	745-1303-00
R11	RESISTOR, FIXED, COMPOSITION: 0.18 meg-ohm ±10%, 1/2 w; MIL type RC20GF184K	745-1447-00
R12	RESISTOR, FIXED, COMPOSITION: 470 ohms ±10%, 1/2 w; MIL type RC20GF471K	745-1338-00
R13	RESISTOR, FIXED, COMPOSITION: 1000 ohms ±10%, 1/2 w; MIL type RC20GF102K	745-1352-00
R14	RESISTOR, VARIABLE, COMPOSITION: same as R8	376-4601-00
R15	RESISTOR, FIXED, COMPOSITION: same as R12	745-1338-00
R16	RESISTOR, VARIABLE, COMPOSITION: 250 ohms ±30%, 0.2 w	376-4600-00
R17	RESISTOR, FIXED, COMPOSITION: 47,000 ohms ±10%, 1 w; MIL type RC32GF473K	745-3422-00
R18	RESISTOR, FIXED, COMPOSITION: 220 ohms ±10%, 1/2 w; MIL type RC20GF221K	745-1324-00
R19	RESISTOR, FIXED, COMPOSITION: same as R2	745-3408-00
R20	RESISTOR, FIXED, COMPOSITION: 2200 ohms ±10%, 1/2 w; MIL type RC20GF222K	745-1366-00
R21	RESISTOR, FIXED, COMPOSITION: same as R3	745-1436-00
R22	RESISTOR, FIXED, COMPOSITION: 1000 ohms ±10%, 1/2 w; MIL type RC20GF102K	745-1352-00
R23	RESISTOR, FIXED, COMPOSITION: 5600 ohms ±10%, 1/2 w; MIL type RC20GF562K	745-1384-00
R24	RESISTOR, FIXED, COMPOSITION: same as R3	745-1436-00
R25	RESISTOR, FIXED, COMPOSITION: 27,000 ohms ±10%, 1 w; MIL type RC32GF273K	745-3412-00
R26	RESISTOR, FIXED, COMPOSITION: 47,000 ohms ±10%, 1/2 w; MIL type RC20GF473K	745-1422-00
R27	RESISTOR, FIXED, COMPOSITION: same as R30	745-1450-00
R28	RESISTOR, FIXED, COMPOSITION: same as R3	745-1436-00
R29	RESISTOR, FIXED, COMPOSITION: 680 ohms ±10%, 1/2 w; MIL type RC20GF681K	745-1345-00
R30	RESISTOR, FIXED, COMPOSITION: 220,000 ohms ±10%, 1/2 w; MIL type RC20GF224K	745-1450-00
R31	RESISTOR, FIXED, COMPOSITION: same as R3	745-1436-00
R32	RESISTOR, FIXED, COMPOSITION: same as R3	745-1436-00
R33	RESISTOR, FIXED, COMPOSITION: same as R3	745-1436-00
R34	RESISTOR, FIXED, COMPOSITION: same as R12	745-1338-00
R35	RESISTOR, VARIABLE COMPOSITION: 1,000,000 ohms ±30%; 1/4 w	376-4501-00

SECTION VI
Parts List

ITEM	DESCRIPTION	COLLINS PART NUMBER
R36	RESISTOR, FIXED, COMPOSITION: same as R2	745-3408-00
R37	RESISTOR, FIXED, COMPOSITION: same as R26	745-1422-00
R38	RESISTOR, FIXED, COMPOSITION: same as R4	745-1468-00
R39	RESISTOR, FIXED, COMPOSITION: same as R2	745-3408-00
R40	RESISTOR, FIXED, COMPOSITION: same as R18	745-1324-00
R41	RESISTOR, FIXED, COMPOSITION: same as R29	745-1345-00
R42	RESISTOR, FIXED, COMPOSITION: same as R29	745-1345-00
R43	RESISTOR, FIXED, COMPOSITION: 2.2 meg-ohms $\pm 10\%$, 1/2 w; MIL type RC20GF225K	745-1492-00
R44	RESISTOR, FIXED, COMPOSITION: same as R4	745-1468-00
R45	RESISTOR, FIXED, COMPOSITION: same as R3	745-1436-00
R46	RESISTOR, FIXED, COMPOSITION: 27,000 ohms $\pm 10\%$, 2 w; MIL type RC42GF273K	745-5712-00
R47	RESISTOR, VARIABLE, COMPOSITION: 1.0 megohms $\pm 20\%$; 1/4 w	376-4258-00
R48	RESISTOR, FIXED, COMPOSITION: same as R20	745-1366-00
R49	RESISTOR, FIXED, COMPOSITION: same as R26	745-1422-00
R50	RESISTOR, FIXED, COMPOSITION: 22,000 ohms $\pm 10\%$, 1/2 w; MIL type RC20GF223K	745-1408-00
R51	RESISTOR, FIXED, COMPOSITION: same as R50	745-1408-00
R52	RESISTOR, FIXED, COMPOSITION: same as R3	745-1436-00
R53	RESISTOR, FIXED, COMPOSITION: same as R30	745-1450-00
R54	RESISTOR, FIXED, COMPOSITION: same as R25	745-3412-00
R55	RESISTOR, FIXED, COMPOSITION: same as R46	745-5712-00
R56	RESISTOR, FIXED, COMPOSITION: 820 ohms $\pm 5\%$, 1/2 w; MIL type RC20GF821J	745-1348-00
R57	RESISTOR, FIXED, COMPOSITION: same as R4	745-1468-00
R58	RESISTOR, FIXED, COMPOSITION: same as R6	745-1303-00
R59	RESISTOR, FIXED, COMPOSITION: same as R17	745-3422-00
R60	RESISTOR, FIXED, COMPOSITION: same as R20	745-1366-00
R61	RESISTOR, FIXED, COMPOSITION: same as R3	745-1436-00
R62	RESISTOR, FIXED, COMPOSITION: same as R6	745-1303-00
R63	RESISTOR, FIXED, COMPOSITION: same as R4	745-1468-00
R64	RESISTOR, FIXED, COMPOSITION: same as R17	745-3422-00
R65	RESISTOR, FIXED, COMPOSITION: same as R20	745-1366-00
R66	RESISTOR, FIXED, COMPOSITION: same as R30	745-1450-00
R67	RESISTOR, FIXED, COMPOSITION: 3900 ohms $\pm 10\%$, 1/2 w; MIL type RC20GF392K	745-1377-00
R68	RESISTOR, FIXED, COMPOSITION: 68,000 ohms $\pm 10\%$, 1 w; MIL type RC32GF683K	745-3429-00
R69	RESISTOR, FIXED, COMPOSITION: same as R13	745-1352-00
*R70	RESISTOR, FIXED, COMPOSITION: 5600 ohms $\pm 10\%$, 1/2 w; MIL type RC20GF562K	745-1384-00
*R70	RESISTOR, FIXED, COMPOSITION: 6800 ohms $\pm 10\%$, 1/2 w; MIL type RC20GF682K	745-1387-00
*R70	RESISTOR, FIXED, COMPOSITION: 8200 ohms $\pm 10\%$, 1/2 w; MIL type RC20GF822K	745-1391-00
*R70	RESISTOR, FIXED, COMPOSITION: 10,000 ohms $\pm 10\%$, 1/2 w; MIL type RC20GF103K	745-1394-00
*R70	RESISTOR, FIXED, COMPOSITION: 4,700 ohms $\pm 10\%$, 1/2 w; MIL type RC20GF472K	745-1380-00
R71	RESISTOR, FIXED, COMPOSITION: same as R29	745-1345-00
R72	RESISTOR, FIXED, COMPOSITION: same as R17	745-3422-00
R73	RESISTOR, FIXED, COMPOSITION: same as R3	745-1436-00
R74	RESISTOR, FIXED, COMPOSITION: 27,000 ohms $\pm 10\%$, 1/2 w; MIL type RC20GF273K	745-1412-00
R75	RESISTOR, FIXED, COMPOSITION: same as R56	745-1348-00
R76	RESISTOR, FIXED, COMPOSITION: same as R4	745-1468-00
R77	RESISTOR, FIXED, COMPOSITION: same as R26	745-1422-00
R78	RESISTOR, FIXED, COMPOSITION: same as R3	745-1436-00
R79	RESISTOR, FIXED, COMPOSITION: same as R67	745-1377-00
R80	RESISTOR, FIXED, COMPOSITION: same as R67	745-1377-00
R81	RESISTOR, FIXED, COMPOSITION: 10,000 ohms $\pm 10\%$, 1/2 w; MIL type RC20GF103K	745-1394-00
R82	RESISTOR, FIXED, COMPOSITION: same as R3	745-1436-00
R83	RESISTOR, FIXED, COMPOSITION: same as R3	745-1436-00
R84	RESISTOR, VARIABLE, COMPOSITION: 0.10 megohm $\pm 20\%$, 1/4 w	376-4255-00
R85	RESISTOR, FIXED, COMPOSITION: same as R9	745-3338-00
R86	RESISTOR, FIXED, COMPOSITION: 470 ohms $\pm 10\%$, 2 w; MIL type RC42GF471K	745-5638-00
R87	RESISTOR, FIXED, COMPOSITION: 1.5 megohms $\pm 10\%$, 1/2 w; MIL type RC20GF155K	745-1485-00

*Chosen per operational requirements.

ITEM	DESCRIPTION	COLLINS PART NUMBER
R88	RESISTOR, VARIABLE, COMPOSITION: same as R84	376-4255-00
R89	RESISTOR, FIXED, COMPOSITION: 2200 ohms $\pm 10\%$, 2 w; MIL type RC42GF222K	745-5666-00
R90	RESISTOR, FIXED, COMPOSITION: 22 ohms $\pm 10\%$, 1/2 w MIL type RC20GF220K	745-1282-00
R91	RESISTOR, VARIABLE, COMPOSITION: 1,000,000 ohms $\pm 30\%$, 1/4 w	376-4500-00
R92	RESISTOR, FIXED, COMPOSITION: same as R6	745-1303-00
R93	RESISTOR, FIXED, WIREWOUND: 3.21 ohms $\pm 1\%$; 2 w; Dale Products Inc. part no. RS2/3R210F	747-9621-00
R94	RESISTOR, FIXED, COMPOSITION: same as R18	745-1324-00
R95	RESISTOR, FIXED, COMPOSITION: same as R74	745-1412-00
R96	RESISTOR, FIXED, COMPOSITION: same as R43	745-1492-00
R97	RESISTOR, FIXED, FILM: 562,000 ohms $\pm 1\%$; 1/4 w; MIL type RN65B5623F	705-7228-00
R98	RESISTOR, FIXED, FILM: 1,620,000 ohms $\pm 1\%$, 1/2 w; MIL type RN70B1624F	705-7750-00
R99	RESISTOR, FIXED, FILM: 1620 ohms $\pm 1\%$, 1/4 w; MIL type RN65B1621F	705-7106-00
R100	RESISTOR, FIXED, COMPOSITION: 560 ohms $\pm 10\%$, 1/2 w; MIL type RC20GF561K	745-1342-00
R101	RESISTOR, FIXED, FILM: 140,000 ohms $\pm 1\%$, 1/4 w; MIL type RN65B1403F	705-7199-00
R102	RESISTOR, FIXED, COMPOSITION: 4700 ohms $\pm 10\%$, 1 w; MIL type RC32GF472K	745-3380-00
R103	RESISTOR, FIXED, COMPOSITION: same as R74	745-1412-00
R104	RESISTOR, FIXED, COMPOSITION: same as R29	745-1345-00
R105	RESISTOR, FIXED, COMPOSITION: same as R3	745-1436-00
R106	RESISTOR, FIXED, COMPOSITION: same as R81	745-1394-00
R107	RESISTOR, FIXED, COMPOSITION: same as R81	745-1394-00
R108	RESISTOR, FIXED, COMPOSITION: same as R43	745-1492-00
R109	RESISTOR, FIXED, COMPOSITION: same as R43	745-1492-00
R110	RESISTOR, FIXED, COMPOSITION: 56,000 ohms $\pm 10\%$, 2 w; MIL type RC42GF563K	745-5726-00
R111	RESISTOR, FIXED, COMPOSITION: same as R6	745-1303-00
R112	RESISTOR, FIXED, COMPOSITION: same as R6	745-1303-00
R113	RESISTOR, FIXED, COMPOSITION: 1000 ohms $\pm 10\%$, 1/2 w; MIL type RC20GF102K	745-1352-00
R114	RESISTOR, FIXED, COMPOSITION: same as R81	745-1394-00
R115	RESISTOR, FIXED, COMPOSITION: same as R20	745-1366-00
R116	RESISTOR, FIXED, COMPOSITION: same as R3	745-1436-00
R117	RESISTOR, FIXED, COMPOSITION: same as R87	745-1485-00
R118	RESISTOR, FIXED, COMPOSITION: same as R110	745-5726-00
R119	RESISTOR, FIXED, COMPOSITION: same as R29	745-1345-00
R120	RESISTOR, FIXED, COMPOSITION: same as R13	745-1352-00
R121	RESISTOR, FIXED, COMPOSITION: same as R4	745-1468-00
R122	RESISTOR, FIXED, COMPOSITION: same as R6	745-1303-00
R123	RESISTOR, FIXED, COMPOSITION: same as R4	745-1468-00
R124	RESISTOR, FIXED, COMPOSITION: same as R81	745-1394-00
R125	RESISTOR, FIXED, COMPOSITION: same as R6	745-1303-00
R126	NOT USED	
R127	RESISTOR, FIXED, COMPOSITION: 47 ohms $\pm 10\%$, 1/2 w; MIL type RC20GF470K	745-1296-00
R128	RESISTOR, FIXED, COMPOSITION: same as R127	745-1296-00
R129	RESISTOR, FIXED, COMPOSITION: 1.0 meg-ohm $\pm 10\%$, 1/2 w; MIL type RC20GF105K	745-1478-00
R130	RESISTOR, FIXED, COMPOSITION: same as R87	745-1485-00
R131	RESISTOR, FIXED, COMPOSITION: 0.27 meg-ohm $\pm 10\%$, 1/2 w; MIL type RC20GF274K	745-1454-00
R132	RESISTOR, FIXED, COMPOSITION: same as R3	745-1436-00
R133	RESISTOR, FIXED, COMPOSITION: same as R43	745-1492-00
R134	RESISTOR, FIXED, COMPOSITION: same as R87	745-1485-00
R135	RESISTOR, FIXED, COMPOSITION: same as R81	745-1394-00
R136	RESISTOR, FIXED, COMPOSITION: same as R50	745-1408-00
R137	RESISTOR, FIXED, COMPOSITION: same as R127	745-1296-00
S1	SWITCH SECTION, ROTARY: 2 circuit, 12 position, 10 fixed, 2 moving contacts; phenolic insulation; Oak Mfg. Co. part no. 187003-F	269-1990-00
S2	SWITCH SECTION, ROTARY: same as S1	269-1990-00
S3	SWITCH SECTION, ROTARY: same as S1	269-1990-00
S4	SWITCH SECTION, ROTARY: 2 circuit, 12 position, 20 fixed, 4 moving contacts; phenolic insulation; Oak Mfg. Co. part no. 187002-F	269-1991-00
S5	SWITCH SECTION, ROTARY: same as S4	269-1991-00
S6	SWITCH SECTION, ROTARY: same as S1	269-1990-00
S7	SWITCH, ROTARY: 2 circuit, 5 positions, 1 section, phenolic insulation; 7/8 in. by 1-9/16 in. by 1-27/64 in.; Oak Mfg. Co. part no. 195670K-1	259-0893-00
S8	SWITCH: single pole double throw switch, 1 amp, 125 v ac - dc; 7/8 in. by 17/32 in. by 1-3/8 in., Carling Electric, Inc. part no. 560B	260-2596-00

SECTION VI
Parts List

ITEM	DESCRIPTION	COLLINS PART NUMBER
S9	SWITCH, SLIDE: dpdt, 0.5 amp at 125 v ac, dc, Stackpole Carbon Co. part no. SS-50	260-2597-00
S10	SWITCH, HOOK: make and break contact arrangement, solder type terminals; Kellogg Switch-board and Supply Co. part no. 164-56280	375-0179-00
S11	SWITCH SECTION, ROTARY: same as S1	269-1990-00
S12	DETENT ASSEMBLY: 20 position, steel cadmium plated shaft, brass bushing; 1-7/16 in. by 1-29/32 in.	269-1984-00
T1	TUNING UNIT RADIO FREQUENCY: 440 to 470 kc freq range; Electro Assemblies, Inc. part no. 18-693	278-0279-00
T2	TRANSFORMER, INTERMEDIATE, FREQUENCY: 455 kc center freq. 1-3/8 in. by 1-3/8 in. by 2-3/4 in. excl terminals; shielded; powdered iron cores; Alladin Radio part no. X-591-1	278-0197-00
T3	TRANSFORMER, AUDIO FREQUENCY: line type, primary 5000 ohms, secondary 500 ohms tapped 4 ohms primary 35 ma, secondary zero; Stancor Electronics, Inc. part no. 11271	667-0018-00
TB1	TERMINAL BOARD: plastic board, incl 18 solder lug terminals; 0.062 in. by 1.500 in. by 3.812 in. board dim.	543-7372-00
V1	ELECTRON TUBE: min. triode pentode, General Electric Co. 6CQ8	255-0372-00
V2	ELECTRON TUBE: twin triode type; Radio Corp. of America part no. 12AT7	255-0205-00
V3	ELECTRON TUBE: glass envelope; pentode; Radio Corporation of America part no. 6DC6	255-0226-00
V4	ELECTRON TUBE: power pentode; General Electric Co. part no. 6CL6	255-0216-00
V5	ELECTRON TUBE: beam power pentode; RCA Electron Tube Division of Radio Corp. of America part no. 6146A	256-0149-00
V6	ELECTRON TUBE: same as V5	256-0149-00
V7	ELECTRON TUBE: same as V1	255-0372-00
V8	ELECTRON TUBE: same as V2	255-0205-00
V9	ELECTRON TUBE: twin diode, Tung - Sol Electric, Inc. part no. 6AL5	257-0018-00
V10	ELECTRON TUBE: same as V1	255-0372-00
V11	ELECTRON TUBE: pentagrid converter; Radio Corp. of America part no. 6BA7	255-0389-00
V12	ELECTRON TUBE: glass envelope; pentode; Radio Corp. of America part no. 6BA6	255-0185-00
V13	ELECTRON TUBE: same as V12	255-0185-00
V14	ELECTRON TUBE: same as V2	255-0205-00
V15	ELECTRON TUBE: same as V2	255-0205-00
V16	ELECTRON TUBE: glass envelope; pentode; Radio Corp. of America part no. 6AQ5/6AQ5A	255-0195-00
V17	ELECTRON TUBE: same as V9	257-0018-00
V18	ELECTRON TUBE: same as V9	257-0018-00
XCR1	SOCKET, ELECTRON TUBE: stainless steel, phosphor bronze terminals, phenolic insulation; 0.812 in. by 1.187 in. by 1.625 in.; Amphenol - Borg Electronics Corp. part no. 88-8TM	220-1005-00
XCR2	SOCKET, ELECTRON TUBE: same as XCR1	220-1005-00
XCR3	SOCKET, ELECTRON TUBE: same as XCR1	220-1005-00
XV1	SOCKET, ELECTRON TUBE: 9 contact miniature top mtg tube socket w/o shield base; plastic; MIL type TS103P02	220-1274-00
XV2	SOCKET, ELECTRON TUBE: brass beryllium copper contacts, phenolic insulation, 1 amp, 500 v ac; 29/32 in. by 49/64 in. by 1-3/8 in.; Sylvania Electric Products, Inc. Parts Division part no. 8000-0315	220-1293-00
XV3	SOCKET, ELECTRON TUBE: 7 pin miniature, top mtg; 500 v ac rms, 1 amp; Sylvania Electric Products, Inc. part no. 8000-0316	220-1291-00
XV4	SOCKET, ELECTRON TUBE: same as XV2	220-1293-00
XV5	SOCKET, ELECTRON TUBE: same as XCR1	220-1005-00
XV6	SOCKET, ELECTRON TUBE: same as XCR1	220-1005-00
XV7	SOCKET, ELECTRON TUBE: same as XV1	220-1274-00
XV8	SOCKET, ELECTRON TUBE: same as XV1	220-1274-00
XV9	SOCKET, ELECTRON TUBE: 7 contact miniature top mtg tube socket w/o shield base; ceramic MFE; MIL type TS102P02	220-1152-00
XV10	SOCKET, ELECTRON TUBE: same as XV2	220-1293-00
XV11	SOCKET, ELECTRON TUBE: same as XV2	220-1293-00
XV12	SOCKET, ELECTRON TUBE: same as XV3	220-1291-00
XV13	SOCKET, ELECTRON TUBE: same as XV3	220-1291-00
XV14	SOCKET, ELECTRON TUBE: same as XV1	220-1274-00
XV15	SOCKET, ELECTRON TUBE: same as XV1	220-1274-00
XV16	SOCKET, ELECTRON TUBE: same as XV3	220-1291-00
XV17	SOCKET, ELECTRON TUBE: same as XV9	220-1152-00
XV18	SOCKET, ELECTRON TUBE: same as XV9	220-1152-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
Y1 thru Y4	NOT SUPPLIED	
Y5	CRYSTAL UNIT, QUARTZ: 455,000 KC	290-9932-00
Z1	SUPPRESSOR, PARASITIC: 5 turns of no. 18 AWG wire; 47 ohms res; 2 w; 0.390 in. dia by 0.688 in. lg o/a dim., excl terminals	543-7468-00
Z2	SUPPRESSOR, PARASITIC: same as Z1	543-7468-00
Z3	SUPPRESSOR, PARASITIC: 4 turns of no. 20 AWG wire; 47 ohms res; 1/2 w; 0.204 in. dia by 0.375 in. lg o/a dim., excl terminals	548-8217-00
Z4	SUPPRESSOR, PARASITIC: same as Z3	548-8217-00
	KIT-COIL: 1.6-2.0 MC incl	567-4662-00
	ANTENNA COIL	544-6102-00
	1st R-F COIL	546-6035-00
	R-F COIL (qty 3 required)	544-6103-00
	PA COIL	567-4652-00
	KIT-COIL: 2.0 - 3.3 MC incl	567-4663-00
	ANTENNA COIL	543-7735-00
	1st R-F COIL	546-6036-00
	R-F COIL (qty 3 required)	543-4346-00
	PA COIL	567-4653-00
	KIT-COIL: 3.3 - 5.5 MC incl	567-4664-00
	ANTENNA COIL	543-7736-00
	1st R-F COIL	546-6037-00
	R-F COIL (qty 3 required)	543-4347-00
	PA COIL	567-4654-00
	KIT-COIL: 5.5 - 9.0 MC incl	567-4665-00
	ANTENNA COIL	543-7737-00
	1st R-F COIL	546-6038-00
	R-F COIL (qty 3 required)	543-4348-00
	PA COIL	567-4655-00
	KIT-COIL: 9.0 - 12.0 MC incl	567-4666-00
	ANTENNA COIL	543-7738-00
	1st R-F COIL	546-6039-00
	R-F COIL (qty 3 required)	543-4349-00
	PA COIL	567-4656-00
	KIT-COIL: 12.0 - 15 MC incl	567-4667-00
	ANTENNA COIL	545-3237-00
	1st R-F COIL	546-6040-00
	R-F COIL (qty 3 required)	543-3238-00
	PA COIL	567-4656-00
	KIT COIL: available but not supplied with equipment	
	FUSE, CARTRIDGE: glass enclosed, time lag; 3 amp, 125 v max. 0.066 ohms resistance; MIL type F02B125V3AS (spare)	264-0009-00
	FUSE, CARTRIDGE: glass enclosed, brass ferrule, 1/16 amp, 250 v max; Littelfuse, Inc. part no. 313.062 (spare)	264-0289-00
	FUSE, CARTRIDGE: slow blow; 1-1/2 amp, 250 v; Bussmann Fuse Division of Mc Graw - Edison Co. part no. MDX-1-1/2 (used in 32RS-1C only) (spare)	264-0303-00
	JACK, TELEPHONE: banana spring type, nickel plated body and nut, tinned lug; 3/4 in. by 3/8 in. by 5/8; E. F. Johnson Co. part no. 108-740-1 (qty 8)	360-2020-00
POWER SUPPLY		543-7335-00
2C1	CAPACITOR, FIXED, ELECTROLYTIC: 10 uf -15% +50%, 250 v dc; Hi-Q Division of Aerovox Corp. part no. E26A787	183-1046-00
2C2	CAPACITOR, FIXED, ELECTROLYTIC: 10 uf -10% +100%, 150 v dc, Hi-Q Division of Aerovox Corp. part no. E26A817	183-1040-00
2C3A	CAPACITOR, FIXED, ELECTROLYTIC: 3 sections, 15 uf, 15 uf; 10 uf, -10% +50%, 450 v dc; Sprague Electric Co. part no. D11635	183-1091-00
2C3B	CAPACITOR, FIXED, ELECTROLYTIC: same as 2C3A	183-1091-00
2C3C	CAPACITOR, FIXED, ELECTROLYTIC: same as 2C3A	183-1091-00
2C4	CAPACITOR, FIXED, ELECTROLYTIC: 30 uf -10% +40%, 400 v dc	183-1771-00
2C5	CAPACITOR, FIXED, ELECTROLYTIC: same as 2C4	183-1771-00
2C6	CAPACITOR, FIXED, ELECTROLYTIC: same as 2C4	183-1771-00
2CR1	RECTIFIER, METALLIC: selenium:	353-0153-00

SECTION VI
Parts List

ITEM	DESCRIPTION	COLLINS PART NUMBER
2DS1	LAMP, INCANDESCENT: 6.3 v, 0.150 amp design current, miniature bayonet base; T-3-1/4 clear bulb; 1.187 in. max lg o/a; MS type MS15571-2	262-3240-00
2DS2	LAMP, INCANDESCENT: same as 2DS1	262-3240-00
2DS3	LAMP, GLOW: neon gas, 65 to 130 v ac striking voltage, 90 to 130 v dc striking voltage; 2-11/32 in. h o/a; integral resistance, 100,000 ohms, Dialight Corp. part no. 201005	262-0090-00
2E1	LENS, INDICATOR LIGHT: clear, green; 21/32 in. dia by 5/8 in. lg; Drake Mfg. Co. part no. 11676	262-2180-00
2E2	LENS, INDICATOR LIGHT: clear, red; 21/32 in. dia by 5/8 in. lg	262-2160-00
2F1	FUSE, CARTRIDGE: 3amps, 125v, Glass case, brass ferrules; MIL type FOB125V3AS	264-0009-00
2F1 Alt.	FUSE, CARTRIDGE: 1.5amps, 250v, Glass case, brass ferrules; BUSSMAN MDX-1-1/2 Alternate for use with 230 volt input.	255-0372-00
2F2	FUSE, CARTRIDGE: same as 2F1	264-0009-00
2F3	FUSE, CARTRIDGE: 1/16 amps, 250 v dc, glass case, brass ferrules; Bussman Mfg Co. part no. MDL-1/16	264-0289-00
2H1	RETAINER, CAPACITOR: metallic; 0.373 in. by 29/32 in. by 5.125 in.; u/w CP70 capacitor; MIL type CP07SB6	139-0168-00
2H2	RETAINER, CAPACITOR: same as 2H1	139-0168-00
2H3	POST, MOUNTING, CONTROL PANEL: aluminum, chromate dip, 1/4 in. hex, 4-9/32 in. lg	543-7381-002
2H4	POST, ELECTRICAL, MECHANICAL EQUIPMENT: aluminum, chemical film; 8-32 UNC-28 thd, 1 in. lg	540-9262-003
2H5	POST, SPACING: aluminum, chromate dip; #8-32 thd; 0.625 in. lg	540-9254-003
2H6	POST, ELECTRICAL, MECHANICAL EQUIPMENT: aluminum, chemical film; 6-32 UNC-28 thd, 2 in. lg	540-9233-003
2L1A	REACTOR: dual filter reactor, 8.0 hy inductance, 150 ma dc nom current rating, 200 ohms dc resistance; Stancor Electronics, Inc. part no. 26603A	668-0253-00
2L1B	REACTOR: same as 2L1A	668-0253-00
2L2	REACTOR: filter type, 1.0 hy, 180 ma dc current, 25 ohms dc resistance, 1400 v dc rms exposed core & coil, wire lead type terminals, two 3/16 in. dia mtg holes; Stancor Electronics, Inc. part no. 26456	668-0254-00
2R1	RESISTOR, FIXED, COMPOSITION: 100 ohms $\pm 10\%$, 1/2 w; MIL type RC20GF101K	745-1310-00
2R2	RESISTOR, FIXED, COMPOSITION: 4700 ohms $\pm 10\%$, 2 w; MIL type RC42GF472K	745-5680-00
2R3	RESISTOR, VARIABLE, WIREWOUND: 2500 ohms $\pm 10\%$, 2 w	750-0522-00
2R4	RESISTOR, FIXED, COMPOSITION: same as 2R2	745-5680-00
2R5	RESISTOR, FIXED, WIREWOUND: 27,000 ohms $\pm 10\%$, 25 w; Ohmite Mfg. Co. part no. 2-K-40-F-27KPORM10PCT	710-0376-00
2R6	RESISTOR, FIXED, WIREWOUND: 50,000 ohms $\pm 20\%$, 50 w	710-4504-40
2R7	RESISTOR, FIXED, COMPOSITION: 270,000 ohms $\pm 10\%$, 2 w; MIL RC42GF274K	745-5754-00
2R8	RESISTOR, FIXED, COMPOSITION: same as 2R7	745-5754-00
2R9	RESISTOR, FIXED, COMPOSITION: same as 2R7	745-5754-00
2S1	SWITCH, TOGGLE: dpdt; 25 v dc, 0.5 amp; 220 ac, 9 amp maintained position; 6 amp momentary position; MIL type MS35059-23	266-3060-00
2S2	SWITCH, TOGGLE: 4 pole, dt; 125 v ac at 20 amp, 30 v dc at 20 amp; Cutler Hammer, Inc. part no. 7665K4	266-0072-00
2S3	SWITCH, TOGGLE: same as 2S1	266-3060-00
2T1	TRANSFORMER, POWER, STEP-DOWN AND STEP-UP: 2 pri 115 v each, 230 connected; 50/60 cycles, secondary 5 v, 6.3 v, 5 v, 750 v CT, 115 v; Stancor Electronics, Inc. part no. 26343	662-0314-00
2T2	TRANSFORMER, POWER, STEP-UP: 2 primary 115 v ea; 230 v connected, 50/60 cycles, secondary, 1900 v, CT, 0.100 amp; Stancor Electronics, Inc. part no. 26344	662-0315-00
2T3	TRANSFORMER, POWER, FIXED AUTOTRANSFORMER: input 230 v, 50/60 cps, output voltage 115 v output load current 0.26 amps, 3 min max "on" time; Stancor Electronics, Inc. part no. 27169	664-0316-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
2TB1	TERMINAL, BOARD: phenolic, 7/8 in. w 4-1/2 in. lg; 11 terminals; Howard Jones part no. 353-18-11-001	367-0019-00
2TB2	TERMINAL BOARD: phenolic w/3 solder-lug terminals; 11/16 in. w by 1-1/8 in. lg; Cinch Mfg. Corp. part no. 1520-A	306-9033-00
2TB3	TERMINAL BOARD: same as 2TB2	306-9033-00
2TB4	TERMINAL BOARD: bakelite, 2 terminals 21/32 in. by 7/16 in. by 3/4 in. lg; Cinch Mfg. Co. part no. 1513-A	306-2220-00
2TB5	TERMINAL BOARD: phenolic, w/5 solder-lug terminals 1-7/8 in. lg by 11/16 in. w; Cinch Mfg. Corp. part no. 1542-A	306-0550-00
2TB6	TERMINAL BOARD: same as 2TB2	306-9033-00
2TB7	TERMINAL BOARD: phenolic; 1/16 in. by 3/8 in. by 1-1/2 in.; 4 brass solder lug terminals; Cinch Mfg. Corp. part no. 1532-A	306-9032-00
2TB8	TERMINAL BOARD: same as 2TB5	306-0550-00
2V1	ELECTRON TUBE: rectifier; Radio Corp. of America part no. 5U4GB	257-0109-00
2V2	TUBE, ELECTRON: rectifier type; General Electric Co. part no. 5R4GYA	257-0142-00
2XDS1	LIGHT, INDICATOR: for use with T-3-1/4 miniature bayonet base bulb, polished chrome; Dialight part no. 81410-1-PC	262-0093-00
2XDS2	LIGHT, INDICATOR: same as 2XDS1	262-0093-00
2XF1	FUSEHOLDER: extractor post type; 125 v, 5 amp; accommodates 3 AG cartridge fuse; Bussman Mfg. Co. part no. HKP 1/16	265-1002-00
2XF2	FUSEHOLDER: same as 2XF1	265-1002-00
2XF3	FUSEHOLDER: same as 2XF1	265-1002-00
2XV1	SOCKET, ELECTRON TUBE: copper base alloy contacts, silver plated; 5/8 in. h, 1-7/64 in. dia, 1-7/8 in. lg o/a dim., excl terminals and contacts; MIL type TS101P01	220-1121-00
2XV2	SOCKET, ELECTRON TUBE: same as 2XV1	220-1121-00
DIRECTIONAL WATTMETER 302E-2		522-1462-00
C1	CAPACITOR, VARIABLE, GLASS: 0.5 uuf to 3.0 uuf; 500 v dc; 11/32 in. w by 1-9/32 in. max cap.; Corning Glass Works part no. 682011	922-0149-00
C2	CAPACITOR, VARIABLE, GLASS: same as C1	922-0149-00
C3	CAPACITOR, FIXED, MICA: 500 uuf $\pm 20\%$, 500 v dc; Sangamo Electric Co. part no. M-23-500M	912-0667-00
C4	CAPACITOR, FIXED, MICA: same as C3	912-0667-00
C5	NOT USED	
C6	NOT USED	
C7	NOT USED	
C8	CAPACITOR, FIXED, CERAMIC: 1000 uuf -20% +80%, 500 v dc; Erie Resistor Corp. part no. 327047 X5T0 102Z	913-1292-00
C9	CAPACITOR, FIXED, CERAMIC: same as C8	913-1292-00
CR1	SEMICONDUCTOR DEVICE, DIODE: silicon; JEDEC type 1N82A	353-3435-00
CR2	SEMICONDUCTOR DEVICE, DIODE: same as CR1	353-3435-00
J1	CONNECTOR, RECEPTACLE, ELECTRICAL: single female contact, irregular shape; panel mtg; Communications Electronic Nomenclature Subpanel part no. UG-447/U	357-9129-00
J2	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J1	357-9129-00
L1	COIL, RADIO FREQUENCY: 220 uh inductance, 7.2 ohms dc resistance, 0.2 amp current rating; James Millen Co., Inc. part no. J301-220	240-2524-00
L2	COIL, RADIO FREQUENCY: same as L1	240-2524-00
M1	AMMETER: panel type, dc, microamperes 0-200 range, scale reading 0-200 w, top to bottom, linear, scale divisions increments of 10, 1.600 by 0.965 by 2.260 solder lug terminals; International Inst. Inc. part no. 3200-093	458-0407-00
P1	CONNECTOR, PLUG, ELECTRICAL: 1 male contact; 50 ohms, Communication Electronic Nomenclature Subpanel part no. UG-913/U	357-9169-00
P2	CONNECTOR, PLUG, ELECTRICAL: same as P1	357-9169-00
P3	CONNECTOR, PLUG, ELECTRICAL: 50 ohms Teflon insulation; Communication Electronic Nomenclature Subpanel part no. UG-88E/U	357-9292-00
R1	RESISTOR, FIXED, FILM: 21.5 ohms $\pm 1\%$, 1/4 w; MIL type RN65B21R5F	705-7016-00

SECTION VI
Parts List

ITEM	DESCRIPTION	COLLINS PART NUMBER
R2	RESISTOR, FIXED, FILM: same as R1	705-7016-00
*R3	RESISTOR, FIXED, FILM: 4750 ohms $\pm 1\%$, 1/4 w; MIL type RN65B4751F	705-7255-00
*R3	RESISTOR, FIXED, FILM: 4870 ohms $\pm 1\%$, 1/4 w; MIL type RN65B4871F	705-7129-00
*R3	RESISTOR, FIXED, FILM: 4990 ohms $\pm 1\%$, 1/4 w; MIL type RN65B4991F	705-7256-00
*R3	RESISTOR, FIXED, FILM: 5110 ohms $\pm 1\%$, 1/4 w; MIL type RN65B5111F	705-7130-00
*R3	RESISTOR, FIXED, FILM: 5230 ohms $\pm 1\%$, 1/4 w; MIL type RN65B5231F	705-7257-00
*R3	RESISTOR, FIXED, FILM: 5360 ohms $\pm 1\%$, 1/4 w; MIL type RN65B5361F	705-7131-00
*R3	RESISTOR, FIXED, FILM: 5490 ohms $\pm 1\%$, 1/4 w; MIL type RN65B5491F	705-7258-00
*R3	RESISTOR, FIXED, FILM: 5620 ohms $\pm 1\%$, 1/4 w; MIL type RN65B5621F	705-7132-00
*R3	RESISTOR, FIXED, FILM: 5760 ohms $\pm 1\%$, 1/4 w; MIL type RN65B5761F	705-7259-00
*R3	RESISTOR, FIXED, FILM: 5900 ohms $\pm 1\%$, 1/4 w; MIL type RN65B5901F	705-7133-00
*R3	RESISTOR, FIXED, FILM: 6040 ohms $\pm 1\%$, 1/4 w; MIL type RN65B6041F	705-7260-00
*R3	RESISTOR, FIXED, FILM: 6190 ohms $\pm 1\%$, 1/4 w; MIL type RN65B6191F	705-7134-00
*R3	RESISTOR, FIXED, FILM: 6340 ohms $\pm 1\%$, 1/4 w; MIL type RN65B6341F	705-7261-00
*R3	RESISTOR, FIXED, FILM: 6490 ohms $\pm 1\%$, 1/4 w; MIL type RN65B6491F	705-7135-00
*R3	RESISTOR, FIXED, FILM: 6650 ohms $\pm 1\%$, 1/4 w; MIL type RN65B6651F	705-7262-00
*R3	RESISTOR, FIXED, FILM: 6810 ohms $\pm 1\%$, 1/4 w; MIL type RN65B6811F	705-7136-00
*R3	RESISTOR, FIXED, FILM: 6980 ohms $\pm 1\%$, 1/4 w; MIL type RN65B6981F	705-7263-00
*R4	RESISTOR, FIXED, FILM: 4750 ohms $\pm 1\%$, 1/4 w; MIL type RN65B4751F	705-7255-00
*R4	RESISTOR, FIXED, FILM: 4870 ohms $\pm 1\%$, 1/4 w; MIL type RN65B4871F	705-7129-00
*R4	RESISTOR, FIXED, FILM: 4990 ohms $\pm 1\%$, 1/4 w; MIL type RN65B4991F	705-7256-00
*R4	RESISTOR, FIXED, FILM: 5110 ohms $\pm 1\%$, 1/4 w; MIL type RN65B5111F	705-7130-00
*R4	RESISTOR, FIXED, FILM: 5230 ohms $\pm 1\%$, 1/4 w; MIL type RN65B5231F	705-7257-00
*R4	RESISTOR, FIXED, FILM: 5360 ohms $\pm 1\%$, 1/4 w; MIL type RN65B5361F	705-7131-00
*R4	RESISTOR, FIXED, FILM: 5490 ohms $\pm 1\%$, 1/4 w; MIL type RN65B5491F	705-7258-00
*R4	RESISTOR, FIXED, FILM: 5620 ohms $\pm 1\%$, 1/4 w; MIL type RN65B5621F	705-7132-00
*R4	RESISTOR, FIXED, FILM: 5760 ohms $\pm 1\%$, 1/4 w; MIL type RN65B5761F	705-7259-00
*R4	RESISTOR, FIXED, FILM: 5900 ohms $\pm 1\%$, 1/4 w; MIL type RN65B5901F	705-7133-00
*R4	RESISTOR, FIXED, FILM: 6040 ohms $\pm 1\%$, 1/4 w; MIL type RN65B6041F	705-7260-00
*R4	RESISTOR, FIXED, FILM: 6190 ohms $\pm 1\%$, 1/4 w; MIL type RN65B6191F	705-7134-00
*R4	RESISTOR, FIXED, FILM: 6340 ohms $\pm 1\%$, 1/4 w; MIL type RN65B6341F	705-7261-00
*R4	RESISTOR, FIXED, FILM: 6490 ohms $\pm 1\%$, 1/4 w; MIL type RN65B6491F	705-7135-00
*R4	RESISTOR, FIXED, FILM: 6650 ohms $\pm 1\%$, 1/4 w; MIL type RN65B6651F	705-7262-00
*R4	RESISTOR, FIXED, FILM: 6810 ohms $\pm 1\%$, 1/4 w; MIL type RN65B6811F	705-7136-00
*R4	RESISTOR, FIXED, FILM: 6980 ohms $\pm 1\%$, 1/4 w; MIL type RN65B6981F	705-7263-00
S1	SWITCH, SLIDE: spdt, 1 amp at 125 ac dc, 1-3/8 in. lg by 17/32 in. w; 3 terminals, two 0.146 in. dia mtg holes; Carling Electric, Inc., part no. S60B	260-2596-00

*Chosen per operational requirements.

ITEM	DESCRIPTION	COLLINS PART NUMBER
T1	COIL, RADIO FREQUENCY: toroidal wound, 60 turns	542-0916-002
PHONE PATCH 152J-1		522-1463-00
C1	CAPACITOR, FIXED, PAPER: 1 uf -10%, +20%, 200 v dc; Cornel Dubilier Electric Corp. part no. PJ2W1	931-6853-00
C2	CAPACITOR, FIXED, CERAMIC: 470 uuf -20% $\pm 100\%$, 500 v dc; Sprague Electric Co. of Wisconsin part no. 19C372	913-3007-00
C3	CAPACITOR, FIXED, CERAMIC: same as C2	913-3007-00
C4	CAPACITOR, FIXED, CERAMIC: same as C2	913-3007-00
C5	CAPACITOR, FIXED, CERAMIC: same as C2	913-3007-00
C6	CAPACITOR, FIXED, PAPER: 0.47 uf -10% +20%, 200 v dc; Sangamo Electric Co. Capacitor Division part no. 330205	931-0169-00
C7	CAPACITOR, FIXED, PAPER: 0.27 uf -10% $\pm 20\%$, 200 v dc	931-0307-00
L1	COIL, RADIO FREQUENCY: 2000 uh nom inductance, 27.5 ohms dc resistance, 0.1 amp current rating, James Millen Mfg. Co., Inc. part no. J301-2000	240-2547-00
L2	COIL, RADIO FREQUENCY: same as L1	240-2547-00
R1	RESISTOR, FIXED, COMPOSITION: 100 ohms $\pm 10\%$, 1/2 w; MIL type RC20GF101K	745-1310-00
R2	RESISTOR, FIXED, COMPOSITION: same as R1	745-1310-00
R3	RESISTOR, FIXED, COMPOSITION: 820 ohms $\pm 10\%$, 1/2 w; MIL type RC20GF821K	745-1349-00
R4	RESISTOR, FIXED, COMPOSITION: same as R1	745-1310-00
R5	RESISTOR, FIXED, COMPOSITION: same as R1	745-1310-00
R6	RESISTOR, FIXED, COMPOSITION: same as R1	745-1310-00
R7	RESISTOR, FIXED, COMPOSITION: same as R1	745-1310-00
R8	RESISTOR, FIXED, COMPOSITION: same as R3	745-1349-00
R9	RESISTOR, FIXED, COMPOSITION: same as R1	745-1310-00
R10	RESISTOR, VARIABLE, COMPOSITION: 1500 ohms $\pm 30\%$, 1/4 w	376-4506-00
R11	RESISTOR, FIXED, FILM: 619 ohms $\pm 1\%$, 1/2 w, MIL type RN70B6190F	705-7586-00
R12	RESISTOR, FIXED, FILM: same as R11	705-7586-00
R13	RESISTOR, FIXED, COMPOSITION: 390 ohms $\pm 10\%$, 1/2 w; MIL type RC20GF391K	745-1335-00
R14	RESISTOR, FIXED, COMPOSITION: 270 ohms $\pm 10\%$, 1/2 w; MIL type RC20GF271K	745-1328-00
R15	RESISTOR, FIXED, COMPOSITION: same as R13	745-1335-00
S1	SWITCH, LEVER: 3 pole, 3 position; 110 v ac, 1 amp 28 v dc, 2 amp Oak Mfg. Co. part no. 89077-N1	259-0986-00
S2	SWITCH, LEVER: 5 pole, 3 position; 110 v ac, 1 amp 28 v dc, 2 amp; Oak Mfg. Co. part no. 89078-J1	259-0987-00
S3	SWITCH, SLIDE: spdt, 1 amp at 125 ac-dc, 1-3/8 in. lg by 17/32 in. w 3 terminals two 0.146 in. dia mtg holes; Carling Electric, Inc. part no. S60B	260-2596-00
T1	TRANSFORMER, AUDIO FREQUENCY: 200 to 20,000 kc freq range; Stancor Electronics, Inc. part no. 28865	667-0325-00
T2	TRANSFORMER, AUDIO FREQUENCY: 200 to 20,000 kc freq. range; Stancor Electronics, Inc. part no. s 28849	667-0326-00
TB1	TERMINAL BOARD: bakelite, 3/32 in. by 5/8 in. 4-3/8 in. lg 9 screw type terminals; Cinch Mfg. Co. part no. 1790	306-0039-00
TB2	TERMINAL BOARD: phenolic, 1/16 in. by 3/8 in. by 1-1/2 in. 4 brass solder lug terminals; Cinch Mfg. Corp. part no. 1532-A	306-0932-00
TB3	TERMINAL BOARD: same as TB2	306-9032-00
TB4	TERMINAL BOARD: same as TB2	306-9032-00
TB5	TERMINAL BOARD: same as TB2	306-9032-00
TB6	TERMINAL BOARD: same as TB2	306-9032-00

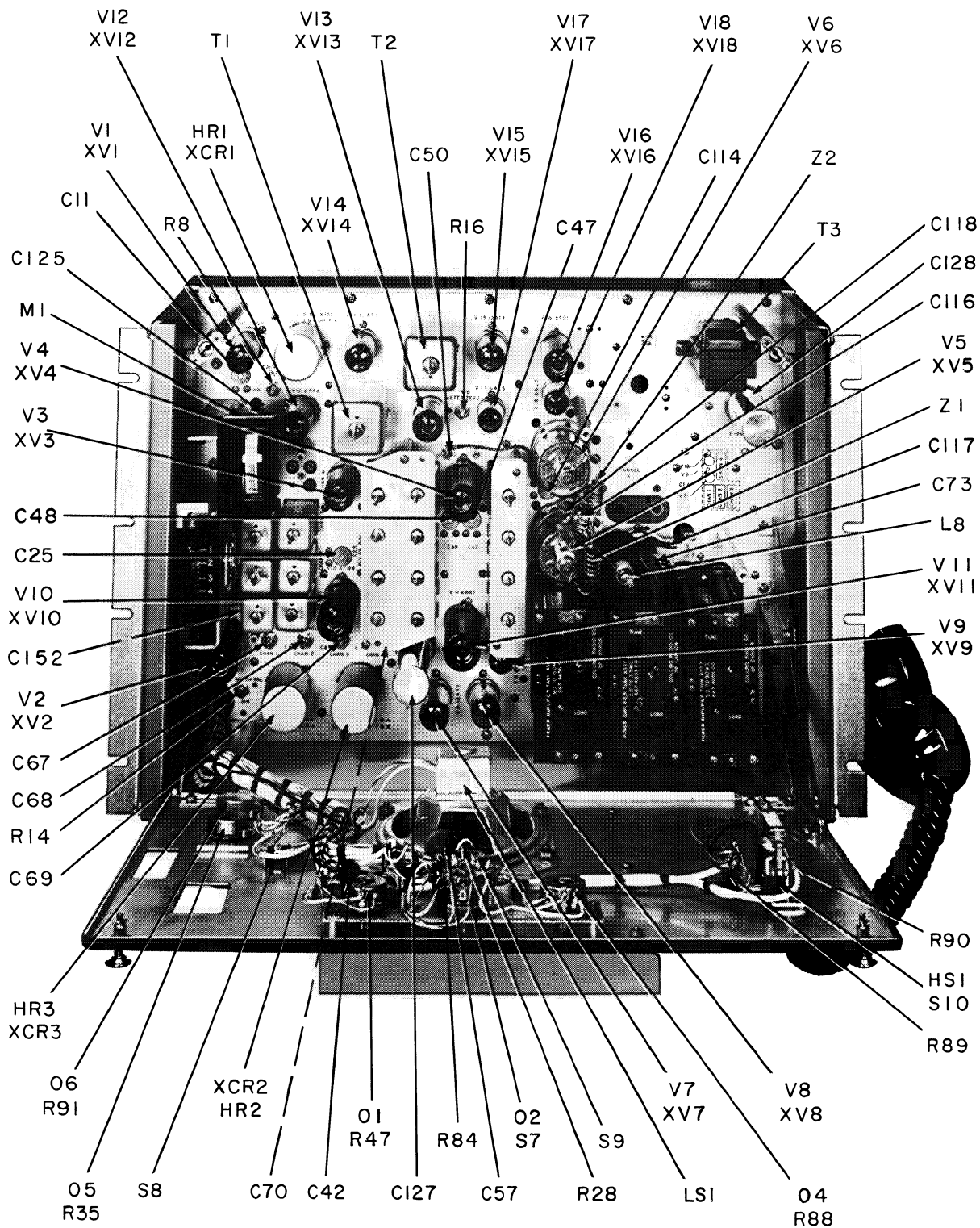


Figure 6-1. Transceiver 32RS-1, Front View, Front Panel Down

SECTION VI
Parts List

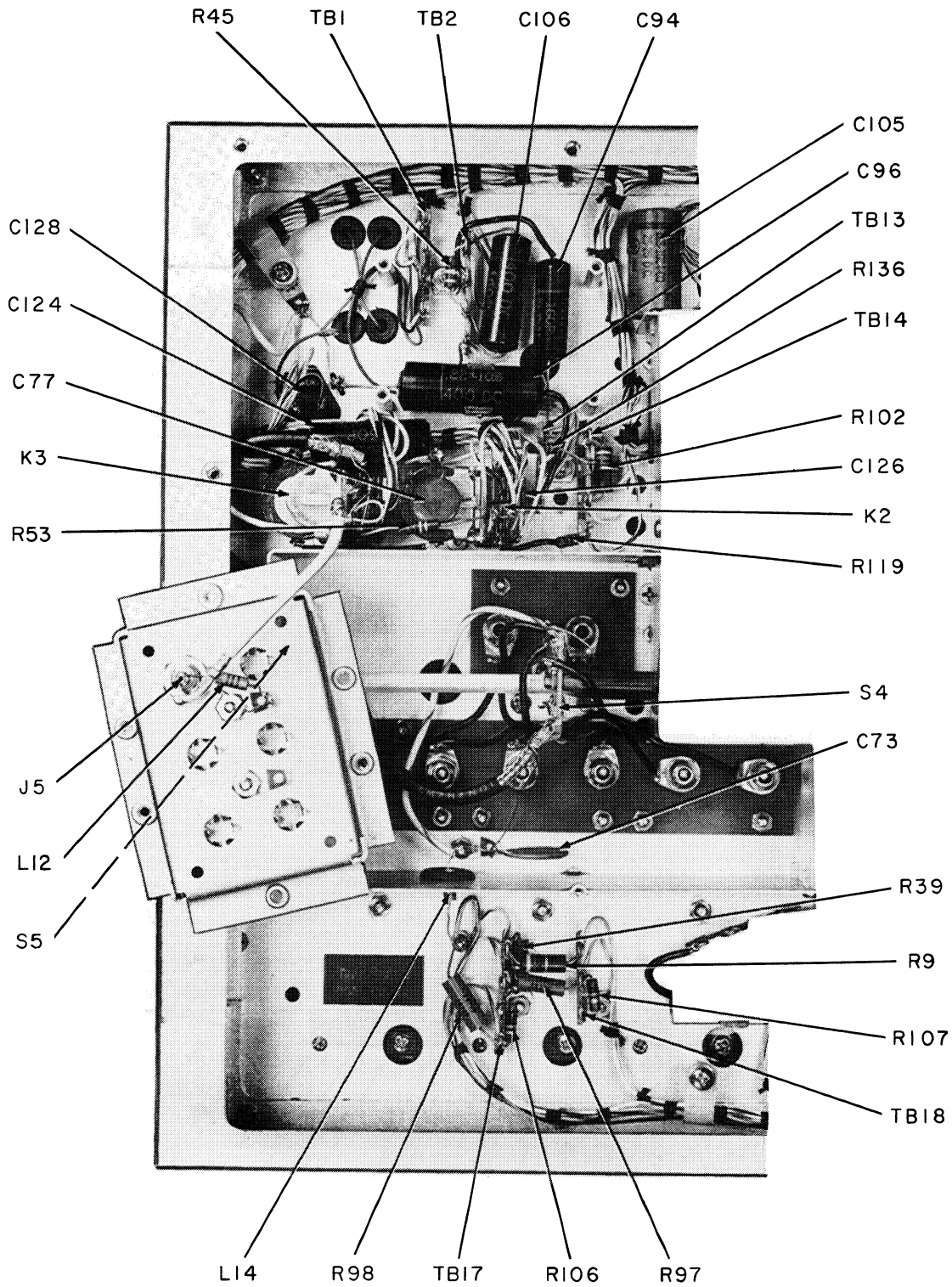


Figure 6-2. Left Side of Chassis

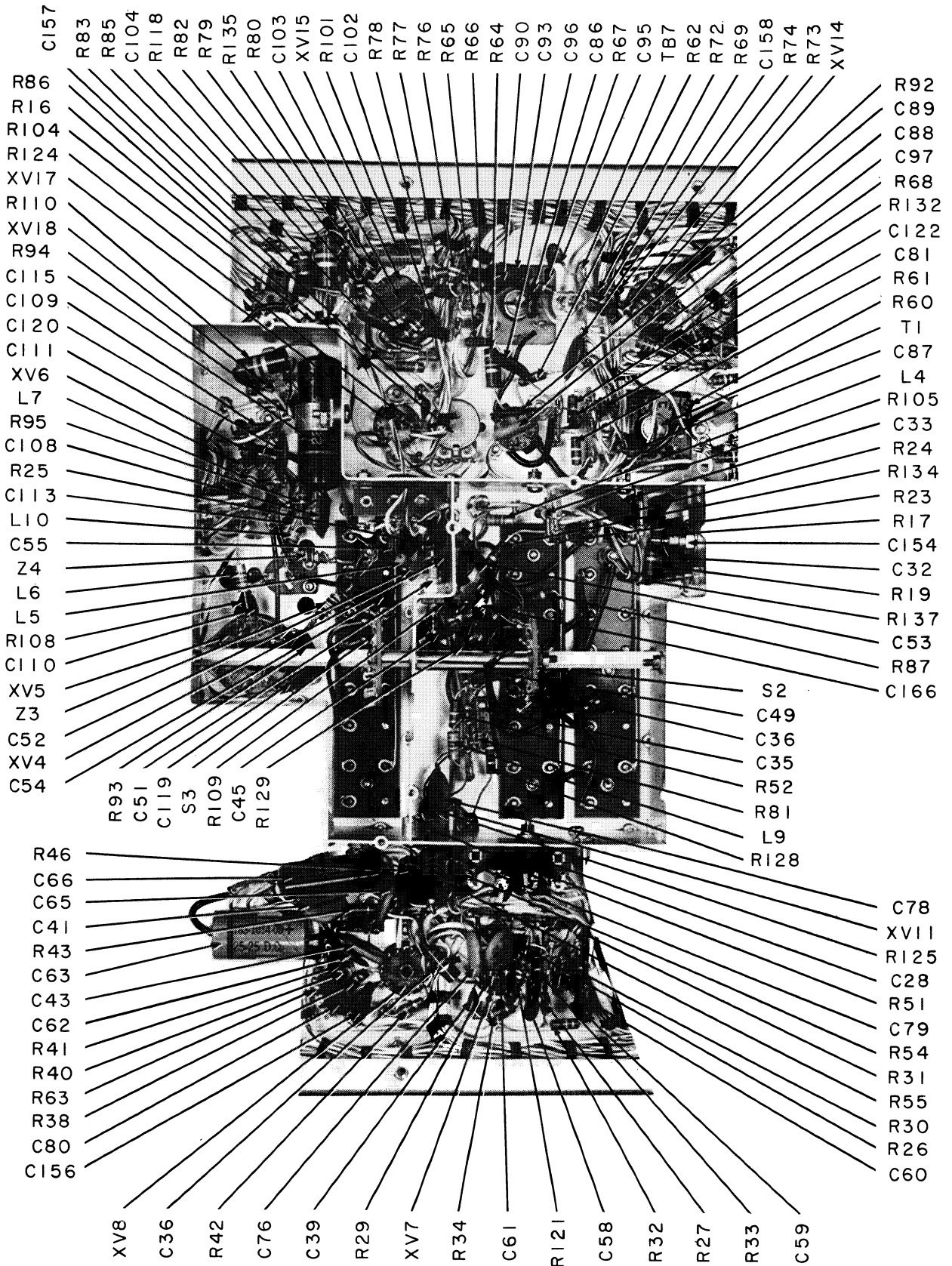


Figure 6-3. Center of Chassis

SECTION VI
Parts List

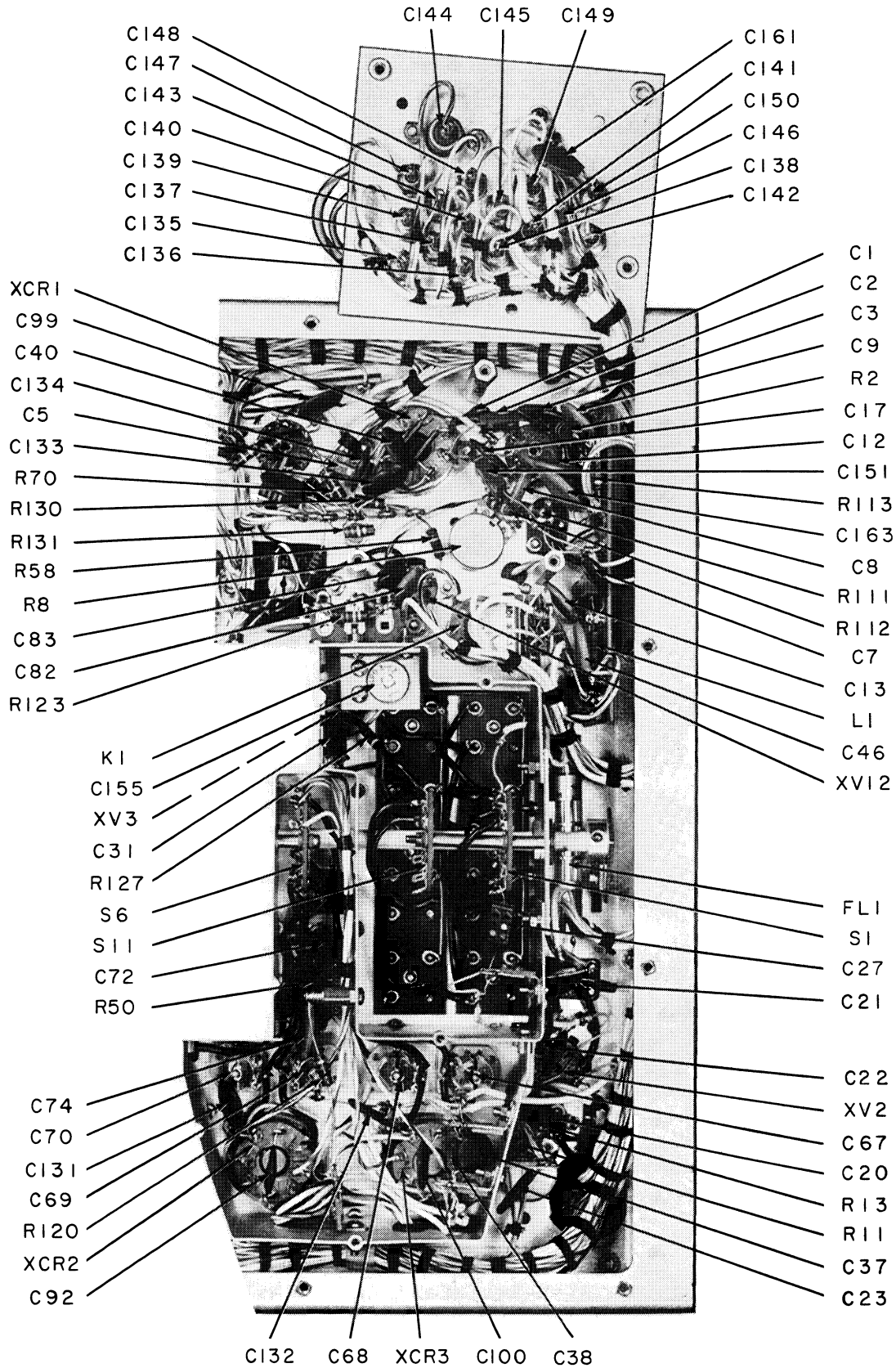


Figure 6-4. Right Side of Chassis

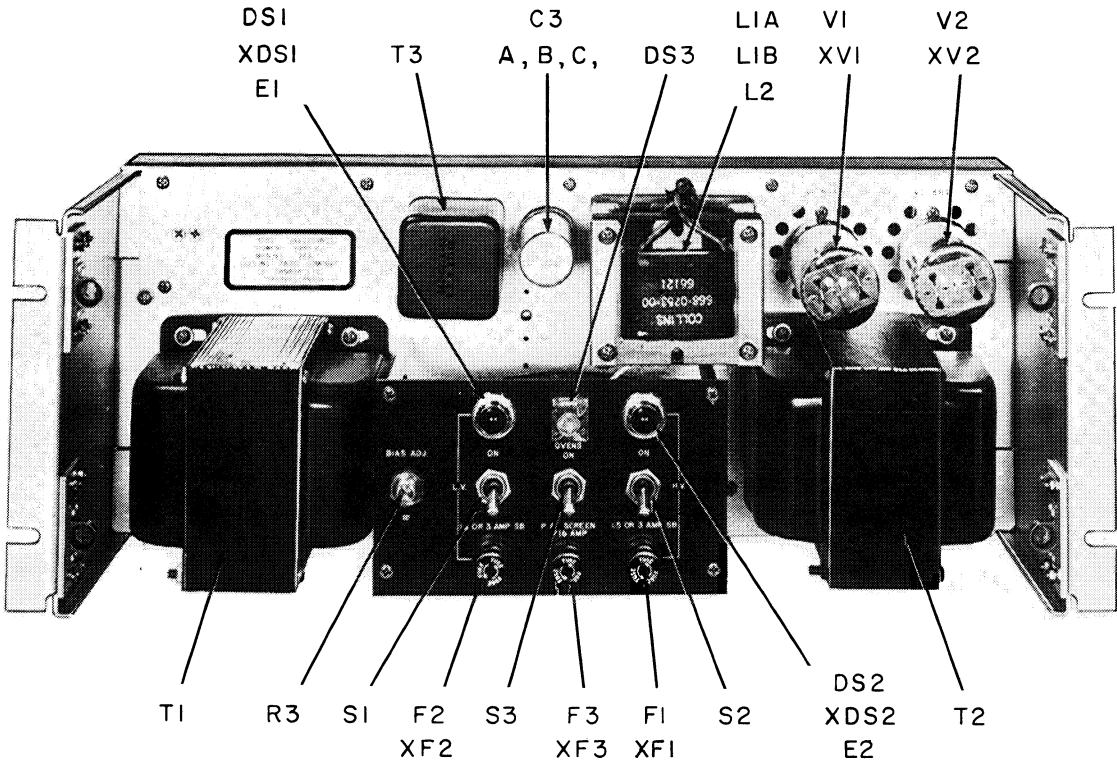


Figure 6-5. Power Supply, Front View, Cover Removed

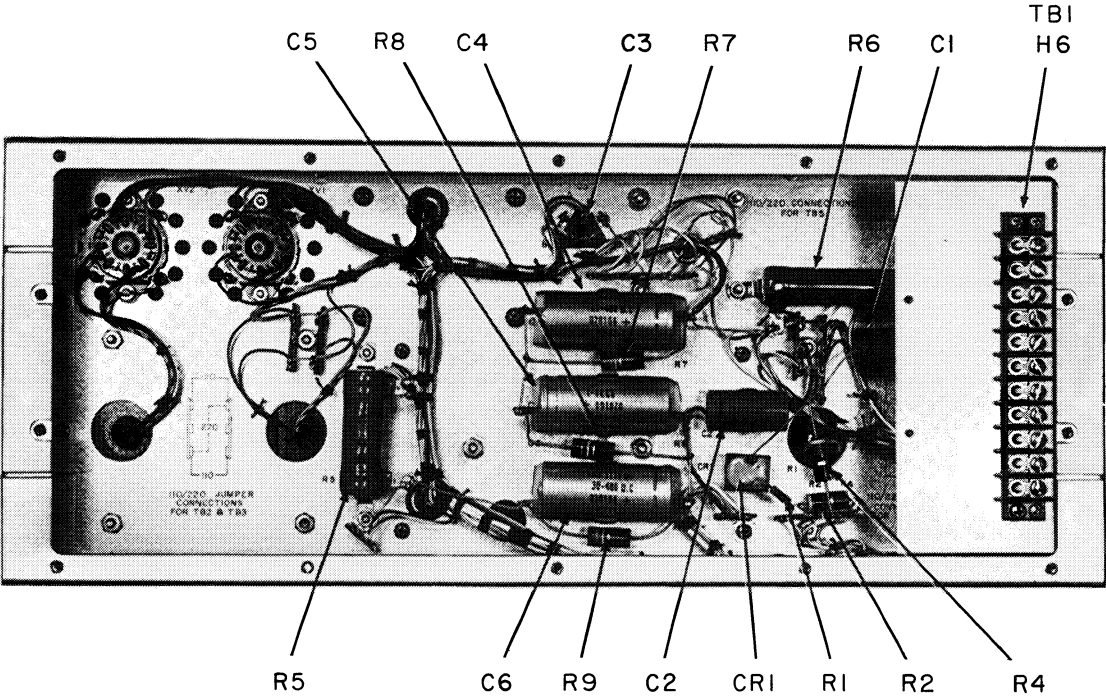
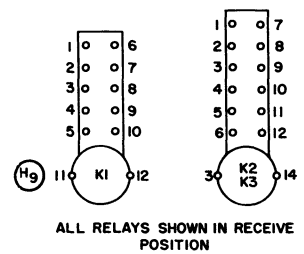
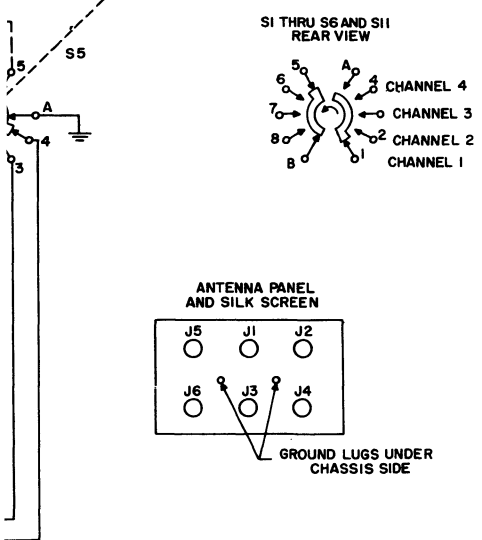
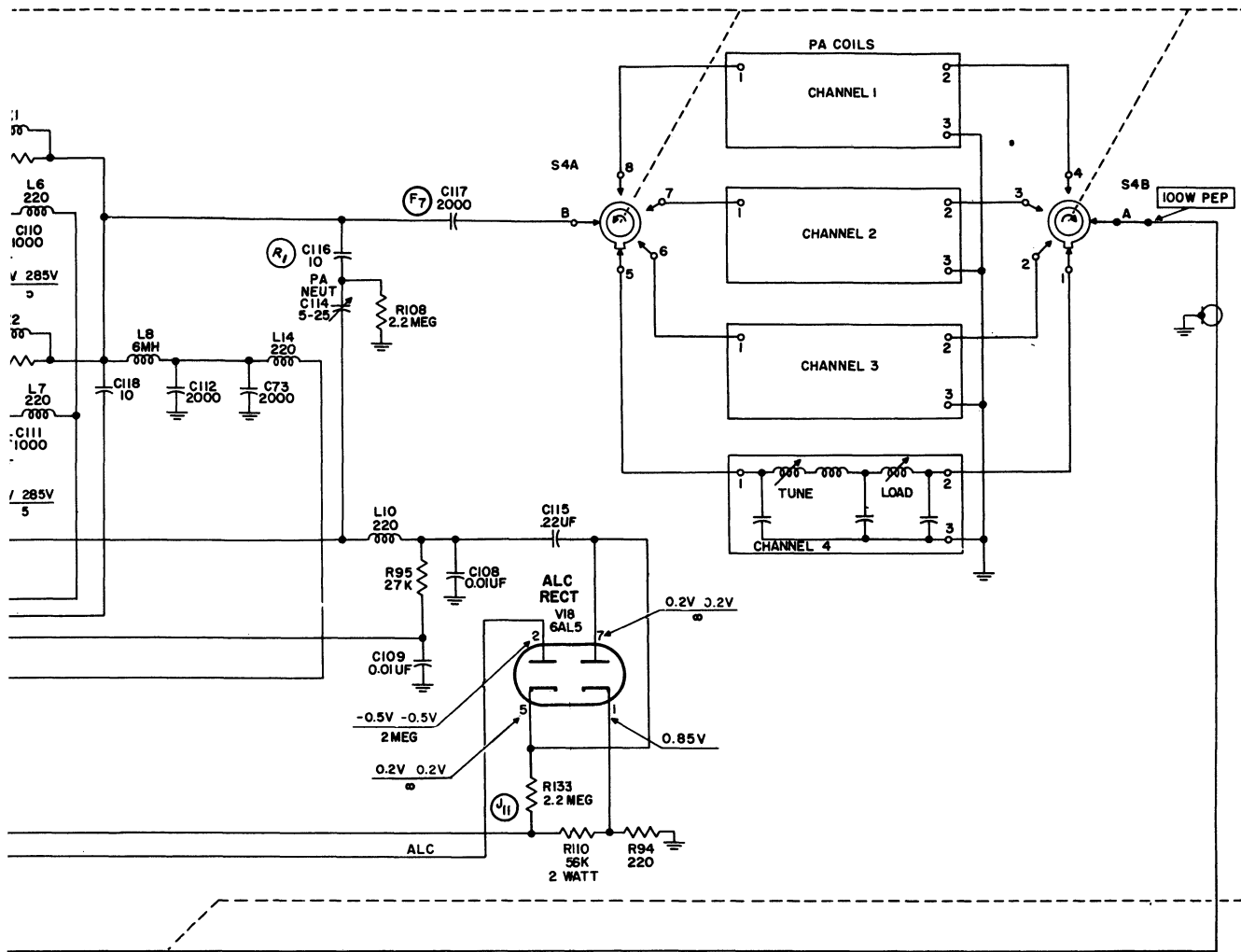


Figure 6-6. Power Supply, Rear View, Cover Removed

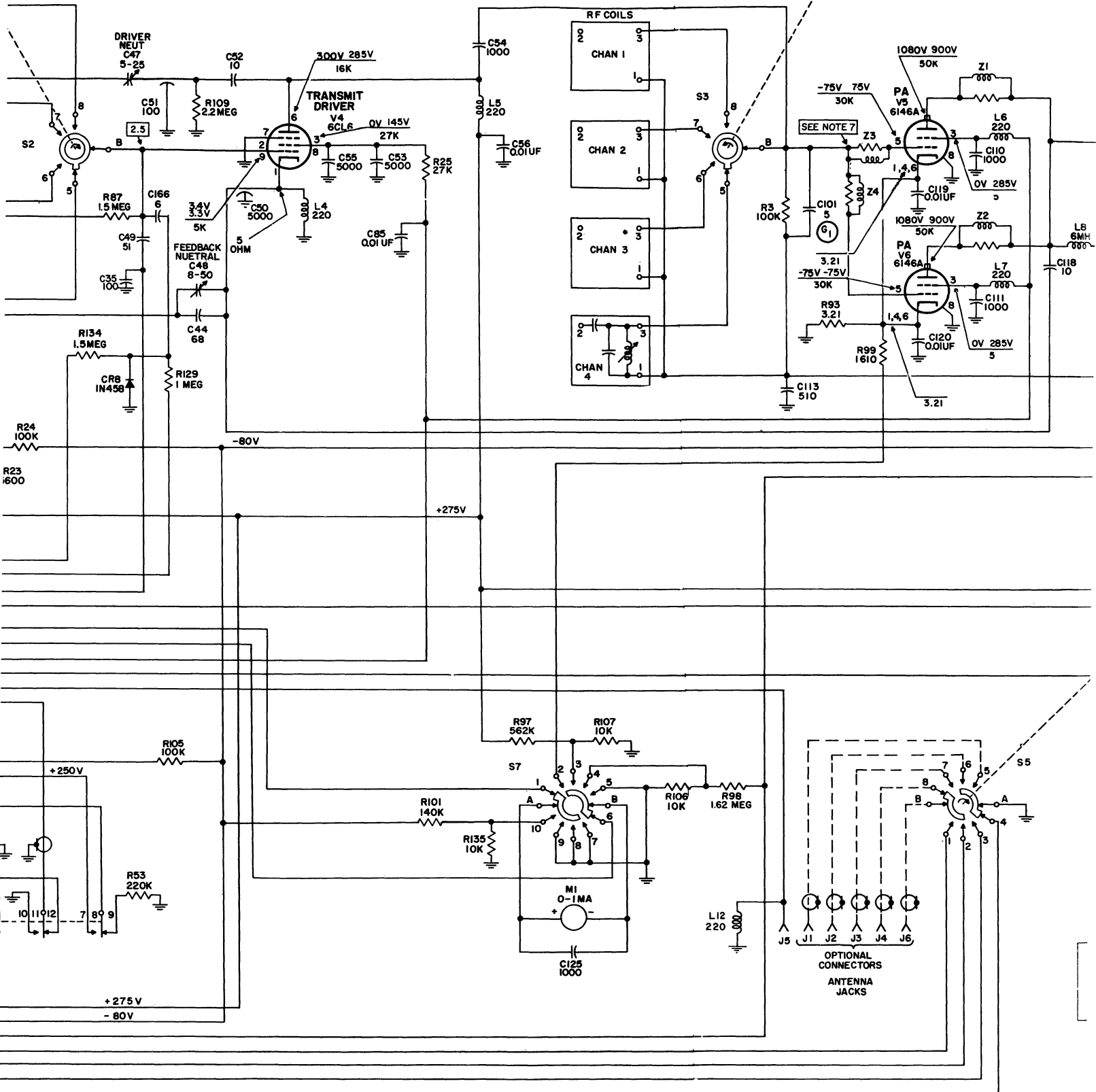
SECTION VII ILLUSTRATIONS



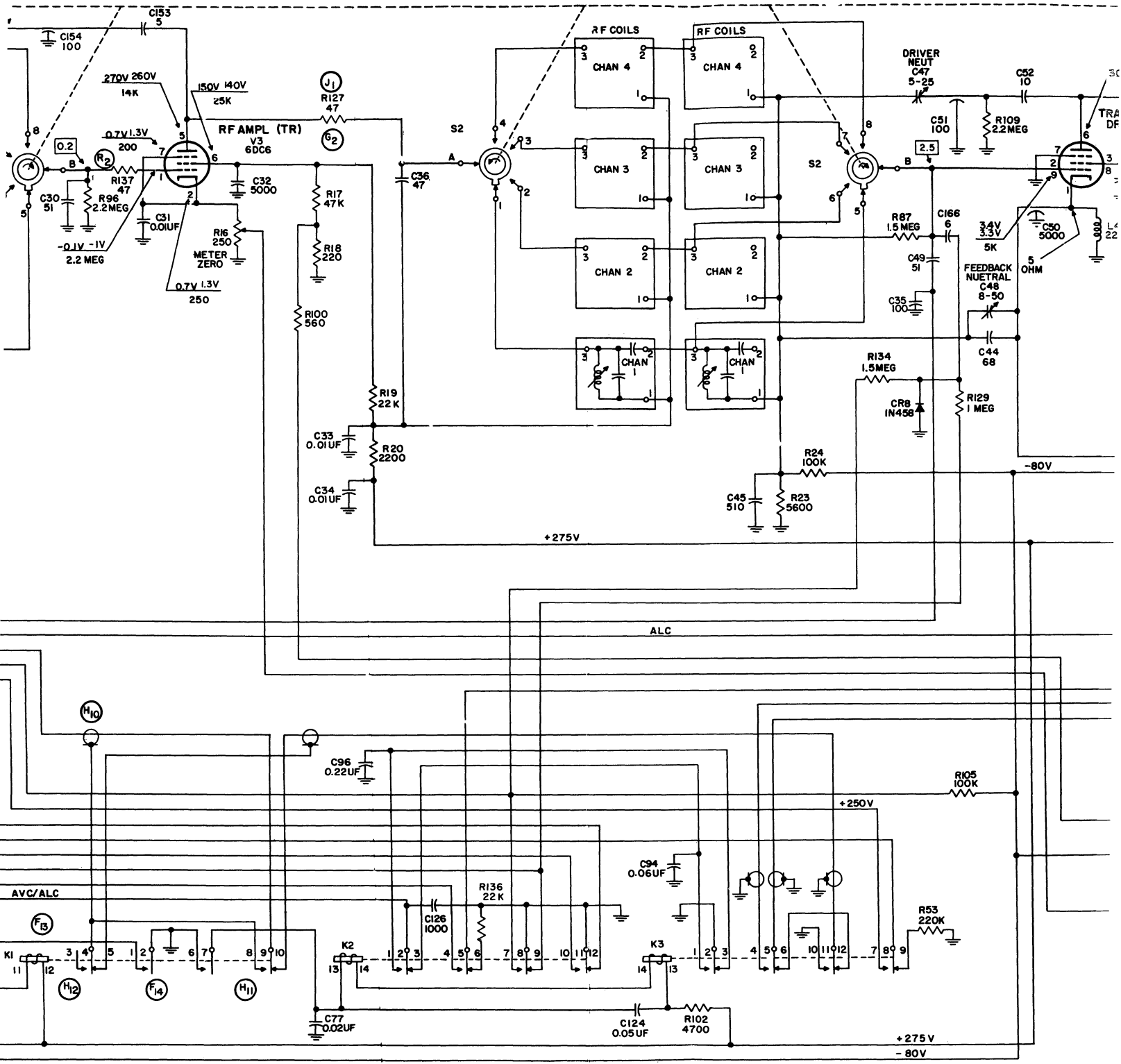
- NOTES:
1. RESISTANCE READINGS ARE BELOW LINE IN BLACK.
 2. VOLTAGE READINGS ARE ABOVE LINE IN RED AND BLACK; RED INDICATES TRANSMIT, BLACK INDICATES RECEIVE.
 3. ALL VOLTAGE AND RESISTANCE READINGS WERE TAKEN WITH A 20K OHM/VOLT METER; POWER DISCONNECTED FOR RESISTANCE READINGS, POWER ON FOR VOLTAGE READINGS. CONTROL KNOB SETTINGS AS FOLLOWS: VOX GAIN, FULL CCW; ANTI-TRIP, FULL CCW; METER SWITCH, PA CATH MA; RECEIVER AUDIO GAIN, 9 O'CLOCK POSITION; SPEAKER, OFF; TRANSMIT AUDIO, FULL CW; TUNE-OPERATE, OPERATE; HANDSET OFF CRADLE; ALL POWER SWITCHES ON.
 4. VOLTAGE AND RESISTANCE READINGS ARE NOMINAL AND WILL VARY FROM EQUIPMENT TO EQUIPMENT.
 5. APPROXIMATE GAIN PER STAGE VALUES IN RED BOXES ARE OBTAINED WITH 0.1V, 1500CPS SIGNAL INPUT TO C146 (ON REAR OF 32RS-1) AND J5 (ANTENNA TERMINAL) TERMINATED IN A 52 OHM LOAD.
 6. UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS, ALL INDUCTANCE VALUES ARE IN MICROHENRYS.
 7. VOLTAGE AT PA GRID IS 130 VOLTS WITH PA TUBES REMOVED AND 50 VOLTS WITH TUBES IN CIRCUIT.
 8. THE LOCATION AND SIZE OF C151 AND C159 IS CHOSEN DURING FINAL TEST TO PROVIDE BALANCED MODULATION.
 9. RECEIVER MIXER PLATE AND SCREEN VOLTAGES VARY WITH CHANNEL CRYSTAL ACTIVITY.

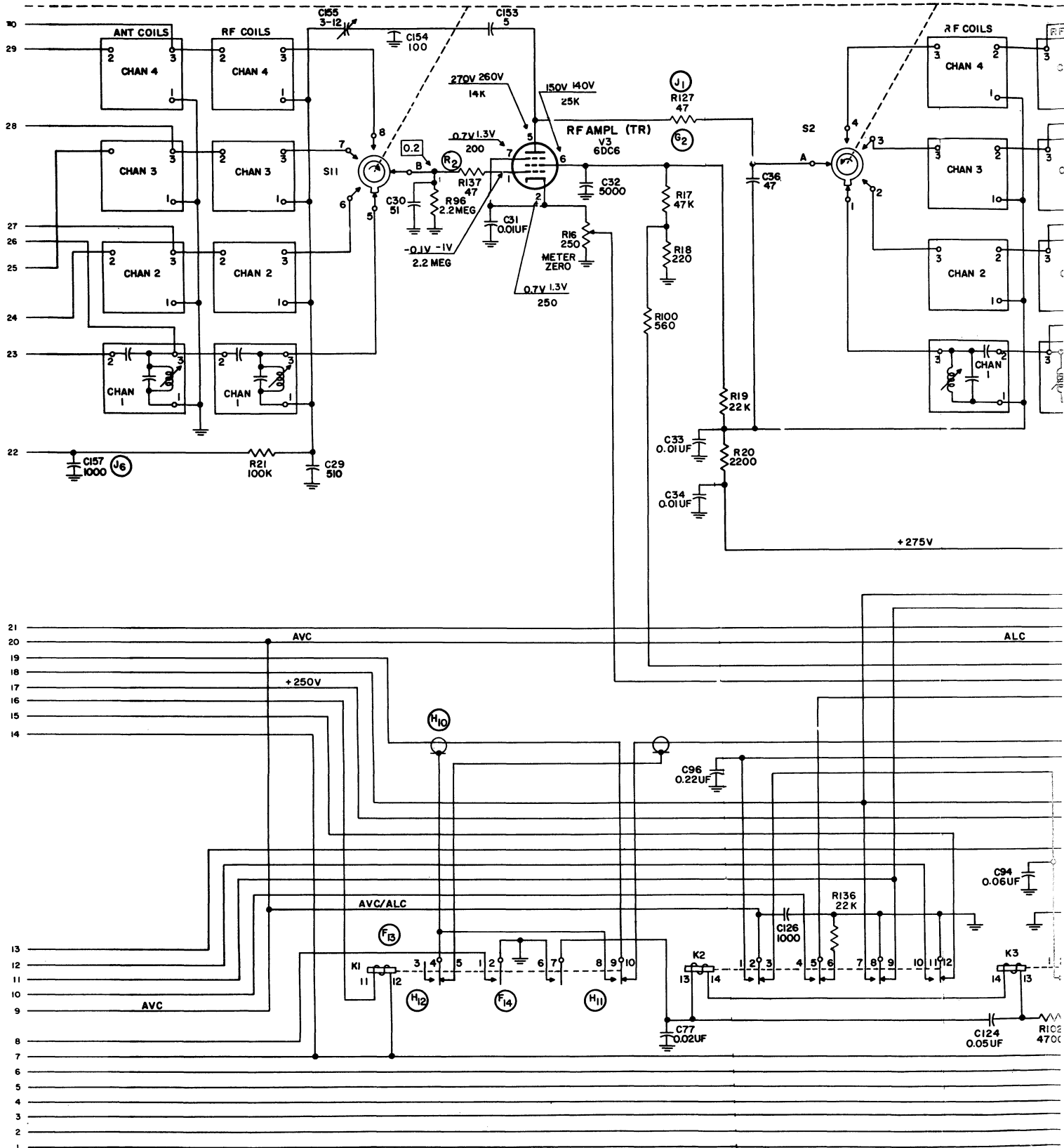
Figure 7-1. Over-all Schematic Diagram of 32RS-1

CHANNEL SELECTOR



OPTIONAL CONNECTORS
ANTENNA JACKS





SECTION VII ILLUSTRATIONS

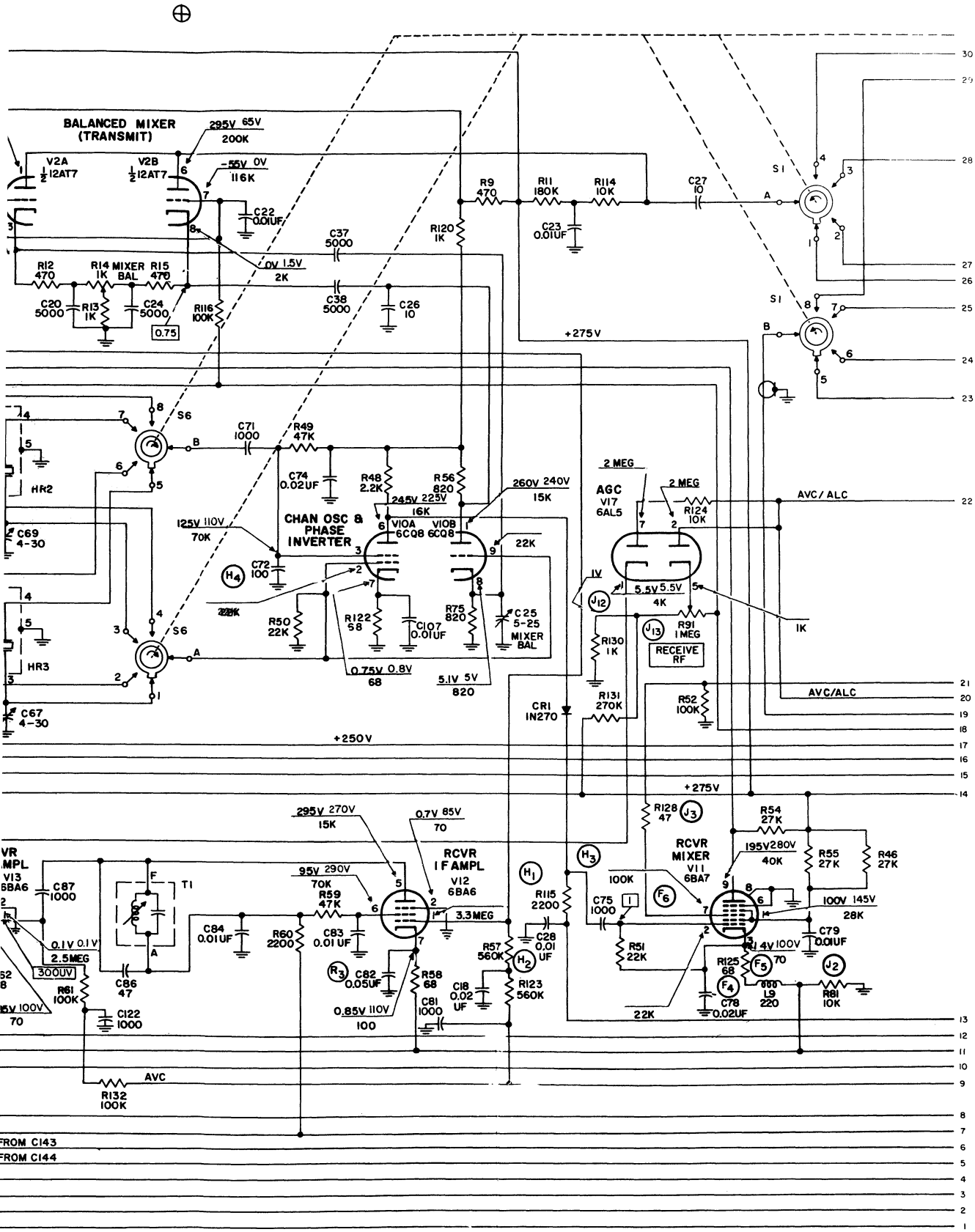
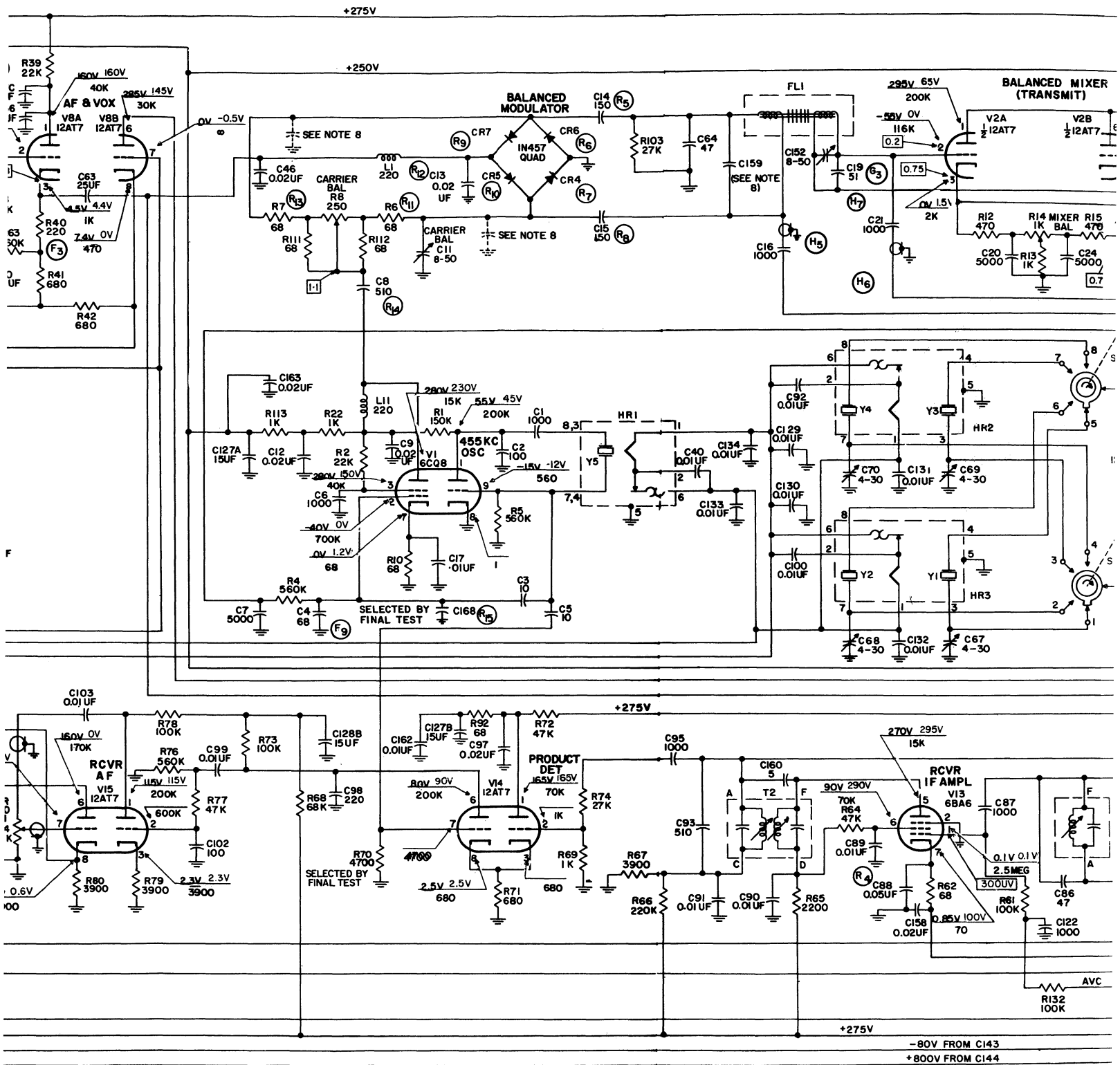
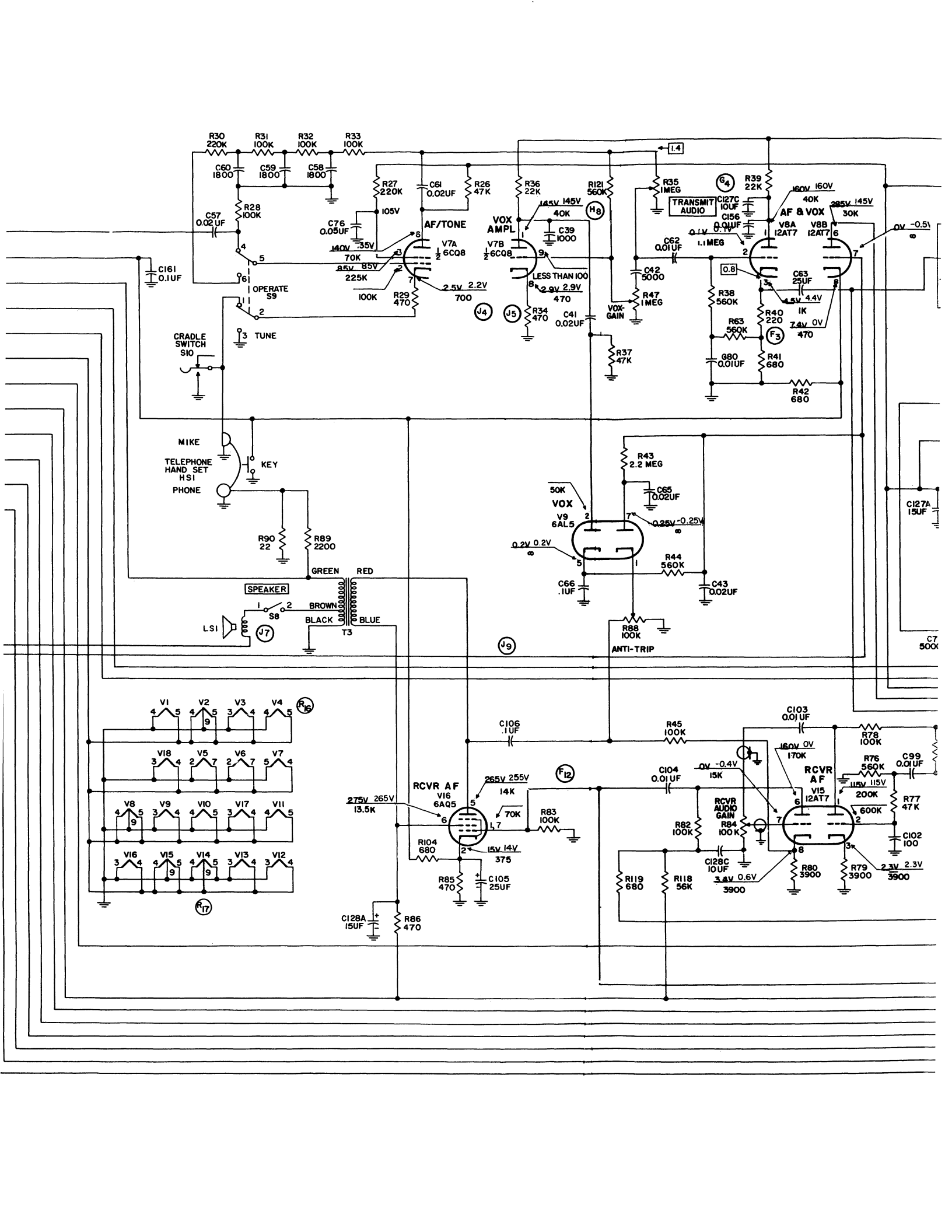
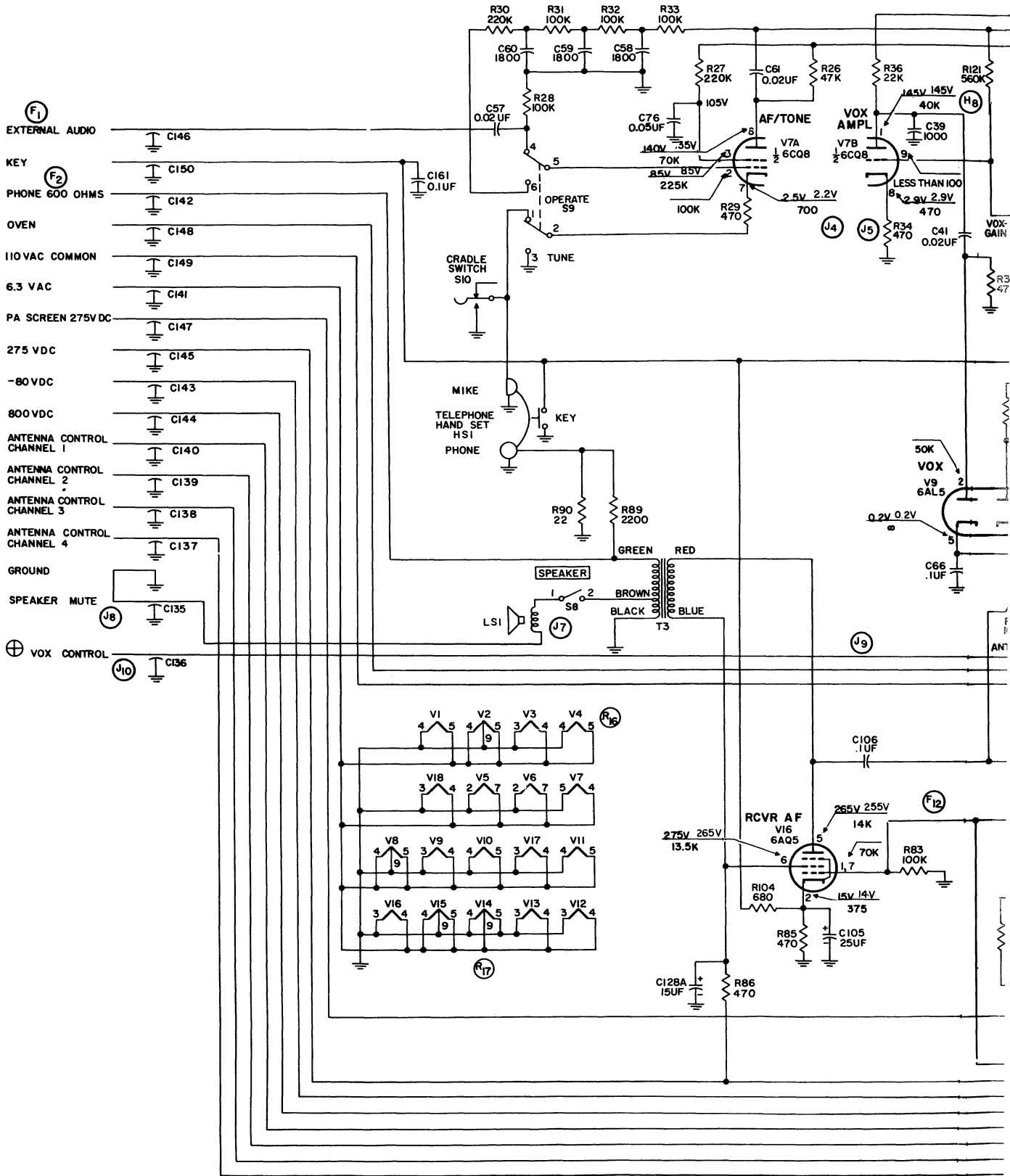


Figure 7-1. Over-all Schematic Diagram of 32RS-1







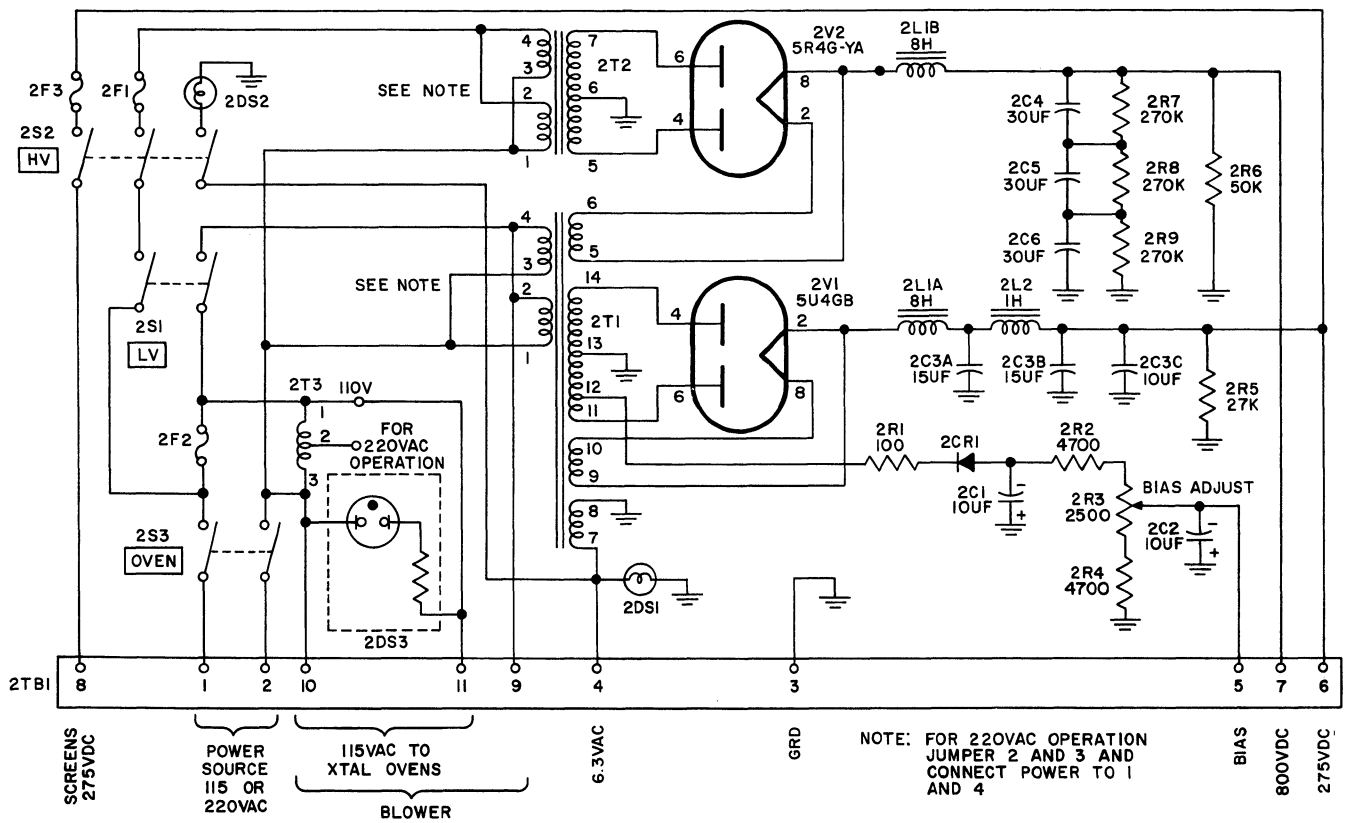


Figure 7-2. Power Supply, Schematic Diagram

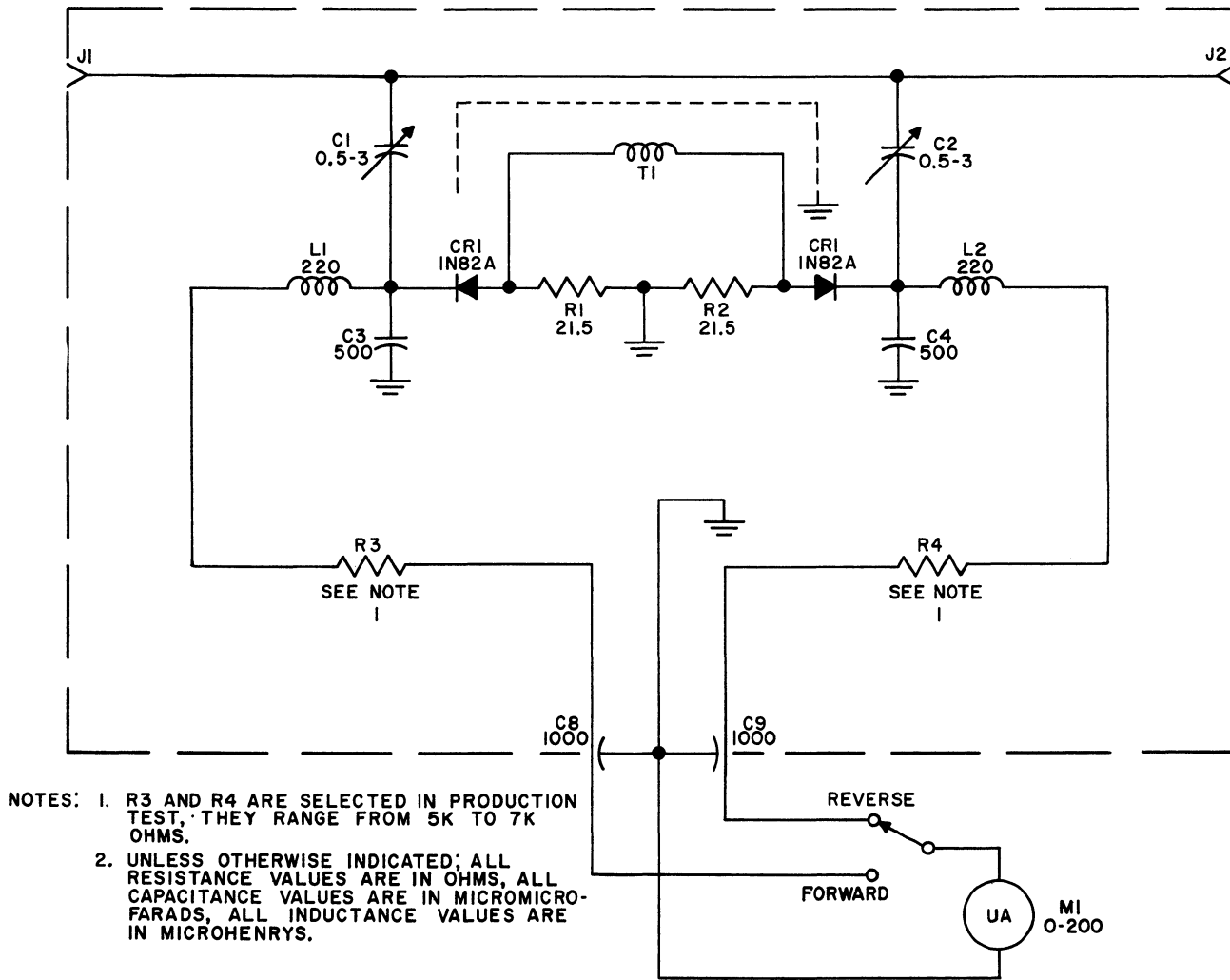


Figure 7-3. Directional Wattmeter 302E-2, Schematic Diagram

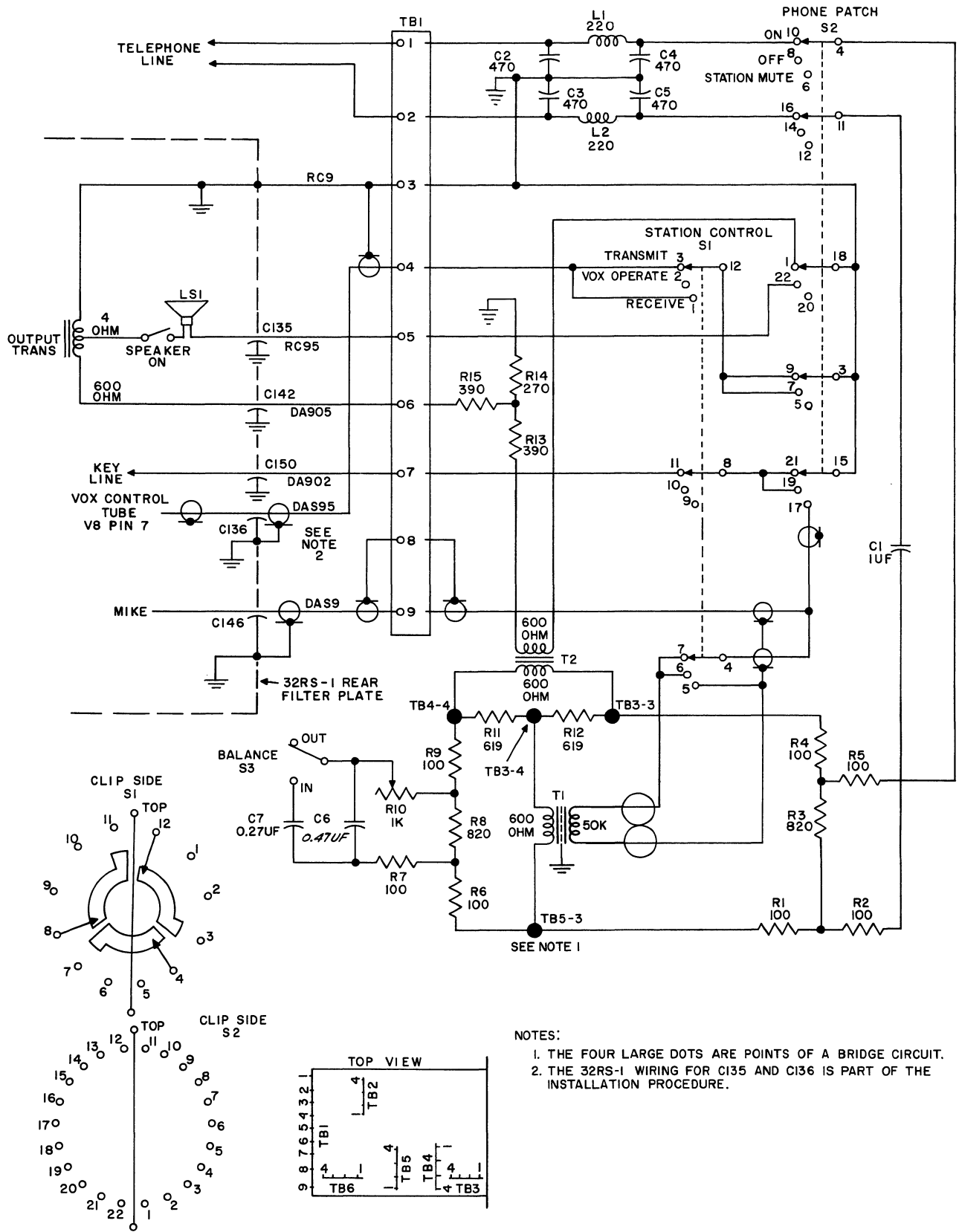


Figure 7-4. Phone Patch 152J-1, Schematic Diagram

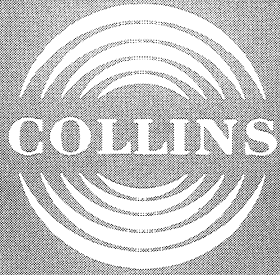
Electrical Wire Code

EXAMPLES:

DA 92	UNSHIELDED WIRE, POLYVINYL, NO. 22 AWG, WHITE WITH A RED TRACER			
	<u>D</u> Type of Wire	<u>A</u> Size of Wire	<u>9</u> Color of Body	<u>2</u> Color of Tracers
DAS 9123	SHIELDED WIRE (SINGLE) POLYVINYL, NO. 22 AWG, WHITE BODY WITH BROWN, RED AND ORANGE TRACERS			
	<u>D</u> Type of Wire	<u>A</u> Size of Wire	<u>S</u> Shielded	<u>9</u> Color of Body
				<u>123</u> Color of Tracers
DASJ (9) (92)	SHIELDED AND JACKETED WIRE (MULTIPLE), POLYVINYL, NO. 22 AWG, WHITE AND WHITE WITH RED TRACER			
	<u>D</u> Type of Wire	<u>A</u> Size of Wire	<u>SJ</u> Shielded and Jacketed	<u>(9)</u> First Conductor
				<u>(92)</u> Second Conductor
A2A 91	UNSHIELDED WIRE, IRRADIATED POLYOLEFIN, NO. 22 AWG, WHITE WITH BLACK TRACER			
	<u>A2</u> Type of Wire	<u>A</u> Size of Wire	<u>9</u> Color of Body	<u>1</u> Color of Tracer

TYPE OF WIRE CODE		SIZE OF WIRE		COVERING OF WIRE	COLOR CODE	
CODE	DESCRIPTION	CODE	SIZE		CODE	TYPE
A	Cotton Braid Over Plastic	A	No. 22 AWG		0	Black
A2	Irradiated Modified Polyolefin, (300 Volts)	B	No. 20		1	Brown
A3	Irradiated Modified Polyolefin, (600 Volts)	C	No. 18		2	Red
A4	Irradiated Modified Polyolefin, (1000 Volts)	D	No. 16		3	Orange
A5	Irradiated Modified Polyolefin, (3000 Volts)	E	No. 14		4	Yellow
B	Buswire, Round Tinned	F	No. 12		5	Green
C	Polyvinyl Chloride, MIL-W-16878, Type B (600 Volts) (No. 20-18-16)	G	No. 10		6	Blue
D	Polyvinyl Chloride, MIL-W-16878, Type B (600 Volts) (No. 22-26-28)	H	No. 8		7	Violet
E	Vinyl, MIL-W-5086, Type I (600 Volts)	J	No. 6		8	Gray (Slate)
E2	Vinyl, MIL-W-5086, Type II (600 Volts) (No. 22-12) Note 1	K	No. 4		9	White
E3	Vinyl, MIL-W-5086, Type II (600 Volts) (No. 0000-10) Note 2	L	No. 2		a	Clear
E4	Vinyl, MIL-W-5086, Type III (600 Volts) (No. 12-22) Note 3	M	No. 1		b	Tan
E5	Vinyl, MIL-W-5086, Type III (600 Volts) (No. 0000-10) Note 4	N	No. 0		c	Pink
G		P	No. 00		d	Maroon
H	Kel-F (Monochlorotrifluoroethylene)	Q	No. 000		e	Light Green
I	Not Available	R	No. 0000	S	f	Light Blue
J		T	No. 28			
K	Neon Sign Cable (15,000 Volts)	V	No. 26	SJ		
L	Silicone, MIL-W-16878, Type FF (600 Volts)	W	No. 24			
L2	Silicone, MIL-W-16878, Type FFW (1000 Volts)	X	No. 19			
L3	Silicone, Non-MIL (5000 Volts)	Y	No. 30			
L4	Silicone, Non-MIL (10,000 Volts)	Z				
L5	Silicone, Non-MIL (15,000 Volts)					
M						
N	Single Conductor Stranded (Non-Rubber)					
O	Not Available					
P	Single Conductor Stranded (Rubber Covered)					
Q						
R	Polyvinyl Chloride, MIL-W-16878, Type C (1000 Volts)					
S	Not Available					
T	Teflon (TFE), MIL-W-16878, Type E (600 Volts) Stranded					
U	Not Available					
V	Polyvinyl Chloride, MIL-W-16878, Type D (3000 Volts)					
W	Teflon (TFE), MIL-W-16878, Type EE (1000 Volts)					
X	Teflon (TFE), MIL-W-16878, Type ET (250 Volts)					
X2	Teflon (FEP), MIL-W-16878, Type K (600 Volts)					
X3	Teflon (FEP), MIL-W-16878, Type KT (250 Volts)					
X4	Teflon (TFE), Non-MIL (3000 Volts)					
Y	Telephone Type, Polyvinyl					
Y1	Teflon (TFE), Non-MIL; Solid Conductor					
Z	Telephone Type, Braided Yarn					

- Note 1 - Extruded nylon over fiber glass braid.
- Note 2 - Braided, lacquered nylon over fiber glass braid.
- Note 3 - Extruded nylon over secondary vinyl over fiber glass over primary vinyl.
- Note 4 - Lacquered extruded nylon over secondary vinyl over fiber glass over primary vinyl.



A-1 General

This appendix is intended for and applicable only to Instruction Book 523-1000-062009249 when supplied with Transceiver 32RS-1D.

A-2 Transceiver 32RS-1D

Transceiver 32RS-1D is intended only for voice communication and RTTY operation provided the upper tone frequency is not higher than 2.3 kHz. Transceiver 32RS-1D is similar to transceiver 32RS-1C, differing only in the reduced IF bandwidth to 2.3 kHz, conforming to the Canadian Department of Transport Regulations, RSS 122 and RSS 123 and FCC Rules and Regulations.

A-3 Changes to Instruction Book

Changes to Instruction Book are as follows:

Section II	Table 2-1, page 6.	
	Delete the following:	
	9.0-12.0 Mc. Coil Kit part number and all associated coil part numbers.	
	Add the following:	
	9.0-10.4 MC	
	Plug-in Coil Kit	Part Number 567-5359-001
	Antenna Coil	Part Number 567-5352-001
	First RF Coil (2 required)	Part Number 567-5353-001
	Plate Coil RF	Part Number 567-5354-001
	Coil RF	Part Number 543-4349-00
	Coil PA	Part Number 567-4656-00
	10.4-12.0 Mc	
	Plug-in Coil Kit	Part Number 567-5360-001
	Antenna Coil	Part Number 567-5356-001
	First RF Coil (2 required)	Part Number 567-5357-001
	Plate Coil RF	Part Number 567-5358-001
	Coil RF	Part Number 543-4349-00
	Coil PA	Part Number 567-4656-00

Section VI	Parts List, page 24.	
	Delete: C30 -----	912-0472-00
	Add: C30, CAPACITOR, FIXED, MICA:	912-0460-00
	36 pf, $\pm 2\%$, 500 V d-c	
	Delete: C36 -----	912-0469-00
	Add: C36, CAPACITOR, FIXED, MICA:	912-0457-00
	33 pf, $\pm 2\%$, 500 V d-c	
	Delete: C49 -----	912-0472-00
	Add: C49, CAPACITOR, FIXED, MICA:	912-0460-00
	36 pf, $\pm 2\%$, 500 V d-c	
	Delete: C50 -----	913-3549-00
	Add: C50, CAPACITOR, FIXED, MICA:	913-4114-00
	5, 100 pf, $\pm 20\%$, 500 V d-c	
	Add the following below CR8:	
	CR9, SEMICONDUCTOR DEVICE, DIODE:	353-3220-00
	Zener voltage regulator IN963A	
Section VI	Parts List, page 25.	
	Delete: C72 -----	912-0493-00
	Add: C72, CAPACITOR, FIXED, CERAMIC:	928-4060-00
	100 pf, $\pm 5\%$, 500 V d-c	
Section VI	Parts List:	
	Add the following:	
	C167 CAPACITOR, FIXED, MICA:	913-5015-030
	thru 15 pf	
	C169 $\pm 2\%$ 500 V d-c	
Section VI	Delete: FL1 -----	526-9365-00
	Add: FL1 FILTER MECHANICAL:	526-9395-00
	453.55 kHz operating frequency,	
	2.3 kHz bandwidth, 100 k ohms,	
	input and output	
Section VI	Parts List, page 26.	
	Delete: K1 -----	972-1353-00
	Add: K1, RELAY ARMATURE: 3A 2C	972-1560-00
	Contacts 250 V d-c, 100 ma or	
	115 V d-c 300 ma. Coil 4,000	
	ohms 6 ma	

Section VII Make the following changes:

Figure 7.1 Change value of C30, 51 pf to 36 pf

Sheet 1 Change value of C36, 47 pf to 33 pf

Change value of C49, 51 pf to 36 pf

Change value of C50, 5,000 to 5,100 pf

Add: C167 15 pf across C30

Add: C168 15 pf across C49

Add: C169 15 pf across C36

Add: CR9 IN963A across C29, with cathode to ground

Section VII Make the following changes:

Figure 7.1 Break the line connecting R28, V2B pin 6 and C89

Sheet 1 Add: a set of open contacts across the break

Designate the contacts as follows:

Add: K1 to denote the relay

Add: 13 to denote relay contact at the junction of R28 and V2B
pin 6

Add: 12 to denote relay contact connecting C89

